Datex-Ohmeda

S/5™ Anesthesia Monitor and S/5™ Critical Care Monitor

Technical Reference Manual

All specifications are subject to change without notice.

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S/5 Anesthesia Monitor

Intended purpose

The Datex-Ohmeda S/5 Anesthesia Monitor with L-ANE01 or L-ANE01A software is intended for multiparameter monitoring with optional patient care documentation.

Indications for use

The Datex-Ohmeda S/5 Anesthesia Monitor with L-ANE01 or L-ANE01A software is indicated for monitoring of hemodynamic (including arrhythmia and ST segment analysis), respiratory, ventilatory, gastrointestinal/regional perfusion and neurophysiological status of all hospital patients.

The software is also indicated for documenting patient care related information.

The S/5 Anesthesia Monitor with L-ANE01 or L-ANE01A software is indicated for use by qualified medical personnel only.

S/5 Critical Care Monitor

Intended purpose

The Datex-Ohmeda S/5 Critical Care Monitor with L-ICU01 or L-ICU01A software is intended for multiparameter patient monitoring. The monitor is indicated for monitoring of hemodynamic (including arrhythmia and ST segment analysis), respiratory, ventilatory, gastrointestinal/regional perfusion and neurophysiological status of all hospital patients. The system is indicated for use by qualified medical personnel only.

Classifications

In accordance with IEC 60601-1

CLASS I EQUIPMENT - the type of protection against electric shock.

TYPE BF or CF equipment. The degree of protection against electric shock is indicated by a symbol on each parameter module.

EQUIPMENT not suitable for use in the presence of a FLAMMABLE ANESTHETIC MIXTURE WITH AIR OR WITH OXYGEN OR NITROUS OXIDE.

CONTINUOUS OPERATION according to the mode of operation.

In accordance with IEC 60529

Degree of protection against the harmful ingress of water as detailed in the IEC 60529: IPX0

In accordance with EU Medical Device Directive

The Datex-Ohmeda S/5 Anesthesia Monitor and S/5 Critical Care Monitor are classified as IIb.

Responsibility of the manufacturer

Datex-Ohmeda Division, Instrumentarium Corp. is responsible for the safety, reliability and performance of the equipment only if:

– assembly, operations, extensions, readjustments, modifications, service and repairs are carried out by personnel authorized by Datex-Ohmeda.

– the electrical installation complies with appropriate requirements.

– the equipment is used in accordance with the User's Guide.

– the system is serviced, maintained and used in accordance with the Technical Reference Manual.

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Datex-Ohmeda S/5™ Anesthesia Monitor and Critical Care Monitor

Technical Reference Manual, 8002783
Folder #1(2), PART I, General Service Guide

Document No.	Updated	Updated	Description	
8002783			Introduction, System description, Installation, Interfacing, Functional check, General troubleshooting	**1**
8002949			Planned Maintenance Instructions	**2**

PART II, Product Service Guide

8001003 - 1			8-Module Frame, F-CU8	**1**
8002818			CPU Board, B-CPU4 Software Cards, L-ANE01, L-ANE01A, L-ICU01, L-ICU01A	**2**
8001022 - 1			UPINET Board, B-UPI4NET	**3**
8001004 -1			Displays, D-VMC15, D-VHC17, LCD Display, D-LCC15, Display Controllers, B-DISP, B-DVGA	**4**
8001589 -1			Command Bars, K-ANEB, K-ICUB, Remote Controller, K-REMCO	**5**
8001005 - 1			Airway Modules, G-AiOV, G-AiO, G-AOV, G-AO, Gas Interface Board, B-GAS	**6**
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S/5™ Modules

Technical Reference Manual

Folder #2(2)

**For S/5™ Compact Anesthesia Monitor and Compact Critical Care Monitor
specific information see 8002782 Folder #1(2),
PART I, General Service Guide
and PART II, Product Service Guide**

**For S/5™ Anesthesia Monitor and Critical Care Monitor
specific information see 8002783 Folder #1(2),
PART I, General Service Guide and
PART II, Product Service Guide**

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S/5™ Anesthesia Monitor and S/5™ Critical Care Monitor

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1   INTRODUCTION

The Datex-Ohmeda S/5 Anesthesia Monitor is a modular multiparameter patient monitor used during anesthesia in operating rooms.

The Datex-Ohmeda S/5 Critical Care Monitor provides a full patient profile throughout the care period.

The modular design provides a flexible system that is easy to upgrade. In addition to parameter changes, the modularity includes an easy upgrade to anesthesia record keeping, monitor networking and interfacing with other external devices.

Figure 1   S/5 AM with D-VMC15 monitor and S/5 CCM with D-LCC15

1.1   Notes to the reader

This Technical Reference Manual is intended for service personnel and engineers who will perform service and maintenance procedures on the Datex-Ohmeda S/5 Anesthesia Monitor and the Datex-Ohmeda S/5 Critical Care Monitor.

This Technical Reference Manual is divided into two parts and into two different folders:

- Document number 8002783 is the main document and also order number for the whole printed manual. This manual includes Technical Reference Manual Slots and every slot has own document number.

- Part I gives the reader an overview of the S/5 Anesthesia Monitor and S/5 Critical Care Monitor and all monitor specific components e.g. Central Unit and Video Displays. This part of the manual also contains the information needed to installing, interfacing and troubleshooting monitors. Instructions for service procedures; functional check and planned maintenance are also included. Read the manual through and make sure that you understand the procedures described before installation of the monitor. To avoid risks concerning safety or health, strictly observe the warning indications. If you need any assistance concerning the installation, please do not hesitate to contact your authorized distributor.

- Part II gives detailed descriptions of each component of the S/5 monitors e.g. parameter modules and different boards. Service check for each product is included in these slots.

The manufacturer reserves the right to change product specifications without prior notice. Although the information in this manual is believed to be accurate and reliable, the manufacturer assumes no responsibility for its use.

Datex-Ohmeda assumes no responsibility for the use or reliability of its software in equipment that is not furnished by Datex-Ohmeda.

1.1.1 Related documentation

S/5 Anesthesia Monitor

For more specific information about the clinical aspects and technical background refer to:

S/5 Anesthesia Monitor, User's Guide
S/5 Anesthesia Monitor, User's Reference Manual

Circuit diagrams, component layout pictures, etc.: Schematic Diagrams

For more specific information about other devices closely related to the S/5 Anesthesia Monitor refer to:

Central, User's Reference Manual
S/5 Record Keeping, User's Reference Manual

S/5 Critical Care Monitor

For more specific information about the clinical aspects and technical background refer to:

S/5 Critical Care Monitor, User's Guide
S/5 Critical Care Monitor, User's Reference Manual

Circuit diagrams, component layout pictures, etc.: Schematic Diagrams

For more specific information about other devices closely related to the S/5 Critical Care Monitor refer to:

Central, User's Reference Manual
CS/3 Arrhythmia Workstation, User's Reference Manual

1.1.2 Conventions used

Throughout this manual, the following conventions are used to distinguish procedures or elements of text:

Sign the check form after performing the procedure.

Hard Keys	Hard key names on the Command Board, the Remote Controller, and modules are written in bold D-O Sans (12 pt) typeface, e.g. **ECG**.
Menu Items	Menu items are written in bold italic, D-O Sans (11 pt) typeface, e.g. ***ECG Setup.***
'Messages'	Messages displayed on the screen are enclosed in single quotes, e.g. 'Please wait'.
Chapters	When referring to different chapters in the same manual, the chapter name is written in italic typeface and is enclosed in double quotes, e.g. chapter "*Cleaning and Care.*"
Other documents	
	When referring to different documents, the document name is written in italic typeface, e.g. refer to *User's Reference Manual*.
Hypertext links	Hypertext links on PDF versions are written in blue color.
WARNING	Warnings are written in bold typeface (13 pt), for example:

WARNING **The 17″ display is wall-mountable only. The display must be mounted at 180 cm /71 inch or higher level to prevent any liquid from entering the display casing.**

CAUTION	Cautions are written in the following way (13 pt):
CAUTION	The circuit boards contain sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the boards is therefore essential.

1.2 Symbols

1.2.1 Symbols on transport packaging

The contents of the transport package are fragile and must be handled with care.

Indicates the correct upright position of the transport package.

The transport package must be kept in a dry environment.

Indicates the temperature limitations within which the transport package should be stored.

1.2.2 Symbols on equipment

Pb This battery contains lead acid, and in the event of disposal must be separated from other waste according to local regulations.

Pb This battery contains Pb and can be recycled.

Dangerous voltage.

When using the ARK Barcode Reader, N-SCAN, do not stare into beam. The N-SCAN Barcode Reader is a Class 2 laser product.

Attention, consult accompanying documents.

When displayed next to an O_2 value, indicates that the FiO_2 low alarm limit is set below 21 %.

When displayed next to an HR value, indicates that the pacer is set on R or a wide QRS is selected.

On the 15″ display, D-VMC15, indicates that the display should be supplied from the Central Unit, F-CU8, or from the mains outlet.

On the 15″ display, D-VNC15, indicates that the display must be supplied from the Central Unit, F-CU8, or from the mains outlet via an appropriate additional separating transformer.

On the 15″ display, D-LCC15, it indicates that the display must be used only together with the original D-LCC15 power adapter. The display should be supplied from the Central Unit, F-CU8, or from the mains outlet.

On the 17″ display, D-VHC17 rev.00-01, indicates that the display must only be supplied from the mains outlet, not from the Central Unit, F-CU8.

On the 17″ display, D-VHC17 rev. 02 or higher, indicates that the display should be supplied from the Central Unit, F-CU8, or from the mains outlet via an appropriate additional separating transformer.

On the 21″ display, D-VSC21, indicates that the display must only be supplied from the mains outlet via an appropriate additional separating transformer, not from the Central Unit, F-CU8.

On the Interface Module, M-INT, indicates that the connection is for external devices and not for patient cables.

On the Tonometry Module, M-TONO, indicates that use only Tonometrics catheters.

On the rear panel of the Central Unit, F-CU8, indicates the following warnings and cautions:

– Electric shock hazard. Do not open the cover or the back. Refer servicing to qualified personnel.

– For continued protection against fire hazard, replace the fuse only with one of the same type and rating.

– Disconnect the power supply before servicing.

Type BF (IEC-60601-1) protection against electric shock.

Type BF (IEC-60601-1) defibrillator-proof protection against electric shock.

Type CF (IEC-60601-1) protection against electric shock.

Type CF (IEC-60601-1) defibrillator-proof protection against electric shock.

When displayed on the upper left-hand corner of the screen, indicates that the alarms are silenced. When displayed on the menu or in digit fields, indicates that the alarm source has been turned off.

Other symbols

	Equipotentiality. Monitor can be connected to potential equalization conductor.
	Alternating current.
	Fuse.
	Connector for color display.
	Display power supply output.
SN, S/N	Serial Number.
	Sub menu. Selecting this symbol on a menu opens a new menu.
	The monitor is connected to the Datex-Ohmeda Network.
	The data card (green) and/or the Menu card (white) is inserted.
	Indicates beats are detected.
	Respiration rate is measured using impedance respiration measurement.
	In this manual indicates the procedure for making selections from the menus.

1.3 Safety

1.3.1 Classification

Classification according to IEC 60601-1

- CLASS 1 equipment according to the type of protection against electrical shock.
- TYPE BF or CF equipment according to the degree of protection against electrical shock is given in the specification for each parameter module.
- Equipment not suitable for use in the presence of flammable anesthetic mixture with air or with oxygen/nitrous oxide.
- Continuous operation according to the mode of operation.

Classification according to IEC 60529

Degree of protection against the harmful ingress of water as detailed in IEC 60529: IPX0.

1.3.2 Responsibility of the manufacturer

Datex-Ohmeda Division, Instrumentarium Corp. is responsible for the safety, reliability and the performance of the software and equipment only if:

- Assembly, operations, extensions, readjustments, modifications, service and repairs are carried out by personnel authorized by Datex-Ohmeda.
- The electrical installation of the monitor room complies with appropriate requirements.
- The system is serviced, maintained and used in accordance with the Technical Reference Manual.

1.3.3 Safety precautions

Warnings

WARNING **A WARNING indicates a situation in which the user or the patient may be in danger of injury or death.**

Power connection

- Before connecting the power cord to the mains outlet, check that the local voltage and frequency correspond with the rating stated on the device plate on the rear panel of Central Unit, F-CU8, and the Video Display, D-VHC17. See instructions for different displays from section *"Displays".*
- Connect the monitor to a three-wire, grounded, hospital grade socket. Do not remove the grounding pin from the power plug.
- Use only an intact power cord. Replace the power cord if it is cracked, frayed, broken or otherwise damaged.
- Do not apply tension to the power cord otherwise the cord may get damaged.
- Do not use extension cords or adapters of any type.

Laser radiation

- When using the ARK Barcode Reader, N-SCAN, do not stare into beam. The N-SCAN is a Class 2 laser product.

External connection

- Do not connect any external devices to the monitor other than those specified by Datex-Ohmeda.

Fuse replacement

- Replace a fuse only with one of the same type and rating.

Explosion hazard

- Do not use the monitor in the presence of flammable anesthetics.

Patient safety

- Do not perform any testing or maintenance on the monitor while it is being used on a patient.

- Use only cables and accessories approved by Datex-Ohmeda. Do not modify them. Other cables and accessories may damage the monitor or interfere with the measurement.

- PACEMAKER PATIENTS: The impedance respiration measurement may cause rate changes in Minute Ventilation Rate Responsive Pacemakers. In this case set the pacemaker rate responsive mode off or turn the monitor impedance respiration measurement off.

Cleaning and service

- Only trained personnel with proper tools and test equipment should perform the tests and repairs described in this manual. Unauthorized service may void the monitor warranty.

- Turn the power off and unplug the power cord before cleaning or service. Completely remove any moisture before reconnecting the power cord to the mains outlet.

- Do not touch any exposed wire or conductive surface while any cover is removed and the monitor is energized. The voltages present can cause injury or death.

- Always perform an electrical safety check and a leakage current test on the monitor after service.

Cautions

CAUTION   A CAUTION indicates a condition that may lead to equipment damage or malfunction.

Installation

- Leave a space behind the monitor to allow proper ventilation.

Before use

- Allow two minutes for warm-up and note any error messages or deviations from normal operation.

- Clean the rear panel fan dust filter once a month or whenever necessary.

- Do not connect a sampling line to the female Patient Spirometry connector while the other end of the sampling line is connected to the D-fend water trap. The pressure in the gas sampling system may cause damage to the PVX unit pressure transducer.

Autoclaving and sterilizing

- Do not autoclave any part of the monitor.

- Do not gas sterilize the modules.

Cleaning and service

- Do not use ammonia, phenol, or acetone based cleaners. These cleaners may damage the monitor surface.

- Do not immerse the monitor in any liquid. Do not allow liquid to enter the monitor or modules.

- Electrostatic discharge through the PC boards may damage the components. Before handling PC boards, wear a static control wrist strap. Handle all PC boards by their non-conductive edges and use anti-static containers when transporting them.

- Do not break or bypass the patient isolation barrier when testing PC boards.

Special components

- Special components are used in these monitors which are vital to assure reliability and safety. Datex-Ohmeda assumes no responsibility for damage if replacement components not approved by Datex-Ohmeda are used.

- A lithium battery on the CPU Board. Dispose of the faulty IC containing the battery according to local regulations.

Batteries

The battery package in the power supply unit contains lead acid (Pb) which is hazardous to the environment and therefore needs to be disposed of carefully according to local regulations.

To replace the batteries safely, please refer to the instructions in this manual.

- Do not short-circuit the battery terminals, this may produce a very high current, which will damage the battery.

- Do not dispose of the battery into open flame, nor put the battery near fire, as it may explode.

- Do not dismantle the battery. It contains electrolyte, which may damage clothing or cause injury to skin or eyes. If exposed to electrolyte, wash the injured area with plenty of clean water and contact a doctor.

See also section *"Displays".*

Storage and transport

Do not store or transport the monitor outside the specified temperature and pressure ranges:

Temperature	-10...+50 °C/14...122 °F
Ambient pressure	660...1060 hPa/500...800 mmHg/660...1060 mbar
Humidity	10...90 % non-condensing
except LCD Display:	10...85 %non-condensing
except D-VSC21	20...80 % non-condensing

Discard

Dispose of any device or parts according to local regulations.

The manufacturer accepts no responsibility for any modifications made to the monitor outside its factory.

2   SYSTEM DESCRIPTION

2.1   Introduction

Datex-Ohmeda S/5 monitors build up a freely configurable modular system. The architecture is designed to enable different module combinations so that the user is able to get the desirable parameter and feature set. This modular approach makes it possible to add new features when they are needed.

2.2   Bus structure

The operation of Datex-Ohmeda S/5 monitors is based on two communication channels, the CPU bus and the module bus. All boards connected to the CPU bus, as well as the parameter modules attached to the module bus, receive power from the same power supply, which is an integral part of the Central Unit, F-CU8.
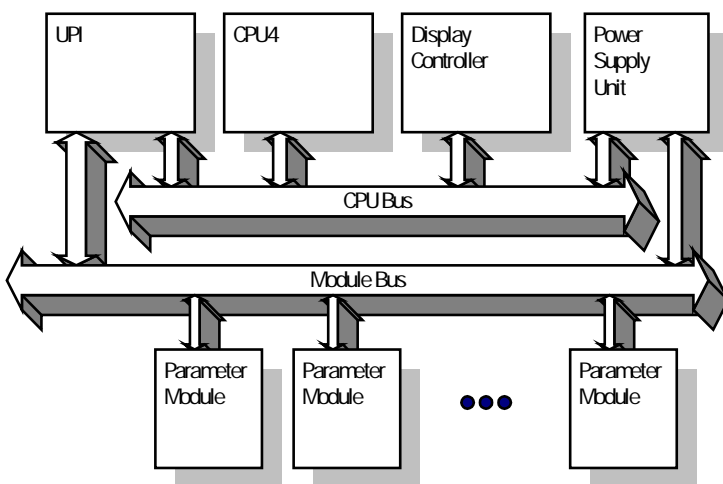
The CPU bus is a parallel communication channel used only for internal data transfer between the boards connected to one Central Unit. It is based on the ISA bus used in IBM PC computers. Data is transferred on this 16 bit wide bus using the CPU clock frequency.

The module bus is used to connect the parameter modules to the Central Unit. It based on the widely used industry standard RS-485, which uses a differential serial method to transfer data. This type of bus is robust and it allows parameter modules to be inserted or removed whilst the power is on. The module bus uses a 500 kbps data transfer rate and can be used for longer distances than the CPU bus, e.g. for external frame connections.

Figure 2   General bus structure of S/5 system

The RS-485 type serial communication supports so-called multidrop or party line connections. This means that all parameter modules connected to module bus use the same two wires for communication purposes. The advantage of this is that all module bus connectors are identical and the parameter modules can be connected in any order and position.

2.3   Distributed processing

A system assembled from S/5 products is a multiprocessor system. All parameter modules have their own microprocessor, which performs low-level functions such as module key control, waveform filtering and pneumatic control, etc. At the same time the main CPU performs higher level tasks such as trending and alarm control. While the parameter modules and CPU are performing their tasks, the UPI (Universal Peripheral Interface) microprocessor handles all functions needed to

transfer data between the parameter modules and the CPU. At the same time the microprocessor on the Display Controller board performs pixel calculations for graphics.
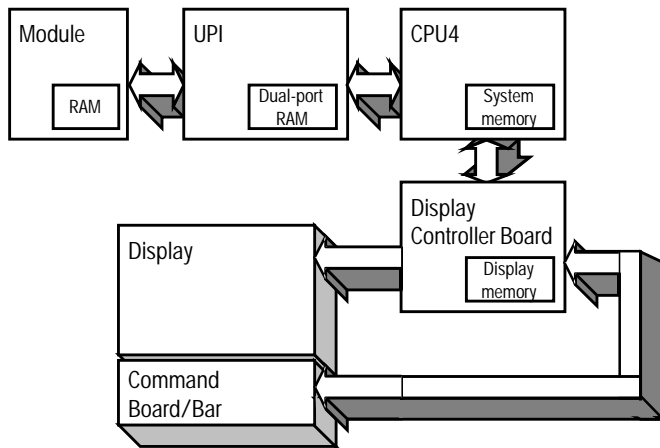
This kind of parallel processing gives one major advantage to centralized processing. When new parameter modules or boards are added to the system, the processing power is increased. As a result, the system does not slow down when new features are added.

Figure 3   Distributed processing in S/5 system

2.4   Module communication

The communication master controlling data transfers between the CPU bus and module bus is called the UPI Board. It sends information or questions to each parameter module 100 times per second. If the parameter module is present it replies to each question immediately by sending a data package back to the UPI board; the package length depends on the type of parameter module. This communication protocol ensures that each module receives and sends information every 10 ms. If the parameter module does not respond, the UPI board presumes that the module is not connected.

Each module type has a unique address, which the UPI board uses to send its messages. Two parameter modules of the same type must not be fitted to the same monitor system, otherwise they would both reply at the same time to the same message, resulting in an error.

The microcontroller on the UPI board collects and stores all information sent from the parameter modules into a dual-port RAM which is mapped directly to the address space of the main CPU. The main CPU therefore reads information from its own memory whilst the UPI board guarantees that the information is up to date. This operation also works in the other direction. In this direction the main CPU fills the dual-port RAM with data and the UPI board microcontroller distributes it to the parameter modules.

Figure 4   Principle of UPI board operation

2.5 Software loading

The CPU's program memory contains the program for the CPU board and some of the other boards attached to the CPU bus. When the system is turned on, all microprocessors load their part of the software from the CPU's program memory and then start to execute their program. The software for CPU Board, B-CPU4 is loaded at the factory. For service procedures the CPU Board, B-CPU4, is fitted with a PCMCIA card drive through which software can be loaded permanently from a Service Software Card.

Figure 5   Software loading

2.6 Parameter modules

The detailed structure of a parameter module depends on the specific needs for each individual parameter. However, some common parts are used in the parameter modules. The electronics inside the module is usually divided into isolated (floating) and non-isolated sections. Typically, the non-isolated section consists of buffers to interface the parameter module to the Module bus whilst the rest of the electronics is located in the isolated section. The isolated section includes the microcontroller together with memory components, the front end analog electronics (amplifiers, etc.) and peripheral drivers to control LEDs, sensors, valves and pumps.

Figure 6   General structure of parameter modules

3   SYSTEM INSTALLATION

3.1   Unpacking instructions

1.   Confirm that the packing box is undamaged. If the box is damaged, contact the shipper.

2.   Open the top of the box and carefully unpack all components.

3.   Confirm that all components are undamaged. If any of the components is damaged, contact the shipper.

4.   Confirm that all components are included. If any of the components is missing, contact your Datex-Ohmeda distributor.

3.2   Choosing location

Consider the following aspects:

- lighting
- space
- connections
- electromagnetic and radio frequency interference
- environment

3.3   Central Unit; S/5 8-Module Frame, F-CU8

Figure 7   Central Unit; S/5 8-Module Frame, F-CU8

The front of the Central Unit, F-CU8, houses plug-in parameter modules which interface the system with external devices. The back of the Central Unit houses the system circuit boards, together with expansion slots which accommodate PC boards which interface with external devices and the Datex-Ohmeda Network.

3.3.1 Connecting to mains

Connect the power cord to the mains power inlet on the rear of the Central Unit and to the wall socket.

WARNING **The power cord may only be connected to a three-wire, grounded, hospital grade receptacle.**

3.3.2 Connecting to Datex-Ohmeda Network

To connect the monitor to the Datex-Ohmeda Network, make sure a Network Board, B-NET or B-UPI4NET is installed.

Use the Monitor-Network cable to connect the monitor to the network as follows:

1.   Make sure that the power to the Central Unit is turned off.

2.   Connect the RJ-45 connector and the Identification Plug to the corresponding connectors on the B-NET or B-UPI4NET.

3.   Connect the other RJ-45 connector to the corresponding connector on the wall box.

4.   Turn on the power to the Central Unit. Enter the *Network* service menu:

Monitor Setup - *Install/Service* (password 16-4-34) -
                  Service (password 26-23-8) -
                  Frame – Network

5.   Make sure that the monitor's network communication has been set according to the used network software:

Network software S-CNET99 -> DRI Level = 1999
Network software S-CNET01 -> DRI Level = 2001

If necessary, change the monitor's network communication by selecting *DRI Level* and turning the ComWheel.

NOTE: If the DRI level is changed, the monitor will restart automatically.

6.   Confirm that the network symbol and 'Connected to Network' message are displayed on the upper part of the screen.

3.3.3 Inserting the parameter modules

Align the parameter module with the Central Unit insertion guide, and then firmly press the module into the frame until you hear a click.
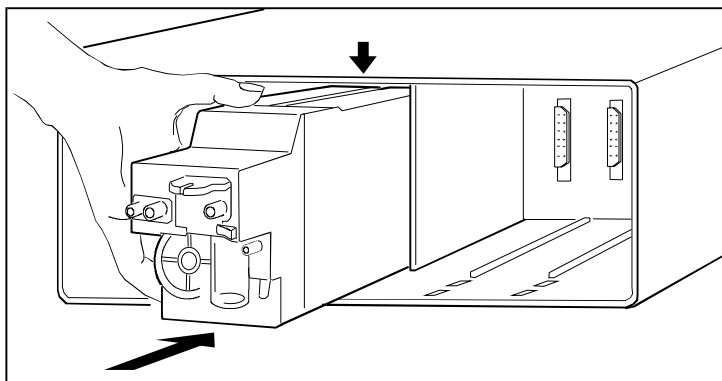
Figure 8   Parameter module insertion

NOTE: The Compact Airway Modules cannot be placed into the third and fourth slot from the right-hand side of the Central Unit.

NOTE: Do not use two or more parameter modules with identical functions in the monitor system. Take special care not to do this when using the Extension Frame, F-EXT4.

Parameter modules or boards with identical functions are:

- Hemodynamic multiparameter modules, M-ESTPR, M-ETPR, M-ESTR, M-NESTPR, M-NETPR, M-NESTR, M-NE12STPR, M-NE12TPR and M-NE12STR
- Pressure Modules, M-P, Pressure Temp Module, M-PT
- Cardiac Output Modules, M-COP and M-COPSv
- NIBP Modules, M-NIBP and hemodynamic modules w/ N measurement
- Airway Modules, M-C, M-CO, M-COV, M-CAiO, M-CAiOV, M-CAiOVX, G-O, G-OV, G-AO, G-AiO, G-AOV, G-AiOV.
- Interface Module, M-INT and Interface Board, B-INT
- Oxygen Saturation Modules, M-OSAT and M-NSAT

3.3.4 Positioning of PC boards
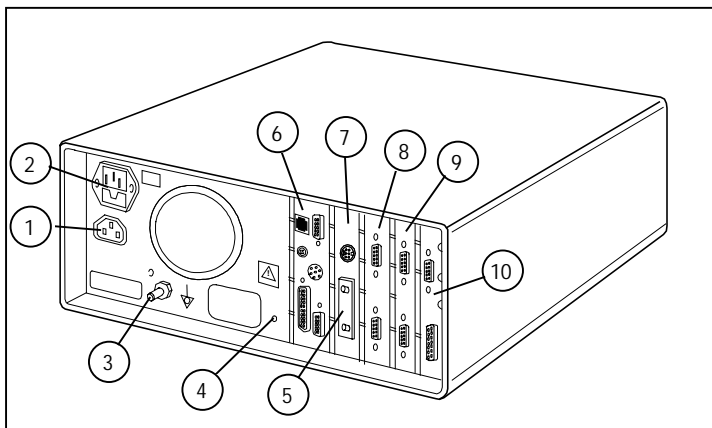
Figure 9   Rear view and PC board positioning

(1)   Display power outlet

(2)   Mains power inlet

(3)   Equipotential connector

(4)   Service reset button

(5)   Backplate lid for CPU Board, B-CPU4

(6)   UPI Board, B-UPI4, UPINET Board, B-UPI4NET

(7)   CPU Board, B-CPU4

(8)   Display Controller Board, B-DISP (primary/screen 1)

(9)   Display Controller Board, B-DISP (secondary/screen 2),
         Keyboard Interface Board, B-ARK

(10)   Interface Board, B-INT,
         Gas Interface Board, B-GAS,
         Display Controller Board, B-DISP (3rd screen)

3.3.5 Replacing PC Boards

For service procedures refer to *Part II.*

1.   Make sure that the power is turned off the Monitor and unplug the power cord. Press and hold the service reset button on the rear panel for at least five seconds or until an audible tone is heard (see figure 10).
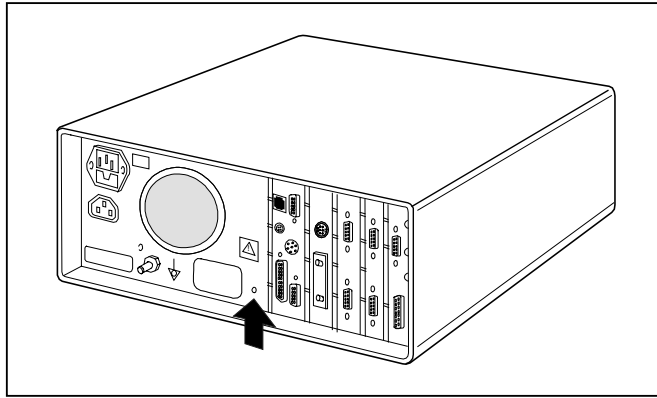
Figure 10   Service reset button

2.   Remove all PC boards, cover plates and EMC plates on the right-hand side of the PC board, to be replaced, then remove the board itself (two screws).

NOTE: The B-UPI4(NET) may have been installed so that it can be removed without removing the other PC boards first.

CAUTION   The circuit boards contain sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the boards is therefore essential.

NOTE: The B-UPI4(NET) contains components on both sides of the PCB. Therefore, the installation of B-UPI4(NET) should be handled with extra care. Detach the board from the frame carefully by pulling it from the X3 connector (25 pin female D-connector).

3.   Remove the new PC board from the protective antistatic packaging. Always hold the board by the edges and wear a wrist-grounding strap.

4.   Insert the new PC board into the vacant slot and firmly press the board into position. Secure the board (two screws).

5.   Insert all other circuit boards, cover plates and EMC plates.

6.   Reconnect the power cord.

3.3.6 Performing factory reset

NOTE: A factory reset is necessary after loading software and after replacing the CPU board.

NOTE: A factory reset will restore all customized defaults, including language selection, to factory defaults.

1.   Press the **Monitor Setup** key.

2.   Select *Install/Service* and password (16-4-34).

3.   Select *Service* and password (26-23-8).

4.   Select *Set/Test* and perform a *Factory Reset*.

3.4 Displays
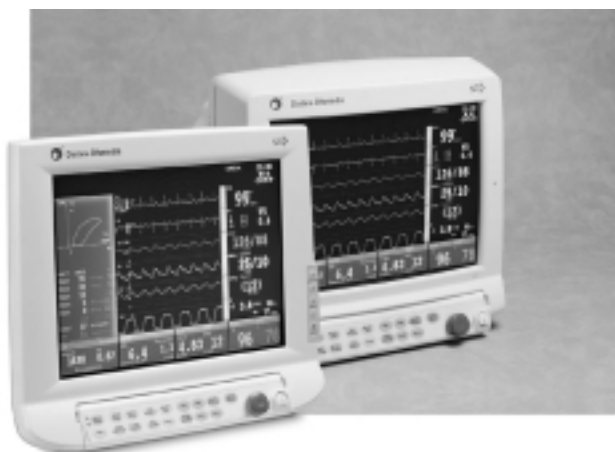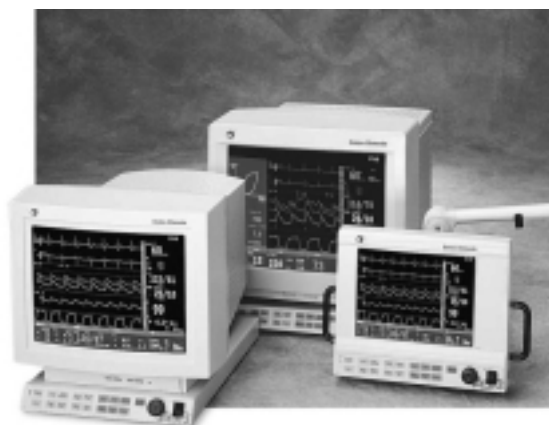
D-LCC15 and D-VMC15   **D-VNC15, D-VHC17 and D-LCC10A**

Figure 11   Display options

3.4.1 Main displays

All options available for the main display are integrated with a S/5 Command Board or S/5 Command Bar and a ComWheel:

- S/5 Video Display, D-VMC15
- Video Display, D-VNC15
- S/5 LCD Display, D-LCC15
- S/5 LCD Display, D-LCC10A
- S/5 Video Display, D-VHC17 + Wall Mount

3.4.2 Secondary display

S/5 21″ Display Monitor Unit, D-VSC21

However, the secondary display can also be any of the main display listed above.

3.4.3 3rd display

The 3rd display can be installed together with Display Controller Board, B-DISP rev.01 or higher. All S/5 main software support the use of 3rd display.

NOTE: Due to increased power consumption only two 10″ displays, D-LCC10A or D-LCC10W should be installed simultaneously.

3.4.4 S/5 Video Display, D-VMC15

Mounting to Central Unit

Attach the Command Bar, K-ANEB / K-ICUB into the Video Display, D-VMC15 housing and pull the Command Bar cable under the display to the rear. Mount the display to the Central Unit using the display alignment studs on the top of the frame.

Connection to Central Unit

1.   Make sure that power to the Central Unit is turned off.

2.   Make sure that the switch on the Command Bar is turned to standby. Connect the Command Bar cable to the connector X3 on the Display Controller Board, B-DISP. Tighten the screws.

3.   Connect the video cable to the connector X2 on the Display Controller Board, B-DISP. Tighten the finger screws.

4.   Connect the display power cord to the display power outlet on the rear of the Central Unit, or to the mains outlet.

Adjustments

Adjust the brightness and contrast using the control keys on the display housing.

3.4.5 S/5 LCD Display, D-LCC15

Mounting to Central Unit

Connect the video cable and power adapter cable to the LCD Display, D-LCC15. Tighten the video cable finger screws. Attach the Command Bar, K-ANEB / K-ICUB into the display housing. Mount the display together with the desk stand to the Central Unit using the display alignment studs on the top of the frame.

Mounting to Display arm

Mount the LCD Display, D-LCC15 to a display arm with appropriate screws. Connect the video cable and power adapter cable to the display. Tighten the video cable finger screws.

Connection to Central Unit

1.   Make sure that power to the Central Unit is turned off.

2.   Make sure that the switch on the Command Bar is turned to standby. Connect the Command Bar cable to the connector X3 on the Display Controller Board, B-DISP. Tighten the screws.

3.   Connect the video cable to the connector X2 on the Display Controller Board, B-DISP. Tighten the finger screws.

4.   Connect the display power cord to the display power outlet on the rear of the Central Unit, or to the mains outlet.

WARNING   **The display must be used only together with the original D-LCC15 power adapter.**

Adjustments

Adjust the brightness and contrast using the control keys on the display housing.

NOTE: The control keys can be unlocked/locked by pressing the -, + and ∨ -keys simultaneously.

3.4.6 15″ Video Display, D-VNC15

Mounting to Central Unit

Mount the Video Display, D-VNC15, to the Central Unit using the display alignment studs on the top of the frame.

Connection to Central Unit

1. Make sure that the power to the Central Unit is turned off.

2. Connect the display cable to the X2 connector on the Display Controller Board, B-DISP. Tighten the finger screws.

3. Connect the display power cord to the display power outlet on the rear of the Central Unit or via an appropriate separating transformer to the wall socket.

WARNING **The Video Display, D-VNC15, power cord may only be connected to the display power outlet on the rear of the Central Unit, or via an appropriate separating transformer to the wall socket.**
Connecting the display power cord directly to the wall socket will cause the leakage current to exceed the limit specified for medical equipment.

4. Connect the Command Board, K-ANE, K-ICU, K-BLANK, cable to the X3 connector on the Display Controller, B-DISP. Tighten the finger screws.

WARNING **Always make sure that the whole combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

Adjusting the display brightness and contrast

Adjust the display brightness and contrast using the controls illustrated below.
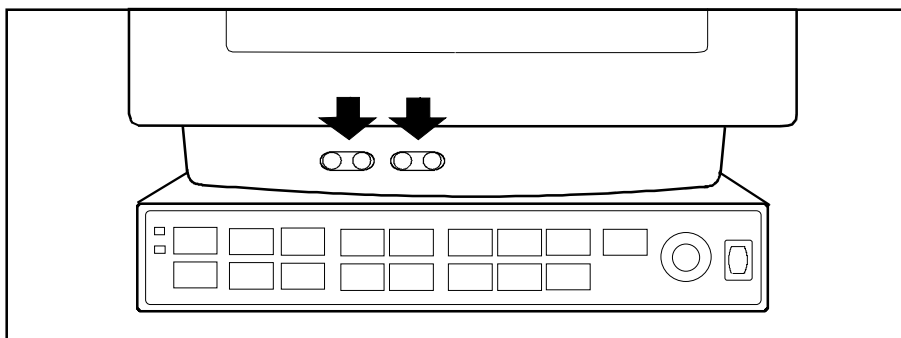
Figure 12   **Brightness and contrast controls, D-VNC15**

3.4.7 17″ Video Display, D-VHC17, revision 00-01

The 17″ Video Display, D-VHC17, can be used as a primary or a secondary display, e.g. to display monitored information close to the surgeon.

Please notice differencies between revisions 00-01 and 02.

WARNING **The Video Display, D-VHC17, power cord may only be connected to the wall socket. A separating transformer is built-into the display stand.**

CAUTION Do not connect the Video Display, D-VHC17, to the Central Unit otherwise the unit may overheat.

WARNING **The Video display, D-VHC17, is wall-mountable only. The display must be mounted at 180 cm/71 in or higher to prevent any liquid entering the display casing.**

3.4.8 17″ Video Display, D-VHC17, revision 02

Please notice differences between revisions 00-01 and 02.

WARNING **Connecting the power supply cord of the Video Display, D-VHC17 revision 02, to the wall socket may cause the display leakage current to exceed the limit specified for medical equipment. Always connect the display to the Central Unit, F-CU8, or via an appropriate separating transformer to the wall socket.**

WARNING **The Video display, D-VHC17, is wall-mountable only. The display must be mounted at 180 cm/71 in or higher to prevent any liquid entering the display casing.**

3.4.9 10″ LCD Display, D-LCC10A/W

Mounting to display arm

Mount the LCD Display, D-LCC10A/W, to a display arm using four M6 threaded screws and spring washers. The screw holes are located on the rear part of the display. The penetration depth of the screws must be 8-10 mm into the upper two holes and 6-7 mm into the lower two holes. A greater penetration depth may damage the display. Tighten the screws carefully.

Connection to Central Unit

1. Make sure that the power to the Central Unit is turned off.

2. Connect the monitor-LCD display cable to the X3 connector on the Display Controller Board, B-DISP and to the corresponding connector on the display. Tighten the finger screws.

3.4.10 21'' Display Monitor Unit, D-VSC21

1. Make sure that the power to the Central Unit is turned off.

2. Connect the video cable to the X2 connector on the Display Controller Board, B-DISP, and to the corresponding connector on the display. Tighten the finger screws.

3. Connect the display power cord via an appropriate separating transformer to the wall socket.

WARNING **The Display Monitor Unit, D-VSC21, does not have the top spill shielding. Make sure that the display is installed in a location, which is not susceptible to dripping liquids.**

WARNING **Connecting the power supply cord of the Display Monitor Unit, D-VSC21, to the wall socket may cause the display leakage current to exceed the limit specified for medical equipment. Always connect the display to an appropriate separating transformer.**

WARNING **Always make sure that the whole combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

3.5   Display controller boards

Different displays must be supported by different display controllers, i.e. the primary display by a primary display controller, the secondary by a secondary display controller etc. Consequently, it is possible to configure the displays separately. One of the displays can, for instance, be used for a continuous display of trend pages.

NOTE: It is possible to use one display controller to obtain duplicate video signals for two displays by using the display Y-cable.

3.5.1 Jumper settings

The display controllers require different address settings to operate correctly. The settings are made through the use of jumper caps to connect jumper pins. Different settings are illustrated in figures 13-17.
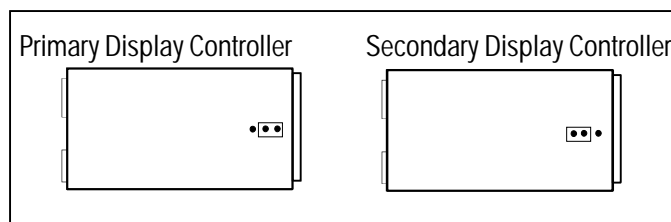
Figure 13   Jumper settings, B-DISP rev. 00
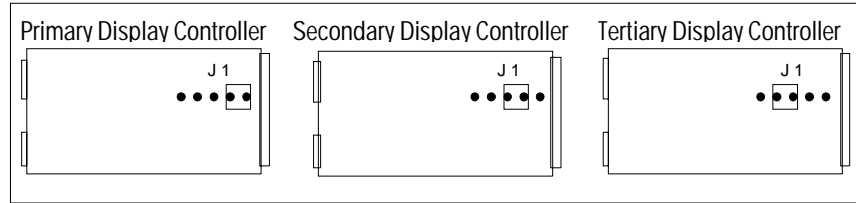
Figure 14   **Jumper settings, B-DISP rev. 01, or higher**

The AUTO/VGA jumper on B-DISP Rev. 01 makes it possible to choose VGA resolution as restricted guidance.
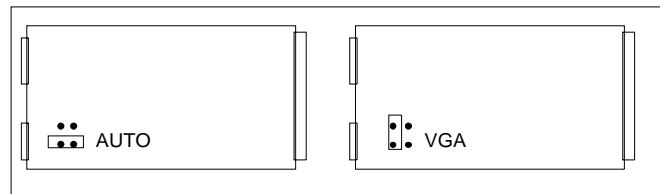
Figure 15   **AUTO/VGA resolution jumper settings, B-DISP rev. 01, or higher**

NOTE: B-DVGA rev. 01 and B-DHIGH rev. 01 boards can be configured only as primary or secondary display controllers by moving the location of jumpers J5 and J2 (board address and interrupt signal).
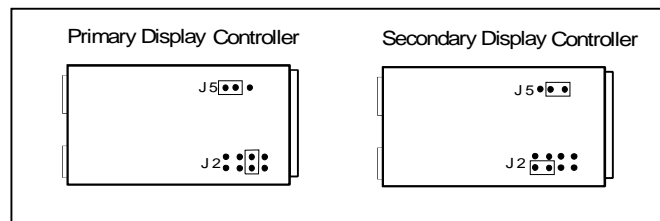
Figure 16   **Jumper settings B-DVGA board, rev. 01, and
                B-DHIGH board, rev. 01 (s/n < 174671)**

NOTE: B-DVGA rev. 02-03 and B-DHIGH boards rev. 01-02 can be configured only as primary or secondary display controllers.
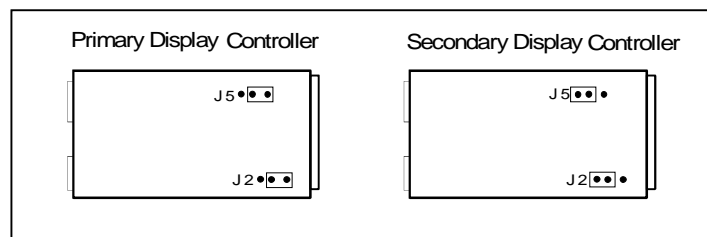
Figure 17   **Jumper settings, B-DVGA board, rev. 02-03,
                and B-DHIGH board, rev. 01-02 (s/n > 174670)**

3.6 S/5 Remote Controller, K-REMCO

Connection to Central Unit, F-CU8

Connect the Remote Controller cable to the X3 connector on the Display Controller, B-DISP. Tighten the finger screws.

3.7 S/5 Airway Modules, G-XXXX

This chapter provides information for installing Airway Modules G-O, G-OV, G-AO, G-AiO, G-AOV and G-AiOV.
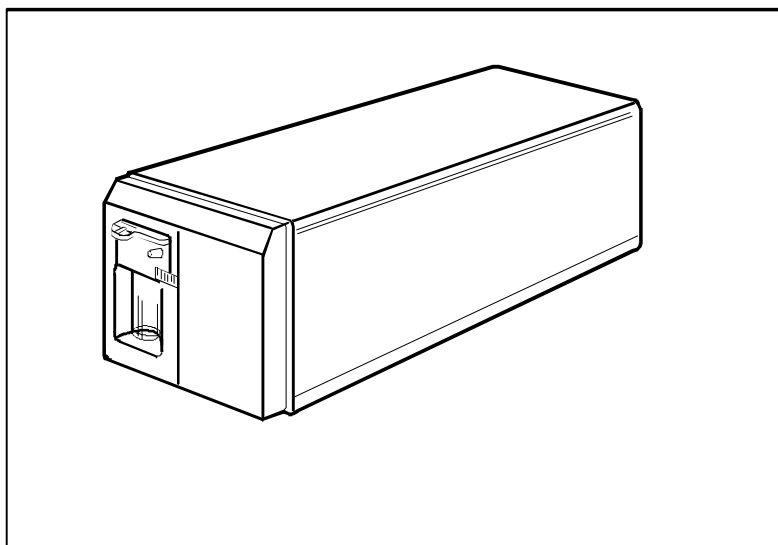
Figure 18   Airway Module, G-XXXX

3.7.1 Connection to Central Unit

Refer to figure 8.

1.   Make sure that the power to the Central Unit is turned off.

2.   Connect the Gas Interface Cable to the X2 connector on the Gas Interface Board, B-GAS, or Interface Board, B-INT, and to the corresponding connector on the rear of the Airway Module.

NOTE: The Gas Interface Board, B-GAS and Interface Board, B-INT are exclusive and cannot be used simultaneously in the same system.

3.7.2 Sample gas exhaust

When N_2O and/or volatile anesthetics are used, pollution of the operating room by these gases should be prevented. Connect the sample gas outlet of the Airway Module to the scavenging system according to one of the following procedures.

1. Connect an exhaust line to the sample gas outlet on the rear of the Airway Module and to the ventilator reservoir. The reservoir tube diameter must be at least 2-3 times larger than the exhaust line.
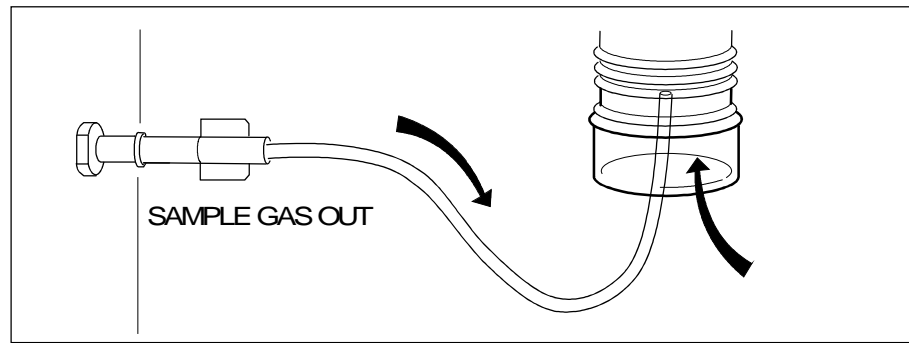
Figure 19   Exhaust to reservoir tube

2. Connect an exhaust line to the sample gas outlet on the rear of the Airway Module and to a scavenging tube. Use a T-fitting between the monitor and the exhaust line.
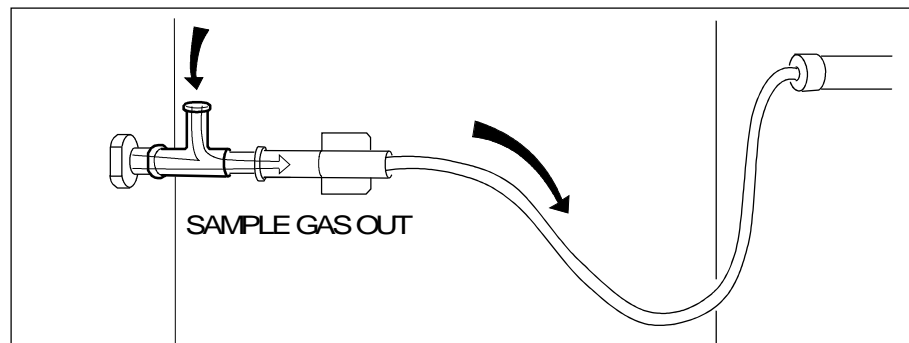
Figure 20   Exhaust to scavenging tube

CAUTION   Make sure that the sample gas is not removed from the Airway Module under a strong suction. To prevent this, there must always be an opening to room air. A strong suction may change the operating pressure of the Airway Module and cause inaccurate readings or internal damage.

3.7.3 Returning sample gas to patient circuit

Take special care when returning sample gas to the patient circuit. For further information, please contact your Datex-Ohmeda distributor.

3.8 Keyboard for the deioRecorder for Anesthesia, K-ARKB

3.8.1 Connection to Central Unit

1. Make sure that the power to the Central Unit is turned off.

2. Connect the keyboard-monitor cable to the X2 connector on the Keyboard Interface Board, B-ARK, and to the connector on the rear of the keyboard. Alternatively you can connect the cable to a Display Controller Board, B-DISP. Secure the connection with the thumbscrew and slip the cable beneath the fasteners.

3.8.2 Connection to LCD Display, D-LCC10A/W

1. Make sure that the power to the Central Unit is turned off.

2. Connect the Keyboard-LCD Display Cable to the K-ARK connector on the LCD Display and to the connector on the rear of the keyboard. Secure the connection with the thumbscrew and slip the cable beneath the fasteners.

3.9 ARK Barcode Reader, N-SCAN (optional)

3.9.1 Connection to Central Unit/LCD Display, D-LCC10A/W

The ARK Barcode Reader, N-SCAN, can be connected to the Keyboard for the deioRecorder for Anesthesia, K-ARK, and Central Unit using a Y-cable as illustrated in left hand figure and the LCD Display, D-LCC10 rev. 03 or higher, or the D-LCC10A/W, as illustrated in right hand figure below.
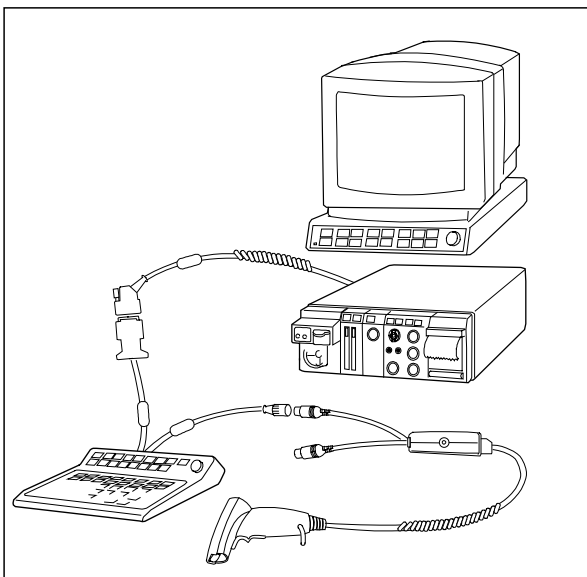
Figure 21 Barcode Reader connected to Central Unit   Figure 22 Barcode Reader connected to LCD Display
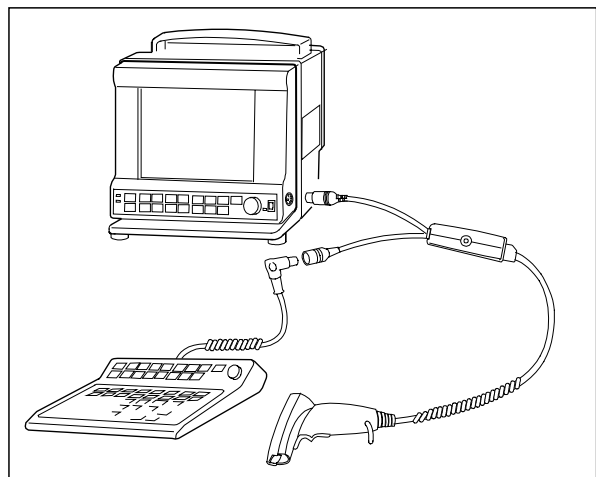
The ARK Barcode Reader, N-SCAN, can be connected to the Keyboard for the deioRecorder for Anesthesia, K-ARKB as illustrated in the figure below.
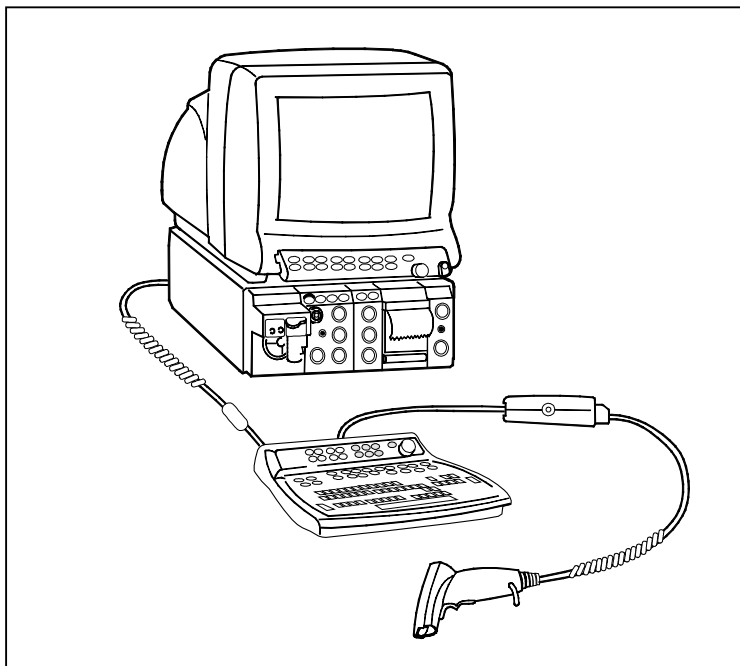
Figure 23   N-SCAN Barcode Reader connection directly to the keyboard

Barcode Reader is configured compatible to your monitor and necessary information is delivered with the monitor.

3.10   S/5 Extension Frame, F-EXT4

Figure 24   S/5 Extension Frame, F-EXT4

The Extension Frame, F-EXT4, enables the monitor system to be expanded using additional parameter modules. The Extension Frame is connected to the Central Unit via the Extension Module, M-EXT. The Extension Module, M-EXT plugs into the Central Unit, F-CU8 in the same way as the parameter modules.

NOTE: Only one Extension Frame can be connected to one Central Unit.

3.10.1 Mounting of Extension Frame, F-EXT4

When mounting the Extension Frame, F-EXT4, for instance to an IV pole, make sure that this does not affect the stability of the IV pole.

3.10.2 Connection to Central Unit

Insert the Extension Module, M-EXT, into the Central Unit. Firmly press the module into position. Connect the Extension Module cable to the Extension Frame.

3.10.3 Inserting parameter modules

Insert the parameter modules into Extension Frame slots. Firmly press the modules into position.

NOTE: Parameter modules with identical functions must not be used simultaneously in the same monitor system. Take special care not to do this when using the Extension Frame.

NOTE: Modules M-REC, M-MEM, M-INT, M-CXXXX cannot be used in the Extension Frame.

3.11 Troubleshooting

If a problem occurs during a functional examination, check the components of the monitor according to the following troubleshooting chart. If the problem persists, please refer to Part II.

Trouble	Treatment
Nothing functions.	Unplug the Command Board or Remote Controller cable. Check that the cable is intact then reconnect the cable.
	Unplug the power cord. Check that the cord is intact then reconnect the cord. Check that the fuses are intact.
The display does not function.	Unplug the display power cord and the display cable. Check that the cord and cable are intact then reconnect the cord and cable.
	Unplug the Monitor-LCD Display cable. Check that the cable is intact and reconnect the cable. Check that the display brightness is adjusted properly.
A parameter module does not function.	Remove and replace the module. Check that the parameters displayed are configured correctly.
The Airway Module does not function.	Check that the 'Occlusion' or 'Calibrating Gas Sensor' messages are not displayed.
	Check that a D-fend water trap and a sampling line are attached.
	Check that the Gas Interface Board, B-GAS or Interface Board, B-INT, is inserted properly. Check that the parameters displayed are configured correctly.
	Press and hold the Select Agent key for three seconds.
	Turn off the power to the Central Unit. Unplug the Gas Interface Cable. Check that the cable is intact then reconnect the cable. Turn on the power to the Central Unit.
Compact Airway Module does not function.	Remove and replace the module.

4   INTERFACING

External devices can be interfaced to the S/5 Anesthesia and Critical Care Monitors via the UPI4 and UPI4NET boards, B-UPI4 and B-UPI4NET, via the Interface Board, B-INT and Interface Module, M-INT, and via the Device Interfacing Solution, N-DISxxx.

An UPI4 and UPI4NET board can be used with:

- Datex-Ohmeda monitors
- S/5 Anesthesia Delivery Unit
- Printers
- Computers

An M-INT and B-INT can be used with:

- Datex-Ohmeda monitors
- Various other manufacturers' monitors
- Various anesthesia machines

Device specific N-DISxxx modules can be used with:

- Ventilators/ anesthesia machines
- Monitors
- Heart-lung machines
- Blood-gas analyzers

4.1   Interfacing external monitors via UPI Board, B-UPI4 or UPINET Board, B-UPI4NET

The parameters transferred to the S/5 Anesthesia Monitor and S/5 Critical Care Monitor are summarized in table 1.

4.1.1 Interconnection Datex-Ohmeda Monitors

Use the UPI-Monitor Cable to connect the S/5 Anesthesia Monitor or the S/5 Critical Care Monitor to the external Datex-Ohmeda monitor.

1.   Make sure that the power to both monitors is turned off.
2.   Connect the 9 pin D-connector to the X8 connector the UPI Board. Tighten the finger screws.
3.   Connect the 25 pin D-connector to the corresponding connector on the rear of the external monitor. Tighten the finger screws.

Table 1   Transference of parameters, Datex-Ohmeda monitors

Device	Waveforms (analog)	Numerics	Alarms
Cardiocap	None	Et&Fi Airway gases, Respiration rate, SpO_2, Pulse rate	None
Capnomac Capnomac II	None	Et&Fi Airway gases, Respiration rate.	None
Capnomac Ultima	None	Et&Fi Airway gases, Respiration rate, Spirometry,SpO_2, Pulse rate, Pleth amplitude	CO_2, O_2, Anesthesia agent, respiration rate, Apnea, occlusion, SpO_2, pulse rate.
Normocap 200 Normocap 200 OXY	None	Et&Fi Airway gases, Respiration rate.	None
Oscar Oscar II Oscar OXY	None	Et&Fi Airway gases, Respiration rate, SpO_2, Pulse rate, Pleth amplitude	None
Satlite Satlite II Satlite Plus	None	SpO_2, Pulse rate, Pleth amplitude	None
Satlite Trans	None	SpO_2, Pulse rate, Pleth amplitude	None

4.1.2 Setting interfacing parameters of Datex-Ohmeda monitors

Set the serial output mode of Datex-Ohmeda monitors: Capnomac Ultima, Satlite Trans and Normocap to numeric. This setting can be stored into permanent memory through the startup menu. See the monitor's manual for further information.

4.1.3 Setting S/5 Anesthesia Monitor and S/5 Critical Care Monitor interfacing parameters

1. Press the **Monitor Setup** key.

2. Select *Install/Service* (password 16-4-34).

3. Select *Installation Interfacing - More...*

4. Combine a required parameter with the external monitor. The selection will be automatically stored in permanent memory.

5. Press the **Normal Screen** key.

4.2 Interfacing external monitors via Interface Module, M-INT, or Interface Board, B-INT

It is possible to interface Datex-Ohmeda monitors, Critikon Dinamap 1846SX, Abbott Oximetrix 3, Baxter Explorer and Vigilance, Nellcor N-100, N-200 and N-1000 to the S/5 Anesthesia Monitor or to the S/5 Critical Care Monitor via Interface Board, B-INT or Interface Module, M-INT. The parameters transferred are summarized in tables 1 and 2.

Interface Board, B-INT, includes two serial connectors (X3 and X9) and two serial/analog connectors (X7 and X8) for interfacing with external monitors. The X3 and X9 connectors provide only numerical data while the X7 and X8 connectors provide both numerical data and analog waveform data. Interface Module, M-INT, has two serial/analog connectors (X7 and X8).

NOTE: Using Interface Board, B-INT, or Interface Module, M-INT, disables interfacing with external Datex-Ohmeda monitors via the UPI Board, B-UPI4 or UPINET Board, B-UPI4NET.

Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.

Table 2 Transference of parameters, external monitors

Device	Waveforms	Numerics	Alarms
Critikon Dinamap 1846SX	None	NIBP	None
Abbott Oximetrix 3	None	SvO_2/SaO_2, CO	None
Baxter Explorer	None	C.O., SvO_2, REF, Tblood	None
Baxter Vigilance	None	C.O., SvO_2,C.C.O., Tblood	None
Nellcor N-100 N-200 N-1000	Pleth (analog)	SpO_2, Pulse rate	None

4.2.1 Connecting interface connector cables to Interface Board, B-INT

When waveforms need to be transmitted or when more than one external monitor will be interfaced to the S/5 Anesthesia Monitor or S/5 Critical Care Monitor, one or more Interface Connector Cables must be used. Connect the cables according to the following procedure. Refer to figure 25.

1. Connect the 9 pin IDC-type connector to the corresponding connector on the Interface Board, B-INT. Ensure that pin 1 is nearest the edge of the board.

2. Slide the cable trough a U-shaped slot in the front panel of the Interface Board, B-INT. Use the top slot for connector X8, the middle slot for connector X7 and the bottom slot for connector X9.
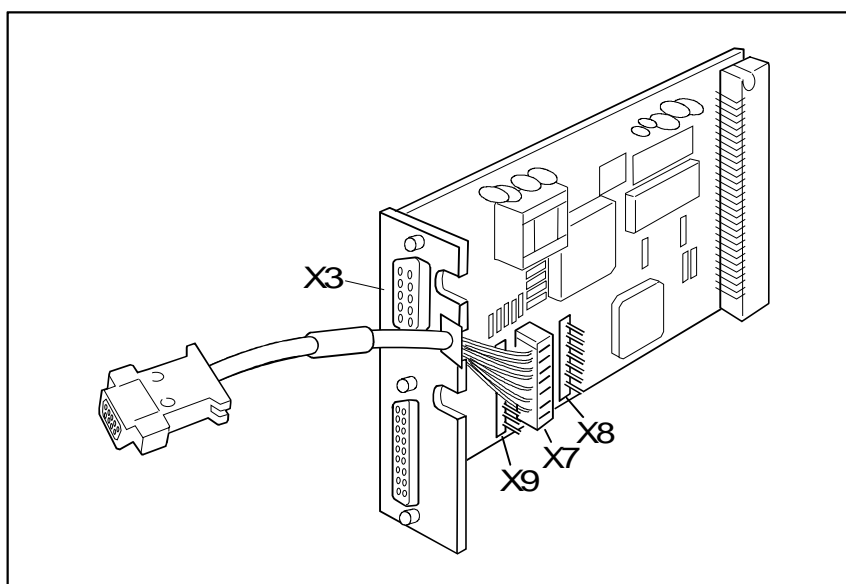
Figure 25 Connecting the interface connector cables to Interface Board, B-INT

WARNING **Interface Module, M-INT, and Interface Board, B-INT, cannot be used simultaneously in the same system. If both of them are connected, the monitor may disregard information.**

4.2.2 Connection to external Datex-Ohmeda monitors

Use the INT-External Device Cable.

1. Make sure that the power to both monitors is turned off.
2. Connect the 9 pin D-connector to the X3, X7, X8 or X9 connector on Interface Board, B-INT, or Interface Module, M-INT. Tighten the finger screws..
3. Connect the 25 pin D-connector to the corresponding connector on the other monitor. Tighten the finger screws.

4.2.3 Connection to Critikon Dinamap 1846SX, Abbott Oximetrix 3 and Baxter Explorer

Use the INT-External Device Cable.

1. Make sure that the power to both monitors is turned off.

2. Connect the 9 pin D-connector to the X3, X7, X8 or X9 connector on Interface Board, B-INT, or Interface Module, M-INT. Tighten the finger screws.

3. Connect the 25 pin D-connector to the connector on the external monitor. Tighten the finger screws.

4.2.4 Connection to Baxter Vigilance

Use the INT-Baxter Vigilance Cable.

1. Make sure that the power to both monitors is turned off.

2. Connect the 9 pin D-connector to the X3, X7, X8 or X9 connector on Interface Board, B-INT, or Interface Module, M-INT. Tighten the finger screws.

3. Connect the other 9 pin D-connector to a corresponding connector on the external monitor. Tighten the finger screws.

Communication parameters are: baud rate 19200, no parity (none), data bits 8, stop bits 1. Mode of communication port: IFM out.

4.2.5 Connection to Nellcor N-100 and N-1000

Use the Monitor-Nellcor Cable.

1. Make sure that the power to both monitors is turned off.

2. Connect the 9 pin D-connector to the X3, X7, X8 or X9 connector on Interface Board, B-INT, or Interface Module, M-INT. Tighten the finger screws.

    NOTE: The X3 and X9 connectors cannot be used when interfacing the S/5 Anesthesia Monitor or the S/5 Critical Care Monitor with Nellcor N-100 monitors.

3. Connect the other connector to the corresponding connector on the external monitor. Tighten the finger screws. Connect also the mono connectors on the external monitor.

4.2.6 Connection to Nellcor N-200

Use the Monitor-Nellcor Cable.

1. Make sure that the power to both monitors is turned off.

2. Connect one of the connectors to the corresponding connector on Interface Board, B-INT, or Interface Module, M-INT. Tighten the finger screws.

3. Connect the other connector to the corresponding connector on the external monitor. Tighten the finger screws. Connect also the mono connectors on the external monitor. Connect also the mono connectors on the external monitor

4.3 Interfacing external bedside devices via S/5 Device Interfacing Solutions, N-DISxxx

The Device Interfacing Solution,N-DISxxx, provides means for transferring physiological, waveform and event data from various bedside patient care devices to the Datex-Ohmeda monitoring system. The real-time and trended data can be displayed on the monitor screen and used for record keeping purposes. The interfacing module reads the data coming from the external device, converts it to a suitable format and sends it to the monitor. With the Device Interfacing Solution, N-DISxxx you can interface up to ten different devices simultaneously.

See the following lists and tables of devices that you can interface with the Device Interfacing Solution.

4.3.1 Interfaced devices and parameters

Ventilator interfaces

Device	Device set values for trends	Measured numeric values	Waveforms	
Datex-Ohmeda SmartVent 7900	Vent. mode, I:E ratio, RR, TV, PEEP, Pinsp, InspPause	FiO_2, TVexp, MV, RR, Pmean, Ppeak, Pplat	Paw, Flow, Vol	N-DIS7900
Datex-Ohmeda Aestiva /5 Aestiva /5 7100 Aestiva /5 Compact	Vent. mode, I:E ratio, RR, TV, PEEP, Pinsp, InspPause	FiO_2, TVexp, MV, RR, Pmean, Ppeak, Pplat	Paw, Flow, Vol	N-DISAEST
Dräger Evita 4	FiO_2, Vent. mode, I:E ratio, RR, TV, PEEP, Pinsp	FiO_2, $EtCO_2$, TVexp, MV, MVspont, RR, Ppeak, Pplat, Pmean, Raw, Compl, PEEPi	Paw, Flow, Vol	N-DISEV
Nellcor Puritan Bennett 7200	Vent. mode, RR, TV, PEEP, O_2 setting	expTV, expMV, expMVspont, RR, Ppeak, Pplat, Pmean, Dyn. Raw, Dyn. Compl, I:E ratio		N-DIS7200
Nellcor Puritan Bennett 840	Vent. mode, I:E ratio, RR, TV, PEEP, O_2 setting.	expTV, expMV, expMVspont, RR, Ppeak, Pplat, Pmean, I:E ratio		N-DIS840
Siemens Servo 300	CMV freq set, SIMV freq set, Insp. Time, Pause time, MV, PEEP, Pinsp, Plimit, Vent mode, O_2 concentr	O_2 insp, TV exp, TV insp, MV exp, MV insp, RR, Ppeak, Pplat, Pmean, PEEP, PAmbient	Paw, Flow, Vol	N-DISS300

Monitor interfaces

Device	Numeric values	
Abbott Qvue/Q2	CO, CCO, Tblood, and SvO$_2$ (Q2 only)	N-DISQVUE
Abbott Oximetrix 3	CO, SvO$_2$	N-DISOXIM3
Aspect A-2000 BIS Monitor	BIS, SQI, EMG	N-DISA2000
Baxter Vigilance	CO, CCO, SvO$_2$, TBLOOD	N-DISVIGIL
Datex-Ohmeda RGM	CO$_2$, O$_2$, N$_2$O, AA, RR, SpO$_2$, HR, Paw, TV, MV	N-DISRGM
Datex-Ohmeda Tonocap	PgCO$_2$	N-DISTONO
Datex-Ohmeda Capnomac, Capnomac II,	EtCO$_2$, FiCO$_2$, EtO$_2$, FiO$_2$, EtN$_2$O, FiN$_2$O, EtAA, FiAA, AA selection, RR, PAmbient	N-DISWHITE
Satlite, Satlite trans and Satlite Plus	Pulse, SpO$_2$	
Oscar II, Oscar oxy, Cardiocap 1GS and Cardiocap 2GS	EtCO$_2$, FiCO$_2$, EtO$_2$, FiO$_2$, EtN$_2$O, FiN$_2$O, RR, Pulse, SpO$_2$%	
Capnomac Ultima	EtCO$_2$, FiCO$_2$, EtO$_2$, FiO$_2$, EtN$_2$O, FiN$_2$O, EtAA, FiAA, AA selection, RR, PAmbient, Auto id AA, Pulse, SpO$_2$%, MV exp, MV insp, TV exp, TV insp, Compl, Ppeak, Pplat, PEEP, I:E	
Normocap CD-200	EtCO$_2$, FiCO$_2$, EtN$_2$O, FiN$_2$O, RR, PAmbient	
Multicap, Normocap CD2-02,	EtCO$_2$, FiCO$_2$, EtO$_2$, FiO$_2$, EtN$_2$O, FiN$_2$O, RR, PAmbient	

Heart-lung machines

Device	Device set values for trends	Measured numeric values in trends	
Jostra HL20	bypass on, bypass off, aorta closed, aorta open	speed, flow rate, systolic pressure, diastolic pressure, mean arterial pressure, FiO$_2$, FiCO$_2$, cardioplegia amount	N-DISHL20

Bloodgas analyzers

Device	Numeric values	
AVL Opti CCA	pH, PCO$_2$, PO$_2$, ctHb, SO$_2$, barometric pressure, HCO$_3$, BE, Temp, Kalium, Natrium, O$_2$Ct	N-DISOPT

4.3.2 Device Interfacing Solution components

The Device Interfacing Solution consists of:

- a device specific interfacing module
- a device specific cable
- a bus cable
- a connector for another bus cable
- label specifying the external device

4.3.3 Connections

Connect the device specific cable to the external device and the bus cable to the S/5 Anesthesia Monitor's UPI4 or UPI4NET board, or to another interfacing module.
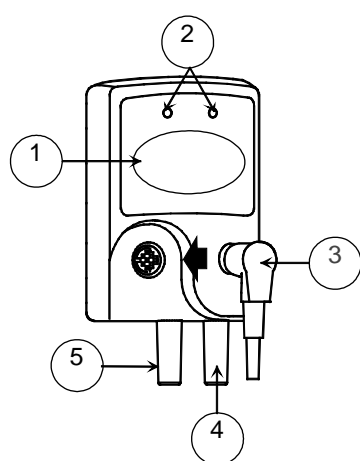
(1)   label specifying the external device

(2)   LED indicators

(3)   black bus cable from another interfacing module, if needed

(4)   grey device specific cable to the communication port of the external device

(5)   black bus cable to the monitor's UPI4 or UPI4NET board (or to another interfacing module)

Figure 26   Connection cables and LED indicators

WARNING   **The S/5 Anesthesia Monitor, interfacing modules and interfaced devices must be situated in the same patient environment (as defined in IEC 60601-1-1).**

WARNING   **Connecting electrical equipment together or using the same extension cord for more than one device may cause their leakage currents to exceed the limits specified in relevant safety standards. Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

4.3.4 Mounting

The DIS module can be mounted on the side panel of the external device. Also IV pole placement is possible.

NOTE: As the Device Interfacing Solution works only with the device specified in the label of the interfacing module, it is recommended that the interfacing module always travels along with the external device.
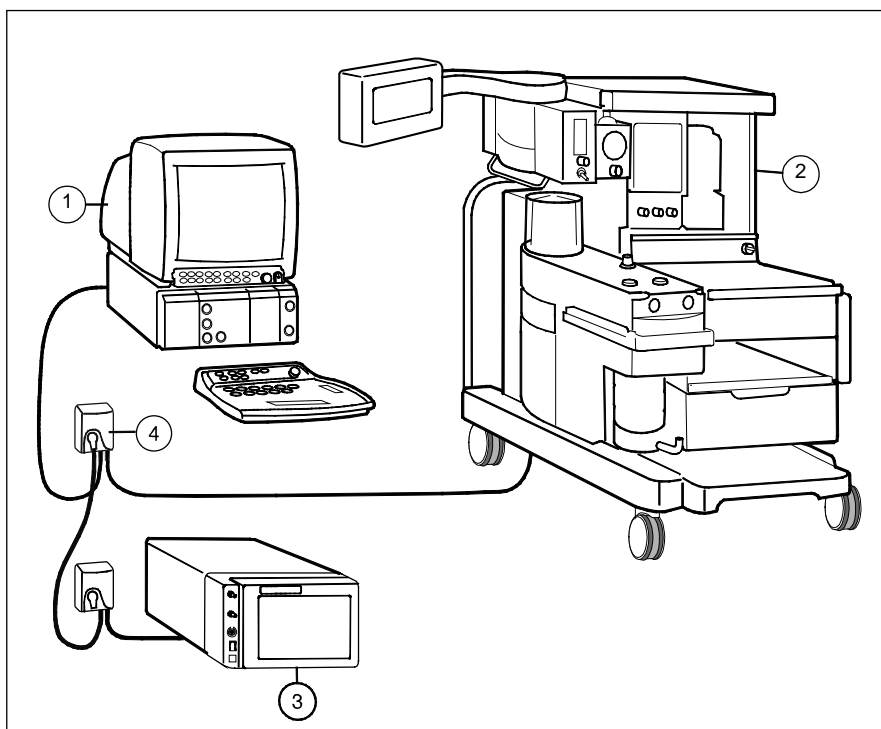
Figure 27   An example of interfacing external devices with Device Interfacing Solution

(1)   Datex-Ohmeda S/5 Anesthesia Monitor (with the L-ANE01(A) or L-ICU01(A) software)

(2)   Aestiva/5 anesthesia machine

(3)   RGM monitor

(4)   Interfacing module (max. 10 pcs)

NOTE: You can connect up to ten (10) interfacing modules to one system simultaneously.

CAUTION   Make sure that the interfacing module is always used in vertical position to prevent water from entering the module.

CAUTION   Make sure that you are connecting the interfacing module to the device specified in the label.

4.3.5 Selecting the external device

1. Connect the interfacing module to the monitor's UPI4(NET) board or to another interfacing module.

2. Connect the device specific cable to the external device and turn the external device on.

3. The monitor identifies the connected device automatically.

4.3.6 Selecting the parameter data source

Select the external device via *Monitor Setup* / *Interfacing* – menu:

- Select the desired measurement parameter (e.g., *Gases*).

- Select the desired source by name (e.g., *Aestiva*).

NOTE: The name of the device is visible on the list only if the device is correctly connected.

4.4 Interfacing Datex-Ohmeda Anesthesia Delivery Unit

It is possible to interface the Datex-Ohmeda Anesthesia Delivery Unit to the S/5 Anesthesia Monitor via the UPI Board, B-UPI4 or UPINET Board, B-UPI4NET. The data link is bi-directional. The parameters transferred to the Anesthesia Delivery Unit are summarized in table 3 and the events transferred to the S/5 Anesthesia Monitor are summarized in table 4. The events are transferred continuously once a minute or during the system check procedure and appear in the trend pages or in the anesthesia record. The transfer of events requires record-keeping software.

4.4.1 Interconnection

Use the ADU-AS/3 Monitor Cable.

4.4.2 Setting interfacing parameters on the S/5 Anesthesia Delivery Unit

1. Press the **Setup** key.

2. Select *Install* password 10.

3. Select *Interfacing* and choose S/5 AM.

4. Press the **Normal Screen** key.

4.4.3 Setting interfacing parameters on the S/5 Anesthesia Monitor

No settings are required on the S/5 Anesthesia Monitor.

Table 3   **Parameters transferred from S/5 Anesthesia Monitor to S/5 Anesthesia Delivery Unit**

Waveforms	Numerics
CO_2	Et & Fi CO_2 % Et & Fi O_2 % O_2% difference (I-E) Et & Fi N_2O% Et & Fi AA% Vol Exp MV Vol Exp TV

Table 4   **Events transferred from S/5 Anesthesia Delivery Unit to the S/5 Anesthesia Monitor**

Events transferred once a minute	
Ventilator settings	Ventilation (mode) Tidal Volume Minute Volume Resp. Rate I:E Times: inp I:E Times: exp Insp. Pause
Ventilator measurements	Ppeak Pplat Peep Pmin
Fresh gas settings	Agent name Agent % in fresh gas Total flow O_2 flow N_2O flow Air flow
Events transferred during system check	
System check test results	Gas Delivery: Agent Gas Delivery: N_2O Leak Tests: AUTO AUTO Leak (ml/min) Leak Test: MAN MAN Leak (ml/min) Number of confirmed checklist items Bypass Check

4.5 Interfacing Dräger Cicero, Cato, Julian and Narkomed 2C (by NAD)

It is possible to interface Dräger Cicero and Cato to the S/5 Anesthesia Monitor or to the S/5 Critical Care Monitor via Interface Board, B-INT, or Interface Module, M-INT.

NOTE: The Interface Board must be equipped with revision 881652-4.0 software or later.

The parameters transferred to the S/5 Anesthesia Monitor or S/5 Critical Care Monitor are summarized in tables 5 and 6.

WARNING **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

4.5.1 Interconnection

Use the INT-External Device Cable, except for Julian and Cicero EM, in which case use the INT-Julian/Cicero EM cable.

1. Make sure that the power to both monitors is turned off.

2. Connect the 9 pin D-connector to the X3, X7, X8 or X9 connector on Interface Board, B-INT, or Interface Module, M-INT. Tighten the finger screws..

3. Connect the 25 pin D-connector to a corresponding connector on the anesthesia machine. The connector is labelled 'RS-232-C'. Tighten the finger screws.

4.5.2 Setting communication parameters

Set the communication parameters for Cicero and Cato to RS-232: 9600, e, 8, 1 (MEDIBUS 3.00). In all cases please refer to the documentation provided by Dräger.

4.5.3 Setting interfacing parameters on the S/5 Anesthesia Monitor or S/5 Critical Care Monitor

Set the interfacing parameters on the S/5 Anesthesia Monitor or S/5 Critical Care Monitor according the instructions given in section 4.1.3.

Table 5 **Parameters transferred from Dräger Cicero monitor to S/5 Anesthesia Monitor or S/5 Critical Care Monitor**

Selection	Waveforms	Numerics	States
Gases / SSS	CO_2 (kPa, mmHg, %)	CO_2 Fi & Et (kPa, %) O_2 Fi & Et (%) N_2O Fi & Et (%) RR (CO_2) (1/min) AA Fi & Et (%) Tidal Volume insp. (1) Minute Volume exp. (1) Ppeak (mbar) Pplat (mbar), PEEP (mbar)	None
SpO_2	Pleth (% full scale)	SpO_2 (%) Pulse Rate (1/min)	Probe Off

Table 6 **Parameters transferred from Dräger Cato, Julian and Narkomed 2C (NAD) monitor to the S/5 Anesthesia Monitor or S/5Critical Care Monitor**

Selection	Waveforms	Numerics	States
Gases / SSS	CO_2 (kPa, mmHg, %)	CO_2 Fi & Et (kPa, %) O_2 Fi & Et(%) N_2O Fi & Et (%) RR (CO_2) (1/min) AA Fi & Et (%) Tidal Volume insp. (1) Minute Volume exp. (1) Ppeak (mbar) Pplat (mbar); not in Narkomed 2C PEEP (mbar)	None
SpO_2	Pleth (% full scale)	SpO_2 (%) Pulse Rate (1/min)	Probe Off

NOTE: The transference of parameters illustrated in tables 5 and 6 represents the maximum. Some of these parameters may not be available in all device versions.

NOTE: The transference of waveforms requires the MEDIBUS real-time extension and, in Cato monitors, waveforms are available only on port 1.

4.6 Interfacing printer

It is possible to interface a laser printer (either serial or parallel) to the S/5 Anesthesia Monitor and Critical Care Monitor via the UPI Board, B-UPI4 or UPINET Board, B-UPI4NET. The printer must be PCL5 or PCL6 compatible and it should contain at least 2 Mb of memory.

NOTE: The following information on the printers can be used as a reference when obtaining suitable printers locally.

WARNING **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

WARNING **Connecting the power supply cord of the printer to the wall socket may cause the printer leakage current to exceed the limit specified for medical equipment. Always connect the printer to an appropriate separating transformer.**

4.6.1 Connection to HP LaserJet 4P printer

Contact your authorized Datex-Ohmeda distributor.

4.6.2 Connection to Epson EPL-5200 printer

Setting the printing parameters

Set the printing parameters for the EPL-5200 printer according to tables 7 and 8.

Table 7   Printing parameter settings - EPL-5200, SelecType Level 1

Item	Settings
Input	Auto
Page size	A4
Copies	1
Orient.	Port.
Font	RD-0
Status sheet	Choose to print
Font sample	Choose to print
Sub config	
Form Symset	64 lines PcMulti
System	
Full print T-offset L-offset Memory left Load macro Save macro Delete macro Power on macro	20 0 0 Actual value displayed 1 1 1 1

Table 8   Printing parameter settings - EPL-5200, SelecType Level 2

Item	Settings
Feature Print	Choose to print
Emulation	
CH Emulation	S 3/P/Si
Interface	
SLCTIN Autofeed Busy delay Word length Baud rate Parity Stop bit DTR XON/XOFF ENQ/ACK DSR CTS	Off Off 0 ms 8 bit 19 200 bps None 1 On Off Off On On
RX-buffer size	5 kbytes
Uset	Autosense
CH time-out	60
Auto cont.	Off
Lang.	English
Density	L***D
Toner	Actual value displayed
Version	Actual value displayed
Page counter	Actual value displayed
Ritech	Medium
Standby	Enable

4.6.3 Connection to Epson EPL-5500 printer

The S/5 Anesthesia Monitor and S/5 Critical Care Monitor can be connected to an Epson EPL-5500 laser printer via the 25 pin parallel connector (X3) or the 9 pin serial connector (X8) on the UPI Board. By default the printer has only a parallel port, but it is possible to add a serial module with a serial port for the connection. The printer and the serial module (C823341) should be purchased from your local Epson dealer. The printer memory should be at least 2 MB. Also the printer cable should be purchased from your local Epson dealer.

WARNING **Connecting the power supply cord of the printer to the wall socket may cause the printer leakage current to exceed the limit specified for medical equipment. Always connect the printer to an appropriate separating transformer.**

Printer setup

NOTE: For a detailed description, please refer to the documentation provided with the printer.

Serial connection

1. To select the serial mode open the printer cover, remove the side cover, and the shield cover. Check that the jumper switch and the side switches on the serial module are in the serial interface position.

Parallel connection and serial connection

2. Insert the photoconductor unit, and the developer cartridge into the printer.

3. Plug the printer into mains supply, and connect the printer cable.

Serial connection

4. Hold down the button on the control panel, and turn on the printer. Continue to hold down the button until both lights on the control panel turn off, then release the button. Make sure that the green light is flashing, indicating that the printer is in the default setting mode. Input the following code numbers:

Code	Option
124	Set baud rate to 19200
111	Exit the default setting mode

e.g. for 124 push the button on the control panel first once, then twice, and then four times.

Parallel Connection and Serial Connection

Load paper into the paper tray and open the top paper support.

S/5 Anesthesia Monitor or S/5 Critical Care Monitor Setup

Set the printer mode to serial or parallel from the Printer Settings menu.

4.7   Interfacing computer

It is possible to interface a computer to the S/5 Anesthesia Monitor and to the S/5 Critical Care Monitor. For further information, please contact your authorized Datex-Ohmeda distributor.

WARNING   **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

WARNING   **Connecting the power supply cord of the computer to the wall socket may cause the computer leakage current to exceed the limit specified for medical equipment. Always connect the computer to an appropriate separating transformer.**
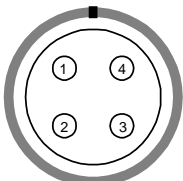
4.8   UPI4 and UPI4NET Board Output Signals

Analog/ digital output signals on the connectors X4 and X7 can be used for interface with other devices. The pin assignments are illustrated in tabels/pictures below.

Coding element connector, X4

9 pin female D-connector	Pin	Signal
	1	IDCS1 (chip select)
	2	IDCL (clock)
	3	IDDI (data in)
	4	IDDO (data out)
	5	IDPE (protect enable)
	6	+5Vdc
	7	Direct ECG
	8	Nurse call
	9	gnd

Synchronization connector , X7

4 pin female connector	Pin	Signal
	1	GND
	2	Def_Sync
	3	Direct ECG
	4	Pressure Out

4.8.1 Digital outputs

The digital output signals are as follows:

Defibrillation Sync (X7 pin 2)
The defibrillation sync signal is generated by the ECG. When activated, the signal is set to a high level and then set back to a low level after 10 ms. The signal is regenerated only after returning to the low level. The high level ranges from 2.8 to 5 V while the low level ranges from 0 to 0.8 V. The delay from the R wave peak to the start of the signal is 35 ms maximum.

Nurse Call (X4 pin 8)

The nurse call signal is generated by the red, yellow and white alarms. When activated, the signal is set to the high state and remains at the high state until the alarm situation is over or the SILENCE ALARM key is pressed. The high state range is from 2.8 to 5 V, while the low state range is from 0 to 0.8 V.

If the output signals are used simultaneously with the coding element, the B-UPINET Y-cable, order number 889308, is recommended to be used.

4.8.2 Analog outputs

Direct ECG (X4 pin 7 and X7 pin3):

– Delay (max.): 15 ms
– Gain ECG (in)/ECG(out): 1 mV/1V

The signals require an input impedance of 100 kΩ

NOTE: The ECG signal is based on the ECG measurement of the Hemodynamic Modules, M-ESTPR (all variations) and M-NE(12)STPR (all variations). The ECG signal from the modules is channel 1 (ECG1). The channels 2 and 3 (ECG2, ECG3) are not transmitted. Make sure that the signal in channel 1 (ECG1) is good enough (extensive QRS for IABP synchronization). For further information, please contact your authorized Datex-Ohmeda distributor.

NOTE: The direct ECG out signal is not available with the Central Unit, F-CU8 rev. 01, and with modules M-ESTP rev. 01, M-EST rev. 00 and M-ETP rev.

Pressure out (pin 4):

– P1 from hemodynamic module

The Invasive pressure output signal is 1 V/100 mmHg, originally ranging from 0 to 300 mmHg, and with a delay of approximately 25 ms. The signal requires an input impedance of 100 kΩ.

4.9 S/5 Pressure Temp Module, M-PT, output signals

The signal output connector on the Pressure Temp Module, M-PT, can be used to interface some models of IABPs to the S/5 Anesthesia Monitor and S/5 Critical Care Monitor. The pin assignments are illustrated in table 9. Please contact your local distributor for more information.
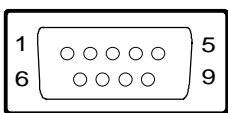
WARNING **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

Table 9   Signal output connector pin assignments

Pin	Signal
1	ECG out, ECG1
2	Pressure out, P3
3	ECG out, ECG1
4	Ground
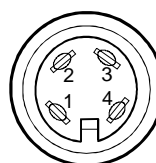
4.9.1 Analog outputs

The analog output signal specifications are as follows.

ECG (ECG1)
The ECG signal is 1 V/1 mV with a delay of max 15 ms. The signal requires an input impedance of 100 kΩ.

NOTE: The ECG signal is based on the ECG measurement of the Hemodynamic Modules, M-ESTPR (all variations) and M-NE(12)STPR (all variations). The ECG signal from the modules is channel 1 (ECG1). The channels 2 and 3 (ECG2, ECG3) are not transmitted. Make sure that the signal in channel 1 (ECG1) is good enough (extensive QRS for IABP synchronization). For further information, please contact your authorized Datex-Ohmeda distributor.

Invasive Pressure (P3)
The Invasive pressure output signal is 1 V/100 mmHg, originally ranging from 0 to 300 mmHg, and with a delay of approximately 25 ms. The signal requires an input impedance of 100 kΩ.

5 FUNCTIONAL CHECK

These instructions include procedures for a functional check for Datex-Ohmeda S/5 Anesthesia Monitor and S/5 Critical Care Monitor. The functional check is recommended to be performed after monitor installation.

These instructions include a Check form (APPENDIX A) to be filled in when performing the corresponding procedures.

The symbol ✍ in the instructions means that the performed procedure should be signed in the check form. The procedures should be performed in ascending order, by passing those that are not applicable for a particular monitor.

All menu selections related to Datex-Ohmeda products are written in following typeface:
e.g. *Parameters -More...-TONO*

As you enter the service menus, you need following passwords:

> *Monitor Setup -Install/Service* (password 16-4-34)-*Service* (password 26-23-8)

In case you evaluate the measurement accuracy with a patient simulator, add simulator 's accuracy specification to the one of the monitor.

The procedures are designed for monitors with S/5 monitor software L-ANE01(A) or L-ICU01(A).However, most of the procedures also apply to monitors with older monitor software.

5.1 Recommended tools

Tool	Order No.	For product(s)
Sampling line 3.0 m	73319	All Airway modules
Sampling line 2.0 m	73318	Compact Airway Module,M-COVX/M-CAiOVX
Spirometry tube	884101	All Airway modules w/(V)
D-lite	733950	All Airway modules w/(V)
Patient simulator		-Hemodynamic modules
SpO2 fi ger probe	SAS-F4	Hemodynamic modules w/(S)
Adult NIBP cuff	572435	Hemodynamic modules w/(NIBP)
Adult NIBP hose	877235	Hemodynamic modules w/(NIBP)
Earphones		EEG Module,M-EEG
Nellcor SpO2 probe		M-NSAT
MemCard –	Menu --	M-MEM
MemCard –	Data --	M-MEM
Screwdriver –		All

5.2 Visual inspection

- Make sure that the monitor is switched to standby.
  Disconnect the mains power cord from the 8-Module Frame, F-CU8.
  If the monitor is connected to the Datex-Ohmeda network, disconnect the Mon-Net cable
  from the Network Board, B-NET or UPI4NET board, B-UPI4NET.
  If the Memory Module, M-MEM is connected, remove any memory cards.

  1. Check all units visually:
  – all parts are intact, the cables and screws are connected and tightened properly
  – the display power cord is locked to the display
  – modules go in smoothly and lock up properly in all module slots
  – sampling line is connected to a used Airway Module

  ✍

5.3 Functional inspection

5.3.1 General

1. Connect the mains power cord to the F-CU8.
   Check that the stand-by LED is lit.

2. Switch the monitor on.
   Check that the monitor starts up properly, i.e. the alarm LEDs turn on and off, normal start-up sound is heard from the loudspeaker and monitoring screen appears.
   No error messages should appear onto the screen.

   Enter the service menus.
   When applicable, check that the 'Timeouts ', 'Bad checksums ' and 'Bad c-s by mod ' values of a module are not increasing faster than by 50 per second. Check also that the modules memories have passed the internal memory test, i.e. 'RAM ', 'ROM ' and 'EEPROM ' all state OK.
   If the Recorder Module, M-REC, is connected, the module should record two lines of start-up information.

   ✍

   Preset measurement settings for those parameters that are connected are, for example:

   Recorder - *Record Waveforms* - *Waveform 1* - *ECG1*
               - *Waveform 2* - *P1*
               - *Waveform 3* - *P2*
   Invasive Pressures - *P1 'ART ' Setup* -- *Label –ART*
               - *P2 'CVP ' Setup* -- *Label –CVP*
               - *P3 Setup* - *Label –PA*
               - *P4 Setup* - *Label -P4*
               - *P5 Setup* - *Label -P5*
               - *P6 Setup* - *Label -P6*

   Pulse Oximetry - *Pleth Scale –AUTO*

   or

Others - *SPO2 Setup* - *Pleth Scale* – *AUTO*

Airway Gas - *Spirometry View* - *Scaling* - *Indep.*
                                  - *Paw Scale* – *20*
                                  - *Flow Scale* – *15*
                                  or

Ventil. - *Spirometry Setup* - *Scaling* - *Indep* .
                                  - *Paw Scale* – *20*
                                  - *Flow Scale* – *15*

Others - *Resp Setup* - *Size* - *1.0*
                                  - *Resp Rate Source* – *AUTO*
                                  - *Measurement* – *ON*
                                  - *Detection Limit* – *AUTO*

5.3.2 Display(s)

1.   Check that the picture on the screen is adjusted correctly. Readjust the picture with the adjustment knobs or with the display menu keys, if necessary.

5.3.3 Keyboard(s)

1.   Tests with the ComBar /Command Board, ARK Keyboard and Remote Controller:
Press the **Help** key. Turn the ComWheel in both directions and check that the cursor in the menu moves corresponding gly. Highlight **Normal Screen**, press the ComWheel and check that the menu disappears from the screen.

5.3.4 8-Module Frame, F-CU8

1.   Check that the fan is running.

2.   Check that the clock on the screen shows correct time.
Readjust the time and date, if necessary.

5.3.5 Extension Frame, F-EXT4

1.   If the F-EXT4 contains a fan, check that the fan is running.

2.   Check that the modules in the F-EXT4 are recognized i.e. the required parameter information is shown on the monitor screen.

5.3.6 Airway Module, G-XXXX

Wait until the message 'Calibrating gas sensor ' disappears from the screen.

1.   Check that the Airway Module fan is running.

2.   If the module contains a membrane key on the front panel, press the key for at least one second and check that it is identified.

✍

For Airway Modules containing the Patient Spirometry option

3.   Connect a clean spirometry tube and D-lite to the module. Connect the sampling line to the D-lite. Breathe through the wider side of the D-lite.Check that the flow waveform moves downwards when you breathe in and upwards when you breathe out.

✍

For all Airway Modules,G-XXXX

4.   Block the tip of the sampling line with your finger and check that the message 'Sample line blocked ' appears onto the monitor screen within 30 seconds.

5.   Remove the D-fend and check that the message 'Check D-fend ' appears on the screen within 30 seconds.

6.   Breathe to the sampling line briefly. Check that the CO_2 information is updated on the screen.

✍

5.3.7 Compact Airway Module

Wait until the message 'Calibrating gas sensor ' disappears from the screen.

1.   Check that the fan is running.

2.   If the module contains membrane keys on the front panel, press each of the keys for at least one second and check that they are identified.

✍

Compact Airway Modules w/the Patient Spirometry option

3.   Connect a clean spirometry tube and D-lite to the module. Connect the sampling line. Breathe through the wider side of the D-lite. Check that the flow waveform moves downwards when you breathe in and upwards when you breathe out.

✍

For all Compact Airway Modules

4.　Block the tip of the sampling line with your finger and check that the message 'Sample line blocked ' appears on the monitor screen within 30 seconds.

5.　Detach the D-fend and check that the messages 'Check D-fend ' appears on the monitor screen within 30 seconds.

6.　Breathe to the sampling line briefly. Check that the CO_2 information is updated on the screen.

　　　✍

5.3.8　Tonometry Module, M-TONO

1.　Press each of the front panel membrane keys for at least one second and check that they are identified.

　　　✍

5.3.9　Hemodynamic Modules

ECG and RESP measurements

1.　Check functioning of the front panel membrane key ECG ,**Lead**, if available.

2.　Connect an ECG cable to the module. Connect the cable leads to a patient simulator. Check that all ECG and impedance respiration information is shown on the monitor screen as configured on the simulator.
Turn the simulator off. Check that the 'Asystole ' and 'Apnea' messages are displayed.

　　　✍

Modules w/temperature measurement

3.　Check the temperature channels with a patient simulator.
Check that temperature measurement information is shown on the monitor screen as configured on the simulator.

　　　✍

Modules w/invasive blood pressure measurement

4.　Check functioning of the front panel membrane keys.

5.　Check the InvBP channels with a patient simulator.
Zero the InvBP channels, the check that the values and waveforms correspond to the simulator settings.

　　　✍

Modules w/SpO2 measurement

6. Connect SpO2 finger probe to the module. Check that the message 'Probe off ' is show when the probe is not connected to a finger.

7. Attach the SpO2 probe to your finger. Check that a reading of 95-99 and a pleth waveform appear onto the screen

    ✍

Modules w/non invasive blood pressure measurement

8. Check functioning the front panel membrane keys.

9. Attach an adult NIBP cuff onto your arm and perform one NIBP measurement. Check the module identifies the cuff, i.e. the text 'Adult ' appears in the NIBP digit field for a short time. Check that the module gives a reasonable measured result.

    ✍

5.3.10 Pressure/Pressure Temp Modules, M-P/-PT

Invasive blood pressure measurement

1. Check the functioning of the front panel **Zero P3** membrane key.

2. Check the InvBP channel with a patient simulator.
    Zero the InvBP channel. Then check that the values and waveforms correspond to the simulator settings.

    ✍

Modules w/temperature measurement

3. Check the temperature channels with a patient simulator.
    Check that temperature measurement information is shown on the monitor screen as configured on the simulator.

    ✍

5.3.11 Dual pressure Module, M-PP

1. Check the functioning of the front panel **Zero P5** and **Zero P6** membrane keys.

2. Check the InvBP channels with a patient simulator.
    Zero the InvBP channels. The check that the values and waveforms correspond to the simulator settings.

    ✍

5.3.12 Cardiac Output Modules, M-COP/-COPSv

Invasive blood pressure measurement

1. Check the functioning of the front panel membrane **Zero P4** key.

2. Check the InvBP channel with a patient simulator.
    Zero the InvBP channel. Then check that the values and waveforms correspond to the simulator settings.

✍

Cardiac Output measurement

3. Check the functioning of the front panel **Start C.O.**membrane key.

✍

5.3.13 NIBP module, M-NIBP

1. Check the functioning of the front panel membrane keys.

2. Attach an adult NIBP cuff onto your arm and perform one NIBP measurement.
    Check the module identifies the cuff, i.e. the text 'Adult ' appears on the NIBP digit field for a short time.
    Check that the module gives a reasonable measured result.

✍

5.3.14 Nellcor Compatible Saturation module, M-NSAT

1. Connect a Nellcor SpO2 finger probe to the module. Check that the message 'Pulse search ' is shown. Check also that the shown message changes to 'Check probe ' within 30 seconds.

2. Attach the SpO2 probe on your finger. Check that a reading of 95-100 and a proper SpO2 waveform appear.

✍

5.3.15 Datex-Ohmeda Oxygen Saturation module, M-OSAT

1. Connect a Datex-Ohmeda OxyLead Cable compatible sensor ot Integrated sensor to the module. Check that the message 'Pulse search ' is shown. Check also that the shown message changes to 'Check probe ' within 30 seconds.

2. Attach the SpO2 probe on your finger. Check that a reading of 95-100 and a proper SpO2 waveform appear.

✍

5.3.16 Memory Module, M-MEM

1.   Insert Menu card and Data card into their slots.
      Check that the corresponding icons appear onto the monitor screen.

      ✐

5.3.17 Recorder Module, M-REC

1.   Press the **Record Wave** key and check that the module starts recording the selected
      waveforms. Press the **Stop** key on the module to stop recording.
      Press the **Print Trends** key and check that the module starts recording trends. Press the
      Stop key on the module to stop recording.

2.   Check that the quality of the recordings is acceptable.

      ✐

5.3.18 Network Board, B-NET and UPINET board, B-UPI4NET

1.   Check that the Mon-Net cable connector and the Identification plug are clean and intact,
      then connect them to the Network/UPI4NET Board.
      Check that the monitor connects to the S/5 Network, i.e.the network symbol appears under
      the clock on the upper right-hand corner of the screen. Also a message regarding the
      connected Central should appear in the message field on the screen.

      ✐

5.3.19 Interface Board/Module, B-INT/M-INT

1.   Make sure that the monitor receives all necessary parameter data from the connected
      devices. Check the screen configuration and the related interfacing settings, if necessary.

      Monitor Setup – *Interfacing*

      ✐

5.3.20 Device Interfacing Solution, N-DISxxx

1.   Make sure that the monitor receives all necessary parameter data from the connected
      devices. Check the screen configuration and the related interfacing settings, if necessary.

      Monitor Setup - *Interfacing - Staus Page*

      ✐

5.3.21 General

1.   Perform an Electrical safety check and a leakage current test.
      Check that the monitor and all connected units function normally after the performed test

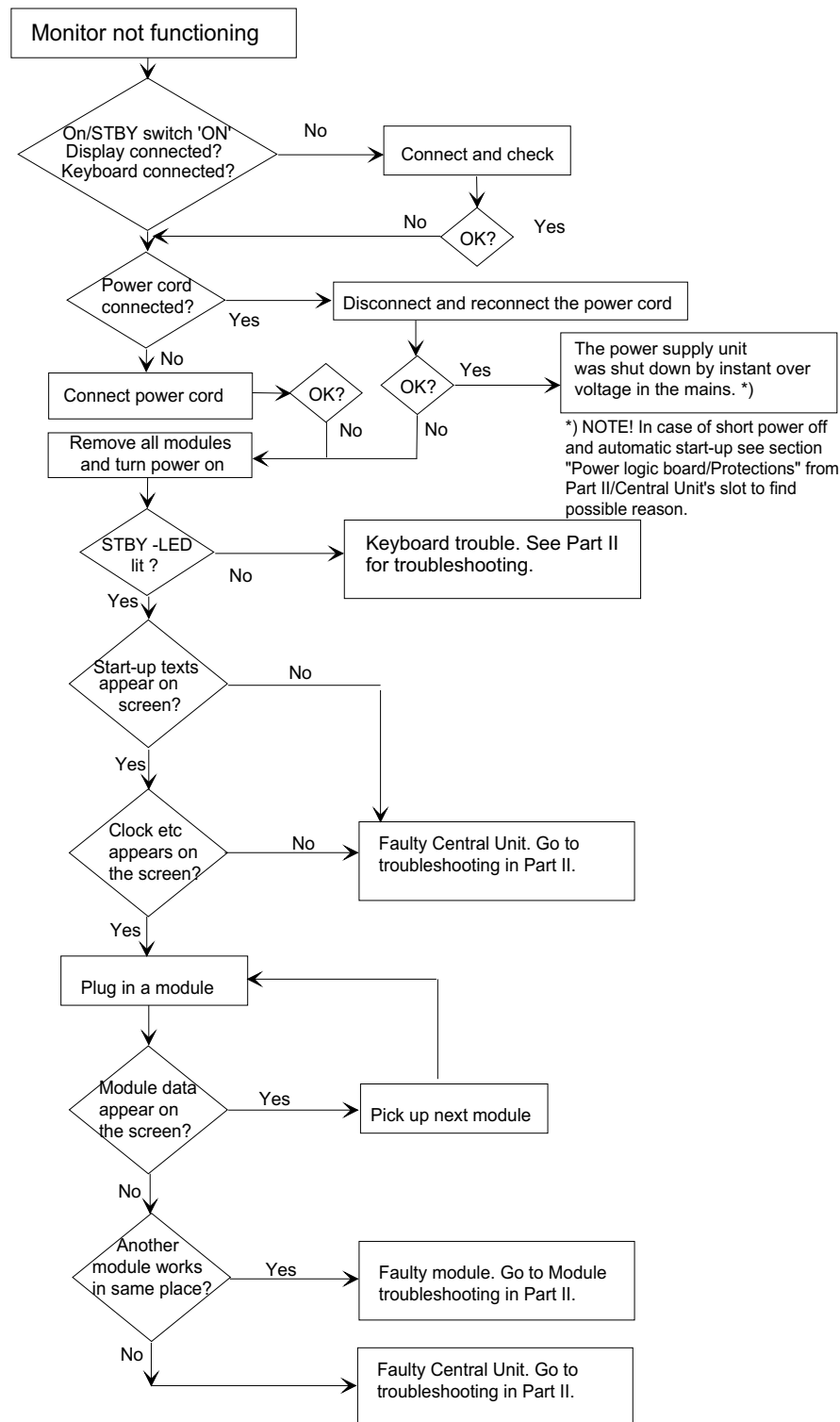   ✐

6   GENERAL TROUBLESHOOTING

Figure 28   S/5 monitor's general troubleshooting flowchart

APPENDIX A

FUNCTIONAL CHECK FORM

S/5 Anesthesia Monitor and S/5 Critical Care Monitor

Customer		
Service		
Service engineer	Date	

Monitor Installation

F-CU8	D-	K-	G-
S-	M-	M-	K-
L-	M-	M-	K-
B-	M-	M-	F-
B-	M-	M-	N-
B-	B-	M-	

☐ OK = Test OK   ☐ N.A. = Test not applicable   ☐ Fail = Test Failed

Visual inspection

		OK	N.A.	Fail
5.2.1.	Check all units visually:	☐	☐	☐

Functional inspection

			OK	N.A.	Fail
5.3.1	General		☐	☐	☐
5.3.2	Display(s)	S/N	☐	☐	☐
5.3.3	Keyboard(s)	S/N	☐	☐	☐
5.3.4	8-Module Frame, F-CU8	S/N	☐	☐	☐
5.3.5	Extension Frame, F-EXT4	S/N	☐	☐	☐

Notes

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	OK	N.A.	Fail
5.3.6 Airway Module, G-X S/N	☐	☐	☐
For Airway modules w Spirometry	☐	☐	☐
For all Airway modules	☐	☐	☐
Notes			

	OK	N.A.	Fail
5.3.7 Compact Airway Module S/N	☐	☐	☐
Compact Airway modules w/ Spirometry option	☐	☐	☐
For all Compact Airway modules	☐	☐	☐
Notes			

	OK	N.A.	Fail
5.3.8 Tonometry Module, M-TONO S/N	☐	☐	☐
Notes			

	OK	N.A.	Fail
5.3.9 Hemodynamic Modules. S/N	☐	☐	☐
ECG and RESP measurement	☐	☐	☐
TEMP measurement	☐	☐	☐
InvBP measurement	☐	☐	☐
SpO$_2$ measurement	☐	☐	☐
NIBP measurement	☐	☐	☐
Notes			

		OK	N.A.	Fail
Pressure/Pressure Temp Modules, M-P/-PT	S/N	☐	☐	☐
Notes				

		OK	N.A.	Fail
5.3.10 Dual pressure Module, M-PP	S/N	☐	☐	☐
Notes				

		OK	N.A.	Fail
5.3.11 Cardiac Output Modules, M-COP/-COPSv.	S/N	☐	☐	☐
InvBP measurement		☐	☐	☐
C.O. measurement		☐	☐	☐
Notes				

		OK	N.A.	Fail
5.3.12 NIBP module, M-NIBP	S/N	☐	☐	☐
5.3.13 Nellcor Compatible Saturation module, M-NSAT	S/N	☐	☐	☐
5.3.14 Datex-Ohmeda Oxygen Saturation module, M-OS	S/N	☐	☐	☐
5.3.15 Memory Module, M-MEM	S/N	☐	☐	☐
5.3.16 Recorder Module, M-REC	S/N	☐	☐	☐
5.3.17 Network Board, B-NET and UPINET board, B-UPI4	S/N	☐	☐	☐
5.3.18 Interface Board/Module, B-INT/M-INT	S/N	☐	☐	☐
5.3.19 Device Interfacing Solution, N-DISxxx	S/N	☐	☐	☐
	S/N	☐	☐	☐
	S/N	☐	☐	☐
	S/N	☐	☐	☐
	S/N	☐	☐	☐
Notes				

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5.3.20 General	☐	☐	☐
Electrical safety test and leakage current test	☐	☐	☐

Notes

_____

_____

_____

_____

_____

_____

_____

Used Spare Parts

Signature