Instructions for use

Infinity Acute Care System

WARNING
To properly use this medical device, read and comply with these instructions for use.

Monitoring applications
Software VG3.n
Typographical conventions

1 Consecutive numbers indicate steps of action, with the numbering restarting with “1” for each new sequence of actions.
   - Bullet points indicate individual actions or different options for action.
   - Dashes indicate the listing of data, options, or objects.
   (A) Letters in parentheses refer to elements in the related illustration.
   A Letters in illustrations denote elements referred to in the text.

Any text shown on the screen and any labeling on the device are printed in bold and italics, for example, Alarms, or Trends/ Data.

The “greater than” symbol > indicates the navigation path in a dialog window, for example, System setup... > Screen setup > General settings. In this example, System setup... represents the dialog window title, Screen setup represents a horizontally aligned tab, and General settings a vertically aligned tab.

Screen reproductions

The reproductions of screen content in the instructions for use can differ from the content actually shown on the screen.
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- Infinity®
- Innovian®
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- Medical Cockpit®
- MegaCare™
- MPo®
- PatientWatch™
- TruST®
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- Masimo® rainbow® SET™
- PV®
- SET™
- SpCo®
- SpHb®
- SpMet®
- SpOCTM
- Pulse CO-Oximeter™
- M-LNCS™
- Nellcor™
- OxiMax®
- SatSeconds®
- BIS VISTA™
- Nellcor®
- Masimo® SET® (Signal Extraction Technology)
- Masimo® rainbow® SET®
- PV®
- SET®
- SpCo®
- SpHb®
- SpMet®
- SpOCTM
- Pulse CO-Oximeter™

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- OxiMax®
- SatSeconds®
- BIS VISTA™

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is a trademark of IDMed

- TOF-Watch®

is a trademark of Merk & Co, Inc.

All devices referenced in these instructions for use may not be approved for sale in all countries. Please check with your local Dräger representative.
Safety information definitions

WARNING
A WARNING statement provides important information about a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
A CAUTION statement provides important information about a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to the user or patient or in damage to the medical device or other property.

NOTE
A NOTE provides additional information intended to avoid inconvenience during operation.

Abbreviations and symbols
For explanations, refer to sections "Abbreviations" and "Device symbols" in chapter "System overview".

Definition of target groups

For this product, users, service personnel, and experts are defined as target groups.

Service personnel
Service personnel are persons who are responsible for the maintenance of the product. Service personnel must be trained in the maintenance of medical devices and install, reprocess, and maintain the product.

Experts
Experts are persons who perform repair or complex maintenance work on the product. Experts must have the necessary knowledge and experience with complex maintenance work on the product.

For these target groups, you must have received instruction in the use of the product and must have the necessary training and knowledge to use, install, reprocess, maintain, or repair the product.

The product must be used, installed, reprocessed, maintained, or repaired exclusively by defined target groups.

Users
Users are persons who use the product in accordance with its intended use.
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For your safety and that of your patients

For your safety and that of your patients
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Strictly follow these instructions for use

NOTE
The Infinity Acute Care System provides the following additional instructions for use:
- Infinity Acute Care System – Infinity M540 patient monitor (describes the M540 user interface)
- Infinity Acute Care System – Medical Cockpit (describes the hardware of the Cockpit)
- Infinity Acute Care System – Monitoring accessories (describes all of the IACS accessories).

Please refer to these additional instructions for use for device-specific information.

WARNING
Risk of incorrect operation and of incorrect use.
Any use of the medical device requires full understanding and strict observation of all sections of these instructions for use. The medical device must only be used for the purpose specified under 'Application' and in conjunction with appropriate patient monitoring.
Strictly observe all WARNING and CAUTION statements throughout these instructions for use and all statements on medical device labels. Failure to observe these safety information statements constitutes a use of the medical device that is inconsistent with its intended use.

Storing the instructions for use
WARNING
Risk of incorrect use
Instructions for use must be kept accessible for the user.

Training
Training for users is available from the responsible Dräger organization, see www.draeger.com.

Maintenance
WARNING
Risk of medical device failure and of patient injury.
The medical device must be inspected and serviced regularly by service personnel. Repair and complex maintenance carried out on the medical device must be performed by experts.
If the above is not complied with, medical device failure and patient injury may occur. Observe chapter "Maintenance". Dräger recommends that a service contract is obtained with DrägerService and that all repairs are performed by DrägerService. For maintenance Dräger recommends the use of authentic Dräger repair parts.

Accessories
WARNING
Risk due to incompatible accessories.
Dräger has only tested the compatibility of accessories listed in the current list of accessories. If other, accessories are used, there is a risk of patient injury due to medical device failure. Dräger recommends that the medical device is only used with accessories listed in the current list of accessories.
For your safety and that of your patients

Installing accessories

<table>
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<tr>
<th>CAUTION</th>
<th>Risk of device failure</th>
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<td>Install accessories to the basic device in accordance with the instructions for use of the basic device. Make sure that there is a safe connection to the basic device.</td>
<td></td>
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<tr>
<td>Strictly observe instructions for use and assembly instructions.</td>
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Sterile accessories

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<tr>
<th>CAUTION</th>
<th>Risk of medical device failure and of patient injury.</th>
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<td>Do not use sterile-packaged accessories if the packaging has been opened, is damaged or if there are other signs of non-sterility. Single-use accessories must not be reused, reprocessed, or resterilized.</td>
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Restriction of distribution

Federal Law (U.S.) restricts this device to sale by or on the order of a physician.

Restrictions for use

<table>
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<tr>
<th>CAUTION</th>
<th>Device for use in health care environments only and exclusively by persons as defined in the target groups (see &quot;Definition of target groups&quot; on page 4).</th>
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Connected devices

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<th>WARNING</th>
<th>Risk of electric shock and of device malfunction</th>
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<td>Any connected devices or device combinations not complying with the requirements mentioned in these instructions for use can compromise the correct functioning of the medical device and lead to electric shock. Before operating the medical device, strictly comply with the instructions for use of all connected devices and device combinations.</td>
<td></td>
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Safe connection with other electrical equipment

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<th>CAUTION</th>
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<tr>
<td>Electrical connections to equipment not listed in these instructions for use must only be made when approved by each respective manufacturer.</td>
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WARNING

The leakage current increases when multiple medical devices are connected to a patient. Make sure that the electrical isolation of each device is suitable for the intended application. Connect only equipment that is set up and tested according to IEC standards to the analog and digital signal inputs and outputs. Connect only passive USB devices to the IACS (Infinity Acute Care System) Cockpit. To protect the patient from possible injury due to electrical shock, peripheral devices should only be connected to a monitor within the same room. The installer or service provider should verify that the leakage current of the interconnected system meets the electrical safety requirements of IEC 60601-1 and IEC 60601-1-1.
For your safety and that of your patients

Electrical safety

WARNING
Because of the danger of electric shock, never remove the cover of a device while it is in use or plugged into a power socket.

CAUTION
To avoid injuring the patient, do not touch any connector or mounting screw on the device when you are touching the patient. Do not allow the conductive parts of electrodes and cables to contact other conductive parts or ground, either.

CAUTION
Connect the PS250 or the P2500 with an attached power cord only to hospital-grade electrical power sockets to make sure that it is properly grounded.

Connection to other devices

Device combinations (Dräger devices + Dräger devices or Dräger devices + third-party devices) approved by Dräger meet the requirements of one or more of the following standards (see instructions for use of individual devices):
– IEC 60601-1-1 (3rd edition)
  Medical electrical equipment
  Part 1-1: General requirements for safety and essential performance
– IEC 60601-1-2
  Medical electrical equipment
  Part 1-2: General requirements for safety and essential performance
  Collateral standard: Electromagnetic compatibility – Requirements and tests
– IEC 60601-1-8
  Medical electrical equipment
  Part 1-8: General requirements for safety
  Collateral standard: General requirements, tests, and guidance for alarm systems in medical equipment and medical electrical systems
– IEC 60601-1 (2nd edition)
  Medical electrical equipment
  Part 1: General requirements for safety
– IEC 60601-1-1
  Medical electrical equipment
  Part 1-1: General requirements for safety
  Collateral standard: Safety requirements for medical electrical systems
– IEC 60601-1-4
  Medical electrical equipment
  Part 1-4: General requirements for safety
  Collateral standard: Programmable electrical medical systems

If a device combination is not approved by Dräger, proper operation of the devices can be compromised.

The operator must ensure that the device combination meets the applicable standards.

Strictly observe instructions for use and assembly instructions of all connected devices.
Connection to hospital network

Many medical devices manufactured by Dräger use networks to transmit patient data in real-time and to notify clinical users of alarm conditions. Hospitals should refer to IEC 80001-1 before attempting to connect such medical devices to their IT networks. The technical documentation that IEC 80001-1 requires manufacturers such as Dräger to make available in support of such network connections can be requested. Contact your Dräger representative for that information.

Patient safety

The design of the medical device, the accompanying documentation, and the labeling on the medical device are based on the assumption that the purchase and the use of the medical device are restricted to persons familiar with the most important inherent characteristics of the medical device. Instructions and WARNING and CAUTION statements are therefore largely limited to the specifics of the Dräger medical device.

These instructions for use do not contain any information on the following points:

- Risks that are obvious to users
- Consequences of obvious improper use of the medical device
- Potentially negative effects on patients with different underlying diseases
- Medical device modification or misuse can be dangerous.

Patient monitoring

The user of the medical device is responsible for choosing a suitable patient monitoring system that provides appropriate information on medical device performance and patient condition. Patient safety may be achieved by a wide variety of means ranging from electronic surveillance of medical device performance and patient condition to direct observation of clinical signs. The responsibility for selecting the best level of patient monitoring lies solely with the user of the medical device.
General safety information

The following WARNING and CAUTION statements apply to general operation of the medical device. WARNING and CAUTION statements specific to subsystems or particular features of the medical device appear in the respective sections of these instructions for use or in the instructions for use of another product being used with this medical device.

WARNING
Risk of explosion and of chemical burns
Improper handling of batteries can result in explosions and chemical burns.
Do not throw batteries into fire. Do not force batteries open.

Observe the applicable laws and regulations for battery disposal.

WARNING
To avoid electric shock, inspect all cables before use. Never use cables that appear cracked, worn, or damaged in any way (doing so may compromise performance or put the patient at risk).

WARNING
Do not cover the device with blankets or bed sheets. To prevent burns to the patient, avoid direct contact between external surfaces and the patient.

CAUTION
To avoid injuring the patient, disconnect all sensors that will not be used during transport, before moving the patient.

CAUTION
Read all cleaning instructions (for example, originating from the disinfectant manufacturer and the hospital) carefully before cleaning the device. Refer to the chapter entitled “Cleaning and disinfection” on page 485 for device-specific cleaning instructions. Moisture may damage the circuits, compromise critical performance and present a safety risk.

WARNING
Dräger recommends using the Infinity Acute Care System or the M540 (if on wireless transport) for primary diagnosis and the (ICS) Infinity CentralStation for patient viewing only.

For countries subject to the EU directive 2002/96/EC
This device is subject to EU Directive 2002/96/EC (WEEE). In order to comply with its registration according to this directive, this device may not be disposed of at municipal collection points for waste electrical and electronic equipment. Dräger has authorized a company to collect and dispose of this device.

To initiate collection or for further information, visit Dräger on the Internet at www.draeger.com. Use the Search function with the keyword “WEEE” to find the relevant information. If access to the Dräger website is not possible, contact the local Dräger organization.

Not for use in areas of explosion hazard

WARNING
Risk of fire
The medical device is not approved for use in areas where combustible or explosive gas mixtures are likely to occur.
Information on electromagnetic compatibility

General information on electromagnetic compatibility (EMC) according to international EMC standard IEC 60601-1-2.

Medical electrical equipment is subject to special precautionary measures concerning electromagnetic compatibility (EMC) and must be installed and put into operation in accordance with the EMC information provided on page 505.

Portable and mobile radio frequency communications equipment can affect medical electrical equipment.

**WARNING**
Do not connect connectors with an ESD warning symbol and do not touch their pins without implementing ESD protective measures. Such protective measures may include antistatic clothing and shoes, touching a potential equalization pin before and during connection of the pins, or using electrically insulating and antistatic gloves. All users concerned must be instructed in these ESD protective measures.

**WARNING**
To avoid interfering with device operation, do not operate devices (monitor, MPod, MCable, and accessories) within 10 m (33 feet) of equipment that emits microwave or other high-frequency emissions.

**WARNING**
To minimize the risk of patient strangulation, carefully position and secure sensor cables. Also position the sensor cables to minimize inductive loops.

**WARNING**
To avoid patient injury as the result of a falling monitor when using a rolling stand, universal bed hook, or handle hook mount, do not apply excessive force to the monitor or mount when entering or exiting elevators or passing over thresholds and other uneven surfaces.

**CAUTION**
To prevent overheating, do not place the device in direct sunlight or near radiant heaters.

**CAUTION**
After extended exposure in a cold environment, acclimate the device carefully so that condensation does not form on the electronic parts and damage the device.

**CAUTION**
To avoid damaging the touch-sensitive screen, do not allow sharp instruments to touch the front panel of the devices.

Site of operation

Only use devices (monitor, MPod, MCable, and accessories) in areas that meet the environmental requirements outlined in the technical data section.

**WARNING**
Make sure that the device is properly mounted and secured to prevent injury. Make sure the requirements for maximum load and slope of floor are met. Consult the documentation of the mounting manufacturer for detailed information.

**WARNING**
To avoid patient injury as the result of a falling monitor when using a rolling stand, universal bed hook, or handle hook mount, do not apply excessive force to the monitor or mount when entering or exiting elevators or passing over thresholds and other uneven surfaces.

**CAUTION**
To prevent overheating, do not place the device in direct sunlight or near radiant heaters.

**CAUTION**
After extended exposure in a cold environment, acclimate the device carefully so that condensation does not form on the electronic parts and damage the device.

**CAUTION**
To avoid damaging the touch-sensitive screen, do not allow sharp instruments to touch the front panel of the devices.
For your safety and that of your patients

**Defibrillator precautions**

The IACS and the peripheral devices are protected against high-frequency interference from defibrillators and electrosurgical units and against 50-Hz and 60-Hz power line interference.

**CAUTION**

To avoid short-circuiting and otherwise damaging the device, Dräger recommends that no fluids come in contact with the IACS devices when they are connected to a power socket. If fluids are accidentally spilled on the equipment, remove the affected device from service as soon as possible and have technical personnel verify that patient safety is not compromised.

**Electrosurgery**

Observe the following precautions during electrosurgery to reduce electrosurgical unit (ESU) interference and improve operator and patient safety.

**WARNING**

For better performance and to reduce the hazard of burns during surgery, always use accessories designed for ESU environments.

**WARNING**

To reduce the hazard of burns during electrosurgery, keep the sensor or transducer (ECG, pressure, SpO₂) and their associated cables away from the surgical site, the ESU return electrode, and earth ground.

**NOTE**

Cover internally placed reusable temperature sensors with temperature probe sheaths.

**Virus protection**

CAUTION

The IACS does not have virus protection software and relies therefore on the firewall of your institution to prevent access to infected files. While setting up IT applications to access web sites, evaluate each web site with regard to possible virus infection.

CAUTION

To prevent burns and electric shock due to rerouting of electrical current through electrodes, do not position the defibrillator pads near any electrodes or sensors.

CAUTION

Only defibrillate across the chest.

CAUTION

Using ECG electrodes and cables specified by Dräger protects the device from damage during defibrillation and reduces noise and other interference on the ECG waveform.
Application

Intended use – Infinity Acute Care System – Monitoring Applications

Indications for use

20
Intended use – Infinity Acute Care System – Monitoring Applications

The IACS is intended for multi-parameter, physiologic patient monitoring of adult, pediatric, and neonatal patients in environments where patient care is provided by trained health care professionals.

The IACS obtains the physiologic, multi-parameter data from the connection to the M540 monitor and optional medical devices and displays. The transfer of this data is accomplished by the Infinity network.

The IACS and any connected optional hardware are not intended for use in the following hospital environments:

- Hyperbaric chambers
- Environments containing MRI equipment

Indications for use

The M540 monitors the following parameters:

- Heart rate
- Arrhythmia (adult and pediatric patients only)
- 12-lead ECG monitoring
- 12-lead ECG monitoring including TruST (adult and pediatric patients only)
- ST segment analysis (adult and pediatric patients only)
- 12-lead ST segment analysis (adult and pediatric patients only)
- Apnea
- Respiration rate
- Invasive blood pressure
- Non-invasive blood pressure
- Temperature
- Cardiac output (adult and pediatric patients only)
- Arterial oxygen saturation – $\text{SpO}_2$
- Pulse rate
- Perfusion index – PI
- Total hemoglobin – $\text{SpHb}$, (adult and pediatric patients only)
- Total oxygen content – $\text{SpOC}$, (adult and pediatric patients only)
- Carboxyhemoglobin saturation – $\text{SpCO}$
- Methemoglobin saturation – $\text{SpMet}$
- Pleth variability index – PVI
- Mainstream etCO$_2$
System overview

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Infinity PS250 power supply (PS250) 
power supply ....................................... 23
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Overview

These instructions for use describe the Cockpit (Medical Cockpit), the primary display and user interface of the Infinity Acute Care System – Monitoring Applications – M540 patient monitor (IACS). Specifically, these instructions for use describe the setup tasks and features available on the Cockpit. For detailed information on the M540 patient monitor, refer to the instructions for use Infinity Acute Care System – Infinity M540.

Some terms used in these instructions for use:
- Cockpit – refers to the Infinity C700 Medical Cockpit or the Infinity C500 Medical Cockpit
- M540 – refers to the Infinity M540 transport component and patient connection point of the IACS.
- M500 – refers to the Infinity M500 docking station that secures the M540, provides communication between the M540 and the Cockpit, and charges the battery in the M540.
- PS250 – refers to the Infinity PS250 power supply Com Hub (power supply)
- P2500 – refers to the Infinity P2500
- Docking the M540 – refers to placing the M540 on the M500.
- Undocking the M540 – refers to removing the M540 from the M500 for patient transport.

The following diagram shows the basic components of the IACS. In addition, you can connect various hardware to expand the viewing and monitoring capabilities (see “Additional hardware” on page 25).

**Infinite Medical Cockpit (Cockpit)**

The Cockpit is the primary display and user interface for the IACS and is available in the following sizes:
- C500 – 43 cm (17 in) wide screen
- C700 – 50 cm (20.1 in) wide screen

For detailed description regarding the front and back panel of the Cockpit, refer to the instructions for use Infinity Acute Care System – Infinity Medical Cockpit.

NOTE
On second-generation hardware of the Cockpit, the previous appearance of the yellow key on the front panel has changed to depict just the symbol without any text.
Infinity PS250 power supply (PS250) power supply

The following diagram shows the bottom of the PS250.

- A Infinity network connectors
- B Nurse call connector
- C Export protocol connector
- D Power cord connection
- E Two interchangeable system cable connectors – one for the M540, one for the Cockpit
- F Network connection LEDs

The front panel of the PS250 has the following two LEDs:
- Power mains – lights up green when the device is connected to AC power.
- Battery indicator – yellow LED that lights up briefly during startup or fault conditions such as a faulty battery.

Infinity P2500 power supply (P2500)

The following diagram shows the bottom of the P2500.

- A Two interchangeable system cable connectors – one for the M540, one for the Cockpit
- B Power cord connection
- C Infinity network connector
- D Nurse call connector
- E Export protocol connector

The front panel of the P2500 has the following two LEDs:
- Power mains – lights up green when the device is connected to AC power.
- Battery indicator – yellow LED that lights up briefly during startup or fault conditions such as a faulty battery.
System overview

Infinity M540 patient monitor (M540)

The following diagram shows the M540 when it is docked in the M500 docking station.

A M540 patient monitor

B M500 docking station

The M540 acquires patient signals, processes them, and relays them to the Cockpit for display. The M540 also provides patient monitoring when it is undocked during patient transport. For more detailed information on the M540, refer to the instructions for use Infinity Acute Care System – Infinity M540.

Infinity M500 docking station (M500)

The M500 is the mechanical device that secures and powers the M540. It also charges the battery, and controls the communication between the M540 and the Cockpit through an optical Ethernet link.

M500 front panel

A Locking mechanism – secures the M540 (for more detailed information, see “Locking/unlocking the M540” on page 82)

B Release buttons for undocking the M540 (you only have to press one button to release the M540)

C Optical Ethernet links

D Pins for charging the battery of the M540 and providing power to the M540 when docked
System overview

M500 back panel

A System cable connector
B Nurse call connector
C LED – lights up green when connected to the network

Additional hardware

The following table lists the additional devices that can be connected to the IACS.

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infinity MCable – Masimo SET</td>
<td>Measures the percentage of functional hemoglobin saturated with oxygen (%SpO2) and reports the perfusion index (PI) and the pulse rate (PLS).</td>
<td>Connects directly to the SpO2 connector of the M540 (see page 234 and page 252).</td>
</tr>
<tr>
<td>Infinity MCable – Masimo SET rainbow</td>
<td>Measures the percentage of functional hemoglobin saturated with oxygen (%SpO2) and reports the perfusion index (PI) and the pulse rate (PLS). In addition, it measures total hemoglobin (SpHb), total oxygen content (SpOC), pleth variability index (PVI), Carboxyhemoglobin saturation (SpCO), methemoglobin saturation (SpMet).</td>
<td></td>
</tr>
<tr>
<td>Infinity MCable – Nellcor OxiMax</td>
<td>Measures the percentage of functional hemoglobin saturated with oxygen (%SpO2) and the pulse rate (PLS).</td>
<td></td>
</tr>
</tbody>
</table>
### System Overview

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemo4 pod</td>
<td>Measures up to 4 pressures, cardiac output, core and body temperature.</td>
<td>Connects directly to the Hemo connector of the M540 (see information starting on page 279).</td>
</tr>
<tr>
<td>Infinity MPod – QuadHemo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemo2 pod</td>
<td>Measures up to 2 pressures, cardiac output, core and body temperature.</td>
<td></td>
</tr>
<tr>
<td>Infinity MCable – Dual Hemo</td>
<td>Measures up to 2 pressures.</td>
<td></td>
</tr>
<tr>
<td>Infinity MCable – Mainstream CO2</td>
<td>Measures mainstream CO2</td>
<td>Connects directly to the CO2 connector of the M540 (see page 316).</td>
</tr>
<tr>
<td>Infinity MCable – Nurse call</td>
<td>Provides remote notification of medium and high priority alarm conditions.</td>
<td>Connects to the PS250 / P2500 (see page 23) or to the M500 (see page 24).</td>
</tr>
<tr>
<td>Infinity MCable – Analog/Sync</td>
<td>Provides a sync pulse to synchronize defibrillators to the heart beat of the patient during cardioversion. The cable's analog out function provides an ECG and arterial blood pressure signal to a device such as intra-aortic balloon pump.</td>
<td>Connects to the Temp/Aux connector of the M540 (see page 258) or to the CO2 connector with a Y-cable.</td>
</tr>
<tr>
<td>Secondary video display</td>
<td>Extends the viewing capabilities of a Cockpit to an additional video display. Secondary displays mirror the content of the Cockpit.</td>
<td>Connects to a Cockpit using the DVI connector located on the Cockpit back panel (see the instructions for use Infinity Acute Care System – Medical Cockpit).</td>
</tr>
<tr>
<td>RS232 recorder</td>
<td>Produces timed and continuous recordings.</td>
<td>Connects to the Infinity network or the PS250 / P2500.</td>
</tr>
<tr>
<td>Laser printer</td>
<td>Prints various reports and Cockpit print screens.</td>
<td>Connects to the Infinity network.</td>
</tr>
</tbody>
</table>
System overview

Device symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔔</td>
<td>Consult instructions for use</td>
</tr>
<tr>
<td>🔴</td>
<td>Lower alarm limits</td>
</tr>
<tr>
<td>🔴</td>
<td>Directive 93/42/EEC concerning Medical Devices</td>
</tr>
<tr>
<td>🔴</td>
<td>Upper alarm limits</td>
</tr>
<tr>
<td>📅</td>
<td>Access to trend pages</td>
</tr>
<tr>
<td>📅</td>
<td>Autoset alarm limits</td>
</tr>
<tr>
<td>🔔</td>
<td>The button next to this symbol accesses special procedure pages</td>
</tr>
<tr>
<td>🔔</td>
<td>Alarm monitoring deactivated temporarily</td>
</tr>
<tr>
<td>🔔</td>
<td>Access to alarm functions</td>
</tr>
<tr>
<td>🔔</td>
<td>Alarm monitoring deactivated permanently</td>
</tr>
<tr>
<td>🕒</td>
<td>Access to the standby and privacy modes, and access to patient discharge</td>
</tr>
<tr>
<td>🔔</td>
<td>Acoustic alarm tone paused temporarily</td>
</tr>
<tr>
<td>🕒</td>
<td>Access to pre-configured Views and layouts</td>
</tr>
<tr>
<td>🔔</td>
<td>Acoustic alarm tone turned off permanently</td>
</tr>
<tr>
<td>🔐</td>
<td>Access to parameter pages</td>
</tr>
<tr>
<td>🔐</td>
<td>Change clinical password</td>
</tr>
<tr>
<td>🤵</td>
<td>Adult patient category</td>
</tr>
<tr>
<td>🤵</td>
<td>Lung symbol that pulsates with each detected breath</td>
</tr>
<tr>
<td>🤵</td>
<td>Pediatric patient category</td>
</tr>
<tr>
<td>🤵</td>
<td>Heart blip that flashes with each detected pulse</td>
</tr>
<tr>
<td>🤵</td>
<td>Neonatal patient category</td>
</tr>
<tr>
<td>🤵</td>
<td>Pacer detection is activated; the heart symbol flashes with each detected paced pulse</td>
</tr>
<tr>
<td>🕒</td>
<td>Battery status LED</td>
</tr>
<tr>
<td>🕒</td>
<td>Scrolls to additional tabs and pages</td>
</tr>
<tr>
<td>🔔</td>
<td>Battery charging error</td>
</tr>
<tr>
<td>🔔</td>
<td>Power on/off</td>
</tr>
</tbody>
</table>
### System overview

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🌐</td>
<td>AC power mains</td>
</tr>
<tr>
<td>🔐</td>
<td>Function/setting is unlocked</td>
</tr>
<tr>
<td>🛠️</td>
<td>Function/setting is locked</td>
</tr>
<tr>
<td>🗄️</td>
<td>Data entry with numeric keypad</td>
</tr>
<tr>
<td>🎨</td>
<td>Trend configuration</td>
</tr>
<tr>
<td>⌨️</td>
<td>Onscreen keyboard access</td>
</tr>
<tr>
<td>📡</td>
<td>Nurse call</td>
</tr>
<tr>
<td>🗑️</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>🗑️</td>
<td>Parameter is excluded from display</td>
</tr>
<tr>
<td>📇</td>
<td>Parameter is represented as a waveform and a parameter box</td>
</tr>
<tr>
<td>🔜</td>
<td>Save modifications (for example, changes to a view)</td>
</tr>
<tr>
<td>🗿️</td>
<td>Save as symbol</td>
</tr>
<tr>
<td>➡️</td>
<td>Navigates forward on a web page</td>
</tr>
</tbody>
</table>
# Instructions for use – Infinity Acute Care System – Monitoring Applications VG3

## System overview

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🗓️</td>
<td>Displays the home screen</td>
</tr>
<tr>
<td>⏪</td>
<td>Navigates backward on a web page</td>
</tr>
<tr>
<td>🎁</td>
<td>Defibrillation-proof Type CF equipment</td>
</tr>
<tr>
<td>⚤</td>
<td>Stops loading the web page</td>
</tr>
</tbody>
</table>

## Abbreviations

The following table lists the abbreviations used in these instructions for use and those that are displayed on the Cockpit. For any abbreviations of parameters originating from external devices, refer to the corresponding instructions for use.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>% MVspon</td>
<td>Spontaneous minute volume, fractional</td>
</tr>
<tr>
<td>% leak</td>
<td>Relative leakage</td>
</tr>
<tr>
<td>% SPACED</td>
<td>Percentage of paced beats</td>
</tr>
<tr>
<td>SC-ISP</td>
<td>Pressure support goal (Smart-Care)</td>
</tr>
<tr>
<td>Ao2</td>
<td>Inspiratory/expiratory oxygen concentration difference</td>
</tr>
<tr>
<td>AAMI</td>
<td>Association for the Advancement of Medical Instrumentation</td>
</tr>
<tr>
<td>AHA</td>
<td>American Heart Association</td>
</tr>
<tr>
<td>Air cons</td>
<td>Cumulated air consumption</td>
</tr>
<tr>
<td>AVNRT</td>
<td>Accelerated idioventricular rhythm</td>
</tr>
<tr>
<td>Alv</td>
<td>Alveolar</td>
</tr>
<tr>
<td>APR</td>
<td>Arterial pulse rate</td>
</tr>
<tr>
<td>ARR</td>
<td>Atrial arrhythmia</td>
</tr>
<tr>
<td>ART</td>
<td>Arterial pressure</td>
</tr>
<tr>
<td>ART D</td>
<td>ART diastolic value</td>
</tr>
<tr>
<td>ART M</td>
<td>ART mean value</td>
</tr>
<tr>
<td>ART S</td>
<td>ART systolic value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTF</td>
<td>Artifact</td>
</tr>
<tr>
<td>ASY</td>
<td>Asystole</td>
</tr>
<tr>
<td>AVF</td>
<td>ECG lead aVF</td>
</tr>
<tr>
<td>AVL</td>
<td>ECG lead aVL</td>
</tr>
<tr>
<td>aVR</td>
<td>ECG lead aVR</td>
</tr>
<tr>
<td>AW-Temp</td>
<td>Gas temperature (airway)</td>
</tr>
<tr>
<td>BCT</td>
<td>Burst count</td>
</tr>
<tr>
<td>BIS</td>
<td>Bispectral index</td>
</tr>
<tr>
<td>BGM</td>
<td>Bilirubin</td>
</tr>
<tr>
<td>BRADY</td>
<td>Bradypnea</td>
</tr>
<tr>
<td>BSA</td>
<td>Body surface area</td>
</tr>
<tr>
<td>BSR</td>
<td>Suppression ratio</td>
</tr>
<tr>
<td>CaO2</td>
<td>Arterial oxygen content</td>
</tr>
<tr>
<td>CCO</td>
<td>Continuous cardiac output</td>
</tr>
<tr>
<td>CCI</td>
<td>Continuous cardiac index</td>
</tr>
<tr>
<td>C.O.</td>
<td>Cardiac output</td>
</tr>
<tr>
<td>Cdyn</td>
<td>Dynamic lung compliance</td>
</tr>
<tr>
<td>C20/Cdyn</td>
<td>Ratio of compliance during last 20 % of inspiration over dynamic compliance</td>
</tr>
<tr>
<td>CI</td>
<td>Cardiac index</td>
</tr>
<tr>
<td>CISPR</td>
<td>International special committee on radio interference</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon dioxide</td>
</tr>
</tbody>
</table>
System overview

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPP</td>
<td>Cerebral perfusion pressure</td>
</tr>
<tr>
<td>CPT</td>
<td>Ventricular couplet</td>
</tr>
<tr>
<td>Cstat</td>
<td>Static lung compliance</td>
</tr>
<tr>
<td>CVo2</td>
<td>Venous oxygen content</td>
</tr>
<tr>
<td>DCO2</td>
<td>CO₂ elimination coefficient during HFO</td>
</tr>
<tr>
<td>CVP</td>
<td>Central venous pressure</td>
</tr>
<tr>
<td>Des</td>
<td>Desflurane</td>
</tr>
<tr>
<td>Des cons</td>
<td>Cumulated desflurane consumption</td>
</tr>
<tr>
<td>DHCP</td>
<td>Dynamic host configuration protocol</td>
</tr>
<tr>
<td>DNS</td>
<td>Domain name system</td>
</tr>
<tr>
<td>DO2</td>
<td>Oxygen delivery</td>
</tr>
<tr>
<td>DO2i</td>
<td>Oxygen delivery index</td>
</tr>
<tr>
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<td>LHCPP</td>
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<tr>
<td>LV S</td>
<td>LV systolic value</td>
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<td>MAP</td>
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<td>Alveolar minute volume</td>
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<td>MVe s</td>
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<td>MV inv</td>
<td>Minute volume, inspiratory</td>
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<tr>
<td>MV inv mand</td>
<td>Minute volume, mandatory</td>
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<tr>
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<td>Non-invasive blood pressure</td>
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<td>NIBP D</td>
<td>NIBP diastolic value</td>
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<td>NIBP M</td>
<td>NIBP mean value</td>
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<td>NIBP S</td>
<td>NIBP systolic value</td>
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<td>NIF</td>
<td>Negative inspiratory force</td>
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<td>NMT</td>
<td>Neuromuscular transmission</td>
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<td>OR</td>
<td>Operating room</td>
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<tr>
<td>PA</td>
<td>Pulmonary arterial pressure</td>
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<td>PA D</td>
<td>PA diastolic value</td>
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<td>PA M</td>
<td>PA mean value</td>
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<tr>
<td>PA P</td>
<td>PA systolic value</td>
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<tr>
<td>PaO2</td>
<td>Arterial O2 pressure</td>
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<tr>
<td>Pause</td>
<td>Pause pressure</td>
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</table>
### Abbreviation | Description
--- | ---
Paw | Airway pressure
Paw min | Minimum airway pressure
PaCO2 | Arterial CO2 pressure
Pl | Barometric pressure
PeCO2 | Mixed expired CO2 pressure
PEEP | Positive end expiratory pressure
PEEPi | Intrinsic positive end expiratory airway pressure
\( \Delta P_{HF} \) | Pressure amplitude during HFO
Phigh | Upper pressure level during APRV
Plow | Lower pressure level during APRV
PLS | Pulse rate from SpO2
PLS ART | Arterial pressure – pulse rate
Pmax | Maximum inspired pressure
Pmean | Mean airway pressure
Pmin | Minimum airway pressure
Pplat | Plateau pressure
PTC | Post tetanic count
PS250 | Power supply
\( \Delta P_{supp} \) | Pressure amplitude above PEEP in pressure support
SC-\( \Delta P_{supp} \) rated | Pressure support by internal controller (SmartCare)
Pv | Pressure-volume loop
Pv/Cmin | Rate of PVC (pre-ventricular contractions) per minute
PvI | Pleth variability index
PVR | Pulmonary vascular resistance
PVRi | Pulmonary vascular resistance index

### Abbreviation | Description
--- | ---
PWP | Pulmonary wedge pressure
PWR | Total signal power
Qs/Qt | Intrapulmonary right-left shunt
RSN | Strip recenter
R | Resistance (airway)
\( \Delta / \) | Parameter correlation factor
RA | Right arm (ECG)
RA | Right atrial pressure
Raw | Resistance (airway)
Raw exp | Expiratory resistance (airway)
Raw insp | Inspiratory resistance (airway)
Resp | Respiration
RR | Respiration rate
RRapn | Rate for apnea ventilation
RPP | Rate pressure product
RC | Respiratory rate (CO2)
RRI | Respiratory rate (impedance)
RRmand | Mandatory respiratory rate
RRs | Respiratory rate, spontaneous
RRspon | Respiratory rate, spontaneous
RR | Respiratory rate, ventilation
RSB | Rapid shallow breathing index
RUN | Ventricular run
RV | Right ventricular pressure
RV | RV diastolic value
RV | RV mean value
RV | RV systolic value
RV/SW | Right ventricular stroke work
RV/SWI | Right ventricular stroke work index
SaO2 | Arterial oxygen saturation
SC-duration | Duration of patient session (SmartCare)
SC-\( \Delta P_{supp} \) | Pressure support by internal controller (SmartCare)
### System Overview

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<tr>
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<td>SC-VT</td>
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<td>Spectral edge frequency</td>
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<td>Carboxyhemoglobin saturation</td>
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<td>SpHb</td>
<td>Total arterial hemoglobin</td>
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<td>SpHbv</td>
<td>Total hemoglobin (venous)</td>
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<td>SpMet</td>
<td>Methemoglobin saturation</td>
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<td>SpOC</td>
<td>Total oxygen content</td>
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<td>Oxygen saturation measured by pulse oximetry</td>
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<td>CO-oximetry</td>
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<td>SvO2</td>
<td>Venous oxygen saturation</td>
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<td>SVRI</td>
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<td>SVT</td>
<td>Supraventricular tachycardia</td>
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<td>SVV</td>
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<td>Time constant</td>
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<td>Ti set</td>
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<td>Total volume, expired</td>
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<td>TVI</td>
<td>Total volume, inspired</td>
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<td>Total vascular resistance</td>
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<td>Chest or precordial lead from a 5 or 6 lead wire set</td>
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<td>Ventricular fibrillation</td>
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<td>Mandatory expiratory tidal volume</td>
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Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n
Operating concept

Overview

The IACS is a fully networked solution that offers patient monitoring, therapy, and IT applications at the point of care.

Dräger developed the IACS to solve problems common in the acute care environment. As a result, the IACS provides standardized user interfaces, improves workplace ergonomics and flexibility, and centralizes patient information at the point of care. The IACS also provides the ability to backfill information automatically after patient transport. An M540 on wireless transport transmits the data to the ICS (Infinity CentralStation) during transport.

The central component of the IACS is the Cockpit. This medical-grade workstation provides centralized viewing and control of Infinity monitoring systems and IT applications at the point of care. The Cockpit is available in two sizes. The C700 is a 20-inch (50.8 cm), and the C500 is a 17-inch (43.2 cm) wide screen. Both offer a large viewing angle, extended screen configuration capabilities, and a fanless design.

The common Dräger-standardized user interface offers intuitive operation via a touch screen and a rotary knob. A 360-degree alarm bar alerts you to the alarm conditions of a patient.
The IACS components

The following diagram shows a possible IACS configuration.

A C500/C700
B DVI cable
C Secondary display (option)
D USB cable
E Keyboard and mouse (option)
F Device connectivity cable (option)
G M540 patient monitor
H M500 docking station
I System cables
J R50N recorder (option)
K AC power
L Infinity network
M Infinity MCable – Nurse call (option)
N P2500 / PS250
O Hospital network
P Ethernet cable
Communication between the M540 and the Cockpit starts as soon as the M540 is docked in the M500 (see page 81). The M540 acquires physiological signals from the patient and relays them to the Cockpit for display. The Cockpit then makes the patient data available to the Infinity network.

When the M540 is docked, the Cockpit assumes the annunciation of all acoustic alarm signals. However, alarms are always reported visually at the Cockpit and at the M540. When the M540 is undocked for transport, it provides acoustic alarm signals. In addition, the ICS can assume the annunciation of acoustic alarm signals for an M540 on wireless transport.

The only exceptions are Cockpit-specific alarm messages such as External device disconnected for which the M540 does not report any acoustic and visual alarm signals.

When the M540 is docked, any changes to the patient setup such as alarm limits made on the Cockpit are automatically transferred to the M540 (and vice versa).

NOTE
If you also want alarms to sound at the M540 when it is docked, select the alarm tone volume at the M540 manually. For information refer to the M540 instructions for use.

The only exceptions are Cockpit-specific alarm messages such as External device disconnected for which the M540 does not report any acoustic and visual alarm signals.

When the M540 is docked, any changes to the patient setup such as alarm limits made on the Cockpit are automatically transferred to the M540 (and vice versa).

NOTE
If you also want alarms to sound at the M540 when it is docked, select the alarm tone volume at the M540 manually. For information refer to the M540 instructions for use.

NOTE
If you dock an M540 with a patient category that differs from the one selected on the Cockpit, the patient category setting of the Cockpit changes to match the one of the M540.

Docking the M540
As soon as you dock the M540 in the M500, the following happens at the Cockpit:
– The message Connecting to M540 appears in the center of the Cockpit screen.
– The Cockpit makes the data of the M540 available to the Infinity network.

NOTE
If the M540 cannot communicate with the Cockpit, the Cockpit sounds an alarm. In addition, an alarm indicating a loss of communication is broadcast over the network to the Infinity Central Station (ICS) provided the patient is admitted there. The M540 continues to monitor the patient.

Docking to the same Cockpit
If you undock an M540 from a Cockpit and later dock the M540 to the same Cockpit, the data collection continues seamlessly. The Cockpit automatically retrieves any data the M540 collected while on patient transport, and merges it with the data set for that patient.
Docking to a different Cockpit

**CAUTION**
Before you connect the M540 to a different Cockpit, make sure that the units of measure align between the two devices. Differing units of measure could result in loss of data or a patient discharge.

If you undock an M540 from a Cockpit and later dock the M540 to a different Cockpit, the original data are automatically retrieved over the network by the new Cockpit. The new Cockpit then automatically merges this data with any data the M540 collected while on patient transport. The original Cockpit automatically discharges the patient once all patient data are transferred.

When moving the M540 between Cockpits in different monitoring units, the time stamps may differ occasionally between the Cockpit and the M540.

If not all patient data was transferred, the message **Transfer of Data Incomplete** appears in the header bar of the new Cockpit. In this case, the original Cockpit does not discharge the patient.

**Undocking the M540**

When you undock the M540, the following happens:

– The message **Disconnected from M540** appears in the center of the Cockpit screen.

– When the M540 is not in wireless mode, a message appears at the ICS that the bed is disconnected. When the wireless option for an M540 is activated and configured properly, the ICS displays the wireless symbol.

– Data are no longer trended at the Cockpit.

– With each docking or undocking of an M540, there is a short transition period. One minute of trend data collected during this transition period may not be displayed at an ICS equipped with software version VG1. However, these trend data can be reviewed at the Cockpit.

– Several buttons remain active on the main menu bar of the Cockpit:
  – **Alarms...** for accessing the alarm history
  – **Trends/Data...** for accessing the trend data
  – **Start/Standby...** for accessing the Start tab from where you can initiate a patient discharge.

– The current patient data from the Cockpit are no longer available to the Infinity network. However, when the wireless option for an M540 is activated and configured properly, it will continue to make the data available to the Infinity network.

– Parameter values acquired using the device connectivity option are no longer available to the Infinity network.

CAUTION
Before you connect the M540 to a different Cockpit, make sure that the units of measure align between the two devices. Differing units of measure could result in loss of data or a patient discharge.
Communicating with the Infinity network

When the M540 is docked on the M500 and the IACS is connected to the network, the patient data are available on the Infinity network. If the connection to the Infinity network is lost, the Cockpit Alarm volume setting (see page 401) changes to 100% until the connection is restored.

Communicating with the Infinity network has the following benefits:

- Patient data are sent across the Infinity network to connected devices.
- The alarm status of the patient is reported to the Infinity network and its connected devices. If multiple alarm conditions are present, the alarm with the highest alarm priority is reported.
- The patient can be admitted at the ICS for central monitoring. The IACS is fully compatible with ICS software V8.12 or higher.
- You can view the Cockpit from other Infinity monitors within the same monitoring unit using the remote view function (see page 43).

M540 wireless mode

When the wireless option is activated and configured properly, the M540 switches to wireless transport mode automatically within 10 seconds of being undocked from the M500 (see “Undocking the M540” on page 39). For detailed information on how an M540 behaves on wireless transport, refer to the instructions for use entitled Infinity Acute Care System – Infinity M540.

M540 in standalone mode

When the wireless option is activated and configured, a standalone M540 communicates wirelessly with the Infinity network when undocked. When docked, a wireless M540 transitions back to a wired connection, and the wireless symbol is replaced by the network symbol.

Network data transfer

The IACS supports the transfer of patient data over the Infinity network to and from the following devices:

- Infinity Delta/Delta XL/Kappa (software version VF7 and higher)
- Other IACS monitoring Cockpits

NOTE

You can also transfer patient data by undocking and redocking an M540.
The following data are included in a patient data transfer:

- Patient demographic information (see page 89 for information of what demographic data is included)
- Trends (up to 59 trended parameters)

**NOTE**
The amount of data being transferred over the network depends on how much data is available at the source device. A maximum of up to 80 trend parameters can be transferred over the network based on the parameter priority of the Cockpit.

For Delta series monitors, the maximum amount of data is 24 hours. For a network transfer between IACS Cockpits, the maximum of data is 96 hours.

- Events containing up to 32 parameters for (C500) or up to 40 parameters for (C700)
- Hemodynamic, oxygenation, and ventilation calculation results
- Lab data values are not transferred during a network transfer.

The following diagram shows the Transfer page which is used for patient data transfers.

A Transfer tab
B Care area selection arrow
C Current patient column
D Device name column
E Start transfer button
Operating concept

To transfer data

1. Place the source device (Infinity Delta/Delta XL/Kappa or another IACS Cockpit) in standby mode.
2. Go to the Cockpit you wish to transfer data to.
3. Select the Start/Standby... button on the main menu bar.
   
   **CAUTION**
   To prevent mixing the data of two patients, first discharge the patient admitted at the destination Cockpit. If the patient is not discharged, the new data will be appended to the existing data stored at the destination Cockpit.

4. Select the Transfer tab (if not already selected). The Transfer page (see page 45) lists all of the devices in the currently selected care area who are in standby mode.
5. Use the care area selection arrow (B) on the Transfer page to select the care area in which the source device is located.
6. Select the source device in the Current patient column (C) or the Device name column (D).
7. Select the Start transfer button (E). A message appears at the Cockpit indicating the transfer was either successful or that it failed.
Operating concept

Remote control and remote view

When a Cockpit is connected to the Infinity network, data can be shared among Infinity devices that are connected to the network. From the Cockpit, you can view other Infinity devices and perform several remote functions. You can also allow other Infinity devices to view a Cockpit and perform remote functions by activating the remote control function (see page 417).

Remote view from the Cockpit

The remote view function of the Cockpit allows you to view patient data from other Infinity monitors within the same monitoring unit. If you are viewing another Cockpit, the remote view window shows the Auto view (see page 58) of the remote Cockpit.

The remote view function also allows you to pause acoustic alarm signals and request timed and continuous recordings of the remote device from the Cockpit.

To access the remote view

1. Select the Views... button on the main menu bar to access the Views dialog.
2. Select the Remote view tab. This dialog lists all of the beds in the monitoring unit of the Cockpit.
3. Select a bed from the list in the Views... dialog to access the remote view of an individual patient.
4. Select the Connect button.

The following diagram shows a Remote view dialog.

A Disconnect button
B Audio Pause button
C Continuous Recording button
D Timed Recording button
Remote view functions

From the Remote view dialog, you can perform the following functions (the letters in parenthesis refer to the Remote view dialog diagram on page 43):

- Select the Disconnect button (A) to exit the remote view.
- Select the Audio Pause button (B) to pause acoustic alarm signals at the remote device.
- Select the Continuous Recording (C) or Timed Recording (D) buttons to request a recording of the remote device. The recordings are printed on the recorder the Cockpit is configured for.

Remote view from the ICS

When a Cockpit communicates with the Infinity network, you can admit the patient at the ICS for central monitoring. A Cockpit patient is represented on the ICS with a viewport and a bed view. A viewport consists of the top Cockpit waveform and the associated parameter box. The ICS also provides a bed view which is a window displaying the content of the Cockpit in greater detail. When the Cockpit is communicating with the ICS, the waveforms and parameter boxes are assigned to the bed view based on the parameter priority order.

In the remote View of the Cockpit the banner Pacer off does not appear when the pacer detection is deactivated on the source monitor.

Remote control

If the remote control feature is activated (see page 417), you can perform the following Cockpit functions remotely from the ICS:

- Autoset alarm limits
- Initiate a relearning phase
- Audio pause acoustic alarm signals (see page 110)
- Configure alarm limits and ST and arrhythmia settings
- Request timed and continuous recordings

If the remote control feature is activated (see page 417), you can perform the following Cockpit functions remotely from one of the following devices: Delta / Delta XL or Kappa, Vista XL, Gamma X XL:

- Request timed and continuous recordings
- Audio pause acoustic alarm signals

If several devices modify the patient settings of a single Cockpit, the last update is always implemented. For detailed information on performing these functions at the ICS, refer to the instructions for use Infinity CentralStation.

IT applications

Several optional IT applications provide remote access to patient information from the Cockpit. For example, the PatientWatch application (accessible with the Infinity Gateway) allows you to view up to four different bedside monitors that are connected to the Infinity network. If configured accordingly, IT applications are accessible by selecting a tab on the Cockpit. For more information, see "IT applications (options)" on page 443.
Operating concept

Communication management

The following table summarizes how the Cockpit, the M540, and the M500 function under specific circumstances.

<table>
<thead>
<tr>
<th>What happens if...</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turning the IACS on and off</td>
<td>The middle LED of the three LEDs located on either side of the on/off key lights up green. After a brief moment, the Dräger startup screen appears before the Cockpit main screen is displayed.</td>
</tr>
<tr>
<td>you switch on the Cockpit?</td>
<td>The M540 emits a high-pitched tone followed by two power-up tones, performs a self-test, and displays the New patient? prompt.</td>
</tr>
<tr>
<td>you switch on the M540?</td>
<td>The M540 continues to monitor the patient and provides acoustic and visual alarm signals.</td>
</tr>
<tr>
<td>Docking/undocking an M540</td>
<td>Certain functions such as trends, alarm history, profiles, and biomed setup are not accessible for a brief period of time.</td>
</tr>
<tr>
<td>you dock an M540?</td>
<td>– An alarm of medium priority sounds at the Cockpit, at the M540, and at the ICS (provided the patient is admitted there).</td>
</tr>
<tr>
<td>you dock an M540 and it is unable to communicate with the Cockpit?</td>
<td>– The message M540 communication failure appears at the Cockpit.</td>
</tr>
<tr>
<td>Alarm behavior</td>
<td>– The M540 continues to monitor the patient and provides acoustic and visual alarm signals.</td>
</tr>
<tr>
<td>an M540 whose acoustic alarm signals have been paused docks to a Cockpit?</td>
<td>All acoustic alarm signals are paused for 2 minutes on both devices.</td>
</tr>
<tr>
<td>you dock an M540 with a different alarm pause state than that of the Cockpit?</td>
<td>Both devices observe the remaining alarm pause interval.</td>
</tr>
<tr>
<td>Connection/power problems</td>
<td>The LEDs on the front panels indicate that the Cockpit and the M540 are on battery power.</td>
</tr>
<tr>
<td>If there is a power failure?</td>
<td>– The Cockpit sounds an alarm of medium priority and switches to battery power for up to 5 minutes before performing a safe shutdown.</td>
</tr>
<tr>
<td></td>
<td>– The M540 switches to battery power for up to 3.5 hours before shutting down.</td>
</tr>
</tbody>
</table>
Operating concept

<table>
<thead>
<tr>
<th>What happens if...</th>
<th>Behavior</th>
</tr>
</thead>
</table>
| the system cable is disconnected from the power supply or the M500? | - The Cockpit sounds an alarm tone of low priority.  
- The Cockpit displays the message **Please plug in system cable** in the header bar and the message *Disconnected from M540* appears in the monitoring area.  
- The Cockpit no longer displays any parameters and waveforms. |
| the Cockpit loses communication with the ICS? | - On the Cockpit the **Alarm volume** setting (see page 401) changes to 100 % volume regardless of whether an alarm condition exists or not. The setting **Off** for the **Alarm volume** selection is no longer available.  
- The M540 produces one alert tone.  
Once the communication is restored, the previously selected **Alarm volume** setting is restored. |
| the Cockpit loses communication with an external device? | - The Cockpit tries to restore the link.  
- If the corresponding function is activated, an alarm sounds and the message **External device disconnected** appears on the Cockpit and ICS (see "External device disconnected alarm control" on page 403). |

**Miscellaneous**

| the Cockpit and the M540 are monitoring a patient and you put either device in standby mode? | Both devices are put in standby mode. |
| the Cockpit and the M540 are monitoring a patient and you discharge the patient on either device? | - The patient is discharged from both devices.  
- The patient discharge is annotated at the Cockpit in the **Alarm history** page with the message **Patient transferred**. |
| a function such as initiating a non-invasive blood pressure measurement is requested at the M540 and almost simultaneously on the Cockpit? | The function is canceled on both devices. |
Operating concept

**Loss of power**

A loss of power has the following effect:
- The Cockpit switches to battery power for up to 5 minutes before performing a safe shutdown that preserves the integrity of the patient data.
- A medium-priority alarm is triggered at the Cockpit and the message *please plug in power supply* appears.
- The M540 switches to battery power for up to 3.5 hours before performing a safe shutdown that preserves the integrity of the patient data.

**Locked options**

The IACS supports several locked options. For a list of options, refer to the instructions for use *Infinity Acute Care System – Monitoring Accessories*.

**Temporary options**

Temporary options make it possible for an M540 in an IACS configuration to perform the intended functions together with the Cockpit when the devices do not share the same option setup. For example, when an M540 with permanent options docks to an IACS Cockpit that does not have the same options activated, the M540 options temporarily loans these options to the Cockpit.

Temporary options are deactivated when a patient is discharged. However, they are retained if you turn the Cockpit or the M540 off and on.
Operating concept

Secondary display

To extend the display capabilities of a Cockpit, you can connect a secondary display to the DVI connector of the Cockpit using one of two LCOM cable types (DVI to DVI or DVI to VGA), which have been qualified by Dräger:

<table>
<thead>
<tr>
<th>Cable type</th>
<th>Length</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVI to DVI</td>
<td>0.91 m (3 ft)</td>
<td>CTLDVI-DL-MM3</td>
</tr>
<tr>
<td></td>
<td>1.52 m (5 ft)</td>
<td>CTLDVI-DL-MM5</td>
</tr>
<tr>
<td></td>
<td>3.04 m (10 ft)</td>
<td>CTLDVI-DL-MM10</td>
</tr>
<tr>
<td></td>
<td>4.75 m (15 ft)</td>
<td>CTLDVI-DL-MM15</td>
</tr>
<tr>
<td>DVI to VGA</td>
<td>0.91 m (3 ft)</td>
<td>CTLDVI-HD-MM3</td>
</tr>
<tr>
<td></td>
<td>1.52 m (5 ft)</td>
<td>CTLDVI-HD-MM5</td>
</tr>
<tr>
<td></td>
<td>3.04 m (10 ft)</td>
<td>CTLDVI-HD-MM10</td>
</tr>
<tr>
<td></td>
<td>4.75 m (15 ft)</td>
<td>CTLDVI-HD-MM15</td>
</tr>
</tbody>
</table>

The secondary display duplicates the content of the Cockpit screen. It does not produce any acoustic alarm signals and does not support any user interaction. A secondary display has to meet certain technical specifications (see page 505). The C500 has a resolution of 1440 x 900 pixels. The C700 has a resolution of 1680 x 1050.

Export protocol

This function allows you to share data with other Dräger and third-party devices such as clinical information and anesthesia record systems and data loggers.

The export protocol connector is located on the P2500/PS250 (see page 23).

Refer to the section “Connected devices” on page 13 whenever you connect third-party devices.
Operating concept

User interface

The following sections describe the user interface of the Cockpit when it is connected to an M540:

The screen of a monitoring Cockpit is divided into the following main areas:

- **A** Header bar
- **B** Main menu bar
- **C** Auto view toolbar (if activated)
- **D** Monitoring area

For a more detailed overview of general user interface components of the IACS, refer to the instructions for use Infinity Acute Care System – Medical Cockpit.
Operating concept

Header bar

The blue header bar appears along the top of the Cockpit screen. It is always visible regardless of what is displayed in the monitoring area.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Patient category field</td>
<td>B</td>
<td>System data field</td>
<td>C</td>
<td>Patient name field</td>
</tr>
<tr>
<td>D</td>
<td>Time and date field</td>
<td>E</td>
<td>Alarm message field</td>
<td>F</td>
<td>Alarm banner field</td>
</tr>
</tbody>
</table>

The patient category field

The patient category field (A) of the header bar identifies the currently selected patient category. It contains one of the following symbols:

- Adult
- Pediatric
- Neonate

Touching this field opens the Start/Standby... dialog window for accessing the Demographics page (see page 90).

The system data field

The system data field (B) of the header bar contains the following information:

- Device label
- Care unit
- Monitoring mode (for example, OR Alarms) or the battery symbol indicating the battery status for the PS250 or the P2500.

Touching this field opens the System setup dialog with the Biomed access code keypad.

The patient name field

The patient name field (C) of the header bar displays the patient name. Selecting this field opens the Demographics page (see page 90).

The content of the patient name field changes when you select the Code button on the main menu bar to activate a set of user-defined emergency monitoring functions. In this case, the patient data field displays a timer along with a Stop and a Reset button. For more information on the Code function, see page 131.

The date and time field

The date/time field (D) of the header bar displays the current date and time. Selecting this field opens the System setup dialog with the Biomed access code keypad.

The alarm message field

The alarm message field (E) of the header bar is reserved for alarm and technical messages. The background color of the alarm message corresponds to the alarm priority (see page 101).

The following table illustrates how the alarm message field is further subdivided.

<table>
<thead>
<tr>
<th>More</th>
<th>Alarm message</th>
<th>Alarm message</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local technical messages</td>
<td>Network-related messages</td>
</tr>
</tbody>
</table>

A maximum of two messages can be displayed side by side. If more than two patient alarm messages are active simultaneously, the More... button appears. Selecting this button accesses the Current alarms page (see “Viewing current alarm messages” on page 105).
Operating concept

The alarm banner field

The alarm banner field (F) of the header bar (see page 50) indicates the current alarm status. It is reserved for one of the following indicators:

- ≤ and the message Audio paused plus a countdown timer when you press the yellow fixed key located next to the rotary knob.

- ≥ and the message All alarms paused with the countdown timer if the All alarms paused function has been set to a time period (see page 401) and you select the Alarms... > All alarms paused buttons.

- ≤ and the message All alarms off if the All alarms paused function has been set to No timeout (see page 401) and you select the Alarms... > All alarms off buttons.

For more detailed information on alarm monitoring, see the "Alarms" chapter.

Monitoring area

The monitoring area of the Cockpit screen contains waveforms and parameter boxes that report the current vital signs of the patient. The monitoring area can also contain dialog windows, mini trends, an auto view toolbar, ST parameters, vent loops, and so on. The appearance of the monitoring area depends on the selected view, which controls the layout and content of the screen (see "Views" on page 65). The appearance of the monitoring area also depends on whether or not the split screen mode or mini trend display is selected (see page 401).

When opening a dialog window, the waveform channels and parameter boxes are reduced to fit on the right side of the screen (see illustration on page 55). This display behavior prevents the vital signs from being obscured while you are performing setup tasks.

Selecting the Home button on the main menu bar or pressing the rotary knob closes any open dialog windows and refreshes the screen.
Operating concept

Parameter boxes

Each parameter box contains real-time values of a parameter and a combination of the following information:

- Parameter labels (including dynamic pressure labels)
- Alarm limits (or crossed triangle symbols when the alarm functions are deactivated)
- Units of measure (can be activated/deactivated)
- ECG heart blip (and pacing blip for paced puls-es), RRi blip, and SpO2 blip
- Time stamps
- Countdown timers and time stamps for non-invasive blood pressure
- Special source labels (for example, PLS for heart rate signal source for pulse oximetry)
- Parameter-specific message fields for non-invasive blood pressure and SpO2

The amount of information on a screen affects the parameter box display. For example, the following diagram shows a typical expanded SpO2 parameter box when enough space is available for the larger parameter box. The primary parameter value (A) appears bigger than the other subordinate parameters who are displayed below each other (B, C). The parameter labels (D) appear above the respective parameter values.

The following example shows how the same parameter box changes when more parameters occupy the main screen. Each parameter box has less space to display its content. The primary parameter value (A) still appears bigger than the subordinate parameters (B, C) which now all appear on one line. The parameter labels (D) still appear above the respective values.

When a parameter is in alarm, the parameter box flashes in the color of the alarm priority and a corresponding alarm message appears in the header bar (see "Problem solving" on page 449). The parameter boxes displayed on the Cockpit for each parameter are described in detail in each parameter chapter.

Waveforms

The Cockpit displays a minimum of 6 seconds of waveform data per waveform channel at a sweep speed of 25 mm/s when no dialog windows are open. The amount of displayed waveforms depend on the size of the Cockpit.

When the waveform option is activated, the Cockpit displays up to 16 waveforms.
The following functions allow you to customize the waveforms:

- Changing the colors for individual parameters (see for example how to change the color for ECG on page 193)
- Changing the sweep speeds (see page 389)

Waveforms are drawn from left to right and can contain the following information:

- Signal scales
- Grids
- Units of measure
- Parameter labels
- Pacer spikes
- QRS synchronization markers
- Respiration waveform markers to indicate breath detection
- Banners (see page 54)

NOTE
If the acquired signal does not fit in the waveform channel, the top of the waveform may appear clipped.

Freezing/stopping waveforms

- Select the Freeze waveforms button on the main menu bar.

All waveforms stop and the message Waveforms stopped appears on each waveform channel. After approximately 60 seconds, the waveforms start scrolling again. To restart the waveforms earlier, select the Freeze waveforms button again.

Freezing waveforms does not affect continuous monitoring of all parameters and does not freeze waveforms on the M540.
Supported banners

The following banners appear on the Cockpit and are also supported on the Infinity network:

- **All alarms off** when the **All alarms paused** function is set to **No timeout** (see page 401) and you select the **All alarms off** button.
- **All alarms paused** when a time is selected in the **All alarms paused** function (see page 401) and you select the **All alarms paused** button.
- **Patient category indicator** (Adult, Pediatric, Neonate)
- **Standby, Discharge, Privacy**

The following banners appear in the header bar of the Cockpit:

- **Audio paused** with countdown timer when you press the yellow **Audio paused 2 min** key (next to the rotary knob).
- **Audio alarms off** when you press the **Code** button on the main menu bar and the **Alarm volume off** function is set to **Yes** (see page 405).
- **HR alarms off** – appears under the following circumstances:
  - when the alarm limits for heart rate are deactivated and the **ASY/VF alarms** function is set to **Always on** (see page 403).
  - when the alarm limits for heart rate are deactivated, the basic arrhythmia function is activated and the **ASY/VF alarms** function is set to **Follow HR alarm** (see page 403).
- **OR Alarms** appears in the header bar when you activate **OR Alarms** (see page 402).
- **All alarms off; bypass** appears in the header bar when you activate cardiac bypass mode (see page 402).
- **Battery symbol** indicates the status of the battery charge.

The following banners appear on the waveform channels of the Cockpit:

- **Filter ESU** appears on the ECG waveform when the filter setting is set to **ESU** (see page 193).
- **Filter off** appears on the ECG waveform when the filter setting is set to **Off** (see page 193).
- **Waveforms stopped** appears on all waveforms when you press the **Freeze waveforms** button on the main menu bar (see page 53).
- **Pacer off, Pacer fusion** appears when the corresponding function is activated or deactivated (see page 193)

The following banners appear in the center of the Cockpit screen:

- **Privacy Touch Screen to resume monitoring** appears when privacy mode is activated (see page 78).
- **Standby, Touch Screen to resume monitoring** appears when standby mode is activated (see page 77).
- **Discharged, Touch Screen to initiate monitoring** appears after you discharge a patient (see page 91).
Operating concept

Dialog windows and pages

The following diagram shows how the monitoring area appears when you access a dialog window. The left side is reserved for the dialog window while the right side displays the monitoring area (F) with real-time data. A dialog window contains horizontal tabs (B) that open pages. Some pages also contain vertical tabs (E) which access subordinate pages. Selecting the corresponding button followed by dots on the main menu bar opens the corresponding dialog window. For example, the Alarms... button opens the Alarms dialog window. You can also access parameter-specific dialog windows and pages directly by selecting the corresponding parameter boxes on the main screen. For example, if you select the heart rate (HR) parameter box, the Sensor parameters dialog window with the ECG page appears.

- A Dialog window title
- B Horizontal tabs – the selected tab appears light blue.
- C Button that closes the dialog window.
- D Display filter on/off button for switching between a display that shows only connected parameters or one that shows all parameters.
- E Vertical tabs for accessing additional pages – the selected tab appears light blue.
- F Monitoring area showing vital signs in real time.
- G Page that contains groups of related settings in the selected tab.
Main menu bar and quick access toolbar

The following diagram shows the main menu bar with the quick access symbols and a quick-access toolbar. The main menu bar and the quick-access symbols are located along the right edge of the screen and are always visible. The quick-access toolbars remain visible after you select the corresponding quick-access symbol.

A Quick access symbols
B Main menu bar buttons
C Quick access toolbar

Main menu bar

The content of the main menu bar can be customized. By adding and removing buttons, the menu bar can contain the most frequently used buttons. However, several buttons with essential functionality are permanently placed on the menu bar and cannot be moved. This fixed button configuration becomes part of a profile. For more information, see page 396.

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarms...</td>
<td>Opens the Alarms dialog window</td>
</tr>
<tr>
<td>Mark event</td>
<td>Stores an event in the alarm history.</td>
</tr>
<tr>
<td>Code</td>
<td>Executes pre-configured functions during an emergency.</td>
</tr>
<tr>
<td>Views...</td>
<td>Opens the Views dialog window</td>
</tr>
<tr>
<td>Print screen 1)</td>
<td>Prints the contents of the current screen on a connected laser printer.</td>
</tr>
<tr>
<td>Freeze waveforms</td>
<td>Stops all waveforms for 60 seconds.</td>
</tr>
<tr>
<td>Trends/ Data...</td>
<td>Opens the Trends/Data dialog window.</td>
</tr>
<tr>
<td>Procedures...</td>
<td>Opens the Procedures dialog window.</td>
</tr>
<tr>
<td>Sensor parameters...</td>
<td>Opens the Sensor parameters dialog window.</td>
</tr>
<tr>
<td>NIBP start/stop</td>
<td>Starts or stops an NIBP measurement. The button remains selected during a measurement. To cancel the measurement, select the button again.</td>
</tr>
<tr>
<td>Zero all 1)</td>
<td>zeroes all pressures</td>
</tr>
<tr>
<td>System setup...</td>
<td>Opens the System setup dialog window.</td>
</tr>
<tr>
<td>Start/Standby...</td>
<td>Opens the Start/Standby dialog window.</td>
</tr>
<tr>
<td>Home</td>
<td>Returns to the main screen and closes any dialog window.</td>
</tr>
</tbody>
</table>

1) This button only appears on the main menu bar of the C700.
Quick access toolbar

Functions that are commonly used are grouped on quick-access toolbars for easy access. These quick-access functions are accessible by selecting the corresponding quick-access symbols on the main menu bar.

To activate a quick-access function
1. Select the symbol to open the associated toolbar.
2. Select the desired button from the toolbar to activate the function directly.

The following table lists the quick access symbol and the associated toolbar they open when selected.

<table>
<thead>
<tr>
<th>Quick access symbol</th>
<th>Associated Toolbar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Located next to the Alarms... button</td>
<td></td>
</tr>
<tr>
<td>Located next to the Views... button</td>
<td></td>
</tr>
<tr>
<td>Located next to the Trends/ Data... button</td>
<td></td>
</tr>
<tr>
<td>Located next to the Sensor parameters... button</td>
<td></td>
</tr>
<tr>
<td>Located next to the Start/Standby... button</td>
<td></td>
</tr>
</tbody>
</table>

- Located next to the Alarms... button
  - All alarms off
  - All alarms paused (depending on configuration)
  - Auto set all

- Located next to the Views... button
  - Show all ECG
  - Remote view
  - Print screen (C700 only)

- Located next to the Trends/ Data... button
  - ECG report
  - Rest ECG report
  - ST report
  - Alarm history report
  - Trend graph report
  - Trend table report
  - Calculations report
  - Timed wvf. report
  - Continuous wvf. report
  - Timed recording
  - Continuous recording
  - Print case summary

- Located next to the Sensor parameters... button
  - Zero all
  - NBP continuous
  - Venous stasis

- Located next to the Start/Standby... button
  - Standby
  - Discharge
  - Privacy

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Operating concept

Filtering the parameter content

You can filter the content of the displayed parameters with the display filter button which appears in the following dialog windows:

- Parameter window of the Trends/Data dialog window (see page 158).
- Sensor parameters dialog window where it appears to the right of the parameter tabs.
- Alarms dialog window (see page 119).
- Setup page for configuring the trend pages (see page 163)

The filter button toggles between an unfiltered and filtered display. The filter is activated, when the display filter button appears on the light green background. Any parameter that is not being actively monitored is removed from the screen, including parameter-specific setup buttons or tabs.

Selecting the button again changes the background to dark green and deactivates the display filter. All parameters, whether monitored or not, including associated setup buttons or tabs, are displayed.

Auto and manual display modes

The user interface has two display modes: Auto view and manual view.

Auto view mode

Auto view mode is a plug-and-play concept where the content of the main screen depends on the connected parameter signals. For example, as soon as you connect an SpO2 MCable, the associated parameters become available for display. When you disconnect the MCable, the parameters are removed from the screen automatically.

NOTE
The NIBP parameter is always displayed. The M540 does not detect the connection status for this parameter.

Manual view mode

In manual view mode, you can select parameters for display even if they are not yet connected. In this mode, the parameter selection list in the Auto view page (see page 65) contains all parameters. The parameters that are not connected appear gray in the parameter selection list. In addition, the display filter button is deactivated.

To select the desired display mode

1. Select System setup... from the main menu bar.
2. Select the Screen setup tab.
3. Select the Auto view tab located along the right side of the System setup dialog.
4. Select the Auto or Manual button next to the Display mode menu selection.
Auto view setup toolbar

When the auto view mode is activated (see page 390), the auto view setup toolbar appears along the bottom of the screen. The auto view setup toolbar is for configuring the parameter priority and display status of a parameter. The auto view setup toolbar is also visible whenever you select a view that contains an auto view component.

It functions dynamically with the Auto view page (see page 390) where you select the maximum amount of ‘waveforms’ and ‘parameter box’ fields and determine the parameter priority. Any changes made on the auto view setup toolbar are reflected on the Auto view page and vice versa.

Customizing the display

You can control the screen brightness, select how to interact with the Cockpit, and customize the monitoring area to suit your clinical workflow needs.

Touch screen versus mouse

You can interact with the Cockpit using the touch screen or a mouse. If you want to use a mouse but cannot see the cursor after the mouse has been connected, press the Alt and F10 keyboard keys simultaneously to display the cursor.

Screen brightness

You can control the brightness of the Cockpit screen by selecting night and day mode (see page 389). Night mode reduces the luminance of the screen so it is less disturbing to a patient while providing enough contrast for the clinical staff. During night time mode, the entire background of the screen appears almost black. All buttons turn dark gray.

Calibrating the touch screen

If the touch screen of the Cockpit is out of alignment, you can calibrate it. During the calibration of the screen, no waveforms are displayed on the Cockpit. Therefore, never calibrate the screen while monitoring a patient.

To calibrate the touch screen

1. Press the rotary knob until the Calibrate Touch Screen popup appears (requires several seconds).
2. Select the Calibrate button in the popup or press the rotary knob again to access the calibration screen.
3. Touch the red dots that appear on the screen in sequence.
4. Select the green check mark symbol to complete the calibration procedure.
Cockpit screen in split screen mode

The following diagram shows the Cockpit display when the following options/features are activated:

- The web enabled layouts option is unlocked
- The split screen mode is activated (see page 391).

The monitoring area of the Cockpit is reduced to accommodate an additional panel (E). The larger right side continues to display the real-time parameters while the left panel displays either a trend table, ventilation loops, ECG show all page, ECG/ventilation, ECG/ST, or ST parameters (see page 390). If the web-enabled IT option is also activated, this panel also displays IT applications that are accessible using IT tabs (see page 63).

The following diagram shows how the split screen mode divides up the screen.

- A Header bar
- B Main screen menu bar
- C Auto view setup toolbar (if activated)
- D Monitoring area with real-time vital signs
- E Split screen panel (content depends on user-selection, and activation of web-enabled layouts option)
Cockpit split screen mode with mini trends

The following diagram shows the Cockpit display when the following options/features are activated:

- The web enabled layouts option is unlocked and the Split screen feature is activated (see page 391).
- The Mini trends feature is activated (see page 391).

If the split screen mode is not activated, the mini trend panel shifts to the left edge of the screen. Mini trends are updated continuously. NIBP mini trends can either be represented in tabular or graphical format (see page 391). All other parameters appear only as graphical mini trends.
Operating concept

Cockpit split screen mode with multi-tab split screen

The following diagram shows the Cockpit display when the Multi-tab split screen feature is activated by itself (see page 391).

- **A** Header bar
- **B** Main screen menu bar
- **C** Monitoring area with real-time vital signs
- **D** Multi-tab split screen – three tabs whose content is configurable. To configure the Multi-tab split screen, see page 398.
Cockpit split screen mode with mini trends and IT tabs

The Cockpit displays IT applications that are accessible via tabs.

The following diagram shows the Cockpit display when the following options are unlocked and the features are activated:

- The web enabled layouts option is unlocked and the Split screen feature is activated (see page 391).
- The web enabled IT tabs option is unlocked
- The Mini trends feature is activated (see page 391).

Once the application is configured and the IT application feature is activated (see page 420), the corresponding tab appears to the left of the monitoring area. The Patient tab (G) always appears as the top tab. It always returns you to the main screen of the Cockpit for viewing the real-time parameter display. For detailed information on setting up IT tabs, refer to the DrägerService technical documentation.

---

A Header bar
B Main screen menu bar
C Auto view setup toolbar (if activated)
D Monitoring area with real-time vital signs
E Mini trend panel
F Split screen panel (content depends on the user-selection)
G IT tabs
Operating concept

Parameter priority

The parameter priority determines what position a parameter occupies on the screen. The number of parameters appearing as waveforms and parameter boxes depends also on the selected Waveforms setting (see page 391).

In the Auto view page (see page 390), you determine the display location and display status of each parameter. In auto view mode, you can also use the auto view setup toolbar to change the parameter priority (see page 393). In manual mode, you can only change the parameter priority in the Auto view page.

Configuring the parameter priority and display

The location of a parameter in the window determines not only where a parameter appears on the screen but also how it is displayed. Parameters are arranged in descending order in the window and occupy the same position on the screen. For example, the top parameter in the parameter selection window occupies the top spot on the main screen.

For more information see, "Configuring parameters for display" on page 392.

Parameter priority list

The following list shows the default parameter priority list. Pressures without assigned labels appear as GP1, GP2, GP3, or GP4.

1. ECG
2. ECG2
3. SpO2
4. SpO2/CO-Ox
5. RRI
6. ART
7. PA
8. CVP
9. RA
10. LV
11. LA
12. RV
13. ICP
14. NIBP
15. T (temperature)
16. T1
17. CO2 (from Infinity MCable – Mainstream CO2)
18. C.O. (not available in neonatal mode)
19. GP1
20. GP2
21. GP3
22. GP4
23. SvO2
24. etCO2 (from ventilators using the device connectivity cable)
25. Vent
26. Paw
Views

Each Cockpit supports eight pre-configured Dräger views and, as an option, up to eight custom views. Views control the content and appearance of the screen.

During a monitoring session, you can always switch to a different view to adjust the screen layout to the needs of the current monitoring session.

Views can be shared among various profiles which are pre-configured setups. This sharing of views eliminates time-consuming setup tasks. You can also assign views to each profile (see page 429).

Selecting a view

You can reconfigure the screen by selecting a different view.

To select a view

1. Select the Views... button on the main menu bar.
2. Select the Views tab if it is not already selected to open a popup with pre-configured views.
3. Select the desired view from the Custom views (option) or the Dräger views selection lists.

The monitoring area is configured accordingly.

The view editor

The view editor (option) allows authorized personnel to create and modify customized views. Dräger views cannot be modified. Access to the view editor is password-protected. For more information, see page 399.
Profiles/status

Cockpits are adaptable to different care areas. This adaptability is partially due to profiles which allow clinical personnel to create unique setups for the patient population of specific care areas.

Profiles are divided into the following two categories:
- Patient and default profiles
- System profiles (see page 72)

Patient and default profiles

A patient profile consists of user-defined settings which are customized for each patient category (adult, pediatric, neonate). For example, a profile may be unique to an adult patient population in a high-acuity OR setting, while another caters to neonatal patients in a low-acuity OR setting. A profile ‘remembers’ patient and device settings for future use. With a profile, time-consuming setup tasks that would otherwise have to be repeated for each monitoring session, are eliminated.

For each patient category, you can set up and save five unique profiles. Included in the five profiles is a Dräger default profile that cannot be changed.

The Dräger default profile is activated when the Cockpit is booted up for the very first time, new software is installed or factory defaults are restored.

The user-defined patient default profile is activated whenever a new patient category is selected. In addition, the patient default profile is activated after patient data are transferred physically or over the network.

The selected patient profile remains unchanged under the following circumstances:
- When the Cockpit is turned off and on again
- When a patient is discharged
- When a monitor transitions out of standby mode
- When a monitor transitions out of privacy mode

Whenever an M540 is docked in an IACS configuration, the profile of the connected Cockpit overwrites any M540 profile settings. The only exceptions are the following profile settings which remain unchanged on the M540:
- ECG cable type
- SpO2 sensitivity mode for Masimo
- SpO2 response mode for Nellcor
- Patient category (adult, pediatric, neonatal)
- Invasive blood pressure labels

After a patient discharge, all patient data are deleted and the current default profile is restored.
## Operating concept

### Settings included in a profile

The following table lists all of the settings included in a patient profile. For details on each setting, such as available selections and detailed descriptions of the setting, refer to the cross-referenced pages.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Included settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
<td><strong>Included settings</strong></td>
</tr>
<tr>
<td>ECG (see page 192)</td>
<td>Size [mV/cm]</td>
</tr>
<tr>
<td></td>
<td>Pulse tone volume</td>
</tr>
<tr>
<td></td>
<td>Pulse tone source</td>
</tr>
<tr>
<td></td>
<td>HR source</td>
</tr>
<tr>
<td></td>
<td>Waveforms</td>
</tr>
<tr>
<td></td>
<td>Leads</td>
</tr>
<tr>
<td></td>
<td>Filter</td>
</tr>
<tr>
<td></td>
<td>Pacer detection</td>
</tr>
<tr>
<td></td>
<td>QRS sync marker</td>
</tr>
<tr>
<td>ARR Processing</td>
<td>ARR monitoring</td>
</tr>
<tr>
<td>RESP monitoring</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td>Arrhythmia (see page 204)</td>
<td>ARD monitoring</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td></td>
<td>Alarm priority (high, medium, low or off)</td>
</tr>
<tr>
<td>Arrhythmia alarm settings (see page 121)</td>
<td>Alarm priority</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
</tr>
<tr>
<td></td>
<td>Count</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Included settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
<td><strong>Included settings</strong></td>
</tr>
<tr>
<td>ST (see page 213)</td>
<td>ST monitoring</td>
</tr>
<tr>
<td></td>
<td>ST lead1</td>
</tr>
<tr>
<td></td>
<td>ST lead2</td>
</tr>
<tr>
<td></td>
<td>ST lead3</td>
</tr>
<tr>
<td></td>
<td>ST Mini Trend</td>
</tr>
<tr>
<td></td>
<td>TruST 12-lead</td>
</tr>
<tr>
<td></td>
<td>Event duration [sec]</td>
</tr>
<tr>
<td></td>
<td>Selected ISO point</td>
</tr>
<tr>
<td></td>
<td>Selected ST measuring point</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td>Temperature (see page 262)</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td></td>
<td>Pulse tone volume</td>
</tr>
<tr>
<td></td>
<td>Pulse tone source</td>
</tr>
<tr>
<td>SpO2 (Nellcor) (see page 255)</td>
<td>Waveform size [%]</td>
</tr>
<tr>
<td></td>
<td>SatSeconds alarm</td>
</tr>
<tr>
<td></td>
<td>SpO2 desat alarm</td>
</tr>
<tr>
<td></td>
<td>(neonatal mode only)</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Archive setting and alarm grade for SpO2 check sensor alarm</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
</tbody>
</table>
## Operating concept

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Included settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 (Masimo)</td>
<td>Pulse tone volume</td>
</tr>
<tr>
<td></td>
<td>Pulse tone source</td>
</tr>
<tr>
<td></td>
<td>Averaging time</td>
</tr>
<tr>
<td></td>
<td>SpO2 desat alarm (neonatal mode only)</td>
</tr>
<tr>
<td></td>
<td>FastSat mode</td>
</tr>
<tr>
<td></td>
<td>Waveform size [%]</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td>SpO2 Masimo rainbow SET (see page 244)</td>
<td>SpO2: Averaging time</td>
</tr>
<tr>
<td></td>
<td>Pulse tone volume</td>
</tr>
<tr>
<td></td>
<td>Parameter display</td>
</tr>
<tr>
<td></td>
<td>PVI averaging time</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Archive setting and alarm grade for SpO2 sensor off alarm</td>
</tr>
<tr>
<td>Non-invasive blood pressure (see page 273)</td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td></td>
<td>Interval time [min]</td>
</tr>
<tr>
<td></td>
<td>Inflation mode</td>
</tr>
<tr>
<td></td>
<td>Chime</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td>Invasive blood pressure</td>
<td>Scale</td>
</tr>
<tr>
<td></td>
<td>Filter</td>
</tr>
<tr>
<td></td>
<td>Large mean</td>
</tr>
<tr>
<td></td>
<td>Min scale (ICP)</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td>Respiration (see page 227)</td>
<td>RESP lead</td>
</tr>
<tr>
<td></td>
<td>Mode</td>
</tr>
<tr>
<td></td>
<td>Size [%]</td>
</tr>
<tr>
<td></td>
<td>RESP marker</td>
</tr>
<tr>
<td></td>
<td>RESP monitoring</td>
</tr>
<tr>
<td></td>
<td>Coincidence detect</td>
</tr>
<tr>
<td></td>
<td>RRI apnea time [sec]</td>
</tr>
<tr>
<td></td>
<td>Apnea archive</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting</td>
</tr>
<tr>
<td></td>
<td>Alarm limits</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting</td>
</tr>
<tr>
<td>Cardiac output (see page 310)</td>
<td>Catheter type</td>
</tr>
<tr>
<td></td>
<td>Catheter size</td>
</tr>
<tr>
<td></td>
<td>Injectate volume [cc]</td>
</tr>
<tr>
<td></td>
<td>C.O. mode</td>
</tr>
<tr>
<td></td>
<td>Alarm on/off setting (Tblood only)</td>
</tr>
<tr>
<td></td>
<td>Alarm limits (Tblood only)</td>
</tr>
<tr>
<td></td>
<td>Trend scales on/off and setting</td>
</tr>
<tr>
<td></td>
<td>Alarm archive setting (Tblood only)</td>
</tr>
</tbody>
</table>

68 Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n
Operating concept

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Included settings</th>
</tr>
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<tbody>
<tr>
<td>CO2</td>
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<tr>
<td>Scale</td>
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<tr>
<td>Gas compensation</td>
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<td>RRc apnea time [sec]</td>
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<td>Alarm on/off setting</td>
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<td>Alarm limits</td>
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<td>Alarm archive setting</td>
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<td>Trends</td>
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<td>Tabular trend setup</td>
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<td>Reports</td>
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### External device profile settings

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<tr>
<td>External devices – CCO/SvO2 (see page 342)</td>
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<tr>
<td>Parameter 1</td>
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<tr>
<td>Parameter 2</td>
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<td>Parameter 3</td>
<td></td>
</tr>
<tr>
<td>Mini trends</td>
<td></td>
</tr>
<tr>
<td>External devices – Paw (see page 371)</td>
<td></td>
</tr>
<tr>
<td>Parameter 1 (paw)</td>
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</tr>
<tr>
<td>Parameter 2 (paw)</td>
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<tr>
<td>Parameter 3 (paw)</td>
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</tr>
<tr>
<td>Paw scale</td>
<td></td>
</tr>
<tr>
<td>Vol scale</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>External devices – ventilator (Medibus Servo I) (see page 372)</td>
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</tr>
<tr>
<td>Parameter 1 (vent, paw)</td>
<td></td>
</tr>
<tr>
<td>Parameter 2 (vent, paw)</td>
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</tr>
<tr>
<td>Parameter 3 (vent, paw)</td>
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</tr>
<tr>
<td>Paw scale</td>
<td></td>
</tr>
<tr>
<td>Flow scale</td>
<td></td>
</tr>
<tr>
<td>CO2 Scale</td>
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</tr>
<tr>
<td>Vol scale</td>
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<td>Color (vent, paw, CO2)</td>
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### Parameter Included settings

<table>
<thead>
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<tr>
<td>Parameter 2 (vent, paw)</td>
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<tr>
<td>Parameter 3 (vent, paw)</td>
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<tr>
<td>Flow scale</td>
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<td>CO2 Scale</td>
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<td>Vol scale</td>
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<td>Color (vent, paw, CO2)</td>
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### All parameters of the Configure show all page (see page 357)

<table>
<thead>
<tr>
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<tr>
<td>External devices – Anesthesia workstation (see page 345)</td>
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<td>Parameter 1</td>
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<td>Parameter 2</td>
<td></td>
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<tr>
<td>Parameter 3</td>
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<td>O2 pbox</td>
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<tr>
<td>etCO2 pbox</td>
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</tr>
<tr>
<td>CO2 Scale</td>
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</tr>
<tr>
<td>Color</td>
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</tr>
<tr>
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<td>Vol scale</td>
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### External devices – Ventilator (Medibus X) (see page 345)

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<tr>
<td>Parameter 2 (vent, paw)</td>
<td></td>
</tr>
<tr>
<td>Parameter 3 (vent, paw)</td>
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</tr>
<tr>
<td>Paw scale</td>
<td></td>
</tr>
<tr>
<td>Flow scale</td>
<td></td>
</tr>
<tr>
<td>CO2 Scale</td>
<td></td>
</tr>
<tr>
<td>Vol scale</td>
<td></td>
</tr>
<tr>
<td>Color (vent, paw, CO2)</td>
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</table>

### External devices – Anesthesia workstation (see page 345)

<table>
<thead>
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<tbody>
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<td>O2 pbox</td>
<td></td>
</tr>
<tr>
<td>etCO2 pbox</td>
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</tr>
<tr>
<td>CO2 Scale</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>Loop draw</td>
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<tr>
<td>Vol scale</td>
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### External devices – CO2 (see page 373)

<table>
<thead>
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<tbody>
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<td>Vol scale</td>
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</table>

### External devices – PV Loop (see page 369)

<table>
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<tbody>
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<td>Loop draw</td>
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<td>Vol scale</td>
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### External devices – BIS (see page 323)

<table>
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</tr>
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<tbody>
<tr>
<td>Scale[vF]</td>
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<tr>
<td>BIS secondary parameter</td>
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### External devices – NMT (see page 329)

<table>
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<th>Included settings</th>
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</thead>
<tbody>
<tr>
<td>Display temperature</td>
<td></td>
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</tbody>
</table>
## Operating concept

### Alarm profile settings
- **Alarm system settings**
  - Alarm limits display
  - Cardiac bypass
  - OR Alarms
  - All alarms paused
  - Alarm validation
  - Pacer detection mode
  - ASY/VF alarms
  - NIBP/SpO2 interlock
- **Config. alarms**
  - Archive setting
  - Pulse tone volume
  - Alarm bar enabled
  - Attention tone volume
  - Alarm volume
- **Alarm volume and tone settings**
- **Code settings**
  - Continuous recording
  - Alarm volume off
  - Continuous NIBP mode
  - All alarms off
- **Screen profile settings**
  - Auto display settings
  - Waveforms
  - Pressure overlap
  - Parameter boxes
  - Layout
  - Split screen
  - Mini trends
  - NIBP trend
  - Toolbar
  - Selected parameter priority

### Parameter Included settings
- **Alarm profile settings**
  - Configurable views
  - Up to eight available, configurable views
  - Button setup
  - Tab 1, Tab 2, or Tab 3
  - Screen system settings
  - Monitoring sweep speed [mm/s]
  - Respiratory sweep speed [mm/s]
  - Parameter units display
- **Config. buttons**
  - Anesthesia and BIS graphical trend
  - Configuration order of parameters
  - Open lung tool
  - Configuration for the quick-access tool bar
- **Procedures profile settings**
  - Wedge
  - Scale
  - Sweep speed [mm/sec]
- **Biomed profile settings**
  - Bedside setup
  - Airway adapter
  - Patient profile selection

### Biomedical profile settings
- **Bedside setup**
- **Airway adapter**
- **Patient profile selection**

### Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n
### Settings not included in a profile

The following settings are not included in a profile and must be configured separately. These settings remain unchanged until they are manually changed again by the user.

<table>
<thead>
<tr>
<th>Parameter/System feature</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-invasive blood pressure</td>
<td>Venous stasis mode Continuous mode</td>
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<tr>
<td>ST</td>
<td>ST relearn</td>
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<tr>
<td>Arrhythmia</td>
<td>Relearn</td>
</tr>
<tr>
<td>Respiration</td>
<td>Relearn</td>
</tr>
<tr>
<td>SpO2 (Masimo)</td>
<td>The Mini trends setting which determines the duration of the mini-trends (see page 390)</td>
</tr>
<tr>
<td></td>
<td>Pulse CO-Ox mini trend parameter</td>
</tr>
<tr>
<td>eCO2 (Infinity MCable – Mainstream CO2)</td>
<td>(see page 321)</td>
</tr>
<tr>
<td>Ventilator</td>
<td>PV Loop or FV Loop</td>
</tr>
<tr>
<td>Alarm history</td>
<td>Filter settings (All, Arrhythmia, High-priority, Medium-priority, Low-priority, Time, Priority, Message)</td>
</tr>
<tr>
<td>System setup... &gt; General settings</td>
<td>All alarms paused</td>
</tr>
<tr>
<td>Volume/ Tone</td>
<td>Alarm reminder enabled</td>
</tr>
</tbody>
</table>

### Operating concept
System profiles

System profiles are system-wide settings. System profiles are divided into the following two categories:

- Shared settings – these settings can be exported and imported using a USB memory stick (see page 431 for information).
- Install persist settings – these settings are not affected by a patient discharge, software upgrade or by turning the Cockpit off and then on again.

Most system settings can be shared and are also install persist settings. However, some settings are install persist settings only which are identified in the following table. For details on each setting, such as available selections and detailed descriptions of each setting, refer to the cross-referenced pages.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Shared and install persist settings</th>
<th>Install persist only settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen setup settings (see page 389)</td>
<td></td>
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<tr>
<td>Brightness</td>
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<tr>
<td>Night time</td>
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<td></td>
</tr>
<tr>
<td>General alarm settings (see page 401)</td>
<td>X</td>
<td></td>
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<tr>
<td>External device disconnected alarm control</td>
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<tr>
<td>Alarm group</td>
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<tr>
<td>M540 alarm settings (see page 408)</td>
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<tr>
<td>Keep device label</td>
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<tr>
<td>Transport speaker volume</td>
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<tr>
<td>Transport pulse tone volume</td>
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<tr>
<td>Tone and volume alarm settings (see page 401)</td>
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<tr>
<td>Audio pause behavior at the ICS</td>
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<tr>
<td>Minimum alarm volume</td>
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<tr>
<td>Tone set</td>
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<tr>
<td>Recorder settings (see page 410)</td>
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<tr>
<td>Delay</td>
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<tr>
<td>Duration</td>
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<td>Speed</td>
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<td>Waveform selection</td>
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<td>Waveform 2</td>
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</table>
## Operating concept

<table>
<thead>
<tr>
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<th>Install persist only settings</th>
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<td>Secondary recorder</td>
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<td>Report setup settings (see page 412)</td>
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<td>Waveform duration [s]</td>
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<td>Biomed printer settings (see page 418)</td>
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<td>Biomed patient monitor settings (see page 415)</td>
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<td>NLM/Bypass sync</td>
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Operating concept

<table>
<thead>
<tr>
<th>Setting</th>
<th>Shared and install persist settings</th>
<th>Install persist only settings</th>
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<td>Biomed network settings (see page 417)</td>
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<tr>
<td>Biomed IT tab settings (see page 423) (identical for the Innovian, PatientWatch, Symphony, Web browser, Application, and MegaCare pages)</td>
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<td>Biomed Citrix settings (see page 422)</td>
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<td>Graphical trend settings (see page 160)</td>
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### Operating concept

<table>
<thead>
<tr>
<th>Setting</th>
<th>Shared and install persist settings</th>
<th>Install persist only settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grids</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Tabular trend settings (see page 168)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>View</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Calculation parameters (see the 'Calculations' chapter starting on page 141)</td>
<td>X</td>
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</tr>
<tr>
<td>All hemodynamic parameters</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>All oxygenation/ventilation parameters</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lab calculation parameter selections (see page 146)</td>
<td>X</td>
<td></td>
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<tr>
<td>PaCO₂</td>
<td>X</td>
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</tr>
<tr>
<td>PaO₂</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SaO₂</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hgb</td>
<td>X</td>
<td></td>
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<td>Body size calculations selections (see page 142)</td>
<td>X</td>
<td></td>
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<td>BSA</td>
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<td>Wt (weight)</td>
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</tr>
<tr>
<td>Ht (height)</td>
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<td></td>
</tr>
<tr>
<td>Drug profile settings (see page 153)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Name of the drug:</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Amount</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dose Units</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Concentration</td>
<td>X</td>
<td></td>
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Managing profiles and views

Each patient category (adult, pediatric, neonatal) has its own unique profiles. For example, if you activate the neonatal patient category, only the profiles defined for the neonatal patient category are selectable. This is unlike views which can be shared among all patient categories.

The following profile functions are available (for detailed instructions, see “Profile setup” on page 425):

- Selecting a profile
- Saving a profile (password-protected)
- Transferring a profile (password-protected)
- Deleting a profile
- Entering a profile name and description
- Assigning a profile to a default view (default profiles are automatically activated after a restart or a patient discharge).

Transferring profiles

Profiles can be transferred to other Cockpits in the password-protected Profile transfer page. This eliminates time consuming duplicate setup tasks. You can transfer profiles either over the network or with a USB memory stick (see page 431).
Operating concept

**Standby mode**

You can temporarily interrupt patient monitoring by placing the Cockpit and the M540 in standby mode. Selecting standby mode on the Cockpit automatically activates standby mode on the M540 and vice versa. Likewise, taking a patient out of standby on one device does the same at the other device.

Standby mode has the following effect:

- All patient data are removed from display on the Cockpit and the M540.
- All monitoring (including acoustic and visual alarm signals) are suppressed.
- Active alarms are considered acknowledged.
- All recordings are canceled.
- The banner **Standby – Touch Screen to resume monitoring** is displayed in the center of the screen.

To place the Cockpit in standby mode

1. Select the symbol next to the Start/Standby... button on the main menu bar to display the Standby toolbar.
2. Select the Standby button on the toolbar.

   **or**

1. Select the Start/Standby... button on the main menu bar to display the Standby dialog window.
2. Select the Start tab if it is not already selected.
3. Select the Standby button next to the menu selection Monitor.

**NOTE**

If configured to appear on the main menu bar, the Standby button is also accessible on the main menu bar. For more information, see page 396.

The banner **Standby – Touch Screen to resume monitoring** appears in the center of the Cockpit screen.

To take the Cockpit out of standby mode

- Touch the screen to resume monitoring the vital signs of the patient.
Privacy mode

Privacy mode is only possible when the patient is admitted at the Infinity CentralStation (ICS). In privacy mode, patient monitoring continues but the patient data are removed from the Cockpit and the M540 and only appears on the ICS.

Selecting privacy mode on the Cockpit automatically activates privacy mode on the M540 and vice versa. Likewise, taking a patient out of privacy mode on one device does the same at the other device.

Privacy mode is canceled automatically when the connection to the Infinity network is disrupted.

Activating privacy mode has the following effect:

- All patient data are removed from the Cockpit and the M540 displays, but continue to be displayed at the ICS.
- The alarm bar is deactivated.
- Acoustic alarm signals are only provided at the ICS.
- The banner Privacy Touch Screen to resume monitoring is displayed in the center of the Cockpit screen.

To place the Cockpit into privacy mode

1. Select the symbol next to the Start/Standby... button on the main menu bar.
2. Select Privacy on the toolbar.
or
1. Select the Start/Standby... button on the main menu bar.
2. Select the Start tab if it is not already selected.
3. Select Privacy next to the menu selection Display.

NOTE
If configured to appear on the main menu bar, the Privacy button is also accessible on the main menu bar. For more information, see page 396.

The banner Privacy Touch Screen to resume monitoring is displayed in the center of the Cockpit screen.

To take the Cockpit out of privacy mode

- Touch the screen to activate the display of the patient data.
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Assembly and preparation

Assembly overview

This chapter describes the following basic assembly tasks:

- Docking/undocking the M540 from the M500
- Locking/unlocking the M540 into the M500
- Connecting/disconnecting the system cables

Commercially available mounting solutions

Various mounting solutions are available. It is the responsibility of the hospital to install, test, and ensure the proper and safe operation of any mounting solution.

Contact your Dräger representative for specific approved mounting solutions.

CAUTION

Avoid mounting solutions that could impede airflow since the M500, PS250 / P2500 require adequate airflow to dissipate heat. In addition, when mounting the PS250 / P2500, always position it vertically for adequate heat dissipation.

IACS components are compatible with commercially available mounting solutions.

CAUTION

Check the weight ratings of the commercially available mounts to avoid injuring the patient or damaging the device.
Docking/undocking the M540

The following diagram shows the front and side panels of the M500 which holds the M540 in place.

**M500 front view (M540 docked)**

- A: M500 locking tab
- B: Release buttons for removing the M540
- C: M540 patient monitor
- D: M500
- E: Swivel mount (optional) and mounting clamp

**To dock the M540**

1. Align the curved portion of the M540 with the curved portion of the M500.
2. Press the M540 (C) into the M500 (D) until it ‘clicks’ into place.
3. Push the locking tab (A) of the M500 towards the front, to the locked position to fasten the M540 into place.

To lock the M540 into place permanently, see ‘Locking/unlocking the M540’ on page 82.

**To undock the M540**

1. Push the locking tab (A) of the M500 towards the back. If the locking tab does not move, it has been permanently locked. See page 82 for information on how to unlock the locking tab.
2. Hold the M540 firmly and press one of the release buttons (B - see arrow) of the M500.
3. Pull the M540 (C) out of the M500 (D).
Assembly and preparation

Locking/unlocking the M540

You can lock the M540 permanently in the M500 to prevent anyone from undocking it.

To lock the M540 into place

1. Push the locking tab (D) of the M500 towards the front. This prevents you from undocking the M540. If you push the locking tab back, you can undock the M540 again.

2. Insert the 2 mm hex wrench tool (A) into the middle hole (B) on the locking tab and turn it clockwise to the locked position. The locking tab is fixed and you cannot remove the M540 unless you ‘unlock’ it again using the hex wrench tool.

To unlock the M540

1. Insert the 2 mm hex wrench tool (A) into the middle hole (B) on the locking tab and turn it counterclockwise to the unlocked position.

2. Push the locking tab (D) back to unlock the release buttons (C) on the M500 to undock the M540.

A  Hex wrench tool (2 mm)
B  Center hole on locking tab for locking/unlocking the M540
C  Release buttons for undocking the M540
D  Locking tab
Assembly and preparation

Connecting the system cables

Connecting the system cables involves 2 main steps:

- Connecting a system cable to the PS250 / P2500 and the Cockpit.
- Connecting a system cable to the PS250 / P2500 and the M500.

Connecting the system cable to the PS250 / P2500 and the Cockpit

1. Connect one end of the system cable to the system connector on the back of the Cockpit (refer to the instructions for use Infinity Acute Care System – Medical Cockpit).

2. Connect the other end of the system cable to one of the two PS250 / P2500 system connectors (A).
Assembly and preparation

Connecting the system cable to the PS250 / P2500 and the M500

1 Connect one end of the system cable (B) to the M500 system connector.

2 Connect the other end of the system cable to one of the two PS250 / P2500 system connectors (see diagram on page 83).
Assembly and preparation

Mounting the Infinity MCable – Masimo SET/Masimo rainbow SET/ Nellcor OxiMax

The following diagram shows how a Masimo MCable can be mounted to the M540. The Nellcor OxiMax MCable can be mounted in the same way.

![Diagram of MCable mounting](image)

**Side view (connectors)**

- A M540
- B Tabs of the MCable mount adapter that lock into the side of the M540.
- C MCable mount
- D Cable end of the MCable
- E Blue SpO2 connector
- F Indentations for locking the MCable mount adapter
- G Intermediate cable or reusable SpO2 sensor which connects directly to MCable

**Bottom view**

- A
- B
- C
- D
Assembly and preparation

To attach the MCable mount adapter

Follow these steps to attach the MCable to the M540:

1. Make sure the cable end of the MCable (D) and mount adapter (C) points in the same direction as the connector side of the M540.

2. Align the tabs on the mount adapter (B) with the indentations on the M540 and push firmly until the mount adapter clicks in place.

3. Connect the MCable (D) to the blue SpO2 connector on the M540.

To remove the MCable mount adapter

1. Insert a flat head screwdriver (or equivalent tool) between the indentations for locking the MCable mount adapter (F).

2. Gently lift to unhinge the adapter.
## Getting started

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Getting started

Overview

This chapter describes the necessary steps to start monitoring a patient on the IACS. Specifically, this chapter describes how to:

- Turn the IACS on/off
- Admit/discharge a patient on the Cockpit
- Change the patient category

Turning the IACS on/off

Before monitoring a patient on the IACS, the Cockpit and the M540 must be turned on. The following steps assume that the M540 has been docked in the M500 (for information see, “Docking/undocking the M540” on page 81).

To turn the Cockpit on

- Press the on/off key (B) of the Cockpit.

The 2 LEDs (A) on either side of the on/off key light up green. The Cockpit emits a power-up tone and performs a self-test. After a brief moment, the Dräger startup screen appears before the Cockpit main screen appears.

To turn the M540 on

- Press the on/off key (C) of the M540.

The M540 emits a high-pitched tone followed by two power-up tones, performs a self-test, and displays the New patient prompt. Select Discharge to delete the previous patient data or Cancel to continue monitoring the patient and append the new data to the previous data set. The main screen appears. The acoustic alarm signals are paused for 2 minutes.
Getting started

To turn the Cockpit off
1. Press the on/off key located in the lower left corner of the Cockpit.
2. Select the Shutdown button in the dialog window.

To turn the M540 off
1. Press and hold the on/off key. The power off dialog window appears.
2. Select the Shutdown button in the dialog window.

Viewing demographic data

The following diagram shows the Demographics page of the Cockpit where you can perform the following functions:
- Admit a patient manually (see page 90)
- Admit a patient over the network via the Get HIS function (see page 91)
- Discharge a patient (see page 91)
- Change the patient category (see page 94)

Demographic data entered on the Demographics page are available to the network. Demographic data are not deleted when you turn the Cockpit off and on. To delete demographic data, discharge the patient.
Getting started

Admitting a patient

You can admit a patient at the Cockpit manually by entering the demographic data on the Demographics page.

You can also admit a patient over the network by pulling the data from an HL7/ADT interface (see “Admitting a patient using Get HIS” on page 91). This is only possible if the M540 is docked, the IACS is connected to the Infinity network, and an Infinity Gateway Suite (Gateway) is present. The Gateway communicates with the network and the HL7/ADT server.

When a patient is admitted, the profile for the selected patient category is assigned with patient settings already setup. Profiles eliminate repetitive and time-consuming setup tasks.

To admit a patient manually

In the following steps, the letters in parentheses refer to the diagram of the Demographics page (see page 89).

- Touch the left most field on the header bar of the Cockpit to access the Demographics page.

1. Select Start/Standby... on the main menu bar.
2. Select the Demographics tab (if not already selected).
3. Enter the patient name – use the symbol (B) next to the Patient name field to activate an on-screen keyboard for entering the patient name (up to 25 alphanumeric characters).
4. Enter the patient ID – use the symbol (C) next to the Patient ID field to activate an on-screen keyboard for entering the ID number (up to 12 alphanumeric characters).
5. Enter the name of the physician – use the symbol (D) next to the Physician name field to activate an on-screen keyboard for entering the name of the physician (up to 12 alphanumeric characters).
6. Select the desired patient category (F) – Adult, Pediatric, or Neonate.
7. Enter the birthday (G) – day, month, year.
8. Enter the admit date (H) – day, month, year.
9. Select the gender (I) – Unknown, male, female.
10. Enter the weight of the patient – use the keypad symbol (J) to activate an onscreen numeric keypad for entering the weight of the patient (see page 93 for supported weight ranges).
11. Enter the height of the patient – use the keypad symbol (K) to activate an onscreen numeric keypad for entering the height of the patient (see page 95 for supported height ranges).

WARNING

Monitors in a care area may seem identical but may use different default alarm settings because of different profile assignments. After admitting a patient, always verify that the set alarm limits are appropriate for the patient.

4 Enter the patient ID – use the symbol (C) next to the Patient ID field to activate an on-screen keyboard for entering the ID number (up to 12 alphanumeric characters).
5 Enter the name of the physician – use the symbol (D) next to the Physician name field to activate an on-screen keyboard for entering the name of the physician (up to 12 alphanumeric characters).
6 Select the desired patient category (F) – Adult, Pediatric, or Neonate.
7 Enter the birthday (G) – day, month, year.
8 Enter the admit date (H) – day, month, year.
9 Select the gender (I) – Unknown, male, female.
10 Enter the weight of the patient – use the keypad symbol (J) to activate an onscreen numeric keypad for entering the weight of the patient (see page 93 for supported weight ranges).
11 Enter the height of the patient – use the keypad symbol (K) to activate an onscreen numeric keypad for entering the height of the patient (see page 95 for supported height ranges).
Getting started

Admitting a patient using Get HIS

You can populate the Demographics page automatically, by pulling the demographic data of a patient from the network. Prerequisite for this network data transfer is the Infinity gateway with an interface to the hospital Admit, Discharge, Transfer (ADT) system. The Hospital Information System (HIS) searches the database for the demographic data of the patient by using the patient ID.

To admit a patient via Get HIS

- Touch the left most field on the header bar to access the Demographics page directly.
  or
1. Select Start/Standby... on the main menu bar.
2. Select the Demographics tab (if not already selected).
3. Enter the patient ID – use the symbol (C) next to the Patient ID field to activate an on-screen keyboard for entering the ID number (up to 13 alphanumeric characters).
4. Select the Get HIS button (E) in the Demographics page (see page 89). The Get HIS button appears grayed out and is not selectable when the HIS is not available or when the Cockpit is not connected to it.

Discharging a patient

You can discharge a patient from the Cockpit or from the M540. Discharging a patient from either device causes a discharge at the other device. Refer to the instructions for use Infinity Acute Care System – Infinity M540, for detailed information on how to discharge a patient from the M540.

Discharging a patient has the following effect on the Cockpit:
- All patient demographic data are removed from the screen
- All trend and event data are deleted
- Any active recordings are canceled
- The profile with defined patient settings is restored
- The message Touch Screen to initiate monitoring appears
Getting started

To discharge a patient

1. Select the left most field on the header bar of the Cockpit to access the Demographics page.
2. Select the Start tab (if not already selected).
3. Select the Discharge button.

or

1. Select Start/Standby... on the main menu bar.
2. Select the Start tab (if not already selected).
3. Select the Start button. A pop-up window with the message Caution discharge will delete patient data appears.
4. Select the Discharge button in the pop-up window.

Discharging a patient may take some time during which the message Please wait... appears on the screen. Once the patient is discharged, the message Touch Screen to initiate monitoring appears in the center of the screen. The message Patient transferred appears in the Alarm history page.

NOTE
If configured to appear on the main menu bar, the Discharge button is also accessible on the main menu bar. For more information, see page 396.
Getting started

Patient categories

Each patient category has specific profiles associated with it. Profiles are a set of patient and user settings that have been pre-configured by the factory or the hospital (for more information, see "Profiles/status" on page 66).

The Cockpit supports the following patient categories:

<table>
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<tr>
<th>Patient category</th>
<th>Typical Age Range</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>12 to 140 years</td>
<td>0.1 to 350.0 kg (0.1 to 772.0 lbs)</td>
<td>10 to 250 cm (5 to 100 in)</td>
</tr>
<tr>
<td>Pediatric</td>
<td>0 to 16 years</td>
<td>0.1 to 350.0 kg (0.1 to 772.0 lbs)</td>
<td>10 to 250 cm (5 to 100 in)</td>
</tr>
<tr>
<td>Neonate</td>
<td>0 to 2 years</td>
<td>1 to 10,000 g (0.1 oz to 351 oz)</td>
<td>10 to 250 cm (5 to 100 in)</td>
</tr>
</tbody>
</table>

If an M540 docks with a different patient category from the one selected on the Cockpit, the following happens:
- The Cockpit aligns its patient category to the M540 patient category setting.
- During the patient category alignment, the M540 continues to monitor the patient.
- The profile changes to the default profile for the new patient category and the message Please wait ... is displayed.
- As soon as the Cockpit has switched to the new patient category, the patient data are automatically transferred to the Cockpit from the M540 that has been monitoring the patient.

Selecting the patient category

If the Patient profile selection function is activated (see page 415), you can change the patient category and select a profile from a list of pre-configured profiles from the Start page. If the function is deactivated, you can only change the patient category from the Demographics page.

A patient category change does not affect the following settings: the patient and physician names, patient ID, birth date, admit date, and height. The weight is affected by a change in patient category as follows:
- Changing from adult to pediatric patient category and vice versa does not affect the weight.
- Changing from adult or pediatric patient category to neonatal patient category causes the weight to appear blank.
- Changing from neonatal patient category to adult or pediatric causes the weight to appear blank.
To change the patient category from the Start page

The following steps are only possible when the Patient profile selection function is activated (see page 415).

1. Select the left most field on the header bar to access the Demographics page directly.

or

1. Select Start/Standby... on the main menu bar.
2. Select the Start tab (if not already selected).
3. Select the desired patient category button (Adult, Pediatric, or Neonate), next to the selection Patient category.
4. Press the rotary knob to confirm the setting.
5. Select a profile using the down arrow next to the selection Profile.

The Cockpit switches to the new patient category and the selected profile.

To change the patient category in the Demographics page

1. Select the left most field on the header bar to access the Demographics page directly.

or

1. Select Start/Standby... on the main menu bar.
2. Select the Demographics tab (if not already selected).
3. Select the desired patient category button (Adult, Pediatric, or Neonate), next to the selection Patient category.
4. Press the rotary knob to confirm the setting.

The Cockpit switches to the new patient category and the default profile for the new patient category.
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Overview of alarms

The Cockpit and the M540 produce acoustic and visual alarm signals. These alarm signals alert you to alarm conditions ranging from limit violations, arrhythmia events, and network issues.

Persistent alarms generate acoustic and visual alarm signals that require user intervention. One-shot alarms are only reported once and do not require any user intervention.

Each alarm condition is assigned one of three alarm priorities: high (life-threatening), medium (serious), and low (advisory). Each alarm priority has unique acoustic and visual alarm signals.

In addition to the visual and acoustic alarm signals, alarm messages appear in the header bar of the Cockpit and in the alarm message field of the M540. For some parameters such as NIBP and SpO2, certain alarm messages are displayed in the parameter box of the Cockpit. All alarm conditions and associated alarm messages are described in detail in the "Problem solving" chapter starting on page 449.

The color of an alarm message corresponds to the priority of the associated alarm condition (see "Alarm priorities" on page 98).

The alarm settings for a patient can be set up to generate automatic recordings and/or store alarms for later event review in the alarm history. A physiological alarm can also activate an external alarm device such as a nurse call system. Special monitoring modes (see page 105), such as cardiac bypass mode, affect the regular alarming behavior.

When connected to the Infinity network, the Cockpit and the M540 can be configured to report alarm conditions occurring at other monitors that are also connected to the Infinity network.

For detailed instructions regarding the alarm functions of the M540, refer to the instructions for use Infinity Acute Care System – Infinity M540.
Alarm priorities

Every alarm condition is assigned to one of three priorities: high (life-threatening), medium (serious), or low (advisory). Visual and acoustic alarm signals indicate the level of the alarm priority. For more information on how alarm priorities affect alarm reporting, see "Visual alarm signals" on page 101 and "Acoustic alarm signals" on page 103.

High-priority alarm conditions

All high-priority alarms are physiological alarm conditions that can be life-threatening and require immediate intervention.

An example of a high-priority alarm condition is an asystole.

Medium-priority alarm conditions

Most medium-priority alarms report physiological alarm conditions that require prompt attention but may not be life-threatening.

An example of a medium-priority alarm condition is a respiratory rate limit violation.

Low-priority alarm conditions

All low-priority alarms alert you to technical issues that may compromise the ability of the system to monitor the patient.

An example of a low-priority alarm condition is an artifact on the ECG waveform.

Alarm processing

When you dock an M540 on the M500 (see page 81), all visual and acoustic alarm signals are transferred to the Cockpit automatically. Acoustic alarm signals only sound at the Cockpit not at the M540 by default. If you also want alarms to sound at the M540 when it is docked, select the alarm tone volume at the M540 manually (refer to the instructions for use Infinity Acute Care System – Infinity M540).

The Cockpit provides acoustic and visual alarm signals for parameters originating from monitors in its alarm group (see page 130). In addition, the Cockpit reports technical alarms affecting the Infinity network.

NOTE

Alarm monitoring is not available for the following parameters: cardiac output (C.O.), injectate temperature (Tinj), pulmonary wedge pressure (PWP), paced beats (%PACED), perfusion index (PI) and SpO2C for the Masimo rainbow SET MCable, any parameter displayed on the Cockpit using the device connectivity option.

When you undock the M540 from the M500 (see page 81), all alarm monitoring stops at the Cockpit but continues on the M540.
Latching and non-latching alarm behavior

When an alarm condition no longer exists, the associated acoustic and visual alarm signals behave in one of two ways:

- The alarm signals automatically stop when the alarm condition ceases to exist. This type of alarm is called a non-latching alarm condition.
- The alarm signals continue until you acknowledge the alarm even though the alarm condition has ceased to exist. This type of alarm is called a latching alarm condition.

In general, high-priority alarms are latching alarm conditions while low-priority alarm conditions are non-latching. Exceptions to this alarm behavior are listed on page 105.

The alarm priority of a latching alarm condition determines how the alarm signals behave after the alarm condition ceases to exist:

- A latched alarm condition of high priority is identified by the standard acoustic and visual alarm signals (see page 103 and page 101).
- A latched alarm condition of medium priority is downgraded to a status message which appears in the header bar. The background of the alarm message in the alarm header and the parameter box no longer flash in the alarm color. In addition, and there are no acoustic alarm signals.

To acknowledge a latched alarm condition

Press one of the following two keys:

- The yellow key \( \text{\text{Cockpit}} \) or \( \text{\text{M540}} \) on the front panel of the Cockpit.
- The yellow key \( \text{\text{M540}} \) on the front panel of the M540.
- Select the \( \text{\text{All alarms off or All alarms paused}} \) button (the name and function of the button depends on the Cockpit configuration – see page 401). To access the button, press the quick access symbol next to the \( \text{\text{Alarms...}} \) button on the main menu bar.

The latched alarm signals are cleared and all acoustic and visual latched alarm signals disappear.

Multiple alarm conditions

During multiple alarm conditions, the Cockpit and the M540 report the most recently detected alarm condition of highest priority. When several alarm conditions occur simultaneously, the parameter boxes flash for all alarming parameters. The alarm condition with the highest priority determines which acoustic alarm signal is generated, how the alarm bar and the parameter box appear, and what alarm message appears in the header bar. If more than two alarms are active simultaneously, the corresponding messages appear in the header bar along with the \( \text{\text{More...}} \) button which provides access to additional messages (see page 50).
Activating or deactivating alarm validation

When the alarm validation function is activated (see page 389), an alarm condition must exist for a certain time before acoustic and visual alarm signals are triggered. This feature reduces nuisance alarms.

When the alarm validation feature is activated, the time between the detection and annunciation of a parameter falling outside the set alarm limits equals the time of detection plus the assigned alarm validation delay. For HR, adding the delay time may exceed the maximum of 10 seconds allowed by AAMI EC13 and IEC 60601-2-27.

The following table lists which parameters have an alarm validation time. Parameters that do not appear in the table have no validation times and acoustic and visual alarm signals are triggered almost immediately.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Upper alarm limit</th>
<th>Lower alarm limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG/Heart rate (HR)</td>
<td>6 s</td>
<td>6 s</td>
</tr>
<tr>
<td>Pulse rate (PLS)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>ST segment analysis (ST)</td>
<td>15 s to 60 s</td>
<td>60 s</td>
</tr>
<tr>
<td>(selectable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory rate (RRi)</td>
<td>14 s</td>
<td>14 s</td>
</tr>
<tr>
<td>Respiratory rate (RRc)</td>
<td>8 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Pulse oximetry (SpO2)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Invasive blood pressure (IBP)</td>
<td>10 s</td>
<td>4 s</td>
</tr>
<tr>
<td>Total hemoglobin (SpHb and SpHbv)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Carboxyhemoglobin saturation (SpCO)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Pleth variability index (PVI)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Methemoglobin saturation (SpMet)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
</tbody>
</table>

NOTE

1) Select the validation period for the ST limit alarm in the ST dialog window (see "Configuring ST alarm settings" on page 124).

2) For Nellcor Oximax SpO2: the SatSeconds alarm time overrides the alarm validation setting (see "SatSeconds alarm" on page 256).
Visual alarm signals

Each alarm priority has its own distinct visual alarm signals. When the M540 is docked on the M500, only the Cockpit provides acoustic alarm signals. However, visual alarm signals appear on the Cockpit and the M540. The alarm message in the header bar is the only visual alarm signal if an alarming parameter is not included in the current screen view or the alarm bar is deactivated.

<table>
<thead>
<tr>
<th>Alarm priority</th>
<th>Parameter box</th>
<th>Alarm message field ¹</th>
<th>Alarm bar (if activated, see page 402)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (life-threatening)</td>
<td>Flashing red background</td>
<td>Red background</td>
<td>Flashing red</td>
</tr>
<tr>
<td>(for example, asystole, ventricular fibrillation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (serious)</td>
<td>Flashing yellow background</td>
<td>Yellow background</td>
<td>Flashing yellow</td>
</tr>
<tr>
<td>(for example, alarm limit violations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (advisory)</td>
<td>Solid cyan background</td>
<td>Cyan background</td>
<td>No visual signal</td>
</tr>
<tr>
<td>(for example, disconnected electrode)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹) Cockpit alarm messages are designed to be legible from a distance of 1 meter (3.3 feet) to 2 meters (6.6 feet). M540 alarm messages are legible at arm’s length.
Alarms

Visual alarm indicators on the Cockpit

A  Alarm message field in the blue header bar
B  Alarming parameter box
C  Alarm bar

Visual alarm indicators on the M540

Alarm bar

The alarm bar on the Cockpit and the M540 visually announce high and medium-priority alarm conditions (see page 98).

However, the alarm bar is inactive when:

- Only low-priority alarm conditions exist
- The alarm bar is deactivated (see page 402)
- Cardiac bypass or Privacy modes are activated (see page 108)
- Alarm monitoring is deactivated (see page 115)

NOTE

The color of the alarm bar always corresponds to the highest grade alarm condition for all active or audio pause alarms.
Alarms

Acoustic alarm signals

During an alarm, the Cockpit also provides distinct acoustic alarm signals for each alarm priority in addition to visual alarm signals (see page 101). The specific characteristics of these acoustic alarm signals depend on the selected alarm tone pattern. The available alarm tone patterns are: *Infinity, IEC fast, and IEC slow.*

When acoustic alarm signals are paused, the alarm bar and the parameter box stop flashing but remain lit up in the respective alarm color.

If multiple alarm conditions exist simultaneously, an acoustic alarm signal sounds for the alarm condition with the highest priority.

<table>
<thead>
<tr>
<th>Alarm priority</th>
<th>IEC fast</th>
<th>IEC slow</th>
<th>Infinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Three beeps &gt; one beep &gt; one beep with higher pitch &gt; short pause</td>
<td>Three beeps &gt; one beep &gt; one beep with higher pitch &gt; short pause</td>
<td>Continuous two-tone sequence</td>
</tr>
<tr>
<td>Medium</td>
<td>Two beeps &gt; one lower pitched beep</td>
<td>Two beeps &gt; one lower pitched beep</td>
<td>Two tones &gt; short pause</td>
</tr>
<tr>
<td>Low</td>
<td>Two beeps repeated every 16 s</td>
<td>Two beeps (no repetition)</td>
<td>Low tone repeated every 30 s</td>
</tr>
</tbody>
</table>

**NOTE**

Normally, acoustic alarm signals only sound at the Cockpit not at the M540. Therefore, all acoustic alarm signals are transferred automatically from the M540 to the Cockpit once you dock the M540. However, if you want alarms to sound at both devices, select the alarm tone volume at the M540 manually.
Alarms

Adjusting the alarm tone

The volume of the alarm tone is adjustable. Make sure you set the alarm volume so that it is suitable for the clinical environment.

You can only deactivate the alarm tone if the patient is assigned to an ICS or the Cockpit is in OR mode. When the alarm tone is deactivated, the banner Audio alarms off appears in the header bar of the Cockpit. If the Cockpit loses its connection to the ICS, the tone volume selection Off is no longer available and the setting automatically goes to 100%. Once the Cockpit restores its connection to the ICS, the previous setting for the alarm tone volume is reinstated.

**NOTE**

If the Alarm volume off feature is enabled in the Code setup page (see page 410), the alarm volume is automatically reduced to its minimum setting when you select the Code button on the main menu bar.

To adjust the alarm tone volume

1. Select the Alarms... button on the main menu bar.
2. Select the Settings tab.
3. Select either the desired setting next to the Alarm volume button. The available settings are:
   - Off (if the patient is connected to the Infinity network or the Cockpit is in OR mode).
   - 5%, 10 to 100% in increments of 10%.

**NOTE**

The 5% setting can only be selected with the Alarm volume button when the password-protected Minimum alarm volume setting has been configured accordingly (see page 404).

Testing visual and acoustic alarm signals

The alarm bar and the speakers of the M540 and the Cockpit are automatically tested during startup. You can also test the visual and acoustic alarm signals by creating an alarm condition (for example, by lowering the upper alarm limit of the heart rate). To end the test, restore the alarm limits to the previous setting (see "Configuring the alarm settings for a patient" on page 115).
Viewing current alarm messages

The Cockpit identifies each alarm condition according to the alarm priorities low, medium, and high (see page 98). In addition to visual and acoustic alarm signals, alarm messages in the header bar identify each alarm condition. The header bar can display two messages simultaneously. If more than two patient alarm conditions are active simultaneously, the button More... appears to the left of the alarm message field (see page 50). Selecting this button activates the Current alarms page. This page lists all of the currently active alarms. Specifically, you can review the following information for each alarm condition:

- How long the alarm has been active (duration).
- The alarm priority of the alarm condition (! = low-priority, !! = medium-priority, !!! = high-priority).
- Alarm message (for detailed information on the cause and possible remedies, see the chapter “Problem solving” on page 449).

To access the current alarm messages

1. Select the More... button to the left of the alarm message field in the header bar (only visible when more than two patient alarm conditions are active).
2. Select the Alarms... button on the main menu bar.

3. Select the Current alarms tab.

Special alarm behavior

Activating any of the following features alters the normal alarm annunciation behavior:

- ASY/VF alarms
- SpO2 desaturation alarm
- NIBP/SpO2 interlock function
- Zeroing invasive blood pressures
- Privacy, Standby, Cardiac bypass, and OR modes
- French NFC mode

ASY/VF alarms

You can control the alarming behavior for ventricular fibrillation (VF) and asystole (ASY) alarms.

WARNING

Alarm signals are not generated for ventricular fibrillation and asystole events when the following conditions are met:

- The ASY/VF alarms setting is set to Always on or Follow HR alarm (see page 401).
- The ARR monitoring is set to OFF.
- The HR source is set to ART or SpO2 with ECG available as a heart rate source.
Alarms

To make sure that asystole and ventricular fibrillation alarms are always reported do one of the following:

– Turn arrhythmia monitoring on

or

– Set the HR source to ECG (see page 192) when the ARR monitoring setting is set to Off (see page 204)

If you select Follow HR alarm, deactivate HR and arrhythmia alarm monitoring, the banner HR, ASY, VF off appears.

SpO2 desaturation alarms

In neonatal mode, the alarm priority is upgraded to high-priority if the SpO2 value falls more than 10% below the lower SpO2 alarm limit. This feature is automatically activated whenever neonatal mode is activated. This function can be activated or deactivated (see page 256 or page 243). When using the Infinity MCable – Nellcor OxiMax, this feature is only available if the SatSeconds alarm function is set to Off (see page 256).

NIBP/SpO2 interlock alarms

To avoid SpO2 nuisance alarms when the non-invasive blood pressure cuff and the SpO2 sensor are placed on the same limb during an active non-invasive blood pressure measurement, select the NIBP/SpO2 interlock function in the General settings page (see page 401).

When the function is activated, all SpO2 alarms are deactivated during an active non-invasive blood pressure measurement. To activate or deactivate this function, see page 402.

Zeroing invasive blood pressures

Zeroing all invasive blood pressures from the Zero all button on the Cockpit menu bar or from the • button on the hemodynamic pods (see page 288) has the following effects:

– All invasive blood pressure and CPP limit alarms and static alarms are suppressed from the time the button is pressed until 30 seconds after the zeroing procedure is completed.

Zeroing an individual blood pressure from a specific invasive blood pressure page on the Cockpit (see page 287) has the following effects:

– The invasive blood pressure limit alarm for that parameter is suppressed from the time the button is pressed until 30 seconds after the zeroing procedure is completed.

– If the zeroed parameter is ICP or ART, the CPP limit alarm is also suppressed from the time the button is pressed until 30 seconds after the zeroing procedure is completed.

The following alarm conditions cancel the suppression of alarms caused by zeroing invasive blood pressures:

– The invasive blood pressure parameter is outside (high/low) the measuring range

– Invasive blood pressure hardware failures

– Unplugged transducers

– Disconnected hemodynamic pods

– A wedge pressure measurement that ends before the 30-second zeroing period ends will activate the alarm limit for the parameter PA M only
Alarms

Privacy mode
When privacy mode is activated, the following happens at the Cockpit:
- All patient data are removed from the Cockpit and the M540 but continue to be visible at the ICS (Infinity CentralStation).
- The Cockpit and at the M540 display the alarm message Privacy Touch Screen to resume monitoring.
- The alarm bar is deactivated.
- Acoustic alarm signals are only provided at the ICS.
- Home is the only active button on the main menu bar of the Cockpit; all other buttons are inactive.
You can activate privacy mode only if the patient is also admitted at the ICS. To activate or deactivate this feature, see page 78.

Standby mode
When Standby mode is activated, the following happens at the Cockpit:
- All patient data are removed from the screen.
- All monitoring (including acoustic and visual alarm signals) is suppressed.
- Active alarms are considered acknowledged by the user.
- The message Touch Screen to resume monitoring appears at the ICS, at the Cockpit, and at the M540.
- Home is the only active button on the main menu bar of the Cockpit; all other buttons are inactive.
- All recordings are canceled.
To activate or deactivate this function, see page 78.
Alarms

Cardiac bypass mode

When Cardiac bypass mode is activated, the following happens at the Cockpit:

- All alarm monitoring (including arrhythmia alarms), and the alarm bar are deactivated.
- The message All alarms off: bypass and the symbol appear in the upper-right corner of the screen.
- Pressing the yellow All alarms paused or the All alarms off button deactivates cardiac bypass mode.
- Pressing the yellow fixed key on the Cockpit does not pause any alarms.
- The non-invasive blood pressure interval mode is deactivated. The interval timer is restored to the last value. To restart the interval measurements, press the NIBP start/stop button or the start/stop fixed key.
- The alarm history records an entry whenever Cardiac bypass mode is activated or deactivated.

Cardiac bypass mode is not supported when the M540 undocks. To activate or deactivate this function, see page 402. If French NFC mode is activated, Cardiac bypass mode is not available.

OR alarms

When OR alarms are activated, alarm messages for medium and high-priority alarms clear when the alarm condition no longer exists.

To activate or deactivate this function, see page 402.

French NFC mode

When this mode is activated, the following happens at the Cockpit:

- HR alarms cannot be deactivated.
- The alarm pause period cannot last longer than 3 minutes.
- You cannot activate Cardiac bypass mode when French NFC mode is activated. If Cardiac bypass mode was activated before French NFC mode was activated, Cardiac bypass mode is deactivated.

To activate or deactivate this function, see page 415.
Pre-silencing alarms

This function allows you to pre-silence (audio pause in advance) potential alarm conditions before they occur. Pre-silencing allows you to concentrate on a procedure without being interrupted by continuous acoustic alarm signals arising from potential alarm conditions. A pre-silence period lasts two minutes.

Pre-silencing alarms has the following effect:
- Any alarm conditions are reported visually by a corresponding alarm message and a blinking parameter box (see page 101).
- The alarm message **Audio paused** appears in the far right field of the header bar along with a countdown timer and the following symbol.
- A single alarm tone sequence is generated for the first occurrence of an alarm condition of low, medium or high alarm priority. For subsequent alarm conditions of equal alarm priority, no further acoustic alarm signals are generated. Only for subsequent alarm conditions of higher alarm priority, a single alarm tone sequence is generated.
- If multiple alarm conditions arise during an active pre-silence period, the Cockpit triggers a single alarm tone sequence for the alarm condition corresponding to the highest priority. The Cockpit remains silent for any subsequent alarm conditions of equal or lower alarm priority.

Central audio pause feature

The selected **Audio pause behavior** setting of the Cockpit determines how the ICS reacts when you pre-silence alarms at the Cockpit. This is a password-protected feature. For detailed information, see page 404.

- **Exit pause** – Any new alarm condition, regardless of its alarm priority, will break through an already active audio pause state at the ICS. All visual and audible signals are reported fully for any new alarm condition.
- **Continue pause** – Only alarm conditions of high priority will break through an active audio pause state at the ICS. The appropriate parameter box flashes. Alarm conditions of low or medium priority will not break through at the ICS.

Initiating a pre-silence period

You can initiate a pre-silence in several ways:
- From the Cockpit
- From an M540 on wireless transport
- From an ICS
- From the remote view of another Infinity monitor within the same monitoring unit

To pre-silence alarms remotely is only possible if the remote control feature of the remote device is activated. Refer to the corresponding instructions for use for information on how to activate the remote control feature.

To pre-silence alarms from the Cockpit

- Press the yellow or key on the Cockpit. The appearance of the yellow key depends on the Cockpit hardware version (see page 22).
- Press the F1 keyboard key.

Pressing the key that initiated the pre-silence period again, cancels the pre-silence state and all alarm events are reported as usual.
To pre-silence alarms remotely

- Press the yellow key on the main menu bar of the ICS to pre-silence alarms for all assigned patients. Press the same button in the viewport area to pause alarm tones for an individual patient. For more information, refer to the ICS instructions for use.
- Press the yellow key on the M540 when it is not docked in an IACS configuration.

- Refer to the instructions for use of other remote devices within the same monitoring unit for detailed instructions on how to initiate an audio pause remotely. Pressing the key that initiated the pre-silence period again, cancels the pre-silence state and all alarm events are reported as usual.

Pausing acoustic alarm signals (audio pause)

Acoustic alarms can be paused, or silenced, at the Cockpit for two minutes.
You can initiate an audio pause from the Cockpit, the M540, the ICS, or from the remote view of another Infinity monitor within the same monitoring unit.
Remote audio pause is possible from a remote device provided its remote control feature and that of the Cockpit (see page 417) is activated. Refer to the instructions for use of the remote device for information on how to activate the remote control feature.

The central audio pause feature of the Cockpit determines how the ICS handles new alarm conditions that occur during an already active audio pause period (see page 109).

**NOTE**
If a new alarm condition cancels the current audio pause and you audio pause the new alarm, the audio pause timer is reset to 2 minutes on all connected devices across the network.
Alarms

Pausing alarms at the Cockpit

The following happens at the Cockpit when you pause active alarms:

- Persistent alarms – the parameter box and the alarm bar stop blinking but appear solid in the alarm color corresponding to the alarm grade (see page 101). The alarm message continues to be displayed in the header bar.
- One-shot alarms – the alarm tone and message are cleared.
- The Audio paused %0 banner appears in the far right field of the header bar along with a countdown timer and the following symbol: 🅰️
- All acoustic alarm signals are paused for a maximum of 2 minutes.

NOTE

If any new alarm conditions occur during an active audio pause period, the following happens at the Cockpit:

- A single alarm tone sequence sounds in addition to the visual alarm signals for any new alarm condition of a higher priority than the previous alarm condition. Any alarm condition of equal or lower alarm priority than the paused alarm, does not generate any new acoustic alarm signals. The only new visual alarm signal for a new alarm condition of equal or lower alarm priority is the parameter box lighting up in the corresponding alarm color.
- The parameter box of the new alarming parameter flashes while the parameter box of the previously paused alarm remains highlighted.

In the presence of multiple alarm conditions, the alarm messages for the alarm condition with the highest alarm priorities rotate in the alarm message field of the header bar (see page 50). The rotating alarm messages include alarm messages for paused alarm conditions.

If the condition of the patient remains unchanged after the alarm pause period, the acoustic and visual alarm signals are reactivated. The only exception are one-shot alarms which are only reported once and are cleared when you pause alarms.
Alarms

To initiate an audio pause from the Cockpit

- Press the yellow or key on the Cockpit. The appearance of the yellow key depends on the Cockpit hardware version (see page 22).
- Press the F1 keyboard key.

Pressing the key that initiated the audio pause period again, cancels the audio pause state, and all alarm events are reported as usual.

To initiate an audio pause remotely

- Press the yellow key on the M540 when it is not docked in an IACS configuration
- Refer to the instructions for use of any remote device within the same monitoring unit for instructions on how to initiate an audio pause.

Pressing the key that initiated the audio pause period again, cancels the audio pause state, and all alarm events are reported as usual.

Central audio pause feature

The following Audio pause behavior settings at the Cockpit determine how the ICS handles new alarm conditions when alarms are already paused (see page 404):

- **Exit pause** – Any new alarm condition, regardless of its alarm priority, will break through an already active audio pause state at the ICS. All visual and audible signals are reported fully for any new alarm condition.
- **Continue pause** – Only alarm conditions of high priority will break through an active audio pause state at the ICS. The appropriate parameter box flashes. Alarm conditions of low or medium priority will not break through at the ICS.

The central audio pause feature does not affect how the Cockpit handles subsequent alarms.
Alarms

Activating or deactivating acoustic alarm signals

Deactivating acoustic alarm signals is a password-protected function (see page 401).

You can deactivate alarm tones permanently. When you deactivate alarm tones, the following happens:

– Alarm tones no longer announce alarm conditions.
– The message Audio alarms off appears in the far right field of the header bar and the following symbol.

After deactivating acoustic alarm signals permanently, you can activate them again (see page 401).

When you activate acoustic alarm signals, the following happens when an alarm condition occurs:

– Acoustic alarm signals sound (see page 103).
– Alarm messages appear in the header bar (see page 101).

Pausing alarm monitoring temporarily

If the password-protected alarm pause feature is activated (see page 401), you can pause alarm monitoring temporarily. The alarm pause duration is adjustable from 1 minute to 5 minutes (default is 2 minutes).

The following happens when you pause alarm monitoring:

– Acoustic and visual alarm signals for new alarm conditions are suppressed for all parameters until alarm monitoring begins again
– Alarm signals for any active alarm condition stop immediately
– The alarming parameter box and alarm bar return to the pre-alarm state
– Alarm messages are removed from the alarm message field in the header bar
– The far right field of the header bar turns yellow and displays the alarm message All alarms paused, a countdown timer, and the following symbol.
– The message All alarms paused is recorded in the alarm history (see page 127).

NOTE
If the Cockpit is connected to the network and the patient is admitted at the ICS, a message also appears at the ICS that alarms are paused.

NOTE
If the French NFC mode is activated (see page 415), you cannot pause alarm monitoring for more than 3 minutes.

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Alarms

To pause alarm monitoring temporarily

1 Select the symbol next to the Alarms... button on the main menu bar of the Cockpit.

2 Select the All alarms paused button.

NOTE
If configured to appear on the main menu bar, the All alarms paused button is also accessible on the main menu bar. For more information, see page 396.

As soon as the alarm pause period ends, the Cockpit generates acoustic and visual alarm signals as needed.

To activate alarm monitoring after pausing

1 Select the symbol next to the Alarms... button on the main menu bar of the Cockpit.

2 Select the All alarms paused button again.

NOTE
If configured to appear on the main menu bar, the All alarms paused button is also accessible on the main menu bar. For more information, see page 396.

Activating or deactivating alarm monitoring

WARNING
If No timeout is assigned to the alarm off period, no counter appears and alarms remain deactivated until you enable them again.

WARNING
Never leave a patient unattended when alarm monitoring is permanently deactivated. Always activate alarm monitoring again as soon as possible.

If the password-protected alarm pause feature is set to No timeout (see page 401), the following happens when you deactivate alarm monitoring:

– All acoustic and visual alarm signals for new alarm conditions are suppressed for all parameters until alarm monitoring is manually activated again
– Acoustic alarm signals for any active alarm condition stop immediately

– The alarming parameter box and alarm bar return to the pre-alarm state
– Alarm messages are removed from the alarm message field of the header bar
– The far right field of the header bar turns yellow and displays the message All alarms off and the following symbol: 
– The message All alarms off is recorded in the alarm history (see page 128)

NOTE
If the Cockpit is connected to the network, a message also appears at the ICS that all alarms are turned off.
Alarms

To deactivate alarm monitoring permanently

1. Select the symbol next to the Alarms... button on the main menu bar of the Cockpit.
2. Select the All alarms off button on the toolbar.

NOTE
If configured to appear on the main menu bar, the All alarms off button is also accessible on the main menu bar. For more information, see page 396.

To activate alarm monitoring after deactivating

1. Select the symbol next to the Alarms... button on the main menu bar of the Cockpit.
2. Select the All alarms off button again on the toolbar.

The Cockpit provides acoustic and visual alarm signals again when it detects a new alarm condition.

Configuring the alarm settings for a patient

The following section describes the available alarm features and settings. You can adjust the alarm settings for an individual parameter in the respective parameter-specific setup page. Or, you can set up the alarm settings of multiple parameters in one page. When setting alarm limits, make sure that they are appropriate for the patient’s condition.

Activating/deactivating alarms

Except for the following parameters, you can activate or deactivate the alarm function for individual parameters:
- Asystole and ventricular fibrillation (for these arrhythmia events you cannot deactivate alarms unless the ASY/VF alarms feature is set to Follow HR alarm)
- Cardiac output (C.O.)
- Injectate temperature (Tinj)
- Pulmonary wedge pressure (PWP)
- Paced beats (%PACED)
- Perfusion index (PI)
- Total oxygen content (SpOC) for the Masimo rainbow SET MCable
- Parameters originating from a device that is displaying its values on the Cockpit using the device connectivity option.
Alarms

When you deactivate alarms, no acoustic and visual alarm signals are triggered for that parameter. When alarm monitoring is deactivated, a crossed out triangle (A) appears in the parameter box.

When you activate the alarm function for a parameter, the set alarm limits replace the crossed out triangle, provided the alarm limits display is activated (see page 491).

Setting the upper and lower alarm limits

You can configure the upper and lower alarm limits of a parameter manually to trigger acoustic and visual alarm signals if a parameter goes above or below the set limits. You can also auto set the alarm limits of all parameters quickly based on a percentage. For more information on the Auto set function, see page 127.

WARNING

Setting alarm limits to extreme values may prevent certain alarm conditions from being detected and from being annunciated with acoustic and visual alarm signals.

Archive function

Depending on the active archive setting, the following happens in response to an alarm limit violation:

- An automatic strip recording (see chapter “Reports/recordings”).
- An electronic event storage in the alarm history for later review (see page 128). For information on configuring the archive function, see “Changing general alarm settings” on page 120.
Configuring the alarm setup for an individual parameter

If you are only changing the alarm settings of an individual parameter, use the parameter-specific setup page which includes the alarm setup.

The following diagram shows an example of a parameter-specific setup page. Regardless of the parameter, buttons for adjusting the alarm settings always appear at the top. The alarm setup portion looks different depending on the parameter.

For example, the following diagram shows a setup page for a composite parameter such as non-invasive blood pressure. There are separate alarm settings for each composite parameter (systolic, diastolic, and mean).

- **A** Alarm on/off buttons for each parameter
- **B** Auto set button
- **C** Buttons setting the upper limits for each parameter
- **D** Buttons setting the lower limits for each parameter
- **E** Archive buttons
- **F** Parameter-specific monitoring settings
Changing alarm settings for a single parameter

In the steps below, the letters in parentheses refer to the diagram of the parameter-specific setup page.

**WARNING**

Setting alarm limits to extreme values may prevent certain alarm conditions from being detected and from being annunciated with acoustic and visual alarm signals.

To configure the alarm settings

1. Select *Sensor parameters...* on the main menu bar.
2. Select the desired parameter tab (for example, *ECG*).
3. Select the **Alarm on/off button (A)**, to activate or deactivate alarm monitoring. A crossed-out triangle appears in the parameter box when alarm monitoring is deactivated.

4. Select the **setup button (C)** to adjust the upper alarm limits.
5. Select the **setup button (D)** to adjust the lower alarm limits.
6. Select one of the following settings for the **Archive buttons (E)** to determine what happens in response to an alarm:
   - **Off** – no event is stored and no recording is generated.
   - **Store** – stores the event for later review (see page 128).
   - **Record** – generates a timed recording.
   - **Str/Rec** – stores an event for later review and generates a timed recording.

**NOTE**

If French NFC mode is activated (see page 415), you cannot deactivate HR alarms.

**WARNING**

Setting alarm limits to extreme values may prevent certain alarm conditions from being detected and from being annunciated with acoustic and visual alarm signals.
Configuring the alarm setup for multiple parameters

The following diagram shows the General page where you configure alarm settings for all available parameters. The page consists of a table with setup rows for each parameter. Each setup row consists of several fields for configuring the individual alarm settings. When you select a field to configure a setting, an orange border highlights the selected row.

- Limits tab
- Parameter labels column
- Alarm on/off column
- Lower limits column
- Actual parameter values
- Upper limits column
- Archive column
- General, ARR, and ST tabs
- Display filter button
- Auto set all button (see "Auto setting all alarm limits" on page 126)
Changing general alarm settings

In the following steps, the letters in parentheses refer to the diagram of the General page (see page 119). Alarm ranges and defaults are listed starting on page 138.

To configure the alarm settings of multiple parameters

1. Select the Alarms... button on the main menu bar.
2. Select the Limits tab (if not already selected).
3. Select the General tab along the right edge of the page.
4. Use the display filter button (I) to determine whether the table displays all parameters or only parameters that are currently connected.
5. Select the corresponding button in the Alarm on/off column (C) to activate or deactivate alarm monitoring. A crossed-out triangle appears in the parameter box when alarm monitoring is deactivated.
6. Select the corresponding button in the Lower column (D) to adjust the lower alarm limits.
7. Select the corresponding button in the Upper column (F) to adjust the upper alarm limits.
8. Use one of the following settings in the Archive column (G) to determine what happens in response to an alarm:
   - Off – no event is stored and no recording is generated.
   - Store – stores the event for later review (see page 128).
   - Record – generates a timed recording
   - Str/Rec – generates a timed recording and stores the event.
9. Select the Auto set all button (J), to auto adjust the alarm limits of all parameters. For more information, see page 127.

**WARNING**

Setting alarm limits to extreme values may prevent certain alarm conditions from being detected and from being annunciated with acoustic and visual alarm signals.

**NOTE**

If configured to appear on the main menu bar, the Auto set all button is also accessible on the main menu bar. For more information, see page 396.
Configuring the arrhythmia alarm setup

The following diagram shows the **Limits > ARR** page for configuring the alarm settings for arrhythmia parameters. This page consists of a table with setup rows for each arrhythmia parameter. Each setup row consists of several fields for configuring the individual ARR alarm settings. When you select a field on this page, an orange frame highlights the selected row.

- **A** Limits tab
- **B** Arrhythmia category column for identifying the ARR label
- **C** Alarm priority column for selecting an alarm priority
- **D** Rate column for setting the rate
- **E** Count column for setting the count
- **F** Archive column
- **G** ARR tab
- **H** Arrhythmia mode buttons
- **I** Relearn button

**Configuring ARR alarm settings**

In addition to ARR alarm settings, the **Limits > ARR** page also allows you to select the arrhythmia mode (see page 200) and initiate the relearn process of ECG leads (see page 215). In the following steps, the letters in parentheses refer to the diagram of the **Limits > ARR** page. Alarm ranges and defaults are listed starting on page 138.
To change ARR alarm settings

1. Select the Alarms... button on the main menu bar.
2. Select the Limits tab (if not already selected).
3. Select the ARR tab along the right side.
4. Select the corresponding setup button in the Alarm priority column (C) to select the alarm priority. A crossed-out triangle appears when alarm monitoring is deactivated. The priority for asystole and ventricular fibrillation events cannot be changed. The alarm priority 'light' is always assigned to these categories.
5. Select the corresponding setup button in the Rate column (D) to set the rate.
6. Select the corresponding setup button in the Count column (E) to set the count.
7. Use one of the following settings in the Archive column (F) to determine what happens in response to an alarm:
   - Off – no event is stored and no recording is generated.
   - Store – stores the event for later review (see page 128).
   - Record – generates a timed recording.
   - Str/Rec – generates a timed recording and stores the event.
8. Select the desired arrhythmia mode using the Arrhythmia mode buttons (H).
The following diagram shows the Limits > ST page where you configure alarm settings for ST parameters. This page consists of a table with setup rows for each ST parameter. Each setup row has several fields for configuring the individual ST alarm settings. When you select a field on the page, an orange frame highlights the selected row to mark your place on the setup page.
Configuring ST alarm settings

Some of the ST alarm settings described are also available on the ST page (see page 212). In the following steps, the letters in parentheses refer to the diagram of the Limits > ST page (see page 123). Alarm ranges and defaults are listed starting on page 132.

To change ST alarm settings

1. Select the Alarms... button on the main menu bar.
2. Select the Limits tab (if not already selected).
3. Select the ST tab (H) on the right side of the page.
4. Select the setup button in the Alarm column (C) to activate or deactivate alarm monitoring. A crossed-out triangle appears in the parameter box when alarm monitoring is deactivated.
5. Select the corresponding setup button in the Lower column (D) to adjust the lower alarm limits.
6. Select the corresponding setup button in the Upper column (F) to adjust the upper alarm limits.
7. Use one of the following settings in the Archive column (G) to determine what happens in response to an alarm:
   - Off – no event is stored and no recording is generated.
   - Store – stores the event for later review (see page 128).
   - Record – generates a timed recording
   - Str/Rec – generates a timed recording and stores the event.
8. Use the Auto set all (I) button to adjust the alarm limits for all ST parameters (see page 127).
9. Use the Event duration [sec] button (J) to select a time an upper ST alarm limit has to be in violation before an alarm is triggered (see page 100).
Alarms

Configuring the SpO2 alarm priority

The following two SpO2 alarm messages can be configured for the alarm priority that is most appropriate for your care environment. Depending on which MCable is used, the message reporting the underlying alarm condition differs:

- **Masimo**: SpO2 sensor off
- **Nellcor**: SpO2 check sensor

Both alarm settings are saved as part of the patient profile.

Configuring the alarm priority for a Masimo sensor off message

The **SpO2 sensor off** message appears when the MCable detects that the sensor is no longer attached to the patient. The alarm priority for this message can be configured separately for each patient category. It is available for the following SpO2 cables:

- Masimo rainbow SET MCable
- Masimo SET MCable

For information on how to configure the alarm priority for the setting **SpO2 sensor off**, see page 407.

<table>
<thead>
<tr>
<th>SpO2 parameter</th>
<th>Masimo rainbow SET MCable</th>
<th>Masimo SET MCable</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2</td>
<td>SpO2</td>
<td>SpO2</td>
</tr>
<tr>
<td>PLS</td>
<td>PLS</td>
<td>PLS</td>
</tr>
<tr>
<td>Sphb or Sphbv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpCO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpMet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpOC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Configuring the alarm priority for a Nellcor check sensor message

This alarm setting is for configuring the alarm priority and the alarm archiving behavior of certain Nellcor SpO2 parameters. The **SpO2 check sensor** message appears when the Nellcor OxMax MCable detects that the sensor is no longer attached to the patient or other technical issues that interfere with the proper functioning of the sensor. This feature can be configured separately for each patient category. For information on how to configure the **SpO2 check sensor** setting, see page 407.

The following SpO2 parameters generate an alarm message according to the selected alarm priority:

- SpO2
- PLS

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Alarms

Auto setting all alarm limits

The auto set function allows you to adjust alarm limits quickly based on preset percentages listed in the following table. You can either auto set:
- individual parameters (see page 127)
- all parameters (see page 127)
- all ST parameters (see page 127)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Upper limit</th>
<th>Lower limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tₐ, Tₔ, T₁ₐ, T₁ₔ, Tblood</td>
<td>≤107 % of current value</td>
<td>≤93 % of current value</td>
</tr>
<tr>
<td>S₇, S₁₇, PVC/min, eCO₂</td>
<td>Not affected</td>
<td>Not affected</td>
</tr>
<tr>
<td>SpO₂</td>
<td>Adult/pediatric: 100 % saturation</td>
<td>Neonate: 98 % saturation</td>
</tr>
<tr>
<td></td>
<td>Current value −(value)*(±5 %)</td>
<td>Current value −2.0 mm</td>
</tr>
<tr>
<td>ST</td>
<td>Current value +2.0 mm</td>
<td>Current value −2.0 mm</td>
</tr>
<tr>
<td>eCO₂</td>
<td>Current value +25 %</td>
<td>Current value −20 %</td>
</tr>
<tr>
<td>All others</td>
<td>Alarm limit that is closest to but not more than 25 % above the current value of the parameter.</td>
<td>Alarm limit that is closest to but not more than 20 % below the current value of the parameter.</td>
</tr>
</tbody>
</table>

NOTE
If the Auto set function forces the alarm limits of a parameter outside the allowable limit range of the monitor, the alarm limits remain unchanged.
To auto set an individual parameter
1. Select the parameter box of the desired parameter.
2. Select the **Auto set** button located in the upper-right corner of each parameter setup page, or
1. Select **Sensor parameters...** on the main menu bar.
2. Select the tab of the desired parameter.
3. Select the **Auto set** button located in the upper-right corner of each parameter setup page.

To auto set all parameters
1. Select the \( \bigtriangleup \) symbol next to the **Alarms...** button on the main menu bar > **Auto set all**.
or
1. Select the **Alarms...** button on the main menu bar
2. Select the **Limits** tab.
3. Select the **Auto set** button which is located in the lower right corner below the parameter setup table.

To auto set all ST parameters
1. Select the **Alarms...** button on the main menu bar
2. Select the **Limits** tab.
3. Select the **ST** side tab to access the **ST** page.
4. Select the **Auto set** button which is located below the **ST** table.

**Alarm history and stored events**

The alarm history is an electronic record of alarms and events. The alarm history records an entry under the following circumstances:
- An alarm occurs for a parameter whose archive function is set to **Store** or **Str/Rec**. These alarm events are marked with the \( \bigtriangleup \) symbol and can be viewed in greater detail (see page 129).
- Whenever an arrhythmia event occurs (even when the alarm function is deactivated). Only the archive function has to be set to **Store** or **Str/Rec**.
- You select the **Mark event** button from the main menu bar. These alarm events are also marked with the \( \bigtriangleup \) symbol and can be viewed in greater detail (see page 129).
- You pause alarms using the **All alarms paused/All alarms off** button (see page 110).
- You activate Cardiac bypass mode (see page 108).
- You activate Standby mode (see page 77).
- You select a different patient category (see page 90).
- You transfer a patient.
- You audio pause an alarm.

The alarm history stores up to 150 events. When the storage capacity of 150 events is reached, new events replace the oldest events.
If a higher priority alarm occurs less than 5 seconds from a previous alarm, the higher priority alarm event is stored while the previous one is deleted.
Viewing the alarm history

The following diagram shows an alarm history. When you select any field on the table, a frame highlights the selected row. For information on what conditions prompt an entry to be stored in the alarm history, see page 127.

To access the alarm history

1. Select the Alarms... button on the main menu bar.
2. Select the Alarm history tab.

To filter the alarm history

The alarm history can be filtered according to different categories as follows:

1. Select the Alarms... button on the main menu bar.
2. Select the Alarm history tab.
3. Use the left button (J) to restrict the alarm history to one of the following alarm conditions:
   - All
   - Arrhythmia
   - High-priority
   - Medium-priority
   - Low-priority
4. Use the second left button (I) to restrict the alarm history to one of the following settings:
   - Time
   - Priority
   - Message

A Alarm history tab
B Identifies an event
C Date of the alarm
D Time the alarm was stored
E Duration of the alarm
Viewing a snapshot of a single event

20 seconds of waveform and parameter data are stored automatically in the alarm history under the following circumstances:

- A parameter whose recording archive feature is set to Store or Str/Rec (see page 116) violates set alarm limits.
- You select the Mark event button on the main menu bar.

In both instances, events with stored waveform and parameter data are identified on the alarm history by the following symbol: \( \Delta \). Such an event consists of a snapshot of all connected parameter values and waveforms. Of the 20-second event capture, 10 seconds were recorded before and 10 seconds were recorded after the event occurred.

To view a snapshot of a stored event

1. Select Alarms... on the main menu bar.
2. Select the Alarm history tab.
3. Select the row of the event marked with the \( \Delta \) symbol that you wish to view.

**NOTE**
To return to the alarm history, select the Select event button.

The diagram shows the event snapshot screen:

![Event snapshot screen diagram](image.png)

A. Event header showing the date, time, duration, priority, and alarm message.
B. Parameter values area
C. **Delete** button for deleting the current event
D. **Print** button for printing an alarm history report
E. **Zoom out** button
F. **Zoom in** button
G. **Navigation arrows** for scrolling through events
H. Select event button
I. Waveform area
Alarms

Remote alarm control

When the Cockpit is connected to the Infinity network, it communicates with other Infinity monitors (including other monitoring Cockpits) that support remote viewing functions. Furthermore, the patient of any monitor that is connected to the network can be admitted at the ICS for central monitoring.

If you are viewing another monitor in remote view, you can audio pause alarms at the remote bed. You can also allow remote devices to audio pause alarms at the Cockpit provided the remote control feature is activated (see page 417).

A Cockpit that is connected to the Infinity network automatically relays alarms to the ICS. A network interruption causes the following to happen:
  – A message indicating that there is a network interruption appears in the message field of the Cockpit.
  – If the alarm volume was deactivated, the Cockpit Alarm volume setting (see page 401) changes to 100 % when the Cockpit is offline from the Infinity network and defaults to 50 % when the Cockpit no longer communicates with the ICS. Once communication is restored, the alarm volume returns to the previous setting.

Alarm groups

The Cockpit can receive alarm messages from other monitors that are connected to the Infinity network. However, these monitors must be in the same monitoring unit and in the same alarm group as the Cockpit.

The alarm group feature allows you to configure several monitors as members of a group. All alarms that occur at any of the monitors within the group are broadcast to all the members in the alarm group, typically in less than two seconds. If multiple monitors in the alarm group are in alarm simultaneously, each alarm message rotates in the header bar of the Cockpit and in the alarm message field of each monitor. Technical personnel with access to the necessary password configure alarm groups and monitoring units (see page 401).

Infinity MCable – Nurse call

You can attach a Nurse Call MCable to the PS250 or the P2500 (see page 23) and connect it to an external nurse call system. Whenever the M540, the Cockpit or a connected external device produces a medium or high-priority alarm, a nurse call system is activated to provide remote notification of the alarm condition.
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Alarms

External device disconnection alarm

If the external device alarm feature is activated at the Cockpit (see page 403) and an external device is disconnected from the Cockpit, the following happens at the ICS and at the Cockpit:

– An alarm tone of low priority sounds.
– The message *External device disconnected* appears.

The Code function

You can configure a set of monitoring functions that can be activated during emergency care by selecting the **Code** button on the main menu bar. Depending on which of these settings are activated (see page 405), any of the following happens when you select the **Code** button:

– A continuous recording starts
– NIBP measurements start in continuous mode
– The alarm volume of the alarm condition with the highest priority is automatically reduced to the minimum setting.

**NOTE**

When the **Alarm volume off** setting is set to **Off** (see page 404), the banner **Audio alarms off** and the 📣 symbol appear in the Cockpit header bar when you invoke the Code function.

– The pre-configured **All alarms off** setting determines if the alarm annunciation is deactivated and the **All alarms off** banner appears in the header bar when you press the **Code** button (see page 406).

**NOTE**

The **All alarms off** button works independently of the pre-configured **Code** setting. You can therefore activate or deactivate the **All alarms off** button even after pressing the **Code** fixed key.

In addition to activating the pre-configured features, a timer appears in the header bar with the following two buttons:

– **Stop** button for stopping the timer. The label of the button changes to **Start**.
– **Reset** button for resetting the timer to zero. The **Code** button does not function unless the M540 is docked.

**NOTE**

When the **Alarm volume off** setting is set to **Off** (see page 404), the banner **Audio alarms off** and the 📣 symbol appear in the Cockpit header bar when you invoke the Code function.

To activate the Code function

● Press the **Code** button on the main menu bar.

To deactivate the Code function

● Press the **Code** button on the main menu bar a second time. All functions are deactivated.
## Alarm ranges and defaults

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm limit range</th>
<th>Upper limit defaults</th>
<th>Lower limit defaults</th>
<th>Archive default setting</th>
</tr>
</thead>
</table>
| **HR adult**  
Increment: 5 bpm | Upper: 25 to 300 bpm  
Lower: 20 to 295 bpm | 120 (adult)  
150 (pediatric)  
170 (neonatal) | 45 (adult)  
50 (pediatric)  
80 (neonatal) | Off (adult/pediatric)  
Off (neonatal) |
| **STV/STCVM**  
Increment: 0.1 mm  
or 0.01 mV | Upper: 0.1 to 45.0 mm  
0.01 to 4.50 mV  
0.00 to 4.49 mV | 1.0 mm (0.1 mV)  
0.0 mm (0 mV) | Off |
| **ST**  
Increment: 0.1 mm  
or 0.01 mV | Upper: –14.9 to +15.0 mm  
–1.49 to +1.50 mV  
–1.50 to +1.49 mV | 1.0 mm (0.1 mV)  
–1.0 mm (–0.1 mV) | Off |
| **RRi (adult)**  
Increment: 1 | Upper: 6 to 150  
Lower: 5 to 99 (adult) | 30 | Off |
| **RRi (pediatric, neonate)**  
Increment: 1 | Upper: 6 to 145  
Lower: 5 to 144 | 80 | Off |
| **PLS**  
Increment of 5 | Upper: 35 to 235  
Lower: 30 to 230 | 120 (adult)  
150 (pediatric)  
180 (neonatal) | 45 (adult)  
50 (pediatric)  
80 (neonatal) | Off |
| **SpO₂**  
Increment: 1 | Upper: 21 to 100 %  
Lower: 20 to 99 % | 100 % (adult, pediatric)  
95 % (neonate) | 85 % | Off |
| **SpHb / SpHbv**  
Increment 0.2 g/dL  
(0.1 mmol/L) | Upper: 1.2 to 25.0 g/dL  
(0.7 to 15.5 mmol/L)  
1.0 to 24.8 g/dL  
(0.6 to 15.4 mmol/L) | 17.0 g/dL  
(10.6 mmol/L)  
7.0 g/dL  
(4.3 mmol/L) | Off |
| **Ptt**  
Increment: 1 | Upper: 1 to 150  
Lower: 0 to 99 | 100 | Off |
### Alarms

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm limit range</th>
<th>Upper limit defaults</th>
<th>Lower limit defaults</th>
<th>Archive default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpCO</td>
<td>Upper: 1 to 99</td>
<td>10</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 0 to 98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpMet</td>
<td>Upper: 0.1 to 99.9</td>
<td>3.0</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 0.0 to 99.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP S adult</td>
<td>Upper: 11 to 250 mmHg; 1.5 to 33.3 kPa</td>
<td>160 mmHg</td>
<td>90 mmHg</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 249 mmHg; 1.3 to 33.2 kPa</td>
<td>21.3 kPa</td>
<td>12.0 kPa</td>
<td></td>
</tr>
<tr>
<td>NIBP S pediatric</td>
<td>Upper: 11 to 170 mmHg; 1.5 to 22.7 kPa</td>
<td>120 mmHg</td>
<td>50 mmHg</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 169 mmHg; 1.3 to 22.6 kPa</td>
<td>16 kPa</td>
<td>6.7 kPa</td>
<td></td>
</tr>
<tr>
<td>NIBP S neonate</td>
<td>Upper: 11 to 130 mmHg; 1.4 to 17.3 kPa</td>
<td>80 mmHg</td>
<td>50 mmHg</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 129 mmHg; 1.3 to 17.2 kPa</td>
<td>10.7 kPa</td>
<td>6.7 kPa</td>
<td></td>
</tr>
<tr>
<td>NIBP D adult</td>
<td>Upper: 11 to 250 mmHg; 1.4 to 33.3 kPa</td>
<td>110 mmHg</td>
<td>50 mmHg</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 249 mmHg; 1.3 to 33.2 kPa</td>
<td>14.7 kPa</td>
<td>6.7 kPa</td>
<td></td>
</tr>
<tr>
<td>NIBP D pediatric</td>
<td>Upper: 11 to 170 mmHg; 1.4 to 22.7 kPa</td>
<td>80 mmHg</td>
<td>35 mmHg</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 169 mmHg; 1.3 to 22.6 kPa</td>
<td>10.7 kPa</td>
<td>4.7 kPa</td>
<td></td>
</tr>
<tr>
<td>NIBP D neonate</td>
<td>Upper: 11 to 130 mmHg; 1.4 to 17.3 kPa</td>
<td>60 mmHg</td>
<td>25 mmHg</td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 129 mmHg; 1.3 to 17.2 kPa</td>
<td>8 kPa</td>
<td>3.3 kPa</td>
<td></td>
</tr>
</tbody>
</table>
### Alarms

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm limit range</th>
<th>Upper limit defaults</th>
<th>Lower limit defaults</th>
<th>Archive default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIBP M adult</td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper: 11 to 250 mmHg 1.4 to 33.3 kPa 13.3 to 33.2 kPa</td>
<td>125 mmHg 16.7 kPa</td>
<td>60 mmHg 8.0 kPa</td>
</tr>
<tr>
<td>NIBP M pediatric</td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper: 11 to 170 mmHg 1.4 to 22.7 kPa 13.3 to 22.6 kPa</td>
<td>85 mmHg 11.3 kPa</td>
<td>40 mmHg 5.3 kPa</td>
</tr>
<tr>
<td>NIBP M neonate</td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper: 11 to 130 mmHg 1.4 to 17.3 kPa 13.3 to 17.2 kPa</td>
<td>70 mmHg 9.3 kPa</td>
<td>40 mmHg 5.3 kPa</td>
</tr>
<tr>
<td>( \Delta )Tx</td>
<td>Increment: 0.1 °C or 0.1 °F</td>
<td>Upper: 0.1 to 39.0 °C 0.2 to 70.2 °F 0.0 to 70.0 °F</td>
<td>1.0 °C 3.6 °F</td>
<td>0.0 °C 0.0 °F</td>
</tr>
<tr>
<td>Txa/b</td>
<td>Increment: 0.1 °C or 0.1 °F</td>
<td>Upper: 0.1 to 50.5 °C 32.2 to 122.0 °F 0.0 to 49.9 °C 32.0 to 121.8 °F</td>
<td>39.0 °C 102.2 °F</td>
<td>34.0 °C 93.2 °F</td>
</tr>
<tr>
<td>IBP S adult</td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper: -24 to +300 mmHg -3.2 to +40.0 kPa -25 to +299 mmHg -3.3 to +39.9 kPa</td>
<td>-160 mmHg (21.3 kPa) for GP1 S to GP4 S ART S, LV S</td>
<td>90 mmHg (12.5 kPa) for GP1 S to GP4 S ART S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower: -25 to +170 mmHg -3.3 to +27.5 kPa</td>
<td>-55 mmHg (4.7 kPa) for PA S, RV S</td>
<td>75 mmHg (10.0 kPa) for LV S</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- 10 mmHg (1.3 kPa) for PA S, RV S</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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## Alarms

### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm limit range</th>
<th>Upper limit defaults</th>
<th>Lower limit defaults</th>
<th>Archive default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IBP S pediatric/neonate</strong></td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper: –24 to +300 mmHg</td>
<td>–3.2 to +40.0 kPa</td>
<td>– 120 mmHg</td>
<td>(16.0 kPa) for GP1 S to GP4 S, ART S, LV S</td>
<td>– 50 mmHg</td>
</tr>
<tr>
<td>Lower: –25 to +299 mmHg</td>
<td>–3.3 to +39.9 kPa</td>
<td>– 35 mmHg</td>
<td>(4.7 kPa) for PA S, RV S</td>
<td>– 75 mmHg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– 10 mmHg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GP1 S to GP4 S, LV S, RV S: Off, PA S, ART S: On</td>
</tr>
<tr>
<td><strong>IBP D adult</strong></td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper: –24 to +300 mmHg</td>
<td>–3.2 to +40.0 kPa</td>
<td>– 110 mmHg</td>
<td>(14.7 kPa) for GP1 D to GP4 D, ART D</td>
<td>– 50 mmHg</td>
</tr>
<tr>
<td>Lower: –25 to +299 mmHg</td>
<td>–3.3 to +39.9 kPa</td>
<td>– 25 mmHg</td>
<td>(3.3 kPa) for LV D</td>
<td>– 2 mmHg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– 13 mmHg</td>
<td>(1.7 kPa) for PA D, RV D</td>
<td>(0.3 kPa) for PA D, LV D, RV D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GP1 D to GP4 D, LV D, RV D: Off, ART D, PA D: On</td>
</tr>
<tr>
<td><strong>IBP D pediatric</strong></td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper: –24 to +300 mmHg</td>
<td>–3.2 to +40.0 kPa</td>
<td>– 80 mmHg</td>
<td>(10.7 kPa) for GP1 D to GP4 D, ART D</td>
<td>– 30 mmHg</td>
</tr>
<tr>
<td>Lower: –25 to +299 mmHg</td>
<td>–3.3 to +39.9 kPa</td>
<td>– 25 mmHg</td>
<td>(3.3 kPa) for LV D</td>
<td>– 2 mmHg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– 13 mmHg</td>
<td>(1.7 kPa) for PA D, RV D</td>
<td>(0.3 kPa) for PA D, LV D, RV D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GP1 D to GP4 D, LV D, RV D: Off, ART D, PA D: On</td>
</tr>
</tbody>
</table>
### Alarms

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm limit range</th>
<th>Upper limit defaults</th>
<th>Lower limit defaults</th>
<th>Archive default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IBP D neonate</strong></td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper: –24 to +300 mmHg –3.2 to +40.0 kPa Lower: –25 to +299 mmHg –3.3 to +39.9 kPa</td>
<td>– 60 mmHg (10.7 kPa) for GP1 D, GP4 D, PA D – 25 mmHg (3.3 kPa) for LV D – 13 mmHg (1.7 kPa) for PA D, RV D</td>
<td>– 35 mmHg (4.7 kPa) for GP1 D, GP4 D, PA D – 2 mmHg (0.3 kPa) for PA D, LV D, RV D</td>
</tr>
<tr>
<td><strong>IBP M adult</strong></td>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper: –24 to +300 mmHg –3.2 to +40.0 kPa Lower: –25 to +299 mmHg –3.3 to +39.9 kPa</td>
<td>– 125 mmHg (16.7 kPa) for GP1 M, GP4 M, ART M – 80 mmHg (10.7 kPa) for LV M – 20 mmHg (2.7 kPa) for LA, ICP, CVP – 17 mmHg (2.3 kPa) for PA M, RV M – 12 mmHg (1.6 kPa) for RA</td>
<td>– 60 mmHg (8.0 kPa) for GP1 M, GP4 M, ART M – 40 mmHg (5.3 kPa) for LV M – 7 mmHg (0.9 kPa) for PA M, RV M – 2 mmHg (0.3 kPa) for RA, ICP – 0 mmHg (0.0 kPa) for LA, CVP</td>
</tr>
</tbody>
</table>
### Alarms

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm limit range</th>
<th>Upper limit defaults</th>
<th>Lower limit defaults</th>
<th>Archive default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IBP M pediatric</strong>&lt;br&gt;Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper:  -24 to +300 mmHg&lt;br&gt;Lower:  -25 to +299 mmHg</td>
<td>– 80 mmHg&lt;br&gt;(10.7 kPa) for GP1 M to GP4 M, ART M, LV M&lt;br&gt;– 20 mmHg&lt;br&gt;(2.7 kPa) for LA, ICP, CVP&lt;br&gt;– 17 mmHg&lt;br&gt;(2.3 kPa) for PA M, RV M&lt;br&gt;– 12 mmHg&lt;br&gt;(1.6 kPa) for RA</td>
<td>– 50 mmHg&lt;br&gt;(6.7 kPa) for GP1 M to GP4 M, ART M&lt;br&gt;– 40 mmHg&lt;br&gt;(5.3 kPa) for LV M&lt;br&gt;– 7 mmHg&lt;br&gt;(0.9 kPa) for PA M, RV M&lt;br&gt;– 2 mmHg&lt;br&gt;(0.3 kPa) for RA, ICP&lt;br&gt;– 0 mmHg&lt;br&gt;(0.0 kPa) for LA, CVP</td>
<td>On</td>
</tr>
<tr>
<td><strong>IBP M neonate</strong>&lt;br&gt;Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper:  -24 to +300 mmHg&lt;br&gt;Lower:  -25 to +299 mmHg</td>
<td>– 80 mmHg&lt;br&gt;(10.7 kPa) for GP1 M to GP4 M, ART M&lt;br&gt;– 80 mmHg&lt;br&gt;(11.3 kPa) for GP1 M to GP4 M, ART M&lt;br&gt;– 80 mmHg&lt;br&gt;(10.7 kPa) for LV M&lt;br&gt;– 20 mmHg&lt;br&gt;(2.7 kPa) for LA, ICP, CVP&lt;br&gt;– 17 mmHg&lt;br&gt;(2.3 kPa) for PA M, RV M&lt;br&gt;– 12 mmHg&lt;br&gt;(1.6 kPa) for RA</td>
<td>– 50 mmHg&lt;br&gt;(6.7 kPa) for GP1 M to GP4 M, ART M&lt;br&gt;– 40 mmHg&lt;br&gt;(5.3 kPa) for LV M&lt;br&gt;– 7 mmHg&lt;br&gt;(0.9 kPa) for PA M, RV M&lt;br&gt;– 2 mmHg&lt;br&gt;(0.3 kPa) for RA, ICP&lt;br&gt;– 0 mmHg&lt;br&gt;(0.0 kPa) for LA, CVP</td>
<td>On</td>
</tr>
<tr>
<td><strong>CPP</strong>&lt;br&gt;Increment: 1 mmHg or 0.1 kPa</td>
<td>Upper:  -24 to +300 mmHg&lt;br&gt;Lower:  -25 to +299 mmHg</td>
<td>– 100 mmHg&lt;br&gt;(13.3 kPa)</td>
<td>– 70 mmHg&lt;br&gt;(9.3 kPa)</td>
<td>Off</td>
</tr>
</tbody>
</table>
### Arrhythmia ranges and defaults

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm grade default</th>
<th>Rate (default)</th>
<th>Count (default)</th>
<th>Alarm archive factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2Y</td>
<td>High</td>
<td>Not adjustable</td>
<td>Not adjustable</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>VF</td>
<td>High</td>
<td>Not adjustable</td>
<td>Not adjustable</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>VT</td>
<td>High</td>
<td>≥100 to 200 (≥125)</td>
<td>≥5 to 15 (≥10)</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>ARTF</td>
<td>Off</td>
<td>Not adjustable</td>
<td>Not adjustable</td>
<td>Off</td>
</tr>
</tbody>
</table>
### Alarms

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarm grade default</th>
<th>Rate (default)</th>
<th>Count (default)</th>
<th>Alarm archive factory default</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN</td>
<td>Medium</td>
<td>not adjustable (Rate = VT)</td>
<td>3 to VT count – 1 (3 to 9) changes based on VT</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>AIVR</td>
<td>Medium</td>
<td>not adjustable (VT rate – 1 (&lt;119))</td>
<td>Not adjustable (≥3)</td>
<td>Off</td>
</tr>
<tr>
<td>SVT</td>
<td>Medium</td>
<td>≥120 to 200 (≥160) increments of 10</td>
<td>≥3 to 10 (≥3) increments of 1</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>CPT</td>
<td>Low</td>
<td>Not adjustable</td>
<td>Not adjustable</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>BGM</td>
<td>Low</td>
<td>Not adjustable</td>
<td>Not adjustable</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>TACH</td>
<td>Off</td>
<td>≥100 to 200 (≥130) increments of 10</td>
<td>≥5 to 15 (≥8) increments of 1</td>
<td>Off</td>
</tr>
<tr>
<td>BRADY</td>
<td>Off</td>
<td>≥30 to 105 (adult ≥ 50; pediatric ≤60) increment of 5</td>
<td>Not adjustable (≥8)</td>
<td>Off</td>
</tr>
<tr>
<td>PAUSE</td>
<td>Off</td>
<td>1 to 3.5 (2.5) increments of 0.5</td>
<td>Not adjustable</td>
<td>Off</td>
</tr>
</tbody>
</table>
Calculations

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Calculations

Overview

With the physiological calculations option, the Cockpit performs physiological calculations using data acquired by the M540 and other devices. The Cockpit stores derived parameters and displays them.

When the Cockpit is connected to the network, you can obtain laboratory data through the Trends/Data... page.

The Cockpit can also be configured to calculate drug-related parameters, including concentration, rate, total dose, and total volume.

In addition to the standard calculation features, two additional features are available with the physiological calculations software option:

– Hemodynamics – the Cockpit calculates hemodynamic parameters based on cardiac output, invasive blood pressure, and other data (see page 147).

– Hemo/Oxy/Vent Calculations – the Cockpit calculates oxygenation and ventilation parameters (see page 149) in addition to hemodynamic parameters.

Calculating the body surface area

The Ht (height) and current Wt (weight) values are used to compute the BSA (body surface area) in m². For adult and pediatric patients, these values are pulled automatically from the Demographics page which is populated during patient admission (see page 90). Because of changing body weight, you must enter the weight manually for neonates. This is to make sure that the most current value is used to calculate the BSA.

The BSA value is required for all indexed calculations such as cardiac index (CI). The available units for height are cm and inches. The available units for weight are kg, g, ounces, lbs.

The following Boyd or DuBois equations are used to compute the BSA.

The Boyd equation is used for patients whose weight is less than 15 kg and whose height is less than 80 cm:

\[
BSA = \text{Wt}^{0.7285 - 0.0188 \times \log_{10}\text{WT}} \times \text{Ht}^{0.3} \times 0.0003207
\]

The DuBois equation

\[
BSA = \text{Wt}^{0.425} \times \text{Ht}^{0.725} \times 0.007184
\]

Note:

Wt = Weight, Ht = Height, BSA = Body surface area
Calculations

Accessing the calculation functions

The following diagram shows the Calculations page for calculating hemodynamic, oxygenation, and ventilation parameters.

A Calculations tab
B Capture values button
C Capture labs button (see page 146)
D Calculate results button (see page 145)
E Results tab
F Labs parameter buttons
G Weight and Height buttons
H BSA value
I Oxygenation/Ventilation parameters
J Hemodynamics parameter values

Performing calculations

Calculations are based on automatically captured and on manually entered values. In pediatric and adult mode, the current height and weight used to compute the BSA value, are taken from the Demographics page the first time you capture any values. In neonatal mode you must enter the weight manually. The height is taken from the Demographics page, if available.

NOTE
Before performing a calculation, measure pulmonary wedge pressure and cardiac output (if defined) because some of the calculated values cannot be determined without these parameter values.
To perform a calculation

In the following steps, the letters in parentheses correspond to the diagram for the Calculations page (see page 143).

1. Select the Procedures... button from the main menu bar.
2. Select the Calculations tab (if not already selected).
3. Select the Capture values button (B). The Cockpit populates the available parameter buttons with current values.
4. Select the Capture labs button (C). The Cockpit populates the available lab parameter buttons with current values.
5. Edit or add any value by selecting the button next to a parameter label to activate a popup with a keypad. The popup displays the valid range of the selected parameter. Any modified value is identified by the symbol #.
6. Select the Enter button on the keypad popup to confirm your input. Any value that has been altered manually is identified with the symbol #.
7. Repeat steps 4 and 5 for additional parameters.
8. Select the Calculate results button (D). The calculated values are listed.
Calculations

Viewing the calculation results

The following diagram shows the **Results** page for viewing hemodynamic, oxygenation, and ventilation parameters.

![Diagram]

<table>
<thead>
<tr>
<th>A</th>
<th>Calculations tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Parameters column</td>
</tr>
<tr>
<td>C</td>
<td>Data column with reference values</td>
</tr>
<tr>
<td>D</td>
<td>Data columns with date and time stamp</td>
</tr>
<tr>
<td>E</td>
<td>Calculation tab (see page 143)</td>
</tr>
<tr>
<td>F</td>
<td>Results tab</td>
</tr>
<tr>
<td>G</td>
<td>Scroll bar</td>
</tr>
<tr>
<td>H</td>
<td>Save button</td>
</tr>
<tr>
<td>I</td>
<td>Setup button</td>
</tr>
</tbody>
</table>

**Viewing and saving calculations**

The Results page allows you to configure the display and save calculations. You can save up to 50 calculations before they are overwritten on a first-in first-out basis. The scroll bar (G) consists of single and double arrow keys and a moveable bar. The double arrows scroll through larger portions than the single arrows. You can also drag the navigation bar located between the arrow keys to the desired location. The same page is also available under the Hemo tab (see page 174).
Calculations

To view calculations
In the following steps, the letters in parentheses correspond to the diagram for the Results page (see page 145).

1. Select the Procedures... button from the main menu bar.
2. Select the Calculations tab (if not already selected).
3. Select the Results tab (if not already selected).
4. Select the Setup button (I) to activate a popup window for selecting which parameters are included and excluded from display. The parameters on the dark background are selected for display, the ones on light background are not.
   The Auto-sort button in the dialog window allows you to sort the parameter list according to the parameter priority list in the Auto view page (see page 65). If you add parameters to the parameter priority list, you must order these parameters manually.
5. Select the OK button in the popup window to confirm your selection. The list of parameters is adjusted accordingly on the Results page.

To save calculations
1. Select the Procedures... button from the main menu bar.
2. Select the Calculations tab if not selected.
3. Select the Results tab.
4. Select the column of calculations you wish to save as reference values. An orange frame highlights the selected column.
5. Select the Save button (H) to save the selected calculations.

Lab data

You can include lab data in calculations of derived parameters.

Capturing lab data
The blood-analysis device available on the network determines which lab parameters are available. You can review the results on the Results page (see page 145). From there you can also save the calculations and configure the display.

To capture lab data
1. Select the Procedures... button on the main menu bar.
2. Select the Calculations > Calculations tabs.
3. Select the Capture labs button (C) on the Calculations page (see page 143).
Calculations

Calculation equations

The following section describes which monitored parameters and equations the Cockpit uses to calculate hemodynamic, oxygenation and ventilation calculations.

Hemodynamic parameters

The Cockpit uses the following monitored parameter values for the hemodynamic calculations.

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Available units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART S</td>
<td>Systolic arterial pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>ART M</td>
<td>Mean arterial pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>ART D</td>
<td>Diastolic arterial pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>C.O.</td>
<td>Cardiac output (intermittent)</td>
<td>L/min</td>
</tr>
<tr>
<td>CCO</td>
<td>Cardiac output (continuous)</td>
<td>L/min</td>
</tr>
<tr>
<td>CVP</td>
<td>Central venous pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>HR</td>
<td>Heart rate</td>
<td>bpm</td>
</tr>
<tr>
<td>PA M</td>
<td>Mean pulmonary arterial pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>PWP</td>
<td>Pulmonary capillary wedge pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>ICI</td>
<td>Intermittent cardiac index</td>
<td>L/min/m²</td>
</tr>
<tr>
<td>ICO</td>
<td>Intermittent cardiac output</td>
<td>L/min/m²</td>
</tr>
</tbody>
</table>
The Cockpit uses the values in the preceding table plus the BSA value to calculate the following derived hemodynamic values:

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Equation</th>
<th>Available units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI</td>
<td>Cardiac index (continuous)</td>
<td>C.O. / BSA, CCO / BSA</td>
<td>L/min/m²</td>
</tr>
<tr>
<td>LVHCPP</td>
<td>Left heart coronary perfusion pressure</td>
<td>ART D – PWP</td>
<td>mmHg</td>
</tr>
<tr>
<td>LVSW</td>
<td>Left ventricular stroke work</td>
<td>0.0136 x (ART M – PWP) x SV</td>
<td>g x m</td>
</tr>
<tr>
<td>LVSWI</td>
<td>Left ventricular stroke work index</td>
<td>0.0136 x (ART M – PWP) x SVI</td>
<td>g x mm²</td>
</tr>
<tr>
<td>PVR</td>
<td>Pulmonary vascular resistance</td>
<td>79.96 x ((PA M – PWP) / C.O.)</td>
<td>dyn x s/cm²</td>
</tr>
<tr>
<td>PVRI</td>
<td>Pulmonary vascular resistance index</td>
<td>79.96 x ((PA M – PWP) / CI)</td>
<td>dyn x s/cm²/m²</td>
</tr>
<tr>
<td>RPP</td>
<td>Rate pressure product</td>
<td>ART S x HR</td>
<td>mmHg/min</td>
</tr>
<tr>
<td>RVSW</td>
<td>Right ventricular stroke work</td>
<td>0.0136 x (PA M – CVP) x SV</td>
<td>g x m</td>
</tr>
<tr>
<td>RVSWI</td>
<td>Right ventricular stroke work index</td>
<td>0.0136 x (PA M – CVP) x SVI</td>
<td>g x mm²</td>
</tr>
<tr>
<td>SV</td>
<td>Stroke volume</td>
<td>C.O. x 1000 / HR</td>
<td>mL</td>
</tr>
<tr>
<td>SVI</td>
<td>Stroke volume index</td>
<td>1000 x (CI / HR)</td>
<td>mL/m²</td>
</tr>
<tr>
<td>SVR</td>
<td>Systemic vascular resistance</td>
<td>79.96 x (ART M – CVP) / C.O.</td>
<td>dyn x s/cm²</td>
</tr>
<tr>
<td>SVRI</td>
<td>Systemic vascular resistance index</td>
<td>79.96 x (ART M – CVP) / CI</td>
<td>dyn x s/cm²/m²</td>
</tr>
<tr>
<td>TPR</td>
<td>Total pulmonary resistance</td>
<td>79.96 x PA M / C.O.</td>
<td>dyn x s/cm²</td>
</tr>
<tr>
<td>TVR</td>
<td>Total vascular resistance</td>
<td>79.96 x ART M / C.O.</td>
<td>dyn x s/cm²</td>
</tr>
</tbody>
</table>
Oxygenation and ventilation parameters

The Cockpit uses the following parameter values for the oxygenation and ventilation calculations. All of these calculations are monitored parameter values except for PaO2, PaCO2, Hgb, and SaO2 which are lab values.

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Available units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hgb</td>
<td>Hemoglobin concentration</td>
<td>g/dL</td>
</tr>
<tr>
<td>FiO2/FIO2</td>
<td>Inspired oxygen</td>
<td>%</td>
</tr>
<tr>
<td>PaCO2</td>
<td>Arterial CO2 partial pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>PaO2</td>
<td>Arterial oxygen partial pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>Pplat, Pplat</td>
<td>Pause (plateau) pressure</td>
<td>cmH2, mbar</td>
</tr>
<tr>
<td>Pb</td>
<td>Barometric pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>PeCO2</td>
<td>Mixed expired CO2 partial pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>PEEP</td>
<td>Positive end expiratory pressure</td>
<td>cmH2, mbar</td>
</tr>
<tr>
<td>RIP</td>
<td>Peak inspiratory pressure</td>
<td>cmH2, mbar</td>
</tr>
<tr>
<td>RR, R, RRI, RR</td>
<td>Respiratory rate</td>
<td>°min</td>
</tr>
<tr>
<td>SaO2</td>
<td>Arterial oxygen saturation</td>
<td>%</td>
</tr>
<tr>
<td>SvO2</td>
<td>Venous oxygen saturation</td>
<td>%</td>
</tr>
<tr>
<td>VTe / VTe</td>
<td>Expired tidal volume</td>
<td>mL, L</td>
</tr>
</tbody>
</table>
The Cockpit uses the values in the preceding table, the lab values, and the BSA value to calculate the following derived oxygenation and ventilation parameter values.

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Derivation</th>
<th>Available units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CaO2</td>
<td>Arterial oxygen content</td>
<td>(0.0134 \times Hgb \times SaO2)</td>
<td>mL/dL</td>
</tr>
<tr>
<td>(\Delta)O2</td>
<td>Arterio-venous oxygen difference</td>
<td>(CaO2 - CvO2)</td>
<td>mL/dL</td>
</tr>
<tr>
<td>DO2</td>
<td>Oxygen availability, delivery, or transport</td>
<td>(10 \times CaO2 \times \text{C.O.})</td>
<td>mL/min</td>
</tr>
<tr>
<td>DO2I</td>
<td>Oxygen availability (or delivery) index</td>
<td>(10 \times CaO2 \times CI) (\text{DO2} / \text{BSA})</td>
<td>mL/min</td>
</tr>
<tr>
<td>MValv</td>
<td>Alveolar minute volume</td>
<td>((VTe - TVd \text{phy}) \times RR)</td>
<td>mL/min</td>
</tr>
<tr>
<td>MVe</td>
<td>Expired minute volume</td>
<td>((VTe \times RR) / 1000)</td>
<td>L/min</td>
</tr>
<tr>
<td>MValv / C.O.</td>
<td>Ventilation cardiac output ratio</td>
<td>(\text{MValv} / \text{C.O.})</td>
<td>No units</td>
</tr>
<tr>
<td>Qa/Qt</td>
<td>Intrapulmonary right-left shunt (percentage shunt)</td>
<td>(\frac{1.34 \times 0.0031 \times PaO2 - PaCO2 \times \frac{100}{1.34} \times 0.0031 \times PaO2 - PaCO2}{\text{TVd phy} \times VTe})</td>
<td>mmHg</td>
</tr>
<tr>
<td>VO2</td>
<td>Oxygen consumption</td>
<td>(10 \times C(a-v)O2 \times \text{C.O.})</td>
<td>mL/min</td>
</tr>
<tr>
<td>VO2I</td>
<td>Oxygen consumption index</td>
<td>(10 \times C(a-v)O2 \times \text{C.O.})</td>
<td>mL/min/m²</td>
</tr>
</tbody>
</table>

**NOTE**

When multiple sources are available, the RR order of priority is RR, RR, RRc, RRI.
Drug calculations

The Cockpit calculates the infusion rates of up to 44 drugs and displays titration tables. 40 of these drugs are pre-configured and four can be customized for a specific patient session. Information pertaining to patient-specific drugs is automatically deleted when you discharge the patient.

Data pertaining to default drugs is not deleted when a patient is discharged. For more information on how to create a customized drug list, see page 152.

Accessing the drug calculation functions

The following diagram shows the Drug Calculation page where you perform drug dosage calculations. Once you enter the required information, a titration table with calculated dose and rate values appears.

Accessing the drug calculations

1. Select the Procedures... button from the main menu bar.
2. Select the Drug dosage tab (A), if not already selected.
3. Select the Drug Calculation tab (C), if not already selected.
Performing drug calculations

You can either select drugs from a pre-configured drug list (see page 152) or enter drugs manually to compute the desired dose and rate values and display them on the titration table.

To perform a drug calculation

In the following steps, the letters in parentheses correspond to the diagram for the Drug Calculation page (see page 151).

1. Access the Drug Calculation page (see page 151).
2. Select the arrow key (B) to activate the drug list containing pre-configured drugs.
3. Select the desired drug. The pre-configured values for amount, dose, and units are assigned to the drug infusion parameter list (E).
4. Add the other infusion parameters such as Rate by selecting the corresponding button and entering the values on the keypad.
5. Select Enter on the keypad to confirm your selection.

The titration table appears once you have entered the necessary information. The blue entry in the titration table corresponds to the entered value. The titration table can accommodate up to 20 settings which are centered around the calculated value.

Customized drug list

Customizing a drug list requires a clinical password. The drug list contains up to 40 drugs with the following pre-configured settings: the name, amount, volume, dose, and unit of measure. Once configured, a drug and its settings are stored as defaults and become available for selection in the Drug Calculation page (see page 151).

The drug list also contains four ‘untitled’ drugs which are available if the pre-configured drugs do not meet the current drug calculation needs. These drugs are place holders for generic drug dosage calculations.
Calculations

The following diagram shows the Drug dosage > Setup page where you customize the drug list:

A Drug dosage tab
B Select drug field and selection arrow
C Edit drug name field
D Setup tab
E Amount button
F Volume button
G Dose Units field and selection arrow
H Save Drug button

Customizing the drug list

Accessing the Drug dosage > Setup page requires a password. In the following steps, the letters in parentheses correspond to the diagram for the Drug dosage > Setup page.

To customize the drug list
1. Select the Procedures... button on the main menu bar.
2. Select the Drug dosage > Setup tabs.
3. Enter the password on the keypad.
4. Select Enter to display the Setup page.
5. Use the arrow in the Select drug field (B) to activate a list of existing drug names. Select an existing drug name for editing or an "Untitled" entry for adding a new drug name. The selected drug is assigned to the Edit drug name field (C).
6. Select the pencil symbol next to the Edit drug name field (C) to activate an on-screen keyboard.
7. Edit or enter a drug name using the onscreen keyboard. A maximum of 25 alpha-numeric characters are available.
8. Select the Enter button on the keyboard.
9. Select the Amount button (E) to activate a pop-up with a keypad for adding the amount. Use the arrow symbol to activate a list of assigned units of measure.
10. Select the Enter button. The amount is assigned to the Amount field (E). The unit is assigned to the Dose Units field (G).
11. Select the Volume button (F) to activate a pop-up with a keypad for adding the volume. Use the arrow symbol to activate a list of assigned units of measure.
12. Select the Enter button. The volume is assigned to the Volume field (F). The unit is assigned to the Dose Units field (G).
13. Select the Save Drug button (H) to save all of the drug and all of its attributes.
Drug calculator equations

The following table lists the variables and equations used to perform drug rate calculations.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>The weight of the drug</td>
<td>Concentration x volume</td>
</tr>
<tr>
<td>Volume</td>
<td>The volume in which the drug is dissolved</td>
<td>Drug amount / concentration</td>
</tr>
<tr>
<td>Concentration</td>
<td>Drug quantity / solution volume</td>
<td>Drug amount / volume</td>
</tr>
<tr>
<td>Rate</td>
<td>Infused volume per unit of time</td>
<td>Dose / concentration</td>
</tr>
<tr>
<td>Duration</td>
<td>The time over which the infusion is administered</td>
<td>User-selectable</td>
</tr>
<tr>
<td>Dose</td>
<td>The amount of a drug the physician prescribes, standardized by weight and time</td>
<td>Rate x concentration or Rate x concentration / weight</td>
</tr>
<tr>
<td>Total Dose</td>
<td>Total dose over duration</td>
<td>Dose x duration</td>
</tr>
<tr>
<td>Total Volume</td>
<td>Total volume over duration</td>
<td>Rate x duration</td>
</tr>
</tbody>
</table>

The following table lists the available ranges for each category on the Drug Calculation page.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range and units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily weight</td>
<td>0.1 to 350 kg (adult, pediatric) 1 to 10000 g (neonate)</td>
</tr>
<tr>
<td>Amount</td>
<td>0.01 to 100,000,000,000 micrograms (µg), m units, mEq, mmol 0.01 to 100,000,000 milligrams (mg), units, mol 0.01 to 100,000 grams (g), k units 0.01 to 100 M units</td>
</tr>
<tr>
<td>Volume</td>
<td>0.01 to 10,000 mL</td>
</tr>
<tr>
<td>Concentration</td>
<td>0.01 to 100,000,000,000 µg/mL, m units/mL, mEq/mL, mmol/mL 0.01 to 100,000,000 mg/mL, units/mL, mol/mL 0.01 to 100,000 g/mL, k units/mL 0.01 to 100 M units/mL</td>
</tr>
<tr>
<td>Rate</td>
<td>0.01 to 10,000 mL/h</td>
</tr>
<tr>
<td>Duration</td>
<td>0.01 to 10,000 h</td>
</tr>
</tbody>
</table>
### Calculations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range and units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dose (per hour)</strong></td>
<td>0.01 to 100,000,000,000 µg/h, mEq/h, m units/h, mmol/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000,000 mg/h, units/h, mol/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 10,000 g/h, k units/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100 M units/h</td>
</tr>
<tr>
<td><strong>Dose (per minute)</strong></td>
<td>0.01 to 1,666,666,666.66 µg/min, mEq/min, m units/min, mmol/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1,666,666.66 mg/min, units/min, mol/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1,666.66 g/min, k units/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1.66 M units/min</td>
</tr>
<tr>
<td><strong>Dose/Daily weight</strong></td>
<td></td>
</tr>
<tr>
<td><em>(per hour)</em></td>
<td></td>
</tr>
<tr>
<td>Adult and pediatric:</td>
<td>0.01 to 100,000,000,000 µg/kg/h, m units/kg/h, mmol/kg/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000,000 mg/kg/h, units/kg/h, mol/kg/min or h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000 g/kg/h, k units/kg/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100 M units/kg/h</td>
</tr>
<tr>
<td>Neonatal:</td>
<td>0.01 to 100,000,000,000 µg/g/h, m units/g/h, mEq/g/h, mmol/g/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000,000 mg/g/h, units/g/h, mol/g/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000 g/l, k units/g/h</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100 M units/g/h</td>
</tr>
<tr>
<td><strong>Dose/Daily weight</strong></td>
<td></td>
</tr>
<tr>
<td><em>(per minute)</em></td>
<td></td>
</tr>
<tr>
<td>Adult and pediatric:</td>
<td>0.01 to 1,666,666,666.66 µg/kg/min, mEq/kg/min, m units/kg/min, mmol/kg/min</td>
</tr>
<tr>
<td>Neonatal:</td>
<td>0.01 to 1,666,666,666.66 µg/kg/min, mEq/kg/min, m units/kg/min, mmol/kg/min</td>
</tr>
<tr>
<td>Adult, pediatric, and neonatal:</td>
<td>0.01 to 1,666,666.66 mg/kg/min, units/kg/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1,666.66 g/kg/min, k units/kg/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1.66 M units/kg/min</td>
</tr>
<tr>
<td><strong>Total Dose</strong></td>
<td>0.01 to 100,000,000,000 µg, m units, mEq, mmol</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000,000 mg, units, mol</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100,000 g, k units</td>
</tr>
<tr>
<td></td>
<td>0.01 to 100 M units</td>
</tr>
<tr>
<td><strong>Total Volume</strong></td>
<td>0.01 to 10,000 mL</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
# Trends/data dialog windows

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</tr>
<tr>
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<td>170</td>
</tr>
<tr>
<td>Configuring the trend table</td>
<td>170</td>
</tr>
<tr>
<td>Configuring the parameter content of the trend table</td>
<td>171</td>
</tr>
<tr>
<td>Printing a tabular trend report</td>
<td>172</td>
</tr>
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</tr>
<tr>
<td>Configuring the mini-trend display</td>
<td>172</td>
</tr>
</tbody>
</table>

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Overview

The Trends/Data dialog window provides numerous trend, data review, and report pages.

To access Trends/Data dialog window

1. Select the Trends/Data... button on the main menu bar.
2. Select one of the following tabs to access the desired page:
   - Trends – accesses the graphical and tabular trends and associated functions.
   - ECG – displays all connected ECG leads (see page 194) and ST complexes (see page 208).
   - Ventilator – displays respiratory/ventilation loops (see page 369). When a Perseus A500 is connected, the name of this tab changes to Anesthesia/Ventilation to display anesthesia/ventilation parameters.
   - Hemo – accesses the hemodynamic calculations and results data (see page 173).
   - Labs – accesses the lab results (see page 173).
   - Reports – accesses the tabs for configuring and requesting reports (see “Printing reports” on page 438).

Trending behavior

The Cockpit stores up to 96 hours of continuous and discrete trend values. Trend data are sampled every 30 seconds at the Cockpit where the trend display is updated automatically. Trend updates at the Cockpit are reflected on connected network devices every 60 seconds.

You can view trend data in graphical or tabular format. You can also customize the trend display by selecting which parameters are displayed and by selecting the time period of the trended parameters.

The Cockpit maintains one trend database per patient. If you dock an M540 that was previously docked on another Cockpit, the trend data from the previous Cockpit are transferred over the network to the new Cockpit, provided a patient ID was entered.

If you undock an M540, trending is suspended on the Cockpit but the trend data remain intact. When you redock the M540, any new trend data collected during patient transport are transferred to the Cockpit. Transferring the trend data may take a brief moment during which trends are not accessible.

NOTE
After docking/undocking the M540, one minute of trend data collected during this transition period may not be displayed at the ICS equipped with software version VG1. However, these trends are visible at the Cockpit.

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 trend functions.

Supported parameters

A trended parameter can either be represented in tabular or graphical form. The following sections explain how the different parameter groups are plotted on the graphical trends.
Continuous parameters

The following parameters are continuously trended and appear as a single, continuous line, or as a band on the graphical trends (see page 29 for definitions of abbreviations):

- ECG parameters: HR, %PACED, ST, PVC/min
- Respiratory parameters: RR
- IBP parameters: for a complete list of invasive blood pressure parameters, see page 276
- CO2 parameters: etCO2, inCO2, RRC
- C.O. parameter: Tblood
- Temperature parameters: Ta, Tb, ΔT, T1a, T1b, and ΔT1
- Continuous cardiac output parameters using the device connectivity option: SvO2, Tblood, CCO, CCI, VO2, DO2, SaO2, SVR, EDV, ESV, EF, SV, SVI, SVV
- Medibus X-compatible devices: Dräger Evita V500, Dräger Babylog VN500, Savina 300, Carina, Dräger Evita V300, Oxylog 3000+, Infinity Perseus A500, Zeus IE, Primus family, Apollo: for a list of trended parameters, see page 348.
- Medibus-compatible devices: Dräger Evita 2D, Dräger Evita 4, Dräger Evita XL: for a list of trended parameters, see page 366.
- Maquet Servo I: for a list of trended parameters, see page 378.
- BIS VISTA – BIS, EMG, SQI, BSR, PWR, SEF, BCT
- NMT – T NMT
- Pulse oximetry parameters with Masimo SET: SpO2, PLS, PI
- Pulse oximetry parameters with Masimo rain-bow SET: SpO2, PLS, PI, SpHb, SpHbv, SpOC, PVI, SpCO, SpMet
- Pulse oximetry parameters with Nellcor OxiMax MCable: SpO2, PLS

NOTE

The color of the SpO2 graphical trend changes based on how the current value compares to the lower SpO2 alarm limit. The color changes from green to yellow to orange to red as the SpO2 trend value progresses further below the lower alarm limit.

Discrete parameters

The following discrete parameters are plotted uniquely in graphical trends:

- NIBP consists of a line with three dots representing the diastolic, mean, and systolic values
- PWP and C.O. appear as a ‘+’ symbol
- Lab data are represented as a ‘+’ symbol and include time stamps
- NMT parameters: Single, PTC, TOF Ratio or TOF Cnt

Trends/data dialog windows
Special characters and symbols

In addition to parameters, certain conditions, such as disconnected leads, artifact, and so on, are also identified on graphical and tabular trends.

<table>
<thead>
<tr>
<th>Event</th>
<th>Character/symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asystole</td>
<td>ASY</td>
</tr>
<tr>
<td>Ventricular fibrillation</td>
<td>VF</td>
</tr>
<tr>
<td>Apnea</td>
<td>Apnea</td>
</tr>
<tr>
<td>No parameter values available</td>
<td>***</td>
</tr>
<tr>
<td>Out of range value</td>
<td>*** (high) - - - (low)</td>
</tr>
<tr>
<td>Relearning</td>
<td>LEARN</td>
</tr>
<tr>
<td>Interruption in power or monitor is placed into standby</td>
<td>No values</td>
</tr>
</tbody>
</table>

Trend graphs

A trend graph plots the behavior of parameters over time. Trend graphs are continuously updated, with the most recent data appearing on the right side of the screen. The Trends/Data dialog consists of the following trends graphs pages:

- **Graph page**
- **Graph vitals page**
- **Ventilation / Anesthesia page**

All trend graphs pages look almost identical. In the Graph and the Ventilation / Anesthesia pages you can change the parameter content. However, the Graph vitals is a pre-configured display consisting of the following set of commonly trended parameters which are displayed in four graphical windows:

<table>
<thead>
<tr>
<th>Window</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
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<td>HR, SpO2, and RRI</td>
</tr>
<tr>
<td>2</td>
<td>NIBP</td>
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<td>3</td>
<td>Ta, Tb</td>
</tr>
<tr>
<td>4</td>
<td>CO2</td>
</tr>
</tbody>
</table>

To access the trend graph pages:

1. Select the **Trends/Data** button on the main menu bar.
2. Select the **Trends** tab (if not already selected).
3. Select one of the following trend graph pages:
   - **Graph** tab to view general trends
   - **Graph vitals** tab to view a set of pre-configured parameters
   - **Ventilation / Anesthesia** tab to view ventilation/anesthesia-related parameters
   - **BIS** tab to view BIS trends
The layout of the trend graphs pages

The trends graph pages share a common layout. They contain up to four separate trend windows. Each trend window can accommodate the trend graphs of up to five selectable parameters. For each parameter, the trend panel also displays trend scales, units of measure, and the parameter label.

The following diagram shows the layout of the trend pages.

![Diagram of trends data dialog windows]

A. Trends tab
B. Graph tab – accesses graphical trends
C. Table tab – accesses the tabular trends
D. Graph vitals tab – accesses the graphical trends of a set of pre-configured trend parameters
E. Ventilation / Anesthesia tab accesses the graphical trends of a set of pre-configured trend parameters for critical care or anesthesia ventilation.
F. BIS tab to access the graphical trends for the BIS VISTA device.
G. Trend setup symbol for selecting up to five parameters
H. Scroll keys
I. Print button
J. Grids on/off button
K. Graphs button
L. View button for selecting how much time is displayed
M. Graphical trend panels

Directly below the trend windows is a time scale that correlates to the selected time interval.
Interacting with the trend graphs pages

You can interact with the trend graph pages by manipulating several display functions.

Configuring the parameter content of the trend graphs

Except for the Graph vitals page whose parameter assignments are fixed, you can customize the parameter content for the Graph and the Ventilation / Anesthesia trend graph pages.

The following diagram depicts the setup window for customizing the parameter content of each trend graph page.

A Display filter button
B Button that closes the setup window
C Group of parameter buttons entitled Medibus X for selecting parameters originating from Medibus X devices using the device connectivity option (for a list of supported Medibus X devices, see page 347)
D OK button
E Cancel button
F Clear all button – deselects any buttons that are currently selected
G Group of parameter buttons entitled Other for selecting miscellaneous parameters such as SpO2, temperature, and so on.
H Group of parameter buttons entitled CO2 for selecting CO2-related parameters
I Group of parameter buttons entitled More devices for selecting parameters such as NMT, BIS, and CCO. These parameters originate from external devices using the device connectivity option.
J Group of parameter buttons entitled ECG for selecting ECG-related parameters
K Group of parameter buttons entitled Pressures for selecting pressure-related parameters
L Group of parameter buttons entitled Vent devices for selecting ventilation-related parameters originating from Medibus devices using the device connectivity option
To modify the parameter selection for a trend graph page

In the following steps, the letters in parentheses refer to the diagram of the trend setup page (see page 162).

1. Access the Graph or the Ventilation / Anesthesia tab (see page 158).
2. Select the trend setup symbol next to a trend graph panel in the selected trend page to activate the Setup dialog window.
3. Use the display filter button (A) to toggle between the filtered or unfiltered display. When the button is on a light green background only the buttons of the connected parameters are displayed. When the symbol appears on a dark green background the buttons of all parameters, whether monitored or not, are displayed.
4. Select the parameters you wish to display in the selected trend window. You can select up to five parameters for each trend panel.
5. Select the OK button (D) to confirm the selection and reconfigure the trend page. Select the Cancel button (E) to exit the screen without accepting the changes.
6. Repeat steps 2 to 5 to configure the parameter setup for other trend graph panels.

Navigating through the trend graphs

The trend database for a patient may contain more data than can be displayed on a single trend graphs page.

One way to navigate through the entire trend data is by using the scroll bar. It is located at the bottom of the trend graphs pages. The scroll bar consists of single and double arrows and a moveable navigation bar. The double arrows scroll through larger portions than the single arrows. If more trend data are stored than are currently displayed, you can also drag the navigation bar located between the arrows to the desired location. As you navigate through the trend data, the time line right above the scroll bar changes to display the time and date corresponding to the displayed graphs.

Using the cursor

The cursor is a vertical line that pinpoints a specific time for all parameters. It extends through all trend graphs. Whenever you display the cursor, popups appear next to each trend window. They display the parameter labels, units of measure and the parameter values that correspond to the position of the cursor. The top popup displays the exact time and date the cursor pinpoints on the graphs.

To display the cursor

1. Access the desired trend graphs page (see page 160).
2. Touch a point on the page to display the cursor.
3. Use the rotary knob to move the cursor to a specific point on the trend data.

To hide the cursor

The cursor and the associated popups disappear automatically after a brief time of no user interaction. You can also hide the cursor immediately as follows:
- Press the rotary knob.

NOTE

Buttons with ellipses such as More ventilation... or More gases... access additional parameters.
Changing trend scales

The trend scales appear to the left of each trended parameter. The scales can be changed at any time provided the trend cursor is not displayed. Hide the cursor by pressing the rotary knob before you change the trend scales.

To change the trend scales

1. Access the desired trend graphs page (see page 160).
2. Touch the trend scale value you wish to change. A trend scale window appears.
3. Select the buttons in the popup to adjust the upper and/or lower trend scale.
4. Use the rotary knob to dial to the desired setting.
5. Press the rotary knob to confirm your selection.

General trend graph display features

The following sections list the various ways available for customizing the content of the trend graphs pages. Refer to the diagram depicting the trend graph (see page 161) for the locations of the buttons used to perform the setup functions.

To access the general display features

1. Access the desired trend graphs page (see page 160).
2. Select the Grids on/off button (I) to display or hide the background grid.
3. Select the Graphs button (J) and use the rotary knob to select how many trend windows are displayed. You can select from 1 to 4 trend windows.
4. Use the View button (K) to select how much time is displayed on the Graph page. The available settings are: 1 h, 2 h, 4 h, 8 h, 12 h, 1 day, 2 day, 4 day.

Printing a graphical trend report

The content of a graphical trend report depends on the user setup (see page 162). The duration of a graphical trend report depends on the reports setup (see page 412).

To print a graphical trend report

1. Access the desired trend graphs page (see page 160).
2. Scroll to the desired trend data.
3. Select the Print button (G) – see page 161.

NOTE

If configured to appear on the main menu bar, a Trend graph report button is also accessible on the main menu bar. For more information, see page 396.

You can also request a graphical trend report from other pages, for details see page 438.

NOTE

You can also request a printout of the current trends display by selecting the Print screen button on the main menu bar. The print screen prints on the connected laser printer.
Recruitment page

The Recruitment page is comprehensive trend page for visualizing information necessary to perform a recruitment maneuver. The page shows the effects on lung mechanics and hemodynamic parameters on a single, integrated display. The Recruitment page displays twelve minutes of data on three graphical trend panels simultaneously. The page is divided into three separate trend graph panels with the following initial default setup which is configurable:

- The top trend graph panel displays PIP, PEEP, ART M
- The middle trend graph panel displays VT, Cdyn,
- The bottom trend graph panel displays SpO₂, etCO₂

Each trend graph panel displays up to three parameters and associated values. With the cursor buttons you can reference separate data points on the graphs. The corresponding values are displayed next to the graphs. The current values for the selected trend parameters are always displayed across the top of the screen.

To access the recruitment page

1. Select the Procedures... button from the main menu bar.
2. Select the Recruitment tab.

The layout of the recruitment page

The following diagram depicts the Recruitment page.
Interacting with the Recruitment page

Configuring the parameter content

Although the Recruitment page comes with an initial default parameter setup, you can customize the page to your current monitoring session.

The following diagram depicts the setup window for customizing the parameter content of the Recruitment page.

To configure the parameter content

1. Select the Procedures... button from the main menu bar.
2. Select the Recruitment tab.
3. Select the trend setup symbol next to a trend graph panel.
4. Use the display filter button (A) to toggle between the filtered or unfiltered display. When the button is on a light green background only the buttons of the connected parameters are displayed. When the symbol appears on a dark green background the buttons of all parameters, whether monitored or not, are displayed.
5. Select the parameters you wish to display in the selected trend window. You can select up to three parameters for each trend panel.

NOTE

Buttons with ellipses such as More ventilation... or More gases... access additional parameters.

6. Select the OK button (C) to confirm the selection. Select the Cancel button (D) to exit the screen without accepting the changes.
7. Select the Clear all button (E) to deselect any buttons that are currently selected.
8. Repeat steps 3 to 6 to configure the parameter setup for other trend graph panels.
Using the cursors

The Recruitment page has two cursors for marking a portion of the trend graphs for closer analysis. The letters in parentheses refer to the diagram on page 165. Whenever you use the cursors, the screen freezes.

To set the cursors

1. Select the Procedures... button from the main menu bar.
2. Select the Recruitment tab.
3. Select the left cursor button (G).
4. Use the rotary knob to move the orange cursor to the desired place on the trend graphs to mark the initial point.
5. Press the rotary knob to set the initial point.
6. Select the right cursor button (F).
7. Use the rotary knob to move the orange cursor to the desired place on the trend graphs to mark the end point.
8. Press the rotary knob to set the end point.

The trend parameter windows to the right of the trend graphs show the following information for each parameter corresponding to the cursor positions:
- \( \Delta \) value – time elapsed between the two cursors
- Initial value
- End value

In addition to values, symbols appear next to the values to indicate how the parameters inside the cursors have trended:
- An equal (=) sign means that the values have remained the same
- An arrow pointing up indicates that the values are trending higher than the first cursor position.
- An arrow pointing down indicates that the values are trending lower than the first cursor position.

NOTE
These symbols also appear in the current parameter values row of the Recruitment page.

Freezing the display

You can temporarily stop the Recruitment page from updating by freezing the screen.

To freeze the display

1. Select the Procedures... button from the main menu bar.
2. Select the Recruitment tab.
3. Select the Freeze button (E).

To "unfreeze" the display

- Select the Freeze button (E) again.

The screen is updated with the most current data.
Printing a recruitment trend graph report

A recruitment trend graph report contains the initial and end cursor values and the \( \Delta \) value for each parameter. You can only print a recruitment trend graph report after you set the cursors. Otherwise the Print button remains grayed out and cannot be selected.

To print a recruitment trend graph report
1. Select the Procedures... button from the main menu bar.
2. Select the Recruitment tab.
3. Set both cursor buttons (see page 167).
4. Select the Print button.

Trend table

The trend table displays trend data in data columns. Trend data are updated according to the selected time scale. For example, if the current time scale is 15 minutes, the trend display is updated every 15 minutes. A time stamp above each column marks the interval during which the data in that column was collected. The displayed value is the last acquired value during that interval. The column on the right side is reserved for the most recent data. Certain parameters and special conditions, such as artifact, are represented in unique ways (see page 158).

To access the trend table
1. Select the Trends/ Data... button on the main menu bar.
2. Select the Trends tab (if not already selected).
3. Select the Table tab (if not already selected).
The layout of the trend table

The following diagram shows the trend table page. You can configure the tabular trend page which also determines how the information appears on the tabular trend report.

A Trends tab
B Parameter label column
C Parameter columns
D Latest trend data
E Graph tab (see page 161)
F Table tab
G Graph vitals tab (see page 160)
H Anesthesia workstation tab accesses the tabular trends of a set of pre-configured trend parameters for critical care or anesthesia ventilation.
I BIS tab for accessing the tabular BIS trends
J Scroll keys and scroll bar
K Print button
L Setup button for selecting which parameters are displayed and in what priority
M View button for selecting how much time is displayed
Interacting with the trend table

You can interact with the trend screen by manipulating several display functions.

Tabular trends in split screen mode

You can display the tabular trends on the main screen by activating the split screen mode for tabular trends in the Auto view page.

When this split screen mode is activated, a tabular trend panel occupies the left side of the monitoring area. You can perform the same setup and viewing functions as for the regular tabular trends.

To activate split screen mode

1. Select the System setup... button from the main menu bar.
2. Select the Auto view tab.
3. Select the button next to the Split screen menu selection.
4. Dial to the Trend table selection using the rotary knob.

The layout of the monitoring area changes and displays the tabular trend panel.

Navigating through the trend table

The trend data base for a patient may contain more data than can be displayed on the trend table. You can navigate through the entire trend data using the scroll bars. They are located at the bottom and along the right side of the trend table.

The scroll bars consists of single and double arrows and a moveable navigation bar. The double arrows scroll through larger portions than the single arrows. If more trend data are stored than is currently displayed, use the rotary knob or drag the navigation bar located between the arrow keys to the desired location.

Configuring the trend table

The following sections list the various ways available for customizing the content of the trend table. Refer to the diagram depicting the Table (see page 168) for the locations of the buttons used to perform the setup functions.

To change the time intervals

1. Access the Trends > Table page (see page 168).
2. Use the View button (L) to change the time intervals of the trend columns. The available settings are: 1 min, 5 min, 10 min, 15 min (default), 30 min, 1 h.
Configuring the parameter content of the trend table

The following diagram depicts the setup page for modifying the parameter content of the trend table.

A. Group of parameter buttons entitled ECG for selecting ECG-related parameters
B. Group of parameter buttons entitled Pressure for selecting pressure-related parameters
C. Group of parameter buttons entitled Vent devices for selecting ventilation-related parameters
D. Group of parameter buttons entitled MedibusX for selecting Medibus X parameters available using the device connectivity option
E. OK button
F. Cancel button
G. Clear all button – deselects any buttons that are currently selected
H. Select all button – selects all buttons at once
I. Auto-sort button
J. Window for sorting the parameters automatically
K. Group of parameter buttons entitled Other for selecting miscellaneous parameters such as SpO2, temperature, and so on.
L. Group of parameter buttons entitled CO2 for selecting CO2-related parameters
M. Group of parameter buttons entitled More devices for selecting additional parameters

To modify the parameter selection for a trend table

1. Access the Trends > Table page (see page 168).
2. Select the trend setup symbol at the bottom of the trend table.
3. Use the display filter button (A) to toggle between the filtered or unfiltered display. When the button is on a light green background only the buttons of the connected parameters are displayed. When the symbol appears on a dark green background, the buttons of all parameters, whether monitored or not, are displayed.
4. Select the Auto-sort button to sort the parameter list according to the parameter priority list in the Auto view setup page (see page 65).
   or
   Select the parameters you wish to display in the trend table.
5. Select the OK button (D) to confirm the selection and reconfigure the trend table. Select the Cancel button (E) to exit the screen without accepting the changes.

NOTE
Buttons with ellipses such as More ventilation... or More gases... access additional parameters.
Printing a tabular trend report

The content of a tabular trend report depends on the system setup (see page 409).

To print a tabular trend report
1. Access the Trends > Table page (see page 160).
2. Scroll to the desired trend data.
3. Select the Print button (J).

You can also request a tabular trend report from other pages, for details see page 438.

Mini-trends

When the mini-trend display is activated (see page 390), a panel appears to the left of the monitoring area of the main screen. The colors of the mini-trend correspond to the selected parameter color. The mini-trend display is updated every 5 seconds.

If you activate split screen mode (see page 391), the mini display is not affected and shifts to the right along with the real-time parameter display.

To configure the mini-trend display
1. Select the System setup... button on the main menu bar to activate the System setup dialog.
2. Select the Auto view tab along the right side of the System setup dialog.
3. Select the button next to Mini trends.
4. Select one of the following settings: Off (deactivates the mini-trend display), 10 min, 15 min, 20 min, 30 min (default), 45 min, 1 h, 90 min, 2 h, 4 h.
5. Select the button next to NIBP trend.
6. Use the rotary knob to select either Graphic or Numeric. The selected setting determines how the parameter is represented on the mini-trend display.

NOTE
If configured to appear on the main menu bar, a Trend table report button is also accessible on the main menu bar. For more information, see page 396.

You can also request a printout of the current trends display by selecting the Print screen button on the main menu bar. The print screen prints on the connected laser printer.

NOTE
If the mini-trends are displayed, you can change the mini-trend scale and the duration by touching the displayed values. A popup appears allowing you to change these settings directly.

NOTE
Although CCO, CCI, and Tblood are trended, there are no CCO parameters included in the mini-trend display.

NOTE
If you activate split screen mode (see page 391), the mini display is not affected and shifts to the right along with the real-time parameter display.

Configuring the mini-trend display

In the System setup dialog, you can activate or deactivate the mini-trend display and select the mini-trend display duration. You can also select how the NIBP parameter appears in the mini-trends.
Data review pages

In addition to trend data, the Trends/Data dialog window also provides several data review pages which are outlined in the following table. Some of these review pages are also available under different tabs.

To access the data reviews
1. Select the Trends/Data... button on the main menu bar.
2. Select one of the following tabs to access the desired data:
   - Trends
   - ECG
   - Ventilator
   - Anesthesia/Ventilation
   - Hemo
   - Labs

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<tr>
<th>Data review page</th>
<th>Description</th>
<th>Available functions</th>
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</thead>
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<tr>
<td>Show all page under the ECG tab</td>
<td>This page shows the waveforms of all connected leads along with the scale and the waveform label.</td>
<td>- Print button for requesting a Rest ECG report&lt;br&gt;- Print button for requesting an ECG report</td>
</tr>
<tr>
<td>ST complex page under the ECG tab</td>
<td>This page shows the ST complexes. The number of displayed ST complexes depends on the connected lead wire set.</td>
<td>- Print button for generating an ST report&lt;br&gt;- ST button&lt;br&gt;- Reference on/off button for displaying reference complexes&lt;br&gt;- ISO button&lt;br&gt;- Relearn button</td>
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**NOTE**
The horizontal tab Ventilator changes to Anesthesia/Ventilation when a A500 is connected.
**Trends/data dialog windows**

<table>
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<tr>
<th>Data review page</th>
<th>Description</th>
<th>Available functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilator or Anesthesia/Ventilation &gt; Show all page</td>
<td>- When an A500 anesthesia device is connected, the tab name is labeled Anesthesia/Ventilation. The page displays current measurement values for ventilation and anesthesia parameters and the current consumption.&lt;br&gt;- When a V500 ventilator is connected, the tab name is labeled Ventilator. The page displays current ventilation values and tabs for PV/FV loops.</td>
<td>Data review page displaying respiration, anesthesia or ventilation parameter information.</td>
</tr>
<tr>
<td>Hemo &gt; Show all page</td>
<td>Displays the currently monitored hemodynamic parameters; includes parameters available using the device connectivity option.</td>
<td>Data review page displaying the currently monitored hemodynamic parameter values.</td>
</tr>
<tr>
<td>Hemo &gt; Calc Results page</td>
<td>Displays calculation results. The same page is also available under the Calculations tab (see page 145)</td>
<td>Setup button for activating a popup window for selecting which parameters are included or excluded from display. The parameters on the dark background are selected for display, the ones on a light background are not.&lt;br&gt;- Auto-sort button for sorting the parameter list according to the parameter priority list in the Auto view page (see page 65). If you add parameters to the parameter priority list, you must order these parameters manually.&lt;br&gt;- Save button for saving the selected calculation parameters.</td>
</tr>
</tbody>
</table>
Trends/data dialog windows

### Reports tab

The **Reports** tab of the **Trends/Data** dialog window combines the various reports under one tab for easy access.

The **Reports** dialog window consists of the following pages:
- **General reports**
- **OR report**
- **Setup**

From the **General reports** and **OR report** pages you can request reports (for detailed information on how to request these reports, see "Printing reports" on page 438. The **Setup** page is for configuring the case summary report (see page 442 for details).

---

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<tr>
<th>Data review page</th>
<th>Description</th>
<th>Available functions</th>
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</table>
| Labs page        | Lab data are sent to the Cockpit over the Infinity network. Whenever new lab data are available, the following happens at the Cockpit:  
  - An attention tone sounds provided the attention tone feature is activated (see page 389).  
  - The message **New lab data available** appears in the header bar. The message disappears when you access the lab data.  
Lab data are made available to the Infinity network and are accessible from the Infinity gateway and other devices that support remote viewing capabilities. | Allows you to select labs and view the associated results. |

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## ECG, arrhythmia, and ST segment

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Overview of ECG and heart rate monitoring

The M540 calculates and displays the heart rate, identifies paced beats, reports arrhythmia conditions, measures ST deviations, and relays these values to the Cockpit for display. ECG and heart rate monitoring is for adult, pediatric, and neonatal patients.

3-, 5-, 6-, and 10-lead wire sets are available for adult and pediatric ECG monitoring (including TruST). A neonatal ECG adapter cable is available for connecting individual ECG leads for neonatal monitoring.

Normal ECG monitoring (including 12-lead ECG monitoring) is not of diagnostic quality. The only report of diagnostic quality is an optional Rest ECG report which is generated from a 10-lead ECG. To generate such a report requires that the patient is admitted at the Infinity CentralStation and that the Rest ECG option is activated (see page 411 for setup information).

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 ECG functions.

The ECG monitoring functions are configurable in the ECG pages (see page 192).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 11.

ECG signal processing and display

The M540 identifies QRS complexes of certain amplitudes and QRS widths for adult, pediatric, and neonatal patients (see the ECG section of the "Technical data" chapter in the M540 instructions for use for detailed parameter specifications). It calculates heart rates within a range of 15 beats to 300 beats per minute, using the R-R intervals of the last 10 seconds. This calculation excludes the two longest and the two shortest R-R intervals. The M540 averages the remaining intervals and displays the result as the current heart rate in the heart rate parameter box.

During dual-channel processing, a weight is assigned to each channel depending on its level of artifact. The cleaner channel always receives the greater weight. When a channel exceeds a certain level of artifact, it is excluded from the composite signal, and the M540 shifts to single-channel processing. If both channels experience excessive artifact, an artifact message appears until at least one channel is sufficiently free of artifact.

During artifact, asterisks (*** *) replace the heart rate value. Once the artifact clears, QRS processing resumes without initiating a relearning phase. Arrhythmia monitoring and the selected arrhythmia mode affect the display of the heart rate parameter box. For detailed information, see "Arrhythmia display" on page 202.

Parameter-specific error messages are listed in the chapter "Problem solving" starting on page 449.

Supported parameters

- ECG: HR (heart rate), %PACED (paced beats)
- ST: ST1, STII, STIII, STaVR, STaVL, STaVF, STV, STV+, STV1 to STV6, STV1, STV2, STV3, STV4, STV5
- Arrhythmia: ARR (ASY, VF, ARFT, VT, RUN, AIVR, SVT, CPT, BGM, TACH, BRADY, Pplat); see page 200 for a description of these arrhythmia modes and PVC/min
ECG precautions

Refer to the following sections for general precautions:
- "Electrical safety" on page 14
- "Electrosurgery" on page 18
- "Defibrillator precautions" on page 18

**WARNING**
Do not select TruST leads for ECG signal processing. If the QRS morphology of a TruST lead differs from that of its equivalent conventional lead, always refer to the conventional lead.

**WARNING**
To prevent patient injury, always verify the timing of the QRS synchronization pulse before attempting cardioversion using the Infinity MCable – Analog/Sync.

**WARNING**
Do not rely solely on the ECG when monitoring seizure-prone patients. Electrical artifacts of non-cardiac origin, such as seizures, may prevent detection of certain arrhythmias.
Connecting the 3-, 5-, 6-lead wire sets for ECG monitoring

The ECG lead wire sets connect directly to the M540.

To connect the ECG lead wire sets

1. Insert the 3-, 5-, or 6-lead wire set (C) into the recessed ECG connector (B) on the side of the M540 that is closest to the non-invasive blood pressure connector (A). Orient the lead wire set (C) so the exposed pins face towards you as you push it firmly into the ECG connector.

2. Insert the spacer (D) to protect the unused ECG lead pins.

3. Connect the lead wires to the patient. For information on applying the electrodes to the patient, refer to the illustrations starting on page 188.

NOTE

An ECG lead wire set can rest in the ECG connector of the M540 without actually being connected. Make sure that all ECG lead wire sets are pushed firmly into the ECG connector of the M540.

Almost every MonoLead features a number on the lead wire set indicating how many leads connect. When connecting a MonoLead, make sure the number faces in the same direction as the M540 display.
Connecting the lead wire sets for 12-lead monitoring

The ECG lead wire sets connect directly to the M540.

To connect the ECG lead wire sets
1. Insert the 6-lead wire set (B) and the 4-lead wire set (C) into the recessed ECG connector (A) on the side of the M540.
   Orient lead wire sets (B and C) so the exposed pins face towards you as you push them firmly into the channel.

NOTE
An ECG lead wire set can rest in the ECG connector of the M540 without actually being connected. Make sure that all ECG lead wire sets are pushed firmly into the ECG connector of the M540.
Almost every MonoLead features a number on the lead wire set indicating how many leads connect. When connecting a MonoLead, make sure the number faces in the same direction as the M540 display.

2. Connect the lead wires to the patient. For information on applying the electrodes to the patient, refer to the illustrations starting on page 188.

NOTE
When using a 12-lead ECG wire set where the lead wires are coiled, it is recommended that the 6-lead wire set is coiled in the same direction as the 4-lead set to prevent artifact. For example, both lead wire sets are either coiled towards the patient or away from the patient.
Connecting the lead wires for neonatal monitoring

The ECG lead wire sets connect directly to the M540.

To connect the ECG lead set

1. Insert the neonatal ECG adapter cable (B) into the recessed ECG connector (A) on the side of the M540.
   Orient the neonatal ECG adapter cable (B) so the exposed pins face towards you as you push them firmly into the channel.

2. Insert the spacer (D) to protect the unused ECG lead pins on the M540.

3. Connect the individual neonatal ECG electrodes (C) to the neonatal ECG adapter cable (B).
   For information on applying the electrodes to the patient, refer to the illustrations starting on page 188.

**NOTE**
An ECG lead wire set can rest in the ECG connector of the M540 without actually being connected.
Make sure that all ECG lead wire sets are pushed firmly into the ECG connector of the M540.

A  M540 ECG connector  
B  Neonatal ECG adapter cable  
C  Neonatal ECG electrodes  
D  Spacer
Patient preparation for ECG monitoring

The following tips provide optimal ECG monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations.

Follow hospital procedures for proper skin preparation. Dräger recommends Ag/AgCl disposable electrodes. Never use disposable electrodes after their expiration date and make sure that there is enough gel and that the gel has not dried out.

P- and T-waves with amplitudes exceeding 0.2 mV can be interpreted as QRS complexes. To allow detection of low heart rate conditions under these circumstances, place the lead with the highest R-wave in channel ECG1. If P- and T-waves continue to be misinterpreted, reposition the electrodes or use a pulse oximeter to monitor the pulse rate.

To maintain a clear signal, change electrodes every 24 to 48 hours or more often when the following occur:

- ECG signal degradation
- Excessive patient perspiration
- Skin irritation

Consider the following when selecting electrode sites:

- Surgery – keep electrodes as far from the surgical site as possible, while maintaining a clinically useful lead configuration. Place the cable and lead wires as far from the ESU as possible and perpendicular to the ESU cables.
- Burn Patients – use sterile electrodes. Clean the equipment thoroughly and follow hospital infection control procedures.

Electrosurgery

Integrated ESU suppression improves the performance of the monitor during electrosurgery, reduces noise on ECG waveforms, and protects the patient from burns.

To minimize interference from the electrosurgical unit:

1. Select the heart rate parameter box.
   or
2. Select Sensor parameters... from the main menu bar.
3. Select ESU next to the Filter selection.

**NOTE**

12-lead monitoring is not available when the ESU filter is enabled. Likewise, the ESU filter selection is not available when you are using 12-lead monitoring.

If the Filter selection is set to ESU at the Cockpit and you switch to a 12-lead cable type at the M540, the Filter setting automatically changes to Monitor at the Cockpit.

ECG display

On the Cockpit, the ECG display consists of:
- ECG parameter box
- ECG waveforms

The ECG parameter box appears differently when you activate arrhythmia monitoring. For more information, see page 202.

ECG parameter box

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

NOTE

The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

The ECG parameter box contains the following elements:

- A Parameter label
- B Units of measure – can be activated/deactivated
- C Upper/lower alarm limits or crossed triangle symbol when alarms are deactivated
- D Heart rate value
- E Heart symbol that flashes with each detected ECG complex (if pacer detection is activated, the symbol appears as \[ \text{\textbullet} \] when a paced beat is detected)

During brief artifact episodes, the parameter box does not display a heart rate value.
ECG waveforms

The ECG waveform contains the following elements:

A Lead label  
B Selected waveform scale  
C Message field indicating the filter and pacer setting. For example, the message Pacer off appears when you deactivate pacer detection.

If pacer detection is activated (see page 194), blue pacer spikes identify paced beats. Pacer spikes are printed on strip recordings.

<table>
<thead>
<tr>
<th>Lead wire set</th>
<th>Available ECG leads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three electrodes</td>
<td>I, II, or III</td>
</tr>
<tr>
<td>Five electrodes</td>
<td>I, II, III, aVR, aVL, aVF, V 1</td>
</tr>
<tr>
<td>Six electrodes</td>
<td>Standard: I, II, III, aVR, aVL, aVF, V, V+</td>
</tr>
<tr>
<td>6 + 4 electrodes</td>
<td>I, II, III, aVR, aVL, aVF, V1 to V6</td>
</tr>
</tbody>
</table>

NOTE
1) V and V+ are chest leads  
2) The letter ‘d’ indicates a derived lead  
3) Using a 6-lead and a 4-lead wire set provides 12 monitored ECG leads

To select the number of leads and the lead wire set, see page 192.
ECG colors

Lead wire connectors to the electrodes are labeled and color-coded according to IEC and AHA.

<table>
<thead>
<tr>
<th>IEC</th>
<th>AHA/US</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Yellow</td>
</tr>
<tr>
<td>F</td>
<td>Green</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>C/C2</td>
<td>White/White yellow</td>
</tr>
<tr>
<td>N</td>
<td>Black</td>
</tr>
<tr>
<td>C+C5</td>
<td>Gray and white/white and black</td>
</tr>
<tr>
<td>C6</td>
<td>White and violet</td>
</tr>
<tr>
<td>C4</td>
<td>White and brown</td>
</tr>
<tr>
<td>C3</td>
<td>White and green</td>
</tr>
<tr>
<td>C1</td>
<td>White and red</td>
</tr>
<tr>
<td>V/V2</td>
<td>Brown/brown/yellow</td>
</tr>
<tr>
<td>RL</td>
<td>Green</td>
</tr>
<tr>
<td>V+V5</td>
<td>Gray and brown/brown and orange</td>
</tr>
<tr>
<td>V6</td>
<td>Brown and violet</td>
</tr>
<tr>
<td>V4</td>
<td>Brown and blue</td>
</tr>
<tr>
<td>V3</td>
<td>Brown and green</td>
</tr>
<tr>
<td>V1</td>
<td>Brown and red</td>
</tr>
</tbody>
</table>
ECG, arrhythmia, and ST segment

Electrode placement

Standard configuration, three electrodes (IEC/AHA)

Standard configuration, five electrodes (IEC/AHA)
ECG, arrhythmia, and ST segment

Pacer configuration, five electrodes (IEC/AHA)

Standard configuration, six electrodes (IEC/AHA)
ECG, arrhythmia, and ST segment

12-lead configuration, ten electrodes for 12-lead Rest ECG monitoring (AHA)

12-lead configuration, ten electrodes for 12-lead Rest ECG monitoring (IEC)
12-lead monitoring

Standard 12-lead monitoring is only available when you use a 6-lead and a 4-lead wire set. 12-lead monitoring using a 10-lead wire set is a locked option that must be purchased separately. Place the chest electrodes in positions 1 through 6 as shown on page 190.

TruST 12-lead monitoring offers real-time assessment of ST segment deviations with only six electrodes. TruST uses the conventional 6-lead standard electrode placement (see page 189), measuring 8 leads and interpolating 4 chest leads. TruST is available for adult and pediatric patients, but not for neonatal patients.

You can view all ECG waveforms, including TruST, on the Show all page (see page 194). For information on how to activate TruST, see page 213.

Accessing the ECG functions

1. Select the heart rate parameter box to select the ECG page directly.
   or
2. Select Sensor parameters... from the main menu bar.
3. Select the ECG tab to access the ECG page.

If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: symbol and the display filter button.

Select the Settings 1, Settings 2, Show all tabs.

The top portion of the page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.

WARNING
Do not select TruST leads for ECG signal processing. If the QRS morphology of a TruST lead differs from that of its equivalent conventional lead, always refer to the conventional lead.
## ECG parameter setup functions

All ECG setup functions take place in the **ECG** pages.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse tone vol-</td>
<td>Off, 5, 10 (deflt)</td>
<td>Sets the volume of the pulse tone.</td>
</tr>
<tr>
<td>ume</td>
<td>10 %</td>
<td></td>
</tr>
<tr>
<td>Pulse tone</td>
<td>ECG (deflt)</td>
<td>Sets the source of the pulse tone.</td>
</tr>
<tr>
<td>source</td>
<td>SpO2</td>
<td></td>
</tr>
<tr>
<td>HR source</td>
<td>ECG (deflt) –</td>
<td>derives the heart rate from the ECG signal.</td>
</tr>
<tr>
<td></td>
<td>ART –</td>
<td>derives the heart rate from the arterial pressure signal.</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>The heart rate parameter box label changes to APR and appears in the color</td>
</tr>
<tr>
<td></td>
<td>of ART.</td>
<td>of ART.</td>
</tr>
<tr>
<td></td>
<td>– SpO2 –</td>
<td>derives the heart rate from the pulse oximetry signal.</td>
</tr>
<tr>
<td></td>
<td>Auto –</td>
<td>derives the heart rate either from the ECG signal or other available sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If an ECG signal is not available, the M540 switches to ART, and then to SpO2.</td>
</tr>
<tr>
<td>Waveforms</td>
<td>1, 2 (deflt), 3</td>
<td>Selects the number of displayed waveforms.</td>
</tr>
</tbody>
</table>
**ECG, arrhythmia, and ST segment**

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leads</strong></td>
<td>Three electrodes: I, II, III</td>
<td>Assigns specific leads for each waveform depending on which lead mode is selected.</td>
</tr>
<tr>
<td></td>
<td>Five electrodes: I, II, III, aVR, aVL, aVF, V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six electrodes: I, II, III, aVR, aVL, aVF, V, V+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six electrodes (with TruST activated): I, II, III, aVR, aVL, aVF, dV1, dV2, dV3, dV4, dV5, dV6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ten electrodes: I, II, III, aVR, aVL, aVF, V1 to V6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default for lead 1: II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default for lead 2: V (with TruST and a 6-lead plus a 4-lead wire set, the default is: V2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default for lead3: aVF</td>
<td></td>
</tr>
<tr>
<td><strong>Size [mV/cm]</strong></td>
<td>0.25, 0.5, 1 (default), 2, 4, 8 mV/cm</td>
<td>Sets the scale of individual ECG waveforms.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green (default), blue, yellow, light blue, purple, orange, white</td>
<td>Determines the color of the waveforms and parameter labels and values.</td>
</tr>
</tbody>
</table>

**Settings 2 page**

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Filter</strong></td>
<td>Off – provides the greatest sensitivity to noise or artifact (the message Filter off appears in the waveform channel).</td>
<td>Controls the sensitivity to various artifact sources.</td>
</tr>
<tr>
<td></td>
<td>Monitor (default) – recommended for standard monitoring; reduces baseline drift, muscle artifact, and power line interference. No message appears in the waveform channel.</td>
<td>When the M540 is in OR mode and the filter selection is set to Monitor, the hardware low pass ESU filter is activated.</td>
</tr>
<tr>
<td></td>
<td>ESU – reduces signal distortion during electrosurgery (the message Filter ESU appears in the waveform channel).</td>
<td>NOTE: None of these filter settings are of diagnostic quality.</td>
</tr>
</tbody>
</table>

**NOTE**

12-lead monitoring is not available when the ESU filter is enabled. Likewise, the ESU filter selection is not available when you are using 12-lead monitoring.
### ECG, arrhythmia, and ST segment

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pacer detection</strong></td>
<td>On (default)</td>
<td>Determines whether pacer impulses are detected. See <em>Pacer fusion mode</em> on page 196 for precautions before you start this mode.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fusion</td>
<td></td>
</tr>
<tr>
<td>(Not available in neonatal mode)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>QRS sync marker</strong></td>
<td>On</td>
<td>Determines whether vertical white markers appear on the waveform to identify QRS complexes. The markers help determine when it is safe to perform synchronized cardioversion.</td>
</tr>
<tr>
<td></td>
<td>Off (default)</td>
<td></td>
</tr>
<tr>
<td><strong>Cable type</strong></td>
<td>Auto detect (default)</td>
<td>When set to <em>Auto detect</em>, this feature detects the number of connected lead wires automatically. If auto detect mode does not detect the connected lead wire set, it allows you to select the cable type manually. “12” denotes a combination of a 6-lead and 4-lead wire set for 12-lead monitoring.</td>
</tr>
<tr>
<td>(TruST is only available with a 6-lead wire set)</td>
<td>3-, 5-, 6-electrodes, and 12 leads</td>
<td></td>
</tr>
<tr>
<td><strong>ARR Processing</strong></td>
<td>ECG1</td>
<td>ECG1 setting – arrhythmia processing occurs only on the lead displayed in waveform channel 1.</td>
</tr>
<tr>
<td></td>
<td>ECG1 &amp; 2 (default)</td>
<td>ECG1 &amp; 2 setting – arrhythmia processing occurs on the leads displayed in the waveform channels 1 and 2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size all ECG</strong></td>
<td>0.25, 0.5, 1 (default), 2, 4, 8 mV/cm</td>
<td>Sets the amplitude of all displayed ECG leads.</td>
</tr>
<tr>
<td><strong>RESP monitoring</strong></td>
<td>On (default for neonate)</td>
<td>Activates/deactivates respiratory monitoring.</td>
</tr>
<tr>
<td></td>
<td>Off (default for adult/pediatric)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

- When using the ECG extension cable, the system always assumes the cable is a 6-lead wire.
- The **ECG1 & 2** selection is not available if the neonatal patient category is selected.
Monitoring paced patients

When pacer detection is activated, the M540 uses the following specifications to identify a pulse as a pacer pulse:

- **Amplitude (ap):** ±2 to ±700 mV
- **Width (dp):** 0.2 to 2.0 ms
- **Rise/Fall times (min):** 0.1 dp, 100 ms
- **Overshoot (min):** 0.025 ap, 2 mV
- **Recharge time constant:** 4 to 100 ms

If a QRS complex occurs within 250 ms of a pacer impulse, it is also considered a paced beat. A paced beat is identified as follows:

- In the heart rate parameter box, the letter 'P' appears next to the flashing heart symbol when a pacer pulse is detected.
- On the ECG waveform, blue spikes appear to identify pacer spikes.

**NOTE**

Pacer detection is deactivated automatically in neonatal mode or when the ESU filter is activated.

When pacer detection is deactivated, the message **Pacer off**, appears in the top ECG channel.

To optimize pacer monitoring, follow the guidelines on page 198.

**To activate/deactivate pacer detection**

1. Select the heart rate parameter box to select the ECG page directly.
2. or
3. Select **Sensor parameters...** from the main menu bar.
4. Select the ECG tab to access the ECG page.
5. Select the **Settings 2** tab.
6. Select **On** next to **Pacer detection**.
Pacemaker precautions

The M540 has been tested for pacemaker pulse detection. However, it is impossible to anticipate every clinically possible waveform characteristic. For paced patient, the M540 could therefore miscount heart rates and misinterpret rate-dependent arrhythmias. False low-rate alarms can result under the following conditions:

- Fused beats and asynchronous pacemakers, when coupling intervals are in the range of +10 to –90 ms
- 700-mV pacer pulses followed by QRS complexes smaller than 0.5 mV
- Asynchronous pacemaker pulses with overshoot

**WARNING**

Make sure pacemaker detection is deactivated for patients without pacemakers. Make sure it is activated for patients with pacemakers. Deactivating pacemaker detection for paced patients may result in pacemaker pulses being counted as regular QRS complexes, which could prevent an asystole alarm from being detected. Always verify that the pacemaker detection status is correct for the patient. Be aware that setting the ECG filter option to ESU deactivates pacemaker detection automatically.

**WARNING**

Impedance respiration and pacemaker detection are inoperative when the ESU filter is selected. Refer to “Electrosurgery” on page 18 for general safety precautions.

**WARNING**

Always keep pacemaker patients under close surveillance and monitor their vital signs carefully.

- Do not assess the patient’s condition exclusively from the heart and respiratory rate values the monitor displays and the rate alarms that are generated. Heart rate meters may continue to count the pacemaker rate during cardiac arrest or some arrhythmias.
- Some pacemakers (especially external pacemakers with body surface electrodes) emit pulses with amplitudes far exceeding the 700 mV maximum amplitude specified for the M540. The M540 may incorrectly detect these large pacemaker pulses as valid QRS complexes and may fail to detect cardiac arrest.

**Pacer fusion mode**

Pacer fusion mode offers increased detection sensitivity to fused paced beats, thereby reducing false asystole and low heart rate alarms.

**WARNING**

Pay close attention to pacemaker patients being monitored in Fusion mode because this mode may increase the risk of falsely counting pacemaker spikes as QRS complexes, thus failing to detect cardiac arrest.
ECG, arrhythmia, and ST segment

Device interference with pacemaker monitoring

The following devices can interfere with pacemaker monitoring.

Impedance-derived rate response pacemakers

These pacemakers emit pulses that adjust the pacemaker rate to the respiratory rate. These pulses could be falsely interpreted as pacer pulses. For impedance-derived rate response pacemakers, modify the electrode placement until the blue spikes on the waveform disappear since they are not related to real pacor impulses.

Infusion or roller bypass pumps

Interference from these devices can cause pacer spikes to appear on the waveform although the ECG appears normal. To determine if the pump is the cause of the artifact, turn it off, if possible. To minimize the artifact, choose the lead with the best signal or replace the electrodes. Rerouting invasive pressure tubing away from the infusion tubing can also improve the ECG signals.

Line isolation devices

To minimize the effect of line isolation devices, which can cause temporary disturbances in the ECG signal, follow these precautions:

– Choose the lead with the best signal for ECG monitoring.
– Check the ECG electrodes; replace them, if necessary.

Transcutaneous electrical nerve stimulators

Signals from transcutaneous electrical nerve stimulators (TENS) often resemble pacor signals and can be labeled as such. The M540 can reject valid QRS complexes, which follow misinterpreted TENS signals. If TENS signals continue to register as pacor spikes, deactivate pacor detection (see page 194).

CAUTION

Fusion mode pacer detection is not intended for use with large-signal, unipolar pacemakers. It is intended for use only with biphasic pacemakers. Observe the following:

– Select Fusion mode only in situations where it becomes necessary to suppress repeated false asystole and/or false low heart rate alarms.
– Before selecting Fusion mode, be certain that the patient has a biphasic pacemaker (external or implanted) and that it is accurately programmed as appropriate for that patient.
– Do not use Fusion mode if you are uncertain as to what type of pacemaker is being used.

NOTE

The displayed heart rate may be incorrect if the pacemaker pulse wanders through the ECG waveform (ineffective pacing). During the wandering pacemaker test required by IEC 60601-2-27 and ANSI/AAMI EC13, the displayed heart rate varied between 15 and 30 bpm (rather than consistently being 30 bpm). The displayed heart rate was not affected by the presence of pacemaker pulses during any of those standard’s other pacemaker tests.
ECG, arrhythmia, and ST segment

Optimizing pacer processing

You can minimize interference and optimize ECG signal acquisition and processing for paced patients.

To optimize pacer processing

1. Select the heart rate parameter box to select the ECG page directly.
2. Select the ECG tab to access the ECG page.
3. Select the Settings 2 tab.
4. Select On next to Pacer detection. Select the lead with the least interference and highest R-wave for display in ECG channel 1.
5. Select the Filter setting Monitor or Off and determine which setting provides the clearest signal.

Arrhythmia monitoring overview

The M540 performs arrhythmia monitoring on adult and pediatric patients and relays these values to the Cockpit for display. Arrhythmia monitoring is not available for neonates. To ensure that asystole and ventricular fibrillation alarms are reported even when heart rate alarm monitoring and arrhythmia monitoring is deactivated, set the ASY/VF alarms selection in the General settings page to Always on (see page 200).

The selected arrhythmia mode (see page 200) controls which arrhythmia parameters are monitored and how they are displayed. Each occurrence of an arrhythmia event is stored in the Alarm history page provided the archive setting is configured (see page 127). Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 arrhythmia functions.
ECG, arrhythmia, and ST segment

The arrhythmia monitoring functions have configurable parameter-specific setup pages (see page 203).

**WARNING**
The banner HR alarms off appears in the right most field in the header bar whenever you deactivate heart rate alarms.
The ⚠ HR, ASY, VF off banner appears when arrhythmia monitoring is deactivated, the ASY/VF alarms feature is set to Follow HR alarm, and heart rate alarms are deactivated.

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 11.

**NOTE**
If French NFC mode is activated (see page 415), you cannot deactivate heart rate alarms.

### Selecting arrhythmia leads

Appropriate lead selection is essential for accurate arrhythmia monitoring. Ideally, the two best leads should be assigned to the top two waveform channels.

The following two selections are available:

- **ECG1** (single channel selection) – dedicates processing to the lead in the top channel.
- **ECG1 & 2** (dual channel selection) – determines the heart rate and ARR based on the leads in the two top channels.

To select arrhythmia leads

1. Select the heart rate parameter box to select the ECG page directly.
2. Select Sensor parameters... from the main menu bar.
3. Select the ECG tab to access the ECG page.
4. Select the Settings 2 tab.
5. Select the button next to ECG1 or ECG1 & 2 and select the desired lead.
Arrhythmia modes

If arrhythmia monitoring is activated, the selected arrhythmia mode (basic or advanced) determines how many events are monitored.

**NOTE**
The advanced arrhythmia mode is only available when the full arrhythmia option is activated.

When the AS/VF alarms setting is set to Always on, asystoles and ventricular fibrillation events are always reported, even when arrhythmia monitoring is deactivated.

The following table lists which arrhythmia events are reported with each monitoring mode.

<table>
<thead>
<tr>
<th>Arrhythmia monitoring off (the following events are detected, if at least one ECG is displayed)</th>
<th>Arrhythmia monitoring on (the following additional events are detected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASY</td>
<td>Asystole</td>
</tr>
<tr>
<td>VF</td>
<td>Ventricular fibrillation</td>
</tr>
<tr>
<td>VT</td>
<td>Ventricular Tachycardia</td>
</tr>
<tr>
<td>PVC</td>
<td>Premature Ventricular Contraction</td>
</tr>
<tr>
<td>ARTF</td>
<td>Artifact</td>
</tr>
</tbody>
</table>
To select the arrhythmia modes

- Select the heart rate parameter box to select the ECG page directly.

1. Select Sensor parameters... from the main menu bar.
2. Select the ECG tab to access the ECG page.
3. Select the ARR settings tab.

4. Select one of the following modes next to ARR monitoring button, located below the arrhythmia alarm setup table:
   - Off
   - Basic
   - Advanced (only available when the full arrhythmia option is unlocked)

### Advanced arrhythmia monitoring mode (the following additional events are detected)

<table>
<thead>
<tr>
<th>BRADY</th>
<th>Bradycardia</th>
<th>Eight or more consecutive normal beats, with an average rate ≤ bradycardia rate setting. (^{1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN</td>
<td>Ventricular RUN</td>
<td>Series of 2 to N-1 consecutive PVCs with a beat-to-beat rate ≤ the VT rate. (^{2})</td>
</tr>
<tr>
<td>AVIR</td>
<td>Accelerated Idioventricular Rhythm</td>
<td>Series of 3 or more PVCs with a rate less than the VT rate.</td>
</tr>
<tr>
<td>SVT</td>
<td>Supraventricular Tachycardia</td>
<td>N or more consecutive normal beats, with a beat-to-beat rate greater than or equal to the SVT setting. (^{2})</td>
</tr>
<tr>
<td>CPT</td>
<td>Ventricular Couplet</td>
<td>Sequence of beats with the pattern: normal, PVC, PVC, normal.</td>
</tr>
<tr>
<td>BGM</td>
<td>Ventricular Bigeminy</td>
<td>Sequence of beats with the pattern: normal, PVC, normal, PVC, normal.</td>
</tr>
<tr>
<td>TACH</td>
<td>Tachycardia</td>
<td>N or more consecutive normal beats, with a beat-to-beat rate ≥ TACH rate setting. (^{2})</td>
</tr>
<tr>
<td>PAUSE</td>
<td>Pause</td>
<td>Sequence of two beats classified as normal or PVC, with an interval ≥ pause rate value in seconds (±100 ms).</td>
</tr>
</tbody>
</table>

**NOTE**

\(^{1}\) Certain ventricular tachycardias have sinusoidal waveforms closely resembling ventricular fibrillation. Because of the similarities between these waveforms, such types of ventricular tachycardia can be classified as ventricular fibrillation, the more serious of the two conditions.

\(^{2}\) N is the event count set in the count column of the arrhythmia setup table (see page 204).

\(^{3}\) In neonatal mode, you set alarm limits for BRADY in the alarm setup page. The M540 alarms for this event as a limit violation.

\(^{4}\) A PVC or another abnormal beat breaks the analysis sequence and restarts analysis.
ECG, arrhythmia, and ST segment

Arrhythmia display

When arrhythmia monitoring is activated, arrhythmia events appear in the heart rate parameter box or in a separate parameter box, depending on how many leads are selected for display.

When arrhythmia monitoring is deactivated (see page 201) and at least one ECG waveform is displayed, asystole and ventricular fibrillation events are still reported.

**NOTE**

To make sure that asystole and ventricular fibrillation alarms are reported even when HR monitoring is turned off, set the ASY/VF alarms selection in the Alarms > General settings page to Always on (see page 403).

Combined heart rate /arrhythmia parameter box

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

**NOTE**

The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

When one or two ECG leads are selected for display and arrhythmia monitoring is activated, all arrhythmia values and labels appear in the heart rate parameter box. The arrhythmia parameter box contains the following elements:

A Heart rate parameter label
B Units of measure – can be activated/deactivated
C Arrhythmia label
D Area reserved for actual event calls (for example, BRADY) or the message LEARN
E Upper/lower alarm limits or crossed triangle symbol when alarms are deactivated
F Number of Premature Ventricular Contractions (PVC) per minute
G PVC/min label
H Heart rate
I Heart symbol that pulsates with each detected beat (if pacer detection is activated, the symbol appears as \[\text{pacer}\] when a paced beat is detected)
**Separate arrhythmia parameter box**

When three ECG channels are selected for display and arrhythmia monitoring is activated, all values and labels appear in a separate parameter box below the heart rate parameter box.

- A Arrhythmia label
- B PVC/min label
- C Upper/lower alarm limits or crossed triangle symbol when alarms are deactivated
- D Number of premature ventricular contractions (PVC) per minute
- E Area reserved for arrhythmia event call (for example, BRADY) or the message LEARN.

**Accessing the arrhythmia functions**

- Select the heart rate parameter box to select the ECG page directly.
- or
- 1 Select Sensor parameters... from the main menu bar > ECG tab to access the ECG page.
- 2 Select the ARR settings tab.
ECG, arrhythmia, and ST segment

Arrhythmia parameter setup functions

All arrhythmia setup functions take place in the ARR settings page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARR monitoring</td>
<td></td>
<td>Selects which events are reported (see page 200 for more details).</td>
</tr>
<tr>
<td>Relearn</td>
<td>None</td>
<td>Establishes a new QRS templates.</td>
</tr>
</tbody>
</table>

See "Configuring the arrhythmia alarm setup" on page 121 for details on available arrhythmia alarm functions.

Monitoring ST overview

ST analysis examines normal QRS complexes from up to 12 ECG leads. The M540 learns each ST lead, combines the measurements into an average QRS complex, and derives the ST segment deviation. ST monitoring is available for adult and pediatric patients.

The ST segment deviation is defined as the displacement (in mm or mV) above or below the isoelectric level. The deviation measurement compares the isoelectric point to the ST measurement point. The following illustration identifies the measured elements of a QRS complex.

![ST Segment Diagram]

- A: Fiducial point
- B: ST level
- C: ST measurement point
- D: QRS offset
- E: QRS onset
- F: Isoelectric point
Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 ST functions. The ST monitoring functions are configurable on parameter-specific setup pages (see page 213). Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 11.

### Standard ST monitoring

The 6-lead wire set monitors eight ECG leads, of which two are chest leads (V and V+). 12-lead ST analysis provides the most comprehensive view of a patient’s condition. However, with optimal placement of the V and V+ leads and using only eight leads, you can achieve an ST analysis that is almost as comprehensive but with fewer electrodes.

### TruST 12-lead monitoring

This feature offers real-time assessment of 12 ST segment deviations, with only six electrodes, which provide eight measured ECG leads and four derived chest leads. The derived leads are identified by adding the letter ‘d’ before the lead label. When TruST monitoring is activated, the V-lead defaults to V2 and the V+ lead defaults to V5. Although you can select derived leads for display, they are excluded from arrhythmia and QRS processing. ECG and ST reports contain the label ‘d’ to identify a derived lead.

**NOTE**

ST analysis is always performed using a dedicated filter which ensures diagnostic quality. The ECG filter settings (ESU, Monitor, and Off) are not of diagnostic quality, and as a result, the ST segment of the ECG waveform may appear differently from the ST segment of the ST complex. An ECG report is not of diagnostic quality. Therefore, the ST segment of the ECG waveform on the report may appear differently from the ST segment of the ST complex. The only report of ECG diagnostic quality is a Rest ECG report.
ECG, arrhythmia, and ST segment

12-lead ST monitoring

During 12-lead ST monitoring, the M540 acquires 12 ST leads in addition to the following:
- ST Vector Magnitude (STVM) – the magnitude (mm or mV) of the ST vector. It is a summary vector, combining the ST values from all 12 leads. STVM is trended and has its own alarm limits.
- ST Change in Vector Magnitude (STCVM) – the change of magnitude (mm or mV) between the current ST vector and the ST vector at the time of the last reference. STCVM values also show a change in the location of the ST vector over time.

To activate or deactivate ST monitoring
You can activate/deactivate ST monitoring at any time as follows:
1. Select the heart rate parameter box to select the ECG page directly.
2. or
3. Select Sensor parameters... from the main menu bar.
4. Select the ECG tab to access the ECG page.
5. Select the ST settings tab.
6. Select On or Off next to ST monitoring.

Connecting lead wire sets for ST monitoring

ST monitoring uses the following lead configurations for each available ST monitoring mode:
- Standard ST monitoring – uses the standard 3-, 5-, and 6-lead wire sets. For more information see the diagrams starting on page 188.
- TruST – provides 12-lead ST monitoring with a 6-lead wire set (see page 181).
- 12-lead ST monitoring – uses the standard 12-lead ECG configuration with a 6-lead plus a 4-lead wire set (see page 181).
ECG, arrhythmia, and ST segment

**ST display**

When ST alarms are activated, the Cockpit alarms for all ST leads whether they are displayed or not. In either case, the ST parameter box flashes and the alarming lead is identified in the header bar.

When ST monitoring is activated, current ST values display in a separate parameter box below the heart rate parameter box.

**NOTE**

The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The ST parameter box contains the following elements:

- **A** Selected ST lead labels
- **B** Upper/lower alarm limits or crossed triangle symbol when alarms are deactivated
- **C** Selected ST deviation values
- **D** Units of measure – can be activated/deactivated

- **NOTE** The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.
ECG, arrhythmia, and ST segment

Reviewing ST complexes

You can view all ST complexes or zoom in on a single complex. The following functions are available in either view:

- Changing the isoelectric point
- Changing the ST measuring point
- Relearning the QRS morphology
- Saving a reference complex
- Requesting an ST report

In all trends, a solid white vertical line on the ST trend graphs marks changes in ST measuring points along with a time stamp.

Reviewing all ST complexes

The following diagram shows the ST complex page. The number of displayed ST complexes depends on the connected lead wire set.

A ECG tab
B ST complex tab
C Save reference button
D Print button for generating an ST report
E ST button
F Reference on/off button
G ISO button
H Relearn button
I ST panels for each monitored ST lead (including waveform scale, ST measuring point, isoelectric point, and reference point)
J ST label (unique for each ST lead)

To access ST complexes:

1. Select the heart rate parameter box to select the ECG page directly.
   or
2. Select Sensor parameters... from the main menu bar.
3. Select the ECG tab to access the ECG page.
4. Select the ST complex tab (if not already selected).
Zooming in on an ST complex

The following diagram shows a single ST complex screen when you zoom in on one ST complex. To zoom in on a single ST complex, select an ST panel on the ST complex page (see page 208).

- **A** ECG tab
- **B** Waveform scale
- **C** ST complex tab
- **D** Save reference button – saves the displayed ST complex as a reference point
- **E** Print button for printing an ST report
- **F** Reference on/off button
- **G** ST button
- **H** Lead button for selecting the desired lead
- **I** ISO button
- **J** Show all button – accesses the general ST complexes screen
- **K** Relearn button (see page 215)
- **L** ST label (unique for each ST lead)
ECG, arrhythmia, and ST segment

ST measuring points

You can change the ST measuring points and iso-electric point from the general or from the single ST complexes page (see illustrations on page 208). In both pages, the setup buttons for changing the measuring points are located at the bottom of the screen. Changing the measuring point of one complex adjusts the measuring points for all ST complexes.

Adjusting ST measuring points

Whenever you adjust the iso-electric and ST measuring points, the ST deviation is recomputed. During this computation, the changing ST deviation values appear yellow. The values appear green when the computation is completed.

To change ST measuring points

- Select the heart rate parameter box to select the ECG page directly.
  - or
- Select Sensor parameters... from the main menu bar.
- Select ECG tab to access the ECG page.
- Select the ST complex tab (B) to display the general ST complex page.
- Select an individual ST panel to zoom in on a single ST complex.
- Select the ISO button (I) and use the rotary knob to dial to the desired setting.
- Select the ST button (G) and use the rotary knob to adjust the ST measuring point.
Instructions for use – Infinity Acute Care System – Monitoring Applications VG3

ECG, arrhythmia, and ST segment

ST reference

You can save ST reference complexes as reference points for future ST deviation measurement comparisons. The first time you relearn QRS complexes, the current ST data are saved as a reference data. The original ST reference data are updated each time you save ST references.

Saving ST reference points

You can save the ST reference from the general ST complexes page (see page 208) and the single ST complex page (see page 208). Saving a reference point in either screen, saves all currently displayed ST complexes as reference points.

To save ST reference points

1. Select the heart rate parameter box to select the ECG page directly.
   or
2. Select Sensor parameters... from the main menu bar.
3. Select the ECG tab to access the ECG page.
4. Select the ST complex tab to display the general ST complex page.
5. Select an individual ST panel to zoom in on a single ST complex.
6. Select the ISO and ST buttons at the bottom of the screen and use the rotary knob to dial the desired values. Click on the rotary knob to accept the new values.
7. Select the Save reference button (in either ST complex page).
ST alarm settings

The ST alarms page allows you to configure the following ST-specific alarm settings:
- Activating or deactivating individual ST alarms
- Setting upper and lower ST alarm limits
- Configuring the alarm archive function
- Auto setting all ST limits

For more detailed information on how to configure these functions, see "Alarm setup for ST" on page 123.

Accessing the ST settings

To access the ST alarms page

- Select the heart rate parameter box to select the ECG page directly.
- or
- 1 Select Sensor parameters... from the main menu bar.
- 2 Select the ECG tab to access the ECG page.
- 3 Select the ST alarms tab to display the ST alarms page.
## ST setup functions

All ST setup functions take place in the **ST settings** page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ST monitoring</strong></td>
<td>- On (default)</td>
<td>Activates/deactivates ST monitoring and determines whether an ST parameter box is displayed and ST parameters are trended.</td>
</tr>
<tr>
<td></td>
<td>- Off</td>
<td></td>
</tr>
<tr>
<td><strong>TruST 12-lead</strong></td>
<td>- On – TruST monitoring is available</td>
<td>Determines whether TruST monitoring is available (see page 107).</td>
</tr>
<tr>
<td></td>
<td>- Off (default) – TruST monitoring is not available</td>
<td></td>
</tr>
<tr>
<td><strong>ST relearn</strong></td>
<td>None</td>
<td>Purges stored average ST complexes, blanks displayed average ST complexes, and learns the arrhythmia and dominant QRS pattern.</td>
</tr>
<tr>
<td><strong>ST lead1</strong></td>
<td>Three electrodes: STI, STII, STIII</td>
<td>Selects an ST lead for analysis and display.</td>
</tr>
<tr>
<td><strong>ST lead2</strong></td>
<td>Five electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, TV</td>
<td></td>
</tr>
<tr>
<td><strong>ST lead3</strong></td>
<td>Six electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STdV1, STV2, STaV3, STaV4, STV5, STaV6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six electrodes (with TruST activated): STI, STII, STIII, STaVR, STaVL, STaVF, STdV1, STV2, STaV3, STaV4, STV5, STaV6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ten electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV1, STV2, STV3, STV4, STV5, STV6, STCVM, and STVM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default for ST lead1: STI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default for ST lead2: STaVL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default for ST lead3: STV (with TruST and a 10-lead wire set, the default is STV2)</td>
<td></td>
</tr>
</tbody>
</table>
**ECG, arrhythmia, and ST segment**

**Event duration (sec)**
- Off, 15, 30, 45, 60 (default) seconds
  - Defines a period an alarm condition must persist, before alarm signals are generated.

**ST Mini Trend**
- Three electrodes: STI, STII, STIII
- Five electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV
- Six electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV, STV+
- Six electrodes (with TruST activated): STI, STII, STIII, STaVR, STaVL, STaVF, STaV1, STV2, STaV3, STaV4, STV5, STaV6
- Ten electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV1, STV2, STV3, STV4, STV5, STV6, STCVM, and STVM
- Default: STII
  - Selects an ST lead for inclusion in the ST mini trend display.
Learning/relearning QRS pattern

The M540 creates a reference template by learning the dominant QRS pattern of a patient. The reference template is stored for reference and all subsequent beats and rhythms are compared against it and classified either as normal or irregular.

The M540 can only learn the QRS pattern of the leads that are selected for arrhythmia processing. If only one lead is available, the M540 only learns on one lead. If no lead wire set is connected, the M540 cannot perform a learning phase. In this case, an error message is displayed.

The M540 starts a learning phase automatically when:
- Arrhythmia monitoring is activated
- A different arrhythmia mode is selected
- Different ECG leads are selected for arrhythmia processing
- The cable type is changed

During the learning phase, which lasts approximately 30 to 40 seconds, a relearning message appears in the message field. In addition, the message LEARN appears in the ECG parameter box.

If ST monitoring is activated, ST deviations are also recomputed during the learning phase.

Manual relearning

Relearn the QRS pattern of a patient when:
- Leads are reconnected or electrodes are repositioned
- Eight hours have passed since the last learning phase
- Questionable ARR calls appear on the ECG
- Other significant changes appear on the ECG

You can initiate a relearning phase from the arrhythmia and the ST pages.

To relearn from the arrhythmia setup page
- Select the heart rate parameter box to select the ECG page.
  or
  1 Select Sensor parameters... from the main menu bar.
  2 Select the ECG tab to access the ECG page.
  3 Select the ARR settings tab.
  4 Select ARR relearn.

NOTE
If configured to appear on the main menu bar, a Relearn ARR button is accessible on the main menu bar. For more information, see page 396.

To relearn from the ST page
- Select the heart rate parameter box to select the ECG page.
  or
  1 Select Sensor parameters... from the main menu bar.
  2 Select the ECG tab to access the ECG page.
  3 Select the ST settings tab.
  4 Select Relearn.

NOTE
If configured to appear on the main menu bar, a Relearn ST button is accessible on the main menu bar. For more information, see page 396.
Impedance respiration (RRi)

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Overview of respiration monitoring

The M540 measures impedance respiration by passing a harmless high-frequency current between two ECG electrodes on the patient’s chest. Electrical resistance (impedance) between the electrodes varies with the expansion and contraction of the chest during inspiration and expiration. The M540 displays a respiration waveform and respiratory rate value from these impedance changes and relays this information to the Cockpit for display.

The M540 uses ECG leads I or II for breath detection regardless of the lead selected for QRS processing.

Respiration monitoring is for adult, pediatric, and neonatal patients. The M540 can use the respiration signal for central apnea monitoring. Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 respiration functions. The respiration monitoring functions are configurable in the parameter-specific setup page (see page 226).

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. Parameter-specific error messages are listed on page 459.

Supported parameter

RRi – respiration rate measured by impedance (RRi values are not displayed when the ESU filter is activated – see page 193).

Respiration precautions

WARNING
The safety and effectiveness of the respiration measurement method in the detection of apnea, particularly the apnea of prematurity and apnea of infancy, has not been established.

WARNING
This device does not monitor obstructive apnea. Patients at risk for respiratory crises should be observed closely.

WARNING
Large amplitude pacemaker pulses (100 mV or greater) may interfere with the monitor’s ability to measure or detect respiration.

WARNING
Impedance respiration and pacer detection are inoperative when the ESU filter is selected. Refer to "Electrosurgery" on page 18 for general safety precautions.

The monitor reports an apneic event when no breaths are detected within the established apnea time period. Therefore, do not rely on impedance respiration monitoring as the sole method for detecting cessation of breathing. Dräger recommends the monitoring of additional parameters that indicate the patient’s oxygenation status, such as etCO2 and SpO2. Heart rate limit alarms should also be enabled and set appropriately.
Connecting the 3-, 5-, 6-lead wire sets for respiration monitoring

The following diagram shows how to attach the lead wire sets to the M540:

To connect the ECG lead wire sets
1. Insert the 3-, 5-, or 6-lead wire set (C) into the recessed ECG connector (B) on the side of the M540 that is closest to the non-invasive blood pressure connector (A).
2. Orient the ECG adapter cable lead wire set (C) so the exposed pins face towards you as you push it firmly into the channel.
3. Insert the spacer (C) to protect the unused ECG lead pins.
4. Connect the lead wires to the patient. For information on applying the electrodes to the patient, refer to the illustrations starting on page 188.

NOTE
An ECG lead wire set can rest in the ECG connector of the M540 without actually being connected. Make sure that all ECG lead wire sets are pushed firmly into the ECG connector of the M540.
Almost every MonoLead features a number on the lead wire set indicating how many leads connect. When connecting a MonoLead, make sure the number faces in the same direction as the M540 display.

Legend:
A Non-invasive blood pressure hose connector
B M540 ECG connector
C Lead wire set
D Spacer
Connecting the lead wire sets for 12-lead monitoring

The ECG lead wire sets connect directly to the M540.

To connect the ECG lead wire sets

1. Insert the 4-lead wire set (B) and the 6-lead wire set (C) into the recessed ECG connector (A) on the side of the M540. Orient the ECG adapter cable lead wire sets (B and C) so the exposed pins face towards you as you push it firmly into the channel.

NOTE
An ECG lead wire set can rest in the ECG connector of the M540 without actually being connected. Make sure that all ECG lead wire sets are pushed firmly into the ECG connector of the M540.

Almost every MonoLead features a number on the lead wire set indicating how many leads connect. When connecting a MonoLead, make sure the number faces in the same direction as the M540 display.

2. Connect the lead wires to the patient. For information on applying the electrodes to the patient, refer to the illustrations starting on page 188.

NOTE
When using a 12-lead ECG wire set where the lead wires are coiled, it is recommended that the 6-lead wire set is coiled in the same direction as the 4-lead wire set to prevent artifact. For example, both lead wire sets are either coiled towards the patient or away from the patient.
Connecting the lead wires for neonatal monitoring

The ECG lead wire sets connect directly to the M540.

To connect the ECG lead wire set

1. Insert the ECG adapter cable (B) into the recessed ECG connector (A) on the side of the M540. Orient the neonatal ECG adapter cable (B) so the exposed pins face towards you as you push them firmly into the channel.

2. Insert the spacer (D) to protect the unused ECG lead pins on the M540.

3. Connect the individual neonatal ECG electrodes (C) to the neonatal ECG adapter cable (B).

For information on applying the electrodes to the patient, refer to the illustrations starting on page 188.

NOTE

An ECG lead wire set can rest in the ECG connector of the M540 without actually being connected. Make sure that all ECG lead wire sets are pushed firmly into the ECG connector of the M540.

A M540 ECG connector
B ECG adapter cable
C Spacer
D Neonatal ECG adapter cable
E Neonatal ECG electrodes
Impedance respiration (RRi)

Patient preparation for respiration monitoring

The following tips regarding skin preparation and proper electrode placement provide strong signals with minimal artifact but must never replace hospital-approved practices or manufacturer’s recommendations. Because ECG electrodes are used for respiration monitoring, see illustrations starting on page 181 for information on electrode placement. Follow the same precautions for respiratory monitoring as for ECG monitoring (see page 181) and observe the following general recommendations:

– Place the electrodes so they generate the clearest possible signals with minimal artifact.
– Electrodes that adhere tightly and have a large conductive area provide the best results. Use a 5-lead wire set to improve the respiration signal (where the N electrode for IEC or RL electrode for AHA is the neutral electrode).
– For adult and pediatric patients, position the electrodes to span the maximum expansion and contraction of the lungs. This is especially important in the case of deep abdominal breathers.
Impedance respiration (RRi)

- For neonates, place the RA and LA electrodes at the midaxillary line. Position the LL electrode below the diaphragm and umbilicus. Avoid the liver area and ventricles of the heart to prevent blood flow artifact.
Respiration display

On the Cockpit, the respiration display consists of:
- Respiration parameter box
- Respiration waveform

Respiration parameter box

NOTE
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

Respiration markers

Respiration markers indicate the time of breath detection, not the beginning, or end of respiration. If respiration markers also appear during artifact, set the respiration measuring mode to manual and adjust the breath detection threshold so only valid breaths are counted.

The following diagram shows how white vertical markers on the respiration waveform can identify each detected breath.

Respiration markers are not sent to the Infinity network.

To activate or deactivate the display of respiration markers, see page 226.
Adjusting the detection threshold and activating the respiration marker

- Select the respiration parameter box to select the Resp. page directly.
  or
1. Select Sensor parameters... from the main menu bar.
2. Select the Resp. tab to access the Resp. page.
3. Select the Settings tab (if not already selected).
4. Select On next to RESP marker.
5. Select Manual next to Mode.
6. Select the button next to Size [%] and use the rotary knob to dial to the lowest value where the respiration marker appears.
Impedance respiration (RRi)

**Respiration measuring modes**

The following respiration measuring modes are available:

- **Auto** (default) – appropriate for patients with regular breathing patterns. It uses the optimal breath-detection threshold calculated at the beginning of respiration monitoring.

- **Manual** – appropriate for adult or pediatric patients whose breathing patterns show excessive variation. Also appropriate for neonates with irregular breathing rhythms whose respiration signals may otherwise not be reliably evaluated. The M540 does not set a breath-detection threshold at the beginning of respiration monitoring. Instead, the adjustments you make to the waveform size (see page 227) alter the breath detection sensitivity of the monitor.

To select the desired respiration mode, see page 227.

**WARNING**

If the respiration waveform size is set too low in manual mode, shallow breaths may not be counted. If it is set too high, cardiac artifact will be counted as breaths. Therefore, use the respiration marker to verify breath detection at the desired amplitude.

**Accessing the respiration settings**

1. Select the respiration parameter box to select the Resp. page directly.
   or
2. Select Sensor parameters... from the main menu bar.
   1. Select the Resp. tab to access the Resp. page.
      If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >>< symbol and the display filter button.
   2. Select the Settings 1 and Settings 2 tabs.
      The top portion of the Settings 1 page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.
# Impedance respiration (RRi)

## Respiration parameter setup functions

All respiration setup functions take place in the Resp. page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Settings 1 page</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RESP lead</strong></td>
<td>I, II (default)</td>
<td>Selects the lead for respiration monitoring.</td>
</tr>
<tr>
<td><strong>Relearn</strong></td>
<td>None</td>
<td>Initiates a relearning of the respiration signal.</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
<td>Auto (default), Manual (see page 226 for more details)</td>
<td>Determines the processing mode for the breath-related impedance change.</td>
</tr>
</tbody>
</table>
| **Size [%]**        | 10 % to 100 % (in 10 % increments) – default: 50 % | Adjusts the waveform size and/or breath detection threshold, according to the selected respiration setting.  
  - Auto mode – Waveform size only, without affecting the breath-detection threshold.  
| **RESP marker**     | – On               | Superimposes a vertical line on the respiration waveform when a breath is detected (see page 224).                                          |
|                     | – Off (default)    |                                                                                                                                              |
| **RESP monitoring** | – On (default in neonatal mode) | Activates/deactivates respiration monitoring.                                                                                               |
|                     | – Off (default in adult/pediatric mode) |                                                                                                                                              |
| **Color**           | Red, green, blue, yellow, light blue, purple, orange, white (default) | Determines the color of the waveforms, parameter labels, and values.                                                                        |

| **Settings 2 page**         |                    |                                                                                                                                              |
| **Coincidence detect**     | – On               | Determines whether or not you are alerted when the respiratory rate is within 20 % of the heart rate, which is an indication that the M540 is counting heart beats as respiration. |
|                           | – Off (default)    |                                                                                                                                              |
### Impedance respiration (RRi)

#### RRi apnea time [sec]
- Off, 10, 15 (default), 20, 25, 30 seconds

Determines how long an apnea has to last before an alarm is triggered.

#### Apnea archive
- **Off**
- **Store** (default) – a waveform segment is stored in response to an apnea.
- **Record** – a recording is triggered automatically in response to an apnea.

Determines what happens in response to an apnea.
SpO₂ and Pulse CO-Ox monitoring with Masimo SET MCable

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Overview of SpO₂ and Pulse CO-Ox monitoring

SpO₂ and Pulse CO-Ox monitoring is only possible with the corresponding MCable. The following hardware is available from Masimo for monitoring SpO₂ and Pulse CO-Ox parameters.

- Infinity MCable – Masimo SET (Masimo SET MCable)
- Infinity MCable – Masimo rainbow SET (Masimo rainbow SET MCable)

The values and the waveform are displayed on the M540 and on the Cockpit.

The Masimo SET MCable and Infinity MCable – Masimo rainbow SET support motion tolerant pulse oximetry using Signal Extraction Technology (SET). This technology enhances the quality of SpO₂ monitoring and also measures the percentage of functional hemoglobin saturated with oxygen (%SpO₂) in the arterial blood of the patient accurately and effectively.

A sensor applied to the patient measures the absorption levels of red and infrared light. The Masimo SET MCable or Masimo rainbow SET MCable uses the difference between the two measurements to calculate the percentage of saturated hemoglobin (SpO₂). Because light absorption varies with blood volume and blood volume varies with pulse rate, both types of Masimo SET MCable can also derive a pulse rate (PLS).

In addition, the Masimo SET MCable also provides a perfusion index (PI) value. PI is the ratio of the pulsatile blood flow to the non-pulsatile blood flow in peripheral tissue. The PI value provides information regarding the perfusion status of the selected application site. This provides a means to select the most optimal site.

The Infinity MCable – Masimo rainbow SET measures additional parameters that continuously and non-invasively measure blood constituents.

NOTE
The Masimo rainbow SET MCable parameters SpHb and SpOC are not approved for neonatal monitoring.

NOTE
Information about wavelength range may be useful during photodynamic therapy. For details, see the technical data chapter of the instructions for use Infinity Acute Care System – Infinity M540.

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 SpO₂ functions. The SpO₂ monitoring functions are configurable in the parameter-specific setup page (see page 242).

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. Parameter-specific error messages are listed on page 462.

NOTE
This device is covered under one or more of the following USA patents: 5,758,644, 6,011,986, 6,699,194, 7,214,986, 7,254,433, 7,530,955 and other applicable patents listed at: www.masimo.com/patents.htm

Supported parameters
The parameters SpO₂, PLS, and PI are available and displayed regardless of which Masimo sensor and which Masimo SET MCable is being used.

The availability of additional Masimo rainbow SET parameters depends on the sensor type that is connected and which parameters are activated on the Masimo rainbow SET MCable.
SpO₂ and Pulse CO-Ox monitoring with Masimo SET MCable

Standard parameter set

The Infinity MCable – Masimo SET and the Masimo rainbow SET MCable always support the following parameters:

- Functional oxygen saturation (SpO₂). The unit of measure is %.
- Pulse rate (PLS). The unit of measure is beats/min.
- Perfusion index (PI) which indicates the arterial pulse signal strength. The unit of measure is %.

Expanded parameter set

In addition to the above standard parameters, the Masimo rainbow SET MCable provides the following additional optional parameters:

- Total hemoglobin (SpHb) measures the total hemoglobin levels in arterial or venous blood. The unit of measure is selectable (see page 414).
- Total oxygen content (SpOC) measures the total blood oxygen content; this value is calculated from the SpHb and the SpO₂ values. The unit of measure is mL/dL.
- Pleth variability index (PVI) measures peripheral perfusion changes secondary to respiration or the PI amplitude over a respiration. PVI may be closely related to intrathoracic pressure changes, circulating blood volume and vascular tone. The unit of measure is %.
- Carboxyhemoglobin saturation (SpCO) measures the amount of carbon monoxide that is bound to hemoglobin. The unit of measure is %.
- Methemoglobin saturation (SpMet) measures the methemoglobin concentration in arterial blood. The unit of measure is %.

Three types of sensors are available for the Masimo rainbow SET MCable. The availability of the parameters depends on the selected sensor type.

Each sensor provides certain parameters which must also be activated on the Masimo rainbow SET MCable.

- CO SpO₂ sensor; this type of sensor provides the following parameters: SpO₂, PLS, PI, SpCO, SpMet, PVI.
- M-LNCS sensor; this type of sensor provides the following parameters: SpO₂, PLS, PI.
- Hb sensor; this type of sensor provides the following parameters: SpO₂, PLS, PI, SpHb, SpOC, SpMet, PVI.

The following illustration shows the multi-color band which appears on the side of the Masimo rainbow SET MCable (see page 234 for more information).

If you connect a sensor but the parameter is not activated on the MCable, the parameter label appears in the parameter box without a value.
SpO₂ and Pulse CO-Ox precautions

Interfering substances: Carboxyhemoglobin may erroneously increase measurement values. The level of increase is approximately equal to the amount of carboxyhemoglobin present. Dyes, or any substance containing dyes that change arterial pigmentation, may cause erroneous measurement values.

**WARNING**
High oxygen levels may predispose a premature infant to retrolental fibroplasia. If this is a consideration do NOT set the high alarm limit to 100 %, which is equivalent to switching the alarm off. Transcutaneous pO₂ monitoring is recommended for premature infants receiving supplemental oxygen.

**WARNING**
A pulse oximeter should not be used as an apnea monitor.

**WARNING**
Use only Masimo-specified sensors. Other sensors may not provide adequate protection against defibrillation and may put the patient at risk.

**WARNING**
A Pulse CO-Oximeter should be considered an early warning device. If a trend towards patient hypoxemia is observed, blood samples should be analyzed by laboratory instruments to completely understand the condition of the patient.

**WARNING**
The pulsations from an intra-aortic balloon support can elevate the pulse rate. Verify the pulse rate of the patient against the heart rate.

**WARNING**
 Elevated levels of methemoglobin (MetHb) may lead to inaccurate SpO₂ and SpCO measurements.
 Elevated levels of total bilirubin may lead to inaccurate SpO₂, SpMet, SpCO, SpHb, and SpOC measurements.
 Motion artifact may lead to inaccurate SpMet, SpCO, SpHb, and SpOC measurements.
 Very low arterial oxygen saturation (SaO₂) levels may cause inaccurate SpCO and SpMet measurements.
 Hemoglobin synthesis disorders may cause erroneous SpHb readings.

**WARNING**
Elevated levels of methemoglobin (MetHb) may lead to inaccurate SpO₂ and SpCO measurements.
Elevated levels of total bilirubin may lead to inaccurate SpO₂, SpMet, SpCO, SpHb, and SpOC measurements.
Motion artifact may lead to inaccurate SpMet, SpCO, SpHb, and SpOC measurements.
Very low arterial oxygen saturation (SaO₂) levels may cause inaccurate SpCO and SpMet measurements.
Hemoglobin synthesis disorders may cause erroneous SpHb readings.

**CAUTION**
Do not immerse the sensor or patient cable in any liquid. Moisture may present a safety risk.
When using the maximum sensitivity setting, the performance of the sensor off-detection may be compromised. If the device is in this setting and the sensor becomes dislodged from the patient, the potential for false readings may occur due to environmental 'noise' such as light, vibration and excessive air movement. In addition, when a sensor becomes detached from a patient, it will have compromised protection against erroneous pulse rate and arterial saturation readings.

A pulse oximeter can be used during defibrillation, but the readings may be inaccurate for up to 20 seconds.

Possession or purchase of the Masimo SET MCable or the Masimo rainbow SET MCable does not convey any expressed or implied license to use the device with unauthorized sensors or cables which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to this device.

Purchase of this device confers no express or implied license under any Masimo patent to use this instrument with any oximetry sensor that is not manufactured or licensed by Masimo. For a list of approved sensors, see the instructions for use – Infinity Acute Care System – Accessories.

Do not use a functional tester to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor. Since pulse oximeter measurements are statistically distributed, only about two-thirds of those measurements can be expected to fall within ±5% of a CO-Oximeter's measured value.

A functional tester can be used to measure the total error of a pulse oximeter monitor-probe system if a particular calibration curve has been independently demonstrated to be accurate for that system. The functional tester can then measure how accurately a particular pulse oximeter is in reproducing the calibration curve.
Connecting the Masimo SET MCable

The Masimo SET MCable connects directly to the M540. The logo on the MCable identifies if you are using a Masimo rainbow SET or a Masimo SET MCable.

To connect the Masimo SET MCable
1. Attach the MCable connector (B) to the blue SpO2 connector (A) of the M540.
2. Attach the intermediate cable (D) to the connector of the MCable (C).
3. Attach the appropriate Masimo LNCS sensor to the end of the intermediate cable (E) – see page 236 for more information.
Connecting the Masimo rainbow SET MCable

The Masimo rainbow SET MCable connects directly to the M540. The logo on the MCable identifies if you are using a Masimo rainbow SET or a Masimo SET MCable.

A color band located on the side of the Masimo rainbow SET MCable indicates which parameters are activated.

- Fields appearing in color represent parameters that are already activated
- Fields with the letter ‘X’ denote parameters that are not activated
- Fields that appear empty denote parameters that might be activated later

A Masimo MCable can be mounted to the back of an M540 (see page 85).

To connect the Masimo rainbow SET MCable

1. Attach the MCable (B) to the blue SpO2 connector (A) of the M540.
2. Attach the intermediate cable (E, F) to the connector of the MCable (C).
   The reusable SpCO sensor (D) connects directly to the connector of the MCable (C).
3. Attach the appropriate Masimo sensor to the end of the intermediate cable (G). For detailed information on which sensors support which parameters, refer to the instructions for use Infinity Acute Care System – Monitoring Accessories.

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Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n 235
SpO2 and Pulse CO-Ox monitoring with Masimo SET MCable

Patient preparation

The following tips provide optimal SpO2 monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations.

The accuracy of SpO2 monitoring depends largely on the strength and quality of the SpO2 signal.

If a finger is used as a monitoring site, remove any nail polish. Cut the finger nails of the patient, if necessary.

The signal may vary due to the following conditions:
- Placement of a sensor that is too tight
- Patient experiences hypotension, severe vasoconstriction, severe anemia, or hypothermia
- Arterial occlusion proximal to the sensor
- Patient is in cardiac arrest or is in shock
- Bright light causing erratic measurement or missing values. Cover the sensor with opaque material if it is likely to be exposed to direct bright light.
- Significant levels of dysfunctional hemoglobins (HbCO or MetHb)
- Intravascular dyes such as indocyanine green or methylene blue
- Excessive patient movement
- Venous pulsations
- Placement of a sensor on an extremity with a blood pressure cuff, arterial catheter, or intravascular line

The maximum sensitivity mode for Masimo MCable is recommended for patients with low perfusion or when the low perfusion or low signal quality message is displayed on the screen in AP2D or normal sensitivity mode. This mode is not recommended for care areas where patients are not monitored visually, such as general wards. It is designed to interpret and display data at the measuring site when the signal may be weak due to decreased perfusion.

The message SpO2 Low Perfusion appears when the monitor detects low amplitude arterial pulsations. In this case, do the following:
1. Check the patient and treat if necessary.
2. Move the sensor to a site that is more adequately perfused.
3. Select maximum sensitivity mode.

Applying the sensor

If you are using a reusable sensor, make sure it is clean before applying it to the patient.

NOTE
Only use Masimo sensors with the Masimo SET MCable and the Masimo rainbow SET MCable. Read the instructions provided with the sensor for optimal application techniques and for safety information. Never use damaged sensors.

WARNING
Inspect the application site every two to three hours to ensure skin quality and correct optical alignment. If the skin quality changes, move the sensor to another site. Change the application site at least every four hours.

Follow the recommendations of the manufacturer.
To apply the sensor

1. Select the size and type of sensor that is best suited for your patient. Follow the recommendations of the manufacturer.

2. Position the sensor correctly and attach it to your patient.

3. Connect the sensor to the Masimo SET MCable or the Masimo rainbow SET MCable.

SpO2 and Pulse CO-Ox display

On the Cockpit, the SpO2 display consists of:
- SpO2 parameter box
- A user-configurable Pulse CO-Ox parameter box when a Masimo rainbow SET MCable with additional parameters activated is connected.
- SpO2 pulse plethysmogram waveform

**NOTE**
The pulse plethysmogram waveform is directly proportional to the strength of the pulse amplitude.

The following table lists the maximum times the M540 requires to report the parameter values after connecting the sensor to the MCable.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum time</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2, PLS, PI</td>
<td>Up to 35 s</td>
</tr>
<tr>
<td>SpMet, PVI, SpCO</td>
<td>Up to 60 s</td>
</tr>
<tr>
<td>SpHb, SpOC</td>
<td>Up to 90 s</td>
</tr>
<tr>
<td>PVI</td>
<td>Up to 150 s</td>
</tr>
</tbody>
</table>
Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

Masimo SET MCable parameter box

- **A** SpO2 label
- **B** Units of measure – can be activated/deactivated
- **C** Sensitivity mode indicator (see page 243)
- **D** PLS (pulse) label
- **E** PLS value
- **F** Perfusion index label
- **G** Perfusion index value
- **H** Message area for SpO2 messages (see page 462)
- **I** SpO2 saturation value
- **J** SpO2 blip that pulsates with each detected pulse (only when the selected pulse tone source is SpO2 – see page 242).

NOTE
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

SpO2 parameter box (Masimo SET MCable)

The SpO2 parameter box contains the following elements:

A B D E F G H I J

A SpO2 label
B Units of measure – can be activated/deactivated
C Sensitivity mode indicator (see page 243)
D PLS (pulse) label
E PLS value
F Perfusion index label
G Perfusion index value
H Message area for SpO2 messages (see page 462)
I SpO2 saturation value
J SpO2 blip that pulsates with each detected pulse (only when the selected pulse tone source is SpO2 – see page 242).
SpO₂ and Pulse CO-Ox monitoring with Masimo SET MCable

Pulse CO-Ox parameter box (Masimo rainbow SET MCable)

The Pulse CO-Ox parameter box appears in addition to the regular SpO₂ parameter box when a Masimo rainbow SET MCable is connected that supports parameters in addition to the standard parameter set (SpO₂, PLS, PI). The parameter content of the parameter box is configurable (see page 244).

The display of Pulse CO-Ox parameters (SpHb/SpHbv, SpOC, SpMet, PVI, SpCO) is affected by the following conditions:

- Blanks appear instead of parameter values if a sensor is connected but the parameter is not activated on the MCable.
- Asterisks (***) replace the parameter values under the following circumstances:
  - A parameter is activated but an incompatible sensor is connected
  - A parameter is activated but no sensor is connected
  - A technical failure exists (for example, an unplugged sensor)

NOTE
The parameter SpHb changes to SpHbv (if Venous was selected for the blood source setting SpHb Cal – see page 247).

You can select up to three parameters to be displayed in the parameter box (see page 244). Units of measure appear next to the parameter label if applicable and can be activated/deactivated (see page 414).

The Pulse CO-Ox parameter box contains the following elements.

- Parameter 1 Pulse CO-Ox label
- Parameter 2 Pulse CO-Ox label
- Upper/lower alarm limits or crossed triangle symbols when alarms are deactivated (for the parameters SpOC and PVI there are no alarm limits)
- Parameter 3 Pulse CO-Ox label
- Parameter 3 Pulse CO-Ox value
- Parameter 2 Pulse CO-Ox value
- Parameter 1 Pulse CO-Ox value
SpO2 and Pulse CO-Ox monitoring with Masimo SET MCable

Reviewing the SpO2 and Pulse CO-Ox parameters

When the Masimo rainbow SET MCable is connected, you can review the values and associated trends of the following parameters on one page. The mini-trend display is updated approximately every five seconds. If no Masimo rainbow SET parameter is activated on the Masimo rainbow SET MCable, only the parameter label but no trends appear.

The following diagram is an example of a Show all page.

To access the SpO2 and Pulse CO-Ox Show all screen
1. Select the CO-Ox parameter box to access the Pulse CO-Ox setup page directly.
   or
2. Select Sensor parameters... from the main menu bar > SpO2 horizontal tab to select the Pulse CO-Ox setup page.

   D

A  SpO2 tab
B  Show all sub tab
C  Duration button to select the trend duration
D  Display area showing parameter labels, values, trend scales, mini-trend and selected time intervals.
SpO₂ and Pulse CO-Ox monitoring with Masimo SET MCable

Accessing the SpO₂ settings

The following three setup pages are available for configuring Masimo SpO₂ parameters:

- **SpO₂** setup page for configuring general SpO₂ parameters (Masimo rainbow SET MCable and Masimo SET MCable).
- **Pulse CO-Ox** setup page and the **Setup** page for configuring Masimo rainbow SET-specific settings.

To access the SpO₂/Pulse CO-Ox pages:

1. Select the SpO₂/Pulse CO-Ox parameter box to select the respective page directly.
2. Select the SpO₂/Pulse CO-Ox tab. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: `>` symbol and the display filter button.
3. Select the horizontal SpO₂ tab to access the SpO₂ page.
   - or
   - Select the **Pulse CO-Ox** tab to access the Masimo rainbow SET-specific setup page.
   - or
   - Select the vertical **Setup** tab > enter the password to access the password-protected setup pages for the Masimo rainbow SET parameters (see page 247).

The top portion of the setup pages contain the Auto set and Alarm buttons for configuring the alarm functions (no acoustic and visual alarm signals for PI and SpOC). For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.
### SpO2 parameter setup functions

General SpO2 setup functions take place in the SpO2 page (see page 241).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse tone volume</td>
<td>Off, 5 %, 10 % (default), 20 %, 30 %, 40 %, 50 %, 60 %, 70 %, 80 %, 100 %</td>
<td>Sets the volume of the pulse tone.</td>
</tr>
<tr>
<td>Pulse tone source</td>
<td>ECG (default) – SpO2</td>
<td>Selects the source of the pulse tone which affects either the ECG or the SpO2 parameter box display (see page 237). For the SpO2 selection, the higher the pitch of the tone, the higher the SpO2 saturation percentage.</td>
</tr>
<tr>
<td>Waveform size [%]</td>
<td>10 %, 20 %, 30 %, 40 % (default), 50 %, 60 %, 70 %, 80 %, 90 %, 100 %</td>
<td>Sets the amplitude of the SpO2 waveforms. If the waveform height exceeds the display size of the channel, the waveform appears clipped (this does not affect the SpO2 signal processing).</td>
</tr>
<tr>
<td>FastSat mode</td>
<td>On, Off (default)</td>
<td>Allows rapid tracking of arterial oxygen saturation changes.</td>
</tr>
</tbody>
</table>

**NOTE**

The password-protected alarm setting SpO2 sensor off provides additional SpO2 alarm configuration. For more detailed information, see page 125.
**SpO2 and Pulse CO-Ox monitoring with Masimo SET MCable**

### Sensitivity mode
- **Normal** (default) – standard mode
- **APOD** (adaptive probe off detection) – the least sensitive mode for detecting a reading on patients with low perfusion. Provides the best detection for detached sensors. This mode is useful for patients at particular risk for sensors becoming detached such as children or patients who are restless.
- **Max** – provides maximum sensitivity for poor signals

The message **APOD** or **Max** appear in the SpO2 parameter box when the corresponding sensitivity setting is selected. When the setting **Normal** is selected, no message appears in the parameter box.

### Averaging time
2 to 4, 4 to 6, 8 (default), 10, 12, 14, 16 s

Determines how quickly the reported SpO2 value responds to changes in the patient’s oxygen saturation.

**NOTE**
A longer averaging time provides a more accurate result. However, in clinical situations where rapid physiological changes have to be monitored, use a shorter averaging time.

### SpO2 desat alarm
- **On** (default), **Off**

This feature is only available in neonatal mode. The alarm priority is upgraded to high-priority if the SpO2 value falls more than 10 % below the lower SpO2 alarm limit.

### Color
Red, green, blue, yellow, light blue, purple, orange, white (default).

Determines the color of the waveforms and parameter labels and values.

**NOTE**
The password-protected alarm setting **SpO2 sensor off** provides additional SpO2 alarm configuration. For more detailed information, see page 125.

---

**Selection** | **Available settings** | **Description**
---|---|---
**Sensitivity mode** | - Normal (default) – standard mode  
- APOD (adaptive probe off detection) – the least sensitive mode for detecting a reading on patients with low perfusion. Provides the best detection for detached sensors. This mode is useful for patients at particular risk for sensors becoming detached such as children or patients who are restless.  
- Max – provides maximum sensitivity for poor signals | Determines the level of detection sensitivity. The message **APOD** or **Max** appear in the SpO2 parameter box when the corresponding sensitivity setting is selected. When the setting **Normal** is selected, no message appears in the parameter box.  

**Averaging time** | 2 to 4, 4 to 6, 8 (default), 10, 12, 14, 16 s | Determines how quickly the reported SpO2 value responds to changes in the patient’s oxygen saturation.  
**NOTE**  
A longer averaging time provides a more accurate result. However, in clinical situations where rapid physiological changes have to be monitored, use a shorter averaging time.  

**SpO2 desat alarm** | On (default), Off | This feature is only available in neonatal mode. The alarm priority is upgraded to high-priority if the SpO2 value falls more than 10 % below the lower SpO2 alarm limit.  

**Color** | Red, green, blue, yellow, light blue, purple, orange, white (default). | Determines the color of the waveforms and parameter labels and values.  

---

**NOTE**
The password-protected alarm setting **SpO2 sensor off** provides additional SpO2 alarm configuration. For more detailed information, see page 125.
SpO2 and Pulse CO-Ox monitoring with Masimo SET MCable

Masimo rainbow SET Pulse CO-Ox parameter setup functions

General Masimo rainbow SET SpO2 setup functions take place in the Pulse CO-Ox page. To access this setup page, see page 241. Additional password-protected functions are available (see page 247).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter display (left button)</td>
<td>– SpHb* (default) – SpOC – PvI – SpCO – SpMet</td>
<td>Selects the parameter for the parameter 1 location in the Pulse CO-Ox parameter box. The associated parameter label and value have the largest font. With an Hb sensor, the default parameter is SpHb. With a CO sensor, the default parameter for the parameter 1 location in the parameter box changes automatically to SpCO.</td>
</tr>
</tbody>
</table>

*Note: if the venous blood source was selected for SpHb Cal, the parameter label changes from SpHb (arterial blood source) to SpHbv. |

**NOTE**
Changes to the parameter selection are retained if the same sensor is disconnected and then re-connected. The parameter selection changes to the default selection, if another Masimo rainbow SET sensor type is connected.
SpO2 and Pulse CO-Ox monitoring with Masimo SET MCable

Parameter display (middle button)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SpHb 1)</td>
<td>Selects the parameter for the parameter 2 location in the Pulse CO-Ox parameter box.</td>
</tr>
<tr>
<td></td>
<td>SpOC (default)</td>
<td>With an Hb sensor, the default parameter is SpOC. With a CO-sensor, the default parameter for the parameter 2 location in the parameter box changes automatically to SpMet.</td>
</tr>
<tr>
<td></td>
<td>PVI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpCO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpMet</td>
<td></td>
</tr>
</tbody>
</table>

1) Note: if the venous blood source was selected for SpHb Cal, the parameter label changes from SpHb (arterial blood source) to SpHbv.

Parameter display (right button)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SpHb 1)</td>
<td>Selects the parameter for the parameter 3 location in the Pulse CO-Ox parameter box.</td>
</tr>
<tr>
<td></td>
<td>SpOC</td>
<td>With an Hb sensor, the default parameter is SpOC. With a CO-sensor, the default parameter for the parameter 3 location in the parameter box for both CO and Hb sensors is PVI.</td>
</tr>
<tr>
<td></td>
<td>PVI (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpMet</td>
<td></td>
</tr>
</tbody>
</table>

NOTE
Changes to the parameter selection are retained if the same sensor is disconnected and then re-connected. The parameter selection changes to the default selection, if another Masimo rainbow SET sensor type is connected.
SpO₂ and Pulse CO-Ox monitoring with Masimo SET MICable

### SpHb Averaging Time
For SpHb:
- **Long**: approximately 6 minutes
- **Medium** (default): approximately 3 minutes
- **Short**: approximately 1 minute

Determines how responsive the monitor is to rapid physiological changes while tracking blood hemoglobin values.

#### NOTE
A longer averaging time provides a more accurate result. However, in clinical situations where rapid physiological changes have to be monitored, use a shorter averaging time.

### Pulse CO-Ox Mini Trend
- **SpHb 1)** (default)
- **SpCO**
- **SpOC**
- **SpMet**
- **PVI**

**SpCO** is the default when a CO sensor is used.

Selects the parameter to be included in the mini-trend display.

### Color
- Red, green, blue, yellow, light blue, purple, orange, white (default).

Determines the color of the parameter labels and values.

**Note**: If the venous blood source was selected for SpHb Cal, the parameter label changes from SpHb (arterial blood source) to SpHbv.

---

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Password-protected Masimo rainbow SET setup functions

Additional Masimo rainbow SET setup functions take place in the Setup page which is protected by a clinical password. To access this setup page, see page 241.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
</table>
| SpHb Cal | - Arterial (default)  
- Venous | selects the blood sampling source which is used to calculate the SpHb value. The SpHb value changes to SpHbv when the SpHb Cal setting Venous is selected. |
| PVI averaging time | - Short  
- Long (default) | determines how responsive the monitor is to rapid physiological changes while tracking pleth variability index.  
**NOTE:** A longer averaging time provides a more accurate result. However, in clinical situations where rapid physiological changes have to be monitored, use a shorter averaging time. |
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SpO2 and pulse rate with Nellcor OxiMax MCable

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Connecting the Nellcor OxiMax MCable 252
Patient preparation for SpO2 monitoring 253
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Overview of SpO2 monitoring

SpO2 monitoring is only possible with an SpO2 MCable. The M540 uses the Infinity MCable – Nellcor OxiMax (Nellcor OxiMax MCable) to measure the percentage of functional hemoglobin saturated with oxygen (%SpO2) and derive a pulse rate (PLS) continuously. The values are displayed on the M540 and the Cockpit.

A sensor applied to the patient measures the absorption levels of red and infrared light. The Nellcor OxiMax MCable uses the difference between the two measurements to calculate the percentage of saturated hemoglobin (SpO2). Because light absorption varies with blood volume and blood volume varies with pulse rate, the Nellcor OxiMax MCable can also derive a pulse rate (PLS).

SpO2 measurements are for adult, pediatric and neonatal patients.

NOTE
Information about wavelength range may be useful during photodynamic therapy. For details, see the technical data chapter of the instructions for use Infinity Acute Care System – Infinity M540.

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 SpO2 functions.

The SpO2 monitoring functions are configurable in the parameter-specific setup page (see page page 255).

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. Parameter-specific error messages are listed on page 482.

Supported parameters
- Saturation (SpO2)
- Pulse rate (PLS)
SpO2 precautions

Interfering substances: Carboxyhemoglobin may erroneously increase measurement values. The level of increase is approximately equal to the amount of carboxyhemoglobin present. Dyes, or any substance containing dyes that change arterial pigmentation, may cause erroneous measurement values.

WARNING
High oxygen levels may predispose a premature infant to retrolental fibroplasia. If this is a consideration do NOT set the high alarm limit to 100 %, which is equivalent to switching the alarm off. Transcutaneous pO2 monitoring is recommended for premature infants receiving supplemental oxygen.

WARNING
A pulse oximeter should not be used as an apnea monitor.

WARNING
Use only Nellcor- and Dräger-specified sensors. Other sensors may not provide adequate protection against defibrillation and may put the patient at risk.

WARNING
A pulse oximeter should be considered an early warning device. If a trend towards patient hypoxemia is observed, blood samples should be analyzed by laboratory instruments to completely understand the condition of the patient.

WARNING
The pulsations from an intra-aortic balloon support can elevate the pulse rate. Verify the pulse rate of the patient against the heart rate.

WARNING
To reduce the hazard of burns during surgery, keep the sensor or transducer and their associated cables away from the surgical site, the electro-surgical unit return electrode, and earth ground.

WARNING
Inspect the application site every two to three hours to ensure skin quality and correct optical alignment. If the skin quality changes, move the sensor to another site. Change the application site at least every four hours.

CAUTION
Do not immerse the sensor or patient cable in any liquid. Moisture may present a safety risk.

NOTE
A pulse oximeter can be used during defibrillation, but the readings may be inaccurate for up to 20 seconds.

NOTE
Purchase of this instrument confers no express or implied license under any Nellcor patent to use this instrument with any oximetry sensor that is not manufactured or licensed by Nellcor. For a list of approved sensors, see the instructions for use Infinity Acute Care System – Accessories.

NOTE
Do not use a functional tester to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor. Since pulse oximeter measurements are statistically distributed, only about two-thirds of those measurements can be expected to fall within ±A rms of a CO-Oximeter’s measured value.
The Nellcor OxiMax MCable connects directly to the M540.

To connect the Nellcor OxiMax MCable

1. Connect the Nellcor OxiMax MCable connector (B) to the blue SpO2 connector (A) of the M540.
2. Attach the intermediate cable (D) to the connector of the Nellcor OxiMax MCable (C).
3. Attach the appropriate sensor cable to the end of the intermediate cable (E) – see page 253 for more information.

NOTE
A functional tester can be used to measure the total error of a pulse oximeter monitor-probe system if a particular calibration curve has been independently demonstrated to be accurate for that system. The functional tester can then measure how accurately a particular pulse oximeter is in reproducing the calibration curve.
SpO2 and pulse rate with Nellcor OxiMax MCable

Patient preparation for SpO2 monitoring

The following tips provide optimal SpO2 monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations. The accuracy of SpO2 monitoring depends largely on the strength and quality of the SpO2 signal.

If a finger is used as a monitoring site, remove any nail polish. Cut the finger nails of the patient, if necessary, for better sensor placement.

Pulses may be counted erroneously due to the following conditions:
- Placement of a sensor that is too tight
- Patient experiences hypotension, severe vasoconstriction, severe anemia, or hypothermia
- Arterial occlusion proximal to the sensor
- Patient is in cardiac arrest or is in shock
- Bright light causing erratic measurement or missing values. Cover the sensor with opaque material if it is likely to be exposed to direct bright light.
- Significant levels of dysfunctional hemoglobins (HbCO or MetHb)
- Intravascular dyes such as indocyanine green or methylene blue
- Excessive patient movement
- Venous pulsations
- Placement of a sensor on an extremity with a blood pressure cuff, arterial catheter, or intravascular line

Applying the sensor

If you are using a reusable sensor, make sure it is clean before applying it to the patient. Follow the recommendations of the manufacturer.

WARNING
Inspect the application site every two to three hours to ensure skin quality and correct optical alignment. If the skin quality changes, move the sensor to another site. Change the application site at least every four hours.

NOTE
Read the instructions provided with the sensor for optimal application techniques and for safety information. Never use damaged sensors. Doing so may compromise performance.

To apply the sensor

1. Select the size and type of sensor that is best suited for your patient. Follow the recommendations of the manufacturer.
2. Position the sensor correctly and attach it to your patient.
3. Connect the sensor to the Nellcor OxiMax MCable.
SpO2 and pulse rate with Nellcor OxiMax MCable

SpO2 display

On the Cockpit, the SpO2 display consists of:
- SpO2 parameter box
- SpO2 pulse plethysmogram waveform

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

NOTE
The pulse plethysmogram waveform is directly proportional to the strength of the pulse amplitude.

SpO2 parameter box

NOTE
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The SpO2 parameter box contains the following elements:

A SpO2 label
B Units of measure – can be activated/deactivated
C PLS (pulse) label
D PLS value
E Upper/lower alarm limits or crossed triangle symbols when alarms are deactivated
F Message area for SpO2 messages
G SpO2 saturation value
H SpO2 blip that pulsates with each detected pulse (only when the selected pulse tone source is SpO2 – see page 255)
Accessing the SpO₂ settings

- Select the SpO₂ parameter box to select the SpO₂ page directly.
- or
- 1 Select Sensor parameters... from the main menu bar.
- 2 If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.

The top portion of the page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.

SpO₂ parameter setup functions

All SpO₂ setup functions take place in the SpO₂ page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse tone volume</td>
<td>Off, 5%, 10% (default), 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%</td>
<td>Sets the volume of the pulse tone.</td>
</tr>
<tr>
<td>Pulse tone source</td>
<td>ECG (default), SpO₂</td>
<td>Selects the source of the pulse tone which affects both the ECG and the SpO₂ parameter box display (see page 254). For the SpO₂ selection, the higher the pitch of the tone, the higher the SpO₂ saturation percentage.</td>
</tr>
<tr>
<td>Waveform size [%]</td>
<td>15%, 20%, 30%, 40% (default), 50%, 60%, 70%, 80%, 90%, 100%</td>
<td>Sets the amplitude of the SpO₂ waveforms. If the waveform height exceeds the display size of the channel, the waveform appears clipped (without affecting the SpO₂ signal processing).</td>
</tr>
</tbody>
</table>

**NOTE**
The password-protected alarm setting SpO₂ check sensor provides additional SpO₂ alarm configuration. For more detailed information see page 125.
SpO2 and pulse rate with Nellcor OxiMax MCable

Response mode
- **Normal** (default) – up to 90% change within 5 to 7 seconds
- **Fast** – up to 90% change within 2 to 4 s

Establishes the frequency the oximeter uses to calculate, record, and display SpO2 saturation levels. Fast mode responds to changes in blood oxygen saturation levels in 2 to 4 seconds when calculating %SpO2. Normal mode responds to changes in blood oxygen saturation in 5 to 7 seconds when calculating %SpO2.

SatSeconds alarm

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off (default), 10, 25, 50, 100 SatSeconds</td>
<td>This function analyzes desaturation events by multiplying their duration (seconds) by the number of percentage points the patient exceeds the alarm limit. <strong>NOTE</strong> This feature eliminates nuisance alarms caused by brief and numerous violations of lower and upper alarm limits. This selection overrides the alarm validation setting (see page 401) and the SpO2 high priority desaturation alarm for neonatal patients.</td>
<td></td>
</tr>
</tbody>
</table>

SpO2 desat alarm

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On (default), Off</td>
<td>This feature is only available in neonatal mode and only if the SatSeconds alarm function is set to Off. The alarm priority is upgraded to high-priority if the SpO2 value falls more than 10% below the lower SpO2 alarm limit. This feature is automatically activated whenever neonatal mode is activated.</td>
<td></td>
</tr>
</tbody>
</table>

Color

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red, green, blue, yellow, light blue, purple, orange, white (default)</td>
<td>Determines the color of the waveforms and parameter labels and values.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
The password-protected alarm setting SpO2 check sensor provides additional SpO2 alarm configuration. For more detailed information see page 125.
## Temperature

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<th>Section</th>
<th>Page</th>
</tr>
</thead>
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<tr>
<td>Connecting the temperature sensors</td>
<td>258</td>
</tr>
<tr>
<td>Connecting the temperature sensors to the M540</td>
<td>259</td>
</tr>
<tr>
<td>Connecting the temperature sensors to the hemodynamic pods</td>
<td>260</td>
</tr>
<tr>
<td>Temperature display</td>
<td>261</td>
</tr>
<tr>
<td>Temperature parameter box</td>
<td>261</td>
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<tr>
<td>Accessing the temperature settings</td>
<td>262</td>
</tr>
<tr>
<td>Temperature parameter setup functions</td>
<td>262</td>
</tr>
</tbody>
</table>
Overview of temperature monitoring

The M540 measures and displays the following temperature values and relays them to the Cockpit for display:

- Surface body temperature
- Core temperature

Temperature monitoring is intended for adult, pediatric, and neonatal patients.

**NOTE**

The temperature functions and associated probes should be calibrated every two years by qualified personnel to maintain an accuracy of ±0.1 °C (+0.2 °F).

The temperature monitoring functions are configurable in the parameter-specific setup page (see page 262).

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 temperature functions.

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. Parameter-specific error messages are listed on page 470.

**Supported parameters**

- Ta/T1a: absolute temperature values
- Tb/T1b: absolute temperature values
- ΔTa/ΔT1: delta temperature values

Connecting the temperature sensors

You can connect temperature sensors directly to the M540 or to one of the following hemodynamic pods:

- MPod – QuadHemo
- Hemo4 pod
- Hemo2 pod

---

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Connecting the temperature sensors to the M540

You can connect a single sensor or two sensors to the M540 directly using the dual temperature adapter cable. The dual temperature sensor cable monitors two temperatures simultaneously.

To connect two temperature sensors
1. Connect the temperature sensors (D) to the connectors (C) of the dual temperature adapter cable.
2. Connect the connector (B) of the dual temperature adapter cable to the M540 Temp/Aux connector (A).

To connect a single temperature sensor
1. Connect a temperature sensor (E) directly to the M540 Temp/Aux connector (A).

---

A M540 Temp/Aux connector
B Dual temperature adapter cable
C Dual temperature adapter cable connectors
D Single temperature sensor
E Temperature sensors connecting directly to the M540
Temperature

Connecting the temperature sensors to the hemodynamic pods

You can connect a single temperature sensor to the following devices:

– Hemo4 pod
– Hemo2 pod
– MPod – QuadHemo

To connect temperature cables to the Hemo2 pod and the Hemo4 pod

1 Connect the temperature sensor connectors (E) to the Temp A connector (H) and/or the Temp B connector (G) of the Hemo4 pod or the Hemo2 pod.

To connect temperature cables to the MPod – QuadHemo

1 Connect the temperature sensor connector (A) to the MPod – QuadHemo Temp B connector (C) or Temp A connector (D).

2 Connect the connection cable to the monitor connector (F) of the Hemo2 pod/Hemo4 pod and to the gray hemo connector on the M540 (see page 259).

2 Connect the connection cable to the monitor connector (B) of the MPod – QuadHemo and to the gray hemo connector on the M540.
Temperature display

On the Cockpit, the temperature display consists of a parameter box. You can select which temperature values are displayed in the parameter box (see page 262).

When the dual temperature cable is connected, the parameter box displays either the corresponding temperature values (for example, $T_a$ and $T_b$) or one direct and one calculated delta value (for example, $T_a$ and $\Delta T$). The symbol $\Delta T$ represents the absolute value of the difference between the two direct values.

Any temperature values originating from the MPod – QuadHemo, the Hemo2 pod, or the Hemo4 pod are labeled $T1a$, $T1b$, and $\Delta T1$. Any temperature values originating from a single or dual temperature cable that are connected to the M540 temperature connector are labeled $T_a$, $T_b$, and $\Delta T$.

When only a single temperature sensor is connected, only one temperature value is displayed. The values for the second temperature appear blank.

Temperature parameter box

The temperature parameter box contains the following elements:

- A Direct temperature label
- B Units of measure (can be activated/deactivated)
- C Delta temperature parameter label or second direct temperature label
- D Calculated delta value or second direct temperature value
- E Upper/lower alarm limits or crossed triangle symbols when alarms are deactivated
- F Direct temperature value

**NOTE**

The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see “Parameter boxes” on page 52.

Temperature values in parameter boxes may display with a decimal point instead of a comma.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter “Problem solving” on page 449.
Temperature

Accessing the temperature settings

- Select the temperature parameter box to select the Temp. page directly.
  
or
- Select Sensor parameters... from the main menu bar.

2 Select the Temp. (Temp. 1) tab to access the Temp. page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.

The top portion of the page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see “Configuring the alarm settings for a patient” on page 115.

Temperature parameter setup functions

All temperature setup functions take place in the Temp./Temp. 1 pages (see page 262).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters</td>
<td>( Ta - Tb ) (( T1a - T1b ))</td>
<td>Selects which parameters are displayed in the parameter box.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue, purple, orange, white (default)</td>
<td>Determines the color of the parameter labels and values.</td>
</tr>
</tbody>
</table>
Non-invasive blood pressure (NIBP)

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Overview of non-invasive blood pressure monitoring

The M540 uses the oscillometric method to acquire and process non-invasive blood pressure (NIBP) signals and sends the results to the Cockpit for display. Blood pressure measurements are determined by the oscillometric method and are equivalent to those obtained by intra-arterial methods, within the limits prescribed by the Association for Advancement of Medical Instrumentation, Electronic Automated Sphygmonanometers (AAMI/ANSI SP-10).

Non-invasive blood pressure measurements are for adult, pediatric, and neonatal patients.

To protect the patient from excessive inflation limits, the blood pressure cuff automatically deflates when:
- A measurement exceeds 2 minutes in adult and pediatric mode
- A measurement exceeds 90 seconds in neonatal mode

Supported parameters
- NIBP S – non-invasive pressure, systolic value
- NIBP D – non-invasive pressure, diastolic value
- NIBP M – non-invasive pressure, mean value

NOTE
The non-invasive blood pressure functionality should be calibrated every two years by technically qualified personnel as described in the Service manual.

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 non-invasive blood pressure functions. The non-invasive blood pressure monitoring functions are configurable in the parameter-specific setup page (see page 273).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 11. Parameter-specific error messages are listed on page 457.
Non-invasive blood pressure precautions

**WARNING**
Rapid, prolonged cycling of non-invasive pressure measurements have on occasion been associated with petechia, ischemia, purpura, or neuropathy. Make sure that the cuff is properly attached and check the cuff site regularly to prevent the cuff pressure from impeding the blood flow.

**WARNING**
Obstructions may cause the cuff to inflate and deflate improperly and result in inaccurate measurement values. Check the hose and cuff for damage and dirt. Do not allow the hose and cuff to come in contact with fluids, and make sure that they are not compressed or kinked.

**WARNING**
Do not place the cuff on injured or breached skin because cuff compression could further damage the tissue.

**WARNING**
Do not place the cuff on a limb with either an intra-arterial line or a vascular prosthesis because cuff compression will impede perfusion.

**WARNING**
Accurate non-invasive blood pressure measurements depend on the correct size and type of the blood pressure cuff in relation to the patient's arm circumference. The wrong sized cuff, or cuffs outside the range or size manufactured by Dräger, can cause inaccurate measurements. Use only Dräger approved cuffs and make sure that the correct size is used for each patient.

**WARNING**
To reduce the possibility of pumping air into the patient's blood vessels, never connect pneumatic connectors to an intravascular system.

**WARNING**
Before monitoring neonates and infants:
- Select the correct cuff size and hose.
- Select the neonatal or pediatric patient category, if not already selected. This provides the appropriate inflation for neonates, infants, and pediatric patients.

**NOTE**
The accuracy of the oscillometric blood pressure signal can decrease (up to loss of measurement) under the following conditions:
- weak pulses
- irregular pulses
- patient movement artifacts
- tremor artifacts
- respiratory artifacts
- pulses generated from a ventricular assist device

**NOTE**
A systolic blood pressure higher than the current high inflation limit may trigger a message that the non-invasive blood pressure inflation limit is low. When this message appears, manually check the blood pressure of the patient.
Connecting the non-invasive blood pressure hose and cuff

The non-invasive blood pressure hose connects directly to the M540.

To connect the hose and cuff

1. Select a non-invasive blood pressure cuff size that is appropriate for the patient.
2. Connect the non-invasive blood pressure cuff tubing (C) to the hose (B).
3. Connect the non-invasive blood pressure hose (B) to the non-invasive blood pressure connector (A) of the M540.

A Non-invasive blood pressure connector on the M540
B Non-invasive blood pressure hose
C Blood pressure cuff
Patient preparation for non-invasive blood pressure monitoring

The following tips provide optimal non-invasive blood pressure monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations.

Accurate non-invasive blood pressure measurements depend on the correct size and type of the blood pressure cuff in relation to the arm circumference of the patient. The wrong sized cuffs, or cuffs outside the range or size manufactured by Dräger, can cause inaccurate measurements. Use only Dräger approved cuffs and make sure that the correct size is used for each patient.

Applying the non-invasive blood pressure cuff

Weak or irregular pulses, patient movement, tremors, or respiratory artifacts can affect the accuracy of non-invasive blood pressure measurements and even cause them to fail. Before applying the cuff, read the non-invasive blood pressure precautions.

We recommend that you do not apply the cuff on a limb that is already used for other measurements. Make sure that other patient connections do not interfere with each other.

The following diagram depicts a typical Dräger cuff.

To apply the cuff

1. Place the cuff 2 to 5 cm (1 to 2 inches) above the elbow (or around the middle of the thigh). Place the cuff label “this side to patient” against the skin.
2. Place the artery marker (B) over the artery pointing to the hand or the foot. The cuff label ‘index’ (A) must fall within the range labels (C).
3. Wrap the cuff snug around the limb without impeding blood flow.
Non-invasive blood pressure display

On the Cockpit, the non-invasive blood pressure display consists of a parameter box.

When a measurement is in progress, the background of the lower part of the parameter box turns white.

During low systolic or diastolic pulse amplitudes or significant motion artifacts, the parameter box may only display a mean value. If the M540 is in venous stasis mode, the cuff pressure and the label Venous stasis appears in the non-invasive blood pressure parameter box of the Cockpit.

If you cannot apply the cuff at heart level, adjust the displayed systolic and diastolic non-invasive blood pressure values as follows: add 8 mmHg (1.1 kPa) for each 10 cm (4 inches) above the heart; subtract 8 mmHg (1.1 kPa) – for each 10 cm (4 inches) below the heart.

Non-invasive blood pressure parameter boxes

NOTE

The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The appearance of non-invasive blood pressure parameter boxes also depends on the selected non-invasive blood pressure mode.
Non-invasive blood pressure (NIBP)

Interval mode

The following diagram shows a parameter box when the interval mode is selected (see page 271 for more information).

\[\begin{array}{|c|c|}
\hline
A & NIBP parameter label \\
B & Unit of measure (can be activated/deactivated) \\
C & Time since last non-invasive blood pressure measurement \\
D & Last mean pressure value \\
E & Alarm limits or crossed triangle symbols when alarms are deactivated \\
F & Selected inflation interval (see page 273) \\
G & Inflation pressure value or progress bar \\
H & Label auto (after the measurement is completed, a progress bar replaces the label to indicate the time before the start of the next measurement) \\
I & Systolic and diastolic pressure value \\
\hline
\end{array}\]

Non-invasive blood pressure measurement modes

At the beginning of a measurement, the M540 inflates the cuff to a pressure that is 25 mmHg (3.3 kPa) in adult/pediatric mode and 30 mmHg (4 kPa) in neonatal mode above the previously detected systolic value. If the M540 cannot obtain a valid measurement, it reinflates the cuff to the maximum inflation pressure provided the measurement cycle has not timed-out. If the M540 cannot obtain a measurement within the measurement cycle, no further attempts are made until the next scheduled interval or until you initiate a single measurement manually. Error messages identify the cause of failed measurements (see page 467).

The last non-invasive blood pressure measurement value is displayed in the parameter box until the new measurement is completed. New values appear at the end of a measurement. A chime sounds at the end of a measurement when the corresponding function is activated (see page 273).

Before taking any non-invasive blood pressure measurements, read the precautions on page 265.

WARNING
Press the start/stop fixed key to deflate the cuff rapidly if an adverse effect occurs on the patient.

The following non-invasive blood pressure measurement modes are available:

- Single
- Interval
- Continuous

The selected mode affects the appearance of the non-invasive blood pressure parameter box (see page 268).

At the beginning of a measurement, the M540 inflates the cuff to a pressure that is 25 mmHg (3.3 kPa) in adult/pediatric mode and 30 mmHg (4 kPa) in neonatal mode above the previously detected systolic value. If the M540 cannot obtain a valid measurement, it reinflates the cuff to the maximum inflation pressure provided the measurement cycle has not timed-out. If the M540 cannot obtain a measurement within the measurement cycle, no further attempts are made until the next scheduled interval or until you initiate a single measurement manually. Error messages identify the cause of failed measurements (see page 467).

The last non-invasive blood pressure measurement value is displayed in the parameter box until the new measurement is completed. New values appear at the end of a measurement. A chime sounds at the end of a measurement when the corresponding function is activated (see page 273).
Non-invasive blood pressure (NIBP)

Single measurement mode

Single measurement mode allows you to start measurements when needed. You can start and stop a single measurement at the M540 and at the Cockpit.

To start/stop a single measurement

Do one of the following:

- Press the start/stop fixed key on the front of the M540. Press the key again to stop the measurement.
- Press the NIBP start/stop button on the main menu bar of the Cockpit. Press the button again to stop the measurement.

Interval measurements mode

WARNING
Because non-invasive blood pressure measurements occur intermittently, a patient’s condition may change between measurements. Therefore, do not rely on non-invasive blood pressure alarms alone to notify you of a patient’s changing condition.

In interval mode, the M540 initiates measurements at set intervals. Changing the interval setting during a measurement resets the interval timer. If you select another interval setting after interval mode was deactivated, you must select the NIBP start/stop button on the menu bar, for interval measurements to start.

NOTE
A safety timer ensures that a cuff remains deflated for at least 30 seconds before the end of a measurement and the beginning of a new one. This precaution avoids prolonged impeded blood flow which could be harmful. The safety timer overrides any interval setting and is of particular importance in the 1 and 2-minute intervals.

You can still take single measurements during an interval cycle.

Interval measurements are not possible during:
- Venous stasis mode – the measurements resume immediately after the cuff deflates.
- Cardiac bypass mode – select the NIBP start/stop button to resume interval measurement after exiting cardiac bypass mode.
- Standby mode – select the NIBP start/stop button to resume interval measurement after exiting standby mode.

Aligning interval mode settings between Cockpit and M540

If interval mode is deactivated on the Cockpit and an M540 is docked with interval mode activated and a measurement is in progress, the non-invasive blood pressure measurement is canceled automatically. In addition, interval mode is deactivated on the M540.

If interval mode is activated on both devices but you dock an M540 with a different interval time, the non-invasive blood pressure measurement continues. However, the M540 interval time is adjusted to the Cockpit setting at the end of the measurement.

If you turn the M540 off and on again, and interval mode is activated on both the Cockpit and the M540, select NIBP start/stop button to resume interval mode.

WARNING
Because non-invasive blood pressure measurements occur intermittently, a patient’s condition may change between measurements. Therefore, do not rely on non-invasive blood pressure alarms alone to notify you of a patient’s changing condition.
To start/stop interval mode

- Select the non-invasive blood pressure parameter box to select the NIBP page directly.
- or
- 1 Select Sensor parameters... from the main menu bar.
- 2 Select the NIBP tab to access the NIBP page.
- 3 Select Interval time [min] and make your selection. The available settings are: Off (default), 1, 2, 2.5, 3, 5, 10, 15, 20, 30, 45, 60, 120, 240 min.

For any interval setting of 5 minutes and up, the following time alignment occurs. After the first measurement is completed, all subsequent measurements align with the next natural time boundary that corresponds to the selected interval. For example, if a 5-minute interval is selected at 10:03, the next interval starts at 10:05, 10:10 and so on. If a 10-minute interval is selected at 10:07, the next interval starts at 10:10, 10:20, and so forth.

4 Press NIBP start/stop button on the main menu bar if you change the mode setting from Off to another setting (otherwise, interval measurements will not start).

NOTE
Pressing the NIBP start/stop button longer than two seconds suspends interval mode and sets the interval time [min] to Off.

If the M540 is power cycled while in interval mode, you must press the NIBP start/stop button to resume interval measurements.

To stop interval measurements

- Press the NIBP start/stop button on the main menu bar of the Cockpit.
- or
- Press the start/stop fixed key on the front of the M540.

Continuous measurements

WARNING
When using continuous mode, observe the patient closely and verify limb perfusion clinically. Be extra vigilant when using continuous mode on neonates or hemodynamically compromised patients.

In continuous mode, the M540 continuously initiates NIBP measurements over a 5-minute period. A 10 second (±1 second) minimum interval between the end of one measurement and the start of another provides minimal perfusion of the limb.

To activate or deactivate continuous mode

- Select the non-invasive blood pressure parameter box to select the NIBP page directly.
- or
- 1 Select Sensor parameters... from the main menu bar.
- 2 Select the NIBP tab to access the NIBP page.
- 3 Select On or Off next to Continuous mode.

NOTE
Continuous non-invasive blood pressure mode prevents you from enabling venous stasis.

To stop continuous measurements

- Press the NIBP start/stop button on the main menu bar.
- or
- Deactivate Continuous mode in the NIBP page (see page 273).
Non-invasive blood pressure (NIBP)

Venous stasis

By maintaining a constant cuff pressure, the M540 stops the blood flow to the lower extremity of the cuffed limb long enough to cannulate a patient. In this mode, the cuff occludes the limb for about as long as an non-invasive blood pressure measurement takes (approximately 2 minutes for adults and approximately 1 minute for neonates).

Activating or deactivating venous stasis

To activate or deactivate venous stasis

1. Select the non-invasive blood pressure parameter box to select the NIBP page directly.
2. Select Sensor parameters... from the main menu bar.
3. Select the NIBP tab to access the NIBP page.
4. Make sure non-invasive blood pressure continuous mode is not activated (see page 273).
5. Select On next to Venous stasis mode.

During active venous stasis, the non-invasive blood pressure parameter box reports the remaining time and displays the message Stasis in the parameter box. As soon as venous stasis is terminated, the parameter box resumes its previous appearance (see page 268).

Interval measurements are suspended during venous stasis but resume immediately after the cuff deflates.

NOTE
When the venous stasis mode begins, an attention tone sounds.

WARNING
Do not use venous stasis on a limb that is unsuitable for non-invasive blood pressure measurements (for example, an arm with a catheter). If the patient experiences adverse reactions, immediately press the NIBP start/stop menu button to deflate the cuff.

Note
Make sure continuous non-invasive blood pressure mode is not enabled (see page 273) because it prevents you from using venous stasis mode.

NOTE
If configured to appear on the main menu bar, the Venous stasis mode button is also accessible on the main menu bar. For more information, see page 396.

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Non-invasive blood pressure (NIBP)

Accessing the non-invasive blood pressure settings

- Select the non-invasive blood pressure parameter box to select the NIBP page directly.
  or

1. Select Sensor parameters... from the main menu bar.

2. Select the NIBP tab to access the NIBP page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.

The top portion of the page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.

Non-invasive blood pressure parameter setup functions

All non-invasive blood pressure setup functions take place in the NIBP page (see page 273).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval time (min)</td>
<td>Off (default), 1 min, 2 min, 2.5 min, 3 min, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 45 min, 60 min, 120 min, 240 min</td>
<td>Defines intervals for non-invasive blood pressure measurements.</td>
</tr>
<tr>
<td>Inflation mode</td>
<td>Adult (default), Pediatric, Neonatal</td>
<td>Sets the threshold for maximum cuff inflation.</td>
</tr>
<tr>
<td>Continuous mode</td>
<td>On, Off (default)</td>
<td>Initiates successive non-invasive blood pressure measurements for 5 min.</td>
</tr>
<tr>
<td>Chime</td>
<td>On, Off (default)</td>
<td>Determines whether or not a tone sounds at the end of a completed non-invasive blood pressure measurement.</td>
</tr>
<tr>
<td>Venous stasis mode</td>
<td>On, Off (default)</td>
<td>Stops the blood flow to the lower part of the cuffed limb for a fixed time.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue, purple, orange, white (default)</td>
<td>Determines the color of the parameter values and labels.</td>
</tr>
</tbody>
</table>
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Invasive blood pressure monitoring

Overview of invasive blood pressure monitoring

The M540 acquires, processes, and displays invasive blood pressure (IBP) signals and relays the data to the Cockpit. Several pods are available for monitoring invasive pressure. Monitoring more than two pressures simultaneously requires the Multi-IBP option.

Invasive blood pressure measurements are for adult, pediatric, and neonatal patients.

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 invasive blood pressure functions.

The invasive blood pressure monitoring functions are configurable in the parameter-specific setup page (see “Invasive blood pressure parameter setup functions” on page 293).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 11. Parameter-specific error messages are listed on page 471.

Supported parameters

See page 284 for available invasive blood pressure labels.

- Systolic pressures: GP1 S to GP4 S, ART S, PA D, LV D, RV D
- Diastolic pressures: GP2 D to GP4 D, ART D, PA D, LV D, RV D
- Mean pressures: GP1 M to GP4 M, ART M, PA M, LV M, RV M
- Additional pressures: ICP, CVP, LA, RA
- If both ART and ICP are connected, the algorithm computes the difference between ICP and mean ART and reports it as CPP.

Invasive blood pressure pods

Invasive blood pressure signals originate from the following hemodynamic pods:

- Hemo4
- Hemo2 pod
- Infinity MPod – QuadHemo (MPod – QuadHemo)
- Infinity MCable – Dual Hemo (Dual Hemo MCable)

Hemo4 pod

This pod measures up to four pressures, cardiac output, and temperature.

A Key 
B Key for starting a cardiac output measurement
C Key for starting wedge pressure measurements
D Pressure label windows
E Transducer slots

NOTE
The connectors for temperature and cardiac output are located on the side panel of the hemodynamic pod.
Invasive blood pressure (IBP)

**Hemo2 pod**
This pod measures up to two pressures, cardiac output, and temperature.

- **A** Key «Q» for zeroing all pressures simultaneously (see page 286)
- **B** Key for starting a cardiac output measurement
- **C** Key for starting wedge pressure measurements
- **D** Pressure label windows
- **E** Transducer slots

**NOTE**
The connectors for temperature and cardiac output are located on the side panel of the hemodynamic pod.

**MPod – QuadHemo**
This pod measures up to four pressures, cardiac output, and temperature.

- **F** Key «Q» for zeroing all pressures simultaneously (see page 286)
- **G** Key for starting a cardiac output measurement
- **H** Key for starting wedge pressure measurements
- **I** Intermediate cables for attaching the transducers

**NOTE**
The connectors for temperature and cardiac output are located on the side panel of the hemodynamic pod.
Invasive blood pressure (IBP)

Dual Hemo MCable
The Dual Hemo MCable measures up to two pressures.

A Dual Hemo MCable connector that connects to the M540
B Transducer adapter cables for attaching the transducers

Invasive blood pressure precautions

WARNING
To prevent patient injury, never reuse a single-use transducer.

WARNING
Do not zero all pressures simultaneously using the \(-\) key if any pressure waveform is flat (nearly static).

There are additional warnings regarding pulmonary wedge pressure on page 289.
Connecting the Hemo4 pod and Hemo2 pod

The Hemo4 pod and Hemo2 pod connect directly to the M540. The following diagram shows where the gray hemo connector (A) is located on the side of the M540.

A Invasive blood pressure connector on the M540
B Hemodynamic connector on the pod
C Pod connection cable
D Transducer cable
E Transducer slot
F Transducer adapter cable
G Invasive blood pressure adapter block

To connect the Hemo4 pod and Hemo2 pod
1 Attach the invasive blood pressure adapter (G) to the bottom of the Hemo4 pod/Hemo2 pod.
2 Connect one end of the connection cable (C) to the Hemo4 pod or the Hemo2 pod connector (B).
3 Connect the other end of the connection cable (C) to the gray hemo connector of the M540 (A).
4 Attach the transducers to the transducer slot (E).
5 Connect the transducer adapter cables (F) to the transducer cable (D).
Connecting the MPod – QuadHemo

The MPod – QuadHemo connects directly to the M540.

To connect the MPod – QuadHemo:
1. Connect one end of the connection cable (C) to the connector located along the right side of the MPod – QuadHemo (B).
2. Connect the other end of the connection cable (E) to the gray Hemo connector of the M540 (A).
3. Insert the transducers into the transducer slots (D).
4. Connect the transducer cables (F) to the transducer adapter cable (G).

The transducer adapter cables are permanently fastened to the back of the MPod – QuadHemo.

A  Invasive blood pressure connector on the M540
B  MPod – QuadHemo
C  Red pod connection cable connector
D  Transducer slot
E  Grey pod connection cable connector
F  Transducer cable
G  Transducer adapter cable
Connecting the Dual Hemo MCable

To connect the Dual Hemo MCable

1. Attach the transducers (D) to the transducer adapter cables (C). The transducer adapter cables are permanently fastened to the Dual Hemo MCable.
2. Connect the Dual Hemo MCable connector (B) to the gray Hemo connector (A) on the M540.

Preventing fluid ingress

The following illustration shows how to correctly position the Dual Hemo MCable to prevent fluids from entering the ports where the transducer cables are attached. If the Dual Hemo MCable is positioned wrong, fluids may enter and damage the MCable.

A Invasive blood pressure connector on the M540
B Dual Hemo MCable connector
C Transducer adapter cable
D Transducer
E Transducer cables
Patient preparation for invasive blood pressure monitoring

NOTE
If air bubbles appear in the tubing system, flush the system with the infusion solution again. Air bubbles may lead to wrong pressure measurement values.

The following tips provide optimal invasive blood pressure monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations.

– When preparing the patient, make sure there are no air bubbles in the sensor or the stopcock.
– For maximum signal strength, choose the shortest possible length of high-pressure tubing. Shorter tubing reduces signal attenuation but is more susceptible to motion artifacts. High-pressure tubing limits signal dampening.
– Position the transducer so that it is level with the appropriate anatomical reference point for each monitored pressure.

Invasive blood pressure display

On the Cockpit, the invasive blood pressure display consists of:
– Invasive blood pressure parameter box
– Invasive blood pressure waveform

Invasive blood pressure parameter box

NOTE
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The content of the invasive blood pressure parameter boxes depends on whether the parameter is pulsatile or non-pulsatile. Parameter boxes for pulsatile pressures (ART, LV, PA, RV, GP1, GP2, GP3, GP4) display systolic, diastolic, and mean pressure values. Parameter boxes for non-pulsatile pressures (LA, RA, CVP, ICP) display only the mean pressure value.

If the M540 detects a static pressure, the algorithm computes only the mean pressure. A static pressure condition occurs when the maximum and minimum values of a pulsatile pressure signal differ by less than 3 mmHg (0.4 kPa).
Invasive blood pressure (IBP)

The invasive blood pressure parameter box contains the following elements:

A IBP parameter label
B Unit of measure (can be activated/deactivated)
C Mean pressure value
D Alarm limits or crossed triangle symbols when alarms are deactivated
E Systolic/diastolic pressure values

Large mean value

The invasive blood pressure mean value can either be displayed in regular or large font size.

To activate the large mean value display

1. Select the invasive blood pressure parameter box to select the IBP page directly.
   or
2. Select Sensor parameters... from the main menu bar.
3. Select the desired IBP tab (for example, GP1) along the right side of the IBP page.
4. Select On next to Large mean.

Invasive blood pressure waveforms

Invasive blood pressure waveforms are either displayed in separate waveform channels or in overlapped format in one channel. When overlapped, the waveform area increases to combine multiple waveforms. For each invasive blood pressure waveform, a corresponding parameter box is displayed. To activate the overlap display for adjacent pressure waveforms, see page 391 in the “System configuration” chapter.
Labeling invasive blood pressure channels

The invasive blood pressure label determines how a signal is analyzed and reported. The M540 takes the pressure labels from the connected pod or MCable provided the transducers are connected. When a new label is assigned to a pressure channel, the M540 clears the parameters and conditions set for the previous label (including alarms and waveform scales). It replaces these values with the settings of the new label. When the M540 is docked on the M500, all pressure labels are transferred to the Cockpit.

The following rules apply to labeling pressure channels:

- If no pressure labels are assigned, the labels GP1 to GP4 are automatically assigned depending on how many pressures are connected.

The zero value, the date, and time associated with the pressure channel remain unchanged even if a new label is assigned.

To assign a pressure label manually

1. Select the invasive blood pressure parameter box to select the IBP page directly.
   or
2. Select Sensor parameters... from the main menu bar.
3. Select the IBP tab to access the IBP page.
4. Select the desired IBP tab (labeled GP1, GP2, GP3, or GP4) along the right side of the IBP page.
5. Select the button next to Label and choose the label from the list (see the table on page 285).

NOTE

If the Cockpit displays the generic pressure labels (GP1, GP2, GP3, GP4), the displays on the Hemo2 and Hemo4 pods are labeled P1a, P1b, P1c, P1d.

NOTE

Certain pressure labels have extra selections in their corresponding Cockpit parameter setup pages. For example, from the PA page you can start a wedge pressure and from the ICP page you can set a minimum scale.
Invasive blood pressure (IBP)

Standard labels

The M540 detects the labels automatically from the hemodynamic pod, provided a transducer is connected. The M540 transfers the labels to the Cockpit. You can also label pressure channels manually.

The following table lists the available invasive blood pressure labels.

<table>
<thead>
<tr>
<th>IBP Labels</th>
<th>Pressure type</th>
<th>Measured pressures</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART</td>
<td>Arterial pressure</td>
<td>Systolic, diastolic, mean</td>
<td>-50 to +400 mmHg</td>
</tr>
<tr>
<td>LV</td>
<td>Left ventricular pressure</td>
<td></td>
<td>-6.6 to +53.3 kPa</td>
</tr>
<tr>
<td>PA</td>
<td>Pulmonary arterial pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV</td>
<td>Right ventricular pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVP</td>
<td>Central venous pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPP 1)</td>
<td>Cerebral perfusion pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RA</td>
<td>Right atrial pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA</td>
<td>Left atrial pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICP</td>
<td>Intracranial pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generic Labels</td>
<td></td>
<td>Systolic, diastolic, mean</td>
<td></td>
</tr>
<tr>
<td>GP1 to GP4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

1) The CPP value is only calculated when ICP and ART M pressure values are available.
Pressure label conflicts

Each pressure label is assigned to one location. If you try to reuse a label, you must confirm it. The M540 assigns the label to the currently selected parameter box and places an automatic pressure label (GP1 to GP4) in the previous location.

Pod and M540 label conflicts

The hemodynamic pods store pressure labels like the M540. When a pod with previously stored labels is connected, different pressure labels may exist for the same channel, thus causing a conflict.

If a transducer is connected to the pod, the label stored in the pod prevails. The M540 assigns that parameter label to the pressure label in the IBP page. If no transducer is connected to the pod, the label stored in the M540 has priority.

Zeroing an invasive blood pressure transducer

To establish accurate invasive blood pressure values, zero the transducer according to the hospital’s protocol at least once a day. Perform additional zeroing under the following circumstances:

– After introducing a catheter into the vascular system of the patient
– Before each monitoring session
– Each time you use a new transducer or tubing
– Whenever you connect the transducer cable to the monitor
– If the reported pressure values seem incorrect
– When the message %0 please check zero appears.

For zeroing to be successful, a pressure must be stable for at least 3 seconds. Messages report the status of the zeroing process. The time and date of the last successful zero is recorded on the IBP page. Check the invasive blood pressure waveform and repeat the zeroing procedure if the zeroing fails because the pressures are not static. If the procedure fails after two attempts, replace the transducer or consult your technical personnel.

If the attention tone is activated (see page 389), a tone sounds when the zeroing procedure is successfully completed.

Zeroing a specific transducer

This procedure allows you to select a specific transducer for zeroing. You can also initiate the procedure from the M540 (see the instructions for use Infinity Acute Care System – Infinity M540 for details).
Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n

Invasive blood pressure (IBP)

To zero a specific transducer
- Select the invasive blood pressure parameter box to select the IBP page directly.
- or
1. Select **Sensor parameters...** from the main menu bar.
2. Select the **IBP** tab to access the **IBP** page.
3. Select the desired IBP tab (for example, ART) along the right side of the IBP page.
4. Align the transducer to the level of the heart (phlebostatic access point, fifth intercostal space and midaxillary line).
5. Close the transducer stopcock to the patient and open it to air.
6. Select the button next to **Zero** in the **IBP** page.
   - If the zeroing of the transducer is successful, the message **zero accepted** appears. If zeroing failed, the message **did not zero** appears. In that case, repeat steps three to five.

Zeroing all pressure transducers
This procedure zeroes all pressure transducers simultaneously.
Zeroing all pressures simultaneously from the Hemo4 pod, the Hemo2 pod, and the MPod – QuadHemo automatically zeroes all transducers open to air simultaneously.

**WARNING**
Using the **Zero all** button on the Cockpit or the **-/-** key on the hemodynamic pods zeroes all static invasive blood pressures < 3 mmHg.

**WARNING**
Certain invasive blood pressure alarms are suppressed while pressures are being zeroed. For detailed information, see page 106.
Invasive blood pressure (IBP)

To zero all pressure transducers from the hemodynamic pods
1 Align the transducer to the level of the heart (phlebostatic access point, fifth intercostal space and midaxillary line).
2 Close the stopcocks to the patient, and open them to air.
3 Press the \( \text{Res} \) key (A) on the Hemo4 pod, Hemo2 pod, or the MPod – QuadHemo.

4 Verify that the transducers have been zeroed. If zeroing failed, repeat steps 2 and 3.

To zero all pressure transducers from the Cockpit
1 Align the transducers to the heart level of the patient.
2 Close the stopcocks to the patient, and open them to air.
3 Select the \textit{Sensor parameters... > Zero all} buttons on the main menu bar (C700).
   or
   Select the \( \text{Res} \) symbol next to the \textit{Sensor parameters...} button on the main menu bar (C500).
   or
   Select the IBP parameter box to access the IBP page.
4 Select the \textit{Zero} button.
5 Verify that the transducers have been zeroed. If zeroing failed, repeat the procedure.

\textbf{WARNING}
Certain invasive blood pressure alarms are suppressed while pressures are being zeroed.
For detailed information, see page 106.

\textbf{NOTE}
If configured to appear on the main menu bar, the \textit{Zero} \( \text{Res} \) button is also accessible on the main menu bar. For more information, see page 396.
Invasive blood pressure (IBP)

**Pulmonary wedge pressure**

When the M540 is docked, you can calculate a pulmonary wedge pressure (PWP) from the Hemo4 pod, Hemo2 pod, and the MPod – QuadHemo. You can also calculate a wedge pressure from the **Wedge** page on the Cockpit (see page 292). You cannot request wedge pressures from the M540.

During PWP measurements, only the mean PA pressure is displayed.

**WARNING**

For the safety of the patient keep the balloon-inflation time to the minimum necessary to acquire an accurate PWP value. Prolonged inflation of the balloon can result in pulmonary hemorrhage or infarction.

**WARNING**

The PA catheter may move into the wedge position before the balloon is inflated. One sign of this “catheter drift” is that the PWP waveform becomes wedge shaped. Follow your hospital’s clinical guidelines to correct the catheter’s position.

**WARNING**

Do not over-inflate the balloon because an over-inflated balloon can rupture the pulmonary artery.

**WARNING**

Alarm monitoring for invasive pressures, if activated, is temporarily deactivated during PWP measurements to prevent nuisance alarms. The parameter box does not display a crossed triangle symbol because alarm monitoring is automatically activated upon completion of a wedge pressure measurement.
**Starting wedge measurements from the pods**

To start a wedge pressure measurement

1. Press the Wedge key (A) on the Hemo2 pod, Hemo4 pod, or the MPod – QuadHemo. The message *Inflate balloon. Press 'Wedge' to start.* appears on the Cockpit.

2. Press the Wedge key (A) again to start.
   - PA alarms are deactivated temporarily.
   - The message *Wedge in progress* appears on the Cockpit and the measurement begins. A PWP value is displayed at the bottom of the Wedge page on the Cockpit within 10 seconds. The message *Deflate balloon and press 'Save Wedge' to finish* appears.

3. Press the Wedge key (A) again to save the value. The following happens on the Wedge page of the Cockpit (see page 291):
   - The message *IBP* appears in the message field.
   - A new PWP value calculated during the next 10 seconds appears. An attention tone sounds at the end of the calculation when the corresponding feature is activated (see page 389). Also, the message *Deflate balloon and press 'Save Wedge' to finish* appears in the message field.
   - The PA and reference waveforms are stopped, and the message *Waveforms stopped* appears above the PA scale in the display window.
   - After a successful wedge measurement, the PA waveform resumes its previous size and sweep speed. PA systolic and diastolic values are displayed again, and PA alarms are restored to the values before entering Wedge mode.
Invasive blood pressure (IBP)

starting wedge measurements from the Cockpit

The following diagram shows the Wedge page where you start wedge measurements manually.
The wedge pressure value is saved automatically when:
- You close the Wedge page.
- 240 seconds have elapsed after the wedge pressure was started and a valid PWP value exists.

The diagram includes:

- A Prepare wedge button
- B Start wedge button
- C Freeze/ Adjust button
- D Save Wedge button
- E Cancel wedge button
- F Message field
- G PWP value
- H PWP results window
- I Scale button
- J Sweep speed [mm/sec] button
- K Reference waveform button
To start a wedge measurement

1. Select the PA parameter box (if displayed) > select the Start wedge button.

**NOTE**
If configured to appear on the main menu bar, the Start wedge button is also accessible on the main menu bar. For more information, see page 396.

or

1. Select the Procedures... button from the main menu bar.
2. Select the Wedge tab (if not already selected).
3. Verify that the PA catheter has been properly inserted.
4. Select the Prepare wedge button (A). The following happens:
   - PA alarms are deactivated temporarily
   - The message Inflate balloon. Press ‘Wedge’ to start appears in the message field (F). Only the PA mean value appears in the parameter box (the diastolic/systolic values are blanked).
   - The button Start wedge appears.
5. Use the Scale button (I) to change the scale, if necessary.
6. Use the Sweep speed [mm/sec] (J) button to select a different sweep speed for the waveform, if necessary.
7. Use the Reference waveform button (K) to select a reference waveform (available settings: None, RRi).
8. Select the Start wedge button (B).
   - The message Wedge in progress appears in the message field (F).
   - A new PWP value calculated during the next 10 seconds appears. An attention tone sounds at the end of the calculation when the feature is activated (see page 389). Also, the message Deflate balloon and press ‘Save Wedge’ to finish appears in the message field (F).
   - The PA and reference waveforms are stopped, and the message Waveforms stopped appears above the PA scale in the display window (H).
   - A horizontal cursor is drawn through the PA waveform.
9. Select one of the following buttons:
   - Freeze/Adjust button (C) to alter the PWP value manually.
   - Save wedge button (D) to save the new value (it is stored in the trend function)
   - Cancel wedge (E) to cancel the measurement.

After a successful wedge measurement, the PA and respiratory waveforms resume their previous size and sweep speed. PA systolic and diastolic values are displayed again, and PA alarms are restored to the values before entering wedge mode.

**NOTE**
If configured to appear on the main menu bar, the Start wedge button is also accessible on the main menu bar. For more information, see page 396.
Invasive blood pressure (IBP)

Accessing the invasive blood pressure settings

- Select the IBP parameter box to select the **IBP** page directly.
- or
- Select Sensor parameters... from the main menu bar > **IBP** tab to access the **IBP** page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.

The top portion of the page contains the **Auto set** and **Alarm** buttons for configuring the alarm functions. For detailed alarm setup information, see “Configuring the alarm settings for a patient” on page 115.

Invasive blood pressure parameter setup functions

All invasive blood pressure setup functions take place in the **IBP** page (see page 293).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>None</td>
<td>Zeroes only the pressure indicated on the <strong>IBP</strong> page and displays the time and date of the last zeroing (see page 287).</td>
</tr>
</tbody>
</table>
| Label     | ART, PA, CVP, LA, LV, RV, RA, ICP, GP1 to GP4. | Allows you to assign a label to each pressure channel. The defaults are as follows:  
- Channel 1: GP1  
- Channel 2: GP2  
- Channel 3: GP3  
- Channel 4: GP4 |
Invasive blood pressure (IBP)

### Scale
- Controls the upper scale of the pressure waveform.

#### Available settings
- 5, 10, 15, 20, 25, 30, 35, 40, 50, 75, 100, 125, 150, 175, 200, 225, 250, 300 mmHg
- 1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24, 30, 32, 36, 40 kPa
- GP1 to 4, ART, LV:
  - 200 mmHg (30 kPa) for adults
  - 150 mmHg (20 kPa) for pediatrics
  - 100 mmHg (16 kPa) for neonates
- PA, RV: 50 mmHg (12 kPa)
- ICP, CVP, LA, RA: 20 mmHg (4 kPa)

### Filter
- Selects the filter setting applied to the invasive blood pressure signal.
- 8 Hz and 16 Hz (default)

### Large mean
- Determines whether the mean invasive blood pressure value appears in large or normal font.
- On, Off (default)

### Color
- Determines the color of the waveforms, parameter labels, and values.
- Red, green, blue, yellow, light blue, purple, orange, white.

#### Available parameters
- ART, GP1 to GP4 = red
- PA = yellow
- CVP = blue
- ICP, LA = purple
- RA, RV = orange
- LV = yellow

### Min scale
- Allows you to select the minimum scale. When this function is activated, the following happens:
  - The lower scale value is either -5 mmHg (~0.7 kPa) for pressures labeled CVP, RA, LA or 0 mmHg (0 kPa) for other pressure labels.
- On, Off (default)

#### Available settings
- The lower scale value is either -5 mmHg (~0.7 kPa) for pressures labeled CVP, RA, LA or 0 mmHg (0 kPa) for other pressure labels.
### Invasive Blood Pressure (IBP)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start wedge</td>
<td>None</td>
<td>Allows you to start a wedge pressure measurement (see page 293)</td>
</tr>
</tbody>
</table>

**PA page only**
Cardiac output (C.O.)

Overview of cardiac output monitoring . . . 298
Cardiac output measurement method . . . . 298
Supported parameters . . . . . . . . . . . . . . 298
C.O. Precautions . . . . . . . . . . . . . . . . . . 298
Connecting the cardiac output hardware . . 299
Patient preparation for cardiac output
monitoring . . . . . . . . . . . . . . . . . . . . . . . . . 301
Cardiac output display . . . . . . . . . . . . . . . . . 302
Cardiac output computation constant . . . . 303
Cardiac output measuring modes . . . . . . . 305
Automatic measurements . . . . . . . . . . . . . 305
Manual measurements . . . . . . . . . . . . . . . . . 307
Saving the cardiac output value . . . . . . . . 308
Reviewing the cardiac output averages . . . 309
Accessing the cardiac output settings . . . . 310
Cardiac output parameter setup functions . . 310
Overview of cardiac output monitoring

The M540 uses the thermodilution method to compute cardiac output (C.O.) for adult and pediatric patients. Cardiac output monitoring is not intended for neonatal patients.

The MPod – QuadHemo, Hemo4, and Hemo2 pods connect to the M540 and acquire the blood and injectate temperatures which are used to compute the cardiac output value.

Although the M540 processes the cardiac output algorithms, you can only view the data and execute Cardiac output functions on the Cockpit.

Cardiac output measurement method

A solution of known temperature and volume is injected into the blood stream in the right atrium. A thermistor in the catheter tip continuously measures the temperature of the blood as it leaves the heart. The injectate mixes with and cools the surrounding blood. The blood reaches its minimum temperature relatively quickly and then warms up slowly until it returns to the baseline blood temperature. The total drop in blood temperature is inversely related to the cardiac output of the patient. The lower the cardiac output value, the more the injectate cools the blood.

When computing cardiac output, the M540 takes the following factors into account:
- Injectate volume, temperature, density, and specific heat of the fluid that is being injected
- Baseline blood temperature, density, and specific heat of the blood
- Temperature changes of the blood injectate mixture
- Area under the temperature curve

The M540 supports the automatic and manual measuring modes.

The cardiac output monitoring functions are configurable in the parameter-specific setup page and the Procedures > C.O. page (see page 309).

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. Parameter-specific error messages are listed on page 471.

Supported parameters
- C.O. – Cardiac output
- Tblood – blood temperature
- Tinj – injectate temperature

C.O. Precautions

**WARNING**
An incorrect computation constant may yield incorrect cardiac output measurements and put the patient at risk. Confirm that the manually entered computation constant is correct for the catheter you are using.

**WARNING**
Verify that you enter the patient's current weight (not his or her "admit" weight). Failure to enter an accurate weight value can result in inaccurate calculations and put the patient at risk.
Connecting the cardiac output hardware

You can connect the hemodynamic cable to one of the following devices:

- MPod – QuadHemo
- Hemo4 pod
- Hemo2 pod

The intermediate cable from the listed devices connect directly to the M540.

1. Connect the grey connector of the hemodynamic intermediate cable (B) to the grey hemodynamic connector (A) of the M540.
2. Connect the red connector of the hemodynamic intermediate cable (C) to the MPod – QuadHemo connector (D).
3. Connect the pod connector of the cardiac output intermediate cable (E) to the cardiac output connector of the MPod – QuadHemo (F).
4. Connect the catheter and the thermistor cables (H) to the thermistor connector of the cardiac output intermediate cable (G).
Cardiac output (C.O.)

To connect the cardiac output hardware using the Hemo4 and the Hemo2 pod

1 Connect the hemodynamic intermediate cable connector (B) to the grey hemodynamic connector (A) of the M540.
2 Connect red connector of the hemodynamic intermediate cable (C) to the Hemo4/Hemo2 pod connector (D).
3 Connect the pod connector of the cardiac output intermediate cable (E) to the cardiac output connector of the Hemo4/Hemo2 pod (E).
4 Connect the catheter and the thermistor cables (H) to the thermistor connector of the cardiac output intermediate cable connector (G).

A M540 hemodynamic connector
B Grey intermediate cable connector
C Red intermediate cable connector
D Hemodynamic pod connector
E Cardiac output connector
F Pod connector of the cardiac output intermediate cable
G Thermistor connector of the cardiac output intermediate cable
H Thermistor cables
Cardiac output (C.O.)

Patient preparation for cardiac output monitoring

The following tips provide optimal cardiac output monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations.

– Follow the recommendations of the manufacturer. Dräger recommends that you place pre-filled syringes or the closed injectate delivery system into an ice bath.

– Check the ice bath regularly and add ice to maintain a temperature between 0 °C (32 °F) and 5 °C (41 °F). The accuracy of measurements done with the thermodilution method increases as the temperature of the injectate approaches 0 °C (32 °F).

– Verify the injectate volume.

– Verify the proper selection of catheter type and size or computation constant if Other is chosen for catheter type.

– Use an in-line injectate system. Systems that measure the injectate temperature in the ice bath can introduce errors. These errors happen because the injectate temperature changes between its removal from the ice bath and the injection.

– If you fill your syringes manually, fill them with the same volume each time. The recommended amount is 10 cc for adults and 5 cc for pediatric patients. Do not touch the body of the syringe to avoid warming the injectate.

– Inject the entire volume in one swift, continuous motion.

– Perform the injection at the end of expiration. Taking successive cardiac output measurements at different points in the respiratory cycle provides different measurements, especially for patients on mechanical ventilators.

– Discard results that are widely different from the general trend, and results associated with irregularly shaped waveforms.

NOTE
For the most accurate results when using an injectate at room temperature, use a 10 cc injectate volume unless clinically contraindicated, to get the best results.

– Verify the injectate volume.

– Verify the proper selection of catheter type and size or computation constant if Other is chosen for catheter type.
On the Cockpit, the cardiac output display consists of a parameter box.

**NOTE**
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The cardiac output parameter box contains the following elements:

- **A** C.O. label
- **B** Time stamp of the last saved cardiac output average (this area is blank if no measurements have been taken over the past 24 hours)
- **C** Blood temperature label
- **D** Blood temperature (\(T_{\text{blood}}\)) value — acquired from the hemodynamic pod
- **E** Upper/lower alarm limits or crossed triangle symbol when alarms are deactivated
- **F** Injectate temperature label
- **G** Injectate temperature value
- **H** Previously saved cardiac output value — average of a series of saved measurements

Temperature values in parameter boxes may display with a decimal point instead of a comma.
Cardiac output computation constant

**WARNING**
An incorrect computation constant may yield incorrect cardiac output measurements and put the patient at risk. Confirm that the manually entered computation constant is correct for the catheter you are using.

The computation constant compensates for the specific characteristics of the cardiac output catheters. If you use a Baxter, BD/Ohmeda, or Arrow catheter, the computation constant is automatically selected. If you choose **Other** as a catheter type (see page 310), enter a computation constant manually. The entered computation constant must correspond to the catheter, its size, injectate volume, and injectate temperature.

Consult the documentation included with the catheter for computation constants, and select one that corresponds to the used injectate volume and temperature.

To enter a computation constant manually
Make sure the catheter type **Other** is selected (see page 310), otherwise the button **Comp. constant** is not available on the **Procedures... > C.O.** page.

1. Access the **C.O.** page (see page 310)
   or
   Access the **Procedures... > C.O.** page (see page 309).
2. Select the keypad symbol next to **Comp. constant** to open a numeric keypad.
3. Enter the correct computation constant for the type of catheter being used (refer to the tables on page 304).
4. Select **Enter** on the keypad to confirm the value.

**Cardiac output (C.O.)**
Cardiac output (C.O.)

The following tables list the computation constants for Baxter, BD/Ohmeda, and Arrow catheters.

### Baxter computation constants

<table>
<thead>
<tr>
<th>Catheter size</th>
<th>Injectate volume</th>
<th>Injectate temperature (T_{inj}) sensor connected</th>
<th>Injectate temperature (T_{inj}) sensor disconnected</th>
</tr>
</thead>
<tbody>
<tr>
<td>7F</td>
<td>10 cc</td>
<td>T_{inj} = –5 to +16 °C (23 to 61 °F)</td>
<td>T_{inj} = 16 to 25 °C (61 to 80 °F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T_{inj} = 20 °C (68 °F)</td>
<td></td>
</tr>
<tr>
<td>7F</td>
<td>5 cc</td>
<td>0.561</td>
<td>0.606</td>
</tr>
<tr>
<td>7.5F</td>
<td>10 cc</td>
<td>0.574</td>
<td>0.595</td>
</tr>
<tr>
<td>7.5F</td>
<td>5 cc</td>
<td>0.287</td>
<td>0.298</td>
</tr>
<tr>
<td>5F</td>
<td>5 cc</td>
<td>0.285</td>
<td>0.307</td>
</tr>
</tbody>
</table>

### BD/Ohmeda computation constants

<table>
<thead>
<tr>
<th>Catheter size</th>
<th>Injectate volume</th>
<th>Injectate temperature (T_{inj}) sensor connected</th>
<th>Injectate temperature (T_{inj}) sensor disconnected</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5F</td>
<td>10 cc</td>
<td>T_{inj} = –5 to +16 °C (23 to 61 °F)</td>
<td></td>
</tr>
<tr>
<td>7.5F</td>
<td>5 cc</td>
<td>0.579</td>
<td>0.628</td>
</tr>
<tr>
<td>7.5F</td>
<td>3 cc</td>
<td>0.160</td>
<td>0.181</td>
</tr>
<tr>
<td>7F</td>
<td>10 cc</td>
<td>0.579</td>
<td>0.628</td>
</tr>
<tr>
<td>7F</td>
<td>5 cc</td>
<td>0.281</td>
<td>0.309</td>
</tr>
<tr>
<td>7F</td>
<td>3 cc</td>
<td>0.160</td>
<td>0.181</td>
</tr>
<tr>
<td>5F</td>
<td>5 cc</td>
<td>0.291</td>
<td>0.316</td>
</tr>
<tr>
<td>5F</td>
<td>3 cc</td>
<td>0.170</td>
<td>0.188</td>
</tr>
</tbody>
</table>
Cardiac output (C.O.)

Cardiac output measuring modes

Two cardiac output measuring modes are available: automatic and manual. If unstable blood temperatures, artifact, or other conditions are preventing automatic measurements, switch to manual mode.

If the attention tone is not deactivated (see page 389), a tone sounds when the cardiac output value has been computed.

Automatic measurements

In auto mode, the message **Inject when ready** appears in the Procedures... > C.O. page of the Cockpit when the baseline blood temperature is stable. If the blood temperature becomes unstable, the message **Inject when ready** is replaced by the message **Poor baseline**. To select the automatic cardiac output mode, see page 310.

### Arrow computation constants

<table>
<thead>
<tr>
<th>Catheter size</th>
<th>Injectate volume</th>
<th>$T_{inj} = -5 , ^\circ C$ to $23.9 , ^\circ C$ (23°F to 75°F)</th>
<th>$T_{inj} \geq 24 , ^\circ C$ (75.2°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5F</td>
<td>10 cc</td>
<td>0.532</td>
<td>0.586</td>
</tr>
<tr>
<td>7.5F</td>
<td>5 cc</td>
<td>0.249</td>
<td>0.265</td>
</tr>
<tr>
<td>7.5F</td>
<td>3 cc</td>
<td>0.131</td>
<td>0.155</td>
</tr>
<tr>
<td>7F</td>
<td>10 cc</td>
<td>0.541</td>
<td>0.601</td>
</tr>
<tr>
<td>7F</td>
<td>5 cc</td>
<td>0.250</td>
<td>0.273</td>
</tr>
<tr>
<td>7F</td>
<td>3 cc</td>
<td>0.134</td>
<td>0.156</td>
</tr>
<tr>
<td>5F</td>
<td>5 cc</td>
<td>0.267</td>
<td>0.303</td>
</tr>
<tr>
<td>5F</td>
<td>3 cc</td>
<td>0.157</td>
<td>0.192</td>
</tr>
</tbody>
</table>
Cardiac output (C.O.)

To start a measurement in auto mode
1 Press the cardiac output start key (A) on the MPod – QuadHemo or the Hemo4/Hemo2.
   or
   Select the C.O. start button on the Procedures... > C.O. page (see page 309).

NOTE
If configured to appear on the main menu bar, the C.O. start button is also accessible on the main menu bar. For more information, see page 396.

2 Wait for a tone to sound and the message Inject when ready message to appear which indicates that a stable blood temperature has been detected. Do not perform an injection before the Inject when ready message appears.

3 Inject the saline solution into the bloodstream. A thermodilution curve appears, displaying the change in blood temperature. If the blood temperature becomes unstable, the measurement is canceled automatically. If no temperature drop is detected, the curve stops and the message No Temperature Change appears.

4 Repeat step 2 to take additional measurements or to repeat a measurement, making sure to wait for the Inject when ready message.

The Procedures... > C.O. page (see page 309) stores up to five cardiac output measurements. Each value panel is touch-sensitive and allows you to include or exclude a value from the calculation of the average. Any value that is crossed out is excluded from the average. If you touch the panel again, the value reappears and will be included in the average.

To save the cardiac output average, see page 308.

NOTE
If configured to appear on the main menu bar, the C.O. start button is also accessible on the main menu bar. For more information, see page 396.
Cardiac output (C.O.)

Manual measurements

If automatic measurements are not possible due to unstable blood temperatures or other causes, switch to manual mode. To select manual cardiac output mode, see page 311.

To start a measurement in manual mode

1. Press the cardiac output start key (A) on the MPod – QuadHemo or the Hemo4/Hemo2 pods.

2. Select Procedures... from the main menu bar.

3. Select the C.O. tab to access the Procedures... > C.O. page.

4. Select the C.O. start button on the Cockpit. Inject the saline solution immediately.

5. Repeat steps 1 and 2 for additional measurements.

The Procedures... > C.O. page (see page 309) stores up to five cardiac output averages with time stamps. Each value panel is touch-sensitive and allows you to include or exclude a value from the calculation of the average. Any value that is crossed out is excluded from the average. If you touch the panel again, the value re-appears and will be included in the average.

To save the cardiac output average, see page 308.
Cardiac output (C.O.)

Saving the cardiac output value

After completing a measurement, you can store the cardiac output average. Closing the Procedures... > C.O. page without saving the cardiac output value(s) causes any unsaved values to be lost.

To save the cardiac output value manually
1. Select Procedures... from the main menu bar.
2. Select the C.O. tab to access the Procedures... > C.O. page.
3. Select the Save C.O. average button.

The stored cardiac output value and the time stamp are stored in the trend function and the parameter box.
Cardiac output (C.O.)

Reviewing the cardiac output averages

Different injection techniques cause variations in cardiac output measurements. To compensate for such discrepancies, you can review up to five measurements and use them to compute a cardiac output average. The following diagram shows the Procedures > C.O. page after computing an average.

A C.O. start button (only available in manual mode – see page 307)
B Save C.O. average button
C Most recent cardiac output average
D Blood and injectate temperature value field
E Curve field
F Up to five cardiac output measurements with time stamps. Each value panel is touch-sensitive and allows you to include or exclude a value from the calculation of the average. Any value that is crossed out is excluded from the average. If you touch the panel again, the value reappears and will be included in the average.
G Catheter type button
H Catheter size button
I Injectate volume [cc] button

If you select the catheter type Other (see page 310), a button appears at the bottom of the page. This button accesses a keypad for entering a computation constant.
Cardiac output (C.O.)

Accessing the cardiac output settings

- Select the cardiac output parameter box to select the C.O. page directly.
- or
- 1 Select Sensor parameters... from the main menu bar.
- 2 Select the C.O. tab to access the C.O. page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter (S) button.

The top portion of the page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.

Cardiac output parameter setup functions

All cardiac output setup functions take place in the C.O. page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catheter type</td>
<td></td>
<td>Displays the currently selected catheter type.</td>
</tr>
<tr>
<td></td>
<td>– BD/Ommeda (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Edwards/Baxter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Arrow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Other</td>
<td></td>
</tr>
<tr>
<td>Catheter size</td>
<td>5F, 7F (default), 7.5F</td>
<td>Displays the currently selected catheter size.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Other is selected for Catheter type setting, this button is not available.</td>
</tr>
<tr>
<td>Injectate volume [cc]</td>
<td>3.0, 5.0, or 10.0 (default)</td>
<td>Displays the currently selected volume of the injectate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Other is selected for Catheter type setting, this button is not available.</td>
</tr>
</tbody>
</table>
Cardiac output (C.O.)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp. constant</td>
<td>- 0.100 to 0.999</td>
<td>The computation constant must be entered manually if the catheter type Other was selected (see page 310). The computation constant depends on the injectate volume and temperature according to the specific values provided by the catheter.</td>
</tr>
<tr>
<td>C.O. mode</td>
<td>Auto (default), Manual</td>
<td>Determines the cardiac output measurement mode (see page 305).</td>
</tr>
<tr>
<td>C.O. start</td>
<td>None</td>
<td>Starts a cardiac output measurement (see page 305).</td>
</tr>
<tr>
<td>Color</td>
<td>White (default), there is no color selection for cardiac output</td>
<td>Determines the color of the curves, parameter labels, and values.</td>
</tr>
</tbody>
</table>
## Carbon dioxide concentrations (CO₂)

- Overview of CO₂ monitoring .......... 314
- Supported parameters ................. 314
- CO₂ precautions ..................... 315
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- Patient preparation for CO₂ monitoring .... 317
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- CO₂ parameter box .................... 318
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- CO₂ parameter setup functions ........ 321
Overview of CO₂ monitoring

The M540 provides fast and continuous mainstream measurements of carbon dioxide concentrations (CO₂) in the airway of intubated patients. The M540 acquires signals from a CO₂ sensor (Infinity MCable – Mainstream CO₂) which fits over a mainstream airway adapter. The lightweight, reusable CO₂ mainstream sensor provides sensitive and accurate measurements. It uses non-dispersive infrared technology to measure CO₂ in respiratory gases.

CO₂ monitoring is available for adult, pediatric, and neonatal patients. Refer to the instructions for use entitled Infinity Acute Care System – Infinity M540 for ordering information of the appropriate size of accessories.

As respiration gases flow through the airway adapter, the sensor analyzes the expired and inspired air of the patient. The analysis is accomplished by sending a beam of infrared light through transparent ports in the airway adapter while detecting changes in CO₂ absorption levels.

Supported parameters
- etCO₂ – end-tidal CO₂
- inCO₂ – inspired CO₂
- RRc – respiration rate calculated from the capnogram

Refer to the instructions for use Infinity Acute Care System – Infinity M540 for a detailed description of the M540 CO₂ functions.

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. Parameter-specific error messages are listed on page 478.
# CO₂ Precautions

Refer to "Site of operation" on page 17 for general precautions.

<table>
<thead>
<tr>
<th>WARNING</th>
<th>CO₂ alarms do not activate until the first breath is detected after turning on the monitor or discharging a patient.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING</td>
<td>The surface temperature of the sensor may rise to 43 °C (109 °F). Prolonged exposure to the patient's skin may result in a burn.</td>
</tr>
<tr>
<td>WARNING</td>
<td>The safety and effectiveness of the respiration measurement method in the detection of apnea, particularly the apnea of prematurity and apnea of infancy, has not been established.</td>
</tr>
<tr>
<td>WARNING</td>
<td>Patient monitors that measure CO₂, anesthetic agents, and/or respiratory mechanics are not intended to be used as an apnea monitor and/or recording device. While these products provide an apnea alarm, that alarm condition is initiated based on the elapsed time since the last breath was detected. Clinical diagnosis of a true apneic event, however, requires multiple physiological signals.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>To avoid accidental disconnections, do not apply excessive tension to any sensor cable.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>To prevent leakage, make sure the airway adapter is firmly connected to the breathing circuit.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>Check the CO₂ mainstream sensor for damage before use. A damaged CO₂ sensor may impair electrical isolation or may introduce debris into the breathing circuit.</td>
</tr>
<tr>
<td>NOTE</td>
<td>Dräger CO₂ accessories that come in contact with the patient do not contain natural rubber latex.</td>
</tr>
</tbody>
</table>

Carbon dioxide concentrations (CO₂)
Connecting the sensor

Before you connect any CO2 hardware, make sure the airway adapter in use matches the airway adapter setting of the Cockpit (see page 415). For example, you should not use a disposable airway adapter if the Cockpit is configured for a reusable airway adapter (and vice versa). Not aligning the adapter with the configuration setting at the Cockpit compromises the displayed CO2 value.

The CO2 cable connects directly to the M540.

1. Connect the CO2 sensor cable connector (B) to the yellow CO2 connector (A) on the M540.
2. Select a suitable mainstream airway adapter (C) whose windows are clean and dry (replace the adapter if necessary).
3. Insert the airway adapter (E) between the endotracheal tube adapter (F) and the ventilator Y-piece (D).
4. Snap the mainstream airway adapter (C) firmly into the airway adapter and make sure that the cable is directed away from the patient.

CAUTION
Always position the sensor windows of the airway adapter vertically to prevent patient secretions from obscuring the adapter windows.

A M540 CO2 connector
B CO2 sensor cable connector
C Mainstream airway adapter
D Y-piece
E Airway adapter
F Tracheal tube adapter

The IACS is only compatible with the sensors 6871950 revision 5 or higher. Previous revisions are not compatible.

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Carbon dioxide concentrations (CO₂)

Patient preparation for CO₂ monitoring

The following tips provide optimal monitoring results but must never replace hospital-approved practices or manufacturer’s recommendations.

A default O₂ concentration of 21 % (the percentage of oxygen in ambient air) for all CO₂ measurements is assumed. If the patient is receiving supplemental oxygen or N₂O or Heliox, select the gas that is being administered in the CO₂ setup page. Make sure to adjust the atmospheric pressure to the actual measurement value. Failure to compensate for supplemental gases results in inaccurate measurement values.

When switching adapter types (from reusable to disposable or adult to pediatric, or vice versa) you do not have to zero a Dräger sensor. If the sensor window is clean and the correct sensor type is selected under the Airway adapter Biomed setting, only zero a Dräger sensor when the measurement value is suspect or when prompted to zero.
CO2 display

On the Cockpit, the CO2 display consists of:
– A CO2 parameter box
– A CO2 waveform (capnogram)

CO2 parameter box

**NOTE**
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see “Parameter boxes” on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter “Problem solving” on page 449.

The CO2 parameter box contains the following elements:

- A etCO2 (end-tidal CO2) label
- B Unit of measure (can be activated/deactivated)
- C inCO2 label (inspired CO2)
- D inCO2 value – the level of CO2 in the airway during inspiration, taken as the minimum value during the previous measurement interval
- E Upper/lower alarm limits or crossed triangle symbols when alarms are deactivated
- F RRc (respiratory rate) parameter label
- G RRc value – respiratory rate derived from the CO2 signal
- H etCO2 value – highest CO2 value in the airway during expiratory period
Carbon dioxide concentrations (CO₂)

**Capnograms**

The Cockpit also displays an instantaneous CO₂ waveform or capnogram.

![Capnogram Diagram]

- A Expiratory or alveolar plateau (level of CO₂ in lungs ceases to increase significantly)
- B End-tidal concentration point (end of expiration phase, where CO₂ is measured)
- C Onset of inspiration phase
- D Onset of expiratory phase
- E Baseline during inspiration

**Troubleshooting**

In addition to evaluating the clinical status of a patient, capnograms can help troubleshoot problems with equipment. The following table shows how capnograms can be used to identify common problems.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cause</th>
<th>Capnogram</th>
</tr>
</thead>
</table>
| Alveolar plateau showing a downward slope that merges with a descending limb. | - Inadequate seal around the endotracheal tube  
- Leaky or deflated endotracheal or tracheostomy cuff  
- Artificial airway that is too small for the patient | ![Capnogram Example] |
<table>
<thead>
<tr>
<th>Description</th>
<th>Cause</th>
<th>Capnogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated waveform baseline with corresponding increase in CO2 level.</td>
<td>Rebreathing due to one of the following causes:</td>
<td><img src="image1.png" alt="Graph" /></td>
</tr>
<tr>
<td></td>
<td>- Disposable airway adapter is used although the Cockpit is configured for the reusable adapter type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Contaminated airway adapter (dirty window)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- CO2 zero drift</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Insufficient expiratory time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Faulty expiratory valve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inadequate inspiratory flow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Malfunction of a CO2 absorber system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Partial rebreathing circuits</td>
<td></td>
</tr>
<tr>
<td>Change in slope of ascending limb. Possible absence of an alveolar plateau.</td>
<td>Obstruction caused by one of the following:</td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
<tr>
<td></td>
<td>- Partial obstruction in expiratory limb of breathing circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Foreign body in upper airway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Partially kinked or occluded artificial airway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Herniated endotracheal or tracheostomy tube cuff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Bronchospasm</td>
<td></td>
</tr>
<tr>
<td>Elevated baseline, with pronounced slope on descending limb</td>
<td>- Faulty ventilator circuit valve</td>
<td><img src="image3.png" alt="Graph" /></td>
</tr>
<tr>
<td></td>
<td>- Rebreathing (see above)</td>
<td></td>
</tr>
</tbody>
</table>
Accessing the CO₂ settings

- Select the CO₂ parameter box to select the CO₂ page directly.
  or
- 1 Select Sensor parameters... from the main menu bar.
- 2 Select the CO₂ tab to access the CO₂ page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.

The top portion of the setup page contains the Auto set and Alarm buttons for configuring the alarm functions. For detailed alarm setup information, see "Configuring the alarm settings for a patient" on page 115.

For the inCO₂ parameter, you can only adjust the upper alarm limit. In addition, the Auto set function does not apply to this parameter.

CO₂ parameter setup functions

All CO₂ setup functions take place in the CO₂ page. Before you connect any CO₂ hardware, make sure the airway adapter that is used, matches the airway adapter setting at the Cockpit (see page 415).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
</table>
| Zero      | None              | Zeroes the CO₂ sensor if necessary. The CO₂ sensor stores a new zero point for CO₂ measurements.  
NOTE  
The sensor must be removed from the airway adapter before zeroing. The sensor is zeroed in room air. Do not breathe on the airway adapter during zeroing. |
| Scale     | 0 to 40 mmHg (default), 0 to 60 mmHg, 0 to 80 mmHg, 0 to 100 mmHg  
- 0 to 5 kPa (default), 0 to 8 kPa, 0 to 12 kPa, 0 to 16 kPa  
- 0 to 5 % (default), 0 to 8 %, 0 to 12 %, 0 to 16 % | Adjusts the size of the CO₂ waveform. |
Carbon dioxide concentrations (CO$_2$)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atm. pressure</strong></td>
<td>570 to 800 mmHg, Default: 760 mmHg</td>
<td>Determines the atmospheric pressure setting of the sensor and compensates for pressure effects. Failure to compensate for pressure can cause inaccurate measurements.</td>
</tr>
<tr>
<td><strong>Gas compensation</strong></td>
<td>Air (default), N$_2$O/O$_2$, O$_2$&gt;50%, HeliOx</td>
<td>Compensates for supplemental oxygen or N$_2$O or Heliox. Failure to compensate for supplemental oxygen can cause inaccurate measurements.</td>
</tr>
<tr>
<td><strong>RRc apnea time [sec]</strong></td>
<td>Off (default), 10, 15, 20, 25, 30 s</td>
<td>Specifies the time the M540 waits before reporting a cessation of breathing as an apnea event.</td>
</tr>
<tr>
<td><strong>Apnea archive</strong></td>
<td>Off, Record, Store (default), Str/Rec</td>
<td>Determines what happens in response to an apnea.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow (default), light blue, purple, orange, white.</td>
<td>Determines the color of the waveforms and parameter labels/values.</td>
</tr>
</tbody>
</table>
External Device – Bispectral index (BIS)

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BIS precautions ........................................ 325
Device compatibility .................................. 325
BIS display ............................................... 325
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BIS parameter setup functions .................... 328
BIS Show all page ..................................... 328
Overview of BIS monitoring

The Cockpit acquires data from the Aspect BIS VISTA Complete monitoring system using an RS232 connection.

BIS monitoring provides the level of consciousness using EEG electrodes that are affixed to the patient’s forehead. The BIS value guides the clinician in administering the correct level of anesthetic agents to achieve the correct level of sedation.

**NOTE**

Waveforms are not supported on recordings.

BIS monitoring is available for adult and pediatric patients. It is not available in neonatal mode.

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 11.

For detailed information and technical specifications regarding BIS monitoring with the BIS VISTA devices, refer to the documentation provided by the manufacturer.

**Supported parameters and settings**

- BIS – Bispectral index
- EMG – Electromyograph indicator
- SQI – Signal quality index
- BSR – Suppression ratio
- PWR – Total signal power
- SEF – Spectral edge frequency
- BCT – Burst count

The **Smoothing rate** setting is supported on the network but it is not available for export protocol.

All supported BIS parameters are trended as graphical and tabular trends. For more information (see page 157). The **Smoothing rate** setting and all of the BIS parameters are displayed in the **Show all** page (see page 328).

All BIS parameters are supported on the network and available for export protocol. The **Smoothing rate** setting is supported on the network but it is not available for export protocol.
BIS precautions

**WARNING**
When connecting a third-party device, verify its proper operation before clinical use. Refer to the instructions for use of the third-party device for complete instructions. For further questions, contact your local representative.

**WARNING**
Always refer to the primary data source before making diagnostic or therapeutic decisions. Connecting peripheral devices is supported via the device connectivity option. Only connect peripheral medical devices to a patient monitor if those devices comply with the electrical safety requirements found in IEC 60601-1. Refer to "Safe connection with other electrical equipment" on page 13 of these instructions for use on how to connect devices safely.

**WARNING**
The following section lists all of the external devices and related software versions that Dräger has validated. Dräger cannot make any claim for the reliability of the data for subsequent or previous software versions or for any devices that have not been validated. In the interest of patient safety and device performance, do not connect devices to the monitor which have not been approved by Dräger. The hospital is responsible for contacting Dräger to determine the compatibility and warranty status of any connection made to another manufacturer’s medical devices.

Device compatibility

The Cockpit supports the Aspect BIS Vista Complete 2 channel monitor with software version 3.00.

BIS display

On the Cockpit, the BIS x display consists of:
- BISx parameter box
- 1 EEG waveform

BIS parameter box

**NOTE**
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

BIS parameter boxes report parameter values. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The BIS parameter box contains the following elements:
External Device – Bispectral index (BIS)

EMG bar graph
The EMG bar graph consists of 5 tic marks. As the amplitude increases, more tic marks are filled in white.

A First section is filled in – 30 to 38 dB
B Second section is filled in – 39 to 47 dB
C Third section is filled in – 48 to 55 dB
D All sections filled in – > 55 dB

A Bispectral index label (BIS)
B Secondary parameter label (selectable)
C Secondary parameter value
D EMG label
E Electromyograph bargraph indicating the current amplitude of the EMG signal.
F Signal quality index (SQI) bargraph indicating the quality of the detected signal.
G Signal quality index label (SQI)
H BIS value

NOTE
If the SQI value is less than 15%, the parameter values for BIS, BSR, BCT, SEF, and PWR will be replaced by *** identifying them as unreliable.

If the SQI value falls between 15% and 50% a question mark appears next to the BIS value indicating the value may be unreliable.

If BSR is less than 5%, the BCT value will be replaced by *** identifying it as unreliable.
SQI bar graph

The SQI bar graph consists of 5 bars. The more bars are filled in green, the better the quality of the signal.

A  SQI value between 0 and 20
B  SQI value between 21 and 40
C  SQI value between 41 and 60
D  SQI value between 61 and 80
E  SQI value between 81 and 100

Waveforms

One EEG waveform (labelled as EEG T) is displayed next to the BIS parameter box.
External Device – Bispectral index (BIS)

Accessing the BIS settings

- Select the BIS parameter box to select the BIS page directly.

or

1. Select Sensor parameters... from the main menu bar.
2. Select the BIS tab to access the BIS page.

If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: symbol and the display filter button.

3. Select the Settings and Show all tab.

BIS parameter setup functions

All BIS setup functions take place in the BIS page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale [µV]</td>
<td>5, 10, 25, 50, 100 (default), 250 µV</td>
<td>Selects the scale of the EEG T waveform.</td>
</tr>
<tr>
<td>Smoothing rate [s]</td>
<td>Informational data only</td>
<td>Not applicable</td>
</tr>
<tr>
<td>BIS secondary parameter</td>
<td>BSR, BCT (default), SEF, PWR</td>
<td>Selects a secondary parameter and assigns it to the BIS parameter box (see page 325)</td>
</tr>
<tr>
<td>No alarm signaling for this device.</td>
<td>Informational message that no visual or acoustic alarm signals are available on the Cockpit</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

BIS Show all page

This page displays all supported BIS parameters, settings, labels and the units of measure where appropriate.
External Device – Neuromuscular transmission (NMT)

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Overview of NMT monitoring

The Cockpit supports communication with third-party neuromuscular transmission devices using an RS232 connection.

NMT monitoring measures the level of muscle relaxation of patients under the influence of neuromuscular blocking agents. By using an electrical stimulus of a peripheral nerve, the muscle response (thumb twitch) and the skin temperature can be measured.

NMT monitoring is available for adult, pediatric, and neonatal patients.

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11.

For detailed information and technical specifications regarding NMT monitoring, refer to the documentation provided by the manufacturer of the NMT device.

Supported parameters

- Start NMT – Thermistor temperature (°C)
- Single-Twitch height (%)
- TOF Ratio – Train of Four ratio (%)
- TOF-Cnt – Train of Four count (no unit of measure)
- PTC – Post Tetanic Count (no unit of measure)

All NMT parameters are trended and available on the Infinity network and export protocol. All trended NMT parameters are available for network transfer. For more information (see page 157).

Supported modes

- Single mode – measures the muscle twitch in response to a single stimulation pulse. 1 Hz and 0.1 Hz stimulation is supported.
- TOF (Train of Four) – A sequence of four stimulation pulses is sent and the magnitude of the muscle twitch after each individual pulse is measured.
- TOFs (slow Train of Four) – the user sets the frequency of the stimulation of four pulses.
- PTC (Post Tetanic Count) – counts the responses of tetanic stimulation followed by single stimuli at one-second intervals

NMT modes are not displayed. Furthermore, they are not available on the network and are not available for export protocol.

Supported settings

- Stimulation current mode – determines if the stimulation current was obtained automatically or set by the user manually.
- Stimulation current – reports the current in mA
- Pulse width – reports the width of the pulse microseconds
- Sensitivity – reports the acceleration transducer sensitivity. This setting is for optimizing the twitch height percentage manually.

All NMT settings are broadcast to the Infinity network. They are not available for Export protocol.
NMT precautions

**WARNING**
When connecting a third-party device, verify its proper operation before clinical use. Refer to the instructions for use of the third-party device for complete instructions. For further questions, contact your local representative.

**WARNING**
Always refer to the primary data source before making diagnostic or therapeutic decisions. Connecting peripheral devices is supported via the device connectivity option. Only connect peripheral medical devices to a patient monitor if those devices comply with the electrical safety requirements found in IEC 60601-1. Refer to "Safe connection with other electrical equipment" on page 13 of these instructions for use for information on how to connect devices safely.

**WARNING**
The following section lists all of the external devices and related software versions that Dräger has validated. Dräger cannot make any claim for the reliability of the data for subsequent or previous software versions or for any devices that have not been validated. In the interest of patient safety and device performance, do not connect devices to the monitor which have not been approved by Dräger. The hospital is responsible for contacting Dräger to determine the compatibility and warranty status of any connection made to another manufacturer’s medical devices.

**Device compatibility**
The Cockpit is compatible with the following NMT devices:
- TOF scan - minimum version 1.5.8
- TOF Watch SX

NMT display

On the Cockpit, the NMT display consists of three NMT parameter boxes. The content depends on one of the following modes which is selected at the NMT device:
- Single
- TOF Ratio or TOF Cnt (parameter box display depends on the selected mode)
- PTC

**NOTE**
The following diagrams show a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52. Parameter boxes report parameter values and indicate certain technical information such as signal strength and time stamps (see page 332 for detailed information).
External Device – Neuromuscular transmission (NMT)

NMT parameter box (single mode)
The NMT parameter box in ‘Single’ mode contains the following elements:

A  Neuromuscular transmission label (NMT)
B  Bar graph indicating the relative magnitude of the twitch response
C  NMT mode label Single
D  Skin temperature value (display depends on menu setting - see page 335)
E  Time stamp of the current value (the time stamp identifies the time the Cockpit received the value from the connected device)
F  No cal! message to indicate that the NMT device was not calibrated
G  Single twitch value

NMT parameter box (PTC mode)
The NMT parameter box in PTC mode contains the following elements:

A  Neuromuscular transmission label (NMT)
B  NMT mode label PTC
C  Time stamp of current value (display depends on menu setting - see page 335)
D  PTC value
E  15 individual amplitude bar graphs indicating the number of twitches
External Device – Neuromuscular transmission (NMT)

NMT parameter box (TOF/TOFS mode)

The NMT parameter box in ‘TOF /TOFS’ mode is very similar and contain the following elements:

A  Neuromuscular transmission label (NMT)
B  NMT parameter label TOF Ratio or TOF Cnt

TOF Ratio appears when the TOF count is equal to four twitches and the amplitude of the first twitch is ≥ 20%.

TOF Cnt appears when the TOF count is < three twitches or there are four twitches and the magnitude of the first twitch is < 20%.

C  Time stamp of the current value (the time stamp identifies the time the Cockpit received the value from the connected device)

D  Count down time bar and value indicating the remaining time in the interval before the start of the next set of measurements - displayed only in TOF's mode

The label auto 15 s appears instead of the count down bar when the user initiates automatic TOF.

E  TOF Ratio / TOF-Cnt value

F  4 individual amplitude bar graphs indicating the number of TOF counts (the last bar shows the magnitude of the fourth twitch).
Printing NMT information

You can print a report of all NMT settings and up to the latest 500 measurements.

Printing NMT settings and measurements

1 Select the NMT parameter box to select the NMT page directly.
2 Select the Print button in the lower left corner of the NMT page.

or

1 Select Sensor parameters... from the main menu bar.
2 Select the NMT tab to access the NMT page.
3 Select the Print button in the lower left corner of the NMT page.

Accessing the NMT settings

- Select the NMT parameter box to select the NMT page directly.

or

1 Select Sensor parameters... from the main menu bar.
2 Select the NMT tab to access the NMT page.

If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: ➔ symbol and the display filter button.
The NMT page

The NMT page displays the settings of the NMT device. Except for the Display temperature and the Print buttons these settings are informational only and cannot be changed on the Cockpit. The NMT page also displays the latest NMT measurement values collected. A total of 500 measurements can be reviewed and are accessible with the scroll bar. Once the data base reaches 500 measurements, the oldest measurement is replaced by the most recent one.

Unlike trends, the measurements on the NMT page cannot be transferred.

The following diagram depicts the NMT page.

A Display temperature button for activating or deactivating the temperature display in the NMT parameter box.
B Settings panel – displays the settings of the connected third-party NMT device.
C Measurements panel – reports the last 500 NMT measurements (see table ‘The NMT page’ on page 335).
D Scroll bar for scrolling through the collected NMT data.
E Print button for printing the measurements and settings.
F No alarm signaling for this device. – Informational message.
## NMT parameter functions and settings

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display temperature</td>
<td>– Off (Default)</td>
<td>Controls the temperature display in the NMT parameter box.</td>
</tr>
<tr>
<td>Stim current</td>
<td>0 to 60 mA (no default)</td>
<td>Displays the stimulation current of the NMT device.</td>
</tr>
<tr>
<td>Stim current mode</td>
<td>Auto</td>
<td>The NMT device establishes a supramaximal current during the first measurement and uses it for subsequent measurements.</td>
</tr>
<tr>
<td></td>
<td>Manual</td>
<td>The stimulation current was selected manually.</td>
</tr>
<tr>
<td>Sensitivity (1-512)</td>
<td>Between 1 and 512 (no default)</td>
<td>Displays the sensitivity of the NMT device.</td>
</tr>
<tr>
<td>Pulse width</td>
<td>200 or 300 µs</td>
<td>Determines the width of the pulse.</td>
</tr>
<tr>
<td>Print</td>
<td></td>
<td>Prints the current NMT settings and up to 500 of the most recent measurements.</td>
</tr>
<tr>
<td>No alarm signaling</td>
<td></td>
<td>Informational message that no visual or acoustic alarm signals are available on the Cockpit.</td>
</tr>
</tbody>
</table>
# External device – continuous cardiac output (CCO)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
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</table>
Overview of CCO monitoring

With the device connectivity option, the Cockpit can display parameter values from a continuous cardiac output device. Within 30 seconds of connecting the device, the data appear at the Cockpit. The following cardiac output devices are supported:

- Vigilance II SvO2/CCO
- Vigileo SvO2/CCO
- EV1000

The CCO monitoring functions are configurable in the parameter-specific setup page (see page 343).

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11.

External device alarms
If the external device alarm feature is activated at the Cockpit (see page 403) and an external device is disconnected from the Cockpit, the following happens at the Cockpit and at the ICS when the patient is admitted at the ICS:

- An alarm tone of low priority sounds.
- The message **External device disconnected** appears.

Reference handbook
For a complete list of available parameters contact your DrägerService representative.
Supported parameters

The following table lists the supported parameters displayed on the Cockpit originating from external CCO devices that are supporting and monitoring these parameters. The range and resolution for all parameters are provided by the CCO device. All of the parameters are displayed in the Show all page (see page 342).

<table>
<thead>
<tr>
<th>Label</th>
<th>Parameter</th>
<th>Unit of measure</th>
<th>Comments</th>
<th>Cockpit Trends page</th>
<th>Originating from which device</th>
</tr>
</thead>
<tbody>
<tr>
<td>SvO2</td>
<td>Venous oxygen saturation</td>
<td>%</td>
<td>Not applicable</td>
<td>Not trended</td>
<td>Vigilance II, Vigileo, EV1000</td>
</tr>
<tr>
<td>CCO</td>
<td>Continuous cardiac output</td>
<td>L/min</td>
<td>Not applicable</td>
<td>Continuous trend</td>
<td></td>
</tr>
<tr>
<td>CCI</td>
<td>Continuous cardiac output index</td>
<td>L/min/m²</td>
<td>Calculated value on Cockpit; requires height and weight values from the Cockpit.</td>
<td>Continuous trend</td>
<td></td>
</tr>
<tr>
<td>SVR</td>
<td>Systemic vascular resistance</td>
<td>dyn x s/cm²</td>
<td>Calculated value at the Cockpit; requires the values for ART M and CVP from the Cockpit.</td>
<td>Continuous trend</td>
<td></td>
</tr>
<tr>
<td>SVRI</td>
<td>Systemic vascular resistance in-</td>
<td>dyn x s/cm²/m²</td>
<td>Calculated value on Cockpit; requires height and weight values from the Cockpit.</td>
<td>Continuous trend</td>
<td></td>
</tr>
<tr>
<td>SV</td>
<td>Stroke volume</td>
<td>mL</td>
<td>Calculated value on Cockpit; requires heart rate to be monitored.</td>
<td>Continuous trend</td>
<td></td>
</tr>
<tr>
<td>SVI</td>
<td>Stroke volume index</td>
<td>mL/m²</td>
<td></td>
<td>Continuous trend</td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td>Parameter</td>
<td>Unit of measure</td>
<td>Comments</td>
<td>Cockpit Trends page</td>
<td>Originating from which device</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------</td>
<td>----------------</td>
<td>----------</td>
<td>---------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Tblood</td>
<td>Blood temperature</td>
<td>°C or °F</td>
<td>Unit of measure is determined by the unit of measure selected at the Cockpit</td>
<td>Continuous trend</td>
<td>Vigilance II and EV1000</td>
</tr>
<tr>
<td>VO2</td>
<td>Oxygen consumption</td>
<td>mL/min</td>
<td>Not applicable</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>DO2</td>
<td>Oxygen delivery</td>
<td>mL/min</td>
<td>Not applicable</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>SaO2</td>
<td>Arterial oxygen saturation</td>
<td>%</td>
<td>Not applicable</td>
<td>Continuous trend</td>
<td>Vigilance II</td>
</tr>
<tr>
<td>EDV</td>
<td>End diastolic volume</td>
<td>mL</td>
<td>Not applicable</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>EDVI</td>
<td>End diastolic volume index</td>
<td>mL/m²</td>
<td>Calculated value on Cockpit; requires height and weight values from the Cockpit</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>ESV</td>
<td>End systolic volume</td>
<td>mL</td>
<td>Not applicable</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>ESVI</td>
<td>End systolic volume index</td>
<td>mL/m²</td>
<td>Calculated value on Cockpit; requires height and weight values from the Cockpit</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>EF</td>
<td>Ejection fraction</td>
<td>%</td>
<td>Not applicable</td>
<td>Not trended</td>
<td></td>
</tr>
<tr>
<td>SVV</td>
<td>Stroke volume variation</td>
<td>%</td>
<td>Calculated parameter on Cockpit; if required parameters are not monitored or entered, the parameter appears blank</td>
<td>Continuous trend</td>
<td>Vigileo and EV1000</td>
</tr>
</tbody>
</table>
External device – continuous cardiac output (CCO)

**CCO precautions**

**WARNING**
To reduce the risk of patient injury due to electrical shock, always position the external device connectivity cable as far from the patient as possible. Make sure that any cables or other conducting devices do not come in contact with the patient. The device connectivity cable is electrically isolated from the monitor and any peripheral devices, but the cable’s enclosure is not electrically isolated from the peripheral device itself.

**WARNING**
The Cockpit does not annunciate alarms for external device parameters.

**WARNING**
Always refer to the primary data source before making diagnostic or therapeutic decisions. Connecting peripheral devices is supported via the device connectivity option. Only connect peripheral medical devices to a patient monitor if those devices comply with the electrical safety requirements found in IEC 60601-1. Refer to "Safe connection with other electrical equipment" on page 13 of these instructions for use for information on how to connect devices safely.
CCO/SvO2 display

On the Cockpit, the CCO/SvO2 display consists of a parameter box.

CCO/SvO2 parameter box

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter “Problem solving” on page 449.

The CCO/SvO2 parameter box contains the following elements:

- **A** Primary parameter label
- **B** Secondary parameter label
- **C** Secondary parameter value
- **D** Third parameter label
- **E** Third parameter value
- **F** Primary parameter value

Viewing the CCO/SvO2 parameters

The **Show all** page displays the values of the currently monitored CCO/SvO2 parameters.

To access the CCO/SvO2 parameters

1. Select the **Sensor parameters...** button from the main menu bar.
2. Select the **CCO** tab. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.
3. Select the **Show all** tab.
   
   or
   
   1. Select the **Trends/Data...** button from the main menu bar.
   2. Select the **Hemo** tab.
   3. Select the **Show all** tab.
External device – continuous cardiac output (CCO)

Accessing the CCO/SvO2 settings

1. Select the **Sensor parameters...** button from the main menu bar.
2. Select the **CCO** tab. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >>, symbol and the display filter button.

SvO2 parameter setup functions

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter 1</td>
<td>SvO2 (default), Tblood, CCO, CCI, VO2, DO2, SaO2, SVR, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV</td>
<td>Selects the primary parameter in the CCO parameter box.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>SvO2, Tblood, CCO (default), CCI, VO2, DO2, SaO2, SVR, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV</td>
<td>Selects the secondary parameter in the CCO parameter box.</td>
</tr>
<tr>
<td>Parameter 3</td>
<td>SvO2, Tblood, CCO, CCI, VO2, DO2, SaO2, SVR (default), SVR, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV</td>
<td>Selects the third parameter in the CCO parameter box.</td>
</tr>
<tr>
<td>CCO mini trend</td>
<td>SvO2, SVV, CCO (default), CCI, SVR, SVRI, SV, SVI</td>
<td>Selects the parameter to be included in the mini trend.</td>
</tr>
</tbody>
</table>
External devices – Medibus.X devices

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- Precautions ..................................... 347
- Compatible Medibus X devices ............... 347
  - Supported Medibus X ventilator and anesthesia data ................. 348
  - Supported parameters on the Cockpit .................. 348
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- CO2 setup functions ........................... 362
External device monitoring

The device connectivity option enables the Cockpit to partner with external Medibus.X-compatible devices to provide the following functionality:

- Display parameter values, waveforms, and loops from ventilators and anesthesia machines
- Trend parameters
- Show all pages for ventilators that can be configured
- Configurable display of parameter boxes for ventilators and anesthesia machines

Within 30 seconds of connecting a device, the data appear at the Cockpit.

External device alarms

Alarms from the ventilator are transmitted to the Infinity network and made available for alarm announcement at the ICS. For more information, refer to the instructions for use Infinity CentralStation.

If the external device alarm feature is activated at the Cockpit (see page 403) and an external device is disconnected from the Cockpit, the following happens at the Cockpit and at the ICS when the patient is admitted at the ICS:

- An alarm tone of low priority sounds.
- The message **External device disconnected** is displayed.

**NOTE**

Ventilation waveforms are not supported on recordings.

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. For device-specific error messages, refer to the instructions for use of the connected ventilator.

**NOTE**

When connecting a ventilator that does not support CO₂ monitoring, the Cockpit may still display a CO₂ tab in the Ventilator dialog window.
External devices – Medibus.X devices

Precautions

**WARNING**
Always refer to the primary data source before making diagnostic or therapeutic decisions.

Connecting peripheral devices is supported via the device connectivity option. Only connect peripheral medical devices to a patient monitor if those devices comply with the electrical safety requirements found in IEC 60601-1. Refer to “Safe connection with other electrical equipment” on page 13 of these instructions for use for information on how to connect devices safely.

**WARNING**
The following table lists all of the external devices and related software versions that Dräger has validated. Dräger cannot make any claim for the reliability of the data for subsequent or previous software versions or for any devices that have not been validated. In the interest of patient safety and device performance, do not connect devices to the monitor which have not been approved by Dräger. The hospital is responsible for contacting Dräger to determine the compatibility and warranty status of any connection made to another manufacturer’s medical devices.

**Supported device** | **Supported software version**
---|---
**Ventilators**
Dräger Evita V500 | 2.31
Dräger Babylog VN500 | 2.31
Savina 300 | 4.02
Carina | 3.21
Dräger Evita V300 | 2.31
Oxylog 3000+ | 1.04
**Anesthesia machines**
Primus family, Apollo | 4.6
Infinity Perseus A500 | 1.11
Zeus IE | 1.04

The Cockpit device connectivity interface allows data from various standalone devices to display parameters, settings and waveforms on the Cockpit.

The following table lists all of the external devices and related software versions that Dräger has validated. Dräger cannot make any claim for the reliability of the data for subsequent or previous software versions or for any devices that have not been validated. In the interest of patient safety and device performance, do not connect devices to the monitor which have not been approved by Dräger. The hospital is responsible for contacting Dräger to determine the compatibility and warranty status of any connection made to another manufacturer’s medical devices.
Supported Medibus.X ventilator and anesthesia data

The Medibus.X ventilators and anesthesia devices send parameters, settings, modes, and waveforms are broadcast to the network via the Cockpit. However, not all parameters are displayed at the Cockpit (see table below for supported parameters). In addition, the Cockpit refuses all low priority alarm messages but broadcasts all medium-priority and high-priority alarm messages to the Infinity network.

Refer to the RS-232 export handbook for information on which parameters are available for export protocol. The RS-232 export handbook is available in English only.

Supported parameters on the Cockpit

The following table lists which Medibus.X ventilator and anesthesia parameters are displayed and trended on the Cockpit. Refer to page 347 for a list of supported ventilators and anesthesia machines and the compatible software versions.

<table>
<thead>
<tr>
<th>Parameter label</th>
<th>Description</th>
<th>Unit of measure</th>
<th>Displayed in Ventilation or Anesthesia</th>
<th>Cockpit Trends page</th>
<th>Available for display in parameter box</th>
<th>Yes/No?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air cons</td>
<td>Accumulated air consumption</td>
<td>L</td>
<td>Ventilation</td>
<td>Not trended</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Cdyn</td>
<td>Dynamic compliance</td>
<td>L/bar</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>CO2 slope</td>
<td>Increase of measured CO2 value in phase III of the capnogram</td>
<td>mHg/L, kPa/L, Vol%L</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>C20/Cdyn</td>
<td>Ratio of compliance during the last 20% of inspiration of dynamic compliance</td>
<td>No units</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>DCO2</td>
<td>CO2 elimination coefficient during HFO</td>
<td>10^6 mL^2/s</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Des cons</td>
<td>Desflurane consumption</td>
<td>mL</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>E</td>
<td>Elastance</td>
<td>mbar/L</td>
<td>Anesthesia and Ventilation</td>
<td>Continuous trend</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Parameter label</td>
<td>Description</td>
<td>Unit of measure</td>
<td>Displayed in Ventilation or Anesthesia (see page 357)</td>
<td>Cockpit Trends page</td>
<td>Available for display in parameter box?</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------</td>
<td>----------------</td>
<td>------------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>EIP</td>
<td>End-inspiratory pressure</td>
<td>mbar</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Enfl cons</td>
<td>Enflurane consumption</td>
<td>mL</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>etCO2</td>
<td>End-tidal carbon dioxide concentration</td>
<td>%</td>
<td>Anesthesia and Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etDes</td>
<td>End-tidal desflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etEnf</td>
<td>End-tidal enflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etHal</td>
<td>End-tidal halothane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etiso</td>
<td>End-tidal isoflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etN2O</td>
<td>End-tidal nitrous oxide concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etO2</td>
<td>End-tidal oxygen concentration</td>
<td>%</td>
<td>Anesthesia and Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>etSev</td>
<td>End-tidal sevoflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>FiO2</td>
<td>Inspiratory oxygen fraction</td>
<td>%</td>
<td>Anesthesia and Ventilation</td>
<td>Continuous trend</td>
<td>Yes (requires 95% FiO2)</td>
<td></td>
</tr>
<tr>
<td>FlowDev</td>
<td>Average device flow</td>
<td>L/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Hal cons</td>
<td>Accumulated halothane consumption</td>
<td>mL</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>inHal</td>
<td>Inspiratory halothane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>inCO2</td>
<td>Inspiratory carbon dioxide concen-</td>
<td>%</td>
<td>Anesthesia and Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Parameter label</td>
<td>Description</td>
<td>Unit of measure</td>
<td>Displayed in Ventilation or Anesthesia (see page 357)</td>
<td>Cockpit Trends page</td>
<td>Available for display in parameter box?</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>-----------------</td>
<td>-----------------------------------------------------</td>
<td>---------------------</td>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>I:E I-Part</td>
<td>Inspiratory component</td>
<td>No units</td>
<td>Ventilation</td>
<td>Not trended</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>I:E E-Part</td>
<td>Expiratory component</td>
<td>No units</td>
<td>Ventilation</td>
<td>Not trended</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>inEnf</td>
<td>Inspiratory enflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>inDes</td>
<td>Inspiratory desflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>inN2O</td>
<td>Inspiratory nitrous oxide concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>inIso</td>
<td>Inspiratory isoflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>inSev</td>
<td>Inspiratory sevoflurane concentration</td>
<td>%</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Iso cons</td>
<td>Isoflurane consumption</td>
<td>mL</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>% leak</td>
<td>Leakage minute volume in % of inspiratory minute volume</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>MV</td>
<td>Minute volume</td>
<td>L/min</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>MVe</td>
<td>Minute volume, expired</td>
<td>L/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>MVspon</td>
<td>Spontaneous expiratory minute volume</td>
<td>L/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>MVleak</td>
<td>Leakage minute volume</td>
<td>L/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>MVi</td>
<td>Minute volume, inspired</td>
<td>L/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>MVmand</td>
<td>Mandatory minute volume</td>
<td>L/min</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>MVspon</td>
<td>Spontaneous minute volume</td>
<td>L/min</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Parameter label</td>
<td>Description</td>
<td>Unit of measure</td>
<td>Displayed in Ventilation or Anesthesia (Show all page (see page 357)</td>
<td>Cockpit Trends page</td>
<td>Available for display in parameter box</td>
<td>Yes/No?</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------</td>
<td>---------------------</td>
<td>--------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>MVspon %</td>
<td>Spontaneous breathing portion of minute volume</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>N2O cons L</td>
<td>Accumulated nitrous oxide consumption</td>
<td>mbar</td>
<td>Anesthesia</td>
<td>Not trended</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>NIF mbar</td>
<td>Negative inspiratory force</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>NIF %</td>
<td>Inspiratory/expiratory oxygen concentration difference</td>
<td>%</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>NIF L</td>
<td>Accumulated oxygen consumption</td>
<td>L</td>
<td>Anesthesia</td>
<td>Not trended</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>PI0.1 mbar</td>
<td>Occlusion pressure</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>PPhf mbar</td>
<td>Pressure amplitude during HFO</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>PIph mbar</td>
<td>Upper pressure level during APRV</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>PIp mbar</td>
<td>Peak inspiratory pressure</td>
<td>%</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>PIow mbar</td>
<td>Lower pressure level during APRV</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Pmin mbar</td>
<td>Minimum airway pressure</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Pmean mbar</td>
<td>Mean airway pressure</td>
<td>%</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Pplat mbar</td>
<td>Plateau pressure</td>
<td>%</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>R mbar/lL/s</td>
<td>Resistance</td>
<td>%</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>r2 min</td>
<td>Correlation factor</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>rCor mbar/lL/s</td>
<td>Patient airway resistance</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>RR min</td>
<td>Respiratory rate</td>
<td>%</td>
<td>Anesthesia and Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Parameter label</td>
<td>Description</td>
<td>Unit of measure</td>
<td>Displayed in Ventilation or Anesthesia (Show all page (see page 357))</td>
<td>Cockpit Trends page</td>
<td>Available for display in parameter box Yes/No?</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>-----------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>RRc</td>
<td>Respiratory rate based on carbon dioxide measurement</td>
<td>1/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>RRf</td>
<td>Respiratory rate based on volume/flow measurement</td>
<td>1/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>RRmand</td>
<td>Mandatory respiratory rate</td>
<td>1/min</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>RRp</td>
<td>Respiratory rate based on pressure</td>
<td>1/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>RRspoon</td>
<td>Spontaneous respiratory rate</td>
<td>1/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>RSB</td>
<td>Rapid shallow breathing index</td>
<td>1/min/L</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Sev cons</td>
<td>Sevoflurane consumption</td>
<td>mL</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Tispon</td>
<td>Spontaneous inspiratory time</td>
<td>s</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>Time constant</td>
<td>s</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Tcase</td>
<td>Therapy case duration</td>
<td>min</td>
<td>Anesthesia</td>
<td>Not trended</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>TCe</td>
<td>Expiratory time constant</td>
<td>s</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Tlow</td>
<td>Effective expiratory time during AP-IVR/AutoRelease</td>
<td>s</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>V'CO2</td>
<td>Carbon dioxide production</td>
<td>mL/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Vds</td>
<td>Serial dead space volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Vds/VTe</td>
<td>Ratio of serial dead space volume to expiratory tidal volume</td>
<td>%</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Parameter label</td>
<td>Description</td>
<td>Unit of measure</td>
<td>Displayed in Ventilation or Anesthesia (Show all page (see page 357))</td>
<td>Cockpit Trends page</td>
<td>Available for display in parameter box Yes/No?</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>-----------------</td>
<td>---------------------------------------------------------------</td>
<td>-------------------</td>
<td>---------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>VCO2</td>
<td>Oxygen uptake</td>
<td>mL/min</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VT</td>
<td>Tidal volume</td>
<td>mL</td>
<td>Ventilation and Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>VTCO2</td>
<td>CO2 production volume per breath</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VTe</td>
<td>Expiratory tidal volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>VTemand</td>
<td>Mandatory expiratory tidal volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VTespon</td>
<td>Spontaneous expiratory tidal volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VTespon mean</td>
<td>Expiratory spontaneous mean tidal volume</td>
<td>mL</td>
<td>Vent</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VThf</td>
<td>Total volume during HFO</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VTI</td>
<td>Inspiratory tidal volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>VTispon</td>
<td>Spontaneous inspiratory tidal volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VTispon mean</td>
<td>Inspiratory spontaneous mean tidal volume</td>
<td>mL</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>VTmand</td>
<td>Mandatory tidal volume</td>
<td>mL</td>
<td>Note: Only mL is supported (L is supported on source device)</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
</tr>
</tbody>
</table>
External devices – Medibus.X devices

<table>
<thead>
<tr>
<th>Parameter label</th>
<th>Description</th>
<th>Unit of measure</th>
<th>Displayed in Ventilation or Anesthesia (see page 357)</th>
<th>Cockpit Trends page</th>
<th>Available for display in parameter box (Yes/No?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTspont</td>
<td>Spontaneous tidal volume</td>
<td>mL, Note: Only mL is supported (L is supported on source device)</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
</tr>
<tr>
<td>VT/Wt</td>
<td>Tidal volume per kg body weight</td>
<td>mL/kg</td>
<td>Ventilation</td>
<td>Continuous trend</td>
<td>No</td>
</tr>
<tr>
<td>xMAC</td>
<td>xMAC mean alveolar concentration derived from expiratory concentration.</td>
<td>no units</td>
<td>Anesthesia</td>
<td>Continuous trend</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Supported waveforms

The following Medibus.X waveforms are displayed on the Cockpit.

<table>
<thead>
<tr>
<th>Waveform label</th>
<th>Description</th>
<th>Unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw</td>
<td>Airway pressure</td>
<td>mbar</td>
</tr>
<tr>
<td>Flow</td>
<td>Inspiratory and expiratory flow</td>
<td>L/min</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide concentration</td>
<td>mmHg, kPa, %</td>
</tr>
</tbody>
</table>
Viewing Medibus.X parameter data

The Cockpit displays parameter data originating from connected Medibus.X devices in the following locations:
- Parameter boxes
- Loops pages (see page 356)
- Trends pages (see page 157)
- Show all pages (see 357)

The Cockpit displays the following waveforms, loops, and parameters:
- Airway pressure waveform (Paw) and associated parameter box
- Expiratory flow waveform and associated flow/volume (vent) parameter box
- CO2 waveforms and associated parameter box
- Loops (flow-volume, pressure-volume)

Parameter boxes

NOTE
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see “Parameter boxes” on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. The content of a parameter box can be configured. For more information see page 358.

The following diagram shows a typical parameter box for a Medibus.X parameter.

NOTE
The background of the Paw parameter box appears cyan when a ventilator or an anesthesia workstation becomes disconnected.
Loops offer important information about the response of the patient to mechanical ventilation. The Cockpit displays loops from supported Medibus.X devices provided the source devices make the data available to the Medibus.X protocol.

Pressure/volume loops illustrate changes in compliance, resistance, and work of breathing. A mechanical breath plots counter-clockwise, while a spontaneous breath plots clockwise. Inspiration starts at a point defined by baseline pressure and the volume level at the beginning of inspiration.

Flow/volume loops also report mechanical and spontaneous breaths. Inspiration begins at the origin and moves upward and clockwise. Expiration plots below the horizontal axis and progresses counter-clockwise to the original starting point.

To view loops
You can view loops from the Ventilator or the Anesthesia workstation tabs. Which tab is displayed depends on whether a ventilator or an anesthesia workstation is connected.

1. Select the Sensor parameters... button on the main menu bar.
2. Select the Ventilator tab or the Anesthesia workstation tab.
3. Select the PV Loop tab to view pressure/volume loops or select the FV Loop tab to view flow/volume loops.
4. Select the Loops tab to view all loops in one dialog window.
5. Select the Loop draw button at the bottom of the pages to choose how many loops are drawn on top of each other before the screen is cleared.
6. Select the Save reference button at the bottom of the page if you want to save a loop for future analysis and comparison.

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. The Medibus.X Ventilator tab is the one that has the message Medibus.X ventilator devices displayed as a header on the various pages.
The Show all pages

The Show all page displays the values and units of measure of the currently monitored parameters in one screen. The following two Show all pages are available:

- Under the Anesthesia workstation tab

To access the Show all pages

You can access the Show all page in the Ventilator or the Anesthesia workstation tabs. Which tab is displayed depends on whether a ventilator or an anesthesia workstation is connected.

NOTE

Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. The Medibus.X Ventilator tab is the one that has the message Medibus.X ventilator devices displayed as a header on the various pages.

The anesthesia Show all page displays the following data:

- Current ventilator measurements
- Current gas measurements
- Current consumption
- Units of measure

The ventilator Show all page displays the following data:

- Current ventilator measurements
- Units of measure

The ventilator Show all page can be configured (see page 357).

To configure the ventilator Show all page

1. Select the Sensor parameters... button on the main menu bar.
2. Select Ventilator or Anesthesia workstation > Show all. Configuring the ventilator Show all page

You can configure the parameter display of the ventilator Show all page and adapt it to the parameter set of the connected device.

NOTE

Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. The Medibus.X Ventilator tab is the one that has the message Medibus.X ventilator devices displayed as a header on the various pages.

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External devices – Medibus.X devices

2 Press any button to activate a list of available parameters. You can also select None to remove any parameter from being displayed in that space. The parameter selection MV auto, RR auto and VT auto are unique because the associated parameter set varies from device to device. When the Vent parameter display setting Auto is selected, the Cockpit pulls the available parameter from the source device according to the following priority list:

- MV auto: MVe, MV, MVi
- RR auto: RR, RRf, RRp
- VT auto: VTe, VT, VTI

3 Select the desired parameter in the list to assign it to the button and to the Show all page.

4 Repeat steps 2 and 3 until the desired configuration for the Show all page is completed.

Accessing parameter setup functions

You can configure the display of ventilation and anesthesia parameters in the following tabs located under the Ventilator or the Anesthesia workstation tabs.

- Paw
- Vent
- CO₂ (when a ventilator is connected) or CO₂/O₂/Agent (when anesthesia workstation is connected)

1 Select Sensor parameters... from the main menu bar.

2 Select the > Ventilator or the Anesthesia workstation tab.

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. The Medibus.X Ventilator tab is the one that has the message Medibus.X ventilator devices displayed as a header on the various pages.

If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: >> symbol and the display filter button.

3 Select either the Paw, Vent or CO₂ or CO₂/O₂/Agent tabs to access the respective setup pages.

NOTE
Most setup functions described in the following tables are available under the Ventilator and the Anesthesia workstation tabs. Exception where a setup function is only available under one tab are noted.
Paw setup functions

See page 358 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw scale</td>
<td>10, 15, 20, 25 (default), 30, 40, 50, 60, 70, 80, 100, 120 mbar</td>
<td>Determines the scale of the displayed Paw waveform.</td>
</tr>
<tr>
<td>Parameter 1</td>
<td>PEEP, PIP (default), Pmean, Pplat</td>
<td>Selects the primary parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>PEEP, PIP, Pmean (default), Pplat</td>
<td>Selects the second parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 3</td>
<td>PEEP (default), PIP, Pmean, Pplat</td>
<td>Selects the third parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue (default), purple, orange, white.</td>
<td>Determines the color of all Medibus.X parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>

Ventilator parameter setup functions

See page 358 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow scale</td>
<td>5, 10, 15, 20 (default in neonatal mode), 35, 50, 100 (default in adult and pediatric mode), 150, 200 L/min</td>
<td>Determines the scale of the displayed Flow waveform.</td>
</tr>
<tr>
<td>Vol scale</td>
<td>5, 10, 25, 50 (default in neonatal mode), 75, 100, 250, 500, 1000 (default in pediatric and adult mode), 1500 mL</td>
<td>Determines the scale of the displayed Volume waveform.</td>
</tr>
</tbody>
</table>
External devices – Medibus X devices

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent parameter display</td>
<td>– Auto (default)</td>
<td>Determines whether the selected parameters for display in the parameter box are selected manually or automatically. With the setting Manual, the parameter for each parameter box location are selected manually. With the setting Auto, the parameter supported by the source device is assigned to the parameter box location.</td>
</tr>
<tr>
<td></td>
<td>– Manual</td>
<td></td>
</tr>
<tr>
<td>Parameter 1</td>
<td>MVe (default), MVi, VTe, VT, VTI, RR, RRf, RRp</td>
<td>Selects the primary parameter in the ventilation parameter box when the Vent parameter display setting is set to Auto. The specific parameter supported by the source device is assigned automatically according to the priority list.</td>
</tr>
<tr>
<td></td>
<td>– MV auto (default) – (available parameter depends on source device: MVe, MVi)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– RR auto – (available parameter depends on source device: RR, RRf, RRp)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– VT auto – (available parameters depend on source device: VTe, VT, VTI)</td>
<td></td>
</tr>
<tr>
<td>Parameter 2</td>
<td>MVe, MVi, VTe, VT, VTI, RR (default), RRf, RRp</td>
<td>Selects the second parameter in the ventilation parameter box when the Vent parameter display setting is set to Manual.</td>
</tr>
<tr>
<td></td>
<td>– MV auto – (available parameter depends on source device: MVe, MVi)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– RR auto (default) – (available parameter depends on source device: RR, RRf, RRp)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– VT auto – (available parameters depend on source device: VTe, VT, VTI)</td>
<td></td>
</tr>
</tbody>
</table>
### Parameter 3

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVe, MVi, VTi (default), VT, VTi, RR, RRf, RRP</td>
<td>Selects the third parameter in the ventilation parameter box when the Vent parameter display setting is set to Manual.</td>
<td></td>
</tr>
<tr>
<td>MV auto – (available parameter depends on source device: MVe, MVi)</td>
<td>Selects the primary parameter in the ventilation parameter box automatically when the Vent parameter display setting is set to Auto. The specific parameter supported by the source device is assigned automatically according to the priority list.</td>
<td></td>
</tr>
<tr>
<td>RR auto – (available parameter depends on source device: RR, RRP</td>
<td>VT auto (default) – (available parameters depends on source device: VTi, VT)</td>
<td></td>
</tr>
</tbody>
</table>

### Color

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red, green, blue, yellow, light blue (default), purple, orange, white.</td>
<td>Determines the color of all ventilation parameter boxes, waveforms, and loops.</td>
<td></td>
</tr>
</tbody>
</table>
CO₂ setup functions

See page 358 for information on how to access this page. The tab is labelled CO₂ when a ventilator is connected. The tab is labelled CO₂/O₂/Agent when an anesthesia workstation is connected.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO₂ Scale</strong></td>
<td>– 0 to 40 (default), 0 to 60, 0 to 80, 0 to 100 mmHg&lt;br&gt;– 0.0 to 5.0 (default), 0.0 to 8.0, 0.0 to 12.0, 0.0 to 16.0 kPa&lt;br&gt;– 0 to 5 (default), 0 to 8, 0 to 12, 0 to 16 %</td>
<td>Determines the scale of the displayed CO₂ waveform.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow (default), light blue, purple, orange, white</td>
<td>Determines the color of the CO₂ parameter box and waveform.</td>
</tr>
</tbody>
</table>

Menu selections when Ventilator tab is selected.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>etCO₂ pbox</strong></td>
<td>– etCO₂ (default)</td>
<td>Determines the appearance of the etCO₂ parameter box.</td>
</tr>
<tr>
<td><strong>CO₂ Scale</strong></td>
<td>– 0 to 40 (default), 0 to 60, 0 to 80, 0 to 100 mmHg&lt;br&gt;– 0.0 to 5.0 (default), 0.0 to 8.0, 0.0 to 12.0, 0.0 to 16.0 kPa&lt;br&gt;– 0 to 5 (default), 0 to 8, 0 to 12, 0 to 16 %</td>
<td>Determines the scale of the displayed CO₂ waveform.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow (default), light blue, purple, orange, white</td>
<td>Determines the color of the CO₂ parameter box and waveform.</td>
</tr>
</tbody>
</table>

Menu selections when Anesthesia workstation tab is selected.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O₂ pbox</strong></td>
<td>– O₂&lt;br&gt;– O₂/N₂O (default)&lt;br&gt;– Off</td>
<td>Determines the appearance of the O₂ parameter box.</td>
</tr>
<tr>
<td><strong>Agent pbox</strong></td>
<td>– Agent&lt;br&gt;– Agent xMAC (default)&lt;br&gt;– AgentN₂O&lt;br&gt;– Off</td>
<td>Determines the appearance of the Agent parameter box. Note: If two agents are detected, both are displayed automatically.</td>
</tr>
</tbody>
</table>
## External devices – Evita 2D, Evita 4, Evita XL (Medibus)

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<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
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<tr>
<td>Infinity CentralStation – Vent Central option</td>
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</tr>
<tr>
<td>External device alarms</td>
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<td>Supported Medibus parameters on the Cockpit</td>
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<td>Supported Medibus waveforms</td>
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<td>Viewing Medibus parameter data</td>
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<td>Parameter boxes</td>
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<td>Viewing loops</td>
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<td>The Show all page</td>
<td>370</td>
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<tr>
<td>Accessing the parameter setup functions</td>
<td>371</td>
</tr>
<tr>
<td>Ventilator Paw setup functions</td>
<td>371</td>
</tr>
<tr>
<td>Ventilator parameter setup functions</td>
<td>372</td>
</tr>
<tr>
<td>CO2 parameter setup functions</td>
<td>373</td>
</tr>
</tbody>
</table>
Overview of ventilation monitoring

The device connectivity option enables the Cockpit to display parameter values, waveforms, and loops from the Medibus-compatible ventilators Evita 2D, Evita 4, and Evita XL. Within 30 seconds of connecting a device, the data appear at the Cockpit. The ventilator monitoring functions are configurable in the parameter-specific setup page (see page 371).

**NOTE**
Ventilation waveforms are not supported on recordings.

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. For device-specific error messages, refer to the instructions for use of the connected ventilator.

**NOTE**
When connecting a ventilator that does not support CO2 monitoring, the Cockpit may still display a CO2 tab in the Ventilator dialog window.

**External device alarms**
Alarms from the ventilator are transmitted to the Infinity network and made available for alarm annunciation at the ICS. For more information, refer to the instructions for use Infinity CentralStation.

If the external device alarm feature is activated at the Cockpit (see page 403) and an external device is disconnected from the Cockpit, the following happens at the Cockpit and at the ICS if the patient is admitted at the ICS:
- An alarm tone of low priority sounds.
- The message *External device disconnected* is displayed.

**Infinity CentralStation – Vent Central option**
Certain parameters, settings, modes, and waveforms originating from Evita ventilators are broadcast to the network via the Cockpit. If the patient is admitted at an ICS (Infinity CentralStation) with software version VF8 and the Vent Central option is activated, the above-mentioned data is displayed at the ICS. For more detailed information, refer to the VF8 Instructions for use entitled 'Infinity CentralStation'.
Precautions

**WARNING**
Always refer to the primary data source before making diagnostic or therapeutic decisions.

Connecting peripheral devices is supported via the device connectivity option. Only connect peripheral medical devices to a patient monitor if those devices comply with the electrical safety requirements found in IEC 60601-1. Refer to “Safe connection with other electrical equipment” on page 13 of these instructions for use for information on how to connect devices safely.

**WARNING**
The following section lists all of the external devices and related software versions that Dräger has validated. Dräger cannot make any claim for the reliability of the data for subsequent or previous software versions or for any devices that have not been validated. In the interest of patient safety and device performance, do not connect devices to the monitor which have not been approved by Dräger. The hospital is responsible for contacting Dräger to determine the compatibility and warranty status of any connection made to another manufacturer’s medical devices.

### Device compatibility

The device connectivity option allows data from Evita 2D, Evita 4, and Evita XL ventilators to display parameters, settings and waveforms on the Cockpit. The following table lists which software versions are supported with Medibus.

<table>
<thead>
<tr>
<th>Supported device</th>
<th>Supported software version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Evita 2D</td>
<td>1.00 and higher</td>
</tr>
<tr>
<td>Dräger Evita 4</td>
<td>1.00 and higher</td>
</tr>
<tr>
<td>Dräger Evita XL</td>
<td>5.00 and higher</td>
</tr>
</tbody>
</table>
The Evita ventilators (Evita 2D, Evita 4, and Evita XL) send parameters, settings, modes and alarm messages to the Cockpit. Certain ventilator parameters, settings, and ventilation modes are broadcast to the Infinity network. In addition, a limited number of alarms are made available to the Infinity network.

Refer to the RS-232 export handbook for information on which parameters are available for export protocol and which settings and modes are supported. The RS-232 export handbook is available in English only.

### Supported Medibus parameters on the Cockpit

The following table lists which parameters are displayed and trended on the Cockpit. Refer to page 365 for a list of supported ventilators and the compatible software versions.

<table>
<thead>
<tr>
<th>Parameter label</th>
<th>Description</th>
<th>Unit of measure</th>
<th>Displayed in Ventilation Show all page (see page 370) Yes/No?</th>
<th>Cockpit Trends page</th>
<th>Available for display in parameter box Yes/No?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cdyn</td>
<td>Dynamic compliance</td>
<td>L/bar</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>eCO2</td>
<td>End-tidal carbon dioxide concentration</td>
<td>mmHg</td>
<td>Yes</td>
<td>Continuous and mini trend</td>
<td>Yes</td>
</tr>
<tr>
<td>FIO2</td>
<td>Inspiratory oxygen fraction</td>
<td>%</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>MVe</td>
<td>Minute volume, expired</td>
<td>L/min</td>
<td>Yes</td>
<td>Continuous and mini trend</td>
<td>Yes</td>
</tr>
<tr>
<td>MVspon</td>
<td>Minute volume, expired, spontaneous</td>
<td>L/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>PO.1</td>
<td>Occlusion pressure</td>
<td>mbar or cmH2O</td>
<td>Not supported for display</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>PEEP</td>
<td>Peak end expiratory airway pressure</td>
<td>mbar or cmH2O</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
<tr>
<td>Pmean</td>
<td>Mean airway pressure</td>
<td>mbar or cmH2O</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
<tr>
<td>Pmin</td>
<td>Minimum airway pressure</td>
<td>mbar or cmH2O</td>
<td>Yes</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>Parameter label</td>
<td>Description</td>
<td>Unit of measure</td>
<td>Displayed in Ventilation Show all page (see page 370)</td>
<td>Yes/No?</td>
<td>Cockpit Trends page</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>-----------------</td>
<td>-----------------------------------------------------</td>
<td>--------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Pplat</td>
<td>Plateau pressure</td>
<td>mbar or cmH2O</td>
<td>Yes</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>PIP</td>
<td>Peak inspiratory pressure</td>
<td>mbar or cmH2O</td>
<td>Yes</td>
<td>Continuous and mini trend</td>
<td>Yes</td>
</tr>
<tr>
<td>R</td>
<td>Resistance</td>
<td>mbar/L/s</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>RRspon</td>
<td>Spontaneous respiratory rate</td>
<td>l/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>RR</td>
<td>Respiratory rate</td>
<td>l/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
<tr>
<td>I:E I part</td>
<td>Inspiratory component</td>
<td>No unit</td>
<td>Yes</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>I:E E part</td>
<td>Expiratory component</td>
<td>No unit</td>
<td>Yes</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>I:E</td>
<td>Ratio inspiratory to expiratory component</td>
<td>No unit</td>
<td>Yes</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>V'TCO2</td>
<td>Carbon dioxide production</td>
<td>mL/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>Vds</td>
<td>Serial dead space volume</td>
<td>mL</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>Vds/VTe</td>
<td>Ratio of serial dead space volume to expiratory tidal volume</td>
<td>%</td>
<td>Yes</td>
<td>Not trended</td>
<td>No</td>
</tr>
<tr>
<td>VTe</td>
<td>Expiratory tidal volume</td>
<td>mL</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: This parameter is calculated and is not broadcast to the network.
External devices – Evita 2D, Evita 4, Evita XL (Medibus)

Supported Medibus waveforms
The following Medibus waveforms are displayed on the Cockpit:

<table>
<thead>
<tr>
<th>Waveform label</th>
<th>Description</th>
<th>Unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>Airway pressure</td>
<td>mbar</td>
</tr>
<tr>
<td>Flow</td>
<td>Inspiratory and expiratory flow</td>
<td>L/min</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon dioxide concentration</td>
<td>mmHg, kPa, %</td>
</tr>
</tbody>
</table>

Viewing Medibus parameter data
The Cockpit displays parameter data originating from connected Evita 2D, Evita 4, and Evita XL ventilators in the following locations:

- Parameter boxes
- **Loops** pages (see page 369)
- **Trends** pages (see page 157)
- **Show all** pages (see 370)

The Cockpit displays the following waveforms, loops, and parameters:

- Airway pressure waveform (Paw) and associated parameter box
- Expiratory flow waveform and associated flow/volume (vent) parameter box
- CO2 waveforms and associated parameter box
- Loops (flow-volume, pressure-volume)
Parameter boxes

**NOTE**
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The following diagram shows a ventilator parameter box.

Viewing loops

Loops offer important information about the response of the patient to mechanical ventilation. You can review loops on two pages: Pressure/volume and Flow/volume.

Pressure/volume loops illustrate changes in compliance, resistance, and work of breathing. A mechanical breath plots counter-clockwise, while a spontaneous breath plots clockwise. Inspiration starts at a point defined by baseline pressure and the volume level at the beginning of inspiration.

Flow/volume loops also report mechanical and spontaneous breaths. Inspiration begins at the origin and moves upward and clockwise. Expiration plots below the horizontal axis and progresses counter-clockwise to the original starting point.

**NOTE**
In neonatal mode, ventilator loops are not available on the Cockpit.

Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n 369

External devices – Evita 2D, Evita 4, Evita XL (Modibus)
External devices – Evita 2D, Evita 4, Evita XL (Medibus)

To view loops
1 Select the Sensor parameters... button on the main menu bar.
2 Select the Ventilator tab. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window:
   - ➔ symbol
   - Display filter button

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. If you select the Ventilator tab and the selected page has the message Medibus.X ventilator devices displayed as a header, you have selected the wrong Ventilator tab.

3 Select the PV Loop tab to view pressure/volume loops or select the FV Loop tab to view flow/volume loops.
4 Select the Loops tab to view all loops in one dialog window.
5 Select the Loop draw button at the bottom of the page to choose how many loops are drawn on top of each other before the screen is cleared.
6 Select the Save reference button at the bottom of the page if you want to save a loop for future analysis and comparison.

The Show all page

The Show all page displays the values of the currently monitored ventilator parameters and units of measure in one screen.

To access the ventilation show all page
1 Select the Trends/Data... button on the main menu bar.
2 Select Trends > Ventilator > Show all or
1 Select the Sensor parameters... button on the main menu bar.

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. If you select the Ventilator tab and the selected page has the message Medibus.X ventilator devices displayed as a header, you have selected the wrong Ventilator tab.

3 Select the Show all tab.
Accessing the parameter setup functions

1 Select Sensor parameters... from the main menu bar > Ventilator tab to access the Ventilator page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: symbol and the display filter button.

2 Select either the Paw or the Vent tabs to access the respective pages.

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. If you select the Ventilator tab and the selected page has the message Medibus.X ventilator devices displayed as a header, you have selected the wrong Ventilator tab.

Ventilator Paw setup functions

See page 371 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw scale</td>
<td>10, 15, 20, 25 (default), 30, 40, 50, 60, 70, 80, 100, 120 mbar</td>
<td>Determines the scale of the displayed Paw waveform.</td>
</tr>
<tr>
<td>Parameter 1</td>
<td>Pmean, PEEP, PIP (default)</td>
<td>Selects the primary parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>Pmean (default), PEEP, PIP</td>
<td>Selects the second parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 3</td>
<td>Pmean, PEEP (default), PIP</td>
<td>Selects the third parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue (default), purple, orange, white.</td>
<td>Determines the color of all ventilation parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>
Ventilator parameter setup functions

See page 371 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flow scale</strong></td>
<td>5, 10, 15, 20 (default in neonatal mode), 35, 50, 100 (default in adult and pediatric mode), 150, 200 L/min</td>
<td>Determines the scale of the displayed Flow waveform.</td>
</tr>
<tr>
<td><strong>Vol scale</strong></td>
<td>5, 10, 25, 50 (default in neonatal mode), 75, 150, 250, 500, 1000 (default in pediatric and adult mode), 1500 mL</td>
<td>Determines the scale of the displayed Volume waveform.</td>
</tr>
<tr>
<td><strong>Parameter 1</strong></td>
<td>MVe (default), RR, VTe</td>
<td>Selects the primary parameter in the Vent parameter box.</td>
</tr>
<tr>
<td><strong>Parameter 2</strong></td>
<td>MVe, RR (default), VTe</td>
<td>Selects the second parameter in the Vent parameter box.</td>
</tr>
<tr>
<td><strong>Parameter 3</strong></td>
<td>MVe, RR, VTe (default)</td>
<td>Selects the third parameter in the Vent parameter box.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow, light blue (default), purple, orange, white.</td>
<td>Determines the color of all ventilation parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>
CO2 parameter setup functions

See page 371 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2 Scale</td>
<td>– 0 to 40 (default), 0 to 80, 0 to 100 mmHg</td>
<td>Determines the scale of the displayed CO2 waveform.</td>
</tr>
<tr>
<td></td>
<td>– 0.0 to 5.0 (default), 0.0 to 8.0, 0.0 to 12.0, 0.0 to 16.0 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– 0 to 5 (default), 0 to 8, 0 to 12, 0 to 16 %</td>
<td></td>
</tr>
<tr>
<td>Atm. pressure</td>
<td>570 to 800 mmHg</td>
<td>Determines the atmospheric pressure setting.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow (default), light blue, purple, orange, white.</td>
<td>Determines the color of the CO2 parameter box and waveform.</td>
</tr>
</tbody>
</table>
External devices – Servo I ventilator

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Overview of ventilation monitoring

The device connectivity option enables the Cockpit to display parameter values, waveforms, and loops from a Servo I ventilator.

Within 30 seconds of connecting a device, the data appear at the Cockpit. The ventilator monitoring functions are configurable in the parameter-specific setup page (see page 383).

NOTE
Ventilation waveforms are not supported on recordings.

Before performing any monitoring functions, refer to the section "For your safety and that of your patients" on page 11. For device-specific error messages, refer to the instructions for use of the connected ventilator.

NOTE
When connecting a ventilator that does not support CO2 monitoring, the Cockpit may still display a CO2 tab in the Ventilator dialog window.

External device alarms

Alarms from the ventilator are transmitted to the Infinity network and made available for alarm annunciation at the ICS. For more information, refer to the instructions for use Infinity CentralStation.

If the external device alarm feature is activated at the Cockpit (see page 403) and an external device is disconnected from the Cockpit, the following happens at the Cockpit and at the ICS when the patient is admitted at the ICS:

– An alarm tone of low priority sounds.
– The message External device disconnected is displayed.

Infinity CentralStation – Vent Central option

Certain parameters, settings, modes, and waveforms originating from Servo I ventilators are broadcast to the network via the Cockpit. If the patient is admitted at an ICS (Infinity CentralStation) with software version VF8 and the Vent Central option is activated, you can review the above-mentioned data at the ICS. For more detailed information, refer to the VF8 instructions for use entitled ‘Infinity CentralStation’.
Precautions

WARNING
Always refer to the primary data source before making diagnostic or therapeutic decisions.

Connecting peripheral devices is supported via the device connectivity option. Only connect peripheral medical devices to a patient monitor if those devices comply with the electrical safety requirements found in IEC 60601-1. Refer to “Safe connection with other electrical equipment” on page 13 of these instructions for use for information on how to connect devices safely.

WARNING
The following section lists all of the external devices and related software versions that Dräger has validated. Dräger cannot make any claim for the reliability of the data for subsequent or previous software versions or for any devices that have not been validated. In the interest of patient safety and device performance, do not connect devices to the monitor which have not been approved by Dräger. The hospital is responsible for contacting Dräger to determine the compatibility and warranty status of any connection made to another manufacturer’s medical devices.

Device compatibility

The Cockpit device connectivity interface allows data from the Servo I ventilator with software version 7 to display parameters, settings and waveforms on the Cockpit. See the table below for supported parameters.
### Supported Servo I parameters

The following table lists which Servo I ventilator parameters are displayed and trended on the Cockpit. Refer to page 377 for a list of supported ventilators and the compatible software versions.

<table>
<thead>
<tr>
<th>Parameter label</th>
<th>Description</th>
<th>Unit of measure</th>
<th>Displayed in Ventilation Show all page (see page 382) Yes/No?</th>
<th>Cockpit Trends page</th>
<th>Available for display in parameter box Yes/No?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cdyn</td>
<td>Dynamic compliance</td>
<td>L/bar</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>etCO2</td>
<td>End-tidal CO2</td>
<td>mmHg</td>
<td>Not supported for display</td>
<td>Continuous and mini trend</td>
<td>Yes</td>
</tr>
<tr>
<td>FiO2</td>
<td>Inspired O2</td>
<td>%</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>MV</td>
<td>Minute volume, expired</td>
<td>L/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>MVspiron</td>
<td>Spontaneous expiratory minute volume</td>
<td>L/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>PEEP</td>
<td>Peak end expiratory airway pressure</td>
<td>cmH2O</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
<tr>
<td>PIP</td>
<td>Peak inspiratory pressure</td>
<td>cmH2O</td>
<td>Yes</td>
<td>Continuous and mini trend</td>
<td>Yes</td>
</tr>
<tr>
<td>Pmean</td>
<td>Mean airway pressure</td>
<td>cmH2O</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
<tr>
<td>RR</td>
<td>Respiratory rate</td>
<td>L/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
<tr>
<td>V'CO2</td>
<td>Carbon dioxide production</td>
<td>mL/min</td>
<td>Yes</td>
<td>Continuous</td>
<td>No</td>
</tr>
<tr>
<td>VTe</td>
<td>Tidal volume, expired</td>
<td>mL</td>
<td>Yes</td>
<td>Continuous</td>
<td>Yes</td>
</tr>
</tbody>
</table>
External devices – Servo I ventilator

Supported Servo I waveforms

The following Modibus waveforms are displayed on the Cockpit.

<table>
<thead>
<tr>
<th>Waveform label</th>
<th>Description</th>
<th>Unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw</td>
<td>Airway pressure</td>
<td>mbar</td>
</tr>
<tr>
<td>Flow</td>
<td>Inspiratory and expiratory flow</td>
<td>L/min</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon dioxide concentration</td>
<td>mmHg, kPa, %</td>
</tr>
</tbody>
</table>

Viewing parameter data

The Cockpit displays parameter data originating from connected Servo I ventilator in the following locations:

- Parameter boxes
- Loops pages (see page 381)
- Trends pages (see page 157)
- Show all pages (see 382)

The Cockpit displays the following waveforms, loops and parameters:

- Airway pressure waveform (Paw) and associated parameter box
- Expiratory flow waveform and associated flow-volume (vent) parameter box
- CO2 waveforms and associated parameter box
- Loops (flow-volume, pressure-volume)
Parameter boxes

NOTE
The following diagram shows a typical parameter box layout. This layout may change when additional parameters are put on display. For more information, see "Parameter boxes" on page 52.

Parameter boxes report parameter values and indicate the alarm status of parameters. Parameter boxes can also report technical conditions such as disconnected sensors, and so on. For detailed information regarding the content of parameter boxes for each parameter, see the chapter "Problem solving" on page 449.

The following diagram shows a ventilator parameter box.

A Primary parameter label
B Second parameter label
C Second parameter value
D Third parameter label
E Third parameter value
F Primary parameter value
Loops offer important information about the response of the patient to mechanical ventilation. You can review loops on two pages: Pressure/volume and Flow/volume.

Pressure/volume loops illustrate changes in compliance, resistance, and work of breathing. A mechanical breath plots counter-clockwise, while a spontaneous breath plots clockwise. Inspiration starts at a point defined by baseline pressure and the volume level at the beginning of inspiration.

Flow/volume loops also report mechanical and spontaneous breaths. Inspiration begins at the origin and moves upward and clockwise. Expiration plots below the horizontal axis and progresses counter-clockwise to the original starting point.

**NOTE**
In neonatal mode, ventilator loops are not available on the Cockpit.

### Viewing loops

**To view loops**

1. Select the **Sensor parameters...** button on the main menu bar.
2. Select the **Ventilator** tab. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window:
   - >> symbol
   - display filter button

**NOTE**
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. If you select the **Ventilator** tab and the selected page has the message Medibus.X ventilator devices displayed as a header, you have selected the wrong **Ventilator** tab.

3. Select the **PV Loop** tab to view pressure/volume loops or select the **FV Loop** tab to view flow/volume loops.
4. Select the **Loops** tab to view all loops in one dialog window.
5. Select the **Loop draw** button at the bottom of the page to choose how many loops are drawn on top of each other before the screen is cleared.
6. Select the **Save reference** button at the bottom of the page if you want to save a loop for future analysis and comparison.
The Show all page

The Show all page displays the values of the currently monitored ventilator parameters and units of measure in one screen.

NOTE
The settings TVi, I:E I part and I:E E part, also appear in the Show all page in addition to the parameters.

To access the ventilation show all page
1 Select the Trends/ Data... button on the main menu bar.
2 Select the Ventilator > Show all tab.

Accessing the parameter setup functions

1 Select Sensor parameters... from the main menu bar > Ventilator tab to access the Ventilator page. If you cannot see the tab, select the following two symbols located in the upper right corner of the dialog window: symbol and the display filter button.

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. If you select the Ventilator tab and the selected page has the message Medibus.X ventilator devices displayed as a header, you have selected the wrong Ventilator tab).

2 Select either the Paw or the Vent tabs to access the respective pages.

NOTE
Depending on which devices are connected to the Cockpit, two Ventilator tabs may be displayed. If you select the Ventilator tab and the selected page has the message Medibus.X ventilator devices displayed as a header, you have selected the wrong Ventilator tab).

1 Select the Sensor parameters... button on the main menu bar.
2 Select the Ventilator tab.
3 Select the Show all tab.
**Ventilator Paw setup functions**

See page 382 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw scale</td>
<td>10, 15, 20, 25 (default), 30, 40, 50, 60, 70, 80, 100, 120 mbar</td>
<td>Determines the scale of the displayed Paw waveform.</td>
</tr>
<tr>
<td>Parameter 1</td>
<td>Pmean, PEEP, PIP (default)</td>
<td>Selects the primary parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>Pmean (default), PEEP, PIP</td>
<td>Selects the second parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 3</td>
<td>Pmean, PEEP (default), PIP</td>
<td>Selects the third parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue (default), purple, orange, white.</td>
<td>Determines the color of all ventilation parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>
## Ventilator parameter setup functions

See page 382 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flow scale</strong></td>
<td>5, 10, 15, 20 (default in neonatal mode), 35, 50, 100 (default in adult and pediatric mode), 150, 200 L/min</td>
<td>Determines the scale of the displayed Flow waveform.</td>
</tr>
<tr>
<td><strong>Vol scale</strong></td>
<td>5, 10, 25, 50 (default in neonatal mode), 75, 100, 250, 500, 1000 (default in pediatric and adult mode), 1500 mL</td>
<td>Determines the scale of the displayed Volume waveform.</td>
</tr>
<tr>
<td><strong>Parameter 1</strong></td>
<td>MVe (default), RR, VTe</td>
<td>Selects the primary parameter in the Vent parameter box.</td>
</tr>
<tr>
<td><strong>Parameter 2</strong></td>
<td>MVe, RR (default), VTe</td>
<td>Selects the second parameter in the Vent parameter box.</td>
</tr>
<tr>
<td><strong>Parameter 3</strong></td>
<td>MVe, RR, VTe (default)</td>
<td>Selects the third parameter in the Vent parameter box.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow, light blue (default), purple, orange, white</td>
<td>Determines the color of all ventilation parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>
CO₂ parameter setup functions

See page 382 for information on how to access this page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ Scale</td>
<td>– 0 to 40 (default), 0 to 60, 0 to 80, 0 to 100 mmHg</td>
<td>Determines the scale of the displayed CO₂ waveform.</td>
</tr>
<tr>
<td></td>
<td>– 0.0 to 5.0 (default), 0.0 to 8.0, 0.0 to 12.0, 0.0 to 16.0 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– 0 to 5 (default), 0 to 8, 0 to 12, 0 to 16 %</td>
<td></td>
</tr>
<tr>
<td>Atm. pressure</td>
<td>570 to 800 mmHg</td>
<td>Determines the atmospheric pressure setting.</td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow (default), light blue, purple, orange, white.</td>
<td>Determines the color of the CO₂ parameter box and waveform.</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
System configuration

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Biomed setup – units of measure .......... 414
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Biomed setup – printer setup .......... 418
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Overview

This chapter describes the System setup dialog window which consists of several setup pages for configuring the Cockpit. Some of these setup pages are password protected and are only accessible to authorized personnel.

The System setup dialog window consists of the following setup pages:

- Screen setup (see page 388)
- Alarms (see page 401)
- Recordings/Reports (see page 409)
- Biomed (see page 412)
- Profiles (see page 425)

Most setup pages consist of selections for configuring individual features. In the following sections such setup pages are presented as tables which list each menu selection, the available settings, and a description. Some setup pages are more complex and are therefore described in more detail. Where necessary, diagrams clarify additional setup procedures.

Screen setup

Several Screen setup pages are available for configuring the layout and the content of the screen.

To access the screen setup functions

1. Select the System setup... button on the main menu bar.
2. Select the Screen setup tab (if not already selected).
3. Select one of the following tabs to access the corresponding setup page:
   - General settings
   - Auto view (if the auto view setup toolbar is visible along the bottom of the screen, you can also select the Setup button in the lower right corner of the screen to access the Auto view page)
   - Views (password required)
   - Config. buttons (password required)
   - Multi-tab split screen
   - View editor (password required)
### Screen setup – general settings

The following table lists the available settings of the General settings page. Your selection takes effect immediately. To access this page, see page 388.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring sweep speed [mm/s]</td>
<td>6.25, 12.5, 25 (default), 50</td>
<td>Sets the sweep speed of the waveforms.</td>
</tr>
<tr>
<td>Respiratory sweep speed [mm/s]</td>
<td>6.25 (default), 12.5, 25, 50</td>
<td>Sets the sweep speed of the respiratory waveform.</td>
</tr>
<tr>
<td>Parameter units display</td>
<td>On, Off (default)</td>
<td>Activates/deactivates the display of parameter units in the parameter boxes.</td>
</tr>
<tr>
<td>Attention tone volume</td>
<td>– Off</td>
<td>Determines the volume of the attention tone or deactivates it.</td>
</tr>
<tr>
<td></td>
<td>– 5, 10 to 100 in increments of 10% (default 40%)</td>
<td></td>
</tr>
<tr>
<td>Brightness</td>
<td>10 to 100 % (default) in increments of 10%</td>
<td>Adjusts the brightness of the Cockpit screen. This setting does not affect the M540.</td>
</tr>
<tr>
<td>Night time</td>
<td>00:00 to 24:00</td>
<td>Sets the start and end time of night time mode. During night time mode, the entire background of the screen appears almost black. All buttons turn dark gray.</td>
</tr>
</tbody>
</table>
Screen setup – auto view functions

The following diagram shows the Auto view page. This page also functions dynamically with the auto view setup toolbar (see page 393). To access this page, see page 388.

- **A** Auto display mode selection button
- **B** Manual display mode selection button
- **C** Display filter button
- **D** Auto view tab
- **E** Waveforms button
- **F** Layout button
- **G** Pressure overlap on/off button
- **H** Parameter boxes button
- **I** Layout button
- **J** Split screen button
- **K** Mini trends selection button
- **L** NIBP trend button
- **M** Toolbar button
- **N** Parameter selection window
System configuration

Configuring the auto view settings

You can perform various functions in the Auto view page. The following settings describe the general settings of the Auto view page. For detailed information on setting up the display attributes of a parameter, see “Configuring parameters for display” on page 392.

To configure the available settings

In the following steps, the letters in parentheses correspond to the diagram for the Auto view page (see page 390).

1. Access the Auto view page (see page 388).
2. Select the display mode by selecting one of the following two buttons next to Display mode:
   - Auto (A) to select the auto display mode (see page 58).
   - Manual (B) to select the manual display mode (see page 58).
3. Select the Waveforms button (E) to determine the number of waveforms that can be selected in the parameter selection window (N). The number of waveforms available for selection depends on the purchased software and hardware options:

<table>
<thead>
<tr>
<th>Device</th>
<th>With option</th>
<th>Without option</th>
</tr>
</thead>
<tbody>
<tr>
<td>C500</td>
<td>12 or 16 waveforms</td>
<td>10 waveforms</td>
</tr>
<tr>
<td>C700</td>
<td>16 waveforms</td>
<td>12 waveforms</td>
</tr>
</tbody>
</table>

4. Select the Pressure overlap on or off (default) button (G) to activate or deactivate pressure overlap mode. This feature works only if the pressure waveforms are displayed in adjacent channels.
5. Select the Parameter boxes button (H) and use the rotary knob to select the desired number of parameter boxes for display. The available selections are: Off, 1, 2, 3 (default), 4, 5, 6.
6. Select the Layout button (I). Then select the Top or Bottom (default) button to determine if the parameter boxes appear along the bottom or the top of the screen.

   – Select the Split screen button (J). This button appears greyed out if the web enabled layouts option is locked. The available selections are: None (default), Anesthesia show all, BIS show all, BIS/NMT show all, CCO show all, ECG/ST, ECG/Vent, ECG show all, Loops, SpO2 show all, ST parameters, Multi-tab split screen, Ventilator show all, Trend table.

   If you select None, the monitoring area contains only real-time parameters. Any other selection divides the monitoring area into two windows. The right window continues to display the real-time parameters. For more detail see “Cockpit screen in split screen mode” on page 60.
7. Select the Mini trends button (K) to activate or deactivate the mini-trend display or select a trend display time (see page 61). The available selections are: Off, 10 min, 15 min, 20 min, 30 min (default), 45 min, 1 h, 90 min, 2 h, 6 h, 12 h, 24 h.
8. Select the NIBP trend button (L) to choose between the graphic or numeric representation of the NIBP mini-trend display.
9. Toggle the Toolbar button (M) to On (default) or Off to activate or deactivate the auto view setup toolbar (see page 391).
Configuring parameters for display

Basically, the parameter selection window (D) of the Auto view page controls where a parameter appears on the screen. The window also controls how a parameter is displayed (as a waveform and/or as a parameter box), or if it is excluded from display. To access this page, see page 388.

The parameter selection window

The parameter selection window (D) in the Auto view page determines where a parameter appears on the screen and how it is displayed. The selected display mode determines how the parameter selection window behaves:

- If you select the Auto button (B) next to Display mode, the parameter selection window functions dynamically with the auto view setup toolbar (see page 393). You can also determine the content of the parameter list by using the display filter button . When it appears on a dark green background, all parameters are displayed in the parameter selection window, even if they are not connected. Parameters that are not connected appear gray. However, as soon as you connect a parameter, the corresponding label appears black, and occupies the assigned location on the screen.

When the display filter button appears on a light green background, the parameter selection window contains only connected parameters.

- If you select the Manual button (C) next to Display mode, all parameters are listed. In this case, the display filter button is deactivated. If a parameter is not connected, the corresponding label appears gray. However, unlike in auto mode, the parameter label and/or waveform occupies a space on the screen even though it is not connected yet.

A Auto view tab
B Auto button
C Manual button
D Parameter selection window
System configuration

Configuring the parameter priority and display

In the parameter selection window, one of three display symbols appears next to each parameter label. The symbols identify how the parameter appears on the screen:

- the parameter appears as a waveform
- the parameter appears as a parameter box
- the parameter is not displayed

Parameters are arranged in descending order in the window and occupy the same position on the screen. For example, the top parameter in the parameter selection window occupies the top location on the screen.

In auto display mode, you can configure a parameter in two ways:
- From the Auto view page
- From the auto view setup toolbar which appears at the bottom of the screen if activated

In manual display mode, you can configure a parameter only from the Auto view page (see page 390).

To configure the parameter priority and display from the Auto view page

In the following steps, the letters in parentheses correspond to the diagram for the Auto view page (see page 390).

1. Access the Auto view page (see page 388).
2. Select the number of waveforms for display with the Waveforms button (E).
3. Select the number of parameter boxes for display with the Parameter boxes button (H).
4. Select the parameter and use the rotary knob to move it up or down the parameter selection window (N) to the desired position. As you move the parameter up or down the list, the display symbol next to the parameter can change. For example, a parameter that previously appeared as a parameter box and a waveform will only appear as a parameter box as you are moving it down the list.
5. Press the rotary knob to confirm the selection.

To configure the parameter priority and display from the Auto view setup toolbar

When activated (see page 390), the auto view setup toolbar appears along the bottom of the screen whenever you activate a view containing an auto view component. The auto view setup toolbar functions dynamically with the parameter selection window of the Auto view page (see page 392). Whatever changes you make in one place is reflected in the other.

Each connected parameter is represented as a small field on the auto view setup toolbar. The following illustration is an example of how the auto view setup toolbar identifies the display modes of parameters on the main screen. The symbols above the parameter label identify the three different display modes. The same symbols appear in the parameter selection window of the Auto view page.
System configuration

A A parameter with the symbol on the auto view setup toolbar appears as a waveform and a parameter box on the main screen. Parameters in this display mode always appear on the left side of the auto view setup toolbar.

B A parameter with the symbol on the auto view setup toolbar appears only as a parameter box on the main screen. Parameters in this display mode always appear in the center of the auto view setup toolbar.

C A parameter with the symbol on the auto view setup toolbar is excluded from display on the main screen. Parameters in this display mode always appear on the right side of the auto view setup toolbar.

In the Auto view page (see page 390), you can select the maximum amount of ‘waveforms’ and ‘parameter box’ fields and determine the parameter priority. The number of parameters you can select depends on the locked option that is activated.

For example, if you select five waveforms and three parameter box fields in the Auto view page, the auto view setup toolbar consists of five waveform fields and three parameter fields. If more parameters are available than there are fields assigned to the auto view setup toolbar, the additional parameters are relegated to the ‘not displayed’ status.

To change the display status of a parameter

1. Select the field on the auto view setup toolbar of the parameter whose display mode you wish to change. A yellow frame highlights the selected field.

2. Use the rotary knob to move the parameter to the desired place on the auto view setup toolbar. Whatever position you move it to determines the display status of the parameter. Pay attention to the symbol that changes as you turn the rotary knob to select a new position.

   For example, if a parameter is assigned to the ‘no display’ status , turn the rotary knob to the left until the field appears in the ‘waveform’ portion of the auto view setup toolbar. The symbol changes to the following image: .

3. Press the rotary knob to confirm your selection. The new parameter and the previous parameter switch positions on the auto view setup toolbar and the screen changes accordingly.

Any changes you make on the auto view setup toolbar are immediately reflected on the Auto view page (see page 390) and vice versa.

NOTE

If the auto view setup toolbar is displayed, you can access the Auto view page by selecting the Setup button at the right edge of the Auto view toolbar.

You can either display or hide the auto view setup toolbar (see page 391). You can also change the display status of a parameter display mode by switching its position on the auto view setup toolbar.
Screen setup – configuring views

The Views page displays all available views which control how information is presented on the screen. The Views page consists of custom views and Dräger views. You can select any view and save changes to custom views. Dräger views can be selected, but they cannot be changed.

To save changes to a custom view
1. Select the System setup... button on the main menu bar.
2. Select the Screen setup tab (if not already selected).
4. Enter the clinical password and select the Enter button.
5. Select the view whose name is followed with an asterisk and appears in italic font (for example, Basic OR *). This display convention identifies a view that has been modified and whose changes have not yet been saved.
6. Select the Save view button. This button does not execute any function if you select it and no custom views are available to be saved.
7. Press the rotary knob.

NOTE
You can also save changes to a custom View from the View editor page.
Screen setup – configuring main menu bar buttons

The Config. buttons page allows you to customize the content of the main menu bar (see page 56) by adding and removing buttons. However, the menu bar contains several buttons with essential functionality that are permanently placed and cannot be removed.

The following diagram shows the default Config. buttons page for a C700. On the C500 the fixed keys (Print screen and Zero all) do not appear on the main menu bar. They appear on the quick access toolbar instead. The depicted menu bar is an exact replica of the actual menu bar. As you make changes to the menu bar on the Config. buttons page, the actual menu bar on the main screen changes accordingly.

A Alarms... button  
B Mark event button  
C Code button  
D Views... button  
E Print screen button  
F Freeze waveforms button  
G Trends/ Data... button  
H Procedures... button  
I Sensor parameters... button  
J NIBP start/stop button  
K Zero all button  
L System setup... button  
M Start/Standby... button  
N Home button  
O Restore config. buttons button  
P Selection window with available buttons  
Q Arrow buttons for moving the cursor up and down the selection list  
R Slide bar for moving a button up or down the menu bar.
To configure the function keys

In the following steps, the letters in parentheses correspond to the diagram for the Config. buttons page (see page 396).

1. Select the System setup... button on the main menu bar.
2. Select the Screen setup tab (if not already selected).
3. Select the Config. buttons tab. A password popup appears.
4. Enter the clinical password and select the Enter button.
5. Select the button on the menu bar list to be replaced with another one. The button to be removed is highlighted in yellow. A popup window (P) with a slide ruler appears. The popup contains a list of available buttons you can choose as a replacement button.
6. Use the rotary button, the slide ruler (R) or the arrow buttons (Q) to scroll through the available selections.
7. Select the desired button or click the rotary knob to move the new button to the menu bar. The previous button is moved to the popup window. The main menu bar changes immediately to reflect the new selection.
8. Repeat steps 5 – 7 for additional configuration changes to the menu bar.

NOTE

Any button appearing on a light grey background identifies one that holds a permanent position on the menu bar. These buttons cannot be exchanged and are therefore not selectable.

To restore the default setup of the menu bar

You can restore the default setup of the menu bar (see page 396) at any time. In the following steps, the letters in parentheses correspond to the diagram for the Config. buttons page (see page 396).

1. Select the System setup... button on the main menu bar.
2. Select the Screen setup tab (if not already selected).
3. Select the Config. buttons tab. A password popup appears.
4. Enter the clinical password and select the Enter button.
5. Select the Restore config. buttons button.
Screen setup – configuring the multi-tab split screen

The Multi-tab split screen is a split screen mode that consists of up to three separate tabs (see diagram on page 62). The content of each tab can be configured.

To configure the split screen

1. Select the System setup... button on the main menu bar.
2. Select the Screen setup tab (if not already selected).
3. Select the Multi-tab split screen tab.

4. Select the Tab 1, Tab 2, or Tab 3 to select the desired content from the following list of available choices:
   - Anesthesia show all (default for Tab 2)
   - BIS show all (default for Tab 3)
   - BIS/NMT show all
   - CCO show all
   - ECG/ST
   - ECG/Vent
   - ECG show all (default for Tab 1)
   - Loops
   - SpO2 show all
   - ST parameters
   - Ventilator show all
   - Trend table
Screen setup – the View editor

In addition to the eight Dräger views, each Cockpit can have eight custom views. The View editor is an option that allows you to create, modify, and save custom views.

NOTE
Although the Cockpit can display many parameters and waveforms, use discretion when building custom views to make sure clinically relevant information is not obscured or unreadable.

The following diagram shows the View editor page.

A View field and arrow button
B Symbol for changing the name of the selected view
C Template field and arrow button
D View editor tab
E Layout panel
F Profiles... button
G Save view symbol

To access the view editor
1 Select the System setup... button on the main menu bar.
2 Select the Screen setup tab > View editor tab (C).
3 Enter the password and select the Enter button.

View editor functions

In the following procedures, the letters in parentheses correspond to the View editor diagram.

The View editor allows you to perform the following functions:
- Modify existing views
- Save changes to a view
- Change the name of the selected view
- Assign a view to profiles
To modify a custom view

NOTE
Although the Cockpit can display many parameters and waveforms, use discretion when building custom Views to make sure clinically relevant information is not obscured or unreadable.

1. Access the View editor page (see page 399).
2. Select the arrow button next to the View field (A) and select the view you wish to modify.

NOTE
You can only change custom Views. Dräger views cannot be changed.

3. Select the arrow button next to the Template field (B) to select a layout template (D) which consists of various panels that illustrate what the basic layout of the screen will look like.
4. Touch a panel of the selected layout template to select a content. The following Content popup appears.

5. Select the top arrow button (G) in the Content popup to assign one of the following contents to the selected panel:
   - Parameters
   - Waveforms
   - Applications

6. Select the bottom arrow button (H) in the Content popup to select additional settings. For example, if you chose Waveforms in step 4, you can select the ECG lead for display.

7. Repeat steps 4 and 5 for all panels in the selected layout template.
8. Select the symbol (G) next to Save view field (see diagram on page 399) to save the changes under the existing name.
   or
   Select the symbol next to the View field (A) to access a keyboard for renaming the current view.

To assign a view to profiles
You can assign a view to a profile after you modify a view or at any time after that.

1. Access the View editor page (see page 399).
2. Select the arrow button next to the View field (A) to choose the view that you wish to assign to profiles (if not already selected).
3. Select the Profiles... button (F) to display the Add to profile popup.
4. Select either the Dräger views or Custom views button under the Adult, Pediatric or Neonate column. An additional popup appears which lists the profiles stored under the selected category.
5. Select as many profiles as you wish to assign the currently selected view to.
6. Select OK.

NOTE
Although the Cockpit can display many parameters and waveforms, use discretion when building custom Views to make sure clinically relevant information is not obscured or unreadable.

NOTE
You can only change custom Views. Dräger views cannot be changed.
System configuration

Configuring the alarm setup

The password-protected Alarms pages are for configuring the general alarm settings.

To access the alarms pages

1. Select System setup... on the main menu bar. A password popup appears.
2. Select the Alarms tab.
3. Enter the password and select the Enter button.

4. Select one of the following tabs to access the respective setup page:
   - General settings
   - Volume/Tone
   - Code
   - Config. alarms
   - M540 settings

Alarms setup – general settings

The following table lists the available settings of the General settings page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All alarms paused</td>
<td>1, 2 (default), 3, 4, 5 min</td>
<td>The button on the alarm toolbar changes to All alarms paused. This button is accessible by selecting the symbol on the quick access toolbar, see page 57). When selected, all alarm functions are temporarily suppressed for the selected time. The alarm function is automatically activated when the alarm pause timer times out.</td>
</tr>
<tr>
<td></td>
<td>– No timeout</td>
<td>The button on the alarm toolbar changes to All alarms off. This button is accessible by selecting the symbol on the quick access toolbar, see page 57). When selected, all alarm functions are suppressed until you select the button again to activate the alarm function again.</td>
</tr>
<tr>
<td></td>
<td>– Disabled</td>
<td>The All alarms paused button on the alarm toolbar is grayed out and you cannot temporarily or permanently deactivate alarm monitoring.</td>
</tr>
<tr>
<td>Alarm validation</td>
<td>On (default), Off</td>
<td>When this function is activated, alarm conditions are verified for a certain time before triggering acoustic and visual alarm signals (see page 195). This feature reduces nuisance alarms.</td>
</tr>
</tbody>
</table>
### System configuration

**SpO2 alarm delay**
- **On** (default)
- **Off**  
  When this function is activated, an SpO2 lower alarm limit violation must persist for 10 seconds before triggering acoustic and visual alarm signals.
  This function is not possible if the Nellcor SatSeconds alarm feature is set to any value other than Off (see page 256).

**Alarm limits display**
- **On** (default)
- **Off**  
  Determines whether alarm limits appear in the parameter boxes.

**Alarm bar enabled**
- **On** (default)
- **Off**  
  Determines whether the alarm bar flashes during an alarm.

**OR Alarms**
- **On**, **Off** (default)  
  Activates/deactivates OR alarms. Alarm functions are affected when OR alarms is activated (see page 108).

**Cardiac bypass**
- **On** (default)
- **Off**  
  Activates/deactivates cardiac bypass mode.
  Alarm functions are affected when cardiac bypass mode is activated (see page 108).

**Alarm group**  
Keypad for configuring an alarm group. Allows you to configure several monitors as members of a group. All alarms that occur at any of the monitors within the group are broadcast to all other members in the alarm group.

**NIBP/SpO2 interlock**
- **On** (default)
- **Off**  
  On – the SpO2 alarm function is deactivated and the SpO2 alarm settings appear ghosted during NIBP and Pulse CO-Ox measurements (for more details, see "NIBP/SpO2 interlock alarms" on page 106).
  Off – the SpO2 alarm function is activated during NIBP and Pulse CO-Ox measurements.
## System configuration

### ASY/VF alarms
- **Always on** (default)
- **Follow HR alarm**

- **Always on** – the ASY/VF alarm functions are always activated.
- **Follow HR alarm** – the ASY and VF alarm settings follow the setting of the heart rate alarms.

**WARNING**

If you select Follow HR alarm, ASY, and VF alarms are not reported if the heart rate and arrhythmia alarm functions are turned off.

### Pacer detection mode
- **Advanced**
- **Basic** (default)

- **Advanced** – you can select fusion mode in the ECG page (see page 194).
- **Basic** – fusion mode is not selectable.

### External device disconnected alarm control
- **On** (default)
- **Off**

- **On** (default) – When this function is activated and an external device is disconnected, an alarm of low priority sounds at the Cockpit. In addition, the message External device disconnected appears in the header bar of the Cockpit and at the ICS, provided the patient has been admitted.
### Alarm setup – configuring the alarm volume and tones

The following table lists the available settings of the **Volume/ Tone** page which controls various tone settings. To access this page, see page 401.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum alarm volume</strong></td>
<td>5 %</td>
<td>Determines the alarm volume options available under the <strong>Alarm volume</strong> button.</td>
</tr>
<tr>
<td></td>
<td>10 % (default)</td>
<td>– When 5 % is selected, the same setting is available under the <strong>Alarm volume</strong> button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– When 10 % is selected, the 5 % setting is no longer available under the <strong>Alarm volume</strong> button. The alarm volume is automatically adjusted to 10 %.</td>
</tr>
<tr>
<td><strong>Alarm volume</strong></td>
<td>Off, 5 %, 10 to 100 % (in increments of 10 %); default is 50 %</td>
<td>Determines the volume of the alarm tone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The 5 % setting is only available when the <strong>Minimum alarm volume</strong> setting is set to 5 %.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure the alarm tone volume is set so it can be heard in the monitoring environment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The setting <strong>Off</strong> is only available when the Cockpit is in OR mode or assigned to an ICS.</td>
</tr>
<tr>
<td><strong>Audio pause behavior</strong></td>
<td>Continue pause</td>
<td>Controls the alarm tone behavior at the ICS.</td>
</tr>
<tr>
<td></td>
<td>Exit pause (default)</td>
<td>– <strong>Exit pause</strong> – Any new alarm condition, regardless of its alarm priority, will break through an already active audio pause state at the ICS. All visual and audible signals are reported fully for any new alarm condition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– <strong>Continue pause</strong> – Only alarm conditions of high priority will break through an active audio pause state at the ICS. The appropriate parameter box flashes. Alarm conditions of low or medium priority will not break through at the ICS.</td>
</tr>
<tr>
<td><strong>Pulse tone volume</strong></td>
<td>Off</td>
<td>Determines the volume of the pulse tone.</td>
</tr>
<tr>
<td></td>
<td>5, 10 (default) to 100 % (in increments of 10 %)</td>
<td></td>
</tr>
</tbody>
</table>
Alarm setup – Code functions

For urgent care, you can configure a set of individual monitoring functions. These functions can be activated simultaneously when you select the Code button on the main menu bar.

The following table lists the available settings of the Code page. To access this page, see page 401.

When the Code button is pressed, a timer along with a Stop and a Reset button appears in the header bar.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention tone volume</td>
<td>– Off&lt;br&gt;– 5, 10 (default) to 100 % (in increments of 10 %)</td>
<td>Determines the volume of the attention tone or deactivates the attention tone.</td>
</tr>
<tr>
<td>Alarm reminder enabled</td>
<td>– On (default)&lt;br&gt;– Off</td>
<td>When this function is activated and the alarm volume is deactivated, an alert tone sounds every 30 seconds. The volume is 50 % of the alarm volume following the audio pause period of 120 seconds.</td>
</tr>
<tr>
<td>Tone set</td>
<td>– Infinity (default)&lt;br&gt;– IEC fast&lt;br&gt;– IEC slow</td>
<td>Determines the type of alarm tone used (for more information, see “Acoustic alarm signals” on page 103).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous recording</td>
<td>– On&lt;br&gt;– Off (default)</td>
<td>– On – a continuous recording starts when you select the Code button.&lt;br&gt;– Off – no recording starts when you select the Code button.</td>
</tr>
<tr>
<td>Continuous NIBP mode</td>
<td>– On&lt;br&gt;– Off (default)</td>
<td>– On – continuous NIBP measurements start when you select the Code button.&lt;br&gt;– Off – no NIBP measurements start when you select the Code button.</td>
</tr>
<tr>
<td>Alarm volume off</td>
<td>– Yes&lt;br&gt;– No (default)</td>
<td>– Yes – the acoustic alarm signal for any active alarm is deactivated, the Audio alarms off banner and the symbol appear in the header bar.&lt;br&gt;– No – the acoustic alarm signals for any active alarm are not affected when you press the Code button.</td>
</tr>
</tbody>
</table>
System configuration

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
</table>
| All alarms off  | On, Off (default)  | Off – the following happens when you select the Code button:  
|                 |                    | – All audible and visual alarm signals are deactivated at the Cockpit and at the ICS.  
|                 |                    | – The banner All alarms off and the symbol appear in the header bar.  
|                 |                    | – The All alarms paused setting is set to No timeout  
|                 |                    | Selecting the Code button again causes any existing alarm conditions to be announced immediately.  
|                 |                    | Off – any existing alarm is still annunciated visually and acoustically when you select the Code button.                                     |
System configuration

Alarm setup – configuring SpO2 sensor alarm features

The **Config. alarms** page allows you to setup the acoustic and visual alarm reporting behavior in response to certain SpO2 sensor messages. To access this page, see page 401.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 sensor off 1)</td>
<td></td>
<td>Assigns an alarm grade to the sensor alarm or deactivates the sensor alarm. The selected alarm grade affects how the alarm event is reported visually and acoustically (see page 101 and page 103).</td>
</tr>
<tr>
<td>SpO2 check sensor 2)</td>
<td></td>
<td>Assigns an alarm grade to the sensor alarm or deactivates the sensor alarm. The selected alarm grade affects how the alarm event is reported visually and acoustically (see page 101 and page 103).</td>
</tr>
<tr>
<td></td>
<td>Alarm column</td>
<td>Assigns an alarm grade to the sensor alarm or deactivates the sensor alarm. The selected alarm grade affects how the alarm event is reported visually and acoustically (see page 101 and page 103).</td>
</tr>
<tr>
<td></td>
<td>– High</td>
<td>Assigns a high alarm grade which triggers both visual and acoustic alarms. The alarm event continues until the condition resolves.</td>
</tr>
<tr>
<td></td>
<td>– Medium</td>
<td>Assigns a medium alarm grade which triggers both visual and acoustic alarms. The alarm event continues until the condition resolves.</td>
</tr>
<tr>
<td></td>
<td>– Low (default for SpO2 check sensor)</td>
<td>Assigns a low alarm grade which triggers both visual and acoustic alarms. The alarm event continues until the condition resolves.</td>
</tr>
<tr>
<td></td>
<td>– (off) (default for SpO2 sensor off)</td>
<td>Assigns an off alarm grade which deactivates the sensor alarm.</td>
</tr>
</tbody>
</table>

|                            | Archive column    | Determines what happens when the corresponding alarm occurs: |
|                            | – Off (default)   | – Off – no event is stored and no recording is generated. |
|                            | – Store           | – Store – stores the event for later review (see page 128). |
|                            | – Record          | – Record – generates a timed recording. |
|                            | – StrRec          | – StrRec – generates a timed recording and stores the event. |

1) Message originating from a Masimo rainbow SET or a Masimo SET MCable.
2) Message originating from a Nellcor MCable.
System configuration

**Alarm setup – configuring M540 settings**

The **M540 settings** page configures certain M540 settings. These settings will automatically update the M540 settings when the M540 is docked. To access this page, see page 401.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport speaker volume</td>
<td>– 50% (default) to 100% (in increments of 10%)</td>
<td>Determines the speaker volume of the M540.</td>
</tr>
<tr>
<td>Transport pulse tone volume</td>
<td>– Off (default) – 5% – 10% to 100% (in increments of 10%)</td>
<td>Determines the pulse tone volume of the M540 while the device is on transport.</td>
</tr>
<tr>
<td>Keep device label</td>
<td>– Yes (default) – No</td>
<td>– Yes – The M540 retains the device label of the Cockpit when it undocks. – No – the M540 retains the device label configured in the M540 wireless menu.</td>
</tr>
</tbody>
</table>
System configuration

Configuring the recording and report settings

The Recordings/Reports pages are for configuring general recording and report settings.

To access the Recordings/Reports pages
1 Select System setup... on the main menu bar.
2 Select the Recordings/Reports tab.
3 Select one of the following tabs to access the respective setup page:
   - Reports
   - Recorder setup
   - Rest ECG report
   - Reports setup

Reports setup – Reports page

The following table lists the available settings of the Reports page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG/ST</td>
<td>– ECG report</td>
<td>Prints the selected report. See “Available reports” on page 438 for detailed descriptions of each report.</td>
</tr>
<tr>
<td></td>
<td>– Rest ECG report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– ST report</td>
<td></td>
</tr>
<tr>
<td>Alarms</td>
<td>Alarm history report</td>
<td></td>
</tr>
<tr>
<td>Trends/Data</td>
<td>– Trend graph report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Trend table report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Calculations report</td>
<td></td>
</tr>
<tr>
<td>Laser Report</td>
<td>– Continuous wvf. report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Timed wvf. report</td>
<td></td>
</tr>
<tr>
<td>Recording</td>
<td>– Timed recording</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Continuous recording</td>
<td></td>
</tr>
</tbody>
</table>
### Recorder setup

The following table lists the available settings of the Recorder setup page.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay</td>
<td>6, 10 (default), 15 s</td>
<td>Determines the amount of delay (pre-event) data included in a timed recording. Delay data refers to data that originated before the recording was initiated. A marker on the strip recording marks where the delay data ends and the real-time data starts.</td>
</tr>
<tr>
<td>Duration</td>
<td>6, 10, 15, 20 s (default)</td>
<td>Determines the length of a timed recording.</td>
</tr>
<tr>
<td>Speed</td>
<td>6.25, 12.50, 25.00 (default), 50.00 mm/sec</td>
<td>Determines the recording speed.</td>
</tr>
<tr>
<td>Waveform selection</td>
<td>– Auto (default) – Manual</td>
<td>– Auto – the top two displayed waveforms are automatically selected for recordings. If no waveforms are displayed, no recording is generated. – Manual – the two selected waveforms under Waveform 1 and Waveform 2 are printed.</td>
</tr>
<tr>
<td>Waveform 1</td>
<td>Selected parameter under Waveform selection setting (factory default is ECG Lead II)</td>
<td>Assigns the selected waveform to the top channel on R50N recordings, provided the Waveform selection is set to Manual.</td>
</tr>
<tr>
<td>Waveform 2</td>
<td>Selected parameter under Waveform selection setting (factory default is ECG lead V)</td>
<td>Assigns the selected waveform to the bottom channel on R50N recordings, provided Waveform selection is set to Manual.</td>
</tr>
<tr>
<td>Alarm waveform</td>
<td>– On (default) – Off</td>
<td>When this function is activated, the waveform of an alarming parameter of medium or high priority is printed in the second recording channel provided the archive function is activated (see page 120).</td>
</tr>
</tbody>
</table>
Rest ECG setup

Appropriate settings are crucial for optimal 12-lead analysis. The following table lists the available settings of the Rest ECG report page which controls various settings. To access this page, see page 409.

**NOTE**
The Rest ECG report is only available for adult and pediatric patients.

To obtain an optimal automatic diagnostic interpretation of an Rest ECG report, make sure the selections in the following table and the Weight, Height, and Birth date in the Demographics page (see page 89) are configured appropriately for the patient.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Unknown (default)</td>
<td>The selected information is included in the report.</td>
</tr>
<tr>
<td></td>
<td>– Male</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Female</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Unknown (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Caucasian</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Asian</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– African</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Other</td>
<td></td>
</tr>
<tr>
<td>Medication 1</td>
<td>No meds, Unknown (default), list of medications</td>
<td></td>
</tr>
<tr>
<td>Medication 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition 1</td>
<td>Selection list with several choices for indicating the medical condition of the patient. (Unknown is the default)</td>
<td></td>
</tr>
<tr>
<td>Condition 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>List of entries for annotating the condition of the patient. (None is the default)</td>
<td></td>
</tr>
<tr>
<td>Rest ECG report</td>
<td>Print button</td>
<td>The button is greyed out and not selectable when:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– The patient is not admitted at the ICS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– The Rest ECG analysis feature is not activated at the ICS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– The 12-lead ECG option is not unlocked.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– The required 12-lead cable is not connected.</td>
</tr>
</tbody>
</table>
System configuration

Reports setup – Reports setup page

The following table lists the available settings of the Reports setup page. To access this page, see page 409.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waveform delay [s]</td>
<td>6, 10 (default), 15 s</td>
<td>Determines the amount of delay (pre-event) data included in a timed waveform report. Delay data refers to data that originated before the report was initiated. A marker on the report marks where the delay data ends and the real-time data starts.</td>
</tr>
<tr>
<td>Waveform duration [s]</td>
<td>10, 20 s (default)</td>
<td>Determines the length of a waveform report.</td>
</tr>
<tr>
<td>Trend duration [hr]</td>
<td>1, 2, 4, 8, 12, 24 (default), 48, 72, 96 hr</td>
<td>Determines the graphical trend interval on the graphical trend report.</td>
</tr>
<tr>
<td>Table interval [min]</td>
<td>1, 5, 10, 15 (default), 30, 60 min</td>
<td>Determines the tabular trend interval on the tabular trend report.</td>
</tr>
</tbody>
</table>

NOTE
Reports printed on a laser printer use the settings in the Reports setup page not the settings defined in the trend setup pages.

Biomed setup

This section describes several pages accessible only to authorized personnel. All Biomed pages are password protected.

To access the biomed pages
1 Select System setup... on the main menu bar.
2 Select the Biomed tab.
3 Enter the password and select Enter.

4 Select one of the following tabs:
   – Country
   – Units of measure
   – Patient monitor
   – Name service
   – Network setup (select either the Infinity or Hospital tab)
   – Printer setup
   – Recorder setup
   – Service
   – IT setup (select the desired tab such as Web browser, Innovian, and so on).
System configuration

Biomed setup – country-specific settings

The following table lists the available settings of the Country page. To access this page, see page 412.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>English (United States), German (Germany), French (France), French (Belgian), Dutch (Belgian), Spanish (Traditional sort), Italian (Italy), Finnish, Danish, Norwegian (Bokmal), Portuguese (Brazil), Swedish, English (United Kingdom), Dutch (Netherlands), Japanese, Russian, Turkish, Polish, Greek, Hungarian, Chinese (PRC), Czech</td>
<td>Selects the language of the Cockpit screen text. You must select the language of the M540 independently.</td>
</tr>
<tr>
<td>Time zone</td>
<td>User-selectable list of time zones</td>
<td>Allows you to configure the Cockpit for the local time zone.</td>
</tr>
<tr>
<td>Daylight savings</td>
<td>– On</td>
<td>Allows you to activate or deactivate automatic activation of daylight savings time based on the regional setting.</td>
</tr>
<tr>
<td></td>
<td>– Off (default)</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Time and date fields</td>
<td>Allows you to set the regional time and date.</td>
</tr>
</tbody>
</table>
## Biomed setup – units of measure

The following table lists the available settings of the Units of measure page where you can configure the units for all parameter groups. To access this page, see page 412. Select the Apply button after making your selection.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>- mmHg (default)</td>
<td>Assigns the selected unit of measure to the parameter. Whenever you change a unit of measure, the Cockpit discharges the patient.</td>
</tr>
<tr>
<td></td>
<td>- kPa</td>
<td></td>
</tr>
<tr>
<td>etCO₂</td>
<td>- mmHg (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- kPa, %</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>- °C (Celsius) default</td>
<td>CAUTION: Before you connect the M540 to a different Cockpit, make sure that the units of measure align between the two devices. Differing units of measure could result in loss of data or a patient discharge.</td>
</tr>
<tr>
<td></td>
<td>- °F (Fahrenheit)</td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>- mm (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- mV</td>
<td></td>
</tr>
<tr>
<td>SpHb (only Masimo rainbow SET)</td>
<td>- g/dL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- mmol/L</td>
<td></td>
</tr>
<tr>
<td>Agent</td>
<td>- kPa (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- %</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>- kg (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- lb (adult, pediatric)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- oz, g (neonate)</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>- cm (default)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- in</td>
<td></td>
</tr>
</tbody>
</table>
### System configuration

**Biomed setup – patient monitor setup**

The following table lists the available settings of the Patient monitor page. To access this page, see page 412.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change clinical password</strong></td>
<td>User input</td>
<td>Allows you to define a new clinical password.</td>
</tr>
<tr>
<td><strong>French NFC mode</strong></td>
<td>- On</td>
<td>When this feature is activated, HR alarms cannot be deactivated, and the all alarm pause period cannot exceed 3 minutes.</td>
</tr>
<tr>
<td></td>
<td>- Off (default)</td>
<td></td>
</tr>
<tr>
<td><strong>Simulation (basic)</strong></td>
<td>- On</td>
<td>Activates or deactivates basic simulation mode.</td>
</tr>
<tr>
<td></td>
<td>- Off (default)</td>
<td></td>
</tr>
<tr>
<td><strong>Simulation (advanced)</strong></td>
<td>- On</td>
<td>Button appears grayed out and is not selectable.</td>
</tr>
<tr>
<td></td>
<td>- Off (default)</td>
<td></td>
</tr>
<tr>
<td><strong>External display</strong></td>
<td>- Analog</td>
<td>Selects the output for the external display.</td>
</tr>
<tr>
<td></td>
<td>- Digital (default)</td>
<td></td>
</tr>
<tr>
<td><strong>Airway adapter</strong></td>
<td>- Disposable</td>
<td>Configures the Cockpit and the M540 for a specific type of airway adapter.</td>
</tr>
<tr>
<td></td>
<td>- Reusable (default)</td>
<td></td>
</tr>
<tr>
<td><strong>Patient profile selection</strong></td>
<td>- On</td>
<td>When this feature is activated, you can select a profile and patient category on the Start dialog.</td>
</tr>
<tr>
<td></td>
<td>- Off (default)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

Changing the clinical password on the Cockpit does not change the password for the M540. Record the new password because you cannot retrieve it once it is lost.
### System configuration

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set OR alarms</strong></td>
<td>– Auto</td>
<td>Auto – OR alarms are automatically activated when an anesthesia machine is connected.</td>
</tr>
<tr>
<td></td>
<td>– Manual</td>
<td>Manual – OR alarms must be activated manually when an anesthesia machine is connected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Whenever you disconnect the A500 from the Cockpit, the OR Alarms and Cardiac bypass features are disabled automatically regardless of their setting.</td>
</tr>
<tr>
<td><strong>HLM/Bypass sync</strong></td>
<td>– Auto</td>
<td>Auto – when an anesthesia machine is connected and the OR Alarms setting is activated at the Cockpit, the Cardiac bypass feature is automatically activated when the A500 is in heart lung mode. Cardiac bypass is automatically disabled when the A500 is no longer in heart lung mode.</td>
</tr>
<tr>
<td></td>
<td>– Manual</td>
<td>Manual – when an anesthesia machine is connected and the OR Alarms setting is activated at the Cockpit, the Cardiac bypass feature must be activated manually (see page 402).</td>
</tr>
<tr>
<td><strong>Restore factory settings</strong></td>
<td>None</td>
<td>Removes all patient and monitoring settings to the factory defaults. Do not restore factory defaults while monitoring a patient.</td>
</tr>
</tbody>
</table>
System configuration

Biomed setup – name service settings

The following table lists the available settings of the Name service page. To access this page, see page 412. After making the desired changes, select the Apply button which causes a brief loss of communication with a docked M540.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring unit ID</td>
<td>1 to 255 (increments of 1)</td>
<td>Allows you to assign the Cockpit to a monitoring unit by entering an ID using the keypad symbol.</td>
</tr>
<tr>
<td>Monitoring unit label</td>
<td>Up to seven alphanumeric characters</td>
<td>Allows you to enter the corresponding label for the network and recordings using the keyboard symbol.</td>
</tr>
<tr>
<td>Care unit label</td>
<td></td>
<td>Note: When entering the Device label, do not use the word ‘IACS’. The word ‘IACS’ is used for the Name service setting. If the Name service setting and any bed labels match, the IACS bed label does not appear on the ICS.</td>
</tr>
<tr>
<td>Device label</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable central station</td>
<td>On (default)</td>
<td>If this feature is activated and an ICS is connected to the network, the message Not monitored by central appears in the Cockpit header bar if the Cockpit is not assigned to an ICS. If this feature is deactivated, an ICS is connected to the network and the Cockpit is not assigned to an ICS, the message Not monitored by central does not appear in the Cockpit header bar.</td>
</tr>
<tr>
<td>Enable remote control</td>
<td>On (default)</td>
<td>If this feature is activated, the Cockpit allows other Infinity monitors and the ICS to view its data and perform simple functions, such as requesting a recording or pausing an alarm.</td>
</tr>
<tr>
<td>Enable remote silence</td>
<td>On (default)</td>
<td>If this feature is activated, the Cockpit allows alarms to be silenced from network devices.</td>
</tr>
</tbody>
</table>
Biomed setup – network setup

The following table lists the available settings for configuring the Infinity and the hospital network settings in the Infinity and the Hospital pages. To access the pages, see page 412. After making the desired changes, select the Apply button to activate them.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCP</td>
<td>– Disabled (default) – Enabled</td>
<td>When the Dynamic Host Configuration Protocol (DHCP) is activated, the settings for IP address, Subnet mask, Gateway, and Primary DNS are pulled automatically from the server.</td>
</tr>
<tr>
<td>IP address</td>
<td>User selectable</td>
<td>Allows you to select an IP address manually (the DHCP setting has to be set to Disabled).</td>
</tr>
<tr>
<td>Subnet mask</td>
<td>User selectable</td>
<td>Allows you to set up a subnet mask (the DHCP setting has to be set to Disabled).</td>
</tr>
<tr>
<td>Gateway</td>
<td>User selectable</td>
<td>Allows you to set up a gateway (the DHCP setting has to be set to Disabled).</td>
</tr>
<tr>
<td>Primary DNS</td>
<td>User selectable</td>
<td>Allows you to set up the primary Domain Name System (DNS) – set the DHCP setting to Disabled.</td>
</tr>
</tbody>
</table>

Biomed setup – printer setup

The following table lists the available settings of the Printer setup page. To access this page, see page 412. After making the desired changes, select the Apply button.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer IP address</td>
<td>User selectable</td>
<td>Allows you to configure the IP address for printing reports on a network printer.</td>
</tr>
<tr>
<td>Printer type</td>
<td>User selectable</td>
<td>Allows you to select the type of laser printer used for printing reports.</td>
</tr>
<tr>
<td>Paper size</td>
<td>Letter, Legal, A4</td>
<td>Allows you to select the printer paper.</td>
</tr>
<tr>
<td>Print test page</td>
<td>Select the Print screen button</td>
<td>To verify that the printer is working properly.</td>
</tr>
</tbody>
</table>
System configuration

Biomed setup – recorder setup

The following table lists the available settings of the Recorder setup page. To access this page, see page 412.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary recorder</strong></td>
<td>Recorders are available for selection once they are connected to the network.</td>
<td>Selects a recorder as the primary recorder for printing recordings.</td>
</tr>
<tr>
<td><strong>Secondary recorder</strong></td>
<td></td>
<td>Selects the secondary recorder for printing recordings when the primary recorder is not available.</td>
</tr>
</tbody>
</table>

Biomed setup – service setup

The following table lists the available settings of the Service page. To access this page, see page 412.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System setup</strong></td>
<td></td>
<td>A Biomed tab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Product identification field displaying software-specific information (for example, software version, and so on).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Select this button to copy all logs to the connected USB memory stick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Select this button to export the current profiles to the connected USB memory stick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E Select this button to import the profiles from the connected USB memory stick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F Window displaying status messages relating to the function that is being executed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G Service button for accessing Service-related functions such as unlocking options (refer to the Technical documentation available from DrägerService for detailed information).</td>
</tr>
</tbody>
</table>

Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n 419
System configuration

Biomed IT setup

The IT page consists of several setup pages for performing the following IT-specific tasks:

– Activating or deactivating all IT tabs
– Configuring a web browser
– Configuring Citrix applications
– Configuring IT applications

Activating/deactivating IT tab feature

When the web enabled tabs option is unlocked, the Cockpit supports IT applications (options) that are accessible via IT tabs (see "Supported IT applications" on page 446). When an IT application is configured and the tab is activated, the corresponding IT tab appears along the left edge of the screen as soon as the IT tab feature is activated. Regardless of how many IT tabs are configured, the top tab is always labeled Patient and provides access to the Cockpit main screen.

To activate or deactivate IT tab feature

1. Access the IT setup page (see page 412).
2. Select the IT tabs button.
3. Select the On or Off button next to the IT tabs selection.

Configuring IT tabs – web browser setup

You can set up a web browser as an IT tab that contains several pre-configured Web pages. These Web pages are accessible from a pull-down dialog under the configured IT tab (see "Accessing an IT tab" on page 445).

CAUTION

The Infinity Acute Care System – Monitoring Applications (IACS) does not have virus protection software and relies therefore on the firewall of your institution to prevent access to infected files. While setting up IT applications to access web sites, evaluate each web site with regard to possible virus infection.
The following diagram shows the Web browser page. The left side displays a selection list which is reserved for pre-configured web sites. The right side is for setting up new sites or for editing existing ones. The site with the asterisks is the default site that appears automatically when you access the corresponding IT tab.

Adding a web browser page

In the following steps, the letters in parentheses refer to the diagram of the Web browser page.

To add a web browser page

1. Access the Web browser page (see page 412).
2. Select the Add button (K). The label Undefined appears in the selection list (J) as a placeholder.
3. Select the following buttons to configure the corresponding settings:
   - Select the symbol next to the Name menu selection (D) to activate an on-screen keyboard for changing the label Undefined to an actual name.
   - Select the symbol next to the URL menu selection (E) to activate an on-screen keyboard for entering the URL.
   - Select the Default on/off buttons (F) to activate or deactivate this site as a default in the selection list (J).
   - Select the Block Popups on/off button (G) to allow or prevent popups from appearing on the web site.
   - Select the Full Trust on/off button (H) to select the security setting for this web site.
4. Select the Tab visible on/off buttons (I) to display or hide the IT tab.

Once a web browser is correctly set up, the web site is accessible under the corresponding IT tab (for more information, see "Accessing an IT tab" on page 445).
Dealing a web browser page

In the following steps, the letters in parentheses refer to the diagram of the Web browser page on page 421.

To delete a web browser page

1. Access the Web browser page (see page 412).
2. Select the web site you wish to delete in the selection list.
3. Select the Delete button (L).

Configuring Citrix applications

The following diagram shows the Application page for configuring Citrix applications. Citrix allows you to access remote applications without running the actual application on the Cockpit.

- **A** Application tab
- **B** IT tabs
- **C** Name symbol and field
- **D** Name column
- **E** Value column
- **F** List of Citrix applications
- **G** Tab visible on/off buttons
- **H** Auto logoff on/off buttons
- **I** Edit button
- **J** Delete button
- **K** Add button
To configure a Citrix application

In the following steps, the letters in parentheses correspond to the diagram for the Application page (see page 422).

1. Access the Application page (see page 412).
2. Select the symbol next to the Name menu selection (C) to activate an on-screen keyboard for changing the name of the IT tab label (the name of the actual tab in the IT setup page does not change).
3. Define the following settings in the Name column (D) and Value column (E) for any application that runs on Citrix:
   - IP address of the PC you are accessing
   - Communication port used for the application
   - Application you will be running using Citrix

Configuring IT tabs

The following diagram shows an example of an IT page. When the appropriate IT application option is unlocked, IT tabs appear with the corresponding label of a pre-configured URL address, provided the web enabled tab option is also unlocked.

![System setup diagram](image-url)
To configure an IT application tab

In the following steps, the letters in parentheses correspond to the diagram for the IT setup page (see page 423).

1 Access the IT setup page (see page 412).
2 Select the tab of the IT application you wish to configure.
3 Select the following buttons to configure the corresponding settings:
   - Select the symbol next to the Name menu selection (C) to activate an on-screen keyboard for changing the name of the IT label (the name of the actual tab in the IT setup page does not change).
   - Select the symbol next to the URL menu selection (D) to activate an on-screen keyboard for entering the URL.
   - Select the Full Trust on/off buttons (E) to select the security setting for this web site.
   - Select the Block Popups on/off button (F) to allow or prevent popups from appearing on this web site.
4 Select the Tab visible on/off button (G) to display or hide the tab.

CAUTION
The URL address shows a pre-configured string. Do not change any portion of the string except for the server name to preserve the correct information.

NOTE
IT tabs appear ghosted and are therefore not selectable while the application is loading. A tab may also appear ghosted the first time an application is turned on.

Once an IT application is correctly set up, the web site is accessible under the corresponding IT tab (for more information, see “Accessing an IT tab” on page 445).
Profile setup

A profile ‘remembers’ patient settings and device settings for future use. Profiles eliminate time-consuming setup tasks that would otherwise have to be repeated for each monitoring session. Each patient category has one default profile. All tasks related to profiles take place in the Profiles pages.

Selecting a profile

The following diagram shows the Select profile page where you can select a profile with pre-configured patient and device settings.

To select a profile

1. Select the System setup... button on the main menu bar.
2. Select the Profiles tab (A) > Select profile tab (B).
3. Select the desired patient category button:
   – Adult (C)
   – Pediatric (D)
   – Neonate (E)
4. Select the arrow button next the Profile menu selection (F) to display a list of profiles within the selected patient category. If available, a description of the selected profile appears in the description field (G).
Saving profiles

For each patient category, you can create and save five unique profiles. Included in the five profiles is a Dräger default profile that cannot be modified. The following diagram shows the Save profile page where you can modify existing profiles and save new ones.

To save changes to an existing profile
In the following steps, the letters in parentheses correspond to the diagram for the Save profile page.

1. Make sure the Cockpit is in the correct patient category before configuring the profiles (see “Selecting the patient category” on page 93).
2. Make the desired changes to the patient settings.
3. Select the System setup... button on the main menu bar.
4. Select the Profiles tab (A).
5. Select the Save profile tab (B). A password popup appears.
6. Enter the password and select the Enter button.
7. Select the arrow button (F) next to the Profile menu selection. A summary of the selected profile appears in the description field (G).
8. Select the Save profile button (I) to apply the changes to the selected profile.

System configuration

Modifying an existing profile
You can save changes to an existing profile. The only profile you cannot modify is the Dräger default profile. The Dräger default profile is activated the very first time the system is booted up, after a software upgrade or after factory defaults are restored. The adult profiles, pediatric profiles, neonate profiles pages have identical setup functions. The only exception is their content which is patient-category specific. This is important when you are resetting all profiles to Dräger profiles. Only the profiles within the currently selected patient-category are affected.

To save changes to an existing profile
In the following steps, the letters in parentheses correspond to the diagram for the Save profile page.

1. Make sure the Cockpit is in the correct patient category before configuring the profiles (see “Selecting the patient category” on page 93).
2. Make the desired changes to the patient settings.
3. Select the System setup... button on the main menu bar.
4. Select the Profiles tab (A).
5. Select the Save profile tab (B). A password popup appears.
6. Enter the password and select the Enter button.
7. Select the arrow button (F) next to the Profile menu selection. A summary of the selected profile appears in the description field (G).
8. Select the Save profile button (I) to apply the changes to the selected profile.
Saving a new profile

You can also save a profile under a new name and assign it to an existing view using the **Save profile** pop-up window.

A **Profile name** field and setup button
B **Description** field and setup button
C **Default view** field and selection button
D **Save profile** button

To save a new profile

1. Repeat steps 1 to 6 for saving changes to an existing profile (see page 426).
2. Select the **Save profile as...** button (H) in the **Save profile** page (see diagram on page 426). The **Save profile** pop-up window appears.
3. Select the setup buttons next to **Profile name** (A), **Description** (B), and **Default view** (C) to enter the corresponding information.
4. Select the **Save profile** button (D).
Configuring profiles

The following diagram shows a patient-specific Profiles page for configuring profiles. These pages allow you to modify existing profiles such as the name of the profile, the profile description, and so on.

There are three pages for each patient category (adult, pediatric, and neonate).

To access the patient-specific Profiles pages:

1. Select the System setup... button from the main menu bar.
2. Select the Profiles tab.
3. Select the Profiles/views tab.
4. Select either the Adult (A), Neonate (B), Pediatric (C) tabs to access the patient category-specific pages.
System configuration

Configuring the patient-specific profiles

In the following steps, the letters in parentheses correspond to the diagram for the patient-specific Profiles page (see page 428).

To configure the profiles

1. Access the patient-specific profiles page.
2. Select the desired profile in the selection list (K).
3. Select one or more of the following buttons:
   - Select the Set as default button (E) to designate the selected profile as the new default profile for the selected patient category. After each patient discharge or a restart of the Cockpit, the default profile is automatically loaded when that patient category is selected.
   - Select the Delete profile button (F) to delete the selected profile.
   - Use the button next to the Profile name field (G) of the profile page to name the profile. The name appears in the Select profile page (see page 425).
   - Use the button next to the Description field (H) of the profile page to add or modify an existing description. The description appears in the Select profile page (see page 425) when you select a profile.
   - Select the arrow button next to the Default view field (I) and select the view that you wish to designate as the default view.
Transferring profiles

You can transfer profiles over the network or with a USB memory stick.

NOTE
Use a FAT32 memory stick for importing or exporting profiles. USB sticks with NTFS format do not produce reliable results.

Only patient profiles can be transferred over the network. See page 431 for details on how to transfer shared system profiles.

NOTE
Whenever you use the transfer profile function, all existing profiles for all patient categories are transferred simultaneously.

Transferring patient profiles over the network

Transferring patient profiles over the network is only possible among Cockpits within the same monitoring unit. The following diagram shows the Profile transfer page which consists of a list of connected devices within the monitoring unit.

A Profiles tab
B Device name column
C Status column
D Profile transfer tab
E Start transfer button
F Clear selection button
G Select all button
System configuration

To transfer a profile over the network
1. Select the System setup... button on the main menu bar.
2. Select the Profiles > Profile transfer tab.
3. Enter the clinical password. The Profile transfer page which lists all the devices in the monitoring unit appears.
4. Select a device from the list or select one of the following buttons:
   - Select all button (G) to select all devices to transfer profiles to.
   - Clear selection button (F) to remove any selection from the device list.
5. Select the Start transfer button (E) to start the profile transfer. The profiles are transferred to the target Cockpit but are not implemented until you select a new profile.

Importing and exporting profiles using a USB memory stick

You can import and export patient and shared system profiles from one Cockpit to another using a USB memory stick.

Whenever you import or export patient profiles or shared system profiles, all settings of the selected profile are transferred. For information what settings are included in a patient or a shared system profile, see page 66 and page 72, respectively.

If you are importing shared system profiles from a Cockpit that has options unlocked (such as physiological calculations) that are locked on the destination Cockpit, the shared system profiles are imported. However, the settings relating to the locked feature will not become active until the option is unlocked on the destination Cockpit.

NOTE
If an M540 is docked its profiles are also imported/exported as part of the patient profiles.

Unlike transferring profiles over the network, using a USB memory stick has the advantage that the Cockpits do not have to reside in the same monitoring unit.

To export patient and shared system profiles to a USB memory stick
1. Insert a USB memory stick into one of the USB ports of the Cockpit whose profiles you wish to transfer.
2. Select the System setup... button from the main menu bar.
3. Select the Biomed tab.
4. Enter the Biomed password.
5. Select the Service tab.
6. Select the Export patient profile button to export all patient profiles to the USB memory stick.
   or
   Select the Export shared system profile button to export all shared system profiles to the USB device.

A message appears in the text window indicating that the profiles have been successfully exported. A corresponding message appears if the export is unsuccessful.
To import patient profiles from a USB memory stick

1. Insert the USB device in the USB port of the Cockpit where you wish to transfer the profiles to.
2. Select the System setup... button from the main menu bar.
3. Select the Biomed tab.
4. Enter the Biomed password.
5. Select the Service tab.
6. Select the Import patient profile button to import all patient profiles from the USB memory stick to the Cockpit.

Messages appear in the text window informing you if the patient profiles imported successfully or not.

To import shared system profiles from a USB memory stick

1. Insert the USB device in the USB port of the Cockpit where you wish to transfer the profiles to.
2. Select the System setup... button from the main menu bar.
3. Select the Biomed tab.
4. Enter the Biomed password.
5. Select the Service tab.
6. Select the Import shared system profile button to import all shared system profiles from the USB device to the Cockpit. A confirmation popup appears stating that the Cockpit will reboot if you press the Import button.
7. Select the Import button in the confirmation popup to start importing the patient profiles. or
   Select Cancel to stop the procedure and dismiss the popup.

Messages appear in the text window informing you if the shared system profiles imported successfully or not.
Reports/recordings

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Reports/recordings

Overview

The Cockpit offers a real-time record of its monitoring results on an R50N recorder. In addition, you can request various reports and print screens which are printed on a laser printer.

**NOTE**
Ventilation waveforms are not supported on recordings.

The content of the recordings and reports depend on the configured settings. You can customize the recording and report settings in the **Recordings/Reports** pages (see page 409).

Messages relating to recordings and reports are listed on page 462.

R50N recorder

Timed and continuous strip recordings are printed on an R50N recorder which is connected to the network or to the PS250 / P2500 using a cross-over cable. The R50N is a two-channel strip recorder.

Replacing the recorder paper

**To replace the paper**

1. Open the paper door and remove the empty paper roll and any paper remaining in the printing mechanism.
2. Place a new paper roll with printed side facing up into the spool holder. Unroll a few inches of paper from the bottom.
3. Align the paper roll with the paper guides, and close the door. (If not aligned properly, the paper may jam.)
4. Generate a timed recording to verify that the recorder is connected properly, and the paper is loaded correctly.

A **Stop** key – stops a recording in progress

B **mm/s** key – does not function
Timed recordings

From the Cockpit, you can request timed strip recordings that are printed on an R50N recorder (see page 437). Timed recordings can be requested manually or triggered automatically depending on configured alarm settings.

If a signal source becomes unavailable, for example due to a disconnected lead or a cable, while a recording is printing, the associated parameter data and waveform appear as blank data on the strip recording.

A timed recording contains data of a specified duration which is configurable from 6 seconds to 20 seconds (see "Configuring the recording and report settings" on page 409). A timed recording contains delay data that originated before the recording was initiated and real-time data that was acquired after the recording started. The ratio of delay and real-time data are configurable (see page 409). Strip recordings also include pacer spikes if present.

The header of a timed recording contains the following information:
- Parameter values at the time the recording starts printing
- Patient name and ID number
- Date and time

The following diagram shows a typical timed recording.

![Diagram of a timed recording]

A Patient name
B Patient ID
C Monitoring unit
D Date
E Time
F Selected delay time
G Selected recording speed
H Origin of recording request (for example, Bed Timed)
I Parameter labels and units of measure

Remote Recordings

You can also request a recording from another monitor or the ICS. Remote recordings use the delay, duration, and speed recorder settings of the Cockpit not the remote device from which you request the recording.
Automatic alarm recordings

When the Alarm waveform feature is activated (see page 409), timed alarm recordings are generated automatically whenever a parameter whose archive function is activated goes beyond the set alarm limits.

Alarm recordings are also generated when an arrhythmia event with an alarm classification of high or medium occurs.

The following sections describe how to set up a parameter or arrhythmia event to generate an automatic alarm recording.

To activate or deactivate the archive function of a parameter

1. Select the parameter box of the parameter whose alarm function you wish to activate or deactivate to access that parameter page directly.
   or
2. Select Sensor parameters... from the main menu bar > select the desired parameter tab to access the page.

To assign an alarm grade to arrhythmia events

1. Select the Alarms... button on the main menu bar.
2. Select the Limits tab (if not already selected).
3. Select the ARR tab along the right side to display the ARR page.
4. Touch the field in the Alarm column of the parameter whose alarm grade you want to modify.
5. Select the field in the Archive column and select either Store, Str/Rec, Record to generate a recording or Off to deactivate the feature.
6. Press the rotary knob to confirm the setting.
Continuous recordings

Continuous recordings are almost identical to timed recordings (see illustration on page 435). The only difference is that a continuous recording runs until you manually interrupt it unlike a timed recording, which runs for a specified time.

The waveform labels, scale bars, and the scales are printed once for each parameter.

To request a continuous recording

- Select the symbol next to the Trends/Data... button on the main menu bar > Continuous recording.

Causes for automatic cancellation of recordings

Any active timed or continuous recording is automatically canceled under the following circumstances:

- If the Cockpit loses its connection to the network. The recordings resume when the network connection is restored.
- If you place the Cockpit into standby mode.
- If you discharge a patient.

Requesting recordings

The following table lists where you can request manual timed and continuous recordings.

<table>
<thead>
<tr>
<th>Type of report</th>
<th>Description</th>
<th>How to request the recording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timed recording</td>
<td>A strip recording of a specified duration (see page 435).</td>
<td>Select the Trends/Data... button on the main menu bar &gt; Timed recording.</td>
</tr>
<tr>
<td>Continuous recording</td>
<td>A strip recording that continues until manually stopped (see page 437).</td>
<td>Select the Trends/Data... button on the main menu bar &gt; Continuous recording.</td>
</tr>
</tbody>
</table>
Available reports

If an IACS patient is admitted at the ICS for central monitoring or was previously admitted there and the data have been archived, you can request the following reports from the Cockpit. The reports are printed on any compatible laser printer.

The reports are printed based on pre-configured settings (see page 412). The header of all reports contains the following information:

- Patient name and ID number
- Hospital name
- Care unit
- Bed name
- Parameter labels and values (for ECG, ST, timed waveform and continuous waveform reports only)

The footer of all reports contains the following information:

- Date
- Page number
- Report title

Printing reports

The following table outlines the types of reports that are available. Most reports can be requested from several places on the Cockpit.

<table>
<thead>
<tr>
<th>Type of report</th>
<th>Description</th>
<th>How to request the report</th>
</tr>
</thead>
</table>
| Print screen   | Prints the current display. Whenever you request a print screen, it is printed on the connected laser printer. | C700: Select the Print screen button on the main menu bar.  
C500: Select the symbol next to the Views... button on the main menu bar.  
NOTE  
If a keyboard is connected to the Cockpit, you can also use the print screen key of the keyboard to generate a print screen. |
| ECG report     | Prints the waveforms of the connected ECG leads. This report is not of diagnostic quality. | Select the symbol next to the Trends/ Data... button on the main menu bar > Rest ECG report  
Select the Trends/ Data... button on the main menu bar > Trends > Reports > General reports > ECG report |
Reports/recordings

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**Reports/recordings**

The Rest ECG report is available in several formats that can be customized at the ICS (refer to the ICS instructions for use). You can also configure the content of a Rest ECG report, see "Rest ECG setup" on page 411.

When requesting a Rest ECG report, use the 1mV/cm scale to avoid overlapping ECG waveforms.

1. Select the symbol next to the **Trends/ Data...** button on the main menu bar > **Rest ECG report**
2. Select the **Trends/ Data...** button on the main menu bar > Trends > Reports > General reports > Rest ECG report

### Notes

**NOTE**

- The Rest ECG report is only available for adult and pediatric patients.
- To obtain an optimal automatic diagnostic interpretation of a Rest ECG report, make sure the required settings are configured appropriately for the patient (see page 411).

**NOTE**

1) If configured to appear on the main menu bar, the buttons for requesting these reports are also accessible on the main menu bar. For more information, see page 396.

<table>
<thead>
<tr>
<th>Type of report</th>
<th>Description</th>
<th>How to request the report</th>
</tr>
</thead>
</table>
| **Rest ECG report** | This 12-lead diagnostic report is generated in different stages. Although you request the report at the Cockpit, the M840 collects the actual ECG data, and the ICS prints it. To be able to generate such a report, the Cockpit must be in the same monitoring unit as the ICS, and the Rest ECG analysis option must be installed at the ICS. The report is available in several formats that can be customized at the ICS (refer to the ICS instructions for use). You can also configure the content of a Rest ECG report, see "Rest ECG setup" on page 411. | When requesting a Rest ECG report, use the 1mV/cm scale to avoid overlapping ECG waveforms.  
- Select the symbol next to the **Trends/ Data...** button on the main menu bar > **Rest ECG report**  
- Select the **Trends/ Data...** button on the main menu bar > Trends > Reports > General reports > Rest ECG report |

| **Timed waveform report** | Prints waveform strips of all currently displayed waveforms (the waveform duration and delay time settings are configurable, see page 412). | Select the symbol next to the **Trends/ Data...** button on the main menu bar > **Timed wvf. report**  
- Select the **Trends/ Data...** button on the main menu bar > Trends > Reports > General reports > Timed wvf. report |

| **Continuous waveform report** | Prints waveform strips of all currently displayed waveforms (prints a maximum of five pages). | Select the symbol next to the **Trends/ Data...** button on the main menu bar > **Continuous wvf. report**  
- Select the **Trends/ Data...** button on the main menu bar > Trends > Reports > General reports > Continuous wvf. report |

---

439
### Type of report | Description | How to request the report
--- | --- | ---
**ST report** | Prints the ST complexes currently displayed on ST screen. This report is not of diagnostic quality. |  
- Select the symbol next to the **Trends/Data...** button on the main menu bar > **ST report**  
- Select the **Trends/Data...** button on the main menu bar > **Trends > Reports > General reports** > **ST report**  
- Select the **Sensor parameters...** button on the main menu bar or the ST parameter box if it is displayed > **ECG > ST complex > Print**

**Trend graph report** | Prints the contents of the trend graphs according to the selected **Trend duration [hr]** setting (see page 412). Trend graph reports do not include discrete data such as C.O. and NIBP. |  
- Select the symbol next to the **Trends/Data...** button on the main menu bar > **Trend graph report**  
- Select the **Trends/Data...** button on the main menu bar > **Trends > Graph > Print**  
- Select the **Trends/Data...** button on the main menu bar > **Trends > Reports > General reports** > **Trend graph report**

**Recruitment trend graph report** | Prints the values of the Recruitment page (see page 165) corresponding to the Cursor 1 and Cursor 2 positions. It also contains the Delta values between the Cursor 1 and the Cursor 2 values. |  
- Select the **Procedures...** button from the main menu bar > **Recruitment tab > Print**

**Trend table report** | Prints the contents of the trend table according to the selected **Table interval [min]** setting (see page 412). |  
- Select the symbol next to the **Trends/Data...** button on the main menu bar > **Trend table report**  
- Select the **Trends/Data...** button on the main menu bar > **Trends > Table > Print**  
- Select the **Trends/Data...** button on the main menu bar > **Trends > Reports > General reports** > **Trend table report**

**Graph vitals report** | Prints the contents of the Graph vitals page. |  
- Select the **Trends/Data...** button on the main menu bar > **Trends > Graph vitals > Print**

**NOTE**

- If configured to appear on the main menu bar, the buttons for requesting these reports button are also accessible on the main menu bar. For more information, see page 356.
### Reports/recordings

<table>
<thead>
<tr>
<th>Type of report</th>
<th>Description</th>
<th>How to request the report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilation/anesthesia report</td>
<td>Prints the contents of the Ventilation / Anesthesia page. A ventilator report requested from the ICS does not print the ventilator settings.</td>
<td>Select the <strong>Trends/ Data...</strong> button on the main menu bar &gt; Trends &gt; Ventilation / Anesthesia &gt; Print</td>
</tr>
<tr>
<td>Alarm history report</td>
<td>Prints the contents of the Alarm history page.</td>
<td>Select the <strong>Trends/ Data...</strong> button on the main menu bar &gt; Alarm history report.</td>
</tr>
<tr>
<td>Calculations report</td>
<td>Prints the calculations results currently displayed in the Calculations page.</td>
<td>Select the <strong>Trends/ Data...</strong> button on the main menu bar &gt; Calculations report.</td>
</tr>
<tr>
<td>Case summary report</td>
<td>Prints a combination of reports configured in the Reports page of the Trends/Data dialog window (see page 175).</td>
<td>Select the <strong>Trends/ Data...</strong> button on the main menu bar &gt; Case summary report.</td>
</tr>
<tr>
<td>OR report</td>
<td>Prints a brief summary of an anesthesia OR case including the agent and gas consumptions during the case.</td>
<td>Select the <strong>Trends/ Data...</strong> button on the main menu bar &gt; OR report.</td>
</tr>
</tbody>
</table>
Configuring a case summary report

The Reports Setup page allows you to select which reports make up a case summary report. Selecting the Case summary report button prints the pre-configured reports without having to select each report manually. If no reports are pre-configured, the following reports are assigned by default to a case summary report: ECG report, Anesthesia trend report, OR report.

To setup a case summary report
1. Select the Trends/Data... button on the main menu bar.
2. Select the Reports tab (if not already selected).
3. Select the Setup tab to display the setup page to be included in the case summary report.
4. Select one or more of the following reports (the buttons of the selected reports appear dark green):
   - ECG report
   - Rest ECG report
   - ST report
   - Alarm history report
   - Trend graph report
   - Trend table report
   - Anesthesia trend report
   - Calculations report
   - Timed wvf. report
   - OR report

You can print a case summary report from several places, see page 441.
IT applications (options)

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Accessing an IT tab ...................... 445
Supported IT applications .............. 446
Overview

The Cockpit supports several IT applications. Each application is an option that is accessible by selecting a tab appearing on the left side of the monitoring area (see "Cockpit split screen mode with mini trends and IT tabs" on page 63). Whenever IT tabs are displayed, the top IT tab is always labeled Patient and allows you to access the monitoring screen that displays the current patient’s vital signs. If you are using a keyboard, you can activate a mouse cursor on the Cockpit by pressing the ALT F10 keys simultaneously.

Configuring IT tabs

Only authorized personnel with the Biomed password can configure IT tabs. In the IT setup page you can activate or deactivate each tab and configure specific settings, such as the blocking of popups and so on. For detailed information, see "Biomed IT setup" on page 42.

CAUTION

The IACS does not have virus protection software and relies therefore on the goodwill of your institution to prevent access to infected files. While setting up IT applications to access web sites, evaluate each web site with regard to possible virus infection.

If the Cockpit loses communication with an application, a message appears on the corresponding IT application page. The Cockpit tries to restore the communication with the IT application as quickly as possible.

Web browser

In addition to IT applications, you can also setup a web browser with pre-configured web sites (see "Configuring IT tabs – web browser setup" on page 42). Once you access the web browser IT tab, you can choose from all of the options that were pre-configured under the Biomed tab. IT tabs are also available in split screen mode (see page 60).
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Accessing an IT tab

The following diagram is an example of a web page. After a browser has been successfully configured (see page 421), you can select it by clicking the corresponding IT tab. Whatever IT application is displayed, the Cockpit header bar is always visible to report the patient’s vital status. The top IT tab is the Patient tab that returns you to the main screen displaying the patient’s vital signs.

A Patient tab – always returns you to the main screen with the patient’s vital signs.
B Navigate backward and forward
C Stops loading the web page
D Refreshes the screen
E Displays the home screen
F Address window

NOTE
Refreshing certain IT applications may disconnect the application and require a new login.
Supported IT applications

If you dock a new M540 and admit the patient at the Cockpit, the content of some application tabs changes to reflect the data of the new patient. Similarly, if you discharge a patient, all IT tabs reflect that the patient is discharged. The following table lists the supported IT applications.

<table>
<thead>
<tr>
<th>Name of Application</th>
<th>Supported software version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovian Solution Suite</td>
<td>VF6</td>
<td>Clinical flow sheet application. The tab can be configured to display a single patient.</td>
</tr>
<tr>
<td>This application includes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Innovian Critical Care (formerly known as ChartAssist)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Innovian Perioperative Care</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: The single patient tab requires that the M540 is docked. Whenever you access the Innovian tab, the local patient is displayed or the admit screen is presented if the local patient has not yet been admitted to Innovian Solution Suite application. For more information, refer to the instructions for use Innovian Solution Suite.</td>
</tr>
<tr>
<td>MegaCare</td>
<td>VF4</td>
<td>An ECG archiving application that allows you to view, analyze, compare, edit and confirm ECG examinations. The tab can display multiple patients.</td>
</tr>
<tr>
<td>Infinity Symphony Suite</td>
<td>VF7</td>
<td>An application that provides retrospective analysis of patient information stored on the ICS. The tab can be configured to run a single patient provided an M540 is docked. The Symphony status page only displays ST-deviations that are displayed in the parameter box.</td>
</tr>
<tr>
<td>RemoteView (Gateway PatientWatch)</td>
<td>VF6 or higher</td>
<td>Allows you to remotely view up to 4 different bedside monitors from the Cockpit. No wireless symbol (example: ) appears on the PatientWatch screen when the M540 is in wireless mode.</td>
</tr>
<tr>
<td>NOTE</td>
<td>PatientWatch is only supported in English.</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>ICA client version 12.1.0.30</td>
<td>Supports IT applications using a Citrix XenApp server (version 5 and 6).</td>
</tr>
<tr>
<td>Internet Explorer</td>
<td>7.0</td>
<td>Used for running the web browser.</td>
</tr>
</tbody>
</table>

NOTE: The single patient tab requires that the M540 is docked.

NOTE: PatientWatch is only supported in English.
## IT applications (options)

<table>
<thead>
<tr>
<th>Name of Application</th>
<th>Supported software version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrix client online plug-in version</td>
<td>12.1.0. 30 version 12.3</td>
<td>Provides remote access to applications residing on the Citrix server. The IACS was verified to connect to XenApp Version 5.0, 6.0 and 6.5.</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
## Problem solving

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>450</td>
</tr>
<tr>
<td>Device communication messages</td>
<td>450</td>
</tr>
<tr>
<td>ECG</td>
<td>453</td>
</tr>
<tr>
<td>ST</td>
<td>456</td>
</tr>
<tr>
<td>ARR</td>
<td>457</td>
</tr>
<tr>
<td>Respiration (RRi)</td>
<td>459</td>
</tr>
<tr>
<td>SpO2</td>
<td>462</td>
</tr>
<tr>
<td>Non-invasive blood pressure (NIBP)</td>
<td>467</td>
</tr>
<tr>
<td>Temperature</td>
<td>470</td>
</tr>
<tr>
<td>Invasive blood pressure (IBP)</td>
<td>471</td>
</tr>
<tr>
<td>Cardiac Output (C.O.)</td>
<td>475</td>
</tr>
<tr>
<td>CO2</td>
<td>478</td>
</tr>
<tr>
<td>Recording status messages</td>
<td>482</td>
</tr>
</tbody>
</table>
Problem solving

Overview

Alarm messages in the alarm display field are displayed in hierarchical order.

For example, if two faults are detected simultaneously, the more urgent of the two is displayed.

The priority level of the alarm messages (see page 98 for definitions) is identified by exclamation marks:

- Warning = !!! Message of high priority
- Caution = !! Message of medium priority
- Advisory = ! Message of low priority

If no priority level is assigned, the message is informational and no action is required.

In the following table, messages are listed in alphabetical order. This table identifies possible alarm causes and provides corrective action. The various causes and remedies should be worked through in the order listed until the problem has been resolved.

Device communication messages

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Disconnected from M540</td>
<td>The M540 is disconnected from the M500.</td>
<td>Dock the M540.</td>
</tr>
<tr>
<td>None</td>
<td>Duplicate IP address</td>
<td>The IP address or domain name is already in use.</td>
<td>Assign a unique IP address or domain name.</td>
</tr>
<tr>
<td></td>
<td>Duplicate address</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duplicate domain name</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Not monitored by central</td>
<td>An external device is no longer communicating with the Cockpit due to a disconnected cable (hardware-related).</td>
<td>Admit the patient at the central station. Return the M540 inside the range of the wireless access point.</td>
</tr>
<tr>
<td>None</td>
<td>Offline</td>
<td>The Cockpit is disconnected from the Infinity network.</td>
<td>Check the network connectivity.</td>
</tr>
<tr>
<td>I</td>
<td>Please plug in power supply</td>
<td>Loss of AC power forces the Cockpit to run on battery power for at least 5 minutes before shutting down.</td>
<td>Check the power source and all connections.</td>
</tr>
<tr>
<td>I</td>
<td>Please plug in system cable</td>
<td>The system cable was disconnected from the M500.</td>
<td>Reconnect the system cable.</td>
</tr>
<tr>
<td>II</td>
<td>Power supply overheating</td>
<td>The power supply is overheating.</td>
<td>Unplug the power supply and contact your technical personnel.</td>
</tr>
<tr>
<td>II</td>
<td>Power supply H/W failure</td>
<td>Faulty power supply.</td>
<td>Replace the power supply and contact your technical personnel.</td>
</tr>
</tbody>
</table>

**External device disconnected**

An external device is no longer communicating with the Cockpit. When this happens repeatedly in rapid succession, the Cockpit will stop monitoring the external connection (software-related). In this instance all connected devices become disconnected.

First check the external device connection and reconnect the cable, if necessary. If the connection is still not restored, turn the Cockpit off, and then turn it on again.

**None**

The Cockpit is connected to the Infinity network but is not assigned to a central station. A wireless M540 is out of range of the access point.

Admit the patient at the central station. Return the M540 inside the range of the wireless access point.

**None**

The Cockpit is disconnected from the Infinity network.

Check the network connectivity.

**I**

Please plug in power supply

Loss of AC power forces the Cockpit to run on battery power for at least 5 minutes before shutting down.

Check the power source and all connections.

**I**

Please plug in system cable

The system cable was disconnected from the M500.

Reconnect the system cable.

**II**

Power supply overheating

The power supply is overheating.

Unplug the power supply and contact your technical personnel.

**II**

Power supply H/W failure

Faulty power supply.

Replace the power supply and contact your technical personnel.
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Power supply low battery</td>
<td>The battery charge is &lt; 20%. When the battery charge falls below 10%, the Cockpit performs a safe shutdown.</td>
<td>Reconnect to AC power.</td>
</tr>
<tr>
<td>I</td>
<td>Power supply HW failure</td>
<td>Faulty power supply</td>
<td>Unplug the power supply and contact your technical personnel</td>
</tr>
<tr>
<td>None</td>
<td>Remote Relearn</td>
<td>The indicated function was initiated from the central station.</td>
<td>Informational message – no action required.</td>
</tr>
<tr>
<td>None</td>
<td>Remote Limit Change</td>
<td>The indicated function was initiated from the central station.</td>
<td>Informational message – no action required.</td>
</tr>
<tr>
<td>None</td>
<td>Silenced at Remote</td>
<td>Remote alarm silence initiated from the central station or another Cockpit.</td>
<td>Informational message – no action required.</td>
</tr>
</tbody>
</table>
**Problem solving**

## ECG

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>!!!</td>
<td>Asystole</td>
<td>ASY</td>
<td>The reported arrhythmia was detected</td>
<td>Check the patient and treat if necessary.</td>
</tr>
<tr>
<td>!!!</td>
<td>Bradycardia (neonatal patient category)</td>
<td>BRADY</td>
<td>The reported arrhythmia was detected</td>
<td>Check the patient and treat if necessary.</td>
</tr>
<tr>
<td>!!!</td>
<td>HR &gt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the set upper/lower alarm limits.</td>
<td>– Check the patient and treat if necessary. – Change the alarm limits.</td>
</tr>
<tr>
<td>!!!</td>
<td>%0 out of range high (^1)</td>
<td>The parameter value is replaced by +++</td>
<td>The parameter value is outside the measurement range of the monitor.</td>
<td>– Check the electrodes and reapply if necessary. – Make sure that the patient’s skin is properly prepped. – Isolate the patient from auxiliary equipment, if possible.</td>
</tr>
<tr>
<td>!!!</td>
<td>ECG artifact (^2)</td>
<td>The parameter value is replaced by ***</td>
<td>– Patient movement (shivering, tremors) – Bad electrode contact – Excessive signal noise interference from auxiliary equipment</td>
<td>– Check the electrodes and reapply if necessary. – Make sure that the patient’s skin is properly prepped. – Isolate the patient from auxiliary equipment, if possible.</td>
</tr>
</tbody>
</table>

\(^1\)%0 is a placeholder for the parameter label HR or ECG.  
\(^2\)After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>%0 unplugged or %0 leads off 1)</td>
<td>The parameter value is replaced by ***</td>
<td>Lead-off condition detected due to:  - broken cable(s)  - disconnected ECG lead wires  - loose lead wire(s)  - wrong lead selected  - dried out electrode gel  - ECG cable(s) disconnected from the M540.</td>
<td>- Replace defective cable(s).  - Reapply gel on reusable electrodes and reapply them or replace new disposable electrodes.  - Select another ECG lead for processing.  - If monitoring augmented leads, verify that the number of selected leads in the ECG setup page is correct.  - Check cable(s) and connection(s)  - Replace cable(s) if necessary</td>
</tr>
</tbody>
</table>

None     | None    | None          | None    | None     |
None     | None    | None          | None    | None     |
None     | None    | None          | None    | None     |
None     | None    | None          | None    | None     |

1) %0 is a placeholder for the parameter label HR or ECG.
Problem solving

### Priority

- **Ventricular fibrillation (VF):** The reported arrhythmia was detected.
  - Check the patient and treat if necessary.

### Rest ECG messages

- **ECG Collecting waveforms**
  - Parameter value: Rest ECG was initiated.
  - Instruct the patient to lie still.

- **ECG busy**
  - Parameter value: The central station is already processing a report.
  - Wait a few minutes before requesting the report again.

- **ECG cannot connect**
  - Parameter value: Connection to central station is not possible.
    - Check that the patient is admitted at the central station.
    - Check that the central station has the Rest ECG option activated.

- **ECG report complete**
  - Parameter value: The Rest ECG report has been printed.
  - Informational message – no action required.

- **%0 comm failure**
  - Parameter value: The external device is not available.
  - Check the configuration at the central station.

- **Sending ECG data**
  - Parameter value: Informational message.
  - Informational message – no action required.

---

1) %0 is a placeholder for the parameter label HR or ECG.
## Problem solving

### ST

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| 1        | ST cannot analyze | The parameter value is replaced by *** | The algorithm cannot determine ST values due to artifact, the absence of normal beats, or invalid leads. | – Perform a relearn (see page 207).  
– Check electrodes: re-apply if necessary.  
– Make sure the patient’s skin is properly prepared.  
– Isolate the patient from auxiliary equipment if possible.  
– Inspect and replace defective cable(s) and wire(s).  
– Reapply gel on reusable electrodes and reapply them or replace new disposable electrodes.  
– Reapply the electrode(s). Make sure the patient’s skin is properly prepared.  
– If a lead or electrode cannot be replaced, select another ST lead for processing. |
| II       | ST > (alarm limit) | Parameter value    | The parameter value is above/below the set upper/lower alarm limits.   | – Check the patient and treat if necessary.  
– Change the alarm limits. |
| II       | ST < (alarm limit) |                    |                                                                         |                                                                          |


Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| ll       | %0 out of range low ¹⁾ | The parameter value is replaced by - - - | The parameter value is below the measurement range of the monitor. | - Check the patient and treat if necessary.  
- Check the placement of electrodes and change their position if necessary. |
| ll       | %0 out of range high ¹⁾ | The parameter value is replaced by +++ | The parameter value is above the measurement range of the monitor. | - Check the patient and treat if necessary.  
- Check the placement of electrodes and change their position if necessary. |
| l        | %0 unplugged ¹⁾ | The parameter value is replaced by *** | ECG lead wires are disconnected from the M540. | Check the cables and connections; replace if necessary. |
| None     | ST relearn | The parameter value appears blank | ST relearn is in progress | Informational message – no action required. |

¹⁾ %0 is a placeholder for the parameter label ST.

ARR

Except for asystole and ventricular fibrillation, you can assign the alarm priority low, medium or high or you can deactivate the alarm function. For asystole and ventricular fibrillation, the alarm priority is fixed as life-threatening and you cannot deactivate the alarm function.
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Asystole</td>
<td>ASY</td>
<td>The indicated arrhythmia was detected.</td>
<td>Check the patient and treat if necessary.</td>
</tr>
<tr>
<td>III</td>
<td>Ventricular fibrillation</td>
<td>VF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>50% Run</td>
<td>RUN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>50% Accelerated idioventricular rhythm</td>
<td>AIVR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>50% Supraventricular tachycardia</td>
<td>SVT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>50% Couplet</td>
<td>CPT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>50% Bigeminy</td>
<td>BGM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>50% tachycardia</td>
<td>TACH or VTACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>50% Bradycardia</td>
<td>BRADY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>50% PAUSE</td>
<td>Pause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>50% artifact</td>
<td>ARTF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

In the parameter box, the value is replaced by an ARR abbreviation (see page 29) except for the "ARR cannot learn" message.

---

1) %0 is a placeholder for the parameter label ARR.
### Problem solving

#### Respiration (RRI)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| II       | RRi > (alarm limit)  
RRi < (alarm limit) | Parameter value | The parameter value is above/below the set upper/lower alarm limits.  
– Check the patient and treat if necessary.  
– Check the alarm limits. | |
| II       | %0 out of range high 1) | The parameter value is replaced by +++ | The respiration rate is higher than 150 breaths per minute.  
– The M540 may be counting artifacts as valid breaths.  
– The M540 may be counting interference caused by faulty equipment.  
– Check the patient and treat if necessary.  
– Check the placement of electrodes.  
– Change their position if necessary.  
– Move the electrodes away from the source of interference. | |
| III      | %0 Apnea 1) | APNEA | Neonatal apnea condition was detected.  
– Check the patient and treat if necessary.  
– Check the placement of electrodes.  
– Change their position if necessary.  
– Initiate a relearn or reset breath detection sensitivity in manual mode. | |
| II       | %0 Apnea 1) | APNEA | Adult or pediatric apnea condition was detected.  
– Check the patient and treat if necessary.  
– Check the placement of electrodes.  
– Change their position if necessary. | |

1) %0 is a placeholder for the parameter label RRi.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| %0       | %0 coinicidence | Parameter value | The heart rate and respiration rate fall within 20 % of each other. | – Check the patient and treat if necessary.  
– Check and change the electrode placement if you receive a coincidence message until you obtain a clear respiration signal.  
– Change the detection threshold in manual mode or initiate a relearning in auto mode. |
| None     | RESP relearning LEARN | | Relearn is in progress | Informational message – no action required. |

¹%0 is a placeholder for the parameter label RRI.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>%0 lead off 1), 2) The parameter value is replaced by ***</td>
<td></td>
<td>The respiration lead has been invalid for 10 seconds.</td>
<td>- Check the patient and treat if necessary.</td>
</tr>
<tr>
<td>1</td>
<td>%0 artifact 1), 2) The parameter value is replaced by ***</td>
<td></td>
<td>Persistent artifact was detected.</td>
<td>- Make sure the patient's skin is prepared properly.</td>
</tr>
<tr>
<td></td>
<td>RESP high impedance The parameter value is replaced by ***</td>
<td></td>
<td>A high respiration impedance was detected.</td>
<td>- Isolate the patient from any auxiliary equipment, if possible.</td>
</tr>
<tr>
<td>1</td>
<td>%0 lead unavailable 1) The parameter value is replaced by ***</td>
<td></td>
<td>Faulty or disconnected electrodes.</td>
<td>- Reapply gel on reusable electrodes and reapply them or replace new disposable electrodes.</td>
</tr>
<tr>
<td></td>
<td>1) %0 is a placeholder for the parameter label RRi. 2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.</td>
<td></td>
<td>2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.</td>
<td>- If a lead or electrode cannot be replaced, select another lead for processing (in the RRi setup page).</td>
</tr>
</tbody>
</table>

Conditions for use – Infinity Acute Care System – Monitoring Applications VG3.n 461
**Problem solving**

**SpO2**

The following messages originate from three different hardware devices (Masimo SET, Masimo rainbow SET, and Nellcor OxiMax).

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (Masimo rainbow SET only)</td>
<td>Learning pulse CO-Ox</td>
<td>Learning</td>
<td>The parameters have been detected but have not yet been computed.</td>
<td>Wait until message disappears.</td>
</tr>
<tr>
<td>None (Masimo rainbow SET only)</td>
<td>Low %0 SIQ</td>
<td>Associated parameter values are still displayed</td>
<td>Poor signal quality - Measurement reading is obscured</td>
<td>– Check the patient and treat if necessary. – Make sure the SpO2 sensor is attached properly to the patient. – Check all cable connections.</td>
</tr>
<tr>
<td>None (Masimo rainbow SET and Masimo rainbow SET only)</td>
<td>Low SpO2</td>
<td>Low SpO2 SIQ</td>
<td>Parameter values are still displayed</td>
<td>The Masimo MCable detects low signal quality</td>
</tr>
</tbody>
</table>

%0 is a placeholder for the following parameter labels: PVI, SpHb (SpHbv), SpMet, SpOC, SpCO.
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PLS out of range low</td>
<td>The parameter value is replaced by - -</td>
<td>The parameter value is below the measurement range of the monitor.</td>
<td>- Check the patient and treat if necessary. - Change the alarm limits.</td>
</tr>
<tr>
<td></td>
<td>PLS out of range high</td>
<td>The parameter value is replaced by ***</td>
<td>The parameter value is above the measurement range of the monitor.</td>
<td>- Check the patient and treat if necessary. - Change the alarm limits.</td>
</tr>
<tr>
<td>2</td>
<td>PVI &gt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above the upper alarm limits.</td>
<td>- Check the patient and treat if necessary. - Change the alarm limits.</td>
</tr>
<tr>
<td></td>
<td>SpHb &gt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpHbv &gt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpMet &gt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpOC &gt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SpO2 &gt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the set upper/lower alarm limits.</td>
<td>- Check the patient and treat if necessary. - Change the alarm limits.</td>
</tr>
<tr>
<td></td>
<td>PLS &gt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SpHb &lt; (alarm limit)</td>
<td>Parameter value</td>
<td>The priority changes to high (!!!) if the SpO2 value falls more than 10 % below the lower limit. This does not occur when using SatSeconds alarm time with the Nellcor Oximax MCable.</td>
<td>In neonatal mode, the priority changes to high (!!!) if the SpO2 value falls more than 10 % below the lower limit. This does not occur when using SatSeconds alarm time with the Nellcor Oximax MCable.</td>
</tr>
<tr>
<td></td>
<td>SpHbv &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PVI &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpOC &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpMet &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SpO2 &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLS &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Masimo rainbow SET only)</td>
<td>SpO2 cable failure</td>
<td>Cable failure</td>
<td>Parameter values are replaced by ***</td>
<td>The Masimo rainbow SET intermediate cable is defective or has expired.</td>
</tr>
<tr>
<td>1 (Nellcor OxiMax MCable only)</td>
<td>SpO2 check sensor</td>
<td>Check sensor</td>
<td>Parameter values are replaced by ***</td>
<td>The SpO2 sensor is disconnected.</td>
</tr>
<tr>
<td>None (Masimo rainbow SET only)</td>
<td>%0 sensor calibrating</td>
<td>Sensor calibrating</td>
<td>Parameter values are replaced by ***</td>
<td>The sensor is being checked for proper functioning.</td>
</tr>
<tr>
<td>1 (Any SpO2 MCable)</td>
<td>SpO2 H/W failure</td>
<td>Parameter values are replaced by ***</td>
<td>Hardware failure</td>
<td>Check for defective MCable.</td>
</tr>
<tr>
<td>1 (Masimo SET and Masimo rainbow SET)</td>
<td>SpO2 Interference Detected</td>
<td>Interference detected</td>
<td>Parameter values are replaced by ***</td>
<td>Interference such as artifact or too much ambient light was detected.</td>
</tr>
</tbody>
</table>

1 %0 is a placeholder for the parameter label SpO2.
2 After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>SpO2 Low Perfusion</td>
<td>Low perfusion</td>
<td>The signal is too small.</td>
<td>Check the patient and treat if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parameter values</td>
<td></td>
<td>Move the sensor to a site that is more adequately perfused.</td>
</tr>
<tr>
<td></td>
<td>SpO2 M Cable unplugged</td>
<td>M Cable unplugged</td>
<td>Parameter values are replaced by <strong>&quot;</strong>. The parameter values are replaced by blanks for PI or SpOC if using Masimo rainbow SET</td>
<td>The SpO2 M Cable is disconnected from the M540.</td>
</tr>
<tr>
<td></td>
<td>SpO2 only mode</td>
<td>SpO2 only mode</td>
<td>The device cannot calibrate the Masimo rainbow SET parameters and is attempting to display the standard Masimo parameters.</td>
<td>Remove and reapply the sensor. If the problem persists, contact your technical personnel.</td>
</tr>
</tbody>
</table>

- **(Masimo rainbow SET and Masimo SET M Cable)**
- **(Masimo rainbow SET and Masimo SET M Cable only)**

---

2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (Any SpO2 MCable)</td>
<td>SpO2 searching</td>
<td>Searching</td>
<td>The sensor is searching for valid pulses to compute a measurement value.</td>
<td>Verify proper sensor application.</td>
</tr>
</tbody>
</table>
| 1 (Any SpO2 MCable) | %0 sensor failure 1) | Sensor failure | Parameter values are replaced by *** | - Hardware failure  
- Defective or expired SpO2 sensor  
- Make sure the SpO2 sensor is properly attached to the patient and all cables are properly connected.  
- Replace the sensor.  
- Contact DrägerService. |
| 1 (Masimo rainbow SET and Masimo SET MCable only) | SpO2 sensor off 2) | Sensor off | Parameter values are replaced by *** | The Masimo MCable has detected that the SpO2 sensor is no longer attached to the patient.  
Reattach the SpO2 sensor. |
| 2 (Any SpO2 MCable) | SpO2 sensor unplugged 3) | Sensor unplugged | Parameter values are replaced by *** | - SpO2 intermediate cable or sensor is unplugged  
- SpO2 sensor is unplugged from Masimo rainbow SET MCable  
- Verify that the cable and the sensor are properly connected.  
- Check for defective sensor. |

1) %0 is a placeholder for the parameter label SpO2.  
2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
### Problem solving

#### Non-invasive blood pressure (NIBP)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>NIBP S &gt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the upper/lower alarm limits.</td>
<td>Check the patient and treat if necessary.</td>
</tr>
<tr>
<td>11</td>
<td>NIBP S &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td>Change the alarm limits.</td>
</tr>
<tr>
<td>11</td>
<td>NIBP D &gt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>NIBP D &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>NIBP M &gt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>NIBP M &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>%0 HW failure 11</td>
<td>Parameter values are replaced by ***</td>
<td>– NIBP measurement circuit failure – NIBP zero out of range or faulty transducer</td>
<td>Check all hardware, contact DrägerService.</td>
</tr>
</tbody>
</table>

11 %0 is a placeholder for the parameter label NIBP.
<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>%0 low inflation limit</td>
<td>The message Last measurement failed is followed by the message Low inflation limit Parameter values are replaced by ***</td>
<td>The pressure of the patient is greater than the maximum allowed cuff inflation pressure.</td>
<td>Select the next higher inflation limit setting.</td>
</tr>
<tr>
<td>I</td>
<td>NIBP mean only</td>
<td>Parameter values are replaced by ***</td>
<td>The pulse amplitude is too small or too high for the M540 to derive systolic and diastolic pressure values but sufficient to report a mean pressure value.</td>
<td>– Check the patient and treat if necessary. – Check the hose and cuff. – Check the size and the placement of the cuff.</td>
</tr>
<tr>
<td>II</td>
<td>%0 out of range high</td>
<td>Parameter value or value is replaced by *** depending on the pressure level</td>
<td>The parameter value is above/below the measurement range of the monitor.</td>
<td>Check the NIBP inflation limits and adjust them if necessary (for example, if the wrong patient category is selected).</td>
</tr>
<tr>
<td>II</td>
<td>%0 out of range low</td>
<td>Parameter value or value is replaced by *** depending on the pressure level</td>
<td>The inflation rate is too high during the inflation cycle or the time to evacuate residual cuff pressure at the end of the deflation cycle is too short.</td>
<td>– Select a different cuff. – Check the hose and cuff for damage. – Restart the measurement. If the message does not clear, contact DrägerService.</td>
</tr>
<tr>
<td>None</td>
<td>NIBP pneumatic char needed</td>
<td>Parameter values are replaced by ***</td>
<td>NIBP hardware failure in the M540.</td>
<td>Contact your technical personnel and take the M540 out of service.</td>
</tr>
<tr>
<td>I</td>
<td>%0 blocked line</td>
<td>The message Last measurement failed is followed by the message Blocked line Parameter values are replaced by ***</td>
<td>The inflation rate is too high during the inflation cycle or the time to evacuate residual cuff pressure at the end of the deflation cycle is too short.</td>
<td>– Select tracking. – Check the hose and cuff for damage. – Restart the measurement. If the message does not clear, contact DrägerService.</td>
</tr>
</tbody>
</table>

\[^{1} %0 is a placeholder for the parameter label NIBP.\]
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| 1 | %0 cannot measure | The message Last measurement failed! is followed by the message Cannot measure | The pulse profile is too poor to establish a reliable measurement (usually due to persistent motion artifact) | - Check the patient and treat if necessary.  
- Move the cuff to a limb with less movement.  
- Restart the measurement. If the message does not clear, contact your technical personnel or DrägerService. |
| 1 | %0 cuff leak | The message Last measurement failed! is followed by the message Cuff leak | The drop in cuff pressure at the end of the inflation cycle is too great. | - Check the hose and cuff for leaks. Replace if necessary.  
- Restart the measurement. If the message does not clear, contact DrägerService. |
| 1 | %0 measurement timeout | Parameter values are replaced by *** | An NIBP measurement has exceeded time-out limit. | Repeat the measurement. |
| 1 | %0 overpressure | Parameter values are replaced by *** | The cuff pressure has exceeded the overpressure threshold. | - Check the patient and treat if necessary.  
- Check the cuff for obstructions.  
- Repeat the measurement. |

1 %0 is a placeholder for the parameter label NIBP.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>%0 open line</td>
<td>The message <em>Last measurement failed</em> is followed by the message <em>Open line</em> Parameter values are replaced by ***</td>
<td>There was no significant increase in cuff pressure during the inflation cycle.</td>
<td>Make sure that the hose and cuff are properly connected to the monitor.</td>
</tr>
<tr>
<td></td>
<td>NIBP venous stasis started</td>
<td>Parameter value or blank value</td>
<td>Message reporting the status of venous stasis.</td>
<td>Informational message – no action required.</td>
</tr>
<tr>
<td></td>
<td>NIBP: venous stasis ending</td>
<td>Parameter value or blank value</td>
<td>Message reporting the status of venous stasis.</td>
<td>Informational message – no action required.</td>
</tr>
<tr>
<td></td>
<td>NIBP venous stasis ended</td>
<td>Parameter value or blank value</td>
<td>Message reporting the status of venous stasis.</td>
<td>Informational message – no action required.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the parameter label NIBP.

### Temperature

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>$T_{1a}$ = (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the upper/lower alarm limits.</td>
<td>– Check the patient and treat if necessary.</td>
</tr>
<tr>
<td>II</td>
<td>$T_{1b}$ = (alarm limit)</td>
<td></td>
<td></td>
<td>– Change the alarm limits.</td>
</tr>
<tr>
<td>II</td>
<td>$T_2$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_2b$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_0$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_0b$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$\Delta T$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$\Delta T_1$ = (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_{1a}$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_{1b}$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_2$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_2b$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_0$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T_0b$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$T$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$\Delta T$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>$\Delta T_1$ &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>%0 out of range high</td>
<td>The parameter value is replaced by +++</td>
<td>The parameter value is above/below the measurement range of the monitor.</td>
<td>- Check the patient and treat if necessary. - Check the equipment and replace, if necessary.</td>
</tr>
<tr>
<td>1</td>
<td>%0 out of range low</td>
<td>The parameter value is replaced by - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Cannot derive %0</td>
<td>The parameter value is replaced by ***</td>
<td>The cable is either defective or unplugged.</td>
<td>- Check the equipment and replace it if necessary. - Connect the second temperature sensor.</td>
</tr>
<tr>
<td>1</td>
<td>%0 H/W failure</td>
<td>The parameter value is replaced by ***</td>
<td>The hardware reference values do not meet the specified tolerance.</td>
<td>Contact DrägerService.</td>
</tr>
<tr>
<td>1</td>
<td>%0 unplugged</td>
<td>The parameter value is replaced by ***</td>
<td>The temperature sensor is unplugged.</td>
<td>Reapply the temperature sensor.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the parameter label T for Temp.
2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.

### Invasive blood pressure (IBP)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IBP label &gt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the upper/lower alarm limits.</td>
<td>- Check the patient and treat if necessary. - Change the alarm limits.</td>
</tr>
<tr>
<td>1</td>
<td>IBP label &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td>Message</td>
<td>Parameter box</td>
<td>Problem</td>
<td>Solution</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>---------------</td>
<td>---------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| II      | CPP > (alarm limit)  
CPP < (alarm limit) | Parameter value | The parameter value is above/below the upper/lower alarm limits. | − Check the patient and treat if necessary.  
− Change the alarm limits. |
| II      | %0 out of range low ¹ ² | The parameter value is replaced by - - - | The parameter falls outside the pressure range of the monitor. | − Check the patient and treat if necessary.  
− Check the equipment and replace, if necessary. |
| II      | %0 out of range high ² | The parameter value is replaced by +++ | | |
| I       | %0 please check zero ³ | Parameter value | The IBP zero value stored in the M540 was lost and the transducer requires zeroing. | Zero the transducer. |
| I       | %0 H/W failure ³ | The parameter value is replaced by *** | IBP hardware failure. | − Check hardware and replace if necessary.  
− Call your technical personnel or contact DrägerService. |
| None    | %0 did not zero ³ | Parameter value | Transducer zeroing failed because of:  
− excessive signal noise  
− a non-static waveform | − Keep all tubing motionless, then rezero.  
− Change the transducer.  
− Check stopcock, then rezero. |

¹ %0 is a placeholder for the respective IBP label (including CPP).
Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>If</td>
<td>%0 static pressure 1)</td>
<td>Parameter value</td>
<td>Static pressure detected on a pulsatile signal, due to: – a physiological condition such as an asystole – a transducer that is closed to the patient – a catheter tip that is lodged against a vessel wall – a clot on the catheter tip</td>
<td>– Check the patient and treat if necessary. – Open the system to the patient by turning the stopcock. – Follow hospital procedures for dislodging catheters. – Follow hospital procedures for clotted catheters.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>%0 unplugged 1, 2)</td>
<td>The parameter value is replaced by ***</td>
<td>The pressure transducer for the specified parameter is either unplugged or defective.</td>
<td>– During an active pressure: Reconnect or replace the cable. – During an inactive pressure: Deactivate alarms.</td>
</tr>
<tr>
<td></td>
<td>HemoPod unplugged 2)</td>
<td>The parameter value is replaced by ***</td>
<td>The IBP pod is disconnected.</td>
<td>Check the equipment and replace if necessary.</td>
</tr>
<tr>
<td>None</td>
<td>%0 zero accepted 1)</td>
<td>Parameter value</td>
<td>Transducer zeroing was successful.</td>
<td>Informational message – no action required.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the respective IBP label (including CPP).
2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| None     | %0 did not zero - offset error 1) | Parameter value | Transducer zeroing failed because static pressure was too high or too low. | - Keep all tubing motionless.  
- Replace the transducer.  
- Check the stopcock and zero again. |
| None     | Inflate balloon and press ‘Start Wedge’ to begin | Parameter value | Action required to start wedge measurement. | Press Start wedge button to begin wedge measurement. |
| None     | Wedge in progress | Parameter value | Informational message. | Informational message – no action required. |
| None     | Deflate balloon and press ‘Save Wedge’ to finish | Parameter value | Action required to complete wedge measurement. | Press Save Wedge button to finish wedge measurement. |

1) %0 is a placeholder for the respective IBP label (including CPP).
## Problem solving

### Cardiac Output (C.O.)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>!!</td>
<td>Tblood &gt; (alarm limit) Tblood &lt; (alarm limit)</td>
<td>Parameter value</td>
<td>The blood temperature is outside the alarm limits because of: - a physiological condition - inappropriate alarm limits - a defective sensor</td>
<td>- Check the patient and treat if necessary. - Change the alarm limits.</td>
</tr>
<tr>
<td>!!</td>
<td>%0 out of range high 1) %0 out of range low 1)</td>
<td>Parameter value</td>
<td>The blood temperature is outside the measurement range because of a defective sensor.</td>
<td>Check equipment and replace if necessary.</td>
</tr>
<tr>
<td>!!</td>
<td>C.O. Catheter Fault - Bad Ref. 2)</td>
<td>Parameter value</td>
<td>The C.O. blood thermistor calibration resistor does not meet the specified tolerance.</td>
<td>- Check the catheter and replace if necessary. - Contact your technical personnel or DrägerService.</td>
</tr>
<tr>
<td>!!</td>
<td>C.O. Pod Fault - Bad Ref. 2)</td>
<td>Parameter value</td>
<td>The C.O. reference values do not meet the specified tolerances.</td>
<td>- Remove and reconnect the pod. - Repeat the measurement. - Replace the pod and contact DrägerService if the message persists.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the parameter label C.O.
2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| None     | %0 out of range high | Parameter value | The C.O. is greater than 20 liters/min or less than 0.5 liters/min because of:  
- a physiological condition  
- unstable baseline  
- incorrect injectate volume, catheter size, or computation constant  
- defective catheter, cable, or cartridge |  
- Check the patient and treat if necessary.  
- Use cooler injectate.  
- Enter the correct values in the C.O. page.  
- Repeat the measurement. If message persists, replace defective components. |
| None     | %0 Check Injectate Probe | Parameter value | The injectate probe is not connected or became disconnected during a measurement. | Connect the probe and repeat the measurement. |
| None     | %0 duplicate device connected | Parameter value | Multiple C.O. sources are connected. This includes CCO devices connected via the device connectivity option. | Disconnect duplicate C.O. sources. |
| None     | %0 Injectate Too Cold | Parameter value | The injectate temperature is too cold during the measurement process. |  
- Use an injectate within the correct temperature range of -5 °C to +30 °C (-23 °F to +86 °F).  
- Check equipment and replace if necessary. |

1 %0 is a placeholder for the parameter label C.O.
<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>C.O. Injectate set to 20°C!</td>
<td>Parameter value</td>
<td>No injectate probe was connected. The M540 assumes a temperature of 20°C (68°F).</td>
<td>Attach an injectate probe.</td>
</tr>
<tr>
<td>None</td>
<td>%0 No Temperature Change ¹</td>
<td>Parameter value</td>
<td>No change in blood temperature during the C.O. measurement.</td>
<td>Repeat the measurement. Use a larger injectate volume. Repeat the measurement. If problem persists, replace the catheter. Use a cooler injectate.</td>
</tr>
<tr>
<td>None</td>
<td>%0 Poor Baseline ¹</td>
<td>Parameter value</td>
<td>Poor blood temperature baseline during C.O. measurement.</td>
<td>Follow hospital procedures. Repeat the measurement. Replace the defective components, if the message persists.</td>
</tr>
<tr>
<td>None</td>
<td>%0 Use Cooler Injectate ¹</td>
<td>Parameter value</td>
<td>The difference between the temperature of the blood and the injectate is less than 5°C (41°F). The injectate temperature is greater than 25°C (77°F).</td>
<td>Use a cooler injectate.</td>
</tr>
</tbody>
</table>

¹ %0 is a placeholder for the parameter label C.O.
Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>%0 Transducer Unplugged (^{1,2})</td>
<td></td>
<td>A cable or transducer has become disconnected.</td>
<td>Reconnect the cable or transducer. Replace the defective part if the message persists.</td>
</tr>
</tbody>
</table>

\(^{1}\) %0 is a placeholder for the parameter label C.O.

\(^{2}\) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.

### CO2

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>CO2 &gt; (alarm limit) CO2 &lt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the upper/lower alarm limits.</td>
<td>Check the patient and treat if necessary. Change the alarm limits.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>None</th>
<th>CO2 please zero</th>
<th>Parameter value</th>
<th>Instructional message for the mainstream sensor only</th>
<th>Zero the mainstream sensor.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CO2 sensor too warm</td>
<td>The parameter value is replaced by ***</td>
<td>The CO2 mainstream sensor is too warm due to ambient temperature.</td>
<td>Unspecified accuracy at ambient temperatures above 40 °C (104 °F). If not, replace the sensor and contact DrägerService.</td>
</tr>
</tbody>
</table>

---

Instructions for use – Infinity Acute Care System – Monitoring Applications VG3.n
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
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<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| None     | CO₂ warming up           | Parameter value or blank parameter value | The mainstream sensor is going through the warm-up cycle.             | - Wait for the mainstream sensor to warm up. During warm-up, the accuracy is reduced.  
|          |                          |               |                                                                        | - If the message persists longer than 15 min after the sensor has warmed up, and the ambient temperature is above 10 °C, contact DrägerService. |

| %0 H/W failure | The parameter value is replaced by *** | CO₂ sensor hardware failure | Contact your technical personnel. |

#### NOTE

You cannot zero the sensor when this message is displayed and the ambient temperature is above 10 °C (50 °F).

When the ambient temperature is below 10 °C (50 °F), the message can persist longer than 15 minutes. In this case, it is possible to zero the sensor after the message has been displayed for at least 10 minutes.

%0 is a placeholder for the parameter label CO2.
## Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| II       | %0 out of range ¹ | The parameter value is replaced by *** | The parameter signal is outside the measuring range of the monitor. | – Check the patient and treat if necessary.  
– Check the equipment and replace if necessary. |

| I        | %0 incompatible sensor ¹ | The parameter value is replaced by *** | – The M540 has detected that the used mainstream sensor is not compatible with the selected sensor type setting (reusable/disposable)  
– Secretions in the adapter  
– Sensor zero drift  
– High inspiratory CO₂ concentration | – Use the airway adapter type the system is configured for or adjust the airway adapter setting (see page 415).  
– If the message persists, clean or replace the airway adapter.  
– If the message persists even though the correct airway adapter type is selected and the airway adapter is clean, zero the sensor.  
– If the message still persists, the inspiratory CO₂ value might not be accurate. Check the patient and ventilation. |

¹ %0 is a placeholder for the parameter label CO₂.

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<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter Box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>%0 check airway adapter 1)</td>
<td>The parameter value is replaced by ***</td>
<td>– The mainstream sensor is not properly seated on the adapter. – There are secretions in the adapter. – There is sensor zero drift</td>
<td>– Make sure the mainstream sensor is attached properly to the adapter. – If message persists, clean or replace the airway adapter. – If message persists though the airway adapter is clean, zero the sensor.</td>
</tr>
<tr>
<td>!</td>
<td>%0 unplugged 2)</td>
<td>The parameter value is replaced by ***</td>
<td>The CO₂ sensor is disconnected.</td>
<td>Check the CO₂ connections.</td>
</tr>
<tr>
<td>!</td>
<td>%0 zero in progress 3)</td>
<td>The parameter value appears blank</td>
<td>The CO₂ zeroing is in progress</td>
<td>Informational message – no action required.</td>
</tr>
<tr>
<td>!</td>
<td>%0 Zero failed 4)</td>
<td>The parameter value is replaced by ***</td>
<td>Zerowing of the sensor has failed or the sensor is defective.</td>
<td>– Try to zero the sensor again making sure not to breathe on the sensor. – If zeroing fails again, replace the sensor and contact DrägerService, if the message persists.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the parameter label CO₂.
2) After discharging a patient or starting the device, the alarm becomes active only after a numeric value has been received for that parameter.
## Recording status messages

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Primary recorder not connected or Secondary recorder not connected</td>
<td>A recording was requested but no recorder is available.</td>
<td>Try again, then contact your technical personnel.</td>
</tr>
<tr>
<td>None</td>
<td>Primary recorder out of paper or Secondary recorder out of paper</td>
<td>A recording was requested but the recorder is out of paper.</td>
<td>Replace the recorder paper (see page 434).</td>
</tr>
<tr>
<td>None</td>
<td>Primary recorder door open or Secondary recorder door open</td>
<td>The recorder door is open.</td>
<td>Close the door of the recorder.</td>
</tr>
<tr>
<td>None</td>
<td>Primary recorder failure or Secondary recorder failure</td>
<td>The recording request was not accepted due to recorder hardware failure.</td>
<td>Contact your technical personnel.</td>
</tr>
<tr>
<td>None</td>
<td>Primary recorder not assigned or Secondary recorder not assigned</td>
<td>No recorder has been assigned.</td>
<td>Contact your technical personnel.</td>
</tr>
<tr>
<td>None</td>
<td>Primary recorder overheating or Secondary recorder overheating</td>
<td>The recorder is overheating.</td>
<td>Contact your technical personnel.</td>
</tr>
</tbody>
</table>
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Timed recording started or Continuous recording</td>
<td>The requested recording is being printed.</td>
<td>Informational message – no action required.</td>
</tr>
<tr>
<td>None</td>
<td>recording started</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Timed recording request accepted or Continuous</td>
<td>The recorder is not available and the requested recording is queued or</td>
<td>Contact your technical personnel to check the</td>
</tr>
<tr>
<td></td>
<td>recording request accepted</td>
<td>stored for later printing.</td>
<td>recorder assignment.</td>
</tr>
<tr>
<td>None</td>
<td>Timed recording finished or Timed recording can-</td>
<td>The requested recording is printed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>celled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Continuous recording canceled</td>
<td>The requested recording was manually canceled.</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Recording not accepted</td>
<td>The assigned recorder is not available and the recording request was</td>
<td>Contact your technical personnel to check the</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>ignored.</td>
<td>recorder assignment.</td>
</tr>
<tr>
<td>None</td>
<td>Excess artifact recording canceled</td>
<td>The recording request was not accepted due to artifact.</td>
<td>Check the ECG lead connections; contact your</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>technical personnel.</td>
</tr>
</tbody>
</table>
Cleaning and disinfection

Overview of general precautions .......... 486
Approved agents .......................... 486
Cockpit components ....................... 487
Cleaning and disinfection

Overview of general precautions

Clean and disinfect the device or device parts before each maintenance step – and also when returning for repair.

The cleaning agents and methods listed on page 486 are approved for the following devices:

– Cockpit (Infinity C500/C700)
– PS250 / P2500

Before cleaning any device, read the general safety precautions under "General safety information" on page 16.

WARNING
Because of the danger of electric shock, never remove the cover of any device while it is in operation or connected to power.

CAUTION
To avoid damaging the device, do not use sharp tools or abrasives. Never immerse electrical connectors in water or other liquids.

For cleaning instructions regarding the M540 and devices that connect to it, refer to the instructions for use Infinity Acute Care System – Infinity M540.

Approved agents

Clean and disinfect the product per hospital approved protocol. Agents tested by Dräger and shown to have no harmful effect at the time of testing on the materials utilized in the device include:

– Isopropyl alcohol (40 % solution)
– Compliance – not to be used on the touch screen (7.35 % hydrogen peroxide, 0.23 % per-acetic acid, 92.42 % inert ingredients)
– Dismozun pur
– Ammonia-based glass cleaners (to be used on the touch screen only)
– Sporox II – not to be used on the touch screen (7.5 % hydrogen peroxide, 0.85 % phosphoric acid, and 91.65 % inert ingredients)
– mild soapy water solution
Cleaning and disinfection

Cockpit Plastic Housing

**CAUTION**
The use of cleaning agents or concentrations of agents other than those listed, may damage the device and will void warranty.

Dräger makes no claims regarding the efficacy of the listed chemicals, their methods as a means for disinfecting, the ability of the agents to control infection, their environmental impact, safe handling, or any related precautions in their use. Refer to information provided by the manufacturer of the cleaning solution for more information in these areas.

Cockpit components

Use only the approved cleaning agents listed under "Approved agents" on page 486.

**NOTE**
Do not clean the front panel of the device while monitoring a patient. Before cleaning, take the device out of operation.

**NOTE**
Do not apply cleaning agents directly to the touch screen or the device. Apply a small amount to a soft cloth and gently wipe all surfaces.

To clean the Cockpit components

1. Wipe the Cockpit housing with a cloth moistened with a soapy water solution. Use an ammonia-based glass cleaner to clean the touch screen.
2. Dry thoroughly with a lint-free cloth.
## Maintenance

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
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<td>490</td>
</tr>
<tr>
<td>Definition of maintenance concepts</td>
<td>491</td>
</tr>
<tr>
<td>Inspection</td>
<td>492</td>
</tr>
<tr>
<td>Visual inspection</td>
<td>492</td>
</tr>
<tr>
<td>Inspection / safety checks</td>
<td>493</td>
</tr>
<tr>
<td>Scope of inspection/safety checks for the</td>
<td>493</td>
</tr>
<tr>
<td>Cockpit (C500/C700)</td>
<td></td>
</tr>
<tr>
<td>Scope of inspection/safety checks for the</td>
<td>493</td>
</tr>
<tr>
<td>PS250 / P2500</td>
<td></td>
</tr>
<tr>
<td>Scope of inspection/safety checks for the</td>
<td>494</td>
</tr>
<tr>
<td>M340</td>
<td>494</td>
</tr>
<tr>
<td>Metrological checks</td>
<td></td>
</tr>
<tr>
<td>Preventive maintenance</td>
<td>495</td>
</tr>
</tbody>
</table>
Overview

This chapter describes the maintenance measures required to maintain the proper functioning of the medical device. Maintenance measures must be performed by the responsible personnel.

**WARNING**
Risk of infection

Users and service personnel can become infected with pathogenic germs.

Disinfect and clean the device or the device parts before any maintenance measures and also before returning the medical device for repair.

**WARNING**
Risk of electric shock

Current-carrying components are located under the cover.

- Do not remove the cover.
- Maintenance measures must be performed by the responsible personnel. Dräger recommends DrägerService to perform these measures.

**WARNING**
If the device is mechanically damaged, or if it is not working properly, do not use it. Contact your hospital’s technical personnel.

**CAUTION**
This device must be inspected and serviced at regular intervals. A record must be kept on this preventive maintenance. We recommend obtaining a service contract with DrägerService through your vendor. For repairs we recommend that you contact DrägerService.

**CAUTION**
When servicing devices from Dräger, always use replacement parts that are qualified to Dräger standards. Dräger cannot warrant or endorse the safe performance of third-party replacement parts for use with the devices.

**CAUTION**
If you spill liquid on the equipment, battery or accessories or immerse these components in liquid, allow them to dry completely for at least 24 hours to 48 hours. Contact your hospital’s technical personnel to test any such component is fully operational before putting it back in clinical use.
### Definition of maintenance concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>All measures (inspection, preventive maintenance, repair) intended to maintain and restore the functional condition of a medical device.</td>
</tr>
<tr>
<td>Inspection</td>
<td>Measures intended to determine and assess the actual state of a medical device.</td>
</tr>
<tr>
<td>Preventive maintenance</td>
<td>Recurrent specified measures intended to maintain the functional condition of a medical device.</td>
</tr>
<tr>
<td>Repair</td>
<td>Measures intended to restore the functional condition of a medical device after a device malfunction.</td>
</tr>
</tbody>
</table>
Maintenance

Inspection

Perform inspections at regular intervals and observe the following specifications.

<table>
<thead>
<tr>
<th>Checks</th>
<th>Interval</th>
<th>Personnel responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection/safety checks</td>
<td>Every 2 years</td>
<td>Expert</td>
</tr>
<tr>
<td>Metrological checks</td>
<td>Every 2 years</td>
<td>Expert</td>
</tr>
</tbody>
</table>

Visual inspection

Perform a visual inspection before every use and in accordance with your hospital’s policy.

1. Make sure that the housing is not cracked or broken and there are no signs of spilled liquids or damage.
2. Inspect all accessories (for example, sensors and cables). Do not use if there are any signs of damage.
3. Turn the monitor on and make sure the backlight is bright enough.
4. Examine all system cables, power plugs and discontinue use if there are any signs of damage.
5. Inspect all patient cables, leads and strain reliefs for general condition. Make sure the connectors are properly engaged at each end.
Maintenance

Inspection / safety checks

Inspection and safety checks of devices must be performed according to the suggested intervals specified in the table on page 492.

Scope of inspection/safety checks for the Cockpit (C500/C700)

The safety checks are no substitute for preventive maintenance measures (including preventive replacement of wear parts) as identified by the manufacturer.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of medical device failure</td>
</tr>
<tr>
<td>If safety checks are not performed on a regular basis, the proper operation of the medical device can be compromised.</td>
</tr>
<tr>
<td>Perform safety checks at the indicated intervals.</td>
</tr>
</tbody>
</table>

1 Check accompanying documents:
   - Instructions for use are available

2 Perform a functional test of the following features according to the instructions for use:
   - Verify the LEDs
   - Perform device checks

3 Check that the device combination is in good condition:
   - All labels are complete and legible
   - There is no visible damage
   - Fuses which are accessible from the outside are in compliance with the specified values

4 Use the instructions for use to check that all components and accessories needed to use the product are available.

5 Check the electrical safety requirements according to IEC62353.

6 Verify that the visual and acoustic alarm signals function properly.

Scope of inspection/safety checks for the PS250 / P2500

The safety checks are no substitute for preventive measures (including preventive replacement of wear parts) as identified by the manufacturer.

1 Check accompanying documents:
   - Instructions for use are available

2 Perform a functional test of the following features:
   - Verify the LEDs
   - Perform device checks

3 Check that the device combination is in good condition:
   - All labels are complete and legible.
   - There is no visible damage.
   - Fuses which are accessible from the outside comply with the specified values.

4 Check the electrical safety requirements according to IEC62353 every two years by qualified DrägerService personnel.

5 Check the following safety features:
   - The power LED and the battery indicator LED function properly.
   - The C500/C700 are powered correctly.
   - Check the correct functioning of the Infinity MCable – Nurse call.
The safety checks are no substitute for preventive maintenance measures (including preventive replacement of wear parts) as identified by the manufacturer.

**WARNING**

**Risk of medical device failure**

If safety checks are not performed on a regular basis, the proper operation of the medical device can be compromised.

Perform safety checks at the indicated intervals.

1. Check accompanying documents:
   - Instructions for use are available

2. Perform a functional test of the following features according to the instructions for use:
   - Verify the LEDs
   - Perform device checks
   - Perform a functional test of the internal battery
   - Perform device checks (for example, communication with the IACS, front panel buttons, alarm bar, and correct functioning of monitored parameters).

3. Check that the device combination is in good condition:
   - All labels are complete and legible
   - There is no visible damage
   - Fuses which are accessible from the outside are in compliance with the specified values

4. Check the electrical safety requirements according to IEC62353 every two years by qualified DrägerService personnel.

5. Check the following safety features:
   - The power LED and the battery indicator LED function properly.
   - The C500/C700 are powered correctly.
   - Check the battery every two years. If necessary, trained personnel must replace it.
   - Check the correct functioning of the Infinity MCable – Nurse call.
   - Correct functioning of the button located on the front panel of the device.
   - Correct functioning of the non-invasive blood pressure overpressure sensor (including the valves and the pump).
   - Correct functioning of the visual and acoustic alarm signals

6. Check the battery every two years and make sure the M540 runs on battery power without fail for one minute as follows:
   - Undock the M540 from the M500.
   - Turn on the M540
   - Wait for one minute and observe the M540.
   - If the battery fails, trained personnel must replace it.

**Metrological checks**

If required by applicable regulations, the following measurement functions must be checked every two years by qualified DrägerService personnel:

- Body temperature
- Non-invasive blood pressure
Preventive maintenance

### Component | Interval | Measure | Personnel responsible
--- | --- | --- | ---
Two non-invasive blood pressure air intake filters of the M540 | Every two years | Replace | Expert

**NOTE**

- If the non-invasive blood pressure air filter seems dirty or damaged, replace it before the recommended two years. The air filter should be replaced, if the M540 was exposed to liquid. See "Exchanging the ambient air filter" in the Technical documentation which is available from DrägerService.

Internal M540 battery | Every two years | Check | Hospital personnel

**NOTE**

- For devices that have high transport or battery use, the battery must be checked more often.
## Maintenance

<table>
<thead>
<tr>
<th>Component</th>
<th>Interval</th>
<th>Measure</th>
<th>Personnel responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal PS250 / P2500 battery</td>
<td>Every two years</td>
<td>Replace</td>
<td>Expert</td>
</tr>
</tbody>
</table>

**NOTE**

For devices that have high transport or battery use, the battery must be checked more often.

**NOTE**

Do not disassemble the Ni-MH battery inside the PS250 / P2500. Aside from the required two-year maintenance recommended for the entire IACS, this battery requires no additional routine maintenance.
Disposal

For countries subject to the EU directive 2002/96/EC

This device is subject to EU Directive 2002/96/EC (WEEE). In order to comply with its registration according to this directive, this device may not be disposed of at municipal collection points for waste electrical and electronic equipment. Dräger has authorized a company to collect and dispose of this device.

To initiate collection or for further information, visit Dräger on the Internet at www.draeger.com. Use the Search function with the keyword "WEEE" to find the relevant information. If access to Dräger’s website is not possible, contact the local Dräger organization.
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Technical data

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Overview

This chapter contains the technical data for the following devices of the Infinity Acute Care System – Monitoring applications:
- PS250 power supply
- P2500 power supply
- Minimal technical requirements for the secondary display
- Infinity MCable – Nurse call

For technical data of the Infinity C500/C700 refer to instructions for use Infinity Medical Cockpit.

For the following information, refer to the instructions for use Infinity Acute Care System – Infinity M540:
- Infinity M500 docking station
- MPod and MCable devices that connect directly to the M540
- Specifications such as measuring ranges of individual parameters

The IACS is intended to be connected to one patient at a time.

Infinity PS250 power supply

<table>
<thead>
<tr>
<th>Physical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x D x H)</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Cooling</td>
</tr>
<tr>
<td>Connections</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity (non-condensing)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### Technical data

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Operating: 0 to 40 °C (32 to 104 °F)</th>
<th>Storage: –20 to +60 °C (–4 to +140 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOTE</strong></td>
<td>The PS250 has an operating temperature range of 0 to 40 °C (32 to 104 °F). When the battery is being charged at ambient temperatures below 5 °C (41 °F), the yellow LED on the PS250 may light up.</td>
<td></td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>Operating: 485 to 795 mmHg (70 to 106 kPa)</td>
<td>Storage: 375 to 795 mmHg (50 to 106 kPa)</td>
</tr>
<tr>
<td>Protection against ingress of water</td>
<td>IPX1 per IEC 60529 – protected against harmful effects of water</td>
<td></td>
</tr>
<tr>
<td>Protection against ingress of water</td>
<td>IPX1 per IEC 60529 – when mounted vertically with the connectors facing down</td>
<td></td>
</tr>
<tr>
<td><strong>Electrical specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>100 to 240 VAC (50/60 Hz, 6 A)</td>
<td></td>
</tr>
<tr>
<td>Mode of operation</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>Dräger NiMH battery pack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating time: approximately 5 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recharging time: 8 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC output</td>
<td>+24 V nominal, SELV per IEC 60601-1</td>
<td></td>
</tr>
</tbody>
</table>
### Technical data

#### Infinity P2500

<table>
<thead>
<tr>
<th><strong>Physical specifications</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions (W x D x H)</strong></td>
<td>218 mm x 150 mm x 348 mm (8.6 in x 5.9 in x 13.7 in)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>10 kg (22 lbs)</td>
</tr>
<tr>
<td><strong>Cooling</strong></td>
<td>Natural convection (no cooling fan)</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>One AC power</td>
</tr>
<tr>
<td></td>
<td>One alarm output for nurse call system</td>
</tr>
<tr>
<td></td>
<td>One Dräger system cable connectors</td>
</tr>
<tr>
<td></td>
<td>One RJ-modular connector for RS232 export protocol</td>
</tr>
<tr>
<td></td>
<td>One RJ-modular connector for connecting the Infinity MCable – Nurse call</td>
</tr>
<tr>
<td></td>
<td>Potential equalization connector (grounding lug)</td>
</tr>
</tbody>
</table>

#### Environmental specifications

| **Humidity (non-condensing)** | Operating: 10 % to 95 % |
|                              | Storage: 10 % to 95 % |
| **Temperature**              | Operating: 0 °C to 40 °C (32 °F to 104 °F) |
|                              | Storage: -20 °C to 60 °C (-4 °F to 140 °F) |
| **Atmospheric pressure**     | Operating: 485 mmHg to 795 mmHg (647 hPa to 1060 hPa) |
|                              | Storage: 375 mmHg to 795 mmHg (500 hPa to 1060 hPa) |
| **Protection against ingress of water** | IPX1 per IEC 60529 – when mounted vertically with the connectors facing down |

#### Electrical specifications

| **Input voltage** | 100 to 240 VAC 50 to 60 Hz |
| **Input current** | 3 A @ 100 VAC and 1.3 A @ 240 VAC maximum |
| **Mode of operation** | Continuous |
| **Rechargeable lead acid batteries** | Operating time: approximately 5 minutes @ 250 W |
| **Recharging time:** | maximum 12 hours |
| **DC output**      | 24.0 V to 30 V under all rated load conditions on AC mains |
|                    | Maximum continuous output: 250 W |
### Technical data

| **LEDs** | - Green LED (device is connected to AC power)  
| - Yellow LED (briefly during startup and during fault conditions such as overload or faulty battery) |
| **Automatic shutdown** | Within 30 seconds of detecting a power overload condition  
| - When the internal temperature is excessive |
| **Thermal protection** | Automatic shut down when reaching an internal temperature of 75 °C ±5 °C (167 °F ±41 °F) |

#### Infinity MCable – Nurse call

<table>
<thead>
<tr>
<th><strong>Physical attributes</strong></th>
<th></th>
</tr>
</thead>
</table>
| **Connections** | Connects to the PS250 / P2500  
| - Connection via cable 8417370 only |
| **Cable signals during non-alarm state** |  |
| 1 | Cable 1 (NO normally open): white |
| 2 | Cable 2 (COM common): brown |
| 3 | Cable 3 (NC normally closed): green |
| **Mode of operation** | Continuous |
| **Power requirements** |  |
| Input voltage | 24 V DC maximum |
| Input current | 1 A DC maximum |
| Switching capacity | 15 W maximum |
| Protection against electric shock | Three contacts from the open cable have an electrical isolation of 1.5 kVAC |
| **Environmental requirements** |  |
| Operation |  |
| Temperature | 5 to 55 °C (41 to 131 °F) |
| Relative humidity | 5 to 95 %, non-condensing |
### Technical data

<table>
<thead>
<tr>
<th><strong>Atmospheric pressure</strong></th>
<th>375 to 825 mmHg (50 to 110 kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
<td>–20 to +60 °C (–4 °F to +140 °F)</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>5 to 95 %, non-condensing</td>
</tr>
<tr>
<td><strong>Atmospheric pressure</strong></td>
<td>375 to 825 mmHg (50 to 110 kPa)</td>
</tr>
</tbody>
</table>

### Infinity R50N

<table>
<thead>
<tr>
<th><strong>Physical attributes</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size (H x W x D)</strong></td>
<td>180 x 120 x 222 mm (7.1 x 4.7 x 8.7 in)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1.6 kg (3.6 lbs)</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>AC power</td>
</tr>
<tr>
<td></td>
<td>X14 Infinity network connector</td>
</tr>
<tr>
<td></td>
<td>Potential equalization connector (grounding lug)</td>
</tr>
<tr>
<td><strong>Cooling</strong></td>
<td>Convection</td>
</tr>
<tr>
<td><strong>Power requirements</strong></td>
<td>100 to 240 VAC (50/60 Hz, 1 A)</td>
</tr>
<tr>
<td><strong>Risk management</strong></td>
<td>Class 1</td>
</tr>
<tr>
<td><strong>Protection against liquid ingress</strong></td>
<td>IPX0 per IEC 60529</td>
</tr>
<tr>
<td><strong>Mode of operation</strong></td>
<td>Continuous</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Environmental requirements</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
<td>15 to 40 °C (59 to 104 °F)</td>
</tr>
<tr>
<td></td>
<td>10 to 95 %, non-condensing</td>
</tr>
<tr>
<td><strong>Atmospheric pressure</strong></td>
<td>550 to 775 mmHg (73 to 103 kPa)</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
<td>–20 to +40 °C (–4 to +104 °F)</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>10 to 95 %, non-condensing without packaging</td>
</tr>
<tr>
<td><strong>Atmospheric pressure</strong></td>
<td>375 to 795 mmHg (50 to 106 kPa)</td>
</tr>
</tbody>
</table>
Technical data

Secondary display

A secondary display has to meet the minimum technical specifications outlined in the following table. For information on how to connect a secondary display to the IACS, see page 48.

<table>
<thead>
<tr>
<th>General requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>50.8 cm (20 in) display: 1680 x 1050</td>
</tr>
<tr>
<td></td>
<td>43.2 cm (17 in) display: 1440 x 900</td>
</tr>
<tr>
<td>Maximum supported distance</td>
<td>5 m (16.4 ft)</td>
</tr>
<tr>
<td>Aspect ratio</td>
<td>16:10</td>
</tr>
<tr>
<td>Display delay</td>
<td>250 ms in reference to the patient signal</td>
</tr>
<tr>
<td>Connection to Cockpit</td>
<td>DVI-I connector only</td>
</tr>
<tr>
<td>Standards compliance</td>
<td>IEC60601</td>
</tr>
</tbody>
</table>

Electromagnetic compatibility

The separation distances are written with regard to the Cockpit. The numbers provided will not guarantee faultless operation but should provide reasonable assurance of such. This information may not be applicable to other medical electrical equipment, and older equipment may be particularly susceptible to interference.

General notes

Medical electrical equipment needs special precautions regarding electromagnetic compatibility (EMC) and needs to be installed and put into service according to the EMC information provided in this manual.

Portable and mobile RF communications equipment can affect medical electrical equipment.

Cables and accessories not specified within the instructions for use are not authorized. Using other cables and/or accessories may adversely impact safety, performance and electromagnetic compatibility (increased emission and decreased immunity).

CAUTION

The equipment should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is inevitable, the equipment should be observed to verify normal operation in the configuration in which it will be used.

Low level signals such as ECGxxxxx are particularly susceptible to interference from electromagnetic energy. While the equipment meets the testing described below, it is not a guarantee of perfect operation, the ‘quieter’ the electrical environment the better. In general, increasing the distance between electrical devices decreases the likelihood of interference.

NOTE

The equipment is intended for use in the electromagnetic environments specified below. The user of this equipment should assure that is used in such an environment.
### Electromagnetic emissions

<table>
<thead>
<tr>
<th>Emissions</th>
<th>Compliance according to...</th>
<th>Electromagnetic environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF emissions (CISPR 11)</td>
<td>Group 1</td>
<td>The equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td>
</tr>
<tr>
<td>CISPR Emissions Classification</td>
<td>Class B</td>
<td>The equipment is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power network that supplies buildings used for domestic purposes.</td>
</tr>
</tbody>
</table>

### Harmonic emissions (IEC 61000-3-2)

| Class A | |

### Voltage fluctuations / flicker (IEC 61000-3-3)

| Complies | |

### Electromagnetic immunity

<table>
<thead>
<tr>
<th>Immunity against...</th>
<th>IEC 60601-1-2 test level</th>
<th>Compliance level (of device)</th>
<th>Electromagnetic environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic dis-charge, ESD (IEC 61000-4-2)</td>
<td>Contact discharge: ≤6 kV Air discharge: ≤8 kV ≤6 kV ≤8 kV</td>
<td>Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.</td>
<td></td>
</tr>
<tr>
<td>Electrical fast transients / bursts (IEC 61000-4-4)</td>
<td>PS250 / P2500 lines: ≤2 kV Longer input / output lines: ≤1 kV ≤2 kV ≤1 kV</td>
<td>Mains power quality should be of a typical commercial or hospital environment.</td>
<td></td>
</tr>
<tr>
<td>Surges on AC mains lines (IEC 61000-4-5)</td>
<td>Common mode: ≤2 kV Differential mode: ≤1 kV ≤2 kV ≤1 kV</td>
<td>Mains power quality should be of a typical commercial or hospital environment.</td>
<td></td>
</tr>
<tr>
<td>Power frequency magnetic field 50/60 Hz (IEC 61000-4-8)</td>
<td>3 A/m</td>
<td>Equipment emitting high levels of power line magnetic fields (in excess of 3A/m) should be kept at a distance to reduce likelihood of interference.</td>
<td></td>
</tr>
</tbody>
</table>
### Technical data

#### Electromagnetic immunity

<table>
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<tr>
<th>Immunity against</th>
<th>IEC 60601-1-2 test level (of device)</th>
<th>Compliance level (of device)</th>
<th>Electromagnetic environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage dips and short interruptions on AC mains input lines (IEC 61000-4-11)</td>
<td>Dip &gt;95 %, 0.5 periods Dip 60 %, 5 periods Dip 30 %, 25 periods Dip &gt;95 %, 5 seconds</td>
<td>&gt;95 %, 0.5 periods 60 %, 5 periods 30 %, 25 periods &gt;95 %, 5 seconds</td>
<td>Mains power should be a typical commercial or hospital environment. If user requires continued operation during power mains interruptions, ensure batteries are installed and charged. Ensure battery life exceeds longest anticipated power outages or provide additional uninterruptible power source.</td>
</tr>
</tbody>
</table>
| Conducted RF RF coupled into lines (IEC 61000-4-6) Radiated RF (IEC 61000-4-3) | 150 kHz to 80 MHz 80 MHz to 2.5 GHz | 3 W/m 3 V/m | Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter as below. Recommended separation distance $d = \left( \frac{E_1}{P} \right)^{1/2}$ where $P$ is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and $d$ is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 

$$d = \left( \frac{E_1}{P} \right)^{1/2}$$
Technical data

### Electromagnetic immunity

<table>
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<tr>
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<th>IEC 60601-1-2 test level</th>
<th>Compliance level (of device)</th>
<th>Electromagnetic environment</th>
</tr>
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<tr>
<td>a) Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the equipment is used exceeds the applicable RF compliance level above, the equipment should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the equipment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

### Recommended separation distances

#### Recommended separation distances between portable and mobile RF telecommunication devices and the Cockpit

<table>
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<tr>
<th>max. Powr (W)</th>
<th>150 kHz to 800 MHz Distance (m)</th>
<th>800 MHz to 2.5 GHz Distance (m)</th>
<th>Comments (if applicable)</th>
</tr>
</thead>
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<tr>
<td>0.001</td>
<td>0.04</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>0.003</td>
<td>0.06</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>0.010</td>
<td>0.12</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>0.040</td>
<td>0.21</td>
<td>0.4</td>
<td>For example: WLAN 5250</td>
</tr>
<tr>
<td>0.100</td>
<td>0.38</td>
<td>0.73</td>
<td>For example: WLAN 2440 (Europe), Bluetooth</td>
</tr>
<tr>
<td>0.200</td>
<td>0.54</td>
<td>1.03</td>
<td>For example: WLAN 5250 (Europe)</td>
</tr>
<tr>
<td>0.250</td>
<td>0.6</td>
<td>1.03</td>
<td>For example: DECT-devices</td>
</tr>
<tr>
<td>1.000</td>
<td>1.2</td>
<td>2.3</td>
<td>For example: GSM 1800 / GSM 1900 / UMTS mobile phones, WLAN 5600 (not in Europe)</td>
</tr>
<tr>
<td>2.000</td>
<td>1.7</td>
<td>3.25</td>
<td>For example: GSM 800 mobile phones</td>
</tr>
<tr>
<td>2.000</td>
<td>2.08</td>
<td>3.98</td>
<td></td>
</tr>
<tr>
<td>10.00</td>
<td>3.8</td>
<td>7.27</td>
<td></td>
</tr>
<tr>
<td>100.00</td>
<td>12.0</td>
<td>23.0</td>
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NOTE: Information regarding separation distances (IEC 60601-1-2:2007, tables 4 and 6)
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</table>
These instructions for use only apply to
Infinity Acute Care System SW VG3.n
with the Serial No.
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Directive 93/42/EEC
concerning Medical Devices

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