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 VG2
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 labelling 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 dialogue window, for example, System setup > Monitoring > Basic settings.

In this example, System setup represents the dialogue window title, Monitoring represents a horizontally aligned tab, and Basic settings a vertically aligned tab.

Screen images

Schematic renderings of screen images are used, which may differ in appearance or in configuration from the actual screen images.
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- Hemo2®
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<th>A WARNING statement provides important information about a potentially hazardous situation which, if not avoided, could result in death or serious injury.</th>
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For explanations, refer to the sections “Abbreviations” on page 28 and “Device symbols” on page 25.
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For your safety and that of your patients

Strictly follow these Instructions for Use

**WARNING**

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 “Intended use” on page 17 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.

Training

Training for users is available from the responsible Dräger organisation. See www.draeger.com for more information.

Safety inspections and maintenance

**WARNING**

Every medical device must be inspected regularly to ensure it remains safe to use. This medical device must be inspected and serviced regularly by trained technical personnel. Trained technical personnel should also perform any repairs that are necessary.

Only authentic Dräger repair parts should be used for maintenance. Using non-Dräger repair parts may adversely affect the operation of the device (see the “Maintenance” chapter). Dräger also recommends obtaining a service contract so that all repairs are performed by DrägerService.

Safety inspections

The medical device must be subject to regular safety inspections. See chapter “Maintenance”.

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For your safety and that of your patients

**Accessories**

**WARNING**
Only the accessories indicated in the Infinity Acute Care System – Monitoring Applications Instructions for Use (latest edition) have been tested and approved for use with the medical device.

Therefore, it is strongly recommended that only these accessories are used in conjunction with the medical device. Otherwise, the correct functioning of the medical device may be compromised.

**Installing accessories**

**CAUTION**
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 system.

Strictly observe Assembly instructions and Instructions for Use.

**Sterile accessories**

**CAUTION**
Do not use sterile-packaged accessories if the packaging has been opened, is damaged or there are other signs of non-sterility. Disposable articles must not be reprocessed and resterilised. Reuse, reprocessing, or resterilisation can lead to a failure of the medical device and cause injury to the patient.

**Restrictions for use**

**CAUTION**
Device for use in health care facilities only and exclusively by persons with specific training and experience in its use.
Electrical safety

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

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

**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.

Combination of Dräger devices and third-party devices that are not approved by Dräger may adversely affect operation of those devices and may put the patient at greater risk of injury.

**CAUTION**
The medical device must only be used with software tested and approved by Dräger. Any modifications of the operating system settings can impair operating safety. Responsibility for any such modifications lies with the owner.

Strictly follow the Assembly Instructions and Instructions for Use for each connected device.

Networking and connection to other devices

When combining Dräger devices with other electrical devices, the owner must ensure that the resulting system meets the requirements of the following standards:

- **IEC 60601-1 (EN 60601-1)**
  Medical electrical equipment
  Part 1: General requirements for safety

- **IEC 60601-1-1 (EN 60601-1-1)**
  Medical electrical equipment
  Part 1-1: General requirements for safety
  Collateral standard: Safety requirements for medical electrical systems

- **IEC 60601-1-2 (EN 60601-1-2)**
  Medical electrical equipment
  Part 1-2: General requirements for safety
  Collateral standard: Electromagnetic compatibility; requirements and tests

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 80000-1 before attempting to connect such medical devices to their IT networks. The technical documentation that IEC 80000-1 requires manufacturers such as Dräger to make available in support of such network connections can be requested. Contact your Dräger representative for that information or to facilitate negotiation of an IEC 80000-1 Responsibility Agreement for additional support from Dräger.
Patient safety

The design of the medical device, the accompanying documentation, and the labelling on the medical device are based on the assumption that the purchase and the use of the medical device are restricted to medical professionals, and that certain inherent characteristics of the medical device are known to a clinical user. Instructions and WARNING and CAUTION statements are therefore largely limited to the specifics of the Dräger medical device.

These Instructions for Use do not refer to various hazards which are obvious to a medical professional who operates this medical device as well as references to the consequences of medical device misuse, and to potentially adverse effects in patients with different underlying diseases. Modifying or misusing this medical device can be dangerous.

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 device.

WARNING
Follow local regulations for safe disposal of batteries. To prevent fire or explosion, never dispose of batteries in fire.

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).

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 405 for device-specific cleaning instructions. Moisture may damage the circuits, compromise critical performance and present a safety risk.

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 authorised 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 organisation.
For your safety and that of your patients

Not for use in areas of explosion hazard or in oxygen-enriched areas

**WARNING**
This medical device is not for use in oxygen-enriched areas or in areas where combustible explosive gas mixtures are likely to occur.

**WARNING**
When placing the device, make sure adequate airflow exists. Do not cover the device with blankets.

Information on electromagnetic compatibility

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 423.

The performance of the medical electrical equipment may be affected by using portable or mobile RF communications equipment near it.

**WARNING**
Do not touch the patient while touching other conductive parts, including exposed pins or a connector marked with the ESD warning symbol.

Site of operation

Only use devices (monitors, MPods, MCables, and accessories) in areas that meet the environmental requirements outlined in the technical data section.

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

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

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

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

**CAUTION**
After extended exposure in a cold environment, acclimatise 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.

**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.
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 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.

**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**

The Infinity Acute Care System (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 the web sites, evaluate each website with regard to possible virus infection.

**CAUTION**

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. Do not use skin temperature sensors.
Intended use

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**Intended use**

**Infinity Acute Care System**

The IACS is intended for multi-parameter, physiologic patient monitoring of adult, paediatric, and neonatal patients in environments where patient care is provided by trained healthcare 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 paediatric only)
- 12-lead ECG monitoring including TruST
- ST segment analysis (adult and paediatric only)
- 12-lead ST segment analysis (adult and paediatric only)
- Apnoea
- Respiratory rate
- Invasive blood pressure
- Non-invasive blood pressure
- Temperature
- Cardiac output
- Arterial oxygen saturation
- Pulse rate (SpO2)
- Perfusion index (PI)
- Total haemoglobin (SpHb)
- Total oxygen content (SpOC)
- Carboxyhaemoglobin saturation (SpCO)
- Methaemoglobin saturation (SpMet)
- Patient volume index (PVI)
- Mainstream eCO2
System overview

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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 (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 “Infinity Acute Care System– Infinity M540” Instructions for Use.

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 Comm Hub
- **P2500** – refers to the Infinity P2500 Communications Hub
- **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 23).

![Diagram of IACS components]

**Infinity 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 “Infinity Acute Care System – Infinity Medical Cockpit” Instructions for Use.
System overview

Infinity PS250 Comm Hub (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.

The 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 connector
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 start-up 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 "Infinity Acute Care System–Infinity M540" Instructions for Use.

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 70)
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

E Nurse call connector
F Network LED – lights up green when connected to the network
G System cable connector

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 haemoglobin 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 212 and page 228).</td>
</tr>
<tr>
<td>Infinity MCable – Masimo SET Rainbow</td>
<td>Measures the percentage of functional haemoglobin saturated with oxygen (%SpO2) and reports the perfusion index (PI) and the pulse rate (PLS). In addition, it measures total haemoglobin (SpHb), total oxygen content (SpOC), patient volume index (PVI), Carboxyhaemoglobin saturation (SpCO), methaemoglobin saturation (SpMet).</td>
<td></td>
</tr>
<tr>
<td>Infinity MCable – Nellcor OxiMax</td>
<td>Measures the percentage of functional haemoglobin 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>Connection Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemo2 pod</td>
<td>Measures up to 2 pressures, cardiac output, core and body temperature.</td>
<td>Connects directly to the Hemo connector of the M540 (see information starting on page 255).</td>
</tr>
<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 255).</td>
</tr>
<tr>
<td>Infinity MPod – QuadHemo</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 255).</td>
</tr>
<tr>
<td>Infinity MCable – Dual Hemo</td>
<td>Measures up to 2 pressures.</td>
<td>Connects directly to the CO2 connector of the M540 (see page 288).</td>
</tr>
<tr>
<td>Infinity MCable – Mainstream CO2</td>
<td>Measures mainstream CO2.</td>
<td>Connects to the PS250 / P2500 (see page 21) or to the M500 (see page 22).</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 Temp/Aux connector of the M540 (see page 234) or to the CO2 connector with a Y-cable.</td>
</tr>
<tr>
<td>Infinity MCable – Analog/Sync</td>
<td>Provides a sync pulse to synchronise defibrillators to the heart beat of the patient during cardioversion. The cable's analogue-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 234) 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 1 connector located on the back panel (see the Infinity Acute Care System – Medical Cockpit Instructions for Use).</td>
</tr>
<tr>
<td>R50N 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>Icon</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>📚</td>
<td>Read accompanying documents for specific safety information</td>
<td>Lower alarm limits</td>
</tr>
<tr>
<td>🔴</td>
<td>Attention: consult accompanying documents</td>
<td>Upper alarm limits</td>
</tr>
<tr>
<td>📊</td>
<td>Access to trend pages</td>
<td>Autoset alarm limits</td>
</tr>
<tr>
<td>🔄</td>
<td>The button next to this symbol accesses special procedure pages</td>
<td>Alarm monitoring deactivated temporarily</td>
</tr>
<tr>
<td>🔴</td>
<td>Access to alarm functions</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>
<td>Acoustic alarm tone paused temporarily</td>
</tr>
<tr>
<td>🕒</td>
<td>Access to pre-configured Views and layouts</td>
<td>Acoustic alarm tone turned off permanently</td>
</tr>
<tr>
<td>📇</td>
<td>Access to parameter pages</td>
<td>Change clinical password</td>
</tr>
<tr>
<td>♂</td>
<td>Adult patient category</td>
<td>Lung symbol that pulsates with each detected breath</td>
</tr>
<tr>
<td>♀</td>
<td>Paediatric patient category</td>
<td>Heart blip that flashes with each detected pulse</td>
</tr>
</tbody>
</table>
### System overview

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Neonatal patient category" /></td>
<td>Neonatal patient category</td>
</tr>
<tr>
<td><img src="image" alt="Battery-status LED" /></td>
<td>Battery-status LED</td>
</tr>
<tr>
<td><img src="image" alt="Battery-charging error" /></td>
<td>Battery-charging error</td>
</tr>
<tr>
<td><img src="image" alt="AC power mains" /></td>
<td>AC power mains</td>
</tr>
<tr>
<td><img src="image" alt="Function/setting is unlocked" /></td>
<td>Function/setting is unlocked</td>
</tr>
<tr>
<td><img src="image" alt="Function/setting is locked" /></td>
<td>Function/setting is locked</td>
</tr>
<tr>
<td><img src="image" alt="Data entry with numeric keypad" /></td>
<td>Data entry with numeric keypad</td>
</tr>
<tr>
<td><img src="image" alt="Trend configuration" /></td>
<td>Trend configuration</td>
</tr>
<tr>
<td><img src="image" alt="On-screen keyboard access" /></td>
<td>On-screen keyboard access</td>
</tr>
<tr>
<td><img src="image" alt="Nurse call" /></td>
<td>Nurse call</td>
</tr>
<tr>
<td><img src="image" alt="Manufacturer" /></td>
<td>Manufacturer</td>
</tr>
</tbody>
</table>
### System overview

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⏰</td>
<td>The parameter is excluded from display.</td>
</tr>
<tr>
<td>📊</td>
<td>The parameter is represented as a waveform and a parameter box.</td>
</tr>
<tr>
<td>🔍</td>
<td>The parameter is represented as a parameter box only.</td>
</tr>
<tr>
<td>🔄</td>
<td>Import functions (for example, importing profiles).</td>
</tr>
<tr>
<td>🔄</td>
<td>Save modifications (for example, changes to a view).</td>
</tr>
<tr>
<td>🔄</td>
<td>ESD warning</td>
</tr>
<tr>
<td>🔄</td>
<td>Save as a symbol.</td>
</tr>
<tr>
<td>🔄</td>
<td>IPX4 Degree of protection against liquid ingress</td>
</tr>
<tr>
<td>☑️</td>
<td>Directive 93/42/EEC Concerning Medical Devices</td>
</tr>
<tr>
<td>⚡</td>
<td>Refreshes a web screen</td>
</tr>
<tr>
<td>→</td>
<td>Navigates forward on a web page</td>
</tr>
<tr>
<td>←</td>
<td>Navigates backward on a web page</td>
</tr>
<tr>
<td>🛡️</td>
<td>Displays the home screen</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>% leak</td>
<td>relative leakage</td>
</tr>
<tr>
<td>% MVspon</td>
<td>spontaneous minute volume, fractional</td>
</tr>
<tr>
<td>%paced</td>
<td>percentage of paced beats</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>AIVR</td>
<td>Accelerated idioventricular rhythm</td>
</tr>
<tr>
<td>alv</td>
<td>alveolar</td>
</tr>
<tr>
<td>apn</td>
<td>apnoea</td>
</tr>
<tr>
<td>APR</td>
<td>arterial pulse pressure</td>
</tr>
<tr>
<td>APRV</td>
<td>airway pressure release ventilation</td>
</tr>
<tr>
<td>ARR</td>
<td>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>
<tr>
<td>ARTF</td>
<td>artefact</td>
</tr>
<tr>
<td>ASY</td>
<td>Asystole</td>
</tr>
<tr>
<td>aVF</td>
<td>ECG lead aVF</td>
</tr>
<tr>
<td>Avg</td>
<td>average</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</td>
<td>airway</td>
</tr>
<tr>
<td>AW-Temp</td>
<td>gas temperature</td>
</tr>
<tr>
<td>BGM</td>
<td>bigeminy</td>
</tr>
<tr>
<td>BRADY</td>
<td>bradycardia</td>
</tr>
<tr>
<td>BSA</td>
<td>body surface area</td>
</tr>
<tr>
<td>C.O.</td>
<td>cardiac output</td>
</tr>
<tr>
<td>C.O. Avg</td>
<td>cardiac output average</td>
</tr>
<tr>
<td>C20/Cdyn</td>
<td>ratio of compliance during last 20% of inspiration over dynamic compliance</td>
</tr>
<tr>
<td>CaO2</td>
<td>arterial oxygen content</td>
</tr>
<tr>
<td>CCI</td>
<td>continuous cardiac index</td>
</tr>
<tr>
<td>CCJ</td>
<td>continuous cardiac index</td>
</tr>
<tr>
<td>CCO</td>
<td>continuous cardiac output</td>
</tr>
<tr>
<td>Cdyn</td>
<td>dynamic lung 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>
<tr>
<td>CO-Ox</td>
<td>CO-oximetry</td>
</tr>
<tr>
<td>CPP</td>
<td>cerebral perfusion pressure</td>
</tr>
<tr>
<td>CPT</td>
<td>ventricular couplet</td>
</tr>
<tr>
<td>Cs</td>
<td>static lung compliance</td>
</tr>
<tr>
<td>Cstat</td>
<td>static lung compliance</td>
</tr>
<tr>
<td>Cuff</td>
<td>continuous cuff pressure value during measurement</td>
</tr>
<tr>
<td>CvO2</td>
<td>venous oxygen content</td>
</tr>
<tr>
<td>CVP</td>
<td>central venous pressure</td>
</tr>
<tr>
<td>DCO2</td>
<td>CO2 elimination coefficient during HFO</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>ΔO2</td>
<td>inspiratory/expiratory oxygen concentration difference</td>
</tr>
</tbody>
</table>
System overview

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO₂</td>
<td>oxygen delivery</td>
</tr>
<tr>
<td>DO₂I</td>
<td>oxygen delivery index</td>
</tr>
<tr>
<td>ΔPhf</td>
<td>pressure amplitude during HFO</td>
</tr>
<tr>
<td>ΔPsupp</td>
<td>pressure amplitude above PEEP in pressure support</td>
</tr>
<tr>
<td>ds</td>
<td>dead space</td>
</tr>
<tr>
<td>ΔSC-PSupp goal</td>
<td>pressure support goal (SmartCare)</td>
</tr>
<tr>
<td>ΔSC-PSupp rated</td>
<td>pressure support by internal controller (SmartCare)</td>
</tr>
<tr>
<td>dV₁ to dV₆</td>
<td>derived chest leads</td>
</tr>
<tr>
<td>DVI</td>
<td>digital visual interface</td>
</tr>
<tr>
<td>dyn</td>
<td>dynamic</td>
</tr>
<tr>
<td>E</td>
<td>elastance</td>
</tr>
<tr>
<td>ECG</td>
<td>electrocardiogram</td>
</tr>
<tr>
<td>EDV</td>
<td>end diastolic volume</td>
</tr>
<tr>
<td>EDVI</td>
<td>end diastolic volume index</td>
</tr>
<tr>
<td>EF</td>
<td>ejection fraction</td>
</tr>
<tr>
<td>EIP</td>
<td>end inspiratory pressure</td>
</tr>
<tr>
<td>Enf</td>
<td>enflurane</td>
</tr>
<tr>
<td>Enf cons</td>
<td>cumulated enflurane consumption</td>
</tr>
<tr>
<td>ESV</td>
<td>end systolic volume</td>
</tr>
<tr>
<td>ESVI</td>
<td>end systolic volume index</td>
</tr>
<tr>
<td>et</td>
<td>end-tidal (in combination with gas values)</td>
</tr>
<tr>
<td>etDes</td>
<td>end-tidal desflurane concentration</td>
</tr>
<tr>
<td>etEnf</td>
<td>end-tidal enflurane concentration</td>
</tr>
<tr>
<td>etHal</td>
<td>end-tidal halothane concentration</td>
</tr>
<tr>
<td>etIso</td>
<td>end-tidal isoflurane concentration</td>
</tr>
<tr>
<td>etN₂O</td>
<td>end-tidal N₂O concentration</td>
</tr>
<tr>
<td>etO₂</td>
<td>end-tidal oxygen concentration</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>etSev</td>
<td>end-tidal sevoflurane concentration</td>
</tr>
<tr>
<td>ext</td>
<td>external</td>
</tr>
<tr>
<td>FiO₂</td>
<td>fractional inspired O₂</td>
</tr>
<tr>
<td>FV</td>
<td>flow-volume loop</td>
</tr>
<tr>
<td>GP1 to 4 D</td>
<td>general pressure 1-4 diastolic value</td>
</tr>
<tr>
<td>GP1 to 4 M</td>
<td>GP 1 to 4 mean value</td>
</tr>
<tr>
<td>GP1 to 4 S</td>
<td>GP 1 to 4 systolic value</td>
</tr>
<tr>
<td>Hal</td>
<td>halothane</td>
</tr>
<tr>
<td>Hal cons</td>
<td>cumulated halothane consumption</td>
</tr>
<tr>
<td>HFO</td>
<td>high-frequency oscillation</td>
</tr>
<tr>
<td>Hgb</td>
<td>haemoglobin</td>
</tr>
<tr>
<td>HR</td>
<td>heart rate</td>
</tr>
<tr>
<td>I</td>
<td>ECG lead I</td>
</tr>
<tr>
<td>I:E</td>
<td>inspiratory-to-expiratory ratio</td>
</tr>
<tr>
<td>I:E E part</td>
<td>inspiratory:expiratory ratio, expiratory component</td>
</tr>
<tr>
<td>I:E I part</td>
<td>inspiratory:expiratory ratio (inspiratory component)</td>
</tr>
<tr>
<td>I:Espon</td>
<td>inspiratory:expiratory ratio, spontaneous</td>
</tr>
<tr>
<td>I:Espon E-Part</td>
<td>inspiratory:expiratory ratio, spontaneous, expiratory component</td>
</tr>
<tr>
<td>I:Espon I-Part</td>
<td>inspiratory:expiratory ratio, spontaneous, inspiratory component</td>
</tr>
<tr>
<td>IACS</td>
<td>Infinity Acute Care System</td>
</tr>
<tr>
<td>IBP</td>
<td>invasive blood pressure</td>
</tr>
<tr>
<td>ICP</td>
<td>intracranial pressure</td>
</tr>
<tr>
<td>ICS</td>
<td>Infinity CentralStation</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>II</td>
<td>ECG lead II</td>
</tr>
<tr>
<td>III</td>
<td>ECG lead III</td>
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### Abbreviation and Description

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>inspiratory (in combination with gas values)</td>
</tr>
<tr>
<td>inDes</td>
<td>inspiratory desflurane concentration</td>
</tr>
<tr>
<td>inEnf</td>
<td>inspiratory enfurane concentration</td>
</tr>
<tr>
<td>inHal</td>
<td>inspiratory halothane concentration</td>
</tr>
<tr>
<td>inIso</td>
<td>inspiratory isoflurane concentration</td>
</tr>
<tr>
<td>inj</td>
<td>injectate temperature</td>
</tr>
<tr>
<td>inN2O</td>
<td>inspiratory N2O concentration</td>
</tr>
<tr>
<td>inO2</td>
<td>inspired O2</td>
</tr>
<tr>
<td>inSev</td>
<td>inspiratory sevoflurane concentration</td>
</tr>
<tr>
<td>Insp. term.</td>
<td>inspiratory termination criterion based on peak inspiratory flow</td>
</tr>
<tr>
<td>inxMAC</td>
<td>MAC factor</td>
</tr>
<tr>
<td>iO2</td>
<td>inspired O2</td>
</tr>
<tr>
<td>ISO</td>
<td>iso-electric point or International Organisation for Standardisation</td>
</tr>
<tr>
<td>Iso</td>
<td>isoflurane</td>
</tr>
<tr>
<td>Iso cons</td>
<td>cumulated isoflurane consumption</td>
</tr>
<tr>
<td>LA</td>
<td>left arm (ECG)</td>
</tr>
<tr>
<td>LA</td>
<td>left atrial pressure</td>
</tr>
<tr>
<td>LHCPP</td>
<td>left heart coronary perfusion pressure</td>
</tr>
<tr>
<td>LV</td>
<td>left ventricular pressure</td>
</tr>
<tr>
<td>LV D</td>
<td>LV diastolic value</td>
</tr>
<tr>
<td>LV M</td>
<td>LV mean value</td>
</tr>
<tr>
<td>LV S</td>
<td>LV systolic value</td>
</tr>
<tr>
<td>LVSW</td>
<td>left ventricular stroke work</td>
</tr>
<tr>
<td>LVSWI</td>
<td>left ventricular stroke work index</td>
</tr>
<tr>
<td>man</td>
<td>manual</td>
</tr>
<tr>
<td>mand</td>
<td>mandatory</td>
</tr>
<tr>
<td>MAP</td>
<td>mean airway pressure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>max</td>
<td>maximum</td>
</tr>
<tr>
<td>min.</td>
<td>minimal</td>
</tr>
<tr>
<td>MV</td>
<td>total minute volume</td>
</tr>
<tr>
<td>MValv</td>
<td>alveolar minute volume</td>
</tr>
<tr>
<td>MVds</td>
<td>minute volume, dead space</td>
</tr>
<tr>
<td>MVe</td>
<td>minute volume, total expiratory</td>
</tr>
<tr>
<td>MVe s</td>
<td>minute volume, spontaneous expiratory</td>
</tr>
<tr>
<td>MVI</td>
<td>minute volume, total inspiratory</td>
</tr>
<tr>
<td>MVI s</td>
<td>minute volume, spontaneous inspiratory</td>
</tr>
<tr>
<td>MVleak</td>
<td>minute volume leakage</td>
</tr>
<tr>
<td>MVmand</td>
<td>minute volume, mandatory</td>
</tr>
<tr>
<td>MVspon</td>
<td>minute volume, expired spontaneous</td>
</tr>
<tr>
<td>N2O</td>
<td>nitrous oxide</td>
</tr>
<tr>
<td>N2O cons</td>
<td>cumulated N2O consumption</td>
</tr>
<tr>
<td>NIBP</td>
<td>non-invasive blood pressure</td>
</tr>
<tr>
<td>NIBP D</td>
<td>NIBP diastolic value</td>
</tr>
<tr>
<td>NIBP M</td>
<td>NIBP mean value</td>
</tr>
<tr>
<td>NIBP S</td>
<td>NIBP systolic value</td>
</tr>
<tr>
<td>NIF</td>
<td>negative inspiratory force</td>
</tr>
<tr>
<td>O2 cons</td>
<td>cumulated O2 consumption</td>
</tr>
<tr>
<td>Occlusion Press</td>
<td>occlusion pressure</td>
</tr>
<tr>
<td>P0.1</td>
<td>occlusion pressure</td>
</tr>
<tr>
<td>P2500</td>
<td>communications hub</td>
</tr>
<tr>
<td>PA</td>
<td>pulmonary arterial pressure</td>
</tr>
<tr>
<td>PA D</td>
<td>PA diastolic value</td>
</tr>
<tr>
<td>PA M</td>
<td>PA mean value</td>
</tr>
<tr>
<td>PA S</td>
<td>PA systolic value</td>
</tr>
<tr>
<td>PaCO2</td>
<td>arterial CO2 pressure</td>
</tr>
<tr>
<td>PaO2</td>
<td>arterial O2 pressure</td>
</tr>
<tr>
<td>Pat ID</td>
<td>patient ID</td>
</tr>
<tr>
<td>Pause</td>
<td>pause pressure</td>
</tr>
</tbody>
</table>
### System overview

- **Abbreviation** | **Description**
- Paw | airway pressure
- PAW min | minimum airway pressure
- Pb | barometric pressure
- PCO₂ | partial pressure of CO₂ in blood
- PeCO₂ | mixed expired CO₂ pressure
- PEEP | positive-end expiratory pressure
- PEEPi | intrinsic positive end expiratory airway pressure
- Phigh | upper pressure level during APRV
- PI | perfusion index (SpO₂)
- Pinsp | inspiratory pressure
- PIP | peak inspiratory pressure
- 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
- PS250 | power supply
- PV | pressure-volume loop
- PVC/min | rate of PVC (pre-ventricular contractions) per minute
- PVI | patient volume index
- PVR | pulmonary vascular resistance
- PVRi | pulmonary vascular resistance index
- PWP | pulmonary wedge pressure
- Qs/Qt | intrapulmonary right-left shunt
- R | resistance (airway)
- r² | parameter correlation factor
- R50N | strip recorder
- RA | right arm (ECG)

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>right atrial pressure</td>
</tr>
<tr>
<td>Raw</td>
<td>resistance (airway)</td>
</tr>
<tr>
<td>Resp</td>
<td>respiration</td>
</tr>
<tr>
<td>RL</td>
<td>right leg (ECG)</td>
</tr>
<tr>
<td>RPP</td>
<td>rate pressure product</td>
</tr>
<tr>
<td>RR</td>
<td>respiration rate</td>
</tr>
<tr>
<td>RRapn</td>
<td>rate for apnoea ventilation</td>
</tr>
<tr>
<td>RRc</td>
<td>respiratory rate (CO₂)</td>
</tr>
<tr>
<td>RRi</td>
<td>respiratory rate (impedance)</td>
</tr>
<tr>
<td>RRmand</td>
<td>mandatory respiratory rate</td>
</tr>
<tr>
<td>RRs</td>
<td>respiratory rate, spontaneous</td>
</tr>
<tr>
<td>RRspont</td>
<td>respiratory rate, spontaneous</td>
</tr>
<tr>
<td>RRv</td>
<td>respiratory rate (ventilator)</td>
</tr>
<tr>
<td>RRv</td>
<td>respiratory rate, ventilation</td>
</tr>
<tr>
<td>RSB</td>
<td>rapid shallow breathing index</td>
</tr>
<tr>
<td>RUN</td>
<td>ventricular run</td>
</tr>
<tr>
<td>RV</td>
<td>right ventricular pressure</td>
</tr>
<tr>
<td>RV D</td>
<td>RV diastolic value</td>
</tr>
<tr>
<td>RV M</td>
<td>RV mean value</td>
</tr>
<tr>
<td>RV S</td>
<td>RV systolic value</td>
</tr>
<tr>
<td>RVSW</td>
<td>right ventricular stroke work</td>
</tr>
<tr>
<td>RVSWI</td>
<td>right ventricular stroke work index</td>
</tr>
<tr>
<td>SaO₂</td>
<td>arterial oxygen saturation</td>
</tr>
<tr>
<td>SC-duration</td>
<td>duration of patient session (SmartCare)</td>
</tr>
<tr>
<td>SC-etCO₂</td>
<td>end-tidal etCO₂ (SmartCare)</td>
</tr>
<tr>
<td>SC-RRspont</td>
<td>spontaneous frequency (SmartCare)</td>
</tr>
<tr>
<td>SC-VT</td>
<td>tidal volume (SmartCare)</td>
</tr>
<tr>
<td>Sev cons</td>
<td>cumulative sevoflurane consumption</td>
</tr>
<tr>
<td>SpCO</td>
<td>carboxyhaemoglobin saturation</td>
</tr>
<tr>
<td>SpHb</td>
<td>total arterial haemoglobin</td>
</tr>
<tr>
<td>SpHbv</td>
<td>total haemoglobin (venous)</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpMet</td>
<td>methaemoglobin saturation</td>
</tr>
<tr>
<td>SpO2</td>
<td>oxygen saturation measured by pulse oximetry</td>
</tr>
<tr>
<td>SpO2</td>
<td>venous oxygen saturation</td>
</tr>
<tr>
<td>SpOC</td>
<td>total oxygen content</td>
</tr>
<tr>
<td>stat</td>
<td>static</td>
</tr>
<tr>
<td>Std(x)</td>
<td>ST deviation of derived leads (dV1 to dV6)</td>
</tr>
<tr>
<td>ST(x)</td>
<td>ST deviation of lead (x)</td>
</tr>
<tr>
<td>support</td>
<td>pressure support</td>
</tr>
<tr>
<td>SV</td>
<td>stroke volume</td>
</tr>
<tr>
<td>SVI</td>
<td>stroke volume index</td>
</tr>
<tr>
<td>SVR</td>
<td>systemic vascular resistance</td>
</tr>
<tr>
<td>SVRI</td>
<td>systemic vascular resistance index</td>
</tr>
<tr>
<td>SVT</td>
<td>supraventricular tachycardia</td>
</tr>
<tr>
<td>SVV</td>
<td>stroke volume variation</td>
</tr>
<tr>
<td>TACH</td>
<td>tachycardia</td>
</tr>
<tr>
<td>Tblood</td>
<td>blood temperature</td>
</tr>
<tr>
<td>TC</td>
<td>time constant</td>
</tr>
<tr>
<td>Tcase</td>
<td>therapy case duration</td>
</tr>
<tr>
<td>Thigh</td>
<td>time of upper pressure level in APRV</td>
</tr>
<tr>
<td>Ti</td>
<td>inspired time</td>
</tr>
<tr>
<td>Ti set</td>
<td>inspired time setting</td>
</tr>
<tr>
<td>Tinj</td>
<td>injectate temperature</td>
</tr>
<tr>
<td>Tispon</td>
<td>spontaneous inspiratory time</td>
</tr>
<tr>
<td>Tlow</td>
<td>time of low pressure level in APRV</td>
</tr>
<tr>
<td>TPR</td>
<td>total pulmonary resistance</td>
</tr>
<tr>
<td>Trapped VOL</td>
<td>trapped volume</td>
</tr>
<tr>
<td>TruST</td>
<td>algorithm that provides a TruST 12-lead-ECG (including derived chest leads dV1, dV3, dV4, dV6) using a 6 lead wire set that provides ECG leads I, II, III, aVL, aVR, aVF, V2, V5.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVd aw</td>
<td>tidal volume, dead space</td>
</tr>
<tr>
<td>TVd aw%</td>
<td>tidal volume, relative dead space</td>
</tr>
<tr>
<td>TVe</td>
<td>tidal volume, expiratory</td>
</tr>
<tr>
<td>TVi</td>
<td>tidal volume, inspired</td>
</tr>
<tr>
<td>TVR</td>
<td>total vascular resistance</td>
</tr>
<tr>
<td>V</td>
<td>chest or precordial lead from a 5 or 6 lead wire set.</td>
</tr>
<tr>
<td>V+</td>
<td>second chest or precordial lead from a 6-lead wire set.</td>
</tr>
<tr>
<td>V1 - V6</td>
<td>ECG chest leads V1 to V6</td>
</tr>
<tr>
<td>VCO2</td>
<td>CO2 production</td>
</tr>
<tr>
<td>VCO2</td>
<td>CO2 production</td>
</tr>
<tr>
<td>Vds</td>
<td>dead space</td>
</tr>
<tr>
<td>Vds/VTx</td>
<td>relative dead space</td>
</tr>
<tr>
<td>Vent</td>
<td>ventilation</td>
</tr>
<tr>
<td>VESA</td>
<td>Video Electronics Standard Association</td>
</tr>
<tr>
<td>VF</td>
<td>ventricular fibrillation</td>
</tr>
<tr>
<td>VO2</td>
<td>O2 parameter uptake</td>
</tr>
<tr>
<td>VO2</td>
<td>oxygen consumption</td>
</tr>
<tr>
<td>VO2I</td>
<td>oxygen consumption index</td>
</tr>
<tr>
<td>VT</td>
<td>tidal volume</td>
</tr>
<tr>
<td>VT/Wt</td>
<td>tidal volume per kg body weight</td>
</tr>
<tr>
<td>VTACH</td>
<td>ventricular tachycardia</td>
</tr>
<tr>
<td>VTi</td>
<td>tidal volume, inspired</td>
</tr>
<tr>
<td>VT mand</td>
<td>mandatory expiratory tidal volume</td>
</tr>
<tr>
<td>VTespon</td>
<td>spontaneous expired total volume</td>
</tr>
<tr>
<td>VTespon mean</td>
<td>spontaneous expired mean total volume</td>
</tr>
<tr>
<td>VTThf</td>
<td>tidal volume for HFO</td>
</tr>
<tr>
<td>VTi</td>
<td>tidal volume, inspired</td>
</tr>
</tbody>
</table>
### System overview

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTispon</td>
<td>spontaneous inspired tidal volume</td>
</tr>
<tr>
<td>VTispon mean</td>
<td>spontaneous inspired mean total volume</td>
</tr>
<tr>
<td>VTmand</td>
<td>tidal volume, mandatory</td>
</tr>
<tr>
<td>Vtrap</td>
<td>trapped volume</td>
</tr>
<tr>
<td>VTspon</td>
<td>spontaneous tidal volume, leakage corrected</td>
</tr>
<tr>
<td>VTspon mean</td>
<td>spontaneous tidal volume</td>
</tr>
<tr>
<td>wvf</td>
<td>waveform</td>
</tr>
</tbody>
</table>
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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 standardised user interfaces, improves workplace ergonomics and flexibility, and centralises 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 Infinity Medical Cockpit. This medical-grade workstation provides centralised 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-standardised 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  I System cables
B DVI cable           J R50N recorder
C Secondary display (option)  K AC power
D The USB cable          L Infinity network
E Keyboard and mouse (option)  M Infinity MCable – Nurse Call (option)
F Device connectivity cable (option)  N P2500 / PS250
G M540 patient monitor      O Hospital network
H M500 docking station     P Ethernet cable
M540 and Cockpit communication

Communication between the M540 and the Cockpit starts as soon as the M540 is docked in the M500 (see page 69). 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.

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 centre of the Cockpit screen.
- The Cockpit makes the data of the M540 available to the Infinity network.

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 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.

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 CentralStation (ICS) provided the patient is admitted there. The M540 continues to monitor the 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 is 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 is 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 centre 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 a wireless symbol.
- Data is no longer trended 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.

*Operating concept*
Communicating with the Infinity network

When the M540 is docked on the M500 and the IACS is connected to the network, the patient data is available on the Infinity network. If the connection to the Infinity network is lost, the Cockpit Alarm volume setting (see page 328) changes to 100 % until the connection is restored.

Communicating with the Infinity network has the following benefits:

- Patient data is 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 (Infinity CentralStation) for central monitoring (the IACS is compatible with ICS software VF8.4 or higher).
- You can view the Cockpit from other Infinity monitors within the same monitoring unit using the remote view function (see page 42).
- From the Cockpit, you can view other bedside monitors (including other Cockpits) in the same monitoring unit using the remote view function (see page 41).

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.

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 is included in a patient data transfer:

- Patient demographic information (see page 77 for information of what demographic data is included)
- Trends

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
- Haemodynamic, oxygenation, and ventilation calculation results
Operating concept

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

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.
4. Select the Transfer tab (if not already selected). The Transfer page (see page 43) 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 (D). A message appears at the Cockpit indicating the transfer was either successful or that it failed.

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 340).

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 56) of the remote Cockpit.
Operating concept

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

The following diagram shows a Remote view dialogue.

Using remote view functions

From the Remote view dialogue, you can perform the following functions (the letters in parenthesis refer to the Remote view dialogue diagram on page 42):

- 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 (Infinity CentralStation)

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 BedView. A viewport consists of the top Cockpit waveform and the associated parameter box. The ICS also provides a BedView 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 BedView based on the parameter priority order.
Remote control

If the remote control feature is activated (see page 340), you can perform the following Cockpit functions remotely from the ICS:

- Autoset alarm limits
- Initiate a relearn
- Audio pause acoustic alarm signals
- Configure alarm limits and ST and arrhythmia settings.
- Request timed and continuous recordings

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 Infinity CentralStation Instructions for Use.

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 365.

Communication management

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

<table>
<thead>
<tr>
<th>What happens if...</th>
<th>Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turning the IACS on and off</strong></td>
<td></td>
</tr>
<tr>
<td>you switch on the Cockpit?</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 M540?</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><strong>Docking/undocking an M540</strong></td>
<td></td>
</tr>
<tr>
<td>you dock 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>
</tbody>
</table>
## Operating concept

<table>
<thead>
<tr>
<th>What happens if...</th>
<th>Behaviour</th>
</tr>
</thead>
</table>
| you dock an M540 and it is unable to communicate with the Cockpit? | - An alarm of medium priority sounds at the Cockpit, at the M540, and at the ICS (provided the patient is admitted there).  
- The message *M540 communication failure* appears at the Cockpit.  
- The M540 continues to monitor the patient and provides acoustic and visual alarm signals. |

### Alarm behaviour

| an M540 whose acoustic alarm signals have been paused docks to a Cockpit? | All acoustic alarm signals are paused for 2 minutes on both devices. |
| you dock an M540 with an alarm pause state, which is different from that of the Cockpit? | Both devices observe the remaining alarm pause interval. |

### Connection/power problems

| if there is a power failure? | - The LEDs on the front panels indicate that the Cockpit and the M540 are on battery power.  
- The Cockpit sounds an alarm of medium priority and switches to battery power for up to 5 minutes before performing a safe shutdown.  
- The M540 switches to battery power for up to 3.5 hours before shutting down. |
| 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 328) 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. |
Operating concept

### What happens if...

<table>
<thead>
<tr>
<th>the Cockpit loses communication with an external device?</th>
<th>Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>– The Cockpit tries to restore the link.</td>
</tr>
<tr>
<td></td>
<td>– If the corresponding function is activated, an alarm sounds and the message <em>External device disconnected</em> appears on the Cockpit and ICS (see “External device disconnected alarm control” on page 330).</td>
</tr>
</tbody>
</table>

### Miscellaneous

| the Cockpit and the M540 are monitoring a patient and you put either device in the standby mode? | Both devices are put in the 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 NIBP measurement is requested at the M540 and almost simultaneously on the Cockpit? | The function is cancelled on both devices. |

### 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 serious 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.
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</td>
<td>CTLDVI-DL-MM3</td>
</tr>
<tr>
<td></td>
<td>1.52 m</td>
<td>CTLDVI-DL-MM5</td>
</tr>
<tr>
<td></td>
<td>3.04 m</td>
<td>CTLDVI-DL-MM10</td>
</tr>
<tr>
<td></td>
<td>4.75 m</td>
<td>CTLDVI-DL-MM15</td>
</tr>
<tr>
<td>DVI to VGA</td>
<td>0.91 m</td>
<td>CTLDVI-HD-MM3</td>
</tr>
<tr>
<td></td>
<td>1.52 m</td>
<td>CTLDVI-HD-MM5</td>
</tr>
<tr>
<td></td>
<td>3.04 m</td>
<td>CTLDVI-HD-MM10</td>
</tr>
<tr>
<td></td>
<td>4.75 m</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 423). Dräger has qualified the ViewSonic, 19-inch (48.3 cm) wide screen high-resolution display. The ViewSonic has a display resolution of 1680 x 1050 pixels.

Export protocol

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

The export protocol connector is located on the P2500/PS250 (see page 21).

Refer to the section “Connected devices” on page 11 whenever you connect third-party devices.
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 unit

For a more detailed overview of general user interface components of the IACS, refer to the “Infinity Acute Care System – Medical Cockpit” Instructions for Use.
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.

A Patient category field
B System data field
C Patient name field
D Date and time field
E Alarm message field
F Alarm banner field

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
- Paediatric
- Neonate

Touching this field opens the Start/Standby... dialogue window for accessing the Demographics page (see page 78).

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 dialogue with the Biomed access code keypad.

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 78).

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 113.

Date and time field

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

Alarm message field

The alarm message field (E) of the header bar is reserved for alarm and technical messages. The background colour of the alarm message corresponds to the alarm priority (see page 88).

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 92).
Operating concept

Alarm banner field
The alarm banner field (F) of the header bar (see page 48) indicates the current alarm status. It is reserved for one of the following indicators:
- and the message Audio paused plus a count-down timer when you press the yellow fixed key located next to the rotary knob.
- and the message All alarms paused with the count down timer if the All alarms paused function has been set to a time period (see page 328) 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 328) 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 dialogue 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 62). The appearance of the monitoring area also depends on whether or not the split-screen mode or mini-trend display is selected (see page 320).

When opening a dialogue window, the waveform channels and parameter boxes are reduced to fit on the right side of the screen (see illustration on page 53). This display behaviour 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 dialogue 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 pacer blip for paced pulses), RRI blip, and SpO2 blip
- Time stamps
- Count-down timers and time stamps for NIBP
- Special source labels (for example, PLS for HR signal source for pulse oximetry)
- Parameter-specific message fields for NIBP 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 colour of the alarm priority and a corresponding alarm message appears in the header bar (see “Problem solving” on page 369). 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 dialogue 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 customise the waveforms:

- Changing the colours for individual parameters (see for example how to change the colour for ECG on page 174)
- Changing the sweep speeds (see page 319)

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

- Signal scales
- Grids
- Units of measure
- Parameter labels
- Pacer spikes
- QRS synchronisation markers
- Respiration waveform markers to indicate breath detection
- Banners (see page 52)

**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.

**NOTE**

If the acquired signal does not fit in the waveform channel, the top of the waveform may appear clipped.
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 328) and you select the **All alarms off** button.

- **All alarms paused** with count-down timer when a time is selected in the **All alarms paused** function (see page 328) 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 count-down 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 332).

- **HR alarms off** – appears under the following circumstances:
  - when the HR alarm limits function is deactivated, the **ASY/VF alarms** function is set to **Always on** (see page 330).
  - when the HR alarm limits function is deactivated and the basic arrhythmia function is activated and the **ASY/VF alarms** function is set to **Follow HR alarm** (see page 330).

- **HR, ASY, VF off** when arrhythmia monitoring is deactivated (see page 104), the arrhythmia function is set to **Follow HR alarm** (see page 330) and HR alarms are deactivated (see page 100).

- **OR Alarms** appears in the header bar when you activate **OR Alarms** (see page 329).

- **All alarms off: bypass** appears in the header bar when you activate cardiac bypass mode (see page 329).

- 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 174).

- **Filter off** appears on the ECG waveform when the filter setting is set to **Off** (see page 174).

- **Waveforms stopped** appears on all waveforms when you press the **Freeze waveforms** button on the main-menu bar (see page 51).

- **Pacer off, Pacer fusion** appears when the corresponding function is activated or deactivated (see page 174)

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

- **Privacy, Touch Screen to return** appears when privacy mode is activated (see page 65).

- **Standby, Touch Screen to resume monitoring** appears when standby mode is activated (see page 64).

- **Discharged, Touch Screen to initiate monitoring** appears after you discharge a patient (see page 79).
Dialogue windows and pages

The following diagram shows how the monitoring area appears when you access a dialogue window. The left side is reserved for the dialogue window while the right side displays the monitoring area (F) with real-time data. A dialogue 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 dialogue window. For example, the Alarms... button opens the Alarms dialogue window. You can also access parameter-specific dialogue 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 dialogue window with the ECG page appears.

- **A** Dialogue window title
- **B** Horizontal tabs – the selected tab appears light blue.
- **C** Button that closes the dialogue 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** The 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 following buttons appear on the main-menu bar.

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarms...</td>
<td>Opens the Alarms dialogue 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 dialogue 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 dialogue window.</td>
</tr>
<tr>
<td>Procedures...</td>
<td>Opens the Procedures dialogue window.</td>
</tr>
<tr>
<td>Sensor parameters...</td>
<td>Opens the Sensor parameters dialogue 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 dialogue window.</td>
</tr>
<tr>
<td>Start/Standby...</td>
<td>Opens the Start/Standby dialogue window.</td>
</tr>
<tr>
<td>Home</td>
<td>Returns to the main screen and closes any dialogue 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><img src="image" alt="Alarms... button" /></td>
<td><strong>All alarms off</strong> or <strong>All alarms paused</strong> (depending on configuration)</td>
</tr>
<tr>
<td><img src="image" alt="Views... button" /></td>
<td><strong>Auto set all</strong></td>
</tr>
<tr>
<td><img src="image" alt="Trends/ Data... button" /></td>
<td><strong>Show all ECG</strong></td>
</tr>
<tr>
<td><img src="image" alt="Sensor parameters... button" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="ECG report" /></td>
<td><strong>Remote view</strong></td>
</tr>
<tr>
<td><img src="image" alt="ST report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Alarm history report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Trend graph report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Trend table report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Calculations report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Timed wvf. report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Continuous wvf. report" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Timed recording" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Continuous recording" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Print case summary" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Zero all" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="NIBP continuous" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Venous stasis" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Standby" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Discharge" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
<tr>
<td><img src="image" alt="Privacy" /></td>
<td><strong>Print screen</strong> (C500 only)</td>
</tr>
</tbody>
</table>
Filtering the parameter content

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

- Parameter window of the Trends/Data dialogue window (see page 139).
- Sensor parameters dialogue window where it appears to the right of the parameter tabs.
- Alarms dialogue window (see page 102).
- Setup page for configuring the trend pages (see page 144)

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 62) contains all parameters. The parameters that are not connected appear grey 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 dialogue.
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 320), 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 320) 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.

Customising the display

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

Touch screen versus mouse

You can interact with the Cockpit using the touchscreen 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 319). The 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 the night-time mode, the entire background of the screen appears almost black. All buttons turn dark grey.

Calibrating the touch screen

If the touchscreen 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 touchscreen

1. Press the rotary knob until the *Calibrate Touch Screen* pop-up appears (requires several seconds).
2. Select the *Calibrate* button in the pop-up 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 checkmark symbol ✓ to complete the calibration procedure.
Operating concept

Cockpit screen in split-screen mode

When the split screen mode is activated (see page 321), 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, vent loops, ECG show all, ECG/Vent or ECG/ST, or ST parameters (see page 320).

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

A  Header Bar
B  The main screen menu bar
C  Auto-view setup toolbar (if activated)
D  The monitoring area with real-time vital signs
E  The split-screen panel (content depends on user selection)
Cockpit screen with mini-trends

When the mini trend display is activated (see page 154), a panel appears to the left of the monitoring area. Mini trends are updated continuously.

On the main screen, NIBP mini-trends can either be represented in tabular or graphical format (see page 321). All other parameters appear only as graphical trends.

The following diagram shows what the screen looks like when the split-screen mode and the mini-trends display are activated at the same time. If the split screen mode is not activated, the mini-trend panel shifts to the left edge of the screen.

A  Header Bar
B  The main screen menu bar
C  Auto-view setup toolbar (if activated)
D  The monitoring area with real-time vital signs
E  The split-screen panel (content depends on user selection)
F  The mini-trend panel
Cockpit split screen with IT tabs

The Cockpit supports IT applications that are accessible via tabs. Whenever an IT application and its tab are activated (see page 343), 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.

The following diagram shows what the Cockpit screen looks like when IT tabs, split-screen mode, and the mini trend display are activated.

A Header Bar
B The main screen menu bar
C Auto-view setup toolbar (if activated)
D The monitoring area with real-time vital signs
E The mini-trend panel
F The split-screen panel (content depends on the user selection)
G IT tabs
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 321).

In the Auto view page (see page 320), 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 323). 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 322.

Parameter priority list

The priority list appears in the parameter selection window of the Auto view page (see page 320). You can change the parameter priority by switching the position of the parameters in the Auto view page. For more information, see "To configure the parameter priority and display from the Auto view setup toolbar" on page 323.

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. Pulse 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. SpO2
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 352).

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 pop-up with pre-configured views.
3. Select the desired view from the Custom views (option) or the Draeger views selection lists.

The monitoring area is configured accordingly.

The view editor

The view editor (option) allows authorised personnel to create and modify customised views. Dräger views cannot be modified. Access to the view editor is password-protected. For more information, see page 326.
Profiles

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

A profile consists of user-defined settings which are customised for each patient category (adult, paediatric, 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.

A profile includes the following settings:

- Alarm limits and trend scales for each parameter depend on the selected patient category.
- Parameter colour and alarm archive status regardless of the selected patient category.
- Settings unique to each parameter that can be set up in the parameter pages for each patient category.

Whenever a patient is admitted, a previously defined default profile is assigned to that monitoring session.

Whenever an M540 is docked, the profile of the connected Cockpit overwrites any profile settings of the M540.

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

Managing profiles and views

Each patient category (adult, paediatric, 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 348):

- 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 354).
Operating concept

Standby mode

You can temporarily interrupt patient monitoring by placing the Cockpit and the M540 in the standby mode. Selecting the standby mode on the Cockpit automatically activates the 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.

The 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 cancelled.
- The banner **Standby – Touch Screen to resume monitoring** is displayed in the centre of the screen.

**To place the Cockpit in the 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 dialogue window.
   2. Select the **Start** tab if it is not already selected.
   3. Select the **Standby** button next to the menu selection **Monitor**.

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

**To take the Cockpit out of the standby mode**

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

The 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 is removed from the Cockpit and the M540 and only appears on the ICS.

Selecting the privacy mode on the Cockpit automatically activates the privacy mode on the M540 and vice versa. Likewise, taking a patient out of the privacy mode on one device does the same at the other device. The privacy mode is cancelled automatically when the connection to the Infinity network is disrupted.

Activating the privacy mode has the following effect:

- All patient data is 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 centre of the Cockpit screen.

To place the Cockpit in the 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.

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

To take the Cockpit out of the privacy mode

- Touch the screen to reactivate the display of the patient data.
Assembly

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Connecting the system cable to the PS250 / P2500 and the M500 72
Mounting the Infinity MCable – Masimo SET/Masimo Rainbow SET/Nellcor OxiMax MCable 73
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.

CAUTION

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

IACS components are compatible with commercially available mounting solutions.
Docking/undocking the M540

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

**M540 front view**

To dock the M540

1. Align the curved portion of the M540 with the curved portion of the M500.
2. Press the M540 (B) into the M500 (C) 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 70.

**M540 side view**

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 70 for information on how to unlock the locking tab.
2. Hold the M540 firmly and press one of the release buttons of the M500.
3. Pull the M540 (B) out of the M500 (C).

A  M500 locking tab  
B  M540 patient monitor  
C  M500  
D  Swivel mount (optional) and mounting clamp
**Assembly**

**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 Allen key (A) into the middle hole (B) on the locking tab and turn it clockwise to the locked position C. The locking tab is fixed and you cannot remove the M540 unless you ‘unlock’ it again using the Allen key.

**To unlock the M540**

1. Insert the 2 mm Allen key (A) into the middle hole (B) on the locking tab and turn it anti-clockwise to the unlocked position D.

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

---

![Top view of the M500](image)

- **A** Allen key (2 mm)
- **B** Centre hole on locking tab for locking/unlocking the M540
- **C** Release buttons for undocking the M540
- **D** Locking tab
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 Infinity Acute Care System – Medical Cockpit Instructions for Use).

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

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 (A).

2. Connect the other end of the system cable to one of the two PS250 / P2500 system connectors (A).
Mounting the Infinity MCable – Masimo SET/Masimo Rainbow SET/Nellcor OxiMax MCable

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.

**Side view (connectors)**

- A M540
- B MCable mount adapter with tabs that lock into the side of the M540
- C MCable mount
- D MCable
- E Blue SpO2 connector
- F Indentations for locking the MCable mount adapter

**Bottom view**

To attach the MCable mount adapter

Follow these steps to attach the MCable to the M540:

1. Make sure that the cable of the MCable (C) mount 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.
Assembly

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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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 69).

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 dialogue window.

To turn the M540 off

1. Press and hold the on/off key. The power-off dialogue window appears.
2. Select the **Shutdown** button in the dialogue window.

Viewing patient demographics

The following diagram shows the **Demographics** page of the Cockpit where you can perform the following functions:

- Admit a patient manually (see page 78)
- Admit a patient over the network via the **Get HIS** function (see page 79)
- Discharge a patient (see page 79)
- Change the patient category (see page 81)

All demographic data entered on the **Demographics** page are available to the network. Demographic data is not deleted when you turn the Cockpit off and on. To delete the demographic data, discharge the patient.
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 79). 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 the patient settings already set up. The 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 77).

- Touch the leftmost field on the header bar of the Cockpit to access the Demographics page.
  - or

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 80 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 80 for supported height ranges).

WARNING

Monitors in a Carearea™ 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.
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 leftmost 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 77). The Get HIS button appears greyed 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 Infinity Acute Care System– Infinity M540 Instructions for Use, 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 is removed from the screen
- All trend and event data is deleted
- Any active recordings are cancelled
- The profile with defined patient settings is restored
- The message Touch Screen to initiate monitoring appears

To discharge a patient

1. Select the leftmost field on the header bar of the Cockpit to access the Demographics page.
2. Select the Start tab (if not already selected).
   
   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 centre of the screen. The message Patient transferred appears in the Alarm history page.
Patient categories

Each patient category has specific profiles associated with it. Profiles are a set of patient settings that have been pre-configured by the factory or the hospital (for more information see “Profiles” on page 63).

The Cockpit supports the following patient categories:

<table>
<thead>
<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>Paediatric</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 is 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 338), 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.

After changing the patient category, the new patient category label and symbol appear in the leftmost field of the header bar (see page 48). The height and weight values are no longer displayed after changing the patient category.

A patient category change does not affect the following settings: the patient and physician names, patient ID, birth date, admit date, height, and weight.
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 338).

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

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

To change the patient category in the Demographics page

1. Select the leftmost field on the header bar to access the Demographics page directly.
   or
2. Select Start/Standby... on the main-menu bar.
3. Select the Demographics tab (if not already selected).
4. Select the desired patient category button (Adult, Pediatric, or Neonate), next to the selection Patient category.
5. 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.

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 369.

The colour of an alarm message corresponds to the priority of the associated alarm condition (see "Alarm priorities" on page 85).

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 92), such as cardiac bypass mode, affect the regular alarming behaviour.

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 "Infinity Acute Care System– Infinity M540" Instructions for Use.
### Alarm priorities

Each 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 88 and “Acoustic alarm signals” on page 90.

#### 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 artefact on the ECG waveform.

### Alarm processing

When you dock an M540 on the M500 (see page 69), 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 “Infinity Acute Care System– Infinity M540” Instructions for Use).

The Cockpit provides acoustic and visual alarm signals for parameters originating from monitors in its alarm group (see page 112). 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 SpOC for the Masimo SET MCable, any parameter displayed on the Cockpit using the device connectivity option.

When you undock the M540 from the M500 (see page 69), all alarm monitoring stops at the Cockpit but continues on the M540.
Alarms

Latching and non-latching alarm behaviour

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 behaviour are listed on page 92.

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 90 and page 88).

– A latched alarm condition of medium priority is downgraded to a status message which appears in the header bar. The alarm header does not flash, and there are no acoustic alarm signals.

To acknowledge a latched alarm condition

Select one of the following two keys:

– The yellow key on the front panel of the Cockpit.

– The yellow key on the front panel of the M540.

or

– Select the All alarms off/All alarms paused button (the name and function of the button depends on the Cockpit configuration – see page 328). To access the button, press the quick-access symbol next to the 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 More... button which provides access to additional messages (see page 48).
Activating or deactivating alarm validation

When the alarm validation function is activated (see page 319), 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 (selectable)¹</td>
<td>60 s</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)²</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 haemoglobin (SpHb and SpHbv)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Carboxyhaemoglobin saturation (SpCO)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Patient volume index (PVI)</td>
<td>6 s</td>
<td>10 s</td>
</tr>
<tr>
<td>Methaemoglobin 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 dialogue window (see “Configuring ST alarm settings” on page 107).
² For Nellcor OxiMax SpO₂: the SatSeconds alarm time overrides the alarm validation setting (see “SatSeconds alarm” on page 232).
Alarms

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) in header bar</th>
<th>Alarm bar (if activated, see page 329)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (life-threatening) (for example, asystole, ventricular fibrillation)</td>
<td>Flashing red background</td>
<td>Red background</td>
<td>Flashing red</td>
</tr>
<tr>
<td>Medium (serious) (for example, alarm limit violations)</td>
<td>Flashing yellow background</td>
<td>Yellow background</td>
<td>Flashing yellow</td>
</tr>
<tr>
<td>Low (advisory) (for example, disconnected lead)</td>
<td>Solid cyan background</td>
<td>Cyan background</td>
<td>No visual signal</td>
</tr>
</tbody>
</table>

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

Visual alarm indicators on the Cockpit

---

Visual alarm indicators on the M540

---

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

Alarm bar

The alarm bar on the Cockpit and the M540 visually announce high and medium-priority alarm conditions (see page 85).

However, the alarm bar is inactive when:
- Only low-priority alarm conditions exist
- The alarm bar is deactivated (see page 329)
- Cardiac bypass or privacy modes are activated (see page 93)
- Alarm monitoring is deactivated (see page 97)
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 87). 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 colour.

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>The following tone sequence is repeated every 4.5 s: Four beeps &gt; one higher-pitched beep &gt; short pause &gt; four beeps &gt; one higher-pitched beep</td>
<td>The following tone sequence is repeated every 8 s: Four beeps &gt; one higher-pitched beep &gt; short pause &gt; four beeps &gt; one higher-pitched beep</td>
<td>Continuous two-tone sequence</td>
</tr>
<tr>
<td>Medium</td>
<td>The following tone sequence is repeated every 7 s: Two beeps &gt; one lower-pitched beep</td>
<td>The following tone sequence is repeated every 15 s: 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, audible alarm signals only sound at the Cockpit, not at the M540. Therefore, all audible 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.

**NOTE**
The minimum sound pressure range for the acoustic alarm signal is 45 dB(A). The pressure range for the alarm signal at full volume is > 70 dB(A).
Adjusting the alarm tone

The volume of the alarm tone is adjustable. Make sure that you set the volume of the alarm tone so it can be heard during the noisiest times.

You can only deactivate the alarm tone if the patient is connected to the Infinity network 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.

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).
   - 10 to 100% in increments of 10%.

NOTE
If the Alarm volume off feature is enabled in the Code setup page (see page 332), the alarm volume is automatically reduced to its minimum setting when you select the Code button on the main-menu bar.

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 HR upper alarm limit). To end the test, restore the alarm limits to the previous setting (see “Configuring the alarm settings for a patient” on page 98).
Viewing current alarm messages

The Cockpit identifies each alarm condition according to the alarm priorities low, medium, and high (see page 85). 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 48). Selecting this button activates the **Current alarms** page. This page lists all of the currently active alarms in a table.

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 369').

**To access the current alarm messages:**
- 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).
- or
- 1. Select the Alarms... button on the main-menu bar.
- 2. Select the Current alarms tab.

Special alarm behaviour

Activating any of the following features alters the normal alarm annunciation behaviour:
- ASY/VF alarm feature
- SpO2 desaturation alarm
- NIBP/SpO2 interlock function
- Privacy, Standby, Cardiac bypass, and OR modes
- French NFC mode

**ASY/VF alarms**

You can control the alarming behaviour for ventricular fibrillation (VF) and asystole (ASY) alarms. To make sure that VF and ASY alarms are always reported, even when HR alarms and ARR monitoring are deactivated, set the **ASY/VF alarms** selection in the General settings page (see page 326) to **Always on**. If you select **Follow HR alarm**, asystole and ventricular fibrillation alarm conditions are only enunciated when either HR alarms or ARR monitoring is also activated. To activate or deactivate this function, see page 328.

If you select **Follow HR alarm**, deactivate HR and ARR 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 232). When using the Infinity MCable – Nellcor Oximax, this feature is only available if the SatSeconds alarm function is set to Off (see page 232).

NIBP/SpO2 interlock alarms

To avoid SpO2 nuisance alarms during an active NIBP measurement, activate the NIBP/SpO2 interlock function in the General settings page (see page 328). When the function is activated, all SpO2 alarms are deactivated during an active NIBP measurement. To activate or deactivate this function, see page 329.

Privacy mode

When privacy mode is activated, the following happens at the Cockpit:
- All patient data is 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 return.
- 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 65.

Standby mode

When standby mode is activated, the following happens at the Cockpit:
- All patient data is 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 cancelled.

To activate or deactivate this function, see page 65.

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 appears in the upper right corner of the screen.
- Pressing the yellow fixed key on the Cockpit does not pause any alarms.
- The alarm history records an entry whenever cardiac bypass mode is activated or deactivated.

To activate or deactivate this function, see page 329. If French NFC mode is activated, cardiac bypass mode is not available.
Alarms

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 329.

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 338.

Pre-silencing alarms

This function allows you to concentrate on a procedure without being interrupted by continuous acoustic alarm signals arising from potential alarm conditions. When you pre-silence alarms, the following happens at the Cockpit:

- Visual alarms are reported as usual (see page 87).
- The alarm message Audio paused appears in the far right field of the header bar along with a countdown timer (%0) and the following symbol: 📣

To pre-silence alarms

- Press the yellow key on the Cockpit. Pressing the key again cancels the pre-silence state.
Pausing acoustic alarm signals

You can pause, or silence, acoustic alarm signals for 2 minutes. The following happens when you pause acoustic alarm signals:

- The parameter box and the alarm bar stop blinking but appear solid in the alarm colour corresponding to the alarm grade (see page 87).
- All acoustic alarm signals are paused for a maximum of 2 minutes. If the same alarm condition occurs again after the alarm has been paused, no acoustic or visual alarm signals are generated.
- The alarm message continues to display in the header bar.
- The **Audio paused** banner appears in the far right field of the header bar along with a countdown timer and the following symbol: 

If the condition of the patient is still unchanged after the alarm pause period, the acoustic alarm signal is reactivated. If new alarm conditions occur during an active audio pause period, the following happens at the Cockpit:

- A single tone sequence consisting of several distinct tones 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 visual or acoustic alarm signals.
- The parameter box of the new alarming parameter flashes while the parameter box of the previously paused alarm remains highlighted.
- The alarm messages for the alarm condition with the highest alarm priority rotate in the alarm message field of the header bar (see page 48). The rotating alarm messages include alarm messages for paused alarm conditions.

**NOTE**

If the patient is admitted at the ICS, audio pausing an alarm at the Cockpit automatically audio pauses that alarm at the ICS.

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

- An acoustic alarm signal sounds for any new alarm condition.
- The parameter box for the new alarm condition flashes in the colour corresponding to the alarm priority.

**To pause acoustic alarm signals**

- Press the yellow \[\text{ }\] key on the Cockpit.
- Press the yellow \[\text{ }\] key on the M540.

To reactivate acoustic alarm signals during an audio pause, select the same keys again.
Activating or deactivating acoustic alarm signals

Deactivating acoustic alarm signals is a password-protected function (see page 328).

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

– Acoustic alarm signals sound (see page 90).
– Alarm messages appear in the header bar (see page 87).

Pausing alarm monitoring temporarily

If the password-protected alarm pause feature is activated (see page 328), you can pause alarm monitoring temporarily. The alarm pause duration is adjustable from 1 minute to 5 minutes.

**NOTE**

If the **French NFC mode** is activated (see page 338), you cannot pause alarm monitoring for more than 3 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 109).

**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.

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.

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.
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 328), 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 110).

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

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.

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.

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 328).
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 109.

**WARNING**

Setting alarm limits to extreme values may prevent certain alarm conditions from being detected and from being enunciated with audible 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 110)

For information on configuring the archive function, see “Changing general alarm settings” on page 103.
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 NIBP. 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 following steps, the letters in parenthesis refer to the diagram of the parameter-specific setup page (see page 100).

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 lower alarm limits.

5 Select the setup button (D) to adjust the upper 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 110).
   - **Record** – generates a timed recording.
   - **Str/Rec** – stores an event for later review and generates a timed recording.

**WARNING**

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

**NOTE**

If French NFC mode is activated (see page 338), you cannot deactivate HR alarms.

To configure the alarm settings

1 Select **Sensor parameters**... on the main-menu bar.

2 Select the desired parameter tab (for example, **ECG**).

   or

   - Select the parameter box to access the parameter-setup page directly.
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.

A. Limits tab
B. Parameter labels column
C. Alarm on/off column
D. Lower limits column
E. Actual parameter values
F. Upper limits column
G. Archive column
H. General, ARR, and ST tabs
I. Display filter button
J. Auto set all button (see “Auto-setting all alarm limits” on page 108)
Changing general alarm settings

In the following steps, the letters in parenthesis refer to the diagram of the General page (see page 102). Alarm ranges and defaults are listed starting on page 121.

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 110).
   - 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 109.

WARNING
Setting alarm limits to extreme values may prevent certain alarm conditions from being detected and from being enunciated with audible and visual alarm signals.
Alarms

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.

Configuring ARR alarm settings

In addition to ARR alarm settings, the Limits > ARR page also allows you to select the arrhythmia mode (see page 180) and initiate the relearn process of ECG leads (see page 195). In the following steps, the letters in parenthesis refer to the diagram of the Limits > ARR page. Alarm ranges and defaults are listed starting on page 121.
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 'high' 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 110).
   - **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).
Alarm setup for ST

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.

A **Limits** tab
B **Parameter** label column
C **Alarm on/off** column
D **Lower** limits column
E **Actual** parameter values
F **Upper** limits column
G **Archive** column
H **ST** tab
I **Auto set all** button
J **Event duration [s]** button
K **ST relearn** button
Alarms

Configuring ST alarm settings

Some of the ST alarm settings described are also available on the ST alarms page (see page 192). In the following steps, the letters in parenthesis refer to the diagram of the Limits > ST page (see page 106). Alarm ranges and defaults are listed starting on page 114.

To change the 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 110).
   - 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 109).
9. Use the Event duration [s] button (J) to select a time an upper ST alarm limit has to be in violation before an alarm is triggered (see page 87).
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 109)
- All parameters (see page 109)
- All ST parameters (see page 109)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Upper limit</th>
<th>Lower limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta, Tb, T1a, T1b, Tblood</td>
<td>≤107 % of current value</td>
<td>≤93 % of current value</td>
</tr>
<tr>
<td>ΔT, ΔT1, PVC/min, inCO2</td>
<td>Unaffected</td>
<td>Unaffected</td>
</tr>
<tr>
<td>SpO2</td>
<td>Adult/paediatric: 100 % saturation</td>
<td>Current value −(value) ×(5 %)</td>
</tr>
<tr>
<td></td>
<td>Neonate: 98 % saturation</td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>Current value +2.0 mm</td>
<td>Current value −2.0 mm</td>
</tr>
<tr>
<td>etCO2</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

- Select the ▲ 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. This includes arrhythmia, and ST events whose archive function is set to *Store* or *Str/Rec*. These alarm events are marked with the ⚠️ symbol and can be viewed in greater detail (see page 111).
- You select the **Mark event** button from the main-menu bar. These alarm events are also marked with the ⚠️ symbol and can be viewed in greater detail (see page 111).
- You pause alarms using the **All alarms paused/All alarms off** button (see page 95).
- You activate cardiac bypass mode (see page 93).
- You activate standby mode (see page 64).
- You select a different patient category (see page 78).
- 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 109.

**To access the alarm history**

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

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm history tab</td>
<td>Identifies an event</td>
<td>Date of the alarm</td>
<td>Time the alarm was stored</td>
<td>Duration of the alarm</td>
<td>Alarm priority</td>
<td>Alarm message</td>
<td>Print button for printing an alarm history report</td>
<td>Button for filtering the alarm history according to time, priority, or message</td>
<td>Button for filtering the alarm history according to category</td>
</tr>
</tbody>
</table>

**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
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 99) 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 \( \text{A} \). 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 \( \text{A} \) symbol that you wish to view.

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

The following diagram shows the event snapshot screen.

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
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 340).

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 328) changes to 100% until the connection is restored.

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 328).

Infinity MCable – Nurse Call

You can attach a Nurse Call MCable to the PS250 or the P2500 (see page 21) 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.
External device disconnection alarm

If the external device alarm feature is activated at the Cockpit (see page 330) 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** button

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 332), 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 332), the banner **Audio alarms off** appears in the Cockpit header bar when you invoke the code function.

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

- **Stop** 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.

**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>
<tbody>
<tr>
<td>HR adult</td>
<td>Upper: 25 to 300 bpm</td>
<td>120 (adult)</td>
<td>45 (adult)</td>
<td>Str/Rec (adult, paediatric)</td>
</tr>
<tr>
<td></td>
<td>Lower: 20 to 295 bpm</td>
<td>150 (paediatric)</td>
<td>50 (paediatric)</td>
<td>Off (neonatal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>170 (neonatal)</td>
<td>80 (neonatal)</td>
<td></td>
</tr>
<tr>
<td>STVM/STCVM</td>
<td>Upper: 0.1 to 45.0 mm</td>
<td>1.0 mm (0.1 mV)</td>
<td>0.0 mm (0 mV)</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>0.01 to 4.50 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 0.0 to 44.9 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.00 to 4.49 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>Upper: –14.9 to +15.0 mm</td>
<td>1.0 mm</td>
<td>–1.0 mm</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>–1.49 to +1.50 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: –15.0 to +14.9 mm</td>
<td>(0.1 mV)</td>
<td>(–0.1 mV)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>–1.50 to +1.49 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRi (adult)</td>
<td>Upper: 6 to 100</td>
<td>30</td>
<td>5</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 5 to 99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRi (paediatric, neonate)</td>
<td>Upper: 6 to 145</td>
<td>80</td>
<td>20</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 5 to 144</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLS</td>
<td>Upper: 35 to 235</td>
<td>120 (adult)</td>
<td>45 (adult)</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 30 to 230</td>
<td>150 (paediatric)</td>
<td>50 (paediatric)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>180 (neonatal)</td>
<td>80 (neonatal)</td>
<td></td>
</tr>
<tr>
<td>SpO2</td>
<td>Upper: 21 to 100 %</td>
<td>100 % (adult, paediatric)</td>
<td>85 %</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 20 to 99 %</td>
<td>95 % (neonate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpHb / SpHbv</td>
<td>Upper: 1.2 to 25.0 g/dL</td>
<td>17.0 g/dL</td>
<td>7.0 g/dL</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>(0.7 to 15.5 mmol/L)</td>
<td>(10.6 mmol/L)</td>
<td>(4.3 mmol/L)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 1.0 to 24.8 g/dL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.6 to 15.4 mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVI</td>
<td>Upper: 1 to 100</td>
<td>100</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lower: 0 to 99</td>
<td></td>
<td></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>SpCO</td>
<td>Upper: 1 to 99</td>
<td>10</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1</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>Increment: 0.1</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</td>
<td>160 mmHg</td>
<td>90 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg</td>
<td>or 0.1 kPa</td>
<td>1.5 to 33.3 kPa</td>
<td>21.3 kPa</td>
<td></td>
</tr>
<tr>
<td>Lower: 10 to 249 mmHg</td>
<td>1.3 to 33.2 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP S paediatric</td>
<td>Upper: 11 to 170 mmHg</td>
<td>120 mmHg</td>
<td>50 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg</td>
<td>or 0.1 kPa</td>
<td>1.5 to 22.7 kPa</td>
<td>16 kPa</td>
<td></td>
</tr>
<tr>
<td>Lower: 10 to 169 mmHg</td>
<td>1.3 to 22.6 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP S neonate</td>
<td>Upper: 11 to 130 mmHg</td>
<td>80 mmHg</td>
<td>50 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg</td>
<td>or 0.1 kPa</td>
<td>1.4 to 17.3 kPa</td>
<td>10.7 kPa</td>
<td></td>
</tr>
<tr>
<td>Lower: 10 to 129 mmHg</td>
<td>1.3 to 17.2 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP D adult</td>
<td>Upper: 11 to 250 mmHg</td>
<td>110 mmHg</td>
<td>50 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg</td>
<td>or 0.1 kPa</td>
<td>1.4 to 33.3 kPa</td>
<td>14.7 kPa</td>
<td></td>
</tr>
<tr>
<td>Lower: 10 to 249 mmHg</td>
<td>1.3 to 33.2 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP D paediatric</td>
<td>Upper: 11 to 170 mmHg</td>
<td>80 mmHg</td>
<td>35 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg</td>
<td>or 0.1 kPa</td>
<td>1.4 to 22.7 kPa</td>
<td>10.7 kPa</td>
<td></td>
</tr>
<tr>
<td>Lower: 10 to 169 mmHg</td>
<td>1.3 to 22.6 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP D neonate</td>
<td>Upper: 11 to 130 mmHg</td>
<td>60 mmHg</td>
<td>25 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg</td>
<td>or 0.1 kPa</td>
<td>1.4 to 17.3 kPa</td>
<td>8 kPa</td>
<td></td>
</tr>
<tr>
<td>Lower: 10 to 129 mmHg</td>
<td>1.3 to 17.2 kPa</td>
<td></td>
<td></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><strong>NIBP M adult</strong></td>
<td>Upper: 11 to 250 mmHg</td>
<td>125 mmHg</td>
<td>60 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>1.4 to 33.3 kPa</td>
<td>16.7 kPa</td>
<td>8.0 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 249 mmHg</td>
<td>1.3 to 33.2 kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NIBP M paediatric</strong></td>
<td>Upper: 11 to 170 mmHg</td>
<td>85 mmHg</td>
<td>40 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>1.4 to 22.7 kPa</td>
<td>11.3 kPa</td>
<td>5.3 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 169 mmHg</td>
<td>1.3 to 22.6 kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NIBP M neonate</strong></td>
<td>Upper: 11 to 130 mmHg</td>
<td>70 mmHg</td>
<td>40 mmHg</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>1.4 to 17.3 kPa</td>
<td>9.3 kPa</td>
<td>5.3 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 10 to 129 mmHg</td>
<td>1.3 to 17.2 kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ΔTx</strong></td>
<td>Upper: 0.1 to 39.0 °C</td>
<td>1.0 °C</td>
<td>0.0 °C</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 0.1 °C or 0.1 ± 0.2 °F</td>
<td>0.2 to 70.2 °F</td>
<td>3.6 °F</td>
<td>0.0 °F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 0.0 to 38.9 °C</td>
<td>0.0 to 70.0 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Txa/b</strong></td>
<td>Upper: 0.1 to 50.0 °C</td>
<td>39.0 °C</td>
<td>34.0 °C</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 0.1 °C or 0.1 °F</td>
<td>32.2 to 122.0 °F</td>
<td>102.2 °F</td>
<td>93.2 °F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 0.0 to 49.9 °C</td>
<td>32.0 to 121.8 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IBP S adult</strong></td>
<td>Upper: –24 to +300 mmHg</td>
<td>160 mmHg</td>
<td>90 mmHg (12.0 kPa) for GP1 to 4, ART, LV</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>–3.2 to +40.0 kPa</td>
<td>(21.3 kPa) for GP1 to 4, ART, LV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: –25 to +299 mmHg</td>
<td>35 mmHg (4.7 kPa) for PA, RV</td>
<td>75 mmHg (10.0 kPa) for LV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>–3.3 to +39.9 kPa</td>
<td>for PA, RV</td>
<td>10 mmHg (1.3 kPa) for PA, RV</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>IBP S paediatric/neonate</td>
<td>Upper: -24 to +300 mmHg&lt;br&gt;-3.2 to +40.0 kPa&lt;br&gt;Lower: -25 to +299 mmHg&lt;br&gt;-3.3 to +39.9 kPa</td>
<td>120 mmHg (16.0 kPa) for GP1 to 4, ART, LV</td>
<td>50 mmHg (6.7 kPa) for GP1 to 4, ART</td>
<td>Off</td>
</tr>
<tr>
<td>IBP D adult</td>
<td>Upper: -24 to +300 mmHg&lt;br&gt;-3.2 to +40.0 kPa&lt;br&gt;Lower: -25 to +299 mmHg&lt;br&gt;-3.3 to +39.9 kPa</td>
<td>110 mmHg (14.7 kPa) for GP1 to 4, ART&lt;br&gt;25 mmHg (3.3 kPa) for LV&lt;br&gt;13 mmHg (1.7 kPa) for PA, RV</td>
<td>50 mmHg (6.7 kPa) for GP1 to 4, ART&lt;br&gt;2 mmHg (0.3 kPa) for PA, LV, RV</td>
<td>Off</td>
</tr>
<tr>
<td>IBP D paediatric</td>
<td>Upper: -24 to +300 mmHg&lt;br&gt;-3.2 to +40.0 kPa&lt;br&gt;Lower: -25 to +299 mmHg&lt;br&gt;-3.3 to +39.9 kPa</td>
<td>80 mmHg (10.7 kPa) for GP1 to 4, ART&lt;br&gt;25 mmHg (3.3 kPa) for LV&lt;br&gt;13 mmHg (1.7 kPa) for PA, RV</td>
<td>30 mmHg (4.0 kPa) for GP1 to 4, ART&lt;br&gt;2 mmHg (0.3 kPa) for PA, LV, RV</td>
<td>Off</td>
</tr>
<tr>
<td>IBP D neonate</td>
<td>Upper: -24 to +300 mmHg&lt;br&gt;-3.2 to +40.0 kPa&lt;br&gt;Lower: -25 to +299 mmHg&lt;br&gt;-3.3 to +39.9 kPa</td>
<td>80 mmHg (10.7 kPa) for GP1 to 4, ART&lt;br&gt;25 mmHg (3.3 kPa) for LV&lt;br&gt;13 mmHg (1.7 kPa) for PA, RV</td>
<td>35 mmHg (4.7 kPa) for GP1 to 4, ART&lt;br&gt;2 mmHg (0.3 kPa) for PA, LV, RV</td>
<td>Off</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 adult</strong></td>
<td>Upper: –24 to +300 mmHg (16.7 kPa) for GP1 to 4, ART &lt;br&gt; –3.2 to +40.0 kPa for LV &lt;br&gt; Lower: –25 to +299 mmHg (2.7 kPa) for LA, ICP, CVP &lt;br&gt; –3.3 to +39.9 kPa for PA, RV</td>
<td>125 mmHg (16.7 kPa) for GP1 to 4, ART &lt;br&gt; 80 mmHg (10.7 kPa) for LV &lt;br&gt; 20 mmHg (2.7 kPa) for LA, ICP, CVP &lt;br&gt; 17 mmHg (2.3 kPa) for PA, RV &lt;br&gt; 12 mmHg (1.6 kPa) for RA</td>
<td>60 mmHg (8.0 kPa) for GP1 to 4, ART &lt;br&gt; 40 mmHg (5.3 kPa) for LV &lt;br&gt; 7 mmHg (0.9 kPa) for PA, RV &lt;br&gt; 2 mmHg (0.3 kPa) for RA, ICP &lt;br&gt; 0 mmHg (0.0 kPa) for LA, CVP</td>
<td><strong>Off</strong></td>
</tr>
<tr>
<td><strong>IBP M paediatric</strong></td>
<td>Upper: –24 to +300 mmHg (10.7 kPa) for GP1 to 4, ART, LV &lt;br&gt; 3.2 to 40.0 kPa for LV &lt;br&gt; Lower: –25 to +299 mmHg (2.7 kPa) for LA, ICP, CVP &lt;br&gt; –3.3 to +39.9 kPa for PA, RV</td>
<td>80 mmHg (10.7 kPa) for GP1 to 4, ART, LV &lt;br&gt; 20 mmHg (2.7 kPa) for LA, ICP, CVP &lt;br&gt; 17 mmHg (2.3 kPa) for PA, RV &lt;br&gt; 12 mmHg (1.6 kPa) for RA</td>
<td>50 mmHg (6.7 kPa) for GP1 to 4, ART &lt;br&gt; 40 mmHg (5.3 kPa) for LV &lt;br&gt; 7 mmHg (0.9 kPa) for PA, RV &lt;br&gt; 2 mmHg (0.3 kPa) for RA, ICP &lt;br&gt; 0 mmHg (0.0 kPa) for LA, CVP</td>
<td><strong>Off</strong></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>IBP M neonate</td>
<td>Upper: -24 to +300 mmHg</td>
<td>85 mmHg (11.3 kPa)</td>
<td>40 mmHg (5.3 kPa)</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Lower: -25 to +299 mmHg</td>
<td>80 mmHg (10.7 kPa)</td>
<td>7 mmHg (0.9 kPa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-3.2 to +40.0 kPa</td>
<td>20 mmHg (2.7 kPa)</td>
<td>2 mmHg (0.3 kPa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-3.3 to +39.9 kPa</td>
<td>17 mmHg (2.3 kPa)</td>
<td>0 mmHg (0.0 kPa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 mmHg (1.6 kPa)</td>
<td>for RA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>for GP1 to 4, ART,</td>
<td>for PA, RV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>for LV</td>
<td>for RA, ICP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>for LA, CVP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPP</td>
<td>Upper: -24 to +300 mmHg</td>
<td>100 mmHg (13.3 kPa)</td>
<td>70 mmHg (9.3 kPa)</td>
<td>Off</td>
</tr>
<tr>
<td>Increment: 1 mmHg or 0.1 kPa</td>
<td>Lower: -25 to +299 mmHg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-3.4 to +40.0 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-3.3 to +39.9 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tblood</td>
<td>Upper: 25.1 to 43.0 °C</td>
<td>39.0 °C (102.2 °F)</td>
<td>34.0 °C (93.2 °F)</td>
<td>Off</td>
</tr>
<tr>
<td>Increment of 0.1 °C or 32.2 °F</td>
<td>Lower: 25.0 to 42.9 °C</td>
<td>77.1 to 109.4 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>77.0 to 109.2 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRc</td>
<td>Upper: 6 to 150 bpm</td>
<td>30 bpm (adult)</td>
<td>5 bpm (adult)</td>
<td>Off</td>
</tr>
<tr>
<td>Increment of 1 bpm</td>
<td>Lower: 5 to 149 bpm</td>
<td>60 bpm (paediatric/neonate)</td>
<td>20 bpm (paediatric/neonate)</td>
<td></td>
</tr>
<tr>
<td>inCO2</td>
<td>Upper: 2 to 10 mmHg</td>
<td>4 mmHg (0.5 kPa, 0.5 %)</td>
<td>Not applicable</td>
<td>Off</td>
</tr>
<tr>
<td>Increment of 1 mmHg, 0.1 kPa, or 0.1 %</td>
<td>Lower: not user-selectable</td>
<td>0.3 to 1.3 kPa, 0.3 to 1.3 %</td>
<td></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>etCO2</td>
<td>Upper: 6 to 100 mmHg</td>
<td>50 mmHg (6.7 kPa, 6.6 %)</td>
<td>30 mmHg (4.0 kPa, 3.9 %)</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Increment of 1 mmHg, 0.1 kPa, or 0.1 %</td>
<td>0.8 to 13.3 kPa</td>
<td>0.8 to 13.2 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower: 5 to 99 mmHg</td>
<td>0.7 to 13.2 kPa</td>
<td>0.7 to 13.0 %</td>
<td></td>
</tr>
<tr>
<td>PVC/min</td>
<td>Upper: 1 to 50</td>
<td>10</td>
<td>Not applicable</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Increment of 1</td>
<td></td>
<td></td>
<td></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>ASY</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>VTACH</td>
<td>High</td>
<td>≥100 to 200 (≥120)</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>
<tr>
<td>RUN</td>
<td>Medium</td>
<td>Not adjustable (Rate = VTACH)</td>
<td>3 to VT count – 1 (3 to 9) changes based on VTACH</td>
<td>Str/Rec</td>
</tr>
<tr>
<td>AIVR</td>
<td>Medium</td>
<td>Not adjustable = VTACH rate – 1 (≤119)</td>
<td>Not adjustable (≥ 3)</td>
<td>Off</td>
</tr>
<tr>
<td>SVT</td>
<td>Medium</td>
<td>≥120 to 200 (≥150)</td>
<td>≥3 to 10 (≥3)</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)</td>
<td>≥5 to 15 (≥8)</td>
<td>Off</td>
</tr>
<tr>
<td>BRADY</td>
<td>Off</td>
<td>≤30 to 105 (adult ≤ 50; paediatric ≤60)</td>
<td>Not adjustable (≥8)</td>
<td>Off</td>
</tr>
<tr>
<td>PAUSE</td>
<td>Off</td>
<td>1 to 3.5 (2.5)</td>
<td>Not adjustable</td>
<td>Off</td>
</tr>
</tbody>
</table>
Calculations

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Accessing the calculation functions ...... 125
Performing calculations ...................... 125
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Calculation equations ....................... 129
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Customising the drug list .................... 135
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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:

- **Haemodynamics** – the Cockpit calculates haemodynamic parameters based on cardiac output, invasive blood pressure, and other data (see page 129).

- **Haemo/Oxy/Vent Calculations** – the Cockpit calculates oxygenation and ventilation parameters (see page 131) in addition to haemodynamic 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 paediatric patients, these values are pulled automatically from the Demographics page which is populated during patient admission (see page 78). 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, lb.

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:

$$\text{BSA} = \text{WT}^{0.7265 - 0.0188 \times (\log_{10} \text{WT})} \times \text{HT}^{0.3} \times 0.0003207$$

The DuBois equation is used for all other patients:

$$\text{BSA} = \text{WT}^{0.425} \times \text{HT}^{0.725} \times 0.007184$$
Accessing the calculation functions

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

**Procedures**

A Calculations tab  
B Capture values button  
C Capture labs button (see page 128)  
D Calculate results button (see page 127)  
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 paediatric 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 desired) because some of the calculated values cannot be determined without these parameter values.
To perform a calculation

In the following steps, the letters in parenthesis correspond to the diagram for the Calculations page (see page 125).

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 the 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 pop-up with a keypad. The pop-up displays the valid range of the selected parameter. Any modified value is identified by the symbol #.
6. Select the Enter button on the keypad pop-up 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.
Viewing the calculation results

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

A Calculations tab
B Parameters column
C Data column with reference values
D Data columns with date and time stamp
E Calculation tab (see page 125)
F Results tab
G The scroll bar
H Save button
I Setup button

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 156).
Calculations

To view calculations

In the following steps, the letters in parenthesis correspond to the diagram for the Results page (see page 127).

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 pop-up 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 dialogue window allows you to sort the parameter list according to the parameter priority list in the Auto view page (see page 62). If you add parameters to the parameter priority list, you must order these parameters manually.
5. Select the OK button in the pop-up 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 the 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 the laboratory data in calculations of the 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 127). From there, you can also save the calculations and configure the display.

To capture the laboratory 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 125).
Calculations

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

Haemodynamic parameters

The Cockpit uses the following monitored parameter values for the haemodynamic 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., CCO</td>
<td>Cardiac output (continuous, intermittent)</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>
</tbody>
</table>
The Cockpit uses the values in the preceding table plus the BSA value to calculate the following derived haemodynamic values.

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Equation</th>
<th>Available units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI, CCI</td>
<td>Cardiac index (continuous)</td>
<td>C.O. / BSA, CCO / BSA</td>
<td>L/min/m²</td>
</tr>
<tr>
<td>LHCPP</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 m/m²</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/cm⁵</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/cm⁵/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 m/m²</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/cm⁵</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/cm⁵/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/cm⁵</td>
</tr>
<tr>
<td>TVR</td>
<td>Total vascular resistance</td>
<td>79.96 x ART M / C.O.</td>
<td>dyn x s/cm⁵</td>
</tr>
</tbody>
</table>
Calculations

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>Haemoglobin concentration</td>
<td>g/dL</td>
</tr>
<tr>
<td>iO₂, FiO₂</td>
<td>Inspired oxygen</td>
<td>%</td>
</tr>
<tr>
<td>PaCO₂</td>
<td>Arterial CO₂ pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>PaO₂</td>
<td>Arterial oxygen pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>Pause, Pplat</td>
<td>Pause (plateau) pressure</td>
<td>cmH₂O, mbar</td>
</tr>
<tr>
<td>Pb</td>
<td>Barometric pressure</td>
<td>mmHg, kPa</td>
</tr>
<tr>
<td>PeCO₂</td>
<td>Mixed expired CO₂ pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>PEEP</td>
<td>Positive end expiratory pressure</td>
<td>cmH₂O, mbar</td>
</tr>
<tr>
<td>PIP</td>
<td>Peak inspiratory pressure</td>
<td>cmH₂O, mbar</td>
</tr>
<tr>
<td>RRc, RRv, RRc, RRi</td>
<td>Respiratory rate, cardiac, venous</td>
<td>/min</td>
</tr>
<tr>
<td>SaO₂</td>
<td>Arterial oxygen saturation</td>
<td>%</td>
</tr>
<tr>
<td>SpO₂</td>
<td>Venous oxygen saturation</td>
<td>%</td>
</tr>
<tr>
<td>TVe</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>C(a-v)O2</td>
<td>Arteriovenous oxygen difference</td>
<td>CaO₂ – CvO₂</td>
<td>mL/dL</td>
</tr>
<tr>
<td>CaO₂</td>
<td>Arterial oxygen content</td>
<td>0.0134 x Hgb x SaO₂</td>
<td>mL/dL</td>
</tr>
<tr>
<td>Cdyn</td>
<td>Dynamic compliance</td>
<td>TVe / (PIP – PEEP)</td>
<td>mL/cmH₂O</td>
</tr>
<tr>
<td>Cs</td>
<td>Static lung compliance</td>
<td>TVe / (Pause – PEEP) or VTe / (Pplat – PEEP)</td>
<td>mL/cmH₂O</td>
</tr>
<tr>
<td>CvO₂</td>
<td>Venous oxygen content</td>
<td>0.0134 x Hgb x SpO₂</td>
<td>mL/dL</td>
</tr>
<tr>
<td>DO₂</td>
<td>Oxygen availability, delivery, or transport</td>
<td>10 x CaO₂ x C.O.</td>
<td>mL/min</td>
</tr>
<tr>
<td>DO₂l</td>
<td>Oxygen availability (or delivery) index</td>
<td>10 x CaO₂ x CI DO₂ / BSA</td>
<td>mL/min/m²</td>
</tr>
<tr>
<td>MV alv</td>
<td>Alveolar minute volume</td>
<td>(TVe – TV phy) x RR or TVe x RR / 1000</td>
<td>mL/min</td>
</tr>
<tr>
<td>MVe</td>
<td>Expired minute volume</td>
<td>TVe x RR / 1000</td>
<td>L/min</td>
</tr>
<tr>
<td>MV/C.O.</td>
<td>Ventilation cardiac output ratio</td>
<td>MV alv / C.O.</td>
<td>No units</td>
</tr>
<tr>
<td>O₂ER</td>
<td>Oxygen extraction ratio</td>
<td>(CaO₂ – CvO₂) / CaO₂</td>
<td>No units</td>
</tr>
<tr>
<td>P(A-a)O₂</td>
<td>Alveolar-arterial oxygen difference</td>
<td>iO₂ x (Pb –47) – PaCO₂ – PaO₂ iO₂ / 100 x (Pb–47) – PaCO₂ – PaO₂</td>
<td>mmHg</td>
</tr>
<tr>
<td>Qs/Qt</td>
<td>Intrapulmonary right-left shunt (percentage shunt)</td>
<td>Hgb x 1.34 + 0.0031 x PaO₂ – CaO₂ Hgb x 1.34 + 0.0031 x PaO₂ – CvO₂ x 100</td>
<td>%</td>
</tr>
<tr>
<td>TVd phy</td>
<td>Tidal volume dead space (physiological)</td>
<td>TVe x (1 – PaCO₂ / PaO₂)</td>
<td>mL</td>
</tr>
<tr>
<td>TVd/TV phy</td>
<td>Ratio of tidal volume dead space to tidal volume dead space (physiological)</td>
<td>Vd phy / TVe</td>
<td>No units</td>
</tr>
<tr>
<td>VO₂</td>
<td>Oxygen consumption</td>
<td>10 x C(a–v) O₂ x C.O.</td>
<td>mL/min</td>
</tr>
<tr>
<td>VO₂l</td>
<td>Oxygen consumption index</td>
<td>10 x C(a–v) O₂ x CI V02 / BSA</td>
<td>mL/min/m²</td>
</tr>
</tbody>
</table>

**NOTE**
When multiple sources are available, the RR order of priority is RR, RRV, RRc, RRL.
Drug calculations

The Cockpit calculates the infusion rates of up to 44 drugs and displays titration tables. Forty of these drugs are pre-configured and four can be customised 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 customised drug list, see page 134.

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 the 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 134) 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 parenthesis correspond to the diagram for the Drug calculation page (see page 133).

1. Access the Drug calculation page (see page 133).
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 centred around the calculated value.

Customised drug list

Customising 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 133).

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.
To customise 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 on-screen keyboard. A maximum of 25 alphanumeric 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.

Customising the drug list

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

Drug calculator equations

The following table lists the variables and equations used to perform the 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 × 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, standardised by weight and time</td>
<td>Rate × concentration or Rate × concentration / weight</td>
</tr>
<tr>
<td>Total dose</td>
<td>Total dose over duration</td>
<td>Dose × duration</td>
</tr>
<tr>
<td>Total volume</td>
<td>Total volume over duration</td>
<td>Rate × 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, paediatric) 1 to 10,000 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 milligrammes (mg), units, mol 0.01 to 100,000 grammes (mg), 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</strong> (per hour)</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</strong> (per minute)</td>
<td>0.01 to 1,666,666,666 µg/min, mEq/minh, m units/min, mmol/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1,666,666,666 mg/min, units/min, mol/min</td>
</tr>
<tr>
<td></td>
<td>0.01 to 1,666,666 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><strong>Adult and paediatric:</strong></td>
</tr>
<tr>
<td>(per hour)</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></td>
<td><strong>Neonatal:</strong></td>
</tr>
<tr>
<td></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/g/h, 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><strong>Adult and paediatric:</strong></td>
</tr>
<tr>
<td>(per minute)</td>
<td>0.01 to 1,666,666,666 µg/kg/min, mEq/kg/min, m units/kg/min, mmol/min</td>
</tr>
<tr>
<td></td>
<td><strong>Neonatal:</strong></td>
</tr>
<tr>
<td></td>
<td>0.01 to 1,666,666,666 µg/g/min, mEq/g/min, m units/g/min, mmol/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>
Trends/data dialogue windows

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Overview

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

To access **Trends/Data** dialogue 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 175) and ST complexes (see page 187)
   - **Respiratory/Ventilation** – displays respiratory/ventilation loops (see page 309). When an Perseus A500 (A500) is connected, the name of this tab changes to Anesthesia/Ventilation to display anaesthesia/ventilation parameters.
   - **Hemo** – accesses the haemodynamic calculations and results data (see page 155)
   - **Labs** – accesses the lab results (see page 155)
   - **Reports** – accesses the tabs for configuring and requesting reports (“Printing reports” on page 360)

Trends

The Cockpit stores up to 96 hours of continuous and discrete trend values. Trend data is 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 a graphical or tabular format. You can also customise 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 at 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 remains intact. When you redock the M540, any new trend data collected during patient transport is transferred to the Cockpit. Transferring the trend data may take a brief moment during which time trends are not accessible.

Refer to the **Infinity Acute Care System– Infinity M540 Instructions for Use** for a detailed description of the M540 trend functions.

Trending behaviour

A trended parameter can either be represented in a tabular or graphical format. 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 28 for definitions of abbreviations):

- ECG parameters: HR, %paced, ST, PVC/min
- Respiratory parameters: RRi
- IBP parameters: for a complete list of invasive blood pressure parameters, see page 252
- 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: SpO2, Tblood, CCO, CCI, VO2, DO2, SaO2, SVR, SVRI, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV
- Ventilation parameters (Evita XL, Evita 4, Evita 2D, Maquet Servo-I) using the device connectivity option: PIP, MAP, PEEP, VTe, MVe, RRv, PAUSE, I:E, I:E I-Part, I:E E-Part, inO2, Cdyn, Raw, Paw min, Occlusion Press, MV e s, RRs, Trapped VOl, AW-Temp, VCO2, TVd aw, TVd aw%, etCO2
- V500, VN500 ventilation parameters using the device connectivity option: PIP, PEEP, Pmean, VTe, Vds, MVspvon, MV, RRspvon, RR, Cdyn, R, CO2, FiO2, etCO2, Pplat
- Pulse oximetry parameters with Masimo SET: SpO2, PLS, PI
- Pulse oximetry parameters with Masimo Rainbow SET: SpO2, PLS, P, SpHb, SpHbv, SpOC, PVI, SpCO, SpMet
- Pulse oximetry parameters with Nellcor OxiMax MCable: SpO2, PLS

NOTE
The colour of the SpO2 graphical trend changes based on how the current value compares to the lower SpO2 alarm limit. The colour 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 three lines forming a band showing the diastolic, mean, and systolic values
- PWP and C.O. appear as a ‘+’ symbol
- Lab data is represented as a ‘+’ symbol and include time stamps
Trends/data dialogue windows

Special characters and symbols

In addition to parameters, certain conditions, such as disconnected leads, artefacts, 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>Apnoea</td>
<td>apn</td>
</tr>
<tr>
<td>No parameter values are available</td>
<td>* * *</td>
</tr>
<tr>
<td>Out-of-range value</td>
<td>+++ (high) - - - (low)</td>
</tr>
<tr>
<td>Relearning</td>
<td>LRN</td>
</tr>
<tr>
<td>Interruption in power or patient is put into the standby mode.</td>
<td>No values</td>
</tr>
</tbody>
</table>

Trend graphs

A trend graph plots the behaviour 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 dialogue 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:

- Window 1 (top) HR, SpO2, and RRI
- Window 2 NIBP
- Window 3 Ta, Tb
- Window 4 CO2

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/anaesthesia-related parameters
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.

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 anaesthesia ventilation.
F Trend setup symbol for selecting up to five parameters
G **Scroll keys**
H **Print** button
I **Grids** on/off button
J **Graphs** button
K **View** button for selecting how much time is displayed
L Graphical trend panels

Directly below the Trend windows is a time scale that correlates with 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 customise the parameter content for the *Graph* and the *Ventilation / Anesthesia* trend graph pages.

The following diagram depicts the setup window for customising 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 *Device 3* for selecting parameters available using the device connectivity option (for example, VN500, V500, A500)
- **D** OK button
- **E** Cancel button
- **F** Clear all button – deselects any buttons that are currently selected
- **G** Group of parameter buttons entitled *Device 2* for devices using the device connectivity option (for example, Evita XL, Evita 4, Evita 2D, Maquet Servo-I)
- **H** Group of parameter buttons entitled *Hemo* for selecting haemodynamic-related parameters
- **I** Group of parameter buttons entitled *Other* for selecting miscellaneous parameters such as SpO2, temperature, and so on.
- **J** Group of parameter buttons entitled *ECG* for selecting ECG-related parameters
- **K** Group of parameter buttons entitled *Pressure* for selecting pressure-related parameters
- **L** Group of parameter buttons entitled *Vent* for selecting ventilation-related parameters
To modify the parameter selection for a trend graph page

In the following steps, the letters in parenthesis refer to the diagram of the trend setup page (see page 144).

1. Access the Graph or the Ventilation / Anesthesia tab (see page 140).
2. Select the trend setup symbol next to a trend graph panel in the selected trend page to activate the Setup dialogue 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 data base 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-arrow keys and a moveable navigation bar. The double arrows scroll through larger portions than the single arrows. If more trend data is stored than is 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, pop-ups 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 pop-up 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 142).
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 142).
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(s).
4 Use the rotary knob to dial to the desired setting.
5 Press the rotary knob to confirm your selection.

Printing a graphical trend report

The content of a graphical trend report depends on the user setup (see page 144). The duration of a graphical trend report depends on the reports setup (see page 335).

To print a graphical trend report
1 Access the desired trend graph pages (see page 142).
2 Scroll to the desired trend data.
3 Select the Print button (G) – see page 143.
You can also request a graphical trend report from other pages, for details see see page 360.

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.

General trend graph display features

The following sections list the various ways available for customising the content of the trend graphs pages. Refer to the diagram depicting the trend graph (see page 143) 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 142).
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.
Recruitment page

The Recruitment page is comprehensive trend page for visualising information necessary to perform a recruitment manoeuvre. The page shows the effects on lung mechanics and haemodynamic 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 customise the page to your current monitoring session.

The following diagram depicts the setup window for customising 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.
6. Select the OK button to confirm the selection. Select the Cancel button to exit the screen without accepting the changes.
7. Repeat steps 3 to 6 to configure the parameter setup for other trend graph panels.

NOTE
Buttons with ellipses such as More ventilation... or More gases... access additional parameters.
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 147. 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 Δ (delta) value for each parameter. You can only print a recruitment trend graph report after you set the cursors. Otherwise, the Print button remains greyed 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 149).
4. Select the Print button.

Trend table

The trend table displays trend data in data columns. Trend data is 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 were 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 artefact, are represented in unique ways (see page 140).

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 The Parameters column
D Latest trend data
E **Graph** tab (see page 143)
F **Table** tab
G **Graph vitals** tab (see page 146)
H **Ventilation / Anesthesia** tab accesses the graphical trends of a set of pre-configured trend parameters for critical care or anaesthesia ventilation.
I Scroll keys and scroll bar
J **Print** button
K **Setup** button for selecting which parameters are displayed and in what priority
L **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 the 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 the 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 consist of single- and double-arrow keys and a moveable navigation bar. The double arrows scroll through larger portions than the single arrows. If more trend data is 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 customising the content of the trend table. Refer to the diagram depicting the Table (see page 150) 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 150).
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 Display filter button
B Button that closes the setup window
C Group of parameter buttons entitled Device 3 for selecting parameters available using the device connectivity option (for example, VN500, V500, A500)
D OK button
E Cancel button
F Clear all button – deselects any buttons that are currently selected
G Select all button – selects all buttons at once
H Auto-sort button
I Group of parameter buttons entitled Other for selecting miscellaneous parameters such as SpO2, temperature, and so on.
J Group of parameter buttons entitled ECG for selecting ECG-related parameters
K Group of parameter buttons entitled Pressure for selecting pressure-related parameters
L Group of parameter buttons entitled Vent for selecting ventilation-related parameters
M Group of parameter buttons entitled Device 2 for devices using the device connectivity option (for example, Evita XL, Evita 4, Evita 2D, Maquet Servo-I)
N Group of parameter buttons entitled Hemo for selecting haemodynamic-related parameters

To modify the parameter selection for a trend table

1. Access the Trends > Table page (see page 150).
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 62).
   or
   Select the parameters you wish to display in the trend table.

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

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.
Printing a tabular trend report

The content of a tabular trend report depends on the system setup (see page 333).

To print a tabular trend report

1. Access the **Trends > Table** page (see page 142).
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 360.

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.

Mini-trends

When the mini trend display is activated (see page 320), a panel appears to the left of the monitoring area of the main screen. The colours of the mini-trend correspond to the selected parameter colour. The mini-trend display is updated every 5 seconds.

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

If you activate the split-screen mode (see page 321), 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** dialogue, 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.

**NOTE**
If the mini-trends are displayed, you can change the mini-trend scale and the duration by touching the displayed values. A pop-up appears, allowing you to change these settings directly.
Data review pages

In addition to trend data, the Trends/Data dialogue 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
   - Respiratory/Ventilation
   - Anesthesia/Ventilation
   - Hemo
   - Labs
   - Reports

<table>
<thead>
<tr>
<th>Data review page</th>
<th>Description</th>
<th>Available functions</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

NOTE
The horizontal tab Respiratory/Ventilation changes to Anesthesia/Ventilation when an A500 is connected.
## Data review page

<table>
<thead>
<tr>
<th>Description</th>
<th>Available functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory/Ventilation or Anesthesia/Ventilation &gt; Show all page</strong></td>
<td>Data review page displaying respiration, anaesthesia or ventilation parameter information.</td>
</tr>
<tr>
<td>– When an A500 anaesthesia device is connected, the tab name is labelled <strong>Anesthesia/Ventilation</strong>. The page displays current measurement values for ventilation and anaesthesia parameters and the current consumption.</td>
<td></td>
</tr>
<tr>
<td>– When a V500 ventilator is connected, the tab name is labelled <strong>Respiratory/Ventilation</strong>. The page displays current ventilation values and tabs for PV/FV loops.</td>
<td></td>
</tr>
<tr>
<td><strong>Hemo &gt; Show all page</strong></td>
<td>Data review page displaying the currently monitored haemodynamic parameter values.</td>
</tr>
<tr>
<td>Displays the currently monitored haemodynamic parameters; includes parameters available using the device connectivity option.</td>
<td></td>
</tr>
<tr>
<td><strong>Hemo &gt; Calc Results page</strong></td>
<td>– <strong>Setup</strong> button for activating a pop-up 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.</td>
</tr>
<tr>
<td>Displays calculation results. The same page is also available under the <strong>Calculations</strong> tab (see page 127)</td>
<td>– <strong>Auto-sort</strong> button for sorting the parameter list according to the parameter priority list in the <strong>Auto view</strong> page (see page 62). If you add parameters to the parameter priority list, you must order these parameters manually.</td>
</tr>
<tr>
<td>– <strong>Save</strong> button for saving the selected calculation parameters.</td>
<td></td>
</tr>
</tbody>
</table>
The Reports tab

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

The Reports dialogue 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 360. The Setup page is for configuring the case summary report (see page 364 for details).
# 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, paediatric, and neonatal patients.

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

12-lead monitoring is of diagnostic quality and can be used with the optional Rest ECG analysis.

Refer to the *Infinity Acute Care System – Infinity M540 Instructions for Use* for a detailed description of the M540 ECG functions.

The ECG monitoring functions are configurable in the ECG pages (see page 173).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9.

ECG signal processing and display

The M540 identifies QRS complexes of certain amplitudes and QRS widths for adult, paediatric, 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 HR parameter box.

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

During an artefact, asterisks (***) replace the heart rate value. Once the artefact clears, QRS processing resumes without initiating a relearning phase.

Arrhythmia monitoring and the selected arrhythmia mode affect the display of the HR parameter box. For detailed information, see “ARR display” on page 182.

Parameter-specific error messages are listed in the chapter ‘Problem solving’ starting on page 369.

Supported parameters

- ECG: HR (heart rate), %paced (paced beats)
- ST: STI, STII, STIII, STaVR, STaVL, STaVF, STV, STV+, STV1 to STV6, STVM, STCVM, STdV1, STdV3, STdV4, STdV6
- Arrhythmia ARR (ASY, VF, ARTF, VTACH, RUN, AIVR, SVT, CPT, BGM, TACH, BRADY, PAUSE); see page 180 for a description of these ARR modes and PVC/min
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ECG precautions

Refer to the following sections for general precautions:
- “Electrical safety” on page 12
- “Electrosurgery” on page 15
- “Defibrillator precautions” on page 15

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 artefacts of non-cardiac origin, such as a seizure, may prevent detection of certain arrhythmias.

Connecting the 3-, 5-, 6-lead wire sets for ECG monitoring

1 Insert the 3-, 5-, or 6-lead wire set (B) into the recessed ECG connector (A) on the side of the M540.

2 Insert the spacer (C) 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 169.

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 set for 12-lead monitoring

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.

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 169.

NOTE
When using a 12-lead ECG wire set where the lead wires are coiled, it is recommended that the 3-lead, 5-lead, or 6-lead wire sets, are wrapped in the same direction as the 4-lead set to prevent artefact. For example, both lead wire sets are either wrapped towards the patient or away from the patient.
Connecting the lead wires for neonatal monitoring

1 Insert the ECG adapter cable (B) into the recessed ECG connector (A) on the side of the M540.

2 Insert the spacer (C) to protect the unused ECG lead pins on the M540.

3 Connect the individual neonatal ECG lead wires (E) to the neonatal ECG adapter cable (D).

For information on applying the electrodes to the patient, refer to the illustrations starting on page 169.

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.
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 occurs:

- ECG signal degradation
- Excessive patient perspiration
- Skin irritation

Consider the following when selecting the 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 minimise interference from the electrosurgical unit

1. Select the HR parameter box.
2. Select Sensor parameters... from the main-menu bar
3. Select Settings 2 tab (if not already selected).
4. Select ESU next to the Filter [Hz] 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.
ECG display

On the Cockpit, the ECG display consists of:

- ECG parameter box
- ECG waveforms
- Show all page containing up to 12 leads

The ECG parameter box appears differently when you activate arrhythmia monitoring. For more information, see page 182.

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 369.

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 50.

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 \( P \) when a paced beat is detected)

During brief artefact episodes, the parameter box does not display a heart rate value.
ECG waveforms

The ECG waveform contains the following elements:

A Lead label
B The selected waveform scale
C The message field indicating the filter and pacer setting. For example, the message *Pacer off* appears when you deactivate pacer detection.

Depending on the selected lead wire set and the ECG cable type, a waveform channel displays up to 3 ECG waveforms.

<table>
<thead>
<tr>
<th>The 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+ 1)</td>
</tr>
<tr>
<td></td>
<td>TruST: I, II, III, aVR, aVL, aVF, dV1, V2, dV3, dV4, V5, dV6 2)</td>
</tr>
<tr>
<td>6 + 4 electrodes</td>
<td>I, II, III, aVR, aVL, aVF, V1 to V6 3)</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

If pacer detection is activated (see page 174), blue pacer spikes identify paced beats. The pacer spikes are printed on strip recordings.

To select the number of leads and the lead wire set, see page 173.
ECG, arrhythmia, and ST segment

ECG colours

Lead wire connectors to the electrodes are labelled and colour-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 and yellow</td>
</tr>
<tr>
<td>N</td>
<td>black</td>
</tr>
<tr>
<td>C+/C5</td>
<td>grey 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></td>
<td>LA black</td>
</tr>
<tr>
<td></td>
<td>LL red</td>
</tr>
<tr>
<td></td>
<td>RA white</td>
</tr>
<tr>
<td></td>
<td>V/V2 brown/brown and yellow</td>
</tr>
<tr>
<td></td>
<td>RL green</td>
</tr>
<tr>
<td></td>
<td>V+/V5 grey and brown/brown and orange</td>
</tr>
<tr>
<td></td>
<td>V6 brown and violet</td>
</tr>
<tr>
<td></td>
<td>V4 brown and blue</td>
</tr>
<tr>
<td></td>
<td>V3 brown and green</td>
</tr>
<tr>
<td></td>
<td>V1 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)
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. The 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 171.

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 170), measuring 8 leads and interpolating 4 chest leads. TruST is available for adult and paediatric patients, but not for neonatal patients.

Accessing the ECG functions

- Select the HR 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.
- If you cannot see the tab, select the following two symbols located in the upper-right corner of the dialogue window: >> symbol and the display filter button.

You can view all ECG waveforms, including TruST, on the Show all page (see page 175). For information on how to activate TruST, see page 193.

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><strong>Pulse tone volume</strong></td>
<td>Off, 5, 10 (default) to 100 % in increments of 10 %</td>
<td>Sets the volume of the pulse tone.</td>
</tr>
<tr>
<td><strong>Tone source</strong></td>
<td>ECG (default), SpO2</td>
<td>Sets the source of the pulse tone.</td>
</tr>
<tr>
<td><strong>HR source</strong></td>
<td>ECG (default) – derives the heart rate from the ECG signal. ART – derives the heart rate from the arterial pressure signal. The HR parameter box label changes to APR and appears in the colour of ART. SpO2 – derives the heart rate from the pulse oximetry signal. The HR parameter box label changes to PLS and appears in the colour of SpO2. Auto – derives the heart rate either from the ECG signal or other available sources. If an ECG signal is not available, the M540 switches to ART, and then to SpO2.</td>
<td>Selects a different source for the heart rate when the ECG channel is unavailable due to artefact resulting from surgical procedures.</td>
</tr>
<tr>
<td><strong>Waveforms</strong></td>
<td>1, 2 (default), 3</td>
<td>Selects the number of displayed waveforms.</td>
</tr>
<tr>
<td><strong>Leads</strong></td>
<td>Three electrodes: I, II, III Five electrodes: I, II, III, aVR, aVL, aVF, V Six electrodes: I, II, III, aVR, aVL, aVF, V, V+ Six electrodes (with TruST activated): I, II, III, aVR, aVL, aVF, dV1, V2, dV3, dV4, V5, dV6 Ten electrodes: I, II, III, aVR, aVL, aVF, V1 to V6 Default for lead 1: II Default for lead 2: V (with TruST and a 10-lead wire sets, the default is: V2) Default for lead3: aVF</td>
<td>Assigns specific leads for each waveform depending on which lead mode is selected.</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>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 colour of the waveforms and parameter labels and values.</td>
</tr>
</tbody>
</table>

### Settings 2 page

<table>
<thead>
<tr>
<th><strong>Filter [Hz]</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>– <strong>Off</strong> –</td>
<td>Provides the greatest sensitivity to noise or artefact (the message <strong>Filter off</strong> appears in the waveform channel).</td>
</tr>
<tr>
<td>– <strong>Monitor</strong> (default) –</td>
<td>Recommended for standard monitoring; reduces baseline drift, muscle artefact, and power-line interference. No message appears in the waveform channel.</td>
</tr>
<tr>
<td>– <strong>ESU</strong> –</td>
<td>Reduces signal distortion during electrosurgery (the message <strong>Filter ESU</strong> appears in the waveform channel).</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.

<table>
<thead>
<tr>
<th><strong>Pacer detection</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Not available in the neonatal mode)</td>
<td>Determines whether pacer impulses are detected. See “Pacer fusion mode” on page 177 for precautions before you start this mode.</td>
</tr>
<tr>
<td>– <strong>On</strong> (default)</td>
<td></td>
</tr>
<tr>
<td>– <strong>Off</strong> –</td>
<td>The message <strong>Pacer off</strong> appears in the waveform channel</td>
</tr>
<tr>
<td>– <strong>Fusion</strong> –</td>
<td>The message <strong>Pacer fusion</strong> appears in the waveform channel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>QRS sync marker</strong></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>– <strong>On</strong> –</td>
<td>Displays QRS synchronisation markers</td>
</tr>
<tr>
<td>– <strong>Off</strong> (default)</td>
<td></td>
</tr>
</tbody>
</table>

Determines whether vertical white markers appear on the waveform to identify QRS complexes. The markers help determine when it is safe to perform synchronised cardioversion.
### Cable type

<table>
<thead>
<tr>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auto detect</strong> (default)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
When using the ECG extension cable, the system always assumes the cable is a 6-lead wire set.
- 3-, 5-, 6-electrodes, and 12 leads

**NOTE**
When set to **Auto detect**, this feature detects the number of connected lead wires automatically. If the 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.

### ARR Processing

<table>
<thead>
<tr>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
</table>
| **ECG1, ECG1 & 2** (default) | ECG1 setting – arrhythmia processing occurs only on the lead displayed in waveform channel 1. 
**ECG1 & 2** setting – arrhythmia processing occurs on the leads displayed in the waveform channels 1 and 2. |

**NOTE**
The **ECG1&2** selection is not available if the neonatal patient category is selected.

### Size all ECG

<table>
<thead>
<tr>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25, 0.5, 1 (default), 2, 4, 8 mV/cm</td>
<td>Sets the amplitude of ALL displayed ECG leads.</td>
</tr>
</tbody>
</table>

### Resp. monitoring

<table>
<thead>
<tr>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On</strong> (default for neonate)</td>
<td>Activates/deactivates respiration monitoring.</td>
</tr>
<tr>
<td><strong>Off</strong> (default for adult/paediatric)</td>
<td></td>
</tr>
</tbody>
</table>

### Show all page
This page displays all available leads (up to 12).
Monitoring paced patients

When pacer detection is activated, the M540 uses the following specifications to identify a pulse as a pacer pulse:
- Amplitude: ±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 followed:
- In the HR 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 optimise the pacer monitoring, follow the guidelines on page 179.

To activate/deactivate pacer detection
- Select the HR parameter box to select the ECG page directly.
- or
- Select Sensor parameters... from the main-menu bar.
- Select the ECG tab to access the ECG page.
- Select the Settings 2 tab.
- Select On next to Pacer detection.
Pacemaker precautions

The M540 has been tested for the pacer pulse rejection. However, it is impossible to anticipate every clinically possible waveform characteristic. For the 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 pacer 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 pacer detection status is correct for the patient. Be aware that setting the ECG filter option to ESU deactivates pacemaker detection automatically.

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.

WARNING
Impedance respiration and pacemaker detection are inoperative when the ESU filter is selected. Refer to “Electrosurgery” on page 15 for general safety precautions.

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

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.

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 artefact, turn it off, if possible. To minimise the artefact, 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 minimise 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 the transcutaneous electrical nerve stimulators (TENS) often resemble the pacer signals and can be labelled as such. The M540 can reject valid QRS complexes, which follow misinterpreted TENS signals. If TENS signals continue to register as pacer spikes, deactivate pacer detection (see page 174).

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.

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 pacer impulses.
Optimising pacer processing

You can minimise interference and optimise ECG signal acquisition and processing for paced patients.

To optimise the pacer processing
- Select the HR 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 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 [Hz] setting Monitor or Off and determine which setting provides the clearest signal.

Arrhythmia monitoring overview

**WARNING**
When HR alarm and ARR monitoring are deactivated and the ASY/VF alarms setting is set to Follow HR alarm, the monitor does not generate ASY/VF alarms. To make sure that ASY/VF alarms are always generated, set the ASY/VF alarms setting to Always on.

The M540 performs arrhythmia (ARR) monitoring on adult and paediatric patients and relays these values to the Cockpit for display. Arrhythmia monitoring is not available for neonates. To make sure that asystole and ventricular fibrillation alarms are reported even when HR alarm monitoring and arrhythmia monitoring is deactivated, set the ASY/VF alarms selection in the General settings page to Always on (see page 328).

The selected arrhythmia mode (see page 180) controls which arrhythmia parameters are monitored and how they are displayed.

Refer to the “Infinity Acute Care System– Infinity M540” Instructions for Use for a detailed description of the M540 ARR functions.

The ARR monitoring functions have configurable parameter-specific setup pages (see page 183).

**NOTE**
The banner HR alarms off appears in the right most field in the header bar whenever you deactivate HR alarms.

The HR, ASY, VF off banner appears when arrhythmia monitoring is disabled, the ASY/VF alarms feature is set to Follow HR alarm, and HR alarms are deactivated.

**NOTE**
If French NFC mode is activated (see page 338), you cannot deactivate HR alarms.

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9.
Selecting ARR leads

Appropriate lead selection is essential for accurate ARR 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 ARR leads

1. Select the HR parameter box to select the **ECG** page directly.
2. Select the **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.

ARR modes

If ARR monitoring is activated, the selected ARR mode (basic or advanced) determines how many events are monitored. When the **ASY/VF alarms** setting is set to **Always on**, asystoles and ventricular fibrillation events are always reported, even when ARR monitoring is deactivated.

The following table lists which ARR events are reported with each monitoring mode.

| ARR monitoring off (the following events are detected, if at least one ECG is displayed) |
|----------------------------------|----------------------------------|
| ASY                              | Asystole                         |
| VF                               | Ventricular fibrillation          |

| Basic ARR monitoring mode (the following additional events are detected) |
|----------------------------------|----------------------------------|
| VTACH                            | Ventricular Tachycardia          |
| PVC                              | Premature Ventricular Contraction|

| ARTF                             | Artefact                         |

![Table]

The following table lists which ARR events are reported with each monitoring mode.

| ARR monitoring off (the following events are detected, if at least one ECG is displayed) |
|----------------------------------|----------------------------------|
| ASY                              | Asystole                         |
| VF                               | Ventricular fibrillation          |

| Basic ARR monitoring mode (the following additional events are detected) |
|----------------------------------|----------------------------------|
| VTACH                            | Ventricular Tachycardia          |
| PVC                              | Premature Ventricular Contraction|

| ARTF                             | Artefact                         |

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 ARR setup table (see page 184).
Instructions for Use Infinity Acute Care System – Monitoring Applications SW VG2

ECG, arrhythmia, and ST segment

To select the ARR modes

- Select the HR 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 ARR settings tab.

4. Select one of the following modes next to ARR mode button, located below the arrhythmia alarm setup table:
   - Off
   - Basic
   - Full (locked option)

Advanced ARR monitoring mode (the following additional events are detected)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRADY</td>
<td>Bradycardia Eight or more consecutive normal beats, with an average rate ≤ bradycardia rate setting. ³)</td>
</tr>
<tr>
<td>RUN</td>
<td>Ventricular RUN Series of 3 to N-1 consecutive PVCs with a beat-to-beat rate ≥ the VTACH rate. ²)</td>
</tr>
<tr>
<td>AIVR</td>
<td>Accelerated Idioventricular Rhythm Series of 3 or more PVCs with a rate less than the VTACH rate.</td>
</tr>
<tr>
<td>SVT</td>
<td>Supraventricular Tachycardia 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 Sequence of beats with the pattern: normal, PVC, PVC, normal.</td>
</tr>
<tr>
<td>BGM</td>
<td>Ventricular bigeminy Sequence of beats with the pattern: normal, PVC, normal, PVC, normal.</td>
</tr>
<tr>
<td>TACH</td>
<td>Tachycardia N or more consecutive normal beats, with a beat-to-beat rate ≥ TACH rate setting. ², ⁴)</td>
</tr>
<tr>
<td>PAUSE</td>
<td>Pause Sequence of two beats classified as normal or PVC, with an interval ≥ pause rate value in sec (±100 ms).</td>
</tr>
</tbody>
</table>

NOTE

²) N is the event count set in the count column of the ARR setup table (see page 184).

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.
ARR display

When ARR monitoring is activated, ARR events appear in the HR parameter box or in a separate parameter box, depending on how many ECG leads are selected for display.

When ARR monitoring is deactivated (see page 181) 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 330).

Combined HR/ARR 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 369.

**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 50.

When one or two ECG leads are selected for display and ARR monitoring is activated, all ARR values and labels appear in the HR parameter box. The ARR parameter box contains the following elements:

- A HR parameter label
- B Units of measure – can be activated/deactivated
- C ARR 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 when a paced beat is detected)
Separate ARR parameter box

When three ECG channels are selected for display and ARR monitoring is activated, all values and labels appear in a separate parameter box below the HR parameter box.

Accessing the ARR functions

- Select the HR 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

ARR parameter setup functions

All ARR 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 mode</td>
<td>Off, Basic (default), Full (locked option)</td>
<td>Selects which events are reported (see page 180 for more details).</td>
</tr>
<tr>
<td>Relearn</td>
<td>None</td>
<td>Establishes a new QRS baseline.</td>
</tr>
</tbody>
</table>

See “Configuring the arrhythmia alarm setup” on page 104 for details on available ARR 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 paediatric 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.

![QRS complex diagram]

A Fiducial point  
B ST level  
C ST measurement point  
D QRS offset  
E QRS onset  
F Isoelectric point

Refer to the *Infinity Acute Care System– Infinity M540 Instructions for Use* for a detailed description of the M540 ST functions.

The ST monitoring functions are configurable parameter-specific setup pages (see page 189).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9.

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 ARR and QRS processing. ECG and ST reports contain the label ‘d’ to identify a derived lead.

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 HR 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 ST settings tab.
5. 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 169).

- TruST – provides 12-lead ST monitoring with a 6-lead wire set (see page 162).

- 12-lead ST monitoring – uses the standard 12-lead ECG configuration with ten electrodes (see page 162).
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 HR 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 50.

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 369.

The ST parameter box contains the following elements:

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 ISO 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.

To access ST complexes

1. Select the HR 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 ECG tab (if not already selected).
5. 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 188).

A **ECG tab**
B **Amplitude**
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 195)
L **ST label** (unique for each ST lead)
ECG, arrhythmia, and ST segment

ST measuring points

You can change the ST measuring points and isoelectric point from the general or from the single ST complexes page (see illustrations on page 187). 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 isoelectric 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

1. Select Sensor parameters... from the main menu bar.
2. Select the ECG tab to access the ECG page.
3. Select the ST complex tab (B) to display the general ST complex page.
4. Select an individual ST panel to zoom in on a single ST complex.
5. Select the ISO button (I) and use the rotary knob to dial to the desired setting.
6. Select the ST button (G) and use the rotary knob to adjust the ST measuring point.
**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 188) and the single ST complex page (see page 187). Saving a reference point in either screen, saves all currently displayed ST complexes as reference points.

**To save ST reference points**

- Select the HR 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 complex tab to display the general ST complex page.
- 4 Select an individual ST panel to zoom in on a single ST complex.
- 5 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.
- 6 Select the Save reference button (in either ST complex page).

---

ECG, arrhythmia, and ST segment
**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 106.

**To access the ST alarms page**

- Select the HR 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.

**Accessing the ST settings**

- Select the HR 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 settings* tab.
### 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), Off</td>
<td>Activates/deactivates ST monitoring and determines whether an ST parameter box is displayed and ST parameters are trended.</td>
</tr>
</tbody>
</table>
| **TruST 12-lead**    | On – TruST monitoring is available  
Not selectable in neonatal mode. TruST is only available when a 6-lead wire set is connected  
Off (default) – TruST monitoring is not available | Determines whether TruST monitoring is available (see page 178). |
| **ST relearn**       | Not applicable     | Purges stored average ST complexes, blanks displayed average ST complexes, and learns the arrhythmia and dominant QRS pattern. |
| **ST lead1**         | Three electrodes: STI, STII, STIII | Selects an ST lead for analysis and display. |
| **ST lead2**         | Five electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV | |
| **ST lead3**         | Six electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STdV1, STV2, STdV3, STdV4, STdV5, STdV6 | |
|                      | Six electrodes (with TruST activated): STI, STII, STIII, STaVR, STaVL, STaVF, STdV1, STV2, STdV3, STdV4, STdV5, STdV6 | |
|                      | Ten electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV1, STV2, STV3, STV4, STV5, STV6, STCVM, and STVM | |
|                      | Default for ST lead1: STI | |
|                      | Default for ST lead2: STaVL | |
|                      | Default for ST lead3: STV (with TruST and a 10-lead wire sets, the default is: STV2) | |
ECG, arrhythmia, and ST segment

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event duration [s]</td>
<td>Off, 15, 30, 45, 60 (default) sec</td>
<td>Defines a period during which an alarm condition must persist before alarm signals are generated.</td>
</tr>
<tr>
<td>ST Mini Trend</td>
<td>Three electrodes: STI, STII, STIII</td>
<td>Selects an ST lead for inclusion in the ST mini-trend display.</td>
</tr>
<tr>
<td></td>
<td>Five electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six electrodes: STI, STII, STIII, STaVR, STaVL, STaVF, STV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Six electrodes (with TruST activated): STI, STII, STIII, STaVR, STaVL, STaVF, STdV1, STV2, STdV3, STdV4, STdV5, STdV6</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: STII</td>
<td></td>
</tr>
</tbody>
</table>
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 ARR 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:
- ARR monitoring is activated
- A different ARR mode is selected
- Different ECG leads are selected for ARR 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 ARR-setup page

1. Select the HR parameter box to select the ECG page.
   or
2. Select **Sensor parameters...** from the main-menu bar.
3. Select the ECG tab to access the ECG page.
4. Select **Relearn**.

#### To relearn from the ST page

1. Select the HR parameter box to select the ECG page.
   or
2. Select **Sensor parameters...** from the main-menu bar.
3. Select the ECG tab to access the ECG page.
4. Select **ST settings** tab.
5. Select **Relearn**.
# 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. The 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.

The respiration monitoring is for adult, paediatric and neonatal patients. The M540 can use the respiration signal for central apnoea monitoring.

Refer to the Infinity Acute Care System – M540 Instructions for Use for a detailed description of the M540 respiration functions. The RRI monitoring functions are configurable in the parameter-specific setup page (see page 205).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. Parameter-specific error messages are listed on page 379.

Supported parameter

RRI – respiration rate measured by impedance (RRI values are not displayed when the ESU filter is activated – see page 174).

Respiration precautions

WARNING

The safety and effectiveness of the respiration measurement method in the detection of apnoea, particularly the apnoea of prematurity and apnoea of infancy, have not been established.

WARNING

This device does not monitor obstructive apnoea. Patients at risk for respiratory crises should be observed closely.

WARNING

The large amplitude pacemaker pulses (100 mV or greater) may interfere with the monitor ability to measure or detect respiration.

WARNING

The monitor reports an apnoeic event when no breaths are reported within the established apnoea 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.

WARNING

Impedance respiration and pacemaker detection are inoperative when the ESU filter is selected. Refer to “Electrosurgery” on page 15 for general safety precautions.
Connecting the 3-, 5-, 6-lead wire sets for RRI monitoring

1. Insert the 3-, 5-, or 6-lead wire set (B) into the recessed ECG connector (A) on the side of the M540.

2. Insert the spacer (C) 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 169.

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 set for 12-lead monitoring

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.

2. Connect the lead wires to the patient. For information on applying the electrodes to the patient, refer to the illustrations starting on page 169.

**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.

**NOTE**

When using a 12-lead ECG wire set where the lead wires are coiled, it is recommended that the 3-lead, 5-lead, or 6-lead wire sets, are wrapped in the same direction as the 4-lead set to prevent artefact. For example, both lead wire sets are either wrapped towards the patient or away from the patient.
Connecting the lead wires for neonatal monitoring

1. Insert the ECG adapter cable (B) into the recessed ECG connector (A) on the side of the M540.

2. Insert the spacer (C) to protect the unused ECG lead pins on the M540.

3. Connect the individual neonatal ECG lead wires (E) to the neonatal ECG adapter cable (D).

For information on applying the electrodes to the patient, refer to the illustrations starting on page 169.

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.

Follow the same precautions for respiratory monitoring as for ECG monitoring (see page 162) and observe the following general recommendations:

- Place the electrodes so they generate the clearest possible signals with minimal artefact.
- 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).
Impedance respiration (RRi)

- For adult and paediatric 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.

- 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 artefact.
Impedance respiration (RRi)

Respiration (RRi) 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 50.

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 369.

The respiration parameter box contains the following elements:

A Impedance respiration rate label (RRi)
B Units of measure – can be activated/deactivated
C Upper/lower alarm limits or crossed-triangle symbols when alarms are deactivated
D The respiratory rate value
E The lung symbol that blinks with each detected breath

Respiration markers

Respiration markers indicate the time of breath detection, not the beginning, or end of respiration. If respiration markers also appear during an artefact, 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 205.
Adjusting the detection threshold and activating the respiration marker

1. Select the respiration parameter box to select the Resp. page directly.
   or
2. Select Sensor parameters... from the main-menu bar.
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.

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 paediatric 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 205) alter the breath detection sensitivity of the monitor.

To select the desired respiration mode, see page 205.

**WARNING**
If the respiration waveform size is set too low in the Manual mode, shallow breaths may not be counted. If it is set too high, cardiac artefacts will be counted as breaths. Therefore, always use the respiration marker to verify the breath detection at the desired amplitude.
Impedance respiration (RRi)

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.
3. 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 dialogue window: >> symbol and the display filter button.

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>Resp. lead</td>
<td>I, II (default)</td>
<td>Selects the lead for respiration monitoring.</td>
</tr>
<tr>
<td>Relearn</td>
<td>None</td>
<td>Initiates a relearning of the respiration signal.</td>
</tr>
<tr>
<td>Mode</td>
<td>Auto (default), Manual (see page 204 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.  
### Impedance respiration (RRi)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resp. marker</strong></td>
<td>On, Off (default)</td>
<td>Superimposes a vertical line on the respiration waveform when a breath is detected (see page 203).</td>
</tr>
<tr>
<td><strong>Resp. monitoring</strong></td>
<td>– On (default in neonatal mode)</td>
<td>Activates/deactivates respiration monitoring.</td>
</tr>
<tr>
<td></td>
<td>– Off (default in adult/paediatric mode)</td>
<td></td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow, light blue,</td>
<td>Determines the colour of the waveforms, parameter labels, and values.</td>
</tr>
<tr>
<td></td>
<td>purple, orange, white (default)</td>
<td></td>
</tr>
<tr>
<td><strong>Settings 2 page</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coincidence detect</strong></td>
<td>On, Off (default)</td>
<td>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.</td>
</tr>
<tr>
<td><strong>RRi apnea time [s]</strong></td>
<td>Off, 10, 15 (default), 20, 25, 30 sec</td>
<td>Determines how long an apnoea has to last before an alarm is triggered.</td>
</tr>
<tr>
<td><strong>Apnea archive</strong></td>
<td>Off</td>
<td>Determines what happens in response to an apnoea.</td>
</tr>
<tr>
<td></td>
<td>– Str./ Rec. – a recording and an event</td>
<td></td>
</tr>
<tr>
<td></td>
<td>storage is triggered automatically in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>response to an apnoea.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Store (default) – a waveform segment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>is stored in response to an apnoea.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Record – a recording is triggered</td>
<td></td>
</tr>
<tr>
<td></td>
<td>automatically in response to an apnoea.</td>
<td></td>
</tr>
</tbody>
</table>
SpO2 and Pulse CO-Ox monitoring with Masimo SET MCables

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Overview of SpO2 and Pulse CO-Ox monitoring

SpO2 and Pulse CO-Ox monitoring is only possible with the corresponding MCables. The following two MCables are available from Masimo for monitoring SpO2 and Pulse CO-Ox parameters.

- Infinity MCable – Masimo SET (Masimo SET MCable)
- Infinity MCable – Masimo SET Rainbow (Masimo Rainbow SET)

The values and the waveform of both MCables are displayed on the M540 and on the Cockpit. Both MCables 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 haemoglobin 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 haemoglobin (SpO2). Because light absorption varies with blood volume and blood volume varies with pulse rate, both Masimo SET MCables can also derive a pulse rate (PLS).

In addition, the Masimo SET MCables also provide 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.

SpO2 and Pulse CO-Ox measurements are for adult, paediatric, and neonatal patients (with the following exceptions).

NOTE
The Masimo Rainbow SET MCable parameters SpHb and SpOC are not approved for neonatal monitoring.

NOTE
Information about the wavelength range may be useful during photodynamic therapy. For details, see the technical data chapter of the M540 Instructions for Use.

Refer to the Infinity Acute Care System– Infinity M540 Instructions for Use for a detailed description of the M540 SpO2 functions. The SpO2 monitoring functions are configurable in the parameter-specific setup page (see page 219).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. Parameter-specific error messages are listed on page 382.

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 MCables

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 haemoglobin (SpHb) measures the total haemoglobin levels in arterial or venous blood. The unit of measure is selectable (see page 337).
- 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.
- Patient volume 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 %.
- Carboxyhaemoglobin saturation (SpCO) measures the amount of carbon monoxide that is bound to haemoglobin. The unit of measure is %.
- Methaemoglobin saturation (SpMet) measures the methaemoglobin 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 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.

NOTE
A coloured band on the Masimo Rainbow SET MCable indicates which parameters are activated on the MCable. If an MCable does not have a label, the supported parameters are by default SpO2, PLS, and PI.

The following illustration shows the multi-coloured band which appears on the side of the Masimo Rainbow SET MCable (see page 212 for more information).

If you connect a sensor but the parameter is not activated on the MCables, the parameter label appears in the parameter box without a value.
### SpO2 and Pulse CO-Ox precautions

**Interfering substances:** Carboxyhaemoglobin may erroneously increase the measurement values. The level of increase is approximately equal to the amount of carboxyhaemoglobin 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**

Elevated levels of methaemoglobin (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 artefact may lead to inaccurate SpMet, SpCO, SpHb, and SpOC measurements.

Very low arterial oxygen saturation (SaO2) levels may cause inaccurate SpCO and SpMet measurements.

Haemoglobin synthesis disorders may cause erroneous SpHb readings.

**WARNING**

A pulse oximeter should not be used as an apnoea 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**

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
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 unauthorised 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.

NOTE
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 entitled ‘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.

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 accurate 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 MCables identifies if you are using a Masimo Rainbow SET or a Masimo SET MCables.

To connect the Masimo SET MCable

1. Attach the MCable (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 214 for more information.

A  SpO2 connector on the M540
B  MCable
C  MCable intermediate connector (14-pin connector)
D  Intermediate cable connector to MCable
E  Intermediate cable connector to sensor
Connecting the Masimo Rainbow SET MCable

The Masimo Rainbow SET MCable connects directly to the M540. The logo on the MCables identifies if you are using a Masimo Rainbow SET or a Masimo SET MCables.

A coloured band located on the side of the Masimo Rainbow SET MCable indicates which parameters are activated.

- Fields appearing in colour 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

Masimo MCables can be mounted to the back of an M540 (see page 73).

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 entitled Infinity Acute Care System – Monitoring Accessories.
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 anaemia, 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 haemoglobins (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.

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.

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 MCables.

<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>

**Masimo SET MCable 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 50.

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 369.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 label</td>
<td>Units of measure – can be activated/deactivated</td>
<td>Sensitivity mode indicator (see page 219)</td>
<td>PLS (pulse) label</td>
<td>PLS value</td>
<td>Upper/lower label limits or crossed-triangle symbols when alarms are deactivated (for the parameter SpOC there are no alarm limits)</td>
<td>Perfusion index label</td>
<td>Perfusion index value</td>
<td>Message area for SpO2 messages (see page 382)</td>
<td>The SpO2 saturation value</td>
</tr>
</tbody>
</table>
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 221).

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 MCables.
- 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 224).

You can select up to three parameters to be displayed in the parameter box (see page 221). Units of measure appear next to the parameter label if applicable and can be activated/deactivated (see page 337).
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

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.
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.
   
   or

2. Select **Sensor parameters**... from the main-menu bar.

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

   the vertical **Setup** tab > enter the password to access the password-protected setup pages for the Masimo Rainbow SET parameters (see page 224).

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 98.
SpO2 parameter setup functions

General SpO2 setup functions take place in the SpO2 page (see page 218).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulse tone volume</strong></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><strong>Tone source</strong></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 215). For the SpO2 selection, the higher the pitch of the tone, the higher the SpO2 saturation percentage.</td>
</tr>
<tr>
<td><strong>Waveform size [%]</strong></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><strong>FastSat mode</strong></td>
<td>On, Off (default)</td>
<td>Allows rapid tracking of arterial oxygen saturation changes.</td>
</tr>
<tr>
<td><strong>Sensitivity mode</strong></td>
<td>– 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</td>
<td>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.</td>
</tr>
</tbody>
</table>

**NOTE**
When the Averaging time setting is set to 2 to 4 s or 4 to 6 s, the FastSat mode selection is ghosted.
SpO2 and Pulse CO-Ox monitoring with Masimo SET MCables

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 oxygen saturation.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Averaging time</td>
<td>2 to 4, 4 to 6, 8 (default), 10, 12, 14, 16 s</td>
<td>Determines how quickly the reported SpO2 value responds to changes in the patient oxygen saturation.</td>
</tr>
</tbody>
</table>

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.

Color
- Red, green, blue, yellow, light blue, purple, orange, white (default).
  Determines the colour of the waveforms and parameter labels and values.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue, purple, orange, white (default).</td>
<td>Determines the colour of the waveforms and parameter labels and values.</td>
</tr>
</tbody>
</table>
## 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 218. Additional password-protected functions are available (see page 224).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter display</strong> (left button)</td>
<td>SpHb $^1$ (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**
Changes to the parameter selection are retained if the same sensor is disconnected and then reconnected. The parameter selection changes to the default selection, if another Masimo Rainbow SET sensor type is connected.

$^1$Note: If the venous blood source was selected for SpHb Cal, the parameter label changes from SpHb (arterial blood source) to SpHbv.
### Parameter display (middle button)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter display</td>
<td>SpHb (^1), SpOC (default), PVI, SpCO, SpMet</td>
<td>Selects the parameter for the parameter 2 location in the Pulse CO-Ox parameter box. 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>
</tbody>
</table>

**NOTE**
Changes to the parameter selection are retained if the same sensor is disconnected and then reconnected. The parameter selection changes to the default selection, if another Masimo Rainbow SET sensor type is connected.

### Parameter display (right button)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter display</td>
<td>SpHb (^1), SpOC, PVI (default), SpMet</td>
<td>Selects the parameter for the parameter 3 location in the Pulse CO-Ox parameter box. PVI is the default parameter for the parameter 3 location in the parameter box for both CO and Hb sensors.</td>
</tr>
</tbody>
</table>

**NOTE**
Changes to the parameter selection are retained if the same sensor is disconnected and then reconnected. The parameter selection changes to the default selection, if another Masimo Rainbow SET sensor type is connected.

\(^1\) Note: if the venous blood source was selected for SpHb Cal, the parameter label changes from SpHb (arterial blood source) to SpHbv.
SpO₂ and Pulse CO-Ox monitoring with Masimo SET MCables

### SpHb Averaging Time

For SpHb¹ the selections are:
- **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 haemoglobin 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 colour of the parameter labels and values.

¹*) Note: if the venous blood source was selected for SpHb Cal, the parameter label changes from **SpHb** (arterial blood source) to **SpHbv**.
### 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 218.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SpHb Cal</strong></td>
<td>Arterial (default), Venous</td>
<td>Selects the blood sampling source which is used to calculate the SpHb value. The SpHb value changes to SpHbv when the <strong>SpHb Cal</strong> setting <strong>Venous</strong> is selected.</td>
</tr>
<tr>
<td><strong>PVI averaging time</strong></td>
<td>Short, Long (default)</td>
<td>Determines how responsive the monitor is to rapid physiological changes while tracking patient volume index. <strong>NOTE</strong> 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.</td>
</tr>
</tbody>
</table>
SpO2 and pulse rate with Nellcor OxiMax MCable

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Supported parameters ......................... 226
SpO2 precautions ................................. 227

Connecting the Nellcor OxiMax MCable .............. 228

Patient preparation for SpO2 monitoring ............ 229
Applying the sensor .............................. 229

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SpO2 parameter box ............................... 230

Accessing the SpO2 settings ....................... 231

SpO2 parameter setup functions .................. 231
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 haemoglobin 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 haemoglobin (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, paediatric and neonatal patients.

NOTE

Information about the wavelength range may be useful during photodynamic therapy. For details, see the technical data chapter of the M540 Instructions for Use.

Refer to the Infinity Acute Care System– Infinity M540 Instructions for Use for a detailed description of the M540 SpO2 functions.

The SpO2 monitoring functions are configurable in the parameter-specific setup page (see page 231).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. Parameter-specific error messages are listed on page 382.

Supported parameters

- Saturation (SpO2)
- Pulse rate (PLS)
SpO2 precautions

Interfering substances: Carboxyhaemoglobin may erroneously increase the measurement values. The level of increase is approximately equal to the amount of carboxyhaemoglobin 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
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.

WARNING
A pulse oximeter should not be used as an apnoea 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.

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 entitled ‘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 ms of a CO-oximeter's measured value.
Connecting the Nellcor OxiMax MCable

The Nellcor OxiMax MCable cable 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 229 for more information.
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 vasconstriction, severe anaemia, 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 haemoglobins (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

**NOTE**
The pulse-plethysmogram waveform is directly proportional to the strength of the pulse amplitude.

### SpO2 parameter box

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 50.

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 369.

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** The SpO2 saturation value
- **H** SpO2 blip that pulsates with each detected pulse (only when the selected pulse tone source is SpO2 – see page 231).
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 dialogue 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 98.

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 %, 100 %</td>
<td>Sets the volume of the pulse tone.</td>
</tr>
<tr>
<td>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 230). 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.</td>
</tr>
<tr>
<td></td>
<td>If the waveform height exceeds the display size of the channel, the waveform appears clipped (without affecting the SpO2 signal processing).</td>
<td></td>
</tr>
</tbody>
</table>
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 seconds

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

- **Off** (default), 10, 25, 50, 100 SatSeconds

This function analyses desaturation events by multiplying their duration (seconds) by the number of percentage points the patient exceeds the alarm limit.

**NOTE**

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 328) and the SpO2 high-priority desaturation alarm for neonatal patients.

### Color

- Red, green, blue, yellow, light blue, purple, orange, white (default).

Determines the colour of the waveforms and parameter labels and values.
Temperature

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Connecting the temperature sensors to the M540 . . . . . . . 235
Connecting the temperature sensors to the haemodynamic pods . . . . . . 236
Temperature display . . . . . . . . . . . . . . . . . . . . . . . . . . 237
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Temperature parameter setup functions . . . . . . . . . . . . . . . . . . 238
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, paediatric 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 238).

Refer to the Infinity Acute Care System – Infinity M540 Instructions for Use 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 9. Parameter-specific error messages are listed on page 390.

Supported parameters

- Ta/T1a: absolute temperature values
- Tb/T1b: absolute temperature values
- ΔT/ΔT1: delta temperature values

Connecting the temperature sensors

You can connect temperature sensors directly to the M540 or to one of the following haemodynamic pods:

- MPod – QuadHemo
- Hemo4 pod
- Hemo2 pod
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 adaptor 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**

- Connect a temperature sensor (E) directly to the M540 Temp/Aux connector (A).
Connecting the temperature sensors to the haemodynamic pods

You can connect a single-temperature sensor to the following devices:

- Hemo4 pod
- Hemo2 pod
- MPod – QuadHemo

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 (B) of the MPod – QuadHemo and to the gray haemo connector on the M540 (see page 235).

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.

2. Connect the connection cable to the monitor connector (F) of the Hemo2 pod/Hemo4 pod and to the gray haemo connector on the M540 (see page 235).
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 238).

When the dual-temperature cable is connected, the parameter box displays either the corresponding temperature values (for example, Ta and Tb) or one direct and one calculated delta value (for example, Ta 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 labelled T1a, T1b, and $\Delta T1$. Any temperature values originating from a single- or dual-temperature cable, that is connected to the M540 temperature connector, are labelled Ta, Tb, 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

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 50.

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 369.
Temperature

Accessing the temperature settings

- Select the temperature parameter box to select the Temp. page directly.
  or
1. 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 dialogue 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 98.

Temperature parameter setup functions

All temperature setup functions take place in the Temp./Temp. 1 pages (see page 238).

<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></td>
<td>- Ta - ΔT (T1a - ΔT1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Tb - ΔT (T1b - ΔT1)</td>
<td></td>
</tr>
<tr>
<td>NOTE</td>
<td>This setting is not part of a profile and does not change when you select another profile.</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue, purple, orange, white (default)</td>
<td>Determines the colour of the parameter labels and values.</td>
</tr>
</tbody>
</table>
Non-invasive blood pressure (NIBP)

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Overview of NIBP 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 Sphygmomanometers (AAMI/ANSI SP-10).

NIBP measurements are for adult, paediatric 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 paediatric mode
- A measurement exceeds 90 seconds in neonatal mode

NOTE
The NIBP functionality should be calibrated every two years by technically qualified personnel as described in the Service manual.

Refer to the Infinity Acute Care System–Infinity M540 Instructions for Use for a detailed description of the M540 NIBP functions.

The NIBP monitoring functions are configurable in the parameter-specific setup page (see page 248).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. Parameter-specific error messages are listed on page 387.

Supported parameters
- NIBP S – non-invasive pressure, systolic value
- NIBP D – non-invasive pressure, diastolic value
- NIBP M – non-invasive pressure, mean value

NIBP precautions

WARNING
Rapid, prolonged cycling of non-invasive pressure measurements have on occasion been associated with petechia, ischaemia, 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.
Non-invasive blood pressure (NIBP)

**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 NIBP 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 paediatric patient category, if not already selected. This provides the appropriate inflation for neonates, infants, and paediatric 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 artefacts
- tremor artefacts
- respiratory artefacts

**NOTE**
A systolic blood pressure higher than the current high inflation limit may trigger a message that the NIBP inflation limit is low. When this message appears, manually check the blood pressure of the patient.
Connecting the NIBP hose and cuff

The NIBP hose connects directly to the M540.

To connect the NIBP hose and cuff

1 Select a NIBP cuff size that is appropriate for the patient.
2 Connect the NIBP cuff tubing (C) to the hose (B).
3 Connect the NIBP hose (B) to the NIBP connector (A) of the M540.

Patient preparation for NIBP monitoring

The following tips provide optimal NIBP monitoring results, but must never replace hospital-approved practices or manufacturer’s recommendations.

Accurate NIBP 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.
Non-invasive blood pressure (NIBP)

Applying the NIBP cuff

Weak or irregular pulses, patient movement, tremors, or respiratory artefacts can affect the accuracy of NIBP measurements and even cause them to fail. Before applying the cuff, read the NIBP 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 NIBP 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 with the “this side to patient” label 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 snugly around the limb without impeding the blood flow.

A  Index line
B  Artery marker
C  Range labels
D  Size indicator
Non-invasive blood pressure (NIBP)

NIBP display

On the Cockpit, the NIBP 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 artefacts, 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 NIBP parameter box of the Cockpit.

If you cannot apply the cuff at heart level, adjust the displayed systolic and diastolic NIBP 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.

NIBP 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 50.

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 369.

The appearance of NIBP parameter boxes also depends on the selected NIBP mode.

Continuous NIBP mode

The following diagram shows a parameter box when the continuous NIBP mode is selected (see page 247).

![Continuous NIBP mode diagram](image)

- **A**: NIBP parameter label
- **B**: Unit of measure (can be activated/deactivated)
- **C**: Time since last NIBP measurement
- **D**: Mean pressure value
- **E**: Alarm limits or crossed-triangle symbols when alarms are deactivated
- **F**: Time remaining before the continuous mode is terminated
- **G**: Label **Cont. mode**
- **H**: Units of measure
- **I**: Inflation pressure value
- **J**: Label **Inflation pressure**
- **K**: Systolic/diastolic pressure value
Non-invasive blood pressure (NIBP)

Interval NIBP mode

The following diagram shows a parameter box when the interval NIBP mode is selected (see page 247 for more information).

A NIBP parameter label
B Unit of measure (can be activated/deactivated)
C Time since last NIBP measurement
D Last mean pressure value
E Alarm limits or crossed-triangle symbols when alarms are deactivated
F Selected inflation interval (see page 248)
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 values

NIBP measurement modes

WARNING
Press the NIBP start/stop fixed key to deflate the cuff rapidly if an adverse effect occurs on the patient.

The following NIBP measurement modes are available:
- Single
- Interval
- Continuous

The selected mode affects the appearance of the NIBP parameter box (see page 244).

Before taking any NIBP measurements, read the precautions on page 240.

At the beginning of a measurement, the M540 inflates the cuff to a pressure that is 25 mmHg (3.3 kPa) in adult/paediatric 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.

The last NIBP 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 248).
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 NIBP 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

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.
- When continuous mode is activated.

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 NIBP measurement is cancelled 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 NIBP 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 NIBP measurements occur intermittently, a patient’s condition may change between measurements. Therefore, do not rely on NIBP alarms alone to notify you of a patient’s changing condition.

In the 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.
To activate or deactivate interval mode

- Select the NIBP 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, 1, 2, 2.5, 3, 5, 10, 15, 20, 30, 45, 60, 120, 240 min.

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).

To stop the interval measurements

- Press the NIBP start/stop button on the main-menu bar of the Cockpit.
  
  or

- Press the NIBP key on the front of the M540

Continuous measurements

**WARNING**
When using the continuous mode, observe the patient closely and verify the limb perfusion clinically. Be extra-vigilant when using the continuous mode on neonates or haemodynamically 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 NIBP 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 NIBP mode prevents you from enabling venous stasis.

To stop the continuous measurements

- Press the NIBP start/stop button on the main-menu bar.
  
  or

- Deactivate Continuous mode in the NIBP page (see page 249).
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 NIBP measurement takes (approximately 2 minutes for adults and approximately 1 minute for neonates).

**To activate or deactivate venous stasis**

1. Select the NIBP 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 NIBP continuous mode is not activated (see page 249).
5. Select On next to Venous stasis.

**NOTE**

When the venous stasis mode begins, an attention tone sounds.

During active venous stasis, the NIBP 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 244).

The interval measurements are suspended during venous stasis but resume immediately after the cuff deflates.

Activating or deactivating venous stasis

**NOTE**

Make sure continuous NIBP mode is not enabled (see page 248) because it prevents you from using venous stasis mode.

Accessing the NIBP settings

- Select the NIBP 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 dialogue 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 98.
Non-invasive blood pressure (NIBP)

NIBP parameter setup functions

All NIBP setup functions take place in the NIBP page (see page 248).

<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 NIBP measurements.</td>
</tr>
<tr>
<td>Inflation mode</td>
<td>Adult (default), Pediatric, Neonate</td>
<td>Sets the threshold for maximum cuff inflation.</td>
</tr>
<tr>
<td>Continuous mode</td>
<td>On, Off (default)</td>
<td>Initiates successive NIBP 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 NIBP measurement.</td>
</tr>
<tr>
<td>Venous stasis</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 colour of the parameter labels and values.</td>
</tr>
</tbody>
</table>
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Invasive blood pressure (IBP)

Overview of IBP 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 the invasive pressure. Monitoring more than two pressures simultaneously requires the Multi-IBP option.

IBP measurements are for adult, paediatric and neonatal patients.

Refer to the Infinity Acute Care System– Infinity M540 Instructions for Use for a detailed description of the M540 IBP functions.

The IBP monitoring functions are configurable in the parameter-specific setup page (see “IBP parameter setup functions” on page 267).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. Parameter-specific error messages are listed on page 391.

Supported parameters

See page 259 for available IBP pressure labels.

- Systolic pressures: GP1 S to GP4 S, ART S, PA S, LV D, RV S
- Diastolic pressures: GP1 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.

IBP pods

IBP signals originate from the following haemodynamic 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 B C

D

E E E E

NOTE

The connectors for temperature and cardiac output are located on the side panel of the haemodynamic pod.
Invasive blood pressure (IBP)

Hemo2 pod
This pod measures up to four pressures, cardiac output, and temperature.

MPod – QuadHemo
This pod measures up to four pressures, cardiac output, and temperature.

A SmartZero key for zeroing all pressures simultaneously (see page 261)
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 haemodynamic pod.
**Invasive blood pressure (IBP)**

**Dual Hemo MCable**

The Dual Hemo MCable measures up to two pressures.

![Diagram of Dual Hemo MCable](image)

**A** Dual Hemo MCable connector that connects to the M540

**B** Transducer adapter cables for attaching the transducers

---

**IBP precautions**

**WARNING**
To prevent patient injury, never reuse a single-use transducer.

**WARNING**
Do not use the SmartZero function if any pressure waveform is flat (nearly static).

There are additional warnings regarding the pulmonary wedge pressure on page 263.
Connecting the Hemo4 pod and Hemo2 pod

The Hemo4 pod and Hemo2 pod connect directly to the M540. The following diagram shows where the grey Haemo connector (A) is located on the side of the M540.

To connect the Hemo4 pod and Hemo2 pod

1. Attach the IBP 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 grey Haemo 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 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 grey Haemo connector of the M540 (A).

3. Insert the transducers into the transducer slot (D).

4. Connect the transducer cables (F) to the transducer adaptor cable (G).

The transducer adaptor cables are permanently fastened to the back of the MPod – QuadHemo.
Connecting the Dual Hemo MCable

The Dual Hemo MCable connects directly to the M540.

To connect the Dual Hemo MCable

1 Attach the transducers (D) to the transducer adaptor cables (C).
   The transducer adaptor cables are permanently fastened to the Dual Hemo MCable.

2 Connect the Dual Hemo MCable connector (B) to the grey Haemo connector (A) on the M540.

Patient preparation for IBP 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 IBP 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 the high-pressure tubing. Shorter tubing reduces signal attenuation but is more susceptible to motion artefacts. High-pressure tubing limits signal dampening.
Invasive blood pressure (IBP)

IBP display

On the Cockpit, the IBP display consists of:
- IBP parameter box
- IBP waveform

IBP 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 50.

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 369.

The content of the IBP 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).

The IBP 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 IBP mean value can either be displayed in regular or large font size.

To activate the large mean value display

- Select the IBP parameter box to select the IBP page directly.
  or
- 1 Select Sensor parameters... from the main-menu bar.
- 2 Select the desired IBP tab (for example, GP1) along the right side of the IBP page.
- 3 Select On next to Large mean.
IBP waveforms

IBP 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 IBP waveform, a corresponding parameter box is displayed. To activate the overlap display for adjacent pressure waveforms, see page 321 in the “System configuration” chapter.

Labelling IBP pressure channels

The IBP 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 labelling 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 IBP 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 (labelled 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 260).

NOTE

If the Cockpit displays the generic pressure labels (GP1, GP2, GP3, GP4), the displays on the Hemo2 and Hemo4 pods are labelled 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.
Standard labels

The M540 detects the labels automatically from the haemodynamic 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 IBP labels.

<table>
<thead>
<tr>
<th>Label</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>Mean</td>
<td></td>
</tr>
<tr>
<td>CPP</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>
</tbody>
</table>

Generic Labels

GP1 to GP4 Systolic, diastolic, mean

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 haemodynamic 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 IBP transducer

To establish accurate IBP 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 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 IBP 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 319), 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 Infinity Acute Care System– Infinity M540 Instructions for Use for details).

To zero a specific transducer

1. Select the IBP parameter box to select the IBP page directly.
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 (SmartZero)

This procedure zeroes all pressure transducers simultaneously.

You can perform a SmartZero from the Hemo4 pod, Hemo2 pod, and the MPod – QuadHemo which allows you to zero all transducers open to air simultaneously.

**WARNING**
Do not use the SmartZero function if any pressure waveform is flat (nearly static).

To zero all pressure transducers from the haemodynamic 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 SmartZero button (A) on the Hemo4 pod, Hemo2 pod, or the MPod – QuadHemo.
4. Verify that the transducers have been zeroed. If zeroing failed, repeat steps two and three.
Invasive blood pressure (IBP)

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 Sensor parameters... > Zero all buttons on the main-menu bar (C700).
   or
   Select the symbol next to the Sensor parameters... button on the main-menu bar (C500).
   or
   Select the IBP parameter box to access the IBP page.
4. Select the Zero button.
5. Verify that the transducers have been zeroed. If zeroing failed, repeat the procedure.

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 265). 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 haemorrhage or infarction.

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.

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 clinical guidelines to correct the catheter’s position.
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 265):
   – 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 319). 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.

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.

A Prepare wedge button  
B Start wedge button  
C Freeze/ Adjust button  
D Save wedge button  
E Cancel wedge button  
F The message field  
G PWP value  
H PWP results window  
I Scale button  
J Sweep speed [mm/s] button  
K Reference waveform button

To start a wedge measurement

- Select the PA parameter box (if displayed) > select the Start wedge button.
  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.
Invasive blood pressure (IBP)

6 Use the **Sweep speed [mm/s]** (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 319). Also, the message **Deflate balloon and press “Save wedge” to finish** appears in the message field (F).

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 Resp 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.

Accessing the IBP 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 dialogue window: >> symbol and the display filter Ω 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 98.
## IBP parameter setup functions

All IBP setup functions take place in the **IBP** page (see page 266).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>Not applicable</td>
<td>Zeroes only the pressure indicated on the IBP page and displays the time and date of the last zeroing (see page 261).</td>
</tr>
</tbody>
</table>

### Label

Selections: *ART, PA, CVP, LA, LV, RV, RA, ICP, GP1 to GP4.*

The defaults are as follows:
- Channel 1: GP1
- Channel 2: GP2
- Channel 3: GP3
- Channel 4: GP4

Allows you to assign a label to each pressure channel.

### Scale

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td>5, 10, 15, 20, 25, 30, 35, 40, 50, 75, 100, 125, 150, 175, 200, 225, 250, 300 mmHg</td>
<td>Controls the upper scale of the pressure waveform.</td>
</tr>
</tbody>
</table>
- 1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24, 30, 32, 36, 40 mmHg for adults
- GP1 to 4, ART, LV: 200 mmHg (30 kPa) for adults
- 150 mmHg (20 kPa) for paediatrics
- 100 mmHg (16 kPa) for neonates
- PA, RV: 50 mmHg (12 kPa)
- ICP, CVP, LA, RA: 20 mmHg (4 kPa)

The lower scale value is either −5 mmHg (−0.7 kPa) for pressures labelled CVP, RA, LA or 0 mmHg (0 kPa) for other pressure labels.

### Filter [Hz]

Selections: 8 Hz and 16 Hz (default)

Selects the filter setting applied to the IBP signal.

### Large mean

Selections: *On, Off* (default)

Determines whether the mean IBP value appears in large or normal font.
Invasive blood pressure (IBP)

The various IBP parameters have the following defaults:
- ART, GP1 to GP 4 = red
- PA = yellow
- CVP = blue
- ICP, LA = purple
- RA, RV = orange
- LV = yellow

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Red, green, blue, yellow, light blue, purple, orange, white.</td>
<td>Determines the colour of the waveforms, parameter labels, and values.</td>
</tr>
<tr>
<td>Min. scale</td>
<td>On, Off (default)</td>
<td>Allows you to select the minimum scale. When this function is activated, the following happens:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The lower value is set at -25 mmHg (-3 kPa)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The higher value is set at 25 mmHg (3 kPa)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The Scale selection appears ghosted</td>
</tr>
<tr>
<td>Start wedge</td>
<td>Not applicable</td>
<td>Allows you to start a wedge pressure measurement (see page 263).</td>
</tr>
</tbody>
</table>
# Cardiac output (C.O.)

Overview of cardiac output (C.O.) monitoring ................................................. 270
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Overview of cardiac output (C.O.) monitoring

The M540 uses the thermodilution method to compute cardiac output (C.O.) for adult and paediatric patients. C.O. 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 C.O. value.

Although the M540 processes the C.O. algorithms, you can only view the data and execute C.O. functions on the Cockpit.

C.O. measurement method

A solution of known temperature and volume is injected into the bloodstream 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 C.O. of the patient. The lower the C.O. value, the more the injectate cools the blood.

When computing C.O., 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 fluid
- Temperature changes of the blood injectate mixture
- Area under the temperature curve

The M540 supports the automatic and manual measuring modes. The C.O. monitoring functions are configurable in the parameter-specific setup page and the Procedures > C.O. page (see page 281).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. Parameter-specific error messages are listed on page 391.

Supported parameters
- C.O. – Cardiac output
- Tblood – blood temperature
- Tinj – injectate temperature

C.O. Precautions

WARNING
An incorrect computation constant may yield incorrect C.O. 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 ‘admission’ weight). Failure to enter an accurate weight value can result in inaccurate calculations and put the patient at risk.
Connecting the C.O. hardware

You can connect the haemodynamic cable to one of the following devices:
- MPod – QuadHemo
- Hemo4
- Hemo2

The intermediate cable from the listed devices connect directly to the M540.

**To connect the C.O. hardware to the MPod – QuadHemo**

1. Connect the haemodynamic intermediate cable connector (B) to the grey haemodynamic connector (A) of the M540.
2. Connect the other end of the haemodynamic intermediate cable (C) to the MPod – QuadHemo connector (D).
3. Connect the C.O. intermediate cable connector (E) to the C.O. connector of the MPod – QuadHemo (F).
4. Connect the catheter and the thermistor cables (H) to the C.O. intermediate cable connectors (G).
To connect the C.O. hardware to the Hemo4 and the Hemo2

1. Connect the haemodynamic intermediate cable connector (B) to the haemodynamic connector (A) of the M540.
2. Connect the other end of the haemodynamic intermediate cable (C) to the Hemo4/Hemo2 connector (D).
3. Connect the C.O. intermediate cable connector (F) to the C.O. connector of the Hemo4/Hemo2 (E).
4. Connect the catheter and the thermistor cables (H) to the C.O. intermediate cable connector (G).
Patient preparation for C.O. monitoring

The following tips provide optimal C.O. 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 paediatric 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 C.O. 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.
Cardiac output (C.O.)

C.O. display

On the Cockpit, the C.O. 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 50.

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 369.

The C.O. parameter box contains the following elements:

- **A** C.O. label
- **B** Time stamp of the last saved C.O. average (this area is blank if no measurements have been taken over the past 24 hours)
- **C** Blood temperature label
- **D** Blood temperature (Tblood) value – acquired from the haemodynamic 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 C.O. value – average of a series of saved measurements
C.O. computation constant

WARNING
An incorrect computation constant may yield incorrect C.O. 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 C.O. 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 282), 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 282), otherwise the button Comp. constant is not available on the Procedures... > C.O. page.

1. Access the C.O. page (see page 282) or Access the Procedures... > C.O. page (see page 281).
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 276).
4. Select Enter on the keypad to confirm the value.
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>$T_{inj} = -5$ to $+16 , ^\circ C$ (23 to 61 $^\circ F$)</th>
<th>$T_{inj} = 16$ to $25 , ^\circ C$ (61 to 80 $^\circ F$)</th>
<th>$T_{inj} = 20 , ^\circ C$ (32 $^\circ F$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7F</td>
<td>10 cc</td>
<td>0.561</td>
<td>0.608</td>
<td>0.542</td>
</tr>
<tr>
<td>7F</td>
<td>5 cc</td>
<td>0.259</td>
<td>0.301</td>
<td>0.247</td>
</tr>
<tr>
<td>7.5F</td>
<td>10 cc</td>
<td>0.574</td>
<td>0.595</td>
<td>0.564</td>
</tr>
<tr>
<td>7.5F</td>
<td>5 cc</td>
<td>0.287</td>
<td>0.298</td>
<td>0.257</td>
</tr>
<tr>
<td>7F</td>
<td>5 cc</td>
<td>0.285</td>
<td>0.307</td>
<td>0.270</td>
</tr>
</tbody>
</table>

### BD/Ohmeda computation constants

<table>
<thead>
<tr>
<th>Catheter Size</th>
<th>Injectate Volume</th>
<th>$T_{inj} = -5$ to $+16 , ^\circ C$ (23 to 61 $^\circ F$)</th>
<th>$T_{inj} = 16$ to $25 , ^\circ C$ (61 to 80 $^\circ F$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5F</td>
<td>10 cc</td>
<td>0.579</td>
<td>0.628</td>
</tr>
<tr>
<td>7.5F</td>
<td>5 cc</td>
<td>0.281</td>
<td>0.309</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.)

C.O. measuring modes

Two C.O. measuring modes are available: automatic and manual. If unstable blood temperatures, artefact, or other conditions are preventing automatic measurements, switch to manual mode.

If the attention tone is not deactivated (see page 319), a tone sounds when the C.O. 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 C.O. mode, see page 282.

<table>
<thead>
<tr>
<th>Catheter size</th>
<th>Injectate volume</th>
<th>Tinj = −5 °C to 23.9 °C (23 °F to 75 °F)</th>
<th>Tinj ≥= 24 °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 the auto mode

1 Press the C.O. start key (A) on the MPod – QuadHemo or the Hemo4/Hemo2.

or

Select the Start C.O. button on the Procedures... > C.O. page (see page 281).

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 cancelled 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 281) stores up to five C.O. 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 C.O. average, see page 280.
Manual measurements

If automatic measurements are not possible due to unstable blood temperatures or other causes, switch to the manual mode. To select manual C.O. mode, see page 283.

To start a measurement in the manual mode

- Press the C.O. Start key (A) on the MPod – QuadHemo or the Hemo4/Hemo2 pods.

or

1 Select Procedures... from the main-menu bar.
2 Select the C.O. tab to access the Procedures... > C.O. page.
3 Select the Start C.O. button on the Cockpit. Inject the saline solution immediately.
4 Repeat steps 1 and 2 for additional measurements.

The Procedures... > C.O. page (see page 281) stores up to five C.O. 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 reappears and will be included in the average.

To save the C.O. average, see page 280.
Saving the C.O. value

After completing a measurement, you can store the C.O. average. Closing the Procedures... > C.O. page without saving the C.O. value(s) causes any unsaved values to be lost.

To save the C.O. 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 C.O. value and the time stamp are stored in the trend function and the parameter box.
Reviewing the C.O. averages

Different injection techniques cause variations in C.O. measurements. To compensate for such discrepancies, you can review up to five measurements and use them to compute a C.O. average. The following diagram shows the Procedures > C.O. page after computing an average.

A  Start C.O. button (only available in manual mode – see page 279)
B  Save C.O. average button
C  Most recent C.O. average
D  Blood and injectate temperature value fields
E  Curve field
F  Up to five C.O. 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 282), 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 C.O. settings

- Select the C.O. 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 dialogue 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 98.

C.O. parameter setup functions

All C.O. 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>– BD/Ohmeda (default)</td>
<td>Displays the currently selected catheter type.</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>
</tbody>
</table>

**NOTE**
If Other is selected for Catheter type setting, this button is not available.

| Injectate volume [cc] | 3.0, 5.0, or 10.0 (default) | Displays the currently selected volume of the injectate. |

**NOTE**
If Other is selected for Catheter type setting, this button is not available.
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 282). The computation constant depends on the injectate volume and temperature according to the specific values provided by the catheter.</td>
</tr>
<tr>
<td>This selection only appears if the Catheter type Other was selected.</td>
<td>– 0.542 (default)</td>
<td></td>
</tr>
<tr>
<td>C.O. mode</td>
<td>Auto (default), Manual</td>
<td>Determines the C.O. measurement mode (see page 277).</td>
</tr>
<tr>
<td>Start C.O.</td>
<td>Not applicable</td>
<td>Starts C.O. measurement (see page 277).</td>
</tr>
<tr>
<td>Color</td>
<td>White (default); there is no colour selection for C.O.</td>
<td>Determines the colour of the curves, parameter labels, and values.</td>
</tr>
</tbody>
</table>
Carbon dioxide concentrations (CO2)

Overview of CO2 monitoring ............ 286
Supported parameters .................. 286
CO2 precautions ....................... 287
Connecting the CO2 sensor ............. 288
Patient preparation for CO2 monitoring . 289
CO2 display ......................... 290
CO2 parameter box .................... 290
Capnogrammes ....................... 291
Troubleshooting ..................... 291
Accessing the CO2 settings .......... 293
CO2 parameter setup functions ....... 293
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 and paediatric patients.

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.

Refer to the *Infinity Acute Care System– Infinity M540 Instructions for Use* 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 9. Parameter-specific error messages are listed on page 398.

Supported parameters

- \( \text{etCO₂} \) – end-tidal CO₂
- \( \text{inCO₂} \) – inspired CO₂
- \( \text{RRc} \) – respiration rate calculated from the capnogramme
CO2 precautions

Refer to “Site of operation” on page 14 for general precautions.

**WARNING**

RRC apnoea alarms are NOT reported if the setting **RRC apnea time [s]** is set to **Off** in the CO2 setup page and the RRC alarm feature is deactivated. To generate RRC apnoea alarms, activate the RRC alarms and select a RRC apnoea time.

**WARNING**

The safety and effectiveness of the respiration measurement method in the detection of apnoea, particularly the apnoea of prematurity and apnoea of infancy, have not been established.

**WARNING**

Patient monitors that measure CO2, anaesthetic agents, and/or respiratory mechanics are not intended to be used as an apnoea monitor and/or recording device. While these products provide an apnoea alarm, that alarm condition is initiated based on the elapsed time since the last breath was detected. The clinical diagnosis of a true apnoeic event, however, requires multiple physiological signals.

**WARNING**

CO2 alarms do not activate until the first breath is detected after turning on the monitor or discharging a patient.

**WARNING**

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.

**CAUTION**

Leaks in the breathing circuit (for example, an uncuffed endotracheal tube or a damaged airway adaptor) may significantly affect CO2 measurement values.

**CAUTION**

To avoid accidental disconnections, do not apply excessive tension to any sensor cable.

**CAUTION**

To prevent leakage, make sure the airway adaptor is firmly connected to the breathing circuit.

**CAUTION**

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.

**NOTE**

Dräger CO2 accessories that come in contact with the patient do not contain latex.
Connecting the CO2 sensor

Before you connect any CO2 hardware, make sure the airway adapter in use matches the airway adapter setting of the Cockpit (see page 338). For example, you should not use a disposable airway adaptor if the Cockpit is configured for a reusable airway adaptor (and vice versa). Not aligning the adaptor with the configuration setting at the Cockpit compromises the displayed CO2 value.

To connect the CO2 hardware

The IACS is only compatible with the CO2 sensors 6871950 revision 5 or higher. Previous revisions are not compatible.

1. Connect the end of the CO2 sensor cable (B) to the yellow CO2 connector (A) on the M540.

2. Insert the airway adaptor (E) between the endotrachael tube adaptor (F) and the ventilator Y-piece (D).

3. Snap the CO2 mainstream sensor (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.
Carbon dioxide concentrations (CO2)

**Patient preparation for CO2 monitoring**

The following tips provide optimal CO2 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 CO2 measurement values.

When you switch adapter types (from reusable to disposable or adult to paediatric, or vice versa) you do not have to rezero a Dräger sensor. If the sensor window is clean and the correct sensor type is selected under the **Airway adapter Biomed setting**, you should only zero a Dräger sensor when the measurement value is suspect or when you are prompted to rezero.
Carbon dioxide concentrations (CO2)

CO2 display

On the Cockpit, the CO2 display consists of:
- A CO2 parameter box
- A CO2 waveform (capnogramme)

CO2 parameter box

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

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 50.

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 369.
**Carbon dioxide concentrations (CO₂)**

**Capnograms**

The Cockpit also displays an instantaneous CO₂ waveform or capnogramme.

![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, capnogrammes can help troubleshoot problems with the equipment.

The following table shows how capnogrammes can be used to identify common problems.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cause</th>
<th>Capnogramme</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] |
Carbon dioxide concentrations (CO₂)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cause</th>
<th>Capnogramme</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="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Disposable airway adaptor is used although the Cockpit is configured for the reusable adaptor type</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Contaminated airway adaptor (dirty window)</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– CO₂ Zero drift</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Insufficient expiratory time</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Faulty expiratory valve</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Inadequate inspiratory flow</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Malfunction of a CO₂ absorber system</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Partial rebreathing circuits</td>
<td><img src="image" alt="Capnogramme" /></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="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Partial obstruction in the expiratory limb of the breathing circuit</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Foreign body in the upper airway</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Partially kinked or occluded artificial airway</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Herniated endotracheal or tracheostomy tube cuff</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Bronchospasm</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td>Elevated baseline, with a pronounced slope on the descending limb</td>
<td>Faulty ventilator circuit valve</td>
<td><img src="image" alt="Capnogramme" /></td>
</tr>
<tr>
<td></td>
<td>– Rebreathing (see above)</td>
<td><img src="image" alt="Capnogramme" /></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 dialogue 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 98.

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 adaptor that is used, matches the airway adaptor setting at the Cockpit (see page 338).

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>Not applicable</td>
<td>Zero’s the CO2 sensor, if necessary. The CO2 sensor stores a new zero point for CO2 measurements.</td>
</tr>
<tr>
<td>(only available if a CO2 device is connected)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale</td>
<td>0 to 40 mmHg (default), 0 to 60 mmHg, 0 to 80 mmHg, 0 to 100 mmHg</td>
<td>Adjusts the size of the CO2 waveform.</td>
</tr>
<tr>
<td></td>
<td>0 to 5 kPa (default), 0 to 8 kPa, 0 to 12 kPa, 0 to 16 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>
</tbody>
</table>

NOTE
The sensor must be removed from the airway adaptor before zeroing. The sensor is zeroed in room air. Do not breathe on the airway adaptor during zeroing.
**Selection** | **Available settings** | **Description**
---|---|---
Atm. pressure | 570 to 800 mmHg, Default: 760 mmHg | Determines the atmospheric pressure setting of the sensor and compensates for pressure effects. Failure to compensate for pressure can cause inaccurate measurements.  
**Gas compensation** | **Air** (default), **N2O/O2, O2>50%, HeliOx** | Compensates for supplemental oxygen, N2O or Heliox. Failure to compensate for supplemental oxygen can cause inaccurate measurements.  
RRc apnea time [s] | **Off** (default), 10, 15, 20, 25, 30 s | Specifies the time the M540 waits before reporting a cessation of breathing as an apnoea event.  
Apnea archive | **Off, Record, Store** (default), **Str./Rec.** | Determines what happens in response to an apnoea.  
Color | Red, green, blue, yellow (default), light blue, purple, orange, white. | Determines the colour of the waveforms and parameter labels/values.
## External device – continuous cardiac output (CCO)

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- **Supported parameters** ................. 297
- **CCO precautions** ....................... 298
- **CCO/SpO2 Display** .................... 299
- **CCO/SpO2 parameter box** ............. 299
- **Viewing the CCO/SpO2 parameters** ........ 299
- **Accessing the CCO/SpO2 settings** ........ 300
- **SpO2 parameter setup functions** ........ 300
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:

- Edwards Vigilance II SpO₂/CCO (all software versions)
- Edwards Vigileo SpO₂/CCO (all software versions)

The CCO monitoring functions are configurable in the parameter-specific setup page (see page 300).

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9.

External device alarms

If the external device alarm feature is activated at the Cockpit (see page 330) 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.
### 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous oxygen saturation</td>
<td>SpO2</td>
<td>%</td>
</tr>
<tr>
<td>Blood temperature</td>
<td>Tblood</td>
<td>°C</td>
</tr>
<tr>
<td>Continuous cardiac output</td>
<td>CCO</td>
<td>L/min</td>
</tr>
<tr>
<td>Continuous cardiac index (1)</td>
<td>CCI</td>
<td>L/min/m²</td>
</tr>
<tr>
<td>Oxygen consumption</td>
<td>VO₂</td>
<td>mL/min</td>
</tr>
<tr>
<td>Oxygen delivery</td>
<td>DO₂</td>
<td>mL/min</td>
</tr>
<tr>
<td>Arterial oxygen saturation</td>
<td>SaO₂</td>
<td>%</td>
</tr>
<tr>
<td>Systemic vascular resistance</td>
<td>SVR</td>
<td>dyn x s/cm⁵</td>
</tr>
<tr>
<td>Systemic vascular resistance index (1, 2)</td>
<td>SVRI</td>
<td>dyn x s/cm⁵/m²</td>
</tr>
<tr>
<td>End diastolic volume</td>
<td>EDV</td>
<td>mL</td>
</tr>
<tr>
<td>End diastolic volume index (1)</td>
<td>EDVI</td>
<td>mL/m²</td>
</tr>
<tr>
<td>End systolic volume</td>
<td>ESV</td>
<td>mL</td>
</tr>
<tr>
<td>End systolic volume index (1)</td>
<td>ESVI</td>
<td>mL/m²</td>
</tr>
<tr>
<td>Ejection fraction</td>
<td>EF</td>
<td>%</td>
</tr>
<tr>
<td>Stroke volume (3)</td>
<td>SV</td>
<td>mL</td>
</tr>
<tr>
<td>Stroke volume index (1)</td>
<td>SVI</td>
<td>mL/m²</td>
</tr>
<tr>
<td>Stroke volume variation (1)</td>
<td>SVV (only supported by Edwards Vigileo)</td>
<td>%</td>
</tr>
</tbody>
</table>

**NOTE**

1) Indexed parameters require the height and weight value from Cockpit.

2) The calculated value at the Cockpit requires the values for ART M and CVP from the Cockpit.

3) This is a calculated value at the Cockpit.
External device – continuous cardiac output (CCO)

**CCO precautions**

<table>
<thead>
<tr>
<th>WARNING</th>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 enclosure is not electrically isolated from the peripheral device itself.</td>
<td>Always refer to the primary data source before making diagnostic or therapeutic decisions. Because the peripheral device can display data from a wide variety of sources, including external devices, and because validity and plausibility checks of external devices cannot be performed, Dräger does not guarantee the accuracy or integrity of data originating from these sources. 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 the Electrical Safety section of these Instructions for Use for information on how to connect devices safely.</td>
</tr>
<tr>
<td>The Cockpit does not enunciate alarms for external device parameters.</td>
<td></td>
</tr>
</tbody>
</table>

**Instructions for Use Infinity Acute Care System – Monitoring Applications SW VG2**
CCO/SpO2 Display

On the Cockpit, the CCO/SpO2 display consists of a parameter box.

CCO/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 50.

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 369.

The CCO/SpO2 parameter box contains the following elements:

- A Primary parameter label
- B Second parameter label
- C Second parameter value
- D Third parameter label
- E Third parameter value
- F Primary parameter value

Viewing the CCO/SpO2 parameters

The *Show all* page displays the values of the currently monitored CCO/SpO2 parameters.

To access the CCO/SpO2 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 dialogue 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.
Accessing the CCO/SpO₂ 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 dialogue window: >> symbol and the display filter button.

---

**SpO₂ parameter setup functions**

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter 1</strong></td>
<td>SvO₂ (default), Tblood, CCO, CCI, VO₂, DO₂, SaO₂, SVR, SVRI, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV</td>
<td>Selects the primary parameter in the CCO parameter box.</td>
</tr>
<tr>
<td><strong>Parameter 2</strong></td>
<td>SvO₂, Tblood, CCO (default), CCI, VO₂, DO₂, SaO₂, SVR, SVRI, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV</td>
<td>Selects the second parameter in the CCO parameter box.</td>
</tr>
<tr>
<td><strong>Parameter 3</strong></td>
<td>SvO₂, Tblood, CCO, CCI, VO₂, DO₂, SaO₂, SVR (default), SVRI, EDV, EDVI, ESV, ESVI, EF, SV, SVI, SVV</td>
<td>Selects the third parameter in the CCO parameter box.</td>
</tr>
</tbody>
</table>
### External device – ventilation / anaesthesia

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Overview of ventilation monitoring

The device connectivity option enables the Cockpit to do the following:

- display parameter values, waveforms, and loops from ventilators.
- display parameter values for anaesthesia devices (see page 313 for more details).

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 311).

**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 9. 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 dialogue window.

**Infinity CentralStation – Vent Central option**

Any external-device ventilator parameters displayed at the Cockpit are also broadcast to the Infinity network. If the patient is admitted at the ICS (Infinity CentralStation) and the Vent Central option is available, you can review additional ventilator-related information. For example, you can review the ventilator settings of each parameter and the current ventilation mode. For more detailed information, refer to the Infinity CentralStation Instructions for Use.

For a list of the supported modes and settings, refer to the Evita Infinity V500 Instructions for Use.

**External device alarms**

Alarms from the ventilator are transmitted to the Infinity network and made available for alarm enunciation at the ICS. For more information, refer to the Infinity CentralStation Instructions for Use.

If the external device alarm feature is activated at the Cockpit (see page 330) 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.
External device – ventilation / anaesthesia

Supported parameters

The following table lists the parameters supported with the device connectivity and the following ventilators:
– Dräger Evita 2D
– Dräger Evita XL
– Dräger Evita 4
– Maquet SERVO-i

The ventilator in use determines which of these parameters are available on the Cockpit and the network. You can review the settings for all ventilator parameters at the ICS (they are not displayed at the Cockpit). The ventilators provide the range and resolution for all parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-tidal CO2</td>
<td>etCO2</td>
<td>mmHg, kPa, %</td>
</tr>
<tr>
<td>Minimum airway pressure</td>
<td>PAW min</td>
<td>mbar</td>
</tr>
<tr>
<td>Occlusion pressure</td>
<td>Occlusion pressure</td>
<td>mbar</td>
</tr>
<tr>
<td>Trapped volume</td>
<td>Trapped VOL</td>
<td>mL</td>
</tr>
<tr>
<td>Gas temperature</td>
<td>AW-Temp</td>
<td>°C</td>
</tr>
<tr>
<td>Dead space</td>
<td>TVd aw</td>
<td>mL</td>
</tr>
<tr>
<td>Peak inspiratory pressure</td>
<td>PIP</td>
<td>mbar or cmH2O</td>
</tr>
<tr>
<td>Mean airway pressure</td>
<td>MAP</td>
<td>mbar or cmH2O</td>
</tr>
<tr>
<td>Peak end expiratory airway pressure</td>
<td>PEEP</td>
<td>mbar or cmH2O</td>
</tr>
<tr>
<td>Tidal volume, expiratory</td>
<td>TVE</td>
<td>mL or L</td>
</tr>
<tr>
<td>Minute volume, expired</td>
<td>MVE</td>
<td>L/min</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>RRv</td>
<td>min.</td>
</tr>
<tr>
<td>Inspired O2</td>
<td>inO2 (Cockpit label)</td>
<td>%</td>
</tr>
<tr>
<td>Relative dead space</td>
<td>TVd aw%</td>
<td>%</td>
</tr>
<tr>
<td>Minute volume, expired, spontaneous</td>
<td>MVE s</td>
<td>L/min</td>
</tr>
<tr>
<td>Respiratory rate, spontaneous</td>
<td>RRs</td>
<td>br/m</td>
</tr>
<tr>
<td>Pause pressure</td>
<td>Pause</td>
<td>cmH2O</td>
</tr>
<tr>
<td>Inspiratory:expiratory ratio</td>
<td>I:E</td>
<td>No units</td>
</tr>
<tr>
<td>Inspiratory:expiratory ratio (inspiratory component)</td>
<td>I:E I part</td>
<td>No units</td>
</tr>
</tbody>
</table>

NOTE
1) This parameter is only available on the Infinity network. It is not available on the Cockpit.
2) This parameter is also displayed in the Show all page (see page 310).
**Supported parameters Dräger Evita V500 / Dräger Babylog VN500**

The ventilator in use determines which of these parameters are available on the Cockpit and the network. You can review the settings for all ventilator parameters at the ICS (they are not displayed at the Cockpit). The ventilators provide the range and resolution for all parameters.

- Dräger Evita V500 (V500)
- Dräger Babylog VN500 (VN500)

### Parameter Label Available unit of measure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspiratory:expiratory ratio (expiratory component)</td>
<td>I:E E part</td>
<td>No units</td>
</tr>
<tr>
<td>Dynamic compliance</td>
<td>Cdyn</td>
<td>L/bar</td>
</tr>
<tr>
<td>Resistance</td>
<td>Raw</td>
<td>mbar/L/s</td>
</tr>
<tr>
<td>Tidal volume setting, inspired</td>
<td>TVi set</td>
<td>mL or L</td>
</tr>
<tr>
<td>CO₂ production</td>
<td>VCO₂</td>
<td>mL/min</td>
</tr>
</tbody>
</table>

**NOTE**

2) This parameter is also displayed in the Show all page (see page 310).
### Parameter | Label | Available unit of Measure
--- | --- | ---
Dynamic compliance 2) | $C_{dyn}$ | L/bar
End-tidal CO₂ 2) | $etCO₂$ | mmHg, kPa, %
End-tidal CO₂ in SmartCare | $SC-etCO₂$ (V500 only) | mmHg
Elastance 1) | $E$ | mbar/L
End airway pressure 1) | $EIP$ | mbar
Fractional inspired O₂ | $FiO₂$ | %
Inspiratory/expiratory ratio (inspiratory component) 2) | $I:E \ I \ part$ | No units
Inspiratory/expiratory ratio, spontaneous 1) | $I:Esp\ E-Part$ | No units
Inspiratory/expiratory ratio (expiratory component) 2) | $I:E \ E \ part$ | No units
Inspiratory/expiratory ratio (inspiratory component) 1) | $I:Esp\ I-Part$ | No units
Intrinsic positive end expiratory airway pressure 1) | $PEEPi$ (V500 only) | mbar
Leakage minute volume 1) | $MV_{leak}$ | L/min
Mean airway pressure 2) | $P_{mean}$ | mbar
Mandatory respiratory rate/breathing frequency 1) | $RR_{mand}$ | 1/min
Mandatory tidal volume 1) | $VT_{mand}$ | L
Mandatory inspired tidal volume 1) | $VT_{imand}$ | mL
Mandatory expired tidal volume 1) | $VT_{emand}$ | mL
Minimum airway pressure 2) | $P_{min}$ | mbar
Minute volume 2) | $MV$ | L/min
Minute volume, spontaneous 2) | $MV_{spon}$ | L/min
Minute volume, spontaneous, fractional 1) | % $MV_{spon}$ | %
Negative inspiratory force 1) | $NIF$ (V500 only) | mbar
Occlusion pressure 1) | $P_{0.1}$ (V500 only) | mbar

**NOTE**
1) This parameter is only available on the Infinity network. It is not available on the Cockpit.
2) This parameter is also displayed in the *Show all* page (see page 310).
### Parameter Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plateau pressure 2)</td>
<td>( P_{\text{plat}} ) (V500 only)</td>
<td>mbar</td>
</tr>
<tr>
<td>Peak inspiratory pressure 2)</td>
<td>( P_{\text{IP}} )</td>
<td>mbar</td>
</tr>
<tr>
<td>Positive end-expiratory pressure 2)</td>
<td>( P_{\text{PEEP}} )</td>
<td>mbar</td>
</tr>
<tr>
<td>Upper pressure level during APRV 2)</td>
<td>( P_{\text{high}} )</td>
<td>mbar</td>
</tr>
<tr>
<td>Lower pressure level during APRV 2)</td>
<td>( P_{\text{low}} )</td>
<td>mbar</td>
</tr>
<tr>
<td>Pressure amplitude during HFO 2)</td>
<td>( \Delta P_{\text{HF}} ) (VN500 only)</td>
<td>mbar</td>
</tr>
<tr>
<td>( \Delta P_{\text{Psupp goal}} )</td>
<td>(V500 only)</td>
<td>mbar</td>
</tr>
<tr>
<td>( \Delta P_{\text{Psupp rated}} )</td>
<td>(V500 only)</td>
<td>mbar</td>
</tr>
<tr>
<td>Rapid shallow breathing index 1)</td>
<td>( R_{\text{SB}} )</td>
<td>1/L*min</td>
</tr>
<tr>
<td>Relative dead space 2)</td>
<td>( V_{\text{ds}}/V_{\text{Te}} ) (V500 only)</td>
<td>%</td>
</tr>
<tr>
<td>Leakage 2)</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Resistance 2)</td>
<td>( R )</td>
<td>mbar/L/s</td>
</tr>
<tr>
<td>Respiratory rate, spontaneous 2)</td>
<td>( R_{\text{Rsp}} )</td>
<td>/min</td>
</tr>
<tr>
<td>Spontaneous frequency in SmartCare 1)</td>
<td>( SC-R_{\text{Rsp}} ) (V500 only)</td>
<td>/min</td>
</tr>
<tr>
<td>Spontaneous inspiratory time 1)</td>
<td>( T_{\text{ispon}} )</td>
<td>s</td>
</tr>
<tr>
<td>Spontaneous expired tidal volume 1)</td>
<td>( V_{\text{Tsp}} )</td>
<td>mL</td>
</tr>
<tr>
<td>Spontaneous inspired mean tidal volume 1)</td>
<td>( V_{\text{Tispon mean}} ) (V500 only)</td>
<td>mL</td>
</tr>
<tr>
<td>Spontaneous expired mean tidal volume 1)</td>
<td>( V_{\text{Tispon mean}} ) (V500 only)</td>
<td>mL</td>
</tr>
<tr>
<td>Spontaneous mean tidal volume 1)</td>
<td>( V_{\text{Tispon}} )</td>
<td>mL</td>
</tr>
<tr>
<td>Spontaneous tidal volume, leakage corrected 1)</td>
<td>( V_{\text{Tispon}} )</td>
<td>mL</td>
</tr>
<tr>
<td>Static compliance 1)</td>
<td>( C_{\text{stat}} ) (V500 only)</td>
<td>mL/mbar</td>
</tr>
</tbody>
</table>

**NOTE**

1) This parameter is only available on the Infinity network. It is not available on the Cockpit.
2) This parameter is also displayed in the *Show all* page (see page 310).
### Parameter Label Available unit of Measure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tidal volume, leakage corrected 2)</td>
<td>VT</td>
<td>mL</td>
</tr>
<tr>
<td>Tidal volume, expiratory 2)</td>
<td>VTe</td>
<td>mL</td>
</tr>
<tr>
<td>Tidal volume per kg body weight 1)</td>
<td>VT/Wt</td>
<td>mL/kg</td>
</tr>
<tr>
<td>Tidal volume in SmartCare 1)</td>
<td>SC-VT</td>
<td>mL</td>
</tr>
<tr>
<td>Tidal volume for HFO 2)</td>
<td>VTthf</td>
<td>mL</td>
</tr>
<tr>
<td>Tidal volume, inspired 2)</td>
<td>VTi</td>
<td>mL</td>
</tr>
<tr>
<td>Time constant 1)</td>
<td>TC</td>
<td>s</td>
</tr>
<tr>
<td>Time of low pressure level in APRV 1)</td>
<td>Tlow</td>
<td>s</td>
</tr>
<tr>
<td>Trapped volume 1)</td>
<td>Vtrap</td>
<td>mL</td>
</tr>
</tbody>
</table>

**NOTE**

1) This parameter is only available on the Infinity network. It is not available on the Cockpit.
2) This parameter is also displayed in the *Show all* page (see page 310).
External device – ventilation / anaesthesia

Ventilator precautions

**CAUTION**
Always refer to the primary data source before making diagnostic or therapeutic decisions. Because the peripheral device can display data from a wide variety of sources, including external devices, and because validity and plausibility checks of external devices cannot be performed, Dräger does not guarantee the accuracy or integrity of data originating from these sources.

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 11 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.

Compatible ventilators

The following table lists which software versions are compatible with the current Infinity Acute Care System.

<table>
<thead>
<tr>
<th>Device</th>
<th>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>
<tr>
<td>Maquet SERVO-i</td>
<td>3.2</td>
</tr>
<tr>
<td>Dräger V500</td>
<td>2.20</td>
</tr>
<tr>
<td>Dräger VN500</td>
<td>2.20</td>
</tr>
</tbody>
</table>
Ventilator display

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)

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 50.

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 369.

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 in an anti-clockwise direction, while a spontaneous breath plots in a clockwise direction. Inspiration starts at a point defined by the 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 upwards and clockwise. Expiration plots below the horizontal axis and progresses anti-clockwise to the original starting point.
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 dialogue window:
   - $\gg\gg$ symbol
   - $\mathbb{S}$ display filter button
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 dialogue 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.

Viewing all ventilation parameters

The Show all page displays the values of the currently monitored ventilator parameters.

To access the ventilation show all page

1 Select the Trends/ Data... button on the main-menu bar.
2 Select Trends > Respiratory/ Ventilation > Show all

Accessing the ventilator settings

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 dialogue window: $\gg\gg$ symbol and the display filter $\mathbb{S}$ button.
2 Select either the Paw or the Vent tabs to access the respective pages.
Ventilator Paw setup functions

See page 310 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><em>MAP</em>&lt;sup&gt;1)&lt;/sup&gt;, <em>PEEP</em>, <em>PIP</em> (default)</td>
<td>Selects the primary parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td><em>MAP</em>&lt;sup&gt;1&lt;/sup&gt; (default), <em>PEEP</em>, <em>PIP</em></td>
<td>Selects the second parameter in the Paw parameter box.</td>
</tr>
<tr>
<td>Parameter 3</td>
<td><em>MAP</em>&lt;sup&gt;1&lt;/sup&gt;, <em>PEEP</em> (default), <em>PIP</em></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 colour of all ventilation parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>

**NOTE**

<sup>1</sup> The label *Pmean* replaces the label *MAP* when a V500 or VN500 is connected.
### Ventilator parameter setup functions

See page 310 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 paediatric 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 paediatric and adult mode), 1500 mL</td>
<td>Determines the scale of the displayed Volume waveform.</td>
</tr>
<tr>
<td>Parameter 1</td>
<td>MVe (default), RRv, T Ve (^1)</td>
<td>Selects the primary parameter in the Vent parameter box.</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>MVe, RRv (default), T Ve (^1)</td>
<td>Selects the second parameter in the Vent parameter box.</td>
</tr>
<tr>
<td>Parameter 3</td>
<td>MVe, RRv, T Ve (default) (^1)</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 colour of all ventilation parameter boxes, waveforms, and loops.</td>
</tr>
</tbody>
</table>

**NOTE**

\(^1\) When a V500 or VN500 is connected, the parameter labels change as follows:
- MVe becomes MV
- RRv becomes RR
- T Ve becomes VT e
CO2 parameter setup functions

See page 310 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>CO2 Scale</strong></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><strong>Atm. pressure</strong></td>
<td>570 to 800 mmHg</td>
<td>Determines the atmospheric pressure setting.</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Red, green, blue, yellow (default), light blue, purple, orange, white.</td>
<td>Determines the colour of the CO2 parameter box and waveform.</td>
</tr>
</tbody>
</table>

Overview of anaesthesia monitoring

With the device connectivity option the Cockpit can display parameter values from standalone Perseus A500 (A500) anaesthesia devices. Within 30 seconds of connecting an anaesthesia device, the data appears at the Cockpit.

Before performing any monitoring functions, refer to the section “For your safety and that of your patients” on page 9. For device-specific error messages, refer to the Instructions for Use of the connected anaesthesia device.

If the external device alarm feature is activated at the Cockpit (see page 330) 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.

For a list of the supported modes and settings, refer to the Evita Infinity V500 Instructions for Use.

Supported waveforms

The A500 makes the following waveforms available on the Infinity network:

- 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)
**Supported parameters**

The following table lists the parameters supported with the device connectivity and the A500 anaesthesia device.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ production</td>
<td>V'CO₂</td>
<td>mL/min</td>
</tr>
<tr>
<td>Correlation factor for R and Cdyn</td>
<td>r²</td>
<td>no unit</td>
</tr>
<tr>
<td>Cumulated air consumption of the device</td>
<td>Air cons</td>
<td>L</td>
</tr>
<tr>
<td>Cumulated N₂O consumption</td>
<td>N₂O cons</td>
<td>L</td>
</tr>
<tr>
<td>Cumulated O₂ consumption</td>
<td>O₂ cons</td>
<td>L</td>
</tr>
<tr>
<td>Cumulated desflurane consumption</td>
<td>Des cons</td>
<td>mL</td>
</tr>
<tr>
<td>Cumulated enflurane consumption</td>
<td>Enf cons</td>
<td>mL</td>
</tr>
<tr>
<td>Cumulated halothane consumption</td>
<td>Hal cons</td>
<td>mL</td>
</tr>
<tr>
<td>Cumulated isoflurane consumption</td>
<td>Iso cons</td>
<td>mL</td>
</tr>
<tr>
<td>Cumulated sevoflurane consumption</td>
<td>Sev cons</td>
<td>mL</td>
</tr>
<tr>
<td>Dynamic lung compliance</td>
<td>Cdyn</td>
<td>L/bar</td>
</tr>
<tr>
<td>End-tidal desflurane concentration</td>
<td>etDes</td>
<td>%, kPa</td>
</tr>
<tr>
<td>End-tidal enflurane concentration</td>
<td>etEnf</td>
<td>%, kPa</td>
</tr>
<tr>
<td>End-tidal halothane concentration</td>
<td>etHal</td>
<td>%, kPa</td>
</tr>
<tr>
<td>End-tidal isoflurane concentration</td>
<td>etIso</td>
<td>%, kPa</td>
</tr>
<tr>
<td>End-tidal sevoflurane concentration</td>
<td>etSev</td>
<td>%, kPa</td>
</tr>
<tr>
<td>Inspiratory desflurane concentration</td>
<td>inDes</td>
<td>%, kPa</td>
</tr>
<tr>
<td>Inspiratory enflurane concentration</td>
<td>inEnf</td>
<td>%, kPa</td>
</tr>
<tr>
<td>Inspiratory halothane concentration</td>
<td>inHal</td>
<td>%, kPa</td>
</tr>
<tr>
<td>Inspiratory isoflurane concentration</td>
<td>inIso</td>
<td>%, kPa</td>
</tr>
<tr>
<td>Inspiratory sevoflurane concentration</td>
<td>inSev</td>
<td>%, kPa</td>
</tr>
<tr>
<td>Inspired mandatory tidal volume</td>
<td>VTimand</td>
<td>mL</td>
</tr>
<tr>
<td>Resistance (airway)</td>
<td>R</td>
<td>mbar/L/min</td>
</tr>
<tr>
<td>Therapy case duration</td>
<td>Tcase</td>
<td>min.</td>
</tr>
<tr>
<td>Parameter O₂ uptake</td>
<td>V'O₂</td>
<td>mL/min</td>
</tr>
<tr>
<td>Inspiratory spontaneous tidal volume</td>
<td>VTispon</td>
<td>mL</td>
</tr>
<tr>
<td>Parameter plateau pressure</td>
<td>Pplat</td>
<td>mbar</td>
</tr>
</tbody>
</table>

**NOTE**

1) This parameter is only available on the Infinity network. It is not available on the Cockpit Patient tab.
2) This parameter is displayed in the anaesthesia Show all page (see page 156).
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Label</th>
<th>Available unit of measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive end expiratory airway pressure</td>
<td>PEEP</td>
<td>mbar</td>
</tr>
<tr>
<td>Mandatory minute volume</td>
<td>MVmand</td>
<td>L/min</td>
</tr>
<tr>
<td>Mandatory expired tidal volume</td>
<td>VTemand</td>
<td>mL</td>
</tr>
<tr>
<td>Mandatory respiratory rate</td>
<td>RRmand</td>
<td>/min</td>
</tr>
<tr>
<td>Mean airway pressure</td>
<td>Pmean</td>
<td>mbar</td>
</tr>
<tr>
<td>Peak airway pressure</td>
<td>PIP</td>
<td>mbar</td>
</tr>
<tr>
<td>Spontaneous expired tidal volume</td>
<td>VTspon</td>
<td>mL</td>
</tr>
<tr>
<td>Tidal volume</td>
<td>VT</td>
<td>mL</td>
</tr>
<tr>
<td>Inspiratory tidal volume</td>
<td>VTi</td>
<td>mL</td>
</tr>
<tr>
<td>MAC factor derived from expiratory concentrations</td>
<td>xMAC</td>
<td>No units</td>
</tr>
<tr>
<td>Respiratory rate, spontaneous</td>
<td>RRspon</td>
<td>/min</td>
</tr>
<tr>
<td>Minute volume, spontaneous</td>
<td>MVspon</td>
<td>L/min</td>
</tr>
<tr>
<td>Minute volume</td>
<td>MV</td>
<td>L/min</td>
</tr>
<tr>
<td>Inspiratory/expiratory oxygen concentration difference</td>
<td>ΔO₂</td>
<td>%</td>
</tr>
<tr>
<td>Respiratory rate based on CO₂</td>
<td>RRc</td>
<td>/min</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>RR</td>
<td>/min</td>
</tr>
<tr>
<td>Inspiratory CO₂ concentration</td>
<td>inCO₂</td>
<td>%, kPa</td>
</tr>
<tr>
<td>End-tidal CO₂</td>
<td>etCO₂</td>
<td>%, kPa</td>
</tr>
<tr>
<td>End-tidal oxygen concentration</td>
<td>etO₂</td>
<td>%</td>
</tr>
<tr>
<td>Fractional inspired O₂ concentration</td>
<td>FI₂</td>
<td>%</td>
</tr>
<tr>
<td>Inspiratory N₂O concentration</td>
<td>inN₂O</td>
<td>%</td>
</tr>
<tr>
<td>End-tidal N₂O concentration</td>
<td>etN₂O</td>
<td>%</td>
</tr>
<tr>
<td>Elastance</td>
<td>E</td>
<td>mbar/L</td>
</tr>
</tbody>
</table>

**NOTE**

1) This parameter is only available on the Infinity network. It is not available on the Cockpit Patient tab.
2) This parameter is displayed in the anaesthesia Show all page (see page 156).
Perseus A500 precautions

CAUTION
Always refer to the primary data source before making diagnostic or therapeutic decisions. Because the peripheral device can display data from a wide variety of sources, including external devices, and because validity and plausibility checks of external devices cannot be performed, Dräger does not guarantee the accuracy or integrity of data originating from these sources.

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 11 of these Instructions for Use for information on how to connect devices safely.

Perseus A500 display

Although the Cockpit does not display any parameter boxes for A500 parameters, you can review A500 data in the following pages:

– **Show all** page under the *Anesthesia/Ventilation* tab (see page 156) – displays the current A500 values

– **Ventilation/Anesthesia** trend graph page (see page 142) – displays A500 graphical trends in configurable trend pages
System configuration

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Overview

This chapter describes the System setup dialogue window which consists of several setup pages for configuring the Cockpit. Some of these setup pages are password protected and are only accessible to authorised personnel.

The System setup dialogue window consists of the following setup pages:
- **Screen setup** (see page 318)
- **Alarms** (see page 328)
- **Recordings/Reports** (see page 333)
- **Biomed** (see page 335)
- **Profiles** (see page 348)

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
   - Modes
   - 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)
   - 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 318.

<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 – 5, 10 to 100 in increments of 10 % (default 40 %)</td>
<td>Determines the volume of the attention tone or deactivates it.</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 times of the night-time mode. During the night-time mode, the entire background of the screen appears almost black. All buttons turn dark grey.</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 323). To access this page, see page 318.

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
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 322.

To configure the available settings

In the following steps, the letters in parenthesis correspond to the diagram for the Auto view page (see page 320).

1. Access the Auto view page (see page 318).
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 56).
   - Manual (B) to select the manual display mode (see page 56).
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>

Select the Layout button (F). Then select the Left or Right (default) button to determine if the waveforms appear to the left or to the right of the parameter boxes.

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.

7. Select the Split screen button (J). The available selections are: None (default), Trend table, Vent loops, ST params, ECG show all, ECG/ST, ECG/Vent.

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. The left side can contain one of the following: Trend table, vent loops, ECG show all leads, ECG/Vent, ECG/ST. For more detail see “Cockpit screen in split-screen mode” on page 58.

8. Select the Mini trends button (K) to activate or deactivate the mini trend display or select a trend display time (see page 59). 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.

9. Select the NIBP trend button (L) to choose between the graphic or numeric representation of the NIBP mini trend display.

10. Toggle the Toolbar button (M) to On (default) or Off to activate or deactivate the auto view setup toolbar (see page 321).
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 318.

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 323). 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 grey. 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 the 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 grey. However, unlike in the auto mode, the parameter label and/or waveform occupies a space on the screen even though it is not connected yet.
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 and as a parameter box
- 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 320).

To configure the parameter priority and display from the Auto view page

In the following steps, the letters in parenthesis correspond to the diagram for the Auto view page (see page 320).

1. Access the Auto view page (see page 318).
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 320), 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 322). 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 mode 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.

Instructions for Use Infinity Acute Care System – Monitoring Applications SW VG2
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.

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 centre of the auto-view setup toolbar.

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 320), 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.

You can either display or hide the auto-view setup toolbar (see page 321). You can also change the display status of a parameter display mode by switching its position on the auto-view setup toolbar.

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 320) 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.
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).
3. Select the **Views** tab. A password pop-up appears.
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, OR general *). 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 – 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.

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 parenthesis 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 326).
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.

A view label that appears in italic font and is followed by an asterisk identifies a view that has been modified but whose changes have not been saved yet.

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 pop-up appears.

5 Select the top arrow button (G) in the Content pop-up to assign one of the following contents to the selected panel:
   - Parameters
   - Waveforms
   - Applications

6 Select the bottom arrow button (H) in the Content pop-up 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 326) 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 326).
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 pop-up.

4 Select either the Draeger views or Custom views button under the Adult, Pediatric or Neonate column. An additional pop-up 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.
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 pop-up 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**

**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><strong>All alarms paused</strong></td>
<td>– 1, 2 (default), 3, 4, 5 min</td>
<td>The button on the alarm toolbar changes to <strong>All alarms paused</strong>. This button is accessible by selecting the ▲ symbol on the quick access toolbar, see page 55). 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>– <strong>No timeout</strong></td>
<td></td>
<td>The button on the alarm toolbar changes to <strong>All alarms off</strong>. This button is accessible by selecting the ▲ symbol on the quick access toolbar, see page 55). When selected, all alarm functions are suppressed until you select the button again to activate the alarm function again.</td>
</tr>
<tr>
<td>– <strong>Disabled</strong></td>
<td></td>
<td><strong>All alarms paused</strong> button on the alarm toolbar is greyed out and you cannot temporarily or permanently deactivate alarm monitoring.</td>
</tr>
<tr>
<td><strong>Alarm validation</strong></td>
<td><strong>On</strong> (default), <strong>Off</strong></td>
<td>When this function is activated, alarm conditions are verified for a certain time before triggering acoustic and visual alarm signals (see page 87). This feature reduces nuisance alarms.</td>
</tr>
</tbody>
</table>
### System configuration

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 alarm delay</td>
<td>On (default), Off</td>
<td>When this function is activated, an SpO2 lower alarm limit violation must persist for 10 seconds before triggering acoustic and visual alarm signals.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This function is not possible if the Nellcor Sat-Seconds alarm feature is set to any value other than Off (see page 232).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The alarm validation feature must be activated.</td>
</tr>
<tr>
<td>Alarm limits display</td>
<td>On (default), Off</td>
<td>Determines whether alarm limits appear in the parameter boxes.</td>
</tr>
<tr>
<td>Alarm bar enabled</td>
<td>On (default), Off</td>
<td>Determines whether the alarm bar flashes during an alarm.</td>
</tr>
<tr>
<td>Alarm group</td>
<td>Keypad for configuring an alarm group.</td>
<td>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.</td>
</tr>
<tr>
<td>OR Alarms</td>
<td>On, Off (default)</td>
<td>Activates/deactivates OR alarms. Alarm functions are affected when OR alarms is activated (see page 94).</td>
</tr>
<tr>
<td>Cardiac bypass</td>
<td>On, Off (default)</td>
<td>Activates/deactivates cardiac bypass mode. Alarm functions are affected when cardiac bypass mode is activated (see page 93).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>This mode is not available when the French NFC mode is enabled (see page 338).</td>
</tr>
<tr>
<td>NIBP/SpO2 interlock</td>
<td>On, Off (default)</td>
<td>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 93).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off – the SpO2 alarm function is activated during NIBP and Pulse CO-Ox measurements.</td>
</tr>
</tbody>
</table>
### System configuration

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASY/VF alarms</strong></td>
<td>– <em>Always on</em> (default)</td>
<td><em>Always on</em> – the ASY/VF alarm functions are always activated.</td>
</tr>
<tr>
<td></td>
<td>– <em>Follow HR alarm</em></td>
<td><em>Follow HR alarm</em> – the ASY and VF alarm settings follow the setting of the HR alarms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>WARNING</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you select <em>Follow HR alarm</em>, ASY, and VF alarms are not reported if the HR and ARR alarm functions are turned off.</td>
</tr>
<tr>
<td><strong>Pacer detection mode</strong></td>
<td><em>Advanced, Basic</em> (default)</td>
<td><em>Advanced</em> – you can select fusion mode in the ECG page (see page 174).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Basic</em> – fusion mode is not selectable.</td>
</tr>
<tr>
<td><strong>External device disconnected alarm control</strong></td>
<td><em>On</em> (default), <em>Off</em></td>
<td>When this function is activated and an external device is disconnected, an alarm of low priority sounds at the Cockpit. In addition, the message <em>External device disconnected</em> is displayed in the header bar of the Cockpit and at the ICS, provided the patient has been admitted.</td>
</tr>
</tbody>
</table>
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 328.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alarm volume</strong></td>
<td>Off, 10 to 100 % (in increments of 10 %); default is 50 %</td>
<td>Determines the volume of the alarm tone.</td>
</tr>
<tr>
<td><strong>Pulse tone volume</strong></td>
<td>Off, 5, 10 (default) to 100 % (in increments of 10 %)</td>
<td>Determines the volume of the pulse tone.</td>
</tr>
<tr>
<td><strong>Attention tone volume</strong></td>
<td>Off, 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><strong>Alarm reminder enabled</strong></td>
<td>On (default), 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><strong>Tone set</strong></td>
<td>Infinity (default), IEC fast, IEC slow</td>
<td>Determines the type of alarm tone used (for more information, see “Acoustic alarm signals” on page 90).</td>
</tr>
</tbody>
</table>

**NOTE**
Make sure the alarm tone volume is set so it can be heard in the monitoring environment.

**NOTE**
If the Cockpit is in OR mode or assigned to an ICS, you can deactivate the tone completely.
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.

When the Code button is pressed, a timer along with a Stop and a Reset button appears in the header bar.

The following table lists the available settings of the Code page. To access this page, see page 328.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous recording</td>
<td>On, Off (default)</td>
<td>- <strong>On</strong> – a continuous recording starts when you select the Code button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Off</strong> – no recording starts when you select the Code button.</td>
</tr>
<tr>
<td>Continuous NIBP mode</td>
<td>On, Off (default)</td>
<td>- <strong>On</strong> – continuous NIBP measurements start when you select the Code button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Off</strong> – no NIBP measurements start when you select the Code button.</td>
</tr>
<tr>
<td>Alarm volume off</td>
<td>Yes, No (default)</td>
<td>- <strong>Yes</strong> – the alarm volume is set to its minimum setting when you press the Code button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>No</strong> – the acoustic alarm signals for any active alarm are not affected when you press the Code button.</td>
</tr>
</tbody>
</table>
Configuring the recording and report settings

The Recordings/Reports pages configure 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.

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 end and the real-time data start.</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>1.00, 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– 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 103).</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 333.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Unknown (default), Male, Female</td>
<td>The selected information is included in the report.</td>
</tr>
<tr>
<td>Race</td>
<td>Unknown (default), Caucasian, Asian, African, 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>
</tbody>
</table>
| Rest ECG report | Print button | The button is greyed out and not selectable when:  
– The patient is not admitted at the ICS.  
– The Rest ECG analysis feature is not activated at the ICS.  
– The 12-lead ECG option is not unlocked.  
– The required 12-lead option is disconnected. |
Reports setup

The following table lists the available settings of the Reports setup page. To access this page, see page 333.

<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 refer to data that originated before the report was initiated. A marker on the report marks where the delay data end and the real-time data start.</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, 24r (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>

Biomed setup

This section describes several pages accessible only to authorised 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 335.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Language</strong></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><strong>Time zone</strong></td>
<td>An user-selectable list of time zones</td>
<td>Allows you to configure the Cockpit for the local time zone.</td>
</tr>
<tr>
<td><strong>Daylight savings</strong></td>
<td><strong>On, Off</strong> (default)</td>
<td>Allows you to activate or deactivate automatic activation of daylight savings time based on the regional setting.</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>The time-and-date field</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 335. 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), kPa</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>etCO2</td>
<td>mmHg (default), kPa, %</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>°C (Celsius) default, °F (Fahrenheit)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg (default), lb (adult, paediatric)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>oz, g (neonate)</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>cm (default), in</td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>mm (default), mV</td>
<td></td>
</tr>
<tr>
<td>SpHb</td>
<td>g/dL, mmol/L (only Masimo Rainbow SET)</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>
</tbody>
</table>
Biomed setup – bedside setup

The following table lists the available settings of the Patient monitor page. To access this page, see page 335.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change clinical password</td>
<td>User input</td>
<td>Allows you to define a new clinical password.</td>
</tr>
<tr>
<td>French NFC mode</td>
<td>On, Off (default)</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>Simulation (basic)</td>
<td>On, Off (default)</td>
<td>Activates or deactivates basic simulation mode. This feature is used when the M540 is connected. When activated, the Cockpit uses the simulator mode from the M540 and adds additional device connectivity parameters.</td>
</tr>
<tr>
<td>Simulation (advanced)</td>
<td>On, Off (default)</td>
<td>Button appears greyed out and is not selectable.</td>
</tr>
<tr>
<td>External display</td>
<td>Analog, Digital (default)</td>
<td>Selects the output for the external display.</td>
</tr>
<tr>
<td>Airway adapter</td>
<td>Disposable, Reusable (default)</td>
<td>Configures the Cockpit and the M540 for a specific type of airway adaptor. If the setting does not match the hardware that is being used, the displayed CO2 value is compromised.</td>
</tr>
<tr>
<td>Patient profile selection</td>
<td>On, Off (default)</td>
<td>When this feature is activated, you can select a profile and patient category on the Start dialogue.</td>
</tr>
<tr>
<td>Set OR alarms</td>
<td>Auto, Manual</td>
<td>Auto – OR alarms are automatically activated when an anaesthesia device is connected. Manual – OR alarms must be activated manually when an anaesthesia device is connected (see page 329). Whenever you disconnect the A500 from the Cockpit, the OR Alarms and Cardiac bypass features are deactivated automatically regardless of their setting.</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>
</table>
| HLM/Bypass sync         | Auto, Manual       | **Auto** – when an anaesthesia device 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. The **Cardiac bypass** feature is automatically deactivated when the A500 is no longer in heart lung mode.  
**Manual** – when an anaesthesia device is connected and the OR Alarms setting is activated at the Cockpit, the **Cardiac bypass** feature must be activated manually (see page 329). |
| Restore factory settings| Not applicable     | Restores all patient and monitoring settings to the factory defaults.  
Do not restore the factory defaults while monitoring a patient. |
Biomed setup – name service settings

The following table lists the available settings of the Name service page. To access this page, see page 335. 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></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), Off</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), Off</td>
<td>If this feature is deactivated, 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), Off</td>
<td>If this feature is activated, the Cockpit allows alarms to be silenced from network devices.</td>
</tr>
</tbody>
</table>
System configuration

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 335. 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><strong>DHCP</strong></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><strong>IP address</strong></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><strong>Subnet mask</strong></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><strong>Gateway</strong></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><strong>Primary DNS</strong></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 335. 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><strong>Printer IP address</strong></td>
<td>User-selectable</td>
<td>Allows you to configure the IP address for printing reports on a network printer.</td>
</tr>
<tr>
<td><strong>Printer type</strong></td>
<td>User-selectable</td>
<td>Allows you to select the type of laser printer used for printing reports.</td>
</tr>
<tr>
<td><strong>Paper size</strong></td>
<td>Letter, Legal, A4</td>
<td>Allows you to select the printer paper.</td>
</tr>
<tr>
<td><strong>Print test page</strong></td>
<td>Select the Print screen button, to verify that the printer is working properly.</td>
<td></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 335.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Available settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary recorder</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>Secondary recorder</td>
<td>Selects the secondary recorder for printing recordings when the primary recorder is not available.</td>
<td></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 335.

A  **Biomed** tab
B  The 'Product identification' field displaying software-specific information (for example, the software version, and so on).
C  Select this button to copy all logs to the connected USB memory stick.
D  Select this button to export the current profiles to the connected USB memory stick.
E  Select this button to import the profiles from the connected USB memory stick.
F  The window displays status messages relating to the function that is being executed.
G  **Service** button for accessing Service-related functions such as unlocking options (refer to the Technical documentation available from DrägerService for detailed information).
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

The Cockpit supports IT applications (options) that are accessible via IT tabs (see "Supported IT applications" on page 368). 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 labelled Patient and provides access to the Cockpit main screen.

To activate or deactivate IT tab feature

1. Access the IT setup page (see page 335).
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 dialogue under the configured IT tab (see "Accessing an IT tab" on page 367).

CAUTION

The Infinity Acute Care System (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 the web sites, evaluate each website 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 websites. 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.

![Diagram of Web browser page](image)

**System setup**

- **A** Web browser tab
- **B** IT setup tabs for accessing pages of the corresponding IT applications.
- **C** Symbol for accessing additional IT applications
- **D** Name button
- **E** URL button
- **F** Default on/off buttons
- **G** Block Popups on/off buttons
- **H** Full Trust on/off buttons
- **I** Tab visible on/off buttons
- **J** Selection window with pre-configured websites.
- **K** Add button
- **L** Delete button

### Adding a web browser page

In the following steps, the letters in parenthesis refer to the diagram of the **Web browser** page.

**To add a web browser page**

1. Access the **Web browser** page (see page 335).
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 pop-ups from appearing on the web site.
   - Select **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 367).
Deleting a web browser page

In the following steps, the letters in parenthesis refer to the diagram of the Web browser page on page 344.

To delete a web-browser page

1. Access the Web browser page (see page 335).
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.

Diagram:

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 Edit button
I Delete button
J Add button
System configuration

To configure a Citrix application

In the following steps, the letters in parenthesis correspond to the diagram for the Application page (see page 345).

1. Access the Application page (see page 335).
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.

A Biomed tab
B IT tabs for accessing setup pages for the corresponding IT applications.
C Name button and description field
D URL button and description field
E Full Trust on/off buttons
F Block Popups on/off buttons
G Tab visible on/off buttons
To configure an IT application tab

In the following steps, the letters in parenthesis correspond to the diagram for the IT setup page (see page 346).

1. Access the IT setup page (see page 335).
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 pop-ups from appearing on this web site.
4. Select the Tab visible on/off button (G) to display or hide the tab.

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 367).
Profile setup

A profile 'remembers' the patient 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 set up and save five unique profiles. Each Cockpit also has 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.

Modifying an existing profile

You can save changes to an existing profile. The only profile you cannot modify is the Dräger default profile.

The adult profiles, paediatric 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 parenthesis 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 80).
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 pop-up 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 as...* button (I) to apply the changes to the selected profile.

A *Profiles* tab
B *Save profile* tab
C *Adult* selection button
D *Pediatric* selection button
E *Neonate* selection button
F Profile arrow button
G Description field of the selected profile
H *Save profile as...* button
I *Save profile* button (see page page 350)
System configuration

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.

To save a new profile

1. Repeat steps 1 to 6 for saving changes to an existing profile (see page 349).
2. Select the **Save profile as...** button (H) in the **Save profile** page (see diagram on page 349). 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).

### Diagram

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profile name</strong> field and setup button</td>
<td><strong>Description</strong> field and setup button</td>
<td><strong>Default view</strong> field and selection button</td>
<td><strong>Save profile</strong> button</td>
</tr>
</tbody>
</table>
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, paediatric, 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.
Configuring the patient-specific profiles

In the following steps, the letters in parenthesis correspond to the diagram for the patient-specific Profiles page (see page 351).

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 348).
   - 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 348) 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**
Whenever you use the transfer-profile function, all existing profiles for all patient categories are transferred simultaneously.

Transferring profiles over the network

Transferring 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.

To transfer a profile over the network

1. Select the **System setup...** button on the main-menu bar.
2. Select the Profiles > Profile transfer tabs.
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.
System configuration

Importing and exporting profiles using a USB memory stick

You can also import and export profiles from one Cockpit to another using an USB memory stick. Unlike transferring profiles over the network, using an USB memory stick has the advantage that the Cockpits do not have to reside in the same monitoring unit.

To export profiles to a USB memory stick

1. Insert an USB memory stick into one of the USB ports of the Cockpit with 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 and select the **Views** button.
5. Select the **Service** tab.
6. Select the **Export profile** button to export all profiles to the USB memory stick.

To import profiles from an 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 profile** button to transfer all profiles from the USB memory stick to the Cockpit.
# Reports/recordings

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**Configuring a case summary report** .... 364
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.

The content of the recordings and reports depend on the configured settings. You can customise the recording and report settings in the Recordings/Reports pages (see page 333).

Messages relating to recordings and reports are listed on page 402.

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 the printed side facing up into the spool holder. Unroll a few centimetres 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

NOTE

Ventilation waveforms are not supported on recordings.
Timed recordings

From the Cockpit, you can request timed strip recordings that are printed on an R50N recorder (see page 359). Timed recordings can be requested manually or triggered automatically depending on the 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 333). A timed recording contains delay data that originated before the recording was initiated and real-time data that were acquired after the recording started. The ratio of delay and real-time data are configurable (see page 333). 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.

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 333), 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 priority 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
   Select *Sensor parameters...* from the main-menu bar > select the desired parameter tab to access the page.

2. Select the button next to the *Archive* setting and select either *Store, Str/Rec, Record* to generate a recording or *Off* to deactivate the feature.

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 357). 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 cancelled 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 in the 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>Name 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 357)</td>
<td>Select the symbol next to 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 359).</td>
<td>Select the symbol next to 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 335). 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>Name 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 | 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

<table>
<thead>
<tr>
<th>Name 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 M540 collects the actual ECG data, and the ICS (central station) 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 customised at the ICS (refer to the *Infinity CentralStation Instructions for Use*). You can also configure the content of a Rest ECG report, see “Rest ECG setup” on page 334. | - Select the symbol next to the *Trends/Data*... button on the main-menu bar > *Rest ECG report*  
- Select to 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 335)                                                                 | - 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* |
| ST report        | Prints the ST complexes currently displayed on ST screen                                                                                                                                                      | - 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* |
### Name of report | Description | How to request the report
---|---|---
Trend graph report | Prints the contents of the trend graphs according to the selected *Trend duration [hr]* setting (see page 335) | • 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 147) 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**.  
**NOTE**  
The **Print** button is only available after you mark a portion of the trend graphs with the cursor buttons.
Trend table report | Prints the contents of the trend table according to the selected *Table interval [min]* setting (see page 335) | • 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**
Ventilation/anaesthesia report | Prints the contents of the *Ventilation / Anesthesia* page | • Select the **Trends/ Data...** button on the main-menu bar > **Trends > Ventilation / Anesthesia > Print**
Alarm history report | Prints the contents of the *Alarm history* page | • Select the symbol next to the **Trends/ Data...** button on the main-menu bar > **Alarm history report**.  
• Select the **Trends/ Data...** button on the main menu bar > **Trends > Reports > General reports > Alarm history report**  
• Select the **Alarms...** button on the main-menu bar > **Alarm history > Print**
### Reports/recordings

<table>
<thead>
<tr>
<th>Name of report</th>
<th>Description</th>
<th>How to request the report</th>
</tr>
</thead>
</table>
| Calculations report     | Prints the calculations results currently displayed in the *Calculations* page | • Select the symbol next to the *Trends/Data*... button on the main-menu bar > *Calculations report*.  
  • Select the *Trends/Data*... button on the main menu bar > Trends > Reports > General reports > Calculations report. |
| Case summary report     | Prints a combination of reports configured in the *Reports* page of the *Trends/Data* dialogue window (see page 150) | • Select the symbol next to the *Trends/Data*... button on the main-menu bar > *Case summary report*.  
  • Select the *Trends/Data*... button on the main-menu bar > Trends > Reports > General reports > Print case summary  
  • Select the *Trends/Data*... button on the main-menu bar > Trends > Reports > General reports > OR report > Print case summary. |
| OR report               | Prints a brief summary of an anaesthesia OR case including the agent and gas consumptions during the case. | • Select the symbol next to the *Trends/Data*... button on the main-menu bar > *OR report*.  
  • Select the *Trends/Data*... button on the main menu bar > Trends > Reports > General reports > OR report  
  • Select the *Trends/Data*... button on the main menu bar > Trends > Reports > OR report > Print |
Reports/recordings

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 by default: ECG report, Anesthesia trend report, OR report.

To set up 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 363.
IT applications (options)

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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 with IT tabs” on page 60). Whenever IT tabs are displayed, the top IT tab is always labelled **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 authorised 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 pop-ups and so on. For detailed information, see “Biomed IT setup” on page 343.

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.

*CAUTION*

The Infinity Acute Care System (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 the web sites, evaluate each website with regard to possible virus infection.

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 343). Once you access the web browser IT tab, you can choose from all of the websites that were pre-configured under the Biomed tab. IT tabs are also available in split screen mode (see page 58).
Accessing an IT tab

The following diagram is an example of a web page. After a browser has been successfully configured (see page 344), 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 Peri-operative Care</td>
<td></td>
<td></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 (Infinity CentralStation). The tab can be configured to run a single patient.</td>
</tr>
<tr>
<td>RemoteView (Gateway PatientWatch)</td>
<td>VF6</td>
<td>Allows you to review up to 4 different bedside monitors from the Cockpit.</td>
</tr>
<tr>
<td>Application ICA client version 12.1</td>
<td>12.1</td>
<td>Supports IT applications using a Citrix server.</td>
</tr>
<tr>
<td>Internet Explorer</td>
<td>7.0</td>
<td>Used for running the web browser.</td>
</tr>
</tbody>
</table>

**NOTE**

PatientWatch is only supported in English and does not support remote control.

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 *Innovian Solution Suite Instructions for Use*. 

The single patient tab requires that the M540 is docked.
Problem solving

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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 85 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 an 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>
<tr>
<td>!</td>
<td>External device disconnected</td>
<td>An external device is no longer communicating with the Cockpit.</td>
<td>Check the external device connections.</td>
</tr>
<tr>
<td>None</td>
<td>Not monitored by central</td>
<td>The Cockpit is connected to the Infinity network but is not assigned to a central station.</td>
<td>Admit the patient at the central station. Return the M540 inside the range of the wireless access point.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A wireless M540 is out of range of the access point.</td>
<td></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>
</tbody>
</table>
### Problem solving

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>!!</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>!</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>!!</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>!!</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>
<tr>
<td>!!</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>!</td>
<td>Power supply H/W 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>Information only – 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>Information only – 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>Information only – 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</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.</td>
</tr>
<tr>
<td>!!</td>
<td>HR &lt; (alarm limit)</td>
<td>Parameter value</td>
<td>The parameter value is above/below the set upper/lower alarm limits.</td>
<td>Change the alarm limits.</td>
</tr>
<tr>
<td>!!</td>
<td>%0 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></td>
</tr>
<tr>
<td>!</td>
<td>ECG artefact</td>
<td>The parameter value is replaced by ***</td>
<td>– Patient's 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 the 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>!</td>
<td>%0 Unplugged ¹</td>
<td>The parameter value is replaced by ***</td>
<td>The lead-off condition detected is due to:</td>
<td>– Replace defective cable(s)</td>
</tr>
<tr>
<td>!</td>
<td>%0 leads off ¹</td>
<td></td>
<td>– Broken cable(s)</td>
<td>– Reapply gel on disposable electrodes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– disconnected ECG lead wires</td>
<td>– Select another ECG lead for processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Loose lead wire(s)</td>
<td>– If monitoring augmented leads, verify that the number of selected leads in the ECG setup page is correct.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Wrong lead selected</td>
<td>– Check cable(s) and connection(s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Dried out electrode gel</td>
<td>– Replace cable(s), if necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ECG cable(s) disconnected from the M540.</td>
<td></td>
</tr>
</tbody>
</table>

| None | LA lead off | Parameter value | The indicated lead is no longer attached to the patient. | Reattach the electrode to the patient. |
| None | LL lead off |
| None | RA lead off |
| None | RL lead off |
| None | V lead off |
| None | V1 lead off |
| None | V2 lead off |
| None | V3 lead off |
| None | V4 lead off |
| None | V5 lead off |
| None | V6 lead off |
| None | V+ lead off |

¹ %0 is a placeholder for the parameter label HR or ECG.
**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>!!!</td>
<td>Ventricular fibrillation</td>
<td>VF</td>
<td>The reported arrhythmia was detected</td>
<td>Check the patient and treat, if necessary.</td>
</tr>
</tbody>
</table>

**Rest ECG messages**

<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>ECG Collecting waveforms</td>
<td></td>
<td>Rest ECG was initiated</td>
<td>Instruct the patient to lie still.</td>
</tr>
<tr>
<td>None</td>
<td>ECG busy</td>
<td>Parameter value</td>
<td>The central station is already processing a report.</td>
<td>Wait a few minutes before requesting the report again.</td>
</tr>
</tbody>
</table>
| None     | 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. |
| None     | ECG report complete    | Parameter value | The Rest ECG report has been printed              | Information only – no action required.             |
| None     | %0 comm failure        | Parameter value | The external device is not available.             | Check the configuration at the central station.    |
| None     | Sending ECG data       | Parameter value | Information only.                                 | Information only – no action required.             |
### Problem solving

#### ST

<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>Cannot analyze ST</td>
<td>The parameter value is replaced by ***</td>
<td>The algorithm cannot determine ST values due to artefact, the absence of normal beats, or invalid leads.</td>
<td>– Perform a relearn (see page 187)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Check electrodes; reapply, if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Make sure that the patient's skin is properly prepared.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Isolate the patient from the auxiliary equipment, if possible.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Inspect and replace defective cable(s) and wire(s).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Reapply gel on reusable electrode(s).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Reapply the electrode(s). Make sure that the patient's skin is properly prepared.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– If a lead or electrode cannot be replaced, select another ST lead for processing.</td>
</tr>
<tr>
<td>!!</td>
<td>ST &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.</td>
</tr>
<tr>
<td></td>
<td>ST &lt; (alarm limit)</td>
<td></td>
<td></td>
<td>– Change the alarm limits.</td>
</tr>
<tr>
<td>!!</td>
<td>%0 out of range low ¹</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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Check the placement of electrodes and change their position, if necessary.</td>
</tr>
</tbody>
</table>

¹%0 is a placeholder for the parameter label ST

---

Instructions for Use Infinity Acute Care System – Monitoring Applications SW VG2
## 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>!</td>
<td>%0 out of range high 1)</td>
<td>The parameter value is replaced by +++</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>!</td>
<td>%0 Unplugged 1)</td>
<td>The parameter value is replaced by ***</td>
<td>ECG lead wires are disconnected from the M540.</td>
<td>Check the cables and connections; replace if necessary.</td>
</tr>
<tr>
<td>None</td>
<td>ST relearn</td>
<td>The parameter value appears blank.</td>
<td>ST relearn is in progress</td>
<td>Information only – no action required.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the parameter label ST
## Problem solving

### 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.

<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 indicated arrhythmia was detected</td>
<td>Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td>!!!</td>
<td>Ventricular fibrillation</td>
<td>VF</td>
<td></td>
<td>Some messages only appear when the Full Arrhythmia option is installed.</td>
</tr>
<tr>
<td>!!!</td>
<td>ARR Ventricular Tachycardia</td>
<td>VTACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>%0 Run 1)</td>
<td>RUN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>%0 Accelerated idioventricular rhythm 1)</td>
<td>AIVR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 Supraventricular tachycardia 1)</td>
<td>SVT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 Coupleт 1)</td>
<td>CPT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 Bigeminy 1)</td>
<td>BGM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 tachycardia 1)</td>
<td>TACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 bradycardia 1)</td>
<td>BRADY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 PAUSE 1)</td>
<td>Pause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>%0 artifact 1)</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 28) except for the ARR cannot learn message.

1) %0 is a placeholder for the parameter label ARR.
## 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     | ARR cannot learn    | The parameter value appears blank  | After 100 beats, the M540 cannot determine the dominant normal complex on any lead selected for QRS processing. | – Check the electrode preparation.  
– Reapply electrodes, if necessary. |
| None     | %0 relearning 1)    | LEARN                              | The M540 is learning the patient’s QRS complex to establish a reference template. | Information only – no action required.                                    |
| II       | PVC/min > (alarm limit) | Parameter value PVC value is above the upper alarm limit. | – Check the patient and treat, if necessary.  
– Reapply electrodes, if necessary. |

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>
<tbody>
<tr>
<td>!!</td>
<td>RRi &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. – Check the alarm limits.</td>
</tr>
<tr>
<td>!!</td>
<td>RRi &lt; (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. – Check 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 respiration rate is higher than 150 breaths per minute. – The M540 may be counting artefacts as valid breaths. – The M540 may be counting interference caused by faulty equipment.</td>
<td>– 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.</td>
</tr>
<tr>
<td>!!!</td>
<td>%0 apnea 1)</td>
<td>APNEA</td>
<td>The neonatal apnoea condition was detected.</td>
<td>– Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td>!!</td>
<td>%0 apnea 1)</td>
<td>APNEA</td>
<td>The Adult or paediatric apnoea condition was detected.</td>
<td>– Check the placement of electrodes. Change their position, if necessary. – Initiate a relearn or reset breath-detection sensitivity in the manual mode.</td>
</tr>
</tbody>
</table>

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>
| None | %0 coincidence | 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 RRI relearning LEARN Relearn is in progress Information only – 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>!</td>
<td>%0 lead off ¹, ²</td>
<td>The parameter value is replaced by ***</td>
<td>The respiration lead has been invalid for 10 seconds.</td>
<td>– Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td>!</td>
<td>%0 artifact ¹, ²</td>
<td>The parameter value is replaced by ***</td>
<td>A persistent artefact was detected.</td>
<td>– Make sure that the patient’s skin is prepared properly.</td>
</tr>
<tr>
<td>!</td>
<td>RRI high impedance</td>
<td>The parameter value is replaced by ***</td>
<td>A high respiration impedance was detected.</td>
<td>– Isolate the patient from the auxiliary equipment, if possible.</td>
</tr>
<tr>
<td>!</td>
<td>%0 lead unavailable ¹</td>
<td>The parameter value is replaced by ***</td>
<td>Faulty or disconnected electrodes.</td>
<td>– Check the electrode(s) and gel and reapply, if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Inspect and replace the defective cables and wires.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– If a lead or electrode cannot be replaced, select another lead for processing (in the RRI setup page).</td>
</tr>
</tbody>
</table>

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.
### Problem solving

#### SpO2

The following messages originate from three different MCables (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><strong>Learning pulse CO-Ox</strong> Learning</td>
<td>Displays parameter values for SpO2, PLS, and PI. Parameter values for SpHb (SpHbv), SpOC, SpMet, PVI are replaced by ***</td>
<td>The parameters have been detected but have not yet been computed.</td>
<td>Wait until message disappears.</td>
</tr>
</tbody>
</table>
| None (Masimo Rainbow SET only) | **Low %0 SIQ** | Associated parameter values are still displayed | - Poor signal quality  
- Measurement reading is obscured | - Check the patient and treat, if necessary.  
- Make sure the SpO2 sensor is attached properly to the patient.  
- Check all cable connections. |
| None (Masimo Rainbow SET and Masimo Rainbow SET only) | **Low SpO2 SIQ** | Parameter values are still displayed. | The Masimo MCable detects low signal quality | - Check the patient and treat, if necessary.  
- Make sure the SpO2 sensor is attached properly to the patient.  
- Check all cable connections. |

1) %0 is a placeholder for the following parameter labels: PVI, SpHb (SpHbv), SpMet, SpOC, SpOC.
### 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>!! (Any SpO2 MCable)</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.</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>– Change the alarm limits.</td>
</tr>
<tr>
<td>!! (Masimo Rainbow SET only)</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.</td>
</tr>
<tr>
<td></td>
<td>SpHb &gt; (alarm limit)</td>
<td></td>
<td></td>
<td>– Change the alarm limits.</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></td>
<td>SpCO &gt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>!! (Any SpO2 MCable)</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.</td>
</tr>
<tr>
<td></td>
<td>PLS &gt; (alarm limit)</td>
<td></td>
<td></td>
<td>– Change the alarm limits.</td>
</tr>
<tr>
<td>!! (Masimo Rainbow SET only)</td>
<td>SpHb &lt; (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.</td>
</tr>
<tr>
<td></td>
<td>PVI &lt; (alarm limit)</td>
<td></td>
<td></td>
<td>– Change the alarm limits.</td>
</tr>
<tr>
<td></td>
<td>SpOC &lt; (alarm limit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SpCO &gt; (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>(Any SpO2 MCable)</td>
<td>SpO2 &lt; (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.</td>
</tr>
<tr>
<td></td>
<td>PLS &lt; (alarm limit)</td>
<td></td>
<td></td>
<td>– Change the alarm limits.</td>
</tr>
</tbody>
</table>

**NOTE**
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.
### 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>!</td>
<td><strong>SpO2 cable failure</strong></td>
<td><strong>Cable failure</strong></td>
<td>Parameter values are replaced by ***</td>
<td>The Masimo Rainbow SET intermediate cable is defective or has expired.</td>
</tr>
<tr>
<td></td>
<td>(Masimo Rainbow SET only)</td>
<td></td>
<td></td>
<td>Replace the intermediate cable.</td>
</tr>
<tr>
<td>!</td>
<td><strong>SpO2 check sensor</strong></td>
<td><strong>Check sensor</strong></td>
<td>Parameter values are replaced by ***</td>
<td>The SpO2 sensor is detecting too much ambient light.</td>
</tr>
<tr>
<td></td>
<td>(Nellcor Oxi-Max MCable only)</td>
<td></td>
<td></td>
<td>– Make sure the SpO2 sensor is attached properly to the patient.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Check all cable connections.</td>
</tr>
<tr>
<td>None</td>
<td><strong>%0 sensor calibrating</strong></td>
<td><strong>Sensor calibrating</strong></td>
<td>Parameter values are replaced by ***</td>
<td>The sensor is being checked for proper functioning.</td>
</tr>
<tr>
<td></td>
<td>(Masimo Rainbow SET only)</td>
<td></td>
<td></td>
<td>Wait until message disappears.</td>
</tr>
<tr>
<td>!</td>
<td><strong>SpO2 H/W failure</strong></td>
<td>**Parameter values are replaced by ***</td>
<td>Hardware failure</td>
<td>– Check for a defective sensor.MCable</td>
</tr>
<tr>
<td></td>
<td>(Any SpO2 MCable)</td>
<td></td>
<td></td>
<td>– Contact DrägerService.</td>
</tr>
<tr>
<td>!</td>
<td><strong>SpO2 Interference Detected</strong></td>
<td><strong>Interference detected</strong></td>
<td>Parameter values are replaced by ***</td>
<td>Interference such as artefact was detected.</td>
</tr>
<tr>
<td></td>
<td>(Masimo SET and Masimo Rainbow SET)</td>
<td></td>
<td></td>
<td>– Make sure the sensor is properly attached.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Make sure that no nail polish or some other substance is blocking the light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Change the sensor location.</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>
</table>
| None (Masimo Rainbow SET and Masimo SET MCable) | SpO2 Low Perfusion | Low perfusion | The signal is too small. | – Check the patient and treat, if necessary.  
– Move the sensor to a site that is more adequately perfused. |
| ! (Masimo Rainbow SET and Masimo SET MCable) | SpO2 MCable unplugged | MCable unplugged | The SpO2 MCable is disconnected from the M540. | Check connections to M540. |
| None (Masimo Rainbow SET MCable only) | SpO2 only mode | Parameter values for SpO2, PLS, PI, and PVI. Parameter values for SpHb (SpHbv), SpOC, SpMet, SpCO are replaced by *** | The device cannot calibrate the Masimo Rainbow SET parameters and is attempting to display the standard Masimo parameters. | Remove and re-apply the sensor.  
If the problem persists, contact your technical personnel. |

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 searching</td>
<td>Searching</td>
<td>Parameter values are replaced by ***</td>
<td>The sensor is searching for valid pulses to compute a measurement value.</td>
</tr>
<tr>
<td>!</td>
<td>%0 sensor failure 1)</td>
<td>Sensor failure</td>
<td>Parameter values are replaced by ***</td>
<td>– Hardware failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Defective or expired SpO2 sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>SpO2 sensor off 2)</td>
<td>Sensor off</td>
<td>Parameter values are replaced by ***</td>
<td>The Masimo MCAble has detected that the SpO2 sensor is no longer attached to the patient.</td>
</tr>
<tr>
<td>!</td>
<td>SpO2 sensor unplugged 2)</td>
<td>Sensor unplugged</td>
<td>Parameter values are replaced by ***</td>
<td>– SpO2 intermediate cable or sensor is unplugged</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– SpO2 sensor is unplugged from Masimo Rainbow SET MCAble</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

#### NIBP

<table>
<thead>
<tr>
<th>Priority</th>
<th>Message</th>
<th>Parameter box</th>
<th>Problem Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td><strong>SpO₂ unrecognized sensor</strong></td>
<td></td>
<td>Parameter values are replaced by ***&lt;br&gt;– An incompatible Nellcor or Masimo SET sensor is connected.&lt;br&gt;– A reusable SpHb Masimo Rainbow SET sensor is connected to an Masimo Rainbow SET MCable that does not support SpHb.</td>
<td>– Connect the right type of sensor.&lt;br&gt;– Contact your technical personnel.</td>
</tr>
<tr>
<td>!</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>!</td>
<td>NIBP S &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td>– Change the alarm limits.</td>
</tr>
<tr>
<td>!</td>
<td>NIBP D &gt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>NIBP D &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>NIBP M &gt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>NIBP M &lt; (alarm limit)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>%0 H/W failure ¹)</td>
<td>Parameter values are replaced by ***&lt;br&gt;– NIBP measurement circuit failure&lt;br&gt;– NIBP zero out of range or faulty transducer</td>
<td>Check all hardware, contact DrägerService.</td>
<td></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>
<tbody>
<tr>
<td>!!</td>
<td>%0 low inflation limit ¹)</td>
<td>The message Last measurement failed! is followed by the message Low inflation limit</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>
</tbody>
</table>
| !        | NIBP mean only                   | Parameter values are replaced by *** | 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. | – Check the patient and treat, if necessary.  
– Check the hose and cuff  
– Check the size and the placement of the cuff.                                           |
| !!       | %0 out of range high ¹)          | Parameter value or value is replaced by *** depending on the pressure level | The parameter value is above/below the measurement range of the monitor.                      | Check the NIBP inflation limits and adjust them if necessary (for example, if the wrong patient category is selected). |
| !!       | %0 out of range low ¹)           | Parameter value or value is replaced by *** depending on the pressure level | NIBP pneumatic char.needed  
Parameter values are replaced by *** | NIBP hardware failure in the M540. Contact your technical personnel and take the M540 out of service. |
| !        | %0 blocked Line ¹)               | The message Last measurement failed! is followed by the message Blocked line | The inflation rate is too high during the inflation cycle or the time to evacuate the residual cuff pressure at the end of the deflation cycle is too short. | – Select a different cuff.  
– Check the hose and cuff for damage.  
– Restart the measurement. If the message does not clear, contact DrägerService. |

¹) %0 is a placeholder for the parameter label NIBP.
### Problem solving

<table>
<thead>
<tr>
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<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| !        | %0 cannot measure 1) | The message Last measurement failed! is followed by the message Cannot measure Parameter values are replaced by *** | The pulse profile is too poor to establish a reliable measurement (usually due to a persistent motion artefact) | – 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. |
| !        | %0 cuff leak 1) | The message Last measurement failed! is followed by the message Cuff leak Parameter values are replaced by *** | The drop in the 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. |
| !        | %0 measurement timeout 1) | Parameter values are replaced by *** | An NIBP measurement has exceeded timeout limit. | Repeat the measurement. |
| !        | %0 overpressure 1) | 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>!</td>
<td>%0 open line 1)</td>
<td>The message Last measurement failed! is followed by the message Open line Parameter values are replaced by ***</td>
<td>There was no significant increase in the 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>None</td>
<td>Venous stasis started</td>
<td>The parameter value appears blank</td>
<td>Message reporting the status of venous stasis.</td>
<td>Information only – no action required.</td>
</tr>
<tr>
<td>None</td>
<td>Venous stasis ending</td>
<td>The parameter value appears blank</td>
<td>Message reporting the status of venous stasis.</td>
<td>Information only – no action required.</td>
</tr>
<tr>
<td>None</td>
<td>Venous stasis ended</td>
<td>The parameter value appears blank</td>
<td>Message reporting the status of venous stasis.</td>
<td>Information only – 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>!!</td>
<td>T(x) &gt; (parameter value)</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>!!</td>
<td>%0 out of range high 1)</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>!!</td>
<td>%0 out of range low 1)</td>
<td>The parameter value is replaced by - - -</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the parameter label T for Temp.
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><img src="image" alt=" Cannot derive %0 2) " /></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>
<td></td>
</tr>
<tr>
<td><img src="image" alt=" %0 H/W failure 1), 2) " /></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>
<td></td>
</tr>
<tr>
<td><img src="image" alt=" %0 Unplugged 1), 2) " /></td>
<td>The parameter value is replaced by ***</td>
<td>The temperature sensor is unplugged.</td>
<td>Reapply the temperature sensor.</td>
<td></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.

**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>!!</td>
<td>IBP S &gt; (parameter value)</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>!!</td>
<td>IBP S &lt; (parameter value)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>IBP D &gt; (parameter value)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>IBP D &lt; (parameter value)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>IBP M &gt; (parameter value)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>IBP M &lt; (parameter value)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>CPP &gt; (parameter value)</td>
<td>Parameter value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>CPP &lt; (parameter value)</td>
<td>Parameter value</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>!</td>
<td>%0 out of range high 1)</td>
<td>The parameter value is replaced by +++</td>
<td>The pressure signal is above/below the measurement range of the monitor.</td>
<td>– Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Check the equipment and replace, if necessary.</td>
</tr>
<tr>
<td>!</td>
<td>%0 out of range low 1)</td>
<td>The parameter value is replaced by - - -</td>
<td>The pulse rate falls outside the measuring range of the monitor.</td>
<td>– Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td>!</td>
<td>%0 out of range high 1)</td>
<td>The parameter value is replaced by +++</td>
<td></td>
<td>– Check the equipment and replace, if necessary.</td>
</tr>
<tr>
<td>!</td>
<td>%0 please check zero 1)</td>
<td>Parameter value</td>
<td>The IBP zero value stored in the M540 was lost and the transducer requires zeroing.</td>
<td>Zero the transducer.</td>
</tr>
<tr>
<td>!</td>
<td>%0 H/W failure 1)</td>
<td>The parameter value is replaced by ***</td>
<td>IBP hardware failure.</td>
<td>– Check the hardware and replace, if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Call your technical personnel or contact DrägerService.</td>
</tr>
<tr>
<td>None</td>
<td>%0 did not zero 1)</td>
<td>Parameter value</td>
<td>Transducer zeroing failed because of:</td>
<td>– Keep all tubing motionless, then re-zero.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– excessive signal noise</td>
<td>– Change the transducer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– a non-static waveform</td>
<td>– Check the stopcock, then re-zero.</td>
</tr>
</tbody>
</table>

1) %0 is a placeholder for the appropriate IBP (x), or the parameter label CPP.
## Problem solving

<table>
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<tr>
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<th>Solution</th>
</tr>
</thead>
</table>
| ! | %0 static pressure<sup>1)</sup> | Parameter value | The static pressure is detected on a pulsatile signal due to: | – 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. |
| – |  | – 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 |  |
| ! | %0 Unplugged<sup>1,2)</sup> | The parameter value is replaced by *** | The pressure transducer for the specified parameter is either unplugged or defective. | – During an active pressure: Reconnect or replace the cable.  
– During an inactive pressure: Deactivate alarms. |
| ! | HemoPod unplugged<sup>2)</sup> | The parameter value is replaced by *** | The IBP pod is disconnected. | Check the equipment and replace, if necessary. |
| None | %0 zero accepted<sup>1)</sup> | Parameter value | Transducer zeroing was successful. | Information only – no action required. |
| None | %0 did not zero - offset error<sup>1)</sup> | Parameter value | Transducer zeroing failed because the static pressure was too high or too low. | – Keep all tubing motionless.  
– Replace the transducer.  
– Check the stopcock and zero again |

<sup>1</sup>%0 is a placeholder for the appropriate IBP (x), or the parameter label CPP.  
<sup>2</sup>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>
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<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Inflated balloon and press “Start wedge” to begin</td>
<td>Parameter value</td>
<td>Action is required to start the wedge measurement.</td>
<td>Press <strong>Start wedge</strong> button to begin wedge measurement.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This message appears in the 'Wedge' dialogue only.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td><strong>Wedge in progress</strong></td>
<td>Parameter value</td>
<td>Information only.</td>
<td>Information only – no action required.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This message appears in the 'Wedge' dialogue only.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Deflate balloon and press “Save wedge” to finish</td>
<td>Parameter value</td>
<td>Action is required to complete the wedge measurement.</td>
<td>Press <strong>Save wedge</strong> button to finish wedge measurement.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This message appears in the 'Wedge' dialogue only.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cardiac Output (C.O.)

<table>
<thead>
<tr>
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<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>!!</td>
<td>( \text{Tblood} &gt; ) (parameter value)</td>
<td>Parameter value</td>
<td>The blood temperature is outside the alarm limits because of:</td>
<td>- Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td></td>
<td>( \text{Tblood} &lt; ) (parameter value)</td>
<td></td>
<td>- a physiological condition</td>
<td>- Change the alarm limits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- inappropriate alarm limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- a defective sensor</td>
<td></td>
</tr>
<tr>
<td>!!</td>
<td>%0 out of range high (^1)</td>
<td>Parameter value</td>
<td>The blood temperature is outside the measurement range because of a defective sensor.</td>
<td>Check the equipment and replace, if necessary.</td>
</tr>
<tr>
<td>!!</td>
<td>%0 out of range low (^1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>\text{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.</td>
</tr>
<tr>
<td>!</td>
<td>\text{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>- Contact your technical personnel or DrägerService.</td>
</tr>
<tr>
<td>!</td>
<td></td>
<td></td>
<td></td>
<td></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>
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<th>Message</th>
<th>Parameter box</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>%0 out of range high ¹)</td>
<td>Parameter value</td>
<td>The C.O. is greater than 20 liters/min or less than 0.5 liters/min because of:</td>
<td>- Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td></td>
<td>%0 out of range low ¹)</td>
<td></td>
<td>- a physiological condition</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- an unstable baseline</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- an incorrect injectate volume, catheter size, or computation constant</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- a defective catheter, cable, or cartridge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>%0 Check Injectate Probe</td>
<td>Parameter value</td>
<td>The injectate probe is not connected or became disconnected during a measurement.</td>
<td>Connect the probe and repeat the measurement.</td>
</tr>
<tr>
<td>None</td>
<td>%0 duplicate device connected ¹)</td>
<td>Parameter value</td>
<td>Multiple C.O. sources are connected. This includes CCO devices connected via the device connectivity option.</td>
<td>Disconnect duplicate C.O. sources.</td>
</tr>
<tr>
<td>None</td>
<td>%0 Injectate Too Cold ¹)</td>
<td>Parameter value</td>
<td>The injectate temperature is too cold during the measurement process.</td>
<td>- Use an injectate within the correct temperature range of −5 °C to +30 °C (−23 °F to +86 °F).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Check the equipment and replace, if necessary.</td>
<td></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>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>
</tbody>
</table>
| None     | %0 No Temperature Change $^1$ | Parameter value | No change in blood temperature during the C.O. measurement. | – Repeat the measurement.  
– Use a larger injectate volume.  
– Repeat the measurement. If the problem persists, replace the catheter.  
– Use a cooler injectate. |
| None     | %0 Poor Baseline $^1$ | Parameter value | Poor blood temperature baseline during C.O. measurement. | – Follow hospital procedures.  
– Repeat the measurement.  
– Replace the defective components, if the message persists. |
| None     | %0 Use Cooler Injectate $^1$ | Parameter value | – 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). | Use a colder injectate. |

$^1$ %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>
</table>
| !        | %0 Transducer Unplugged ¹, ² | A cable or transducer has become disconnected. | Reconnect the cable or transducer.  
Replace the defective part, if the message persists. |

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>
</table>
| II       | CO₂ > (parameter value) CO₂ < (parameter value) | The parameter value is above/below the upper/lower alarm limits. | Check the patient and treat, if necessary.  
Change the alarm limits. |
| None     | CO₂ please zero | Instructional message for the mainstream sensor only | Zero the mainstream sensor. |
| I        | CO₂ sensor too warm | The parameter value is replaced by *** | The CO₂ mainstream sensor is too warm due to the ambient temperature.  
Unspecified accuracy at ambient temperatures above 40 °C (104 °F).  
The sensor will return to normal operation at ambient temperatures below 40 °C (104 °F). If not, replace the sensor and contact DrägerService. |
### 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><strong>CO₂ warming up</strong></td>
<td>Parameter value or blank parameter value</td>
<td>The mainstream sensor is going through the warm-up cycle.</td>
<td>Wait for the mainstream sensor to warm up. During the warm-up, the accuracy is reduced.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- If the message persists longer than 15 min after the sensor has warmed up, and the ambient temperature is above 10 °C, contact DrägerService.</td>
</tr>
<tr>
<td>!</td>
<td><strong>%0 H/W failure</strong> ¹)</td>
<td>The parameter value is replaced by ***</td>
<td>CO₂ sensor hardware failure.</td>
<td>Contact your technical personnel.</td>
</tr>
</tbody>
</table>

¹) %0 is a placeholder for the parameter label CO₂

---

**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.
## 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>!%0</td>
<td>out of range 1)</td>
<td>The parameter value is replaced by ***</td>
<td>The parameter signal is outside the measuring range of the monitor.</td>
<td>– Check the patient and treat, if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Check the equipment and replace, if necessary.</td>
</tr>
<tr>
<td>!%0</td>
<td>incompatible sensor 1)</td>
<td>The parameter value is replaced by ***</td>
<td>– The M540 has detected that the used mainstream sensor is not compatible with the selected sensor type setting (reusable/disposable)</td>
<td>– Use the airway adaptor type the system is configured for or adjust the airway adapter setting (see page 338).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Secretions in the adaptor</td>
<td>– If the message persists, clean or replace the airway adaptor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– The sensor has a zero drift</td>
<td>– If the message persists even though the correct airway adaptor type is selected and the airway adaptor is clean, zero the sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– High inspiratory CO2 concentration</td>
<td>– If the message still persists, the inspiratory CO2 value might not be accurate. Check the patient and ventilation</td>
</tr>
</tbody>
</table>

1) %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>
| !        | %0 check airway adapter | The parameter value is replaced by *** | – The mainstream sensor is not properly seated on the adaptor  
– There are secretions in the adaptor  
– There is a sensor zero drift | – Make sure the mainstream sensor is attached properly to the adaptor.  
– If the message persists, clean or replace the airway adaptor.  
– If the message persists even though the airway adaptor is clean, zero the sensor. |
| !        | %0 Unplugged | The parameter value is replaced by *** | The CO2 sensor is disconnected. | Check the CO2 connections. |
| None     | %0 zero in progress | The parameter value appears blank | The CO2 zeroing is in progress. | Information only – no action required. |
| None     | %0 Zero failed | The parameter value is replaced by *** | Zeroing of the sensor has failed or the sensor is defective. | – 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. |

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.
## Problem solving

### 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><strong>Primary recorder not connected</strong>&lt;br&gt;or&lt;br&gt;<strong>Secondary recorder not connected</strong></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><strong>Primary recorder out of paper</strong>&lt;br&gt;or&lt;br&gt;<strong>Secondary recorder out of paper</strong></td>
<td>A recording was requested, but the recorder is out of paper.</td>
<td>Replace the recorder paper (see page 356)</td>
</tr>
<tr>
<td>None</td>
<td><strong>Primary recorder door open</strong>&lt;br&gt;or&lt;br&gt;<strong>Secondary recorder door open</strong></td>
<td>The recorder door is open.</td>
<td>Close the door of the recorder.</td>
</tr>
<tr>
<td>None</td>
<td><strong>Primary recorder failure</strong>&lt;br&gt;or&lt;br&gt;<strong>Secondary recorder failure</strong></td>
<td>The recording request was not accepted due to a recorder hardware failure.</td>
<td>Contact your technical personnel.</td>
</tr>
<tr>
<td>None</td>
<td><strong>Primary recorder not assigned</strong>&lt;br&gt;or&lt;br&gt;<strong>Secondary recorder not assigned</strong></td>
<td>No recorder has been assigned.</td>
<td>Contact your technical personnel.</td>
</tr>
<tr>
<td>None</td>
<td><strong>Primary recorder overheating</strong>&lt;br&gt;or&lt;br&gt;<strong>Secondary recorder overheating</strong></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</td>
<td>The requested recording is being printed.</td>
<td>Information only – no action required.</td>
</tr>
<tr>
<td>None</td>
<td>Continuous recording started</td>
<td>or</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Timed recording request accepted</td>
<td>The recorder is not available and the requested recording is queued or stored for later printing.</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Continuous recording request accepted</td>
<td>or</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Timed recording finished</td>
<td>The requested recording is printed.</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Timed recording canceled</td>
<td>or</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Continuous recording canceled</td>
<td>Time required</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 ignored.</td>
<td>Contact your technical personnel to check the recorder assignment.</td>
</tr>
<tr>
<td>None</td>
<td>Excess artifact recording canceled</td>
<td>The recording request was not accepted due to an artefact.</td>
<td>Check the ECG lead connections; contact your technical personnel.</td>
</tr>
</tbody>
</table>
Cleaning and disinfection

Overview of general precautions ........................................ 406
Approved agents .............................................................. 406
Cockpit components ......................................................... 407
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 406 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 13.

**WARNING**

Because of the danger of electric shock, never remove the cover of any device while it is in operation or connected to power.

**WARNING**

Do not immerse or rinse the device and its peripherals. If you spill liquid on the device (including the battery or accessories), or accidentally immerse it in liquid, disconnect the device from the power source and allow it to dry completely for at least 24 to 48 hours. Contact your technical personnel regarding the continued safety of the device and its peripherals before placing it back in operation.

**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 *Infinity Acute Care System– Infinity M540 Instructions for Use.*

Approved agents

Clean and disinfect the product as per the hospital-approved protocol. Agents tested by Dräger and shown to have no harmful effect at the time of testing on the materials utilised in the device include:

– Isopropyl alcohol (40 % solution)
– Compliance – not to be used on the touch screen (7.35 % hydrogen peroxide, 0.23 % peracetic acid, 92.42 % inert ingredients)
– Sporox II – not to be used on the touch screen (7.5 % hydrogen peroxide, 0.85 % phosphoric acid, and 91.65 % inert ingredients)
– Dismozun pur
– Ammonia-based glass cleaners (to be used on the touch screen only)
– mild soapy water solution

406 Instructions for Use Infinity Acute Care System – Monitoring Applications SW VG2
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 the 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 406.

CAUTION

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.

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.
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Maintenance

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Maintenance of the IACS components .... 411

Safety inspections ................................. 412
  Scope of safety inspection for the Cockpit (C500/C700) .... 412
  Scope of safety inspection for the PS250 / P2500 .... 412
  Scope of safety inspection for the M540 .... 413
Overview

This chapter describes the necessary maintenance steps to be performed by your technical personnel for the proper functioning of the equipment. For complete instructions on how to perform the required maintenance, refer to the Technical Service Document which can be obtained from Dräger.

**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 technical personnel to test any such component is fully operational before putting it back in clinical use.
Maintenance of the IACS components

**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.

**NOTE**
The following table provides an overview of the recommended maintenance intervals for the IACS components (Infinity C500, C700, and PS250 / P2500).

The normal inspection interval for a Cockpit is 24 months. This interval is shorter if a device with a shorter inspection interval, that depends on the Cockpit for its proper function, is connected to the Cockpit.

<table>
<thead>
<tr>
<th>Device part</th>
<th>Maintenance interval and tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIBP air intake filter of the M540</td>
<td>– Exchange after two years.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td>If the NIBP air filter seems dirty or damaged, replace it before the recommended two years.</td>
</tr>
<tr>
<td></td>
<td>The NIBP air filter should be replaced, if the M540 was exposed to liquid. See &quot;Exchanging</td>
</tr>
<tr>
<td></td>
<td>the ambient air filter&quot; in the Technical documentation which is available from DrägerService.</td>
</tr>
<tr>
<td></td>
<td>– Dispose of the part with normal domestic waste.</td>
</tr>
<tr>
<td>Internal M540 battery and internal PS250 / P2500 battery</td>
<td>– Service during regular inspections.</td>
</tr>
<tr>
<td></td>
<td>– Exchange at least every two years by trained service personnel.</td>
</tr>
<tr>
<td></td>
<td>– Check the battery once a year. If necessary, trained service personnel must replace it.</td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong></td>
</tr>
<tr>
<td></td>
<td>During high-performance use of this device, the battery must be checked more often.</td>
</tr>
<tr>
<td>Inspection of all devices</td>
<td>Exchange every two years by trained service personnel.</td>
</tr>
<tr>
<td>Safety inspection of all devices</td>
<td>Every year by trained service personnel according to hospital protocol. For the scope of the</td>
</tr>
<tr>
<td></td>
<td>safety inspections, see page 412.</td>
</tr>
</tbody>
</table>
Safety inspections

**CAUTION**
Perform the safety inspections in the specified intervals. Otherwise, the correct functioning of the device may be compromised.

Scope of safety inspection for the Cockpit (C500/C700)

The following safety inspections are no substitute for the inspection and maintenance indicated by the manufacturer, including the preventive exchange of parts subject to wear. For technical documentation, contact your local DrägerService representative.

1. Check accompanying documents and determine if the Instructions for Use are available.
2. Check that the equipment is complete and ready for use according to the Instructions for Use.
3. Verify that the device in combination with other system components is in good working condition. Specifically, verify the following:
   - All labels are complete and legible
   - There is no visible damage
4. Check that the device meets the electrical safety requirements according to IEC62353, Medical electrical equipment – recurrent test and test after repair of medical electrical equipment.
5. Verify that the visual and acoustic alarm signals function properly.
6. Verify that the following device features operate according to the Instructions for Use:
   - Verify the LEDs
   - Perform the device checks

Scope of safety inspection for the PS250 / P2500

The following safety inspections are no substitute for the inspection and maintenance indicated by the manufacturer, including the preventive exchange of parts subject to wear. For technical documentation, contact your local DrägerService representative.

1. Check accompanying documents and determine if the Instructions for Use are available.
2. Verify that the device in combination with other system components is in good working condition. Specifically, verify the following:
   - All labels are complete and legible
   - There is no visible damage
   - Fuses which are accessible from the outside comply with the specified values
3. Check that the device meets the electrical safety requirements according to IEC62353, Medical electrical equipment – recurrent test and test after repair of medical electrical equipment.
4. Verify 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.
5. Perform a functional test of the internal battery.
Scope of safety inspection for the M540

The following safety inspections are no substitute for the inspection and maintenance indicated by the manufacturer, including the preventive exchange of parts subject to wear. For technical documentation, contact your local DrägerService representative.

1. Check accompanying documents and determine if the Instructions for Use are available.
2. Check that the equipment is complete and ready for use according to the Instructions for Use.
3. Verify that the device in combination with other system components is in good working condition. Specifically, verify the following:
   - All labels are complete and legible.
   - There is no visible damage
4. Check that the device meets the electrical safety requirements according to IEC62353, Medical electrical equipment – recurrent test and test after repair of medical electrical equipment.
5. Verify the following safety features:
   - Correct functioning of the visual and acoustic alarm signals.
   - Correct functioning of the Audio Pause button located on the front panel of the device.
   - Correct functioning of the NIBP overpressure sensor (including the valves and the pump).
6. Verify that the following M540 features operate according to the Instructions for Use:
   - Perform a functional test of the internal battery.
   - Perform the device checks (for example, communication with the IACS, front panel buttons, alarm bar, and correct functioning of monitored parameters).
Disposal

For countries subject to the
EU directive 2002/96/EC ................. 416
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 authorised 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 organisation.
Technical data

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Technical data

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 the following information, refer to the Infinity Acute Care System– Infinity M540 Instructions for Use:

- MPods and MCables 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 Comm Hub

<table>
<thead>
<tr>
<th>Physical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x D x H)</td>
<td>27.76 x 11.68 x 34.59 cm (10.93 x 4.60 x 13.62 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>5.5 kg (12 lbs)</td>
</tr>
<tr>
<td>Cooling</td>
<td>Convection</td>
</tr>
<tr>
<td>Connections</td>
<td>RS232</td>
</tr>
<tr>
<td></td>
<td>Alarm output</td>
</tr>
<tr>
<td></td>
<td>System cable</td>
</tr>
<tr>
<td></td>
<td>Infinity network (Ethernet)</td>
</tr>
<tr>
<td></td>
<td>Potential equalisation connector (earthing lug)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity (non-condensing)</td>
<td>Operating: 20 to 95 %</td>
</tr>
<tr>
<td></td>
<td>Storage: 20 to 95 %</td>
</tr>
<tr>
<td>Temperature</td>
<td>Operating: 0 to 40 °C (32 to 104 °F)</td>
</tr>
<tr>
<td></td>
<td>Storage: −20 to +60 °C (−4 to +140 °F)</td>
</tr>
</tbody>
</table>

**NOTE**
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.
### Technical data

<table>
<thead>
<tr>
<th>Atmospheric pressure</th>
<th>Operating: 485 to 795 mmHg (70 to 106 kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Storage: 375 to 795 mmHg (50 to 106 kPa)</td>
</tr>
<tr>
<td>Protection against electrical shock</td>
<td>Type CF</td>
</tr>
<tr>
<td>Protection against water ingress</td>
<td>IPX1 per IEC 60529 – protected against harmful effects of water</td>
</tr>
</tbody>
</table>

#### Electrical specifications

<table>
<thead>
<tr>
<th>Input voltage</th>
<th>100 to 240 VAC (50/60 Hz, 6 A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of Operation</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Dräger NiMH battery pack</td>
</tr>
<tr>
<td></td>
<td>Operating time: approximately 5 min</td>
</tr>
<tr>
<td></td>
<td>Recharging time: 8 hours</td>
</tr>
<tr>
<td>DC output</td>
<td>+24 V nominal, SELV per IEC 60601-1</td>
</tr>
</tbody>
</table>
### Technical data

#### Infinity P2500

<table>
<thead>
<tr>
<th>Physical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x D x H)</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>Weight</td>
<td>10 kg (22 lbs)</td>
</tr>
<tr>
<td>Cooling</td>
<td>Natural convection (no cooling fan)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connections</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Two LAN RJ45 connectors (for simultaneous connection of the Infinity LAN and a recorder or a network printer)</td>
<td></td>
</tr>
<tr>
<td>- One alarm output for nurse call system</td>
<td></td>
</tr>
<tr>
<td>- Two Dräger system cable connectors</td>
<td></td>
</tr>
<tr>
<td>- One RJ-modular connector for RS232 export protocol</td>
<td></td>
</tr>
<tr>
<td>- One RJ-modular connector for connecting the Infinity MCable – Nurse Call</td>
<td></td>
</tr>
<tr>
<td>- Potential equalisation connector (earthing lug)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity (non-condensing)</td>
<td>Operating: 10 % to 95 % Storage: 10 % to 95 %</td>
</tr>
<tr>
<td>Temperature</td>
<td>Operating: 0 °C to 40 °C (0 °F to 104 °F) Storage: –20 °C to 60 °C (–4 °F to 140 °F)</td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>Operating: 485 mmHg to 795 mmHg (647 hPa to 1060 hPa) Storage: 375 mmHg to 795 mmHg (500 hPa to 1060 hPa)</td>
</tr>
<tr>
<td>Type of protection against electric shock</td>
<td>Class 1 according to IEC 60601-1</td>
</tr>
<tr>
<td>Protection against water ingress</td>
<td>IPX1 per IEC 60529 – when mounted vertically with the connectors facing down</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>100 to 240 VAC 50 to 60 Hz</td>
</tr>
<tr>
<td>Mode of Operation</td>
<td>Continuous</td>
</tr>
<tr>
<td>Battery</td>
<td>Rechargeable lead acid batteries</td>
</tr>
<tr>
<td></td>
<td>Operating time: approximately 5 minutes @ 250 W</td>
</tr>
<tr>
<td></td>
<td>Recharging time: maximum 12 hours</td>
</tr>
<tr>
<td>DC output</td>
<td>24.0 V to 30 V under all rated load conditions on AC mains</td>
</tr>
<tr>
<td></td>
<td>Maximum continuous output: 250 W</td>
</tr>
</tbody>
</table>
### 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>Physical attributes</th>
</tr>
</thead>
</table>
| Connections | Connects to the PS250 / P2500  
|             | Connection via cable 8417370 only  
| Cable signals during the non-alarm state |  
| 1 |  
| 2 |  
| 3 |  
| Cable 1 (NO normally open): white  
| Cable 2 (COM common): brown  
| Cable 3 (NO 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  
| Risk management |  
| Protection against electrical shock | Three contacts from the open cable have an electrical isolation of 1.5 k VAC  

Instructions for Use Infinity Acute Care System – Monitoring Applications SW VG2
**Technical data**

### Environmental requirements

<table>
<thead>
<tr>
<th></th>
<th>Operation</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>5 to 55 °C (41 to 131 °F)</td>
<td>–20 to +60 °C (–4 °F to +140 °F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 to 95 %, non-condensing</td>
<td>5 to 95 %, non-condensing</td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>375 to 825 mmHg (50 to 110 kPa)</td>
<td>375 to 825 mmHg (50 to 110 kPa)</td>
</tr>
</tbody>
</table>

### Physical attributes

<table>
<thead>
<tr>
<th></th>
<th>Infinity R50N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (H x W x D)</td>
<td>180 x 120 x 222 mm (7.1 x 4.7 x 8.7 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.6 kg (3.6 lbs)</td>
</tr>
<tr>
<td>Connections</td>
<td>AC power</td>
</tr>
<tr>
<td></td>
<td>X14 Infinity network connector</td>
</tr>
<tr>
<td></td>
<td>Potential equalisation connector</td>
</tr>
<tr>
<td></td>
<td>(earthing lug)</td>
</tr>
<tr>
<td>Cooling</td>
<td>Convection</td>
</tr>
<tr>
<td>Power requirements</td>
<td>100 to 240 VAC (50/60 Hz, 1 A)</td>
</tr>
<tr>
<td>Risk management</td>
<td>Class 1</td>
</tr>
<tr>
<td>Protection class</td>
<td>IPX0 per IEC 60529</td>
</tr>
<tr>
<td>Mode of Operation</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

### Environmental requirements

<table>
<thead>
<tr>
<th></th>
<th>Operation</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>15 to 40 °C (59 to 104 °F)</td>
<td>–20 to +40 °C (–4 °F to +104 °F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>10 to 95 %, non-condensing</td>
<td>10 to 95 %, non-condensing</td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>550 to 775 mmHg (73 to 103 kPa)</td>
<td>375 to 795 mmHg (50 to 106 kPa)</td>
</tr>
</tbody>
</table>
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 46.

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<tr>
<th>General requirements</th>
<th></th>
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<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>7.6 m (25.0 ft)</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 1 connector only</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 authorised. 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 ECG 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 it is used in such an environment.
### Technical data

#### 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>
<tr>
<td>Harmonic emissions (IEC 61000-3-2)</td>
<td>Class A</td>
<td></td>
</tr>
<tr>
<td>Voltage fluctuations / flicker (IEC 61000-3-3)</td>
<td>Complies</td>
<td></td>
</tr>
</tbody>
</table>

#### 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 discharge, ESD (IEC 61000-4-2)</td>
<td>Contact discharge: ±6 kV</td>
<td>±6 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>
</tr>
<tr>
<td></td>
<td>Air discharge: ±8 kV</td>
<td>±8 kV</td>
<td></td>
</tr>
<tr>
<td>Electrical fast transients / bursts (IEC 61000-4-4)</td>
<td>PS250 / P2500 lines: ±2 kV</td>
<td>±2 kV</td>
<td>Mains power quality should be of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>Longer input / output lines: ±1 kV</td>
<td>±1 kV</td>
<td></td>
</tr>
<tr>
<td>Surges on AC mains lines (IEC 61000-4-5)</td>
<td>Common mode: ±2 kV</td>
<td>±2 kV</td>
<td>Mains power quality should be of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>Differential mode: ±1 kV</td>
<td>±1 kV</td>
<td></td>
</tr>
<tr>
<td>The power frequency of the magnetic field is 50/60 Hz. (IEC 61000-4-8)</td>
<td>3 A/m</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 the likelihood of interference.</td>
</tr>
</tbody>
</table>
## Technical data

### 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>Voltage dips and short interruptions on AC mains input lines (IEC 61000-4-11)</td>
<td>Dip &gt;95 %, 0.5 periods</td>
<td>&gt;95 %, 0.5 periods</td>
<td>Mains power should be of a typical commercial or hospital environment. If the user requires continued operation during power-mains interruptions, ensure that the batteries are installed and charged. Ensure the battery life exceeds the longest anticipated power outages or provide additional uninterruptible power source.</td>
</tr>
<tr>
<td></td>
<td>Dip 60 %, 5 periods</td>
<td>60 %, 5 periods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dip 30 %, 25 periods</td>
<td>30 %, 25 periods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dip &gt;95 %, 5 seconds</td>
<td>&gt;95 %, 5 seconds</td>
<td></td>
</tr>
<tr>
<td>Conducted RF</td>
<td>150 kHz to 80 MHz</td>
<td>3 Vrms</td>
<td>Portable and mobile RF communications equipment should not be used any 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.</td>
</tr>
<tr>
<td>The RF is coupled into lines. (IEC 61000-4-6)</td>
<td>80 MHz to 2.5 GHz</td>
<td>3 V/m</td>
<td></td>
</tr>
<tr>
<td>Radiated RF (IEC 61000-4-3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[V] V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[E] V/m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
d = \left[ \frac{3.5}{V} \right]^{\frac{1}{3}} \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}
\]

\[
d = \left[ \frac{3.5}{E} \right]^{\frac{1}{3}} \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}
\]

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 metres (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:  

\[\mathcal{E}\]
**Technical data**

**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>a) Field strengths from fixed transmitters, such as the base stations for radio (mobile/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 re-orienting or re-locating 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>
</tbody>
</table>

<p>| Recommended separation distances between portable and mobile RF telecommunication devices and the Cockpit |</p>
<table>
<thead>
<tr>
<th>max. ( \text{PEIRP} ) (W)</th>
<th>150 kHz to 800 MHz Distance ( 1) ) (m)</th>
<th>800 MHz to 2.5 GHz Distance ( 1) ) (m)</th>
<th>Comments (if applicable)</th>
</tr>
</thead>
<tbody>
<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 900 mobile phones</td>
</tr>
<tr>
<td>3.000</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</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

\( 1) \text{NOTE: Information regarding separation distances (IEC 60601-1-2:2007, tables 4 and 6) }
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Distributed in the U.S. by
Dräger Medical, Inc.
3135 Quarry Road
Telford, PA 18969-1042
U.S.A...
☎ (215) 721-5400
(800) 4DRAGER
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MS28360 – R02 enUK
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Edition: 2 – 2011-07
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