
Agilent M1165/66/67/75/76/77A
Component Monitoring System
and
Agilent M1205A V24 & V26

User's Reference Manual
Volume 1
System Information



Agilent Technologies

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Printing History

New editions of this document will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged by a revision date at the bottom of the page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

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First Edition. June 2000

Important

United States federal law restricts these devices to sale by or on the order of a physician.

The M1165/66/75/76A Systems comply with UL544, CSA 22.2-125, IEC 601-1, EN 60601-1, and EN 60601-1-2 and carries **CE**₀₃₆₆ Marking to Council Directive 93/42/EEC, European Medical Device Directive (MDD).

The M1167/77A Systems comply with UL2601-1, CSA 22.2 No. 601.1-M90, IEC 601-1, EN 60601-1, and EN 60601-1-2 and carries **CE**₀₃₆₆ Marking to Council Directive 93/42/EEC, European Medical Device Directive (MDD).

The M1205A Systems comply with UL2601, IEC 601-1, CSA C22.2 no. 601-1, EN60601-1, and EN60601-1-2 and carries **CE**₀₁₂₃ Marking to Council Directive 93/42/EEC, European Medical Device Directive (MDD).

Electromagnetic Interference

Anomalies due to electromagnetic interference are not unique to the M1165/66/67/75/76/77A or the M1205A but are characteristic of patient monitors in use today. This performance is due to the very sensitive high gain front end amplifiers used to display the physiological signals. Among the many similarly performing monitors already in use by customers, interference from electromagnetic sources is rarely a problem in actual use.

Avoiding Electromagnetic Interference

When electromagnetic interference (EMI) is encountered there are a number of actions that can be taken to mitigate the problem.

- Eliminate the source. Possible sources of EMI can be turned off or moved away to reduce their strength.
- Attenuate the coupling. If the coupling path is through the patient leads, the interference may be reduced by moving and/or rearranging the leads. If the coupling is through the power cord, plugging the monitor into a different circuit may help.
- Reduce the sensitivity of the system. In all of the EMC testing the monitor was adjusted to maximum sensitivity. For the ECG amplifier the gain was four times what is normally required. By reducing the gain of the system receiving the EMI, the interference can often be eliminated.
- Add external attenuators. If EMI becomes an unusually difficult problem external devices such as an isolation transformer or a transient suppressor may be of help. An Agilent Customer Engineer can be of help in determining the need for external devices.

Intended Use

Description

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 Monitors are network connectable bedside patient monitoring devices.

The Agilent M1205A Models V24CT and V26 CT may powered by either AC line power or by battery power.

Purpose

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors measure and display multiple physiological parameters and waves, and generate alarms and recordings. They exchange information with compatible devices. The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors are not therapeutic devices.

Patient Population

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors are intended to be used on adult, pediatric, and neonatal patients.

Environment

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors are intended to be used in a clinical environment by trained healthcare professionals. They are not intended for home use.

They communicate with devices such as a central station through network interface ports and a serial I/O port.

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 Monitors are prescription devices and will carry the following label, "United States Federal law restricts this device to sale by or on the order of a physician."

Indications for Use

Condition

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 Monitors are generally indicated when the clinician decides there is a need to measure and display multiple physiological parameters and waves, to generate alarms and recordings of adult, pediatric, or neonatal patients.

Part of Body or Type of Tissue with Which the Device Interacts

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors do not contact the body or tissue of the patient. Signals are obtained from accessory electrode, transducer, and sensor devices.

Frequency of Use

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors are indicated for use when prescribed by a clinician.

Physiological Purpose

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 Monitors are indicated when the purpose is to gain information for treatment, to assess adequacy of treatment, or to rule out causes of symptoms. The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors are well suited for patient monitoring.

Patient Population

Adult, pediatric, and neonatal non-ambulatory patients.

Prescription Versus Over-the-Counter

The Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 Monitors are prescription devices.

Warnings, Cautions, and Notes

Warnings, cautions, and notes are used throughout this User's Manual to give you additional information about the Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors. The warnings and cautions included in this safety section refer to the equipment in general.

Warning

A “warning” calls attention to the user of imminent hazard to people if proper procedures are not followed.

- For continued safe use of this equipment, it is necessary that the listed instructions are followed. Instructions in this manual in no way supersede established medical procedures.
- Explosion Hazard- Do not use this equipment in the presence of flammable anesthetics.
- Alarms - Do not rely exclusively on the audible alarm system for patient monitoring. Adjustment of alarm volume to a low level or off during patient monitoring may result in patient jeopardy. Remember that the most reliable method of patient monitoring combines close personal surveillance with correct operation of monitoring equipment.
- This equipment is only intended for use in healthcare facilities by trained healthcare professionals.
- The product is not intended for outside hospital use such as a helicopters or ambulances.
- This product is not intended for home use.
- To reduce the risk of electrical shock, do **NOT** remove any cover. Refer servicing to qualified personnel.
- This equipment may interfere with ultrasound imaging equipment by causing interference on the ultrasound display. Try to keep the instruments as far apart as possible.

- Exposure of electrical contacts or connections to saline or other liquids and gels is dangerous. Electrical contacts and connections such as cable connectors, power supplies, parameter module plug-in connections and rack connections must be kept clean and dry. Thoroughly dry any electrical connections that become contaminated with liquids. If additional decontamination is required please contact your biomedical department or Agilent Technologies Response Center.
- Although this equipment is shielded against Electromagnetic Interference (EMI), it is recommended to avoid the use of electrically radiating devices in close proximity to this equipment.
- Connecting the Agilent monitoring network (SDN) cable when the product is powered on is not supported. Error codes and Agilent monitoring network (SDN) interface lock-up may occur. Power cycling the product will recover the product. No permanent damage will result. To prevent unintentional disruption in monitoring, be sure the SDN interface cable is properly secured at both ends when connecting to the Agilent monitoring network (SDN).
- Do not connect a second rack by a cable when using a module rack docked to the back of the Agilent V24CT or V26CT. Using a second rack connected by a cable may disrupt module communication.

Caution

A “caution” calls attention to a condition or possible situation that could cause injury to the user.

- **Ventilation Requirements** - Failure to meet ventilation requirements may cause equipment failure and, in turn, jeopardize the functions of automated monitoring. Do not locate equipment in an enclosed area which could restrict heat dissipation.
- **Maintenance** - Failure on the part of the responsible individual, hospital, or institution employing the use of this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.
- **Do not spray cleaning solutions directly onto the monitor.** Moisture droplets may enter the internal components and cause equipment malfunction or failure. Cleaning solutions should be applied to a cloth and the cloth used to wipe the monitor clean. The monitor should be turned off during cleaning.

Indications for Use

- **Replacement Parts** - It is highly recommended that only Agilent Technologies recommended parts and accessories be used with this equipment. Failure to do so may result in the degradation of performance. Accessories and parts for individual modules and components are listed at the back of the appropriate section in this manual.

Note—A note gives special instructions to highlight an operating procedure or practice. Notes may precede or follow the applicable text.

At this time, Agilent Technologies will make available on request, and in English only, such circuit diagrams, component part lists, descriptions, calibration instructions, or other information which will assist the user's appropriate qualified technical personnel to repair those parts of the equipment which are classified by Agilent Technologies to be repairable. A list of Agilent Sales and Support Offices is provided at the end of this manual.

Using This Manual

To enable you to find information easily, there is a contents list at the front of the guide and a comprehensive index at the back.

The User's Reference Manual is separated into two parts; the core document and the parameter module guides.

The Core Document

This section of the guide contains all the general information about the system. It is a good place for new users to start because it gives an introduction to the system and the way it works, and shows you how to get started. Here is a list of the major sections:

- Introducing the Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors
- Getting Started
- Configuring the System
- Other Patients
- Alarm Functions
- Recording Functions
- Trends and Data Management
- Installation and Patient Safety
- Care and Cleaning

Parameter Module Sections

These sections each contain information for one parameter module. This covers setting-up, monitoring, and problem solving if you encounter difficulty. Each section is separated with a white tab which has the title of the section.

Note— The User's Reference Manual contains information for all the parameter modules available for the system. This means, of course, that depending on the model and number of modules you have ordered, the screens will not always apply to your system. However, the information for the parameters and functions is valid for all the systems.

Note—The screenshots displayed in this manual were generated in demo mode and may therefore differ from what actually appears on your screen during patient monitoring.

Notice to the User

Although there may be products in your area that look similar to the Agilent M1165/66/67/75/76/77A Component Monitoring System and the Agilent M1205A V24 and V26 monitors, their functionality may not be the same. This User's Reference Manual is intended to be used with the Agilent M1165/66/67/75/76/77A Component Monitoring System, the M1026A Anesthetic Gas Module and the Agilent M1205A V24 and V26 monitors only.

This Manual is only applicable for Release C.0 versions of the monitors listed above. A Release C.0 monitor can be identified by:

- a. the Release C.0 label on the monitor, or
- b. the suffix of the EPROMpack part number. To view this number, press

Monitor Setup → **Monitor Revision** → **Show SW Rev** .

The suffix of the EPROMpack part number on a Release C.0 Agilent CMS is **A**.

The Software Revision of a Release C.0 Agilent V24 or V26 monitor is **L.xx.xx**

Responsibility of the Manufacturer

Agilent Technologies only considers itself responsible for any effects on safety, reliability and performance of the equipment if:

assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by Agilent, and

the electrical installation of the relevant room complies with national standards, and

the instrument is used in accordance with the instructions for use.

To ensure optimum usage, we recommend that Agilent parts and accessories are used in conjunction with the Agilent M1165/66/67/75/76/77A Component Monitoring System, the Agilent M1026A Anesthetic Gas Module and the Agilent M1205A V24 and V26 Monitors, wherever available. If non-Agilent parts are used, Agilent Technologies is not liable for any damage that these parts may cause to the Agilent equipment.

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MA 01810-1099

For all other countries:

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Responsibility of the Manufacturer

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The Agilent CMS, V24 and V26 Monitors

This chapter provides an overview of the Agilent CMS, V24 and V26 Monitors. It includes the following sections:

- Introduction 1-2
- Parameter Modules 1-16
- Agilent V26CT/V24CT Power Supply 1-14
- Operating Levels 1-19
- Touch or Mouse/Trackball Operation (CMS only) 1-26
- The CMS Computer Modules 1-31
- The Agilent V24 and V26 Parameter Module Rack 1-33
- Operating Rules to Remember 1-34

Introduction

The Agilent M1165/66/67/75/76/77 CMS and the Agilent M1205A V24 and V26 Monitors, hereafter referred to as the “monitor”, are modular patient monitors with networking and data management capabilities. All the systems can have modules added or removed at a later time as needed, or you can interchange the modules between systems in your unit.

Note—Some features explained in this manual are not available for both the Agilent CMS, V24 and V26 Monitors. The respective sections are marked throughout the manual with either “**Agilent CMS only**” or “**Agilent V24 and V26 only**”.

The following system types are available:

CMS

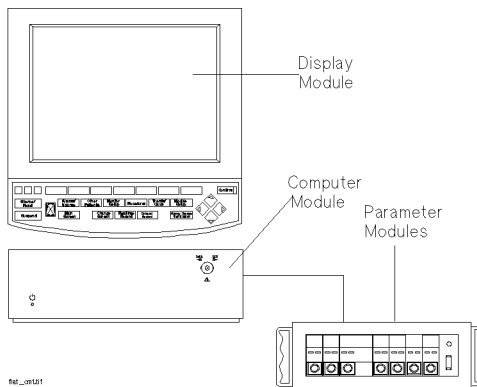
The Agilent CMS is available as a choice of three system types. Each system consists of three individual parts; a display module, a computer module and parameter modules:

1. M1167/77A Color Flatscreen Display and Computer Module with Satellite Module Rack

Note—This system is also available with an External Alarm Device and an XGA compatible display controller to drive commercially available ITE (Information Technology Equipment) displays (XGA Type).

2. M1165/75A Monochrome CRT Display and Computer Module with Integral Module Rack
3. M1166/76A color CRT Display and Computer Module with Integral Module Rack

M1167/77A System



Display Module

M1095A 10.4" Flatscreen Display

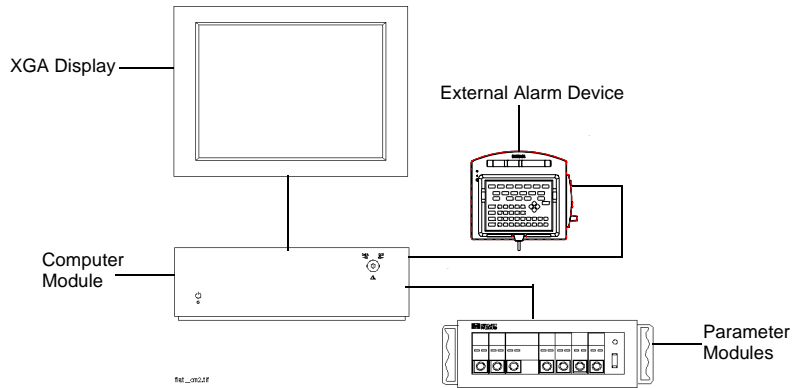
Computer Module

M1046B Computer Module

Parameter Modules

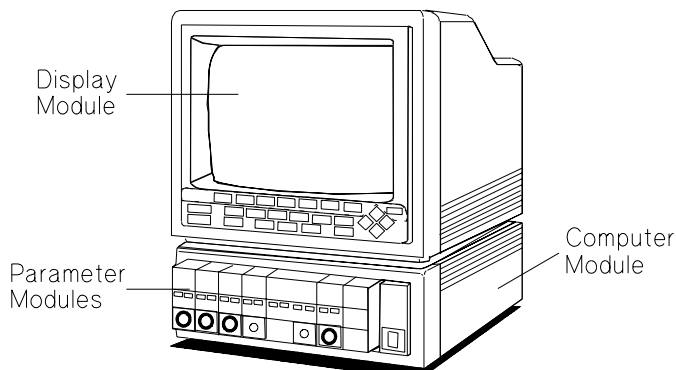
Satellite Rack

M1167/77A System with External Alarm Device



<i>Display Module</i>	ITE Display of choice ^a
<i>Computer Module</i>	M1046B Computer Module
<i>Parameter Modules</i>	Satellite Rack

a. Agilent offers the M1167/77A #H05 (XGA Touchscreen display configuration). The display is also available separately under the order number M1097A #A02.

M1165/75A and M1166/76A System

<i>Display Module</i>	M1094A/B/92A 14" CRT Display
<i>Computer Module</i>	M1046A Computer Module
<i>Parameter Modules</i>	Integral and/or Satellite Rack

Model Types

All system types are also available as a choice of three different model types:

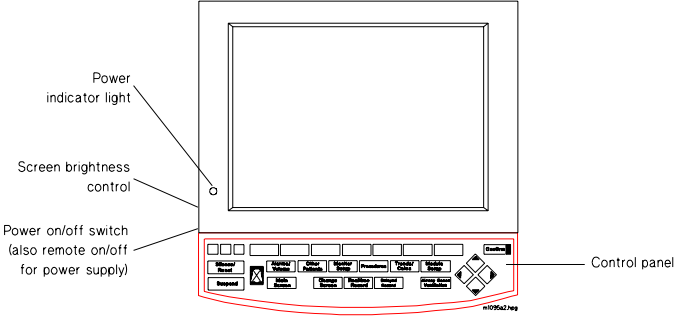
Full Title	Abbreviation
<i>The Agilent Component Monitoring System</i>	Agilent CMS
<i>The Agilent Component Monitoring System for Anesthesia Care</i>	Agilent ACMS
<i>The Agilent Component Monitoring System for Neonatal Care</i>	Agilent NCMS

Note—In this manual, the system will be referred to as the Agilent CMS, the Agilent ACMS and the Agilent NCMS.

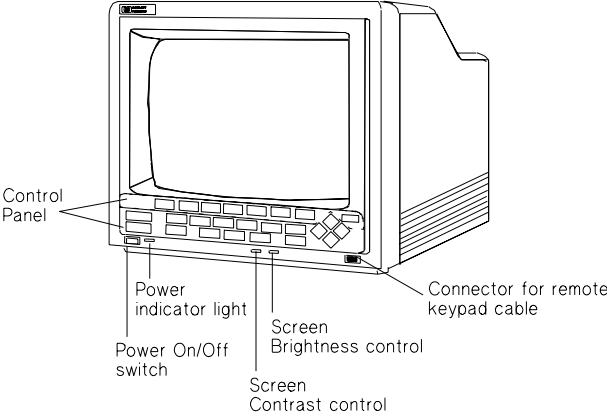
Introduction

Display Modules

Below are labeled diagrams of the display modules provided by Agilent Technologies. The control panel is described in more detail in the following sections



M1095A Flatscreen Display Module

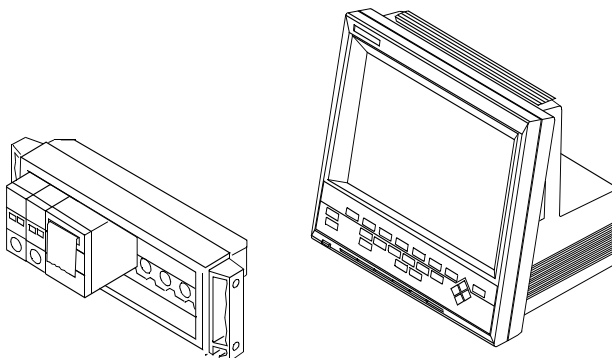


M1092A / M1094B CRT Display Module

Agilent V24 and V26

Each Agilent V24 and V26 monitor consists of two individual parts.

1. One of two types of Display Modules, depending on the particular model monitor you have purchased—either:
 - a. A monochrome display with control panel supporting the Agilent V24, or
 - b. A color flat panel display with control panel supporting the Agilent V24C, the Agilent V24CT, the Agilent V26C and the Agilent V26CT.
2. The Rack with Parameter Modules



The Agilent Models V24, V24C and V26C are powered by connection to an AC power supply. The Agilent Models V24CT and V26CT can be powered by rechargeable batteries or by connection to an AC power supply. See “Agilent V26CT/V24CT Power Supply” on page 1-14.

Control Panel

The control panel consists of softkeys, hardkeys and alarm lamps.

Softkeys

The softkeys perform multiple functions. Their functions correspond to the labels displayed at the bottom of the screen. When no softkey labels are on the screen, the softkeys do not function.

Hardkeys

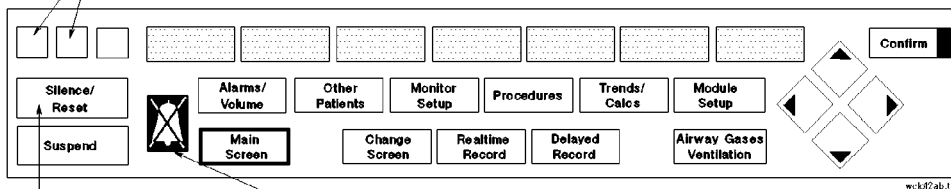
The hardkeys have only one function defined by the label on the key.

The hardkeys are labeled in blue. Each one of these keys gets you into a level where adjustments and changes can be made or performs an immediate action. The keys are labeled according to their function, for example, **Realtime Record** key allows you to start a recording of a waveform.

Note—If you are using the M1167/77A system with the External Alarm Device, the handheld keypad can be used to operate the system and to enter data. It contains all the hardkeys and softkeys available on the control panel of the other systems.

Alarm Lamps The alarm lamps are lit when a red or yellow alarm condition exists.

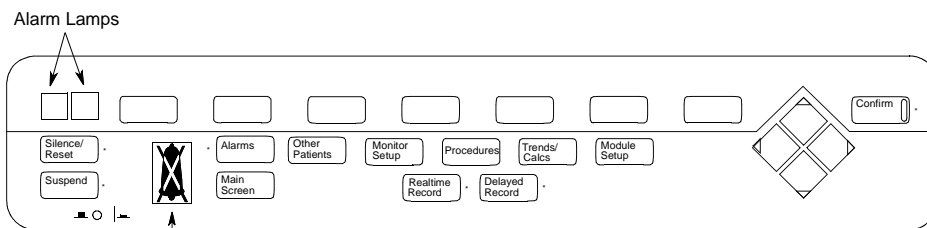
Alarm Lamps



SILENCE/RESET key

Alarms Suspended Sign

CMS Control Panel



Alarms Suspended Lamp

V24 and V26 Control Panel

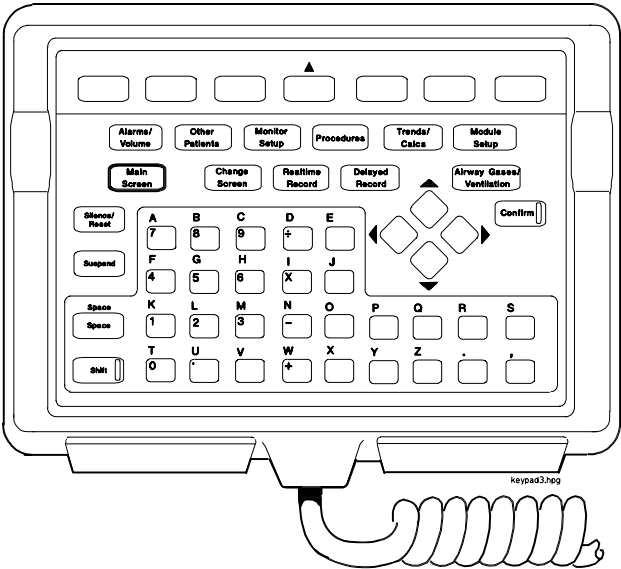
Note—Earlier versions of the Agilent V24 feature a **Trends** key instead of the **Trends/Calcs** key.

The Handheld Keypad

(Agilent CMS only):

The handheld keypad consists of the same softkeys and hardkeys that are available on the control panel. In addition, the keypad provides data entry keys which enable you to enter letters, numbers, punctuation marks, and arithmetic symbols.

Note—The handheld keypad is the main means of operating the M1167/77A System with External Alarm Device. Do not remove the keypad from systems with touch or mouse/trackball operation as it is still required to perform certain tasks.



Softkeys and Hardkeys

The softkeys and hardkeys on the keypad are in the same relative position and operate in the same manner as the keys on the control panel.

Data Entry Keys

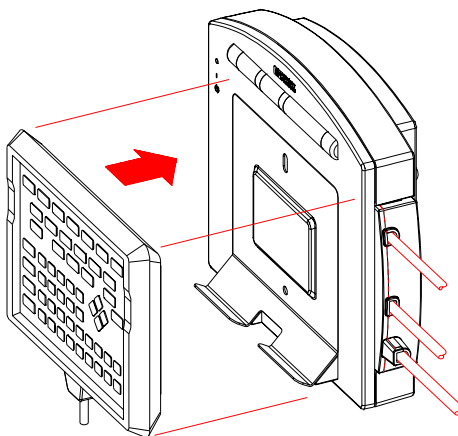
The data entry keys are located on the bottom half of the keypad.

- To enter numbers and arithmetic symbols (labeled in white), simply press the keys you want.
- To enter letters and punctuation marks (labeled in blue), press the **Shift** key. The lamp in the **Shift** key lights up and remains on until **Shift** is pressed again. The softkeys and hardkeys work as normal.

External Alarm Device

(Agilent CMS only):

Since the External Alarm Device is used only with commercially available ITE displays that do not have a control panel, it contains all the alarm lamps, the Alarms Suspended Lamp and the loudspeaker. It does not contain any hardkeys or softkeys and therefore can only be used in conjunction with the Handheld Keypad. The Handheld Keypad can be mounted onto the External Alarm Device as illustrated below.



Hardkey Functions

Silence/Reset - press to silence an alarm or alarms that are sounding or, if alarms are latching, to reset them.

Suspend - press to suspend or switch on all alarms. The current state is indicated by the Alarm Suspend Lamp.

Main Screen - press to return to the main monitoring screen.

Change Screen - (**Agilent CMS only**) press to change between screen layouts or to access a 2nd or 3rd display. You can also freeze any wave movement on the screen (INOPs, alarms and numerics are not affected).

Realtime Record - press to record pre-selected waves onto a system recorder or a bedside recorder.

Delayed Record - press to record pre-selected waveforms that are no longer on the monitor screen.

Alarms - press to enable you to suspend or switch on alarms, set and review alarm limits, enter Monitor Standby, or set the alarm volume.

Other Patients - press to enable you to view data from other beds in your group.

Monitor Setup - press to enable you to pre-select certain system characteristics.

Procedures - press to enable you to set up and perform procedures such as Cardiac Output, Wedge Pressure (**Agilent CMS only**), ST analysis, Drug Calculations, admit and discharge patients, or end a particular patient case and transfer patient data.

Trends/Calcs - press to enable you to view vital signs and graphical trends, make and review calculations, print reports and mark events to view in graphs.

Module Setup - press to enable you to change or adjust parameter settings, switch parameters on or off, or set up parameters.

Arrow Keys

The arrow keys consist of up/down/left/right keys. They only function when illuminated. The arrow keys allow you to move between areas on operating screens to enable you to change or adjust settings, perform procedures, or make changes to the screen display.

Confirm Key

This key functions only when it is illuminated. A prompt message “...press CONFIRM...” appears on the screen when you need to use it.

Airway Gases/Ventilation - **(Agilent CMS only)** Press to view airway gases or ventilator waves and numerics.

Agilent V26CT/V24CT Power Supply

The Agilent Models V24CT and V26CT are powered by an external AC (line power) or by their own internal battery power supply. Your monitoring needs will determine which power source is used. We recommend that you plug the monitor into line or AC power whenever the monitor is not being moved or used, or for long term bedside monitoring. When transporting a patient or when monitoring in a remote area, where AC power is not feasible, use battery power.

Warning

Do not disconnect the power cord from the monitor and leave it connected to the AC power source. This could cause damage to the power cord. Instead, keep the power cord connected to the monitor and unplug it from the AC power source.

The power cord must be inspected periodically for cracks or exposed metal parts. Replace immediately if there are any cracks, exposed metal parts, or any other signs of wear and tear.

Battery Power Supply

The Agilent Models V24CT and V26CT can be powered by 1 or 2 sealed lead-acid batteries with 12 Volt 2.3 Amp-Hour capacity. The rate of battery discharge is dependent on temperature and power load. The power load is a function of the number and type of parameter modules as well as parameter settings being used. The battery life for the Agilent Models V24CT and V26CT ranges from approximately 30 minutes for a fully loaded system operating on one battery to:

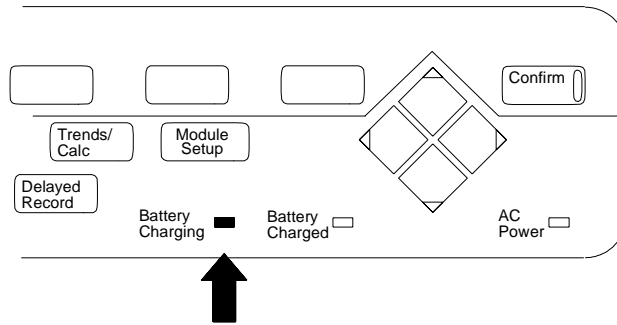
- 1 hour for a fully loaded system operating on two batteries when loaded with the following parameter modules:
ECG/Resp, NBP, SpO₂, Pressure, Recorder and
- 1 hour 15 minutes for a minimally loaded system operating on two batteries when loaded with the following parameter modules:
ECG/Resp, NBP, SpO₂, Pressure.

We recommend you use 2 fully charged batteries to get the optimum battery life when using the battery power supply.

Battery Specifications

- 1 or 2 lead-acid batteries.
- 12 Volt 2.3 Amp-hour capacity.
- Up to 1.25 hours battery capacity typical on full charge at 25°C, depending on modules used in the product.

Note—Charging time is 4 hours to 90% of full capacity if the monitor is off. 16 hours to 90% of full capacity if the monitor is on.



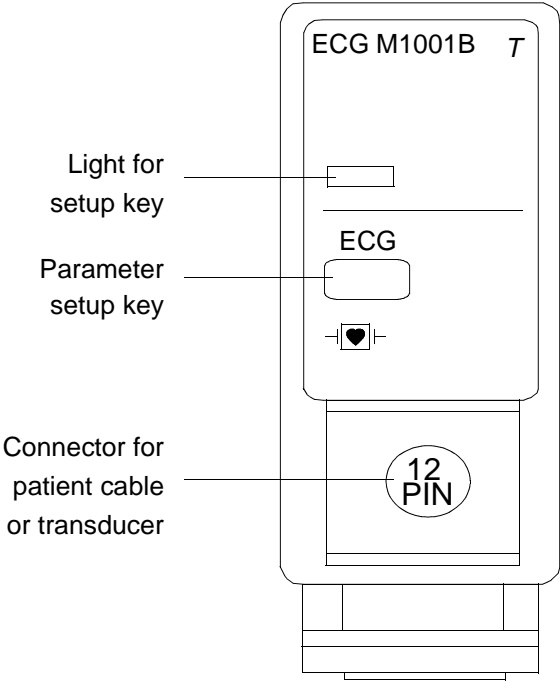
Note—When AC is connected and the monitor is on, the Battery Charge LEDs may take some time to cycle to the appropriate charge indication and may underreport battery capacity during this setting period. Use the fuel guage rather than the Battery Charge LEDs during this period to estimate battery capacity or turn the monitor off to accelerate the charge setting time.

See Chapter 12, “Battery Information (Agilent V24 and V26 only)” for additional information on battery operation and Battery Charge LEDs and indicators.

Parameter Modules

The parameter modules have one or more hardkeys on the front. The key labeled with the parameter name is called the Setup key, which gets you directly into the setup screen for that parameter. When you press the Setup key on the front of the module, and get into the parameter setup window or task window, a light appears above the key.

The connector socket on the front of each module is the same color as the corresponding connector plug on the transducer or patient cable.



Note—If a “T” is present on the front of a module, certain parameter settings may be transferred with that module when it is moved from one rack to another. This behavior is dependent on a setting made in a

special Service Mode, either by your biomedical engineering department or the Agilent service engineer. You can find a description of this behavior (called “*Parameter Settings Transfer*”) in Chapter 3.

Parameter modules can be plugged into the following types of rack:

Rack Type	Mounting	Comments
Agilent CMS		
Integral Rack	This is fitted to the front of the M1046A computer module.	Cannot be used with the M1167/77A CMS System. 8-slot rack.
Satellite Rack	You can have one or more satellite racks attached to an I.V. pole, bedside or wall.	Can be used with all CMS Systems. Available as 6-slot or 8-slot rack.
Agilent V24 and V26		
8-slot Satellite Rack (Standard)	Same as Satellite Rack for CMS.	Only one Satellite Rack can be used with an Agilent V24 or V26 Monitor.
6-slot Satellite Rack (Optional)	Same as Satellite Rack for CMS. This can also be mounted to the back of the M1205A V24CT and V26 CT Monitors	

Caution

When the rack is mounted in close proximity to any intravenous infusion equipment, do not let saline solution get onto the rack or parameter modules. Severe damage to the equipment can result if saline solution leaks into the connectors at the rear of the modules.

Parameter Modules

You can plug the parameter modules into the rack and remove them as you require them. The number of modules you can plug in depends on the type of rack and the model of monitor you have ordered.

For most types of parameter modules, the system allows only one of each type per patient (ECG, for example). Other types of modules allow more than one per patient (Invasive Pressure, for example).

If too many modules or an unsupported module are plugged in, a message detailing where the extra module is, appears in the system message field:

```
Currently ignored module in rack position R-P  
where:
```

R is the number of the rack
(e.g. 1=integral rack, 2=first satellite rack, ...
or 1=first satellite rack, 2=second satellite rack, ...)

P is the slot number in that rack
(counted from left to right)

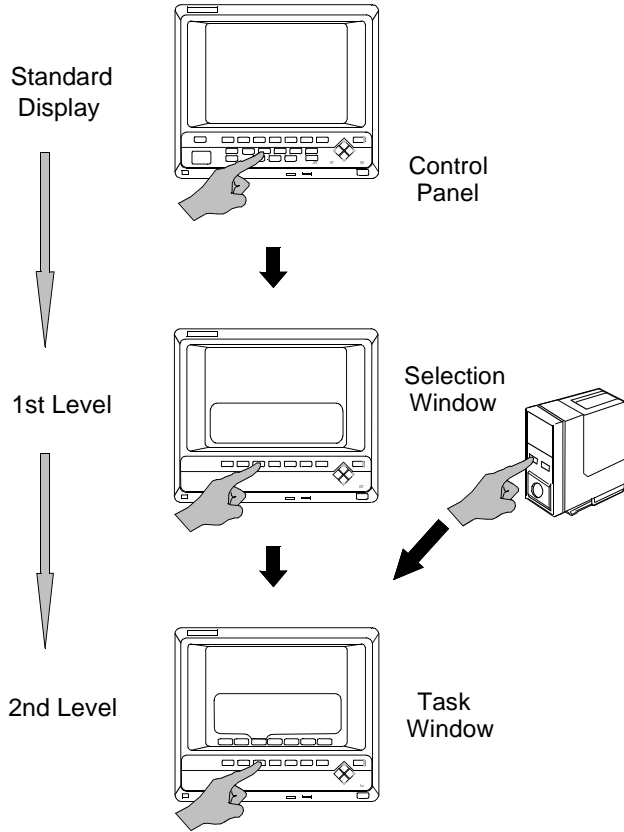
The message

Unrecognized module in rack position R-P
is displayed if an unknown module is plugged into the rack.

Note—Since the Agilent V24 and V26 Monitors only support one module rack, *R* will always be 1.

Operating Levels

There are three types of screens which you will see on the display module. The three types of screen and the interconnections between them are shown below.

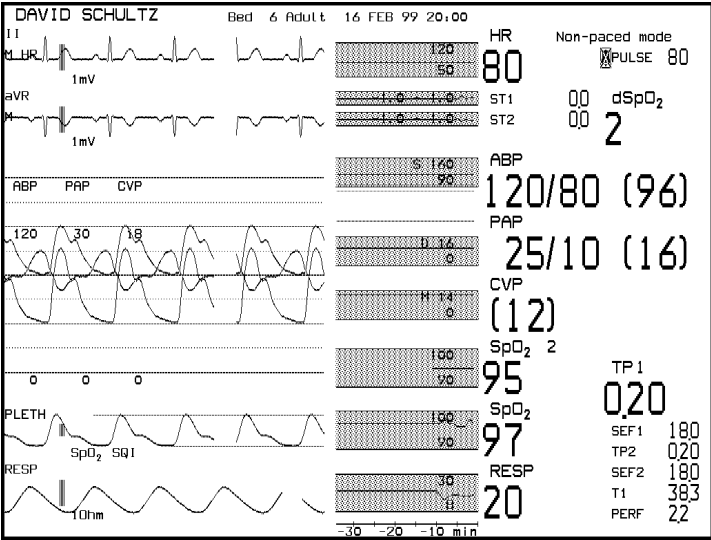


Main Screen

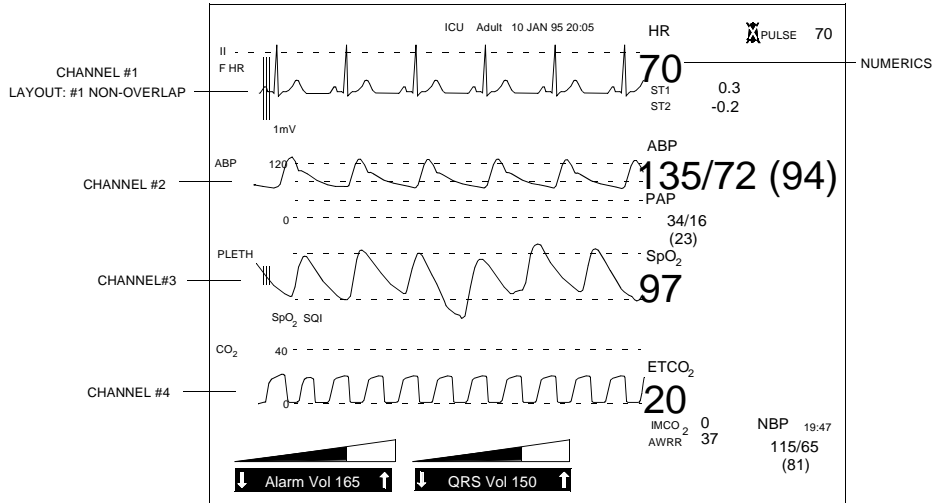
This display shows the waveforms and numerical readouts of the parameters you have chosen to monitor, alarms, INOP messages, bed label, date and time, and arrhythmia messages (when assigned).

You can configure the number and position of the waveforms on the display screen. The numerics are aligned with the corresponding waves. The numeric information is updated every two seconds. With the color model, the numeric appears in the same color that you have assigned to the corresponding waveform.

The hardkey **Main Screen** always returns you directly to the Main Screen.



Note—The Main Screen of the Agilent V24 and V26 Monitors includes Alarm Volume Control and QRS Volume Control Bars (see figure below)



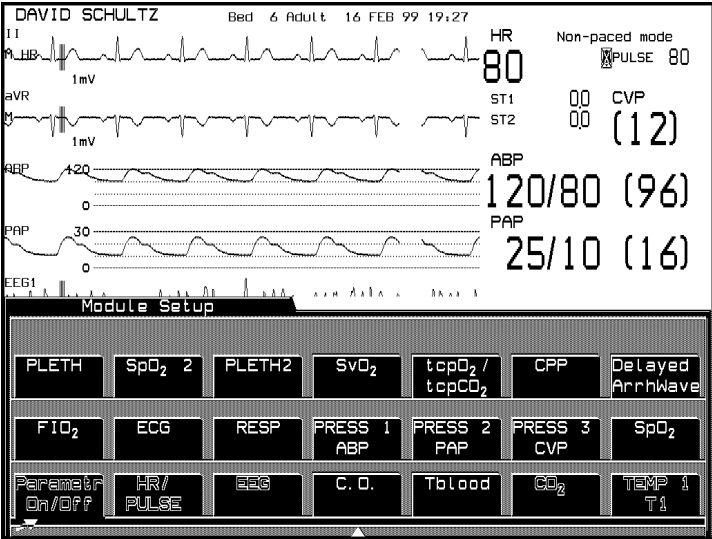
Selection Window

This is the first operating level where you can choose a specific activity or function.

You get into a Selection Window by pressing one of the blue-labeled hardkeys on the control panel.

When you get into the Selection Window the bottom line is always active. This is indicated by a bar below the keys and the yellow labeling. The selection can be changed within the Selection Window one line at a time. For information on how to change the selection see page 1-24.

There is also an arrow symbol in the Window that moves along the selected line when the cursor keys are pressed. To enter the Task Window to which the arrow is pointing, press **Confirm**.



Task Window

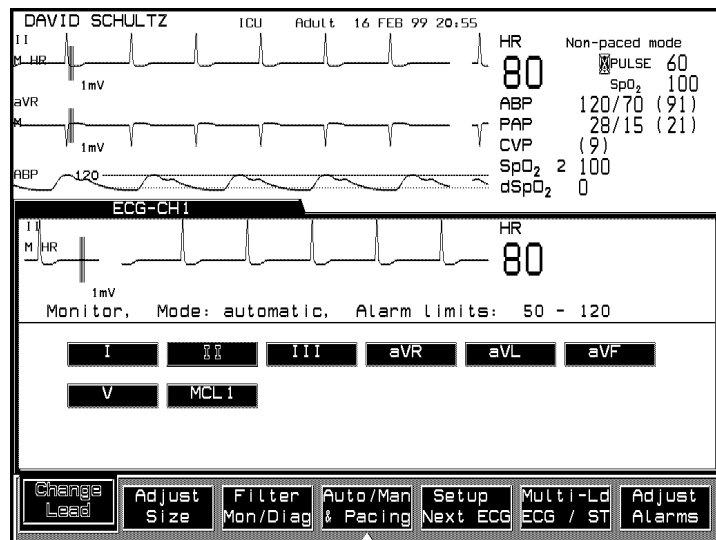
This is the second operating level, which allows you to make changes or adjustments to the parameters and screen displays, or to perform procedures. Each parameter or procedure has a series of Task Windows.

There are two ways to get into the second operating level:

via the Selection Window,

or for parameters:

by pressing the Setup key on the parameter module.



Getting into the Operating Levels

Before you can start to make adjustments or changes to the parameters or perform a procedure, you need to know how to get into the operating levels and how to navigate through the selections. Follow the procedures below to get into the Selection and Task Windows.

Selection Window

1. Press the blue-labeled hardkey for the function you require.
2. When you get into a Selection Window, the bottom line is always active. Select the line with the parameter or function you require, by pressing the same hard key again that got you into the selection window, or use the arrow keys if they are illuminated.
3. Press either the softkey corresponding to the parameter or function you require or **Confirm**. This gets you into the Task Window.

For example, to get into the Noninvasive Blood Pressure (NBP) Task Window:

1. Press the hardkey **Module Setup**
2. If it is not already active, select the line containing NBP by pressing **Module Setup** again.
3. Press the softkey **NBP** to get into the Noninvasive Blood Pressure Task Window.

Task Window

There are two ways to get into a parameter Task Window, either:

via the Selection Window,

or

by pressing the Setup key on the parameter module which gets you directly into the Task Window.

Getting into other Task Windows for functions like Other Patients or Monitor Setup is only possible via the Selection Window. In the Task Window there are separate keys. The selections that are currently active for the parameter or function you have chosen are indicated by yellow labeling. In addition the selected keys appear to be “pushed in” on the screen.

There are two reasons for changing the selection in the Task Windows: you will either want to move to the next Task Window, or make an adjustment to a setting.

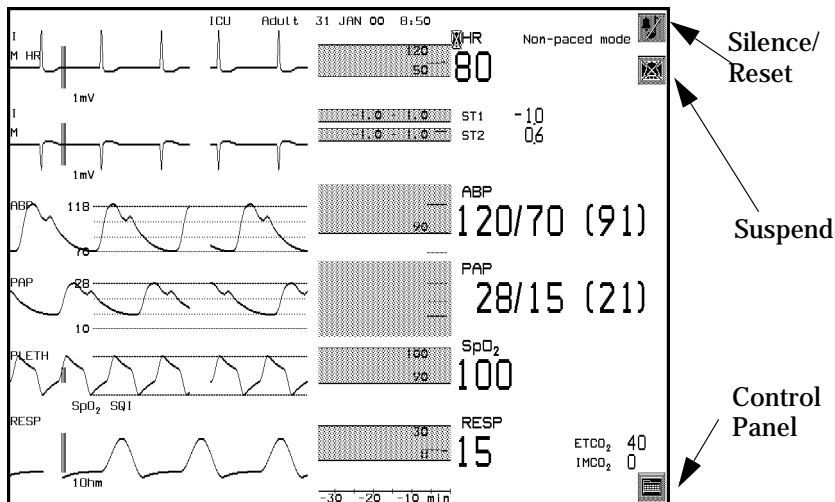
1. To move to the next Task Window, press the softkey for the function you require, for example **Filter/Mon/Diag**. This gets you into the Filter/Mon/Diag Task Window where you can make any necessary adjustments.
2. To make an adjustment, change the selection by pressing the softkey for that window again, until the adjustment or change you want is active, or use the arrow keys if they are illuminated.

Touch or Mouse/Trackball Operation (CMS only)

The M1167A/77A systems also allow connection of XGA displays, enabling touch (requires touchscreen displays), mouse or trackball operation of the monitor. Since these displays do not contain a control panel, there are slight differences in operating the system. The following sections contain the instructions specific to touch, mouse or trackball operation.

Main Screen

The layout of the main screen is basically the same as with other CMS systems, with the only exception that it contains three additional buttons: the Silence/Reset button, the Suspend button (both in the upper right corner of the display) and the Control Panel button (in the lower right corner of the display). These buttons are touch-responsive and can be used alternatively to the hardkeys of the control panel or the handheld keypad..

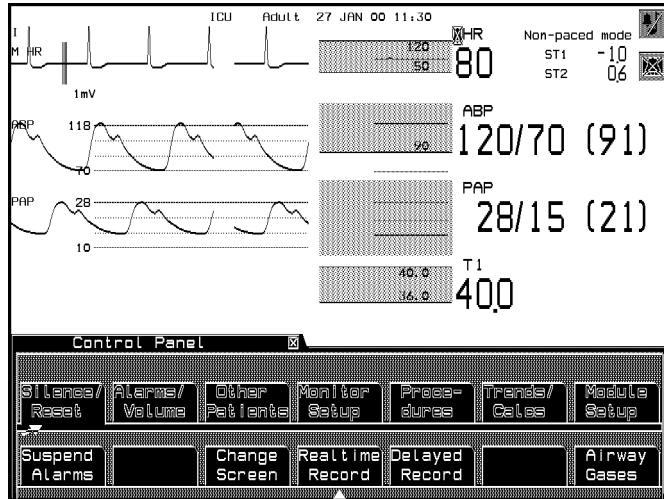


Note—Do not remove the keypad from systems with touch or mouse/trackball operation as it is still required to perform certain tasks.

Control Panel Task Window

The Control Panel Task Window contains most of the hardkeys found on the control panel of non-touch systems. See “Hardkey Functions” on page 1-12 for detailed descriptions of these keys. You can access the Control Panel Task Window by touching the Control Panel symbol in the lower right corner of the main screen display.

Control Panel Task Window



General Touch/Mouse/Trackball Operation

If a touch-responsive object or area of the screen is selected (either by touch or by mouseclick), a white '+' appears and the area is surrounded by a white frame. In addition, an audible click is issued. The white frame disappears automatically when the object is released. If an object or area of the screen that is not touch-responsive is touched, a white 'x' appears in the selected area.

Note—When using a mouse/trackball, the white '+' and 'x' signs appear, wherever the mouse/trackball pointer is currently located. This indicates touch-responsive areas before they are actually selected by mouseclick.

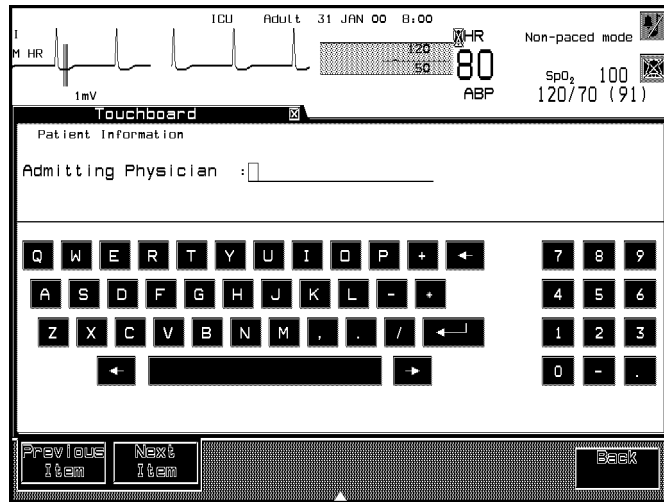
Touch-Responsive Objects

Touch-responsive objects and areas of the screen include:

- **Numerics and Waves** - When a numeric or wave is selected, the respective parameter setup window opens up.
- **Alarms/INOP messages** - Selecting an Alarm or INOP Message opens the alarm messages window.
- **Task Windows/Selection Windows** - All softkeys displayed in Task Windows and Selection Windows are touch-responsive. When a Task Window/Selection Window is open, a selection of any area outside this window (except the Silence/Reset and Suspend keys) will close the task window. Selecting the black x in the corner of the Task Window label also closes the Window. Closing a Task Window returns you to the Main Screen.
- **Items/Selections** - All Items and all Selections within Task Windows can be directly selected by touch or mouseclick without the Select Item softkey or the arrow keys.
- **Arrow Keys** - Depending on the application, buttons are provided to perform the task of the arrow keys.
- **Confirm Button** - A confirm button is displayed in the lower right corner of the task window everytime a confirm is required.
- **Application Windows** - Split Screen, oxyCRG and CSA Display contain touch-responsive areas which lead to the respective task windows. Please refer to Chapter 3 of this manual for further details.
- **Application-specific buttons** - Touch/Mouse/Trackball Operation has special implications for the Vital Signs, Graph Trends and Calculation Task Windows (see Chapter 8 *Trends and Calculations* for details), for the Patient Admit Task Window (see Chapter 7 *Admit/Discharge/End Case* for details), for the ST Analysis Task Window (see Chapter 14 *EKG and EKG/Respiration Module Section* for details) and for defining screen labels and adjusting the date and time (see Chapter 3 *Setting up your Monitor* for details).

Alphanumeric Entries

A Touchboard can be accessed when alphanumerical data needs to be entered. This is an alternative to the entry of data with the handheld keypad. The Touchboard can be activated with the “Touch Board” softkey e.g. from the Patient Admit Task Window.



The Touchboard Task Window contains a subtitle which references the Task Window from which the Touchboard was accessed. Data entry can be performed for one item at a time.

Press **←** to save edited data.

Press **Next Item** or **Previous Item** to navigate through the editable items of the Task Window the Touchboard was accessed from.

Press **Back** to return to the Task Window the Touchboard was accessed from.

Disabling Touch/ Mouse/ Trackball Operation

In order to prevent unintended or uncontrolled operations of the monitor, touch operation must be disabled while cleaning the touchscreen. To disable touch and mouse/trackball operation press and hold or click and hold the control panel button in the lower right corner of the main screen for at least four seconds. A padlock icon over the control panel button indicates when touch and mouse/trackball operation is disabled. To re-enable touch and mouse/trackball operation press and hold or click and hold the padlock icon for at least four seconds. The control panel button will reappear.

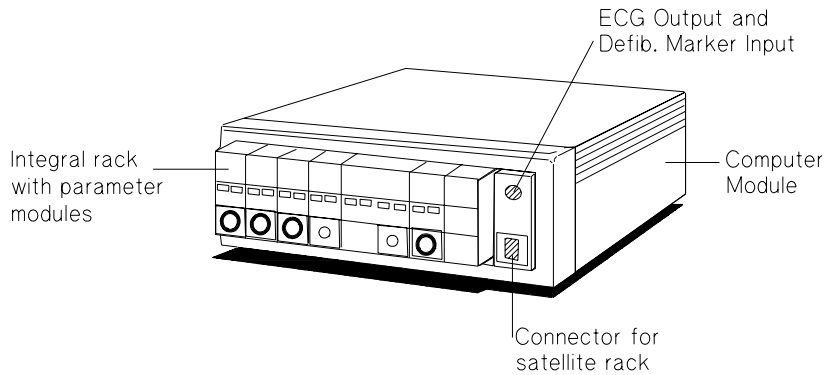
Note—If a task window is opened or the monitor is put in standby mode via the handheld keypad while touch and mouse/trackball operation is disabled, touch any area of the screen to return to the main screen. The padlock icon will be displayed.

The CMS Computer Modules

The signals from the parameters being monitored are transmitted to the computer module, where they are processed and then displayed on the screen as waveforms and numerical readouts.

M1046A Computer Module

The M1046A Computer Module is for use with the Agilent M1165/66A and the Agilent M1175/76A CMS.



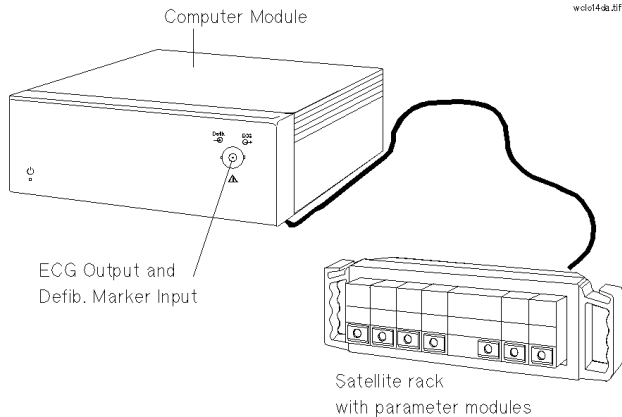
Maximum Voltages

ECG Output and Defib. Marker Input	3.2 V p-p
Connector for satellite rack	60 V

The parameter module rack can be attached to the computer module, or a blank panel can be fitted to the computer module if you want to use a satellite parameter module rack.

M1046B Computer Module

The M1046B Computer Module is for use with the Agilent M1167/77A CMS.



Maximum Voltage

ECG Output and Defib. Marker Input	3.2 V p-p
------------------------------------	-----------

The parameter modules are inserted into one or several satellite racks. They cannot be attached to the front of the computer module.

ECG Output and Defibrillator Marker Input

Applies to both the M1046A and M1046B Computer Modules.

The ECG output and defibrillator marker input connector on the computer module is used during cardioversion to provide an ECG waveform for synchronizing a defibrillator. It is also used to receive a marker pulse from the defibrillator for indicating the defibrillator discharge in the ECG waveform on the monitor display.

If you are using an Agilent defibrillator without a built-in recorder, the marker pulse from the defibrillator is returned to the monitor. If the Agilent defibrillator has a built-in recorder, then the marker pulse is returned to that recorder rather than to the monitor. The ECG output can also be used for other applications, such as synchronizing intra-aortic balloon pump systems.

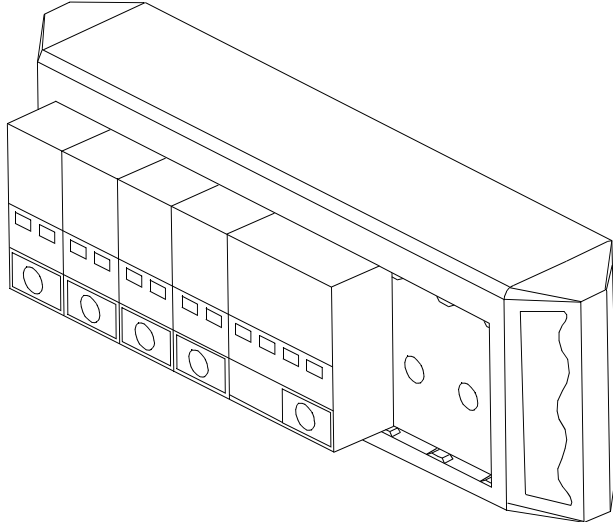
The Agilent V24 and V26 Parameter Module Rack

The Agilent V24 and V26 parameter module rack is attached to the display module by a cable to a connector on the left side of the display module. In addition, the Agilent Models V24CT and V26CT allow you to dock a 6-slot rack directly to the mainframe.

Warning

Do not connect a second rack by a cable when using the Agilent Model V24CT or V26CT with a 6 wide rack docked to the mainframe. Docking a second rack by a cable may disrupt module communication.

The signals from the parameters being monitored are transmitted to the internal computer, where they are processed and then displayed on the screen as waveforms and numerical readouts.



Operating Rules to Remember

- Pressing **Main Screen** key always returns you to the Main Screen.
- To get into a Selection Window press a hardkey.
- What is labeled in yellow and appears “pushed in” is active.
- Softkeys function only in the Selection and Task Windows (with the exception of the Alarm Volume Control and the QRS Tone Volume Control on the Agilent V24 and V26 Monitors).
- The parameter module Setup key gets you directly into a Task Window.
- The arrow keys and **Confirm** key are illuminated when available for use.

Performance Specifications of the Agilent Displays

M1095A Flatscreen Display

<i>Useful Screen:</i> ($\pm 5\%$ unless otherwise noted)	158 mm x 211 mm (6.2" x 8.3")
<i>Pixel Size</i>	0.33 mm x 0.33 mm
<i>Storage Time at 25 mm/sec</i>	5.5 seconds
<i>Trace Speeds</i>	6.25, 12.5, 25, 50 mm/sec $\pm 10\%$

M1094A/B and M1092A CRT Display

<i>Useful Screen:</i> ($\pm 5\%$ unless otherwise noted)	180 mm x 225 mm (7.1" x 8.9")
<i>Pixel Size</i>	0.22 mm x 0.35 mm
<i>Storage Time at 25 mm/sec</i>	6 seconds
<i>Trace Speeds</i>	6.25, 12.5, 25, 50 mm/sec $\pm 10\%$

M1097A #A02 XGA Flatscreen Display

<i>Useful Screen:</i> ($\pm 5\%$ unless otherwise noted)	304.1 mm x 228.1mm (12" x 9")
<i>Pixel Size</i>	0.297 mm x 0.297 mm

Using an ITE Display

The M1167A/77A CMS provides means for customers to use ITE displays. There are several restrictions associated with this option. Since the display is used as part of a medical device within the patient vicinity, there are additional requirements to be fulfilled in order to be in compliance with the European Council Directive 93/42/EEC (Medical Device Directive) and with FDA recognized consensus standards:

- **Safety**
- **EMC**
- **Performance Requirements**

Safety

1. The display must either comply with the requirements of the: EN60601-1 +A1 +A2 {IEC601-1 +A1 +A2}, or

it must conform to the requirements of an IEC XXX electrical safety standard and fulfill specific requirements according to the EN60601-1-1 +A1 {IEC601-1-1 + A1} to provide the same level of safety as EN60601-1 {IEC601-1}:

- The display must be constructed or protected so that spillage of liquids does not wet parts of the display which may cause a safety hazard (IEC601-1; 44.3).
 - The ITE display must be used with an isolation transformer (e.g. Agilent M1389A), if the enclosure leakage current exceeds the requirements of EN60601-1/IEC601-1 (normal and single fault condition). The power cable must be secured so that the transformer cannot be disconnected without the use of a tool.
2. A test of the Enclosure Leakage Current (normal and single fault condition) of the complete system, including the display, has to be performed and documented.

EMC

1. The display must either fulfill the requirements of the EN60601-1-2 {IEC 601-1-2}, or

it must conform to the requirements of the EMC standard for ITE devices, EN50082-1: 1997 and EN50081-1 / CISPR 22.

2. The video cable between M1167A/77A CMS and the ITE display must not exceed a length of 3.0m. For cables exceeding 3.0m EMC testing according to IEC 801-4:1988 has to be done.

Performance Requirements

Agilent cannot assure compliance with the ANSI/AAMI EC-13 Standard for Cardiac Monitors, Heartrate Meters and Alarms when using ITE displays. Compliance with the ECG aspect ration and 25 mm/s $\pm 10\%$ sweep-speed specifications can only be assured when using the Agilent Displays M1092A, M1094B and M1095A. In addition, the following display specifications are recommended:

Specification	Requirement or Value	Units
Resolution (pixel addressability)	1024 x 768	Dots x lines
Vertical Refresh Rate	60	Hz (non-interlaced)
Red, Green and Blue Video Inputs	~0.7	V p-p
Vertical & Horizontal Multi-Sync Inputs	5	V TTL
Video-Cable Connector	HD15male	

Using an ITE Display

2

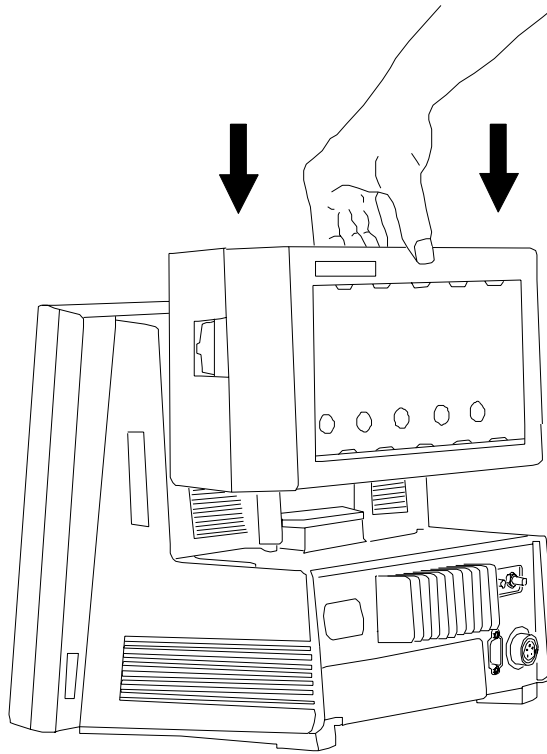
Getting Started

Now that you have been introduced to the monitor you are probably ready to start using it. This chapter will help you get started. It contains the following sections:

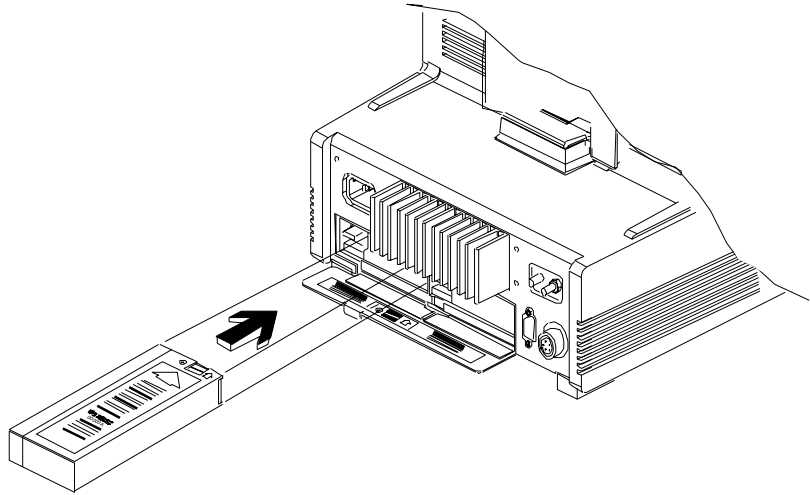
- Setting up the Monitor (Agilent V24 and V26 only). 2-2
- Setting up the Parameter Modules 2-5
- Attaching the Patient 2-6

Setting up the Monitor (Agilent V24 and V26 only)

1. Attach the parameter module rack to the display module by a cable to the connector on the left side of the display module. If you are using the Agilent Model V24CT or V26CT you can attach the 6-slot rack to the back of the mainframe display without the need for a cable. The two components will snap or dock together.



2. If you are using the Agilent Model V24CT and V26CT and the batteries are not already in place, insert 2 Agilent 40488A 12 Volt 2.3 Amp-hour sealed lead-acid batteries into the spring-loaded battery door in the back of the monitor. The batteries should be inserted with the grey Agilent battery label facing upwards and the contacts pointing into the monitor. The batteries will snap or click into place when properly inserted.



Caution

Agilent Technologies recommends you fully charge the batteries before using the Agilent Models V24CT or V 26CT for the first time. Plug the monitor into an AC power supply (line power) for an initial charging cycle. When the monitor is plugged in and the power is off, it takes approximately four hours for the batteries to reach a charge of 90% capacity and nine hours for the batteries to be fully charged. If the monitor is plugged in and the power and external battery charger is on, it takes approximately 16 hours to charge the batteries.

3. If using an AC power supply, plug the power cord into the power source.

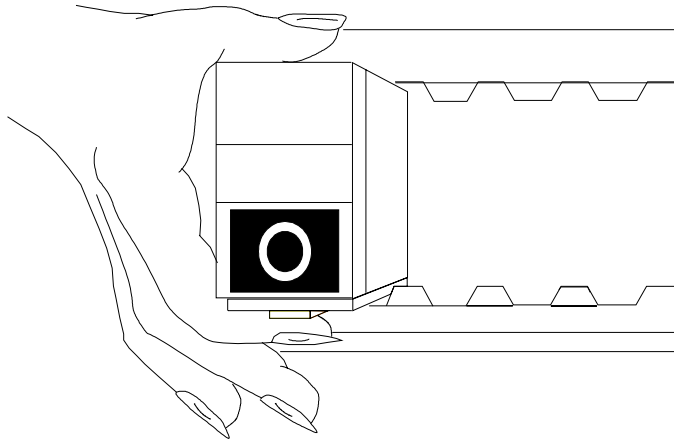
4. Switch on the system using the power On\Off switch. A self test is then performed.

Warning

Connecting the Agilent monitoring network (SDN) cable when the product is powered on is not supported. Error codes and Agilent monitoring network (SDN) interface lock-up may occur. Power cycling the product will recover the product. No permanent damage will result. To prevent unintentional disruption in monitoring, be sure the SDN interface cable is properly secured at both ends when connecting to the Agilent monitoring network (SDN).

Setting up the Parameter Modules

1. Decide which parameters you want to monitor.
2. Make sure the appropriate modules are plugged into the rack. If not, insert the module into the rack until the lever on the base of the module clicks into place. To remove a module, press the lever upwards and pull the module out. (See diagram below.)



3. Check that you have the correct patient cables and transducers plugged into the modules. The module connectors are color-coded to the patient cables and transducers, for easy identification.

Your monitor may have *Parameter Settings Transfer* set ON. To understand the effect this has when using modules with the “T” label, turn to *Parameter Settings Transfer* in Chapter 3.

Attaching the Patient

1. Attach the electrodes, probes, transducers, and insert pressure catheters as required for monitoring the patient.
2. Connect the electrodes, probes and transducers to the appropriate modules.

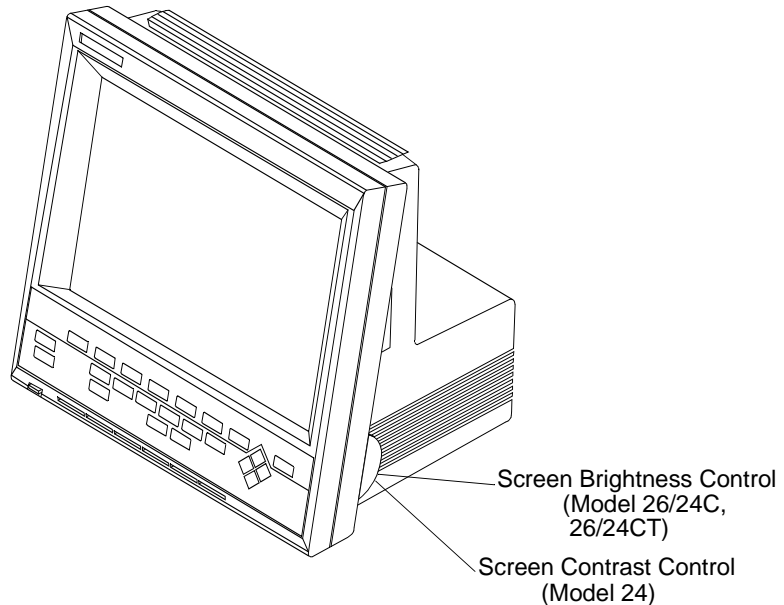
After less than 10 or 20 seconds you should see a display on the screen similar to the one under “Main Screen” in Section 1. The number of waveforms depends on the waveforms you have selected to have displayed and also on the model of your system.

The numerics are aligned with the corresponding waveform.

Adjusting Screen Contrast

Agilent V24 and V26:

The brightness or contrast of the screen display can be adjusted by using the dial located behind the edge of the display, on the lower right side of the monitor. The Agilent V24 uses a contrast control. Agilent Models V24C, V24CT, V26C and V26CT are equipped with a brightness control. Make sure that all of the screen information is visible.



Agilent CMS:

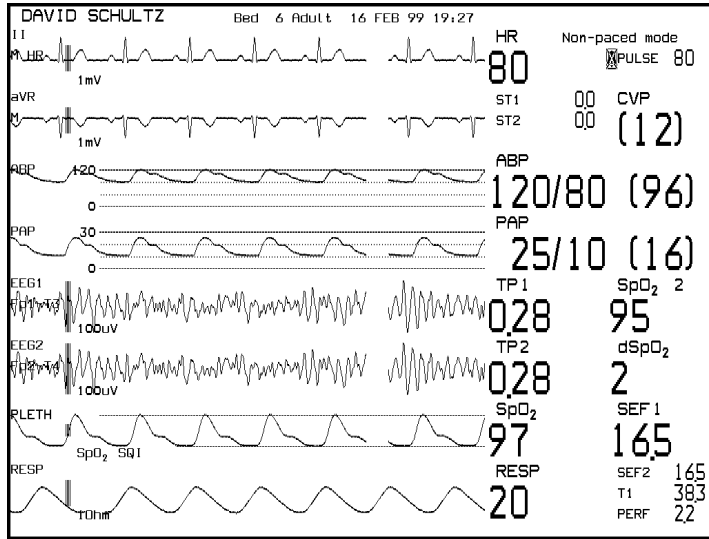
The brightness and contrast of the screen display can be adjusted by means of the two dials underneath the hardkeys.

Follow this procedure to achieve the optimum screen display:

1. Turn the brightness and contrast controls to their maximum settings.
2. Slowly turn the brightness and contrast controls down to the lowest acceptable position where the display can still be seen clearly. The most acceptable position will be dependent upon the surrounding light conditions. Please ensure that all the screen information is visible.

Starting Monitoring

Getting Started



The patient's vital signs are now appearing on the screen. The pre-configured default settings for the parameters and screen display, that were set up at installation or have been stored in the module ("Parameter Settings Transfer"), are active.

If you want to make changes to the screen display see the section "*Configuring the System*". If you want to make changes to the parameter settings see the individual parameter sections.

Switch the system alarms ON (by pressing the **Suspend** key so that the Alarm Suspend lamp goes out). The patient is now being monitored.

Screen Messages

Two types of messages appear at the top of the display screen:

- Prompt messages - these instruct the user to perform an action
- Status messages - these give information about the current situation. For instance:

"sync output not available, plug-in ECG module"

this message stays as long as the ECG module is not plugged in.

Prompt and status messages are displayed either in the appropriate Task Window, or at the top of the Main Display screen, depending on the operating level.

On the Main Screen display the prompt and status messages are shown below the alarm and INOP messages.

Prompt messages appear for 3 seconds.

Status message are displayed in rotation for 3 seconds each.

In the Task Window the prompt and status messages remain until the appropriate user action is performed.

Reserving a Channel

A parameter module may be turned OFF, but left in the rack. The empty channel where the waveform should be still appears on the Main Screen. There is no waveform, waveform label, or numeric. Another wave may use its screen channel temporarily, but will be discarded as soon as the assigned wave is reactivated.

This ensures that particular waveforms can always be allocated to the same place on the Main Screen, and avoids inconsistencies in the waveform display of different patients in the same department.

Note—If trend data for this patient is to be collected, old data from a previous patient should be deleted. The old data will be automatically deleted if the monitor has been shut off for three hours or more. See “Discharging a Patient/Ending a Case” on page 7-9 for more information.

Power Failure

If a power failure occurs, any alarm conditions that were stored in the monitor will NOT be retained when power is restored. Settings such as alarm limits stored in “T” modules ARE retained - see “Parameter Settings Transfer” on page 3-61.

Caution

You are advised to check all the monitor settings after any power failure.

The monitor reacts according to the length of the power failure:

Less than 60 seconds	Patient Data Management data and all settings retained.
Less than 3 hours	Patient Data Management data retained. All settings revert to user defaults.
More than 3 hours	Patient Data Management data not retained. All settings revert to user defaults. Time setting may be lost if not networked.

Patient Information Center

If the monitor is connected to a Patient Information Center PIC (Agilent 78504 and Agilent 78508) and you select the same lead for ECG channels 1 and 2, the wave is not displayed in channel 2 of the Patient Information Center.

Monitor Standby

If you want to stop patient monitoring, but keep all settings and Patient Data Management information, you can switch the monitor into “Monitor Standby”:

1. Press **Alarms / Volume** or **Alarms**
2. Press **Monitor Standby** .

All waves and numerics disappear from the display, and all monitoring is suspended. The word “Standby” appears in big letters on the screen.

If your monitor is connected to an Agilent patient care system while the monitor is in standby, no parameter data from your monitor is sent over the system. Instead, a message indicating that your monitor is in “Standby” is sent to other beds in the system, and is displayed at the Central Station. If your bed is configured to receive alarms, and another bed in the system goes into alarm, the status message “Other Bed in Alarm” is displayed on your monitor. You will hear the overview prompt tone (two double beeps), but the Alarm Bed Task Window will not be displayed.

To resume monitoring, simply press one of the keys (except **Suspend**) on the control panel on the front of the display or on the handheld keypad (Agilent CMS only). The changes and adjustments that you made to the settings before going into Monitor Standby are retained. Patient Data Management information collected before going into Monitor Standby is also retained.

As all monitoring is suspended, no patient data is collected while the monitor is in Monitor Standby.

The **Suspend** hardkey operates as usual when you are in Monitor Standby, so you can prepare the monitor alarm capability before you resume monitoring.

Setting up your Monitor

This chapter describes the characteristics of your system that can be changed during monitoring, using the **Monitor Setup** key. It includes the following sections:

- Changing Display Screens 3-2
- Selecting a Screen 3-3
- What you Can Configure. 3-5
- Changes to the Configuration 3-6
- Assigning Waves to Screen Channels 3-8
- Selecting the Number of Waves. 3-13
- Changing the Wave Overlap. 3-14
- Selecting Realtime Wave Speeds. 3-15
- Displaying Split Screen Trends 3-22
- oxyCRG Display. 3-25
- CSA Display (Agilent CMS only) 3-28
- Configuring a Second Independent Display (Agilent CMS only) 3-32
- Adjusting the Volume Control 3-35
- Adjusting the Date and Time 3-37
- Selecting Waves for Central Recorders 3-39
- Configuring Module, Bedside and Central Recordings 3-40
- Other Patients Controls 3-41
- The Status Log Function. 3-42
- The Monitor Revision Function. 3-43
- Changing Default Settings and Patient Category 3-44
- Changing the Patient Category 3-45
- Changing the Configuration Set. 3-53
- Changing Operating Modes 3-55
- The Test Signals Function 3-58
- Parameter Settings Transfer 3-61

Changing Display Screens

A display screen is a pre-selected arrangement of realtime waveforms, numerics and overlaid application windows. A particular display screen can, for instance, be created to monitor a patient during a specific procedure in a department or unit.

There are five separate display screens which can be configured. The default names of these screens are Screen A, Screen B, Screen C, Screen D and Screen E. You can select additional screen labels (such as Standard, or Surgeon) for these screens.

A softkey corresponding to each screen is available in the Change Screen Task Window (Agilent CMS) or the Monitor Setup Task Window (Agilent V24 and V26). The display screen which is active is identified by an inactive softkey for that screen.

You can change to one of the other screens at any time, by pressing one of the other softkeys.

You can reconfigure only the screen which is currently active. Once a display screen has been configured, the settings remain either until the user changes them, or the monitor is switched off. When the monitor is switched off, the settings automatically revert to the defaults.

Agilent CMS only: If you have a second or third independent display, the **Next Display** softkey is available in the Change Screen Task Window. This key is used to configure the second or third display.

Selecting a Screen

If the screen you want to change is not the currently active screen, you must select the required screen (for example, Screen A, Screen B, Screen C, screen D or Screen E).

Procedure

1. Press the hardkey **Change Screen** (Agilent CMS) or **Monitor Setup** (Agilent V24 and V26).
2. Press the softkey corresponding to the screen you want to change. The Main Display appears for the selected screen.

Freezing Waves (Agilent CMS only)

You can freeze any wave movement on the screen via the **Change Screen** → **Freeze Waves** keys. Press **Start Waves** or any other key except **Suspend** or **Silence/Reset** to restart the waves.

You can also freeze the waves on your 2nd and 3rd independent display. To restart the waves on an independent display, press **Start Waves**.

What you Can Configure

Changes and adjustments you make to the settings in Monitor Setup screens remain active while the system is switched on. With the exception of changes to the date and time, all settings revert back to their default settings (factory defaults or user defaults) if the system is switched off for longer than 60 seconds. The settings for the date and time are stored by the system when it is switched off.

Note—If necessary, these default settings can also be changed. This is done in a special configuration mode, either by your biomedical engineering department or the Agilent service engineer. See the “Changing Default Settings and Patient Category” on page 3-44 for more details.

Changes to the Configuration

To make changes to the settings, you need to get into the Monitor Setup Selection Window. The key sequence to get into the Task Windows is shown above the screen figures in this guide.

The softkeys are indicated in the text like this:

Display .

The hardkeys are indicated in the text like this:

Monitor Setup .

Making Changes to the Main Display

The following describes how to change screen A, B, C, D, or E and assign a label. The description includes:

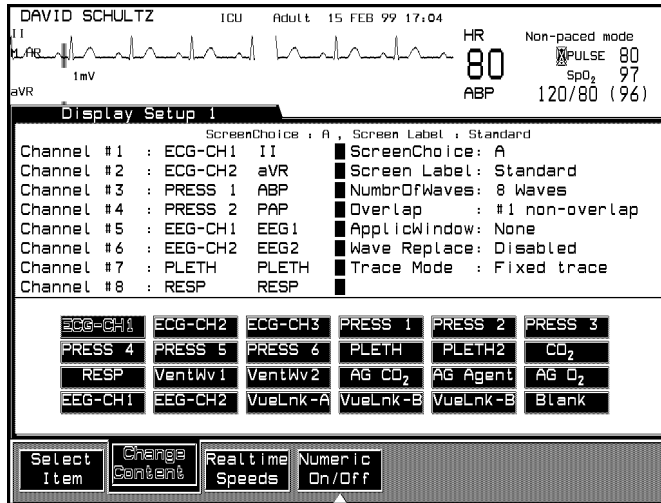
- Assigning Waves to Screen Channels
- Selecting a Screen
- Selecting Screen Labels for Realtime Display Screens
- Selecting the Number of Waves
- Selecting the Wave Overlap Configuration
- Selecting Realtime Wave Speeds
- Numerics On/Off
- Selecting an Application Window
- Wave Replace Mode
- Trace Mode

A description is then given for changing a completely separate display screen.

Assigning Waves to Screen Channels

You can assign realtime waves to positions on the screen. This defines where the waves appear on the Main Screen.

Monitor Setup → **Display1 Setup**



Notes—

- You can also return to the Display Setup Task Window from the Realtime Speeds Task Window by pressing the softkey Display Setup.

Procedure

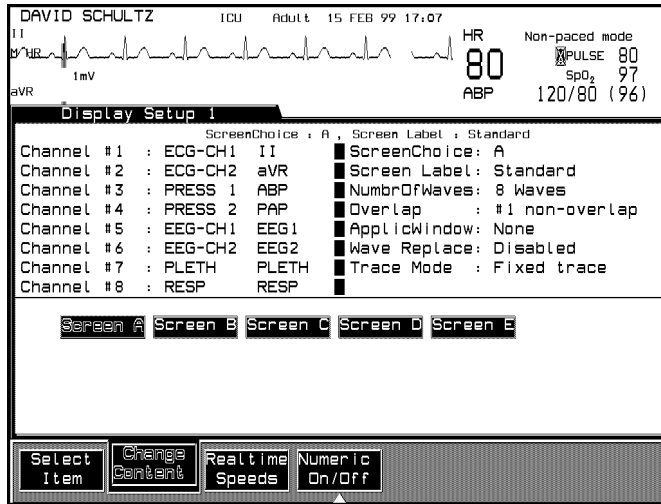
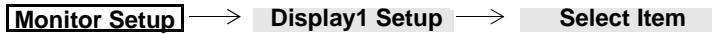
1. Press **Select Item** repeatedly to select a channel on the screen.
2. Press **Change Content** to move the selection to the wave you want to place in your selected channel.
3. Repeat steps 1 and 2 for each wave position you want to change.
4. Press **Main Screen** to return to the Main Screen screen.

Note—If one of the assigned waves is not available (parameter switched off or unplugged), then another wave will use its channel until the assigned wave is reactivated, provided Wave Replace Mode is enabled. The channel will only remain blank if:

- It is assigned to ECG or Blank.
- Another wave is available, but numerics aligned to that wave are switched off.

Selecting a Screen

You can switch between the five available screens (A-E) in the Display Setup Task window.



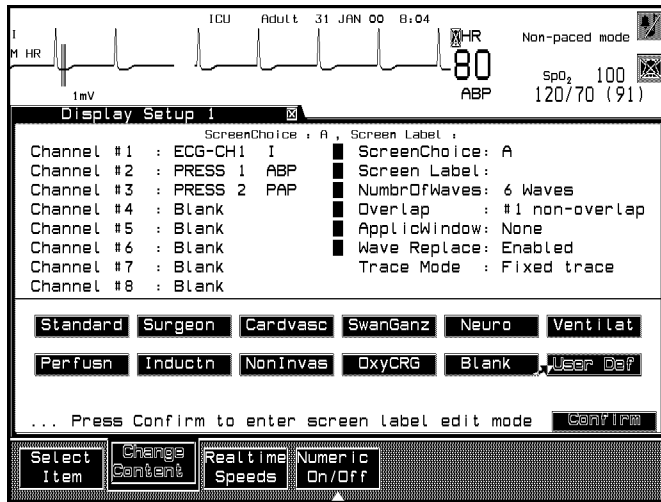
Procedure

1. Press **Select Item** until “Screen Choice” is selected on the screen.
2. Press **Change Content** to select a screen (A-E). The selected screen choice and its screen label will appear at the top of the Task Window. The other items on the screen will change depending on the configuration of the different screens
3. Press **Main Screen** to return to the Main Screen.

Selecting Screen Labels for Realtime Display Screens

A screen label may be selected for a realtime display screen. There are eleven choices.

Monitor Setup → **Display1 Setup** → **Select Item**



Procedure

1. Press **Select Item** until "Screen Label" is selected on the screen.
2. Press **Change Content** to select the key label that you require. The choices are:
 - a. Neuro
 - b. Cardvasc
 - c. SwanGanz
 - d. Standard
 - e. Ventil at
 - f. Perfusn
 - g. Surgeon

- h. Inductn
 - i. Non Invasive
 - j. OxyCRG3.
 - k. Blank (No screen label).
 - l. User Def (user defined screen label - see below)
3. Press **Monitor Setup** to return to the Selection Window or press **Main Screen** to return to the Main Screen screen.

User Defined Screen Labels

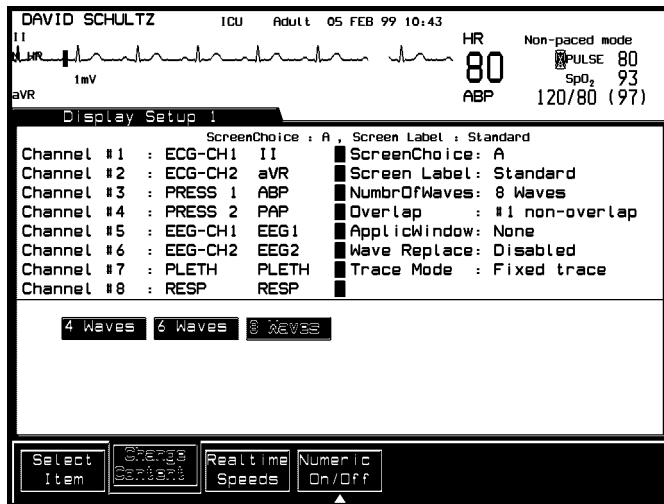
In addition to the pre-defined screen labels, you can define your own labels for each screen (A-E). To define a screen label:

1. Select User Def in the Display Setup Task Window.
2. Press **Confirm** .
3. Enter new label using either the handheld keypad, the touchboard (CMS only) or the arrow keys (V24/26).
4. Press **Confirm** .
5. The user defined labels will also appear in the Change Screen Task Window

Selecting the Number of Waves

You can select how many waves you want displayed on the screen (within the capabilities of the model you have ordered).

Monitor Setup → **Display1 Setup** → **Select Item**

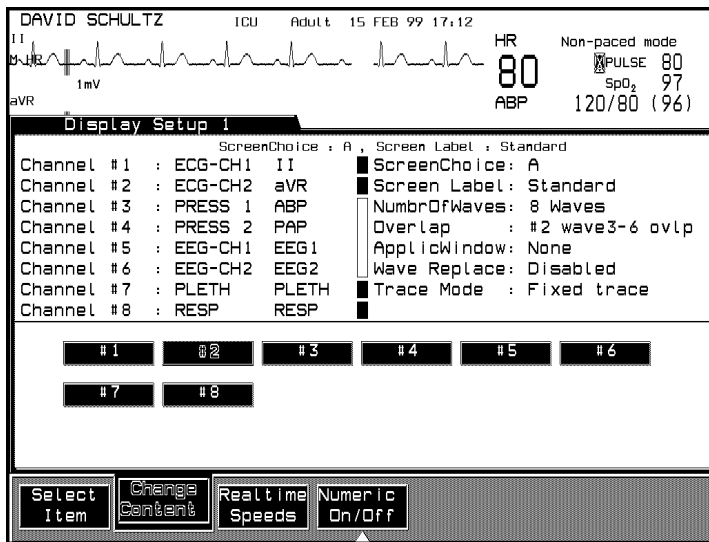
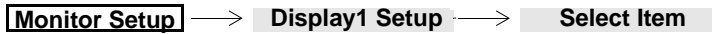


Procedure

1. Press **Select Item** until "NumbrOfWaves" is selected on the screen.
2. Press **Change Content** to choose 4, 6, or 8 waves to be displayed depending on your model.
3. Press **Monitor Setup** to return to the Selection Window or **Main Screen** to return to the main screen.

Changing the Wave Overlap

The wave overlap refers to the position of particular waves on the screen. You can select to have overlapping and non-overlapping waves. Overlapping waves allow a larger wave amplitude and you can compare waveforms of various parameters (i.e. pressure waves).



Setting up your Monitor

Procedure

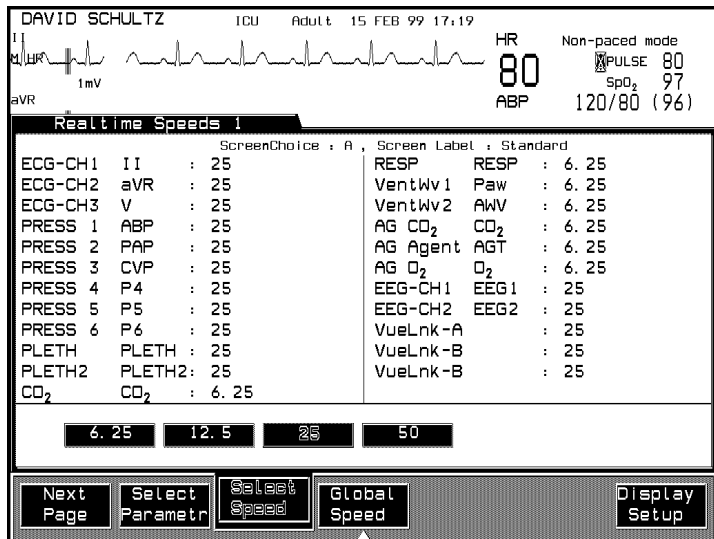
1. Press **Select Item** until “Overlap” is selected on the screen.
2. Press **Change Content** to choose one of the available numbers (dependent on model). The boxes in the middle of the screen indicate which waves are overlapping.
3. Press **Monitor Setup** to return to the Selection Window or **Main Screen** to return to the Main Screen.

Selecting Realtime Wave Speeds

The same speed can be selected for all the waveforms or different speeds can be chosen for different waveforms. You can select the speed for the waveforms from the following:

- 50 mm/sec
- 25 mm/sec
- 12.5 mm/sec
- 6.25 mm/sec

Monitor Setup → **Display1 Setup** → **Realtime Speeds**



Setting up your Monitor

Procedure

To select different speeds for the waveforms:

1. Press the softkey **Select Parameter** repeatedly to select a parameter to which you want to assign a different speed.
2. Press **Select Speed** repeatedly to select the speed you require.

3. Repeat steps 1 and 2 for each parameter speed you want to change.

Press the softkey **Display Setup** to return to the Realtime Waves Task Window, press **Monitor Setup** to return to the Selection Window or **Main Screen** to return to the Main Screen.

To select the same speed for all the waveforms:

1. Press **Global Speed** repeatedly to select the speed you require.
2. Press the softkey **Display Setup** to return to the Realtime Waves Task Window, press **Monitor Setup** to return to the Selection window or **Main Screen** to return to the Main Screen.

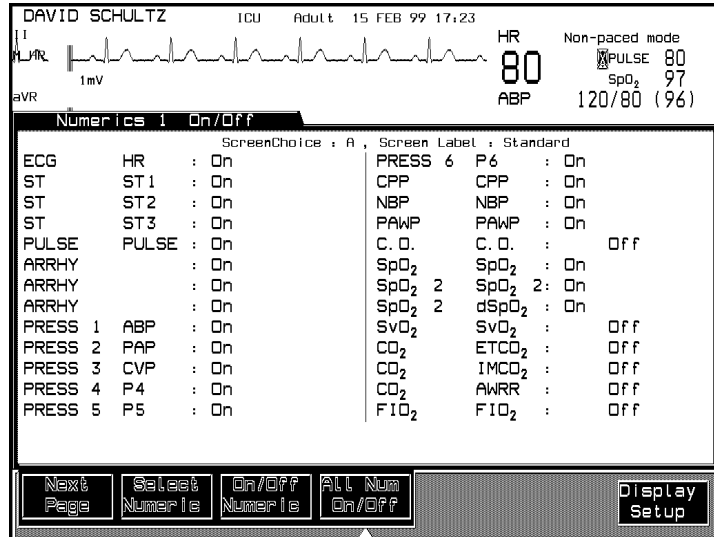
Note—

- The speed of the Resp or CO₂ waves and of the AG waves must always be set individually. You cannot alter their speeds by pressing **Global Speed**.
- If waves overlap, all the waves travel at the speed of the wave in the first overlapping channel. If the overlap is then changed to non-overlapping waves each wave travels at its assigned speed.

Numerics On/Off

To tailor the numeric display format to specific needs, individual numerics can be switched on or off. This is possible for each individual screen (A-E) of an independent display. When monitoring many parameters, switching off the numerics for some of the parameters results in more of the remaining numerics being displayed in large digits.

Monitor Setup → **Display1 Setup** → **Numerics1 On/Off**



Setting up your Monitor

1. Press the softkey **Select Numeric** to highlight the required parameter numeric. To view parameters which are not displayed, press the softkey **Next Page**.
2. Press the softkey **On/Off Numeric** to set the selected numeric display on or off.
3. Repeat Steps 1 and 2 for each numeric that requires resetting.
4. Press the softkey **All Num On/Off** to switch ALL numerics on or off at the same time.
5. Press **Main Screen** to return to the Main Screen.

If numerics are switched off, the status message "Not all numerics displayed" is displayed. This message can be disabled in configuration mode by your biomedical engineer or by the Agilent service engineer.

Numeric Positioning

Parameter numerics on the Main Screen screen are shown as **aligned numerics** - the numerics are next to the corresponding waveforms.

Aligned Numerics:

The monitor controls the position of numerics on the screen, and also controls the size of some numerics.

Numeric Positions:

Numerics are positioned on the screen in the following order:

1. Parameters with waveforms (such as Pressure) are positioned first. The numerics are aligned with the corresponding waveform.
2. Numerics, which are part of a contiguous block (i.e. CO₂, AGM, ST, BIS, HR/PULSE) are positioned next.
3. Parameters without waveforms which are not part of a contiguous block (such as Temperature) are positioned in the left column if space is available. Otherwise, they are placed from bottom to top in a column to the right of the waveform numerics according to their priority as shown in the Numerics On/Off Task Window.

Numeric Sizes:

Parameter numerics on the screen are displayed in 2 sizes - big or small.

When there are too many large numerics to be displayed on the Main Screen display, the monitor performs the following actions to make more space available:

- The large numerics decrease in size, starting from bottom to top.
- If more than one temperature is being monitored, the additional temperatures are shown continuously in rotation in the position of the third temperature numeric

Invasive pressures are multi-numeric parameters because each pressure has numerics for systolic, diastolic and mean pressures. They are decreased in size. Pressure 1 (P1) numerics preferably stay big.

Additional Information

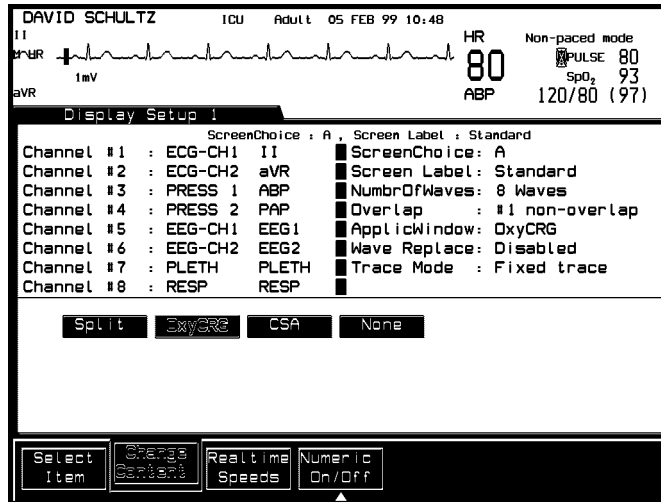
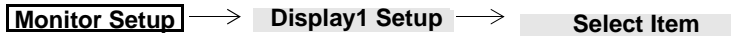
- The ST1, ST2, and ST3 values are shown next to the 2nd ECG channel if present.
- The NBP numerics are displayed big next to the 2nd or 3rd ECG channels or a blank channel.
- CO2, AGM, and BIS numerics are each preferably kept together as a block.

Selecting an Application Window

One of three application windows can be selected for display in each screen:

- Split Screen
- oxyCRG
- CSA

They are described in more detail in the following sections.



Procedure

1. Press **Select Item** until “ApplicWindow” is selected on the screen.
2. Press **Change Content** to choose Split, OxyCRG, CSA or None (no application window) to be displayed.
3. Press **Monitor Setup** to return to the selection window or **Main Screen** to return to the Main Screen.

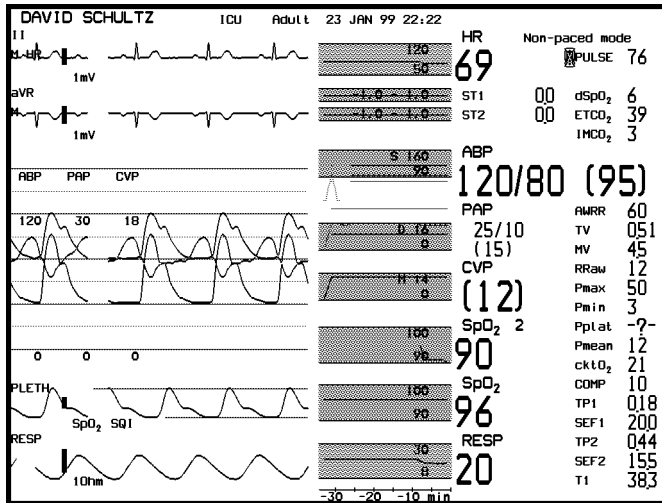
Note—If you have configured a second or third independent display, oxyCRG and CSA can only be on one of these displays at a time. Split Screen can be configured for all displays simultaneously.

Special Implications for Touch or Mouse Operation

- If Split Screen is active and a split trend is selected, the Graph Trends Window opens up displaying the selected parameter in combination with the adjacent parameters.
- If the oxyCRG display is active and is selected, the Neonatal Event Review Window opens up. If Neonatal Event Review is not available, the Graph Trends Task Window opens up.
- If the CSA Display is active and is selected, the EEG Setup Window opens up.

Displaying Split Screen Trends

Split Screen trends display the last 30 minutes of the patient's trend data along with any alarm limits that are set. The trend values are updated every minute. The trend value itself is calculated as the average of all the values sampled with the previous minute.



With Split Screen trending you can:

- Display the preceding 30 minutes of trend data for all vital signs next to their waves.
- Obtain a clear indication if a patient's vital signs tend towards exceeding the alarm limits.

Note—Split Screen Trends are not available with selected Agilent V24 and V26 ICU bundles.

The alarm limits are represented by a rectangle, filled with the parameter's color at low intensity. When a measurement exceeds an alarm limit, it is clearly visible against the screen's black background. The limits themselves are displayed on the right side of the trend display, next to their corresponding boundaries.

The alarm-limit values are always displayed within the rectangle defined by alarm limits, if they fit.

Note—Some trends, such as vital signs that are received through VueLink, do not have alarm limits associated with them. In this case, no rectangle is displayed for the alarm range. Instead, the default range scales are displayed with low intensity on the left side of the trend display, to distinguish them from alarm limits.

Trend data is only displayed for those vital signs that are positioned in the left column of the numeric display.

Viewing Trend Data for Invasive Blood Pressure

Three trend values are displayed for invasive pressure; systolic, diastolic, and mean pressure. These three trends are displayed together as shown in the diagram below.



s-invas.tif

Display of Trend Data for Invasive Blood Pressure - Example

The alarm limits can apply to any of the three pressures, depending on how they are configured. The alarm limits are therefore prefixed with a letter, which identifies the pressure to which they are configured. These letters are:

- S** Systolic pressure
- D** Diastolic pressure
- M** Mean pressure

In addition to this, the trend to which the alarm limits apply is displayed with a thicker line than the other trends.

Viewing Trend Data for Non-invasive Blood Pressure

Because the NBP is not a continuously measured parameter, a special symbol is used to display the trend values, as shown in the diagram below.



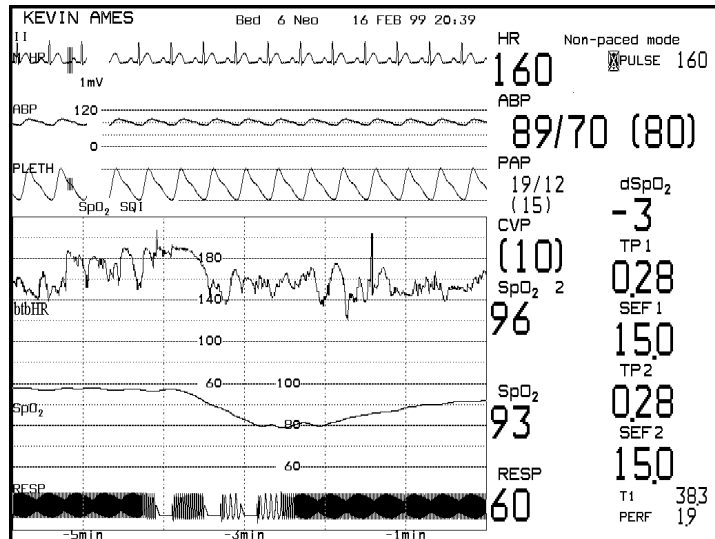
Display of Trend Data for Non-invasive Blood Pressure - Example

oxyCRG Display

The oxyCRG (oxygen CardioRespiroGram) display provides a simultaneous presentation of the following three waveforms overlaid on the Main Screen:

- Beat-to-beat heartrate trend
- An oxygen parameter trend
- Compressed respiration wave

Approximately the last six minutes of information is displayed for each parameter.



Main Screen Display with oxyCRG

The oxyCRG display can help you to make early detections of respiratory regulation problems in neonates, by comparing trend patterns, or finding interrelationships among the three parameters.

Approximately the bottom two thirds of the Main Screen area are covered with the three oxyCRG waveforms.

The number of realtime waves that you can display simultaneously with oxyCRG is related to the maximum number of realtime waves that your system is capable of displaying. Details are provided in the following table:

Main Screen

Standard Display	oxyCRG Display
4 realtime waves	oxyCRG + 1 realtime wave
6 realtime waves	oxyCRG + 2 realtime waves
8 realtime waves	oxyCRG + 3 realtime waves

Notes on oxyCRG

- The oxyCRG information is overlaid on the realtime waves at the bottom of the Main Screen. These realtime waves disappear from the display, but the parameters are still being monitored, and the parameter alarms are still active.
- If oxyCRG covers part of an overlap channel, the entire overlap channel disappears from the display.
- The **Freeze Waves** softkey has no effect on the oxyCRG section of the Main Screen, because the display speed is very low.
- The beat-to-beat heart rate (btbHR) in the oxyCRG display will vary from the heart rate (HR) numeric on the Main Screen, since the HR numeric is an averaged value.
- If the monitor is switched off for less than 60 seconds, oxyCRG data is retained. However, when the power is switched back on, you will see gaps in the oxyCRG display. The gaps correspond to the amount of time it takes the monitor to get the first readings after power is restored, **not** the amount of time that the monitor was switched off. For this reason, you cannot properly measure the time difference between an event which occurs before power

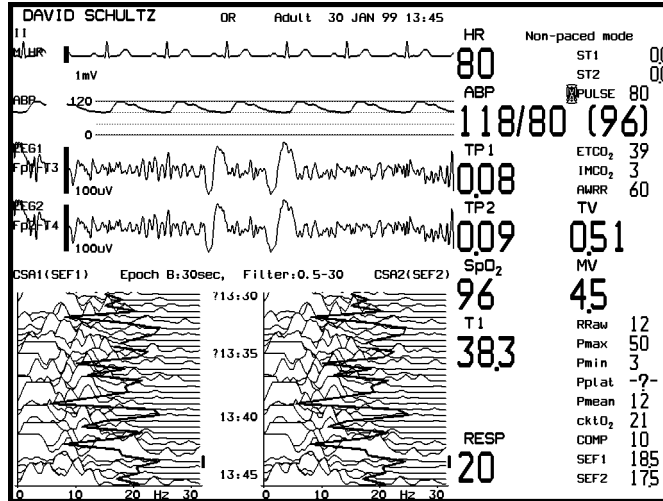
is switched off, and one which happens after the power is restored.

- If you are using a touchscreen, selecting the oxyCRG display either via touch or mouseclick will open up the Neonatal Event Review Task Window (or the Graph Trends Window, if Neonatal Event Review is not available).

You can find information about oxyCRG recording in Chapter 6.

CSA Display (Agilent CMS only)

The CSA (Compressed Spectral Array) is a format presenting the processed EEG. It compresses a large amount of data into a compact, easy to read trend and consists of 30 complete spectral lines.



The bottom half of the Main Screen area is covered with the CSAs.

The number of realtime waves that you can display simultaneously with CSA is related to the maximum number of realtime waves that your system is capable of displaying. Details are provided in the following table:

Main Screen

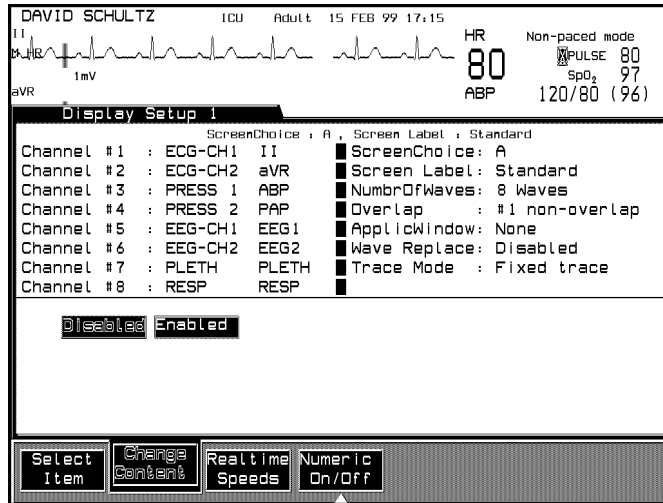
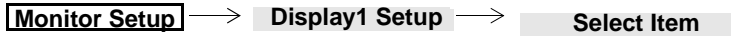
Standard Display	CSA Display
4 realtime waves	CSA + 2 realtime wave
6 realtime waves	CSA + 3 realtime waves
8 realtime waves	CSA + 4 realtime waves

**Notes on
CSA**

- The CSA information is overlaid on the realtime waves at the bottom of the Main Screen. These realtime waves disappear from the display, but the parameters are still being monitored, and the parameter alarms are still active.
- If CSA covers part of an overlap channel, the entire overlap channel disappears from the display.
- If you are using a touchscreen, selecting the CSA display via touch or mouseclick will open up the EEG Setup Task Window

Wave Replace

Wave Replace enables the monitor to fill a currently unused channel, which is assigned to a specific wave, and replace it temporarily with another wave.



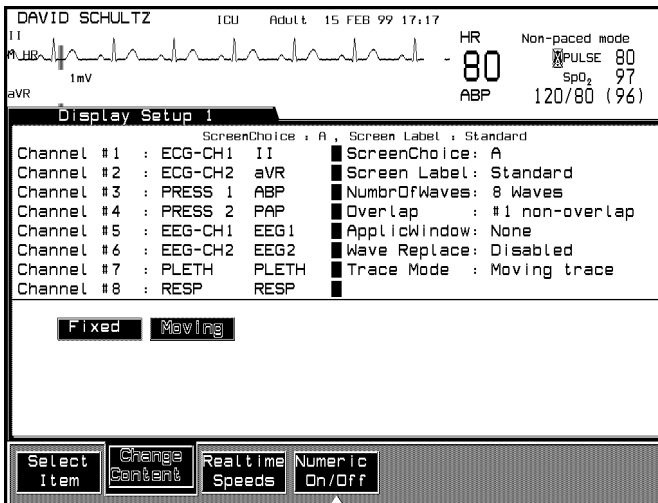
Procedure

1. Press **Select Item** until “Wave Replace” is selected on the screen.
2. Press **Change Content** to enable or disable Wave Replace. With Wave Replace enabled, assigned, but currently unused channels will be filled with another wave.
3. Press **Monitor Setup** to return to the selection window or **Main Screen** to return to the Main Screen.

Trace Mode

Trace Mode allows you to choose between fixed and moving traces:

Monitor Setup → **Display1 Setup** → **Select Item**




Procedure

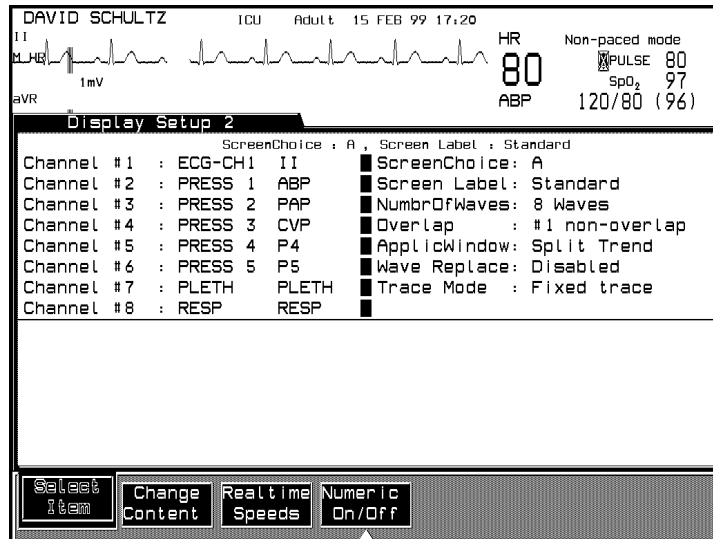
1. Press **Select Item** until “Trace Mode” is selected on the screen.
2. Press **Change Content** to choose fixed or moving traces.
3. Press **Monitor Setup** to return to the selection window or **Main Screen** to return to the Main Screen.

Note—Moving Trace is not recommended for flatscreen displays

Configuring a Second Independent Display (Agilent CMS only)

The second independent display is normally configured as a true surgeon's display. We suggest that "Surgeon" is the most appropriate keylabel. It does NOT contain any alarm indications (blinking messages or ) or alarm controls or outputs (alarm sounds or lamps). You can change the screen to have the same display as the main display or you can have a different configuration. There are again five separate display screens: the default names are Screen A, Screen B, Screen C, Screen D and Screen E. To get into the Task Windows, press **Display2 Setup** in the Monitor Setup Selection Window. The procedures are then the same as for changing the main display (described in "Changing Display Screens").

Monitor Setup → **Display2 Setup**

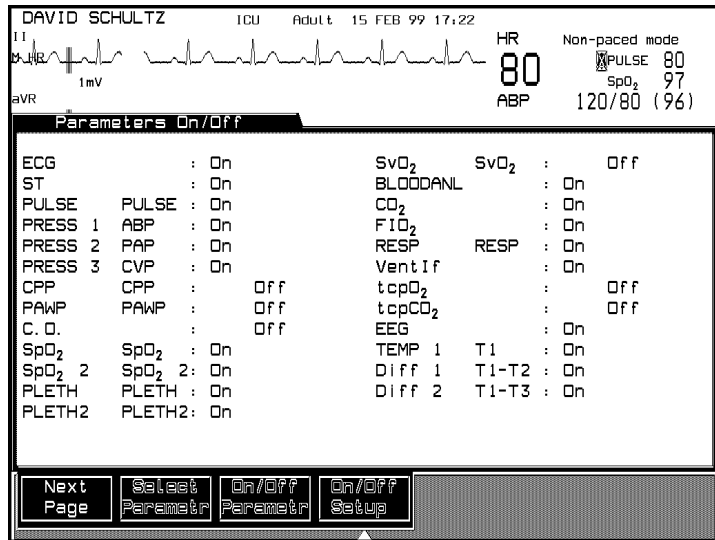


Other Functions You Can Configure

Parameters On/Off

Individual parameters can be switched ON or OFF on the monitor. No alarms or INOPs are reported for parameters that are switched off, and they are not available for display, trending, or recording on the monitor.

Module Setup → **Parametr On/Off**



1. Press the softkey **Select Parametr** to highlight the required parameter. To view parameters which are not displayed, press the softkey **Next Page**.
2. Press the softkey **On/Off Parametr** to set the selected parameter on or off. Repeat this procedure for each parameter you want to set.
3. Press the softkey **On/Off Setup** if you want to preset parameter settings when the module is plugged in WITHOUT the transducer.

Switch this setup off again using **On/Off Setup** or **Silence/Reset**.

4. Press **Main Screen** to return to the Main Screen.

You can also switch OFF parameters in the following ways:

- **Any parameter:** unplug the module, and suspend or silence the alarms.
- **Any parameter** except **ECG, RESP** or **NBP:** disconnect the transducer or adapter cable from the module, and suspend or silence the alarms.

If you switch off a parameter, you can ONLY enter the parameter's Setup Task Window (via the module's hardkey) by first pressing

Module Setup → **On/Off Setup** .

When you plug in a parameter module and connect the transducer or adapter cable, the parameter is automatically switched on. (ECG, RESP and NBP are automatically switched on when you plug in the relevant module.)

Adjusting the Volume Control

You can adjust the QRS and alarm volume independently.

The QRS tone is the audible tone produced by the ECG pulse channels to indicate each QRS complex or pulse trigger event picked up.

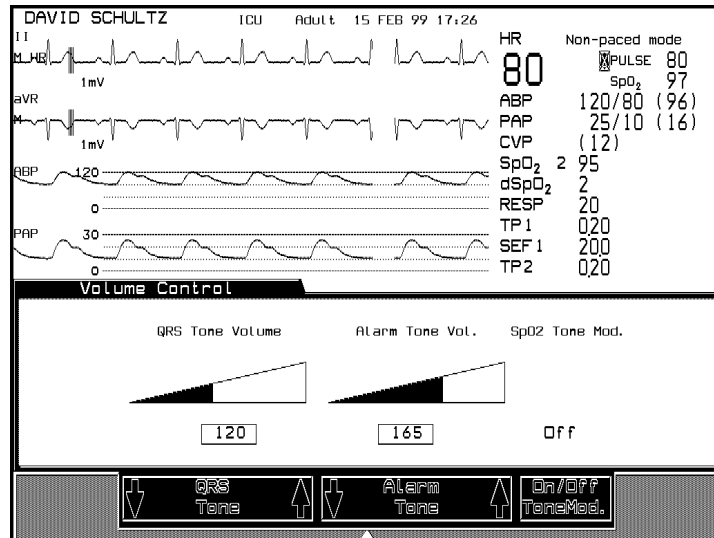
Procedure

Agilent CMS:

Monitor Setup → **Volume Control** or

Alarms/Volume → **Volume Control** or

SpO₂ → **Volume Control**



1. Increase or decrease the QRS or alarm tone volume by pressing the corresponding softkeys. If there is currently no active alarm or INOP, two short alarm tones sound at each press of the alarm tone keys so that you can hear the effect of changing the volume.

2. Press **Monitor Setup** to return to the Selection Window or **Main Screen** to return to the Main Screen.

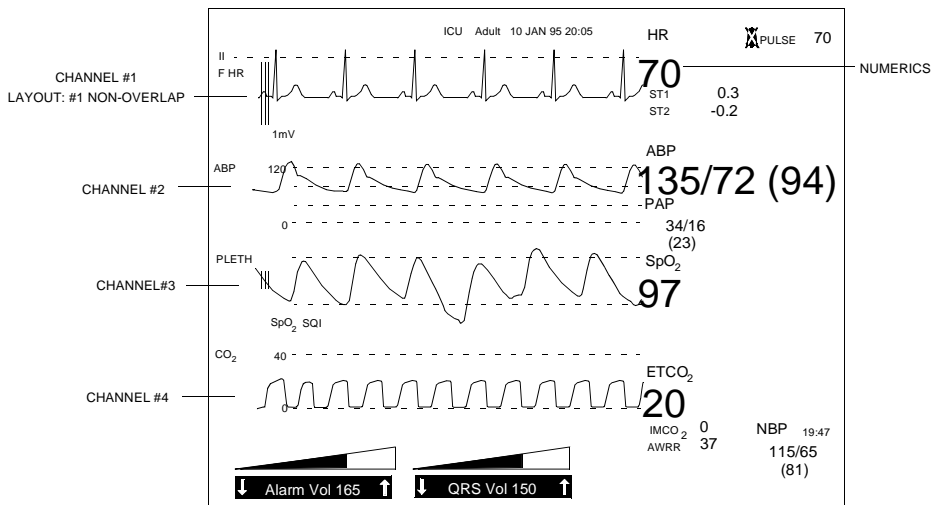
Note—Tone Modulation can also be set to On or Off in this window using the **On/Off Tone Mod** key. (see also SpO₂ Module chapter in Volume 2)

Note—If the alarm tone volume is set to zero the warning **“ALARM VOL = 0”** will appear in the lower right corner of the display.

Agilent V24 and V26:

If not already in the Main Screen, press **Main Screen**.

Increase or decrease the QRS or alarm tone volume by pressing the corresponding softkeys directly under the Alarm Volume and QRS Volume indicators.

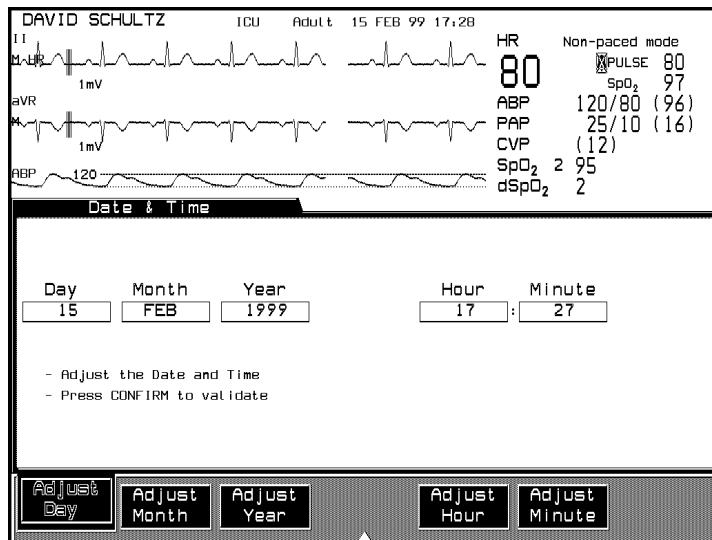


Adjusting the Date and Time

You can set the date and time to be displayed on the screen. Once it has been set, the internal clock retains the setting even when the system is turned off.

If your monitoring system is connected to a Central Station via an Agilent patient care system network, the date and time on your monitor is automatically taken from the Central Station.

Monitor Setup → **Date Time**



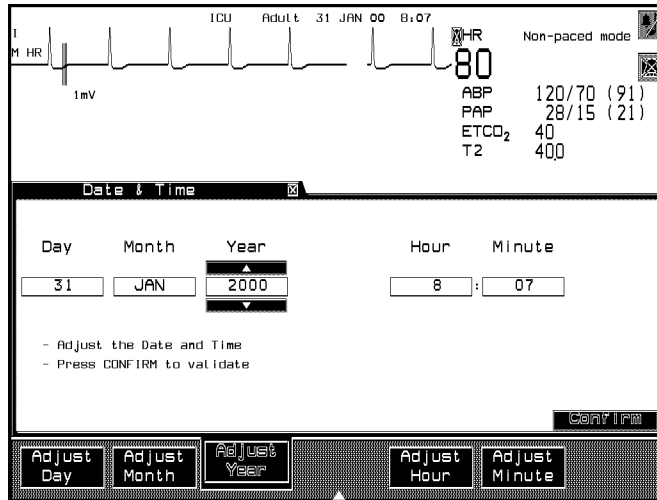
Procedure

1. Change the day, month, year, hour and minute by pressing the corresponding softkeys.
2. Press **Confirm** after all the adjustments have been made and a message will appear with the date and time settings.

Adjusting the Date and Time

3. Press **Monitor Setup** to return to the Selection Window or **Main Screen** to return to the Main Screen.

Note—If you are using a touchscreen display, arrow buttons will appear above and below the date and time fields. These can be selected to adjust the date and time instead of pressing the arrow keys.



Selecting Waves for Central Recorders

You can select two waves to be used for delayed alarm recordings at an Agilent patient care system central recorder. The waves you select can also be displayed at the central station. With a single channel recorder you can record the primary wave, or with a dual channel recorder you can record the primary and secondary waves. The primary wave defines which wave is the default wave at the central station and at other bedsides in the overview screen.

When ECG is available it **must** be selected as the primary wave; it cannot be deselected.

The procedures for configuring delayed recordings are described in the section *“Recording Functions”*.

Configuring Module, Bedside and Central Recordings

Note—Recordings on a 4-channel bedside recorder are only possible with the Agilent CMS.

The **Recording Setup** key enables you to configure five types of recordings:

1. Delayed and Alarm Recordings on a module, bedside or central recorder. A maximum of four delayed waves can be recorded, depending on the type of recorder. Up to four additional waves can be selected for alarm recordings, depending on the model of the monitor.
2. Realtime Recordings. Three recording modes can be configured to record waveforms at your request. For each mode you can choose the waves to be recorded, their position on the recording strip and the recorder to be used. Realtime recordings can be produced on module, 4-channel bedside or central recorders.

Note—To ensure an optimal **realtime recording** check that the recording configuration is appropriate for your recorder.

3. Monitoring Procedure Recordings on a module, bedside or central recorder. You can record the curves produced during cardiac output and pulmonary artery wedge pressure measurements.
4. Vital Signs Recordings. Automatic Vital Signs Recording gives the option of printing out all parameter numerics on the Plug-in Recorder Module either at user programmed time intervals, or upon completion of an NBP measurement.
5. OxyCRG and Neonatal Event Review Recordings. You can record the contents of the oxyCRG display and Neonatal Events onto an M1116B plug-in recorder module. For Neonatal Event Review Recordings, the M1116B plug-in recorder module has to be selected as the procedure recorder.

The procedures for configuring recordings are described in Chapter 6 “*Recording Functions*”.

Other Patients Controls

If your system is connected via the Agilent patient care system network to other bedsides you can choose to send alarms, receive alarms and assign your bed to a care group. The procedures for setting up the networking system are described in Chapter 4 *“Other Patients”*.

The Status Log Function

The softkey **Status Log** is used by service engineers. It produces a list of accumulated error codes.

The Monitor Revision Function

The softkey **Monitor Revision** is used by service engineers. It gives information about the current hardware and software revision of the monitor.

Changing Default Settings and Patient Category

Each system is configured in the factory with the **factory default settings**. The settings are collected together to form **Configuration Sets**. There are 4 Configuration Sets available with universal settings:

Configuration Set 1 is for adult, intensive care unit application.

Configuration Set 2 is for adult, operating room application.

Configuration Set 3 is for neonatal, intensive care unit application.

Configuration Set 4 is for neonatal, operating room application.

The Configuration Sets also include parameter default settings.

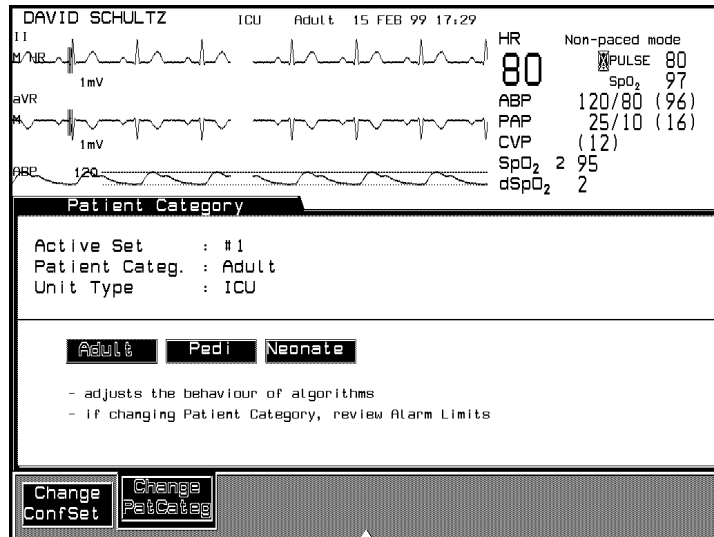
If your hospital requested it, these Configuration Sets will have been customized at installation to your specific requirements. In this case those new settings are the **user default settings**; if the settings were not changed at installation, the user default settings and the factory default settings are the same.

You can change the patient category within a Configuration Set during normal monitoring. However, if after delivery of your system, you want to change any of the other parameters or universal settings, you will need to contact your Agilent service engineer or your biomedical engineering department, as this procedure has to be done in a special *Configuration Mode*. Changes can be made to a Configuration Set to suit an individual clinician's needs, for example, or to provide optimal settings for a particular medical procedure.

Changing the Patient Category

The monitor processes patient signals in different ways (using different **algorithms**) depending on the patient category. The patient category within a Configuration Set can be changed during normal monitoring.

Monitor Setup → **Adult/Pedi/Neo** → **Change PatCateg**



In general, all the parameter settings and patient data management information are kept if you change the patient category without changing Configuration Set.

Possible exceptions occur because measurement ranges and alarm limit ranges for some parameters are different for each patient category (see the following list). If active alarm limits are no longer within range after you change patient category, the alarm limits are automatically adjusted to the closest possible values within the new range.

The following table details the differences between the patient categories for those parameters where differences occur:

Parameter	Patient Category		
	Adult	Pedi	Neo
NBP	Adult	Pedi	Neo
ECG	Adult	Neo	Neo
HR/PULSE	Adult	Neo	Neo
RESP	Adult	Adult	Neo
Inv. Pressure	Adult	Neo	Neo
CO ₂	Adult	Adult	Neo

For example:

The ECG parameter uses the neonatal algorithm if you choose either the *Neonatal* or *Pediatric* patient category. If you choose the *Adult* patient category, the ECG parameter uses the adult algorithm.

The following pages describe in detail how the choice of patient category influences monitoring.

NBP

The patient's tolerance for the cuff pressure (i.e. stress) when an NBP measurement is made is an important factor to consider when choosing patient category. The amount of stress is determined by:

- the size of the cuff, and
- the duration of time the cuff pressure is applied.

Since a neonate can usually tolerate less stress than a pediatric patient, and a pediatric patient can tolerate less than an adult, the System algorithm has *category-dependent safety values*. If the cuff pressure exceeds these *values* for more than a given time period, the cuff immediately deflates and a severe INOP Alarm is given. These *values* are adapted to normal physiological values.

NBP Examples**Overpressure**

Overpressure occurs if the cuff maintains a pressure above the safety value for more than two seconds. The safety values are:

Adult:	300 mmHg
Pediatric:	300 mmHg
Neonate:	150 mmHg

Continuous Pressure

Continuous Pressure occurs if, for any reason, a safety pressure value is maintained in the cuff for more than a safety period, dependent on the patient category.

Adult:	if over 15 mmHg for more than 120 seconds
Pediatric:	if over 15 mmHg for more than 120 seconds
Neonate:	if over 5 mmHg for more than 60 seconds

These safety values effect the measurement range of each category. The Adult category has the greatest range (systolic 30 to 270 mmHg) and the Neonate has the smallest (systolic 30 to 130 mmHg). **Therefore you cannot use Neonate or Pediatric if the expected pressure values are outside the measurement range for that category.**

The following tables list the measurement ranges and safety values for each patient category.

NBP Measurement Range (in mmHg) for Differing Patient Categories

Measurement Range	Patient Category		
	Adult	Pedi	Neo
Systolic	30 to 270	30 to 180	30 to 130
Mean	20 to 255	20 to 160	20 to 120
Diastolic	10 to 245	10 to 150	10 to 100
Cuff Size	A to E	Any Cuff	1 to 4 & A
Default Inflation Pressure	165 mmHg	125 mmHg	100 mmHg

NBP Safety Values for Differing Patient Categories

Safety Value	Patient Category		
	Adult	Pedi	Neo
Continuous Pressure	15 mmHg (for 120s)	5 mmHg (for 120s)	5 mmHg (for 60s)
Time to inflate from 0 to 60 mm Hg	40s	20s	20s
Max. inflation time	60s	40s	30s

NBP Safety Values for Differing Patient Categories

Safety Value	Patient Category		
	Adult	Pedi	Neo
Max. deflation time	80s	80s	60s
Max. measurement time	100s	100s	60s
Overpressure protection ¹	300 mmHg	200 mmHg	50 mmHg
Cuff Size	A to E	Any Cuff	1 to 4 & A
Default Inflation Pressure	165 mmHg	125 mmHg	100 mmHg

¹The figure given for overpressure protection is the maximum pressure the cuff can reach for 2 seconds before it deflates.

NBP Recommendations

Agilent Technologies makes the following recommendations when selecting a patient category for NBP:

1. Choose the category with the most appropriate safety values for your patient.
2. Reduce the stress on the patient by choosing the appropriate cuff size (a cuff that is too large prolongs inflation time).
3. Use a repetition time appropriate to the patient.

ECG

The following factors can cause the cardiotech to calculate an incorrect heart rate:

- Morphology of the ECG,
- Weak signal,
- Paced patients.

Morphology of the ECG

Agilent offers two different ECG algorithms to allow for differing morphologies.

Recommendation

Choose the patient category according to the QRS morphology, rather than the patient's age. Use Adult if the duration of the QRS base is 50 to 70 ms; use Neonate/Pediatric if the duration is less than 50 ms.

Weak signal

The signal may be weak due to the patient's constitution, the electrode placement or other factors. A 1 mV calibration bar at the left side of the ECG channel enables you to estimate the quality of the signal.

Recommendation

- Use the strongest signal on channel 1 and compare the QRS amplitude with the 1 mV bar; the height should be at least half of that size. If not, change the lead or try a different electrode placement.

Paced Patients

Paced pulse rejection is available for patient categories.

Recommendations

- Derive the cardiac rate from pulse.
- Look for a lead on channel 1, where the pace pulse amplitude is zero to avoid paced pulses being counted as beats.
- Whenever acceptable use the Adult category.

Heart Rate (HR) / Pulse

	Adult (bpm)	Pedi/Neo (bpm)
Cardiotach Range	15 to 300	15 to 350
HR Alarm Limit Range	15 to 250	15 to 300
Pleth/Pressure Pulse Alarm Limit Range	30 to 250	30 to 300

The expected range can be estimated by performing a manual pulse count.

RESP

	Adult/Pedi (rpm)	Neo (rpm)
Respirotach Range	0 to 120	0 to 180
High Alarm Limit Range	10 to 100	30 to 150
Low Alarm Limit Range	0 to 95	0 to 145

In general, use the Adult or Pediatric category if rates below 50 rpm are expected; use Neonatal if expected rate is above 100.

Pressure

The algorithm responsible for respiration artifact suppression is used in all three patient categories for the 10 and 30 scales. In the Pediatric and Adult categories, the algorithm is also used for the 60 scale.

SpO₂

Default for averaging time is 10 seconds for Adult, Pedi and Neo.

Note—Default can be changed in Configuration Mode.

CO₂

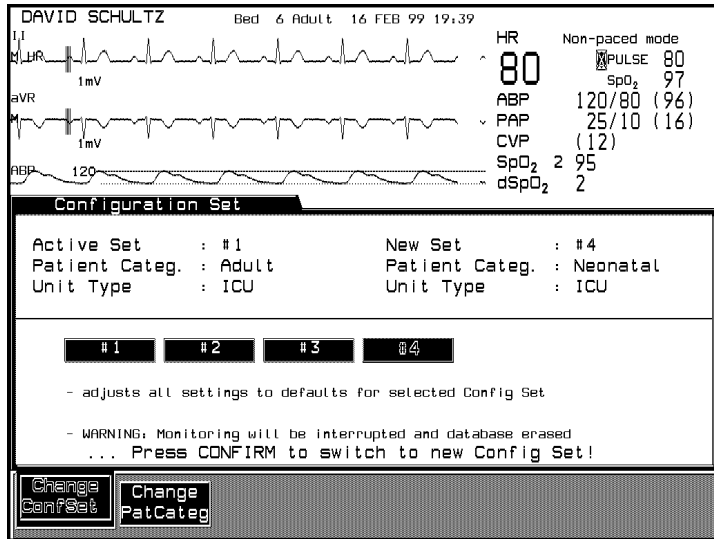
	Adult/Pedi	Neo
AWRR High Range	10 to 100 rpm	30 to 150 rpm
AWRR Low Range	0 to 95 rpm	0 to 145 rpm
Delay before alarm sounds	20 s	20 s

Note—The Apnea alarm delay time cannot be changed

Changing the Configuration Set

If you want to change the application of your system, for example, from Configuration Set 1 adult to Configuration Set 3 neonatal, you can do this in monitoring mode by getting into the Monitor Setup setup. This procedure will not *modify* a Configuration Set, but will change completely from one Configuration Set to another.

Note—Changing the Configuration Set causes all the monitor’s settings to revert automatically to user default settings. All patient data is lost.



Setting up your Monitor

Note—If you are using the Anesthesia CMS, you will not have a choice of “Unit Type”, as this is automatically set to OR.

Note—If you do not want to store the default settings in the plug-in modules, do one of the following:

- Remove the plug-in modules from the rack before starting the procedure.
- Ask your biomedical engineering department or Agilent service engineer to set Parameter Settings Transfer to OFF.

Procedure

The current Configuration Set for the monitor is highlighted and the universal settings are displayed at the top of the Task Window.

1. Press the softkey **Change ConfSet** to select the Configuration Set you require. The universal settings for the selected Configuration Set are displayed.
2. Press the hardkey **Confirm** to switch to the selected set.

Wait at least one minute before plugging in or removing any modules from the rack.

Changing Operating Modes

This function will be mainly used by service engineers for configuring the system on installation or for servicing the system. Before you can operate in this Task Window you have to use a *password*.

There are three levels of password:

Level 1 password allows you to select Monitor or Config mode only.

Level 2 password allows you to select Monitor or Service mode only.

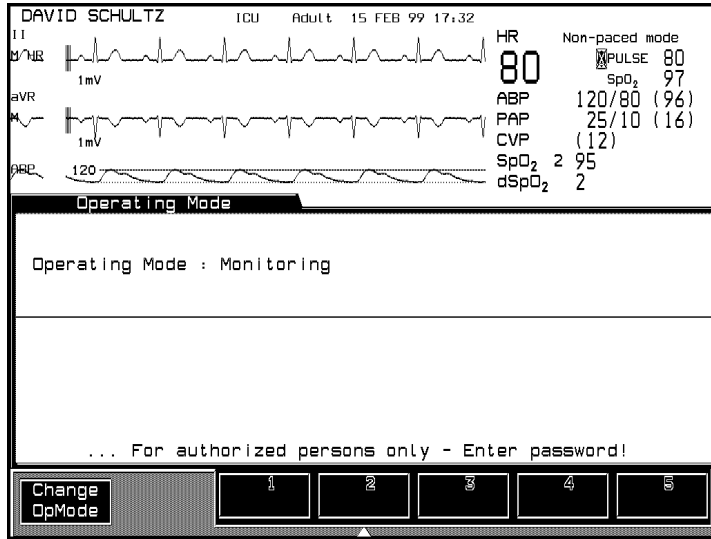
Level 3 password allows you to select any of the four operating modes listed below:

- | | |
|----------------|---|
| Monitor | This is the usual operating mode and fully supports patient monitoring. If the system is attached to a patient it must be in this mode. |
| Config | This mode is for configuring the monitor, for example, on installation. The settings that are selected in this mode will be the active default settings for when the system is turned on. |
| Service | This mode is used by service personnel. |
| Demo | This mode can be used for training purposes. The data base has 24 hrs of simulated waveform and trend data. |

Warning

The Configuration, Service and Demo modes do not support patient monitoring. When the monitor is attached to a patient it must be in the monitor mode.

Monitor Setup → **Operatng Modes**



Setting up your Monitor

Returning to Monitoring Mode

To exit Config, Demo or Service Mode, press **Monitor Setup** → **Resume Monitor**. This will return you to Monitoring Mode without having to enter a password.

It is also possible to exit demo mode by powering down and restarting the monitor.

Procedure

1. Enter the password by pressing the appropriate combination of softkeys which are numbered 1-5.

If you enter the password correctly, you can proceed with the next step. If not, exit the Task Window by pressing **Main Screen** and try again.

2. Press the softkey **Change Opmode**. Move the highlighting to the mode you require.
3. The prompt message “Press CONFIRM to switch to selected mode” appears. Press the hardkey **Confirm**.

The instrument goes through the boot-up sequence and reverts automatically to default settings and the mode of your choice becomes active.

Note—If you have entered either Config, Service or Demo Mode successfully, it is possible to return to Monitoring Mode without entering a password by pressing **Monitor Setup** → **Resume Monitor**

The Test Signals Function

The Test Signals function allows a check of the way signals are processed from the parameter module to the screen. The aim of the function is to identify broken lines and cables in the signal processing areas.

Note—While the Test Signals function is active, no patient monitoring is supported - parameter values are not collected. Alarms will occur, depending on the test values, as part of the monitor's self test procedure. They are patient alarms. See for individual tests for each module.

Procedure

1. Press hardkey **Monitor Setup**
2. Press softkey **Test Signals** in the Instrument Configuration Selection Window.

The monitor returns to Main Screen. Test waves for each parameter being monitored are generated for 30 seconds to test the processing abilities of the monitor. The message “Test Signals active - no monitoring” appears on the screen.

After 30 seconds, the monitor automatically switches back to Monitoring Mode.

If you want to go back to Monitoring Mode before 30 seconds have elapsed, press **Monitor Setup**, then **Stop Signals**.

Analog Output (CMS only)

The Analog Output function provides eight channels of Analog Output for connection to recorders and other data collection instruments. For more information on Analog Output, refer to Appendix B.

System Self-Test Values:

Module	Test Numeric Limits	Test Waveforms
ECG and EC/RESP		
ECG	100 bpm in ADULT mode 125 bpm in NEO/PEDI mode	Simulated squarewave and numeric
RESP	15 rpm in ADULT mode 30 rpm in PEDI mode 55 rpm in NEO mode	Simulated Resp wave and numeric
Pressure		Simulated squarewave and numerics
Systolic	120 mmHg ADULT 60 mmHg PEDI/NEO	
Diastolic	0 mmHg ADULT/PEDI/NEO	
SpO ₂ /Pleth		
SpO ₂	100%	Numeric only
Pleth	Wave on display	Simulated Wave
tcpO ₂ /tcpCO ₂		Numeric only
tcpO ₂	60 mmHg (8.0 kPa)	
tcpCO ₂	40 mmHg (5.3 kPa)	
CO ₂		Simulated squarewave and numerics
ETCO ₂	40 mmHg (6.0 kPa)	
IMCO ₂	0 mmHg (0.0 kPa)	
AWRR	25 rpm	
Temperature	40°C (104°F)	Numeric only

Setting up your Monitor

Parameter Settings Transfer

Parameter modules which are labeled on the front with a small “T” in the upper right hand corner can be transported from one rack to another (or from one Agilent system to another) and still keep their parameter settings.

Note—There are a few modules that may or may not be marked with a “T” that **DO** transfer parameter settings. They are: M1006A, M1016A, M1006A-#C01, M1029A, M1006B, M1032A, M1012A, M1012A #C10, M1034A. Any other module without a “T” does not transfer parameter settings.

The settings (such as alarm limits) are stored inside the module. You could even unplug a satellite rack full of these modules from one monitor, and plug it into another monitor without losing the parameter settings. This behavior permits fast and easy transport, and is called “Parameter Settings Transfer”.

Note—The settings that are stored in each module are detailed in the relevant module chapters of this guide.

For Parameter Settings Transfer to work on your monitor, it must be set ON in a special Service Mode, either by your biomedical engineering department or the Agilent service engineer.

After making changes to parameter settings, wait about 10 seconds until the new settings are stored in the relevant module before removing the module.

After plugging in a module, wait about 10 seconds to let the monitor read the settings before opening the Task Window.

After switching on the system or going into Monitor mode from Config mode, the first 30 seconds are used to store settings from the system to the modules. Modules plugged in after this initial 30 second period are capable of keeping their settings.

You can change parameter settings *either*:

- in the parameter Task Window,

or

- by resetting all parameter settings to their default values when changing Configuration Sets or operating modes.

You can find more information about Parameter Settings Transfer in each of the parameter chapters, in particular Chapter 17, "*Pressure Module Section*", and Chapter 15, "*Temperature Module Section*".

If Parameter Settings Transfer for your monitor is set OFF, parameter settings are NOT transferred with your modules.

Parameter Settings Transfer Messages

The following messages related to Parameter Settings Transfer can appear on the display:

Message	Condition	Action required
(Parameter name) no settings transfer capability	The indicated parameter module is not a <i>T</i> module.	Insert a module that has a <i>T</i> on the front.
(Parameter name) check settings”	No settings are stored in the module, or the settings are incorrectly stored.	Enter the parameter Task Window and check the settings. The settings are automatically stored when you exit the Task Window.
Check Patient Category and (parameter name) settings	The patient category stored with the settings in the module is different from that of the monitor.	<i>Either</i> change the patient category for the monitor <i>or</i> change the parameter settings.
(Parameter name) unable to store settings in module	The parameter module was removed before the settings could be stored, or there is a malfunction in the module. (This message can appear with Settings Transfer On or Off.)	Press Silence Reset , re-insert the module and check/adjust the settings in the parameter Task Window. Exit the Task Window and leave the module in the rack for about 10 seconds before you remove it. If the same message appears, replace the module.

Parameter Settings Transfer Messages

Message	Condition	Action required
(Parameter name) reading settings from plug-in module”	A parameter key has been pressed while parameter settings are being taken from the indicated module.	Wait for the message to disappear before pressing the key for that parameter.
(Pressure label) check zero and transducer level”	A pressure module has been plugged-in with the transducer connected. Zero and calibration values will be taken from the module.	If the transducer has not been recently zeroed and calibrated, or if you are setting up a new measurement, do the zero and calibration procedures.

Other Patients

This chapter describes the Other Patients function. It includes the following sections:

- Overview 4-2
- Agilent Patient Care System 4-3
- Using Agilent Patient Care System with an Arrhythmia Computer 4-8

Overview

If you are connected to an Agilent patient care system the Other Patients function allows you to put your bed into groups, send and receive alarms between beds in the groups and view data from other beds in your group.

If you require information about the automatic alarm Other Patients function, see the next section.

If you have an arrhythmia computer attached to your monitor or a Central Station equipped with arrhythmia channels, refer to the “Using Agilent Patient Care System with an Arrhythmia Computer” on page 4-8.

Agilent Patient Care System

The Agilent patient care system is a network which transports information. If your system is connected to such a network you can send information to other systems or central stations, and receive information from them.

One aspect of this information transmission capability is called Other Patients.

The Other Patients setup, based on nursing care assignments, allows you to view data from another bed in your group or the "ALL" group.

If your monitoring system is connected to the network, you can have 7 waves transmitted to the central station*. Only the primary wave is displayed on the main screen at the central station. Each Other Patients screen of any device connected to the network starts with the primary wave.

If you have ECG turned on, it is always selected as the primary wave. If it is not turned on you can select a primary wave in the System Waves Task Window under Monitor Setup.

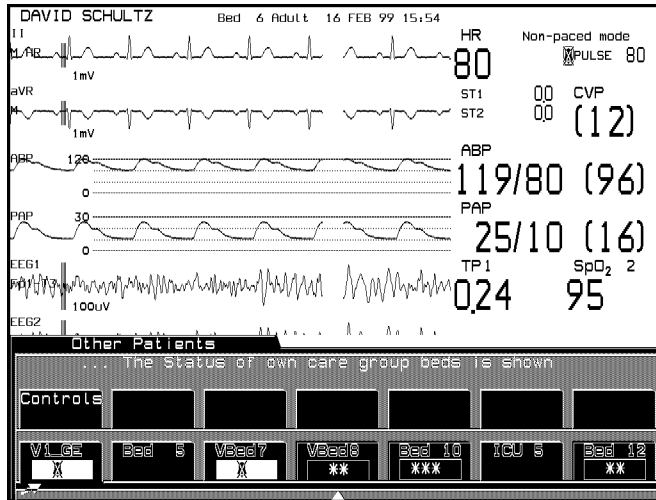
* If EASI 12-Lead ECG is configured ON only 5 waves can be transmitted to the central station.

The Other Patients Selection Window

The softkeys in the Other Patients Selection Window contain the bed labels of the beds currently available for viewing on your monitor. Pressing a softkey leads you into the Other Bed Task Window for that particular bed. This task window contains detailed patient information including alarms and INOPs.

If your bed is configured to receive alarms and the beds in your Other Patients group are configured to transmit alarms, the softkeys in the Other Patients Selection Window contain alarm information under the bed label. Alarm severity is indicated in the second line of the softkey label by ** for a yellow alarm and by *** for a red alarm. Additionally, the softkey will have a red or a yellow frame if a bed is in alarm.

The frame around the softkey for a bed in alarm will blink until the alarm is silenced by that bed. If the alarms on a bed in your Other Patients Selection Window are suspended, the **A** symbol will appear on the respective softkey.



Automatic Alarm Other Patients

Incoming Alarm

If your bed is configured to receive alarms, you receive alarms from beds in your Other Patients group which are configured to transmit alarms. If such a bed in your group goes into alarm, it can be:

- A totally new alarm.
- A new alarm situation on a bed which is already in alarm.

There are two ways your monitor can react:

- If it is in Main Screen it reverts automatically to Other Patients mode and enters the Alarm Bed Task Window.
- If it is in a Selection or Task window the message Other bed in alarm is displayed in the status line.

In both cases you will hear the Other Patients prompt tone consisting of two double beeps.

The Alarm Bed Task Window shows the bed label of the other bed in alarm, the primary wave, up to 10 numerics of the parameters being monitored, INOP and ALARM messages in a rotating field. The alarm parameter numeric will be blinking.

If the alarm at the other bed has been silenced, the message SILENCED appears below the wave. If your monitor is configured to receive silenced alarms the Alarm Bed Task Window remains on the display; if your monitor is configured not to receive silenced alarms the Alarm Bed Task Window is removed from the display.

An arrow next to the bed label in the Task Window means that there are one or more other beds in the Other Patients group with an unacknowledged alarm. (See next page).

Multiple Incoming Alarms

If there are one or more beds with unacknowledged alarms, superseded by an actual displayed alarm, there is an arrow in front of the bed label. The unacknowledged alarms are stacked and the beds are viewed in sequence as the alarms arrived. If alarms arrive simultaneously they are viewed with the lowest bed number first. Each bed in alarm is automatically displayed for 5 seconds. When all the alarm beds have been displayed, the last bed stays on the display and the softkeys **Show Next Wave** and **Clear Alarm Bed** become active.

When you have viewed the primary wave for that patient you can press the softkey **Show Next Wave** to view the next waveform for that patient.

An arrow next to the bed number signifies that there are one or more beds with unacknowledged alarms in the Other Patients group.

Press the softkey **Clear Alarm Bed** . This:

- Acknowledges the alarm of the bed in your own Alarm Other Patients Task Window and automatically displays the next alarm bed from the alarm stack.
- If there is no arrow next to the bed number, it automatically takes you out of the automatic alarm display.

Note—When an alarm has been acknowledged, the acknowledged bed no longer appears in your Other Bed Alarm stack. It is NOT removed from

the alarm stack viewed by other monitors in the Other Patients group. No arrow next to a bed number means: **either** there are no more new alarms **or** all the existing alarms have been acknowledged.

Configuring the Other Patients Controls

With the Other Patients Controls you can place your own bed into one of eight groups: A, B, C, D, E, F, G or the ALL group, based on nursing care assignments within a unit.

The Other Patients Controls Task Window allows you to change the Send/Receive alarms configuration for your bed.

Note—When a bed is assigned to the ALL group, alarms can be received from and sent to beds in group A-G as well as the other beds in the ALL group. When a bed is assigned to any group in A-G, alarms are received from and sent to any bed in the same group and also to beds in the ALL group.

Note—The bed will automatically be assigned to the ALL group if the connection to the Agilent Network is interrupted (for example, if the Agilent Network cable at the back of the monitor is disconnected, or the central station is switched off) and the monitor comes back on a different branch.

Note—Any changes made to Other Patients settings will be stored for up to three hours after the monitor is switched off.

Using Agilent Patient Care System with an Arrhythmia Computer

Note—The Agilent CMS, V24 and V26 Monitors perform analysis on the patient’s ECG waveform. This includes triggering alarms on asystole, bradycardia, ventricular fibrillation and tachycardia conditions. Enhanced arrhythmia monitoring is available when the Agilent CMS, V24 or V26 Monitor is connected to one of Agilent’s arrhythmia systems via the Agilent Network Interface (see below).

If your monitor is connected via the Agilent patient care system to an arrhythmia computer (78720A), or you have a Central Station with arrhythmia channels such as the 78560A or 2300, or you have a M3150A/M3153A Agilent Information Center, you are able to display a delayed arrhythmia wave. Using the 78720A or the M3150A/M3153A, the arrhythmia monitoring for your monitor must be turned on or off at the computer display. Using the 78560A or M2300, this can be done from the Central Station or from the monitor itself.

Arrhythmia monitoring is most easily assigned in SELECT BED at the central station or arrhythmia computer, or from the ARRHYTHMIA MENU at the monitor. The ARRHYTHMIA MENU enables you to:

- Set up arrhythmia monitoring on a patient (not available for 78720A).
- Tabulate trends and review trend data (M2300 only).
- Review and edit alarms (not available for 78720A).

When arrhythmia is assigned, the monitor automatically goes to “Paced” mode. You cannot change the mode back to “Non-Paced” mode until arrhythmia is unassigned.

Note—The screens that can be seen on the monitor via the ARRHYTHMIA MENU are all similar to screens on the arrhythmia computer or central station. For further information on using the arrhythmia monitoring function, refer to the operating guide for the arrhythmia computer or central station.

If arrhythmia monitoring for your system is on, the heartrate on your screen is that calculated by the arrhythmia computer. Alarm messages from the arrhythmia computer are also displayed. Within the ECG channel, arrhythmia information is displayed on the rhythm and abnormal beat status of the patient. In the "Delayed ArrhWave" Task Window the delayed ECG arrhythmia waveform displays a beat label with each QRS complex.

See the following table for information on beat labels.

Beat Label	Meaning
A	Artifact beat
N	Normal beat
S	Supraventricular beat
V	Ventricular ectopic beat
M	Missing beat
?	Questionable beat
P	Paced beat
'	Pace pulse (tick mark)
L	Learning ECG pattern
U	Unknown, since pace learning is incomplete

If arrhythmia is assigned, and an arrhythmia alarm occurs, the Arrhythmia Validation Task Window will appear automatically on the status display unless you turn it off under Trends/Calcs.

Arrhythmia Alarms on the 78560A and 78720 Arrhythmia Computers

Alarm	Minimum Condition Required for Alarm
ASYSTOLE (***)	No QRS for 4 consecutive seconds in absence of V fib or chaotic signal.
VENT FIB/TACH (***)	Fibrillatory waveform detected for 4 consecutive seconds.
HR BRADY XXX < BBB (***)	Heart rate < lower HR limit set or 40 bpm whichever is lower.
VENT TACHY (***)	Either VENT RHYTHM with average heartrate > tachy HR limit or RUN VPB's > tachy run limit with rate for the run > tachy HR limit. Tachy run limit is adjustable from 3 to 9 using the Change Limits display. Tachy HR limit is adjustable from 80 bpm to 120 bpm using the Change Limits display.
VENT RHYTHM (**)	Dominant rhythm of adjacent V's and HR < = 120
PAIR VPBs (**)	Two consecutive VPBs between non VPBs
PACER NON-CAPT/PACER NOT-CAPTURE (**)	Missed beat with pace pulse in paced patient
MISSED BEAT(S) (**)	Beat omitted with HR < 120 or no beat for 1 second with HR >120

Other Patients

Alarm	Minimum Condition Required for Alarm
R-on-T VPBs (**)	For HR < 100, a VPB with R-R interval < 1/3 second and < 1/3 of the average R-R interval followed by a compensatory pause, or 2 such Vs without a compensatory pause in 5 min. (When HR > 100, 1/3 R-R interval is too short for detection.
VENT BIGEMINY (**)	Dominant rhythm of SV, V, SV, V.
VENT TRIGEMINY (**)	Dominant rhythm of SV, SV, V, SV, SV, V.
MULTIFORM VPBs (**)	The occurrence of two different shaped VPBs within last 300 beats, repeated in the last 60 beats.
HR XXX >UUU (**)	Heartrate >UUU, where UUU is the adjustable bedside high alarm limit. The heartrate of XXX is the highest heartrate measured since the alarm was detected.
HR XXX < LLL(**)	HR < LLL, where LLL is the adjustable bedside low heartrate limit. The heartrate of XXX is the lowest heartrate measured since the alarm was detected.
IRREGULAR (HR) (**)	Irregular SV rhythm

Arrhythmia Alarms on the 78560A Arrhythmia Computer

Alarm	Minimum Condition Required for Alarm
RUN VPBs > X (**)	Run of more than X VPB's, where X is adjustable from 2 to 9 using the Change Limits display.
PACER NON-FUNCT (**)	Missed beat without pace pulse in paced patient
VPBs > XX/min (**)	More than XX VPBs per minute, where XX is adjustable from 1 to 30 using the Change Limit display.

Arrhythmia Alarms on the 78720 Arrhythmia Computer

Alarm	Minimum Condition Requiring an Alarm
EXTREME TACHY	Heartrate >Tachy limit
RUN VPBs >9 (**)	Run of VPB's > 9 and heartrate <esc < limit set for VENT TACHY
RUN VPB's 3-9 (**)	Run of 3-9 VPB's
PACER NOT PACE (**)	Missed beat without pace pulse in paced patient
VPB's > 23/min (**)	More than 23 VPB's/minute
VPB's > 11/min (**)	More than 11 VPB's/minute
VPB's > 5/min (**)	More than 5 VPB's/minute

Other Patients

Arrhythmia Alarms on the 3150A/3153A Arrhythmia Computer

Message	Minimum Condition Requiring an Alarm
*** ASYSTOLE	No QRS for 4 consecutive seconds
*** V-FIB/TACH	Fibrillatory wave for 4 consecutive seconds
*** V-TACH	Consecutive PVCs \geq V-Tach Run limit <u>and</u> HR $>$ V-Tach HR limit
*** TACHY yyy $>$ xxx	Heart Rate (yyy) greater than the Extreme Tachy limit (xxx)
*** BRADY yyy $<$ xxx	Heart Rate (yyy) less than the Extreme Brady limit (xxx)
** NON-SUSTAIN VT	A run of Vs having a ventricular HR $>$ V-Tach HR limit, but lasting for less than the V-Tach Run limit
** VENT RHYTHM	A dominant rhythm of adjacent Vs $>$ vent rhythm limit and ventricular HR $<$ V-Tach HR limit
** RUN PVCs	Run of PVCs greater than 2
** PAIR PVCs	Two consecutive PVCs between non-PVCs
** PACER NOT CAPT	No QRS for 1.75 x the average R-R interval with Pace Pulse (paced patient only)
** PACER NOT PACE	No QRS and Pace Pulse for 1.75 x the average R-R interval (paced patient only)
** PAUSE	No beat detected for 1.75 x average R-R interval for HR $<$ 120, or no beat for 1 second with HR $>$ 120
** SVT	Run of SVPBs \geq SVT Run limit and with SVT Heart Rate greater than the SVT HR limit

Message	Minimum Condition Requiring an Alarm
** R-ON-T PVCs	For HR <100, a PVC with R-R interval <1/3 the average interval followed by a compensatory pause of 1.25 x average R-R interval or 2 such Vs without a compensatory pause occurring within 5 min. of each other. (When HR >100, 1/3 R-R interval is too short for detection.)
** VENT BIGEMINY	A dominant rhythm of N, V, N, V (N=supraventricular beat, V=ventricular beat)
** VENT TRIGEMINY	A dominant rhythm of N, N, V, N, N, V (N=supraventricular beat, V=ventricular beat)
** PVCs > xxx/MIN	PVCs within one minute exceeded the PVCs /min limit (xxx)
** MULTIFORM PVCs	The occurrence of two differently shaped Vs, each occurring at least twice within the last 300 beats as well as each occurring at least once within the last 60 beats
** HR yyy > xxx	Heart Rate (yyy) greater than the upper HR limit (xxx)
** HR yyy < xxx	Heart Rate (yyy) lower than the lower HR limit (xxx)
** IRREGULAR HR	Consistently irregular rhythm (irregular R-R intervals)

Extended Overview (Agilent CMS only)

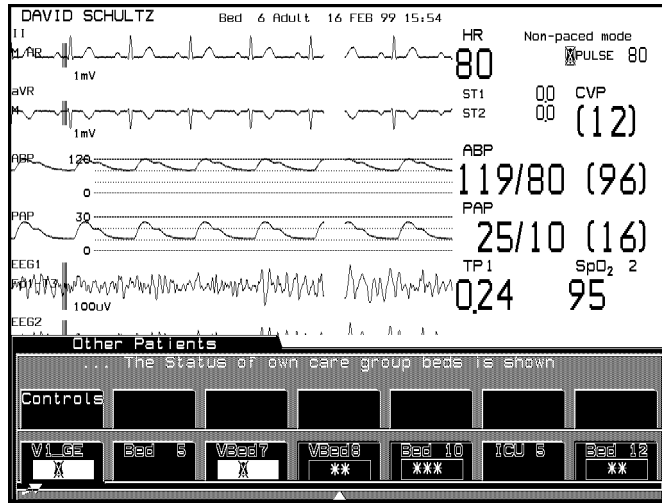
Note—The Extended Overview feature is optional and requires the M1272A Inter-Agilent Network Gateway.

Extended Overview enables you to review the status of patients on another Agilent Network - either in another care unit or in a care unit larger than 24 beds. The Extended Overview Task Window provides display of one wave, cascaded into two 4-second segments, up to seven parameter numerics including arrhythmia if available, and alert status messages.

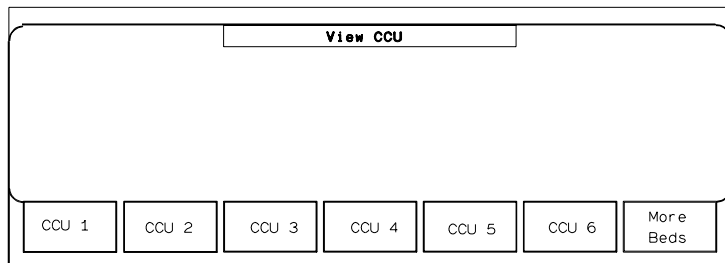
Extended Other Patients can be in use at a maximum of eight beds in each Agilent Network simultaneously. When the maximum use is exceeded, the message “CANNOT DISPLAY WAVES AND VITAL SIGNS, OTHER BED DISPLAY LIMIT EXCEEDED” is displayed.

To View an Extended Other Patients Bed

1. Press **Other Patients**.
2. Depending on your monitor's configuration, select a group softkey (in the following display labeled **View CCU**) to bring up bed labels in another unit or **other Beds** for bed labels in a unit larger than 24 beds.



3. Select the bed, using **More Beds** if necessary.



The Extended Overview Task Window will be displayed.

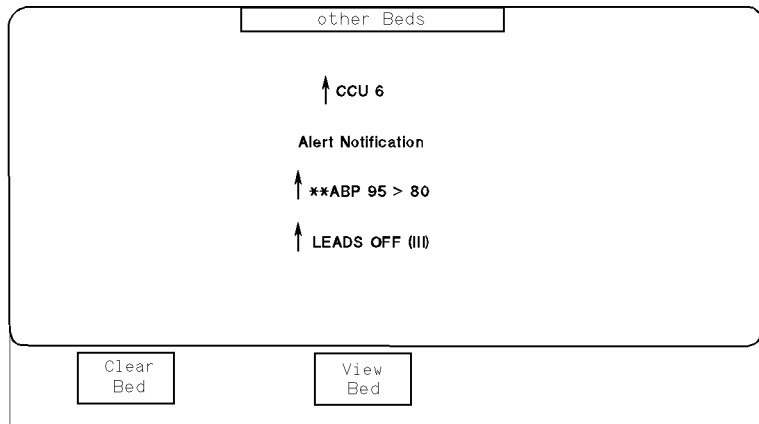
Note that only beds available on the other Agilent Network can be selected.

- To view another bed in the group, select the appropriate group label.
To select any bed not in the group, press **Other Patients**

Alert Notification

Alert Notification provides automatic notification of Alarms and INOPs from other extended Other Patients beds within a single unit of more than 24 beds. With one keypress at the bedside, you can view the alarming bed waves and numerics. If more than one bed is in alarm, a 5-second Alert Notification window is provided for each bed in turn. Alert notification is not provided between care units.

The operation of receive/send alarm choices and group selections is unchanged for Alert Notification. Alarms cannot be reset in Alert Notification.



To view an Alarming Bed from Alert Notification

- Select **View Bed** to display waves
- When done, select **Clear Bed** to return to the Main Screen or to view next bed's Alert Notification (if more than one bed is in Alert Notification, ↑ preceding bed name).

A maximum of 4 beds can be viewed on each Agilent Network at one time. When the maximum use is exceeded, the message "CANNOT DISPLAY WAVES AND VITAL SIGNS, OTHER BED DISPLAY LIMIT EXCEEDED" is displayed for 5 seconds.


Note—If the gateway is configured to provide Alert Notification and the gateway is inoperational, the message “SDN comm error - inter-network gateway failed” will be displayed in the message area of the main screen display. The Alert Notification display is removed if **Silence/Reset** is pressed on the source bedside monitor or **Silence** on the central station. All ***-star, **-star and hard INOP alerts will generate alert notification.

Alarm Functions

This chapter provides general information on alarm functions and what to do if an alarm occurs. It includes the following sections:

- Alarm Display. 5-2
- Alarm Setup 5-12

Alarm Display

The alarm messages are displayed across the top of the screen. When you switch the power on, the system alarm capability is switched off. This is indicated by an ALARMS SUSPENDED or ALARMS SUSPND 1, 2 or 3 MIN message at the top right corner of the screen, depending on the alarm suspended mode which is configured on the monitor. The Alarm Suspend symbol () on the control panel is also illuminated.

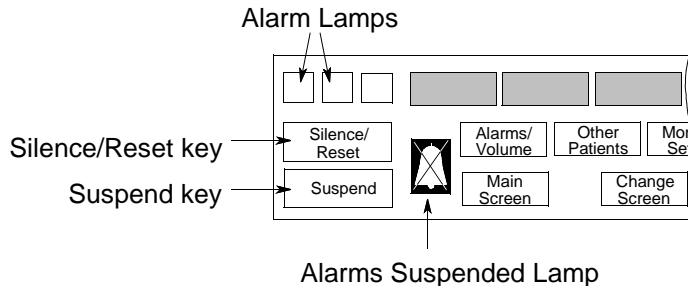
Note—When you switch the monitor on, a loudspeaker test is conducted for approximately 3 seconds. If there is no sound, please check the volume settings.

If there is more than one red alarm, yellow alarm or INOP message, you will see an up arrow (↑) next to the message. The messages are displayed in rotation every 2 seconds. If your patient has more than one alarm, you can see a list of all these active alarms in the Alarm Messages Task Window. To access this Task Window press **Alarms/Volume** or **Alarms** followed by **Alarm Messages**.

Warning

Alarms and INOPs are not active in the configuration and service modes, but are active in monitoring and demo modes.




Alarm Functions on the Control Panel



Alarm Lamps

Red and yellow alarm lamps on the control panel signify the severity of the cause of the alarm. One of these lamps is always lit in the event of an alarm sound. In the case of more than one alarm, the highest severity alarm lamp is always lit.

What the Symbol Means

When the alarm capability is suspended by using the **Suspend Alarms** softkey, or the **Suspend** hardkey, the  sign on the control panel is illuminated. If, however, you have turned the individual parameter alarms off one by one, the  sign on the control panel is not illuminated, but a  appears next to the individual parameter numerics on the screen.

Suspending Alarms

There are four alarms-off modes available. You configure which one you want at installation of your system. The four modes are:

1. ALARMS SUSPND 1 MIN
2. ALARMS SUSPND 2 MIN
3. ALARMS SUSPND 3 MIN
4. ALARMS SUSPENDED

ALARMS SUSPENDED 1, 2, 3 MIN

In these modes the alarm capability can be switched off, but is automatically switched on after 1, 2 or 3 minutes (unless you have switched it on manually beforehand with the **SwitchOn Alarms** softkey in the Alarms Selection Window, or the **Suspend** hardkey).

ALARMS SUSPENDED

In this mode the alarm capability is switched off permanently and must be switched on manually when required (using the **SwitchOn Alarms** softkey in the Alarms Selection Window, or the **Suspend** hardkey).

Note—We recommend that you have your system configured to ALARMS SUSPND 1,2 or 3 MIN for Intensive Care use, and ALARMS SUSPENDED for Operating Room use.

If all the alarms have been turned off using the **Suspend Alarms** softkey or the **Suspend** hardkey, they can all be turned back on by pressing the **SwitchOn Alarms** softkey or the **Suspend** hardkey.

While the alarms are suspended (permanently or for 1, 2 or 3 minutes), INOP messages continue to be displayed but alarm messages, lamps and alarm tones are not active. The nurse call relay is inactive.

Suspended Alarms during Arrhythmia Monitoring

Notes—

- While Arrhythmia is assigned, the central Arrhythmia Computer takes over the ECG/HR alarms.
- Suspending Alarms switches off all alarms, including Arrhythmia alarms.
- If Arrhythmia is assigned and alarms are suspended, the ECG/HR alarms are switched off. The **ON/OFF** Softkey in the Alarm Limits and ECG Adjust Alarms Task Windows will not be available (inactive softkey). The ECG/HR alarm **ON/OFF** capability can only be reactivated by switching the main Alarms on, or unassigning Arrhythmia.

Silencing and Resetting Alarms

If an alarm occurs you can silence it by pressing the **Silence/Reset** key. This will silence ALL alarms that are occurring at that moment. The alarm messages numeric will continue to blink.

You can configure your system on installation to have all latching or all non-latching alarms or to have visual alarms latching and audible alarms non-latching. You can also configure the alarm reminder function to be on or off.

*Note—*Audible alarm indications broadcast over the Agilent Network (SDN) are always treated like visual alarms on the Central Station or remote systems (even if the bedside monitor is configured differently).

- Latching Alarms - The alarm continues when the alarm condition is eliminated. Latching alarms can be reset by pressing the **Silence/Reset** key. Alternatively, all latching alarms can be turned off using the **Suspend Alarms** softkey or the **Suspend** hardkey. Latching alarms for individual parameters can be turned off in the Adjust Alarms Task Window or the Alarm Limits Task Window.

- Non-latching Alarms - These automatically reset when the alarm condition is eliminated. INOPs are always non-latching.
- Alarm Reminder - This only functions with alarms and not INOPs. (It does not work for arrhythmia alarms.) It affects the alarm sound, lamp, nurse call relay and the recorder, but not the alarm messages. The alarm reminder and reminder time can be configured as follows:

Alarm Reminder	Reminder Time
Off	Not Applicable
On	2 or 3 mins
Re-alarm	2 or 3 mins

If you have acknowledged an alarm by pressing the **Silence/Reset** key and the alarm condition continues, then the system will behave according to the following configurations:

Alarm Reminder	Reminder Time	Alarm Behavior
Off	---	No alarm reminder.
On	2 or 3 mins	Alarm reminder tone Alarm lamp No new alarm recording Nurse call relay signals <i>The alarm tone is reannounced for a duration of 6 seconds every 2 or 3 minutes unless the alarm condition is eliminated.</i>

Alarm Reminder	Reminder Time	Alarm Behavior
Re-alarm	2 or 3 mins	Full alarm tone Alarm lamp New Alarm Recording Nurse call relay signals <i>A full alarm tone is reannounced after 2 or 3 minutes. The alarm tone will sound continuously until it is silenced by pressing the Silence/Reset key.</i>

*The alarm reminder clock starts counting from the beginning again every time the **Silence/Reset** key is pressed. If an alarm has been acknowledged by pressing the **Silence/Reset** key, and during the next 3 minutes a new alarm (of whatever priority) occurs and is silenced, the alarm reminder will sound 3 minutes later for the highest priority alarm. The alarm reminder always functions for the highest priority acknowledged alarm. The alarm reminder will not sound if there is an active INOP or alarm present. For maximum safety when monitoring patients, you must resolve active INOPs and alarms quickly so that the alarm reminder function can operate.*

Even when the alarms are suspended or individually switched off, the corresponding parameter numeric will blink if an alarm condition occurs **and** “Maintain Visual Alarms” is set to “Yes” in a special Configuration Mode by your biomedical engineering department.

Note—The central stations 78560A, M2350A and M2360A can be configured to silence and reset the alarms of the bedside monitors. If your system is connected to such a central station you can silence an alarm at the central station. The central stations 78504A and 78508A can silence and reset the alarms of the bedside monitor only if configured to do so by an Agilent service engineer or hospital biomedical engineer. This is then permanent and cannot be altered by the user.

Summary of Alarm Behavior

		Non-latching alarms	Latching alarms	Visual Latching Audible Non-Latching
Silence/Reset has NOT been pressed	Alarm is given Alarm situation no longer present	Audible alarm Alarm lamp Alarm message, blinking numerics Automatic reset	Audible alarm Alarm lamp Alarm message, blinking numerics Audible alarm Alarm lamp Alarm message, blinking numerics	Audible alarm Alarm lamp Alarm message, blinking numerics Alarm lamp Alarm message, blinking numerics Audible alarm reset
Silence/Reset has been pressed	Alarm situation still present Alarm situation no longer present	Audible alarm silenced Alarm lamp off Audible alarm reminder every 3 minutes (if configured) Alarm message, blinking numerics Automatic reset	Audible alarm silenced Alarm lamp off Audible alarm reminder every 3 minutes (if configured) Alarm message, blinking numerics Automatic reset	Audible Alarm silenced Alarm lamp off Audible alarm reminder every 3 minutes (if configured) Alarm message, blinking numerics Automatic reset

Alarm Priorities

- **Red alarms** - Highest priority alarms, displayed in the top right corner of the display screen. These are marked with three asterisks (***) next to the alarm message, for example, ***ASYSTOLE.
- **Yellow alarms** - displayed in the top center of the display screen. There are two types of yellow alarms; continuous yellow alarms and short yellow alarms. The continuous yellow alarms are associated with preset alarm limits. The short yellow alarms are active from the arrhythmia computer.

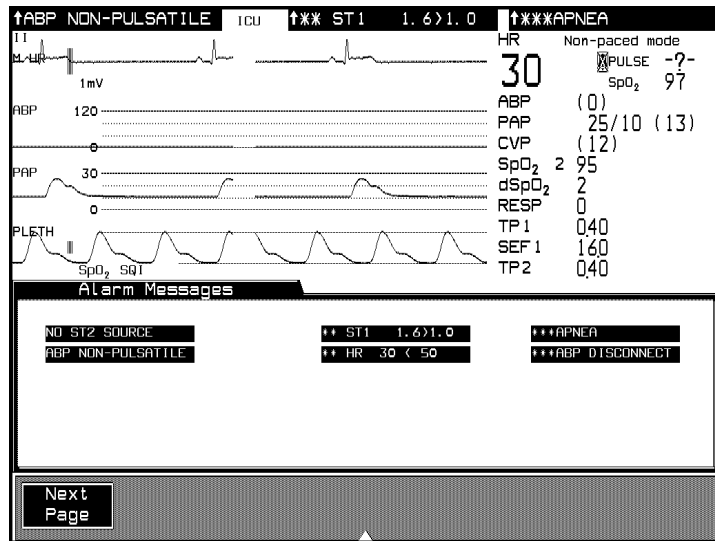
Both types of yellow alarms are marked with two asterisks (**) next to the alarm message, for example, **HR 56<60, but the alarm tone is shorter with the alarms from the arrhythmia computer. For both the short and continuous yellow alarm, the yellow lamp is lit.

- **INOPs** - displayed in the top left corner of the display screen. The INOPs also have priority levels, they are as follows:
 - **Equipment Related INOPs** - These are caused by setup or hardware faults, for example, “ABP NO TRANSDUCER”. You will hear an INOP tone. When an equipment-related INOP can have a direct effect on the patient, for example “NBP CUFF OVERPRESS” of the noninvasive pressure cuff, it is categorized as a severe INOP. When a severe INOP occurs the system alarm capability is switched ON by the system, if not already on. You will hear an INOP tone. System alarms cannot be suspended until the cause of the severe INOP has been eliminated.
 - **Patient Related INOPs** - These are usually caused by the system being unable to process signals properly, for example, “Noisy ECG”. You will not hear an INOP tone with this level of INOP.

Viewing Alarm Messages

The monitor alarms are arranged in increasing severity across the screen:

1. Press **Alarms/Volume** or **Alarms** hardkey
2. Press **Alarm Messages** in the Alarms Selection Window.



Note—When an alarm occurs, you should always check the patient's condition first.

Audible Alarms



There are four different tones (3 alarm tones and one INOP tone):

- Alarm tones
 - red
 - yellow continuous
 - yellow short
- INOP tone

Individual Parameter Alarms

When you plug in a parameter module and connect the transducer or adapter cable, the parameter is automatically switched on. (ECG, RESP and NBP are automatically switched on when you plug in the relevant module.)

Whether the parameter alarms are switched on or off at start-up can be selected for each parameter separately in the special Configuration Mode

The parameter alarms can be switched off individually either in each parameter Adjust Alarms Task Window or in the Alarm Limits Task Window. A  symbol appears next to the numeric of any parameter for which the alarms are switched off. A parameter without any INOP or alarm capabilities does not show a .

If all the alarms have been turned off individually, they must be turned on individually. There is one exception to this rule, when the monitor is set up in Operating Room mode (this applies to all Anesthesia CMSs and Agilent V24 and V26 Monitors and others using a Configuration Set with Unit Type=OR). In this mode all parameter alarms can be switched off with a single key press. This enables you, for example, to quickly switch all alarms off and individually switch on those parameter alarms really needed, depending on your monitoring requirements. All parameter alarms can be switched off (or on) using **Confirm** in the Alarm Limits Task Window.

If a parameter alarm is turned off, INOP messages continue to be displayed but alarm messages, lamps and the alarm tones are not active. The nurse call relay is inactive.

Note—The heart rate derived from a continuously monitored ECG is a measure of the heart's overall electrical activity. The pulse rate is a measure of the heart's mechanical activity, pumping blood around the body. With the HR/PULSE parameter you can select only one of them to be the active alarm source. If you choose HR, all alarms for PULSE are not active. If you choose PULSE, all alarms for HR are not active. The INOPs for both HR and PULSE are displayed regardless of which one is the alarm source.

When an Alarm Occurs

The alarm messages appear across the top of the screen. You need to identify the alarm and act appropriately, according to the cause of the alarm.

- Identify which monitor is in alarm.
- Check the patient's condition.
- Identify the cause of the alarm.
- Silence the alarm, if necessary.
- When alarm condition is eliminated check that the alarm has reset.

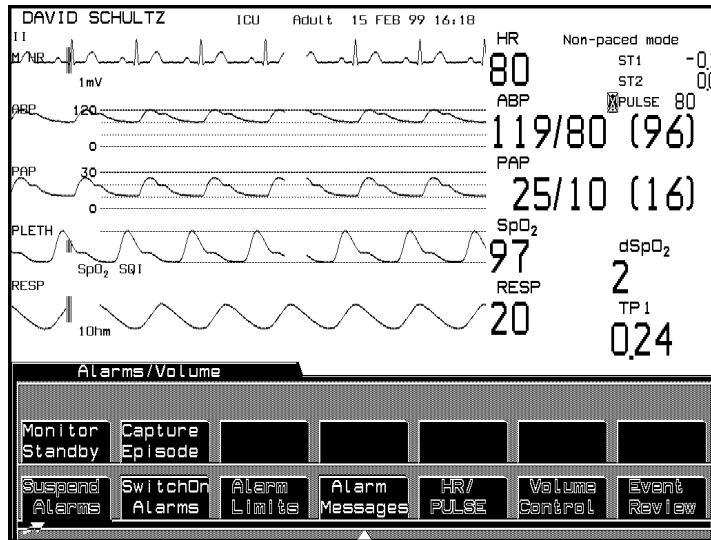
You will find the alarm messages for the individual parameters in the appropriate parameter sections of the Manual.

Alarm Setup

In the Alarm Limits Task Window you are able to review all of the alarm limits that have been set for a patient. In this Task Window you are able to turn off individual parameter alarms and adjust the limits. This means that if you just want to adjust an alarm limit you do not have to get into the individual parameter setups.

Getting into the Alarms Selection Window

Press the hardkey **Alarms/Volume** or **Alarms**.

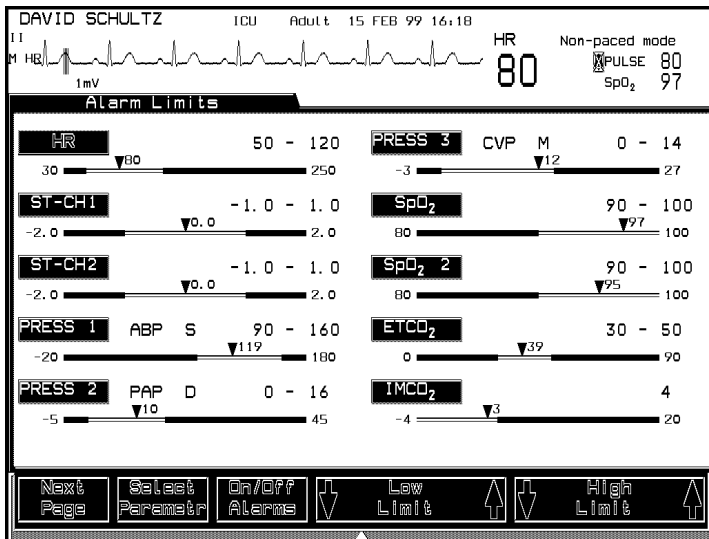



The first two softkeys **Suspend Alarms** and **SwitchOn Alarms** function in the Selection Window. If you select one of these softkeys, its function is performed and you are returned to the Standard Display.

(Remember, you can also suspend the alarms and switch them back on by using the **Suspend** hardkey.)

Changing the Alarm Limits

Alarms/Volume --> **Alarm Limits**



1. Press **Select Parametr** to highlight the parameter that you want to adjust.
2. Use the **On/Off Alarms** softkey to switch the parameter's alarms on or off. When the alarms are turned off, a  appears next to the parameter alarm limits.
3. Use **Low Limit** and **High Limit** softkeys if you want to adjust the limits.
4. If there are more than 10 alarm bars to review, press the **Next Page** softkey, and the remaining alarm bars appear on the screen.
5. Stay in the Task Window if you want to adjust more limits or press **Main Screen** to return to the Main Screen.

Setting the Volume Control

The QRS and the alarm tone volume can be set independently.

1. Press **Alarms/Volume** hardkey.
2. Press **Volume Control** in the Alarms Selection Window.

The QRS and alarm tone are each represented by the outline of a triangle which can be filled in. When the triangle is completely filled, this represents maximum tone volume.

3. Press the up and down arrow softkeys to fill each triangle to the required amount. If there is no current alarm or INOP, two short alarm tones will sound each time the alarm tone keys are pressed so that you can hear the effect of changing the volume.
4. Press **Main Screen** to return to the Main Screen.

Note—The QRS tone can be derived from other sources than ECG such as pressure or pleth. See Chapter 14, “ECG and ECG/Respiration Module Section” for more details.

Note—Tone Modulation can also be set to On or Off in this window using the **On/Off Tone Mod.** key.

The Nurse Call Relay

Note—The nurse call relay is not available for the Agilent Models V24CT and V26CT.

The nurse call relay is a paging system which warns the nurse if an alarm occurs on a monitor. It becomes active in one of four situations depending on the way it has been configured:

- Red only alarms
- Red and Yellow alarms
- Red and INOP alarms
- Red and Yellow INOP alarms.

The nurse call relay is not active when the monitor's alarm capability is switched off.

When an alarm has been silenced using the **Silence/Reset** key, and the audible 2 or 3 minute alarm reminder is configured to be either On or Re-alarm, the nurse call relay signals will behave as follows:

Alarm Reminder	Reminder Time	Nurse Call Relay Signal Behavior
On	2 or 3 mins	The nurse call relay signals are repeated for a duration of 6 seconds every 2 or 3 minutes unless the alarm condition is eliminated
Re-alarm	2 or 3 mins	The nurse call relay signals are activated after 2 or 3 minutes. The alarm tone and relay signals run continuously until they are interrupted by pressing the Silence/Reset key.

Recording Functions

This chapter contains information on the recordings that can be made using the Agilent CMS, V24 and V26 monitors, and the recorders which can produce them. It includes the following sections:

- General Recorder Information 6-2
- Types of Recordings 6-7
- Delayed Recording 6-8
- Alarm Recording 6-12
- Procedure Recordings 6-16
- Realtime Wave Recordings 6-20
- Realtime Vital Signs / Blood Recordings 6-25
- Trended Vital Signs Recordings. 6-29
- Neonatal Event Review Recordings 6-33
- oxyCRG Recordings 6-36
- Additional Information 6-39
- Recording Status Messages 6-46
- Loading Paper 6-48

General Recorder Information

Recorders The following recorders are available for use with the Agilent CMS, V24 and V26 Monitors:

Recorder	<u>Model Number</u>
Plug-In	M1116A/B ^a
4-Channel Bedside	M1117A (for Agilent CMS only)
2-Channel Bedside	78574A (for Agilent CMS only)

a. Only the M1116B can be used with the Agilent Information Center

The Plug-In recorder has 2 channels, and can also be used at a central location.

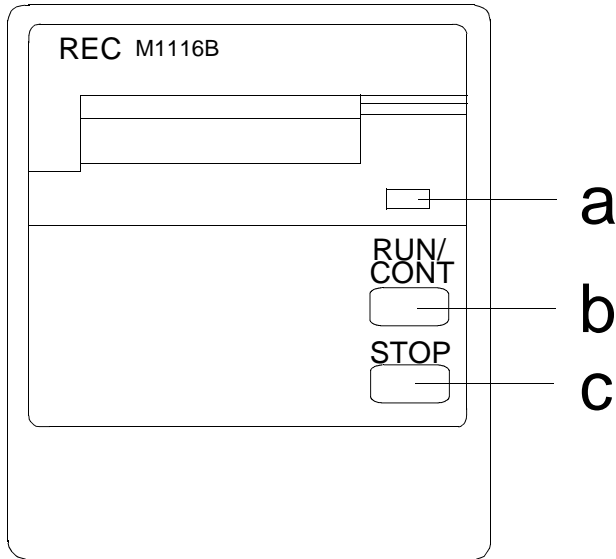
The 4-channel thermal recorder can also be used at a central location.

The Agilent central recorder records the waves you select for transmission over the Agilent patient care system.

This document provides configuration information for the Plug-In, 4-channel, and central recorders. The controls and indicators on the Plug-In and 4-channel are also described.

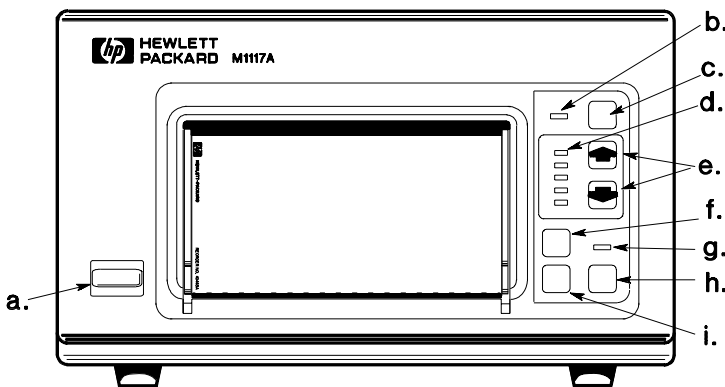
For information about the 2-channel bedside and the central recorder controls, please refer to the relevant operating guide.

Controls and Indicators on the Plug-In Recorder



- | | |
|--------------------------|---|
| a. Continue light | Flashes if the currently printing recording is continuous |
| b. RUN/CONT key | Starts a timed delayed recording and/or makes a currently printing recording continuous (if possible) |
| c. STOP key | Stops the currently printing recording |

Controls and Indicators on the 4-Channel Recorder (Agilent CMS only)



- a. Power On/Off key** Switches recorder power on (in) and off (out)
- b. Out-of-paper light** Lights when paper is out or recorder door is open
- c. TEST key** Initiates a self-test to check that the recorder is working properly and prints a test strip
- d. Speed selection lights** Lights to indicate current speed setting
- e. Speed selection keys** Selects another printing speed while the recorder is running
- f. Feed key** Advances paper until key is released.
- g. Continue light** Lights when the currently printing recording has been made continuous.

- | | |
|--------------------|---|
| h. Cont key | Makes currently printing recording continuous if possible |
| i. Stop key | Stops the currently printing recording |

Recorder Capabilities

Plug-In Recorder (M1116A/B)

Can record up to 3 waveforms (if 2 waveforms are overlapped).

- Makes delayed recordings of any waveforms you select.
- Makes realtime vital signs recordings.
- Makes realtime blood measurement recordings
- Makes trended vital signs recordings
- Makes neonatal event review recordings (M1116B)
- Makes oxyCRG recordings (M1116B)
- Runtime and delay time are configured when the monitor is installed.
- You can choose layout and speed, except for vital signs recordings. With oxyCRG recordings, layout cannot be chosen.
- Time annotation is at the beginning of printout.

4-Channel Recorder (M1117A) (CMS only)

- Makes delayed recordings of any waveforms you select.
- Runtime and delay time are configured when the monitor is installed
- You can choose layout and speed
- Annotation is along the top edge.

General Recorder Information

Central Recorder (1, 2 or 4 channel recorder)

- Makes delayed recordings of waveforms broadcast over the Agilent patient care system. (These are waveforms viewed at the central station and other monitors in overview mode.)

Single channel recorder records only the primary wave. If ECG is monitored, it must be selected as the primary wave. It cannot be deselected.

Dual channel recorder records the primary and secondary wave (if the central station supports 2-channel strips).

See the Central Recorder operating guide for recording speed, runtime and delay time.

Types of Recordings

The monitor produces several different types of recordings. Alarm recordings are generated automatically by the monitor when clinical criteria are violated. In addition, you can make the following types of strip chart recordings from the monitor:

- Delayed
- Monitoring Procedure
- Realtime Waves
Realtime recordings can either be made from a pre-selected set of waves or selected when the recording is initiated.
- Realtime Vital Signs and Blood Analysis (made on a M1116A/B Plug-In recorder).
- Trended Vital Signs (made on a M1116A/B Plug-In recorder)
- Neonatal Event Review (made on a M1116B Plug-In recorder)
- OxyCRG recordings can be made only on an M1116B Plug-In recorder.

Note—Depending on the configuration of your monitor, when you press **Realtime Record**, either the Select Recording Waves window appears (where you can choose the waves for a realtime recording), or the Preset Recordings window appears (where you can initiate delayed, preset realtime, and vital signs recordings). To switch to the other window, press **Preset Recorder** or **Select RecWaves**.

Delayed Recording

Definitions

Delayed Recordings - recordings of waveforms that are delayed in time, so that if you see a waveform you want to record, you can record it even if it has passed off the monitor screen. A delayed recording runs for a preset time and begins with delayed waveform from before the recording was initiated.

Delayed recordings are either:

- | | |
|--------------------------|---|
| manual recordings | initiated by the user - generally called “delayed” recordings |
| alarm recordings | automatically generated when alarm occurs |

Depending on the model of your monitor a maximum of 4 delayed waves can be recorded. The waves are selected in the Delayed/Alarm Recording Task Window.

The waves recorded on an alarm strip are also chosen from the list in the Delayed/Alarm Task Window. If the parameter in alarm is not already selected, it will replace the last selected channel.

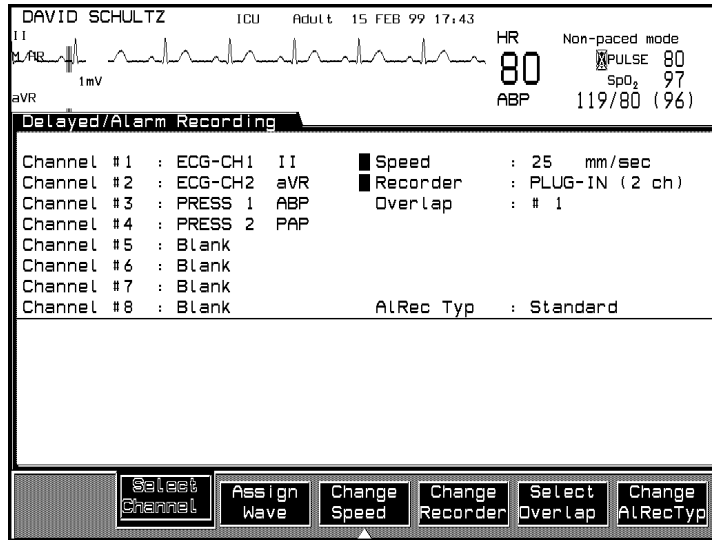
Delay Time - the maximum time between seeing a waveform on the screen and still being able to record it. This is configured when the monitor is installed. Choices are 10 or 15 seconds for the Plug-In recorder.

Runtime - the length of time the recording runs. This is configured when the monitor is installed. Choices are 10, 15, 20, 25, or 30 seconds.

Configuring Delayed Recordings

For Plug-In and 4-Channel Bedside Recorders

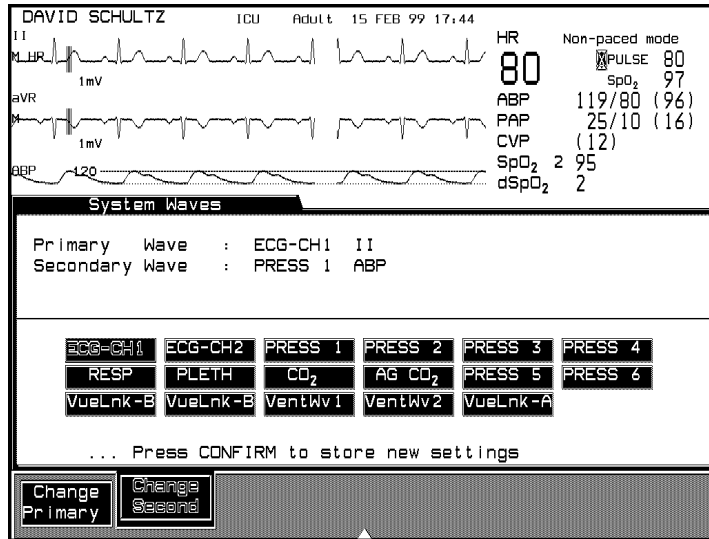
Monitor Setup → **Recording Setup** → **Delayed & Alarm**



1. Select the recorder and layout:
 - a. Press **Change Recorder** to select the recorder.
 - b. Press **Select Overlap** to select wave layout. The sector sizes in millimeters and the ECG gain required for 1 mV to equal 1 centimeter on a strip appear below the layout choices.
 - c. Press **Change Speed** to change recorder speed.
2. Select wave for each channel
 - a. Press **Select Channel** to select channel number.
 - b. Press **Assign Wave** to select waveform.
3. Press **Change AIRecTyp** to select the type of recording (standard or oxyCRG) that will be generated by alarms.

For Central
Recorders

Monitor Setup → **System Waves** .



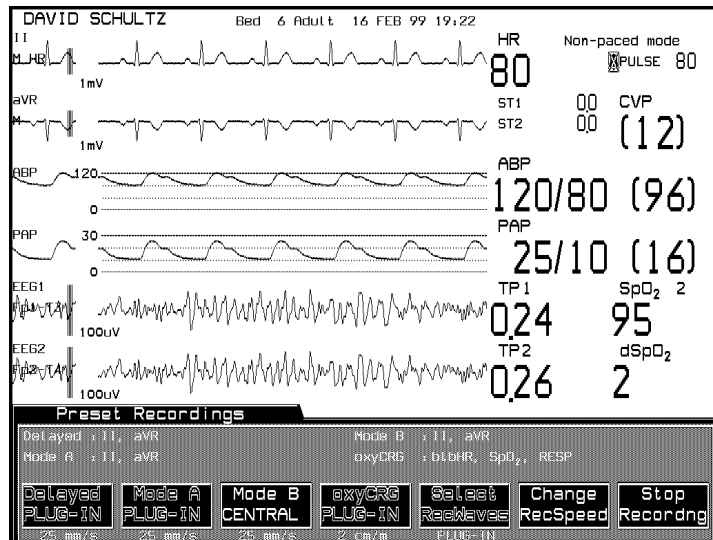
1. Select the central recorder in the Delayed/Alarm Recording Task Window (see steps 1-3 for Plug-In and 4-Channel Bedside Recorders above).
2. Select the waves in the System Waves Task Window
 - a. Press **Change Primary** to select the primary wave. The **Change Primary** key does not function if an ECG wave is available. In this case the primary wave is always ECG-CH1.
 - b. Press **Change Second** to select secondary wave.
 - c. Press **Confirm** to store the selected wave.
 - d. Press **Main Screen** to return to the standard monitoring display.

Making Delayed Recordings

To initiate a delayed recording on any recorder, press Delayed Record.

On the Plug-In recorder only, press RUN/CONT.

Delayed recordings can also be initiated from the Preset Recordings Task Window. Here, the waves pre-selected for a delayed recording are identified above the Delayed softkey label.



Note—If a delayed recording is configured so that it is produced on a Plug-In recorder or a 4-Channel Bedside Recorder, alarm recordings are also produced on this recorder. If the specified recorder is inoperable for any reason, the alarm recording is re-routed to the central recorder. (Remember that arrhythmia alarms are always recorded at the central recorder.)

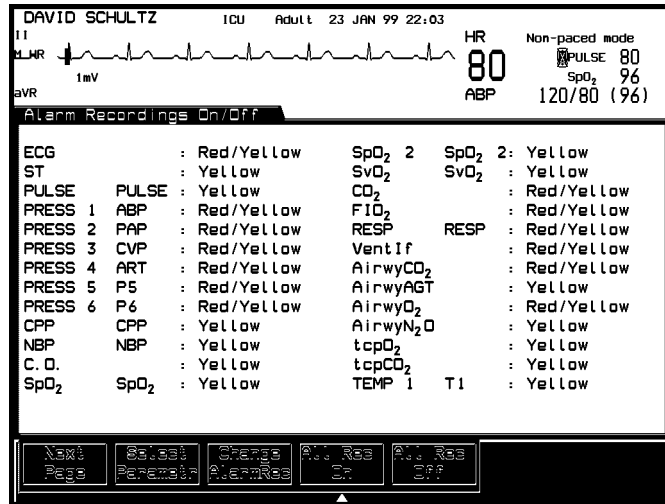
Alarm Recording

Alarm recordings are a type of delayed recording, that is, the recording includes waveform information from before the alarm event so you can see the change in the patient's condition. When a patient goes into an alarm condition, an alarm recording is generated automatically according to the monitor's configuration. You can determine the alarm severity on a parameter-by-parameter basis that will cause an alarm recording to run. You can also enable and disable alarm recordings for individual parameters.

With the exception of oxyCRG alarm recordings, alarm recordings run at a speed of 25 mm/sec regardless of the speed selected in the Delayed and Alarm Task Window. OxyCRG alarm recordings run at the pre-configured oxyCRG speed. If oxyCRG is enabled in your monitor's configuration, you can select the type of alarm recording (standard or oxyCRG); refer to "Configuring Delayed Recordings" on page 6-9.

Configuring Alarm Recordings

Monitor Setup → **Recording Setup** → **AlarmRec On/Off**



1. Press **Select Parametr** to highlight a parameter to change.
2. Press **Change AlarmRec** to select the severity (Red, Red/Yellow, Yellow, Off).
3. Press **All Rec On** to enable recordings for all red and yellow conditions.
4. Press **All Rec Off** for no alarm recordings.

Note—If delayed/alarm recordings are being sent to the central recorder, the ECG alarm recording setting is displayed in the Alarm Recording On/Off Task Window as RED/YELLOW. This setting cannot be changed unless you choose a bedside recorder (either a Plug-In or 4-channel bedside).

Note—The AlarmRec On/Off function must be enabled in Configuration Mode.

Alarm Recording Priorities

In a delayed recording, waves are recorded in the order assigned in the Delayed/Alarm Recording Task Window, and the number of waves recorded is determined by the recorder configured for delayed recordings. In alarm recordings, the alarming parameters replace the waves in the lower channels. In the default alarm recording, the top channel contains the first delayed wave, usually ECG. Additional delayed channels are overwritten by the additional alarming parameter, starting at the bottom channel, in the following priority:

- Parameter whose alarm status has escalated in the last second, and has alarm recording enabled.
- Parameter in red alarm with alarm recording enabled.
- Parameter in yellow alarm with alarm recording enabled.
- Parameter in red alarm with alarm recording disabled (if space is available).
- Parameter in yellow alarm with alarm recording disabled (if space is available).

Alarm Recording Examples

On the Plug-In (2-channel) recorder with respiration recordings disabled, an apnea alarm followed by a Pressure 1 limit alarm would produce a strip:

Channel 1 ECG

Channel 2 Pressure 1

provided that P1 has been selected in the Delayed/Alarm Recordings Task Window.

For a 4-channel bedside recorder with a standard delayed recording configured as:

Channel 1 ECG

Channel 2 Pressure 1

Channel 3 Pressure 2

Channel 4 Respiration

A yellow CO₂ alarm would produce a recording ordered as:

Channel 1 ECG

Channel 2 Pressure 1

Channel 3 Pressure 2

Channel 4 CO₂ alarm

If a red P3 alarm occurred, the recording order would then become:

Channel 1 ECG

Channel 2 Pressure 1

Channel 3 P3 alarm

Channel 4 CO₂ alarm

For alarm recordings with oxyCRG (to document neonatal events without the Neonatal Event capability), the alarm recording items should be set to the following:

Alarm Record Type oxyCRG

All AlarmRec Off
Change AlarmRec to red for ECG, Resp and SpO₂.

In the event of a Brady, Apne and/or Desat alarm the recorder will document an eight minute oxyCRG recording (six minutes preceding the event and two minutes following the event).

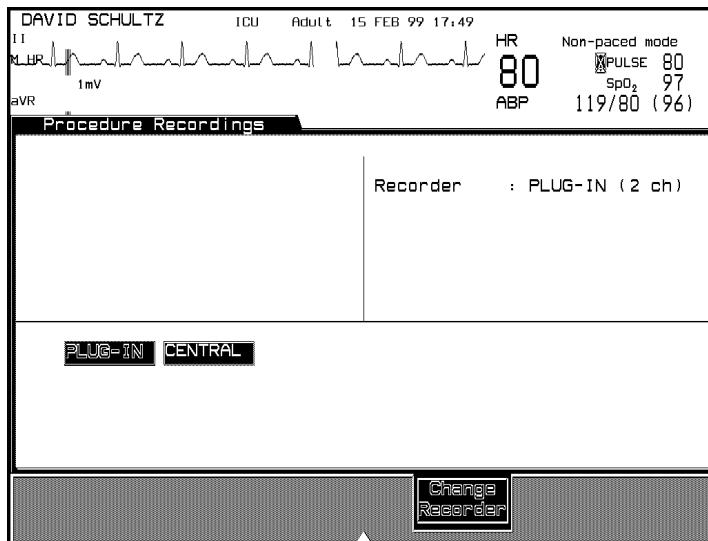
Procedure Recordings

Recordings can be made during cardiac output measurements.

Configuring Procedure Recordings

You first select the recorder which will record the curve.

Monitor Setup → **Recording Setup** → **Procedure Recording**

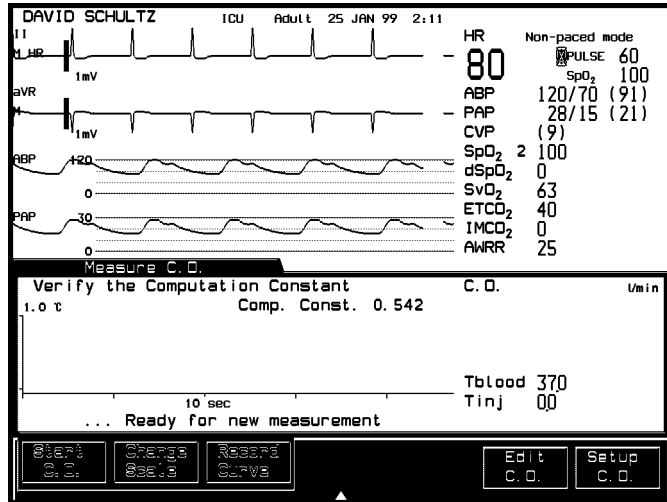


1. Press **Change Recorder** to select the recorder that will produce the recording.
2. Press **Main Screen** to return to the standard monitoring display.

Note—To generate trended vital signs and neonatal event recordings, the recorder selection must be set to “PLUG-IN” in the Procedure Recordings task window.

Making Procedure Recordings

Procedures → **C.O.**



See Cardiac Output Section for details on cardiac output measurements.

When a cardiac output measurement has been made, the curve in the Measure C.O. Task Window can be recorded by pressing

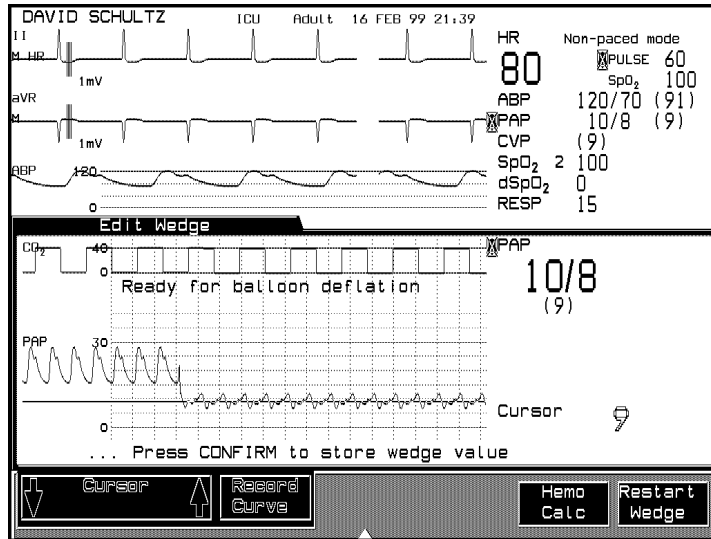
Record Curve.

The recording strip shows the curve and is annotated with the date, time, cardiac output value, computation constant, blood and injectate temperatures.

Note—Only the most recent cardiac output curve can be recorded. Record a curve before including it in an averaging calculation. When **Confirm** is pressed, all the curves are deleted and cannot be recorded.

CMS only:

Procedures → **Wedge** → **Edit Wedge**



See the Pressure Section for details on Pulmonary Artery Wedge Pressure (PAWP) Measurements.

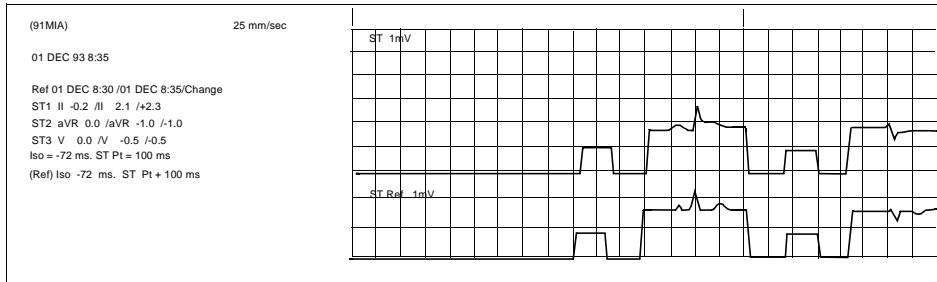
When a PAWP measurement has been performed, the PAWP waveform can be recorded by pressing the **Record Curve** softkey. If displayed, the CO₂ or RESP waveform is also recorded.

The recording strip is also annotated with the date, time, and wedge value.

ST Recordings

Recordings of ST waves and their reference waves can be made on the bedside or central recorders. They are initiated from the ST Analysis Task Window. An ST recording shows the ST beat(s) from the cursor spot in the upper channel, and the corresponding reference beat(s) in the lower channel, with the measurement values, net change, and measurement points listed in the annotation.

ST values transferred by the Agilent M1235A Data Transfer Module are indicated by a "T" after the time. Because the ST waveforms are not transferred, no waveforms will be recorded.



Realtime Wave Recordings

Definitions **Realtime Recordings** - recordings of waveforms from the time of your request.

There are two types of realtime recordings:

Preset Recordings the user presses one of the pre-configured recording keys to initiate recording of pre-selected waveforms on a pre-selected recorder. The waves are identified *above* the key labels; the recorder name appears on the key label.

Non-Preset Recordings the user selects the waveforms and recorder immediately prior to making the recording

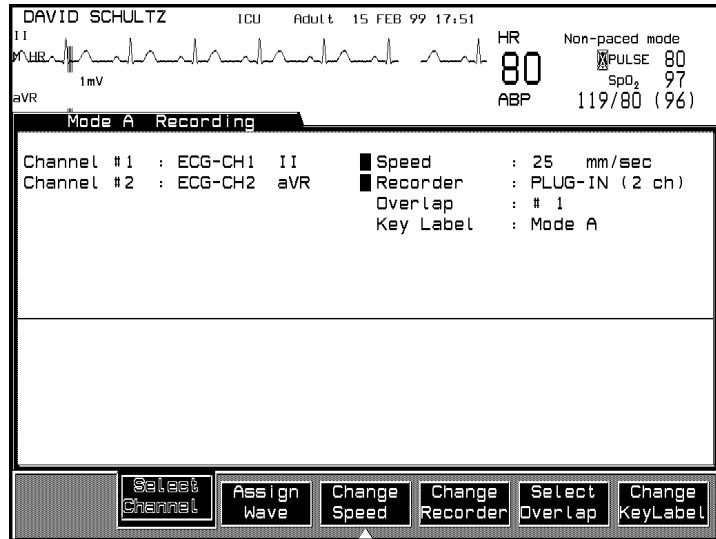
Realtime Recording Mode - a pre-selected set of waveforms will be recorded when one of the pre-configured recording keys is pressed. Three separate recording modes (A, B, C) can be configured. The user can choose the waves to be recorded, their positions on the recording strip and the recorder to be used. Mode B may be reassigned to vital signs/blood recordings, and Mode C to oxyCRG recordings, depending on the monitor's configuration. A particular mode might be configured to record a specific procedure performed in a unit.

Realtime recordings can be produced on Plug-In, 4-channel bedside and central recorders.

Remember that realtime recordings are initiated in two Task Windows: Preset Recordings and Select Recording Waves, depending on the type of realtime recording.

Configuring Preset Recording Modes

Monitor Setup → **Recording Setup** → **Mode A Recording**



1. Select the recorder and layout.
 - a. Press **Change Recorder** to select the recorder that will produce the recordings.
 - b. Press **Select Overlap** to change the layout of the waves on the recording strip.
 - c. Press **Change Speed** to change the recorder speed.
2. Select wave for each channel.
 - a. Press **Select Channel** to select required recorder channel.
 - b. Press **Assign Wave** to highlight the wave for selected channel.
3. Press **Change KeyLabel** to give a name to the mode being configured.

Modes B and C are configured in the same way.

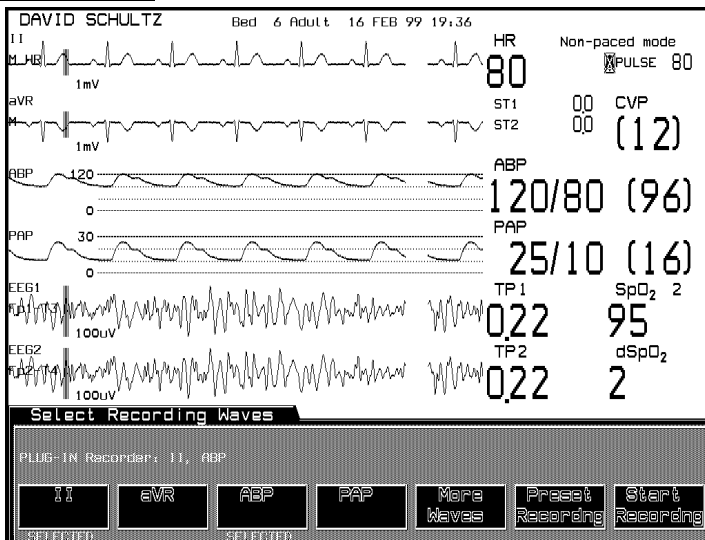
Realtime Wave Recordings

Making Preset Recordings

Realtime Record → **Preset Recordng** if available → **Mode A**, **Mode B**, or **Mode C**.

Making Non-Preset Recordings

Realtime Record → **Select RecWaves** if available.



Select the wave(s) to be recorded.

Selected waves are identified in the window after the recorder name in the order they were selected. Each wave that is selected is also identified below the key label.

The recording is always continuous, running at 25 mm/s in non-overlapped mode.

To stop realtime recordings:

either press **Stop Record**.

or press **STOP** on the recorder.

All realtime non-configured recordings must be stopped manually.

Note—**(CMS only)**: The number of recording channels available depends on the recorder. If you change from a 4- to a 2-channel recorder, only the first two waves are recorded.

Note—Non-preset recordings are made on the same recorder as procedure recordings (selected in the Procedure Recordings Task Window). If the power is off for more than 1 minute, a non-preset recording automatically reverts to the default waves and recorder for Mode A. However, the speed (25 mm/s), waves non-overlapped, and continuous runtime do not change.

Note—If a realtime recording is requested during an alarm recording, it is produced when the alarm recording is finished. If a realtime recording is in progress, and another parameter goes into alarm, an alarm message appears on the realtime recording. When the realtime recording is finished, the alarm recording is produced.

Making Calibrated ECG Recordings

If you want your ECG recording to be calibrated, you must select the size of the ECG wave, depending on your recorder sector size. To select the size, refer to the “Switching between EASI and Standard leads” on page 14-22. The calibrated ECG wave recording will be 10mm/mV.

If the Recorder is Busy

Realtime: If a delayed recording, or any recording from another monitor, is in progress at the central monitor at the time of your request, you are alerted with a message on the monitor display, and the *request* is queued.

When the recorder is free, the recording runs. It consists of current waveforms (not the waveforms from the time the recording was requested).

If the recorder is busy with a realtime recording and you request another realtime recording from the *same monitor*, the current recording stops and the newly requested recording starts.

Delayed: If the recorder is busy at the time of your request, the *waveform data* and the request are queued.

When the recorder is free, the recording runs. The recording shows the waveforms from the time the recording was requested.

For Central Recorders, the requests are run and queued according to the priority for that recorder. See the operating guide of the recorder for information. For the M1116A/B Plug-In Recorder and the Agilent M1117A Bedside Recorder, the recording prints when the recorder is free.

Note—If you are using a monitor connected to a Patient Information Center PIC (78504 and 78508) and you are using an 78572 recorder, please observe the following rule:

- Always select a valid waveform. Do **not** select “Blank” as the waveform to be recorded in the Select Recording Waves Task Window, as the recorder will not function. It will give the prompt “Central recorder not available”.
- For the Monitor connected to the Agilent Component Central Monitor or other Agilent central station, realtime recordings must have at least one non-blank channel to generate a recording on the central recorder.

Realtime Vital Signs / Blood Recordings

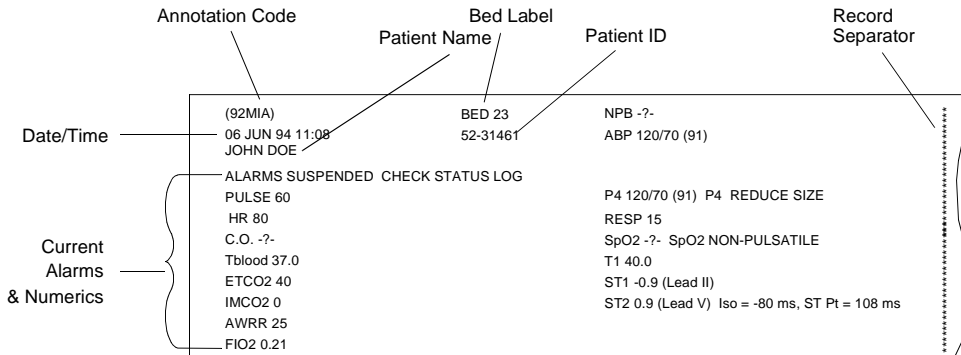
Definitions

1. Realtime Recordings - recordings of vital signs / blood analysis from the time of your request.
2. Automatic Recordings - automatic recordings of vital signs / blood analysis by an NBP measurement or by a blood analysis measurement. The NBP measurement can be taken by the M1008A/B module or an NBP monitor connected through VueLink. Recordings can also be triggered by a timer when an independent NBP monitor is used.
3. Timed Interval Recordings - recording of vital signs / blood analysis at specific timed intervals

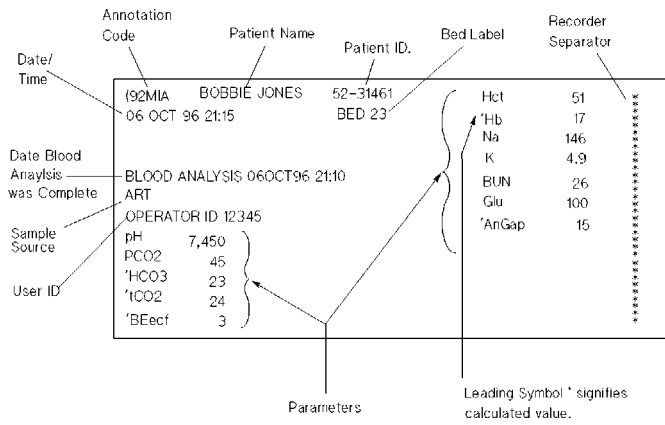
Recordings can include:

- Just vital signs data
- Just blood analysis data
- A combination of vital signs and blood analysis data

Vital signs / blood recordings are made only at the bedside on the M1116A/B plug-in recorder; this type of recording is not rerouted to a central recorder if the bedside recorder is not available.



Realtime Vital Signs / Blood Recordings

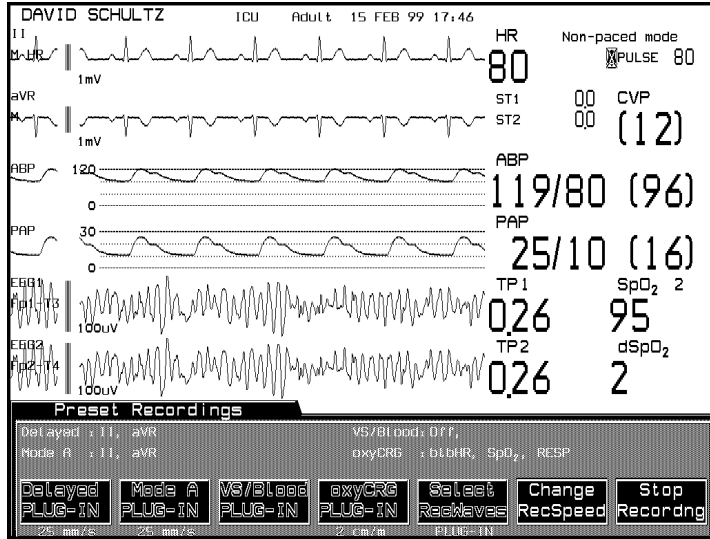


Depending on the number of parameters being monitored, a vital signs / blood recording may take up to 15 seconds to complete. The recording speed is set by the system, and cannot be adjusted.

Note—If vital signs / blood recordings are configured on when the monitor is turned off, a vital signs recording will be generated within the 30 seconds after the monitor is turned back on. If vital signs / blood recordings are configured on when the system clock is changed, a recording will be generated immediately. Subsequent recordings will be generated based on the configuration choices.

Making a Single Vital Signs/Blood Recording

If your monitor is configured to have a **VS/Blood PLUG-IN** softkey in the Preset Recordings Task Window, you can initiate a single vital signs or blood recording.



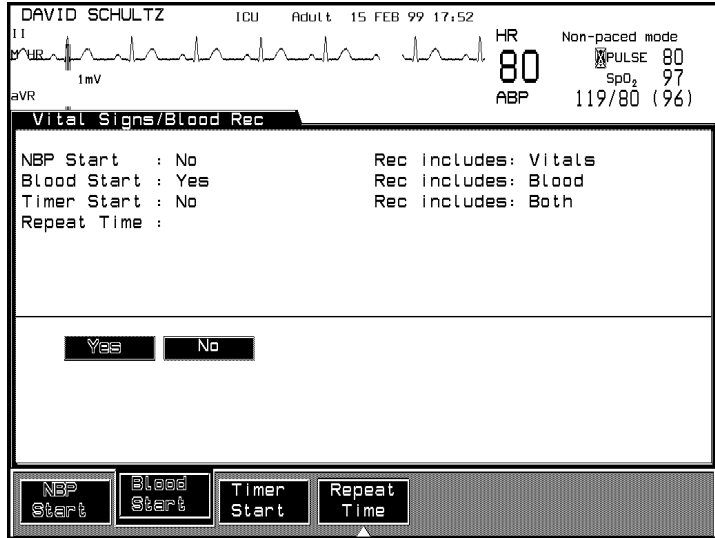
Making Timed Sequences of Vital Signs/Blood Recordings

An automatic sequence of vital signs / blood recordings can be enabled or disabled in monitoring mode in the Vital Signs/Blood Recording Task Window under Monitor Setup/Recorder Setup. You can also determine whether vital signs recordings will be initiated on an NBP measurement, a blood analysis measurement, at a specific time interval, or any combination of the above.

New configuration choices become effective when you leave the Vital Signs / Blood Recording task window. Any recordings currently active will be completed using the old choices, and the next recording will use the new configuration.

The settings for vital signs / blood recordings are displayed in the Preset Recordings Task Window above the softkey labels

If you are configured for vital signs / blood recordings and you are in Mode B, selecting the Vital Signs / Blood Recording key produces a recording consistent with NBP configuration.



Trended Vital Signs Recordings

You can record the contents of the Vital Signs display in a tabular format on an M1116A/B plug-in recorder. The recorder selection must be set to “PLUG-IN” (the default) in the Procedure Recordings task window before trended vital signs can be recorded.

You can access the Procedure Recordings task window by selecting:

- **Monitor Setup** on the control panel and
- **Recording Setup** in the Monitor Setup selection window.

Header Information

Each trended recording begins with a header page which contains general information such as date, time, patient’s name, medical record number and the bed label.



strip2.tif

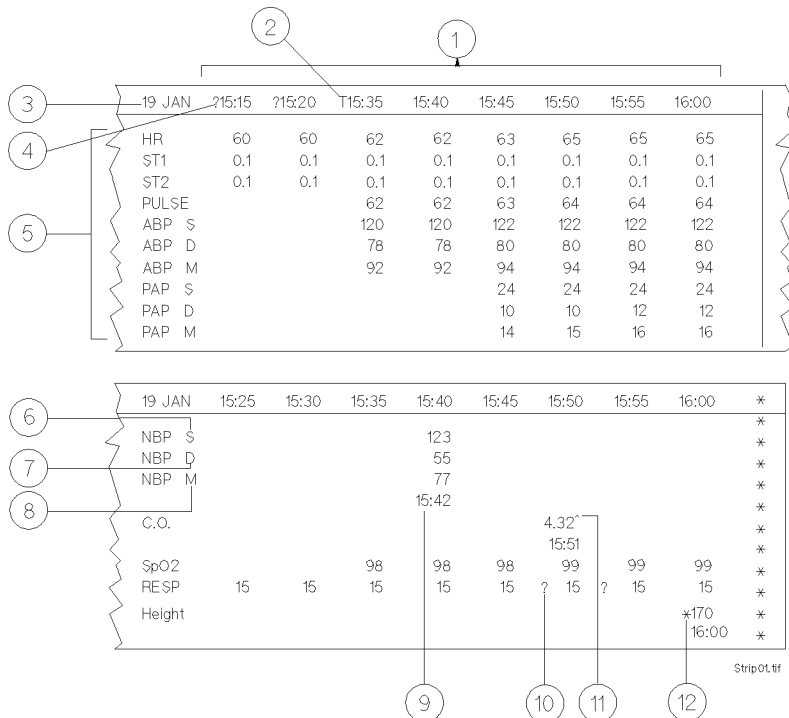
1. Recording code
2. Date and Time
3. Patient’s name
4. Recording title
5. Bed label (if connected to the Agilent Network).
6. Medical record number

Trend Data

Depending upon the number of trended parameters, the header page is followed by one or more pages of trend data. A trend data recording may take from 15 seconds to 50 seconds to complete. The recording speed is set by the system and cannot be adjusted.

The trended parameters are recorded in the same order as those displayed in the Vital Signs task window and the Vital Signs report. Please refer to the Trends and Calculations section later in this manual (Chapter 8, Volume 1) for further information on the data displayed in the Vital Signstask window and the Vital Signs report.

Note—Blood Analysis parameters are not included in a trended vital signs recording. Please consult the Realtime Recordings section of this chapter for further information on recording Blood Analysis data.



- 1. Time line.
- 2. Data that has been transferred.
- 3. Date.
- 4. Time setting has been altered during time period
- 5. Parameter labels.
- 6. Systolic
- 7. Diastolic.
- 8. Mean.
- 9. Time of measurement.
- 10. Questionable value.
- 11. More than one value is available in the time period.
- 12. Value has been entered manually.

Making Trended Vital Signs Recordings

Trends / Calcs → **Vital Signs**

The trended data displayed in the Vital Signs task window can be recorded by selecting the **Vitals PLUG-IN** softkey.

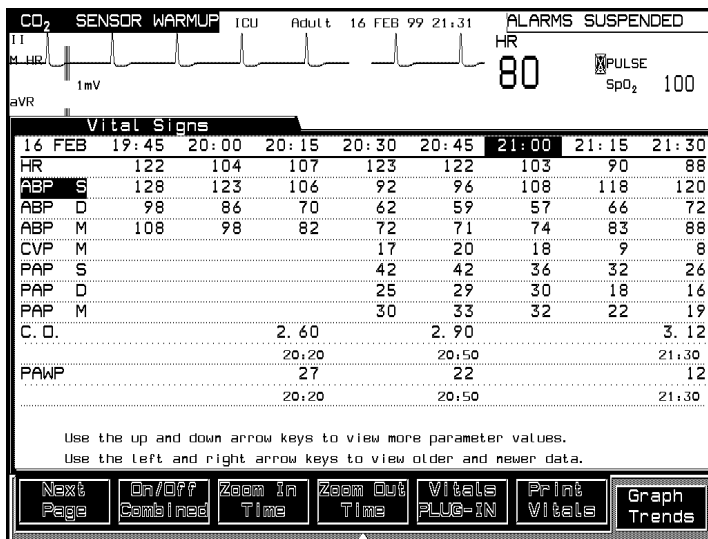
To stop trended vital signs recordings:

The recording can be stopped at any time by selecting:

- **Stop Recording** in the Preset Recording task window,
- **STOP** on the recorder itself or
- by beginning another procedure recording.

The time intervals and the time span can be changed by selecting:

- **Zoom In Time** and
- **Zoom Out Time** .



Neonatal Event Review Recordings

Tabular Neonatal Event Recordings

You can record the contents of the Event Review task window in a tabular format on an M1116A/B plug-in recorder. The recorder selection must be set to “PLUG-IN” (the default) in the Procedure Recordings task window before neonatal events can be recorded.

You can access the Procedure Recordings task window by selecting:

- **Monitor Setup** on the control panel and
- **Recording Setup** in the Monitor Setup selection window.

Note—Neonatal Event Review recordings can only be made on the M1116B plug-in recorder. The M1116A plug-in recorder, the M1117A four channel recorder, and the central recorder do **not** support Neonatal Event Review recordings.

Header Information

Each neonatal event recording begins with general information such as the recording date, time, patient’s name, medical record number and the bed label. Beneath this, comes the Event Summary information including the total number of stored events and their respective event categories. See the “Neonatal Event Review” section of this manual (Chapter 9, Volume 1) for further details on event categories.

Neonatal Event Data

A tabular recording of neonatal event data includes the following information:

1. The date and time the event was captured
2. The event labels (Brady, Desat and Apnea Duration). For reference purposes, the event labels are reprinted after every 8 columns. For filing purposes, the recording strip can be cut after every 8 columns and attached to a standard sized sheet of paper.
3. The trigger event, which is underlined

Depending upon the number of events stored, a neonatal event recording may take from 15 seconds to 40 seconds to complete. The recording speed is set by the system and cannot be adjusted

(91MIN)			07 JAN 98	07 JAN 98	07 JAN 98
08 JAN 98 9:26	TEL 1		14:35	14:38	14:42
		BRADY		<u>106 < 120</u>	
9 STORED EVENTS:					
A(D): 2(0)		DESAT	<u>52 < 92</u>		
B(D): 3(0)					
AB(D) 2(0)					
D: 2		APNEA DURAT'n		+60 > 20	<u>26 > 20</u>

Strip03.hpg

Making a Tabular Neonatal Event Recording

Alarms/Volume → **Event Review**

The data displayed in the Event Review task window can be recorded in a tabular format by selecting the **Record Summary** softkey.

oxyCRG Episode Recordings for Neonatal Events

An oxyCRG episode for a selected neonatal event can be recorded on the M1116B Recorder Module from the oxyCRG Episode task window.

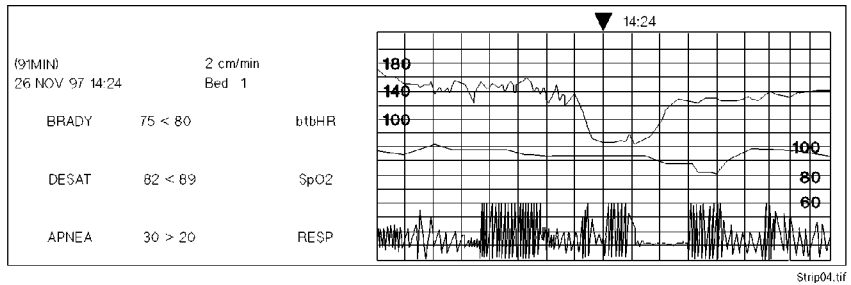
Header Information

Each oxyCRG episode recording begins with general information such as the date, time, patient's name, medical record number and the bed label. Beneath this, is a tabular list of neonatal event data for the event currently selected in the Event Review task window. The trigger event is underlined.

OxyCRG Episode Data

The oxyCRG episode is recorded with the same labels, recorder grid and scale labels as those which appear on a standard oxyCRG recording. The oxyCRG episode depicts 2 minutes prior and 2 minutes past the captured event (alternatively 1 minute / 3 minutes configurable). For manually captured events 4 minutes prior the captured event are depicted.

A typical oxyCRG episode recording takes about 20 seconds to complete. The recording speed is set by the system and cannot be adjusted.



Making an oxyCRG Episode Recording

Alarms/Volume → **Event Review** → **oxyCRG Episode**

The data displayed in the oxyCRG task window can be recorded by selecting the **Record Episode** softkey.

oxyCRG Recordings

You can record the contents of the oxyCRG display on an M1116B Plug-In recorder.

Note—oxyCRG recordings can only be made on the M1116B Plug-In recorder. The M1116A Plug-In recorder, the M1117A four channel recorder, and the central recorder do **not** support oxyCRG recording.

You can manually request an oxyCRG recording, and you can configure an alarm recording of oxyCRG.

Manual request: An oxyCRG recording with a fixed delay of six minutes (corresponding to the display content) is produced.

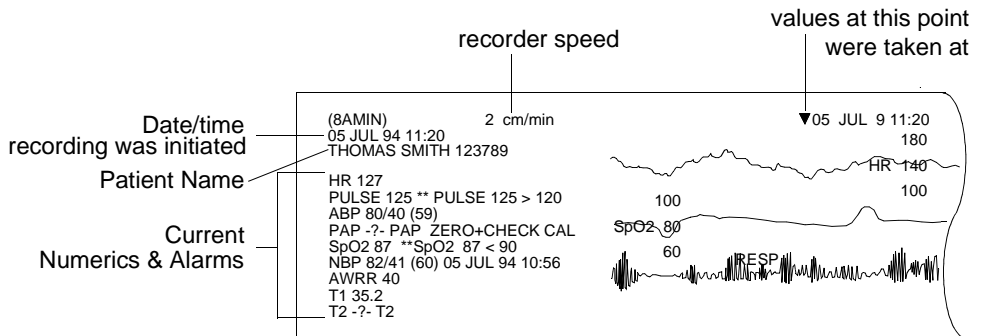
Alarm recording: An automatic oxyCRG recording of six minutes of pre-alarm data and two minutes of post-alarm data is produced.

The oxyCRG recording is always 6 minutes prior to the most recent data on the screen. This enables you to have a hardcopy of events leading up to the current situation. When you stop recording, the recorder stops immediately, with the result that the most recent 6 minutes of patient data will not be recorded.

Note—OxyCRG alarm triggered recordings differ slightly from the oxyCRG episode recordings generated by Neonatal Events. All standard oxyCRG recordings are realtime recordings, i.e. when the alarm occurs. An oxyCRG episode recording is initiated by the user to document selected events retrospectively.

The oxyCRG is shown in three distinct non-overlapping “channels” on the strip. The time, the three wave labels, and the scales for the oxygen and beat-to-beat Heart Rate channels are printed periodically on the recording.

Three speeds are available for oxyCRG recording: 1, 2, or 3 cm/min. You can choose the speed in the oxyCRG Task Window



Note—oxyCRG recordings made at slow speeds (1 or 2 cm/min) can cause deposits of paper debris on the printhead over time. In this case, recordings may appear unevenly faint. To correct, see “Cleaning the Printhead in the Plug-In Recorder” on page 6-51. Then reload the paper and continue recording.

oxyCRG Alarm Recording

Monitor Setup → **Recording Setup** → **Delayed & Alarm**

DAVID SCHULTZ ICU Adult 15 FEB 99 17:55

HR 80 Non-paced mode
PULSE 80
SpO₂ 97
ABP 119/80 (96)

Delayed/Alarm Recording

Channel #1 : btbHR Speed : 2 cm/min
Channel #2 : SpO₂ Recorder : PLUG-IN (3 ch)
Channel #3 : RESP Overlap : oxyCRG

AlRec Typ : oxyCRG

Standard oxyCRG

... Channel and Speed must be changed in oxyCRG

Select Channel Assign Wave Change Speed Change Recorder Select Overlap Change AlRecTyp

Pressing the **Change AlRecTyp** softkey allows you to choose between “Standard” alarm recording or “oxyCRG” alarm recording.

If you select “oxyCRG”, an oxyCRG recording is started when an alarm occurs. Six minutes of pre-alarm data and two minutes of post-alarm data are recorded. Any manually initiated recording that is in progress will be interrupted, and the oxyCRG recorded instead. If a second alarm occurs while an oxyCRG alarm recording is already in progress, the recording will be extended to two minutes after the second alarm appears on the strip.

If you select “Standard”, your selected realtime waves are recorded when an alarm occurs, as described earlier in this chapter.

Additional Information

Annotations Delayed and realtime recordings are annotated with codes which identify:

1. The type of recording
2. The monitor operating mode
3. The application area
4. The type of patient
5. The delay time

The following table shows the annotation codes.

	Code	Meaning
Recording Type	90 8A 0B 91 92	Realtime Delayed Alarm Stored Vital Signs
Operating Mode	M D	Monitoring Demo
Application Area	I O	ICU OR
Patient Type	A P N	Adult Pediatric Neonatal
Delay Time	10 ¹ 15 ¹ 360 ²	10 seconds 15 seconds 360 sec. (6 min.)

¹For all waveforms except oxyCRG

²For oxyCRG waveforms only

For example, the complete code (8AMIN360) at the beginning of a recording strip means:

The recording is delayed (8A).

The monitor is in monitoring mode (M).

The application area is ICU (I).

The patient type is neonatal (N).

The delay time is 6 minutes, and the recording is an oxyCRG one (360).

Realtime and delayed recordings are also annotated with the following information:

- Date and time (time of the alarm for alarm recordings, time of request for delayed recordings, time data was measured for stored recordings such as cardiac output, and time when run for others).
- Alarm/INOP text (if applicable)
- Patient parameters
- Recorder speed
- Waveform labels
- Scale lines and labels
- Bed label and patient name (if the monitor is attached to the Agilent patient care system, or if the patient data management option has been purchased).

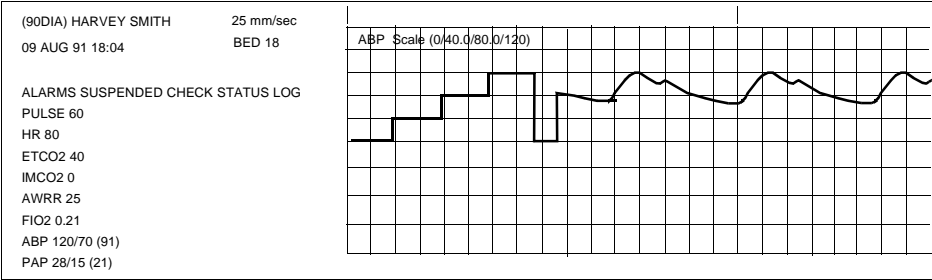
Note—For recordings made at speeds lower than 6.25 mm/s, the time is updated every 15 minutes. If you are making a continuous realtime recording at these speeds on the 4-channel recorder, the recording is started at 25 mm/s for the calibration marks and annotations, then switched to the configured speed. No re-annotations are made. Recordings made at speeds greater or equal to 6.25 mm/s are annotated every 60 seconds on the Plug-In and 4-channel recorders. There is no re-annotation on central station recorders.

A calibration pulse scale is included for ECG, pressure, CO₂, EEG and VueLink waveforms. This annotation appears above the waveform. For cardiac output recordings, the calibration annotation takes the form:

CAL @@@ DEG C BY 5 SEC

where @@@ is the signal value as follows:

Cal Pulse @@@	Scale
0.25	0.5
0.50	1.0
1.00	2.0

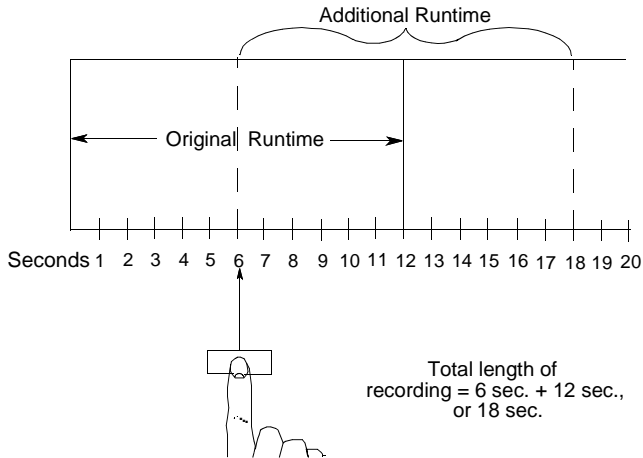


Changing the Recording Length

Delayed and realtime recordings can be extended or continued.

Extending a timed recording resets the runtime. You can extend a recording as many times as needed.

In the example below, the recording with a runtime of 12 seconds is extended after it has been running 6 seconds. The runtime is reset, producing a recording of 18 seconds of waveforms.



Changing the Recorder Speed

The recording speed can be changed for delayed, realtime, and oxyCRG recordings made on a bedside recorder. Changes made in the Change Recording Speed window affect only the *last requested and running* recording.

Note—If more than one bedside recording is running, the Change Recording Speed window affects only the last requested and running recording. However, if the last requested recording is stopped, the Change Recording Speed window then affects the recording that started running before the stopped one.

Because the recorder must complete the annotation at the beginning of the strip before the key to access this window appears, there may be a wait of a few seconds before the speed can be changed. For delayed recordings, access to the Change Recording Speed window is through the **Realtime Record** key. The new speed is not stored.

The speed of alarm recordings cannot be changed; these recordings always run at 25 mm/sec.

Changing the Recorder

You can change the recorder where alarm, delayed, preset, or realtime non-configured recordings are made.

1. Press **Monitor Setup**.
2. Press **Recording Setup**.
3. Select the recording type (Delayed & Alarm, Mode, or Procedure).
4. Press **Change Recorder** to choose the appropriate recorder.

Continuing a Timed Recording

Press **CONT** on the recorder. The recording runs until you stop it (by pressing the **STOP** on the recorder or the **Stop Recording** softkey on the display).

Inserting a Calibration Signal

You can insert a calibration signal into the waveform display on the monitor and into any actively running recording. Calibration signals are automatically generated for calibrated waves. The signals can then be used to determine the amplification of the waveform.

To insert the signal, press **Trends/Calcs**, then **Mark Event**. If you press the **Cal Signals** softkey at the bottom of the screen, when a recording is being run, the signal appears on the display and is inserted in the recording. Refer to Chapter 3, "Setting up your Monitor" for further details.

Recording Layouts

Layout Choices on Recorder M1116A/B

Layout	Sector 1	Sector 2
#1 ¹	20 mm Wave 1	20 mm Wave 2
#2	40 mm Wave 1,2	
#3	20 mm Wave 1	20 mm Wave 2,3;
#4	40 mm Waves 1-3	

¹Alarm recordings always use layout #1, even if the delayed recordings are configured with layout #2, 3, or 4.

Layout Choices on Recorder M1117A

Layout	Sector 1	Sector 2	Sector 3	Sector 4
#1 ¹	25 mm Wave 1	25 mm Wave 2	25 mm Wave 3	25 mm Wave 4
#2	25 mm Wave 1	75 mm Wave 2-4		
#3	25 mm Wave 1	25 mm Wave 2	50 mm Wave 3,4	
#4	50 mm Wave 1	50 mm Wave 2-4		

Recording Status Messages

When a recording is running, you get a message in the top center of the monitor display, telling you which parameters are being recorded. In addition, the following messages provide information on the status of your recording request.

Message	Meaning
Continuous Recording <i>Mode: Waves Being Recorded</i>	A continuous recording is currently running on a Bedside or Central Recorder.
Delayed Recording: <i>Waves Being Recorded</i>	A delayed recording has been accepted and runs if recorder is free or is queued if recorder is busy.
Earlier Recording Cancelled	A new recording has been requested before a queued request has started to run -- the queued request is cancelled and the latest request runs.
<i>Recorder Name</i> Recorder Failure	The recorder has failed - notify your service personnel
No Alarm Recording Available	There is no Central Recorder operable or configured, and the recorder configured for delayed recordings is not available. Alarm recordings are lost.
<i>Recorder Name</i> Recorder Not Available	Selected recorder is not operable or has not been installed.
Procedure Recording Running	Trended vital signs recording or neonatal event recording is currently running.

Message	Meaning
Wrong Procedure Recorder Configuration	A trended vital signs recording or neonatal event recording has been requested but not supported by the selected procedure recorder.
Check Paper/Door on <i>Recorder Name</i> Recorder	The bedside recorder is out of paper or the recorder door is open - load new paper and/or shut the door.
<i>Recorder Name</i> Recorder Stopped	An actively running recording has been stopped by pressing STOP on the recorder or the Stop Recording softkey on the display or a timed recording has stopped automatically.
Recording: Waves that are being Rec.	A timed recording is currently running on a Bedside or a Central Recorder.
Waiting for <i>Recorder Name</i> Recorder	A recording has been requested for a recorder that is currently busy.
Recorder does not support <i>Recording Type</i>	The recorder configured cannot support the requested application. For example, an oxyCRG recording that is requested on a recorder other than M1116B.
Running Recordings <i>Mode</i>	A list of running recordings is shown when Record is pressed.

Note—Recording ink sometimes fades when covered with transparent tape. Please avoid covering any part of a recording that is clinically relevant (annotation or waveforms) when taping a recording strip to a patient record or other patient documentation.

Loading Paper

Central Recorders

To load paper into the Central Recorders, see the operating guide for the instrument.

Loading Paper into the Plug-In Recorder

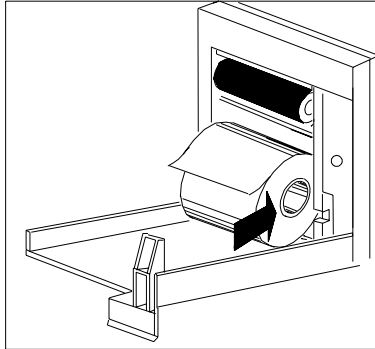
Directions for loading paper into the Plug-In Recorder are given on the next pages. Before starting, pull the paper storage door open and remove the remaining paper core.

Caution

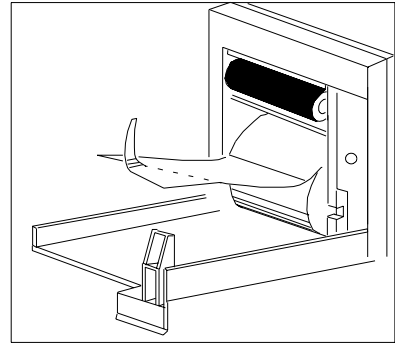
For superior performance and top quality recordings, it is strongly recommended that you use Agilent paper (Agilent order part number 40477A or 40477B).

To Replace Paper in the Plug-In Recorder

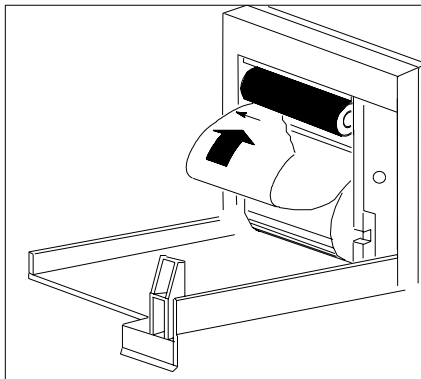
1. Insert new roll with paper feeding from the TOP. Pull paper out until it clicks into place.



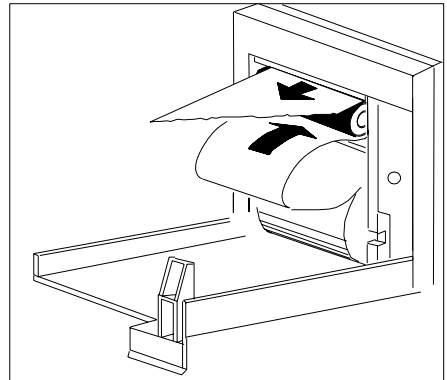
2. Pull out some paper and discard first 2 inches; tear or fold front edge of paper at a 45° angle.



3. Feed paper UNDER roller, using left edge of paper as a guide.



4. Pull paper out and close door.



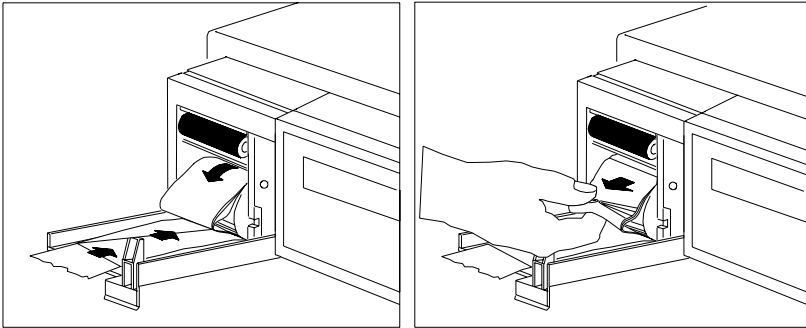
Note—To test if paper is loaded correctly, initiate a recording. If no printing appears, paper is loaded backwards. Remove and reload.

Loading Paper

If the Paper is Loaded Backwards

If you have loaded the paper backwards, to remove the roll, do the following:

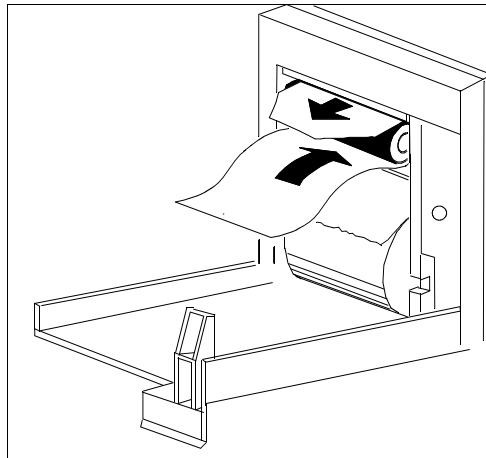
- 1. Tear off paper, then open recorder door.
- 2. Pinch paper at shelf below roller, and pull paper off of roller (see illustration below).
- 3. Gently push excess paper back onto paper roll.
- 4. With paper rolled loosely, pinch several thicknesses of the loose paper with your fingers at front of roll, and pull roll out from recorder. Tear off any damaged paper before attempting to reload (see illustration below).



Cleaning the Printhead in the Plug-In Recorder

If very slow speed (1 or 2 cm/min) recordings are run for extended periods of time, deposits of paper debris may collect on the printhead. Symptoms of this are recordings that are unevenly fainter in horizontal stripes.

To clean the printhead, remove the recorder from the rack. Open the recorder door and un-thread the paper from behind the rubber roller. Tear off or roll up the excess paper into the roll chamber to be out of the way. Thread the cloth cleaning strip instead of paper around the rubber roller until the leader exits from the top of the roller by about 2 inches.



Close the recorder door, with both ends of the strip aligned over the top of the door. Grasp the top end of the cleaning strip between thumb and forefinger, and pull the strip through and out of the recorder.

Open the door and ensure that the paper cavity is free of dust. Re-thread the paper and plug the recorder back into the rack.

Caution

When the Plug-In recorder is disabled (by removal from the rack, door open, or out of paper), any alarm recordings will be run or queued at the central station recorder, if there is one. Otherwise alarm recordings will be lost during the time the Plug-In recorder is disabled, and an alerting

message “no alarm recording available” will be displayed periodically on the monitor screen.

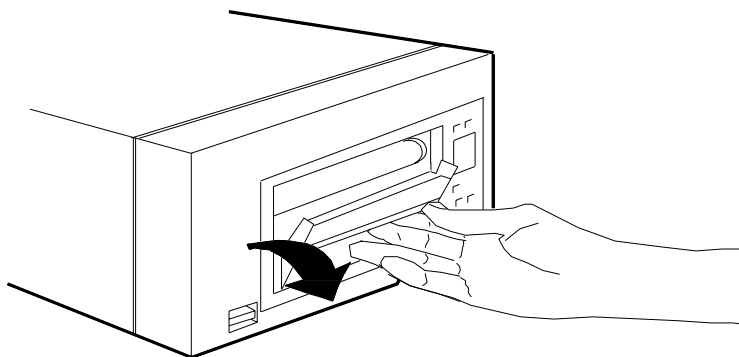
Loading Paper into the Four Channel Recorder (M1117A) (Agilent CMS only)

Directions for loading paper into the four channel recorder are given on this page and the next. Before starting to load the paper, *check to see that the power is on.*

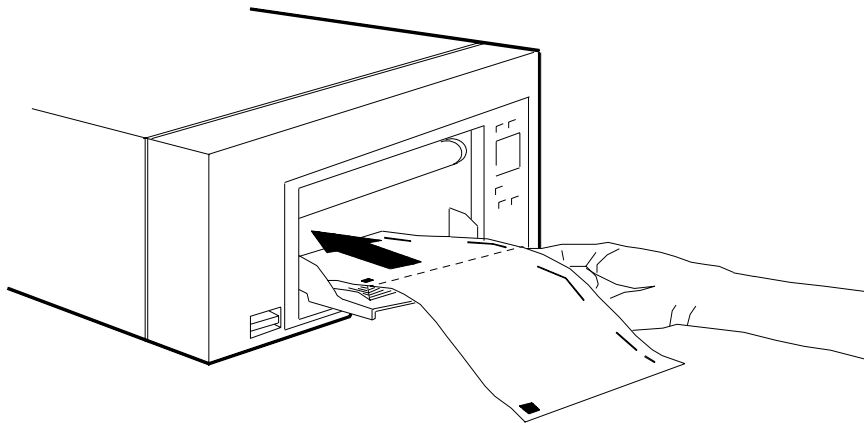
Caution

To avoid damage to the instrument:

- Make sure hands are clean before loading paper
 - Use only the approved paper (Agilent order part number 40469A).
-
-

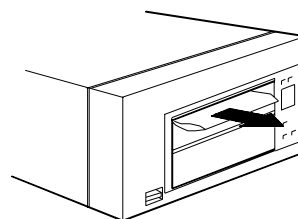
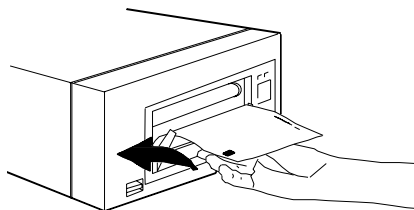


- Step 1** Open the door by placing fingertips in the recessed groove and pulling forward. Use the Feed key to advance any remaining sheets and paper scraps.



Step 2 Unfold the first one or two sheets. Then, place the paper pack in the compartment with the black squares on the left-hand side, facing up, as shown.

Note—No more than one sheet should be left hanging outside of the unit. Tear off extra sheets if necessary.



Step 3

Close the door. The paper should feed automatically.

Note—The first sheet will come out folded, as shown.

Cleaning the Roller on the Four Channel (M1117A) Recorder

If the paper doesn't move through the roller properly, a possible cause is that the roller needs to be cleaned. (Be sure your hands are clean before touching the roller).

Equipment Required

- *Lint-free* cloths or wipes
- Alcohol solvent that is low in water content. We recommend either reagent grade denaturated ethanol or isopropanol (90% rather than 70%)

Directions

1. Turn the power off.
2. Open the door and remove any paper from the recorder.
3. Wipe the visible part of the roller with a saturated (but not dripping) cloth. Rotate the roller with clean fingertips to expose the entire surface and wipe the other side.
4. Remove any excess liquid by wiping with a dry cloth.

Caution

The roller must be completely dry before using the recorder or you can permanently damage the recording mechanism.

Loading Paper

Admit/Discharge/End Case

This chapter describes the procedures for reviewing patient admit information, entering height and weight and deleting patient records using the Admit, Discharge, and End Case functions. These functions are accessible under the **Procedures** key. Discharge and End Case are not operational during a transfer to or from the Agilent M1235A Data Transfer module; the Admit function is not accessible during a transfer to the monitor.

Admitting a Patient

The Agilent CMS, V24 and V26 monitors provide you with a display of demographic information on your patient. Patient name and medical record number will appear if the monitor is connected to a central station (the patient must be admitted at the central station) or patient demographic information transferred with the Data Transfer module (M1235A). Alternatively the information can be entered at the bedside with the cursor keys. The following tables list the patient information fields for ICU and OR configuration sets.

Admission Information (ICU mode)

Items	Required or Optional	Instructions
Patient Name	Recommended	Enter up to 18 characters.
Medical Record No.	Recommended	Enter up to 12 characters.
Date of Admission	Optional	Enter up to 14 characters in any form.
Height	Required for calculations	Enter a value (either cm or in).
Weight	Required for calculations	Enter a value (g, kg, or lb).
Sex	Optional	One character allowed (use either F or M).
Date of Birth	Optional	Enter up to 14 characters in any form.
Admitting Physician	Optional	Enter up to 18 characters.
Attending Physician	Optional	Enter up to 18 characters.
Other (Comments)	Optional	Enter up to 2 lines of 40 characters.
Mother's Name	Optional ¹	Enter up to 18 characters.
Gestational Age	Optional ¹	Enter up to 2 characters.
Birth Weight	Optional ¹	Enter a value (g, kg, or lb).
Birth Length	Optional ¹	Enter a value (either cm or in).
Head Circumference	Optional ¹	Enter a value (either cm or in).

¹Neonatal only

Admission Information (OR Mode)

Items	Required or\ Optional	Instructions
Patient Name	Recommended	Enter up to 18 characters.
Medical Record No.	Recommended	Enter up to 12 characters.
Date of Procedure	Optional	Enter up to 14 characters in any form.
Height	Required for calculations	Enter a value (either cm or in).
Weight	Required for calculations	Enter a value (g, kg, or lb).
Sex	Optional	One character allowed (use either F or M).
Date of Birth	Optional	Enter up to 14 characters in any form.
Anesthetist Physician	Optional	Enter up to 18 characters.
Surgeon	Optional	Enter up to 18 characters.
Diagnosis	Optional	Enter up to 40 characters.
Procedure Type	Optional	Enter up to 40 characters.
ASA Category	Optional	Enter up to 4 characters.
Other	Optional	Enter up to 40 characters.

Patient name will appear on the Main Screen. Name and medical record number will appear on recordings and reports. Reports will also provide the date of birth and physician names if available.

Patient name and medical record number will appear automatically if they are being transmitted by the central station. You cannot change the

name and medical record number at the bedside monitor (you can only change these at the central station). For the patient's name to appear on the display, recordings, and reports, the patient must be admitted to the monitor.

Before you admit a new patient, existing data - demographic and monitored - from the current patient must be cleared from the monitor in order to avoid combining information from two patients in one record. Depending on the monitor's configuration, either the Discharge Data or End Case Task Window is displayed, **Confirm**. Additionally, if the previous patient was initially admitted at central, you must also discharge the patient from the central station before a new patient can be admitted at central or at the bedside. When a new patient is admitted at the central, the name and medical record number will appear automatically in the Review Admit Task Window.

The Review Admit Task Window is not accessible during a data transfer to the monitor.

Note—Data begins to be collected within one to two minutes after the patient is connected to the monitor. However, if data from the previous patient is not erased, it will appear in the trends with the new patient's data. No distinction will be made between the old and the new patients' data.

Changing Patient Information

At some time you may need to change or add to the patient information entered for your patient. If the monitor is connected to a Central Station, name and medical record number can only be changed at the central station. Otherwise, all patient information in the Patient Information Task Window can be changed at the bedside using the cursor keys and the softkeys. These keys have the following functions:

	↑ Select Line ↓	Moves the cursor up and down
	Clear Line	erases the input of a whole line
Agilent V24 and V26 only	ABC/123	toggle key to switch between Numeric and Alphabetical input. The actual input mode is shown above the key (ABC or 123)
	left and right cursor key	select the digit on a line to enter or change
	up and down cursor key	in numeric mode the selected digit of a number is increased or decreased in alpha mode the selected digit of a string changes in alphabetical order
	Print Admit	prints the patient information
	confirm key	stores the whole line
	Touch Board (on touchscreens only)	calls up touchboard for alphanumeric data entry

ICU Adult 30 JAN 00 13:02

HR 80 Non-paced mode

SpO₂ 100

ABP 120/70 (91)

Patient Information

Patient Name : DAVID SCHULZ

Medical Record # : _____

Date of Admission : _____

Height : _____ cm

Weight : _____ kg

Sex : _____

Date of Birth : _____

Admitting Physician : _____

Attending Physician : _____

Other : _____

Select Line Clear Line Print Admit Touch Board

ICU Mode (Adult/Pediatric)

ICU Neo 30 JAN 00 12:57

HR 160 Non-paced mode

SpO₂ 100

ABP 120/70 (91)

Patient Information

Infant's Name : KEVIN AMES

Infant's ID Number : _____

Mother's Name : _____

Date of Admission : _____

Gestational Age : _____

Current Length : _____ cm Birth Length : _____ cm

Current Weight : _____ kg Birth Weight : _____ kg

Sex : _____ Head Circumference : _____ cm

Date of Birth : _____

Admitting Physician : _____

Attending Physician : _____

Other : _____

Select Line Clear Line Print Admit Touch Board

ICU Mode (Neonatal)

Admitting a Patient

Admit/Discharge/End Case

The monitor displays the following information:

- Top status bar: OR Adult 30 JAN 00 12:53 ALARMS SUSPENDED
- Vital signs: HR 80 (Non-paced mode), SpO₂ 100, ABP 120/70 (91)
- ECG: 1mV scale, 118 bpm (APR)
- Section: Patient Information
- Fields: Patient Name (DAVID SCHULZ), Medical Record #, Date of Procedure, Height (cm), Weight (g), Sex, Date of Birth, Anesthetist, Surgeon, Diagnosis, Procedure Type, ASA Category, Other.
- Bottom navigation: Select Line, Clear Line, Print, Admit, Touch Board.

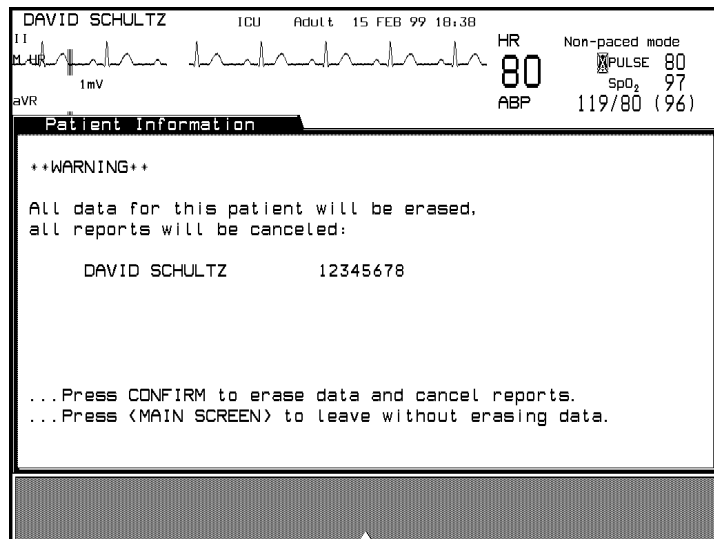
OR Mode

Discharging a Patient/ Ending a Case

Patient data for the current patient can be erased in the Patient Information Window (ICU configuration sets) or the End Case Task Window (OR configuration sets). You must press **Confirm** for the discharge to take effect. This erases the entire patient database. When a case is ended, the monitor also resets all settings to the user defaults, and initiates printing of a scheduled report (if configured). The system returns to Monitor Standby (OR sets) or the Admit Patient Task Window (ICU sets).

If the monitor is connected to an Agilent Documentation Center and arrhythmia is assigned, arrhythmia must be unassigned under **Arrhyth Functns**. If the monitor is connected to an Agilent Component Central Monitor, discharge must be performed at central as well. The discharge procedure is not complete until the patient's information is erased from all parts of the system and the system is available for a new patient.

During a transfer to or from the M1235A Data Transfer Module, the Discharge and End Case Task Windows are not available.



Admit/Discharge/End
Case

Trends and Calculations

This chapter gives you information on the patient data trends and calculations of the Agilent CMS, V24 and V26 Monitors. It includes the following sections:

- Introduction to Trends & Calculations 8-2
- Viewing Patient Data 8-3
- Performing and Reviewing Calculations 8-20
- Printing Reports 8-26
- Drug Calculator 8-32

Note—Your system may not include all the functions described in this chapter.

Introduction to Trends & Calculations

The Agilent CMS, V24 and V26 Monitors provide you with several tools to manage and present patient data. These tools are available in the Trends or Trends/Calcs displays. You can:

- View patient vital signs in graphs or tables.
- Mark and review clinical events in Graph Trends.
- Perform hemodynamic, ventilation, and oxygenation calculations.
- Print reports of patient information, calculations, and patient data graphs and tables through Task Windows and at scheduled times.
- Calculate drug infusion values.

To enter the displays for trends and calculations, press the **Trends** or **Trends/Calcs** key. The Selection Window for Trends/Calcs will appear. You can choose the task you want to perform from this window.

Note—It depends on the monitor option purchased, whether all of the tasks described are available on your monitor.

Viewing Patient Data

There are two ways to view patient data:

In graphs where parameter values are points plotted on a graph along a time axis

In tables where parameter values and the times the values were collected are listed in a table

In either form, the most recent data is displayed at the right of the screen (unless entered through the Graph Trends where you may have moved the time bar). The patient data will be presented in the default resolution (level of detail) and time span.

The number of parameters available to be viewed depends on the patient data management configuration and the options purchased. Data is stored and appears in tables and graphs (if configured) even though the numeric is not displayed on the Main Screen.

The number of parameters tracked, the frequency of measurement capture, and the number of hours of database storage are determined in configuration mode prior to monitor use. The combinations are:

Standard Database

No. of Parameters	Resolution	Size
16	1 minute	24 hours
16	12 seconds	4 hours


Extended Database (CMS only)

No. of Parameters	Resolution	Size
16	12 seconds	9 hours
16	1 minute	48 hours
32	12 seconds	4 hours
32	1 minute	24 hours

If data is stored every minute, the values displayed are the stored averaged values of samples taken every 12 seconds for a one-minute interval (5 samples per minute). If data is stored every 12 seconds, the values displayed are the exact values taken at one of the 12-second intervals.

For example, if the database has been configured for 4 hours, typical of the OR, the data values appear at 12 second intervals. In this case, the values are exactly as measured, not averaged.

An asterisk on the trend or graph (*) indicates (1) a manually entered value, (2) a resampled continuously monitored value from the last second, or (3) a value more than 10 minutes old at the time of resampling.

Note—When the time in the upper right corner of the Graph Trends Task Window matches the system time (time bar at rightmost position on trend), the screen will be updated as new data is acquired. The Vital Signs display does not update automatically when new data becomes available. To see new data, use the right arrow key  .

Printed copies of the displayed data can be made (if a printer is available) by pressing the **Print Vitals** key in the Vital Signs display, the **Print Review** key in the Blood Review display, or the **Print Graphs** in the Graph Trends.

Trended vital signs can be recorded (if an M1116B PLUG-IN Recorder is available) by selecting “Vitals PLUG-IN” in the Vital Signs task window.

Vital Signs and Graph Trends are not functional during a transfer of data from the Agilent M1235A Data Transfer Module to the monitor.

Trending Priority

Trending priority enables you to specify which parameters will be trended. This is done by assigning a “must” status to parameters in the Trending Priority Task Window. Initially, parameters which have been stable for at least one minute are listed with a priority of “normal”. A maximum of 16/32¹ musts can be chosen. Each parameter requires one must, except for multi-valued parameters, where each value in the multi-valued parameter requires one must.

“Musts” will be trended if the parameter is being monitored. After “musts”, normal parameters are trended until the maximum of 16/32¹ is reached. Parameters which are currently being trended are identified by an asterisk (*). If a “must” parameter is not currently being monitored, trend(s) will be reserved for it until you change the priority back to normal.

Note—Parameters are displayed in descending priority.

Multi-valued parameters, such as all pressures, are treated differently from single-valued ones. A multi-valued parameter will not be trended unless a trend is available for each value within the parameter. Thus, for example, a CVP trend would require three available musts.

Data from devices connected to the monitor via the M1032A VueLink module can be trended and used in calculations.

Viewing Blood Measurements

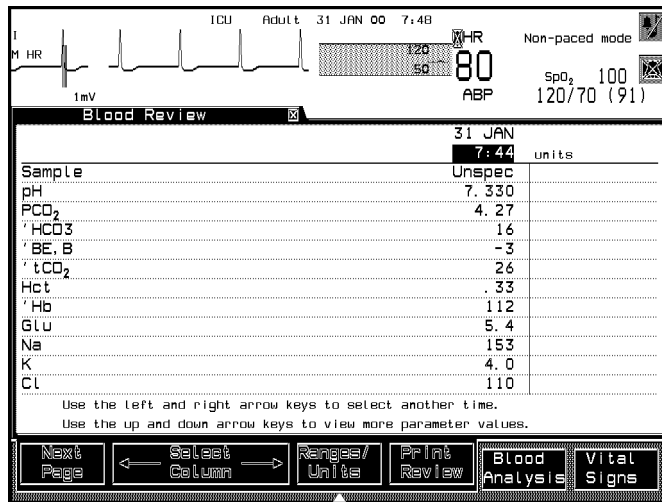
Once blood analysis results have been transmitted in the Blood Analysis task window (or automatically if configured), you can view a summary of those results in the Blood Review task window. The Blood Review task window contains only Blood Analysis module parameters. No other parameters appear.

Note—If your system is configured for mandatory Operator ID entry, you will not be able to access blood analysis results until you have entered an Operator ID.

-
1. If configured with extended database (Agilent CMS only)

You can access the Blood Review task window by selecting **Blood Review** from the Blood Analysis task window or by selecting **Blood Review** from the Trends/Calcs Selection Window.

On an Agilent CMS Monitor, the Blood Review task window allows you to view blood results up to 48 hours old or a maximum of 96 data points for each blood parameter. On an Agilent V24 or V26 monitor, the Blood Review task window allows you to view blood results up to 24 hours old or a maximum of 48 data points for each blood parameter (96 in specific configurations). The blood results that appear in the Blood Review task window can be older than other standard database displays and reports for example, Vital Signs, Trends Graphs and Calculations which can only be 24 hours old.



The Blood Review task window displays blood results in chronological order with the most recent appearing on the right hand side of the screen. The time at which the blood measurements were completed appears in 24 hour format along the top of the task window.

Qualifying indicators (which have specific meaning) appear in the Blood Review task window. The following list identifies and defines all indicators used to qualify blood analysis results in the Blood Review task window.

- A "T" next to the time indicates that the data was transferred to the monitor using the Data Transfer module.
- A question mark beside a time (?7:15) indicates the blood measurement occurred prior to clock changes at the bedside or central station.
- A question mark preceding a blood measurement value (?5.0) indicates that blood measurement has been invalidated by a user.
- A question mark standing alone in a blood measurement field (?) indicates that no valid result could be derived from the sensor signals.
- The ' symbol at the beginning of the blood measurement label ('BEecf) indicates the measurement has been calculated by the blood analysis module.
- The "&" symbol before a label (e.g. &PCO2) indicates the measurement has been adjusted to the patient's temperature.
- The > symbol preceding a blood measurement value (>3.0) indicates the value is greater than the upper limit of the reportable range.
- The < symbol preceding a blood measurement value (<3.0) indicates the value is less than the lower limit of the reportable range.

If configured to "Enabled" in the Blood Analysis configuration task window, O2*, the Free Fields (Field1, Field2, and Field3), and Operator ID of the person performing the blood measurement appear after the last measurement (in the order listed).

Viewing Blood Review Reference Ranges

You can compare an adult arterial/venous blood result value against a corresponding adult arterial/venous blood reference range. The blood results on the Blood Review task window can be within the reference range or outside the reference range. You can view reference ranges by selecting the **Ranges/Units** key on the Blood Review task window display. The reference ranges correspond to the rightmost time displayed in the Blood Review task window. The reference range information that appears corresponds to the last measurement. The out of range indication refers to the reference range at the time of the measurement.

The table below describes how reference ranges appear on monochrome and color displays.

Status	Monochrome Display	Color Display	Printout
Inside Range	Full intensity	White	Normal print
Outside Range	Inverse full-intensity	Yellow	Bold print

Cross-Connection to Vital Signs

When the **Vital Signs** key is pressed in the Blood Review Task Window, the Vital Signs Task Window opens up and the column closest in time to the column selected in the Blood Review Task Window is selected. This allows viewing of vital signs stored at the time with the best fit to the time of the blood analysis.

A **Blood Review** softkey is also available in the Vital Signs window to return to the Blood Review Task Window. If you select another column in the Vital Signs Task Window before returning to the Blood Review Task Window, the cursor is positioned on the time column closest to your selection.

Viewing Vital Signs

Patient data can be shown in a table three minutes after monitoring begins. The table appears in the default data time interval (1-min., 5-min., 15-min., 1-hr., 2-hrs., or 3-hrs.) with the most recent data at the right of the screen. The number of hours of patient data available (maximum 24 hours or 48 hours (CMS only)) depends on the patient data management configuration of the monitor and the options purchased.

The values shown are for the exact time they are labelled (they are the stored averaged value of readings taken every 12 seconds for a one-minute interval; in 12-second mode, only one 12-second sample is shown for each minute).

A “?” beside a value indicates that the data for that time may not be reliable. For example, when the message “NOISY SIGNAL” appears on the screen, it often causes a “?” to appear as the HR numeric. If the “?” appears in the HR area for 3 out of the 5 samples taken in a minute, the value stored for that minute will be “?”.

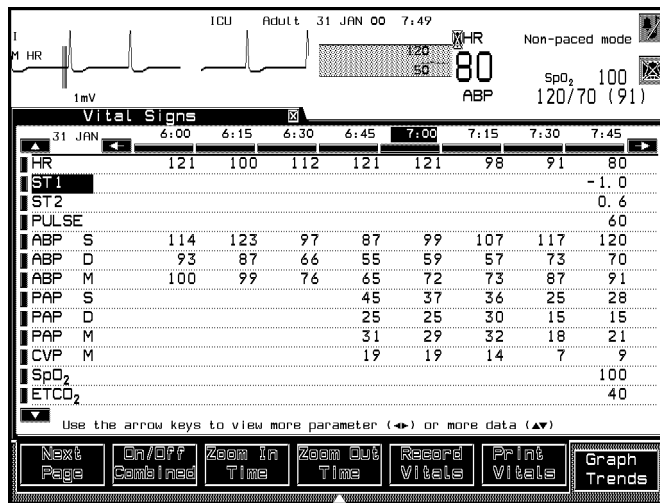
If a “?” appears, adjust the parameter settings so that they are appropriate for your patient. (This is done in the parameter's Task Window.) Check to be sure that any patient cables, leads or tubing are not being pulled, and that the patient is not lying on them.

When you go directly between Graphs and Vital Signs Task Windows to view data in a different format, the mapping is as follows:

Vital Signs Interval	Direction	Graph Trends Span
1-minute	-->	1 hour
5-minute	<--	1 hour
15-minute	<-->	2 hours
1-hour	<-->	8 hours
2-hour	<-->	16 hours
3-hour	-->	24 hours


For example, when you press **Graph Trends** from a Vital Signs display at one-minute resolution, the total time the graphs spans is 1 hour. Conversely, when you go directly from Graph Trends with a 2-hour span to the Vital Signs display, the intervals are 15-minute.

Note—If configured for the OR environment, the data is stored every 12 seconds. Depending on the patient data management configuration and the options purchased, the default data time intervals are 1-min., 5-min., 15-min., and 1-hr. with a maximum of 4 hours; and (for CMS only) 1-min., 5-min., 15-min., 1-hr., and 2-hrs. (with a maximum of 9 hours).



Up to 13 lines are displayed on the screen at one time. Only monitored parameters are shown. The continuously monitored parameters are shown in the general order in which their numeric values appear on the Main Screen, followed by the aperiodic parameters (for example, C.O.). Triple-valued parameters, such as ABP, are shown on three separate lines. Parameter units (for example, beats/minute) are not shown.

Note—If the numeric for a parameter is turned OFF in the Display Setup / Numerics On/ Off Task Window (but the parameter is ON), the data is still stored and will be shown in the table.

Aperiodic parameters (parameters which are not monitored continuously such as C.O.) are shown with their collection times below them. An up-arrow  beside an aperiodic parameter indicates that more than one value is available for this time column. On a Agilent CMS Monitor, up to 96 data points for each aperiodic parameter can be stored for 24 hours¹. On an Agilent V24 or V26 monitor, up to 48 data points for each aperiodic parameter (96 for selected configurations) can be stored for 24 hours. An asterisk (*) beside the value indicates the value was either manually entered or automatically copied to the time indicated during resampling. The time appears along the top of the table in 24-hour format (for example, 18:00 means 6:00 p.m.). A “?” beside a time indicates that the time is questionable (for example, the time/date setting may have been altered during that time period). A “T” beside a time indicates that data for that time includes values transferred to the monitor from a Agilent M1235A Data Transfer Module.

Note—With specific configurations, data loss can occur when transferring data via the Data Transfer Module to a Virida 26/24 Series Release B.0 Monitor.

The arrow keys can be used to navigate through the parameters and time columns. This allows you to view more parameters, view older and newer data, select a time column for zooming in or out and to select parameters for graph trend display.

Arrow buttons are displayed to the left and right of the time columns and above and below the parameter rows. On touch- or mouse/trackball-operated systems these buttons perform the same functions as the arrow keys on the control panel. In addition buttons are displayed above each time column and in front of each parameter row, for direct selection of a column or row.

Note—If a parameter which is already highlighted is directly selected, the On/Off/Combined function is performed. See “Selecting Parameters for Graph Trends” on page 8-12 for details.

Note—The data displayed in the Vital Signs task window can be recorded in a tabular format on the M1116A/B Recorder Module. Please refer to the

-
1. 48 hours, if extended database is installed and configured on your monitor (Agilent CMS only).

“Recording Functions” section (chapter 6) of this manual for further information..

Selecting Parameters for Graph Trends

You can select up to 9 parameters to be displayed in the Graph Trends Task Window by using the **On / Off / Combined** softkey. The parameters are placed into the graph channels according to the following rules:

- If the current parameter is not selected and you press the **On / Off / Combined** key, the system will try to combine the parameter with any of the selected parameters in one graph channel. If this fails, a new graph channel will be assigned automatically.
- If the current parameter is combined with any other parameter in a graph channel and you press the **On / Off / Combined** key, the system will try to assign this parameter to a new graph channel. If this fails, the parameter will be unselected.
- If the current parameter is selected and is the only parameter in one graph channel, pressing the **On / Off / Combined** key will unselect this parameter from Graph Trends.

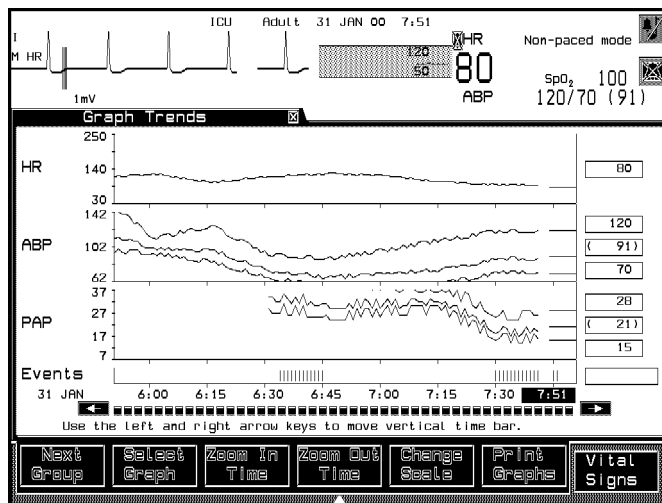
In the Vitals Signs Task Window, parameters that are selected for Graph Trends are displayed with a sign to the right of the parameter label:

Parameter is combined	A # sign appears next to the parameter label
Parameter is on	A hyphen (--) appears next to the parameter label
Parameter is off	No sign next to parameter label

Viewing Graph Trends

Patient data can be shown in a graph three minutes after monitoring begins. The graph appears in the default time period with the most recent data at the right of the screen. The times appear along the X-axis (horizontal) in 24-hour format (for example, 18:00 means 6:00 p.m.). For all database configurations except 9-hour, the default time period is 1, 2, 8, 16, or 24 hours. The parameter labels are listed on the Y-axis (vertical). The number of hours of patient data available (maximum 24) depends on the data management configuration and the options purchased.

The vertical line located at the far right of the graph (when the display is first presented) is called the time bar. This bar can be moved along the time axis by using the **▶** and **◀** keys (these keys can be held down to move the bar more quickly). When using a touchscreen, the arrow buttons displayed on the screen perform the same action as the arrow keys. To select a time directly, it is also possible to select a button underneath that time label.



The numbers at the right of the graph indicate the time and parameter numeric values associated with the position of the time bar.

The values plotted are the stored averaged values of readings taken every 12 seconds for a one-minute interval. Invalid data (such as a noisy ECG) is not plotted on the graph. Instead, a gap will appear in the graph.

If you have configured your monitor for the OR, up to 4 hours of data at 12-second time intervals is available. In this case, the values are the stored values for each 12-second reading.

Up to three graph channels are presented on the screen at once. The graph will be blank when a listed parameter is not being monitored.

Up to five pre-configured screens can be displayed using the **Next Group** softkey.

The **Change Scale** softkey allows you to adjust the scaling of the y-axis of all graph channels at once. To change the scaling of individual graph channels press the **Select Graph** softkey prior to **Change Scale**. When using a touchscreen select the label of the graph channel instead of pressing select graph.

The report started with the **Print Graphs** softkey will use the current scaling of the graphs displayed.

The number of points plotted for aperiodic parameters depends on the number of values stored. Usually, every value is plotted. On an Agilent CMS Monitor, up to 96 data points for each parameter can be stored for 24 hours (or for 48 hours if a memory extension is purchased and configured). On an Agilent V24 or V26 Monitor, up to 48 data points for each parameter (96 with specific configurations) can be stored for 24 hours.

A “?” below a time label indicates that the time is questionable (e.g., the time may have been altered since that time period). A “T” on the time line denotes that some or all data has been transferred to the monitor from a Agilent M1235A Data Transfer Module.

The Events line below the graphs is for events marked manually (A, B, C, D) and automatically (ST). Markers that are more than one-line thick indicate multiple events for this time. See “Marking Events” on page 8-16.

If a non-continuous measured parameter such as C.O is trended in graphs, a star (*) appears beside each value.

If you change a value in Hemodynamics Calculations, (for example, you change ABP from 120 to 140), the new value will be identified in Patient Data graphs by a star (*).

Note—(CMS only) For the 9-hour database, the default time period is 9 hours, with 4.5 hours of information displayed at any one time. Data within the other 4.5 hours can be viewed by scrolling with the arrow keys

Marking Events

The Mark Event function enables you to mark events and then review them in Graph Trends.

Events are labelled A, B, C, or D. You decide for your unit what each letter means (for example, A = drug administration, B = out of bed, C = suctioning, etc.).

For instance, you may want to mark an event such as drug administration. Pressing the event key with the appropriate label (for example, **Event A**) stores the event time and label. On the Graph Trends, the event will be shown by a tick mark for that time.

Events are shown on one line at the bottom of the Graph Trends and, if configured, on five lines as part of a graph group. In addition to the events that have been manually marked (Events A through D), events that have been automatically marked through ST Segment monitoring (ST Adjust) are also shown.

Event trends are included in reports, both scheduled reports and those initiated from the Trends or Trends/Calcs Task Window. When “events” is selected as part of a graph group during configuration, graphical events trends are shown on reports whenever that group is printed. If “events” is not configured as part of a graph group, then an event trend is printed below the graph group.

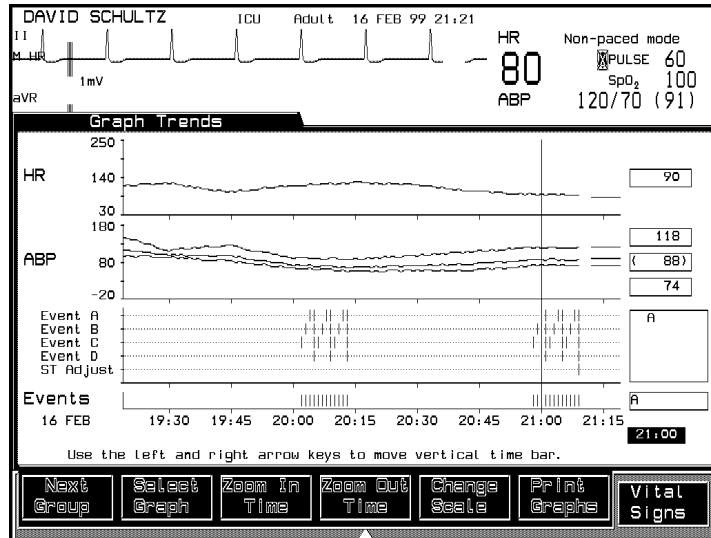
Reviewing

Events can be reviewed and correlated with other graph data in two forms:

The Events line at the bottom of all Graph Trends shows all events (A—D and ST).

If configured, you can review events on five separate lines as part of a graph group.

A tick mark on the line indicates that an event was recorded for that time. When the time bar is positioned on the tick mark, the corresponding event letter is displayed in the box below the numerics (at the right of the graphs).



Inserting a Calibration Mark

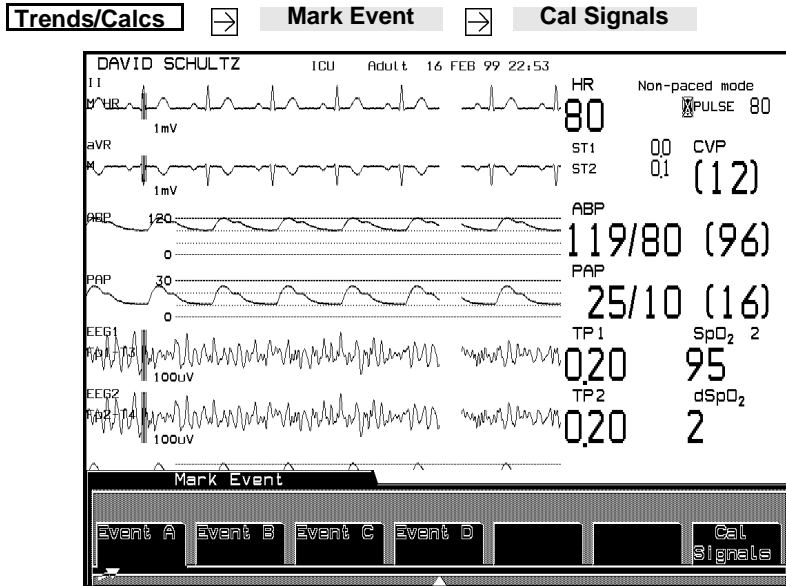
The Mark Event function also enables you to insert a calibration reference into displayed waves.

When checking the magnitude of a displayed wave, it can be useful to have a reference or standard to compare against. The **Cal Signals** key momentarily interrupts the displayed ECG, RESP, and pressure waves and inserts the cal pulse(s) for reference. (This calibration wave is in addition to the calibration reference bar that is always displayed on the ECG and RESP waves.)

Since these calibration pulses momentarily become the waveform signal, they are also communicated over the Agilent monitoring network (SDN) and appear on system displays and recorders. The RS232 and analog output interfaces also carry these pulses.

If a recording is in progress, the calibration wave also appears on the recording (in addition to the recorder calibration wave at the start of the recording).

Procedure to Insert a Calibration Pulse



When you press **Cal Signals**, you'll hear a beep as the calibration pulse appears in the displayed waves. The event label softkeys and the **Cal Signals** softkey disappear. In the time period between the **Cal Signals** softkey being pressed and it disappearing from the screen, parameter numeric values are not collected and alarms are not active. The calibration pulse will stay on the screen for the length of time it takes a waveform to move across the screen. If the waveform is fixed, the calibration pulse will be overwritten. The **Freeze Waves** key under **Change Screen** can be used to freeze the screen to allow close examination of the waveform(s) and calibration signals.

Pressing **Cal Signals** during a recording produces a calibration pulse on that recording (in addition to the calibration wave that routinely appears at the beginning of the recording).

The calibration pulse does not appear in the Vital Signs or Graphs display.

The calibration pulse varies according to the wave type:

ECG	1 mV square wave
RES	1 ohm M-shaped wave
All Pressures	Stepped wave with 30, 60, 120, and 180 mmHg increments

For pressure scales of 240 and 180, all four steps are displayed. At lower ranges, however, not all the steps are displayed since one or more steps exceeds the full scale range.

Note—If you don't want to insert a calibration pulse or mark an event after you have pressed **Mark Event**, press any other hardkey (such as **Main Screen**).

Performing and Reviewing Calculations

There are two calculation functions available:

- Perform calculations** where parameter values can be entered automatically or manually to perform calculations in a specified group
- Review calculations** where previously made calculations can be examined

The three calculation groups available are Hemodynamics, Ventilation, and Oxygenation. Examples of values which can be calculated are given below.

Hemodynamics

Left Cardiac Work (LCW)

Cardiac Index (CI)

Stroke Volume (SV)

Oxygenation

Percent Shunt (Q_s/Q_t)

Venous Oxygen Content (CvO_2)

Oxygen Consumption (VO_2)

Ventilation

Minute Volume (MINVOL)

Compliance (COMP)

Dead Space (V_d)

Performing Calculations

Calculations can be performed using automatically-entered values or manually-entered values. If a parameter is being continuously monitored, its value is automatically entered. Values which are not monitored must be entered manually. You can also change any of these values if needed.

In hemodynamic calculations, if the systolic and diastolic pressures are manually entered via the cursor keys or the handheld keypad, the mean pressure is calculated, marked with an asterisk, and stored automatically. The following formula will be used to estimate the mean pressure:

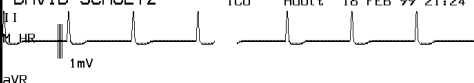
$$\text{systolic} + (\text{diastolic} \times 2) / 3$$

Both indexed and non-indexed values are calculated. Calculated and input values are first presented with their associated units. If desired, the units column for calculated values may be replaced with normal ranges, and the input units column may be replaced with the times at which the values were stored in the database.

Parameters that are sourced in kPa, cmH₂O or mbar are automatically converted into mmHg to provide consistent indexed and non-indexed calculation units. Ventilation calculations convert input pressures from mmHg, kPa, and mbar into cmH₂O before calculating output values.

Calculation Task Window

DAVID SCHULTZ ICU Adult 16 FEB 99 21:24



HR 80 Non-paced mode
 PULSE 60
 SpO₂ 100
 ABP 120/70 (91)

Hemodynamic Calculations

	units		units		units
C. O.	3.12 L/min			C. I.	1.78 L/min/m ²
HR	88 bpm	SV	ml	SI	ml/m ²
ABP S	120 mmHg	SVR	DS/cm ⁵	SVRI	DSm ² /cm ⁵
ABP D	72 mmHg	PVR	DS/cm ⁵	PVRI	DSm ² /cm ⁵
ABP M	88 mmHg	LCW	kg-m	LCWI	kg-m/m ²
PAP S	26 mmHg	LVSW	g-m	LVSWI	g-m/m ²
PAP D	16 mmHg	RCW	kg-m	RCWI	kg-m/m ²
PAP M	19 mmHg	RVSW	g-m	RVSWI	g-m/m ²
PAWP	12 mmHg				
CVP M	8 mmHg				

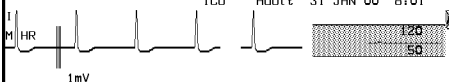
Height* 188 cm Calculation Time: 16 FEB 99 21:09
 Weight kg BSA(D) m²

Use the up and down arrow keys to select a parameter value.
 Use the keypad to change the selected value.

Perform Resample On/Off Change On/Off Print Review
 Calc Vitals DataTime Time Ranges Calc Calc

Calculation Task Window for Touch Screen

ICU Adult 31 JAN 00 8:01



HR 80 Non-paced mode
 PULSE 60
 SpO₂ 100
 ABP 120/70 (91)

Hemodynamic Calculations

	units		units		units
C. O.	3.12 L/min			C. I.	1.78 L/min/m ²
HR	88 bpm	SV	35.5 ml	SI	20.3 ml/m ²
ABP S	120 mmHg	SVR	2050 DS/cm ⁵	SVRI	3588 DSm ² /cm ⁵
ABP D	72 mmHg	PVR	179 DS/cm ⁵	PVRI	314 DSm ² /cm ⁵
ABP M	88 mmHg	LCW	3.2 kg-m	LCWI	1.8 kg-m/m ²
PAP S	26 mmHg	LVSW	36.6 g-m	LVSWI	20.9 g-m/m ²
PAP D	16 mmHg	RCW	.47 kg-m	RCWI	.27 kg-m/m ²
PAP M	19 mmHg	RVSW	5.30 g-m	RVSWI	3.03 g-m/m ²
PAWP	12 mmHg				
CVP M	8 mmHg				

Height* 170 cm Calculation Time: 31 JAN 00 7:41
 Weight* 65.0 kg BSA(D) 1.75 m²

Use the up and down arrow keys to select a parameter value.
 Use the keypad to change the selected value.

Perform Resample On/Off Change On/Off Print Review
 Calc Vitals DataTime Time Ranges Calc Calc

Notes—

- If you plan to use monitored parameter values in Calculations, be sure that when you are configuring parameters, you assign the parameter the same label that is used in Calculations. For example, ABP should be used instead of ART because ABP is the label used by Calculations.
- When you enter the Task Window, the Calculation time will be the last C.O. time or the current time, depending on how the monitor is configured. If C.O. time is used, values stored more than one minute before that time, are automatically entered. Values up to and including 30 minutes before the calculation time will be used. The most recent values occurring before the calculation time will be used for height, weight, and head circumference calculations.
- Displayed values may have been automatically stored or manually entered using the keypad or **Resample Vitals**.
- You must verify that all input values are appropriate for your patient prior to performing calculations.
- If you enter pressure values manually, you must enter all three parts - systolic, diastolic, and mean - in order for calculations to be performed for that pressure reading.

BSA Formula

The Agilent CMS, V24 and V26 monitors provide both the Boyd and Dubois formulas for the calculation of body surface area (BSA). The default configuration for all patients is the Boyd formula. All calculation results that use BSA are indexed to the selected formula. The Hemodynamics and Oxygenation Calculations Task Windows which display BSA use the label BSA(B) for the Boyd formula and BSA(D) for Dubois. To change the default [for example to use Dubois for adults and keep Boyd for neonates], the appropriate selection must be made in the Patient Data Configuration Task Window. See your Agilent Service Engineer or biomedical engineering department for assistance in making a change.

Resampling Vital Signs

Resampling of vital signs enables you to override the values in the Trends database, which are stored every 12 seconds or averaged over 1 minute, depending on the monitor's configuration. Resampling enables you to use the most recent continuously monitored values. Resampling sets the calculation time to the current time, and displays the corresponding values for the previous second in the calculations task window. Resampled values are indicated by a preceding asterisk (*) in Calculations, Graph Trends, and Vital Signs task windows.

If no current values exist, then the most recent value within 30 minutes will be retrieved. The most recent height, weight, (and head circumference for neonatal only) are used regardless of how long ago they were entered.

Pressing **Confirm** stores the resampled values at the current time. Pressing **Perform Calc** also stores the resampled values at the current time and does the calculations using the resampled values. Pressing any other softkey except **On/Off DataTime** cancels the resampled values and brings up the database values for the displayed calculation time. Resampled values that are not stored or used in calculations will be erased.

When data is transferred with the Data Transfer module, values that have been resampled are transferred to the destination monitor. Resampled and other manually entered data is annotated with an asterisk (*) at the destination monitor if both the source and destination monitors have software at the Release F level or higher (CMS) or Release A.0 level or higher (Agilent V24 and V26).

Changing or Entering an Input Value

The arrow keys are used to select a parameter and the keypad is used to enter or change the selected value. With a touchscreen, you can select a parameter by selecting the touch button in front of the parameter label. A numeric touchboard will be included in the task window to enter or change values.

If you enter a value that has more decimal places than allowed for a particular input, the value you enter will be rounded off after you press **Confirm**. Numbers 1 to 4 will round the value down and numbers 5 to 9 will round the value up. For example, if you enter 6.55 as an input for a value where only one decimal place is allowed, 6.6 will be the value used in the calculation and displayed. If you enter 6.54, 6.5 will be used in the calculation and displayed.

If you enter a value which cannot be stored, the message Parameter value input range X: "Y OUT OF RANGE" will appear. The value for X will be either the upper limit (if the value entered is greater than the upper limit) or the lower limit (if the value entered is less than the lower limit). Y is the value you entered. Enter a new value.

Reviewing Calculations

The Hemodynamics, Ventilation, and Oxygenation Review displays enable you to review all calculations made in these groups within the last 24 hours (48 hours if a memory extension is purchased and configured).

Calculated parameter values (both indexed and non-indexed) are presented with the values used to calculate them. The calculation times are indicated along the top of the display. The normal ranges for the parameters can also be shown.

Additional calculation or input values are available by using the **Next Page** key. To select another time column, either use the arrow keys or the **←Select Column→** softkey.

Printing Reports

You can print reports manually through task windows or automatically through pre-scheduled printing.

Through Task Windows You can print a report of the data shown in the Task Window you are viewing. These reports are available for Patient Information, Graphs, Blood Review, Vital Signs (all parameters for the displayed time period), Calculations, Calculation Review, and Drug Calculator Titration Table, if available.

Through Scheduled Reports User-defined reports may consist of tables, graphs, and calculations and blood review reports. These can be printed according to a configured schedule or you can choose to print a report before its scheduled time in the Selection Window under **Trends/Calcs**

Printing Task Window Reports

In the Graph Trends, Blood Review, Vital Signs, Calculations, and Calculation Review Task Windows you can print a report of the information being presented. The data will be printed in the same detail (same time intervals) as shown.

Note—In Tables and Calculations Review, the reports will include data for the displayed time period including those parameters which are not displayed. In Graph Trends, only the displayed graphs are printed.

Printing Scheduled Reports

The print times and the contents of scheduled reports are chosen during the configuration of the monitor. However, the **Print SchedRep** key in the Selection Window accessed through **Trends/Calcs** enables you to print a report identical to the scheduled report at any time. Using this key doesn't interfere with the normal printing of scheduled reports (the report will still print again later at its scheduled time). You can print this report even when the scheduled report capability is turned off.

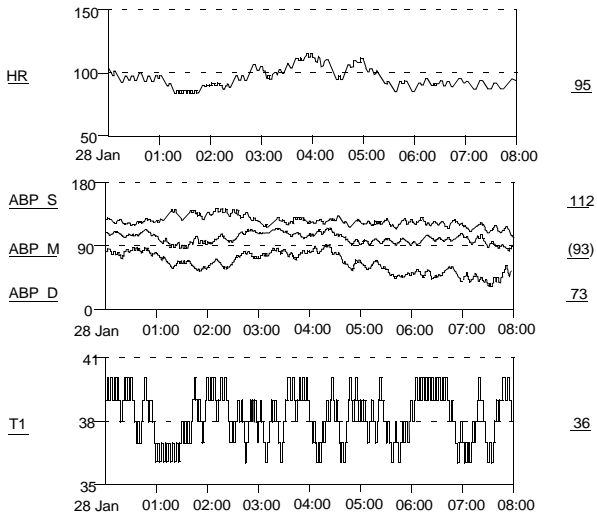
To turn the scheduled report capability on or off, press **SchedRep On/Off** in the Patient Data Selection Window. This brings you to the Scheduled Reports On/Off Task Window. The current setting (On or Off) is indicated, and a softkey is highlighted (for example, if scheduled reports are off, the **SchedRep On** key is highlighted). Press the highlighted key to change the setting.

To cancel a report, press **Cancel Report** in the Selection Window under **Trends/Calcs**. This cancels only the report that is currently printing. Any reports that have been waiting will then print.

Refer to “What to Do If Your Report Does Not Print” on page 8-30 for troubleshooting information.

DAVID SCHULTZ Bed : CCU 7 Report : 28 JAN 1987 8:01
MR # : 012-34-56789 Adm Phys : M.MULLER Admit : 27 JAN 1987 15
DOB : 22 FEB 1945 Att Phys : R.SCHWARTZ
MEMORIAL MEDICAL CENTER, BOSTON, MA

Graphs Report



Graph Trends Report

Trends and Calculations

DAVID SCHULTZ	Bed	: CCU 7	Report	: 28 JAN 1996	17:22			
MR# : 012-34-56789	Adm Phys	: M.MULLER	Admit	: 27 JAN 1996	10:15			
DOB : 22 FEB 1945	Att Phys	: R.SCHWARTZ						
MEMORIAL MEDICAL CENTER, BOSTON, MA								
Table Report								
27 JAN	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
HR	88	85	87	83	85	84	88	94
ABP S	115	125	110	112	115	112	118	125
ABP D	75	90	71	72	75	72	82	90
ABP M	95	100	92	90	95	92	102	100
PAP S	35	28	24	25	23	24	28	27
PAP D	18	15	11	13	12	13	15	13
PAP M	24	19	15	17	16	17	19	17
T1	37.8	37.5	37.6	37.8	37.5	37.9	38.0	37.8
C.O.	5.3^		5.1			5.0	5.2^	5.4
	2:50		6:47			12:54	14:49	17:23
PAWP	13		11			10	12	4
	2:52		6:49			12:56	14:52	17:25

Vital Signs Report

BOBBIE JONES	Bed:	CCU 7	Report:	05OCT1996 02:00				
MR#:012-34-5679	Adm Phys:	M MILLER	Admit:	03OCT1996 08:15				
DOB: 22FEB 1945	Att Phys:	R SCHWARTZ						
FIRST MEDICAL CENTER TALL CITY, USA								
Blood Review Report								
	05OCT 3:10	05OCT T3:24	05OCT 5:17	05OCT 7:19	05OCT 12:15	05OCT 17:45	ref ranges	units
Sample	Art	Art	Art	Art	Art	Art		
pH	7.350	7.350	7.390	7.393	7.442		7.35...7.45	
PCO2	36	35	39	40	41		35...45	mmHg
'HCO3	19	18	20	21	22		18...23	mEq/l
'CO2	20	19	20	21	22		19...24	mEq/l
'BEecf	-1	-2	0	-1	0		-2...+3	mEq/l
Hct	36	38	39	40	41	42	38...51	%PCV
'Hb	15	12	13	15	17	17	12...17	g/dl
Na	139	138	139	140	141	143	138...146	mEq/l
K	3.7	3.5	3.6	3.7	3.9	4.0	3.5...4.9	mEq/l
Cl	99	98	99	100	101		98...109	mEq/l
BUN	10	8	9	15	18		8...26	g/dl
Glu	76	70	75	86	92		70...105	mg/dl
'AnGap	11	10	12	17	15		10...20	mEq/l
OperId	123456	123456	123456	123456	123456	123456		

Blood Review Report

Trends and Calculations

What to Do If Your Report Does Not Print

During normal report printing, messages appear in the status message area of the display. However, sometimes a printing status message may alert you to a problem that needs to be corrected. The following information describes printing messages that may appear, what they mean, and what you may need to do to correct a problem (should there be one).

MESSAGE: Printer Malfunction

Meaning: While printing a report, the monitor detected a problem with the printer.

What You Need to Do: Check the printer to be sure it is plugged in, turned on, and has paper loaded. If you are using a printer at the central station, be sure the central station is operating. If these do not correct the problem, call your Agilent service representative.

MESSAGE: Report On Printer Has Been Canceled

Meaning: The report sent to the printer has been stopped because someone has pressed the Cancel Report.

What You Need to Do: You don't need to do anything.

MESSAGE: No Printer Available

Meaning: A report cannot be started on this printer.

What You Need to Do: Check the printer to be sure it is plugged in, turned on, and has paper loaded. If you are using a printer at the central station, be sure the central station is operating. If these do not correct the problem, call your Agilent service representative.

MESSAGE: Report Complete

Meaning: A requested report has been printed.

What You Need to Do: You don't need to do anything.

MESSAGE: Report In Progress

Meaning: A requested report is being printed on a printer.

What You Need to Do: You don't need to do anything.

MESSAGE: Report Request Accepted

Meaning: The report has been accepted for printing.

What Do You Need to Do: You don't need to do anything.

MESSAGE: Too Many Reports In Line - Please Wait

Meaning: The printer has reports waiting to print and cannot accept another report request.

What Do You Need to Do: Do not send a new report request to the printer. Wait and send your request when the message "Report Complete" appears.

MESSAGE: Waiting For Printer

Meaning: A central printer is busy with another report.

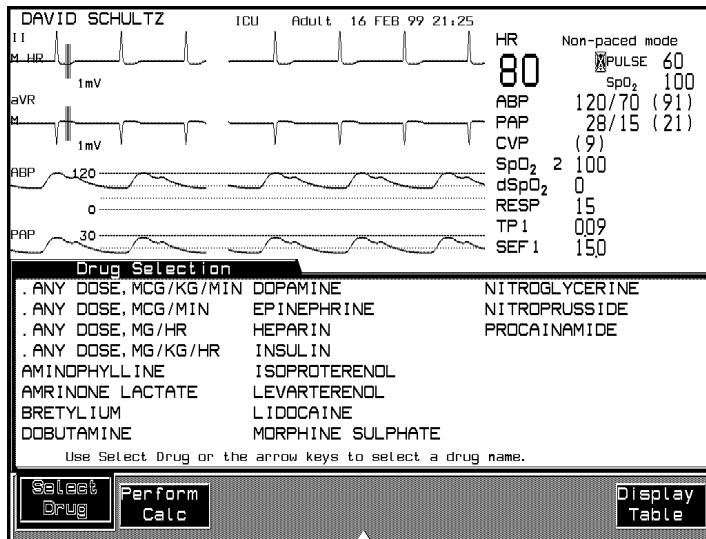
What Do You Need to Do: Nothing. The requested report will be printed when the copier becomes available.

Drug Calculator

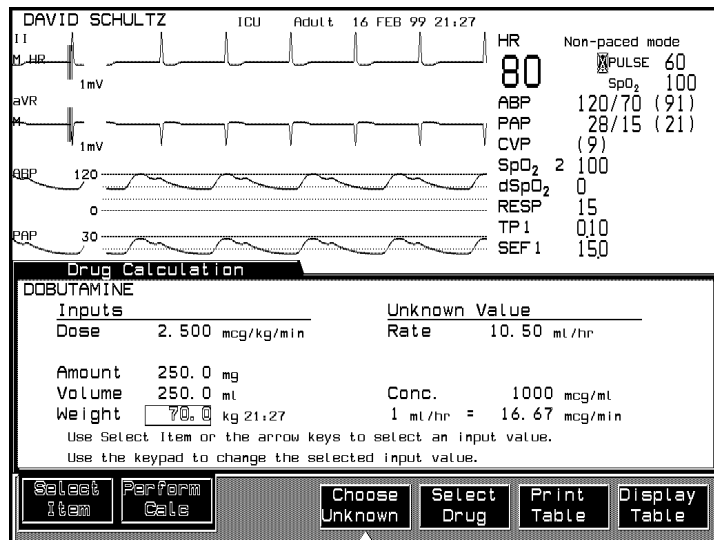
The drug calculator provides drug infusion information at the bedside for up to 24 drugs. Using the calculator, you can determine infusion rate, dose, amount, or volume, and display or print a titration table for each drug.

The drug calculator is accessed through the **Trends/Calcs** key and the Drug Calc softkey.

The first window - Drug Selection - lists the drugs available for use with the calculator. These drugs have been configured for use in your unit during system installation. In this window, you can select the drug you wish to work with.



By pressing **Perform Calc**, you will enter the Drug Calculation task window for the selected drug. In this window, the input values and units configured for the selected drug are listed on the left. The unknown value and the concentration are shown on the right. Here you can enter or change values for the inputs using the keypad or the up and down arrow keys. You can also select a different unknown value to calculate. When you press **Perform Calc**, the unknown value is calculated and displayed.



If you are performing a calculation for a drug that is weight-dependent, the calculator will retrieve the most recent weight entered, either through the Admit task window or one of the physiological calculations task windows. If weight is not available, you can enter it in the Drug Calculator task window. The weight you enter will be stored with the patient's history.

Caution

If you use the Drug Calculator for any patient other than the one currently being monitored, the current patient's history will be altered when another patient's weight is stored.

The Titration Table task window notes the relationship between dose and rate as configured during system installation. This table can be printed directly from the Titration Table task window, or from the Drug Calculation task window.

DAVID SCHULTZ ICU Adult 16 FEB 99 21:29 HR 80 Non-paced mode
 M HR 1mV PULSE 60
 aVR SpO₂ 100
 ABP 120/70 (91)

Titration Table

Amount 250.0 mg Volume 250.0 ml Weight 70.0 kg

Dose		Rate		Dose		Rate		Dose		Rate	
mcg/kg/min	ml/hr	mcg/kg/min	ml/hr	mcg/kg/min	ml/hr	mcg/kg/min	ml/hr	mcg/kg/min	ml/hr	mcg/kg/min	ml/hr
5.500	23.10	10.50	44.10	15.50	65.10						
6.000	25.20	11.00	46.20	16.00	67.20						
6.500	27.30	11.50	48.30	16.50	69.30						
7.000	29.40	12.00	50.40	17.00	71.40						
7.500	31.50	12.50	52.50	17.50	73.50						
8.000	33.60	13.00	54.60	18.00	75.60						
8.500	35.70	13.50	56.70	18.50	77.70						
9.000	37.80	14.00	58.80	19.00	79.80						
9.500	39.90	14.50	60.90	19.50	81.90						
10.000	42.00	15.00	63.00	20.00	84.00						

Use Scroll or arrow keys to select another column of data.

Scroll <====> Scroll <====> Select Drug Print Table Perform Calc

When a patient is discharged, any modifications made to the inputs or in the unknown value for the discharged patient will be discarded, and the configured defaults will be re-initialized for the next patient.

Trends and Calculations

Neonatal Event Review

This chapter contains information on how to view and interpret Neonatal Events and oxyCRG Episodes for an individual Event.

- Introduction to Neonatal Event Review..... 9-2
- Viewing Neonatal Events 9-3
- Viewing oxyCRG Episodes..... 9-14
- Adjusting Neonatal Event Review Settings 9-18

Introduction to Neonatal Event Review

The Neonatal Event Review application enables the Agilent CMS, V24 and V26 Monitors to automatically detect, store, display and document up to 48* neonatal events over a period of 24 hours. The neonatal events detected by the monitors are:

- Apnea,
- Bradycardia,
- Desaturations and/or a combination of the three.

In addition, events (e.g. breathing patterns) can be stored manually.

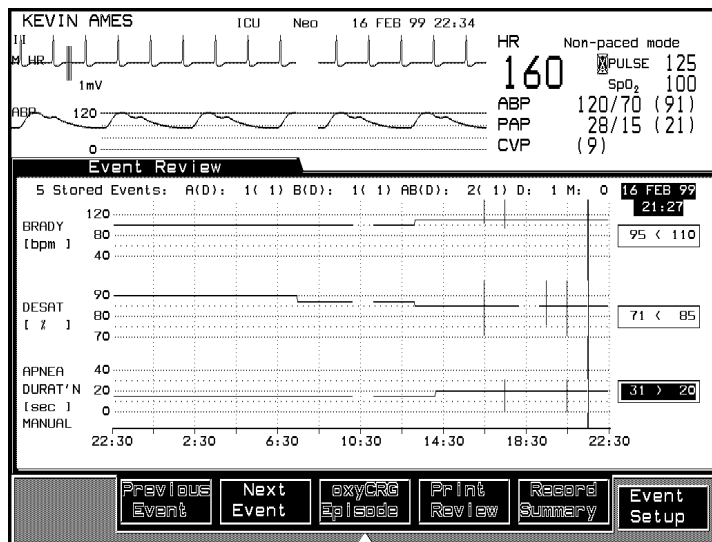
The above neonatal events represent the most frequently encountered cardiorespiratory problems in newborn babies. The documentation of these events enables the clinician to diagnose and manage the patient's condition more accurately and effectively and determine an appropriate course of treatment

*The Agilent V24 and V26 monitors can only store up to 24 events.

Viewing Neonatal Events

Once an event has been captured and stored by the monitor, it is displayed in the Event Review task window. You can access the Event Review task window by selecting:

- **Alarms/Volume** on the control panel and
- **Event Review** in the Alarms/Volume selection window.



The information displayed in the Event Review task window is presented in a graph format and is divided up into the following four channels:

1. The Bradycardia channel with a range from 40 up to 120 bpm.
2. The Desaturation channel with a range from 70 up to 90%.
3. The Apnea Duration channel with a range from 0 to 40 seconds.

4. The Manual Event Channel

The graph provides an overview of the total number of events and how they were distributed over the last 24 hours.

Manual Event Storage

If you would like to capture an event manually, press **Alarms/Volume** followed by **Capture Episode**.

Graphical Details

The following information is displayed on the graph in the Event Review task window

1. Event bars.
2. Event threshold lines.
3. Event time.
4. Event numerics.
5. Event summary line.

Event Bar

A neonatal event is indicated by one or more vertical bars which are displayed across one or more graph channels. Each event bar can be selected by the graph cursor.

Isolated Events:

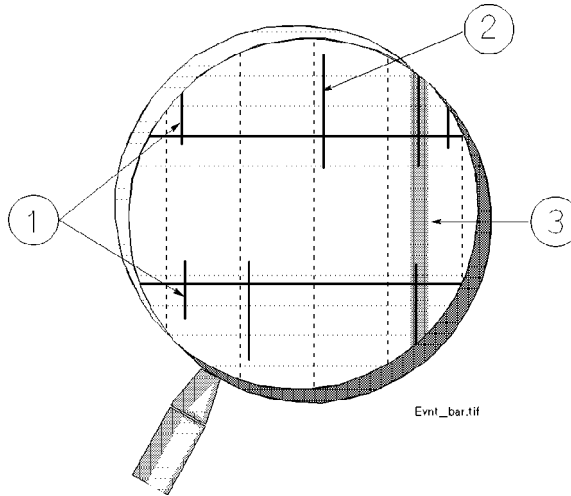
indicated by **one event bar**, displayed in one graph channel.

Associated Events:

indicated by **two or three event bars**, displayed in a vertical line, across two or three graph channels.

Manual Events

indicated by **one event bar** in the manual channel



(1) Associated Event

(2) Isolated Event

(3) Cursor

The severity of an event is indicated by the length of the event bar; the longer the event bar, the more severe the event.

The Bradycardia and Desaturation event bars start at the top of their channels and extend downwards. The Apnea event bars start at the bottom of the Apnea channel and extends upwards.

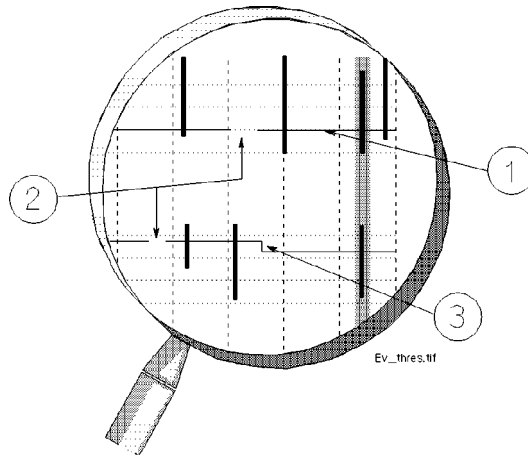
The Manual Event Bar is only a marker to be selected by the graph cursor.

Event Threshold Line

The Agilent CMS, V24 and V26 Monitors can be adjusted in monitoring mode so that an event is either triggered by an alarm or by criteria defined specifically by the user.

The event trigger level is represented in the graph by a threshold line, located in each graph channel. This line enables the user to see the following:

1. Whether a trigger is active. This means that the parameter is switched on, the parameter alarm is switched on, the main alarms are switched on and valid numerical values are available. The threshold line is indicated on the graph by an unbroken line.
2. At what value it has been set.
3. Whether it has been changed during the 24-hour review period.



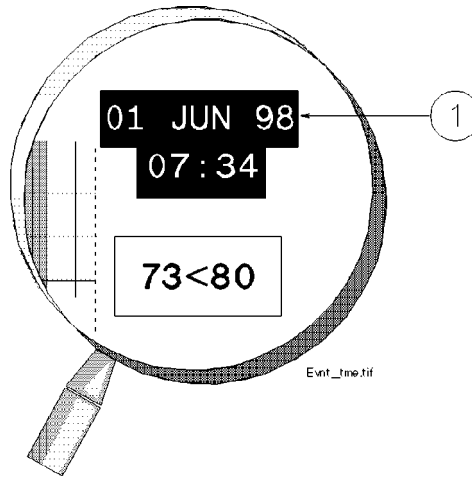
(1) Event Threshold Line

(2) Non Active Threshold Line

(3) Trigger Level Change

Note— When the Agilent CMS, V24 or V26 monitor is connected to the Agilent Information Center, the Bradycardia threshold line is displayed as a shaded area.

Event Time The time at which the event was captured is stored with each event. To display the event time, move the cursor onto the event you wish to view. The event time is displayed immediately in the top right hand corner of the task window.



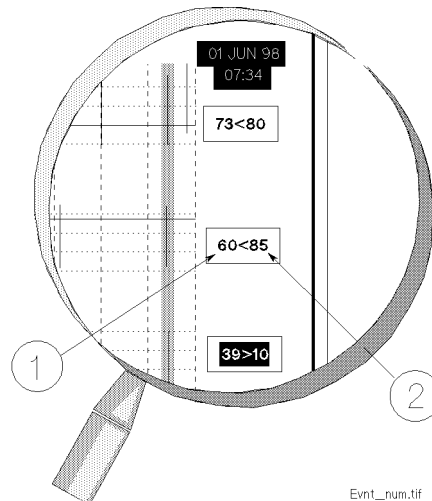
(1) Event Time

Event Numerics

When the cursor is moved onto an event bar, specific numerical data for that event is displayed in the three boxes on the right hand side of the task window.

The background of one of the three boxes is always highlighted. This indicates which one of the parameters triggered the capture of the event.

Note—When an event is captured manually, all boxes contain the word “Manual” and no box is highlighted.

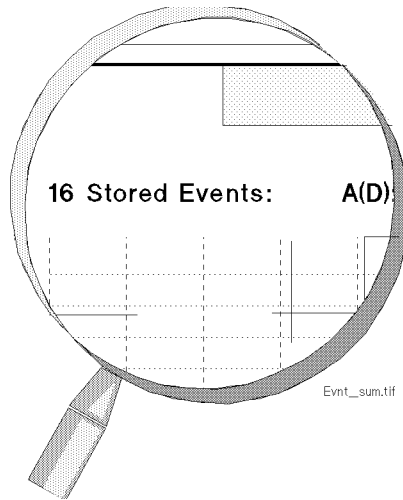


- (1) This value represents the most severe value during an event.
- (2) This value represents the trigger threshold which was valid at the time that the event was captured. The value is defined by an alarm limit or specifically by the user.

Event Summary Line The event summary line is located above the graph, along the top of the task window. The user can view, at a glance, the total number of stored events.

The events are divided into five categories:

1. **A(D) =>** Total Apneas (with or without associated Desaturation).
2. **B(D) =>** Total Bradycardias (with or without associated Desaturation)
3. **AB(D) =>** Associated Apnea and Bradycardia (with or without associated Desaturation).
4. **D =>** Isolated Desaturation.
5. **M =>** Manually captured event.



Event Review

19 Stored Events: A(D): 4(2) B(D): 3(0) AB(D): 1(1) D: 9 M: 2

Example of an Event Summary Line

The above example of an event summary line, conveys the following information:

- A total of 19 neonatal events are stored.
- Four Apnea events occurred, of which two resulted in a Desaturation.
- Three isolated Bradycardia events occurred, none of them resulted in a Desaturation.
- One associated Apnea and Bradycardia occurred which also resulted in a Desaturation.
- Nine isolated Desaturations occurred.
- Two events were manually captured and stored.

Event Storage

If the number of stored events reaches a total of 44¹, the following status message is displayed in the Event Review task window:

- “Event Storage>90% full”

If the number of stored events exceeds a total of 48², the oldest events are overwritten and the following status message is displayed in the Event Review task window:

- “Event Storage overflow. First events overwritten”

1. 22 for Agilent V24 and V26

2. 24 for Agilent V24 and V26

If the event storage is full, the newest (49th¹) event will enter the graph on the right hand side and push the oldest (1st) event off the graph on the left hand side. This information cannot be retrieved. To document the event review before the event storage becomes overfull, you should initiate an event summary recording.

To free up space in the event storage and remove unwanted events from the Event Review graph, you can delete events in the oxyCRG Episode task window.

Operating Controls

In the Event Review task window you can:

1. Select the previous event.
2. Select the next event.
3. View an oxyCRG Episode for the selected event.
4. Record the event summary.
5. Print the event summary
6. Enter the Event Setup Window to change the neonatal event trigger conditions.

Selecting an Event

Selecting the **Previous Event** and/or **Next Event** softkeys moves the cursor from one event to the next in both directions. Alternatively, the arrow keys on the control panel can also be used.

Once the cursor has been positioned on an event, the date and event time is shown and the event values specific to that event are displayed in the three boxes located on the right hand side of the task window.

Viewing an oxyCRG Episode for the Selected Event

Selecting the **oxyCRG Episode** softkey enters the oxyCRG Episode task window, where you can review the oxyCRG episode for the event currently selected. At this point, and not before, an event can be deleted permanently from the event storage.

1. 25th for Agilent V24 and V26

Note—The **oxyCRG Episode** softkey is only active if at least one event is stored.

Recording the Event Summary

Selecting the **Record Summary** softkey documents in tabular form the numerical data (not graphical) of all events displayed in the Event Review task window for the last 24-hours, on the bedside M1116B Recorder Module. Please refer to the "Making Recordings" section of this manual (Chapter 6, Volume 1) for further details on recording neonatal events.

Printing the Event Summary

Selecting the **Print Review** softkey starts a print-out of the current Event Review display.

Changing the Neonatal Event Trigger Conditions

Selecting the **Event Setup** softkey enters the Event Setup task window, where you can change the trigger conditions currently selected for each graph channel.

Viewing oxyCRG Episodes

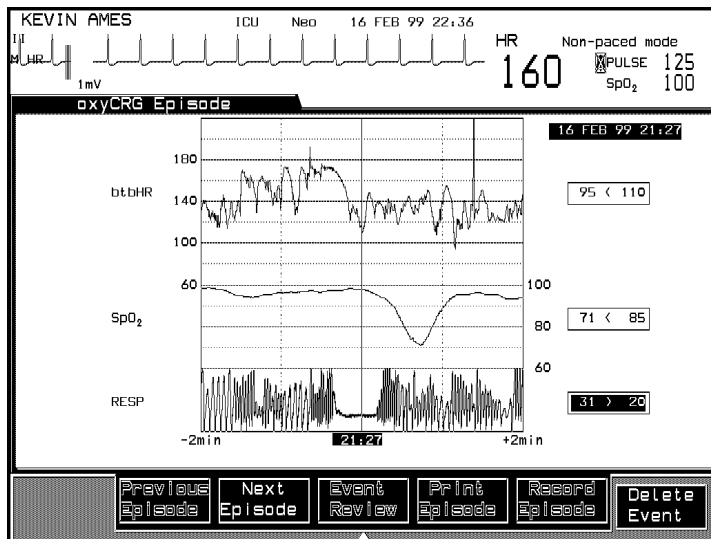
The oxyCRG Episode task window displays a four minute oxyCRG episode for the event currently selected in the Event Review task window. It enables you to view the event in context, by showing the oxyCRG reading during the Pre and Post-Event Time.

Note—Manual Events are only shown with 4 minutes Pre-Event Time.

For further information on the Oxy-Cardiorespirography application, please consult the Agilent Oxy-Cardiorespirography Application Note, part number: 5963-3949L.

You can access the oxyCRG Episode task window by selecting:

- **oxyCRG Episode** in the Event Review task window.



The oxyCRG Episode graph is divided up into the following three channels:

1. The btb HR trend channel with a range from 60 up to 220 bpm.
2. The SpO₂ trend channel with a range from 60 up to 100%.
3. The RESP compressed wave channel.

The exact time an event was triggered is indicated by a vertical line which is positioned on the graph according to the monitor's configuration. Depending upon the user's requirements, the monitor can be configured (in Configuration Mode) to display and store an oxyCRG Episode in the following way:

- Two minutes of Pre-Event Time / Two minutes of Post-Event Time (the default) or
- One minute of Pre-Event Time / Three minutes of Post-Event Time

Note—In both cases manual events are displayed with four minutes Pre-Event Time.

The association of events is determined by the configuration of the post event time. The events that occur during the configured two or three minutes of post event time are associated and displayed as one event in the Event Review and oxyCRG Episode Task Window.

Operating Controls

In the oxyCRG task window you can:

1. Select the previous episode.
2. Select the next episode.
3. Return to the Event Review task window.
4. Record an episode.
5. Print an episode.
6. Delete an event.

Selecting an Episode

Selecting the **Previous Episode** and/or **Next Episode** softkeys jumps from one oxyCRG episode to the next in both directions.

Entering the Event Review Task Window

Selecting the **Event Review** softkey returns you to the Event Review task window. The event last selected in the oxyCRG Episode task window will be selected here.

Recording an Episode Selecting the **Record Episode** softkey documents the selected oxyCRG episode in a graphical format on the bedside M1116B Recorder Module with fast paper speed. Please refer to the "Making Recordings" section of this manual (Chapter 6) for further details on recording neonatal events and associated oxyCRG episodes.

Printing an Episode Selecting the **Print Episode** softkey starts a print-out of the current oxyCRG display.

Deleting an Event Selecting the **Delete Event** softkey enables you to delete an event. This can **only** be done in the oxyCRG Episode task window, after the clinician has identified that the event is invalid and does not need to be stored or documented. Once confirmed, the event is deleted from the event storage permanently and cannot be retrieved.

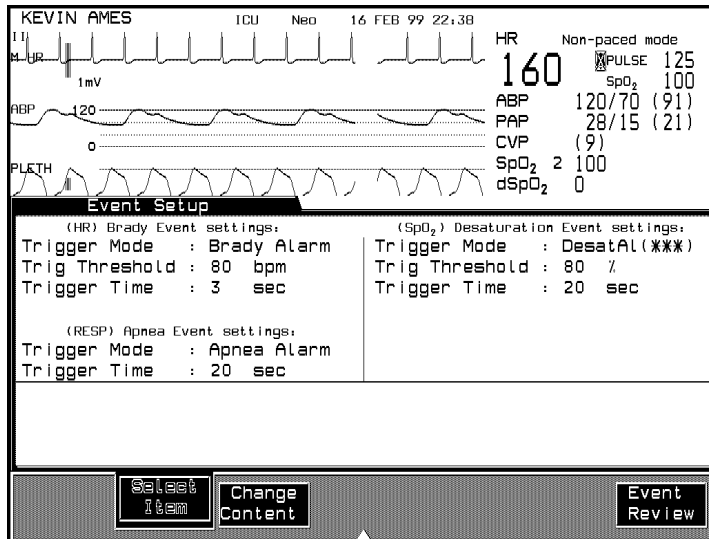
Note—As long as the deleted episode is still on the screen, it can still be documented.

Adjusting Neonatal Event Review Settings

The Event Setup task window enables you to adjust event settings to determine how and when an event is detected and stored.

You can access the Event Setup task window by selecting:

- **Event Setup** in the Event Review task window.



Note—An event is only triggered if:

- The parameter is switched on
- The parameter alarms are switched on
- There are no INOPs
- The main alarms are switched on

The Event Setup task window enables you to adjust the following items:

Trigger Mode	The trigger mode determines whether an event is triggered by a physiological alarm or by criteria defined specifically by the user.
Trig Threshold	The trigger threshold can be adjusted if the user defined trigger mode setting has been selected
Trigger Time	The trigger time can be adjusted if the user defined trigger mode setting has been selected.

Event Criteria

The event type (Apnea, Bradycardia, Desaturation) determines how a specific event is triggered and stored on the monitor.

Apnea Event Settings

Apnea events are **always** triggered by a Red*** Apnea alarm. The Apnea alarm is derived from the RESP parameter and occurs whenever breathing ceases for a period exceeding the defined Apnea alarm limit (usually 20 seconds).

The Apnea alarm limit and trigger time can be viewed but not adjusted in the Event Setup task window. These settings must be adjusted in **Monitoring Mode**, in the RESP task window.

Bradycardia Event Settings

Alarm Triggered

The Bradycardia event is triggered by a Red*** Brady alarm.

The Bradycardia alarm limit can be viewed but not adjusted in the Event Setup task window. The alarm limit must be adjusted in **Monitoring Mode** in the HR/PULSE or Alarm Limits task window and the trigger time must be adjusted in **Configuration Mode** in the HR/PULSE task window.

If the Bradycardia alarm related trigger threshold and trigger time items are selected, the **Change Content** key is inactive and the following status message is displayed in the Event Setup task window:

- "Brady items must be changed in the HR/PULSE Setup"

User Defined

For situations where the storage and documentation of an event should be independent of all Bradycardia alarms, you can adjust the Bradycardia event threshold and trigger time in **Monitoring Mode** in the Event Setup task window.

Note—When the Agilent CMS, V24 or V26 Series Monitor is connected to an Arrhythmia System, the Bradycardia alarms are generated by the latter and not the former. The alarm limits can only be viewed and adjusted on the Arrhythmia. In this situation, the Bradycardia threshold line is displayed in the Event Review task window as a shaded area and the Brady trigger time and threshold items are set to "From Arrhyth" in the Event Setup task window.

Desaturation Event Settings

Alarm Triggered

The Desaturation events are derived from the first SpO₂ bedside module and triggered either by a Red*** Desat alarm or a Yellow** low limit SpO₂ alarm. The Desat/SpO₂ alarms and trigger times can be viewed but not adjusted in the Event Setup task window. These settings must be adjusted in **Monitoring Mode** in the SpO₂ task window. If the SpO₂ alarm related trigger threshold and trigger time items are selected, the **Change Content** key is inactive and the following status message is displayed in the Event Setup task window:

- "SpO₂ items must be changed in the SpO₂ Setup"

User Defined

For situations where the storage and documentation of an event should be independent of all Desat/SpO₂ alarms, you can adjust the Desaturation event threshold and trigger time in **Monitoring Mode** in the Event Setup task window.

Desat Trigger Off

It is also possible to turn the Desaturation event triggers **OFF** in cases where the occurrence of Desaturation events are so frequent that the event storage facility risks becoming full (a total of 48* events can be stored). If the Desaturation event trigger is switched to OFF, the oxygen saturation is still displayed in the oxyCRG Episode task window but the Desaturation events are not captured or displayed in the Event Review task window

*24 for Agilent V24 and V26

Operating Controls

In the Event Setup task window you can:

1. Select items.
2. Change the item content.

Selecting Items

Selecting the **Select Item** softkey enables you to step through the items listed under each event group.

Adjusting Neonatal Event Review Settings

Changing Item Contents Selecting the **Change Content** softkey enables you to change the contents of an item.

10

Data Transfer

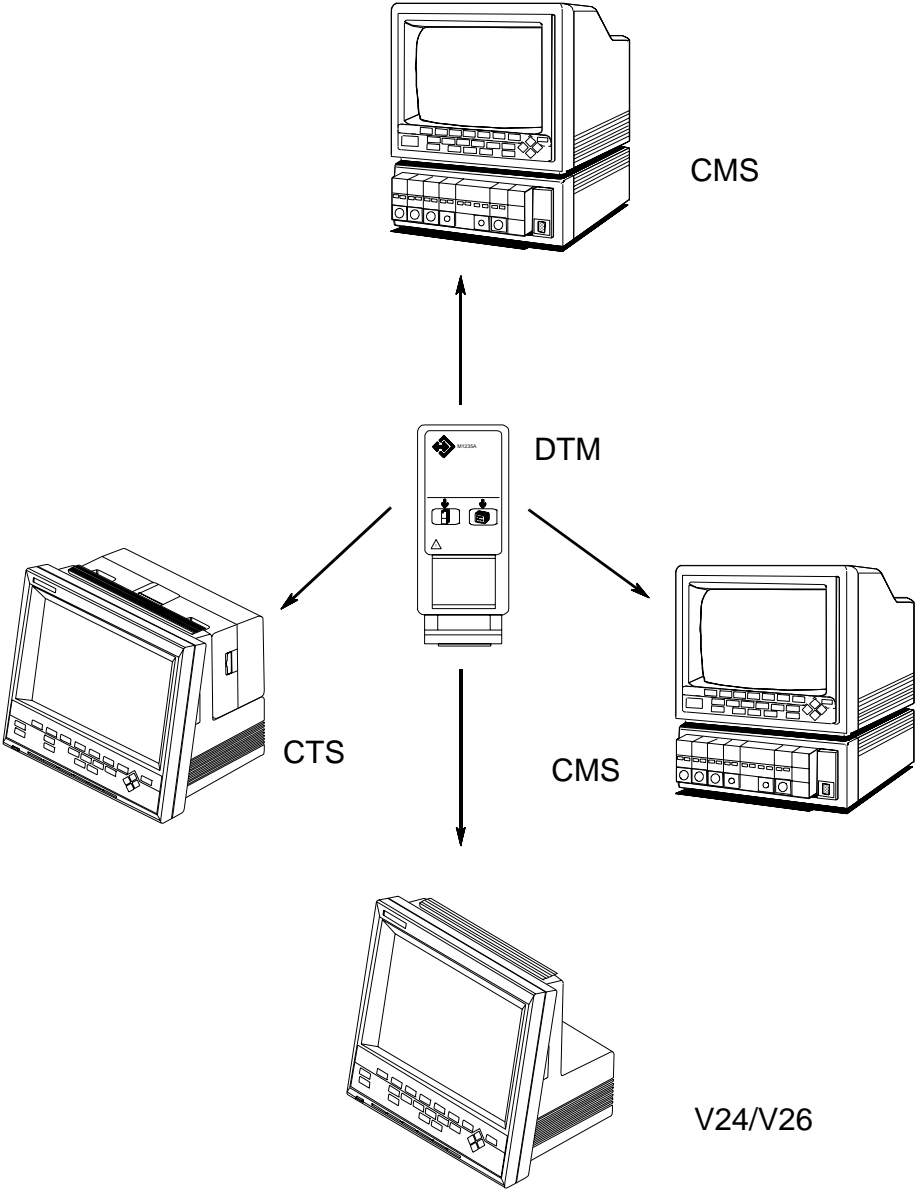
This chapter describes the Agilent M1235A Data Transfer module. It includes the following sections:

- Data Transfer Module 10-2
- Types of Transfer 10-7
- Combining Data 10-14
- Vital Signs, Blood Review and Graphs 10-17
- Troubleshooting 10-19
- Performance Specifications 10-20

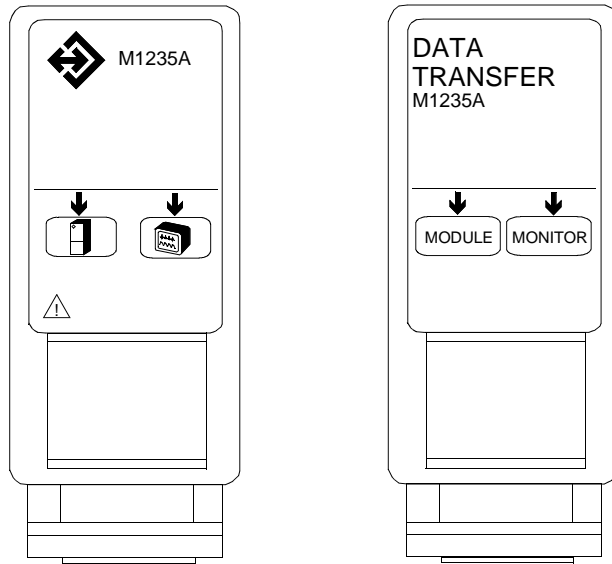
Data Transfer Module

The Agilent M1235A Data Transfer module allows for rapid, convenient, and easy transfer of patient data among Agilent V24 and V26, Agilent Component Monitoring System (CMS) and Agilent Component Transport System (CTS) systems. For example, if a patient is moved to another location, the Data Transfer module can be used to transfer the patient's data, along with the patient, to the new location. During the transport, the Data Transfer module can be used to continuously collect the patient's vital sign information. When the patient arrives at the new location, the Data Transfer module is able to move both the data from the old location as well as the data obtained during transport, into the monitor at the new location.

A typical transfer takes less than one minute. When unplugged, the module retains data for at least one hour.



Data transfer presents no interruptions to realtime monitoring and provides near-continuous trends. However, some functions under **Trends/Calcs** and **Procedures** are not available during the transfer of data. The ST Analysis task windows are unavailable during a transfer to the monitor.



The front of the module has two keys:

- The **Monitor** key for initiating a transfer from the module to the monitor.
- The **Module** key for initiating a transfer from the monitor to the module. The information transferred may consist of up to 24 hours of the database, ongoing updates to the database, or both.

Transfers can also be initiated or stopped through **Procedures**.

During a transfer, the module light is on when the corresponding Data Transfer task window is active. The light blinks rapidly when a transfer is in progress, and at a slower rate during the collection of new data (see “Types of Transfer” on page 10-7).

When the module is unplugged, it retains data for at least one hour.

After data is transferred to the monitor, the module is automatically erased. This is to ensure that the module is empty when it is used for the next transfer.

What is Transferred

The module is capable of storing and transferring up to 24 hours of trend data and demographic information. When a transfer is initiated, the following data is transferred:

- Continuously monitored parameters (for example, ECG)
- Resampled Values
- Aperiodic measurements (for example, CO)
- All patient demographic information except bed number
- The time at which calculations were performed in the Hemodynamic, Oxygenation, and Ventilation calculation task windows
- Marked events
- ST events (lead changes, reference changes)

The following data is not transferred:

- Waveforms, including ST and CO waveforms
- Split Screen trends
- Arrhythmia events

The order in which the parameters are listed on the display is relative to the destination monitor, not the originating monitor.

Patient demographics have the highest priority in the order of data being transferred. The aperiodic parameters are transferred next, before continuously monitored parameters, for each hour. During a transfer to the monitor, aperiodic data obtained by the receiving monitor after the start of the transfer will have higher priority than the aperiodic data from the module.

Note—If the module is unplugged before a transfer is complete, some data may not be transferred.

With the exception of gas parameters, if a parameter has different units at the source and destination monitors, the data from the source will be converted to the units of the destination.

For gas parameters, there is no unit conversion between volume% and pressure (mmHg/kPa), and vice versa. To transfer gas parameters using a Data Transfer Module, the gas units at the source monitor must match the default units at the destination monitor. So, for example, if the CO₂ units are configured for volume% at the source and for mmHg at the destination, ET_{CO₂} and IM_{CO₂} values will not be transferred.

If the monitor is put in Monitor Standby during a transfer, all processing in the monitor will stop, but the transfer will continue until it has completed, or the module is unplugged. The module keys will be disabled in Monitor Standby. When the monitor comes out of standby, regular updates to the module will continue at a rate of once per minute.

Transfers can occur in both Monitoring and Demo modes. Transfers between modes can only be made from a module in Monitoring Mode to a monitor in Demo mode.

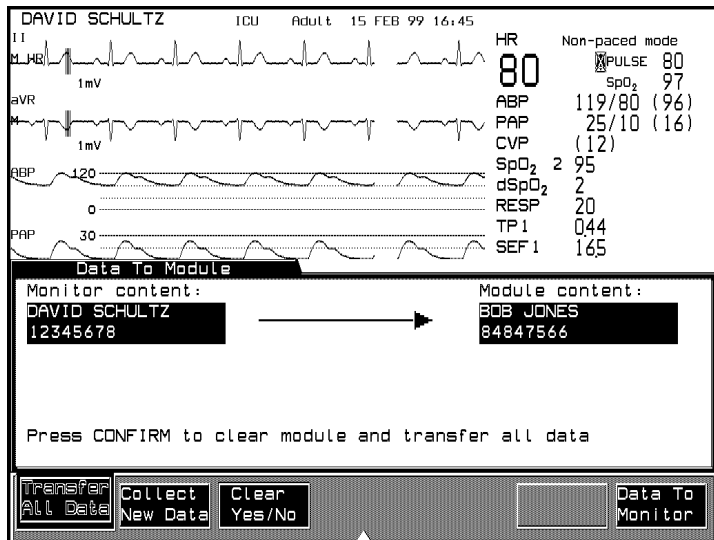
Resampled and other manually entered data is annotated with an asterisk (*) at the destination monitor only if *both* source and destination monitors have software for Release F or higher (CMS) or Release A.0 or higher (Viridia 26/24).

Types of Transfer

There are two types of transfer to the module and one type of transfer to the monitor.

To Module

1. **Transfer All Data** - Any data existing in the module is erased before the transfer begins. After the transfer, updates continue once per minute until they are manually stopped.



Transfer All Data to Module

2. **Collect New Data** - Patient demographics plus all data starting at the current time is transferred to the module.
 - **Clear Yes/No** - Selecting **Yes** erases any data existing in the module before the transfer begins.
 - **Clear Yes/No** - Selecting **No** appends new data to data currently in the module.

Types of Transfer

Updates continue once per minute until the transfer is manually stopped.

DAVID SCHULTZ ICU Adult 15 FEB 99 16:48

HR 80 Non-paced mode
 PULSE 80
 SpO₂ 97
 ABP 119/80 (96)
 PAP 25/10 (16)
 CVP (12)
 SpO₂ 2 95
 dSpO₂ 2
 RESP 20
 TP1 032
 SEF1 165

Combine in Module

Data will be combined and identified under this name in module.

Module	BOB JONES	84847566
Monitor	DAVID SCHULTZ	12345678

Press CONFIRM to start the transfer...

Select Name Data To Monitor

Append New Data to the Module (Patient not matching)

DAVID SCHULTZ ICU Adult 15 FEB 99 16:53

HR 80 Non-paced mode
 PULSE 80
 SpO₂ 97
 ABP 119/80 (96)
 PAP 25/10 (16)
 CVP (12)
 SpO₂ 2 95
 dSpO₂ 2
 RESP 20
 TP1 036
 SEF1 185

Data To Module

Monitor content:	Module content:
DAVID SCHULTZ 12345678	DAVID SCHULTZ 12345678

Clear module before starting:

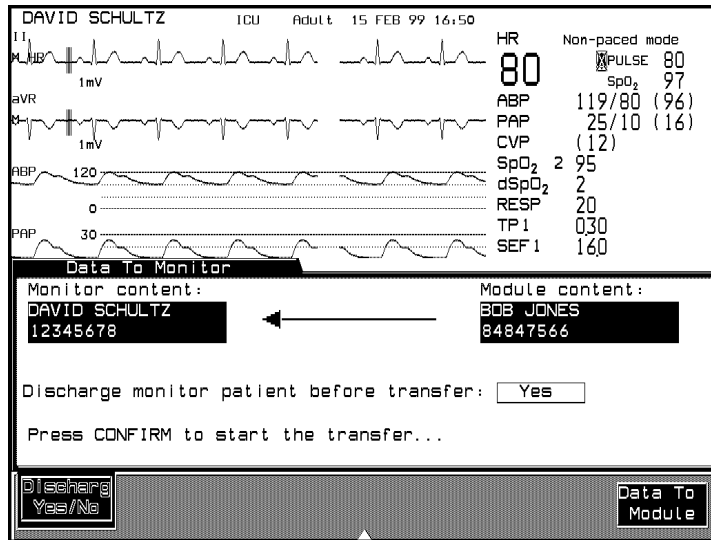
Press CONFIRM to append new data to module

Transfer All Data Collect New Data Clear Yes/No Data To Monitor

Append New Data to the Module (Patient matching)

To Monitor

When a **Data to Monitor** transfer is selected, all the module contents will be transferred to the destination monitor. If patient information exists in the monitor, the message “Discharge monitor patient before transfer?” gives you the option of erasing the previous patient’s data before transferring. After a transfer to the monitor, the module contents are automatically erased.



Transfer Data to the Monitor

Transferring Blood Analysis Data

The transfer of blood analysis data from one monitor to another will vary depending upon the software level of your monitor. Please refer to one of the scenarios on the next pages to transfer blood analysis data.

Identifying the Software Release of your Monitor

To identify the software release of your monitor, press

Monitor Setup → **Monitor Revision** → **Show SW Rev** .

The software release of a Viridia CMS Monitor can be identified in this task window by the suffix of the EPROMpack part number. The software release of a Viridia 26/24 Series Monitor can be identified in this task window by the prefix of the software release name. The following table lists the suffixes and prefixes.

Software Release	Viridia CMS	Viridia 26/24 Series
	EPROMpack part number suffix	Software Release Name Prefix
A	E	n/a
B	F	n/a
C	G, H or I	C
D	K	n/a
E	L or M	E
F	N or P	n/a
G	T or U	n/a
A.0	V	H
B.0	W	K

**Blood Analysis
Data Transfer
Scenarios**

- *Transferring data from a source monitor to a destination monitor where:*
 - *The source monitor is:*
 - *Viridia CMS Release G or later or*
 - *Viridia 26/24 Release A.0 or later*
 - *The destination monitor is:*
 - *Viridia CMS Release E or later or*
 - *Viridia 26/24 Release A.0 or later or*
 - *Viridia 24 Release E*
1. Plug the Data Transfer Module into the rack of the source monitor.
 2. Press the **Module** hardkey on the module and transfer all data to the module.
 3. Remove the module from the source monitor and plug it into the destination monitor.
 4. Press the **Monitor** hardkey on the module and transfer the data to the monitor.

Note—Not all blood analysis results will be presented if the destination monitor is a Viridia CMS Release E or F or a Viridia 24 Release E.

- *Transferring data from a source monitor via a transit monitor to a destination monitor requires special handling if:*
 - *The source monitor **and** the destination monitor are:*
 - *Viridia CMS Release G or later or*
 - *Viridia 26/24 Release A.0 or later*
 - and***
 - *The transit monitor is:*
 - *Viridia CMS Release E or F*
 - *Viridia 24 Release E*
 - *CTS*
1. Plug the Data Transfer Module into the rack of the source monitor.
 2. Press the **Module** hardkey on the module and transfer all data to the module.
 3. Plug the Data Transfer Module into the rack of the transit monitor.
 4. Select **Collect New Data** in the Data to Module task window to collect new data to the module without clearing the module.
 5. Remove the module from the transit monitor and plug it into the destination monitor.
 6. Press the **Monitor** hardkey on the module and transfer the data to the monitor.

Note—With specific configurations, data loss can occur when transferring data to a Viridia 26/24 Release B.0 monitor via the Data Transfer module.

Combining Data

In some situations, the patient name and/or ID in the monitor and module may not match (see Append New Data display on previous page). In other cases, one or both names may be blank. The Data Transfer Combine Task Window enables you to combine files when the demographic data is missing or different.

Time Conversion

Data in a monitor can be stored at either 1-minute or 12-second resolution, depending on the monitor's configuration. Data in a module is stored only at 1-minute resolution. Time conversions are done automatically when the resolutions are different.

When converting data from 12-second to 1-minute resolution (that is, from a monitor to a module), one data sample out of 5 is selected to represent the minute. The sample selected is the one on the minute boundary.

When transferring data from 1-minute to 12-second resolution (from a module to a monitor), one valid sample and 4 blanks will be used for each minute. The valid sample will be placed on the minute boundary.

Database Conversion

Transfers to the Module

A module contains enough memory to store 24 hours of data for 16 parameters at 1 minute resolution. If the data to be transferred does not fit in the module, then the number of hours will be reduced to fit the available memory.

The following table shows the conversion between the monitor and module databases during a transfer to the module.

Database Conversion - Transfers to Module

Monitor Database	What will be Stored in Module
16 param, 24hr, 1 min	16 param, 24 hr, 1 min
16 param, 4 hr, 12 sec	16 param, 4 hr, 1 min
CMS Only:	
16 param, 48 hr, ext 1 min	16 param, 24 hr, 1 min
32 param, 24 hr, ext 1 min	32 param, 12 hr, 1 min
16 param, 9 hr, ext 12 sec	16 param, 9 hr, 1 min
32 param, 4 hr, ext 12 sec	32 param, 4 hr, 1 min

Transfers to the Monitor

The following table shows the mapping for transfers to the monitor when the data in the module has come from a monitor with a different configuration.

Database Conversion - Transfers To Monitor

Module Database	Monitor Configuration	What will be Stored in Monitor
16 param, 24 hr, 1 min	16 param, 24 hr, 1 min	16 param, 24 hr, 1 min
16 param, 24 hr, 1 min	16 param, 48 hr, Ext 1 min	16 param, 24 hr, 1 min
16 param, 24 hr, 1 min	16 param, 4 hr, 12 sec	16 param, 4 hr, 1 min
16 param, 24 hr, 1 min	32 param, 24 hr, Ext 1 min	16 param, 24 hr, 1 min
16 param, 24 hr, 1 min	16 param, 9 hr, Ext 12 sec	16 param, 9 hr, 1 min
16 param, 24 hr, 1 min	32 param, 4 hr, Ext 12 sec	16 param, 4 hr, 1 min
32 param, 12 hr, 1 min	16 param, 24 hr, 1 min	32 param, 12 hr, 1 min
32 param, 12 hr, 1 min	16 param, 48 hr, Ext 1 min	32 param, 12 hr, 1 min

Combining Data

Module Database	Monitor Configuration	What will be Stored in Monitor
32 param, 12 hr, 1 min	16 param, 4 hr, 12 sec	32 param, 12 hr, 1 min
32 param, 12 hr, 1 min	32 param, 24 hr, Ext 1 min	32 param, 12 hr, 1 min
32 param, 12 hr, 1 min	16 param, 9 hr, Ext 12 sec	32 param, 4 hr, 1 min
32 param, 12 hr, 1 min	32 param, 4 hr, Ext 12 sec	32 param, 4 hr, 1 min

Vital Signs, Blood Review and Graphs

Some functions under Trends and Procedures are unavailable during transfers of patient data.

To the Monitor

Vital Signs

Blood Review

Graph Trends

Discharg Patient or

End Case

ST Analysis

To the Module

Discharg Patient or **End Case**

Caution

Transferred data is not entered into the module database until up to one minute after it enters the Viridia system. Because of this delay, during updates to the module, some aperiodic data may not be transferred for up to 2 minutes after the actual time it was obtained.

Time Stamp

Transferred data is identified in Patient Data displays by a “T” placed before the time in the Vital Signs, Graph Trends, and Calculation Review task windows. Transferred data is labeled relative to the time in the destination monitor. The Data Transfer module has a clock which ages the data the exact amount of time which has transpired between when the measurement was obtained and when the data is put into the receiving monitor.

The destination monitor creates the time stamp for transferred data by determining how old each data sample is and subtracting the age of the data from the current monitor time.

Caution

Hemodynamic, oxygenation, and ventilation calculations result values may show slightly different times before and after being transferred, because a different set of valid parameters was used for the calculation at calculation time.

If there is a time change at the destination monitor for data occurring after the transferred data, the "T" will not be overwritten by a "?", the indicator of time change.

Reports

Although transfers to the module and report printing can occur simultaneously, data cannot be transferred to the monitor during the printing of reports. If a transfer to the monitor is initiated during printing, the printing can be suspended for the duration of the transfer through the Data Transfer Task Window; it will continue automatically when the transfer is finished.

Troubleshooting

Caution

In a centrally networked system, if the previous patient is discharged only at the monitor and a new patient's data is transferred to the monitor, the new patient's name and ID will be overwritten by the central station's broadcast of the previous patient's name. To prevent this situation from occurring, the previous patient should be discharged from central **before** the transfer.

The following table outlines the Data Transfer behavior under various events.

Event	Results
Power Off < 1 min	Transfer will restart automatically
Power Off > 1 min	Transfer is stopped. Collection of new data must be restarted manually.
Op. Mode Change	Transfer is stopped. Data in module remains intact.
Config Mode Change	Transfer is stopped. Data in module remains intact.
Patient Discharge or End Case	Transfer is stopped. Data in monitor is deleted. Data in module remains intact.

Performance Specifications

For safety and environmental specifications, please refer to Chapter 11, “Monitor Installation and Patient Safety”.

Data Transfer Module

Transfer Time

A typical transfer time for 24 hours of data is under 30 seconds. The transfer time could be as high as 60 seconds for highly customized trends.

Back up Memory Time

The Data Transfer Module will store data for a minimum of 1 hour under the following conditions:

- the module is out of the monitor,
- the module is in the rack of a powered Off monitor,
- the monitor has a power failure.

Monitor Installation and Patient Safety

This chapter contains important information on the installation requirements for the monitor. It includes the following sections:

- Introduction 11-2
- Installation Information 11-5
- The Front Panel of the M1046A Computer Module . . . 11-17
- The Front Panel of the M1046B Computer Module . . . 11-19
- The Rear Panel of the M1046A/B Computer Modules . 11-21
- The Rear Panel of the Display Modules 11-23
- The Rear Panel of the M1109A External Alarm Device 11-29
- The Rear Panel of the M1026A Anesthetic Gas Module 11-30
- The V24 and V26 Monitor Connectors 11-34
- Accessories and Ordering Information. 11-37

Introduction

This section contains important information on patient safety and installation requirements for the:

- Agilent CMS
- Agilent ACMS
- Agilent NCMS
- Agilent M1026A Anesthetic Gas Module
- Agilent V24 and V26

The M1165/66/75/76A Systems are designed to comply with the following international safety requirements for medical electrical equipment:

- UL 544
- CSA 22.2-125
- IEC/EN 60601-1
- EN 60601-1-2

The M1167/77A Systems and the M1026A Anesthetic Gas Module are designed to comply with the following international safety requirements for medical electrical equipment:

- UL 2601-1
- CSA 22.2 No. 601.1-M90
- IEC/EN 60601-1
- EN 60601-1-2
- JIS T 1001-1992
- JIS T 1002-1992

The M1205A V24 and V26 monitors and compatible modules and accessories are designed to comply with the following international safety requirements for medical electrical equipment:

- UL 2601-1
- CSA C22.2 No. 601-1
- IEC 601-1
- IEC 601-1-1

Classification (IEC 601-1): Class 1, type CF, continuous operation.

IP20 indicates ordinary protection against the ingress of liquids.

Note—If you have the M1205A option 020, 022, 024, or 025 versions of the Agilent V24 and V26, refer to the Declaration of Conformity (DOC) for a complete list of international safety requirements for medical electrical equipment.

The patient leakage current is less than 10 μ A. All systems and the Anesthetic Gas Module have floating inputs and are protected against the effects of defibrillation and electrosurgery.



This symbol appears next to certain connectors located on the front and/or rear of the instrument. It indicates that the connectors are designed to have special protection against electric shocks and are defibrillator proof.

Warning

Do not touch the patient, table or instruments during defibrillation.

Caution

If liquid is spilt on the equipment or accessories, contact your biomedical engineering department or the Agilent Service Engineer.

Installation Information

Power Source Requirements

The Agilent CMS systems and the Anesthetic Gas Module can be operated from an AC source of 100 - 120V \pm 10%, or 220 - 240V \pm 10%, 50 - 60Hz.

Typical input currents for the monochrome and color systems are:

Monochrome CRT 100 - 120V = 2.2 amps
 200 - 240V = 1.2 amps

Color CRT 100 - 120V = 2.6 amps
 200 - 240V = 1.4 amps

Color Flatscreen 110 - 120V = 2.0 amps
 200 - 240V = 1.0 amps

Typical input current for the Anesthetic Gas Module is:

100 - 240V = 1.0 amps

Typical input current for the V24 and V26 monitors is:

90 - 250V = 150VA

Grounding the System

To protect the patient and hospital personnel, the cabinet of the installed equipment has to be grounded. The equipment is supplied with a detachable 3-wire cable which grounds the instrument to the power line ground (protective earth) when plugged into an appropriate 3-wire receptacle. If a 3-wire receptacle is not available, consult the hospital electrician.

Warning

Do not use a 3-wire to 2-wire adapter.

Installation Information

If the computer and display module of the M1165/66/75/76A Systems and the Anesthetic Gas Module are set up together, connect the grounding wire to the equipotential grounding terminal on the display.

If the computer and display module of the M1165/66/75/76A Systems and the Anesthetic Gas Module are separated, connect one grounding wire to the display, one to the computer module and one to the Anesthetic Gas Module.

**Equipotential
Grounding**

Protection class 1 instruments are already included in the protective grounding (protective earth) system of the room by way of grounding contacts in the power plug. For internal examinations on the heart or the brain, Computer Module and Display Module of the system and the Anesthetic Gas Module must have separate connections to the equipotential grounding system.

One end of the equipotential grounding cable (potential equalization conductor) is connected to the equipotential grounding terminal on the instrument's rear panel and the other end to one point of the equipotential grounding system. The equipotential grounding system assumes the safety function of the protective grounding conductor if ever there is a break in the protective grounding system.

To protect the patient and hospital personnel, the cabinet of the installed equipment has to be grounded. The equipment is supplied with a detachable 3-wire cable which grounds the instrument to the power line ground (protective earth) when plugged into an appropriate 3-wire receptacle. If a 3-wire receptacle is not available, consult the hospital electrician.

Warning

Do not use a 3-wire to 2-wire adapter with these instruments

If the computer and display module of the M1165/66/75/76A Systems and the Anesthetic Gas Module are set up together, connect the grounding wire to the equipotential grounding terminal on the display.

**Safety Ground
(Protective
Earth)**
(V24 and V26
only)

Additional Protective Earth (Secondary Ground Wire) Hazardous leakage currents can be caused when other equipment is interconnected with either monitor.

A secondary ground wire is provided with the Agilent CMS, V24 and V26 instruments to comply with IEC 601-1-1. This additional protection ensures against excessive chassis leakage current in the event of a single fault in the health care facility's primary grounding means.

It is recommended that the secondary ground wire be connected to a ground source separate from the primary grounding source found in the instruments' power source.


This cord should be permanently attached to either monitor mainframe rear panel attachment screw.

Check each time before use that the monitor is in perfect working order. The cable connecting the patient to the instrument must be free of electrolyte.

Combining Equipment

If it is not evident from the instrument specifications whether a particular instrument combination is hazardous or not, for example due to summation of leakage currents, the user should consult the manufacturers concerned or else an expert in the field, to ensure that the necessary safety of all instruments concerned will not be impaired by the proposed combination.

Warning

- **Any combination of the Agilent M1165/66/67/75/76/77A CMS or the Agilent M1205A V24 and V26 with non-medical equipment must comply with IEC 601-1-1. The monitor must be properly grounded, or the non-medical device (e.g. a printer or an ITE display) properly isolated. Isolation may be achieved by powering the non-medical device through a safety isolation transformer. This must be done in order to prevent the possibility of an electrical shock hazard (to the user and or patient) from excessive ground leakage currents from the non-medical device such as a printer.**
 - **V24 and V26 only:** In normal AC line operation grounding the monitor is accomplished by ensuring that the AC line cord is connected from the monitor to a properly grounded AC receptacle. When the Agilent V24CT/V26CT is operated in battery mode, the possibility of an electrical shock hazard is especially prevalent. Alternatively and additionally, proper grounding may be achieved by attaching a safety grounded wire to the threaded safety ground (protective earth) stud  found on the rear of the monitor.
-
-

Environment

To ensure a completely safe electrical installation, follow the instructions described later in this section. The environment where the system will be used should be reasonably free from vibration, dust, corrosive or explosive gases, extremes of temperature, humidity, and so on.

For a cabinet mounted installation, allow sufficient room at the front for operation and sufficient room at the rear for servicing with the cabinet access door open.

Approximately 15 minutes after switch-on, the Component Monitoring System and the Anesthetic Gas Module operate within specifications at ambient temperatures shown in the tables below. These specifications do not apply to the plug-in modules; they are specified for different ambient temperatures.

Ambient temperatures that exceed these limits could affect the accuracy of these instruments and cause damage to the components and circuits. Allow at least 2 inches (5cm) clearance around the instruments for proper air circulation.

Refer to the tables below for a summary of the environmental specifications of the different system combinations:

Agilent M1167/77A CMS for Critical, Anesthesia and Neonatal Care

	Operating	Storage
Temperature Range	5 to 45°C (41 to 113°F)	-20 to 60°C (-4 to 140°F)
Humidity	up to 95% RH at 40°C (104°F)	up to 85% RH at 50°C (122°F)
Altitude Range	up to 4,600m (15,000 ft)	up to 4,600m (15,000 ft)

Agilent M1165/66/75/76A CMS for Critical, Anesthesia and Neonatal Care

	Operating	Storage
Temperature Range	0 to 45°C (32 to 113°F)	-40 to 70°C (-40 to 158°F)
Humidity	up to 95% RH at 40°C (104°F)	up to 95% RH at 65°C (149°F)
Altitude Range	up to 4,600m (15,000 ft)	up to 15,300m (50,000 ft)

Agilent ACMS with Anesthetic Gas Module

	Operating	Storage
Temperature Range	15 to 40°C (59 to 104°F)	-40 to 65°C (-40 to 149°F)
Humidity	up to 95% RH at 40°C (104°F)	up to 95% RH at 65°C (149°F)
Altitude Range	up to 3,048m (10,000 ft)	up to 15,300m (50,000 ft)

Agilent M1205A V24, V26, V24C, V26C

	Operating	Storage
Temperature Range	5 to 40°C (41 to 104°F)	-20 to 60°C (4 to 140°F)
Humidity	up to 95% RH at 40°C (104°F)	up to 90% RH at 60°C (140°F)
Altitude Range	up to 4,600m (15,000 ft)	up to 4,600m (15,000 ft)

Agilent M1205A V24CT and V26CT

	Operating	Storage
Temperature Range	5 to 35°C (41 to 95°F)	-15 to 40°C (5 to 104°F)
Humidity	up to 95% RH at 35°C (95°F)	up to 90% RH at 40°C (104°F)
Altitude Range	up to 4,600m (15,000 ft)	up to 4,600m (15,000 ft)

**Conden-
sation**

Make sure that during operation, the instruments are free of condensation. Condensation can form when equipment is moved from one building to another, thus being exposed to moisture and differences in temperature.












Warning










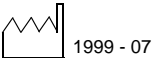
Possible explosion hazard if used in the presence of flammable anesthetics.

Warning

Do not use cellular phones in the vicinity of the system. Cellular phones may generate excessive radiated fields which can disturb the specified function of the system.

Explanation of Symbols used

	Attention: Consult accompanying documents.
	This symbol appears next to certain connectors located on the front and/or rear of the instrument. It indicates that the connectors are designed to have special protection against electric shocks and are defibrillator proof.
	An electrical output. This symbol is also used to indicate the gas output on the ssCO ₂ module and the Anesthetic Gas Module.
	An electrical input (for example video input) and 60V dc. This symbol is also used for the gas input to the Anesthetic Gas Module.
	Equipotential grounding system.
	Data out
	Data in
	RS232 input.
	Fuse.
	Off/Standby.
	On.

	<p>Switch position is on/off.</p>
	<p>Contrast.</p>
	<p>Alternating current.</p>
	<p>Protective earth</p>
	<p>Contains parts to be recycled</p>
	<p>Contains parts which may not be put into the normal waste disposal but must be recycled or dealt with as chemical waste.</p>
	<p>Altitude or atmospheric pressure</p>
	<p>Temperature</p>
	<p>Humidity</p>
	<p>This symbol identifies the date of manufacture. The date format is Year - Month, e.g. 1999 -07</p>

Maintenance Checks

Before commencing monitoring on a patient, carry out the following checks on the system:

- Check for any mechanical damage
- Check all the external leads, plug-ins and accessories
- Check all the functions of the instrument which will be needed to monitor the patient, and ensure that the instrument is in good working order.

Do not use the system for any monitoring procedure on a patient if you identify features which demonstrate impaired functioning of the instrument. Contact the hospital biomedical engineer or the Agilent Service Engineer.

Maintenance	Frequency	Source of Information
Full performance checks including safety checks.	At least once a year, after any repairs or as needed.	See "Testing and Maintaining the Agilent CMS" in the CMS Service Guide" or "Testing and Maintaining the Agilent V24 and V26" in the V24 and V26 Service Guide.
Synchronization of the monitor and defibrillator.	At least once a year, after any repairs or as needed.	See the Agilent M1722/3/4A Codemaster XL/XL+/XE Defibrillator Service Guide.
Functional testing procedure.	At least once a year, after any repairs or as needed.	See "Testing and Maintaining the Agilent CMS" in the CMS Service Guide" or "Testing and Maintaining the Agilent V24 and V26" in the V24 and V26 Service Guide.

Maintenance	Frequency	Source of Information
Electrical Safety Tests	At least once a year, after system installation, after any repairs or as needed.	See "Testing and Maintaining the Agilent CMS" in the CMS Service Guide" or "Testing and Maintaining the Agilent V24 and V26" in the V24 and V26 Service Guide.
Testing of all cables and cords.	Daily.	See "Testing and Maintaining the Agilent CMS" in the CMS Service Guide" or "Testing and Maintaining the Agilent V24 and V26" in the V24 and V26 Service Guide.
Calibration of the measurement modules where appropriate (For EU/EFTA countries only)	Every 2 years.	See individual module chapters in Volume 2 of this manual for details.
User Tests	Module dependent. Please refer to chapter 13 "Maintenance" of this manual or chapter 3 of the CMS Service Guide "Maintaining the Agilent CMS" for details.	See chapter 13 "Maintenance" of this manual for details.

This recommendation does not supersede any local procedures or legal requirements.

Patient Cables and Leads

Inspect the patient cables and leads and their strain reliefs for general condition. Examine cables carefully to detect breaks in the insulation and to ensure that they are gripped securely in the connectors of each end to prevent rotation or other strain.

To ensure operation of the Anesthetic Gas Module within specified limits:

- calibrate the Anesthetic Gas Module at least once every 12 months, or whenever the validity of the readings is in doubt.
- check the ventilator fan in the Anesthetic Gas Module for proper operation every 6 months.

All checks which require the instrument to be opened must be made by qualified hospital service personnel. Safety and maintenance checks can also be made by Agilent personnel.

Warning

Failure on the part of the responsible individual hospital or institution employing the use of this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

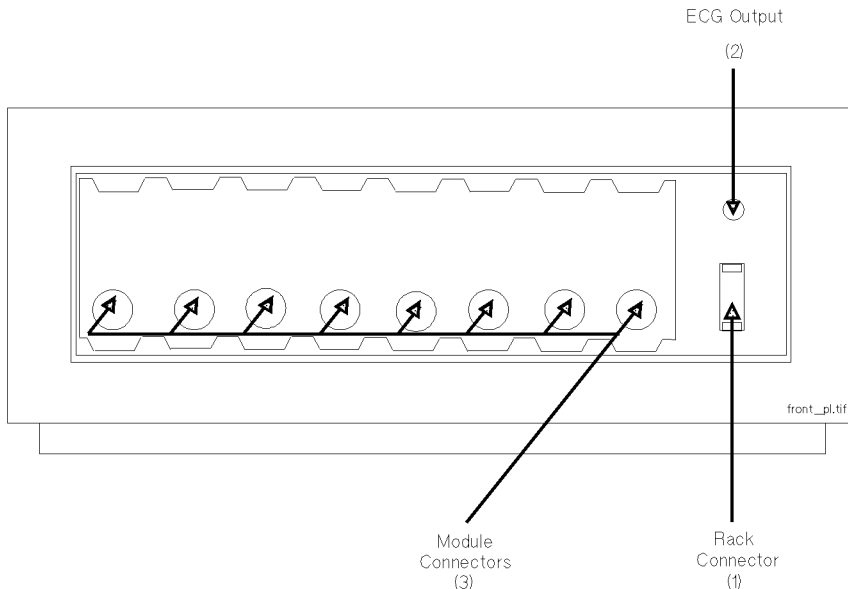
Controls and Connectors

This section describes the various controls and connectors on the front and/or rear panels of:

- the Computer Modules
- the Display Modules
- the External Alarm Device
- the Anesthetic Gas Module
- the V24 and V26 Monitors

The Front Panel of the M1046A Computer Module

The M1046A Computer Module is a component of the M1165A/66A/75A/76A Systems. The front of the M1046A Computer Module can be mounted with an integral plug-in module rack or a blank rack. The connectors on the front panel of the M1046A Computer Module are shown in the following diagram:



Maximum Voltages

(1) Rack Connector	60 V
(2) ECG Output	3.2 V p-p
(3) Module Connectors	60 V

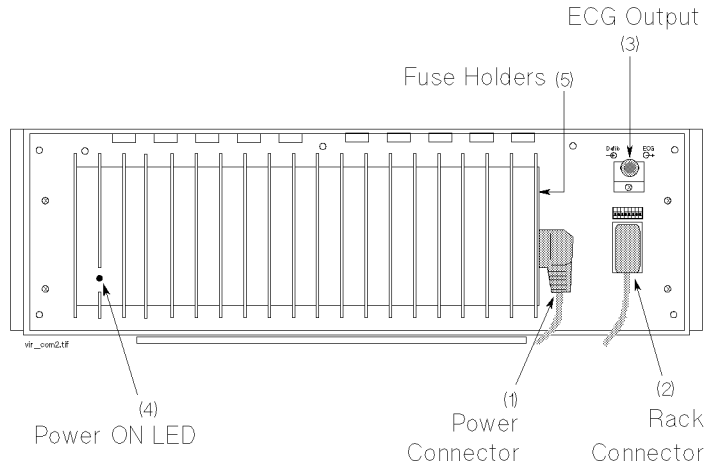
Connectors of the M1046A Computer Module

The connectors on the front panel of the computer module are:

1. Rack Connector; female interface connector used to connect a satellite rack to the computer module.
2. ECG Output; used to output an ECG wave to synchronize a defibrillator and provide an input for the defibrillator marker signal.
3. Plug-in Module Connectors; female plug-in module connectors, used to input the information from the plug-in modules to the integral rack.

The Front Panel of the M1046B Computer Module

The M1046B Computer Module is a component of the M1167A/77A System. The M1046B has a detachable front panel which must be removed to view the connectors (except for the ECG Output connector, which is also visible when the front panel is attached). The connectors on the front panel of the M1046B Computer Module are shown in the following diagram:



Maximum Voltages

Rack Connector	60 V
ECG Output	3.2 V p-p

**Connectors of
the M1046B
Computer
Module**

The connectors on the front panel of the computer module are:

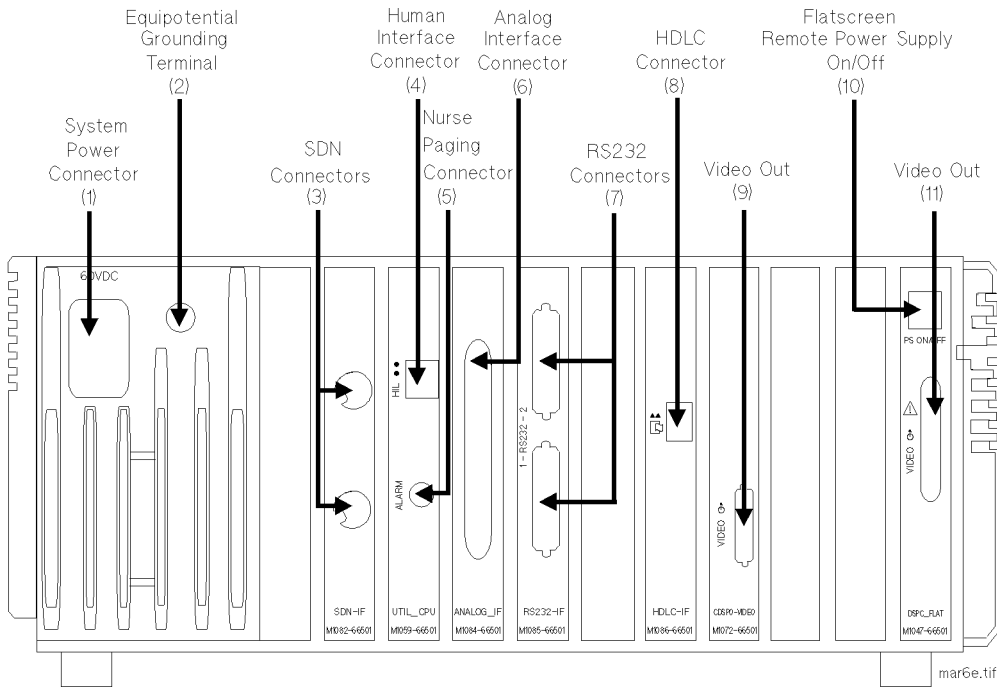
1. Local Power Connector; a 3-pin, 90° connector is used to input the local line voltage.
2. Rack Connector; female interface connector used to connect a satellite rack to the computer module.
3. ECG Output; used to output an ECG wave to synchronize a defibrillator and provide an input for the defibrillator marker signal.
4. Power-on LED.
5. Two fuse holders for the line protection fuses:

for 200 - 240V 3.15 amps 250V

for 100 - 120V 3.15 amps 250V

The Rear Panel of the M1046A/B Computer Modules

The rear panel of the M1046A and M1046B computer modules has several connectors. The connectors, and their position, depends upon which function cards are fitted; as the rear panel is made up of small panels that are attached to certain function cards. A typical computer module rear panel is shown below.



Maximum Voltages

System Power Connector	60 V
SDN Connectors	5 V
Human Interface Connector	12 V
Nurse Paging Connector	24 V

Maximum Voltages

RS232 Connectors	±12 V
HDLC Connector	5 V
Video Out (9)	5 V
Flatscreen Remote Power Supply On/Off	15 V
Video Out (11)	60 V

Note—Do not apply a voltage of more than ±12V to any of these outputs.

The connectors on the rear panel of the computer module (together with their connecting function cards) are:

1. System Power Connector; on the M1046A Computer Module, this is a connector used to input the 60V dc power supply from the CRT display module. It is not for use on the M1046B Computer Module but is instead fitted with a stub connector.
2. Equipotential Grounding Terminal; this is used to connect the computer module to the hospital's grounding system.
3. Agilent Network Connectors (Agilent Network Interface); these are Agilent Network connectors, used to input/output information to/from an Agilent Network.
4. Human Interface Connector (Utility CPU); this is an Agilent HIL connector, used to input information from the keypad in the display module.
5. Nurse Paging Relay output; this is a mini-phone jack, used to connect to the hospital's Nurse Paging System.
6. Analog Interface Connector; a 37-pin "D" type connector is used to output information to analog devices.
7. RS232 Connectors (RS232 Interface); these are 25-pin "D" type connectors, used to output information to printers or computers,

(or receive inputs from the Ohmeda 7800/7810 Ventilator or the Anesthetic Gas Module).

Warning

Make sure all devices connected to the RS232 connectors are isolated. Consult your biomedical engineer, who will verify this for you.

8. HDLC Connector; this is used to connect to a STRIP recorder (such as the Agilent M1117A).
9. Video Out Connector (CDSPC-Video or DSPC); this is a connector used to output information to be displayed on the display module.
10. PS ON/OFF connector (DSPC_FLAT); this is left open.
11. Video Out Connector (Flatscreen); this is a connector used to output information to be displayed on the Flatscreen Display Module and also to output 60V DC to the Flatscreen Display Module.

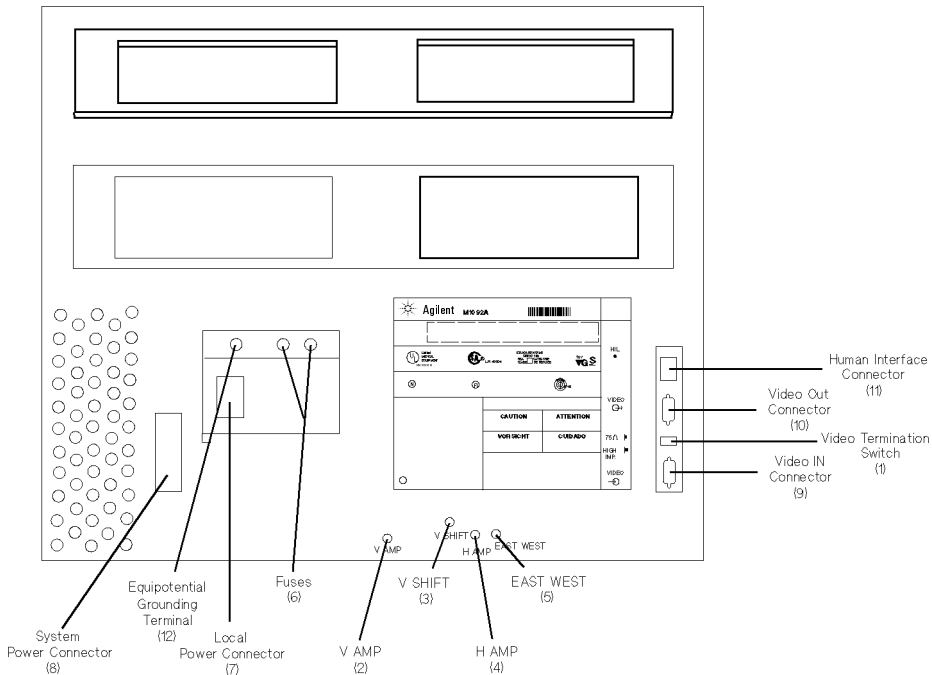
The Rear Panel of the Display Modules

The system can have one of the following displays:

- the M1092A Monochrome display
- the M1094A Color display
- the M1094B Color display
- the M1095A Flatscreen Color display

The rear panel of each display module is shown below. The back of the display module should only be removed by **qualified service personnel**

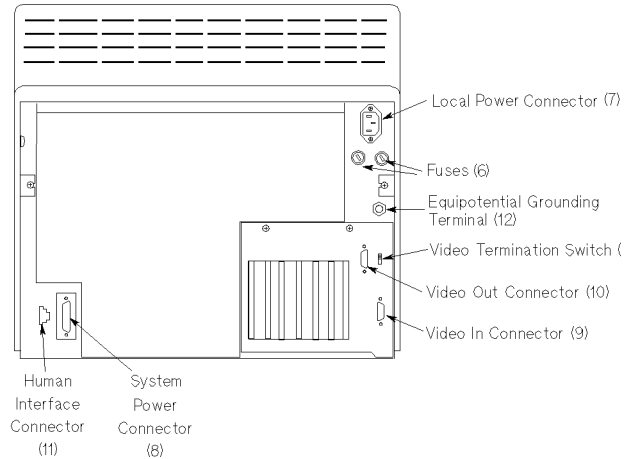
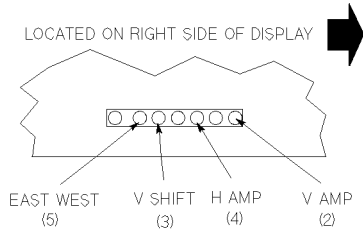
M1092A/M1094A Display Module.



Maximum Voltages

System Power Connector	60 V
Local Power Connector	240 V
Human Interface Connector	12 V
Video Out Connector	5 V
Video In Connector	5 V

M1094B DisplayModule



Maximum Voltages

System Power Connector	60 V
Human Interface Connector	12 V
Local Power Connector	240 V
Video Out Connector	5 V
Video In Connector	5 V

Controls of the M1092A, M1094A and M1094B Displays

1. Video Termination Switch; this switch is used to terminate the video signal at this display; this must be switched to the "75Ω" position if only a master display is used and must be switched to the "HIGH IMP." position if a second, duplicate display is used.

2. V AMP; this is the vertical amplitude control used to adjust the height of the displayed video.
3. V SHIFT; this is the vertical shift control used to adjust the vertical position of the displayed video.
4. H AMP; this is the horizontal amplitude control used to adjust the width of the displayed video.
5. EAST WEST; this control is used to adjust the pin-cushion effect of the displayed video.

Connectors of the M1092A, M1094A and M1094B Displays

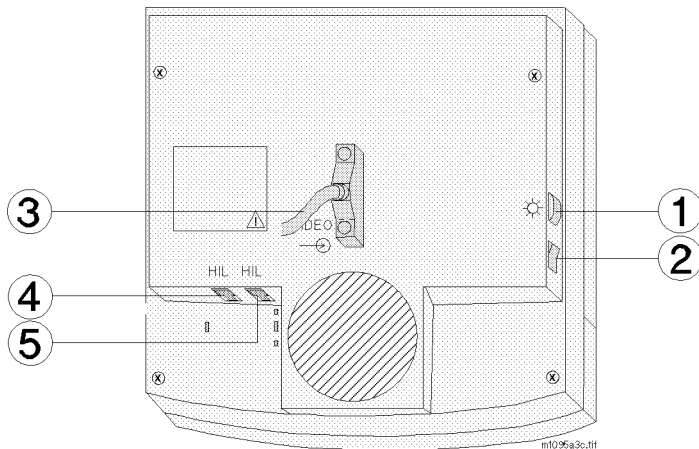
1. There are two fuse holders for the line protection fuses. The fuses depend on the type of monitor and the power supply as summarized below:

200-240V M1094A color monitor	2.5A 250V
200-240V M1094B color monitor	3.15A 250V
200-240V monochrome monitor	2A 250V
100-120V color or monochrome monitor	4A 125V (Slow-Blow)

2. Local Power Connector; a 3-pin connector is used to input the local line voltage.
3. System Power Connector; a 15-pin "D" type connector is used to output 60V DC (100W max) to a similar connector on the DC/DC converter in the rear of the computer module.
4. Video In Connector; a 9-pin "D" type connector is used to input the video signal to be displayed from the display controller in the computer module (DSPC for monochrome or CDSPC-Video for color).
5. Video Out Connector; a 9-pin "D" type connector is used to output the video signal to be displayed on a duplicate display.

6. **Human Interface Link Connector**; this is a Agilent HIL connector, used to output the information from the keypad and control panel to the Utility CPU function card in the computer module.
7. **Equipotential Grounding Terminal**; this is a grounding stud connector, used to connect the system to an equipotential grounding system.

M1095A Display Module



Controls of the M1095A Display

1. Brightness Control
2. Standby Switch

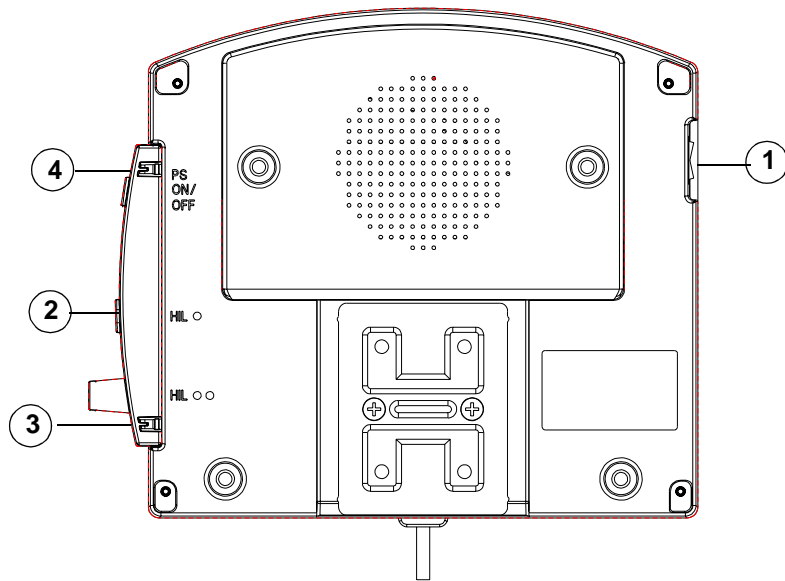
Connectors of the M1095A Display

3. Combined Video In / Power Connector; a male SCSI connector with 25 pin pairs is used to input the video signal and the 60 V dc line voltage.
4. Human Interface Link Connector In; this is an Agilent HIL connector used to connect the handheld keypad.
5. Human Interface Link Connector Out; this is an Agilent HIL connector used to output the information from the keypad and control panel to the Utility CPU function card in the computer module.

Note—The HIL connector cover must be closed when the two HIL connectors are connected.

The Rear Panel of the M1109A External Alarm Device

M1109A External Alarm Device



Controls and Connectors of the M1109A External Alarm Device

1. Standby Switch
2. Human Interface Link Connector Out; this is an Agilent HIL connector used to output the information from the handheld keypad to the Utility CPU function card in the computer module.
3. Human Interface Link Connector In; this is an Agilent HIL connector used to connect the handheld keypad.
4. Power on/off cable; this connects to the XGA Display Controller Board C'DSPC'XGA in the M1046B Computer Module.

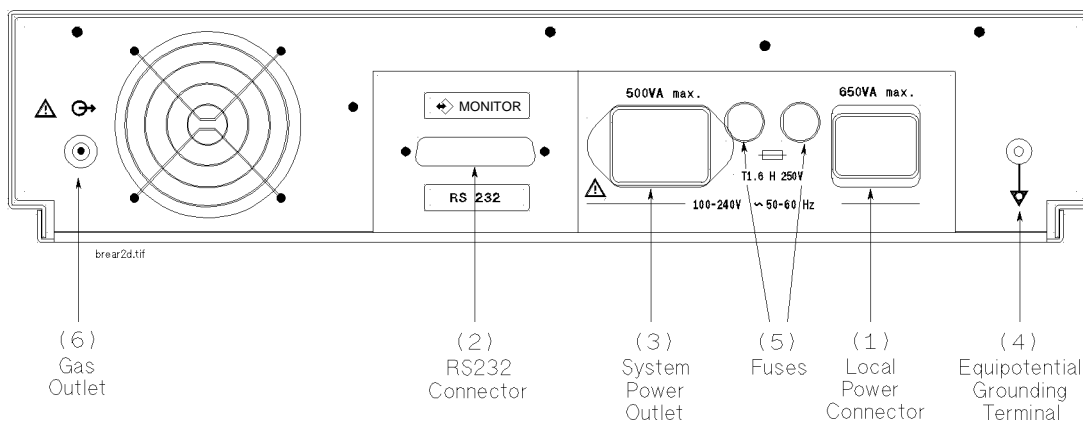
Notes—

- The connector cover must be put back on after all cables have been connected
- The External Alarm Device should be mounted for maximum visibility of the alarm indicators on the front. The device should not be mounted directly against a wall in order to ensure that the alarm

loudspeaker is not covered and can be heard. The most suitable location for the External Alarm Device is in close proximity to the ITE display.

The Rear Panel of the M1026A Anesthetic Gas Module

The connections on the rear panel of the Anesthetic Gas Module are shown in the following diagram:



The rear of the Anesthetic Gas Module has the following connections:

1. Local Power connector; a 3-pin connector is used to input the local line voltage.
2. RS232 Connector (RS232 Interface); a 25-pin "D" type connector is used for connection to the Anesthesia Component Monitoring System.

Note—Do not apply a voltage greater than $\pm 12V$ to the RS232 connections.

3. System Power Outlet (restricted use); this can be used to output power to the Agilent M1165A/66A/75A/76A ACMS.

Caution

- The System Power Outlet cannot be used to output power to other devices such as the Agilent M1167A/77A ACMS.
 - The System Power Outlet can only be used to supply power to the Agilent ACMS when the total leakage current does not exceed 300 μA .
-

4. Equipotential Grounding Terminal; this is used to connect the Anesthetic Gas Module to the hospital's grounding system.
5. Line protection fuses, T1.6 H 250V.
6. Anesthetic Gas Exhaust.

Caution

Make sure that the anesthetic gas exhaust at the rear of the module is connected to the gas extraction system. If it is not, contact your biomedical engineer in order to make this connection.

The module can be operated from an ac power source of 100 - 240 V \pm 10%, 50/60Hz.

The adjustment is made automatically by the power supply inside the module.

Assembling the System

The Systems consist of the following separate parts:

- The Display Module (with control panel)
- The Parameter Modules (with parameter racks)
- The Computer Module
- The Anesthetic Gas Module (optional)

If the system (display module and computer module) was delivered as an *unpacked shipment*, the assembly procedure below does not apply.

M1167/77A System The display module (M1095A) cannot be attached to the computer module (M1046B). It is designed for mounting on a horizontal or vertical rail such as an I.V. pole. For further details, please refer to the Agilent CMS Service Guide, chapter 2; *Installing Agilent CMS*.

The computer module can be attached to the top or bottom of the Anesthetic Gas Module by a locking device. This is a lever which is operated from the rear of the monitor, and is attached to the bottom of both pieces of equipment.

To **assemble** the computer module and Anesthetic Gas Module:

- Ensure that the locking lever is in the far right position.
- Place the Anesthetic Gas Module onto the computer module, ensuring that its four feet are in their correct grooves.
- Push the locking lever from right to far left. The equipment is now secure.

To **dismantle** the computer module and Anesthetic Gas Module:

- Push the locking lever from left to far right.
- Lift the Anesthetic Gas Module off the computer module.

M1165/66/75/76A System The display module (M1094B/92A) can be attached to the computer module (M1046A) by a locking device. This is a lever which is operated from the rear of the monitor, and is attached to the bottom of the display module.

To **assemble** the computer module and display module:

- Ensure that the locking lever is in the far right position.
- Place the display module onto the computer module, ensuring that its four feet are in their correct grooves.
- Push the locking lever from right to far left. The equipment is now secure.

To **dismantle** the computer module and display module:

- Push the locking lever from left to far right.
- Lift the display module off the computer module.

Lifting the Display Module

The M1092A display module weighs 26 lbs (12kgs)

The M1094A display module weighs 42 lbs (19kgs)

The M1094B display module weighs 43 lbs (19.5kgs)

When carrying the display module, hold it firmly from underneath. For safety reasons it is **strongly recommended** that at least two people should lift the display unit. One person on their own should not attempt to do so.

Connecting the Anesthetic Gas Module

Caution

If the Anesthetic Gas Module has been stored at sub-zero temperatures, it must be left to warm up for a minimum of 4 hours at room temperature, before any connection is made to it.

The Anesthetic Gas Module connects to the Agilent ACMS over an RS232 cable to the Computer Module.

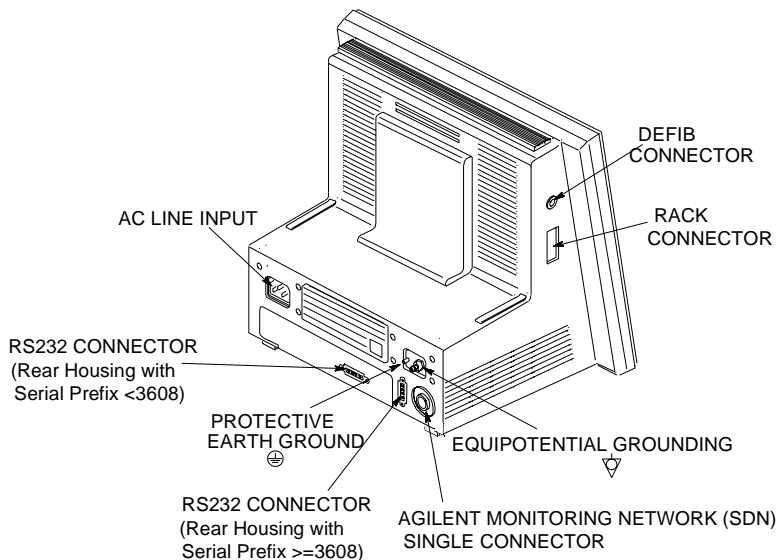
Disposal of the System

When the system has reached the end of its useful life, it should be disposed of in accordance with local regulations for disposal of electronic equipment. Plastic parts (the housing for the display, modules and computer module) and sheet metal parts (the rear, top and bottom of the computer module) can be recycled.

Note—The FIO₂ module (M1017A) and the Blood Analysis Module (M1022A) contain a Nickel-Cadmium battery, to be disposed of in accordance with local requirements.

The V24 and V26 Monitor Connectors

The monitor has several connectors which are shown below.



Do not apply a voltage of more than $\pm 12V$ to any of the pins on the defibrillator sync, parameter module rack, Agilent monitoring network (SDN) or equipotential ground connectors.

The secondary ground complies with IEC 601-1-1 as shown on page 10-4.

The connectors on the monitor are:

1. AC Power Connector; this connector is used to connect the monitor to an AC power source.

Note—If you have an Agilent M1026A Anesthetic Gas Module (AGM), do not daisy-chain the AC power through the AGM. This configuration may degrade RFI performance.

2. Secondary Ground Screw; this is a posidrive screw to connect the monitor chassis to earth ground per IEC 601-1-1 standard.
3. Equipotential Ground Post, this connects the monitor to the equipotential ground system.

4. Agilent Monitoring Network Connector (SDN Interface); this is a proprietary Agilent system connector, used to input/output information to an Agilent patient care system network.

Warning

Connecting the Agilent monitoring network (SDN) cable when the product is powered on is not supported. Error codes and Agilent monitoring network (SDN) interface lock-up may occur. Power cycling the product will recover the product. No permanent damage will result. To prevent unintentional disruption in monitoring, be sure the SDN interface cable is properly secured at both ends when connecting to the Agilent monitoring network (SDN).

5. Parameter Module Rack Connector; this connects the parameter module rack to the monitor.
6. Defibrillator sync connector; sends an ECG signal out to a defibrillator or other external device or receives a marker pulse from a defibrillator or other external device. The marker pulse is processed with the ECG signal and displayed on the monitor.

Note—To filter radiated emissions, a core shielding bead (Agilent P/N 9170-1521) must be attached to the defibrillator synchronization cable when a defibrillator is connected to the monitor. This filter has no impact on the function of the monitor. To attach the core shielding bead:

- a. Open the core shielding bead (filter).
- b. Place the bead around the defib sync cable as close to the jack as possible.
- c. Close the bead over the cable and snap shut.
- d. Plug the cable into the monitor's defib sync port. The bead should be at the monitor end of the cable.

Assembling the V24 and V26 monitor

The monitors consist of two individual parts.

1. One of two types of Display Modules, depending on the particular model monitor you have— either:
 - a. A monochrome display with control panel supporting the Agilent V24, or
 - b. A color flat panel display with control panel supporting the Agilent Models V24C, V24CT, V26C and V26CT
2. The Rack with Parameter Modules

To **assemble** the display module and parameter rack:

- Connect the parameter module rack with the front end cable to the connector on the left side of the display module.
- You now have an electrical connection from the rack to the display module and will see monitoring displays.

Lifting the Display Module

The Agilent Models V24, V24C and V26C display module weighs 11.3 lbs (5.1 kg). The Agilent Models V24CT and V26CT display module weight 14.8 lbs (6.7 kg) without batteries and 16.9 lbs (7.7 kg) with batteries. Use the monitor's handle when lifting or carrying the monitor. You may need to support the bottom of the monitor with your other hand.

Caution

If the monitor falls or is dropped, check the Agilent V24 monochrome or the Agilent Model V24C/V24CT/V26C/V26CT color display for any cracks. If the display is broken contact your biomedical department or local state environmental personnel for proper disposal.

Note—At this time, Agilent Technologies will make available on request, and in English only, such circuit diagrams, component part lists, descriptions, calibration instructions or other information which will assist the user's appropriate qualified technical personnel to repair those parts of the equipment which are classified by Agilent Technologies to be repairable.

Accessories and Ordering Information

M1276A	Six Slot Satellite Rack
M1041A	Eight Slot Satellite Rack
8120-5236	Four Meter Satellite Rack Cable
78599AI-#J03	0.91 m (3 ft.) Local Distribution Cable
78599AI-#J06	1.8 m (6 ft.) Local Distribution Cable
78599AI-#J10	3.0 m (10 ft.) Local Distribution Cable
78599AI-#J20	6.1 m (20 ft.) Local Distribution Cable
M1181-61625	Defibrillator Sync Cable
40488A	12 Volt Lead-Acid Batteries
M1278A	Battery Charger

Check the parameter module sections of this manual for specific parameter module accessories.

Battery Information (Agilent V24 and V26 only)

The Agilent Models V24CT and V26CT can be operated on AC line or DC battery power. This chapter provides information on battery power. It includes the following sections:

- AC and DC (Battery) Operation 12-2
- Battery Indicator and Messages 12-6
- External Battery Charger 12-8
- Battery Care and Maintenance 12-9
- Accessories and Ordering Information. 12-11

AC and DC (Battery) Operation

You should only use Agilent 40488A 12 Volt 2.3 Amp-hour sealed lead-acid batteries obtained from Agilent Technologies for use with the Agilent M1205A V24CT. Use of other camcorder-type batteries could result in inaccurate estimates of battery capacity remaining or in shorter battery life.

Warning

When connecting a non-medical device such as a printer to the RS-232 Interface of V24CT, the monitor must be properly grounded, or the non-medical device properly isolated. This must be done in order to prevent the possibility of an electrical shock hazard (to the user and or patient) from excessive ground leakage currents from the non-medical device such as a printer, and to maintain compliance with IEC 601-1-1 where applicable. This hazard is especially prevalent when the V24CT is operated in battery mode.

In normal AC line operation grounding the monitor is accomplished by ensuring that the AC line cord is connected from the monitor to a properly grounded AC receptacle. Alternatively and additionally, proper grounding may be achieved by attaching a safety grounded wire to the threaded safety ground stud ↓ found on the rear of the monitor.

Isolation may be achieved by powering the printer through a safety isolation transformer.

Operating Instructions

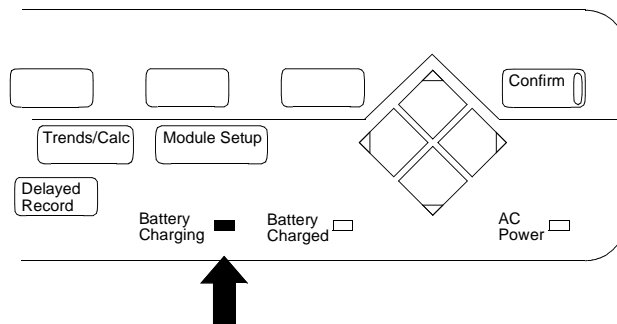
The following is a list of AC and battery operating instructions.

- The batteries continuously charge when the instrument is connected to AC power. Charging occurs whether the monitor is turned Off or On.

Caution

Agilent Technologies recommends you fully charge the batteries before using the Agilent V24CT for the first time. Plug the monitor into AC power (line power) for an initial charging cycle.

- AC power is indicated by the **AC Power** green LED indicator.
- Battery charging is indicated by the **Battery Charging** amber LED. The LED indicator flashes when the batteries first start charging, and continues flashing until the batteries are 30 - 40% charged.
- When the batteries are 30 - 40% charged, the indicator goes from flashing to continuously on. The **Battery Charging** indicator will be on steady until the batteries are 90% charged. The **Battery Charging** indicator will turn off when both batteries are 90% charged or when the line power is disconnected.
- The **Battery Charged** green LED illuminates when the battery charging function has reached 90% charged, and will stay on steady even when the batteries are fully charged. If the line power is disconnected, this LED indicator will be turned off.



Note—When AC is connected and the monitor is on, the Battery Charge LEDs may take some time to cycle to the appropriate charge indication. The Agilent Models V24CT/V26CT may under report battery capacity during this setting period. Use the fuel gauge rather than the Battery Charge LEDs during this period to estimate battery capacity or turn the monitor off to accelerate the charge setting time.

Battery LED Pattern

Residual Capacity	Charging LED	Charged LED
Up to 40%	Flashing	Off
More than 40%, Less than 90%	Steady	Off
More than 90%	Off	Steady
Full	Off	Steady

- A fully depleted battery will charge to 90% of full capacity in 4 hours when the monitor is not being used. When the monitor is in use, it will take approximately 16 hours to charge the batteries to 90%.
- To preserve battery integrity, the battery must be fully charged each time the battery is depleted.
- A new battery or one that has been stored for an extended period requires 4 hours of charging before use.
- To operate on internal battery power only, disconnect the power cord from the AC outlet.
- The battery life cycle is approximately 250 charge and discharge cycles. Battery life depends on the number and type of modules you use and the way you use your monitor.
- The lead-acid batteries need not be fully discharged prior to charging. Unlike Ni-Cad batteries, lead-acid battery capacity is not affected by depth of discharge.

Note—If you insert only one battery into the monitor for charging, the **Battery Charging** LED will flash continuously. The **Battery Charged** LED will not light even when the one battery is fully charged. This is to remind you that both batteries are not fully charged. The one battery will provide enough power to run the monitor. However, the operating time with one charged battery is less than half the operating time with two charged batteries.

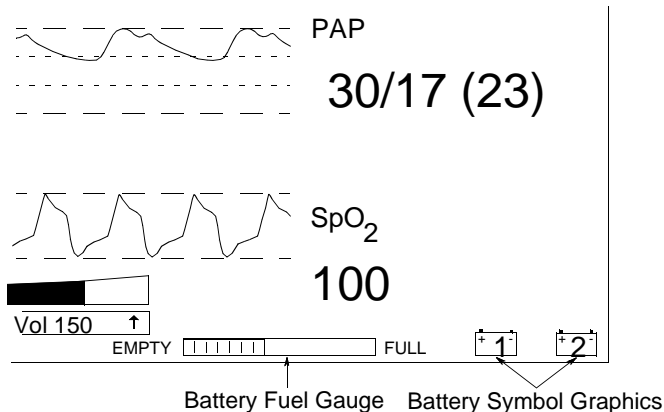
Note—When the unit is not being used for transport, connect it to AC power with the monitor turned off. This maintains a full battery charge and prolongs battery life.

Note—In the event of AC power failure, the instrument's battery is automatically activated so that no data or product information is lost.

Battery Indicator and Messages

- The battery fuel gauge, located on the lower right of the display, indicates the remaining capacity of the batteries in a bar graph form. As power discharges from the batteries, the number of segments within the battery fuel gauge will decrease. (When you first switch to battery power, the message “Battery Measurement in Progress” will be displayed for up to 2 minutes before being replaced by the battery fuel gauge.)
- The rate at which the batteries discharge is dependent on the power load or the number of modules and type being used.
- *** appears on the display instead of the battery symbol graphics when a battery is unplugged or removed.
- If you are running the monitor by the batteries, the two lead-sealed batteries are indicated in the lower right of the display by battery symbol graphics.

Note—Battery #1 is the battery on the right when looking at the back of the monitor. This battery corresponds to the #1 battery symbol graphic on the display screen.



- A low battery alarm INOP tone will sound and the message “RE-CHARGE BATTERIES” will flash and replace the battery gauge when the time remaining on the battery is approximately less than 15 minutes.
- The **Silence/Reset** key will silence the tone for 3 minutes.
- When new batteries are inserted or the monitor is plugged into AC line power, the low battery condition will be cleared.
- Alarm tones for patient alarms will have higher priority than the low battery INOP tone.
- The battery fuel gauge will be replaced by the message “AC POWER ON” when the monitor is plugged into AC.
- When the battery voltage cannot be read because of a hardware or battery malfunction, the fuel gauge will be replaced by a flashing message “HARDWARE MALFUNCTION” and an INOP alarm will sound (even if the alarms are suspended.) The **Silence/Reset** key will silence the tone for 3 minutes. The alarm will reoccur until the condition is corrected.

External Battery Charger

We suggest that you use the Agilent M1278A external battery charger to charge the M1205A batteries. This battery charger can charge up to 4 sealed lead-acid batteries at one time in two-and-a-half hours. LED indicators will indicate the status of each battery during a charging cycle.

Note—Use of other battery chargers may result in shorter battery life and is not recommended.

Refer to the external battery charger operating guide for specific operating instructions.

Battery Care and Maintenance

The Agilent 40488A sealed lead-acid batteries used in the Agilent Model V24CT provide optimum performance and battery life when properly cared for. Proper handling of batteries is essential to the life of the battery and safety of the user.

Storage

- Store batteries in a cool dry area. A refrigerator is an excellent place to store batteries. Allow batteries to return to room temperature before charging or use.
- The charge in the batteries gradually deteriorates even during storage. They will self-discharge 4-5% for each month in storage at 25°C.
- Batteries should be stored in a fully charged state.
- Charge stored batteries at least once every 6 months. Batteries can be charged in the monitor or by using a battery charger.

Note—Recharge the batteries after using them. It is especially important to avoid allowing the batteries to stay in a fully discharged state for long periods of time. Simply plug the monitor into AC line power after transporting a patient or when the monitor is not in use. If possible, avoid discharging the battery completely.

- If batteries do not charge to full capacity or discharge quickly when being used (indicated by the monitor's battery fuel gauge), replace with known charged batteries.

or

Contact your Agilent service technician.

Care and Handling

- Do not disassemble the battery. Strong acid electrolyte may burn your skin or clothes.
- Check the batteries for any sign of irregularities in appearance. Replace the battery if any damage, such as a crack, or electrolyte leakage is found on the case or cover.
- Do not short the battery by directly connecting the positive and negative terminals. Shorting can burn out the connections, and serious burns or fire may result.
- Do not dispose of batteries in an incinerator. Batteries may explode if put into fire.
- Clean the battery if it is dirty or dusty. Wipe the battery with a dry cloth or water dampened cloth. Never use oil, gasoline, thinner or other petrochemicals.
- If the battery is accidentally broken and electrolyte (sulfuric acid) leaks out, wipe it up with a cloth and neutralize the acid with an alkaline substance, such as sodium bicarbonate (baking soda).
- If you need to dispose of the batteries, follow local laws for proper disposal. Be aware that batteries contain lead.

Caution

In the event electrolyte (sulfuric acid) contacts the skin, immediately flush with water and consult a physician.

Accessories and Ordering Information

40488A	12 Volt Lead-Acid Batteries
M1278A	Battery Charger

13

Maintenance

This chapter details the cleaning and maintenance procedures for the monitor. It includes the following sections:

- General cleaning of the System 13-2
- Monitor Maintenance 13-6
- Performance Assurance Checks 13-11

General cleaning of the System

The Component Monitoring System should be kept free of dust and dirt.

Exterior cleaning of the case and screen is recommended. Clean it with a lint-free cloth, moistened with either warm water (40°C/104°F. max) and soap, a diluted non-caustic detergent or one of the approved cleaning agents listed below::

Soaps	mild soaps
Tensides (dishwasher detergents)	Edisonite Schnellreiniger [®] , Alconox [®]
Ammonias	Dilution of Ammonia <3%, Window cleaner
Alcohol	Ethanol 70%, Isopropanol 70%, Window cleaner

Caution

To avoid damage to the product, observe the following general precautions for cleaning. You should only deviate when this is explicitly described in the cleaning instruction for the individual transducer or accessory.

1. Do not use strong solvents such as acetone or trichloroethylene.
2. Always dilute according to the manufacturers instructions, or use lowest possible concentration.
3. Never use abrasive material (such as steel wool or silver polish).
4. Do not allow liquid to enter into the product.
5. Never submerge any part of the system.
6. Do not pour liquid onto the system during cleaning.

7. Do not allow cleaning agent to remain on any of the equipment surfaces - wipe it off immediately with a cloth dampened with water.
-
-

Caution

If you want to clean a touch enabled display such as the M1097A #A02 Flatscreen Display, the touch operation has to be disabled during the cleaning procedure.

If you use a mouse and want to clean it, mouse operation has to be disabled during the cleaning procedure.

For more detailed information on how to perform these actions, please refer to Chapter 1 of this manual.

General Disinfecting of the System

We recommend that you disinfect the product only when necessary as determined by your hospital's policy, to avoid long term damage to the product.

We also recommend that the products being disinfected be cleaned first, as described under "General cleaning of the System" on page 13-2.

Use the recommended disinfecting substances listed below:

Alcohol based	Ethanol 70%, Isopropanol 70%, Cutasept [®] , Hospisept [®] , Kodan [®] Tinktur forte, Sagrosept [®] , Spitacid [®] , Sterilium fluid [®] . ¹ only Ethanol 70% and Isopropanol 70% are tested and qualified
Aldehyde based	Dilution of formaldehyde (3-5%), Cidex [®] , Gigasept [®] , Kohrsolin [®] . ² only Cidex is tested and qualified
Bleach	Dilution of sodium hypochlorite (laundry bleach): concentration ranging from 500ppm (1:100 dilution of household bleach) to 5000ppm (1:10 dilution of household bleach), Hydrogen peroxide 3%, Chlorox [®] (1:10 dilution), Dakin's Solution.
Phenol based	Wofasept [®] , Sporicidin [®] .

Caution

To avoid damage to the product, observe the following general precautions for disinfection. You should only deviate when this is explicitly stated in the disinfecting instruction of a specific product.

1. Do NOT use Povodine[®], Sagrotan[®], Mucocit[®] disinfecting agents or strong solvents e.g. acetone.
2. Always dilute according to the manufacturer's instructions or use lowest possible concentration.
3. Do not allow any liquid to enter the case.

4. Never submerge any part of the system.
 5. Do not pour liquid onto the system during cleaning.
 6. Never use abrasive material (such as steel wool or silver polish).
 7. Do not allow any disinfecting agent to remain on any of the equipment surfaces – wipe it off immediately with a cloth dampened with water.
-
-

Caution

If you want to disinfect a touch enabled display such as the M1097A #A02 Flatscreen Display, the touch operation has to be disabled during the cleaning procedure.

If you use a mouse and want to disinfect it, mouse operation has to be disabled during the cleaning procedure.

Warning

Agilent makes no claims regarding the efficacy of the listed chemicals or methods as a means of controlling infection. Consult your hospital's infection Control Officer or Epidemiologist

Notes—

- For comprehensive details on cleaning agents and their efficacy, refer to “Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Health Care and Public-Safety Workers.” issued by the U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Georgia, February 1989.
- Do not use any cleaning agents that corrode or damage Polycarbonate.

Monitor Maintenance

The following is a list of the tasks and procedures to maintain the monitor.

- Performance Assurance Test
- Functional Testing procedures
- Preventative Maintenance
- Check Accuracy and Calibration of NBP and Temperature

The recommended maintenance schedule is shown in the following table.

Recommended Maintenance Schedule

Procedure	Frequency	Source of Information
Inspect the system, cables and cords	Daily	See the following pages of this chapter.
Safety Checks	Once a year	See chapter 3 of the Agilent CMS Service Guide “Maintaining the Agilent CMS”.
Functional Testing Procedures	Once a year	See the following pages of this chapter or chapter 3 of the Agilent CMS Service Guide “Maintaining the Agilent CMS” for details.
Preventative Maintenance <ul style="list-style-type: none"> • Replace backlight tube assembly • Cleaning procedures 	2.5 years of continuous use or as needed	See chapter 3 of the Agilent CMS Service Guide “Maintaining the Agilent CMS”.

Maintenance

Procedure	Frequency	Source of Information
Performance Assurance	Upon installation, when instrument is repaired or at least once a year	See chapter 3 of the Agilent CMS Service Guide "Maintaining the Agilent CMS".
Check Calibration of NBP & Sidestream CO ₂	Once a year	See chapter 3 of the Agilent CMS Service Guide "Maintaining the Agilent CMS".
Check Calibration of all parameters except NBP & Sidestream CO ₂	Every 2 years	See chapter 3 of the Agilent CMS Service Guide "Maintaining the Agilent CMS".

Inspect the System

The following lists what to look for when inspecting the system:

Inspect the Exterior of the Monitor

1. Examine the exterior of the unit for cleanliness and general physical condition. Ensure that plastic housings are intact, that all hardware is present and tight, and that there are no spilled liquids or other serious abuse.
2. Inspect connectors of the Rack and ensure that the Modules are locked into place and do not slide out without first releasing the locking plate on the bottom of the Module.
3. Inspect all accessories external to the system such as transducers, referring to the manufacturer's documentation.
4. Verify the backlight tube brightness is adequate. If the brightness is not adequate, notify your biomedical department or the Agilent representative. Agilent recommends replacement of the backlight tube every 18 months of continuous use.

Inspect the Cables and Cords

1. Examine the line/power plug for damage. Ensure that the prongs of the plug do not move in the casing.
2. Inspect the line/power cord for signs of damage. If damaged, replace the entire cord. Ensure that any new line/power cord or plug is fitted with the same polarity as the old one.
3. Inspect the interconnecting cable between the module rack and the mainframe for general condition. Examine it carefully to detect breaks in the insulation. Ensure that the cable connectors are properly engaged and that any connector screws are fully tightened.
4. Inspect the patient cables and leads and their strain reliefs for general condition. Examine cables carefully to detect breaks in the insulation and to ensure that they are gripped securely in the connectors of each end to prevent rotation or other strain.
5. Flex the patient cable near each end to verify that there are no intermittent faults.

Perform a Start-up Sequence Test of the System

The System automatically starts every time the system is switched ON.

TEST - Turn the System On by pressing the power switch in the lower left-hand corner of the display.

RESULT - The system will click and light-up the LEDs on the control panel. After several seconds, the LEDs will go off and the display will start showing waveforms and numerics. If the system fails to boot, notify your biomedical department or the Agilent representative.

Verify the Integrity of the Display

Note the position of the contrast control on the Agilent V24 (or the brightness control on the Agilent Model V24C/V24CT/V26C/V26CT) before starting tests so that they are returned to their previous positions (assuming they are correct) at the end of the testing procedure.

1. Set up an ECG signal from a fixed rate simulator on the screen.
2. Check the ECG complexes. They should be regularly spaced. Uneven spacing indicates missing pixels. All portions of a simulated ECG waveform should be clear and visible, including the P wave and QRS.
3. Adjust the contrast control on the Agilent Model V24 (or the brightness control on the Agilent Model V24C/V24CT/V26C/V26CT) so it is at the maximum setting and then adjust to the minimum setting.
4. Check to see if any noise (interference) is superimposed on the baseline with the ECG simulator attached. Baseline interference may be apparent as a thick baseline at high gain settings.
5. Apply an external 1 mV pulse. The trace should exhibit a leading edge with minimal rounding and a spike (or overshoot) of less than 10%. After 1 second, the pulse should have decayed no more than half of its original amplitude.
6. Return the contrast control on the Agilent Model V24 (or the brightness control on the Agilent Model V24C/V24CT/V26C/V26CT) to its previous position (assuming it was correct). If any problems are identified, notify your biomedical department or the Agilent representative.

Perform a System Self-Test

The following lists how to perform the system self-test.

1. Examine all controls for physical condition. During the course of this examination, ensure that the controls perform their proper function
2. Check that the parameter module LED's light up when first plugged in.
3. Confirm that the display lights up and displays a Main Screen.
4. Press the ECG key on the front of the ECG module in a system that is turned On. This brings up the ECG Task Window and verifies that the System board and integral rack are communicating with the plug-in module. If the ECG module does not respond, perform the ECG module Functional self-test.
5. Ensure correct operation (visually and audibly) of all alarms using, if required, the User Guide and a patient simulator.
6. If possible connect the ECG parameter module of the unit to an ECG simulator and verify that an adequate trace is received at each patient lead selection.
7. Press **Monitor Setup** , **Monitor Revision** , **Show H W Rev** . In this screen, press **Show H W Rev** . This provides a real-time list of the modules in the rack. Remove a module and observe the list changes to delete the module you removed. Re-insert the module and observe the list changes to include the module.

Performance Assurance Checks

The following performance assurance checks are designed to be completed to verify proper operation when:

- The monitor has been installed
- An assembly has been repaired
- To verify the operation any time the unit is suspect.

The performance assurance checks fall into two parts:

1. Verification of overall operation by completing the Performance Assurance Test
2. Verification of plug-in module operation by completing the Functional Test procedures.

You can perform any of the checks in any order you choose. They are broken up here for organizational sake.

Performance Assurance Test

To verify your monitor works properly, perform the following performance assurance test:

1. Connect the power cord to the monitor and plug it in to an AC power source.
2. Turn the monitor on by pressing the ON/OFF button. (The monitor should complete the start-up after a few moments.)
3. Observe that there is a screen display and no error codes.

If any error codes are displayed, refer to the chapter “Troubleshooting Instruments” in the Service Guide.

If the screen comes up blank, check that the external power cable is plugged in. If the screen is still blank, contact your biomedical engineering department or the Agilent representative.

4. If you are using the Agilent Models V24CT/V26CT, make sure the battery Charging and Charged LEDs are behaving consistent with

the battery charged. The following table describes the LED behavior:

LED Pattern During Charge Sequence

Residual Capacity	Charging LED	Charged LED
Up to 40%	Flashing	Off
More than 40%, Less than 90%	Steady	Off
More than 90%	Off	Steady
Full	Off	Steady

If the pattern is not correct, refer to the troubleshooting chapter of the Service Guide.

5. If you are using the Agilent Models V24CT/V26CT:
 - a. Disconnect the AC power cord. The Models 24CT/26CT will switch to battery power and the display will indicate that a battery measurement is in progress. After about 30 seconds, a battery gauge and two battery symbols appear in the lower right corner of the screen display.
 - b. Remove one of the batteries. The monitor should continue to operate. If the monitor does not continue to operate go to “Battery Problems” in the *Agilent M1205A V24 and V26 Service Guide* and check the fuses on the battery contact board.
 - c. Repeat this procedure for the second battery.

Functional Testing Procedures

The system has a module self-test which generates and displays test waveforms and corresponding numerics for all the modules that are connected and turned on. The test signals are displayed for about 30 seconds and then the display returns to monitoring mode. The test signal will be displayed only if the system self-test was successful and the parameter is plugged into the system and turned on.

Perform the following quick system check to verify that System board, integral rack and modules are communication properly before verifying the individual parameter modules.

Perform a Quick System Check

You can verify that the System board, integral rack and modules are communicating properly by completing the following test.

TEST - Press the ECG key on the front of the ECG module in a system that is turned On.

RESULT - Pressing the ECG key brings up the ECG Task Window and verifies that the System board and integral rack are communicating with the plug-in module.

If the plug-in module Task Window, waveform or numeric is missing from the display, the module may not be turned On. Try pushing the key on the plug-in to see if the system is communicating with the module.

If the ECG module does not respond, perform the module self-test.

To turn a parameter On, press the following key sequence:

1. Press **Module Setup**
2. **Parametr On/Off**
3. **Select Parametr**
4. **On/Off Setup**

Procedure Overview

1. Choose a patient category (Adult/Pedi/Neo) by pressing:
Monitor Setup → Config Sets → Change Pat Categ
2. Display 30 seconds of the waveforms and numerics of all connected modules by pressing:
Monitor Setup → Test Signals
3. Repeat Step 2 as necessary to check the individual test waveforms and numerics for the category.
4. Use Step 1 to choose a new patient category and repeat Steps 2 and 3.

See the following table for test values.

System Self-test Values

Module	Test Numeric	Test Waveform
ECG and ECG/ RESP		
ECG	100 bpm in ADULT mode 125bpm in NEO/PED mode	Simulated Square Wave
RESP	15 rpm in ADULT mode 30 nrpm in PEDI mode 55 rpm in NEO mode	Simulated Wave
Pressure		Simulated squarewave
Systolic	120 mmHg ADULT 60 mmHg PEDI/NEO	
Diastolic	0 mmHg ADULT 0 mmHg PEDI/NEO	
SpO ₂ /Pleth		
SpO ₂	100%	No Wave
Pleth	Wave on display	Simulated wave

Maintenance

Module	Test Numeric	Test Waveform
Cardiac Output	5 l/min (+0.1 l/min) (Blood Temp: 37°C) (Inj Temp: 0°C)	No wave
tcpO ₂ /tcpCO ₂		No wave
tcpO ₂	60 mmHg (8.0 kPa)	
tcpCO ₂	40 mmHg (5.3 kPa)	
CO ₂		Simulated squarewave
ETCO ₂	40 mmHg (6.0 kPa)	
IMCO ₂	0 mmHg (0.0 kPa)	
AWRR	25 rpm	
Temperature	40°C (104°F)	No wave

Performing the ECG Module and ECG/RESP Self-Test

Auto Check - None

Self-Test The ECG and ECG/RESP self-test may be performed at any time as the lead selector and pace pulse detection are inhibited during the check. The module will produce ECG test signals at the beginning of the processing circuitry, and process the test signals in the same way patient signals are processed. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

TEST - Press **Monitor Setup** → **Test Signals** .

RESULT - If the module is functioning correctly, the following heart rate and respiration are displayed without the alarms being activated:

ECG 100 bpm in ADULT mode 125 bpm in NEO/PEDI mode

RESP 15 rpm in ADULT mode 30 rpm in PEDI mode 55 rpm in NEO mode

Performing the Invasive

Pressure Module Self-Test

Auto Check - The check for these modules is started every time the system is switched ON and checks the complete module circuitry, including the sensitivity detection circuit.

Self-Test - The test signals lasts about 30 seconds and then the display returns to the normal monitoring mode.

The M1006A Pressure self-test may be performed at any time as the input switch switches the CAL divider to 0mmHg, and the pressure test signals bypass the sensitivity detection circuit. From here, the signals are processed in the same way as the patient signals.

The M1006B Pressure self-test may be performed at any time, as the signal is output from a microprocessor based controller. From here, the test signal is processed in the same way as a patient signal, testing the complete signal path from the module to the display.

TEST - Press **Monitor Setup** → **Test Signals**

RESULT - If the module is functioning correctly, the following systolic and diastolic pressures are displayed without the alarms being activated:

Systolic 120 mmHg ADULT 60 mmHg PEDI/NEO

Diastolic 0 mmHg ADULT 0 mmHg PEDI/NEO

Performing the NBP Module Self-Test

Auto Check - The NBP module performs a check periodically during operation.

Self-Test - None

Performing the SpO₂/Pleth Module Self-Test

Auto Check - None

Self-Test - The SpO₂/Pleth module self-test may be performed at any time. The integral waveform generator in the module produces test signals using the current driver at the beginning of the processing circuitry. The test signals are processed in the same way as patient signals are processed. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

TEST - Press **Monitor Setup** → **Test Signals**.

RESULT - If the module is functioning correctly, the following Derived values and waveforms are displayed without the alarms being activated:

SpO₂ 100%

Pleth Wave height after auto gain is 100% of scale height

Pleth Pulse Rate 100 bpm in ADULT mode 125 bpm in NEO/PEDI mode

Performing the Cardiac Output Module Self-Test

Auto Check - None

Self-Test - The Cardiac Output module test may be performed at any time. The test signal lasts about 30 seconds and then the display returns to the normal monitoring mode.

TEST - Press **Monitor Setup** → **Test Signals**.

RESULT - If the module is functioning correctly, the following derived values will be displayed without the alarms being activated:

Cardiac Output 5.0 l/min ±0.1 l/min

TBlood 37C + 0.1C

Tinj 0C + 0.1C

Performing the tcpO₂/tcpCO₂ Module Self-Test

Auto Check - The check is performed automatically when the system is switched on, during calibration and continuously when no transducer is connected. When the auto check fails, the INOP message "Equipment Malfunction" is given (refer to the Troubleshooting Chapter in this manual for troubleshooting details).

Self-Test - The tcpO₂/tcpCO₂ module self-test may be performed at any time. The test signal lasts about 30 seconds and then the display returns to the normal monitoring mode.

TEST - Press **Monitor Setup** → **Test Signals**

RESULT - If the module is functioning correctly, the following numerics are displayed without the alarms being activated:

tcpO₂ 60 mmHg (8.0 kPa)

tcpCO₂ 40 mmHg (5.3 kPa)

Caution

Radiated immunity: If operating under conditions according to EN 60601-1-2 up to 1 V/m electrical field strength, the following deviations in the measurements could occur: tcpO₂ 2 mmHg or less, tcpCO₂ 1 mmHg or less. It is recommended to avoid the use of electrically radiating devices in close proximity to a tcpO₂/tcpCO₂ monitor.

Performing the CO₂ Module Self- Test

Auto Check - None

Self-Test - The self-test may be performed at any time. The test signals last about 30 seconds, and then the display returns to the normal monitoring mode.

TEST - If a transducer is connected to the module, the following conditions must be met:

- The motor in the transducer is running.
- No heater malfunction is reported.

Press **Monitor Setup** → **Test Signals**

RESULT - If the module is functioning correctly the values will be displayed without the alarms being activated and should read as follows:

ET CO₂ 40 mmHg (6.0kPa)

IMCO₂ 0 mmHg (0.0kPa)

AWRR 25 rpm

Performing the Temperature Module Self- Test

Auto Check - None

Self-Test - The Temperature module self-test may be performed at any time as the switch network switches to the reference resistors for the duration of the check. The system connects the reference resistors to the beginning of the processing circuitry, and processes this test value in the same way as the patient values are processed. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

TEST - Press **Monitor Setup** → **Test Signals**

RESULT - If the module is functioning correctly, the following temperature will be displayed without the alarms being activated:

Temp 40 C (+0.1C)

Performing the Blood Analysis Module Self-Test

Auto Check - The Blood Analysis Module performs a check when the system is switched on

Self-Test - The Self-Test with the External Simulator M3634A may be performed at any time.

TEST - Insert the External Simulator into the cartridge slot of the module.

RESULT - Either PASS or FAIL will be displayed on the Monitor to indicate whether the module has passed the self-test or not. If the module fails the self-test, try the procedure again. If it fails again, wait half an hour and then try the procedure again. If the module continues to fail the self-test the module should be replaced.

Performing the Recorder Module Self-Test

Auto Check - The recorder module performs a check when it is plugged into the parameter module rack.

Self-Test - The Recorder Module check may be performed at any time.

TEST - Turn on the system power and plug in the recorder module

RESULT - The LED on the front panel indicates whether the module has passed the self-test by flashing.

LED flashes twice - module has passed check LED flashes once - module failed self-test. Take the module out and try the procedure again to make sure there is a good connection. LED does not flash - module processors are not working properly and the module should be replaced

Performing the Data Management Database Self-Test

The data management database is tested during system start-up with an SRAM checksum procedure. If there is an error found in the SRAM checksum, the system will restart (cold start) and all patient data will be lost.

**Tests for
Vuelink
Module and
Anesthetic
Gas Module**

There are no Self-Tests for the M1032A Vuelink Module and the M1026A Anesthetic Gas Module.

The M1032A Vuelink Module performs automatic checks periodically during operation. The M1026A Anesthetic Gas Module performs a 2-minute check automatically when the system is switched on.

Performance Assurance Checks

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