

## Service Guide

# IntelliVue Patient Monitor

## MP5/MP5T/MP5SC

Rel. L.x

Patient Monitoring

**PHILIPS**



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# Introduction

This Service Guide contains technical details for the IntelliVue MP5/MP5T/MP5SC Patient Monitor

This guide provides a technical foundation to support effective troubleshooting and repair. It is not a comprehensive, in-depth explanation of the product architecture or technical implementation. It offers enough information on the functions and operations of the monitoring system so that engineers who repair them are better able to understand how it works.

## Who Should Use This Guide

This guide is for biomedical engineers or technicians responsible for installing, troubleshooting, repairing, and maintaining Philips' patient monitoring systems.

## How to Use This Guide

Navigate through the table of contents at the left of the screen to select the desired topic. Links to other relevant sections are also provided within the individual topics. You can also scroll through the topics using the page up and page down keys.

## Abbreviations

Abbreviations used throughout this guide are:

| Name                                      | Abbreviation |
|---|--------------|
| IntelliVue MP5/MP5T/MP5SC Patient Monitor | the monitor  |
| Medical Information Bus                   | MIB          |

## Responsibility of the Manufacturer

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

- assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by Philips, 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 safety and EMC, use only those Philips parts and accessories specified for use with the monitor. If non-Philips parts are used, Philips is not liable for any damage that these parts may cause to the equipment.

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## Passwords

In order to access different modes within the monitor a password may be required. The passwords are listed below.

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### CAUTION

Your hospital/organization is responsible that the passwords listed below are revealed to authorized personnel only.

---

Monitoring Mode: No password required

Configuration Mode: 71034

Demo Mode: 14432

Service Mode: 1345

Consult the configuration guide before making any changes to the monitor configuration.

## Warnings and Cautions

In this guide:

- A **warning** alerts you to a potential serious outcome, adverse event or safety hazard. Failure to observe a warning may result in death or serious injury to the user or patient.
- A **caution** alerts you where special care is necessary for the safe and effective use of the product. Failure to observe a caution may result in minor or moderate personal injury or damage to the product or other property, and possibly in a remote risk of more serious injury.

# Theory of Operation

## Monitor Theory of Operation

The IntelliVue MP5/MP5T/MP5SC patient monitor is used for monitoring and recording multiple physiological parameters of adults, pediatrics, and neonates. The monitor also generates alarms for the measured parameters. The monitor is used by trained healthcare professionals in a hospital environment.

The monitor stores data in trend, event, and calculation databases. You can see tabular trends (vital signs) and document them on a printer. You can view measurement trend graphs, with up to three measurements combined in each graph, to help you identify changes in the patient's physiological condition. You can view fast-changing measurement trends with beat to beat resolution and see up to four high resolution trend segments. Event surveillance enhances documentation and review of physiologically significant events by automatically detecting and storing up to 50 user-defined clinical events over a 24 hour period.

The monitor can be configured with various different measurement and interface capabilities.

The following comparison table shows in detail the differences between MP5, MP5T and MP5SC:

| Functionality (including optional features)           | MP5 | MP5T | MP5SC |
|---|-----|------|-------|
| ECG   | yes | no   | no    |
| SpO2  | yes | yes  | yes   |
| NBP   | yes | yes  | yes   |
| Predictive Temperature                                | yes | yes  | yes   |
| Temperature   | yes | no   | no    |
| Invasive Pressure                                     | yes | no   | no    |
| Carbon Dioxide  | yes | no   | no    |
| Microstream CO <sub>2</sub>                           | yes | no   | yes   |
| Direct Telemetry Connection                           | yes | yes  | no    |
| ECG Output signal                                     | yes | no   | no    |
| LAN networking capability                             | yes | no   | yes*  |
| WLAN networking capability                            | yes | no   | yes*  |
| IntelliVue Instrument Telemetry networking capability | yes | no   | no    |
| USB Interface   | yes | no   | yes   |
| Short Range Radio capability                          | yes | yes  | yes   |

| Functionality (including optional features)   | MP5 | MP5T | MP5SC |
|---|-----|------|-------|
| Severe Sepsis Screening                       | yes | no   | no    |
| OxyCRG high resolution trend                  | yes | no   | no    |
| Neonatal event review                         | yes | no   | no    |
| Integrated recorder                           | yes | yes  | yes   |
| Drug Calculator                               | yes | yes  | no    |
| Gas monitor support                           | yes | no   | no    |
| Connection to a host monitor (companion mode) | yes | no   | no    |
| Connection to an external display             | yes | no   | yes   |
| Nurse call capability                         | yes | no   | yes   |
| Spot Check                                    | yes | no   | yes   |
| Multi-Patient Spot Check                      | no  | no   | yes   |
| Early Warning Score                           | yes | no   | yes   |

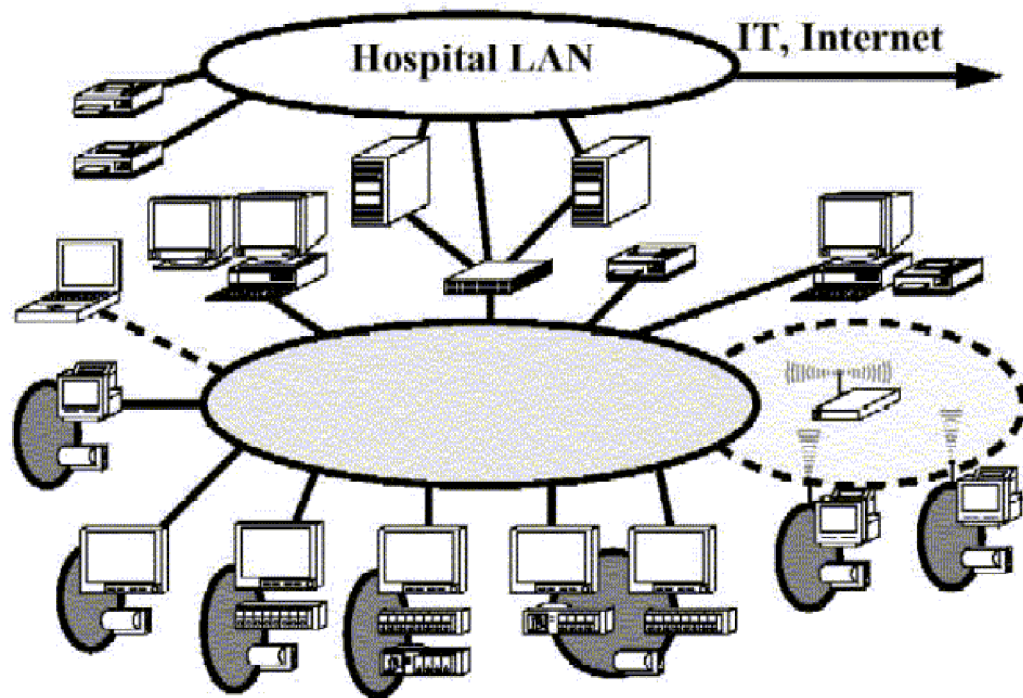
\* For MP5SC LAN and WLAN Networking capability are only available for HL7 export, not for IIC support.

### NOTE





The following descriptions may vary depending on the monitor option purchased.

## System Boundaries

The following diagram discusses specific boundaries within the overall system with respect to their openness and real-time requirements:

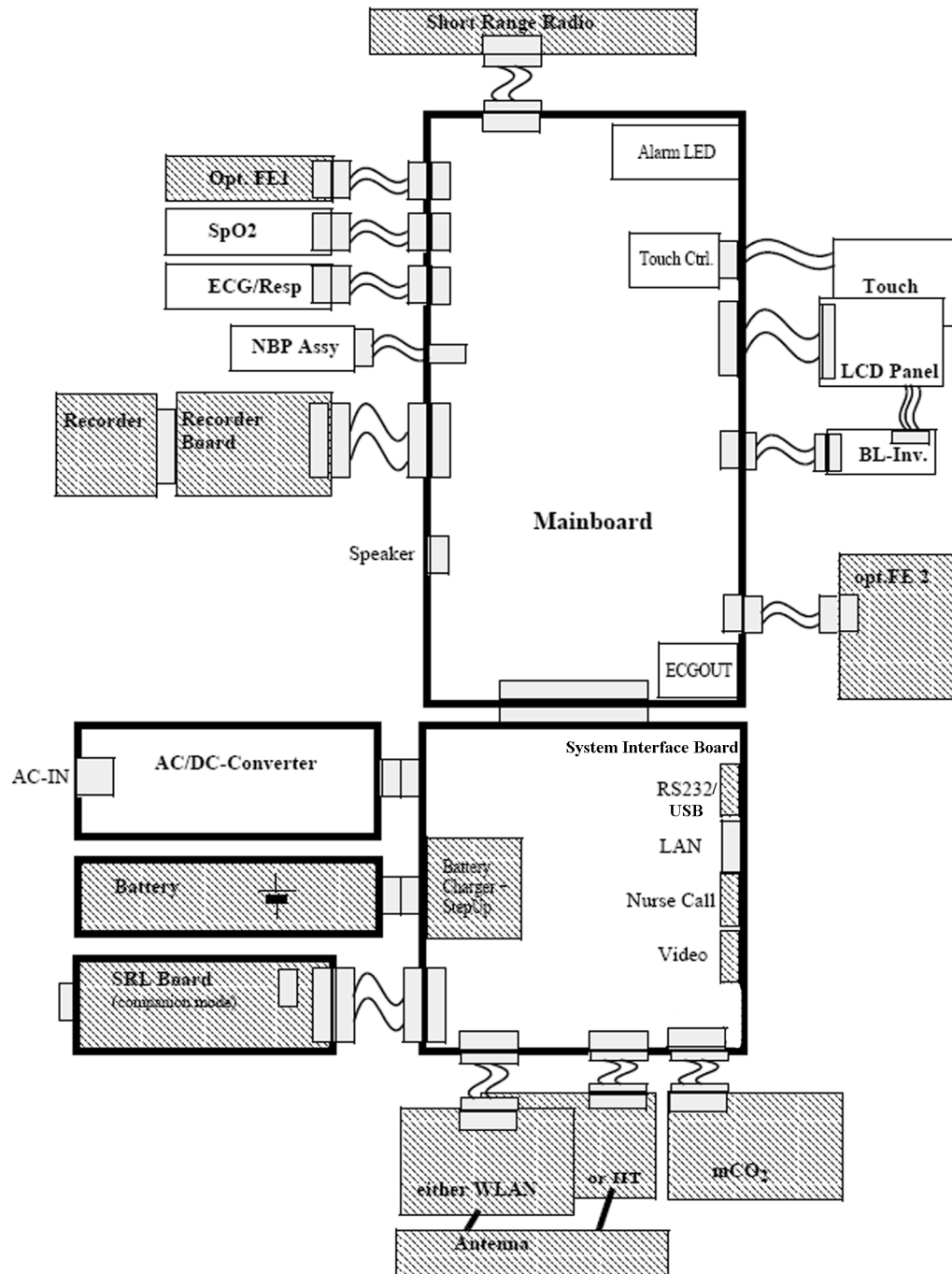


*System Boundaries*

|   |   |
|---|---|
|  | Measurement connections<br>Built-in measurement block   |
|  | Philips Clinical Network (wired LAN)<br>connects multiple patient monitors, information centers, application servers; closed system, only Philips qualified products (tested and with regulatory approval) are connected, Philips is responsible for guaranteed real-time functionality and performance |
|  | Philips Clinical Network (wireless)<br>like Philips Clinical Network (wired) LAN, however due to current wireless technologies available it has reduced bandwidth, longer latencies, reduced functionality  |
|  | Hospital LAN, Internet<br>Standard Network, not under Philips control, no guaranteed service, no real-time requirements   |

## Hardware Building Blocks

The following hardware building blocks make up the monitoring system. (Note that the MP5T and MP5SC do not include all the hardware components shown below):



*MP5/MP5T/MP5SC Hardware Building Blocks*



## IntelliVue MP5/MP5T/MP5SC

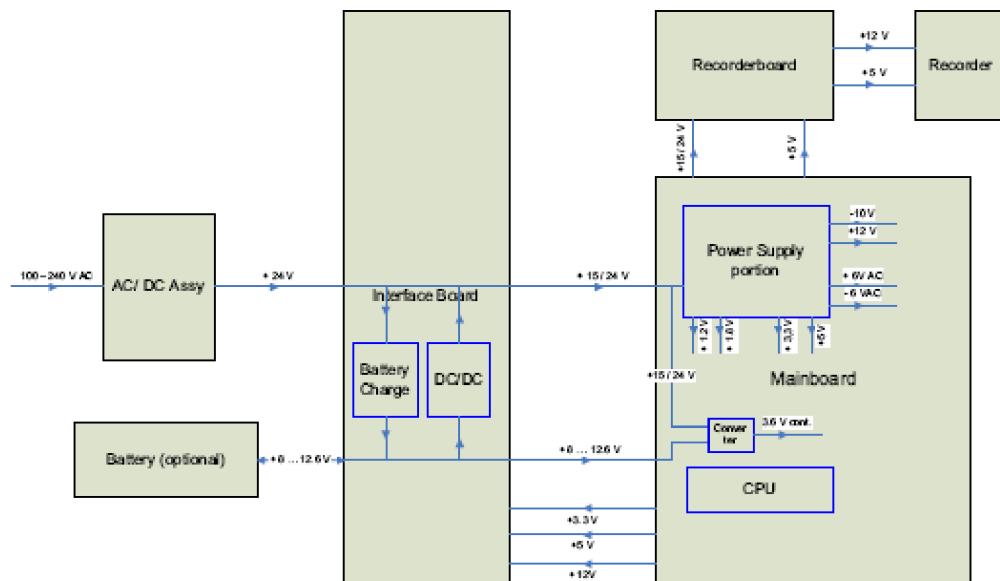
The MP5/MP5T/MP5SC monitor:

- integrates the display and processing unit into a single package
- uses a 8.4" TFT SVGA color display
- uses the Touchscreen as input device
- integrates the measurement block (Front End 1 (FE1) and Front End 2 (FE2)) with optional parameter sets

## Optional Hardware

- One slot is provided for one of three available system interface boards. An optional built-in wireless network interface IntelliVue 802.11 Bedside Adapter or IntelliVue Instrument Telemetry is supported. For further details regarding the wireless network please refer to the M3185A Philips Clinical Network documentation.
- optional recorder
- optional battery
- optional MSL board
- optional Short Range Radio (SRR) board

## Power Distribution



### *Power Distribution Architecture*

The AC/DC converter transforms the AC power (100-240 V AC range) coming from the power plug into a 24 V / 50W DC source and isolates the monitoring system from the AC power mains.

The 24 V DC is distributed via the Interface Board to the optional battery charging circuit and to the main- and recorder board.

If the interface board contains the optional battery circuits, the power is used to charge the battery and supply the monitoring system. As soon as the AC power source is disconnected, the optional battery starts and keeps the system powered (battery mode). A DC/DC converter on the interface board converts the 8-12.6 V DC power supplied by the battery into 15 V DC power, which is distributed to the monitoring system.

The main board and recorder board contain power supply circuits, which convert the 24 /15 V DC into several voltages supplying the particular components of the monitoring system.

The realtime clock and the buffered RAM is supplied with cont. 3.6 V DC power, provided either by the 24 / 15 V DC system power or by the battery power and converted to 3.6 V DC.

The CPU board has an MPC852/62 MHz processor in the patient monitor that provides a number of on-chip, configurable interfaces. An array of fast UARTS with configurable protocol options are implemented in an ASIC (along with other system functions such as independent watchdogs, video, etc.), providing interfacing capabilities to integrated measurements and System Interface Boards. The serial interfaces can easily be electrically isolated. The main board contains additional video hardware.

The CPUs provide a LAN interface to connect to the Philips Clinical Network (Ethernet).

### NOTE

An MP5 in companion mode does not receive its power from the host monitor via the MSL. MP5 is always powered by AC power or battery.

## System Interfaces

The following is a list of Interface boards which may be present in your monitor, depending on your purchased configuration:

System Interface boards:

- Basic: LAN, Video #J01(no longer orderable)
- Battery: LAN, Battery Board, mCO<sub>2</sub> #J02
- Full: LAN, Battery, MIB/RS232, Video, Nurse Call, mCO<sub>2</sub> #J40
- Full USB: LAN, Battery, USB, Video, Nurse Call, mCO<sub>2</sub> #J43

Note that WLAN, IIT and MSL Interface require the full system interface board or the Full USB system interface board.

The MP5T is delivered only with the Battery system interface board. The MP5SC is delivered only with a Full USB system interface board.

The specifications for the above listed interfaces can be found in the technical data sheet for the monitor and in the *Installation and Specifications* chapter of the Instructions for Use.

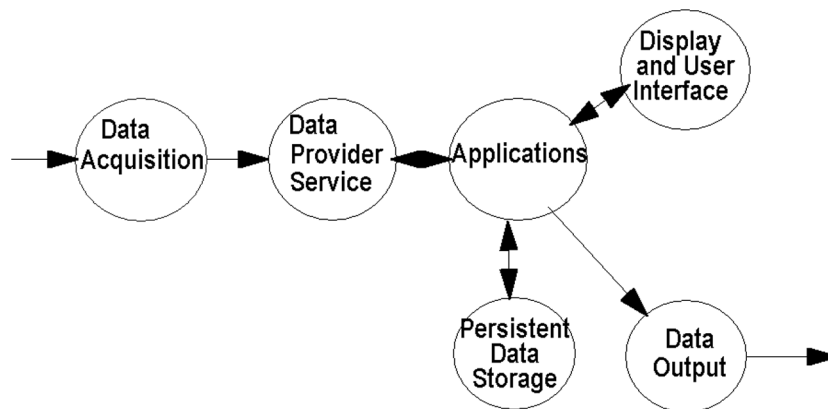
## Compatible Devices (not for MP5T and MP5SC)



*IntelliVue G1/G5 Anesthetic Gas Module*

## Data Flow

The following diagram shows how data is passed through the monitoring system. The individual stages of data flow are explained below.



*Data Flow*

## Data Acquisition

Monitoring data (for example patient measurement data in the form of waves, numerics and alerts) is acquired from a variety of sources:

- Measurement Block

The integrated measurements convert patient signals to digital data and apply measurement algorithms to analyze the signals.

- External measurement devices

Data can be also acquired from devices connected to interface boards of the monitor. Software modules dedicated to such specific devices convert the data received from an external device to the format used internally. This applies to the IntelliVue G1/G5 Anesthetic Gas Module (not for MP5T and MP5SC).

- Server systems on the Philips Clinical Network

To enable networked applications such as the other bed overview, data can be acquired from server systems attached to the Philips Clinical Network, for example a Philips Information Center

### Data Provider System Service

All data that is acquired from integrated measurements or external measurement devices is temporarily stored by a dedicated data provider system service. All monitor applications use this central service to access the data in a consistent and synchronized way rather than talking to the interfaces directly.

This service makes the applications independent of the actual type of data acquisition device.

The amount of data stored in the data provider system service varies for the different data types. For example several seconds of wave forms and the full set of current numerical values are temporarily stored in RAM.

### Persistent Data Storage System Service

Some applications require storage of data over longer periods of time. They can use the persistent data storage system service. Dependent on the application requirements, this service can store data either in battery backed-up (buffered) memory or in flash memory. The buffered memory will lose its contents if the monitor is without power (not connected to mains) for an extended period of time. The flash memory does not lose its contents.

The trend application for example stores vital signs data in a combination of flash memory and buffered memory, while the system configuration information (profiles) is kept purely in flash memory.

### Display and User Interface Service

Applications can use high level commands to display monitoring data or status and command windows on the internal LCD panel. These commands are interpreted by the display manager application. This application controls the dedicated video hardware which includes video memory and a special hardware in the ASIC.

User input is acquired from the touchscreen. The system software makes sure that the user input is directed to the application which has the operating focus.

### Monitor Applications

The monitor applications provide additional system functionality over the basic measurement and monitoring capabilities. This includes for example trending, report generating, event storage or derived measurements.

In general, the monitor applications use the data provider system service to access the measurement data. Application interfaces to the other system services allow the application to visualize data, to store data over extended periods of time or to output data to other devices.

### Internal LAN (Measurement Link)

The MP5 communicates as a Multi-Measurement Module (MMS) in companion mode when connected to a host monitor using an IEEE802.3/Ethernet LAN in the Measurement Link (MSL). This network is used to distribute data between the the MP5 and the host monitor, for example:

- Digitized patient signals including wave data, numerical data and status information (typically from the measurement server to a display unit)

- Control data representing user interactions (typically from the display unit to a measurement server)
- Shared data structures, for example representing patient demographical data and global configuration items

The internal LAN allows plug and play configuration of the monitoring system. The system automatically detects plugging or unplugging of measurement servers on the host monitor and configures the system accordingly.

The components on the internal LAN are time-synchronized to keep signal data consistent in the system. Dedicated hardware support for synchronization eliminates any latency of the network driver software.

The integrated LAN provides deterministic bandwidth allocation/reservation mechanisms so that the real-time characteristic of signal data and control data exchange is guaranteed. This applies to the data flow from the measurement server to the monitor (for example measurement signal data) and the data flow from the monitor to a measurement server (for example to feed data to a recorder module).

Integrated communication hubs in the monitor allow flexible cabling options (star topology, daisy chaining of servers).

#### NOTE

The MP5 does not support any MMS on the MSL.

## Microstream CO<sub>2</sub>

CO<sub>2</sub> sample rate: 20 samples/second

Calculation of end tidal CO<sub>2</sub> (etCO<sub>2</sub>):

The M3015A/B MMS Extensions use Microstream® non-dispersive infrared (NDIR) spectroscopy to continuously measure the amount of CO<sub>2</sub> during every breath, the amount of CO<sub>2</sub> present at the end of exhalation (etCO<sub>2</sub>), the amount of CO<sub>2</sub> present during inhalation (imCO<sub>2</sub>), and the respiratory rate. The displayed etCO<sub>2</sub> is the maximum etCO<sub>2</sub> over the previous peak-picking interval as defined by the Max Hold setting (configuration mode). It can be set to no peak picking (off), 10 seconds and 20 seconds.

Test method for respiration rate range:

A breath simulator system combined with CO<sub>2</sub> and N<sub>2</sub> gases was used to simulate respiration rates covering the specified range. The resulting end tidal CO<sub>2</sub> values were compared to the expected value. Differences between actual and expected end tidal CO<sub>2</sub> values were within the limits of the specified accuracy for the respective respiration rate, i.e. there was no effect of the respiration rate on the end tidal CO<sub>2</sub> values beyond those limits.

## Philips Clinical Network

The monitoring system may be connected to the Philips Clinical Network, for example to provide central monitoring capabilities or other network services. This connection may be through a normal wired connection or through a wireless connection.

The monitor supports the connection of an internal wireless adapter, depending on the monitor model (#J35, #J45, #J47). Switching between wired and wireless networks is automatically triggered by the plugging or unplugging of the network cable.

After configuration, the monitoring system sends the digitized patient signals including wave data, numerical data and status information onto the network. Control data representing user interactions can be exchanged between the monitoring system and a central station bi-directionally.

Additional protocols are supported for networked applications, for example for the other bed overview function, which allows viewing of monitoring data from other patients on the network.

For plug and play operation, the monitoring system uses the standard BootP protocol to automatically acquire a network address.

### **How does the Support Tool Work with the Monitor**

The support tool is a Windows application typically installed on the laptop of a customer engineer or a biomedical engineer working in the customer's own service department.

The purpose of the support tool is to upgrade, configure and diagnose all monitoring components in the system over the network.

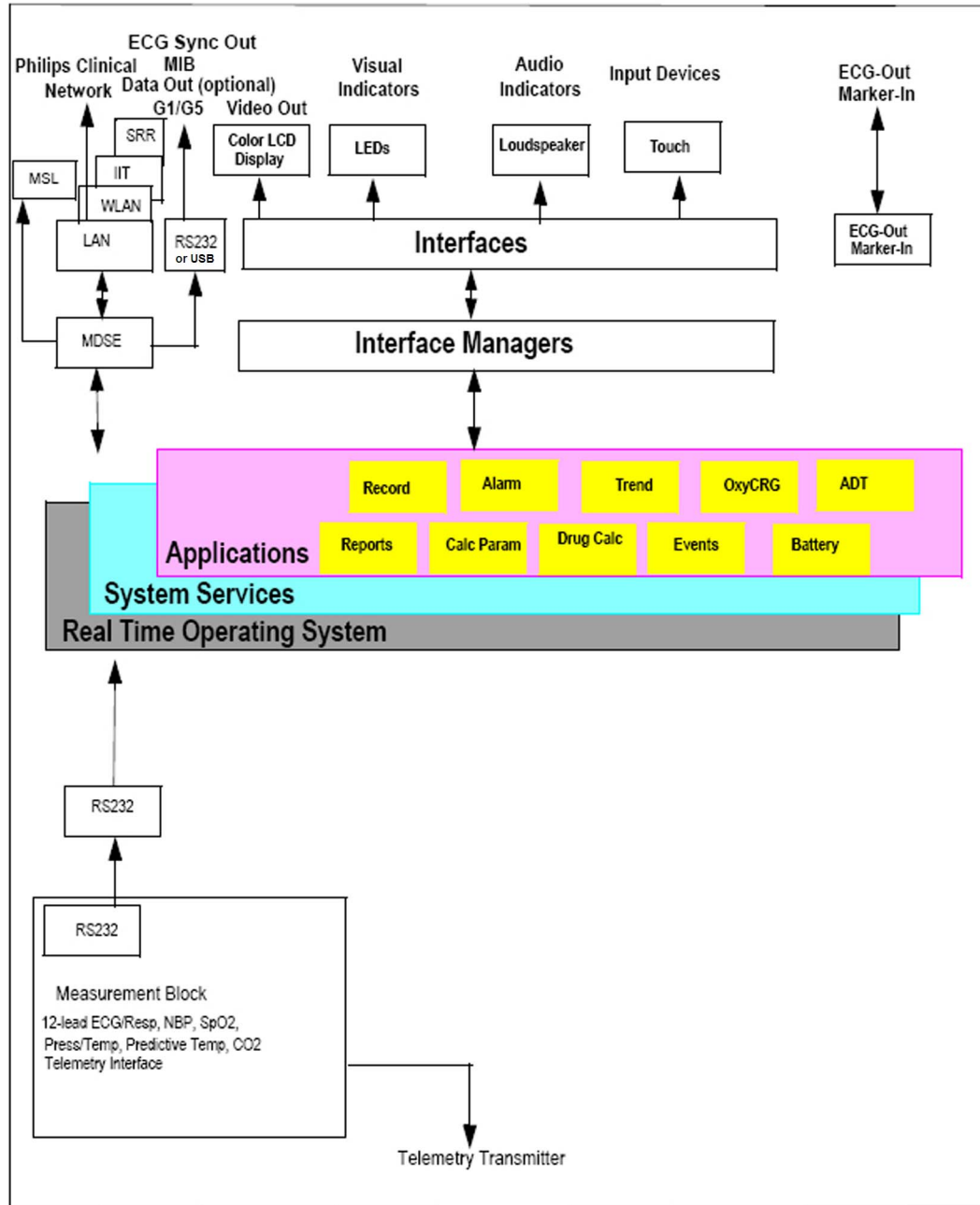
The service protocol developed for this purpose uses a raw access to the devices without the need for IP addresses etc. over a standard customer network installation, so that even defective devices can be upgraded as long as the few kBytes of initial boot code are working. The boot code itself can also be upgraded using the same protocol.

The tool allows access to internal service information and to serial numbers. It can be remote-controlled, for example via a dial-up connection from a response center, provided the proper infrastructure is in place.

For details see the Instructions for Use for the Support Tool.

## Monitor Software Block Diagram

The following shows the functional block diagram for the monitoring system. A legend explaining terms and diagram elements follows. The information below varies depending on the purchased monitor options.



*IntelliVue Patient Monitoring System Functional Block Diagram*

## Block Diagram Legend

| Functional Block | Description   |
|------------------|---|
| Services         |   |
| Operating System | The Operating System (OS) provides a layer of isolation between the specific hardware implementation and the application software. The OS performs system checks and allocates resources to ensure safe operation when the system is first started. This includes internal self-tests on several hardware modules and configuration checks for validity of configuration with the operating software. During normal operation, the OS continues to run checks on system integrity. If error conditions are detected the OS will halt monitoring operations and inform the operator about the error condition. |
| System Services  | The System Services provide generic common system services.<br>In particular:<br>They use a real-time clock component to track time. They synchronize to network time sources and verify the accuracy of the system time information. They are also responsible for managing persistent user configuration data for all Measurement parameters and IntelliVue Patient Monitoring System software modules. User configuration data is stored in a non-volatile read/write storage device   |
| Applications     |   |
| Reports          | The Reports Service retrieves current and stored physiological data and status data to format reports for printing paper documentation. Examples of supported reports: <ul style="list-style-type: none"> <li>• Vital Signs Report</li> <li>• Graphical Trend Report</li> <li>• Event Review Report</li> <li>• Event Episode Report</li> <li>• ECG Report (12 Lead/Multi-Lead)</li> <li>• Test Report</li> </ul> The Reports service generates report data which can be printed on a central printer.   |
| Record           | The Record Service retrieves current and stored physiological data and status data to format a continuous strip recording. A recording can be triggered manually by the operator or automatically by an alarm condition. The Record Service uses the services of the Recorder Interface to control a recorder. The Record Service can also send data to a central recorder.   |



| Functional Block   | Description  |
|--------------------|--|
| Alarm              | The Alarm Service contains logic that prioritizes alarm conditions that are generated by IntelliVue Patient Monitoring System software modules. Visual alarm signals (messages) are displayed at the top of the IntelliVue Patient Monitoring System display and alarm sounds are generated by a loudspeaker. Alarm conditions may be generated when a physiological parameter exceeds preselected alarm limits or when a physiological parameter or any other software module reports an inoperative status (technical alarm, for example, the ECG leads may have fallen off the patient). The Alarm service manages the alarm inactivation states, for example suspension of alarms, silencing of alarms, and alarm reminder. Alarm signals may also be configured as latching (alarm signals are issued until they are acknowledged by the operator, even when the alarm condition is no longer true). The Alarm service controls the visual alarm signals (alarm lamps). |
| Trend              | The Trend service stores the sample values of physiological data and status data with a resolution of 12 seconds, 1 minute or 5 minutes for a period of up to 48 hours. The data is kept in battery buffered read/write storage and flash memory devices to be preserved across power failures. The stored data is protected via consistency checks and checksums. When a new patient is admitted, the trend database erases all data of the previous patient.   |
| OxyCRG             | The OxyCRG (Oxygen CardioRespiroGram) service derives a high-resolution trend graph from the Beat-to-Beat Heart Rate, SpO <sub>2</sub> , and Respiration physiological data. The OxyCRG is specialized for neonatal applications, allowing the operator to identify sudden drops in Heart Rate (Bradycardia) and SpO <sub>2</sub> (Desaturation), and supporting the operator in visualizing Apnea situations.   |
| ADT                | The ADT (Admit/Discharge/Transmit) service maintains the patient demographics information. The operator may admit a new patient, discharge the old patient and enter or modify the patient demographics.   |
| Calc Param         | The Calc Param (Calculated Parameters) application performs calculations on physiological numerical values to derive calculated parameters like Temperature Difference.  |
| Interface Managers |  |

| Functional Block             | Description  |
|------------------------------|--|
| MDSE                         | <p>The MDSE (Medical Data Service Element) Interface Manager is responsible for the exchange of real-time data between the IntelliVue Patient Monitoring System display unit and the Measurement parameters and other devices attached to the network. MDSE establishes and maintains a data communication link between the devices. It provides configuration information about the remote device to applications in the local device and it allows the exchange of measurement data and status information between the devices.</p>  |
| Printer                      | <p>The Printer Interface Manager provides a high level interface to a printer. It provides means to:</p> <ul style="list-style-type: none"> <li>• establish a connection to the printer</li> <li>• transfer data to the printer</li> <li>• get status of the printer</li> <li>• close connection to the printer</li> </ul> <p>The Printer Interface Manager also supervises the connection to the printer and whether the printer accepts data (for example paper out). The Printer Interface Manager notifies the operator in such cases.</p>   |
| Display & Operator Interface | <p>The Display and Operator Interface Manager performs the following tasks:</p> <ul style="list-style-type: none"> <li>• Screen presentation of real-time and stored physiological measurement data, alarm condition data and status information received from the MDSE interface manager, the Alarm service or other IntelliVue Patient Monitoring System modules</li> <li>• Screen presentation of operating controls (control windows)</li> <li>• Processing of operating control commands received from HIF Control interface. The module verifies and interprets the received commands and forwards them to other software modules of the IntelliVue Patient Monitoring System display unit or measurement parameters.</li> <li>• Sound generation (issues audible alarm signals and generates audible information signals, for example QRS and SpO2 tones, operator audible feedback)</li> </ul> |
| Interfaces                   |  |

| Functional Block                              | Description  |
|---|--|
| LAN   | The LAN interface implements the physical layer of IEEE 802.3. The LAN interface performs Manchester encoding/decoding, receive clock recovery, transmit pulse shaping, jabber, link integrity testing, reverse polarity detection/correction, electrical isolation, and ESD protection. Electronically separated interfaces are used for communication to the Measurement parameters and to the network.  |
| Display Controller                            | The Display Controller Interface consists of a video controller, video RAM and the controlling software. The Display Controller interface processes the high level display commands (character and graphic generation, wave drawing) and translates them into pixels, which are written into the video RAM where the video controller chip generates the video synchronization signals and the pixel stream for the Color LCD Display.   |
| HIF Control                                   | The HIF (Human Interface Control) interface scans the Human Interface devices for operator controls (Touch Screen), formats the collected data and sends it to the display and Operating Interface.  |
| ECG-Out Marker-In<br>(not for MP5T and MP5SC) | The ECG Out/Marker In interface receives the ECG waveform directly from the ECG/Resp Arrhythmia ST-Segment physiological algorithm running on the main CPU and converts the digital ECG signal to an analog ECG signal. In addition, the ECG Out hardware receives from a connected device the marker information and forwards this data to the ECG/Resp Arrhythmia ST-Segment physiological algorithm. The converted analog signal is used to synchronize a connected device to the patient's ECG |
| Nurse Call<br>(not for MP5T)                  | The Nurse Call board contains a phone jack type connector with a single close-on-alarm relay.  |
| MIB<br>(not for MP5T and MP5SC)               | The MIB interface allows full-duplex, short-haul asynchronous binary communication between the monitor and an arbitrary (medical/non-medical) device using an eight-pin RJ45 modular connector. Communication protocols using this interface can be configured.  |
| ECG Sync Out<br>(not for MP5T and MP5SC)      | A pulse signal is provided on the RS-232 interface to allow synchronisation with other medical devices.  |
| IIT<br>(not for MP5T and MP5SC)               | The built-in IIT adapter allows operation of the MP5 monitors within IntelliVue Instrument Telemetry infrastructure.   |
| WLAN<br>(not for MP5T)                        | The built-in WLAN interface allows wireless operation of the MP5 monitors with the IntelliVue 802.11 Bedside Adapter.  |
| SRR   | The built-in SRR interface allows wireless communication of the MP5, MP5T and MP5SC monitors with an IntelliVue Instrument Telemetry Transceiver.  |

| Functional Block                | Description  |
|---------------------------------|--|
| MSL<br>(not for MP5T and MP5SC) | All components of the monitoring system communicate using an IEEE802.3/ Ethernet LAN in the Measurement Link (MSL). This network is used to distribute data between the components |
| USB Interface<br>(not for MP5T) | The USB interface allows connection of USB devices (Mouse, Keyboard, Barcode Scanner) to the monitor. Note that USB printers are not supported.                                    |

# Testing and Maintenance

## Introduction

This chapter provides a checklist of the testing and maintenance procedures to ensure the performance and safety of the monitor.

These tests must be performed only by qualified personnel certified by the responsible organization. Qualifications required are: training on the subject, knowledge, experience and acquaintance with the relevant technologies, standards and local regulations. The personnel assessing safety must be able to recognize possible consequences and risks arising from non-conforming equipment.

All recurring safety and performance assurance tests must be performed under equal environmental conditions to be comparable.

Preventive Maintenance refers specifically to the series of tests required to make sure the measurement results are accurate. The accuracy and performance procedures are designed to be completed as specified in the following sections or when readings are in question.

For detailed instructions on the maintenance and cleaning of the monitor and its accessories, see *Care and Cleaning*, *Using Batteries* and *Maintenance and Troubleshooting* in the monitor's *Instructions for Use*.

## Terminology and Definitions

The following terms and definitions are used throughout this chapter and taken from the international standards IEC 60601-1, IEC 60601-1-1 and IEC 62353.

- **Medical System:** a medical electrical system is a combination of at least one medical electrical device and other electrical equipment, interconnected by functional connection or use of a multiple portable socket-outlet.
- **Patient Environment:** any area in which intentional or unintentional contact can occur between the patient and parts of the medical system or between the patient and other persons who have had contact with parts of the medical system. The patient environment is defined anywhere within 1.5m (5 feet) of the perimeter of the patient's bed and 2.5m (8.2 feet) from the floor.
- **Separation Device/Transformer:** a component or arrangement of components with input parts and output parts that, for safety reasons, prevent a transfer of unwanted voltage or current between parts of a medical system.
- **Multiple Portable Socket-Outlet:** a combination of two or more socket-outlets intended to be connected to or integrated with flexible cables or cords, which can easily be moved from one place to another while connected to the power mains.
- **Functional Connection:** an electrical connection for transfer of signals and/or power.

- **Tests:** Safety or Performance Assurance test procedures which may consist of several steps.

## Recommended Frequency

Perform the procedures as indicated in the suggested testing timetable. These timetable recommendations do not supersede local requirements.

| Tests                       |   | Frequency  |
|-----------------------------|---|--|
| Preventive Maintenance      | NBP Performance   | Once every two years, or more often if specified by local laws.  |
|                             | Microstream CO <sub>2</sub> Calibration <sup>1</sup>                    | <b>Once a year</b> or after <b>4000 hours</b> of continuous use and following any instrument repairs or the replacement of any instrument parts.   |
|                             | Tympanic Temperature Calibration  | Once a year. If the unit is dropped or damaged, check it and calibrate it before further use.  |
| Other Regular Tests         | Visual Inspection   | Before each use.   |
|                             | Power On Test   |  |
| Performance Assurance Tests | ECG/Resp Performance  | Once every two years, or if you suspect the measurement is incorrect, except Mainstream CO <sub>2</sub> Accuracy Check, Sidestream CO <sub>2</sub> Accuracy Check and Flow Check and Predictive Temperature Accuracy Check - required once a year. |
|                             | ECG Out Sync Performance <sup>1,2</sup>                                 |  |
|                             | ECG Sync Pulse Performance <sup>1,2</sup>                               |  |
|                             | SpO <sub>2</sub> Performance  |  |
|                             | NBP Performance   |  |
|                             | Invasive Pressure Performance <sup>1,2</sup>                            |  |
|                             | Temperature Accuracy <sup>1,2</sup>                                     |  |
|                             | Predictive Temperature Accuracy Check                                   |  |
|                             | Mainstream CO <sub>2</sub> Accuracy Check <sup>1,2</sup>                |  |
|                             | Sidestream CO <sub>2</sub> Accuracy Check and Flow Check <sup>1,2</sup> |  |
|                             | Microstream CO <sub>2</sub> Performance Test <sup>1</sup>               |  |
|                             | Nurse Call Relay Performance <sup>1</sup>                               |  |
|                             | Power Loss Alarm Buzzer Performance                                     |  |
|                             | MSL Assurance Test <sup>1,2</sup>                                       |  |
|                             | Mounting Integrity Test   |  |
|                             | Battery Performance   |  |

| Tests        |            |                           | Frequency   |
|--------------|------------|---------------------------|---|
| Safety Tests | Visual     | Visual Inspection         | After each service event  |
|              | Electrical | Protective Earth          | Once every two years and after repairs where the power supply has been removed or replaced or the monitor has been damaged by impact. |
|              |            | Equipment Leakage Current |   |
|              |            | Patient Leakage Current   |   |
|              |            | System Test               | Once every two years  |

<sup>1</sup> These tests do not apply for MP5T.

<sup>2</sup> These tests do not apply for MP5SC

## When to Perform Tests

This table tells you when to perform specific tests. The corresponding test procedures are described in the following sections **All tests listed below must be performed on the monitor.**

| Service Event<br>(When performing...   | Tests Required<br>...Complete these tests)   |
|--|--|
| <b>Installation</b>  |  |
| <b>Installation</b> of a monitor in combination with a medical or non-medical device connected to the same multiple socket outlet. | Perform Visual Inspection, Power On and System Tests   |
| <b>Installation</b> of a standalone monitor with <b>no</b> display connected to the video output                                   | Perform Visual Inspection and Power On Test  |
| <b>Installation</b> of a monitor with a medical display specified by Philips   | Perform Visual Inspection and Power On Test  |
| <b>Installation</b> of a monitor with an off-the-shelf display (non-compliant with IEC60601-1)                                     | Perform Visual Inspection, Power On and System Test  |
| <b>Installation</b> of a monitor with IntelliVue G1/G5, connected to separate mains sockets.                                       | Perform Visual Inspection and Power On Tests   |
| <b>Installation</b> of monitor with IntelliVue Instrument Telemetry (IIT)  | Perform Visual Inspection, Power On and IIT communication test                               |
| <b>Installation</b> of a monitor with IT equipment e.g. PC connected via a functional connection e.g. Centronics or USB.           | Perform Visual Inspection, Power On and System Tests   |
| <b>Installation</b> of monitor with IntelliVue 802.11 Bedside Adapter  | Perform Visual Inspection, Power On and IntelliVue 802.11 Bedside Adapter Communication Test |
| <b>Installation</b> of a monitor with Short Range Radio (SRR)  | Perform Visual Inspection, Power On and SRR communication test                               |
| <b>Installation</b> of networked monitor (LAN)   | Perform Visual Inspection and Power On Test  |

| Service Event<br>(When performing...   | Tests Required<br>...Complete these tests)  |
|--|---|
| <b>Preventive Maintenance</b>  |   |
| Preventive Maintenance*  | Perform preventive maintenance tests and procedures: <ul style="list-style-type: none"> <li>• NBP calibration</li> <li>• Microstream CO2 calibration</li> <li>• Tympanic Temperature Calibration</li> </ul> |
| <b>Other Regular Tests and Tasks</b>   |   |
| Visual Inspection  | Perform Visual Inspection   |
| Power On Test  | Perform Power On test   |
| <b>Repairs</b>   |   |
| <b>Repairs</b> where the monitor has been damaged by impact, liquid ingress, fire, short circuit or electrical surge.  | Perform Visual Inspection, Power On, all Safety Tests and Full Performance Assurance Tests  |
| <b>Repairs</b> where the power supply, the mains socket or an interface board is removed or replaced or the protective earth ground connection is disrupted. | Perform Visual Inspection, Power On, all Safety Tests and Basic Performance Assurance Test  |
| <b>Repairs</b> where the main board has been replaced.   | Perform Visual Inspection, Power On, Basic Performance Assurance Test and NBP Accuracy Test and Calibration.  |
| <b>Repairs</b> where the measurement block has been removed or replaced  | Perform Visual Inspection, Power On, all Safety Tests and Basic Performance Assurance Test. If a certain parameter seems suspicious, perform Full Performance Assurance Test for this parameter.            |
| <b>Repairs</b> where the NBP pump has been replaced  | Perform Visual Inspection, Power On, all Safety Tests, Basic Performance Assurance Test and NBP Performance Test and Calibration  |
| <b>Repairs</b> of IntelliVue Instrument Telemetry (IIT) Module   | Perform Visual Inspection, Power On Test Block and IIT communication test   |
| <b>Repairs</b> of IntelliVue 802.11 Bedside Adapter  | Perform Visual Inspection, Power On and IntelliVue 802.11 Bedside Adapter Communication Test  |
| <b>Repairs</b> of Short Range Radio (SRR) Interface  | Perform Visual Inspection, Power On and SRR Communication Test  |
| <b>Repairs</b> of the IntelliVue G1/G5   | Perform Basic Performance Assurance Test. For further testing requirements, see IntelliVue G1/G5 Service Guide  |
| <b>Repairs</b> where the Quick Mount has been disassembled   | Perform Mounting Integrity Test   |
| All other IntelliVue Monitoring System repairs (except when power supply is removed)   | Perform Visual Inspection, Power On Test and Basic Performance Assurance Test   |



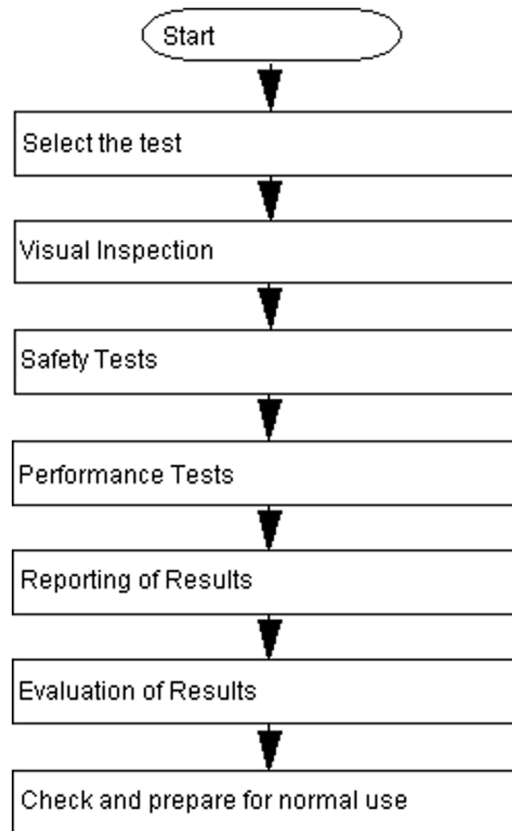
| Service Event<br>(When performing...   | Tests Required<br>...Complete these tests)  |
|--|---|
| <b>Performance Assurance</b>   |   |
| Basic Performance Assurance  | Perform basic performance assurance tests for the respective monitoring system component.   |
| Full Performance Assurance   | Perform all accuracy and performance test procedures listed in the following sections. If a particular measurement is in question, perform the measurement performance test only. |
| <b>Upgrades</b>  |   |
| Software <b>Upgrades</b>   | Perform Visual Inspection, Power On Test and Basic Performance Assurance Test unless otherwise specified in the Upgrade Installation Notes shipped with the upgrade.              |
| Hardware <b>Upgrades</b>   | Perform Visual Inspection, Power On Test and Basic Performance Assurance Test unless otherwise specified in the Upgrade Installation Notes shipped with the upgrade.              |
| Hardware <b>Upgrades</b> where IntelliVue Instrument Telemetry (IIT) is installed  | Perform Visual Inspection, Power On Test, Basic Performance Assurance Test and IIT communication Test   |
| Hardware <b>Upgrades</b> where IntelliVue 802.11 Bedside Adapter is installed  | Perform Visual Inspection, Power On Test, Basic Performance Assurance Test and IntelliVue 802.11 Bedside Adapter Communication Test   |
| Hardware <b>Upgrades</b> where Short Range Radio (SRR) is installed  | Perform Visual Inspection, Power On Test, Basic Performance Assurance Test and SRR communication Test   |
| Installation of Interfaces or Hardware <b>Upgrades</b> where the power supply or parameter boards need to be removed.  | Perform Visual Inspection, Power On Test, Basic Performance Tests and all Safety Tests  |
| <b>Combining or Exchanging System Components</b> (non-medical equipment connected to an IntelliVue monitor or medical system equipment operated on a multiple socket outlet) | Perform the System Test for the respective system components  |

**NOTE**

It is the responsibility of the facility operator or their designee to obtain reference values for recurring safety and system tests. These reference values are the results of the first test cycles after an installation. You may also purchase this service from Philips.

# Testing Sequence

Summary of the recommended sequence of testing:



## NOTE

If any single test fails, testing must be discontinued immediately and the device under test must be repaired or labeled as defective.

# Visual Inspection

## Before Each Use

Check all exterior housings for cracks and damage. Check the condition of all external cables, especially for splits or cracks and signs of twisting. If serious damage is evident, the cable should be replaced immediately. Check that all mountings are correctly installed and secure. Refer to the instructions that accompany the relevant mounting solution.

## After Each Service, Maintenance or Repair Event

Ensure all fuses accessible from the outside comply with the manufacturer's specification.

Check:

- the integrity of mechanical parts, internally and externally.
- any damage or contamination, internally and externally

- that no loose parts or foreign bodies remain in the device after servicing or repair.
- the integrity of all relevant accessories.

## Power On Test

- 1 Connect the monitoring system to mains and switch it on. This includes connected displays and gas analyzers.
- 2 Make sure that all steps listed in the table *Initial Instrument Boot Phase* in the Troubleshooting section are completed successfully and that an ECG wave appears on the screen.

The expected test result is pass: the monitor boots up and displays an ECG wave. The wave might be a flat line if no simulator is attached.

## Safety Tests

Safety tests are comprised of the following tests performed on the monitoring system:

- protective earth resistance
- equipment leakage current
- applied part leakage current
- system test (if applicable)

Safety test requirements are set according to international standards, their national deviations and specific local requirements. The safety tests detailed in this Service Guide are derived from international standards but may not be sufficient to meet local requirements. We recommend that you file the results of safety tests. This may help to identify a problem early particularly if the test results deteriorate over a period of time.

Each individual piece of equipment which has its own connection to mains or which can be connected or disconnected from mains without the use of a tool must be tested individually. The monitoring system as a whole must be tested according to the procedure described in “System Test” on page 55.

Accessories which can affect the safety of the equipment under test or the results of the safety test must be included in the tests and documented.

## Warnings, Cautions, and Safety Precautions

- These tests are well established procedures of detecting abnormalities that, if undetected, could result in danger to either the patient or the operator.
- Disconnect the device under test from the patient before performing safety tests.
- Disconnect the device under test from mains before performing safety tests. If this is not possible, ensure that the performance of these tests does not result in danger to the safety analyzer operator, patients or other individuals.
- Test equipment (for example, a *Safety Analyzer*) is required to perform the safety tests. Please refer to Annex C of IEC/EN 62353 for exact requirements for the measurement equipment and for measurement circuits for protective earth resistance and leakage currents. Refer to the documentation that accompanies the test equipment. Only certified technicians should perform safety testing.
- The consistent use of a *Safety Analyzer* as a routine step in closing a repair or upgrade is emphasized as a mandatory step to maintain user and patient safety. You can also use the *Safety*

*Analyzer* as a troubleshooting tool to detect abnormalities of line voltage and grounding plus total current loads.

- During safety testing, mains voltage and electrical currents are applied to the device under test. Ensure that there are no open electrical conductive parts during the performance of these tests. Avoid that users, patients or other individuals come into contact with touch voltage.
- For Europe and Asia/Pacific, the monitor complies with:  
IEC 60601-1:1988 + A1:1991 + A2:1995(Ed.2); EN60601-1:1990 + A1:1993 + A2:1995(Ed.2);  
IEC 60601-1-1:2001; EN 60601-1-1:2001; IEC 60601-1-2:2001+A1:2004; EN 60601-1-2:2001+A1:2006.  
For USA, the monitor complies with:  
UL60601-1:2003  
For Canada, CAN/CSA C22.2#601.1-M90+S1+A2
- Local regulations supersede the testing requirements listed in this chapter.
- If a non-medical electrical device is connected to a medical electrical device, the resulting medical electrical system must comply IEC 60601-1-1:2000/ EN 60601-1-1:2001 or IEC 60601-1:2005/ EN 60601-1:2006+A1:2012 (Ed.3) Section 16 "ME Systems"
- Perform safety tests as described on the following pages.

## Safety Test Procedures

Use the test procedures outlined here **only** for verifying and recording the initial values prior to or at installation, safe installation or service of the product, and for periodic recurrent testing. The setups used for these tests and the acceptable ranges of values are derived from local and international standards but may not be equivalent. These tests are not a substitute for local safety testing where it is required for an installation or a service event. If using an approved safety tester, perform the tests in accordance with the information provided by the manufacturer of the tester and in accordance with your local regulations, for example IEC/EN 60601-1, UL60601-1 (US), IEC/EN 62353, and IEC/EN 60601-1-1. The safety tester should print results as detailed in this chapter, together with other data.

Please refer to Annex C of IEC/EN 62353 for requirements for the measurement equipment and for measurement circuits for protective earth resistance and leakage currents.

The following symbols are used in the diagrams illustrating the safety tests:



Supply mains



Protective earth

L, N

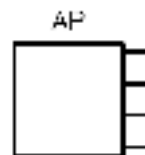
Supply mains terminals

PE

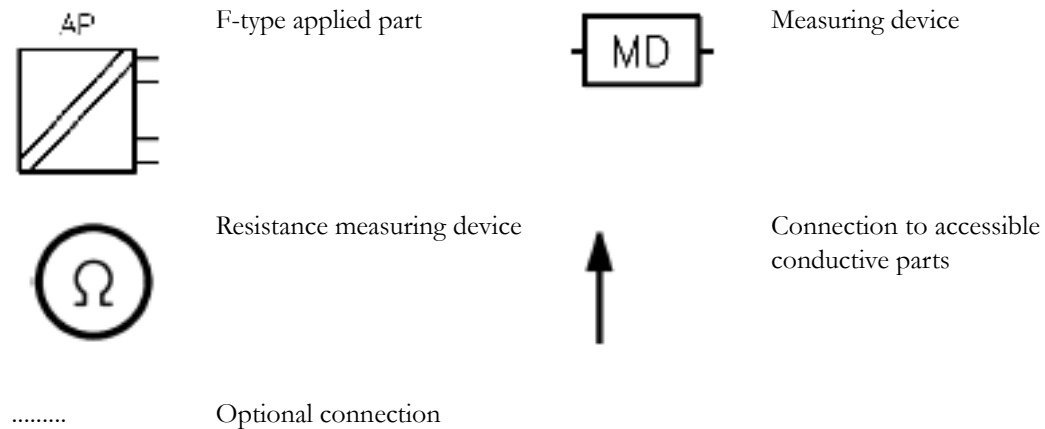
Protective earth terminal



Mains part



Applied part

**CAUTION****After each service, maintenance or repair event:**

Ensure all fuses accessible from the outside comply with the manufacturer's specification.

Check:

- the integrity of mechanical parts, internally and externally.
- any damage or contamination, internally and externally.
- that no loose parts or foreign bodies remain in the device after servicing or repair.
- the integrity of all relevant accessories.

**Hints for Correct Performance of Safety Tests**

- Perform a visual inspection on all detachable power cords used with the monitoring system and include these in all safety test procedures.
- Connection lines such as data lines or functional earth conductors may appear to act like protective earth connections. These may lead to incorrect measurements and need to be considered during testing. If necessary, unplug these connections.
- During measurements, the device under test shall be isolated from earth (e.g. test on an insulated work bench), except the protective earth conductor in the power supply cord.
- Position all cables and cords in such a manner that they do not influence the safety tests.
- Measurement of insulation resistance is not required.
- When testing a medical electrical system, where possible, test it such that potential ground voltage variations are present as they may be during actual use.

**Guideline for Performance of Safety Tests**

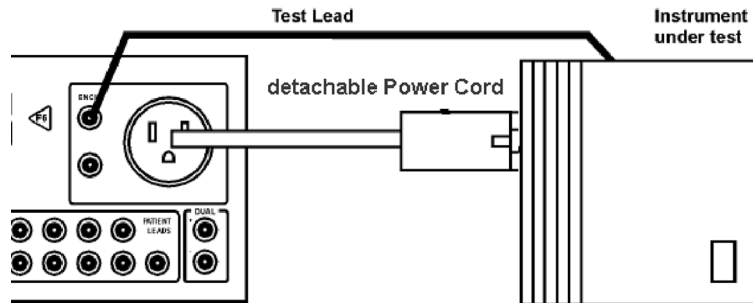
This section introduces the general principle of performing recurrent safety tests. Product specific test descriptions are described in the following sections.

Connect the detachable power cord of the device under test to the safety analyzer's test mains port.

Connect the enclosure test lead of the safety analyzer to the enclosure of the device under test, e.g. to

### 3 Testing and Maintenance

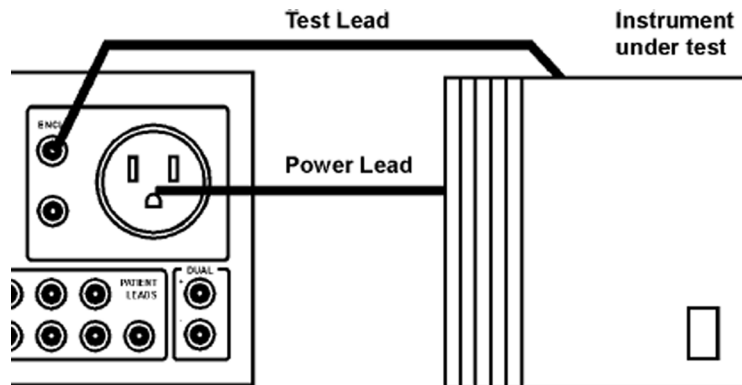
the equipotential connector or unearthed conductive accessible parts where applicable during Equipment Leakage Current Tests and Applied Part Leakage Current Tests. For testing the applied part leakage current, connect all applied parts to the safety analyzer using the appropriate patient lead or adapter cable. For the ECG parameter all ten ECG-leads need to be connected to the safety analyzer. If necessary, use an adapter cable to connect all ten ECG-leads. If necessary, repeat the safety test procedure until all available applied parts have been tested. Refer to the documentation that accompanies the safety analyzer for further details on how to set up and perform the test.



Protective Earth Resistance Test - Setup Example

#### NOTE

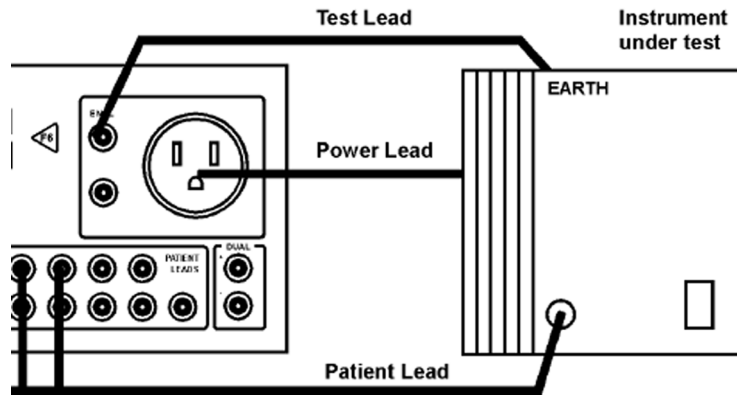
The test lead needs to go to parts that require protective earthing. This may be a single connection or several tested after each other



Equipment Leakage Current Test - Setup Example

#### NOTE

The test lead needs to go to the grounded enclosure parts, the ungrounded enclosure parts and all of the applied parts connected together.



Applied Part Current Test - Setup Example

#### NOTE

The above graphics resemble the Metron QA-90 setup and are protected by copyright. Copyright owned by Fluke (Metron).

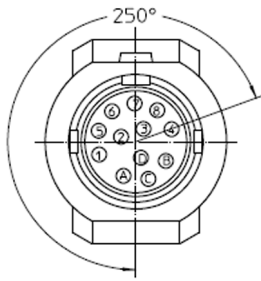
### Safety Test Adapter Cable - Schematics

The following graphics provide schematics of safety test (patient lead) adapter cables which can be used for electrical safety testing. These schematics can also be used as a guideline for making your own safety test adapter cables. Alternatively, other methods to make safety test adapter cables can be used, e.g. using a modified accessory cable.

#### NOTE

You may not need all of the cables displayed below for electrical safety testing of your respective monitor.

## ECG



### Wiring Schematic

PLUG 12-PIN

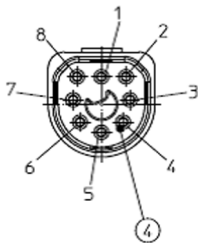
MALE

Conductor Coloring

Plug Banana



## SpO2 (X2 #A01-#A04, M3001AL #A01-#A04, MP2/MP5 #SP1-#SP4)



### Wiring Schematic

PLUG 8-PIN

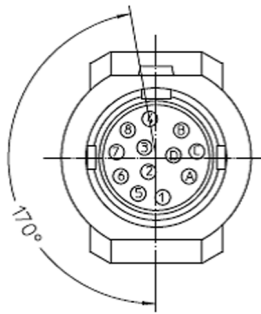
MALE

Conductor Coloring

Plug Banana

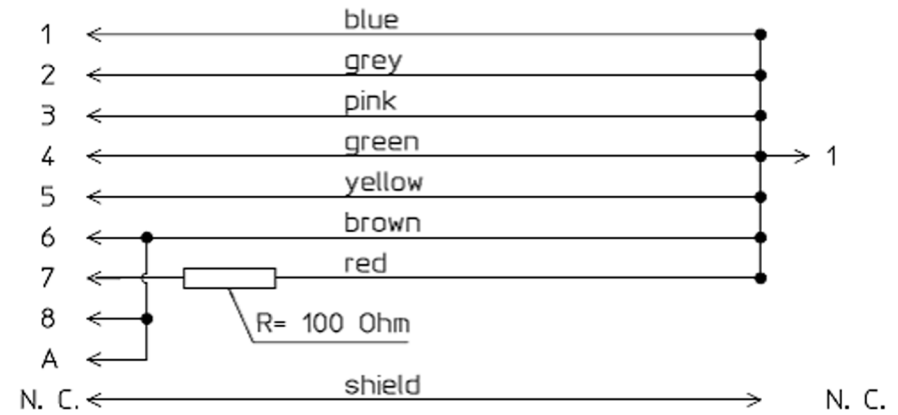




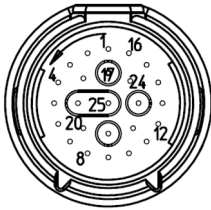
**SpO2 (M1020A)**Wiring SchematicPLUG 12-PIN

MALE

Conductor Coloring

Plug Banana

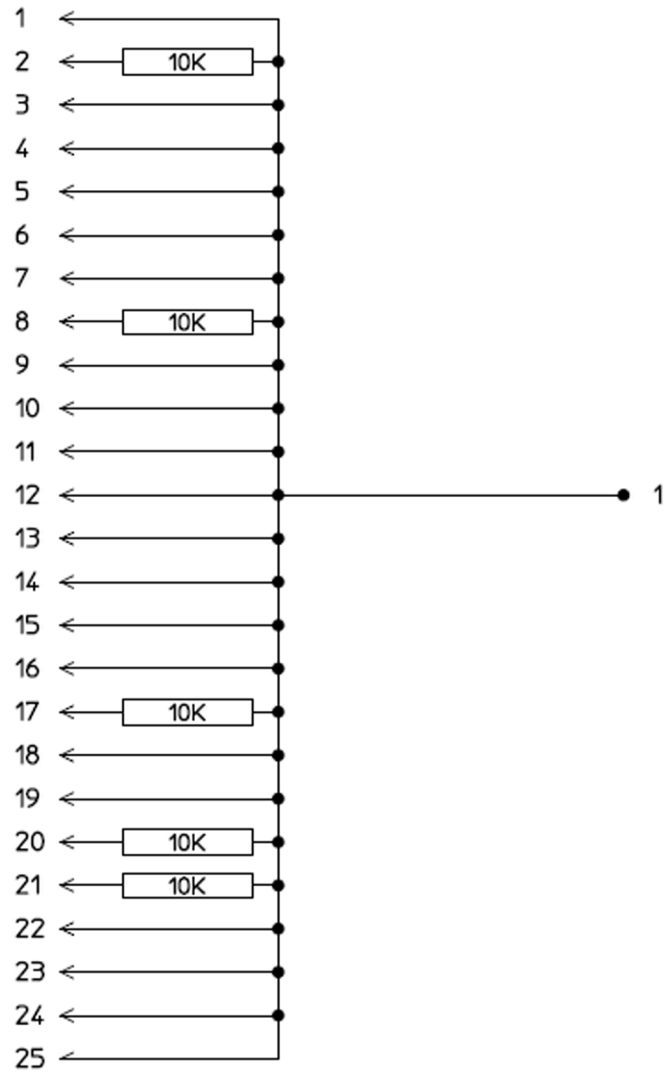
Masimo rainbow SET (X2 #A05, M3001AL #A05, MP2/MP5 #SP5)



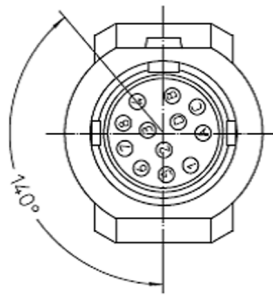
Wiring Schematic

Connector, 25-Contacts

Plug Banana



## Invasive Pressure



### Wiring Schematic

PLUG 12-PIN

MALE

Conductor Coloring

Plug Banana



## Invasive Pressure (M1006B #C01)

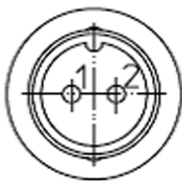
### Wiring Schematic

Phone Jack 1/8"  
Stereo

Plug Banana



## Temperature



### Wiring Schematic

Plug 2-Contact

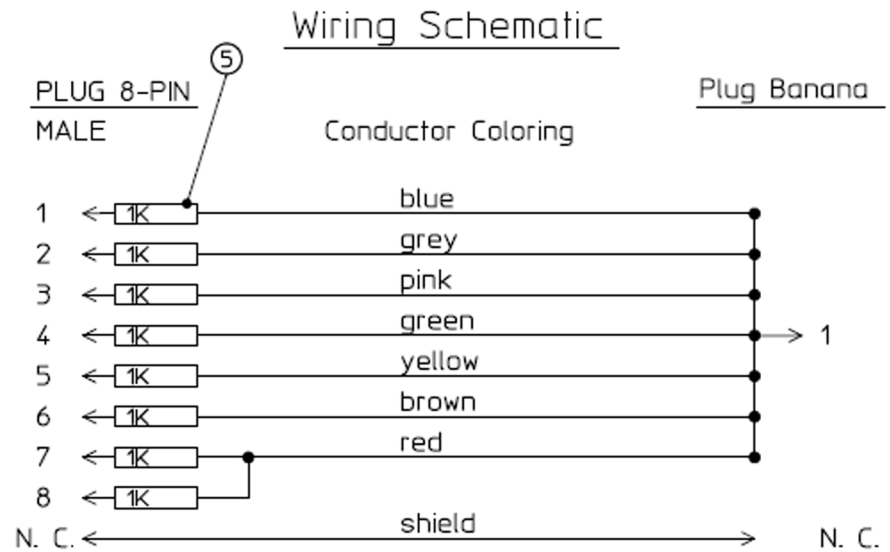
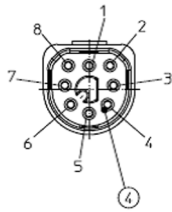
Male

Conductor Coloring

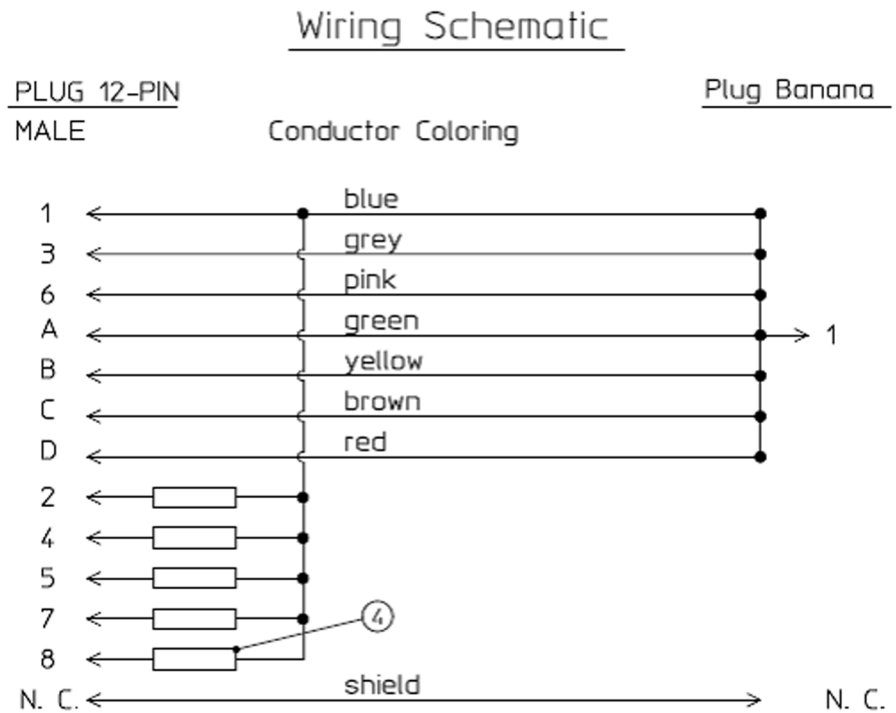
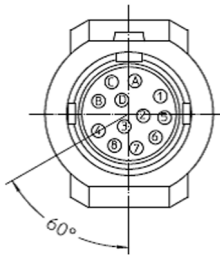
Plug Banana



## CO2 (MP5, M3014A)

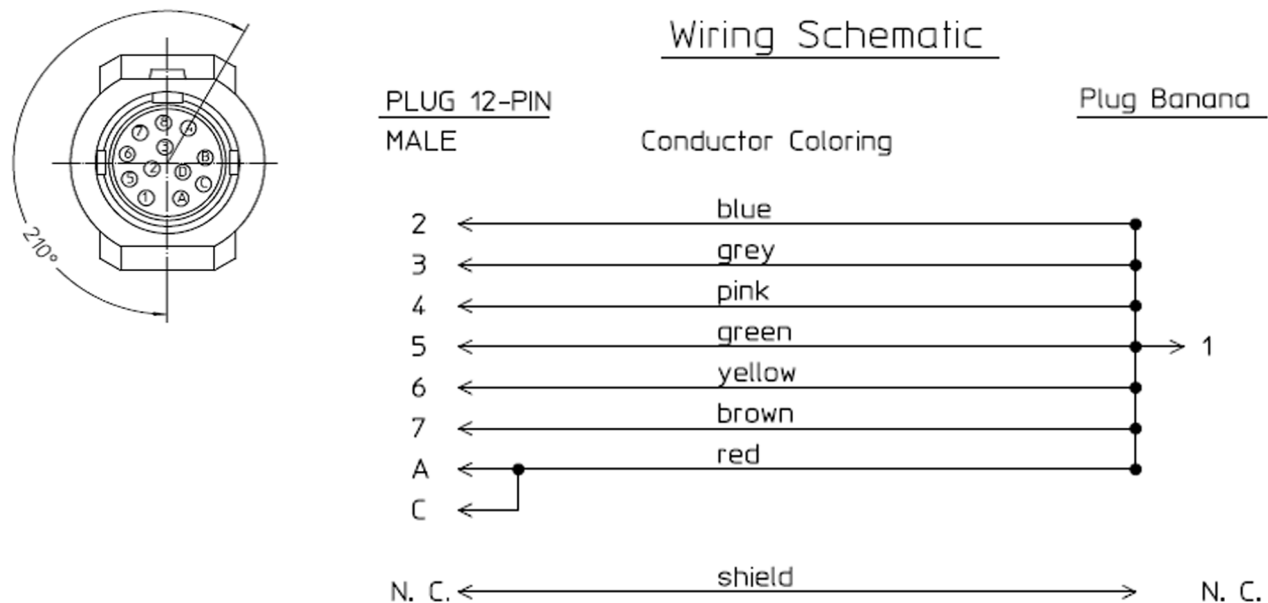


## CO2 (M1016A, M3016A)



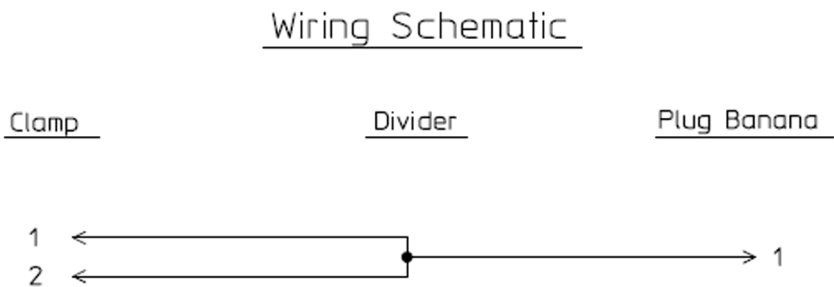
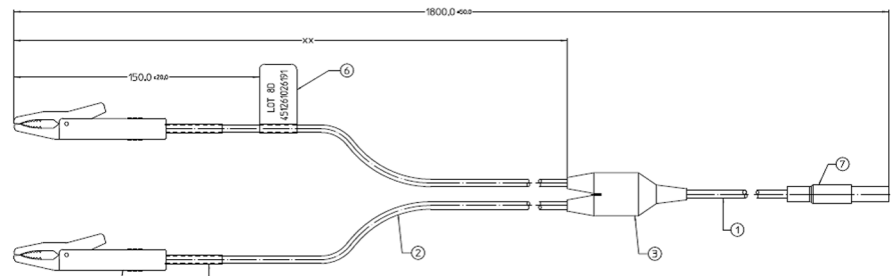
4 = all resistors 120 KOhm

Cardiac Output

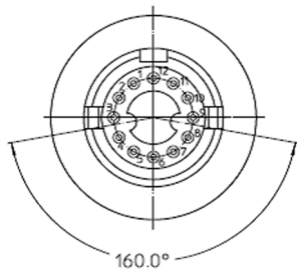


BIS

Use Clamp Adapter Cable and BIS sensor simulator (P/N: M1034-61650, 453563233731).



## VueLink



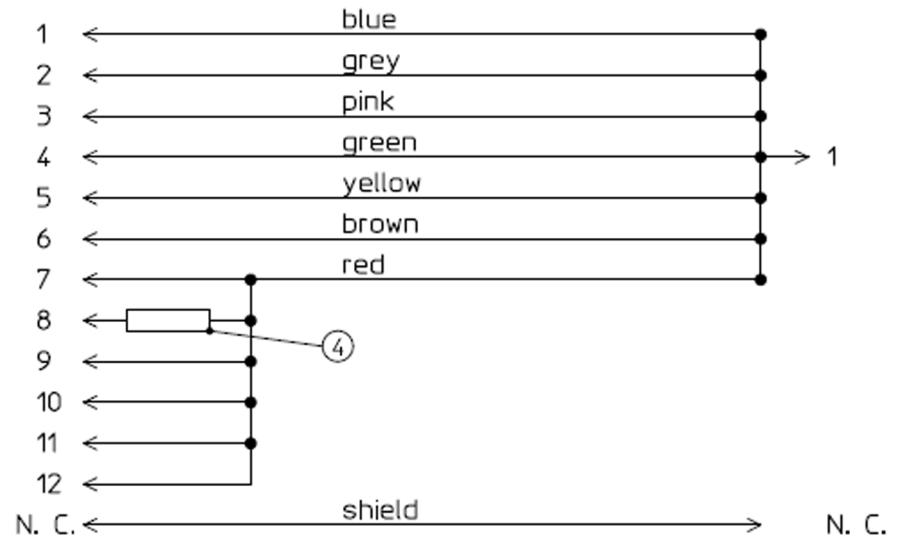
### Wiring Schematic

PLUG 12-PIN

MALE

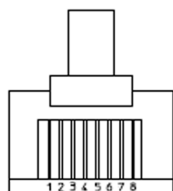
Conductor Coloring

Plug Banana



4 = 220 Ohm

## IntelliBridge



## Wiring Schematic

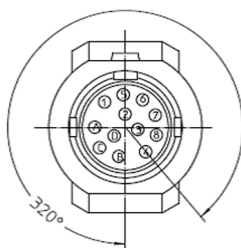
Plug RJ-45

Plug Banana

Conductor Coloring



## EEG



## Wiring Schematic

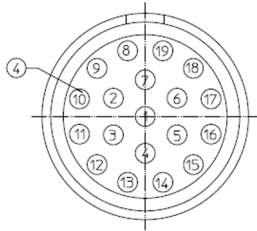
Plug 12-Contact

Plug Banana

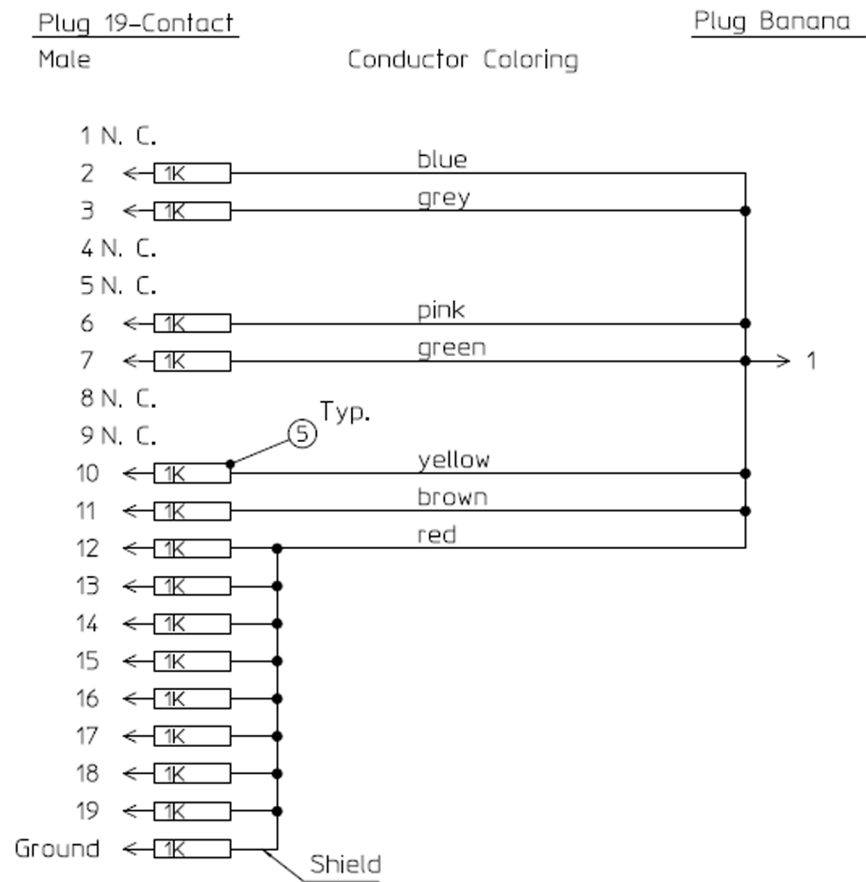
Male Conductor Coloring



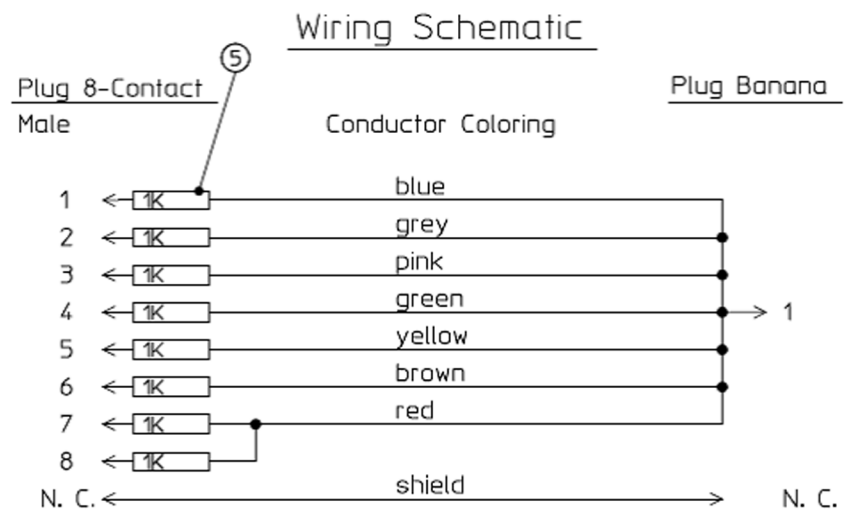
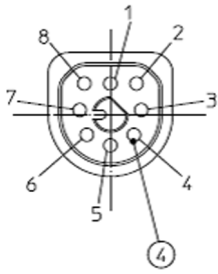
## SvO2 (M1021A)



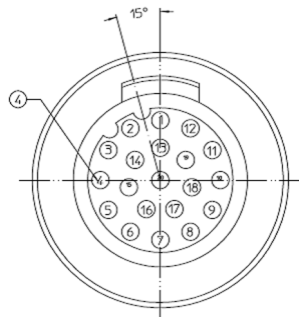
### Wiring Schematic



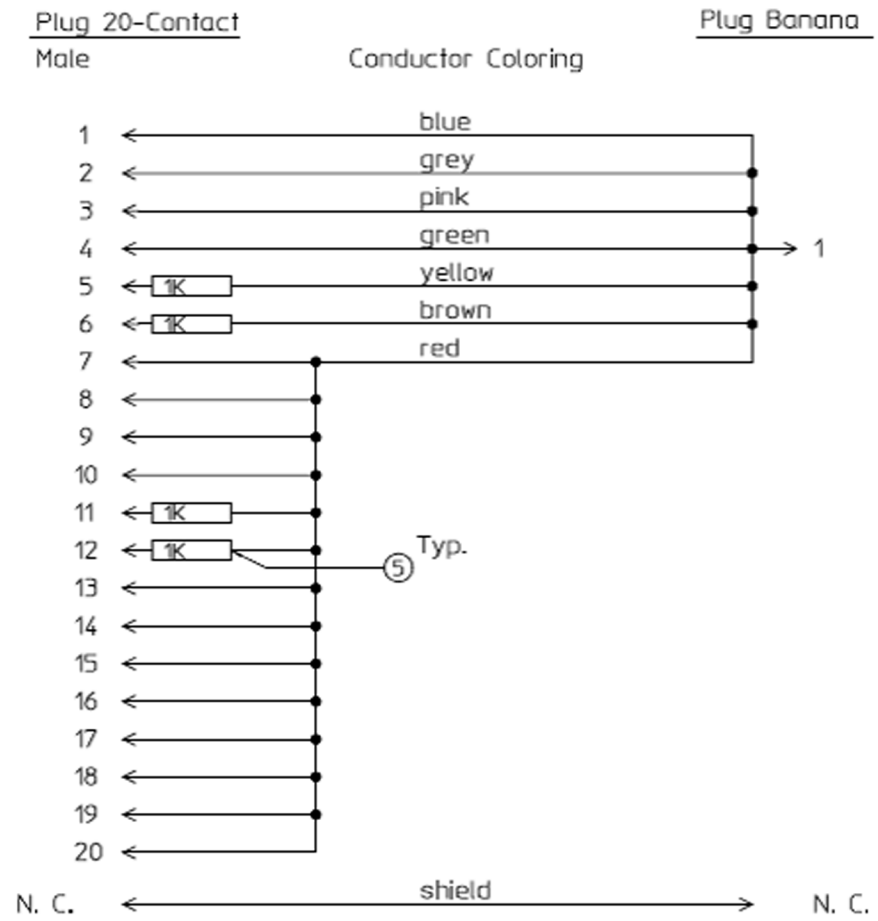


**ScVO2 (M1011A)**

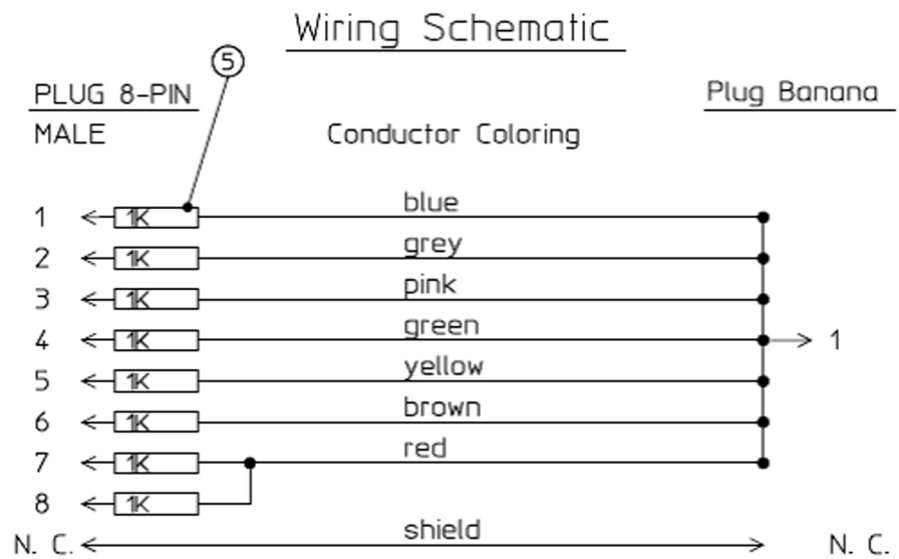
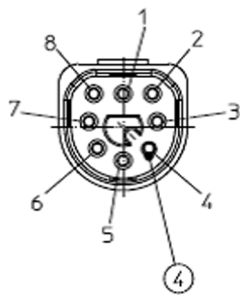
## tcpO2/tcpCO2



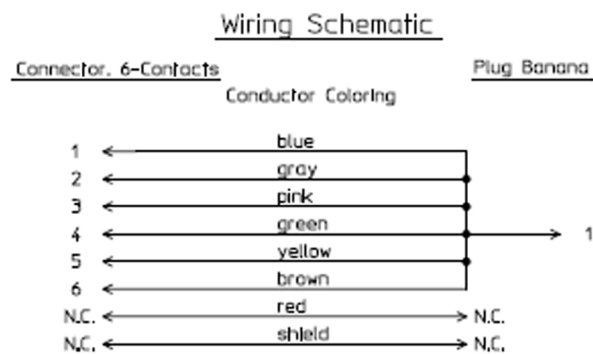
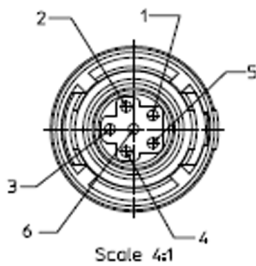
### Wiring Schematic



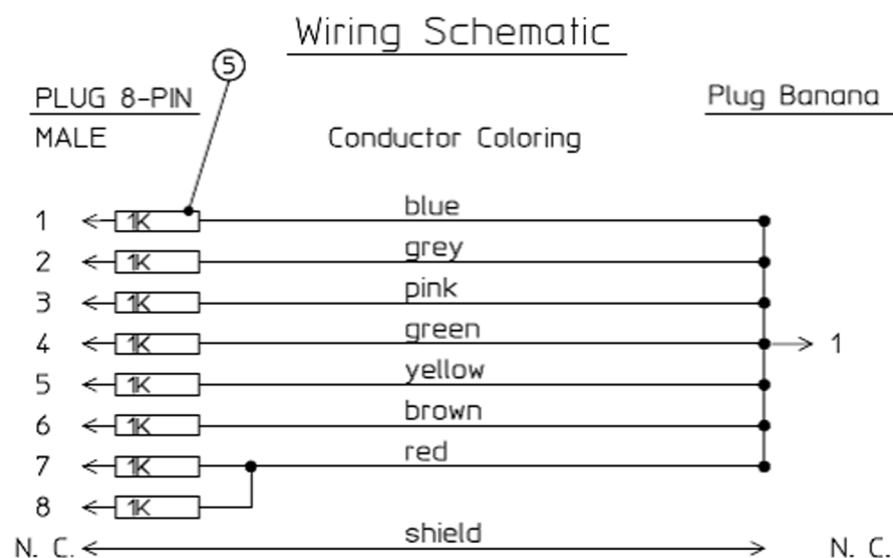
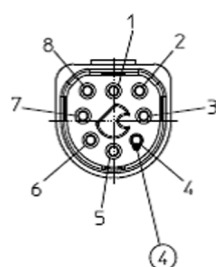
## MP5 Predictive Temperature



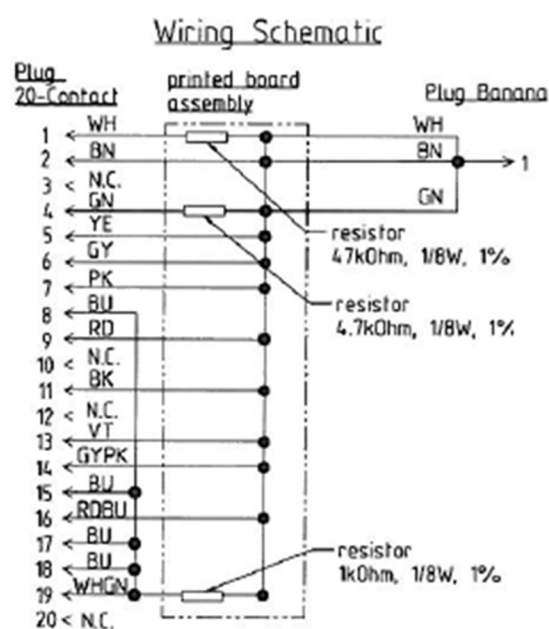
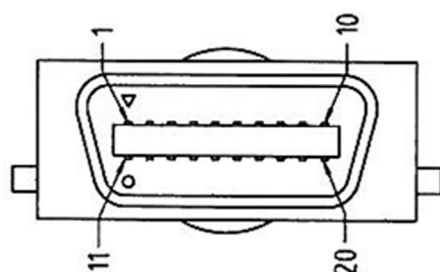
## Tympanic Temperature



# MP5 TAAP

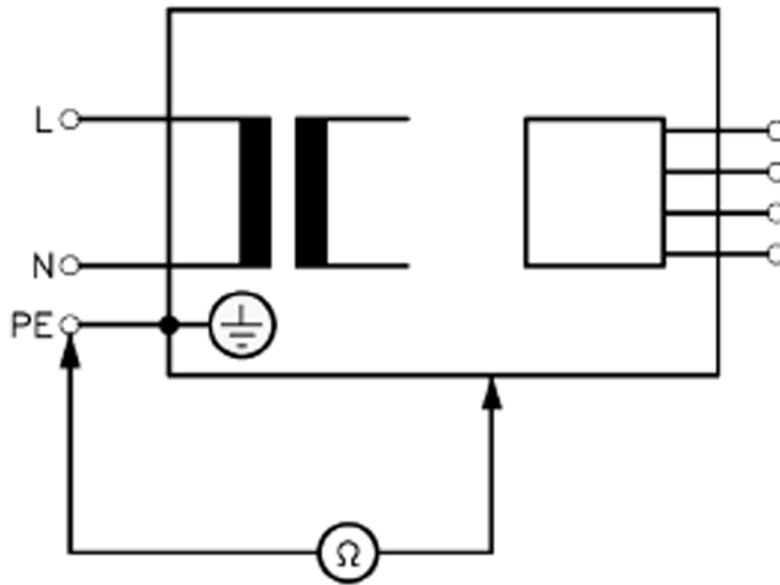


# TcG10



### S(1): Protective Earth Resistance Test

Test to perform:



**Measuring circuit for the measurement of Protective Earth Resistance in medical electrical equipment that is disconnected from the supply mains.**

This measures the impedance of the Protective Earth (PE) terminal to all exposed metal parts of the Device under Test (DUT), which are for safety reasons connected to the Protective Earth (PE).

You can find metal parts of the device at the equipotential connector.

Measurements shall be performed using a measuring device capable to deliver a current of at least 200 mA into 500 mOhms with maximum open circuit voltage of 24V

This safety test is based on IEC/EN 62353.

Report the highest value (X1).

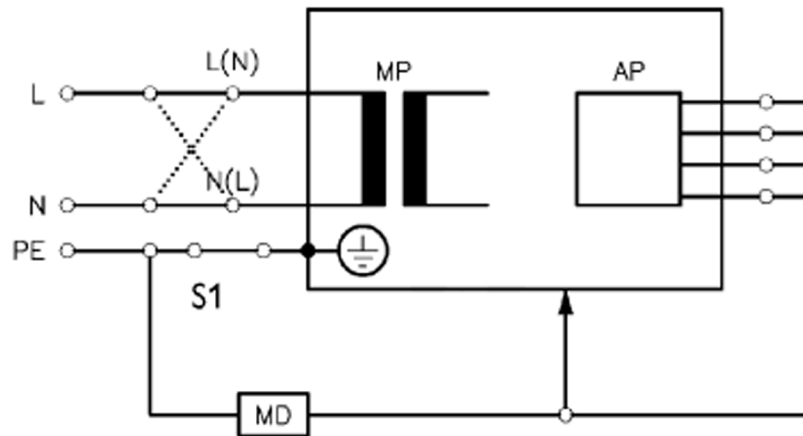
| Test  | Expected test results |
|---|-----------------------|
| Protective Earth Resistance Test (with mains cable) | X1 ≤ 300mOhms         |

#### NOTE

- If the protective earth resistance test fails, testing must be discontinued immediately and the device under test must be repaired or labeled as defective.
- All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.
- Flex the power cord during the protective earth resistance test to evaluate its integrity. If it does not pass the test, exchange the power cord. Then repeat the test. If it still does not pass, follow the instructions in the first bullet point of this note above.

## S(2): Equipment Leakage Current Test - Normal Condition

Test to perform:



**Measuring circuit for the measurement of Equipment Leakage Current - Direct method according to IEC/EN 62353.**

This test measures leakage current of accessible conductive and non-conductive metal parts of the monitor and the functional earth leakage current. It tests normal and reversed polarity. Perform the test with S1 closed (Normal Condition).

There are no parts of the equipment that are not protectively earthed. Disconnect any data cables and any connections that may provide an extraneous earth path. Test the device under test (DUT) on an insulated surface. Do not touch the DUT during testing.

This safety test is based on IEC/EN 62353.

Report the highest value (X1).

| Test  | Expected test results |
|---|-----------------------|
| Equipment Leakage Current Test<br>(Normal Condition - with mains cable) | X1 ≤ 100μA            |

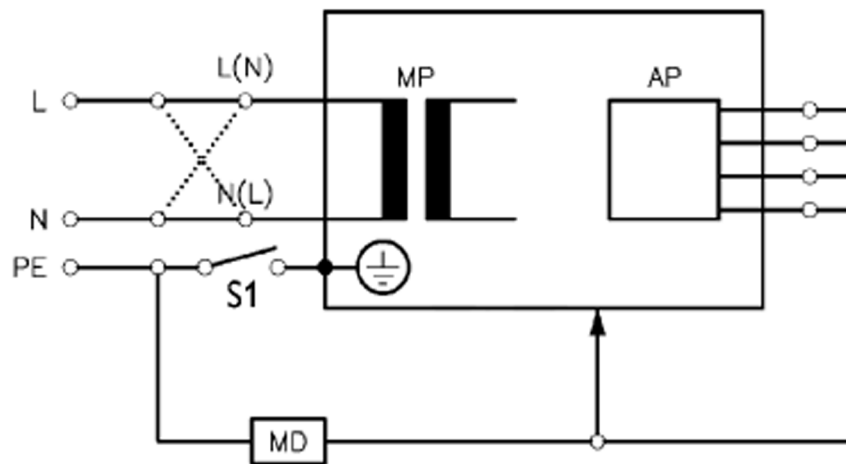
### NOTE

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

In case of an IT-power system, this safety test measurement requires a special measuring circuit, for example with its own integrated TN-system or use of an external isolation transformer attached to the safety test device.

### S(3): Equipment Leakage Current Test - Single Fault Condition

Test to perform:



**Measuring circuit for the measurement of Equipment Leakage Current - *Direct method* according to IEC/EN 62353.**

This test measures leakage current of accessible conductive and non-conductive metal parts of the monitor and the functional earth leakage current. It tests normal and reversed polarity. Perform the test with S1 open (Single Fault Condition).

There are no parts of the equipment that are not protectively earthed. Disconnect any data cables and any connections that may provide an extraneous earth path. Test the device under test (DUT) on an insulated surface. Do not touch the DUT during testing.

This safety test is based on IEC/EN 62353.

Report the highest value (X2).

| Test   | Expected test results |
|--|-----------------------|
| Equipment Leakage Current Test (Single Fault Condition - with mains cable) | $X2 \leq 300\mu A$    |

#### NOTE

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

In case of an IT-power system, this safety test measurement requires a special measuring circuit, for example with its own integrated TN-system or use of an external isolation transformer attached to the safety test device.

### S(4): Applied Part Leakage Current - Mains on Applied Part

#### NOTE

During measurement of the Applied Part Leakage Current it is possible that the measured current can exceed the allowed limit (per IEC/EN 60601-1 or IEC/EN 62353).

This can occur when the safety tester is connected to the invasive blood pressure and temperature connectors at the same time during the applied leakage current measurement.

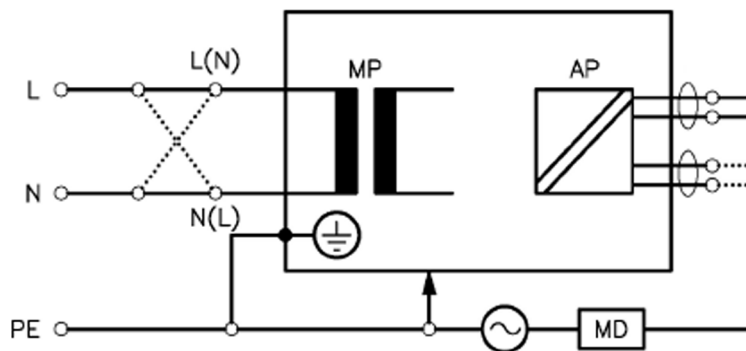
The connectors for the invasive blood pressure and temperature are independently functioning connectors.



Although there are individual connectors on the front end, internally those parameters use the same electrical insulation interface and are hardwired to each other. This results in an electrical short of those connectors during measurement if a test current is applied simultaneously. Therefore this should be avoided.

Due to the combined insulation interface, it is sufficient to connect to only one parameter interface (that is, Invasive Blood Pressure or Temperature) of the invasive blood pressure/temperature measurement block. This avoids a short and the potential of exceeding the limit for the current.

Test to perform:



**Measuring circuit for the measurement of Applied Part Leakage Current - Direct method according to IEC/EN 62353.**

This test measures applied part leakage current from applied part to earth caused by external main voltage on the applied part. Each polarity combination possible shall be tested. This test is applicable for ECG measurement inputs.

There are no parts of the equipment that are not protectively earthed.

This safety test is based on IEC/EN 60601-1, IEC/EN 62353, *UL2601-1 Ed. 2/UL60601-1:2003 and CSA 601.1-M90*.

Report the highest value. (X1).

| Test  | Expected test results  |
|---|------------------------|
| Applied Part Leakage Current Test<br>(Single Fault Condition - mains on applied part) | $X1 \leq 50\mu A$ (CF) |



**NOTE**

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

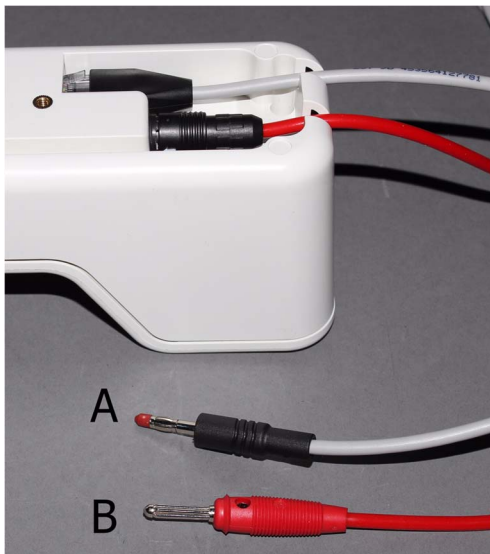
In case of an IT-power system, this safety test measurement requires a special measuring circuit, for example with its own integrated TN-system or use of an external isolation transformer attached to the safety test device.

### Applied Part Leakage Current - Mains on Applied Part for Tympanic Thermometer on Standalone Base Station

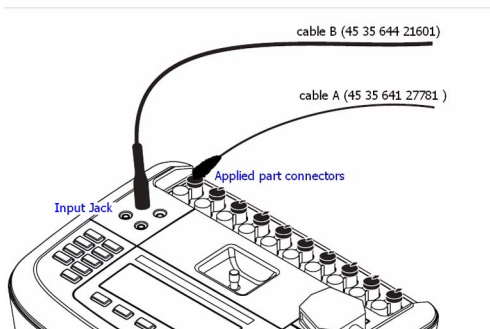
- 1 Remove the interface and the thermometer cable from the base station.
- 2 Insert the two safety test cables as shown below.



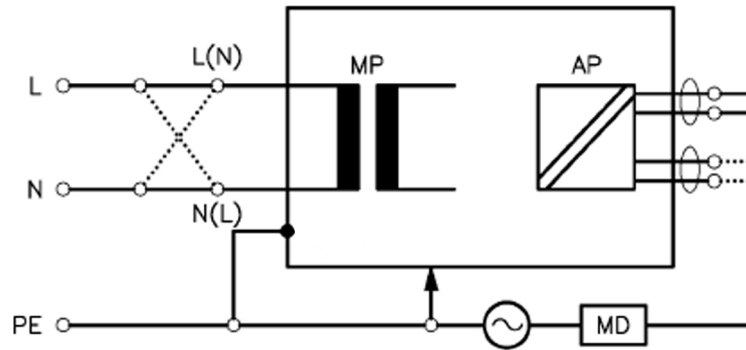
*Cable A (IntelliBridge - 453564127781) and Cable B (Tympanic Temperature - 453564421601)*



- 1 Connect to an appropriate safety tester (e.g. Fluke ESA 620) as shown below.



2 Perform the test:



**Measuring circuit for the measurement of Applied Part Leakage Current - Direct method according to IEC/EN 62353**

This test measures applied part leakage current from applied part to earth caused by external main voltage on the applied part. Each polarity combination possible shall be tested. There are no parts of the equipment that are not protectively earthed. This safety test is based on IEC/EN 60601-1, IEC/EN 62353, UL2601-1 Ed. 2/UL60601-1:2003 and CSA 601.1-M90. Report the highest value. (X1).

| Test   | Expected test results     |
|--|---------------------------|
| Applied Part Leakage Current test (Single Fault Condition - mains on applied part) | $X1 \leq 5000 \mu A$ (BF) |

#### NOTE

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

In case of an IT-power system, this safety test measurement requires a special measuring circuit, for example with its own integrated TN-system or use of an external isolation transformer attached to the safety test device.

### Reference: Allowable Values for IEC 60601-1:1998 and UL 60601-1 Measurements

Protective Earth resistance (between the PROTECTIVE EARTH TERMINAL and any ACCESSIBLE METAL PART which is PROTECTIVELY EARTHED, w/o power cord): 100mOhms

Protective Earth resistance of power cord: 100mOhms

Enclosure leakage current (IEC 60601-1 and UL60601-1): 100  $\mu A$  (N.C.)

Enclosure leakage current: (IEC 60601-1): 500  $\mu A$  (S.F.C)

Enclosure leakage current (UL 60601-1): 300  $\mu A$  (S.F.C)

Patient leakage current: (IEC 60601-1 and UL60601-1): 100  $\mu A$  (N.C.) for BF

Patient leakage current: (IEC 60601-1 and UL60601-1): 500  $\mu A$  (S.F.C.) for BF

Patient leakage current: (IEC 60601-1 and UL60601-1): 10  $\mu A$  (N.C.) for CF

Patient leakage current: (IEC 60601-1 and UL60601-1): 50  $\mu A$  (S.F.C.) for CF

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated

## Insulation Resistance

It is not recommended to perform measurements of the insulation resistance. Refer to IEC 62353 for details about methods of the insulation resistance measurement.

# System Test

After mounting and setting up a system, perform system safety tests according to IEC/EN 60601-1-1.

## What is a Medical Electrical System?

A medical electrical system is a combination of at least one medical electrical piece of equipment and other electrical equipment, interconnected by functional connection or use of a multiple portable socket-outlet.

- Devices forming a medical electrical system must comply either with IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16.
- Any electrical device such as IT equipment that is connected to the medical electrical equipment must comply either with IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16 and be tested accordingly.
- Non-medical electrical equipment may require connection through a separating device (e.g. an isolation transformer).

## General Requirements for a System

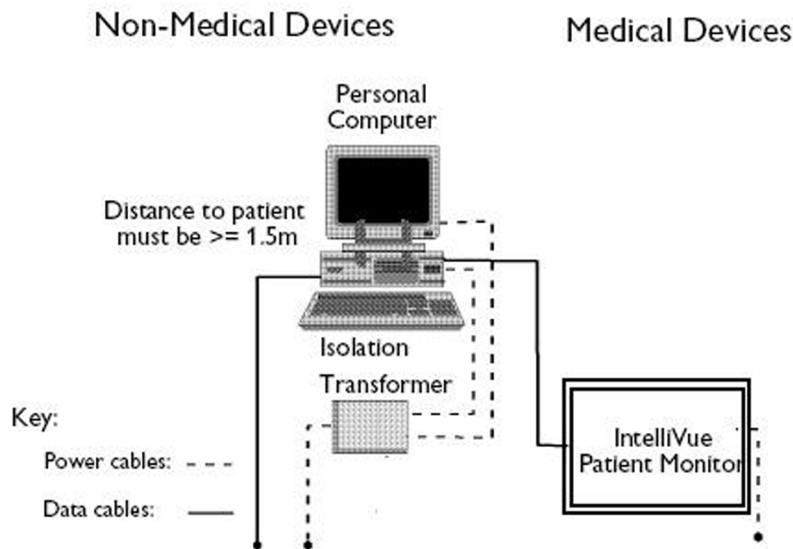
After installation or subsequent modification, a system must comply with the requirements of the system standard IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16. Compliance is checked by inspection, testing or analysis, as specified in the IEC/EN 60601-1-1 or in this book.

Medical electrical equipment must comply with the requirements of the general standard IEC/EN 60601-1, its relevant particular standards and specific national deviations. Non-medical electrical equipment shall comply with IEC safety standards that are relevant to that equipment.

Relevant standards for some non-medical electrical equipment may have limits for equipment leakage currents higher than required by the standard IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16. These higher limits are acceptable only outside the patient environment. It is essential to reduce equipment leakage currents to values specified in IEC/EN 60601-1 when non-medical electrical equipment is to be used within the patient environment.

## System Example

This illustration shows a system where both the medical electrical equipment and the non-medical electrical equipment are situated at the patient's bedside.



### WARNING

- Do not use additional AC mains extension cords or multiple portable socket-outlets. If a multiple portable socket-outlet is used, the resulting system must be compliant with IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16. Do not place multiple socket-outlets on the floor. Do not exceed the maximum permitted load for multiple socket-outlets used with the system. Do not plug additional multiple socket outlets or extension cords into multiple socket outlets or extension cords used within the medical electrical system.
- Do not connect any devices that are not supported as part of a system.
- Do not use a device in the patient vicinity if it does not comply with IEC/EN 60601-1 or IEC 60601-1 edition 3 clause 16. The whole installation, including devices outside of the patient vicinity, must comply with IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16. Any non-medical device placed and operated in the patient's vicinity must be powered via a separating transformer (compliant with IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16) that ensures mechanical fixing of the power cords and covering of any unused power outlets.

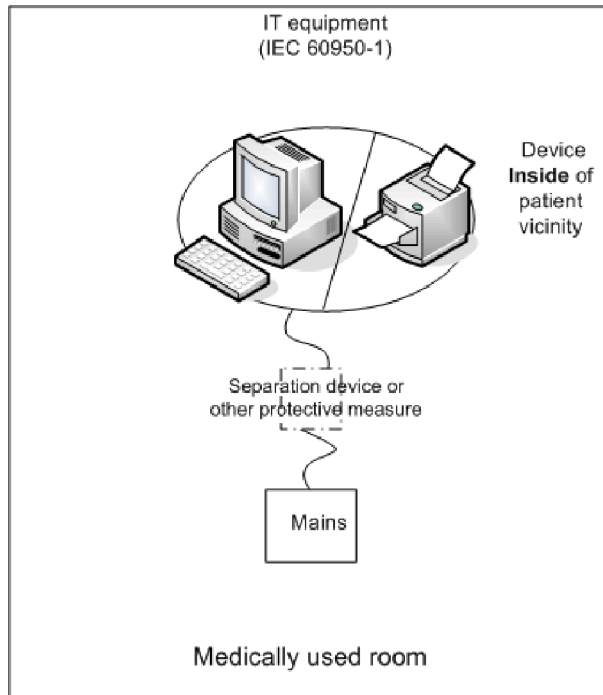
## System Installation Requirements

- Ensure that the medical electrical system is installed in a way that the user achieves optimal use.
- Make sure the user is informed about the required cleaning, adjustment, sterilization and disinfection procedures listed in the Instructions for Use.
- The medical electrical system must be installed in such a way that the user is able to carry out the necessary cleaning, adjustment, sterilization and disinfection procedures listed in the Instructions for Use.

- Ensure that the medical electrical system is installed in a way that an interruption and restoration of power to any part of the medical electrical system does not result in a safety hazard.
- We recommend using fixed mains socket outlets to power the medical system or parts thereof. Avoid using multiple portable socket-outlets.
- Any multiple portable socket outlets used must be compliant with IEC 60884-1 and IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16.
- Ensure that any part of the system connected to multiple portable socket-outlets is only removable with a tool, i.e. the multiple portable socket-outlet provides a locking mechanism to prevent power cords from being plugged or unplugged unintentionally. Otherwise, the multiple portable socket-outlet must be connected to a separation device. Multiple Socket Outlets used within the medical electrical system must only be used for powering medical electrical equipment which is part of the system.
- Ensure that any functional connections between parts of the medical electrical system are isolated by a separation device according to IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16 to limit increased equipment leakage currents caused by current flow through the signal connections where necessary (e.g. leakage current coming from non-medical electrical equipment into medical electrical equipment or building ground voltage differences providing leakage current through grounded data cables). This only works if the equipment leakage current of the respective medical electrical system parts is not exceeded under normal conditions. This isolation is especially important where the non-medical electrical equipment leakage currents can pass to the medical electrical equipment in the system or building ground voltage differences can pass to the medical electrical equipment via ground in a data cable connection in the system
- Avoid increase of equipment leakage currents when non-medical electrical equipment within the medical electrical system is used. This only applies when if the equipment leakage current of the respective medical electrical system parts is not exceeded under normal conditions. Use of an additional protective earth connection, separation device or additional non-conductive enclosures are options that can prevent a problem.
- Within the patient environment it is important to limit electrical potential differences between different parts of a system. If necessary, use potential equalization equipment (equipotential cable) or additional protective earth connections.
- Medical electrical equipment used in medical rooms must be connected to potential equalization equipment (equipotential cable) to avoid electrical potential differences. Check your local requirements for details.

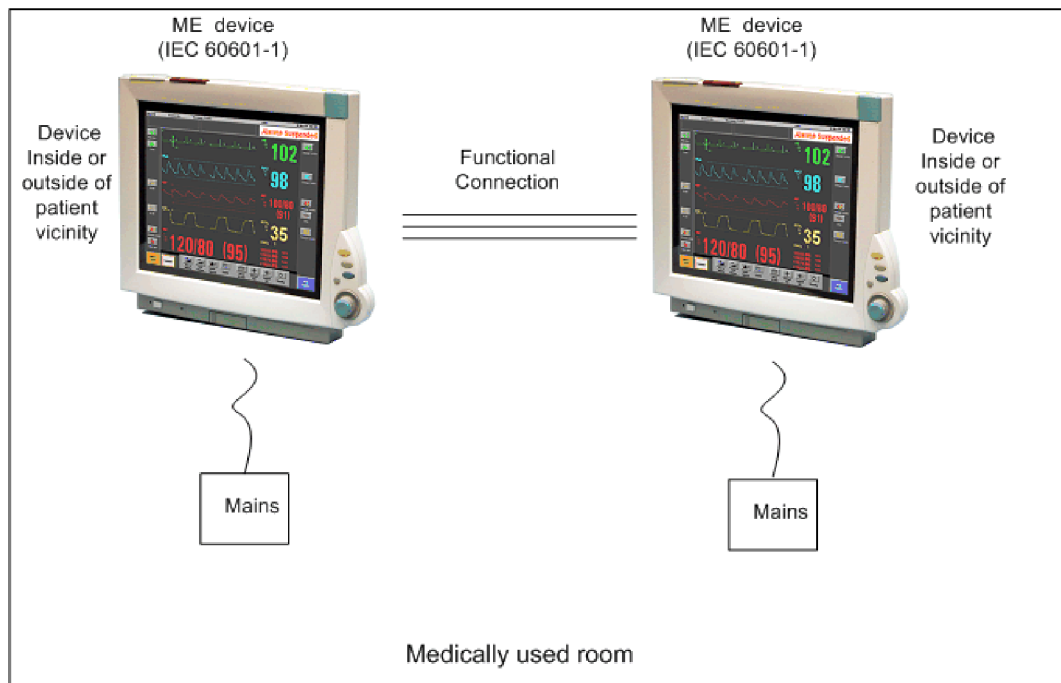
## Required Protective Measures at System Installation

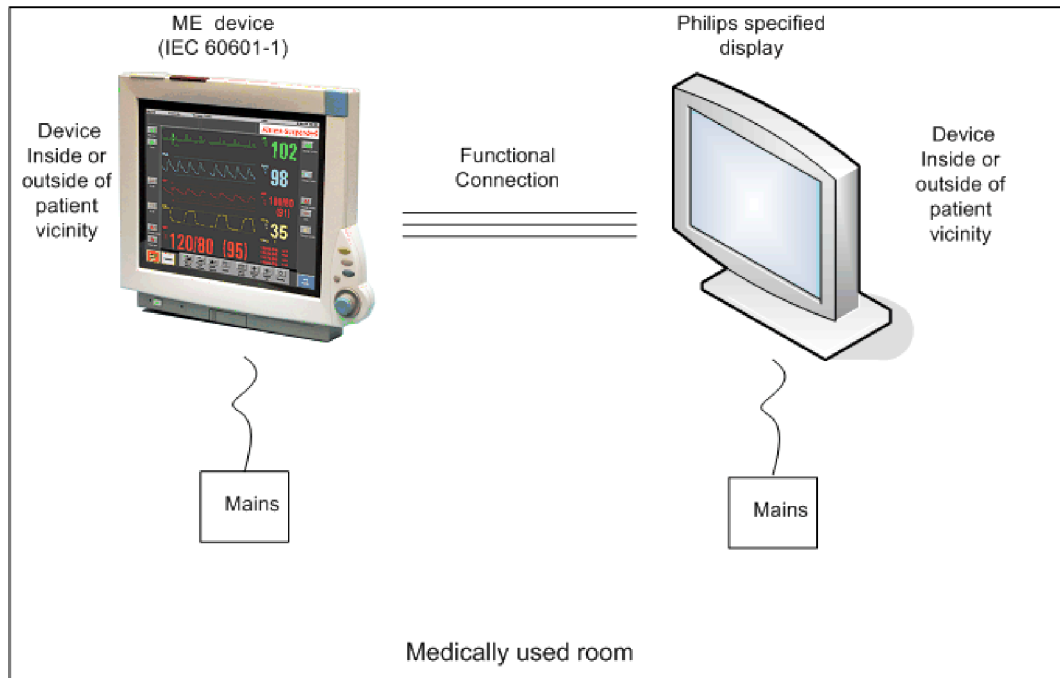
For any IT equipment (IEC60950-1) operated in the patient environment ensure that the equipment leakage current does not exceed the limits described in IEC 60601-1. Use a separation device to ensure compliance. After installation of IT equipment in the patient environment, an equipment leakage current test is required.



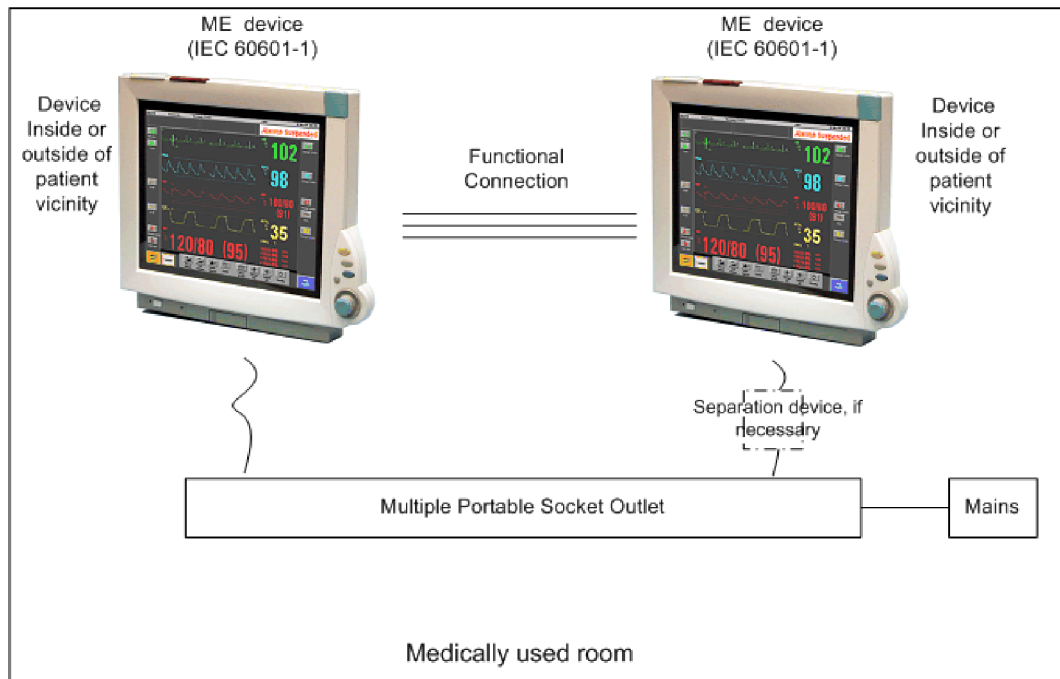
#### Case 1: Medical Device Combined with Medical Device

If you combine a medical device with another medical device (incl. Philips specified displays) to form a medical electrical system according to IEC60601-1-1 or IEC/EN 60601-1 edition 3 clause 16, no additional protective measures are required. The medical electrical devices may be located in or outside the patient vicinity in a medically used room. This is valid as long as the medical devices are connected to separate mains outlets. No system test is required.



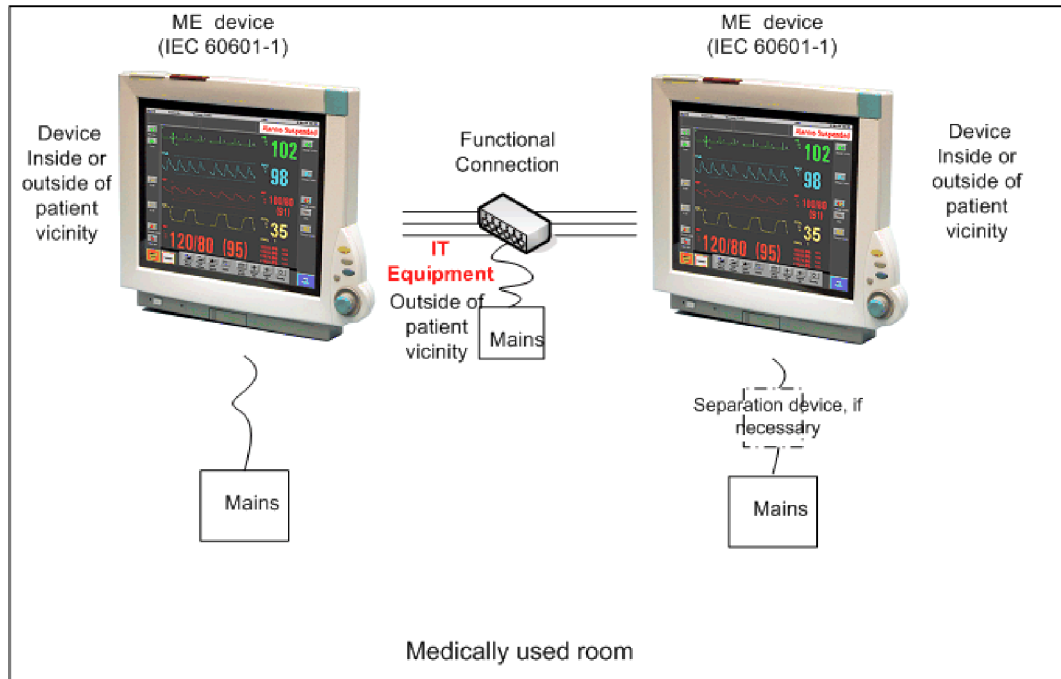


If the combined medical devices are connected to the same multiple portable socket outlet an enclosure leakage current test of the entire device combination on the multiple portable socket outlet is required to ensure that the resulting protective earth leakage current and equipment leakage current does not exceed the limits of IEC 60601-1-1 or IEC/EN 60601-1 edition 3 clause 16. Avoid using multiple portable socket outlets. The medical electrical devices may be located in or outside the patient vicinity in a medically used room. If the limits are exceeded, additional protective measures are required, e.g. a separation device or the connection of each device to separate mains.



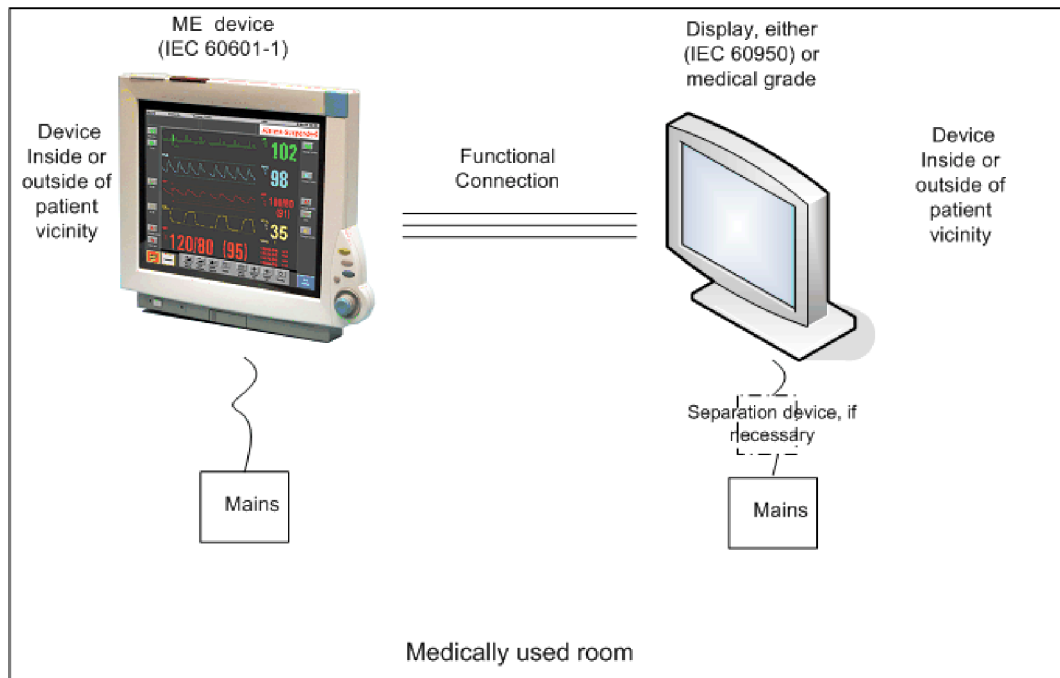
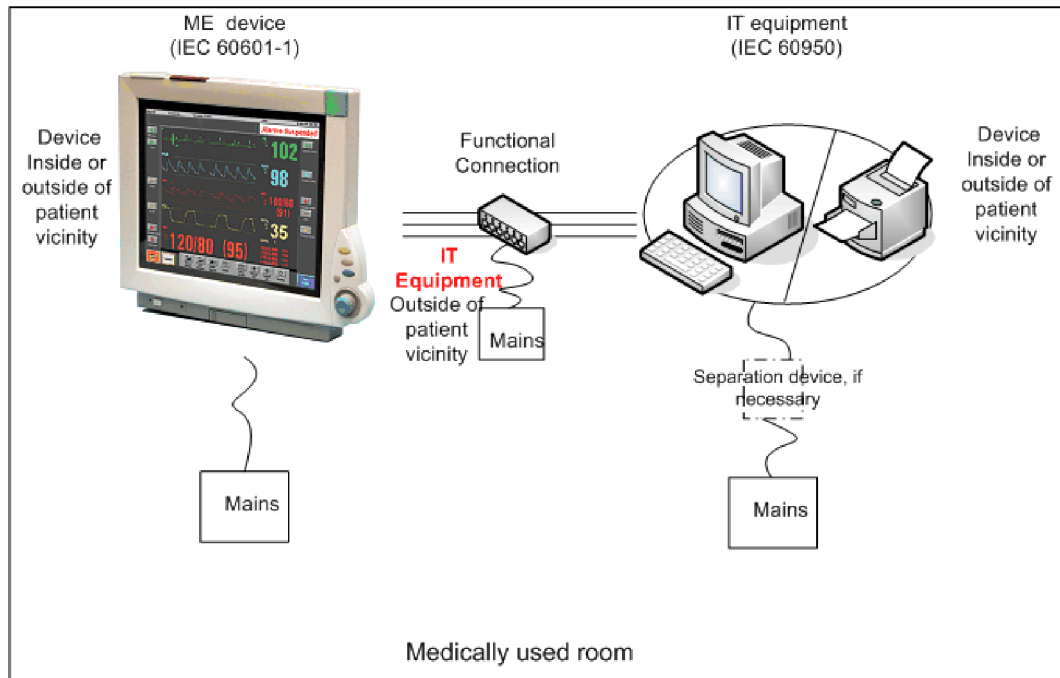
#### Case 2: Medical Device Combined with a Non-Medical Device

If you combine a medical device with a non-medical device to form a medical electrical system according to IEC60601-1-1 or IEC/EN 60601-1 edition 3 clause 16, additional protective measures are required, e.g. usage of a separation device. The medical electrical devices or the IT equipment may be located in or outside the patient vicinity in a medically used room. After system installation incl. protective measures, a system test is required to ensure that the resulting equipment leakage current and applied part leakage current does not exceed the limits of IEC 60601-1-1 or IEC/EN 60601-1 edition 3 clause 16.



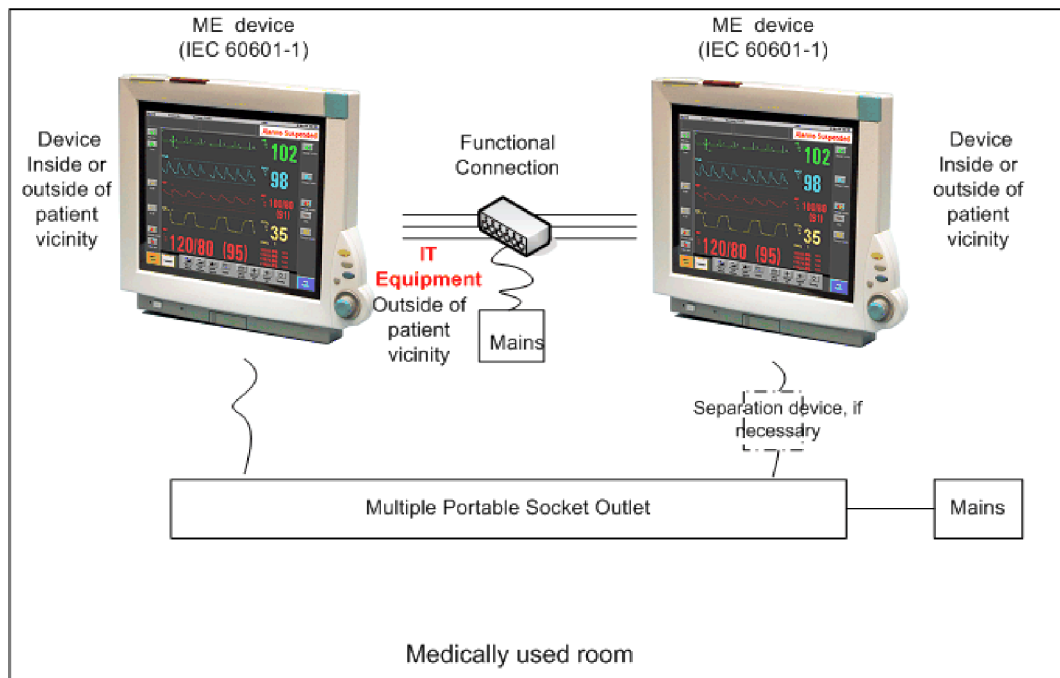
For any IT equipment (IEC60950-1) operated in patient vicinity ensure that the equipment leakage current does not exceed the limits described in IEC 60601-1 or IEC/EN 60601-1 edition 3 clause 16. Use a separation device to ensure compliance. After installation of IT equipment in patient vicinity, an equipment leakage current test is required.



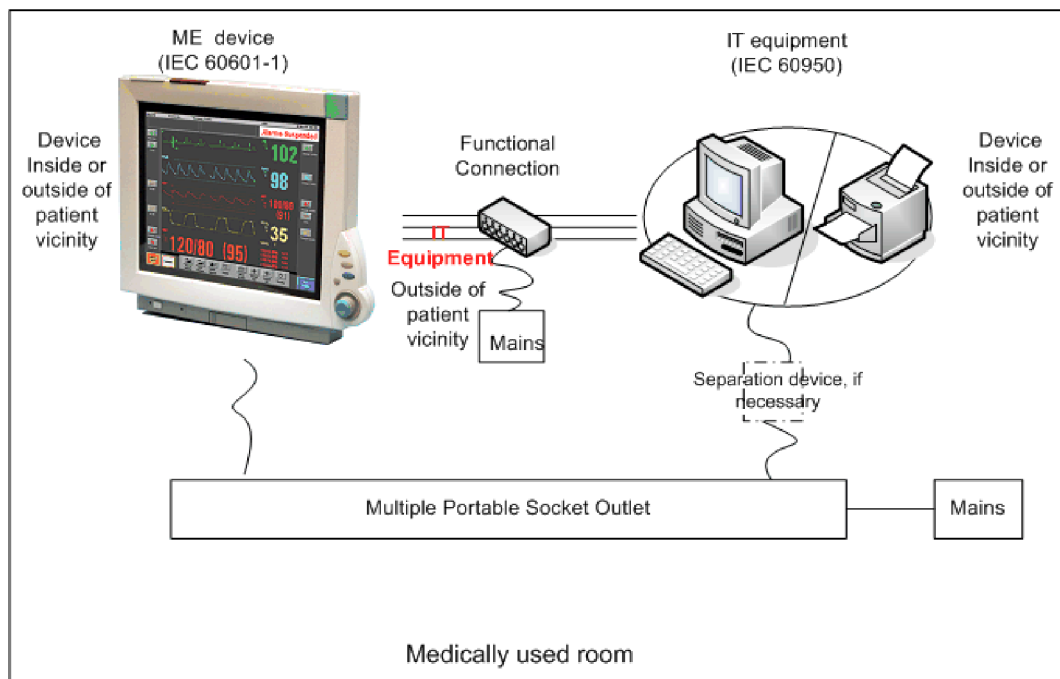


If the combined devices forming the medical electrical system are connected to the same multiple portable socket outlet, ensure that the resulting protective earth leakage current **and** equipment leakage current do not exceed the limits of IEC 60601-1-1 or IEC/EN 60601-1 edition 3 clause 16. The medical electrical devices or IT equipment may be located in or outside the patient vicinity in a medically used room. Avoid using multiple portable socket outlets. If the limits of IEC 60601-1-1 or IEC/EN 60601-1 edition 3 clause 16 are exceeded, additional protective measures are required, e.g. a separation device or the connection of each device to separate mains.

### 3 Testing and Maintenance

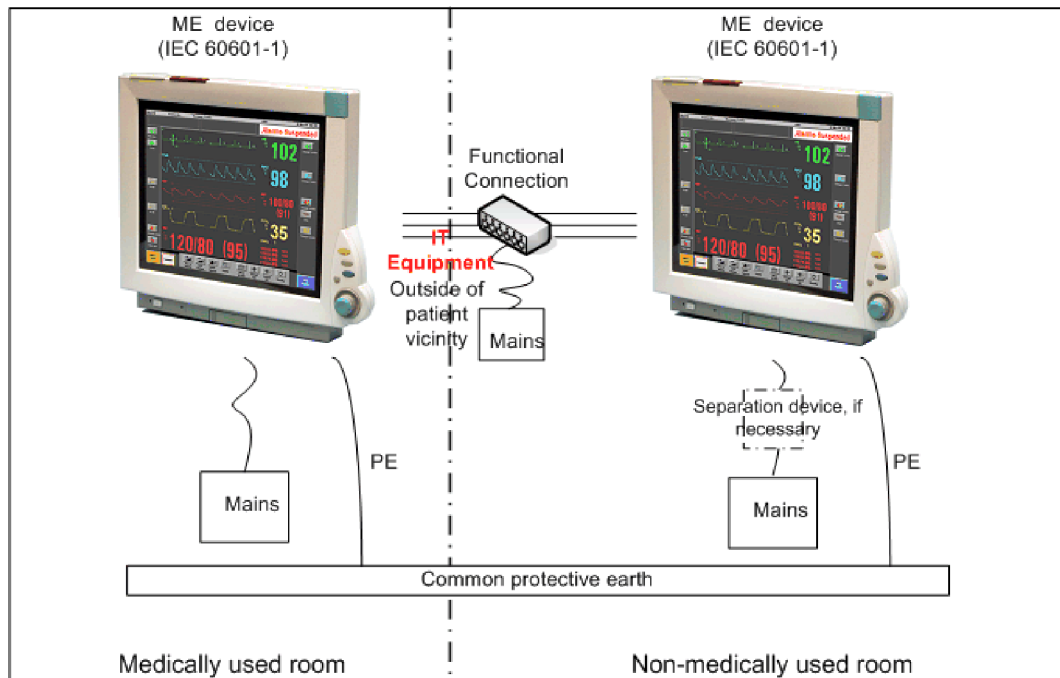


For any IT equipment (IEC60950-1) operated in patient vicinity ensure that the equipment leakage current does not exceed the limits described in IEC 60601-1 or IEC/EN 60601-1 edition 3 clause 16. Use a separation device to ensure compliance. After installation of IT equipment in patient vicinity, an equipment leakage current test is required.

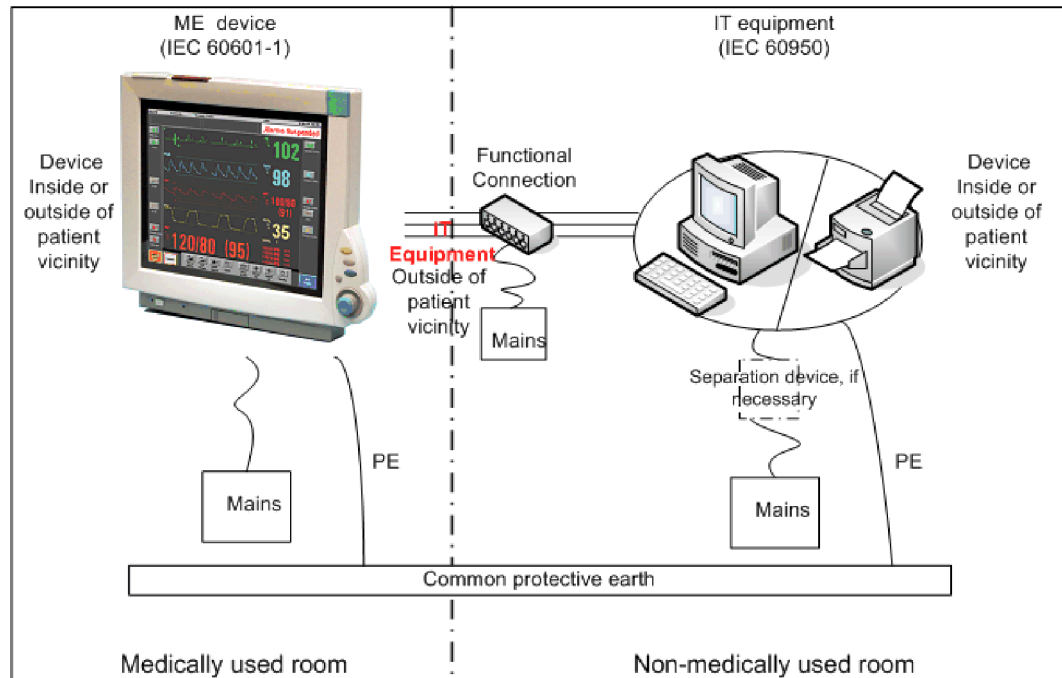


### Case 3: Medical Device Combined with a Medical or Non-Medical Device with one Device in a Non-Medically-Used Room

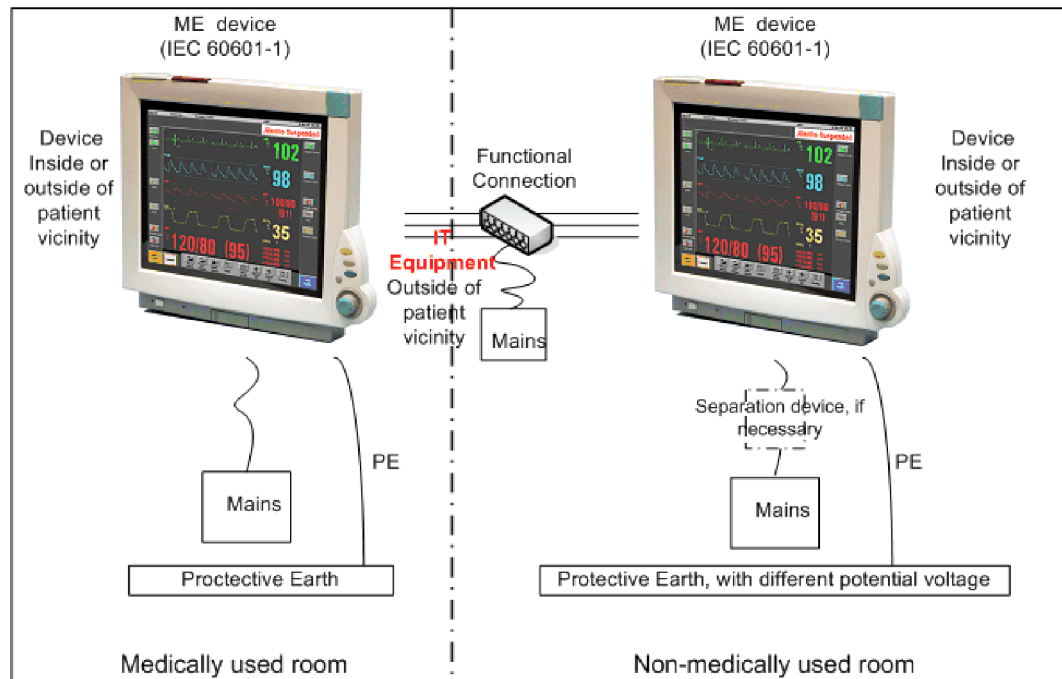
If you combine a medical device with a medical or non-medical device to form a medical electrical system according to IEC60601-1-1 or IEC/EN 60601-1 edition 3 clause 16 using a common protective earth connection and one of the devices is located in a non-medically used room, additional protective measures are required, e.g. usage of a separation device or additional protective earth connection. The medical electrical devices or IT equipment may be located in or outside the patient vicinity. After system installation incl. protective measures, a system test is required to ensure that the resulting equipment leakage current does not exceed the limits of IEC 60601-1-1 or IEC/EN 60601-1 edition 3 clause 16.

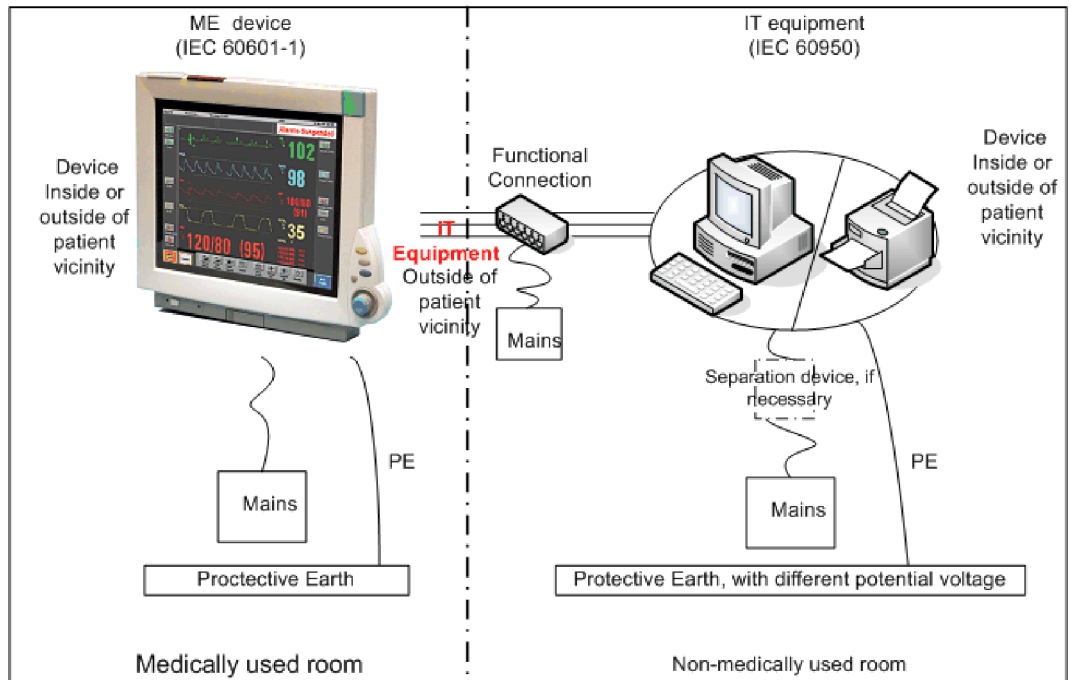


### 3 Testing and Maintenance



If you combine a medical device with a medical or non-medical device to form a medical electrical system according to IEC60601-1-1 or IEC/EN 60601-1 edition 3 clause 16 using two separate protective earth connections and one of the devices is located in a non-medically used room creating a potential voltage difference, additional protective measures are required, e.g. usage of a separation device or additional protective earth connection. The medical electrical devices or IT equipment may be located in or outside the patient vicinity. After system installation incl. protective measures, a system test is required to ensure that the resulting equipment leakage current does not exceed the limits of IEC 60601-1-1 or IEC/EN 60601-1 edition 3 clause 16.





## System Test Procedure

If the medical electrical device has already been tested as a standalone device e.g. during factory safety testing, an equipment leakage current test must only be performed once the device is connected to another electrical device/system. If the medical electrical system has not been tested as a standalone device, the device has to be tested as a standalone device (without connection to the system) and as part of the system (with connection to the system).

Connect the detachable power cord of the device under test to the safety analyzer's test mains port. Connect the enclosure test lead of the safety analyzer to the enclosure of the device under test as described in the "Equipment Leakage Test" section. Refer to the documentation that accompanies the safety analyzer for further details on how to set up the test.

| Test  | Expected test results      |
|---|----------------------------|
| Equipment Leakage Current Test (Normal Condition)       | Sys1 $\leq 100\mu\text{A}$ |
| Equipment Leakage Current Test (Single Fault Condition) | Sys2 $\leq 300\mu\text{A}$ |

After the testing of the device as a standalone device and as part of the system, check that the resulting values (without connection and with connection to the system) do not differ by more than  $\pm 10\%$  from each other.

If the devices in the medical electrical system are connected to a multiple portable socket outlet the resulting protective earth leakage current needs to be determined. All system components must be connected to the multiple portable socket outlet and be switched on during this measurement.

| Test  | Expected test results      |
|---|----------------------------|
| Protective Earth Leakage Current of Multiple Socket Outlets | Sys3 $\leq 300\mu\text{A}$ |

Refer to the documentation that accompanies the safety analyzer for further details on how to set up the test.

## Preventive Maintenance Procedures

### Noninvasive Blood Pressure Measurement Calibration

Carry out the noninvasive blood pressure measurement performance tests at least every two years , or as specified by local laws (whichever comes first).

### Microstream CO<sub>2</sub> Calibration

Carry out the Microstream CO<sub>2</sub> calibration once a year or after 4000 hours of continuous use and following any instrument repairs or the replacement of any instrument parts.

### Tympanic Temperature Calibration

To verify the performance of the Tympanic Thermometer:

- 1 Purchase a Covidien calibration device, part number 303097. See the Covidien web site for ordering information ([www.covidien.com](http://www.covidien.com)).
- 2 Follow the instructions provided with the calibration device to perform the test.

#### NOTE

The battery compartment in the Tympanic temperature probe is not functional.

#### CAUTION

After performing the calibration, check the body reference site selection of the Tympanic Thermometer to make sure it matches the required settings for your hospital.

## Performance Assurance Tests

Some of the following test procedures must be performed in service mode. To enter service mode select **Operating Modes** in the main menu. Then select **Service Mode** and enter the password.

If required, open the screen menu in the monitor info line at the top of the screen and select **Service** to access the service screen. This is required particularly for Anesthetic Gas Module testing procedures.

### Basic Performance Assurance Test

This section describes the basic performance test procedure. Please refer to the section “When to Perform Tests” on page 27 for detailed information on when which test procedure is required.

#### Procedure:

Power on the monitoring system and go into demo mode. Check that each parameter (incl. Gas Analyzer) displays values.

## Full Performance Assurance Test

The following sections describe the full performance testing procedures i.e. detailed testing of each parameter with a patient simulator or specified tools. Please refer to the section for information on when which testing procedure is required.

## ECG/Resp Performance Test

This test checks the performance of the ECG and respiration measurements.

**Tools required:** Patient simulator.

### ECG Performance

- 1 Connect the patient simulator to the ECG/Resp connector on the monitor.
- 2 Configure the patient simulator as follows:
  - ECG sinus rhythm.
  - HR = 100 bpm or 120 bpm (depending on your patient simulator).
- 3 Check the displayed ECG wave and HR value against the simulator configuration.
- 4 The value should be 100bpm or 120 bpm +/- 2 bpm.

### Respiration Performance

- 1 Change the Patient Simulator configuration to:
  - Base impedance line 1500 Ohm.
  - Delta impedance 0.5 Ohm.
  - Respiration rate 40 rpm or 45 rpm.
- 2 The value should be 40 rpm +/- 2 rpm or 45 rpm +/- 2 rpm.

| Test                         | Expected test results                   |
|------------------------------|---|
| ECG Performance Test         | 100bpm +/- 2bpm or<br>120bpm +/- 2bpm   |
| Respiration Performance Test | 40 rpm +/- 2 rpm or<br>45 rpm +/- 2 rpm |

## ECG Out Sync Performance Test (not available via TAAP or SRR)

This test checks the performance of ECG synchronization between the monitor and a defibrillator. It only needs to be performed when this feature is in use as a protocol at the customer site.

**Tools required:**

- Defibrillator with ECG Input.
  - Patient simulator.
- 1 Connect the patient simulator to the ECG connector and the defibrillator to the ECG Sync Output on the monitor with the ECG Sync cable.
  - 2 Set the patient simulator to the following configuration:
    - HR = 100 bpm or 120 bpm (depending on your patient simulator).
    - ECG sinus rhythm.
  - 3 Switch the defibrillator to simulation mode.

- 4 Check that the ECG signal is displayed.

| Test                     | Expected test results   |
|--------------------------|-------------------------|
| ECG Out Performance Test | ECG Signal is displayed |

## ECG Sync Pulse Performance Test

This test checks the performance of the ECG sync pulse synchronization between the MP5 and another medical electrical device. It only needs to be performed when this feature is used at the customer site.

### Tools required:

- other medical electrical device, e.g. CT Scanner etc.
  - patient simulator
- 1 Connect the patient simulator to the ECG connector and the other medical electrical device to the monitor.
  - 2 Set the patient simulator to the following configuration:
    - HR = 100 bpm or 120 bpm (depending on your patient simulator).
    - ECG sinus rhythm.
  - 3 Verify that the connected medical electrical device triggers accordingly.

| Test                            | Expected test results                                    |
|---------------------------------|--|
| ECG Sync Pulse Performance Test | Connected medical electrical device triggers as expected |

## SpO<sub>2</sub> Performance Test

This test checks the performance of the SpO<sub>2</sub> measurement.

### Procedure for Philips FAST SpO<sub>2</sub> Technology:

#### Tools required: none

- 1 Connect an adult SpO<sub>2</sub> transducer to the SpO<sub>2</sub> connector.
- 2 Measure the SpO<sub>2</sub> value on your finger (this assumes that you are healthy).
- 3 The value should be between 95% and 100%.

| Test                              | Expected test results |
|-----------------------------------|-----------------------|
| SpO <sub>2</sub> Performance Test | 95% and 100%          |

### Procedure for Nellcor OxiMax SpO<sub>2</sub> Technology:

Nellcor recommends that the functionality of this parameter be verified using the SRC-MAX.

A possible performance assurance check requiring no tools would be:

- 1 Connect an adult SpO<sub>2</sub> transducer to the SpO<sub>2</sub> connector.
- 2 Measure the SpO<sub>2</sub> value on your finger (this assumes that you are healthy).
- 3 The value should be between 95% and 100%.

| Test                              | Expected test results |
|-----------------------------------|-----------------------|
| SpO <sub>2</sub> Performance Test | 95% and 100%          |



**Procedure for Masimo rainbow SET Technology:****Tools required:** none

- 1 Connect an adult SpO<sub>2</sub> transducer to the SpO<sub>2</sub> connector.
- 2 Measure the SpO<sub>2</sub> value on your finger (this assumes that you are healthy).
- 3 The value should be between 95% and 100%.

| Test                              | Expected test results |
|-----------------------------------|-----------------------|
| SpO <sub>2</sub> Performance Test | 95% and 100%          |

In addition to the SpO<sub>2</sub> Performance Test procedure described above, the following tests are recommended when using Masimo rainbow SET technology after a field repair or if the performance of the Masimo rainbow SET board in the MMS is in question.

**NOTE**

The part numbers listed below are subject to change. All parts required for the tests described in this section must be ordered directly from Masimo.

**SET Tester and RRa Simulator:**

- 1 Connect a dual patient cable (Masimo part number 3503) to the board.
- 2 Connect a Masimo SET tester (Masimo part number 3776) to M15 side of the dual cable.
- 3 Connect one end of an RRa simulator cable (Masimo part number EQ-12070) to M6 side of the dual cable.
- 4 Connect the other end (3.5MM) of the RRa simulator cable (Masimo part number EQ-12070) to a laptop or PC which contains TR19673A\_Appendix\_A.wav wave file.
- 5 Play the wave file and set up the computer per instructions in R-EQ-12070 document.
- 6 Verify that all enabled parameters are within specified range.

**Sensor Port Test Tool:**

- 1 Connect a round connector sensor port test tool (Masimo part number 3494) to the board.
- 2 Confirm that each LED turns on one at a time and then all LEDs turn on.

**Shield Continuity:**

- 1 Connect a shield continuity test cable (Masimo part number 3854) to the board.
- 2 Using a multimeter, measure the resistance across the red and black banana plugs. Verify that the resistance is less than 5Ω.

**Measurement Validation****NOTE**

A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor or sensor. However, it can be used to demonstrate that a particular pulse oximeter monitor reproduces a calibration curve that has been independently demonstrated to fulfill a particular accuracy specification.

#### **Philips FAST SpO<sub>2</sub> Technology**

The SpO<sub>2</sub> accuracy has been validated in human studies against arterial blood sample reference measured with a CO-oximeter. In a controlled desaturation study, healthy adult volunteers with saturation levels between 70% and 100% SaO<sub>2</sub> were studied. The population characteristics for those studies were:

- about 50% female and 50% male subjects
- age range: 19 to 39
- skin tone: from light to dark brown

Pulse rate accuracy has been validated with an electronic pulse simulator.

#### **Nellcor OxiMax Technology**

Accuracy specifications are based on controlled hypoxia studies with healthy non-smoking adult volunteers over the specified saturation SpO<sub>2</sub> range(s). Pulse oximeter SpO<sub>2</sub> readings were compared to SaO<sub>2</sub> values of drawn blood samples measured by hemoximetry. All accuracies are expressed as  $\pm$  "X" digits. Pulse oximeter equipment measurements are statistically distributed; about two-thirds of pulse oximeter measurements can be expected to fall in this accuracy (ARMS) range. Because scatter and bias of pulse oximeter SpO<sub>2</sub> and blood SaO<sub>2</sub> comparisons commonly increase as the saturation decreases, and accuracy specifications are calculated from data spanning the stated range, different accuracy values may result when describing partially overlapping ranges.

Subjects used to validate SpO<sub>2</sub> measurement accuracies were healthy and recruited from the local population. Comprised of both men and women, subjects spanned a range of skin pigmentations and ranged in age from 18-50 years old.

Oxygen saturation accuracy can be affected by certain environmental, equipment, and patient physiologic conditions (as discussed in the Instructions for Use for the monitor) that influence readings of SpO<sub>2</sub>, SaO<sub>2</sub>, or both. Accordingly, observations of clinical accuracy may not achieve the same levels as those obtained under controlled laboratory conditions.

Pulse rate accuracy has been validated with an electronic pulse simulator.

#### **Masimo rainbow SET Technology:**

The Masimo rainbow SET Technology with the designated sensors has been validated by Masimo during motion and no motion conditions in human studies against an arterial blood sample reference measured with a CO-oximeter and an ECG monitor. Pulse oximeter measurements are statistically distributed, only about two-thirds of the measurements can be expected to fall within the specified accuracy compared to CO-oximeter measurements.

SpO<sub>2</sub>, SpCO, and SpMet accuracy was determined by testing on healthy adult volunteers in the range of 60-100% SpO<sub>2</sub>, 0-40% SpCO, and 0-15% SpMet against a laboratory CO-Oximeter. SpO<sub>2</sub> and SpMet accuracy was determined on 16 neonatal NICU patients ranging in age from 7-135 days old and weighing between 0.5-4.25 kg. Seventy-nine (79) data samples were collected over a range of 70-100% SaO<sub>2</sub> and 0.5-2.5% MetHb with a resultant accuracy of 2.9% SpO<sub>2</sub> and 0.9% SpMet.

The Masimo sensors have been validated for motion and no motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark skin pigmentation in induced hypoxia studies in the range of 70-100% SpO<sub>2</sub> against a laboratory CO-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

Masimo SET technology with LNOP, LNCS, and M-LNCS sensors has been validated for motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies while performing rubbing and tapping motions, at 2 to 4 Hz at an amplitude of 1 to 2 cm and a non-

repetitive motion between 1 to 5 Hz at an amplitude of 2 to 3 cm in induced hypoxia studies in the range of 70-100% SpO<sub>2</sub> against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation, which encompasses 68% of the population

The Masimo SET Technology with LNOP Neo, LNCS Neo, and M-LNCS Neo sensors has also been validated for neonatal motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies while performing rubbing and tapping motions, at 2 to 4 Hz at an amplitude of 1 to 2 cm and a nonrepetitive motion between 1 to 5 Hz at an amplitude of 2 to 3 cm in induced hypoxia studies in the range of 70-100% SpO<sub>2</sub> against a laboratory CO-oximeter and ECG monitor.

The Masimo SET Technology has been validated for low perfusion accuracy in bench top testing against a Biotek Index 2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus one standard deviation which encompasses 68% of the population.

The Masimo sensors have been validated for pulse rate accuracy for the range of 25-240 bpm in bench top testing against a Biotek Index 2 simulator. This variation equals plus or minus one standard deviation which encompasses 68% of the population.

SpHb accuracy has been validated on healthy adult male and female volunteers and on surgical patients with light to dark skin pigmentation in the range of 8-17 g/dl SpHb against a laboratory CO-oximeter. This variation equals plus or minus one standard deviation which encompasses 68% of the population. The SpHb accuracy has not been validated with motion or low perfusion.

For more details please refer to the sensor's directions for use (DfU).

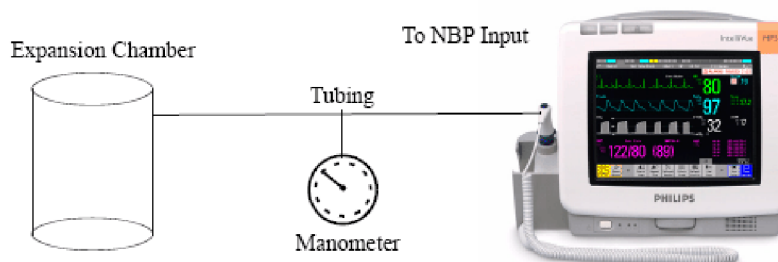
## NBP Performance Test

This section describes NBP test procedures. The monitor must be in service mode and the screen "Service A" must be selected to perform these tests. The NBP Performance Test consists of:

- NBP Accuracy Test
- NBP Leakage Test
- NBP Linearity Test
- Valve Test

## NBP Accuracy Test and Calibration

This test checks the performance of the non-invasive blood pressure measurement. Connect the equipment as shown:



Tools required:

- Reference manometer (includes hand pump and valve), accuracy  $\pm 0.8$  mmHg.
- Expansion chamber (volume 250 ml  $\pm 10\%$ )

- Appropriate tubing.

In service mode, the systolic and diastolic readings indicate the noise of NBP channels 1 and 2 respectively. When static pressure is applied, the reading in NBP channel 1 should be below 50. The value in parentheses indicates the actual pressure applied to the system.

- 1 Connect the manometer and the pump with tubing to the NBP connector and to the expansion chamber.
- 2 In service mode, select the **Setup NBP** menu.
- 3 Select **Close Valves: On**
- 4 Raise the pressure to 280 mmHg with the manometer pump.
- 5 Wait 10 seconds for the measurement to stabilize.
- 6 Compare the manometer values with the displayed values.
- 7 Document the value displayed by the monitor (**x1**).
- 8 If the difference between the manometer and displayed values is greater than 3 mmHg or when the NBP pump assembly has been changed, calibrate the NBP measurement. If not, proceed to the leakage test.
- 9 To calibrate the NBP measurement, select **Close Valves off** then **Calibrate NBP** and wait for the instrument to pump up the expansion chamber. Wait a few seconds after pumping stops until **EnterPrVal** is highlighted and then move the cursor to the value shown on the manometer. If one of the following prompt messages appears during this step, check whether there is leakage in the setup:
  - NBP unable to calibrate—cannot adjust pressure
  - NBP unable to calibrate—unstable signal
- 10 Press **Confirm**.

If the INOP NBP Equipment Malfunction message occurs in monitoring mode, go back to service mode and repeat the calibration procedure.

## NBP Leakage Test

The NBP leakage test checks the integrity of the system and of the valve. It is required once every two years and when you repair the monitor or replace parts.

- 1 If you have calibrated, repeat steps 2 to 6 from the accuracy test procedure so that you have 280 mmHg pressure on the expansion chamber.
- 2 Watch the pressure value for 60 seconds.
- 3 Calculate and document the leakage test value (**x2**).  
$$x2 = P1 - P2$$

where P1 is the pressure at the beginning of the leakage test and P2 is the pressure displayed after 60 seconds.

The leakage test value should be less than 6 mmHg.

### NOTE

The leakage test value of 6 mmHg applies for an expansion chamber of 250ml. When using a different size of expansion chamber, the expected test result needs to be adapted accordingly. E.g for an expansion chamber of 500ml, the leakage test value should be less than 3 mmHg. All other NBP performance tests are independent of the expansion chamber size.

## NBP Linearity Test

- 1 Reduce the manometer pressure to 150 mmHg.
- 2 Wait 10 seconds for the measurement to stabilize.
- 3 After these 10 seconds, compare the manometer value with the displayed value.
- 4 Document the value displayed by the monitor (x3)
- 5 If the difference is greater than 3 mmHg, calibrate the MMS or X2 (see steps 9 to 10 in the accuracy test procedure).

## Valve Test

- 1 Raise the pressure again to 280 mmHg.
- 2 Select **Close valves: Off**.
- 3 Wait five seconds and then document the value displayed. The value should be less than 10 mmHg.
- 4 Document the value displayed by the monitor (x4).

| Test           | Expected test results   |
|----------------|---|
| Accuracy test  | x1 = $280 \pm 3$ mmHg<br>Difference $\leq 3$ mmHg                     |
| Leakage test   | x2 = leakage test value<br>x2 < 6 mmHg (with 250ml expansion chamber) |
| Linearity test | x3 = $150 \pm 3$ mmHg<br>Difference $\leq 3$ mmHg                     |
| Valve Test     | x4 = value < 10 mmHg  |

## Invasive Pressure Performance Test

This test checks the performance of the invasive pressure measurement.

**Tools required:** Patient simulator.

- 1 Connect the patient simulator to the pressure connector.
- 2 Set the patient simulator to 0 pressure.
- 3 Make a zero calibration.
- 4 Configure the patient simulator as P(static) = 200 mmHg.
- 5 Wait for the display.
- 6 The value should be  $200 \text{ mmHg} \pm 5 \text{ mmHg}$ . If the value is outside these tolerances, calibrate the Invasive Pressure measurement. If the measurement was calibrated with a dedicated reusable catheter, check the calibration together with this catheter.

| Test                               | Expected test results                 |
|------------------------------------|---------------------------------------|
| Invasive Pressure Performance Test | $200 \text{ mmHg} \pm 5 \text{ mmHg}$ |

## Temperature Performance Test

This test checks the performance of the temperature measurement.

Tools required: Patient simulator (with 0.1°C or 0.2°F tolerance).

- 1 Connect the patient simulator to the temperature connector.
- 2 Configure the patient simulator to 40°C or 100°F.
- 3 The value should be 40°C  $\pm$  0.2°C or 100°F  $\pm$  0.4°F.

| Test                         | Expected test results                 |
|------------------------------|---------------------------------------|
| Temperature Performance Test | 40°C $\pm$ 0.2°C or 100°F $\pm$ 0.4°F |

## Predictive Temperature Accuracy Check

Tools required:

- Calibration Key (CalKey) - Part No. 453564033691

The CalKey can be used to verify correct function of the module (in continuous mode). It does not test the probe. The CalKey contains a known resistance which is converted to a specific temperature by the module.

The monitor can stay in monitoring mode for this procedure.

### Procedure:

- 1 Disconnect the probe and connect the CalKey.
- 2 Remove the probe from the holder. The monitor software switches to continuous mode automatically.
- 3 Observe the displayed temperature. The value should read: **97.3°F  $\pm$  0.2°F (36.3°C  $\pm$  0.1°C)**. Document whether the predictive temperature module passed or failed the accuracy check.
- 4 Disconnect the CalKey, connect the probe and return it to the holder.
- 5 The module test with the CalKey should be performed once a year.

| Test                                 | Expected test results                   |
|--------------------------------------|---|
| Predictive Temperature Accuracy Test | 97.3°F $\pm$ 0.2°F (36.3°C $\pm$ 0.1°C) |

The 9600 Plus Calibration Tester from Welch Allyn provides a convenient way of testing the entire thermometer system, module and probe. It is not intended for use by clinical users. Nevertheless, biomedics or Philips field personnel may use it for probe verification. Currently, the tester is orderable from Welch Allyn only. Follow the instructions provided with the tester.

## Mainstream CO2 Accuracy Check

Tools Required:

- three airway adapters
- Verification Gas M2506A
- Gas cylinder regulator M2505A

You also need a local barometric pressure rating received from a reliable local source (airport, regional weather station or hospital weather station) which is located at the same altitude as the hospital.

**Procedure:**

- 1 Attach the M2501A CO<sub>2</sub> sensor to the patient monitor. Attach an airway adapter to the sensor. Make sure that the sensor is disconnected from the patient circuit.
- 2 Switch on the patient monitor.
- 3 Enter the monitor's Service Mode.
- 4 Using the sensor status provided in the M2501A Serial protocol, wait for the M2501A sensor to warm up to its operating temperature.
- 5 The default setting for gas temperature is 22°C. If the gas temperature is significantly above or below this value, correct the gas temperature setting.
- 6 Zero the sensor on the airway adapter being used in this test. Ensure Zero Gas is set to Room Air.
- 7 Attach a regulated flowing gas mixture of 5% CO<sub>2</sub>, balance N<sub>2</sub> to the airway adapter.
- 8 Set the gas correction to off.
- 9 Allow a few seconds for the gas mixture to stabilize and observe the CO<sub>2</sub> value. The expected value is 5% of the ambient pressure  $\pm 2$ mmHg.

**NOTE**

Make sure that you follow the above steps correctly. If the sensor fails this check it must be exchanged. The sensor cannot be calibrated.

**Example for an expected test result:**

The expected test result for an altitude of 0 m (sea level) at approximately 760 mmHg ambient pressure is:

| Test                                     | Expected test results (x1)           | Acceptance Range  |
|--|--------------------------------------|-------------------|
| Mainstream CO <sub>2</sub> Accuracy Test | 5% of 760 mmHg pressure $\pm 2$ mmHg | 36 mmHg - 40 mmHg |

**NOTE**

The expected test results will differ depending on the conditions (i.e. altitude or ambient pressure).

## Sidestream CO<sub>2</sub> Accuracy Check

Tools Required:

- Cal gas flow regulator M2267A
- Cal tube 13907A
- Verification Gas M2506A
- Straight Sample Line M2776A

You also need a local barometric pressure rating received from a reliable local source (airport, regional weather station or hospital weather station) which is located at the same altitude as the hospital.

**Procedure:**

- 1 Attach the M2741A CO<sub>2</sub> sensor to the patient monitor. Attach the sample line and the cal tube to the sensor. Make sure that the sensor is disconnected from the patient circuit.
- 2 Switch on the patient monitor.
- 3 Enter the monitor's Service Mode.

### 3 Testing and Maintenance

- 4 Using the sensor status provided in the M2741A Serial protocol, wait for the M2741A sensor to warm up to its operating temperature.
- 5 Zero the sensor. Ensure Zero Gas is set to Room Air
- 6 Attach a regulated flowing gas mixture of 5% CO<sub>2</sub>, balance N<sub>2</sub> to the cal tube.
- 7 Set the gas correction to off.
- 8 Allow a few seconds for the gas mixture to stabilize and observe the CO<sub>2</sub> value. The expected value is 5% of the ambient pressure  $\pm 2$ mmHg

#### NOTE

Make sure that you follow the above steps correctly. If the sensor fails this check it must be exchanged. The sensor cannot be calibrated

#### Example for an expected test result:

The expected test result for an altitude of 0 m (sea level) at approximately 760 mmHg ambient pressure is:

| Test                                     | Expected test results (x2)           | Acceptance Range  |
|--|--------------------------------------|-------------------|
| Sidestream CO <sub>2</sub> Accuracy Test | 5% of 760 mmHg pressure $\pm 2$ mmHg | 36 mmHg - 40 mmHg |

#### NOTE

The expected test results will differ depending on the conditions (i.e. altitude or ambient pressure).

## Sidestream CO<sub>2</sub> Flow Check

Check the flow rate in the Sidestream CO<sub>2</sub> extension as follows:

- 1 Connect the flowmeter to the sample line
- 2 Check on the flowmeter the flow that the Sidestream CO<sub>2</sub> extension pump draws. It should be 50 ml/min  $\pm 10$  ml/min. If the value is not within tolerance check your setup again and perform another flow check. If it fails again, the sensor must be replaced. The sensor cannot be calibrated.

#### Example for an expected test result:

The expected test result for an altitude of 0 m (sea level) at approximately 760 mmHg ambient pressure is:

| Test                                  | Expected test results (x3) | Acceptance Range      |
|---------------------------------------|----------------------------|-----------------------|
| Sidestream CO <sub>2</sub> Flow Check | 50 ml/min $\pm 10$ ml/min  | 40 ml/min - 60 ml/min |

#### NOTE

The expected test results will differ depending on the conditions (i.e. altitude or ambient pressure).

## Microstream CO<sub>2</sub> Performance Test

Allow five seconds between individual service procedures to ensure stable equipment conditions.

When certain monitor procedures are running, service procedures are not possible and trying to start them will result in a message **Service Operation Failed** in the monitor's status line. Wait until the monitor completes the current operation, then restart the service procedure.

This test checks the performance of the Microstream CO<sub>2</sub> measurement. The Microstream CO<sub>2</sub> measurement can either be integrated into the IntelliVue MP5 monitor or, for other IntelliVue monitors, into the M3015A/B MMS Extensions. The Microstream CO<sub>2</sub> performance test is required



once per year or after 4000 hours of continuous use and when the instrument is repaired or when parts are replaced.

This test uses calibration equipment that you can order (see the *Parts* section for the part number). The procedure is summarized in the following steps. Refer to the documentation accompanying the equipment for detailed instructions.

Tools Required:

- Standard tools, such as screwdriver, tweezers
- Electronic flowmeter, M1026-60144 or Mass Flowmeter 453564178121
- Digital Barometer  $\pm 2$ mbar or better
- Gas calibration equipment:
- Cal 1 gas 15210-64010 (5% CO<sub>2</sub>)
- Cal 2 gas 15210-64020 (10% CO<sub>2</sub>)
- Cal gas flow regulator M2267A
- Cal tube 13907A
- Calibration Line M3015-47301
- Leakage Test Kit M1013-64002 (451261014851) (only required for leakage test without M1026-60144 Flowmeter)
- Flexible Connecting Tube

You also need a local barometric pressure rating received from a reliable local source (airport, regional weather station or hospital weather station) which is located at the same altitude as the hospital.

The CO<sub>2</sub> calibration for the Microstream extension consists of the following steps:

- Leakage check, **either** with M1026-60144 Flowmeter **or** with 453564178121 Mass Flowmeter\*
- Barometric pressure check and calibration, if required.\*
- Flow check and calibration, if required
- Noise check
- CO<sub>2</sub> Cal check and calibration, if required
- CO<sub>2</sub> Cal verification

Perform all checks in the same session.

\* Not applicable for all HW Revisions. See individual test sections for details.

#### NOTE

The M3015A/B HW Rev C is indicated as HW Rev. Q.xx.xx in the IntelliVue Revision Screen.

### Leakage Check with M1026-60144 Flowmeter (only for M3015A with HW Rev. A and B and Firmware Revision < P.01.32)

The leakage check consists of checking the tubing between:

- the pump outlet and the mCO<sub>2</sub> outlet and
- the pump inlet and calibration line inlet.

Check the user's guide of the flowmeter for details on how to make a correct flow reading.

#### Part 1

- 1 Go into service mode and select **Setup CO<sub>2</sub>** menu.
- 2 Connect a calibration line to the Microstream CO<sub>2</sub> input to start the pump running.
- 3 Check the ambient pressure and the cell pressure shown in the monitor's status line. The cell pressure should be approximately 20 mmHg lower than ambient pressure. (This test is only to check that the pump starts and is running, which is also indicated by the noise generated by the running pump.)
- 4 Connect the flowmeter outlet to the calibration line inlet using a flexible connecting tube.
- 5 Block the mCO<sub>2</sub> outlet using your fingertip and observe the flowmeter display. The value on the flowmeter (**x1**) should decrease to between 0 and 4 ml/min, accompanied by an audible increase in pump noise. If the value is within the tolerance limits, continue with part 2 of the leakage check.
- 6 If the value is outside the tolerance limits, there is a leakage between the pump outlet and the mCO<sub>2</sub> outlet.
- 7 Open the MMS Extension or MP5 and check the tubing connections at the pump outlet and the extension gas outlet. If the connections are good, then there is a leakage in the tubing and you must exchange the MMS Extension or the mCO<sub>2</sub> Assembly of the MP5 respectively.

#### Part 2

- 1 Disconnect the flowmeter from the Part 1 setup and connect the flowmeter inlet to the M3015A gas outlet or the MP5 mCO<sub>2</sub> gas outlet.
- 2 Leave the calibration line connected to the M3015A inlet or the MP5 mCO<sub>2</sub> inlet..
- 3 Block the inlet of the calibration line using your fingertip and observe the flowmeter display. The value on the flowmeter (**x2**) should decrease to between 0 and 4 ml/min, accompanied by an audible increase in pump noise. The cell pressure shown in the status line on the display should decrease to between 300 and 500 mmHg. Do not block the inlet for longer than 25 seconds as this will lead to an "Occlusion" INOP. If the value is within the tolerance limits, there are no leakages and the leakage check is completed; proceed to the pump check.
- 4 If the value is not within the tolerance limits, there is a leakage between the calibration line inlet and the pump inlet.
- 5 Check the calibration line connections and open the M3015A or MP5 to check the tubing connections at the pump inlet and the M3015A or MP5 mCO<sub>2</sub> gas inlet. If the connections are good, try replacing the calibration line and repeating the leakage check. If the situation remains, there is a leakage in the tubing and the M3015A or the mCO<sub>2</sub> assembly of the MP5 must be exchanged.

| Test                        | Expected test results  |
|-----------------------------|--|
| Leakage Check Parts 1 and 2 | <b>x1</b> = value of part 1 leakage check on flowmeter<br><b>(x1 &lt; 4.0 ml/min)</b><br><br><b>x2</b> = value of part 2 leakage check on flowmeter<br><b>(x2 &lt; 4.0 ml/min)</b> |

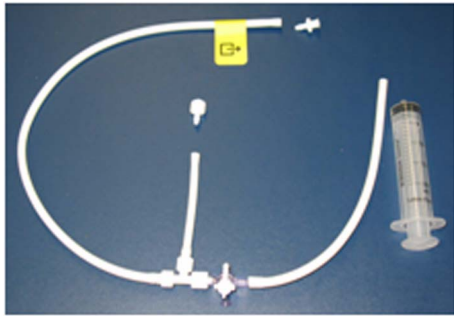
## Leakage Check for M3015B and M3015A with HW Rev C or M3015A with HW Rev. A/B without M1026-60144 Flowmeter

### Preparation of Leakage Test Kit:

Remove two Luer connectors from the Leakage Test Kit, as shown in the following picture.

### NOTE

These Luer connectors are not required for the actual Leakage Check. However, you should keep them, as they are required for other tests (e.g. for the kit leak test as documented later in this section).



### Test Setup:

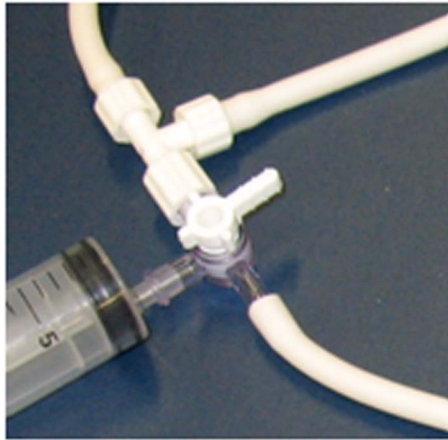
- 1 Connect the Calibration Line (M3015-47301) to the inlet of the M8105A/M3015A/B (the M8105A/M3015A/B must be switched off, either by disconnecting from the host monitor or by switching off the monitor).
- 2 Connect the leakage test tubing to the outlet of the M8105A/M3015A/B, to the digital barometer, to the calibration line, and the (empty) syringe as shown below. Make sure all connections have a tight fit!



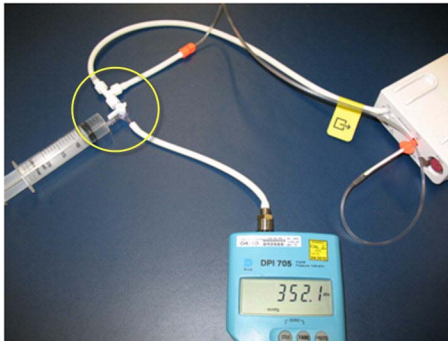
### 3 Testing and Maintenance

#### Test Procedure:

- 1 Open the 3-way stopcock for all three limbs.



- 2 Switch on the digital barometer (the digital barometer should now display the actual ambient pressure).
- 3 Now slowly draw at the syringe, as if filling the syringe, until the pressure (as displayed on the digital barometer) drops to approximately 350 mbar below ambient pressure. Then close the line to the syringe at the 3-way stopcock to syringe (circled in picture below).
- 4 Let the reading on the digital barometer stabilize for a moment and then perform the leakage check: for 30 seconds the change of the pressure reading should be less than 20 mbar.



- 5 If the leakage test is NOT passed, check all connections once more and repeat the test.

| Test          | Expected test results   |
|---------------|---|
| Leakage Check | Reading on the digital barometer change is less than 20 mbar for 30 seconds (pass/fail) |

#### NOTE

To ensure the integrity of the Leakage Test Kit (M1013-64002, 451261014851) the following Kit Leak Test Procedure must be performed:

- a. Form a loop with the leakage test kit as shown in the picture below.



- b. Connect the syringe to the 3-way stopcock and the digital barometer to the open tubing.  
 c. Draw at the syringe until the digital barometer shows approximately 350 mbar below ambient pressure.  
 d. Close the 3-way stopcock to the syringe and wait 5 - 10 seconds. In this time, the overall pressure should stabilize.  
 e. After 1 minute, check the pressure. The pressure should not increase more than 8 mbar in 1 minute for the test to pass.  
 f. If this test fails, exchange the leakage test kit.

## Barometric Pressure Check and Calibration

### NOTE

The M3015A with HW Rev C and the M3015B do not require calibration of the barometric pressure. Therefore you will not be able to activate a barometric pressure calibration. If you are using a HW Rev C M3015A or M3015B, perform the barometric pressure check as described below, making sure that only a sample line is connected to the MMS Extension. If the pressure check fails, the M3015A/B needs to be exchanged.

Check the barometric pressure value in the M3015A/B MMS Extension or the MP5 as follows:

- 1 Go into service mode and select **Setup CO<sub>2</sub>** menu.
- 2 Connect a calibration line to the Microstream CO<sub>2</sub> input. This activates the pump in the M3015A/B MMS Extension or the MP5.
- 3 The status line at the bottom of the screen displays “CO<sub>2</sub> pressure reading (ambient/cell) xxx/yyy” where xxx is the ambient pressure and yyy is the measured cell pressure. Check whether the ambient pressure value (**x3**) matches (within the acceptable tolerance of  $\pm 12$  mm Hg) the reference value you have received. If so, proceed to the leakage check.

If the value is not correct, calibrate as follows.

- a. Select **CO<sub>2</sub>** then select **Barom.Press** to activate a table of values.
- b. Select the value in the table which matches the reference value received from a reliable local source (airport, regional weather station or hospital weather station). (The values are displayed with a resolution of 2 mmHg up to 500 mmHg and a resolution of 1 mmHg from 500 mmHg to 825 mmHg.) Note: the selected value must be within  $\pm 10\%$  of the current measured ambient pressure, otherwise an error message will occur at restarting the monitor.

### 3 Testing and Maintenance

- c. Confirm the barometric pressure setting.
- d. Check that the ambient pressure displayed in the status line at the bottom of the screen is the same as the value which you selected from the list in step b.

| Test                      | Expected test results   |
|---------------------------|---|
| Barometric Pressure Check | <b>x3</b> = difference between the reference pressure and the measured ambient pressure displayed on the monitor<br>( <b>x3</b> <12 mmHg) |

### Flow Rate Check and Calibration

Check the flow rate in the M3015A/B MMS Extension or the MP5 as follows:

- 1 Connect the calibration line to the mCO<sub>2</sub> inlet and the flowmeter outlet to the calibration line.
- 2 Check on the flowmeter the flow that the M3015A/B MMS Extension or MP5 mCO<sub>2</sub> pump draws (**x5**). It should be 50 +15/-7.5 ml/min. If the value is within tolerance, proceed to the CO<sub>2</sub> Gas calibration check.

If the value is not within tolerance, calibrate as follows.

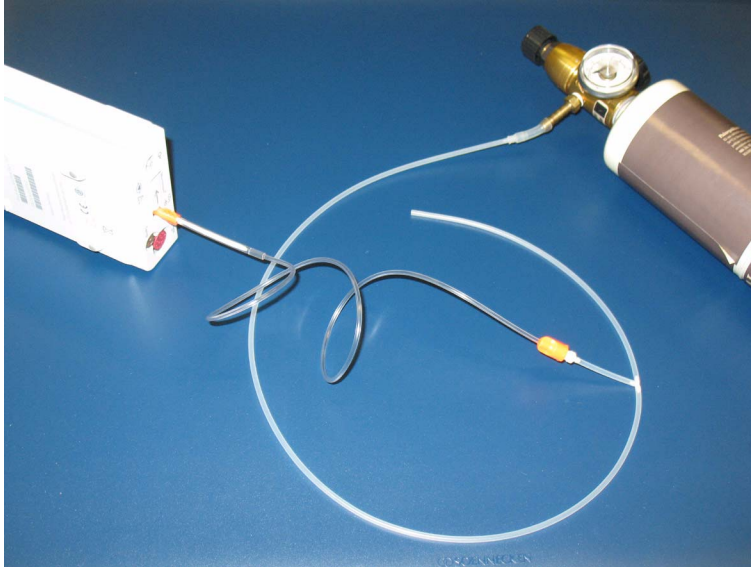
- a. Adjust the flow in the instrument by selecting **Increase Flow** or **Decrease Flow** until it is as close as possible to 50 ml per minute as indicated on the flowmeter gauge.
- b. When you are satisfied that the flow is set as close as possible to 50 ml per minute, select **Store Flow** and confirm the setting. If you do not store the adjusted flow within 60 seconds of the adjustment, the old flow setting is restored.
- c. If you cannot adjust the flow to within tolerance, replace the pump . If you still cannot make the flow adjustment, this indicates a fault in the measurement extension, which must be replaced.

Note that the pump can only be replaced on M3015A with the old hardware Rev. A (i.e. Serial No. DE020xxxxx)

| Test            | Expected test results           |
|-----------------|---------------------------------|
| Flow Rate Check | Flow rate is 50 +15/-7.5 ml/min |

## Noise Check

- 1 With the monitor in service mode, select **Setup CO<sub>2</sub>** menu.
- 2 Connect the calibration line, the cal tube, the flow regulator and the 5% calibration gas to the mCO<sub>2</sub> inlet.



- 3 Open the valve to apply the 5% calibration gas and wait until the value is stable.
- 4 Check the noise index (**x6**) displayed next to the CO<sub>2</sub> value on the display (this indicates the level of noise on the CO<sub>2</sub> wave). If the value exceeds 3 mmHg, replace the measurement extension.

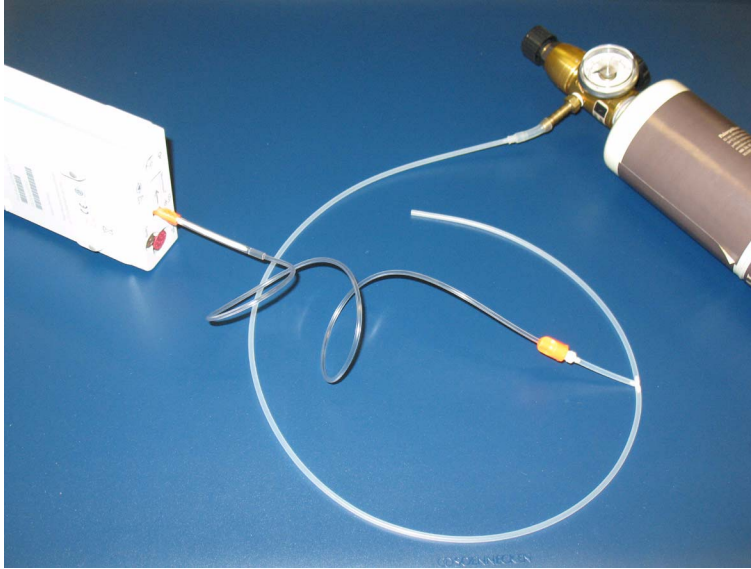
| Test        | Expected test results  |
|-------------|--|
| Noise Check | <b>x6</b> = noise index displayed on monitor<br>( <b>x6</b> < 3.0) |



## CO2 Cal Check and Calibration

After switching the measurement extension on, wait at least 20 minutes before checking the calibration. Check the calibration of the CO<sub>2</sub> gas measurement as follows:

- 1 Connect the calibration line, the cal tube, the flow regulator and the 5% calibration gas to the mCO<sub>2</sub> inlet.



- 2 Calculate the expected measurement value in mmHg as follows:  
 $0.05 \times (\text{ambient pressure}) = \text{value mmHg}$   
 for example  $0.05 \times 736 = 36.8 \text{ mmHg}$  (with an ambient pressure of 736 mmHg)
- 3 Open the valve on the flow regulator to allow 5% CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize.
- 4 Check that the value on the instrument (measurement value on the main screen, **x7**) matches the calculated mmHg value  $\pm 2.6 \text{ mmHg}$ .  
 If the value is outside the tolerance, calibrate as described in step 8a to 8e below.
- 5 Disconnect the 5% calibration gas and connect the 10% calibration gas.
- 6 Calculate the expected measurement value and tolerance in mmHg as follows:  
 $0.1 \times (\text{ambient pressure}) = \text{value mmHg}$   
 $\pm 0.07 \times (\text{value mmHg}) = \text{tolerance}$   
 for example  $0.1 \times 737 \text{ mmHg} = 73.7 \text{ mmHg}$  (with an ambient pressure of 737 mmHg)  
 $\pm 0.07 \times 73.7 \text{ mmHg} = \pm 5.16 \text{ mmHg tolerance}$
- 7 Open the valve on the flow regulator to allow 10% CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize.
- 8 Check that the value on the instrument (**x8**) matches the calculated mmHg value within the calculated tolerance. If so, the measurement extension is correctly calibrated.  
 If the value is outside the tolerance, calibrate as follows.
  - a. Keep the same setup and connect the 5% calibration gas.
  - b. Select **Cal. CO<sub>2</sub>**.
  - c. Select the value for the calibration gas. (The default value is 5.0%.)



- d. Open the valve on the calibration gas to allow CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize before the start of the calibration. Leave the valve open until the instrument gives a prompt that gas can be removed.
- e. The extension calibrates and prompts when calibration is successful.

| Test                      | Expected test results   |
|---------------------------|---|
| CO <sub>2</sub> Cal Check | x7 = calculated mmHg value $\pm 2.6$ mmHg<br>x8 = calculated mmHg value within calculated tolerance |

### Calibration Verification

- 1 Keep the same setup as described in “CO<sub>2</sub> Cal Check and Calibration” on page 84.
- 2 Reopen the 5% gas valve and allow the value to stabilize.
- 3 Check that the value displayed on the monitor is correct within the tolerance (see step above).
- 4 Disconnect the 5% calibration gas and connect the 10% calibration gas.
- 5 Open the valve on the flow regulator to allow 10% CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize.
- 6 Check that the value displayed on the monitor is correct within the tolerance (see step above).

If one or both values are not within tolerances, you must exchange the M3015A/B MMS Extension or the MP5 mCO<sub>2</sub> Assembly.

| Test                                  | Expected Test Results   |
|---------------------------------------|---|
| Leakage Check parts 1 and 2*          | x1 = value of part 1 leakage check on flowmeter (x1 < 4.0 ml/min)<br>x2 = value of part 2 leakage check on flowmeter (x2 < 4.0 ml/min)                                    |
| Leakage Check without Flowmeter       | reading on the digital barometer change is less than 20 mbar for 30 seconds   |
| Barometric Pressure Check             | x3 = difference between the reference pressure and the measured ambient pressure displayed on the monitor (x3 < 12 mmHg)  |
| Flow Check                            | x4 = difference between measured value and 50.0 ml/min (x4 = 50 + 15/-7.5 ml/min)   |
| Noise Check                           | x5 = noise index displayed on monitor (x5 < 3.0)  |
| CO <sub>2</sub> Gas Calibration Check | x6 = difference between measured CO <sub>2</sub> value and calculated value, based on 5% CO <sub>2</sub> cal. gas. (x6 < 2.6 mmHg)  |
| CO <sub>2</sub> Cal Verification      | x7 = difference between measured CO <sub>2</sub> value and calculated value, based on 10% CO <sub>2</sub> cal. gas. (x7 < $\pm \{0.07 \times \text{value calculated}\}$ ) |

\* M3015A HW Rev. B and FW Revision < P.01.32 only

## Nurse Call Relay Performance Test

The nurse call relay performance test can be performed either at the phone jack type connector (this only tests one relay) or at the multi-port nurse call connector (to test all three relays).

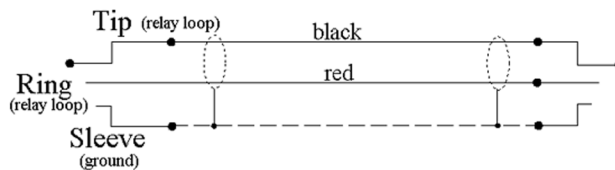
### Phone Jack Type Connector Test (Traditional Nurse Call)

This test checks the operation of the traditional Nurse Call Relay. The Nurse Call Relay test is recommended for customer sites where the nurse call is in use. The Nurse Call relay functions as follows:

- Standard Operation—Relay open.
- Alarm Condition—Relay closed.

**Tools required:** Ohmmeter.

- 1 Plug a phono connector into the Nurse Call Relay connector.
- 2 Connect the ohmmeter.
- 3 If no alarm occurs, the relay contacts are open. When an alarm occurs, the relay contacts close.



- 4 The expected test result is: Alarm condition - Relay closed.

| Test                              | Expected test results        |
|-----------------------------------|------------------------------|
| Nurse Call Relay Performance Test | Alarm Condition—Relay closed |

### Modified MP5 Nurse Call Alarm Relay Test

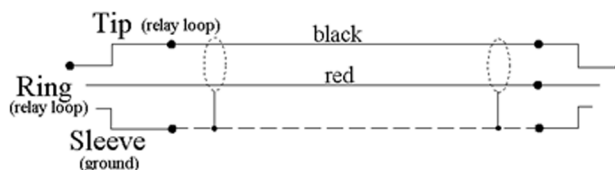
Some customers may have an Open-On-Alarm relay instead of a Closed-On-Alarm for their Nursecall system.

The modified Nurse Call relay functions as follows:

- Standard Operation—Relay closed.
- Alarm Condition—Relay open.

**Tools required:** Ohmmeter.

- 1 Plug a phono connector into the Nurse Call Relay connector.
- 2 Connect the ohmmeter and verify the above conditions.
- 3 If no alarm occurs, the relay contacts are closed. When an alarm occurs, the relay contacts open.



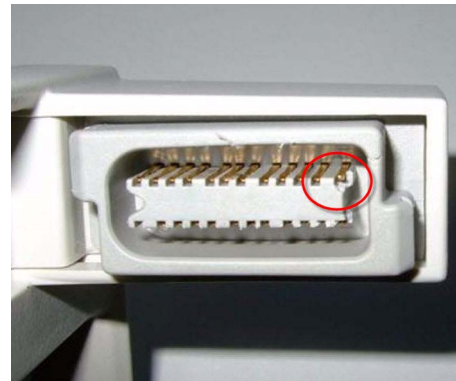
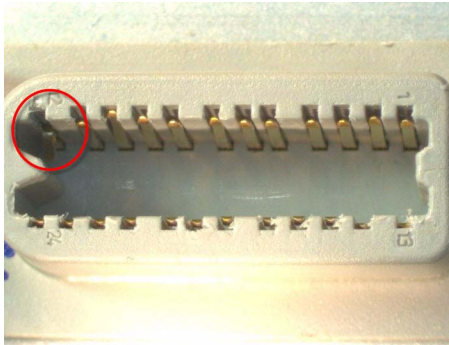
- 4 The expected test result is: **Alarm Condition - Relay open.**

| Test                              | Expected test results      |
|-----------------------------------|----------------------------|
| Nurse Call Relay Performance Test | Alarm Condition—Relay open |

## MSL Assurance Test

Visually inspect all MSL connector sockets (cable/monitor/FMS/MMS).

- 1 Make sure that the pins of the connectors are not jolted.
- 2 Make sure that no pin is bent inwards or outwards.
- 3 Exchange connectors that show any evidence of damage or breakage.



*Examples of damaged connectors*

| Test               | Expected test results                         |
|--------------------|---|
| MSL Assurance Test | Pins of connector not jolted/bent (pass/fail) |

## Power Loss Alarm Buzzer Performance Test

- 1 Switch on the monitor.
- 2 Remove the battery and disconnect the monitor from AC power.
- 3 The Power Loss Alarm Buzzer should beep for about one minute.
- 4 To switch off the alarm sound, either press the power button, connect the monitor to AC power or insert a battery

| Test                                     | Expected test results |
|--|-----------------------|
| Power Loss Alarm Buzzer Performance Test | Beep for one minute   |

## Battery Performance Test

The lifetime of a Lithium Ion battery depends on the frequency and duration of use. When properly cared for, the useful life is approximately 3 years or 500 charge-discharge cycles, whichever comes first.

In addition, experience indicates that the incidence of failure may increase with battery service life due to the accumulated stresses of daily use.

The age of a lithium ion battery begins at the date of manufacture. To see the date of manufacture and the number of charge-discharge cycles:

- 1 Select the battery symbol on the patient monitor screen.
- 2 Select the appropriate Battery pop-up key.
- 3 If necessary, select the Battery pop-up key again to view the battery details.  
The date of manufacture and the number of charge-discharge cycles are listed with other battery data on the screen.  
Provide customer with details about age of battery and recommend replacement, if necessary.

| Test                     | Expected test results  |
|--------------------------|--|
| Battery Performance Test | Battery age less than 3 years or 500 charge/discharge cycles |

## IntelliVue 802.11 Bedside Adapter Communication Test - Rev G.0 or lower (not for MP5T)

- 1 Make sure the LAN cable is disconnected from the rear of the monitor, then switch on the monitor.
- 2 Go into Service Mode and select **Main Setup -> Network -> Setup WLAN**. In the **Setup WLAN** menu:
  - set **Mode** to either **802.11Ah**, **802.11G**, **802.11Bg** (not recommended), **Auto** (not recommended) or **None** (this setting disables the wireless LAN functionality permanently), to match your wireless infrastructure installation.
  - set **SSID** to match your installation.
  - set the **Country** code to “1000”. Setting the country code to this value will automatically adjust the regulatory domain to match the configuration of the infrastructure. Do not set the country code to values other than “1000” unless otherwise instructed.
  - set the **Security Mode** to match your installation.
  - Enter the required keys/passwords.
- 3 Select **Main Setup -> WLAN Diagnostic** to access the service window.
- 4 Proper installation of the IntelliVue 802.11 Bedside Adapter is assured by connecting to an access point over the wireless link. Place the monitor with the IntelliVue 802.11 Bedside Adapter installed in close proximity to the access point (e.g. if the access point is mounted on the ceiling, place the monitor directly below). Wait until the **Conn.Status** field in the service window shows *Authenticated* (for Rel. C.0 monitors) or *Connected* (for Rel D.0 or higher). Take the monitor approximately 5 m away from the access point. There should be no walls or other obstacles between the monitor and the access point. The following should apply:
  - Observe the **RSSI** (Received Signal Strength Indicator) value for at least 5 - 10 seconds. The **RSSI** value will fluctuate but should stay above 30 in a 5 m distance from the access point used. The wireless link should be active, i.e. the **Conn.Status** field should be *Authenticated* (for Rel. C.0 monitors) or *Connected* (for Rel D.0 or higher), and the other fields should contain values. If the **RSSI** value is significantly lower, check the distance to the access point and the antenna orientation at the monitor. The antenna orientation should be vertical, but the physical placement of the monitor or other equipment within its vicinity as well as walls or other obstacles may influence the antenna orientation required to receive the best RSSI value.
- 5 If this test fails, retry in a different physical area with a different access point and/or check the credential settings in the monitor.

| Test   | Expected test results |
|--|-----------------------|
| IntelliVue 802.11 Bedside Adapter Performance Test | RSSI value above 30   |

## IntelliVue 802.11 Bedside Adapter Communication Test - Rev H.0 or higher (not for MP5T)

- 1 Make sure the LAN cable is disconnected from the rear of the monitor, then switch on the monitor.
- 2 Go into Service Mode and select **Main Setup -> Network -> Setup WLAN**. In the **Setup WLAN** menu:
  - set **Mode** to either **802.11Ah**, **802.11G**, **802.11Bg** (not recommended), **Auto** (not recommended) or **None** (this setting disables the wireless LAN functionality permanently), to match your wireless infrastructure installation.
  - set **SSID** to match your installation.
  - set the **Country** code to “1000”. Setting the country code to this value will automatically adjust the regulatory domain to match the configuration of the infrastructure. Do not set the country code to values other than “1000” unless otherwise instructed.
  - set the **Security Mode** to match your installation.
  - Enter the required keys/passwords.
- 3 Select **Main Setup -> Network -> WLAN Diagnostic** to access the WLAN Diagnostic window.
- 4 Proper installation of the IntelliVue 802.11 Bedside Adapter is assured by connecting to an access point over the wireless link. Place the monitor with the IntelliVue 802.11 Bedside Adapter installed in close proximity to the access point (e.g. if the access point is mounted on the ceiling, place the monitor directly below). Wait until the **Conn.Status** field in the service window shows *Authenticated* (for Rel. C.0 monitors) or *Connected* (for Rel D.0 or higher). Take the monitor approximately 5 m away from the access point. There should be no walls or other obstacles between the monitor and the access point. The following should apply:
  - Observe the **RSSI** (Received Signal Strength Indicator) value for at least 5 - 10 seconds. The **RSSI** value will fluctuate but should stay above 30 in a 5 m distance from the access point used. The wireless link should be active, i.e. the **Conn.Status** field should be *Authenticated* (for Rel. C.0 monitors) or *Connected* (for Rel D.0 or higher), and the other fields should contain values. If the **RSSI** value is significantly lower, check the distance to the access point and the antenna orientation at the monitor. The antenna orientation should be vertical, but the physical placement of the monitor or other equipment within its vicinity as well as walls or other obstacles may influence the antenna orientation required to receive the best RSSI value.
- 5 If this test fails, retry in a different physical area with a different access point and/or check the credential settings in the monitor.

| Test   | Expected test results |
|--|-----------------------|
| IntelliVue 802.11 Bedside Adapter Performance Test | RSSI value above 30   |

## IIT Communication Test - Rev G.0 or lower (not for MP5T)

- 1 Make sure the LAN cable is disconnected from the rear of the monitor, then switch on the monitor.
- 2 Go into Configuration mode and, in the **Network** menu, set the **RF Access Code** in each profile to match your installation.
- 3 Go into Service Mode. Select **Main Setup -> Instr. Telemetry** to access the Instrument Telemetry Service window.
- 4 Proper installation of the IIT module is assured by connecting to an access point over the wireless link. Place the monitor with the IIT module installed in close proximity to the access point (e.g. if the access point is mounted on the ceiling, place the monitor directly below). Wait until the

**Conn.Status** field in the Instrument Telemetry Service window shows *Active*. *Take the monitor approximately 5 m away from the access point. There should be no walls or other obstacles between the monitor and the access point. The following should apply:*

- Observe the **RSSI** (Received Signal Strength Indicator) value for at least 5 - 10 seconds. The **RSSI** value should be around  $-50 \pm 10$  in a 5 m distance from the access point used and the IIT link should be active, i.e. the **Conn.Status** field should be *Active* and the other fields should contain values. If the **RSSI** value is significantly lower, check the distance to the access point and the antenna orientation at both the monitor and the access point (both should be vertical).
  - Remove the antenna. The **RSSI** value should be around  $-90 \pm 10$ . The IIT link may be active but the connection could be unreliable. The **Conn. Status** field may toggle between *Inactive* and *Seeking*. If the difference between the **RSSI** values measured with and without antenna is significantly lower, check the antenna and the antenna connector for damage and verify that the cable from the IIT adapter to the antenna connector plate is connected properly.
- 5 If this test fails, retry in a different physical area with a different access point.
- Error Conditions:
- The field **MAC Instr. Tele** should show a value **unequal to** 0000 0000 0000. If it does not, there is a communication problem between the monitor and the IIT adapter.
  - With an incorrect RF Access Code or an incorrect or defective antenna installation, the fields **IP Address**, **Server IP**, **Subnet Mask**, and **RSSI** in the Instrument Telemetry Service window will stay blank. The field **Conn. Status** will slowly toggle between *Inactive* and *Seeking*.
- 6 Perform the Access Point Controller (APC) test blocks as described in the Philips IntelliVue Wireless Network Installation and Configuration Guide.

| Test                   | Expected test results                  |
|------------------------|--|
| IIT Communication Test | IIT Communication without interference |

## IIT Communication Test - Rev H.0 or higher (not for MP5T and MP5SC)

- 1 Make sure the LAN cable is disconnected from the rear of the monitor, then switch on the monitor.
- 2 Go into Service mode and, select **Main Setup** -> **Network** -> **Setup IIT**. In the Setup IIT menu, set the **RF Access Code** in each profile to match your installation.
- 3 Go into Service Mode. Select **Main Setup** -> **Network** -> **IIT Diagnostic** to access the Instrument Telemetry Diagnostic window.
- 4 Proper installation of the IIT module is assured by connecting to an access point over the wireless link. Place the monitor with the IIT module installed in close proximity to the access point (e.g. if the access point is mounted on the ceiling, place the monitor directly below). Wait until the **Conn.Status** field in the Instrument Telemetry Service window shows *Active*. *Take the monitor approximately 5 m away from the access point. There should be no walls or other obstacles between the monitor and the access point. The following should apply:*
  - Observe the **RSSI** (Received Signal Strength Indicator) value for at least 5 - 10 seconds. The **RSSI** value should be around  $-50 \pm 10$  in a 5 m distance from the access point used and the IIT link should be active, i.e. the **Conn.Status** field should be *Active* and the other fields should contain values. If the **RSSI** value is significantly lower, check the distance to the access point and the antenna orientation at both the monitor and the access point (both should be vertical).
  - Remove the antenna. The **RSSI** value should be around  $-90 \pm 10$ . The IIT link may be active but the connection could be unreliable. The **Conn. Status** field may toggle between *Inactive* and

*Seeking*. If the difference between the **RSSI** values measured with and without antenna is significantly lower, check the antenna and the antenna connector for damage and verify that the cable from the IIT adapter to the antenna connector plate is connected properly.


- 5 If this test fails, retry in a different physical area with a different access point.

**Error Conditions:**

- The field **MAC IIT** should show a value **unequal to** 0000 0000 0000. If it does not, there is a communication problem between the monitor and the IIT adapter.
  - With an incorrect RF Access Code or an incorrect or defective antenna installation, the fields **IP Address**, **Server IP**, **Subnet Mask**, and **RSSI** in the Instrument Telemetry Service window will stay blank. The field **Conn. Status** will slowly toggle between *Inactive* and *Seeking*.
- 6 Perform the Access Point Controller (APC) test blocks as described in the Philips IntelliVue Wireless Network Installation and Configuration Guide.

| Test                   | Expected test results                  |
|------------------------|--|
| IIT Communication Test | IIT Communication without interference |

## Short Range Radio (SRR) Performance Test

- 1 Make sure that the short range radio interface is configured as follows: SRR On and appropriate channel selected.
- 2 Assign a telemetry transceiver or IntelliVue CL Cableless Measurement device to the IntelliVue Monitor according to the procedure described in the Instructions for Use of the patient monitor.
- 3 Check that the following conditions are fulfilled:
  - a. Place the telemetry transceiver or CL device close to the monitor.
  - b. The telemetry transceiver or CL device status is displayed on the monitor in the measurement selection window.
  - c. Waves or numerics from the telemetry transceiver or CL device are displayed on the monitor. There are no dropouts or gaps in waves or numeric transmission.
  - d. The battery status of the telemetry transceiver or CL device is displayed in the measurement selection window.
  - e. The Signal Quality Indicator shows at least 
- 4 Check that the data from the telemetry transceiver or CL device is transmitted to the monitor within a 1m radius and that there are no dropouts or gaps in waves or numerics.
- 5 Check whether the connection remains stable within a 5m radius from the monitor.
- 6 Switch on all telemetry transceivers or CL devices used on the site and check that there are no interferences between the transceivers and their assigned monitors.
- 7 Check and record the coverage area of the telemetry transceivers or CL devices and inform the customer about this coverage area.

| Test                                     | Expected test results                                      |
|--|--|
| Short Range Radio (SRR) Performance Test | SRR Communication without interference within the coverage |



## Mounting Integrity Test

Perform the Mounting Integrity Test

- whenever you have removed and reassembled a quick mount
- if one or more of the quick mount screws are loose
- if the monitor mounting is unstable

Remove the monitor from the mount and disassemble the quick mount. Ensure that the threaded inserts of the MP5 chassis are not damaged.

If the quick mount is damaged, exchange the quick mount.

Ensure that all quick mount screws are tight (1.3 Nm). Test the quick mount by pressing the quick release button. If it comes back out gradually and regularly, the quick mount is inserted correctly. If it gets stuck, check whether the quick mount is assembled correctly.

| Test                    | Expected test results   |
|-------------------------|---|
| Mounting Integrity Test | All quick mount screws are tight. No damage to quick mount. No damage to threaded inserts of the MP5. |

## Reporting of Test Results

Philips recommends all test results are documented in accordance with local laws. Authorized Philips personnel report the test result back to Philips. While hospital personnel (biomedical engineers or technicians) do not need to report results to Philips, Philips recommends that they record and store the test results in accordance with local laws.

The following table lists what to record after completing the tests in this chapter. Record the results in the empty column in the Test and Inspection Matrix.

The following is a guide as to what your documentation should include:

- Identification of the testing body (for example, which company or department carried out the tests).
- Name of the person(s) who performed the tests and the concluding evaluation.
- Identification of the device(s) and accessories being tested (serial number, etc.).
- The actual tests (incl. visual inspections, performance tests, safety and system tests) and measurements required
- Date of testing and of the concluding evaluation.
- A record of the actual values of the test results, and whether these values passed or failed the tests.
- Date and confirmation of the person who performed the tests and evaluation.

The device under test should be marked according to the test result: passed or failed.



## Carrying Out and Reporting Tests

### Test Report

|   |   |
|---|---|
| Testing Organization:   | (Check one of the following three options)<br>Test before putting into service (reference value)<br>Recurrent Test<br>Test after Repair |
| Name of testing person:   |   |
| Date:   |   |
| Responsible Organization:   |   |
| Device Under Test:  | ID-Number   |
| Product Number:   | Serial No.:   |
| Accessories:  |   |
| Measurement Equipment (Manufacturer, Type, Serial No., Calibration Date): |   |
| Safety Test Method used   |   |
| Functional Test (parameters tested):                                      |   |
| Mains voltage and frequency used during safety testing:                   |   |

### Test and Inspection Matrix

| Test   | Test or Inspection to be Performed                             | Expected Test Results  | Record the Results (mandatory for Philips Personnel only) |                |
|--|--|--|---|----------------|
|  |  |  | What to record  | Actual Results |
| Visual Inspection                            | Perform Visual Inspection                                      | Pass or Fail   | V:P or V:F  |                |
| Power On                                     | Power on the unit.<br>Does the self-test complete successfully | If Yes, Power On test is passed  | PO:P or PO:F  |                |
| Noninvasive Blood Pressure Performance Tests | Perform the Accuracy Test                                      | X1 = value displayed by monitor<br>Difference $\leq 3$ mmHg  | PN:P/X1 or<br>PN:F/X1                                     |                |
|  | Performance Leakage Test                                       | X2 = leakage test value<br>X2 $< 6$ mmHg   | PN:P/X2 or<br>PN:F/X2                                     |                |
|  | Performance Linearity Test                                     | X3 = value displayed by monitor<br>Difference $\leq 3$ mmHg  | PN:P/X3 or<br>PN:F/X3                                     |                |
|  | Performance Valve Test   | X4 = value $< 10$ mmHg   | PN:P/X4 or<br>PN:F/X4                                     |                |
| Temperature Performance Test                 | Perform the Temperature Performance Test                       | X1 = $40^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$ or $100^{\circ}\text{F} \pm 0.4^{\circ}\text{F}$ | PT: P/X1 or<br>PT: F/X1                                   |                |

### 3 Testing and Maintenance

| Test  | Test or Inspection to be Performed   | Expected Test Results  | Record the Results (mandatory for Philips Personnel only) |                |
|---|--|--|---|----------------|
|   |  |  | What to record  | Actual Results |
| All other performance tests   | Perform the remaining parameter performance tests, if applicable   | See expected results in test procedures  | P: P or<br>P: F   |                |
| Safety (1)  | Perform Safety Test (1): Protective Earth Resistance   | With mains cable:<br>Maximum impedance (X1):<br>$\leq 300 \text{ mOhms}$   | S(1):P/X1 or<br>S(1):F/X1                                 | *              |
| Safety (2)  | Perform Safety Test (2): Equipment Leakage Current - Normal Condition.   | With mains cable:<br>Maximum leakage current (X1): $\leq 100 \mu\text{A}$  | S(2): P/X1 or<br>S(2): F/X1                               | *              |
| Safety (3)  | Perform Safety Test (3): Equipment Leakage Current - Single Fault Condition (Open Earth)   | With mains cable:<br>Maximum leakage current (X2): $\leq 300 \mu\text{A}$  | S(3): P/X2 or<br>S(3): F/X2                               | *              |
| Safety (4)  | Perform Safety Test (4): Applied Part Leakage Current - Single Fault Condition, mains on applied part.   | Maximum leakage current (X1):<br>$\leq 50 \mu\text{A}$ (CF)  | S(4): P/X1 or<br>S(4): F/X1                               | *              |
| System (Sys 1-2)  | Perform the system test according to subclause 19.201 of IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16, if applicable, after forming a system | Equipment Leakage Current:<br>Sys1 $\leq 100 \mu\text{A}$ (Normal Condition)<br>Sys2 $\leq 300 \mu\text{A}$ (Single Fault Condition)                               | Sys: PSys1/PSys2<br>or<br>Sys: FSys1/FSys2                | *              |
| System (Sys 3)  | Perform the system test according to subclause 19.201 of IEC/EN 60601-1-1 or IEC/EN 60601-1+A1 Ed.3 clause 16, if applicable, after forming a system | Protective Earth Leakage Current if medical electrical system components are connected to the same Multiple Portable Socket Outlet:<br>Sys3 $\leq 300 \mu\text{A}$ | Sys: PSys3<br>or<br>Sys: FSys3                            | *              |
| Key: P = Pass, F = Fail, X or Sys = test value to be recorded, * = Record the worst-case results and the associated switch positions (e.g. normal/reverse polarity) |  |  |   |                |

**NOTE**

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

**Evaluation**

|   | Yes | No |
|---|-----|----|
| Safety and Functional Test passed                                   |     |    |
| Repair required at a later date, safety and functional test passed  |     |    |
| Device must be taken out of operation until repair and passed tests |     |    |
| Device failed and must be taken out of operation.                   |     |    |
| <b>Notes:</b>   |     |    |
|   |     |    |
| <b>Next Recurrent Test:</b>   |     |    |
| <b>Name:</b> _____  |     |    |
| <b>Date/Signature:</b> _____  |     |    |

**Evaluation of Test Results**

The evaluation of the test results must be performed by appropriately trained personnel with sufficient product, safety testing and application knowledge.

If any test results are between 90% and 100% of the respective expected result, the previously measured reference values must be taken into consideration for the assessment of the electrical safety of the device under test. If no reference values are available, you should consider shorter intervals between upcoming recurrent tests.

**NOTE**

If any single test fails, testing must be discontinued immediately and the device under test must be repaired or labeled as defective. Be sure to inform the user about the test failure in writing.

**Other Regular Tests**

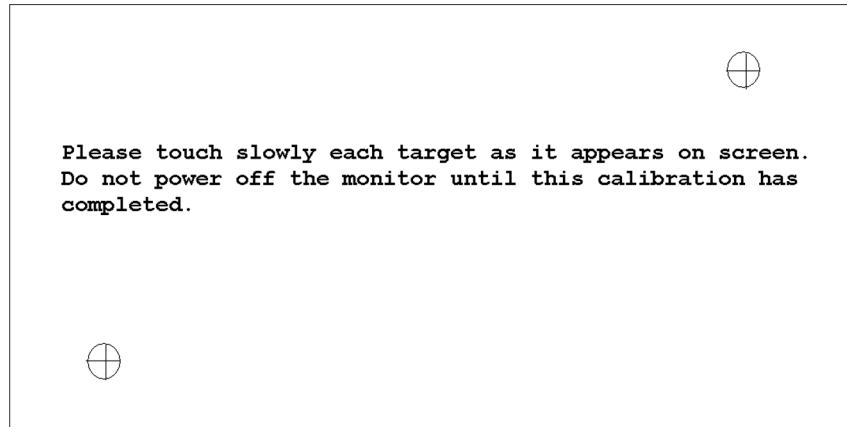
The care and cleaning requirements that apply to the monitor and its accessories are described in the Instructions for Use. This section details periodic maintenance procedures recommended for the monitor and its accessories.

**Touchscreen Calibration**

To access the touchscreen calibration screen:

- 1 Enter service mode
- 2 Select **Main Setup**
- 3 Select **Hardware**

#### 4 Select **Touch Calibration**



##### *Touchscreen Calibration Screen*

Make sure you complete the calibration procedure without powering off the monitor mid-way. If the monitor is powered off after the first point is touched, the touch panel will be deactivated until the touch calibration is performed again.

If the touchscreen is accidentally mis-calibrated by selecting the wrong spot, you must use another input device to re-enter calibration mode. If you have the Support Tool, you can initiate a touch calibration from there.

Please refer to the documentation shipped with your selected display for further details on touchscreen calibration procedures.

## Disabling/Enabling Touch Operation

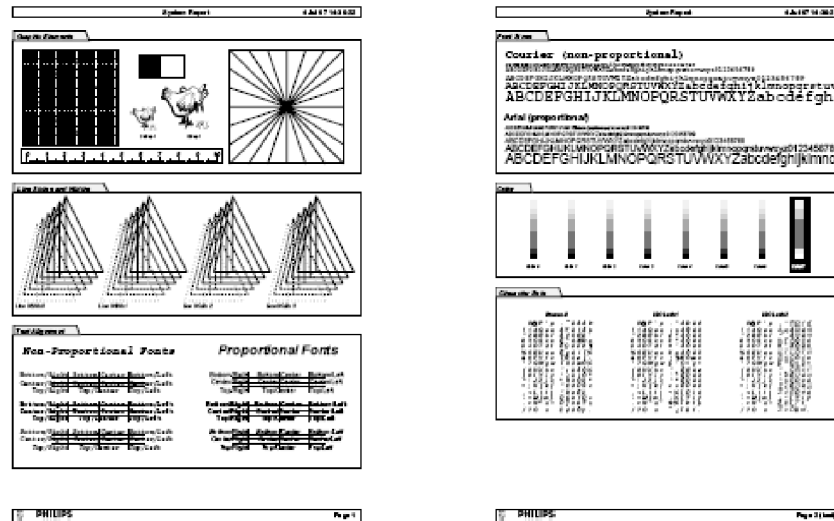
To *temporarily* disable touchscreen operation of the monitor, press and hold the **Main Screen** key. A padlock symbol will appear on the key. Press and hold the **Main Screen** key again to re-enable touchscreen operation.

## Printer Test Report

To verify your printer configuration you may want to print a test report.

To print a test report select **Main Setup -> Reports -> Setup Printers -> Print Test Rep.**

Your test report should look like this:



## Battery Handling, Maintenance and Good Practices

This section provides some information on how to handle and maintain the battery in order to get the best usage from them. Additionally, some good working practices are also given regarding the correct disposal of the batteries. This section only applies if a system interface board with battery functionality is installed in the monitor.

### NOTE

If your monitor is connected to an IntelliVue Information Center, you should make sure that the IIC uses the text catalog revision E.0 or later, otherwise battery INOPs may not display correctly on the IIC. Consult your IIC documentation for instructions on upgrading the text catalog.

## Battery Care

Battery care begins when you receive a new battery and continues throughout the life of the battery. The table below lists battery care activities and when they should be performed.

| Activity                    | When to Perform   |
|-----------------------------|---|
| Perform a visual inspection | Before inserting a battery into the monitor   |
| Charge the battery          | Upon receipt, after use, or if a low battery state is indicated. To optimize performance, a fully (or almost fully) discharged battery should be charged as soon as possible. |
| Condition the battery       | When the "battery requires maintenance" symbol appears  |

| Activity  | When to Perform                                |
|---|--|
| Store the battery in a state of charge in the range of 40% to 50% | When not in use for an extended period of time |

Refer to your monitor's Instructions for Use for details on how to perform battery care activities, including charging and conditioning. We recommend using the Philips Smart Battery Conditioner LG 1480 (865432)

## Handling Precautions

Lithium ion batteries store a large amount of energy in a small package. Use caution when handling the batteries; misuse or abuse could cause bodily injury and/or property damage.

- Do not short circuit - take care that the terminals do not contact metal or other conductive materials during transport and storage
- Do not crush, drop or puncture - mechanical abuse can lead to internal damage and internal short circuits which may not be visible externally
- Do not apply reverse polarity
- Do not expose batteries to liquids
- Do not incinerate batteries or expose them to temperatures above 60°C (140°F)
- Do not attempt to disassemble a battery.

If a battery has been dropped or banged against a hard surface, whether damage is visible externally or not:

- discontinue use
- dispose of the battery in accordance with the disposal instructions

**If a battery shows damage or signs of leakage, replace it immediately. Do not use a faulty battery in the monitor.**

## Storage

When storing batteries, make sure that the battery terminals do not come into contact with metallic objects, or other conductive materials.

If batteries are stored for an extended period of time, they should be stored in a cool place, ideally at 15°C (60°F), with a state of charge of 20% to 40%. Storing batteries in a cool place slows the aging process.

The batteries should not be stored at a temperature outside the range of -20°C (-4°F) to 60°C (140°F).

Do not store batteries in direct sunlight.

Stored batteries should be partially charged to 20% to 40% of their capacity every 6 months. They should be charged to full capacity prior to use.

### NOTE

Storing batteries at temperatures above 38°C (100°F) for extended periods of time could significantly reduce the batteries' life expectancy.

## Battery Lifetime Management

The lifetime of a Lithium Ion battery depends on the frequency and duration of use. When properly cared for, the useful life is approximately 3 years or 500 full charge-discharge cycles, whichever comes first. In addition, experience indicates that the incidence of failure may increase with battery service life due to the accumulated stresses of daily use. We therefore strongly recommend that lithium ion batteries be replaced after 3 years or 500 full charge-discharge cycles.

The age of a lithium ion battery begins at the date of manufacture. To see the date of manufacture and the number of charge-discharge cycles:

- 1 Select the battery symbol on the patient monitor screen.
- 2 Select the appropriate Battery pop-up key.
- 3 If necessary, select the Battery pop-up key again to view the battery details.

The date of manufacture and the number of charge-discharge cycles are listed with other battery data on the screen.

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### WARNING

The risk of battery failure increases with age, when a battery remains in use longer than 3 years or 500 full charge-discharge cycles. Such failures can result in overheating that in rare cases can cause the battery to ignite or explode.

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## Disposal

Batteries should be disposed of in an environmentally-responsible manner. Consult the hospital administrator or your local Philips representative for local arrangements.

Discharge the batteries and insulate the terminals with tape before disposal. Dispose of used batteries promptly and in accordance with local recycling regulations.

## About the Battery

The rechargeable Lithium-Ion batteries used in the monitor are regarded as Smart batteries because they have built-in circuitry. (This circuitry communicates battery status information to the monitor.)

Capabilities of integrated battery charger: 12.6V, 5 Amps max.

Actual current/voltage: depends on smart battery request and monitor configuration. The approximate charging time is 4 hours with the monitor switched off and up to 12 hours during monitor operation, depending on the monitor configuration.

### NOTE

Batteries will discharge within about 20 days if they are stored inside the monitor without AC power connection.

## Checking the Battery Status

When the Monitor is connected to the AC power supply, the battery charges automatically. The battery can be charged remotely from the Monitor by using the battery charger. Use only the 865432 Smart battery conditioner.

Battery status (level of charge) is indicated in several ways:

- LED on the front panel of the Monitor.

- Battery gauge.
- Display of battery time below gauge.
- Battery status window.
- INOP messages.

The AC Power LED is only on when the power cord is connected and AC power is available to the Monitor. In this case, the battery can be either charging or fully charged.

The battery LED can be green, yellow, or red depending on the following conditions:

| Battery LED Colors          | If the monitor is connected to AC power, this means | If the monitor is running on battery power, this means |
|-----------------------------|---|--|
| Green                       | battery full ( $\geq 90\%$ )                        |  |
| Yellow                      | battery charging<br>(battery power $< 90\%$ )       |  |
| Red, flashing               |   | $\leq 10$ minutes power remaining                      |
| Red, flashes intermittently | battery or charger malfunction <sup>1,2</sup>       | battery or charger malfunction <sup>1,2</sup>          |

1 indicated by malfunction symbol and INOP

2 for further details see Troubleshooting section

## Battery Status on the Main Screen



Battery status information can be configured to display permanently on all Screens. It shows the status of the battery and the battery power and battery time remaining. The battery time is only displayed when the monitor is not running on AC power. Note that the battery status information may take a few minutes after the monitor is switched on to stabilize and show correct values.

Battery power gauge:







This shows the remaining battery power. It is divided into sections, each representing 20% of the total power. If three and a half sections are shaded, as in this example, this indicates that 70% battery power remains. If no battery is detected, the battery gauge is greyed out.

Battery malfunction symbols:

If a problem is detected with the battery, these symbols are displayed. They may be accompanied by an INOP message or by a battery status message in the monitor information line (if battery window is open) providing more details.

| Battery Status Symbols |                              |
|------------------------|------------------------------|
|                        | Battery requires maintenance |
|                        | Battery is empty             |



|   |   |
|---|---|
|  | Battery not charging as the temperature is above or below the specified range |
|  | Charging stopped to protect the battery                                       |
| Battery Malfunction Symbols   |   |
|  | Incompatible Battery  |
|  | Battery Malfunction   |
|  | Battery temperature too high  |
|  | Battery has no power left   |

Explanations of Battery Status and Malfunction Symbols:

*Battery requires maintenance:* The battery requires conditioning. Refer to “Conditioning Batteries” for details.

*Battery is empty:* The capacity of the battery is  $\leq 10$  min. Recharge the battery as soon as possible.

*Temperature outside specified range:* The charging of the battery is stopped if the temperature is below 15°C or above 50°C in order to protect the battery. Charging is resumed as soon as the temperature is within this range.

*Incompatible Battery:* The inserted battery is checked for certain battery internal parameters. If these are not correct, the incompatible battery symbol is displayed. Please use only M4605A batteries with the MP5/MP5T/MP5SC monitor. Note that the incompatible battery symbol may also appear if there is a communication problem between the battery and the battery board.

*Battery Malfunction:* Communication between the battery and the battery board could not be established within about 4 minutes or battery internal data indicates malfunction. Please see the “Troubleshooting” section for remedies.

*Battery Temperature too high:* This symbol is displayed if the battery temperature goes above 65°C. In addition the INOP message CHECK BATT TEMP is displayed. If the battery temperature increases further above 70°C the batteries will switch off for safety reasons. Allow the battery to cool down to avoid the monitor switching off.

*Battery has no power left:* If the monitor is not running on AC power: battery will switch off power delivery at any moment - in this case recharge the battery immediately - or, if the monitor is running on AC power, the battery is in deep discharge and requires pre-charging to restore communication. To avoid this condition charge batteries to 50% for storage. Note that the battery malfunction INOP will eventually be issued if the pre-charging does not restore battery communication within about 4 minutes.

## Battery Status Window

- ◆ To access the **Battery Status** window and its associated pop-up keys, select the battery status information on the Screen, or select **Main Setup -> Battery**.

| Battery Status |       |             | ×     |
|----------------|-------|-------------|-------|
|                |       | TimeToFull: | 1:30  |
| Capacity       |       |             |       |
| remaining      | [mAh] |             | 6072  |
| fullCharge     | [mAh] |             | 6686  |
| Voltage        | [V]   |             | 11.63 |
| Current        | [mA]  |             | 406   |
| Temperature    | [°C]  |             | 25.3  |

**Capacity, Remaining** tells you how much power is left in the battery.

**Capacity, Full Charge** tells you how much power the battery can hold when fully charged.

**Time To Empty** tells you approximately how long you can continue to use the monitor with this battery. Note that this time fluctuates depending on the system load (how many measurements and recordings you carry out), the age of the battery, and the remaining capacity of the battery. The time indication appears after AC has been unplugged for about 30 seconds (after finishing calculation of the Time to Empty)

**Time To Full** is shown in place of **Time To Empty** if the monitor is connected to AC power, and tells you how much time is left until the battery is charged to 90%. Please allow indication to stabilize for 3 to 5 minutes after beginning the charging cycle. If the battery is charged over 90% **Battery Full (>90%)** is displayed until they are charged to 100%. Then **Batt Fully Charged** is displayed.

## Viewing Battery Details

- ◆ To view detailed information for the battery, select the pop-up key **Batt**.

| Batt            |                   | × |
|-----------------|-------------------|---|
| Model           | PHILIPS M4605A    |   |
| Chemistry       | LION              |   |
| ManufactureDate | 28 Oct 03         |   |
| S/N             | 00315             |   |
| Type            | 10. 80V / 6000mAh |   |
| Request         | 12. 60V / 4500mA  |   |
| Cycles          | 30 ( 3% )         |   |

## Documenting Battery Status

To print all battery information in the **Battery Status** window,

- 1 Select the battery status information on the Screen or select **Main Setup -> Battery** to open the **Battery Status** window
- 2 Select the **Record Status** pop-up key to print the information on a recorder  
or  
Select the **Print Status** pop-up key to print the information on a connected printer.

## Conditioning a Battery

### What is Battery Conditioning?

Battery conditioning recalibrates the battery to ensure that it has accurate information on the actual battery capacity.

### Why is Battery Conditioning Necessary?

The capacity of a battery decreases gradually over the lifetime of a battery. Each time a battery is charged its capacity decreases slightly. Therefore, the operating time of a monitor running on batteries also decreases with each charge cycle.

Battery conditioning ensures that the value stored in the battery for its full capacity takes account of this decrease, so that the remaining battery charge can be calculated accurately, and the low battery warning given at the right time.

### When Should Battery Conditioning be Performed?

Battery conditioning should be performed once per year or when indicated by the Battery Status.

#### NOTE

When the battery status signals a conditioning request, the displayed **Time to Full** or **Time to Empty** may not be reliable.

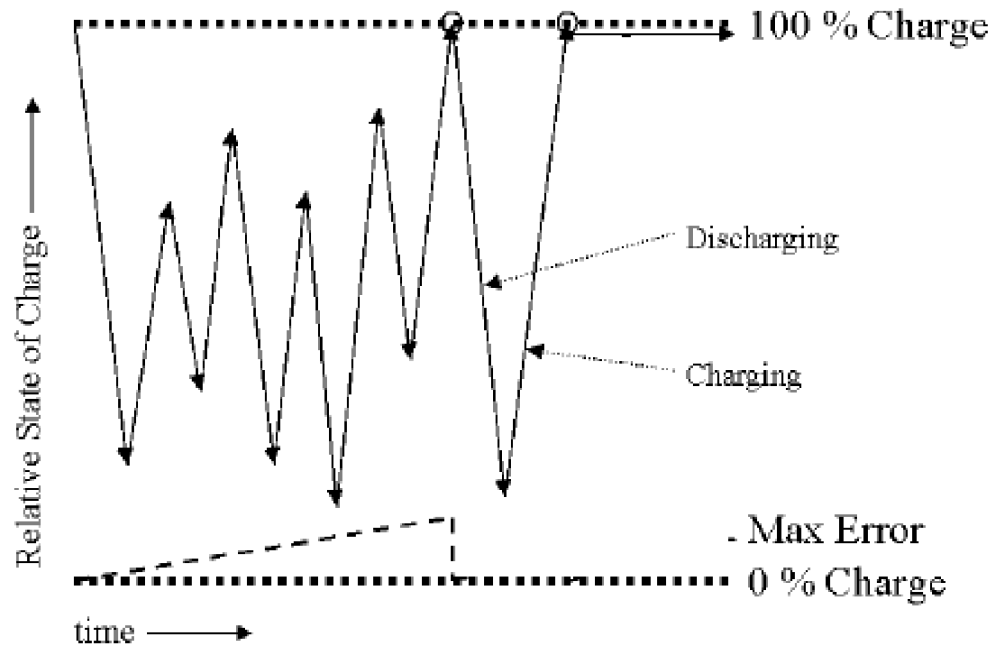
### What Causes the Conditioning Message on the Monitor?

In addition to the value for the full capacity, the battery also stores a value for the Max Error. The Max Error tracks the maximum possible deviation of the estimated charge of a battery from the actual charge.

If a battery is charged or discharged partially, or if it is charged while the monitor is being used, the accuracy of the “reference points” for the fully discharged and fully charged states decreases, causing an increase in the value for the Max Error (see diagram, below).

When the Max Error rises over a certain limit, a message is displayed prompting the user to condition the battery, as described in .

You can reset the value for the Max Error before the battery needs conditioning, by performing the steps described in “Conditioning Batteries”. The minimum value of the Max Error after conditioning is 2%.



## Conditioning Batteries

Battery conditioning can either be performed in the monitor or with an external battery charger. Philips recommends using the 865432 Smart Battery Conditioner to condition batteries.

### Battery Conditioning in the Monitor

#### CAUTION

Do not use a monitor being used to monitor patients to condition batteries. The monitor switches off automatically when the battery is empty.

You should condition a battery when its “battery requires maintenance” symbol shows on the Screen. If conditioning is not performed immediately the monitor will still function according to specifications. However, the displayed time to empty and time to full will show increasing inaccuracy. Do not interrupt the charge or discharge cycle during conditioning. To condition a battery,

- 1 Insert the battery into a monitor connected to mains power.
- 2 Charge the battery until it is completely full. Switch the monitor off to decrease the charging time. When the battery LED turns green i.e. the battery is >90% charged, switch on the monitor and open the **Battery Status** window. Check that the **Battery fully charged** message is displayed.
- 3 Disconnect the monitor from AC power, and let the monitor run until the battery is empty and the monitor switches itself off.
- 4 Reconnect the monitor to AC power and charge the battery until it is full for use or charge to 50% for storage.

### **Battery Conditioning with an External Charger**

You can use the 865432 Smart Battery Conditioner for external battery conditioning. For details please see the IfU for the Smart Battery Conditioner. Use only the 865432 Smart Battery Conditioner.

## **After Installation, Testing or Repair**

Before handing the patient monitor over to the end-user, make sure it is configured appropriately and that it is in monitoring mode. Ensure that the user receives the current revision of the monitor documentation.



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# Troubleshooting

## Introduction

This section explains how to troubleshoot the monitor if problems arise. Links to tables that list possible monitor difficulties are supplied, along with probable causes, and recommended actions to correct the difficulty.

## How To Use This Section

Use this section in conjunction with the sections *Testing and Maintenance* and *Parts*. To remove and replace a part you suspect is defective, follow the instructions in the section *Repair and Disassembly*. The *Theory of Operation* section offers information on how the monitor functions.

## Who Should Perform Repairs

Only qualified service personnel (biomedical engineers or technicians) should open the monitor housing, remove and replace components, or make adjustments. If your medical facility does not have qualified service personnel, contact Philips' Response Center or your local Philips representative.

---

### **WARNING**

High Voltage - Voltages dangerous to life are present in the instrument when it is connected to the mains power supply. Do not perform any disassembly procedures (other than server removal) with power applied to the instrument. Failure to adhere to this warning could cause serious injury or death.

---

## Replacement Level Supported

The replacement level supported for this product is to the printed circuit board (PCB) and major subassembly level. Once you isolate a suspected PCB, follow the procedures in the *Repair and Disassembly* section, to replace the PCB with a known good PCB. Check to see if the symptom disappears and that the monitor passes all performance tests. If the symptom persists, swap back the replacement PCB with the suspected malfunctioning PCB (the original PCB that was installed when you started troubleshooting) and continue troubleshooting as directed in this section.

## Software Revision Check

Some troubleshooting tasks may require that you identify the Software Revision of your monitor. You can find the software revision along with other information, such as the system serial number, in the monitor revision screen. To access the monitor revision screen:

- 1 Enter the Main Setup menu and select **Revision**
- 2 Select **Product**
- 3 Select **Software Revision**
- 4 Select the pop-up key for the device you want to check (e.g. **M8105A**)

### NOTE

The part numbers listed in the monitor revision screen do not necessarily reflect the part numbers required for ordering parts. Please refer to the *Parts* section for the ordering numbers.

### NOTE

The system serial number can also be found on the back of the monitor.

## Software Compatibility Matrix

For a detailed software compatibility matrix, please refer to the IntelliVue Compatibility Matrix on InCenter or in the Service Bulletin SB86202000x, where x is the latest revision.

## Obtaining Replacement Parts

See *Parts* section for details on part replacements.

## Troubleshooting Guide

Problems with the monitor are separated into the categories indicated in the following sections and tables. Check for obvious problems first. If further troubleshooting instructions are required refer to the .

Taking the recommended actions discussed in this section will correct the majority of problems you may encounter. However, problems not covered here can be resolved by calling Philips Response Center or your local representative.

### Checks for Obvious Problems

When first troubleshooting the instrument, check for obvious problems by answering basic questions such as the following:

- 1 Is the power switch turned on?
- 2 Is the battery adequately charged?
- 3 Is the AC power cord connected to the instrument and plugged into an AC outlet?



## Checks Before Opening the Instrument

You can isolate many problems by observing indicators on the instrument before it is necessary to open the instrument.

### Checks with the Instrument switched Off

- AC connected, without battery:
  - AC Power LED is on (green).
- AC connected, with battery:
  - AC Power LED is on (green).
  - Battery LED is green if battery is fully loaded, yellow if battery is being charged.
  - Battery LED red and blinking signals battery or charger malfunction. See *Battery-related problems*.
- No AC connected, with battery:
  - All LEDs are off.

### Checks with the Instrument switched On, AC connected, without battery

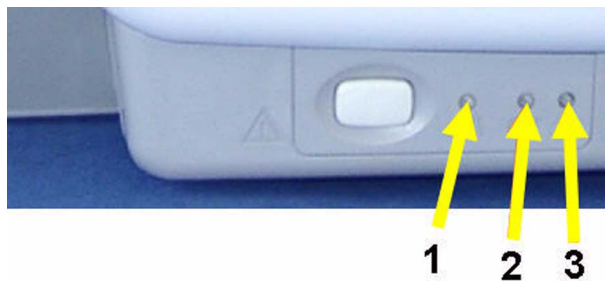
When the monitor is first switched on the AC Power LED switches on and stays on. The Power On/Error LED lights up red and then switches to green and stays on.

### Checks with the Instrument switched On, AC connected, with battery

When the monitor is first switched on the AC Power LED switches on and stays on. The Power On/Error LED lights up red and then switches to green and stays on. Battery LED is either green or yellow

### Checks with the Instrument switched On, AC not connected, with battery

When the monitor is first switched on the Power On/Error LED lights up red and then switches to green and stays on.



| No. | Description                    |
|-----|--------------------------------|
| 1   | Power On/Error LED (Green/Red) |
| 2   | Battery LED (Green/Red/Yellow) |
| 3   | AC Power LED (Green)           |

## Initial Instrument Boot Phase

The following tables describe the regular initial boot phase of the monitor and its components. If the boot phase does not proceed as described below go to Troubleshooting information.

Monitor Boot Phase:

For these steps it is assumed that the Monitor is powered correctly and the +3,3 V System Board supply voltage is okay. This is indicated by the green Power On LED.

| Time (sec.)<br>after Power<br>On | Event   |
|----------------------------------|---|
| 0                                | When the Power On/Off button is pressed, the combined Power On and Error LED switches on immediately and is red.  |
| 3                                | The alarm LEDs are switched on with low intensity. Colors: Left LED:cyan; Middle LED:red; Alarm Suspend LED (right): red. Power On/Error LED switches to green. |
| 6                                | Boot Screen with the Philips Logo appears on the display.   |
| 7                                | Test Sound is issued.   |
| 10                               | Alarm LEDs are tested in the following sequence:<br>Cyan on-off (left LED only)<br>Yellow on-off (left & middle LED)<br>Red on-off (all LEDs)                   |
|                                  | Boot Screen with the Philips Logo disappears  |
|                                  | Fixed screen elements (for example smart keys, alarm fields) appear on the screen.  |
| 15-30                            | First measurement information appears on the screen, touchscreen is functional  |

## Troubleshooting Tables

The following tables list troubleshooting activities sorted according to symptoms.

### NOTE

Be sure to check all cable connections within the monitor before proceeding to further troubleshooting.

### NOTE

Removing the system interface board erases the status log of the monitor. Please make sure to save the status log using the support tool before removing the system interface board. Refer to the support tool instructions for use for further details.

## How to use the Troubleshooting tables

The possible causes of failure and the remedies listed in the troubleshooting tables should be checked and performed in the order they appear in the tables. Always move on to the next symptom until the problem is solved.

## Boot Phase Failures

| Symptoms   | Possible Causes of Failure  | Failure Isolation and Remedy   |
|--|---|--|
| AC LED does not light up   | AC Connection not ok  | Check that the AC-Mains are powered and the power cord is ok and connected   |
|  | Power supply defective  | Exchange Power Supply  |
|  | System Interface Board defective  | Exchange System Interface Board  |
|  | Main Board defective  | Exchange Main Board  |
| Combined Power On/ Error LED remains off after pressing power on button:       | Remote Devices  | Disconnect all connections to the remote devices and try to switch on the monitor again  |
|  | Recorder PCA defective<br>IIT module defective<br>Flat Panel defective<br>Backlight Inverter defective<br>integrated measurements defective | Disconnect cables and boards:<br>- Recorder PCA<br>- IIT module<br>- Flat Panel<br>- Backlight Inverter<br>- Measurement Block<br>then try to switch on the monitor again.                           |
|  | System Interface Board defective  | Exchange System Interface Board and try to switch the monitor on again.  |
|  | Main Board defective  | Exchange main board. Add boards in reverse order and try again with each board.  |
| AC Power LED or Power On/ Error LED remain off after pressing Power on button: | Main board defective  | exchange main board  |
| Red Power On/ Error LED stays on continuously                                  | External connected device defective   | disconnect all external cables (except AC) and switch the monitor on again   |
|  | Flex adapter cable defective<br>MSL board defective<br>Recorder PCA defective<br>System Interface Board defective<br>IIT module defective   | Disconnect cables and boards: (except Power DC/DC cable):<br>- Flex adapter cable<br>- MSL<br>- Recorder PCA<br>- System Interface Board<br>- IIT module<br>then try to switch on the monitor again. |
|  | Main board defective  | Exchange Main board  |

| Symptoms   | Possible Causes of Failure | Failure Isolation and Remedy  |
|--|----------------------------|---|
| Red Power On/<br>Error LED<br>blinks<br>(indicating<br>cyclic reboots) | Software Fault             | connect Support Tool directly to monitor with crossover cable and start “search for defective devices”<br><br>If the Support Tool can detect the device and it indicates the Operating Mode is ‘Boot’, download and store the status log. Reload software and re-clone the monitor. If this fixes the problem e-mail the status log to your local response center |
|  | Hardware Failure           | If no device is detected or if reloading the software does not fix the problem, proceed as described above in section “Red error LED stays on continuously”   |
| Alarm LEDs remain off:   | Main board defective       | Exchange Main board   |
| No Test Sound issued   | Speaker defective          | check for INOPs and follow instructions<br>exchange speaker   |
|  | Main board defective       | exchange main board   |

### Integrated Display is blank

| Symptoms  | Possible Causes of Failure             | Failure Isolation and Remedy   |
|---|--|--|
| Integrated display is blank<br>(The information listed in this table is only valid if the boot phase has completed without error. See table for a description of the Boot phase.) |  | If you have an external display, connect it to the video port. If the external display works, you can most likely eliminate the main board as the cause of failure. If the external display also does not work, see also “External Display is blank” |
|   | Flexible Display cable not connected   | Check Flexible Display cable connection to main board and display  |
|   | Backlight Inverter Cable not connected | Check cable connection of main board to Backlight Inverter Board   |
|   | Backlight tube cable not connected     | Check cable connection from Backlight tube to Backlight Inverter board.  |
|   | Backlight tubes defective              | If there are visible fields on the LCD screen when it is switched on but the display stays dark, the backlight tubes are most likely defective. Replace backlight tubes  |
|   | Backlight Inverter board defective     | If backlight tubes have already been replaced, replace backlight inverter board.   |

| Symptoms | Possible Causes of Failure | Failure Isolation and Remedy |
|----------|----------------------------|------------------------------|
|          | LCD Flat panel defective   | Replace LCD Flat panel       |
|          | Main board defective       | Replace main board           |

### Touch Operation not functioning

| Symptoms                     | Possible Causes of Failure  | Failure Isolation and Remedy  |
|------------------------------|---|---|
| Touch Screen not functioning | Touchscreen functionality has been temporarily disabled                 | Check if touchscreen functionality has been temporarily disabled (padlock symbol on Main Screen key). If yes, press and hold the Main Screen key to re-enable touchscreen operation.            |
|                              | Previously stored touch calibration is lost due to main board exchange. | Calibrate touch (initial) using the support tool.   |
|                              | Touch panel cable not connected   | Check connection from main board to touch panel   |
|                              | Backlight tube cable is positioned close to the touch sensor            | Refit the backlight tube cable into its clip.   |
|                              | Touch sensor defective  | Replace touch sensor<br><b>Note:</b> recalibration of touch necessary   |
|                              | Main board defective  | Replace main board  |
| Touch Position invalid       | Touch not calibrated  | Perform touch calibration:<br>1. Enter the Main Setup Menu<br>2. Select Hardware<br>3. Select Touch Driver Settings<br>4. Select Calibrate<br>or use the support tool to calibrate touch screen |

## External Display is blank (Slave Display)

| Symptoms                  | Possible Causes of Failure                                 | Failure Isolation and Remedy                                    |
|---------------------------|--|---|
| External Display is blank | Video cable to external display not connected or defective | Check video cable connection to external display                |
|                           | External display has no power                              | Check electricity supply of external display                    |
|                           | External display is defective                              | Check external display and video cable on another monitor or PC |
|                           | System Interface board defective                           | Replace System Interface board                                  |
|                           | Main board defective                                       | Replace main board  |

## General Monitor INOP Messages

| INOP Message                               | Possible Causes of Failure   | Failure Isolation and Remedy   |
|--|--|--|
| Check intern voltage<br>Check Monitor Func | Problem with too low voltages (5V, 12V) in the monitor. Alarm lamps, display or interfaces may not function correctly. | Disconnect cables of:<br>- all measurement boards<br>- Recorder board<br>- IIT or WLAN<br>- NBP Pump<br>and reconnect them one at a time to isolate any defective board. |
|  | Main board defective   | Replace the main board   |
| Check Monitor Temp                         | The temperature inside the monitor is too high   | Check the environment for possible causes  |
|  | Monitor ventilation obstructed   | Clean the monitor ventilation internally and then cool monitor down for 8 hours  |
|  | Main Board defective   | replace Main Board   |
| Settings Malfunction                       | Problem during cloning process.  | Reclone configuration file   |
|  | Memory space in which the settings are stored has been corrupted   | Reclone configuration file. This will reload the memory space.   |
|  | Main board defective   | Replace Main board   |

## MSL-related problems (not for MP5T and MP5SC)

| Symptoms   | Possible Causes of Failure  | Failure Isolation and Remedy  |
|--|---|---|
| MP5 does not start up when connected via MSL to host monitor | MP5 not powered   | Connect MP5 to AC power or insert charged battery. MP5 does not receive power via MSL.  |
|  | Feature “Power up on MSL power” not functioning   | Check external MSL cable and exchange if necessary.<br><br>Check internal flat ribbon cable between MSL board and system interface board. Replace if defective.<br><br>Check MSL board, system interface board, main board and exchange if necessary. |
| <b>Unsupported MMS</b><br>INOP is issued                     | Incompatible software revision on MP5 or host monitor.<br>(Companion Mode requires SW rev. F.0 or higher) | Upgrade your monitor software accordingly.  |
| INOP <b>Bad Server Link</b> is issued                        | Communication between MP5 and the host monitor via MSL corrupted  | Check external MSL cable and exchange if necessary.<br><br>Check internal flat ribbon cable between MSL board and system interface board. Replace if defective.<br><br>Check MSL board, system interface board, main board and exchange if necessary. |
| INOP <b>Chk MSL Connection</b> is issued                     | MP5 detects MSL power but receives no valid PSYNC signal  | External MSL cable defective.<br>Exchange MSL cable.<br>(Assumption: Host Monitor is functioning correctly)   |
| MP5 not communicating with host monitor via MSL              | Hardware for communicating with host monitor is defective.  | Check external MSL cable and exchange if necessary.<br><br>Check internal flat ribbon cable between MSL board and system interface board. Replace if defective.<br><br>Check MSL board, system interface board, main board and exchange if necessary. |

| Symptoms  | Possible Causes of Failure   | Failure Isolation and Remedy  |
|---|--|---|
| no ECG-OUT at host monitor (MP5 is in companion mode) | Hardware for communicating with host monitor is defective              | Check external MSL cable and exchange if necessary.<br><br>Check internal flat ribbon cable between MSL board and system interface board. Replace if defective.<br><br>Check MSL board, system interface board, main board and exchange if necessary. |
| NG-LAN to central not functioning                     | MP5 connected via MSL cable to host monitor switches NG-LAN at MP5 off | Remove MSL cable  |

### Battery Related Problems











| Symptoms   | Causes of Failure   | Failure Isolation and Remedy   |
|--|---|--|
| Battery symbol is not displayed  | The monitor is not configured for battery operation.  | Make sure a system interface board with battery capability is installed.   |
| <b>Batt Empty</b> INOP tone, battery LED flashes<br>During this INOP, alarms cannot be paused or switched off  | The estimated remaining battery-powered operating time of the battery is $\leq 10$ minutes.                                     | Recharge the battery immediately.<br>If the condition persists, this INOP is re-issued two minutes after you acknowledged it.  |
| <b>Batt Incompat</b> INOP tone   | The indicated battery cannot be used with this monitor.   | Replace with the correct battery (M4605A).   |
| <b>Batt Low</b> INOP tone  | The estimated battery-powered operating time remaining is less than 20 minutes.   | Recharge the battery.  |
| <b>Battery Malfunc</b> INOP tone, battery LED flashes<br>During this INOP, alarms cannot be paused or switched off, if the monitor is not connected to AC power. | The monitor cannot determine the battery status, or there is a communication problem between the battery and the battery board. | Replace the faulty battery. If the condition persists, and the monitor is not connected to AC power, this INOP is re-issued two minutes after you acknowledged it.<br><br>Check the battery in a different monitor or in a battery charger. If the INOP persists the battery is faulty.<br><br>Check the battery board with known good batteries. If the INOP persists, replace the battery board.<br><br>If the problem persists, replace the main board. |



| Symptoms   | Causes of Failure   | Failure Isolation and Remedy  |
|--|---|---|
| <b>Charger Malfunct</b> INOP tone, battery LED may flash | There is a problem with the battery charger in the monitor. | Switch the monitor off and back on again. If the problem persists replace battery with a known good battery. If the INOP is shown again, replace the battery board. If the problem persists replace the main board. |
| <b>Check Batt Temp</b> INOP tone                         | The temperature of the battery is too high.                 | Check that monitor is not exposed to heat.  |

### Bedside Network Status Icons (not for MP5T)

The following table shows the icons displayed on the monitor when network related issues occur.

| Wireless Icon   | Wired Icon  | Inverse Video | Blinks | Icon Comments   | Inop Message                       | What does it mean?  |
|---|---|---------------|--------|---|------------------------------------|---|
| No Icon   | No Icon   | -             | -      | -   | -                                  | MONITOR does not have a LAN connection (Wireless MONITOR cannot find an access point to talk to, wired MONITOR cannot hear anything on its LAN connection)  |
|    |    | Yes           | Yes    | Central - outline only  | "UNSUPPORTED LAN" (after 1 minute) | MONITOR has a LAN connection but does not have an IP address assignment (Wireless MONITOR has found an access point to talk to, wired MONITOR hears traffic on the LAN)   |
|   |   | No            | No     | Central - outline only  | "NO CENTRAL MONITORING"            | MONITOR is connected to the LAN and has an IP address assignment, but the bed is not being monitored at the central<br>1. MONITOR is not assigned to a sector<br>2. There is another monitor on the network with the same "Equipment Label" |
|  |  | No            | No     | Central - solid box   | -                                  | Normal Operation - MONITOR assigned to a sector and is being monitored by a central   |
| -   |  | No            | No     | Central - solid box, network line extended                    | -                                  | Normal Operation - MONITOR assigned to a sector and is being monitored by a central This monitor also has OVERVIEW functionality on other beds  |
|  | -   | No            | Yes    | Central - solid box   | "WIRELESS OUT OF RANGE"            | Wireless MONITOR that currently is being monitored by a central is losing contact with the access point and cannot find another to talk to  |
|  |  | Yes           | Yes    | Central - outline only, line for broken connection to central | "NO CENTRAL MONITORING"            | Monitor lost connection to the Information Center:<br>1. LAN cable was disconnected<br>2. Information Center was disconnected<br>3. Network infrastructure failure (switch, etc.)<br>4. Out of range (wireless MONITOR)                     |

## Network related problems (not for MP5T)

| Symptoms  | Possible Causes of Failure  | Failure Isolation and Remedy   |
|---|---|--|
| Prompt Message “no central assigned to this bed” is issued                                    | The monitor label is not set in the monitor (if the beds are “monitor labeled” in the IntelliVue Information Center (IIC))                              | Set Monitor Label in Config Mode   |
|   | Problem with the IntelliVue Information Center (IIC) to Switch communication (if the beds are “port mapped” in the IntelliVue Information Center (IIC)) | Check IntelliVue Information Center (IIC) to Switch communication, Switch configuration and Firmware status                                |
| INOP “Unsupported LAN” is issued. One of the following icons is displayed.                    | Network failure   | Check if network switches, IntelliVue Information Center (IIC) and Database Server are all running and connected to the network            |
|   | Monitor connected to wrong network  | Check if monitor has been connected for example to a different hospital network instead of the Philips Clinical Network                    |
|   | IP address conflict after infrastructure re-installation  | Reboot Database Server and IntelliVue Information Center (IIC)   |
|   | IIT installed, but no IIT infrastructure available  | Move monitor back into IIT infrastructure or, with SW Rev. H.0 or higher: disable IIT in Setup IIT menu if no infrastructure is available. |
| No connectivity to IntelliVue Information Center (IIC), no prompt or error message on monitor | Hardware Defect   | Check LAN cable connection   |
|   |   | Check System Interface Board in Monitor  |
|   | Configuration problem   | Check network switch   |
|   |   | Check switch configuration and firmware revision   |

| Symptoms                             | Possible Causes of Failure   | Failure Isolation and Remedy   |
|--------------------------------------|--|--|
| Other Bed Overview not available     | Configuration Problem  | Check configuration in IntelliVue Information Center (IIC) regarding other bed overview (care group assignment)  |
|                                      |  | Verify configuration of switch (setting of multicast filters)  |
|                                      | This function is not available for IntelliVue Instrument Telemetry and, in combination with earlier IntelliVue Information Center (IIC) revisions, for WLAN (IntelliVue 802.11 Bedside Adapter). | If you are using an IntelliVue 802.11 Bedside Adapter, check the software revision of the IntelliVue Information Center (IIC) to make sure it is compatible. If the software revision of the IIC is incompatible or you are using IIT, switch to a wired configuration |
| “Other Bed” Alarms are not appearing | Configuration problem  | Verify configuration in IntelliVue Information Center (IIC), in Monitor (Config Mode) and check that the feature is not temporarily disabled by the user (Bed Info Window)   |

### IIT-related Problems (not for MP5T and MP5SC)

| Symptoms  | Cause of Failure   | Failure Isolation and Remedy   |
|---|--|--|
| No Network icon or Network icon flashes. No association to central station. | Incorrect RF Access Code. No IP Address.   | Check that RF Access Code is set correctly. Make sure that network is set up correctly.  |
|   | Communication problem between the monitor and the IIT adapter. MAC Instr. Tele. field in Instrument Telemetry Service Window is 0000 0000 0000 | <p>Check that RF Access Code is set correctly and the network is correctly set up.</p> <p>Check the flat cable connection between the system interface board and the IIT module.</p> <p>Check the antenna cable connection between the IIT module and the antenna.</p> <p>Replace flat cable, antenna, antenna cable or IIT module if necessary.</p> |

## IntelliVue 802.11 Bedside Adapter Problems (not for MP5T)

| Symptoms  | Cause of Failure  | Failure Isolation and Remedy  |
|---|---|---|
| No Network icon or Network icon flashes. No association to central station. | Communication problem between the monitor and the IntelliVue 802.11 Bedside Adapter or RSSI value below 30. | <p>Ensure that the network infrastructure is functioning properly. See Troubleshooting tables in the IntelliVue 802.11 a/g Infrastructure Installation and Configuration Guide for details.</p> <p>Check the antenna cable connection between the IntelliVue 802.11 Bedside adapter and the antenna.</p> <p>Check the cable connection between the IntelliVue 802.11 Bedside Adapter and the system interface board.</p> <p>Check that the indicator behind the RSSI value (Main Setup -&gt; Network -&gt; WLAN Diagnostic -&gt; RSSI) is rotating. If it is not, check IntelliVue 802.11 Bedside Adapter hardware.</p> <p>Replace cable, antenna, antenna cable or IntelliVue 802.11 Bedside Adapter if necessary.</p> |
|   | IntelliVue 802.11 Bedside Adapter not yet operational   | <p>Check menu line 'Wireless LAN' ( Main Setup -&gt; Network -&gt; WLAN Diagnostic -&gt; Wireless LAN). If it shows 'Off', the wireless adapter is not yet operational. This does NOT indicate that WLAN has been disabled by a setting.</p> <p>If problem persists, check for an installed wired LAN cable.</p>  |
|   | Configuration problem using WEP, WPA(PSK), WPA2(PSK).   | Make sure that the Mode, SSID, Country and Security settings in the Setup WLAN menu match your installation   |

| Symptoms | Cause of Failure  | Failure Isolation and Remedy  |
|----------|---|---|
|          | Configuration problem using WPA Enterprise or WPA2 Enterprise | <p>1. Check the connection status.(Main Setup -&gt; Network -&gt; WLAN Diagnostics -&gt; Conn.Status)</p> <p>If the state only shows 'Scanning', make sure that the Mode, SSID, Country and Security settings in the Setup WLAN menu match your installation.</p>   |
|          |   | <p>2. Check the connection status. If the device shows the state 'Authenticating', your SSID, Mode, Country and Security settings are correct.</p> <p>You already have a WLAN connection to your Access Point, but the device fails to authenticate, check your authentication server and WLAN controller error log.</p>  |
|          |   | <p>3. As an investigation step, disable the CertificateCheck.</p> <p>(Main Menu -&gt; Network -&gt; WLAN Setup -&gt; CertificateCheck)</p> <p>If authentication is now possible, proceed with step 4.</p> <p>Otherwise double check your authentication server configuration, WLAN controller configuration and the user credentials (User Name, Password, Anonymous Identity).</p> <p>Note:</p> <p>If the previously used credential settings were wrong, the device is perhaps on the exclude list of your WLAN Controller. Resolve this issue on your WLAN controller.</p> <p><b>Note: Do not forget to re-enable the certificate check.</b></p> |

| Symptoms | Cause of Failure | Failure Isolation and Remedy   |
|----------|------------------|--|
|          |                  | 4. Check the time setting of the device (Main Setup -> Date, Time). If not correctly set, the used certificates are detected as invalid. Adjust to the correct time  |
|          |                  | 5. Check the installed CA certificate using the support tool. - Task -> Clone from Medical Device<br>- Open the cloned file using Configuration -> Configuration Editor<br>- In Configuration Editor check Configuration -> Hardware -> Network -> Certificate 1 for validity(Valid from, Valid until) |
|          |                  | 6. Make sure that the installed CA certificate is the root certificate of your authentication server certificate chain.  |

## Short Range Radio Interface Problems

| Symptoms   | Cause of Failure   | Failure Isolation and Remedy  |
|--|--|---|
| Measurement selection icon does not change to SRR.   | Assignment of SRR device to monitor not possible                 | Check SRR Configuration Settings.<br>Replace defective SRR interface or cable, if necessary.<br>Make sure SRR interface is installed. |
|  | SRR interface of telemetry transceiver defective or incompatible | Make sure the telemetry transceiver SRR interface is compatible and functional.   |
| Measurement selection icon changes to SRR but Assignment of SRR device to monitor fails.<br><b>SRR Interference</b> INOP is issued | RF Interferences   | Check location for RF interferences and free frequencies by performing a site survey (e.g. with air magnet tool).                     |

| Symptoms  | Cause of Failure  | Failure Isolation and Remedy  |
|---|---|---|
| Communication Dropouts or gaps in parameter waves. <b>SRR Interference</b> INOP may be issued     | RF Interferences  | Check location for RF interferences and free frequencies by performing a site survey (e.g. with air magnet tool). |
|   | Too many SRR devices allocated to one SRR channel                 | Up to two SRR connections can be established per channel.<br>Check SRR Configuration Settings.                    |
| SRR communication aborted. <b>SRR Interference</b> or <b>SRR Invalid Chan</b> INOP may be issued. | RF Interferences  | Check location for RF interferences and free frequencies by performing a site survey (e.g. with air magnet tool). |
|   | Too many SRR devices allocated to one SRR channel                 | Up to two SRR connections can be established per channel.<br>Check SRR Configuration Settings.                    |
|   | SRR device out of range (either monitor or Telemetry Transceiver) | Position the SRR devices closer to each other. Check SRR signal quality indicator for signal strength.            |
| Telemetry Device using SRR not recognized by the monitor.   | Telemetry Device not supported by the SRR adapter                 | Make sure you use a telemetry device which is compatible with SRR.  |

## Alarm Lamps

| Symptoms  | Possible Causes of Failure        | Failure Isolation and Remedy          |
|---|-----------------------------------|---------------------------------------|
| INOP Message <b>Check Alarm Lamps</b> is issued | Main board defective              | replace Main board                    |
| Alarm occurs, but no LED lights up              | Environmental lighting too bright | Place monitor in a darker environment |
|   | Main Board defective              | Main board                            |

## Alarm Tones

| Symptoms   | Possible Causes of Failure                      | Failure Isolation and Remedy            |
|--|---|---|
| INOP Message <b>Speaker Malfunction</b> is displayed | Speaker cable disconnected                      | Reconnect speaker cable                 |
|  | Speaker defective                               | Replace speaker                         |
|  | Sound amplifier on main board defective         | Replace main board                      |
| Alarm occurs but no alarm sound is issued            | Audible alarm indicators have been switched off | Switch audible alarm indicators back on |
|  | Volume set to 0                                 | Increase volume                         |
|  | Speaker defective                               | Replace speaker                         |
|  | Sound amplifier on main board defective         | Replace main board                      |

## Power Loss Alarm Buzzer Problems

| Symptoms  | Possible Causes of Failure   | Failure Isolation and Remedy   |
|---|--|--------------------------------|
| Power loss alarm buzzer does not sound when battery is removed and monitor is disconnected from AC power. | Power loss alarm buzzer defective                                    | Replace system interface board |
|   | Communication problem between main board and power loss alarm buzzer | Replace main board             |

## Alarm Behavior

If your monitor did not alarm in the way in which the end user expected, please consult the Instructions for Use for possible setup issues or configuration settings which could affect alarm behavior.

## Individual Parameter INOPs

If any of the following parameter INOP messages are issued and persist replace the respective measurement. If problem persists, replace the main board.

- **CO2 Equip Malf**
- **ECG Equip Malf**
- **NBP Equip Malf**
- **<Pressure Label> Equip Malf**
- **RESP Equip Malf**
- **SpO2 Equip Malf**
- **SpO2 Transduc Malf**
- **<Temp Label> Equip Malf**



- <pTemp Lbl> Equip Malf
- Tele Equip Malf

## Predictive Temperature Problems

| Symptoms  | Cause of Failure  | Failure Isolation and Remedy  |
|---|---|---|
| Incorrect pTemp values  | Wrong label has been chosen e.g. pTacial instead of pToral or vice versa                                    | Choose correct label  |
|   | Wrong patient category chosen e.g. adult instead of pediatric or vice versa                                 | Choose correct patient category   |
|   | Incorrect application of the temperature probe  | Make sure probe is applied correctly to the patient.  |
|   | Wrong probe covers used   | Use only recommended probe covers   |
|   | Probe defective   | Replace probe   |
|   | Predictive temperature assembly defective   | Replace predictive temperature assembly   |
|   | Values measured in different places are compared e.g. oral compared with axial                              | Only compare values measured in the same location.  |
| Predictive Temperature Accuracy is in doubt                                     | Predictive Temperature Probe or Predictive Temperature Assembly defective.                                  | Perform a predictive temperature accuracy test using a test key. Depending on result, replace the defective predictive temperature probe or predictive temperature assembly |
| Presumably incorrect pTemp values   | Axially or orally measured predictive temperature values do not represent the core temperature of the body. | Only compare values measured in the same location. To obtain Tcore values, choose correct measurement application.  |
| Reference Value displayed on the monitor does not match the value on the Calkey | Defective CalKey  | Replace CalKey  |
|   | Defective CalKey contacts or predictive temperature assembly contacts                                       | Replace CalKey or predictive temperature assembly if necessary  |

| Symptoms                                   | Cause of Failure  | Failure Isolation and Remedy  |
|--|---|---|
| Predictive temperature label not available | Measurement deactivated<br><br>Connector defective<br><br>Predictive temperature module or measurement connector on monitor defective | Make sure the parameter is switched on and the measurement is activated<br><br>Check the connection between the module and the monitor.<br><br>Try on the same monitor with a known good predictive temperature module. If this solves the problem, replace the module. If problem persists replace measurement block in monitor. |
| pTemp Equip Malf INOP is issued            | Communication problem   | Power cycle the monitor. If problem persists, try again on the same monitor with a known good predictive temperature module. If this solves the problem, replace the module. If problem persists replace measurement block in monitor.  |
| pTemp No Sensor INOP is issued             | Predictive temperature probe is not recognized. Probe connector is damaged.   | Visually inspect the probe connector contacts for damage. Replace probe if necessary  |
| pTemp Transducer Malf INOP is issued       | There is a problem with the predictive temperature probe  | Visually inspect the probe for damage. Disconnect and reconnect the probe. If problem persists, replace the probe.  |
| pTemp Check Probe INOP is issued           | Probe holder not installed correctly or connector damaged   | Check the correct installation of the probe holder. If problem persists, visually inspect the probe connector for damage, disconnect and reconnect the probe. If problem persists, replace probe.   |

### Tympanic Temperature Problems

| Symptoms                                    | Possible Cause of Failure   | Failure Isolation and Remedy   |
|---|---|--|
| The Tympanic Thermometer does not function. | There is no connection either between the base station and the thermometer, or the base station and the host monitor. | Verify that the interface cable between the base station and the host monitor is connected correctly.  |
| The Tympanic Thermometer display is blank.  | The thermometer is defective.   | Verify that the thermometer cable is connected to the base station, and that its connector is not damaged. If the problem persists, replace the thermometer. |

| Symptoms                                   | Possible Cause of Failure                               | Failure Isolation and Remedy   |
|--|---|--|
| The temperature reading is unusually high. | The probe cover is damaged, or not attached correctly.  | Verify that the probe cover is not torn, and that the probe is inserted into the cover completely. If the problem persists, use a new probe cover. |
| The temperature reading is unusually low.  | The probe, probe cover, or the ear canal is obstructed. | Remove any obstructions from the probe cover, the probe tip, and the patient's ear canal.  |

### Masimo rainbow SET SpO2-related Problems

| Symptoms   | Possible Causes of Failure  | Failure Isolation and Remedy                               |
|--|---|--|
| INOP <SpO2 label><br><b>Upgrade</b> is issued      | An upgrade tool is connected and a firmware upgrade was started in service mode, but the monitor is no longer in service mode | Return the monitor to service mode to continue the upgrade |
| INOP <SpO2 label><br><b>Unkn. Sensor</b> is issued | Demo tool is connected but monitor is not in demo mode  | Put the monitor in demo mode                               |

### Telemetry Device related Problems (TAAP)

| Symptoms                                       | Cause of Failure   | Failure Isolation and Remedy   |
|--|--|--|
| <b>Tele Unsupported</b> INOP message is issued | Unsupported Telemetry Device is connected to the monitor | Make sure your telemetry device has the appropriate firmware revision. Refer to Telemetry service manual and accompanying documents (SB or FCO) to determine the required Firmware Revision. |

| Symptoms   | Cause of Failure  | Failure Isolation and Remedy   |
|--|---|--|
| <b>Tele Disconnected</b> INOP message is issued  | The cable between the telemetry device and the monitor has been disconnected or has fallen off. | Check the cable connections. If cable falls off regularly, replace cable.  |
|  | The SRR link between the telemetry device and the monitor is disrupted.                         | Position the SRR device and the monitor closer to each other.<br>Check SRR signal quality indicator for signal strength.<br>Check SRR Configuration Settings.<br>Alternatively, use the TAAP cable connection between the telemetry device and the monitor (valid for telemetry device running with FW Rev. <D.x). |
| <b>Invalid Leadset</b> INOP message is issued  | see the instructions supplied with the telemetry device   | see the instructions supplied with the telemetry device  |
| <b>Replace Battery T</b> or <b>Battery Low T</b> INOP message is issued                                    | no battery is inserted in the telemetry device or the battery is low.                           | insert/replace the battery in the telemetry device. <b>Note:</b> If you are using the SRR connection, you must silence the INOPs even when the battery has been replaced. For further details see the instructions provided with the telemetry device.   |
| <b>Tele Equip Malf</b> INOP message is issued  | no stable connection between the telemetry device and the monitor                               | Disconnect and reconnect the telemetry device from the monitor. Remove and reinsert the battery in the telemetry device. If problem persists, replace the telemetry device.  |
| Telemetry Device using SRR not recognized by the monitor.  | Telemetry Device not supported by the SRR adapter   | Make sure you use a telemetry device which is compatible with SRR.   |
| Telemetry Device not functioning with IntelliVue CL Cableless Measurements or with wired TAAP on MP5/MP5T. | Incompatible FW Revision of Telemetry Device.   | For wired TAAP, Telemetry device must have FW Rev. C. For use with IntelliVue CL Cableless Measurements, the Telemetry device must have FW Rev D or higher.  |

**Printer (not for MP5T and MP5SC)**

| Symptoms  | Cause of Failure  | Failure Isolation and Remedy  |
|---|---|---|
| Prompt message “Print job could not be queued” is issued. No print device is found.                       | Printer is disabled in the Setup Printers menu<br>Paper size of printer does not match paper size of report   | Enable the correct printer in the Setup Printers menu<br>Change paper size of the printer in the Setup Printers menu or change paper size of the report in the Setup Reports menu.  |
| Status message “Print device Remote 1 (Remote 2, Remote 3) unavailable” is issued. Printer job is stalled | Print error on IntelliVue Information Center (IIC)<br>Network Connection to IntelliVue Information Center (IIC) not functioning   | Print a test report on the IntelliVue Information Center (IIC). If this fails, refer to IntelliVue Information Center (IIC) documentation<br>Check that the network connection between the monitor and the IntelliVue Information Center (IIC) is working |
| Status message “Printing on device Remote 1... (Remote 2, Remote 3)” is issued but no report is printed   | Print queue on IntelliVue Information Center (IIC) is full.<br>Reasons for this may be:<br>- Printer is not switched on<br>- Printer paper tray is empty  | Switch on printer power<br>Fill printer paper tray  |
| Printouts are not as expected   | Printer paper size is not correctly configured<br>Printer resolution is not correctly configured<br>Printer color support is configured to “On” although the printer does not support color<br>Printer not compatible | Configure the paper size according to the inserted print media<br>Configure the printer resolution according to the printer capabilities<br>Configure the printer color support to “Off”<br>Check specifications  |

**Recorder**

| Symptom   | Possible Cause         | Corrective Action  |
|---|------------------------|--------------------|
| Monitor reports that door is open when it is not. | Defective door switch. | Exchange recorder. |

## 4 Troubleshooting

| Symptom   | Possible Cause   | Corrective Action   |
|---|--|---|
| Monitor reports that the recorder is out of paper when it is not. | Paper-out sensor dirty.  | Pull paper out a little bit and straighten the paper to make sure it is fixed tightly in the recorder. Make sure the paper has been loaded correctly and that the correct paper has been used. If problem persists, clean paper-out sensor. |
| Content of recording is not as expected                           | Monitor not configured properly.   | Check the configuration of the connected monitor.   |
| Poor print quality  | Paper not inserted correctly   | Check that paper is inserted correctly  |
|   | Printhead dirty.   | Clean the Printhead.  |
|   | Printhead failure.   | Exchange the recorder.  |
| Paper not feeding properly.                                       | Paper roll off center.   | Center paper roll on roller guides.   |
|   | Dirty roller.  | Clean roller.   |
| Recorder not communicating, not printing                          | Loose recorder connector<br>Loose flat cable<br>Recorder defective<br>Recorder Interface defective<br>Main Board defective | Remove and reinsert recorder.<br>Check flat cable connection between recorder board and main board<br>Exchange Recorder<br>Exchange Recorder Interface Board<br>Exchange main board   |

### MIB / RS232 (not for MP5T and MP5SC)

| Symptoms   | Cause of Failure   | Failure Isolation and Remedy                                     |
|--|--|--|
| Gas module connected to the RS232 port not functioning | The MIB/RS232 port is not configured for the gas module                              | Check configuration of the MIB/RS232 ports in configuration mode |
|  | The cable between the gas module and monitor is not connected correctly or defective | Check cable connection, replace cable if necessary               |
|  | The system interface board is defective  | Check board and replace if necessary                             |

| Symptoms                           | Cause of Failure  | Failure Isolation and Remedy   |
|------------------------------------|---|--|
| External device not receiving data | The MIB/RS232 port is not configured for data export  | Check configuration of the MIB/RS232 ports in configuration mode   |
|                                    | The wrong data export protocol driver is configured in the monitor  | Check the export protocol required by the attached device and configure the monitor accordingly  |
|                                    | The wrong cable is being used (usually a cross-over cable is needed)  | Choose correct cable (or use an adapter)   |
|                                    | The cable between the external device and the monitor is not connected correctly or defective                               | Check cable and replace if necessary   |
|                                    | The external device does not support the version of the data export protocol used in the monitor                            | Check if the device supports the version of the data export protocol. Upgrade device or monitor if necessary (if matching versions exist).                 |
|                                    | A terminal concentrator is used in between the device and the monitor and a protocol with dynamic speed negotiation is used | Some terminal concentrators do not support changing the transmission speed (baud rate) dynamically. Check if the connection works without the concentrator |
|                                    | The system interface board is defective   | Check board and replace if necessary   |
| Detailed Protocol Problem          |   | Consult the Data Export Protocol document.   |

### Troubleshooting the ECG Sync Pulse (not for MP5T and MP5SC)

| Symptoms          | Cause of Failure                  | Failure Isolation and Remedy   |
|-------------------|-----------------------------------|--|
| No ECG Sync Pulse | Software not configured correctly | Make sure the software is correctly configured (see configuration guide) |
|                   | Wrong cable                       | Make sure you are using the correct cable                                |
|                   | No ECG pulse signal available     | Measure ECG Pulse out with scope.  |

### Troubleshooting the ECG OUT (not for MP5T and MP5SC)

| Symptoms                                    | Cause of Failure     | Failure Isolation and Remedy   |
|---|----------------------|--|
| No ECG-OUT signal to the Defib              |                      | Disconnect the Defib cable.<br><br>Connect Known good Defib and Defib cable. Check Marker pulse and ECG OUT signal at defib again. <b>If there is still no signal:</b>   |
|   | Main Board defective | Replace main board   |
| No marker pulse is displayed on the monitor |                      | Disconnect the Defib cable.<br><br>Connect Known good Defib and Defib cable. Check Marker pulse and ECG OUT signal at defib again. Check Marker pulse on monitor display again. If problem persists exchange the main board. |

### Basic Nurse Call Relay (not for MP5T)

| Symptoms                                     | Cause of Failure  | Failure Isolation and Remedy                          |
|--|---|---|
| Monitor alarmed, Nurse Call did not activate | Incorrect configuration (Relay latency, Relay trigger)          | Check monitor configuration (see configuration guide) |
|  | Connection of cable to monitor or nurse call system not correct | Check cable connections                               |
|  | The system interface board is defective                         | Replace system interface board                        |

### USB Problems (not for MP5T)

| Symptoms                                       | Cause of Failure                          | Failure Isolation and Remedy  |
|--|---|---|
| None of the connected devices are functioning. | Connected devices or USB board defective. | Unplug all devices and reboot the monitor. Check if USB is supported.<br><br>Replace the USB device with a known good device.<br><br>If the problem persists, the USB board is defective and needs to be exchanged. |



## Barcode Reader Problems (not for MP5T)

| Symptoms  | Cause of Failure   | Failure Isolation and Remedy  |
|---|--|---|
| The barcode scanner does not function. (No lights, no sound; scanner cannot read barcodes)                | The scanner is not plugged into the USB port of the monitor. | Check the scanner's physical connection to the monitor's USB port.  |
|   | The system does not recognize the scanner.                   | Use only barcode scanners approved by Philips.  |
|   | The scanner has a mechanical problem.                        | Replace the scanner.  |
| The barcode scanner cannot read barcodes. (Lights and sounds function, but scanner cannot read barcodes.) | The scanner is held too close or too far from the barcode.   | The scanner must be held between 6 and 12 inches from the barcode.  |
|   | The scanner window is not clean or is blocked.               | Clean the barcode scanner.  |
|   | The system does not recognize the barcode format.            | Barcodes must be written in a recognizable format.<br><br>If the barcode is written in a recognizable format, and the scanner cannot read the barcode, reset the scanner. |
|   | The system does not recognize the scanner.                   | Use only barcode scanners approved by Philips.  |
|   | The scanner has a mechanical problem.                        | Replace the scanner.  |

## Image Sticking

If a static image is displayed for a long time on an LCD display, image sticking, i.e. a temporarily retained image, may occur. To eliminate image sticking, switch off the display and switch it back on again. It is also recommended to use the moving image in standby mode.

## Status Log

Many events that occur during start-up or regular monitoring are logged in the Status Log. The Status Log can be printed and cleared. Not all entries in the Status Log are errors.

| Monitor |      |       |   |                |
|---------|------|-------|---|----------------|
| H       | 1720 | 20050 | 1 | 4 Apr 02 16:37 |
| C       | 1721 | 21050 | 1 | 4 Apr 02 15:37 |

The Status Log window shows logged events which caused a reboot of the system component (monitor or measurement block).

To enter the Status Log Window, select Main Setup -> Revision. The following list opens up:

- **Status Log**
- **Product**
- **Appl. SW**
- **Config**

- **Boot**
- **Language**

Select **Status Log**.

The first column in the log identifies the event class (“C”: caused a cold start, “H”: caused a hot start, “N”: no restart, for information only). Column 3 and 4 identify the event source and event code. Column 4 counts the number of occurrences of the event. The last column shows the time and date of the last occurrence of the event.

**Cold Start:** A cold start erases patient data incl. ADT, trends and customer configuration settings.

**Hot Start:** A hot start is a system reset. No data is erased.

The following pop-up keys overlay the SmartKeys:

|                      |  |  |              |
|----------------------|--|--|--------------|
| <b>Clear StatLog</b> |  |  | <b>M8105</b> |
|----------------------|--|--|--------------|

### **Clear StatLog**

This key clears the currently displayed Status Log

### **M8105**

This key switches to the Monitor Revision Window

### **NOTE**

- If an event occurs repeatedly, contact your Philips Service Representative.
- It is possible, using the support tool, to download the status log and send it to your Philips Service Representative as a file (for example via e-mail).
- Log files generated by the monitors and measurement modules are used for system troubleshooting and do not contain protected health information.

## Troubleshooting with the Support Tool

Using the support tool you can:

- access the full status log which can be saved as a file
- reload software
- identify defective devices
- reset touch screen calibration

For details on how to perform these tasks see the Support Tool User Manual.

## Troubleshooting the Individual Measurements or Applications

For problems isolated to an individual parameter or application, please consult the Instructions for Use and configuration information.

If you are getting questionable readings for individual measurements you may want to do the Performance Verification tests in the *Testing and Maintenance* section.

The performance of the individual applications (arrhythmia, trending) are affected by the configuration of the monitor. When contacting Philips support you may be asked about the configuration of the monitor to aid in troubleshooting.

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# Repair and Disassembly

The following section describes the disassembly and reassembly procedures for the monitor and its components.

## Who Should Perform Repairs

Only qualified service personnel (biomedical engineers or technicians) should open the monitor housing, remove and replace components, or make adjustments. If your medical facility does not have qualified service personnel, contact Philips' Response Center or your local Philips representative.

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### WARNING

High Voltage - Voltages dangerous to life are present in the instrument when it is connected to the mains power supply. Do not perform any disassembly procedures (other than server removal) with power applied to the instrument. Failure to adhere to this warning could cause serious injury or death.

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### WARNING

The electrical characteristics of anti-static mats should be checked before use, as described in the manufacturer's instructions for continued protection to both you and the equipment.

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### CAUTION

Before handling any circuit boards, firmly touch the exposed metal on the case to equalize the ground potentials. This will prevent static discharge and protect the logic components of the monitor.

Handle circuit boards on the edges only; avoid touching board surfaces unless performing circuit board repair. Contaminants like skin oil will attract dust to accumulate which could retain moisture and affect the circuit performance.

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## Tools required

- Torx screwdrivers (sizes 6, 8, 10, 20)
- Torque wrench
- mCO<sub>2</sub> Luer Remover
- Small flat head screwdriver
- 1 small Pozi or Philips head screwdriver
- Needle Nose Pliers
- Allen Wrench (Size 6)
- ESD mat and wrist strap
- Cleaning Agent

Recommended cleaning agents are:

|                                  |   |
|----------------------------------|---|
| Tensides (dishwasher detergents) | Edisonite Schnellreiniger®, Alconox®            |
| Ammonias                         | Dilution of Ammonia <3%, Window cleaner         |
| Alcohol                          | Ethanol 70%, Isopropanol 70%,<br>Window cleaner |

### NOTE

If parts of the housing of your monitor are exchanged, check the labeling on your existing housing and apply the respective labels to your new housing. Use the appropriate label from the label sheet provided with the exchange part.

## Removing the Handle or Bedhanger

### NOTE

There are two versions of the bedhanger. The old version (MP5/MP5T Handle Bed hanger, M8100-44902, 12NC: 451261019361) is no longer orderable. The new version (MP5/MP5T/MP5SC Handle bed hanger non-slip, M8105-60112, 12NC: 451261023691) has an integrated anti-slip protection to reduce slipping from a bed rail. The picture below shows the new bedhanger.



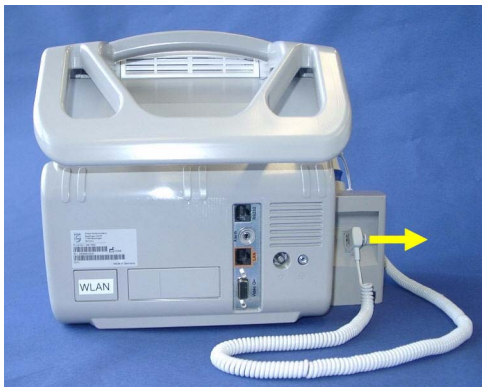
**Removal of the handle or bedhanger is not required for opening the monitor.**

- 1 Unscrew the two screws securing the handle/bedhanger and pull off the handle/bedhanger.



## Removing the Predictive Temperature Assembly

- 1 Unplug the sensor connector at the back of the predictive temperature assembly and remove the probe and its housing from the assembly.

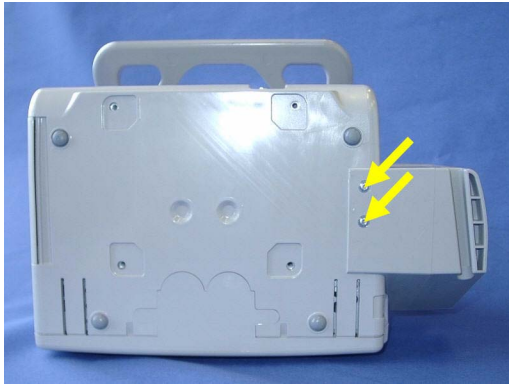


## 5 Repair and Disassembly

- 2 Remove the white pin at the back of the assembly by turning it counterclockwise with a screwdriver and then pulling it out.



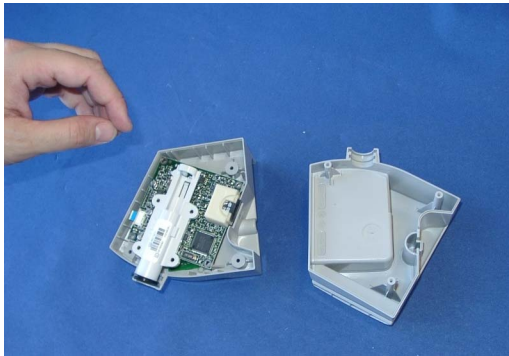
- 3 Unscrew the two screws at the bottom of the monitor and pull off the predictive temperature assembly to the side.



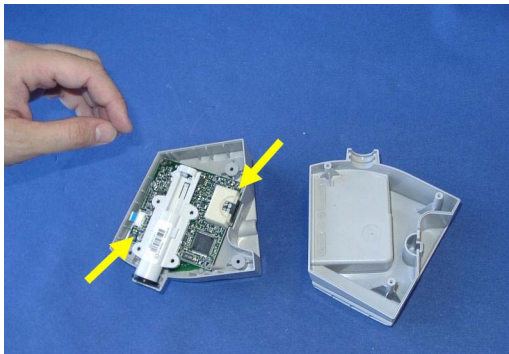
- 4 Reassemble the predictive temperature assembly by performing the above steps in reverse order.

## Disassembling the Predictive Temperature Assembly

- 1 Unscrew the three self-tapping screws holding the assembly together, remove the rubber sealing from the predictive temperature assembly and separate the two halves of the assembly.

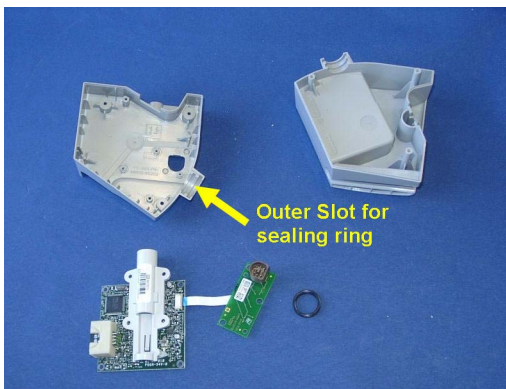
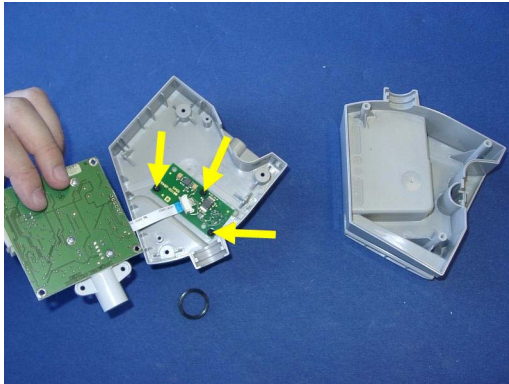


- 2 Unscrew the two screws securing the predictive temperature board.





- 3 Flip the predictive temperature board to the side out of the housing and remove the three screws from the small connector board. Open the connector and release the cable. Then remove the connector board. Remove the black sealing ring from the predictive temperature probe tube.



- 4 For reassembly, perform the above steps in reverse order.

**Reassembly Note:** When reattaching the small connector board to the housing, do not overtighten the screws. The board should sit loosely in the housing. The black sealing ring must be inserted into the outer of the two slots in the housing.

## Removing/Exchanging the NBP Inlet

- 1 Position the monitor as shown below.





- 2 Using an Allen wrench, turn the NBP connector slowly counterclockwise until it is released.



#### NOTE

When releasing the connector, be careful not to remove its transparent cover.

- 3 Verify that the connector contains all 4 metal balls in the transparent cover. If a ball is missing, it may have fallen into the NBP connector chamber.



- 4 Insert the new connector using the same wrench, turn it clockwise and tighten the connector carefully.



- 5 Perform a visual check of the new connector once it is assembled. Verify that the hole in the silicone cover is round and not oval or otherwise deformed because this can cause leakage. Perform the NBP Performance test as outlined in chapter “Testing and Maintenance”.

## Separating the Front and Back of the Monitor

- 1 Remove the Predictive Temperature Assembly as described above.
- 2 Open the battery compartment, push up the battery compartment latch and remove the battery from the battery compartment by pulling on the tab.



- 3 Open the recorder, remove the recorder paper and locate the two screws inside the recorder.



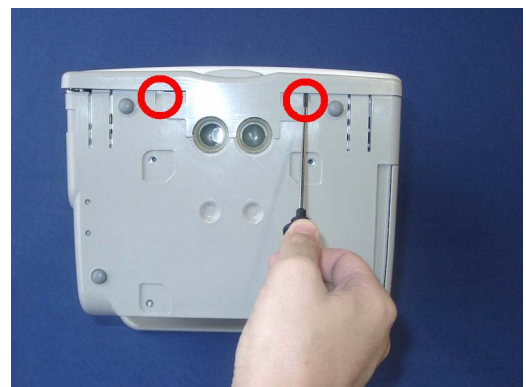
- 4 Unscrew the two screws inside the internal recorder and pull out the recorder. Note that these screws will not come out completely but remain in the recorder housing.



- 5 Remove the two screws securing the quick mount cover.



- 6 Insert a screwdriver into the slots at the bottom of the quick mount cover and push the cover off on each side. Then pull the quick mount cover off the monitor.

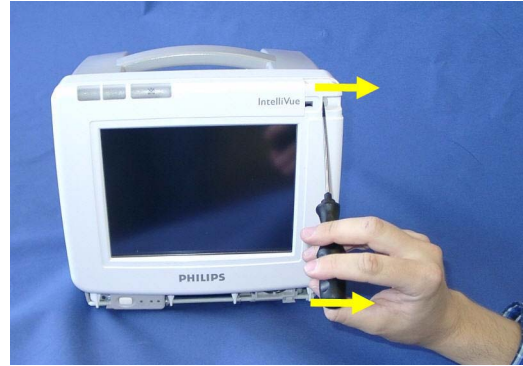


- 7 Remove the cover branding clip.

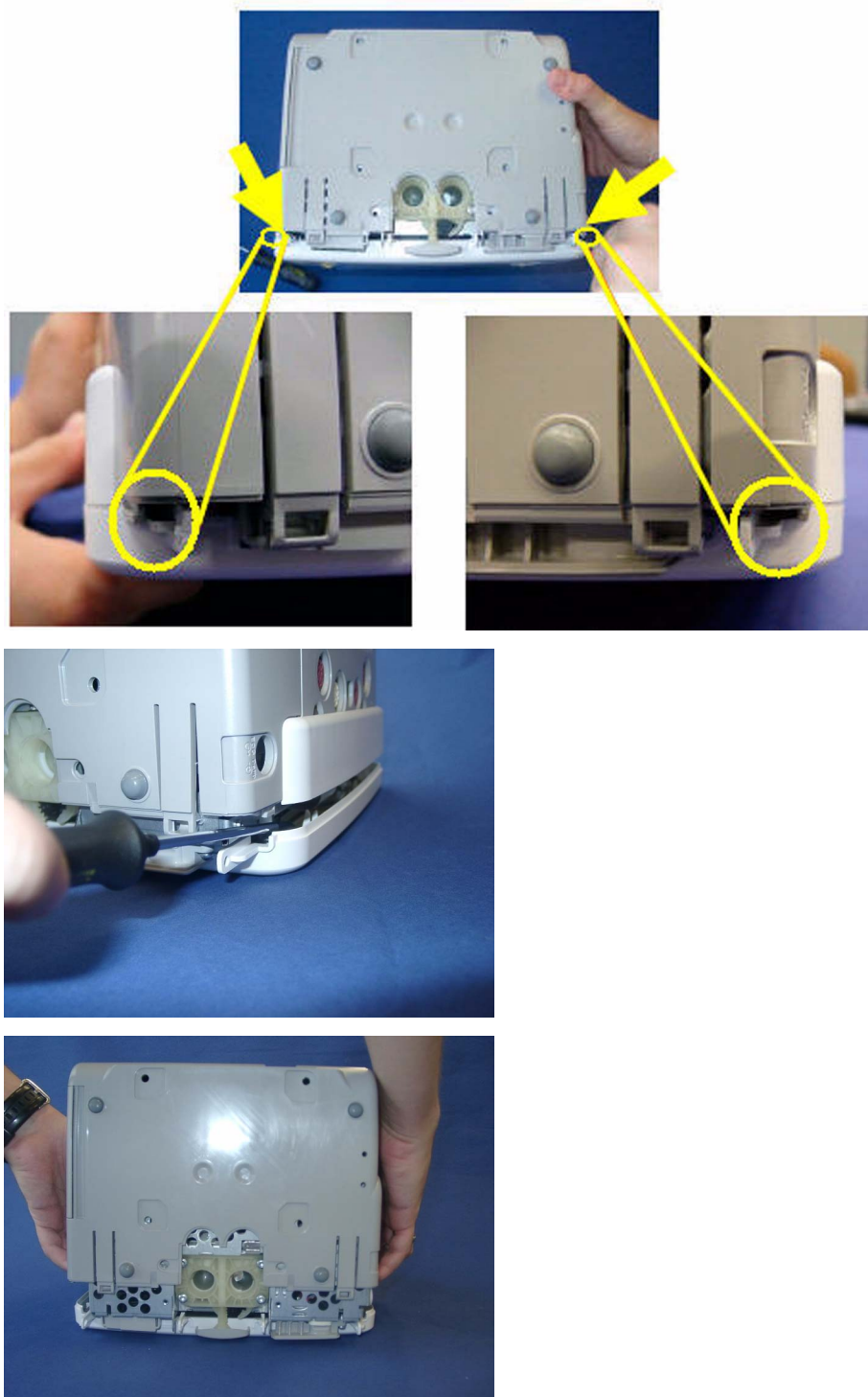


## 5 Repair and Disassembly

- 8 Release the white pins at the top and the bottom of the monitor by turning them counterclockwise with a flat-tipped screwdriver and then pull them out as shown below.



- 9 Insert a screwdriver into the outer slots (on the outside of the latches of the white housing) on both sides to loosen the rear cover and then lift the back of the monitor off.



- 10 Reassemble the monitor by performing the above steps in reverse order.



## Removing the Recorder Slot Cover

If you do not have a recorder installed in your monitor, you will have to remove the recorder slot cover before a recorder installation. Depending on which version of the monitor you have, the securing mechanism of the cover may vary.

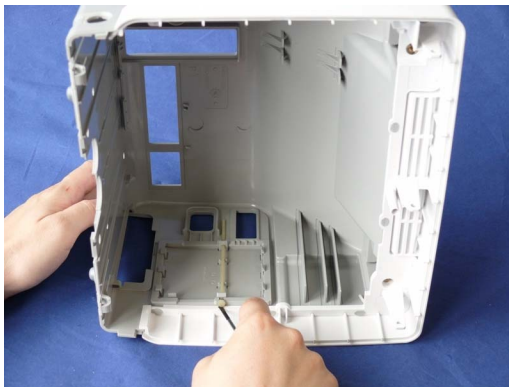
### Old version:

- Remove the cover by pressing in the three snaps



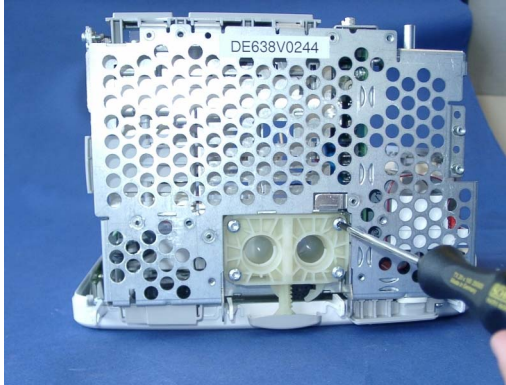
### New Version:

1. Release the white pin securing the recorder slot cover.
2. Release the cover by pressing in the three snaps (see old version above).



## Removing the Internal Quick Mount Solution

- 1 Remove the Predictive Temperature Assembly as described above.
- 2 Separate the front and back half of the monitor as described above
- 3 Unscrew the screws securing the quickmount and remove the quick mount.

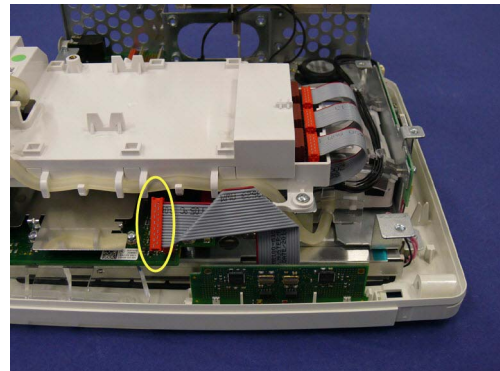
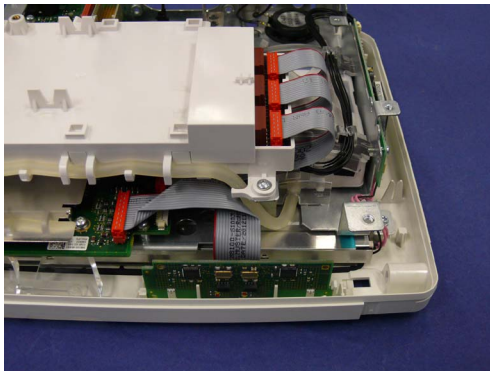


- 4 For reassembly, perform the above steps in reverse order.

## Removing the Short Range Radio (SRR) Interface

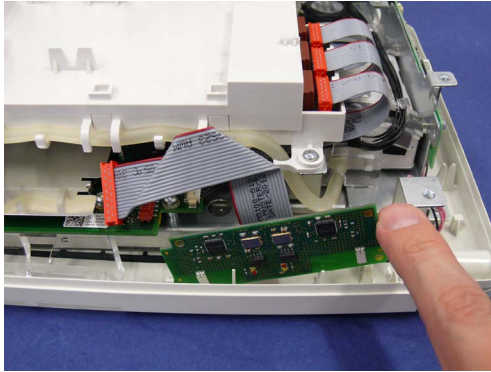
The SRR interface consists of a combined antenna and interface board. It is connected via a ribbon cable to the main board.

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Disconnect the ribbon cable connecting the SRR board and the main board from the main board.

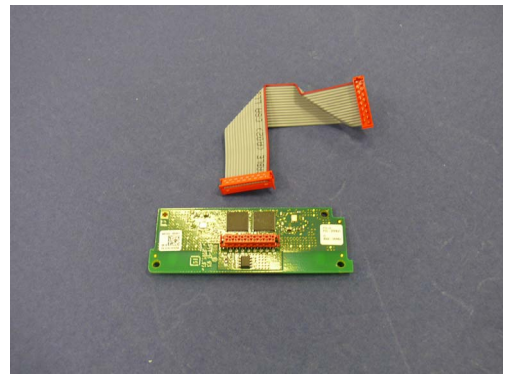
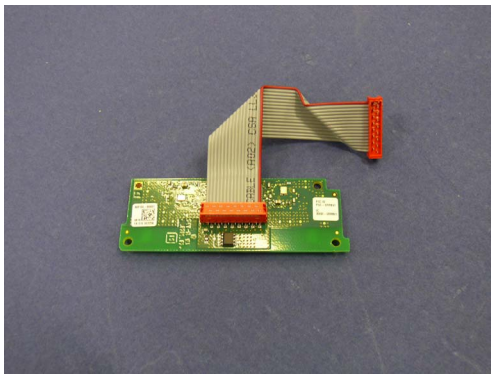


## 5 Repair and Disassembly

- 4 The board is locked into its position by a latch on the right. Pull the latch to the right to release the SRR board and lift the board upwards and out.



- 5 Separate the flat ribbon cable from the SRR board.



**Reassembly Note:** When reconnecting the flat ribbon cable to the SRR board the cable must be connected as shown above (i.e. the shorter end attached to the SRR board.)

- 6 Reassemble the monitor. When reassembling the housing, make sure that the white plastic noses of the rear housing do not scratch or damage the SRR board.



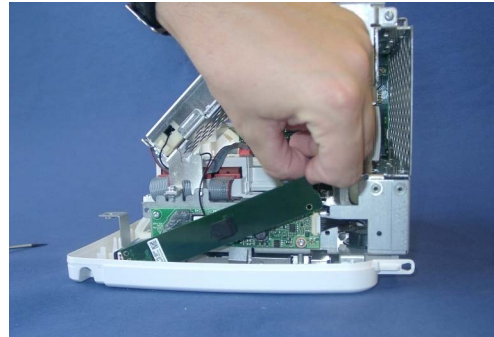
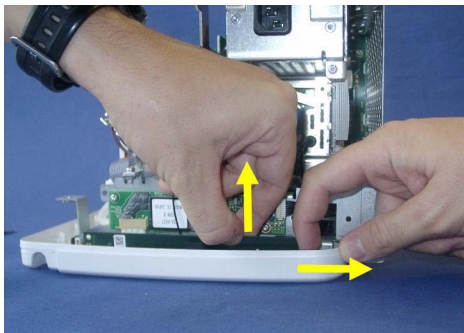


## Removing the IntelliVue 802.11 Bedside Adapter Antenna or IIT Antenna (not for MP5T)

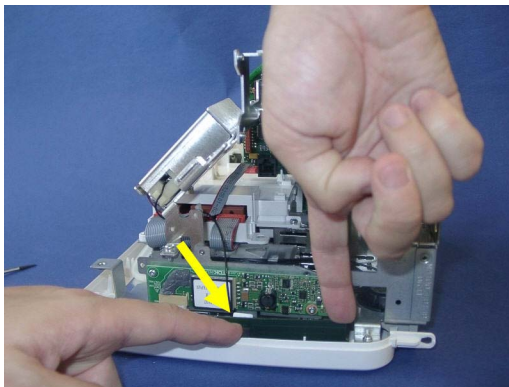
### NOTE

The antenna is a three band antenna and is used with the IntelliVue 802.11 Bedside Adapter as well as with IntelliVue Instrument Telemetry (IIT).

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Press down the latch at the bottom side of the antenna mounting, then lift up the antenna.



**Reassembly Note:** When reinserting the antenna, press against the black foam piece in the middle to squeeze it into the housing.

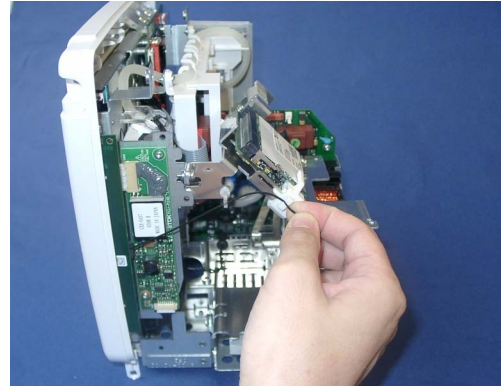
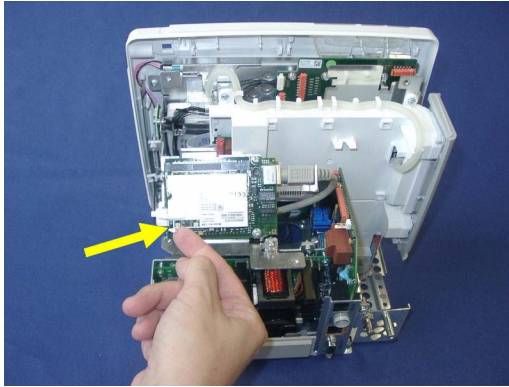


## Removing the IntelliVue 802.11 Bedside Adapter (WLAN) (not for MP5T)

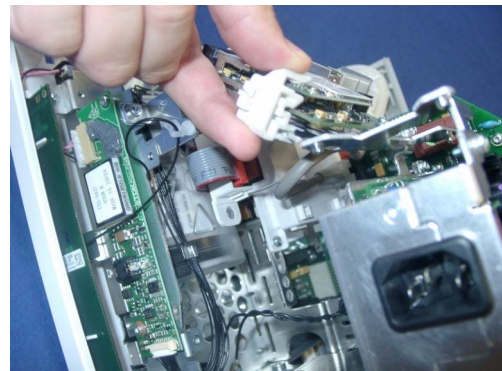
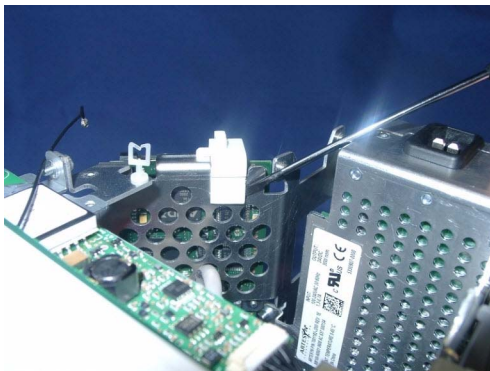
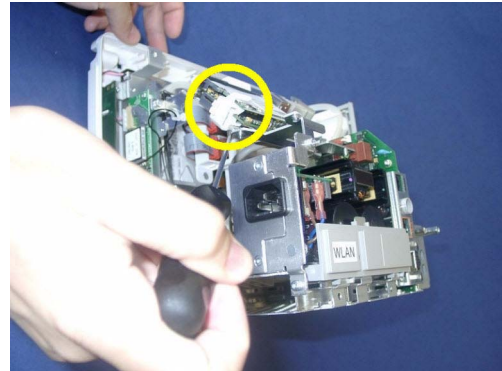
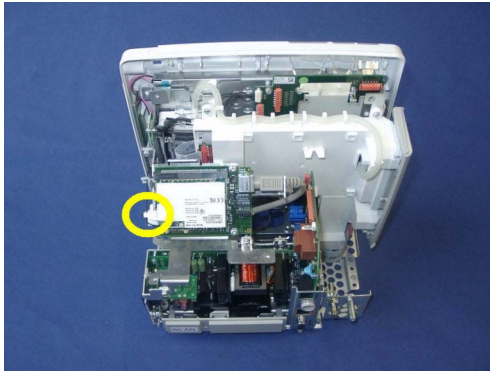
- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.

## 5 Repair and Disassembly

- 3 Unplug the antenna connector from the 802.11 bedside (WLAN) adapter and pull the cable out of its holder in the white clip on the side.

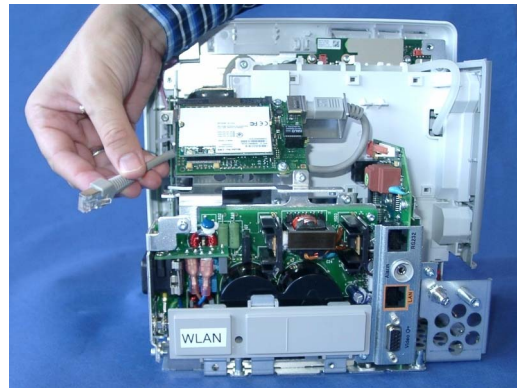
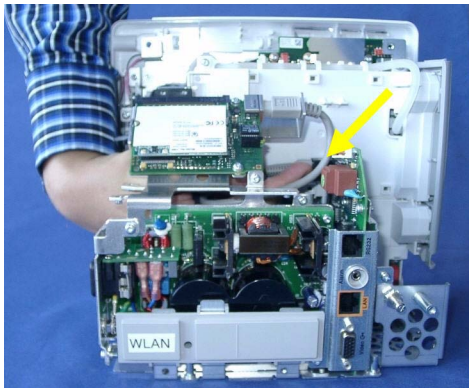


- 4 Remove the white clip from the WLAN adapter.

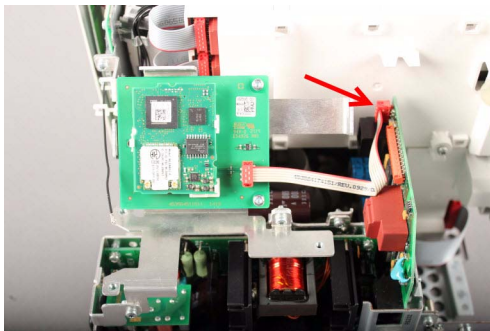


- 5 Disconnect the WLAN adapter from the system interface board. Depending on which version of the WLAN adapter your monitor has, the adapter itself and the cable connections may look different.

### Version 1:



### Version 2:

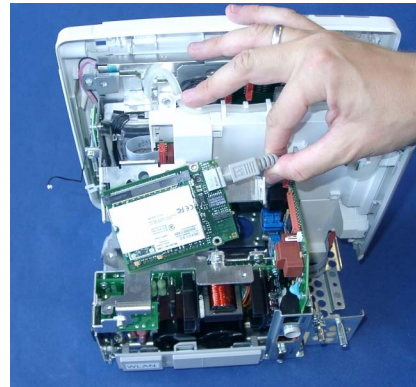
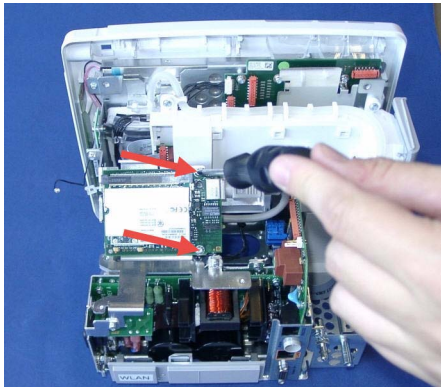




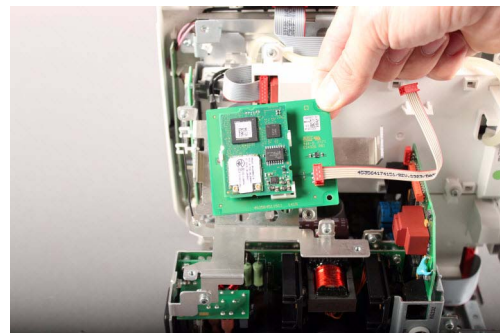
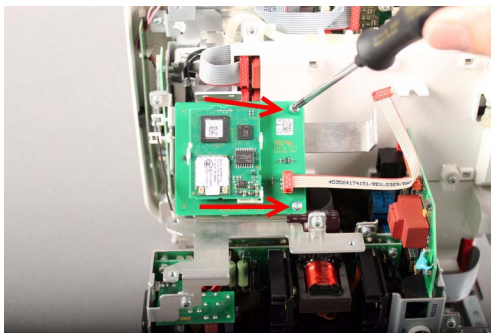
## 5 Repair and Disassembly

- 6 Unscrew the two screws on the WLAN adapter and remove the module by pulling it upwards.

**Version 1:**

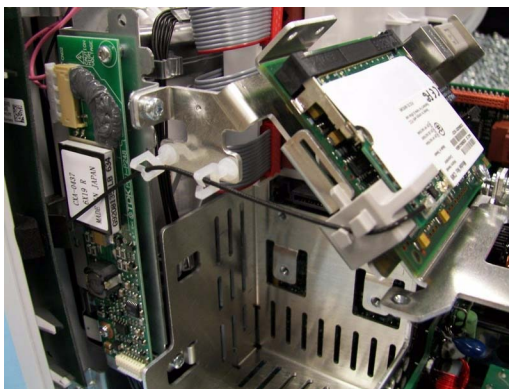


**Version 2:**



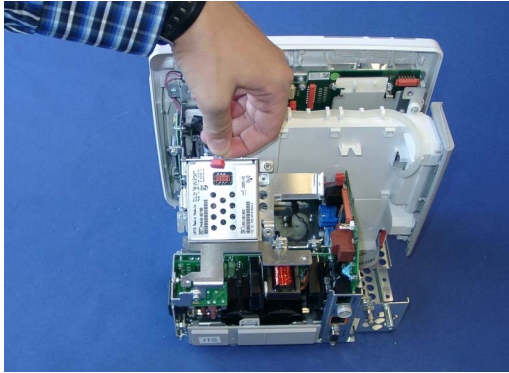
- 7 For reassembly, perform the above steps in reverse order.

**Reassembly Note:** When reconnecting the WLAN adapter use the outer of the two antenna connectors on the adapter. Make sure that the antenna cable is threaded through the white holders as shown below.

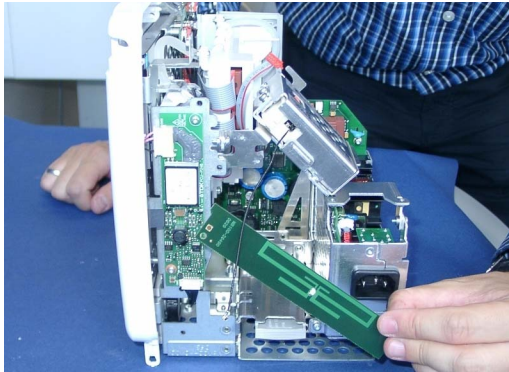


## Removing the IntelliVue Instrument Telemetry (IIT) Module (not for MP5T and MP5SC)

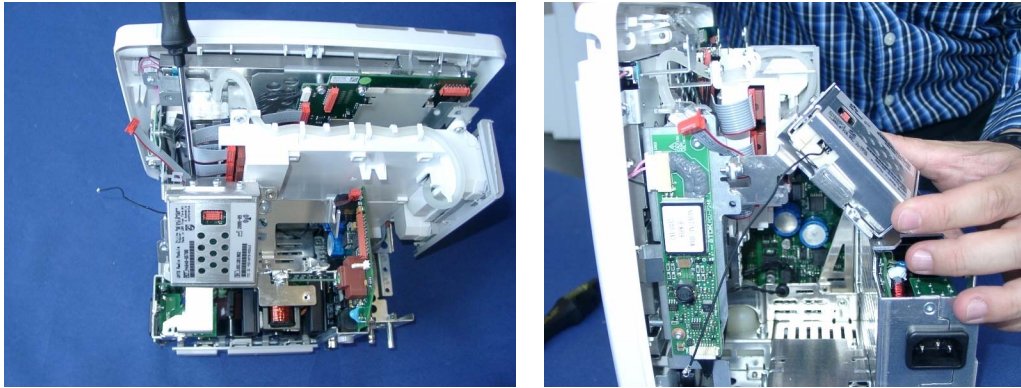
- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Unplug the connector from the IIT Module



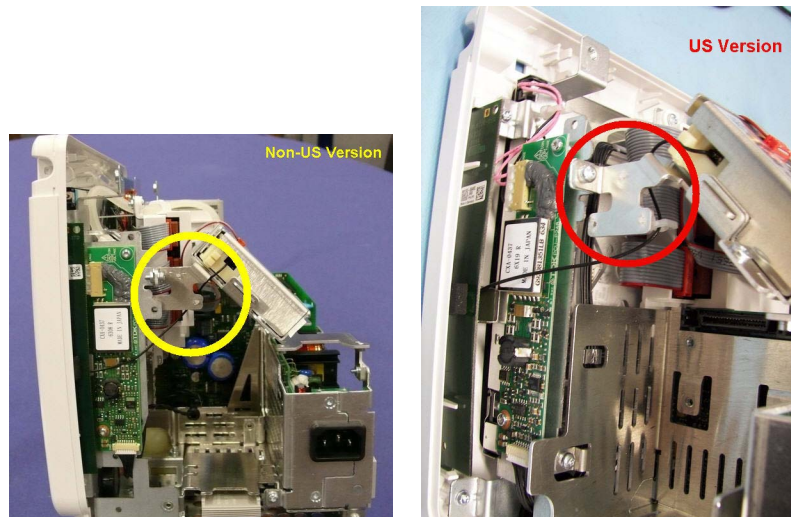
- 4 Remove the antenna board and unplug the antenna connector from the antenna board.



- 5 Remove the screws securing the IIT module and remove the IIT module.



**Reassembly Note:** Depending on the which version of the IIT module you are using the antenna cable needs to be threaded through the cable holders in different ways. The pictures below show the two different versions.



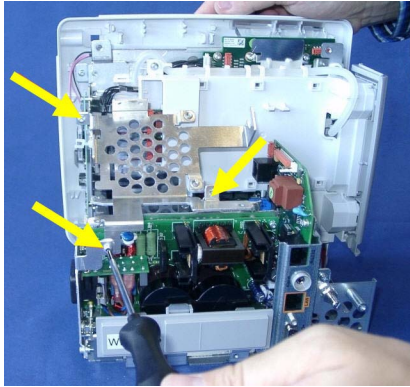
- 6 For reassembly, perform the above steps in reverse order.

## Removing the IntelliVue 802.11 Bedside Adapter/IIT Holder

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the optional IIT Module or Bedside Adapter as described above.



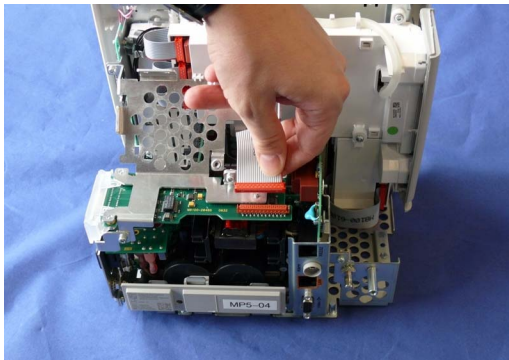
- 4 Unscrew the three screws securing the IIT/Bedside Adapter Holder and remove the holder. If an MSL board is installed, disconnect its connector to the interface board.



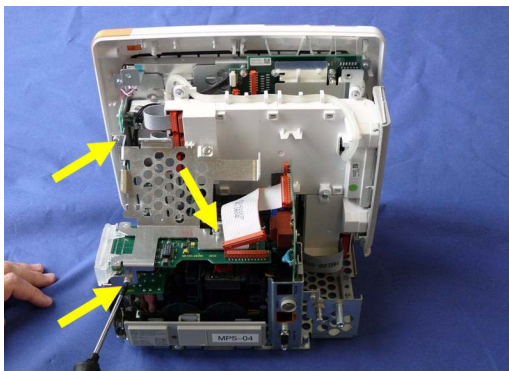
- 5 For reassembly, perform the above steps in reverse order.

## Removing the MSL Board (not for MP5T and MP5SC)

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Disconnect the connector from the MSL board to the interface board.

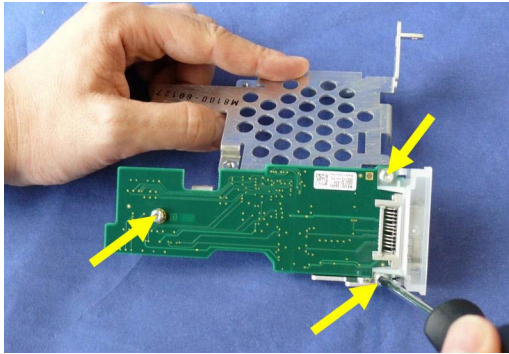


- 4 Remove the three screws securing the IntelliVue 802.11 Bedside Adapter/IIT holder and remove the holder..

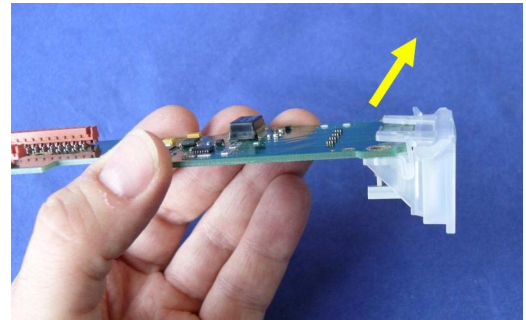
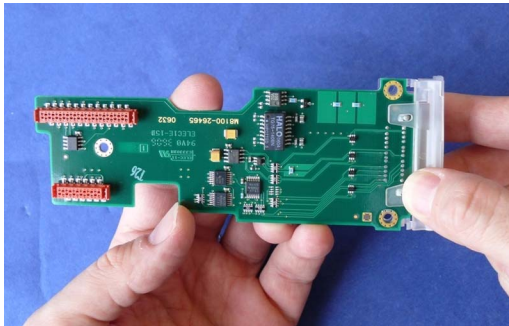


## 5 Repair and Disassembly

- 5 Separate the MSL board from the IIT/Bedside Adapter Holder by removing the three screws..



- 6 Pull off the connector holder by lifting up the hooks.



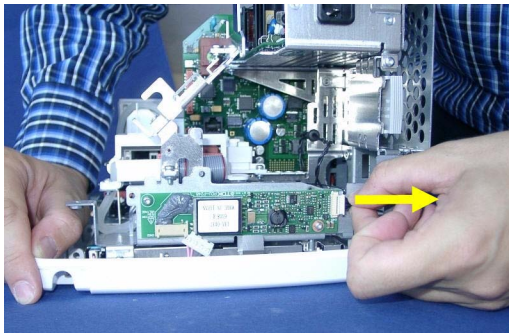
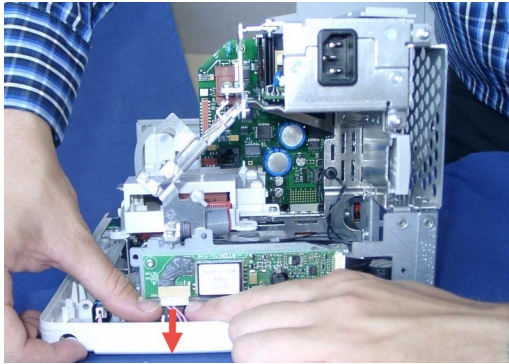
- 7 For reassembly, perform the above steps in reverse order.

## Removing the Backlight Inverter Board (Old NEC Display)

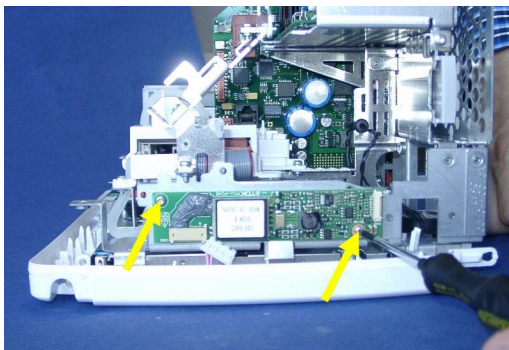
- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.



- 3 Disconnect the two connectors on the backlight inverter board.



- 4 Unscrew the two screws on the board and remove the board. Make sure that you also take out the spacers behind the screws.

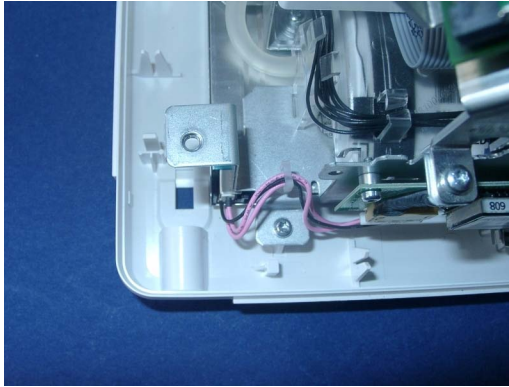


- 5 For reassembly, perform the above steps in reverse order.

**Reassembly Notes:**

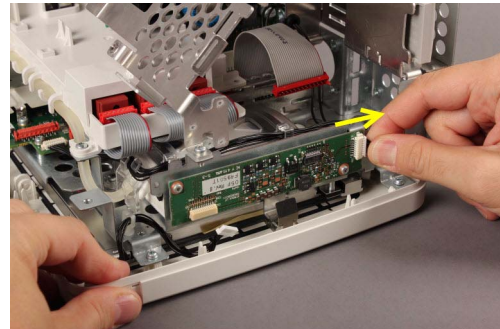
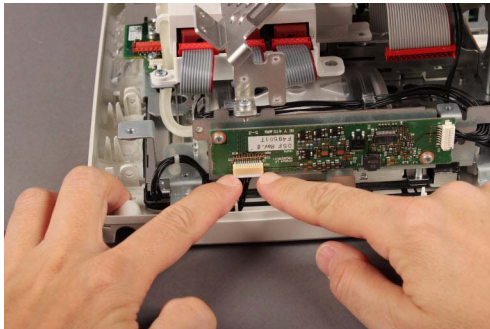
- Make sure that you reinsert the spacers when you screw the backlight inverter board back into place.
- Insert the Backlight tube cable connector correctly into the board and make sure it fits tightly.

- The backlight tube cable must be placed correctly in its holder. Otherwise the touch functionality of the display may be disturbed.

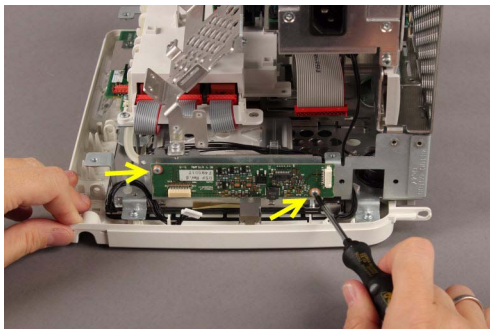


## Removing the Backlight Converter Board (New NLT Display)

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Disconnect the two connectors on the backlight converter board.



- 4 Unscrew the two screws on the board and remove the board. Make sure that you also take out the spacers behind the screws.

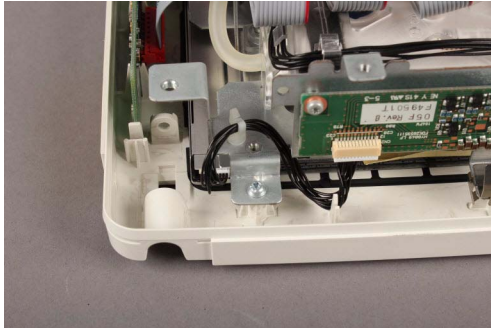


- 5 For reassembly, perform the above steps in reverse order.

### Reassembly Notes:

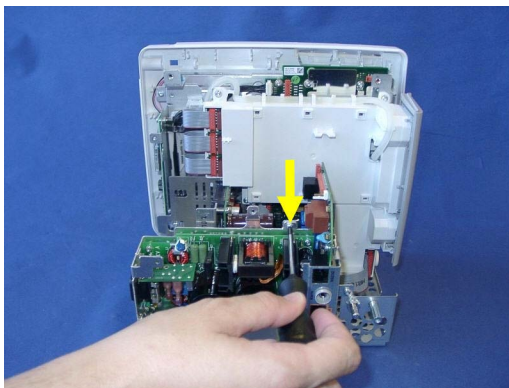
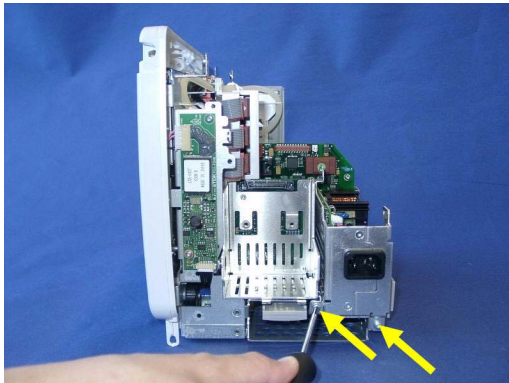
- Make sure that you reinsert the spacers when you screw the backlight converter board back into place.

- Insert the Backlight cable connector correctly into the board and the LED backlight and make sure it fits tightly.
- The backlight cable must be placed correctly in its holder. Otherwise the touch functionality of the display may be disturbed.

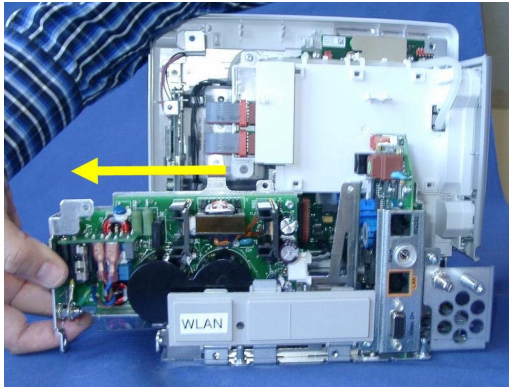


## Removing the Power Supply

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the IIT/Bedside Adapter Holder as described above.
- 4 Remove the three screws securing the power supply.



- 5 Pull out the power supply.



- 6 For reassembly, perform the above steps in reverse order.

**Reassembly Note:** When reinserting the power supply, slide it carefully into the guiding latches of the metal chassis.

## Removing the System Interface Board

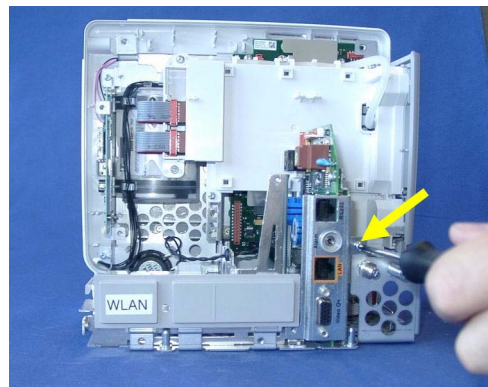
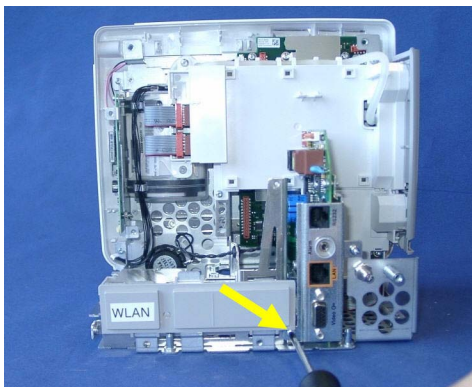
### NOTE

When replacing the system interface board, the monitor must have the serial number and product / measurement option reloaded. A support tool is required to perform this task. Please see the Support Tool Instructions for Use document for details on how to load a new serial number and product / measurement options.

### NOTE

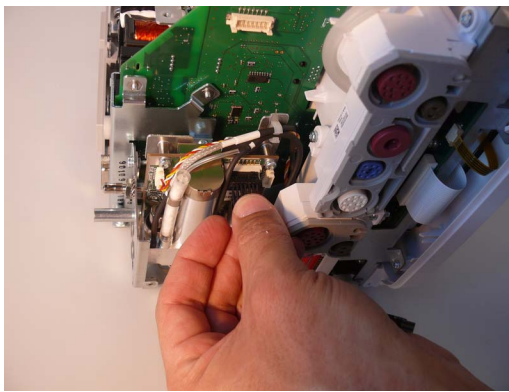
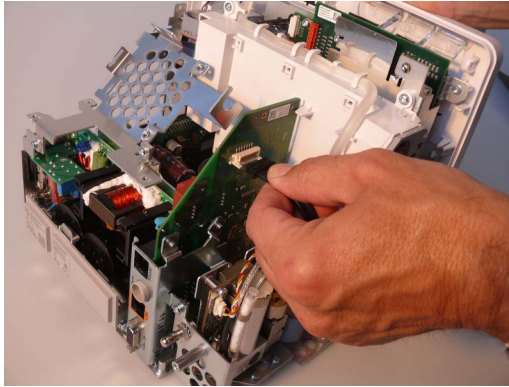
Removing the system interface board erases the status log of the monitor. Please make sure to save the status log using the support tool before removing the system interface board. Refer to the support tool instructions for use for further details.

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the IIT/Bedside Adapter Holder as described above.
- 4 Remove the power supply as described above.
- 5 Remove the screws securing the system interface board.

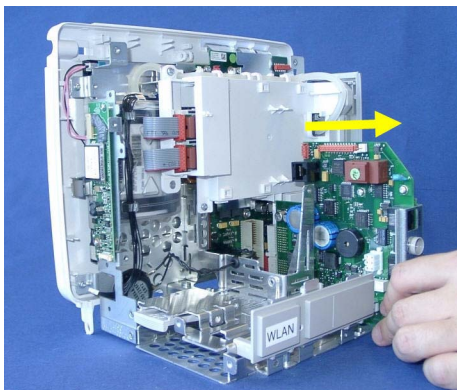




- 6 If you have Microstream CO<sub>2</sub>, you need to unplug the cable between the CO<sub>2</sub> board and the interface board.



- 7 Pull out the system interface board.



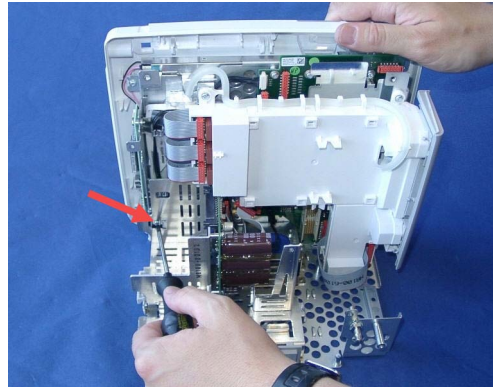
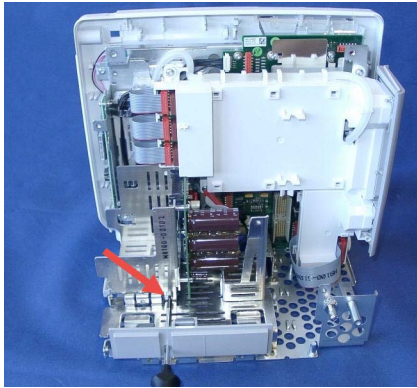
- 8 For reassembly, perform the above steps in reverse order.

## Removing the Recorder Board

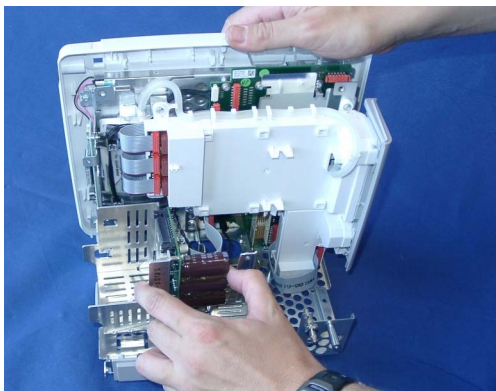
- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the IIT module or 802.11 Bedside adapter and its holder as described above.
- 4 Remove Power Supply
- 5 Remove System Interface Board

## 5 Repair and Disassembly

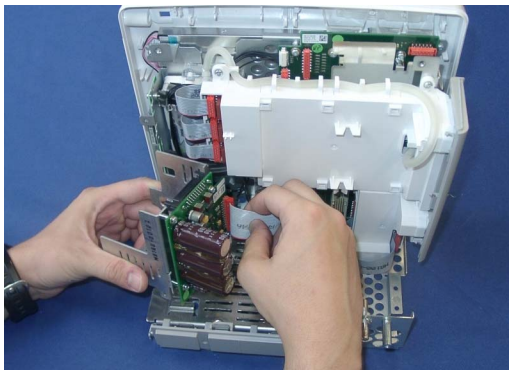
- 6 Unscrew the screws securing the recorder board.



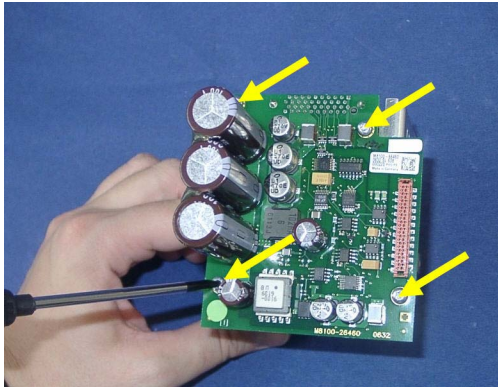
- 7 Pull out recorder board



- 8 Unplug the main board connector from the recorder board.



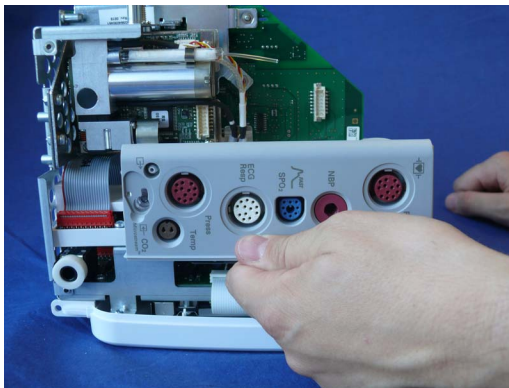
- 9 Unscrew the recorder board from the recorder assembly.



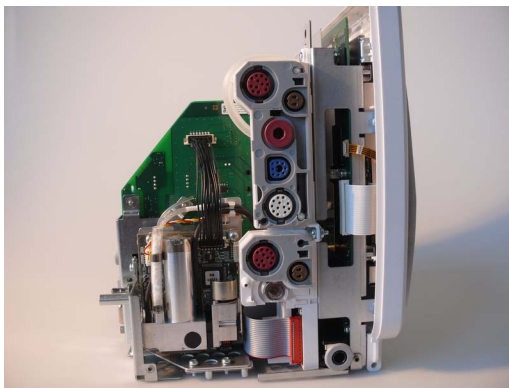
- 10 For reassembly, perform the above steps in reverse order.

## Removing the Microstream CO2 Assembly

- 1 Separate the front and back of the monitor as described above.
- 2 Pull off the Measurement Block Cover by flipping it upwards from the bottom as shown below.

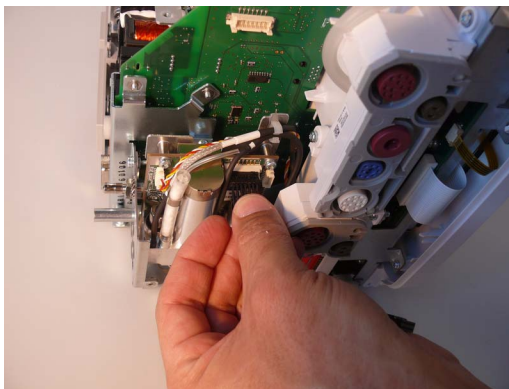
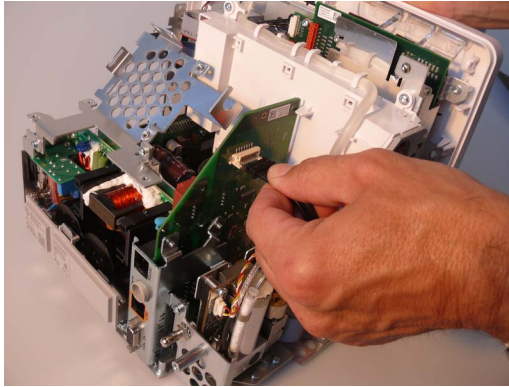


- 3 Depending on your Front End 1 and 2 options, your monitor should now look similar to this.

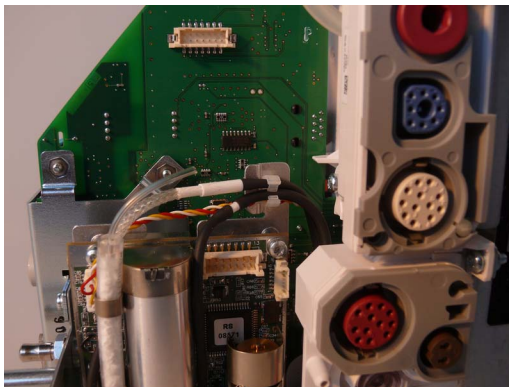


## 5 Repair and Disassembly

- 4 If not already done, unplug the cable between the CO2 board and the system interface board. Unplug the other end of the cable from the CO2 board.

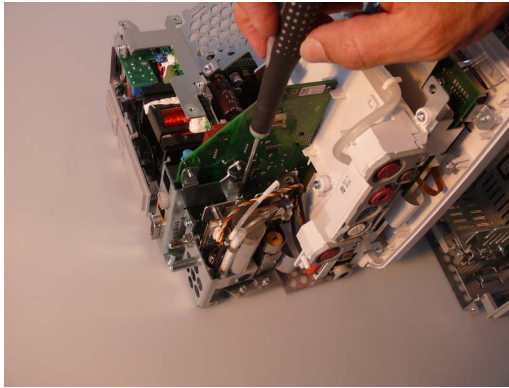


- 5 Remove the tubings and the cable from their holder.

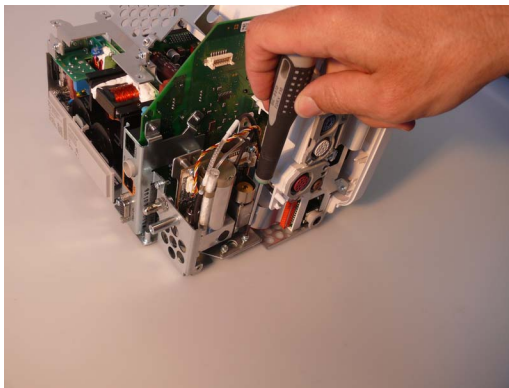
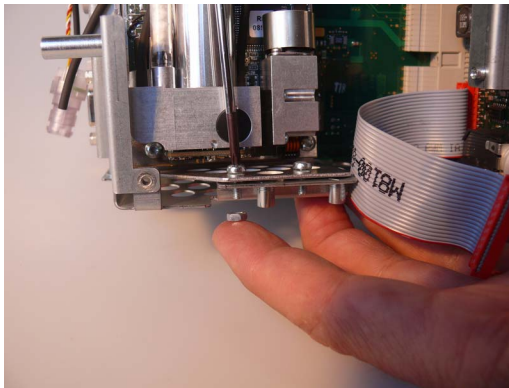




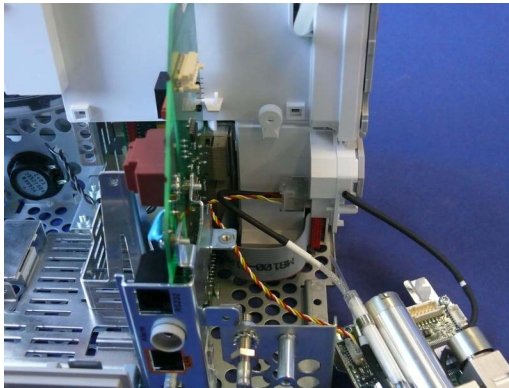
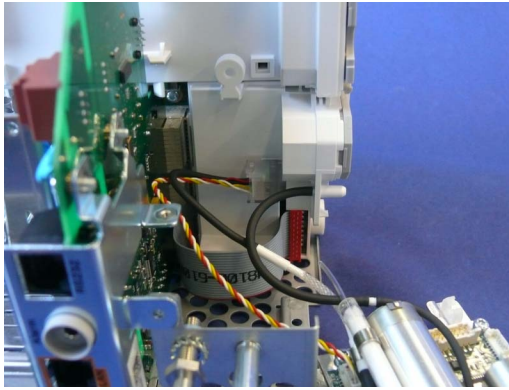
- 6 Unscrew the CO2 holder from the system interface board.



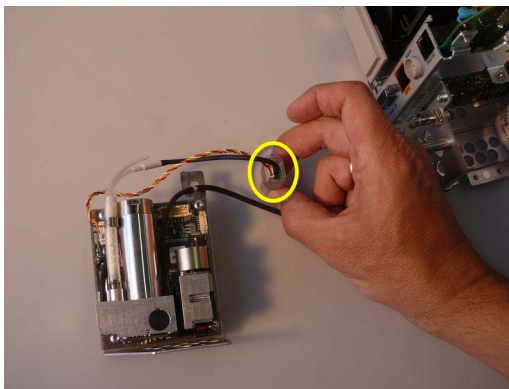
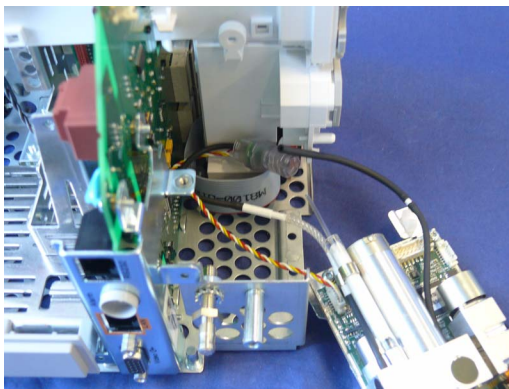
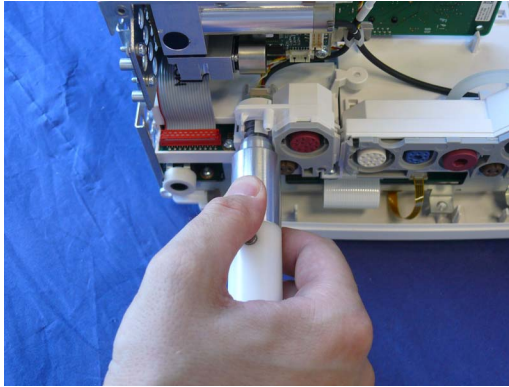
- 7 Unscrew the CO2 holder from the housing. Monitors with a serial number prefix <DE748 additionally use a screw/nut combination to secure the CO2 holder. Make sure that you do not lose the screws or nuts. Monitors with serial no. prefix DE748 or higher already have the necessary screw threads in the housing and therefore do not require additional nuts.



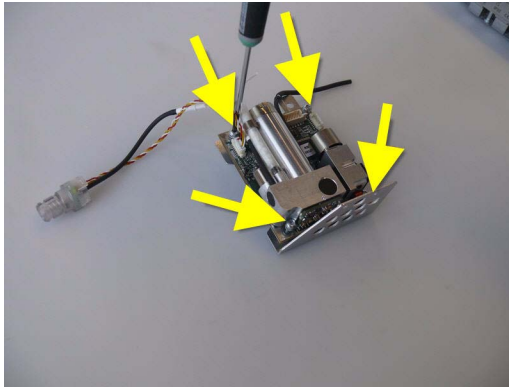
- 8 Remove the CO2 tubing from the CO2 inlet of the Front End 2 housing.



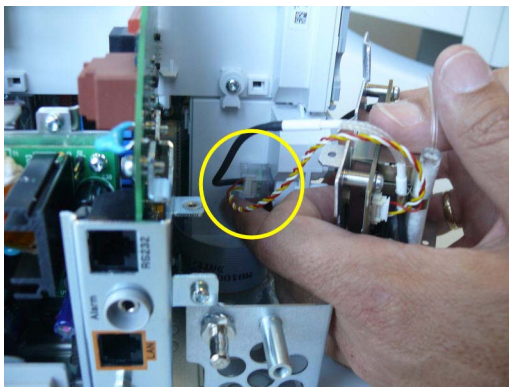
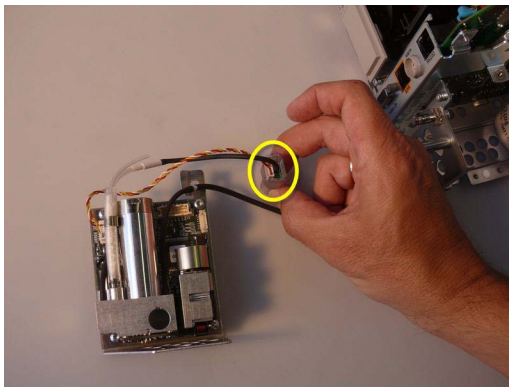
- 9 Remove the CO2 board connector from the slot in the Front End 2 housing using the Luer Remover.



- 10 Remove the CO2 board from the CO2 board holder by disassembling the holder.



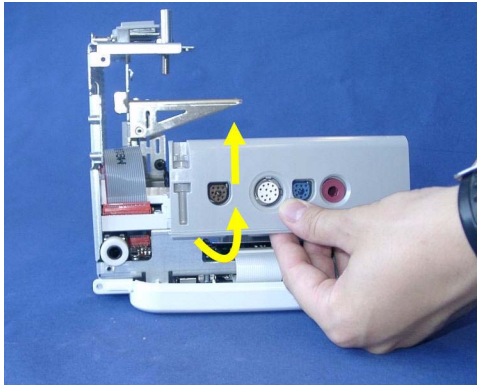
**Reassembly Note:** Make sure the CO2 connector is inserted into the slot in the Front End 2 housing with the colored cable facing you.



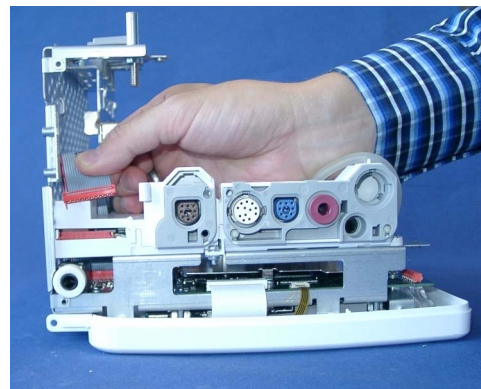
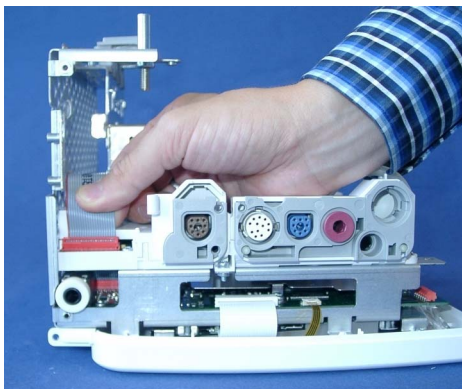
- 11 Reassemble by performing the above steps in reverse order.

## Removing the Measurement Block

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the IIT module or 802.11 Bedside adapter and its holder as described above.
- 4 Remove Power Supply
- 5 Remove System Interface Board
- 6 Remove the recorder board as described above.
- 7 Remove the Microstream CO2 Assembly as described above.
- 8 If not already done in the previous step, pull off the Measurement Block Cover by flipping it upwards from the bottom as shown below.

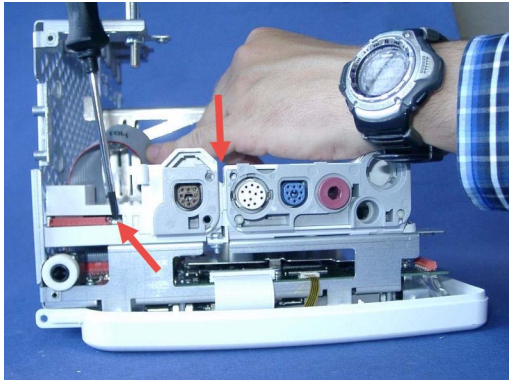


- 9 Unplug the ribbon connector from the Front End 2 measurement block to the measurement board.

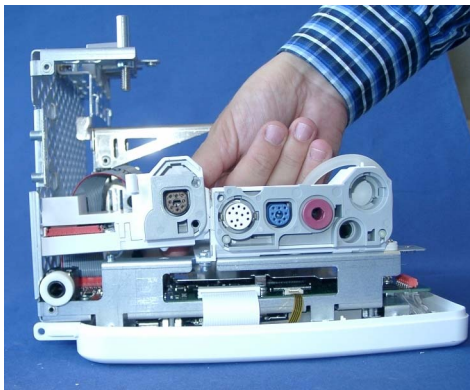




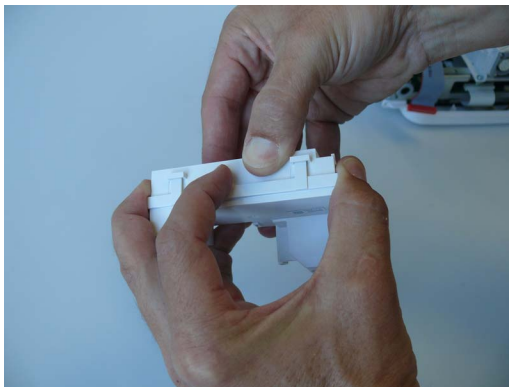
- 10 Unscrew the screws from the Front End 2 measurement board



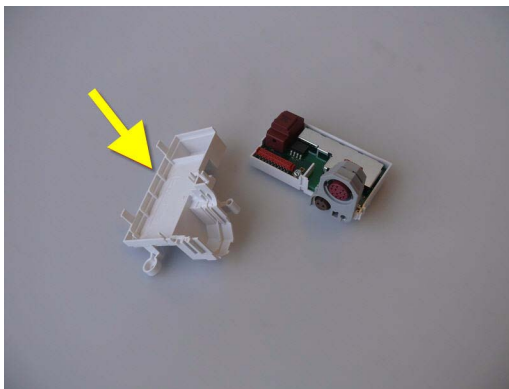
- 11 Lift off the Front End 2 measurement block.



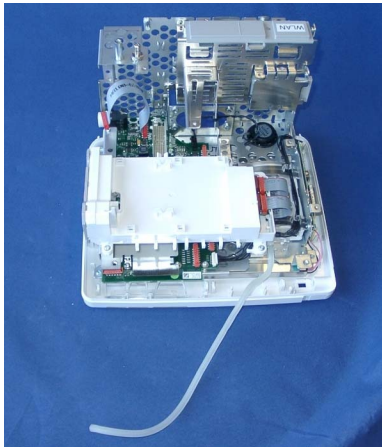
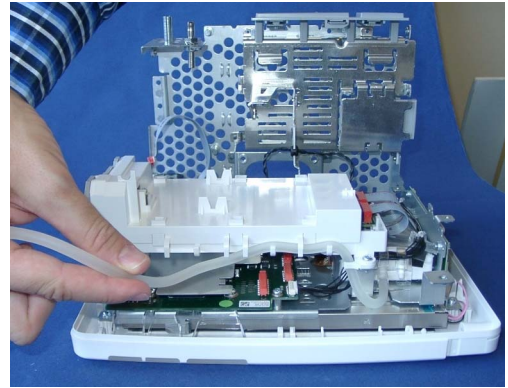
- 12 Replace the Front End 2 measurement block, if necessary.
- 13 Exchange Front End 2 housings contain a CO2 inlet which may not fit with your Front End 2 Measurement block cover. This may be the case if your monitor was originally not equipped with Microstream CO2.  
If you have the old version without the CO2 inlet, separate the Front end 2 measurement block housing of the exchange part as shown below.



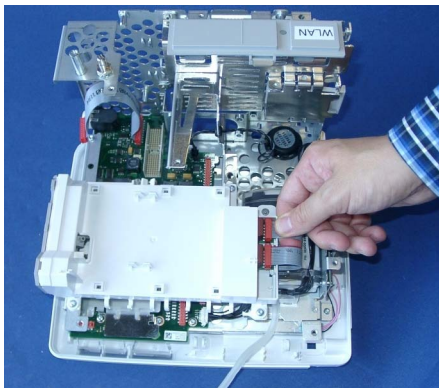
- 14 Replace the exchange Front End 2 measurement block top cover with the old version without CO2 inlet (either the old one or the one provided with the exchange part).



- 15 Unplug the end of the NBP tubing and remove the tubing from its holders.

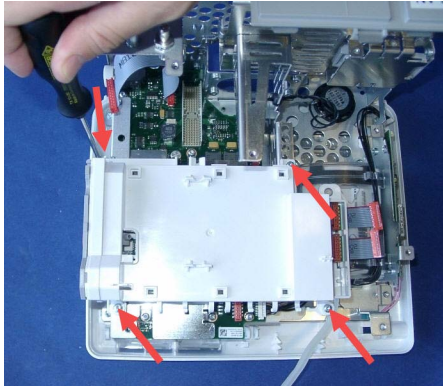


- 16 Unplug the connectors from the Front End 1 measurement block.





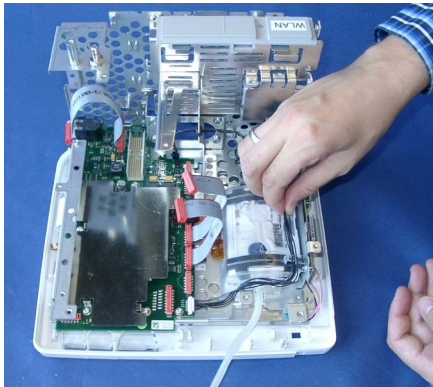
- 17 Unscrew the screws securing the Front End 1 measurement block and remove the measurement block.



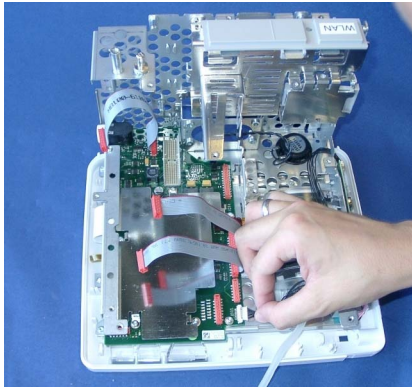
- 18 For reassembly, perform the above steps in reverse order.

## Removing the NBP Pump

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the IIT module or 802.11 Bedside adapter and its holder as described above.
- 4 Remove Power Supply
- 5 Remove System Interface Board
- 6 Remove the recorder board as described above.
- 7 Remove the Microstream CO2 Assembly as described above.
- 8 Remove the measurement block as described above.
- 9 Remove the black backlight cables from their holders in the NBP pump cage.



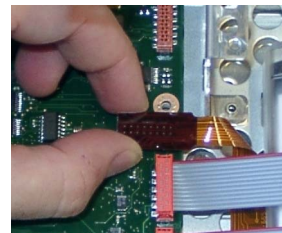
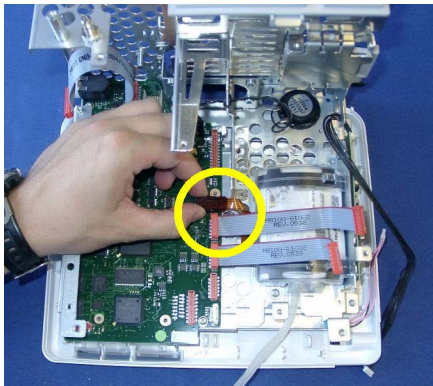
- 10 Unplug the backlight connector from the main board.



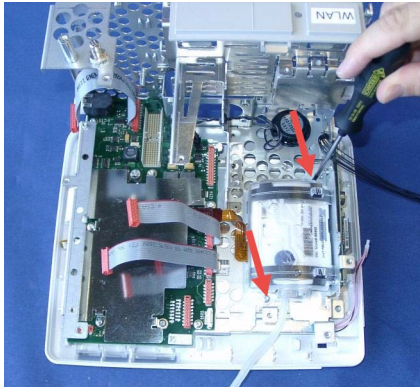
- 11 Unscrew the three screws and remove the metal sheet from the main board.



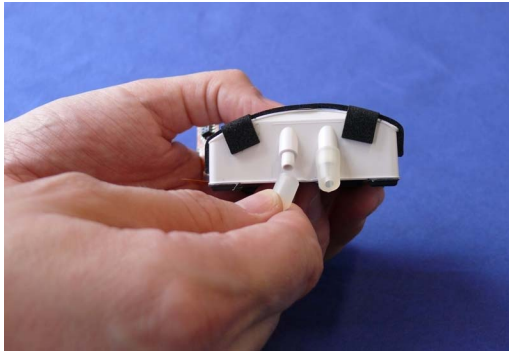
- 12 **Carefully** unplug the NBP pump connector from the main board by holding the connector on its sides and gently pulling up.



- 13 Unscrew the screws securing the NBP pump cage.



- 14 Remove the NBP pump cage and the NBP pump.  
15 Remove the two plastic tubings from the new NBP pump and insert the new pump.



- 16 For reassembly, perform the above steps in reverse order.

**Reassembly Notes:**

- Make sure that the NBP tubing is reinserted and correctly fitted into its position before reinstalling the NBP pump.
- Insert the NBP pump cage in the correct position, so the NBP tubing fits under the rounded cover and the NBP pump cages sits correctly on the metal frame domes.
- When reattaching the metal sheet to the main board do not overtighten the screws.

**NOTE**

If the NBP pump is replaced you need to perform an NBP performance test and calibration afterwards.

## Removing the Main Board

**NOTE**

- When replacing the main board, the monitor must be reloaded with the software, purchased options and settings. A support tool is required to perform these tasks. Please see the Support Tool Instructions for Use document for details on how to load software, options and settings.
- When upgrading or cloning an MP5 monitor, the support tool may display the following text string:  
"A faulty main board is detected. Please replace the main board. For further details contact your

local Philips Support."

**Upgrading and cloning processes are still possible and will continue.**

This message is due to the fact that the support tool includes a new feature which checks the reliability of a main board component which is suspected to be the cause of an increased future failure rate of the main board. Only a few monitors contain this potentially faulty main board component. If the support tool detects an affected main board during any upgrade or cloning activity, replace the affected main board. After the main board is replaced, reload the software and configuration of the monitor. Please order the exchange main board M8100-68450 - 12NC: 451261019011

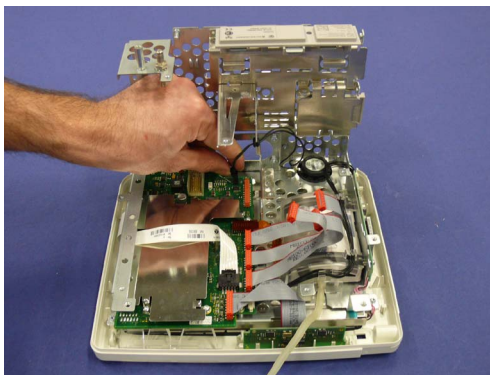
**NOTE**

You must perform a touchscreen calibration with the support tool after a main board exchange.

**NOTE**

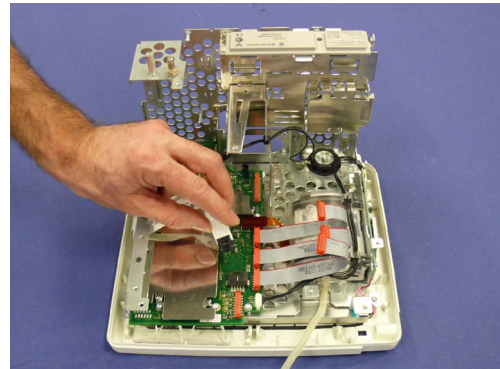
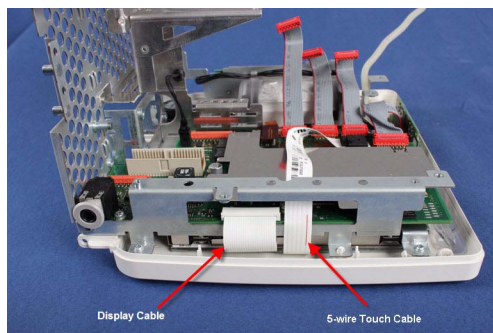
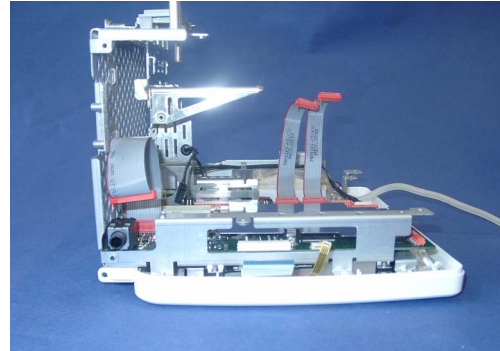
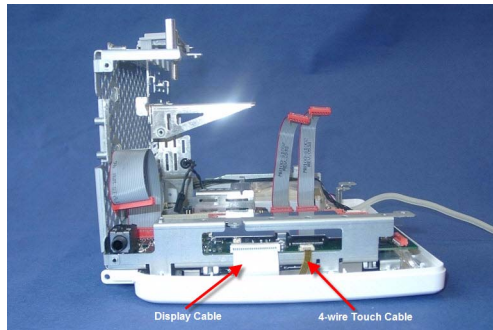
Before exchanging the main board, retrieve the status log from the monitor with the support tool. Please include a status log printout when returning the defective main board

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the Short Range Radio Interface as described above.
- 4 Remove the IIT module or 802.11 Bedside adapter and its holder as described above.
- 5 Remove the Power Supply as described above.
- 6 Remove the System Interface Board as described above.
- 7 Remove the recorder board as described above.
- 8 Remove the Microstream CO<sub>2</sub> Assembly as described above.
- 9 Remove the measurement block as described above.
- 10 Unplug the speaker cables from the main board.

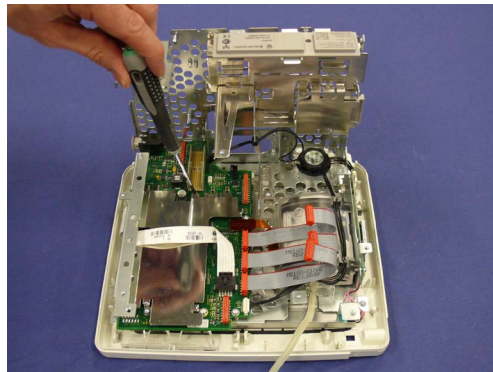




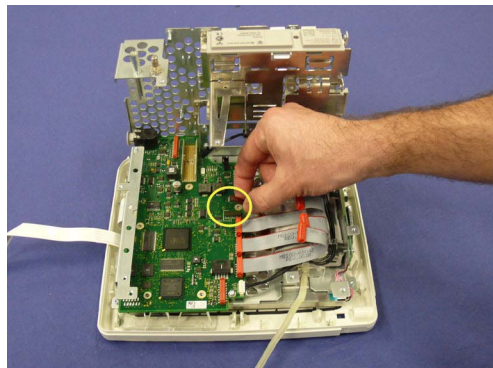
- 11 Unplug the touch screen and display cable connectors from the main board. Unlock the connector locks by pulling the connector lock mechanism forwards.



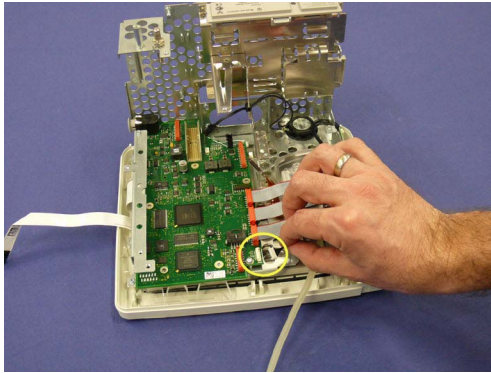
- 12 Unscrew the three screws and remove the metal sheet from the main board.



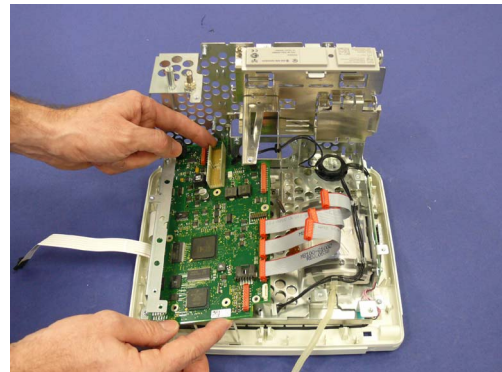
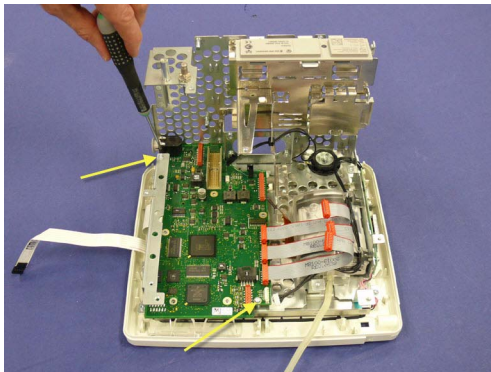
- 13 Carefully unplug the NBP pump connector from the main board by holding the connector on its sides and gently pulling up.



- 14 Carefully unplug the backlight cable from the main board.



- 15 Remove the remaining screws securing the main board. Then take out the main board.



- 16 For reassembly, perform the above steps in reverse order.

### Reassembly Notes:

- Reattach the main board with the two screws not used for the metal sheet first. When reattaching the metal sheet to the main board do not overtighten the screws.
- Make sure that the display and touch cables are inserted correctly and the retainers are locked.

### NOTE

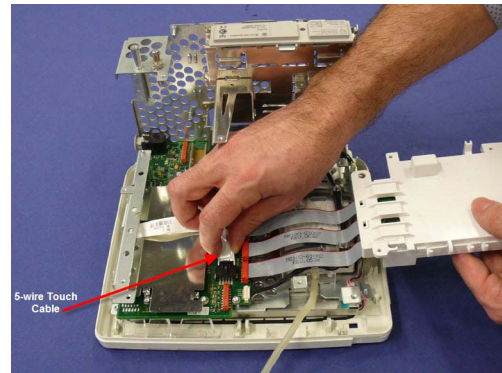
When the main board is replaced, you need to perform a NBP accuracy check afterwards.

## Removing the Touch Assembly

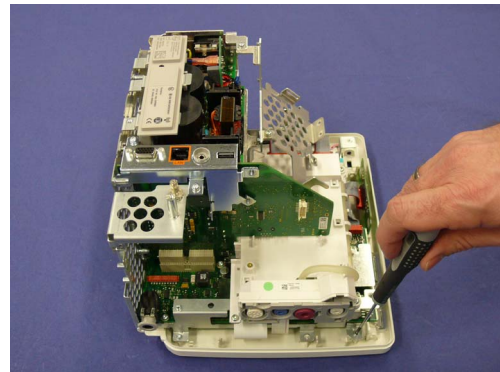
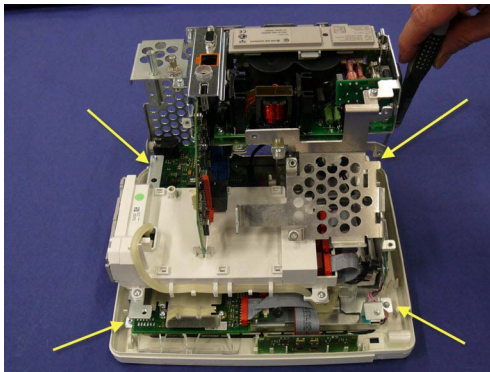
- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the antenna as described above.
- 4 If you have the 5-wire touch cable connection to the main board (see pictures in step below), remove the measurement block as described above.



- 5 Unplug the touch cable from the main board.



- 6 Unscrew the four screws securing the touch assembly.



- 7 Separate the touch assembly from the unit.

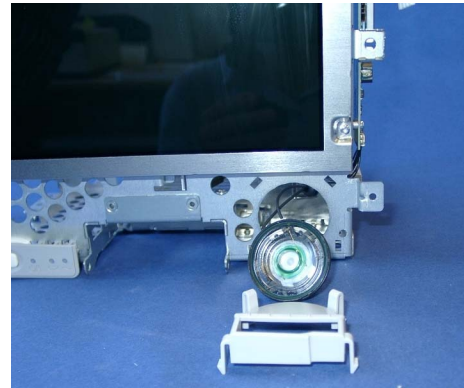


- 8 For reassembly, perform the above steps in reverse order.

- 9 After reassembly, recalibrate the touchscreen.

### Removing the Loudspeaker

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the IIT module or 802.11 Bedside adapter and its holder as described above.
- 4 Remove Power Supply
- 5 Remove System Interface Board
- 6 Remove the recorder board as described above.
- 7 Remove the touch assembly as described above.
- 8 Disconnect the speaker connector from the main board.
- 9 Press the clips of the loudspeaker to the inside and remove the speaker as shown below.



- 10 For reassembly, perform the above steps in reverse order.

### Removing the Power Button and LED Assembly

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Unscrew the screw securing the Power Button LED Assembly.



- 4 From the front, push the assembly to the side and then remove it.



- 5 For reassembly, perform the above steps in reverse order.

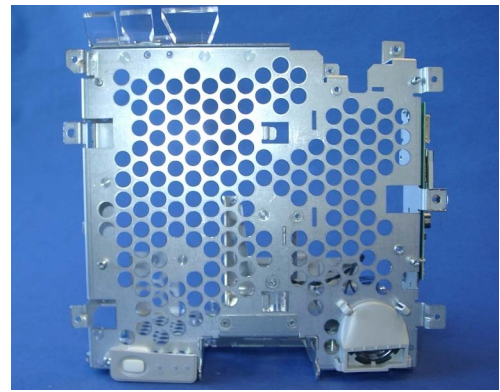
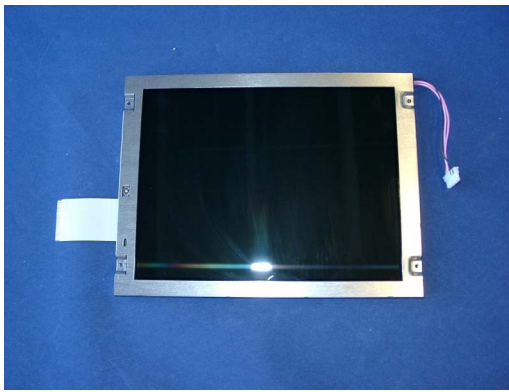
## Removing the LCD Panel

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the touch assembly as described above.
- 4 Unplug the display cable from the main board.
- 5 Unplug the backlight tube cable from the backlight inverter board.

- 6 Unscrew the four screws securing the LCD panel.



- 7 Separate the LCD panel from the metal chassis.



### NOTE

Avoid touching the screen of the LCD panel. If necessary, remove fingerprints and dust from the screen with a soft tissue.

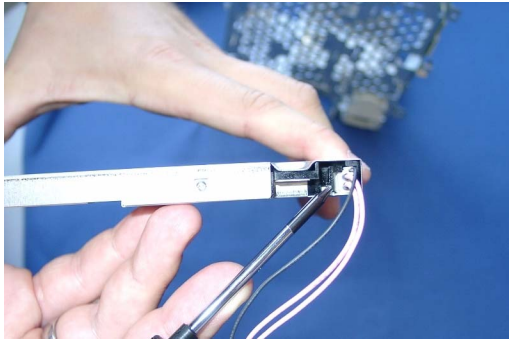
- 8 For reassembly, perform the above steps in reverse order.

**Reassembly Note:** Connect the flat display cable before reassembling the LCD panel.

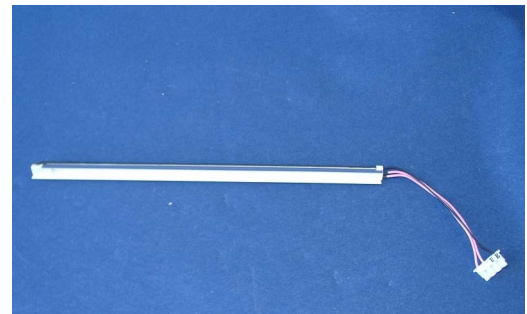
## Exchanging the Backlight (Old NEC Display only)

- 1 Remove the predictive temperature assembly as described above.
- 2 Separate the front and back of the monitor as described above.
- 3 Remove the touch assembly as described above.
- 4 Remove the LCD panel as described above.

- 5 Push back the snap securing the backlight with a screwdriver.



- 6 Pull out the backlight.



- 7 For reassembly, perform the above steps in reverse order.

## Modifying the Nurse Call Relay

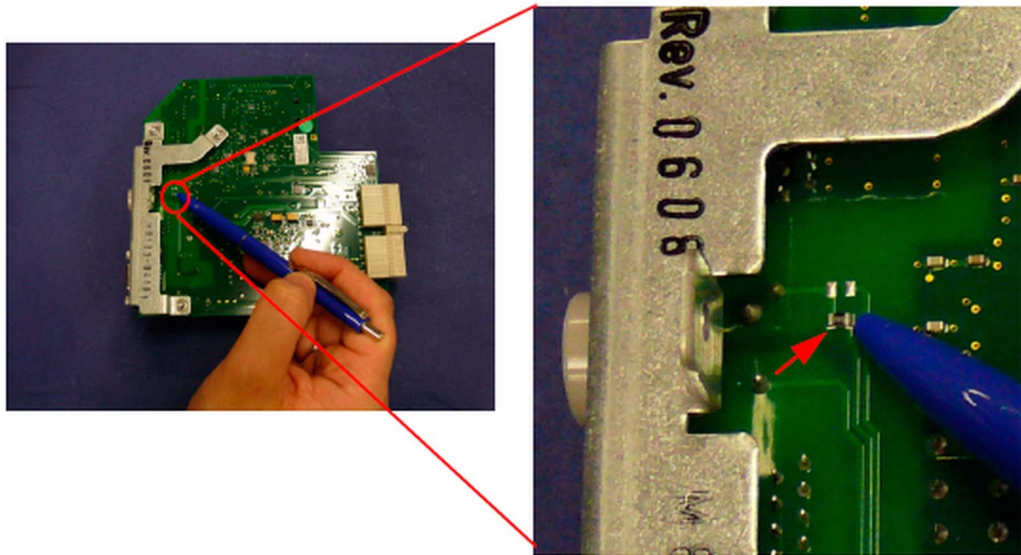
Some customers may want to have an Open-On-Alarm relay instead of a Closed-On-Alarm for their Nursecall system. Using this installation procedure, qualified Philips service personnel can modify the MP5 system interface board, part number M8100-67580 (4512 610 19281).

**The modification should be done only on request, in the field. All factory supplied MP5 system interface boards or MP5 monitors have the original board including the Close-On-Alarm Relay.**

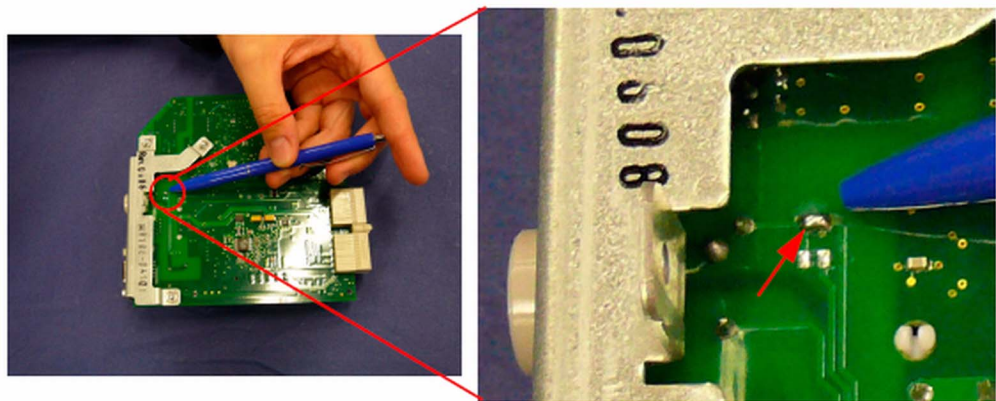
To make the Open-On-Alarm relay modification, complete the following steps:

## 5 Repair and Disassembly

- 1 Unsolder the existing SMD Resistor shown in the pictures below on the back of the system interface board:



- 2 Make sure that no electrical connection remains between the formerly connected solder points. Verify this by using an Ohmmeter. Expected Result: High Impedance ( $\geq 10k\Omega$ ).
- 3 Build a new connection to the Open-On-Alarm contact as shown below. Using a piece of wire and solder, connect the two solder points on the back of the circuit board above the original soldered joint as illustrated in the following photographs:



- 4 Make sure that there is an electrical connection between the soldered points. Verify this by using an Ohmmeter. Expected result: Low Impedance ( $\leq 1\Omega$ ).
- 5 Attach a label to the instrument next to the output and, using permanent black or blue ink, add localized text similar to: "Nursecall is Open-On-Alarm Relay" or "Nursecall is open". Inform the customer that the specification of the Nurse Call Relay has been changed from active closed contact to active open contact.

## Verification Procedure

Perform the following tests:

- 1 Power On Test.
- 2 Nursecall Performance Test (“Modified MP5 Nurse Call Alarm Relay Test” on page 86).
- 3 Safety Test.

Note that you must document the modification for a particular unit including the verifications.





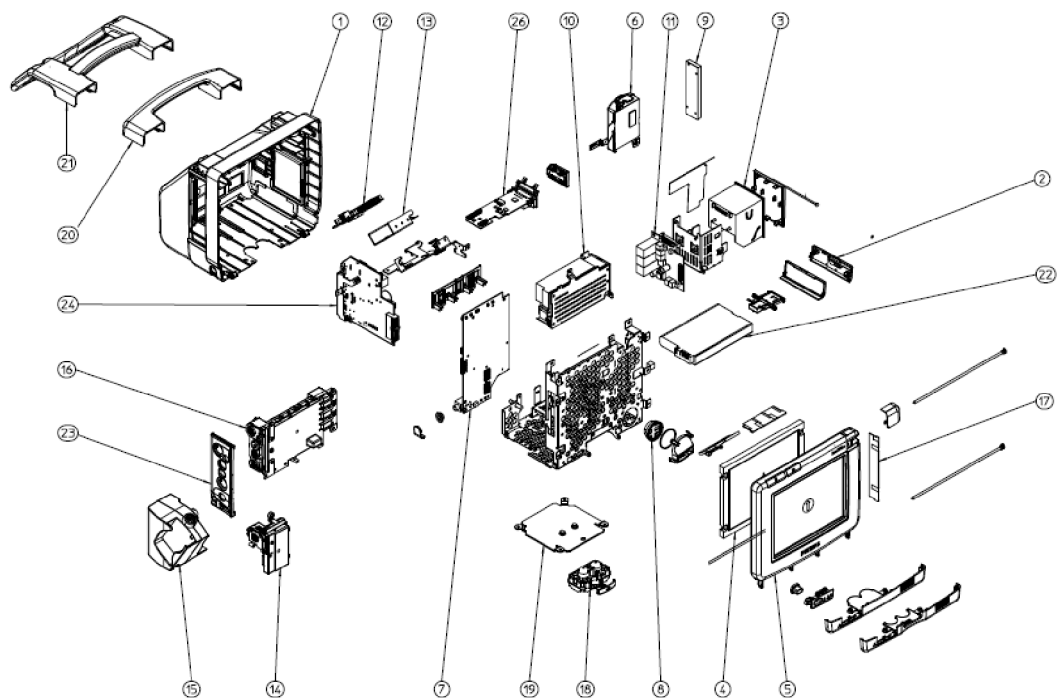
# Parts

This section lists the replacement and exchange parts for the Philips IntelliVue Patient Monitoring System and its components.

## MP5/MP5T/MP5SC Parts

### NOTE

For part numbers of interconnecting cables, please consult the *Site Preparation* and *Installation Instructions* sections. For network-related parts, please see the M3185A Philips Clinical Network documentation.





## Exchange and Replacement Parts

| Part number  | 12NC         | Description                       | Comment  | Number in Diagram |
|--------------|--------------|-----------------------------------|--|-------------------|
| M8100-60300  | 451261018941 | IV-MP5 MECHASY Assy Housing Rear  |  | 1                 |
| M8100-40301  | 451261018951 | IV-MP5 PLST Door Battery          |  | 2                 |
| M8001-60101  | 451261018961 | IV-MP30 MP5 Recorder              |  | 3                 |
| 2090-0984    | 451261018971 | DSPL MP5 TFT LCD 8.4inch          | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE704, DE748, DE913, DE210, DE424, DE469<br><b>M8105AS:</b><br>DE037, DE210, DE425, DE470<br><b>M8105AT:</b><br>DE745, DE913, DE210, DE427, DE471 | 4                 |
| 453564514541 | 453564514541 | IV-MP5 DSPL LCD assembly          | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE501, DE537<br><b>M8105AS:</b><br>DE505, DE538<br><b>M8105AT:</b> DE515  | 4                 |
| M8105-60010  | 451261018981 | IV-MP5 Bezel Touch Assembly 4wire | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE704, DE748, DE913<br><b>M8105AS:</b><br>DE037<br><b>M8105AT:</b><br>DE745, DE913  | 5                 |
| 453564315151 | 453564315151 | IV-MP5 Bezel Touch Assembly 5wire | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE210, DE424, DE469, DE501, DE537<br><b>M8105AS:</b><br>DE210, DE425, DE470, DE505, DE538<br><b>M8105AT:</b><br>DE210, DE427, DE471, DE515        | 5                 |

| Part number  | 12NC         | Description                              | Comment  | Number in Diagram |
|--------------|--------------|--|--|-------------------|
| M3000-60503  | 451261018991 | IV-MP5 NBP Assembly incl tubing          |  | 6                 |
| 453564423471 | 453564423471 | MS_X2 CONN NiBP Inlet X1/X2/MP2/MP5(5ea) |  |                   |
| M8100-68450  | 451261019011 | IV-MP5 Mainboard 4wire                   | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE704, DE748, DE913<br><b>M8105AS:</b><br>DE037<br><b>M8105AT:</b><br>DE745, DE913  | 7                 |
| 453564251831 | 453564251831 | IV-MP5 Mainboard 5wire                   | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE210, DE424, DE469, DE501, DE537<br><b>M8105AS:</b><br>DE210, DE425, DE470, DE505, DE538<br><b>M8105AT:</b><br>DE210, DE427, DE471, DE515        | 7                 |
| M8100-61403  | 451261019021 | IV-MP5 CBL Speaker Assembly              |  | 8                 |
| 0950-9086    | 451261019031 | DSPL MP5 Backlightinverter for 8,4       | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE704, DE748, DE913, DE210, DE424, DE469<br><b>M8105AS:</b><br>DE037, DE210, DE425, DE470<br><b>M8105AT:</b><br>DE745, DE913, DE210, DE427, DE471 | 9                 |
| 453564520311 | 453564520311 | IV-MP5 LED Backlightconverter            | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE501, DE537<br><b>M8105AS:</b><br>DE505, DE538<br><b>M8105AT:</b><br>DE515   | 9                 |
| M8105-60002  | 453564153851 | IV-MP5 ASSY-PWR Power Supply             |  | 10                |
| M8100-66561  | 453564170001 | IV-MP5 Recorder board                    |  | 11                |

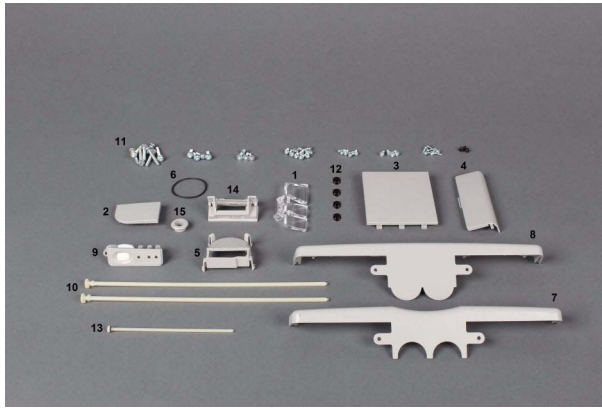
| Part number  | 12NC         | Description                         | Comment   | Number in Diagram |
|--------------|--------------|-------------------------------------|---|-------------------|
| M8096-67501  | 451261019061 | IV-MP5 WLAN Assy ver1               | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE704, DE748,<br>DE913, DE210,<br>DE424, DE469<br><b>M8105AS:</b><br>DE037, DE210,<br>DE425, DE470 | 12                |
| 453564514531 | 453564514531 | IV-MP5 WLAN Assy ver2               | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE501, DE537<br><b>M8105AS:</b><br>DE505, DE538  | 12                |
| 453564505921 | 453564505921 | IV IIT Module 1.4 GHz               |   | 13                |
| 453564473921 | 453564473921 | IV IIT Module 2.4 GHz               |   | 13                |
| M8080-61001  | 453563484581 | IV CBL Y-cable IIT                  |   | 13                |
| M8105-60560  | 451261019221 | IV-MP5 FE2 pred. Temp               |   | 14                |
| 453564107711 | 453564107711 | IV-MP5 FE2 BP/Temp (mCO2 ready)     |   | 14                |
| 453564414651 | 453564414651 | IV-MP5 FE2 Tympanic Temp            |   | 14                |
| 453564414661 | 453564414661 | IV-MP5 FE2 Tympanic Temp with mCO2  |   | 14                |
| M8105-64100  | 451261019241 | IV-MP5 pred. Temp Housing Kit       |   | 15                |
| M8105-60500  | 451261019251 | IV-MP5 pred. Temp Assy              |   | 15                |
| 453564251811 | 453564251811 | IV-MP5 FE NBP/SpO2 Nellcor          |   | 16                |
| M8105-68040  | 451261019081 | IV-MP5 FE ECG/NBP/SpO2              |   | 16                |
| M8105-68042  | 451261019101 | IV-MP5 FE ECG/NBP/SpO2/BP/Temp      |   | 16                |
| M8105-68044  | 451261019121 | IV-MP5 FE ECG/NBP/SpO2/CO2          |   | 16                |
| M8105-68046  | 451261019131 | IV-MP5 FE ECG/NBP/SpO2/TAAP         |   | 16                |
| 453564189891 | 453564189891 | IV-MP5 FE ECG/NBP/SpO2 Nellcor      |   | 16                |
| 453564189911 | 453564189911 | IV-MP5 FE ECG/NBP/SpO2/PT Nellcor   |   | 16                |
| 453564189931 | 453564189931 | IV-MP5 FE ECG/NBP/SpO2/CO2 Nellcor  |   | 16                |
| 453564189951 | 453564189951 | IV-MP5 FE ECG/NBP/SpO2/TAAP Nellcor |   | 16                |
| 453564107701 | 453564107701 | IV-MP5 FE NBP/SpO2                  |   | 16                |
| M8105-60536  | 451261021131 | IV-MP5 MP5T FE NBP/TAAP             |   | 16                |
| M8105-68038  | 451261025991 | IV-MP5 MP5T FE NBP/SpO2/TAAP        |   | 16                |

| Part number  | 12NC         | Description                              | Comment | Number in Diagram |
|--|--------------|--|---------|-------------------|
| 453564190071   | 453564190071 | IV-MP5 MP5T FE NBP/SpO2/TAAP Nellcor     |         | 16                |
| 453564506491   | 453564506491 | IV-MP5 FE ECG/NBP/Rainbow SpO2/BP/Temp   |         | 16                |
| 453564506511   | 453564506511 | IV-MP5 FE ECG/NBP/Rainbow SpO2           |         | 16                |
| 453564506531   | 453564506531 | IV-MP5 FE NBP/Rainbow SpO2               |         | 16                |
| <b>Front End boards SN Prefix &lt;&gt; M8105A: DE537, M8105AS: DE538</b> |              |  |         |                   |
| M8105-68040  | 451261019081 | IV-MP5 FE ECG/NBP/SpO2                   |         | 16                |
| 453564189891   | 453564189891 | IV-MP5 FE ECG/NBP/SpO2 Nellcor           |         | 16                |
| M8105-68042  | 451261019101 | IV-MP5 FE ECG/NBP/SpO2/BP/Temp           |         | 16                |
| M8105-68044  | 451261019121 | IV-MP5 FE ECG/NBP/SpO2/CO2               |         | 16                |
| 453564189931   | 453564189931 | IV-MP5 FE ECG/NBP/SpO2/CO2 Nellcor       |         | 16                |
| 453564189911   | 453564189911 | IV-MP5 FE ECG/NBP/SpO2/PT Nellcor        |         | 16                |
| <b>Front End boards SN Prefix &gt; M8105A: DE537, M8105AS: DE538</b>     |              |  |         |                   |
| 453564556101   | 453564556101 | IV-MP5 FE ECG/NBP/SpO2 ver2              |         | 16                |
| 453564556111   | 453564556111 | IV-MP5 FE ECG/NBP/SpO2/BP/Temp ver2      |         | 16                |
| 453564556121   | 453564556121 | IV-MP5 FE ECG/NBP/SpO2/CO2 ver2          |         | 16                |
| 453564556131   | 453564556131 | IV-MP5 FE ECG/NBP/NellcorSpO2 ver2       |         | 16                |
| 453564556141   | 453564556141 | IV-MP5 FE ECG/NBP/Nel.SpO2/BP/Temp ver2  |         | 16                |
| 453564556151   | 453564556151 | IV-MP5 FE ECG/NBP/NellcorSpO2/CO2 ver2   |         | 16                |
| M8100-66490  | 451261019291 | IV-MP5 PCA Antenna triband               |         | 17                |
| M8100-60800  | 451261019331 | IV-MP5 MECHASY Assy Quickmount           |         | 18                |
| M8105-60310  | 451261019401 | IV-MP5 MET Mounting Adapter              |         | 19                |
| M8100-44901  | 451261019351 | IV-MP5 PLST Handle Standard              |         | 20                |
| M8105-60112  | 451261023691 | IV-MP5 MECHASY Handle Bedhanger non-slip |         | 21                |
| M4605A   | 989803135861 | BATTERY 10.8V 6Ah LiIon                  |         | 22                |
| M8100-67582  | 451261019261 | IV-MP5 I/F Assy LAN, Video               |         | 24                |
| M8100-67584  | 453564112891 | IV-MP5 I/F LAN/Bat/mC02                  |         | 24                |

| Part number  | 12NC         | Description                              | Comment  | Number in Diagram                    |
|--------------|--------------|--|--|--------------------------------------|
| M8100-67583  | 453564112881 | IV-MP5 I/F LAN/Video/Bat/RS-232/NCall/mC |  | 24                                   |
| 453564219961 | 453564219961 | IV-MP5 ASSY IF LAN Vid Bat USB NC mCO2   |  | 24                                   |
| M8100-66565  | 451261021171 | IV-MP5 MSL board                         |  | 26                                   |
| 453564435571 | 453564435571 | IV-MP5 mCO2 assy                         |  |                                      |
| 453564107731 | 453564107731 | IV-MP5 mCO2 assy nRoHS                   |  |                                      |
| 453564107751 | 453564107751 | IV-MP5 Small Parts Kit 1 (misc.)         |  | See following table for more details |
| 453564107761 | 453564107761 | IV-MP5 Small Parts Kit 2 (cable)         |  | See following table for more details |
| M8105-64006  | 451261021161 | IV-MP5 MP5T FE Cover Kit                 |  | See following table for more details |
| 2090-0987    | 451261017041 | DSPL MP5 BACKLIGHT LAMP ASSY FOR TFT-LCD | <b>Monitor SN Prefix:</b><br><b>M8105A:</b><br>DE704, DE748, DE913, DE210, DE424, DE469<br><b>M8105AS:</b><br>DE037, DE210, DE425, DE470<br><b>M8105AT:</b><br>DE745, DE913, DE210, DE427, DE471 |                                      |
| 453564258611 | 453564258611 | IV SRR brd ver2 (for MP5/T/SC+MX6/7/800) |  |                                      |
| 453564033691 | 453564033691 | SS EMCH Temperature Calibration Key      |  |                                      |
| 453564117411 | 453564117411 | IV-MP5 MECHASY mCO2 Luer Remover         |  |                                      |
| 453564239731 | 453564239731 | IV2 MECHASY Table Mount Kit              |  |                                      |
| 989803143481 | 989803143481 | TELE CBL PWD HALF OF TETHER              |  |                                      |

| Part number  | 12NC         | Description                            | Comment | Number in Diagram |
|--------------|--------------|--|---------|-------------------|
| 989803146911 | 989803146911 | CBL MP5 TETHER                         |         |                   |
| 453564219911 | 453564219911 | IV-MP5 Parts Kit MP5/T/SC brand covers |         |                   |
| 453564219921 | 453564219921 | IV-MP5 FE Cover Kit text w/o mCO2      |         |                   |
| 453564219931 | 453564219931 | IV-MP5 FE Cover Kit text w mCO2        |         |                   |
| 453564219941 | 453564219941 | IV-MP5 FE Cover Kit symbol w/o mCO2    |         |                   |
| 453564219951 | 453564219951 | IV-MP5 FE Cover Kit symbol w mCO2      |         |                   |

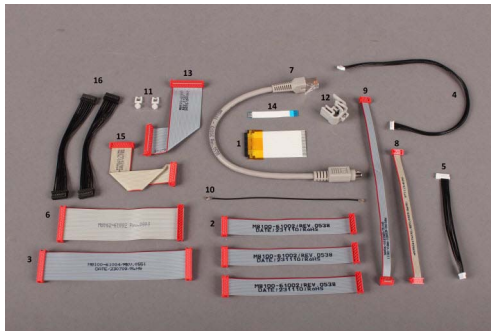
### Small Parts Kit 1 Contents (misc.) - 453564107751



| Description                    | Quantity | No. in Photo |
|--------------------------------|----------|--------------|
| Light pipes                    | 1        | 1            |
| SRL Cover                      | 1        | 2            |
| Recorder Cover                 | 1        | 3            |
| Cover battery opening          | 1        | 4            |
| Sound Tube                     | 1        | 5            |
| O-Ring Loudspeaker             | 1        | 6            |
| Front Cover (with Quick mount) | 1        | 7            |
| Front Cover (w/o Quick mount)  | 1        | 8            |
| Power On / Off Button          | 1        | 9            |
| Holder Power Button Assy       | 1        | 9            |
| White Pins                     | 2        | 10           |
| Screw Torx M2.5*8              | 6        | 11           |
| Screw Torx M3*8 w/ washer      | 10       | 11           |

| Description                | Quantity | No. in Photo |
|----------------------------|----------|--------------|
| Screw Torx M4*25 w/ washer | 8        | 11           |
| Screw Torx M4*12 w/ washer | 4        | 11           |
| Screw Torx M3*12           | 4        | 11           |
| Screw Torx K30*8           | 4        | 11           |
| Screw K25*8                | 7        | 11           |
| Screw K25*5 (black)        | 3        | 11           |
| Foot                       | 4        | 12           |
| Pin for Recorder Cover     | 1        | 13           |
| MSL Holder                 | 1        | 14           |
| Frame ECG Out Connector    | 1        | 15           |

### Small Parts Kit 2 Contents (cables) - 453564107761

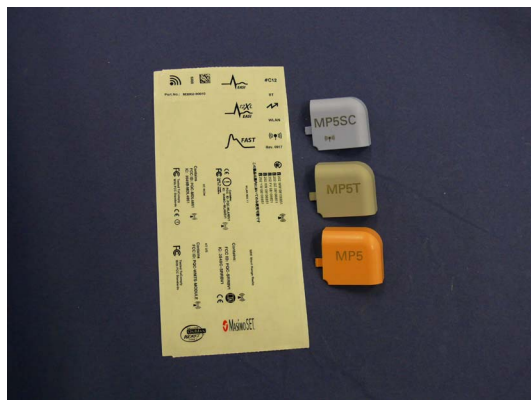


| Description                       | Quantity | No. in Photo |
|-----------------------------------|----------|--------------|
| TFT Display Flex Cable            | 1        | 1            |
| FE cables                         | 3        | 2            |
| FE2 cable                         | 1        | 3            |
| Backlight inverter cable          | 1        | 4            |
| LED-Backlight cable               | 1        | 5            |
| Recorder cable                    | 1        | 6            |
| WLAN Assembly cable<br>Version 1  | 1        | 7            |
| WLAN Assembly cable<br>Version 2  | 1        | 8            |
| IIT Assy cable                    | 1        | 9            |
| WLAN & IIT Antenna cable,<br>coax | 1        | 10           |
| Holder IIT Antenna cable          | 2        | 11           |
| WLAN bracket                      | 1        | 12           |
| MSL Cable                         | 1        | 13           |
| Flex Cable Predictive Temp.       | 1        | 14           |



| Description | Quantity | No. in Photo |
|-------------|----------|--------------|
| SRR Cable   | 1        | 15           |
| mCO2 Cable  | 2        | 16           |

#### IV-MP5 Parts Kit MP5/MP5T/MP5SC brand covers - 453564219911



| Description                      | Quantity |
|----------------------------------|----------|
| IV-MP5 Cover Brand               | 1        |
| IV-MP5T Cover Brand              | 1        |
| IV-MP5 Cover Brand MP5SC         | 1        |
| MP2/X2/MP5 Label sheet incl. SRR | 1        |

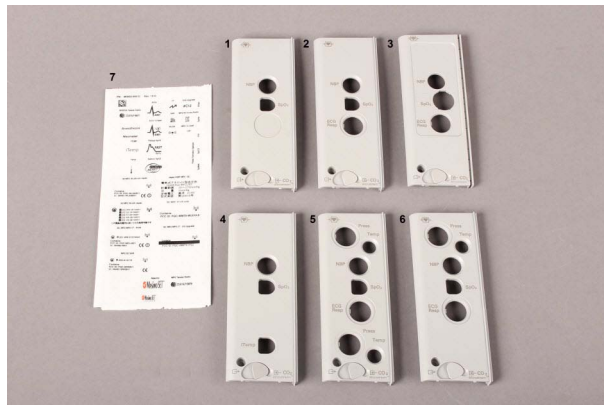
#### MP5 FE Cover Kit, text without mCO2- 453564219921



| Description                              | Quantity | No. in Photo |
|--|----------|--------------|
| IV-MP5 Cvr txt NBP/SpO2                  | 1        | 1            |
| MP5 FE Cvr txt ECG/NBP/SpO2              | 1        | 2            |
| MP5 FE Cvr txt ECG/NBP/SpO2/2xBP/2xTemp  | 1        | 3            |
| MP5 FE Cvr txt ECG/NBP/SpO2/TAAP/BP/Temp | 1        | 4            |

| Description                                  | Quantity | No. in Photo |
|--|----------|--------------|
| MP5 FE Cvr txt ECG/NBP/SpO2/BP/Temp          | 1        | 5            |
| MP5 FE Cvr txt ECG/NBP/Rainbow SpO2          | 1        | 6            |
| IV-MP5 Cvr txt NBP/Rainbow SpO2              | 1        | 7            |
| IV-MP5 Cvr txt NBP/SpO2/Pred.Temp            | 1        | 8            |
| MP5 FE Cvr txt ECG/NBP/SpO2/predTemp         | 1        | 9            |
| MP5 FE Cvr txt ECG/NBP/SpO2/BP/Temp/predTemp | 1        | 10           |
| MP5 FE Cvr txt ECG/NBP/SpO2/TAAP/predTemp    | 1        | 11           |
| MP5 FE Cvr txt ECG/NBP/SpO2/BP/Temp/CO2      | 1        | 12           |
| MP5 FE Cvr txt ECG/NBP/Rainbow SpO2/predTemp | 1        | 13           |
| MP5 FE Cvr txt ECG/NBP/Rainbow SpO2/BP/Temp  | 1        | 14           |
| MP2/X2/MP5 Label Sheet incl. SRR             | 1        | 15           |
| Bezel cover clip Tympanic Temp               | 1        | 16           |

### MP5 FE Cover Kit, text with mCO2 - 453564219931



| Description                      | Quantity | No. in Photo |
|----------------------------------|----------|--------------|
| IV-MP5 Cvr txt NBP/SpO2/mCO2     | 1        | 1            |
| IV-MP5 Cvr txt ECG/NBP/SpO2/mCO2 | 1        | 2            |

| Description                                      | Quantity | No. in Photo |
|--|----------|--------------|
| IV-MP5 Cvr txt ECG/NBP/<br>Rainbow SpO2/mCO2     | 1        | 3            |
| IV-MP5 Cvr txt NBP/SpO2/iTemp/<br>mCO2           | 1        | 4            |
| IV-MP5 Cvr txt ECG/NBP/SpO2/<br>2xBP/2xTemp/mCO2 | 1        | 5            |
| IV-MP5 Cvr txt ECG/NBP/SpO2/<br>BP/Temp/mCO2     | 1        | 6            |
| MP2/X2/MP5 Label Sheet incl.<br>SRR              | 1        | 7            |

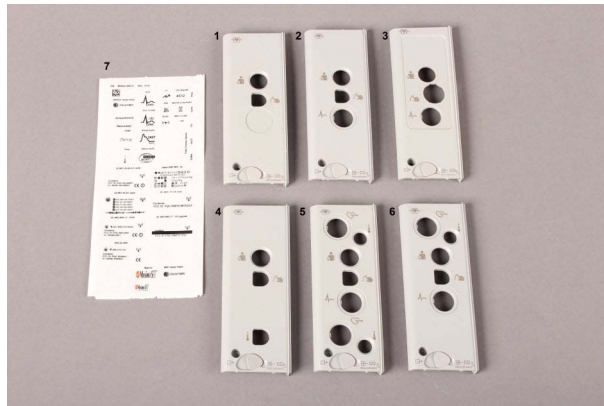
### MP5 FE Cover Kit, symbol without mCO2 - 453564219941



| Description                                       | Quantity | No. in Photo |
|---|----------|--------------|
| IV-MP5 Cvr symb NBP/SpO2                          | 1        | 1            |
| MP5 FE Cvr symb ECG/NBP/SpO2                      | 1        | 2            |
| MP5 FE Cvr symb ECG/NBP/SpO2/<br>2xBP/2xTemp      | 1        | 3            |
| MP5 FE Cvr symb ECG/NBP/SpO2/<br>TAAP/BP/Temp     | 1        | 4            |
| MP5 FE Cvr symb ECG/NBP/SpO2/<br>BP/Temp          | 1        | 5            |
| MP5 FE Cvr symb ECG/NBP/<br>Rainbow SpO2          | 1        | 6            |
| IV-MP5 Cvr symb NBP/Rainbow SpO2                  | 1        | 7            |
| IV-MP5 Cvr symb NBP/SpO2/<br>Pred.Temp            | 1        | 8            |
| MP5 FE Cvr symb ECG/NBP/SpO2/<br>predTemp         | 1        | 9            |
| MP5 FE Cvr symb ECG/NBP/SpO2/<br>BP/Temp/predTemp | 1        | 10           |

| Description                                   | Quantity | No. in Photo |
|---|----------|--------------|
| MP5 FE Cvr symb ECG/NBP/SpO2/TAAP/predTemp    | 1        | 11           |
| MP5 FE Cvr symb ECG/NBP/SpO2/BP/Temp/CO2      | 1        | 12           |
| MP5 FE Cvr symb ECG/NBP/Rainbow SpO2/predTemp | 1        | 13           |
| MP5 FE Cvr symb ECG/NBP/Rainbow SpO2/BP/Temp  | 1        | 14           |
| MP2/X2/MP5 Label Sheet incl. SRR              | 1        | 15           |
| Bezel cover clip Tympanic Temp                | 1        | 16           |

### MP5 FE Cover Kit, symbol with mCO2 - 453564219951



| Description                                   | Quantity | No. in Photo |
|---|----------|--------------|
| IV-MP5 Cvr symb NBP/SpO2/mCO2                 | 1        | 1            |
| IV-MP5 Cvr symb ECG/NBP/SpO2/mCO2             | 1        | 2            |
| IV-MP5 Cvr symb ECG/NBP/Rainbow SpO2/mCO2     | 1        | 3            |
| IV-MP5 Cvr symb NBP/SpO2/iTemp/mCO2           | 1        | 4            |
| IV-MP5 Cvr symb ECG/NBP/SpO2/2xBP/2xTemp/mCO2 | 1        | 5            |
| IV-MP5 Cvr symb ECG/NBP/SpO2/BP/Temp/mCO2     | 1        | 6            |
| MP2/X2/MP5 Label Sheet incl. SRR              | 1        | 7            |

## MP5T Cover Kit - M8105-64006 (451261021161)



| Description                             | Quantity | No. in Photo |
|---|----------|--------------|
| MP5T FE Cvr txt NBP/TAAP                | 1        | 1            |
| MP5T FE Cvr txt NBP/SpO2/TAAP           | 1        | 2            |
| MP5T FE Cvr txt NBP/SpO2/TAAP/predTemp  | 1        | 3            |
| MP5T FE Cvr symb NBP/TAAP               | 1        | 4            |
| MP5T FE Cvr symb NBP/SpO2/TAAP          | 1        | 5            |
| MP5T FE Cvr symb NBP/SpO2/TAAP/predTemp | 1        | 6            |
| MP5T Cover Brand                        | 1        | 7            |
| MP5T Cover Brand SRR                    | 1        | 8            |
| Cover ECG Synch.p                       | 1        | 9            |
| MP2/X2/MP5 Label Sheet incl. SRR        | 1        | n/a          |

## 5/6 Lead vs. 12 Lead ECG Capability Identification

### MP5 with Rev. E

There is no visible mark on the MP5 housing that indicates whether or not the ECG 12-lead option is enabled.

The Front End 1 part number of the MP5 (located on the label on the white housing cover of the Front End 1) indicates the ECG 12-lead option. The following table lists the respective parts to be ordered and then upgraded to 12 Lead support using the Support Tool Rev. G or higher.

| Reference Part No. on FE1 Cover | 12NC         | Part No. Exchange | Part Description            |
|---------------------------------|--------------|-------------------|-----------------------------|
| M8105-60040/<br>M8105-68040     | 451261019081 | M8105-68040       | MP5 FE ECG/NBP/SpO2         |
| M8105-60042/<br>M8105-68042     | 451261019101 | M8105-68042       | MP5 FE ECG/NBP/SpO2/BP/Temp |

| Reference Part No. on FE1 Cover | 12NC         | Part No. Exchange | Part Description         |
|---------------------------------|--------------|-------------------|--------------------------|
| M8105-60044/<br>M8105-68044     | 451261019121 | M8105-68044       | MP5 FE ECG/NBP/SpO2/CO2  |
| M8105-60046/<br>M8105-68046     | 451261019131 | M8105-68046       | MP5 FE ECG/NBP/SpO2/TAAP |

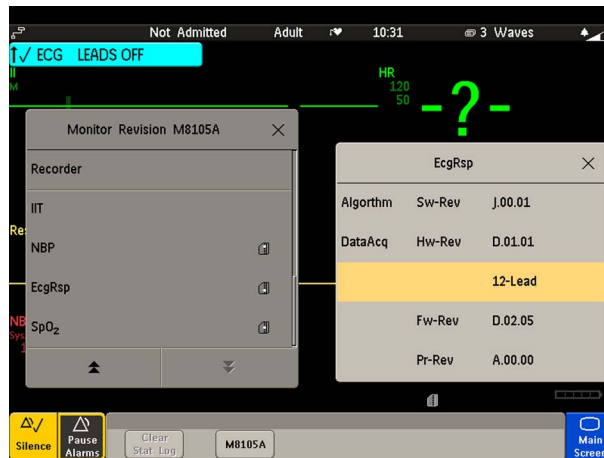
Additionally, the following procedure can be used to verify whether or not the ECG 12-lead option is enabled:

- 1 Power on the MP5 without an ECG cable attached.
- 2 Open the ECG menu.
- 3 Select Lead II as primary lead.
- 4 Check the selection list for the secondary lead; if all V leads (V1 - V6) are visible and selectable, the MP5 has the 12-Lead option.

### MP5 with Rev. F and higher

Beginning with Software Revision F, the ECG 12-lead option can be identified by viewing the ECG/Resp Revision screen. To do this:

- 1 Select **Main Setup**
- 2 Select **Revision**
- 3 Select **ECG/Resp**
- 4 An onscreen window indicates the Hardware and Software Revisions of the ECG/Resp. The ECG capability is displayed as either 5,6 or 12-lead.



Additionally, the MP5 may be marked with the 12XL label as shown below.



For the support part numbers of the Front End 1 offering 5-lead support (and 6-lead support running with ECG Firmware Rev. D.02.05 and Monitor SW Rev. F.xx.xx) refer to “Exchange and Replacement Parts” on page 188. If 12 Lead support is required, the Support Tool Rev. G or higher must be used to upgrade the respective exchange part.

## External Display Part Numbers (not for MP5T)

| Part number  | 12NC         | Description   |
|--------------|--------------|---|
| M8031B       | 862137       | 15in TFT Touch XGA Display (FIMI)                   |
| M8031-68001  | 451261001941 | IV DSPL 15" Medical Grade w Touch                   |
| M8031-60005  | 451261001921 | IV ASSY-PWR 12V for M8031B Display                  |
| M8031-64001  | 451261001931 | IV ASSY Pwr Supply Holder 15"/19" displ             |
| M8033-04701  | 453563480981 | IV DSPL Desk Stand for M8033A/M8033B                |
| 2090-0985    | 451261014381 | DSPL Backlights (2x) (Version 2)                    |
| 2090-0860    | 453563463201 | Backlights (2x) (Version 1)                         |
| M8033C       | 862212       | 17 in. TFT Touch (S)XGA Display                     |
| M8033-68071  | 451261009161 | IV DSPL 17" Medical Grade with Touch                |
| M8031-04701  | 451261001901 | IV MECHASY Mon Desk Stand M8031B/M8033C             |
| M8033-64603  | 451920880311 | IV DSPL Backlights for M8033C                       |
| 453564263911 | 453564263911 | IV MECHASY 17" display replacement kit <sup>1</sup> |
| 865299       | 865299       | 19 in. TFT Touch (S)XGA Display                     |
| 453564116741 | 453564116741 | ASSY-PWR - E539821 Power Brick - 12V                |
| 453564179151 | 453564179151 | IV DSPL 19" Medical Grade w Touch 865299            |
| M8031-64001  | 451261001931 | IV ASSY Pwr Supply Holder 15"/19" displ             |



## Ordering Information for M8033C Replacement Parts

### M8033C Replacement Parts for Countries WITH Regulatory Clearance for the 19" Display:

If service is required on an M8033C 17" display, and it is replaced as part of the service, it must be replaced by the following 19" display and the appropriate mounting hardware:

| Part Number   | Description                            |
|---------------|--|
| 453564263911* | IV MECHASY 17" display replacement kit |
| 453564179151* | IV DSPL 19" Medical Grade w/ Touch     |

\* Both the 453564263911 IV MECHASY 17" display replacement kit and the 453564179151 IV DSPL 19" Medical Grade w/Touch must be ordered.

Currently, the 19" display does not have regulatory clearance in all countries. For this reason, some countries will continue to receive the 17" display replacement kits as indicated below until regulatory clearance is received for the 19" display. All countries that do have regulatory clearance for the 19" display will receive that display.



### M8033C Replacement Parts for Countries WITHOUT Regulatory Clearance for the 19" Display:

| Old Part Number | Description                          |
|-----------------|--------------------------------------|
| M8033-68071     | IV DSPL 17" Medical Grade with Touch |

#### NOTE

Please check SAP ordering notes regarding regulatory clearance

## Tympanic Thermometer Part Numbers

| Part Number    | Description                                      | Image   |
|----------------|--|---|
| 989803180831   | Genius 2 tympanic temperature probe (commercial) |   |
| 453564507601   | Probe, Tympanic Temperature, OEM                 |   |
| 4535 634 84591 | MIB cable 1,5 m                                  |  |
| 4535 634 84601 | MIB cable 3,0 m                                  |   |

## Smart Battery Charger Part Numbers

| Part number | 12NC         | Description                            |
|-------------|--------------|--|
| M8043-68000 | 453563498911 | BAT Smart Battery Conditioner (LG1480) |
| M8043-60010 | 451261001281 | EMCH Repl Kit 2 Air-Fan+2 Filter-Mats  |
| M8043-60011 | 451261001291 | FLTR Repl. Kit: 2 Filter-Mats          |

# Test and Service Tools

**Table 1 UTP LAN Crossover**

| Part number | 12NC         | Description                  |
|-------------|--------------|------------------------------|
| M3199-60101 | 453563337371 | PIC CBL NI 3FT CROSSOVER UTP |
| M3199-60102 | 453563337381 | NI CBL UTP Crossover 12ft    |

**Table 2 Grounding**

| Part number | 12NC         | Description                          |
|-------------|--------------|--------------------------------------|
| 8120-4808   | 453563199211 | CMS CBL EXT GND ASSY (gnd lug con)   |
| 8120-2961   | 453563198651 | CMS CBL EXT GND ASSY(Crocodile clip) |

**Table 3 Test Cables**

| Part number  | 12NC         | Description                            |
|--------------|--------------|--|
| 451261026081 | 451261026081 | CBL Safety Test ECG                    |
| 451261026141 | 451261026141 | CBL Safety Test IBP                    |
| 451261026041 | 451261026041 | CBL Safety Test SpO2 (MMS/M1020B)      |
| 453564427181 | 453564427181 | IV CBL Safety Test SpO2 Rainbow        |
| 451261026131 | 451261026131 | CBL Safety Test Temp                   |
| 451261026031 | 451261026031 | CBL Safety Test CO2 (M3014A)           |
| 451261026051 | 451261026051 | CBL Safety Test TAAP                   |
| 451261026061 | 451261026061 | CBL Safety Test predictive Temperature |
| 453564127781 | 453564127781 | CBL Safety Test IntelliBridge          |
| 453564421601 | 453564421601 | IM CBL IRTemp test cable               |

**Table 4 Capnography - Respironics Mainstream**

| Part number | 12NC | Description            |
|-------------|------|------------------------|
| M2506A      |      | GAS Verification Gas   |
| M2505A      |      | GAS CYLINDER REGULATOR |

**Table 5 Capnography - Respironics Sidestream**

| Part number | 12NC         | Description                     |
|-------------|--------------|---------------------------------|
| M2267A      | 989803106081 | Calibration Regulator           |
| 13907A      | 989803100361 | Calibration Tube Assembly       |
| M1026-60144 | 453563230731 | M_AGM Electronic Mass FlowMeter |
| M2506A      |              | GAS Verification Gas            |

| Part number                | 12NC         | Description                           |
|----------------------------|--------------|---------------------------------------|
| M2776A                     |              | Straight Sample Line                  |
| <b>Capnography Sensors</b> |              |                                       |
| M2741-68000                | 451261011291 | SNSR M2741A Sidestream Sensor, Exch   |
| M2501-68000                | 451261006391 | MS_MCO2 M2501A MainstreamSensor, Exch |
| M2741-60000                | 451261011731 | Mounting Bracket Replacement          |

Table 6 Capnography - Microstream Oridion

| Part number  | 12NC         | Description                           |
|--------------|--------------|---------------------------------------|
| M1013-64002  | 451261014851 | M_G1 IV G1/G5 Leakage Test Kit        |
| 15210-64010  | 989803100841 | GAS Cal 1 cylinders for TCPC02, 6/bx. |
| 15210-64020  | 989803100851 | GAS Cal 2 Cylinders for TCPC02, 6/bx. |
| M2267A       | 989803106081 | Calibration Regulator                 |
| M3015-47301  | 989803143081 | MS_SCO2 LBSPLY Calibration Line       |
| 13907A       | 989803100361 | Calibration Tube Assembly             |
| 453564178121 | 453564178121 | M_AGM Flowmeter TSI                   |

Table 7 Predictive Temperature

| Part number  | 12NC         | Description                         |
|--------------|--------------|-------------------------------------|
| 453564033691 | 453564033691 | SS EMCH Temperature Calibration Key |



# Installation Instructions

Installation should be carried out by qualified service personnel, either by the hospital's biomedical department, or by Philips Support.

The monitor is suitable for use in all medically used rooms which fulfil the requirements regarding electrical installation according to IEC60364-7-710 "Requirements for special installations or locations - Medical locations, or corresponding local regulations.

The following measurements and system interfaces are, in addition, suitable for use in establishments directly connected to the public low-voltage supply network that supplies buildings used for domestic purposes (see table in Electromagnetic Emissions below):

- ECG/Respiration, NBP, SpO<sub>2</sub>, Pressure, Temperature, CO<sub>2</sub> (only Mainstream Sensor M2501A)
- LAN, Video Out, Battery, Nurse Call, RS232, and recorder interfaces

If you have purchased a "customer-installable bundle", it is assumed that your own hospital personnel (biomedical engineer or technician) will install and, if necessary, configure the monitor. You can contact Philips Support for assistance if required; any assistance will be associated with additional costs.

For mechanical and electrical installation, you need technically qualified personnel with a knowledge of english. Additionally, for monitor configuration, you need clinically qualified personnel with a knowledge of the use environment.

Installation in ambulances, airborne systems or helicopters must be performed by Philips service personnel. The monitor may not be installed in airborne systems or helicopters in the EU.

**As the first step in preparing the monitor for use, follow the installation instructions given in this chapter.**

## Out-Of-Hospital Transport - Standards Compliance

The MP5 patient monitor with measurements and interfaces other than those listed below, and the MP5T and MP5SC cannot be used for patient transport outside of the hospital environment.

The MP5 patient monitor with the following measurements and interfaces:

- ECG/Respiration, NBP, SpO<sub>2</sub>, Pressure, Temperature, CO<sub>2</sub> (only Mainstream Sensor M2501A) and Microstream CO<sub>2</sub>
- LAN, Video Out, Battery, Nurse Call, RS232, and recorder interfaces

can be used in a transport environment such as a road ambulance, airplane or helicopter. For this purpose the monitor fulfils the following additional mechanical, EMC and environmental requirements:

## 7 Installation Instructions

- **Shock Tests** according to IEC TR 60721-4-7, Class 7M3. Test procedure according to IEC/EN 60068-2-27 (peak acceleration up to 100g).
- **Random Vibration** according to IEC TR 60721-4-7, Class 7M3. Test procedure according to IEC/EN 60068-2-64 (RMS acceleration 5g).
- **Sinusoidal Vibration** according to IEC TR 60721-4-7, Class 7M3. Test procedure according to IEC/EN 60068-2-6 (acceleration up to amplitude 2g).
- **Bump Test** according to IEC/EN60068-2-29 (peak acceleration 15g, 1000 bumps).
- **Free Fall Test** according to EN1789 (covers also IEC TR 60721-4-7 and Class 7M3). Test procedure according to EN 60068-2-32 (height 0.75 m).
- Specification for degrees of protection provided by enclosures according to **IEC/EN 60529: IP 32**
- **EN 1789 +A1:2003** Medical vehicles and their equipment - Road ambulances (chapter 6 - Medical Devices).
- **Radiated susceptibility 20 V/m** according to EN ISO 9919 (SpO<sub>2</sub>) and EN ISO 21647 (CO<sub>2</sub>).
- **Altitude Range** from -500 to 3000 m operating and -500 to 4600 m storage and transportation.
- **Extended radiated susceptibility** tests
  - GSM-900: Immunity at 900 MHz (uplink mobile phone), 20 V/m, Pulse/Pause Ratio 1:7
  - GSM-1800: Immunity at 1800 MHz (uplink mobile phone), 20 V/m, Pulse/Pause Ratio 1:7
  - DECT: Immunity at 1800 MHz (digital cordless phone), 20 V/m, Pulse/Pause Ratio 1:23
  - AM: 1kHz Immunity from 80 MHz to 1.0 GHz (any radio communication unit; Broadcasting and TV transmitters), 20 V/m, modulation factor 80%

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### CAUTION

Temperature measurement accuracy may be compromised in the presence of strong electromagnetic fields (>3 V/m) in certain small frequency bands.

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- **Magnetic Field emission** according to MIL STD 461E, Chapter RE101: Radiated emissions, magnetic field, 30 Hz to 100 kHz
- **Magnetic Field susceptibility:** Radiated susceptibility, magnetic field, 50, 60 and 400 Hz, 18 µT(15 A/m)
- **Operating ambient temperature** testing over the range from 0 to 40 °C (32 to 100 °F).
- **Operating ambient humidity** testing up to 95% RH at 40 °C (100 °F), non condensing.

### NOTE

There may be additional requirements for transport situations in air, on water or in difficult terrain in certain countries, e.g. EU.



## Electromagnetic Emissions

The monitor is suitable for use in the electromagnetic environment specified in the table below. You must ensure that it is used in such an environment.

| Emissions test                     | Compliance | Avoiding Electromagnetic Interference  |
|------------------------------------|------------|--|
| Radio Frequency (RF) emissions     | Group 1    | The monitor uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment  |
| RF emissions CISPR 11              | Class A    | The monitor is suitable for use in all establishments other than those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.   |
| RF emissions CISPR 11              | Class B    | The monitor, with the following measurements and interfaces:<br>ECG/Respiration, NBP, SpO2, Pressure, Temperature, CO2 (only Mainstream Sensor M2501A) and Microstream CO2<br>LAN, Video Out, Battery, Nurse Call, RS232, and recorder interfaces<br>is suitable for use in all establishments including those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic emissions IEC 61000-3-2   | complies   |  |
| Voltage fluctuations IEC 61000-3-3 | complies   |  |

## Electromagnetic Interference (SRR)

Commercially available Short Range Radio 802.15.4 transceivers operate at very low RF power levels to transmit data and need to have high sensitivity receivers to achieve a good link budget. Due to technological limitations the selectivity of the receiver is limited. Consequently, the SRR link is susceptible to other strong RF transmitters not only in the operating frequency band and 5% around it, but also to non-transient RF disturbances stronger than 1V/m at frequencies close to the operating frequency band (2.0 to 2.3 GHz)

## Installation Checklist

Use this checklist to document your installation.

| Step | Task   | Check Box when Task Done |
|------|--|--------------------------|
| 1    | Perform initial inspection of delivery, unpack and check the shipment (see “Unpacking and Checking the Shipment” on page 210”) |                          |
| 2    | Mount the monitor as appropriate for your installation (see “Mounting the Monitor” on page 226)                                |                          |

| Step | Task  | Check Box when Task Done |
|------|---|--------------------------|
| 3    | Connect the monitor to AC mains using the supplied power cord (see )  |                          |
| 4    | Perform Visual, Power On and Functional test blocks (see “Checking Out The Monitor” on page 233)                                |                          |
| 5    | Perform Safety Tests, if required by local laws and regulations (see “Checking Out The Monitor” on page 233)                    |                          |
| 6    | Load paper into the recorder, if present (see “Loading Paper” on page 236)  |                          |
| 7    | Check/set the time and date (see “Setting the Date and Time” on page 239)   |                          |
| 8    | Check that the country-specific default settings are appropriate (see “Checking Country-Specific Default Settings” on page 237) |                          |
| 9    | Perform System Test as necessary  |                          |

## Unpacking and Checking the Shipment

The monitor and any supporting options ordered are supplied packed in protective shipping cartons.

### Initial Inspection

Before unpacking, check the packaging and ensure that there are no signs of mishandling or damage.

Open the package carefully and remove the monitor and accessories.

Check that the contents are complete and that the correct options and accessories have been delivered

| System Components, Accessories and Supplies            | Comments |
|--|----------|
| Monitor with options as ordered                        | 1        |
| ECG accessories (not for MP5SC)                        | optional |
| NBP accessories  | 1        |
| SpO <sub>2</sub> accessories                           | optional |
| Pressure accessories (not for MP5T and MP5SC)          | optional |
| Temperature accessories (not for MP5T and MP5SC)       | optional |
| Predictive Temperature accessories                     | optional |
| CO <sub>2</sub> Accessories (not for MP5T and MP5SC)   | optional |
| Microstream CO <sub>2</sub> Accessories (not for MP5T) | optional |
| Recorder paper   | optional |
| Power Cord   | 1        |
| Telemetry Interface cable (not for MP5SC)              | optional |
| Measurement Link (MSL) cable (not for MP5T and MP5SC)  | optional |
| Instructions for Use                                   | 1        |
| Quick Guide  | 1        |

| System Components, Accessories and Supplies                            | Comments |
|--|----------|
| Documentation CD-ROM (includes Service Guide and Instructions for Use) | 1        |

### Electrical Inspection

The instrument has undergone extensive testing prior to shipment. All tests are described in the *Testing and Maintenance* section of this manual. Additional tests may be required according to local requirements.

## Claims for Damage and Repackaging

### Claims for Damage

When the equipment is received, if physical damage is evident or if the device does not meet the specified operational requirements of the patient safety checks or the extended self check, notify the carrier and the nearest Philips Sales/Support Office at once. Philips will arrange for immediate repair or replacement of the instrument without waiting for the claim settlement by the carrier.

### Repackaging for Shipment or Storage

If the instrument is to be shipped to a Philips Sales/Support Office, securely attach a label showing the name and address of the owner, the instrument model and serial numbers, and the repair required (or symptoms of the fault). If available and reusable, the original Philips packaging should be used to provide adequate protection during transit. If the original Philips packaging is not available or reusable please contact the Philips Sales/Support Office who will provide information about adequate packaging materials and methods.

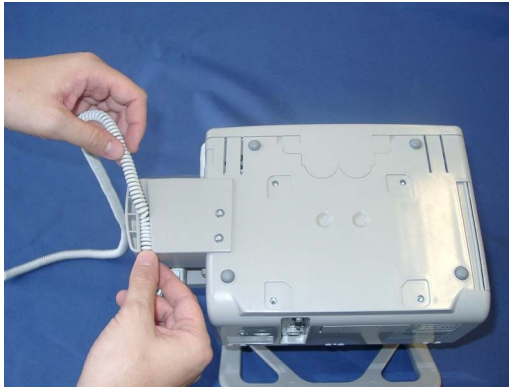
## Installing the Predictive Temperature Probe

- 1 Attach the probe connector to predictive temperature assembly.



## 7 Installation Instructions

- 2 Insert the probe cable into the slot provided at the bottom of the predictive temperature assembly.



- 3 Insert the probe holder as shown below.



- 4 Insert the probe into its holder.



# Installing the Tympanic Thermometer

- 1 Insert the communication cable into the RJ45 connector until it clicks into place. Then route the communication cable through one of the channels in the base station.



- 2 Attach the mounting plate or mounting clamp to the base station. See “Mounting the Tympanic Thermometer Base Station” on page 214 for details.
- 3 Insert the thermometer cable into the base station by aligning the white arrows on the cable connector and the base station.



- 4 Route the cable through the strain relief in the base station.



- 5 Insert the probe covers into the base station. Up to two units of 16 probe covers each can be stored within the base station.

## 7 Installation Instructions

- 6 Insert the thermometer into the base station until it clicks into place.



- 7 Insert the other end of the communication cable into the appropriate port of the monitor.

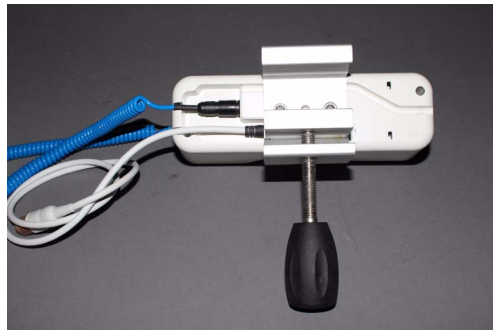
### NOTE

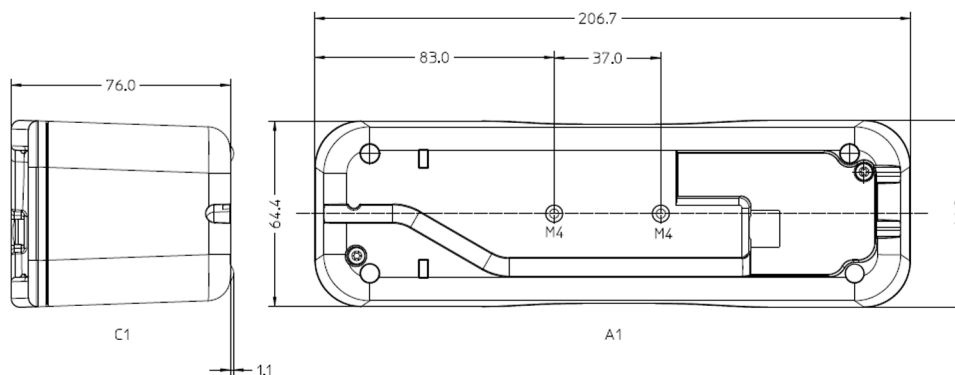
When disconnecting the thermometer cable from the base station, **DO NOT** twist the connector. Pull on the ring of the connector to disconnect the cable.

## Mounting the Tympanic Thermometer Base Station

The Tympanic Thermometer can be mounted either to the wall using a mounting plate or to a pole or rail mount using the Universal Mounting Clamp.

The picture below shows as an example, how the mounting clamp is attached to the Tympanic Thermometer Base Station.



**Mounting Interface:**

## Tympanic Thermometer Biotech Mode

**NOTE**

To access biotech mode, the tympanic thermometer must be switched off and with no probe cover on the probe.

The biotech function is used to select the operational mode of the thermometer and to verify the installed software version. All operational mode settings in biotech mode are stored in nonvolatile memory and retained through system power cycles, such as changing batteries. All factory calibration parameters are also stored in nonvolatile memory.

The factory default settings are shown below:

|                  |               |
|------------------|---------------|
| Temperature mode | °C (unlocked) |
| Site mode        | Ear           |
| Site text        | On            |

The biotech mode is accessed by pressing and holding the timer and °C/°F buttons for four seconds. All LCD segments will light for one second, the thermometer will issue a single beep, and the display will show scrolling dashes. Pressing the timer button cycles through the biotech modes. When options are available within a mode, the °C/°F button cycles through the options.



Pressing the timer button after the site text display will return the user to the installed software version. To exit biotech mode, two options are available: (1) press and hold the °C/°F and timer buttons for one second, or (2) the device will automatically exit biotech mode after about 30 seconds of inactivity. Any changes are saved.

The biotech mode sequence is shown below:

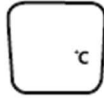
**Software version**

Displays the installed software version of device. Where “00” is the current software version.



### Temperature mode

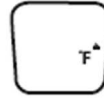
°C (unlocked)



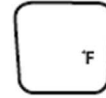
Locked °C



Locked °F



°F (unlocked)



### Site mode

Oral



Core



Rectal



Ear



### Site text

Pressing the °C/°F button when in this mode turns the body site text labels on or off. The labels will remain on when an “X” appears inside the box icon, and the text will remain off when the box is empty.



## Installing the HS1-R Barcode Reader

This section describes how to install and test the HS1-R (2D) Barcode Scanners. It does not apply to the HS1 Barcode Scanner without RFID functionality. The HS1-R Barcode Scanner is easily identifiable by the RFID symbol.







## Supported Barcode Symbolologies

The 2D barcode scanner can read the following barcode symbolologies:

- Composite Code
- Code 128
- Code 39
- Codabar
- Interleaved 2 of 5
- Code 11
- Code 93
- Matrix 2 of 5
- MSI Plessey
- Straight 2 of 5 (IATA)
- EAN (Default Setting: OFF)
- PDF 417
- UPC (Default Setting: OFF)
- Aztec
- Data Matrix
- Maxicode
- QR Code
- Micro PDF
- RSS-14
- GS1 Formatting

## Installation Instructions

Plug the barcode reader into the USB connector of your IntelliVue patient monitor. See the section "Connection of USB devices" in this Service Guide for details. You can either use the barcode scanner as provided on delivery or use the JADAK Programming Service to have it configured to suit your needs.

## Using the Barcode Scanner with Default Settings

The Barcode Scanner is preconfigured by the manufacturer with the following default settings:

- **RFID Mode:** RFID-Off
- **Beeper Mode:** Beeper Off
- **Vibration Mode:** Vibrates on positive Reading
- **Keyboard Country:** Keyboard Country US
- **Barcode Symbologies:** Enable all one and two dimensional codes except for retail symbologies (UPC and EAN)
- **Barcode Formatting:** No additional formatting of barcode like prefix, suffix, carriage return or separators

To reset the barcode scanner to these default settings, scan the following barcode:






In addition, you can change the settings for RFID, Serial Number Mapping, Beeper Volume and Vibration using the barcodes below.

The RFID Reader (only applicable for HS1-R) can work in two different modes:







- In compatibility mode, the RFID reader can be used to read the serial number of any supported (ISO14443A/B or ISO15693 compliant) RFID tag. Depending on the Serial Number Mapping setting, the serial number of the tag will be used as one of the following items:
  - OperatorID
  - LocationID
  - MRN
  - Transaction ID
  - FirstName
  - MiddleName
  - LastName
- In standard mode (requires SW Rev. L.0 or higher), the reader additionally supports the IntelliVue ProxiTag (e.g. for assignment of CL pods).



### RFID MODE

|   |          |
|---|----------|
|  | RFID Off |
|---|----------|

|   |                            |
|---|----------------------------|
|  | RFID Compatibility Mode On |
|  | RFID Standard Mode On      |





## Serial Number Mapping

|   |                 |
|---|-----------------|
|    | No Mapping      |
|    | MRN/Lifetime ID |
|    | Transaction ID  |
|   | First Name      |
|  | Middle Name     |
|  | Last Name       |

|   |             |
|---|-------------|
|  | Location ID |
|  | Operator ID |


**Beeper Volume**

Note that when Beeper Volume is on (High/Medium/Low) the Beeper will only beep on a good reading or during power-up.

|   |                      |
|---|----------------------|
|   | Beeper Off           |
|  | Beeper Volume Low    |
|  | Beeper Volume Medium |
|  | Beeper Volume High   |




### Vibration







Note that when Vibration is on it will only vibrate on a good reading.




|   |               |
|---|---------------|
|  | Vibration Off |
|  | Vibration On  |

### Keyboard Country

Scan the appropriate country code below to program the keyboard for your country. For support of special or country-specific characters (e.g. @|\${#}{}[]=/'\<>~äöü), make sure that the monitor and the barcode scanner both have the same keyboard country setting.

|   |                  |
|---|------------------|
|  | English - US     |
|  | English - UK     |
|  | German - Germany |

|   |                     |
|---|---------------------|
|    | French - France     |
|    | French - Belgium    |
|    | Swedish - Sweden    |
|   | Norwegian - Norway  |
|  | Danish - Denmark    |
|  | Dutch - Netherlands |

|   |                       |
|---|-----------------------|
|  | Portuguese - Portugal |
|  | Italian - Italy       |
|  | Spanish - Spain       |

### Using the Programming Service

The barcode scanner manufacturer JADAK provides a programming service to simplify the configuration, to automatically detect the content of the barcode, e.g. operator Id from nurse badge, lifetime or encounter id from patient wristband, location from bed label, and to support 2D barcodes with multiple contents.

This service is offered free of charge for customers who purchase bar code scanners through Philips Healthcare.

If you wish to have JADAK program the barcode scanner for you, fill out the Programming Service Request Form (453564567201). The request form can be downloaded from InCenter. This form describes which information you need to provide. JADAK will then send you a programming barcode that contains your requested settings.



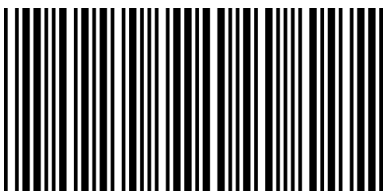
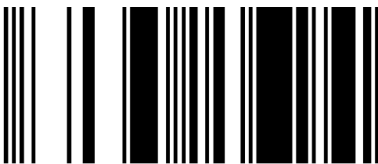


## Testing the Barcode Scanner

Use the following procedure to test the 2D barcode scanner. This test checks the scanner's ability to accurately read data and input that information into the monitor.

To perform the barcode scanner test:

- 1 Print the following sample barcodes:

| Symbology                     | Barcode  | Expected Output  |
|-------------------------------|--|------------------|
| QR Code                       |                           | abcd-12345       |
| Aztec                         |                          | abcd-12345       |
| Code 39                       | <br>*987654*           | 987654           |
| Reduced Space Symbology (RSS) | <br>(01)00000009876545 | 0100000009876545 |

### NOTE

\*The 01 will be displayed as 01 without the parentheses

- 1 Open the Quick Admit menu of your monitor.
- 2 Scan a barcode. The information written below the barcode should appear in the first recommended patient admission field (defined by the ADT Quick Admit configuration). If the barcode information does not appear, see the Troubleshooting section.

- 3 Press the Main Screen smartkey to close the menu.
- 4 Repeat steps 2 to 4 for each of the remaining barcodes.

### Cleaning the Barcode Scanner

- 1 Disconnect the scanner from the monitor.
- 2 Dampen a soft cloth with water (or a mild detergent-water solution). Wring any excess moisture from the cloth.
- 3 Wipe the surfaces of the scanner. If a detergent solution is used, rinse the scanner with a soft cloth dampened with water only.

Reading performance may degrade if the barcode scanner's window is not clean. If the window is visibly dirty, or if the scanner is not operating well:

- 1 Dampen a soft cloth or lens tissue with water (or a mild detergent-water solution). Wring any excess moisture from the cloth.
- 2 Clean the window. If a detergent solution is used, rinse the window with a soft cloth dampened with water only.

---

#### CAUTION

Do not submerge the barcode scanner in water. Do not use abrasive wipes or tissues on the scanner's window, as they may scratch the window. Never use solvents (for example acetone, benzene, ether, or phenol-based agents) on the housing or window. Solvents may damage the finish or the window.

---

### Mounting the Monitor

Every type of compatible mounting solution is delivered with a complete set of mounting hardware and instructions. Refer to the documentation delivered with the mounting hardware for instructions on assembling mounts.

---

#### WARNING

- It is the customer's responsibility to have the attachment of the mounting hardware to the ceiling, wall, or mounting rail and the construction of the ceiling, wall, or mounting rail evaluated for structural integrity and compliance with all local, state and any other required codes by a registered, professional, structural and/or mechanical engineer.  
Ensure that this commitment has been met before assembling mounts.
  - Incorrect mounting and use of inappropriate mounting material may lead to injury. It is the customer's responsibility to ensure that the mounting procedures have been performed correctly and the appropriate mounting devices have been used.
  - Perform the Mounting Integrity Test:
    - whenever you have removed and reassembled a quick mount
    - if one or more of the quick mount screws are loose
    - if the monitor mounting is unstablesee "Mounting Integrity Test" on page 92 for details.
-

Please mount the monitor using either the Philips Quick Mount or Fix Mount solution or another approved mounting solution. The mounting shall be done in a manner that no patient, operator or other person can be harmed by a monitor removed intentionally or released accidentally from the mount. When using the Quick Mount, be aware of the danger of accidental activation of the Quick Mount release button when lifting or moving items located under the monitor, such as pole mounts, etc. If in doubt, use the Philips Fix Mount solution to avoid such situations.

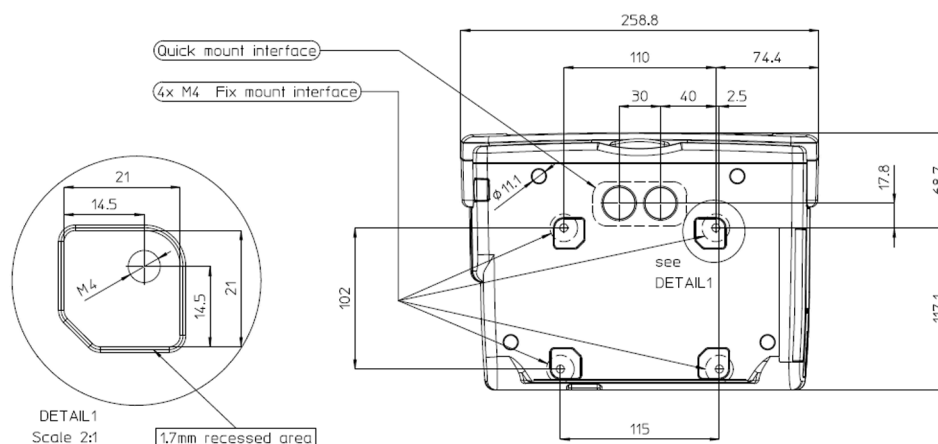
In most cases, the monitor will be delivered with the Philips Quick Mount as the default mounting solution. Exceptions are X2 / MP2 (not applicable for those monitors) and MP5/MP5T/MP5SC (Fix mount adapter plate is default).

## General Specifications for the Mounting Interface

### Fixed Mounting

Fixed mounting typically means a screw-fixed installation of a device to a mounting hardware. Torque specification depends on the max. extraction force (see below) and has to be defined and verified by the mounting supplier. It is recommended to use screws with locking coating.

| Specifications                          | Quantity | Unit | Comment   |
|---|----------|------|---|
| Number of mounting holes                | 4        | EA   |   |
| Diameter of through-holes               | n/a      | mm   |   |
| Thread type and diameter                | M4       | —    |   |
| Min. thread depth                       | 8.5      | mm   |   |
| Max. thread depth                       | 10       | mm   |   |
| Max. extraction force per thread insert | n/a      | N    | result of pull-out test divided by a safety factor of 2 |



### MP5 Mounting Interface

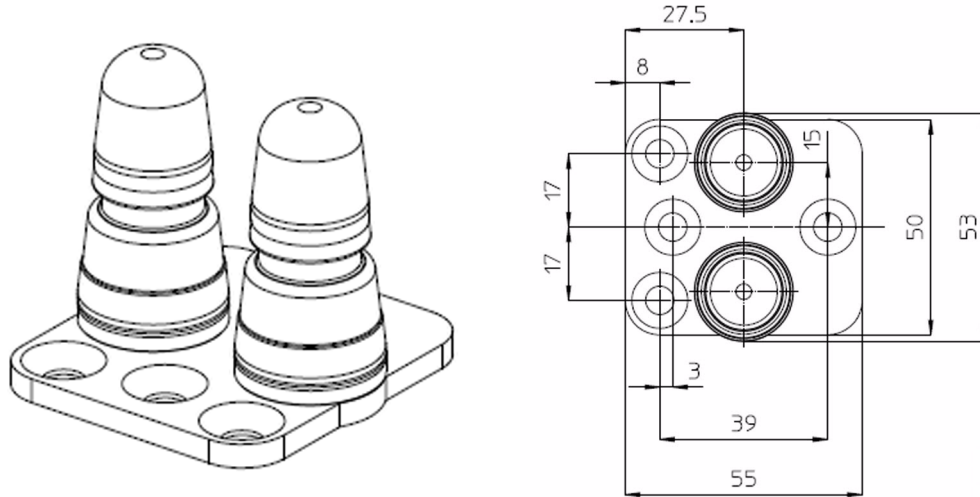
#### Quick-Release Mounting

Quick-Release mounting means a flexible installation to mounting hardware using the Philips Quick Mount without any tools. The Philips Table Mount is essential for this mounting solution.

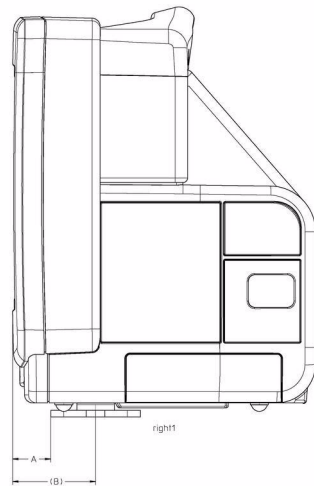
## 7 Installation Instructions

Mounting hardware for use with the Philips Quick Mount, must contain the Philips Table Mount as a counterpart. Similar looking cone plates by other manufacturers are not supported and must not be used.

For instructions on how to mount the monitor using the quick release Table Mount refer to the Assembly Instructions delivered with the mounting kit M8000-64100 or 453564239731.



*Table Mount*



*Table Mount - MP5 shown as an example*

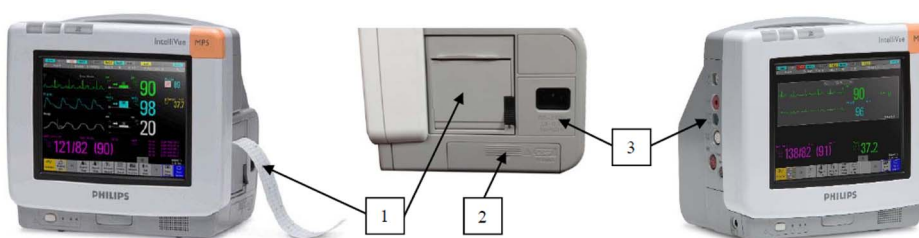
|         | A    | (B)  |
|---------|------|------|
| MP5     | 24   | 51.5 |
| MP20/30 | 85.5 | 113  |
| MP40/50 | 79.5 | 107  |

|         |    |      |
|---------|----|------|
| MP60/70 | 62 | 89.5 |
|---------|----|------|

### Restricted Areas

Mounting hardware must not restrict the typical use of the device. Therefore, the environmental and space requirements of the device must always be observed: e.g. vents area, swing range of movable components, cable slots and cable management, slots for Philips plug-in modules, bed mount area, Quick Mount openings, height restrictions.

- 1 Do not restrict the access to and use of the internal recorder
- 2 Do not block the battery door. Consider the swing range of the door and make sure it can be opened entirely.
- 3 Do not restrict access to connectors



### NOTE

If the interface for fixed mounting is intended for a fixed stationary installation using an additional adapter plate, use of the Quick Mount is no longer allowed. Due to the geometry of the plate, there is a danger that the Quick Mount lock will not function properly. In this case, the use of the Quick Mount must be prevented and the Quick Mount openings on the bottom of the device must be covered by this additional adapter plate.

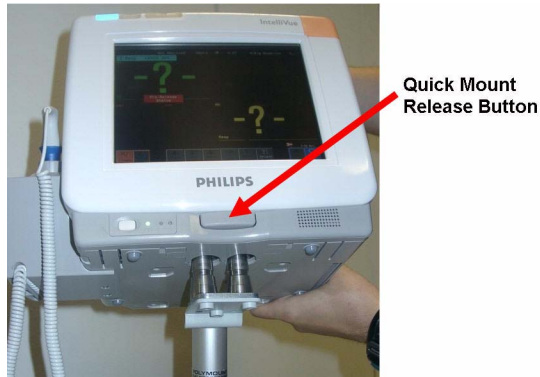
## Mounting the Monitor using the Quick Mount

Mounting the monitor using the quick mount requires an installed and functioning quick mount solution inside the monitor. This quick mount solution is optional and can also be purchased as an upgrade option. For details on installing the quick mount solution inside the monitor, refer to the Repair and Disassembly section.



## 7 Installation Instructions

The monitor with the internal quick mount solution is mounted onto the quick mount domes as shown below:



### NOTE

Make sure that the quick mount domes are properly and completely inserted into the quick mount solution of the monitor. This is signalled by a click.

---

### WARNING

When you press the quick mount release button, the release mechanism remains open for a delay time of a few seconds. During this time the monitor is easily removable from the tabletop mount domes and may fall down if lifted upwards.

---

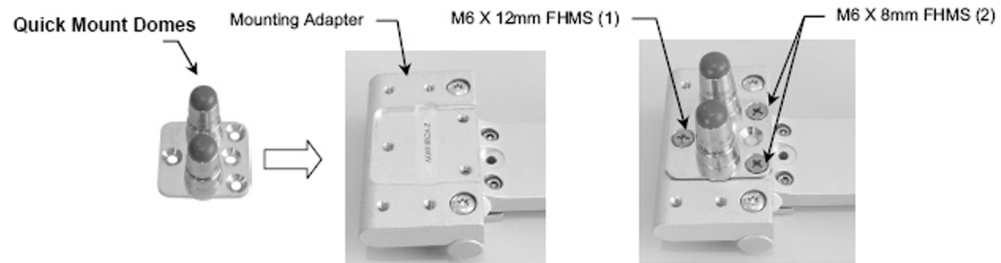
## Mounting the Monitor onto the Rollstand using the Quick Mount

The quick mount domes are attached to the rollstand with three M6x10 FHMS screws as shown below. For details see IfU provided with the rollstand.



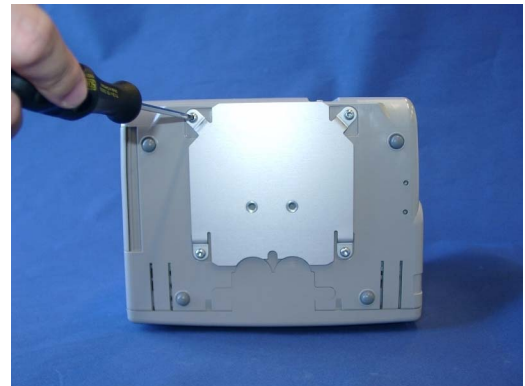
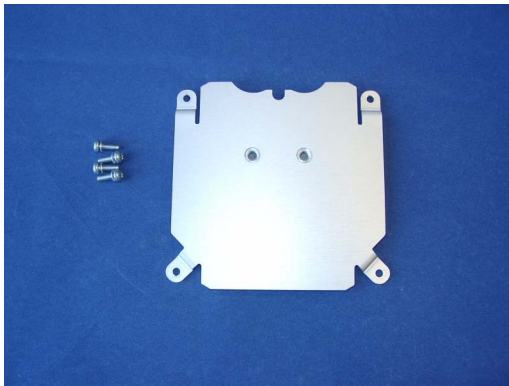
## Mounting the Monitor on the Wall Mount using the Quick Mount

The quick mount domes are attached to the wall mount with one M6x12 FHMS and two M6x8 FHMS screws. For details see IfU provided with the wall mount.



## Mounting the Monitor using the Mounting Plate (Fix Mount)

- 1 The mounting plate is attached to the monitor with four screws



- 2 Mount the mounting plate on a level surface with two screws.

### NOTE

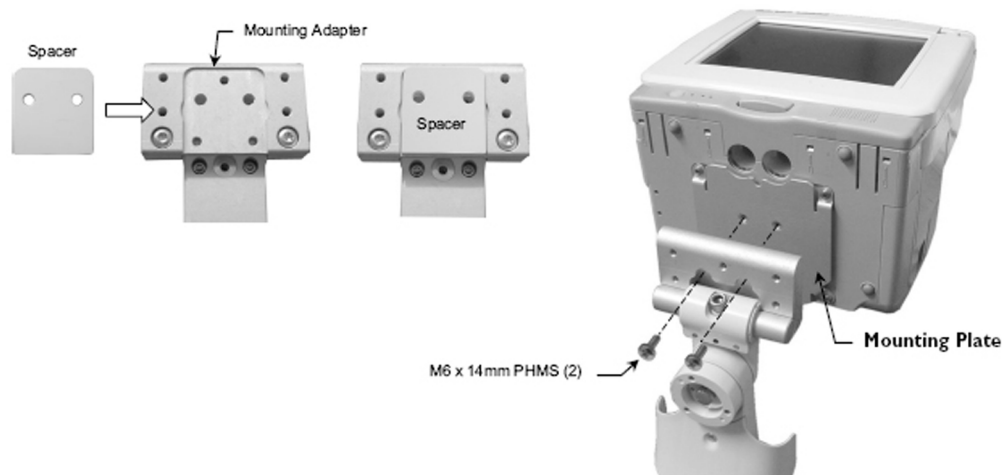
The mounting plate is not designed for out-of-hospital use (e.g. ambulance, helicopter, airplane)

### Mounting the Monitor onto the Rollerstand using the Mounting Plate

- 1 The monitor can be attached to the rollerstand as shown below. For details see the IfU provided with the rollerstand.



### Mounting the Monitor on the Wall Mount using the Mounting Plate



The mounting plate is attached to the wall mount with two M6x14 PHMS screws. For details see IfU provided with the wall mount.



**NOTE**

The mounting plate is not designed for out-of-hospital use (e.g. ambulance, helicopter, airplane).

## Connecting the Monitor to AC Mains

The monitor has a wide-range power supply that allows you to operate the monitor from an AC (alternating current) power source of 100 V to 240 V ( $\pm 10\%$ ) and 50/60 Hz ( $\pm 5\%$ ).

**WARNING**

- Always use the supplied power cord with the earthed mains plug to connect the monitor to an earthed AC mains socket. Never adapt the mains plug from the power supply to fit an unearthed AC mains socket.
- Do not use AC mains extension cords or multiple portable socket-outlets. If a multiple portable socket-outlet without an approved isolation transformer is used, the interruption of its protective earthing may result in enclosure leakage currents equal to the sum of the individual earth leakage currents, so exceeding allowable limits.
- Do not connect any devices that are not supported as part of a system.
- Any non-medical device placed and operated in the patient's vicinity must be powered via an approved isolation transformer that ensures mechanical fixing of the power cords and covering of any unused power outlets.
- The On/Standby switch does not disconnect the monitor from the AC power source. To disconnect, unplug the power cable.
- Always ensure that the monitor is positioned so that the AC power plug is easily accessible, to allow disconnection of the monitor from the AC power source.

## Checking Out The Monitor

The following table defines which tests and inspections need to be performed, and when they are required.

| Test         | Test or Inspection to be Performed  |
|--------------|---|
| Visual       | Inspect the monitor, measurement accessories and cables for any damage.<br>Are they free of damage?   |
| Power On     | Power on the monitor. Does it start up successfully without errors? Do all alarm lamps light up during power up?<br>After start up the monitor sounds a tone, and you can see the monitoring main screen (normally with measurement wave channels and numeric positions).   |
| Safety Tests | Perform safety tests, as described in the <i>Testing and Maintenance section</i> , for standalone devices if required by local laws and regulations, and each time you combine equipment to form a system, or exchange system components. Details of the safety tests and procedures are described in the <i>Testing and Maintenance section</i> . These safety tests are derived from international standards but may not always be sufficient to meet local requirements. |

| Test   | Test or Inspection to be Performed   |
|--------|--|
| System | Perform the system test according to IEC 60601-1-1, if applicable, after combining equipment to form a system. |

For test and inspection information regarding repairs, upgrades and all other service events, refer to the *Testing and Maintenance* section.

## Connections

The following figure shows the cable and interface board connections.



*MP5 System Interface Boards (Basic, Battery, Full, Full USB)*

### NOTE

The Nurse Call and RS232 connections are only available on the full system interface board. The basic system interface board only contains the LAN and the video connector. The battery system interface board only contains the LAN connector.

The Full USB system interface board provides LAN, Video, Nurse Call and USB connections and allows battery operation.

## Connection of Devices via the MIB/RS232 Interface (not for MP5T and MP5SC)

The configuration of the MIB/RS232 port can be viewed in config mode and altered in service mode. This is required, for example, when a slave display with touchscreen is installed. To alter the configuration of an MIB port select **Main Setup** then **Hardware** then **Interfaces**. You can configure **Data Out**, **GM**, and **Touch** to the MIB/RS232 port.

For details on the ECG Sync Pulse refer to the “ECG Sync Pulse (not for MP5T and MP5SC)” on page 256 section of this chapter.

### NOTE

Be aware that if you change a port assignment this assignment is not reset upon boot up. If the system interface board is removed and replaced with a different type of board the settings are deleted. If the

original board is then refitted, you must reconfigure the MIB/RS232 port. The configuration of MIB/RS232 is not cloned between services.

#### NOTE

Removing the system interface board erases the status log of the monitor. Please make sure to save the status log using the support tool before removing the system interface board. Refer to the support tool instructions for use for further details.

The MIB/RS232 port is in BCC mode.

| Computer Client | Pin and Signal Direction | MP5 monitor |
|-----------------|--------------------------|-------------|
| GND             | 4 <=>                    | GND         |
| TxD             | 5 =>                     | RxD         |
| RxD             | 7 <=                     | TxD         |
|                 | 8 <=                     | PWR         |

The pins from the RJ45 are counted from 1 for the lowest pin to 8 for the highest pin when looking at the RS232/MIB interface board.

An adapter from D-SUB (PC interface) to MIB (monitor interface) may be made with the following pin assignment:

| Computer Client | D-SUB 9 pin | D-SUB 25 pin | dir. | MIB pin | MP5 monitor |
|-----------------|-------------|--------------|------|---------|-------------|
| GND             | 5           | 7            | <=>  | 4       | GND         |
| TxD             | 3           | 2            | =>   | 5       | RxD         |
| RxD             | 2           | 3            | <=   | 7       | TxD         |
|                 |             |              | NC   | 8       | PWR         |

For more details on data output to computer systems, refer to the Data Export Programming Guide.

## Connection of USB Devices

The USB port on the MP5SC System Interface Board supports the following USB devices:

- keyboard
- barcode scanner
- computer mouse or trackball

#### NOTE

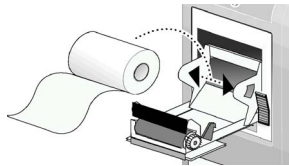
- Connect only the above mentioned devices to the USB Interface. Other devices are not supported.



*MP5SC with Barcode Scanner connected to USB Port*

## Loading Paper

- 1 Use the latch on the right side of the recorder door to pull the door open.
- 2 Remove the empty core.
- 3 Insert a new roll and secure it in place on the paper holder. The paper feeds from the bottom of the roll and over the top of the recorder door. Recommended paper: M4816A and M4817A.



- 4 With at least one inch of paper extending beyond the edge of the door, swing the recorder door up and push it firmly closed.
- 5 To test if paper is loaded correctly, start a recording. If no printing appears, paper may be loaded backwards or the wrong paper may be inserted. Try reloading the paper. Make sure you are using the correct paper.

## Configuration Tasks

You must configure these settings during installation in configuration mode.

- Line Frequency
- Altitude
- Equipment Label (for wireless networked monitors, or when the Information center is in flexible monitoring mode).
- IP Address, Subnet Mask and Default Gateway (for manual IP Address Configuration - only in **service mode**) (SW Rev. G.0 or lower)
- ECG cable colors
- Height and Weight units
- IGMP, CI Mode, CI Address, CI TTL (for Customer Supplied Clinical Network (CSCN) Routed Bedside Configurations) - only in **service mode**) (SW Rev. G.0)

- Setup Network (**service mode**) (SW Rev. H.0 or higher)
- Setup WLAN (**service mode**) (SW Rev. H.0 or higher)
- Setup IIT (**service mode**) (SW Rev. H.0 or higher)

## Checking Country-Specific Default Settings

Some settings are made in the factory to match the typical requirements in a specific country. Line frequency, units for weight and height, and ECG cable colors (AAMI or IEC) have been set to appropriate values. If you suspect that these settings may not match your institution's requirements, check the settings and change them if necessary as described in the *Configuration Guide*. Default settings are listed in Appendix B.

---

### WARNING

Before starting monitoring, check that the configuration meets your requirements, especially patient category, alarm limits and paced setting.

---

If you need to enter configuration mode:

- 1 In the **Main Setup** menu, select **Operating Modes**.

- 2 Select **Config** and enter the passcode.

The passcode for configuration mode is given in the monitor's service documentation.

The monitor displays **Config** at the right hand side of the status line and in the center of the Screen while you are in configuration mode.

Before you leave configuration mode, always be sure to store any changes you made. You must store changes made to each Settings Block and to each Profile, individually. As it may be difficult to remember whether the settings you changed belong to a Monitor Settings block or a Measurement Settings block, we recommend that you store each block before you leave configuration mode.

To leave configuration mode:

- ◆ In the **Main Setup** menu, select **Operating Modes** and then select **Monitoring**.

## Setting Altitude, Line Frequency, ECG Cable Colors and Height & Weight Units

You require a local barometric pressure rating from a reliable source (such as airport, regional weather station, or hospital weather station) that is located at the same altitude as the institution.

- 1 From the **Main Setup** menu, select **Global Setting**. Select **Altitude** and enter the altitude.
- 2 From the **Main Setup** menu, select **Global Setting**. Select **Line Frequency** and choose the Line Frequency.
- 3 From the **Main Setup** menu, select **Global Setting**. Select **ECG Cable Color** and choose the Cable Color.
- 4 From the **Main Setup** menu, select **Global Setting**. Select **Height Unit** and choose the Height unit.
- 5 From the **Main Setup** menu, select **Global Setting**. Select **Weight Unit** and choose the Weight unit.

## Configuring the Equipment Label

If the Information Center is in fixed monitoring mode, it controls the equipment label. You do not need to follow this procedure.

However, if you are on a wireless network, or your Information Center is configured for flexible monitoring mode, you must set the equipment label. This associates the monitor with a central monitoring sector. An identical monitor label must also be configured in the Information Center.

- 1 Select **Main Setup** -> **Bed Information** to call up the **Bed Information** menu.
- 2 Select **Equipment Label** to call up the onscreen keyboard.
- 3 Enter the system identifier. This needs to be set up in either the monitor or the Information Center. If the Information Center is in flexible monitoring mode, the monitor must be setup to match the Information Center's monitor label.

## Configuring IP Address, Subnet Mask and Default Gateway (Rev G.0 or lower)

Typically the automatic configuration via the BOOTP Server of the central station is used. In this case all fields are set to 0.0.0.0. For special requirements, it is possible to switch to a manual/fixed IP address configuration.

### NOTE

- Only limited checks of the manual values are possible. Therefore, it is mandatory that a manual configuration is only performed by an experienced service person to avoid problems such as duplicate IP addresses, non matching subnet mask, etc.
- 1 Select **Main Setup** -> **Bed Information** to call up the **Bed Information** menu.
  - 2 Select **IP Address**. If the IP Address is set to 0.0.0.0, all values are dynamically requested from a BOOTP Server. Otherwise the manually entered address is used.
  - 3 Select **Subnet Mask**. The Subnet Mask must be provided for manual IP addresses. The Subnet Mask must consist of a single consecutive series of "1" bits; e.g. 255.255.248.0. The configured value is ignored when the IP Address is provided by a BOOTP Server.
  - 4 Select **Default Gateway**. The IP Address of the Default Gateway can be optionally configured. The configured value is ignored if IP Address and gateway are provided by a BOOTP Server. The configured value must be within the range of the Subnet Mask.

## Configuration Settings for CSCN Routed Bedside Monitors (RBM) (Rev G.0)

The following settings are used for Customer Supplied Clinical Network (CSCN) Routed Bedside monitors. To access these settings, select the Main Setup -> **Bed Information** to call up the **Bed Information** menu.

**IGMP:** Shows status of IGMP Support (On or Off). IGMP (Internet Group Multicast Protocol) is used by many switch manufacturers to limit the number of destinations targeted by a multicast packet.

**CI Mode:** The mode in which CI messages (Connect Indication messages) are sent (Broadcast, Multicast, Manual).

**CI Address:** IP Address for Connect Indication messages only being used if CI Mode is set to Manual. If CI Mode is Broadcast the CI Address is implicitly the subnet broadcast address. If CI Mode is Multicast the CI Address is implicitly 224.0.23.63.

**CI TTL:** Sets the TTL (Time To Live) of the CI message. Defaults to 1.

## Setting the Date and Time

To set the date and time:

- 1 Select the **Date, Time** screen element from the monitor's info line to enter the **Date, Time** menu.
- 2 Select, in turn, the **Year, Month, Day, Hour** (in 24 hour format, only) and **Minute** as necessary. Select the correct values from the pop-up list.
- 3 Select **Store Date, Time** to change the date and time.

If your monitor is connected to an Information Center, the date and time are automatically taken from this.

Once it is set, the internal clock retains the setting even when you switch off the monitor.

## Network Configuration Tasks (Rev H.0 or higher)

The following sections only apply for monitors with SW Rev H.0 or higher. For network-related configuration settings on monitors with SW Rev G.0 or lower, please refer to the sections “Configuring IP Address, Subnet Mask and Default Gateway (Rev G.0 or lower)” on page 238 and “Configuration Settings for CSCN Routed Bedside Monitors (RBM) (Rev G.0)” on page 238.

## Setup Network

### Network Status Window

The network status window provides network status information which can be used for troubleshooting purposes.

**Main Setup => Network => Network Status**

| Network Status   |                           |
|------------------|---------------------------|
| Network Type     | LAN                       |
| MAC Address      | 0030 D301 376B            |
| MAC IIT          | 0097 3498 87EC            |
| RF Access Code   | 2                         |
| IP Config        | BOOTP                     |
| Dynamic IP       | Mandatory                 |
| IP Address       | 172.31.10.03              |
| Subnet Mask      | 255.255.0.0               |
| Default Gateway  | 172.31.20.10              |
| BOOTP Server     | 172.31.10.165             |
| IPv6 Address     | FE80::0209:FBFF:FE6E:D163 |
| IGMP             | Off                       |
| CI Mode          | Broadcast                 |
| CI Address       | 172.31.255.255            |
| CI TTL           | 1                         |
| QoS State        | Off                       |
| QoS Level        | 0                         |
| Directory Mode   | Broadcast                 |
| Directory Addr.  | 172.31.255.255            |
| LLDP             | On                        |
| LLDP System Name | switch                    |
| LLDP Chassis ID  | 0023 AC71 B600            |
| LLDP Port ID     | Fa0/4                     |
| LLDP Port Status | 10 Mbps / HD              |

**Network Type** Displays the current active network type (LAN, IIT, WLAN)

**MAC Address** MAC Address of LAN adapter



|                         |  |
|-------------------------|--|
| <b>MAC IIT</b>          | MAC Address of IntelliVue Instrument Telemetry adapter (only when IIT is enabled)  |
| <b>RF Access Code</b>   | IntelliVue Instrument Telemetry specific partitioning of the radio domain (only when IIT is enabled)   |
| <b>LLDP System Name</b> | Advertised System Name of the link partner. This is normally a switch or router.   |
| <b>LLDP Chassis ID</b>  | Advertised Chassis ID of the link partner. Chassis ID is an administratively assigned name that identifies the particular chassis.   |
| <b>LLDP Port ID</b>     | Advertised Port ID of the link partner. Port ID is a string that identifies the port component of the link partner.  |
| <b>LLDP Port Status</b> | <p>Shows the current ethernet duplex mode and the speed of the link partner.</p> <p>The <b>MAC Address</b>, current IP address configuration (<b>IP Address</b>, <b>Subnet Mask</b>, <b>Default Gateway</b>, <b>Server IP address and CI mode/ CI Address/ CI TTL</b>) and <b>BOOTP/ DHCP Server</b> is displayed. The IP address configuration can be changed in Service Mode only. Manually entered IP addresses are marked by the suffix "Manual", invalid fields are marked by the suffix "Invalid".</p> <p>If the Instrument Telemetry interface is available, its <b>MAC Address</b> and <b>RF Access Code</b> are displayed. In addition, the bedside monitor's IPv6 link local address is shown.</p> |

### Network Configuration Check (only for SW ≥ K.2)

If LLDP is configured "on" while a network connection is established, the network is checked for specific LLDP related issues or incompatibilities.

If issues are found during this check, the status message „Check LLDP Configuration" will be shown in the status prompt area of the monitor's resting display.

The status message is shown when one of the following issues is found:

| Cause of Failure  | Failure Isolation and Remedy                         |
|---|--|
| LLDP is configured "on" and a static IP is configured and LLDP answers are received via the network   | do not configure a manual IP address when using LLDP |
| LLDP is configured "on" and the received Chassis ID and Port ID of the link partner changed   | Check LLDP settings of switch                        |
| LLDP is configured "on" and more than one link partner is sending LLDP answers (e.g. if monitor is connected to hub or non-LLDP/multicast capable switch) | connect monitor to LLDP/multicast capable devices    |

The prompt will be cleared after a power cycle or after reconnecting the network cable, but will be shown again if the issue persists.

## Setup WLAN

Main Setup => Network => Setup WLAN

| Setup Wireless LAN   |              |
|----------------------|--------------|
| Country              | 1000         |
| IP Address           | 172.31.10.04 |
| WMM Mode             | disabled     |
| Mode                 | 802.11bg     |
| SSID                 | Philips      |
| Security Mode        | WPA2Enterpr. |
| WEP Key Size         | 40 bit       |
| WEP Key              | *            |
| WEP Key Index        | 2            |
| WPA Password         | *            |
| Authentication       | PEAP         |
| Inner Authentication | MSCHAPv2     |
| PEAP Version         | Default      |
| PEAP Label           | Default      |
| User Name            | username     |
| Password             | secret       |
| Anonymous Ident.     | anonymous    |
| CertificateCheck     | Enabled      |
| CA Certificate       | Installed    |

The Setup Wireless LAN Menu allows you to configure the following items:

- Country** Country setting for the WLAN card to adapt to the local frequency and transmit power regulations. The default value 1000 should be left to support adapting to country provided by the AP.
- IP Address** IP Address of the WLAN card. Typically the automatic configuration via the BOOTP/ DHCP Server of the central station is used. In this case the field is set to 0.0.0.0. For special requirements, it is possible to switch to a manual/fix IP address configuration.
- Manually entered IP addresses are marked by the suffix "Manual"

**NOTE**

- The subnet mask and the gateway address of the WLAN card will be taken from the corresponding fields in the **Bed Information** or **Setup Network** menu.
- Only limited checks of the manual values are possible. Therefore it is mandatory that a manual configuration is only performed by experienced service personnel to prevent problems such as duplicate IP addresses, non matching subnet mask, etc.

|                      |  |
|----------------------|--|
| <b>WMM Mode</b>      | Changes to WMM (Wireless Multimedia Mode) mode for the WLAN adapter supporting this feature.   |
| <b>Mode</b>          | Defines the WLAN operating mode/ IEEE 802.11 Standard. Valid values are either 802.11ah, 802.11bg, 802.11g, Auto or None. None indicates that no wireless connection should be established although a wireless adapter is available and operational.       |
| <b>SSID</b>          | Set Identifier: Logical WLAN Network Name.   |
| <b>Security Mode</b> | <b>WEP</b> , <b>WPA(PSK)</b> or <b>WPA2(PSK)</b> , <b>WPA-Enterprise</b> and <b>WPA2-Enterprise</b> with either Protected EAP (PEAP) or Tunneled TLS (TTLS) as authentication methods.   |
| <b>WEP Key Size</b>  | 40 bit or 104 bit.   |
| <b>WEP Key</b>       | The number of hex chars for the WEP key depends on the WEP key size chosen. For a 40 bit WEP key size the WEP key must be 10 hex chars long, for a 104 bit key the WEP key must be 26 hex chars long. Will be shown as “*” after the user entered the key. |
| <b>WEP Key Index</b> | Defines the transmit WEP Key Index. This entry must match the WEP Key Index configured at the infrastructure device, i.e. on a WLAN Access Point, and ranges from 1 to 4.  |
| <b>WPA Password</b>  | In WPA(PSK) or WPA2(PSK) mode this entry defines the Pre-Shared-Secret or Password with 8 to 63 alpha-numeric characters. Will be shown as “*” after the password is entered.  |

In WPA-Enterprise or WPA2-Enterprise mode the following read only fields are available. The configuration can only be performed via the IntelliVue Support Tool:

|                                       |   |
|---------------------------------------|---|
| <b>Authenti-<br/>cation</b>           | Authentication method can be either Protected EAP (PEAP) or Tunneled TLS (TTLS).  |
| <b>Inner<br/>Authenti-<br/>cation</b> | PEAP and TTLS can be used with several different Inner Authentication methods. PEAP with MSCHAPv2 and TTLS with PAP, CHAP, MSCHAP or MSCHAPv2   |
| <b>PEAP Version</b>                   | This setting describes the PEAP protocol version to be used while authenticating against the authentication server. Valid values are either Default, Version 0 and Version 1. If set to Default the decision is up to the wireless adapter. Version 0 or 1 forces the wireless adapter to use the protocol version required for a certain authentication server. This setting is intended for experts only. |
| <b>PEAP Label</b>                     | The PEAP label setting defines the string to be used to signal EAP-PEAP encryption to the authentication server. Valid values are Default, EAP or PEAP. Default lets the decision up to wireless adapter. Both EAP and PEAP forces the wireless adapter to use this setting. This setting is intended for experts only.   |
| <b>Username</b>                       | The username used in the encrypted tunnel with 1-63 alpha-numeric characters. It is also used as outer identity as long as the Anonymous Identity is not set.   |
| <b>Password</b>                       | The password used in the encrypted tunnel with 8-63 alpha-numeric characters. Will be shown as four stars “****” after the user entered the password.   |

## 7 Installation Instructions

- Anonymous Identity** The identity used for the outer PEAP or TTLS authentication, which may be “unprotected”. Thus, the identity should be different to the Username for enhanced security. The Anonymous Identity contains 1-63 characters. It can be set to NotConfigured by clearing it.
- CA Certificate** Indicates that the certificate of the Certification Authority (CA) has been installed on the device. The CA certificate is the root certificate of the server delivered certificate chain. The certificate chain ends with the server certificate, which contains the key material used to build up the encrypted tunnel for PEAP or TTLS. Values are either Installed or NotInstalled. This field is not user configurable. The CA certificate can only be installed with the IntelliVue Support Tool.
- Certificate Check** As long the Certificate Check is set to Enabled, the CA Certificate is used to verify the authenticity of the certificate chain delivered by the authentication server. The verification involves also the system time to check the validity period of every certificate in the chain. This item can only be set to Enabled, if an CA Certificate has been installed. Valid values are Disabled or Enabled.

## WLAN Diagnostic Window

The WLAN Diagnostic window provides WLAN status information which can be used for troubleshooting purposes.

Main Setup => Network => WLAN Diagnostic

| WLAN Diagnostic  |                |
|------------------|----------------|
| Wireless LAN     | On             |
| Check WLAN       | Security Mode  |
| MAC WLAN         | 0097 3498 87EC |
| IP Address WLAN  | 172.31.11.15   |
| IP Address       | 172.31.10.03   |
| Server IP        | 172.31.10.165  |
| Subnet Mask      | 255.255.0.0    |
| Country          | 1000 / 1276    |
| WMM Mode         | Disabled       |
| Mode             | 802.11bg       |
| Security Mode    | WPA2Enterpr.   |
| Authentication   | PEAP           |
| Inner Authentic. | MSCHAPv2       |
| PEAP Version     | Default        |
| PEAP Label       | Default        |
| User Name        | username       |
| Anonymous Ident. | anonymous      |
| CertificateCheck | Enabled        |
| CA Certificate   | Installed      |
| SSID             | Philips        |
| Rate             | 54,0 Mb/s      |
| Active Channel   | 9              |
| RSSI             | 65 -           |
| Conn. Status     | Connected      |
| MAC AP WLAN      | 00A0 F8CE D231 |

In the WLAN Diagnostic window, the wireless LAN address information is shown (**MAC address**, **IP addresses** and **Subnet Mask**) as well as the active security settings, **WLAN Mode**, **SSID** as well as **Country** setting, which are all not editable in this window. In addition, the following status information is shown:

**Wireless LAN** State of the wireless adapter. Off indicates inactive or just starting, On indicates operational. Does not take the wireless state into account.

## 7 Installation Instructions

- Check WLAN** Indicates that a configuration issue has been detected. The message text depends on the operating mode.
- Country** The configured country code and the dynamically chosen country code based on access point setting.
- WMM Mode** The WMM mode being used.
- Mode** Defines the WLAN operating mode/ IEEE 802.11 Standard. Valid values are either 802.11ah, 802.11bg, 802.11g, Auto (not recommended) or None. None indicates that no wireless connection should be established although a wireless adapter is available and operational.
- NOTE**
- Starting with the new firmware A.03.08 the behavior was changed for radio mode setting 802.11g: When configuring radio mode 802.11g, the device does not connect to a wireless infrastructure, if one of the 802.11b rates (1, 2, 5.5 or 11Mbit/s) is set as mandatory basic data rate. Therefore, please use radio mode setting 802.11bg at the device in a mixed 802.11b/g infrastructure.
- RSSI** Received Signal Strength Indicator.
- Conn. Status** Current wireless LAN connection status (**None, Scanning, Authenticating, Authenticated Shared, Associating, Connected, Link Problem**).
- Active Channel** Current radio channel.
- Rate** Currently selected transmission rate (adapts dynamically based on wireless signal propagation behavior).
- MAC AP WLAN** The MAC address of the access point to which a connection has been established.

## RF Design Requirements for Philips Devices

Philips medical devices require a robust and high capacity WLAN. The WLAN deployed should meet specific RF requirements in all areas of coverage where Philips devices will operate. One of these requirements is the minimum RF signal (RSSI) level of -67 dBm.

Due to different internal calculation the RSSI will be different for WLAN assembly version 1 and 2. To achieve the required minimum signal strength of -67dBm, the RSSI must be as follows:

| WLAN Assembly Version 1 | WLAN Assembly Version 2 |
|-------------------------|-------------------------|
| RSSI $\geq$ 28          | RSSI $\geq$ 22          |

**Identification of installed WLAN Firmware (Main Setup -> Revision -> WLAN):**

| WLAN Assembly Version 1   | WLAN Assembly Version 2   |
|---|---|
| >SW Rev 1 A.xx.xx   | >SW Rev 1 B.xx.xx   |
| Firmware versions for WLAN assembly version 1 always have the numbering format <b>A.xx.xx</b> | Firmware versions for WLAN assembly version 2 always have the numbering format <b>B.xx.xx</b> |

## WLAN Configuration Check

Before a wireless connection is established, the configuration is checked for basic issues or incompatibilities. If issues are found during this check, a status message will be shown in the status prompt area of the monitor's resting display. Additionally, the Check WLAN line of the WLAN Diagnostic window will display the status message. In Service Mode, a detailed status message is shown, while a simplified message is shown in all other operating modes.

The table below lists the status messages displayed in service mode, depending on the issue found.

| Issue                | Status Message                       |
|----------------------|--------------------------------------|
| Security Mode        | Check WLAN Security Mode             |
| Country Setting      | Check WLAN Country Setting           |
| IEEE Wireless Mode   | Check WLAN IEEE Mode                 |
| WMM Mode             | Check WLAN WMM Mode                  |
| WEP Encryption       | Check WLAN WEP Settings              |
| WPA Encryption       | Check WLAN WPA/WPA2 Key              |
| Authentication       | Check WLAN Authentication Mode       |
| Inner Authentication | Check WLAN Inner Authentication Mode |
| PEAP settings        | Check WLAN PEAP Properties           |
| Certificate Check    | Check WLAN Certificate Check Setting |
| User Name,Password   | Check WLAN EAP Credentials           |

The simplified message in all other operating modes is "Check WLAN Settings"

## Setup IIT

Main Setup => Network => Setup IIT

| IIT Setup      |         |
|----------------|---------|
| IIT            | Enabled |
| RF Access Code | 1       |

The Setup IIT Menu allows you to configure the following items:

- Instr. Telemetry** The Instrument Telemetry network interface can be disabled by a Global Setting to suppress network related technical INOPS if the IIT-capable device is operated in a non-IIT environment.
- RF Access Code** Instrument telemetry specific partitioning of the radio domain. Displays "Disabled" instead of RF Access Code if Instrument Telemetry is disabled by Global Setting.

## Instrument Telemetry Diagnostic Window

The Instrument Telemetry Diagnostic window provides IIT status information which can be used for troubleshooting purposes.

**Main Setup => Network => IIT Diagnostic**

| Instrument Telemetry Diagnostic |                |
|---------------------------------|----------------|
| MAC IIT                         | 0097 3498 87EC |
| RF Access Code                  | 2              |
| IP Address                      | 172.31.10.03   |
| Server IP                       | 172.31.10.165  |
| Subnet Mask                     | 255.255.0.0    |
| RSSI                            | -50            |
| Conn. Status                    | Active         |

**Network addresses** To support troubleshooting of the network connection, the following fields are displayed: Instrument Telemetry **MAC Address**, **IP Address**, **BOOTP/ DHCP Server IP address** and **Subnet Mask**.

**RF Access Code** Instrument telemetry specific partitioning of the radio domain. Displays “Disabled” instead of RF Access Code if Instrument Telemetry is disabled by Global Setting.

**RSSI** Received Signal Strength Indicator.

**Conn. Status** Current connection status of the Instrument Telemetry Subsystem.

## Handing Over the Monitor

If you are handing over the monitor to the end-users directly after configuration, make sure that it is in Monitoring mode.

Ensure that the users have access to the following documentation delivered with the monitor:

- Training Program -for self-training on the monitor before use
- Quick Guide - for quick reminders during use
- Instructions for Use - for more detailed questions during use

---

### WARNING

All users must complete the training program and read the Instructions for Use before working with the monitor.

---

These training materials (in combination with this service guide) can also be used to train service personnel on how to use and service the MP5/MP5T/MP5SC monitor.

### NOTE

The battery must be charged prior to use of the monitor.



# Installing Remote Devices (not for MP5T)

This section provides instructions for Philips products. Installation instructions for devices not sold by Philips must be provided by the device manufacturer.

## Mounting the 15" Remote Display (M8031B)

Mounting solutions for the M8031B must be purchased separately. Please refer to the installation instructions which ship with the mounting solution purchased.

### Connections

Connect the cables to the display as shown in the photographs below.



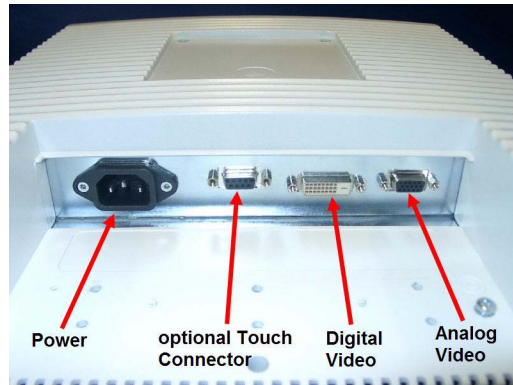
| No. | Description                                |
|-----|--|
| 1   | Power Connector                            |
| 2   | Digital Video Connector (not used for MP5) |
| 3   | Analog Video Connector                     |

## Mounting the 17" Remote Display (M8033C)

Mounting solutions for the M8033C must be purchased separately. Please refer to the installation instructions which ship with the mounting solution purchased.

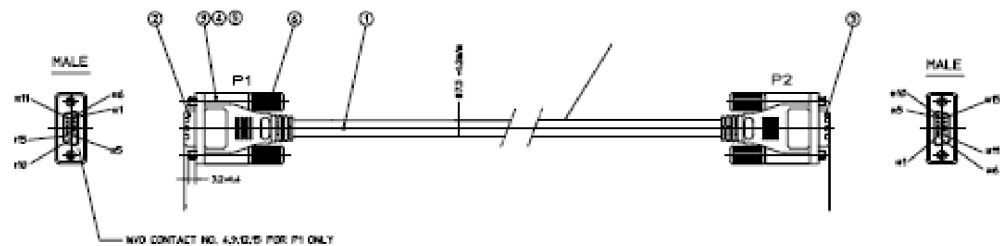
### Connections

Connect the cables to the display as shown in the photographs below.



*Connections M8033C*

### Video Cable Wiring Schematics



| CIRCUIT DIAGRAM |                   |       |
|-----------------|-------------------|-------|
| P1              | WIRE              | P2    |
| 1               | RED COAX. CENTER  | 1     |
| 2               | GREY COAX. CENTER | 2     |
| 3               | BLUE COAX. CENTER | 3     |
| 5               | BLACK             | 5     |
| 10              |                   | 10    |
| 6               | RED COAX. SHIELD  | 6     |
| 7               | GREY COAX. SHIELD | 7     |
| 8               | BLUE COAX. SHIELD | 8     |
| 11              | BROWN             | 11    |
| 13              | YELLOW            | 13    |
| 14              | WHITE             | 14    |
| SHELL           | OVER SHIELD       | SHELL |

*Analog Video Cable Wiring Schematic*

### Hardware Settings

This section lists all the settings grouped in the Hardware Settings Block which are available in Service Mode. These settings are set once per monitor and are the same in every profile. Any changes you make to the hardware settings configuration are automatically stored, there is no need to save them in an extra step. Hardware settings must be entered for each monitor individually, they are stored in the monitor, and they are not cloned. To enter the hardware settings menu, select **Main Setup -> Hardware**.

- Setup Video - this setting allows you to set the correct display resolution for the displays.

- MIB/RS232 - see “Connection of Devices via the MIB/RS232 Interface (not for MP5T and MP5SC)” on page 234 section in this chapter for details.

## Clinical Network (Wired and Wireless)

Creating a network solution to support patient monitoring system data is a significant undertaking. The network must be designed to support real-time transmission of patient waveforms, data, and alarms on an uninterrupted and continuous basis.

Philips can deploy a patient monitoring system in one of two ways:

- 1 Some customers prefer to purchase a patient monitoring system that includes a Philips-provided network switching infrastructure. These systems are known as a Philips-Supplied Clinical Network (PSCN).
- 2 Other customers prefer to run their patient monitoring system on the hospital's existing network infrastructure. These types of systems are known as a Customer-Supplied Clinical Network (CSCN).

Please refer to the appropriate PSCN/CSCN documentation when connecting bedside devices to an IntelliVue Information Center via PSCN or CSCN infrastructure.

For creating network solutions which connect to other systems than an IntelliVue Information Center please refer to the documentation of the respective systems.

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### WARNING

In order to maintain the galvanic isolation of the IntelliVue monitor, it is essential that UTP (Unshielded Twisted Pair) LAN cables is used to connect the IntelliVue monitor to other devices.

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## Philips IntelliVue Information Center

Please refer to the installation instructions and Instructions for Use of the IntelliVue Information Center Rev. System J or higher.

## IntelliVue Instrument Telemetry (IIT)(not for MP5T and MP5SC)

Frequency Coordination (USA only):

Frequency coordination is a registration and coordination process for wireless medical telemetry devices used in the U.S.A. which operate in the FCC-allocated Wireless Medical Telemetry Service (WMTS) bands (608-614 MHz, 1395-1400 MHz, 1427-1432 MHz). The M8001/2A #J45 and the M8004/5A with the IntelliVue Patient Monitor Instrument Telemetry adapter M2638A operate in both of the 1395-1400 and 1427-1432 MHz bands.

Under U.S. Federal Communications Commission (FCC) rules, authorized healthcare providers must register their WMTS devices with an authorized Frequency Coordinator designated by the FCC. The American Society for Healthcare Engineering (ASHE) is the current designated Frequency Coordinator.

Registration/Coordination is a two-step process.

**Step 1: Registration:** Register the healthcare facility on-line, from the ASHE website). Click on the link for Wireless Medical Telemetry Service and come to the registration page. Fill out the details, and pay the associated fee as per the instructions provided. You will receive confirmation of this registration. Confirmation must be received before proceeding to the next step.

**Step 2: Frequency Coordination:** Along with confirmation of registration, you will receive access information necessary to perform this second step, frequency coordination. This step involves logging the equipment and frequencies used into the FCC's database, so as to identify any existing potential interference and to help prevent potential future interference. Coordination is accomplished via the ASHE website. Click on the links for Wireless Medical Telemetry Service and then Frequency Coordination. The way the coordination process is executed as of today, it will need to be repeated twice; once for the 1395-1400 MHz band, and then again for the 1427-1432 MHz band, both of which are used concurrently by the Philips product. There is a separate fee for each coordination request, which varies, depending upon the number of transmitting devices used and the band/s of operation. Coordination is executed by a company named Comsearch, on behalf of ASHE.

To fill in the frequency coordination forms, you'll need to know the following:

- The county.
- Latitude and longitude that represents the center of the area where the transmitting devices will be deployed. Comsearch can help provide this information; [www.comsearch.com](http://www.comsearch.com) provides contact information.
- The name/s of the Clinical Unit/s using the devices (e.g. ICU4, CCU-West, ER1, Step-Down North, etc.
- The radius of deployment, expressed in meters. Imagine drawing a circle around the center of the clinical unit, that encloses/encompasses the unit. What is its radius?
- The number of the highest floor on which a transmitting device will operate.
- How many transmitting devices will be used, i.e. the total number of IntelliVue Instrument Telemetry adapter devices combined.
- The Effective Radiating Power: 6.3 mW.
- The Equipment Manufacturer: Philips Medical Systems.
- The Model numbers: M8105A #J45 IntelliVue Instrument Telemetry adapter used with M8105A (MP5)
- The Frequency Range to be used: Two separate coordinations are required: For the first one, click on the range of 1395.0 through 1400.0 MHz. For the second one, click on all the frequency ranges listed in the range of 1427.0 through 1432.0 MHz.

When both Registration and Frequency Coordination have been successfully completed, the IntelliVue Instrument Telemetry System can be activated. Note that this process is the responsibility of the customer, as the final "operator" of the transmitting equipment.

## Short Range Radio

Installation of the Short Range Radio interface should be performed by Philips service personnel. Before installing an SRR infrastructure it might be necessary to perform a site survey to determine available channels. This should be performed by Philips telemetry installation experts.

## Configuring SRR Channels

Hardware Setting: **Main Setup -> Hardware -> SRR Channel**

SRR channel settings only apply for monitors that have a short range radio interface installed. They must be set to match the hospital's wireless infrastructure. SRR channel settings are hardware settings and will typically be set by service personnel at installation.

Refer to your configuration guide for details.

### SRR Channel Settings Configuration Implications

**Channel** Use this setting to configure the SRR channel the monitor should use. SRR provides a total of 16 channels in the ISM (2.4 GHz) band and 3 channels in the MBAN band (2390-2400 MHz). The channels are labeled ISM 11 to 26 and MBAN 06, 13 and 14. Up to two SRR connections can be established per channel. The ISM band is not exclusively reserved for SRR applications. It is also used by, for example, Wireless LAN (WLAN) and the IntelliVue Telemetry network (except for the US). For this reason, depending on the hospital's existing wireless infrastructure, a number of SRR channels might already be occupied by other wireless applications. MBAN frequencies are not used by WLAN or the IntelliVue Telemetry network and cannot be used with monitors operated with WTAAP.

To achieve the best SRR performance possible, follow these recommendations:

- Usage of WLAN together with SRR may cause interferences. Each WLAN network uses at least four of the 16 SRR channels. If the use of WLAN cannot be avoided, limit the number of channels used for the WLAN infrastructure to a minimum.
- Usage of Bluetooth devices together with SRR may cause interferences. Bluetooth devices automatically change channels regardless of whether a channel is already used by another component of the wireless infrastructure and therefore interfere with SRR connections.
- Usage of cordless phones using the ISM band in the vicinity of SRR devices may cause interferences.
- Usage of wireless PC keyboards or mice using the ISM band in the vicinity of SRR devices may cause interferences.

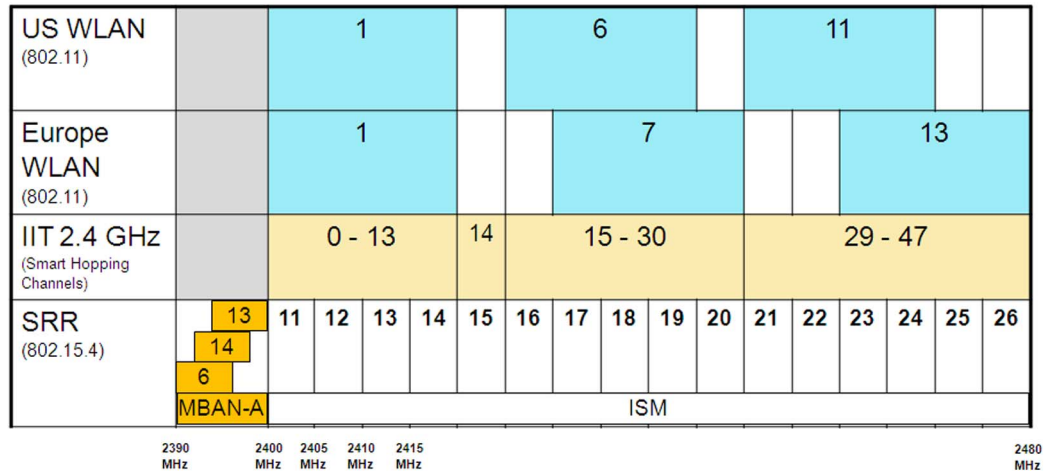
**To assign SRR channels to all monitors in a unit that should be used with SRR connections,**

- 1 Identify unused SRR channels. This can be done by using commercially available tools, such as AirMagnet.
- 2 Obtain a floor plan of the unit and identify where the monitors with SRR interface are located.
- 3 Determine SRR groups. An SRR group may contain a maximum of two monitors which share the same SRR channel. Monitors belonging to an SRR group should be located close to each other.
- 4 For each SRR group, assign the same SRR channel to all monitors belonging to a group.

#### SRR Channel Restrictions with WLAN, IIT, and DECT Phones

The following table and graphic show the restrictions of WLAN, IIT, or DECT phone usage together with SRR.

## 7 Installation Instructions



For a successful SRR deployment, the SRR channels must be located in RF spectra where they are least likely to be interfered with. Choosing appropriate channels after reviewing the Spectrum Analyzer data is critical. In hospitals, 802.11 systems are most the likely source of interference with SRR channels. The figures above show the relationship between 802.11 devices, IIT devices, and DECT phones. For example, if the site uses European 802.11 channel 1 for WLAN and has no IIT devices or DECT phones in the SRR channels 15 or 16, these channels can be used for SRR. Philips telemetry experts will identify available SRR channels by performing a site survey.

When using the Philips IntelliVue 802.11 Bedside Adapter we recommend that you use the 5 GHz band to free the 2.4 GHz band for SRR usage.

### NOTE

Short range radio signals are low power signals and therefore have a relatively short range. You can use this fact if the number of unused channels is low, and you run out of channels. Provided the distance between two SRR groups is large enough, i.e. none of the short range radio signals transmitted by the one group can interfere with signals of the other group, you may attempt to assign the same SRR channel to both groups. Take into consideration that portable components (such as Telemetry transceiver, MP5/MP5T or an X2) belonging to one group may be temporarily used within the range of another group.

The range of SRR signals cannot be clearly defined as it depends on external factors such as the components and structure of walls, ceilings, etc.

## Connecting the MP5 to a Host Monitor (not for MP5T and MP5SC)

The MP5 is connected to the host monitor using the measurement link (MSL) cable:



### NOTE

An MP5 in companion mode does not receive its power from the host monitor via the MSL. MP5 is always powered by AC power or battery.

## Nurse Call Relay (not for MP5T)

### Connections



#### *Nurse Call Relay Connection at Monitor*

The MP5 Nurse Call Relay is a single-closure relay with its contacts connected to a stereo phone jack.

| Nurse Call Relay       | Connectors  | Contact                              | Isolation |
|------------------------|---|--------------------------------------|-----------|
| Basic Nurse Call Relay | 3.5 mm phone jack<br>active closed contact only (except modified nurse call relay: active open contact) | $\leq$<br>100 mA, $\angle$<br>24 VDC | 1.5 kV    |

# ECG Out Functionality (ECG Sync) (not for MP5T and MP5SC)

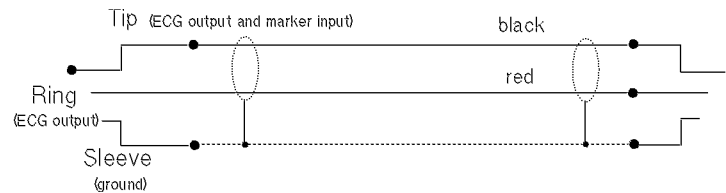
## Connections



The cables 8120-1022 and M1181-61625 have both ends terminated. The photograph above shows the monitor side connection.

If using a non-terminated cable:

- 1 Strip 5 mm (3/16") insulation from leads and twist conductor strands tightly.
- 2 Solder leads to the connector as shown in the following diagram.



### WARNING

According to AAMI specifications the peak of the synchronized defibrillator discharge should be delivered within 60 ms of the peak of the R wave. The signal at the ECG output on the IntelliVue Patient Monitor MP5 patient monitors is delayed by a maximum of 20 ms. Your biomedical engineer should verify that your ECG/Defibrillator combination does not exceed the recommended maximum delay of 60 ms.

### NOTE

The ECG Out is non-floating i.e. not galvanically separated.

## ECG Sync Pulse (not for MP5T and MP5SC)

The ECG-Sync pulse is output only if a corresponding cable is detected and the interface is configured accordingly in the monitor's settings. The detection of the cable is made by bridging two pins with a 100 Ohms resistor (preferred) or a direct connection (permitted). Note that the ECG Pulse has RS232 voltage levels and drives inputs with a resistance of 3 kOhms or higher. The ECG Pulse is active high



(approximately +5V) for 100ms and low (approximately -5V) for the rest of the time, according to the RS232 levels "0" and "1", respectively.

| ECG Pulse Client  | Pin and Signal Direction | MP5 monitor        |
|---|--------------------------|--------------------|
| GND   | 4 <=>                    | GND                |
| ECG Pulse   | 7 <=                     | ECG Pulse (TxD)    |
| Cable detect:<br>bridge pins 5 and 8 with<br>100 Ohms resistor or<br>connect directly | 5 =>                     | Cable detect (RxD) |
|   | 8 <=                     | PWR                |

Make sure to configure the interface properly in Service Mode. Provide a clean ECG signal (from patient or simulator) to the monitor. Then connect the cable to the monitor and check that marker pulses are shown on the screen. At last connect the cable to the ECG Pulse Client and process the signal.

The pins of the RJ45 connector are counted from 1 for the lowest pin to 8 for the highest pin when looking at the RS232/MIB interface board.



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# Site Preparation

## Introduction

This section describes the procedures you should follow to plan and prepare a site for an MP5 monitor installation. It describes:

- Site planning.
- Roles and responsibilities for local and Philips personnel.
- Remote installation planning.

## Site Planning

The careful planning of the site for the MP5/MP5T/MP5SC monitor is essential for its safe and efficient operation. *A consulting schedule should be established between the Customer and Philips Sales and Support Representatives, to ensure that all preparations are completed when the system is delivered.*

The site planning phases prior to equipment installation are:

**Location:** Planning the location of the various system components.

**Environment:** Confirming and correcting, as necessary, the environment of the proposed installation site(s).

**System Capabilities:** Explaining the possibilities for system expansion.

**Mounting:** Referencing the mounting hardware information website for the listing of suitable mounting hardware recommended for use with the various system components, and all details on the available mounts and accessories.

**Cabling:** Identifying the requirements for the cabling, conduiting and faceplates for connecting the various system components.

## Roles & Responsibilities

This section describes the procedures necessary to prepare a site for a system installation. The procedures are grouped into two parts: procedures that local staff or contractors are responsible for, and procedures that Philips personnel are responsible for.

### Site Preparation Responsibilities

Local Staff

- Ensure that all safety, environmental and power requirements are met.

- Provide power outlets.
- Prepare mounts.
- Pull cables, install conduit, install wallboxes.
- Terminate network cables if a Philips Clinical Network is in use.
- It may be necessary to certify the network cable plant, see Philips Clinical Network Installation Manual for details.

Alternatively, the following procedures can be performed by Philips Personnel

- Provide the customer with the safety, environmental and power requirements.
- Assemble mounts.
- Prepare monitor remote cabling.

### Procedures for Local Staff

The following tasks must be completed **before** the procedures for Philips personnel may be started.

- Providing Power Outlets

One power outlet for each display and for any peripheral device (for example, a printer or slave display) is required by the system. Provide a power outlet in the vicinity (1 m or 3 ft.) of each component that requires power.

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#### WARNING

Only the power cables provided with the system may be used. For reasons of safety, power (mains) extension cables or adapters shall not be used.

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- Preparing Mounts

Where ceiling, wall, or shelf mounts are required for mounting the equipment, the customer is responsible for the following:

- Providing and installing all hardware which is required to install the mounting hardware supplied by Philips as detailed in the installation notes.
- Making sure that all ceilings, walls, and mounting rails that supports mounting hardware are suitable for their proposed load.

---

#### WARNING

It is the customer's responsibility to have the attachment of the mounting hardware to the ceiling, wall, or mounting rail and the construction of the ceiling, wall, or mounting rail evaluated for structural integrity and compliance with all local, state and any other required codes by a registered, professional, structural and/or mechanical engineer.

Although considerable effort has been made to ensure the safety of the ceiling mount installation and or mounting guidelines, it is to be understood that the installation itself is beyond the control of Philips Medical Systems. Accordingly, Philips Medical Systems will not be responsible for the failure of any such installation.

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- Providing Conduit

Where a remote installation is required, for example the installation of a remote display, the customer is responsible for the following hardware installations:

- Providing conduit and/or trunking of a sufficient cross-sectional area for the planned cables and possible future expansion (for additional components or systems). See for cable specifications for remote installations.
- Providing and/or installing suitable wall boxes to accommodate the faceplates.
- Pulling Cables

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### WARNING

NEVER run power cables through the same conduit or trunking used for system cables.

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- Installing Wall Boxes

It is the customer's responsibility to provide and install wallboxes to house faceplates. The customer must notify the Philips installation coordinator of which size is to be used.

If you have purchased a “customer-installable bundle”, it is assumed that your own hospital personnel (biomedical engineer or technician) will install and, if necessary, configure the monitor. You can contact Philips Support for assistance if required; any assistance will be associated with additional costs.

- Install the MP5/MP5T/MP5SC monitor using the appropriate mounting solution and perform the installation procedures as described in the Installation section.
- Hand over the monitor to the end-users as described in *Handing Over the Monitor* in the Installation section

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### WARNING

Incorrect installation, mounting and use of inappropriate mounting material may lead to serious injury. It is the customer's responsibility to ensure that the mounting procedures have been performed correctly, the appropriate mounting devices have been used and the monitor has been installed and configured correctly.

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## Procedures for Philips Personnel

Before you begin the procedures in the installation sections, ensure that the customer has completed all necessary preparations outlined in the previous section, "Procedures for Local Staff."

- Install the MP5/MP5T/MP5SC monitor using the appropriate mounting solution and perform the installation procedures as described in the Installation section.
- Hand over the monitor to the end-users as described in *Handing Over the Monitor* in the Installation section

# Monitor Site Requirements

## Space Requirements

The siting of the monitor should be planned such that the nursing staff are able to monitor the patient with relative ease, with all patient connectors and controls readily available and the displays clearly visible. The location should also allow access to service personnel without excessive disruption and should have sufficient clearance all round to allow air circulation.

Dimensions and weight:

Size (W x H x D)

259 x 248 x 186 mm (10.2 x 9.76 x 7.32in)

Weight (with battery, without options)

< 4.4 kg (9.7 lb.)

For detailed specifications, see the Specifications chapter.

## Environmental Requirements

The environment where the MP5/MP5T/MP5SC monitor will be used should be reasonably free from vibration, dust and corrosive or explosive gases. The ambient operating and storage conditions for the MP5/MP5T/MP5SC monitor must be observed. If these conditions are not met, the accuracy of the system will be affected and damage can occur.

For detailed environmental specifications, see the Specifications chapter.

## Electrical and Safety Requirements (Customer or Philips)

### Safety Requirements

If the MP5/MP5T/MP5SC monitor is to be used in internal examinations on the heart or brain ensure that the monitor is connected to an equipotential grounding system.

Grounding

The MP5/MP5T/MP5SC monitor **MUST** be grounded during operation (Class I equipment according to IEC 60601-1). If a three-wire receptacle is not available then the hospital electrician must be consulted to ensure that proper grounding is available on installation. **NEVER** attempt to use a three-wire to two-wire adapter with the MP5/MP5T/MP5SC monitor.

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### WARNING

Each component must be individually grounded for safety and interference suppression purposes.

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### Electrical Requirements

Line Voltage Connection

The MP5 monitor uses < 40W average and <65W peak (0.7 to 0.4 A).

Line Voltage

The MP5 monitor may be operated on ac line voltage ranges of 100 to 240V (50/60 Hz).

## Remote Device Site Requirements

The system can be installed with Remote Displays

Where more than one site is used for locating equipment (a remote installation), the following sections should be considered for EACH device:

- Space Requirements

- Environmental Requirements
- Mounting
- Electrical and Safety Requirements
- Cabling Options and Conduit Size Requirements

## Connecting Non-Medical Devices

The standard IEC-60601-1-1 applies to any combination of medical and non-medical electrical devices, where at least one is a medical electrical device. Therefore IEC-60601-1-1 must still be met after all devices are connected.

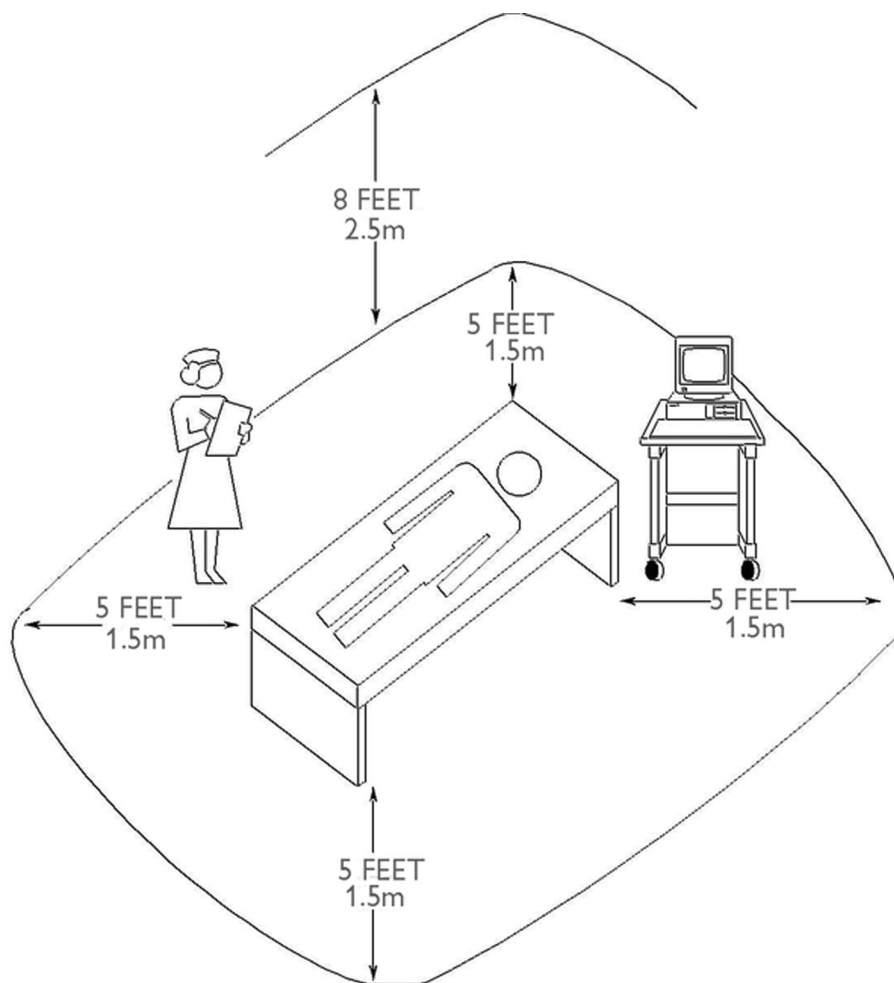
For further details refer to the *Testing and Maintenance* section.

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### WARNING

Do not use a device in the patient environment if it does not comply with IEC-60601-1. The whole installation, including devices outside of the patient environment, must comply with IEC-60601-1-1; or IEC 60601-1 edition 3 clause 16; one reasonable solution may be the use of a separating transformer.

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*Equipment Location in the Patient Environment*

### NOTE

The site planning requirements, with the exception of the cabling, must be provided by the device manufacturer, if the remote device is not purchased from Philips.

# Remote Displays (M8031B)

## Space Requirements

### Size (W x D x H)

372mm x 308mm x 74.1mm (14.65" x 12.13" x 2.92")

### Weight

Without deskstand: 5200g (11.5lb)

With desk stand: 9000g (19.8lb)

## Environmental Requirements

### Temperature

Operating: 0 to 40°C (32 to 104°F)

Storage: -20 to 60°C (-4 to 140°F)

### Humidity

Operating: 20 to 85% RH (Non-condensing)

Storage: 5 to 85% RH (Non-condensing)

### Altitude

Operating: Up to 4000m (13123.36 ft.)

Storage: Up to 12000m (39370.08 ft.)

## Electrical and Safety Requirements

### Voltage ranges:

90V to 264V

### Voltage selection:

Wide range input, no voltage selection required

Power consumption: ~30W

# Remote Displays - M8033C

## Space Requirements

### Size (W x H x D)

429mm x 359mm x 61mm (16.89" x 14.13" x 2.4")

### Weight

6.1 kg (13.45 lbs.)



## Environmental Requirements

Temperature

Operating: 0 to 40°C (32 to 104°F)

Storage: -20 to 60°C (-4 to 140°F)

Humidity

Operating: 30 to 70% RH (Non-condensing)

Storage: 10 to 90% RH (Non-condensing)

Altitude

Operating: Up to 4000m (13123.36 ft.)

Storage: Up to 12000m (39370,08 ft.)

## Electrical and Safety Requirements

Voltage ranges:

100V to 240V

Voltage selection:

Wide range input, no voltage selection required

Power consumption: ~48W

## Cabling Options and Conduit Size Requirements

The following table describes the cabling options for the M8031A/B 15" and the M8033A/B/C 17" TFT Medical Grade Touch Displays.

**Table 8 Analogue Video Cables**

| Part number   | 12NC         | Description  | Conduit sizes      | Bend Radius | Connector Size (L x W) |
|---|--------------|--------------|--------------------|-------------|------------------------|
| M3080-61606   | 453563484451 | CBL VGA 1.5m | 64 mm <sup>2</sup> | 40 mm       | 35 x 16 mm             |
| M3080-61602   | 453563334661 | CBL VGA 3m   | 64 mm <sup>2</sup> | 40 mm       | 35 x 16 mm             |
| M3080-61603   | 453563334671 | CBL VGA 10m  | 64 mm <sup>2</sup> | 40 mm       | 35 x 16 mm             |
| M3080-61607   | 453563484461 | CBL VGA 15m  | 64 mm <sup>2</sup> | 40 mm       | 35 x 16 mm             |
| M3080-61608   | 453563484471 | CBL VGA 25m  | 64mm <sup>2</sup>  | 40 mm       | 35 x 16 mm             |
| Both ends are terminated with HDSUB15 ("VGA") straight connectors |              |              |                    |             |                        |

## Touch Cable

| Part number | 12NC         | Description        | Conduit sizes     | Bend Radius | Connector Size (L x W) |
|-------------|--------------|--------------------|-------------------|-------------|------------------------|
| M8081-61010 | 451261006551 | IV CBL Touch, 1.5m | 30mm <sup>2</sup> | 25 mm       | 35 x 16 mm             |
| M8081-61011 | 451261006561 | IV CBL Touch, 3m   | 30mm <sup>2</sup> | 25 mm       | 35 x 16 mm             |
| M8081-61012 | 451261006571 | IV CBL Touch, 10m  | 30mm <sup>2</sup> | 25 mm       | 35 x 16 mm             |
| M8081-61013 | 451261006581 | IV CBL Touch, 15m  | 30mm <sup>2</sup> | 25 mm       | 35 x 16 mm             |
| M8081-61014 | 451261006591 | IV CBL Touch, 25m  | 30mm <sup>2</sup> | 25 mm       | 35 x 16 mm             |

## MSL Cables

| Part number   | 12NC         | Description                             | Conduit sizes     | Bend Radius | Connector Size (L x W) |
|---|--------------|---|-------------------|-------------|------------------------|
| <b>Both ends are terminated with MSL connectors</b> |              |   |                   |             |                        |
| M3081-61626   | 453563474781 | CBL MSL 0.75m                           | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| M3081-61601   | 453563402721 | CBL MSL 1m                              | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| M3081-61602   | 453563377851 | CBL MSL 2m                              | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| M3081-61603   | 453563402731 | CBL MSL 4m                              | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| M3081-61627   | 453563484501 | CBL MSL 10m                             | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| M3081-61628   | 453563484511 | CBL MSL 15m                             | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| M3081-61629   | 453563484521 | CBL 25m MSL                             | 72mm <sup>2</sup> | 40 mm       | 40 mm x 17 mm          |
| <b>Both ends are unterminated, use faceplates</b>   |              |   |                   |             |                        |
| M3081-61615   | 453563484481 | CBL MSL Instal.15m unterminated         |                   |             |                        |
| M3081-61625   | 453563484491 | CBL MSL Instal.25m unterminated         |                   |             |                        |
| <b>Faceplates</b>                                   |              |   |                   |             |                        |
| M3081-68707   | 453563484531 | CBL MSL Face Plate pair of boxes NON US |                   |             |                        |
| M3081-68708   | 453563484541 | CBL MSL Face Plate pair of boxes US     |                   |             |                        |

| Part number           | 12NC         | Description                             | Conduit sizes | Bend Radius | Connector Size (L x W) |
|-----------------------|--------------|---|---------------|-------------|------------------------|
| <b>Insertion Tool</b> |              |   |               |             |                        |
| M3086-43801           | 453563484771 | MSL Insertion Tool for unterminated CBL |               |             |                        |

## Philips Medical LAN

For information refer to the IntelliVue Information Center documentation.

## LAN Interface

| Part number | 12NC         | Description                    | Conduit Sizes      | Max. Bend Angle | Connector Size (L x W)                  |
|-------------|--------------|--------------------------------|--------------------|-----------------|---|
| M8081-61001 | 453563484591 | IV CBL 1.5m LAN/RS232 straight | 30 mm <sup>2</sup> | 25 mm           | 15 x 15 mm (not for use with MIB/RS232) |
| M8081-61002 | 453563484601 | IV CBL 3m LAN/RS232 straight   | 30 mm <sup>2</sup> | 25 mm           | 15 x 15 mm (not for use with MIB/RS232) |
| M8081-61003 | 453563484611 | IV CBL 10m LAN/RS232 straight  | 30 mm <sup>2</sup> | 25 mm           | 15 x 15 mm (not for use with MIB/RS232) |
| M8081-61004 | 453563484621 | IV CBL 15m LAN/RS232 straight  | 30 mm <sup>2</sup> | 25 mm           | 15 x 15 mm (not for use with MIB/RS232) |
| M8081-61005 | 453563484631 | IV CBL 25m LAN/RS232 straight  | 30 mm <sup>2</sup> | 25 mm           | 15 x 15 mm (not for use with MIB/RS232) |

*Cable and Adapter Set*

## Telemetry Device (Patient Worn Device) cables

Table 9 PWD cables

| Part number  | 12NC         | Description                 |
|--------------|--------------|-----------------------------|
| 989803143481 | 989803143481 | TELE CBL PWD HALF OF TETHER |
| 989803146911 | 989803146911 | CBL MP5 TETHER              |

## Nurse Call Relay Interface

Table 10 Nurse Paging Cable

| Part number | 12NC         | Description                  | Conduit Sizes      | Bend Radius | Connector Size   |
|-------------|--------------|------------------------------|--------------------|-------------|--|
| M1181-61648 | 453563375601 | IV CBL NURSE PAGING CABLE 3m | 13 mm <sup>2</sup> | 20 mm       | Diameter 12 mm<br>(3m traditional nurse paging relay cable.<br><br>One end terminated with phone plug, one end without connector.) |

# ECG Out Interface

Table 11 ECG Out Cable

| Part number | 12NC         | Description   | Conduit Sizes      | Bend Radius | Connector Size (Diameter) |
|-------------|--------------|---|--------------------|-------------|---------------------------|
| 8120-1022   | 453563198151 | CBL ECG Out 3m<br>Phone plug terminated<br>(Both ends are terminated with .25" phone plugs)                         | 40 mm <sup>2</sup> | 30 mm       | 13 mm                     |
| M1181-61625 | 453563255091 | CMS CBL ECG OUT CABLE KIT 25m<br>(cable kit consisting of:<br>25 m raw cable,<br>2 x 1/4" socket,<br>1 x 1/4" plug) |                    |             |                           |
| M1783A      | 989803105251 | Sync Cable 12-pin 2.5m (8ft.)   |                    |             |                           |
| M5526A      | 989803129001 | 24' Sync Cable  |                    |             |                           |



# Gas Analyzers (not for MP5T and MP5SC)

For details on M1013A IntelliVue G1 and the M1019A IntelliVue G5, please refer to the respective Service Guide on your documentation CD.





# Specifications

This section contains selected specifications for the IntelliVue MP5/MP5SC/MP5T Patient Monitors. For a complete and detailed list of specifications, see the Instructions for Use.

## Essential Performance Characteristics

This chapter defines the Essential Performance for IntelliVue patient monitors, in combination with IntelliVue Cableless measurement devices.

Under normal and single fault conditions either at least the performance / functionality listed in the table below is provided or failure to provide this performance / functionality is readily identifiable by the user (e.g. technical alarm, no waves and/or numeric values, complete failure of the monitor, readily identifiable distorted signals, etc.).

| Parameter         | Essential Performance   |
|-------------------|---|
| General           | No interruption or cessation of current operating mode (e.g. no reboot, display ok). No spontaneous operation of controls (e.g. no activation of touch screen without user interaction).  |
| BIS               | Measurement of bispectral index (BIS).  |
| ECG               | Measurement of heart rate within $\pm 10\%$ or $\pm 5$ bpm, whichever is greater.   |
|                   | Alarming on Asystole, or heart rate limit violation within specified delay time.  |
|                   | Detection of VFIB and alarming on it.   |
|                   | ECG-Out Signal delay $\leq 35$ msec.  |
| Invasive Pressure | Measurement of systolic, diastolic and mean blood pressure within $\pm 4\%$ or $\pm 4$ mmHg, whichever is greater, and pulse rate within $\pm 10\%$ or $\pm 5$ bpm, whichever is greater. |
|                   | Alarming on systolic, diastolic and mean blood pressure and pulse rate limit violations.  |

| Parameter              | Essential Performance   |
|------------------------|---|
| NBP                    | Measurement of systolic, diastolic and mean blood pressure and pulse rate within specified accuracy / error limits.   |
|                        | Automatic cycling.  |
|                        | Alarming on systolic, diastolic and mean blood pressure limit violations.   |
| Respiration            | Measurement of respiration rate within specified accuracy/ error limits.  |
|                        | Alarming on apnea and on respiration rate limit violation.  |
| CO <sub>2</sub>        | Measurement of CO <sub>2</sub> within the following measurement accuracy ranges:<br>$\pm (0,43 \% \text{ absolute} + 8 \% \text{ of reading})$                                    |
|                        | Measurement of airway respiration rate within specified accuracy/ error limits.   |
|                        | Alarming on apnea, airway respiration rate and CO <sub>2</sub> limit violation.   |
| SpO <sub>2</sub>       | Measurement of oxygen saturation within 4% <sub>RMS</sub> over the range from 70 to 100% and pulse rate within 10% <sub>RMS</sub> or 5 bpm <sub>RMS</sub> , whichever is greater. |
|                        | Alarming on oxygen saturation and pulse rate limit violation.   |
| Temperature            | Measurement of temperature within specified accuracy/ error limits.   |
|                        | Alarming on temperature limit violation.  |
| Predictive Temperature | Measurement of temperature within specified laboratory accuracy/ error limits.  |
|                        | Alarming on temperature limit violation   |
| Tympanic Temperature   | Measurement of temperature within specified laboratory accuracy/ error limits.  |
|                        | Alarming on temperature limit violation.  |

The table above also represents the minimum performance when operating under non-transient electromagnetic phenomena according to IEC 60601-1-2:

- Radiated electromagnetic fields
- Conducted disturbances induced by RF fields
- Conducted disturbances induced by magnetic fields
- Voltage dips/ voltage variations

The following table identifies minimum performance for defibrillation and the following transient electromagnetic phenomena according to IEC 60601-1-2:

- Electrostatic Discharge (ESD)

- Electrical Fast Transients / Bursts
- Surges
- Voltage interruptions
- Electrosurgery (ESU)

| Parameter | Essential Performance  |
|-----------|--|
| All       | After electrostatic discharge, fast transients / bursts, surges, electro surgery interference and defibrillation, the equipment returns to previous operation mode within 30 seconds <sup>1</sup> without operator intervention and without loss of any stored data. |
|           | After voltage interruptions the equipment returns to previous operating mode without operator intervention and without loss of any stored data.  |

<sup>1</sup> Some standards (e.g. IEC 60601-2-49, IEC 60601-2-27, etc.) may specify shorter recovery times.

## MDD Classification

According to the Council Directive 93/42/EEC (Medical Devices Directive) the device classification is IIb, according to Rule 10.

## Classification According to IEC 60601-1

Classification (according to IEC 60601-1): Class 1, Type CF, Continuous Operation.

## Safety and Regulatory Information

For details about safety and regulatory information, refer to the Instructions for Use.

## Use Environment

### Hospital Environment

The monitors are suitable for use in all medically used rooms which fulfill the requirements regarding electrical installation according to IEC 60364-7-710 "Requirements for special installations or locations - Medical locations", or corresponding local regulations.

### Physical Security and Limited Access to the Monitor

Access to the monitor must be limited to authorized users. It is important that you consider physical security measures to ensure that unauthorized users cannot gain access.

### EMC Environment

The following measurements and system interfaces are, in addition, suitable for use in establishments directly connected to the public low-voltage supply network that supplies buildings used for domestic purposes (see table in ):

- ECG/Respiration, NBP, SpO<sub>2</sub>, Pressure, Temperature, CO<sub>2</sub> (only Mainstream Sensor M2501A and Microstream CO<sub>2</sub>).
- LAN, Video Out, Battery, Nurse Call, RS232, and recorder interfaces.

**WARNING**



















The monitors are not intended for use in an MRI environment or in an oxygen-enriched environment (for example, hyperbaric chambers).


























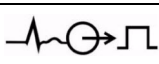





## Disconnecting from Power






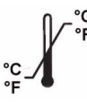



The On/Standby switch does not disconnect the monitor from the AC power source. To disconnect, unplug the power cable.

## Symbols

These symbols can appear on the monitor and its associated equipment (depending on options).

| Symbols   |  |   |   |
|---|--|---|---|
|    | Caution, refer to accompanying documents                   |    | Protective earth  |
|    |  |   |   |
|   |  |   |   |
|  | Standby  |  | Equipotential grounding   |
| RS-232  | RS232 connector  |  | Identifies year and month of manufacture  |
|  | Non-ionizing radiation symbol                              |  | Alternating current   |
|  | Connection direction indicator                             |  | Connector has special protection against electric shocks and is defibrillator proof |
|  | Electrical input indicator                                 |  | Electrical output indicator   |
|  | Gas input indicator  |  | Gas output indicator  |
|  | Quick mount release  |  | IntelliVue Instrument Telemetry wireless network                                    |
|  | LAN connection indicator for connection to a wired network | Alarm   | Nurse call relay connection indicator   |

| Symbols   |   |   |   |
|---|---|---|---|
|    | Rechargeable battery symbol   |    | Analog interface indicator for connection to any analog video display       |
|    | Data input/output symbol  |    | Error LED   |
|    | Always use separate collection for waste electrical and electronic equipment (WEEE)   |    | built-in wireless network   |
|    | Pressure connector  |    | Temperature connector   |
|    | NBP connector   |    | SpO <sub>2</sub> connector  |
|    | Telemetry device connector  |    | Uses FAST SpO <sub>2</sub> algorithm  |
|    | ECG connector   |    | Monitor supports 12-lead ECG  |
|   | built-in short range radio interface  |   | Indicates location of serial number   |
|  | Indicates location of the date of manufacture and/or name and address of manufacturer |  | Followed by two alphanumeric characters, indicates ingress protection grade |
|  | SmartKeys   |  | Alarms On/Off   |
|  | Indicates location of catalog number  |  | Indicates location of service number  |
|  | Main Screen   |  | Alarms Switched Off   |
|  | Non-ionizing radiation symbol   |  | Back key  |
|  | ECG Sync Pulse Output indicator   |  | Type BF   |
|  | Nellcor OxiMax compatible   |  | Masimo rainbow SET Technology   |
|  | USB interface   |  | Start a measurement   |

| Symbols   |  |   |  |
|---|--|---|--|
|  | Stop a measurement                           |  | Mass in kilogram (kg)                        |
|  | Indicates location of batch number.          |  | Indicates the location of the "use by" date. |
|  | Humidity limitations for storage             |  | Temperature limitations for storage          |
|  | Atmospheric pressure limitations for storage |  | Contents of the packaging are not sterile.   |
|  | Not made with natural rubber latex           |   |  |

## Physical Specifications

### Monitor

| Specification                            | Comments   |
|--|--|
| Maximum Weight                           |  |
| 5.1 kg (11.2 lbs)                        | with ECG/Resp, NBP, SpO <sub>2</sub> and battery |
| W x H x D                                |  |
| 259 x 248 x 187 mm (10.2 x 9.8 x 7.4 in) | without Predictive Temperature unit              |
| 312 x 250x 235 mm (12.3 x 9.8 x 9.3 in)  | with Predictive Temperature unit and bedhanger   |

### Tympanic Temperature

| Thermometer              |  |
|--------------------------|--|
| Dimensions               | 187 x 44 x 71 mm (7.4 x 1.7 x 2.8 in)  |
| Cable length             | spiral cable relaxed: 600 mm (23.6 in)<br>spiral cable extended: 2500 mm (98.4 in) |
| Weight (including cable) | 0.2 kg (0.4 lbs)   |

| Base Station             |                                       |
|--------------------------|---------------------------------------|
| Dimensions               | 208 x 65 x 78 mm (8.2 x 2.5 x 3.1 in) |
| Weight (excluding cable) | 0.3 kg (0.7 lbs)                      |

## Environmental Specifications

The monitor may not meet the performance specifications given here if stored or used outside the specified temperature and humidity ranges.

The monitor is protected against ingress of objects and fluids according to IEC 60529 IP32 (except monitors with the predictive temperature unit). Do not expose the monitor directly to heavy rain.

When the monitor and related products have differing environmental specifications, the effective range for the combined products is that range which is common to the specifications for all products.

| Item  | Condition                                       | Range   |
|---|---|---|
| Temperature Range   | Operating                                       | 0 to 40°C (32 to 104°F)   |
|   | Storage   | -20 to 60°C (-4 to 140°F)   |
|   | Transportation <sup>1</sup>                     | -20 to 60°C (-4 to 140°F)   |
| Temperature Range with IntelliVue 802.11 Bedside Adapter or IntelliVue Instrument Telemetry Wireless Network or when charging the battery | Operating                                       | 0 to 35°C (32 to 95°F)  |
| Temperature Range with Predictive Temperature Unit  | Operating                                       | 10 to 40°C (50 to 104°F)  |
|   | Storage   | -20 to 50°C (-4 to 120°F)   |
| Humidity Range  | Operating                                       | 15% to 95% Relative Humidity (RH) (non condensing)  |
|   | Storage   | 5% to 90% Relative Humidity (RH)  |
|   | Transportation <sup>1</sup>                     | 5% to 90% Relative Humidity (RH)  |
| Altitude Range  | Operating                                       | -500 m to 3000 m (10000 ft)   |
|   | Storage   | -500 m to 4600 m (15000 ft) <sup>2</sup>  |
|   | Transportation <sup>1</sup>                     | -500 m to 4600 m (15000 ft) <sup>2</sup>  |
| Ingress Protection  | Monitor without the predictive temperature unit | IP32 (protected against ingress of water when the water is dripping vertically and the monitor is tilted up to 15° and protected against contact with or ingress of foreign objects larger than 2.5 mm) |
|   | Monitor with the Predictive Temperature Unit    | IPX1 (protection against ingress of water when the water is dripping vertically)  |

<sup>1</sup> Short-term storage during shipment

<sup>2</sup> Sufficient for flight altitudes up to 12,000 m with pressurized cabins

### Tympanic Temperature Thermometer

| Ambient Temperature Range   |             |              |
|---|-------------|--------------|
|   | Range °C    | Range °F     |
| Operating 10 to 95% RH, non-condensing  | 16 to 33    | 60.8 to 91.4 |
| Storage up to 95% RH, non-condensing  | -25 to 55.0 | -13 to 131   |
| <b>Caution:</b><br>EN 12470-5 specifies 16.0°C to 35.0°C (60.8°F to 95°F), 10 to 95% RH, non-condensing<br>ASTM E1965-98 specifies 16.0°C to 40.0°C (60.8°F to 104°F), up to 95% RH, non-condensing<br>Storing the thermometer outside the specified temperature/humidity range might adversely affect measurement accuracy. Check the calibration after storage in uncertain conditions. |             |              |









Part Number 453564550611  
Published in Germany 06/15



**PHILIPS**