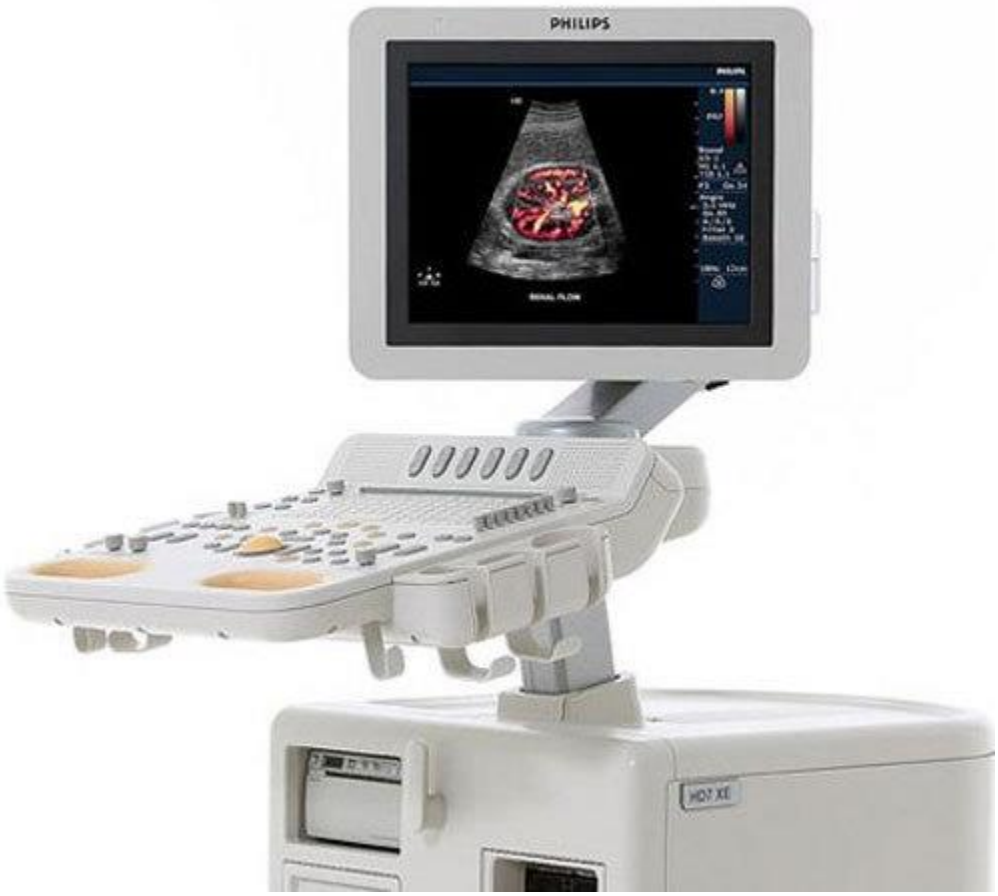
PHILIPS



MONITOR VIEWING SCREEN (MVS) SYSTEM

SERVICE MANUAL

CONTENTS

ACTIVITY: SAFETY

BASIC SAFETY

Warnings:

- Do not use the system for any application until you have read, understood, and know all the safety information, safety procedures, and emergency procedures contained in this "Safety" section. Operating the system without a proper awareness of safe use could lead to fatal or other serious personal injury.
- Do not use this system for any application until you are sure that the system's periodic maintenance is current. If any part of the system is known or suspected to be defective or incorrectly adjusted, do not use the system until it is repaired. Operating the system with defective or incorrectly adjusted components could expose you and the patient to safety hazards.
- Do not use the system for any application until you are adequately and properly trained on its safe and effective operation. If you are unsure of your ability to operate the system safely and effectively, do not use it. Operation of the system without proper and adequate training could lead to fatal or other serious personal injury.
- Do not operate the system with patients unless you have an adequate understanding of its capabilities and functions. Using the system without such understanding may compromise the system's effectiveness and the safety of the patient, you, and others.
- Never attempt to remove, modify, override, or frustrate any safety device on the system. Interfering with safety devices could lead to fatal or other serious personal injury.
- Use the system only for its intended purposes. Do not use the system with any product that Philips does not recognize as compatible with the system. Operation of the product for unintended purposes, or with incompatible products, could lead to fatal or other serious injury.

ELECTRICAL SAFETY

This equipment has been verified by a recognized third-party testing agency as a Class I device with Type BF and Type CF isolated patient-applied parts, and Type B non-isolated patient-applied parts. (The safety standards met by this system are included in the "Specifications" section.) For maximum safety observe these warnings and cautions:

Warnings:

- Shock hazards may exist if this system (when mounted on its cart or plugged directly into an AC power source), including all externally mounted recording and monitoring devices, is not properly grounded. Protection against electrical shock is provided by grounding the cart or the AC power adapter with a three-wire cable and plug, which must be plugged into a grounded outlet. The grounding wire must not be removed or defeated.
- To avoid the risk of electrical shock, never connect the system power cord to a power strip or an extension cord. When using the power cord, always connect it directly to a grounded wall outlet.
- Use only the AC adapter supplied with your system.
- Use only Type CF transducers for invasive procedures. Type B transducers are insufficiently electrically isolated for invasive use.
- Do not remove the protective covers on the system; hazardous voltages are present inside. Cabinet panels must be in place while the system is in use. All internal adjustments and replacements must be made by a qualified Philips Ultrasound field service engineer.
- Do not operate this system in the presence of flammable gases or anesthetics. Explosion can result. The system is *not* compliant in AP/APG environments as defined by IEC 60601-1.
- To avoid risk of electrical shock hazards, always inspect the transducer before use: Check the face, housing, and cable before use. Do not use if the face is cracked, chipped, or torn; the housing is damaged; or the cable is abraded.

- To avoid risk of electrical shock hazards, always turn off the system, disconnect it from the wall outlet, and remove the battery (see "Installing the Battery" on page 149) before cleaning the system.
- All patient-contact devices, such as transducers, pencil probes, and ECG leads not specifically indicated as defibrillation-proof must be removed from patient contact before application of a high-voltage defibrillation pulse. See "Defibrillators" on page 29.
- During transesophageal echocardiographic (TEE) procedures, either remove the TEE transducer from the patient or disconnect the TEE transducer from the system immediately following image acquisition.
- Ultrasound equipment in normal operation, as with other medical electronic diagnostic equipment, uses high-frequency electrical signals that can interfere with pacemaker operation. Though the possibility of interference is slight, be alert to this potential hazard and stop system operation immediately if you note interference with a pacemaker.
- When using additional peripheral equipment powered from an electrical source other than the ultrasound system, the combination is considered to be a medical system. It is your responsibility to comply with IEC 60601-1-1 and test the system to those requirements. If you have questions, contact your Philips representative.
- Do not use nonmedical peripherals, such as report printers, within 1.5 m (5 ft) of a patient, unless the nonmedical peripherals receive power from an isolated power outlet on the Philips ultrasound system, or from an isolation transformer that meets medical safety standards, as defined by standard IEC 60601-1-1.
- The system and patient-applied parts meet the standard IEC 60601-1. Applied voltages exceeding the standard, although unlikely, may result in electrical shock to the patient or operator.
- Connection of optional devices not supplied by Philips Ultrasound could result in electrical shock. When such optional devices are connected to your ultrasound system, ensure that the total system earth leakage current does not exceed 500 µA, or in the United States, 300 µA.

- To avoid risk of electrical shock, do not use any transducer that has been immersed beyond the specified cleaning or disinfection level.
- To avoid risks of electrical shock and fire hazards, inspect the system power cord and plug regularly. Ensure that they are not damaged in any way.
- Do not drape the power cord over any of the cable hooks or the handle on the system cart. Damage to the cord or power receptacle unit can occur if the cart is raised. Operating the system with physio input signals that are below the specified minimum levels may cause inaccurate results. See the "Specifications" section.
- Electrosurgical units (ESUs) and other devices intentionally introduce radio frequency electromagnetic fields or currents into patients. Because imaging ultrasound frequencies are coincidentally in the radio frequency range, ultrasound transducer circuits are susceptible to radio frequency interference. While an ESU is in use, severe noise interferes with the black-and-white image and completely obliterates the color image. Concurrent failures in an ESU or other device and in the outer layer of the TEE transducer shaft can cause electrosurgical currents to return along the transducer conductors. This could burn the patient, and the ultrasound system and the transducer could also be damaged. Be aware that a disposable transducer cover provides no protective electrical insulation at ESU frequencies.
- To avoid risk of a burn hazard, do not use transducers with high-frequency surgical equipment. A burn hazard may result from a defect in the high-frequency surgical neutral electrode connection.

Cautions:

- Although your system has been manufactured in compliance with existing EMI/EMC requirements, use of this system in the presence of an electromagnetic field can cause momentary degradation of the ultrasound image. When interference is present or intermittent, use caution when continuing to use the system. If interference occurs often, review the environment in which the system is being used, to identify possible sources of

radiated emissions. These emissions could be from other electrical devices used within the same room or an adjacent room. Communication devices such as cellular phones and pagers can cause these emissions. The existence of radio, TV, or microwave transmission equipment located nearby can cause emissions. In cases where EMI is causing disturbances, it may be necessary to relocate your system.

- For information on electromagnetic emissions and immunity as it applies to the system, see "Electromagnetic Compatibility" on page 66. Ensure that the operating environment of your system meets the conditions specified in the referenced information. Operating the system in an environment that does not meet those conditions may degrade system performance.

MECHANICAL SAFETY

A list of precautions related to mechanical safety follows; observe these precautions when using the system:

Warnings:

- Be aware of the wheels on the system cart, especially when moving the system. The system could cause injury to you or others if it rolls over feet or into shins. Use caution when going up or down ramps.
- When attempting to overcome an obstacle, do not push the system from either side with excessive force, which could cause the system to tip over.
- Position external hardcopy devices away from the system. Ensure that they are secure. Do not stack them on the system. When positioning the monitor, move it carefully to avoid pinching hands or extremities against other objects, such as a bed rail.
- Never park the system on an incline.
- The brakes are intended as a convenience. To increase cart security, use wheel chocks when the system is parked.
- If system operation is abnormal after you move or transport the system, contact Philips Ultrasound Customer Service immediately. System components are installed securely and can withstand considerable shock, but excessive shock can cause a system failure.
- To avoid injury, Philips recommends against lifting the system cart.

Cautions:

- Before moving the system, ensure that the system is secured for transport. On some systems, that may include ensuring that the monitor is latched, to prevent monitor damage during transport.
- Ensure that the cables for all patient-applied parts are secure before moving the system. Use the cable management system to ensure that transducer cables are protected from damage.

- Do not roll the system over transducer cables or power cables.
- Do not use the system handle or transducer holders to move the cart.
- Never move the cart with the system on it, unless the system is properly attached to the cart.
- To avoid the possibility of tipping the system cart when you move it over a threshold, lift the cart slightly with the handle on the rear of the cart and pull the cart over the threshold.

EQUIPMENT PROTECTION

Follow these precautions to protect your system:

Cautions:

- Excessive bending or twisting of cables on patient-applied parts may cause failure or intermittent operation of the system. Do not roll the system over cables, which may damage them.
- Improper cleaning or sterilization of a patient-applied part may cause permanent damage. For cleaning and disinfection instructions, see the "Transducer Care" section.
- Do not submerge the transducer connector in solution. The cables and transducer bodies are liquid-tight, but the connectors are not.
- Do not use solvents, such as thinner or acetone, or abrasive cleaners on the system, transducers, or any hardcopy device.
- For optimal performance, connect your ultrasound system to a circuit dedicated solely for the system. Do not connect life-support devices to the same circuit as the ultrasound system.
- If systems, transducers, and peripherals have been in an environment below 10°C (50°F), allow them to reach room temperature before connecting or turning them on. Philips recommends allowing 24 hours for complete normalization. Otherwise, condensation inside the devices could cause damage. If the device was only briefly exposed to temperatures below 10°C (50°F), then the time required for the device to return to room temperature could be significantly less than 24 hours.
- To avoid damaging the flat-panel display in the monitor, do not store the system where the ambient temperature exceeds 65°C (149°F).

PRODUCT COMPATIBILITY

Do not use your system in combination with other products or components, unless Philips expressly recognizes those other products or components as compatible. For information about such products and components, contact your Philips representative.

Changes and additions to the system should be made only by Philips or by third parties expressly authorized by Philips to do so. Such changes and additions must comply with all applicable laws and regulations that have the force of law within the jurisdictions concerned, and best engineering practices.

Warnings:

System changes and additions that are made without the appropriate training or by using unapproved spare parts may void the Philips warranty. As with all complex technical products, maintenance by unqualified persons or using unapproved spare parts carries serious risks of system damage and personal injury.

BIOLOGICAL SAFETY

This section contains information about biological safety and a discussion of the prudent use of the system.

A list of precautions related to biological safety follows; observe these precautions when using the system. For more information refer to Medical Ultrasound Safety on your user information CD.

Warnings:

- Do not use the system if an error message on the video display indicates that a hazardous condition exists. Note the error code, turn off power to the system, and call your customer service representative.
- Do not use a system that exhibits erratic or inconsistent image updating. Discontinuities in the scanning sequence indicate a hardware failure that must be corrected before use.
- Perform ultrasound procedures prudently. Use the ALARA (as low as reasonably achievable) principle.
- Use only acoustic standoffs that have been approved by Philips Ultrasound. For information on ordering approved accessories, see "Supplies and Accessories" on page 21.
- Verify the alignment of the biopsy guide before use. See the "Biopsy Guides" section.
- Verify the condition of the biopsy needle before use. Do not use a bent biopsy needle.
- Transducer covers may contain natural rubber latex. Those covers may cause allergic reactions in some individuals. See "FDA Medical Alert on Latex" on page 44.
- The M2203A bite guard strap contains natural rubber latex, which may cause allergic reactions. See "FDA Medical Alert on Latex" on page 44.
- In contrast studies using a high-MI acoustic field, capillary rupture, due to microbubble expansion within a capillary in an acoustic field, can cause extravasation. References: (1) Skyba, D.M., Price, R.J., Linka, A.Z., Skalak, T.C., Kaul, S. "Direct in vivo visualization of intravascular destruction of microbubbles by ultrasound and its local effects on tissue."

Circulation, 1998; 98:290-293. (2) van DerWouw, P.A., Brauns, A.C., Bailey, S.E., Powers, J.E., Wilde, A.A. "Premature ventricular contractions during triggered imaging with ultrasound contrast." Journal of the American Society of Echocardiography, 2000;13(4):288-94.

- Preventricular contractions can be caused by the oscillations of microbubbles when a high-MI acoustic field is triggered in the heart at the end of systole. In a very sick patient with certain risk factors, theoretically, this could lead to ventricular fibrillation. Reference: van Der Wouw, P.A., Brauns, A.C., Bailey, S.E., Powers, J.E., Wilde, A.A. "Premature ventricular contractions during triggered imaging with ultrasound contrast." Journal of the American Society of Echocardiography, 2000;13(4):288-94.
- If a sterile transducer cover becomes compromised during an intraoperative application involving a patient with transmissible spongiform encephalopathy, such as Creutzfeldt-Jakob disease, follow the guidelines of the U.S. Centers for Disease Control and this document from theWorld HealthOrganization: WHO/CDS/ APH/2000/3, WHO Infection Control Guidelines for Transmissible Spongiform Encephalopathies. The transducers for your system cannot be decontaminated using a heat process.
- If the system becomes contaminated internally with bodily fluids carrying pathogens, you must immediately notify your Philips service representative. Components inside the system cannot be disinfected. In that case, the system must be disposed of as biohazardous material in accordance with local or federal laws.

ACTIVITY: PREPARING THE SYSTEM

CONNECTING DEVICES

In addition to the devices installed in the system cart, the system supports external devices.

Warnings:

- When using additional peripheral equipment powered from an electrical source other than the ultrasound system, the combination is considered to be a medical system. It is your responsibility to comply with IEC 60601-1-1 and test the system to those requirements. For more information on peripheral devices, see "Electrical Safety" on page 26. If you have questions, contact your Philips representative.
- Do not use nonmedical peripherals, such as report printers, within 1.5 m (5 ft) of a patient, unless the nonmedical peripherals receive power from an isolation transformer that meets medical safety standards, as defined by standard IEC 60601-1-1.
- Philips ultrasound systems are tested to the requirements of IEC 60601-1, with on-cart peripherals that are powered by the built-in isolation transformer. The system peripherals meet general electrical safety usage requirements, but not necessarily medical device standards.
- Off-cart devices connecting to the ultrasound system must comply with the applicable IEC or national standards, such as IEC 60601-1, IEC 60950, or the equivalent.

Cautions:

- Using accessories, transducers, peripherals, or cables not supplied with the ultrasound system or recommended by Philips can affect the system in the form of increased emissions or decreased immunity to external EMI/EMC occurrences.
- If systems, transducers, and peripherals have been in an environment below 10°C (50°F), allow them to reach room temperature before connecting or turning them on. Philips recommends allowing 24 hours for complete normalization. Otherwise, condensation inside the devices could cause damage. If the device was only briefly exposed to temperatures below 10°C (50°F), then the time required for the device to return to room temperature could be significantly less than 24 hours.

Note:

Any device that is not purchased from Philips or a Philips-authorized agent is not covered under a Philips service agreement or warranty.

ATTACHING THE SYSTEM

The optional system cart includes latches for securely attaching the system.

Cautions:

Never move the cart with the system on it, unless the system is properly attached to the cart.

1. Slide the back of the system onto the rear latch so that the pins seat fully into the holes in the system. You may need to open and close the rear latch.
2. Lower the front of the system onto the cart until the front latch snaps into place.
3. Ensure that both latches are fully engaged and that the system is firmly attached to the cart.
4. Connect all required cables to the system.

REMOVING THE SYSTEM

The optional system cart includes a latch mechanism for securely attaching the system. Remove the system from the cart only when you are holding the system securely by the handle.

1. Disconnect all cables from the system.
1. Holding the handle of the system, release the front latch and slide the system out of the cart.
2. If the system configuration includes the Multiport adapter, put the connector into a transducer holder on the cart.

SYSTEM CONFIGURATION

The ultrasound system is configured using the System setups. The configuration information for the system includes the IP address, port number, and other attributes required for transmitting images and other study data across a network.

The system must be configured before you use either the standard network support or the capabilities available through the DICOM Networking option. To configure the system, information must be typed into the corresponding fields in the System setups display.

Standard Network Support:

The system supports standard wired and wireless network functions, which include printing to local printers and report printers. Additional network capabilities are available in the DICOM Networking option.

DICOM Networking Option:

The DICOM Networking option permits network transfer of image and report information to a DICOM storage server or PACS. The system conforms to the Digital Imaging and Communications in Medicine (DICOM) standard, version 3.0. Centralized printers, print servers, network file servers, and review workstations that comply with the DICOM standard can take advantage of the DICOM Networking option.

With the DICOM Networking option, you can store ultrasound images on DICOM-compatible file servers or storage devices and review them using a workstation. You can also print studies directly to a DICOM printer. Capabilities include support for DICOM services such as Modality Worklist, Performed Procedure Step, and Storage Commit. Additionally, the DICOM Networking option includes the DICOM Structured Reporting option, which allows you to transfer tagged report data to a DICOM storage server or PACS.

The DICOM Networking option is initially set up by your Philips Ultrasound field service engineer or the system administrator. The DICOM setups are available from the System setups display or by clicking or . After you select DICOM, the options available to you depend upon the configuration of your system. The DICOM Networking option requires additional levels of setup.

Once the ultrasound system is configured, it remains that way through power cycles until you reconfigure it.

Configuration Information:

Before you can use either the standard network support or the capabilities provided by the DICOM Networking option, the system must be configured to communicate on the network. The system configuration information must contain the correct AE title, port number, and IP address for each device on the network, including the system and its subnet mask.

ENTERING SYSTEM NETWORK SETTINGS

You must enter settings for your system before you connect your system to the network. If you have questions, see your network administrator.

Notes:

- You cannot make DICOM setup changes if you have a study open or if any DICOM jobs are pending. Close the open study and complete or delete pending DICOM jobs first. A message is displayed if you have pending jobs.
- If you change DICOM presets, the new preset's network settings are not applied immediately. You must first apply the network settings before trying to ping or create a new DICOM device in the new preset.

1. To avoid the possibility of conflicting IP addresses in static IP configurations, do not connect the LAN cable (if you are using a wired connection) or the wireless network adapter (if you are using a wireless connection) to the system. If it is already connected, disconnect it.
2. Press the Setup key.
3. On the System tab, click DICOM.
4. Click the DICOM Preset tab.
5. On the Change DICOM Preset menu, select the preset that you want to change.
6. Click Change Settings For Current Preset.
7. Click the This System tab.
8. In the System Name area, change the PC Name to that specified by your network administrator.

Notes:

- The AE title for each device on the network must be unique.
- AE titles are case sensitive. (That is, PACS1 is different from Pacs1.)
- In many institutions, the AE title is derived from the PC Name, which must be unique across the institution's network.

9. If the configuration of your system allows you to enter the AE title, enter it in the AE Title field as specified by your network administrator.
10. If the configuration of your system allows you to derive the AE title from the PC name, select Derive the AE Title Fromthe PC's Name and type the applicable information in the Format and PCNAME fields.
11. In the System Port Number area, type, or click the arrows to change, the port number specified by your network administrator.

CHANGING THE PC NAME

1. Press the **Setup** key.
2. On the **System** tab, click **DICOM**.
3. Click the **DICOM Preset** tab.
4. Select a preset from the **Change DICOM Preset** menu.
5. Click **Change Settings for Current Preset**.
6. Click the **This System** tab.
7. In the **System Name** area, click **Change** next to the **PC Name** field.
8. Enter the new computer name in the **Change Computer Name** dialog box.
9. Click **OK**.
10. In the **Change Confirmation** dialog box, click **OK**.
11. Shut down the system and restart it.

Notes:

After you change the PC Name, the system disables all DICOM options until you restart the system. After you restart the system, all installed DICOM options are available again.

WIRELESS NETWORKING

The system supports wireless networking.Wireless networking does not require the DICOM Networking option. The system supports only one wired or wireless network connection at a time.

The system supports the IEEE 802.11 b/g wireless networking specification.

Use only Philips-approved USB wireless network adapters with the system.

Notes:

- You cannot back up or restore wireless network settings, because they are not stored with DICOM presets.
- Wireless connection quality can be affected by many factors. The system may experience a connection interruption while a network job is in progress. If this occurs, the job remains in the job queue. When the connection is restored, the system resumes the job automatically.
- For more information about your wireless network adapter, see the documentation that accompanies the adapter.
- It is your responsibility to configure the wireless network security mechanisms that are compatible with your network.