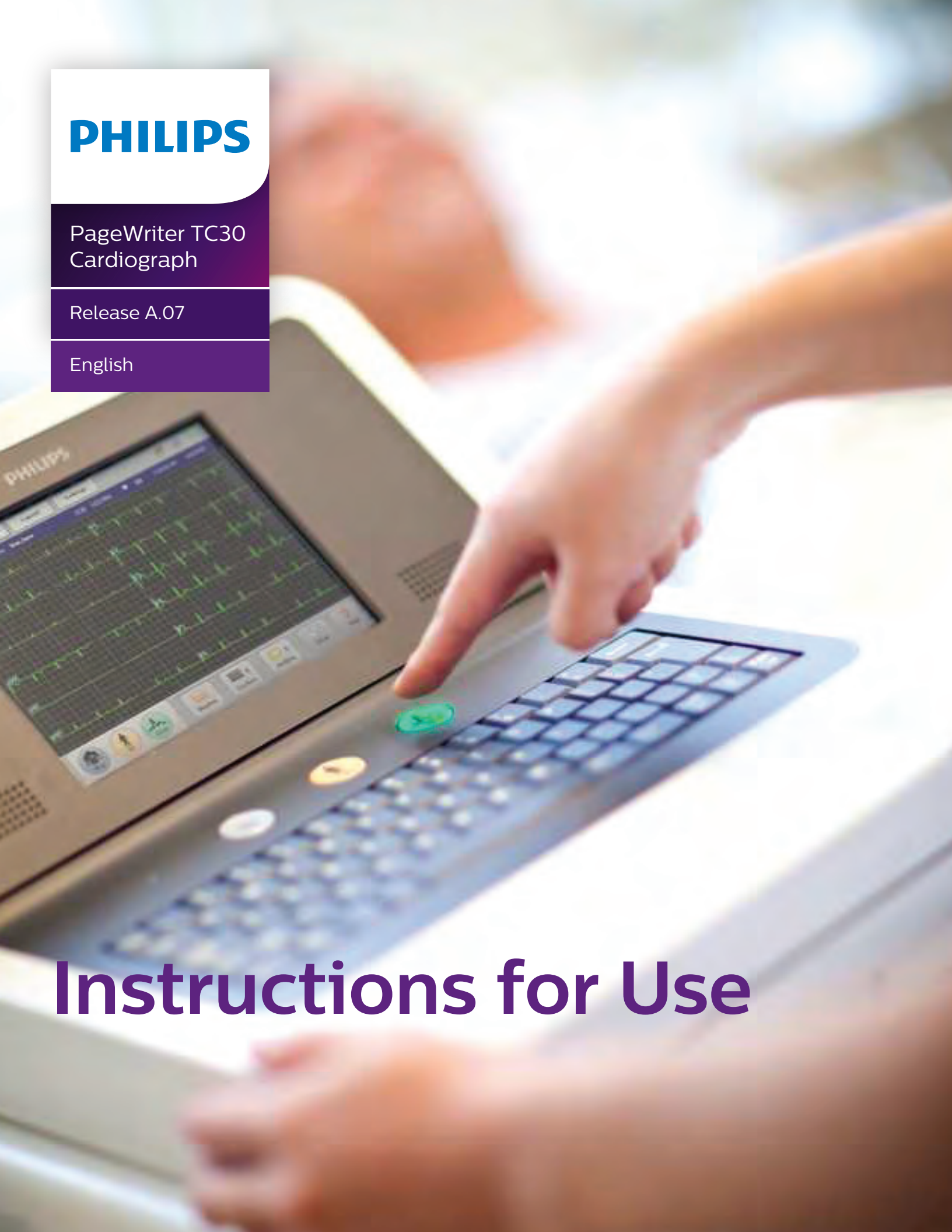
PHILIPS

PageWriter TC30 Cardiograph

Release A.07

English



Instructions for Use

PageWriter TC30 Cardiograph

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Release A.07

Revision A
June 2019

Notice

PN 453564890121
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Revision A, applies to software version A.07.07 and higher.

Revision History

Revision A,

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Warranty

Philips Medical Systems reserves the right to make changes to both this *Instructions for Use* and to the product that it describes. Product specifications are subject to change without notice.

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Responsibility of Manufacturer

Philips Medical Systems only considers itself responsible for any effects on safety, reliability and performance of the product if:

- assembly operations, extensions, readjustments, modifications or repairs are done by persons authorized by Philips Medical Systems, and
- the electrical installation of the relevant room or vehicle complies with the IEC or national requirements, and
- the instrument is used according to the instructions for use presented in this manual.

Responsibility of Customer

The user of this product is responsible for ensuring the implementation of a satisfactory maintenance schedule. Failure to do so may cause undue failure and possible health hazards.

Instructions for Use

This Philips product is intended to be operated only in accordance with the safety procedures and operating instructions provided in this *Instructions for Use*, and in accordance with the purposes for which it was designed. Installation, use, and operation of this product is subject to the laws in effect in the jurisdiction(s) in which the product is being used.

Users must only install, use, and operate this product in such a manner that does not conflict with applicable laws or regulations that have the force of law.

Use of this product for purposes other than the express intended purpose provided by the manufacturer, or incorrect use and operation, may relieve the manufacturer (or agent) from all or some responsibility for resultant non-compliance, damage, or injury.

The generic term “cardiograph” used in this documentation is equivalent to “electrocardiograph.”

Training

Users of this product must receive adequate clinical training on its safe and effective use before attempting to operate the product as described in this *Instructions for Use*.

Training requirements vary by country. Users must ensure that they receive adequate clinical training in accordance with local laws or regulations.

For further information on available training on the use of this product, please contact your Philips representative.

Trademarks

Product and company names mentioned herein may be the trademarks or registered trademarks of their respective owners.

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About the PageWriter TC30 Cardiograph

About the Instructions for Use

The *PageWriter TC30 Cardiograph Instructions for Use* is intended to assist users in the safe and effective use of the product.

Before attempting to operate this product, read this *Instructions for Use*, and note and strictly observe all Warning and Cautions as described in this document.

Pay special attention to all of the safety information provided in the Safety Summary section. For more information, see page vi.

The following conventions are used in this *Instructions for Use*:.

Typeface	Usage	Example
Bold	User interface items and system keys, internal software components and file names	Touch **Settings**. Press **CTRL+F**.
Italic	Variables, document titles	*<product name>-<hardware configuration>-<software version>.cfg* *PageWriter TC20 Cardiographs Instructions for Use*
URL	Website URLs	www.healthcare.philips.com

WARNING

Warning statements describe conditions or actions that may result in a potentially serious outcome, adverse event, or a safety hazard. Failure to follow a Warning may result in death or serious injury to the user or to the patient.

Caution

Caution statements describe when special care is necessary for the safe and effective use of the product. Failure to follow a caution may result in minor to moderate personal injury or damage to the product or other property, a remote risk of more serious injury, or may cause environmental pollution.

Note:

Notes contain additional important information about a topic.

Obtaining a Paper Copy of the Instructions for Use

Paper copies of the Instructions for Use may be obtained from Philips by sending an e-mail request to ECG@Philips.com. Please use the words "**Paper IFU**" in the subject line.

If you have an immediate need, please consider printing the PDF copy of the Instructions for Use from your user documentation DVD, or from the Philips InCenter website (https://incenter.medical.philips.com/).

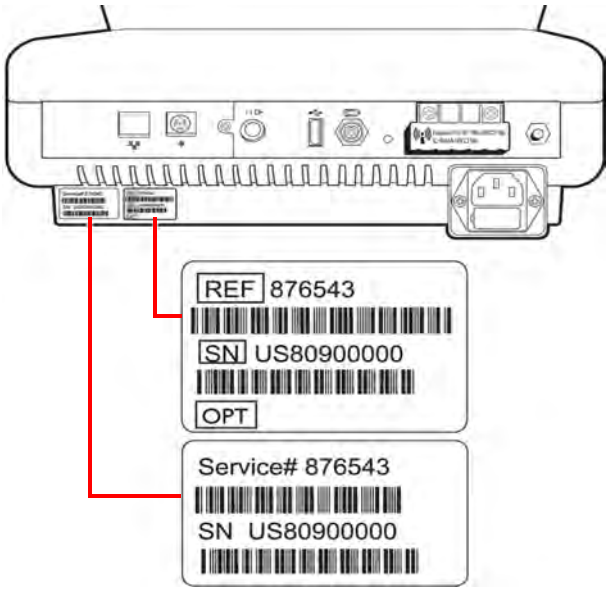
Using the Philips InCenter Site

The Philips InCenter site provides frequent updates to all Philips Cardiac Systems product documentation and product software.

The Philips InCenter site requires an active registration and password. To register, go to the InCenter site at incenter.medical.philips.com. Click on the **Need help?** link on the main page (located under the user login and password fields). On the following page, under **Software Updates** (lower right corner of page), click the **Click here for account registration** link. The Cardiac Systems InCenter Registration page appears. Complete all of the information fields on the page to receive a login and password for the InCenter site.

Registration for the InCenter site requires the serial number of at least one PageWriter cardiograph in active use at your facility. The serial number is found on the product identification label, located next to the text **SN**. The product identification label is located on the rear panel of the cardiograph.

Figure 1 TC30 Cardiograph Product Identification Label (rear view)



About Adobe Acrobat Versions

Adobe Acrobat Reader version 9.0 or higher must be installed on the PC that is used to access the Philips InCenter site. Previous versions of Acrobat Reader are not compatible with the Philips InCenter site, and attempting to access InCenter with a previous version of Acrobat Reader will result in error messages when opening documents. Uninstall all previous versions of Acrobat Reader, and then proceed for a free install of Acrobat Reader to www.adobe.com.

Any version of Adobe Acrobat Professional or Acrobat Elements is also not compatible with the Philips InCenter site, and error messages will appear when opening documents with these applications. Acrobat Reader must be installed in addition to Acrobat Professional or Acrobat Elements.

Follow this procedure when accessing documents on the Philips InCenter site.

To access documents on the Philips InCenter site:

1. Close Acrobat Professional or Acrobat Elements (if open).
2. Start Acrobat Reader.
3. Open a web browser and go to the Philips InCenter site. Keep Acrobat Reader open the entire time while accessing the InCenter site.

Regulatory Information

Medical Device Directive

The PageWriter TC30 Cardiographcomplies with the requirements of the European Council Directive 93/42/EEC concerning medical devices as amended by 2007/47/EC, Annex XII, and carries the following mark accordingly:

CE 0123

Global Medical Device Nomenclature (GMDN)

The 5-digit GMDN code adjacent to the symbol is defined in the EN ISO 15225 standard.

GMDN 16231

Authorized EU Representative

EC REP

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71034 Böblingen
Germany

Australia Sponsor

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Regulatory Compliance

The Philips PageWriter TC30 Cardiograph complies with all relevant international and national standards and laws. Information on compliance will be supplied on request by a local Philips representative, or by the manufacturer.

The PageWriter TC Cardiograph meets the following requirements for safety and performance:

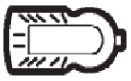
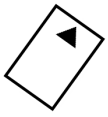
- IEC 60601-1:2005 + A1:2012 Medical electrical equipment - Part 1: General requirements for basic safety and essential performance.
- IEC 60601-1-2:2014 Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests.
- IEC 60601-1-2:2007 Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests.
- IEC 60601-2-25: 2011 Medical electrical equipment - Part 2-25: Particular requirements for the basic safety and essential performance of electrocardiographs.
- IEC 60601-1-6:2010 +A1:2013 Medical electrical equipment - Part 1-6: General requirements for basic safety and essential performance - Collateral standard: Usability.
- IEC 62304:2006+A1:2015 Medical device software - Software life cycle processes.
- IEC 62366-1:2015 Medical devices Part 1- Application of usability engineering to medical devices.
- ISO 15223-1:2016 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements.
- AAMI EC53:1995/(R)2008 ECG Trunk Cables and Patient Leadwires.

Directive 2014/53/EU

Philips Medical Systems hereby declares that the PageWriter TC Cardiographs are in compliance with Directive 2014/53/EU concerning medical devices. The full text of the Declaration of Conformity is available on the Philips InCenter website (incenter.medical.philips.com).

Safety Summary

Safety and Regulatory Symbols Marked on the Cardiograph or Patient Interface Module (PIM)

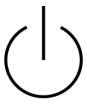
Symbol	Description	Standard/Reference
	See the *PageWriter TC30 Cardiograph Instructions for Use*.	ISO 7010¥ M002
	ECG physio isolation is type CF, defibrillator proof. Suitable for all patient applications including direct cardiac application. System is in continuous operation.	IEC 60417† 5336
	Dispose of in accordance with the requirements of your country.	Waste Electrical and Electronic Equipment directive 2012/19/EU, Article 14.4
	The connector near this symbol provides access to an analog ECG signal that can be used as a synchronization signal for external devices, such as an imaging device. This analog ECG signal is not diagnostic quality and should not be used for ECG analysis purposes.	NA
	Connect the Ethernet RJ45 LAN cable to the connector directly above this symbol to establish LAN connectivity.	NA
	See the *PageWriter TC30 Cardiograph Instructions for Use*.	ISO 15223-1* 5.4.4
	Connect the PIM patient data cable to the connector located directly above this symbol.	NA
	Insert the wireless adapter into the slot located directly below this symbol.	NA

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

† IEC 60417 Graphical symbols for use on equipment

¥ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs

Safety and Regulatory Symbols Marked on the Cardiograph or Patient Interface Module (PIM) *(continued)*

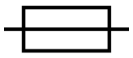
Symbol	Description	Standard/Reference
	Connect the Barcode Reader or Magnetic Card Reader to the connector located directly above this symbol. **Note:** *Magnetic card reader is no longer available for purchase, but may be found on older cardiographs.*	NA
	The number next to this symbol is the serial number of the cardiograph.	ISO 15223-1* 5.1.7
	The number next to this symbol is the catalogue number of the cardiograph.	ISO 15223-1* 5.1.6
	Identifies the date on which the product was manufactured.	ISO 15223-1* 5.1.3
	Identifies the manufacturer of the product., including name and address.	ISO 15223-1* 5.1.1
	Pressing the button with this symbol on it puts the cardiograph into Standby (power saving mode).	IEC 60417† 5009
	The connector near this symbol is used with a USB device.	NA
	Interference may occur in the vicinity of equipment marked with this symbol.	IEC 60417† 5140
	Equipotential grounding post used for establishing common ground between instruments.	IEC 60417† 5021

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

† IEC 60417 Graphical symbols for use on equipment

¥ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs

Safety and Regulatory Symbols Marked on the Cardiograph or Patient Interface Module (PIM) *(continued)*

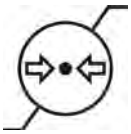
Symbol	Description	Standard/Reference
	Terminal intended for connection to an external conductor for protection against electric shock in case of a fault.	IEC 60417† 5019
	Indicates that the equipment is suitable for AC current only. **Note:** *Symbol is located inside the cardiograph.*	IEC 60417† 5032
	Indicates a high risk of exposure to HIGH VOLTAGE from the AC/DC module after the top cover is removed. To reduce the risk, see “Servicing the Cardiograph” on page xxvii. **Note:** *Symbol is located inside the cardiograph.*	ISO 7010¥, W012
	Contains a 1.6 amp (250V) time-delay fuse.	IEC 60417† 5016
	Indicates protection against a spray of water from any direction for at least five (5) minutes.	IEC 60529, Ed. 2.2 Degrees of protection provided by enclosures (IP Code), section 6
	The product has been certified by SGS (Société Générale de Surveillance)	NA

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

† IEC 60417 Graphical symbols for use on equipment

¥ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs

Safety and Regulatory Symbols Marked on the Cardiograph Packaging

Symbol	Description	Standard/Reference
	Keep dry.	ISO 15223-1* 5.3.4
	Ambient temperature range (non-condensing) for transport and storage (see Appendix C, “Specifications”). **Note:** *the batteries will discharge at a rapid rate if the cardiograph is stored at a high temperature.*	ISO 15223-1* 5.3.5
	Atmospheric pressure range for transport and storage (see Appendix C, “Specifications”).	ISO 15223-1* 5.3.9
	Relative humidity range (non-condensing) for transport and storage. (see Appendix C, “Specifications”)	ISO 15223-1* 5.3.8
	Made from recycled materials.	ISO 7000¥ 1135
	Fragile.	ISO 15223-1* 5.3.1

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

¥ ISO 7000 Graphical symbols for use on equipment - Registered symbols

Safety and Regulatory Symbols Marked on the Cardiograph Cart

Symbol	Description	Standard/Reference
	Do not place more than 3 kg (6.6 pounds) of weight into the cart storage bin.	ISO 7010‡, P012
	Do not place more than 11 kg (25 pounds) on top of the cart.	ISO 7010‡, P012
	Total mass of the cart and equipment cannot exceed 44 kg (97 pounds) total weight, including the cart, the cardiograph, the drawer contents, and storage bin(s) contents.	ISO 7000*, 1321B
	Do not place more than 4.5 kg (10 pounds) into the wire basket.	ISO 7010‡, P012
	Do not transport the cart with the patient cable arm positioned to the side. Only transport the cart with the patient cable arm positioned to the front of the cart.	N/A

* ISO 7000 Graphical symbols for use on equipment - Registered symbols

‡ ISO 7010 Graphical symbols - Safety colours and safety signs - Registered safety signs

Safety and Regulatory Symbols Marked on the Cardiograph Battery

Symbol	Description	Standard/Reference
	Do not dispose of this product (or any parts of it) in industrial or domestic waste. The system may contain materials or hazardous substances that can cause serious environmental pollution. The system also contains privacy-sensitive information. It is advisable to contact your service personnel before disposing of this product.	Waste Electrical and Electronic Equipment directive 2012/19/EU, Article 14.4
	See the *PageWriter TC30 Cardiograph Instructions for Use*.	ISO 7010¥, M002
	Product meets the requirements of 93/42/EEC for Medical Devices distributed in the European Economic Area (EEA).	European Council Directive 93/42/EEC concerning medical devices as amended by 2007/47/EC, Annex XII
	Identifies the date on which the product was manufactured.	ISO 15223-1* 5.1.3
	The number next to this symbol is the serial number of the cardiograph.	ISO 15223-1* 5.1.7
	The number next to this symbol is the catalogue number of the cardiograph.	ISO 15223-1* 5.1.6
	The number next to this symbol is the catalogue number of the cardiograph.	ISO 15223-1* 5.1.5
	Product is certified to meet all US and Canadian standards requirements.	UL 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements, 5.1

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

¥ ISO 7000 Graphical symbols for use on equipment - Registered symbols

Safety and Regulatory Symbols Marked on the Cardiograph Battery *(continued)*

Symbol	Description	Standard/Reference
	Product components are certified to meet all US and Canadian standards requirements.	UL 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements, 5.1
	Indicates that the product meets requirements for certification by the Bureau of Indian Standards	IS 16046 Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes -- Safety Requirements for Portable Sealed Secondary Cells, and for Batteries made from them, for use in Portable Applications.
	Indicates conformity with South Korean EMC regulations	KRRA Radio Waves Act, Article 58-2
	This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.	47 CFR 15.19 (a)(3)
	Secondary batteries containing alkaline or other non-acid electrolyte -- meets safety requirements for portable sealed secondary cells for use in portable applications.	CNS 15364
	Recycle lithium-ion battery in accordance with Taiwan regulations and requirements.	Environmental Protection Administration Executive:0012 Recycling rule
 Li-ion	Ensure collection rates meet the directive. Recycling efficiency of batteries collected shall be: 65% for lead acid batteries; 75% for nickel cadmium batteries; and 50% for all other types	Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

¥ ISO 7000 Graphical symbols for use on equipment - Registered symbols

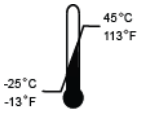
Safety and Regulatory Symbols Marked on the Cardiograph Battery *(continued)*

Symbol	Description	Standard/Reference
	Lithium-ion batteries are shipped with only a 30% charge. Charge battery completely before first use of the cardiograph.	NA

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

¥ ISO 7000 Graphical symbols for use on equipment - Registered symbols

Safety and Regulatory Symbols Marked on Adapter or Disposable Electrode Packaging

Symbol	Description	Standard/Reference
	Single use only. Do not reuse.	ISO 15223-1* 5.4.2
	Not made with natural rubber latex.	NA
	Ambient temperature range of -25 °C (-13° F) to 45 °C (113° F) (non-condensing) for transport and storage.	ISO 15223-1* 5.3.5
	Indicates the device should not be used after the date accompanying the symbol.	ISO 15223-1* 5.1.4
	Product meets the requirements of 93/42/EEC for Medical Devices distributed in the European Economic Area (EEA).	European Council Directive 93/42/EEC concerning medical devices as amended by 2007/47/EC, Annex XII

* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements

¥ ISO 7000 Graphical symbols for use on equipment - Registered symbols

Safety and Regulatory Symbols Marked on Adapter or Disposable Electrode Packaging *(continued)*

Symbol	Description	Standard/Reference
	Consult the instructions for use included with the device.	ISO 15223-1* 5.4.3
	Indicates the manufacturer's lot or batch code.	ISO 15223-1* 5.1.5
* ISO 15223-1 Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements ¥ ISO 7000 Graphical symbols for use on equipment - Registered symbols		

Caution Statements for the PageWriter TC Cardiograph

Caution

Failure to follow a caution may result in minor to moderate personal injury or damage to the product or other property, a remote risk of more serious injury, or may cause environmental pollution.

- This product is not intended for home use.
- **Rx Only**: In the U.S., Federal law restricts this device to sale on or by the order of a physician.
- Any serious incident that has occurred in relation to this device should be reported to Philips and the competent authority of the Member State in which the user and/or patient is established
- Philips strongly recommends that your site not use patient identification numbers that are related to any other forms of identity, such as social security number or driver's license number. Using unique patient identification numbers is part of best practices for any information technology system as a way to help health care providers and patients avoid identity theft.

Warning Statements for the PageWriter TC Cardiograph

WARNING

Failure to follow warnings could affect both patient and operator safety.

- As with all electronic equipment, Radio Frequency (RF) interference between the PageWriter TC30 Cardiographsystem and any existing RF transmitting or receiving equipment at the installation site, including electrosurgical equipment, should be evaluated carefully and any limitations noted before the equipment is placed in service.
- Radio frequency generation from electrosurgical equipment and close proximity transmitters may seriously degrade performance.
- Philips Medical Systems assumes no liability for failure resulting from RF interference between Philips Medical Systems medical electronics and any radio frequency generating equipment at levels exceeding those established by applicable standards.

Important Patient and Safety Information

The cardiograph isolates all connections to the patient from electrical ground and all other conductive circuits in the cardiograph. This reduces the possibility of hazardous currents passing from the cardiograph through the patient's heart to ground.

WARNING

Failure to follow these warnings could affect both patient and operator safety.

Accessories and Supplies

WARNING

Always clean and disinfect reusable electrodes before patient use. Failure to properly clean and disinfect reusable electrodes before patient use may cause infectious materials to be transferred between patients.

WARNING

The Welsh bulb electrodes (available as an accessory for the cardiograph) do not meet the requirements of IEC 60601-2-25 for defibrillation recovery time, and cannot be reliably used for patient diagnosis immediately following defibrillation.

WARNING

When using additional peripheral equipment powered from an electrical source other than the cardiograph, the combination is considered to be a medical system. It is the responsibility of the operator to comply with the system clauses of IEC 60601-1 and to test the medical system according to the requirements. For additional information contact Philips.

WARNING

Do not use non-medical peripherals within 6 feet of a patient.

WARNING

Do not plug patient cable connectors into the Mains socket or other outlets of the cardiograph.

WARNING

Using accessories, peripherals, or cables that are not supplied with the cardiograph or that are not recommended by Philips can result in increased leakage current, emissions or decreased immunity of the cardiograph.

Caution

- The use of equipment that applies high frequency voltages to the patient (including electrosurgical equipment and some respiration transducers) is not supported and may produce undesired results to device performance.
- Only use Philips replacement parts and supplies with the cardiograph. The use of non-approved replacement parts and supplies with the cardiograph is strictly prohibited. Cardiograph safety and performance are not guaranteed when non-approved replacement parts and supplies are used with the cardiograph. For a list of approved parts and supplies, see Appendix E, “Accessories, Supplies and Ordering Information”.

- Connect other equipment in accordance with IEC 60601-1: 2005 +A1:2012 (edition 3.1) Medical Electrical Equipment Standard Clause 16 Medical Electrical Systems.
- When connecting the cardiograph to other AC powered equipment, only connect equipment approved to IEC 60601-1 Medical Electrical Equipment.

AC Power Adapter and AC Power Cord

WARNING

Whenever the AC power cord is connected to a live power outlet, ensure that it is also securely attached to the cardiograph. Always disconnect the AC power cord from the power outlet when it is not connected to the cardiograph.

WARNING

Only use grounded power cords (three-wire power cords with grounded plugs) and grounded electrical outlets that are labeled as Hospital Only or Hospital Grade.* NEVER *adapt a grounded plug to fit an ungrounded outlet by removing the ground prong. Use the equipotential post when redundant earth ground is necessary according to IEC 60601-1.

WARNING

To avoid the risk of electric shock, this equipment must be connected only to a supply mains with protective earth.

WARNING

Real-time clock information within the cardiograph may be lost if both the external AC power source and internal battery are disconnected for more than five minutes.

Caution

The surface of the cardiograph case above the internal power supply could feel warm to the touch.

- To disconnect the cardiograph from AC power, unplug the cardiograph AC power cord from the mains power supply. Do not place the cardiograph in a location that would make it difficult to disconnect from AC power.
- This equipment complies with the earth leakage current limits as specified in IEC 60601-1 Medical Electrical Equipment - General Requirements for Basic Safety and Essential Performance.
- Periodically inspect the patient cable and AC power cord for any worn or cracked insulation. Ensure that no exposed wires are visible on the AC power cord.
- Only use the Philips AC power supply supplied with the cardiograph. Use of any other power supply has not been verified and may lead to operator or patient harm, including electrical shock. Periodically inspect the AC power cord and AC power connector to ensure that both are in a safe and operable condition. If the AC power cord or AC power connector is not in a safe or operable condition, disconnect the power cord or power connector and operate the cardiograph on battery power and contact Philips for service.

Analog ECG Output Signal Port

- Do not use the analog ECG output signal port (not supported on cardiograph) for diagnostic purposes and do not use this signal for critical synchronization timing.
- Do not connect any equipment to the cardiograph analog ECG output signal port.

Applied Parts

WARNING

Do not touch accessible live parts and the patient simultaneously.

Applied parts for the cardiograph include the Patient Interface Module (PIM), lead set, and electrodes.

Batteries

Caution

- **Before removing and replacing batteries from the cardiograph, press down and hold the On/Standby button (located on the front of the cardiograph), to shut down the cardiograph. Ensure that the cardiograph is shut down. When the cardiograph is fully shut down, the screen is black, and the On/Standby button is not illuminated. Once the cardiograph is shut down, proceed to remove and replace the batteries.**
- **When removing batteries from the cardiograph, the batteries could feel warm to the touch.**
- **In order to avoid potential negative impact to batteries due to electrostatic discharge, do not touch the area around the battery connector pins when holding the batteries during maintenance or replacement.**

The rechargeable lithium ion battery used in the PageWriter TC cardiographs is a smart battery with built-in circuitry that communicates battery status information to the cardiograph.

To properly maintain the battery and prevent damage to the cardiograph, observe these guidelines:

- If a battery shows damage or signs of leakage, replace it immediately.
- Never use a faulty battery in a cardiograph.
- Never dispose of the battery in a normal waste container.
- Never leave a battery inside the cardiograph if the cardiograph is not being used for a long period of time (2 months or longer).
- Never store a battery that is charged to more than 50% capacity.
- Lithium batteries are shipped with a 30% charge. Before initial use, fully charge the batteries for five hours before operating the cardiograph without AC power. Regularly and consistently charging the batteries will prolong battery life. Check the battery power indicator on the Status Bar. Tap the battery icon on the Status Bar for information on remaining battery power. See Figure 1-13, “The Status Bar,” on page 1-33.
- If the cardiograph needs to be returned to Philips for service, allow the batteries to deplete to 20-30% charge, or remove the batteries before shipping. Lithium batteries cannot be legally shipped with more than 30% charge.
- Charging, storing, or using the batteries at temperatures above 50 °C (122 °F) can damage the batteries and reduce overall battery life.

- Operate the cardiograph, charge the batteries, and store the batteries at a room temperature of 25 °C (77 °F) or lower. Exposure to higher temperatures may reduce battery life, damage the batteries, and degrade overall cardiograph performance.
- When a battery's state of health (SOH) has decreased to 80 percent of the design capacity, or the battery cycle count is greater than 300, the battery is considered end-of-life and should be replaced.
- Use *only* approved Philips batteries, part number 989803194541. The battery part number identification label is found on the bottom of the battery. The cardiograph cannot operate with two batteries that contain different part numbers. If the cardiograph is operated with two batteries with different part numbers, the cardiograph will display an error message and will not operate.

WARNING

Use only approved Philips batteries when operating the TC cardiograph. Using batteries other than those approved by Philips can lead to undesired consequences (battery overheating, shortened battery life, etc.

- When operating a PageWriter TC30 cardiograph with only one battery installed, a Philips approved battery must be used.
- When operating the PageWriter TC30 cardiograph with one battery installed, the battery may be inserted into either battery compartment.
- The PageWriter TC30 cardiograph supports printing with only a single battery installed.
- When operating the PageWriter TC30 cardiograph with one battery installed, battery charge time from depletion to 90% charge in normal use is maximum four (4) hours.
- When operating the PageWriter TC30 cardiograph with two batteries installed, ensure that both batteries contain the same Philips approved part number.
- When operating the PageWriter TC30 cardiograph with two batteries installed, battery charge time from depletion to 90% charge in normal use is maximum eight (8) hours.

Biocompatibility

The materials used by the TC series cardiograph meet ISO 10993 biocompatibility standards requirements.

Cart

Ensure that the cardiograph is securely attached to the cardiograph cart before use.

Defibrillation

WARNING

Do not touch the patient, patient cable, leads, or the cardiograph during defibrillation. Death or injury may occur from the electrical shock delivered by the defibrillator.

Defibrillation recovery time is within 5 seconds when the TC cardiograph is operated using Philips approved Applied Parts.

Display Accuracy

- The accuracy of the ECG signals are within +/- 5% (or +/- 40 uV whichever is greater), over a range of 0 to 5 mV, in the presence of differential and common mode DC offset voltages of +/- 300 mV. The cardiograph performance is tested to comply with the accuracy requirements over the dynamic ranges and frequency ranges specified in the IEC 60601-2-25:2011 standard.
- For additional details regarding accuracy and precision, refer to the *Philips DXL Algorithm Physician's Guide* and the *DXL Algorithm Manufacturer's Disclosure Statement*, included on the *PageWriter TC User Documentation DVD*. These documents can also be downloaded from Philips InCenter.

ECG Interpretation

Caution

- **Always enter accurate patient information (including age and gender) if using the Philips DXL ECG Algorithm or Philips 12-Lead Algorithm for ECG interpretation.**
- **Before acquiring an ECG, ensure that the cardiograph screen does not show the DEMO MODE watermark on the waveform screen or report, and the Patient ID does not display the text, *Simulated data*. If these elements are present, the cardiograph is in Simulation mode and is not acquiring patient data! Restart the cardiograph to exit Simulation mode. For details, see "Working with Simulated Data" on page 1-36.**

Electrodes

Caution

Only use patient electrodes that are approved by Philips. The use of non-approved patient electrodes may degrade cardiograph performance.

- Do not use dissimilar metal electrodes which could develop polarized potential, and result in the cardiograph not getting an ECG signal.
- Philips recommends the use of disposable electrodes at all times for all patient applications. Choose either adult or pediatric disposable electrodes based on the age and size of the patient.
- For information on ordering disposable electrodes, see “Ordering Accessories and Supplies” on page E-1.

General Cardiograph Use

WARNING

Electrical shock hazard. Keep the cardiograph, Patient Interface Module (PIM), and all cardiograph accessories away from liquids. Do not immerse the cardiograph, PIM, or other accessories in any liquids.

WARNING

Do not use the cardiograph near flammable anesthetics. It is not intended for use in explosive environments or in operating rooms. The disconnection or connection of AC power, or electrostatic discharge (ESD) may result in an electrical spark.

WARNING

Do not use the cardiograph in Magnetic Resonance Imaging (MRI) applications.

WARNING

Do not modify this equipment without authorization of the manufacturer.

WARNING

If this equipment is modified or repaired, appropriate inspection and testing must be conducted to ensure continued safe use of equipment.

WARNING

Do not connect additional Multiple Portable Socket-Outlets (MPSOs) or extension cords to the system.

WARNING

Do not connect to the system any items which are not specified as part of the system.

WARNING

Defibrillator protection requires the use of Philips-specified accessories including electrodes, lead wires, and patient cables.

WARNING

Ensure that components are installed securely and that no items are placed on the cart or cardiograph that could cause the unit to become unstable.

Caution

- **The cardiograph may generate electromagnetic interference (EMI) that may cause nearby equipment to fail.**
- **To avoid the possibility of the cardiograph shutting down due to momentary mains voltage dips/interruption during printing, it is recommended that you install the cardiograph batteries before printing.**
- **The use of equipment that applies high frequency voltages to the patient (including electrosurgical equipment and some respiration transducers) is not supported and may produce undesired results.**

- The use of non-Philips equipment connected to, or operating with, the PageWriter cardiograph is not tested or supported, and may produce undesired results.

- Connecting multiple cardiographs to the same patient may pose a safety hazard due to the summation of leakage currents. Any combination of instruments should be evaluated by local safety personnel before being put into service.
- The cardiograph is suitable for use in the patient environment. The cardiograph should be located so that the operator cannot contact the patient and any live parts (including Mains power) in the patient environment at the same time. The cardiograph should be located so that the patient cannot access the enclosure and signal input/output ports of the cardiograph in normal use.
- The TC Cardiograph is inoperable when ECG channels are marked as “Lead Off” and red, dashed lines are shown on the screen.
- The cardiograph can resume normal operation in the previous operating mode, without loss of any user settings or stored data, and continue to perform its intended function within 5s after exposure to the defibrillation voltage.
- Philips will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information which will assist the user's appropriately qualified technical personnel to repair those parts of equipment which are designated by the manufacturer as repairable.
- The cardiograph has been safety tested with the recommended accessories, peripherals, and leads, and no hazard was found when the cardiograph is operated with cardiac pacemakers or other stimulators.

Lead Wires

WARNING

Electrical shock hazard. Do not touch accessible connector pins and the patient simultaneously.

WARNING

Do not touch any loose or exposed leads during defibrillation. Death or injury may occur from the electrical shock delivered by the defibrillator.

WARNING

Ensure that the electrodes or lead wires do not come in contact with any other conductive materials (including earth-grounded materials) especially when connecting or disconnecting electrodes to or from a patient.

WARNING

Periodically inspect the lead wires for any cracks or breaks in the cable insulation. If the integrity of the lead wires is compromised, replace the lead wires. Contact Philips Healthcare or your certified dealer for further assistance.

WARNING

Do not plug the lead wires into the mains socket, or into any other socket or outlet of the cardiograph.

Caution

Only use lead wires that are approved by Philips. The use of non-approved lead wires may degrade cardiograph performance.

Main Waveform Display Screen

Manual measurements of ECG intervals and magnitudes should be performed on printed ECG reports only. Do not make manual measurements of ECG intervals and magnitudes on the main waveform display screen since these ECG representations are scaled.

Pacemaker

Pace pulses may not be visible on a printed ECG report that uses simultaneous acquisition.

Patient Data Cable

WARNING

The Philips patient cable (supplied with cardiograph) is an integral part of the cardiograph safety features. Use of any other patient cable may lead to the distortion or corruption of patient ECG data, may compromise defibrillation protection and degrade cardiograph performance, and overall cardiograph safety may be seriously degraded.

WARNING

Ensure that the patient data cable is securely connected to the PIM Connector () on the rear panel of the cardiograph.

- Keep the patient cable away from power cords and any other electrical equipment. Failure to do so can result in AC power line frequency interference on the ECG trace.
- Periodically inspect the patient cable for any cracks or breaks in the cable insulation. If the integrity of the patient cable is not assured, replace the patient cable. Contact Philips or your certified dealer for further assistance.

Patient Interface Module (PIM)

WARNING

Always clean and disinfect the Patient Interface Module (PIM) after patient use, if the PIM comes into direct contact with the patient's skin. Failure to properly clean and disinfect the PIM after direct contact with the patient's skin may cause infectious materials to be transferred between patients.

Caution

Always ensure that the leads connected to the Patient Interface Module (PIM) are the same leads that are displayed on the cardiograph screen.

- The PageWriter TC30 cardiograph is compatible only with the Class B 12-lead PIM and Class B patient data cable (Philips part number 989803164281).

- Always put the cardiograph in Standby before replacing the Patient Interface Module (PIM). Do not change the PIM while the cardiograph is in active use.
- The PIM might feel warm to the touch but should not cause a burn.

Printer

Caution

- **Do not pull on the paper while an ECG report is being printed. This can cause distortion of the waveform and can lead to potential misdiagnosis.**
- **Do not use the printer in rooms or areas with high humidity, as paper jams may result.**

Servicing the Cardiograph

- Only qualified personnel may service the cardiograph or may open the cardiograph housing to access internal cardiograph components. Do not open any covers on the cardiograph. There are no internal cardiograph components that are serviced by the operator.
- The Philips Medical Systems warranty is applicable only if you use Philips approved accessories and replacement parts. See “Ordering Accessories and Supplies” on page E-1 for more information.

Software

WARNING

Only install Philips Medical Systems software on the cardiograph. The installation or use of software not approved by Philips is strictly prohibited and cardiograph safety and performance are not guaranteed.

Training

Users of this product must receive adequate clinical training on its safe and effective use before attempting to operate the product as described in this *Instructions for Use*.

Training requirements vary by country. Users must ensure that they receive adequate clinical training in accordance with local laws or regulations.

For further information on available training on the use of this product, please contact a Philips Healthcare representative, or the manufacturer.

Touch Screen

WARNING

Do not use sharp objects with the touch screen or apply excessive force to the touch screen. Applying excessive force to the touch screen may result in breaking the touch screen display and can cause sharp, jagged parts to expel to persons nearby.

Manual measurements of ECG intervals and magnitudes should be performed on printed ECG reports only. Do not make manual measurements of ECG intervals and magnitudes on the touchscreen display since these ECG representations are scaled.

USB Memory Stick

To be compatible with TC cardiographs, a USB memory stick must meet the following requirements:

- USB 2.0 or 3.0 compliant;
- FAT32 file format;
- 32 GB or less.

WARNING

Do not use the USB memory stick to import ECGs onto the cardiograph that have been used with other cardiographs, or other non-Philips devices.

Caution

- **Only use the USB memory stick that is available for purchase as an optional accessory from Philips with the cardiograph.**
- **Philips does not guarantee that EMC compliance is met when USB memory sticks not approved by Philips are connected to the PageWriter TC cardiographs.**

- **Do not insert a USB memory stick into the cardiograph, or remove a USB memory stick from the cardiograph when the cardiograph is acquiring ECG data from the patient.**
- **Only use the USB memory stick to transfer data between the cardiograph and a computer. Do not use the USB memory stick with other devices.**
- **Keep all USB memory sticks that contain patient data in a secure location where they cannot be accessed by unauthorized personnel. Always delete patient data from a USB memory stick promptly after use.**
- **Affix a label to all USB memory sticks that contain patient data notifying users that unauthorized access of patient data on the USB memory stick is punishable by law.**

Periodically inspect the USB connectors (side and rear of cardiograph) for any cracks or breaks. If the integrity of a USB connectors is not assured, do not use the USB connector, and contact Philips for further assistance, see “Contacting Philips Customer Care” on page E-8.

The PageWriter TC Cardiograph

These Philips products are intended to be used and operated only in accordance with the safety procedures and operating instructions provided in this *Instructions for Use*, and for the purposes for which it was designed. The purposes for which the product is intended are provided below. However, nothing stated in this *Instructions for Use* reduces the responsibility of the user for sound clinical judgment and best clinical procedures.

Indications for Use

To acquire multi-channel ECG signals from adult and pediatric patients from body surface ECG electrodes and to record, display, analyze and store these ECG signals for review by the user. To be used in healthcare facilities by trained healthcare professionals. Analysis of the ECG signals is accomplished with algorithms that provide measurements, data presentations, graphical presentations and interpretations for review by the user.

The interpreted ECG with measurements and interpretive statements is offered to the clinician on an advisory basis only. It is to be used in conjunction with the clinician's knowledge of the patient, the results of the physical examination, the ECG tracings, and other clinical findings. A qualified physician is asked to over read and validate (or change) the computer generated ECG interpretation.

Essential Performance

Within the intended use and environment, the performance elements critical to TC cardiograph remain to be the accurate, safe acquisition of ECG signal, accurate rendering of acquired ECG information, as well as correct processing, analysis and printing of the ECG report. These functionalities shall not be degraded below the performance specified by the manufacturer based on Basic Safety and Essential Performance risk analysis. Temporary loss of functionality resulting in delayed treatment, including minor ECG noise artifact in the presence of EMI are considered acceptable from a patient safety risk perspective. Transmission of ECG is not considered essential performance element under environmental disturbances. Optional device functions are not considered essential performances.

Operating Principle

The PageWriter TC cardiograph collects multi-channel ECG signals of adult and pediatric patients from body surface ECG electrodes. These electrical ECG signals are amplified, digitized and processed in the digital domain. The PageWriter cardiograph records, displays, analyzes and prints the processed ECG signals for review by the clinical operator.

Intended Patient Population

The intended patient population is adult and pediatric patients in a wide variety of departments in the hospital and physician office environments. The pediatric patient is a patient whose age is under 16 years. To the intended patient population, there is no limit to patient's stature, weight and health situation.

The Philips ECG Algorithm

The PageWriter TC cardiograph software uses the Philips ECG Algorithm. The algorithm in the software analyzes the morphology and rhythm on each of the 12 leads and summarizes the results. The set of summarized measurements is then analyzed by the clinically-proven ECG Analysis Program.

12-lead reports may include or exclude ECG measurements, reasons, or analysis statements.

Indications for Use

To analyze multi-channel ECG signals from adult and pediatric patients with algorithms that provide measurements, data presentations, graphical presentations and interpretations for review by the user.

The interpreted ECG with measurements and interpretive statements is offered to the clinician on an advisory basis only. It is to be used in conjunction with the clinician's knowledge of the patient, the results of the physical examination, the ECG tracings, and other clinical findings. A qualified physician is asked to over read and validate (or change) the computer generated ECG interpretation where the clinician decides to evaluate the electrocardiogram of adult and pediatric patients as part of decisions regarding possible diagnosis, potential treatment, effectiveness of treatment or to rule-out causes for symptoms.

1

Getting Started

Welcome to the PageWriter TC30 Cardiograph, a versatile and powerful addition to your cardiac care patient workflow. The PageWriter TC cardiographs help to simplify patient cardiac care through easy-to-use 1-2-3 touch screen operation, color-coded signal quality indicators, and integrated connectivity with the IntelliSpace ECG Management System for one touch patient order download and ECG transmission. The cardiograph also supports integrated connectivity with an ADT Order Update system, and optional transmission of DICOM reports.

Powerful clinical features include the Philips DXL ECG Algorithm that provides comprehensive measurement and interpretive analysis, and includes full pediatric interpretation, enhanced pacemaker pulse detection, lead reversal detection notification, and the *Critical Values* feature that provides a visual alert on the report to caregivers of a silent MI or other conditions that require immediate treatment, an integral tool for acute care environments (see see “Critical Values” on page 4-5).

Other time-sensitive clinical tools include ST Map reports that indicate ST elevation, along with optional culprit artery identification that locates the probable anatomical site of a coronary artery occlusion responsible for an ischemia.

This *PageWriter TC30 Cardiograph Instructions for Use* and the other components provided in the Learning Kit describe all aspects of setting up, using, and maintaining your cardiograph.

Note:

Read and complete the materials included in the PageWriter TC Cardiograph Learning Kit before using the cardiograph. Pay close attention to all warnings and cautions.

PageWriter TC Cardiograph Learning Kit

Philips provides detailed instructional and reference materials in the PageWriter Cardiograph Learning Kit.

The PageWriter Cardiograph Learning Kit contains the *Quick Help Guide*, User Skills Checklists, and the *PageWriter TC User Documentation DVD*.

Figure 1-1 The PageWriter Cardiograph Learning Kit



About the PageWriter TC Cardiograph Learning Kit

- *User Skills Checklists* (**A**)

  These checklists provide a comprehensive list of all of the tasks associated with patient preparation, taking an ECG, and using the cardiograph features. They provide the basis for all critical tasks recommended for inclusion in a clinical training program. These checklists can be copied as necessary, and retained as an official record of clinical training at your facility. The checklists are also included as PDF files on the *User Documentation and Training DVD*.

- *Quick Help Guide* (**B**)

  The Quick Help Guide is presented as an easy-to-use flip book that can be left at the cardiograph in order to provide clear and simple instructions to users on using cardiograph features. Included are instructions on proper patient preparation and electrode placement, signal quality indicators, taking STAT or urgent ECGs, how to retrieve orders, and using other cardiograph features. The guide is included as a PDF file on the *PageWriter TC User Documentation DVD*, and additional copies may be printed if necessary. The PDF file is sized appropriately for printing on standard sized paper.

- *PageWriter TC User Documentation DVD* (**C**)

  The user documentation and training DVD includes many useful files including:

  – *Philips DXL ECG Algorithm Physician's Guide*

    This Physician's Guide provides a comprehensive description of the Philips DXL ECG Algorithm and lists all of the interpretive statements included in the criteria.

  – *PageWriter TC Cardiograph Network Configuration Guide (only available in English)*

    This Network Configuration Guide provides detailed instructions on installing and configuring wired or wireless network connectivity between the cardiograph and the IntelliSpace ECG Management System (including the IntelliBridge Enterprise order handling option), or other third party ECG management system.

  – *PageWriter TC Cardiographs Wireless LAN Installation and Configuration Guide (only available in English)*

    This document contains detailed instructions on installing and configuring a wireless LAN adapter.

  – *PageWriter TC Cardiograph Service Manual (only available in English)*

    This document provides comprehensive information on product troubleshooting, performance verification and safety tests, using the Service Utilities accessed from the Setup menu, and installing software upgrades.

  – *Installing and Testing the DECG Barcode Scanner (only available in English)*

    This document provides detailed instructions on installing and testing the 2D barcode scanner for use with the PageWriter TC Cardiographs.

  – *Metrologic Scanner Instructions for Use (only available in English)*

    This document provides information on using and configuring the optional barcode scanner available with the cardiograph, and also provides detailed calibration sequences for configuring the barcode scanner for use with extended Code 39 barcode standards.

  – *PageWriter TC Cardiograph Interactive Training Program (only available in English)*

    This training program provides detailed information on the purpose of 12-lead ECGs, the different views of the heart that the ECG represents, electrode placement for 12 leads, effective patient preparation, basic cardiograph operation, and how to troubleshoot various ECG signal quality problems. The training program also includes interactive, hands-on training exercises to test users on information provided in the training program. Updates to this training program will be available on a periodic basis, and may be downloaded from the Philips InCenter site. For more

information on accessing and using the Philips InCenter site, see “Using the Philips InCenter Site” on page ii..

To open the *PageWriter TC User Documentation DVD*:

1. Insert the DVD into a DVD-compatible drive on a standard PC. The main menu opens automatically. Click on a blue button or on the file name to open a file.
2. If the main menu does not automatically appear, open the DVD in Windows Explorer.
3. Double-click the file **menu.pdf** on the DVD. The main menu appears. Any of the files on the DVD may be printed or saved to a PC hard drive

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Note:

If you save PDF files from the DVD to a PC hard drive, Acrobat Reader 9.0 or higher will need to be installed on the PC in order to view the files. For a free install, go to www.adobe.com.

Philips ECG XML Information

The PageWriter TC cardiograph exports ECG data in XML (Extensible Markup Language) format. There are four available XML schema versions on the cardiograph: version 1.03, version 1.04, version 1.04.01, and version 1.04.02.

For information about the Philips ECG XML schema, see the *Data Dictionary and XML Schema Reference*, available under the TraceMasterVue product line in InCenter.

Note:

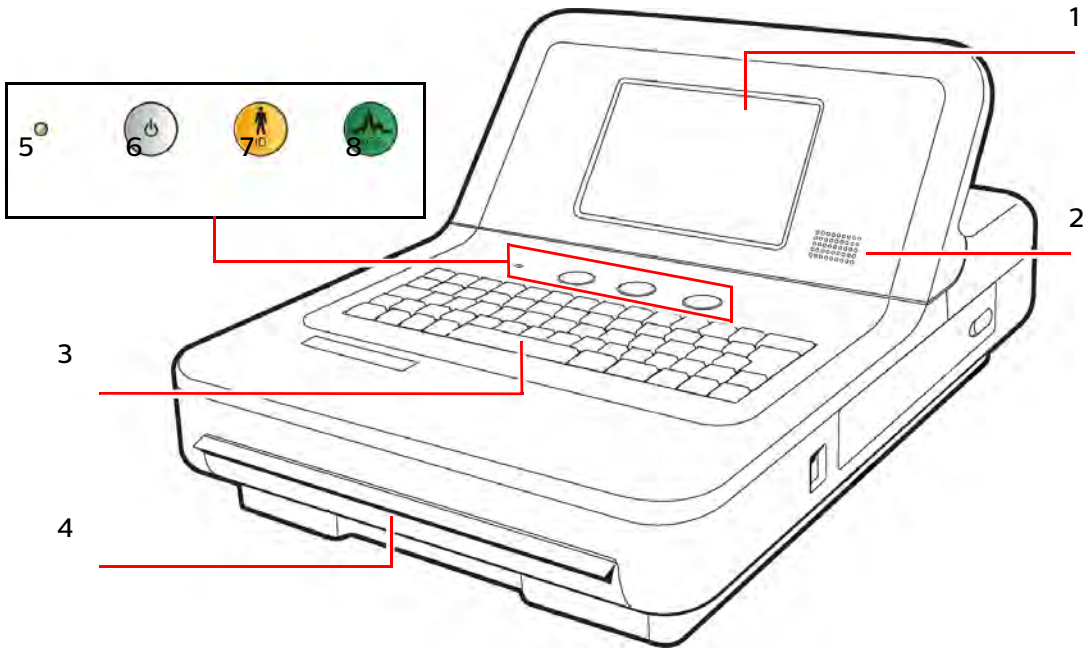
The default XML version setting on the cardiograph must be coordinated with the XML version compatibility of the IntelliSpace ECG Management System, or other third party ECG management system used by your facility. For more information on configuring your cardiograph for use with an external ECG management system, see the PageWriter TC Cardiograph Network Configuration Guide included on the PageWriter TC User Documentation DVD, or download the file from the Philips InCenter site.

PageWriter TC30 Cardiograph Components

The following sections include a description of all of the components of the PageWriter TC30 cardiograph, including the connection ports on the cardiograph, the Patient Interface Module (PIM), and optional accessories available with the cardiograph.

For more information on using the cardiograph features, see Chapter 3, “The Patient Session.” For information on ordering any of the optional accessories for the cardiograph, see “Ordering Options and Upgrades” on page E-6.

Figure 1-2 PageWriter TC30 Cardiograph (right front view)

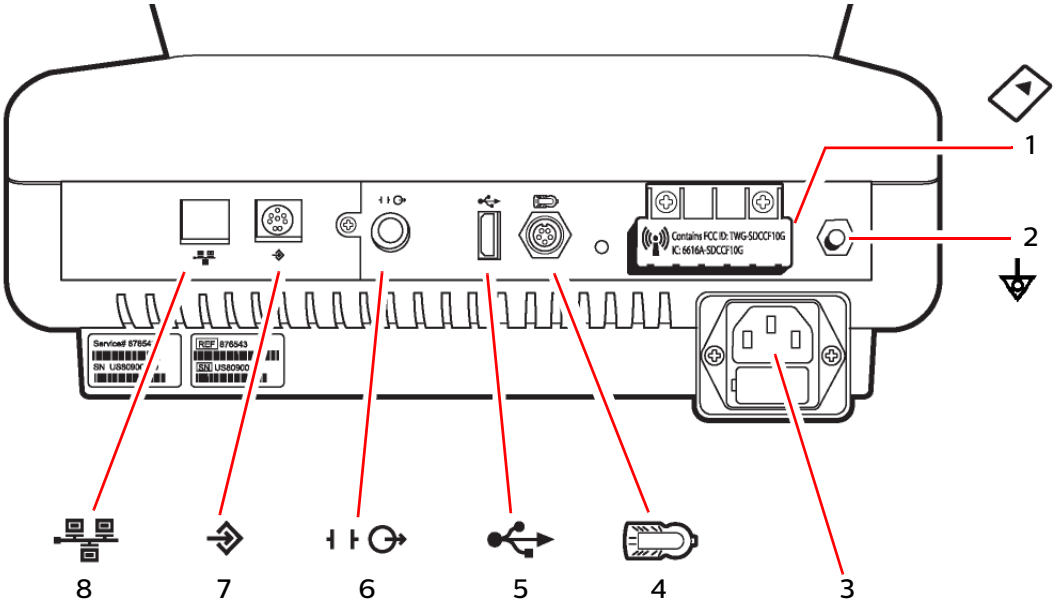


1 Touch screen
2 Audio speaker
3 Keyboard
4 Paper tray
5 AC power on indicator light
6 On/Standby button
7 ID button
8 ECG button

Note:

- *The Power On indicator light (**5**) is illuminated in green when AC power is applied to the unit. The LED is not illuminated when power is disconnected.*
- *The On/Standby button (**6**) will be illuminated in green if the unit is On. In Standby mode, the button will be illuminated in amber. When the unit is off, the LED will not be illuminated.*
- *The **ID** button (**7**) will be illuminated in amber if the signal from any lead is detected and required patient information is missing.*
- *The **ECG** button (**8**) will be illuminated in green only if 1) there are 12 ECG traces detected, 2) the overall signal quality level is greater than the ECG Quality Threshold, and, 3) if no required patient information is missing. Otherwise, the ECG button will not be illuminated.*

Figure 1-3 PageWriter TC30 Cardiograph (rear view)

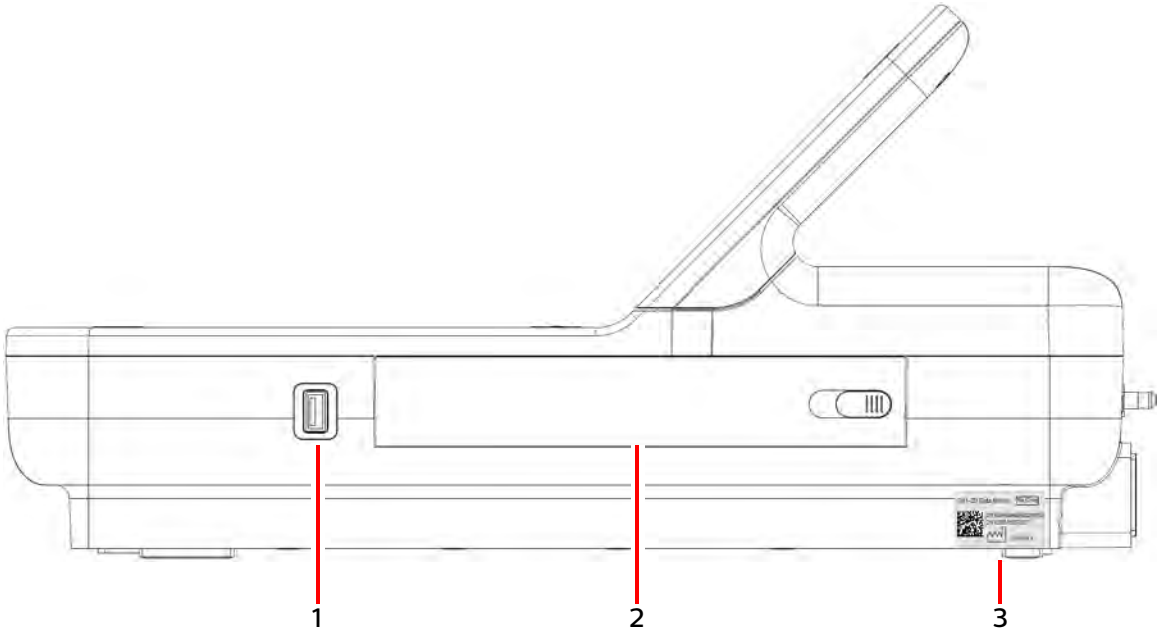


1	Wireless LAN adapter slot (with protective cover installed)	5	USB connector
2	Equipotential grounding post	6	Analog ECG output signal connector (not supported)
3	AC power cord connector	7	Barcode reader or magnetic card reader connector
4	PIM connector	8	LAN connector

Caution

- **Do not insert a USB memory stick into the cardiograph, or remove a USB memory from the cardiograph when the cardiograph is acquiring ECG data from a patient.**
- **Only use grounded power cords (three-wire power cords with grounded plugs) and grounded electrical outlets that are labeled as *Hospital Only* or *Hospital Grade*. Never adapt a grounded plug to fit an ungrounded outlet by removing the ground prong. Use the equipotential post when redundant earth ground is necessary according to IEC 60601-1.**

Figure 1-4 PageWriter TC30 Cardiograph (right side view)



1 USB connector

2 Battery compartment door

3 UDI label

Assembling the Cardiograph Cart

The cardiograph is available with an optional cart that includes a storage bin and a built-in holder for the PIM (patient interface module). A second storage bin is available as an optional accessory. The instructions in this section describe the unassembled cart option.

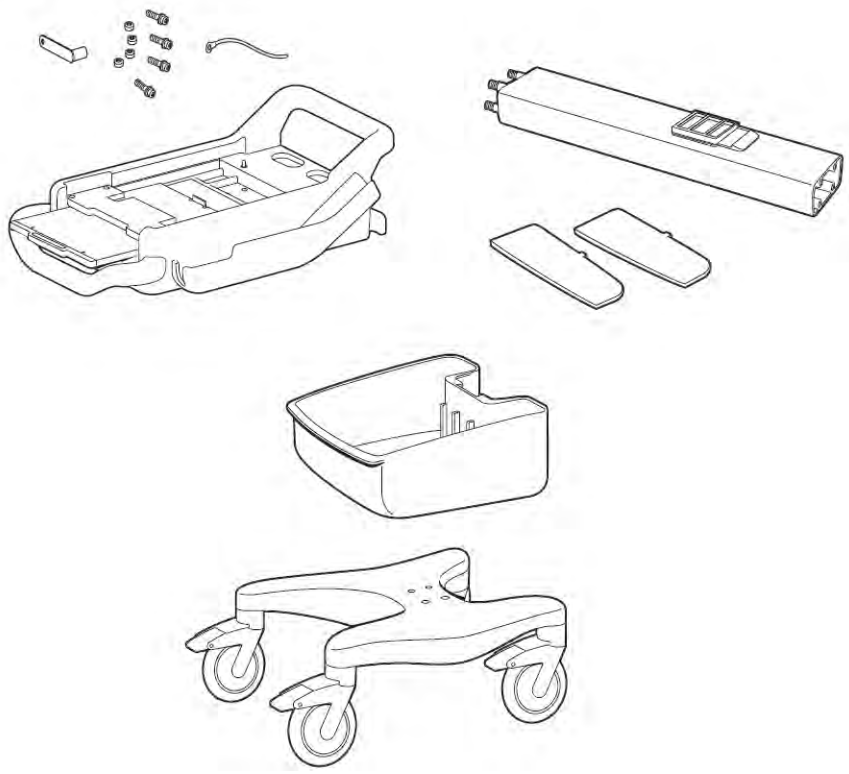
For information on ordering the cart, see the *PageWriter TC Cardiograph Service Manual*, available on the *PageWriter TC User Documentation DVD* and on InCenter.

To attach the cardiograph to a fully assembled cart, see Step 10 on page 1-11.

Caution

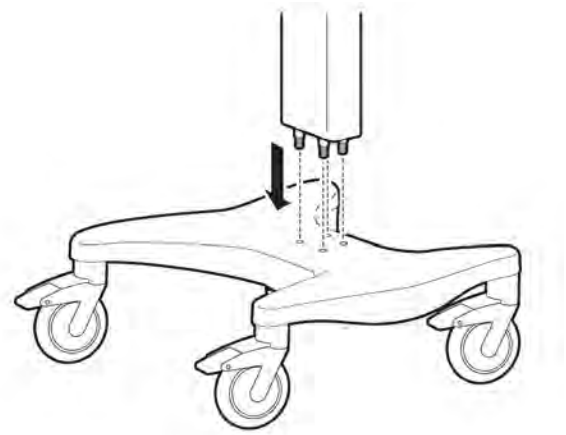
Follow the next procedure to ensure that the cardiograph is securely fastened to the cart before use.

Figure 1-5 Unassembled Cart Kit Contents

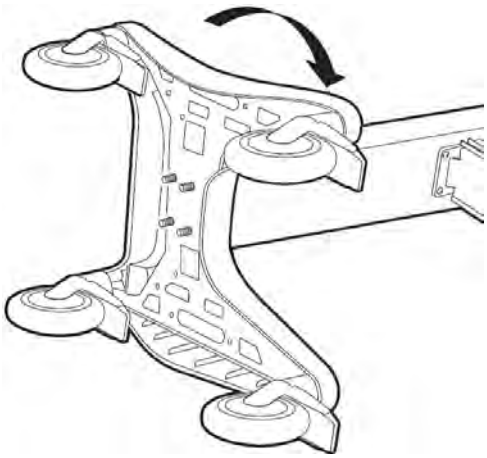


To attach the cardiograph to the cart:

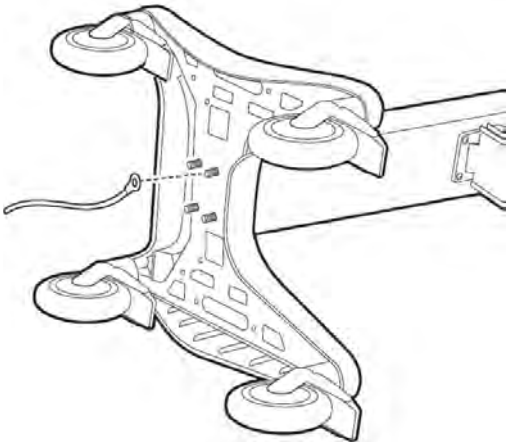
1. Insert the beam into the cart base.



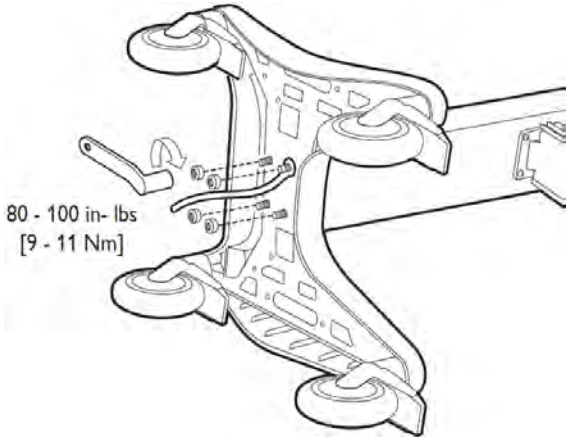
2. Hold the beam steadily. Turn the cart onto the side to expose the bottom of the cart.



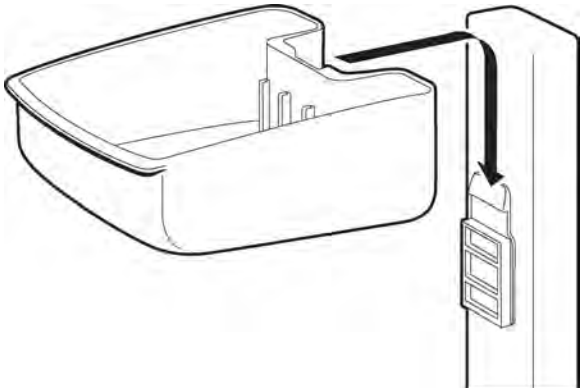
3. Place the ground strap onto the screw end.



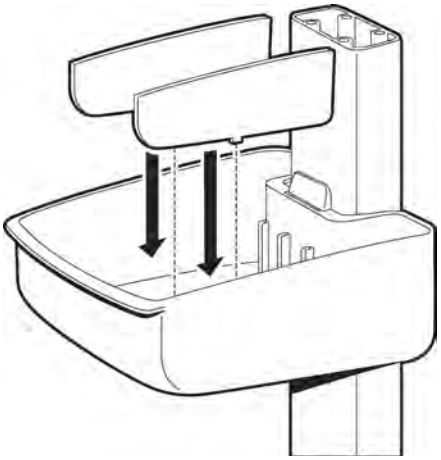
4. Attach the bolt screws and tighten using the provided wrench. Ensure that the bolt screws are tightened to 80–100 in lbs. (9–11 Nm).



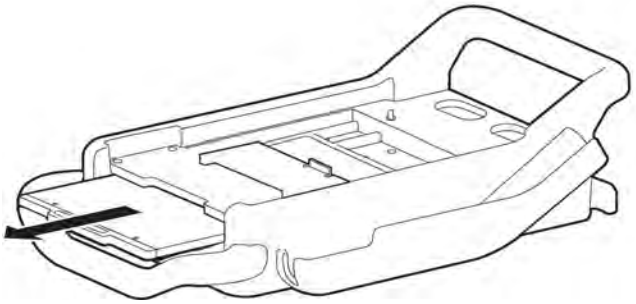
5. Turn the cart upright.
6. Attach the bin to the beam.



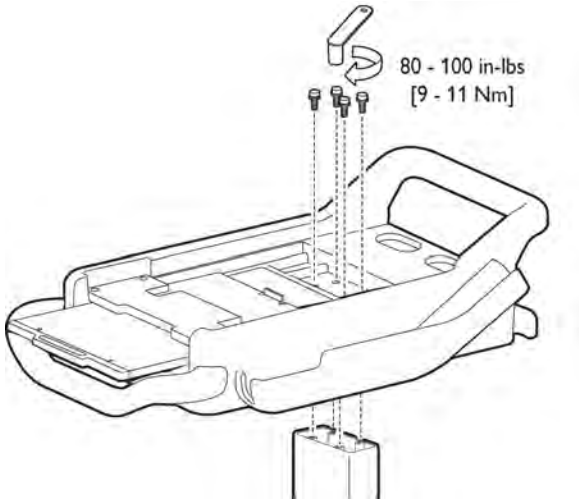
7. Insert the bin dividers as shown.



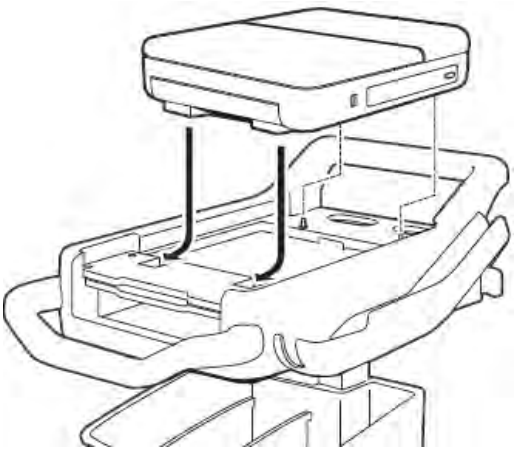
8. Slide out the tray on the top shelf.



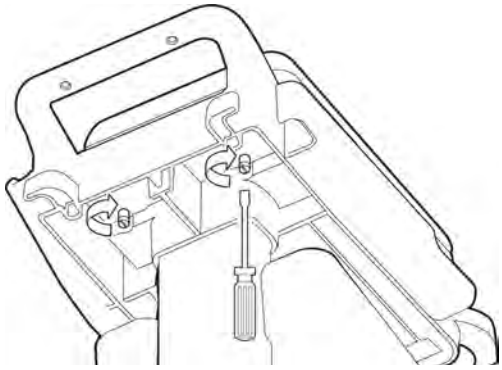
9. Attach the top shelf to the beam using the bolt screws. Tighten the bolts using the provided wrench. Ensure that the bolt screws are tightened to 80–100 in lbs. (9–11 Nm).



10. Align the rear feet of the cardiograph with the rear holes on the cart. Lower the front feet of the cardiograph into the front holes on the cart and push the cardiograph into place. Ensure that the cardiograph is locked into the slot on the front right of the cart.



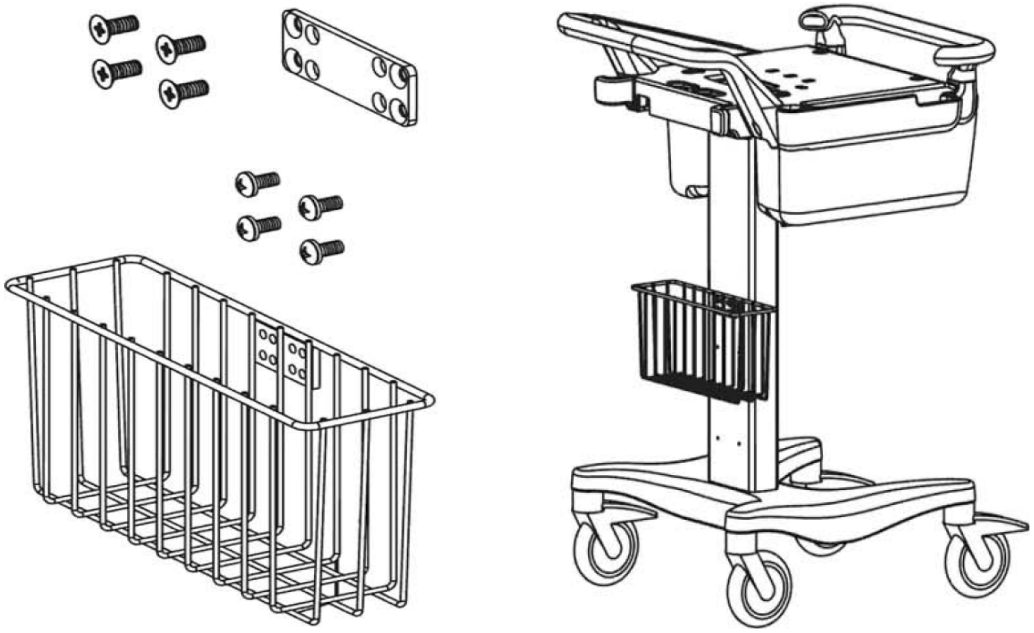
11. Insert the screws through the bottom of the base, and tighten.



To install the optional patient cable arm, refer to the *Patient Cable Arm Instructions* (PN 453564174311) included in the cable arm packaging.

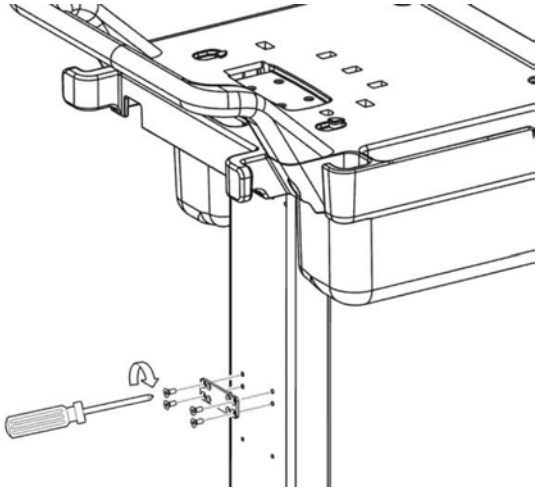
An optional wire storage basket is available for the cart. Install the basket after the cart has been fully assembled.

Figure 1-6 Unassembled Wire Basket Kit Contents

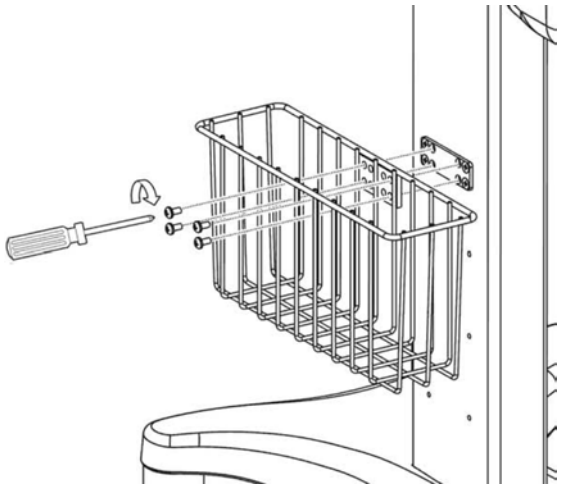


To install the optional wire basket:

1. Install the bracket onto the rear of the cart stand using the four bevel topped screws.



2. Attach the basket to the bracket using the four round topped screws.

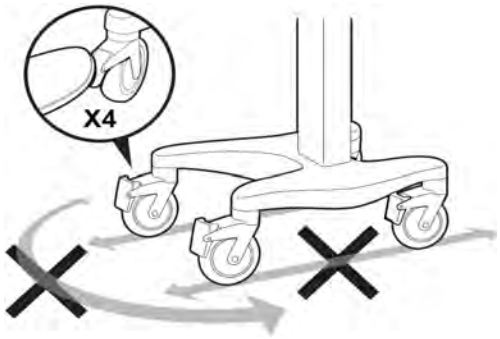


Using the Cart Wheel Positioners and Brake

The cart includes four wheel brakes. Lock the wheel positioners at all times when using the cart to prevent the cart from moving.

To use the cart wheel positioners and brake:

- Step down on all four brakes to lock the wheels so that the cart will not move. Step on the wheel brakes again to unlock the cart.



Patient Interface Module (PIM)

The Patient Interface Module (PIM) is a hand-held device that connects to the patient data cable. The patient data cable is then connected to the cardiograph. The PIM is shipped with the patient data cable fully connected to the PIM.

Figure 1-7 The Patient Interface Module (PIM)



Note: *Image shown is an AAMI version PIM*

Attaching the Patient Data Cable to the PIM and Cardiograph

The patient data cable must be attached to the PIM connector before use. Once attached to the PIM, the patient data cable is then attached to the cardiograph through the appropriate PIM connector on the rear of the cardiograph.

WARNING

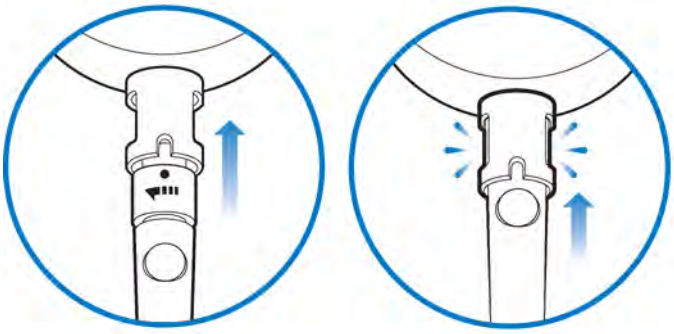
Ensure that the patient data cable is securely connected to the PIM connector ( ) on the rear panel of the cardiograph.

WARNING

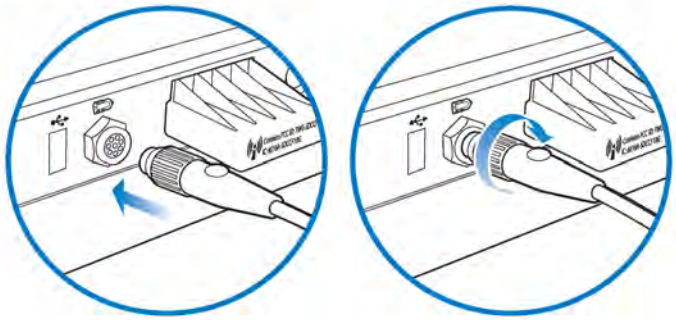
The Philips patient data cable (supplied with cardiograph) is an integral part of the cardiograph safety features. Use of any other patient data cable may lead to the distortion or corruption of patient ECG data, may compromise defibrillation protection and degrade cardiograph performance, and overall cardiograph safety may be seriously degraded.

To attach the patient data cable to the PIM and to the cardiograph:

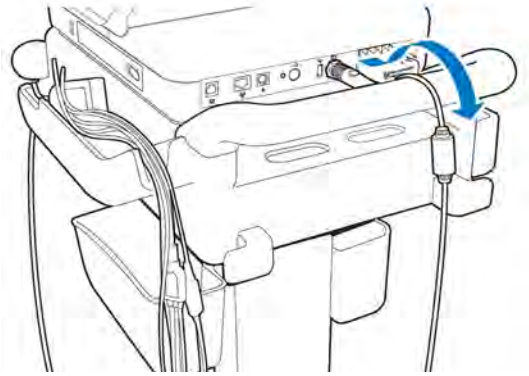
1. Align the raised dot on the top of the patient data cable connector with the front of the PIM. Insert the patient data cable connector through the metal housing. Push the patient data cable connector firmly into the PIM connector. The connector *clicks* when it is locked into position.



2. Connect the other end of the patient data cable to the PIM connector port ( ) located on the rear panel of the cardiograph. Align the raised circle on the cable connector upright as shown in the figure. Turn the cable connector to the right to lock it into position.

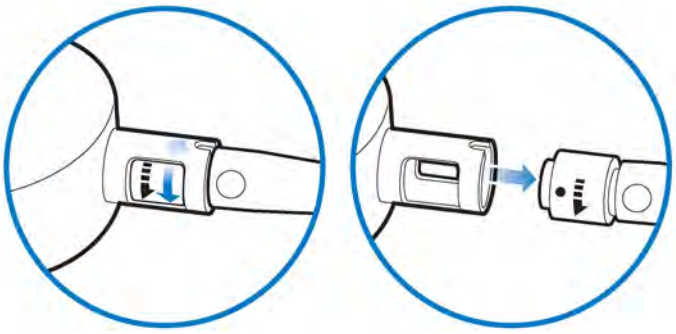


3. Drape the patient data cable over the top of the rear handle on the cart to help ensure that the patient data cable does not drag on the ground.



To disconnect the patient data cable from the PIM:

- Twist the end of the patient cable connector inside the metal housing and pull the connector out.



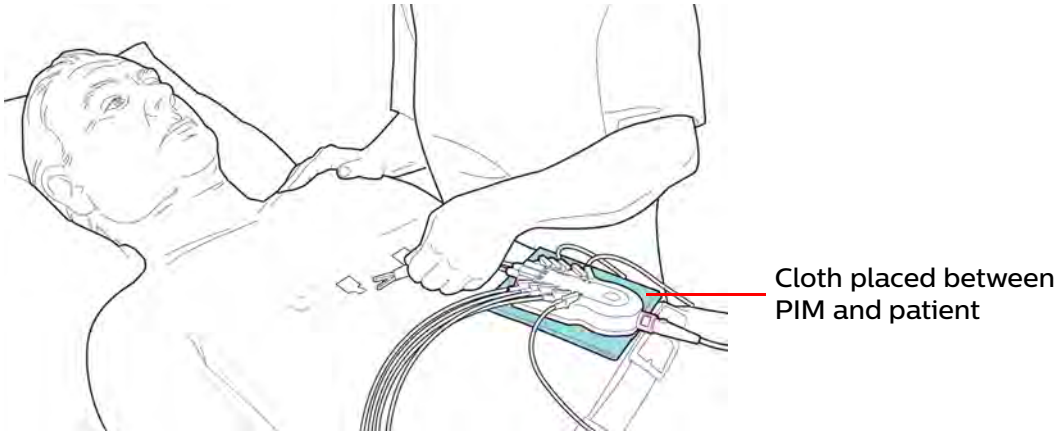
Special Note about the Patient Interface Module (PIM)

The PIM is an electronic device and can feel warm if placed on bare skin.

Caution

Never place the PIM on the patient's bare skin. Always place a folded sheet or cloth between the PIM and the patient to prevent injury. While the cardiograph is being used for monitoring purposes, the PIM could reach a maximum temperature of 49°C (120°F) in a room environment with a temperature of 40°C (104°F).

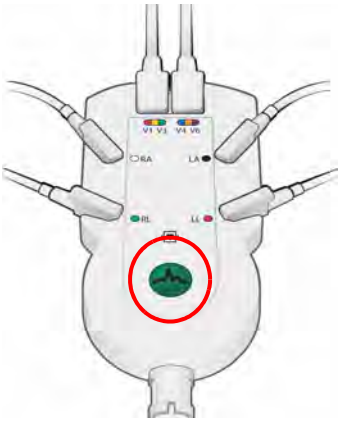
Figure 1-8 Placing PIM on patient's skin



PIM ECG Button

The PIM has an **ECG** button that is used to take ECGs from the bedside. For information on connecting the PIM to the patient, or on using the PIM ECG button, see Chapter 3, "The Patient Session."

Figure 1-9 PIM ECG button



Working with the Batteries

The cardiograph is shipped with one or an optional two batteries that are used to power the cardiograph when AC power is not available.

WARNING

Use only Philips-approved batteries.

WARNING

Do not short-circuit the batteries.

WARNING

Do not force-discharge the batteries.

WARNING

Do not heat the batteries.

WARNING

Do not dispose of batteries in fire.

Caution

- **Insert the batteries into the cardiograph before plugging the cardiograph into AC power.**
- **When removing the batteries from the cardiograph, the batteries could feel warm to the touch.**
- **Before removing and replacing batteries from the cardiograph, press down and hold the On/Standby button (located on the front of the cardiograph), to shut down the cardiograph. Ensure that the cardiograph is shut down. When the cardiograph is fully shut down, the screen is black, and the On/Standby button is not illuminated. Once the cardiograph is shut down, disconnect the cardiograph from AC power before removing and replacing the batteries.**

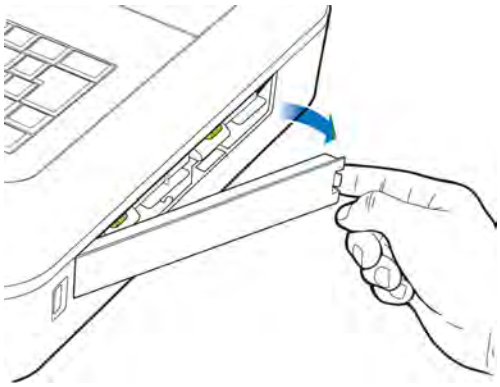
Installing the Batteries

Note:

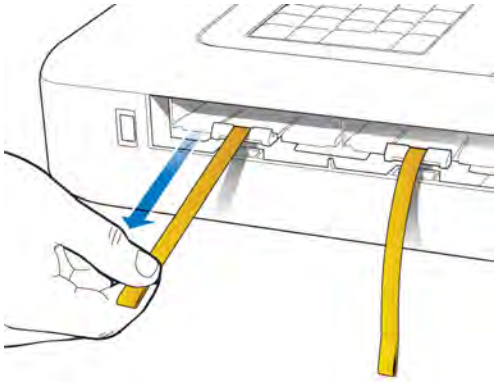
- *If operating the cardiograph with one battery installed, the battery may be inserted into either battery compartment.*
- *When operating the cardiograph with two batteries installed, ensure that both batteries contain the same Philips approved part number.*

To install the battery or batteries:

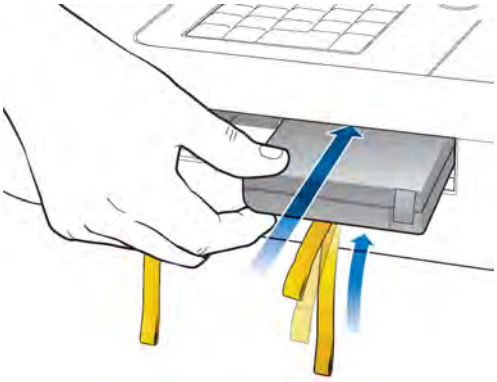
1. Open the battery door.



2. Locate the two gold pull tabs inside of the battery compartment. Pull the tabs straight out of the battery compartment and lay flat.

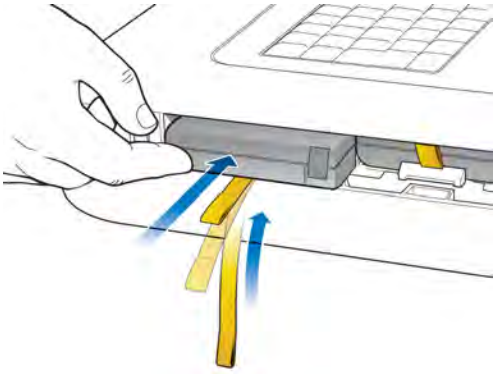


3. Insert the battery with the external connector facing the bottom rear of the compartment.



4. Push in the battery and ensure that the battery is fully inserted into the slot. The gold pull tab will insert along with the battery.

   Insert the second battery (if necessary) following the same procedure.



5. Reinstall the battery door.



6. Connect the AC power cord to the cardiograph and turn the cardiograph on. Charge the batteries for five hours before operating the cardiograph on battery power only.

   Note: *Batteries will not charge if cardiograph is turned off.*

Charging the Batteries

Caution

Batteries will not charge if the cardiograph is not powered on. Ensure that the green AC power indicator light is lit.

Charge a new battery for five hours prior to initial use. After initial charging, plug the cardiograph into AC power whenever possible, and ensure that the batteries are fully recharged. Proper maintenance and care, including frequent and full recharging of the batteries, will help to prolong battery life.

There are configurable power saving features available on the cardiograph that can be used to help prolong overall battery life, and to optimize battery power use between battery charges. For more information, see “Configuring Power Options” on page 2-20.

In addition to the automatic power save settings, the cardiograph can be manually put into Standby mode by pressing the On/Standby button for approximately 2 seconds, or by closing the lid to less than a 30° angle.

If the cardiograph is powered on or in Standby mode, and the battery charge is less than 1440 mAh, an audible tone will sound every 2 seconds until the cardiograph is plugged into AC power. If the battery charge drops to 1080 mAh, the cardiograph will immediately enter Standby mode, and must be plugged into AC power to continue operating.

Calibrating the Batteries

The batteries may require periodic calibration to ensure the continued accuracy of the battery power and overall battery status information displayed on the cardiograph. If battery calibration is necessary, the message **Recommend Calibration** appears on the Battery Status Information window. For more information on battery calibration, refer to the *PageWriter TC Cardiograph Service Manual*, found on the *PageWriter TC User Documentation DVD*.

Battery Power Indicator

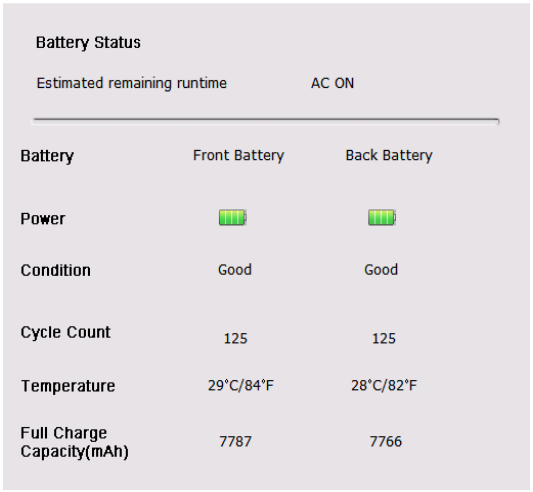
The battery power indicator () appears on the Status Bar and is always visible. The indicator displays the current battery power level. The cardiograph can operate on AC power while the batteries are charging, but the batteries will charge at a slower rate.

Figure 1-10 Battery Power Indicator on the Status Bar

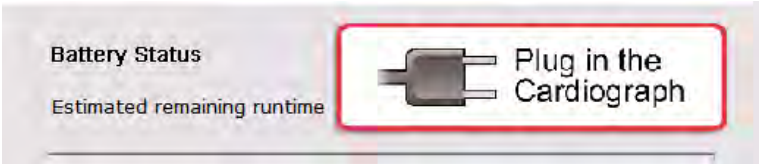


To check the battery power level:

1. From any screen, tap on the battery icon on the Status Bar (). The Battery Status window appears. This window provides detailed information on the status of the cardiograph batteries. The battery icon indicates the overall charge status of the batteries (see “Battery Icon (on Status Bar or Battery Status window)” on page 1-22).



Note: *If the **Plug in the Cardiograph** message appears, the cardiograph needs to be plugged into AC power immediately. You will not be able to continue operating the cardiograph until it is plugged in.*



2. Touch the **Close** button to close the window.

Table 1-1 Battery Icon (on Status Bar or Battery Status window)

Icon on Status Bar	Battery Level
	Fully Charged Battery

Table 1-1 Battery Icon (on Status Bar or Battery Status window)

Icon on Status Bar	Battery Level
	75% power capacity
	50% power capacity
	Low Battery Power: • red battery icon appears when power level is below 25% • cardiograph *beeps* and an error message appears until the unit is plugged into AC power (audio feature may be disabled) • tap the icon to see how many minutes are left of operating battery power • If average battery capacity is less than 1080 mAh and the cardiograph is in Standby, when the On/Standby button is pressed it will flash green five times and the cardiograph will be unable to return to active use. Plug the cardiograph into AC power to recharge the batteries.
	No or Dead Battery
	Battery Status warning **Note:** *Battery status messages can be caused by either battery when two batteries are installed.*

Battery Status Messages

When there is an issue with a battery installed in your cardiograph that requires attention, the battery icon on the status bar will display a warning symbol. Touch the icon to view battery status information. The table below describes the battery status messages, the possible causes, and what you should do to resolve the problem.



Message	Possible Cause and Investigation	Solution
Unrecognized battery. Please shut down the cardiograph and check batteries.. **Note:** *Cardiograph function is suspended.*	One or more installed batteries are not supported by the cardiograph.	Shut down the cardiograph and verify the following: **a** all installed batteries are approved by Philips; **b** all installed batteries have the same part number. Replace all installed batteries that are not approved by Philips and make sure all installed batteries have the same part number.

Message	Possible Cause and Investigation	Solution
Both installed batteries must have the same part number, Please shut down the cardiograph and check both batteries.	Two batteries with different PNs are installed. User cannot access the user interface until the problem is corrected.	Battery charging is suspended. After the cardiograph shuts down, verify the following: **a** both batteries are approved by Philips; **b** both batteries have the same part number. Replace at least one battery with a new battery with a PN that matches the installed Philips approved battery. If either or both batteries are not approved by Philips, replace with new batteries with the same Philips-approved part number.
The Front/Back Battery is overcharged. Please check the battery.	A non Philips-approved battery is installed. Battery charger circuitry has problem.	Replace all installed batteries with batteries approved by Philips. If problem persists, contact a Philips Response Center.
Over Temperature. Battery has exceeded recommended temperature level.	Battery has reached a temperature of 50°C (122 °F), or **Over Temperature** has been detected.	Suspend use of the cardiograph and allow the battery to cool down. Battery charging will be suspended until the batteries reach a temperature of 45 °C (113 °F) or lower. If problem persists, replace the battery. Suspend use of the cardiograph and allow the battery to cool down.

Message	Possible Cause and Investigation	Solution
Battery temperature is too high. Shut down in... **Note:** *When user acknowledges the message, the cardiograph shuts down.*	Battery temperature has reached or exceeded 60 ^{o}C (140 ^{o}F) (>= 60 ^{o}C).	Cardiograph will automatically shut down in the amount of time indicated, or if the user acknowledges the message. Allow the battery to cool down. Battery charging will be suspended until the batteries reach a temperature of 45 ^{o}C (113 ^{o}F) or lower. If problem persists, replace the battery.
Battery cycle count > 300. Replace battery.	The battery has exceeded 300 charge cycles.	The battery will continue to charge; however, the battery should be replaced as soon as possible.
Battery cycle count > 400. Replace battery immediately.	The battery has exceeded 400 charge cycles.	The battery will continue to charge; however, the battery should be replaced immediately.
Battery SOH (state of health) <= 80%. Replace battery.	The full charge capacity of the battery has reached a limit of 80 percent of its design capacity.	The battery will continue to charge; however, the battery should be replaced as soon as possible.
Battery SOH (state of health) <= 75%. Replace battery immediately.	The full charge capacity of the battery has reached a limit of 75 percent of its design capacity.	The battery will continue to charge; however, the battery should be replaced immediately.

If the cardiograph shuts down unexpectedly, the batteries may not charge. You should always perform a full restart of the cardiograph after restoring power from an unexpected shutdown in order to ensure the batteries will resume charging normally when the cardiograph is connected to AC power.

To perform a restart:

1. Press and hold the On/Standby button for 3 seconds to shut down the cardiograph. When the cardiograph is shut down, any unsaved patient data is lost.

2. Press the On/Standby button to return the cardiograph to active use. The cardiograph fully restarts and the Main screen appears.

Using the Wireless Connection

The PageWriter TC30 cardiograph supports the Summit wireless LAN card.

The wireless option allows the transfer of ECG and order/patient demographic data between the cardiograph and an IntelliSpace ECG Management System or IntelliBridge Enterprise server. The cardiograph can also be configured to transfer ECG data using a wireless connection to a third party ECG management system. For information on configuring cardiograph connectivity, see the *PageWriter TC Cardiograph Network Configuration Guide* available on the *PageWriter TC User Documentation DVD*, or the file can be downloaded from the Philips InCenter site.

Caution

Only use appropriate wireless LAN devices with the cardiograph that have been purchased from Philips. The use of non-approved wireless LAN devices with the cardiograph is not tested or supported, and Philips does not guarantee cardiograph operation or wireless LAN connectivity.

For information on installing the option and configuring the cardiograph for wireless transmission, see the *PageWriter TC Wireless LAN Installation and Configuration Guide*. The file is provided with the Wireless kit, and is also available for download from the Philips InCenter site (incenter.medical.philips.com).

For information on ordering the wireless option, see “Ordering Accessories and Supplies” on page E-1.

Using the Barcode Reader

The barcode reader is an optional accessory that is used to quickly enter ID information by scanning a barcode. A linear barcode reader is offered, as well as a 2D (QR) barcode scanner.

Note:

The linear barcode reader is shipped in Manual Activation Mode to ensure conducted EMI compliance. If you configure the scanner into another operation mode, then EMI compliance is not guaranteed.

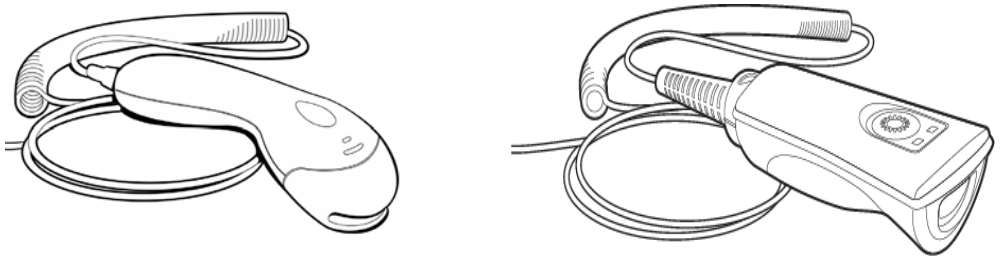
The barcode reader attaches to the barcode reader connector, or to the USB host port on the rear panel of the cardiograph.. Attach the barcode reader to the cardiograph before turning on AC power. For information on ordering the barcode reader, see “Ordering Options and Upgrades” on page E-6.

Both the linear and 2D barcode readers should be configured to use a <TAB> as the suffix of barcode input. The *PageWriter TC User Documentation DVD* includes the following documents that describe how to configure the <TAB> suffix:

- *MetroSelect® Single-Line Scanner Configuration Guide – linear barcode reader*
- *flexpoint™ HS-1M User’s Guide – 2D barcode reader*

For a list of supported symbologies, refer to the *Installing and Testing the DECG Barcode Scanner* document.

Figure 1-11 Barcode Readers



Linear Barcode Reader

2D Barcode Reader

The linear barcode reader can scan only a single line item. The 2D barcode scanner can be used to input multiple fields with a single scan on the **New Patient** or **Find Patient** screen:

- Last Name
- First Name
- Additional Name
- Date of Birth
- Gender
- Patient ID
- Physician Name

- Age
- Room
- Race
- Account Number

For more information on configuring and using a barcode scanner with a TC Cardiograph, see the configuration guides located on the “PageWriter TC Cardiograph Learning Kit” on page 1-2.

Using the Cardiograph Touch Screen

The touch screen provides access to all of the cardiograph features. Simply touch the buttons on the screen to open the different screens and to perform different functions.

Touch Screen Overview

The touch screen is organized into different areas that are grouped by function. The following sections provide an overview of each area of the touch screen. See the figure on the next page.

Figure 1-12 Touch Screen Overview (with 12x1 lead format)

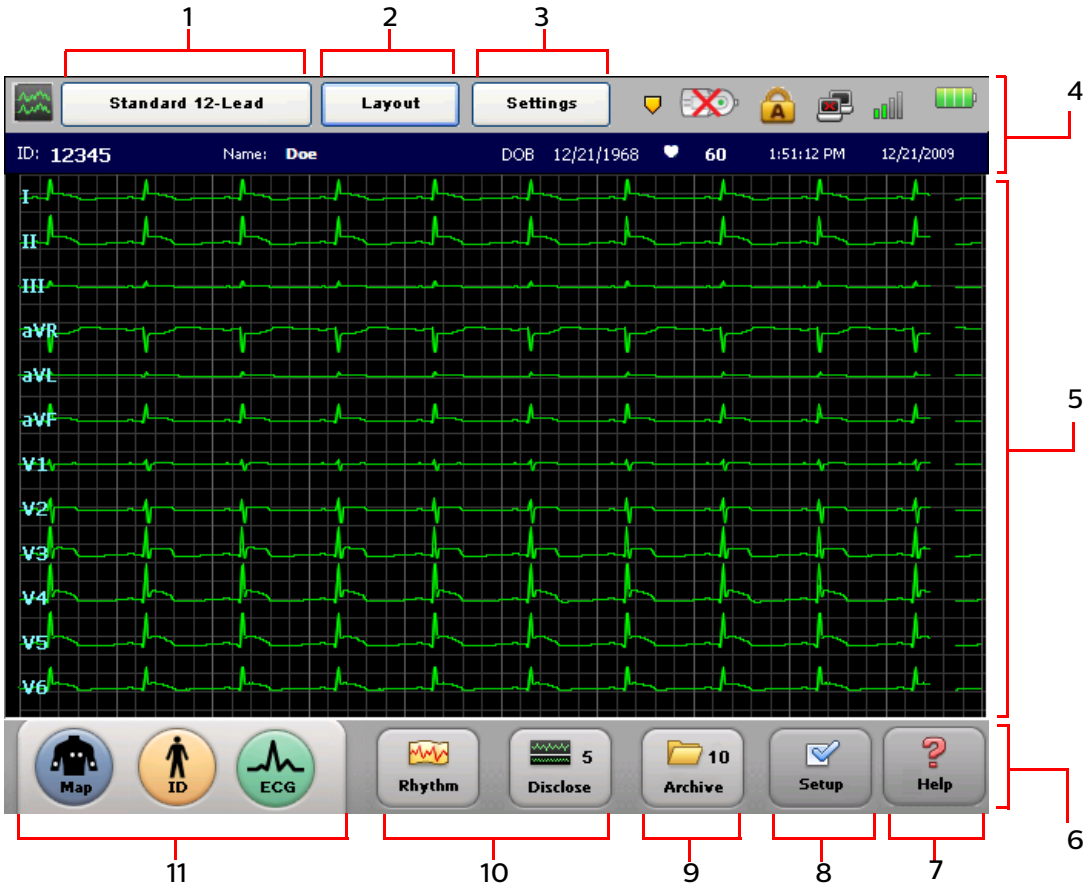


Table 1-2 Touch Screen Overview

Touch Screen Item	Feature	Description
1	**Selected Exam Type** 	• The Exam Type selected for the current patient session. • The available Exam Types are: **Resting 12-Lead** and **Timed ECG**. • Touch the button to change the selected Exam Type.

Table 1-2 Touch Screen Overview *(continued)*

Touch Screen Item	Feature	Description
2	**Exam Layout** 	• The settings underneath this button include the selected ECG report layout settings, and the level of interpretation generated by the Philips interpretive algorithm that are being applied to the selected Exam Type. • Any of the settings on this screen may be edited, and the new settings are applied to the current patient session.
3	**Current Operating Settings** 	• The settings underneath this button include the selected filters (Artifact, Baseline Wander), pacing detection setting, and report scaling settings being applied to the current patient session. • The **Unknown** pacing setting is recommended for most ECGs.
4	**Status Bar**	Displays information about the current cardiograph settings, including selected Exam Type, current patient name, network connectivity status, PIM status, and the current date and time.
5	**Waveform Display**	• Display area for ECG waveforms. Lead connection quality is indicated by the color of the waveform. • Press the up arrow (↑) or the down arrow (↓) key (on keyboard) to change the displayed lead format.
6	**Toolbar**	All cardiograph ECG acquisition modes and ECG management features.
7	**Help** 	Provides information on how to use the cardiograph.

Table 1-2 Touch Screen Overview *(continued)*

Touch Screen Item	Feature	Description
8	**Setup** 	The settings underneath this button are used to configure or change cardiograph settings, or to access the service utilities. Access to these screens may require entering a password.
9	**ECG Storage and Management Features** 	• Provides access to the ECG Archive, which is used as temporary storage for all ECGs acquired on the cardiograph. • From the Archive, ECGs may be transferred to an IntelliSpace ECG Management System, or a third party ECG management system. • From the Archive, an IntelliSpace server may be searched for previous ECGs to view and print on the cardiograph. • The number on the button (**10**) displays the number of ECGs currently stored in the Archive.
10	**Rhythm and Disclose Features** 	• The Rhythm feature is used to print continuous rhythm strips of up to 12 selected leads until the **Stop** button is touched. • The Disclose feature is used to review captured Events, to view continuous data from one selected lead, or to print ECG reports in a variety of formats. • The number on the **Disclose** button (**5**) displays the number of Events currently stored in Disclose for the current patient session.
11	**1-2-3 Operation Features** 	The **Map**, **ID**, and **ECG** buttons are used in sequence to acquire and print a standard 12-lead ECG.

The Status Bar

The Status Bar (top of the screen) provides information about the current cardiograph settings. The Status Bar is always visible.

Figure 1-13 The Status Bar

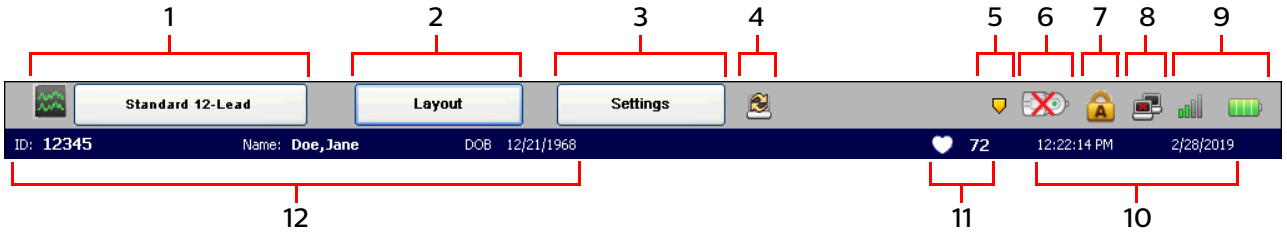


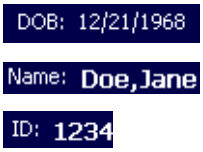
Table 1-3 The Status Bar

Status Bar Item	Feature	Description
1	**Selected Exam Type** Standard 12-Lead	• The Exam Type selected for the current patient session. • The available Exam Types are: **Resting 12-Lead** and **Timed ECG**.
2	**ECG Layout** Layout	• The current ECG report layout settings, including the level of interpretation generated by the Philips interpretive algorithm. • Any of the settings on this screen may be edited for the current patient session.
3	**Operating Settings** Settings	• The current selected filters (Artifact, Baseline Wander), pacing detection setting, and report scaling settings. • The **Unknown** pacing setting is recommended for most ECGs.
4	**Pending Task**	If this icon is present, a task has been scheduled for the cardiograph from the Device Management Dashboard. Touch the icon for more information about the task.

Table 1-3 The Status Bar *(continued)*

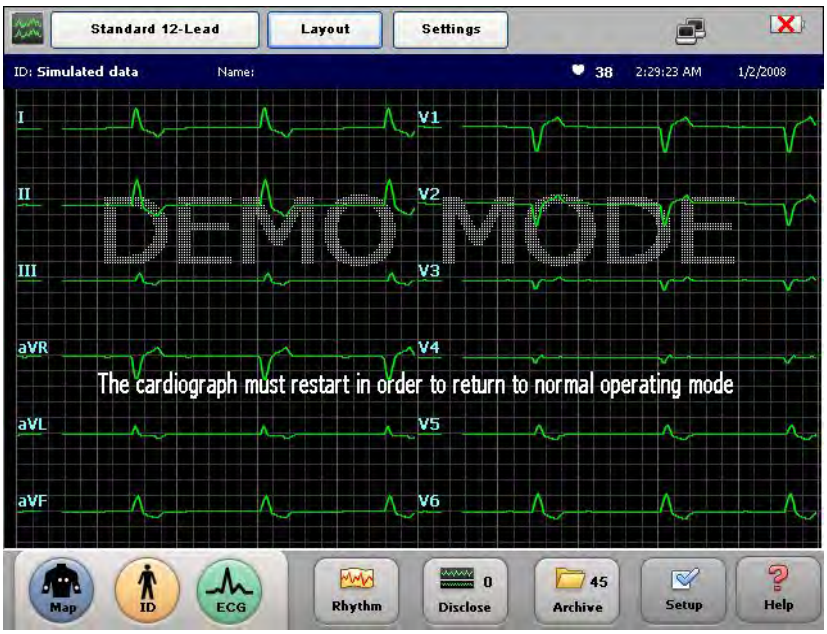
Status Bar Item	Feature	Description
5	**Event Marker Alert** 	If this flashing icon appears, saved Event markers ( ) have not yet been reviewed on the Disclose screen, and will be deleted within the next 75 seconds. Touch the **Disclose** button on the toolbar to review these saved Events.
6	**PIM Disconnected** 	If this icon appears, the Patient Interface Module (PIM) is not connected to the cardiograph. Check that the PIM cable is firmly attached to the connector on the cardiograph, and that there are no breaks or cracks in the cable.
7	**Caps Lock** 	Indicates that the Caps Lock setting is enabled (keyboard types in all capital letters). Touch the *Caps Lock* key (on keyboard) to disable the setting.
8	**LAN and Wireless LAN Connectivity**   	**LAN connectivity** • Indicates if the cardiograph is connected to a live Ethernet connection through the LAN connector ( ) on the rear of the cardiograph. • If no LAN connection is detected, a red "x" mark appears on the icon. **Wireless LAN connectivity** • Indicates the signal strength of a the wireless LAN connection. • Green bars indicate that the wireless adapter is associated to an access point. The higher the number of green bars, the better the connection. • Gray bars indicate that the wireless adapter is unable to associate to an access point.
9	**Battery Power Indicator** 	Displays the available battery power. For more information, see "To check the battery power level:" on page 1-22.

Table 1-3 The Status Bar *(continued)*

Status Bar Item	Feature	Description
10	**Date and Time** 	• Displays the current date and time. • The date and time can be set manually, or the cardiograph can be configured to automatically synchronize the date and time with an IntelliSpace ECG Management server. • Go to the **Archive** or **Setup** screens to manually change the date and time (accessing these screens may require entering a password). Tap the displayed date and time to edit the settings.
11	**Heart Rate Indicator** 	• Displays the patient heart rate in beats per minute. • The icon appears in white when no patient is attached to the cardiograph. **Note:** *The heart rate indicator measurement has been verified with a simulator that can generate ECG waveforms up to 240 bpm (beats per minute). Accuracy of this measurement beyond 240 bpm has not been verified.*
12	**Patient Date of Birth, Name, and ID Number** 	Displays the date of birth, patient name, and patient ID number for the current patient session.

Working with Simulated Data

The cardiograph offers a simulation mode in which cardiograph displays simulated waveforms on every screen, as well as on printed reports. This mode may be useful when training users on cardiograph operation.



When simulated waveforms are enabled:

- No data is acquired from the patient.
- The **Patient ID** field is set to *Simulated data* (appears on the screen, in the status bar, and on printed reports).
- A large watermark with the text *Demo Mode* appears on the screen and on printed reports.
- Canceling standby keeps the cardiograph in Simulation mode.
- After it is initially enabled, restarting the cardiograph a second time ends simulation mode. After a second restart, the cardiograph returns to real-data acquisition mode.

  To return to simulation mode, you must re-enable it in the settings.

For instructions on enabling or disabling demo mode, see “Enabling and Disabling Simulation Mode” on page 2-22.

2

Configuring Default Clinical Settings

All of the settings on the PageWriter TC cardiograph may be customized to meet the needs of a specific clinical environment. The cardiograph is shipped with factory default settings, and any of these settings may be changed. All configuration of the cardiograph is completed on the **Setup** screens.

Configuring the Wireless Option

For information on configuring the wireless LAN option, see the *PageWriter TC Wireless LAN Installation and Configuration Guide* provided with the wireless adapter, or download the file from the Philips InCenter web site (incenter.medical.philips.com). For information on using the Philips InCenter web site, see page ii.

Password Access

Access to all functions that are used to configure the cardiograph may be set to be password access controlled.

Note:

Philips strongly recommends enabling password access control when the PageWriter TC Cardiograph is used for the first time, and also recommends changing the password periodically.

Tips for Creating Secure Passwords

Use the following guidelines when creating passwords used on the cardiograph:

- Include at least one upper case character
- Include at least one number
- Create passwords at least eight characters in length
- Do not use common words, names, or other easily identified terms

Configuration with a Philips IntelliSpace ECG Management System

For information on configuring networking and other settings on the cardiograph that are used with an IntelliSpace ECG Management System (including the IntelliBridge order handling option), see the *PageWriter TC Cardiograph Network Configuration Guide* (only available in English) included on the *PageWriter TC User Documentation DVD*, or download the file from the Philips InCenter web site (incenter.medical.philips.com). For information on the Philips InCenter site, see “Using the Philips InCenter Site” on page ii.

For more comprehensive information on configuring the PageWriter TC cardiograph, or other Philips PageWriter cardiographs with an IntelliSpace ECG Management System, see the *Configuring External Devices Guide* (only available in English) available for download from the Philips InCenter web site. For information on using the Philips InCenter web site, see page ii.

Configuration with a Third Party ECG Management System

For information on configuring networking and other settings on the cardiograph that are used with a third party ECG management system, see the *PageWriter TC Cardiograph Network Configuration Guide*(only available in English) included on the *PageWriter TC User Documentation DVD*, or download the file from the Philips InCenter web site (incenter.medical.philips.com). For information on the Philips InCenter site, see “Using the Philips InCenter Site” on page ii.

DICOM Configuration

For information on configuring DICOM settings on the cardiograph, see the *PageWriter TC Cardiograph Network Configuration Guide* (only available in English) included on the *PageWriter TC User Documentation DVD*, or download the file from the Philips InCenter web site (incenter.medical.philips.com). For information on the Philips InCenter site, see “Using the Philips InCenter Site” on page ii.

Saving Custom Configuration Settings

After configuring the cardiograph, save the settings to a USB memory stick, or to a configured shared remote computer in case of system failure. If the cardiograph loses custom settings, the settings may be quickly and easily restored by loading them onto the cardiograph from a USB memory stick, or from a configured shared remote computer.

To save custom settings:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Touch **Save/Load Settings**.
4. Select the device on which to save the settings (USB memory stick or Remote Computer) from the drop-down list. Touch **Save**.

   Note: *If saving the settings to a USB stick, insert the USB stick before proceeding.*
5. Touch the checkbox next to the settings you want to save (**Custom Settings** and/or **Network Settings**). Enter a name in the field for each file.

   Note: *User settings are saved to an XML file. Network settings are saved to a DAT file. The file extensions cannot be changed.*
6. Touch **OK** to save the file(s), or **Cancel** to abort the operation.
7. If the settings have been saved to a USB stick, remove the stick and save it in a secure location.

Restoring Custom Configuration Settings

After configuring the cardiograph, save the settings to a USB memory stick, or to a configured shared remote computer in case of system failure. If the cardiograph loses custom settings, the settings may be quickly and easily restored by loading them onto the cardiograph from a USB memory stick, or from a configured shared remote computer. For information on configuring a shared remote computer, see the *PageWriter TC Cardiograph Network Configuration Guide*.

Note:

Beginning with software version A.07.03, when attempting to load a cardiograph configuration file from a USB stick, the PageWriter TC software will verify whether the configuration file is compatible with the target cardiograph. The software version in the configuration file must be identical to the software version installed on the TC cardiograph. If the software versions do not match, the configuration file will not be loaded onto the target cardiograph, and a message will be displayed indicating that the configuration file is not compatible with the software installed on the TC cardiograph.

To restore custom settings:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Touch **Save/Load Settings**.
4. Select the device from which to load the settings (USB memory stick or Remote Computer) from the drop-down list. Touch **Load**.

   Note: *If restoring the settings from a USB stick, insert the USB stick before proceeding.*

5. Touch the checkbox next to the file name you want to restore (**Custom Settings** and/or **Network Settings**). Touch **Browse**. Select the configuration file you wish to restore to the cardiograph.

   Note: *User settings are restored from an XML file. Network settings are restored from a DAT file. The file extensions cannot be changed.*

6. Touch **OK** to restore the selected file(s), or **Cancel** to abort the operation.
7. If the settings have been restored from a USB stick, remove the stick and save it in a secure location.

Configuring Multiple Cardiographs

When you need to configure multiple cardiographs with the same settings, you can save all settings from one cardiograph to a USB memory stick, or to a remote shared computer, and then load the saved configuration file onto additional cardiographs, with the following exceptions:

- You cannot transfer custom settings between different models of cardiographs. For example, you can only transfer custom settings from a TC30 cardiograph to another TC30 cardiograph, and not to a PageWriter TC50 cardiograph.
- Wireless network settings are saved to the network settings (.dat) file and can only by copied onto cardiographs with the same WLAN adapter as the originally configured cardiograph. For example, you can only transfer network settings from a cardiograph with a D21 adapter to another cardiograph with a D21 adapter, and not to a cardiograph with a D24 adapter (see “Wireless LAN Option Specifications” on page C-16 for information on adapter types).
- The software version on the target cardiograph must match the software version on the originally configured cardiograph. When attempting to load a cardiograph configuration file from a USB stick, the PageWriter TC software will verify whether the configuration file is compatible with the target cardiograph. If the software versions do not match, a message will be displayed indicating that the configuration file is not compatible with the software installed on the TC cardiograph.

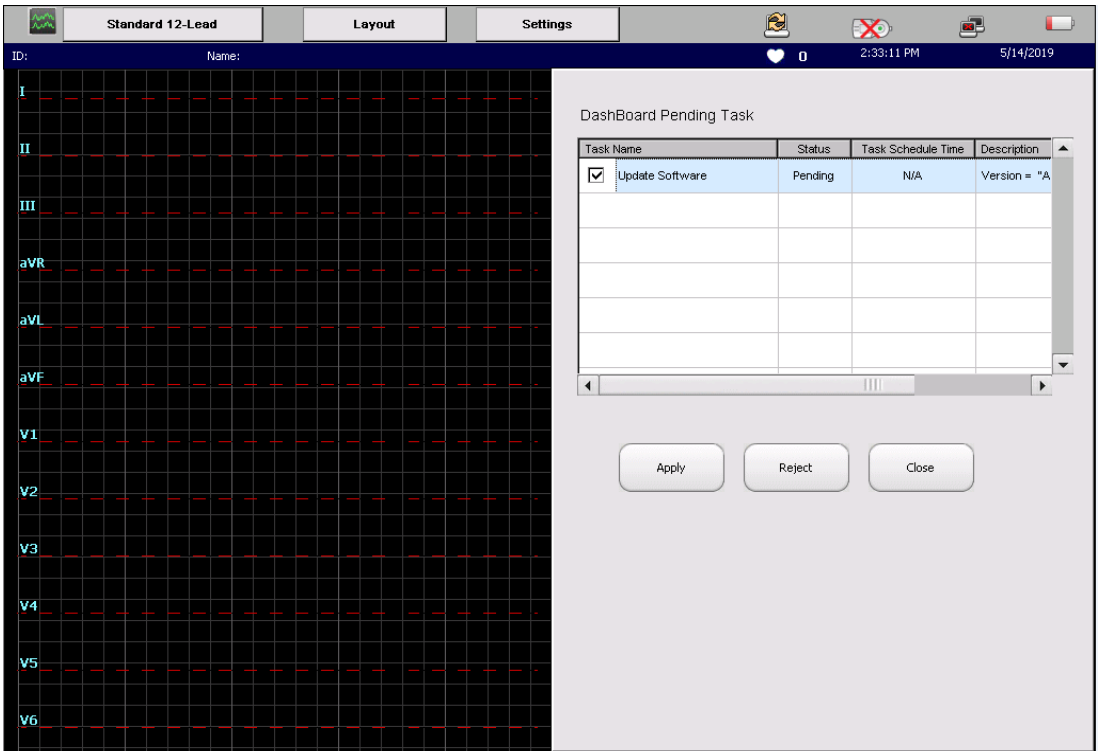
Philips Device Management Dashboard

The Philips Device Management Dashboard allows your system administrator to schedule and perform remote software upgrades, and to perform other tasks via the Dashboard interface. For information on installing and configuring the Philips Device Management Dashboard, refer to the *PageWriter TC Cardiograph Network Configuration Guide*. For information on configuring a TC cardiograph for Dashboard communication, refer to the *Philips Device Management Dashboard Installation and Configuration Guide*..

When a cardiograph receives an incoming request from the Dashboard, a Pending Task icon will appear on the task bar.



Tapping the icon will display information about the pending task, for example, a configuration file update or software upgrade.



If the task has been scheduled to execute automatically, the execution time will appear in the **Task Schedule Time** column. You do not need to take any action for scheduled tasks. They will execute automatically, although you will receive a message informing you that the task is about to run.

However, you can bypass the scheduled time and execute the task by touching the task to highlight it, then touching **Apply**.

To cancel the task, touch it to highlight it, then touch **Reject**. Touch **Close** to return to the main screen. If the task is rejected, the Dashboard will display a Reject message for the cardiograph.

Caution

Scheduled tasks, such as software upgrades, should be performed only when approved by authorized personnel. Do not accept a scheduled task without permission from your system administrator or other authorized representative.

Opening the Setup Screens

To open the setup screens:



▶ Touch the **Setup** button on the toolbar. The Setup menu appears.

Figure 2-1 The Setup and Service Utilities Menu

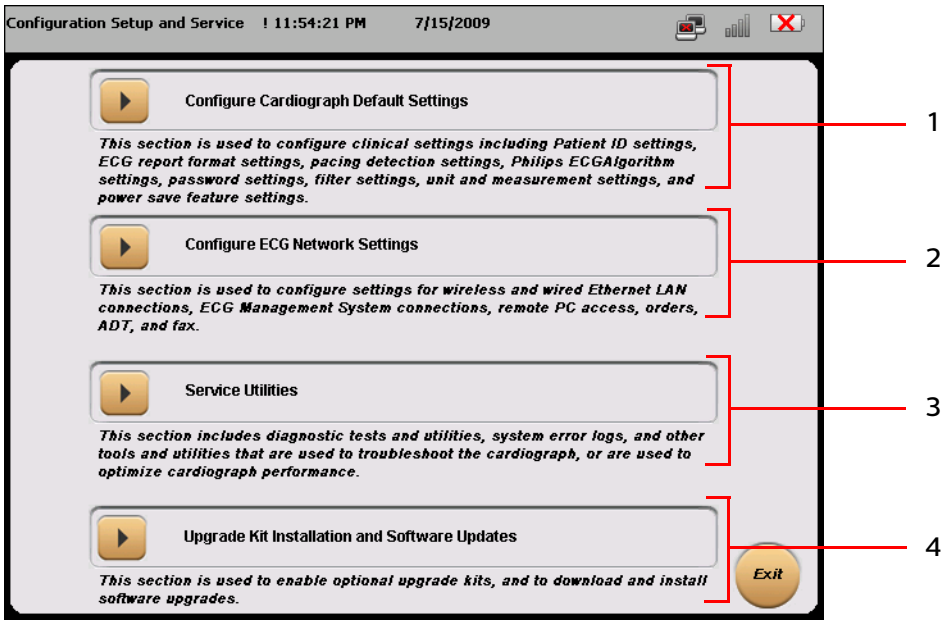


Table 2-1 Setup and Service Utilities Menu

Menu Item	Feature	Description
1	**Configure Cardiograph Default Settings**	• Touch to configure all clinical settings used on the cardiograph, including Simulation mode. • Touch to configure password and power save features. • Includes Maintenance Tests that can be used to troubleshoot or to optimize cardiograph performance. For more information, see Chapter 5, “Cardiograph Care and Maintenance.”

Table 2-1 Setup and Service Utilities Menu *(continued)*

Menu Item	Feature	Description
2	**Configure ECG Network Settings**	• Touch to configure IntelliSpace, IntelliBridge Enterprise, or third-party ECG management system settings. • Touch to configure LAN or wireless LAN connectivity. • For more information, see the *PageWriter TC Cardiograph Network Configuration Guide* (only available in English).
3	**Service Utilities**	• Touch to access the Service Utilities, including all maintenance and performance tests. • For more information on using the Service Utilities, see the *PageWriter TC Cardiograph Service Manual* (only available in English).
4	**Upgrade Kit Installation and Software Updates**	• Touch to access software updates and to add options. • See the *PageWriter TC Cardiograph Service Manual* (only available in English

Using Setup Help

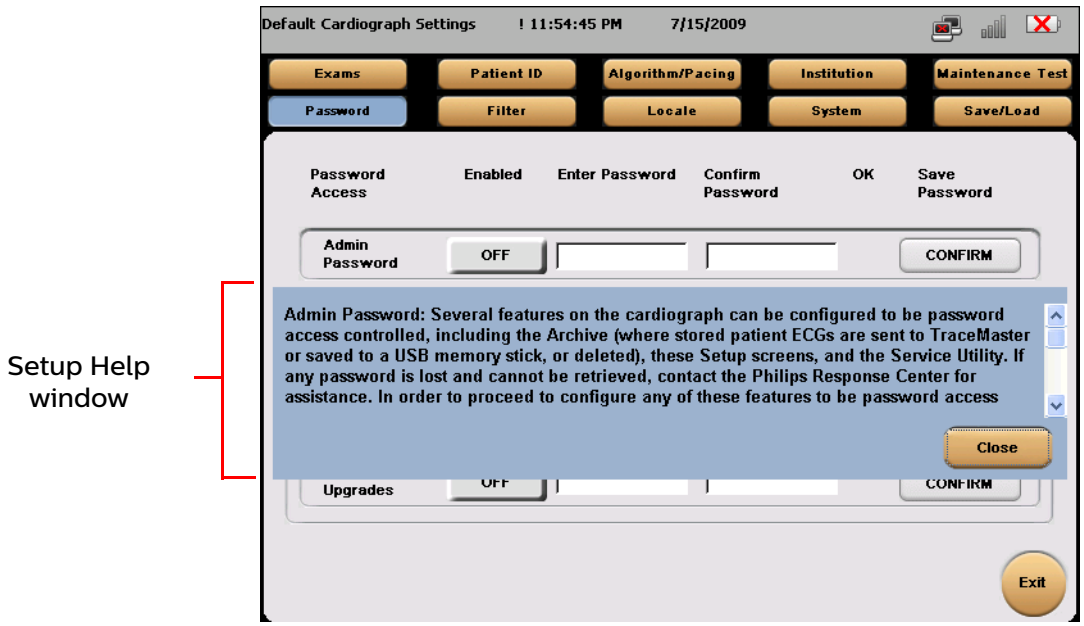
Each Setup screen within the cardiograph software application provides Help that describes the currently selected option or field. Use the Help when configuring cardiograph settings, or to learn more about a specific feature or item.

When a Setup screen is opened, Help displays in a blue *Information box* that appears on the screen. Touch the **Close** button when done. Touch a tab, or touch the name of any field or option displayed on the screen to display Help for that specific item.

To view help for a tab or field:

1. Touch a tab or touch the name of the field or option so that it is highlighted in blue. Help for the selected item displays in the blue Information box on the screen (see Figure 2-2 on page 2-9).
2. Touch the **Close** button when done.

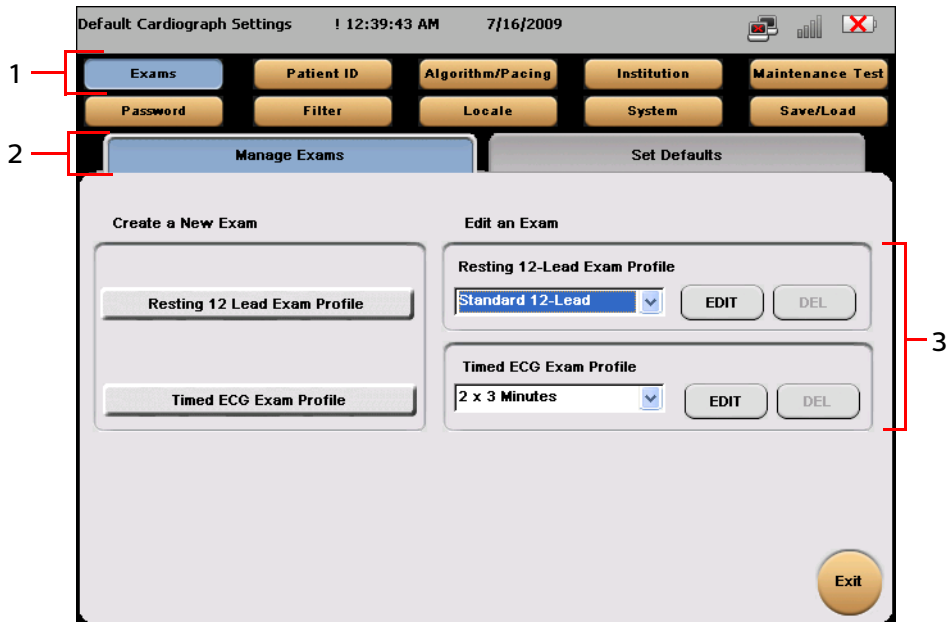
Figure 2-2 Help displayed on a Setup screen



Configuring 12-Lead Exam Settings

The Exam setup wizard is used to specify ECG operating settings, and 12-lead ECG report settings. Each set of defined settings is saved as an individual *Exam Profile* that is given a unique name. This Exam Profile can then be selected during a patient session.

Figure 2-3 The Exams Setup screen



1 **Exams** button selected

2 **Manage Exams** tab

3 **Edit Exams** dropdown lists

To configure Exams settings:

1. Touch the **Exams** button (top left of screen) on the Default Cardiograph Settings screen
2. The Exams setup screens appear. The **Manage Exams** tab is selected (in blue).
3. Touch a button under **Create a New Exam** to begin creating a new Exam for Resting 12-lead, or Timed ECG.
4. On the following screen select a lead sequence (**Standard** or **Cabrera**) and a lead standard (**AAMI** or **IEC**). Touch the **Next** button (bottom right of screen) to continue.
5. On the following screen, select a report format to specify for this Exam. Select the Rhythm leads for the selected report format (if necessary). Touch the **Next** button to continue.

6. Select the settings for the selected report format; these settings include the waveform scale and size settings, and if the ECG data shown on the report is captured simultaneously, or time sequentially. On the right side of the screen, select an interpretation level for the Philips 12-lead or DXL ECG algorithm. Touch the **Next** button to continue.

   Note:

   - *The* **Print Severity** *setting enables the printing of the ECG severity on the ECG report. For more information on the Severity setting, see "Interpretive, Reason, and Severity Statements" on page 4-4.*
   - *The* **Extended Measurements** *setting enables the printing of the full Extended Measurements Report with each ECG. For details, see "Extended Measurements Report" on page 4-34.*

7. The following screen specifies the Rhythm leads and the waveform speed and scale settings for all Rhythm reports printed using this Exam Profile.

8. Touch the **Back** button to return to any previous screen and make edits. Touch the **Save** button when complete.

9. The Create New Exam profile window appears. Enter a name for the Exam Profile. Touch **OK**. The Exam Profile is now saved and may be selected during a patient session. The new Exam Profile settings may also be edited. Select the Exam Profile from the **Edit an Exam** dropdown menus on the main Manage Exams screen. See Figure 2-3, "The Exams Setup screen," on page 2-10.

Configuring User Authentication

If your facility supports user authentication through an Active Directory Domain Controller, you can configure a TC cardiograph to require users to log in on startup, using their domain user names and passwords. For instructions on configuring user authentication, see the *PageWriter TC Cardiograph Network Configuration Guide*.

Note:

- *Cardiographs must be configured for LAN or WLAN network connectivity in order to support user authentication.*
- *An administrator password must be configured for user authentication. For information on configuring an administrator password, refer to the Service Manual provided with your cardiograph.*

When user authentication is enabled, the user will be prompted to enter domain credentials (domain\user name, password) in order to access the main screen whenever a cardiograph is powered on.

Note:

Users cannot change or reset their domain passwords on a TC cardiograph. Passwords must be changed on a computer that supports domain password reset.

Configuring Restricted Characters

Software version A.07.07 introduces the ability for you to restrict certain characters from being used in entry fields.

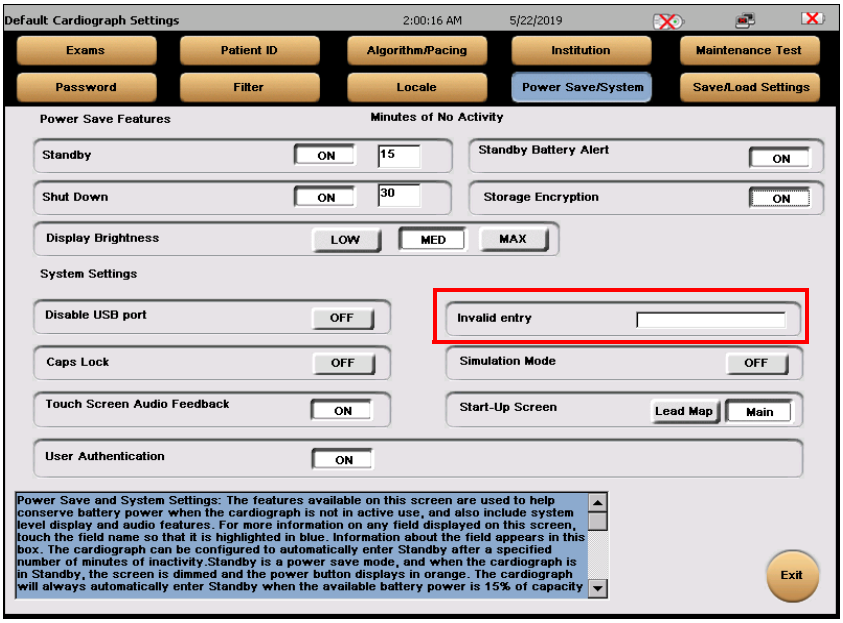
Caution

Characters that you identify as restricted cannot be input into ANY entry field. This includes patient demographic fields, configuration screen entry fields, and entry fields on every other screen. Use care when selecting restricted characters to prevent users from having to enter incomplete data or not being able to perform certain functions.

To configure restricted characters:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Select the **Power Save/System** tab.

4. In the **Invalid Entry** field, enter the characters whose use you want to restrict. Enter the characters with no spaces and no separating characters (e.g., do not use commas or spaces to separate characters).



Note: *Screen shown is from TC70. TC30 screen may differ slightly.*

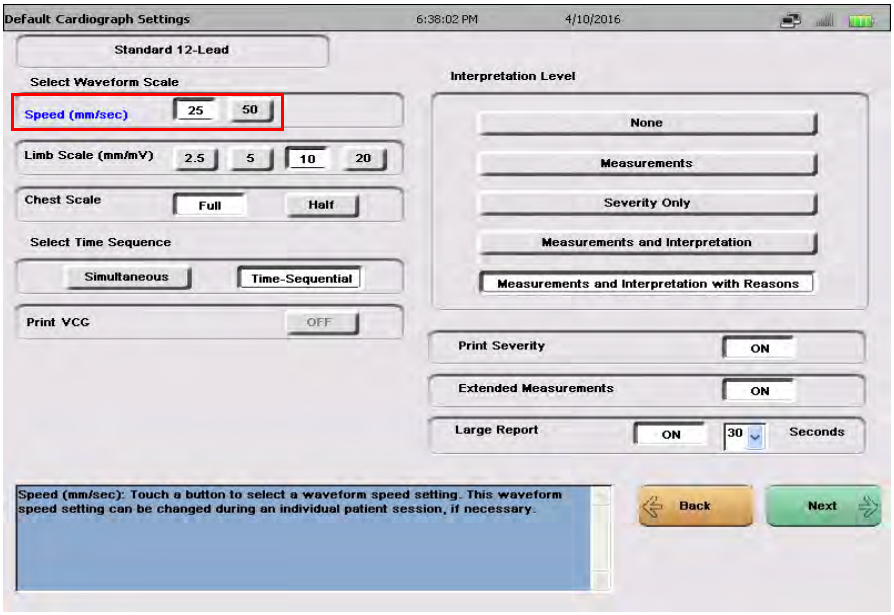
5. Touch **Exit** to save the setting.
6. Restart the cardiograph.

Configuring Vector ECG Reports

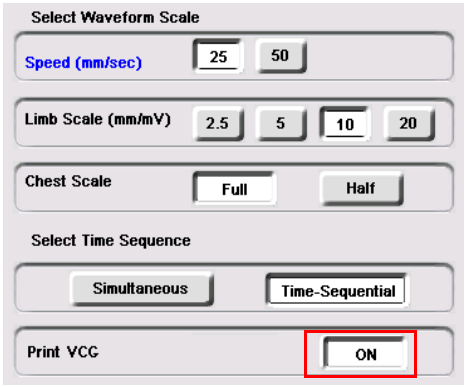
To configure vector ECG (VCG) reports:

1. Touch **Setup.**
2. Touch **Configure Cardiograph Default Settings**
3. Touch **Exams**.
4. Select the **Manage Exams** tab.
5. Touch **Resting 12-Lead Exam Profile.**
6. Create a new exam profile and touch **Next**.
7. Select and touch **Next**.

8. In order to enable the **Print VCG** button, you must set **Speed** to **25 mm/mv**.



9. Turn on **Print VCG**.



10. Touch **Next** to name and save the profile.
11. Select the **Set Defaults** tab.
12. Under **Select Default Resting 12-Lead Profile**, select the vector ECG report profile you created.
13. Touch **Exit** to save the settings.

Note:

- *The vector ECG report is supported only for resting ECGs. It is not available for timed ECGs.*
- *Vector ECG is only supported at 25 mm/mv speed. If the speed is changed to 50 mm/mv on the main screen, vector ECG will not be supported.*

Configuring Paperless Workflow

Beginning with software version A.07.03, an automated workflow of saving and transferring ECGs, and/or downloading the last recorded ECG can be triggered even when the ECG report is not automatically printed. This is known as the "paperless workflow."

To configure the paperless workflow:

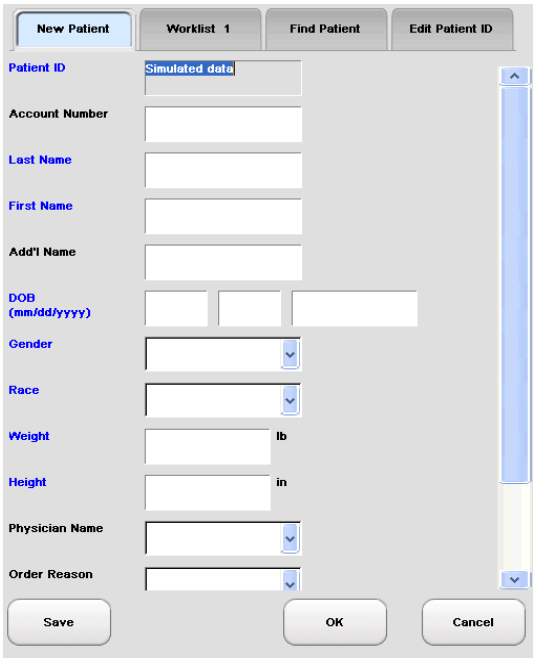
1. Touch **Setup,**
2. Touch **Configure Cardiograph Default Settings**
3. Touch **Exams**.
4. Select the **Set Defaults** tab.
5. Set **Paperless** to **ON**.
6. Touch **Exit** to save the setting.

Note:

Users may still print ECG reports manually from the report preview screen.

Configuring Patient Information Fields

The patient information fields that appear on the New Patient screen and other screens can be enabled or disabled to fit your facility's needs. You can configure which fields appear on the screen, and designate additional properties for specific fields.



Note:

*Fields that appear on the **New Patient** screen will also appear on the **Edit Patient ID** screen. Blue text indicates a required field.*

To configure patient information fields:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Touch **Patient ID**. The Patient Info tab is displayed.
4. To enable a field, set the Enabled value to **ON**.

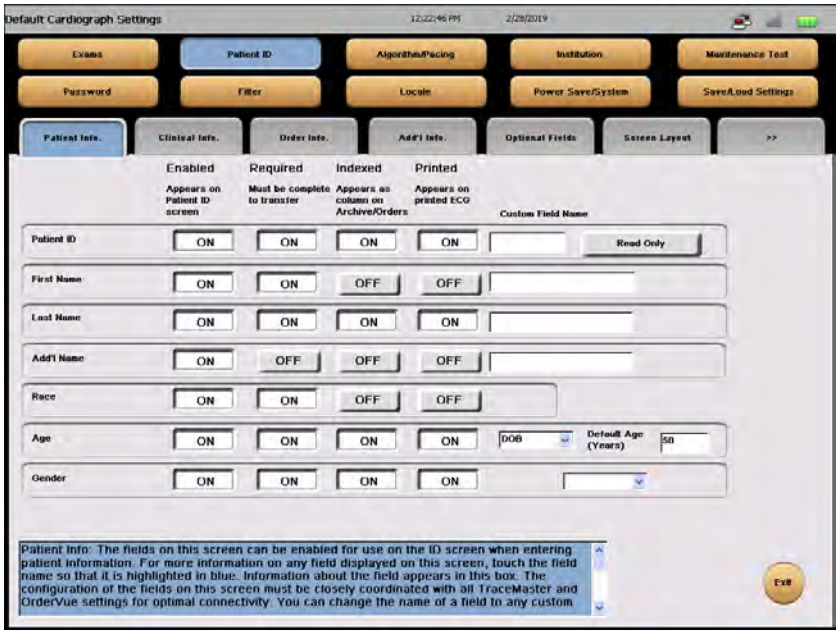
5. To enable additional properties, set the desired value to **ON**. Additional properties include:

   Required: the field must be populated before beginning a recording.

   Note: *Required fields are indicated by blue labels.*

   Indexed: the field will appear as a column on the Archive/Orders screen.

   Printed: the information in the field will be printed on the ECG report.



Note: *Screen shown is from TC70. TC30 screen may differ slightly.*

6. To create a custom label for a field, enter the desired text in **Custom Field Name**.

7. You can set a default unit and value for some fields (e.g., Age, Facility, Department).

   To specify the default unit, touch the first drop-down list and select the desired unit. In this example, the default unit for the Facility field is "Code."

8. To create a selection list, enter a value in the second field and touch **ADD**. Continue creating entries in this way until the list is complete.

   Users can select entries from this list when populating the field on the **New Patient** screen.

9. Continue through the tabs, enabling any desired fields/properties.

10. Touch **Exit** to save the settings.

For information about the patient information fields, including format and maximum characters, refer to Appendix D, “Patient Information Fields”.

Configuring Read-Only Patient ID

The Patient ID field can be configured to be read-only. When the Patient ID is read-only, the data cannot be changed on a TC cardiograph. Also, if a new patient is created manually, the Patient ID field cannot be completed by a user.

To configure read-only Patient ID:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Touch **Patient ID**.
4. Select the **Patient Info** tab.
5. Set **Read Only** to **ON**.
6. Touch **Exit** to save the setting.

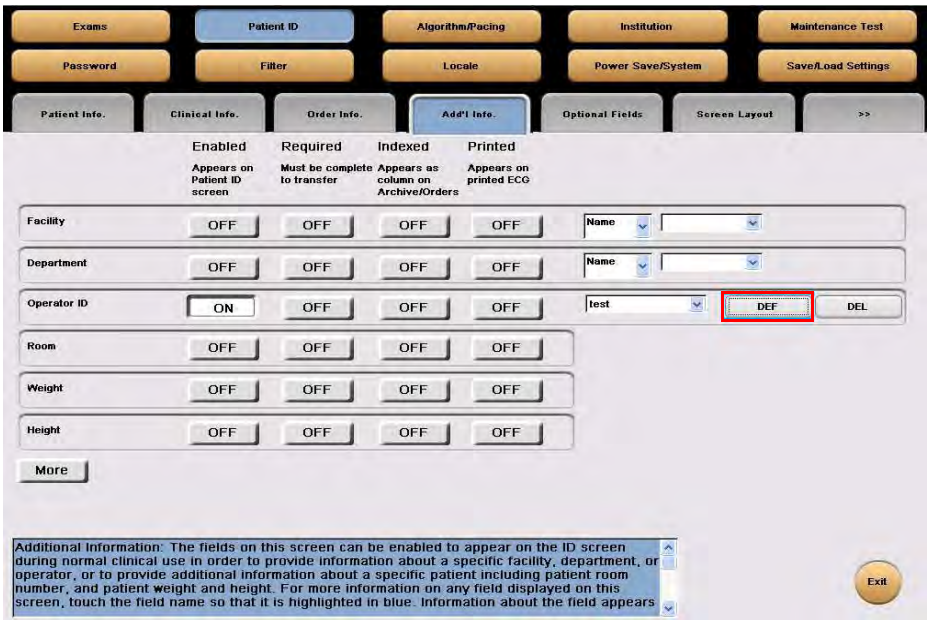
Configuring a Default Operator ID Value

If desired, you can configure each TC Cardiograph to automatically populate the **Operator ID** field with a default value.

To configure a default value for Operator ID:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Touch **Patient ID**.
4. Select the **Add’l Info** tab.
5. Set **Operator ID** to **ON**.
6. Select the default ID value.

7. Touch **DEF** (default).



Note: *Screen shown is from TC70. TC30 screen may differ slightly.*

8. Touch **Exit** to save the setting.

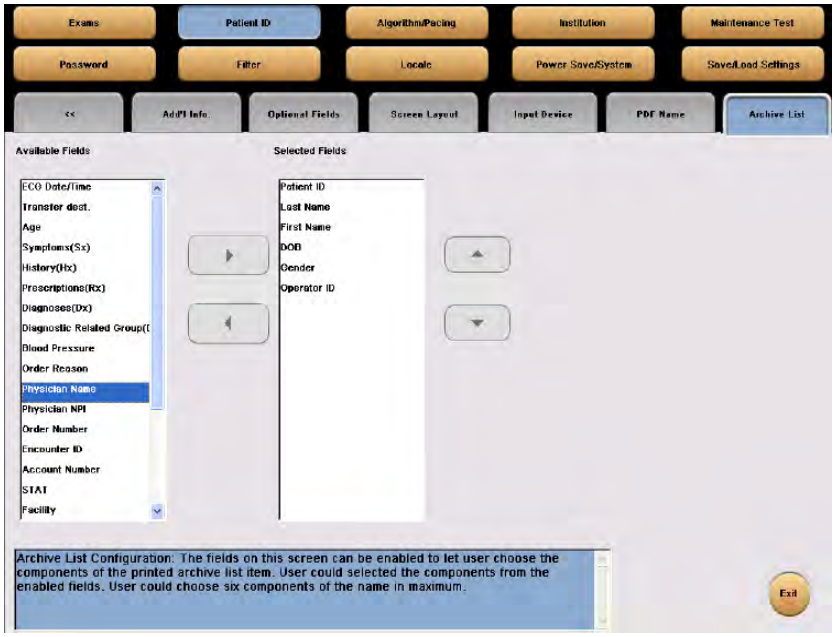
Configuring Archive List Print Fields

When printing a list from the Archive screen, you can select the fields you want to appear on the report format.

To select Archive print fields:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Touch **Patient ID**.
4. Select the **Archive List** tab.

5. To select a field for inclusion in a printed list, touch the field to highlight it in the **Available Fields** list, and touch ▶.



Note: *Screen shown is from TC70. TC30 screen may differ slightly.*

6. To set the order in which the fields print, highlight a field in the **Selected Fields** list, and use the ▲ and ▼ buttons to adjust its order in the list.
7. To remove a field from the printout, highlight the field in the **Selected Fields** list, and touch ◀.
8. Touch **Exit** to save the setting.

Configuring Power Options

The cardiograph can be configured to enter Standby mode after a period of no activity, and from Standby, to shut down completely. You can also configure an audible tone to remind the user to connect AC power when the cardiograph is in standby so that the batteries will be charged.

Note:

When the cardiograph is shut down, the batteries will not charge in order to prevent overheating. Always verify the battery charge level when a cardiograph is powered on after being shut down manually or automatically. If the battery charge is low, plug the cardiograph into AC power to charge the batteries. Make sure the cardiograph is turned on.

To configure power options:

1. Touch **Setup**.
2. Touch **Configure Cardiograph Default Settings**.
3. Select the **Power Save/System** tab.
4. To have the cardiograph automatically enter Standby mode after a period of no activity:
   - set **Standby** to **ON**;
   - enter the number of minutes of no activity (between 2 and 60 minutes).



5. To configure the audible battery tone, set **Standby Battery Alert** to **ON**.

   Note: *If configured, the cardiograph will emit an audible tone every 45 seconds when it has been in Standby for at least five minutes on battery power. If the cardiograph is plugged into AC power while in Standby, the tone will not sound.*

6. To have the cardiograph automatically shut down after a period of no activity:
   - set **Shut Down** to **ON**;
   - enter the number of minutes of no activity (between 2 and 180 minutes).



   Note: *If both Standby and Shut Down are configured, the period of no activity for automatic shutdown should always be longer than the period for automatic standby.*

7. Touch **Exit** to save the setting.
8. Restart the cardiograph.

Caution

When a battery's cycle count is less than 600 and the full charge capacity is 50-89% of design capacity, and AC power is connected, the cardiograph will not automatically shut down. It will remain in standby until at least one battery is charged to 90% of full capacity (when two batteries are installed). The cardiograph will then shut down, and battery charging will be suspended.

Enabling and Disabling Simulation Mode

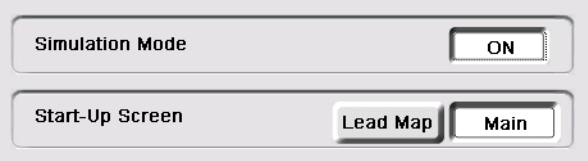
For details on Simulation mode, see "Working with Simulated Data" on page 1-36.

To enable or disable Simulation mode:

1. On the Default Cardiograph Settings screen, touch the **Power Save/ System** button.
2. In the **Simulation Mode** field, touch the **OFF/ON** button. If the button is set to **OFF**, simulation mode is disabled. If the button is set to **ON**, simulation mode is enabled.

   To enable simulation mode, touch the button to set it to **ON**.

   To disable simulation mode, touch the button to set it to **OFF**.



3. Touch the **Exit** button to exit Setup, and to confirm your changes.
4. Touch **OK** when prompted to restart the cardiograph.

   A restart is required to change the Simulation mode setting.

Note:

After it is initially enabled, restarting the cardiograph a second time ends simulation mode. After a second restart, the cardiograph is restored to real-data acquisition mode.

3 The Patient Session

Introduction

A patient session is the period of time when waveform data is acquired and processed from a single patient. A patient session begins by entering accurate patient information. Patient information is then linked with all waveform data acquired during the patient session.

Caution

- **Entering accurate patient information (age, gender) is highly recommended if using the Philips DXL ECG Algorithm for ECG interpretation. For more information see the *Philips DXL ECG Algorithm Physician's Guide* on the *PageWriter TC User Documentation DVD*, or download the file from the Philips InCenter site (incenter.medical.philips.com).**
- **Before acquiring an ECG, ensure that the cardiograph screen does not show the DEMO MODE watermark on the waveform screen or report, and the Patient ID does not display the text, *Simulated data*. If these elements are present, the cardiograph is in Simulation mode and is not acquiring patient data! Restart the cardiograph to exit Simulation mode. For details, see "Working with Simulated Data" on page 1-36.**

The steps in a typical patient session are described in the following table.

Table 3-1 The Patient Session

The Patient Session		
Prepare the Patient		
Step	**Description**	**More Information See...**
1	Prepare the patient for the procedure.	"Patient Preparation" on page 3-4.

Table 3-1 The Patient Session *(continued)*

The Patient Session		
2	Prepare the electrode sites and attach the electrodes.	• "Preparing the Skin" on page 3-5. • "Electrode Placement" on page 3-6. • "Attaching Disposable Electrodes" on page 3-9. • "Attaching Welsh Bulb and Limb Clamp Electrodes" on page 3-10.
3	Attach the lead wires.	"Attaching the Lead Wires" on page 3-12.
Enter Patient Information or Take a STAT ECG		
Step	Description	**More Information See...**
1	Return the cardiograph to active use from standby mode.	"Using the On/Standby Button" on page 3-12.
2	• Take an urgent/STAT ECG. • Enter patient information or select an order from the Worklist.	• "Identifying ECG Problems" on page 3-30. • "Entering Patient Information" on page 3-17.
Check the Signal Quality		
Step	**Description**	**More Information See...**
1	When the patient is connected to the cardiograph, color-coded ECG waveforms appear on the Main screen. Check the signal quality.	"Checking Signal Quality" on page 3-24.
2	Touch the **Map** button on the cardiograph to verify electrode and lead connections.	"Leads Map" on page 3-25.

Table 3-1 The Patient Session *(continued)*

The Patient Session		
Select an ECG Acquisition Mode		
Step	**Description**	**More Information See...**
▶	Do any of the following:	
	• Capture Events for review on the Disclose screen.	"Capturing Events from the Main or Rhythm Screens" on page 3-44.
	• Print an Auto ECG.	"Main ECG Screen" on page 3-32.
	• Print a Rhythm report.	"Rhythm ECG Acquisition" on page 3-40.
	• Use the Disclose feature to: – Review Events captured on the Main or Rhythm screens. – Print a 12-lead ECG of captured Event data – View continuous waveform data for a selected Disclose lead. – Print a 1-minute report of a selected Disclose lead. – View live patient waveform data for a selected Disclose lead.	"Disclose ECG Acquisition" on page 3-44.
	• Use the Timed ECG feature to take ECGs at preset intervals.	"Using Timed ECG" on page 3-48.
View, Print, Save, and Transfer ECG(s) from the Preview Screen		
Step	**Description**	**More Information See...**
▶	Compare the most recent ECG from the same patient using the optional **Last ECG** feature (requires an active IntelliSpace ECG connection).	• "Using the Last ECG Feature on the Preview Screen" on page 3-38. • "Critical Values on Preview Screen" on page 3-39.

Table 3-1 The Patient Session *(continued)*

The Patient Session		
End the Patient Session		
Step	**Description**	**More Information See...**
▶	Disconnect the patient.	--
Transfer ECGs from the Archive		
Step	**Description**	**More Information See...**
1	Transfer completed ECGs from the Archive as a PDF file or as an XML file using a USB memory stick, or a network connection.	"Transferring ECGs from the Archive" on page 3-49.
2	Download ECGs from IntelliSpace ECG to the cardiograph using a network connection.	"Downloading ECGs from IntelliSpace ECG" on page 3-51.
The patient session ends when: • New patient information is entered or a new pending order is selected • The cardiograph enters Standby or is shut down • The patient is disconnected or leads are off for more than 10 seconds • Archive or Setup are selected		

Patient Preparation

Thorough patient preparation techniques are essential for a good quality ECG. Follow the procedures listed in this section to ensure a quality ECG for each patient.

Note:

Good ECG technique is very important to achieve the best quality results.

Instructing the Patient

Before attaching the electrodes, greet the patient and explain the procedure. Explaining the procedure decreases anxiety and informs the patient about what to expect.

- Privacy is important to relaxation. When possible, take the ECG in a quiet room or area where others can't see the patient. Draw the curtains around the bed when taking the ECG in a room with other people.
- Reassure the patient that the procedure is painless.
- Make sure the patient is lying down and is comfortable. The patient's arms and hands must be relaxed. If the table is too narrow, place the patient's hands under the buttocks to prevent muscle tension in the arms.

Once the electrodes and patient cable are attached, instruct the patient to:

- Remain still and do not talk
- Breathe normally
- Try not to shiver
- Do not chew or clench teeth

The more relaxed the patient, the less the ECG will be affected by noise.

Preparing the Skin

Thorough skin preparation is very important. The skin is a poor conductor of electricity and frequently creates artifact that distorts the ECG signal. There is a natural resistance on the skin surface due to dry, dead epidermal cells, oils, and dirt.

Note:

The area of the skin where the electrodes are applied must be clean and free of skin oil.

To prepare the skin:

1. Clip hair from electrode sites if necessary (excessive hair prevents a good connection).
2. Wash thoroughly with soap and water.
3. Dry the skin vigorously to increase capillary blood flow to the tissues and to remove the dead, dry skin cells and oil.

Note:

Do not use alcohol *to clean the skin because it dries the skin. If there is no time to follow the procedure above, rub the site with gauze to remove dead, dry skin and to increase capillary flow.*

Electrode Placement

Review the following lead labeling and electrode placement information to ensure a quality ECG.

Table 3-2 AAMI and IEC Lead Labeling and Electrode Placement

AAMI Lead	IEC Lead	Electrode Position
RL	N	On the right leg (inside calf, midway between knee and ankle)
LL	F	On the left leg (inside calf, midway between knee and ankle)
RA	R	On the right arm (on the inside)
LA	L	On the left arm (on the inside)
V1	C1	Right side of the sternum in the 4th intercostal space
V2	C2	Left side of the sternum in the 4th intercostal space
V3	C3	Midway between V2/C2 and V4/C4
V4	C4	Left midclavicular line in the 5th intercostal space

Table 3-2 AAMI and IEC Lead Labeling and Electrode Placement *(continued)*

AAMI Lead	IEC Lead	Electrode Position
V5	C5	Anterior axillary line at the same level as V4/C4
V6	C6	Left midaxillary line at the same level as V4/C4

Figure 3-1 Male Standard 12-Lead Electrode Placement (AAMI/IEC)

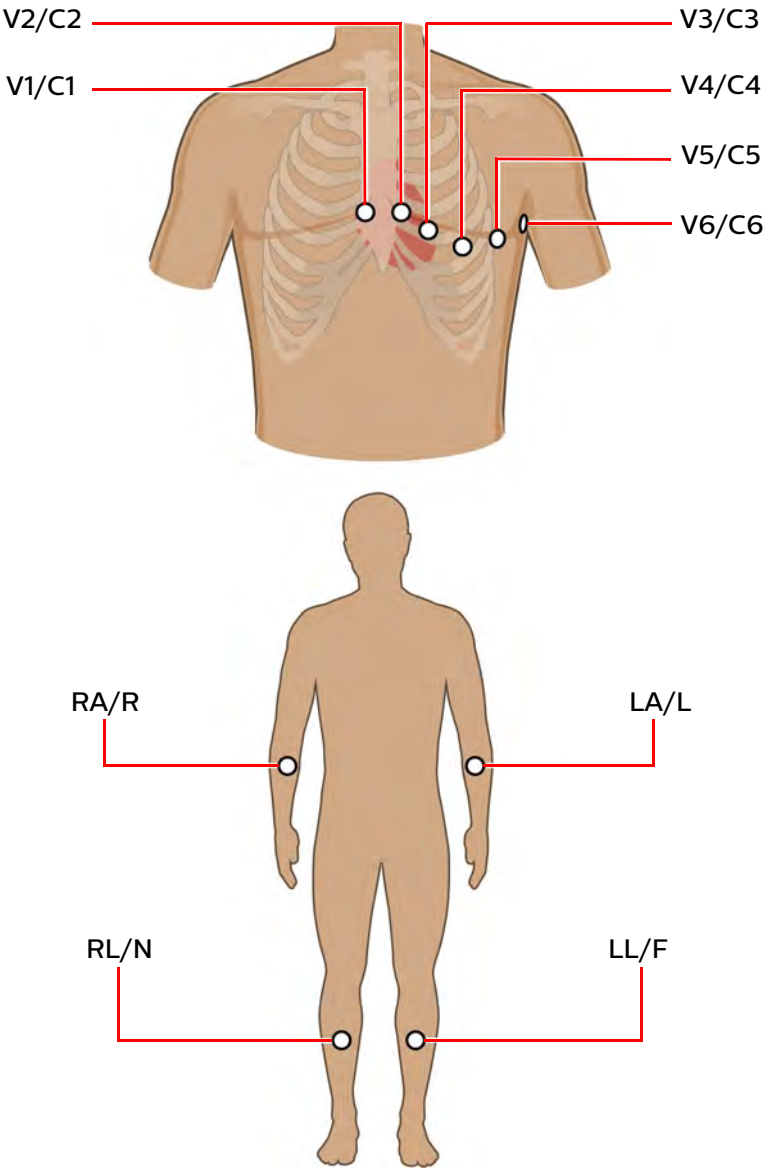
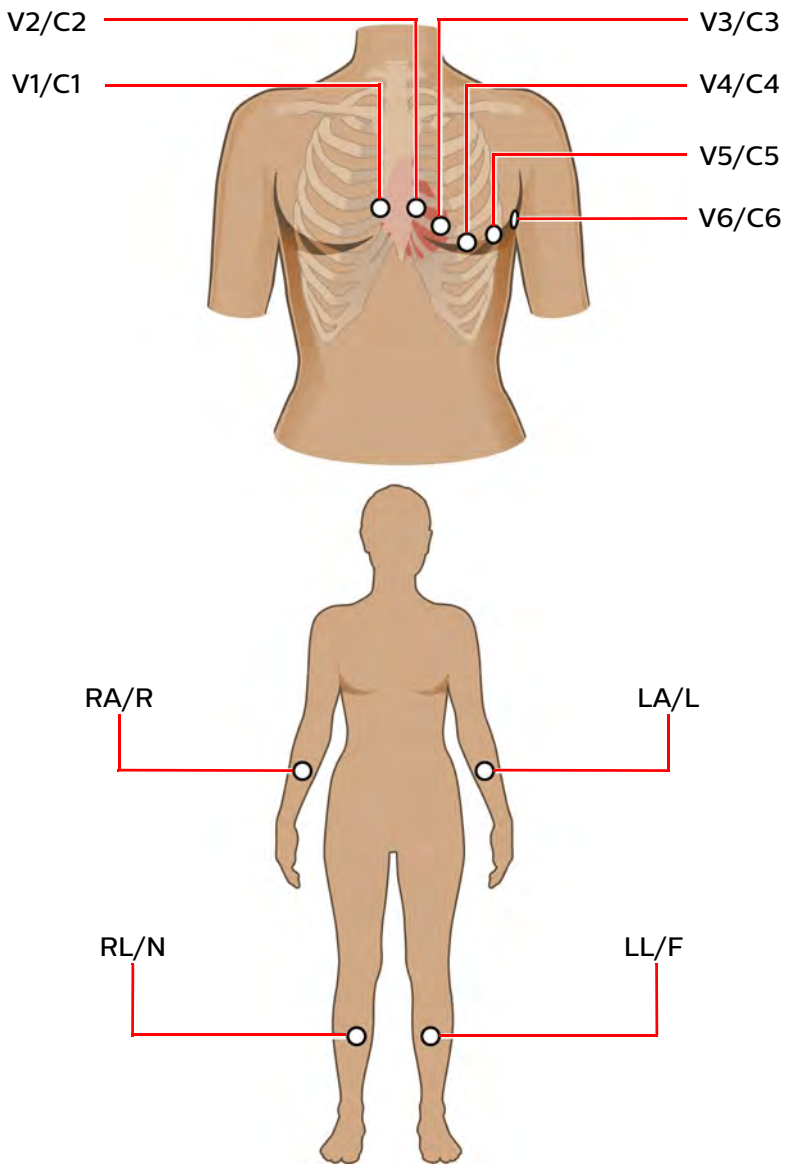


Figure 3-2 Female Standard 12-Lead Electrode Placement (AAMI/IEC)



Attaching Disposable Electrodes

For the best quality ECG, ensure that all skin preparation procedures described in “Preparing the Skin” on page 3-5 have been followed.

To attach disposable electrodes:

1. Expose the arms and legs of the patient (to place the limb electrodes).
2. Place the electrodes on flat, fleshy parts of the arms and legs.

3. Place the electrodes on the inside of each arm (between the wrists and elbows).
4. Place the electrodes on the inside of each calf (between the knee and the ankle).
5. Place the limb electrodes equal distance from the heart. Position the electrodes at the same place on each limb.
6. If a limb site is not available (amputation, injury) place the electrodes closer to the torso.
7. Attach the electrodes to the skin. A good test for firm electrode contact is to try to move it. If it moves easily, the electrode connection is too loose. Do not allow the electrodes to move in any way.

Attaching Welsh Bulb and Limb Clamp Electrodes

Special Note about Welsh Bulb Electrodes

Special care is necessary when using Welsh Bulb electrodes. Pay special attention to all warning associated with these electrodes. For information on cleaning the reusable Welsh Bulb electrodes, see “Reusable Electrode Cleaning” on page 5-5. Philips recommends the use of disposable electrodes at all times with the PageWriter TC cardiograph.

WARNING

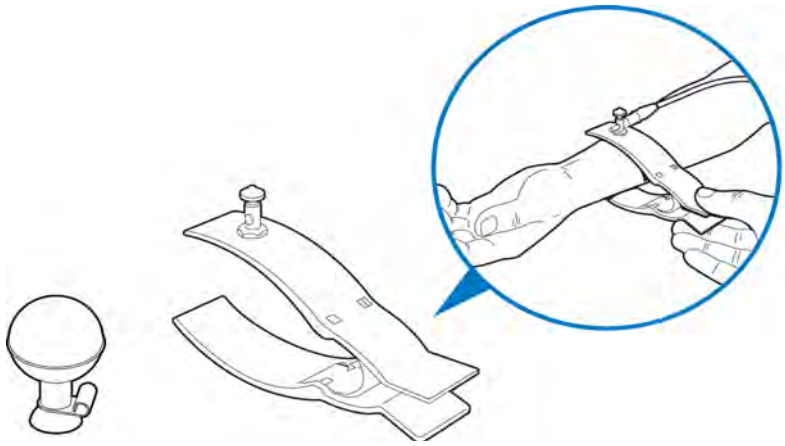
The Welsh bulb electrodes (available as an accessory for the cardiograph) do not meet the requirements of IEC 60601-2-25 for defibrillation recovery time, and cannot be reliably used for patient diagnosis immediately following defibrillation.

WARNING

Always clean and disinfect reusable electrodes before patient use. See “Reusable Electrode Cleaning” on page 5-5 for information on cleaning and disinfecting reusable electrodes. Failure to properly clean and disinfect reusable electrodes before patient use may cause infectious materials to be transferred between patients.

The Welsh Bulb electrode is a self-restraining electrode that consists of a rubber squeeze bulb and a metal cup. The rubber squeeze bulb provides sufficient suction to hold the electrode firmly on the patient without causing discomfort. This electrode is used on the chest. The limb clamp electrodes are used on the arms and legs. Philips recommends the application of highly conductive multipurpose electrolyte gel to the electrode site whenever Welsh Bulb and limb clamp electrodes are used.

Figure 3-3 Welsh Bulb and Limb Clamp Electrode



For the best quality ECG, ensure that all skin preparation procedures described in “Preparing the Skin” on page 3-5 have been followed.

Caution

When applying the precordial electrodes, do not overlap the electrolyte gel of adjacent electrode sites. Overlapping electrolyte gel will cause interaction between electrode sites, and may result in distortion of the ECG signal.

To attach limb clamp and welsh bulb electrodes:

1. Expose the arms and legs of the patient (to place the limb plate electrodes).
2. Inspect both the limb clamp and the Welsh Bulb electrodes to ensure that both are clean. For information on cleaning reusable electrodes, see “Reusable Electrode Cleaning” on page 5-5.
3. Ensure that the patient data cable and the lead wires are not twisted, and lay the Patient Interface Module (PIM) flat.
4. Connect the lead wire to the corresponding electrode, this may be done one electrode at a time for convenience.
5. Apply a thin layer of electrolyte gel to the area of the skin where the electrode will be applied. The skin area covered by the electrolyte gel should not exceed the diameter of the electrode.
6. Rub the electrode on the skin with a circular motion to apply and spread the electrolyte gel to the electrode surface and skin. This is very important if the patient’s skin is extremely dry. If the patient’s skin is excessively hairy, follow the procedure “Preparing the Skin” on page 3-5 to remove hair from electrode sites.

7. Hold the electrode on the patient's skin and depress the top of the rubber bulb.
8. Release the rubber bulb, and the electrode attaches to the patient. A good test for firm electrode contact is to try to move it. If it moves easily, the electrode connection is too loose. Do not allow the electrodes to move in any way.

Note:

- *Place the electrodes on flat, fleshy parts of the arms and legs.*
- *Place the electrodes on the inside of each arm (between the wrists and elbows).*
- *Place the electrodes on the inside of each calf (between the knee and the ankle).*
- *Place the limb electrodes equal distance from the heart. Position the electrodes at the same place on each limb.*
- *If a limb site is not available (amputation, injury) place the electrodes closer to the torso.*

To remove limb clamp and welsh bulb electrodes:

▶ Detach the rubber bulb from the metal cup by pulling. Follow the procedure, "Reusable Electrode Cleaning" on page 5-5, to clean reusable electrodes after each use.

Attaching the Lead Wires

Each lead wire tip is labeled and color-coded for easy identification.

To attach the lead wires:

▶ Attach each lead wire to the corresponding electrode.

Using the On/Standby Button

The On/Standby button is used to:

- Initially power on the cardiograph;

- Put the cardiograph into standby mode when not in active use in order to conserve battery power;
- Recover from standby to return the cardiograph to active use;
- Shut down all power to the cardiograph for extended periods of inactivity.

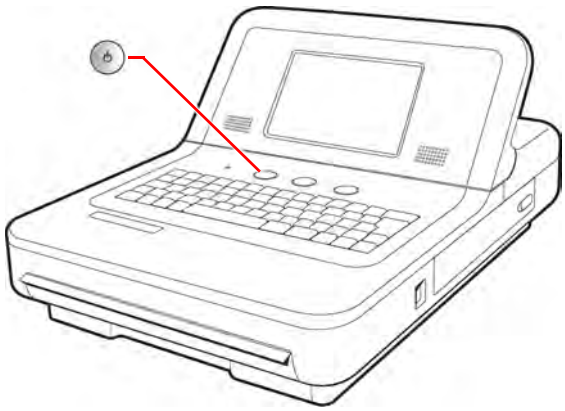
The On/Standby button LED light indicates the operational mode of the cardiograph:

- illuminated green: the cardiograph is in Run mode;
- illuminated amber: the cardiograph is in Standby mode;
- not illuminated: the cardiograph is in Off mode.

Caution

Ensure that all patient data from an active patient session is saved before entering Standby, or shutting down the cardiograph. Unsaved patient data (patient identification information, unreviewed Event Markers, unsaved ECGs) is deleted when the cardiograph enters Standby.

Figure 3-4 The On/Standby button



On/Standby button

To turn on the cardiograph:

▶ Press the On/Standby button and release. A tone will sound, and the On/Standby button will be illuminated in green. A brief introductory screen will appear, followed by the main screen.

To put the cardiograph in Standby mode:

1. Press the On/Standby button and for approximately 2 seconds, then release. The cardiograph will enter Standby. The On/Standby button will be illuminated in amber.
2. To return the cardiograph from Standby to normal operation, press the On/Standby button again, or press any key on the keyboard. A tone will sound, and the On/Standby button will be illuminated in green.

Note:

- *Plug the cardiograph into AC power and turn it on whenever possible to recharge the batteries. Batteries will not charge if the cardiograph is turned off.*
- *The cardiograph will enter Standby mode automatically if the lid is lowered to an angle less than 30°.*
- *If the Disclose or Rhythm screens are being viewed prior to entering Standby, the Main screen will appear when the cardiograph is returned to active use.*

To shut down the cardiograph:

- ▶ Press and hold the On/Standby button for 3 seconds to shut down the cardiograph. When the cardiograph is shut down, any unsaved patient data is lost.

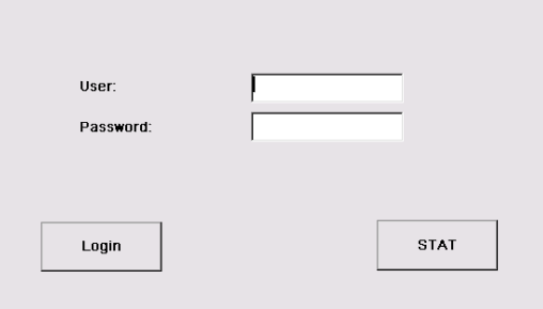
Note:

Generally, when the cardiograph is shut down, the batteries will not charge. Always verify the battery charge level when a cardiograph is powered on after being shut down manually or automatically. If the battery charge is low, plug the cardiograph into AC power to fully charge the batteries.

There is one exception: when a battery's cycle count is 600 or less, or the full charge capacity is 50% of design capacity or greater, and AC power is connected, the cardiograph will remain in standby until either battery is charged to 90% of full capacity (whether one or two batteries are installed). The cardiograph will then shut down, and battery charging will be suspended.

Logging in with User Authentication

If your cardiograph is configured for user authentication, you will be prompted for your domain credentials when the cardiograph is powered on. When prompted to log in, enter your credentials (domain\user name and password) and touch **Login** to access the main screen.

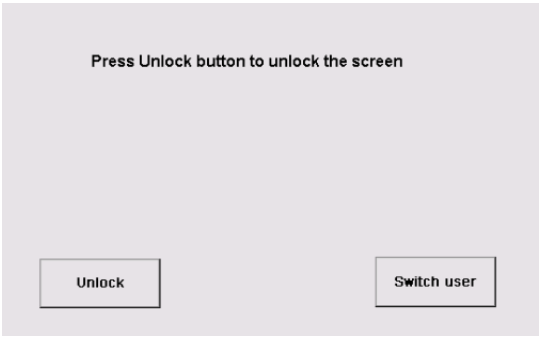


After you have logged in with user authentication, your name will automatically populate the **Operator ID** field on the ID screen when you begin a study, if that field is enabled.

The cardiograph will remain logged in until you lock the screen, or until the cardiograph enters standby. You will be prompted to log in again when returning the cardiograph from standby.

To lock the cardiograph:

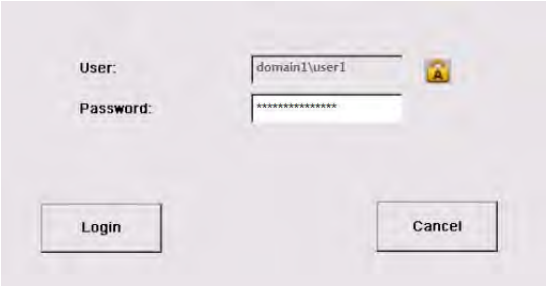
- Hold down **CTRL+ALT+L** on the keyboard. The Lock screen will appear. From this screen, you can unlock the cardiograph, or a different user can log on.



To unlock the cardiograph:

1. Touch **Unlock**.

2. Enter your password.



3. Touch **Login.**

To switch users:

1. Touch **Switch User**.
2. Enter your user name and password.



3. Touch **Login.**

Note:

Any work in progress will be lost if a different user logs in.

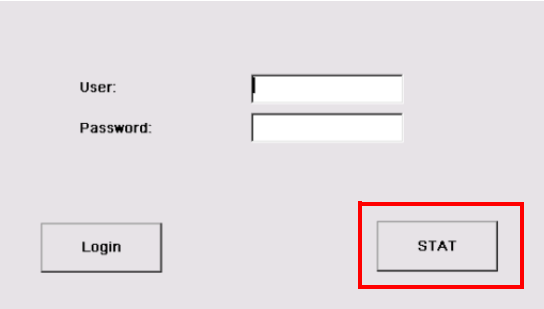
If you need to perform an urgent ECG, you can bypass the login screen and enter STAT mode.

To enter STAT mode:

1. Press and hold the On/Standby button for 3 seconds to shut down the cardiograph.

   Note: *If the cardiograph is not powered on, skip to step 2.*

2. Press the On/Standby button to return the cardiograph to active use. The cardiograph fully restarts and the Login screen appears.



3. Touch **STAT** to bypass the login process.

When in STAT mode, you can enter patient data and record an ECG; however, some functions are suspended. Functions that are not available in STAT mode include:

- Setup;
- Worklist;
- Archive;
- Find Patient;
- Last ECG.

For information on configuring user authentication, see “Configuring User Authentication” on page 2-11.

Entering Patient Information

Patient information is entered by:

- Keyboard
- Selecting a pending order
- Barcode reader (optional)

Required Patient Information

Required patient information is indicated in blue text on the ID screen. This information must be complete in order to transmit an ECG (as either an XML or PDF file) from the Archive to an IntelliSpace ECG Management System, or to a USB memory stick.

Caution

The *Gender*, *Age*, *Date of Birth* and *Prescriptions (Rx)* patient data fields affect the interpretive diagnostic statements generated by the TC cardiograph. If the data in any of these fields are incorrect, the cardiograph will generate incorrect interpretive diagnostic statements. If patient data is incorrect, edit the information and record a new ECG.

Navigating on the ID Screen

- To move to the next field on the screen, press the *Tab* key (on keyboard).
- To move to the previous field on the screen, press and hold the *Shift* key (on keyboard) and then press the *Tab* key.

One Scan

Note:

One Scan is available with HL7/XML brokers that support the Philips XML orders interface, including the Philips IntelliBridge Enterprise (IBE) broker.

For information on configuring a cardiograph to utilize One Scan, refer to the PageWriter TC Cardiograph Network Configuration Guide.

For instructions on programming the Jadak 2D barcode scanner, refer to the DECG Barcode Scanner Instructions for Use provided with your cardiograph, or available for download from the Philips InCenter website (https://incenter.medical.philips.com/).

The One Scan function, introduced with software version A.07, allows you to utilize the barcode reader to scan a patient search field (for example, Patient ID) from a patient's barcode, which then automatically retrieves patient and orders information, and populates the information into either the ID screen or the Worklist screen, depending on the information provided by the broker.

To use One Scan:

1. From the **Main** screen, scan the patient's barcode.

   The cardiograph will send a Find Patient request to the broker. Depending on the information provided, one of the following actions will occur:

   - If the patient exists in the orders broker, but no orders are found, patient information will be displayed in the **New Patient** screen. The fields that are populated will depend on the results returned.

   Note: *This will occur only with the IBE broker. This function is not supported by third-party brokers.*

   - If a single order is found by the broker, patient and orders information is displayed in the **New Patient** screen. The fields that are populated will depend on the information found in the order.
   - If two or more orders are found, patient and orders information is displayed in the **Worklist** screen. If the **Worklist** screen is displayed, select the desired order and touch **Select** to continue.

2. On the **New Patient** screen, you can manually enter any other data in unpopulated fields, if required or desired.

   Note: *A message will appear if you attempt to exit the ID screen before completing required fields.*

   Touch **OK** when done.

Fields that will populate using One Scan include any field retrievable by typing in a search field into **Find Patient** and manually sending a request to the broker. For information on configuring the fields that appear on the **New Patient** and **Edit Patient ID** screens, see "Configuring Patient Information Fields" on page 2-16.

Note:

Required patient information fields should be designated by your system administrator.

Entering Patient Information with the Keyboard

To enter patient information with the keyboard:

1. Touch the **ID** button on the Toolbar. The ID screen appears. The **New Patient** tab (top of screen) is selected. Patient information is entered under this tab. Fields in blue are required (if configured) and must be completed
2. Enter the information. Press the *Tab* key (on keyboard) to scroll between the different fields.

   Note: *Do not add any spaces to the* **ID** *number field if transferring ECGs to an IntelliSpace ECG Management System.*
3. Touch **OK** when done.

   Note: *A message will appear if you attempt to exit the ID screen before completing required fields.*

Entering Patient information with a Barcode Reader

If you don't have One Scan configured, you can still enter patient information using the barcode reader. The fields that are populated depend on the information contained in the barcode.

To enter patient information using a barcode reader:

1. Touch the **ID** button on the Toolbar. The ID screen appears. The **New Patient** tab (top of screen) is selected. Patient information is entered under this tab. Fields in blue are required (if configured) and must be completed

   Note: *Do not add any spaces to the* ***ID*** *number field if transferring ECGs to an IntelliSpace ECG Management System.*
2. Scan the patient's barcode.

   Patient data encoded in the barcode will appear in the corresponding fields of the **New Patient** screen.

   Note: *Some fields may not be populated if the information is not included in the barcode.*
3. Manually enter any other patient information in unpopulated fields, if required or desired. You can also manually modify any scanned data.

   Touch **OK** when done.

   Note: *A message will appear if you attempt to exit the ID screen before completing required fields.*

Patient information fields that will populate when using the barcode reader include any fields that can be manually completed. For information on configuring the fields that appear on the **New Patient** and **Edit Patient ID** screens, see “Configuring Patient Information Fields” on page 2-16.

Note:

Required patient information fields should be designated by your system administrator.

You can also populate these fields on the **Find Patient** screen in order to search for an existing patient’s record.

To locate a patient order using a barcode reader:

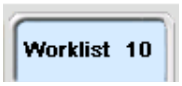
1. Touch the **ID** button on the Toolbar. The ID screen appears.
2. Select the **Find Patient** tab. The cursor will automatically be placed in the **Patient ID** field.
3. Scan the patient’s barcode. Available data will populate the appropriate fields.
4. Touch **Find**.
5. Select the desired patient in the search results and touch **Select**.

Selecting a Record from the Worklist

Any record contained in the Worklist may be selected for a patient session. Records are downloaded to the cardiograph from a specified remote site through an inbox configured for use on the cardiograph.

To select a pending order or ADT update for a patient session:

1. Touch the **ID** button The ID screen appears.
2. Touch the **Worklist** tab (top of screen). The selected tab is highlighted in blue. The Worklist screen appears.

   Note: *The number that displays on the Worklist tab (***10***) indicates how many pending records are available in the Worklist.*
3. The records available in the worklist appear on the screen. Touch a record to highlight it. The selected record is highlighted in blue.

4. Touch the **Select** button (lower right corner of screen) to open the highlighted record for the current patient session. The Main screen appears with the patient information for the selected record appearing on the Status Bar (top of screen).

Searching for Orders or ADT Updates

You can search for records in any inbox that is available on the cardiograph, or you can search for a record during an active patient session by using data scanned from a barcode reader or magnetic card reader.

The cardiograph must be connected to the network in order to use the search feature.

To search for records:

1. Touch the **ID** button The ID screen appears.
2. Touch the **Find Patient** tab (top of screen). The selected tab is highlighted in blue.

3. The **Location** dropdown list (top left of screen) contains all of the available search locations for the cardiograph. Touch the dropdown arrow button to open the list. Touch a location to select it. The selected location appears highlighted in blue and the list closes.

   Note: Worklist *is the internal cardiograph pending order and/or patient record list.*

4. Enter search data into the available fields including **Patient ID**, **Last Name**, **First Name**, **Date of Birth**, and **Room** (number).

   The entered information will be used to search for records. To search using data entered from an external device (barcode reader, magnetic card reader), place the cursor in the field in which the data is to be scanned. Scan the data. The data appears in the field.

   Note: *Enter the wildcard character (**) into any field to broaden the search information. For example, to search for orders for all patients with the last name of Doe, enter* **Doe** *into the* **Last Name** *field, and enter* ***** *into the* **First Name** *field.*

5. The selectable optional search field is located at the upper right of the screen.

   This available optional search field includes the following options: **Order Number**, **Account Number**, **Gender**, **Unit Number** or **Priority** (STAT).

   ADT patient information includes **Account Number**, **Gender**, **Unit Number**, **Encounter ID**, and **Bed Number**.



6. Touch the dropdown arrow to open the list of optional search fields. Touch an optional search field to select it. Then, enter search data into the field.
7. When all patient information to be used in the search is entered, touch the **Find** button (bottom of screen). The Message Bar (bottom of screen) displays the search status.
8. Touch a record to select it. The selected record appears highlighted in blue. To select the highlighted record for the current patient session, touch the **Select** button (bottom of screen).

   Note: *Touch the* **Cancel** *button to exit the screen without saving the record.*

Editing Patient Information

Patient information may be edited at any time during a patient session, or may be edited for a single ECG on the Archive screen. A message appears if changes made to patient information could affect ECG interpretation.

Changes to patient information are applied to all ECGs taken during an active patient session, or to a single ECG stored in the Archive.

To edit patient information:

1. From the Archive only, touch the saved ECG that you wish to edit. The selected item is highlighted in blue.
2. From the Main screen, or from the Archive, touch the **ID** button. The ID screen appears.

3. From the Archive, the **Edit Patient ID** tab is automatically selected, or touch this tab to select it. The selected tab is highlighted in blue.



4. Edit the ID information displayed on the screen. Press the *Tab* key (on keyboard) to scroll between the different fields.
5. Touch **OK** to save the edits.

   Note: *Touch the* **Cancel** *button to exit the screen without saving the record.*

Checking Signal Quality

The signal quality of each lead is indicated by the color of the lead as displayed on the screen (see “Color-Coded Waveforms” on page 3-25). In addition to the color-coded signal quality indicators, there are additional signal quality features available on the cardiograph. If the signal quality of all leads is good, and all required patient information has been entered, the **ECG** button (front panel of cardiograph, or on the PIM) illuminates, indicating that the ECG is ready to be taken. Also, the **Map** button can be used to check for any loose or disconnected leads or electrodes. When the **Map** button is touched, a lead diagram appears and any loose or disconnected leads are indicated with a red *x* mark ( ).

Finally, when using the Philips DXL ECG Algorithm, the cardiograph also detects the one of 20 lead reversals. After you press the ECG button, if detected, an alert message appears on the screen indicating one of the following conditions:

V1-V2 swapped	V1-V3 swapped	V1-V4 swapped
V1-V5 swapped	V1-V6 swapped	V2-V3 swapped
V2-V4 swapped	V2-V5 swapped	V2-V6 swapped
V3-V4 swapped	V3 V5 swapped	V3-V6 swapped
V4-V5 swapped	V4 V6 swapped	V5-V6 swapped
LA-LL swapped	LA-RA swapped	RA-LL swapped
LA-LL-RA swapped (counter-clockwise rotation)		LA-RA-LL swapped (clockwise rotation)

For information on troubleshooting signal quality issues, see “Troubleshooting Signal Quality” on page 3-26. To determine which version of the DXL algorithm is being used, see “Algorithm Version Number” on page 4-20.

Color-Coded Waveforms

When the patient cable is attached to the patient (with the cardiograph turned on), waveforms appear on the Main ECG screen. The color of the waveform indicates the signal quality of the individual lead.

Table 3-3 Waveform Quality Indicators

Waveform Color	Indicates...	Possible Causes
Green waveform	Good connection	--
Yellow waveform	• Moderate noise level, artifact, electrical interference, or a poor electrode connection • ECG quality will be affected	• Inadequate patient preparation • Electrical interference from another device • Moderate patient movement, tense patient • Improperly gelled electrode (dried gel)
Orange waveform	• Severe artifact, electrical interference, or a poor electrode connection • One or more limb leads are disconnected (chest leads display in orange)	• Electrical interference from another device • Patient tremors, shivering patient, inadequate preparation • Very poor electrode contact, dry electrodes
Red dotted line	• Loose electrode connection • ECG waveform data that cannot be analyzed	• Inoperative electrode, electrode that has fallen off the patient • Defibrillation has been performed too recently to take ECG measurements • Other cause that renders waveform data useless

Leads Map

The Leads Map is a graphical representation of a patient that shows the location of loose or inoperative electrode(s). The Leads Map is available on the Main screen only.

To open the Leads Map:

1. Touch the **Map** button on the tool bar. 

2. The location of a loose or inoperative electrode is indicated with a red *x* mark ( ).

Troubleshooting Signal Quality

Always follow good skin and patient preparation techniques prior to taking an ECG. Proper skin preparation helps to ensure a good quality ECG. Skin is a poor conductor of electricity and frequently creates artifact that distorts the ECG signal. For more information, see “Patient Preparation” on page 3-4.

Use the following table to identify and correct the connection:

Table 3-4 Signal Acquisition Issues

Symptom	Possible Cause & Investigation Step	Solution
All leads show leads off (red dashed line) *continuously*	PIM communications have been lost due to USB patient data cable connection failure, or defective leads are connected to the PIM	**1** Check to see if the RL/N lead and electrode are firmly attached. **2** Check to see whether the PIM disconnected icon () appears at the top right of the screen. If this icon appears, check that the patient data cable is firmly connected to the PIM, and to the PIM connector port on the rear of the cardiograph. For more information, see “Attaching the Patient Data Cable to the PIM and Cardiograph” on page 1-15. **3** If the PIM is firmly attached, perform the PIM test as described in “Patient Interface Module (PIM) Test” on page 5-15. If the PIM Test fails, replace the patient data cable. If the PIM Test continues to fail with a new patient data cable attached, replace the PIM. **4** If the PIM test passes, ensure that all lead wires are fully seated in the PIM lead connectors. **5** Ensure that all lead wires are intact and that there are no cracks visible in any of the lead wires. **6** Run the lead wire open and short tests, as described in “Lead Wire Performance Test” on page 5-17 **7** If the lead wire open and short tests fail, contact Philips Customer Service or your certified dealer.

Table 3-4 Signal Acquisition Issues *(continued)*

Symptom	Possible Cause & Investigation Step	Solution
One or more leads show leads off (red dashed line) *periodically*	Improper or incomplete patient and skin preparation techniques	Ensure that good patient preparation and skin preparation techniques have been followed as described in “Patient Preparation” on page 3-4.
	Improperly attached electrodes or lead wires; expired disposable gel electrodes	**1** Ensure that the lead adapters are clean and have a tight fit. **2** Ensure that the electrodes are within their shelf life and are firmly attached to the patient.
	Defib or high noise event	Observe frequency and recovery behavior. The PIM performs an automatic ranging action when input signals vary significantly. If this behavior persists in the absence of electrode movement or defib events, the cardiograph should be serviced to inspect and possibly replace the PIM or lead cables. Contact Philips Customer Service. See “Contacting Philips Customer Care” on page E-8.
	PIM reset (up to ten second duration)	It is normal for the PIM to reset under the following conditions: • Power on/wake up • Screen changes • Insertion/removal of a USB device (USB memory stick) When the PIM resets, it is normal for all leads to display red dashed lines for up to ten seconds. The PIM disconnected icon () is displayed during the PIM reset.

Table 3-4 Signal Acquisition Issues *(continued)*

Symptom	Possible Cause & Investigation Step	Solution
One or more leads show leads off (red dashed line) *periodically*	PIM communications have been lost due to USB patient data cable connection failure, or defective leads are connected to the PIM	**1** Check to see if the RL/N lead and electrode are firmly attached. **2** Check to see whether the PIM disconnected icon () appears at the top right of the screen. If this icon appears, check that the patient data cable is firmly connected to the PIM, and to the PIM connector port on the rear of the cardiograph. For more information, see “Attaching the Patient Data Cable to the PIM and Cardiograph” on page 1-15. **3** If the PIM is firmly attached, perform the PIM test as described in “Patient Interface Module (PIM) Test” on page 5-15. If the PIM Test fails, replace the patient data cable. If the PIM Test continues to fail with a new patient data cable attached, replace the PIM. **4** If the PIM test passes, ensure that all lead wires are fully seated in the PIM lead connectors. **5** If the PIM test passes, ensure that all lead wires are fully seated in the PIM lead connectors. **6** Ensure that all lead wires are intact and that there are no visible cracks in the lead wires. **7** Run the lead wire open and short tests, as described in “Lead Wire Performance Test” on page 5-17. **8** If the lead wire open and short tests fail, contact Philips Customer Service or your certified dealer.

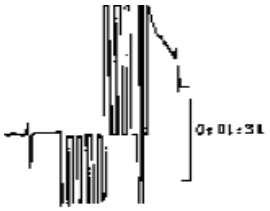
Identifying ECG Problems

The following table shows symptoms and solutions to problems that can occur when recording an ECG.

Table 3-5 ECG Problems and Solutions

Symptom	Cause	Possible Solutions
Power line AC Interference 	Poor electrode contact. Dry or dirty electrodes.	Abrade skin. Use new electrodes. Reapply electrodes. Check expiration date on disposable electrodes.
	Lead wires may be picking up interference from poorly grounded equipment near the patient.	Route lead wires along limbs and away from other electrical equipment. Fix or move poorly grounded equipment.
	Patient cable is too close to the cardiograph or other power cords.	Move cardiograph away from the patient. Unplug the cardiograph and operate on battery only. Move other electrical equipment away from patient. Unplug electric bed.
Wandering Baseline 	Patient movement.Electrode movement.	Reassure and relax the patient.
	Poor electrode contact and skin preparation.	Be sure that the lead wires are not pulling on the electrodes. Reapply electrodes. Enable the Wander filter (**Status Bar > Settings**).
	Respiratory interference.	Move lead wires away from areas with the greatest respiratory motion.
Tremor or Muscle Artifact 	Poor electrode placement. Poor electrode contact. Patient is cold.	Clean the electrode sites. Reapply electrodes. Be sure the limb electrodes are placed on flat, non-muscular areas. Warm the patient.
	Tense, uncomfortable patient.	Reassure and relax the patient. Enable the Artifact filter (**Status Bar > Settings**).
	Tremors.	Attach the limb electrodes near the trunk. Enable the Artifact filter.

Table 3-5 ECG Problems and Solutions *(continued)*

Symptom	Cause	Possible Solutions
Intermittent or Jittery Waveform 	Poor electrode contact. Dry electrodes. Faulty lead wires.	Clean the electrode site. Reapply electrodes. Check expiration date on disposable electrodes. Replace faulty patient cable.
Poor print quality (uneven contrast or blank streaks)	Dirty print head.	Clean the print head. Use recommended paper.

Urgent (STAT) ECGs

Patient information does not have to be entered in an emergency situation in order to take an ECG.

Complete all patient information after the urgent ECG is taken, but before the patient session ends. All required patient information fields must be completed in full in order to transfer an ECG to an IntelliSpace ECG Management System or to a USB memory stick (as either an XML or PDF file).

To take an emergency or STAT ECG:

1. From the Main screen, check that all leads have a good connection.

2. When all leads have a good connection, touch the green **ECG** button on the front of the cardiograph twice rapidly, or press the green **ECG** button on the PIM twice rapidly.
3. The ECG prints and appears on the Preview screen.

Note:

If no patient information is entered a statement is included on the ECG that interpretation used a default age (50 years) and gender (male). The default age and gender that appear on the ECG report is specified by your supervisor.

Main ECG Screen

The Main ECG screen displays live patient ECG data in a variety of formats. The Main ECG screen is the default screen that appears when the cardiograph is restarted.

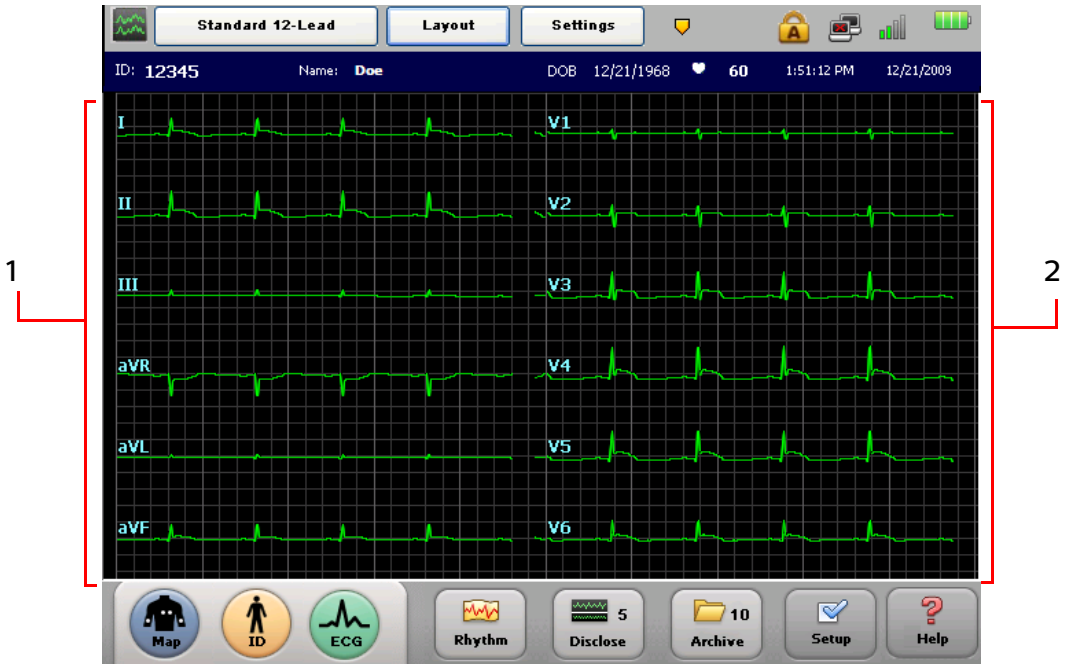
Changing the Lead Format on the Main ECG Screen

The format of the waveforms that display on the Main screen can be changed at any time. The available lead formats are described in Table 3-6.

Table 3-6 Main Screen Lead Formats

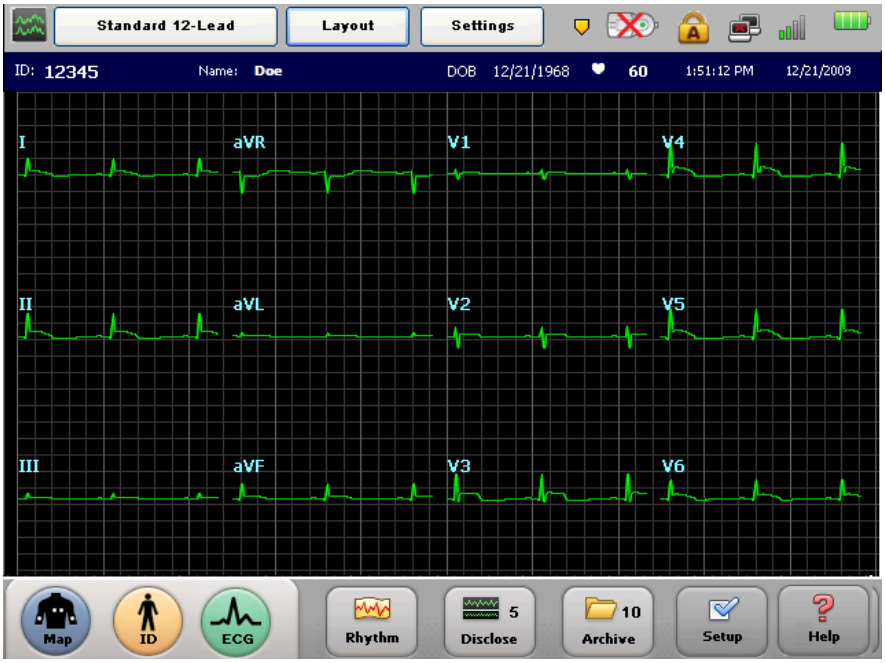
Lead Format	Description
6x2	• This is the default lead format on the cardiograph • This view provides five seconds of continuous ECG waveform data for each lead on a split screen • In the split screen display, the limb and augmented leads on the left, and the precordial leads are on the right • See Figure 3-5 on page 3-33
12x1	• This view provides ten seconds of continuous ECG waveform data for each lead. • For an example with Cabrera leads, see Figure 4-36 on page 4-29.
3x4	• This view provides 2.5 seconds of waveform data for each lead, with 3 total rows with 4 leads in each row • In this view, the limb and augmented leads are on the left, and the precordial leads are on the right • See Figure 3-6 on page 3-33

Figure 3-5 Default 6x2 Lead Format on Main Screen



1 Limb Leads 2 Precordial Leads

Figure 3-6 3x4 Lead Format on Main Screen



To change the lead display on the main screen:

1. Press the down arrow key (on keyboard) or the up arrow key to scroll through the available Main screen lead formats.
2. The lead format that displays on the Main screen when the cardiograph is shut down (by pressing and holding the On/Standby button will be retained once the cardiograph is returned to active use.

Taking an Auto ECG

Once all waveforms are of good quality, and all patient information is complete, the ECG button illuminates (on the cardiograph or the PIM). When the ECG button illuminates, it means that the ECG is ready to be taken.

To take an Auto ECG:

- When the **ECG** button is lit, press it to take an Auto ECG.



Using the Preview Screen

The Preview screen displays the ECG exactly as it looks when printed. The **ECG** button can be touched at any time from the Main screen to display a full-screen preview of an ECG. The ECG captures the most recent 10-seconds of waveform data.

Depending on how the Preview screen is configured to operate, once the ECG appears on the Preview screen it may automatically print, be saved to the Archive, and it may be automatically transferred to IntelliSpace ECG or other third party ECG management system. Also, the cardiograph can be configured to automatically retrieve the most recent ECG from the same patient from a specified IntelliSpace ECG server for direct comparison purposes at the cardiograph.

To preview an ECG from the Main ECG screen:

- On the Main ECG screen, or on the Patient Interface Module (PIM), touch the **ECG** button to see a previewed ECG of the most recent 10-seconds of waveform data. If no patient information has been entered, touch the **ECG** button twice rapidly.



Note:

As shown in Figure 3-7, "The Preview Screen," on page 3-35, the **Print**, **Save**, **Transfer**, *or* **Last ECG** *buttons may not appear on your individual cardiograph, or may appear grayed out (cannot be selected), depending on how your cardiograph is configured. If the buttons are grayed out, your cardiograph is configured to automatically perform these functions. If the buttons do not appear, your cardiograph is not configured to support these functions.*

Figure 3-7 The Preview Screen

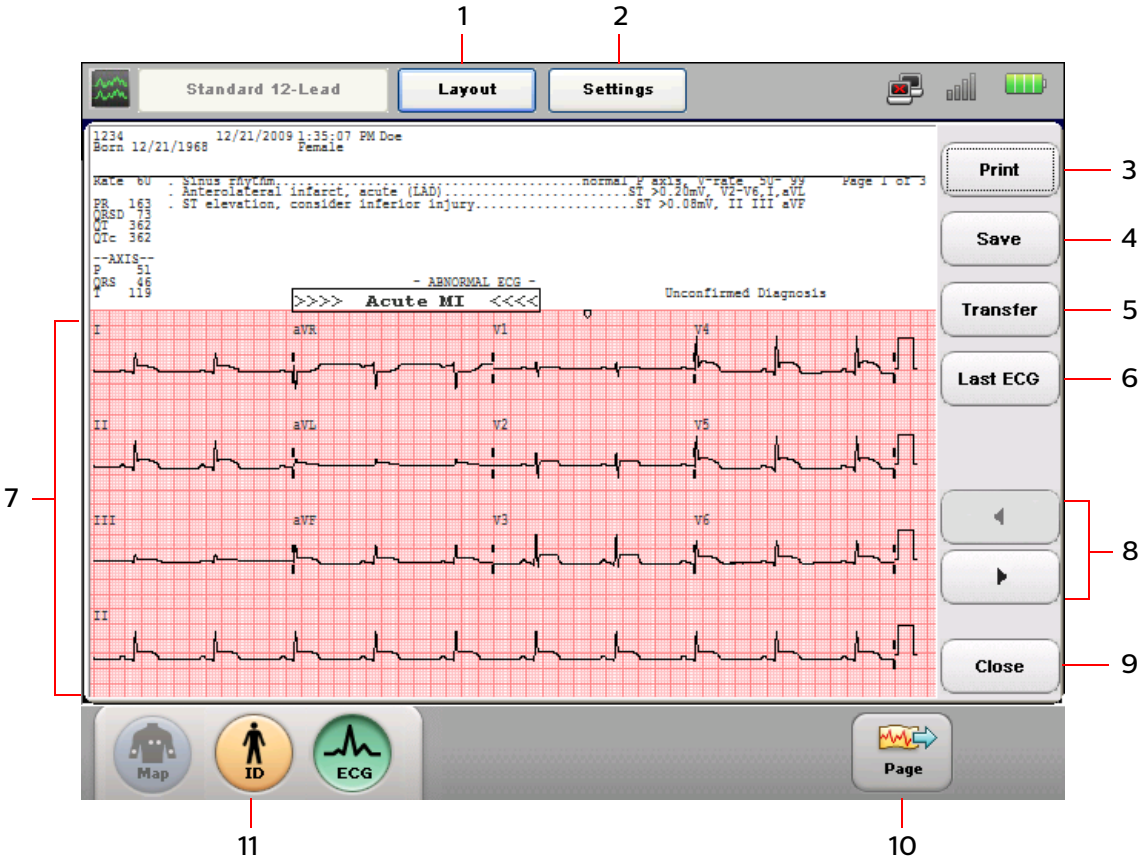


Table 3-7 Preview Screen Description

Preview Screen Item	Feature Name	Description
1	Layout Button	Touch to: • Change the layout/format of the ECG report displayed on the screen and change whether the waveforms are displayed simultaneously or time sequentially • Change the rhythm lead • Change the amount of interpretation that appears on the ECG report The new settings are immediately applied.
2	Settings Button	Touch to: • Change the optional filter settings (Artifact, Baseline Wander). • Change pacing detection setting. • Change waveform speed and scale settings. • Change the High and Low Pass filter settings. The new settings are immediately applied.
3	Print Button	Touch to print the displayed ECG.
4	Save Button	Touch to save the displayed ECG.
5	Transfer Button	Touch to send the displayed ECG to IntelliSpace ECG or to a third party ECG management system. **Note:** *Only ECGs with complete required patient information can be transferred. Touch the* ID *button to complete any missing required patient information.*

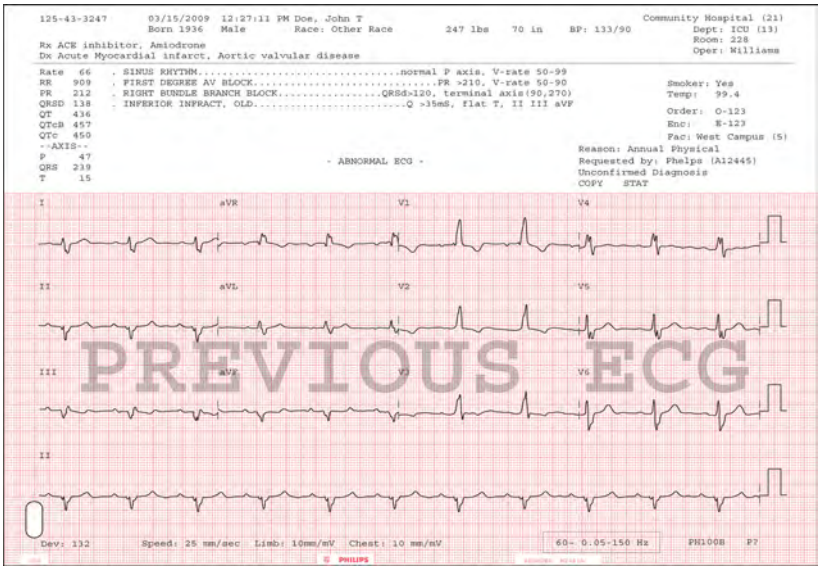
Table 3-7 Preview Screen Description *(continued)*

Preview Screen Item	Feature Name	Description
6	Last ECG	Touch to: • Review on the Preview screen and print from the cardiograph the most recent previous ECG from the same patient • Use of this feature requires an active network connection to the specified IntelliSpace server **Note:** *The* **Last ECG** *feature is only available with the IntelliSpace ECG Management System.*
7	ECG Report	• The displayed ECG report. • Press the down arrow key (↓) or the up arrow key (↑) to change the displayed report format. Touch the **Print** button to print out the ECG report with the new format applied. • Press and hold the *Shift* key (on keyboard) and then press the down arrow key (↓) or the up arrow key (↑) to change the level of interpretation displayed on the ECG preview. Touch the **Print** button to print out the ECG report with the new interpretation applied.
8	Page forward and page back button	Touch to view additional pages of the displayed ECG report. For example, touch Page Forward (▶) to view the Vector ECG report.
9	Close Button	Touch to close the Preview screen and to return to the Main screen.
10	Page Advance Button	Touch to advance the printer paper to the beginning of the next page.
11	ID Button	Touch to enter missing patient information for the displayed ECG (not available with the Last ECG feature). **Note:** *This feature is not used to enter patient information for a new patient.*

Using the Last ECG Feature on the Preview Screen

When a previous patient ECG is printed at the cardiograph using the **Last ECG** feature (if enabled), a note appears on the ECG report specifying that this is a previously recorded ECG.

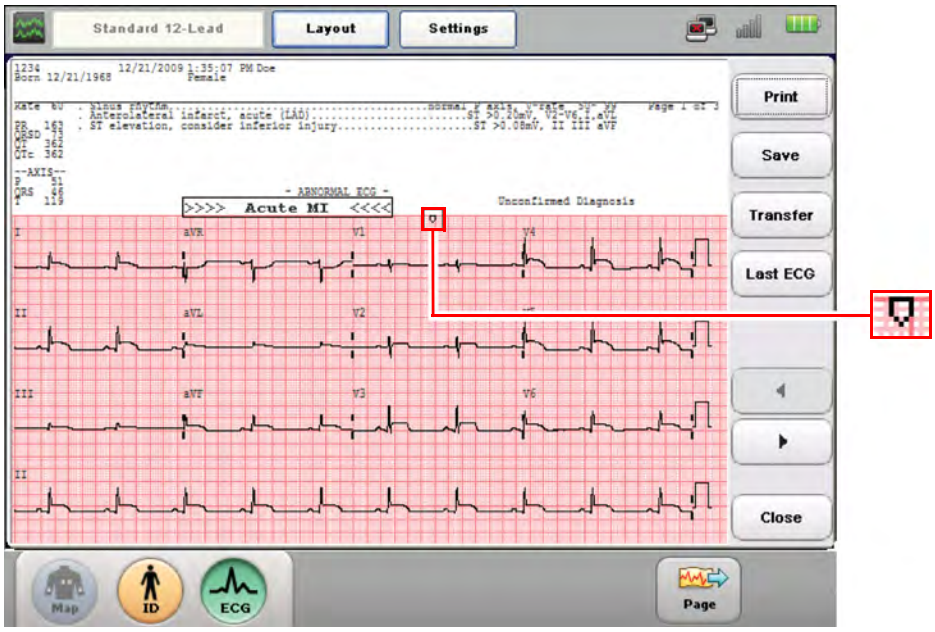
Figure 3-8 Previous ECG Watermark on ECG Report



Viewing Event Markers on the Preview Screen

If any Event Markers are captured within the 10-seconds of ECG data that appear on the Preview screen or the printed ECG report, an Event Marker symbol ( ) will appear directly above the waveform. For information on capturing Events on the Main or Rhythm screens, see “Capturing Events from the Main or Rhythm Screens” on page 3-44.

Figure 3-9 Event Marker Symbol on Preview Screen



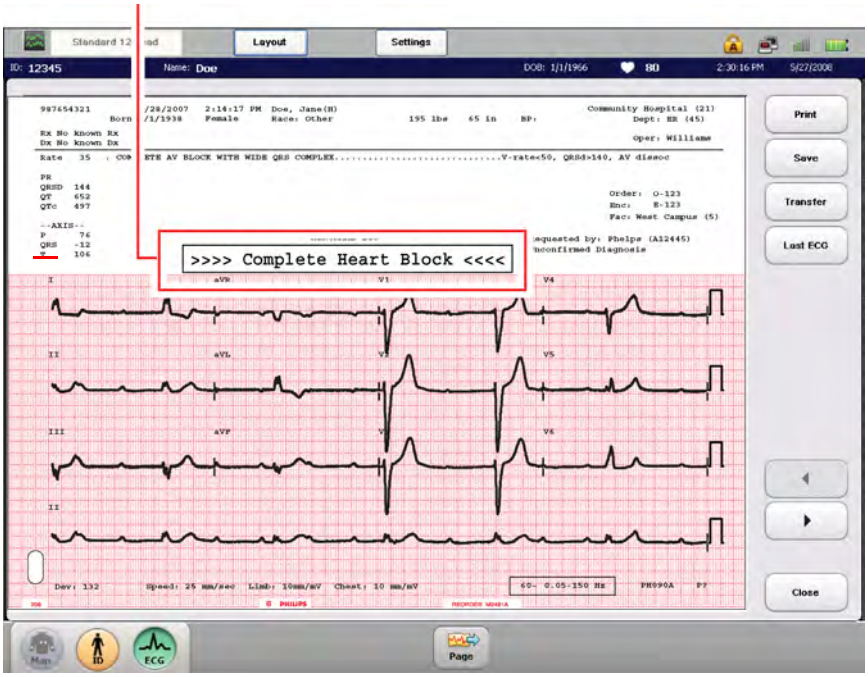
Critical Values on Preview Screen

The algorithm offers a feature called *Critical Values*, that when enabled will display an ECG message on the Preview screen and print the message on the ECG report in order to notify caregivers of an ongoing or imminent cardiac event, such as a silent MI, that requires immediate treatment. The notification statement displays prominently on the Preview screen. If any of these Critical Values appear on the Preview screen, obtain help immediately.

The messages are triggered by a defined set of interpretive statements that are listed in Appendix B, “Critical Value Statements.” These warning statements include **ACUTE MI**, **VERY HIGH HEART RATE**, **COMPLETE HEART BLOCK**, and **ACUTE ISCHEMIA**.

Figure 3-10 Critical Value Message on Preview Screen

Complete Heart Block critical value message on Preview screen



Very High Heart Rate Critical Value

The **VERY HIGH HEART RATE** statement is generated by the following formula: the measured heart rate in beats per minute, minus the patient age in years. For patients 80 years old and younger, if this value is 220 bpm or higher, the **VERY HIGH HEART RATE** statement will appear on the ECG. For patients who are older than 80 years, if this value is 140 bpm or higher, the **VERY HIGH HEART RATE** statement will appear on the ECG.

Rhythm ECG Acquisition

Rhythm ECG acquisition is used to print continuous rhythm strips of up to 12 selected leads until the **Stop** button is touched. The selected Rhythm leads, the size and scale of the waveforms on the printed report, pacing detection settings, and the optional Artifact filter settings may be changed at any time during the recording.

Note:

- *You do not have to stop printing the Rhythm report to change Rhythm leads.*
- *Rhythm reports are not analyzed.*

To record a rhythm ECG:

1. Touch the **Rhythm** button on the toolbar.

2. Touch the **Stop** button on the toolbar to stop printing.
3. Touch the **Page** button on the toolbar to advance the paper to the top of the next page.

To change the rhythm leads:

1. Touch the **Leads** button on the toolbar to select a predefined group of leads, or select the leads individually by touching the lead label.

2. Touch the **Select All** button to select all available rhythm leads.
3. Touch the **Apply** button to apply the new settings. Touch the **Close** button to exit the screen without changing leads.

   The new rhythm lead settings are immediately applied, and the report continues to print with the selected rhythm leads.

To change rhythm report settings:

1. Touch the **Settings** button on the Status Bar (top of screen). The Settings window appears.

2. Touch the **ON**/**OFF** button next to **Artifact** to enable or to disable the Artifact filter.
3. Touch settings for waveform speed and scale as desired.

   Note: *The* **Chest Leads** *setting scales the precordial leads to the same size as the limb leads (***Full***) or to half the size of the limb leads (***Half***).*

4. Touch a setting next to **Pacing** to change the pacing detection setting.

   Note: *The* **Unknown** *setting is recommended for most ECGs.*

5. Touch the **OK** button to close the window and to apply the settings. Touch the **Cancel** button to close the window and to discard the settings.

Special Note about Artifact Filter

The purpose of the Artifact filter is to remove skeletal muscle artifact from the ECG signal. Skeletal muscle artifact is the most difficult noise source to eliminate due to the fact that it contains the same frequencies as actual patient ECG signals. The Artifact filter will eliminate skeletal muscle artifact, but it will also reduce all high frequency components of the ECG signal. Due to this fact, use of the Artifact filter may make it impossible to detect pacemaker pulses, and may affect P waves, and the entire QRS-T complex. Only use the Artifact filter for ECGs that otherwise would be unreadable due to significant levels of muscle artifact. For more information on filters, see “Filter Settings” on page 4-21.

Figure 3-11 The Rhythm Screen with rhythm report printing

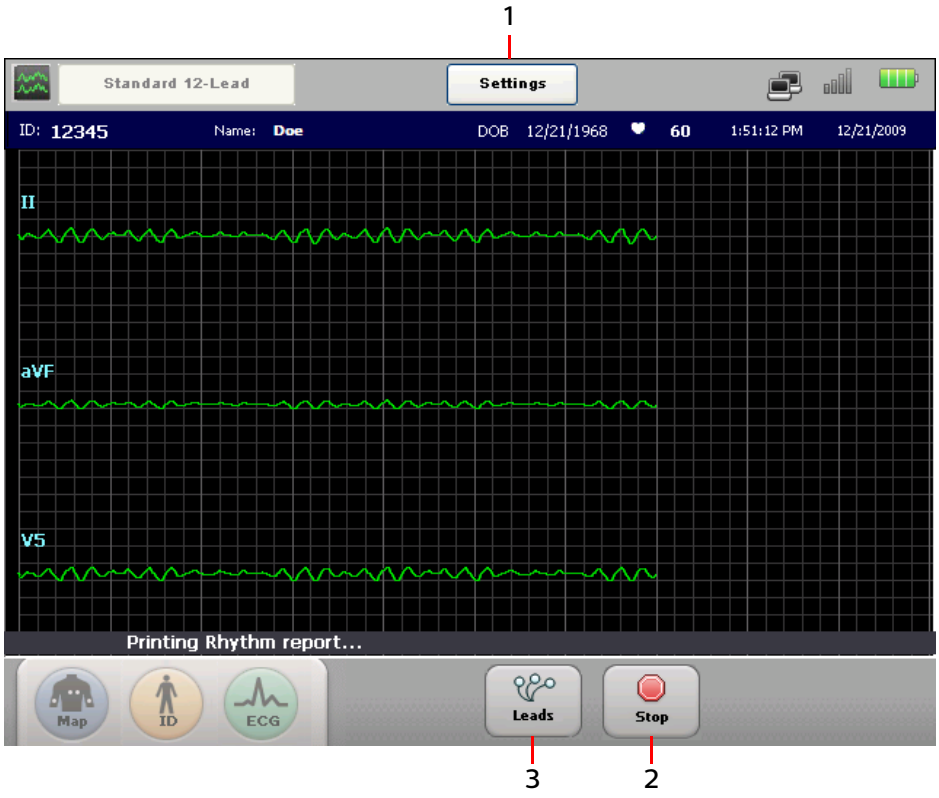


Figure 3-12 Rhythm Toolbar with no report actively printing

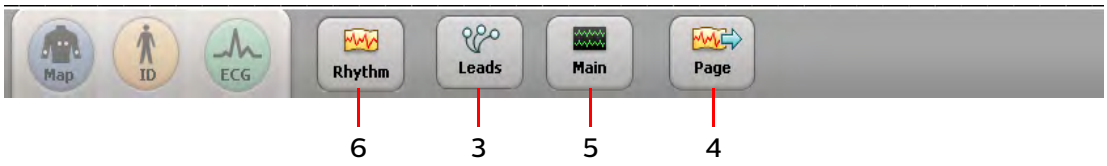


Table 3-8 Rhythm Screen

Rhythm Screen Item	Feature Name	Description
1	Settings Button	Touch to: • Change Artifact filter settings • Change pacing setting • Change waveform speed setting • Change waveform scale setting The new settings are immediately applied.
2	Stop Button	• Touch to stop printing the rhythm report. • When the rhythm report is stopped the toolbar shown in Figure 3-12 on page 3-43 appears.
3	Leads Button	• Touch to change the rhythm leads. • This button appears whether or not a rhythm report is printing.
4	Page Button	• Touch to advance the printer paper to the beginning of the next page. • This button only appears when no rhythm report is printing.
5	Main Screen Button	• Touch to exit the Rhythm screen and return to the Main screen. • This button only appears when no rhythm report is printing.
6	Rhythm Button	• Touch this button to resume printing a rhythm report. • This button only appears when no rhythm report is printing.

Disclose ECG Acquisition

Disclose ECG acquisition is used to review Events captured on the Main or Rhythm screens, or to review up to 5 minutes of continuous ECG waveform data for a selected lead, in either a static or in a live view. The waveform data may be reviewed on the screen, and any data viewed on the screen may be selected and printed as a standard 12-lead ECG report, or as a 1-minute Disclose report of a single lead. For an example of the 1-minute Disclose report format, see "1-Minute Disclose Report" on page 4-34.

Event Marker Warning

A flashing icon ( ) appears on the Status Bar (top of screen) if Event Markers captured during an individual patient session have not yet been reviewed on the Disclose screen and are about to be deleted. For more information, see "The Status Bar" on page 1-33.

Capturing Events from the Main or Rhythm Screens

If a clinically significant event is viewed on either the Main or Rhythm screens, this clinically significant data can be captured for future review and processing on the Disclose screen. This captured data is called an *Event* and is marked on the screen with a white arrow symbol ( ). This white arrow symbol is called an *Event Marker*, and appears directly above the waveform.

The number of Events captured for the current patient session appears as a number on the **Disclose** button located on the toolbar (see image below).

As the waveform data on the screen refreshes, additional Events can be captured as necessary. Even though an Event scrolls off of the screen, it is saved for review on the Disclose screen.

To capture an Event on the Main or Rhythm screens:

1. If a clinically significant event is viewed, touch and press down on the screen directly above the waveform for two seconds in order to capture the significant data for future review and processing.
2. Once the data is captured, a white Event Marker appears above the waveform. A maximum of 6 Events can be captured for an individual patient session. After the Event is captured, the number that appears on the **Disclose** button increases by 1.

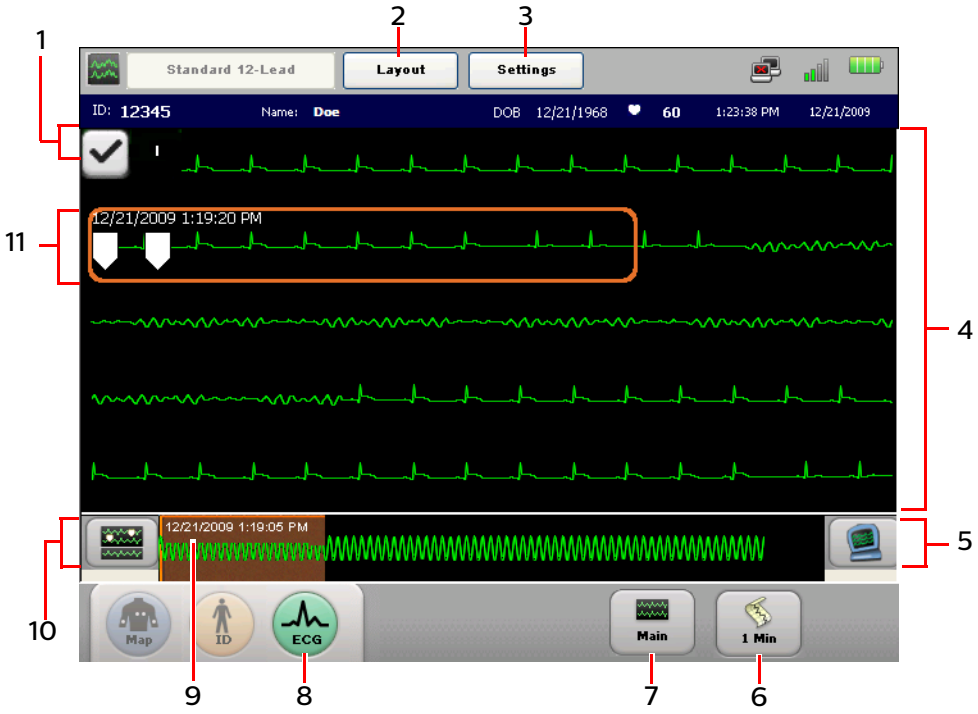


Continue to capture Events as necessary, or proceed to review Events on the Disclose screen. Even though an Event scrolls off of the screen, it is saved for future review and processing. Wait 15 seconds after capturing an Event, and then touch the **Disclose** button to view Events.

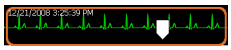
Reviewing Events on the Disclose Screen

Captured Events can be reviewed on the Disclose screen. When the **Disclose** button is touched, the Disclose screen appears in a static view.

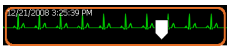
Figure 3-13 Disclose Screen, Static View with Captured Events



Disclose Screen Item	Feature Name	Description
1	Selected Disclose Lead	• Touch to change the displayed Disclose lead. • Only one lead may be selected as the Disclose lead.

Disclose Screen Item	Feature Name	Description
2	Layout Button	• Touch to change ECG report settings, including report layout, time sequential settings, and any rhythm leads that appear on the 12-lead ECG report • Touch the change the amount of interpretive information generated by the algorithm that appears on the ECG report • The 12-lead ECG report is derived from the 10-seconds of data that is captured inside the orange Focus box  • The new settings are immediately applied.
3	Settings Button	Touch to: • Change Artifact filter settings • Change pacing setting • Change waveform speed setting • Change waveform scale setting The new settings are immediately applied
4	Waveform Display Area	• The area where Disclose lead waveforms appear. • Touch any area on the screen to move the orange Focus box 
5	Live View Button	• Touch to enter Live View that displays live waveforms. • In this view, live waveforms scroll across the screen; the most recent data is seen at the top of the screen, and the oldest data is seen at the bottom of the screen.
6	1-Minute Disclose Report Button	Touch this button to print continuous 1-minute report of the selected Disclose screen. **Note:** *The 1-minute Disclose report is not analyzed.*
7	Main Screen Button	Touch to exit the Disclose screen and return to the Main screen.

Disclose Screen Item	Feature Name	Description
8	ECG Button	• Touch to print a 12-lead ECG report of the data captured inside the orange Focus Box  • Touch the ECG button on the front panel of the cardiograph or on the PIM twice rapidly to take a STAT ECG. • The ECG report appears on the Preview screen.
9	Disclose Timeline	• This is a data timeline that displays up to 5 minutes of waveform data. • The orange shaded area in the timeline indicates the data that is displayed above in the waveform area. • Tap anywhere on the timeline to move the orange shaded area and to display different ECG waveform data on the screen. • White upright lines in the timeline are saved Events.
10	Previous Events Button	• Touch this button to view Events captured more than 5 minutes in the past. • Events are saved in 15-second segments that can be reviewed and printed as 12-lead or 16-lead ECGs. • Touch any spot on the saved 15-second segment to move the Focus box  • The Focus Box contains 10-seconds of ECG data that can be printed as a 12-lead or 16-lead ECG report.

Disclose Screen Item	Feature Name	Description
11	Focus Box	• The Focus Box captures 10-seconds of ECG data that can be printed as a 12-lead ECG report. • Tap anywhere on the waveform display area to move the Focus Box  • The date and time at the upper left corner of the Focus Box is the date and the beginning time of the waveform data captured inside the Focus Box.

Using Timed ECG

The Timed ECG feature is used to take ECGs at pre-defined intervals, most commonly as part of a stress test protocol. The number of total ECGs recorded, and the interval between ECGs can be defined as a Timed ECG Exam in Setup. For more information on configuring Exams settings, see “Configuring 12-Lead Exam Settings” on page 2-9.

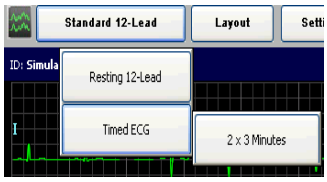
To take ECGs using the Timed ECG feature:

1. When all patient information has been entered, and all leads are of good quality, touch the Exams button on the Status Bar (upper left corner of screen). By default, the Exams button will display **Standard 12-Lead**.

2. On the Exams dropdown, touch **Timed ECG**. The available Timed ECG protocols then appear as side buttons. Touch a Timed ECG profile to select it for the current patient session. **2x3 Minutes** is the factory default Timed ECG profile.

   The dropdown list closes with the selected Timed ECG profile appearing on the Exams button.

3. Touch the **ECG** button. The Timed ECG protocol begins.



4. A progress bar on the bottom of the screen provides a status update on the number of ECGs remaining, and the number of seconds remaining until the next ECG is taken. Touch the **Stop** button (bottom of screen) at any time to stop the Timed ECG protocol.



Transferring ECGs from the Archive

ECG reports may be transferred during a patient session from the Preview screen (if the cardiograph is configured to support this feature). Or, saved ECGs may be transferred from the Archive after the patient session ends as a:

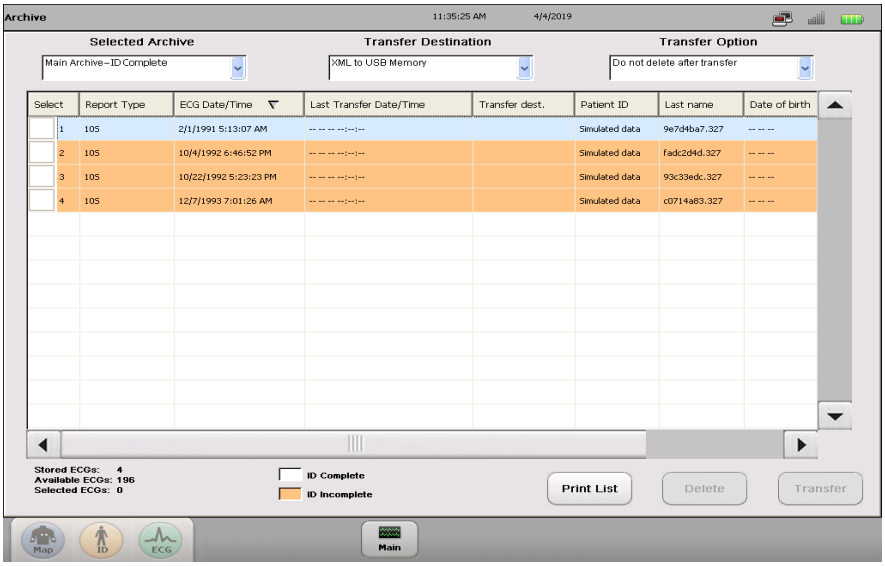
- PDF file to a USB memory stick;
- XML file to a USB memory stick;
- XML file to configured IntelliSpace ECG or other third party ECG management system using a network connection.

To transfer ECGs from the Archive:

1. Touch the **Archive** button on the main toolbar. The number on the button (**10**) indicates how many ECGs are currently saved to the **Main Archive** (internal cardiograph storage).



2. Ensure that **Main Archive - ID Complete** is selected (top left of screen). This directory contains all ECGs that may be transferred from the cardiograph.



Note:

- *Only ECGs that contain all required patient information may be transferred from the cardiograph. Required patient information fields are specified by your individual facility. For information on editing or completing patient information from the Archive screen, see "Editing Patient Information" on page 3-23*
- *To review ECGs that are saved as XML files to a USB memory stick (inserted into the USB connector on the cardiograph) select* **USB memory stick** *from the dropdown list.*
- *Report Type indicates the length (in seconds) of the report (10S).*

3. Touch an ECG displayed in the directory to select it for transfer. A selected ECG is highlighted in blue. To select or to deselect all ECGs in the directory, touch the **Select** column header (top of screen).

4. To print a list of ECGs to be transferred, touch **Print List**.

5. When all ECGs have been selected, touch the **Transfer Destination** dropdown (top center of screen). Select an option from the dropdown list.

   Note: *ECGs saved as XML files are saved to the default XML schema version specified in* **Setup, Configure ECG Network Settings, ECG Management System**. *The XML schema version is dependent upon the selected ECG Mgmt version or third party ECG management system that is selected on this screen. For more information, see the PageWriter TC Cardiograph Network Configuration Guide, which is available for download from the Philips InCenter site. For information on using the Philips InCenter site, see "Using the Philips InCenter Site" on page ii.*

6. Touch the **Transfer** button (lower right corner of screen) to transfer the selected ECGs to the specified destination.
7. Touch the **Delete** button to delete the selected (highlighted) ECGs on the screen. A message then appears confirming that you wish to delete the selected ECGs from the Archive.

Automatic Retransfer of ECGs

If the transfer of ECG reports has failed for any reason (e.g., network connection failure), when you access the Archive screen again, you will be prompted to attempt retransfer of these reports.

Select **Yes** to attempt retransfer, or **No** to postpone transfer to a later time.

Downloading ECGs from IntelliSpace ECG

Downloading ECGs from the IntelliSpace ECG Management System requires an active network connection, and at least one configured IntelliSpace remote site.

To download ECGs from IntelliSpace ECG to the cardiograph:

1. Select **Remote Sites** from the Selected Archive dropdown (top left of screen).
2. The available remote sites configured for use on the cardiograph appear under the **Query From** dropdown (top center of screen). Select an IntelliSpace remote site.
3. Touch the **Get ECGs** button (top right of screen).
4. The Remote Site search screen appears. Enter information into the available search fields to use to search for ECGs on the specified remote site. To scan barcode data into a search field, place the cursor in the field. Scan the barcode data. Enter a percent sign (**%**) into any field to search using a wildcard for that field. If a field is left blank it will not be used in the search.
5. When all search information has been entered, touch the **Search** button. A message appears (bottom of screen) with the search status. Touch the **Stop** button to cancel the search once it is in process.
6. When the search is complete, any ECGs that match the entered search criteria appear on the screen. Touch an ECG to select it for download. A selected ECG appears highlighted in blue.

7. Touch the **Download** button (bottom of screen) to download the selected ECGs from the Remote Site for viewing on the cardiograph.

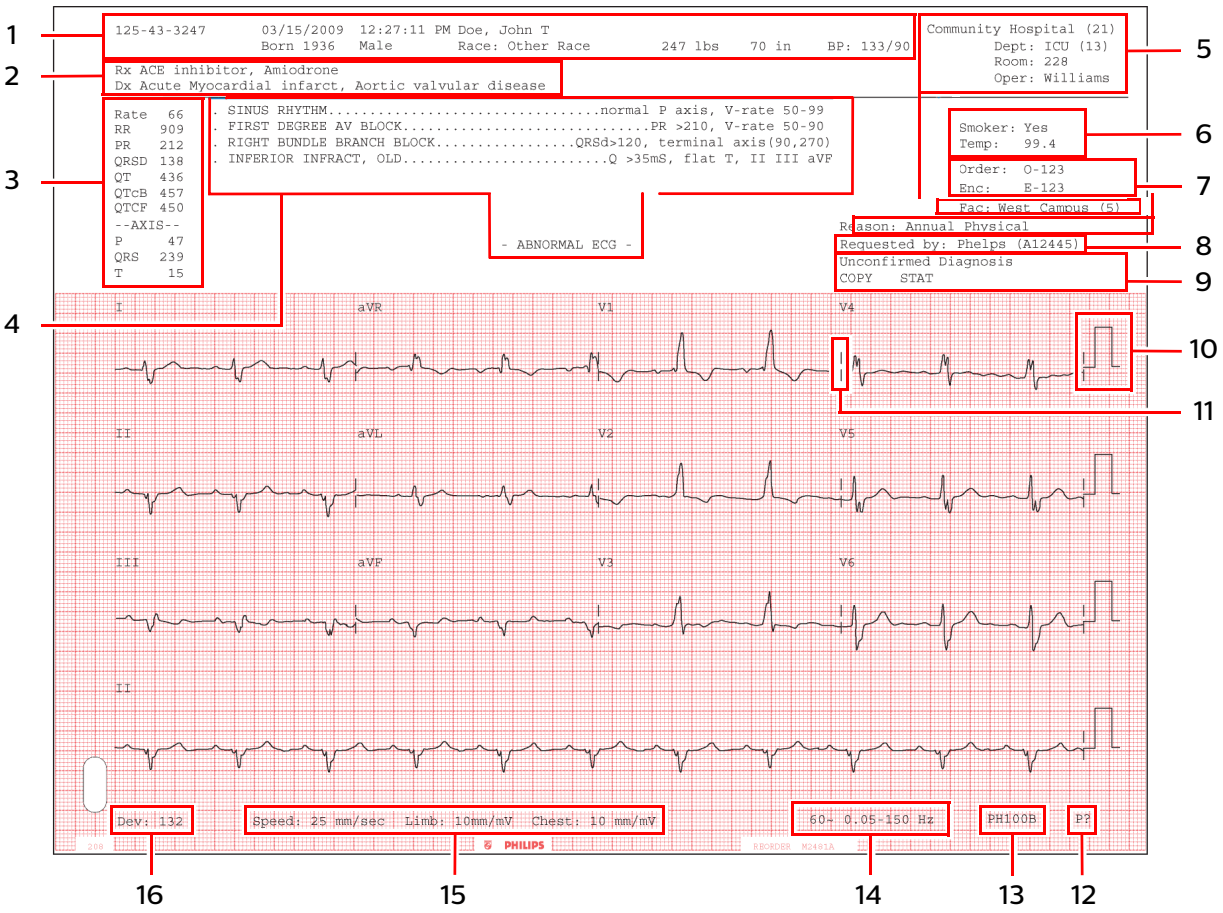
4

Reading the Printed ECG Report

Report Elements

The ECG report formats described in this chapter are available on the TC cardiograph with installed software version A.04.00 and higher.

Figure 4-1 12-Lead 3x4, 1R Report (page one)

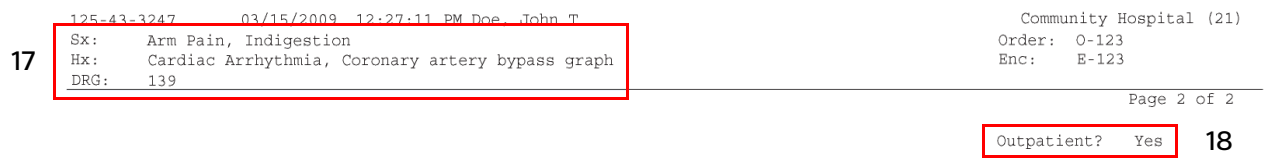


1 Patient ID Information (see page 4-10)
2 Basic Measurements (see page 4-7)
3 Basic Measurements (see page 4-7)
4 Interpretive, Reason, and Severity Statements (see page 4-4)
5 Institution Information (see page 4-11)
6 Configurable Clinical Information (see page 4-12)
7 ECG Order Information (see page 4-13)
8 Physician Information (see page 4-14)
9 Report Information (see page 4-14)
10 Calibration Information (see page 4-15)
11 Time Separator (see page 4-17)
12 Pacing Detection Setting (see page 4-18)
13 Algorithm Version (see page 4-20)
14 Filter Settings (see page 4-21)
15 Speed and Sensitivity Settings (see page 4-24)
16 Device Identification Number (page 4-25)

Additional patient information fields may appear on the top of a second page of the ECG report if more than two clinical fields (Rx, Dx, Sx, Hx) are entered with the Patient ID information.

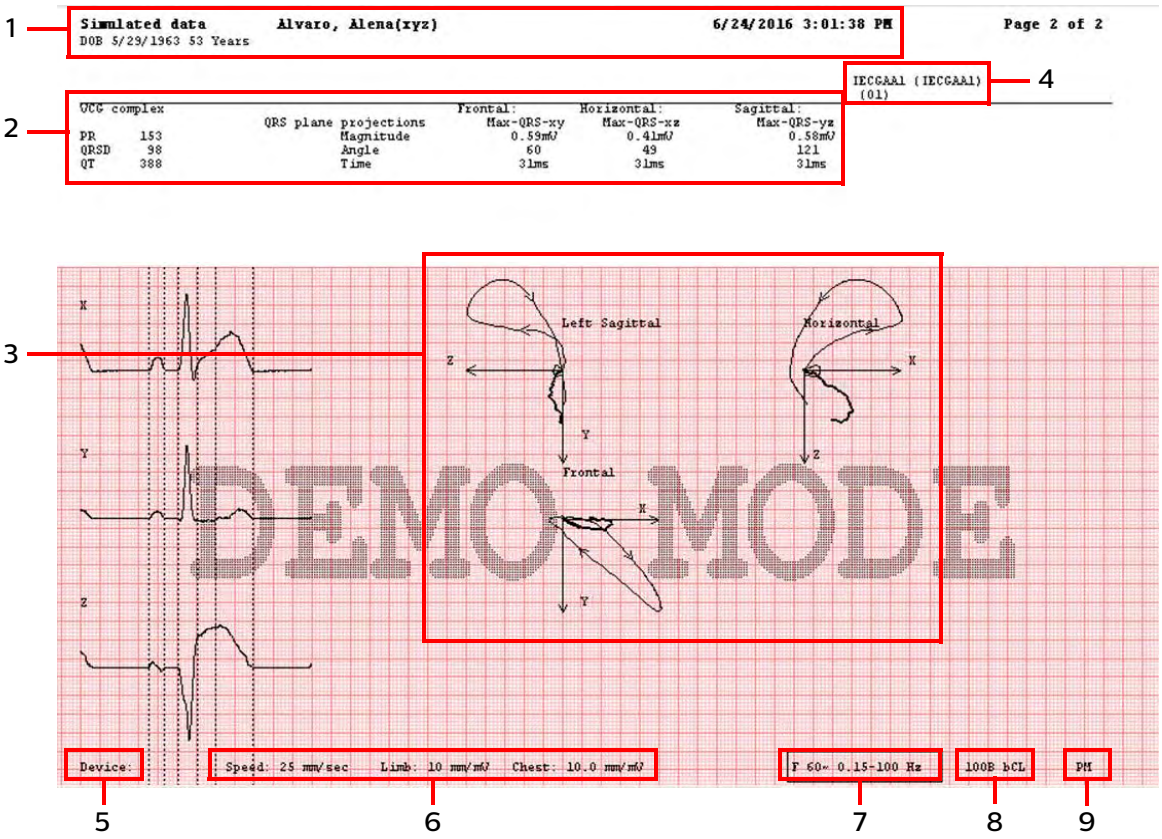
Additional configurable clinical information fields may also appear on the top of a second page of the ECG report if more than four fields are configured.

Figure 4-2 A 12-Lead 3x4, 1R Report (page two)



17 Additional Configurable Clinical Information (see page 4-12)
18 Additional Patient Clinical Information Fields (see page 4-9)

Figure 4-3 Vector ECG (VCG) Report



1 Patient ID information (see page 4-10)

2 The vector of the frontal, horizontal and sagittal QRS analysis, including the maximum vector amplitude, direction and time

3 The spatial center of the vector loop is flattened on the forehead, transverse and lateral Qualitative analysis of face-to-face vector graphs, including P-rings, QRS rings, ST-T ring, and the direction of operation of the ring, where the P ring is indicated by a dashed line, QRS ring with a thin line, and ST-T ring with a thick line

4 Institution Information (see page 4-11)

5 Device Identification Number (page 4-25)

6 Speed and Sensitivity settings (see page 4-24)

7 Filter settings (see page 4-21)

8 Algorithm version (see page 4-20)

9 Pacing Detection Setting (see page 4-18)

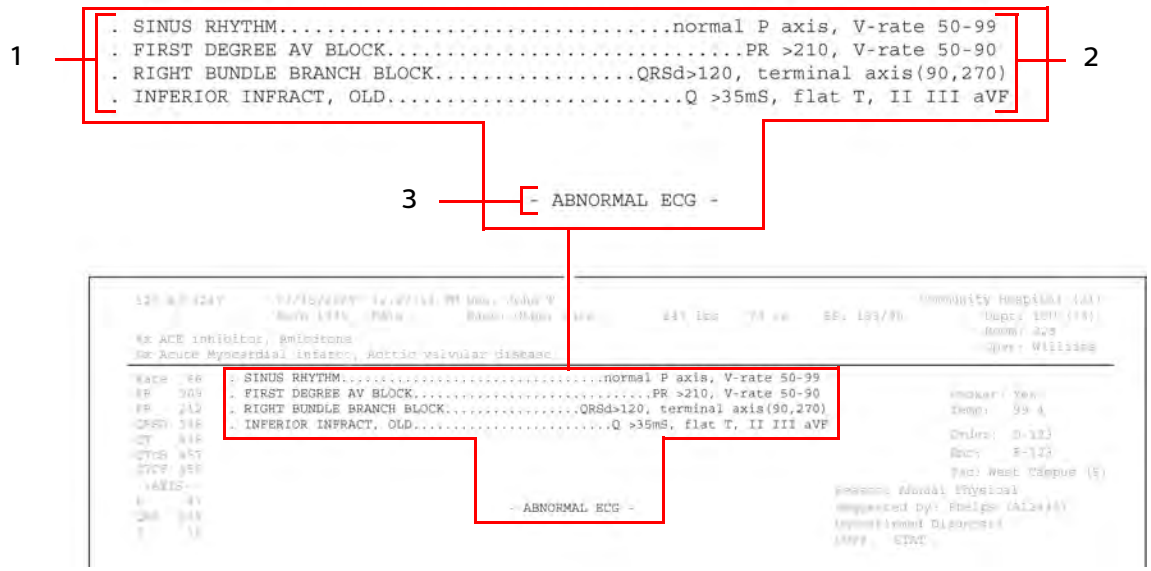
Note:

The patient information printed on the VCG report is not as extensive as the information included on the ECG report due to available space. Some information, such as orders, operator ID, room, etc., will not be displayed on the VCG report.

Interpretive, Reason, and Severity Statements

This area of the report contains the interpretive, reason, and severity statements generated by the Philips DXL ECG Algorithm.

Figure 4-4 Interpretive, Reason, and Severity Statements on the ECG Report



1 Interpretive Statements

2 Reason Statements

3 Severity Statement

Interpretive statements may include a reason statement that summarizes the criteria that generated the interpretive statement.

Note:

The interpretive statements may include quality statements that describe a signal quality problem that occurred during recording, such as ARTIFACT IN LEAD(S) I, III, aVL.

Severity Statement

Each interpretive statement included on the ECG report has an associated severity. Severities that are more abnormal override lesser severities. The severities of all selected interpretive statements are combined to determine the overall severity of the ECG. This severity code is printed on the front page of the ECG report.

Table 4-1 Overall ECG Severity with Code

Severity	Code
No Severity	NS
Normal ECG	NO
Otherwise Normal ECG	ON
Borderline ECG	BO
Abnormal ECG	AB
Defective ECG	DE

Critical Values

When the **Critical Values** setting is enabled on the acquisition equipment, statements may appear on the ECG report if specific interpretive statements are generated by the Philips DXL ECG Algorithm. These statements are intended to alert caregivers of an ongoing or imminent cardiac event, such as a silent MI, that require immediate clinical treatment. This feature is provided in part to help satisfy Section 2C of Goal 2 of the 2009 National Patient Safety Goals of the United States of America, as defined by the Joint Commission on Accreditation of Healthcare Organizations.

There are four Critical Value statements that may appear on the ECG report. These statements are shown in Figure 4-5 through Figure 4-8.

About the Extreme Tachycardia Statement

The extreme tachycardia statement **Very High Heart Rate** is generated by the following formula: the measured heart rate in beats per minute, minus the patient age in years. If this value is 150 bpm or higher, the measurement will generate the extreme tachycardia statement. If no patient age is specified for the ECG, the default patient age specified on the acquisition device is used.

Figure 4-5 Acute Myocardial Infarction Statement on ECG Report

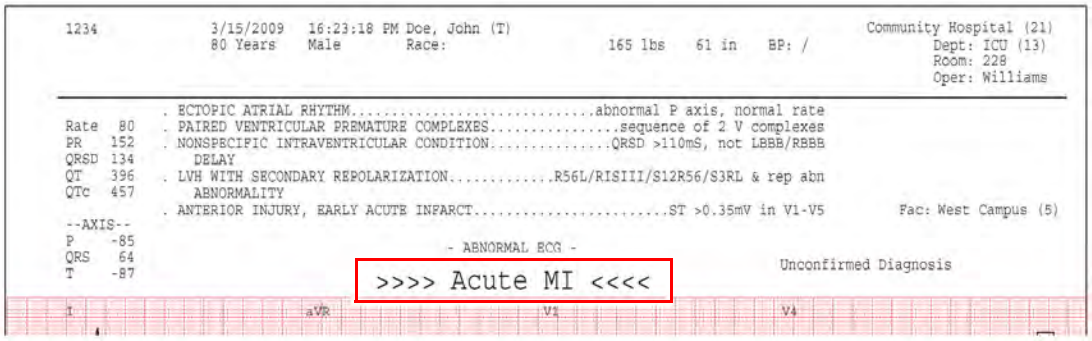


Figure 4-6 Extreme Tachycardia Statement on ECG Report

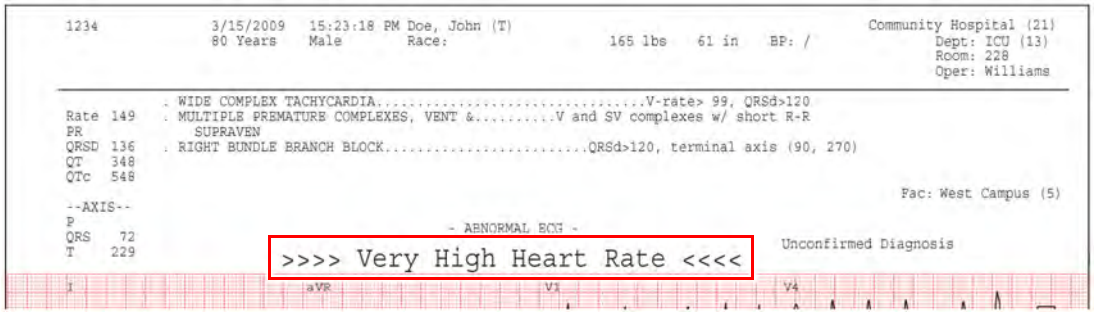


Figure 4-7 Complete Heart Block Statement on ECG Report

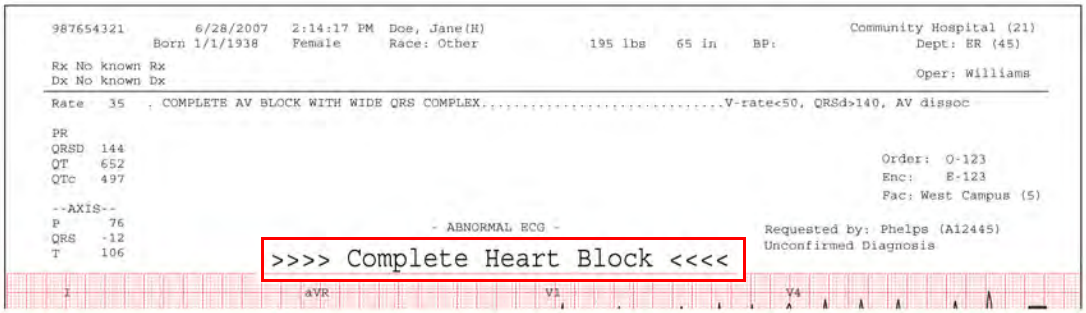
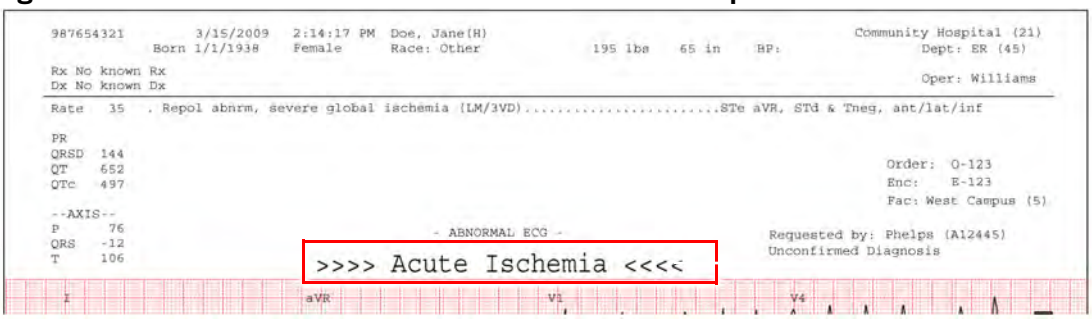


Figure 4-8 Acute Ischemia Statement on ECG Report



Basic Measurements

These measurements provide standard interval and duration measurements in milliseconds, and limb lead axis measurements in degrees. These are the values measured from the representative beat pattern in the ECG.

About Rate-Corrected QT Interval Settings

The default QT rate correction formula available on the acquisition device is Bazett's formula. The Fridericia, Hodges, and Framingham rate-corrected QT interval settings can be enabled on the acquisition device.

The QT rate correction formulas are listed below:

Bazett's

$QTc = QT / \sqrt{RR}$

Fridericia

$QTc = QT / \sqrt[3]{RR}$

Hodges

$QTc = QT + 1.75(HR - 60)$

Framingham

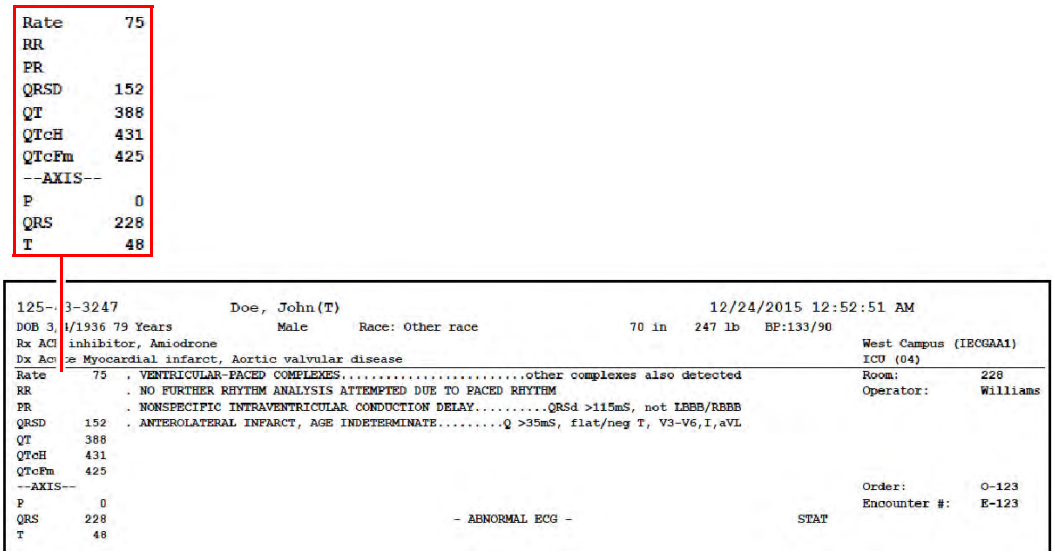
$QTc = QT + 0.154(1 - RR)$

For certain clinical situations, the Fridericia, Hodges, or Framingham corrected QT intervals may be preferable over Bazett's, and these additional measurements may be configured to appear in the measurements section of the printed ECG report.

Figure 4-9 The Bazett's (QTcB) and Fridericia (QTcF) Rate-Corrected QT interval on the printed ECG report



Figure 4-10 The Hodges (QTcH) and Framingham (QTcFm) Rate-Corrected QT interval on the printed ECG report



Note:

Some reports do not include the heart rate (RATE) in Basic Measurements, but do include a heart rate above the interpretive statements. This rate may be edited.

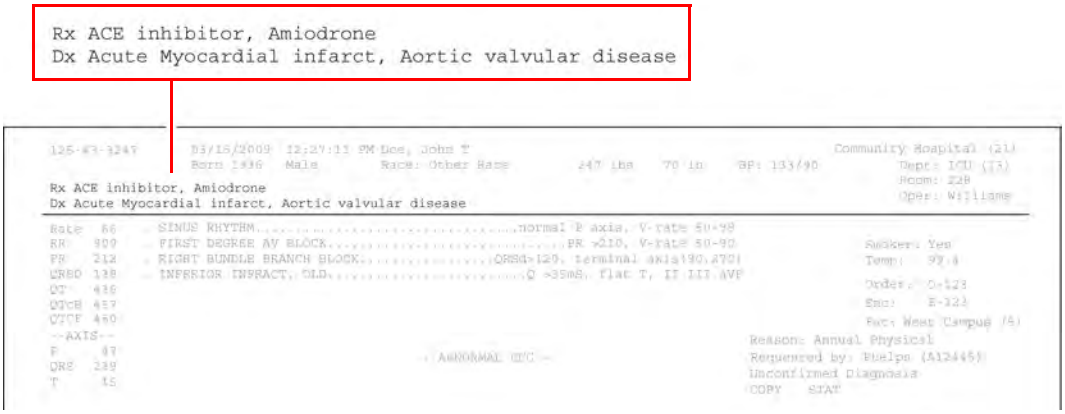
Table 4-2 Basic Measurements

Label	Description	Units
RATE	Heart rate	beats per minute
RR	RR interval	milliseconds
PR	PR interval	milliseconds
QRSD	QRS duration	milliseconds
QT	QT interval	milliseconds
QTcB	Bazett's Rate-Corrected QT interval	milliseconds
QTcF	Fridericia Rate-Corrected QT interval	milliseconds
QTcH	Hodges' Rate-Corrected QT interval	milliseconds
QTcFm	Framingham's Rate-Corrected QT interval	milliseconds
P	Frontal P axis	degrees
QRS	Frontal QRS axis	degrees
T	Frontal T axis	degrees

Patient ID Clinical Information

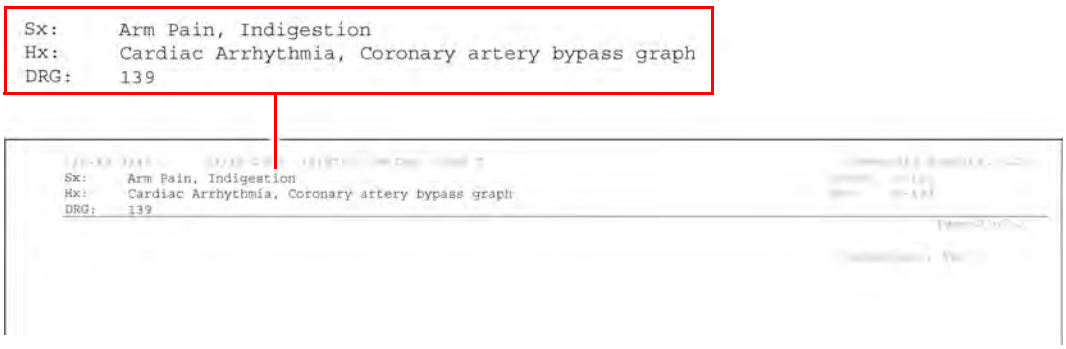
This area of page one or page two of the ECG report contains clinical patient information that is entered on the patient information entry screen, or that is contained in the order associated with the ECG. This includes information about the patient's Medications (Rx), Diagnoses (Dx), Symptoms (Sx), History (Hx), and a Diagnosis Related Group (DRG) code. The example below is for informational purposes only.

Figure 4-11 Patient ID Clinical Information on the ECG Report (page one)



If more than two Patient ID Clinical Information fields are entered, the third and subsequent fields appear at the top of a second page of the report.

Figure 4-12 Patient ID Clinical Information on the ECG Report (page two)



Patient ID Information

This section contains patient identification information. The example below is for informational purposes only.

Figure 4-13 Patient ID Information on the ECG Report

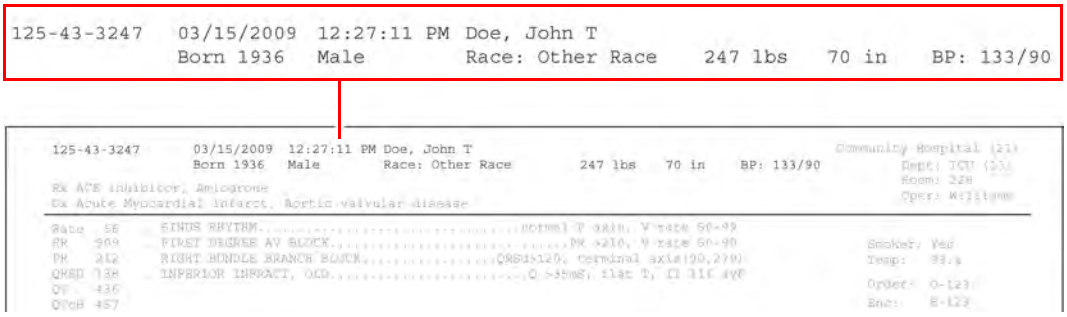


Table 4-3 Patient ID Information

Label	Description
123456789	Patient identification number
09/06/2006; 12:27:11 PM	• Date and time of ECG acquisition • Cannot be edited
Doe, John T.	Patient name
70 Years	Patient age (may be configured to display date of birth)
Male	Patient gender
Race	Patient ethnicity
247 lbs, 70 in.	Patient weight and height
BP: 133/90	Patient blood pressure (mm/Hg)

Institution Information

This block of identification information is optional and is fully configurable. The example below is for informational purposes only.

Figure 4-14 Institution Information on the ECG Report

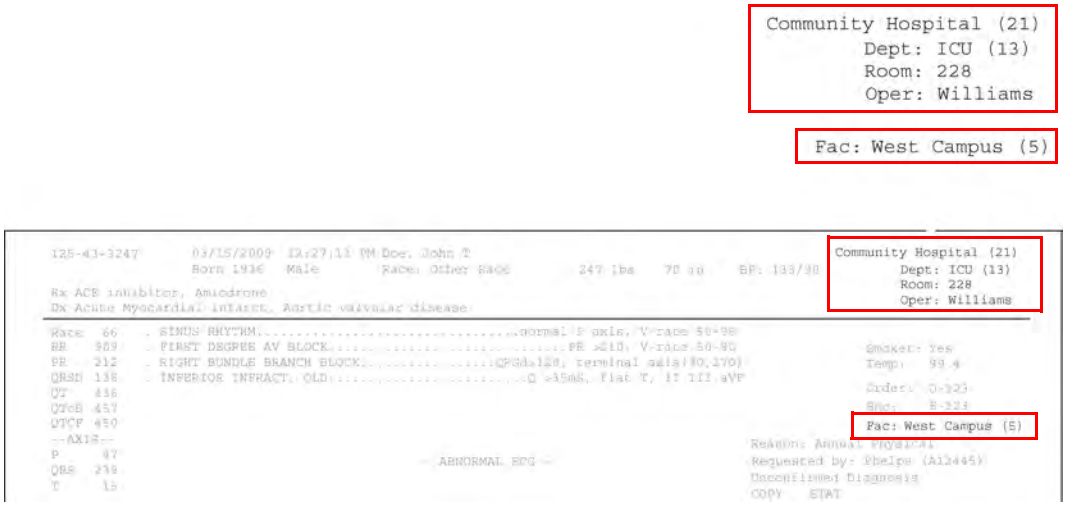


Table 4-4 Institution Information

Label	Description
Community Hospital (21)	Name and ID number of institution
Dept: ICU (13)	Name and ID number of department
Room: 228	Room number of patient or room number where ECG was acquired
Oper: Williams	Operator identification
Fac: West Campus (5)	Name and ID number of facility or other unit within an institution

Configurable Clinical Information

This information is configurable to fit specific clinical needs. Up to seven configurable clinical information fields may be available for use on the acquisition device.

The first four clinical fields appear on page one of the ECG report. The fifth and subsequent fields appear on page two of the ECG report. The examples below are for informational purposes only.

Figure 4-15 Configurable Clinical Information on the ECG Report (page 1)



Figure 4-16 Configurable Clinical Information on the ECG Report (page 2)



ECG Order Information

This area of the ECG report is optional and fully configurable, and is intended to meet the requirements of an order management system.

Figure 4-17 ECG Order Information on the ECG Report

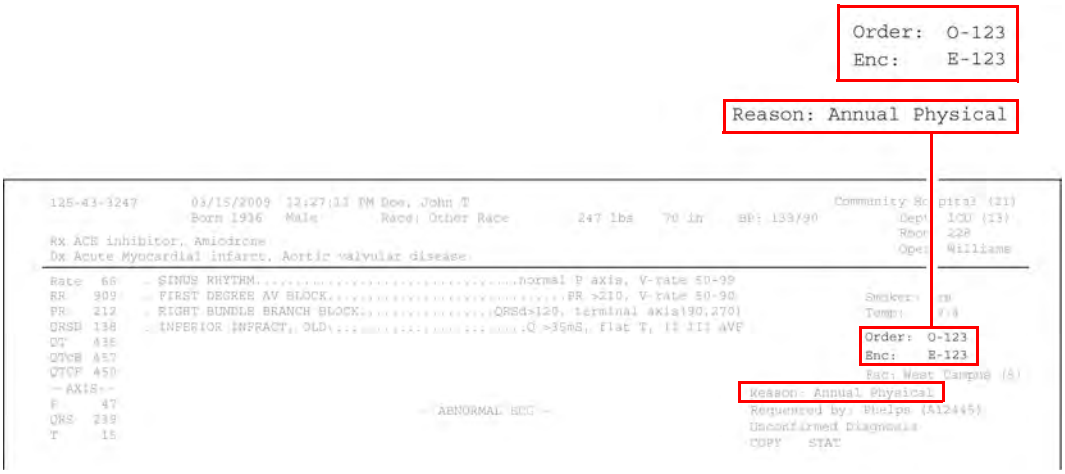


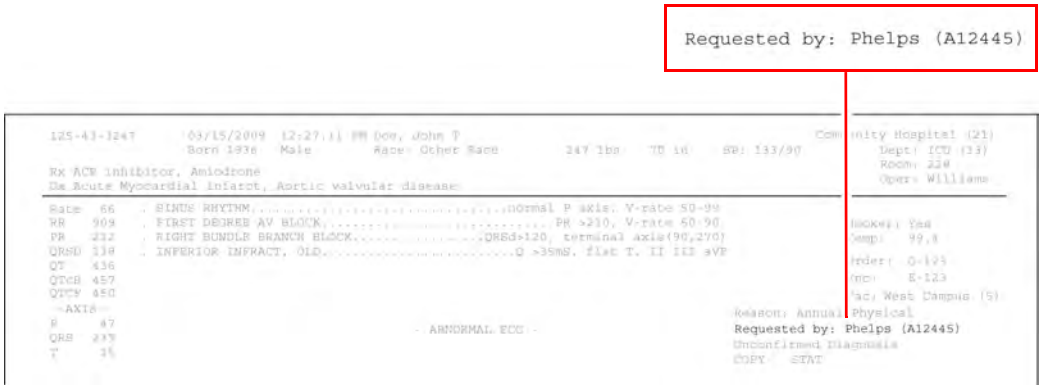
Table 4-5 ECG Order Information

Label	Description
Order: 0-123	Institution-defined order number, part of order management system.
Enc: E-123	Institution-defined encounter number, part of order management system.
Reason: Annual Physical	The reason for acquiring the ECG, may be part of an order management system.

Physician Information

This information block is optional, and contains physician identification information, including the name of the ordering physician, and may include the NPI (National Provider Identifier) number in parenthesis. The NPI is only applicable to providers inside the United States.

Figure 4-18 Physician Information on the ECG report



Report Information

Information about the status of the ECG report is included in this section, and may include a statement indicating that the ECG report has not yet been overread by a qualified physician.

Figure 4-19 Report Information on the ECG Report

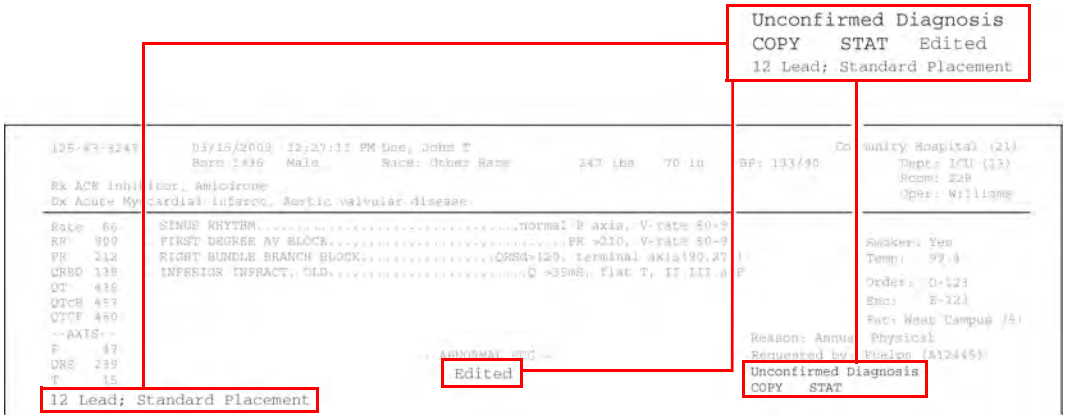


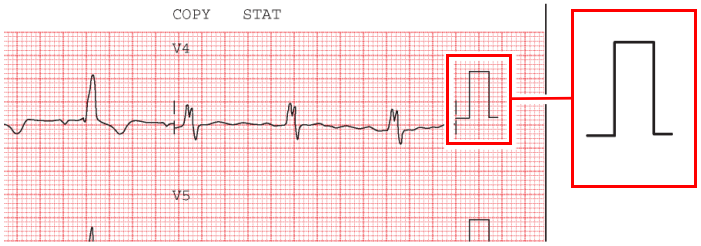
Table 4-6 Report Information

Label	Description
Report type	Identifies the report type. For example, *12 Lead; Standard Placement*
Edited flag	If one or more changes were made to interpretation statements on the IntelliSpace ECG system, the text **Edited** appears on the report.
Unconfirmed Diagnosis	• Indicates that the ECG report has not been overread by a qualified physician. • This statement may be customized by an institution.
COPY	The ECG report is a printed copy of an original.
STAT	The ECG report is designated as STAT.
Non-standard lead gains	• The limb leads or precordial leads were recorded at a gain other than the standard 10mm/mV. • See “Calibration Information” on page 4-15.

Calibration Information

The calibration pulse is the rectangular waveform shown in each line of ECG trace. It shows the hypothetical deflection of the trace in response to a 1 mV calibration pulse applied to the acquisition circuitry.

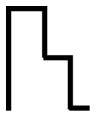
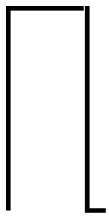
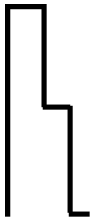
Figure 4-20 Calibration Pulse on the ECG Report



The shape of the calibration pulse reflects the scaling of the trace.

- If the calibration pulse is square  the precordial leads and limb leads were recorded at the same scale.
- If the calibration pulse is stepped  the precordial leads were recorded at half the scale of the limb leads.

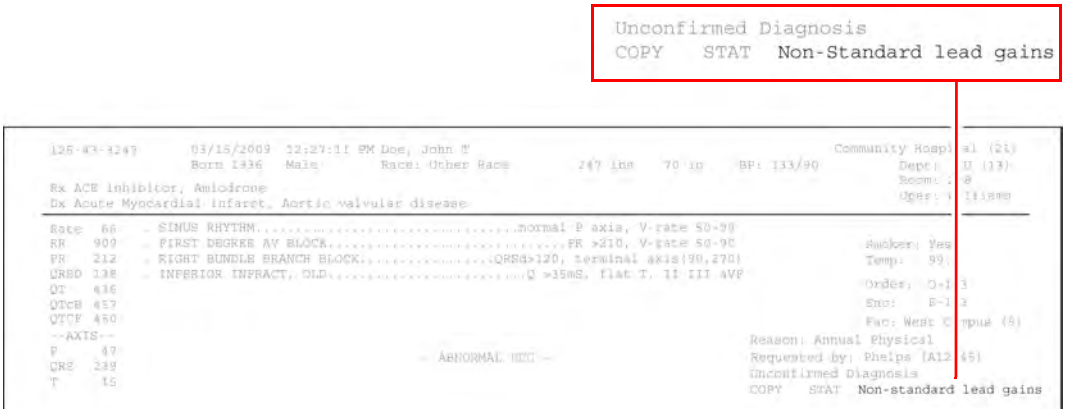
Table 4-7 Calibration Pulse Shapes

Calibration Pulse Shape	Limb (mm/mV)	Precordial (mm/mV)
	5	5
	5	2.5
	10	10
	10	5
	20	20
	20	10

Note:

For ECG recordings where the precordial leads or limb leads were recorded at a gain other than 10mm/mV, the statement Non-standard lead gains appears in the Report Information section on the printed report.

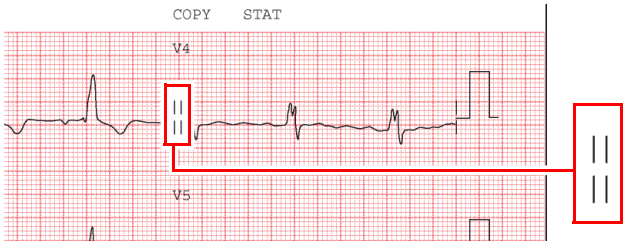
Figure 4-21 Calibration information on the ECG report



Time Separator

The time separator marks indicate whether the ECG data is displayed on the printed ECG report simultaneously or time-sequentially. The data for each lead is always acquired simultaneously.

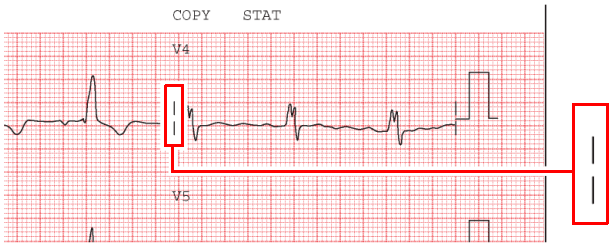
Figure 4-22 Simultaneous time separator on ECG report



Simultaneous Time Separator

The double line indicates that the ECG data for each lead is displayed simultaneously. The starting point of each lead is the same time even though they may appear to start at different times on the printed ECG report.

Figure 4-23 Time sequential separator on ECG report



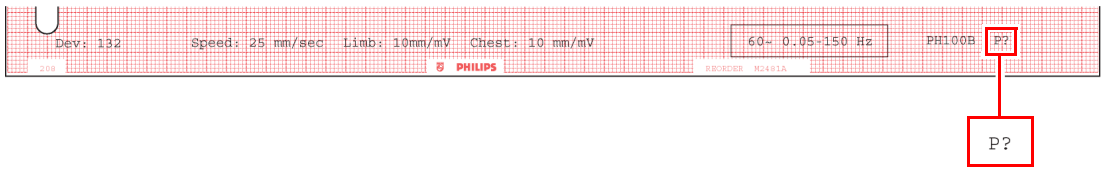
The single line indicates that the ECG data for each lead is displayed over a continuous period of time. For example, on a 3x4 grid all signals start at 0 in the first column, 2.5 seconds in the second column, 5.0 seconds in the third column, and 7.5 seconds in the fourth column.

Pacing Detection Settings

This area of the report contains information about the pacing detection settings that were selected when the ECG report was printed.

Pacemaker pulses that are detected by the acquisition device are marked on the ECG report with small vertical tick marks. These marks enable the overreader to identify false pacemaker pulse detections, or if true pulses are not being detected.

Figure 4-24 Pacing Detection Setting on the ECG report



The table below describes the possible Pacing Detection Settings available on the acquisition device, along with the setting code that appears on the printed ECG report.

Table 4-8 Pacing Detection Settings

Setting	Description	ECG Report Code
Paced Unknown	• This is the default setting and normally is used for both paced and non-paced patients. • Pacemaker pulse detection is on and is at normal sensitivity. • Occasional false pacemaker pulse detections may occur in ECGs with excessive noise. • False detections may result in an incorrect interpretive statement appearing on the report. • Small amplitude pacemaker pulses may not be detected using this setting.	**P?**
Non-paced	• Pacemaker pulse detection is off. • Use this setting if there are false pacemaker pulse detections from noise, or if incorrect interpretive statements or inappropriate paced ECG complexes appear on the report.	No code appears on the ECG report if the Non-paced setting is selected.
Paced	• Pacemaker pulse detection is on and is set at a higher sensitivity. • Use this setting if small amplitude pacemaker pulses are not being detected at the default (**Not Known if Paced**) setting. • False pacemaker pulse detections may occur if the ECG is noisy.	**P**

Table 4-8 Pacing Detection Settings *(continued)*

Setting	Description	ECG Report Code
Paced (magnet)	• Use this setting if the ECG is acquired with an active pacemaker magnet or programmer in place. • Pacemaker pulse detection is on and is at a higher sensitivity. • Magnets or programmers often put the pacemaker in a fixed-rate, non-sensing mode. • The statement **ECG ACQUIRED WITH MAGNET IN PLACE** is printed on the ECG report. This statement notifies the overreader that a magnet or programmer was used and would explain the fixed rate behavior of the pacer.	**PM**

Algorithm Version Number

The algorithm version number is printed at the bottom of the ECG Report. The algorithm version number appears as either **100B** or **110C** (Philips DXL ECG Algorithm). A Critical Values (**C**) lead reversal detection symbol (**L?**) can also appear in this area of the ECG report if these optional features are is enabled.

Figure 4-25 Algorithm Version Information on ECG report

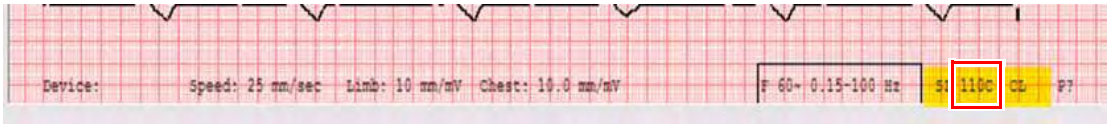


Table 4-9 Algorithm Code Information

Label	Description
100B 110C	• **10** or **11** refers to the version of the measurement program • **0B** or **0C** refers to the criteria version installed on the cardiograph

Table 4-9 Algorithm Code Information *(continued)*

Label	Description
C	This symbol appears on the report if the optional Critical Values feature is enabled on the cardiograph
S	This symbol indicates a low sensitivity acute MI (110C algorithm)
Z	This symbol indicates the MI size (110C algorithm)
L?	This symbol may appear with the algorithm version number. If this symbol appears, it designates that the optional lead reversal detection feature is enabled on the cardiograph, and that the cardiograph detected a lead reversal that the operator overrode when printing the ECG
B	Borderline suppression flags indicate whether the acquiring cardiograph suppresses these statements. Options are: • No setting. Borderline suppression was disabled. • **Exclude low certainty statements**. Shown as **b**. • **Exclude all borderline statements**. Shown as **B**. See Appendix A, “Suppressed Borderline Interpretive Statements.”

Filter Settings

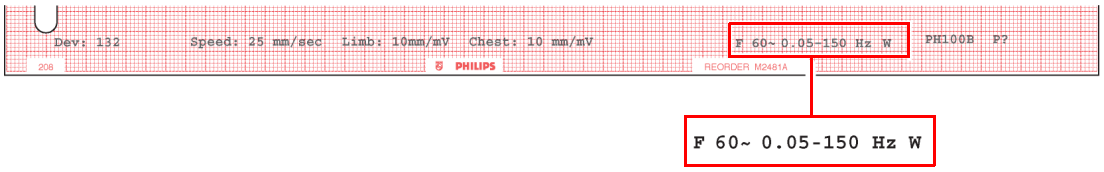
The filter settings applied to the ECG report are displayed in filter information box that is located at the bottom of the ECG report. These filters are used to optimize the displayed or printed ECG waveform.

With the exception of the AC filter, which is highly selective, there is trade off between fidelity and clarity of the ECG trace when a filter is applied. The more filtering that is applied, the greater the possibility of removing ECG signal details.

Note:

While all filters affect displayed and printed ECGs, the interpretive algorithms always receive, store, and analyze data at 0.05 to 150 Hz.

Figure 4-26 Filter Information Box on the Printed ECG Report



Artifact Filter

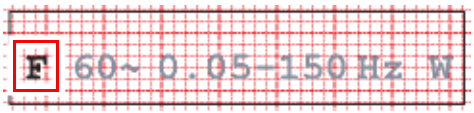
The Artifact filter removes skeletal muscle artifact. This noise source is the most difficult to eliminate because it possesses the same frequencies as legitimate ECG signals. While this filter eliminates skeletal muscle artifact, it also reduces all high frequency components of the ECG. This effect may make it impossible to detect pacemaker pulses, can cause visual underestimation of signal amplitudes, and can also render QRS notching invisible.

The filter removes up to 50 µV of signals in the 5 Hz to 150 Hz frequency range. This may affect P waves and the entire QRS-T complex.

Use the Artifact filter *only* for ECGs that would be unreadable due to significant levels of muscle artifact. Using the filter should provide at least rhythm information, although paced pulses may only be evident by looking at the markers that are produced on the ECG reports.

When the Artifact filter is used, the **F** symbol is included in the filter information box at the lower right corner of the printed ECG report.

Figure 4-27 Artifact Filter Symbol on Printed ECG Report

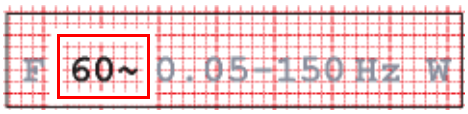


AC Filter

The AC filter removes interference created by the magnetic fields associated with electrical power interacting with the patient cable. The frequency of the AC interference is stable at 60 or 50 Hz. The AC filter removes the AC noise and leaves the ECG signal intact. The line frequency of 60 or 50 Hz is selected during the configuration of the acquisition device.

When the AC filter is used, the AC filter symbol is included in the filter information box at the lower right corner of the printed ECG report.

Figure 4-28 AC Filter Symbol on Printed ECG Report



Frequency Response Filters

These filters suppress frequencies at the high and low ends of the ECG signal spectrum. The available low frequency response filter settings are 40, 100, and 150 Hz.

In 1989, the American Heart Association recommended that frequencies up to 125 Hz be recorded for adult ECGs, and that frequencies up to 150 Hz be recorded for pediatric ECGs[1].

Changing the low-pass frequency filter to 40 or 100 Hz permits frequencies below these values to remain in the report and results in a smoother-looking ECG waveform, but eliminates some fine detail in the signal. Small deflections, notches, and slurs may be distorted or may disappear if one of these filters is applied.

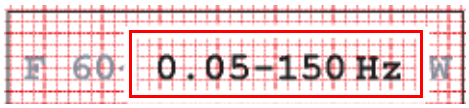
The high-pass frequency response filter settings are 0.05, 0.15, and 0.5 Hz. Using this filter permits frequencies above the selected value to appear in the ECG report. That is, this filter suppress frequencies below the selected value.

Caution

When the baseline wander filter is enabled, the high-frequency response filter is automatically set to 0.5. It is recommended that the 0.15 high frequency response filter setting be used for all other ECGs.

The frequency response of the ECG is included in the filter information box at the lower right corner of the printed ECG. The interpretive algorithms always use 0.05 to 150 Hz bandwidth for maximum fidelity. The maximum fidelity waveform is always stored in the permanent record.

Figure 4-29 Frequency Response Filter on the ECG Report



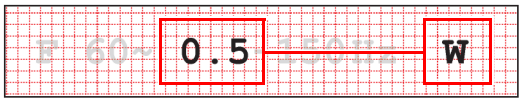
1. Bailey JJ, Berson AS, Garson A, Horan LG, Macfarlane PW, Mortara DW, Zywietz C. “Recommendations for Standardization and Specifications in Automated Electrocardiography: Bandwidth and Digital Signal Processing.” *Circulation* 81:730-739 (1990).

Baseline Wander Filter

Baseline wander is the slow (typically 0.1 – 0.2 Hz) drifting of the ECG baseline up or down during ECG recording. Baseline wander may result from patient respiration or from other sources. Severe baseline wander may make it difficult to determine the true wave shapes in the ECG.

Effective baseline wander suppression techniques do not distort the ST segment. While the highest frequency response limit of 0.05 Hz (recommended for normal use) eliminates baseline wander from most ECGs, additional suppression may be required. Enabling the baseline wander filter suppresses all frequencies below 0.5.

Figure 4-30 Baseline Wander Filter on the ECG Report



Caution

A 0.5 Hz baseline wander filter that may distort the ST segment is used during continuous ECG recording in Rhythm mode. *Do not* attempt to interpret the contour aspects of rhythm ECGs at this setting. If contour analysis is important in Rhythm mode, use the 0.05 Hz Rhythm high-pass frequency response setting that minimizes the ST segment distortion. Rhythm characteristics of the ECG are accurately recorded, regardless of the low-pass frequency setting in Rhythm mode.

Speed and Sensitivity Settings

This area contains information about the speed and sensitivity settings that were used for the ECG recording.

Figure 4-31 Speed and Sensitivity Settings on the ECG Report

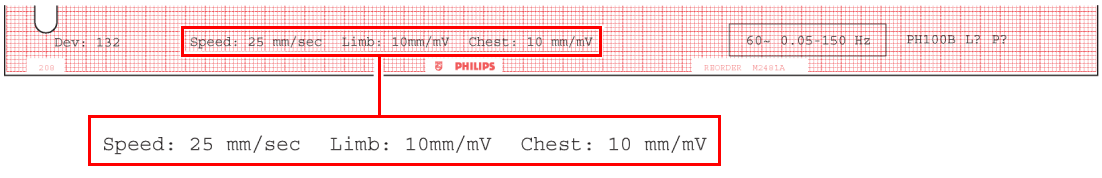


Table 4-10 Speed and Sensitivity Settings

Label	Description
Speed	• The speed at which the ECG was printed • Available settings: – 25mm/sec – 50 mm/sec
Limb	• The limb lead sensitivity setting • Available settings: – 5, 10, or 20 mm/mV
Chest	• Precordial lead sensitivity setting • Available settings: – 2.5, 5, 10, or 20 mm/mV

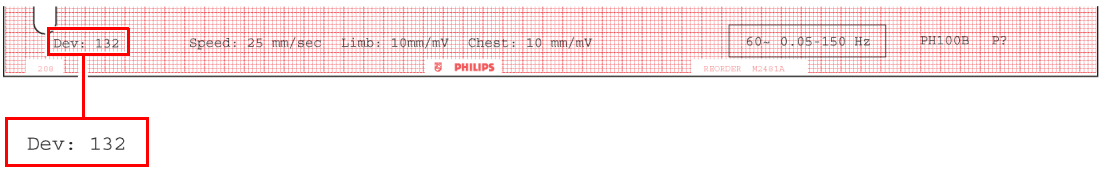
Note:

For ECG recordings where the precordial leads or limb leads were recorded at a gain other than 10mm/mV, the statement Non-standard lead gains appears in the Report Information section on the printed report.

Device Identification Number

This identification number may be entered at the acquisition device. This number is used to identify the individual device that acquired the ECG.

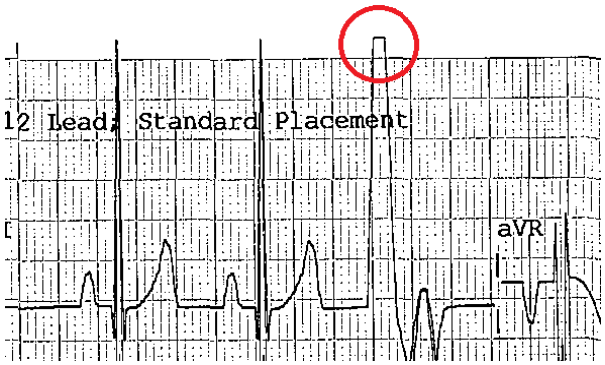
Figure 4-32 Device ID on the ECG Report



Signal Quality Indicators

The appearance of the waveform on the printed report can indicate a problem with the signal quality of the individual lead at the time the ECG was recorded.

Table 4-11 Signal Quality Indicators

Waveform Appearance	Indicates...
Red dotted line	Signal out of valid range. If the acquired signal is out of the valid signal range, the lead will be displayed as a dotted red line on the display and on the printed report. See “Color-Coded Waveforms” on page 3-25 for more information.
Solid flat line	Signal out of print range. If the signal is in the valid range, but the amplitude is too high to be printed on the report, the printed report will display a solid flat line. 

12-Lead ECG Report Examples

The following section includes examples of other 12-lead ECG formats.

- 3x4, 1R report with Standard Leads
- 3x4, 1R report with Cabrera Leads
- 6x2, 1R report with Cabrera Leads
- 6x2 report (5-second waveform segments) with Cabrera Leads

- 12x1 report with Cabrera Leads. The 12x1 report shows 10 seconds of continuous waveform data for 12 leads and includes a second page with interpretive, reason, and severity statements (if configured).
- Panoramic (Pan-12) report with Cabrera Leads. The Pan-12 report shows a one-second representative complex for each Cabrera Lead and three pre-selected rhythm strips at the bottom (aVF, V2, V5).

Figure 4-33 3x4, 1R Report with Standard Leads

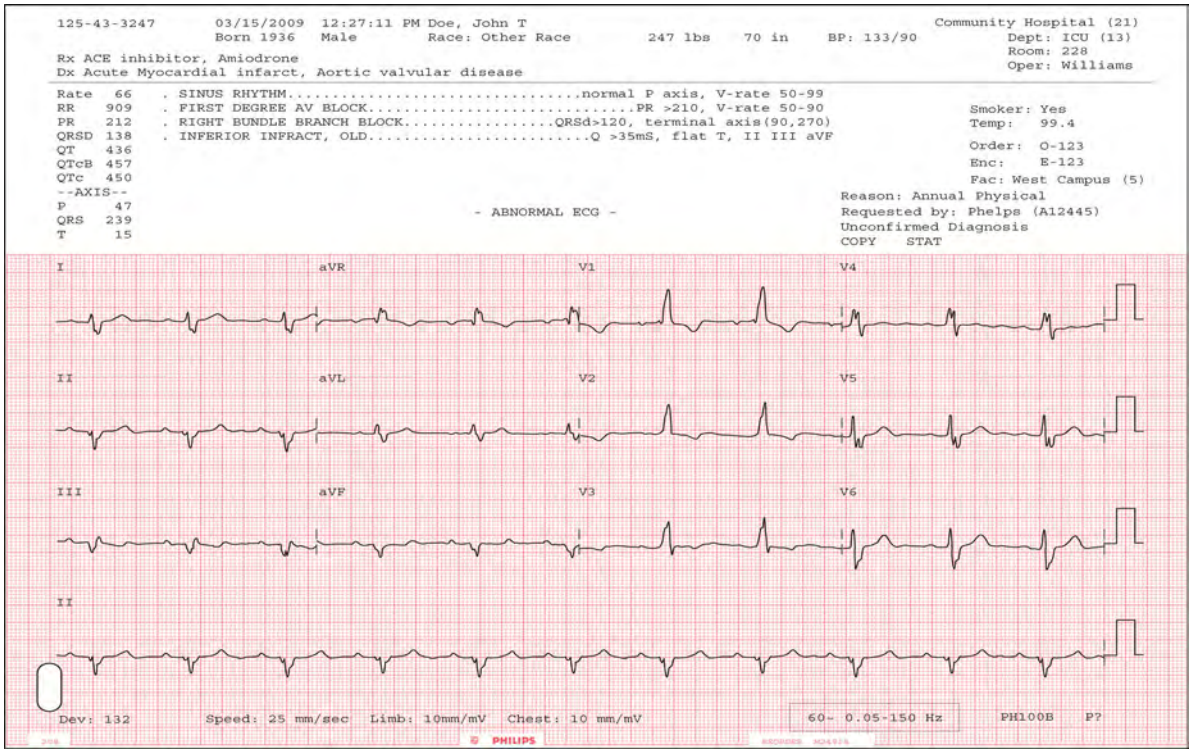


Figure 4-34 3x4, 1R Report with Cabrera Leads and Simultaneous Acquisition

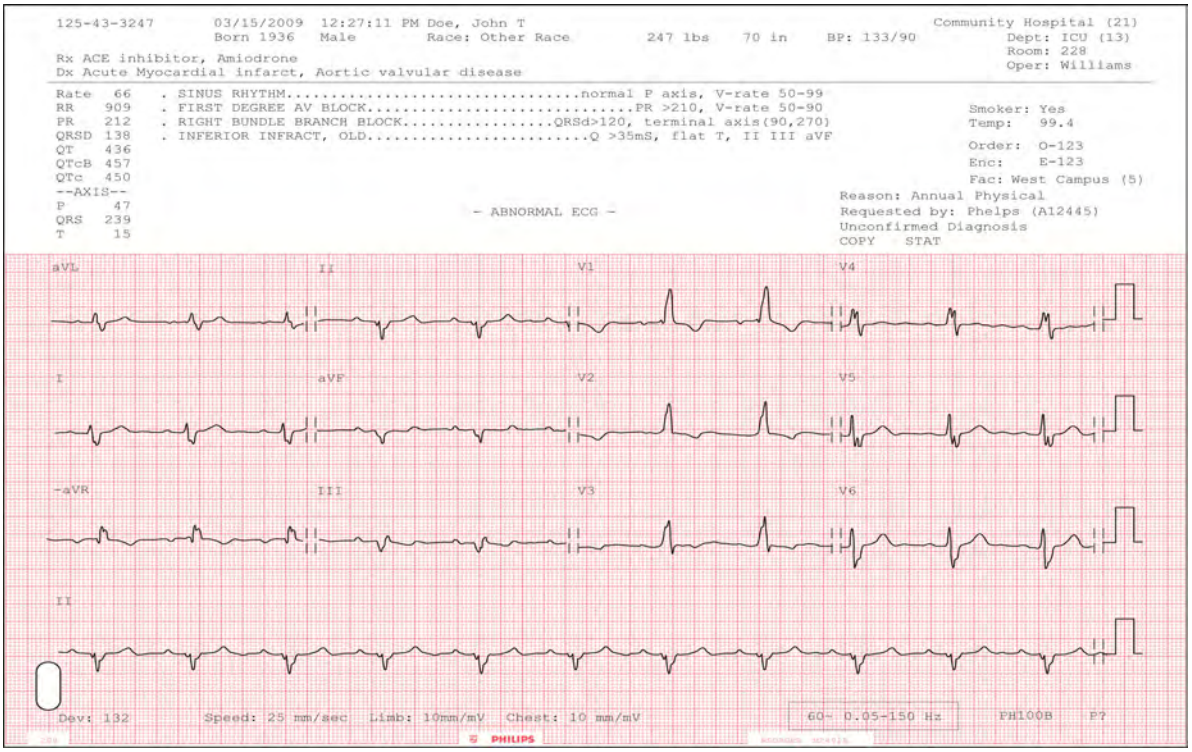


Figure 4-35 6x2, 1R Report with Cabrera Leads

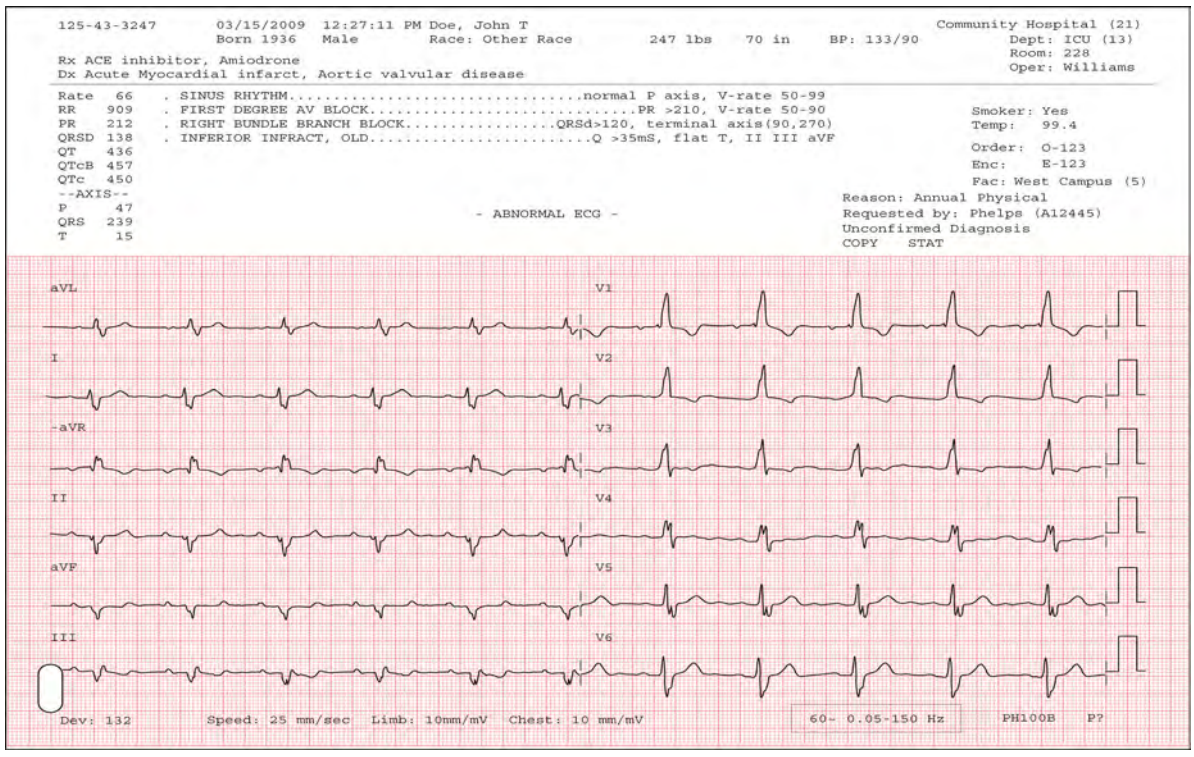


Figure 4-36 12x1 Report with Cabrera Leads (page one)

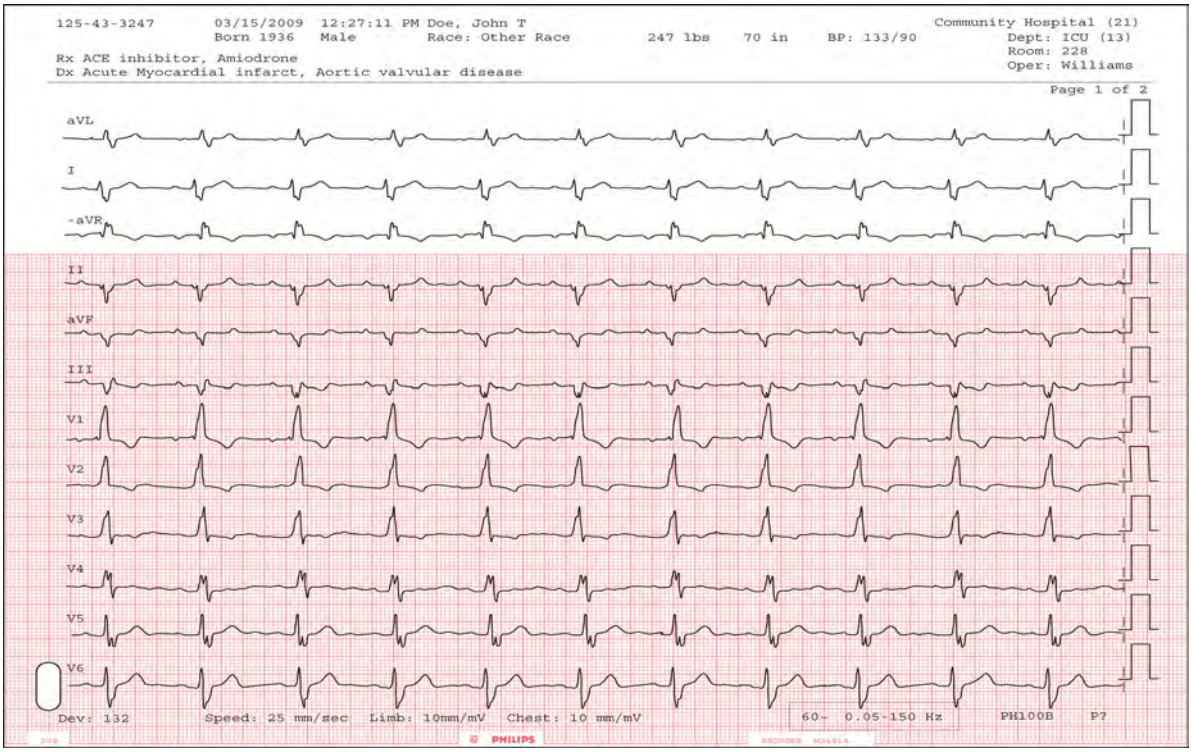


Figure 4-37 12x1 Report with Cabrera Leads (page two)

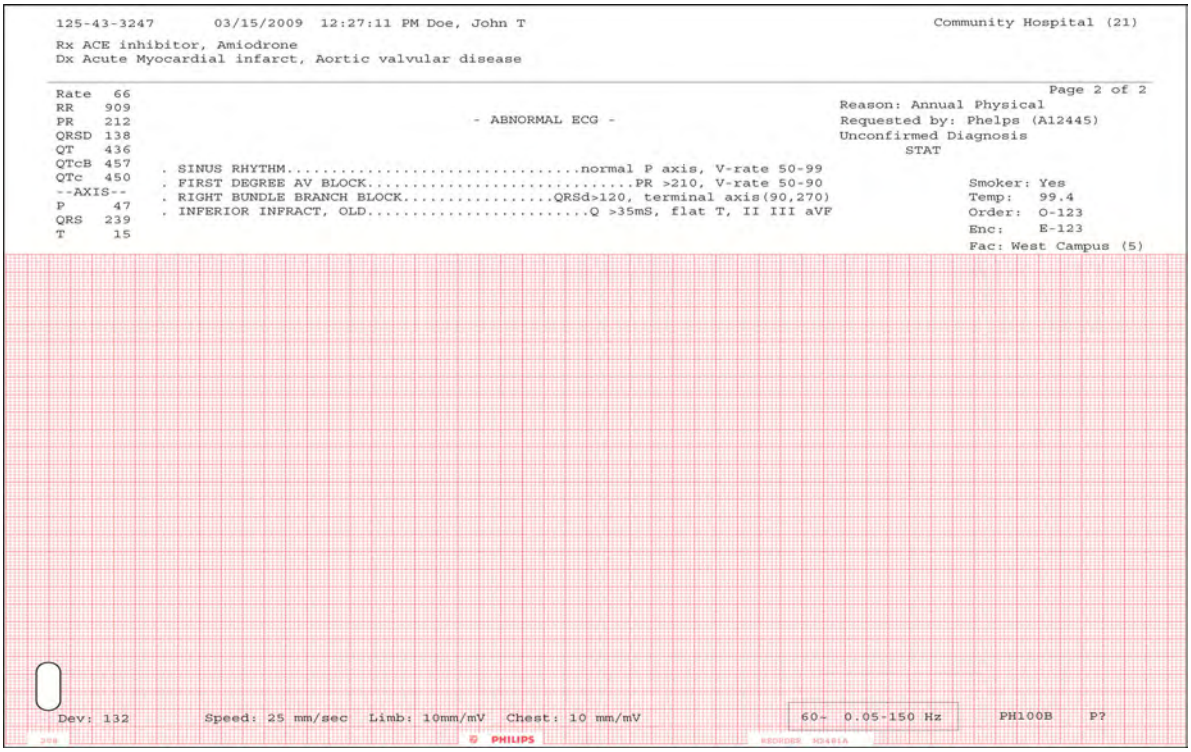
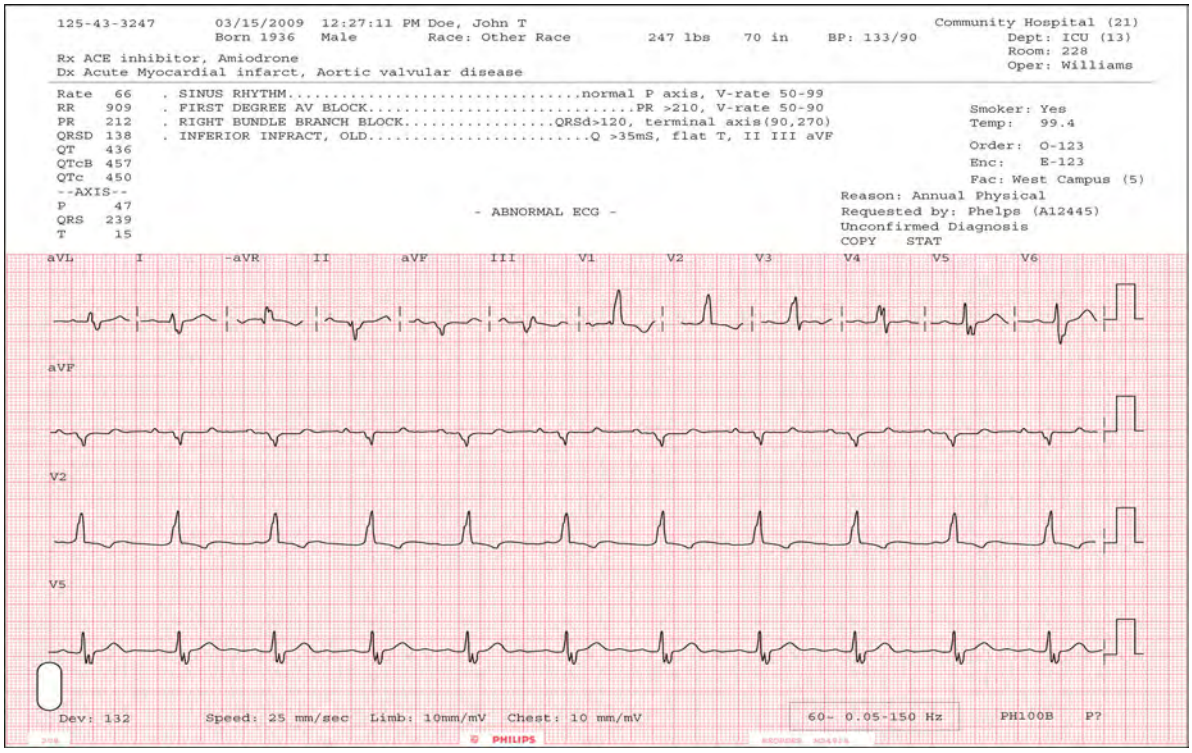


Figure 4-38 Panoramic (Pan-12) Report



Note:

Leads are displayed in Cabrera sequence on the Panoramic (Pan-12) Report regardless of the selected lead standard on the acquisition device.

ST Map Reports

ST Map reports are supported on the PageWriter TC cardiograph. The ST Map displays the ST values for each of the leads as derived by the interpretive algorithm. These ST values enable the clinician to accurately detect ST elevation or ST depression, and also allow the clinician to identify the anatomical location of the ST elevation or depression. The ST segment is the portion of the ECG tracing that can indicate myocardial ischemia.

These ST values are shown graphically in two separate diagrams, or “maps.” The first diagram depicts ST values for the limb leads, and the second diagram depicts the ST values for the chest leads. Each of these diagrams depict a multi-axis orthogonal plane, and each individual axis within this plane represents the ST value at the J point for an individual lead.

12-Lead ST Map Reports

For Standard 12 leads, two ST-related reports are provided. The 3x4 1R 10ST report displays three rows of four 2.5-second waveform segments, with 1 ten-second rhythm strip and the ST Maps at the bottom of the report. The 3x4 1R 8ST report displays three rows of four 2-second waveform segments, with 1 eight-second rhythm strip at the bottom, and the ST Maps at the right side of the report.

Note:

For the 3x4 1R 8ST report, if the ST value of a lead exceeds +/-.30mV, the value displayed for leads in the ST Map will not exceed +/-.30mV, regardless of their actual value.

Figure 4-39 3x4 1R 8ST Report

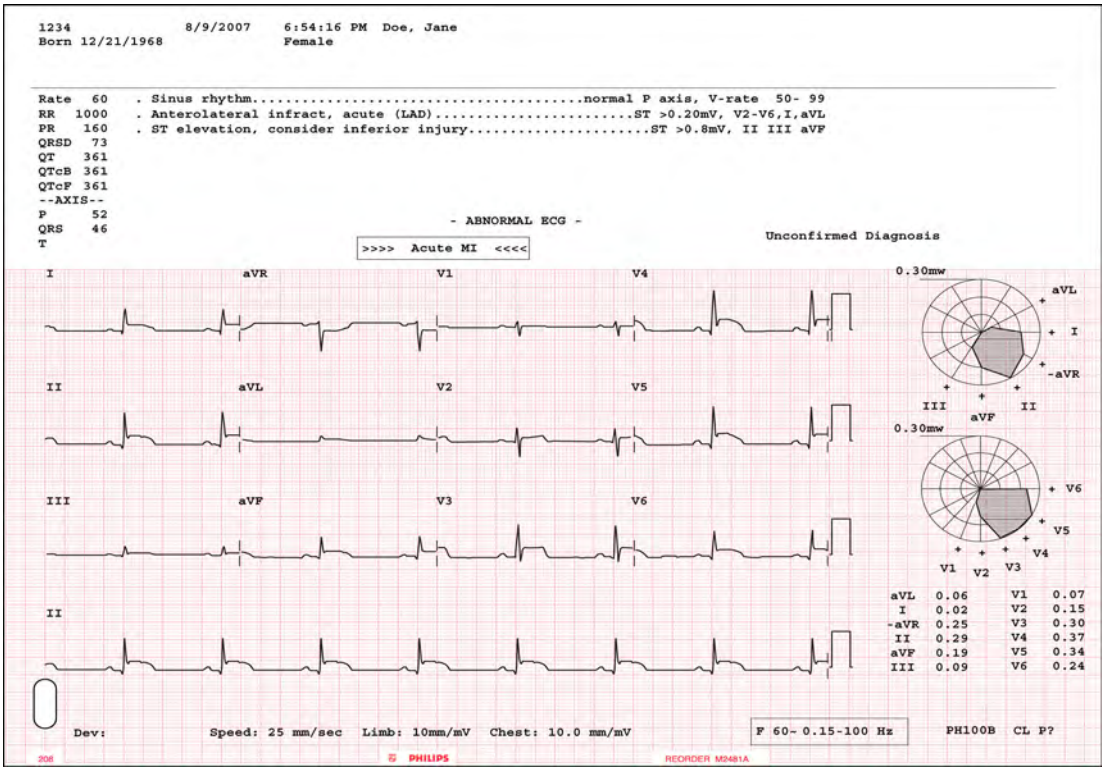
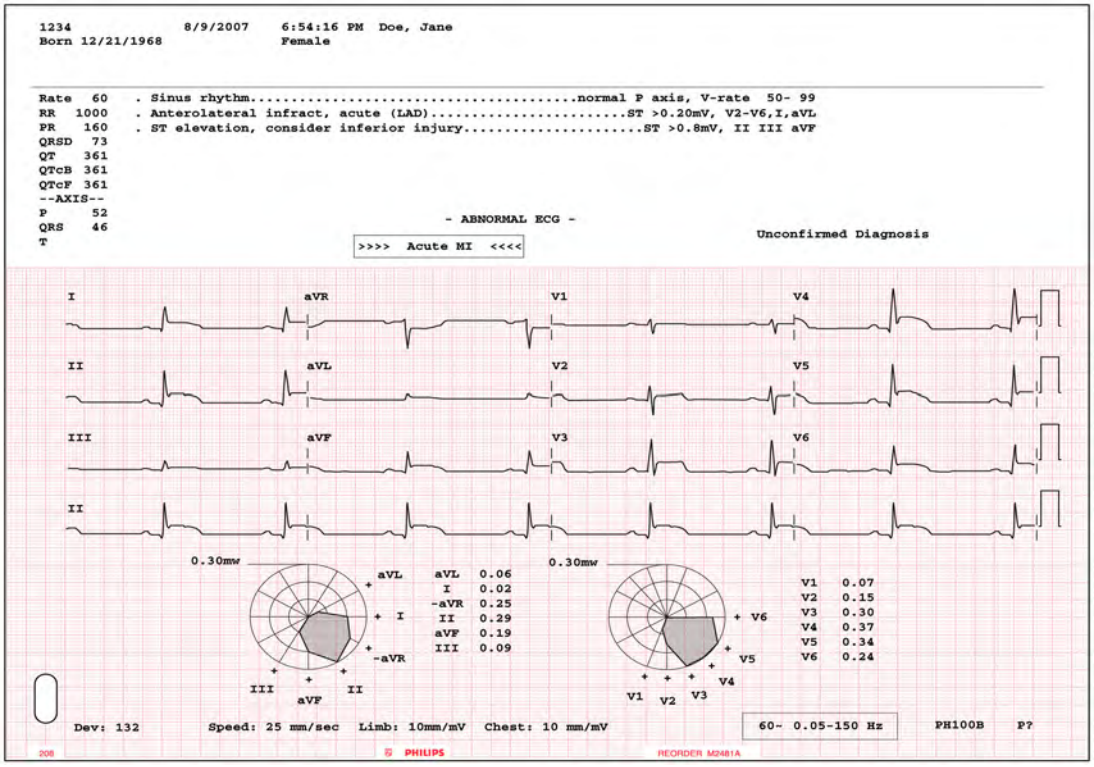


Figure 4-40 3x4 1R 10ST Report



Rhythm Report

Rhythm reports show up to 12 leads of continuous waveform data. The amount of report information that is included on the report is dependent upon the number of leads selected for recording. Information on the report may include:

- Patient information
- Data and time of recording
- Settings information (scale and sensitivity, filter settings)

Rhythm reports are not analyzed, so they do not provide measurement information or interpretive statements, and they are not saved to the Archive. The calibration pulse appears at the beginning of each ECG trace.

Figure 4-41 Rhythm Report with 6 Leads

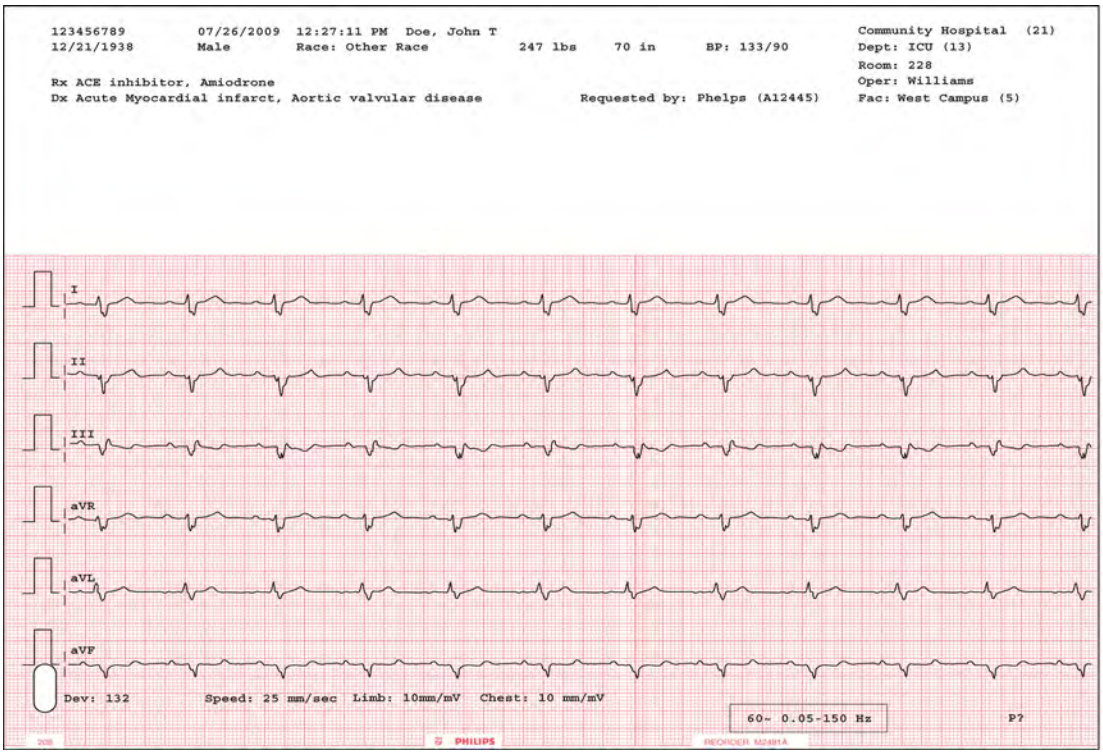
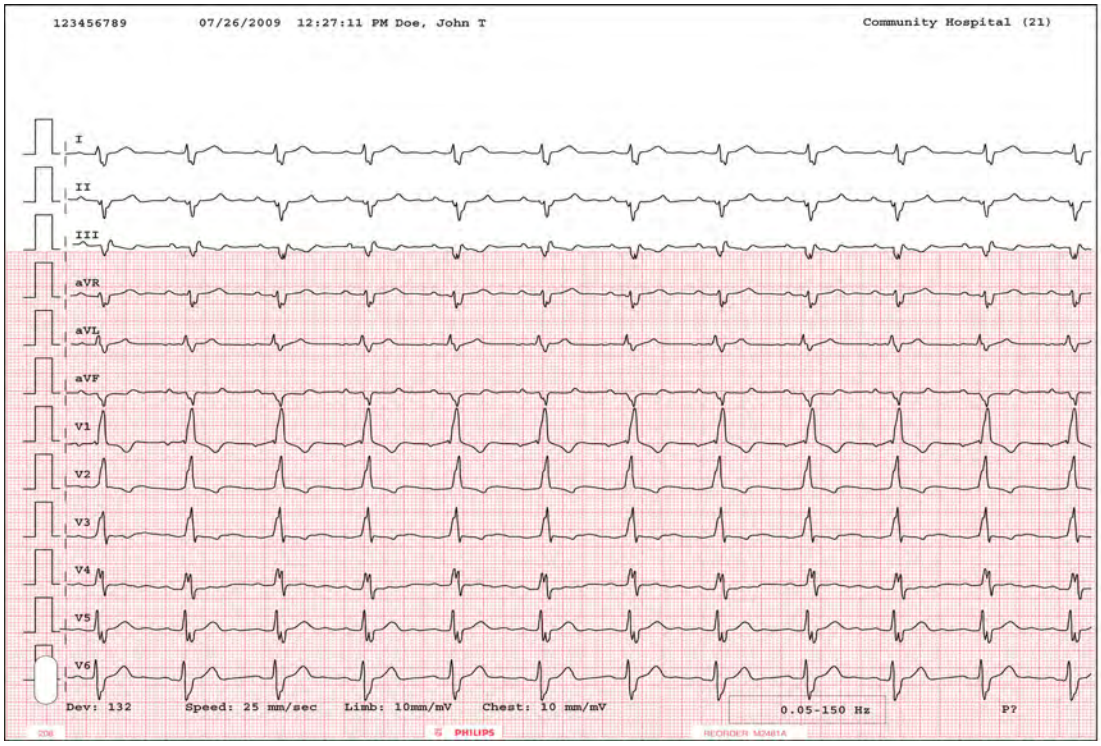


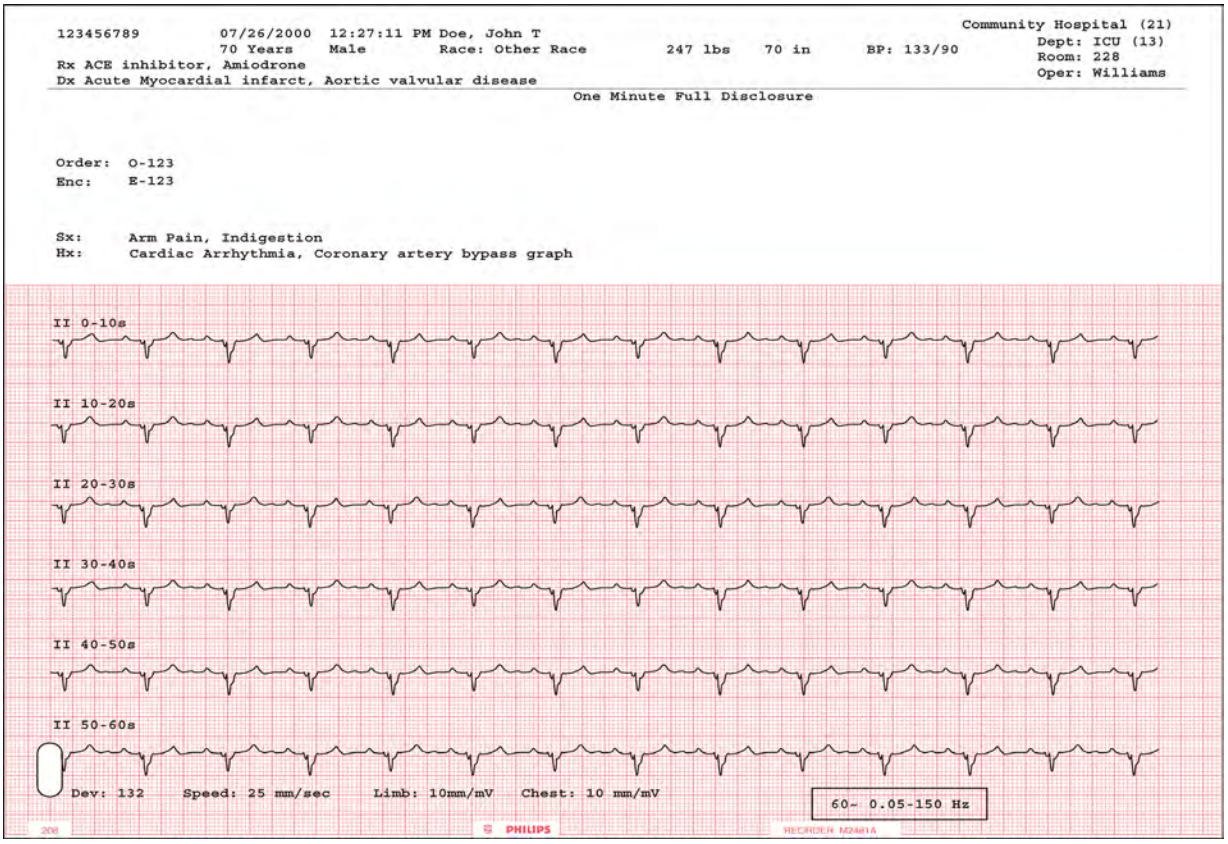
Figure 4-42 Rhythm Report with 12 Leads



1-Minute Disclose Report

The 1-Minute Disclose Report displays up to one minute of continuous ECG waveform data for the selected Disclose lead. Disclose reports are not analyzed, so they do not provide measurement information or interpretive statements, and they are not saved to the Archive. Each 10-second waveform segment on the report is labeled next to the lead name.

Figure 4-43 1-Minute Disclose Report



Extended Measurements Report

The Extended Measurements Report summarizes the output of the Philips DXL ECG Algorithm. The report includes the morphology characteristics for the individual leads, and the rhythm characteristics for the rhythm groups. The algorithm uses this measurement information to generate interpretive statements. The Extended Measurements Report is especially useful if you want to examine the measurements used to generate an interpretation.

For more information on the Extended Measurements Report, see Chapter 5 of the *Philips 16-Lead Algorithm Physican's Guide* on the *PageWriter TC User Documentation DVD*, or download the file from the InCenter site (incenter.medical.philips.com). For information on using the InCenter site, see page ii.

5

Cardiograph Care and Maintenance

The following chapter contains information about basic cardiograph care, and periodic cardiograph maintenance that may be required. If further technical assistance is required, contact Philips Customer Care (see page E-8.)

For additional scheduled maintenance and performance testing, refer to the *PageWriter TC Cardiograph Service Manual*, found on the *PageWriter TC Cardiograph Documentation DVD*.

Table 5-1 Recommended Frequency of Maintenance Tasks

Component	Recommended Frequency	Maintenance Task and page number
Cardiograph and Patient Interface Module (PIM) Cleaning	Weekly or after patient use if patient's skin comes into contact with patient cable	*"Cardiograph and PIM Cleaning" on page 5-2*
Patient Data Cable and Lead Wire Cleaning	Weekly or after patient use if patient's skin comes into contact with patient cable	*"Patient Cable Cleaning" on page 5-4*
Reusable Electrode Cleaning	After each patient use	*"Reusable Electrode Cleaning" on page 5-5*
Electrode Adapter Cleaning	After each patient use	*"Electrode Adapter Cleaning" on page 5-7*
Print Head Cleaning	When necessary due to uneven print quality	*"Cleaning the Print Head" on page 5-7*
Battery Calibration	When necessary, due to inaccurate battery status information displayed on cardiograph	*"Battery Calibration" on page 5-13*
Patient Interface Module (PIM) Test	When necessary, to confirm that the PIM is communicating with the cardiograph	*"Patient Interface Module (PIM) Test" on page 5-15*

Table 5-1 Recommended Frequency of Maintenance Tasks (continued)

Component	Recommended Frequency	Maintenance Task and page number
Ping Test	When necessary, to confirm that the cardiograph can successfully communicate with an entered IP address	*"Ping Test" on page 5-16*
Lead Wire Performance Test	Weekly	*"Lead Wire Performance Test" on page 5-17*
Touch screen calibration	When necessary, due to decreased touch screen performance	*"Touch Screen Calibration" on page 5-18*
Touch screen cleaning	Weekly	*"Touch Screen Cleaning" on page 5-19*
Cardiograph Overall Sensitivity Test	Once per year	The overall sensitivity test is used to test the calibration voltage. According to *IEC 60601-2-25:2011*, this test should be run regularly. Taking an ECG using a 12-lead simulator allows you to verify areas of operation that the extended self tests cannot check, and allows you to verify the accuracy of the sensitivity settings. See the *PageWriter TC Cardiograph Service Manual* for detailed instructions on the performance of this test.
Replacing the Cardiograph Fuse	When the cardiograph is plugged into AC power, but the green AC power indicator light does not illuminate	*"Replacing the Cardiograph Fuse" on page 5-20*

Cardiograph and PIM Cleaning

WARNING

Electrical shock hazard. Keep the cardiograph, Patient Interface Module (PIM), and all cardiograph accessories away from liquids. Do not immerse the cardiograph, PIM, or other accessories in any liquids.

WARNING

Always clean and disinfect the Patient Interface Module (PIM) after patient use, if the PIM comes into direct contact with the patient's skin. Failure to properly clean and disinfect the PIM after direct contact with the patient's skin may cause infectious materials to be transferred between patients.

To clean the cardiograph and PIM:

1. Unplug the AC power cord.
2. Ensure that the AC power indicator light (next to power button) is not lit.
3. Wipe the external surfaces of the cardiograph and the PIM with a soft cloth dampened in any of the approved cleaning solutions listed below.

Caution

When cleaning, avoid the lead wire connectors and patient data cable connectors.

Approved Cleaning Solutions

- Mild soap and water
- Isopropyl alcohol (consisting of 70% solution)
- Chlorine bleach (5.25% sodium hypochlorite content) mixed as 3% solution in water
- Quaternary ammonium compounds such as *Steris Coverage Plus NPD*, mixed as one half fluid ounce per gallon water, or one part *Coverage Plus NPD* to 256 parts water

Caution

Do not use strong solvents or abrasive cleaning materials.

Do not use any of the following to clean the cardiograph:

- **Acetone**
- **Iodine-based cleaners**
- **Phenol-based cleaners**
- **Ethylene oxide sterilization**

- **Ammonia-based cleaners**

The cardiograph, PIM, lead wires, and patient data cable should not be autoclaved, ultrasonically cleaned, or immersed.

Patient Cable Cleaning

Prior to cleaning the patient data cable, inspect the cable for any cracks or breaks in the cable insulation. If the integrity of the patient cable is not assured, replace the patient cable. Contact Philips or your certified dealer for further assistance. See “Contacting Philips Customer Care” on page E-8.

WARNING

Always clean and disinfect the patient cable after patient use, if the cable comes into direct contact with the patient’s skin. Failure to properly clean and disinfect the cable after direct contact with the patient’s skin may cause infectious materials to be transferred between patients.

Approved Cleaning Solutions

- Mild soap and water
- Isopropyl alcohol (consisting of 70% solution)
- Chlorine bleach (5.25% sodium hypochlorite content) mixed as 3% solution in water
- Quaternary ammonium compounds such as *Steris Coverage Plus NPD*, mixed as one half fluid ounce per gallon water, or one part *Coverage Plus NPD* to 256 parts water

Caution

Do not use strong solvents or abrasive cleaning materials.

Do not use any of the following to clean the cardiograph:

- **Acetone**
- **Iodine-based cleaners**
- **Phenol-based cleaners**
- **Ethylene oxide sterilization**

- **Ammonia-based cleaners**

The cardiograph, PIM, lead wires, and patient data cable should not be autoclaved, ultrasonically cleaned, or immersed.

To clean the patient data cable and lead wires:

1. Dampen a soft cloth with soapy water or with one of the disinfectants or cleaning agents listed in “Approved Cleaning Solutions” on page 5-4.
2. Wring excess moisture from the cloth before cleaning.

Caution

Do not:

- **Autoclave the patient cable or use ultrasonic cleaners**
- **Immerse**
- **Use abrasive materials**
- **Wet the connectors**

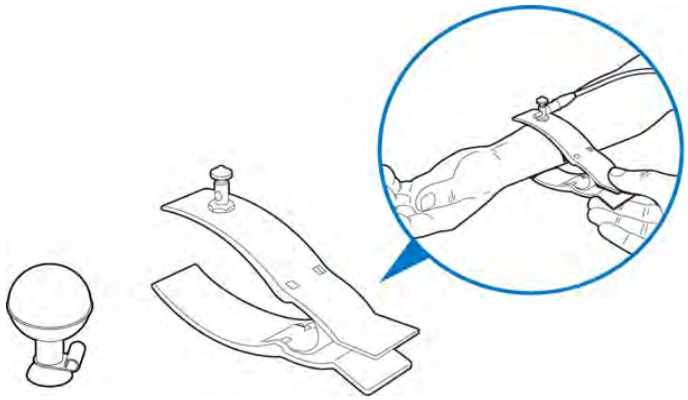
Reusable Electrode Cleaning

Reusable limb clamp and Welsh Bulb electrodes must be cleaned after each use.

WARNING

Always clean and disinfect reusable electrodes before patient use. Failure to properly clean and disinfect reusable electrodes before patient use may cause infectious materials to be transferred between patients.

Figure 5-1 Welsh Bulb and Limb Clamp Electrode



To clean reusable electrodes:

1. For Welsh Bulb electrodes only: detach the bulb from the metal cup by pulling. Wash the bulb in warm water. Remove all electrolyte gel residue, check inside the bulb to ensure that all residue is removed.
2. For all reusable electrodes: dampen a soft cloth with one of the disinfectants or cleaning agents listed below.
    - green soap, green soap tincture (U.S. Pharmacopoeia), or alcohol-free hand soap;
    - 2% glutaraldehyde solution, such as Cidex;
    - sodium hypochlorite (bleach) solution 10% in water.
3. Wring excess moisture from the cloth before cleaning.
4. Dry the bulb and cup of the Welsh Bulb electrode thoroughly before use.
5. Store the reusable electrodes away from direct sunlight and excessive heat when not in use.

Caution

Do not:

- **Use isopropyl alcohol**
- **Autoclave the reusable electrodes or use ultrasonic cleaners**
- **Use abrasive materials**

Electrode Adapter Cleaning

To clean the electrode adapter, use a soft cloth and one of the disinfectants or cleaning agents listed below,

For electrode adapters with PN 989803129231 or 989803129241, use:

- Isopropyl alcohol, 70% solution;
- Mild soap and water;
- Steris Coverage Plus NPD, 0.5 fluid ounce per gallon of water (one part Coverage Plus NPD to 256 parts water).

Caution

- **Do not use chlorine bleach to clean the electrode adapter.**
- **Do not autoclave or steam sterilize the electrode adapter.**

For electrode adapters with PN 989803166031, please refer to the product instructions for use for a list of approved cleaning agents.

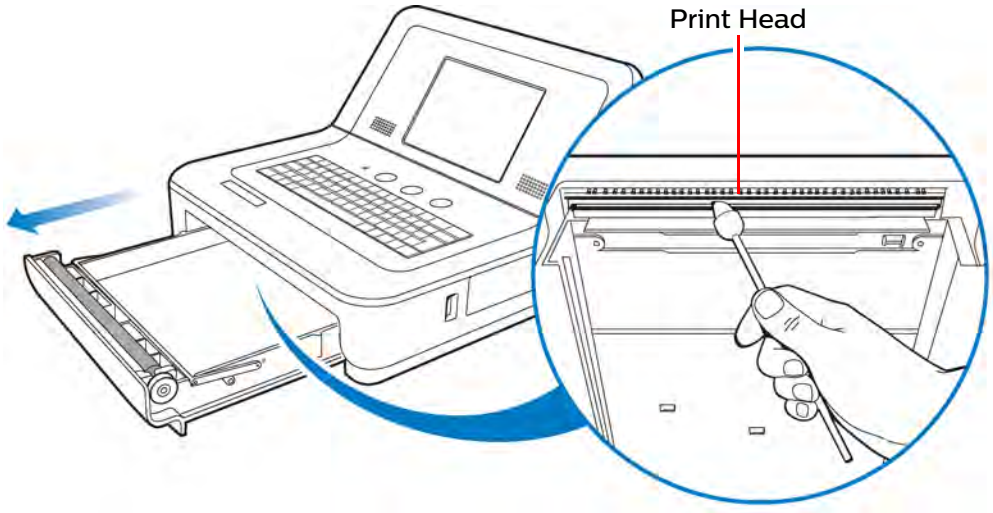
Cleaning the Print Head

Clean the print head periodically, as a dirty print head may cause poor or uneven print quality. Clean the print head more frequently when printing large volumes of ECGs.

To clean the print head:

1. Open the paper drawer.
2. Wipe the print head lightly with a foam swab dipped in 90% alcohol.
3. Allow the print head to dry before cleaning the drawer.

Figure 5-2 PageWriter TC30 Cardiograph - Cleaning the Print Head

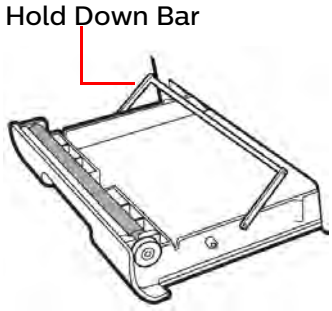


Printer Paper

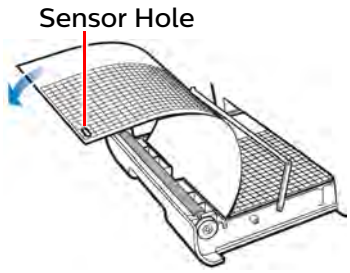
Replace the printer paper when a red stripe appears on the printed ECG report. Only use Philips replacement printer paper. For part ordering information, see “Ordering Accessories and Supplies” on page E-1.

To change the printer paper:

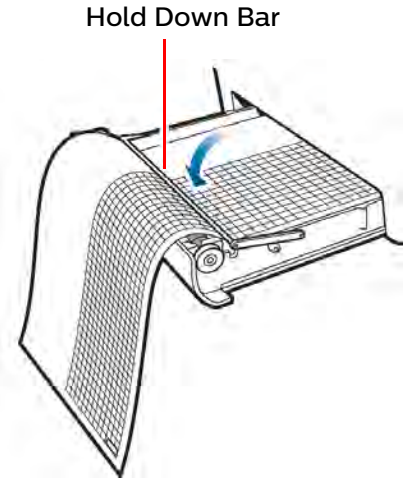
1. Open the paper drawer and remove any remaining sheets. Lift up the paper hold down bar.



2. Insert a new pack of printer paper with the printed side facing up. Make sure that the hole for the paper sensor is positioned as shown below.



3. Drape the first sheet over the roller and place the paper hold down bar on top of the paper.



4. Close the paper drawer.

Battery Maintenance and Care

The PageWriter TC30 cardiograph uses either one or two removable lithium ion batteries that supply power to the cardiograph during mobile use.

For optimal battery performance:

- When operating the PageWriter TC30 cardiograph with two batteries installed, ensure that both batteries contain the same Philips part number, 989803194541. The battery part number identification label is found on the bottom of the battery. The cardiograph cannot operate with two batteries that contain different part numbers. If the cardiograph is operated with two batteries with different part numbers, the cardiograph will display an error message.

- Before initial use, fully charge the batteries for five hours before operating the cardiograph without AC power. Regularly and consistently charging the batteries will prolong battery life. Check the battery power indicator on the Status Bar. Tap the battery icon on the Status Bar for information on remaining battery power. See Figure 5-3, “Battery Power Indicator on the Status Bar,” on page 5-13.
- Always charge the batteries when the cardiograph is not in use. Plug the cardiograph into AC power. Ensure that the green AC power indicator light on the front of the cardiograph is lit. The batteries will charge while the cardiograph is in use, but will charge at a slower rate.

Note:

The batteries will not charge if the cardiograph is powered off.

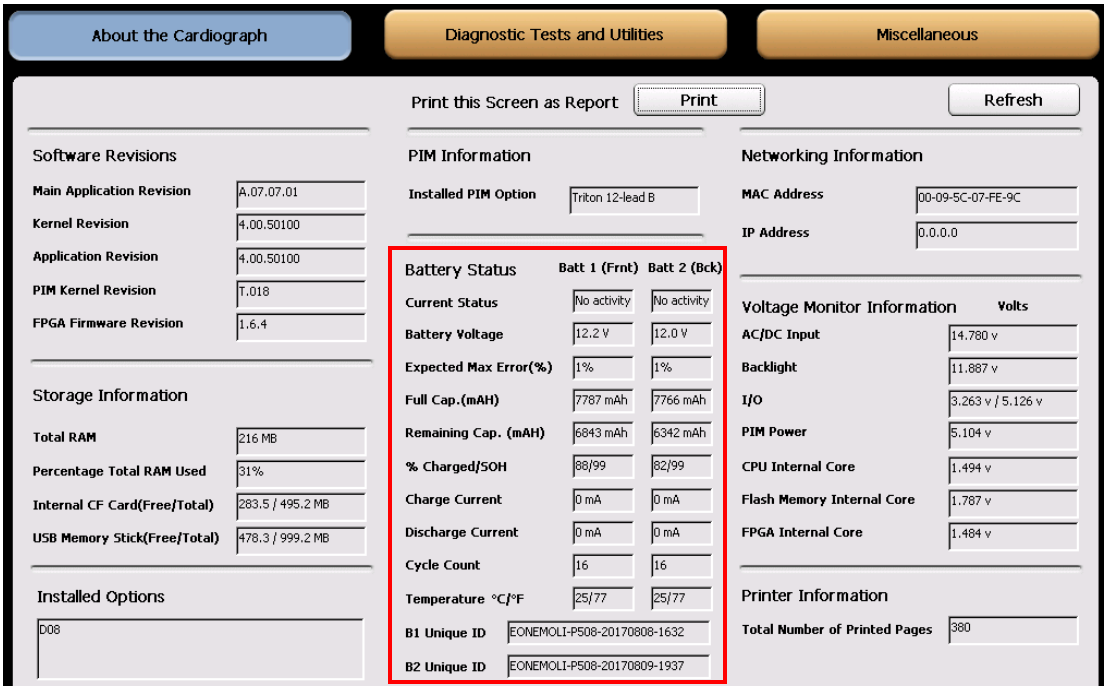
- Operate the cardiograph, charge the batteries, and store the batteries at a room temperature of 25 ^{O}C (77 ^{O}F) or lower. Exposure to higher temperatures may reduce battery life, damage the batteries, and degrade overall cardiograph performance.

Viewing Battery Information

As a battery ages, its capacity decreases, and the battery status indicator becomes increasingly less accurate as the total number of charges and discharges increase. You can view information about the battery on the **About the Cardiograph** screen. Ensure that the monitor is connected to AC power before attempting to view battery information.

To access the About the Cardiograph screen:

1. From the Main screen, touch **Setup**. The Setup and Services main screen appears.
2. Touch the button next to **Service Utilities**. The Setup and Service Utilities screen appears.
3. Touch the **About the Cardiograph** tab.



Note:

If only one battery is installed, information will not be displayed for the empty battery compartment.

Battery information displayed on the **About the Cardiograph** screen includes:

Current Status: displays the current status of the battery: No Bat (no battery), No activity, Charging, Discharging.

Battery Voltage: the voltage of the battery.

Expected Max Error (%): the expected margin of error in the state of the charge calculation.

Full Cap. (mAh): the predicted capacity of the battery when it is fully charged. The value in the Full Cap. field decreases as the battery ages.

Remaining Cap. (mAh): shows the remaining capacity, in mAh, of the battery.

% Charged/SOH: the relative state of charge and the current state of health (SOH) expressed as a percentage.

Charge Current: current value while the battery is charging.

Discharge Current: current value while the battery is discharging.

Cycle Count: the number of full charge and discharge cycles calculated by the battery.

Temperature: current temperature of the battery in degrees Celsius/degrees Fahrenheit.

B1 Unique ID: battery ID information, including battery vendor information, battery device name, battery date of manufacture (YYYYMMDD, e.g., 20170808) and battery serial number.

B2 Unique ID: battery ID information, including battery vendor information, battery device name, battery date of manufacture (YYYYMMDD, e.g., 20170808) and battery serial number.

Caution

If a battery exceeds the recommended limit of 300 cycles, or the battery's state of health (SOH) has decreased to 80 percent, the battery should be replaced as soon as possible.

Replacing the Batteries

WARNING

Properly dispose of or recycle depleted batteries according to local regulations. Do not disassemble, puncture, or incinerate the disposed batteries.

WARNING

Carefully follow the instructions for replacing the batteries. Only use batteries with approved Philips part numbers.

WARNING

Incorrect replacement of lithium batteries or fuel cells or replacement by inadequately trained personnel could result in an unacceptable risk (e.g., excessive temperatures, fire, explosion).

Caution

- **Before removing and replacing the batteries from the cardiograph, press down and hold the On/Standby button (located on the front of the cardiograph), to shut down the cardiograph. Ensure that the cardiograph is shut down. When the cardiograph is fully**

shut down, the screen is black, and the On/Standby button is not illuminated. Once the cardiograph is shut down, proceed to remove and replace the batteries.

- **When removing the batteries from the cardiograph, the batteries could feel warm to the touch.**
- **If replacing only one battery, always ensure that the PN of the new battery matches the PN of the battery that is already installed. If the PNs of both batteries do not match, the cardiograph will not operate.**
- **In order to avoid potential negative impact to batteries due to electrostatic discharge, do not touch the area around the battery connector pins when holding the batteries during maintenance or replacement.**

How often the batteries should be replaced depends on how well the batteries are maintained and how much the cardiograph is used. If the batteries are fully charged but loses significant power after only a few ECGs, consider replacement. For information on ordering replacement batteries, see “Ordering Options and Upgrades” on page E-6.

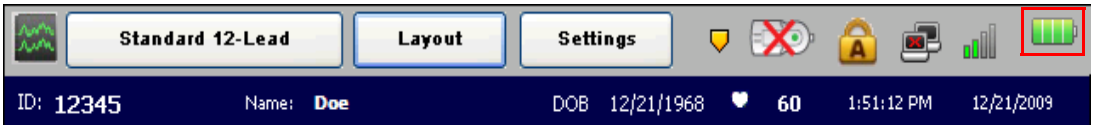
To install the batteries:

▶ See “Installing the Batteries” on page 1-19.

Battery Calibration

Battery calibration may be necessary to enhance the accuracy of the battery level indicator that appears on the Status Bar. If the accuracy of this indicator is affected, the other battery indicators included on the Battery Status window (opened by tapping the battery icon on the Status Bar) may also be less accurate.

Figure 5-3 Battery Power Indicator on the Status Bar



The recommended intervals for battery calibration are dependent upon factors in your clinical use model. When the battery power indicators are not functioning so that they are useful in your daily work environment, Philips recommends calibrating the batteries following the procedure described in this section.

The battery calibration procedure requires that the cardiograph be taken out of active use for up to 36.5 hours.

To calibrate the batteries on the cardiograph:

1. Attach the AC power cord to the cardiograph. Ensure that the AC power supply is connected to a grounded electrical outlet and that the cardiograph is receiving AC power. Check that the AC power indicator light (located next to the power button) is lit.
2. Fully charge the batteries (8 hours maximum).
3. To ensure that the batteries are fully charged, view the **Charge Current** field in the Service Utility. Touch the **Setup** button on the tool bar. Select the Service Utility from the Configuration Setup and Service Utilities main menu.

   Note: *Accessing the Service Utility may require entering a password. If a password is lost and cannot be retrieved, contact Philips Customer Service for assistance (see page E-8).*
4. From the Service Utility screen, ensure that the **About the Cardiograph** button is selected (top of screen). A selected button is highlighted in blue.
5. Underneath the **Battery Status** column (middle of screen), check that the **Charge Current** field displays **0 mA**, ensuring that the **batteries** are fully charged.

   Note: *For devices with battery PN 989803194541, the battery should remain in fully charged status for 5.25 hours or longer.*
6. Touch the **Print** button (top of screen) to print out a report of the cardiograph settings displayed on this screen.
7. Touch the **Exit** button (lower right hand corner of screen). Touch the **Exit** button again on the Setup main menu.
8. Once the Main screen appears, touch the **ID** button to open the ID entry screen. Ensure that the ID screen remains open.
9. Unplug the cardiograph from AC power. Ensure that the AC power indicator light (located next to the power button) is *not* lit.
10. Keep the ID screen displayed and allow the batteries to deplete of all battery power. This process will take approximately 18 hours (maximum) to complete. When the batteries are depleted of all power, the screen is black and the cardiograph cannot be returned to active use by touching the power button.

    Note: *For devices with battery PN 989803194541, the battery should remain in fully discharged status for 5.25 hours or longer.*

11. Once the batteries are fully depleted, reconnect the cardiograph to AC power. Press the On/Standby button to power on the cardiograph in order to confirm successful calibration. Afterward, charge the batteries fully before returning the cardiograph to active use.
12. On the Main screen, touch the **Setup** button.
13. Select the Service Utility from the Configuration Setup and Service Utilities main menu.
14. From the Service Utility screen, ensure that the **About the Cardiograph** button is selected (top of screen). A selected button is highlighted in blue.
15. Underneath the **Battery Status** column, check the **Expected Max Error (%)** and **Full Capacity (mAh)** values as viewed on the screen are different than the values printed on the report generated from the Service Utility screen. If the values are different, the battery calibration procedure is complete.

Note:

If the **Expected Max Error (%)** *field has not been reset to 2%, another calibration procedure may be necessary.*

Patient Interface Module (PIM) Test

This test is used to confirm that the Patient Interface Module (PIM) is communicating with the cardiograph. This test can be performed when the cardiograph displays PIM error messages, or when the cardiograph is unable to acquire data from the PIM. Be sure that the PIM patient data cable is securely attached to the PIM connector on the rear of the cardiograph before performing the test.

If this test fails, it may indicate a problem with the PIM or with the PIM patient data cable.

To perform the PIM Test:

1. Ensure that the patient data cable is securely attached to the PIM connector () on the rear of the cardiograph. Ensure that the PIM disconnected icon () does not appear on the Status Bar (top of screen).

2. Touch the **Setup** button on the bottom tool bar. The Configuration Setup and Service Utilities menu appears.
3. Touch **Configure Cardiograph Default Settings**. On the Default Cardiograph Settings screen, touch the **Maintenance Test** button (upper right side of screen).
4. The Maintenance Test screen appears. Touch the **Patient Interface Module (PIM) Test** button. The PIM test automatically starts and the results appear on the screen. The **Patient Interface Module (PIM) Test** window reports the **PIM Option**, the currently installed software **PIM Kernel Version**, and whether the PIM Test has failed or passed. If the message **PIM Test Passed** appears, the PIM is communicating properly with the cardiograph.
5. Touch the **Close** button to close the window.
6. If the message **PIM Test Failed** appears, check that the PIM patient data cable is securely attached to the PIM connector on the rear of the cardiograph. If the error message persists, contact Philips Customer Service or your certified dealer for assistance.

Ping Test

The Ping Test is used with a wireless or wired network connection to verify that the cardiograph can successfully communicate over a network connection to an entered IP address.

To perform the Ping Test:

1. Ensure that the LAN cable is securely attached to the LAN connector on the rear of the cardiograph, or that the wireless LAN connection is associated to an access point and that green bars appear on the Status bar (top of screen), indicating a live wireless connection.



2. Touch the **Setup** button on the bottom tool bar. The Configuration Setup and Service Utilities menu appears.
3. Touch **Configure Cardiograph Default Settings**. On the Default Cardiograph Settings screen, touch the **Maintenance Test** button (upper right side of screen).
4. On the Maintenance Test screen, touch the **Ping Test** button. The Ping Test window appears.

5. Enter the IP address to ping. Touch the **Ping** button.
6. The Ping Test results window appears and reports the test results.

Lead Wire Performance Test

The Lead Wire Performance Test should be run on a weekly basis. This test examines all of the lead wires for shortages and reports the results. Any lead that is reported as having a shortage must be replaced.

To perform the Lead Wire Performance Test:

1. Ensure that the patient data cable is securely attached to the PIM connector () on the rear of the cardiograph. Ensure that the PIM disconnected icon () does not appear on the Status Bar (top of screen).
2. Disconnect the leads from a patient or patient simulator before starting the test.
3. Touch the **Setup** button on the bottom tool bar. The Configuration Setup and Service Utilities menu appears.
4. Touch **Configure Cardiograph Default Settings**. On the Default Cardiograph Settings screen, touch the **Lead Wire Performance Test** button.
5. The Lead Wire Performance Test window appears with the message **Checking Leadwires...**. At the conclusion of the test, any lead wire shortages are identified on the same window.
6. Replace any leads that are identified as having a lead wire shortage. Touch the **Close** button when done.

Lead Wire Performance Test Reminder

You can configure the cardiograph to provide a reminder that a lead wire performance test must be run. By default, the reminder is set to **OFF**. However, you may configure the reminder to occur either one week or three weeks after the last lead wire performance test was run. The PageWriter TC Cardiograph's status bar will display an orange wrench icon if the configured time has elapsed after the cardiograph has run a lead wire performance test.



Touch the wrench icon to bring up a dialog box that asks if you want to run the lead wire performance test. Touch “Yes” in the dialog box to run the test as described in the instructions for use provided with the cardiograph. If the test runs, regardless of the results of the test, the wrench icon disappears. If the test fails to run, the wrench icon remains until the cardiograph is able to complete a test.

Cardiograph and Accessory Disposal

When the cardiograph has reached the end of its product life, dispose of it according to local ordinances. When any of the cardiograph accessories reach the end of their product life, dispose of these items in accordance with manufacturer instructions and local ordinances.

Maintaining the Touch Screen

The touch screen may require occasional maintenance, including calibration and cleaning.

Touch Screen Calibration

The touch screen may be calibrated at any time. Calibration is recommended if it requires many attempts to select an item on the screen, or if selecting items on a specific area of the screen is difficult.

The touch screen may also require calibration if the cardiograph is used in different settings (seated instead of standing) or by users of significantly different height. The touch screen may need to be recalibrated to work optimally in the new setting or with the new user.

To calibrate the touch screen:

1. From any screen, touch the **Ctrl** + **Alt** + **C** keys (on keyboard) at the same time. Or, touch the **Setup** button on the tool bar (accessing the Setup screens may require entering a password). On the following screen, touch **Configure Cardiograph Default Settings**. Touch the **Maintenance Test** button (top right of screen), and then touch **Touch Screen Calibration and Test**.

2. A white screen appears with a cross hair (center of screen). Touch the middle of the cross hair where the two lines intersect. When the cross hair is touched it moves to a new location. Continue to touch the center of the cross hair.
3. Tap the screen (when a message appears) to end the test.

Touch Screen Cleaning

The touch screen may require occasional cleaning.

To clean the touch screen:

1. Dampen a soft cloth with water or with isopropyl alcohol.
2. Wring excess moisture from the cloth.
3. Wipe the touch screen area clean. Allow the touch screen to dry completely before use.
4. Perform the Touch Screen Calibration test (see page 5-18) to optimize performance.

Changing the Date and Time

The date and time that displays on the cardiograph may be changed manually, or may be configured to automatically synchronize with a specified IntelliSpace ECG server using the Time Synchronization feature. For more information on configuring the Time Synchronization feature on the cardiograph, see the *PageWriter TC Cardiograph Network Configuration Guide* on the *PageWriter TC User Documentation DVD*.

Follow the procedure below to manually set the date or time.

Note:

Opening the Setup screens may require entering a password. If a password is lost and cannot be retrieved, call Philips Customer Service or your certified dealer for further assistance.

To set the date and time:

1. On the Archive or Setup screen, touch the date or time setting at the top of the display.



   The Date and Time Settings window appears with the current specified date and time displayed. To change the current date, touch the back or forward arrows next to the name of the displayed month (to change the month), or touch a date on the calendar to change the date within the displayed month.

   Note: *You can also access time settings on the* **Edit/Delete Remote Site** *tab. Under* **Time Synchronization Settings** *(middle of screen), touch the* **Sync** *button next to* **Manual Time Sync**.

2. To change the displayed time, touch the hour and minutes displayed under **Current Time**, or touch the up or down arrow buttons next to the displayed time to manually change the time. Touch the time designator to change it to **AM** or to **PM**.

3. Touch the dropdown arrow button under **Time Zone** to change the selected time zone.

   Notes:

   - *The time displayed on the cardiograph automatically adjusts for Daylight Savings Time, if this functionality is enabled.*
   - *Touch the* **Sync** *button to manually synchronize the cardiograph date and time with a specified IntelliSpace ECG server.*

4. Touch the **OK** button when done. Touch the **Exit** button (lower right corner of screen) to exit the Setup screen. The new time and date are immediately applied.

Replacing the Cardiograph Fuse

The AC fuse needs to be replaced when the cardiograph is plugged into AC power, but the green AC power on indicator light does not illuminate.

WARNING

Disconnect the AC power cord before replacing the fuse.

WARNING

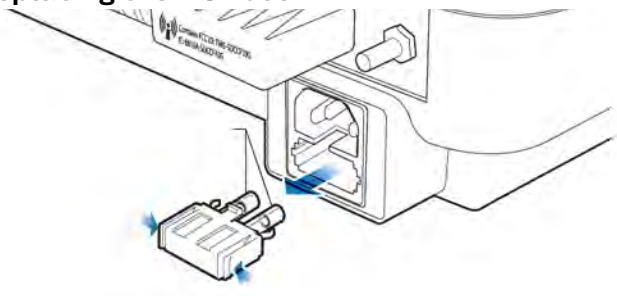
Real-time clock information within the cardiograph may be lost if both the external AC power source and internal battery are disconnected for more than five minutes.

Figure 5-4 AC power on indicator light on cardiograph



Only use replacement AC fuses with Philips part number 453564131221, or use a 1.6 amp (250V) time-delay fuse the same size and configuration as the original fuse.

Figure 5-5 Replacing the AC Fuse



To replace the AC fuse:

1. Unplug the cardiograph from AC power. Pull out the AC power cord from the AC power connector on the rear of the cardiograph.
2. Locate the AC fuse, which is directly below the AC power connector.
3. Push on both ends of the fuse and pull out the fuse from the fuse holder slot.
4. Insert the new fuse using the same orientation.
5. Push the fuse all the way into the fuse holder slot. The fuse snaps into place.

A

Suppressed Borderline Interpretive Statements

Introduction

This Appendix includes a listing of all borderline interpretive statements that are suppressed using the *Borderline Statement Suppression* feature that is available with the Philips DXL ECG Algorithm. This feature is used to exclude interpretive statements that indicate a borderline or otherwise normal condition from appearing on the ECG report. Borderline interpretive statements are generated by measurements that are above an abnormal threshold, but may in fact indicate a non-pathological condition. These statements indicate to the clinician that a condition may be present, but there is no decisive indicator. These statements often include the terms “minimal,” “consider,” or “borderline.”

For more information on the Philips DXL Algorithm, see the *Philips 16-Lead Algorithm Physican’s Guide,* available on the *PageWriter TC User Documentation DVD*, or may be downloaded from the Philips InCenter web site (incenter.medical.philips.com). For information on using the Philips InCenter web site, see page ii.

Note:

*The symbol *** in an interpretive statement is replaced with a numeric value on the ECG report.*

Exclude Low Certainty Suppressed Statements

The following interpretive statements listed in Table A-1 are suppressed when the **Exclude Low Certainty** setting is selected under the **Algorithm/Pacing** button on the Setup, Default Cardiograph Settings screen.

Table A-1 Exclude Low Certainty - Suppressed Statements

Statement Code	Interpretive Statement
BAVCD	Borderline prolonged PR interval.....PR > ** , V-rate ** - **
BIVCD	Borderline intraventricular conduction delay.....QRSd > ** mS
CLAE	Consider left atrial enlargement.....wide or notched P waves
CRAE	Consider right atrial enlargement.....P >0.24mV limb lead
ET	Abnormal R-wave progression, early transition.....QRS area>0 in V2
ETRSR1	RSR' in V1 or V2, right VCD or RVH.....QRS area positive & R' V1/V2
LOWT	Borderline T wave abnormalities.....flat T
LT	Abnormal R-wave progression, late transition.....QRS area <0 in V5/V6
LVHQ	Consider left ventricular hypertrophy.....deep Q in V5-6 or II III aVF
LVOLFB	Borderline low voltage, extremity leads.....all extremity leads <0.6mV
NFAD	No further analysis attempted due to paced rhythm
NFRA	No further rhythm analysis attempted due to paced rhythm
QMAB	Artifact in lead(s) ** and baseline wander in lead(s) **
QMART	Artifact in lead(s) **
QMBW	Baseline wander in lead(s) **
REPB	Borderline repolarization abnormality....ST dep & abnormal T
RSR1	RSR' in V1 or V2, probably normal variant.....small R' only

Table A-1 Exclude Low Certainty - Suppressed Statements *(continued)*

Statement Code	Interpretive Statement
RSRNV	RSR′ in V1, normal variation.....term-vector post-rightward
SDALP	Nonspecific ST depression, anterolateral lds.....ST <-0.10mV, I aVL V2-V6
SDANP	Nonspecific ST depression, anterior leads.....ST <-0.10mV, V2-V5
SDCU	Minimal ST depression.....ST concave upward
SDINP	Nonspecific ST depression, inferior leads.....ST <-0.10mV, II III aVF
SDJ	Junctional ST depression.....ST <-0.10mV any 3 leads
SDM	Minimal ST depression.....ST <-0.05mV in 2 leads
SEALP	ST elevation, prob normal variation, ant-lat.....ST >0.15 mV, I aVL V2-V6
SEANP	ST elev, probably normal variation, ant leads.....ST>0.15mV, V2-V5
SEINP	ST elevation, probably normal variation, inf.....ST>0.15mV, II III aVF
SPRB	Borderline short PR interval.....PR int < ** mS
TAXAB	Borderline T wave abnormalities...T axis not between (-10,100)
TAXQT	Borderline T wave abnormalities.....QRS-T axis angle (91,180)
TTW1	Tall T, probably normal variant, ant-lat lds.....T >1.0mV, I aVL V2-V6

Exclude All Suppressed Statements

The interpretive statements listed in Table A-1, “Exclude Low Certainty - Suppressed Statements,” on page A-2, and the interpretive statements listed in Table A-2, “Exclude All Setting - Suppressed Statements,” on page A-4, are suppressed when the **Exclude All** setting is selected under the **Algorithm/ Pacing** button on the Setup, Default Cardiograph Settings screen.

Table A-2 Exclude All Setting - Suppressed Statements

Statement Code	Interpretive Statement
ANTQ	Abnormal Q wave in V1.....Q >15mS in V1
AXL	Borderline left-axis deviation.....QRS axis (** , **)
AXR	Borderline right-axis deviation.....QRS axis (** , **)
BIVCDL	Borderline IVCD with LAD.....QRSd > ** mS, axis(-90,-30)
CRHPI	Consider RVH or posterior infarct.....large R in V1
CRHPIR	Consider RVH or PMI w/ sec repol abnormality....large R V1, repol abnormality
RPMIC	Tall R wave in V2, consider RVH or PMI.....R/S ratio >3, T >0.30mV V1 V2
CRVH	Consider right ventricular hypertrophy.....large R or R′ V1/V2
INFQ	Abnormal inferior Q waves.....Qs add to 80 mS in II III aVF
IQNV	Inferior Q waves, probably normal variation....Q >30mS, age <21 male, <30 female
IRBBRV	IRBBB, the RSR′ pattern may also reflect RVH...IRBBB, R or R′ >0.5mV in V1-V3
LATQ	Abnormal lateral Q waves.....Q >35mS, I aVL V5 V6
LQNV	Lateral Q waves, probably normal variation...Q >35mS, age<31 male, <40 female
LQTB	Borderline prolonged QT interval.....QTc > ** mS
LVHR56	LVH by voltage.....R >*.***mV in V5 or V6

Table A-2 Exclude All Setting - Suppressed Statements *(continued)*

Statement Code	Interpretive Statement
LVHR6	LVH by voltage.....R >*.***mV in V6
LVHRS	Consider left ventricular hypertrophy.....RV6+SV1 >*.***mV
LVHRSI	LVH by voltage.....(R I+S III) >*.***mV
LVHS12	LVH by voltage.....S <*.*** in V1 or *.*** in V2
LVHTA	Consider left ventricular hypertrophy...prominent leftward forces
LVHV	LVH by voltage.....R >*.*** in aVL
MSTEA	Minimal ST elevation, anterior leads.....ST >0.10mV, V1-V4
MSTEAL	Minimal ST elevation, anterolateral leads.....ST >0.08mV, I aVL V2-V6
MSTEI	Minimal ST elevation, inferior leads....ST >0.06mV, II III aVF
MSTEL	Minimal ST elevation, lateral leads...ST >0.06mV, I aVL V5 V6
PLAE	Probable left atrial enlargement.....P >50mS, <-0.10mV V1
PQAL	Borderline Q wave in anterolateral leads.....Q >35mS, I aVL V3-V6
PQAN	Borderline Q wave in anterior leads.....Q >30mS in V2-V5
PQIN	Borderline Q waves in inferior leads.....Qs add to 80 mS in II III aVF
PQLA	Borderline Q waves in lateral leads...Q >35mS in I aVL V5 V6
PRAE	Probable right atrial enlargement....biphasic P >0.20 mV in V1
REPBAL	Borderline repol abnormality, ant-lat leads.....ST dep, T flat/neg, I aVL V2-V6
REPBAN	Borderline repol abnormality, ant leads.....ST dep, T flat/neg, V2-V4
REPBIL	Borderline repol abnormality, inf-lat leads.....ST dep, T flat/neg, inf/lat

Table A-2 Exclude All Setting - Suppressed Statements *(continued)*

Statement Code	Interpretive Statement
REPBIN	Borderline repol abnormality, inferior leads.....ST dep, T flat/neg, II III aVF
REPBLA	Borderline repol abnormality, lateral leads.....ST dep, T flat/neg, I aVL V5 V6
RVHS5	Consider right ventricular hypertrophy.....deep S in V5
RVHS6	Consider right ventricular hypertrophy.....deep S in V6
SD0AL	Minimal ST depression, anterolateral leads.....ST <-0.04mV, I aVL V2-V6
SD0AN	Minimal ST depression, anterior leads....ST <-0.03mV, V2-V4
SD0IN	Minimal ST depression, inferior leads...ST <-0.04mV, II III aVF
SD0LA	Minimal ST depression, lateral leads.....ST <-0.04mV, I aVL V5 V6
SD0NS	Minimal ST depression.....ST <-0.04mV, T neg, any 2 leads
SPR	Short PR interval.....PR < ** mS
SQT	Short QT interval.....QTc <340mS
T0AL	Borderline T abnormalities, ant-lat leads.....T flat/neg, I aVL V2-V6
T0AN	Borderline T abnormalities, anterior leads...T flat or neg, V2-V4
T0IN	Borderline T abnormalities, inferior leads.....T flat/neg, II III aVF
T0LA	Borderline T abnormalities, lateral leads.....T flat/neg, I aVL V5 V6
T0NS	Borderline T wave abnormalities.....T/QRS ratio < 1/20 or flat T
TTW30	Tall T waves, probably normal variant....T >1.2mV, age 16-30

B

Critical Value Statements

This Appendix includes a listing of all interpretive statements generated by the Philips DXL ECG Algorithm that will result in a *Critical Value* statement appearing on the ECG report. Use of the Critical Values feature makes it simple to align with the Joint Commission's National Patient Safety Goals to improve the timeliness of reporting critical test results and their receipt by a responsible licensed caregiver. The Critical Values feature is a configurable option that summarizes four critical values for ECG interpretation using simple terminology. When appropriate, the DXL Algorithm outputs an emphasized statement to advise caregivers of the need for urgent care, with the goal of reducing time from discovery of a critical cardiac event to intervention.

Thirty interpretive statements are summarized in the following four Critical Values:

- Acute Myocardial Infarction
- Complete Heart Block
- Very High Heart Rate
- Acute Ischemia

Table B-1 through Table B-4 on the following pages provide a list of all of the interpretive statements that will generate a Critical Value. Multiple interpretive statements can trigger an individual Critical Value, and this Critical Value statement appears in the interpretive statement block on the ECG report, and a second notation also appears at the bottom right of the ECG report for additional emphasis.

For more information on the Philips DXL ECG Algorithm, see the *Philips 16-Lead Algorithm Physican's Guide* on the *PageWriter TC User Documentation DVD*, or download the file from the Philips InCenter web site (incenter.medical.philips.com). For information on using the Philips InCenter web site, see page ii.

Acute Myocardial Infarction Critical Value Statements

If any of the interpretive statements listed in Table B-1 result from the measurements generated by an ECG, the Critical Value statement **Acute MI** will appear on the ECG report.

Table B-1 Acute Myocardial Infarct Critical Value Statements

Statement Code	Interpretive Statement
AMIA	Anterior infarct, acute.....ST >0.25mV, V2-V5
AMIAP	Probable anterior infarct, acute.....ST >0.15mV, upright T, V2-V5
AMIPA	Anterior infarct, possibly acute.....ST >0.15mV, upright T, V2-V5
AMIAD	Anterior infarct, acute (LAD).....ST >0.25mV, V2-V5
AMIAPD*	Anterior infarct, acute (proxLAD).....ST >0.2mV, V2-V5
IMIAP	Probable inferior infarct, acute.....ST>0.10mV, II III aVF
IMIPA	Inferior infarct, possibly acute.....Q >30mS, ST >0.10mV, II III aVF
IMIA	Inferior infarct, acute.....ST>0.10mV, T upright, II III aVF
IMIAR	Inferior infarct, acute (RCA).....ST>0.10mV in III > II
IMIAX	Inferior infarct, acute (LCx).....ST>0.10mV, II III aVF, STd V1-V3
PMIA	Posterior infarct, acute.....ST<-0.1 V1-V3 or ST>.05 V7-V9
PMIAP	Probable posterior infarct, acute.....ST<-.05 V1-V3 or >.05 V7-V9
PMIAX	Posterior infarct, acute (LCx).....ST<-0.1 V1-V3 or ST>.05 V7-V9
IPMIA	Inferoposterior infarct, acute.....ST>.1 inf, <-.1 V1-3 or >.05 V7-9
IPMIAR	Inferoposterior infarct, acute (RCA).....ST>.1 inf, <-.1 ant
IPMIAX	Inferoposterior infarct, acute (LCx).....ST>.1 inf, <-.1 V1-3 or >.05 V7-9
LBBMIP*	Probable acute infarct and LBBB.....concordant ST
*** Philips DXL Algorithm version PH110C only.**	

Table B-1 Acute Myocardial Infarct Critical Value Statements *(continued)*

Statement Code	Interpretive Statement
LMIAP	Probable lateral infarct, acute.....Q >28mS, ST>0.10mV, V5 V6 I aVL
LMIPA	Lateral infarct, possibly acute.....Q >28mS, ST >0.10mV, V5 V6 I aVL
LMIA	Lateral infarct, acute.....ST >.10mV, V5 V6 I aVL
LMIAD	Lateral infarct, acute (LAD).....ST >.10mV, V5 V6 I aVL
ILMIA	Inferolateral infarct, acute.....ST>.10mV, inf-lat leads
ILMIAX	Inferolateral infarct, acute (LCx).....ST>.10mV, inf-lat leads
ILMIAR	Inferolateral infarct, acute (RCA).....ST>.10mV, inf-lat leads
ASMIAP	Probable anteroseptal infarct, acute.....ST>0.15mV, T upright, V1-V2
ASMIPA	Anteroseptal infarct, possibly acute.....Q>35mS, ST>0.15mV, V1-V2
ASMIA	Anteroseptal infarct, acute.....ST >0.20mV, V1-V2
ASMIAD	Anteroseptal infarct, acute (LAD).....ST >0.25mV, V1-V2
EAMIA	Extensive anterior infarct, acute.....ST >0.20mV, V1-V6
EAMIAD	Extensive anterior infarct, acute (LAD).....ST >0.20mV, V1-V6
EAMIPA	Extensive anterior infarct, possibly acute.....Q >35mS, ST >0.15mV, V1-V6
ALIAP	Probable anterolateral infarct, acute.....ST >0.15mV, V2-V6,I,aVL
ALIPA	Anterolateral infarct, possibly acute.....Q >35mS, ST >0.15mV, V2-V6,I,aVL
ALIA	Anterolateral infarct, acute.....ST >0.20mV, V2-V6, I, aVL
ALIAD	Anterolateral infarct, acute (LAD).....ST >0.20mV, V2-V6, I, aVL
*** Philips DXL Algorithm version PH110C only.**	

Table B-1 Acute Myocardial Infarct Critical Value Statements *(continued)*

Statement Code	Interpretive Statement
RMIAP	Probable right ventricular infarct, acute...ST>.08, V3R-V5R, aVR & STd in lat
RMIA	Right ventricular infarct, acute.....ST>.10, V3R-V5R, aVR & STd in lat
RMIAR	Right ventricular infarct, acute (RCA).....ST>.08, aVR V3R-V5R & STd lat lds
*** Philips DXL Algorithm version PH110C only.**	

Tachycardia Critical Value Statements

If any of the interpretive statements listed in Table B-2 result from the measurements generated by an ECG, the Critical Value statement **Very High Heart Rate** will appear on the ECG report.

Table B-2 Tachycardia Critical Value Statements

Statement Code	Interpretive Statement
ETACH	Extreme tachycardia.....V-rate >(220-age)
TACHW	Wide-QRS tachycardia V-rate>***, QRSd>***
VTACH	Extreme tachycardia with wide complex, no further rhythm analysis attempted

Complete Heart Block Critical Value Statements

If any of the interpretive statements listed in Table B-3 result from the measurements generated by an ECG, the Critical Value statement **Complete Heart Block** will appear on the ECG report.

Table B-3 Complete Heart Block Critical Value Statements

Statement Code	Interpretive Statement
3AVB	AV block, complete (third degree).....V-rate<***, AV dissociation
3AVBIR	Complete AV block with wide QRS complex.....V-rate<***, QRSd>***, AV dissoc
3AVBFF	A-flutter/fibrillation w/ complete AV block...A-rate>220, V-rate<***, AV dissoc

Acute Ischemia Critical Value Statements

If the interpretive statement listed in Table B-4 is generated by the measurements from a patient ECG, the Critical Value statement **Acute Ischemia** will appear on the ECG report.

Table B-4 Acute Ischemia Critical Value Statements

Statement Code	Interpretive Statement
LMMVD	Repol abnrm, severe global ischemia (LM/3VD) STe aVR, STd & Tneg, ant/lat/inf

C

Specifications

Technical Specifications

Cardiograph ECG Acquisition

- Simultaneous Lead Acquisition (up to 12 leads)
- Rhythm Strips (up to 12 selected leads)
- Event Marking (6 independent events can be marked for later review and analysis)
- Full Disclosure: five-minute history of up to 12 leads, complete ECG of any 10 seconds.
- Timed ECG

Keyboard

- 65 button, standard full alphanumeric capability keyboard
- Support for special characters
- Optional, silicone-based flexible membrane keyboard cover that protects keyboard from particulate and liquid ingress

Touch Screen Display

- 640 x 480 pixel resolution VGA with 18-bit/pixel color depth
- 5-wire, resistive touch screen

- 13.33 cm wide x 9.9 cm high (5.25 inches wide x 3.9 inches high, 6.5-inch diagonal) color liquid crystal touch screen display with backlight

Patient Interface Module

- Remote, microprocessor-controlled digital module
- ECG button with signal quality indicator allows user to take ECGs from the bedside

Patient Interface Module Signal Acquisition

8,000 samples per seconds on individual leads for 12 lead ECG

Signal Processing/Acquisition

Raw Sampling Rate

- 8,000 samples per seconds per electrode/lead
- 24-bit A/D conversion provides down sampled 97.5nV resolution

Sampling Rate

- 500 samples per second per electrode/lead
- 12-bit A/D conversion provides down sampled 5µV resolution

Auto Frequency Response

0.05-150 Hz, 0.15-150 Hz, 0.5-150 Hz
0.05-100 Hz, 0.15-100 Hz, 0.5-100 Hz
0.05-40 Hz, 0.15-40 Hz, 0.5-40 Hz

Rhythm Frequency Response

0.05-150 Hz, 0.15-150 Hz, 0.05-100 Hz,
0.15-100 Hz, 0.05-40 Hz, 0.15-40 Hz

Minimum Amplitude or Value of Patient Physiological Signal

Caution

The QRS wave must be a minimum of 100µV peak to peak or greater for the lead's complex to be measured. The operation of the cardiograph below this value may cause incorrect ECG analysis.

Filters

- AC noise (None, 50 Hz, 60 Hz)
- Baseline Wander (OFF, ON)
- Artifact (OFF, ON)
- Low-pass (40 Hz, 100 Hz, 150 Hz)
- High-pass (0.05 Hz, 0.15 Hz, 0.5 Hz)

Printer

Printer Resolution

- High-resolution, digital-array printer using thermal-sensitive paper
- 200 dpi (voltage axis) by 500 dpi (time axis) at 25 mm/sec

Report Formats

Exam Profiles

Up to 12 configured Exam Profiles can be specified

12 Lead Report Formats

- 3x4 (1R, 3R)
- 3x4, 1R 8ST
- 3x4, 1R 10ST
- 3x4, 3R ST

- 3x5, 1R ST
- 4x4 1R ST
- 6x2
- 6x2, 1R
- Panoramic 12 (Cabrera sequence only)
- 12x1
- Extended Measurements
- Vector ECG

Rhythm Report Formats

Rhythm (up to 12 selected leads)

STEMI Diagnostic Aids

- Polar ST Maps with frontal and transverse planes available on two ECG report formats
- STEMI-CA criteria
- Critical Values

Battery Operation

SMBus compliant batteries

Battery Capacity

7800 mAh (per battery)

Battery Voltage

9.0 to 12.6 VDC

Battery Discharging Current

6.0 A max per battery (continuous)

Power

54 W max (continuous)

Capacity

- Typically 50 ECGs and copies on a single battery or 40 minutes of continuous rhythm recording
- Fully charged single battery is to last up to 5 hours under normal usage

Status Display

- Full Charge Capacity (mAh)
- Remaining Capacity (%)
- Temperature (deg C)
- Discharge Current (mA)
- Charge Current (mA)
- Low battery audio and visual alerts

Recharge

With one battery:

- Less than 4 hours to at least 90% capacity.

With two batteries:

- Less than 8 hours to at least 90% capacity.

Network Connection

- 10/100 Base-T IEEE 802.3 Ethernet via RJ45 connector (standard)
- Optional software required for wireless LAN connection. Wireless LAN connection is 802.11 a/b/g/n compatible.

Barcode Reader (optional)

- Reads Code 39 (standard and full ASCII)
- Flexible field data entry

ECG Storage

- XML File Format in version 1.03, 1.04, 1.04.01, and 1.04.02
- Up to 200 ECGs to internal flash memory

- Up to 200 ECGs per USB Memory Stick (optional)
- Full fidelity at 500 Hz of all 10 seconds of all 12 leads

Orders and ADT

- Orders: Up to 200 pending orders can be stored on the cardiograph
- ADT: Full patient demographic information can be automatically retrieved

ECG File Formats

- XML (Schema 1.03 and 1.04, 1.04.01, 1.04.02)
- PDF

Power and Environment

Cardiograph AC Voltage

- Line Power: 100-240 Vac, 50/60 Hz, 1.2-0.6A
- Output: 15 Volts DC, 60W maximum

Cardiograph Environmental Operating Conditions

- 10° to 40 °C (50° to 104°F)
- 10% to 90% relative humidity (non-condensing)
- Up to 697 hpa (3,048 m/10,000 ft)

Cardiograph Environmental Transport and Storage Conditions

- -20° to 50 °C (-4° to 122°F)
- 10% to 90% relative humidity (non-condensing)
- Up to 572 hpa (4,572 m/15,000 ft)

Cardiograph Dimensions

Length	Width	Height	Weight
40.5 cm (16 in.)	31 cm (12 in.)	20.5 cm (8 in.)	<8.5 kg (19 lbs.)

PageWriter TC Cardiograph Shipping Container Weight

Maximum shipping weight of packaged PageWriter TC cardiograph (including all accessories) is 17.1 kg (37.69 lb)

Safety and Performance

Classification (IEC 60601-1)

PageWriter TC30 Cardiograph Class I (Internally Powered)

Symbol	Meaning
	ECG physio isolation is type CF, defibrillator proof. Suitable for all patient applications including direct cardiac application. System is in continuous operation.
IPX0	Cardiograph has ordinary protection against the entry of liquids.
IPX4	The PIM (patient interface module) is protected against splashing water. Water splashed against the PIM from any direction shall have no harmful effect.
• Cardiograph is not suitable for use in the presence of flammable anesthetic mixture with air, oxygen, or nitrous oxide. • System is continuous operation.	

WARNING

When using additional peripheral equipment powered from an electrical source other than the cardiograph, the combination is considered to be a medical system. It is the responsibility of the operator to comply with IEC 60601-1 system clauses and test the medical system according to the requirements. For additional information contact Philips.

Notes:

- *IEC 60601-2-25:2011 high frequency response is tested by methods A and E.*
- *The TC cardiograph is a digital system. Because of their sampling characteristics and the asynchronism between sample rate and signal rate, digital systems may produce a noticeable modulating effect from one cycle to the next, particularly in pediatric recordings. This phenomenon is not physiologic and must be understood by operators.*

Electromagnetic Compatibility (EMC)

Electronic devices can either generate or receive electromagnetic interference. The PageWriter TC cardiograph has been evaluated for electromagnetic compatibility (EMC) with the appropriate accessories according to Medical Collateral standard IEC 60601-1-2 (with exceptions noted in proceeding tables). This IEC standard has been adopted in the European Union as the European Norm, EN 60601-1-2.

WARNING

Radio frequency (RF) interference from nearby transmitting devices may degrade performance of the electronic equipment. Electromagnetic compatibility with surrounding devices should be assessed prior to using the equipment.

WARNING

Fixed, portable, and mobile radio frequency communications equipment can also affect the performance of electrical equipment. See your Service Provider for assistance with the minimum recommended separation distance between RF communications equipment and the PageWriter TC cardiograph.

WARNING

The use of accessories and cables other than those specified in the Philips PageWriter TC cardiograph service and user documentation can result in increased emissions or decreased immunity of the system.

WARNING

The PageWriter TC cardiograph should not be used next to or stacked on top of other equipment. If you must stack the product, you must check that normal operation is possible in the necessary configuration before the product is used.

Reducing Electromagnetic Interference

The PageWriter TC cardiograph and accessories may become sensitive to interference from other RF energy sources including power lines. RF energy sources include other medical devices, wireless devices, information technology equipment, and radio/television transmission. Should interference be encountered, as demonstrated by artifact on the ECG trace, unintended change on operating state, or unit lockup, attempt to locate the source by assessing:

- If the interference is intermittent or constant?
- Does the interference occur only in certain locations?
- Does the interference occur only when in close proximity to certain medical devices?
- Does the ECG signal quality change dramatically when the AC power cord is unplugged?

Once the source of the interference is located, attempt to attenuate the EMC coupling path by distancing the cardiograph from the source of the interference as much as possible. If further assistance is needed, contact Philips Customer Service or your certified dealer.

The PageWriter TC cardiograph has been evaluated in the Electromagnetic Environment listed in tables C-1 to C-4 based on Medical Collateral standard IEC 60601-1-2:2007, and in tables C-5 to C-9 based on Medical Collateral standard IEC 60601-1-2:2014.

Table C-1 PageWriter TC Cardiograph Guidance and Manufacturer's Declaration: Electromagnetic Emissions

The PageWriter TC cardiograph is intended for use in the electromagnetic environment specified in the table below. The customer or the user of the PageWriter TC cardiograph should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment: guidance
RF Emissions CISPR 11	Group 1	The PageWriter TC cardiograph uses RF energy only for its internal function. Therefore, its RF emissions are very low are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class B	The PageWriter TC cardiograph is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

Table C-2 Guidance and Manufacturer's Declaration: Electromagnetic Immunity

The PageWriter TC cardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the PageWriter TC cardiograph should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment: guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors should be constructed of wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast transient/burst IEC 61000-4-4	+/- 2 kV for power supply lines +/- 1 kV for input/ output lines	+/- 2 kV for power supply lines +/- 1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	+/- 1 kV differential mode +/- 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.

Table C-2 Guidance and Manufacturer's Declaration: Electromagnetic Immunity

The PageWriter TC cardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the PageWriter TC cardiograph should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment: guidance
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (>30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 seconds	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (>30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 seconds	Mains power quality should be that of a typical commercial or hospital environment. If the user of the cardiograph requires continued operation during power mains interruptions, it is recommended that the cardiograph be powered from an uninterruptable power supply or a battery.
Power frequency (50./60 Hz) magnetic field	3 A/m	Complies	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Note: U_T is the a.c. mains voltage prior to application of the test level.

Table C-3 Guidance and Manufacturer's Declaration: Electromagentic Immunity

The PageWriter TC cardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the PageWriter TC cardiograph should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment: guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the PageWriter TC cardiograph, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance: $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2,5 GHz Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/m	

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from surfaces, objects, and people.

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the PageWriter TC cardiograph is used exceeds the applicable RF compliance level above, the PageWriter TC cardiograph should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the PageWriter TC cardiograph.

b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Table C-4 Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the PageWriter TC Cardiograph: for equipment and systems that are not life-supporting

The PageWriter TC cardiograph is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the PageWriter TC cardiograph can help to prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the PageWriter TC cardiograph as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter (W)	Separation Distance According to Frequency of Transmitter (meters)	
0.01	150 KHz to 800 KHz	800 KHz to 2.5 GHz
	$d = 1.2 \sqrt{P}$	$d = 2.3 \sqrt{P}$
	0.1 m	0.2 m
0.1	0.4 m	0.7 m
1	1.2 m	2.3 m
10	4.0 m	7.0 m
100	12.0 m	23.0 m

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by the absorption and reflection from structures, objects, and people.

Table C-5 Electromagnetic Emissions

Phenomenon	Compliance	Electromagnetic Environment
RF Emissions	CISPR 11, Group 1, Class B	Professional healthcare facility environment
Harmonic distortion	IEC 61000-3-2 Class A	Professional healthcare facility environment
Voltage fluctuations and flicker	IEC 6100-3-3	Professional healthcare facility environment

Table C-6 Enclosure Port

Phenomenon	Compliance	Immunity Test Levels Professional Healthcare Facility Environment
Electrostatic discharge	IEC 61000-4-2	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air
Radiated RF EM field	IEC 61000-4-3	3 V/m 80 MHz – 2.7 GHz 80% AM at 1 kHz
Proximity fields from RF wireless communications equipment	IEC 61000-4-3	Refer to table C-7
Rated power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz

Table C-7 Proximity fields from RF wireless communications equipment

Test Frequency (MHz)	Band (MHz)	Immunity Test Levels Professional Healthcare Facility Environment
385	380 –390	Pulse modulation 18 Hz, 27 V/m
450	430 –470	FM, ±5 kHz deviation, 1 kHz sine, 28 V/m
710	704–787	Pulse modulation 217 Hz, 9 V/m
745		
780		
810	800–960	Pulse modulation 18 Hz, 28 V/m
870		
930		
1720	1700–1990	Pulse modulation 21 Hz, 28 V/m
1845		
1970		

Table C-7 Proximity fields from RF wireless communications equipment *(continued)*

Test Frequency (MHz)	Band (MHz)	Immunity Test Levels Professional Healthcare Facility Environment
2450	2400–2570	Pulse modulation 217 Hz, 28 V/m
5240	5100–5800	Pulse modulation 217 Hz, 9 V/m
5500		
5785		

Table C-8 Input AC Port

Phenomenon	Basic EMC Standard	Immunity Test Levels Professional Healthcare Facility Environment
Electrical fast transients/burst	IEC 61000-4-4	±2 kV 100 kHz repetition frequency
Surges line-to-line	IEC 61000-4-5	±0.5 kV, ±1 kV
Surges line-to-ground	IEC 61000-4-5	±0.5 kV, ±1 kV, ±2 kV
Conducted disturbances induced by RF fields	IEC 61000-4-6	3 V, 0.15–80 MHz 6 V in ISM bands between 0.15 and 80 MHz 80% AM at 1 kHz
Voltage dips	IEC 61000-4-11	0% U_T; 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°
		0% U_T; 1 cycle and 70% U_T; 25/30 cycles Single phase at 0°
Voltage interruptions	IEC 61000-4-11	0% U_T; 250/300 cycles

Table C-9 Signal Input/Output Port

Phenomenon	Basic EMC Standard	Immunity Test Levels Professional Healthcare Facility Environment
Electrostatic discharge	IEC 61000-4-2	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air
Conducted disturbances induced by RF fields	IEC 61000-4-6	3 V, 0.15–80 MHz 6 V in ISM bands between 0.15 and 80 MHz 80% AM at 1 kHz

Wireless LAN Option Specifications

The specifications in the following sections are applicable to the wireless adapters that are offered as options for the PageWriter TC3050 and TC70 cardiographs.

- Option D21, Summit SDC-CF20G wireless adapter (available only for upgrade);
- Option D24, Summit SDC-MSD40NBT wireless module.

Note:

The D21 option is no longer provided with new cardiographs. It is available for purchase only as an upgrade option.

Physical Dimensions/Characteristics

	D21	D24
Length	72.8 mm (2.87 inches)	79.6 mm (3.13 in)
Width	43 mm (1.69 inches)	42 mm (1.65 inches)
Thickness	Card body: 3.3 mm (0.13 inches) Antenna: 7.3 mm (0.29 inches)	11.9 mm (0.47 inches)
System Interface	16-bit Compact Flash Type I with 50-pin connector	Standard SDIO Interface

Physical Dimensions/Characteristics (continued)

	D21	D24
Operating Temperature	-30 to 75°C (-22 to 167°F)	10 to 40°C (50 to 104°F)
Operating Humidity	10 to 90% (non-condensing)	10 to 90% (non-condensing)

Network Specifications

	D21	D24
Network Standards	802.11b,g	802.11a,b,g,n
Operating Channels	FCC: 11 (3 non-overlapping) ETSI: 13 (3 non-overlapping)	**2.4 GHz** • ETSI: 13 (3 non-overlapping) • FCC: 11 (3 non-overlapping) • KCC: 13 (3 non-overlapping) **5 GHz:** • ETSI: 19 non-overlapping • FCC: 23 non-overlapping • KC: 23 non-overlapping
Transmit Power **Note:** *Maximum transmit power will vary according to individual country regulations. All values nominal, +/- 2 dBm.*	**DSSS OFDM** • 19 dBm (80 mW) • 17 dBm (50 mW) • 15 dBm (30 mW) • 10 dBm (10 mW) • 0 dBm (1 mW) **OFDM** • 15 dBm (30 mW) • 10 dBm (10 mW) • 0 dBm (1 mW)	**802.11a** • 6 Mbps 16 dBm (40 mW) • 54 Mbps 14 dBm (25 mW) **802.11b** • 1 Mbps 17 dBm (50 mW) • 11 Mbps 16 dBm (40 mW) **802.11g** • 6 Mbps 15 dBm (32 mW) • 54 Mbps 13 dBm (20 mW) **802.11n (2.4 GHz)** • 6.5 Mbps (MCS0) 15 dBm (32 mW) • 65 Mbps (MCS7) 11 dBm (13 mW) **802.11n (5 GHz)** • 6.5 Mbps (MCS0) 16 dBm (40 mW) • 65 Mbps (MCS7) 13 dBm (20 mW)

Network Specifications (continued)

	D21	D24
Frequency Band	**2.4 GHz Operating Channels** • ETSI: 2.4 to 2.483 GHz • FCC: 2.4 to 2.473 GHz	**WiFi 2.4 GHz Frequency Bands** • ETSI: 2.4 to 2.483 GHz • FCC: 2.4 to 2.483 GHz • KC: 2.4 to 2.483 GHz **WiFi 5 GHz Frequency Bands** • ETSI: – 5.15 to 5.35 GHz – 5.47 to 5.725 GHz • FCC: – 5.15 to 5.35 GHz – 5.47 to 5.725 GHz – 5.725 to 5.85 GHz • KC: – 5.15 to 5.35 GHz – 5.725 to 5.82 GHz
Maximum Output Power for Each Frequency		18.00 dBm, 2.412 to 2.472 GHz 4.70 dBm for BT 20.5 dBm, 5.15 to 5.25 GHz 20.5 dBm, 5.25 to 5.35 GHz 20.5 dBm, 5.47 to 5.725 GHz

Security

	D21	D24
Standards	Wireless Equivalent Privacy (WEP) Wi-Fi Protected Access (WPA) IEEE 802.11i (WPA2)	Wireless Equivalent Privacy (WEP) Wi-Fi Protected Access (WPA) IEEE 802.11i (WPA2)
Encryption Protocols	Wireless Equivalent Privacy (WEP, RC4 Algorithm) Temporal Key Integrity Protocol (TKIP, RC4 Algorithm) Advanced Encryption Standard (AES, Rijndael Algorithm)	Wireless Equivalent Privacy (WEP, RC4 Algorithm) Temporal Key Integrity Protocol (TKIP, RC4 Algorithm) Advanced Encryption Standard (AES, Rijndael Algorithm)

Security (continued)

	D21	D24
Encryption Key Provisioning	Static (40-bit and 128-bit lengths) Pre-Shared (PSK) Dynamic	Static (40-bit and 128-bit lengths) Pre-Shared (PSK) Dynamic
802.1X Extensible Authentication Protocol Types	LEAP EAP-FAST EAP-TLS PEAP-GTC PEAP-MSCHAPv2	EAP-FAST EAP-TLS EAP-TTLS PEAP-GTC PEAP-MSCHAPv2 PEAP-TLS LEAP

Summit SDC-MSD40NBT Conformity to EU Directive 2014/53/EU

The Summit SDC-MSD40NBT complies with the essential requirements of the Radio Equipment Directive: 2014/53/EU. The following test methods have been applied by the device manufacturer in order to prove presumption of conformity with the essential requirements of this directive:

- EN 60950-1:2006+A11+A1:2010+A12:2011+A2 2013 Safety of Information Technology Equipment;
- EN 300 328 v2.1.1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques; Harmonized EN covering essential requirements under article 3.3 of the R&TTE Directive;
- EN 301 489-1 v2.2.0 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements;
- EN 301 489-17 v3.2.0 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2.4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment;
- EN 301 893 v2.1.1 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Broadband Radio Access Networks (BRAN); Specific conditions for 5 GHz high performance RLAN equipment;

- EU 2011/65/EU (RoHS) Declaration of Compliance - EU Directive 2011/65/EU; Reduction of Hazardous Substances (RoHS).

The SDC-MSD40NBT is a 2.4 GHz wideband transmission system (transceiver), intended for use in all EU member states and EFTA countries, except in France and Italy where restrictive use applies.

In Italy, the end-user should apply for a license at the national spectrum authorities in order to obtain authorization to use the device for setting up outdoor radio links and/or for supplying public access to telecommunications and/or network services.

The SDC-MSD40NBT may not be used for setting up outdoor radio links in France, and in some areas, the RF output power may be limited to 10 mW EIRP in the frequency range of 2454 -2483.5 MHz. For detailed information, the end-user should contact the national spectrum authority in France.

D

Patient Information Fields

The following tables identify the maximum length of fields and the maximum number of entries allowed for the “optional fields” that are accessed from the **Patient ID** button on the Setup, Default Cardiograph Settings screen.

Pre-defined Fields

Table D-1 Format and Maximum Length of Pre-defined Patient Information Fields

Pre-defined Patient Information Fields	Format	Maximum Length
Patient ID (Account # or Medical Record Number)	Free Text	32
Last Name	Free Text	40
First Name	Free Text	40
Additional Name	Free Text	40
Encounter ID	Free Text	40
DOB	Formatted Text	N/A (Year: 1800-2099; Month: 1-12; Day: 1-31)
Age (Format encoded)	Formatted Text with units	N/A (year: 1-199; month/day/week/hours: 1-99)
Gender (selection)	Selection	N/A
Height	Formatted Text with units	N/A (1-9999)
Weight	Formatted Text with units	N/A (1-9999)

Table D-1 Format and Maximum Length of Pre-defined Patient Information Fields

Pre-defined Patient Information Fields	Format	Maximum Length
Race	Combo Selection	N/A
Sx (Symptoms)*	Combo Selection - configurable	40
Dx (Diagnosis)	Combo Selection - configurable	40
Rx (Medications)	Combo Selection - configurable	40
Hx (History)	Combo Selection - configurable	40
Operator ID**	Combo Selection - configurable	40
Room	Free Text	32
BP	Formatted Text	N/A (1-999)
Ordering Physician with UPIN (note: Physician UPIN is changed to Physician NPI)	Combo Selection - configurable	Physician Name: 32 Physician NPI: 40
Reason for Order	Combo Selection - configurable	32
Diagnostic Related Grouping (DRG) category	Combo Selection - configurable	40
Department	Combo Selection - configurable	32
Order Number	Free Text	32
Account Number	Free Text	40
STAT	Selection (Yes/No)	N/A
Facility	Combo Selection - configurable	32
User Field 1 to 8	Combo Selection - configurable	Label:16 Value:32

* Symptoms field is also intended to satisfy the requirement for a "Reason for Exam" field.

** Customer can choose a default "Operator ID". When the user wants to start a new patient session, the default operator ID information is filled automatically on the "New Patient" / "Edit Patient ID" tab.

Configurable Fields

Fields identified as having a “Combo Selection - configurable” format provide the operator with a list of choices which are user-configurable. These fields allow entry of free-text in addition to pre-configured choices. These “Combo Selection - configurable” fields support the number of entries per table below.

Table D-2 Number of Entries Supported for Configurable Fields

Tab	Field Name	Number of Entries
Clinical Info.	Symptoms(Sx)	16
	History(Hx)	16
	Prescriptions(Rx)	16
	Diagnoses(Dx)	16
	Diagnostic Related Group(DRG)	16
Order Info.	Order Reason	32
	Physician Name	256
	Physician NPI	256
Addl Info.	Facility (Name)	16
	Facility (Code)	16
	Department (Name)	32
	Department (Code)	32
	Operator ID	64
Optional Info.	All drop list custom fields	64
Inbox Settings	Orders InBoxes	96
	Orders OutBoxes	24

E

Accessories, Supplies and Ordering Information

Ordering Accessories and Supplies

All supplies can be ordered on the web at http://shop.medical.philips.com.

Use the part numbers listed in this section to ensure that the correct supplies are ordered.

This chapter contains a list of accessories, supplies and options available for the TC cardiographs. The list is provided as reference only. You should always verify availability through the online ordering system, as some items may no longer be available. For further assistance with ordering, or if the item that you need is not listed in this section, please contact Philips Customer Care for further assistance. See “Contacting Philips Customer Care” on page E-8.

Special Note about Welsh Bulb Electrodes

Figure E-1 Welsh Bulb Electrode



Welsh Bulb electrodes are offered as an optional supply part with the PageWriter TC cardiograph. Special care is necessary when using these electrodes. Pay special attention to all warnings associated with these electrodes. For information on cleaning the reusable Welsh Bulb electrodes, “Reusable Electrode Cleaning” on page 5-5. Philips recommends the use of disposable electrodes with the PageWriter TC cardiograph.

WARNING

The Welsh bulb electrodes (available as an accessory for the cardiograph) do not meet the requirements of IEC 60601-2-25 for defibrillation recovery time, and cannot be reliably used for patient diagnosis immediately following defibrillation.

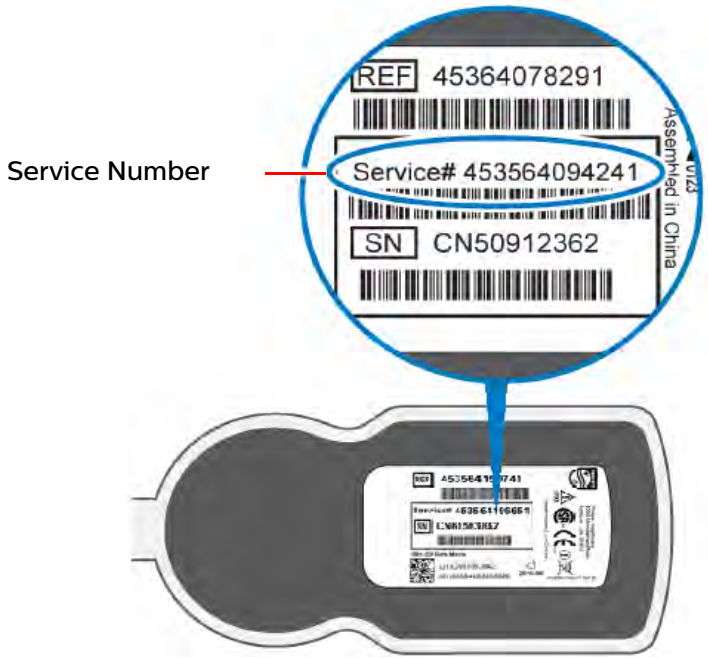
WARNING

Always clean and disinfect reusable electrodes before patient use. See "Reusable Electrode Cleaning" on page 5-5 for information on cleaning and disinfecting reusable electrodes. Failure to properly clean and disinfect reusable electrodes before patient use may cause infectious materials to be transferred between patients.

Patient Interface Module (PIM) Replacement

Before ordering a replacement PIM, check the **Service Number** on the bottom PIM label. Record this Service Number and keep this information with you when ordering replacement PIM parts, as this number determines which replacement part is ordered. For further assistance, contact Philips Customer Care (page E-8).

Figure E-2 Service Number on PIM Label (bottom of PIM)



Note:

3rd Edition PIMs are no longer available for purchase and will be replaced by 4th Edition PIMs. The Exchange PN should be used to order a 4th Edition PIM.

Cardiograph Supply Part Numbers

PIM Patient Data Cable

Part Number	Description
989803164281	Patient data cable, class B 8-pin (2.0 meters/6.56 feet length)

PIM Modules

Reference PN*	Description	Exchange PN*	Description
* Order the exchange PN based on the reference number of your current PIM. **Note:** *4th edition PIMS are backwards compatible with 2nd edition PIMs. If 2nd edition PIMS are out of stock, you may order a 4th edition PIM.*			
453564150741	PIM B, 2nd Ed. 12-lead AAMI	453564196651	PIM B, 2nd Ed. 12-lead AAMI
453564150761	PIM B, 2nd Ed. 12-lead IEC	453564196671	PIM B, 2nd Ed. 12-lead IEC
453564659321	PIM B, 3rd Ed. 12-lead AAMI	453564675711	PIM B, 4th Ed. 12-lead AAMI
453564659331	PIM B, 3rd Ed. 12-lead IEC	453564675731	PIM B, 4th Ed. 12-lead IEC
453564675711	PIM B, 4th Ed. 12-lead AAMI	453564675711	PIM B, 4th Ed. 12-lead AAMI
453564675731	PIM B, 4th Ed. 12-lead IEC	453564675731	PIM B, 4th Ed. 12-lead IEC

Complete Lead Sets

Part Number	Description
989803151631	Complete AAMI lead set for standard 12 leads (arm lead 99 cm/39 in., leg lead 104.1 cm/41 in., chest leads 69.8 cm/27.5 in.)
989803151641	Complete IEC lead set for standard 12 leads (arm lead 99 cm/39 in., leg lead 104.1 cm/41 in., chest leads 69.8 cm/27.5 in.)
989803151711	Limb lead set (AAMI/IEC) (arm lead 99 cm/39 in., leg lead 104.1 cm/41 in.)
989803151671	Complete chest lead set (AAMI/IEC) (chest leads 69.8 cm/27.5 in.)
989803151651	Long complete AAMI lead set for standard 12 leads (arm lead 137.1cm/54 in., leg lead 142.2 cm/56 in., chest leads 69.8 cm/27.5 in.)
989803151661	Long complete IEC lead set for standard 12 leads (arm lead 137.1cm/54 in., leg lead 142.2 cm/56 in., chest leads 106.6 cm/42 in.)
989803151731	Long limb lead set (AAMI /IEC) (arm lead 137.1cm/54 in., leg lead 142.2 cm/56 in.)
989803151691	Long chest lead set (AAMI/IEC) (chest leads 106.6 cm/42 in.)
989803151701	Additional leads spare parts kit (9x2 colored identifier clips, 6 banana post adapters, 6 shorting plugs, 2 lead separators, and Instructions for Use)

Lead Accessories

Part Number	Description
989803129231	Alligator clips for disposable tab electrodes (AAMI) (10 total per pack)
989803129241	Alligator clips for disposable tab electrodes (IEC) (10total per pack)
989803166031	Clear tab with snap adapter (10 total electrodes)

Disposable and Reusable Electrodes

Part Number	Description
989803100441	Single use, solid gel tab disposable cardiography electrode, resting diagnostic ECG (35 mm x 22 mm, 1.37 x 0.86 in.) (1000 total electrodes)

Disposable and Reusable Electrodes (continued)

Part Number	Description
989803149901	Single use, pediatric disposable tab electrode (14 mm x 34 mm, 0.55 x 1.33 in.) (1000 total electrodes)
989803101691	Reusable adult limb clamp electrode (AAMI/IEC) (4 total electrodes)
989803185251*	Reusable Welsh bulb electrode, AHA/IEC (6 electrodes per box)
989803185261*	Replacement Welsh bulb, 9 cc (12 bulbs per box)

* Not available for purchase in the United States

Printer Paper

Part Number	Description
989803106261	Z-fold, with header, A size (21.6 x 28 cm/8.5 x 11 in.)
989803106271	Z-fold, with header, A4 size (21 x 29.69 cm/8.27 x 11.69 in.)
989803106281	Anti-fade, A size (21.6 x 28 cm/8.5 x 11 in.)
989803106291	Anti-fade, A4 size (21 x 29.69 cm/8.27 x 11.69 in.)

Replacement Fuse

Part Number	Description
453564171881	1.6 amp (250 V) replacement fuse

Batteries

Part Number	Description
989803194541	Lithium-ion replacement battery (7800mAh, 11.1V)

WARNING

Batteries with PNs not listed here are not supported. Using unsupported batteries can lead to undesired consequences (battery overheating, shortened battery life, etc.).

Note:

If your cardiograph contains batteries with PN 989803160981, these batteries are no longer available for purchase. Philips strongly recommends that you replace these batteries as soon as possible with one of the supported batteries listed above.

Keyboard Covers

Part Number	Description
989803166501	Cardiograph keyboard cover (5 per pack)

USB Memory Stick

Part Number	Description
989803145331	USB memory stick

Ordering Options and Upgrades

For more information on ordering any of the following cardiograph upgrades or options, please contact your Philips Sales Representative or your local distributor.

Data Input Hardware

Option Number	Description
H12	Barcode reader
H15	Additional battery
H17	2D Barcode scanner
H18	2D Barcode scanner holder

Patient Interface Module (PIM) and Patient Cable Options

Option Number	Description
H21	12-Lead Patient Interface Module (PIM) (AAMI or IEC)
H23	Long lead wire

Product Upgrades

Option Number	Description
D01	Networked worklists/patient list support
D02	ADT support
D03	DXL 12-lead interpretive ECG algorithm
D05	Disclosure and events
D06	Archive, Last ECG, and interactive query
D07	Manual worklists/patient list support
D08	Native DICOM support
D21	Wireless LAN support (802.11b/g) **Note:** *Available only for upgrades*
D24	Wireless module (802.11 a, b, g, n)
H10	Ethernet LAN/connectivity board
H24	D24 option with Mainboard upgrade kit

Cardiograph Cart and Accessories

Option Number	Description
B01	Partially assembled cardiograph cart
B02	Fully assembled cardiograph cart (only available in USA)
C02	Additional cart storage bin
C03	Patient cable arm
C04	Wire Basket

Cardiograph Cart and Accessories (continued)

Option Number	Description
E01	Alligator Clips
E04	Welsh Bulbs
E06	Double-sided Tab Clips, compatible with both tab and snap electrodes

Keyboard Covers

Option Number	Description
H16	Keyboard cover

Contacting Philips Customer Care

Philips Customer Care can assist with product troubleshooting and provide technical expertise to help with any issue with the PageWriter TC cardiographs or any of its accessories.

For more information on how to contact Philips Customer Care, go to http://www.usa.philips.com/healthcare/country-selector.html. Select the link for your country or region, scroll to the bottom of the page, and click “Contact.”



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Instructions for Use