ApexPro™
Telemetry System
Operator's Manual

Software Version 3

2001989-134 Revision D

GE Medical Systems
Information Technologies

gemedical.com

NOTE:

The information in this manual only applies to ApexPro Telemetry System software version 3. It does not apply to earlier software versions. Due to continuing product innovation, specifications in this manual are subject to change without notice.

CE Marking Information

Compliance

The ApexPro telemetry system bears CE mark CE-0459 indicating conformity with the provisions of the Council Directive 93/42/EEC concerning medical devices, and fulfills the essential requirements of Annex I of this directive. The product is radio-interference protection class A in accordance with EN 55011.

The country of manufacture can be found on the equipment labeling.

The product complies with the requirements of standard EN 60601-1-2 “Electromagnetic Compatibility-Medical Electrical Equipment.”

The safety and effectiveness of this device has been verified against previously distributed devices. Although all standards applicable to presently marketed devices may not be appropriate for prior devices (i.e. electromagnetic compatibility standards), this device will not impair the safe and effective use of those previously distributed devices. See user's information.

Exceptions

The CIC Pro and ApexPro server is suitable for use in the specified electromagnetic environment. The customer and/or the user of the CIC Pro and ApexPro server should assure that it is used in an electromagnetic environment as described below:

CE Exception Table		
EN60601-1-2 Clause 36	**Exception**	**Electromagnetic Environment Guidance**
36.202.1 Immunity: ESD	Direct - Discharges of 6 KV or greater to the rear I/O connector area may cause the system to lock up, thus experiencing loss of data and loss of functionality. Operator intervention may be required. Likelihood of occurrence: Remote During testing there were 2 occurrences out of 1,920 discharges. The rear I/O connector area is not considered to be user accessible during normal operation.	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
36.202.3.1 Immunity: Fast Transient	Transients on the AC power line of +/- 1 KV or higher may cause momentary network packet loss (i.e. waveform and/or numeric data), thus experiencing momentary loss of data at the time of the surge.	Mains power quality should be that of a typical commercial and/or hospital environment.
36.202.3.2 Immunity: Fast Surges	Surges on the AC power line of +/- 1 KV or higher may cause momentary network packet loss (i.e. waveform and/or numeric data), thus experiencing momentary loss of data at the time of the surge.	Mains power quality should be that of a typical commercial and/or hospital environment.

CE Exception Table		
EN60601-1-2 Clause 36	**Exception**	**Electromagnetic Environment Guidance**
ApexPro and ApexPro CH Transmitters		
36.202.2 Immunity: Radiated Fields	If operated in the midst of the conditions outlined in EMC standard EN60601-1-2 (Radiated Immunity 3 V/m), fields in excess of 1 V/m may cause waveform distortions and erroneous numeric data at various electromagnetic interference (EMI) frequencies.	■ Review the AAMI EMC Committee technical information report (TIR-18) titled *Guidance on electromagnetic compatibility of medical devices for clinical/biomedical engineers - Part 1: Radiated radio-frequency electromagnetic energy.* This TIR provides a means to evaluate and manage the EMI environment in the hospital. ■ Manage (increase) distance between sources of EMI and susceptible devices. ■ Manage (remove) devices that are highly susceptible to EMI. ■ Lower power from internal EMI sources under hospital control (i.e., paging systems). ■ Label devices susceptible to EMI. ■ Educate staff (nurses and doctors) to be aware of, and to recognize, potential EMI related problems.
ApexPro Antenna System		
36.202.2 Immunity: Radiated Fields	If operated in the midst of the conditions outlined in EMC standard EN60601-1-2 (Radiated Immunity 3 V/m), fields in excess of 0 V/m in the frequency ranges of 520-534 MHz and 645-660 MHz may cause loss of telemetry.	■ Review the AAMI EMC Committee technical information report (TIR-18) titled *Guidance on electromagnetic compatibility of medical devices for clinical/biomedical engineers - Part 1: Radiated radio-frequency electromagnetic energy.* This TIR provides a means to evaluate and manage the EMI environment in the hospital. ■ Manage (increase) distance between sources of EMI and susceptible devices. ■ Manage (remove) devices that are highly susceptible to EMI. ■ Lower power from internal EMI sources under hospital control (i.e., paging systems). ■ Label devices susceptible to EMI. ■ Educate staff (nurses and doctors) to be aware of, and to recognize, potential EMI related problems.

CE Exception Table		
EN60601-1-2 Clause 36	**Exception**	**Electromagnetic Environment Guidance**
Apex Oximeter 36.202.2 Immunity: Radiated Fields	If operated in the midst of the conditions outlined in EMC standard EN60601-1-2 (Radiated Immunity 3 V/m), fields in excess of 0.5 V/m may cause waveform distortions and erroneous numeric data at various electromagnetic interference (EMI) frequencies.	■ Review the AAMI EMC Committee technical information report (TIR-18) titled *Guidance on electromagnetic compatibility of medical devices for clinical/biomedical engineers - Part 1: Radiated radio-frequency electromagnetic energy.* This TIR provides a means to evaluate and manage the EMI environment in the hospital. ■ Manage (increase) distance between sources of EMI and susceptible devices. ■ Manage (remove) devices that are highly susceptible to EMI. ■ Lower power from internal EMI sources under hospital control (i.e., paging systems). ■ Label devices susceptible to EMI. ■ Educate staff (nurses and doctors) to be aware of, and to recognize, potential EMI related problems.
Xpod Oximeter 36.202.2 Immunity: Radiated Fields	If operated in the midst of the conditions outlined in EMC standard EN60601-1-2 (Radiated Immunity 3 V/m), fields in excess of 1 V/m may cause waveform distortions and erroneous numeric data at various electromagnetic interference (EMI) frequencies.	■ Review the AAMI EMC Committee technical information report (TIR-18) titled *Guidance on electromagnetic compatibility of medical devices for clinical/biomedical engineers - Part 1: Radiated radio-frequency electromagnetic energy.* This TIR provides a means to evaluate and manage the EMI environment in the hospital. ■ Manage (increase) distance between sources of EMI and susceptible devices. ■ Manage (remove) devices that are highly susceptible to EMI. ■ Lower power from internal EMI sources under hospital control (i.e., paging systems). ■ Label devices susceptible to EMI. ■ Educate staff (nurses and doctors) to be aware of, and to recognize, potential EMI related problems.

CE Exception Table		
EN60601-1-2 Clause 36	**Exception**	**Electromagnetic Environment Guidance**
Accutracker DX NBP Monitor 36.202.1 Immunity: ESD	Air — Discharges in excess of ±6 Kv may cause the cuff to deflate and the unit to lock up. By turning the power switch off, then back on (manual reset), the unit will be restored to the user-defined settings and normal operation.	■ The Accutracker DX blood pressure monitor should be kept in the carrying pouch supplied with each unit. ■ Care should be taken to minimize the ESD potential when the Accutracker DX blood pressure monitor is removed from the pouch. This includes: ◆ Handling the unit in an ESD-protected area. ◆ Maintaining humidity levels of 50% relative humidity or greater. ◆ Discharging ESD potentials on human hands prior to handling the unit out of the pouch.

Radio and Telecommunication Terminal Equipment Directive

The ApexPro telemetry system transmitters bear the CE mark CE 0123 indicating conformity with the provisions of the Council Directive 1999/5/EC of 9 March 1999 concerning R&TTE as tested by MKES BABT Services GmbH Notified Body TUV (0123).

The product complies with the requirements of standard EN 300 220-1 [ETSI 300 220-1 v1.3.1]: “Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Short Range Devices (SRD); Part 1: Technical Characteristics and Test Methods”.

Restrictions

The Radio and Telecommunication Terminal Equipment Directive (R&TTE) states that radio equipment operating in frequency bands for which the use has not been harmonized across the European Community have to be identified by an equipment symbol. ApexPro is classified as Class 2 Equipment and bears the following equipment symbol (also called the Alert Mark):  .

Not all European member states have approved the frequencies within 433. 25 MHz to 434.75 MHz transmitted by the ApexPro telemetry system for medical telemetry applications.

The following European member states have approved the frequencies within 433. 25 MHz to 434.75 MHz transmitted by the ApexPro telemetry system for medical telemetry application:

- Austria: Approved for 433.25 MHz to 434.75 MHz; individual approval from local authorities necessary.
- Belgium
- Denmark: Individual registration by user necessary in accordance with “Danish Radio Interface Regulation for radio equipment for medical telemetry No. 00024.”
- Finland
- France
- Germany
- Ireland
- Italy: Approved providing compliance with Art. 344 p. to 8 of the Codice P.T.
- Luxembourg
- Netherlands
- Norway: Approved for 441.750 MHz to 441.975 MHz.
- Spain
- Sweden
- United Kingdom: Approved for 458.975 MHz to 459.100 MHz.

General Information

- This manual is an integral part of the product and describes its intended use. It should always be kept close to the equipment. Observance of the manual is a prerequisite for proper product performance and correct operation and ensures patient and operator safety.
- The symbol ⚠ means ATTENTION: Consult accompanying documents.
- Information which refers only to certain versions of the product is accompanied by the model number(s) of the product(s) concerned. The model number is given on the nameplate of the product.
- The warranty does not cover damages resulting from the use of accessories and consumables from other manufacturers.
- GE Medical Systems *Information Technologies* is responsible for the effects on safety, reliability, and performance of the product, only if:
  - assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE Medical Systems *Information Technologies*;
  - the electrical installation of the relevant room complies with the requirements of the appropriate regulations; and,
  - the device is used in accordance with the instructions for use.
- All publications conform with the product specifications and applicable IEC publications on safety and essential performance of electromedical equipment as well as with applicable UL and CSA requirements and AHA recommendations valid at the time of printing.
- The GE Medical Systems *Information Technologies* quality management system complies with the international standards EN ISO 9001 and EN 46001, and the Council Directive on Medical Devices 93/42/EEC.

For your notes

Contents

For your notes

1 The Basics

For your notes

About This Manual

Manual Purpose

This manual contains the instructions necessary to operate the ApexPro telemetry system safely and in accordance with its function and intended use.

This manual addresses the operation of the ApexPro telemetry system at the CIC Pro. Be sure to read the entire manual before using the equipment.

Intended Audience

This manual is geared for clinical professionals. Clinical professionals are expected to have a working knowledge of medical procedures, practices, and terminology, as required for monitoring of critically ill patients.

This manual assumes that you are familiar with the operating procedures of the CIC Pro. If you would like more information about using the CIC Pro, refer to the CIC Pro Clinical Information Center Operator's Manual.

This manual also assumes that you are familiar with the operation of a two-button computer mouse. If you would like more information about operating the mouse, refer to the CIC Pro Clinical Information Center Operator's Manual, or to the documentation supplied with the mouse.

Revision History

Each page of the document has the document part number and revision letter at the bottom of the page. The revision letter changes whenever the document is updated.

Revision	Date	Comments
A	25 June 2003	Initial release of this document, corresponding to ApexPro telemetry system software version 3.
B	23 October 2003	■ Updated to support the ApexPro FH Transceiver ■ Added additional CE Exceptions for the ApexPro system. ■ Added FCC Compliance ■ Added Industry Canada Compliance ■ Changed Nurse Graph to Event Marker Graph and Transmitter Nurse to Event Marker
C	21 January 2004	■ Added Data Source information ■ Changed recommended cleaning solutions ■ Added information regarding time discrepancy between waveforms ■ Added information on stopping manual graphs ■ Made correction to INTFC connector ports 1 and 2 ■ Updated Equipment Symbols
D	12 March 2004	■ Warning added regarding adjusting System Status Alarms levels ■ Added verify lead information to the admit procedure and electrode placement ■ Message alarm level added to System Status Alarm ■ Graph Location Settings information revised ■ Removed reference to alarm level settings for ARR SUSPEND, LEADS FAIL, and OFF NETWORK ■ Changes made to Appendix D for the ApexPro FH Transceiver

Manual Conventions

This section describes terminology, standards, and other conventions that are used throughout this manual.

Product References

In this manual:

- The ApexPro telemetry system is referred to as the ApexPro system, or simply the system.
- The CIC Pro Clinical Information Center is referred to as the clinical information center, the CIC Pro or the central station.
- The SunTech Medical Systems Accutracker DX noninvasive blood pressure monitor is referred to as the blood pressure monitor or the Accutracker.
- The PRN 50 Digital Writer is referred to as the digital writer or the writer.
- The Direct Digital Writers are referred to as DDWs or writers.
- The laser printer is referred to as the printer.

Definitions

The following terms are used in this manual:

Buttons — The word "button" is defined in two ways:

1. A button is a labeled gray or red rectangle on the CIC Pro. Clicking on a button with the mouse pointer opens a tab sheet or performs the specified action (such as *Print*). Red buttons are used to view beds in alarm.
2. A button is a labeled circle, square, or rectangle located on the ApexPro transmitter, the Apex Oximeter, or the Accutracker blood pressure monitor. Pressing the button with your finger activates it.

NOTE

The computer mouse used with the CIC Pro also has two buttons. Refer to the CIC Pro Clinical Information Center Operator's Manual for information about using those buttons.

Messages/Prompts — A message is text that appears on the CIC Pro. It informs you of conditions occurring that are not necessarily part of normal operating conditions. Prompts are text messages that appear, instructing you to perform a specific action.

Multiple patient viewer — The multiple patient viewer is the CIC Pro display in its normal state. Bed windows for admitted patients are shown, as well as a menu bar at the bottom of the display.

Screen text — Any text that appears on the CIC Pro display. In this manual, screen text is shown in italics (for example, *ECG*, *SAVING*, etc.).

Single patient viewer — When you click on a patient's bed window at the CIC Pro, the display rearranges to accommodate a set of tab sheets (see definition below) in the bottom portion of the display. This set of tab sheets is referred to as the single patient viewer because it contains information specific to one patient.

Tab options — Tab options are the choices and text entry fields available on a tab sheet. The information presented as tab options may pertain to a patient's data, or may be control information (such as alarm settings) that can be modified to meet the user's specific needs.

Tab sheets — Tab sheets look like labeled index cards. The menu tab labels indicate the type of information to be viewed and/or changed on its tab sheet. Clicking on a tab brings its tab sheet to the front of the "index card" stack, or to the front of the currently viewed window.

Tabs — Tabs are the labeled section of the tab sheets. Clicking on a tab brings its tab sheet to the front. Tab and tab sheet are sometimes used interchangeably.

Illustrations and Names

All illustrations in this manual are provided as examples only. They may not necessarily reflect your telemetry monitoring setup or data displayed on your equipment.

In this manual, all names appearing in examples and illustrations are fictitious. The use of any real person's name is purely coincidental.

Common Operations

Some operations are used repetitively at the CIC Pro or the ApexPro telemetry system. Rather than explaining how to perform each operation every time it appears in this manual, these operations are presented below. Please familiarize yourself with the proper procedure for each.

"Clicking" the Mouse

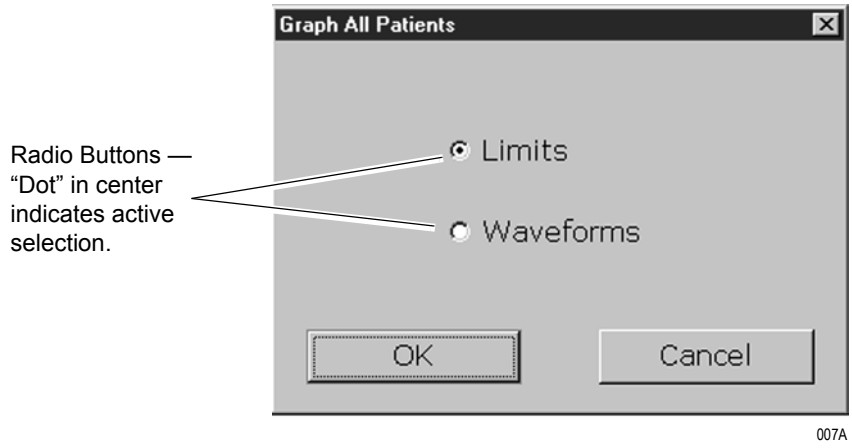
The term "click" refers to positioning the mouse pointer on a selection and pressing the left mouse button one time.

In situations where the right mouse button should be pressed, this is specifically called out. In all other cases, assume that you should press the LEFT mouse button.

Pressing the mouse button two times in a row is called double clicking. In situations where the mouse needs to be double clicked to perform a function, this is specifically called out. In all other cases, assume that you only need to click the mouse button ONE time.

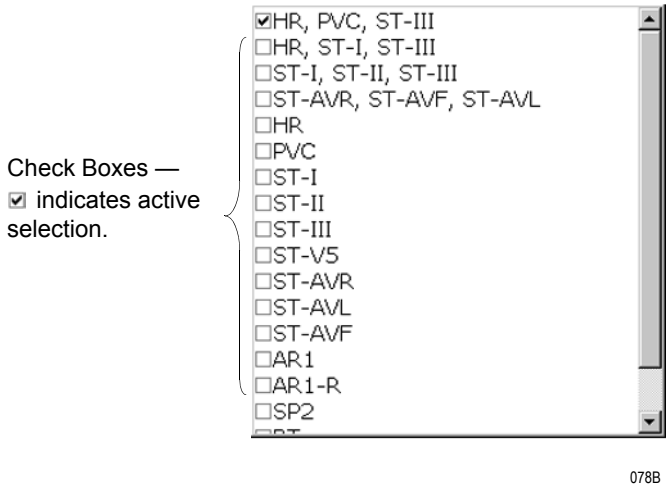
Radio Buttons

To use a radio button control, click on the white circle (radio button) or the text next to it. When selected, a black dot is shown in the white circle. To deselect a radio button control, click again on the label text or in the white circle. When it is not selected, no black dot is shown.



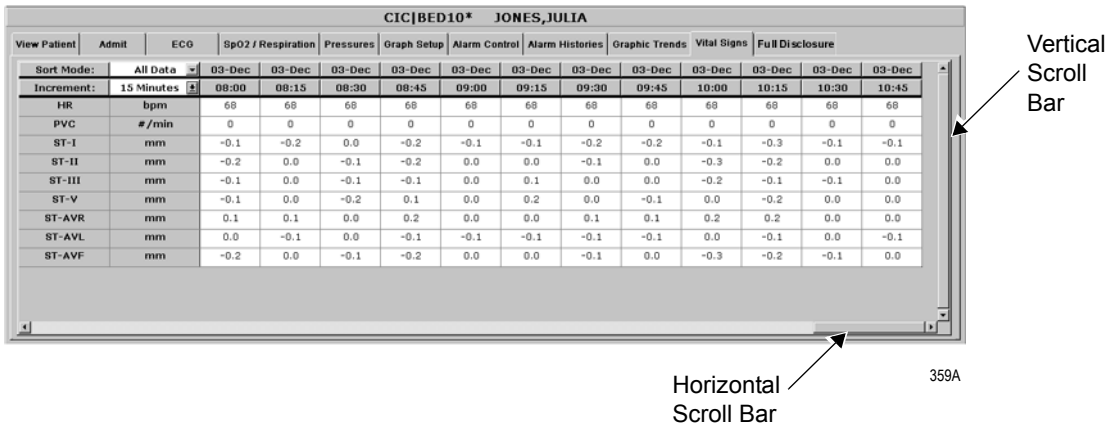
Check Boxes

To use check box controls, click on the square or the text next to it. When selected, a check mark is shown in this square. To deselect a check box control, click again on the text or in the square. When deselected, no check mark is shown.



Scroll Bars

Use horizontal and vertical scroll bars to move a window's contents left/ right and up/down. Place the mouse pointer on the appropriate arrow to move the scroll bar, or click and hold the mouse button down while dragging the scroll bar until the desired information is displayed.



Popup Lists

Clicking in a text field may produce a down arrow button on the right side of the field. This arrow button is used to open a popup list. A popup list is a list of options available for that particular field. Use the mouse to click on the arrow button, which opens the popup list.

Once the popup list is open, use the mouse to click on an option. This selects the option and closes the popup list.

NOTE

If you click on the right side of a field, the down arrow button and the popup list of selections may appear simultaneously.

Unit Defaults Worksheet

This worksheet has been provided as an optional reference tool to record your care unit's default settings. Fill out the information and keep it in a prominent place to refer to your setup. For your convenience, the factory default settings appears dimmed. Fill in only those settings that differ from the factory default ones.

NOTE

Before you fill it out, you may want to make additional copies of the worksheet for future use.

Date: _____ Unit: _____

Telemetry Alarm Control Defaults

Parameter Limits and Alarm Levels		Low	High	Level
HR	bpm	50	150	Warning
ST-I	mm	-2.0	2.0	Warning
ST-II	mm	-2.0	2.0	Warning
ST-III	mm	-2.0	2.0	Warning
ST-V	mm	-2.0	2.0	Warning
ST-V2	mm	-2.0	2.0	Warning
ST-V3	mm	-2.0	2.0	Warning
ST-V4	mm	-2.0	2.0	Warning
ST-V5	mm	-2.0	2.0	Warning
ST-V6	mm	-2.0	2.0	Warning
ST-AVR	mm	-2.0	2.0	Warning
ST-AVL	mm	-2.0	2.0	Warning
ST-AVF	mm	-2.0	2.0	Warning
NBP-S	mmHg	80	200	Warning
NBP-D	mmHg	20	120	Warning
NBP-M	mmHg	40	140	Warning
SPO2	%	90	105	Warning
SPO2-R	bpm	50	150	Warning
RR	breaths/min	5	30	Warning
RR-APNEA	seconds		30	Warning
PVC	#/min		6	Advisory

Arrhythmia Alarm Levels	Levels
Asystole	Crisis
VFIB/VTAC	Crisis
V Tach	Crisis
VT > 2	Crisis
V Brady	Crisis
Acc Vent	Advisory
Pause	Advisory
Tachy	Advisory
Brady	Advisory
R on T	Message
Couplet	Message
Bigeminy	Message
Trigeminy	Message
PVC	Message
Irregular	Message
Atrial Fib	Message

System Alarm Levels	Levels
Change Battery	Sys Warning
Off Network	Sys Warning
Arr Suspend	Sys Warning
Leads Fail	Sys Warning
Probe Off	Sys Warning

Telemetry Unit Defaults

Graph Setup:

Manual Graph Location	
Alarm Graph Location	
Print Window Graph Location	

Waveforms:

ECG 1 Waveform Display	
Waveform 2 Display	
Waveform 3 Display	
Waveform 4 Display	

Transmitter Graph	
Alarm Graph On/Off	
Event Marker Graph On/Off*	

ECG:

Display Lead	
Arrhythmia	
Lead Analysis	
ST Analysis	
Va Lead	
Vb Lead	
Detect Pace	

Patient Age	
Transmitter Alarm Pause	
Alarm Pause Breakthrough	
Event Marker*	

*The Event Marker Graph and Event Marker features are not applicable to all transmitters.

For your notes

2 Safety

For your notes

For Your Safety

Intended Use

The ApexPro Telemetry System is intended for use under the direct supervision of a licensed healthcare practitioner. The system is designed to acquire and monitor physiological data for ambulating patients within a defined coverage area. The system processes this physiological data to detect various ECG arrhythmia events and select physiological parameter limit violations.

The ApexPro Telemetry System is intended to be installed in the hospital or clinical environment in order to provide clinicians with patient physiological data, while allowing for patient mobility. These systems are typically deployed in sub acute care areas in hospitals or clinical sites where patient mobility can enhance the effectiveness of the medical procedures administered.

The physiological parameters monitored include ECG, non-invasive blood pressure and SpO2. The ApexPro Telemetry System is intended to provide ECG data via Ethernet to the computer platform for processing. The ApexPro is also intended to provide physiologic data over the Unity network to clinical information systems for display.

Definitions

The terms danger, warning, and caution are used throughout this manual to point out hazards and to designate a degree or level or seriousness. Familiarize yourself with their definitions and significance.

Hazard is defined as a source of potential injury to a person.

DANGER indicates an imminent hazard which, if not avoided, will result in death or serious injury.

WARNING indicates a potential hazard or unsafe practice which, if not avoided, could result in death or serious injury.

CAUTION indicates a potential hazard or unsafe practice which, if not avoided, could result in minor personal injury or product/property damage.

NOTE provides application tips or other useful information to assure that you get the most from your equipment.

System Safety

The safety statements presented in this chapter refer to the equipment in general and, in most cases, apply to all aspects of the telemetry system. There are additional safety statements in other chapters that are specific to the information presented in that chapter.

The order in which safety statements are presented in no way implies order of importance.

Dangers

There are no dangers that refer to the equipment in general. Specific "Danger" statements may be given in the respective sections of this manual.

Warnings

WARNINGS

ACCIDENTAL SPILLS — To avoid electric shock or device malfunction liquids must not be allowed to enter the device. If liquids have entered a device, take it out of service and have it checked by a service technician before it is used again.

ACCURACY — If the accuracy of any value displayed on the monitor, central station, or printed on a graph strip is questionable, determine the patient's vital signs by alternative means. Verify that all equipment is working correctly.

ADJUSTING SYSTEM ALARM LEVELS — The LEADS FAIL alarm indicates that one or more electrodes are not connected to the patient and, as a result, there is loss of all waveforms and arrhythmia analysis. The ARR SUSPEND alarm indicates that arrhythmia conditions are not being detected and therefore alarms associated with arrhythmias will not occur. The LEADS FAIL and ARR SUSPEND alarms should be adjusted to a lower priority level only by experienced qualified personnel and with great caution. Adjusting these alarms to a lower priority level may result in reduced awareness of conditions that indicate the loss of patient monitoring.

WARNINGS

ALARMS — Do not rely exclusively on the audible alarm system for patient monitoring. Adjustment of alarm volume to a low level or off during patient monitoring may result in a hazard to the patient.

Do not rely exclusively on the alarm pause breakthrough feature for alarm notification during an alarm pause. This may result in a hazard to the patient. Only crisis alarms break through an alarm pause.

Remember that the most reliable method of patient monitoring combines close personal surveillance with correct operation of monitoring equipment.

After connecting the monitor to the central station, nurse alert system, and/or network, verify the function of the alarm system.

The functions of the alarm system for monitoring of the patient must be verified at regular intervals.

BEFORE USE — Before putting the system into operation visually inspect all connecting cables for signs of damage. Damaged cables and connectors must be replaced immediately.

Before using the system, the operator must verify that it is in correct working order and operating condition.

Periodically, and whenever the integrity of the product is in doubt, test all functions.

CABLES — Route all cables away from patient's throat to avoid possible strangulation.

WARNINGS

CONDUCTIVE CONNECTIONS — Extreme care must be exercised when applying medical electrical equipment. Many parts of the human/machine circuit are conductive, such as the patient, connectors, electrodes, transducers. It is very important that these conductive parts do not come into contact with other grounded, conductive parts when connected to the isolated patient input of the device. Such contact would bridge the patient's isolation and cancel the protection provided by the isolated input. In particular, there must be no contact of the neutral electrode and ground.

DEFIBRILLATION — Do not come into contact with patients during defibrillation. Otherwise serious injury or death could result.

DISCONNECTION FROM MAINS — When disconnecting the system from the power line, remove the plug from the wall outlet first. Then you may disconnect the power cord from the device. If you do not observe this sequence, there is a risk of coming into contact with line voltage by inserting metal objects, such as the pins of leadwires, into the sockets of the power cord by mistake.

DISPOSAL — Dispose of the packaging material, observing the applicable waste control regulations and keeping it out of children's reach.

EXPLOSION HAZARD — Do not use this equipment in the presence of flammable anesthetics, vapors or liquids.

INTERFACING OTHER EQUIPMENT — Devices may only be interconnected with each other or to parts of the system when it has been determined by qualified biomedical engineering personnel that there is no danger to the patient, the operator, or the environment as a result. In those instances where there is any element of doubt concerning the safety of connected devices, the user must contact the manufacturers concerned (or other informed experts) for proper use. In all cases, safe and proper operation should be verified with the applicable manufacturer's instructions for use, and system standards IEC 60601-1-1/EN 60601-1-1 must be complied with.

WARNINGS

LEAKAGE CURRENT TEST — When interfacing with other equipment, a test for leakage current must be performed by qualified biomedical engineering personnel before using with patients.

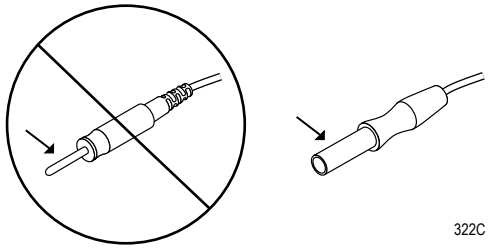
NETWORK INTEGRITY — The clinical information center resides on the hospital's computer network, and it is possible that inadvertent or malicious network activity could adversely affect patient monitoring. The integrity of the computer network is the responsibility of the hospital.

POWER SUPPLY — The device must be connected to a properly installed power outlet with protective earth contacts only.

All devices of a system must be connected to the same power supply circuit. Devices which are not connected to the same circuit must be electrically isolated when operated (electrically isolated RS232 interface).

Do not use this power unit in the presence of flammable anesthetics.

PROTECTED LEADWIRES — Only use protected leadwires and patient cables with this device. The use of unprotected leadwires and patient cables creates the potential for making an electrical connection to ground or to a high voltage power source which can cause serious injury or death to the patient.



Unprotected Leadwire **Protected Leadwire**

WARNINGS

RATE METERS — Keep pacemaker patients under close observation. Rate meters may continue to count the pacemaker rate during cardiac arrest and some arrhythmias. Therefore, do not rely entirely on rate meter alarms.

SITE REQUIREMENTS — For safety reasons, all connectors for patient cables and sensor leads are designed to prevent inadvertent disconnection, should someone pull on them. Do not route cables in a way that they may present a stumbling hazard. For devices installed above the patient, adequate precautions must be taken to prevent them from dropping on the patient.

Cautions

CAUTIONS

ACCESSORIES (SUPPLIES) — To ensure patient safety, use only parts and accessories manufactured or recommended by GE Medical Systems *Information Technologies*.

Parts and accessories used must meet the requirements of the applicable IEC 60601 series safety standards and essential performance standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical systems standard.

ACCESSORIES (EQUIPMENT) — The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- use of the accessory in the PATIENT VICINITY; and
- evidence that the safety certification of the ACCESSORY has been performed in accordance to the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

CAUTIONS

BEFORE INSTALLATION — Compatibility is critical to safe and effective use of this device. Please contact your local sales or service representative prior to installation to verify equipment compatibility.

DEFIBRILLATOR PRECAUTIONS — Patient signal inputs labeled with the CF and BF symbols with paddles are protected against damage resulting from defibrillation voltages. To ensure proper defibrillator protection, use only the recommended cables and leadwires.

Proper placement of defibrillator paddles in relation to the electrodes is required to ensure successful defibrillation.

DISPOSABLES — Disposable devices are intended for single use only. They should not be reused as performance could degrade or contamination could occur.

DISPOSAL — At the end of its service life, the product described in this manual, as well as its accessories, must be disposed of in compliance with the guidelines regulating the disposal of such products. If you have questions concerning disposal of the product, please contact GE Medical Systems *Information Technologies* or its representatives.

ELECTROCAUTERY PRECAUTIONS — To prevent unwanted skin burns, apply electrocautery electrodes as far as possible from all other electrodes, a distance of at least 15 cm/6 in. is recommended.

ELECTRODES — Whenever patient defibrillation is a possibility, use non-polarizing (silver/silver chloride construction) electrodes for ECG monitoring. Polarizing electrodes (stainless steel or silver constructed) may cause the electrodes to retain a residual charge after defibrillation. A residual charge will block acquisition of the ECG signal.

CAUTIONS

EMC — Magnetic and electrical fields are capable of interfering with the proper performance of the device. For this reason make sure that all external devices operated in the vicinity of the monitoring system comply with the relevant EMC requirements. X-ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation.

INSTRUCTIONS FOR USE — For continued safe use of this equipment, it is necessary that the listed instructions are followed. However, instructions listed in this manual in no way supersede established medical practices concerning patient care.

LOSS OF DATA — Should the monitor at any time temporarily lose patient data, the potential exists that active monitoring is not being done. Close patient observation or alternate monitoring devices should be used until monitor function is restored.

Once monitoring is restored, you should verify correct monitoring state and alarm function.

MAINTENANCE — Regular preventive maintenance should be carried out annually. You are responsible for any requirements specific to your country.

MPSO — The use of a multiple portable socket outlet (MPSO) for a system will result in an enclosure leakage current equal to the sum of all individual earth leakage currents of the system if there is an interruption of the MPSO protective earth conductor. Do not use an additional extension cable with the MPSO as it will increase the chance of the single protective earth conductor interruption.

NEGLIGENCE — GE Medical Systems *Information Technologies* does not assume responsibility for damage to the equipment caused by improperly vented cabinets, improper or faulty power, or insufficient wall strength to support equipment mounted on such walls.

CAUTIONS

OPERATOR — Medical technical equipment such as this monitor/monitoring system must only be used by persons who have received adequate training in the use of such equipment and who are capable of applying it properly.

POWER REQUIREMENTS — Before connecting the device to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the unit's label. If this is not the case, do not connect the system to the power line until you adjust the unit to match the power source.

RESTRICTED SALE — U.S. federal law restricts this device to sale by or on the order of a physician.

SECURITY — The web browser which runs in conjunction with the clinical information center is intended for hospital INTRANET use only. If confidential patient information is made available from the hospital intranet, the security of the data is the responsibility of the hospital.

SUPERVISED USE — This equipment is intended for use under the direct supervision of a licensed health care practitioner.

UNINTENTIONAL RADIO FREQUENCY (RF) INTERFERENCE — Unintentional RF interference could degrade the reliability and performance of the wireless data link. The facility must maintain an RF environment free from unintentional interference. Refer to the service manuals for more information.

VENTILATION REQUIREMENTS — Set up the device in a location which affords sufficient ventilation. The ventilation openings of the device must not be obstructed. The ambient conditions specified in the technical specifications must be ensured at all times.

Notes

- Put the system in a location where you can easily see the screen and access the operating controls.
- This product is not likely to cause abnormal operation of other patient-connected equipment such as cardiac pacemakers or other electrical stimulators. Exceptions are noted in the pacemaker monitoring section, if applicable.
- This product is protected against the effects of cardiac defibrillator discharges to ensure proper recovery, as required by test standards.
- This equipment is suitable for connection to public mains as defined in CISPR 11.
- This equipment is suitable for use in the presence of electrosurgery.

Reference Literature

Medical Device Directive 93/42/EEC.

EN 60601-1/1990 + A1: 1993 + A2: 1995: Medical electrical equipment. General requirements for safety.

EN 60601-1-1:2001: General requirements for safety. Safety requirements for medical electrical systems.

IEC Publication 513/1994: Fundamental aspects of safety standards for medical equipment.

ROY, O.Z.: Summary of cardiac fibrillation thresholds for 60-Hz currents and voltages applied directly to the heart. Med. & Biol. Engn. & Computing 18: 657...659 (1980).

Classification

The telemetry system is classified, according to IEC 60601-1, as:

Type of protection against electrical shock	Transmitter — Internally powered Receiver system — Class I
Degree of protection against electrical shock	ApexPro Transmitter — Type B applied part ApexPro *CH Transmitter—Type CF Defibrillation proof applied part
Degree of protection against harmful ingress of water	ApexPro Transmitter — IPX3 (IEC 60529) ApexPro *CH Transmitter — IPX7 (IEC 60529) Receiver system — **Ordinary Equipment** (enclosed equipment without protection against ingress of water)
Degree of safety of application in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide	**Equipment not suitable** for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
Method(s) of sterilization or disinfection recommended by the manufacturer	Not applicable
Mode of operation	Continuous operation

*The ApexPro CH Transmitter is not for sale outside of the U.S. and Canada.

Underwriters Laboratories, Inc.

Medical Equipment
With respect to electric shock, fire and mechanical hazards only in accordance with UL 2601-1, and CAN/CSA C22.2 NO. 601.1 and if applicable, IEC 60601-2-27, IEC 60601-2-30, and IEC 60601-2-49.

FCC Compliance Information Statement

NOTE

The FCC and the Industry Canada compliance are applicable to the Apexpro CH Transmitter only. The ApexPro CH Transmitter is not for sale outside of the U.S. and Canada.

This equipment complies with Part 95 Subpart H of the FCC rules to be used in wireless medical telemetry service. Operation of this equipment requires prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service. This device is also certified for RSS-210 of Industry Canada.

Installation and maintenance of this transmitter should be performed by a person certified as technically qualified to perform such operations. Replacement of any transmitter component or modifications to the transmitter could result in a violation of the rules. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Use only GE Medical Systems approved replacement parts, non-approved parts may result in a violation of the FCC rules.

RF Exposure

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. The RF transmission power from the antenna conforms to the general public FCC limit of Specific Absorption Rate (SAR) 1.6 W/kg. The maximum SAR value measured from this device was 0.01 W/kg. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada

Industry Canada

Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) RSS-210

This telemetry device is only permitted for installation in hospitals and health care facilities. Devices shall not be operated in mobile vehicles (even ambulances and other vehicles associated with health care facilities). The installer/user of this device shall ensure that it is at least 80 km from the Penticton radio astronomy station (British Columbia latitude: 49◦ 19' 12" N, longitude: 118◦ 59'56" W).

For medical telemetry systems not meeting this 80 km separation (e.g. the Okinagan valley, British Columbia) the installer/ user must coordinate with and obtain the written concurrence of the Director of the Penticton radio astronomy station before the equipment can be installed or operated. The Penticton contact is Tel: 250-493-2277/ fax 250-493-7767. (In case of difficulty, the Manager, Radio Equipment Standards, Industry Canada, may also be contacted, see section 2.3).

Equipment Symbols

NOTE

Some symbols may not appear on all equipment.

	ATTENTION: Consult accompanying documents.
	CAUTION: To reduce the risk of electric shock, do NOT remove cover. Refer servicing to qualified service personnel.
 	TYPE CF APPLIED PART: Isolated (floating) applied part suitable for intentional external and internal application to the patient including direct cardiac application. “Paddles” outside the box indicate the applied part is defibrillator proof. [Medical Standard Definition:] F-type applied part (floating/isolated) complying with the specified requirements of IEC 60601-1/UL 2601-1/CSA 601.1 Medical Standards to provide a higher degree of protection against electric shock than that provided by type BF applied parts. TYPE BF APPLIED PART: Isolated (floating) applied part suitable for intentional external and internal application to the patient excluding direct cardiac application. “Paddles” outside the box indicate the applied part is defibrillator proof. [Medical Standard Definition:] F-type applied part (floating/isolated) complying with the specified requirements of IEC 60601-1/UL 2601-1/CSA 601.1 Medical Standards to provide a higher degree of protection against electric shock than that provided by type B applied parts. **NOTE** The rating of protection against electric shock (indicated by symbol for CF or BF) is achieved only when used with patient applied parts recommended by GE Medical Systems *Information Technologies*.
	TYPE B APPLIED PART: Non-isolated applied part suitable for intentional external and internal application to the patient excluding direct cardiac application. [Medical Standard Definition:] Applied part complying with the specified requirements of IEC 60601-1/UL 2601-1/CSA 601.1 Medical Standards to provide protection against electric shock, particularly regarding allowable leakage current.
	Fuse
	Equipotential Stud: A ground wire from another device can be tied here to ensure the devices share a common reference.

	Alternating current (AC)
	Power; I = ON; O = OFF
PRESS 	Indicates where to press to open the door on the 7160 DDW.
	Silence Alarms keyboard key.
	Non-ionizing electromagnetic radiation: To indicate elevated, potentially dangerous, levels of non-ionizing radiation. Note - In case of application in a warning sign the rules according to ISO 3864-1 shall be adhered to. IEC 60878 note: See safety sign ISO 7010 - W005 "Warning, non-ionizing radiation".
	Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.
	Interface Connector(s)
IPX3	Complies with IPX3 standards for water ingress
IPX7	Complies with IPX7 standards for water ingress

3 Equipment Overview

For your notes

Introduction

This chapter provides an overview of the equipment used in the ApexPro telemetry system. For battery installation and equipment interconnection instructions, refer to Chapter 4, Connection, in this manual. For detailed installation instructions, refer to the appropriate service manual.

ApexPro Telemetry System

The ApexPro telemetry system consists of the following components:

- ApexPro transmitter (one for each monitored patient) and/or
  - ApexPro CH transmitter (not for sale outside the U.S. and Canada)
  - ApexPro FH transceiver (not for sale outside the U.S. and Canada)
- Apex Oximeter (optional)
- Xpod Oximeter (optional)
- Accutracker DX noninvasive blood pressure monitor (optional)
- DINAMAP PRO 100, 200, 300, and 400 series monitor (optional)
- ApexPro antenna system
- ApexPro quad receiver module (4 receivers)
- ApexPro receiver system (holds up to 4 ApexPro quad receivers)
- Unity network
- CIC Pro (software version 2 or later).
  - The ApexPro CH transmitter supports CIC Pro software version 4 or later.
  - The ApexPro FH transceiver supports CIC Pro software version 4 or later.

Compatibility with Bedside Monitors

ApexPro telemetry system patient data can be viewed on most GE Medical Systems *Information Technologies* patient monitors. The monitor must be connected to the Unity network and in the same care unit as the ApexPro telemetry system.

The telemetry patient can be viewed on the bedside monitor using the monitor's split screen view, or when the monitor is set for either Combo or Rover Combo monitoring mode.

NOTES

- When the monitor is set for Combo mode, the second V lead can NOT be viewed or manipulated.
- Users should be aware of a possible time discrepancy between the waveforms from the Telemetry device and the waveforms hard-wired to the display device. Users should not consider these waveforms to be synchronous. If absolute synchronicity is desired, Combo mode should be discontinued and the ECG waveforms should be acquired via the hard-wired bedside device.

Refer to the appropriate monitor's operator's manual for more information.

CAUTION

Only ECG monitoring is compatible when viewing an ApexPro telemetry system patient in the Combo and Rover Combo modes on:

- Eagle 4000 patient monitor running software version 6F or earlier.
- Solar 7000/8000 patient monitor running software version 5E or earlier.
- Tram critical care monitor (Tramscope) running software version 7D or earlier.

Monitoring other parameters is not compatible. Erroneous patient data may result.

The Dash 2000 patient monitor must be running software version 2A or later to work with the ApexPro telemetry system.

Contact your GE Medical Systems *Information Technologies* representative if you have questions regarding compatibility.

ApexPro Transmitters

The ApexPro transmitter sends the patient's ECG data to the ApexPro receiver subsystem for processing. Data is then transmitted via a dedicated Ethernet interface to the CIC Pro for further processing and viewing.

The ApexPro transmitter can send the patient's SpO2 data when the optional Apex Oximeter is connected to it. Additionally, the ApexPro transmitter can send the patient's SpO2 and noninvasive blood pressure data when the optional Xpod Oximeter and/or Accutracker DX noninvasive blood pressure monitor are connected to it.

The DINAMAP PRO 100–400 series monitors can also be connected to the ApexPro transmitter. It monitors SpO2, NBP, and temperature.

Configurations

Your transmitters can have one of the following configurations.

Transmitter Configuration	Transmitter Identification
■ Single Lead ECG[1] ■ INACTIVE interface connector ports [2]	■ **Single Lead** label. ■ Blue colored interface connector port dust cover and the inactive interface connector ports label. 
■ Single Lead ECG[1] ■ ACTIVE interface connector ports[3, 4]	■ **Single Lead** label. ■ Gray colored interface connector port dust covers.
■ Multi-Lead ECG[4] ■ ACTIVE interface connector ports[3, 4]	■ No **Single Lead** label. ■ Gray colored interface connector port dust covers.

[1] Single Lead ECGs may be acquired using a 3-, 5-, or 6-lead Multi-Link leadwire set. However, only a Single Lead ECG is transmitted or processed.

[2] Interface connector ports are active for service use only.

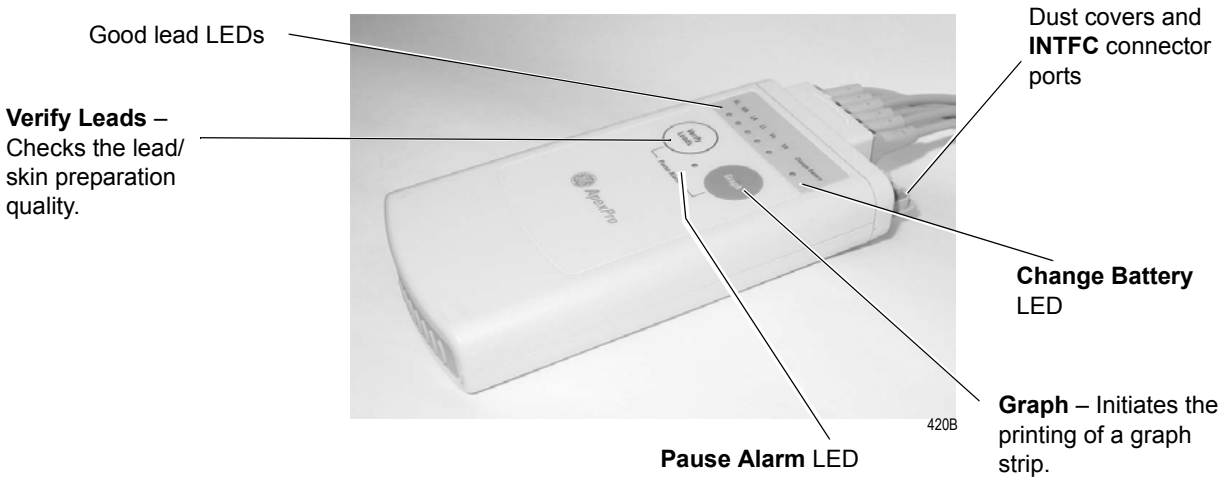
[3] Interface connector ports are for connecting serial interface devices.

[4] This is a purchased option.

ApexPro Transmitter Buttons and LEDs

When the transmitter is first powered up, all the LEDs will flash rapidly, followed by two slow flashes of the top row of LEDs (RA, LA, LL, Va, Vb, Change Battery). The transmitter will begin functioning after the two slow flashes.

When any of the transmitter's buttons are pushed (Verify Leads, Graph, or the Pause Alarm combination), the top row of LEDs will flash twice. The two flashes indicate the button was pushed, nothing more.



ApexPro Transmitter

Verify Leads

When the **Verify Leads** button is pushed, the top row of LEDs will flash twice, indicating the button was pushed. If a lead is valid, its LED will light up and stay lit for one minute.

Graph

When the **Graph** button is pushed, the top row of LEDs will flash twice, indicating the button was pushed. Pressing the **Graph** button initiates a 20-second graph strip to be printed on the writer or printer.

When an IMPACT.*wf* paging system (version II or later) is also available in the same care unit, pressing the **Graph** button enables the View on Demand feature (also called the Apex Graph Button Push feature). The IMPACT.*wf* server generates a manually initiated sample page or snapshot of the patient's ECG waveform and any other enabled/ monitored non-arrhythmia parameters.

When you press the **Graph** button on the ApexPro transmitter, it generates both an IMPACT.*wf* update as well as a standard ECG waveform graph at the CIC Pro. The IMPACT.*wf* update is labeled "Sample" when this data is displayed on the IMPACT.*wf* receiver and stored in history. Additionally, all receivers assigned to the patient receive an update/sample.

Pausing Alarms

Refer to Chapter 8, Alarm Control, for important information regarding transmitter alarm pause, alarm pause breakthrough, and the *Enable Transmitter Pause* option.

The *Enable Transmitter Pause* option for a telemetry patient admitted to the CIC Pro must be activated before the patient can initiate an alarm pause from the transmitter.

To pause the alarms for five minutes, press the **Verify Leads** and **Graph** buttons simultaneously. When the **Pause Alarm** combination is pushed, the following takes place:

- The top row of LEDs will flash twice, indicating the buttons were pushed.
- The Pause Alarm LED will flash at a 1 second rate until the Pause Alarm condition times out (5 minutes by default, but settable through the programming box).
- "*ALARM PAUSE*" is displayed in the patient's waveform window on the CIC Pro screen.

After five minutes, the LED on the transmitter will no longer flash and alarms will be reactivated.

WARNING
Alarms do not sound and alarm graphs do not print during an *"ALARM PAUSE"* condition.

Reactivating Alarms

To reactivate the alarms before the five minute time period has elapsed, press both transmitter buttons simultaneously again.

Low Batteries

The **Change Battery** LED flashes when battery power is running low. Change the batteries in the ApexPro transmitter when this LED flashes. Refer to the ApexPro Transmitter Battery Installation section in Chapter 4, Connection, for more information about changing the batteries.

Interface Connector Ports

There are two **INTFC** (interface) connector ports on the top of the ApexPro transmitter. These are used for connecting serial interface devices such as the Apex Oximeter or Xpod Oximeter, the Accutracker DX noninvasive blood pressure monitor and the DINAMAP PRO 100, 200, 300, or 400 series monitors. The ports are labeled **1** and **2** (on the dust covers).

- The interface connector port labeled **2** is the inside port, closest to the leadwire set. It is for use with episodic monitoring serial devices, such as NBP.
- The interface connector port labeled **1** is the outside port, furthest from the leadwire set. It is for use with continuous monitoring serial devices, such as SpO2.

Dust Covers

The ApexPro transmitter has two dust covers, used when the **INTFC** (interface) connectors are not being utilized.

WARNING

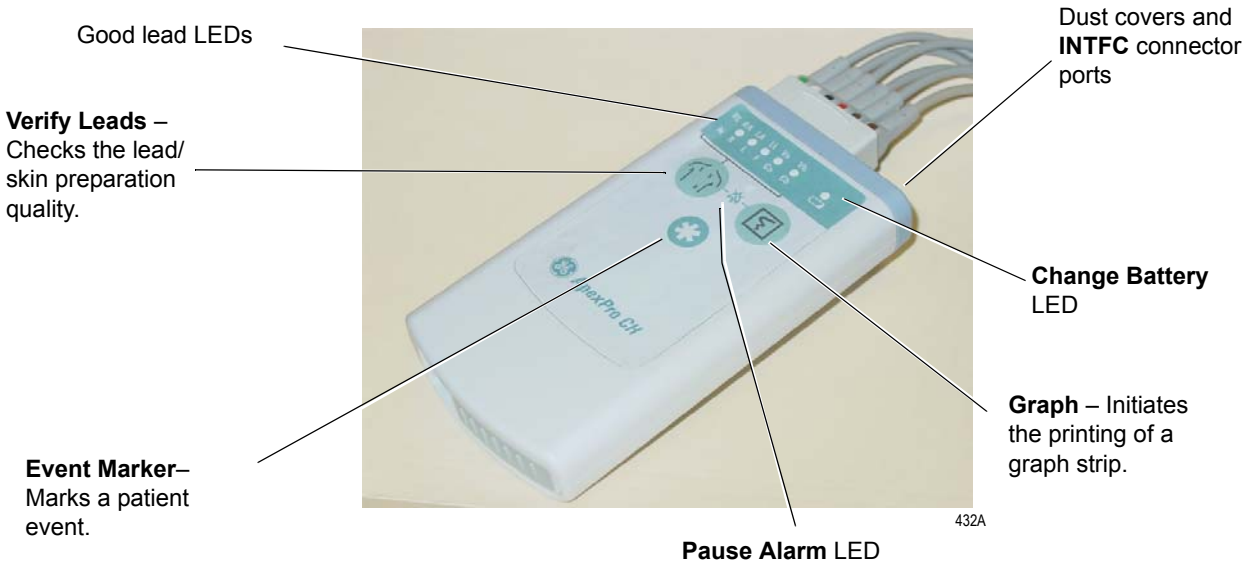
DUST COVERS — If the dust covers for the **INTFC** (interface) connectors become detached from the ApexPro transmitter, they may pose a choking hazard for pediatric patients. Inspect the dust covers before each use to verify that they are securely attached. If the dust covers become detached and cannot be reinserted into their retaining slot, do not use them on the ApexPro transmitter, and keep them out of pediatric patients' reach.

ApexPro CH Transmitter (not for sale outside of the U.S. and Canada)

The Channel Number (CH) is how the ApexPro CH transmitter is identified. During setup, when the TTX ID is entered for a patient at the CIC Pro, the CIC Pro recognizes the transmitter type and translates the information into an alpha-numeric number.

The alpha-numeric number of the transmitter is displayed under the ECG parameter window. It identifies the type of transmitter (**AP** for ApexPro or **CH** for ApexPro CH transmitters), and the channel number for ApexPro CH transmitters

The ApexPro CH transmitter is designed to be IPX7 compliant, so it can survive inadvertent submersion. It supports the same features as the ApexPro transmitter with the exception of the Event Marker button.



AperPro CH Transmitter

Event Marker

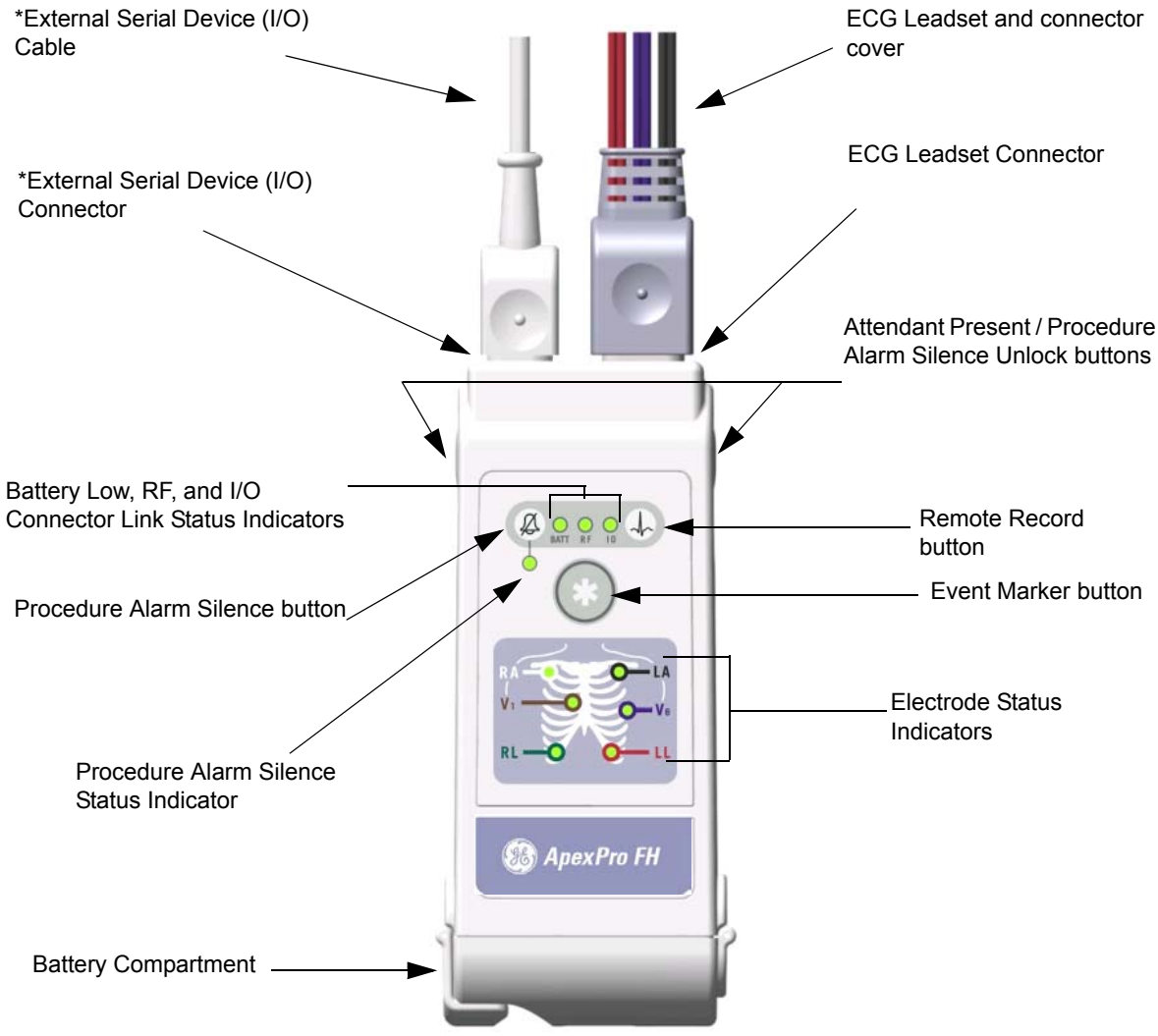
Pressing the **Event Marker** button, located on the front panel of the ApexPro CH transmitter, marks a patient event.

The CIC Pro responds to an event marker by displaying a blue border around the event bed and sounding an alarm tone. The message *Remote Event* appears under the ECG parameter window for approximately ten seconds.

When enabled, the event marker will generate a 20-second graph and an event in alarm history. The graph feature can be turned off in the Setup CIC tab sheet, Event Marker Graph On/Off. The event marker can be disabled on the Setup CIC tab sheet, Event Marker On/Off.

ApexPro FH Transceiver (not for sale outside of the U.S.)

Please refer to Appendix D for operator's instructions on the ApexPro FH Transceiver.



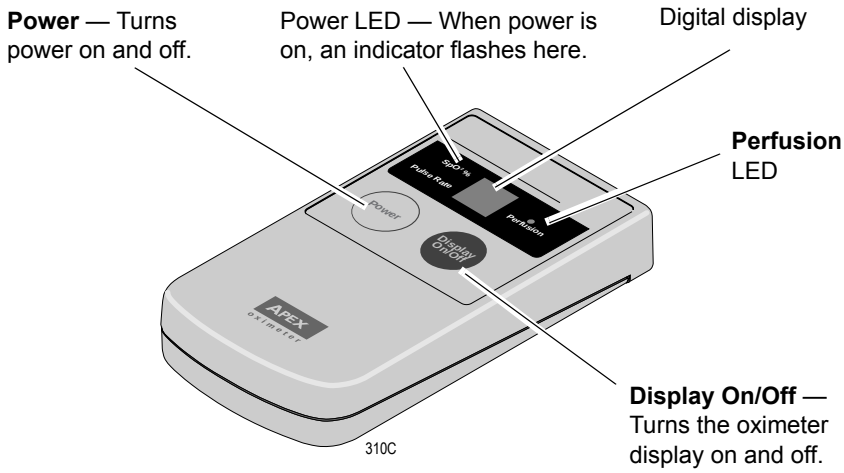
Apex Oximeter SpO2 Module

The Apex Oximeter is an optional module that can be connected to the ApexPro transmitter, allowing telemetry monitoring of a patient's pulse oximetry data. The Apex Oximeter must be connected to an ApexPro transmitter in order to convey SpO2 data to the CIC Pro. Only digital data is available; no waveforms are generated or transmitted. Digital data is stored in Graphic Trends and Vital Signs on the CIC Pro, and it is also displayed on the Apex Oximeter.

NOTE

SpO2 and SPO2 are used interchangeably throughout this manual.

Apex Oximeter Buttons and LEDs



Pressing the **Power** button turns on the battery power to the Apex Oximeter. The digital display also turns on for one minute. After one minute, the display will turn off, but power to the Apex Oximeter remains on. This is indicated by the flashing Power LED (horizontal bar).

When display power is off (flashing Power LED), pressing the **Display On/Off** button turns the display on for one minute. After one minute the display turns off, but power to the Apex Oximeter remains on, indicated by the flashing Power LED.

To turn the display on continuously, press and hold the **Display On/Off** button for 2 seconds. The flashing Power LED turns off to verify that the display has been turned on in continuous mode. To turn the display off at any time, press the **Display On/Off** button again.

NOTE

Using the Apex Oximeter with the display on continuously will result in reduced battery life.

To turn all power to the Apex Oximeter off, press and hold the **Power** button for 2 seconds.

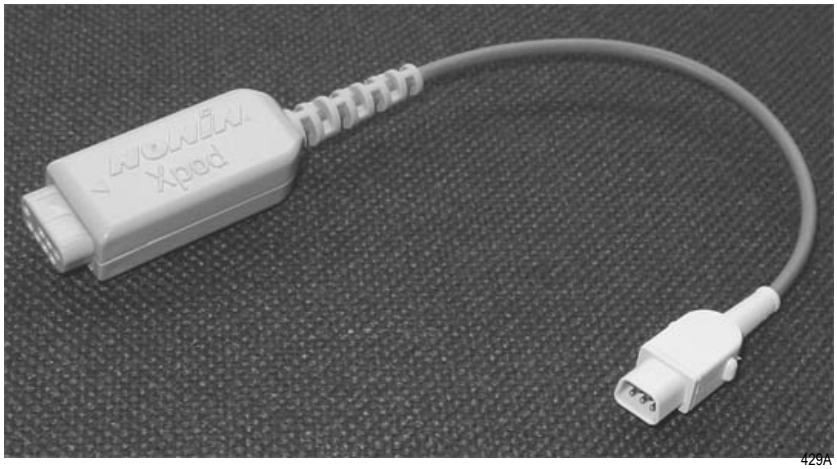
The **Perfusion** LED indicates the strength of the patient's SPO2 signal. For more information, refer to Chapter 12, SpO2 Monitoring.

Xpod™ Oximeter

The Xpod Oximeter connects to the ApexPro transmitter. It provides the following oximetry vital signs for display at the CIC Pro:

- arterial oxygen saturation (SpO2)
- peripheral pulse rate (PPR)
- perfusion quality indicator

The Xpod Oximeter uses the battery power supplied by the ApexPro transmitter. When the oximeter is connected to the transmitter, the expected battery life of fully-charged batteries is approximately 30 hours.



The Nonin Xpod Oximeter and the Apex Oximeter can display the same SpO2 system status messages, except for the CHANGE BATTERY message. See the SpO2 Monitoring chapter for more detailed information.

Accutracker DX Noninvasive Blood Pressure (NBP) Monitor

NOTE

The Accutracker DX noninvasive blood pressure monitor is available in the United States only. This model, available from GE Medical Systems *Information Technologies*, has been modified by SunTech Medical Instruments to operate with the ApexPro telemetry system.

The Accutracker DX noninvasive blood pressure monitor is an optional module that can be connected to the ApexPro transmitter, allowing telemetry monitoring of a patient's NBP data. The blood pressure cuff is connected to the blood pressure monitor, which measures and displays systolic and diastolic blood pressures using the auscultatory method. When the blood pressure monitor is connected to an ApexPro transmitter, digital values are also displayed at the CIC Pro, and stored in Graphic Trends and Vital Signs on the CIC Pro.

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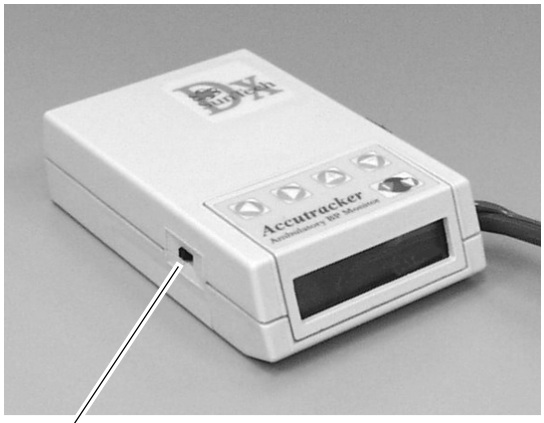
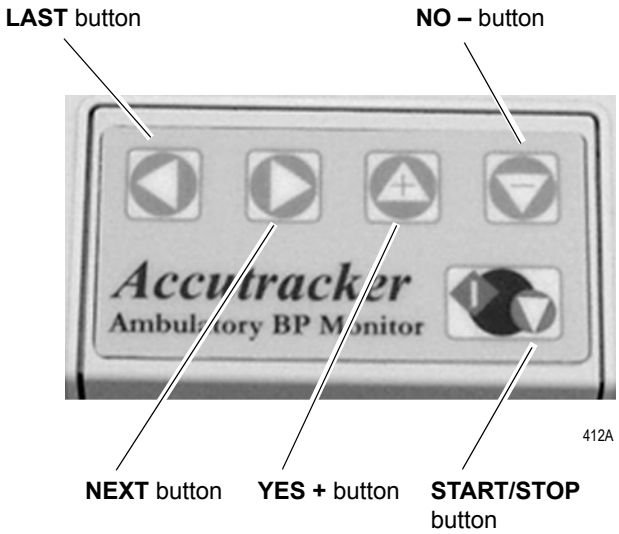
Accutracker DX Buttons and Switches

An on/off switch and five buttons control the functions of the blood pressure monitor. Their functions are described below.



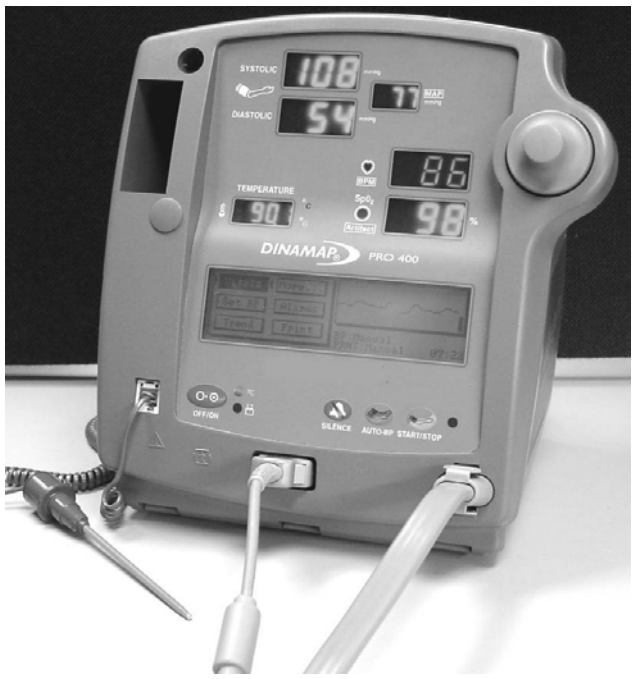


- The on/off switch, labeled **1/0**, is located on the side of the blood pressure monitor. The on position is **1**; the off position is **0**. It is used to turn the main power on and off.
- The **START/STOP** button starts and stops blood pressure readings. During the monitoring period, it can be used by the patient at the clinician's discretion. Pressing the **START/STOP** button once while a patient is being monitored "wakes up" the blood pressure monitor from sleep mode and offers the options to change the measurement interval, view the time left until the next measurement, or perform a manual reading by pressing the **START/STOP** button a second time.
- The **NEXT** button moves forward to the next menu item on the blood pressure monitor display.
- The **LAST** button moves back to the previous menu item on the blood pressure monitor display.
- The **YES +** button allows a yes response to a question or an increase in the value shown on the blood pressure monitor display.
- The **NO** – button allows a no response to a question or a decrease in the value shown on the blood pressure monitor display.

Refer to Chapter 13, NBP Monitoring, for more information about Accutracker DX operation.

DINAMAP® PRO Series Monitors

The DINAMAP PRO 100, 200, 300, and 400 series monitors can be connected to the ApexPro telemetry transmitter. They monitor SpO2, NBP, and temperature, depending on the purchased configuration. Parameter data from the PRO 100–400 series monitors is displayed, trended, and stored at the CIC Pro.

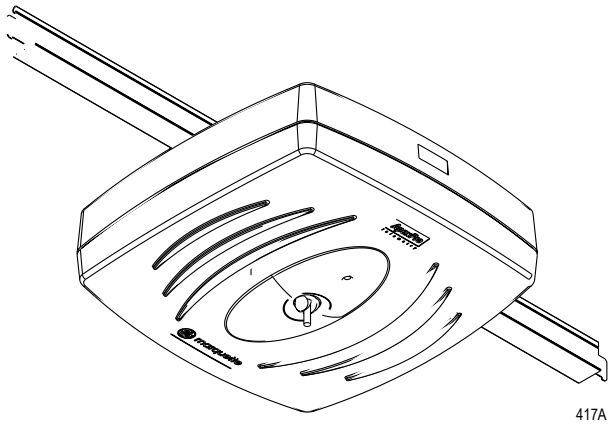


DINAMAP PRO 400 Series Monitor

The DINAMAP PRO 100–400 series monitors alarm limits are not configurable at the CIC Pro. Alarms can be silenced at the CIC Pro; however, alarms that are silenced at the CIC Pro will not be silenced at the monitor. Refer to the *DINAMAP PRO Series 100–400 Operation Manual* for detailed information.

Antenna System

The antenna system is used for transmission of data from the transmitter to the receiver system. An ApexPro receiver antenna is illustrated below.



Receiver System

Each receiver in the quad receiver module, located in the receiver subsystem, receives data from the transmitters. This data is processed by the receiver system and then transmitted via the dedicated Ethernet interface to a CIC Pro for further processing and display. The quad receivers and the receiver subsystem together are known as the receiver system.

Unity Network

The Unity network is GE Medical Systems *Information Technologies* information network system, used to transmit information from one GE Medical Systems *Information Technologies* product to others connected to the same Unity network.

CIC Pro Clinical Information Center

The CIC Pro is the central station that displays ApexPro telemetry system data sent to it via the dedicated Ethernet interface. The CIC Pro also allows modification of telemetry defaults and setup information, among other telemetry functions.

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4 Connection

For your notes

ApexPro Transmitter Setup

ApexPro Transmitter Battery Installation

CAUTION
Never store the transmitter with the batteries inside. Storing the transmitter with the batteries inside may result in damage to the transmitter.

Install two new AA alkaline batteries in the transmitter.

1. Locate the battery cover at the bottom of the transmitter.
2. Slide the cover over to open the battery compartment.
3. Insert the batteries, being careful to follow the polarity signs embossed on the lower back side of the transmitter.
4. Close the battery cover.

NOTE

- When new batteries are installed, all LEDs on the transmitter flash, then flash again twice to acknowledge the new battery installation. The flashing LEDs do not indicate good leads. You must press the VERIFY LEADS button to check lead status.
- When the **Change Battery** LED starts flashing, the ApexPro transmitter has approximately one hour of reserve power before the unit shuts down.

CAUTION
Replace the transmitter batteries promptly when the "Low Battery" message is displayed at the central station or when the change battery LED flashes on the transmitter. Failure to replace the batteries before they are completely depleted will result in interrupted patient monitoring and may cause damage to the transmitter.

Battery Functional Life

The ApexPro transmitter runs on two AA batteries. Battery life is approximately 40 hours. Battery life for the ApexPro CH transmitter is approximately 120 hours (not for sale outside of the U.S. and Canada).

For optimum performance, follow these guidelines:

- Install two new alkaline batteries each time you begin monitoring a new patient.
- Install two new alkaline batteries whenever the **Change Battery** LED on the ApexPro transmitter is flashing.
- Do not use rechargeable batteries.
- Always change both batteries at the same time.
- Always use new batteries.

CAUTION
GE Medical Systems *Information Technologies* recommends that you always replace both batteries at the same time. Re-using old batteries or using a combination of old and new batteries in the ApexPro transmitter will compromise functionality of the transmitter and increase the risk of fire hazard.

ApexPro Transmitter Leadwires

Installation

The ApexPro transmitter can be used with the following Multi-Link leadwire sets:

- Multi-Link six-leadwire set
- Multi-Link five-leadwire set
- Multi-Link three-leadwire set

To install a leadwire set into the ApexPro transmitter, align the leadwire pins with the connector on the top of the transmitter, then push the leadwire set firmly into the transmitter.

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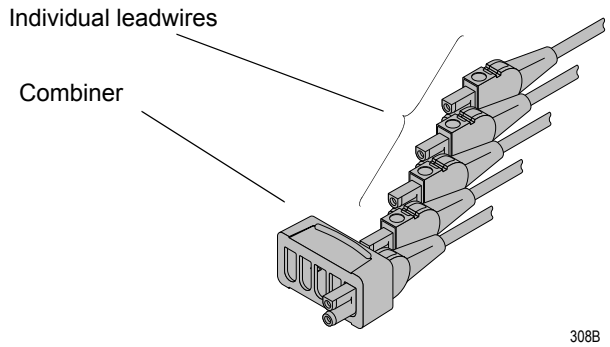
Disconnection from the Transmitter

To disconnect the leadwires from the ApexPro transmitter, grasp the molded end or the combiner firmly and pull away from the transmitter.

Multi-Link Leadwire Sets

To use sets of Multi-Link individual leadwires, firmly press the individual leadwires into their appropriate locations on the combiner. Use the colors on the leadwires to place them in corresponding order with the colors that appear on the back of the ApexPro transmitter.



Attachment to the Electrodes

1. Attach leadwires to the transmitter by plugging the Multi-Link leadwire set into the transmitter.
2. Attach leadwire clip to the terminal on the electrodes. Take care to attach the color-coded clips to the corresponding electrode locations.
3. Loop the leadwires and secure them to the patient with tape. Stress loops prevent the connection to the electrode from being loosened or pulled apart as the patient moves.

   NOTE

   Do not tape across the electrode.

Apex Oximeter Setup

Apex Oximeter Battery Installation

Install two new AA alkaline batteries in the Apex Oximeter:

1. Locate the battery cover at the bottom of the back of the Apex Oximeter.
2. Press the latch tab and lift up to open the battery compartment.
3. Insert the batteries, being careful to follow the polarity signs located within the battery compartment.
4. Close the battery cover.

NOTE

When the digital displays on the Apex Oximeter start flashing, the Apex Oximeter has approximately one hour of reserve power left before the unit shuts down.

Battery Functional Life

The Apex Oximeter runs on two AA batteries. Battery life is approximately 60 hours.

For optimum performance, follow these guidelines:

- Install two new alkaline batteries each time you begin monitoring a new patient.
- Install two new alkaline batteries whenever the digital displays on the Apex Oximeter start flashing.
- Always change both batteries at the same time.
- Always use new batteries.

CAUTION

GE Medical Systems *Information Technologies* recommends that you always replace both batteries at the same time. Re-using old batteries or using a combination of old and new batteries in the Apex Oximeter will compromise functionality of the transmitter and increase the risk of fire hazard.

Apex Oximeter Connections

To function correctly, the Apex Oximeter must be connected to a pulse oximetry (SpO2) probe. To transmit data to the CIC Pro, the Apex Oximeter must also be connected to the ApexPro transmitter.

SpO2 Probe Connection

Connect the SpO2 probe to the Apex Oximeter by plugging the non-sensor end of the probe into the 9-pin connector on the top of the Apex Oximeter.

CAUTION
Use only Nonin SpO2 probes with the Apex Oximeter. The reliability of SpO2 data obtained with any other probe has not been verified.

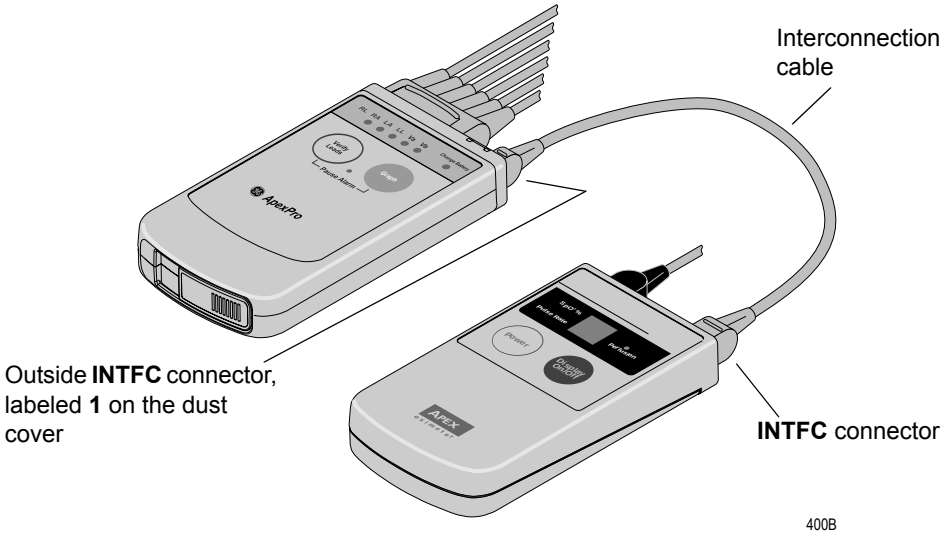
Connection to the ApexPro Transmitter

Connect the Apex Oximeter to the ApexPro transmitter by using the interconnection cable supplied with the Apex Oximeter.

NOTE
Refer to the Interconnection Cables section in this chapter for information about cable compatibility.

Plug one end of the interconnection cable into the 5-pin connector labeled **INTFC** (interface) on the Apex Oximeter. Plug the other end into the outside 5-pin **INTFC** connector on the ApexPro telemetry transmitter (labeled **1** on its dust cover).

When properly interconnected, the Apex Oximeter and the ApexPro transmitter should appear similar to the illustration below.

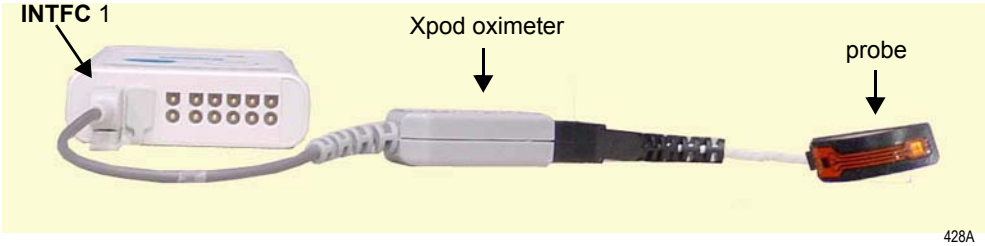


The Apex Oximeter and the ApexPro transmitter can now be attached to the patient. Follow your unit's protocol for attaching them to the patient. A common method is to place them back-to-back in the same pouch and belt them on the patient.

Xpod Oximeter Connection

Connect the Xpod Oximeter to the transmitter's **INTFC** 1 connector and to the Nonin SpO2 probe.

Once connected, follow your unit's protocol for attaching the transmitter and the oximeter to the patient.



NOTE

Use only Nonin SpO2 probes with the oximeter. The reliability of SpO2 data obtained with any other probe has not been verified.

Accutracker DX Setup

NOTE

The Accutracker DX noninvasive blood pressure monitor is available in the United States only.

Tips for Monitoring

- Use a microphone pad to maintain the best microphone position.
- Use a cuff anchor to maintain the blood pressure cuff's position.
- Advise the patient not to shower or bathe while being monitored.

Battery Installation

Install four new AA alkaline batteries in the Accutracker DX blood pressure monitor. Follow these steps:

1. Locate the battery cover on the back of the blood pressure monitor.
2. Press down and gently slide off the cover.
3. Remove the old batteries by lifting up on the ribbon in the battery case. Dispose of the old batteries properly, following your local ordinances.
4. Insert the new batteries, being careful to follow the polarity signs. Be sure to place the batteries on top of the ribbon.
5. Slide the battery cover back on securely.

NOTE

Change the batteries in the blood pressure monitor when the message *"Low Batt"* appears on the Accutracker display.

Accutracker DX Functional Life

IMPORTANT — Store and use the Accutracker DX blood pressure monitor with four good AA batteries installed.

The four AA batteries will last for approximately 250 blood pressure readings, taken at an average interval of 15 minutes.

Install four new alkaline batteries each time you begin monitoring a patient.

The Accutracker DX blood pressure monitor contains an internal lithium battery capable of sustaining the Accutracker for a MAXIMUM of 9 months (6400 hours) WITHOUT AA batteries installed. If the lithium battery becomes fully discharged, the Accutracker must be returned to the factory for service. To extend the life of the lithium battery, always store the Accutracker DX with four good AA batteries installed.

NOTE

This is a CUMULATIVE 9-month period, spanning the entire life of the blood pressure monitor.

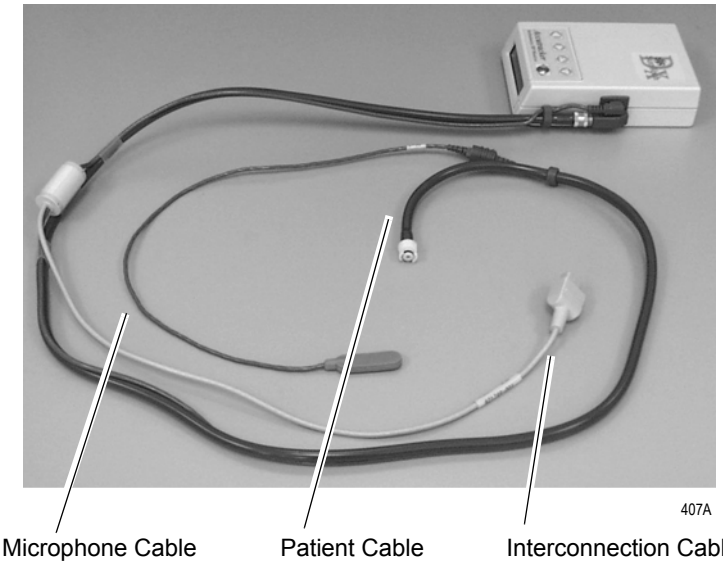
If the lithium battery is completely drained, the unit will not function. The internal lithium battery is NOT user replaceable. The unit must be returned for service if the lithium battery needs to be replaced.

It is recommended that the lithium battery be serviced every three to five years.

Store and use the Accutracker DX blood pressure monitor with four good AA batteries installed. For long-term storage, install new batteries and replace them every four months.

Accutracker DX Connections

The patient cable, microphone cable, and interconnection cable are attached to one another in one assembly. Refer to the illustration below.

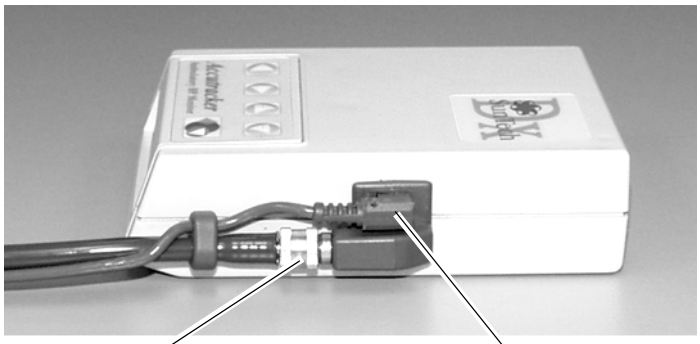


NOTE

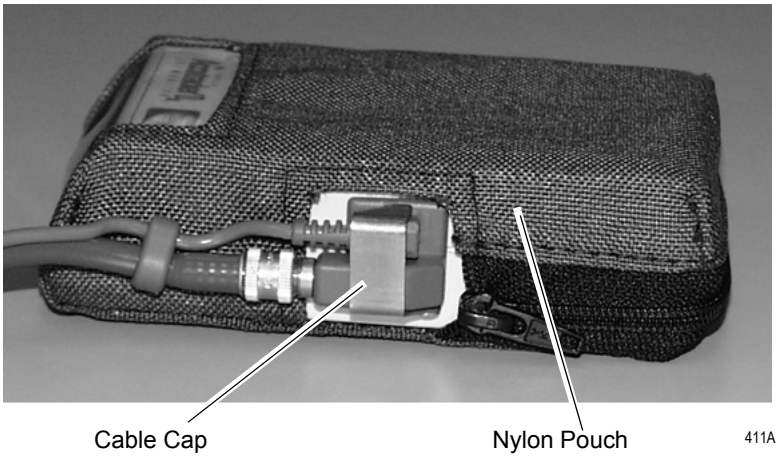
Refer to the Interconnection Cables section in this chapter for information about cable compatibility.

If the patient cable/microphone cable/interconnection cable assembly is not already connected to the Accutracker DX noninvasive blood pressure monitor, follow this procedure to connect it:

1. Attach the brass end of the patient cable to the blood pressure monitor by screwing it onto the brass air hose connector on the side of the blood pressure monitor.
2. Connect the microphone cable to the blood pressure monitor by plugging it into the 6-pin connector on the side of the blood pressure monitor, near the air hose connector.

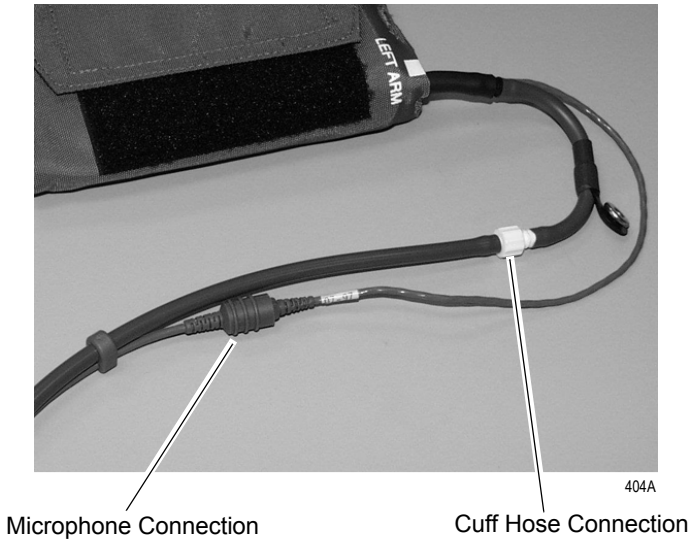


3. Secure the cable by screwing on the metal cable cap, then insert the blood pressure monitor into the nylon pouch. When the patient cable assembly is connected, the blood pressure monitor will look similar to the following photograph.



Completed Patient Cable Assembly Connection

4. Attach the blood pressure cuff hose to the patient cable already attached to the blood pressure monitor. Insert the cuff hose into the white plastic fitting on the patient cable. Turn the fitting to the right approximately one quarter turn. Some connector models will click when they are connected, otherwise, be sure that it is securely tightened. Then plug the 3-pin microphone connector into 3-pin connector on the microphone cable.

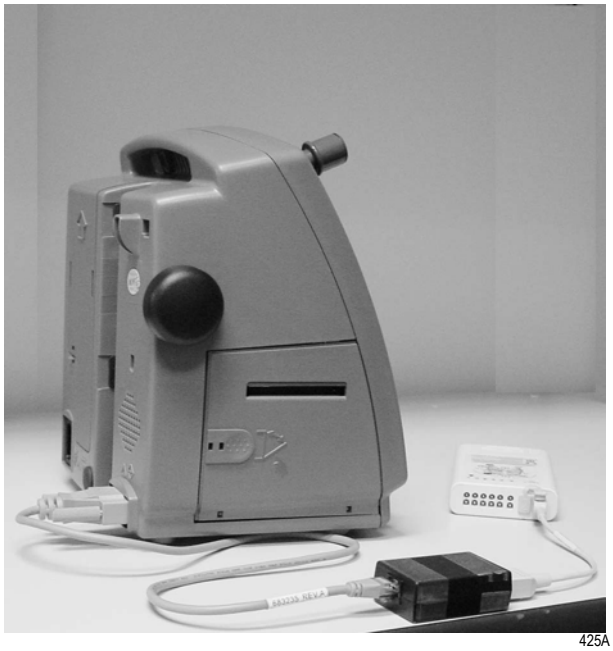


Blood Pressure Cuff Connections

5. Connect the 5-pin end of the interface cable to the inside 5-pin **INTFC** connector on the ApexPro telemetry transmitter (labeled **2** on its dust cover). The interface cable is already connected to the blood pressure monitor because it is a branch of the patient cable. Ensure that the ApexPro transmitter's patient leadwires are properly connected. The leadwires must be connected for telemetry transmission of NBP data.

DINALink™ Serial Cable

The DINALink serial cable is used to connect the ApexPro transmitter to the PRO 100–400 series monitors. The interconnect cable connects to either of the interface ports on the ApexPro transmitter.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DINAMAP PRO 400 Monitor with DINALink Serial Cable

Interconnection Cables

The interconnection cables used to connect the ApexPro transmitter with the Apex Oximeter and/or the Accutracker DX blood pressure monitor are not the same as those used with the Apex S transmitter (CD Telemetry-LAN monitoring system).

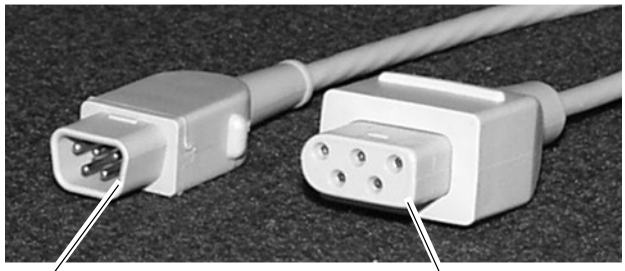
NOTE

The Accutracker DX noninvasive blood pressure monitor is available in the United States only.

The connector ends that are plugged into the telemetry transmitters are different and are not interchangeable.

Be sure to use the correct interconnection cable when you connect the Apex Oximeter or Accutracker DX blood pressure monitor to the ApexPro transmitter.

The figure below illustrates the difference in connector ends for each system.



ApexPro telemetry system interconnection cable connector — plugs into the ApexPro transmitter.

CD Telemetry-LAN monitoring system interconnection cable connector — plugs into the Apex S transmitter.

For your notes

5 Maintenance

For your notes

Biocompatibility

When used as intended, the parts of the product described in this operator manual, including accessories that come in contact with the patient during the intended use, fulfill the biocompatibility requirements of the applicable standards. If you have questions about this matter, please contact GE Medical Systems *Information Technologies* or its representatives.

Inspection

An effective maintenance schedule should be established for your monitoring equipment and reusable supplies. This should include inspection as well as general cleaning on a regular basis. The maintenance schedule must comply with the policies of your institution's infection control unit and/or biomedical department.

CAUTION
Failure on the part of the responsible hospital or institution employing the use of this monitoring equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

Check with your biomedical department to be sure preventive maintenance and calibration have been done. The service manuals contain detailed information.

Follow these guidelines when inspecting the equipment:

- Inspect the equipment for obvious physical damage and replace damaged items.
- Inspect all cords for fraying or other damage. Inspect all plugs and connectors for bent prongs or pins. Repair or replacement must be performed by qualified service personnel.
- Inspect all cable insulation. Qualified service personnel should repair or replace damaged or deteriorated cables.

In the United States, GE Medical Systems *Information Technologies* Service is available 24-hours a day by calling 800-558-7044.

Outside the United States, please contact your sales/service office.

NOTE
Refer to the service manuals for more comprehensive checkout procedures.

Cleaning

General Cleaning/Disinfecting

WARNING
Disconnect AC-powered equipment from the power line before cleaning or disinfecting its surface. Turn off the power to battery-powered equipment before cleaning or disinfecting its surface.

The equipment should be cleaned on a regular basis. (Comply with the policies of your institution's infection control unit and/or biomed department.) The exterior surfaces of the equipment may be cleaned with a soft, lint-free cloth, using the following solution, as recommended in the APIC Guideline for Selection and Use of Disinfectants (1996):

- Sodium hypochlorite (5.2% household bleach) 1:500 dilution (100 ppm free chlorine)

CAUTION
Severe corrosion may occur to any metal parts that come in contact with non-diluted bleach. Do not submerge patient cable ends or leadwire ends.

To avoid damage to the equipment, follow these rules:

- Always dilute the solutions according to the manufacturer's suggestions.
- Always wipe off all the cleaning solution with a dry, lint free cloth after cleaning or let air dry for at least 15 minutes.
- Never use conductive solutions, solutions that contain chlorides, wax, or wax compounds.
- Never pour or spray water or any cleaning solution on the equipment.
- Never permit fluids to run behind switches, into the connectors, or into any ventilation openings in the equipment.

- Never use these cleaning agents:
  - abrasive cleaners or solvents of any kind,
  - acetone,
  - ketone,
  - quaternary ammonium solutions
  - alcohol-based cleaning agents, or
  - Betadine

CAUTION
Failure to follow these rules may melt, distort, or dull the finish of the case, blur lettering on the labels, or cause equipment failures.

Cleaning the Transmitters

Importance of Proper Cleaning

Some disinfecting solutions can be conductive and cause anomalies in the performance of the transmitter. Improper cleaning methods can result in:

- appearance of waveforms when the transmitter is not connected to a patient, causing false alarms,
- degradation of overall system performance,
- total transmitter failure,
- replacement of leadwires and/or transmitter.

Additionally, improper cleaning methods could result in:

- melting, dulling, or distorting the case,
- blurred lettering on the labels.

NOTE
Cleaning products known to cause the types of problems listed above include, but are not limited to, Sani-Cloth® wipes and Ascepti® wipes; these should be avoided. Products that contain active ingredients and solutions similar to these products should also be avoided.

Transmitter Cleaning Process

Follow these steps to properly clean your transmitter.

CAUTIONS

- Do not autoclave or steam clean the transmitters.
- Do not submerse the transmitters.

1. Always remove batteries and disconnect leadwires from the transmitter before cleaning.
2. For general cleaning, wipe with a lint-free cloth dampened with the recommended diluted bleach solution (refer to "General Cleaning/ Disinfecting" on page 5-5).
3. Do not saturate the transmitter with cleaning solution. Avoid getting cleaning solution in the "wells" that surround the ECG pins of the transmitter.
4. Thoroughly dry the transmitter after cleaning. Use paper towel or a lint free cloth to remove any liquid in the "wells" that surround the ECG pins.
5. Use the Verify Leads feature of the transmitter to check the transmitter after cleaning.
   a. Do NOT connect the leadwires to the transmitter during this checking process.
   b. Insert batteries in the transmitter and close the battery door.
   c. Wait for the transmitter to start up (The LEDs will first flash rapidly and then flash slowly twice. Wait until the LEDs are done flashing).
   d. Press the Verify Leads button. All the LEDs will flash twice to indicate the button was pushed.
   e. Look for LEDs that light up and stay lit. If the transmitter is dry, none of the LEDs will light up. If the transmitter is wet and an electrically conductive path is established, some of the LEDs will light up.
   f. If any of the LEDs light up, re-dry the transmitter. Allow the transmitter to air dry if other methods are not effective.
6. Do not attach the transmitter to a patient until the transmitter is thoroughly dry.

Leadwire Cleaning Process

Follow these step for proper cleaning of your leadwires.

CAUTIONS

- Do not use acetone or ketone solvents for cleaning; do not use an autoclave or steam cleaner.
- Do not submerse the telemetry leadwires.

1. Always disconnect the ECG cable from the transmitter before cleaning.
2. For general cleaning, wipe with a lint-free cloth dampened with the recommended diluted bleach solution (refer to "General Cleaning/ Disinfecting" on page 5-5).
3. Do not saturate the leadwire with cleaning solution. Avoid getting cleaning solution in the connector end that plugs into the transmitter.
4. Thoroughly dry the leadwire after cleaning. Leadwires should hang freely when wiping. Use a paper towel to or a cotton swab to remove any liquid in the connector.
5. Use the Verify Leads feature of the transmitter as a check.
   a. Connect the leadwire to the transmitter, but do not connect the leadwire to a patient.
   b. Insert batteries in the transmitter and close the battery door.
   c. Wait for the transmitter to start up (The LEDs will first flash rapidly and then flash slowly twice. Wait until the LEDs are done flashing).
   d. Press the Verify Leads button. All the LEDs will flash twice to indicate the button was pushed.
   e. Look for LEDs that light up and stay lit. If you are using a 5 or 6 lead leadwire and it is dry, none of the LEDs will light up. If you are using a 3-lead leadwire and it is dry, only the reference lead LED will light up and stay lit.
   f. If any unexpected LEDs light up, re-dry the leadwire. Allow the leadwire to air dry if paper towel is not effective.
   g. Do not attach the leadwire to a patient until the leadwire is thoroughly dry.

More Intensive Disinfecting or Sterilization

CAUTION
The decision to sterilize must be made per your institution's requirements with an awareness of the effect on the integrity of the transmitter and leadwire.

Cleaning the Oximeter and Accutracker DX

To clean the Apex Oximeter, the Nonin Xpod Oximeter, or the Accutracker DX blood pressure monitor, follow the instructions in "General Cleaning/Disinfecting" on page 5-5.

CAUTION
- Do not autoclave or steam-clean the equipment.
- The decision to sterilize must be made per your institution's requirements with an awareness of the effect on the integrity of the transmitter and leadwire.

Cleaning the Power Unit

Follow these precautions when cleaning the antenna power unit, connected to the antenna system.

WARNING
When cleaning the power unit, use a cloth dampened with cleaning alcohol on the outside of the enclosure only. Do not immerse the product in water or a safety hazard could arise during use.

Periodic leakage current testing should be done on the combined power supply and end-use system on a yearly basis when used in a hospital environment where such test equipment is commonly available.

Transmitter and Leadwire Storage

Storage Guidelines

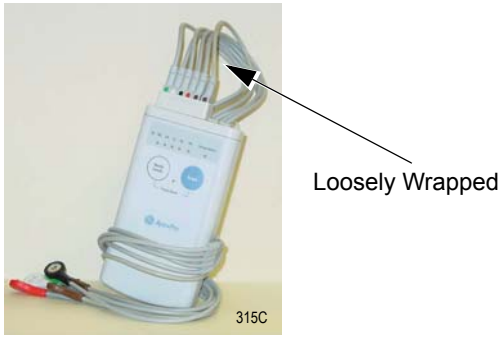
Always remove batteries when the transmitter is not in use, even for short periods of time. Store transmitters in a dry environment. The preferred method of storage is to hang the transmitter in the transmitter holder. If leadwires are attached, they should hang straight.

Storage Using the Optional Transmitter Holder

It is recommended that you store the transmitter and leadwires in the optional transmitter holder (not pictured). This wall-mounted holder can store up to six ApexPro transmitters. The leadwires hang freely below the holder, minimizing the possibility of damage.

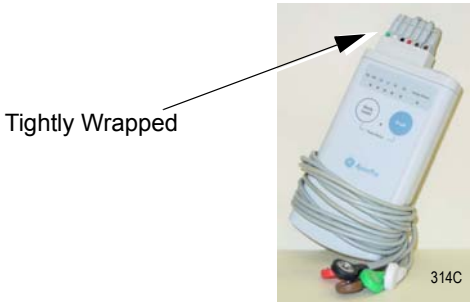
Storage Without a Transmitter Holder

If a transmitter holder is not available, wrap the leadwires around the transmitter, allowing the top of the leadwires to remain loose. Leadwires should NOT be stretched tightly during storage.



Improper Storage

Do NOT bend or stretch leadwires tightly before wrapping around the transmitter. Improper storage will cause damage and shorten the leadwires' useful lifetime.



Technical Maintenance

Schematic diagrams and other relevant technical information can be found in the service manuals supplied with this equipment. Comply with the policies of your institution's biomedical department, or the recommendations made within the Preventive Maintenance section of the product's service manual.

Technical Specifications

Technical specifications are located in the service manuals.

For your notes

6 Telemetry Setup

For your notes

Introduction

The *Setup CIC* button, located in the CIC Pro's main menu at the bottom of the display, opens the *CIC Setup* window. The *CIC Setup* window contains the tab sheets used for customizing the CIC Pro.

The Telemetry Unit Defaults, CIC Defaults, Current Telemetry Listings, Full Disclosure Defaults, and Service Password tab sheets are discussed in this chapter. The Telemetry Alarm Control Defaults tab sheet is discussed in Chapter 8, Alarm Control.

For information about the Display Format and Screen Calibration tab sheets, refer to the CIC Pro Clinical Information Center Operator's Manual.

While all of the tab sheets within the *CIC Setup* window can be viewed from user mode, most of the functions on these tab sheets can only be configured from within the service mode.

The functions available on these tab sheets are discussed in detail in the service manual for the CIC Pro.

Telemetry Factory Default Settings

These factory defaults are in effect, depending upon the patient's age, unless they have been modified through Telemetry Unit Defaults.

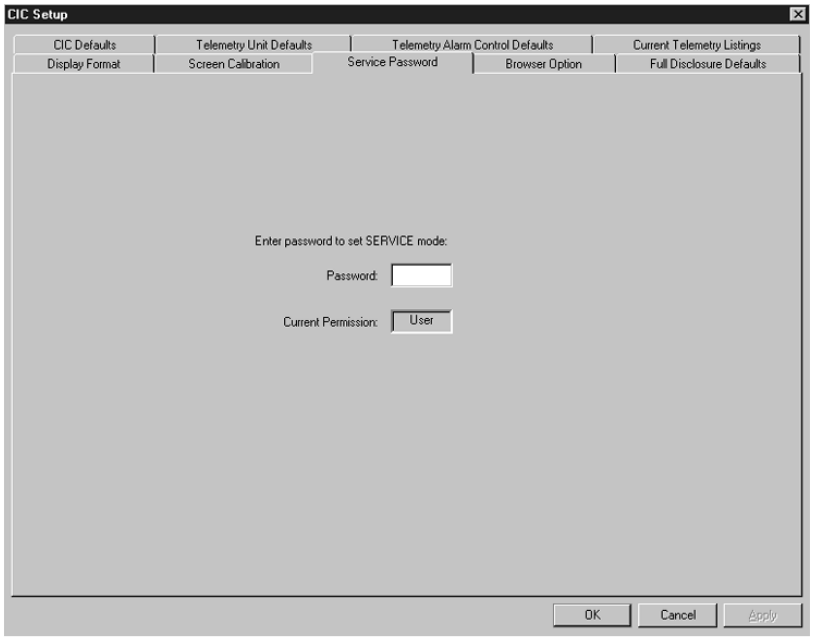
- ECG displayed lead is II
- Multi-lead analysis
- Heart rate alarm limits (high/low):
  - Adult—150/50
  - 0–2 years—200/90
  - 3–10 years—180/60
  - 11–13 years—150/50
- ST measurement:
  - Adult— J+ 60ms
  - 0–2 years— J+ 30ms
  - 3–10 years— J+ 40ms
  - 11–13 years— J+ 50ms
- PVC limit is 6
- 1X size
- Pace off
- Arrhythmia on (arrhythmia changes with age)
- ST off
- Graph leads II and V
- 25 millimeters per second speed
- Alarm graph location at the CIC Pro where patient was admitted
- TTX (manual) graph location at the CIC Pro where patient was admitted
- Print window location at the CIC Pro where patient was admitted

Service Password

The Service Password tab sheet contains a field for entering the password to access the CIC Pro's service mode.

To open the Service Password tab sheet, follow these steps.

1. Use the mouse to click on *Setup CIC* in the main menu.
2. Click on the *Service Password* tab to bring it to the front.



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CAUTION
The service mode is intended for use only by qualified personnel with training and experience in its use. The consequences of misuse include loss of alarm configuration, loss of patient data, corruption of the CIC Pro operating system software, or disruption of the entire Unity network.

3. To change from the user mode to the service mode, use the keyboard to enter the service password, then click *Apply*. The *Current Permission* entry changes from *User* to *Service*.

NOTE
Contact your biomedical engineering department or your GE Medical Systems *Information Technologies* representative to access the service mode.

Telemetry Unit Defaults

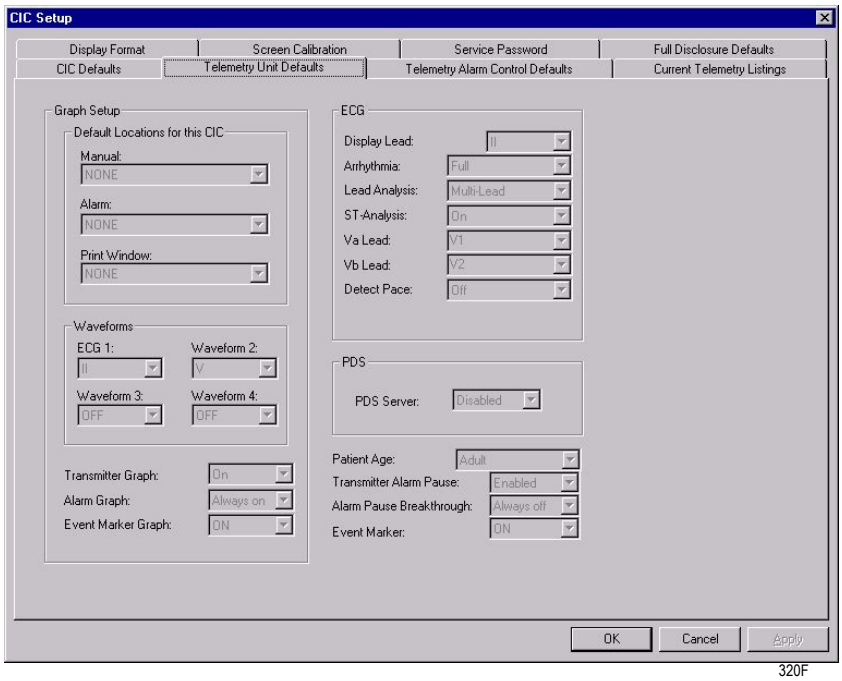
Unit defaults are saved settings for various features and alarm levels that apply to telemetry monitoring at the CIC Pro. Unit defaults can be set only in service mode, and once they are set, they remain in effect and are automatically applied each time a new telemetry patient is admitted to the CIC Pro.

Viewing Telemetry Unit Defaults

You can view the current telemetry unit defaults settings by clicking on the *Setup CIC* button, but defaults can only be modified when in the service mode. Unless you are in the service mode, you will not be able to see all available options, you will not be able to highlight the options, and the current settings will appear dimmed.

To view Telemetry Unit Defaults, follow this procedure.

1. Click on the *Setup CIC* button at the bottom of the CIC Pro display. A set of tabs appears.
2. Click on the *Telemetry Unit Defaults* tab. The current settings for the unit appear.



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Telemetry unit defaults can be set for the following features:

- Manual, alarm, and print window graph locations
- ECG 1, and Waveforms 2, 3, and 4
- Transmitter graph
- Alarm graph on/off
- Event marker graph on/off (not applicable to all transmitters)
- Display lead
- Arrhythmia
- Lead analysis
- ST analysis
- Va and Vb leads
- Detect pace
- PDS server
- Patient age
- Transmitter alarm pause
- Alarm pause breakthrough
- Event marker (not applicable to all transmitters)

Once you have entered the service mode, you may modify the telemetry unit defaults, as described below. Refer to the Service Password section in this chapter for information about entering the service mode.

Graph Setup

Graph location defaults can be set for a Manual graph location, an Alarm graph location, and a Print Window graph location. Refer to Chapter 9, Printing, for more information about graphing.

Waveforms

The *ECG 1* popup list is used to set the unit default for the waveform that will print in the first position on a graph. Lead II is the default.

The *Waveform 2, 3,* and *4* options are used to set the unit defaults for the waveforms that will be printed in the second, third, and fourth positions on the graph.

The options found in these popup lists are:

- *I*
- *II*
- *III*
- *V* (This option will indicate the V lead being monitored, e.g., V2.)
- *AVR*
- *AVL*
- *AVF*
- *Off* (available for Waveform 2, 3, and 4 only)

Transmitter Graph

The *Transmitter Graph* option can be set to *On* or *Off*. When this option is set to *On*, a telemetry patient can initiate a graph by pressing the **Graph** button on the telemetry transmitter. When this option is set to *Off*, graphs cannot be initiated at the transmitter.

This option sets the unit default for all telemetry patients admitted to the CIC Pro. When the *Transmitter Graph* option is set to *On*, transmitter graph privileges can also be set on an individual patient basis using the *Enable Transmitter Graph* check box in the patient's Graph Setup tab sheet.

Alarm Graph

The *Alarm Graph On/Off* option allows you to select whether a graph will be printed when an alarm occurs. The choices are:

- *Always off*
- *Always on* (factory default selection)

This option sets the unit default for all patients admitted to the CIC Pro. It cannot be changed on an individual patient basis.

Event Marker Graph

The *Event Marker Graph* option allows you to select whether a graph will be printed when a patient's event is marked using the Event Marker button on the transmitter (refer to "Event Marker" on page 3-10). The choices are:

- *Off* (factory default selection)
- *On*

This feature is not applicable to all transmitters.

Display Lead

The options found in the popup list for the *Display Lead* field are:

- *I*
- *II* (factory default selection)
- *III*
- *V* (This option will indicate the V lead being monitored, e.g., V2.)
- *AVR*
- *AVL*
- *AVF*

Arrhythmia

The options found in the popup list for the *Arrhythmia* field are:

- *Off*
- *Lethal*
- *Full* (factory default selection)

Lead Analysis

The options found in the popup list for the *Lead Analysis* field are:

- *Multi-Lead* (factory default selection)
- *Single Lead*

ST Analysis

The options found in the popup list for the *ST Analysis* field are:

- *Off* (factory default selection)
- *On*

Va and Vb Lead

Use the *Va Lead* and *Vb Lead* options to set the defaults for the V leads that will be monitored in these positions. A 6-lead cable is required for dual V-lead monitoring. The options are:

- *V1* (recommended for arrhythmia detection*)
- *V2*
- *V3*
- *V4*
- *V5* (recommended for ST depression monitoring*)
- *V6*

* Barbara J. Drew, RN, PhD, FAAN (2000). *Value of Monitoring a Second Precordial Lead for Patients in a Telemetry Unit*, GE Medical Systems (order document number M04243ME0).

Detect Pace

NOTE
Refer to Chapter 11, ECG Monitoring, for important information regarding *Detect Pace* and the pacemaker detection programs.

The options found in the popup list for the *Detect Pace* field are:

- *Pace 1*
- *Pace 2*
- *Off* (factory default selection)

NOTE
The *Off* option turns pacemaker detection off. It does NOT perform pacemaker detection. Either the *Pace 2* or *Pace 1* option MUST be used with patients who have pacemakers.

PDS

This option allows you to enable/disable use of the Patient Data Server (PDS).

Patient Age

The options found in the pull-down list for the *Patient Age* field are:

- *0-2 years*
- *3-10 years*
- *11-13 years*
- *Adult* (factory default selection)

The patient age setting chosen in the Telemetry Unit Defaults tab sheet affects the alarm settings. Refer to the example below.

Example 1. Patient Age

Telemetry Unit Defaults Tab Sheet Setting	Age Chosen In The Admit Tab Sheet When Patient Admitted	Resulting Limits	Unit Default Alarm Level (Brady)	Resulting Alarm Level
Adult	Adult 0-2 years 3-10 years 11-13 years	10, 155[1] 90, 200 60, 180 50, 150	Message Message Message Message	Message Crisis Crisis Advisory
0-2 years	Adult 0-2 years 3-10 years 11-13 years	50, 150 10, 155* 60, 180 50, 150	Message Message Message Message	Advisory Message Crisis Advisory
3-10 years	Adult 0-2 years 3-10 years 11-13 years	50, 150 90, 200 10, 155* 50, 150	Message Message Message Message	Advisory Crisis Message Advisory
11-13 years	Adult 0-2 years 3-10 years 11-13 years	50, 150 90, 200 60, 180 10, 155*	Message Message Message Message	Advisory Crisis Crisis Message

1. These reflect the unit default values set for this example. These values will reflect whatever your unit default is set to.

NOTE

This is an example of *Brady* changes associated with age changes.

The Telemetry Unit Defaults tab sheet settings take precedence when the patient age chosen in the Admit tab sheet and the age default setting from the Telemetry Unit Defaults tab sheet match.

When the ages do not match, the Admit tab sheet age setting takes precedence.

Transmitter Alarm Pause

NOTE
Refer to Chapter 8, Alarm Control, for important information about Transmitter Alarm Pause.

The options found in the popup list for the *Transmitter Alarm Pause* field are:

- *Disabled* (factory default selection)
- *Enabled*
- *Off*

This option sets the unit default for all telemetry patients admitted to the CIC Pro. When the *Transmitter Alarm Pause* option is set to *Disabled* or *Enabled*, transmitter alarm pause privileges can also be set on an individual patient basis using the *Enable Transmitter Pause* check box in the patient's Alarm Control tab sheet.

Alarm Pause Breakthrough

NOTE
Refer to Chapter 8, Alarm Control, for important information about Alarm Pause Breakthrough.

The *Alarm Pause Breakthrough* option allows you to set the default for when a crisis alarm will sound, even if an alarm pause has been set. The choices are:

- *Always On* (factory default selection)
- *Always Off*

This option sets the unit default for all telemetry patients admitted to the CIC Pro. It cannot be changed on an individual patient basis.

Event Marker

The *Event Marker* option allows you to enable/disable this feature, which is used to remotely mark a patient's event (refer to "Event Marker" on page 3-10). The choices are:

- *Off* (factory default selection)
- *On*

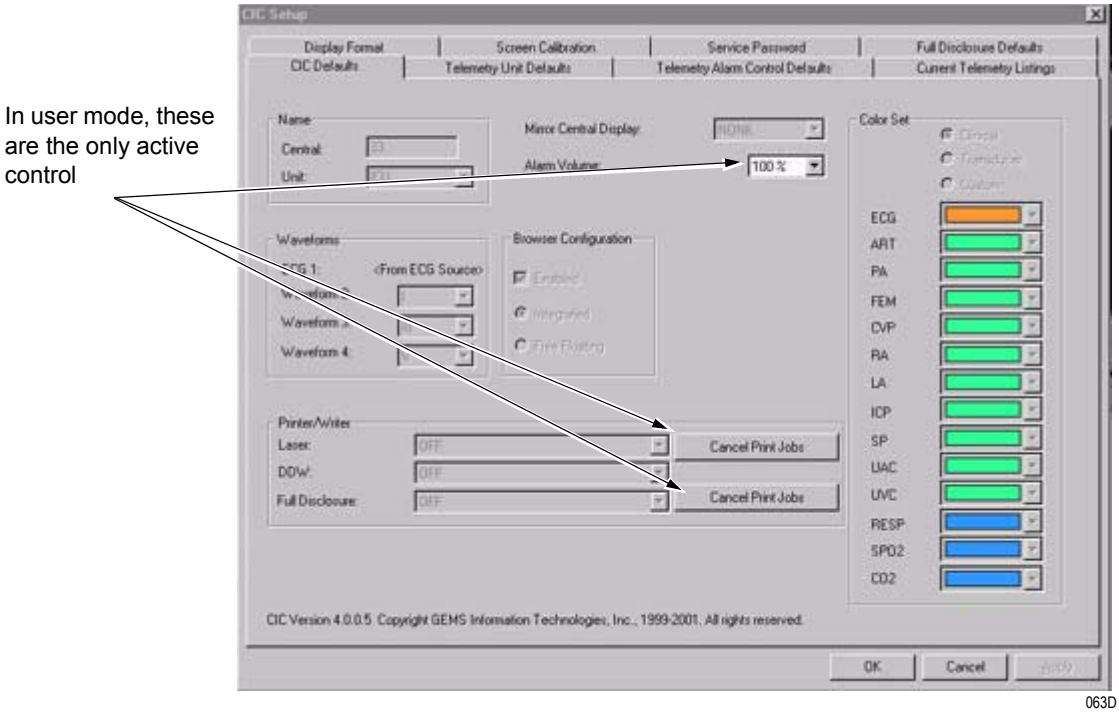
This feature is not applicable to all transmitters.

CIC Defaults

You can view the current CIC Pro default settings by clicking on the *CIC Setup* button, but defaults can only be modified when in the service mode. Unless you are in the service mode, you will not be able to see all available options, you will not be able to highlight the options, and the current settings will appear dimmed. Refer to the Service Password section in this chapter.

To open the CIC Defaults tab sheet, follow these steps.

1. Click on the *Setup CIC* button at the bottom of the CIC Pro display. A set of tabs appears.
2. Click on the *CIC Defaults* tab to bring it to the front.



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The following features of the CIC Defaults tab sheet can be modified in the service mode.

Name:

- *Central*—allows you to enter the name for this CIC Pro.
- *Unit*—allows you to enter the care unit name for use on the Unity IS network.

Waveforms:

- *ECG 1*—this is defined by the ECG source.
- *Waveform 2 – 4*—allows you to define multiple patient viewer waveforms.

Mirror Central Display—allows double-monitoring of patients from remote, or secondary, central stations.

Browser Configuration—allows you to browse your intranet using the provided web browser.

Alarm Volume—allows you to set a default alarm volum**e.**

Printer/Writer:

- *Laser*—allows you to designate the default laser printer for this CIC Pro.
- *DDW*—allows you to designate the default writer for this CIC Pro.
- *Full Disclosure*—allows you to designate the default printer to print Full Disclosure for this clinical information center.

Cancel Print Jobs—This control allows you to cancel a print job to the Laser printer and Full Disclosure printer.

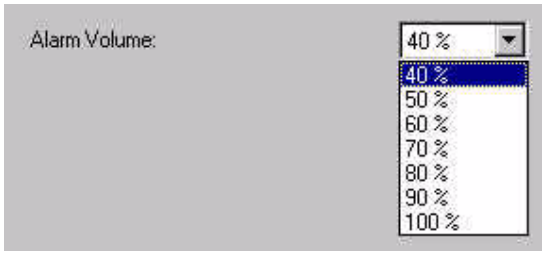
Color Set:

- *Clinical*—selects a preset clinical color scheme for waveforms.
- *Transducer*—selects a preset transducer color scheme for waveforms.
- *Custom*—allows you to set each waveform color individually.

Adjusting Alarm Volume

The default alarm volume can be adjusted without entering the service mode when the alarm level is set above 40%. Follow these steps.

1. Click on the *Alarm Volume* field. The Alarm Volume popup menu opens.



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2. Click on the desired volume level. The volume can be set between 40% and 100%. To set the volume below 40%, you must enter the service mode. When the alarm level is set below 40%, the *Alarm Volume* field is disabled for the user.

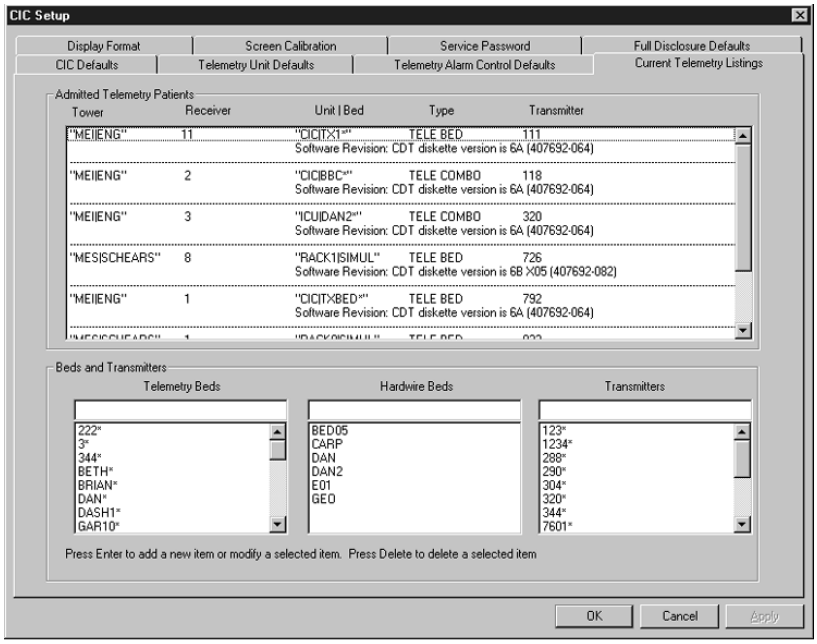
3. When you are satisfied with the new volume level, use the mouse to click *Apply* to activate your change.
4. Click on another tab to bring the corresponding tab sheet to the front, or click on the *OK* button in the bottom right corner of the tab sheet to close the close the CIC Setup window and return to the multiple patient viewer.

Current Telemetry Listings

You can view the Current Telemetry Listings by clicking on the *Setup CIC* button, but defaults can only be modified when in the service mode. Refer to the Service Password section in this chapter.

The Current Telemetry Listings tab sheet allows you to view characteristics of telemetry settings. To open the Current Telemetry Listings tab sheet, follow these steps.

1. Click on the *Setup CIC* button at the bottom of the display. A set of tabs appears.
2. Click on the *Current Telemetry Listings* tab to bring it to the front.



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The *Admitted Telemetry Patients* control is for information only. The *Beds and Transmitters* controls can only be modified from within the service mode.

Admitted Telemetry Patients

NOTE

This overview covers the controls in a row. Each row contains information for one telemetry patient.

The second line of an entry shows the current software level for the patient bed in question.

Tower—indicates which telemetry receiver system this telemetry patient is communicating with.

Receiver—indicates the receiver inside the telemetry receiver system with which this telemetry transmitter is communicating.

Unit|Bed—indicates the unit and bed to which this patient has been assigned.

Type—indicates the type of patient this is: *Tele Bed* or *Tele Combo*.

Transmitter—indicates the identification number assigned to this patient's transmitter.

Bed and Transmitters

Telemetry Beds—allows you to add, modify, or delete a telemetry bed name.

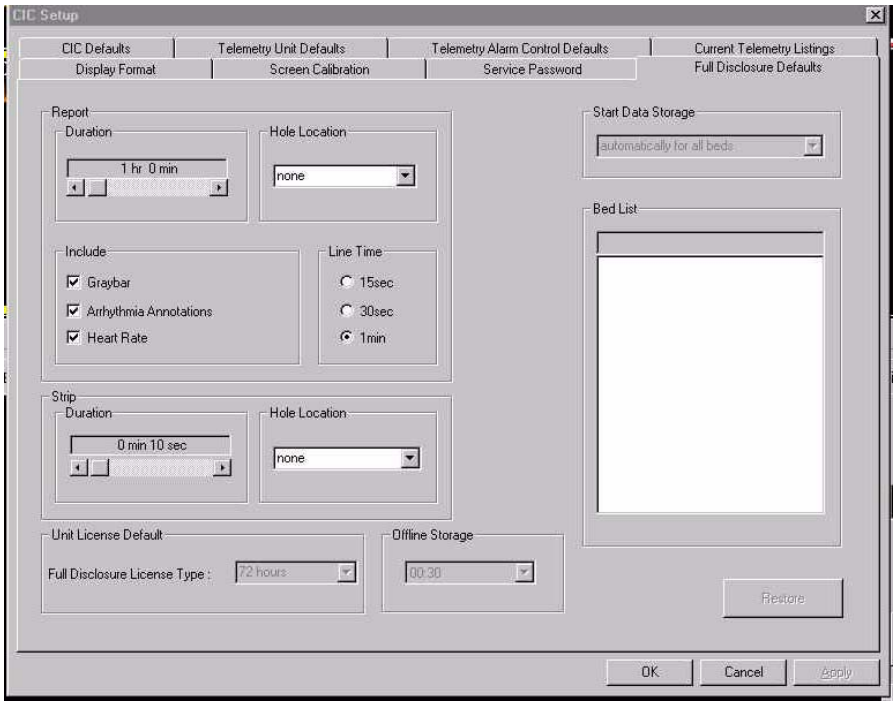
Hardwire Beds—allows you to add, modify, or delete a hardwire bed name.

Transmitters—allows you to add, modify, or delete a telemetry transmitter.

Full Disclosure Defaults

The Full Disclosure Defaults tab sheet is used to set up the defaults for full disclosure monitoring. You must enter the service mode to make any modifications to this tab sheet. Refer to the Service Password section in this chapter for more information about entering the service mode.

Below is an illustration of the Full Disclosure Defaults tab sheet. For complete details about the full disclosure function, please refer to the CIC Pro Clinical Information Center Operator's Manual.



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For your notes

7 Admit/View a Patient

For your notes

About Admitting

Switching Transmitters

If you wish to switch to an ApexPro transmitter from a CD Telemetry-LAN transmitter (Apex S, Apex 5, Apex 3, or CD Telemetry transmitter) or vice versa while a patient is admitted, you must follow this procedure:

- Discharge the patient (losing stored data).
- Switch transmitters.
- Re-admit the patient.

Monitoring will stop if you switch transmitters while a patient is admitted. Attempting to change the TTX number for an admitted telemetry patient at the CIC Pro will generate the message "*INVALID TTX*."

Terminology

For the purposes of this document, the following terms apply:

Telemetry Monitoring

Telemetry monitoring occurs when patient vital signs data is transmitted by a telemetry transmitter to a telemetry receiver system over an established antenna system and viewed at a CIC Pro. The CIC Pro identifies a telemetry bed by placing an asterisk next to the bed name (e.g., IMC|BED4*). ECG data is processed by the telemetry receiver system.

Bedside Monitoring

A bedside monitor is a stationary monitor (user-configured or factory-configured). These monitors are connected directly to the patient via an ECG cable. They are set up with a unit name as well as a bed name (e.g., IMC|BED4). For a user-configured monitor, ECG data is processed by an acquisition module. For a factory-configured monitor, ECG data is processed within the monitor itself.

For information about bedside monitoring at the CIC Pro, refer to the CIC Pro Clinical Information Center Operator's Manual.

Combo Monitoring

This application provides the option to acquire ECG data from either the monitor or from a telemetry receiver system. This ECG data acquisition capability enhances basic telemetry monitoring by providing additional access to all of the available parameters from the monitor. A Unity network connection is required.

NOTE

Users should be aware of a possible time discrepancy between the waveforms from the Telemetry device and the waveforms hard-wired to the display device. Users should not consider these waveforms to be synchronous. If absolute synchronicity is desired, Combo mode should be discontinued and the ECG waveforms should be acquired via the hard-wired bedside device.

Locked and Unlocked Beds

The CIC Pro can be configured with the bed names in either locked or unlocked mode. When locked, the bed names are permanently assigned to specific windows.

For information about locked and unlocked beds, refer to the service manual for the CIC Pro.

NOTE

It is possible to admit a patient to a window with a bed name that is locked to *NONE*. To avoid duplication of patient waveforms, a window locked to *NONE* should not be used to admit a patient.

Alpha-Numeric TTX ID Number

Each transmitter has a transmitter (TTX) ID that corresponds to a frequency and service type. The TTX ID is found in parenthesis on the back of the ApexPro transmitter.

When the TTX ID is entered for a patient at the CIC Pro, the CIC Pro recognizes the transmitter type and translates the information into an alpha-numeric number. The alpha-numeric number of the transmitter is displayed under the ECG parameter window.

NOTE

The TTX ID number is composed of either a three, four or five digit number.

Admit Instructions

Admitting a telemetry patient is a simple, yet important procedure. After you have prepared the patient's skin, properly placed the electrodes, verified lead quality and electrode status, and set up the transmitter, the patient can be admitted.

- Refer to "Patient Preparation" on page 11-4 for information on patient skin preparation, proper electrode placement and verifying lead quality and electrode status.
- Refer to "ApexPro Transmitter Battery Installation" on page 4-3 for information on setting up the ApexPro and ApexPro CH transmitter. Refer to "Installing and Removing a Battery" on page D-24 for information on setting up the ApexPro FH transceiver.

Admit Procedure

1. At the CIC Pro, choose a bed window that is blank except for an *Admit* button or appropriate bed number.

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If a bed window similar to the one illustrated above does not appear on your CIC Pro, click on the *Auto Display* button in the main menu at the bottom of the display. The display will rearrange to add at least one empty bed window with an *Admit* button.

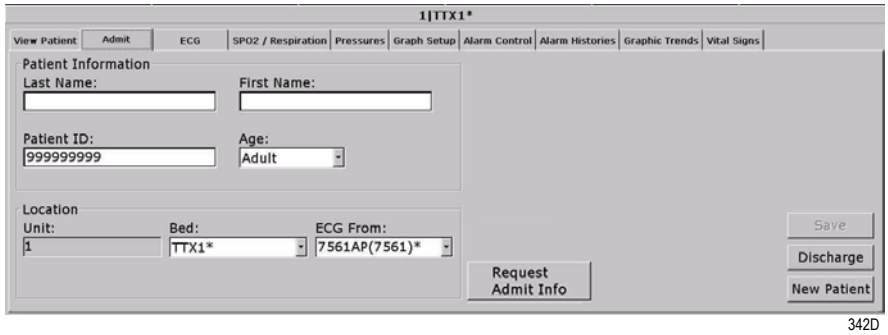
NOTE

If there are no additional bed windows available, the message "*Reconfiguration failed!"* will appear. Do a discharge to make a bed window available for admit. For more information on discharging, refer to the Discharging a Patient section in this chapter.

NOTE

A bed window that still contains some patient information and the message *"DISCHARGED"* is available for admit. For information on clearing the data and making this type of window available for admit, refer to the Clearing a Patient Window section in this chapter.

2. Use the mouse to click on the *Admit* button. The single patient viewer appears at the bottom of the display, with the Admit tab in front.



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3. Select the desired bed number by using the mouse to click on the down arrow that appears to the right of the *Bed* field. A popup list of beds in the unit appears. Click on your choice to select it.

   The bed number selection will not change if the bed number is locked. (Refer to the service manual for the CIC Pro for more information about locked beds.)

4. Select the *Request Admit Info* option. There are two possibilities of what may happen:

   a. If HL7 admit data is available on a MUSE system or QS system, the appropriate fields on the *Admit* tab sheet will be populated with data from those devices.

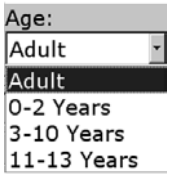
   b. If no HL7 admit data is available, an error message will appear, and the fields on the *Admit* tab sheet will have to be entered manually.

5. After selecting the bed number and requesting admit information, select the source of the ECG in the *ECG From* field. Click on the down arrow at the right of the field, and a popup list of choices will appear. Click on your choice to select it.

   Be sure that the TTX number you select from this list matches the TTX number on the back of the ApexPro transmitter connected to the patient.

6. You can enter patient information by clicking in the various patient information fields, typing in the information, and then tabbing into or clicking in the next field. The patient information that should be entered is: *Last Name, First Name, Patient ID*, and *Age*. You do not have to enter this information in order to admit a patient. However, it is recommended that you enter it.

   - *Last Name, First Name,* and *Patient ID* are entered using the keyboard. Click or tab into the field before typing the information. Press the backspace key to delete characters when changing or correcting the patient's name or ID number.
   - *Age* appears as a popup list of selections. Click on the down arrow to the right of the field to open the list. Click on your choice to select it.



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7. Once you have entered all the patient information desired, click on the *Admit* button in the lower right corner of the tab sheet to admit the patient. Verify that the patient's bed window and waveforms appear on the CIC Pro.

Discharge Instructions

To discharge a patient, follow this procedure:

1. At the CIC Pro, click on the bed window of the patient you wish to discharge. The display rearranges to accommodate the single patient viewer at the bottom of the display.
2. Click on the *Admit* tab to bring the tab sheet to the front.

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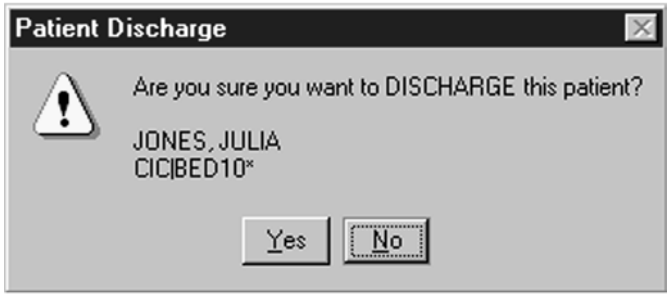
3. Click on the *Discharge* button in the lower right corner of the tab sheet. A dialog box similar to the one below appears on the display.



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4. Click on the *Yes* button or type the letter **Y** on the keyboard if this is the patient you wish to discharge. All patient information will clear.

   While the information is being cleared, the message *"Discharging patient…"* appears briefly on the Admit tab sheet.

The single patient viewer closes, and the display returns to the multiple patient viewer. The bed window of the patient you just discharged will show the message "*DISCHARGED"* at the bottom of the window. If the bed is not locked, an *Admit* button appears in the window as soon as the display is rearranged or refreshed. If the bed is locked, the "*DISCHARGED"* message remains on the bed window.

New Patient Button

This option is only available for *Telemetry Beds* and *Tele Combo* type patients. It is located on the *Admit* tab sheet on the CIC Pro. It allows the user to discharge a patient and admit a new patient, while keeping the same bed number and transmitter ID number.

To discharge then admit a patient, follow this procedure:

1. At the CIC Pro, click on the bed window of the patient you wish to discharge. The display rearranges to accommodate the single patient viewer at the bottom of the display.
2. Click on the *Admit* tab to bring the tab sheet to the front.
3. Click on *New Patient* in the lower right corner of the tab sheet.
4. Click on *Yes* or type the letter **Y** on the keyboard if this is the patient you wish to discharge. The CIC Pro automatically discharges the old patient and allows the user to enter a new patient to the patient bed slot. The transmitter ID stays in that slot so that the new patient can be admitted to the same transmitter.