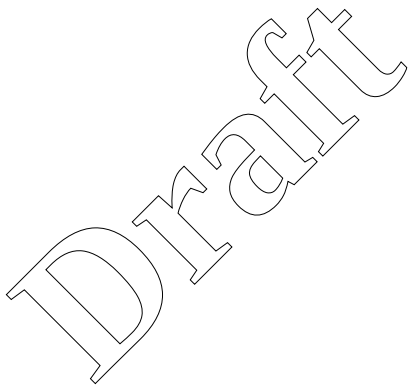
APEX®, ApexPro™ and ApexPro™ CH

Transmitter Programming Instructions

Software Version 2

2001989-135 Revision A - Draft 7



GE Medical Systems
Information Technologies

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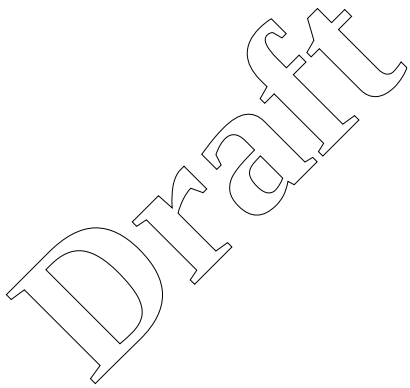
NOTE:

The information in this manual only applies to APEX, ApexPro, and ApexPro CH Transmitter Programming Instructions software version 1. It does not apply to earlier software versions. Due to continuing product innovation, specifications in this manual are subject to change without notice.

Contents

1 Introduction



Overview

The programming device can be used to perform these functions:

- Program the transmitter's basic functions.
- View the transmitter's firmware code version numbers and diagnostic test results.
- Replace a transmitter's PCB (by trained service personnel only.)
- Generate reports for transmitters that have been programmed.
- (ApexPro and ApexPro CH) Update the firmware code.
- (ApexPro) Set the transmitter's feature level.
- Perform troubleshooting.

When you are done programming transmitters, disconnect the transmitter from the programming device and remove the batteries from the transmitter. (See page 12).

If you have problems at any time, refer to the troubleshooting section for your specific transmitter.

Standards Used in this Manual

Definitions

The following methods are used in this manual to describe various features and functions.

Button or LED label — The name of a specific LED or a physical button located on the transmitter or the programming device. Press to perform a function. In this manual, a button is shown in bold (for example, **RA**, **LL**, **Graph**, etc.)

Screen text — Any text that appears on the PC display for the software. In this manual, screen text is shown in italics (for example, *TTX Number*, *OK*, etc.).

Illustrations and Names

All illustrations in this manual are provided as examples only. They may not necessarily reflect your specific setup or the data displayed on your PC.

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

Document Revision History

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

Rev.	Date	Comments
A	04 August 2003	Initial release of this document for software version 2A.

Install the Programming Device

Hardware Requirements for the Programming Device

- IBM-compatible PC with the following:
  - Pentium (or better) processor
  - 32 MB available memory
  - 20 MB available hard drive space
  - Windows 2000, Service Pack 3 recommended
    (Installer must have administrator rights to the PC on which the system is being installed.)

    NOTE

    MAY work on the following operating systems, but is not supported:

    Windows 98

    or

    Windows XP
    (Installer must have administrator rights to the PC on which the system is being installed.)

    or

    Windows NT 4.0, Service Pack 6 or greater
    (Service Pack 6 is provided on the installation CD. To perform this upgrade, run *sp6i386.exe* from the CD.)
  - SVGA monitor with minimum resolution of 800 x 600
  - RS232C serial port or USB port
- Apex, ApexPro, or ApexPro CH telemetry system transmitter
- Two new AA alkaline batteries
- Programming Kit (Only one is required no matter how many transmitters are to be programmed.) See the following kit listings.

QTY	Programming Kit (Non-Japan) PN 421733-003
1	Transmitter programming device
1	9-pin, 6-ft. RS232 serial cable
1	USB-to-serial cable
1	Software CD for configuration and transmitter
1	Channel 37 TTX number label set
1	APEX, ApexPro, and ApexPro CH Transmitter Programming Instructions

QTY	Programming Kit (Japan) PN 421733-004
1	Transmitter programming device
1	9-pin, 6-ft. RS232 serial cable
1	USB-to-serial cable
1	Software CD for configuration and transmitter
1	ApexPro channel label set
1	ApexPro TTX number label set
1	PT Series TTX ID label set
1	APEX, ApexPro, and ApexPro CH Transmitter Programming Instructions – Japan

NOTE

To order other TTX number or channel labels or if items are missing from your kit, contact Technical Support. (See page 78.)

Install the Software

Remove the Previous Version of Software

You must remove the previous version of configuration software before you install the new version.

To remove software version 1B or earlier:

1. Select *Start* > *Settings* > *Control Panel* > *Add/Remove Programs*.
2. Select *Apex & ApexPro Programming Box Software* and select *Add/Remove*.
3. Select *Yes* to confirm removal of this version of the software.

To remove software version 2A:

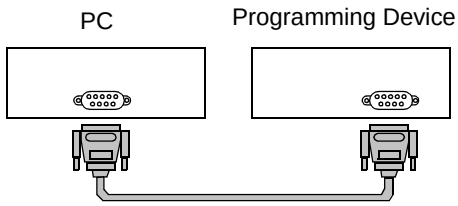
1. Select *Start* > *Settings* > *Control Panel* > *Add/Remove Programs*.
2. Select *Apex & ApexPro Programming Box Software – Version 2A* and select *Add/Remove*.
3. Select *Yes* to confirm removal of this version of the software.

Run the Installation Wizard

1. Close all open applications on the PC.
2. Insert the configuration software CD into the CD drive.
3. Run the "*Setup.exe*" file from the CD.
4. Follow the on-screen instructions.

Connect the Hardware

1. Connect the 9-pin serial cable to the transmitter programming device. On your PC, the port might be labeled "1" or "2". If so, make a note of this for later identifying the COM port used when running the software.

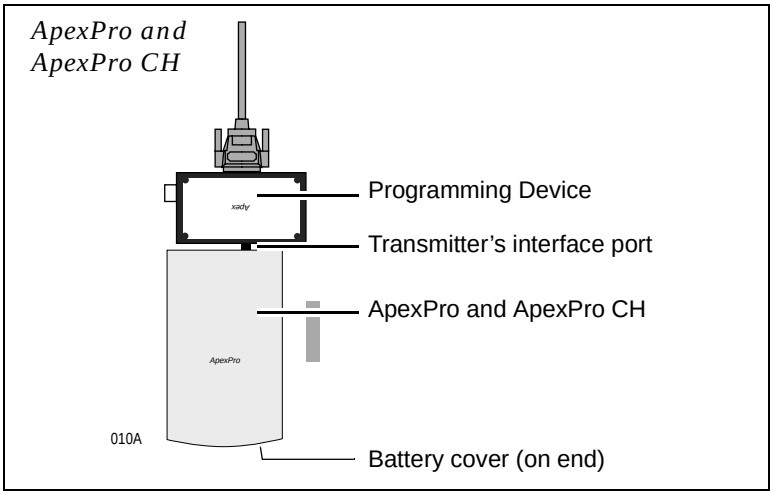


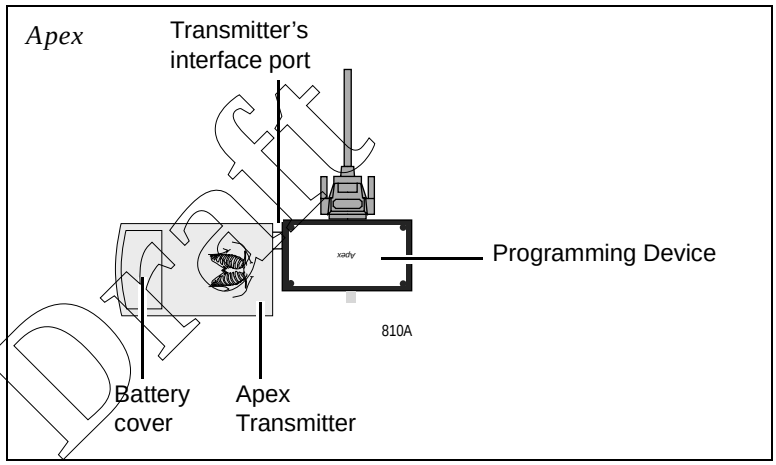
NOTE

If the PC does not have a serial port, install USB-to-serial cable/adapter (PN 2015891-001) and configure it using its accompanying software.

2. Replace the transmitter batteries with two new AA alkaline batteries.
3. Remove the transmitter's leadwire set and the interface connector port dust covers.

4. Insert the programming device connector into either of the transmitter's interface connector ports.





5. Turn the transmitter on:
   - For ApexPro and ApexPro CH, slide the battery cover over the battery compartment. The LED lights will blink rapidly several times and then slowly two times.
   - For Apex, close the battery cover. The LED lights will blink once and then turn off.

Disconnect the Hardware

The transmitter should be disconnected and turned off when it is not in use.

1. Disconnect the transmitter from the programming device.
2. Turn off the transmitter by sliding the battery cover away from the battery compartment. Doing this greatly extends the life of the batteries. You may wish to remove the batteries and place them in a safe location.
3. (Optional) Disconnect the serial cable from the programming device and from the PC.

Run the Apex & ApexPro Programming Box Software

Start the Software

1. Complete the procedure "Install the Programming Device" on page 9.
2. Complete the procedure "Connect the Hardware" on page 11.
3. Select *Start > Programs > GE Medical Systems > Apex & ApexPro Tx Config > Apex & ApexPro Tx Config* to start the programming software. You may also have a shortcut on the desktop called *Apex & ApexPro Tx Config* to start the software.

Select the Transmitter

Select the type of transmitter to be programmed and the communications port, as described below.

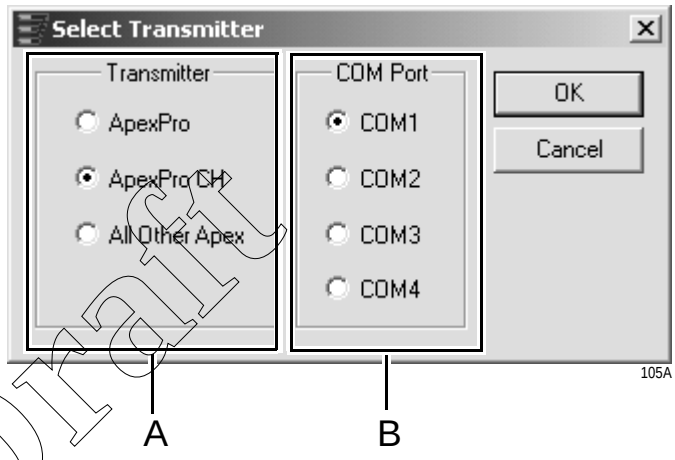


Table 1. Select Transmitter	
Ref	**Definition**
A	Type of transmitter to be used
B	COM port on the computer to which the programming box cable is connected

1. Select the type of transmitter.
2. Select the correct *COM Port*.

   If you know which *COM Port* is being used, select that. *COM1* is most common.

   If you do not know the correct *COM Port*, select *COM1* and then *OK*. If this is not the correct *COM Port*, an error message *No communication from the transmitter* will appear in the message area of the *Program ApexPro Transmitter* window. You can then try *COM2* and so on. See "The Main Programming Window" on page 23 for explanation of that window.
3. Select *OK*. The software remembers the settings.

Select a Hospital

In the *Select Hospital* window, select the correct hospital. This information is used for reporting purposes. A separate report is created for each hospital. (See "Generate Reports" on page 15.) In this window you can also establish the settings for a new hospital, or change the settings for a hospital already listed.

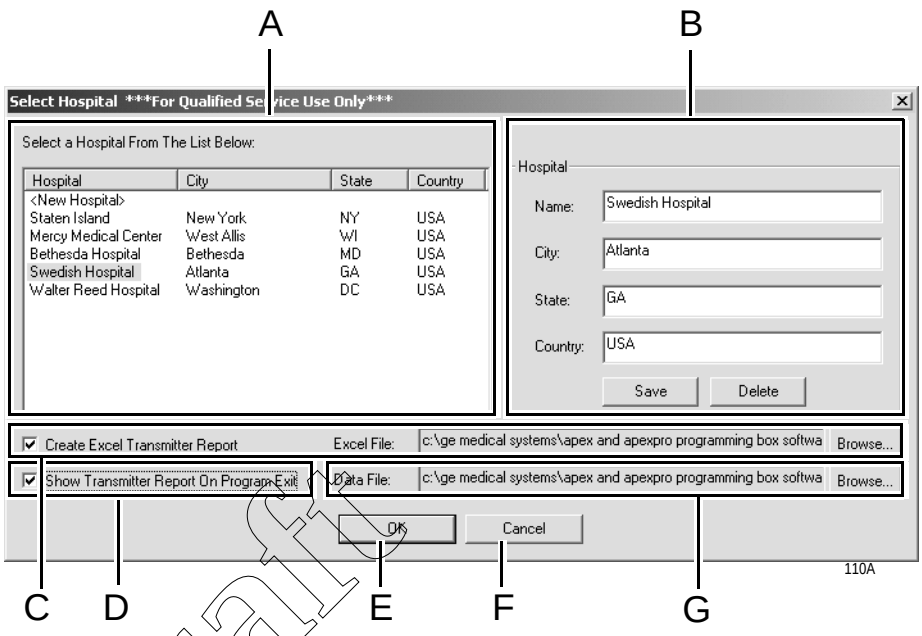


Table 2. Select Hospital window

Ref	Definition
A	List of hospitals
B	Specific hospital name and location, with *Save* and *Delete* buttons
C	Option for displaying the Excel Transmitter report, with *Browse* button for changing the location of the report
D	Option to view the Transmitter Report (Ref. C above) when exiting the Programming Box application, with *Browse* button for changing the location of the report
E	*OK* button to process the Select Hospital data
F	*Cancel* button to exit the application
G	File to be used to save data for the hospital(s) and transmitters (See step 7 below.)

1. Select the hospital for where the transmitter is located (A).
2. After selecting a hospital, its name and location will be displayed on the right side of the window (B). This information is used for reporting purposes.
3. If the correct hospital is not listed, select *<New Hospital>* at the top of the list (A). Enter the name and location information for that hospital on the right side of the window. Select *Save*. Do not select *OK* yet.
4. If the name and location displayed are not correct, make the appropriate changes and select *Save* (B).
5. If there is a hospital in the list which is no longer needed, select that hospital and select the *Delete* button (B).

6. The software can automatically generate a Microsoft Excel report of all channels, TTX IDs and frequencies to be used. (See "Excel Report" below for details about generating this report.)
7. Identify the data file (G) to be used for storing all information about each hospital and its transmitters. You can choose to store all information for all transmitters programed at this hospital, or all transmitters ever programmed.
   - This file stores all data about all transmitters.
   - You can copy the file and rename it for each individual hospital. You might want to do this to send it to other personnel involved in the installation.
   - Alternatively, you can keep all data for all hospitals in the same file.
   - This file is used to generate the Excel Transmitter Report.
8. Select *OK* (E) to continue programming transmitters. (If you select *Cancel* (F), you will exit the application.)
9. The next configuration window, the *Program ApexPro Transmitter* window, appears. Within 30 seconds, the transmitter's settings display, as described in "The Main Programming Window" on page 23.

Generate Reports

Excel Report

The software can automatically generate a Microsoft Excel report of all channels and TTX IDs used. For each channel and TTX ID within that channel, this report lists:

- Associated frequency
- Serial number of transmitter programmed
- Board ID
- Date and time programmed
- Comments you enter manually
- TTX IDs at this frequency, if any are already programmed
- Incompatible TTX IDs
- Errors

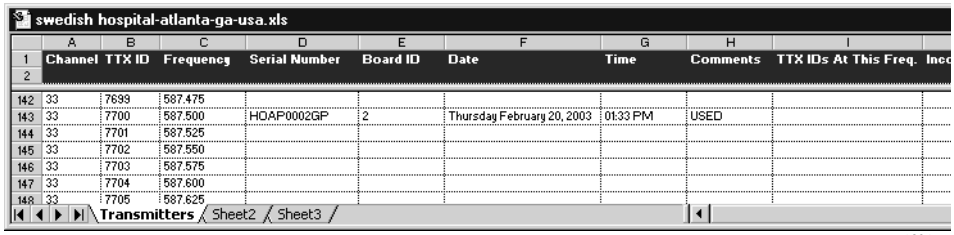
This report is a separate Microsoft Excel report. It is displayed only if you select the *Exit* button. It is not displayed if you quit the application by using the close box.

You can edit any data in the report, notably the Comments section.

NOTE

To keep any changes you make in the report, you should save it with a different name. Otherwise, changes will be overwritten when you regenerate the report.

This is a section of a sample report:



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To generate the Transmitter Report:

1. Verify that Microsoft Excel is installed on the computer.
2. Verify that the In-Band Noise Test has been performed per details in the ApexPro Antenna System Tests and Troubleshooting Instructions manual. Have test results available.
3. In the *Select Hospital* window, select *Create Excel Transmitter Report.*
4. Accept the Excel file location named by default as shown in the *Excel File* box (Ref. C in Table 2 on page 14), or navigate to another location using the *Browse* button (C).
5. Select *Show Transmitter Report On Program Exit* (D).
6. When done programming the transmitters, select *Exit*.
7. This window appears. Follow the instructions in Table 3 below.

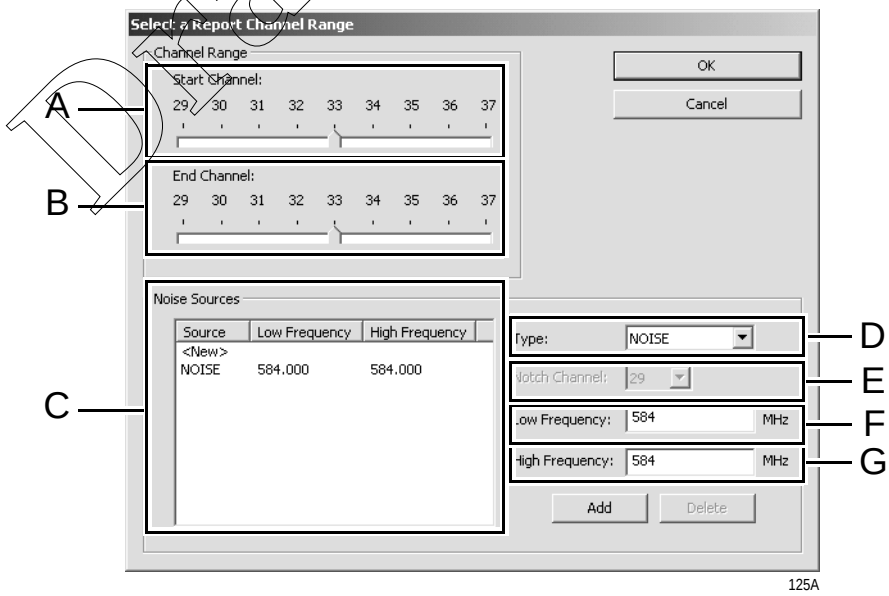

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Table 3. Select Channel Range window	
Ref	**Definition**
A	Start Channel: Select the lowest channel to be used for analysis of the system
B	End Channel: Select the highest channel to be used for analysis of the system
C	List of all frequencies that can not be used for transmitter signals. Enter References D, E, F and G and then select *Add*.
D	Type of signal blockage. Select *Noise* or *Notch*.

Table 3. Select Channel Range window	
Ref	**Definition**
E	List of all channels that can be notched out if *Type* is *Notch*: Select the specific channel to notch.
F	Low frequency within the range: Accept the default lowest frequency of the range or specify another frequency. This will create a slice of the channel's full range.
G	High frequency within the range: Accept the default highest frequency of the range or specify another frequency. This will create a slice of the channel's full range.

8. Select *OK*. The Excel Transmitter Report generates and is displayed when you exit the program.

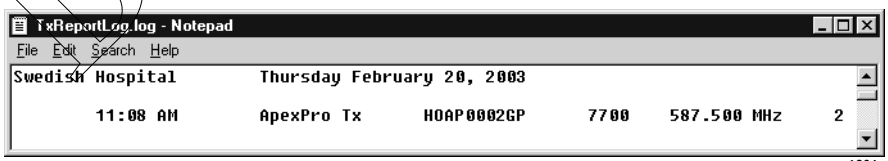
Log Report

A separate text file called *TxReportLog* is automatically generated and appears on your PC desktop.

This report lists:

- All hospital names accessed
- Date and time
- Apex model
- Serial number
- TTX number
- Frequency
- Board ID

You can print this report and view information for each transmitter. This is a section of a sample report:



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Getting Help

Apex and ApexPro Transmitter Programming Instructions Manual

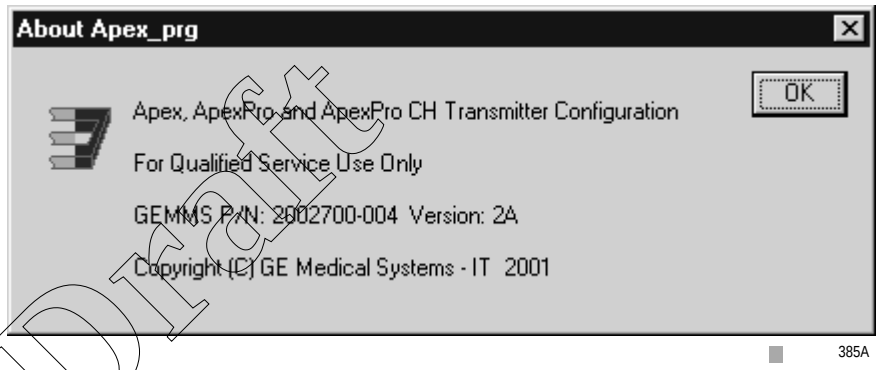
You can access the Apex and ApexPro Transmitter Programming Instructions manual by clicking the *Help* button on the *Program ApexPro Transmitter* window, or pressing F1 on your keyboard. Doing so brings up Adobe Acrobat Reader with a PDF file of this document. You can browse the bookmarks, the table of contents or the document itself. You can also perform *Find* and *Search* functions.

Flyover Windows

The program also has informational flyovers that appear when you pause the cursor over various areas of the program windows.

About the Apex Program

Rightclick on the titlebar to display the *About Apex_prg* information window. This window includes the part number and version of the transmitter configuration.



Program Other Transmitters

You can program more than one transmitter without disconnecting the programming box.

If the next transmitter is the **same** type (both Apex or both ApexPro), you do not need to exit the *Apex & ApexPro Tx Config* software:

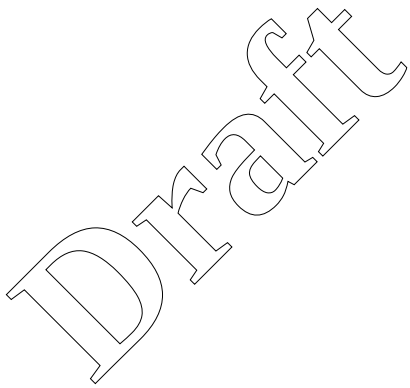
1. Disconnect the current transmitter.
2. Connect the next transmitter.
3. The software will detect the new configuration for you to view or change.

If the next transmitter is a **different** type (Apex vs. ApexPro):

1. Exit the *Apex & ApexPro Tx Config* software.
2. Disconnect the current transmitter.
3. Connect the next transmitter.
4. Restart the *Apex & ApexPro Tx Config* software.
5. Select the new type of transmitter. The *COM Port* should remain the same. Select *OK*.
6. Select the hospital and then *OK*.
7. The software will detect the new configuration for you to view or change.

2 Apex Transmitter

For your notes



Program the Transmitter's Basic Functions

The Main Programming Window

The *Program Apex Transmitter* window displays various configuration settings for the transmitter. These are described in the sections below.

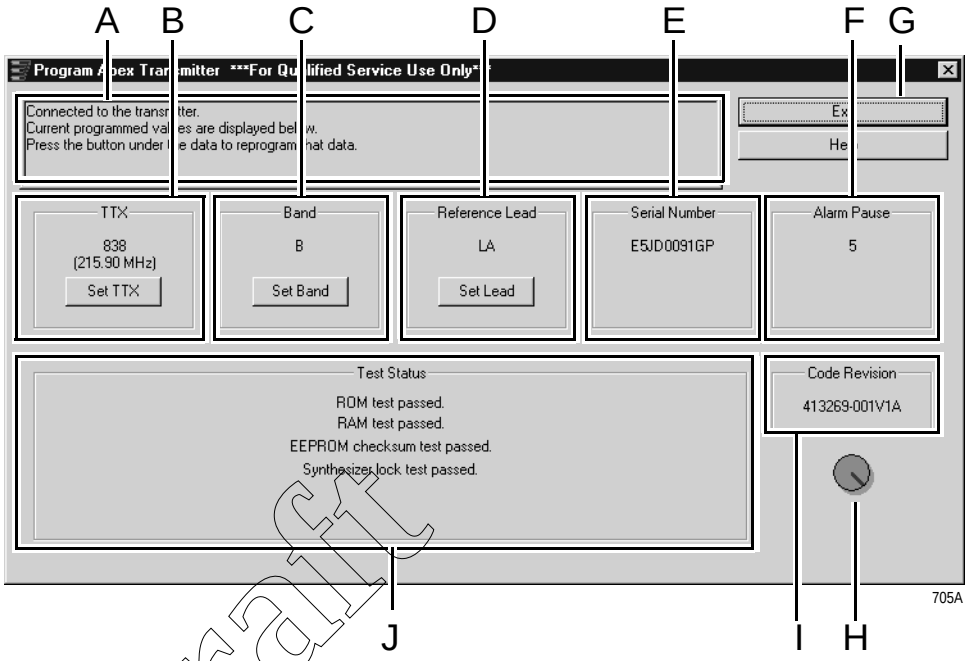


Table 4. *Program Apex Transmitter* **Window**

Ref	Definition
A	Message area for the programming application
B	TTX number and frequency settings
C	Band selection
D	Reference lead setting
E	Serial number of the transmitter
F	Alarm pause time
G	Exit program button
H	Communication status button
I	Code version number
J	Test status results

Message Area

This area is used by the software for general status messages, operator instructions and error messages.

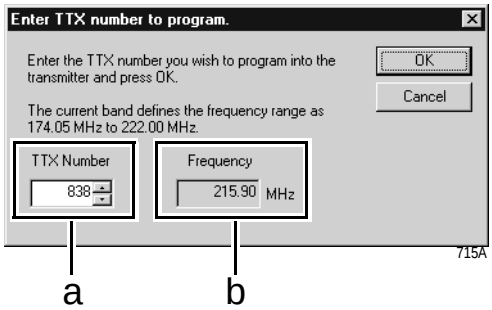
NOTE
If a message indicates *No communication from the transmitter*, refer to "Programming Problems" on page 29.

TTX Number and Frequency Settings

The current TTX number which the transmitter is to use and the associated frequency settings are displayed.

To change the settings:

1. Select the *Set TTX* button, reference B in "Program Apex Transmitter Window" on page 23.
2. Another window appears.



3. This window allows you to:
   - a – Change the *TTX Number*: Either use the up- and down-arrows to scroll to the desired TTX number or highlight and type in the number to use. The frequency changes automatically as you change the *TTX Number*.
   - b – View the associated *Frequency* in MHz.

   NOTE

   Select a frequency that is within the frequency range allowed by your location. Operating outside of the allowed frequency range may cause interference problems or data dropout.

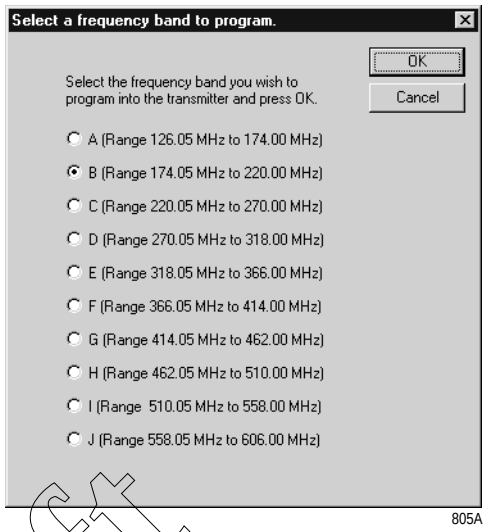
   Some frequencies are reserved. If the TTX number you choose has a reserved frequency, this will be indicated as *RESERVED* in the frequency display. See the ApexPro Telemetry Transmitter Service Manual for a list of TTX numbers, associated frequencies and reserved frequencies.
4. Select *OK* to save your changes or *Cancel* to revert to the original settings.
5. Update the "TTX Frequency Chart" in the ApexPro Telemetry Transmitter Service Manual to identify changes to the TTX numbers and the frequencies.
6. Remove the existing label located on the back of the transmitter, select the appropriate TTX label from the label sheet and apply it to the transmitter.

Band Setting

The band setting determines the range of frequencies within which the transmitter is to operate. The band for each transmitter is identified by a label found in the battery compartment.

To set the band:

1. Select the *Set Band* button, reference C in "Program Apex Transmitter Window" on page 23.
2. Another window appears. Select the correct band. (Selecting one eliminates the others.) Select *OK*.



3. The change is shown on the *Program Apex Transmitter* window.

Reference Lead Setting

For 5- or 6-Lead Cables

The reference lead setting has no effect when 5- or 6-lead cables are used. For 5- or 6-lead cables, the reference lead defaults to **RL**.

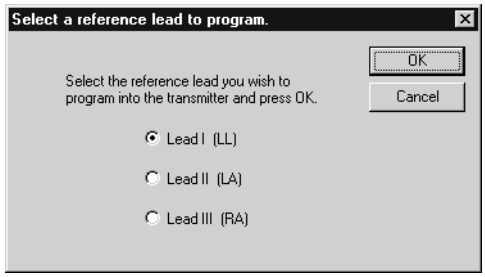
For 3-Lead Cables

For 3-lead cables, one of the lead wires (LL, LA, or RA) is used to connect the reference voltage to the patient. Selection of the reference lead determines which ECG waveform will be displayed at the CIC, according to the table below.

Select this reference lead...	to view this waveform at the CIC
LL (left leg)	Lead I
LA (left arm)	Lead II
RA (right arm)	Lead III

To change the setting:

1. Select the *Set Lead* button, reference D in "Program Apex Transmitter Window" on page 23.
2. Another window appears. Select the correct lead. (Selecting one eliminates the others.) Select *OK*.



3. The change is shown on the *Program Apex Transmitter* window.

Alarm Pause Setting

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The purpose of the alarm pause setting is to allow clinicians to adjust the transmitter and/or the patient without setting off alarms. The alarm pause setting is an amount of time, in minutes, during which alarms will not activate. After this time has elapsed, the alarm pause will automatically be deactivated and the transmitter will resume normal operation. You can manually turn off the alarm pause at any time by pressing **Verify Leads** and **Graph** at the same time.

NOTE
Activation and deactivation of the alarm pause is done on the transmitter itself. The setting in the software only sets the number of minutes to wait until the alarm pause times out.

To change the setting, see "Change Alarm Pause Setting" on page 27.

Firmware Code Revision Number

This is a display of the version number of the transmitter's firmware.

Exit Button

When you are done with changing all configuration settings, select the *Exit* button (reference F in "Program Apex Transmitter Window" on page 23) to save the settings and exit the program.

Perform Advanced Functions

Perform Advanced Programming

Communication Status Button

The Communication status button (reference C in "Appendix 2: Access Apex Technical Functions" on page 31) revolves clockwise to indicate that the hardware (transmitter, programming device, and the PC) is properly connected and the software is processing normally.

In addition, by clicking on this button, authorized personnel can access the advanced functions described in this section. A password is needed to access these functions.

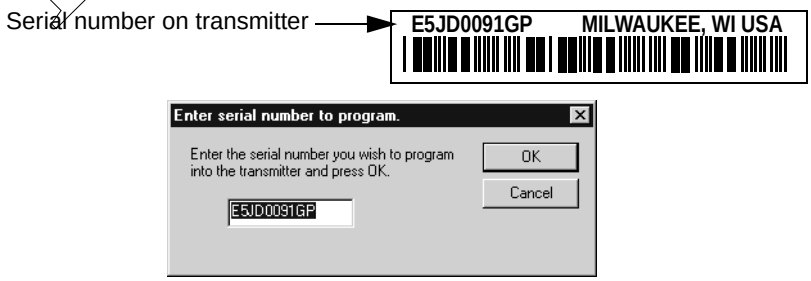
Set Serial Number

This is a display of the serial number of the specific transmitter that uses this software.

Whenever a transmitter is replaced, you must enter the new transmitter's serial number. You must also identify the level of software to be used with the new transmitter.

To change the settings:

1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 31.
2. Select the *Set S / N* button, reference A in "Program Apex Transmitter Technical Functions Window" on page 31.
3. A window appears asking for the new serial number. Enter the new serial number, found on the label on the back of the transmitter. (You must use upper-case.)



4. Select *OK* to proceed with the change. (Select *Cancel* to make no change.)
5. The change is shown on the *Program Apex Transmitter* window.

Change Alarm Pause Setting

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See "Alarm Pause Setting" on page 26 for a description of this setting.

To change the setting:

1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 31.
2. Select the *Set Pause* button (reference B in "Program Apex Transmitter Technical Functions Window" on page 31.)
3. Another window appears.

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4. Set the correct number of minutes. Either use the up- and down-arrows to scroll to the desired number or highlight and type in the number to use.
5. Select *OK*.
6. The change is shown on the *Program Apex Transmitter* window.

Monitor the Status of Transmitter Tests

Transmitter tests run whenever the transmitter is powered up. You can view the test results with the *Apex & ApexPro Tx Config* software. The results shown indicate pass-or-fail status for these tests:

- ROM — Read-Only Memory. If this test fails, the ROM needs to be replaced.
- RAM — Random-Access Memory. If this test fails, the RAM needs to be replaced.
- EEPROM Checksum — Indicates whether the transmitter firmware is valid or is corrupt.
- Synthesizer Lock — Shows the current status of the phase lock loop in the transmitter. This indicates whether or not the transmitter is operating at its programmed frequency. Failure of this test indicates that this transmitter could be operating at a different frequency and could be causing interference with another transmitter programmed to that other frequency. If this is the case, this transmitter should be removed from service until the problem is corrected. Refer to "Test Status Failures" on page 30.

If any test has failed:

1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 31.
2. Select the *Clear Failures* button (reference E in "Program Apex Transmitter Technical Functions Window" on page 31.)

If any tests fail again, see "Appendix 1: Apex Troubleshooting" on page 29.

Apex Appendices

Appendix 1: Apex Troubleshooting

LED Status Problems

Condition	Possible Cause	Possible Actions
No lights are blinking.	Normal status when hardware is properly connected and the software is running.	No action needed.
	Hardware is not connected properly.	Check the hardware connections as described in "Connect the Hardware" on page 11.
	Software is not installed.	Install the *Apex & ApexPro Tx Config* software as described in "Install the Programming Device" on page 9.
	Software is not running.	Start the *Apex & ApexPro Tx Config* software as described in "Run the Apex & ApexPro Programming Box Software" on page 13.
	Batteries do not have enough power.	Replace the batteries: 1. Disconnect the transmitter from the programming device. 2. Replace the transmitter batteries with two new AA alkaline batteries. 3. Reconnect the transmitter to the programming device.
All lights blink once and then turn off.	Normal status when hardware has just been properly connected.	No action needed.

Programming Problems

Condition	Cause	Possible Actions
Unable to display or program the transmitter settings	Batteries do not have enough power.	Replace the batteries: 1. Disconnect the transmitter from the programming device. 2. Replace the transmitter batteries with two new AA alkaline batteries. 3. Reconnect the transmitter to the programming device.
Message indicates *No communication from the transmitter*:	Hardware is not connected properly.	Check the hardware connections as described in "Connect the Hardware" on page 11.
	Incorrect COM port was selected.	1. Exit this window. (Reference G in "Program Apex Transmitter Window" on page 23.) 2. Restart *Apex & ApexPro Tx Config*: In your PC's *Start* menu, select *Programs* > *GE Medical Systems* > *Apex & ApexPro Tx Config* > *Apex & ApexPro Tx Config*. 3. In the *Select Transmitter* window, choose a different *COM Port* from what you selected before. Select *OK*. 4. Repeat steps 1 through 3 until a connection is established and the message area indicates *Connected to the transmitter*. 5. If the transmitter still is not working after trying all of the COM ports, refer to other sections of this appendix.

Test Status Failures

Condition	Possible Cause	Possible Actions
EEPROM Checksum indicates fail status.	The transmitter firmware is incorrect or corrupt.	Cycle the power on the transmitter. If the failure occurs again, re-program the transmitter's functions and cycle the power on the transmitter. If the failure still occurs, contact Technical Support. (See below.)
Synthesizer Lock indicates fail status.	The transmitter is currently unable to operate at its programmed frequency.	Try programming the transmitter to another frequency. If the failure still occurs, contact Technical Support. (See below.)

Technical Support

If the above information does not resolve your problem, call:

U.S. and Canada	800-558-7044
Other countries	561-575-5000

Appendix 2: Access Apex Technical Functions

Several high-level technical functions are available by following the steps in "Access the Super User Mode" below. Technical functions are password-protected to prevent accidental use.

Requirements

You must have the items identified in "Hardware Requirements for the Programming Device" on page 9.

Access the Super User Mode

Start the software as in "Run the Apex & ApexPro Programming Box Software" on page 13 and then access the Super User mode of the software by following these steps:

1. Select the Communication status button, reference H in "Program Apex Transmitter Window" on page 23 and reference C in "Program Apex Transmitter Technical Functions Window" below.
2. Type the password *mms_aps*.
3. Select *OK*.
4. The *Program Apex Transmitter* window will display additional features.

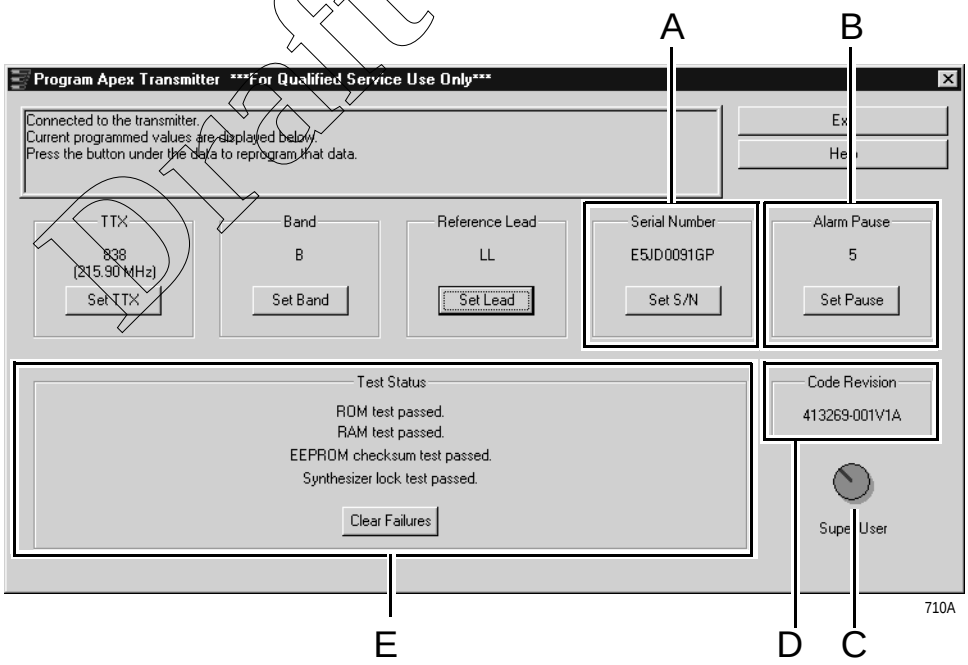
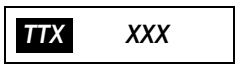


Table 5. *Program Apex Transmitter* Technical Functions Window	
Ref	**Definition**
A	Serial number
B	Alarm pause time
C	Communication status button
D	Code version number
E	Test Status results

5. To exit the Super User mode, select the Communication status button again.

Appendix 3: Apex TTX Labels

Transmitters used with Apex systems require TTX labels that have this format:



3 ApexPro CH Transmitter

For your notes

Program the Transmitter's Basic Functions

The Main Programming Window

The *Program ApexPro CH Transmitter* window displays various configuration settings for the transmitter. These are described in the sections below.

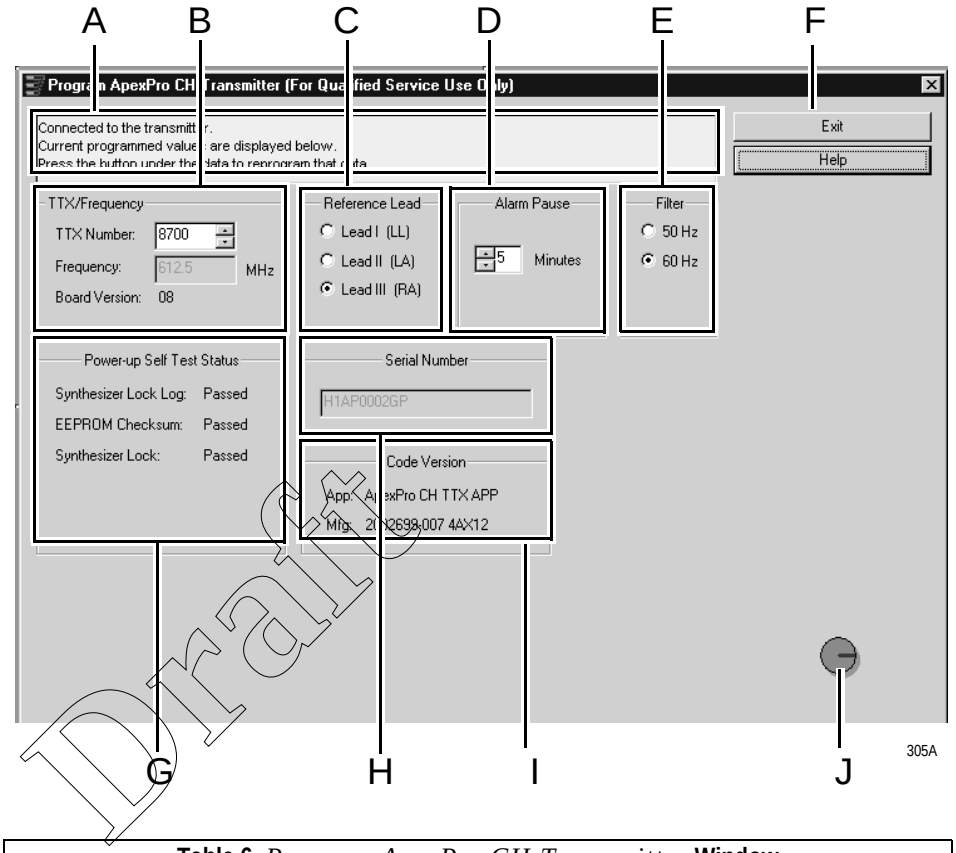


Table 6. *Program ApexPro CH Transmitter* **Window**

Ref	Definition
A	Message area for the programming application
B	TTX number and frequency settings
C	Reference lead setting
D	Alarm pause setting
E	Filter setting
F	Exit program button
G	Power-up self-test status results
H	Serial number of the transmitter
I	Code part/version numbers
J	Communication status button

Message Area

This area is used by the software for general status messages, operator instructions and error messages.

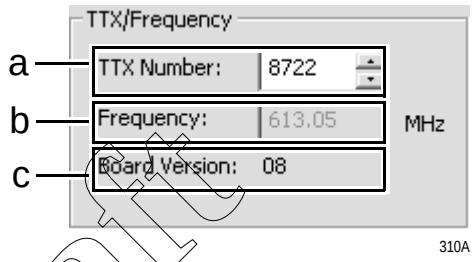
NOTE

If a message indicates *No communication from the transmitter*, refer to "Programming Problems" on page 50.

TTX Number and Frequency Settings

The current TTX number and associated frequency settings are displayed. The board version, important to a technician, is also displayed. This window allows you to change the *TTX Number*.

To change the settings use the up- and down-arrows to scroll to the desired TTX number, or highlight the field and type the number to use. The frequency changes automatically as you change the *TTX Number*.



NOTE

Select a frequency that is within the frequency range allowed by your location. Operating outside of the allowed frequency range may cause interference problems or data dropout.

Some frequencies are reserved and cannot be used. If the TTX number you choose has a reserved frequency, this will be indicated as *RESERVED* in the frequency display. See the ApexPro Telemetry Transmitter Service Manual for a list of TTX numbers, associated frequencies and reserved frequencies.

Update the "TTX Frequency Chart" in the ApexPro Telemetry Transmitter Service Manual to identify changes to the TTX numbers and the frequencies.

Select the appropriate TTX label for ApexPro CH V2 from the label sheet and apply it to the transmitter inside the label depression located on the back of the transmitter. (See "Appendix 3: ApexPro CH TTX Labels and Frequencies" on page 56 for applicable label part numbers.)

Reference Lead Setting

For 5- or 6-Lead Cables

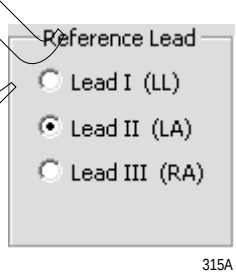
The reference lead setting has no effect when 5- or 6-lead cables are used. For 5- or 6-lead cables, the reference lead defaults to **RL**.

For 3-Lead Cables

For 3-lead cables, one of the lead wires (LL, LA, or RA) is used to connect the reference voltage to the patient. Selection of the reference lead determines which ECG waveform will display at the CIC.

Select this reference lead...	to view this waveform at the CIC
Lead I	LL (left leg)
Lead II	LA (left arm)
Lead III	RA (right arm)

Select the desired *Reference Lead*.



Alarm Pause Setting

The purpose of the alarm pause setting is to allow clinicians to adjust the transmitter and/or the patient without setting off alarms. The alarm pause setting is an amount of time, in minutes, during which alarms will not activate. After this time has elapsed, the alarm pause will automatically be deactivated and the transmitter will resume normal operation. You can manually turn off the alarm pause at any time by pressing **Verify Leads** and **Graph** at the same time.

NOTE

Activation and deactivation of the alarm pause is done on the transmitter itself. The setting in the software only sets the number of minutes to wait until the alarm pause times out.

To change the settings use the up- and down-arrows to scroll to the desired alarm pause, or highlight the field and type the number of minutes to pause.

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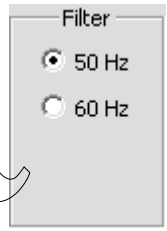
Filter Setting

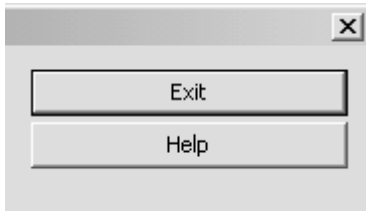
The filter setting is the frequency of the power lines for the country in which the transmitter will be used, either 50 or 60 Hz. In the United States, this is typically 60 Hz. For most other countries, this is typically 50 Hz. Select the appropriate setting.



325A

Exit Button

When you are done with changing all configuration settings, select the *Exit* button (reference F in "Program ApexPro CH Transmitter Window" on page 35) to save the settings and exit the program.



135A

Help

At any time, you can access Help by clicking the Help button (see figure above) or pressing F1 on your keyboard which brings up Adobe Acrobat Reader with a PDF file of this document. You can browse the bookmarks, the table of contents, or the document itself. You can perform *Find* and *Search* functions also.

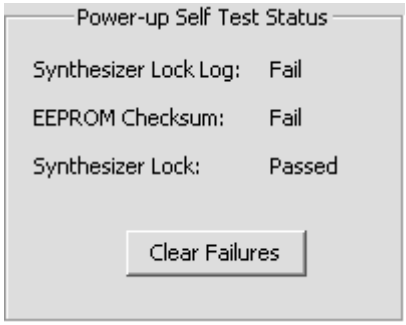
The program also has short informational pop-ups that appear when you pause the cursor over various areas of the program windows.

View Transmitter Diagnostics

View Test Results

Power-up Self Test Status

Power-up self-tests (reference G in "Program ApexPro CH Transmitter Window" on page 35) run whenever the transmitter is powered up. You can view the test results with the *Apex & ApexPro Tx Config* software. The results shown indicate pass-or-fail status for these power-up self-tests:



335A

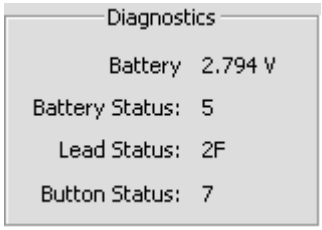
- *Synthesizer Lock Log* — Indicates fail status if the transmitter was ever unable to operate at its programmed frequency. A single failure may be caused by a temporary deviation. Repeated failures may indicate a hardware problem. If this is the case, contact Technical Support. (See "Technical Support" on page 51.)
- *EEPROM Checksum* — Indicates whether the transmitter firmware is valid or is corrupt.
- *Synthesizer Lock* — Shows the current status of the phase lock loop in the transmitter. This indicates whether or not the transmitter is operating at its programmed frequency. Failure of this test indicates that this transmitter could be operating at a different frequency and could be causing interference with another transmitter programmed to that other frequency. If this is the case, this transmitter should be removed from service until the problem is corrected. Refer to "Power-Up Self-Test Failures" on page 50.

NOTE

The *Clear Faliures* button only displays when in Super User mode. (See "Access Super User Mode" on page 52.) If any test has failed, access Super User mode and click the *Clear Faliures* button. If any tests fail again, see "Power-Up Self-Test Failures" on page 50.

Diagnostic Test

Diagnostic tests (reference D in "Appendix 2: Access ApexPro CH Technical Functions (Super User)" on page 52) run at all times but are accessible only by personnel authorized for high-level (Super User) functions.



- *Battery* – the specific combined voltage of the two AA batteries in the transmitter. Each AA battery is nominally rated at 1.5V, so two fresh batteries together should register at 3.0V. The lowest total voltage for the transmitter to operate properly is approximately 1.5V.
- *Battery Status* – the relative strength of the AA batteries in the transmitter, ranging from zero (dead) to 7 (full power).
- *Lead Status* – the status of any leads connected to the transmitter. Since the transmitter is connected to the programming device and not to any leads, the status during the programming process will always be "2F", indicating no leads attached.
- *Button Status* – indicates which buttons on the transmitter are being pressed. You can use this to test the buttons if you suspect they may be stuck.

  0 = All three buttons are pressed.

  1 = **Attendent Call** and **Graph** buttons are pressed.

  2 = **Attendent Call** and **Verify Leads** buttons are pressed.

  3 = **Attendent Call** button is pressed.

  4 = **Graph** and **Verify Leads** buttons are pressed.

  5 = **Graph** button is pressed.

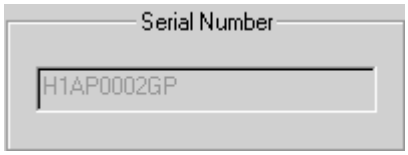
  6 = **Verify Leads** button is pressed.

  7 = No buttons are pressed.

View Firmware Codes

Serial Number

Displays the serial number of the transmitters's PCB (Printed Circuit Board).



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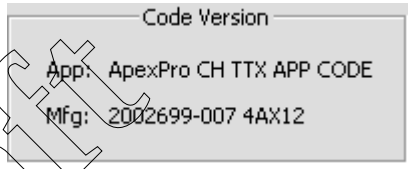
Code Version Numbers

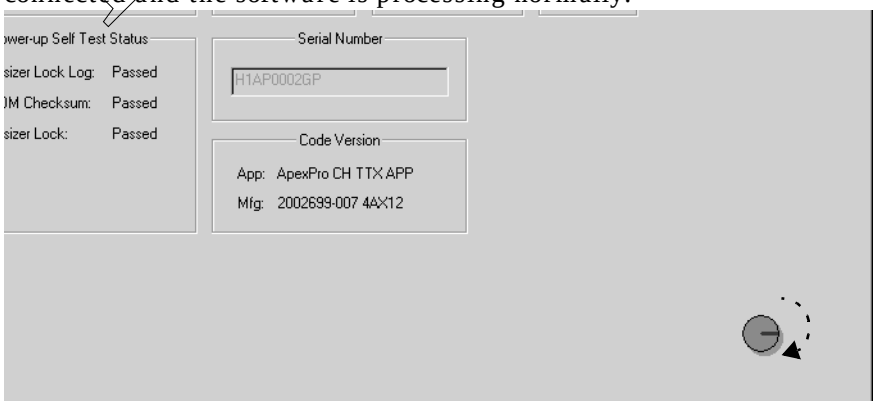
Display of the part numbers and their versions (reference I in "Program ApexPro CH Transmitter Window" on page 35) for the application firmware (used when the transmitter is operating independently to send patient data), and the manufacturing firmware (used when the transmitter is plugged into the programming device).



345A

Communication Status Button

The Communication status button (reference J in "Program ApexPro CH Transmitter Window" on page 35) revolves clockwise to indicate that the hardware (transmitter, programming device, and the PC) is properly connected and the software is processing normally.



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In addition, by clicking on this button, authorized personnel can access high-level functions (Super User). A password is needed to access these functions. See "Appendix 2: Access ApexPro CH Technical Functions (Super User)" on page 52 for more information.

Update Transmitter Firmware

Update Firmware Code

Occasionally there are updates to the transmitter firmware. In addition, in rare cases, you may experience problems with the firmware and may need to download one or more of the files to the transmitter. See "Appendix 1: ApexPro CH Troubleshooting" on page 49 to determine which file(s), if any, should be downloaded.

The files to download will have these extensions:

- .app (Application firmware code – for transmitter operation)
- .mfg (Manufacturing firmware code – for programming the transmitter)

When updating the transmitter firmware, these files are installed in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, except if a different location is chosen. When downloading specific files after experiencing problems, you will find the necessary files on your hard drive where the firmware was installed.

Firmware Download

If the transmitter is functioning:

These conditions will require downloading the Application and Software code.

- **RA** or **LA** lights on the transmitter are flashing.
- Transmitter is working correctly but the firmware needs to be updated.
- The *EEPROM Checksum* test failed.

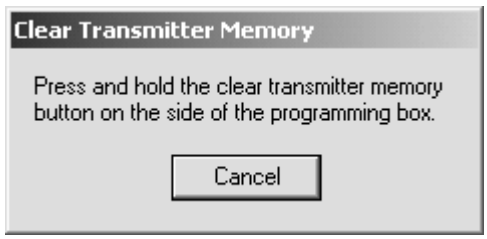
If the transmitter is not functioning:

Manually reset it as instructed in "Reset the Transmitter Manually" on page 51.

Erase & Download Application Code

1. Access the high-level technical functions of the software as described in "Access Super User Mode" on page 52.
2. The *Program ApexPro CH Transmitter* window will display additional features, including a *Download EEPROM Code* button (reference E in "Appendix 2: Access ApexPro CH Technical Functions (Super User)" on page 52.)

3. Select the *Download EEPROM Code* button. The message shown below will display.



386A

NOTE
If the above message does not display, you must manually reset the program as instructed in "Reset the Transmitter Manually" on page 51.

4. Using a small pointed device (such as the tip of a pen) press in and hold the Clear Transmitter Memory button in the side of the Apex programming device. Another window will display after approximately 4 seconds. Or select *Cancel* to stop the download process and return to the Super User window.

5. Select the type of file to update and select *OK*.

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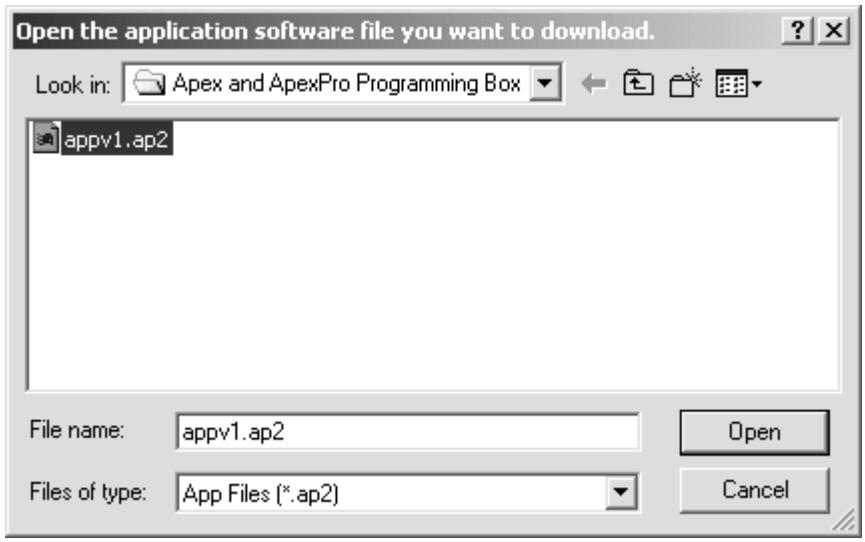
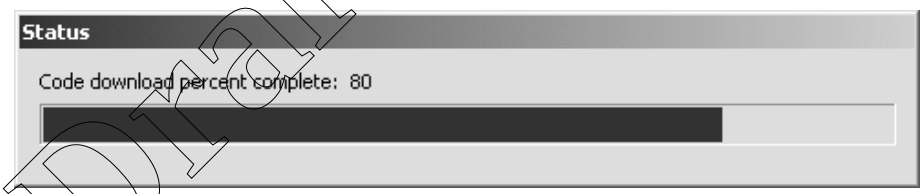
6. Click once on the *.app* file and select *Open*. The upgrade process starts automatically.



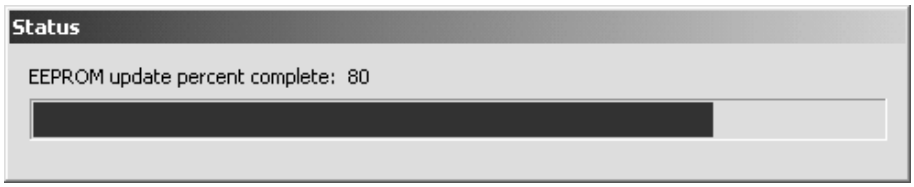
389A

7. A code download status bar displays the progress of the code download. In addition, the **RA** LED light on the transmitter flashes.



390A

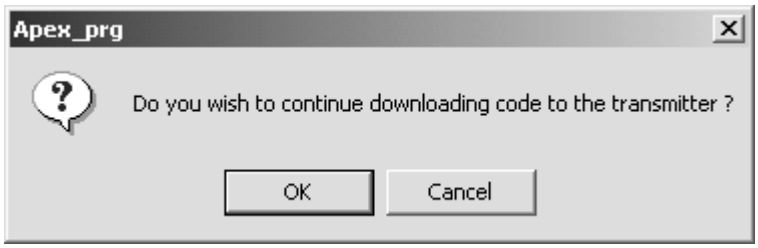
8. When the code download is complete, a EEPROM update status bar displays the progress of the EEPROM update. In addition, all the LED lights on the transmitter flash.



393A

9. A window displays asking if you want to continue downloading code to the transmitter. (The **RA** and the **LA** LED lights flash.) Select *OK* to

return to the *Select Download Type* window, or *Cancel* to exit the update process.



- To download the Service code, proceed with step 5 in "Erase & Download Service Code" on page 45

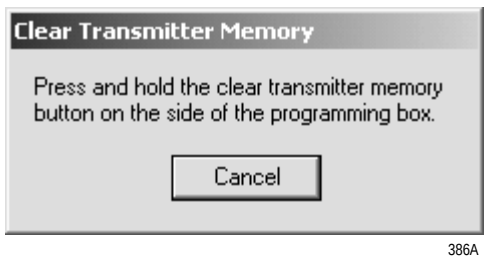
  or

- Select *Cancel* to exit the update process and return to the *Program ApexPro CH Transmitter* window. (Selecting *Cancel* closes *Super User* functions.

10. Confirm that all *Power-up Self Test Status* messages indicate *Passed*. See "Appendix 1: ApexPro CH Troubleshooting" on page 49 if any failures occur.

Erase & Download Service Code

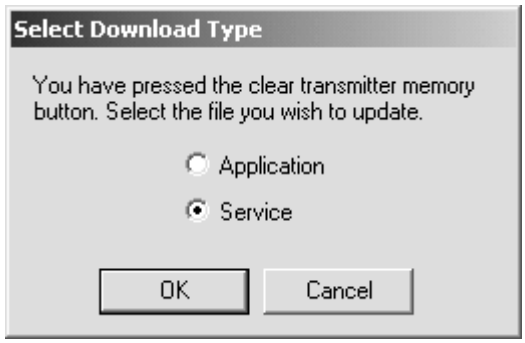
1. Access the high-level technical functions of the software as described in "Access Super User Mode" on page 52.
2. The *Program ApexPro CH Transmitter* window will display additional features, including a *Download EEPROM Code* button (reference E in "Appendix 2: Access ApexPro CH Technical Functions (Super User)" on page 52.)
3. Select the *Download EEPROM Code* button. The message shown below will display.



NOTE
If the above message does not display, you must manually reset the program as instructed in "Reset the Transmitter Manually" on page 51.

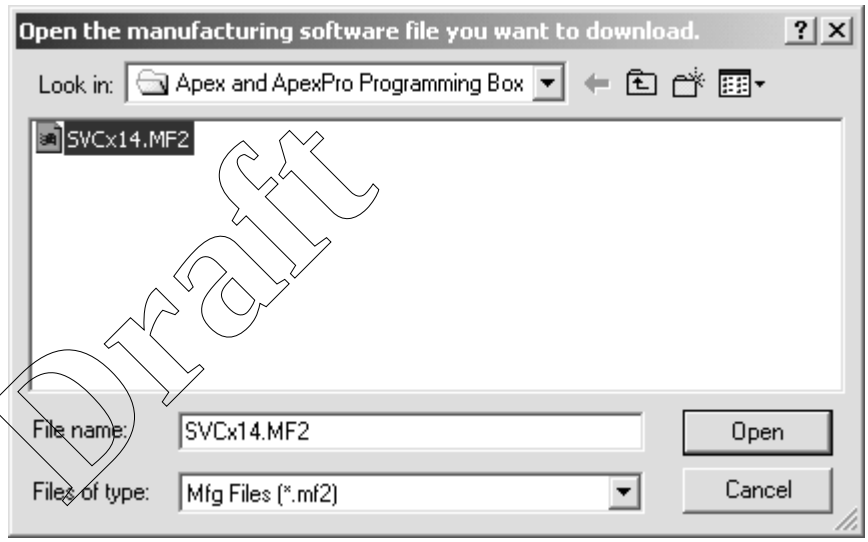
4. Using a small pointed device (such as the tip of a pen) press in and hold the Clear Transmitter Memory button in the side of the Apex programming device. Another window will display after approximately 4 seconds. Or select *Cancel* to stop the download process and return to the Super User window.

5. Select the type of file to update and select *OK*.



388A

6. Click once on the *.mfg* file and select *Open*. The upgrade process starts automatically.

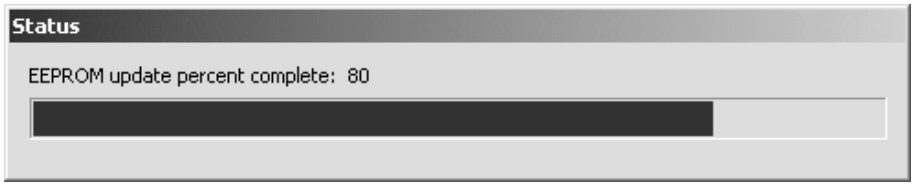


392A

7. A code download status bar displays the progress of the code download. In addition, the **LA** LED light on the transmitter flashes.

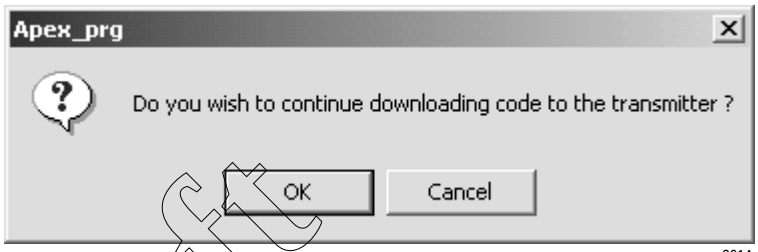
390A

8. When the code download is complete, a EEPROM update status bar displays the progress of the EEPROM update. In addition, all the LED lights on the transmitter flash.



393A

9. A window displays next asking if you want to continue downloading code to the transmitter. (The **RA** and the **LA** LED lights flash.) Select *OK* to return to the *Select Download Type* window, or *Cancel* to exit the update process.



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- To download the Application code, proceed with step 5 in "Erase & Download Application Code" on page 42

or

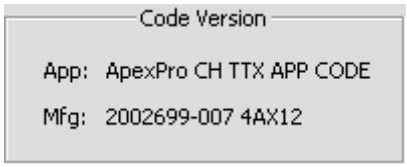
- Select *Cancel* to exit the update process and return to the *Program ApexPro CH Transmitter* window. (Selecting *Cancel* closes *Super User* functions.

10. Confirm that all *Power-up Self Test Status* messages indicate *Passed*. See "Appendix 1: ApexPro CH Troubleshooting" on page 49 if any failures occur.

Verify Correct Operation

Verify the Transmitter's Firmware Code Version

The transmitter's code version displays in the *Program ApexPro CH Transmitter* window. Verify that the *App:* text string matches the *.app* file name listed on the data disk. Also verify that the *Mfg:* text string matches the *.mfg* file name listed on the data disk.



345A

Confirm that all *Power-up Self Test Status* messages indicate *Passed*. (See "Power-Up Self-Test Failures" on page 50.) Call Technical Support (page 51) if any failures occur.

Verify Transmitter Operation

Complete the checkout procedures identified in the ApexPro Telemetry Transmitter Service Manual.

Track the Software Upgrade (Field Engineer Use Only)

For this upgrade, complete the following.

1. Use the MDOC number found on the data disk as the tracking number in the PROACTIVE REPAIR# window of the Clarify case.
2. Bill travel and labor only as authorized by Marketing - CIC/ApexPro using the MDOC number as the PO#.
3. Fill out and fax the "Update Installation Verification Form" provided with this manual. (Please make additional copies as needed.)

ApexPro CH Appendices

Appendix 1: ApexPro CH Troubleshooting

LED Status Problems

Condition	Possible Cause	Possible Actions
No lights are blinking.	Hardware is not connected properly.	Check the hardware connections as described in "Connect the Hardware" on page 11.
	Software is not installed.	Install the *Apex & ApexPro Tx Config* software as described in "Install the Programming Device" on page 9.
	Software is not running.	Start the *Apex & ApexPro Tx Config* software as described in "Run the Apex & ApexPro Programming Box Software" on page 13.
	Batteries do not have enough power.	Replace the batteries: 1. Disconnect the transmitter from the programming device. 2. Replace the transmitter batteries with two new AA alkaline batteries. 3. Reconnect the transmitter to the programming device.
	One or both firmware files are corrupt.	Follow the instructions in "Update Transmitter Firmware" on page 42.
All lights blink rapidly several times and then slowly two times.	Normal status when hardware has just been properly connected.	No action needed.
All lights blink on and off every second.	Normal status when hardware is properly connected and the software is running.	No action needed.
RA and **LA** LED lights are blinking.	You have chosen to download an Application or Service file.	Follow the instructions in "Update Firmware Code" on page 42.
	Transmitter is receiving a download of application firmware.	No action needed.

Programming Problems

Condition	Possible Cause	Possible Actions
Unable to display or program the transmitter settings.	Batteries do not have enough power or are dead.	Replace the batteries: 1. Disconnect the transmitter from the programming device. 2. Replace the transmitter batteries. 3. Reconnect the transmitter to the programming device.
Message indicates *No communication from the transmitter.*	Hardware is not connected properly.	Check the hardware connections as described in "Connect the Hardware" on page 11.
	Incorrect COM port was selected.	1. Exit this window. (Reference F in "Program ApexPro CH Transmitter Window" on page 35.) 2. Restart *Apex & ApexPro Tx Config*: In your PC's *Start* menu, select *Programs* > *GE Medical Systems* > *Apex & ApexPro Tx Config* > *Apex & ApexPro Tx Config*. 3. In the *Select Transmitter* window, choose a different *COM Port* from what you selected before. Select *OK*. 4. Repeat steps 1 through 3 until a connection is established and the message area indicates *Connected to the transmitter*. 5. If the transmitter still is not working after trying all of the COM ports, refer to other sections of this appendix.

Power-Up Self-Test Failures

Condition	Possible Cause	Possible Actions
Synthesizer Lock Log indicates fail status.	Transmitter has been unable to operate at programmed frequency.	May be caused by temporary conditions. Check the "Synthesizer Lock" test below for current lock conditions. If the Synthesizer Lock test is currently passing: 1. Clear the Synthesizer Lock Log ("Power-up Self Test Status" on page 39), under the Super User mode ("Appendix 2: Access ApexPro CH Technical Functions (Super User)" on page 52.) 2. Remove the transmitter from the programming box, and allow the transmitter to reboot. 3. Reconnect the transmitter to the programming box. 4. Check the Synthesizer Lock Log status. If the failure occurs again, contact Technical Support. (See page 51.)
Synthesizer Lock indicates fail status.	The transmitter is currently unable to operate at its programmed frequency.	Try programming the transmitter to another frequency. If the failure still occurs, contact Technical Support. (See page 51.)
EEPROM Checksum indicates fail status.	The transmitter firmware is incorrect or corrupt.	Cycle the power on the transmitter. If the failure still occurs, download new application and service firmware into the transmitter. (See "Update Transmitter Firmware" on page 42.)

Other Problems

Condition	Possible Cause	Possible Actions
Unexpected behavior. Message indicates *No communication from the transmitter*.	Transmitter firmware is corrupt.	Manually reset the transmitter and re-load the transmitter firmware. (See "Reset the Transmitter Manually" below.)
Transmitter is not connected to the programming device and the LEDs keep flashing repeatedly.	The transmitter is resetting: firmware is probably corrupted.	Manually reset the transmitter and re-load the transmitter firmware. (See "Reset the Transmitter Manually" below.)

Reset the Transmitter Manually

You can manually reset the transmitter if:

- the *Power-up Self-Test Status* section of the *Program ApexPro CH Transmitter* window shows that the *EEPROM Checksum* test failed

  or

- none of the above processes corrects the problem you are experiencing.

NOTE

You need Super User authority, page 52, to complete this procedure.

To manually reset the transmitter:

1. Complete the procedure "Connect the Hardware" on page 11.
2. Using the tip of a pen or other object with a small point, depress the **Clear Transmitter Memory** button on the side of the programming device and at the same time, turn off the transmitter and turn it back on by sliding the battery cover away from the battery compartment and then back. When reset, the **RA** and **LA** LEDs will blink.
3. Follow the process "Update Transmitter Firmware" on page 42.

Technical Support

If the above information does not resolve your problem, call:

U.S. and Canada	800-558-7044
Other countries	561-575-5000

Appendix 2: Access ApexPro CH Technical Functions (Super User)

Several high-level technical functions are available by following the steps in "Access Super User Mode" below. Technical functions are password-protected to prevent accidental use. These functions are generally used only by qualified service personnel.

Requirements

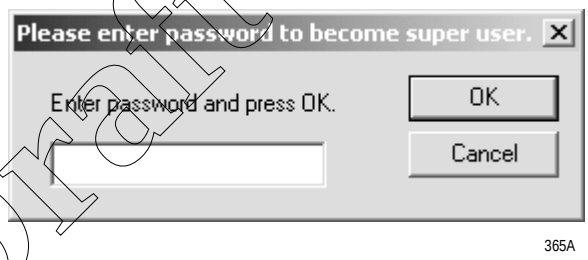
You must have the items identified in "Hardware Requirements for the Programming Device" on page 9.

You may have a software upgrade kit, PN 2007039-005, containing one software upgrade CD.

Access Super User Mode

Start the software as in "Run the Apex & ApexPro Programming Box Software" on page 13 and then access the Super User mode of the software by following these steps:

1. Click on the Communication status button (reference C below). A password prompt will display.
2. Enter the password, mms_aps.



3. Click *OK*.

The *Program ApexPro CH Transmitter* window displays additional Super User features.

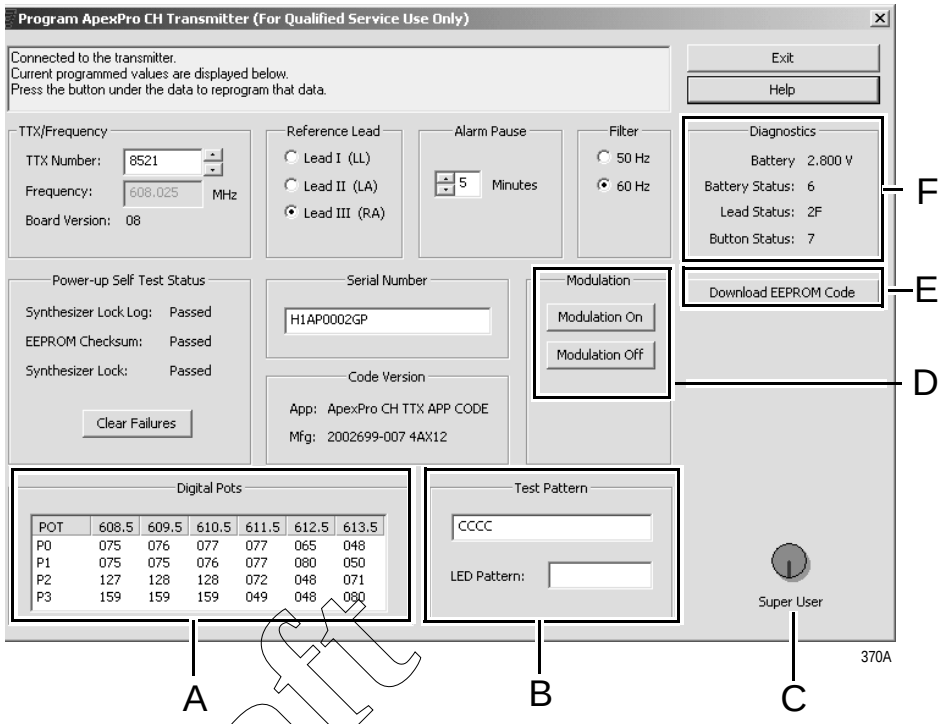


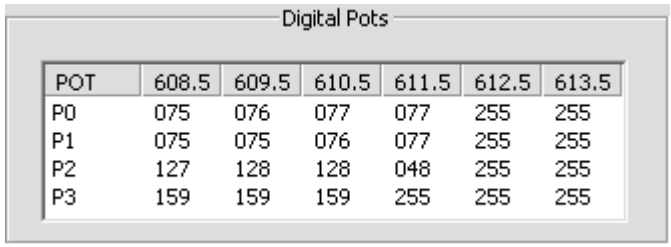
Table 7. *Program ApexPro CH Transmitter* **Technical Functions Window**

Ref	Definition
A	View factory defaults for the Digital Pots
B	Test Pattern conducts a Carrier Frequency test
	LED Pattern tests whether the LED lights are working correctly
C	Communication status button in Super User mode
D	Modulation On/Off selection for enabling/disabling modulation
E	Download EEPROM Code for updating the firmware code
F	Diagnostic displays self-test results

4. To exit Super User mode, click the Communication status button again.

Digital Pots

View only. View the factory RF settings. For factory and engineering use only.

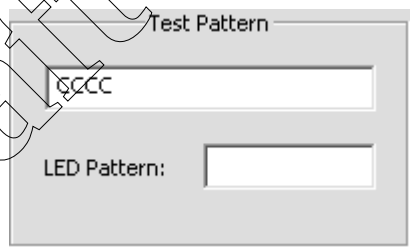


355A

Test Pattern

Test Pattern – a 4-digit hexidecimal value sent by the transmitter to test the carrier frerquency. See the ApexPro Telemetry Transmitter Service Manual for detailed information on Carrier Frequency Error test patterns.

LED Pattern – a 2-digit hexidecimal value used to determine if the LED lights are working.



360A

Modulation

Modulation sets the mode of the frequency being transmitted.

- *Modulation On* – Use during normal operation. Data is transmitted in relationship to the “peaks” of the high frequencies and the “valleys” of the low frequencies.
- *Modulation Off* – Use during service routines. Transmitts a constant frequency with no modulation.

350A

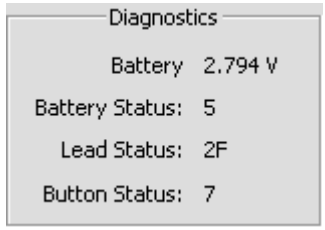
Download EEPROM Code

Click this button to enter download mode. See “Update Firmware Code” on page 42 for procedure to update the firmware. If the program does not respond after clicking this button, see “Reset the Transmitter Manually” on page 51.

375A

Diagnostics

See “Diagnostic Test” on page 40.



330A

Appendix 3: ApexPro CH TTX Labels and Frequencies

Transmitters used with ApexPro CH systems require TTX labels that have this format:

TTX ***XXXXAP (XXXX)***

The available frequency for the ApexPro CH transmitter is:

600 MHz

U.S. TV Channel	Frequency (MHz)	TTX# Range	ApexPro CH V2 PN Label
37	608.025 - 613.975	8521 - 8759	2009840-009

4 ApexPro Transmitter

For your notes

Program the Transmitter's Basic Functions

The Main Programming Window

The *Program ApexPro Transmitter* window displays various configuration settings for the transmitter. These are described in the sections below.

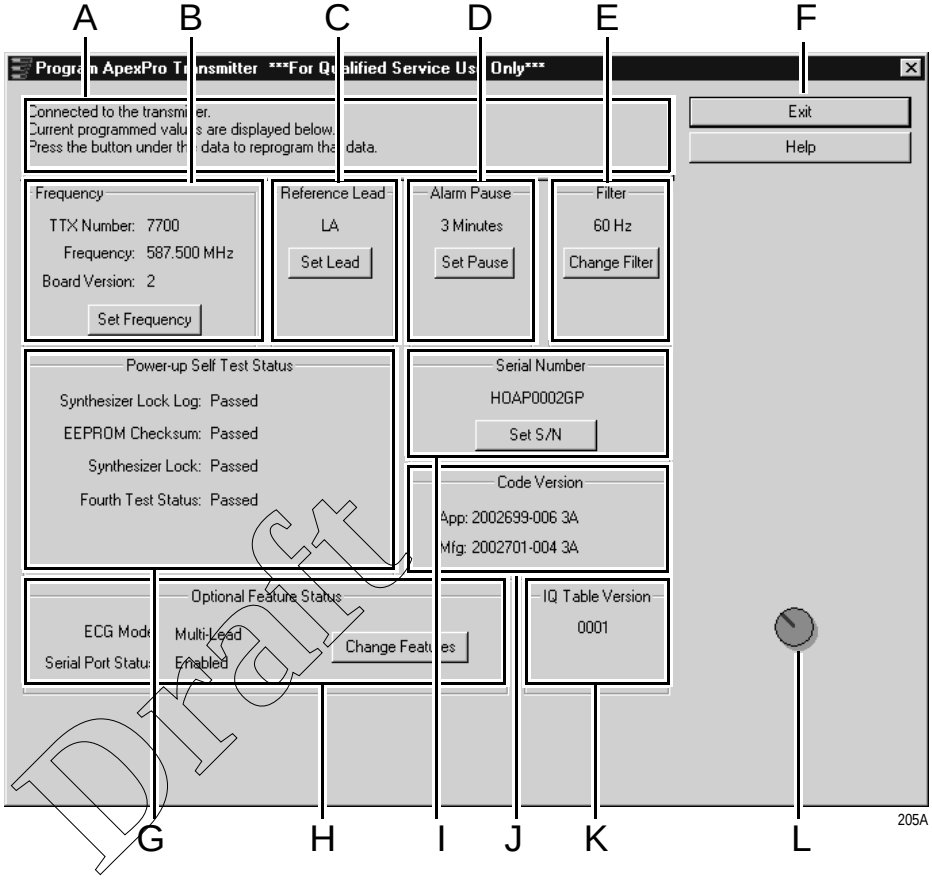


Table 8. *Program ApexPro Transmitter* Window	
Ref	**Definition**
A	Message area for the programming application
B	TTX number and frequency settings
C	Reference lead setting
D	Alarm pause setting
E	Filter setting
F	Exit program button
G	Power-up self-test status results
H	Optional feature settings
I	Serial number of the transmitter
J	Code part/version numbers
K	IQ table version
L	Communication status button

Message Area

This area is used by the software for general status messages, operator instructions and error messages.

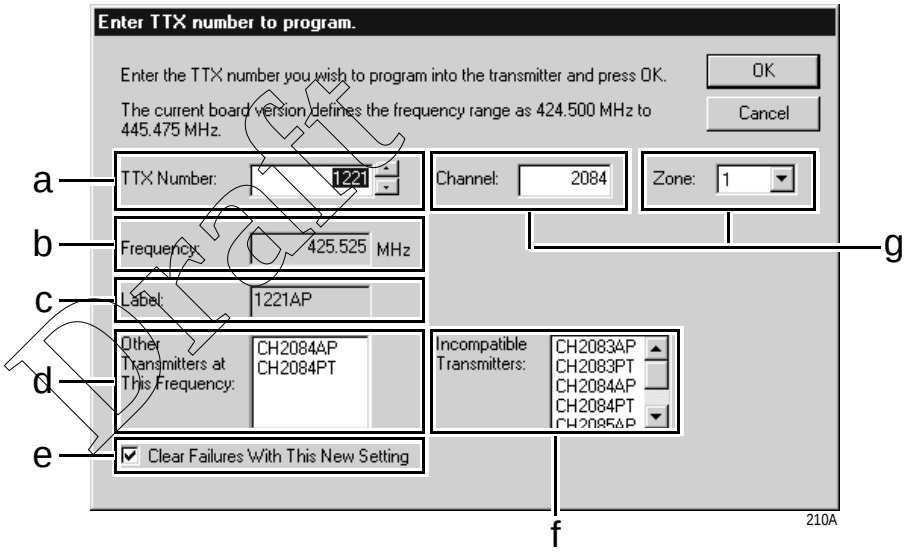
NOTE
If a message indicates *No communication from the transmitter*, refer to "Programming Problems" on page 77.

TTX Number and Frequency Settings

The current TTX number and associated frequency settings are displayed. The board version, important to a technician, is also displayed.

To change the settings:

1. Select the *Set Frequency* button, reference B in "Program ApexPro Transmitter Window" on page 59.
2. Another window appears.



3. This window allows you to:
   - a – Change the *TTX Number*: Either use the up- and down-arrows to scroll to the desired TTX number or highlight and type in the number to use. The frequency changes automatically as you change the *TTX Number*.
   - b – View the associated *Frequency* in MHz.

     NOTE
     Select a frequency that is within the frequency range allowed by your location. Operating outside of the allowed frequency range may cause interference problems or data dropout.

     Some frequencies are reserved and cannot be used. If the TTX number you choose has a reserved frequency, this will be indicated as *RESERVED* in the frequency display. See the ApexPro Telemetry Transmitter Service Manual for a list of TTX numbers, associated frequencies and reserved frequencies.

- c – View the *Label*. This is a combination of the TTX number and an abbreviation of the transmitter model. The label automatically changes as you change the *TTX Number*. For example, an ApexPro transmitter set at TTX number 7700 would be labeled “7700AP”.
- d – View *Other Transmitters at This Frequency*. If there are any other transmitters set to this frequency, there could be interference with signals from this transmitter. Avoid this whenever possible.
- e – Check the *Clear Failures With This New Setting* box. This resets any failed status that was indicated in the *Power-up Self-Test Status* section of the *Program ApexPro Transmitter* window. When this option is checked, failures will be cleared when you select the *OK* button.
- f – View *Incompatible Transmitters*. Incompatible transmitters have frequencies within +/– 12.5 KHz. These transmitters cannot be admitted on the same system. If a list of any other transmitters appears in this box, the TTX number selected cannot be used and the *OK* button is disabled. You must select a different *TTX Number*.
- g – *Channel* and *Zone* (JAPAN ONLY) are coordinated with *TTX Number* in that they change as you change the *TTX Number*. Refer to the Apex® and ApexPro™ Transmitter Programming Instructions (Japan) document for specific usage.

4. Select *OK* to save your changes or *Cancel* to revert to the original settings.
5. Update the “TTX Frequency Chart” in the ApexPro Telemetry Transmitter Service Manual to identify changes to the TTX numbers and the frequencies.
6. Select the appropriate TTX label for ApexPro V1, V2 from the label sheet and apply it to the transmitter inside the label depression located on the back of the transmitter. (See “Appendix 3: ApexPro TTX Labels and Frequencies” on page 80 for applicable label part numbers.)

Reference Lead Setting

For 5- or 6-Lead Cables

The reference lead setting has no effect when 5- or 6-lead cables are used. For 5- or 6-lead cables, the reference lead defaults to **RL**.

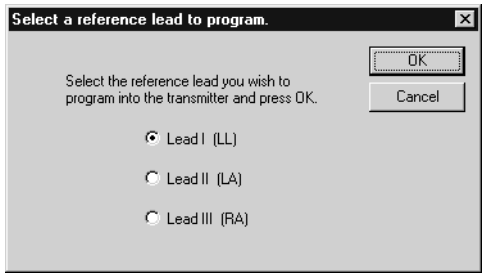
For 3-Lead Cables

For 3-lead cables, one of the lead wires (LL, LA, or RA) is used to connect the reference voltage to the patient. Selection of the reference lead determines which ECG waveform will be displayed at the CIC, according to the table below.

Select this reference lead...	to view this waveform at the CIC
Lead I	LL (left leg)
Lead II	LA (left arm)
Lead III	RA (right arm)

To change the setting:

1. Select the *Set Lead* button, reference C in "Program ApexPro Transmitter Window" on page 59.
2. Another window appears. Select the correct lead. (Selecting one eliminates the others.) Select *OK*.



215A

3. The change is shown on the *Program ApexPro Transmitter* window.

Alarm Pause Setting

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The purpose of the alarm pause setting is to allow clinicians to adjust the transmitter and/or the patient without setting off alarms. The alarm pause setting is an amount of time, in minutes, during which alarms will not activate. After this time has elapsed, the alarm pause will automatically be deactivated and the transmitter will resume normal operation. You can manually turn off the alarm pause at any time by pressing **Verify Leads** and **Graph** at the same time.

NOTE
Activation and deactivation of the alarm pause is done on the transmitter itself. The setting in the software only sets the number of minutes to wait until the alarm pause times out.

To change the setting:

1. Select the *Set Pause* button, reference D in "Program ApexPro Transmitter Window" on page 59.
2. Another window appears.

220A

3. Set the correct number of minutes. Either use the up- and down-arrows to scroll to the desired number or highlight and type in the number to use.
4. Select *OK*.
5. The change is shown on the *Program ApexPro Transmitter* window.

Filter Setting

The filter setting is the frequency of the power lines for the country in which the transmitter will be used, either 50 or 60 Hz. In the United States, this is typically 60 Hz. For most other countries, this is typically 50 Hz.

To change the setting:

1. Select the *Change Filter* button, reference E in "Program ApexPro Transmitter Window" on page 59.
2. This changes the filter from 60 Hz to 50 Hz or from 50 Hz to 60 Hz.
3. The change is shown on the *Program ApexPro Transmitter* window.

Exit Button

When you are done with changing all configuration settings, select the *Exit* button (reference F in "Program ApexPro Transmitter Window" on page 59) to save the settings and exit the program.

View Transmitter Diagnostics

View Firmware Codes

Communication Status Button

The Communication status button (reference L in Table 8, "Program ApexPro Transmitter Window," on page 59) revolves clockwise to indicate that the hardware (transmitter, programming device, and the PC) is properly connected and the software is processing normally.

In addition, by clicking on this button, authorized personnel can access high-level functions. A password is needed to access these functions. See "Appendix 2: Access ApexPro Technical Functions" on page 79 for more information.

Code Version Numbers

This is a display of the part numbers and their versions (reference J in Table 8, "Program ApexPro Transmitter Window," on page 59) for the application firmware (used when the transmitter is operating independently to send patient data) and the manufacturing firmware (used when the transmitter is plugged into the programming device.)

IQ Table Version

This is a display of the version number of the IQ table (reference K in Table 8, "Program ApexPro Transmitter Window," on page 59), which is used for modulation.

View Test Results

Power-up Self-Tests

Power-up self-tests (reference G in Table 8, "Program ApexPro Transmitter Window," on page 59) run whenever the transmitter is powered up. You can view the test results with the *Apex & ApexPro Tx Config* software. The results shown indicate pass-or-fail status for these power-up self-tests:

- Synthesizer Lock Log — Indicates fail status if the transmitter was ever unable to operate at its programmed frequency. This fail status can be cleared in the window for TTX number and associated frequency settings: check the *Clear Failures With This New Setting* box (Ref. e on page 60). A single failure may be caused by a temporary deviation. Repeated failures may indicate a hardware problem. If this is the case, contact Technical Support. (See "Technical Support" on page 78.)
- EEPROM Checksum — Indicates whether the transmitter firmware is valid or is corrupt.
- Synthesizer Lock — Shows the current status of the phase lock loop in the transmitter. This indicates whether or not the transmitter is operating at its programmed frequency. Failure of this test indicates that this transmitter could be operating at a different frequency and could be causing interference with another transmitter programmed to that other frequency. If this is the case, this transmitter should be removed from service until the problem is corrected. Refer to "Power-Up Self-Test Failures" on page 77.
- Fourth Test Status — Reserved for future use.

If any test has failed:

1. Select the *Set Frequency* button, reference B in "Program ApexPro Transmitter Window" on page 59.
2. Check the *Clear Failures With This New Setting* box.

If any tests fail again, see "Power-Up Self-Test Failures" on page 77.

Diagnostic Tests

Diagnostic tests (reference D in "Appendix 2: Access ApexPro Technical Functions" on page 79) run at all times but are accessible only by personnel authorized for high-level functions. The results shown are:

- Battery voltage – the specific combined voltage of the two AA batteries in the transmitter. Each AA battery is nominally rated at 1.5V, so two fresh batteries together should register at 3.0V. The lowest total voltage for the transmitter to operate properly is approximately 1.5V.
- Battery Status – the relative strength of the AA batteries in the transmitter, ranging from zero (dead) to 7 (full power).
- Lead Status – the status of any leads connected to the transmitter. Since the transmitter is connected to the programming device and not to any leads, the status during the programming process will always be "3F", indicating no leads attached.
- Button status – indicates which buttons on the transmitter are being pressed. You can use this to test the buttons if you suspect they may be stuck.
  - 0 = Both **Verify Leads** and **Graph** buttons are pressed.
  - 1 = **Verify Leads** button is pressed.
  - 2 = **Graph** button is pressed.
  - 3 = Neither button is pressed.

Update Transmitter Firmware

Update Firmware Code

Occasionally there are updates to the transmitter firmware. In addition, in rare cases, you may experience problems with the firmware and may need to download one or more of the files to the transmitter. See "Appendix 1: ApexPro Troubleshooting" on page 76 to determine which file, if any, should be downloaded.

The files that may be involved have these extensions:

- .app (Application firmware code – for transmitter operation)
- .mfg (Manufacturing firmware code – for programming the transmitter)
- .tbl (IQ table – for modulation)

When updating the transmitter firmware, these files are installed in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, except if a different location is chosen. When downloading specific files after experiencing problems, you will find the necessary files on your hard drive where the firmware was installed.

Firmware Download Decisions

Follow these instructions if the transmitter is functioning.

If the transmitter is not functioning at all, try manually resetting it as instructed in "Reset the Transmitter Manually" on page 78.

When these conditions occur...	Use this *Download Function*
RA light on the transmitter is flashing.	*Erase & Download App* (page 66)
LA light on the transmitter is flashing.	*Erase & Download Mfg* (page 67)
Transmitter is working correctly but the firmware needs to be updated.	*Erase & Download App & Mfg* (page 68)
The EEPROM checksum test failed.	
The transmitter was manually reset.	
There is a problem with the transmitter but you don't know what it is.	*Download File* (page 70)

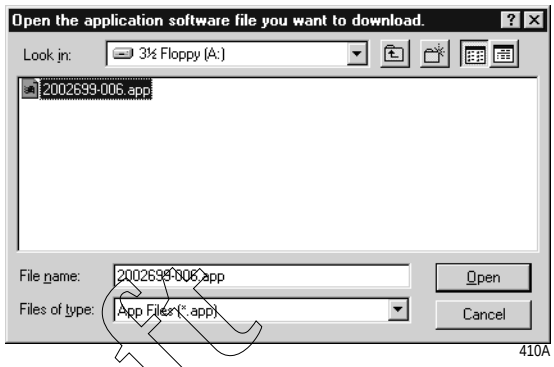
Erase & Download Application Code

1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 79.
2. The *Program ApexPro Transmitter* window will display additional features, including a *Download Functions* section (reference D in "Appendix 2: Access ApexPro Technical Functions" on page 79.)
3. Select the *Erase & Download App* button.

4. Select *OK* at this screen.

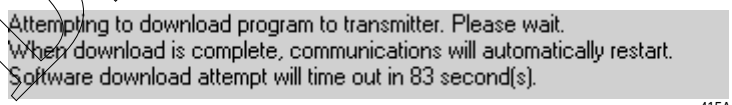
405A

5. Locate the transmitter firmware, generally in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, or where the firmware was installed.
6. Click once on the *.app* file and select *Open*. The upgrade process starts automatically.



410A

7. During the upgrade, the message box on the *Program ApexPro Transmitter* window displays a countdown timer and the transmitter settings appear greyed out. In addition, sometimes the **RA** LED light on the transmitter flashes and sometimes all the LED lights flash.



415A

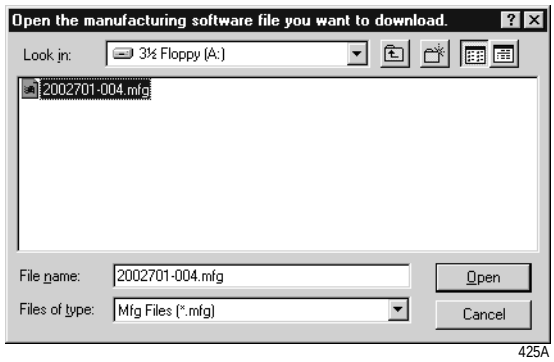
8. Wait until the first line in the message box displays the text *Connected to the transmitter*. If there are any problems, refer to "ApexPro Appendices" on page 76.

Erase & Download Service Code

1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 79.
2. The *Program ApexPro Transmitter* window will display additional features, including a *Download Functions* section (reference D in "Appendix 2: Access ApexPro Technical Functions" on page 79.)
3. Select the *Erase & Download Mfg* button.
4. Select *OK* at this screen.

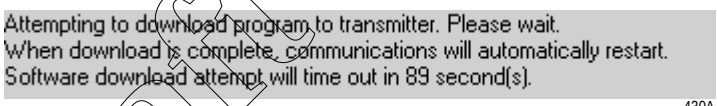
420A

5. Locate the transmitter firmware, generally in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, or where the firmware was installed.
6. Click once on the *.mfg* file and select *Open*. The upgrade process starts automatically.



425A

7. During the upgrade, the message box on the *Program ApexPro Transmitter* window displays a countdown timer and the transmitter settings appear greyed out. In addition, sometimes the **LA** LED light on the transmitter flashes and sometimes all the LED lights flash.

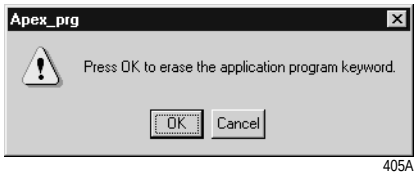


430A

8. Wait until the first line in the message box displays the text *Connected to the transmitter*. If there are any problems, refer to "ApexPro Appendices" on page 76.

Erase & Download Application and Service Codes

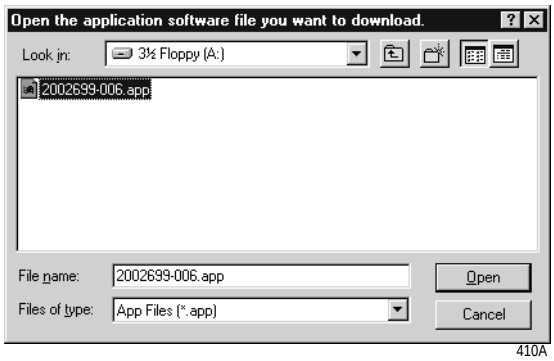
1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 79.
2. The *Program ApexPro Transmitter* window will display additional features, including a *Download Functions* section (reference D in "Appendix 2: Access ApexPro Technical Functions" on page 79.)
3. Select the *Erase & Download App & Mfg* button.
4. Select *OK* at this screen.



405A

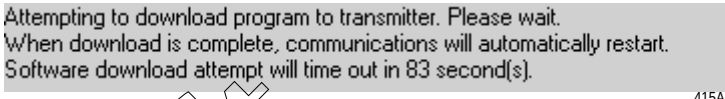
5. Locate the transmitter firmware, generally in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, or where the firmware was installed.

6. Click once on the *.app* file and select *Open*. The upgrade process starts automatically.



410A

7. During the upgrade, the message box on the *Program ApexPro Transmitter* window displays a countdown timer and the transmitter settings appear greyed out. In addition, sometimes the **RA** LED light on the transmitter flashes and sometimes all the LED lights flash.



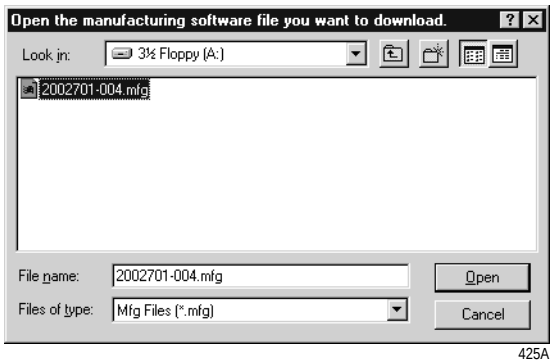
415A

8. Next, the download process downloads the *.mfg* file. Select *OK* at this screen.

420A

9. Locate the transmitter firmware, generally in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, or where the firmware was installed.

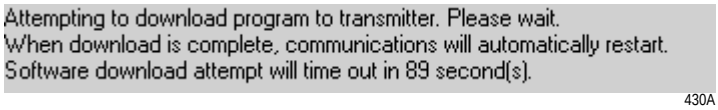
10. Click once on the *.mfg* file and select *Open*. The upgrade process starts automatically.



425A

11. During the upgrade, the message box on the *Program ApexPro Transmitter* window displays a countdown timer and the transmitter

settings appear greyed out. In addition, sometimes the **LA** LED light on the transmitter flashes and sometimes all the LED lights flash.



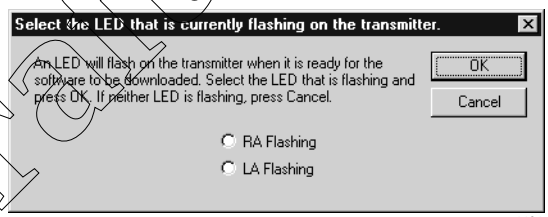
430A

12. Wait until the first line in the message box displays the text *Connected to the transmitter*. If there are any problems, refer to "ApexPro Appendices" on page 76.

Download File

This function helps determine which firmware file to download, either the application code or the manufacturing code.

1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 79.
2. The *Program ApexPro Transmitter* window will display additional features, including a *Download Functions* section (reference D in "Appendix 2: Access ApexPro Technical Functions" on page 79.)
3. Select the *Download File* button.
4. Follow the instructions at this screen.



440A

- If the **RA** light is flashing, select *RA Flashing* and then select *OK*.
- If the **LA** light is flashing, select *LA Flashing* and then select *OK*.
- If neither LED is flashing on the transmitter, there is no need to update the firmware, so you can select *Cancel*.

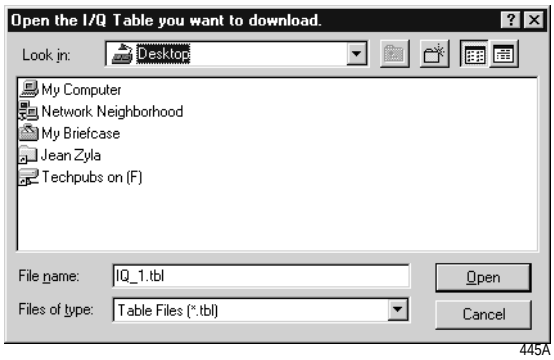
Change the IQ Table Version

The IQ table is used to generate the RF modulation in the transmitter.

If you receive a new IQ table file:

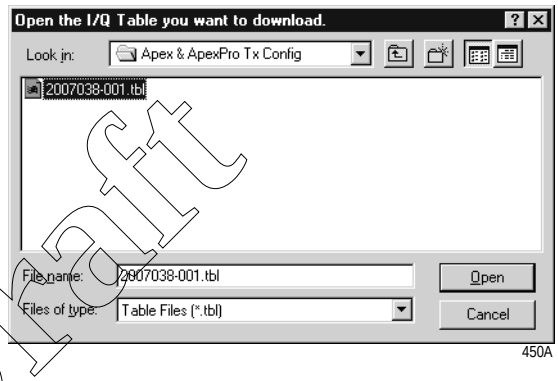
1. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 79.
2. Select the *Load I/Q Table* button, reference B in "Appendix 2: Access ApexPro Technical Functions" on page 79.

3. A window opens for you to navigate to the I/Q Table you need.

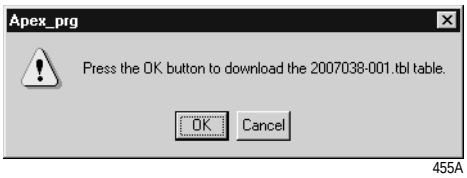


4. Locate the transmitter firmware, generally in *C:\Program Files\GE Medical Systems\Apex and ApexPro Programming Box Software*, or where the firmware was installed.

5. Click once on the *.tbl* file and select *Open*.



6. Select *OK*.



7. The transmitter's settings will disappear temporarily from the *Program ApexPro Transmitter* window. When the settings reappear, verify that the *I/Q Table Version* matches the last three digits of the *.tbl* file name listed on the CD.

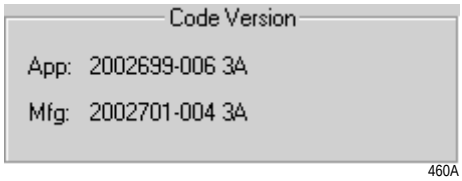
NOTE
The version has 4 digits and is stored inside the table itself. The version number may not correlate to the file name or to the firmware part number.

8. Confirm that all *Power-up Self Test Status* messages indicate *Passed*. See "Appendix 1: ApexPro Troubleshooting" on page 76 if any failures occur.

Verify Correct Operation

Verify the Transmitter's Firmware Versions

1. Disconnect the transmitter from the programming device and wait for the transmitter to reboot. (All the LED lights flash rapidly several times and then slowly two times.)
2. Reconnect the transmitter to the programming device.
3. When the transmitter's settings reappear in the *Program ApexPro Transmitter* window, verify that the *Code Version App:* text string matches the *.app* file name listed on the data disk. Also verify that the *Code Version Mfg:* text string matches the *.mfg* file name listed.



4. Confirm that all *Power-up Self Test Status* messages indicate *Passed*. Call Technical Support (page 78) if any failures occur.

Verify Transmitter Operation

Complete the checkout procedures identified in the ApexPro Telemetry Transmitter Service Manual.

Track the Software Upgrade (Field Engineer Use Only)

For this upgrade, complete the following.

1. Use the MDOC number found on the data disk as the tracking number in the PROACTIVE REPAIR# window of the Clarify case.
2. Bill travel and labor only as authorized by Marketing - CIC/ApexPro using the MDOC number as the PO#.
3. Fill out and fax the "Update Installation Verification Form" provided with this manual. (Please make additional copies as needed.)

Perform Advanced Functions

Set Transmitter Feature Level

Three settings are available, with varying levels of software functions. Using a password obtained from the packing slip, you can enable these functions.

Feature Levels

Feature Level	Functionality
Multi-Lead ECG acquisition with fully-functional interface connector ports	The transmitter can be used with multiple leads and can be used with accessories that use the serial ports. This is the typical level.
Single Lead ECG acquisition with fully-functional interface connector ports	The transmitter can only be used for single-lead acquisition but can be used with a number of accessories, including the programming device.
Single Lead ECG acquisition with service-use only interface connector ports	The transmitter can only be used with a single lead and can not be used with any accessories except the programming device.

Requirements for Setting Features

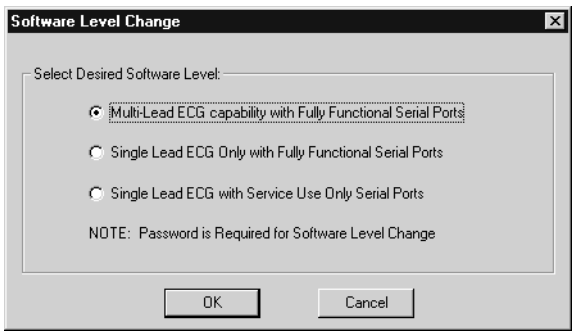
1. Verify the transmitter firmware is at version 2A or later.
2. Verify you have the packing slip identifying the software feature password. The password is specific to each transmitter's serial number. (To get the password, contact Technical Support. See page 78.)
3. Verify you have the items identified in the "Hardware Requirements for the Programming Device" on page 9.
4. Verify the transmitter programming software is at version 2A or later: Under your PC's *Start* menu, select *Programs* > *Apex & ApexPro Tx Config* > *Readme.txt* to identify the configuration software version, shown in the headings.

Procedure for Setting Features

1. Complete the procedure "Install the Programming Device" on page 9.
2. Complete the procedure "Connect the Hardware" on page 11.
3. Run the programming software. (See "Run the Apex & ApexPro Programming Box Software" on page 13.)
4. Access the high-level technical functions of the software as described in "Access the Super User Mode" on page 79.
5. Confirm the features available in the *Optional Feature Status* field, reference A in "Appendix 2: Access ApexPro Technical Functions" on page 79.
6. To enable a feature, complete the following steps:

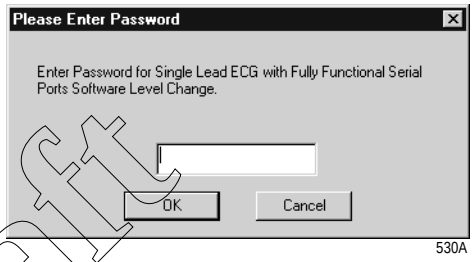
a. Select the *Change Features* button.

b. Click on the desired software level, then select *OK*. Note that if you downgrade, you will lose some features.



520A

c. Enter the password. (To get the password, contact Technical Support. See page 78.) Then select *OK*.



530A

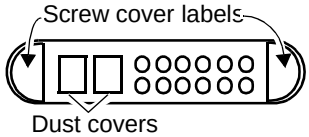
7. The change is shown on the *Program ApexPro Transmitter* window. Check the *Optional Feature Status* field to verify that the features you selected were enabled.

Verify Transmitter Operation

Complete the checkout procedures identified in the ApexPro Telemetry Transmitter Service Manual.

Update Labels and Dust Covers

The screw cover labels and the dust covers are used to visually identify the software features of the transmitter. If the feature level is changed, the labels and the dust covers should be updated according to the table below.



Feature	Transmitter Appearance
Multi-Lead ECG acquisition with fully-functional interface connector ports	■ Grey-colored screw cover label ■ Grey-colored dust covers
Single Lead ECG acquisition with fully-functional interface connector ports	■ **Single Lead** screw cover label ■ Grey-colored dust covers

Feature	Transmitter Appearance
Single Lead ECG acquisition with service-use only interface connector ports	■ Blue-colored dust covers ■ Screw cover label:  535A

Track the Software Upgrade (Field Engineer Use Only)

For this upgrade, complete the following:

1. Use the appropriate MDOC number in the table below as the tracking number in the PROACTIVE REPAIR# window of the Clarify case.

Number	Software Feature
MDOC-640	APROT1-APROT1P UPGD APROTX UPG 1-ECG ONLY TO SERIAL PORT
MDOC-641	■ APROT1-APROTX UPGD APROTX UPG 1-ECG TO MULTILEAD + PORT ■ APROT1P-APROTX UPGD APROTX UPG 1-ECG W/ PORT TO MULTI + PORT

2. Bill travel and labor only as authorized by Marketing - CIC/ApexPro using the MDOC number as the PO#.
3. Fill out and fax the “Update Installation Verification Form” provided with this manual. (Please make additional copies as needed.)

ApexPro Appendices

Appendix 1: ApexPro Troubleshooting

LED Status Problems

Condition	Possible Cause	Possible Actions
No lights are blinking.	Hardware is not connected properly.	Check the hardware connections as described in "Connect the Hardware" on page 11.
	Software is not installed.	Install the *Apex & ApexPro Tx Config* software as described in "Install the Programming Device" on page 9.
	Software is not running.	Start the *Apex & ApexPro Tx Config* software as described in "Run the Apex & ApexPro Programming Box Software" on page 13.
	Batteries do not have enough power.	Replace the batteries: 1. Disconnect the transmitter from the programming device. 2. Replace the transmitter batteries with two new AA alkaline batteries. 3. Reconnect the transmitter to the programming device.
	One or both firmware files are corrupt.	Follow the instructions in "Download File" on page 70.
All lights blink rapidly several times and then slowly two times.	Normal status when hardware has just been properly connected.	No action needed.
All lights blink on and off every second.	Normal status when hardware is properly connected and the software is running.	No action needed.
RA LED light is blinking.	You have chosen to "Download File" on page 70 and need to download the .app file.	Follow the instructions in "Erase & Download Application Code" on page 66.
	Transmitter is receiving a download of application firmware.	No action needed.
LA LED light is blinking.	You have chosen to "Download File" on page 70 and need to download the .mfg file.	Follow the instructions in "Erase & Download Service Code" on page 67.
	Transmitter is receiving a download of service firmware.	No action needed.

Programming Problems

Condition	Possible Cause	Possible Actions
Unable to display or program the transmitter settings.	Batteries do not have enough power or are dead.	Replace the batteries: 1. Disconnect the transmitter from the programming device. 2. Replace the transmitter batteries. 3. Reconnect the transmitter to the programming device.
Message indicates *No communication from the transmitter.*	Hardware is not connected properly.	Check the hardware connections as described in "Connect the Hardware" on page 11.
	Incorrect COM port was selected.	1. Exit this window. (Reference F in "Program ApexPro Transmitter Window" on page 59.) 2. Restart *Apex & ApexPro Tx Config*: In your PC's *Start* menu, select *Programs > GE Medical Systems > Apex & ApexPro Tx Config > Apex & ApexPro Tx Config*. 3. In the *Select Transmitter* window, choose a different *COM Port* from what you selected before. Select *OK*. 4. Repeat steps 1 through 3 until a connection is established and the message area indicates *Connected to the transmitter*. 5. If the transmitter still is not working after trying all of the COM ports, refer to other sections of this appendix.

Power-Up Self-Test Failures

Condition	Possible Cause	Possible Actions
Synthesizer Lock Log indicates fail status.	Transmitter has been unable to operate at programmed frequency.	May be caused by temporary conditions. Check the "Synthesizer Lock" test below for current lock conditions. If the Synthesizer Lock test is currently passing: 1. Clear the Synthesizer Lock Log ("Power-up Self-Tests" on page 64), under the Super User mode ("Appendix 2: Access ApexPro Technical Functions" on page 79.) 2. Remove the transmitter from the programming box, and allow the transmitter to reboot. 3. Reconnect the transmitter to the programming box. 4. Check the Synthesizer Lock Log status. If the failure occurs again, contact Technical Support. (See page 78.)
Synthesizer Lock indicates fail status.	The transmitter is currently unable to operate at its programmed frequency.	Try programming the transmitter to another frequency. If the failure still occurs, contact Technical Support. (See page 78.)
EEPROM Checksum indicates fail status.	The transmitter firmware is incorrect or corrupt.	Cycle the power on the transmitter. If the failure still occurs, download new application and service firmware into the transmitter. (See "Erase & Download Application and Service Codes" on page 68.)

Other Problems

Condition	Possible Cause	Possible Actions
Unexpected behavior. Message indicates *No communication from the transmitter*.	Transmitter firmware is corrupt.	Manually reset the transmitter and re-load the transmitter firmware. (See "Reset the Transmitter Manually" below.)
Transmitter is not connected to the programming device and the LEDs keep flashing repeatedly.	The transmitter is resetting: firmware is probably corrupted.	Manually reset the transmitter and re-load the transmitter firmware. (See "Reset the Transmitter Manually" below.)

Reset the Transmitter Manually

You can manually reset the transmitter, if:

- the *Power-up Self-Test Status* section of the *Program ApexPro Transmitter* window shows that the EEPROM Checksum test failed

  or

- none of the above processes corrects the problem you are experiencing.

NOTE

You need Super User authority, page 79, to complete this procedure.

To manually reset the transmitter:

1. Complete the procedure "Connect the Hardware" on page 11.
2. Using the tip of a pen or other object with a small point, depress the **Clear Transmitter Memory** button on the side of the programming device and at the same time, turn off the transmitter and turn it back on by sliding the battery cover away from the battery compartment and then back. When reset, the **RA** LED will blink.
3. Follow the process "Erase & Download Application and Service Codes" on page 68.

Technical Support

If the above information does not resolve your problem, call:

U.S. and Canada	800-558-7044
Other countries	561-575-5000

Appendix 2: Access ApexPro Technical Functions

Several high-level technical functions are available by following the steps in "Access the Super User Mode" below. Technical functions are password-protected to prevent accidental use.

Requirements

You must have the items identified in "Hardware Requirements for the Programming Device" on page 9.

You may have a software upgrade kit, PN 2007039-005, containing one software upgrade CD.

Access the Super User Mode

Start the software as in "Run the Apex & ApexPro Programming Box Software" on page 13 and then access the Super User mode of the software by following these steps:

1. Select the Communication status button, reference L in "Program ApexPro Transmitter Window" on page 59 and reference C below.
2. Type the password *mms_aps*.
3. Select *OK*.
4. The *Program ApexPro Transmitter* window will display additional features.

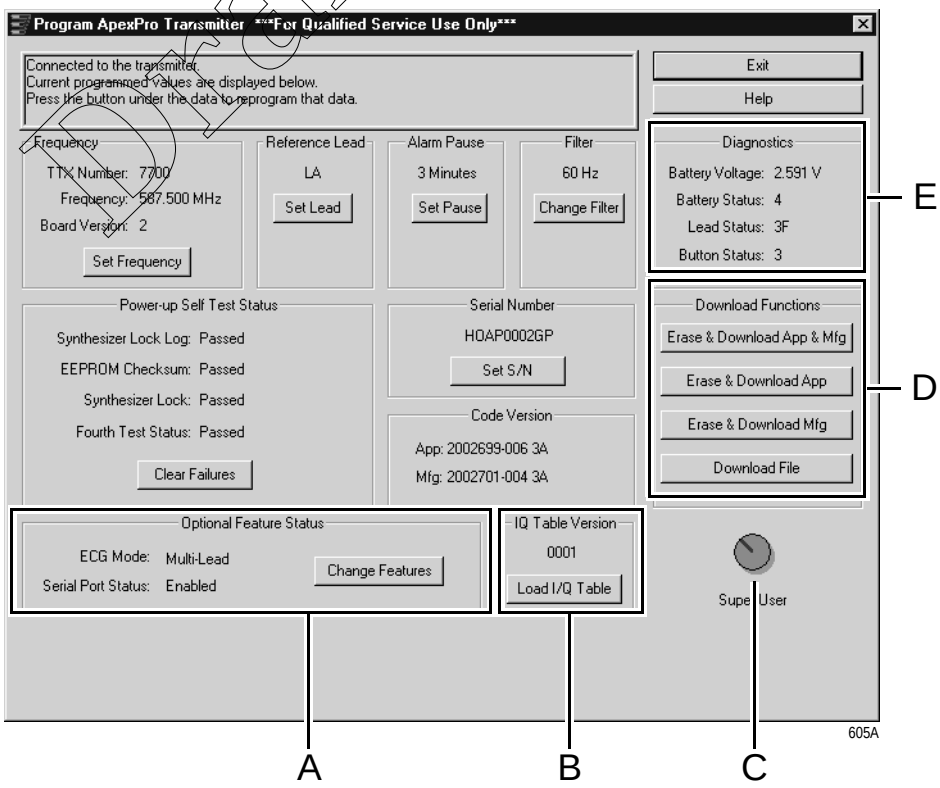


Table 9. *Program ApexPro Transmitter* Technical Functions Window	
Ref	**Definition**
A	Optional Features selected
B	IQ Table version
C	Communication status button
D	Download Functions available
E	Diagnostic test results

5. To exit the Super User mode, select the Communication status button again.

Appendix 3: ApexPro TTX Labels and Frequencies

Transmitters used with ApexPro systems require TTX labels that have this format:

TTX ***XXXXAP (XXXX)***

Frequencies available for ApexPro transmitters are in these ranges:

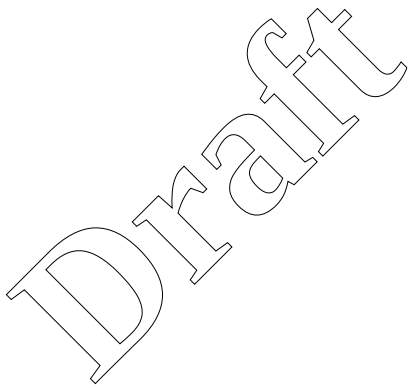
600 MHz

U.S. TV Channel	Frequency (MHz)	TTX# Range	ApexPro V2 PN
33	584.025 - 589.975	7561 - 7799	2009840-005
34	590.025 - 595.975	7801 - 8039	2009840-006
35	596.025 - 601.975	8041 - 8279	2009840-007
36	602.025 - 607.975	8281 - 8519	2009840-008
37	608.025 - 613.975	8521 - 8759	2009840-009

400 MHz

Frequency (MHz)	TTX# Range	ApexPro V2 PN
420.000 - 425.950	1000-1238	2009841-001
425.975 - 431.925	1239-1477	2009841-002
431.950 - 437.900	1478-1716	2009841-003
437.925 - 443.875	1717-1955	2009841-004
443.900 - 449.850	1956-2194	2009841-005
449.875 - 455.825	2195-2433	2009841-006
455.850 - 460.000	2434-2600	2009841-007

For your notes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