FLUKE®
Biomedical

Ansur TNT 12000

Plug-In

Users Manual

August 2009, Rev. 2, 12/09

Table of Contents

List of Tables

List of Figures

Chapter 1
Introduction

Title **Page**

About This Manual

This Users Manual is designed to assist the reader in using the Ansur TNT 12000 Plug-In with Ansur software. The manual covers all features specific to the plug-in. Familiarity with both Ansur software and Microsoft Windows® and their features will help in the design and use of tests for the Ansur TNT 12000.

Ansur Software

Ansur Test Automation software is the foundation for all Fluke Biomedical test systems. Ansur manages test procedures by allowing both manual and visual automated test sequences.

The software works hand-in-hand with Fluke Biomedical analyzers and simulators, creating a seamless integration for:

- Visual inspections
- Preventive maintenance
- Work procedures
- Performance tests
- Safety tests

Ansur Plug-ins

Ansur Test Executive software utilizes plug-in modules that work with a wide array of Fluke Biomedical instruments. The plug-in module is a software interface that provides test elements to the Ansur Test Executive program. This scheme allows the use of a similar user interface for all analyzers and simulators supported by Ansur.

With the purchase of a new Fluke Biomedical analyzer or simulator, it is possible to update existing Ansur software by installing a new plug-in. Each plug-in module allows users to work with the options and capabilities of the test instrument.

TNT 12000 Plug-In

The Ansur TNT 12000 Plug-In provides remote access to the TNT 12000 X-Ray Test Device, referred to throughout this manual as the “Detector.” In addition to the general test plug-ins, specialized plug-ins address all test requirements for specific instruments.

Note

The TNT 12000 X-Ray Test Device Users Manual explains the Detector’s capabilities and use.

Create and use Ansur test procedures with Ansur TNT 12000 test elements to incorporate the capabilities of a Detector into automated testing. Users can customize tests to analyze specific performance requirements. There are unique test elements for each of the tests, and simulations typically run on the Detector.

Additional References

In addition to this manual, answers to questions using the Detector or PC may be found in the following sources:

- *Fluke Biomedical TNT 12000 Users Manual*
- *Fluke Biomedical Ansur Test Executive Users Manual*
- Microsoft Windows Help and Support Center

Software Updates

Updates for Ansur are published on the Fluke Biomedical website, *http://www.flukebiomedical.com*.

Terms and Abbreviations

Table 1-1 lists terms and abbreviations used in this manual.

Table 1-1. Terms and Abbreviations

Term	Description
Ansur	Ansur is a software suite using plug-ins to perform test and inspection procedures in conjunction with several Fluke Biomedical test instruments.
DUT	Device Under Test—the equipment subjected to a test using the Detector.
TNT 12000	X-Ray Test Device from Fluke Biomedical.
Plug-In	Add-on software program that extends Ansur so that it can interface with a specific Fluke Biomedical test instrument to configure it for a specific test and to automatically collect the measured data (if applicable).
Test Element	An Ansur construct that encapsulates test configuration and results. A test template is built of several test elements.
Test Guide	A window displayed by Ansur or any of its plug-ins when a test element is being performed.
Test Record	An Ansur file containing the results of a performed test template. The test record can be printed as a test report.
Test Template	An Ansur file containing a set of test elements that define how a particular DUT is to be tested. A test template can also contain instructions on how to perform service, preventive maintenance, repair, and other tasks on a DUT.

Chapter 2
Getting Started

Introduction

This chapter describes installation of the TNT 12000 Plug-In and its use together with the Ansur Test Automation software and the Detector.

Note

A Detector is not necessary to create test templates and experiment with the functionality available in Ansur and the TNT 12000 Plug-In. However, actual tests cannot be performed unless the Detector is connected to the computer.

System Requirements

The following are recommended minimum requirements for installation:

- Microsoft Windows 2000, Windows XP, or Vista operating system
- Fluke Biomedical Ansur V2.8.3 or newer
- 50 MB of available hard drive for software
- Hard drive space (from 100 k to several megabytes) for result and template files

Installing the TNT 12000 Plug-In

The TNT 12000 Plug-In must be installed on the computer before the features described in this user manual can be implemented. For information on obtaining the Ansur software and the TNT 12000 Plug-In, contact the local Fluke Biomedical representative or visit the Fluke Biomedical website (http://www.flukebiomedical.com).

Note

Ansur version 2.8.3 or newer must be installed before the TNT 12000 Plug-In can be installed and used.

Download the TNT 12000 Plug-In from the Fluke Biomedical website and follow the steps below:

Note

When downloading the TNT 12000 Plug-In from the Fluke Biomedical web site, it is possible to run the installation without first downloading.

Note

When installing Ansur or any of its components/plug-ins on computers running Microsoft Vista, it is important to perform the installation as the Administrator for that computer. Otherwise the registry will not be properly updated and Ansur will not work properly.

1. Open **Windows Explorer** and browse to the saved TNT 12000 Plug-In installation program file, usually named **AnsurTNT12000Plug-InVn.n.n.msi**, where *n.n.n* is the plug-in version number.
2. Double-click the installation program. The installation extracts the plug-in elements and displays the **Welcome** dialog box.
3. Click **Next** to display the license agreement.
4. Select the checkbox for "**I accept the terms in the license agreement**," and click **Next** to display the default destination folder.
5. Choose one of the following options:
   - Click **Next** to accept the default destination folder in which Ansur was installed.

- Click **Change** if Ansur has been installed in a different folder. In this case, the destination folder for the plug-in is changed so that it resides in the same directory as the Ansur program.

Note

If Ansur has been installed in a different destination folder from the default, be sure to use the same folder for the TNT 12000 Plug-In.

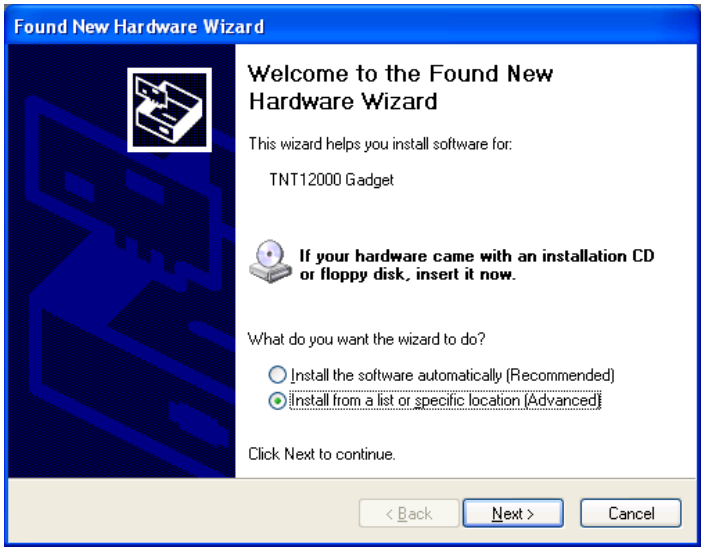
6. Click **Install** to begin the installation. A progress bar indicates the status of the plug-in installation.

   After a few minutes, the installation concludes, and the window displays the dialog box and the **Finish** button.

7. Click **Finish**. The plug-in will load when Ansur is started.

Installing the TNT 12000 Vendor Class Driver

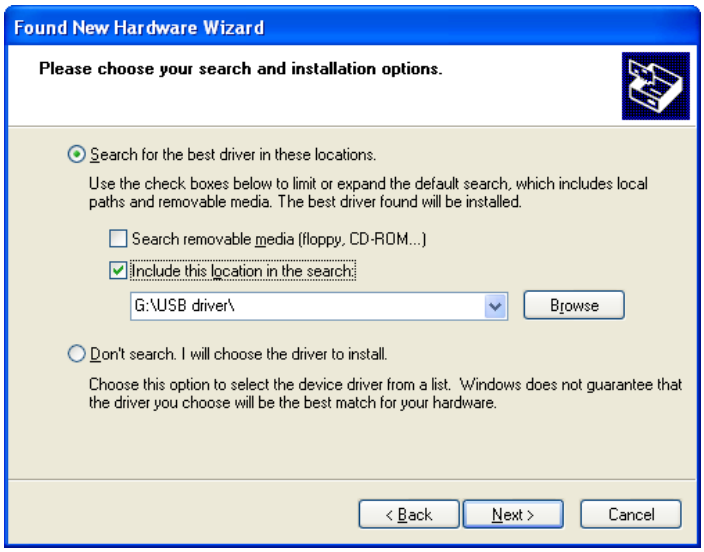
1. Start the computer.
2. Connect the Detector to the computer through the USB cable (Type-A to Mini-B) and turn on the Detector.
3. The New Hardware Wizard window appears as shown in Figure 2-1. Select **Install from a list or specific location (Advanced)** option and click **Next**.



gao01.bmp

Figure 2-1. Found New Hardware Wizard Window

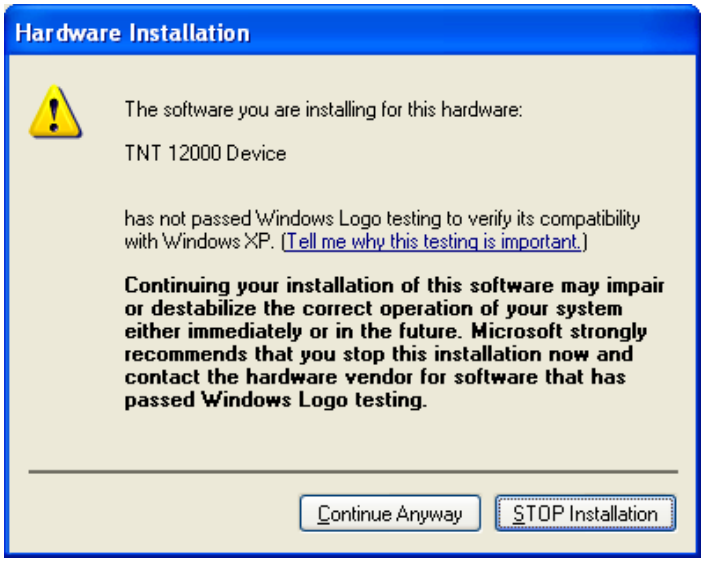
4. A window to choose the search and installation option appears as shown in Figure 2-2. Select **Search for the best driver in these locations** and **Search removable media (floppy, CD-ROM…)** option.



gao02.bmp

Figure 2-2. Driver Search Window

5. Click **Next**.
6. While installing, a warning message window appears as shown in Figure 2-3. This is normal. Click **Continue Anyway**.



gao03.bmp

Figure 2-3. Warning Screen

7. Wait while the wizard installs the USB driver and the dialog shown in Figure 2-4 appears. Click **Finish** to complete the installation.

gao04.bmp

Figure 2-4. Hardware Wizard Finish Window

Entering License Key

When using the plug-in for the first time, the user is prompted to enter a software license key provided by Fluke Biomedical at the time of purchase.

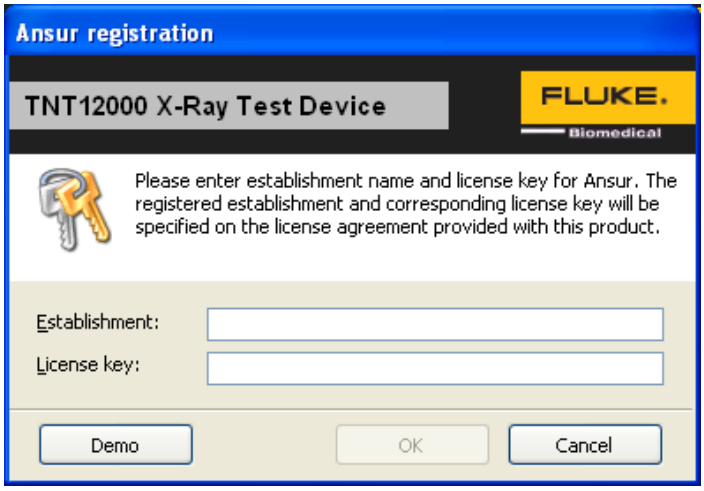
Note

Test templates can be created without a license key by using the demonstration mode. Demonstration mode allows many of the tasks described in this user manual. However, a user may not save or print test results without licensing the plug-in.

1. Start Ansur by doing one of the following:
   - Double-click the **Ansur** icon on the desktop.
   - From the **Start** menu, select **Start** | **Programs** | **Fluke** | **Ansur**.

Note

The license key dialog box shown in Figure 2-5 appears at startup if a license key has not yet been entered for the plug-in.



gao05.bmp

Figure 2-5. Ansur Registration Screen - License Key

2. Enter the **Establishment** name and the plug-in **License key.** If a license key is not available, click the **Demo** button to start Ansur in demonstration mode.

   Note

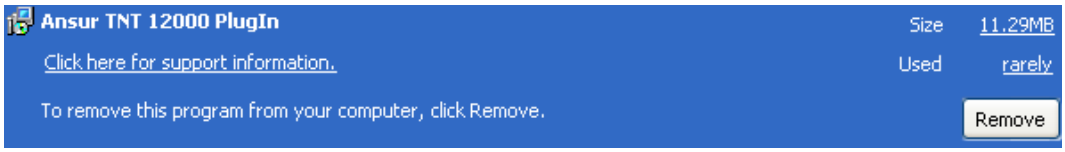
   Because the license key is derived from the establishment name, both strings must match the license information provided by Fluke Biomedical. This information is case sensitive and space sensitive. If the establishment name has been entered in the past, this field is already filled in.

3. Click **OK** to start Ansur.
4. Click **Cancel** to prevent the plug-in from being loaded.

UnInstalling the Plug-In

To uninstall the TNT 12000 Plug-In:

1. Select **Start** | **Control Panel** and double-click **Add or Remove Programs**.
2. Locate and select the entry named **Ansur TNT 12000 Plug-in**, as shown in Figure 2-6.



gao06.bmp

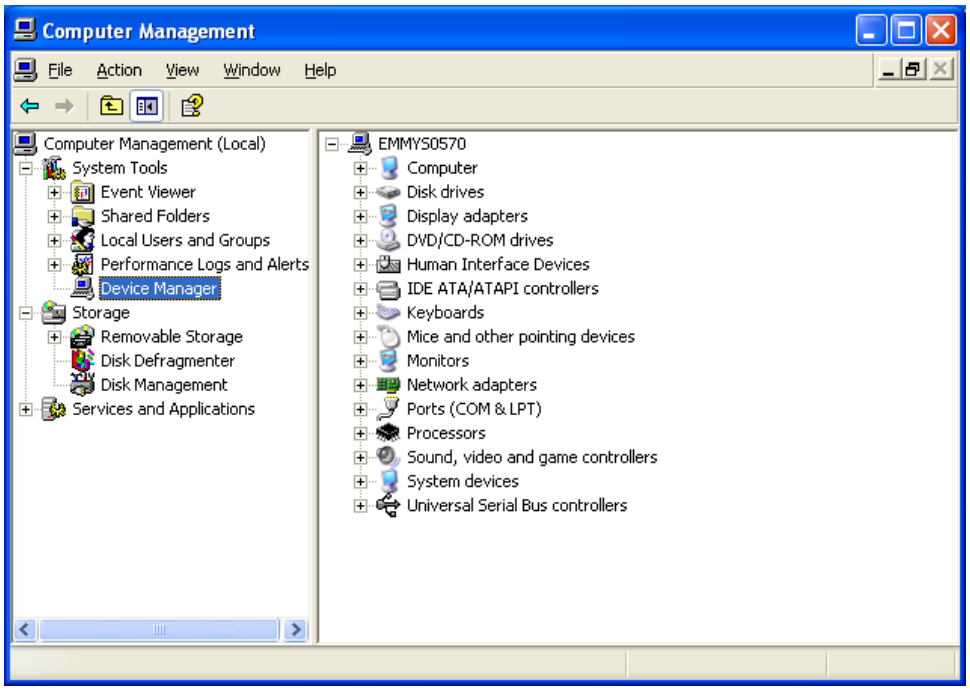
Figure 2-6. Removing TNT 12000 Plug-In

3. With the entry highlighted, click the **Remove**.
4. When asked to verify the removal, click **Yes**. A dialog box with a progress bar displays while the TNT 12000 Plug-In is being removed from the computer.

   When the plug-in is no longer listed in the **Add or Remove Programs** window, it has been completely removed.

Uninstalling the TNT 12000 Vendor Class Driver

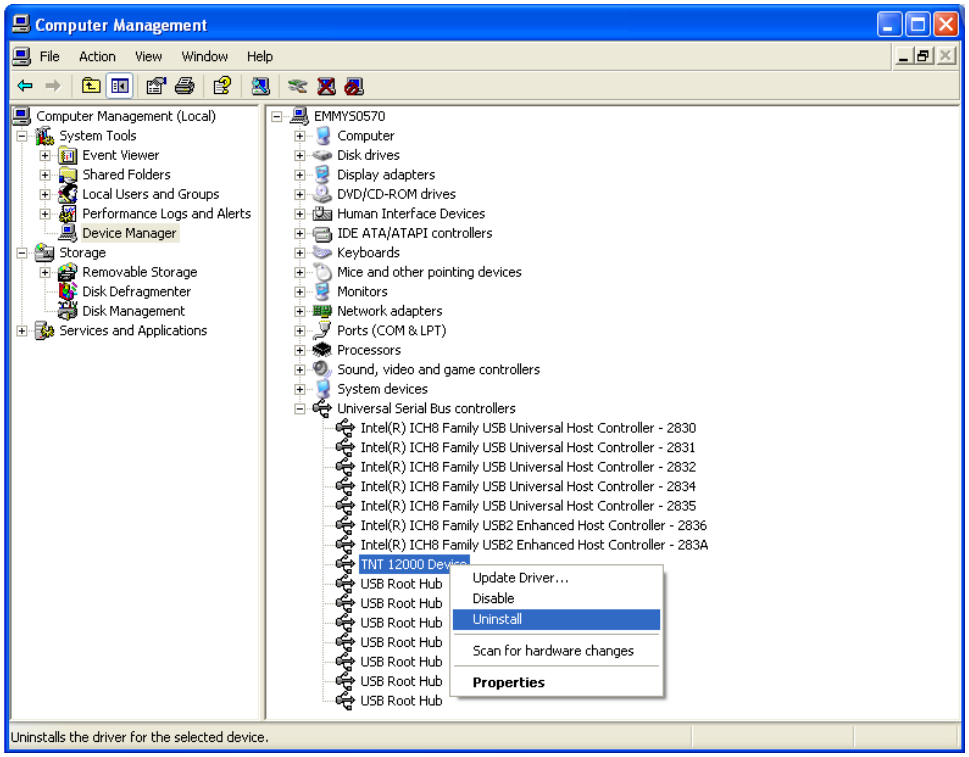
1. Start the computer.
2. Connect the Detector to the computer through Mini-B to Type-A USB cable and turn on the Detector.
3. Right click the My Computer icon and click on Manage.
4. Select Device Manager on the left side of the window as shown in Figure 2-7.



gao07.bmp

Figure 2-7. Device Manager Window

5. Click the (+) sign adjacent to **Universal Serial Bus controllers**. A list of connected devices appears as shown in Figure 2-8. Right click **TNT 12000 Device** and select **Uninstall**.



gao08.bmp

Figure 2-8. Removing Vendor Class Driver

6. A confirmation window appears as shown in Figure 2-9. Click **OK** to uninstall the Vendor Class Driver.

gao09.bmp

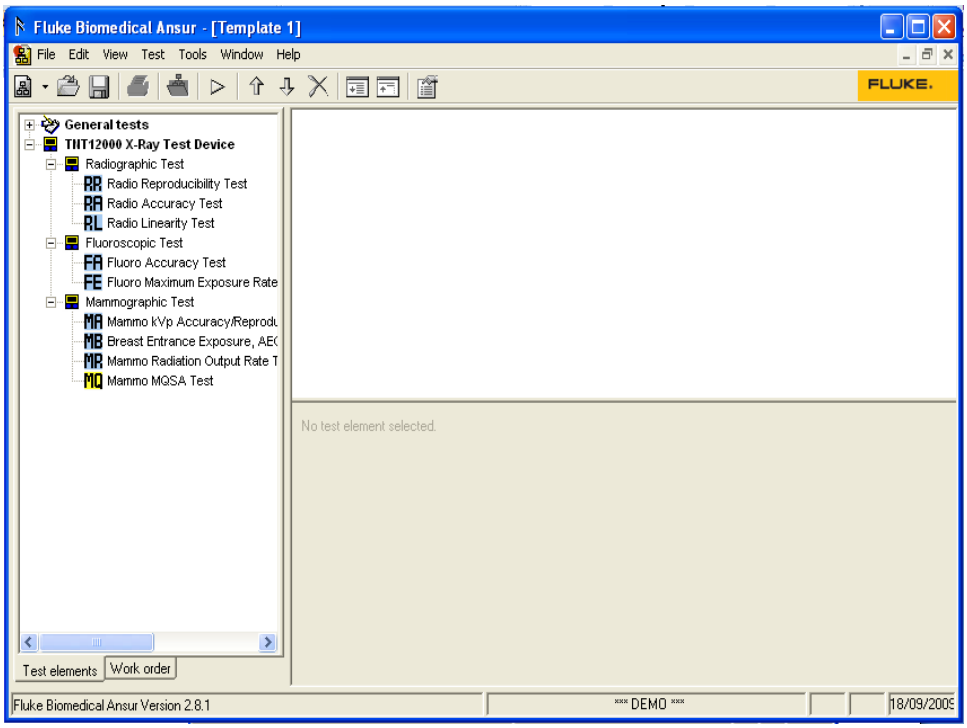
Figure 2-9. Removal Confirmation

Ansur Main Window

At startup, Ansur displays the **Main Application** window shown in Figure 2-10. Test templates can be created and edited from this window.

Test Explorer

The left pane of the **Main Application** window is called the **Test Explorer** (Figure 2-10). It displays the installed plug-ins available in Ansur.



gao10.bmp

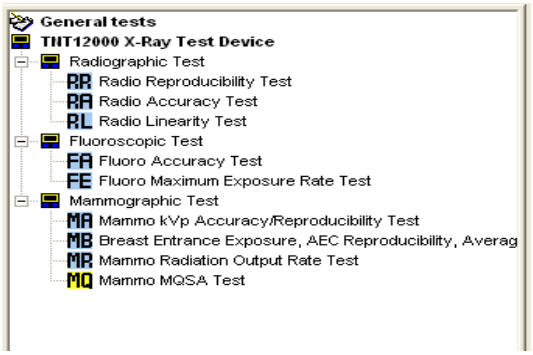
Figure 2-10. TNT 12000 Main Application Window

Look in the **Test Explorer** to verify that a plug-in has loaded properly following installation. If **TNT 12000 X-Ray Test Device** appears in the list, then the plug-in was correctly loaded during startup.

Test Elements

To expand the list and view the available plug-in test elements in the Test Explorer window, either click the + (plus) symbol to the left of the plug-in name or double-click the name itself; in this case TNT 12000 X-Ray Test Device.

Expanding the plug-in, displays the list of test elements. See Figure 2-11.



gao11.bmp

Figure 2-11. TNT 12000 Test Explorer Window

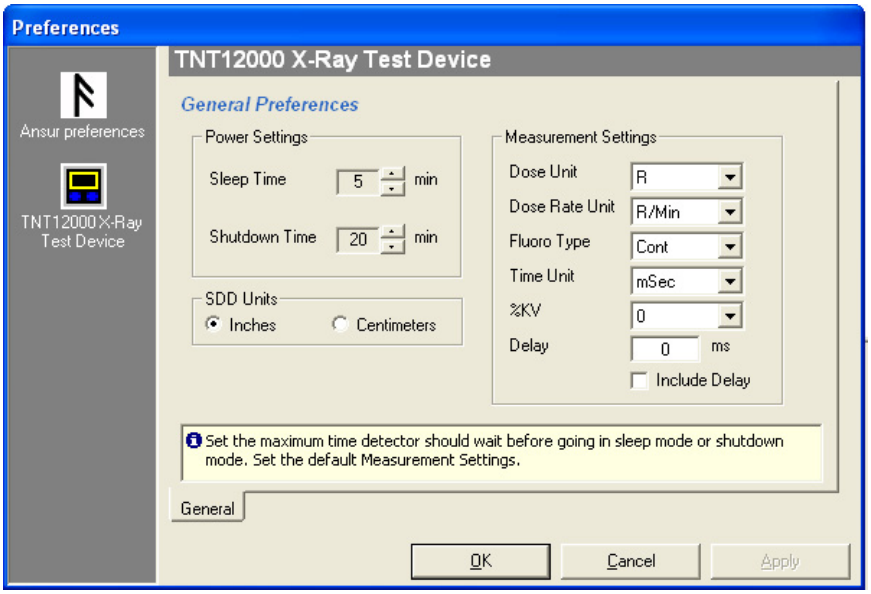
Plug-In Preferences

The plug-in preferences allow selection of default settings that best suit normal instrument use. Defaults typically handle most performance testing requirements.

To change plug-in preferences:

1. Start the Ansur Test Executive program.

2. Click **Tools** | **Options** to display the **Preferences** window shown in Figure 2-12.



gao12.bmp

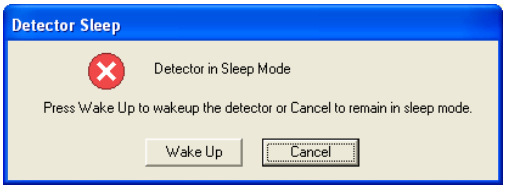
Figure 2-12. X-Ray Test Device Preference Window

3. Click the **TNT 12000 X-Ray Test Device** icon. The window opens with the **General** tab displayed.

In this window, the Power Settings and the Measurement Settings can be changed.

Power Settings

Sleep Time: Select the system sleep time (2 min – 9 min). All the system circuitry of the Detector will be put in the low power mode if there are no measurements for the set system sleep time, and the **Detector Sleep** window appears as shown in Figure 2-13.



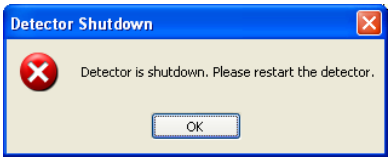
gao13.bmp

Figure 2-13. Detector Sleep Window

Click **Wake Up** to make the Detector come out of the sleep mode. Click **Cancel** to continue the Detector in the sleep mode and a **Wake Up** button is added to the tools option in Test Guide.

Shutdown Time: Select the system shutdown time (10 min – 99 min).

The Detector shuts down if there are no measurements for the set system shutdown time and the **Detector Shutdown** window appears as shown in Figure 2-14.



gao14.bmp

Figure 2-14. Detector Shut Down Window

Press the On/Off key of the Detector to restart the system.

Measurement Settings

Table 2-1 lists the measurement settings for the TNT 12000 X-Ray Device.

Table 2-1. Measurement Settings

Options	Description
Dose Units	Select R (Roentgen) or Gy (Gray) from the drop-down list.
Dose Rate Units	Select dose (R or Gy) per second, minute, hour, or pulse from the drop-down list.
Fluoro Type	Select Fluoroscopic type CONT (Continuous) or PULSED from the drop-down list.
Time Units	Select ms (milliseconds) or Pulses from the drop-down list.
%kV	Select %kV 0 %, 75 %, 80 %, or 90 % from the drop-down list. If 0 % is selected, the detector measures radiographic exposure time from the moment x-rays are detected by the detector until they are no longer detected. If 75 %, 80 %, or 90 % is selected, the detector measures exposure time between the 75 %, 80 % or 90 % points on the kV waveform. For best results when selecting 75 %, 80 %, or 90 %, make sure that the percentage of the kV waveforms peak kV is within the selected filter range.
Delay	A measurement delay is used to postpone the start of data analysis in order to skip over waveform anomalies (such as overshoots or preheat effects) that may occur at the beginning of an exposure. A delay of 0 ms to 999 ms can be entered.
Include Delay	Select this checkbox when the waveform anomalies such as leading edge overshoots are to be excluded for kV measurement but included in exposure time measurement. Deselect this checkbox when waveform anomalies such as filament preheat pulses are to be excluded for kV and Exposure time measurement.
SDD Units	Measurement units in inches or centimeters can be selected by clicking on either the inches or centimeters option button in the SDD (Source to Detector Distance) units box.

4. Click **OK** to use the changed settings for making measurements and close the **Preferences** window.
5. Click **Cancel** to discard the changes and close the preferences window.

Chapter 3
TNT 12000 Tests

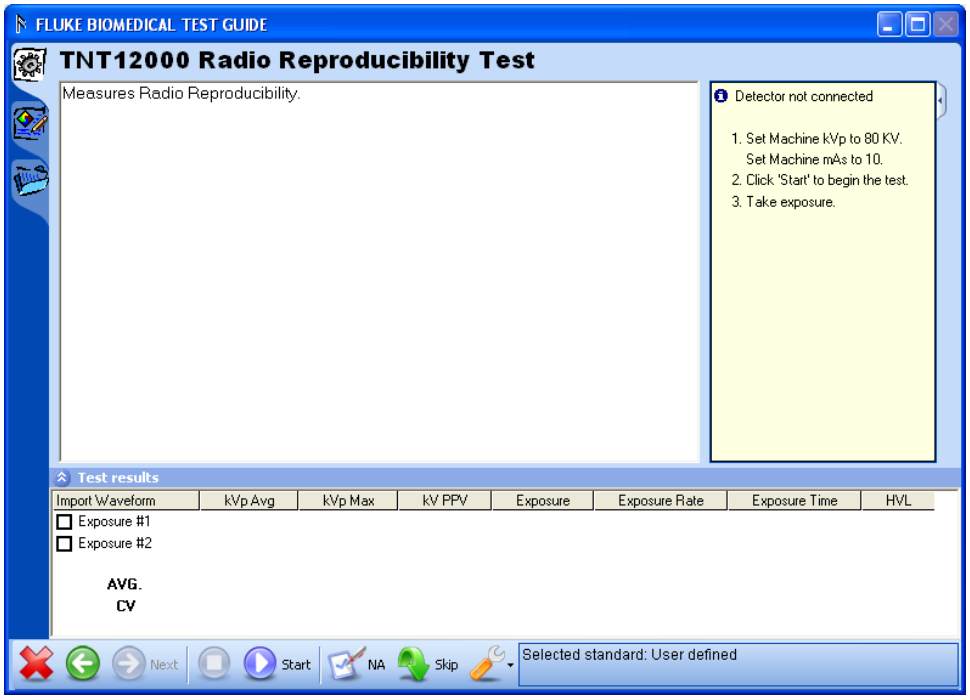
Ansur Test Guide

This manual includes tests unique to the plug-in for the TNT 12000 X-Ray Test Device. For overall information on selecting and executing tests with Ansur software, please refer to the latest version of the *Ansur Executive User Manual*.

When a test is executed with the TNT 12000 Plug-In, the **TEST GUIDE** window opens. Use the **TEST GUIDE** to step through each element in the test procedure. Figure 3-1 shows the **TEST GUIDE** for a Radio Reproducibility test. The panes function as follows:

- Left pane – displays either the default explanation or one entered when a custom template was created.
- Right pane – provides Battery Status of connected Detector, Target Filter and step-by-step directions for the test being performed.
- Test results pane – the bottom pane that displays results of the test being run.

In this example, the screen directs the setting of the kVp and mAs for the X-Ray machine. Press **Start** on the **TEST GUIDE** toolbar to begin the test.



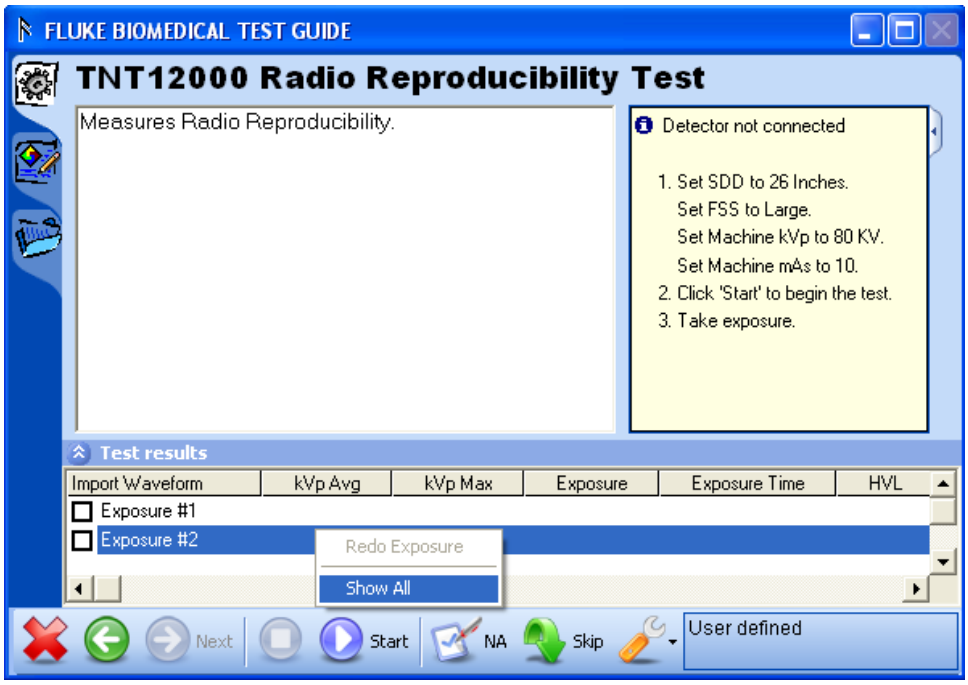
gao15.bmp

Figure 3-1. Ansur Test Guide Window

Note

The parameters not selected in the Expected Result tab will not be displayed.

To show the parameters of a test result, right click on a test result line and then click on the **Show All** selection as shown in Figure 3-2.

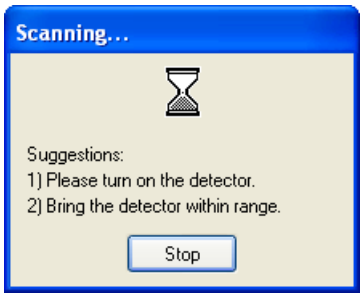


gao30.bmp

Figure 3-2. Ansur Test Guide Window with Menu Selection

Connection Procedure

When **Start** is clicked the first time, a scanning window appears as shown in Figure 3-3.

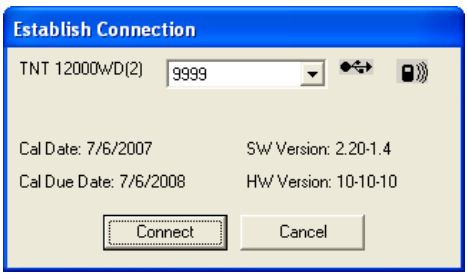


gao16.bmp

Figure 3-3. Scanning Window

Stop: To stop scanning for detectors and close the window.

The **Establish Connection** window (see Figure 3-4) appears if the scanning for the Detectors finds more than one detector.



gao17.bmp

Figure 3-4. Connection Window

Table 3-1 describes the controls in the connection window.

Table 3-1. Establish Connection Controls

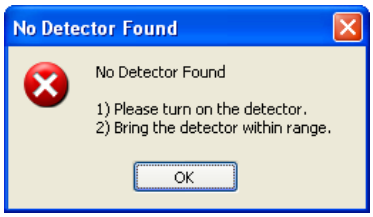
Control	Description
TNT 12000WD(2)	Drop-down list for choosing the Detector. The number in parenthesis indicates the number of available Detectors.
Connect	Establishes a connection to the chosen Detector.
Cancel	Click to abort connecting to a detector and close the window.

The communication icons Zigbee ((( ))) and/or USB ( ) appear indicating the mode of communication through which the Detectors are connected.

Last calibrated date, calibration due date, software version, and hardware version of the selected Detector is displayed in this window.

Note

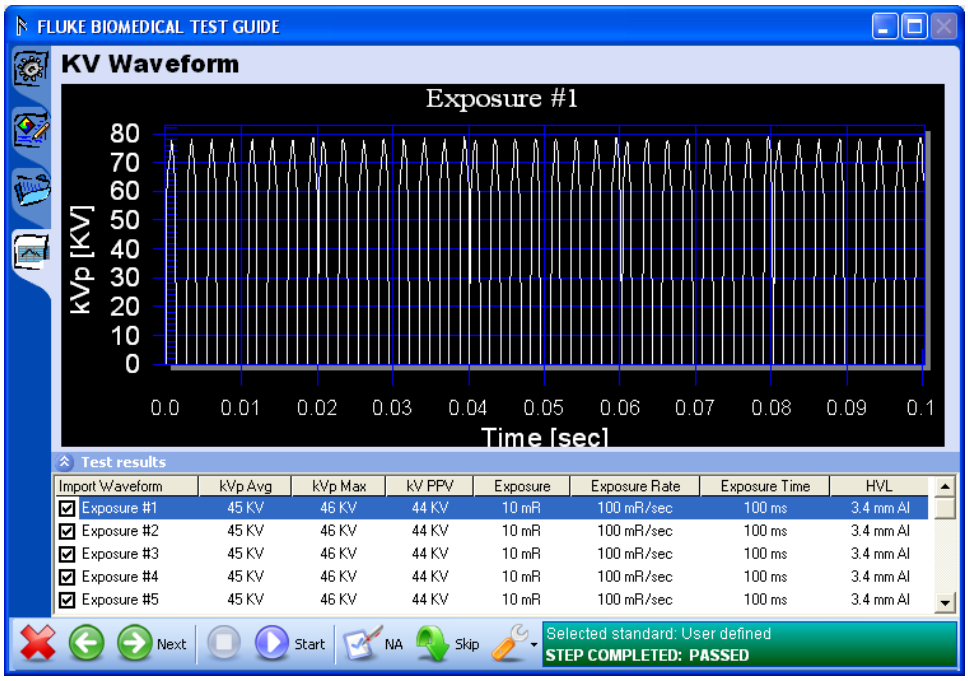
If there are no Detectors in the vicinity of if the Detectors are turned off, the No Detector Found window appears. See Figure 3-5.



gao18.bmp

Figure 3-5. No Detector Found Window

Detector measurement results appear in the Test Results pane as shown in Figure 3-6.

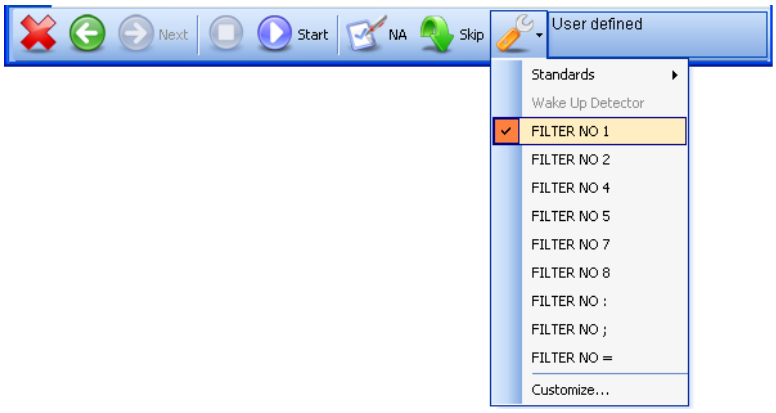


gao19.bmp

Figure 3-6. Test Results Window

Target Filter

To select a target or filter, Click **Tools** on the **Test Guide** toolbar. The drop-down list shown in Figure 3-7 is used to select the appropriate target or filter

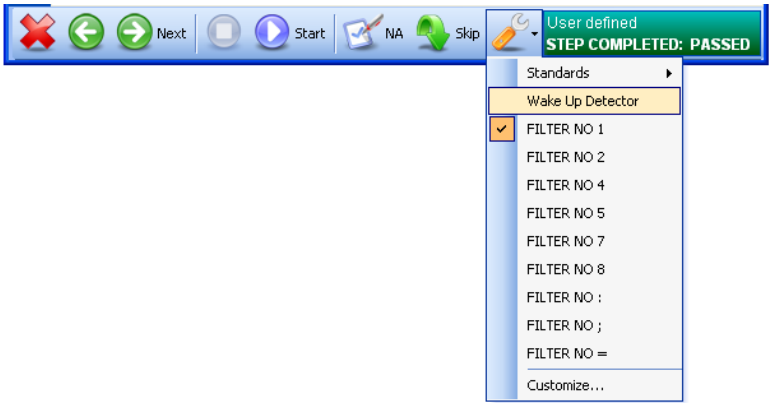


gao20.bmp

Figure 3-7. Target/Filter Selection

Wake Up Detector

When the detector is in sleep mode, click **Wake Up Detector** under the **Tools** option shown in Figure 3-8 to make the Detector come out of the sleep mode.



gao21.bmp

Figure 3-8. Wake Up Detector

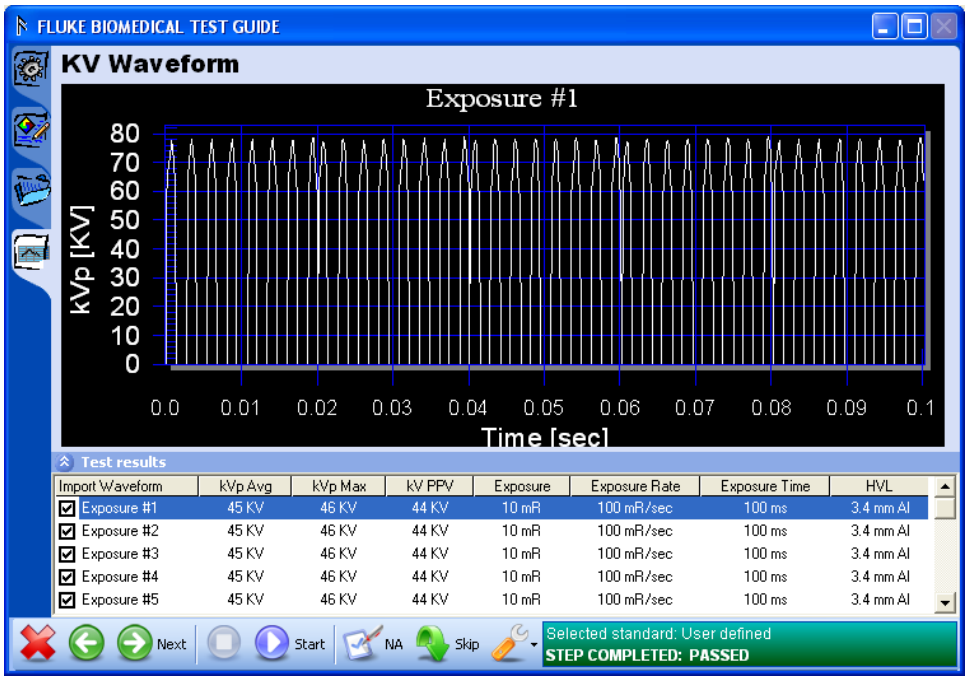
Redo Exposure

To redo the exposure with the TNT 12000 Plug-In, perform the following:

1. Select the row in the Test results pane.
2. Right click the selected row and a context menu appears on the screen.
3. Select **Redo Exposure**.
4. New exposure data fills in the selected row as shown in Figure 3-9.

Note

Redo Exposure is enabled in the menu only after completion of the test.



gao19.bmp

Figure 3-9. Redo Exposure Screen

Radiographic Tests

The TNT 12000 Plug-in allows testing of X-Ray Device performance using a PC running the Ansur software. At the conclusion of each test procedure, Ansur collects the results of the tests to display or to store on a PC.

Radio Reproducibility Test

Reproducibility is tested by making a series of exposures with the same machine settings. The average and CV (coefficient of variation) are then calculated for all measured values. The CV of the measured results are then compared with the CV that has been entered as pass/fail criteria and the results are displayed in the **TEST GUIDE** status bar.

Note

The coefficient of variation is defined as the standard deviation divided by the average.

To run a Radio Reproducibility test:

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, the Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the **Test results** pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9.

Radio Accuracy Test

Accuracy is tested by making a series of exposures with specific machine settings. The calculated error percentages of the measured results are compared with the error percentages that have been entered as pass/fail criteria. The results are displayed in the **TEST GUIDE** status bar.

To perform a Radio Accuracy Test, perform the following:

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the **Test results** pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9.

Radio Linearity Test

Linearity (mA or mAs) is evaluated by calculating the mR/mAs (uGy/mAs) at each mA or mAs station and calculating the linearity coefficient between consecutive mA or mAs stations.

Note

The CL (coefficient of linearity) is calculated by the formula (X1-X2)/(X1+X2), where X1 and X2 are mR/mAs values obtained at each of two consecutive mA or mAs stations.

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the Test result pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9.

Fluoroscopy Test

Fluoroscopy Testing consist of three tests: Fluoro kVp Accuracy, Fluoro HVL, and Fluoro Maximum Exposure Rate tests.

Fluoro kVp Accuracy Test

Accuracy is tested by making a series of exposures with specific machine settings. The calculated error percentages of the measured results are compared with the error percentages that have been entered as pass/fail criteria. The results are displayed in the **TEST GUIDE** status bar.

To perform a Fluoro kVp Accuracy Test, perform the following:

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test**

Results pane.

5. Click **Stop** on the **TEST GUIDE** toolbar to retain the particular measurement data of the exposure.

Note

Click Stop on the TEST GUIDE toolbar before the completion of the exposure to conclude the test.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the Test result pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9.

Fluoro Maximum Exposure Rate Test

The Exposure Rate Test is used to record maximum exposure rates. The measured exposure rate is compared with the maximum exposure rate that have been entered in the pass/fail criteria. If the measured exposure rate is greater than the maximum exposure rate than a fail will be indicated in the TEST GUIDE status bar.

To perform a Fluoro Maximum Exposure Rate Test, perform the following:

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.
5. Click **Stop** on the **TEST GUIDE** toolbar to retain the particular measurement data of the exposure.

Note

Click Stop on the TEST GUIDE toolbar before the completion of the exposure to conclude the test.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the Test result pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9.

Mammography Tests

Mammography tests consists of five tests: Mammo kVp Accuracy/Reproducibility, Mammo HVL, Mammo Breast Entrance Exposure and AEC Reproducibility/Average Glandular Dose, Mammo Radiation Output Rate, and Mammo MQSA tests.

Mammo kVp Accuracy/Reproducibility Test

The kVp Accuracy/Reproducibility is tested by making a series of exposures, all with the same machine settings. The Coefficient of Variation (CV) and error percentages are then calculated for kVp values. The CV and the error percentages of the measured results are compared with the CV and the error percentages that have been entered as pass/fail criteria and the results are displayed in the **TEST GUIDE** status bar.

Note

The coefficient of variation is defined as the standard deviation divided by the average.

To perform a Mammo kVp Accuracy/Reproducibility test, perform the following:

1. Align the TNT 12000 Detector has to be aligned on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the Test result pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9

Mammo Breast Entrance Exposure and AEC Reproducibility/Average Glandular Dose Test

The Breast Entrance Exposure and AEC Reproducibility / Average Glandular Dose are tested by making a series of exposures, all with the same machine settings. The Energy Corrected Mean values, Standard deviations (SD), Coefficient of variation (CV), Inverse square corrected skin exposure, Dose conversion factor, Computed average glandular dose (mrad) are then calculated for all measured values.

To perform a Mammo Breast entrance exposure and AEC reproducibility / Average Glandular dose test, perform the following:

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

After an exposure is made next to a checked waveform box, the exposure data are placed in the Test result pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9

Mammo Radiation Output Rate Test

The Radiation Output Rate is tested by making a series of exposures, all with the same machine settings. The exposure rate and Air Kerma rate are then calculated for all measured values.

To perform a Mammo Radiation Output Rate test, perform the following:

1. Align the TNT 12000 Detector on the beam center, with the long axis of the Detector perpendicular to the x-ray tube axis (refer to the *TNT 12000 Users Manual* for connection instructions).
2. Click **Start** on the **TEST GUIDE** toolbar.
3. If no detector is currently connected, then Connection Procedure is initiated.
4. Make an exposure. The measurement data of each exposure will appear in the **Test Results** pane.

If any of the waveform checkboxes are checked, the desired waveform will be extracted from the TNT 12000 when the respective measured data is received.

Note

Waveform checkboxes must be checked prior to making a measurement.

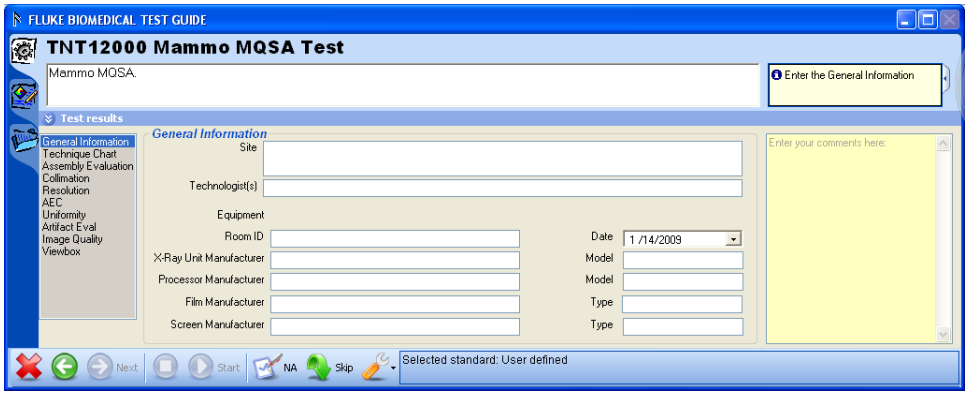
After an exposure is made next to a checked waveform box, the exposure data are placed in the Test result pane and a waveform chart is created. To view a graph of the Exposure, click the graph tab located along the left side of the **TEST GUIDE** as shown in Figure 3-9

Mammo MQSA Test

The MQSA test is different from all other tests in that is does not require a Detector. The user enters the data manually.

To perform a Mammo MQSA test, perform the following:

1. Enter the appropriate data in each of the fields of the form shown in Figure 3-10. Use the parameter descriptions in Table 3-2 to better understand the information in each field of the form.



gao22.bmp

Figure 3-10. Test Guide Window for the MQSA Test Element

Table 3-2. Mammo MQSA Test Parameters

Parameter	Description
Site	Enter the Site.
Technologist(s)	Enter the Technologist(s) name.
Room ID	Enter the Room ID of the Equipment.
Date	Select the date of test performed.
X-ray unit manufacturer	Enter the X-ray unit manufacturer name.
Model	Enter the Model of X-ray Unit.
Processor Manufacturer	Enter the Processor manufacturer name.
Model	Enter the Model of Processor.
Film manufacturer	Enter the Film manufacturer name.
Type	Enter Type of Film.
Screen manufacturer	Enter the Screen manufacturer name.
Type	Enter the Screen Type.
Mammography Phototimer Technique Chart	Enter the Target, Filter, kVp & Density for different size & different type of breast.
Mammographic Unit Assembly Evaluation	Select Pass, Fail or Not Applicable for each description.
Evaluation of Site's Technologist QC Program	Select Pass, Fail or Not Applicable for each description.
Medical Physicist's QC Tests Performed by the Trainee or Assistant	Select Pass, Fail or Not Applicable for each description.
SID	Enter the Source to image receptor distance in centimeters
Deviation between X-ray field and light field	ACR/MQSA - If sum of left plus right edge deviations or anterior plus chest edge deviations exceeds 2% of SID, seek service adjustment.
Alignment of chest-wall edges of compression paddle and film	ACR/MQSA - If chest-wall edge of compression paddle is within the image receptor or projects beyond the chest-wall edge of the image receptor by more than 1% of SID, seek service correction.
X-ray tube manufacturer	Enter the X-ray tube manufacturer name.
Evaluation of System Resolution	ACR/MQSA - If limiting resolution with the bars parallel to the anode-cathode axis is < 13 line-pairs/mm or with the bars perpendicular to the anode-cathode axis is < 11 line-pairs/mm, then a more detailed investigation of the reason should be made and corrective action should be taken. MQSA - Until October 28, 2002, MQSA allows system resolution to also be evaluated by measuring focal spot dimensions. See Section VII for performance criteria.

Table 3-2. Mammo MQSA Test Parameters (cont.)

Parameter	Description
AEC position	Enter the position of AEC
Density control	Enter the Density control
Small cassette ID	Enter the Small cassette ID
Large cassette ID	Enter the Large cassette ID
Thickness-kVp Tracking	ACR - The AEC system should be able to maintain constant film optical density to within +0.30 of the average over the phantom thicknesses and imaging modes tested. ACR/MQSA - The AEC system must be capable of maintaining film optical density within +0.30 of the mean (+0.15 after 10/28/2002) when the thickness of the phantom is varied over 2 - 6 cm and the kVp is varied over the range of those used clinically for those thicknesses. The optical density in the center of the phantom image must not be less than 1.20. If these standards are not met, seek service adjustment.
Alignment of chest-wall edges of compression paddle and film	ACR/MQSA - If chest-wall edge of compression paddle is within the image receptor or projects beyond the chest-wall edge of the image receptor by more than 1% of SID, seek service correction.
Image Mode Tracking	ACR – The AEC system should be able to maintain constant film optical density to within +0.30 of the average over the phantom thicknesses and imaging modes tested. ACR/MQSA – The AEC system must be capable of maintaining film optical density within +0.30 of the mean (+0.15 after 10/28/2002) when the thickness of the phantom is varied over 2 – 6 cm and the kVp is varied over the range of those used clinically for those thicknesses. The optical density in the center of the phantom image must not be less than 1.20. If these standards are not met, seek service adjustment.

Table 3-2. Mammo MQSA Test Parameters (cont.)

Parameter	Description
Overall AEC Performance	ACR – The AEC system should be able to maintain constant film optical density to within +0.30 of the average over the phantom thicknesses and imaging modes tested. ACR/MQSA – The AEC system must be capable of maintaining film optical density within +0.30 of the mean (+0.15 after 10/28/2002) when the thickness of the phantom is varied over 2 – 6 cm and the kVp is varied over the range of those used clinically for those thicknesses. The optical density in the center of the phantom image must not be less than 1.20. If these standards are not met, seek service adjustment.
Density Control Function:	ACR – Each step should result in a 12 to 15% change in mAs, or approximately a 0.15 change in film optical density. If not, seek service.
Screen type	Enter Type of the Screen used.
Processor used	Enter the Processor Used
Film type	Enter Type of the Film used.
kVp setting	Enter the kVp setting
Focal spot	Enter the Focal spot
AEC density control	Enter the AEC density control
Small Cassettes	ACR/MQSA – If standard deviation of control cassette densities is less than 0.05 and density range exceeds 0.3, then corrective action is needed.
Small Cassettes Size (cm)	Size of Small Cassettes.
Small Cassettes Film Emulsion	Film Emulsion of Small Cassettes.
Large Cassettes	ACR/MQSA - If standard deviation of control cassette densities is less than 0.05 and density range exceeds 0.3, then corrective action is needed.
Large Cassettes Size (cm)	Enter the size of Large Cassettes.
Large Cassettes Film Emulsion	Enter the Film Emulsion of Large Cassettes.
Artifact Evaluation	ACR/MQSA - If significant artifacts are visible, contact the appropriate person maintaining or servicing the processor or X-ray equipment.
Type of Attenuator	Enter Type of Attenuator
Attenuator Thickness	Enter the Attenuator Thickness
kVp Setting	Enter the kVp Setting

Table 3-2. Mammo MQSA Test Parameters (cont.)

Parameter	Description
Density Control Setting	Enter the Density Control Setting
Image Quality Evaluation	ACR/MQSA - The largest 4 fibers, 3 speck groups, and 3 masses must be visible. Background optical density must be at least 1.20. Corrective action must be taken before any further examinations are performed if the results of this test fail any MQSA regulations. ACR - The density difference should be at least 0.40 for a 4-mm thick acrylic disk. Background optical density should be at least '1.40 and must be at least 1.20. If % mAs change exceeds +15%, if background density change exceeds +0.20, if density difference change exceeds +0.05, or if fiber, speck group or mass score decreases by more than 0.5, the source of change should be identified and corrected.
Phantom Used	Enter the Phantom Used
AEC Detector Position	Enter the AEC Detector Position
Cassette Size	Enter the Cassette Size
Cassette #	Enter the Cassette #
Viewbox Luminance and Room Illuminance	ACR - The illuminance on the viewbox surface or the illuminance seen by the observer should be 50 lux or less. The mammography viewboxes should be capable of a luminance of 3000 cd/m2. If these levels are not met, corrective action should be taken.

2. Click **Pass** or **Fail** or **NA** for each description in the **Test Results** pane.
3. Click **Next** on the **TEST GUIDE** toolbar.

Chapter 4
TNT 12000 Test Templates

Introduction

This chapter introduces the template capabilities of the TNT 12000 Plug-In and provides guidance for customizing test templates.

Detailed information on creating Ansur test templates can be found in the *Ansur Test Executive User Manual.*

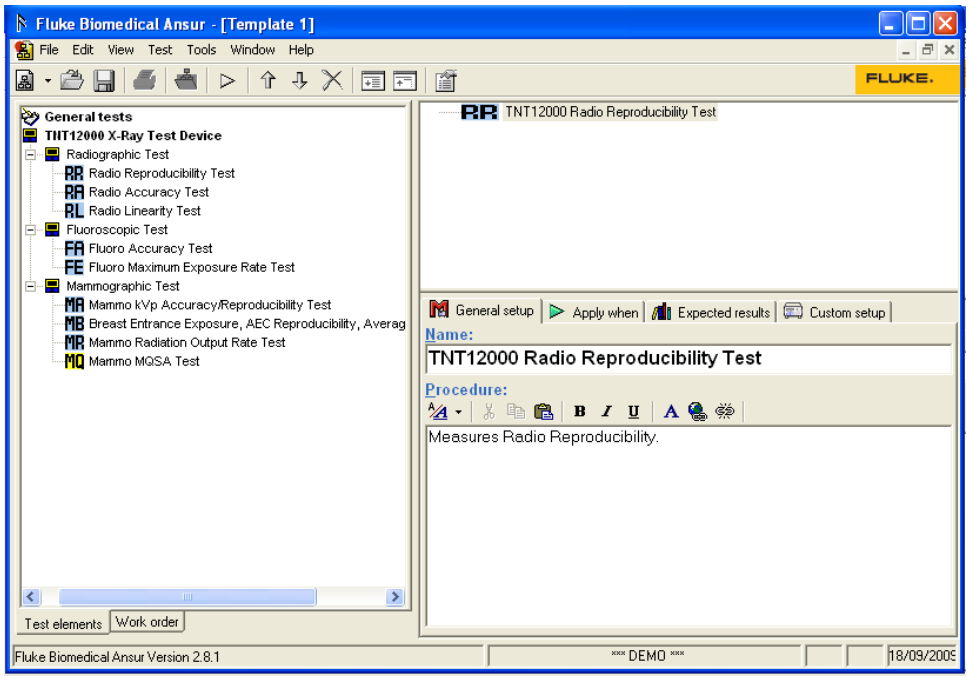
Creating Test Templates

Create, modify, and review test templates using the Ansur **Main Application** window as a template editor. The TNT 12000 Plug-In provides 12 test elements that are used to build new test procedures. These are accessible in **Test Explorer** and are coded as follows:

- Light blue icon – the Analyzer automatically provides test result data to Ansur as the test is completed.
- Yellow icon – resultant data must be manually entered into Ansur by the user.

To build a test template, perform the following, beginning from the **Main Application** window:

1. Drag a test element from the **Test Explorer** (left pane) into the **Test Template** (right pane), as displayed in Figure 4-1. Clicking the test element in the **Test Template** highlights the test element and its properties. In this illustration, the highlighted element is the **TNT 12000 Radio Reproducibility Test,** the first test step to be performed.



gao23.bmp

Figure 4-1. Test Template with Selected Test Element

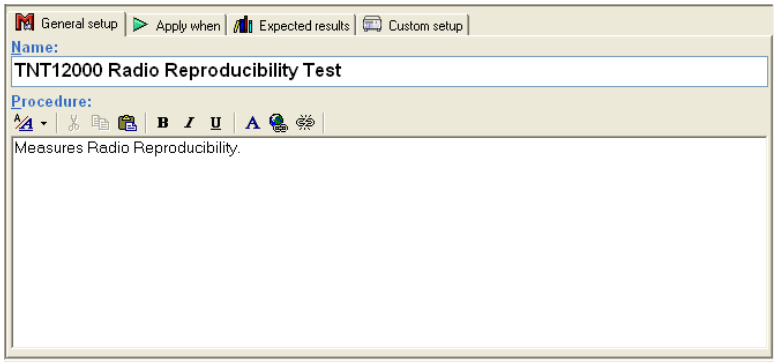
In the middle of the **Test Template** window are located the following tabs to allow definition of the properties of the highlighted test element.

- **General setup**
- **Apply when**
- **Expected results**

- **Custom setup**

Test element properties consist of multiple pages, described below.

2. Click the **General setup** tab. A screen opens, allowing entry of a name for the test. See Figure 4-2. In the space below the name, enter the procedures and instructions to be followed when conducting the test.



gao24.bmp

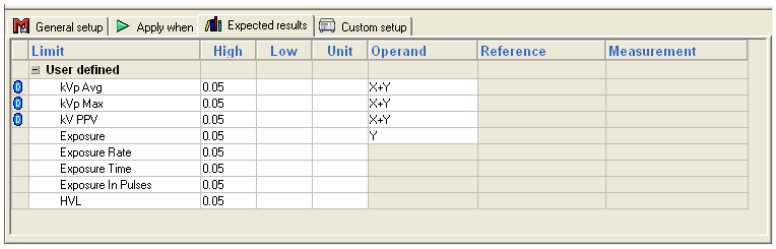
Figure 4-2. User-Definable Parts of the General Setup Tab

3. Click the **Apply when** tab to assign report levels, standards, and service events to test elements. For more information about this feature, see the *Ansur Test Executive User Manual.*

4. Click the **Expected results** tab to view or change the measurement limits for tests, as shown in Figure 4-3.

Note

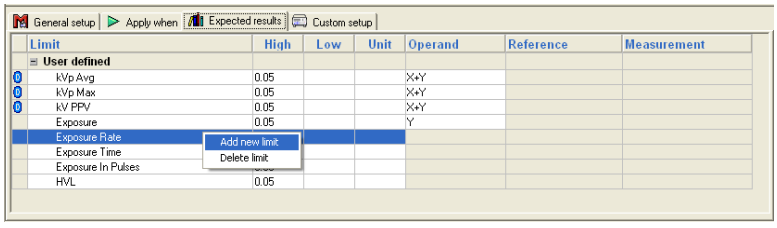
*The **Expected results** page is unavailable when test elements do not return measurement data.*



gao25.bmp

Figure 4-3. Expected Results Options for User Input

5. To add or delete limits, right click one of the rows of the **Expected results** page and select from the pop-up menu, as shown in Figure 4-4.

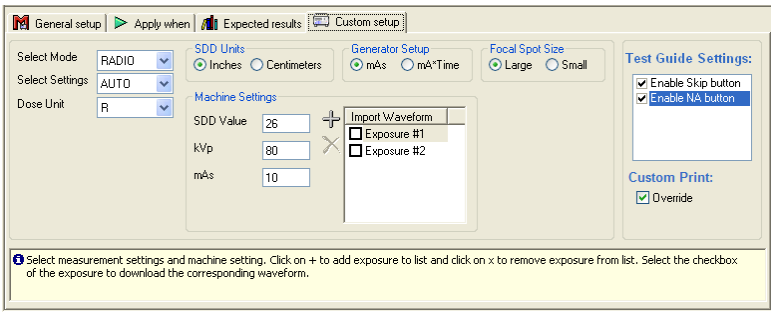


gao26.bmp

Figure 4-4. Add or Delete Limits Pop-up Menu

6. Click the **Custom setup** tab to view and define the parameters used in tests. Test elements have unique custom setups for the capabilities they provide. An example is shown in Figure 4-5.

The Custom Print option sets whether or not the operator can change the parameters printed on the report. With this option checked, the operator can change the parameters. When unchecked, the list of parameters defined by the template author appears on the report. Selecting “Override” allows the user to change the custom print selection.



gao27.bmp

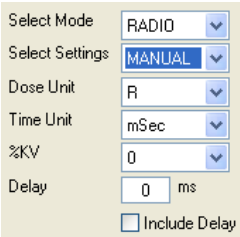
Figure 4-5. Custom Setup for Radiographic Reproducibility Test Element

7. If desired, deselect (uncheck) either or both of the **Test Guide Settings** checkboxes to disable the **Skip** and **NA** button options.

The **Test Guide Settings** control whether certain test elements can be skipped altogether or marked as Not Applicable (NA) while the tests run. The **Skip** and **NA** buttons, shown below, are enabled by default. If a setting is *enabled*, the corresponding **Skip** or **NA** button is available on the toolbar.

eur022.bmp

8. Set the operating mode and related settings in the **Custom Setup** tab as shown in Figure 4-6. Table 4-1 lists and describes the four operating modes for the TNT 12000.



gao28.bmp

Figure 4-6. Measurement Settings in Custom Setup

Table 4-1. Operating Modes

Operating Mode	Description
Radio	Radio mode is used to make measurements on radiographic x-ray machines. Radio mode simultaneously measures kVp Average, kVp Maximum, Kv PPV, Dose, Average Dose Rate, Exposure Time, and HVL from a single radiographic exposure.

Table 4-1. Operating Modes (cont.)

Operating Mode	Description
Mammo	Mammo mode is used to make measurements on mammographic x-ray generators. Mammo mode simultaneously measures kVp Average, kVp Maximum, kV PPV, Dose, Average Dose Rate, Exposure Time, and HVL from a single mammographic exposure.
Fluoro	Fluoro mode is used to make measurements on fluoroscopic x-ray generators. Fluoro mode supports both Continuous fluoro and Pulsed fluoro measurements. The TNT 12000 measures kVp Average, kVp Maximum, kV PPV, Dose Rate, Accumulated Dose, Elapsed Time, Pulse Rate (for Pulsed Fluoro only), Pulse Width (for Pulsed Fluoro only), and HVL.
Dental	Dental mode is used to make measurements on Dental x-ray generators. Dental mode simultaneously measures kVp Average, kVp Maximum, kV PPV, Dose, Average Dose Rate, Exposure Time, and HVL from a single exposure.

All four operating modes have Auto, Manual, and Default settings. Table 4-2 lists the modes with their settings and parameters.

Table 4-2. Measurement Settings and Parameters

Operating Mode	Settings	Parameters
Radio	Auto	Dose Units
	Manual	Dose Units, Time Units, %kV, Delay, Include Delay.
	Default	Dose Units, Time Units, %kV, Delay, Include Delay. (can't edit)
Mammo	Auto	Dose Units
	Manual	Dose Units, Time Units, %kV, Delay, Include Delay.
	Default	Dose Units, Time Units, %kV, Delay, Include Delay. (can't edit)
Fluoro	Auto	Dose Units, Dose Rate Units
	Manual	Dose Units, Dose Rage Units, Fluoro Type.
	Default	Dose Units, Dose Rage Units, Fluoro Type. (can't edit)
Dental	Auto	Dose Units
	Manual	Dose Units, Time Units, %kV, Delay, Include Delay.
	Default	Dose Units, Time Units, %kV, Delay, Include Delay. (can't edit)

Using TNT 12000 Test Elements

The test elements contained in the TNT 12000 Plug-In are designed to test specific aspects of an x-ray system. This section describes the parameters that can be customized for each test element and the measurement data they provide.

Radio Reproducibility Test

Table 4-3 lists the Radio Reproducibility measurements and their descriptions.

Table 4-3. Radio Reproducibility Test Measurements

Measurement	Description
kVp Avg	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses
HVL	Half Value Layer is calculated using the equation: [Tb ln(2Ea/Eo) – Ta ln(2Eb/Eo)]/Ln(Ea/Eb)) Ta and Tb are the filter thickness just above and below the HVL, (Ta<Tb) Eo = exposure w/o filtration, exposure Ea and Eb correspond to thickness Ta and Tb (Ea>Eb). Since m is normally given in units of cm-1, the HVL is commonly expressed in units of cm.

Table 4-4 lists the custom parameters for the Radio Reproducibility measurements.

Table 4-4. Radio Reproducibility Test Custom Parameters

Parameter	Description
SDD Units	Measurement units of inches or centimeters can be selected by clicking on either the inches or centimeters option button in the SDD (Source to Detector Distance) Units box.
Generator Setup	There are two options available for mAs determination; mAs or user entered mA * the exposure time. When evaluating a generator with selectable mAs, mAs can be selected by clicking the mAs button in the Generator Setup box. When evaluating a generator with selectable mA and exposure time, mA * time can be selected by clicking the mA * time button in the Generator Setup box.
Focal Spot Size	Focal Spot Size can be selected by clicking on either the Large or Small option button in the Focal Spot Size box.
SDD Value	The Source to Detector distance.
kV	Machine Settings - Generator Voltage.
mA	X-Ray tube current.
msec	X-Ray exposure time.
mAs	The product of the x-ray tube current (mA) and the x-ray exposure time (s).
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.

Radio Accuracy Test

Table 4-5 lists the Radio Accuracy measurements and their descriptions and Table 4-6 lists the custom parameters for these measurements.

Table 4-5. Radio Accuracy Test Measurements

Measurement	Description
%Timer Error.	Percent Exposure time error.
% kVp Avg Error.	Percent kVp Avg. Error.
Absolute kVp Avg Error.	Absolute kVp Avg. Error.
kVp Avg	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-6. Radio Accuracy Test Custom Parameters

Parameter	Description
SDD Units	Measurement units of inches or centimeters can be selected by clicking on either the inches or centimeters option button in the SDD (Source to Detector Distance) Units box.
Generator Setup	There are two options available for mAs determination; mAs or user entered mA * the exposure time. When evaluating a generator with selectable mAs, mAs can be selected by clicking the mAs button in the Generator Setup box. When evaluating a generator with selectable mA and exposure time, mA * time can be selected by clicking the mA * time button in the Generator Setup box.
SDD Value	The Source to Detector distance.
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.
Focal Spot Size	Focal Spot Size can be selected either the Large or Small in Focal Spot Size combo box for each exposure.
Pass/Fail Criteria	Select the criteria for Pass/Fail.
kVp	Machine Settings - Generator Voltage for each exposure.
mA	X-Ray tube current for each exposure.
msec	X-Ray exposure time for each exposure.
mAs	The product of the x-ray tube current (mA) and the x-ray exposure time (s) for each exposure.

Radio Linearity Test

Table 4-7 lists the Radio Linearity measurements and their descriptions and Table 4-8 lists the custom parameters for these measurements.

Table 4-7. Radio Linearity Test Measurements

Measurement	Description
CL Adjacent	Linearity is evaluated by calculating the mR/mAs (uGy/mAs) at each mA or mAs station and calculating the linearity coefficient between consecutive mA or mAs stations. The CL (coefficient of linearity) is calculated by the formula (X1-X2)/(X1+X2), where X1 and X2 are mR/mAs values obtained at each of two consecutive adjacent mA or mAs stations.
CL Non Adjacent	Linearity (mA or mAs) is evaluated by calculating the mR/mAs (uGy/mAs) at each mA or mAs station and calculating the linearity coefficient between consecutive mA or mAs stations. The CL (coefficient of linearity) is calculated by the formula (X1-X2)/(X1+X2), where X1 and X2 are mR/mAs values obtained at each of two consecutive adjacent mA or mAs stations.
kVp Avg	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-8. Radio Linearity Test Custom Parameters

Parameter	Description
SDD Units	Measurement units of inches or centimeters can be selected by clicking on either the inches or centimeters option button in the SDD (Source to Detector Distance) Units box.
Generator Setup	There are two options available for mAs determination; mAs or user entered mA * the exposure time. When evaluating a generator with selectable mAs, mAs can be selected by clicking the mAs button in the Generator Setup box. When evaluating a generator with selectable mA and exposure time, mA * time can be selected by clicking the mA * time button in the Generator Setup box.
SDD Value	The Source to Detector distance.
kV	Machine Settings – Generator Voltage.
Msec	X-Ray exposure time.
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.

Table 4-8. Radio Linearity Test Custom Parameters (cont.)

Parameter	Description
Adjacent	Check the Adj. checkboxes if the mA/mAs stations are adjacent. If the Adj. checkbox is checked for a mA/mAs station, it is considered to be adjacent to the previous station. Also, the pass fail criterion for adjacent stations is used. If the Adj. checkbox is not checked, the pass fail criterion for non-adjacent stations is used. Note. No checkbox for first exposure.
Focal Spot Size	Focal Spot Size can be selected either the Large or Small in Focal Spot Size combo box for each exposure.
Set mA	X-Ray tube current.
Set mAs	The product of the x-ray tube current (mA) and the x-ray exposure time(s).

Fluoro kVp Accuracy Test

Table 4-9 lists the Fluoro kVp Accuracy measurements and their descriptions and Table 4-10 lists the custom parameters for these measurements.

Table 4-9. Fluoro kVp Accuracy Test Measurements

Measurement	Description
% kVp Avg. Error	The percent kVp Avg. error.
kVp Avg	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-10. Fluoro kVp Accuracy Test Custom Parameters

Parameter	Description
SDD Units	Measurement units of inches or centimeters can be selected by clicking on either the inches or centimeters option button in the SDD (Source to Detector Distance) Units box.
Focal Spot Size	Focal Spot Size can be selected by clicking on either the Large or Small option button in the Focal Spot Size box.
SDD Value	The Source to Detector distance.
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.
kVp	Machine Settings - Generator Voltage for each exposure.
mA	X-Ray tube current for each exposure.

Fluoro Maximum Exposure Rate Test

Table 4-11 lists the Fluoro Maximum Exposure Rate measurements and their descriptions and Table 4-12 lists the custom parameters for these measurements.

Table 4-11. Fluoro Maximum Exposure Rate Test Measurements

Measurement	Description
Maximum Exposure Rate	The allowable exposure rate in the same units as the TNT 12000 is configured for.
kVp Avg	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-12. Fluoro Maximum Exposure Rate Test Custom Parameters

Parameter	Description
SDD Units	Measurement units of inches or centimetres can be selected by clicking on either the inches or centimetres option button in the SDD (Source to Detector Distance) Units box.
Focal Spot Size	Focal Spot Size can be selected by clicking on either the Large or Small option button in the Focal Spot Size box.
SDD Value	The Source to Detector distance.
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.
kVp	Machine Settings - Generator Voltage for each exposure.
mA	X-Ray tube current for each exposure.
Phantom Thickness	Enter Phantom Thickness for each exposure.
Mode	Enter Mode for each exposure.

Mammo kVp Accuracy/Reproducibility Test

Table 4-13 lists the Mammo kVp Accuracy/Reproducibility measurements and their descriptions and Table 4-14 lists the custom parameters for these measurements.

Table 4-13. Mammo kVp Accuracy/Reproducibility Test Measurements

Measurement	Description
% kVp Avg Error.	Percent kVp Avg. Error.
CV kVp Avg.	Coefficients of variation of kVp Avg.
kVp Avg	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-14. Mammo kVp Accuracy/Reproducibility Test Custom Parameters

Parameter	Description
Focal Spot Size	Focal Spot Size can be selected by clicking on either the Large or Small option button in the Focal Spot Size box.
Normal kVp Settings	Machine Settings - Generator Voltage.
mA	X-Ray tube current.
mAs	The product of the x-ray tube current (mA) and the x-ray exposure time (s).
Exposure Time	Exposure Time.
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.

Mammo Breast Entrance Exposure and AEC Reproducibility/Average Glandular Dose Test

Table 4-15 lists the Mammo HVL measurements and their descriptions and Table 4-16 lists the custom parameters for these measurements.

Table 4-15. Mammo Breast Entrance Exposure and AEC Reproductivity/Average Glandular Dose Measurements

Measurement	Description
CV Exposure	The coefficients of variation of the Exposure.
CV mAs	The coefficients of variation of mAs (The product of the x-ray tube current (mA) and the x-ray exposure time (s)).
Average Glandular Dose.	ACR/MQSA – If average glandular dose exceeds 300 mrad (3 mGy) for 4.2 cm effective breast thickness, seek service or technique adjustment. Corrective action must be taken before further examinations are performed if the test results fail MQSA regulations.
kVp Avg	kVp Average

Table 4-15. Mammo Breast Entrance Exposure and AEC Reproductivity/Average Glandular Dose Measurements (cont.)

Measurement	Description
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-16. Mammo Breast Entrance Exposure and AEC Reproducibility/Average Glandular Dose Test Custom Parameters

Parameter	Description
Breast thickness	Enter the Breast thickness in centimeters
Glandular Fraction	Enter the Glandular Fraction
Nominal kVp setting	Machine Settings – Generator Voltage.
SDD	Enter the Source-detector distance in centimeters
SBD	Enter the Source-bucky distance in centimeters
Energy correction factor	Enter the Energy correction factor
Density control setting	Enter the Density control setting
Cassette size	Enter the Cassette size in centimeters
SID	Enter the Source to image receptor distance in centimeters
Film type	Enter the Film type
Filter	Enter the Filter
AEC mode	Enter the AEC mode
Field Restriction	Enter the Field Restriction
Imaging mode	Enter the Imaging mode
Screen type	Enter the Screen type
Target material	Enter the Target Material.
Measured HVL (mm Al)	Enter the thickness of each of the aluminum filters used to make an HVL exposure measurement.
Phantom	Enter the Phantom
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.
mAs	The product of the x-ray tube current (mA) and the x-ray exposure time (s) for each exposure.

Mammo Radiation Output Rate Test

Table 4-17 lists the Mammo HVL measurements and their descriptions and Table 4-18 lists the custom parameters for these measurements.

Table 4-17. Mammo Radiation Output Rate Test Measurements

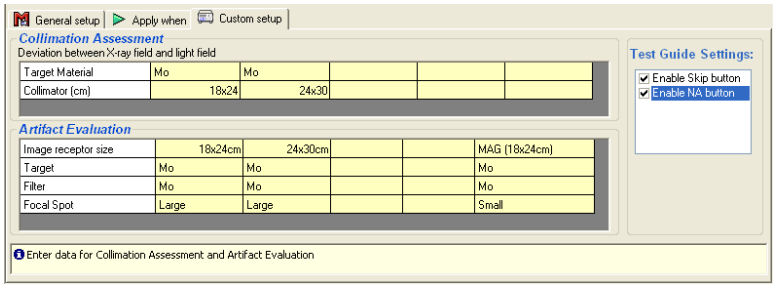
Measurement	Description
Exposure Rate	Exposure Rate.
Air Kerma Rate	Adequate Dose in air.
kVp Avg.	kVp Average
kVp Max	kVp Max
kV PPV	kV PPV
Exposure	Exposure
Exposure Rate	Exposure Rate
Exposure Time	Exposure Time
Exposure In Pulses	Exposure In Pulses

Table 4-18. Mammo Radiation Output Rate Test Custom Parameters

Parameter	Description
kVp	Machine Settings - Generator Voltage.
Exposure Time	The time the tube was energized.
SDD	Enter the Source to Detector distance in centimeters.
Filter	Enter the Filter.
Anode (Target)	Enter the Target.
Import Waveform	Number of line indicates the number of exposure. If checkbox is checked then corresponding waveform will get downloaded.
SID	Enter the Source to image receptor distance in centimeters for each exposure.
mAs	The product of the x-ray tube current (mA) and the x-ray exposure time (s) for each exposure.

Mammo MQSA Test

Figure 4-7 shows the setup form for the MQSA Test Elements and Table 4-19 lists the test parameters for this test.



gao29.bmp

Figure 4-7. Custom Setup Window for MQSA Test Element

Table 4-19. Mammo MQSA Test Custom Parameters

Parameter	Description
Deviation between X-ray field and light field	Enter Target material & Collimator in cm.
Artifact Evaluation	Enter the Image receptor size, Target, Filter & Focal spot.

Printing a Test Report

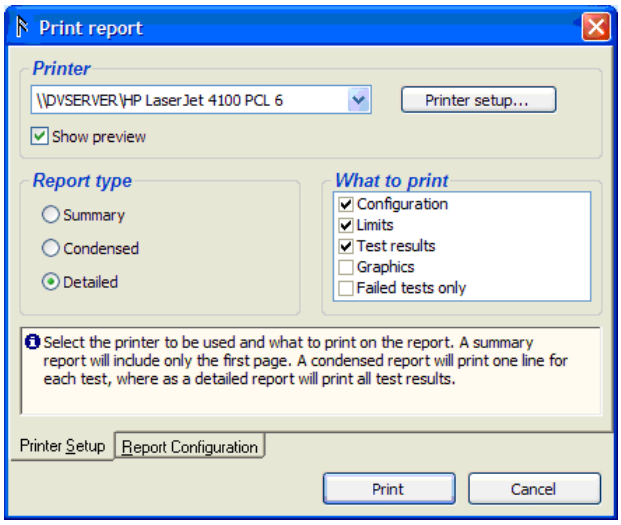
Ansur test reports can be printed in three different formats: Summary, Condensed, and Detailed. Table 4-20 lists the test report formats with a description.

Table 4-20. Test Report Formats

Format	Description
Summary	Prints only the front page containing DUT info and the overall status of the safety test. This one-pager report can be used as a simple pass or fail report.
Condensed	Print the summary page as well as one line for every test element in the test record indicating whether the test element passed or failed.
Detailed	Includes the summary page and all configuration data and test result data for each test element in the test record.

To print a test report perform the following:

1. Click on **File | Print** or click the Print () button on the main toolbar. The Print report window shown in Figure 4-8 is displayed.



gao31.bmp

Figure 4-8. Print Report Dialog

2. Select the Report type and what to print in the report and then click on the **Print** button.