

User Manual



MTS 200 Series Real-Time Analyzer

071-0076-01

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Use Proper Power Source. Do not operate this product from a power source that applies more than the voltage specified.

Avoid Electric Overload. To avoid electric shock or fire hazard, do not apply a voltage to a terminal that is outside the range specified for that terminal.

Avoid Overvoltage. To avoid electric shock or fire hazard, do not apply potential to any terminal, including the common terminal, that varies from ground by more than the maximum rating for that terminal.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Do Not Operate Without Covers. To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Use Proper Fuse. To avoid fire hazard, use only the fuse type and rating specified for this product.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. To prevent product overheating, provide proper ventilation.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



DANGER
High Voltage



Protective Ground
(Earth) Terminal



ATTENTION
Refer to Manual

Preface

This document applies to the Real-Time Analyzer software and hardware of the Tektronix MTS 205 and MTS 215 MPEG Test Systems. The MTS 205 contains only the Real-Time Analyzer; the MTS 215 also contains software for deferred-time transport stream analysis and creation and Data Store hardware and software for transport stream acquisition and generation.

For information about the additional MTS 215 hardware and software, refer to the *MPEG Test System User Manual*, Tektronix part number 071-0078-0X.

For information about the Windows NT Workstation operating system, refer to the Microsoft documentation that accompanied your test system.

For information about the Compaq server, refer to the Compaq documentation that accompanied your test system.

For the latest information about MTS200 Series Real-Time Analyzer features and bugs, refer to the *MPEG Test System Software Version 2.5 Read This First* document, Tektronix part number 071-0237-0X, that accompanied your test system or upgrade.

Contacting Tektronix

Product Support	<p>For application-oriented questions about a Tektronix measurement product, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 6:00 a.m. – 5:00 p.m. Pacific time</p> <p>Or contact us by e-mail: tm_app_supp@tek.com</p> <p>For product support outside of North America, contact your local Tektronix distributor or sales office. You can also call 1-503-627-2400 between 14:00 and 01:00 UTC (GMT).</p>
Service Support	<p>Contact your local Tektronix distributor or sales office. Or visit our web site for a listing of worldwide service locations.</p> <p>http://www.tek.com</p>
For other information	<p>In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.</p>
To write us	<p>Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000</p>



Getting Started

Getting Started

The MTS 200 Series Real-Time Analyzer (RTA) is designed to continuously monitor an input bitstream for compliance with the MPEG-2 and DVB-SI digital television standards. You can use the RTA to constantly monitor an array of stream parameters to ensure decodability or you can concentrate on just a few parameters for closer examination.

NOTE. *The number of stream parameters that you can monitor at one time while maintaining real-time error reporting depends on the compliance of the input stream, the speed of the test system processor, and the amount of test system RAM. Refer to Real-Time Analysis on page 1–2 for further information.*

This section contains general information about logging on to your new MTS 205 or MTS 215 Real-Time Analyzer (RTA). Refer to the *MPEG Test System Technical Reference* that accompanied your system for complete installation and interconnection instructions. Refer to the next section, *Operating Basics*, for information about RTA capabilities and use.

Once you have installed the server, the Real-Time Analyzer is ready to operate. Switch computer power on to begin the Windows NT initialization process, which can take up to two minutes. For more information on the Windows NT initialization process, please see the Windows NT documentation. Under normal circumstances no action is required until the **Begin Logon** window appears; when it does, press **CTRL + ALT + DELETE** (all three keys simultaneously) to open the **Logon Information** window.

Logging On

To log on to the RTA, enter “MTS100” (without the quotation marks) in the **User name** box, leave the password blank, and then press **ENTER** (these are the default values set at the factory). This is the login account you should use for most of your work.

Two additional logins are available. The first is “guest” with no password. This level has only limited access to files and applications. The second is “administrator” with “MPEG2” as the password. This user has administrator privileges. You must use this login when performing any software upgrades.

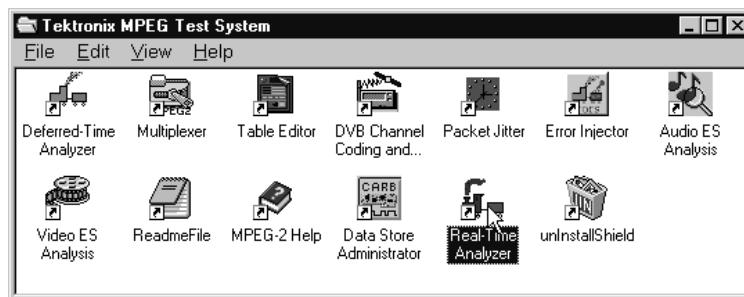


CAUTION. *The administrator user has all the privileges of an administrator. If you are connected to a network, you may have more privileges than you realize within the network. It is recommended that you do not perform normal operations while logged in as administrator.*

You can change the passwords if necessary; refer to the Windows NT documentation for instructions. If you change any password, be sure to create a new emergency repair disk. (See page B-1.)

Starting the Application

Once you have logged in, start the Real-Time Analyzer application by selecting it from the Windows NT Start menu or by double-clicking the Real-Time Analyzer icon in the **Tektronix MPEG Test System** window.



NOTE. *The example shows the MTS 215 program group. The MTS 205 program group does not contain all Tektronix MPEG Test System applications.*

This manual explains how to use the Tektronix RTA application. If you need information about any other Tektronix MPEG Test System application, consult the *MTS 210 User Manual*, which is supplied with the MTS 215.

Real-Time Analysis

The Real-Time Analyzer analyzes the input stream as it is received and attempts to report errors as they are detected. When the RTA cannot process and display errors in real time, the **Buffer filling** bar (in the center of the Status bar on the bottom of the Real-Time Analyzer application window) becomes visible. The greater the buffer filling, the less timely is RTA error and message display.



The following factors determine the real-time performance of the RTA:

- The number and type of errors in the stream.
- The number and type of analyses that you have configured the RTA to perform.
- The host computer processor speed. An RTA based on a 120 MHz Compaq Prosignia platform is more likely to use the buffer than one based on a 266 MHz Compaq Proliant 1600 (serial number B080000 and later).
- The memory (RAM) that is available on the host computer. The computer should have at least 32 Mbytes RAM; 64 Mbytes are standard on the Proliant 1600.

If the input stream contains many errors, you can reduce buffer filling by limiting the number of analyses performed and probes set. Refer to *Automatic Analyses* on page 3–7 and to *Probes* on page 3–16 for more information.

Exiting the RTA Application

To exit the Real-Time Analyzer, select **Exit** from the Configuration menu or click the close box in the upper-right corner of the application window. The current configuration is preserved and used the next time you start the application. In the default configuration, information and error messages (up to 2048 kbytes) are automatically saved in the Windows NT Event Viewer. No other information is saved.



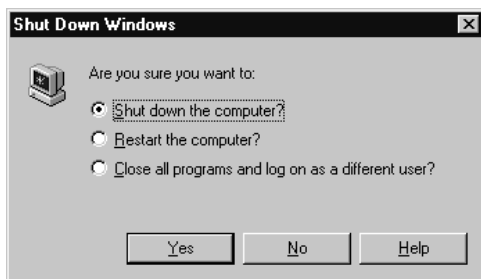
Shutting Down the Computer

To avoid loss of data and possible problems during subsequent Windows NT initialization, always shut down Windows NT before switching computer power off. To shut down Windows NT, select **Shut Down** from the Start menu.



Select **Shut down the computer?** in the resulting **Shut Down Windows** dialog box and then click **Yes**. After a few seconds, the **Shutdown Computer** window

appears with the message that “It is now safe to turn off your computer.” You can now power off the Proliant server.



CAUTION. Do not switch computer power off before the message “It is now safe to turn off your computer” appears. Doing so may result in lost data and difficulty in restarting Windows NT.



Operating Basics

Operating Basics

The Real-Time Analyzer (RTA) is designed to continuously monitor an input bitstream for compliance with the MPEG-2 and DVB-SI digital television standards.

You can use the RTA to constantly monitor an array of stream parameters to ensure decodability or you can concentrate on just a few parameters for closer examination. For convenience and flexibility, the RTA performs analysis in three ways:

- Basic analyses are performed whenever the RTA monitors an input stream. You cannot disable the basic analyses.
- Automatic analyses evaluate important input stream parameters, including most of the parameters identified in the DVB-MG guidelines (ETR 290). In normal circumstances, all automatic analyses are enabled for constant monitoring. However, for maximum flexibility, the Real-Time Analyzer makes it possible to enable or disable these analyses either in groups or one at a time.

The RTA shows pass/fail results of all DVB-MG-recommended evaluations in one convenient display, the DVB-MG view.

- Probes are user-initiated analyses of table sections, program clock references (PCRs), or elementary stream time stamps (PTS/DTS).

This section contains four step-by-step tutorials intended to introduce you to RTA capabilities, features, and techniques. Perform each tutorial with your own input stream and then spend some time experimenting with the various configuration and analysis options. Consult the *Reference* section of this manual if you need more information on any topic. If you have an MTS 215, be sure to capture a portion of the stream and then examine it more closely with the deferred-time analyzer. Doing so will enable you to get the most out of your Tektronix MPEG Test System. The tutorials begin on the following pages:

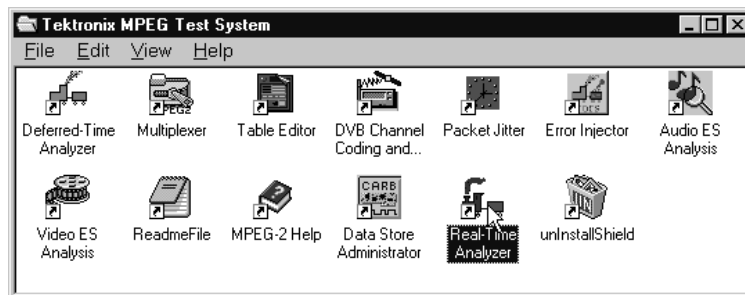
- *Monitoring an Input Stream*, page 2–2
- *Using the DVB-MG View*, page 2–12
- *Setting Probes*, page 2–16
- *Capturing Input Streams* (MTS 215 only), page 2–25

All tutorials assume that you have connected an input to the rear panel of the instrument and started the machine; refer to *Getting Started* on page 1–1 for instructions. The tutorials also assume that you have a basic level of familiarity with Windows NT 4.0 or Windows 95. If you are not comfortable with either

operating system, please review the Windows NT documentation that accompanied your test system.

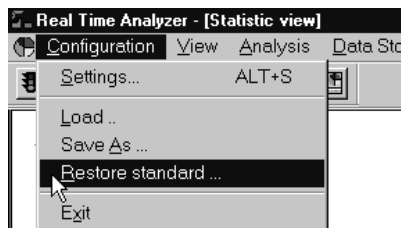
Monitoring an Input Stream

1. Double-click the Real-Time Analyzer icon in the **Tektronix MPEG Test System** program group window.

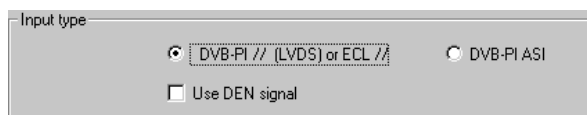


The RTA application window opens.

2. Open the Configuration menu and select **Restore Settings**.



3. Click **OK** in the resulting **RTA** dialog box.
4. Open the Configuration menu again and select **Settings**.
5. Choose the appropriate input type in the Hardware Configuration tab of the resulting **Settings** window..



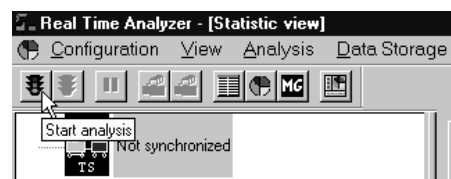
6. Select the General **Settings** window tab and then choose either **MPEG-2** or **DVB** mode, depending on the type of stream you intend to monitor.



7. Click **OK** on the bottom of the **Settings** window to accept your changes and close the window.

NOTE. If you have selected either ASI input or DVB mode, you may find it convenient to save the current configuration for later recall. Then, to return to a base configuration, you can load the saved setup instead of restoring the standard configuration, which uses the parallel input and modified ECL output level. Refer to Saving and Restoring Configurations on page 3–69 for more information.

8. Click the **Start analysis** toolbar button.

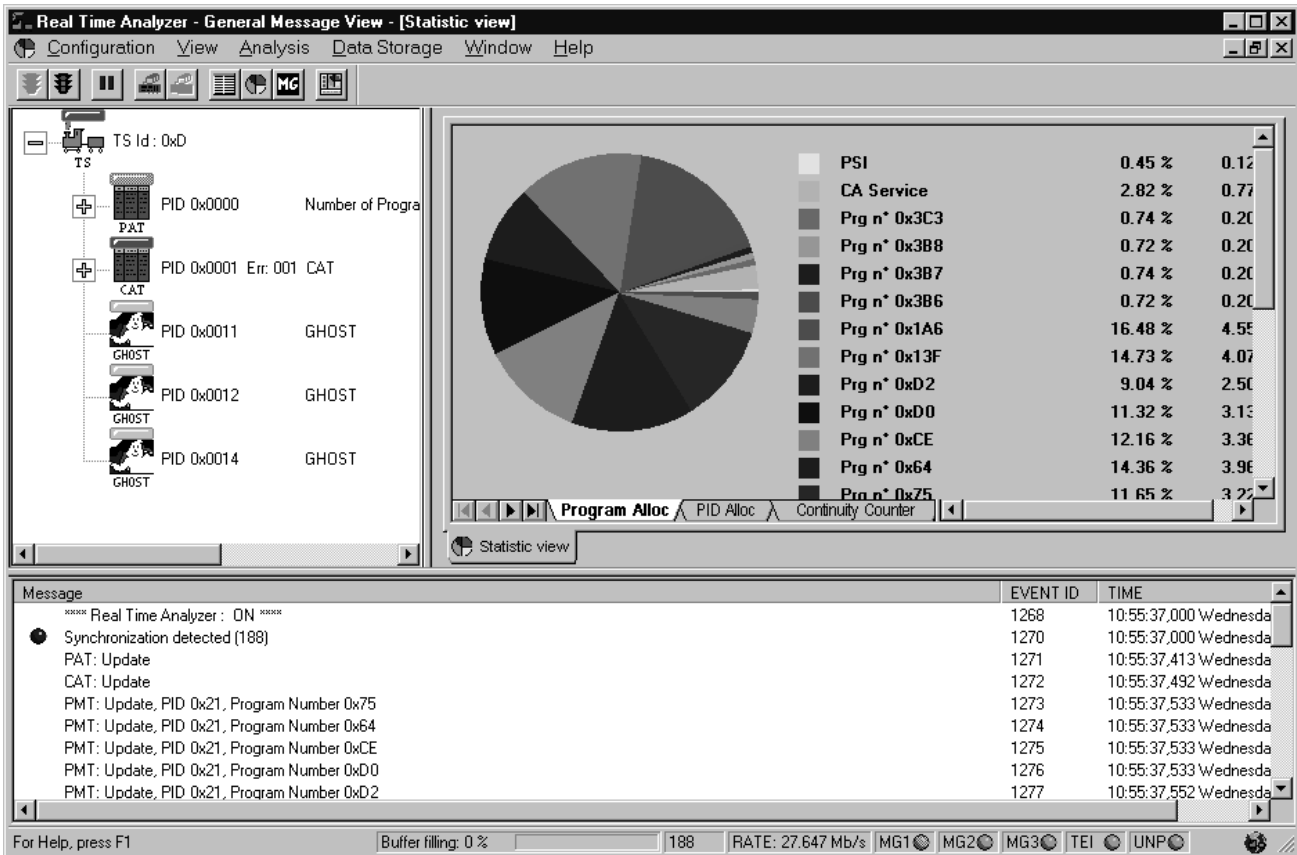


The RTA hardware (the PIA board) is initialized and analysis begins. The default display resembles the next screen capture.

Icons that represent stream items appear in the Hierarchic window pane. The rectangular lozenge above each icon is an error indicator. Indicators are normally gray in the standard RTA configuration. If any of the indicators turn red, you know that an error is occurring in or under the stream item; if the indicator then turns orange, you know that the error has stopped. A complete discussion of the Hierarchic view begins on page 3–33.

The Program Allocation panel of the Statistic view appears in the Client window pane. The panel uses a pie chart and table to show how the services (PSI/SI, programs, and null packets) use the available input bandwidth. A complete discussion of the Statistic view begins on page 3–50.

Information messages appear in the General Message window pane. Error messages, preceded by a red round indicator, also appear when input errors are detected. A complete discussion of the Message window and Message views begins on page 3–43.

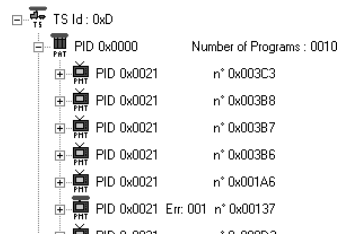


The preceding steps are sufficient to begin monitoring an input stream. Continue with this tutorial to learn more about using the RTA.

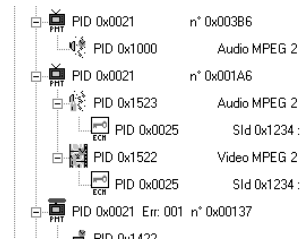
Exploring the Hierarchic View

9. Press **F8** (on the keyboard); notice what happens to the Hierarchic view. If you like, click on and drag the borders between window panes to enlarge the hierarchic pane.
10. Now press **F9** and **F10** in succession while paying attention to the Hierarchic view. At each step, another level of the input multiplex hierarchy is revealed.

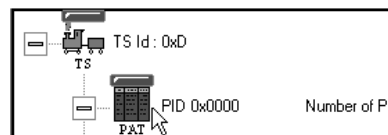
Press the F8 function key to show the second hierarchy level.



Press the F10 function key to reveal all levels and items in the hierarchy.



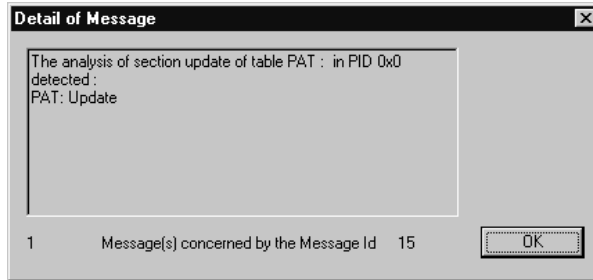
11. Find the PAT icon near the top of the hierarchy. You may have to use the vertical scroll bar to see the top. Double-click on the icon, and a PAT Message view opens in the Client window pane to the right of the hierarchy.



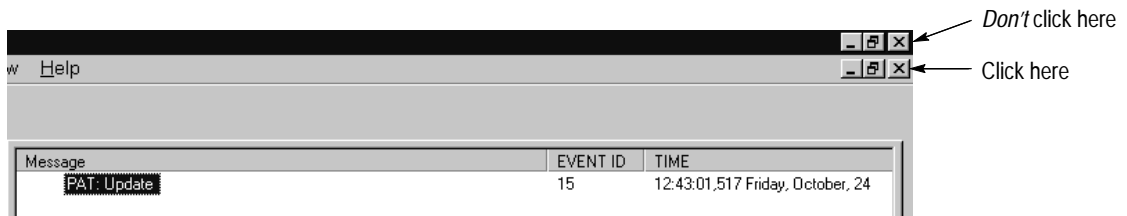
This Message view contains information and error messages that apply only to the PAT. If your input stream is reasonably compliant with the mode you selected in step 6, there may be only one initial PAT:Update message.

Message	EVENT ID	TIME
PAT: Update	2328	09:12:35,060 Tuesday, April

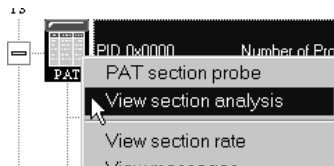
12. Double-click the PAT: Update message. A **Detail of Message** window opens to display information that has been logged to the Windows NT Event Viewer application log.



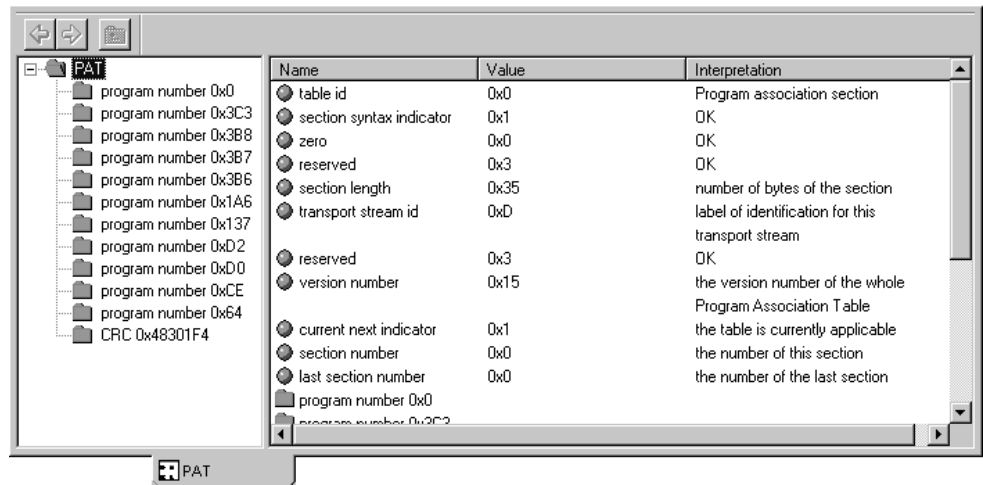
13. Click **OK** to close the **Detail of Message** window.
14. Click the Client window pane Close box to close the PAT Message view. The Close box is at the right end of the RTA menu bar, immediately below the application window size boxes. Do not click the application close box; doing so will exit the Real-Time Analyzer application.



15. Select the Hierarchic view PAT icon again and right-click to open the shortcut menu.



16. Select **View section analysis**. A PAT section analysis view opens in the Client window pane. Notice that the view has two sub-views. The left sub-view contains a hierarchical representation of the table section. The right sub-view shows the contents of the currently selected left sub-view folder.



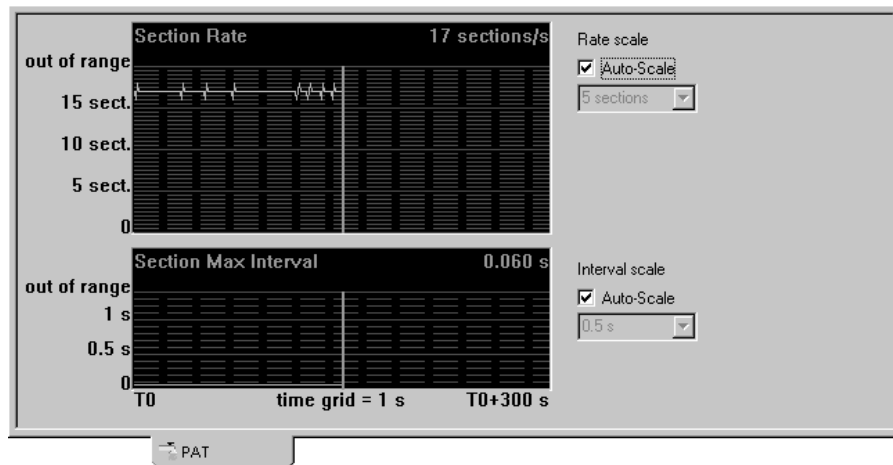
The first eleven items in the right sub-view are preceded by a round indicator. The indicator identifies an item as a table section field; it is green when the field contents are correct and is red if the field contents do not comply with the applicable MPEG-2 standards.

17. Press **F2** and notice that the numbers in the Value column (in the right sub-view) change to decimal base. Press **F2** again to toggle the numbers back to hexadecimal base.
18. Click on the gray vertical bar that divides the two sub-views; then drag the bar to the right to reveal all program numbers in the left sub-view.
19. Drag the vertical scroll box down, if necessary, to see the remainder of the right sub-view. Notice that each second-level folder in the left sub-view has a corresponding folder item in the right sub-view. Each folder icon is green if no errors are detected in the represented item; otherwise, the icon is red.
20. Click on one of the “program number 0x...” folder icons in the left sub-view. The right sub-view changes to show the PAT section fields that assign a PID to the the NIT (program number 0x0) or to a particular program in the stream.

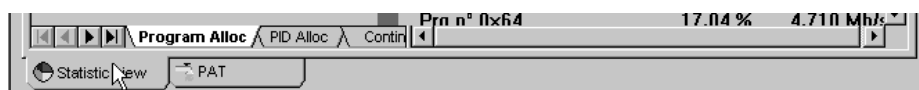
Name	Value	Interpretation
program number	0x0	the following PID reference shall be the network PID
reserved	0x7	Correct value
network PID	0x10	PID of the Transport Stream packets which contains the NIT

Note that in several DVB-SI tables, the left sub-view hierarchy can contain more than one sub-level. You can expand and collapse levels as you would in a Windows NT Explorer hierarchy.

21. Click the Client window pane Close box to close the PAT syntax view.
22. Right-click on the PAT icon to again open the shortcut menu. This time, select **View section rate**. As you might expect, a section rate view opens in the Client window pane.

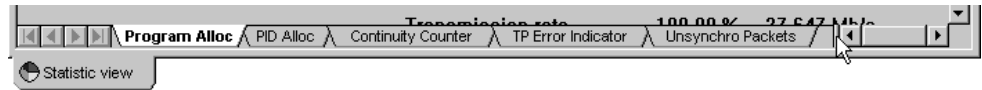


23. Watch the time cursors proceed across the graphs for a few seconds. If the PAT appears in your input stream as often as required by the MPEG-2 standard, the graph text is green and the plot lines are pale blue. Both the text and the plot turn red if an error is detected.
24. Move the pointer to the bottom of the Client pane and click the Statistic view tab.



**Exploring the
Statistic View**

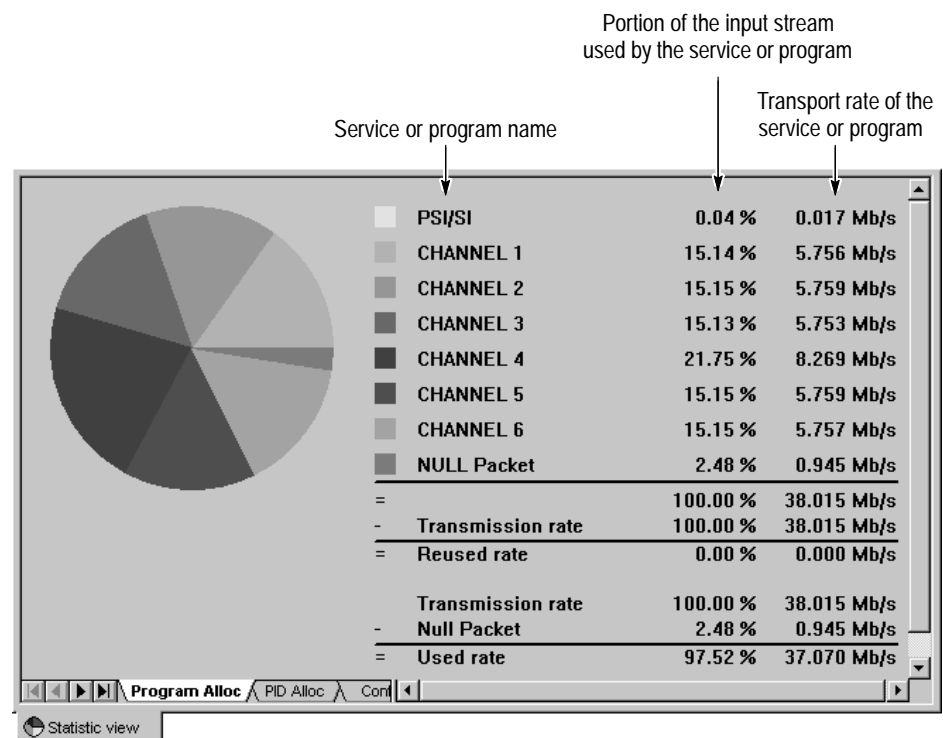
- The Statistic view consists of five tabbed panels. When the view first opens, most tabs are hidden by the horizontal scroll bar. Click the thin split box at the left end of the horizontal scroll bar and drag to the right to shorten the scroll bar and reveal the last two tabs.



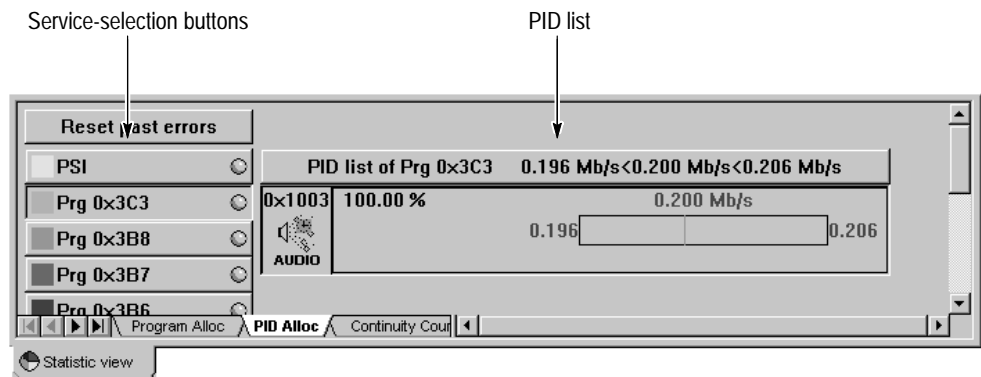
- Click each tab in turn to familiarize yourself with the information that each contains. Notice that the Program Alloc[ation], TP Error Indicator, and Unsynchrono Packets tabs pertain to the input stream as a whole, while the PID Alloc[ation] and Continuity Counter tabs pertain to the selected service (PSI/SI, programs, null packets, and unreferenced ghost packets).

The remainder of this section explains features of the PID Allocation and Program Allocation panels. For more information about the Continuity Counter, TP Error Indicator, and Unsynchrono Packet panels, refer to the discussion of the Statistic view that begins on page 3–50.

- Return to the Program Allocation panel by clicking the Program Alloc tab. Notice that the pie chart provides a quick graphic overview of input stream contents while the table to the right provides the equivalent numeric data.



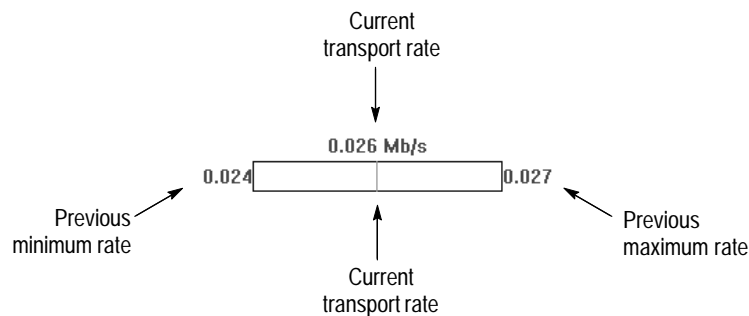
28. Notice that the yellow pie chart slice represents the service information (PSI or PSI/SI). Now double-click on any other slice of the chart. The PID Allocation panel replaces the Program Allocation panel in the Statistic view.



The PID Allocation panel contains a dynamic transport rate display for each PID in the selected service (PSI/SI, program, null packets, or unreferenced ghost packets). Notice that the “pressed down” service-selection button and the PID list on the right side of the panel both correspond to the pie slice that you have double-clicked. The service in the above example is composed of only one PID.

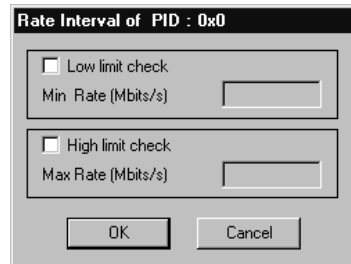
29. Click the **PSI** (MPEG-2 mode) or **PSI/SI** (DVB mode) button to see the transport rates of all service information tables in the input stream.

The PAT is the first PID listed. The rate bar shows the current transport rate, which may change as often as twice per second, as well as the highest and lowest rates since you began monitoring.

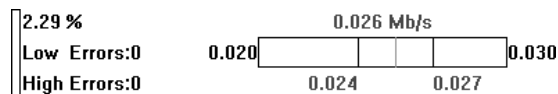


You can set transport rate error limits for any PID in the stream through the Hierarchic view. When you do so, the limits and any errors are visible on the PID allocation panel.

30. To set error limits for the PAT, position the cursor over the PAT rate bar and click the right-hand mouse button.

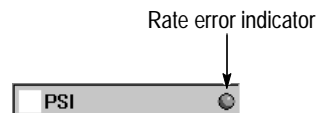


31. In the resulting dialog box, select both **Low limit check** and **High limit check**. Then enter a low limit that is less than the previous minimum and a high limit that is greater than the previous maximum. Click **OK** and notice the changes in the PID Allocation Statistic view.



The limits now define the ends of the rate bar. **Low Errors:** and **High Errors:** readouts now appear to the left of the bar to report the number of half-second intervals in which the rate has violated the limits.

Notice also that the round indicator at the right end of the PSI (or PSI/SI) selection button has changed from gray to green. The indicator turns red when a rate limit error is detected.



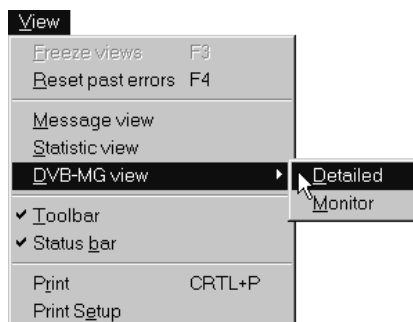
The arrangement and colors of the rate bar and rate readout numerals also change when errors occur. Refer to *PID Allocation* on page 3-3 for a complete description and explanation.

Using the DVB-MG View

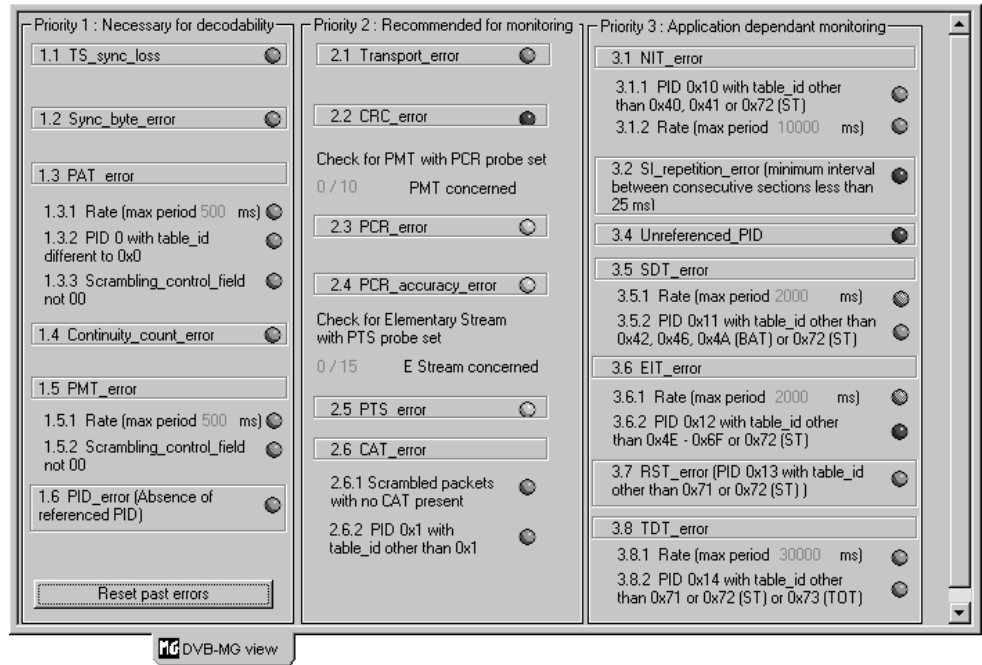
DVB-MG is the DVB working group that recommends measurements and controls to be performed on all elements of the digital television chain. The RTA can perform all but a few of the DVB-MG recommended tests as a stream is received, and performs most of them automatically in the standard configuration. The DVB-MG view presents pass/fail results of the recommended tests in one display; you can use the DVB-MG view to get a quick overview of the DVB compliance of the input stream.

Perform the following steps to familiarize yourself with the DVB-MG view; refer to *Appendix A: DVB-MG Measurements* for additional information about the DVB-MG recommendations and tests.

1. If the Real-Time Analyzer is not running, start the program and configure it as described in steps 1 through 8 beginning on page 2–2. Then continue with step 3, below.
2. If the RTA is running, stop analysis and restore the original settings before proceeding.
 - a. Click the red stoplight toolbar button and then select **Restore standard** from the Configuration menu.
 - b. If you are using a DVB input stream or are receiving your input through the ASI connector, open the Configuration menu and select **Settings**. Make the appropriate settings on the Hardware Configuration and General settings tabs. Click **OK** to confirm the changes and close the **Settings** window.
 - c. Click the green stoplight toolbar button to restart analysis.
3. Open the View menu, click **DVB-MG view**, and select **Detailed**.



The detailed DVB-MG view opens in the Client window pane.



The view lists every DVB-MG test that the RTA can perform; a colored indicator light accompanies each listing to show the status of the test. The colors have much the same meaning as in the Hierarchic view:

- *Gray* signifies that the RTA is not currently performing the test.

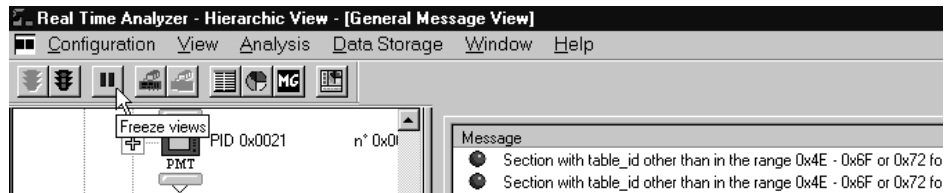
The indicators for tests 2.3 (PCR_error), 2.4 (PCR_accuracy_error) and 2.5 (PTS_error) are gray in the standard RTA configuration because those tests are conducted with user-initiated probes. Refer to the tutorial, *Setting Probes* on page 2–16, to learn more about RTA probes.

Other indicators may be gray because your input stream does not contain the applicable table. MPEG-2 streams, for example, do not contain SI tables; therefore, tests 3.2 through 3.8 cannot be performed on a non-DVB stream.

- *Green* signifies that the test is running and that no errors have been detected.
- *Red* signifies that the RTA detects the error in the input stream.
- *Orange* signifies that at least one error has occurred since monitoring began (or since the last error reset) but that it is not currently present in the input stream.

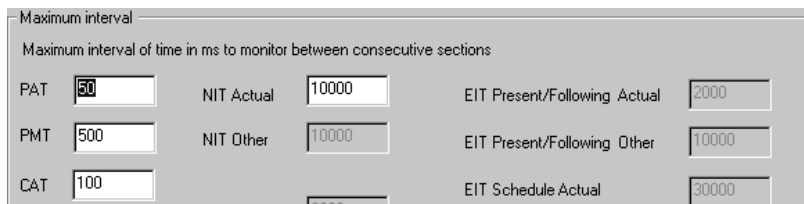
The DVB-MG view of a fully-compliant stream will contain only green or gray indicators. When the stream does contain errors, you can double-click on a red or orange indicator to open a client view of messages pertaining to the particular DVB-MG error.

If the input stream contains so many errors or message events that messages quickly scroll off the top of the window, click the **Freeze views** toolbar button to pause window updates. Then use the vertical scroll bar to locate the applicable error message.



You can change the error limits (thresholds) for some DVB-MG tests, although doing so may not be consistent with DVB-MG recommendations.

4. Choose **Settings** from the Configuration menu and then select the Section Rates Analysis tab on the resulting **Settings** window.
5. The DVB-MG-recommended maximum interval between PAT sections is 500 ms. Highlight the **PAT** setting and change it to 50 ms.

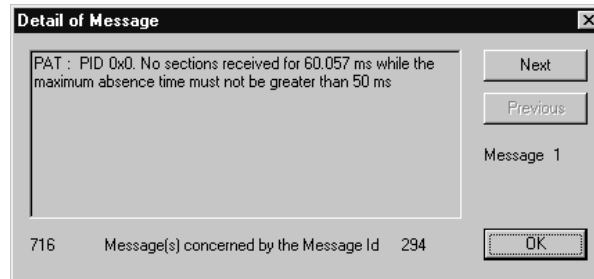


6. Click **OK** to confirm the change and close the **Settings** window.
7. The DVB-MG indicator for parameter 1.3.1, the PAT section rate, should be red. Locate the corresponding message in the general Message view.

Message	EVENT ID	TIME
Ghost packets disappearance for the PID 0x14	292	14:01:25.984 Tuesday, October, ...
Ghost packets detected for the PID 0x14	293	14:01:26.484 Tuesday, October, ...
● PAT - PID 0x0. No sections received for 60.057 ms while the maximum absence time must not be greater than 50 ms	294	14:01:25.871 Tuesday, October, ...
Ghost packets disappearance for the PID 0x14	293	14:01:27.984 Tuesday, October, ...
...

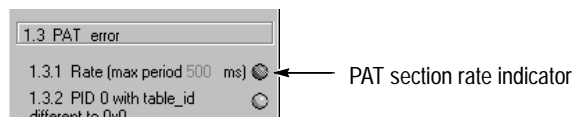
8. Double-click on the error message to retrieve message details from the Windows NT Event Viewer. Notice, on the bottom of the resulting **Detail of Message** window that the message ID represents more than one error. If you

close the window and then reopen it (by again double-clicking the PAT error message), the number is greater.

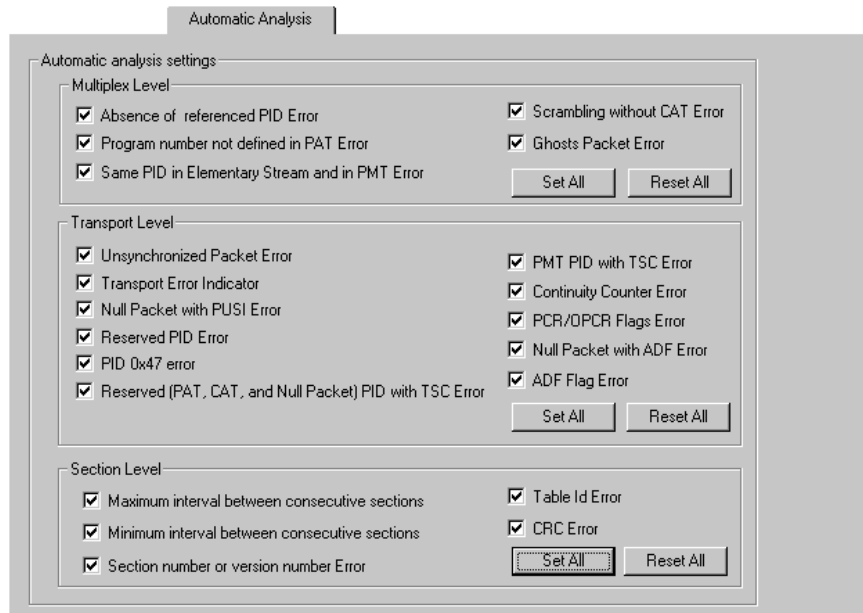


9. Close the **Detail of Message** window. Then choose **Settings** from the Configuration menu. Select the Section Rates Analysis tab and click **Restore default** to reset the PAT interval value to 500 ms. Finally, click **OK** to confirm the change and close the **Settings** window.
10. If necessary, click on the DVB-MG view tab at the bottom of the Client window pane to bring the view back to the top of all client views.

Restoring the default PAT interval should change the PAT section rate DVB-MG indicator to orange (if it remains red, your input stream contains other PAT section rate errors). Click **Reset past errors** in the lower-left of the DVB-MG view. The indicator should change back to green.



- Once again choose **Settings** from the Configuration menu. Then select the Automatic Analysis tab of the **Settings** window.



- Click the three **Reset All** buttons to deselect all automatic analyses. Then click **OK** to confirm the changes and close the **Settings** window.

Notice, on the DVB-MG view, that only the TS_sync_loss indicator remains colored; all others have become gray, signifying that the associated tests are no longer being performed. You can disable tests if you want to free RTA processing and buffer resources for other functions, which may be necessary if you want to set several probes and see the results in real time. Be aware, however, that the tests remain disabled until you again set them through the Configuration menu or you restore the standard configuration (even if you exit and restart the Real-Time Analyzer application).

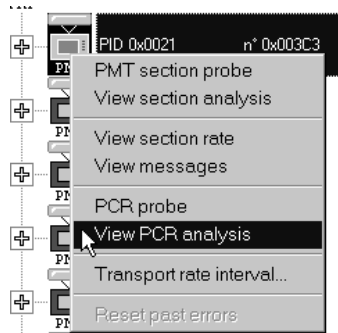
- Reopen the **Settings** window and click the three **Set All** buttons on the Automatic Analysis tab. Then click **OK** to accept the changes and close the window.

Setting Probes

Real-Time Analyzer probes are simply user-initiated analyses. Two of the probes, PCR and PTS/DTS, fulfill DVB-MG recommendations.

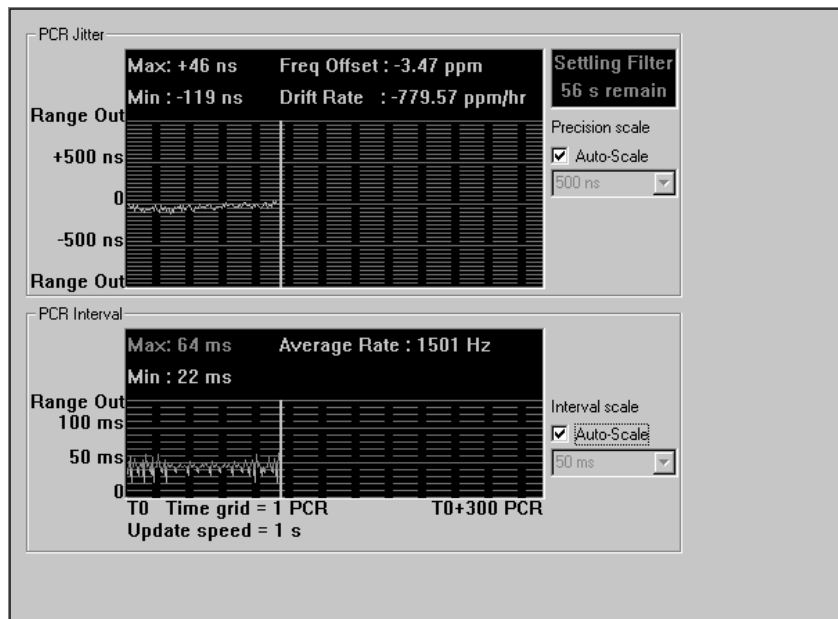
PCR Probes

1. If the Real-Time Analyzer is not running, start the program and configure it as described in steps 1 through 8 beginning on page 2–2. Then continue with step 3, below.
2. If the RTA is running, stop analysis and restore the original settings before proceeding.
 - a. Click the red stoplight toolbar button and then select **Restore standard** from the Configuration menu.
 - b. If you are using a DVB input stream or are receiving your input through the ASI connector, open the Configuration menu and select **Settings**. Make the appropriate settings on the Hardware Configuration and General settings tabs and then click **OK** to close the settings window.
 - c. Click the green stoplight toolbar button to restart analysis.
3. Press **F8** to reveal the second level in the Hierarchic view.
4. Select a PMT hierarchy icon that is accompanied by a gray error indicator, if possible, and then right-click to open the shortcut menu.



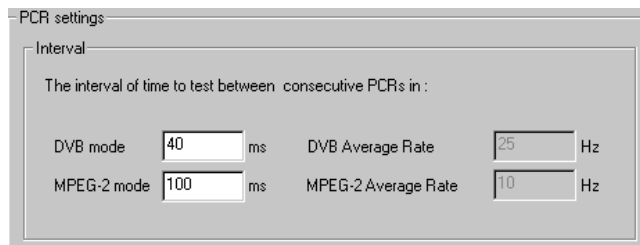
Notice the two commands, **PCR probe** and **View PCR analysis**. Either command sets the PCR probe to monitor the clock references that apply to the selected program.

5. Select **View PCR analysis**. The icon error indicator changes to green or red, signifying that the PCR probe is set. At the same time, a PCR analysis view opens in the Client window pane.



Refer to *PCR Analysis View* on page 3–64 for information about the view. If the PCR precision and interval is within the DVB-MG-recommended error limits, the Min and Max readouts are green and the plots are light blue. You can change the PCR error limits, but remember that doing so will put the DVB-MG view out of compliance with DVB-MG recommendations.

6. Make a note of the Min: and Max: PCR intervals shown on the lower PCR analysis view graph.
7. Choose **Settings** from the Configuration menu and then click the PCR Analysis tab on the resulting window.



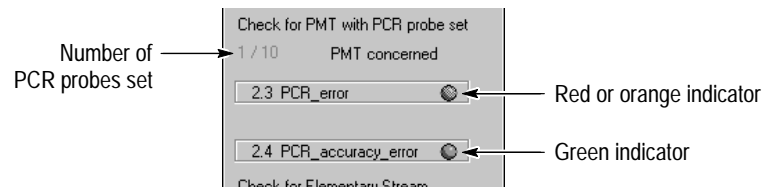
8. Depending on your operating mode, change either the **DVB mode** interval or the **MPEG-2 mode** interval to a value that is between the actual minimum and maximum that you recorded in step 6.
9. Click **OK** to accept the new value and close the **Settings** window.

The new PCR interval setting should have the following results:

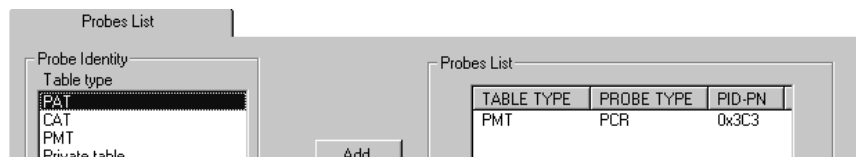
- The indicator above the PMT hierarchy icon should change color. It should quickly become red to indicate the presence of PCR interval errors. After that, it may turn orange in the times between errors. If the indicator remains green, reopen the **Settings** window and reduce the interval setting.
- Error messages should begin appearing in the message window pane.



10. Open the RTA View menu, click **DVB-MG view**, and select **Detailed**. Notice that setting the PCR probe has changed the information for recommended tests 2.3 and 2.4 (near the center of the view).



11. Open the Configuration menu and select **Settings**. Then click the Probes List tab. Notice that the PCR probe appears on the **Probes List** on the right side of the tab.

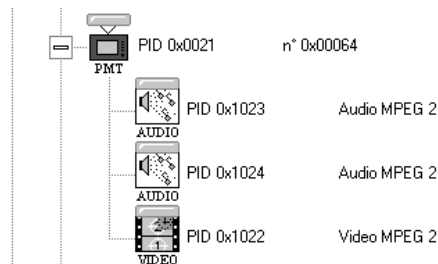


12. Double-click the PCR probe entry to remove it from the **Probes List** and then click **OK** on the bottom of the **Settings** window. Doing so removes the PCR probe. Notice that the DVB-MG view indicators for the PCR parameters (2.3 and 2.4) are now gray.

13. Close the DVB-MG view to reveal the PCR analysis view (recall that the Client view Close box is at the right end of the RTA menu bar, immediately below the application window size boxes). Notice that the graphs are no longer updating because the probe has been removed.
14. Click the Client window pane Close box to close the PCR Analysis view.
15. Open the View menu and select **Reset past errors** (and notice that **F4** is the F-key equivalent). The indicator above the PMT icon (from which the probe was removed) should change from orange to gray.
16. Restore the default PCR interval setting.
 - a. Choose **Settings** from the Configuration menu and select the PCR Analysis tab on the resulting window.
 - b. Click **Restore default**, on the lower-right of the settings tab.
 - c. Click **OK** on the bottom of the **Settings** window to confirm the default settings and close the window.

PTS/DTS Probes

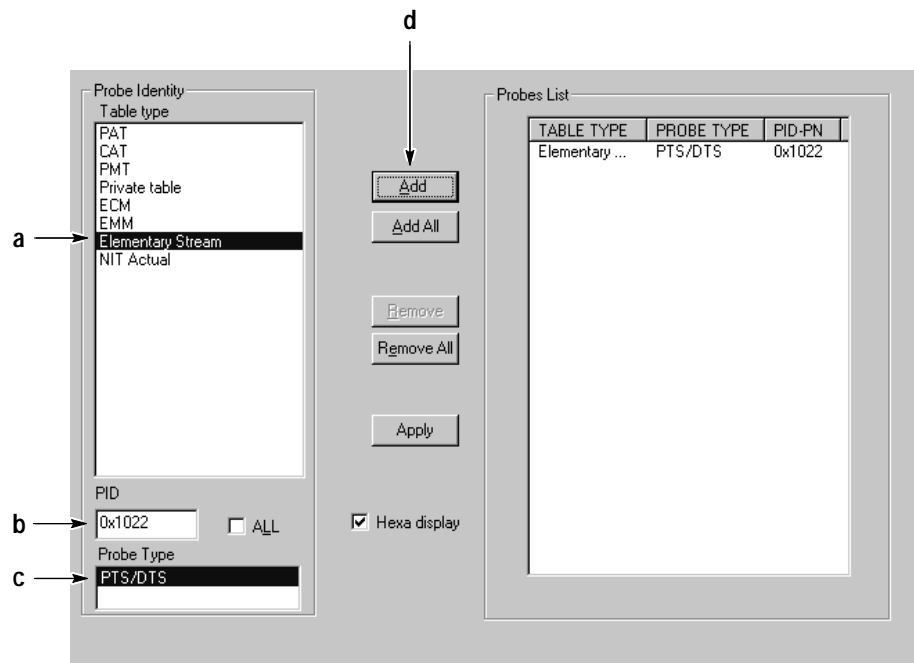
17. Press **F9** to reveal the third level of the hierarchy. You can now see elementary stream icons under the PMT icons.



Notice that some elementary stream icons have green clock symbols on the upper-right; those streams contain PCRs. Several elementary stream icons may have a blue padlock symbol on the lower-left; the lock symbol indicates that the stream is scrambled.

18. Find an icon that represents an unscrambled audio or video stream. The icon error indicator should be gray. Make a note of the stream PID. (The item PID appears immediately to the right of all hierarchy icons.)
19. Open the Configuration menu and select **Settings**. Select the Probes List tab of the **Settings** window.
20. Set a PTS/DTS probe on the elementary stream that you identified in step 18.

- a. Highlight **Elementary Stream** in the **Table type** list on the left side of the tab.
- b. Enter the stream PID in the **PID** box. Notice, but *do not* select, the **ALL** option; this option sets a probe on every eligible elementary stream in the input multiplex.
- c. Highlight **PTS/DTS** in the **Probe Type** list.
- d. Click **Add**.



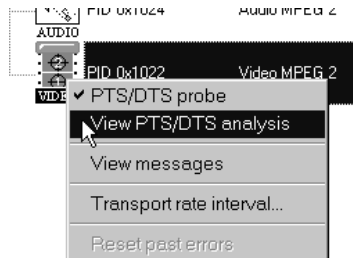
- e. Click **OK** on the bottom of the **Settings** window to set the probe and close the window.

The hierarchy icon error indicator immediately changes from gray to either green or red.

21. Through the View menu, open the detailed DVB-MG view.

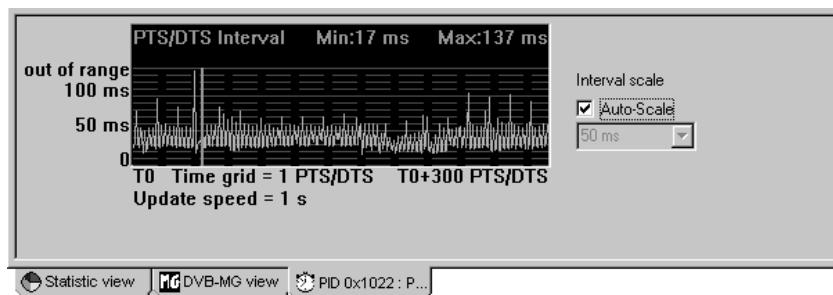
Notice that the PTS_error indicator (parameter 2.5), like the icon error indicator, is green, red, or orange, depending on the contents of your input stream. The DVB-MG error condition is an interval of more than 700 ms between consecutive PES packets that contain a presentation time stamp. You cannot change the PTS/DTS error interval in the RTA.

22. In the Hierarchic view, select the icon that represents the elementary stream that you are probing and then right-click to open the shortcut menu.



Notice that **PTS/DTS probe** is selected because you set the probe through the Configuration menu.

23. Select **View PTS/DTS analysis**. A PTS/DTS analysis view opens in the Client window pane.



If the RTA detects PTS/DTS errors, the Max: readout text becomes red and the interval plot line changes from blue to red in regions that correspond to the errors.

24. If the selected elementary stream contains PTS/DTS errors, look for error messages in the general Message view. Remember that you can double-click on a message to retrieve the error information logged to the Event Viewer.
25. Again select the hierarchy icon of the elementary stream that you are probing; right-click to open the shortcut menu and then click **PTS/DTS probe**. Doing so removes the probe.

Notice that, because the probe is removed, the PTS/DTS analysis view no longer updates.

26. Close the PTS/DTS analysis view (click the Client window close box, *not* the RTA close box).

Closing the PTS/DTS analysis view reveals the DVB-MG view. Notice that the PTS_Error indicator (parameter 2.5) is now gray.

27. Open the Configuration menu and select **Settings**.

The Probes list **Settings** tab should still be selected. Notice that the PTS/DTS probe is no longer listed in the **Probes List** box.

28. Close the **Settings** window.

The InterSI Probe

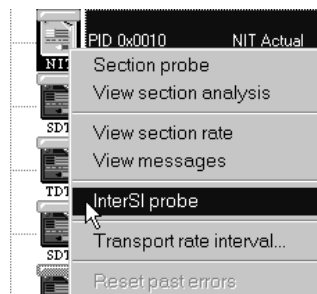
The InterSI probe checks for errors within and between DVB-SI tables. Continue with this tutorial only if your input stream contains SI tables (for example, EIT, BAT, and SDT).

29. Stop analysis (click the red stoplight toolbar button) and then restart it (click the green stoplight button).

Restarting analysis resets all past errors and removes any extra views from the Client window. In this case, the DVB-MG view closes.

30. Press **F7** to hide all but the top hierarchy level.

31. Select the NIT icon and open the shortcut menu (right-click). Select **InterSI probe**.



If not previously red or orange because of errors detected by basic or automatic analysis, the error indicators of the BAT, EIT, NIT, and SDT icons now change from gray to signify that the InterSI probe is set.

After a few moments, depending on the contents of your input stream, one or more of the indicators may become red and then perhaps orange to signal InterSI errors. InterSI information, warning, and error messages also appear in the General message view. You can also double-click an affected icon to open a

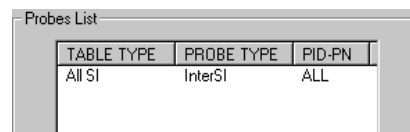
item-specific message window. Refer to *The InterSI Probe* on page 3–16 for more information.

Message	EVENT ID	TIME
<><><> BEGINNING OF INTER SI ANALYSIS (INTER SECTIONS ANALYSIS PER SI TABLE + INTER SI TABLES ANALYSIS) <><>...	1694	15:47:31,000 Friday, t
INTER SECTIONS ANALYSIS PER SI TABLE: ***** INTRA ANALYSIS *****	1695	15:47:31,000 Friday, t
INTER SECTIONS ANALYSIS PER SI TABLE: - NIT analysis :	1696	15:47:31,000 Friday, t
INTER SECTIONS ANALYSIS PER SI TABLE: - SDT analysis :	1697	15:47:31,000 Friday, t
INTER SECTIONS ANALYSIS PER SI TABLE: - EIT analysis :	1698	15:47:31,000 Friday, t
INTER SECTIONS ANALYSIS PER SI TABLE: - PMT analysis :	1699	15:47:31,000 Friday, t
INTER SECTIONS ANALYSIS PER SI TABLE:	1700	15:47:31,000 Friday, t
INTER SI TABLES ANALYSIS: ***** INTER ANALYSIS *****	1701	15:47:31,000 Friday, t
INTER SI TABLES ANALYSIS:	1702	15:47:31,000 Friday, t
INTER SI TABLES ANALYSIS: - NIT <> SDT analysis :	1703	15:47:31,000 Friday, t
INTER SI TABLES ANALYSIS: - SDT <> EIT analysis :	1704	15:47:31,000 Friday, t
⊙ INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L1 : there is no Eit Present/Following subtable but the P/F flag (...)	1705	15:47:31,000 Friday, t
⊙ INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L2 : there is no Eit Present/Following subtable but the P/F flag (...)	1706	15:47:31,000 Friday, t
⊙ INTER SI TABLES ANALYSIS: Error EIT (Tid 78 Sid 1 Tsid 1995 Onid 2000) : must have exactly two valid sections describing Sid 1 (present ...)	1707	15:47:31,000 Friday, t
⊙ INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L1 : no Event describing the Sid 2 (or no valid EIT section)	1708	15:47:31,000 Friday, t
⊙ INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L2 : no Event describing the Sid 3 (or no valid EIT section)	1709	15:47:31,000 Friday, t
INTER SI TABLES ANALYSIS: - NIT <> EIT analysis :	1710	15:47:31,000 Friday, t
<><><><> END OF INTER SI ANALYSIS <><><><>	1711	15:47:31,000 Friday, t

32. Select the icon of the SDT or an EIT and open the shortcut menu. Notice that **InterSI Probe** is selected.

You can set and remove the InterSI probe through any SI table icon or through the Probes List **Settings** window tab.

33. Through the Configuration menu, open the **Settings** window and select the Probes List tab.



34. Select the InterSI entry in the **Probes List** box and the click **Remove** (or simply double-click the list entry). Click **OK** to confirm the change and close the **Settings** window.

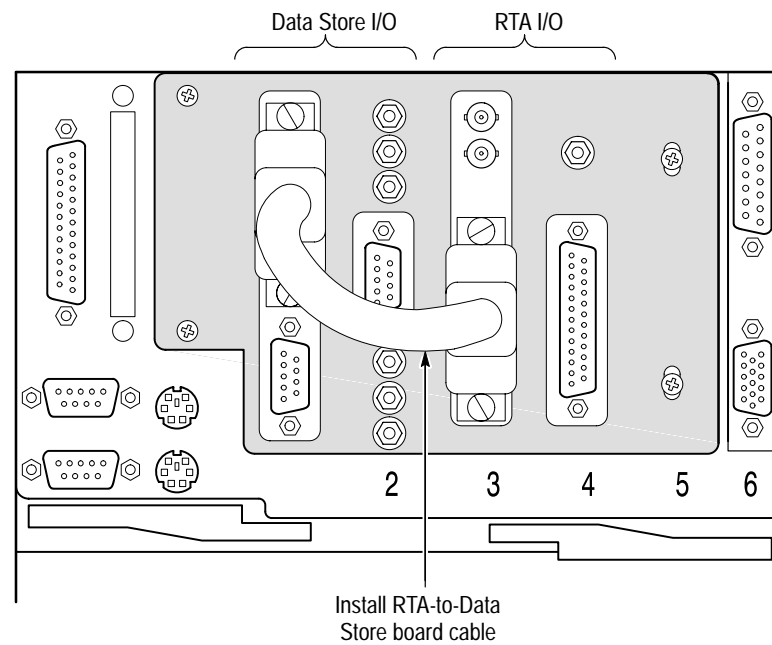
35. If any of the SI table icon error indicators remain orange, press **F4** to reset past errors. The indicators change to gray unless the automatic analyses detect other SI table errors.

Capturing Input Streams (MTS 215 only)

If you have an MTS 215, you can easily capture and store a portion of the input stream on the Data Store disks for deferred-time analysis or other use of the data.

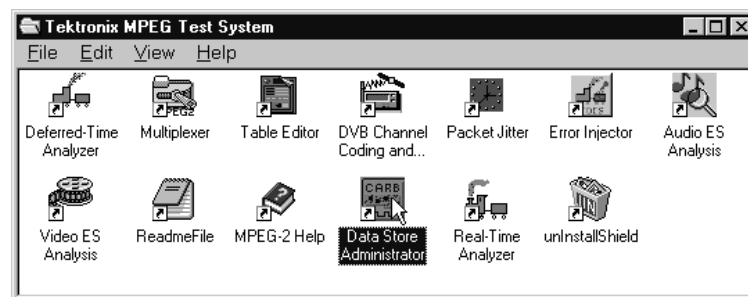
Hardware Setup

1. Use the shielded cable provided with the MTS 215 Real-Time Analyzer, Tektronix part number 174-3799-0X, to connect the 25-pin RTA output to the 25-pin Data Store (parallel/serial ECL) input.



NOTE. You must use a shielded cable to maintain EMC compliance.

2. Start the Data Store Administrator application by double-clicking the **Data Store Administrator** icon in the **Tektronix MPEG Test System** window.



3. Confirm that there is a Single shot partition and that it is large enough hold the data you intend to store. Repartition the disks if necessary; see the *MPEG Test System User Manual* for instructions.

```
Single shot partition
Total size      : 6,172,049,408
Available size  : 6,167,048,192
Number of files : 1

Loop partition
Total size      : 12,032,409,600
```

NOTE. *Repartitioning the Data Store disks erases all existing files. Before proceeding, confirm that the Data Store disks do not contain important and irreplaceable data*

4. Check the **File information** list and confirm that no file on the single shot partition is named Rta.trp; if such a file does exist, delete the file and then compress the disks (if necessary) to completely remove the file from the partition.
5. Minimize the **Data Store Administrator** window.

RTA Software Setup

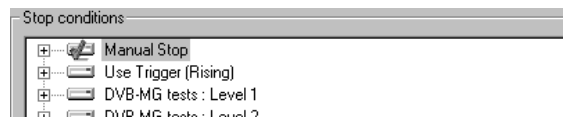
6. If the Real-Time Analyzer is not running, start the program and configure it as described in steps 1 through 8 beginning on page 2–2. Be sure to start analysis before continuing with this tutorial and making any Filtering or Data Storage Start/Stop settings selections.
7. Choose **Settings** from the RTA configuration menu and then select the Hardware Configuration tab. Change the **Output Level** setting to **Modified ECL** if necessary.
8. Select the Filtering Configuration **Settings** window tab. Notice that you can select **PID based filtering** and specify the tables, programs, or elementary streams that you wish to capture and store. Refer to *Filtering Configuration* on page 3–91 for instructions. For this tutorial, select **No filtering mechanism** to capture all packets contained in the input stream.

NOTE. *PID-based filtering can result in a relatively low data output rate. If you intend to capture filtered output, be sure to consider the data rate when you specify (in the following step) the amount of the stream to capture. It can take several minutes, for example, to capture 5 Mbytes of output that contains only SI table sections.*

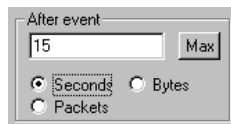
9. Select the Data Storage Start/Stop **Settings** window tab. Through this tab you can specify one or more **Stop conditions**, such as an external trigger or a DVB-MG error. Manual stop is always selected. You can also specify how much of the input stream (or filtered output) is to be captured.

Refer to *Data Storage Start/Stop* on page 3–92 for a full discussion of the Data Storage Start/Stop settings tab.

10. Click **Reset All** (immediately below the **Stop conditions** list) to ensure that only Manual stop is selected.
11. Confirm that **Manual Stop** is highlighted in **Stop conditions** list as shown below.



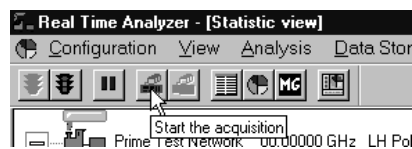
12. In the **After event** area at the lower-right of the settings tab, click **Seconds** and then enter 15 in the text box. Then click **Bytes** to see the size of the file to be stored. The number of bytes depends on the transmission rate of your input stream; the example below is for a 30 Mbit/s input stream.



13. Click **OK** to confirm all settings changes and close the **Settings** window.

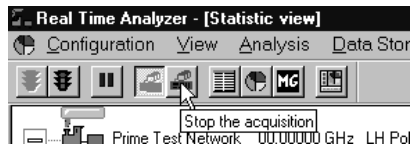
Stream Capture

14. Click the **Start acquisition** toolbar button.

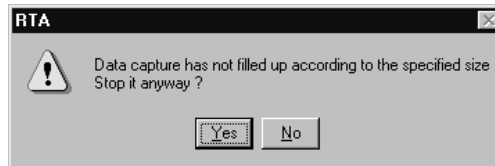


NOTE. The message “Acquisition stopped! File already exists” can appear if you attempt to start acquisition when a file named *Rta.trp* exists on the single shot data store partition. When the message appears, you must delete the file and compress the data store disks before you can proceed with data storage. Refer to the *MPEG Test System Deferred-Time Applications User Manual* for information about using the *Data Store Administrator* application.

15. Wait approximately two seconds and then click the **Stop acquisition** button.

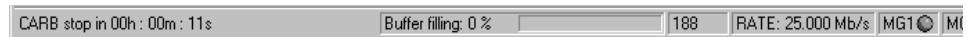


NOTE. If you attempt to stop acquisition before the test system receives enough input to satisfy the **Before event** setting, the following message appears:



If you click **Yes**, acquisition stops and no file is saved. If you click **No**, acquisition continues; you can stop it later, after enough input has been received.

16. A message appears at the left end of the Real-Time Analyzer status bar to show the time remaining for the data capture.



At the same time, “REC” and a cassette tape icon alternate at the right end of the status bar. Shortly after the capture period is over, a flashing red WAIT symbol replaces REC to indicate that the RTA is creating a file on the Data Store disks. The entire process for this tutorial example takes approximately 30 seconds.



When the WAIT symbol stops flashing, a “Data are stored...” message appears in the General message view.

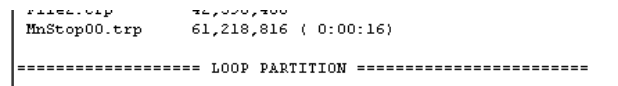


NOTE. During data storage, the test system must first acquire the event trace data and then rewrite that data to a contiguous file at the beginning of the free space on the data store disks.¹ As a result, the time required to save an event trace file—from stop condition detection to the appearance of the “Data are stored...” message—can be up to twice the time required to acquire the event trace data. In extreme circumstances, such as saving 16 Gbytes of input immediately following a stop condition, data storage through the RTA can take over one hour.

Be aware of this limitation when configuring the RTA to store a large event trace file, as you cannot run the Data Store Administrator, Deferred-Time Analyzer, or Multiplexer applications during RTA data storage.

17. Maximize the **Data Store Administrator** window.

18. Select **FAT Read** from the File menu (or press **F5**) and then confirm that the file MnStop00.trp is on the Single Shot partition.



NOTE. In a standard MTS200 Series test system, the saved file size must be an exact multiple of 96256 bytes. Therefore, the resulting file can be up to 96255 bytes smaller than the total size specified in the **Before Event** and **After Event** size fields.

19. Minimize the Data Store Administrator application window.

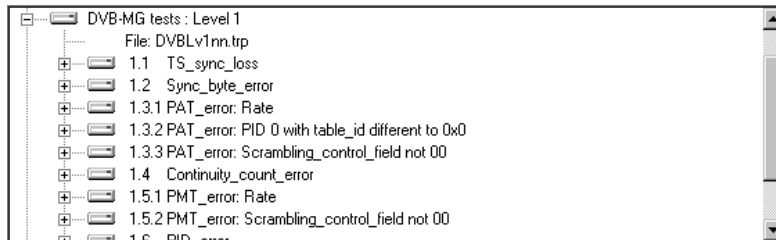
If you repeat steps 14 through 18, you will see that another file, MnStop01.trp, is added to the single shot Data Store partition. The number at the end of the file name increments to permit saving stream data before and/or after several similar data storage stop events.

¹ Refer to the *MPEG Test System Deferred-Time Applications User Manual* for additional information about file management on the data store disks.

Continuous Acquisition

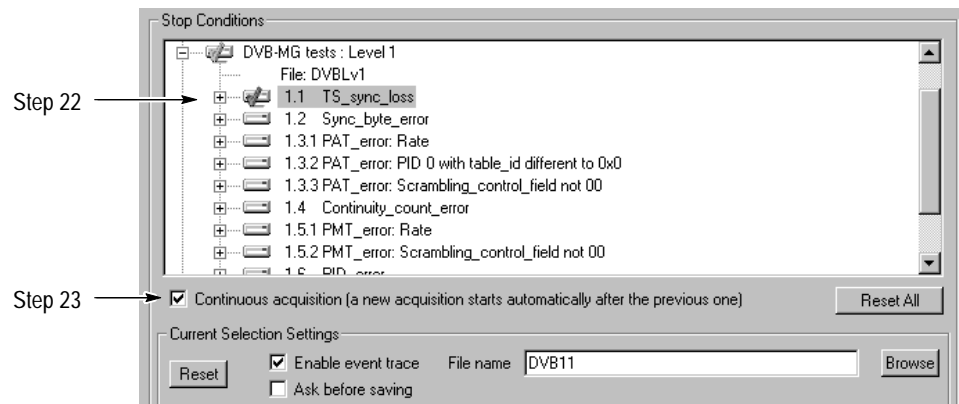
You can also configure the RTA to monitor a stream and automatically save a number of “event trace” files of data immediately before and/or after similar DVB-MG errors.

- 20. Select **Settings** from the Configuration menu and click the Data Store Start/Stop tab.
- 21. In the **Stop conditions** list, click the “+” box to the left of the “DVB-MG tests: Level 1” item to expand the hierarchy below that item.



- 22. Click the hard disk icon of the “1.1 TS_sync_loss” stop condition; a green check mark appears to indicate that the Stop condition is enabled.
- 23. Select **Continuous acquisition** to enable the capture of several DVB11m.trp event trace files.

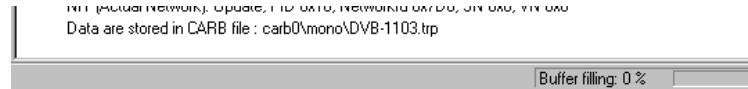
At this time, the **Stop conditions** portion of the Data Storage Start/Stop tab resembles the following illustration.



- 24. Click **OK** to confirm your selections and close the **Settings** window.
- 25. Click the **Start acquisition** command button to begin monitoring the input stream for sync loss error events.
- 26. After approximately two seconds, disconnect the cable from the RTA input connector on the rear panel of the MTS 215 Doing so will cause a sync loss

error. Notice that when an error is detected, the **Stop acquisition** button is grayed.

27. Reconnect the input cable. After a few seconds, the message “Data are stored in CARB file: carb0\mono\DVB1100.trp” appears at the bottom of the general message window.



28. Repeat steps 26 and 27 twice to capture two more error trace files.
29. After “Data are stored in CARB file: carb0\mono\DVB1102.trp” appears at the bottom of the general message window, click the **Stop acquisition** toolbar button.
30. When the “Data are stored in CARB file: carb0\mono\MnStopnn.trp” message appears, maximize the Data Store Administrator application window.
31. Select **FAT Read** from the Data Store Administrator File menu (or press **F5**) and then confirm that several DVB11nn.trp files are on the Single shot partition and that the last file listed is MnStop0n.trp.

```

files.trp          4,909,056
DVB1100.trp       4,909,056
DVB1101.trp       4,909,056
DVB1102.trp       4,909,056
MnStop02.trp      4,909,056
===== LOOP PARTITION =====

```

This tutorial example is contrived to show how you can use data storage to capture data immediately preceding or following infrequent errors. You can configure the RTA to monitor a stream for a number of different DVB-MG errors for an extended period without user attention or input. You can later analyze any resulting event trace files with the MPEG System (Deferred-Time) Analyzer to diagnose the cause or effects of the error event.

32. When you are done experimenting with data storage, delete the MnStopnn.trp and DVB11nn.trp files from the Data Store disks and exit the Data Store Administrator.
33. Stop analysis and restore the standard configuration to ensure that the settings used in this tutorial do not cause unexpected results when you again use the Real-Time Analyzer.

This ends the data storage tutorial.



Reference

Analysis

This section explains the various types of Real-Time Analyzer analyses in detail. As explained in the *Operating Basics* section of this manual, the RTA performs three classes of analysis: basic analyses, automatic analyses, and probes.

Basic analyses are fundamental to Real-Time Analyzer operation and cannot be disabled. Refer to *Basic Analyses* on page 3–1.

Automatic analyses are all performed by default in the standard Real-Time Analyzer configuration; however, you can disable these analyses one-by-one through the Configuration menu. Disabled automatic analyses remain disabled until reselected or until you restore the standard RTA configuration. Exiting and restarting the Real-Time Analyzer does *not* restore the standard configuration. Several of the automatic analyses satisfy DVB-MG recommendations; you should leave these analyses enabled if you intend to monitor the DVB-MG compliance of the input stream. Refer to *Automatic Analyses* on page 3–7.

Probes are user-initiated analyses that must be set to monitor and analyze certain selected features of the input stream. No probes are active in the standard configuration. Once set, probes remain active until removed, even if you exit and restart the Real-Time Analyzer application. The four types of RTA probes are section syntax, PCR, PTS/DTS, and InterSI. Refer to *Probes* on page 3–16.

Basic Analyses

The RTA always checks for Synchronization and monitors Transport Rates.

Synchronization

If the RTA cannot achieve synchronization, it reports an error in the General Message view. This error is the same as DVB–MG error 1.1, TS_sync_loss. If synchronization cannot be achieved, no other tests or analyses can be conducted.

Transport Rate Analysis

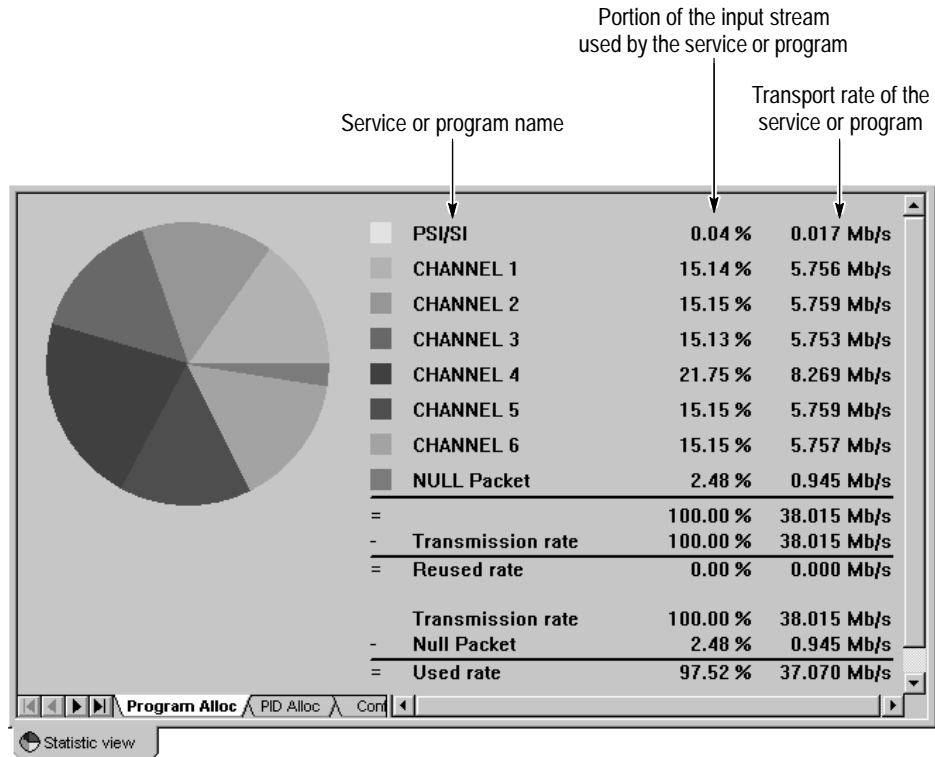
In transport rate analysis, the RTA calculates the average bit rate of each PID in the input stream and displays the results in the Program Allocation and PID Allocation panels of the Statistic View. The analysis is completely automatic and cannot be disabled. You can set upper and lower error limits for any PID in the stream; the RTA then alerts you when the transport rate of the selected PID is outside of the desired range.

The RTA calculates transport rates every 500 ms, but uses a smoothing period for transport rate averaging. In the default configuration, the RTA averages the reported transport rate over one second, or two 500 ms sample periods. You can increase the smoothing period up to 10 seconds through the **Settings** command

on the Configuration menu. Refer to *Statistic Analysis* on page 3–85 for further information.

Program Allocation. The Program Allocation panel of the Statistic view shows the bandwidth allocation of the input multiplex. The yellow slice of the pie chart represents PSI/SI information; each remaining colored slice represents a program, null packets, or unreferenced (ghost) packets. The pie chart and accompanying color-coded list provide both a graphic and numeric report of bandwidth usage. Both the numeric data and the pie chart update every 500 ms to give a near-instantaneous report of input stream composition.

The Program Allocation panel occupies the Client window pane by default whenever you start stream analysis.

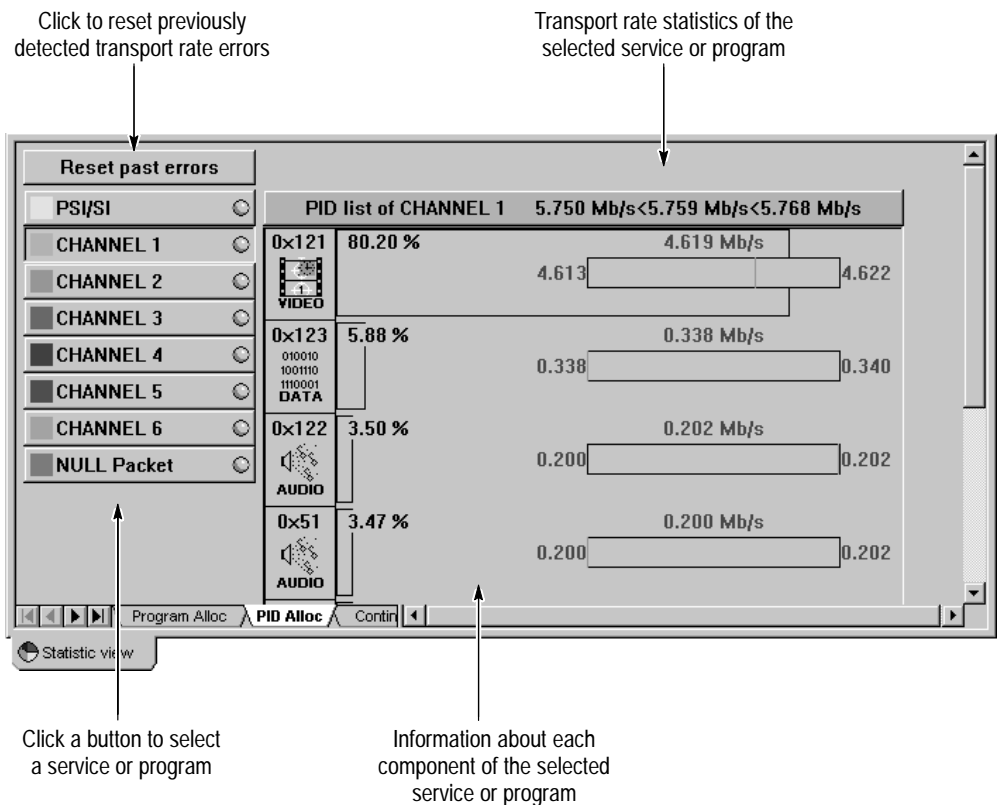


The Reused rate is the rate of shared items (that is, PIDs shared between programs).

The Used rate is the transmission rate less the Null Packet rate.

Double-click on a slice of the pie chart to change to the PID allocation panel with the corresponding program already selected.

PID Allocation. The PID Allocation panel provides a more detailed, program-level view of input stream bandwidth allocation. The panel also indicates whether or not transport rate error limits are set and signals rate errors when they occur. Click a button on the left side of the panel to select a service and see the instantaneous, previous maximum, and previous minimum multiplex rates for every PID in the service. As in the Program Allocation panel, all values update every 500 ms.

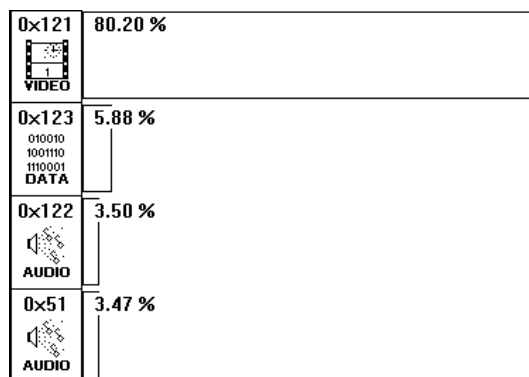


The banner in the upper-right of the panel contains information about the selected service. The area below the banner lists each PID in the service and, with graphics and text, reveals additional information about the stream item identified with that PID. If the program/service contains more than a few PIDs, you may have to use the vertical scroll bar to view the information for every PID.

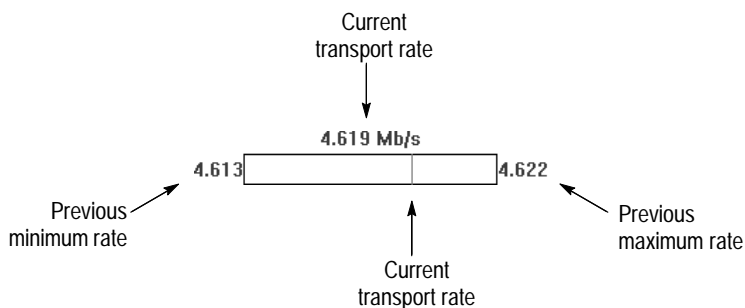
PID list of CHANNEL 1 5.750 Mb/s < 5.759 Mb/s < 5.768 Mb/s			
0x121	80.20 %	4.619 Mb/s	4.613 - 4.622
0x123	5.88 %	0.338 Mb/s	0.338 - 0.340

Notice the following PID Allocation display features:

- The icon corresponds to the item type as it does in the Hierarchic view. In the example above, PID 0x121 carries a video elementary stream.
- The number immediately to the right of the icon is the proportion of the service used by the PID. In the example, PID 0x121 accounts for 80.20% of the program. The length of the outline bar also corresponds to the proportion, as you can see in the following edited screen capture.



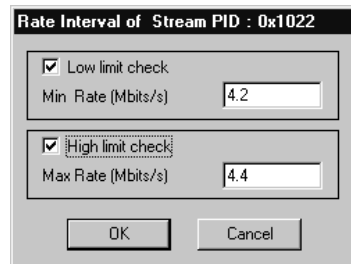
- The rate bar shows the current rate and the minimum and maximum rates measured since the start of analysis.



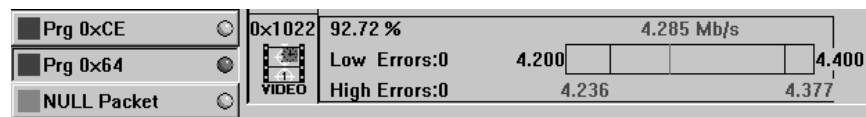
Because no error limits have been set in the above examples, the RTA displays all transport rate values with green numerals.

Setting Error Limits. You can set upper and lower transport rate error limits for individual stream items so the RTA can alert you when the transport rate is outside of the desired range. To do so, right-click in the horizontal region of the PID list that contains the item icon and rate bar. In the resulting dialog box,

select **Low limit check**, **High limit check**, or both and then enter the desired error limit value or values.



Click **OK** to accept the error limits and close the dialog box. The new limit values change the appearance of the PID Allocation panel.



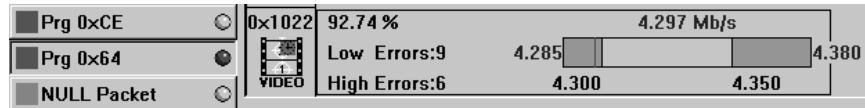
Because they are outside the transport rate range encountered so far, the limits define both ends of the rate bar and appear in black text. The number of errors detected (in this case, 0) is listed just to the right of the PID icon. Notice also that the indicator “light” on the program button turns green to indicate that an error limit is set.

The following conventions apply to the PID Allocation panel transport rate display:

- The minimum, maximum, and instantaneous rates are each shown with green numerals when the value remains within the user-specified low and high limits. The RTA shows the instantaneous rate in red when it violates either limit, while the min and max numerals become and remain red when the value goes outside of the associated limit.
- Once a limit has been violated, the region of the bar between the limit and the actual min or max value becomes red.
- The number of **Low Errors** reported is the number of 500 ms samples in which the actual rate has been below the lower limit.
- The number of **High Errors** reported is the number of 500 ms samples in which the actual rate has been above the upper limit.
- The instantaneous rate is always displayed above the rate bar.

- The minimum rate, maximum rate, low limit, and high limit are displayed from the lowest value to the highest. The lower and higher values are displayed at the left and right ends of the bar and define the scale of the bar. The other values are displayed below the rectangle.

If you set narrower limits and the transport rate goes above and below the specified range, the PID allocation panel may resemble the following capture.

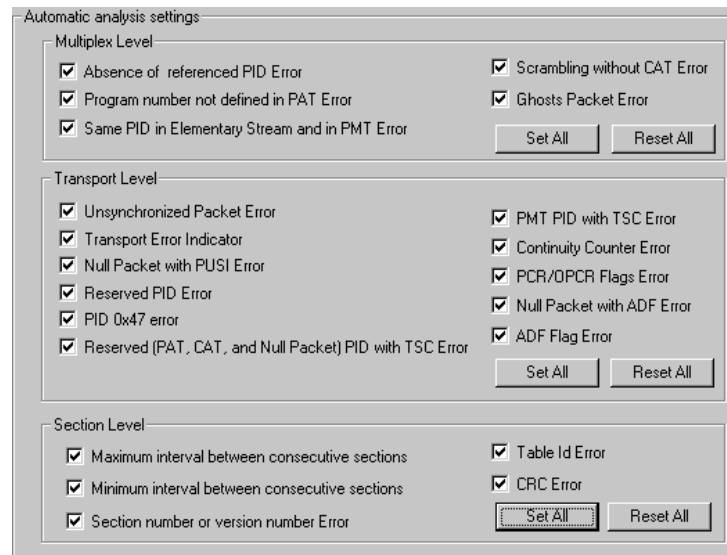


Notice that the program button indicator color follows the same convention as the hierarchy icon error indicators (and all other indicators in the RTA):

- *Gray* signifies that no transport rate probe is set for the program.
- *Green* signifies that a transport rate probe is set and that the rate has remained within the user-specified limits.
- *Red* signifies that a transport rate error is occurring.
- *Orange* signifies that all of the program's monitored rates are currently within the user-set limits but that a rate error has occurred since monitoring began.

Automatic Analyses

This section discusses the automatic analyses in the order that they are listed in the Automatic Analysis **Settings** window tab. Refer to Table 3–1 for the page on which each analysis is explained.



In the standard configuration, all analyses on the Automatic Analysis **Settings** window tab are selected as shown in the above illustration. If the input stream contains many errors, the RTA can begin filling the RTA-to-PC buffer and performance can slow to less than real-time as the software and hardware attempt to detect, report, and record all errors.



To minimize or eliminate buffer filling or to ignore certain errors, disable one or more automatic analyses as follows:

1. Select **Settings** from the Configuration menu.
2. Click the Automatic Analysis tab of the resulting **Settings** window.
3. Click a check box to clear it and disable the associated analysis or click **Reset All** to disable all analyses of the same level (Multiplex, Transport Packet, or Table Section).
4. Click **OK** at the bottom of the **Settings** window to confirm the changes and close the window.

Table 3-1: Automatic analyses in the RTA

Analysis	Page
Absence of Referenced PID Error	3-9
Program Number Not Defined in PAT Error	3-9
Same PID in Elementary Stream and in PMT Error	3-9
Scrambling without CAT Error	3-9
Ghosts Packet Error	3-9
Unsynchronized Packet Error	3-10
Transport Error Indicator	3-10
Null Packet with PUSI Error	3-11
Reserved PID Error	3-11
PID 0x47 Error	3-11
Reserved PID with TSC Error	3-11
PMT PID with TSC Error	3-12
Continuity Counter Error	3-12
PCR/OPCR Flags Error	3-13
Null Packet with ADF Error	3-13
ADF Flag Error	3-13
Maximum Interval Between Consecutive Sections	3-13
Minimum Interval Between Consecutive Sections	3-15
Section Number or Version Number Error	3-15
Table ID Error	3-15
CRC Error	3-16

NOTE. Several Automatic Analysis selections control DVB-MG tests. Do Not disable any of these automatic analyses if you plan to use DVB-MG tests to judge DVB compliance of the input stream.

**Absence of Referenced
PID Error**

Error Condition: The time interval between a PID reference in a PAT, CAT, or PMT and the appearance of that PID in the stream exceeds the value set on the Statistic Analysis tab of the **Settings** window.

Associated DVB-MG recommendation: PID_error, 1.6.

How/where an error is reported: In the DVB-MG view and as an error message in the General Message view.

Additional information: Choose **Settings** from the RTA Configuration menu to open the **Settings** window; click the Statistic Analysis tab to see and change the intervals.

**Program Number Not
Defined in PAT Error**

Error Condition: A PMT program number is not defined in the PAT.

Associated DVB-MG recommendation: None.

How/where an error is reported: As an error message in the General Message view.

**Same PID in Elementary
Stream and in PMT Error**

Error Condition: A PMT and an elementary stream are identified with the same PID.

Associated DVB-MG recommendation: None.

How/where an error is reported: As an error message in the General Message view.

**Scrambling without CAT
Error**

Error Condition: Packets with non 00 transport_scrambling_control exist in the stream but no section with table_id 0x01 (a CAT) is found.

Associated DVB-MG recommendation: CAT_error, 2.6.1.

How/where an error is reported: In the DVB-MG view and as an error message in the General Message view.

Ghosts Packet Error

Error Condition: A PID (other than one of the defined or reserved values) appears in the stream but is not referenced in a PMT within 0.5 seconds.

Associated DVB-MG recommendation: Unreferenced_PID, 3.4.

How/where an error is reported: In the DVB-MG view, in the General Message view, as a Ghost icon in the Hierarchic view, and as a Ghost service/program in several Statistic view panels.

Unsynchronized Packet Error

Error Condition: A transport packet header Sync_byte that is not 0x47.

Associated DVB-MG recommendation: Sync_byte_error, 1.2.

How/where an error is reported: In the General Message view, the UNP indicator on the application window status bar, and the Unsynchrono Packets panel of the Statistic View.

Additional information: If synchronization is lost, no other analyses are possible.

Like the TP Error Indicator panel shown above, the Unsynchrono Packets panel provides a graphical view of Unsynchronized Packet occurrence (UNP). The vertical units are UNP per 500 ms; the scale is logarithmic to display both very low and very high rates of error.

The status bar **UNP** indicator follows the same color conventions as the **TEI** indicator.

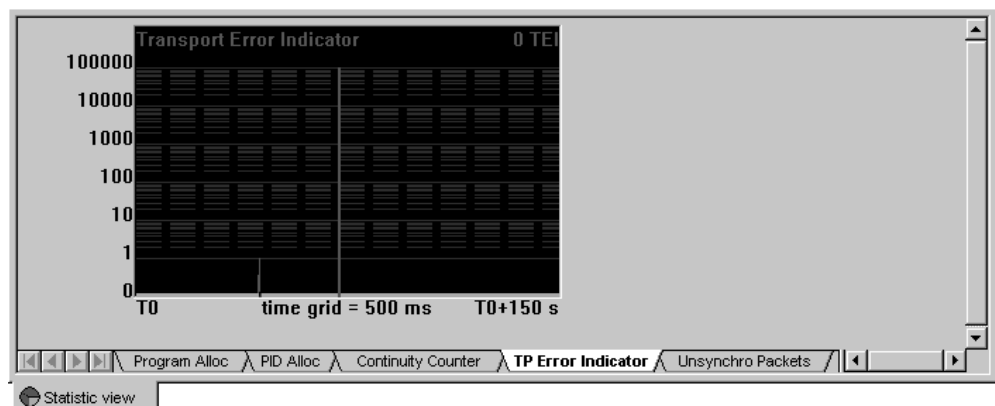
Transport Error Indicator

Error Condition: A transport_error_indicator field (of a transport packet header) is equal to 1, which indicates that at least one uncorrectable bit error exists in the associated transport packet.

Associated DVB-MG recommendation: Transport_error, 2.1.

How/where an error is reported: The DVB-MG view, the TEI indicator on the application window status bar, and the TP Error Indicator panel of the Statistic View.

Additional information: The TP Error Indicator panel provides a graphical view of TEI occurrence. The vertical units are TEI per 500 ms; the scale is logarithmic to display both very low and very high rates of error.



The status bar TEI indicator follows the standard RTA color sequence to signal errors: *gray* signifies that the analysis is disabled; *green* signifies that analysis is enabled, but that no errors have been detected; *red* signifies that errors are being

detected; *orange* signifies that one or more errors have occurred, but are not currently detected.



Null Packet with PUSI Error

Error Condition: The payload_unit_start_indicator in a null packet (PID 0x1FFF) is not 0.

Associated DVB-MG recommendation: None.

How/where an error is reported: As an error message.

Reserved PID Error

Error Condition: A reserved PID is found in the input stream. PIDs must be 0x0000, 0x0001, or within the range of 0x0010 through 0x1FFF; any other PID is an error.

Associated DVB-MG recommendation: None.

How/where an error is reported: As an error message in the General Message view.

PID 0x47 Error

Error Condition: A packet with PID 0x47 is received.

This is not a violation of the MPEG-2 standard. However, you may want to detect PID 0x47 since it can lead to troubles during decoding if the decoder incorrectly interprets the PID as a sync byte.

Associated DVB-MG recommendation: None.

How/where an error is reported: As a syntax error in the appropriate Message view(s).

Reserved PID with TSC Error

Error Condition: A PID 0x0000 (PAT), 0x0001 (CAT), or 0x1FFF (null/stuffing) packet with a transport_scrambling_control field that does not equal 00.

Associated DVB-MG recommendation: PAT_error, 1.3.3.

How/where an error is reported: An error message in the General Message view and in the item Message view, if any.

PMT PID with TSC Error

Error Condition: A PMT packet (table_id 0x2) with a transport_scrambling_control field that does not equal 00. MPEG standards do not allow scrambled PMT.

Associated DVB-MG recommendation: PMT_error, 1.5.2.

How/where an error is reported: In the DVB-MG view, in the general Message view, and in the PMT Message view, if it is open in the Client window pane.

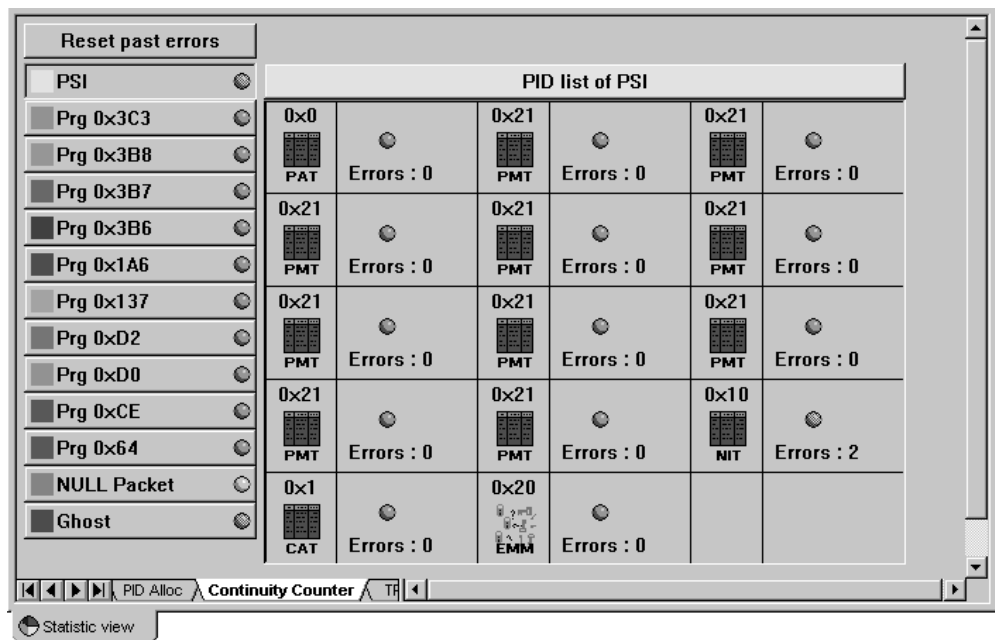
Continuity Counter Error

Error Condition: An incorrectly incremented transport packet continuity_counter. Except for null packets and in cases of duplicate packets or discontinuities, the continuity counter of each successive payload-carrying packet of the same PID must increment by one, from 0x0 to 0xF (modulo 16).

Associated DVB-MG recommendation: Continuity_count_error, 1.4.

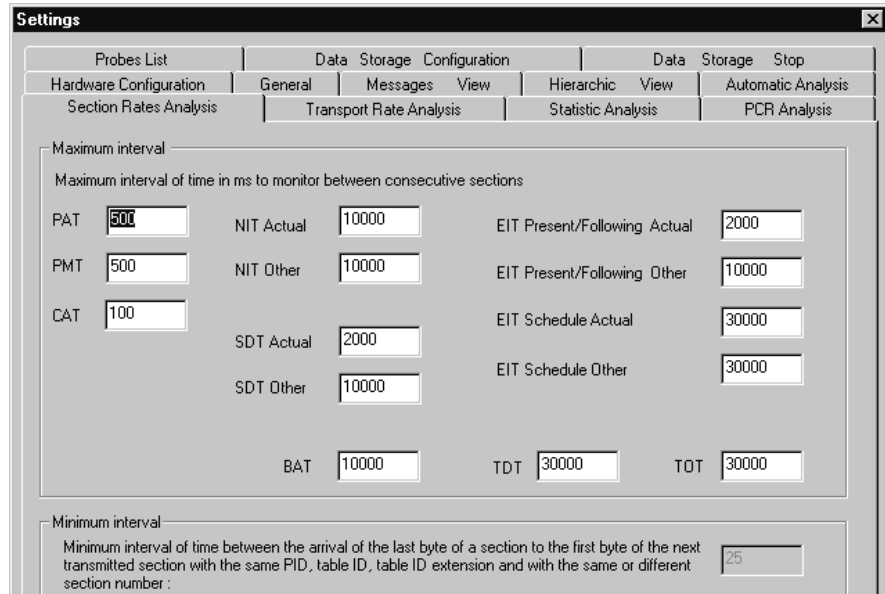
How/where an error is reported: The DVB-MG view, the Continuity Counter panel of the Statistic view, and the appropriate Message view(s).

Additional information: The Continuity Counter panel displays detected errors on a per-service basis. Refer to *Continuity Counter* on page 3–55 for an explanation of this panel.

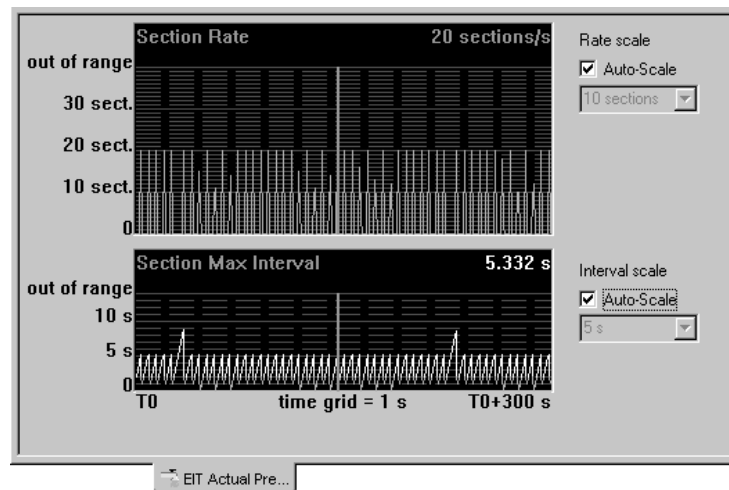


PCR/OPCR Flags Error	<p>Error Condition: A transport packet adaptation field PCR_flag is set to 0 when the OPCR_flag is set to 1 (cannot have an OPCR without a PCR).</p> <p>Associated DVB-MG recommendation: None.</p> <p>How/where an error is reported: An error message in the appropriate Message view(s).</p>
Null Packet with ADF Error	<p>Error Condition: There are three error conditions:</p> <ul style="list-style-type: none">■ The adaptation_field_control is 00.■ The adaptation_field_control is 10, but the adaptation_field_length is not equal to 183.■ The adaptation_field_control is 11, but the adaptation_field_length is not in the range of 0 through 182. <p>Associated DVB-MG recommendation: None.</p> <p>How/where an error is reported: As an error message.</p>
ADF Flag Error	<p>Error Condition: A transport packet adaptation_field_control field set to 00, which is not allowed in the MPEG-2 standard.</p> <p>Associated DVB-MG recommendation: None.</p> <p>How/where an error is reported: As a syntax error in the appropriate Message view(s).</p>
Maximum Interval Between Consecutive Sections	<p>Error Condition: Interval between consecutive table sections exceeds the value set on the Section Rates Analysis tab of the Settings window.</p> <p>Associated DVB-MG recommendation: PAT_error, 1.3.1; PMT_error, 1.5.1; NIT_error, 3.1.2; SI_repetition error, 3.2; SDT_error, 3.5; EIT_error, 3.6.1; TDT_error, 3.8.1.</p> <p>How/where an error is reported: In the DVB-MG view, in a Client window Section Rate view, and in the appropriate Message view(s).</p> <p>Additional information: Choose Settings from the RTA Configuration menu to open the Settings window; click the Section Rates Analysis tab to see and change the intervals. The default Section Rates Analysis settings are consistent</p>

with DVB-MG. Do not change values if you intend to follow DVB-MG recommendations.



To open a dynamic table section rate view in the Client window pane, select the Hierarchic view icon of the table, right-click to open the shortcut menu, and then select **View section rate**. The lower **Section Max Interval** graph indicates errors in red.



Minimum Interval Between Consecutive Sections

Error Condition: The minimum interval between consecutive table sections is less than 25 ms.

Associated DVB-MG recommendation: SI_repetition_error, 3.2.

How/where an error is reported: In the DVB-MG view and as an error message in the appropriate Message views(s).

Section Number or Version Number Error

Error Condition: One or more of the following section and version numbering errors found in a PSI or SI table section:

- Sections received out of order; for example section number 1 arrives before section number 0.
- All sections with the same version number do not have the same last section number.
- The version number is improperly incremented.
- The version number increments before the last section of the previous version number has been received.

Associated DVB-MG recommendation: None.

How/where an error is reported: In the appropriate Message view(s).

Table ID Error

Error Condition: A table_id value that is incompatible with the PID of the (SI table) packet that contains it.

Table type	PID	Permissible table_id values
PAT	0x0000	0x00
CAT	0x0001	0x01
NIT	0x0010	0x40, 0x41, 0x72
SDT	0x0011	0x42, 0x46, 0x4A, 0x72
EIT	0x0012	0x4E through 0x6F, 0x72
RST	0x0013	0x71, 0x72
TDT	0x0014	0x70, 0x72

Associated DVB-MG recommendation: PAT_error, 1.3.2; CAT_error, 2.6.2; SDT_error, 3.6.2; TDT_error, 3.8.2.

How/where an error is reported: In the DVB-MG view and on the appropriate Message view(s).

CRC Error **Error Condition:** A CRC error in a PSI or SI table.

Associated DVB-MG recommendation: CRC_error, 2.2.

How/where an error is reported: In the DVB-MG view and as a syntax error in the appropriate Message view(s).

Probes

Real-Time Analyzer probes are user-initiated analyses that you can set to monitor and analyze certain selected features of the input stream. There are four probe types; the discussion of each type begins on the indicated page:

- *InterSI*, page 3–16
- *PCR*, page 3–18
- *PTS/DTS*, page 3–20
- *Section Syntax*, page 3–21

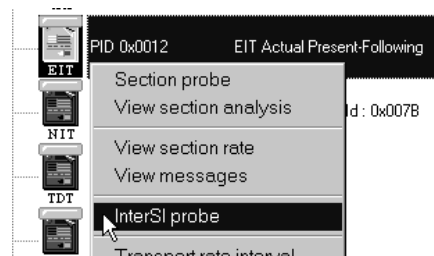
The InterSI probe applies to all SI tables in the stream. The section syntax probe applies to all sections of a given table, such as the SDT (actual) or the BAT. You can set the PCR and PTS/DTS probes to monitor the PCRs or time stamps embedded in one, several, or all individual programs or elementary streams.

You can set and remove probes either through Hierarchic view shortcut menus or through the Probes List tab of the **Settings** window.

The InterSI Probe Setting the InterSI probe activates two types of analysis :

- Intra analysis, which detects problems *within* PSI or SI tables.
- Inter analysis, which detects problems of coherence between SI tables.

Setting the InterSI Probe. To set/remove the InterSI probe, select a Hierarchic view icon that represents an SI table (NIT, EIT, SDT), right-click to open the shortcut menu, and then select **InterSI Probe** from the menu.



You can also set the InterSI probe through the Probes List tab of the **Settings** window. To open the window, select **Settings** from the RTA Configuration menu; refer to *Probes List* on page 3–88 for more information.

Analyses Within Tables. When the InterSI probe is set, the RTA checks the PMT, NIT, BAT, EIT and SDT for the presence of mandatory descriptors and checks all descriptors for compliance with DVB standards.

The RTA also checks the following specific characteristics of the NIT and EIT:

- In the NIT, the `transport_stream_id` and the `network_id` must be unique for a given `network_id`.
- In the EIT, the field `event_id` must be unique for a given `service_id`, `transport_stream_id`, and `original_network_id`.
- If an EIT is of type “schedule,” then the `running_status` field must be set to “undefined.”
- If EIT is of type “following,” then the `running_status` field shall not be set to “running.”

Analyses Between Tables. When the InterSI probe is set, the RTA monitors the NIT, SDT, EIT, and BAT for inter-table compatibility and reports errors if the tables do not satisfy the following conditions:

- The `transport_stream_id` and `original_network_id` fields of the NIT should be referenced in an SDT.
- Each `transport_stream_id`, `original_network_id`, `service_list_descriptor`, and `service_id` of the NIT must be present in an SDT.
- The `transport_stream_id`, and `original_network_id` fields of the EIT must be declared in the NIT.
- Each `transport_stream_id`, `original_network_id`, `service_list_descriptor`, and `service_id` of the BAT must be present in an SDT.
- There should be an EIT referencing the `service_id`, `transport_stream_id`, and `original_network_id` fields of the SDT.
- If the `EIT_schedule_flag` field of the SDT is set to 1, then an EIT schedule for `service_id`, `transport_stream_id`, and `original_network_id` must be present.
- If the `EIT_schedule_flag` of the SDT is set to 0, then an EIT schedule should not be present for `service_id`, `transport_stream_id`, or `original_network_id`.

- If the `EIT_present_following_flag` of the SDT is set to 1, then an EIT present/following for `service_id`, `transport_stream_id`, and `original_network_id` must be present.
- If the `EIT_present_following_flag` of the SDT is set to 0, then an EIT present/following should not be present for `service_id`, `transport_stream_id`, or `original_network_id`.

InterSI Error Reporting. InterSI probe information and Error messages are displayed in the General Message view as shown in the following illustration. If the InterSI probe detects errors within a table, the indicator above the hierarchy icon of the affected table becomes red; the associated error message(s) also appear in the Message view of that table (if you double-click the table icon to open such a view in the Client window pane).

Message	EVENT ID	TIME
<><><><> BEGINNING OF INTER SI ANALYSIS (INTER SECTIONS ANALYSIS PER SI TABLE + INTER SI TABLES ANALYSIS)<><>...	1694	15:47:31.000 Friday, May, 15
INTER SECTIONS ANALYSIS PER SI TABLE: ***** INTRA ANALYSIS *****	1695	15:47:31.000 Friday, May, 15
INTER SECTIONS ANALYSIS PER SI TABLE: - NIT analysis :	1696	15:47:31.000 Friday, May, 15
INTER SECTIONS ANALYSIS PER SI TABLE: - SDT analysis :	1697	15:47:31.000 Friday, May, 15
INTER SECTIONS ANALYSIS PER SI TABLE: - EIT analysis :	1698	15:47:31.000 Friday, May, 15
INTER SECTIONS ANALYSIS PER SI TABLE: - PMT analysis :	1699	15:47:31.000 Friday, May, 15
INTER SECTIONS ANALYSIS PER SI TABLE:	1700	15:47:31.000 Friday, May, 15
INTER SI TABLES ANALYSIS: ***** INTER ANALYSIS *****	1701	15:47:31.000 Friday, May, 15
INTER SI TABLES ANALYSIS:	1702	15:47:31.000 Friday, May, 15
INTER SI TABLES ANALYSIS: - NIT <> SDT analysis :	1703	15:47:31.000 Friday, May, 15
INTER SI TABLES ANALYSIS: - SDT <> EIT analysis :	1704	15:47:31.000 Friday, May, 15
● INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L1 : there is no Eit Present/Following subtable but the P/F flag [...]	1705	15:47:31.000 Friday, May, 15
● INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L2 : there is no Eit Present/Following subtable but the P/F flag [...]	1706	15:47:31.000 Friday, May, 15
● INTER SI TABLES ANALYSIS: Error EIT (Tid 78 Sid 1 Tsid 1995 Onid 2000) : must have exactly two valid sections describing Sid 1 (present ...)	1707	15:47:31.000 Friday, May, 15
● INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L1 : no Event describing the Sid 2 (or no valid EIT section)	1708	15:47:31.000 Friday, May, 15
● INTER SI TABLES ANALYSIS: Warning SDT (Tid 66 Tsid 1995 Onid 2000) L2 : no Event describing the Sid 3 (or no valid EIT section)	1709	15:47:31.000 Friday, May, 15
INTER SI TABLES ANALYSIS: - NIT <> EIT analysis :	1710	15:47:31.000 Friday, May, 15
<><><><><> END OF INTER SI ANALYSIS <><><><><>	1711	15:47:31.000 Friday, May, 15

PCR Probes PCR probes monitor the clock references of a selected program for regularity and precision. When you set a PCR probe in the standard configuration, the RTA reports a PCR error if the interval between consecutive PCR packets is greater than 100 ms in MPEG-2 mode or greater than 40 ms in DVB mode, or if the PCR inaccuracy is greater than +/-500 ns.

The default error limits are consistent with DVB-MG recommendations. You can change the limits if necessary through the Configuration menu.

Setting PCR Probes. You can set a PCR probe either through the Hierarchic view or through the Configuration menu:

- To set a PCR probe through the Hierarchic view, select the PMT icon that represents the program of interest, right-click to open a shortcut menu, and then select **PCR Probe** or **View PCR Analysis**.

When you select **View PCR Analysis**, a PCR Analysis view, as described on page 3–64, opens and the probe is set automatically. To remove the PCR probe, select **PCR Probe** a second time from the PMT shortcut menu.

- To set a PCR probe through the Configuration menu, open the menu and select **Settings**. Then click the Probes List tab on the resulting **Settings** window. Click PMT in the **Table type** list; enter the hexadecimal program number in the **Program Number** box or select **ALL**; click PCR in the **Probe Type** box; click **Add**; and finally click **OK** on the bottom of the window. Refer to *Probes List* on page 3–88 for more information.

When you select **ALL** on the Probes List tab, the RTA monitors all PCRs in the input stream. If you enter a single program or activate the probe through the Hierarchic view, the RTA monitors the clocks used by that program.

PCR Probe Thresholds. You can change the PCR probe error thresholds through the Configuration menu with the following steps:

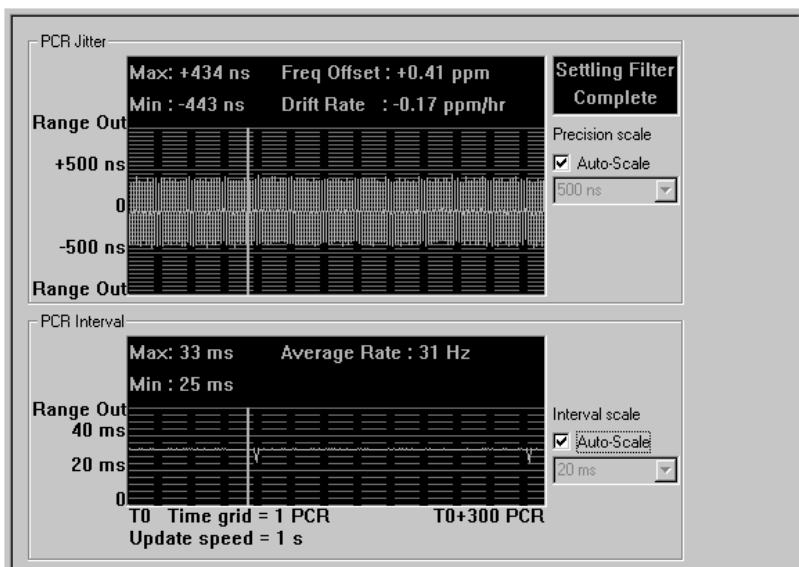
1. Open the Configuration menu and click **Settings**.
2. Select the PCR Analysis tab of the resulting **Settings** window.
3. Enter the desired values in the **Interval** and **Precision** fields.
4. Click **OK** to accept the new values and close the **Settings** window.

Refer to *PCR Analysis* on page 3–87 for more information about the PCR Analysis settings tab.

Settling Filter. The Settling Filter, which improves the accuracy of PCR jitter analysis, must have at least 60 seconds of data before before the RTA can detect and report PCR jitter errors. Wait 60 seconds after setting a PCR probe to judge the PCR jitter performance or compliance.

PCR Error Reporting. When a PCR error occurs, the colored indicator above the affected Hierarchic view PMT icon turns red and an error message appears in the General Message view. The message also appears on the PMT Message view if it is open in the Client window pane.

The RTA also indicates PCR errors in the DVB-MG view and the PCR Analysis view. The application signals errors in the PCR analysis view by changing the graph plot line and the corresponding Min or Max readout text from blue to red.



PCR Analysis Accuracy. Real-Time Analyzer hardware considerations limit the accuracy of PCR analysis. The following table summarizes the accuracy possible for jitter parameters displayed in the PCR Analysis view.

Table 3–2: PCR analysis accuracy

Characteristic	Description
Frequency Offset readout	
Accuracy	± 3.0 ppm
Drift, typical	± 1 ppm per year
Jitter readout and graphical display accuracy, typical	
Parallel input	± 30 ns peak
ASI input	± 60 ns peak

PTS/DTS Probes

PTS/DTS probes monitor the time stamps of selected elementary streams for compliance with the DVB-MG recommended interval of no more than 700 ms between consecutive PES packets with non zero PTS/DTS flags. You can set PTS/DTS probes only on unscrambled elementary streams.

Setting PTS/DTS Probes. You can set PTS/DTS probes either through the Hierarchic view or through the configuration menu.

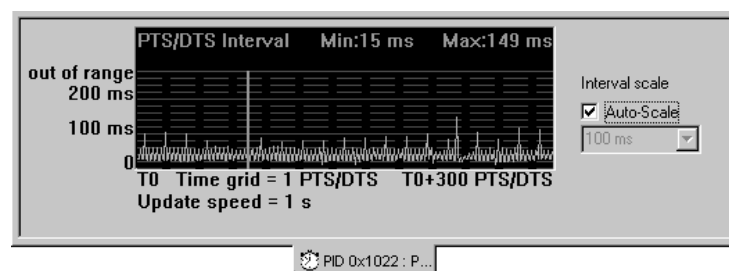
- To set a PTS/DTS probe through the Hierarchic view, select the audio or video elementary stream icon that represents the stream of interest, right-click to open a shortcut menu, and then select **PTS/DTS Probe** or **View PTS/DTS Analysis**.

When you select **View PTS/DTS Analysis**, a PTS/DTS Analysis view—as described on page 3–63—opens and the probe is set automatically. To remove the PTS/DTS probe, again select **PTS/DTS Probe** from the elementary stream shortcut menu.

- To set a PTS/DTS probe through the Configuration menu, open the menu and select **Settings**. Then click the Probes List tab on the resulting **Settings** window. Click Elementary Stream in the **Table type** list; enter the hexadecimal PID in the **PID** box or select **ALL**; click **Add**; and finally click **OK** on the bottom of the window. Refer to *Probes List* on page 3–88 for more information.

PTS/DTS Error Reporting. When a PTS/DTS error occurs, the colored indicator above the affected Hierarchic view elementary stream icon turns red and an error message appears in the General Message view. The message also appears on the elementary stream Message view if it is open in the Client window pane.

The RTA also indicates PTS/DTS errors in the DVB-MG view and the PTS/DTS Analysis view. The application signals errors in the analysis view by changing the graph plot line and the corresponding Max readout text from blue to red.



Section Syntax Probes

Set a section syntax probe to perform a complete analysis of every field in all sections of the selected table type.

Setting a Section Syntax Probe. You can set section probes either through the Hierarchic view or through the configuration menu.

- To set a section probe through the Hierarchic view, select the icon that represents the table of interest, right-click to open a shortcut menu, and then

select **Section Probe** or **(PAT, PMT, or CAT) Section Probe** (the first command on the shortcut menu).

You can also select **View section analysis** to open a Section Analysis view of the table as described on page 3–59. Once the view opens, the syntax probe is automatically set on the selected table type.

- To set a section syntax probe through the Configuration menu, open the menu and select **Settings**. Then click the Probes List tab on the resulting **Settings** window. Click any table entry in the **Table type** list; click **Syntax** in the **Probe Type** list; click **Add**; and finally click **OK** on the bottom of the window. Refer to *Probes List* on page 3–88 for more information.

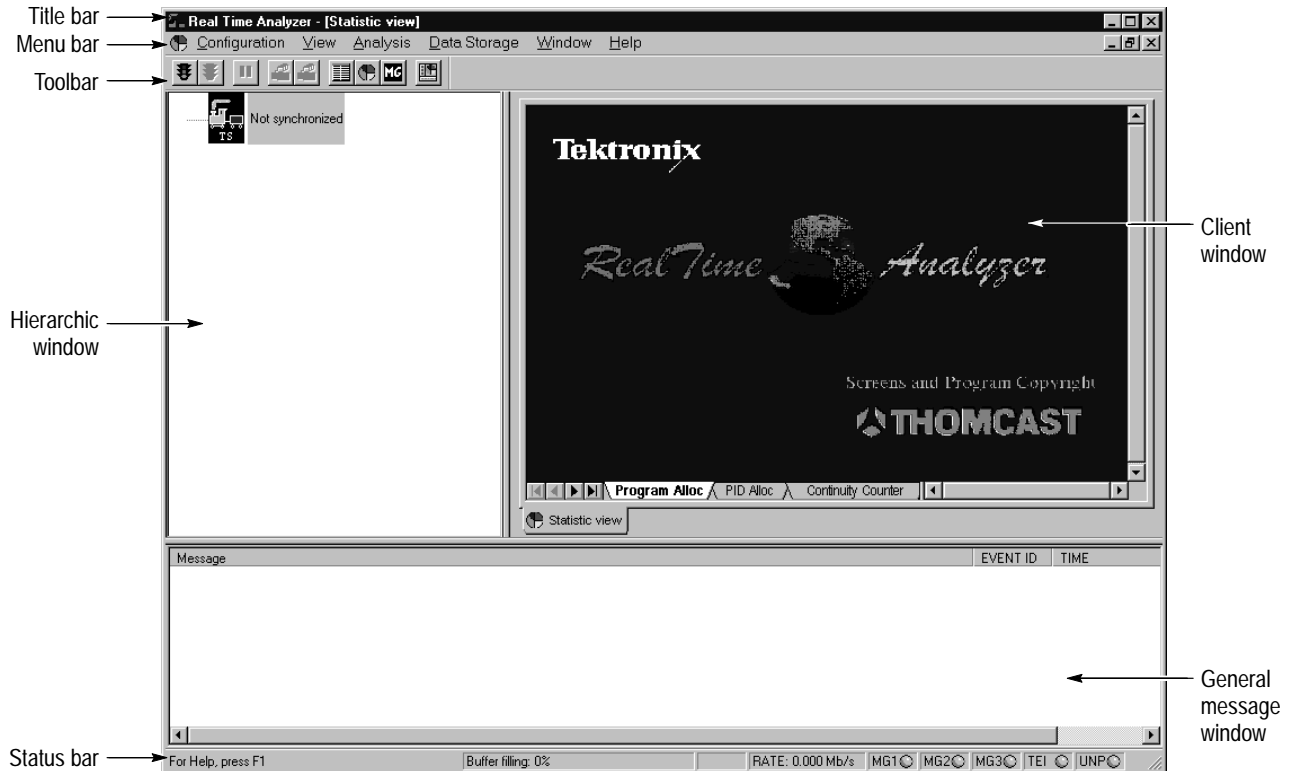
Syntax Error Reporting. When the RTA detects a section syntax error, the error indicator above the Hierarchic view icon turns red and an error message appears in the General Message view. You can also double-click the Hierarchic view icon to open a Message view particular to the affected table.

The RTA also notes the presence and nature of each section syntax error in the section analysis view, as explained under *Section Analysis View* on page 3–59.

Name	Value	Interpretation
table id	0x40	Actual network
section syntax indicator	0x1	OK
reserved future use	0x1	OK
reserved	0x3	OK
section length	0x110	number of bytes of the section
network id	0x7B	label to identify the delivery system
ISO reserved	0x0	Error, all bits must be '1'
version number	0x1D	version number of the sub table
current next indicator	0x1	the subtable is currently applicable
section number	0x1	number of this section in this subtable
last section number	0x1	number of the last section in this subtable
DVB reserved	0x0	Error, all bits must be '1'
network descriptor length	0xA	

User Interface

The Real-Time Analyzer (RTA) application window shown below fills the entire screen when you start the program.



This section describes and explains the following features of the RTA application window:

- The title bar (page 3–25)
- The menu bar, which provides access to the various RTA command menus (page 3–25)
- The toolbar, which contains graphical command buttons for many of the most-used menu commands (page 3–30)
- The status bar, which displays help statements and useful information about the analyzed stream (page 3–32)
- The Hierarchic window pane, which, during monitoring/analysis, contains the Hierarchic view (page 3–33)

- The General Message window pane (page 3–43)
- The Client window pane, which can contain one or more subordinate views (page 3–48; the section also discusses the subordinate views in detail)

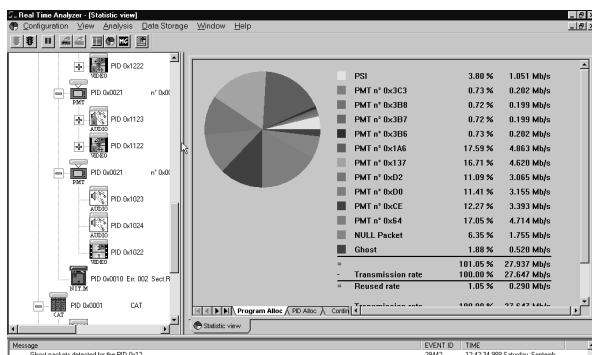
Application Window Conventions

Wherever possible, the RTA follows Windows NT 4.0/Windows 95 user interface conventions.

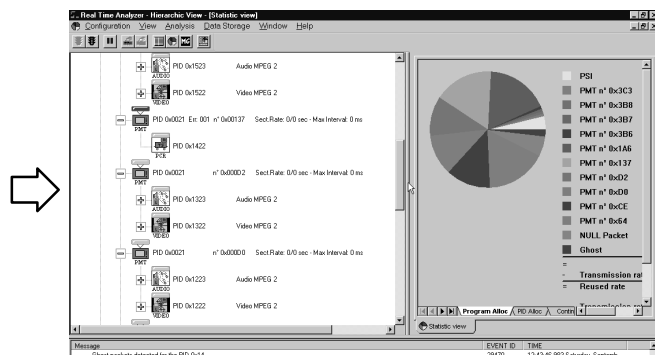
NOTE. This manual is written assuming a basic level of familiarity with the Windows 95 or the Windows NT 4.0 operating system. If you are not familiar with either operating system, please review the Windows NT documentation that accompanied your instrument.

As you use the RTA, you may find it useful to change the relative sizes of the Hierarchic, Client, and General Message window panes, depending on the information that is most important at a given time. To change the relative widths of the Hierarchic and Client panes, position the pointer over the split bar (the border between the two panes); the pointer changes from an arrow to a special shape (◄|►). Press the mouse button down and drag the border left or right to decrease or increase the width of the Hierarchic pane.

Default window widths



Split bar moved to the right to show more of the hierarchy



You can change the height of all three panes by dragging the split bar that separates the Hierarchic and Client windows from the General Message window.

You can also maximize the height of the Hierarchic and Client window panes by changing the General Message window into a Client window view. Refer to *Toggle Docking* on page 3–48 for instructions.

Title Bar

In addition to identifying the Real-Time Analyzer application, the title bar indicates which of the three window panes is selected and the contents or subject of the current Client view.

The Hierarchic pane is selected and the DVB-MG view is the current Client view:



The General Messages pane is selected and the DVB-MG view is the current Client view:



The Client pane is selected and the DVB-MG view is the current Client view:



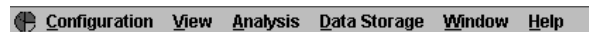
The Client pane is selected and EMM, PID 0x20, is the subject of the current Client view:



Because the contents of the selected pane are printed, it is important to know which pane is selected before choosing **Print** from the View menu. To select a pane, click anywhere within the pane.

Menu Bar

The menu bar contains the six RTA command menus.



- **Configuration.** The Configuration menu contains commands for managing program settings and configurations and for exiting the RTA application.
- **View.** The View menu contains commands for managing the different RTA views.
- **Analysis.** The Analysis menu contains commands to start and stop input stream analysis.
- **Data storage.** The Data Storage menu contains commands to start and stop input stream storage (on the MTS 215 only).
- **Window.** The Window menu contains commands for managing the various windows within the RTA Client window.
- **Help.** The Help menu provides access to RTA online help and version information.

The Active view menu, denoted with various view symbols, appears on the left end of the menu bar when a view is maximized in the Client window. The pie chart symbol in the menu bar shown above indicates that the **Statistic** view is active in the Client window.

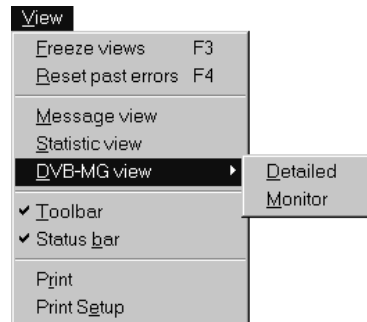
Configuration Menu

The Configuration menu contains commands for managing program settings and configurations and for exiting the RTA application (because there is no File menu). Refer to *Configuration*, beginning on page 3–67, for more information.



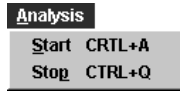
Use	To
Settings	Open the Settings window
Load	Restore a previously-saved configuration
Save as	Save the current configuration
Restore standard	Restore default settings only when analysis is stopped
Exit	Quit the Real-Time Analyzer application

View Menu Use the View menu commands to control the information displayed in the RTA application window.



Use	To
Freeze views	Suspend (freeze) window updates while analysis continues. Freezing the views allows you to examine or capture transitory information (that is likely to soon disappear from the display) and to find and examine error messages that have scrolled off the top of a message window.
Reset past errors	Acknowledge all previously-detected errors, reset all error counters to zero, and restore all orange-colored indicators to their original color.
Message[s] view	Open the Message view or select the Message view and place it in front of all other views if necessary.
Statistic view	Open the Statistic view or select the Statistic view and place it in front of all other views, if necessary.
DVB-MG view	Open a (detailed or monitor) DVB-MG view or select the DVB-MG view and place it in front of all other views, if necessary.
Toolbar	Toggle the presence of the Toolbar (Command buttons) in the RTA application window. A check mark precedes the command when the Toolbar is present.
Status bar	Toggle the presence of the Status bar in the RTA application window. A check mark precedes the command when the Status bar is present.
Print	Print the current window or window pane.
Print Setup	To configure the printer.

Analysis Menu The Analysis menu contains commands for starting and stopping input stream analysis. You may find it more convenient to use the command button equivalents on the toolbar.



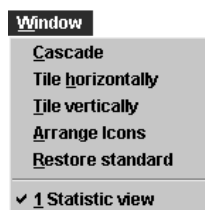
Use	To
Start	Begin analyzing the input stream
Stop	Stop input stream analysis

Data Storage Menu The Data Storage menu is only applicable to MTS 215 instruments, which are equipped with the Data Store system.



Use	To
Start	Begin saving the input stream to the data store disks (MTS 215 only)
Stop	Stop data capture

Window Menu The Window menu contains commands for managing the various windows within the RTA Client window.



Use	To
Cascade	Arrange windows in the Client view in an overlapping upper-left to lower-right cascade. The active window is on the lower right.
Tile horizontally	Arrange Client view windows as non-overlapping tiles that stretch from left to right across the Client window.
Tile vertically	Arrange Client view windows as non-overlapping tiles that stretch from from the top of the Client window to the bottom.
Arrange icons	Arrange minimized view icons along the bottom of the Client window.
Restore standard	Restore the default RTA window arrangement.
(List of open windows)	Select the window to be shown in front of all other windows.

Help Menu The Help menu provides access to online help and version information.



Use	To
Help Topics	Open the RTA Help window
About RTA	Display RTA version and copyright information

Active View Menu

The active view menu pertains to the top view in the Client window when the Client views are maximized; the menu contains standard Windows NT window-management commands. Only four of the commands are available.









Use	To
Restore	Change all open Client views to windows or icons within the Client window, depending on the last state of each window. This command is equivalent to clicking on the Restore button above the upper right corner of the Client window. The active view menu disappears from the Menu bar when you select this command.
Minimize	To minimize all open Client views to icons within the Client window. The active view menu disappears from the Menu bar when you select this command.
Close	Close the current active (top) Client view.
Next	Select the next Client view. This command is equivalent to clicking the view tab to the right of the tab attached to the currently active view.

The Toolbar

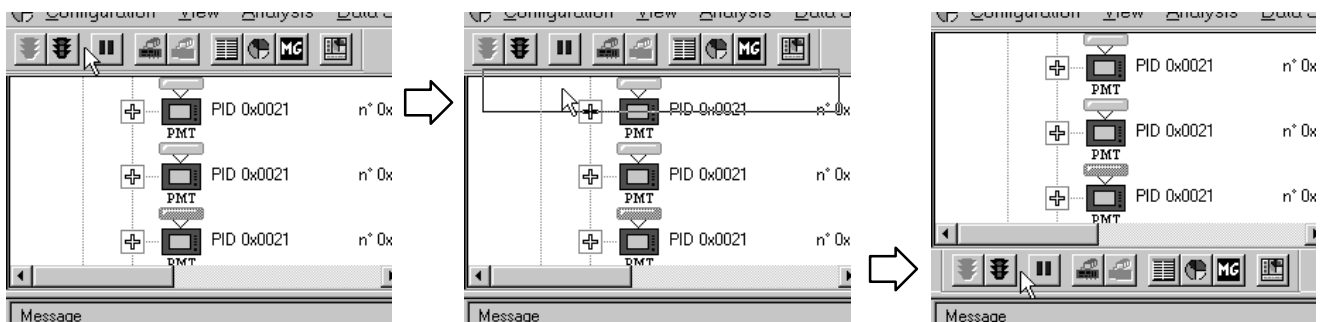
The toolbar provides shortcut buttons for many of the most often used menu commands. Click the button to choose the corresponding command. You can toggle the toolbar on and off with the View menu **Toolbar** command.



Icon	Name	Function
	Start Analysis	Begin analysis; equivalent to the Start command on the Analysis menu.
	Stop Analysis	End analysis; equivalent to the Stop command on the Analysis menu.
	Freeze (or Pause)	Suspend all window updates but continue monitoring incoming stream; equivalent to the Freeze views command on the View menu.

Icon	Name	Function
	Start Data Store (MTS 215 only)	Begin capturing the incoming stream onto the data store disks or pass the input stream through to the parallel output; equivalent to the Start command on the Data Storage menu.
	Stop Data Store (MTS 215 only)	Stop capturing the incoming stream; equivalent to the Stop command on the Data Storage menu.
	Message view	Open or select the Message view; equivalent to the Messages view command on the View menu.
	Statistic view	Open or select the Statistic view; equivalent to the Statistic view command on the View menu.
	DVB-MG view	Open or select the DVB-MG view; equivalent to the DVB-MG view command on the View menu.
	Restore standard	Equivalent to the Restore standard command on the Window menu.

You can relocate the toolbar elsewhere within the RTA application window as shown in the following sequence by clicking the gray area between two command buttons, dragging the bar to the new location, and releasing the mouse button.



The Status Bar

By default, the status bar appears at the bottom of the RTA application window. You can toggle the status bar on and off with the View menu **Status bar** command.



The Status bar shows the following information:

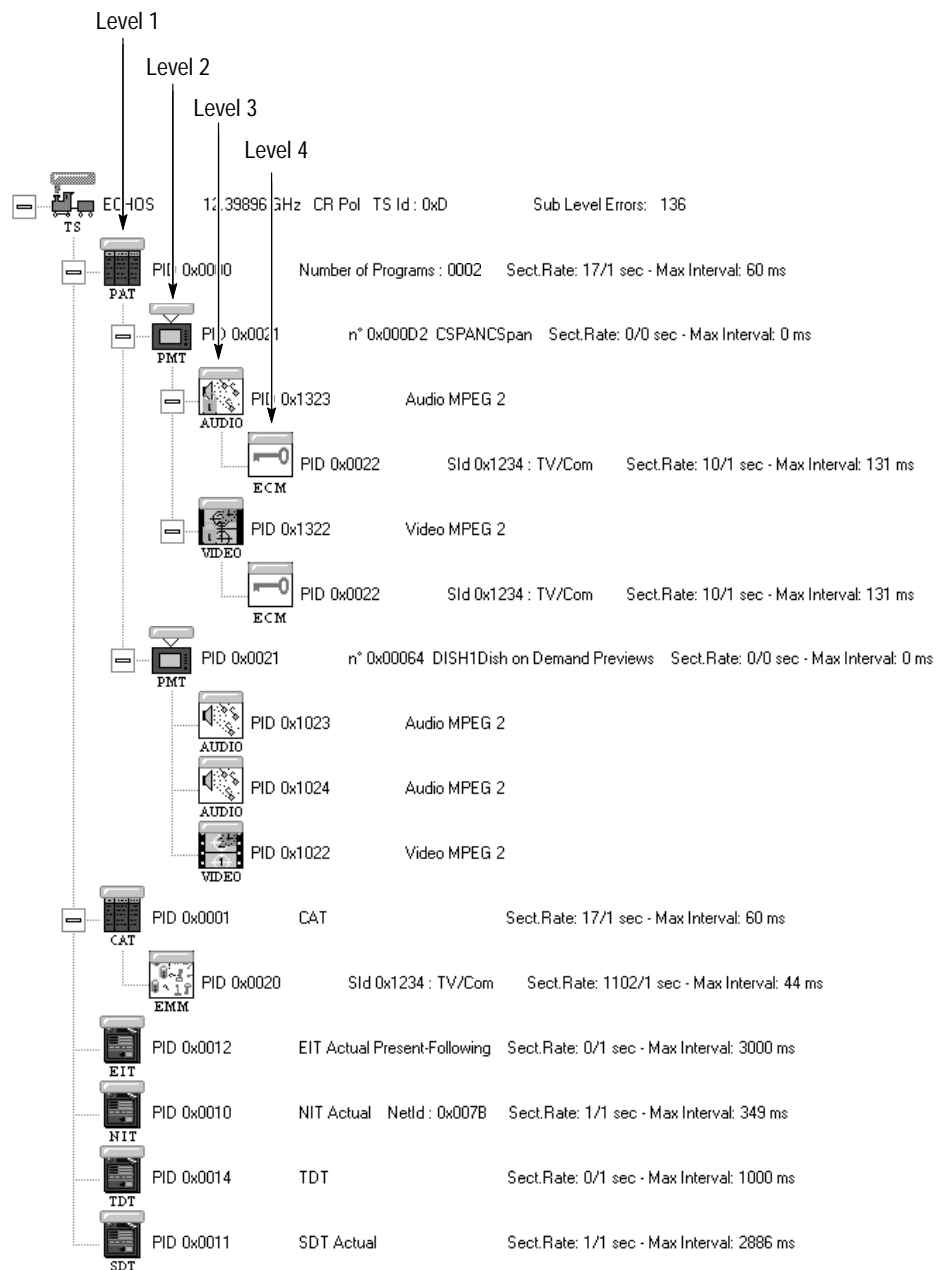
- **Help and status messages** for menu and toolbar commands. For example, when you select the **Freeze views** command from the View menu, the word **PAUSE** appears on the left end of the status bar, as shown in the following capture.



- The status (percent usage) of the PC-to-RTA communication buffer.
- The number of bytes (188 or 204) in the input stream transport packets.
- The global bit-rate of the input stream.
- Presence of priority one (MG1), priority two (MG2), and priority three (MG3) DVB-MG errors. If there is no error, a green sphere icon is displayed; when an error occurs, the sphere becomes red. If the error stops occurring, the icon becomes orange to indicate that at least one error has been detected in the past.
- Status of the TEI (Transport Error Indicator). The error indicator icon follows the same color conventions as the MG1, 2, and 3 indicators. The icon is gray when TEI analysis is disabled.
- State of the UNP (Unsynchronized Packet). The error indicator icon follows the same color conventions as the MG1, 2, and 3 indicators. The icon is gray when UNP analysis is disabled.
- Running state of the data storage (MTS 215 only). If the input stream is being saved on the data store disks, a cassette tape icon alternates with the abbreviation "REC."
- Running state of the analysis. If the stream is currently under analysis, the world globe icon at the right end of the bar appears to rotate.

The Hierarchic View

The Hierarchic view uses icons to show the interrelationship of stream components and displays additional text information about each component. The Hierarchic view can be the starting point for several types of analysis. The fully expanded Hierarchic view of a simple DVB transport stream might resemble the hierarchy below (you must enlarge the Hierarchy window pane to see this much of the view at one time).



The colored indicator rectangles above each icon highlight stream items in which errors have been detected. Refer to *Error Indicators* on page 3–35.

Hierarchic View Icons

Table 3–3 lists and explains the base icons used in the Hierarchic view. These icons normally appear in color on the RTA display except when the corresponding item is referenced in a table but has not yet appeared in the stream. Icons for these referenced but absent items remain grayed until the item appears in the input stream.

NOTE. *Grayed icons represent items that have been referenced, but not yet detected by the RTA. Ghost icons represent items that have been detected by the RTA but are not referred to in any table.*

An error indicator appears above each icon in the hierarchy. In addition, the PCR clocks and scrambling symbols are superimposed on icons when appropriate.

Table 3–3: Base icons used in the RTA Hierarchic view











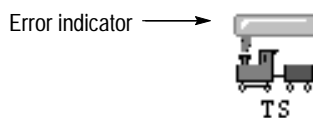
Icon	Element type
 TS	Transport stream
	PAT (Program Allocation Table) or CAT (Conditional Access Table)
 PMT	PMT (Program Map Table)
	Another PSI (MPEG-2) or SI (DVB) table, such as NIT, SDT, EIT, RST, or TDT, or a private table
 GHOST	GHOST. A ghost indicates one or more transport packets identified with a PID that is not referenced in an appropriate table.
 VIDEO	Video elementary stream
 AUDIO	Audio elementary stream
 DATA	Data stream

Table 3-3: Base icons used in the RTA Hierarchic view (Cont.)

Icon	Element type
 ECM	ECM (Entitlement Control Message) table
 EMM	EMM (Entitlement Management Message) table

Error Indicators. The colored rectangles that appear over each icon in the Hierarchic view are error indicators; the error indicator color conveys information about the monitoring and error status of the stream element.



A *gray* indicator signifies that no user-specified probes that affect the item are set and that the automatic tests have detected no errors.

A *green* indicator signifies that at least one user probe is set and that no error has been detected.

A *red* indicator signifies that at least one error has been detected and is still pending.

An *orange* indicator signifies that at least one error has been detected in the past but is no longer occurring.

When an error occurs at a given level, the indicator changes its color not only for the considered item, but also for all parent items. For example, if an error occurs for an elementary stream, both the program icon and the multiplex icon captions will change color. This is especially useful when the RTA detects errors when a “+” sign next to the icon indicates that the tree is collapsed.

PCR Clock Symbol. A PCR clock (⌚) symbol is added to the upper-right corner of stream icons to indicate streams that carry PCR clocks.



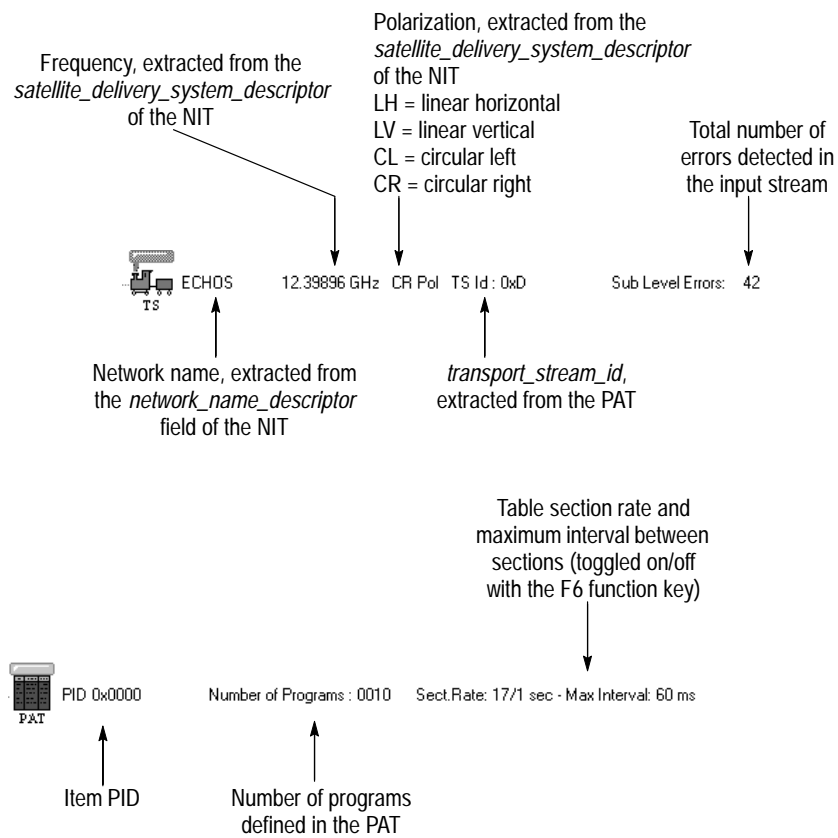
The TS railcar and clock icon represents PCR clocks in an independent stream (that is, transport packets containing PCRs).

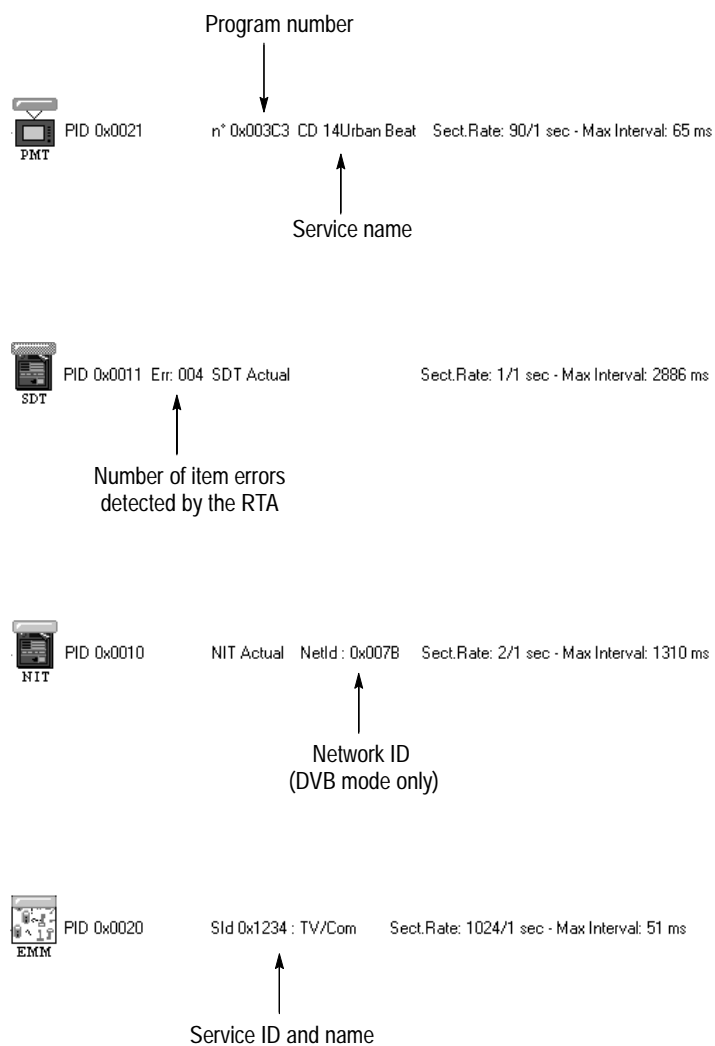
Scrambling Symbol. A padlock symbol (🔒) is added to the lower-left corner of stream icons to signify the streams that are scrambled.



Item Information

Information about an item appears to the right of its icon. The information depends on the type of item as shown in the following hierarchy excerpts.





Using the Hierarchic View

Table 3–4 summarizes the affects of mouse and keyboard actions that change the appearance of the Hierarchic view and reveal (or hide) additional information about the input stream.

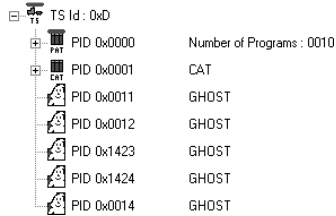
Table 3–4: RTA mouse and keyboard actions

Mouse action	Keyboard action	Affect on Hierarchy
Left-click on a Hierarchic view icon		Select the icon
Right-click on an icon		Display a shortcut menu for the hierarchy item. Refer to <i>Shortcut Menus</i> , on page 3–41.

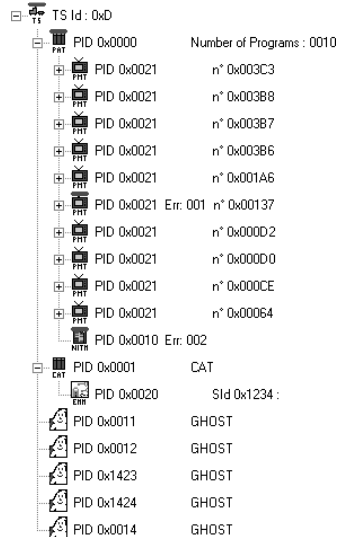
Table 3–4: RTA mouse and keyboard actions (Cont.)

Mouse action	Keyboard action	Affect on Hierarchy
Double-click on an icon		Open an item Message view in the Client window.
Click the + box next to an icon	Press + on the numeric keypad	Display one sub level (if any) below the selected icon.
Click the – box next to an icon	Press – on the numeric keypad	Collapse the sub level below the selected icon (will not override the F7 through F10 selections explained below).
	Press * on the numeric keypad	Open all sublevels below the selected icon.
	Press the up or down arrow key	Select the icon immediately above or below the currently-selected icon.
	Press F2	Toggle numeric display between hexadecimal and decimal base (for example, 0x00C1 ↔ 193).
	Press F3	Freeze/unfreeze view updates.
	Press F4	Reset all past errors; all orange error indicators become green or gray.
	Press F6	Toggle section rate display.
	Press F7	Show first-level hierarchy items only.
	Press F8	Show hierarchy items in the first and second levels only.
	Press F9	Show hierarchy items in the first three levels.
	Press F10	Show all hierarchy items in the first four levels. There will be no "+" signs to the left of hierarchy icons.

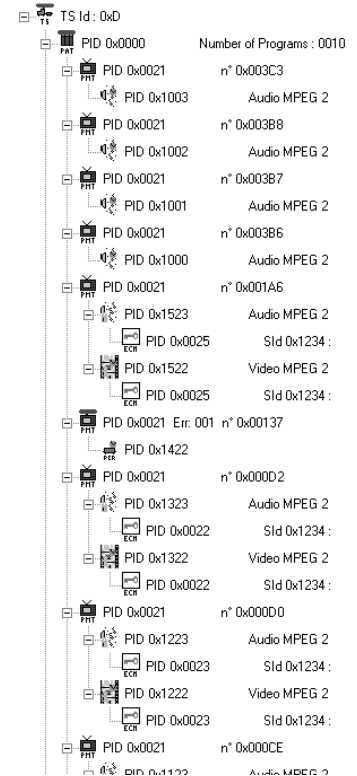
Press the F7 function key to hide all but the top-level hierarchy items.



Press the F8 function key to show only the top two hierarchy levels.



Press the F10 function key to show all items in the hierarchy.



Error Reporting in the Hierarchic View

In addition to the error indicator at the top of each Hierarchic view icon, the number of errors detected for the item or for sublevels of the item are listed in the text entry to the right of the icon.

For example, the following Hierarchic view shows that a total of 104 errors have been detected since monitoring began (or since the last error reset).

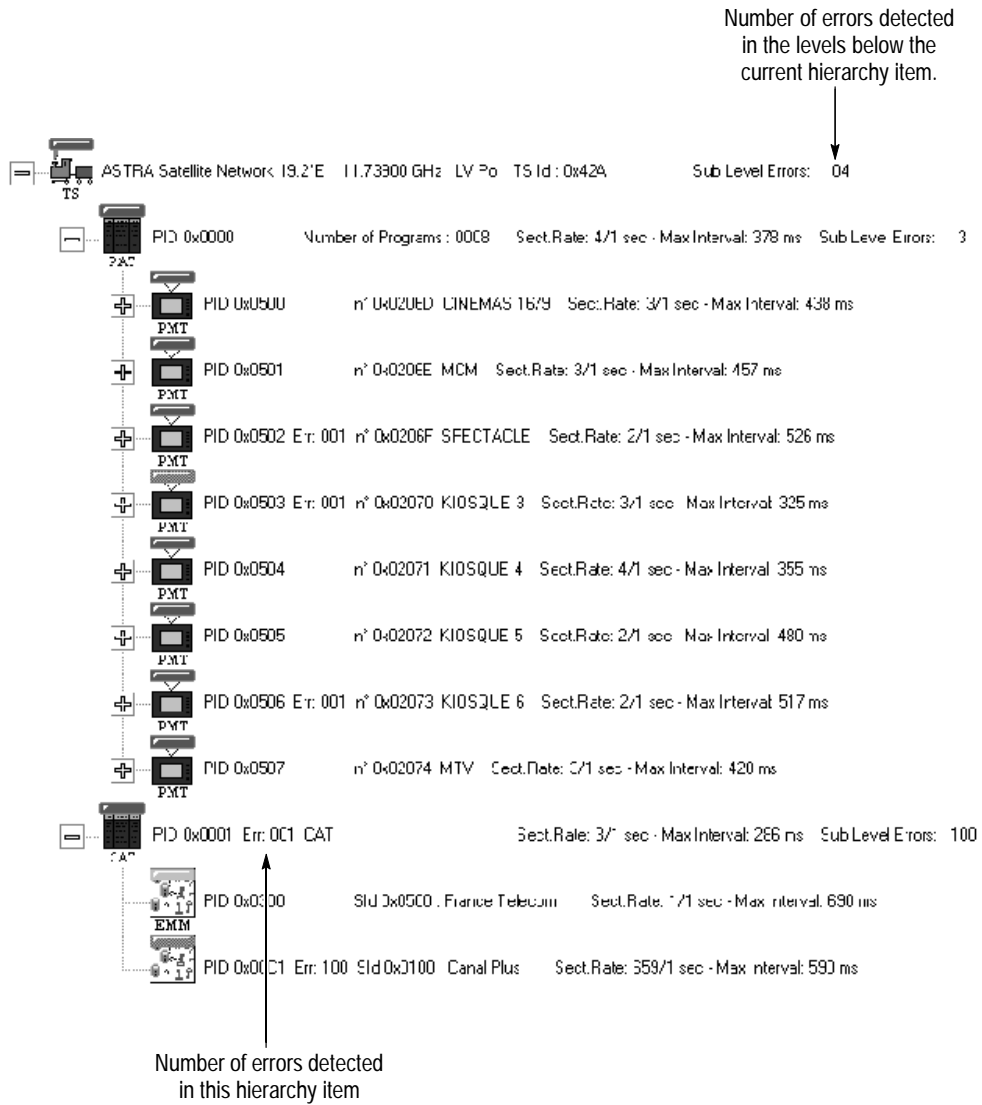
There have been three errors under the PAT:

One in the PMT of PID 0x502

One in the PMT of PID 0x503

One in the PMT of PID 0x506

There has been one error in the CAT and 100 errors under the CAT, in the EMM of PID 0x00C1.

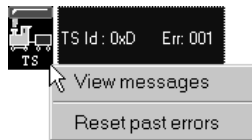


Shortcut Menus

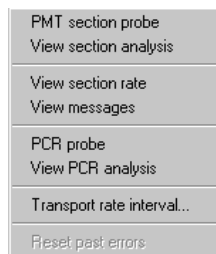
Every active hierarchy item that is represented by a color icon has a shortcut menu that enables you to learn more about a selected item, reset errors, and—depending on the item—set and clear probes directly from the Hierarchic view. Right-click on an icon to open the shortcut menu; then left-click on a menu command to select it.

The shortcut menus associated with the various stream items are shown in the following illustrations and explained in Table 3–5.

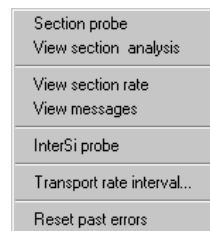
Transport Stream



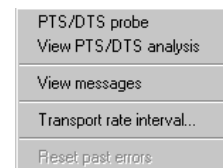
PMT



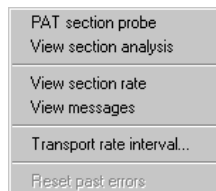
DVB-SI Table



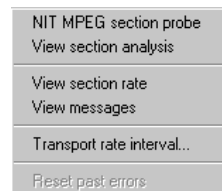
Elementary Stream



PAT



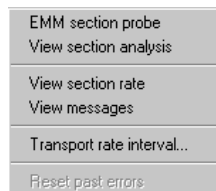
MPEG NIT



Private Section



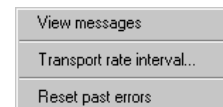
ECM



EMM



Ghost



Notice that grayed menu items are unavailable and cannot be selected. Items are unavailable for a number of reasons:

- PTS/DTS probes cannot be set on scrambled elementary streams.
- PTS/DTS probes cannot be removed through the shortcut menu when the probe has been set on all elementary streams through the Configuration menu.
- PCR probes cannot be removed when the probe has been set on all programs through the Configuration menu.
- **Reset past errors** is unavailable when no errors have been detected.

Table 3-5: Hierarchic view shortcut menu commands

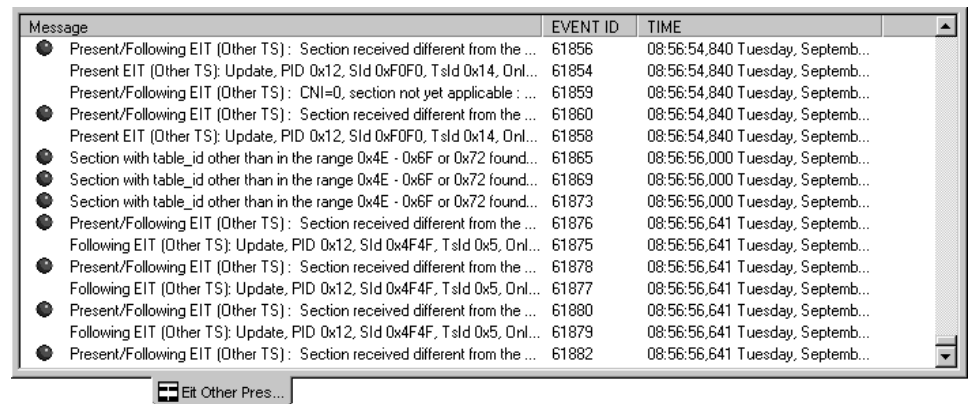
Select	To
(XXX) Section probe	Set or clear the probe for the selected section type; refer to <i>Section Syntax Probes</i> on page 3-21.
View section analysis	Open a section analysis view of the selected table; refer to <i>Section Analysis View</i> on page 3-59.
View section rate	Open a section rate view for the selected table; refer to <i>Section Rate View</i> on page 3-62.
View messages	Open an item message window in the RTA Client window pane or bring an already-opened message window to the front. Equivalent to double-clicking on the icon.
Transport rate interval	Set transport rate error thresholds for the selected item; refer to <i>Transport Rate Analysis</i> on page 3-1.
Reset past errors	Clear error history and reset error counter to zero. Enabled only when the error indicator is orange (indicating a past error, but no current errors).
PCR probe (PMT shortcut menu)	Set or remove a PCR probe on the selected program; refer to <i>PCR Probes</i> on page 3-18.
View PCR analysis (PMT shortcut menu)	Open a PCR analysis window for this program; refer to <i>PCR Analysis View</i> on page 3-64.
InterSI probe (DVB-SI shortcut menus)	Set or remove the InterSI probe; refer to <i>InterSI Probe</i> on page 3-16.
PTS/DTS probe (Elementary Streams)	Set or remove the PTS/DTS probe on the selected elementary stream; refer to <i>PTS/DTS Probes</i> on page 3-20.
View PTS/DTS analysis (Elementary Streams)	Open a PTS/DTS analysis window for this elementary stream; refer to <i>PTS/DTS Analysis View</i> on page 3-63.

The Message Window and Message Views

The Real-Time Analyzer displays information about the input stream, stream components, and detected errors in Message windows and Message views. By default, the General Message view, which displays all messages resulting from stream monitoring and analysis, appears in a separate window pane at the bottom of the RTA application window.



The RTA can also create additional Message views that are specific to a given stream item. To open an item Message view in the Client window pane, either double-click on the Hierarchic view icon or select **View messages** from the icon shortcut menu (refer to *Shortcut Menus* on page 3–41).



Message Types

The Message views can contain four types of messages, depending on configuration choices made in the **Message Views** settings panel (refer to *Messages View* on page 3–76 for configuration information):


- Information messages, which note significant events such as the establishment and loss of synchronization, updates of most PSI and SI tables, and error disappearance
- Error messages, with which the RTA attempts to report all errors detected in the input stream

- TDT and TOT update messages
- EMM update messages

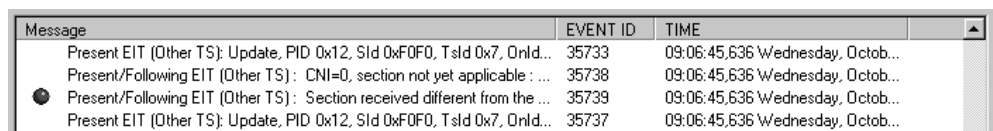
Some messages are highlighted by a colored indicator sphere at the left end of the display. A *blue* indicator precedes “Synchronization detected” messages; a *red* indicator precedes error messages; and a *yellow* indicator precedes “Loss of Synchro[nization]” messages.

The messages that appear in the Message views are determined by your view configuration choices, all RTA settings that affect error detection, and the contents of the input stream. For example, imagine that you configure the RTA to display information messages only and then (through the **Transport Rate Analysis** settings panel) set a low transport rate error threshold for a selected PID. Then, if the transport rate drops momentarily below the error threshold, you will not see an error message when the transport rate is below the threshold, but you will be informed when the error has disappeared.

Reading Messages

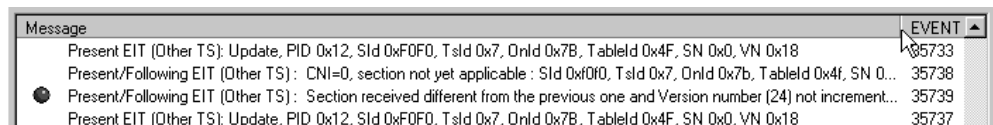
In the standard configuration, Message views can contain up to 1000 message lines. To see earlier messages that have scrolled off the top of the view, use the vertical scroll box and arrows to locate the message. If the RTA configuration and input stream contents result in frequent messages, you may have to first press F3 or click the toolbar **Pause** () button to suspend window updates. When more than 1000 messages are received, the earliest messages drop off the top of the list to make room for the latest messages at the bottom.

Because each Message view line represents a single message, the entire text often does not fit in the available display space.



Message	EVENT ID	TIME
Present EIT (Other TS): Update, PID 0x12, SId 0xF0F0, T sId 0x7, OrId...	35733	09:06:45,636 Wednesday, Octob...
Present/Following EIT (Other TS): CNI=0, section not yet applicable: ...	35738	09:06:45,636 Wednesday, Octob...
● Present/Following EIT (Other TS): Section received different from the ...	35739	09:06:45,636 Wednesday, Octob...
Present EIT (Other TS): Update, PID 0x12, SId 0xF0F0, T sId 0x7, OrId...	35737	09:06:45,636 Wednesday, Octob...

To see more of a message, drag the column border (in the window heading, between the **Messages** column and the **Event ID** column) to the right.



Message	EVENT ID	EVENT
Present EIT (Other TS): Update, PID 0x12, SId 0xF0F0, T sId 0x7, OrId 0x7B, TableId 0x4F, SN 0x0, VN 0x18	35733	
Present/Following EIT (Other TS): CNI=0, section not yet applicable: SId 0xF0F0, T sId 0x7, OrId 0x7b, TableId 0x4f, SN 0...	35738	
● Present/Following EIT (Other TS): Section received different from the previous one and Version number (24) not increment...	35739	
Present EIT (Other TS): Update, PID 0x12, SId 0xF0F0, T sId 0x7, OrId 0x7B, TableId 0x4F, SN 0x0, VN 0x18	35737	

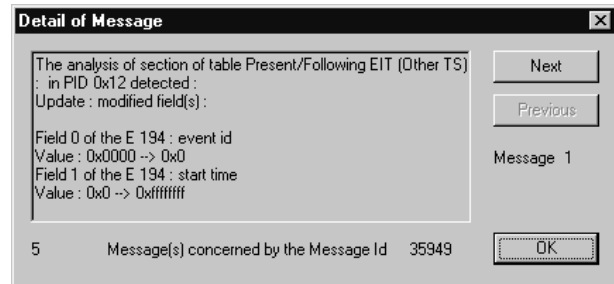
To make the column width fit the longest message, double-click the border; then you may have to drag the horizontal scroll box to the right to read the entire message.

When the RTA is set to log messages to the Windows NT Event Viewer (as it is in the standard configuration), you can double-click on a message to open a **Detail of Message** window.

```

Present EIT (Other TS): Update, PID 0x12, SId 0x4F4F, Tslid 0x14, Orld 0x7B, TableId 0x4F, SN 0x0, VN 0x5      35945
● Present/Following EIT (Other TS): Section received different from the previous one and Version number (5) not incre... 35949
Present EIT (Other TS): Update, PID 0x12, SId 0x4F4F, Tslid 0x14, Orld 0x7B, TableId 0x4F, SN 0x0, VN 0x5      35948

```



Notice that a single Message view line can represent several Event Viewer entries.

Printing Messages

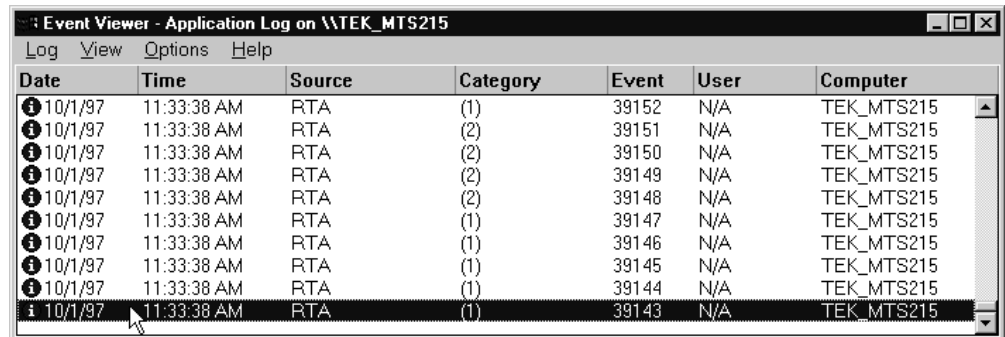
Select **Print** from the View menu (or press CTRL+P) to print some or all of the messages in the current message window. It is good practice to choose **Print Preview** before printing from the RTA to verify that you have selected the correct window and to discover which pages contain the messages you are interested in. In the standard configuration, a Message view can contain up to 1000 message lines, which, when printed, will occupy more than 40 letter-sized pages.

Messages and the Event Viewer

The RTA can save message details in the Windows NT Event Viewer Application log. This gives you the opportunity to save a permanent record of RTA events which would otherwise be lost when you pause window updates (**Freeze views** in the View menu), begin another analysis session, or exit the application.

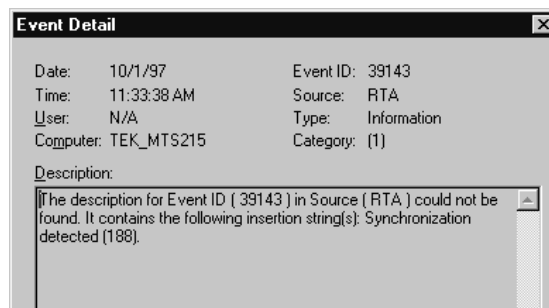
Turn Event Viewer logging on or off through the **Settings** command on the RTA configuration menu; the Event viewer selection is on the **General** panel of the resulting **Settings** window.

When you open a **Detail of Message** window from within a Message view, you are accessing the Event Viewer Application log. To access the log directly, start the Event Viewer application through the Windows NT Start menu (select **Programs, Administrative Tools (Common), Event Viewer**). When the **Event Viewer** window opens, select **Application** from the Log menu.



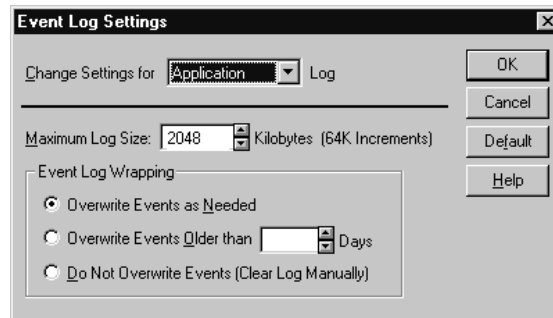
Date	Time	Source	Category	Event	User	Computer
10/1/97	11:33:38 AM	RTA	(1)	39152	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(2)	39151	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(2)	39150	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(2)	39149	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(2)	39148	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(1)	39147	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(1)	39146	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(1)	39145	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(1)	39144	N/A	TEK_MTS215
10/1/97	11:33:38 AM	RTA	(1)	39143	N/A	TEK_MTS215

The Application Log can contain hundreds of entries; use the vertical scroll bar and arrows to see entries that will not fit in the window. If the RTA is running, press F5 occasionally to refresh the view. To open an **Event Detail** window, double-click on a log entry.



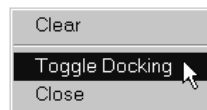
You can save the current contents of the Application Log to a file for later use, you can clear the log to make room for more entries, you can change the log size, and you can specify how the Event Viewer acts when the log is full. Refer to the Windows NT documentation (or the Event Viewer online help) for more information.

NOTE. For best results, do not select any Event Viewer log wrapping setting other than **Overwrite Events as Needed**. The RTA may freeze if the application event log fills to capacity during stream analysis. Choose **Log Settings** from the Log menu of the Event Viewer to verify the current log wrapping option and to change the size of the application event log, if necessary.



The Message View Shortcut Menu

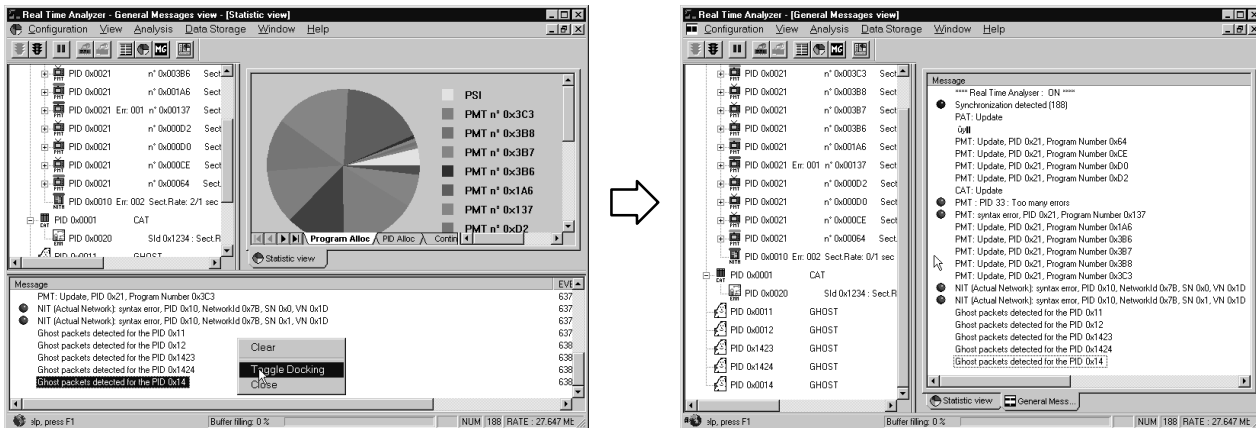
The Message view shortcut menu appears when you right-click within a Message view or window. The three commands as shown below are **Clear**, **Toggle Docking**, and **Close**.



Clear. Select the Clear command to erase all messages from the window. This command does not reset past errors or suspend window and view updated. New messages appear in the window as they are generated by the RTA.

Close. Select the Close command to close the general message window. All messages are erased. You can later select the **Messages view** command on the View menu to open a new General Message window.

Toggle Docking. Select the Toggle Docking command to toggle the position of the General Message window between the default position, at the bottom of the application window, and the alternate position, within the Client window.



The Client Window Pane

The Client window pane occupies the upper-right portion of the default RTA application window. Immediately after you start analysis, the Client window contains the maximized Statistic view as shown the left side of the above illustration.

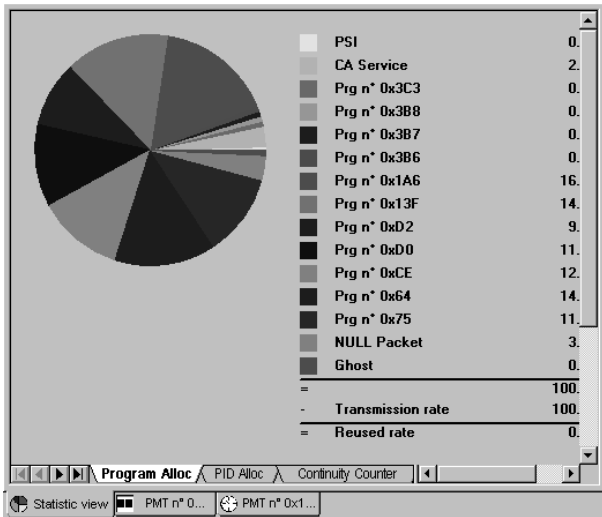
You can also open several different stream analysis results views in the Client window. This section describes the following client views; the descriptions begin on the indicated page:

- *Statistic view*; page 3–50
- *DVB-MG view*; page 3–57
- *Section analysis view*; page 3–59
- *Section rate view*; page 3–62
- *PTS/DTS analysis view*; page 3–63
- *PCR analysis view*; page 3–64

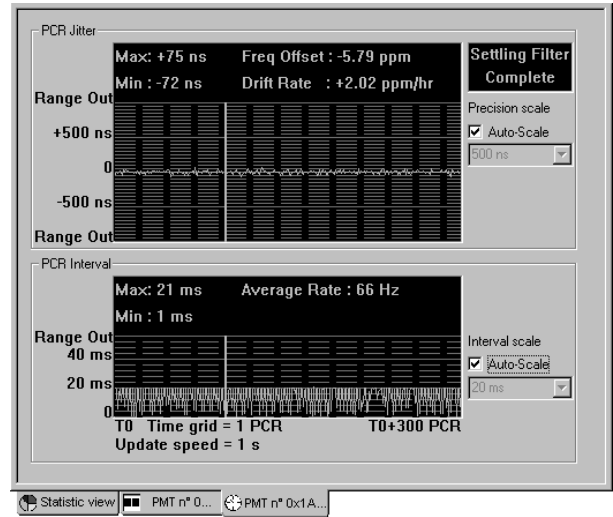
You can also open hierarchy-item Message views in the Client window; for information, refer to *The Message Window and Message Views* beginning on page 3–43.

Client Window Features and Conventions

Normally, the Client views are maximized. That means that each view occupies the entire Client window. If more than one view is open at a time, you can switch among them by clicking the appropriate view tab at the bottom of the Client window.

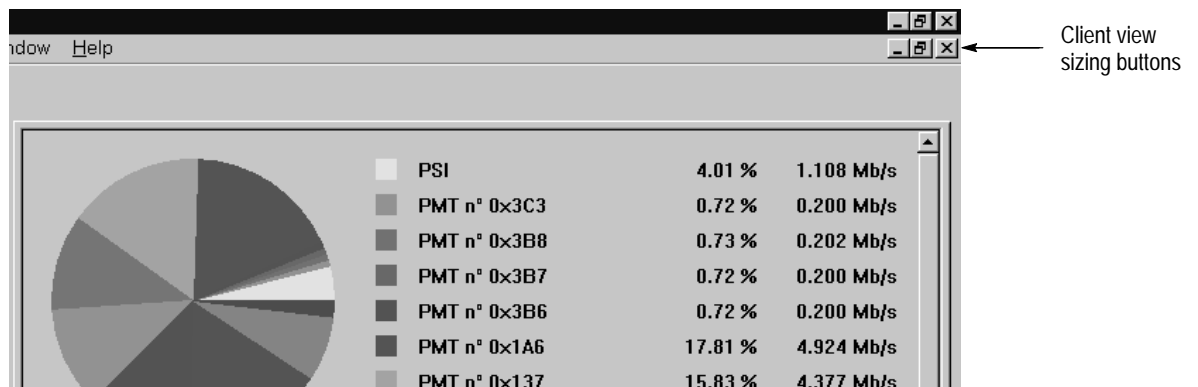


Statistic view tab



PCR analysis view tab

Sizing (Minimize, Restore, and Close) buttons appear on the right end of the menu bar when the Client windows are maximized.



- Click the Close button (X) to close the top (currently selected) view.

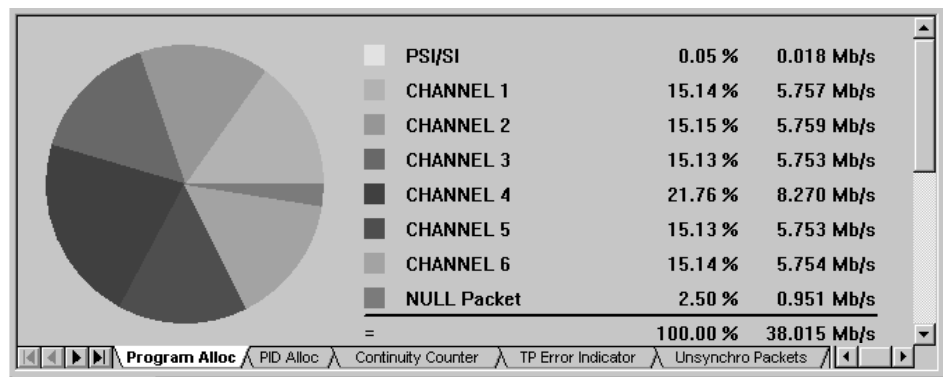
NOTE. Closing a window clears all existing information. Unless you are logging messages to the Event Viewer, all information in a Client view is lost when you close the view.

- Click the Minimize button (☐) to reduce the top view to an icon within the Client window and change all other Client views to windows or icons within the Client window, depending on their previous size. Each window and icon has its own sizing buttons; the sizing buttons disappear from the menu bar.
- Click the Restore button (☒) to reduce all client views to windows or icons within the Client window, depending on their previous status, if any. Again, the sizing buttons disappear from the menu bar because each icon and window has its own sizing buttons.

To simultaneously maximize the Statistic view and close other client views, select **Restore standard** from the Window menu or click the **Restore Standard views** toolbar button.

The Statistic View

The Statistic view is actually a collection of five different tabbed views or panels that display data about the input stream and the programs carried in the stream. One panel is displayed at a time; select the page by clicking on the corresponding tab on the bottom of the view window.



The five Statistic view panel tabs

This section describes the following Statistic view panels; the descriptions begin on the indicated page:

- *Program Alloc(ation)*; page 3–52
- *PID Alloc(ation)*; page 3–53
- *Continuity Counter*; page 3–55

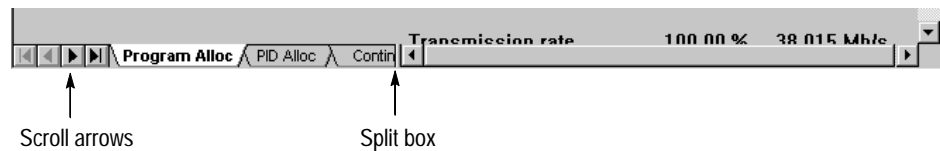
- *TP (Transport Packet) Error Indicator*; page 3–55
- *Unsynchro(nized) Packets*; page 3–56

Statistic View Features and Conventions.

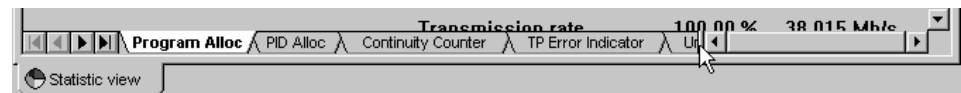
The Program Allocation panel of the Statistic view appears in the Client window immediately after you begin input stream analysis.

When the view first opens, most tabs are hidden by the horizontal scrollbar. You can click the scroll arrows to reveal the remaining tabs, or you can click the thin split box and drag to the right to shorten the scrollbar.

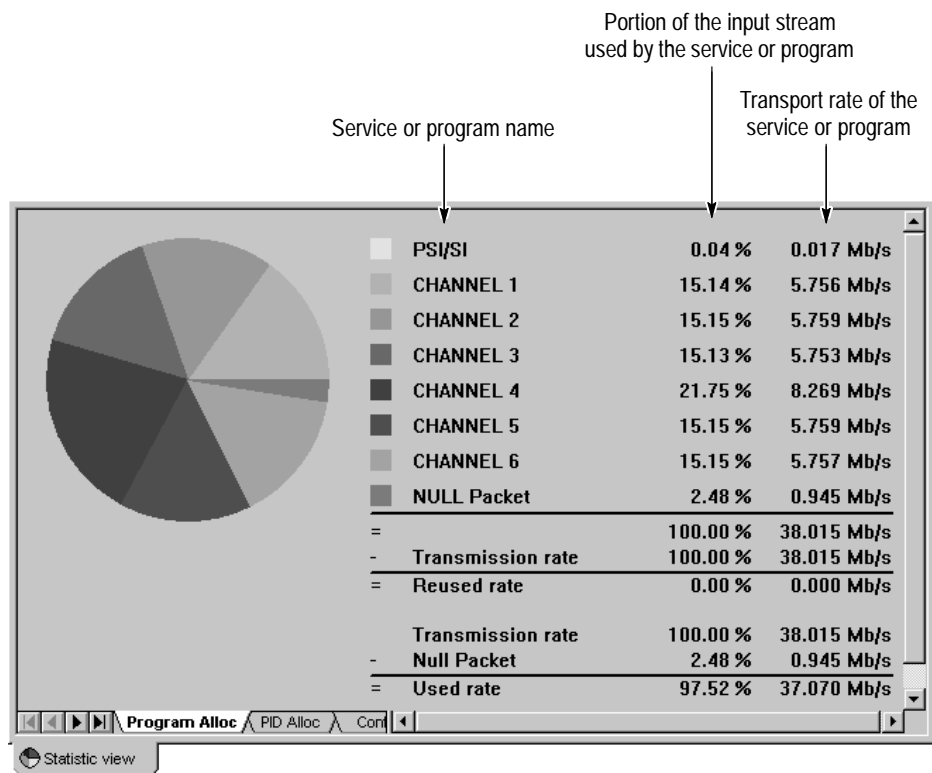
This is the original tab and scrollbar configuration:



This is how it looks when the scrollbar is shortened:

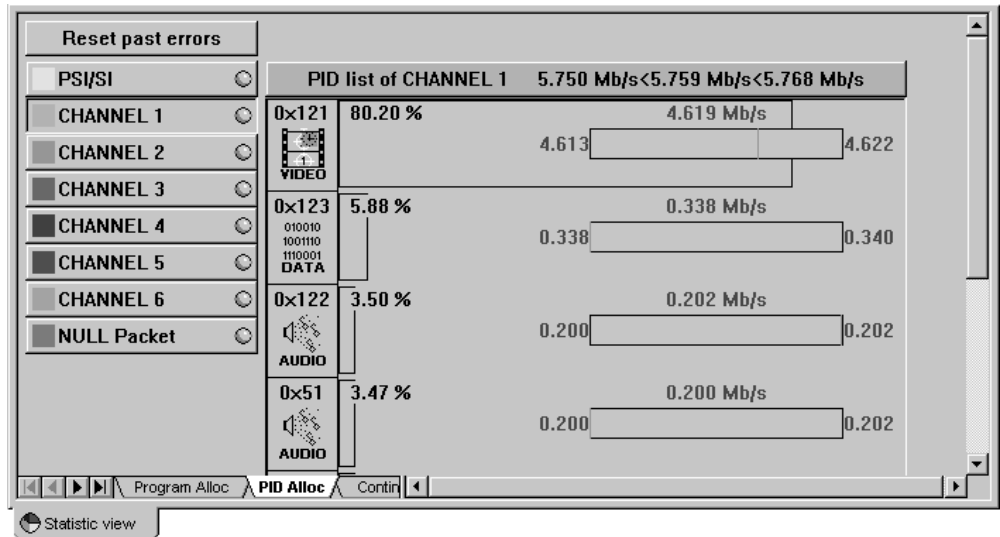


Program Allocation. The Program Alloc panel shows the bandwidth allocation of the input multiplex. The yellow slice of the pie chart represents PSI/SI information; each remaining colored slice represents a program, null packets, or unreferenced (ghost) packets. The pie chart and accompanying color-coded list provide both a graphic and numeric report of bandwidth usage.



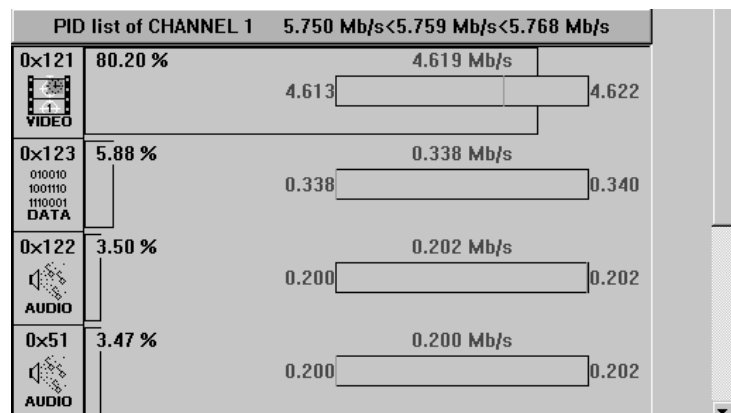
Double-click on a slice of the pie chart to switch to the PID allocation panel with the corresponding program already selected. The PID allocation panel is described next.

PID Allocation. The PID Alloc panel gives a more detailed, program-level view of input stream bandwidth allocation. Instantaneous, previous maximum, and previous minimum multiplex rates are shown by PID for the selected program.

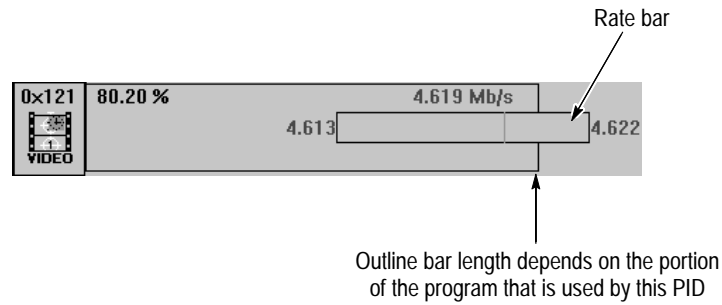


Select a program by clicking the corresponding button on the left edge of the PID Allocation panel or by double-clicking the program slice in the Program Allocation view. Each program button has a round error indicator “light” that shows the status of any transport rate probe that is set. Click **Reset past errors** (in the upper-left corner of window) to reset previously-detected transport rate errors. Refer to *Transport Rate Analysis* on page 3–1 for complete information.

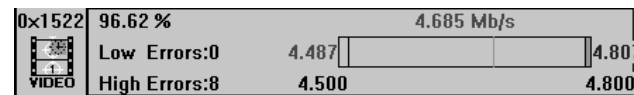
The right portion of the PID Allocation panel shows transport rate activity for the entire program and for its constituent parts. Use the vertical scroll bar, if necessary, to reveal the remaining parts of the program.



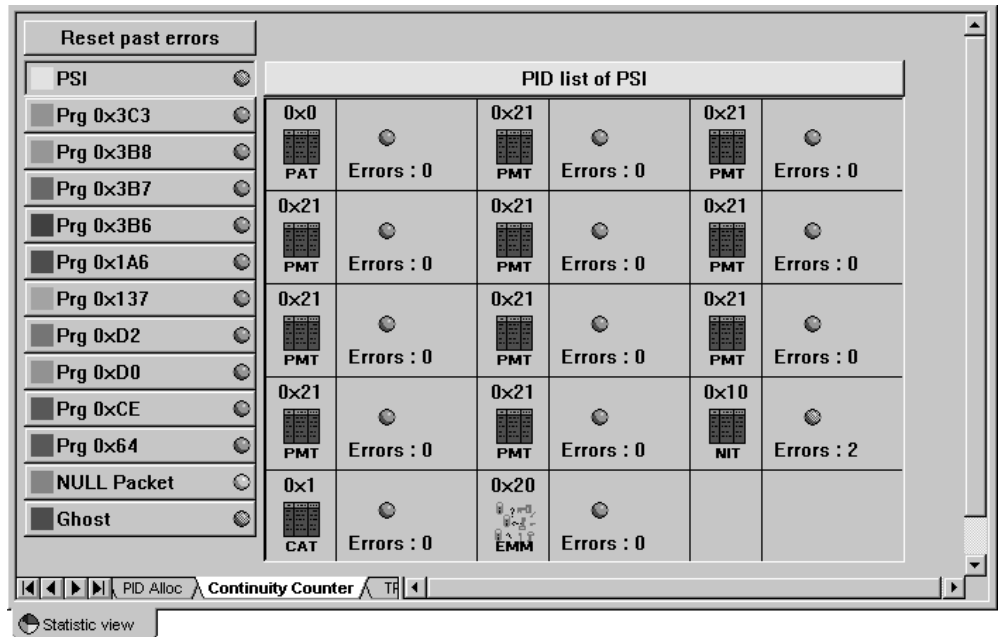
In the panel shown above, the program CHANNEL 1 has an instantaneous transport rate of 5.759 Mbits/s and has been between 5.750 and 5.768 Mbits/s. The PID 0x121 video stream has an instantaneous rate of 4.619 Mbits/s, has ranged from 4.613 to 4.622 Mbits/s, and represents 80.20 % of the program.



You can right-click on the PID list to set transport rate error limits. When PID transport rate limits are set, limit and error data are also shown; refer to *Transport Rate Analysis* on page 3-1 for more information.



Continuity Counter. The Continuity Counter panel shows the results of automatic monitoring (per the DVB measurement guidelines, ETR 290) for each PID in the selected program or service. The data are displayed PID-by-PID, similar to the PID Allocation view.



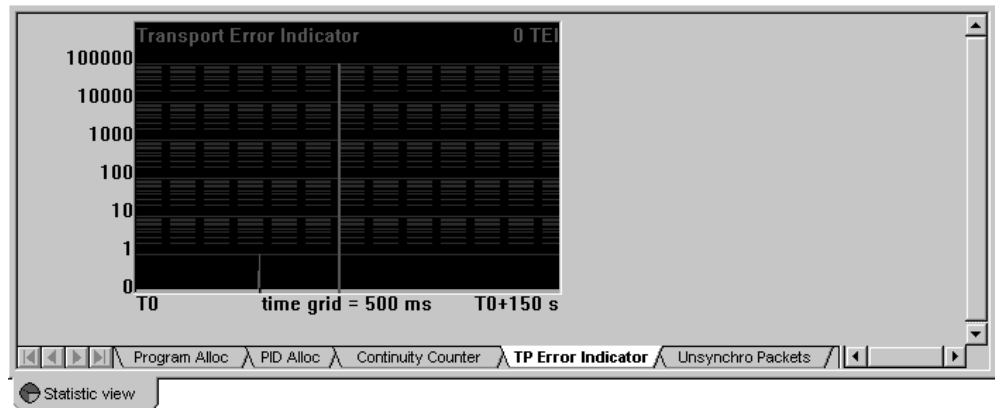
Select a program by clicking the corresponding button on the left edge of the panel. Each program button has a round error indicator light that shows the presence or absence of continuity counter errors in that program; the right portion of the panel shows the error status of each individual PID in the program.

- A *Green* light indicates that there is no continuity counter error.
- A *Red* light indicates that at least one continuity counter error has occurred in the last second.
- An *Orange* light indicates that at least one continuity counter error has occurred in the past. The exact number of errors is shown under the light.

Click **Reset past errors** (in the upper-left corner of window) to reset all previously-detected continuity counter errors (all orange lights become green).

Transport Packet Error Indicators. The TP Error Indicator panel reports the results of the automatic transport error indicator (TEI) monitoring per ETR 290. The RTA checks the *transport_error_indicator* field of every transport packet header

and counts the number of packets with this bit-field set to 1 every 500 ms. The Transport Packet Error Indicator panel displays the results in graphical form.

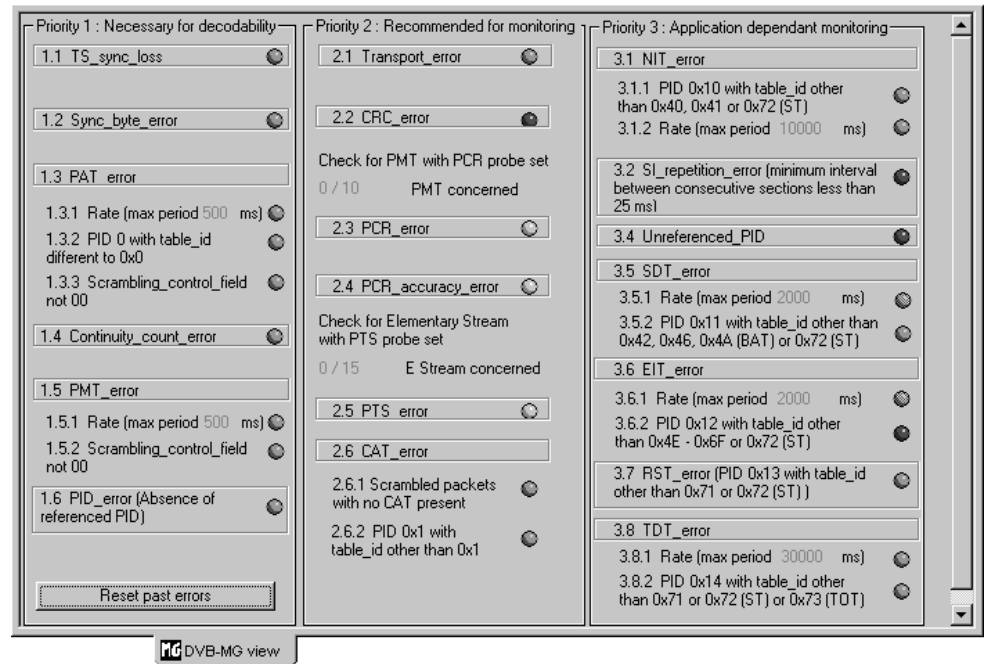


The horizontal (time) scale of the graph is linear. The vertical (errors/500 ms) scale is logarithmic to show both very low and very high error rates.

Unsyncronized Packets. The Unsynchro Packets panel reports the results of the automatic sync byte monitoring per ETR 290. The RTA checks the *sync_byte* field of every transport packet header and counts the number of packets with incorrect values every 500 ms. The Unsyncronized Packets panel displays the results in the same graphical format as the transport error indicator panel: The number of packets with *sync_byte* other than 0x47 is counted every 500 ms and plotted on a graph with a logarithmic vertical scale.

The DVB-MG View

The two DVB-MG views provide an at-a-glance report of all DVB-MG² recommended tests performed by the RTA.



To open a DVB-MG view, point to **DVB-MG view** on the View menu and then click either **Detailed** or **Monitor**. Or click the **DVB-MG view** toolbar button to quickly open the DVB-MG Monitor view.

In either DVB-MG view, test numbers are those used in the DVB measurement guidelines, ETR 290. A colored indicator light shows the status of each test. The colors are consistent with other RTA indicators:

- *Gray* signifies that the RTA is not currently performing the test.

A test is not performed for one of three reasons: the user probe is not set; the test is disabled through the RTA Configuration menu; or the input stream does not contain the applicable table (MPEG-2 streams, for example, do not contain SI tables; therefore, tests 3.2 through 3.8 cannot be performed).

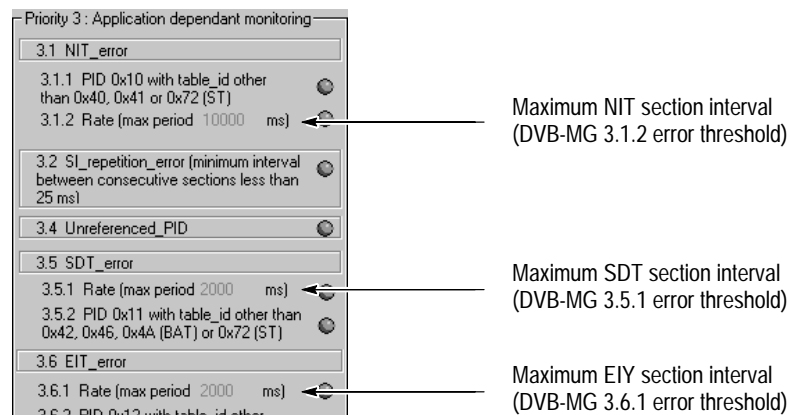
- *Green* signifies that the test is running and that no errors have been detected.
- *Red* signifies that at least one error is occurring.
- *Orange* signifies that at least one error occurred in the past.

² DVB-MG is the DVB consortium working group that is responsible for recommending measurements and controls to be performed on all the elements of a digital television chain. See *Appendix A: DVB-MG Measurements* for additional information about the DVB-MG recommendations and tests.

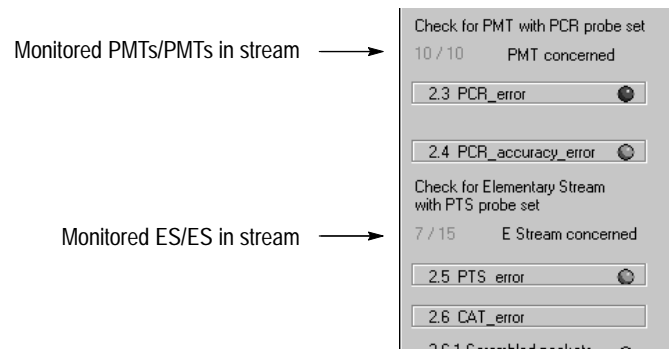
You can double-click on a red or orange indicator to open a message view that displays the error messages that pertain to that particular DVB-MG error condition.

The DVB-MG Detailed View. In the DVB-MG Detailed view, shown on the previous page, three columns list the tests defined in the DVB-MG recommendations by name and reveal additional information about test thresholds and affected stream items.

Tests 1.3.1, 1.5.1, 3.1.2, 3.5.1, 3.6.1, and 3.8.1 use error criteria that can be changed on the Section Rates Analysis tab of the **Settings** window. The current values are displayed in gray on the DVB-MG Detailed view.

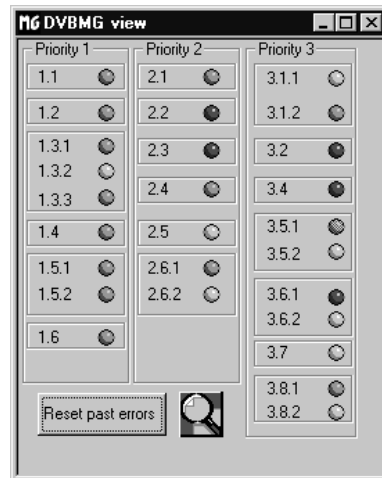


Tests 2.3, 2.4, and 2.5 (PCR and PTS/DTS probes) are not automatic and are performed only on user-selected PMTs and elementary streams. Therefore, the detailed view shows how many of PMTs and elementary streams (ES) in the input stream have been selected for monitoring.



Click **Reset past errors**, at the bottom of the first column, to reset all previously detected DVB-MG errors (all orange lights become green).

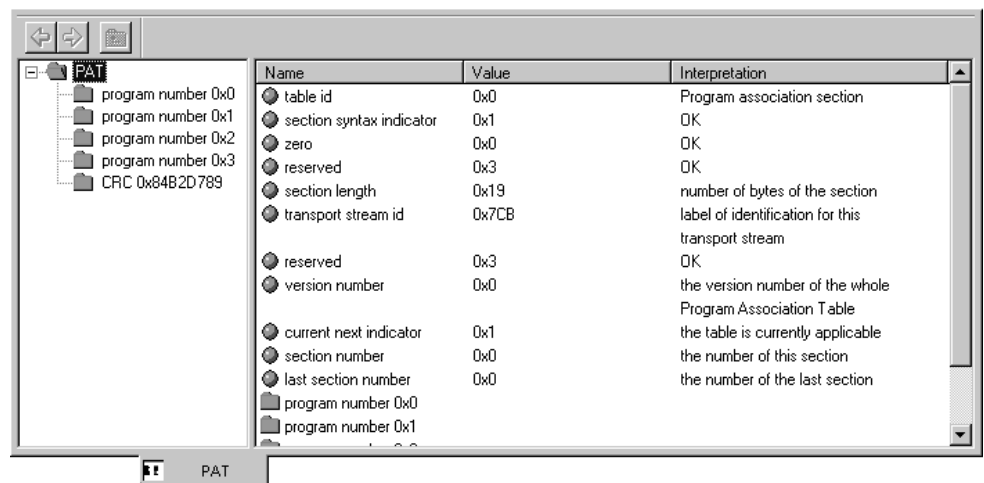
The DVB-MG Monitor View. The DVB-MG Monitor view is a simplified version of the detail view. It is especially useful when you have reduced all client views to windows because it leaves the greatest possible Client window area free for other views. Click the magnifying glass icon at the bottom of the monitor view to open a detailed view.



As in the detailed DVB-MG view, double-clicking an orange or red error indicator opens a message view that contains messages pertaining to the error.

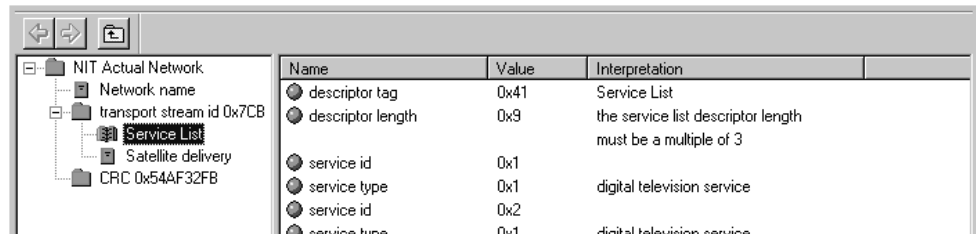
Section Analysis View

The Section analysis view provides a hierarchic and field-by-field view of the selected table section.



In the left sub-view hierarchy, related fields are grouped and shown as folders and other icons. With some table types you can expand and collapse the

hierarchy as you would a Windows NT Explorer directory hierarchy. Click a hierarchy icon to show the contents of the represented item in the right sub-view. You can also double-click the same icon in the right sub-view to show the same information.

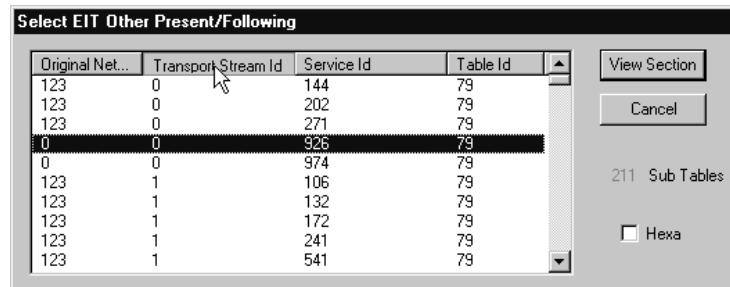


Opening a Section Analysis View. To open a section analysis view, select **View section analysis** from the shortcut menu of the Hierarchic view icon that represents the table you are interested in. (Select the icon, then right-click to open the shortcut menu; move the pointer to highlight **View section analysis** and then click to open the view.) Selecting **View section analysis** automatically selects the **Section probe** menu item as well.



If you choose **View section analysis** for an NIT, SDT, or EIT, a dialog box opens to permit further selection of table sections. The **Select EIT** list identifies the sections by their original network ID (Onid), transport stream ID (TSid),

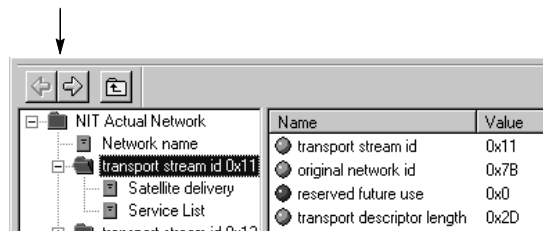
Service ID, and Table ID. SDT sections are identified by the Onid and TSid. You can reorder either list by any one of the IDs by clicking the column header.



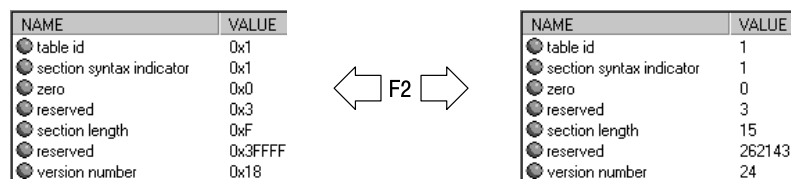
Highlight the desired subtable and click **View Section**.

Scrolling Among Subtable Sections. When more than one section of the selected subtable exists, use the section selection buttons to scroll among the sections.

Section selection buttons



Changing Numeric Display. Although the normal numeric display is hexadecimal, it may be convenient in some instances to see the decimal value of one or more fields. Press the F2 function key to toggle between decimal and hexadecimal display.

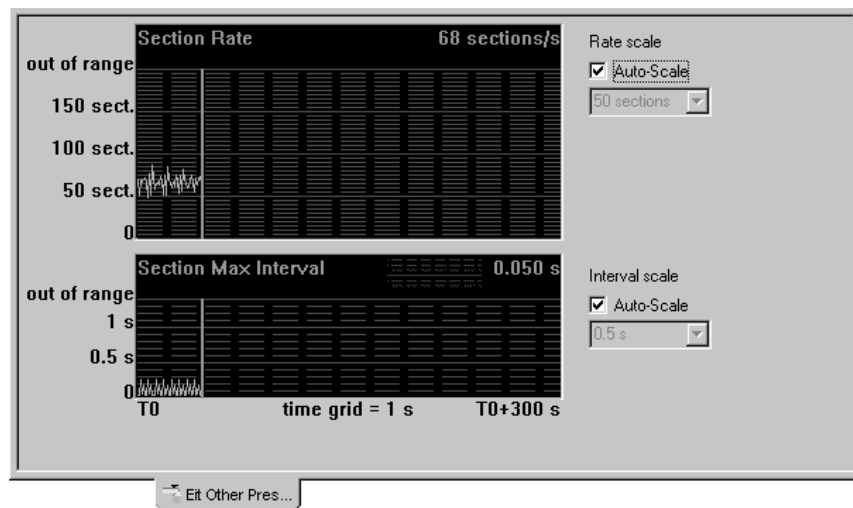


Printing a Section Analysis View. You can print a record of the current Section Analysis by selecting the view and the choosing **Print** from the View menu (or pressing **CTRL+P**). Select the view by clicking in the Client window pane; check the title bar of RTA Application window confirm that the view is selected.



Section Rate View

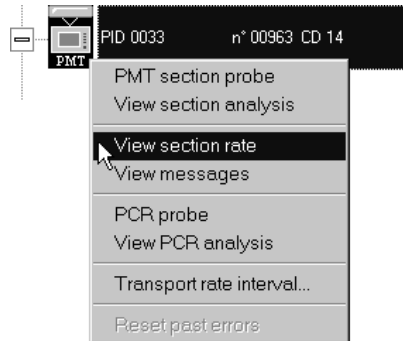
The section rate view contains graphs that show the section rate and time interval between sections of the selected table.



All scales on the rate and interval graphs are linear. To change the vertical scale on either graph, clear the corresponding **Auto-Scale** box and select an appropriate scale increment from the drop-down list box. The Section Rate vertical scale ranges from zero to four times the selected scale increment; the Section Max Interval scale ranges from zero to approximately three times the scale increment. Notice that both vertical scales begin at zero regardless of the scale setting.

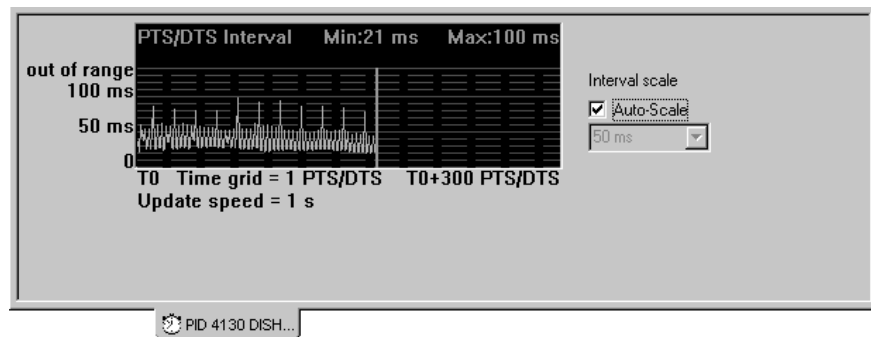
The lower **Section Max Interval** graph displays interval errors in red when the automatic maximum section interval analysis is enabled, as it is in the standard configuration (refer to *Maximum Interval Between Consecutive Sections* on page 3–13).

To open a section rate view of a table, select the corresponding Hierarchic view icon, right-click to open the shortcut menu, and then click **View section rate**.

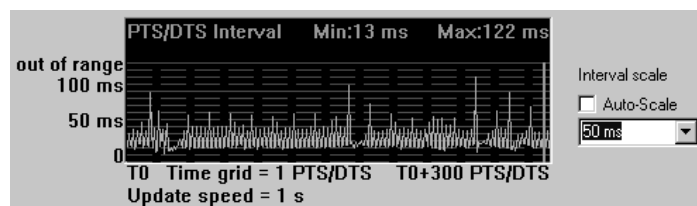


PTS/DTS Analysis View

The PTS/DTS analysis view graphs the interval between consecutive time stamps in the selected elementary stream. The minimum and maximum intervals between any two of the last 300 time stamps are also shown.

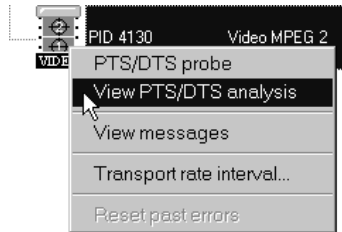


To change the vertical scale of the graph, clear the **Auto-Scale** box and select an appropriate scale increment from the drop-down list box. The interval vertical scale ranges from zero to approximately three times the selected scale increment.



To open a PTS/DTS analysis view of a video or audio elementary stream, select the corresponding Hierarchic view icon, right-click to open the shortcut menu,

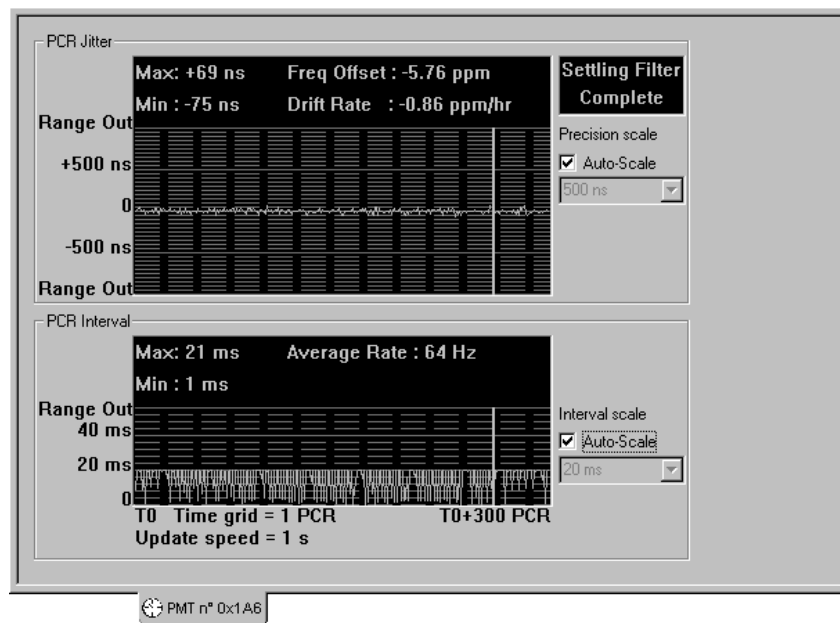
and then click **View PTS/DTS analysis**. Selecting **View PTS/DTS analysis** automatically selects the **PTS/DTS probe** menu item as well, activating the probe for the selected elementary stream only. The PTS/DTS interval graph does not update unless the PTS/DTS probe is active for the given elementary stream.



The RTA cannot open a PTS/DTS analysis view for a scrambled elementary stream; therefore, the **View PTS/DTS analysis** menu choice is unavailable when the lock symbol appears on the stream icon.

PCR Analysis View

The PCR analysis view is a graphical display of PCR precision and frequency. The upper graph plots the precision of each clock reference of the selected program, while the lower graph plots the interval between consecutive references used by the program. Each graph contains numeric readout of the minimum and maximum values measured in the last 300 clock references.

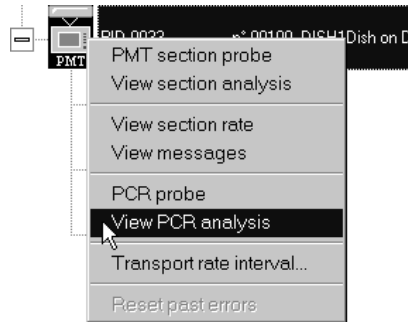


Red colored portions of the graphs and red Min or Max readouts indicate that the data exceeds the RTA PCR error limits. The default interval error limit is 100 ms

in MPEG-2 mode and 40 ms in DVB mode. Any interval between consecutive clock references that exceeds these values is reported as an error. The default precision error limit is ± 500 ns for both modes. To view or change the PCR error limits, select **Settings** from the Configuration menu and then click the **PCR Analysis** tab on the resulting **Settings** window. Refer to *PCR Analysis* on page 3–87 for more information.

To change the vertical scale on either graph, clear the corresponding **Auto-Scale** box and select an appropriate scale increment from the drop-down list box. The range of the Precision graph is approximately \pm twice the selected increment; the range of the Interval graph is from zero to approximately three times the selected interval.

To open a PCR analysis view, select the appropriate Hierarchic view PMT icon, right-click to open the shortcut menu, and then click **View PCR analysis**.



Selecting **View PCR analysis** automatically selects the **PCR probe** menu item as well. The PCR graphs do not update unless the PCR probe is active for the given program.

Configuration

Configuration, as used in the Real-Time Analyzer interface, has the following two meanings:

1. Configuration is the process of changing one or more of the instrument settings.
2. A Configuration is also the collection of all hardware and software settings at any given time; that is, the way the RTA is configured.

The Configuration menu has commands for changing the settings and for saving and restoring configurations. This section discusses use of Configuration menu commands and explains all of the instrument settings in detail.

Changing the Configuration begins on page 3–68.

Saving and Restoring Configurations begins on page 3–69

RTA Settings begins on page 3–72.

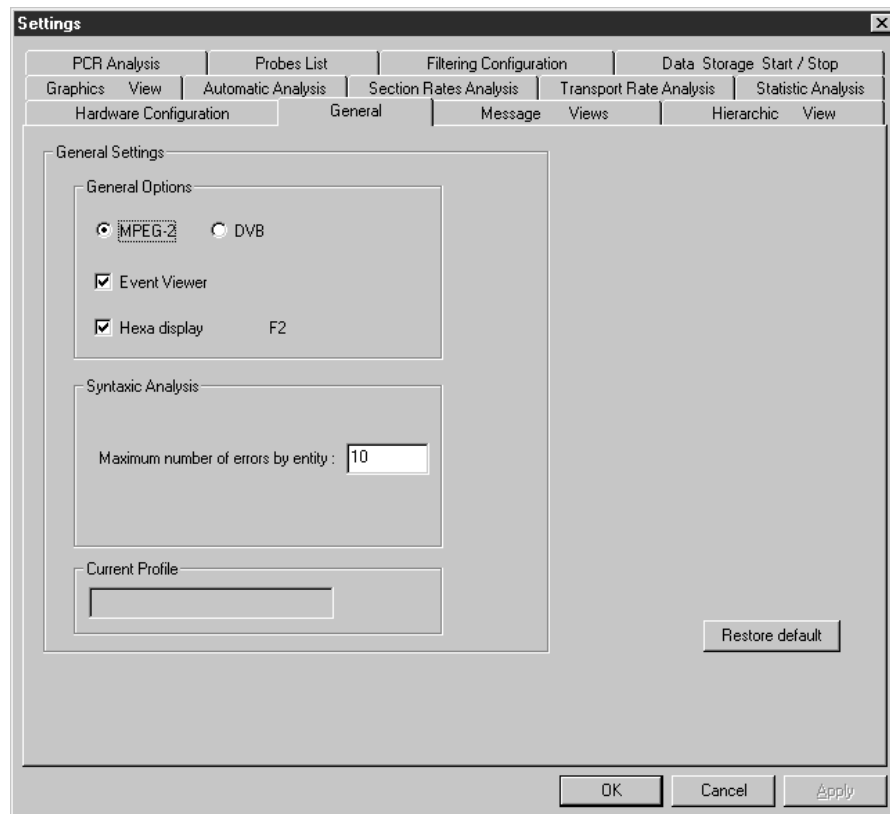
NOTE. *RTA settings are saved to the Windows NT registry and automatically persist from session to session, even if you exit the program and power the computer down.¹ To return all settings to their original states, select **Restore standard** from the Configuration menu.*

If your use of the RTA requires many deviations from the “standard” settings, consider saving a baseline configuration profile that contains the settings that work for your unique situation. Restoring a baseline can be a convenient alternative to restoring the standard configuration and then making the necessary configuration changes.

¹ You must log in as the same user. RTA settings made by the user “MTS100” and those made by the administrator are saved in separate registries. For consistent results, always log in as MTS100. The administrator can create additional users to permit several people to use the RTA without settings conflicts. To save and restore configuration profiles, a user must be a member of either the “Backup Operators” group or the “Administrators” group; refer to the Windows NT documentation for additional information.

Changing the Configuration

To change the current configuration, choose the **Settings** command in the Configuration menu. The resulting **Settings** window has twelve tabs that contain settings and options for the various Real-Time Analyzer functions and views.



Click the appropriate tab and then change the setting with standard Windows techniques: click the appropriate round option button to select among options, select or clear a square check box, select from a list of several alternatives, or enter a new value in a text box. Several tabs also have a **Restore default** button which you can click to return all settings on the tab to the settings used in the standard configuration. When you have changed all the appropriate settings on one or more tabs, click **OK** on the bottom of the **Settings** window to confirm the changes and close the window. Click **Cancel** at any time to close the window without changing any settings.

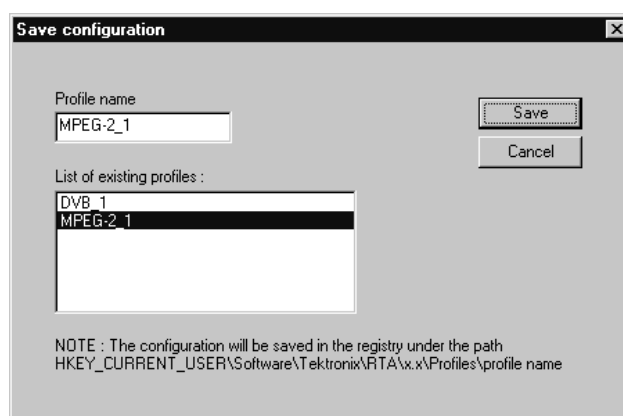
See *RTA Settings*, beginning on page 3–72, for complete information about all options on the twelve **Settings** window tabs.

Saving and Restoring Configurations

Through the Configuration menu, you can save all the current RTA settings as a named profile in the Windows NT registry, you can load a registry profile to restore a previously saved configuration, and you can restore the standard, default configuration.

Save the Current Configuration

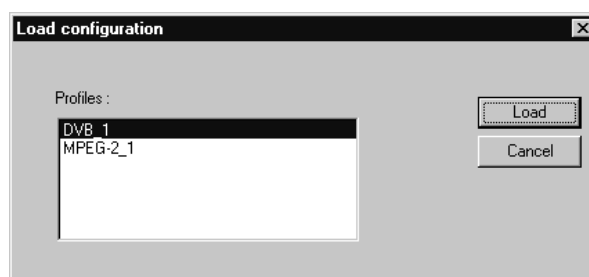
To save the current configuration in the NT registry, choose **Save as** from the Configuration menu. The **Save configuration** window opens.



Either enter a unique name in the **Profile name** box and click **Save** to create a new configuration profile or highlight a name on the **List of existing profiles** and click **Save** to overwrite an existing named profile with the current settings.

Load a Saved Configuration

To restore an RTA configuration that has been saved in the current user's NT registry, choose **Load** from the Configuration menu. The **Load Configuration** window opens.



Highlight the name of the profile that you want to restore (by clicking on the name in the **Profiles** list) and then click **Load**. If a newly loaded configuration calls for a change in the hierarchy icon size, that change will not occur until you

exit and restart the RTA application; otherwise, there is no need to exit the application.

Restore the Standard Configuration

To restore the default configuration, stop analysis and choose **Restore standard** from the Configuration menu.

***NOTE.** The **Restore standard** command is not available when the RTA is analyzing an input stream. You must stop analysis before you can restore the default configuration.*

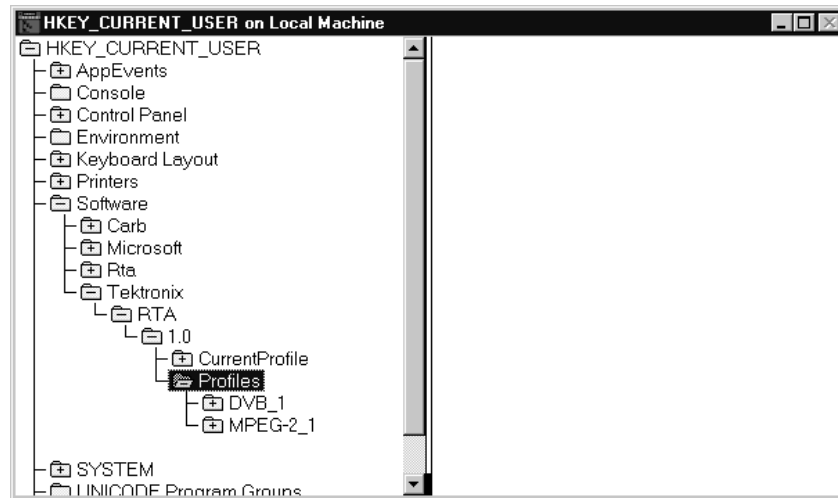
Deleting a Saved Configuration Profile

Use the Registry Editor program, Regedt32.exe, to delete a configuration profile.

1. Open the Windows NT Start menu and select **Run**. The **Run** window opens.



2. Type **regedt32** in the **Open** text box and click **OK**.
3. Select the **HKEY_CURRENT_USER on Local Machine** window and double-click the folder icons to open the path to the RTA profile keys, **HKEY_CURRENT_USER/Software/Tektronix/RTA/1.1/Profiles**. The two named profiles in the following example are “DVB_1” and “MPEG-2_1.”



4. Highlight the name of the configuration profile to delete and press **DEL** (or select **Delete** from the Registry Editor Edit menu). A Warning message appears; click **Yes** to confirm the deletion.
5. Exit the Registry Editor.

RTA Settings

MTS 215 settings tabs

Graphics View	Automatic Analysis	Section Rates Analysis	Transport Rate Analysis	Statistic Analysis
PCR Analysis	Probes List	Filtering Configuration	Data Storage Start / Stop	
Hardware Configuration	General	Message Views	Hierarchic View	

MTS 205 settings tabs

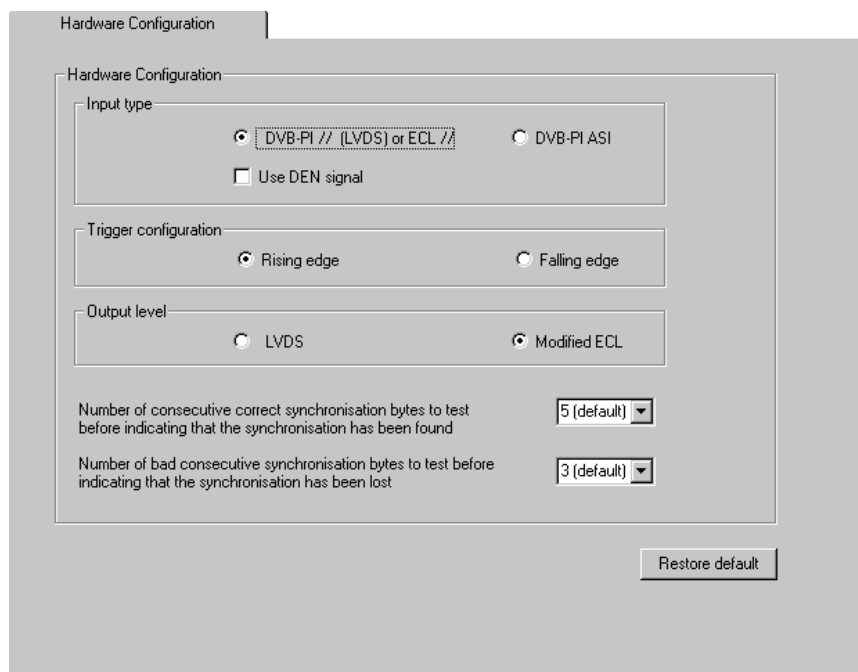
Section Rates Analysis	Transport Rate Analysis	Statistic Analysis	PCR Analysis	Probes List	Filtering Configuration
Hardware Configuration	General	Message Views	Hierarchic View	Graphics View	Automatic Analysis

This section describes and explains the RTA settings on the **Settings** window tabs. To learn more about the settings on a given tab, refer to the page indicated in the following list:

- *Hardware Configuration*; 3–73
- *General*; 3–74
- *Message Views*; 3–76
- *Hierarchic View*; 3–78
- *Graphics View*; 3–81
- *Automatic Analysis*; 3–82
- *Section Rates Analysis*; 3–83
- *Transport Rate Analysis*; 3–84
- *Statistic Analysis*; 3–85
- *PCR Analysis*; 3–87
- *Probes List*; 3–88
- *Filtering Configuration*; 3–91
- *Data Storage Start/Stop (MTS 215 only)*; 3–92

Hardware Configuration

The Hardware Configuration tab contains options for configuring the Real-Time Analyzer hardware, which is known as the Processing Interface Adaptor (PIA).



There are several options on this tab:

- **Input type.** Select either **DVB-PI // (LVDS) ECL//** (parallel; the default) or **DVB-PI ASI** (asynchronous serial).
- **Use DEN signal.** (Available only when parallel input type is selected.) Select **Use DEN signal** to limit analysis to only those packets that have the DEN (Data Enable) signal asserted. This option is disabled in the standard configuration.
- **Trigger configuration.** The trigger configuration applies only if your instrument contains a Data Store system and you intend to use an external, TTL-level (0 V to +5 V) signal to start/stop data storage. Choose to trigger on either the rising edge or the falling edge of the trigger signal.
- **Output level.** Select either **LVDS** or **Modified ECL** (the default).
Modified ECL output is nominally 400 mV_{pp}; standard ECL is approximately 700 mV_{pp}.
- The number of correct consecutive synchronization bytes to test before indicating that the synchronization has been found.

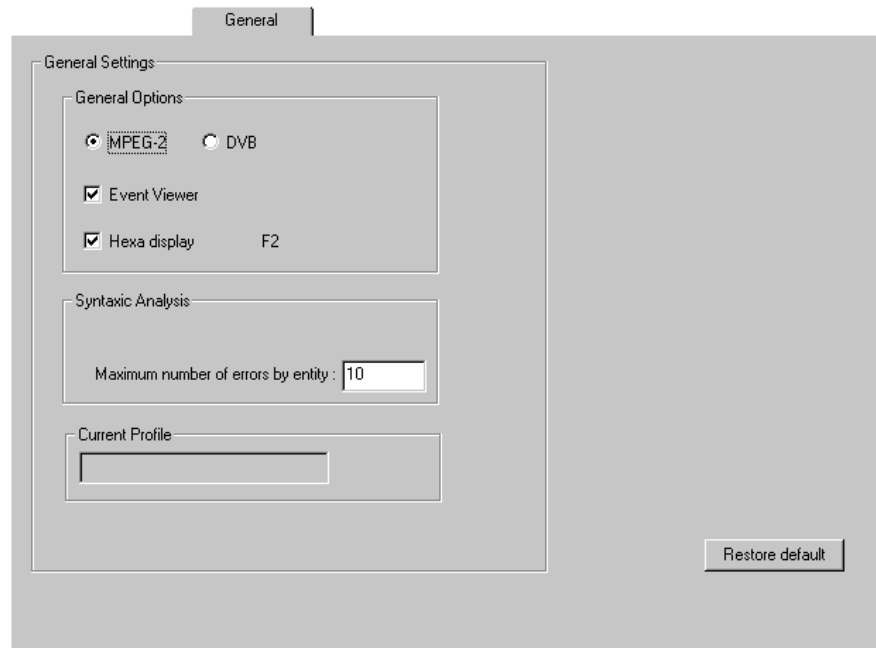
The choices are 3, 5, 7 or 9 correct synchronization bytes; the default is 5. Click the arrow to the right of the current value and select the desired value from the resulting list.

- The number of bad consecutive synchronization bytes to test before indicating that the synchronization has been lost.

The choices are 1, 3, 5, or 7 correct synchronization bytes; the default is 3. Click the arrow to the right of the current value and select the desired value from the resulting list.

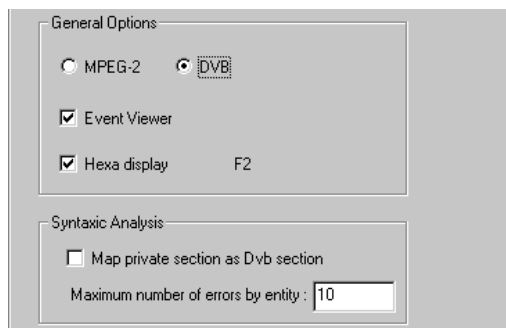
To restore all standard hardware configuration settings, click **Restore default**.

General The General tab contains the most basic RTA operating options.



MPEG-2 or DVB. This option determines whether the RTA monitors for compliance to the **MPEG-2** or the **DVB** standard. Choose **MPEG-2** (the default) if the stream you are analyzing complies with the MPEG standard but not DVB; choose **DVB** if the input stream complies with all or most of the DVB standard. You may have to ignore many false error reports if you select DVB to monitor a stream that does not comply fully with the DVB standard. Notice that another

option (Map private sections...) appears under **Syntactic Analysis** when you choose to monitor for DVB compliance.



Event Viewer. Select this option to log all events detected by the RTA to the Windows NT Event Viewer. Clear the option to prevent RTA error and message logging. **Event Viewer** is selected in the default configuration.

***NOTE.** The Event Viewer is set during software installation to overwrite application log events as needed. This can result in lost information when monitoring an input stream that contains many errors. However, selecting another Event Viewer log wrapping option can result in buffer overflow and can freeze the RTA. You can increase the size of the Event Viewer application log; do not change the log wrapping setting without good reason.*

For further information about the Event Viewer, refer to *Messages and the Event Viewer* on page 3–45 of this manual. Also consult the Windows NT documentation and the Event Viewer online Help.

Hexa Display. The **Hexa display** option causes the RTA to display most numeric values in hexadecimal base. Clear this option to display values in decimal base. You can also toggle this setting during normal operation by pressing the F2 function key.

Map private sections as DVB sections. This option appears when you have selected DVB monitoring through the first option on the tab. When you select this option, the RTA attempts to interpret all private sections encountered in the stream as DVB SI sections. The option is not present in the standard configuration, which has MPEG-2 monitoring selected. The option is cleared when you first specify DVB monitoring; select it if necessary to force the RTA to interpret PIDs 0x10 through 0x14 as SI.

Maximum number of errors by entity. This option limits the number of errors that the RTA detects before stopping analysis for a single input stream item. A “too many errors” message indicates an instance in which the RTA has reached this maximum.

Current Profile. If you have loaded a saved configuration profile (through the **Load** command on the Configuration menu), the name of that profile appears in this box. The background is gray because the profile cannot be changed through the General **Settings** window tab.

To restore all standard general settings, click **Restore default**.

Message Views

The Message Views tab contains settings options that apply to all Message views.



The **Display** portion of the tab gives you the opportunity to limit the types of messages displayed and logged to the Event Viewer (if **Event Viewer** is selected in the General tab).

Information messages. Selected by default, Information messages alert you to input stream events that are not considered errors, but may be important to your stream analysis. These events include as PSI and SI table updates, the presence of ghost (unreferenced) packets, and error disappearance. Clear the **Information messages** check box to prevent the display and logging of these information events.

Error messages. Error messages, also selected by default, inform you of all errors detected in the input stream. The number and types of errors detected by the RTA depend, in part, on your selections on the various **Settings** window tabs.

TDT and TOT Update message. This option is not selected in the standard configuration. Select **TDT and TOT Update message** to see and log information messages that report TDT (time and date table) and TOT (time offset table) updates.

EMM Update message. This option is also cleared in the standard configuration. Select **EMM Update message** to see and log information messages that report EMM (Entitlement Management Message) updates.

The **Messages** portion of the tab contains display and logging options that affect all messages.

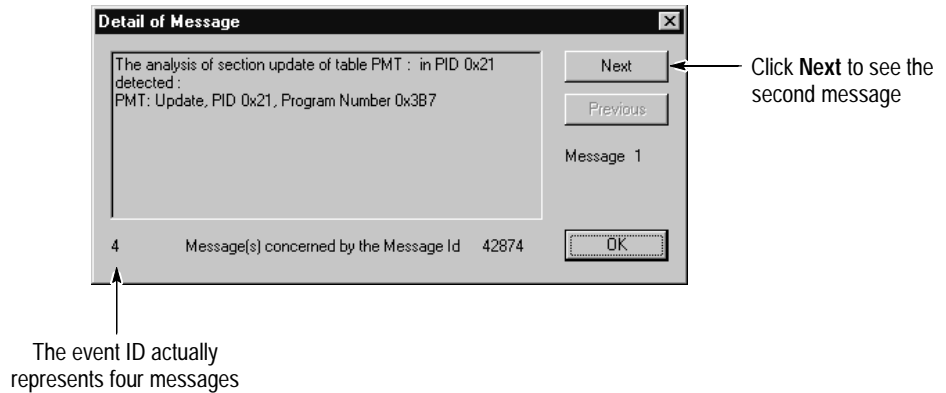
Maximum number of messages. This option limits the number of messages that any Message view can contain. The maximum includes those messages that have scrolled off the top of the current message window or window pane; use the vertical scroll bar to see the messages that will not fit in the display window (you may have to press F3 to pause view updates when monitoring a stream with many errors). When a Message view reaches the specified maximum, the oldest message is discarded as each new message appears. The default maximum for the general Message view is 1000 messages; the default for all other views is 50.

This setting does not affect the capacity of the Windows NT Event Viewer application log.

Only one message with the same event id in Event Viewer. Limits the amount of message detail logged to the Event Viewer.

The RTA posts only one general message for each event ID in the Message views. In reality, a Message view entry can represent many error or information messages. In the standard configuration, all information or error detail repre-

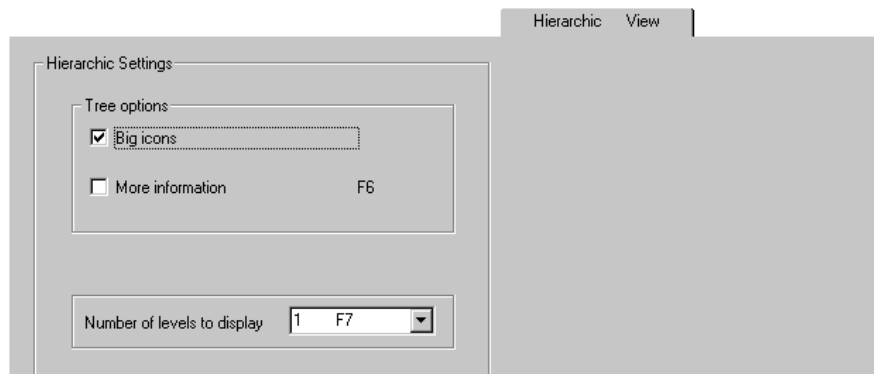
sent by the general message is logged to the Event Viewer. Double-clicking on the message opens a window that provides access to the event details.



When you are monitoring a stream that contains many items with many errors, logging all details can delay the appearance of messages in the Message views and quickly fill the Event Viewer application log. To log only general messages to the Event viewer, select this option.

Hierarchic View

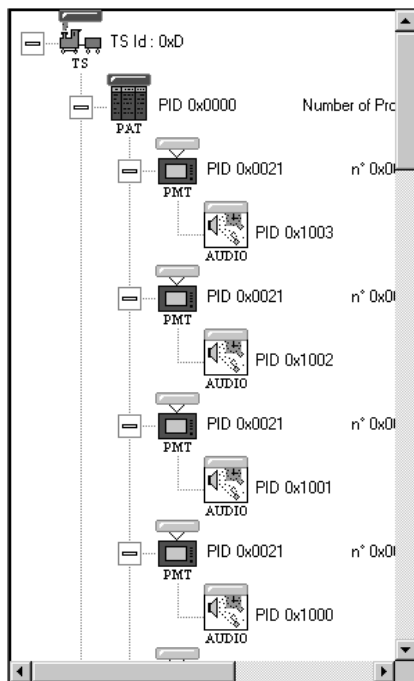
The Hierarchic View tab contains options that apply only to the Hierarchic view.



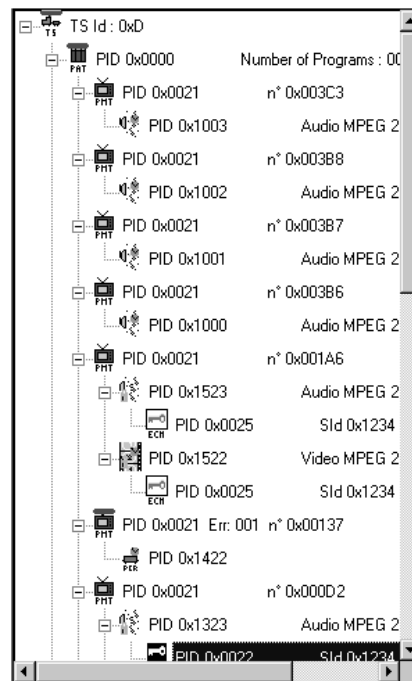
Big icons, selected in the standard configuration, causes the RTA to use the larger of the two available icon sizes in the Hierarchic view. See the following screen captures for a comparison of the two icon sizes.

Clear this selection to use small icons. The change will not take effect until you exit and restart the RTA application.

Big hierarchy icons

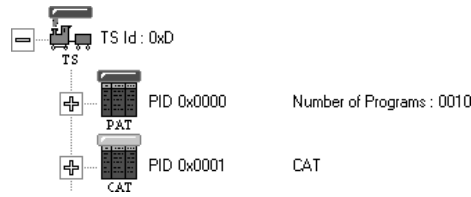


Small hierarchy icons

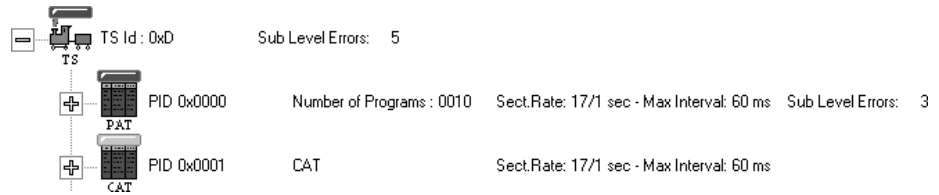


More information. This option controls the Hierarchic view display of additional information to the right of the standard icon information. During normal operation, you can press F6 to toggle this selection. **More information** is not selected in the standard configuration.

The standard configuration:

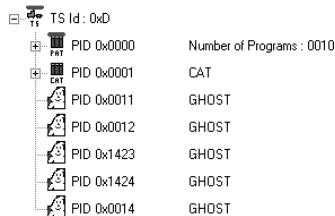


More information selected:

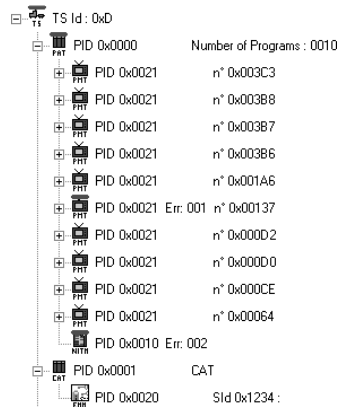


Number of levels to display. This option controls how many hierarchy levels are shown in the Hierarchic view. Click the arrow to reveal the choices; each choice includes the F-key equivalent, which you can use to expand or collapse the hierarchy during normal operation. The default selection is **1 F7**, which displays only the top level of the hierarchy. See the following examples.

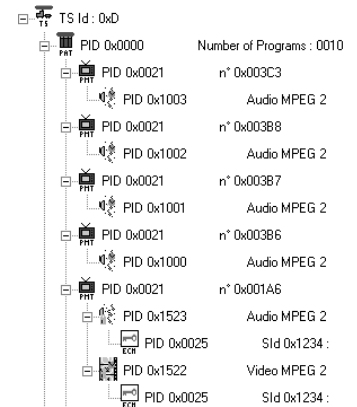
Select **1** or press **F7** to hide all but the top-level hierarchy items.



Select **1** or press **F8** to show only the top two hierarchy levels.



Select **4** or press **F10** to show all items in the hierarchy.

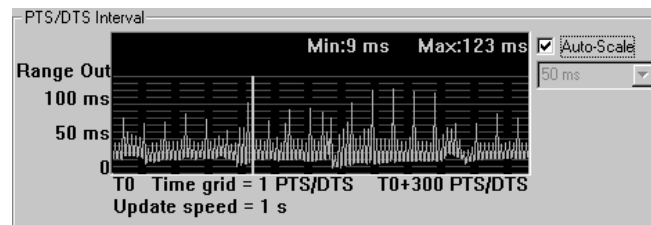


Graphic Views

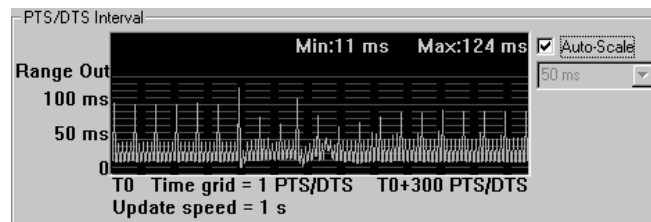
Graphic Views tab settings determine how the RTA updates the various analysis graphs. In the standard configuration, Scrolling is disabled for all graph types.



When Scrolling is disabled, the passage of time is indicated with a moving cursor. The cursor—visible in the graph below—moves from left to right. The most recent data are immediately to the left of the cursor; the oldest data are immediately to the right of the cursor.

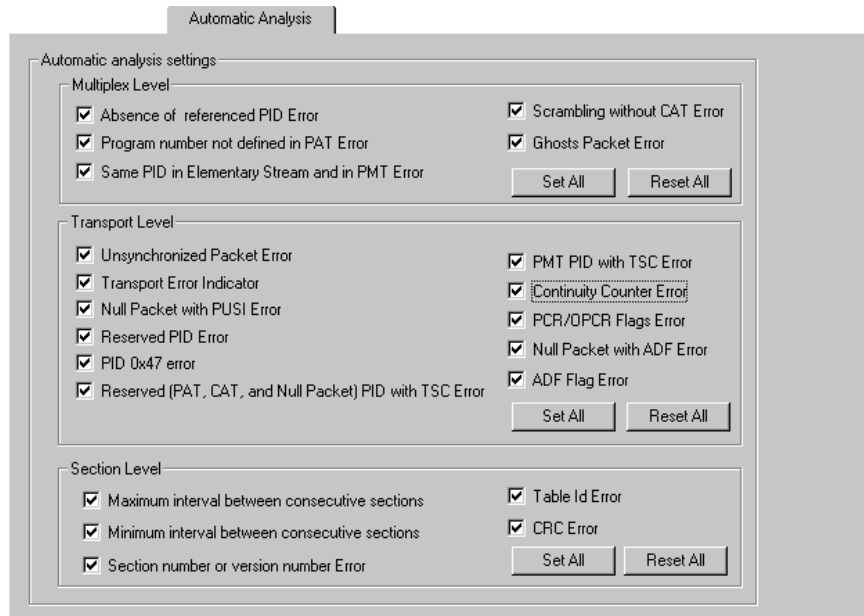


When Scrolling is selected, the cursor disappears after the first sweep and the data itself then moves from right to left on the graph as if the right border of the graph has become the cursor. The most recent data are at the right end of the graph; the oldest data continually scroll off the left end.



Automatic Analysis

The Automatic Analysis tab provides a way to limit the analyses that are performed at the multiplex, transport packet, and table section levels. In the standard configuration, all analyses are selected.



You can disable/enable individual analyses by clearing/selecting the associated check box; you can disable or enable all Multiplex Level, all Transport Level, or all Section Level analyses by clicking the associated **Reset All** or **Set All** button.

NOTE. Several Automatic Analysis selections control DVB-MG tests. Do not disable any automatic analyses if you plan to use DVB-MG tests to judge DVB compliance of the input stream.

Refer to *Automatic Analyses* on page 3–7 for a complete discussion of all analyses on this tab.

Section Rates Analysis

Use the Section Rates Analysis tab to specify the maximum acceptable interval between consecutive table sections of each table type. When you have configured the RTA for MPEG-2 monitoring, only the **PAT**, **PMT**, **CAT**, and **NIT Actual** settings are available; when you have configured the RTA for DVB monitoring, all settings are available.

The RTA uses the Section Rate Analysis intervals when the **Maximum interval between consecutive sections** option on the Automatic Analysis tab is selected.

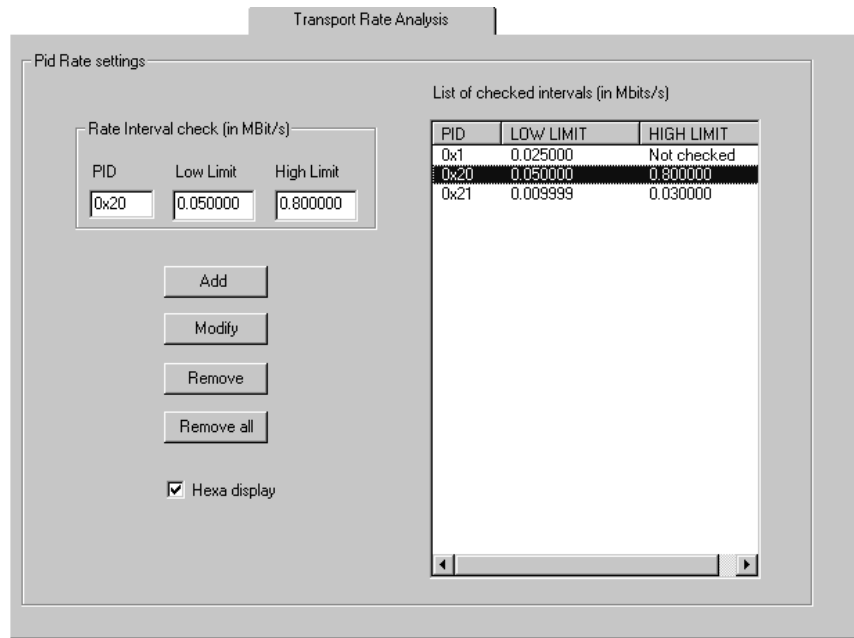
NOTE. *These settings determine the threshold for errors reported on the DVB-MG view. The default settings are consistent with DVB-MG recommendations. Do not change these settings if you plan to use DVB-MG tests to judge DVB compliance of the input stream.*

The second zone on this tab reports that 25 ms is the minimum permissible interval between consecutive sections when the **Minimum interval between consecutive sections** option on the Automatic Analysis tab is selected. This value cannot be changed by the user.

Click **Restore default** to restore all standard section rate analysis interval values.

Transport Rate Analysis

The Transport Rate Analysis tab lists the transport rate error thresholds (limits) that the RTA is monitoring and provides a way to set, modify, and remove transport rate error thresholds for any stream component.



NOTE. You can also set and remove transport rate error thresholds through the shortcut menu of each Hierarchic view icon. Refer to Shortcut Menus on page 3-41 and Transport Rate Analysis on page 3-1 for more information.

Setting Thresholds and Beginning Analysis. To set new rate limits and initiate transport rate analysis through this tab, perform the following steps:

1. Enter the PID of the stream item in the **Rate interval check PID** field. Either enter the hexadecimal value of the PID (such as 0x21) or clear the **Hexa display** selection and then enter the decimal PID (such as 33).
2. Enter the low error threshold, if any, in the **Low Limit** field.
3. Enter the high error threshold, if any, in the **High Limit** field.
4. Click **Add**.

Transport rate analysis of the stream item begins when you click **OK** to close the **Settings** window.

Changing Thresholds. Perform these steps to change one or both of the the error thresholds for a stream item:

1. Click on the item entry on the **List of checked intervals** to highlight the entry and to enter the information into the **Rate Interval check** fields.
2. Change the **Low Limit** and **High Limit** as necessary. To remove a threshold (the list entry becomes “Not checked”), double-click in the field and then press DELETE.
3. Click **Modify**.

The new transport rate analysis threshold(s) take effect when you click **OK** to close the **Settings** window.

Stopping Analysis. Removing an item entry from the **List of checked intervals** ends analysis for a single stream item. To remove an item, highlight the list entry and then click **Remove**. To end transport rate analysis of all listed items, click **Remove all**. Analysis will end for the removed items when you click **OK** to close the **Settings** window.

Statistic Analysis

The Statistic Analysis tab contains settings that apply to two types of automatic analysis.

Statistic Analysis

Transport Rate

Smoothing time seconds (value between 1 and 10 s)

Alarm if item not present during time range after detection of the first occurrence of associated table

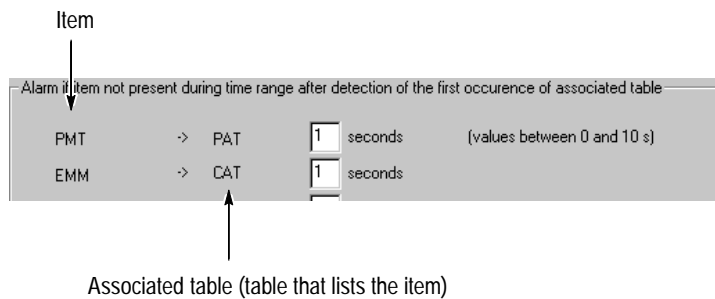
PMT	-> PAT	<input type="text" value="1"/> seconds	(values between 0 and 10 s)
EMM	-> CAT	<input type="text" value="1"/> seconds	
NIT	-> PAT	<input type="text" value="1"/> seconds	
Video	-> PMT	<input type="text" value="1"/> seconds	
Audio	-> PMT	<input type="text" value="1"/> seconds	
Private	-> PMT	<input type="text" value="1"/> seconds	
Data	-> PMT	<input type="text" value="1"/> seconds	
Independent PCR	-> PMT	<input type="text" value="1"/> seconds	
ECM	-> PMT	<input type="text" value="1"/> seconds	

Restore default

Transport Rate Smoothing time. Smoothing time is the period over which the RTA averages the transport rates reported in the Statistic view Program Alloc

and PID Alloc panels. The default value is one second; you can enter any integer value from **1** to **10**. In most cases, selecting a longer smoothing time reduces the range over which reported transport rates vary.

Alarm if item not present [etc.] Use these settings to specify the permissible interval between the first table section that lists a stream item and the appearance of that item in the stream. The RTA reports an error if the item does not appear before the end of the interval. The default value is one second; you can enter any integer value from **0** to **10**. If you enter **0**, the RTA reports an error if the item is not present in the stream before it is referenced in a table.



NOTE. Several of these settings are used as criteria for the DVB-MG *PID_error* reported on the DVB-MG view. The measurement guidelines state that the precondition for a *PID_error* is that a “referred PID does not occur for a user specified period.” Changing a time interval on this tab does not affect the accuracy of the results displayed in the DVB-MG view.

Click **Restore default** to restore all standard statistic analysis values. New Statistic analysis settings take effect when you click **OK** to close the **Settings** window.

PCR Analysis The PCR Analysis tab contains settings options that apply only to user-initiated PCR analysis and PCR probes.

Interval. These settings specify the maximum permissible interval between consecutive PCRs. When a PCR probe is active, the RTA reports an error when the interval between two consecutive PCRs for the monitored program exceeds the applicable (DVB or MPEG-2) value. The default for DVB mode is 40 ms; the default for MPEG-2 is 100 ms.

Max and Min. These settings specify the maximum permissible deviation from the expected PCR value. When a PCR probe is active, the RTA reports an error when the deviation falls outside of the **Max** and **Min** values. The default for both DVB and MPEG-2 mode is +500 ns/–500 ns.

NOTE. These settings determine thresholds for errors reported on the DVB-MG view. The default settings are consistent with DVB-MG recommendations. Do not change these settings if you plan to use DVB-MG tests to judge DVB compliance of the input stream.

Frequency Offset. The threshold for a frequency offset error. The default for both DVB and MPEG-2 mode is 30 ppm.

Drift Rate Max. The threshold for a frequency drift rate error. The default for both DVB and MPEG-2 mode is 10 ppm/hr.

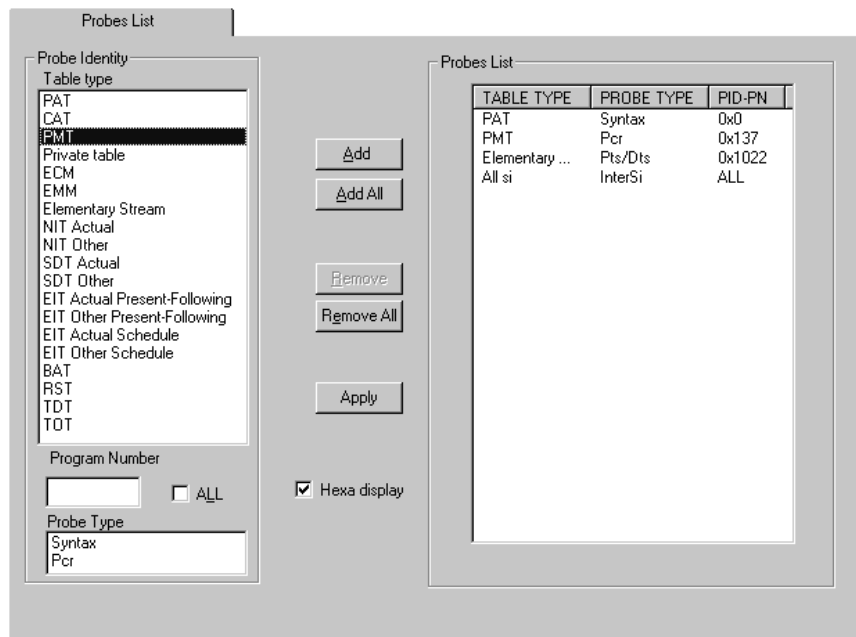
Mask Discontinuities. Under normal circumstances, the Real-Time Analyzer uses every PCR value in the stream to build the accuracy model that is used to judge the jitter of each newly decoded PCR. Occasional discontinuities (large PCR errors due to looped input, for example) can prevent creation of a valid model and hinder PCR analysis. Select **Mask discontinuities** to ignore very inaccurate² PCRs, both for error reporting and for calculating the PCR jitter model.

Refer to *PCR Analysis* on page 3–18 for more information about PCR analysis and PCR probes.

Click **Restore default** to restore the standard PCR analysis settings. New settings take effect when you click **OK** to close the **Settings** window.

Probes List

The Probes List tab lists all active probes and provides a way to set and remove the various probes (section syntax, PCR, PTS/DTS, and InterSI) for one or more stream items.



² The difference between the expected PCR value (interpolated from previous values) and the decoded PCR value is greater than 1.0 ms.

***NOTE.** You can also set and remove probes through the shortcut menus of the appropriate Hierarchic view icons. Refer to Shortcut Menus on page 3–41.*

Probes List Conventions. The following conventions apply to the Probes List:

- The **Table type** list contains only the tables consistent with the current monitoring mode (MPEG-2 or DVB).
- The **Probes List** on the right side of the tab lists all active probes, including those activated through the Hierarchic view.
- Setting a probe through the Probes List tab also checks the corresponding probe command on the shortcut menus of all affected stream items.
- Removing a probe from the **Probes List** also deselects the corresponding probe command on the shortcut menus of affected stream items.

Adding and Activating a Section Syntax Probe. You can set a section syntax probe on one or more stream items with the following procedure:

1. Highlight the table name in the **Table type** list.
2. For PMT, enter the desired program number below the **Table type** list or select the **ALL** check box to probe all PMTs in the stream. For Private Tables, ECM, and EMM, enter the PID of a particular table or select the **ALL** check box to probe every table of that type in the stream.
3. Click **Syntax** in the **Probe Type** list.
4. Click **Add** to add the section syntax probe to the **Probes List**.
5. Click **Apply** to activate the probe. If you do not click **Apply**, all probes on the list become active when you close the **Settings** window.

Adding and Activating a PCR probe. You can add and activate a PCR probe with the following procedure:

1. Highlight **PMT** on the **Table type** list.
2. Enter the desired program number below the **Table type** list or select the **All** check box to probe all PCRs in the stream.
3. Highlight **PCR** in the **Probe Type** list.
4. Click **Add**.
5. Click **Apply** to activate the probe. If you do not click **Apply**, all probes become active when you close the **Settings** window.

Adding and Activating a PTS/DTS probe. Add and activate a PTS/DTS probe with the following procedure:

1. Highlight **Elementary Stream** on the **Table type** list.
2. Enter an elementary stream PID below the **Table type** list or select the **All** check box to probe all PTS/DTS in the stream.
3. Click **Add**.
4. Click **Apply** to activate the probe. If you do not click **Apply**, all probes become active when you close the **Settings** window.

Adding and Activating the InterSI probe. Add and activate the InterSI probe with the following procedure:

1. Highlight any SI table (NIT, SDT, EIT, or BAT) on the **Table type** list.
2. Highlight **InterSI** on the **Probe Type** list.
3. Click **Add**.
4. Click **Apply** to activate the InterSI probe. If you do not click **Apply**, all probes on the list become active when you close the **Settings** window.

Setting All Probes. Click **Add All** and then click **Apply** to set every probe possible on every input stream table, program, and elementary stream.

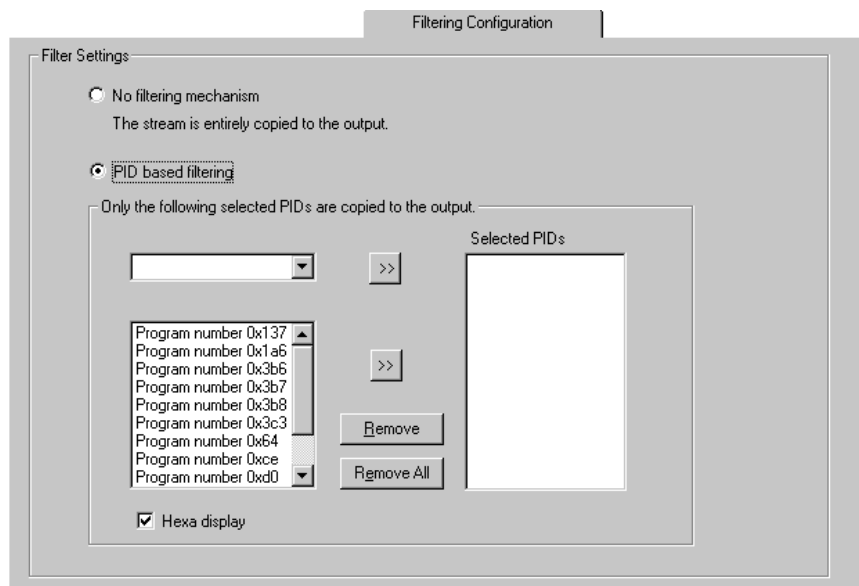
***NOTE.** Unless the input stream is compliant with almost every aspect of the MPEG-2 or DVB standard (whichever is applicable), setting all probes can result in many error messages, which can begin to fill the buffer and slow the RTA to less than real-time performance.*

Removing Probes. To remove a single probe, either highlight the probe entry in the **Probes List** and click **Remove** or simply double-click the **Probes List** entry. To remove all probes, click **Remove All**.

In either case, the probe(s) remain active until you click **OK** to close the **Settings** window.

Filtering Configuration

The Filtering Configuration tab options enable PID-based filtering, in which only selected PIDs are passed to the parallel output. On an MTS 215, you can use these settings to select and limit the portion of the input stream that is captured to the Data Store disks during data storage.



Select the default option, **No filtering mechanism**, to pass the entire input stream to the parallel output during analysis and to capture all input stream items during data storage.

When you choose **PID based filtering**, only the transport packets whose PIDs you have added to the **Selected PIDs** list are passed to the parallel output or captured.

Adding PIDs. There are several ways to add PIDs to the **Selected PIDs** list:

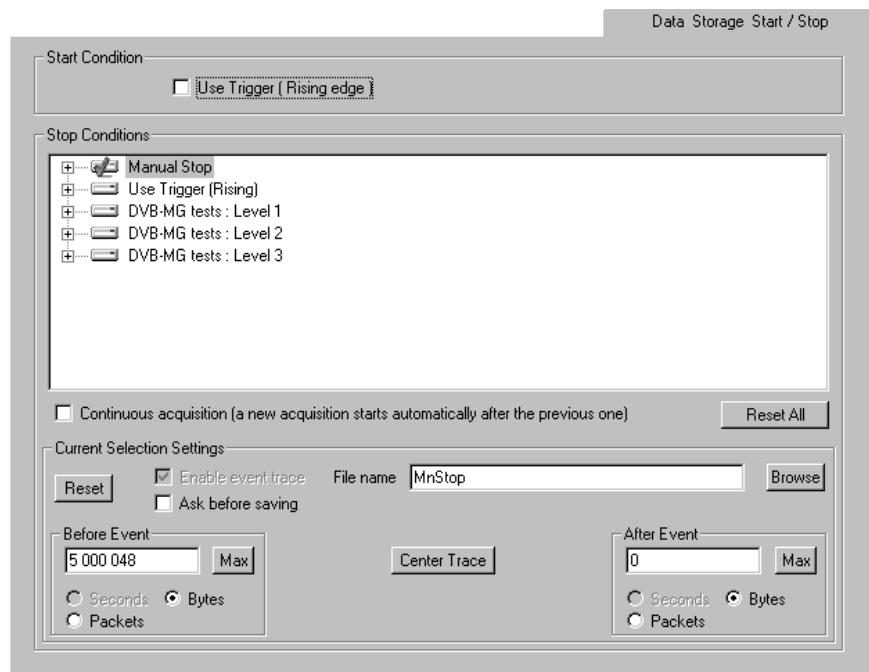
- Enter a PID directly into the upper-left list box and click the adjacent (upper) >> button. Numeric entry must be hexadecimal (for example, 0x10) unless you have cleared the **Hexa display** check box. If you clear the check box, you must enter the decimal value of the PID (16, for example, instead of 0x10).
- Select an individual PSI or SI PID from the upper-left list box and click the upper >> button. The choices are 0x0 (PAT), 0x1 (CAT), 0x10 (NIT), 0x11 (SDT), 0x12 (EIT), 0x13 (RST), and 0x14 (TDT).
- Select a program from the lower-left list box and click the adjacent (lower) >> button. The RTA automatically adds the PIDs of the program-defining PMT and all elementary streams and ECM sections in the program to the **Selected PIDs** list.

- Select **PSI** or **SI** from the lower-left list box and click the lower >> button. The RTA automatically adds the PIDs of all PSI or SI tables in the stream to the **Selected PIDs** list.

Removing PIDs. To remove a single PID from the **Selected PIDs** list, either highlight the PID and click **Remove** or simply double-click the PID. To remove all PIDs from the list, click **Remove All**.

Data Storage Start/Stop

The Data Storage Start/Stop **Settings** window tab is present only in the MTS 215, which contains both the RTA and the Data Store system. Use the Data Storage Start/Stop settings to select the method of initiating data storage, the conditions that will stop data storage, and how much of the input stream is to be captured.



Start Condition. A Data Storage Start condition initiates RTA data acquisition mode. When the RTA is in acquisition mode, the specified portion of the input stream preceding, following, or including the first-encountered Stop condition (or “storage event”) is saved to a file.

The Manual Start condition is always active. In the default configuration, you must initiate data acquisition by selecting **Start** from the Data Storage menu or by clicking the **Start acquisition** toolbar button.

Select **Use Trigger** to also make it possible to initiate acquisition with a rising or falling TTL-level signal applied to the RTA Trigger input. Refer to *Trigger Configuration* on page 3–73 for additional information.

NOTE. The option appears either as **Use Trigger (Rising edge)** or as **Use Trigger (Falling edge)**, depending on the Trigger configuration selection on the Hardware Configuration Settings tab.

Stop Conditions. Select one or more **Stop conditions** that, when detected or encountered during data acquisition, will cause the actual storage of input data to an event trace file.

You can select one or more of the following Stop conditions:

- External TTL-level trigger
- All level 1 DVB-MG tests
- Individual level 1 DVB-MG tests
- All level 2 DVB-MG tests
- Individual level 2 DVB-MG tests
- All level 3 DVB-MG tests conducted by the RTA
- Individual level 3 DVB-MG tests

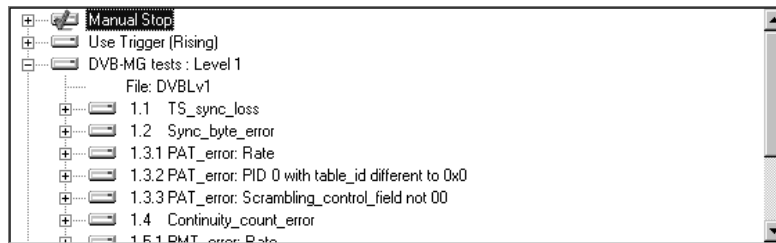
NOTE. A selected Stop condition must be detected by the RTA to cause data storage. Always confirm that the related analysis or probe is enabled before beginning data acquisition. To confirm that a DVB-MG test is enabled, open the DVB-MG view and verify that the test indicator is green, orange, or red (not gray).

The Manual Stop condition cannot be disabled, so you can always select **Stop** from the RTA Data Storage menu or click the **Stop acquisition** toolbar button to end data acquisition mode. No other Stop conditions are enabled in the default configuration.

Data acquisition ends in the default configuration when the RTA saves the event trace file. However, a Stop condition event does not end data acquisition when you select **Enable automatic trace sequencing**. Instead, the RTA continues to monitor the input stream in data acquisition mode and attempts to save an event trace file for every Stop condition encountered. You must manually stop acquisition when automatic trace sequencing is enabled.

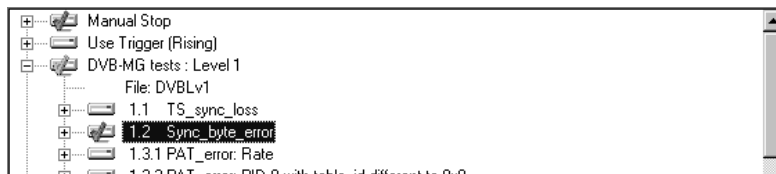
To select Stop conditions,

1. If necessary, click the appropriate “+” box to expand the hierarchy and then click the hard disk icon of the desired Stop condition. You can click the “DVB-MG tests: Level *n*” icon to select all DVB-MG tests in the level.



NOTE. You can move the highlight within the Stop Condition hierarchy with the keyboard arrow keys. You can also expand one level of the hierarchy with the “+” numeric keypad key, open the entire hierarchy with the “*” keypad key, and close the hierarchy with the “-” keypad key. The exact effect of these keystrokes depends on the context; experiment and practice to become proficient at keyboard hierarchy navigation.

A green check mark appears on the disk icon to show that the Stop condition is selected. A gray check mark appears on the parent “DVB-MG tests: Level *n*” disk icon to show that one of the tests in that level is selected.



By default, the event trace data are stored on the Single shot Data Store partition. The file is specified in the **File name** text box. You can enter an alternate file name and you can click Browse to save the data onto the system disk. Refer to *File Name and Path Conventions* on page 3–95 for additional information.

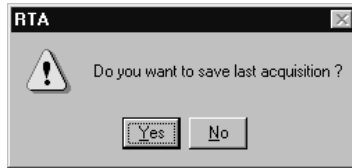
2. Once you have selected a Stop condition, specify the desired amount of input stream to capture before and after the data storage event. By default, the event trace data are the 5 000 048 Bytes of input received before the Stop condition occurs. Refer to *Specifying Trace Size Before and After the Event* on page 3–96 for more information.
3. Repeat steps 1 and 2 for each Stop condition that you want to detect and trace.

4. Select **Enable automatic trace sequencing**, if appropriate, to save event trace files for more than one Stop condition event.
5. Click **OK** at the bottom of the **Settings** window to confirm all Data Storage Start/Stop settings and close the window.

File Name and Path Conventions. The event trace file can contain input data received before the Stop condition event, after the event, or both before and after the event. If the Stop condition is a DVB–MG error, you can later examine the event trace file with the MPEG–2 System (Deferred–Time) Analyzer to determine the causes or effects of the error.

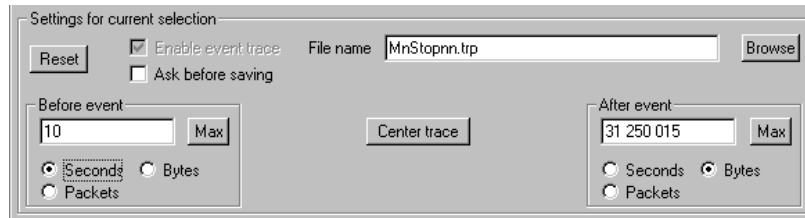
- An event trace file name is automatically assigned when you select a Stop condition. For example, the file name for a DVB–MG 1.1 (TS_sync_loss) error trace is DVB11*nn*.trp, where “*nn*” is a hexadecimal number assigned when the file is created. When the first DVB–MG 1.1 error is detected, the RTA saves DVB1100.trp. File names increment (DVB1101.trp, DVB1102.trp, ...) for each subsequent data capture. To force the file names to begin again at 00, you must delete all Data Store event trace files with the same root name (DVB11*.trp, for example) and then, through the RTA Configuration menu, restore the standard configuration or load another configuration that was saved when the counters were 00.
- By default, event trace files are saved to the Single Shot partition of the Data Store disks, which is also visible in Windows NT as C:\Carb0\Mono. You can choose instead to save event trace files to the system disk. To save data to the C:\Mts200\Cfg-trp directory, for example, click **Browse** (to the right of the File name field) and then click the **Open** button in the resulting Open window. The path then appears in the file name field.
- You can enter an alternate name for the event trace file; the RTA automatically uses the first six characters of the name and appends the appropriate sequence number (*nn* = 00, 01, 02, ...) when it saves the file. For best results, always delete all previous trace files that pertain to the same event and restart the RTA application before saving under a new name. Use only alphanumeric characters or an underscore in the file name. The data store system cannot transfer files to other disks if the file name contains characters such as “–” (hyphen), “ ” (space), “.” (period), or “+” (plus).

Ask Before Saving. Select **Ask before saving** to display the following window when the stop condition is encountered.



Specifying Trace Size Before and After the Event. The default event trace file contains the five Mbytes of input received immediately before the event. You can configure the RTA to save as much or as little data before and after the event as you like, limited only by the size of the Single Shot partition. You can change the **Before event** and **After event** file sizes with the following techniques:

- Select the most convenient units (Seconds, Bytes, or Packets) and then enter the quantity. Notice that changing the selection from Bytes to Packets or to Seconds converts the quantity into the correct units. You can select Seconds only when analysis is occurring; you cannot select Seconds when PID based filtering is selected (on the Filtering Configuration tab).



- Click **Max** to enter the entire Single Shot Data Store partition.
- Click **Center trace** to enter half of the Single Shot partition size in the Before event field and half of the partition size in the After event field.
- Click **Reset** to deselect the error condition and clear **Enable event trace**, restore the default file name, and restore the default event trace sizes.

NOTE. When the RTA detects a stop condition, it must communicate with the data store system to initiate the actual saving of an event trace file. Under normal circumstances, this communication takes approximately 0.5 seconds. Therefore, if you want to save the packet that contains a triggering DVB-MG error, do not set the **Before event** value to less than 0.5 seconds of input data. The default value, 5 Mbytes, is adequate for most input streams.

Data Storage Examples. The following numbered examples assume that the RTA is analyzing an input stream.

1. To capture a set portion of the input stream:
 - a. On the Filtering Configuration settings tab, select **No filtering mechanism**.
 - b. On the Data Storage Start/Stop settings tab, click **Reset All**, change the Manual Stop **Before event** value to 0 (zero), and the **After event** value to the desired duration (seconds) or size (bytes).
 - c. Click **OK** to confirm the settings and close the **Settings** window.
 - d. Through the Data Storage menu (or with the corresponding command button), start data storage.
 - e. To trigger data storage, select **Stop** from the Data Storage menu or click the corresponding toolbar button. The Real-Time Analyzer saves the specified portion of the input stream to the file MnStopnn.trp on the single shot partition of the data store disks (nn is a hexadecimal number that increments as succeeding manual stop files are saved). A message appears in the General message view when the entire MnStopnn.trp file is saved.

NOTE. During RTA data storage, the test system must first acquire the event trace data and then rewrite that data to a contiguous file at the beginning of the free space on the data store disks.³ As a result, the time required to save an event trace file—from stop condition detection to the appearance of the “Data are stored...” message—can be up to twice the time required to acquire the event trace data.

Remember, you can configure the RTA to pass input directly through to the parallel output, and you can capture that data directly with the Data Store Administrator application. Capturing a large file (that does not begin or end with a particular DVB-MG error) directly with the Data Store Administrator can require much less time than using RTA data storage to capture the same file. Because the Data Store Administrator and RTA can run simultaneously, you can still monitor and analyze the input with the RTA as you are capturing it on the data store disks.

2. To capture the 5 Mbytes of data immediately preceding the first level 1 DVB-MG error in the stream:
 - a. Select **DVB-MG view** from the View menu and then click **Detailed**. Confirm that all Priority 1 tests are active (no indicators are gray).

³ Refer to the *MPEG Test System Deferred-Time Applications User Manual* for additional information about file management on the data store disks.

- b. On the Filtering Configuration settings tab, select **No filtering mechanism**.
- c. On the Data Storage Start/Stop settings tab, click **Reset All** and then click the “DVB-MG tests: Level 1” disk icon. A green check mark appears on the icon to indicate that all level 1 tests are designated as stop conditions.
- d. Click **OK** to confirm the settings and close the **Settings** window.
- e. Select **Start acquisition** from the Data Storage menu (or click the corresponding command button).

When the next Priority 1 DVB-MG error is detected, the RTA stops data acquisition and saves the 5 Mbytes of input that immediately preceded the error. The event trace file is DVBLv1nn.trp on the Single shot Data Store partition.

- 3. To monitor the input for an extended period and capture only the PSI and SI tables immediately preceding and following an NIT_error (DVB-MG 3.1.1), an SDT_error (DVB-MG 3.5.2), or an EIT_error (DVB-MG 3.6.2):
 - a. Select **DVB-MG view** from the View menu and then click **Detailed**. Confirm that NIT_error (DVB-MG 3.1.1), SDT_error (DVB-MG 3.5.2), and EIT_error (DVB-MG 3.6.2) tests are active.
 - b. On the Filtering Configuration settings tab, select **PID based filtering**; if necessary, click **Remove All** to clear the **Selected PIDs** list; highlight PSI in the left-hand list and click the >> button; highlight SI in the left-hand list and again click >>.
 - c. On the Data Storage Start/Stop tab, click **Reset All**; then, in the **Stop conditions** list, click the “+” box next to the “DVB-MG tests: Level 3” disk icon.
 - d. Click the “3.1.1 NIT_error: ...” Stop condition (hard disk) icon; a green check mark appears on the icon. Then change the **Before event** and **After event** values to 20 Packets. (First click the Packets button, then enter 20 in the text box.)
 - e. Repeat step **d** for both the “3.5.2 SDT_error: ...” and the “3.6.2 EIT_error: ...” Stop conditions.
 - f. Select **Continuous acquisition** and then click **OK** on the bottom of the **Settings** window to confirm all your settings and close the window.
 - g. Select **Start acquisition** from the Data Storage menu (or click the corresponding command button).

If you let the RTA monitor the input stream for an extended period (overnight, for example), it will capture and store only PSI and SI table sections received immediately before and after any of the selected errors.

- Event trace files for a DVB-MG 3.1.1 error are stored on the Single shot partition of the Data Store disks as DVB311*nn*.trp.
- Files for DVB-MG 3.5.2 errors are named DVB352*nn*.trp.
- Files for DVB-MG 3.6.2 errors are named DVB362*nn*.trp.

In each of the above file names, “*nn*” is a hexadecimal number that is 00 for the first file saved and increments for each subsequent file with the same root name (DVB352, for example).

- h.** To stop acquisition, select **Stop acquisition** from the Data Storage menu or click the corresponding command button.
- i.** The RTA saves the last 5 Mbytes of acquisition to MnStop*nn*.trp, also on the Single shot Data Store partition.



Appendices

Appendix A: DVB-MG Measurements

The DVB Measurement Guidelines (ETR 290) have been issued by the DVB-MG group. This document provides guidelines for measurement in Digital Video Broadcasting (DVB) satellite, cable and terrestrial and related digital television systems. The document is designed to define a number of measurement techniques, such that the results obtained are comparable when the measurements are carried out in compliance with the appropriate definition.

Chapter 5 of ETR 290 recommends and defines tests at the Transport Stream level. The recommendations are grouped into three categories of importance:

- First priority: necessary for decodability (basic monitoring)
- Second priority: recommended for continuous or periodic monitoring
- Third priority: application-dependent monitoring

The Real-Time Analyzer performs most first, second, and third priority DVB-MG measurements, either automatically or at user request. Table A-1 lists the measurements recommended in ETR 290 and indicates how the RTA performs each one.

Table A-1: DVB-MG tests in the RTA

Test number	Test name	Automatic	User-requested	Not performed
1.1	TS sync loss	●		
1.2	Sync byte error	●		
1.3	PAT error	●		
1.4	Continuity count error	●		
1.5	PMT error	●		
1.6	PID error	●		
2.1	Transport error	●		
2.2	CRC error	●		
2.3	PCR error		●	
2.4	PCR accuracy error		●	
2.5	PTS error		●	
2.6	CAT error	●		
3.1	NIT error	●		
3.2	SI repetition rate	●		

Table A-1: DVB-MG tests in the RTA (Cont.)

Test number	Test name	Automatic	User-requested	Not performed
3.3	Buffer error			●
3.4	Unreferenced PID	●		
3.5	SDT error	●		
3.6	EIT error	●		
3.7	RST error	●		
3.8	TDT error	●		
3.9	Empty buffer error			●
3.10	Data delay error			●

Tests 3.3, 3.9, and 3.10 concern the T-STD (the hypothetical Transport Stream System Target Decoder) and are too computation-intensive to be performed by the Real-Time Analyzer. You can perform T-STD analysis with the deferred-time analyzer that is part of the MTS 215 if you first capture part of the input stream to the Data Store disks. Refer to the *MTS 210 MPEG Test System User Manual* for more information.

First Priority Measurements

The RTA continuously monitors all of the DVB-MG first priority parameters.

TS_Sync_Loss (1.1)

Each packet of the transport stream is preceded by a header consisting of four bytes. The first byte of the header is the synchronization byte (SyncByte), whose content is always the hexadecimal value 0x47. In the MPEG-2 decoder, the SyncByte serves for synchronization with the packetized transport stream. DVB recommendations define synchronism such that a sequence of at least five SyncBytes has to be detected by the MPEG-2 decoder. Synchronism is lost if the SyncBytes in a sequence of at least three TS packets are not detected according to the DVB recommendations. This status is referred to as TS_Sync_Loss.

In the DVB Measurement Guidelines (ETR290), the preconditions for a TS_Sync_Loss message is as follows:

Indicator	Precondition	Reference
TS_Sync_Loss	Loss of synchronization with consideration of hysteresis parameters	ISO/IEC 13818-1: Sub clause 2.4.3.3 / annex G.01

Sync_byte_error (1.2)

Each packet of the transport stream is preceded by a header consisting of four bytes. The first byte of the header is the synchronization byte (SyncByte), whose content is always the hexadecimal value 0x47. In the MPEG-2 decoder the SyncByte serves for synchronization with the packetized transport stream. If the SyncByte is missing or contains errors too often, the decoder will not be able to synchronize to the transport stream.

The MPEG test decoder checks the SyncByte of every packet in the transport stream for correct contents.

The precondition for a SyncByte_Error message is defined in ETR 290 as follows:

Indicator	Precondition	Reference
Sync_byte_error	Sync_byte not equal 0x47	ISO/IEC 13818-1: Sub clause 2.4.3.3

PAT_error (1.3)

The Program Association Table (PAT) contains a list of all programs and PIDs contained in the transport stream and of associated PMTs (Program Map Tables), which contain detailed program descriptions. The PAT is of key importance for decoding TV and audio programs. If the PAT is not available or contains an error, the MPEG-2 decoder will not be able to select and decode a program from the transport stream multiplex.

The syntactic structure of a PAT is comprehensively defined in MPEG-2 systems (ISO/IEC 13818–1). The PAT is exclusively transmitted in packets with PID 0x0000. The table may be divided into a maximum of 256 sections with the table index (table_id) of each section being 0x00.

The preconditions for a PAT_Error message are defined in ETR 290 as follows:

Indicator	Precondition	Reference
PAT_error	PID 0x0000 does not occur at least every 0.5 seconds A PID 0x0000 does not contain a table_id 0x00 (that is, a PAT) Scrambling_control_field is not 00 for PID 0x0000	ISO/IEC 13818-1: Sub clauses 2.4.3.3, 2.4.4.4

Continuity_count_error (1.4)

Each packet of the transport stream is preceded by a header consisting of four bytes. The fourth byte of the header contains the count of a four-bit continuity counter. The count must be increased by one for every packet of the transport stream that has the same PID. The count may consist of values ranging from 0 to 15; beyond 15, it will start from 0 again (modulo-16 counter). The continuity

counter serves to recognize packets of a video or audio program that are either missing or repeated more than once.

The MPEG-2 standard also tolerates counter discontinuity, provided this is indicated by a discontinuity indicator in the optional adaptation field (AF) of the same packet. This method is primarily used for the suppression of error messages when changing programs preceded by remultiplexing of the transport stream.

In the case of null packets (packets that do not contain any useful data but have a PID of 0x1FFF), continuity is not checked, since the value of the continuity counter in zero packets is not defined in the MPEG-2 standard.

The preconditions for a Continuity_Count_Error_Error message are defined in ETR 290 as follows:

Indicator	Precondition	Reference
Continuity_count_error	Incorrect packet order A packet occurs more than twice Lost packet	ISO/IEC 13818-1: Sub clauses 2.4.3.2, 2.4.3.3

PMT_error (1.5)

The PMT (Program Map Table) is a table for detailed program descriptions referenced in the PAT. As essential information for the MPEG-2 decoder, it contains the PIDs of all packets of the individual TV, audio, and data streams (elementary-stream PIDs) as well as the PIDs of packets serving for the transmission of PCR values associated with the program. Like the PAT, the PMT is of key importance for decoding TV and audio programs. If PMT is not available or contains an error, the MPEG-2 decoder will not be able to select and decode a program from the transport stream multiplex.

The syntactic structure of a PMT is defined in MPEG-2 systems (ISO/IEC 13818-1). In contrast to the PAT, the PIDs of the individual PMTs are variable; MPEG-2 permits values ranging from 0x0010 to 0x1 FFE (compare to DVB ETS 300468: 0x0020 to 0x1 FFE). The table may be divided into a maximum of 256 sections with one section for each program. The table index (table_id) of each section must be 0x02.

ETR290 states the preconditions for a PMT_Error message as follows:

Indicator	Precondition	Reference
PMT_error	Sections with table_id 0x02, (that is, a PMT), do not occur at least every 0.5 sec on the PID which is referred to in the PAT Scrambling_control_field is not 00 for all PIDs containing sections with table_id 0x02 (i.e. a PMT)	ISO/IEC 13818-1: Sub clauses 2.4.3.3, 2.4.4.4, 2.4.4.8

PID_error (1.6) The PMT (Program Map Table) entries reveal the elementary-stream PIDs that are contained in the transport-stream multiplex. To decode a program with the corresponding PID, these packets must be contained in the transport stream, and for the MPEG-2 decoder to function error-free these packets also need to be transmitted at certain intervals. The DVB Measurement Guidelines speak of a user-specified period, which means that it can be freely selected by the user. The default value used by the RTA is 1 second; you can change this value through the Statistic Analysis tab of the **Settings** window, which opens when you choose **Settings** from the RTA Configuration menu.

ETR 290 states the precondition for a PID_Error message as follows:

Indicator	Precondition	Reference
PID_error	Referred PID does not occur for a user-specified period	ISO/IEC 13818-1: Sub clause 2.4.3.8

Second Priority Measurements

The DVB-MG recommends “continuous or periodic” monitoring of second priority parameters. The RTA monitors most second priority parameters automatically. For maximum flexibility, however, you can set PCR and PTS/DTS probes on the programs and elementary streams of your choice; you must do so to perform measurements 2.3, 2.4, and 2.5.

Transport_error (2.1) The second byte of every packet header in the transport stream contains the transport_error_indicator, which is a flag that serves to indicate bit errors in the following packet. This flag is generated and inserted by the Viterbi or Reed-Solomon decoder at the receiver end if the decoder is no longer capable of correcting all bit and byte errors in the transport stream.

Because it is not possible in the case of a set transport_error_indicator to predict which bit or byte contains an error, this packet must not be evaluated by an MPEG-2 decoder. For this reason, the MPEG test decoder only indicates the Transport_Error, which means that the packet is not checked for further transport stream errors.

ETR 290 states the precondition for a Transport_Error message as follows:

Indicator	Precondition	Reference
Transport_error	Transport_error_indicator in the TS-Header is set to '1'.	ISO/IEC 13818-1: Sub clauses 2.4.3.2 / 2.4.3.3

CRC_error (2.2) If program-specific information (PSI tables), such as PAT, CAT, PMT, NIT, EIT, SDT, BAT and TOT, is transmitted, a value for checking the check sum of this section is inserted at the end of each table section. The CRC (Cyclic Redundancy Check) is used for calculating the check sum at the transmitter and receiver end. Combined with the additionally transmitted CRC value, the check sum for each table section must be zero.

If the resulting check sum does not equal zero, the MPEG-2 decoder must reject the information contained in this table.

If a CRC_error is detected, it cannot be predicted which part of the information contained in the table is not correct. In this case, the MPEG test decoder signals the CRC_error, but the transport stream is not checked for further errors which are derived from the faulty content of this table (for example, a search for PMT PIDs from a PAT or ES PIDs from a PMT).

ETR 290 states the precondition for a CRC_Error message as follows:

Indicator	Precondition	Reference
CRC_error	CRC error occurred in CAT, PAT, PMT, NIT, EIT, BAT, SDT or TOT table	ISO/IEC 13818-1: Sub clause 2.4.4 / annex B ETS 300 468: Sub clause 5.2

PCR_error (2.3) In every transport stream, coded time values derived from the system time clock are transmitted so that the MPEG-2 decoder can link its own timing to the coder system timing in order to decode the input stream. Each program contained in the transport stream may have its own independent program system timing. The Program Map Table (PMT) identifies the PID of the transport packets that contain the PCR (Program Clock Reference) values used by the particular program.

The specified packets contain the optional Adaptation Field in which 42 bit PCR values are transmitted. The 42 bits contain two parts: a 33 bit PCR base and a 9 bit PCR extension. The following formulas hold for the bit structure:

$$\text{PCR base (i)} = (\text{system clock frequency} \times t(i) \text{ DIV } 300) \% 2^{33}$$

$$\text{PCR extension (i)} = (\text{system clock frequency} \times t(i) \text{ DIV } 1) \% 300$$

$$\text{PCR (i)} = (\text{PCR base (i)} \times 300) + \text{PCR extension (i)}$$

A 42-bit PCR value coded this way starts again from count 0 after the elapse of $2^{33} \times 300$ clocks (corresponding to a time period of approximately 26.5 hours at 27 MHz).

The MPEG-2 standard also tolerates discontinuity of PCR values following one another, provided this is indicated by the discontinuity indicator in the optional adaptation field (AF) of the same packet. This method is primarily used for the suppression of PCR error messages when changing programs preceded by remultiplexing of the transport stream.

ETR 290 states the preconditions for a PCR_Error message as follows:

Indicator	Precondition	Reference
PCR_error	PCR discontinuity of more than 100 ms occurring without specific indication Time interval between two consecutive PCR values more than 40 ms	ISO/IEC 13818-1: Sub clauses 2.4.3.4 / 2.4.3.5 ISO/IEC 13818-4: Sub clause 9.11.3 ETR 154: Sub clause 4.5.4

The specified intervals are the default values of the RTA. You can change the intervals, however, on the PCR Analysis tab of the **Settings** window, available through the **Settings** command of the RTA Configuration menu.

PCR_accuracy_error (2.4)

The DVB Measurement Guidelines also recommend additional monitoring of the accuracy of the PCR values transmitted. Accuracy of PCR values may be impaired by inaccurate calculation of the 42-bit PCR word width or by errors during modification of PCR values in a remultiplex.

NOTE. *The term accuracy in this case does not refer to absolute frequency accuracy of the 27 MHz system timing, but to the fluctuation width of the PCR values of a program, which is caused by the above mentioned errors.*

ETR 290 states the precondition for a PCR_accuracy_Error message as follows:

Indicator	Precondition	Reference
PCR_accuracy_error	PCR accuracy of selected program is not within ± 500 ns	ISO/IEC 13818-1: Sub clause 2.4.2.2

PTS_error (2.5)

Presentation Time Stamps (PTS values) in the PES headers are transmitted by transport stream packets of a program. They enable the MPEG-2 decoder to identify the exact time that a transmitted data block (picture for video streams and beginning of an audio sequence for audio streams) is to be presented. The time stamps are transmitted with a word width of 33 bits and relate to the

27 MHz system timing sequence transmitted in the transport stream together with the PCR values.

ETR 290 states the precondition for a PTS_Error message as follows:

Indicator	Precondition	Reference
PTS_error	PTS repetition period more than 700 ms	ISO/IEC 13818-1: Sub clauses 2.4.3.6 / 2.4.3.7 / 2.7.4

CAT_error (2.6)

If encrypted data are contained in a packet of the transport stream, this must be indicated in the packet header (2nd byte) within the field that is two bits wide and is labeled `transport_scrambling_control`. The individual values indicate the following:

Value (binary)	Description
00	No encrypted data contained in the packet
01, 10, 11	Defined by user

If encrypted data are to be transmitted, the MPEG-2 standard recommends the additional transmission of the tables containing the encryption data (Conditional Access Table, CAT) in separate packets with (0x0001) as PID and 0x01 as table index.

The MPEG-2 standard prescribes that packet header including the optional adaptation fields must not be transmitted in encrypted form. According to DVB specifications (ETS 300 468), the same applies to tables containing service information (SI tables PAT, PMT, NIT, EIT, BAT, TDT, TOT and SDT). The only exception to this rule is the EIT (Event Information Table) when program overviews are transmitted.

ETR 290 states the preconditions for a CAT_Error message as follows:

Indicator	Precondition	Reference
CAT_error	Packets with <code>transport_scrambling_control</code> not 00 present, but no section with <code>table_id = 0x01</code> (that is, a CAT) present Section with <code>table_id</code> other than 0x01 (that is, not a CAT) found on PID 0x0001	ISO/IEC 13818-1: Sub clause 2.4.4

Third Priority Measurements

The Real-Time Analyzer continuously monitors the following third priority parameters. You can check the three remaining third priority parameters with the MTS 215 deferred-time analyzer.

NIT_error (3.1)	These types of service information (SI) are also inserted into the transport stream as additional data (multiplex) and contain items such as the current date, time, and description of the TV program. Each of these tables is transmitted in the form of packets with a given packet number (PID) and must be contained in the transport stream at certain intervals according to the DVB specification. However, not every SI has a different PID; packets for TDT and TOT as well as SDT and BAT have identical PIDs. These tables are differentiated by an entry in the table header, the so-called table index (table_id). This table_id enables an MPEG-2 decoder working in compliance with the DVB standard to identify the type of service information with which it is dealing.
SDT_error (3.5)	
EIT_error (3.6)	
RST_error (3.7)	
TDT_error (3.8)	

Table A–2 is an overview of the service information according to ETS 300 468. In the standard configuration, the RTA uses these values. You can change the maximum interval for each table type through the Section Rates Analysis tab of the **Settings** window, which opens when you choose **Settings** from the RTA Configuration menu. Do not change any Maximum interval settings, however, if you plan to use DVB-MG tests to judge DVB compliance of the input stream.

Table A–2: Overview of service information defined in ETS 300 468

Service Information	PID [hex]	Table_id [hex]	Max. interval [sec]
NIT	0x0010	0x40, 0x41, 0x42	10
SDT	0x0011	0x42, 0x46	2
BAT	0x0011	0x4A	10 ¹
EIT	0x0012	0x4E to 0x4F, 0x50 to 0x6F	2 ²
RST	0x0013	0x71	—
TDT	0x0014	0x70	30
TOT	0x0014	0x73	30
Stuffing Table	0x0010 to 0x0013	0x72	—

¹ Only if present.

² For the current transport stream multiplexer.

ETR 290 states the preconditions for NIT_error, SDT_error, EIT_error, RST_error, or TDT_error messages as follows:

Indicator	Precondition	Reference
NIT_error	Section with table_id other than 0x40 or 0x41 or 0x72 (that is, not an NIT or ST) found on PID 0x0010 No section with table_id 0x40 or 0x41 (i.e. an NIT) in PID value 0x0010 for more than 10 sec	ETS 300 468: Sub clause 5.2.1 ETR 211: Sub clauses 4.1, 4.4
SDT_error	Sections with table_id = 0x42 (SDT, actual TS) not present on PID 0x0011 for more than 2 sec Sections with table_ids other than 0x42, 0x46, 0x4A or 0x72 found on PID 0x0011	ETS 300 468: Sub clause 5.1.3 ETR 211: Sub clauses 4.1, 4.4
EIT_error	Sections with table_id = 0x4E (EIT-P/F, actual TS) not present on PID 0x0012 for more than 2 sec Sections with table_ids other than in the range 0x4E - 0x6F or 0x72 found on PID 0x0012	ETS 300 468: Sub clause 5.1.3 ETR 211: Sub clauses 4.1, 4.4
RST_error	Sections with table_id other than 0x71 or 0x72 found on PID 0x0013	ETS 300 468: Sub clause 5.1.3
TDT_error	Sections with table_id = 0x70 (TDT) not present on PID 0x0014 for more than 30 sec Sections with table_id other than 0x70, 0x72 (ST) or 0x73 (TOT) found on PID 0x0014	ETS 300 468: Sub clause 5.1.3 ETR 211: Sub clauses 4.1, 4.4

SI_repetition_error (3.2)

The ETR211 standard prescribes minimum and maximum intervals for the repetition of individual packets; Table A–3 lists the values for service information (SI). The RTA uses these values in the standard configuration. You can change the maximum interval for each table type through the Section Rates Analysis tab of the **Settings** window, which opens when you choose **Settings** from the RTA Configuration menu. Do not change any Maximum interval settings, however, if you plan to use DVB-MG tests to judge DVB compliance of the input stream.

Table A-3: SI repetition rates according to DVB

Service information	Maximum interval (complete table)	Minimum interval (individual sections)
PAT	0.5 s	25 ms
CAT	0.5 s ¹	25 ms ¹
PMT	0.5 s	25 ms
NIT	10 s	25 ms
SDT	2 s ²	25 ms
BAT	10 s ¹	25 ms ¹
EIT	2 s ²	25 ms
RST	—	25 ms
TDT	30 s	25 ms
TOT	30 s	25 ms

¹ If present.

² For current transport stream multiplex.

ETR 290 states the precondition for an SI_repetition_Error message as follows:

Indicator	Precondition	Reference
SI_repetition_error	Repetition rate of SI tables outside of specified limits	ETS 300 468: Sub clause 5.1.4 ETR 211: Sub clause 4.4

Unreferenced PID (3.4) The transport stream multiplex is permitted to contain only packets with program-specific information (PSI and SI tables), packets with certain PIDs that are reserved in the MPEG-2 standard, and packets that are identified in a Program Map Table (PMT).

ETR 290 states the precondition for an Unreferenced_PID message as follows:

Indicator	Precondition	Reference
Unreferenced_PID	PID (other than PAT, CAT, CAT_PIDs, PMT_PIDs, NIT_PID, SDT_PID, TDT_PID, EIT_PID, RST_PID, reserved_for_future_use PIDs, or PIDs user defined as private data streams) not referred to by a PMT within [0.5] seconds	ETS 300 468: Sub clause 5.1.3

Notice that according to the DVB Measurement Guidelines, if a program is changed (a new PMT), an unreferenced PID may appear in the transport stream during a transition period of no more than 0.5 s.

Appendix B: Software Repair

There are two parts to this appendix. The first part explains how to create and use an Emergency Repair Disk. The second part tells you how to reload the test system software if the installed copy becomes corrupted.

Creating and Using an Emergency Repair Disk

An emergency repair disk, specific to the system, is supplied with each Tektronix MPEG Test System. Whenever you upgrade the software or change your password, it is strongly recommended that you also create a new emergency repair disk. This will minimize the chances that you will need to completely reload the operating software for a minor problem.

Use the emergency repair disk to restore your system to its initial setup state if your system files become corrupt and you are unable to recover the previous start up configuration (Last Known Good — the Windows NT startup screen option). If you don't have the emergency repair disk, you will have to reinstall Windows NT. Please see the Windows NT System Guide, provided with your back-up copy of Windows NT, for the procedure required to restore your system.

You may also need the emergency repair disk to restore user passwords if they are forgotten. Be sure to update the emergency repair disk each time you add a user or change a password.



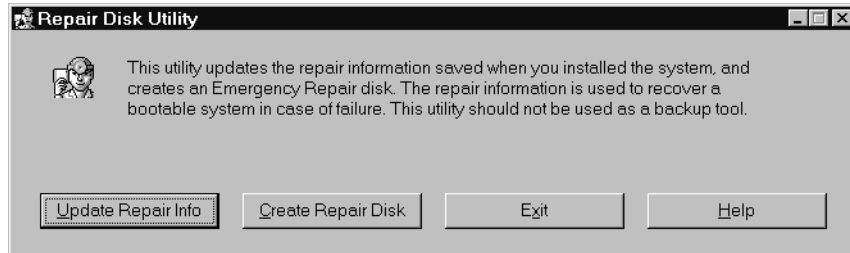
CAUTION. *The files on the Emergency Repair Disk are test system-specific; that is, the disk shipped with your test system is the **ONLY** disk that will work with your system. Do not lose this disk. If you lose the Emergency Repair Disk provided with your test system, create a new one as described below.*

Creating an Emergency Repair Disk

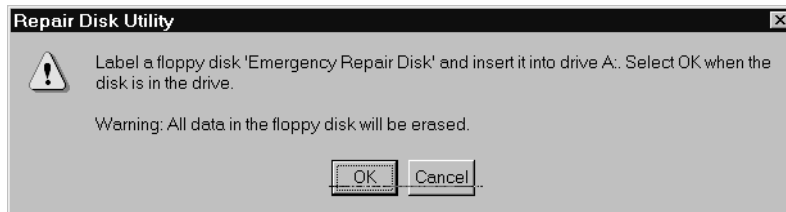
To create an emergency repair disk, clearly mark a high density 3.5-inch floppy disk as the emergency repair disk for your test system, serial number <B0xxxxx> (be sure to write the serial number exactly as it appears on the rear panel); then perform the following steps.

NOTE. *The emergency repair disk is test system specific. Make sure that the emergency repair disk is clearly marked with its serial number. The serial number of your Real-Time Analyzer appears on the original emergency repair disk and on the server rear panel, near the power input connector.*

1. Choose **Run** from the Windows NT Start menu.
2. Type **rdisk** in the **Run** dialog box. The **Repair Disk Utility** dialog box opens.



3. Click **Update Repair Info** to save your current configuration. A message appears to remind you that earlier repair information is overwritten. Click **Yes** to continue.
4. When the process is complete, a message appears to ask if you wish to create an Emergency Repair Disk. Click **Yes**. You are then prompted to insert a diskette into drive A.



5. Insert a 3.5-inch disk in drive A and click **OK**. Rdisk formats the disk and copies the configuration files onto it.
6. When the operation is complete, click **Exit** in the Repair Disk Utility dialog box. Remove the disk from drive A and keep it in a safe place.

Using the Emergency Repair Disk

Always refer to the Windows NT documentation if you need more information.

1. Verify that you have a source of setup information available (the Windows NT back up software package).
2. Insert the Windows NT Setup disk.
3. Restart the Test System.
4. When the Windows NT Setup Screen appears, press **R** (repair).
5. When prompted, insert the emergency repair disk.

6. The emergency repair disk performs the following tasks:
 - Runs CHKDSK.EXE on the WINNT and SYSTEM partitions.
 - Verifies each file in the installation and replaces any that are missing or corrupt.
 - Replaces the System, Security, and Security Accounts Manager hives in the registry.
 - Reinstalls the Boot Loader (the boot sector, BOOT.INI, etc.).

Reinstalling the RTA Software

Use the procedures below to reinstall your test system software if it is accidentally deleted or becomes corrupted. Software has been supplied on CD ROM.

***NOTE.** The following instructions are for reinstalling MPEG Test System software on a machine running Windows NT Workstation 4.0 only; procedures for upgrading your software could be different. If you are installing a software upgrade, follow the instructions provided with the upgrade kit.*

Reinstalling software involves three procedures:

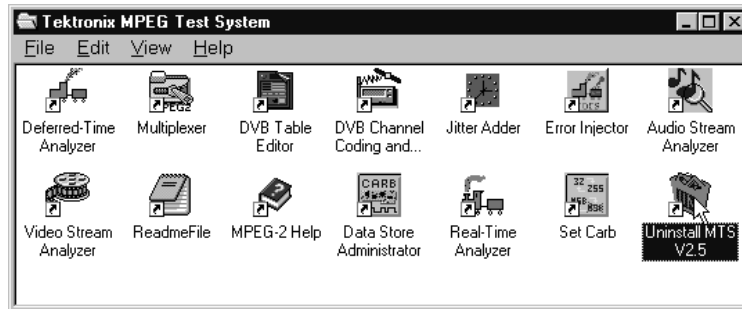
- Uninstalling the software
- Copying the program files
- Entering passwords for your licensed applications

Uninstalling the Software

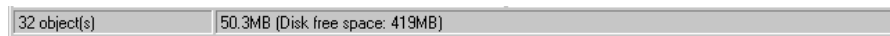
For best results, uninstall the software using unInstallShield application.

1. Restart Windows NT and log in as the administrator (Username = administrator; password = MPEG2). You must log in as the administrator to install the RTA applications.
2. Quit any applications that automatically started at login.

3. Double-click the **Uninstall MTS V2.5** icon in the **Tektronix MPEG Test System** program group window.

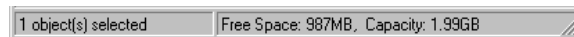


4. When the dialog box asks you to confirm file deletion, click **Yes**.
5. When uninstall is complete, Click **OK** to close the **Remove Programs From Your Computer** window.



Copying the Program Files

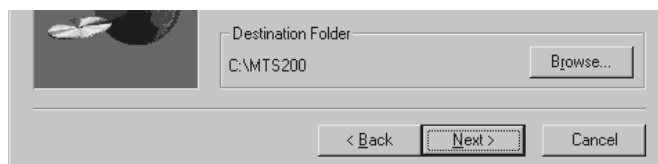
1. Double-click the **My Computer** icon on your Windows NT desktop and, in the resulting **My Computer** window, select the (C:) disk icon. Check the window status bar to verify that the system disk has at least 100 MB of free space. The program will not install if the system disk has less than 100 MB of free space.



2. Place the MPEG Test System Version 2.5 Installation Software CD ROM into the CD ROM drive.
3. Select **Run...** from the Windows NT Start menu. Then enter d:\Setup.exe in the resulting window and click **OK**.



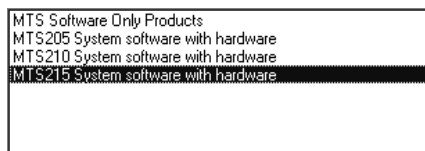
4. In a few seconds, the **Tektronix MTS200 Series** window appears on the computer screen.
5. Read the window text and then click **Next** to proceed to the **Choose Destination Directory** window.



6. The default destination folder is C:\Mts200\. Click **Next** to accept the default folder. The applications may not function correctly if you specify another target folder.

NOTE. *It is strongly recommended that you use the default destination folder.*

7. The **Setup Type** window opens. If your test system has only real-time analysis hardware and software, select **MTS205 System software with hardware**; if your system also contains a Data Store (CARB) system, select **MTS215 System software with hardware**.



8. Click **Next**. The **Select MTS2nn Platform** window opens.



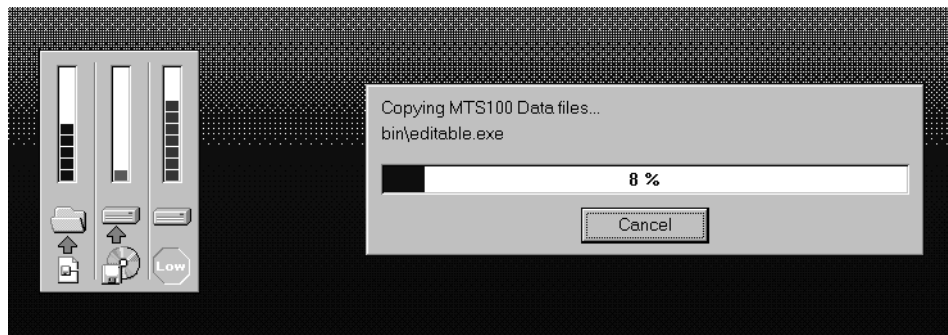
9. Select the option that applies to your test system and then click **Next**.



CAUTION. *Selecting the wrong platform will prevent use of the Real-Time Analyzer and the Data Store system, if it is installed. Be sure to identify your computer platform and select the appropriate option.*

10. The **Select Program Folder** window opens. Click **Next** to accept the default folder name (Tektronix MPEG Test System) and continue. The **Selection Summary** window opens.
11. Review the Destination Directory, System Product, and Start Menu Folder selections; if all are correct, click **Next** to proceed with installation.

The setup program begins installing the RTA software. The activity and progress gauges appear to show that installation is progressing. Installation proceeds without your input (and sometimes with no apparent activity) for approximately 2 ½ minutes, depending on your platform.



12. After the program group and submenu are set up, an information dialog box reminds you to verify that the Dongle (Software Key) is installed. Verify that the Software Key is installed on the parallel port; then click **OK** to continue.

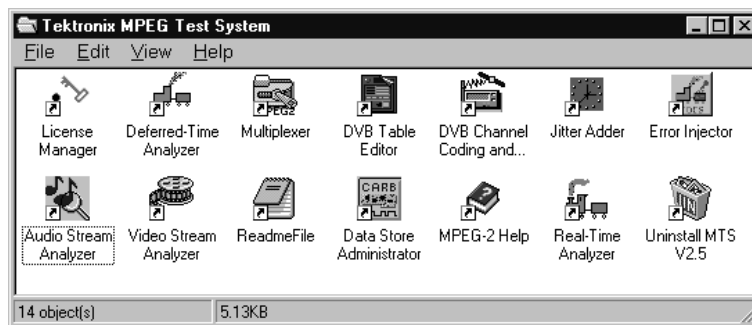


13. The **Setup Complete** window opens; click **Finish** to continue.
14. A **Notepad** window opens to display the Readme file. Scan the text for important information, then select **Exit** from the File menu to close the window.
15. Another **Setup Complete** window opens. For best results, accept the "Yes, I want to restart my computer now" option, remove the MPEG Test System disc from the CD ROM drive, and click **Finish** to complete setup and reboot the system.
16. Log on as **MTS100**. No password is required.

17. Locate the **Tektronix MPEG Test System** folder on the Windows NT desktop and double-click the folder to open the program group window.



The program group window resembles the screen capture below after full MTS 215 installation. The Data Store Administrator icon will not be present after MTS 205 installation. Neither the Data Store Administrator icon nor the Real-Time Analyzer icon are present after software-only installation.



Entering the General License Password

Perform the remaining steps to reenter the general password that corresponds to the attached Software Key.

1. Double-click the **License Manager** icon to start the application.



The **Tektronix Software Protection** window appears.



2. Consult the list of passwords supplied with your most recent system upgrade and identify the General password. Use the original password supplied with your system only if you have not upgraded the system or added any options.
3. Enter the three 6-character Hexadecimal numbers of the password in the corresponding **Tektronix Software Protection** window entry fields (lowercase characters are acceptable) and then click **OK**. A **License** message window appears.
4. If the password is correct, click **OK** to acknowledge the message. If you made an error entering the password, click **OK** and return to step 1.

When you enter the correct password, software reinstallation is complete.

Appendix C: Real-Time Analyzer Input and Output

Figure C-1 shows Real-Time Analyzer input and output (I/O) connectors as they appear on the Compaq Proliant rear panel; Figure C-2 shows how the same connectors are arranged on the Compaq Prosignia (serial numbers below B040000). Refer to *RTA I/O Connections* beginning on page C-2 for information about connecting the RTA to a MPEG-2 or DVB source, to the Data Store system, and to other equipment. For I/O port specifications, refer to *Electrical Characteristics* beginning on page C-4.

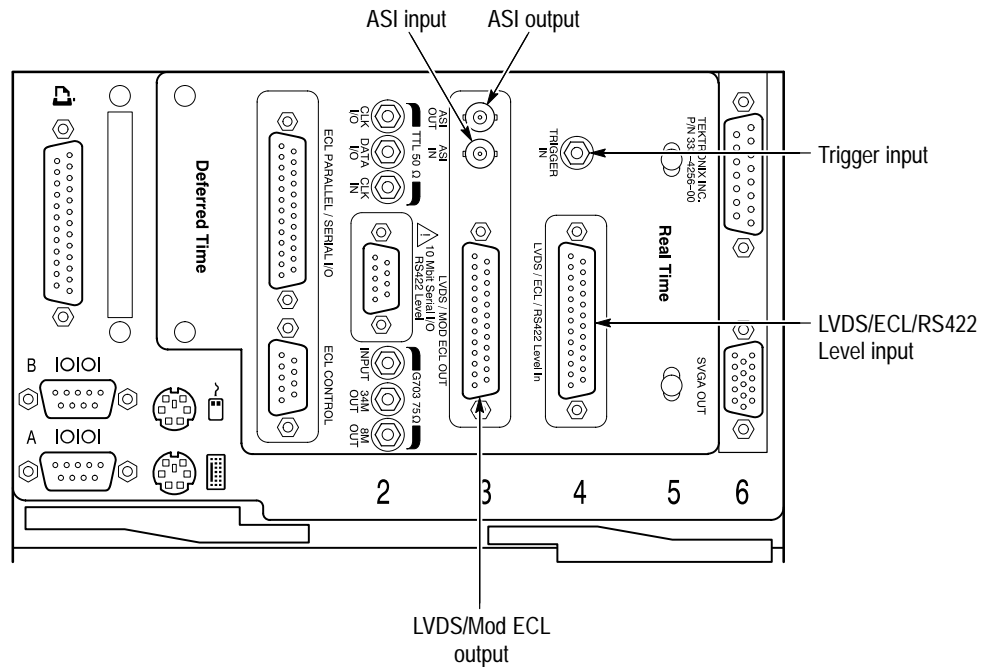


Figure C-1: Real-Time Analyzer input and output ports (Proliant)

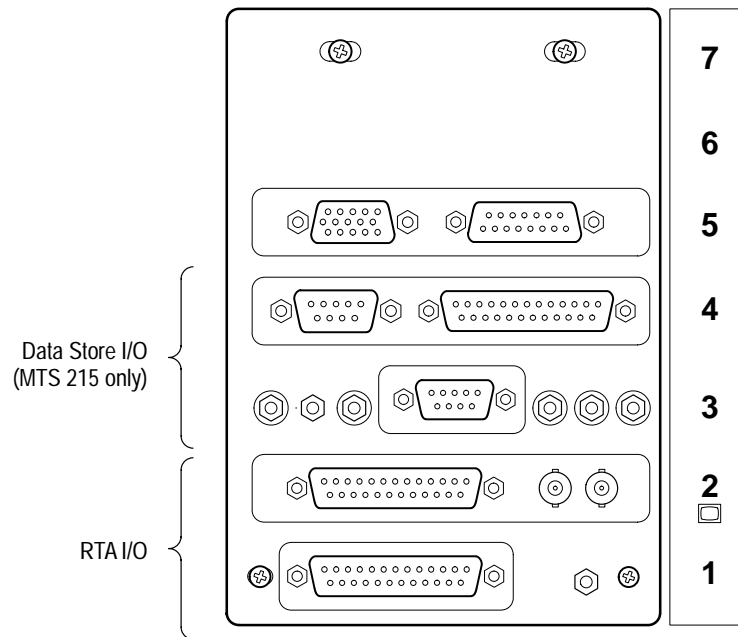


Figure C-2: Input and output ports, Prosorgia platform

RTA I/O Connections

The Real-Time Analyzer can input and output both parallel and serial data.

Input The RTA accepts input through the LVDS/ECL/RS422 parallel connector or through the ASI serial connector. In the standard configuration, either LVDS or ECL parallel input is accepted as the default. If you provide serial input, you must change the software configuration before monitoring an input data stream. To change the software configuration, refer to *Monitoring an Input Stream* in the *Operating Basics* section of this manual.

Output to the Data Store System (MTS 215 only)

If you intend to capture and save portions of the input bitstream on the Data Store disks, connect the parallel RTA output to the parallel Data Store I/O connector as shown in Figure C-3 below. Use the 25-conductor straight-through shielded cable provided with the test system, Tektronix part number 174-3799-0X. For further details, see *Capturing Input Streams* in the *Operating Basics* section of this manual.

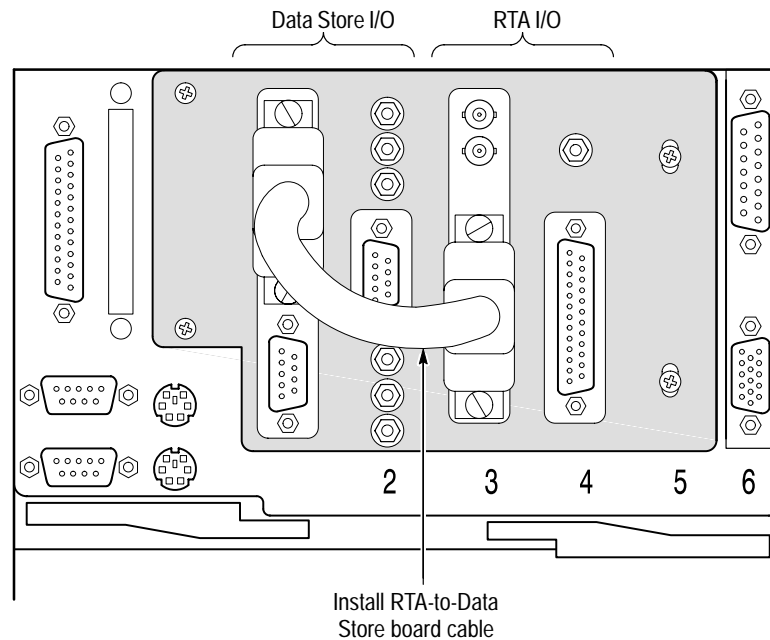


Figure C-3: RTA output to Data Store input connection

Output to Other Equipment

The Real-Time Analyzer can output all or part of the input stream through the parallel and serial (ASI) output connectors.

Parallel Output. Real-Time Analyzer parallel output is active only when the RTA is running and analysis is occurring. The output level can be either LVDS or modified ECL. Refer to *Hardware Configuration* on page 3-73 for information about setting the output level; refer to Table C-3 on page C-5 for parallel output characteristics.

The RTA software can filter parallel output. For complete information, refer to *Filtering Configuration* on page 3-91.

Serial (ASI) Output. With data input through the ASI connector, the serial output is continuously active. With a parallel input, the serial output is disabled when Data Storage (through the parallel output) is occurring.

The Serial output stream is always equivalent to the input stream and is not affected by selections made on the Filtering Configuration tab of the Real-Time Analyzer **Settings** window.

Refer to Table C-5 on page C-6 for serial output characteristics.

Trigger Input

The trigger input accepts a TTL-level (0 to +5 V) signal that you can use to control capture of the RTA input stream to the Data Store system, if your test system contains one. You can configure the RTA to start/stop data capture on either the rising edge (low to high transition) or the falling edge (high to low transition) of the trigger signal. Refer to *Data Storage Start/Stop* on page 3-92 for further information.

Electrical Characteristics

Tables C-1 through C-5 list the electrical characteristics of the Real-Time Analyzer I/O ports. These tables are included here for your convenience. Refer to the optional *MPEG Test System Service Manual* for additional information.

Table C-1: LVDS/ECL/RS422 Level In port

Characteristic	Description	Supplemental information
Connector	D-25	Female; pinout as shown in Table C-2
Input data rate	60 Mbits/s maximum, 1 Mbits/s minimum	
Signal amplitude, typical	2.0 V _{p-p} maximum, 100 mV _{p-p} minimum	
Signal common mode range, typical	-1.8 V to +2.5 V	
Termination, nominal	100 ohms resistive	Line to line
Timing reference	Rising edge of clock	
Clock-to-data timing	Data must be stable to ± 5 ns of the rising clock edge	

Table C-2: LVDS/ECL/RS422 parallel data pinout

Parallel input pinout	Pin	Function	Pin	Function
	1	DCLK	14	$\overline{\text{DCLK}}$
	2	Ground	15	Ground
	3	DATA 7	16	$\overline{\text{DATA 7}}$
	4	DATA 6	17	$\overline{\text{DATA 6}}$
	5	DATA 5	18	$\overline{\text{DATA 5}}$
	6	DATA 4	19	$\overline{\text{DATA 4}}$
	7	DATA 3	20	$\overline{\text{DATA 3}}$
	8	DATA 2	21	$\overline{\text{DATA 2}}$
	9	DATA 1	22	$\overline{\text{DATA 1}}$
	10	DATA 0	23	$\overline{\text{DATA 0}}$
	11	DVALID	24	$\overline{\text{DVALID}}$
	12	PSYNC	25	$\overline{\text{PSYNC}}$
	13	Shield		

Asserted Low differential signal.

Table C-3: LVDS/MOD ECL Out port (parallel)

Characteristic	Description	Supplemental information
Connector	D25	Female; pinout as shown in Table C-2
Signal amplitude	Selectable by software to LVDS or modified ECL levels	
LVDS	454 mV _{p-p} maximum, 247 mV _{p-p} minimum	100 Ω line-to-line termination
Modified ECL	454 mV _{p-p} maximum, 247 mV _{p-p} minimum	100 Ω line-to-line termination Modified Differential ECL is less than the typical 100K ECL level of ≈ 700 mV _{p-p} .
Common mode voltage		
LVDS output, typical	0.85 V	
Modified ECL output	-1.80 V maximum, -1.50 V minimum	

Table C-4: ASI In port

Characteristic	Description	Supplemental information
Connector	BNC	Female
Input bit rate		270 Mbits/s \pm 100 ppm
Transport stream	60 Mbits/s max	Content of bit rate
Signal amplitude, typical	800 mV _{p-p} maximum, 200 mV _{p-p} minimum	
Termination, nominal	75 Ω	
Return loss, typical	-17 dB minimum	27 MHz to 270 MHz
Data formats	Accepts both burst and packet modes	

Table C-5: ASI Out port

Characteristic	Description	Supplemental information
Connector	BNC	Female
Output bit rate		270 Mbits/s \pm 100 ppm
Signal amplitude	880 mV _{p-p} maximum, 500 mV _{p-p} minimum	Into a 75 Ω load
Rise and fall times, typical	1.2 ns maximum	20% to 80%

Table C-6: Trigger input

Characteristic	Description	Supplemental information
Connector	SMB	Male
Input level	TTL	



Glossary

Glossary

ACTS (Advanced Communications Technologies and Services)

A set of telecommunication research projects financed by the European Union.

BAT (Bouquet Association Table)

One of the tables defined by DVB-SI, the BAT provides information regarding bouquets (collections of services marketed as a single entity). DVB only.

CARB (Carte d'Acquisition / Restitution Binaire)

(French for Binary Acquisition/Restitution Board) The MTS 215 Data Store system, which can capture, store, and output MPEG-2 compliant transport streams.

CAT (Conditional Access Table)

One of the PSI tables described by the MPEG-2 standard, the CAT provides the association between one or more CA systems, their EMM (Entitlement Management Message) streams, and any special parameters associated with them.

CRC (Cyclic Redundancy Check)

One of the fields described in the MPEG-2 standard, used to verify the correctness of data in PSI and SI tables.

DVB (Digital Video Broadcast)

A project group of the European Broadcasting Union (EBU).

DVB-MG

Digital Video Broadcasting - Measurement Guidelines

DVB-SI (Digital Video Broadcast Service Information)

The DVB-SI adds the information that enables DVB IRDs to automatically tune to particular services and allows services to be grouped into categories with relevant schedule information. It has several tables, including: NIT, SDT, BAT, and EIT. (NIT is also required for MPEG-2.)

DTS (Decoding Time-Stamp)

One of the fields described in the MPEG-2 standard, may be present in a PES packet header that indicates the time that an access unit is decoded in the T-STD.

ECM (Entitlement Control Message)

Private conditional access information that specifies control words and possibly other, typically stream-specific, scrambling and/or control parameters.

EISA (Extended Industry Standard Architecture)

The PC bus used to communicate with the CARB and PIA boards.

EIT (Event Information Table)

One of the tables defined by DVB-SI, the EIT contains data concerning events (a grouping of elementary broadcast data streams with a defined start and end time belonging to a common service) and programs (a concatenation of one or more events under the control of a broadcaster, such as event name, start time, and duration).

EMM (Entitlement Management Message)

Private conditional access information that identifies the authorization levels or the services of specific decoders.

ETS (European Telecommunication Standard)

One of the types of documents released by ETSI.

ETSI

European Telecommunications Standards Institute.

ETR (ETSI Technical Report)

One of the types of documents released by ETSI.

IRD (Integrated Receiver / Decoder)

A receiving decoder that can automatically configure itself using the MPEG-2 Program Specific Information (PSI).

ISO (International Standard Organization)

Organization responsible for establishing standards at the world-wide level.

NIT (Network Information Table)

One of the PSI tables described by the MPEG-2 standard and also one of the tables defined by DVB-SI. The NIT conveys information relating to the physical organization of the multiplex; that is, transport streams carried via a given network and the characteristics of the network itself. Transport streams are identified by the combination of an original network ID and a transport stream ID in the NIT.

OPCR (Original Program Clock Reference)

Optional transport packet field defined in the MPEG-2 standard that contains a coded time stamp used in the reconstruction of a single program transport stream from another transport stream. The OPCR field shall be coded only in transport stream packets in which the PCR field is present.

PAT (Program Association Table)

One of the PSI tables described in the MPEG-2 standard, the PAT gives information about the structure of a transport stream.

PCR (Program Clock Reference)

One of the fields defined in the MPEG-2 standard, a time stamp in the transport stream from which decoder timing is derived.

PES (Packetized Elementary Stream)

A structure defined in the MPEG-2 standard used to carry elementary stream data.

PIA (Processing Interface Adapter)

The Real-Time Analyzer circuit board that filters, decodes, and analyzes the compliance at low level of an MPEG-2 transport stream.

PID (Packet Identifier)

One of the fields described in the MPEG-2 standard, a unique integer value used to identify elementary streams of a program in a single or multiprogram TS.

PMT (Program Map Table)

One of the PSI tables described by the MPEG-2 standard, the PMT identifies and indicates the locations of the streams that make up each service and the location of the Program Clock Reference (PCR) fields for a service. This table is transmitted in sections.

Probe

A user-initiated analysis.

PSI (Program Specific Information)

A set of tables described by the MPEG-2 standard, the PSI contains all the tables that define the MPEG-2 transport stream. It consists of the PAT, PMT, CAT, and NIT tables. (NIT is also used for DVB-SI.)

PTS (Presentation Time Stamp)

One of the fields described in the MPEG-2 standard, the PTS may be present in a PES packet header that indicates the time that a presentation unit is presented in the T-STD.

QUOVADIS (QUality Of Video and Audio for DIgital Television Services)

One of the ACTS projects in which MATRA COMMUNICATION is involved, QVOVADIS deals with the definition of parameters for quality of service in digital television systems.

RTA

Real-time Analyzer.

RST (Running Status Table)

One of the tables defined by DVB-SI, the RST gives a quick updating mechanism for the status information carried in the EIT.

SDT (Service Description Table)

One of the tables defined by DVB-SI, the SDT contains data describing the

services in the system. Examples include: names of services and the service provider.

SI (Service Information)

Set of tables defined by DVB-SI, SI provides information on services and events carried by different Multiplexes, and even other networks. SI is structured as six tables (PAT, NIT, CAT, SDT, EIT, and BAT). The applications are only concerned with NIT, BAT, SDT, and EIT.

ST (Stuffing Table)

One of the tables defined by DVB-SI, the ST provides stuffing sections.

TDT (Time & Date Table)

One of the tables defined by DVB-SI, the TDT carries the current time and date information.

TOT (Time Offset Table)

One of the tables defined by DVB-SI, the TOT gives information about a local time offset in a given area.

TS (Transport Stream)

A bit stream that contains 0 or more elementary streams combined in a manner that conforms to the MPEG-2 standard.

T-STD (Transport Stream System Target Decoder)

Described by the MPEG-2 standard, the T-STD is a hypothetical reference model of a decoding process used to define the semantics of a TS.



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