User Manual

Tektronix

MTS 200 Series
Real-Time Analyzer

071-0076-02

This document supports MPEG Test System version 3.0 software

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

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Tektronix warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If a product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

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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 Tektronix MPEG Test System Real-Time Analyzer (RTA) software and hardware. The MTS 205 contains only the RTA; 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.

If you purchased an RTA test system and are looking for information about installation, first-time operation, or specifications, refer to the *MTS 200 Series Hardware Installation and Specifications Compaq Proliant 1600 Platform Technical Reference*, Tektronix part number 071-0261-XX.

For the latest information about MTS 200 Series Software features and bugs, refer to the *MPEG Test System Software Version 3.0 Read This First* document, Tektronix part number 071-0537-XX, that accompanied your test system, software product, or upgrade.

Manual Structure

This manual is divided into the following sections:

Getting Started. This section contains all the information you will need to get the RTA up and running.

Operating Basics. This section contains basic information for operating the RTA user interface and tutorials to familiarize you with the functions of the RTA.

Reference. This section contains in-depth descriptions of the RTA analyses and complete descriptions of configuration options.

Appendix A: ETR 290 Measurements. This section describes the ETR 290 tests and measurements that the RTA can perform and report in the ETR 290 view.

Appendix B: ATSC Program Paradigm. This section describes the ATSC program paradigm that the RTA uses.

Appendix C: Using the Private Syntax Interpreter. This section describes how to use the Private Syntax Interpreter application to create and compile private syntax definitions for use with the RTA.

Appendix D: Software Repair. This section contains information that you might need in case of system disk errors, inadvertent software erasure, or application file corruption.

Glossary. Consult the glossary when you encounter an unfamiliar term.

Index.

Symbols and Terms

The MTS 200 Series Real-Time Analyzer interface uses many unique icons and symbols. For an explanation of a particular icon or symbol, please refer to the appropriate subsection of the *Operating Basics* section. For example, the icons that appear in the Hierarchic view are explained in *Using the Hierarchic View.*

This manual uses several terms as defined below. Please see the *Glossary* for additional definitions.

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.

RTA
Real-time Analyzer.

Related Documents

The *MTS200 Series MPEG-2 DVB/ATSC System Analyzer User Manual*, Tektronix part number 071-0532-XX, contains information about using the Deferred-Time Analyzer and DVB Channel Coding and Decoding applications.

The *MTS200 Series Stream Creation Applications User Manual*, Tektronix part number 071-0534-XX, contains information about using the Multiplexer, DVB Table Editor, ATSC Table Editor, DVB Channel Coding and Decoding, Jitter Adder, Error Injector, and Open Mux Controller applications.

The *MTS200 Series Program Stream Analyzer User Manual*, Tektronix part number 071-0384-XX, contains information about using the deferred-time Program Stream Analyzer application.

The *MPEG Test System Dolby Digital Audio Stream Analyzer User Manual*, Tektronix part number 071-0535-XX, contains information about using the deferred-time AC-3 Audio Stream Analyzer application.

The *MTS200 Series MPEG Audio Stream Analyzer User Manual*, Tektronix part number 071-0192-XX, contains information about using the deferred-time MPEG Audio Stream Analyzer application.

The *MTS200 Series Video Stream Analyzer User Manual*, Tektronix part number 071-0249-XX, contains information about using the deferred-time MPEG Video Stream Analyzer application.

The *MTS200 Series Data Store Administrator User Manual*, Tektronix part number 071-0536-XX, contains information about using the Data Store (CARB) system that is part of MTS 210 and MTS 215 test systems.

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.

Related Applications

The following table lists all MTS 200 Series MPEG Test System, version 3.0, applications. The applications that appear in the Tektronix MPEG Test System program group and Start menu of your test system depend on the system and its installed options. See the version 3.0 *Read This First* document for additional information about software options and licensing.

Table i: Tektronix MPEG Test System applications

Icon	Application title	Function	User Document
 Real-Time Analyzer	Real-Time Analyzer	Continuously monitor an input bitstream for compliance with the MPEG-2, DVB SI, and ATSC PSIP digital television standards.	MTS 200 Series Real-Time Analyzer User Manual 071-0076-XX
 Private Syntax Interpreter	Private Syntax Interpreter	Create table definitions used by the Real-Time Analyzer to interpret private syntax sections and descriptors.	
 Deferred-Time Analyzer	MPEG-2 DVB/ATSC System Analyzer	Analyze transport streams and packetized elementary streams that are saved in system disk or data store (CARB) files.	MTS 200 Series MPEG-2 DVB/ATSC System Analyzer User Manual 071-0532-XX
 DVB Channel	DVB Channel Coding and Decoding	Code and decode transport stream files to DVB specifications.	MTS 200 Series Stream Creation Applications User Manual 071-0534-XX (Information repeated in both manuals)

Table i: Tektronix MPEG Test System applications (Cont.)

Icon	Application title	Function	User Document
 Multiplexer	MPEG-2 Transport Stream Multiplexer	Create transport stream files from PSI/SI/PSIP table files, elementary stream files, and data files.	MTS 200 Series Stream Creation Applications User Manual 071-0534-XX
 DVB Table Editor	DVB Table Editor	Create and edit PSI and DVB SAI table files for use with the transport stream multiplexer.	
 Editor	ATSC Table Editor	Create and edit PSI and ATSC PSIP table files for use with the transport stream multiplexer.	
 Jitter Adder	Jitter Adder	Add jitter to the PCR data in an MPEG-2 transport stream file.	
 Error Injector	Error Injector	Insert or correct errors in transport stream packets.	
 Real-Time Multiplexer	Real-Time Multiplexer	Configure the real-time multiplexer application to remultiplex system and or elementary streams for immediate output.	
 Open Mux Server	Open Mux Server	Remultiplex various MPEG inputs (system, MPEG-2, DVB, ATSC, and elementary streams) into a valid transport stream for immediate output. The user interface for this application is the Real-Time Multiplexer.	
 Data Store Administrator	Data Store Administrator	Manage the data store (CARB) disks and control acquisition/generation of MPEG-2 transport streams.	MTS 200 Series Data Store Administrator User Manual; 071-0536-XX
 Program Strea...	Program Stream Analyzer	Analyze MPEG program stream files that are saved in a system disk or data store file.	MTS 200 Series Series Program Stream Analyzer User Manual; 071-0384-XX
 Video Stream Analyzer	MPEG Video Stream Analyzer	Analyze MPEG-1 and MPEG-2 video elementary streams that are saved in system disk or data store (CARB) files.	MPEG Test System Video Stream Analyzer User Manual; 071-0249-XX
 Audio Stream Analyzer	MPEG Audio Stream Analyzer	Analyze MPEG-1 and MPEG-2 audio elementary streams that are saved in system disk or data store (CARB) files.	MPEG Test System Audio Stream Analyzer User Manual; 071-0192-XX
 Dolby Digital Analyzer	Dolby Digital Audio Stream Analyzer	Analyze Dolby digital (AC-3) audio elementary stream files or streams extracted from the MPEG-2 DVB/ATSC System Analyzer.	MTS 200 Series Dolby Digital Audio Stream Analyzer User Manual; 071-0535-XX

Table i: Tektronix MPEG Test System applications (Cont.)

Icon	Application title	Function	User Document
 License Manager	Tektronix Software Protection	Enter or reenter the general password to enable licensed applications.	Read This First, MTS 200 Series Software V3.0; 071-0537-XX
 MPEG-2 Help	MPEG2_Part1 (ISO/IEC 13818-1)	The international MPEG-2 system standard in Windows Help format.	none
 Uninstall MTS	UninstallShield	Remove MPEG Test System software from the system disk.	MTS 200 Series User Manuals

Software Version

Table ii lists the MTS 200 Series MPEG Test System application version numbers supported by this manual. To verify an application version number, select **Help** in the application menu bar; then select **About** from the Help menu.

Table ii: MTS 200 Series MPEG Test System (V3.0) supported applications

Application	Supported version	Applicable document(s)	Manual part number
Real-Time Analyzer	V2.0 and above	MTS 200 Series RTA User Manual	071-0076-XX

Contacting Tektronix

Product Support	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 Or contact us by e-mail: tm_app_supp@tektronix.com For product support outside of North America, contact your local Tektronix distributor or sales office.
Service Support	Contact your local Tektronix distributor or sales office. Or visit our web site for a listing of worldwide service locations. www.tektronix.com
For other information	In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.
To write us	Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000

Getting Started

Getting Started

This manual explains the function and use of the Tektronix MTS 200 Series MPEG Test System Real-Time Analyzer (RTA) application. If you need information about any other application included in the MTS200 Series system, refer to *Related Documents* on page x for a list of MTS200 Series manuals.

NOTE. *If you are not familiar with the Windows 95 or Windows NT 4.0 operating systems, review the Windows NT documentation that accompanied your MTS 200 Series test system.*

This section contains the following information:

Refer to *Operating Basics* starting on page 2–1 for detailed information about operating the RTA application.

Several tutorials are located in *RTA Operating Tutorials* starting on page 2–67 that are intended to introduce you to RTA operating capabilities, features, and techniques.

Refer to *Reference* starting on page 3–1 for in-depth descriptions of the RTA analyses and complete descriptions of configuration options.

Product Description

The RTA application is designed to continuously monitor a transport stream (TS) for compliance with the MPEG-2, DVB-SI, and ATSC/PSIP digital television standards. You can use the RTA application to continuously monitor an array of stream parameters to ensure decodability or you can concentrate on just a few parameters for close examination.

The RTA conducts very few full-time analyses on the input stream. These default analyses are fundamental to RTA operation and cannot be disabled. Refer to *Default Analyses* on page 3–2 for a description of the full-time default analyses. All of the remaining RTA analyses are user-initiated and user-controlled.

***NOTE**. To differentiate user-controlled analyses from RTA default analyses, this manual refers to any user-controlled analysis as a **Probe**.*

The number of stream parameters that you can monitor at one time while maintaining real-time error reporting depends on the compliance level of the input stream, the speed of the MTS200 Series test system's processor, and the amount of test system RAM. Refer to Real-Time Analysis Performance Factors *on page 1–6 for more information.*

If you use the Data Store system, you can record a portion of the input stream for use in off-line analysis by other MTS200 Series applications. Refer to *Capturing Input Streams (MTS 215 only)* on page 2–96 for instructions.

The RTA provides the following types of analysis:

- Multiplex analysis
- Syntactic analysis of the transport and section levels
- Rate analysis of the transport and section levels
- Timing analysis of PCRs and PTS/DTSs
- Display pass/fail results of all ETR 290-recommended evaluations in one display (the ETR 290 view)
- IP data transfer analysis

RTA Signal Connections

If you purchased an RTA test system and are looking for information about installation, first-time operation, or specifications, refer to the *MTS 200 Series Hardware Installation and Specifications Compaq Proliant 1600 Platform Technical Reference*, Tektronix part number 071-0261-XX. After you have installed the MTS 200 Series server, the RTA is ready to operate.

Logging On to the MTS200 Series System

Perform the following steps to log on to your MTS200 Series system:

1. Switch the MTS200 Series power on to begin the Windows NT initialization process. Initialization can take up to two minutes. Under normal circumstances no action is required until the **Begin Logon** window appears.
2. When the **Begin Logon** window appears, press **CTRL + ALT + DELETE** (all three keys simultaneously) to open the **Logon Information** window.
3. Enter **MTS100** 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. Refer to *Login User Names* and *Login Passwords* below for more information about those topics.

Login User Names

The "MTS100" user name is the login account you should use for most of your work. Two additional login user names are available. The first is "guest" with no password. The guest login level has only limited access to files and applications. The second is "administrator" with "MPEG2" as the password. The administrator login level has administrator privileges to files and applications.

NOTE. *You must use the "administrator" login when you perform 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 an "administrator" user.*

Login Passwords

You can change the login passwords if necessary; refer to the Windows NT documentation for instructions. If you change any login password, be sure to create a new emergency repair disk. (Refer to *Creating and Using an Emergency Repair Disk* on page D–1.)

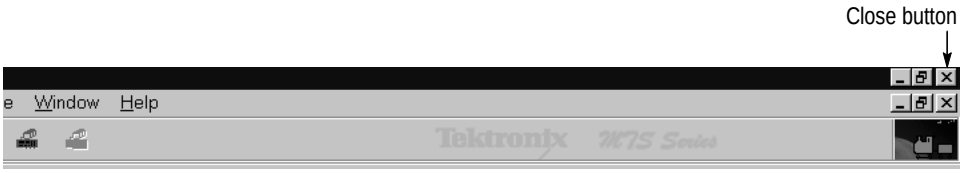
Starting and Exiting the RTA Application

Once you have logged in to the MTS200 Series system, you can start the RTA application using one of the following two methods:

- Select **Real-Time Analyzer** from the Windows NT Start menu
- Double-click the Real-Time Analyzer icon (shown below) in the **Tektronix MPEG Test System** window

You can exit the Real-Time Analyzer application using one of the following two methods:

- Select **Exit** from the Configuration menu
- Click the close button in the upper-right corner of the application window (shown below)



When you exit the application, the current configuration is preserved and used the next time you start the application. In the default configuration, information and error messages (up to 20 Mbytes) are automatically saved in the Windows NT Event Viewer. No other information is saved.

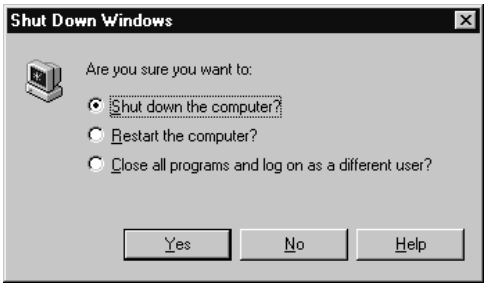
Shutting Down the MTS200 Series System

CAUTION. *Do not switch power off to your MTS200 Series system 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.*

Perform the following steps to shut down the MTS200 Series system:

1. 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 (shown below).

2. Select **Shut down the computer?** in the resulting **Shut Down Windows** dialog box (shown below) and then click **Yes**.



3. 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 MTS200 Series system.

Real-Time Analysis Performance Factors

The RTA application 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 becomes active. The Buffer filling bar (shown below) is located in the center of the Status bar on the bottom of the RTA application window. As buffer filling increases, RTA error and message displays are less timely.

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

***NOTE**. An RTA running on a 120 MHz Compaq Prosignia platform is more likely to use the buffer than one that is based on a 200 MHz, 266 MHz, or 300 MHz Compaq Proliant platform.*

- 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. Refer to *Analysis* starting on page 3–1 for more information.

Operating Basics

Operating Basics

NOTE. *If you are not familiar with the Windows 95 or Windows NT 4.0 operating systems, review the Windows NT documentation that accompanied your MTS 200 Series test system.*

This section will familiarize you with the Real-Time Analyzer (RTA) display and will provide you with a basic understanding of the functions available within the application. Refer to *Getting Started* on page 1–1 for information about logging onto the MTS200 Series test system and starting the RTA application. Refer to the *Reference* section of this manual for information about analysis considerations and configuring the RTA for specific analyses.

This section contains the following information:

The RTA Window Display

The RTA window (see Figure 2–1) fills the entire screen when you start the application. The RTA window contains the following elements:

- **Title Bar.** In addition to identifying the RTA application, the title bar indicates which of the three main RTA views is selected and the contents or subject of the current display in the Client view. Refer to *Title Bar* on page 2–3 for more information about the title bar.
- **Menu Bar.** The menu bar provides access to the various RTA command menus. Refer to *Menu Bar* on page 2–4 for descriptions of the menu functions available within the menu bar.
- **Toolbar.** The toolbar contains graphical command buttons for many of the most-used menu commands as well as an icon indicating whether the RTA is actively analyzing the input stream. Refer to *Toolbar* on page 2–8 for more information.

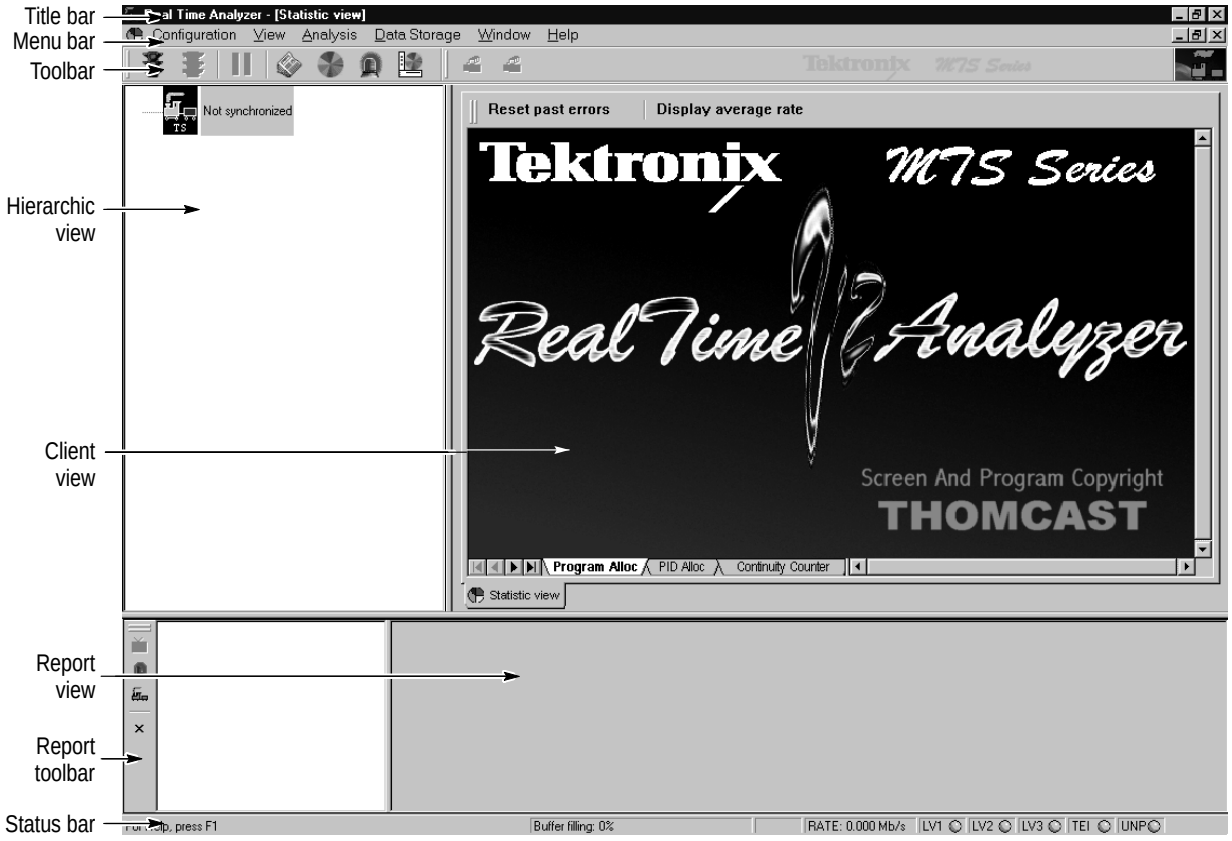


Figure 2–1: Elements of the RTA application window

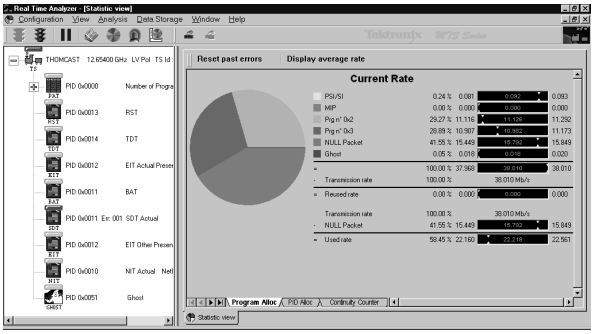
- **Hierarchic View.** The Hierarchic view uses icons to show the interrelationship of stream components and displays additional text information about each component. Refer to *Using the Hierarchic View* on page 2–11 for more information.
- **Client View.** The Client view can contain one or more user-selected subordinate views. Refer to *Using the Client View* on page 2–39 for more information.
- **Report View and Report Toolbar.** The Report view includes the report toolbar and displays all stream analysis results across the bottom of the RTA window. Refer to *Using the Report View* on page 2–23 for more information.
- **Status Bar.** The status bar displays help statements and useful information about the analyzed stream. Refer to *Status Bar* on page 2–9 for more information.

RTA Window Interface Conventions

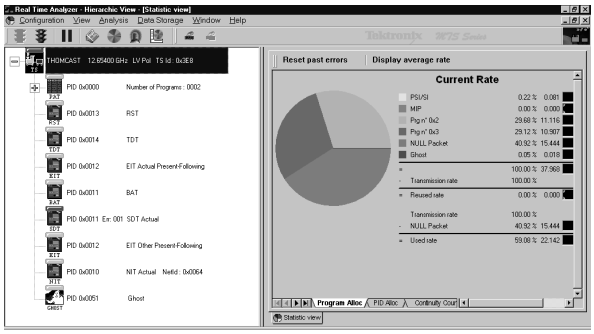
Wherever possible, the RTA application follows Windows NT 4.0/Windows 95 user interface conventions.

As you use the RTA, you can change the relative sizes of the Hierarchic, Client, and Report views, depending on the information that is most important at a given time. To change the relative widths of the Hierarchic and Client views, 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 view as shown below.

Default view widths



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



You can change the height of all three views by dragging the split bar that separates the Hierarchic and Client views from the Report view.

You can also maximize the height of the Hierarchic and Client views by changing the Report view into a Client view. Refer to *Hierarchic View Menus* on page 2–26 for instructions.

Title Bar

In addition to identifying the RTA application, the title bar indicates which of the three main views (Hierarchic, Report, or Client) is selected and the contents or subject of the Client view.

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

Figure 2–2 shows some example title bar messages.

The Hierarchic view is selected and the ETR 290 view is the current Client view:

The Report view is selected and the ETR 290 view is the current Client view:

The Client view is selected and the ETR 290 view is the current Client view:

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

Figure 2–2: Examples of title bar messages

Menu Bar

The menu bar (shown below) contains the RTA command menus. You can access the menus using your PC mouse, or you can use the keyboard by pressing the underlined letter in the displayed menu name. The following pages describe the selections available within each of the menus.

- **Configuration Menu.** The Configuration menu contains commands for managing program settings and configurations and for exiting the RTA application.
- **View Menu.** The View menu contains commands for managing the different RTA views.
- **Analysis Menu.** The Analysis menu contains commands to start and stop input stream analysis.
- **Data Storage Menu.** The Data Storage menu contains commands to start and stop input stream storage (on the MTS 215 only).
- **Window Menu.** The Window menu contains commands for managing the various displays within the Client view.
- **Help Menu.** The Help menu provides access to RTA online help and version information.
- **Active View Menu.** 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 view. The pie chart symbol in the menu bar shown above indicates that the Statistic view is active in the Client view.

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). Table 2–1 describes the menu selections available in the Configuration menu.

Table 2–1: Menu bar Configuration menu

Menu selection	Function
Settings	Open the Settings window (refer to *Configuration* on page 3–41)
Load	Restore a previously-saved configuration
Save as	Save the current configuration
Restore standard	Restore default settings only when analysis is stopped
Exit	Quit and exit the Real-Time Analyzer application

View Menu

Use the View menu commands to control the information displayed in the RTA application window. Table 2–2 describes the menu selections available in the Configuration menu.

Table 2–2: Menu bar View menu

Menu selection	Function
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.
Report view	Open the Report view or select the Report 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.
ETR 290 view	Open a (detailed or monitor) ETR 290 view or select the ETR 290 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. In the Message view just the contents of the message view are printed.
Print Setup	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. Table 2–3 describes the menu selections available in the Analysis menu.

Table 2–3: Menu bar Analysis menu

Menu selection	Function
Start	Begin analyzing the input stream
Stop	Stop input stream analysis

Data Storage Menu (MTS 215 only)

The Data Storage menu is only applicable to MTS 215 instruments, which are equipped with the Data Store system. Table 2–4 describes the menu selections available in the Data Storage menu.

Table 2–4: Menu bar Data Storage menu

Menu selection	Function
Start	Begin saving the input stream to the data store disks
Stop	Stop data capture

Window Menu

The Window menu contains commands for managing the various windows within the RTA Client view. Table 2–5 describes the menu selections available in the Window menu.

Table 2–5: Menu bar Window menu

Menu selection	Function
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 view.
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 view.
Restore standard	Restore the default RTA window arrangement.
(List of open windows)	Select the Client view to be shown in front of all other windows.

Help Menu

The Help menu provides access to online help and version information. Table 2–6 describes the menu selections available in the Help menu.

Table 2–6: Menu bar Help menu

Menu selection	Function
Help topics	Open the RTA Help window
About RTA	Display RTA version and copyright information

Active View Menu

The Active View menu performs actions on the top view in the Client view. You access this menu by clicking on the icon at the far left of the Menu bar when the Client views are maximized (the example below shows the Statstic view icon). The icon representing the menu changes to match the type of the top panel in the Client view. When the panels in the Client view are tiled, this menu can be accessed on each panel in the Client view. The menu contains standard Windows NT window-management commands. Table 2–7 describes the menu selections available in the Active View menu.

Table 2–7: Menu bar Active View menu

Menu selection	Function
Restore	Change all open Client views to windows or icons within the Client view, 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 view. The active view menu disappears from the Menu bar when you select this command.
Move	Move the selected view within the Client view.
Size	Resize the selected view within the Client view.
Minimize	Minimize all open Client views to icons within the Client view. The Active View menu icon disappears from the Menu bar when you select this command.
Maximize	Maximize all open Client views. The Active View menu returns to 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.

Toolbar

The toolbar (shown below) 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 using the View menu **Toolbar** command. Table 2–8 describes the functions available in the toolbar.

Table 2–8: Toolbar functions and analysis indicator

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 the incoming stream; equivalent to the **Freeze views** command on the View menu.
	Report view	Open or select the Report view; equivalent to the **Report view** command on the View menu.
	Statistic view	Open or select the Statistic view; equivalent to the **Statistic view** command on the View menu.
	ETR 290 view	Open or select the ETR 290 Monitor view; use the **ETR 290 view** command on the View menu to open the ETR 290 Detailed view.
	Restore standard	Equivalent to the **Restore Standard** command on the Window menu.
	Start Data Store (MTS 215 only)	Begin capturing the incoming stream onto the data store disks; 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.
	RTA analysis indicator	This icon is animated when RTA analysis is enabled. The icon is motionless when RTA analysis is disabled.

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 message **PAUSE** appears on the left end of the status bar.
- The status (percent usage) of the PC-to-RTA communication buffer.
- The number of bytes (188, 204, or 208) in the input stream transport packets.
- The global bit-rate of the input stream.
- Presence of level one (LV1), level two (LV2), and level three (LV3) ETR 290 errors. If no error is detected, a green sphere icon is displayed; when an error occurs, the sphere becomes red. If the error stops, 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.”

Using the Hierarchic View

The Hierarchic view (see Figure 2–3) uses icons to show the interrelationship of transport stream components. Additional text information about each stream component is listed next to the associated icon.

This section contains the following information about the Hierarchic view:

Hierarchic View Display

A portion of a fully expanded Hierarchic view of a simple DVB transport stream is shown in Figure 2–3. The Hierarchic view uses the Windows NT 4.0 operating system's convention for viewing file directories to display different levels of the transport stream.

The colored rectangles above each icon indicate the error status of that stream component. Refer to *Icon Error Indicators* on page 2–14 for more information.

NOTE. *When the PID Allocation panel of the Statistic view is open in the Client view and Selection is highlighted in the PID Allocation panel, you can drag and drop icons between the Hierarchic view and the PID Allocation panel to add and remove stream items from the PID Allocation display. Refer to* PID Allocation Panel *on page 2–46 for more information.*

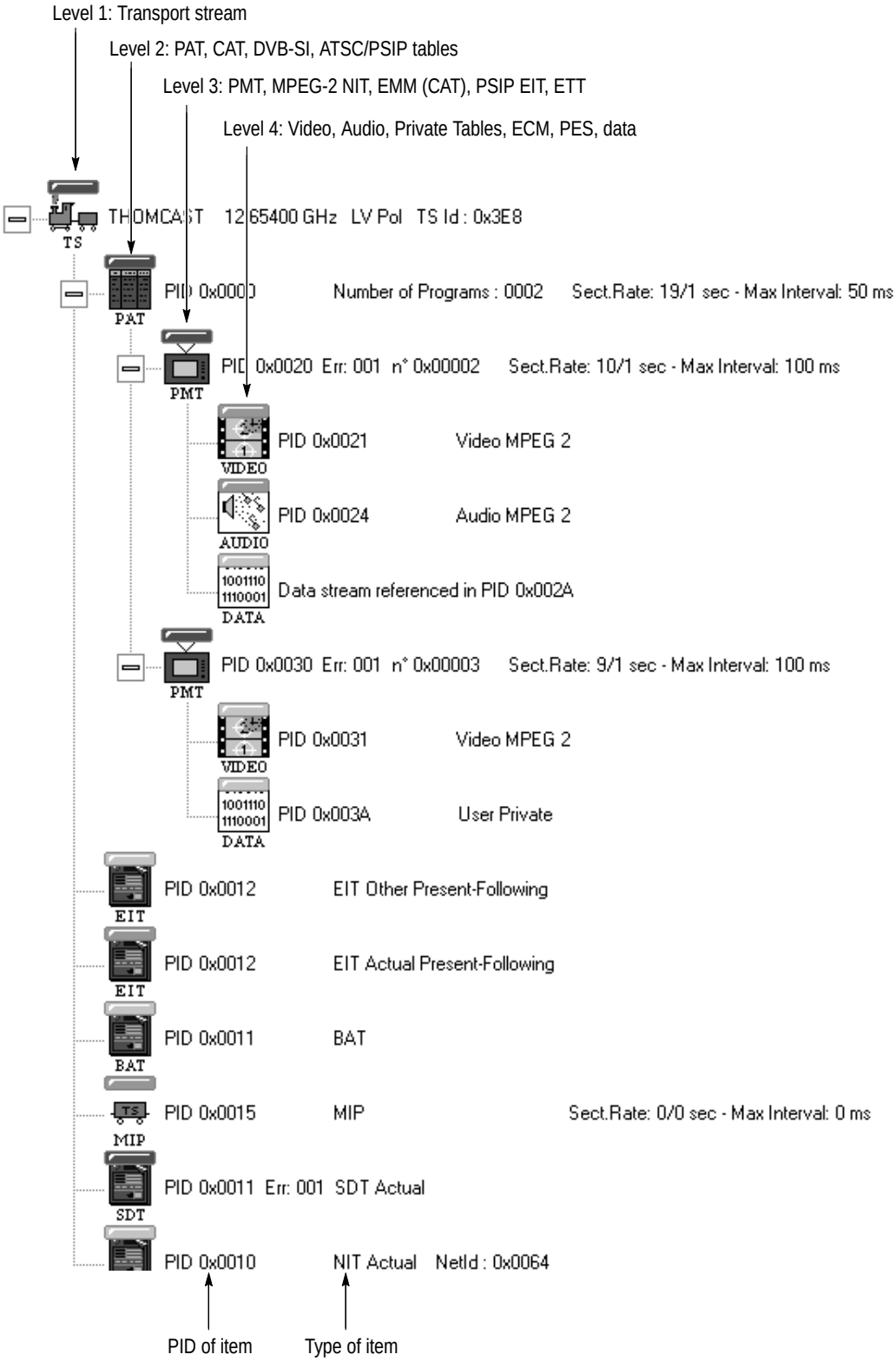


Figure 2–3: Hierarchic view display

Setting the Hierarchic View Appearance

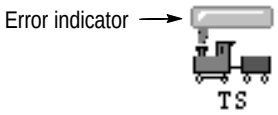
Table 2–9 summarizes the effects of mouse and keyboard actions that change the appearance of the Hierarchic view and reveal (or hide) additional information about the input stream.

Table 2–9: Mouse and keyboard actions in the Hierarchic view

Mouse action	Keyboard action	Effect on Hierarchic view
Left-click on an icon		Select the icon
Right-click on an icon		Display a shortcut menu for the hierarchy item. Refer to *Hierarchic Icon Shortcut Menus* on page 2–19.
Double-click on an icon		Open an item Report view in the Client view.
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 F1	Open the Help file.
	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.

Icon Error Indicators

The colored rectangles that appear over each icon in the Hierarchic view are error indicators; the color of the error indicator 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.

Refer to *Hierarchic Error Reporting* on page 2–18 for more information about error reporting in the Hierarchic view.

Identifying Hierarchic Icons

The RTA uses a variety of icons to represent stream items. Each of the hierarchic icons has an associated menu that allows you to perform specific functions related to the stream item. Table 2–10 identifies the icons used in the Hierarchic view and shows the associated menus.

Icon Appearance

The hierarchic icons normally appear in color on the RTA display except when the corresponding stream item is referenced in a table but has not yet appeared in the stream. Icons for these referenced but absent items remain gray until the item appears in the input stream.

PCR clocks and scrambling symbols are superimposed on icons when appropriate. Refer to *PCR Clock and Scrambling Symbols* on page 2–16 for more information.

Use Table 2–10 to identify the icons used in the Hierarchic view.

Table 2–10: Hierarchic view icon identification

Icon	Hierarchy level	Element type
	1	Transport stream. This icon represents all (188/204/208-byte) transport packets that make up the stream. If you visualize the transport stream as a train, this icon represents every car in the train, regardless of its configuration or what it contains.
	2	PAT, CAT, or TSDT table
	2	Any other table (such as DVB-SI)
	2	ATSC-PSIP tables (such as CVCT, TVCT, MGT, STT, RRT)
	2	A specific transport packet (such as MIP)
	2	GHOST. A ghost indicates one or more transport packets identified with a PID that is not referenced in an appropriate table.
	3	PMT table
	3	MPEG-2 NIT table
	3	For ATSC: EIT and/or ETT tables referenced by MGT
	3	EMM table
	4	Video stream
	4	Audio stream
	4	Data stream
	4	ECM table for program

Table 2–10: Hierarchic view icon identification (Cont.)

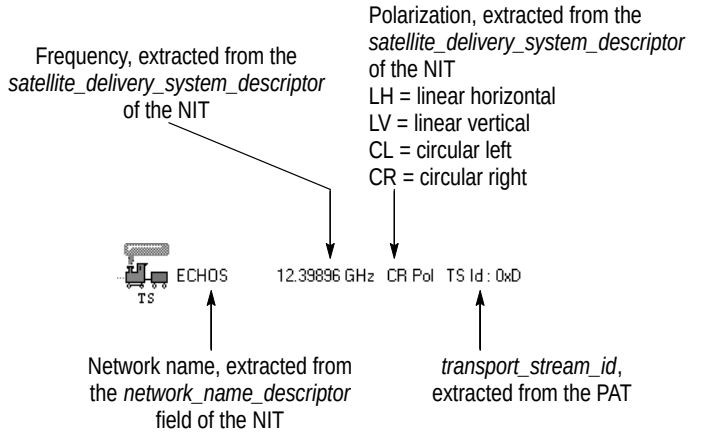
Icon	Hierarchy level	Element type
	4	For SIDAT 360 streams: DownloadInfoIndication tables for one-layer Data Carousels
	4	For SIDAT 360 streams: DownloadServerInitiate tables for two-layer Data Carousels
	4	For SIDAT 360 streams: Multiprotocol Encapsulation sections
	4	DSM-CC generic stream (may carry several tables)
	4	Private table
	5	ECM table for elementary stream
	5	For SIDAT 360 streams: DownloadInfoIndication tables for two-layer Data Carousels
	5	For SIDAT 360 streams: Data Carousel module (one-layer Data Carousels)
	6	For SIDAT 360 streams: Data Carousel module (two-layer Data Carousels)

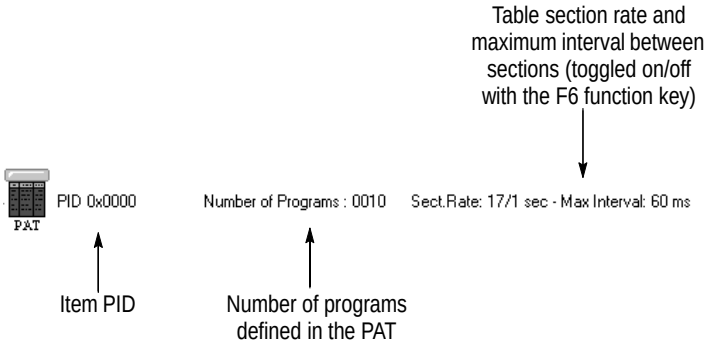
PCR Clock and Scrambling Symbols

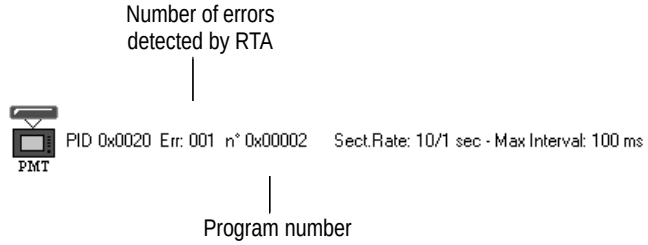
A PCR clock () symbol is added to the upper-right corner of stream icons to indicate streams that carry PCR clocks. The TS railcar and clock icon (shown below) represents PCR clocks in an independent stream (that is, transport packets containing PCRs). A padlock symbol () is added to the lower-left corner of stream icons to signify the streams that are scrambled. Examples of icons with the PCR clock and scrambling symbols added are shown below.

Hierarchic Text Messages

Information about a transport stream component appears to the right of its associated icon. The information displayed about each stream component depends on the type of item as shown in the following examples.







Hierarchic Error Reporting

In addition to the error indicator at the top of each Hierarchic view icon, the number of errors detected for the item are listed to the right of the item as shown above. Refer to *Icon Error Indicators* on page 2–14 for information about icon error reporting.

Hierarchic Icon 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 menu selections associated with the various stream components are shown in Table 2–11. Many of the menu functions are similar; refer to Table 2–12 on page 2–22 for descriptions of the functions available in these shortcut menus.

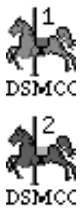
Table 2–11: Hierarchic view icon shortcut menus

Icon	Element type	Shortcut menu selections
	Transport stream	View report Reset past errors
	PAT or TSDT	PAT section probe (PAT icon only) TSDT section probe (TSDT icon only) View section analysis View section rate View report Transport rate interval Reset past errors
	PMT	PMT section probe View section analysis View section rate View report PCR probe View PCR analysis Transport rate interval Reset past errors
	MPEG-2 NIT	NIT MPEG section probe View section analysis View section rate View report Transport rate interval Reset past errors
	DVB table	Section probe View section analysis View section rate View report InterSI probe Transport rate interval Reset past errors

Table 2–11: Hierarchic view icon shortcut menus (Cont.)

Icon	Element type	Shortcut menu selections
	Elementary stream data	View report Transport rate interval Reset past errors
 	Elementary stream video or audio	PTS/DTS probe View PTS/DTS analysis View report Transport rate interval Reset past errors
	Private section	Private section probe View section analysis View section rate View report Transport rate interval Reset past errors
	ECM	ECM section probe View section analysis View section rate View report Transport rate interval Reset past errors
	EMM	EMM section probe View section analysis View section rate View report Transport rate interval Reset past errors
	Generic DSMCC	Private section probe View section analysis View section rate View report Transport rate interval Reset past errors IP monitoring
	Multiprotocol encapsulation	Multiprotocol encapsulation probe IP datagrams monitoring View section analysis View section rate View report Reset past errors

Table 2–11: Hierarchic view icon shortcut menus (Cont.)

Icon	Element type	Shortcut menu selections
	Data carousel	View section analysis View section rate View report Reset past errors
	Data carousel module	Module probe View section analysis View section rate View report Reset past errors
 MIP	MIP	View MIP packet analysis View report Transport rate interval Reset past errors
	Ghost	View report Transport rate interval Reset past errors

Menu selection items that are gray are unavailable and cannot be selected. Menu items may be unavailable for a number of reasons:

- PTS/DTS probes cannot be set on scrambled elementary streams
- The **Reset past errors** menu selection is unavailable when no errors have been detected

The shortcut menu selections associated with each of the various stream components are shown in Table 2–11 starting on page 2–19. Many of the menu functions are similar between the icons. Table 2–12 describes each of the functions available in the Hierarchic shortcut menus.

Table 2–12: Hierarchic view shortcut menu commands

Menu command	Function
<*stream icon*> section probe	Sets or removes the section probe for the selected stream icon. When the section probe is active, a check mark appears by the menu selection.
View section analysis	Opens a section analysis view of the selected table in the Client view. Opening a section analysis view automatically sets the section analysis probe for the selected stream icon. Refer to *Section Analysis View* on page 2–56.
View section rate	Opens a section rate view for the selected table in the Client view. Refer to *Section Rate View* on page 2–58.
View report	Opens a message window for the selected stream item in the Client view or brings an already-opened message view to the front. Equivalent to double-clicking on the icon.
Transport rate interval	Opens a dialog box where you can set transport rate error thresholds for the selected stream item. Refer to *Transport Rate* on page 3–2.
Reset past errors	Clears error history and resets the error counter to zero. This selection is enabled only when the error indicator for the selected stream item is orange (indicating a past error, but no current errors).
PCR probe (PMT icon)	Sets or removes a PCR probe on the selected program. Refer to *PCR Timing Analyses* on page 3–29.
View PCR analysis (PMT icon)	Opens a PCR analysis view for the selected program in the Client view. Refer to *PCR Analysis View* on page 2–61.
PTS/DTS probe (elementary stream video and audio icons)	Sets or removes the PTS/DTS probe on the selected elementary stream video or audio item. Refer to *PTS/DTS Timing Analyses* on page 3–31.
View PTS/DTS analysis (elementary stream video and audio icons)	Opens a PTS/DTS analysis view for the selected elementary stream video or audio item in the Client view. Refer to *PTS/DTS Analysis View* on page 2–59.
InterSI probe (DVB table icon)	Sets or removes the InterSI probe. Refer to *Using the InterSI Analysis Probe* on page 3–14.
IP monitoring (generic DSMCC icon)	Opens an IP Monitoring view for the selected generic DSMCC item in the Client view. Refer to *IP Monitoring View* on page 2–65.
MIP packet analysis (MIP icon)	Opens an MIP Packet view for the selected MIP item in the Client view. Refer to *MIP Packet Analysis View* on page 2–63.

Using the Report View

The Report view occupies the bottom of the default RTA window (see Figure 2–1 on page 2–2) and displays all of the stream analysis results.

This section contains the following information about the Report view:

Report View Display

The Report view (see Figure 2–4) occupies the bottom of the default RTA application window and displays all stream analysis results. The Report view is divided into two sections. The left section contains the hierarchic view that you use to specify the display and organization of the information in the right section. Depending on the item selected in the hierarchic view, the right section of the Report view can contain a summary view, a graph view, or a message view.

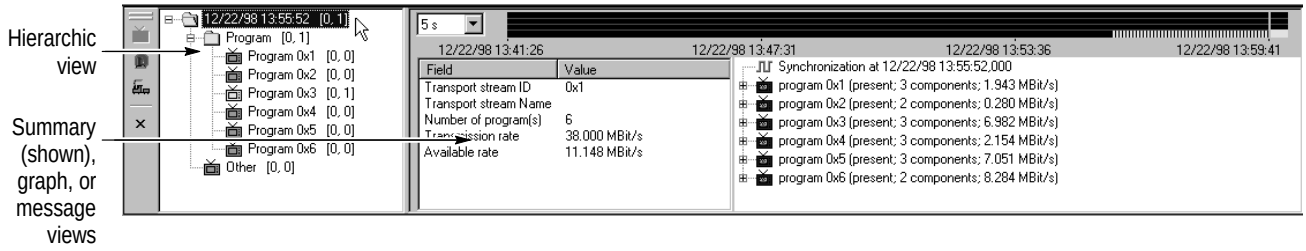


Figure 2–4: Report view display

Hierarchic Report View

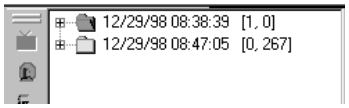
The hierarchic view in the Report view lets you specify how RTA analysis results are organized. You can view all or selected error messages. The hierarchic view uses the Windows NT 4.0 operating system's convention for viewing file directories to display different levels of the transport stream.

Hierarchy Icons and Levels

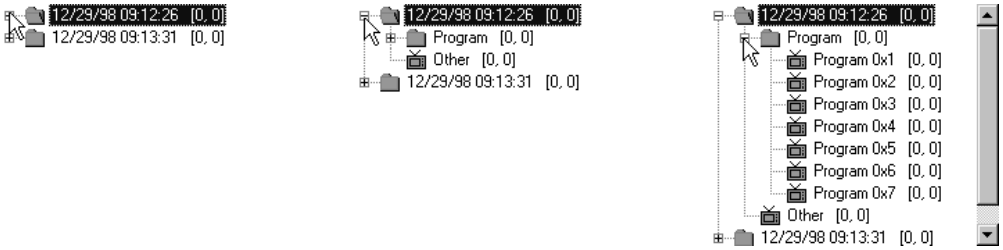
When the RTA displays its analysis of the transport stream, initially only the top level of the hierarchy is displayed. The top level of the hierarchy is displayed as folder icons each representing a "Configuration." A Configuration is a collection of all analysis results gathered by the RTA since the previous synchronization.

NOTE. *The RTA creates a new Configuration every time synchronization is established. Therefore, if you stop and restart analysis, or if the RTA loses and regains synchronization for any reason (such as a momentary loss of the input signal), another Configuration icon appears in the hierarchic view.*

The following figure shows a report hierarchy that contains two Configurations. The time of synchronization appears to the right of the folder icon; the numbers within the square brackets are the total number of error and warning messages, respectively, generated for the Configuration. The top folder is open, indicating that the right section of the Report window displays results in the first Configuration.



To see additional levels of the results hierarchy, either click the + box to the left of an icon, or double-click the icon itself. The figure below shows the hierarchy being expanded by clicking the + boxes.



Selecting the various second- and third-level icons changes the contents and appearance of the right section of the Report view. The actual appearance and organization of the second and third levels depends on the current report mode.

Error Reporting. The color of each report hierarchy icon signifies the presence or absence of errors and warnings within the corresponding item.

- A *green* icon indicates that no error or warning messages have been generated for the item or its hierarchic descendents.
- A *red* icon indicates that at least one error message has been generated for the item or its hierarchic descendents.
- A *yellow* icon indicates that at least one warning message has been generated for the item or its hierarchic descendents.

When the item (or its descendents) contains both errors and warnings, the errors take precedence, and the icon is red. Notice in Figure 2–5 that the RTA displays the total number of error messages and the total number of warning messages in the item (or its descendents) in square brackets to the right of the synchronization time.

Report Modes

For your convenience, the RTA can parse and display results by program, by ETR 290 level, or by advanced analyses. Figure 2–5 shows the same Configuration hierarchy in each of the three report modes. You can access the report modes using one of the following methods:

- Report view toolbar
- Hierarchic view Display menu

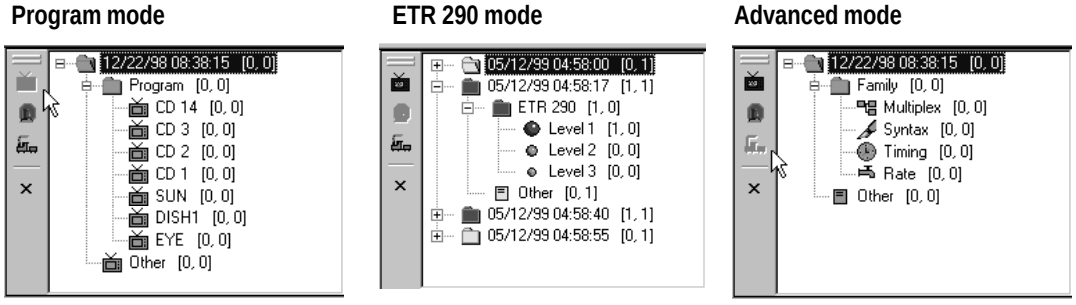


Figure 2–5: Report view hierarchic display modes

Report Toolbar

The report toolbar, located on the left side of the Report view, allows you to set the report mode for the Report view. You can also change report mode through the report view shortcut menu. Select the desired report mode by clicking the appropriate report view toolbar button, as indicated by the arrows in Figure 2–5. The ✕ icon at the bottom of the toolbar closes the Report view. (To reopen the Report view, either select **Report View** from the RTA View menu or click the corresponding toolbar button.)

Hierarchic View Menus

You can use the right mouse button to access two different menus within the Report view hierarchic view. The Display menu appears when you right-click within the hierarchic view but not on a hierarchy item. The Message and Configuration menu appears when you right-click on a hierarchy item.

Display Menu. Table 2–13 lists the commands found in the Display menu, which appears when you right-click within the hierarchic view of the Report view, but not on a hierarchy item.

Table 2–13: Report view Display menu

Menu selection	Function
Program	Sets the report display mode to Program, which organizes messages for each program in the stream (see Figure 2–5).
ETR 290	Sets the report display mode to ETR 290, which organizes messages by the ETR 290 error level (see Figure 2–5).
Advanced	Sets the report display mode to Advanced, which organizes messages by each of the Advanced analysis types: multiplex, syntax, timing, and rate (see Figure 2–5).
Toggle docking	Maximizes the Hierarchic and Client views by changing the location of the Report view from the bottom of the RTA application window to inside the Client view as shown in Figure 2–6. You can switch between the views in the Client view using the tabs at the bottom of the Client view. To return the Report view to its default location at the bottom of the RTA window, right click within the hierarchic portion of the Report view in its location in the Client view, but not on a hierarchy item to reopen this menu. Then select toggle docking again.
Close	Closes the Report view. To reopen the Report view, either select Report View from the RTA View menu or click the corresponding toolbar button.

Message Menu. Table 2–14 lists the commands found in the Message menu, which appears when you right-click on a hierarchy item in the Report view.

For information about acknowledging or deleting individual error messages, refer to *Acknowledging and Deleting Messages* on page 2–35.

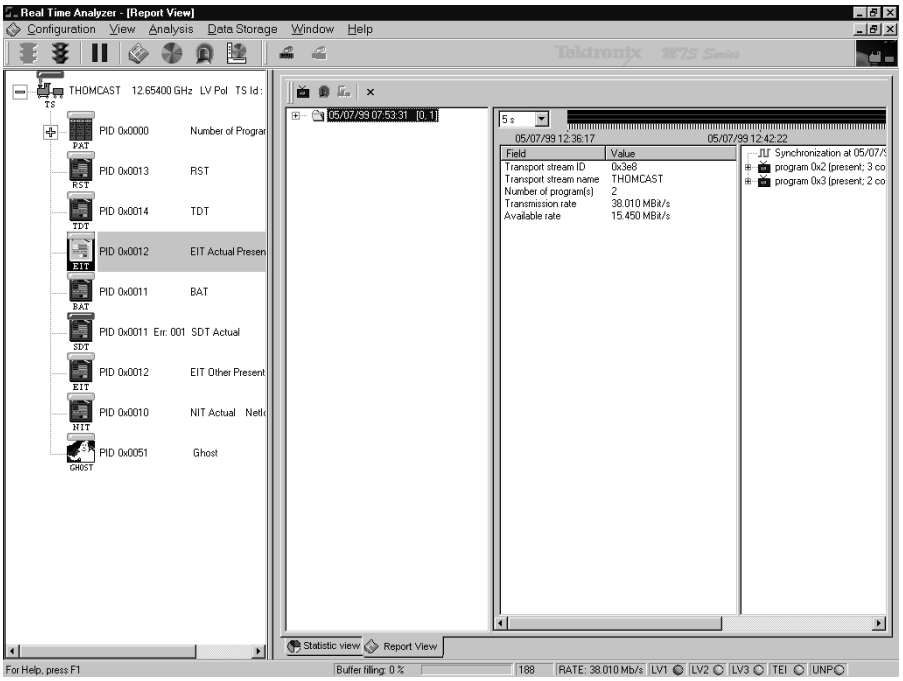


Figure 2–6: Toggle docking the Report view into the Client view

CAUTION. *You cannot undo the following Message menu commands. Acknowledged messages cannot be reset, and deleted messages or configurations cannot be recovered.*

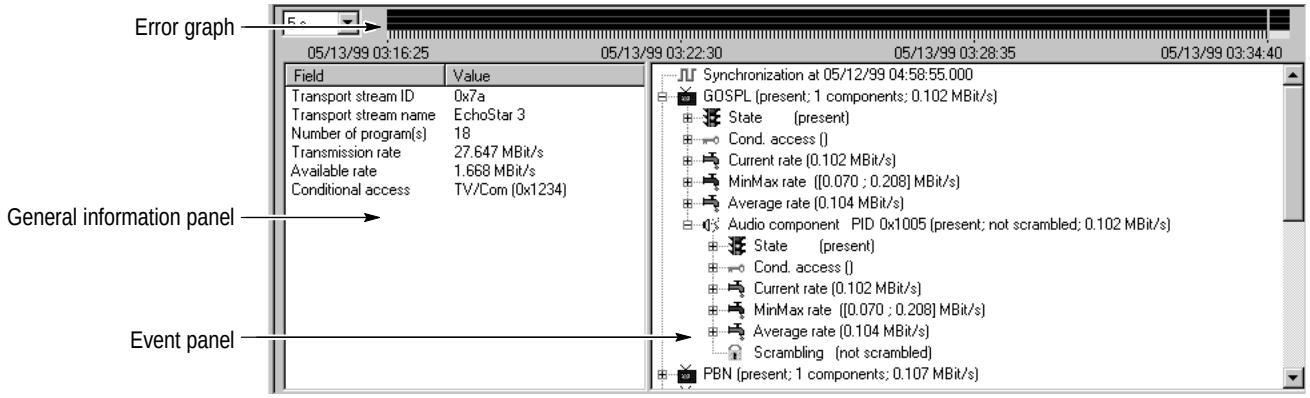
Table 2–14: Report view Message menu

Menu selection	Function
Acknowledge all messages	Acknowledges all of the Report view error messages for the selected configuration. Acknowledging all messages is equivalent to resetting past errors; the hierarchic icon becomes green (at least momentarily) as if no messages had been generated. A checkmark precedes all acknowledged messages.
Delete acknowledged messages	Deletes all acknowledged error messages from the selected configuration. Error messages that have not been acknowledged will not be deleted.
Delete all messages	Deletes all error messages (acknowledged or not) for the selected configuration.
Delete configuration	Deletes the selected configuration.
Delete all configurations	Deletes all but the most recent configuration.

Summary Report View

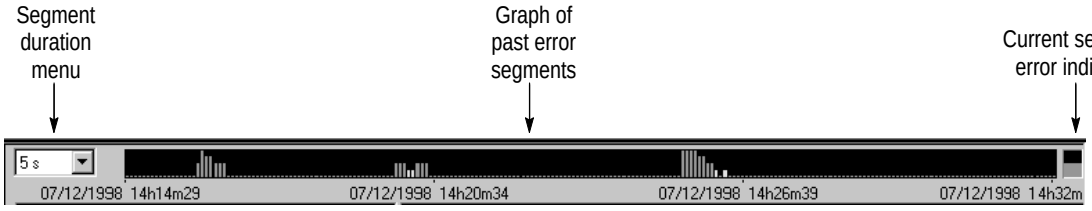
The Report view summary view (shown below) appears in the right section of the Report view whenever you select a Configuration icon (folder) in the Report view hierarchic view. The summary view presents a record of the input stream characteristics, contents, and errors.

The summary view is divided into three regions: the summary error graph, the general information panel, and the event panel. The three regions are explained on the following pages.



Error Graph

The error graph provides an at-a-glance indicator of the frequency and severity of the errors measured during the current configuration, or monitoring session. The level of each segment in the graph indicates the most significant error, if any, detected during the corresponding time period. The most recent segments appear at the right end of the graph, while the oldest segments scroll off the left end of the graph. The error level of the current segment is indicated at the right of the error graph.



The segment duration menu at the left end of the error graph controls the duration of each graph segment. The selections range from 5s (five seconds) to 15m (fifteen minutes). The time span of the error graph (from 18 minutes, 15 seconds to 54 hours, 45 minutes) depends on the settings in the segment duration menu.

As each measurement time period expires (as set by the segment duration menu), one of the following five symbols appears in the right-most graph segment:

- A green dot indicates that no error was detected during the measurement time period
- A short yellow bar (extending to the first graph line) indicates that at least one warning message was generated during the measurement time period
- A short red bar (extending to the first graph line) indicates at least one ETR 290 level three or other non-critical error was detected during the measurement time period
- A medium red bar (extending to the second graph line) indicates at least one ETR 290 level two or other critical error was detected during the measurement time period
- A tall red bar (extending to the third graph line) indicates at least one ETR 290 level one or other very critical error was detected during the measurement time period

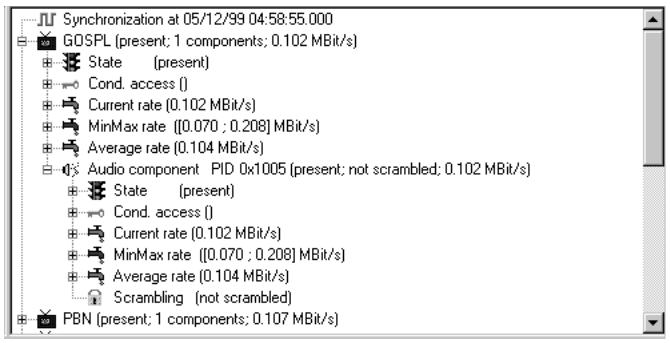
General Information Panel

The general information panel (shown below) displays a variety of information about the input stream. Displayed information includes the transport stream ID, the network name, the number of programs, the conditional access, the transmission rate, and the available rate.

Field	Value
Transport stream ID	0xd
Transport stream Name	EchoStar 1 and 2
Number of program(s)	11
Transmission rate	10.000 MBit/s
Available rate	0.350 MBit/s
Conditionnal access	TV/Com (0x1234)

Event Panel

The event panel (shown below) presents information about the stream and its contents as well as significant changes to the stream characteristics and content. Information is presented in a three-level hierarchic format. To expand the hierarchy at any point and reveal additional information about a stream item, either click the + box to the left of the item icon or double-click the icon itself.



First Level Icons. The first level icons (see Figure 2–7) display event information about the stream as a whole. The information displayed for each icon type is listed below.

- **Synchronization** icons display the time of the last synchronization and consequently the beginning of a configuration.
- **Program** icons display the program name and its current state (presence, number of components, and rate).
- **Lost Synchronization** icons display the time of synchronization loss and, consequently, the end of a configuration.

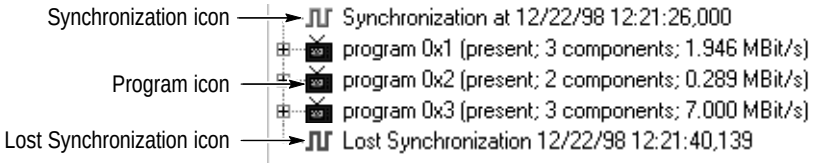


Figure 2–7: Event panel first level icons

Second Level Icons. Click the + box to the left of a program icon to reveal the second-level icons (see Figure 2–8). The second-level icons display the history of each program. The information displayed for each icon type is listed below.

- The program **State** icon indicates whether the program is “present” or “not present.” You can expand the State icon to reveal all program appearance and disappearance times.
- The program **Cond. access** icon displays all changes in the program conditional access.
- The program **Rate** icons show the current bitrate for the program, the minimum/maximum bitrate for the program, and the average bitrate for the program. Expand the rate items to reveal all program rate changes.
- The Audio, Video, Data, or Section **Component** icons displays the program component type, its PID, and its current state (presence, scrambling, and current, minimum/maximum, and average rate). (The Data and Section component icons are not shown in Figure 2–8.)

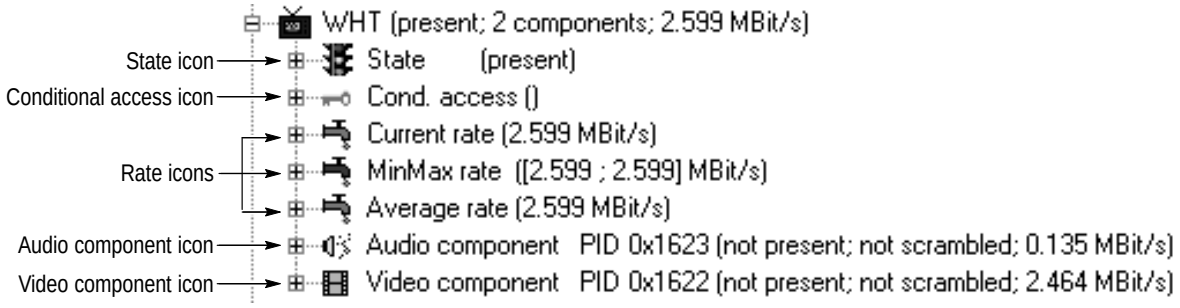


Figure 2–8: Event panel second level icons

Third Level Icons. Click the + box to the left of a second-level icon to reveal the third-level icons (see Figure 2–9). The third-level icons display the history of each component The information displayed for each icon type is listed below.

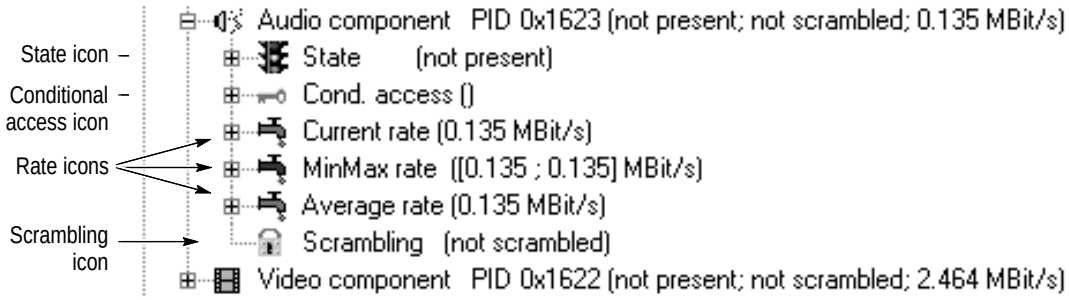


Figure 2–9: Event panel third level icons

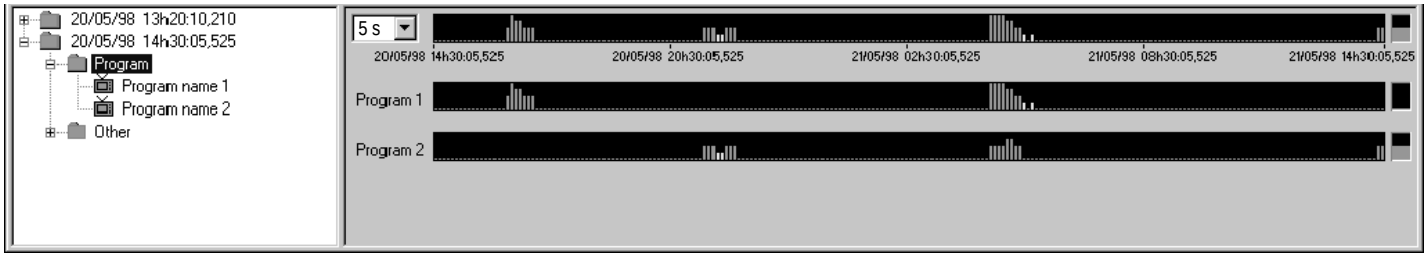
- The component **State** icon indicates whether the component is “present” or “not present.” You can expand the State icon to reveal all component appearance and disappearance times.
- The component **Cond. access** icon displays all changes in the component conditional access.
- The component **Rate** icons show the current bitrate for the component, the minimum/maximum bitrate for the component, and the average bitrate for the component. Expand the rate item to reveal all component rate changes.
- The component **Scrambling** icon displays the status and history of changes in the component scrambling state.

Graph Report View

The graph view varies slightly, depending on the selected report mode. Refer to *Report Modes* on page 2–25 for more information. In all cases, the top, summary graph indicates the most severe condition or error for each time segment. All graphs use the same conventions as explained under *Error Graph* on page 2–28.

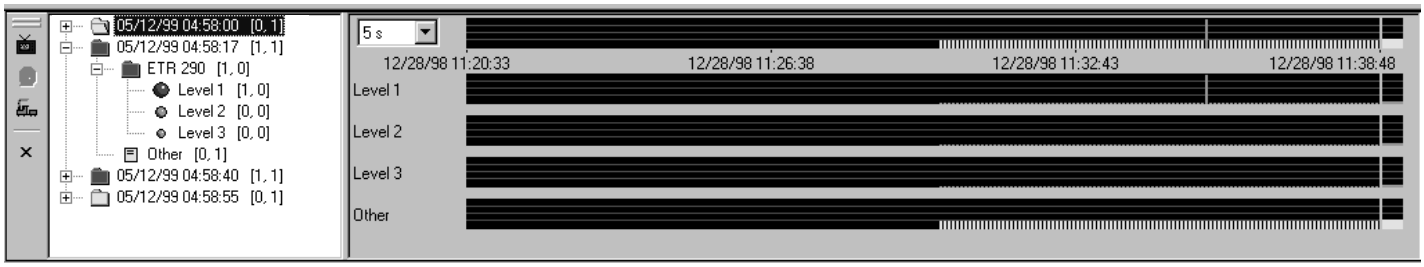
Program Report Mode Graph

When the Program report mode is displayed and you select the Program folder icon as shown below, the Report view contains an error graph for each program in the stream. In the case of multiple programs, a scroll bar may appear to the right of the graph display to allow you to view all graphs.



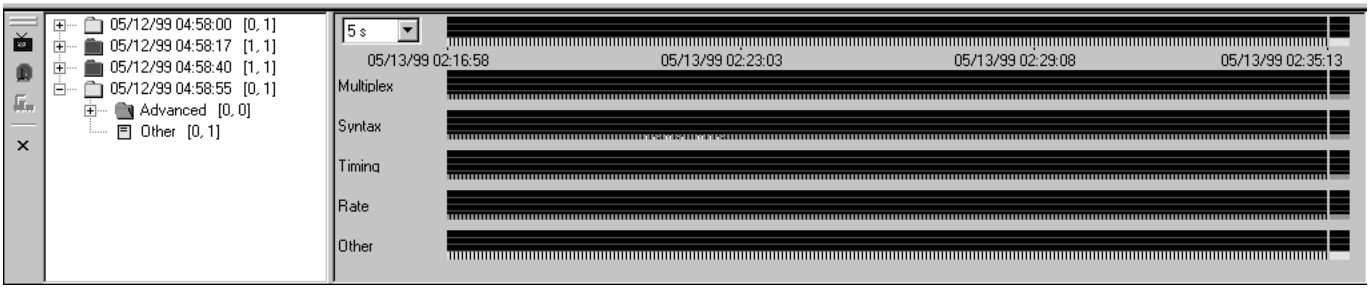
ETR 290 Report Mode Graph

When the ETR 290 report mode is displayed and you select the ETR 290 folder icon as shown below, the Report view contains an error graph for each of the three ETR 290 levels as well as a graph for other, non-ETR 290 errors.



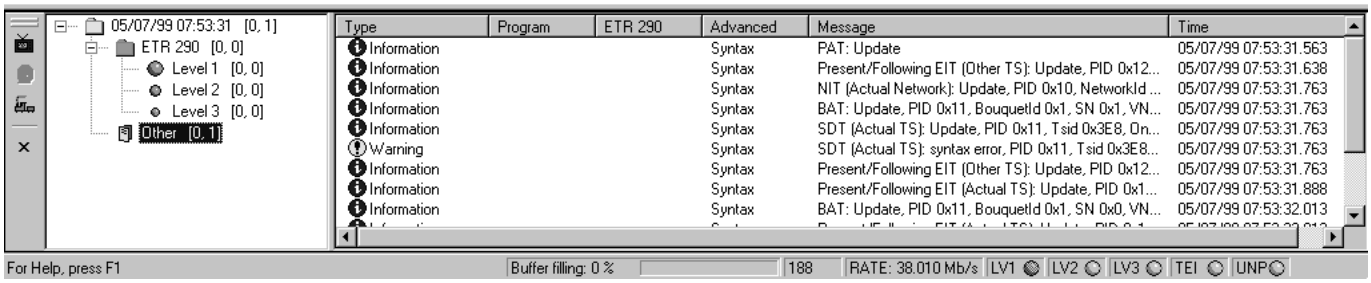
Advanced Report Mode Graph

When the Advanced report mode is displayed and you select the Advanced folder icon as shown below, the Report view contains an error graph for each type of advanced analysis (multiplex, syntax, timing, and rate) as well as a graph for other errors. A scroll bar may appear to the right of the graph display to allow you to view all graphs.



Message Report View

The message view appears in the right side of the Report view when you select an “other” report hierarchy icon or any third-level icon. The message view contains all information and error messages that pertain to the selected item. For example, when you select the program report mode and then select a program icon as shown below, the message view displays the messages that pertain only to the selected program.



The messages that appear are determined by your report view configuration choices, all RTA settings that affect error detection, and the contents of the input stream.

Message Columns

The message view has five or six columns, depending on the current report mode and the selected icon.

- The **Type** column displays the type of message: Information, Warning, Warning disappearance, Error appearance, and Error disappearance.
- The **Program** column displays the program, if any, that contains the event.
- The **ETR 290** column displays the ETR 290 designation, if any, of the error (Level 1.1 to Level 3.8.2).
- The **Advanced** column displays the type of advanced analysis of the message (multiplex, syntax, timing, or rate).
- The **Message** column displays the content of the message.
- The **Time** column displays the time (and date) of the message.

Column Widths. To change the width of a column in the message view, position the cursor over the divider to the right of the column heading; the cursor shape changes to indicate that you can change the width. Then click and drag the divider right or left to increase or decrease column width.

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

Sorting Messages

By default the messages appear in the order that they are generated. You can sort the messages by type, ETR 290 level, advanced analysis type, and time by clicking on the column headers.

Acknowledging and Deleting Messages

You can acknowledge and delete messages using the Message menu. To acknowledge or delete an individual message in a right-section message view, position the cursor over the message type, right-click to open the menu, and then select from the menu items listed in Table 2–15.

CAUTION. *You cannot undo the commands in the Message menu. Acknowledged messages cannot be reset, and deleted messages or configurations cannot be recovered.*

Table 2–15: Report view Message menu

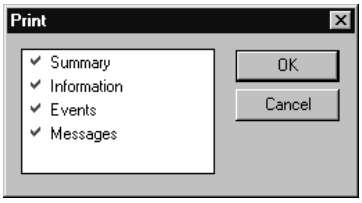
Menu selection	Function
Acknowledge selected message	Acknowledges the selected Report view error message. A checkmark precedes all acknowledged messages.
Acknowledge all messages	Acknowledges all of the Report view error messages for the selected configuration. Acknowledging all messages is equivalent to resetting past errors; the hierarchic icon becomes green (at least momentarily) as if no messages had been generated. A checkmark precedes all acknowledged messages.
Delete acknowledged messages	Deletes all acknowledged error messages from the selected configuration. Error messages that have not been acknowledged will not be deleted.
Delete all messages	Deletes all error messages (acknowledged or not) for the selected configuration.

Viewing Message Events

Each message can represent many individual events. 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 **Type** entry (for example, “Error detected”) to open an **Event viewer messages** window that lists all events represented by the particular message.

Printing Reports and Messages

To print some or all of the data for a Report view Configuration, select the Configuration icon and then select **Print** from the View menu or press **CTRL+P** to open the **Print** window (shown below).



The Print window lists all the items you can print from the selected Configuration. All items preceded by a check mark will be printed when you click **OK**. Click on a Print window item to select or deselect the item for printing.

NOTE. *A full report printout can be quite lengthy, depending on the complexity of the input stream, the duration of the analysis, and the number of events and errors encountered.*

To print only the messages for one program, a single ETR 290 level, one advanced analysis type, or the "other" category, select the corresponding report hierarchy icon so the messages are displayed in the right report view section. Then select **Print** from the View menu (or press **CTRL+P**).

Specific Message Views

The RTA can also create additional Message views that are specific to a given stream item. To open a stream item Message view in the Client view, either double-click on the Hierarchic view icon or select **View Report** from the icon shortcut menu (refer to *Hierarchic Icon Shortcut Menus* on page 2–19).

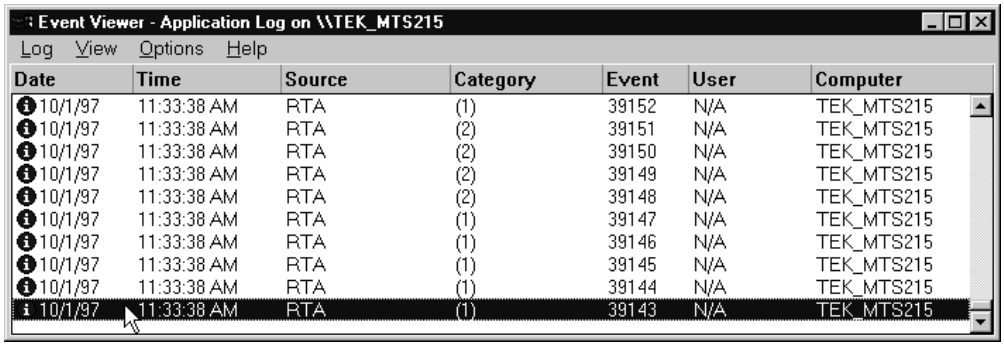
Messages and the Event Viewer

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) or exit the application.

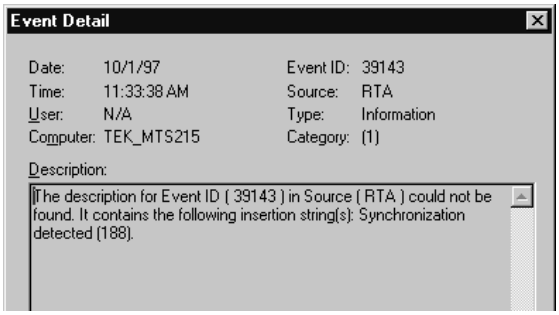
Turn Event Viewer logging on or off through the **Settings** command on the RTA configuration menu; the Event viewer selection is on the Report View panel of the resulting Settings window (refer to *View:Report* on page 3–78).

When you open an **Event viewer messages** window from within a Message view, you are accessing the Event Viewer Application log. To access the log directly, perform the following steps:

1. Start the Event Viewer application through the Windows NT Start menu by selecting **Programs, Administrative Tools (Common),** and **Event Viewer**.
2. When the **Event Viewer** window opens, select **Application** from the Log menu.

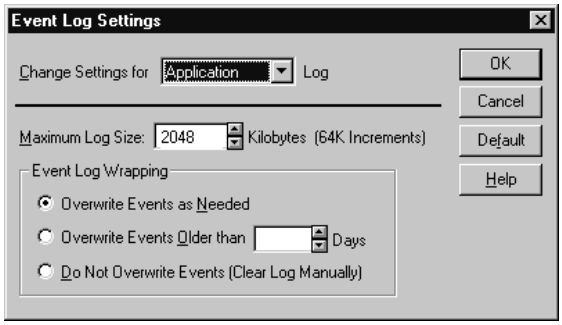


The Application Log can contain hundreds of entries; use the vertical scroll bar and arrows to see entries that will not fit in the window. If the RTA is running, press **F5** occasionally to refresh the view. To open an **Event Detail** window, double-click on a log entry.



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.*



Using the Client View

The Client view occupies the upper-right portion of the default RTA application window (see Figure 2–1 on page 2–2). The Client view can display several different views representing various aspects of the application's analysis of the input stream.

Listed below are the starting page numbers for descriptions of the various views available in the Client view.

From the Hierarchic view you can also open stream-component specific Message views in the Client view. For more information refer to *Using the Report View* on page 2–23.

Client View Features and Conventions

By default, the Client view displays the Statistic view whenever you start RTA analysis. The Statistic view contains several panels, which display data about the input stream and the programs carried in the stream. Refer to *Statistic View* on page 2–42 for more information. The Client view can contain numerous other analysis panels that you can access through the Hierarchic view icons. Refer to *Using the Hierarchic View* on page 2–11.

Normally, the individual Client views are maximized. That means that each view occupies the entire Client view. If more than one view is open at a time in the Client view, you can switch among them by clicking the appropriate Client view tab (see illustration on page 2–41).

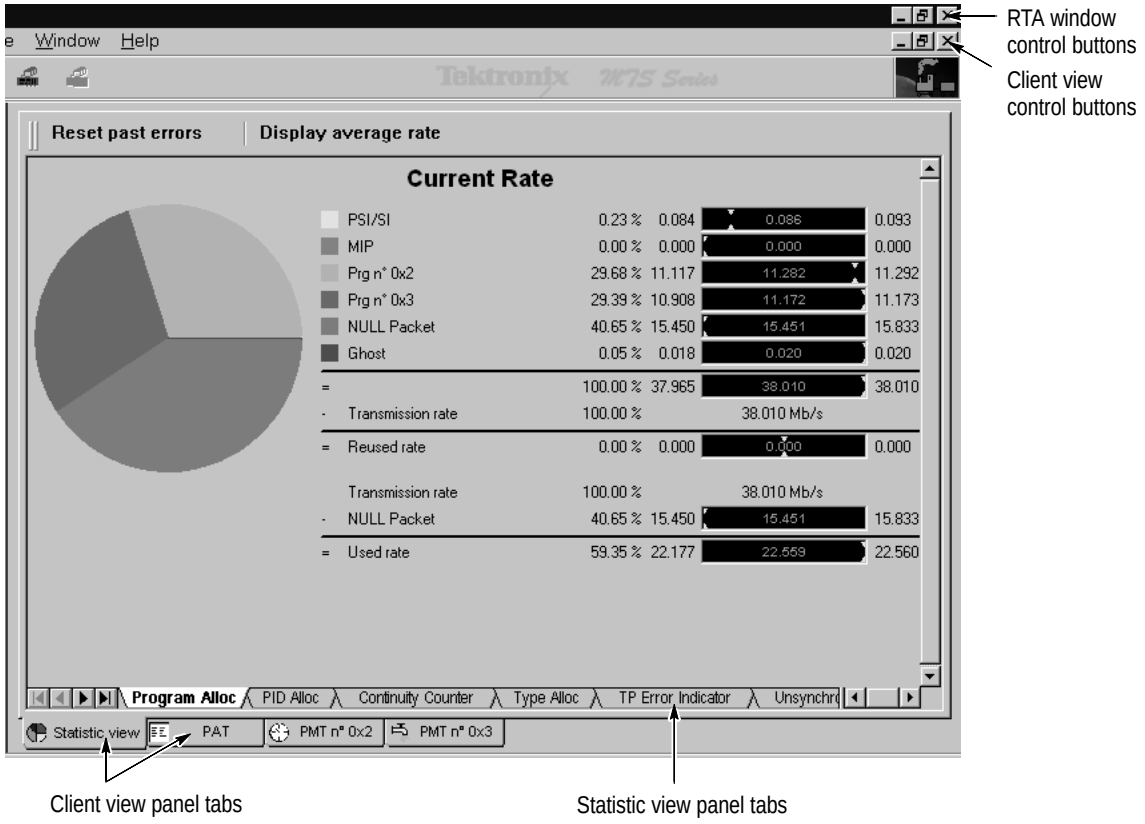
Client View Control Buttons

The Client view control buttons appear at the right end of the RTA Menu bar when the Client views are maximized (see illustration on page 2–41).

- Click the Minimize button ( ) to reduce the top Client view to an icon within the Client view and change all other Client views to windows or icons within the Client view, 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. The sizing buttons disappear from the menu bar because each icon and window has its own sizing buttons.
- Click the Close button ( ) to close the top (currently selected) view.

NOTE. *Closing a view 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.*

To simultaneously maximize the Statistic view and close other Client views, click the **Restore standard views** toolbar button (refer to *Toolbar* on page 2–8 for more toolbar information).



Error Indicators

The Client view uses the same colors for error indicators as the rest of the RTA.

- *Gray* signifies that no test is currently running.

  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 on non-DVB streams.)

- *Green* signifies that a probe is set and that the rate has remained within the user-specified limits.

- *Red* signifies that an error is occurring.

- *Orange* signifies that the monitored parameter is currently within the user-set limits but that an error has occurred since monitoring began.

Statistic View

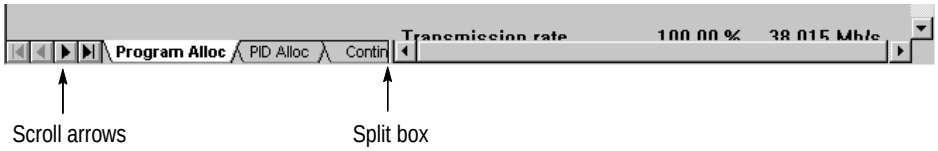
The Statistic view is a collection of different tabbed panels that display data about the input stream and the programs carried in the stream. One Statistic view panel is displayed at a time.

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

Statistic View Features and Conventions

By default, the Program Allocation panel of the Statistic view appears in the Client view after you begin analysis on the input stream. You can view a different panel by clicking on the corresponding tab on the bottom of the Statistic view panel (see illustration on page 2–41).

When the Statistic view first opens, most panel tabs are hidden by the horizontal scroll bar. 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 scroll bar.



Program Allocation Panel

The Program Allocation panel (see Figure 2–10) shows the bandwidth allocation of individual items in the input multiplex using a graphical pie chart. 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 accompanying color-coded list of programs (matches the pie-chart colors) provides a numeric report of bandwidth usage. A graphic bar displaying the current or average transport rate for each program or service in the multiplex is displayed on the right.

You can double-click on a slice of the pie chart to switch to the PID Allocation panel (see Figure 2–11 on page 2–47) with the corresponding program or service already selected.

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.

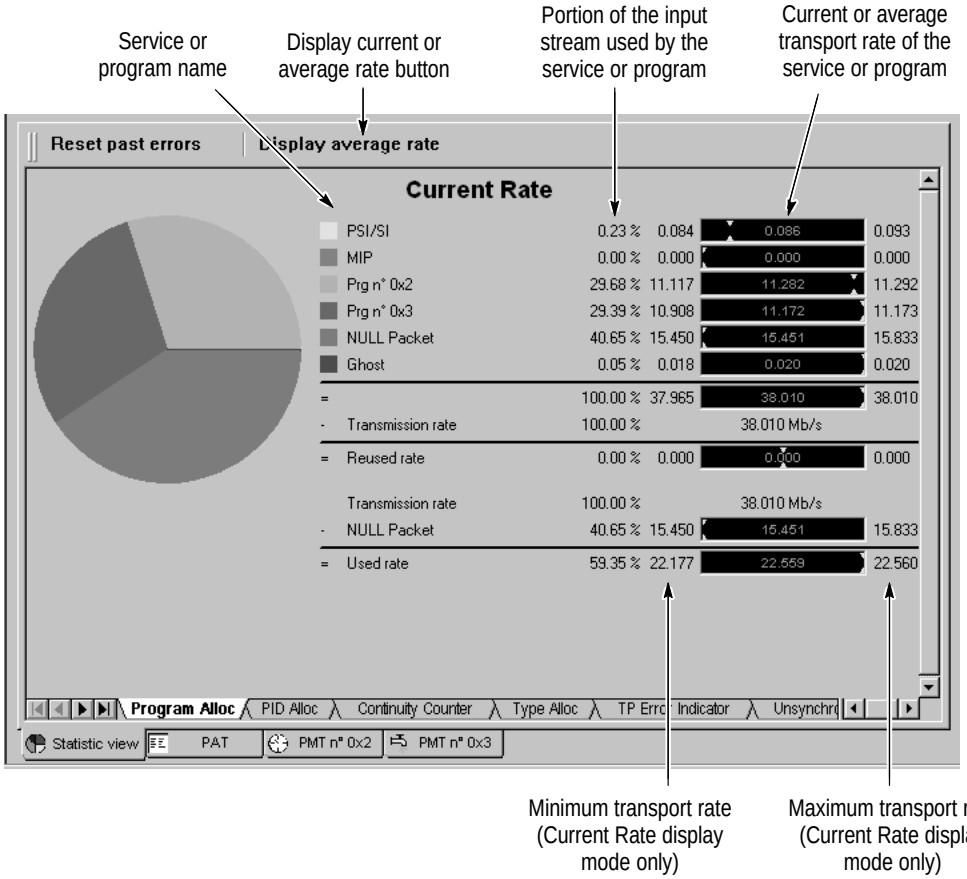


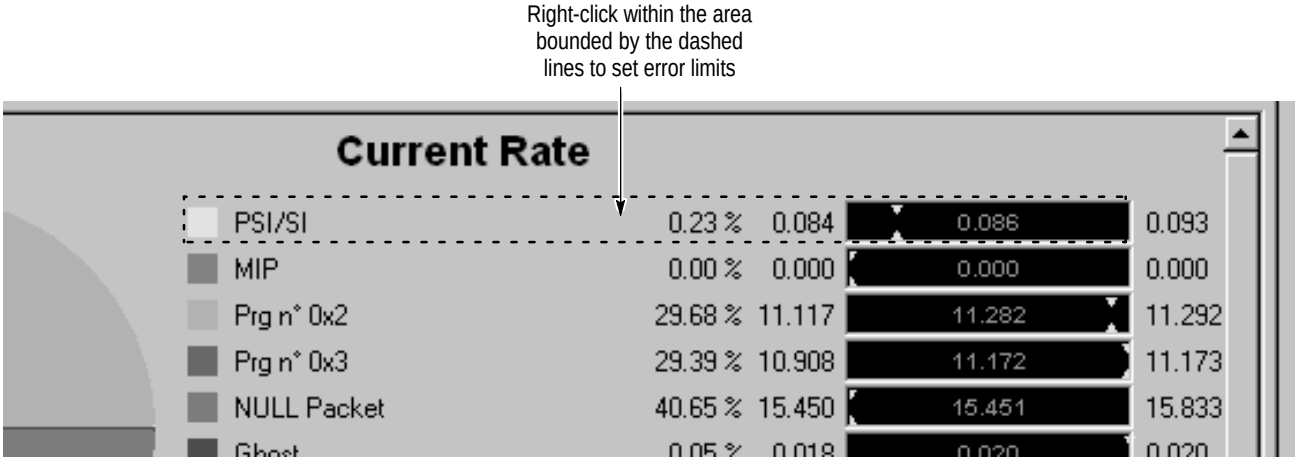
Figure 2–10: Program Allocation panel (current rate mode)

Current Rate and Average Rate Display Modes. You can set the Program Allocation and PID Allocation panels to display current or average transport rates for the current configuration.

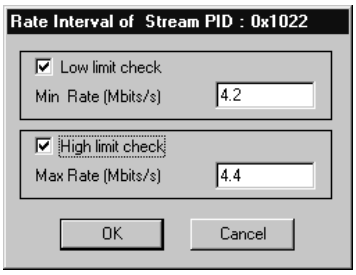
- Select **Display current rate** to display current transport rates. In this mode the minimum and maximum transport rates for the current configuration are displayed as well as the current transport rate. Current Rate is displayed on both the Program Allocation and PID Allocation panels when this mode is selected.
- Select **Display average rate** to display average transport rates. In this mode the transport rates for the current configuration are averaged and only the average rates are displayed. Average Rate is displayed on both the Program Allocation and PID Allocation panels when this mode is selected.

Setting Transport Rate Error Limits. You can set user-defined upper and/or 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 set user-defined transport rate error limits, perform the following steps:

1. Right-click in the horizontal region corresponding to a program or service (as shown below) to open a Rate Interval dialog box for the selected program or service.

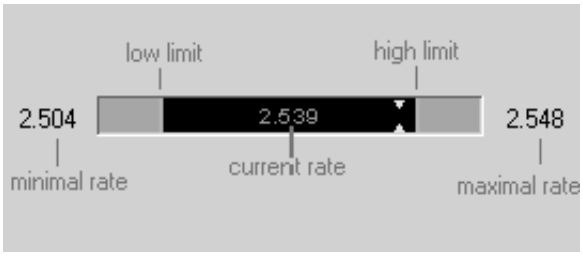


2. In the resulting dialog box (shown below), select **Low limit check** and/or **High limit check**, and then enter the desired error limit value or values.



3. Click **OK** to accept the error limits and close the dialog box.

Setting new limit values can change the appearance of the graphic bar display (shown below). When you have set limits inside the range of minimal and/or maximal rates, the graphic bar displays the standard RTA colors to indicate error conditions. Refer to *Error Indicators* on page 2–41 for more information.



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

- The RTA shows the current rate in red when it violates either limit.
- When a limit has been violated, the region of the bar between the limit and the actual min or max value becomes red; when the rate returns to the preferred range, the region becomes orange.

PID Allocation Panel

The PID Allocation panel (see Figure 2–11) 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. Each PID icon corresponds to the stream item type as it does in the Hierarchic view.

You can select a program to view in the PID Allocation panel using one of the following methods:

- Double-click the program slice in the Program Allocation panel to open the PID Allocation panel for that program.
- Click the corresponding program button in the PID Allocation panel.

Additionally, you can view selected PIDs by clicking the **Selection** button in the PID Allocation panel to display the PIDs you referenced using the PID Allocation View panel of the Settings window (refer to *View:PID Allocation* on page 3–85 for more information).

NOTE. *When you click the* ***Selection*** *button in the PID Allocation panel, the PIDs referenced on the PID Allocation View panel of the Settings window are displayed. You can add and remove PIDs directly from the PID Allocation panel by performing a drag-and-drop action on stream icons between the Hierarchic view and the PID Allocation panel in the Client view. Doing so will automatically update the PID Allocation View panel of the Settings window.*

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** to reset previously detected transport rate errors. Refer to *Transport Rate* on page 3–2 for complete information.

The banner over the displayed PIDs in the PID Allocation panel contains information about the selected program or service. In the panel shown on the following page, PSI/SI has an instantaneous transport rate of 0.084 Mbits/s and the rate has been between 0.075 and 0.096 Mbits/s for the current configuration.

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

NOTE. *You can sort the PID Allocation display by clicking on the Type, PID, Percent, or Rate column headers.*

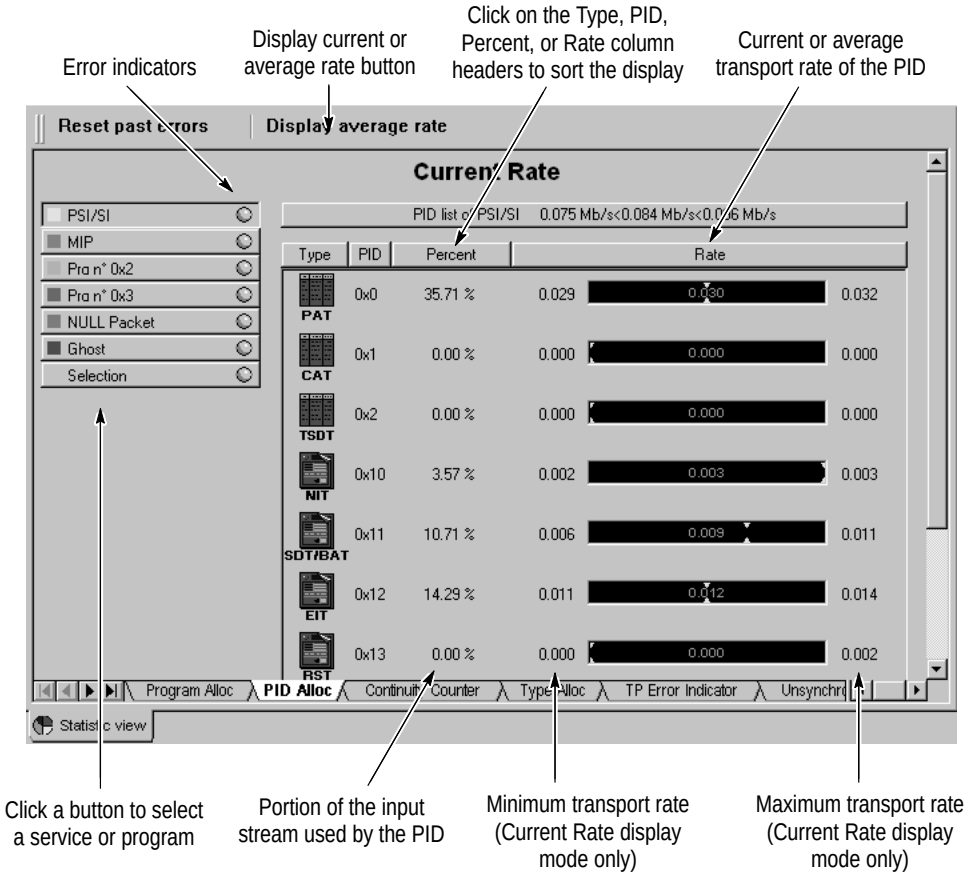


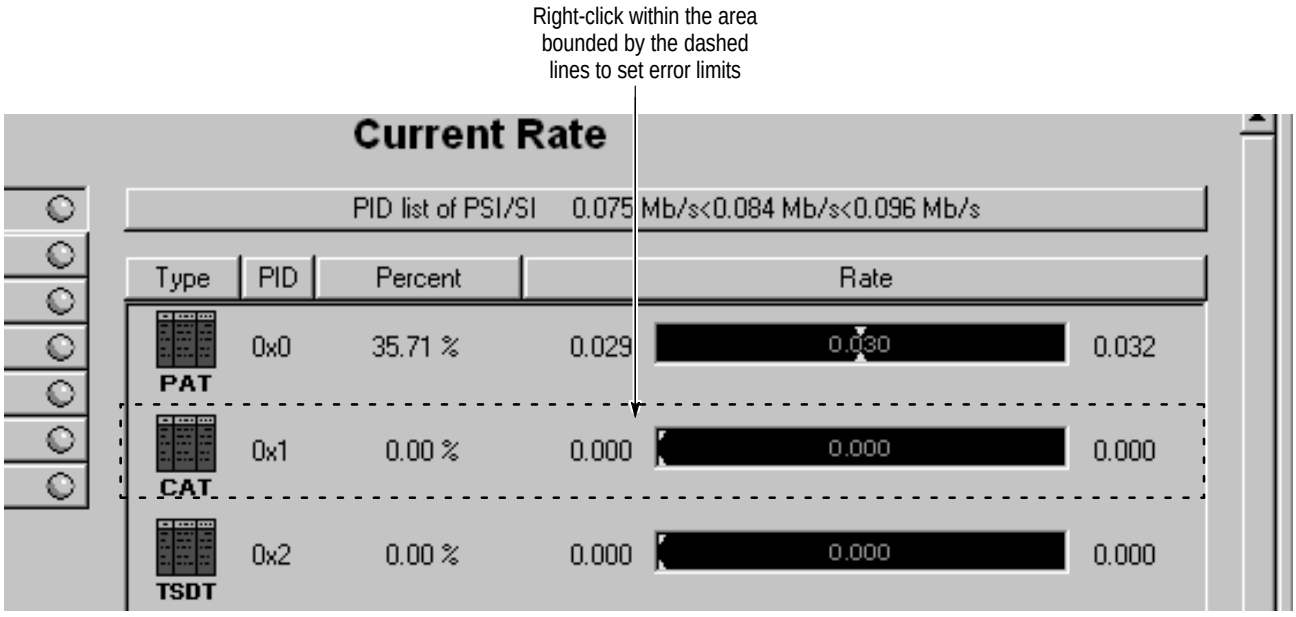
Figure 2–11: PID Allocation panel (current rate mode)

Current Rate and Average Rate Display Modes. You can set the Program Allocation and PID Allocation panels to display current or average transport rates for the current configuration.

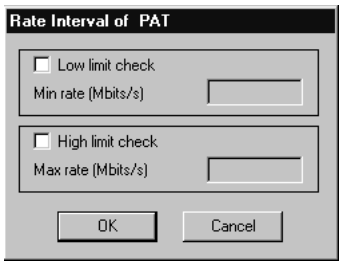
- Select **Display current rate** to display current transport rates. In this mode the minimum and maximum transport rates for the current configuration are displayed as well as the current transport rate. Current Rate is displayed on both the Program Allocation and PID Allocation panels when this mode is selected.
- Select **Display average rate** to display average transport rates. In this mode the transport rates for the current configuration are averaged and only the average rates are displayed. Average Rate is displayed on both the Program Allocation and PID Allocation panels when this mode is selected.

Setting Transport Rate Error Limits. You can set user-defined upper and/or lower transport rate error limits for individual stream PIDs so the RTA can alert you when the transport rate is outside of the desired range. To set user-defined transport rate error limits, perform the following steps:

1. Right-click in the horizontal region corresponding to a program or service (as shown below) to open a Rate Interval dialog box for the selected PID.

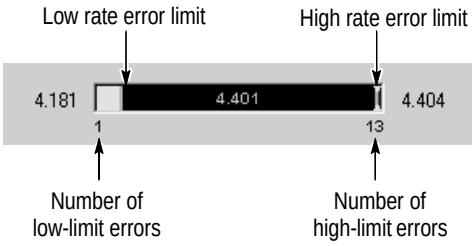


2. In the resulting dialog box (shown below), select **Low limit check** and/or **High limit check**, and then enter the desired error limit value or values.



3. Click **OK** to accept the error limits and close the dialog box.

Setting new limit values can change the appearance of the graphic bar display (shown below). When you have set limits inside the range of minimal and/or maximal rates, the graphic bar displays the standard RTA colors to indicate error conditions. The round error indicators in the program selection buttons match the error condition displayed in the graphic bar display. Refer to *Error Indicators* on page 2–41 for more information.



The number of low-limit errors detected (in this case, 1) appears immediately below the left end of the rate bar while the number of high-limit errors appears below the right end.

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

- The RTA shows the current rate in red when it violates either limit.
- When a limit has been violated, the region of the bar between the limit and the actual min or max value becomes red; when the rate returns to the preferred range, the region becomes orange.
- The number of (low- or high-limit) errors reported is the number of 500 ms samples in which the actual transport rate has been below or above the specified limits.

Continuity Counter Panel

The Continuity Counter panel (see Figure 2–12) shows the results of continuity counter 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. If a continuity error is detected, a message is sent to the report view. The Transport Syntactic Analysis Settings panel controls which PID are shown in this view. Refer to *Analysis:Advanced: Syntax:Transport* on page 3–59 for more information.

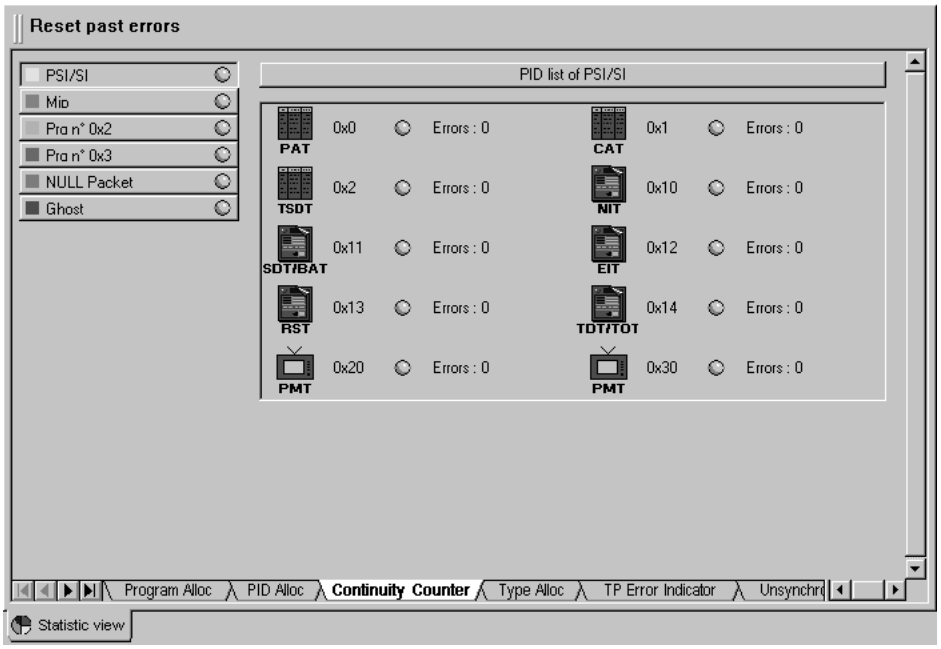


Figure 2–12: Continuity Counter panel

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. The error indicators display the standard RTA colors to indicate error conditions. Refer to *Error Indicators* on page 2–41 for more information.

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

Type Allocation Panel

The Type Allocation panel (see Figure 2–13) shows the bandwidth allocation of each PID type in a pie-chart display. Each slice of the pie chart represents a PID type (such as audio, video, or data).

The accompanying color-coded list of PIDs (matches the pie-chart colors) provides a numeric report of bandwidth usage. A graphic bar displaying the current transport rate for each PID in the multiplex is displayed on the right.

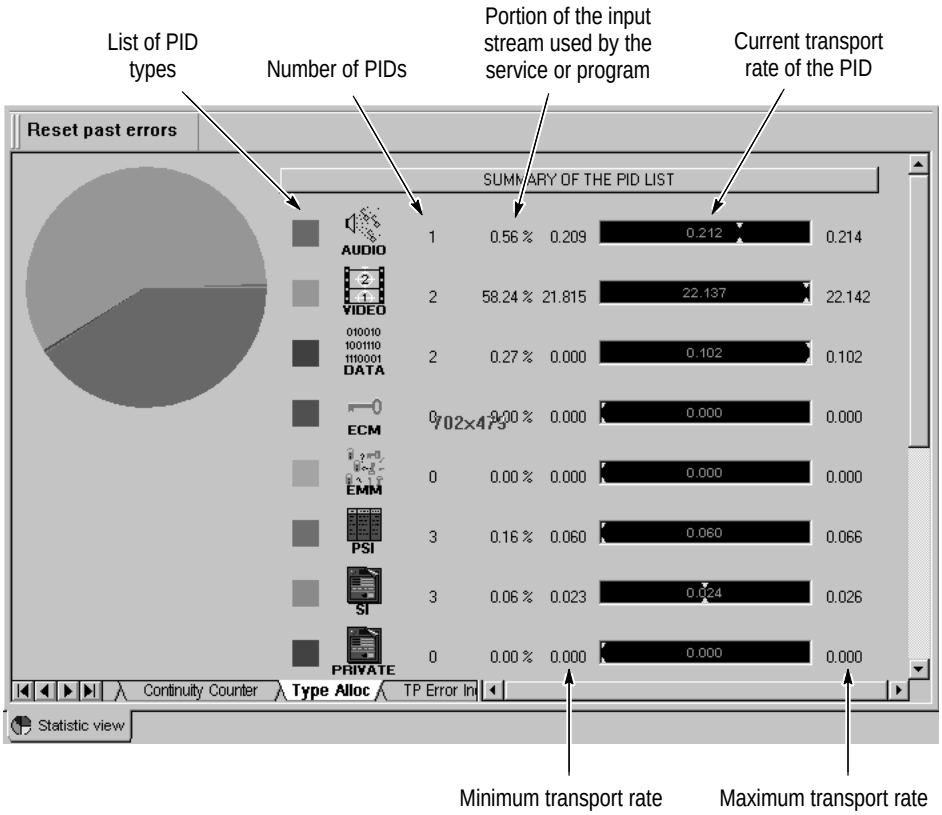


Figure 2–13: Type Allocation panel

TP (Transport Packet) Error Indicator Panel

The TP Error Indicator panel (see Figure 2–14) reports the results of transport error indicator (TEI) monitoring per ETR 290. The Transport Syntactic Analysis Settings panel controls this view. Refer to *Analysis:Advanced: Syntax:Transport* on page 3–59 for more information. You must set the transport error indicator probe in the Settings panel to perform TEI monitoring. When the probe is set, 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 TP Error Indicator panel displays the last 150 seconds of 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.

The **TEI** indicator in the status bar follows the same RTA color conventions for error reporting. Refer to *Error Indicators* on page 2–41 for more information.

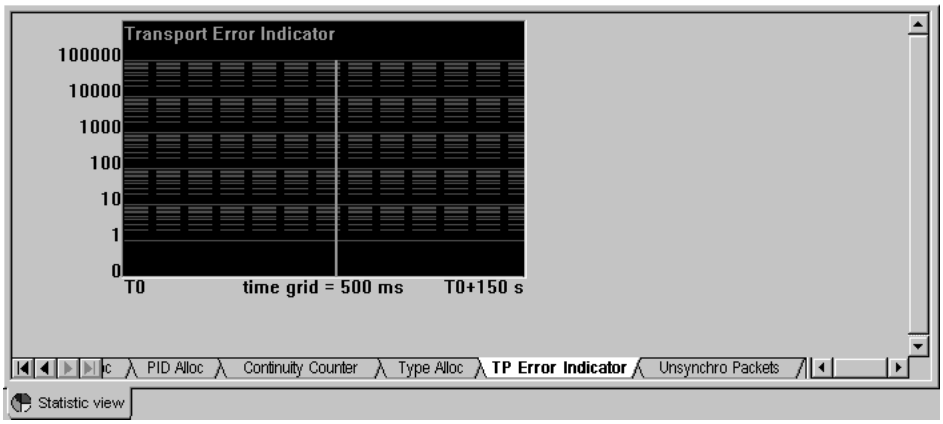


Figure 2–14: TP (Transport Packet) Error Indicator panel

Unsynchronized Packets Panel

The Unsynchronized Packets panel display is identical to the above TP Error Indicator panel display except for the graph title. The Unsynchronized Packets panel reports the results of sync byte monitoring per ETR 290 recommendations. You must set the unsynchronized packet probe through the Multiplex Analysis Settings panel to perform sync byte monitoring. Refer to *Analysis:Advanced:Multiplex Panel* on page 3–55 for more information.

When the unsynchronized packet probe is set, the RTA checks the sync_byte field of every transport packet header and counts the number of packets with sync_byte other than 0x47 every 500 ms. The number of those packets are plotted on a graph with a logarithmic vertical scale to display both very low and very high rates of error. The vertical units are UNP per 500 ms.

The **UNP** indicator in the status bar follows the same RTA color conventions for error reporting. Refer to *Error Indicators* on page 2–41 for more information.

ETR 290 View

There are two ETR 290 views: Detailed (see Figure 2–15) and Monitor. The ETR 290 views provide an at-a-glance report of all ETR 290[1] recommended tests performed by the RTA.

To open an ETR 290 view, point to **ETR 290 view** on the RTA View menu and then click either **Detailed** or **Monitor**. You can also click the **ETR 290 view** toolbar button to quickly open the ETR 290 Monitor view (refer to *Toolbar* on page 2–8 for more toolbar information).

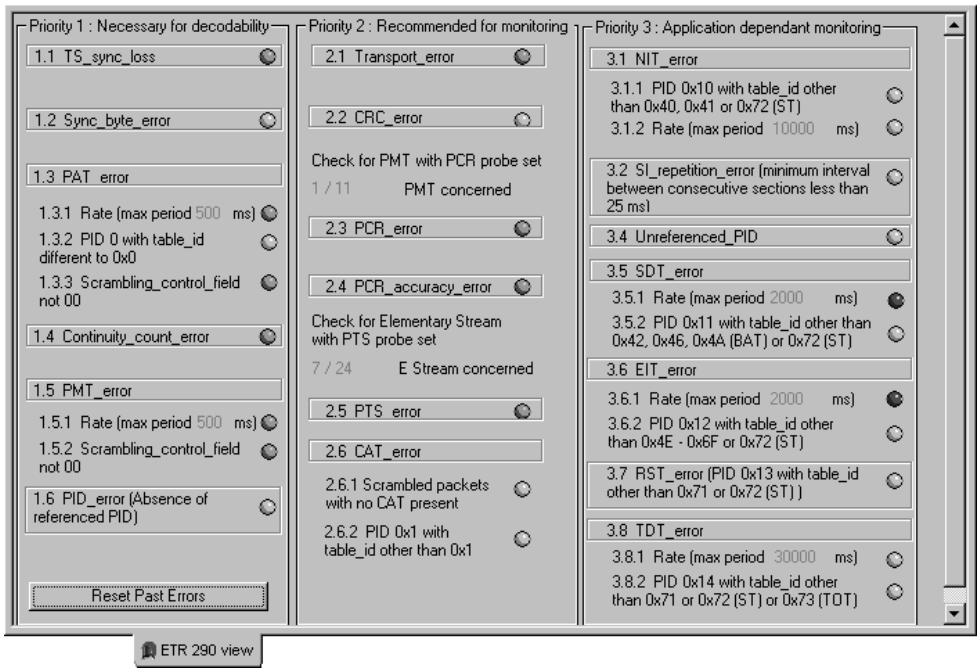


Figure 2–15: ETR 290 detailed view (DVB mode)

The status bar includes indicators (LV1, VL2, and LV3) to indicate the status of ETR 290 errors. Refer to *Status Bar* on page 2–9 for more information.

***NOTE**. ETR 290 level 3 deals with checking DVB-SI tables. In ATSC mode these checks do not apply except for 3.4 Unreferenced_PID. Therefore, the RTA uses six tests specific to ATSC/PSIP tables based on the model of ETR 290. As a consequence, the ETR 290 views change dynamically with the analysis mode.*

1 **ETR 290 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. Refer to *Appendix A: ETR 290 Measurements* for additional information about the ETR 290 recommendations and tests.**

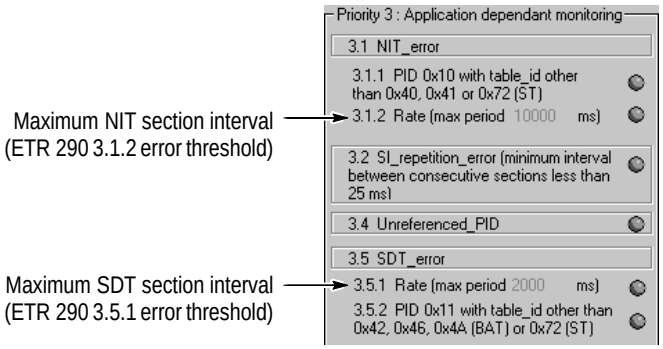
In both ETR 290 views, test numbers are those used in the DVB measurement guidelines, ETR 290, except for the level 3 checks which apply only to the DVB mode. In MPEG-2 mode, the level 3 column does not appear and in ATSC mode the column is customized for that mode. Colored indicator lights show the status of each test. The error indicators follow the standard RTA color conventions for error reporting. Refer to *Error Indicators* on page 2–41 for more information.

In both ETR 290 views, you can double-click on an error indicator to open a Message view in the Client view that displays the error messages pertaining to that particular ETR 290 error condition.

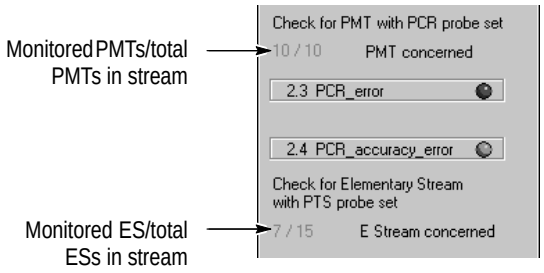
ETR 290 Detailed View

In the ETR 290 Detailed view (see Figure 2–15 on page 2–53), three columns list the tests defined in the ETR 290 recommendations by name and reveal additional information about test thresholds and affected stream items. The level 3 column contains different information when the analysis mode is set to ATSC and the column does not appear when the analysis mode is set to MPEG-2.

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 Rate Analysis panel of the Settings window. Refer to *Analysis:Advanced:Rate:Section Panel* on page 3–74 for more information. The user-defined values set in the Section Rate Analysis panel are displayed in gray on the ETR 290 Detailed view as shown below.



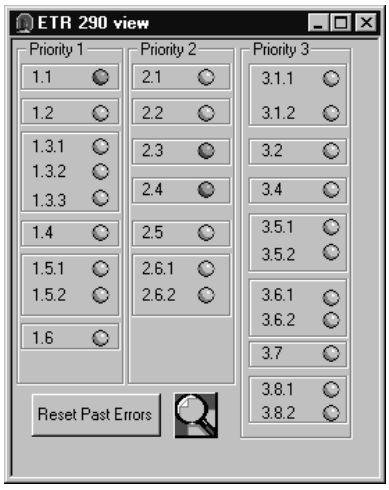
Tests 2.3, 2.4, and 2.5 (PCR and PTS/DTS probes) are performed only on user-selected PMTs and elementary streams. The ETR 290 detailed view shows how many of the PMTs and elementary streams (ES) in the input stream have been selected for monitoring as shown below.



Click **Reset Past Errors,** at the bottom of the ETR 290 Priority 1 column, to reset all previously detected ETR 290 errors (all orange and red error indicators become green).

ETR 290 Monitor View

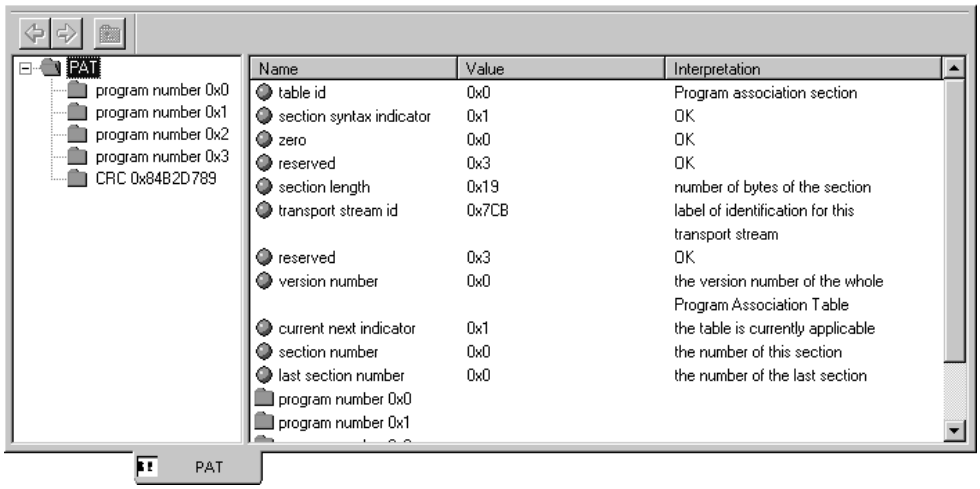
The ETR 290 Monitor view (shown below) is a simplified version of the ETR 290 Detailed view. This view is useful when you have reduced all Client views to windows because it leaves the greatest possible Client view area free for other views. Click the magnifying glass icon at the bottom of the ETR 290 Monitor view to open an ETR 290 Detailed view.



As in the detailed ETR 290 view, double-clicking an error indicator opens a Message view in the Client view that contains messages pertaining to the error.

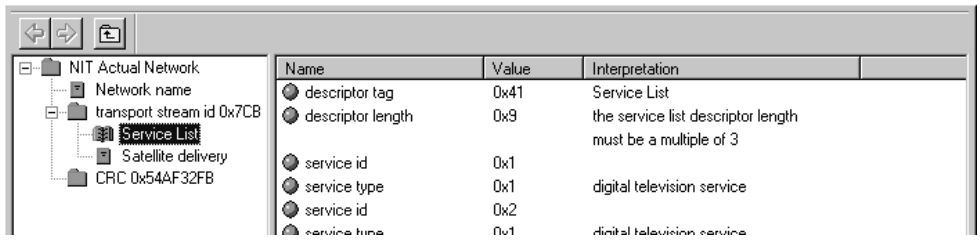
Section Analysis View

The Section Analysis view (shown below) provides both a hierarchic and field-by-field view of the selected table section.



In the Section Analysis 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 as shown below. You can also double-click the same folder icon in the right sub-view to show the same information.

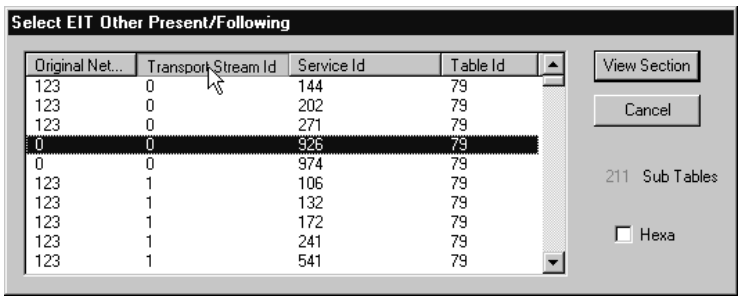
Click the Close Folder button ( ) to close an open folder in the hierarchy.



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. Refer to *Hierarchic Icon Shortcut Menus* on page 2–19 for more information.

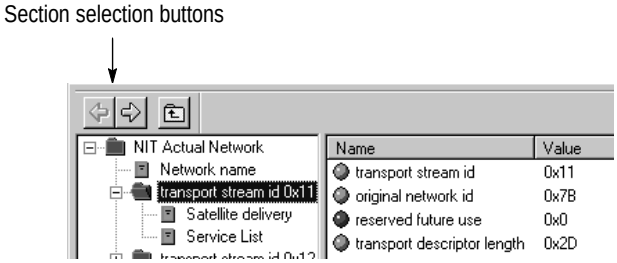
If you select **View Section Analysis** for an NIT, SDT, or EIT, a dialog box opens to permit further selection of table sections. For example, the **Select EIT Other Present/Following** list identifies the sections by their original network ID (Onid), transport stream ID (TSid), Service ID, and Table ID. SDT sections are identified by the Onid and TSid. You can reorder either list by any one of the IDs by clicking the desired column header as shown below.



Highlight the desired sub-table and click **View Section**.

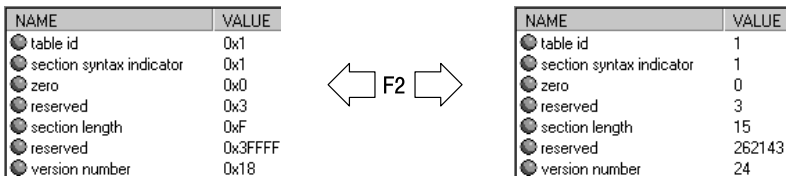
Scrolling Among Sub-table Sections

When more than one section of the selected sub-table exists, use the section selection buttons to scroll among the sections.



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

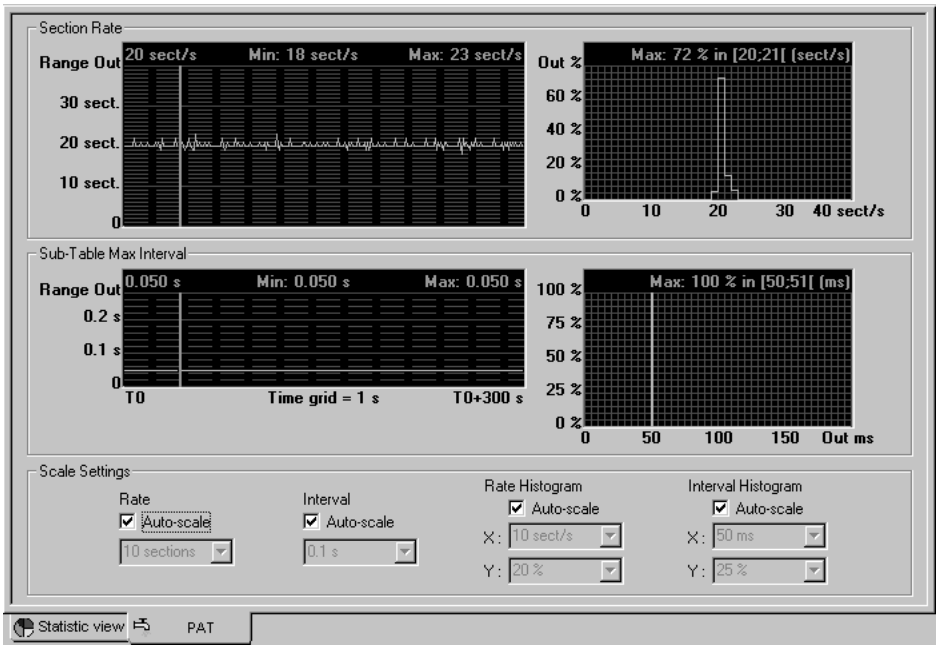
You can print a record of the current Section Analysis view by clicking inside the view to select the view, and then choosing **Print** from the View menu (or pressing **CTRL+P**).

NOTE. *Before printing a view, check the RTA title bar to confirm that the desired view is selected.*

Section Rate View

The Section Rate view (shown below) contains graphs that show the section rate and time interval between sections of the selected table. 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**.

The lower **Sub-Table Max Interval** graph displays interval errors in red when a maximum section interval probe is set for the particular table type (refer *Section Rate Analysis* on page 3–37 for more information).



Setting Graph Scales

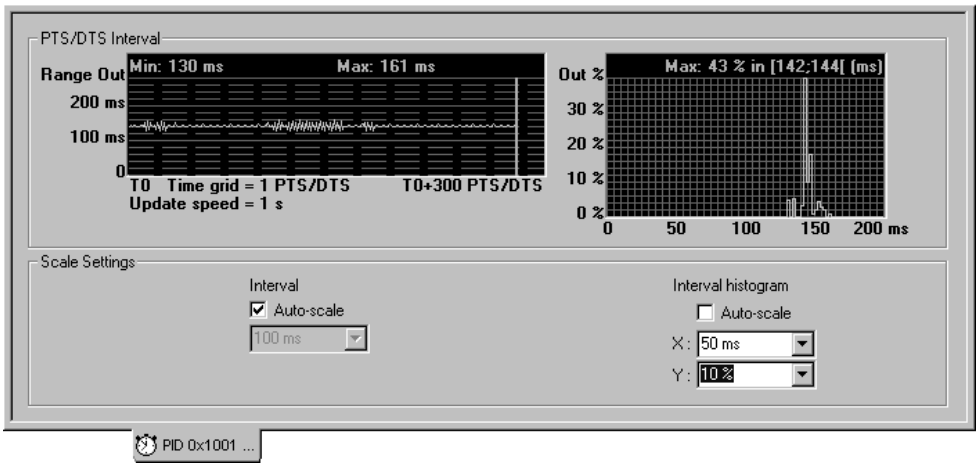
All scales on the rate and interval graphs are linear and by default the RTA auto-scales the vertical scale on the graphs. To change the vertical scale on a graph, clear the corresponding **Auto-scale** box and select an appropriate scale increment from the drop-down list box. The Section Rate vertical scale ranges from zero to four times the selected scale increment; the Sub-Table Max Interval scale ranges from zero to approximately three times the scale increment. Both vertical scales begin at zero regardless of the scale setting.

Histogram Readout

The two right section-analysis graphs are histograms, which show the relative frequency of section rates and intervals. By default, the histogram readout lists the maximum rate or interval measured. If you position the cursor within a histogram, the cursor shape changes to resemble cross hairs and the histogram readout changes to display the rate or interval value at the cursor position.

PTS/DTS Analysis View

The PTS/DTS Analysis view (shown below) graphs the interval between consecutive time stamps in the selected video or audio elementary stream. The minimum and maximum intervals between any two of the last 300 time stamps are also shown.



Opening a PTS/DTS Analysis View

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**. In the resulting **PTS/DTS probe...** dialog box, you can enter a user-defined maximum PTS/DTS interval. Click **OK** to set the probe and open the PTS/DTS Analysis view.

NOTE. *The **PTS/DTS Interval** setting determines the threshold for errors reported on the ETR 290 view. The default setting is consistent with ETR 290 recommendations. Do not change this setting if you plan to use ETR 290 tests to judge DVB compliance of the input 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.*

Opening a PTS/DTS Analysis view 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.

Setting Graph Scales

The scales on the PTS/DTS Analysis view graphs are linear and by default the RTA auto-scales the vertical scale on the graphs. To change the vertical scale on a graph, clear the corresponding **Auto-scale** box and select an appropriate scale increment from the drop-down list box. The PTS/DTS Interval vertical scale ranges from zero to approximately three times the scale increment. The vertical scale begin at zero regardless of the scale setting.

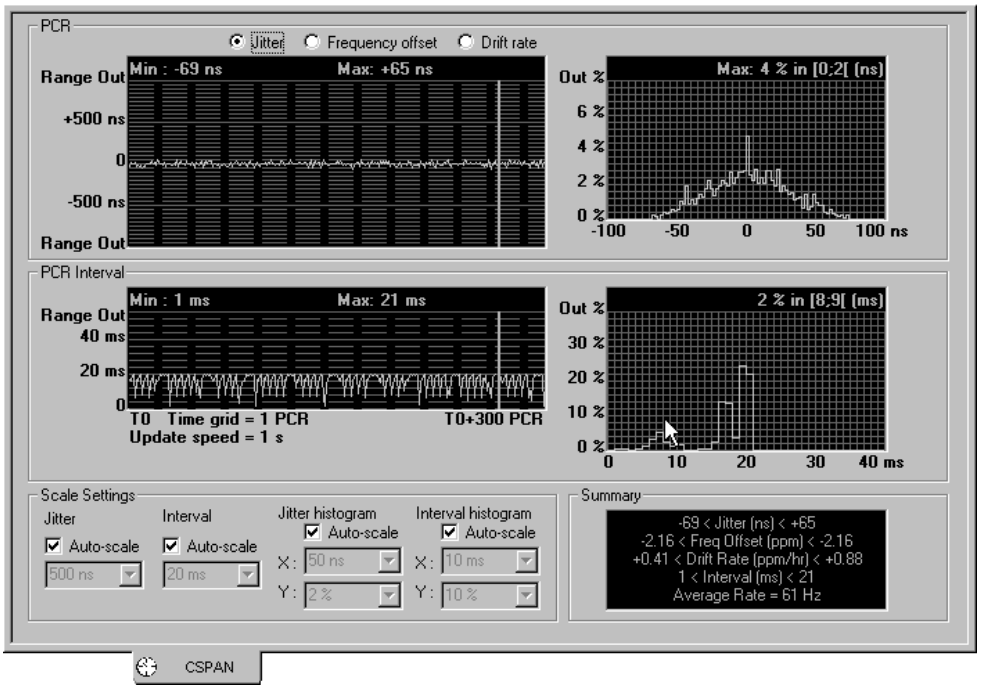
Histogram Readout

The right graph is a histogram, which shows the relative frequency of PTS/DTS intervals. By default, the histogram readout lists the maximum interval measured. If you position the cursor within the histogram, the cursor shape changes to resemble cross hairs and the histogram readout changes to display the interval value at the cursor position.

PCR Analysis View

The PCR Analysis view (shown below) is a graphical display of PCR precision and frequency. The upper graph plots your selection of either the **Jitter**, **Frequency offset**, or **Drift rate** 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 readouts of the minimum and maximum values measured in the last 300 clock references. The graphs on the right are histograms, which show the relative frequency of the PCR data in the graphs on the left.

Red colored portions of the graphs and red Min or Max readouts indicate that the data exceeds the 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. You can view or change PCR error limits using the PCR Timing Analysis panel of the Settings window. Refer to *Analysis:Advanced:Timing:PCR Panel* on page 3–65 for more information.



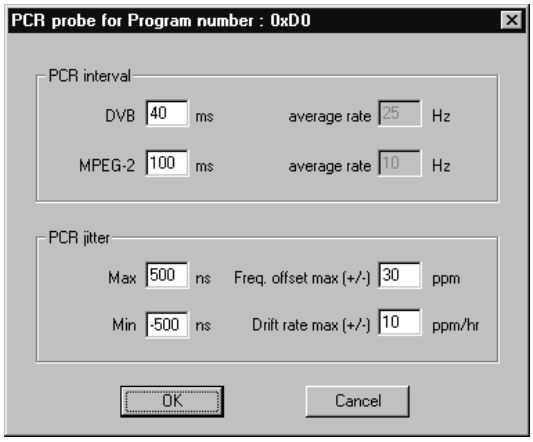
Settling Filter

The RTA uses an internal Settling Filter to improve the accuracy of PCR jitter analysis. The Settling Filter must have at least 60 seconds of data before the RTA can detect and report PCR jitter errors. When you first set a PCR probe and open a PCR Analysis view, a message appears in the upper histogram displaying how many seconds remain before the settling filter completes its operation.

Opening a PCR Analysis View

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**. In the resulting **PCR probe...** dialog box (shown below), you can enter user-defined maximum PCR interval and PCR jitter limits. Click **OK** to set the probe and open the PCR Analysis view.

NOTE. *The **PCR interval** and **PCR jitter** settings determine the thresholds for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations. Do not change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*



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

Setting Graph Scales

The scales on the PCR Analysis view graphs are linear and by default the RTA auto-scales the vertical scale on the graphs. To change the vertical scale on a 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 twice the selected increment; the range of the Interval graph is from zero to approximately three times the selected interval.

Histogram Readout

The graphs on the right are histograms, which show the relative frequency of the PCR data in the graphs on the left. By default, the histogram readout lists the maximum measured result. If you position the cursor within the histogram, the cursor shape changes to resemble cross hairs and the histogram readout changes to display the interval value at the cursor position. The histogram scales range from zero to approximately four times the selected increment.

PCR Analysis Accuracy

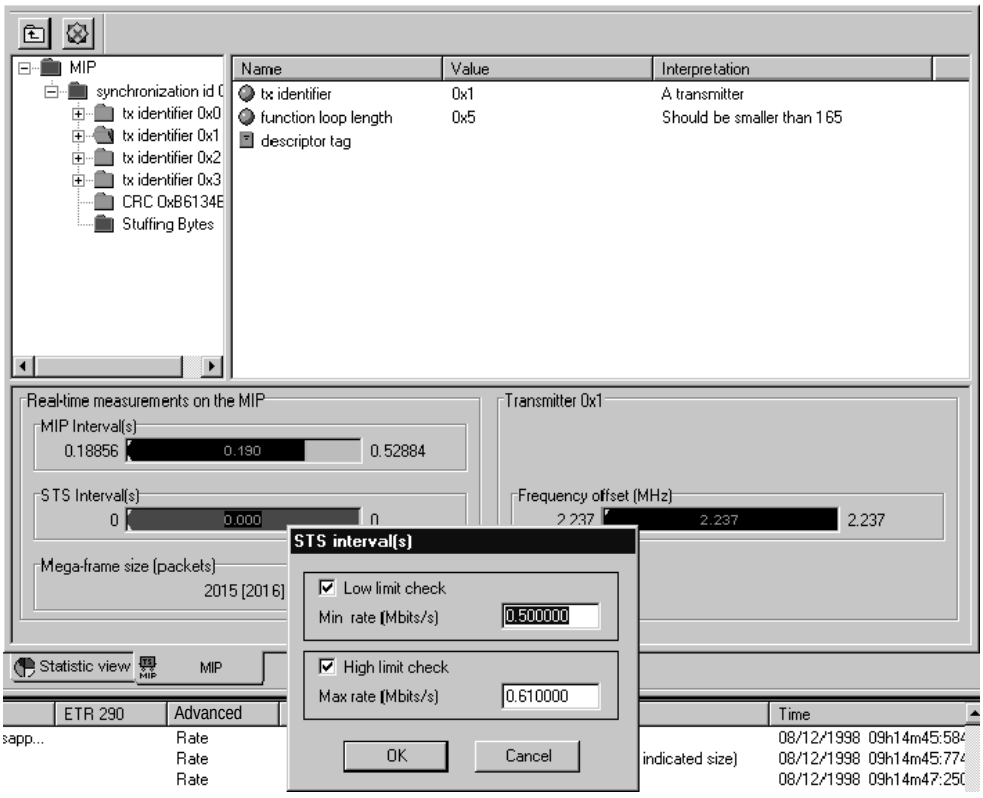
RTA hardware considerations limit the accuracy of PCR analysis. Table 2–16 summarizes the accuracy possible for jitter parameters displayed in the PCR Analysis view.

Table 2–16: 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

MIP Packet Analysis View (DVB-T only)

The MIP Packet Analysis view (shown below) provides both a hierarchic and a field-by-field view of the selected MIP.



In the MIP Packet Analysis 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 as shown below. You can also double-click the same folder icon in the right sub-view to show the same information.

Click the Close Folder button () to close an open folder in the hierarchy.

There is also a control that displays the emitted Mega Frame size (between brackets) and the measured Mega Frame size, side by side. If the measured Mega Frame size differs from the emitted size, it means that an error occurred between the emission point and the reception point.

Opening an MIP Packet Analysis View

To open an MIP Packet Analysis view, select the appropriate Hierarchic view MIP icon, right-click to open the shortcut menu, and then click **View MIP Packet Analysis**.

NOTE. *Before the RTA can recognize an MIP, DVB-T must be selected in the Analysis panel of the Settings window. Refer to* Analysis Panel *on page 3–50 for more information.*

Setting User-Defined Intervals

On the bottom-left side of the view there are bar graphs, which report the measurements of the intervals between MIPs and synchronization time-stamps. You can control these measurements by adding user-defined intervals. You can set user-defined intervals using one of the following two methods:

- Right-click on the desired bar graph to open either an MIP interval or a STS interval dialog box.
- Use the Mega Frame Timing Analysis panel to set the STS interval (refer to *Analysis:Advanced:Timing:Mega Frame Panel* on page 3–71) or use the Mega Frame Rate Analysis panel to set the MIP interval (refer to *Analysis:Advanced:Rate:Mega Frame Panel* on page 3–76).

On the bottom-right side of the view there are bar graphs that display the current values of the transmitter functions. These bar graphs appear only when the corresponding transmitter is selected. You can control these measurements by adding user-defined intervals. You can set user-defined intervals for the transmitters using one of the following two methods:

- Right-click on the desired bar graph to open either an interval dialog box.
- Use the Mega Frame Syntactic Analysis panel to set the interval (refer to *Analysis:Advanced:Syntax:Mega Frame Panel* on page 3–63).

IP (Internet Protocol) Monitoring View (SIDAT 360 only)

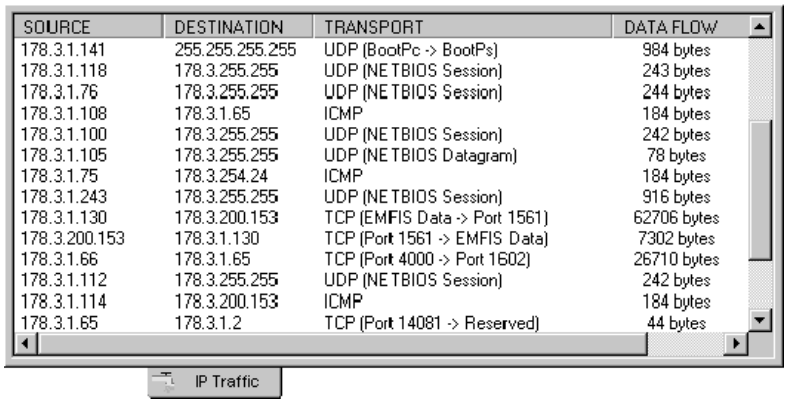
Depending on the type of protocol in use, the RTA can monitor the data transfer between two Internet or MAC addresses. This is done only on Multiprotocol Encapsulation sections, which are the only sections in which IP headers can be detected and read properly.

If the probed stream contains multiprotocol encapsulated datagrams, an interpretation of the IP (and TCP/UDP if present) headers is displayed, along with the sender and receiver addresses, and the total amount of data exchanged on that session. The RTA assumes that packets which have the same IP source/destination couple and the same TCP/UDP ports belong to the same session. A session line may disappear from the view when no corresponding packets are sent for a certain period of time (40 seconds usually).

Opening an MIP Packet Analysis View

To open an IP Monitoring view (shown below), select the appropriate Hierarchic view DSM-CC icon, right-click to open the shortcut menu, and then click **IP Monitoring**. You must set a probe on one of the DSM-CC streams through the Hierarchic view or through the Settings window before you can open this view.

NOTE*. Before the RTA can recognize a multiprotocol encapsulation section, SIDAT 360 data broadcasting analysis must be selected in the Analysis panel of the Settings window. Refer to* Analysis Panel *on page 3–50 for more information.*



NOTE*. There is only one IP Monitoring view for the RTA application. Therefore, if you add a probe on another stream, the results will be added to the same view.*

IP monitoring can be tremendously bandwidth- and CPU-consuming. The section rate of such streams is usually very high.

RTA Operating Tutorials

This section contains four step-by-step tutorials intended to introduce you to RTA capabilities, features, and techniques. Refer to *Operating Basics* starting on page 2–1 for detailed information about operating the RTA application.

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:

Preliminary Setup

All of the tutorials assume that you have connected an input to the rear panel of the instrument and started the Tektronix MPEG Test System (refer to *Getting Started* on page 1–1 for instructions).

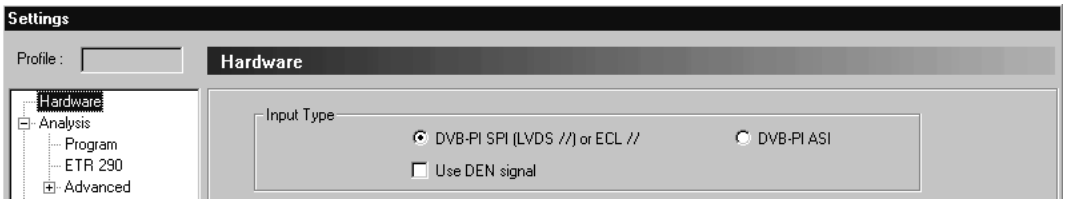
NOTE. *If you are not familiar with the Windows 95 or Windows NT 4.0 operating systems, review the Windows NT documentation that accompanied your MTS 200 Series test system.*

Monitoring an Input Stream

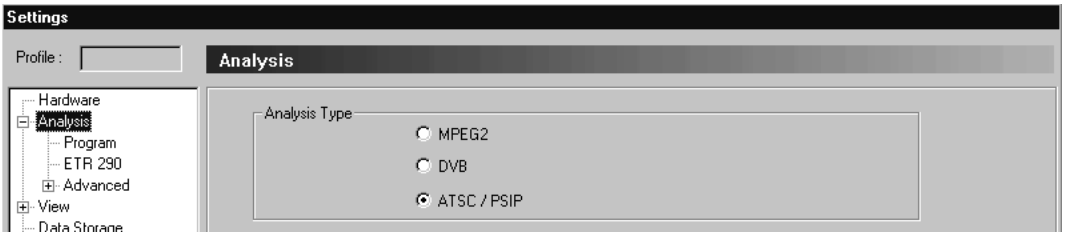
Perform the following steps to have the RTA monitor your input stream:

1. Start the RTA application using one of the following two methods:
   - Select **Real-Time Analyzer** from the Windows NT Start menu
   - Double-click the Real-Time Analyzer icon (shown below) in the **Tektronix MPEG Test System** window

2. From the Menu bar in the RTA application window, open the Configuration menu and select **Restore Standard**.
3. Click **OK** in the resulting **RTA** dialog box to restore the default Configuration settings.
4. From the Menu bar, open the Configuration menu and select **Settings**.
5. Select **Hardware** in the Settings window hierarchy display to reveal the Hardware panel (shown below).



6. Select the appropriate input type to match the type of your stream.
7. Select **Analysis** in the Settings window hierarchy display to reveal the Analysis panel (shown below).



8. Select the appropriate analysis type to match the type of your stream.

9. Click **OK** on the bottom of the Settings window to confirm your changes and close the window.

***NOTE**. If you have selected ASI input or changed the Analysis 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 MPEG-2 mode. Refer to* Saving and Restoring Configurations *on page 3–43 for more information.*

10. Start the RTA analysis using one of the following two methods:

- From the menu bar, open the Analysis menu and select **Start**
- Click the **Start analysis** toolbar button

Figure 2–16 illustrates the RTA display during the analysis of a stream.

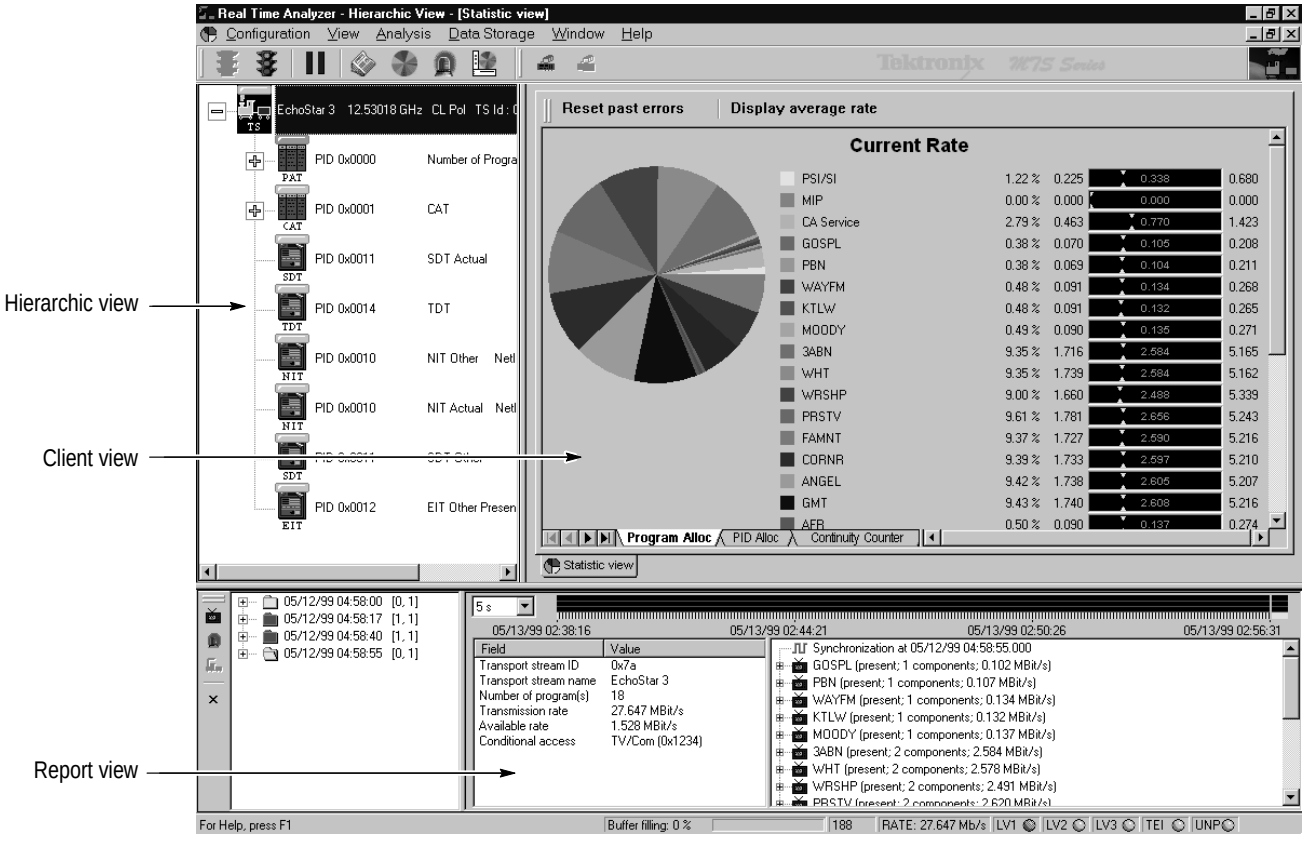


Figure 2–16: Example of RTA display

When you start the RTA analysis, the RTA hardware (known also as the PIA board) is initialized and analysis begins. The animated train icon at the far right of the toolbar indicates that an analysis is in progress (refer to *Toolbar* on page 2–8).

The default RTA display resembles Figure 2–16. Icons that represent stream items appear in the Hierarchic window. The colored rectangle above each icon is an error indicator. Refer to *Icon Error Indicators* on page 2–14 for more information.

Refer to *Using the Hierarchic View* on page 2–11 for more information.

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/PSIP, programs, and null packets) use the available input bandwidth. A complete discussion of the Statistic view begins on page 2–42.

You can access all information gathered about the input stream through the Report view, which in the standard configuration occupies the bottom portion of the application window. Refer to *Using the Report View* on page 2–23 for more information.

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

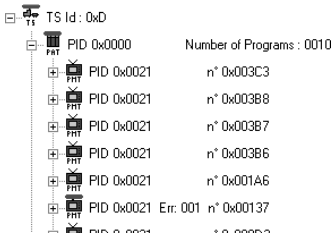
Using the Hierarchic View

The following procedure will acquaint you with features of the Hierarchic view.

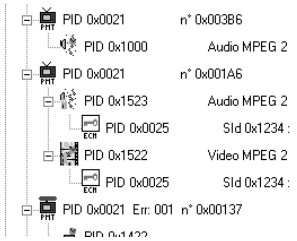
1. Press **F8** (on the keyboard) and notice what happens to the Hierarchic view. You can also click on and drag the borders between window panes to enlarge the Hierarchic view.

2. 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.

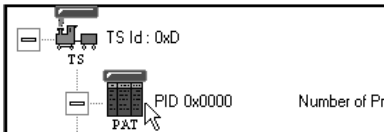
Press the F8 function key to show the second hierarchy level.



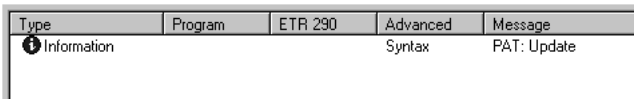
Press the F10 function key to reveal all levels and items in the hierarchy.



3. Find the PAT icon near the top of the hierarchy (shown below). You may have to use the vertical scroll bar to see the top of the hierarchy. Double-click on the icon, and a PAT Message view opens in the Client view.



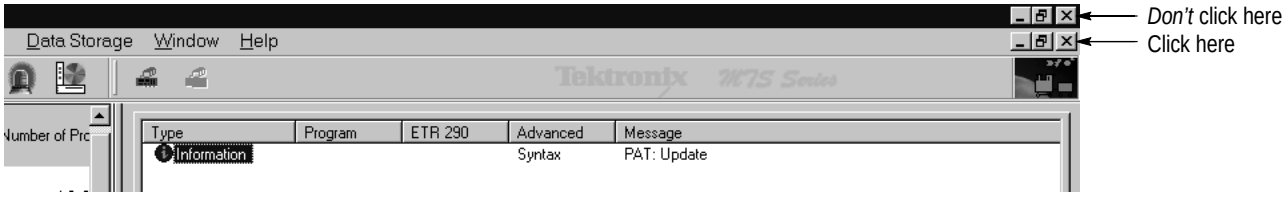
The PAT Message view contains information and error messages that apply only to the PAT. If your input stream is reasonably compliant with the analysis mode, there may be only one initial PAT: Update message, as shown below.



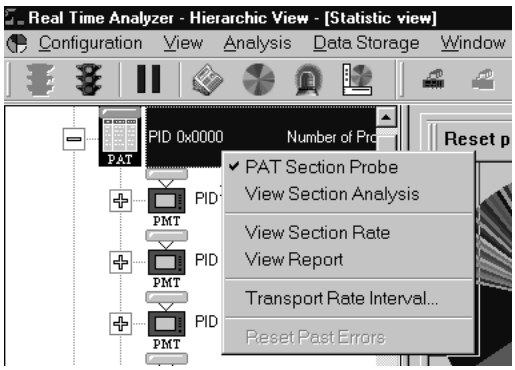
4. Double-click the PAT: Update message. A **Detail of message** window opens to display information that has been logged to the Windows NT Event Viewer application log.

5. Click **OK** to close the **Detail of Message** window.

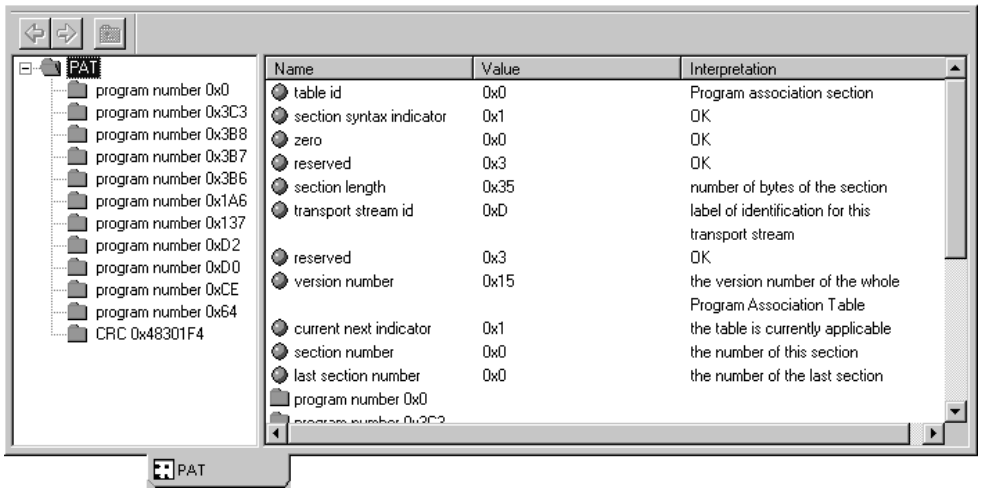
6. Click the Client view Close box to close the PAT Message view. When you click the Client view Close box, the selected view within the Client view is closed. The Close box is at the right end of the RTA menu bar, immediately below the RTA application window size boxes. Do not click the application close box; doing so will exit the RTA application.



7. Select the PAT icon in the Hierarchic view. Right-click on the selected icon to open the PAT shortcut menu.



8. Select **View Section Analysis** from the PAT menu to open a PAT section analysis view in the Client view. Notice that the section analysis 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.



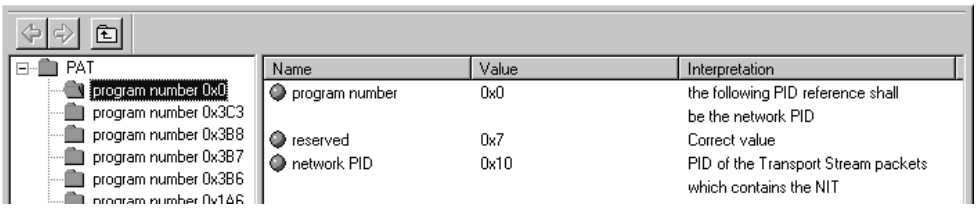
The first eleven items in the right sub-view are preceded by a round indicator. The indicator identifies an item as a table section field; it is green when the field contents are correct and is red if the field contents do not comply with the applicable standards (MPEG-2, DVB, or ATSC, depending on the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

9. 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.

10. 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.

11. 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.

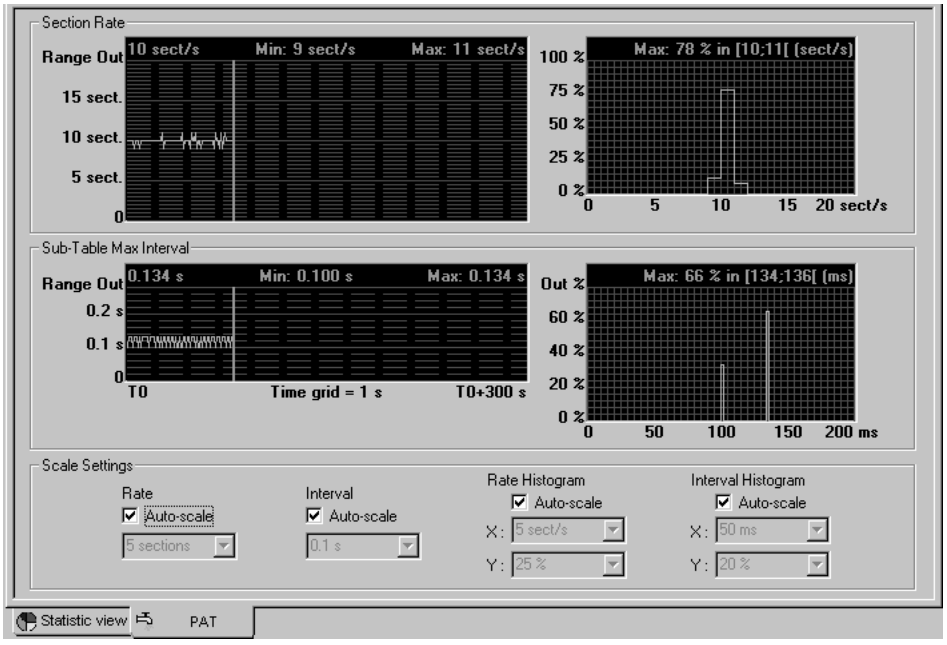
12. Click on one of the “program number 0x...” folder icons in the left sub-view. The right sub-view changes to show the PAT section fields that assign a PID to the the NIT (program number 0x0) or to a particular program in the stream.



Note that in several DVB-SI and ATSC-PSIP 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.

13. Click the Client view Close box to close the PAT syntax view.

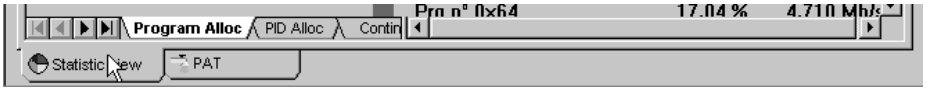
14. Right-click on the PAT icon to open the shortcut menu. This time, select **View Section Rate**. A section rate view (shown below) opens in the Client view.



15. 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.

16. The bar chart readout displays the maximum rate. If you position the pointer into the bar chart, you can use the cursor to measure the rate at any point in the bar chart.

17. Move the pointer to the bottom of the Client view and click the Statistic view tab. The statistic view is now visible in the Client view.



Using the Statistic View

The following procedure will acquaint you with features of the Statistic view.

1. The Statistic view in the Client view consists of six 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 three tabs.

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

NOTE. *The remainder of this tutorial explains features of the Program Allocation and PID Allocation panels. For more information about the Continuity Counter, Type Allocation, TP Error Indicator, and Unsynchronized Packet panels, refer to the discussion of the Statistic view that begins on page 2–42.*

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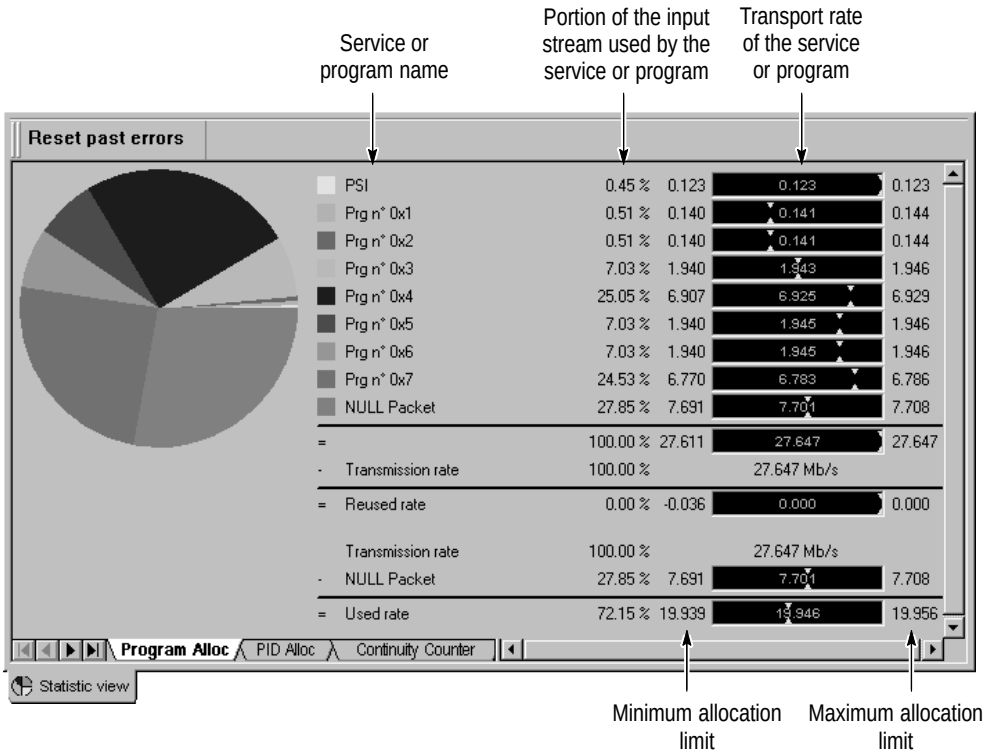
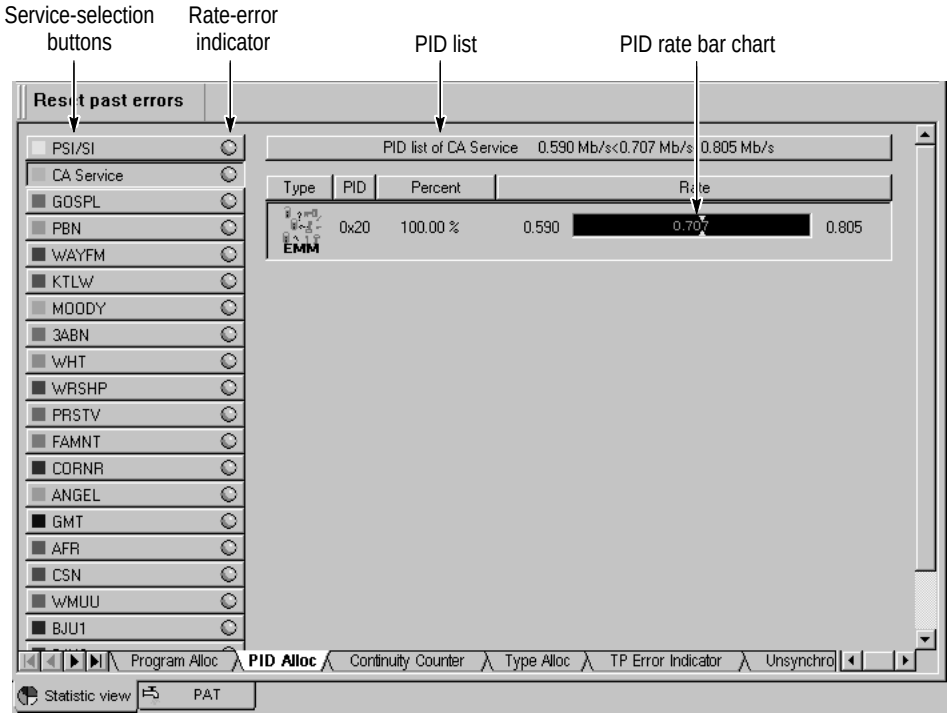
3. Return to the Program Allocation panel by clicking the Program Allocation tab. Notice that the pie chart provides a quick graphic overview of input stream contents while the table to the right provides equivalent numeric data.



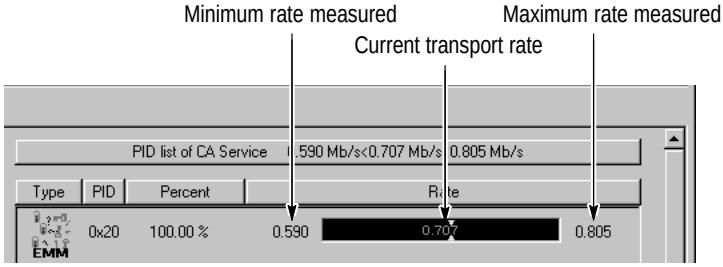
4. The yellow pie chart slice represents the service information (PSI, PSI/SI, or PSI/PSIP). Double-click on any other slice of the chart. The PID Allocation panel replaces the Program Allocation panel in the Statistic view. The PID Allocation panel contains a dynamic transport rate display for each PID in the selected service (PSI/SI/PSIP, program, null packets, or unreferenced ghost packets).

   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 selected in the following PID Allocation example is composed of only one PID.



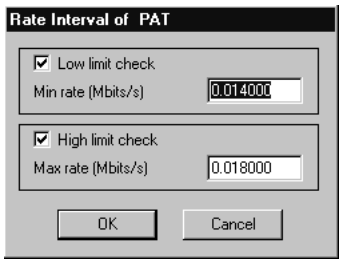
5. Click the **PSI** (MPEG-2 mode) or **PSI/SI** (DVB or ATSC mode) service button to view the transport rates of all service information tables in the input stream.

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

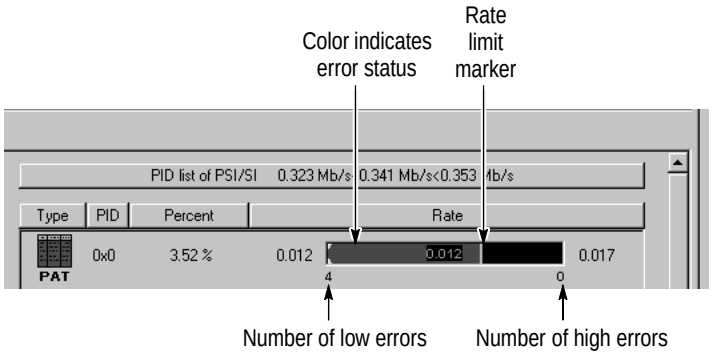


You can set transport rate error limits for any PID in the stream through the PID Allocation panel or the Hierarchic view. When you do so, the limits and any errors are visible on the PID allocation panel.

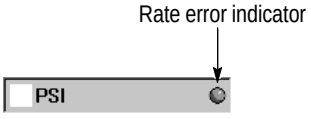
6. To set error limits for the PAT, position the cursor over the PAT rate bar and click the right-hand mouse button.



7. In the resulting dialog box, select both **Low limit check** and **High limit check**. Then enter a low limit that is greater than the previous minimum (but lower than the previous maximum) and a high limit that is greater than the previous maximum. Click **OK** and notice the changes in the PID Allocation Statistic view as shown below.



The number of **Low Errors** and **High Errors** appear in readouts below the ends of the bar chart to report the number of half-second intervals in which the rate has violated the limits. The color of the bar chart shading between the rate-limit marker and the end of the bar chart indicates the error status. The color of the round indicator at the right end of the PSI (or PSI/SI) selection button matches the highest error status of the bar chart.



The arrangement and colors of the rate bar and rate readout numerals also change when errors occur. Refer to *PID Allocation Panel* on page 3–35 for a complete description and explanation.

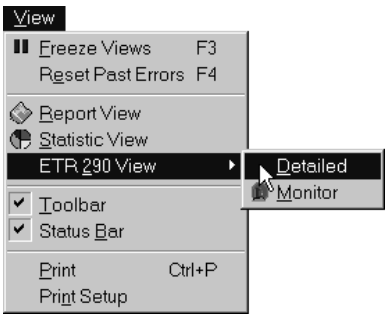
Using the ETR 290 View

ETR 290 is the DVB working group that recommends measurements and controls to be performed on all elements of the digital television chain. You can configure the RTA to perform all but a few of the ETR 290 recommended tests as a stream is received. The ETR 290 view presents pass/fail results of the recommended tests in one display; you can use the ETR 290 view to get a quick overview of the DVB compliance of the input stream.

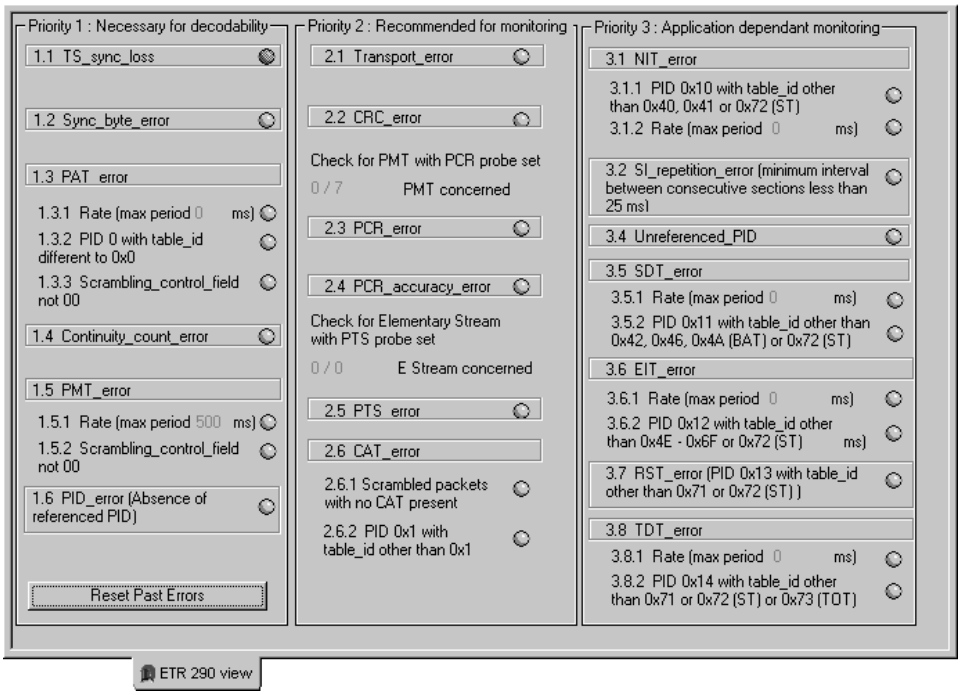
Refer to *Appendix A: ETR 290 Measurements* for additional information about the ETR 290 recommendations and tests.

Perform the following steps to familiarize yourself with the ETR 290 view:

1. If the RTA is not running, start the application and configure it as described in *Monitoring an Input Stream* on page 2–68. 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 or ATSC 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 and Analysis configuration panel of the Settings window. 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 **ETR 290 View**, and select **Detailed**.



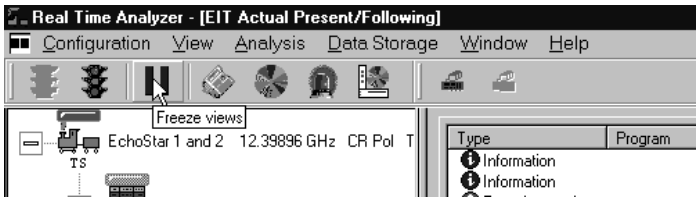
The detailed ETR 290 view opens in the Client view as shown below. The view lists every ETR 290 test that the RTA can perform. This illustration is for DVB mode only. The view will be different for ATSC or MPEG-2 modes.



A colored indicator accompanies each listing to shows the status of the test. Notice that, in the standard configuration, all indicators are gray except the TS_sync_loss indicator (number 1.1, in the upper left corner of the view).

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

You can double-click on an error indicator to open a view in the Client view of messages pertaining to the particular ETR 290 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.

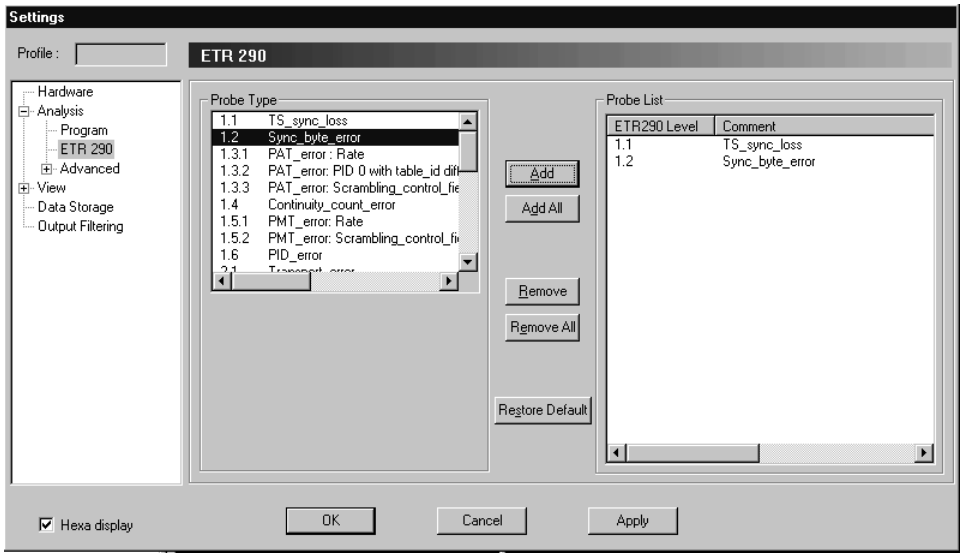


Other indicators may be gray because your input stream does not contain the applicable table. MPEG-2 streams, for example, do not contain SI tables; therefore, tests 3.2 through 3.8 cannot be performed on a non-DVB stream.

4. In the standard configuration, all ETR 290 tests are disabled to free RTA processing and buffer resources for other functions, such as reporting the the results of several computation-intensive “probes” in real time. Perform the following steps to enable ETR 290 tests:

a. Select **Settings** from the Configuration menu, and then select **Analysis/ ETR 290** in the Settings window hierarchy.

b. In the ETR 290 Settings window, select **1.2 Sync_byte_error** and then click **Add** to add the test to the ETR 290 probe list. Click **Apply** to apply the test changes.



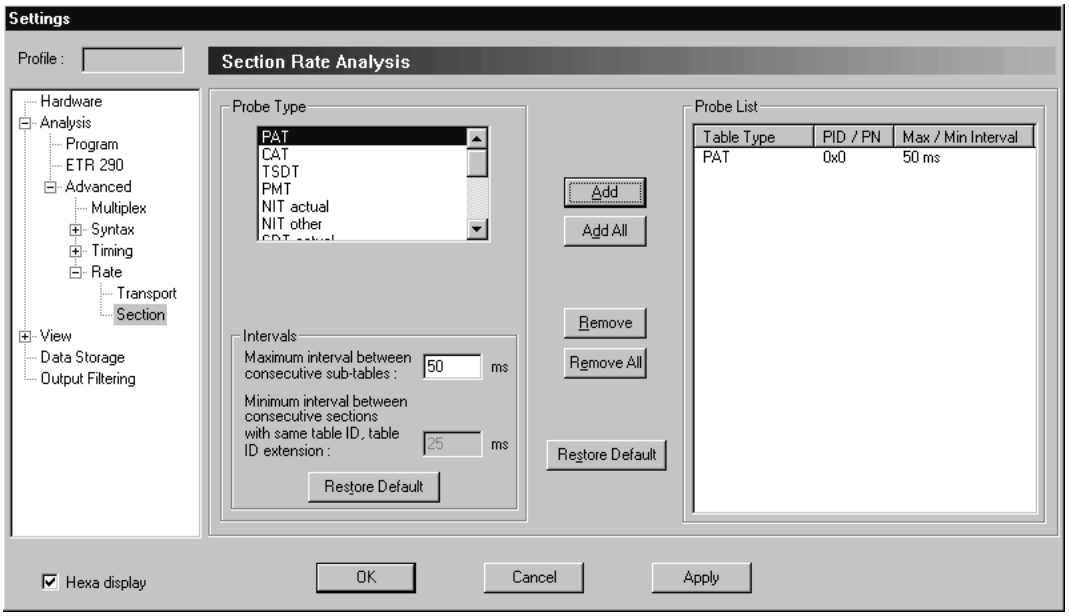
***NOTE**. The following step tells you how to change the error limits (thresholds) for some ETR 290 tests, although doing so may not be consistent with ETR 290 recommendations.*

5. Perform the following steps to change the ETR 290 error limits:

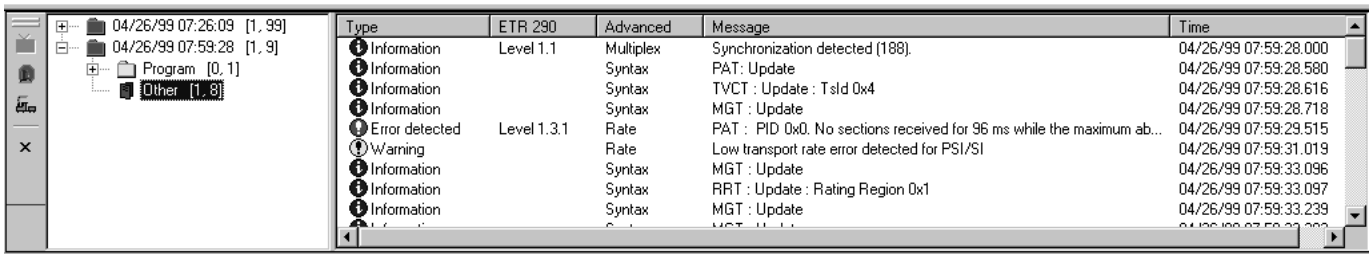
a. Select **Settings** from the Configuration menu and then select the **Analysis/Advanced/Rate/Section** item in the Settings window hierarchy. The Section Rate Analysis panel opens.

b. The ETR 290-recommended maximum interval between PAT sections is 500 ms. Highlight the **PAT** in the **Probe Type** list, change the Maximum interval setting to 50 ms, and then click **Add**. The new PAT interval is added to the **Probes list** as shown in the next illustration.

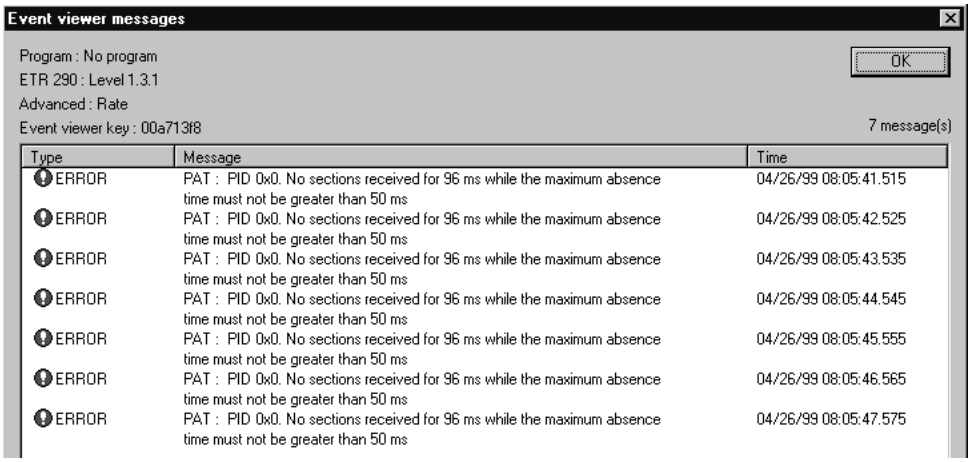
c. Click **OK** to confirm the change and close the Settings window.



6. The ETR 290 indicator for parameter 1.3.1, the PAT section rate, should be red in the ETR 290 view. Locate the corresponding message in the Report window, as shown below.



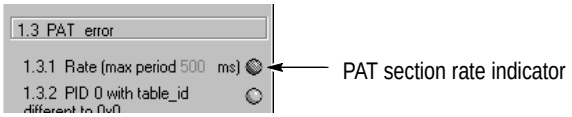
7. Wait a short while and then double-click on “Error detected” at the left end of the Level 1.3.1/Rate error message to retrieve error details from the Windows NT Event Viewer (shown below). The single report view error represents all such errors since you set the probe. If you close the window and then reopen it (by again double-clicking the PAT error message), the number of errors indicated by the “*n* message(s)” readout (below the **OK** button) is greater.



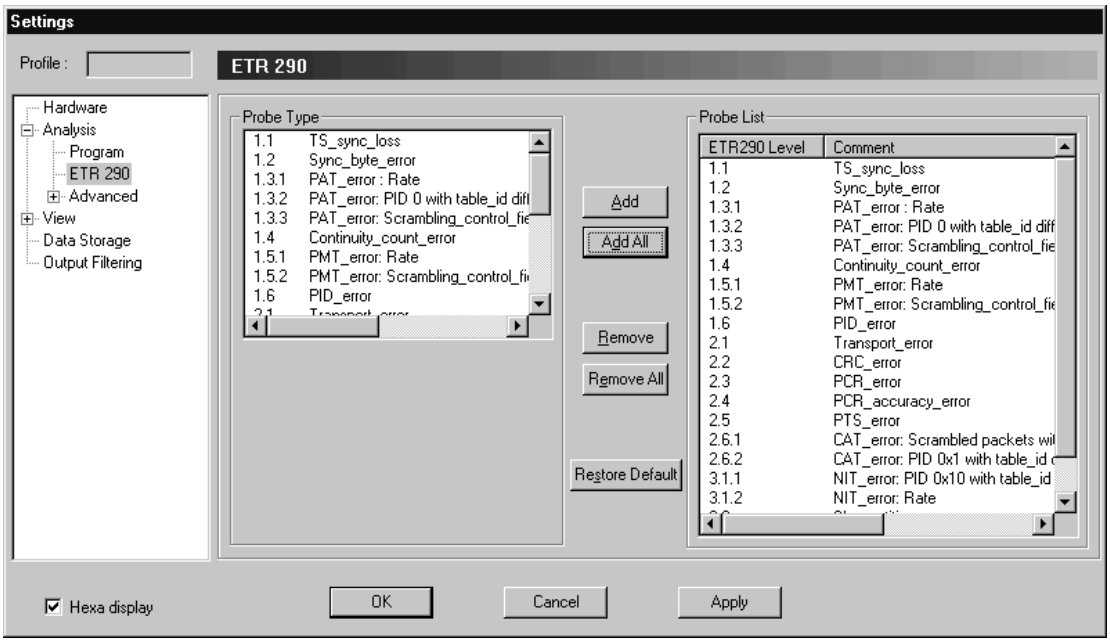
8. Close the **Event viewer messages** window. Then choose **Settings** from the Configuration menu. Select the Section Rate Analysis panel, if necessary, and click **Add** to reset the PAT interval value to 500 ms. Finally, click **OK** to confirm the change and close the Settings window.

9. If necessary, click the ETR 290 view tab at the bottom of the Client view to bring the view back to the top of all client views.

   Resetting the default PAT interval to 500 ms should change the 1.3.1 PAT section rate indicator in the ETR 290 view 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 ETR 290 view (you may need to scroll the ETR 290 view to locate). The 1.3.1 PAT rate indicator should change to green.



10. Select **Settings** from the Configuration menu. Then select the **Analysis/ ETR 290** in the Settings window hierarchy.



11. Click **Remove All** buttons to deselect all of the ETR 290 analyses except for 1.1 TS_sync_loss. Then click **OK** to confirm the changes and close the Settings window. On the ETR 290 view, only the TS_sync_loss indicator remains colored; all others become gray, signifying that the associated tests are no longer being performed.

NOTE. *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. However, disabled 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 RTA application).*

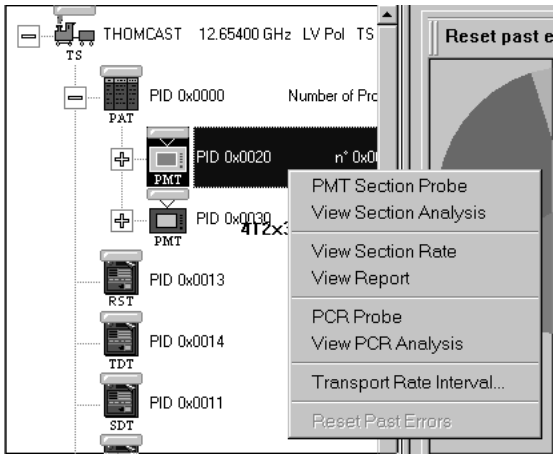
Setting Probes

RTA probes are simply user-initiated analyses. Two of the probes, PCR and PTS/DTS, fulfill ETR 290 recommendations.

Setting PCR Probes

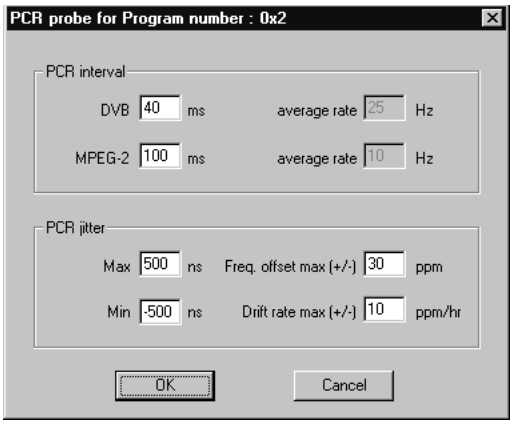
Perform the following procedure to set PCR probes:

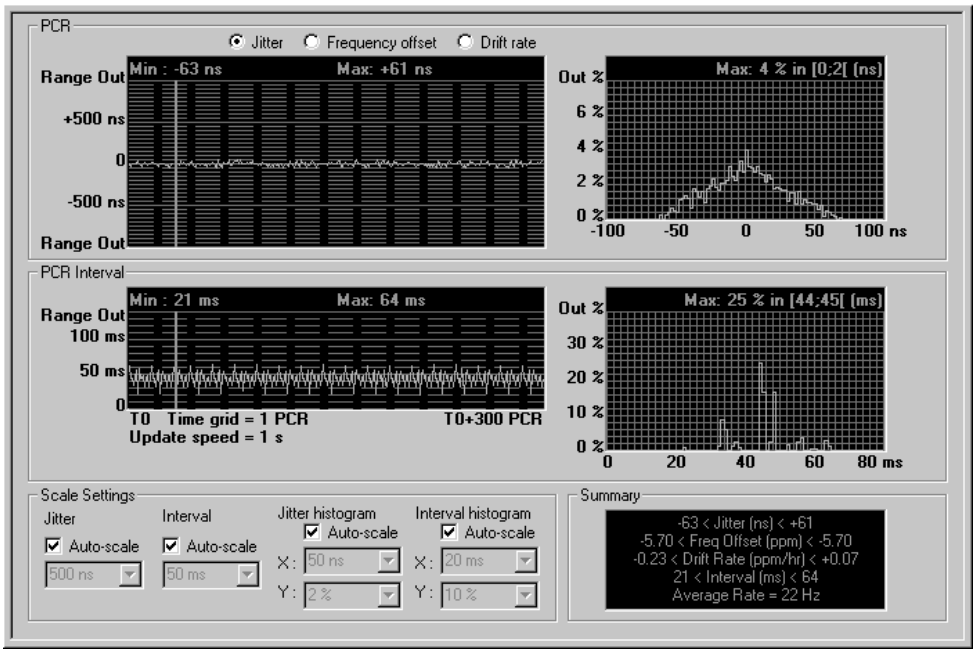
1. If the RTA is not running, start the program and configure it as described in *Monitoring an Input Stream* beginning on page 2–68, and then continue with step 3, below.
2. If the RTA is running, stop analysis and restore the original settings before proceeding:
   a. Click the red stoplight toolbar button and then select **Restore standard** from the Configuration menu.
   b. If you are using a DVB or ATSC 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 and Analysis configuration panels of the Settings window, 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.



You can use either of the **PCR Probe** and **View PCR Analysis** commands to set the PCR probe to monitor the clock references that apply to the selected program.

5. Select **View PCR Analysis**. A PCR probe dialog box for the selected program opens (shown below). You can set probe parameters for the PCR interval and PCR jitter. Click **OK** to enable the PCR probe. The error indicator for the selected PMT icon 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.

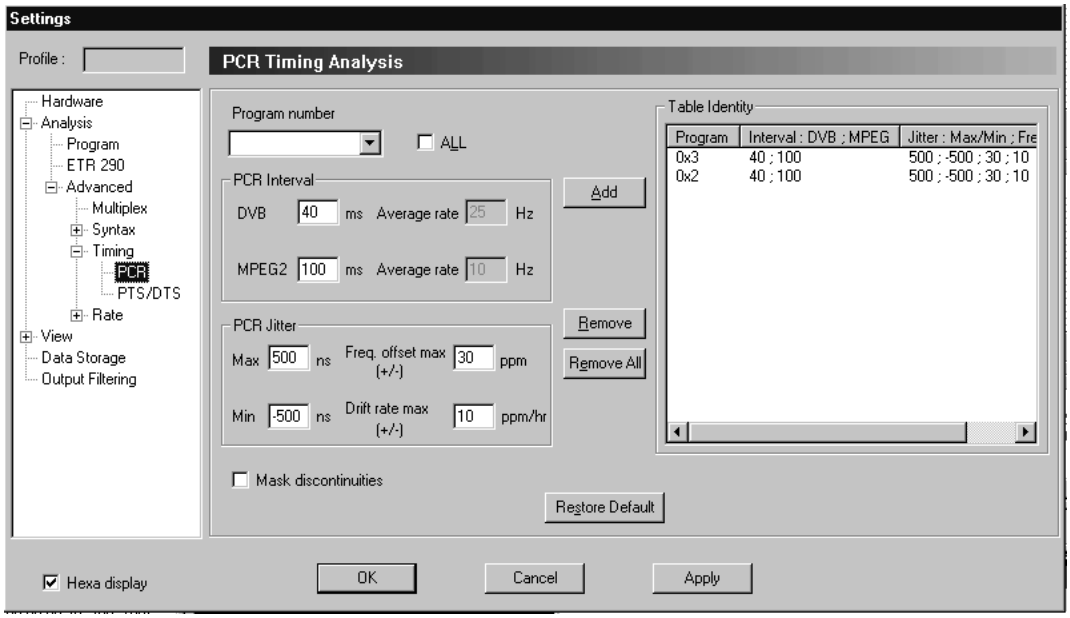




Refer to *PCR Analysis View* on page 2–61 for information about the view. If the PCR precision and interval is within the ETR 290-recommended error limits, the Min and Max readouts are green and the plots are light blue. You can change the PCR error limits, but doing so will put the ETR 290 view out of compliance with ETR 290 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 select the **Analysis/ Advanced/Timing/PCR** in the Settings window hierarchy to open the PCR Timing Analysis panel.



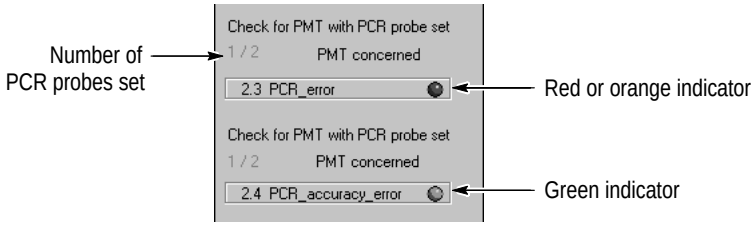
8. Depending on your operating mode, change either the **DVB** interval or the **MPEG-2** interval to a value that is between the actual minimum and maximum that you recorded in step 6.

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 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 can be viewed by selecting **View Report** from the PMT icon menu, which opens a message view in the Client view.

10. Open the RTA View menu, click **ETR 290 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. Choose **Settings** from the Configuration menu and then select the **Analysis/Advanced/Timing/PCR** in the Settings window hierarchy to open the PCR Timing Analysis panel. Notice that the PCR probe appears on the **Probes List** on the right side of the panel.

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 ETR 290 view indicators for the PCR parameters (2.3 and 2.4) are now gray.

13. Click the Client window Close box to close the ETR 290 view. Select the PCR analysis view (if necessary). 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** (**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.

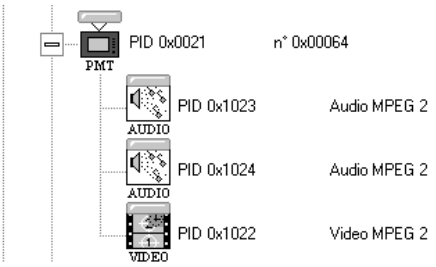
    a. Choose **Settings** from the Configuration menu and then select the **Analysis/Advanced/Timing/PCR** in the Settings window hierarchy to open the PCR Timing Analysis panel.

    b. Click **Restore Default** in the PCR Timing Analysis panel, and then click **OK** on the bottom of the Settings window to confirm the default settings and close the window.

Setting PTS/DTS Probes

Perform the following procedure to set PTS/DTS probes:

1. If the RTA is not running, start the program and configure it as described in *Monitoring an Input Stream* beginning on page 2–68. 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 or ATSC 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 and Analysis configuration panels of the Settings window, and then click **OK** to close the Settings window.
   c. Click the green stoplight toolbar button to restart analysis.
3. 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.

4. 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.)

5. Set a PTS/DTS probe on the elementary stream that you identified in step 4 using one of the following two methods:

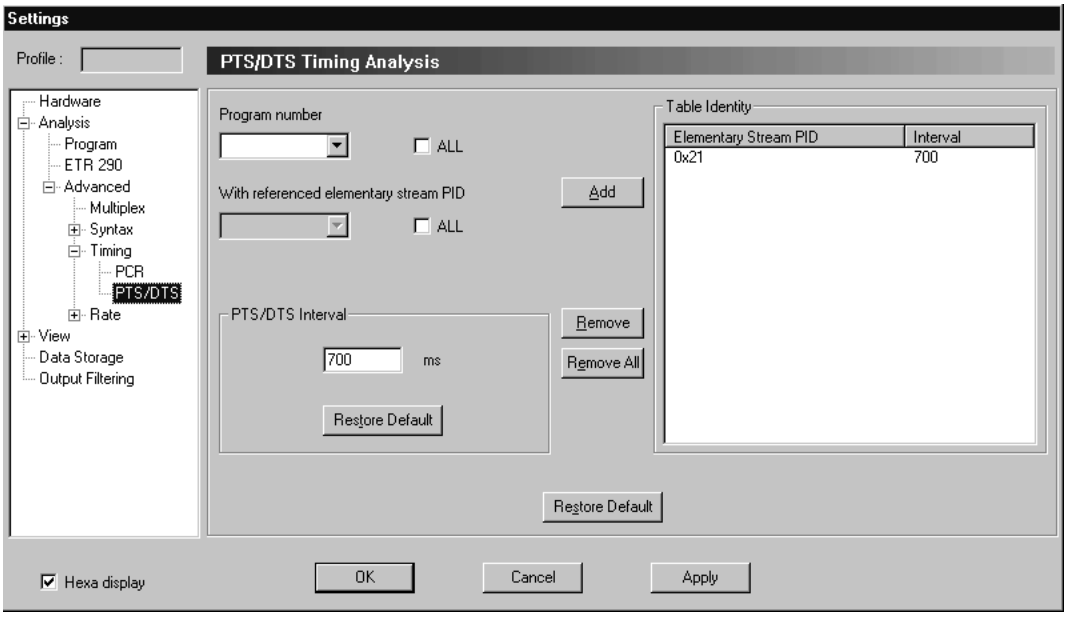
Method 1

- In the Hierarchic window highlight the icon of the elementary stream you want to probe. Select **PTS/DTS Probe** from the icon's shortcut menu.
- Set the PTS/DTS interval in the dialog box (if you want to change the default 700 ms value), and then click **OK**.

  The ETR 290 error condition is an interval of more than 700 ms between consecutive PES packets that contain a presentation time stamp. You can change the PTS/DTS error interval, but doing so may violate ETR 290 recommendations.

Method 2

- Choose **Settings** from the Configuration menu and then select the **Analysis/Advanced/Timing/PTS/DTS** in the Settings window hierarchy to open the PTS/DTS Timing Analysis panel (shown below).



- Select the program that the elementary stream is in from the Program number pull-down menu. Select the elementary stream from the With referenced elementary stream PID pull-down menu.

- Set the PTS/DTS interval (if you want to change the default 700 ms value), and then click **OK**.

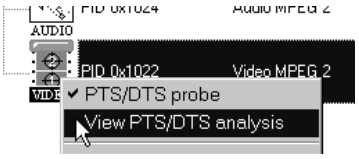
  The ETR 290 error condition is an interval of more than 700 ms between consecutive PES packets that contain a presentation time stamp. You can change the PTS/DTS error interval, but doing so may violate ETR 290 recommendations.

- Click the **Add** box to add the probe to the Table Identity list box. Click **OK** on the bottom of the Settings window to set the probe and close the window.

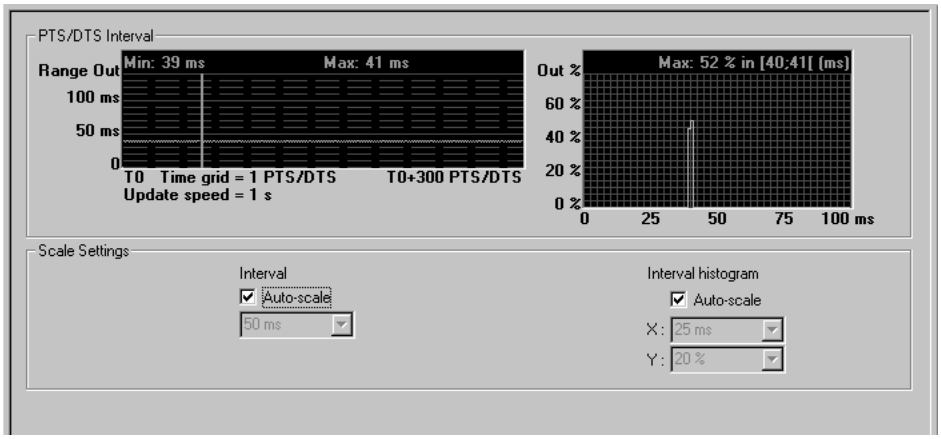
The hierarchy icon error indicator immediately changes from gray to either green or red.

6. Select **ETR 290 View Detailed** from the View menu. 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.

7. 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. **PTS/DTS Probe** is selected (noted by a check mark) because you set the probe through the Configuration menu.



8. Select **View PTS/DTS Analysis**. A PTS/DTS analysis view (shown below) opens in the Client view.



The PTS/DTS analysis view consists of two graphs. The left graph is a PTS/DTS interval plot. If the RTA detects PTS/DTS errors, the readout text becomes red and the interval plot line changes from blue to red in regions that correspond to the errors. You can change the scale of the plot using the Interval Scale Settings control box. The second graph is a histogram. You can change the scale of the histogram using the Interval Histogram Scale Settings control box.

9. To view error messages related to the PTS/DTS analysis, select **View Report** from the shortcut menu associated with the elementary stream icon you are probing. A message view opens in the Client view.

10. 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 (the check mark disappears). Notice that, because the probe is removed, the PTS/DTS analysis view no longer updates.

11. Close the PTS/DTS analysis view (click the Client view close box, *not* the RTA close box). Closing the PTS/DTS analysis view reveals the ETR 290 view. Notice that the PTS_Error indicator (parameter 2.5) is now gray.

12. Open the Configuration menu and select **Settings**. The PTS/DTS Timing Analysis panel should still be selected. Notice that the PTS/DTS probe is no longer listed in the **Table Identity** box.

13. Close the Settings window.

Setting 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).

1. If the RTA is not running, start the program and configure it as described in *Monitoring an Input Stream* beginning on page 2–68. Then continue with step 3, below.

2. If the RTA is running, stop analysis and restore the original settings before proceeding:

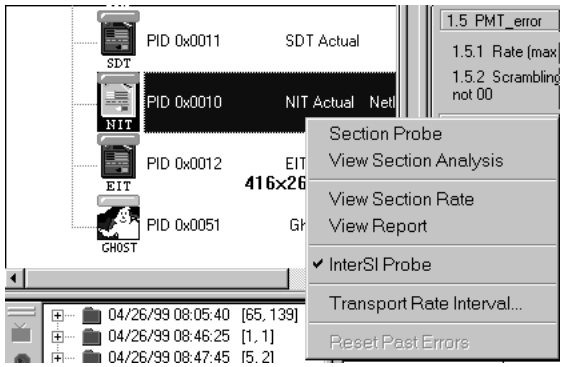
   a. Click the red stoplight toolbar button and then select **Restore standard** from the Configuration menu.

   b. Because you must use a DVB input stream to enable the InterSI probe, open the Configuration menu and select **Settings**. Make the appropriate settings on the Hardware and Analysis configuration panels of the Settings window, and then click **OK** to close the Settings window.

   c. Click the green stoplight toolbar button to restart analysis.

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

4. Select the NIT icon in the Hierarchic view and open the shortcut menu (right-click). Select **InterSI Probe**.



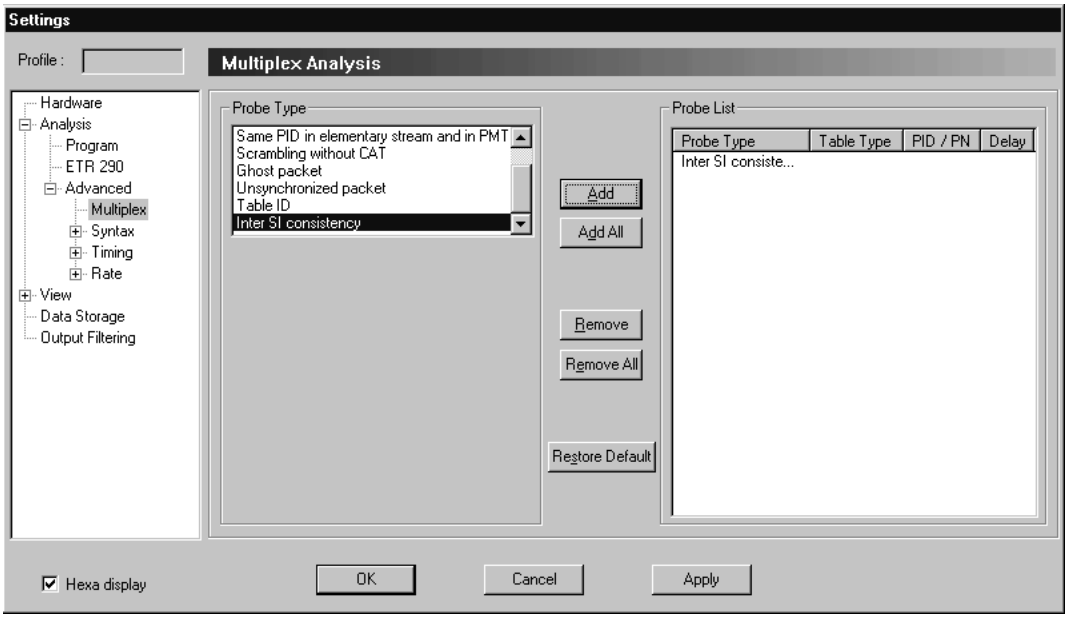
If not previously red or orange because of errors detected by basic or automatic analysis, the error indicators of the BAT, EIT, NIT, and SDT icons now change from gray to signify that the InterSI probe is set.

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. You can view InterSI error messages by selecting **View Report** from the icon's shortcut menu, or by double-clicking on the icon in the Hierarchic view. InterSI information, warning, and error messages also appear in the Report view. Refer to *Using the InterSI Analysis Probe* on page 3–14 for more information.

5. Select the icon of an SDT or an EIT in the Hierarchic view 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 Multiplex Analysis panel of the Settings window.

6. Select **Settings** from the Configuration menu, and then select **Analysis/Advanced/Multiplex** from the Settings window hierarchy. Inter SI consistency is shown on the probes list.



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

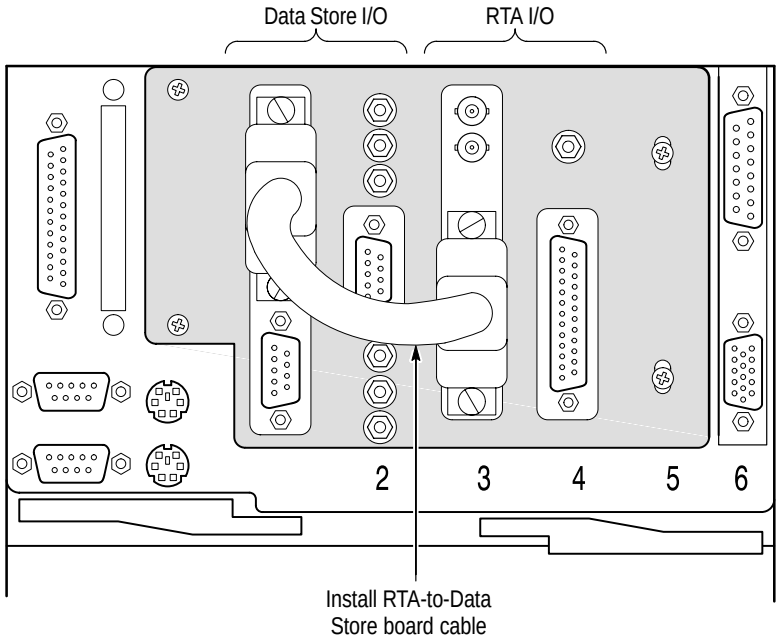
8. If any of the SI table icon error indicators remain orange, press **F4** to reset past errors. The indicators change to gray unless the automatic analyses detect other SI table errors.

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

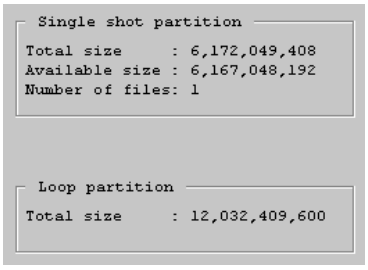
1. Use the shielded cable (Tektronix part number 174-3799-XX) provided with the MTS 215 Real-Time Analyzer to connect the 25-pin RTA output to the 25-pin Data Store (parallel/serial ECL) input.



***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 (shown below) 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; refer to the *MPEG Test System User Manual* for instructions.



***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 RTA is not running, start the program and configure it as described in *Monitoring an Input Stream* beginning on page 2–68. Then continue with step 8, below.

7. 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.

8. Choose **Settings** from the Configuration menu, and then select **Hardware** in the Settings window hierarchy. Set the **Output Level** to **Modified ECL** if necessary.

9. Select **Output Filtering** in the Settings window hierarchy. 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 *Output Filtering Panel* on page 3–94 for instructions. For this tutorial, select **No PID filtered** 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.*

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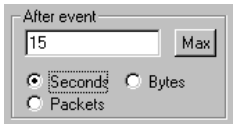
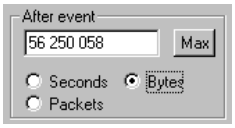
10. Select **Data Storage** in the Settings window hierarchy. Through this panel you can specify one or more Stop Conditions, such as an external trigger or an ETR 290 error. Manual stop is always selected. You can also specify how much of the input stream (or filtered output) is to be captured.

    Refer to *Data Storage Panel* on page 3–86 for a full discussion of the Data Storage Settings panel.

11. Click **Reset All** (immediately below the **Stop Conditions** list) to ensure that only Manual stop is selected.

12. In the **After Event** area, 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.

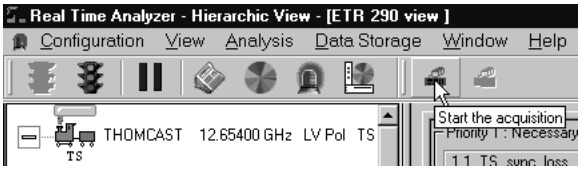




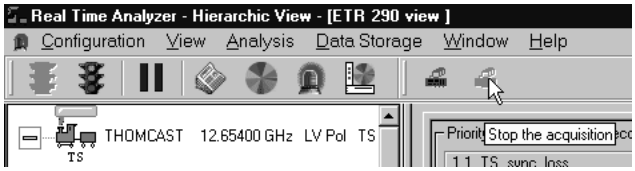
13. Click **OK** to confirm all settings changes and close the **Settings** window.

Stream Capture

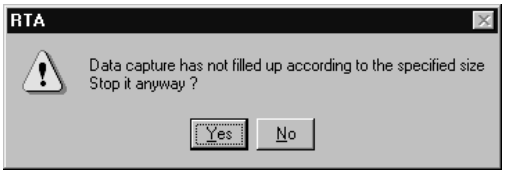
14. Click the **Start the acquisition** toolbar button.



15. Immediately click the **Stop the 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 RTA 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 Report 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.[2] As a result, the time required to save an event trace file—from stop condition detection to the end of the acquisition—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.

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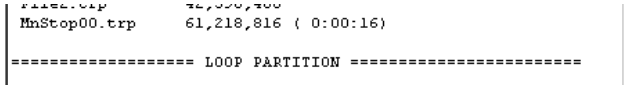
17. Maximize the **Data Store Administrator** window.

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.*

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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.

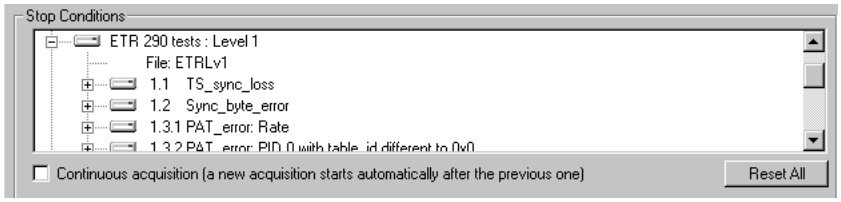
[2] **Refer to the *MTS200 Series MPEG-2 DVB/ATSC System Analyzer User Manual, Tektronix part number 071-0532-XX*, for additional information about file management on the data store disks.**

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 ETR 290 errors.

20. Select **Settings** from the Configuration menu, and then select **Data Storage** in the Settings window hierarchy.

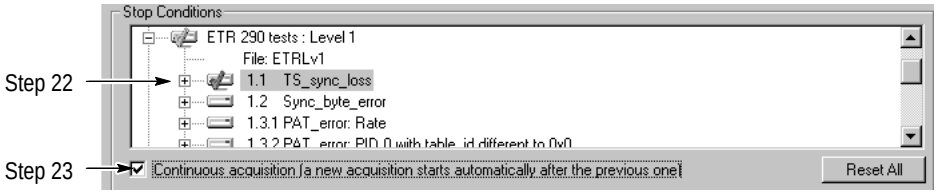
21. In the **Stop Conditions** list, click the “+” box to the left of the “ETR 290 tests: Level 1” item to expand the hierarchy below that item.



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 DVB11*nn*.trp event trace files.

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

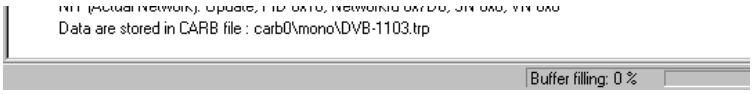


24. Click **OK** to confirm your selections and close the **Settings** window.

25. Click the **Start the acquisition** toolbar 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. When an error is detected, the **Stop the acquisition** toolbar 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.

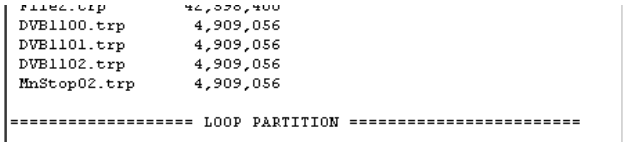


28. Repeat steps 26 and 27 twice to capture two more error trace files.

29. After “Data are stored in CARB file: carb0\mono\DVB1102.trp” appears at the bottom of the general message window, click the **Stop the acquisition** toolbar button.

30. When the “Data are stored in CARB file: carb0\mono\MnStop*nn*.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 DVB11*nn*.trp files are on the Single shot partition and that the last file listed is MnStop0*n*.trp.



This tutorial example shows 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 ETR 290 errors for an extended period without user 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 finished experimenting with data storage, delete the MnStop*nn*.trp and DVB11*nn*.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.

Remote Control Using SNMP

SNMP is a communication protocol built on the top of TCP/UDP. It implements a set of commands consisting of operations and variables. Equipment or applications (such as the RTA) that support SNMP present a set of variables that you can modify or consult as well as a set of notifications. All of these parameters are grouped into a Management Information Base (MIB).

MIBs are specifications containing definitions of management information so that network systems can be remotely monitored, configured, and controlled.

Accessing the RTA MIB

To remotely control the RTA application using any SNMP MIB browser, you only need to load the RTA MIB file. This file is located in the following directory on your MTS 200 test system:

C:\Mib\rta.mib

To display the RTA MIB file and its components, open the following file:

C:\Mib\RTA.html

The RTA.html file contains the RTA MIB file with hyperlinks added to help you become familiarized with the file.

SNMP Operations

The operations in SNMP are limited to retrieving the value of management information, modifying the value of management information, and reporting an event.

Retrieval

The most common type of retrieval operation requires that the identities are those that exactly match the identity of returned variables. This retrieval operation is called GET.

For instance, from a DOS prompt window you can run the following command to get the analysis state of the RTA:

getone –v2c MTS100 public rtaStartStop.0

Modification

There is one modification operation, which is called SET. The operand for SET is a list of pairs. Each pair consists of the identity of a variable and its desired value. Use this operation to configure and control a managed system.

For instance, from a DOS prompt window you can run the following command to start analysis on the RTA:

```
setany –v2c MTS100 public rtaStartStop.0 -i start
```

Event Reporting

The event reporting operation is called TRAP. It specifies an event and a list of pairs. A pair consists of the identity of a variable and its values. This operation is used to report the occurrence of events on a managed system to a list of managers configured to receive events. To send traps to a specific monitoring station, perform the following steps:

1. Make sure the RTA application is closed.
2. Run the following commands in a DOS prompt window:
   - Snmpdm –stop
   - Msnsaagt –stop
3. Edit the following file: C:\Etc\srconf\agt\snmpd.cnf.
   - Change MACHINE_NAME to the name of your MTS machine.
   - Change every occurrence of SUPERVISOR_MACHINE_NAME to the name of the monitoring station you want to send traps to.
   - Change SUPERVISOR_IP_ADDRESS to the IP address of the monitoring station you want to send traps to.
   - Change SUPERVISOR_NETWORK_MASK to the network mask of the monitoring system you want to send traps to.
4. Run the following commands in a DOS prompt window:
   - Snmpdm –start
   - Msnsaagt –start

When you run the RTA application after you have performed these steps, the RTA will send SNMP traps to the monitoring station.

NOTE. *The event reporting (TRAP) operation can be very CPU-intensive. To disable the TRAP operation, repeat the steps above, replacing the values you entered with MACHINE_NAME, SUPERVISOR_MACHINE_NAME, SUPERVISOR_IP_ADDRESS, and SUPERVISOR_NETWORK_MASK.*

Reference

Analysis

This section explains the Real-Time Analyzer (RTA) analyses in detail and also describes the options available in the configuration panels of the Settings window.

The RTA conducts very few full-time analyses on the input stream. These default analyses are fundamental to RTA operation and cannot be disabled. Refer to *Default Analyses* on page 3–2 for a description of the full-time default analyses.

All of the remaining RTA analyses are user-initiated and user-controlled.

NOTE. *To differentiate user-controlled analyses from RTA default analyses, this manual refers to any user-controlled analyses as Probes.*

This *Reference* section contains the following information:

Default Analyses

The RTA always checks for synchronization and monitors transport rates to ETR 290 recommendations.

Synchronization

If the RTA cannot achieve synchronization with the input stream, it reports a general error in the Report view. This error is the same as ETR 290 error 1.1, TS_sync_loss.

NOTE. *If the RTA cannot achieve synchronization with the input stream, no other tests or analyses can be conducted by the RTA.*

Transport Rate

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, PID Allocation, and Type Allocation panels of the Statistic View. The analysis is completely automatic and cannot be disabled.

Use the Transport Rate Analysis panel of the Settings window to set probes on selected stream PIDs for transport rates that fall below or exceed limits of your choosing. Refer to *Analysis:Advanced:Rate:Transport Panel* on page 3–72 for information about using the Transport Rate Analysis panel.

Refer to *Transport Rate Analysis* on page 3–33 for more information about RTA transport rate analysis.

User Controlled Analyses (Probes)

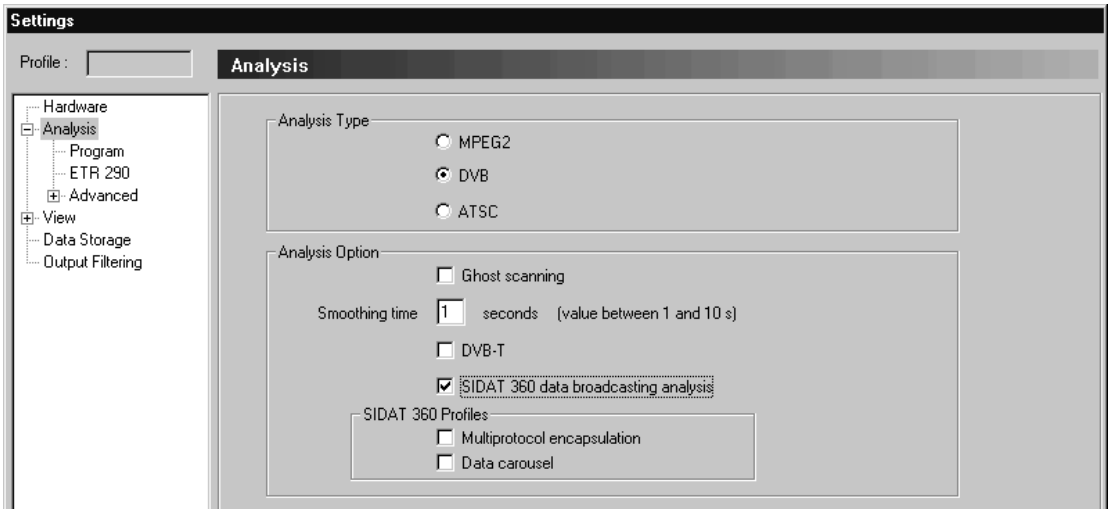
All of the RTA analyses, other than the default analyses listed above, are user-controlled and are referred to in this manual as **probes**. While you can set, configure, and remove several types of probes through the RTA Hierarchic and Statistic views, you can control all RTA probes using the configuration panels available in the Settings window. To open the Settings window, select **Settings** from the Configuration menu.

The next few pages will give you an overview of how to use the configuration panels in the Settings window to set RTA probes. Refer to *Configuration* on page 3–41 for detailed descriptions of each configuration panel.

Analysis Types and Options

Use the Analysis panel of the Settings window (shown below) to select the analysis type and various analysis options. Refer to *Analysis Panel* on page 3–50 for detailed information about the Analysis panel settings.

NOTE. *Before configuring or initiating any additional RTA analyses or probes beyond the default analyses listed on page 3–2, always select the appropriate analysis type and analysis options using the Analysis panel of the Settings window. Your selections on the Analysis panel determine which RTA analyses are available on other configuration panels.*



Analysis Type. The Analysis Type setting determines which standard the RTA uses to monitor the input stream. You can select from **MPEG-2** (the default), **DVB**, and **ATSC** analysis types.

Analysis Options. The **Ghost scanning** and **Smoothing time** options are available for all three analysis type settings. The remaining analysis options are available only when you select the DVB analysis type.

Select **DVB-T** to enable Mega Frame analysis. Three of the Settings panels—Mega Frame Syntax, Mega Frame Timing, and Mega Frame Rate—are available only when you select the DVB analysis type and the DVB-T analysis option.

Select **SIDAT 360 Profiles** to enable SIDAT 360 analysis and to enable the two SIDAT 360 options **Multiprotocol Encapsulation** and **Data Carousel**.

Refer to *SIDAT 360 Analyses* on page 3–6 for more information.

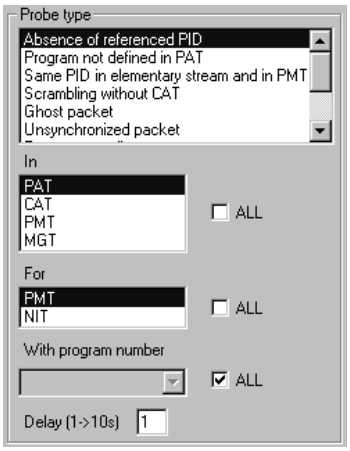
Probe Operating Conventions

Please make note of the following general information regarding user-controlled RTA analyses (probes):

- User-controlled analyses (probes) are not part of the default RTA analyses. To restore RTA operation to only the default analyses, stop any active analysis and then select **Restore Standard** from the Configuration menu.
- You can set (initiate), configure, and remove (end) all probes using the configuration panels in the Settings window. Select **Settings** from the Configuration menu to open the Settings window.
- You can also control several probes through the Hierarchic view or the Statistic view. Refer to *Using the Hierarchic View,* on page 2–11, and *Statistic View,* on page 2–42, for more information.
- The RTA stores probe settings and uses those settings whenever it is analyzing an input stream. If a probe is set when you stop analysis and power the computer down, it is also set the next time you use the RTA.
- To maximize RTA performance (especially with input streams that contain many errors), limit the number of probes set at any one time.

Setting Probes. The following procedure uses the Multiplex Analysis panel as an example. You can set probes on other configuration panels using the same functional steps.

1. Select **Settings** from the Configuration menu to open the Settings window. Select the desired configuration panel from the Settings window hierarchy. The following example uses the Multiplex Analysis panel.
2. Select (highlight) the desired probe in the **Probe Type** list of the Multiplex Analysis panel (shown below).



3. Make any additional selections required for the particular probe. Additional configuration settings for the selected probe appear below the **Probe Type** list when you select the probe, as shown in the following illustration.

   a. In this example, when you select **Absence of referenced PID**, the **In** box appears that allows you to select the absence table to analyze. When you select an item in the In box, a **For** box appears that allows you to select the table.

   b. When you select an item in the For box, a **With PID** or **With program number** box appears that allows you to select PIDs or program numbers for PMTs. A **Delay** box appears that allows you to set the delay (1 to 10s).

4. Click **Add** to add the probe to the **Probe List**.

5. Click **Apply** to activate the probe (and all other settings changes made since you opened the Settings window or last clicked **Apply**) or click **OK** to activate the probe (and all new settings) and close the Settings window.

Removing Probes. The following procedure uses the Multiplex Analysis panel as an example. You can remove probes on other configuration panels using the same functional steps.

1. Remove the probe or probes from the **Probe List**.

   - To remove a single probe from the list, highlight the probe in the **Probe List** and then click **Remove**. (You can also remove a probe by double-clicking the **Probe List** entry.)

   - To remove several probes from the list at one time, highlight each probe name in the **Probes List** and then click **Remove**. To highlight several contiguous names, click the first name and then hold the SHIFT key down while selecting the last name; to highlight non-contiguous names, hold the CTRL key down while making your selections.

   - To remove all probes from the **Probes List**, click either **Remove All** or **Restore Default**.

2. To confirm your selections, deactivate the probes, and close the **Settings** window, click **OK**; to confirm your selections and deactivate the probes while leaving the Settings window open, click **Apply**.

NOTE. *Removing a probe from the **Probe List** only does not end the probe/analysis; you must also click **Apply** or **OK**.*

Changing Current Probe Settings. The following procedure uses the Multiplex Analysis panel as an example. You can change current probe limits on other configuration panels without removing and resetting the probe using the same functional steps.

1. Select (highlight) the probe in the **Probe List**.
2. Change the limit settings as desired.
3. Click **Add**. The error limit change appears in the **Probe List**.
4. Click **Apply** to change the probe error limits, or click **OK** to change the limits and to close the Settings window.

***NOTE**. You must click **Apply** or **OK** to put the changed probe limits into effect.*

SIDAT 360 Analyses

SIDAT 360 is a set of analyses that allow you to analyze the following two main types of standard DVB Data Broadcasting streams: Multiprotocol Encapsulation and Data Carousel.

Multiprotocol Encapsulation streams usually carry IP packets and Data Carousel streams may carry application-specific data modules that are broadcast cyclically, such as teletext pages.

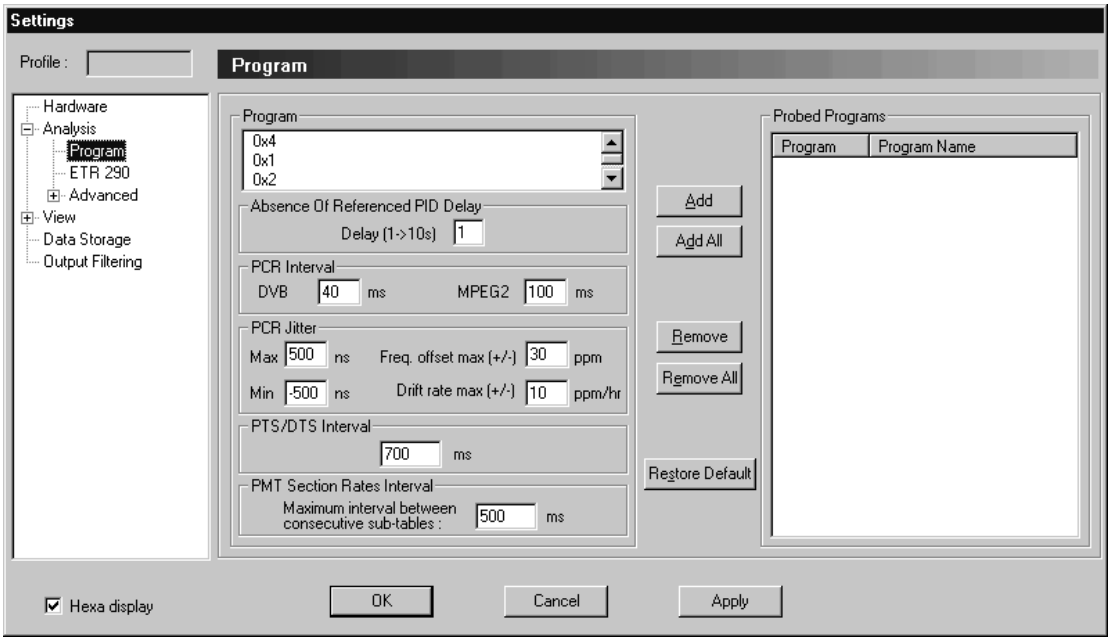
Selecting the **SIDAT 360 data broadcasting analysis** option on the Analysis configuration panel of the Settings window sets a probe, which controls the validity and consistency of the related data_broadcast_descriptor that is carried in the SDT or the EIT. The three different types of tables carried on those streams have the same probing facilities as standard DVB tables, except for defining the maximum and minimum allowed rates.

Additionally, when you select the Multiprotocol Encapsulation option, you can use the IP Monitoring view to monitor the IP traffic on the input stream. Refer to *IP Monitoring View* on page 2–65 for more information about the view.

Program Analyses

The Program configuration panel of the Settings window (shown below) allows you to set and configure probes for each program contained in the input stream.

Refer to *Analysis:Program Panel* on page 3–52 for information about using the Program panel.

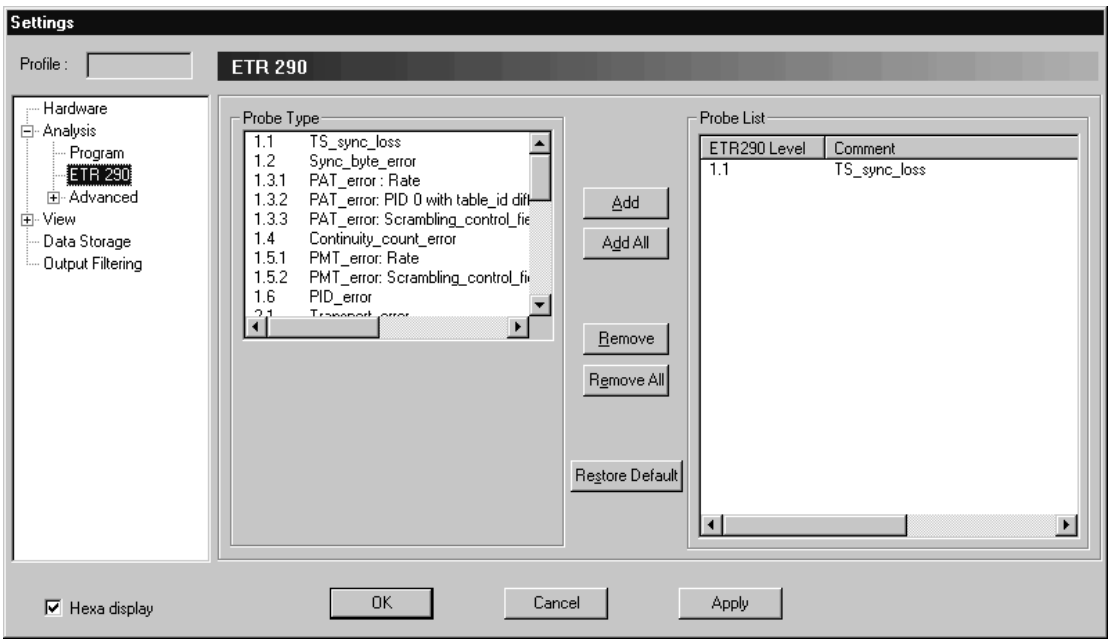


ETR 290 Analyses

The ETR 290 configuration panel of the Settings window (shown below) allows you to set and configure ETR 290 probes.

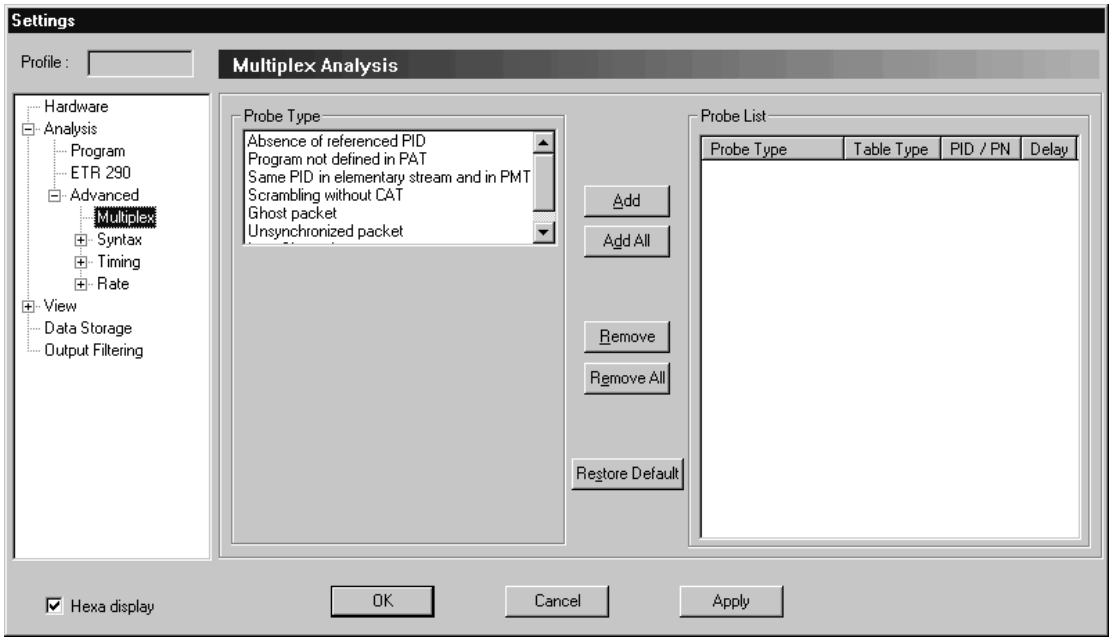
Refer to *Analysis:ETR 290 Panel* on page 3–54 for information about using the ETR 290 panel.

Refer to *Appendix A:ETR 290 Measurements* for additional information about ETR 290 analyses.



Multiplex Analyses

This section discusses each of the multiplex analyses in the order that they are listed in the Multiplex Analysis panel in the Settings window (shown below). Refer to *Analysis:Advanced:Multiplex Panel* on page 3–55 for information about using the configuration panel.



This section contains the following information:

Table 3–1 lists all of the multiplex analyses, the associated ETR 290 recommendation, the required analysis type setting (refer to *Analysis Panel* on page 3–50), and the starting page number for each analysis error description.

Table 3–1: Multiplex analyses

Analysis probe		ETR 290	Analysis type
Absence of referenced PID		1.6	All
Program not defined in PAT		—	All
Same PID in elementary stream and in PMT		—	All
Scrambling without CAT		2.6.1	All
Ghosts packet		3.4	All
Unsynchronized packet		1.2	All
Table ID	PAT	1.3.2	All
	CAT	2.6.2	All
	NIT	3.1.1	All
	TSDT	—	All
	SDT	3.5.2	DVB only
	EIT	3.6.2	DVB only
	RST	3.7	DVB only
	TDT	3.8.2	DVB only
	TOT	—	DVB only
	MGT	—	ATSC/PSIP only
	TVCT	—	ATSC/PSIP only
	CVCT	—	ATSC/PSIP only
	STT	—	ATSC/PSIP only
	RRT	—	ATSC/PSIP only
Inter SI consistency		—	DVB and DVB-T
Mega Frame size		—	DVB-T only
Terrestrial descriptor consistency		—	DVB-T only
Program paradigm		—	ATSC/PSIP only
Scrambled ES without CA descriptor		—	ATSC/PSIP only
Absence of mandatory EIT		—	ATSC/PSIP only

Multiplex Analysis Probe Descriptions

The following pages contain descriptions of the errors detected by each of the multiplex analyses.

Absence of Referenced PID Probe

Error Condition: Reports an error if the time interval between a PID reference in a PAT, CAT, or PMT and the appearance of that PID in the stream exceeds the user-specified period of delay (1 to 10 seconds).

Associated ETR 290 recommendation: PID_error, 1.6.

How/where an error is reported: In the ETR 290 view and as a general error message in the Report view.

Program Not Defined in PAT Probe

Error Condition: Reports an error if a PMT program number is not defined in the PAT.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

Same PID in Elementary Stream and in PMT Probe

Error Condition: Reports an error if a PMT and an elementary stream are identified with the same PID.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

Scrambling without CAT Probe

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

Associated ETR 290 recommendation: CAT_error, 2.6.1.

How/where an error is reported: In the ETR 290 view and as a general error message in the Report view.

Ghosts Packet Probe

Error Condition: Reports an error if 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 ETR 290 recommendation: Unreferenced_PID, 3.4.

How/where an error is reported: In the ETR 290 view, as a general error message in the Report view, as a Ghost icon in the Hierarchic view, and as a Ghost service/program in several Statistic view panels.

Unsynchronized Packet Probe

Error Condition: Reports an error if the transport packet header Sync_byte is not 0x47.

***NOTE**. If synchronization is lost, no other RTA analyses are possible.*

Associated ETR 290 recommendation: Sync_byte_error, 1.2.

How/where an error is reported: As a general error message in the Report view, the UNP indicator on the application window status bar, the Unsynchro Packets panel of the Statistic View, and the ETR 290 level 1.2 indicator.

Table ID Probe

Error Condition: Reports an error if the Table ID of the PSI/SI selected is not corrected.

Associated ETR 290 recommendation: See the table below.

Table ID analysis error	ETR 290 recommendation
PAT error: PAT 0 with table_id different to 0x0	1.3.2
CAT error: PID 0x1 with table_id other than 0x1	2.6.2
NIT error: PID 0x10 with table_id other than 0x40, 0x41, or 0x72 (ST)	3.1.1
SDT error: PID with 0x11 table_id other than 0x42, 0x46, 0x4A (BAT), or 0x72 (ST)	3.5.2
EIT error: PID with 0x12 table_id other than 0x4E – 0x6F or 0x72 (ST)	3.6.2
RST error: PID with 0x13 table_id other than 0x71 or 0x72 (ST)	3.7
TDT error: PID with 0x14 table_id other than 0x71 or 0x72 (ST) or 0x73 (TOT)	3.8.2

How/where an error is reported: As an error message in the Report view, the ETR 290 LV1, LV2, and LV3 indicators on the application window status bar, and the ETR 290 views of the Statistic View.

Inter SI Consistency Probe (DVB only)

This analysis probe appears only when the analysis type setting is set to DVB (refer to *Analysis Panel* on page 3–50). Refer to *InterSI Analysis* on page 3–14 for more information about the InterSI probe.

Error Condition: Reports an error if the RTA detects problems between PSI and SI tables.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

Mega Frame Size Probe (DVB-T only)

This analysis probe appears only when the analysis type setting is set to DVB and DVB-T is selected (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the Mega Frame Size probe detects inconsistency between the indicated size of the Mega Frames in the MIP and the measured size (calculated from the packet rate and the PIA time stamps.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

Terrestrial Descriptor Consistency Probe (DVB-T only)

This analysis probe appears only when the analysis type setting is set to DVB and DVB-T is selected (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the parameters carried in the MIP match those carried in the terrestrial delivery system descriptor (if present in the NIT).

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

Program Paradigm Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the RTA detects problems of consistency with the method specified by the program paradigm. Refer to *Appendix B: ATSC Program Paradigm* for more information.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view and as a specific report of the ES or table concerned. The messages are logged in the multiplex folder.

Scrambled ES Without CA Descriptor Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the CA descriptor is not found where expected for an ES PID.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view and in the specific report of the stream in the Hierarchic window.

Absence of Mandatory EIT Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the mandatory EIT (0, 1, 2, 3) are not all present.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view. The messages are logged in the multiplex folder.

Using the InterSI Analysis Probe

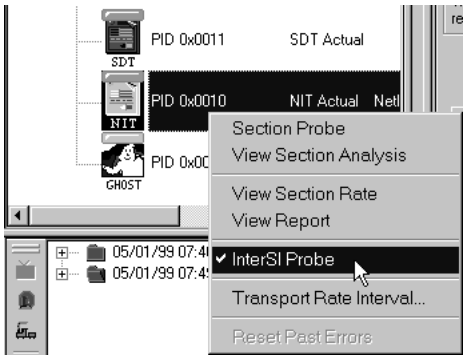
Setting the InterSI probe activates two types of analysis :

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

Setting and Removing the InterSI Probe

You can use either of the following two methods to set or remove the InterSI probe:

- Select **InterSI consistency** in the Multiplex Analysis panel. Refer to *Analysis:Advanced:Multiplex Panel* on page 3–55.
- Select an icon in the Hierarchic window that represents an SI table (NIT, EIT, SDT), right-click to open the shortcut menu, and then select **InterSI Probe** from the menu. When the probe is selected, a check mark appears in front of InterSI Probe in the menu.



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.”

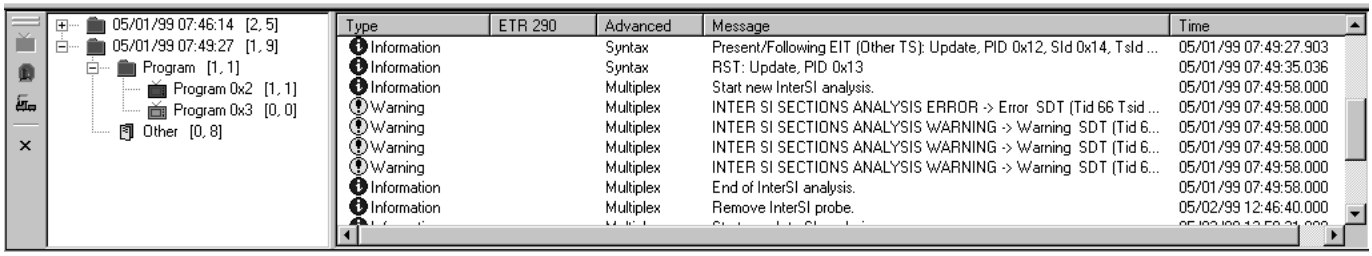
Analyses Between Tables

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 Report 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).



Syntax Analyses

The RTA provides the following levels of syntax analyses.

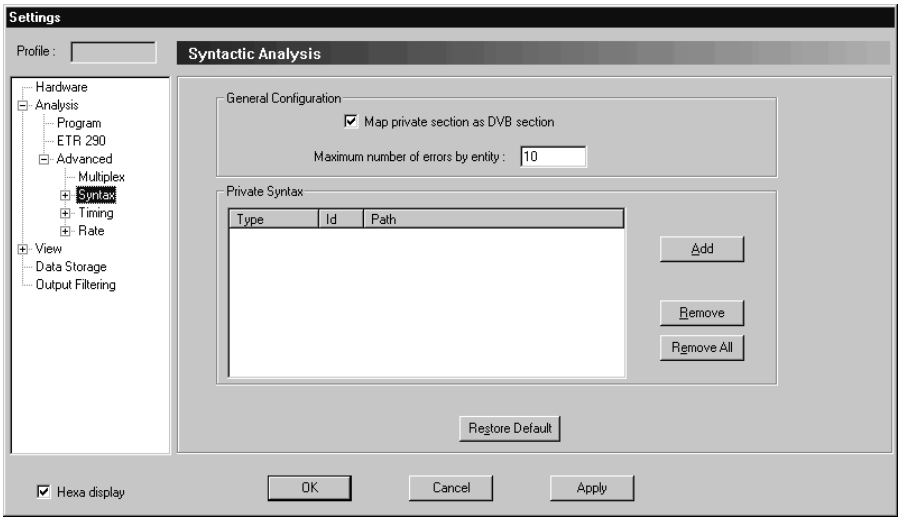
Refer to *Appendix C* for more information about using the Private Syntax Interpreter and generating user-defined private syntax definition files.

Syntax Error Reporting

When the RTA detects a section syntax error, the error indicator above the Hierarchic view icon turns red and a general error message appears in the Report 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 (refer to *Section Analysis View* on page 2–56).

Syntax Analysis

The Syntactic Analysis panel of the Settings window (shown below) contains General Configuration and Private Syntax options that affect private section interpretation and syntax error reporting.



General Configuration

There are two possible general configuration settings:

- The **Maximum number of errors by entity** setting allows you set the maximum number of errors the RTA detects before stopping analysis for one entity. This limits the number of syntax errors reported by the RTA for each entity. This option is convenient when you are analyzing non-compliant streams that contain many errors.
- The **Map private section as DVB section** option appears only when you have set the analysis type to DVB through the Analysis panel (refer to *Analysis Panel* on page 3–50).

  When you select Map private section as DVB section (a check appears in front of the 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.

NOTE. *The **Map private section as DVB section** option is cleared when you first specify DVB monitoring on the Analysis panel; select this option if necessary to force the RTA to interpret PIDs 0x10 through 0x14 as SI.*

Private Syntax

You can load user-defined private syntax definition (.cta) files through the Private Syntax portion of the panel. These files, generated with the Private Syntax Interpreter application, make it possible to analyze proprietary or non-standard tables and descriptors contained in the RTA input stream.

Refer to *Appendix C* for more information about using the Private Syntax Interpreter and generating user-defined private syntax definition files.

Transport Syntax Analyses

Use the Transport Syntactic Analysis panel of the Settings window (shown on the following page) to set and remove probes that monitor transport syntax. Refer to *Analysis:Advanced:Syntax:Transport Panel* on page 3–59 for information about using the Transport Syntactic Analysis panel.

The following pages describe the transport syntax analyses in the order that they are listed in the Transport Syntactic Analysis panel. Table 3–2 lists the transport syntax analyses, the associated ETR 290 recommendation, the analysis type setting on the Analysis panel (refer to *Analysis Panel* on page 3–50), and the page on which each analysis error is explained.

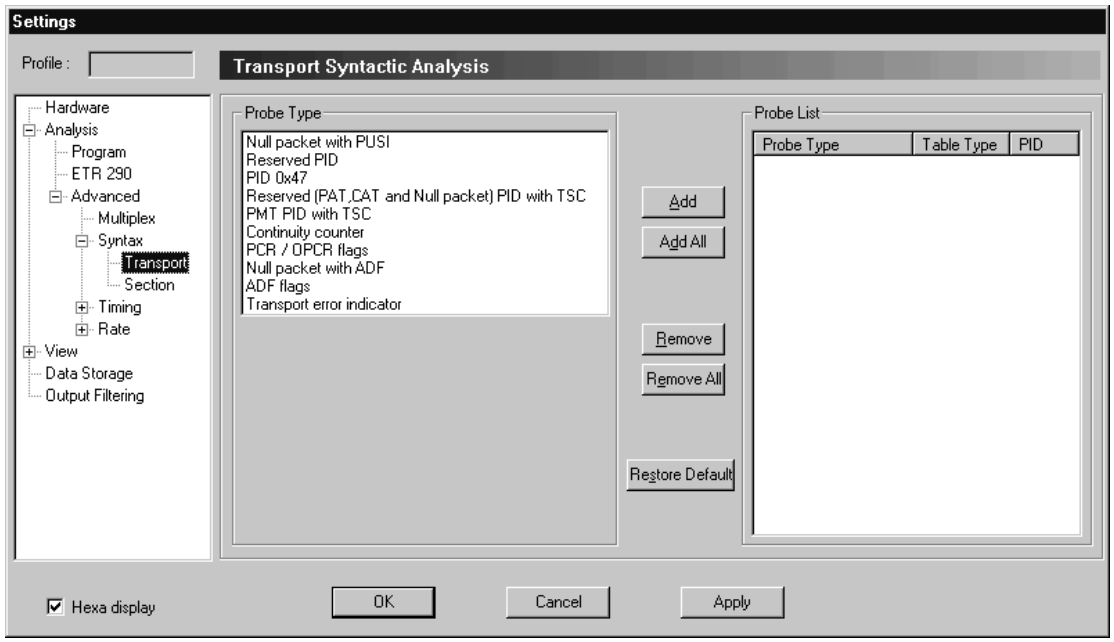


Table 3–2: Transport syntax analyses

Analysis probe	ETR 290	Analysis type
Null packet with PUSI	none	All
Reserved PID	none	All
PID 0x47	none	All
Reserved (PAT, CAT, or Null Packet) PID with TSC	1.3.3	All
PMT PID with TSC	1.5.2	All
Continuity counter	1.4	All
PCR/OPCR flags	none	All
Null packet with ADF	none	All
ADF flags	none	All
Transport error indicator	2.1	All
PAT PID with AFC & DI	—	ATSC/PSIP only
PMT PID with AFC & DI	—	ATSC/PSIP only
PSIP tables PID with TSC	—	ATSC/PSIP only
PSIP tables PID with ADF	—	ATSC/PSIP only
MGT PID with PUSI & pointer field	—	ATSC/PSIP only

Null Packet with PUSI Probe

Error Condition: Reports an error if a null packet (PID 0x1FFF) is received with the bit PUSI (payload_unit_start_indicator) set to "1." If the PUSI bit is set to 1, it indicates that the payload of this transport stream packet will commence.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

Reserved PID Probe

Error Condition: Reports an error if any PID value is not equal to the following: 0x0000 (PAT), 0x0001 (CAT), 0x0002 (TSDT), or in the interval 0x0010–0x1FFF (user-defined).

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

PID 0x47 Probe

Error Condition: Reports an error if a packet with PID 0x47 is received.

NOTE*. The* ***PID 0x47*** *error 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 ETR 290 recommendation: None.

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

Reserved (PAT, CAT, and Null Packet) PID with TSC Probe

Error Condition: Reports an error if a PID 0x0000 (PAT), 0x0001 (CAT)**,** or 0x1FFF (null/stuffing) packet has a transport_scrambling_control field that does not equal 00.

Associated ETR 290 recommendation: PAT_error, 1.3.3.

How/where an error is reported: In the ETR 290 view, as a general error message in the Report view, and in the item Message view, if any.

PMT PID with TSC Probe

Error Condition: Reports an error if a PMT PID (described by the PAT) has a transport_scrambling_control field that does not equal 00. MPEG standards do not allow scrambled PMT.

Associated ETR 290 recommendation: PMT_error, 1.5.2.

How/where an error is reported: In the ETR 290 view, as a general error message in the Report view, and in the PMT Message view (if it is open in the Client view).

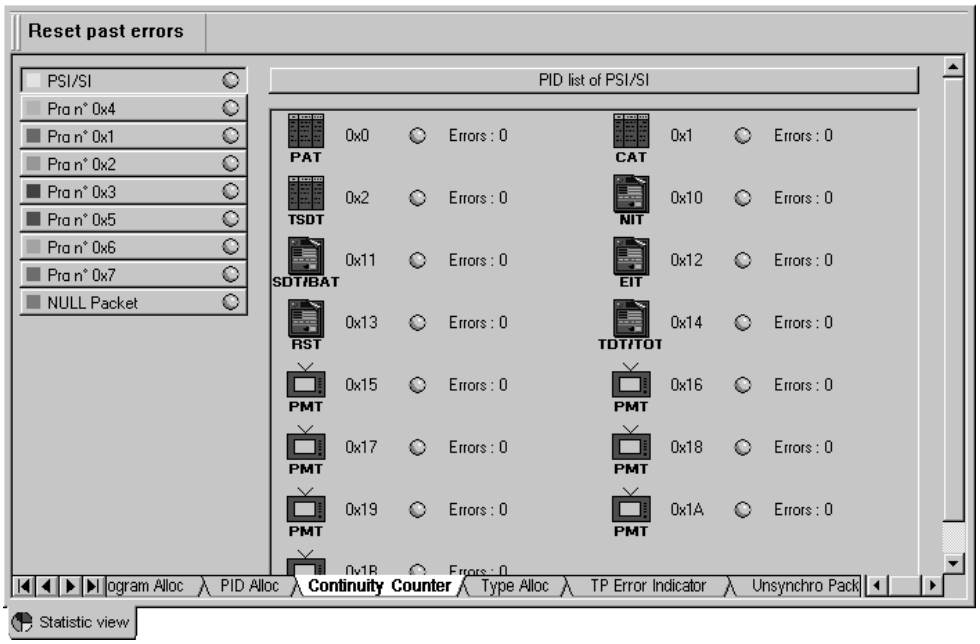
Continuity Counter Probe

Error Condition: Reports an error if the RTA detects 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 (module 16).

Associated ETR 290 recommendation: Continuity_count_error, 1.4.

How/where an error is reported: The ETR 290 view, the Continuity Counter panel of the Statistic view (shown below), and the appropriate Message view(s).

NOTE. *The Continuity Counter panel displays detected errors on a per-service basis. Refer to* Continuity Counter Panel *on page 2–50 for more information about this panel.*



PCR/OPCR Flags Probe

Error Condition: Reports an error if the RTA detects a transport packet adaptation field PCR_flag set to 0, and if the OPCR_flag is set to 1 (cannot have an OPCR without a PCR).

Associated ETR 290 recommendation: None.

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

Null Packet with ADF Probe

Error Condition: Reports an error if the RTA detects a null packet that has an adaptation field.

Associated ETR 290 recommendation: None.

How/where an error is reported: As a general error message in the Report view.

ADF Flags Probe

Error Condition: Reports an error if the RTA detects no coherence between the adaptation field control and the adaptation field length. The RTA detects three error conditions:

- 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.

Associated ETR 290 recommendation: None.

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

Transport Error Indicator Probe

Error Condition: Reports an error if the RTA detects 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 ETR 290 recommendation: Transport_error, 2.1.

How/where an error is reported: The ETR 290 view, the TEI indicator on the RTA status bar (refer to *Status Bar* on page 2–9), and the TP Error Indicator panel of the Statistic View (refer to *TP Error Indicator Panel* on page 2–52).

PAT PID with AFC & DI Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the RTA detects no coherence between the adaptation field control and the discontinuity indicator (if the AFC = 10 or 11, the DI must be set to 1) within the PAT.

Associated ETR 290 recommendation: None.

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

PMT PID with AFC & DI Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the RTA detects no coherence between the adaptation field control and the discontinuity indicator (if the AFC = 10 or 11, the DI must be set to 1) within a PMT.

Associated ETR 290 recommendation: None.

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

PSIP Tables PID with TSC Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the RTA detects PSIP table packet PID with a transport_scrambling_control field that does not equal 00.

Associated ETR 290 recommendation: None.

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

PSIP tables PID with ADF Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the RTA detects PSIP table packet PID that has an adaptation field.

Associated ETR 290 recommendation: None.

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

MGT PID with PUSI & Pointer Field Probe (ATSC only)

This analysis probe appears only when the analysis type setting is set to ATSC (refer to *Analysis Panel* on page 3–50).

Error Condition: Reports an error if the RTA detects no coherence between the payload_unit_start_indicator and the pointer field (if the PUSI is 1 then the pointer field must be set to 0).

Associated ETR 290 recommendation: None.

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

Section Syntax Analyses

Use the Section Syntactic Analysis panel of the Settings window (shown below) to set and remove probes that monitor section syntax. Refer to *Analysis:Advanced:Syntax:Section Panel* on page 3–61 for information about using the Section Syntactic Analysis panel.

The following pages describe the section syntax analyses in the order that they are listed in the Section Syntactic Analysis panel. Table 3–3 lists the section syntax analyses, the associated ETR 290 recommendation, the analysis type setting on the Analysis panel (refer to *Analysis Panel* on page 3–50), and the page on which each analysis error is explained.

The RTA notes the presence and nature of each section syntax error in the section analysis view. Refer to *Section Analysis View* on page 2–56 for information about the section analysis view.

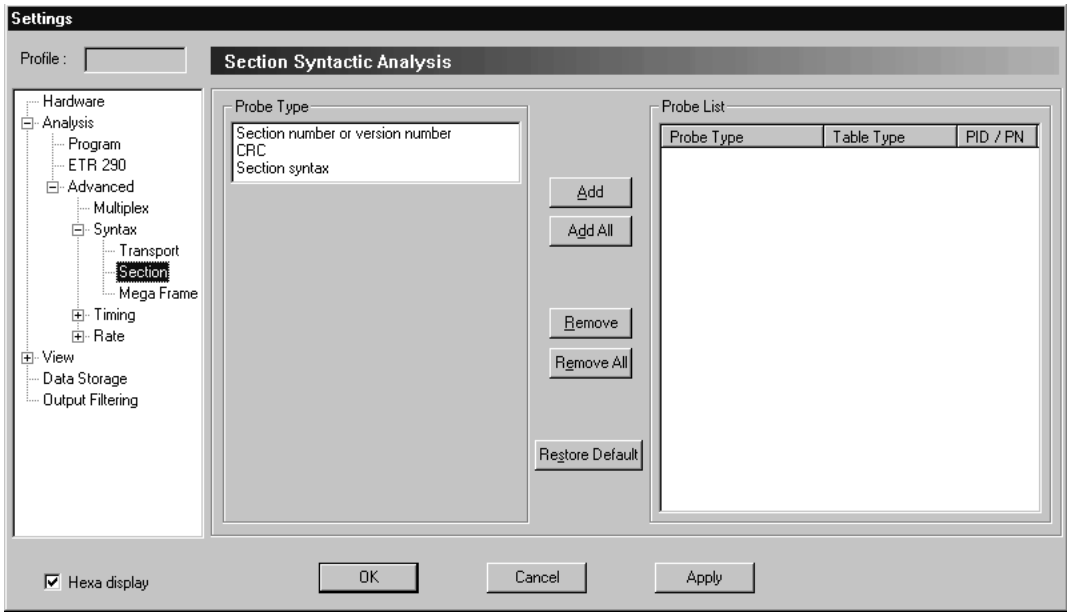


Table 3–3: Section syntax analyses

Analysis probe	ETR 290	Analysis type
Section number or version number	—	All
CRC	2.2	All
Section syntax	—	All

Section Number or Version Number Probe

Error Condition: Reports an error if one or more of the following section and version numbering errors are found in a PSI, SI, or PSIP 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 ETR 290 recommendation: None.

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

CRC Probe

Error Condition: Reports an error if the RTA detects a CRC error in a PSI, SI, or PSIP table.

Associated ETR 290 recommendation: CRC_error, 2.2.

How/where an error is reported: In the ETR 290 view, and as a syntax error in the appropriate Message view(s).

Section Syntax Probe

Section syntax probes perform a complete analysis of every field in all sections of the selected table type.

Error Condition: Reports an error if the section syntax of the PSI/SI/PSIP selected is not corrected.

Associated ETR 290 recommendation: None.

How/where an error is reported: As coloration of the associated Hierarchic view icon error indicator(s), and as a syntax error in the appropriate Message view(s).

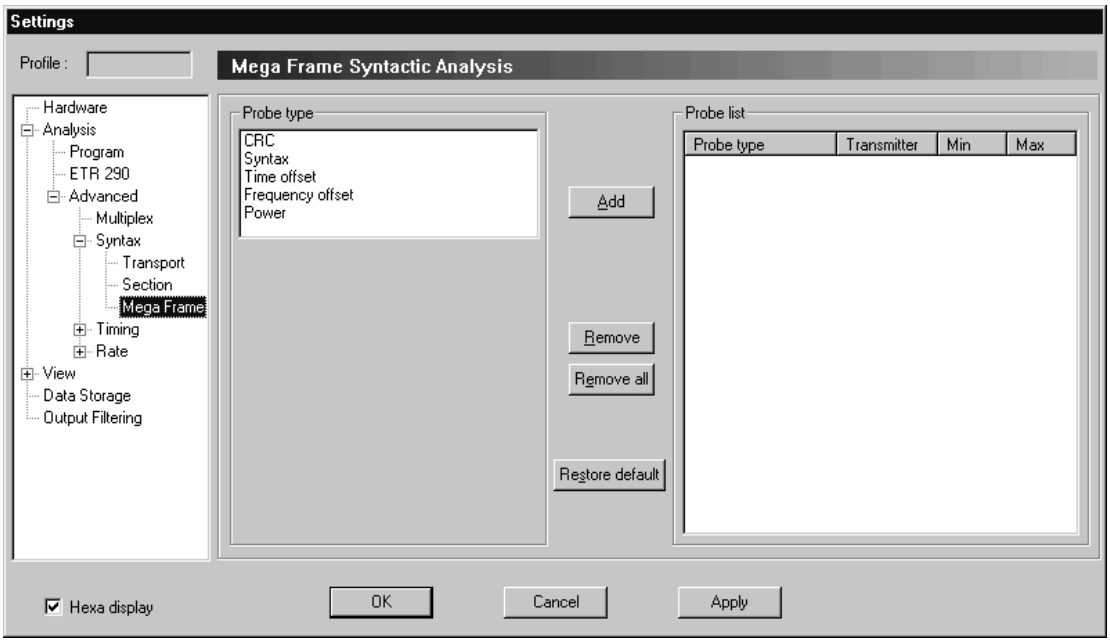
The RTA also notes the presence and nature of each section syntax error in the section analysis view. Refer to *Section Analysis View* on page 2–56 for information about the section analysis view.

Mega Frame Syntax Analyses (DVB-T Only)

NOTE. *To access the Mega Frame syntax analyses, you must select the DVB analysis type with the DVB-T analysis option using the Analysis panel of the Settings window. Refer to* Analysis Panel *on page 3–50 for information about using the Analysis panel.*

Use the Mega Frame Syntactic Analysis panel of the Settings window (shown below) to set and remove probes that monitor Mega Frame syntax. Refer to *Analysis:Advanced:Syntax:Mega Frame Panel* on page 3–63 for information about using the Mega Frame Syntactic Analysis panel.

The following pages describe the Mega Frame syntax analyses in the order that they are listed in the Mega Frame Syntactic Analysis panel.



CRC Probe

Error Condition: Reports an error if the computed Mega Frame CRC and the Mega Frame CRC carried in the MIP do not match.

Associated ETR 290 recommendation: None.

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

Syntax Probe

Error Condition: Reports an error if every field of Mega Frame syntax is not valid.

Associated ETR 290 recommendation: None.

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

Time Offset Probe

Error Condition: Reports warnings if the value carried in the time offset function of a transmitter exceeds the user-defined limits. Three parameters are required for the probe: transmitter ID (entered in hex), and the minimum and maximum values (entered in 100 nanosecond units).

Associated ETR 290 recommendation: None.

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

Frequency Offset Probe

Error Condition: Reports warnings if the value carried in the frequency offset function of a transmitter exceeds the user-defined limits. Three parameters are required for the probe: transmitter ID (entered in hex), and the minimum and maximum values (entered in Hertz).

Associated ETR 290 recommendation: None.

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

Power Probe

Error Condition: Reports warnings if the value carried in the power function of a transmitter exceeds the user-defined limits. Three parameters are required for the probe: transmitter ID (entered in hex), and the minimum and maximum values (entered in 0.1 dBm units).

Associated ETR 290 recommendation: None.

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

Timing Analyses

The RTA provides the following levels of timing analyses.

PCR Timing Analyses

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 one of the following conditions is detected:

- The interval between consecutive PCR packets is greater than 100 ms in MPEG-2 mode or greater than 40 ms in DVB mode
- The PCR inaccuracy is greater than +/–500 ns

NOTE. *The default PCR error limits used by the RTA are consistent with ETR 290 recommendations. You can change the error limits, if necessary, using the PCR Timing Analysis configuration panel in the Settings window (refer to* Analysis:Advanced:Timing:PCR Panel *on page 3–65).*

Setting PCR Probes

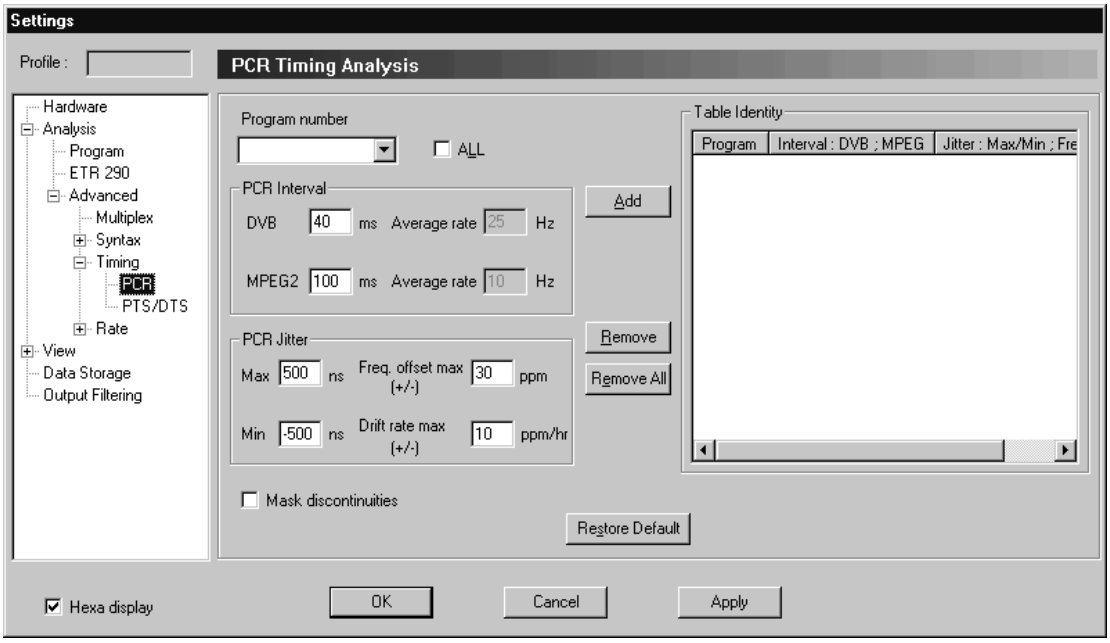
You can use either of the following methods to set PCR probes:

- Select a PMT icon in the Hierarchic view, right-click to open the shortcut menu, and then select **PCR Probe** or **View PCR Analysis**. To remove the PCR probe, select **PCR Probe** a second time from the selected PMT shortcut menu in the Hierarchic view.

  When you select **View PCR Analysis**, a PCR Analysis view opens in the Client view and the PCR probe is enabled. Refer to *PCR Analysis View* on page 2–61 for information about using the PCR Analysis view.

- Use the PCR Timing Analysis panel of the Settings window (shown on page 3–30) to configure and set PCR probes one program at a time and, if desired, use unique error limits for each individual program. You can also set PCR probes on all stream programs at once, but you must then use the same measurement error limits for all programs.

Refer to *Analysis:Advanced:Timing:PCR Panel* on page 3–65 for information about using the PCR Timing Analysis panel to set PCR probes.



PCR Analysis Accuracy

RTA hardware considerations limit the accuracy of PCR analysis. Table 3–4 summarizes the accuracy possible for jitter parameters displayed in the PCR Analysis view.

***NOTE**. The RTA uses an internal **Settling Filter** to improve the accuracy of PCR jitter analysis. The Settling Filter 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.*

Table 3–4: 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

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

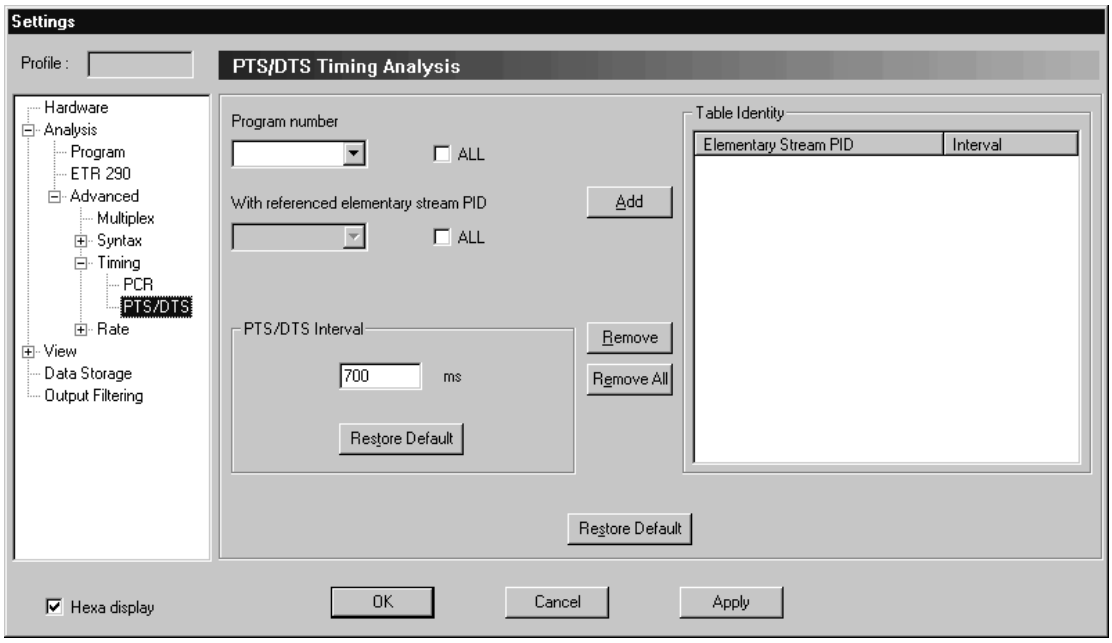
The RTA also indicates PCR errors in the ETR 290 view (refer to *Using the ETR 290 View* on page 2–53) and the PCR Analysis view (refer to *PCR Analysis View* on page 2–61).

PTS/DTS Timing Analyses

PTS/DTS probes monitor the time stamps of selected elementary streams for compliance with the ETR 290 recommended interval of no more than 700 ms (default setting; you can set a different value) between consecutive PES packets with non-zero PTS/DTS flags.

***NOTE**. You can set PTS/DTS probes only on unscrambled elementary streams.*

Refer to *Analysis:Advanced:Timing:PTS/DTS Panel* on page 3–69 for information about using the PTS/DTS Timing Analysis panel.



Setting PTS/DTS Probes. You can use either of the following two methods to set PTS/DTS probes:

- Select an audio or video elementary stream icon in the Hierarchic view, right-click to open the shortcut menu, and then select **PTS/DTS Probe** or **View PTS/DTS Analysis**. To remove the PTS/DTS probe, select **PTS/DTS Probe** a second time from the selected icon shortcut menu in the Hierarchic view.

  When you select **View PTS/DTS Analysis**, a PTS/DTS Analysis view opens in the Client view and the PTS/DTS probe is enabled. Refer to *PTS/DTS Analysis View* on page 2–59 for information about using the PCR Analysis view.

- Use the PTS/DTS Timing Analysis panel of the Settings window (shown on the previous page) to configure and set PTS/DTS probes one program at a time and, if desired, use unique error limits for each individual elementary stream. You can also set PTS/DTS probes on all elementary streams at once, but you must then use the same measurement error limits for all programs.

  Refer to *Analysis:Advanced:Timing:PTS/DTS Panel* on page 3–69 for information about using the PTS/DTS Timing Analysis panel.

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

The RTA also indicates PTS/DTS errors in the ETR 290 view (refer to *ETR 290 View* on page 2–53) and the PTS/DTS Analysis view (refer to *PTS/DTS Analysis View* on page 2–59).

Mega Frame Timing Analysis (DVB-T Only)

The only specific timing analysis performed on DVB-T streams (in addition to the regular MPEG-2/DVB rate analyses) is the STS interval check.

Use the STS interval probe to check that the difference between two consecutive Synchronization Time Stamps carried in the MIP remains within a user-defined interval, and to report warnings every time the limits are exceeded.

The STS interval probe has two parameters: the **Min:** and **Max:** values allowed (expressed in 100 nanosecond units). Typically the STS interval should remain within the (0.5, 0.61) seconds interval.

Set the STS interval probe using the Mega Frame Timing Analysis configuration panel in the Settings window (refer *Analysis:Advanced:Timing:Mega Frame Panel* on page 3–63).

Rate Analyses

The RTA provides the following levels of rate analyses.

Transport Rate Analysis

In transport rate analysis, the RTA calculates the average bit rate of each PID in the input stream. Transport rate analysis is automatic and cannot be disabled.

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 using the Analysis panel of the Settings window. Refer to *Analysis Panel* on page 3–50 for more information.

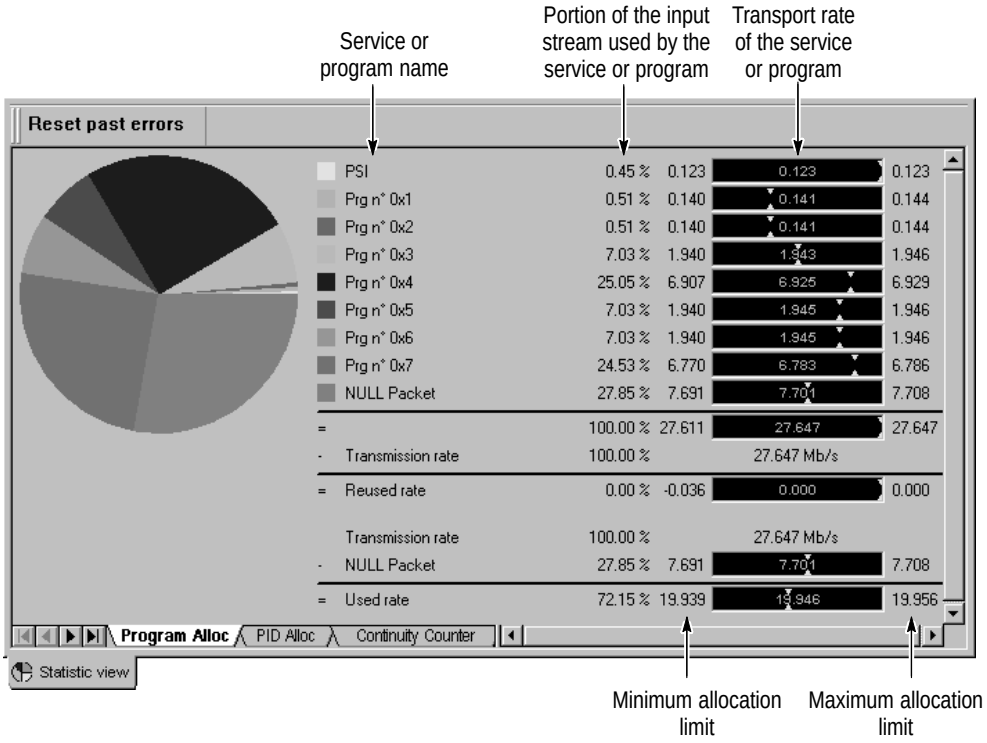
In addition to calculating transport rates for every PID in the stream, the RTA can also monitor selected PIDs and alert you when the transport rate of the selected PID(s) violates user-specified high and low error limits.

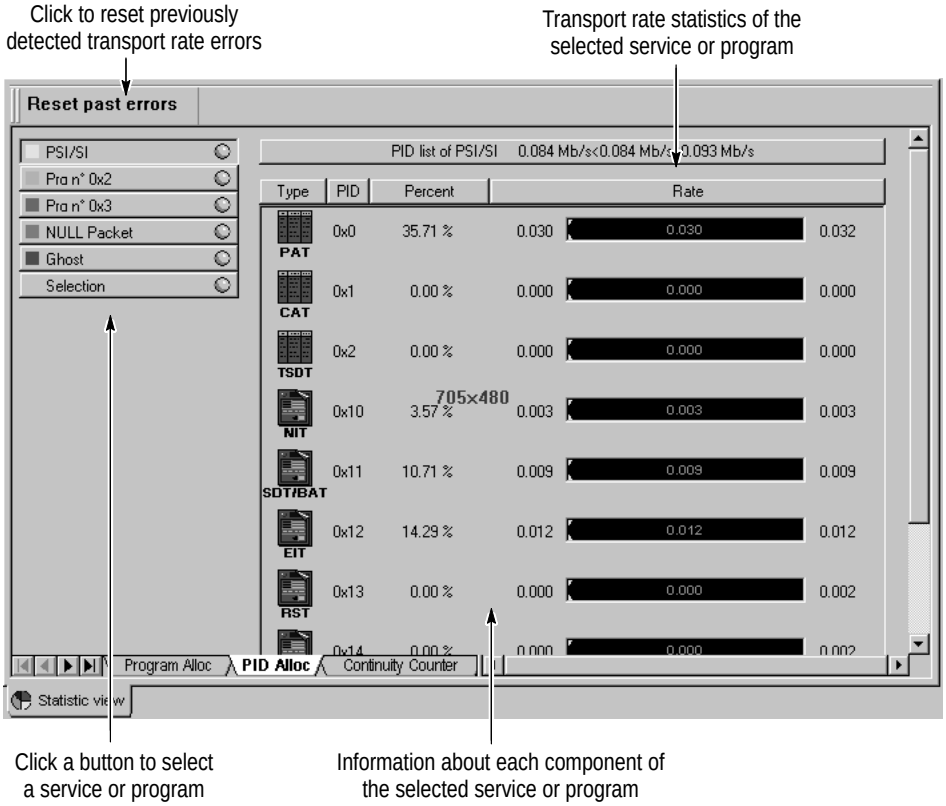
Viewing Transport Rate Analysis Results

The RTA displays the results of transport rate analysis in the Program Allocation, PID Allocation, and Type Allocation panels of the Statistic View.

Program Allocation Panel. The Program Allocation panel of the Statistic view (shown at the top of the next page) shows the bandwidth allocation of the input multiplex. Both the numeric data and the pie chart update every 500 ms to give a near-instantaneous report of input stream composition. Double-click on a slice of the pie chart to change to the PID Allocation panel with the corresponding program already selected.

Refer to *Program Allocation Panel* on page 2–43 for more information.

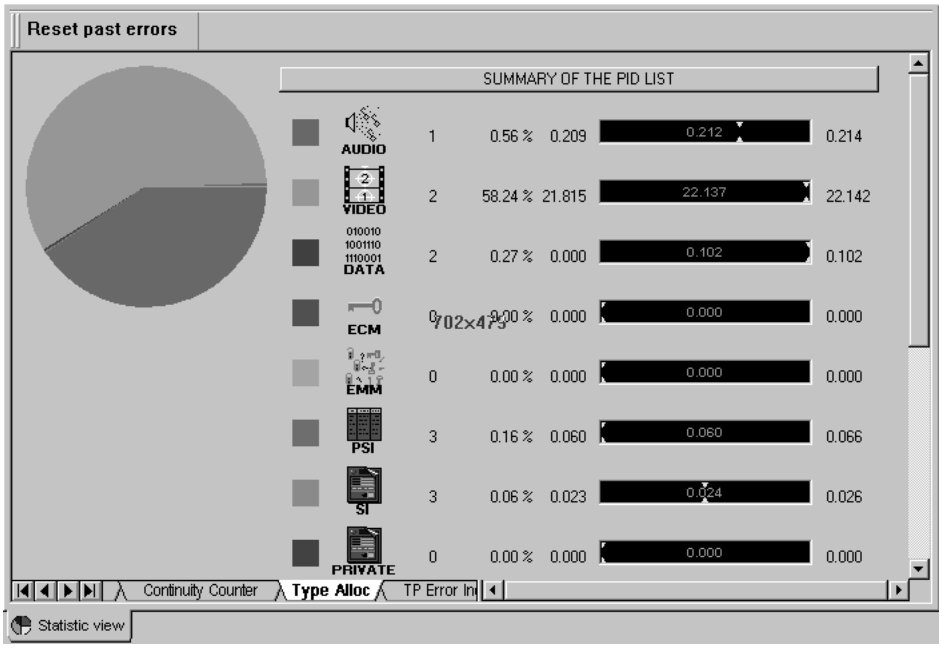

Service or program name
Portion of the input stream used by the service or program
Transport rate of the service or program
Reset past errors
PSI 0.45 % 0.123 0.123 0.123
Prg n° 0x1 0.51 % 0.140 0.141 0.144
Prg n° 0x2 0.51 % 0.140 0.141 0.144
Prg n° 0x3 7.03 % 1.940 1.943 1.946
Prg n° 0x4 25.05 % 6.907 6.925 6.929
Prg n° 0x5 7.03 % 1.940 1.945 1.946
Prg n° 0x6 7.03 % 1.940 1.945 1.946
Prg n° 0x7 24.53 % 6.770 6.783 6.786
NULL Packet 27.85 % 7.691 7.701 7.708
= 100.00 % 27.611 27.647 27.647
- Transmission rate 100.00 % 27.647 Mb/s
= Reused rate 0.00 % -0.036 0.000 0.000
Transmission rate 100.00 % 27.647 Mb/s
- NULL Packet 27.85 % 7.691 7.701 7.708
= Used rate 72.15 % 19.939 19.946 19.956
Program Alloc
PID Alloc
Continuity Counter
Statistic view
Minimum allocation limit
Maximum allocation limit


Click to reset previously detected transport rate errors
Transport rate statistics of the selected service or program
Reset past errors
PSI/SI
Prg n° 0x2
Prg n° 0x3
NULL Packet
Ghost
Selection
PID list of PSI/SI 0.084 Mb/s<0.084 Mb/s<0.093 Mb/s
Type
PID
Percent
Rate
PAT 0x0 35.71 % 0.030 0.030 0.032
CAT 0x1 0.00 % 0.000 0.000 0.000
TSDT 0x2 0.00 % 0.000 0.000 0.000
NIT 0x10 3.57 % 0.003 0.003 0.003
SDT/BAT 0x11 10.71 % 0.009 0.009 0.009
EIT 0x12 14.29 % 0.012 0.012 0.012
RST 0x13 0.00 % 0.000 0.000 0.002
0x14 0.00 % 0.000 0.000 0.002
705×480
Program Alloc
PID Alloc
Continuity Counter
Statistic view
Click a button to select a service or program
Information about each component of the selected service or program

PID Allocation Panel. The PID Allocation panel of the Statistic view (shown at the bottom of the previous page) 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 shows 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.

Refer to *PID Allocation Panel* on page 2–46 for more information.

Type Allocation Panel. The Type Allocation panel of the Statistic view (shown below) shows the bandwidth allocation of each PID type in a pie chart display. Each slice of the pie chart represents a PID type (such as audio, video, or data). The number of PIDs, the allocation percentage, the minimal and maximal rate and its current value are displayed for each pie chart slice.



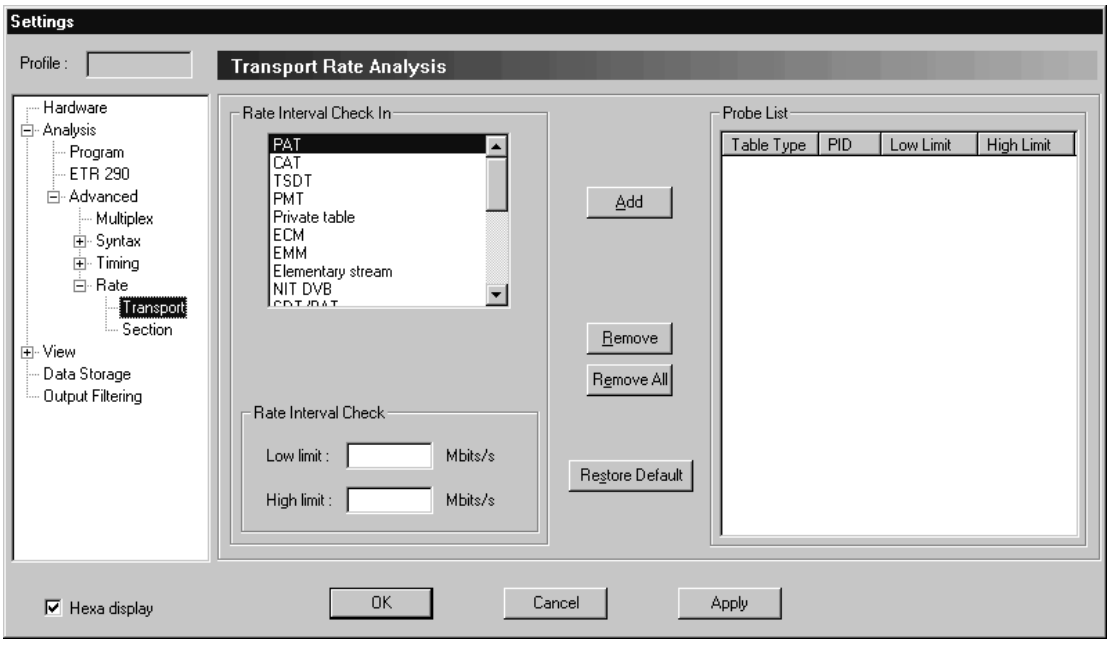
Setting Transport Rate Probes

You can use either of the following two methods to set transport rate probes with user-defined rate limits on selected stream items:

- Use the Transport Rate Analysis panel of the Settings window
- Use the Program Allocation and PID Allocation panels of the Statistic view

Transport Rate Analysis Panel. You can use the Transport Rate Analysis panel of the Settings window (shown below) to set probes on selected stream PIDs for transport rates that fall below or exceed limits of your choosing. You must enter a high- or low-limit value to add a probe.

Refer to *Analysis:Advanced:Rate:Transport Panel* on page 3–72 for information about using the Transport Rate Analysis panel to set transport rate probes.



Program Allocation and PID Allocation Panels. You can use the Program Allocation and PID Allocation panels of the Statistic view (shown on page 3–34) to set probes on selected stream PIDs for transport rates that fall below or exceed limits of your choosing. You must enter a high- or low-limit value to add a probe.

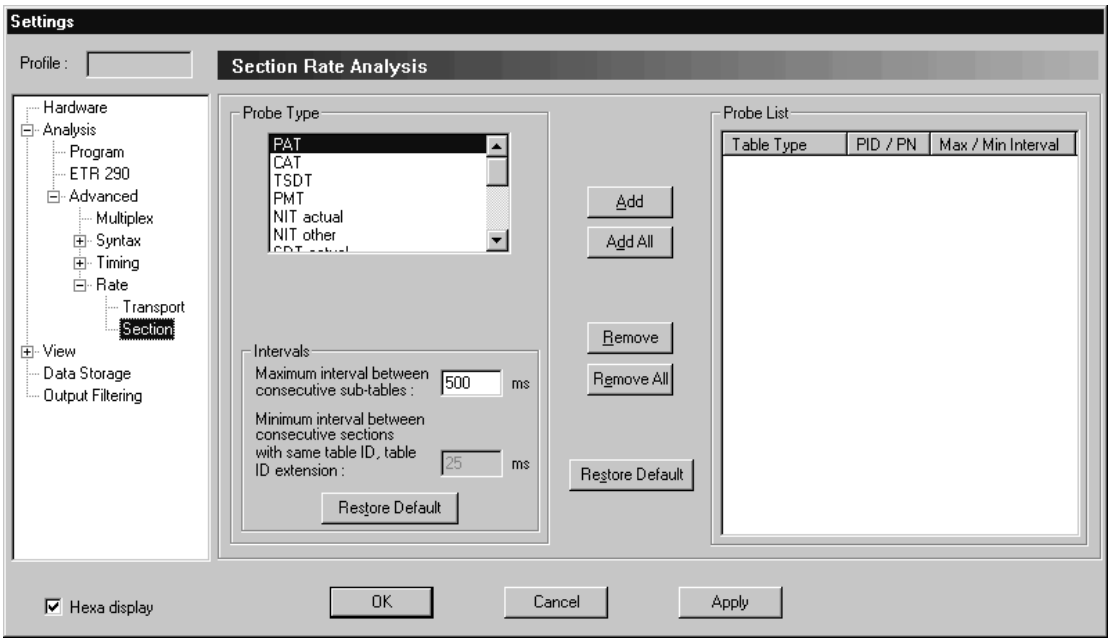
Refer to *Program Allocation Panel* on page 2–43 and *PID Allocation Panel* on page 2–46 for information about using these panels to set transport rate probes.

Section Rate Analysis

Use the Section Rate Analysis panel of the Settings window (shown below) to specify the maximum acceptable interval between consecutive sub-table sections of each selected table type.

NOTE. *The* ***Intervals*** *settings determine the threshold for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations. Do not change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

Refer to *Analysis:Advanced:Rate:Section Panel* on page 3–74 for information about using the Section Rate Analysis panel.



To open a dynamic Section Rate analysis view (shown on page 3–38), select a stream icon in the Hierarchic view, right click to open the shortcut menu, and then select **View Section Rate**. The lower **Sub-Table Max Interval** graph indicates section rate errors in red.

Refer to *Section Rate View* on page 2–58 for more information about using the Section Rate view.

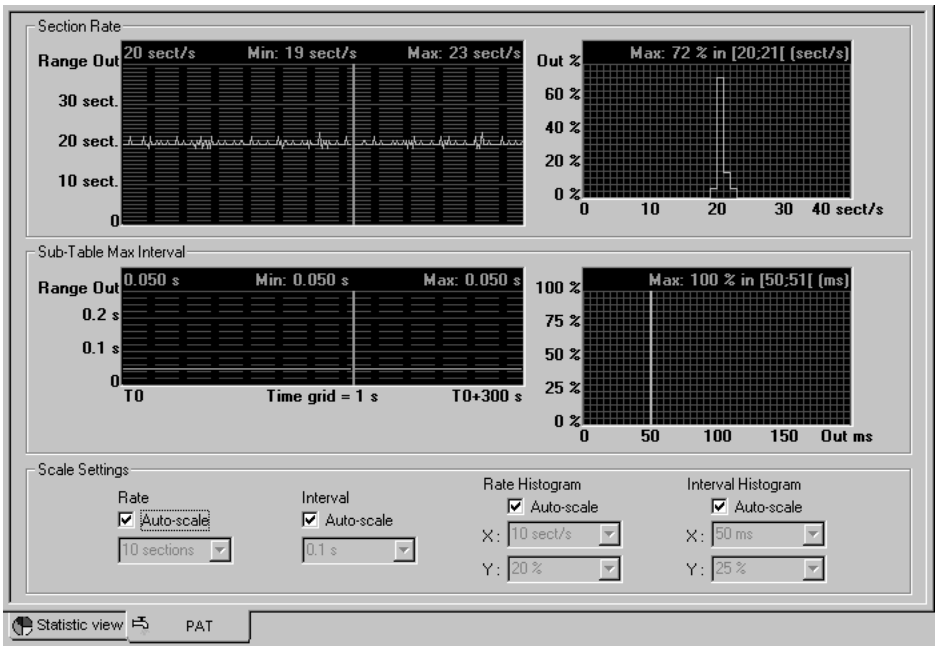


Table 3–5 lists each of the section rate probes, the associated ETR 290 recommendation for each applicable probe, and the required analysis type setting (refer to *Analysis Panel* on page 3–50).

Table 3–5: Section rate analyses

Analysis probe	ETR 290	Analysis type
Maximum interval between consecutive PAT sub-table sections	1.3.1	All
Maximum interval between consecutive CAT sub-table sections	—	All
Maximum interval between consecutive TSDT sub-table sections	—	All
Maximum interval between consecutive PMT sub-table sections	1.5.1	All
Maximum interval between consecutive NIT sub-table sections. Two probes are available: NIT actual and NIT other.	3.1.2	DVB and DVB-T
Maximum interval between consecutive SDT sub-table sections. Two probes are available: SDT actual and SDT other.	3.5.1	DVB and DVB-T
Maximum interval between consecutive EIT sub-table sections. Four probes are available for DVB and DVB-T analysis: EIT actual present-following, EIT other present-following, EIT actual schedule, and EIT other schedule. One EIT probe is available for ATSC/PSIP analysis.	3.6.1	DVB, DVB-T, and ATSC/PSIP
Maximum interval between consecutive BAT sub-table sections	—	DVB and DVB-T

Table 3–5: Section rate analyses (Cont.)

Analysis probe	ETR 290	Analysis type
Maximum interval between consecutive TDT sub-table sections	3.8.1	DVB and DVB-T
Maximum interval between consecutive TOT sub-table sections	—	DVB and DVB-T
Maximum interval between consecutive MGT sub-table sections	3.5	ATSC/PSIP
Maximum interval between consecutive TVCT sub-table sections	3.6.1	ATSC/PSIP
Maximum interval between consecutive CVCT sub-table sections	3.6.2	ATSC/PSIP
Maximum interval between consecutive STT sub-table sections	3.3	ATSC/PSIP
Maximum interval between consecutive RRT sub-table sections	3.7	ATSC/PSIP
Maximum interval between consecutive EIT sub-table sections	—	ATSC/PSIP
Minimum interval between consecutive sections with the same table ID, table ID extension	3.2	All

Maximum Interval Between Consecutive Sub-Tables Probe

Error Condition: Reports an error if the maximum interval between consecutive sub-table sections of the specified stream item exceeds the value set on the Section Rate Analysis panel of the Settings window. Refer to Table 3–5 for a list of section rate probes.

Associated ETR 290 recommendation: Refer to Table 3–5 for a list of associated ETR 290 recommendations for each stream item.

How/where an error is reported: In the ETR 290 view, as a general error message in the Report view, and in the appropriate Message view(s).

Minimum Interval Between Consecutive Sections Probe

Error Condition: Reports an error if the minimum interval between consecutive table sections with the same table ID is less than 25 ms.

Associated ETR 290 recommendation: SI_repetition_error, 3.2.

How/where an error is reported: In the ETR 290 view and as an error message in the appropriate Message views(s).

***NOTE**. You cannot change the minimum interval setting from the default (25 ms).*

Mega Frame Rate Analysis (DVB-T only)

The only specific rate analysis performed on DVB-T streams (in addition to the regular MPEG-2/DVB rate analyses) is the measurement of the intervals between two consecutive MIPs.

Use the MIP interval probe to check that the difference between the PIA time stamps (the arrival time of the packets) of two consecutive MIPs remains within a user-defined interval, and to report warnings every time the limits are exceeded.

The MIP interval probe has two parameters: the **Min:** and **Max:** values allowed (expressed in 100 nanosecond units). Typically the MIP interval should remain within the (0.5, 0.61) seconds interval.

Set the MIP interval probe using the Mega Frame Rate Analysis configuration panel in the Settings window (refer *Analysis:Advanced: Rate:Mega Frame Panel* on page 3–76).

Configuration

The term “Configuration,” as used in the RTA 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 instrument configurations. This section discusses the use of Configuration menu commands and explains the instrument settings in detail.

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 down the computer.*[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.

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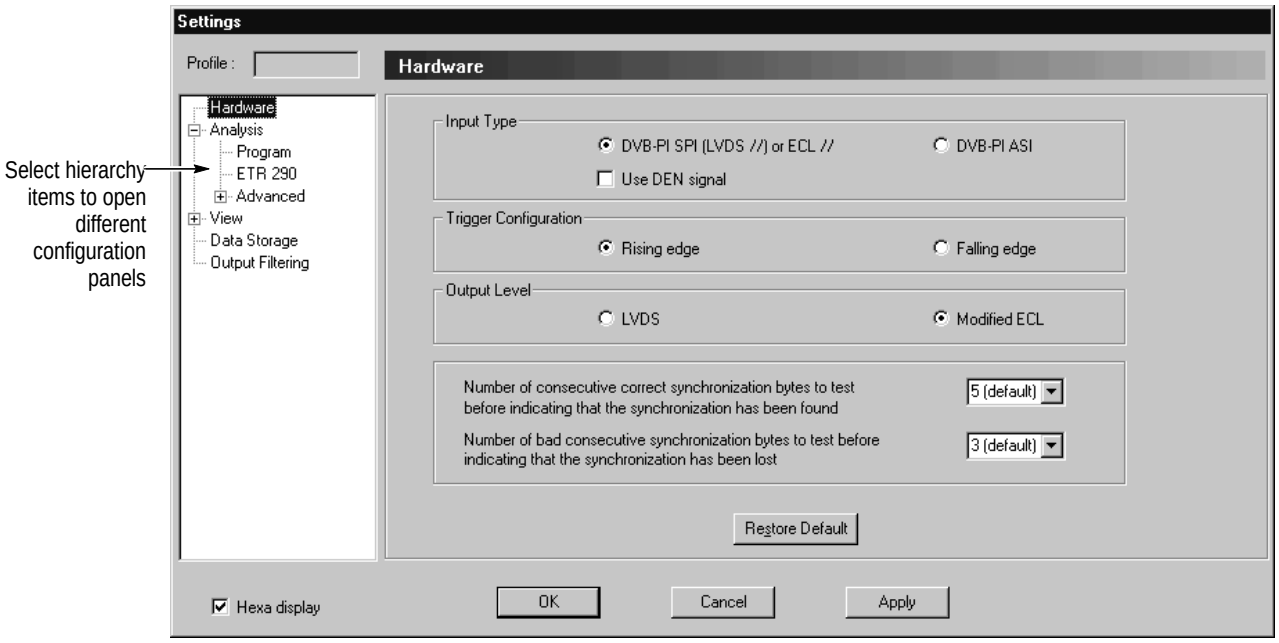
1 You must log in as the same user. RTA settings made by the user “MTS100” and those made by the administrator are saved in separate registries. For consistent results, always log in as MTS100. The administrator can create additional users to permit several people to use the RTA without settings conflicts. 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 RTA Configuration

To change the current RTA configuration, perform the following procedure:

1. Select **Settings** in the Configuration menu. The resulting Settings window (shown below) has several panels that contain measurement settings and options for the various RTA functions and views.
2. Select the appropriate configuration category from the Settings window hierarchy. Each hierarchy item has its own associated configuration panel.
3. Change configuration settings using standard Windows techniques such as the following:
   - Click the appropriate round option button to select among options
   - Select or clear a square check box
   - Select from a pull-down list of several alternatives
   - Enter a new value in a text box

***NOTE**. Most of the configuration panels have a **Restore Default** button that you can click to return all settings on the displayed panel to the settings used in the RTA standard configuration.*



4. When you have changed all the appropriate settings on one or more configuration panels, perform one of the following actions:
   - Click **Apply** on the bottom of the Settings window to confirm and apply all configuration changes
   - Click **OK** to confirm and apply all configuration changes and close the Settings window
   - Click **Cancel** to close the window and cancel all settings changes made since you opened the window or last clicked Apply

Refer to *Configuration Panel Settings*, beginning on page 3–46, for complete information about all options on the Settings window configuration panels.

Saving and Restoring RTA Configurations

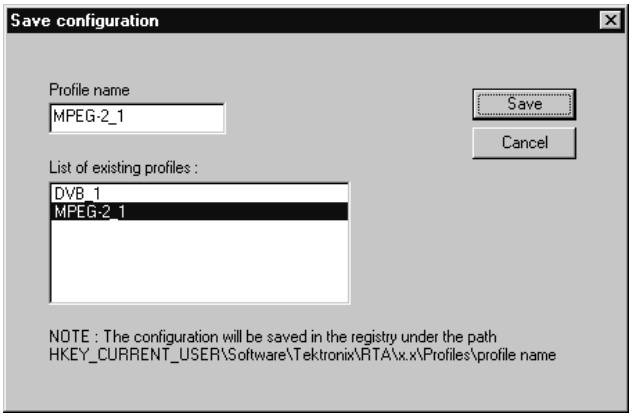
Through the Configuration menu, you can perform the following functions:

- Save all of the current RTA configuration settings as a named profile in the Windows NT registry
- Load a registry profile to restore a previously saved configuration
- Restore the standard, default RTA configuration

Saving the Current Configuration

To save the current RTA configuration in the Windows NT registry, perform the following procedure:

1. Select **Save as** from the Configuration menu to open the **Save Configuration** window (shown below).



2. Save the current configuration using one of the following methods:
   - Enter a unique name in the **Profile name** box and click **Save** to create a new configuration profile
   - Highlight a name on the **List of existing profiles** and click **Save** to overwrite an existing named profile with the current RTA settings

Loading a Saved Configuration

To restore an RTA configuration that has been saved in the current user's Windows NT registry, perform the following procedure:

***NOTE**. RTA analysis must be stopped before you can load a saved configuration.*

1. Select **Load** from the Configuration menu to open the **Load Configuration** window (shown below).

2. Highlight the name of the profile that you want to restore (by clicking on the name in the **Profiles** list) and then click **Load**.

***NOTE**. 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.*

Restoring the Standard Configuration

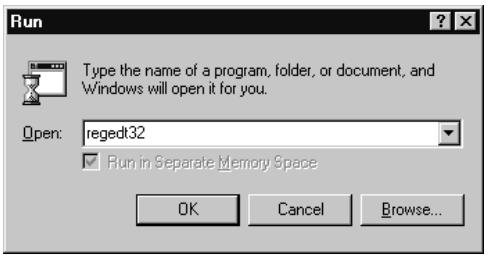
To restore the standard (default) configuration, stop RTA analysis and select **Restore Standard** from the Configuration menu.

***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

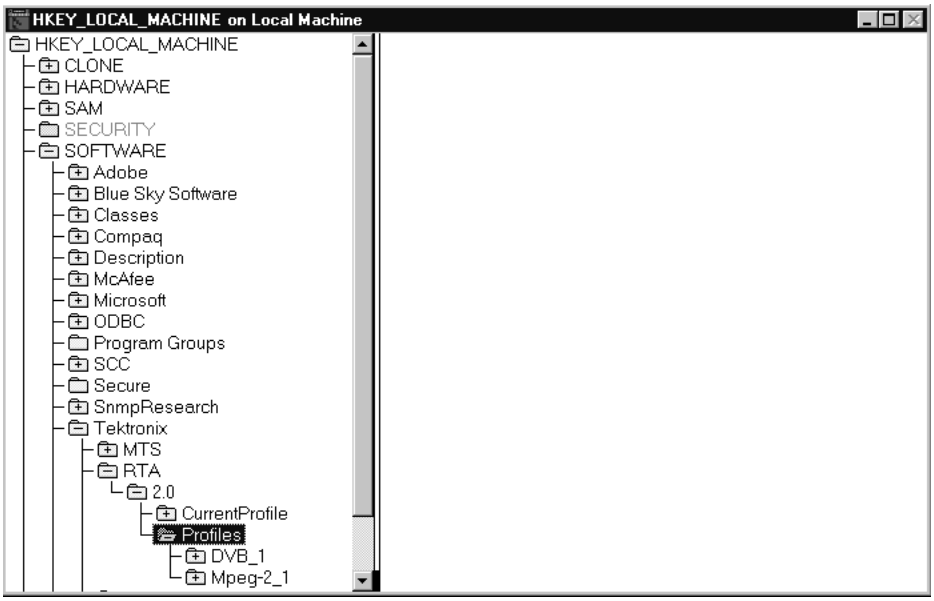
Perform the following procedure, using the Registry Editor program, Regedt32.exe, to delete a configuration profile.

1. Open the Windows NT Start menu and select **Run**. The Run window (shown below) opens.



2. Type **regedt32** in the **Open** text box and click **OK**.

3. Select the **HKEY_LOCAL_MACHINE on Local Machine** window and double-click the folder icons to open the path to the RTA profile keys, **HKEY_LOCAL_MACHINE/Software/Tektronix/RTA/2.0/Profiles**. The two named profiles in the following example are "DVB_1" and "MPEG-2_1."

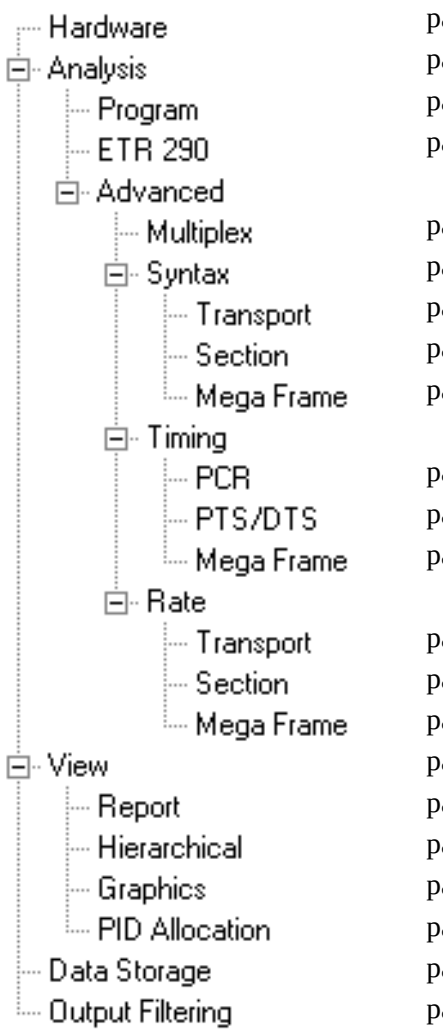


4. Highlight the name of the configuration profile to delete and press **DEL** (or select **Delete** from the Registry Editor Edit menu). A warning message appears; click **Yes** to confirm the deletion.

5. Exit the Registry Editor.

Configuration Panel Settings

This section describes and explains the RTA settings on the various configuration panels available in the Settings window. Each hierarchy item in the Settings window opens a different configuration panel. Illustrated below is a fully expanded Settings window hierarchy with page numbers where the associated configuration panel is described.



[2] **This selection is present only when the RTA is in DVB-T analysis mode (refer to *Analysis Panel* on page 3–50).**

Common Elements in the Settings Window

The following elements are always present on the configuration panels in the Settings window:

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 Settings window.

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

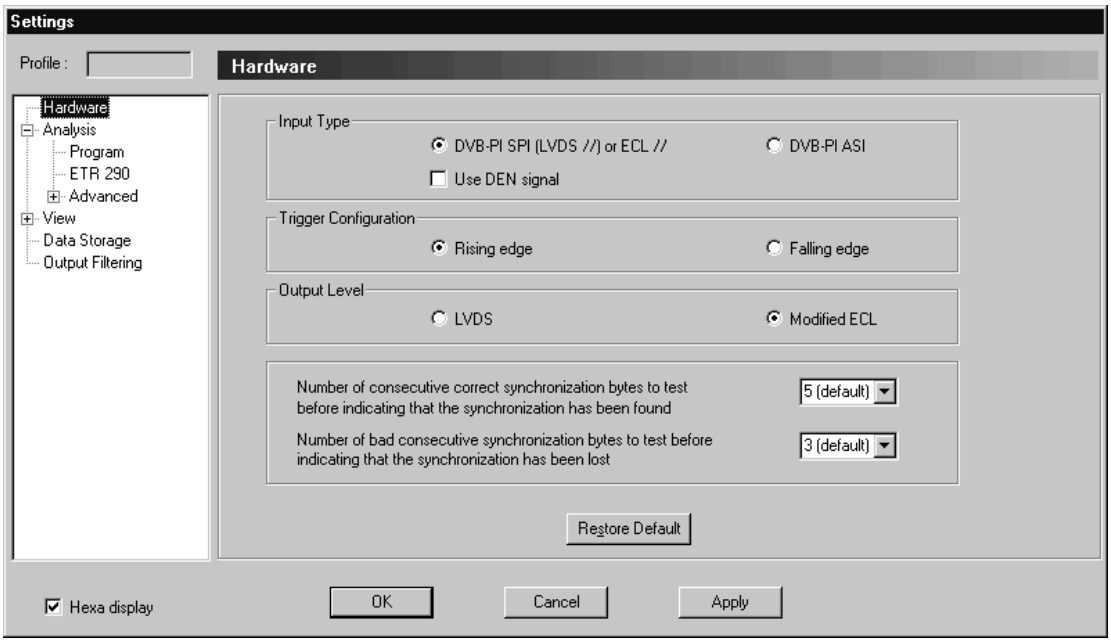
Apply. Click Apply to confirm and apply all configuration changes made since you opened the Settings window or last clicked Apply. The selected configuration window remains open.

OK. Click OK to confirm and apply all configuration changes and also close the Settings window.

Cancel. Click Cancel to close the window and cancel all settings changes made since you opened the window or last clicked Apply.

Hardware Panel

Select **Hardware** in the Settings window to open the Hardware configuration panel (shown below).



The Hardware panel contains the following options for configuring the RTA input and output:

Input Type. Select either **DVB-PI SPI (LVDS //) or ECL//** (parallel) or **DVB-PI ASI** (asynchronous serial; the default) to match the type of your input stream.

Select **Use DEN signal** (available only when parallel input type is selected) to limit analysis to only those packets that have the Data Enable signal asserted. This option is disabled in the standard configuration.

Trigger Configuration. The trigger configuration settings apply 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 on the RTA Trigger input. Choose to trigger on either the **Rising edge** or the **Falling edge** of the trigger signal. This trigger setting is noted on the Data Storage configuration panel. Refer to *Data Storage Panel* on page 3–86.

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}.

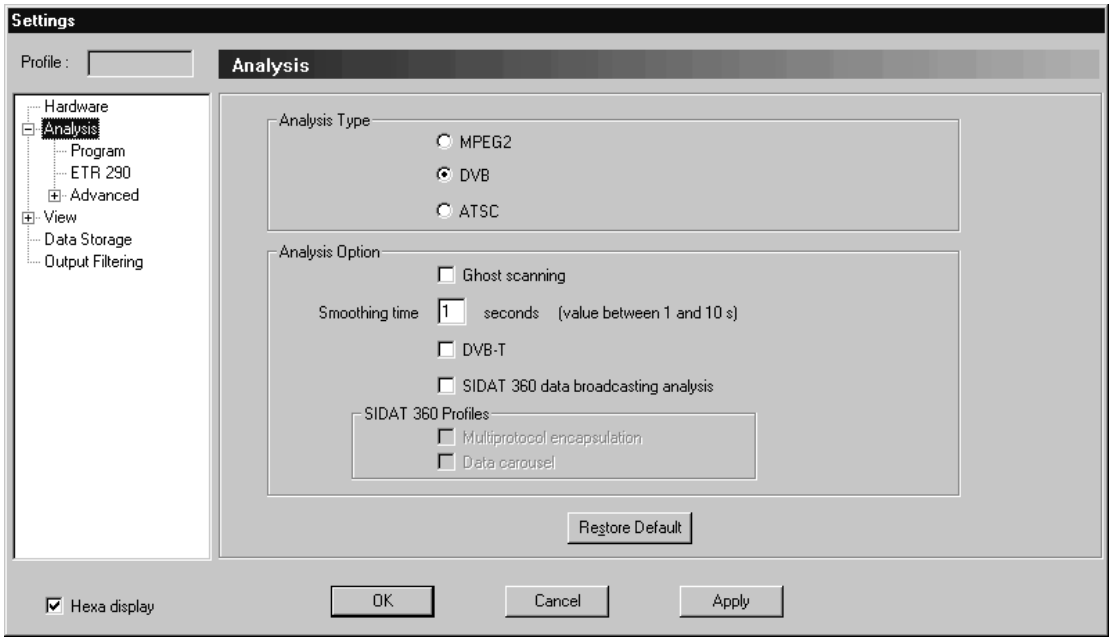
Number of correct consecutive synchronization bytes to test before indicating that the synchronization has been found. The choices are 3, 5, 7, or 9 correct synchronization bytes; the default value is 5 bytes. Click the arrow to the right of the current value and select the desired value from the resulting list.

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 value is 3 bytes. Click the arrow to the right of the current value and select the desired value from the resulting list.

Restore Default. Click Restore Default to restore all standard hardware configuration settings.

Analysis Panel

Select **Analysis** in the Settings window hierarchy to open the Analysis configuration panel (shown below).



The Analysis panel contains the following configuration options:

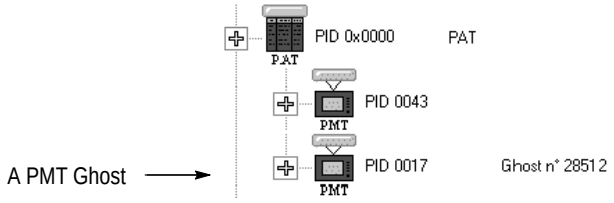
Analysis Type. The Analysis Type setting determines which standard the RTA uses to monitor the input stream.

- Select **MPEG-2** (the default) if the stream you are analyzing complies with the MPEG standard but not DVB or ATSC.
- Select **DVB** to analyze stream compliance with DVB standards.

  Two of the analysis options, **DVB-T** and **SIDAT 360**, are available only when you select the DVB analysis type. Three of the Settings panels—Mega Frame Syntax, Mega Frame Timing, and Mega Frame Rate—are available only when you select the DVB analysis type and the DVB-T analysis option.
- Select **ATSC** to analyze the stream with regard to the ATSC standards.

Analysis Options. The first two analysis options are available for all three analysis types.

- Select **Ghost scanning** to cause the RTA to attempt to define all ghost packets[3] found in the stream. For example, if the RTA identifies a ghost packet as a PMT, the RTA positions the icon under the PAT as shown in the following illustration. You can then perform on the ghost sections all the analyses allowed on PMT sections, such as Section syntax analysis and PCR analysis.



- Select **Smoothing time** to adjust the period over which the RTA averages the transport rates reported in the Statistic view Program Allocation, PID Allocation, and Type Allocation 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.

The following analysis options are available only when you select DVB analysis (in the **Analysis type** portion of this settings panel).

- Select **DVB-T** to enable Mega Frame analysis. Three of the Settings panels—Mega Frame Syntax, Mega Frame Timing, and Mega Frame Rate—are available only when you select the DVB analysis type and the DVB-T analysis option.
- Select **SIDAT 360 data broadcasting analysis** to enable SIDAT analysis and the two SIDAT 360 Profiles options:
- The following two **SIDAT 360 Profiles** are available only after you select the SIDAT 360 data broadcasting analysis option. You can enable both options simultaneously. Refer to *SIDAT 360 Analyses* on page 3–6 for more information.

  Select **Multiprotocol Encapsulation** to enable protocol encapsulation testing for SIDAT 360 analysis. Select **Data Carousel** to enable RTA monitoring of data carousel presence.

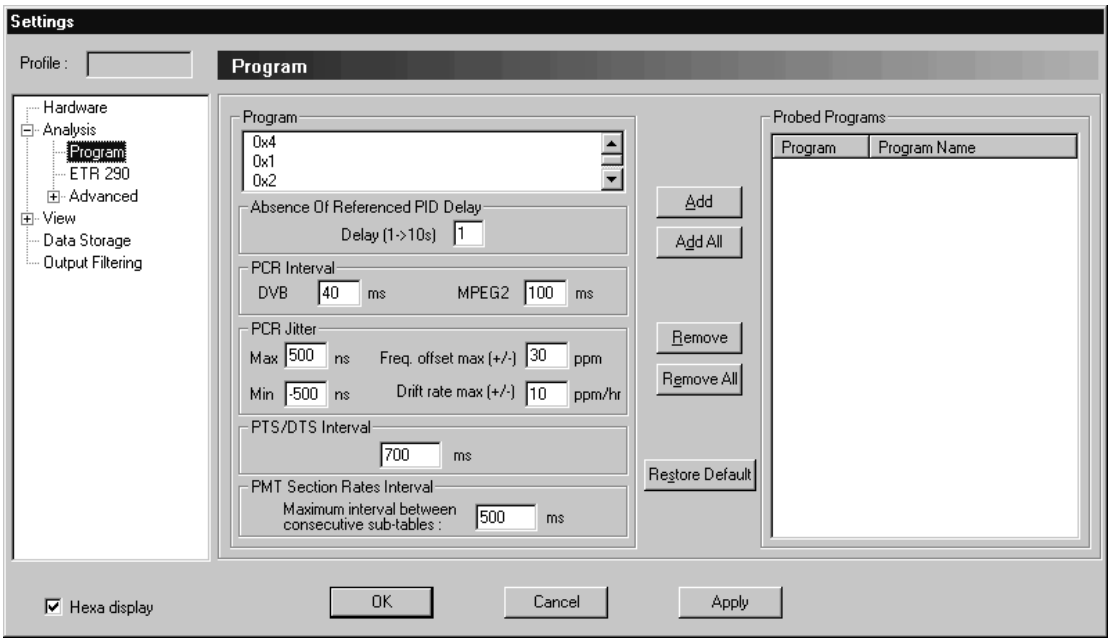
Restore Default. Click Restore Default to restore all standard Analysis panel configuration settings.

3 **One or more packets found in the transport stream but not referenced in any appropriate table.**

Analysis:Program Panel

Select **Analysis:Program** in the Settings window hierarchy to open the Program Analysis configuration panel (shown below).

***NOTE**. Programs in the Probed Programs list and their monitoring parameters can appear in italics on this panel. If a Probed Program is listed in italics, then at least one probe of the corresponding program is not set. This can happen if you have already set specific probes for this program using the Advanced configuration panels in the Settings window. If a probe parameter is in italics, that indicates that the probe is partially set. Use this panel to activate all probes and set all monitoring parameters for a selected program.*



The Program Analysis panel contains the following configuration options:

Program. The Program box contains a list of all programs in the input stream. If your stream contains many programs, use the scroll bar to view all programs. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probed Programs. The Probed Programs box contains a list of probed programs along with the program name. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Absence of Referenced PID Delay. This box allows you to enter a delay value between 1 and 10 seconds.

NOTE*. The PCR Interval and the PCR Jitter Max and Min settings determine thresholds for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations.* Do not *change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

PCR 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 and ATSC modes is 100 ms.

PCR Jitter. The Max and Min 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 all analysis modes is +500 ns/–500 ns.

The **Frequency offset** setting determines the threshold for frequency offset errors. The default for all analysis modes is 30 ppm.

The **Drift rate max** setting determines the threshold for frequency drift rate errors. The default for all analysis modes is 10 ppm/hr.

NOTE*. The PTS/DTS Interval and the PMT Section Rates Interval settings determine thresholds for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations.* Do not *change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

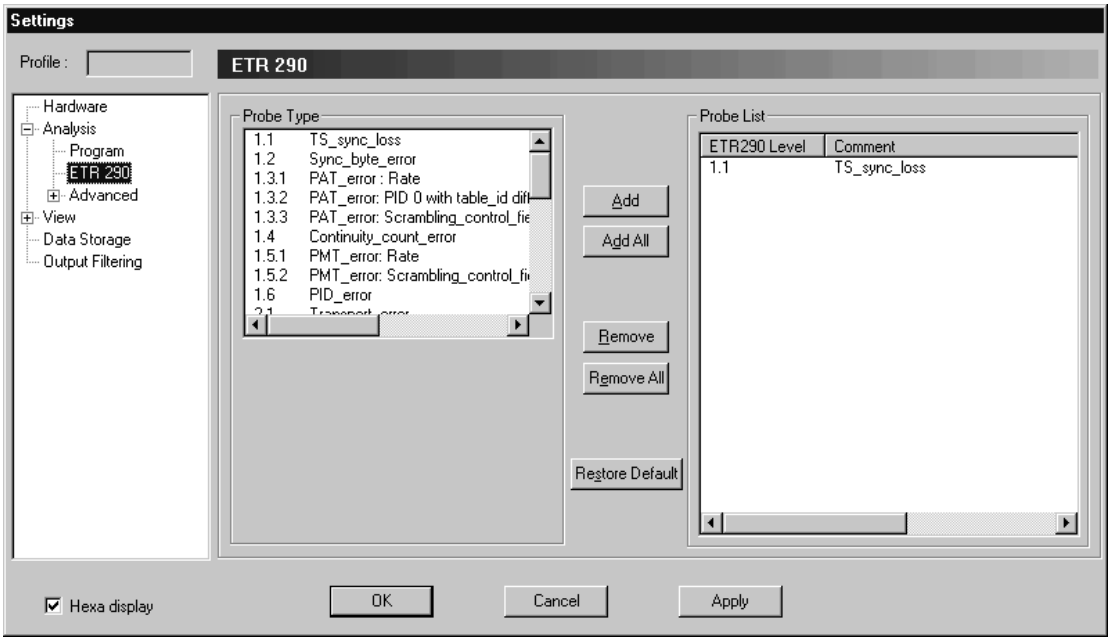
PTS/DTS Interval. This box allows you to change the PTS/DTS interval if necessary. The default value is 700 ms.

PMT Section Rates Interval. This box allows you to change the maximum interval for PMT section rates if necessary. The default value is 500 ms.

Analysis:ETR 290 Panel

Select **Analysis:ETR 290** in the Settings window hierarchy to open the ETR 290 configuration panel (shown below).

NOTE. *ETR 290 probes in the Probes List box can appear in italics on this panel. If an ETR 290 probe is listed in italics in the Probe List, then at least one probe of the corresponding ETR 290 recommendation is not set. This can happen if you have already set specific probes for the ETR 290 recommendation using the Advanced configuration panels in the Settings window. Use this panel to activate all probes for a selected ETR 290 recommendation.*



The ETR 290 panel contains the following configuration options:

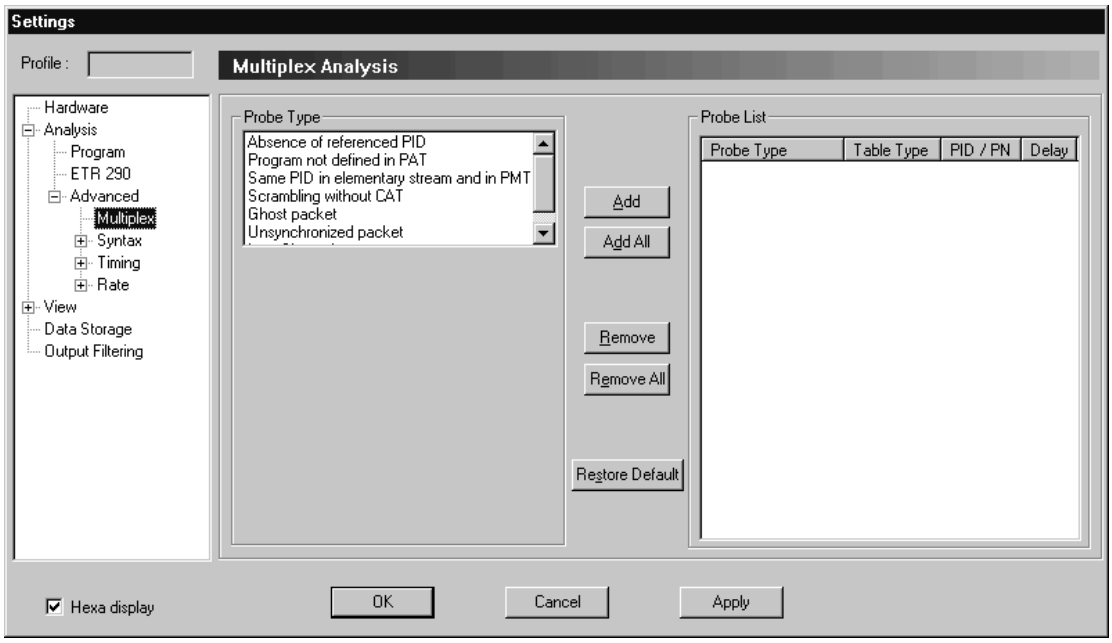
Probe Type. The Probe Type box contains a list of the available ETR 290 probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probes List. The Probes List box contains a list of the selected ETR 290 probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Analysis:Advanced: Multiplex Panel

Select **Analysis:Advanced:Multiplex** in the Settings window hierarchy to open the Multiplex Analysis configuration panel (shown below).

***NOTE**. The Multiplex Analysis panel is one of several panels used for setting and configuring RTA probes. The probes available on this panel apply to the entire input stream multiplex and are appropriate to the current Analysis settings panel selections.*



The Multiplex Analysis panel contains the following configuration options:

Probe Type. The Probe Type box contains a list of the available multiplex probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probes List. The Probes List box contains a list of the selected multiplex probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Available Multiplex Probes. Table 3–6 lists all of the probes that you can control through the Multiplex Analysis panel. Some probes are only available for certain analysis types.

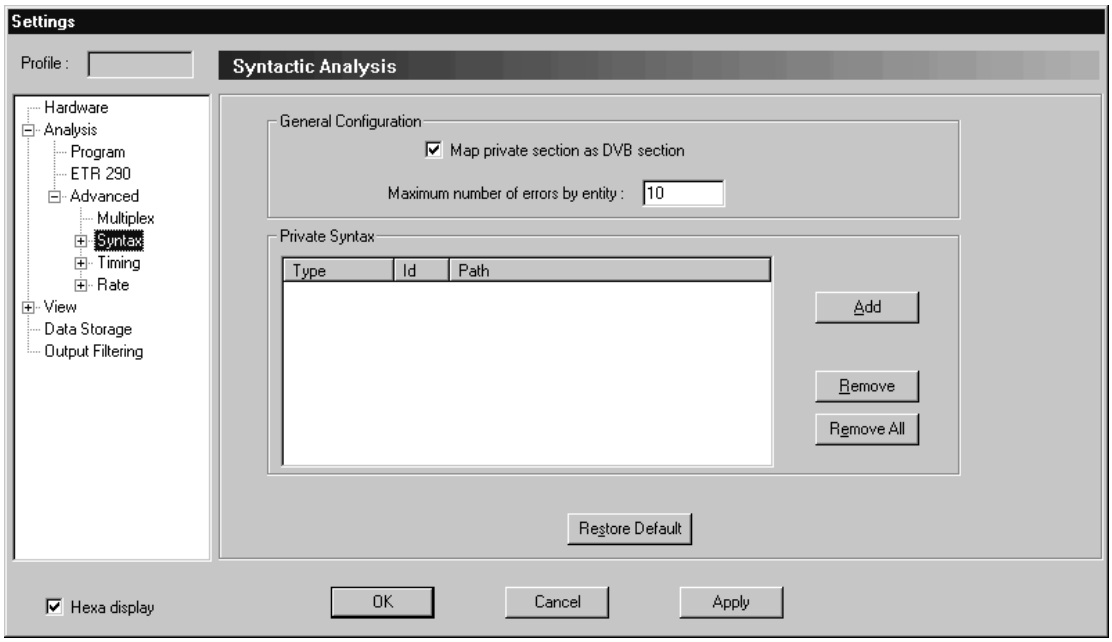
Table 3–6: Multiplex analysis probes

Probe title		Analysis type	ETR 290 level
Absence of referenced PID		All	1.6
Program not defined in PAT		All	—
Same PID in elementary stream and in PMT		All	—
Scrambling without CAT		All	2.6.1
Ghost packet		All	3.4
Unsynchronized packet		All	1.2
Table ID	PAT	All	1.3.2
	CAT	All	2.6.2
	NIT	All	3.1.1
	TSDT	All	—
	SDT	DVB only	3.5.2
	EIT	DVB only	3.6.2
	RST	DVB only	3.7
	TDT	DVB only	3.8.2
	TOT	DVB only	—
	MGT	ATSC/PSIP only	—
	TVCT	ATSC/PSIP only	—
	CVCT	ATSC/PSIP only	—
	STT	ATSC/PSIP only	—
	RRT	ATSC/PSIP only	—
Inter SI consistency		DVB and DVB-T	—
Mega Frame Size		DVB-T only	—
Terrestrial descriptor consistency		DVB-T only	—
Program paradigm		ATSC/PSIP only	—
Scrambled ES without CA descriptor		ATSC/PSIP only	—
Absence of mandatory EIT		ATSC/PSIP only	—

Refer to *Multiplex Analyses* beginning on page 3–9 for detailed information about the Multiplex Analysis probes.

Analysis:Advanced: Syntax Panel

Select **Analysis:Advanced:Syntax** in the Settings window hierarchy to open the Syntactic Analysis configuration panel (shown below). The Syntactic Analysis panel contains options that affect private section interpretation and syntax error reporting.



The Syntactic Analysis panel contains the following configuration options:

General Configuration. There are two possible general configuration settings:

- The **Maximum number of errors by entity** setting allows you to set the maximum number of errors the RTA detects before stopping analysis for one entity. This limits the number of syntax errors reported by the RTA for each entity. This option is convenient when you are analyzing non-compliant streams that contain many errors.
- The **Map private section as DVB section** option appears only when you have set the analysis type to DVB through the Analysis panel (refer to *Analysis Panel* on page 3–50).

  When you select **Map private section as DVB section** (a check appears in front of the 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.

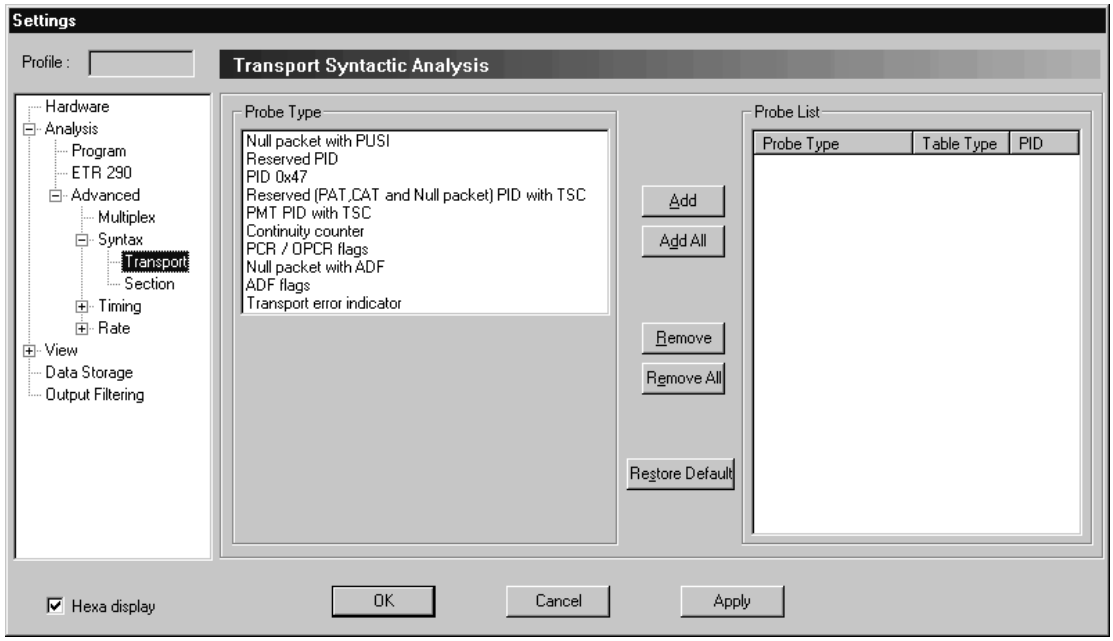
***NOTE**. The **Map private section as DVB section** option is cleared when you first specify DVB monitoring on the Analysis panel; select this option if necessary to force the RTA to interpret PIDs 0x10 through 0x14 as SI.*

Private Syntax. You can load user-defined private syntax definition (.cta) files through the Private Syntax portion of the panel. These files, generated with the Private Syntax Interpreter application, make it possible to analyze proprietary or non-standard tables and descriptors contained in the RTA input stream.

Refer to *Appendix C* for more information about using the Private Syntax Interpreter and generating user-defined private syntax definition files.

Analysis:Advanced: Syntax:Transport Panel

Select **Analysis:Advanced:Syntax:Transport** in the Settings window hierarchy to open the Transport Syntactic Analysis configuration panel (shown below). Use this configuration panel to set and configure RTA transport syntax probes.



The Transport Syntactic Analysis panel contains the following configuration options:

Probe Type. The Probe Type box contains a list of the available probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probe List. The Probe List box contains a list of the selected probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Available Transport Syntax Probes. Table 3–7 lists all of the probes that you can control through the Transport Syntactic Analysis panel. Some probes are only available for certain analysis types. Refer to *Setting Probes* on page 3–4 and *Removing Probes* on page 3–5 for instructions on setting and removing probes.

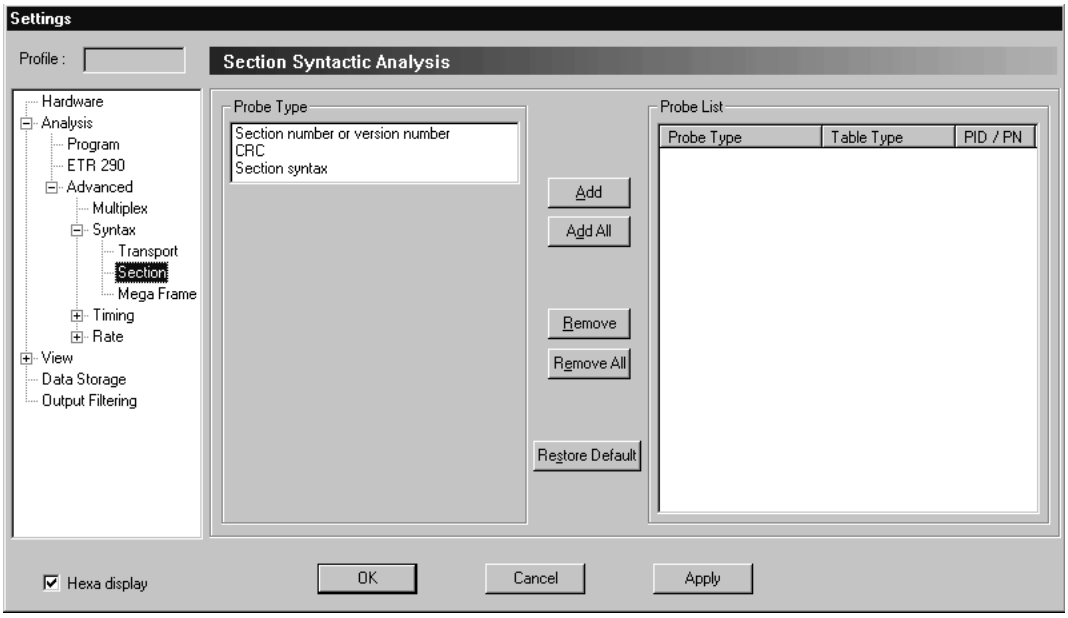
Table 3–7: Transport syntax probes

Probe title	Analysis type	ETR 290 level
Null packet with PUSI	All	—
Reserved PID	All	—
PID 0x47	All	—
Reserved (PAT, CAT, and Null packet) PID with TSC	All	1.3.3
PMT PID with TSC	All	1.5.2
Continuity counter indicator	All	1.4
PCR/OPCR flags	All	—
Null packet with ADF	All	—
ADF flags	All	—
Transport error indicator	All	2.1
PAT PID with AFC & DI	ATSC/PSIP only	—
PMT PID with AFC & DI	ATSC/PSIP only	—
PSIP tables PID with TSC	ATSC/PSIP only	—
PSIP tables PID with ADF	ATSC/PSIP only	—
MGT PID with PUSI & pointer field	ATSC/PSIP only	—

Refer to *Transport Syntax Analyses* beginning on page 3–18 for detailed information about any of the transport syntax probes.

Analysis:Advanced: Syntax:Section Panel

Select **Analysis:Advanced:Syntax:Section** in the Settings window hierarchy to open the Section Syntactic Analysis configuration panel (shown below). Use this configuration panel to set and configure RTA section syntax probes.



The Section Syntactic Analysis panel contains the following configuration options:

Probe Type. The Probe Type box contains a list of the available probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probe List. The Probe List box contains a list of the selected probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Available Section Syntax Probes. Table 3–8 lists all of the probes that you can control through the Section Syntactic Analysis panel. Some probes are only available for certain analysis types. Refer to *Setting Probes* on page 3–4 and *Removing Probes* on page 3–5 for instructions on setting and removing probes.

Table 3–8: Section syntax probes

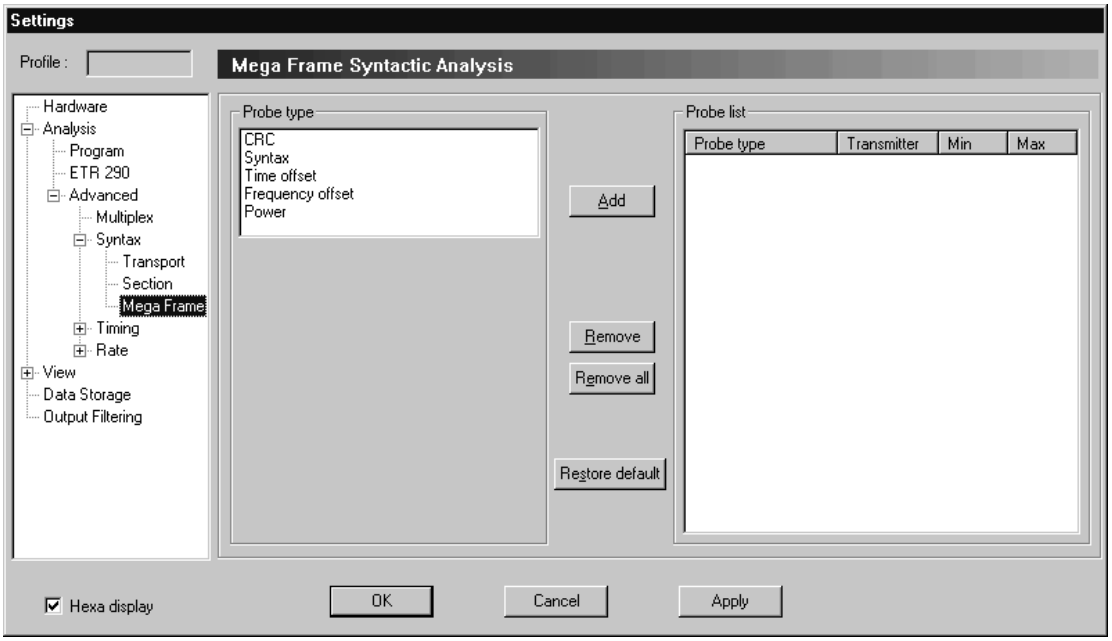
Probe title	Analysis type	ETR 290 level
Section number or version number	All	—
CRC	All	2.2
Section syntax	All	—

Refer to *Section Syntax Analysis* beginning on page 3–24 for detailed information about any of the section syntax probes.

Analysis:Advanced: Syntax:Mega Frame Panel

Select **Analysis:Advanced:Syntax:Mega Frame** in the Settings window hierarchy to open the Mega Frame Syntactic Analysis configuration panel (shown below). Use this configuration panel to set and configure RTA mega frame syntax probes.

NOTE*. The Mega Frame Syntactic Analysis panel is available only when you have specified DVB-T analysis on the Analysis settings panel (refer to* Analysis Panel *on page 3–50).*



The Mega Frame Syntactic Analysis panel contains the following configuration options:

Probe Type. The Probe Type box contains a list of the available probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probe List. The Probe List box contains a list of the selected probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Available Mega Frame Syntax Probes. Table 3–9 lists all of the probes that you can control through the Mega Frame Syntactic Analysis panel. Some probes are only available for certain analysis types. Refer to *Setting Probes* on page 3–4 and *Removing Probes* on page 3–5 for instructions on setting and removing probes.

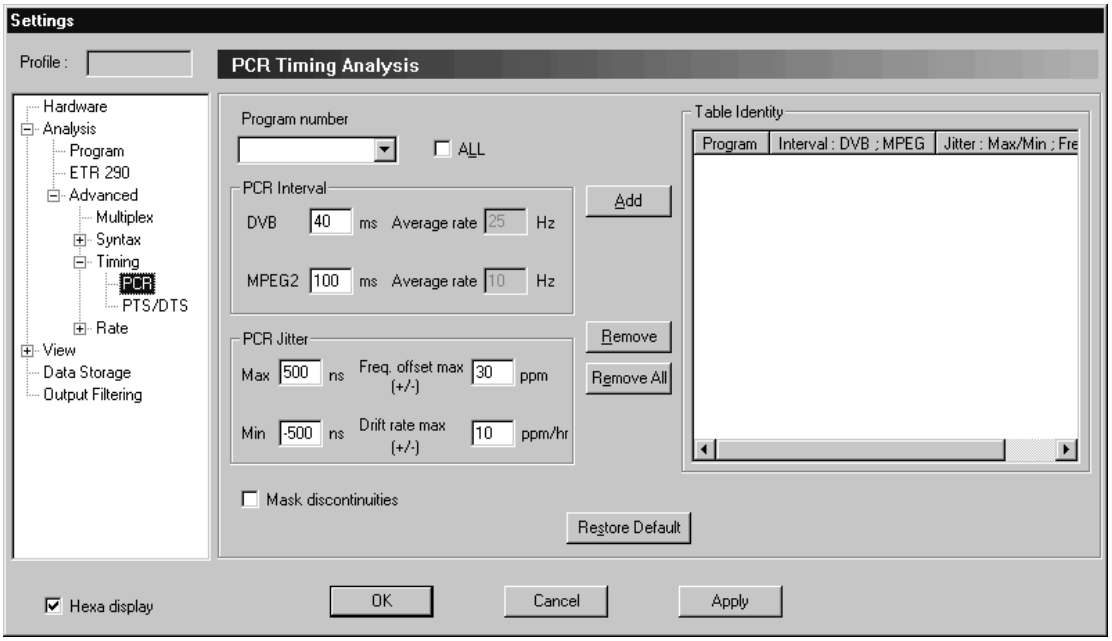
Table 3–9: Mega Frame syntax probes

Probe title	Analysis type	ETR 290 level
CRC	DVB-T only	—
Syntax	DVB-T only	—
Time offset	DVB-T only	—
Frequency offset	DVB-T only	—
Power	DVB-T only	—

Refer to *Mega Frame Syntax Analyses* beginning on page 3–26 for information about any of the Mega Frame syntax probes.

Analysis:Advanced: Timing:PCR Panel

Select **Analysis:Advanced:Timing:PCR** in the Settings window hierarchy to open the PCR Timing Analysis configuration panel (shown below). Use the PCR Timing Analysis panel to configure and set PCR probes one program at a time and, if desired, use unique error limits for each individual program. You can also set probes on all stream programs at once, but you must then use the same measurement error limits for all programs.



PCR Analysis Accuracy. RTA hardware considerations limit the accuracy of PCR analysis. Table 3–10 summarizes the accuracy possible for jitter parameters displayed in the PCR Analysis view.

NOTE. *The RTA uses an internal* ***Settling Filter*** *to improve the accuracy of PCR jitter analysis. The Settling Filter 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.*

Table 3–10: 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

The PCR Timing Analysis panel contains the following configuration options:

Program Number. Use the Program Number box to select individual programs or all programs to probe. Refer to page 3–67 for instructions on setting, changing, and removing PCR probes.

Table Identity. The Table Identity box contains a list of the selected programs. Refer to page 3–67 for instructions on setting, changing, and removing PCR probes.

NOTE. *The PCR Interval and the PCR Jitter Max and Min settings determine thresholds for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations.* Do not *change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

PCR 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.

PCR Jitter. The Max and Min 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 all analysis modes is +500 ns/–500 ns.

The **Frequency offset** setting determines the threshold for frequency offset errors. The default for all analysis modes is 30 ppm.

The **Drift rate max** setting determines the threshold for frequency drift rate errors. The default for all analysis modes is 10 ppm/hr.

Mask Discontinuities. Under normal circumstances, the RTA 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 inaccurate[4] PCRs, both for error reporting and for calculating the PCR jitter model.

Refer to *PCR Timing Analysis* on page 3–29 for more information about PCR analysis and PCR probes.

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

Setting PCR Probes on Programs. To set PCR Probes on programs, perform the following procedure:

1. Select individual programs or all programs using the **Program number** box.
   a. To select individual programs, perform the following:
      - Be sure to use the current numeric base; for example, you would enter the hexadecimal number 0x64 when **Hexa display** is selected, but 100 (the decimal equivalent) when the **Hexa display** check box is cleared.
      - When analysis is ongoing, you can select a program number from the drop-down list box by first clicking the down arrow symbol.
   b. To select all programs, select the **ALL** check box (to the right of the **Program number** box).
2. Change the **PCR Interval** and **PCR Jitter** settings as necessary. The changes will apply to the selected program(s) only. Refer to *PCR Interval* and *PCR Jitter* on page 3–66 for additional information.

***NOTE**. The PCR Interval and the PCR Jitter Min and Max settings determine thresholds for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations.* Do not *change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

3. Click **Add** to enter the program(s) and error limits in the **Table identity** list.
4. If you are selecting individual programs, repeat steps 1 through 3 for all the programs you intend to monitor.

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

5. When the correct program information appears in the **Table identity** list, click **Apply** to confirm the settings and activate the PCR probes; click **OK** if you also want to close the Settings window.

NOTE. *Adding a probe to the* ***Table identity*** *list does not start the probe/analysis; you must also click* ***Apply*** *or* ***OK****.*

Changing PCR Probe Settings. Perform the following procedure to change PCR probe error limits without removing and resetting the probe.

1. Select (highlight) the probe in the **Table identity** list.
2. Change the **PCR Interval** and **PCR Jitter** settings as desired.
3. Click **Add**. The error limit change appears in the **Table identity** list.
4. Click **Apply** to change the PCR probe error limits; click **OK** if you also want to close the Settings window.

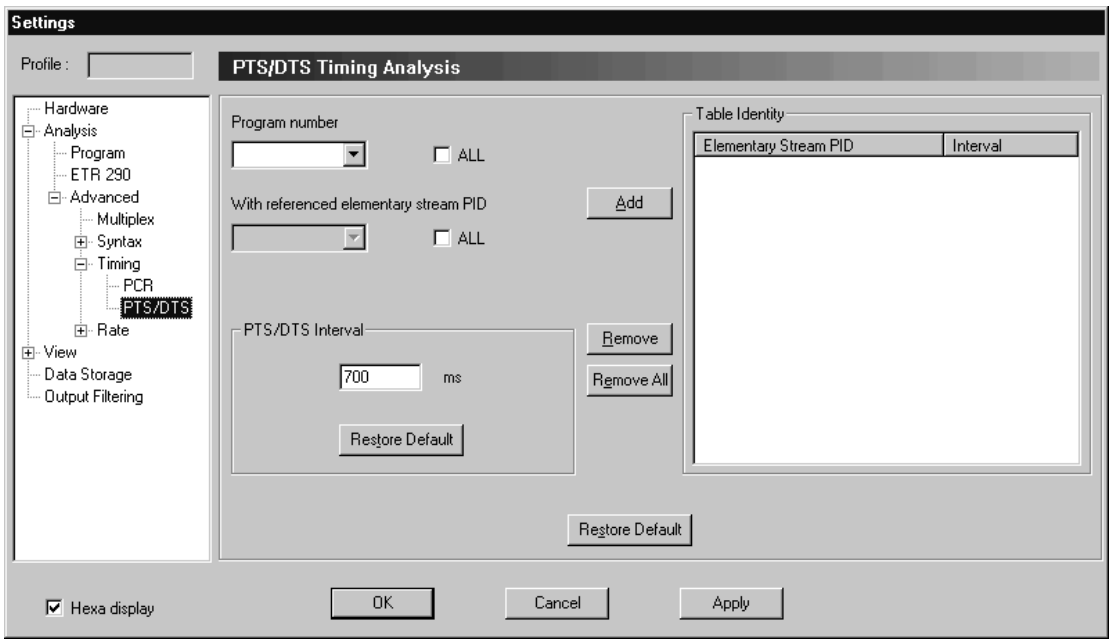
Removing PCR Probes. Use the following procedure to remove one or more PCR probes through the PCR Timing Analysis panel:

1. Remove the probe(s) from the **Table identity** list.
   - To remove a single probe from the list, highlight the probe in the **Table identity** list and then click **Remove**. (You can also remove a probe by double-clicking the **Table identity** entry.)
   - To remove several probes from the list at one time, highlight each probe name in the **Table identity** list and then click **Remove**. To highlight several contiguous names, click the first name and then hold the **SHIFT** key down while selecting the last name; to highlight non-contiguous names, hold the **CTRL** key down while making your selections.
   - To remove all probes from the list, click either **Remove all** or **Restore default**.
2. To confirm your selections, deactivate the probes, close the Settings window, and click **OK**; to confirm your selections and deactivate the probes while leaving the Settings window open, click **Apply**.

NOTE. *Removing a probe from the* ***Table identity*** *list does not end the probe/analysis; you must also click* ***Apply*** *or* ***OK****.*

Analysis:Advanced: Timing:PTS/DTS Panel

Select **Analysis:Advanced:Timing:PTS/DTS** in the Settings window hierarchy to open the PTS/DTS Timing Analysis configuration panel (shown below). Use the PTS/DTS Timing Analysis settings panel to set and configure PTS/DTS probes on one or more of the unscrambled video and audio elementary streams in the multiplex.



The PTS/DTS Timing Analysis panel contains the following configuration options:

Program Number. Use the Program Number box to select individual programs or all programs to probe. Selecting a program number activates the With referenced elementary stream PID box. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Table Identity. The Table Identity box contains a list of the selected programs. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

With Referenced Elementary Stream PID. This box is activated when you select a program in the Program number box. Use this box to select elementary stream PIDs to reference with the selected program.

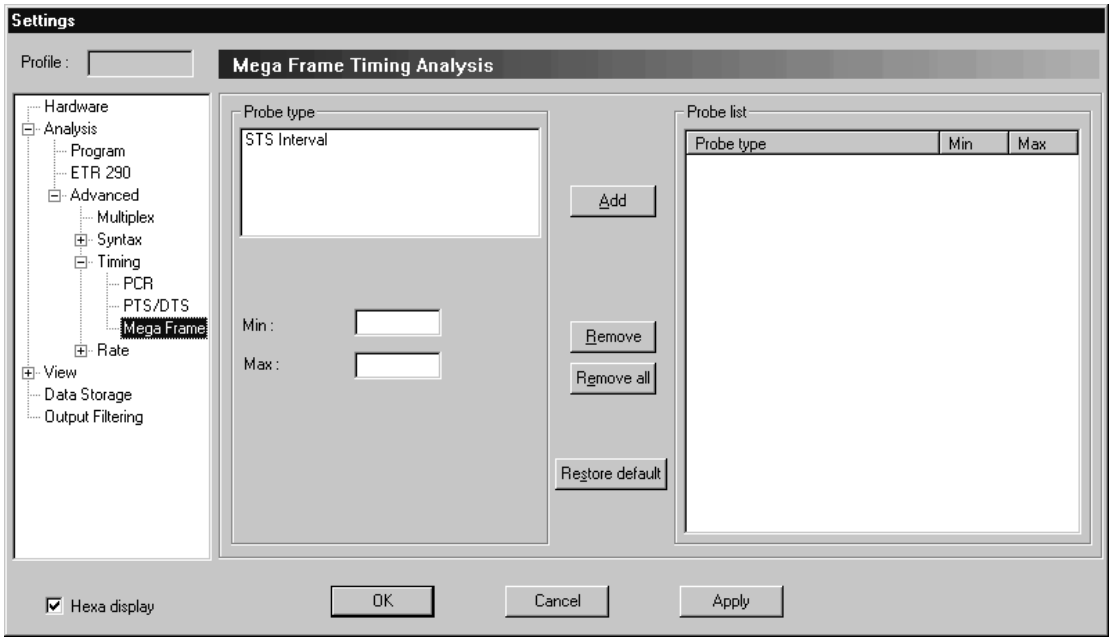
NOTE*. The PTS/DTS Interval setting determines thresholds for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations.* Do not *change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

PTS/DTS Interval. This box allows you to change the PTS/DTS interval if necessary. The default value is 700 ms.

Analysis:Advanced: Timing:Mega Frame Panel

Select **Analysis:Advanced:Timing:Mega Frame** in the Settings window hierarchy to open the Mega Frame Timing Analysis configuration panel (shown below). Use this panel to set the STS interval probe.

NOTE. *The Mega Frame Timing Analysis panel is available only when you have specified DVB-T analysis on the Analysis settings panel (refer to* Analysis Panel *on page 3–50).*



Use the STS interval probe is to check that the difference between two consecutive Synchronization Time Stamps carried in the MIP remains within a user-defined interval, and to report warnings every time the limits are exceeded.

The STS interval probe has two parameters: the **Min:** and **Max:** values allowed (expressed in 100 nanosecond units). Typically the STS interval should remain within the (0.5, 0.61) seconds interval.

You must enter a **Min:** and/or **Max:** value to add the STS interval probe. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

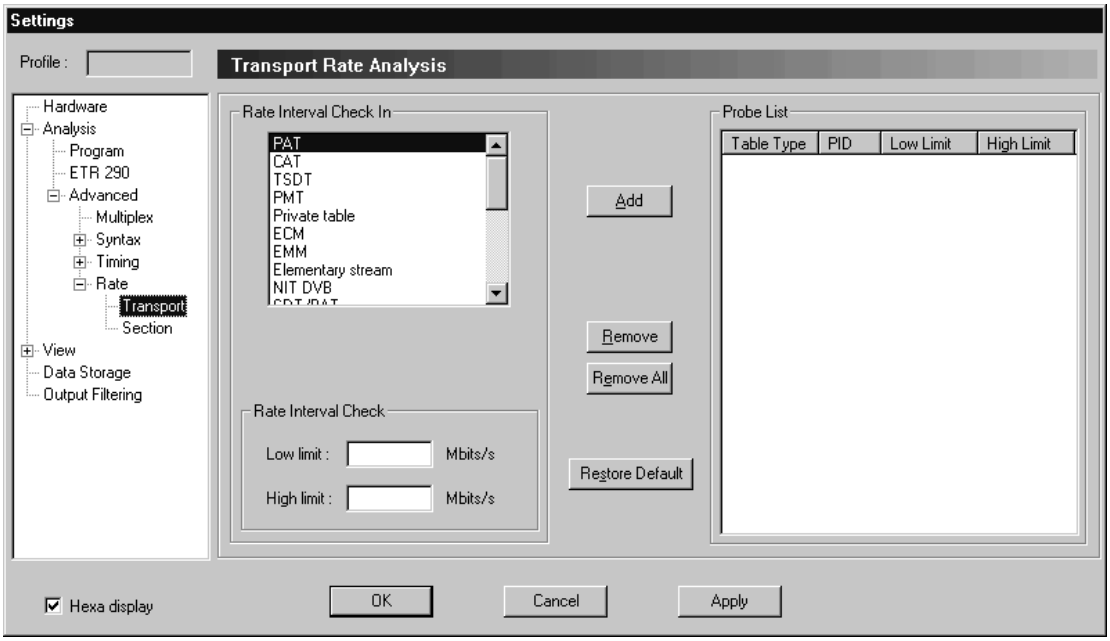
Analysis:Advanced: Rate:Transport Panel

Select **Analysis:Advanced:Rate:Transport** in the Settings window hierarchy to open the Transport Rate Analysis configuration panel (shown below).

NOTE. *The RTA automatically performs transport rate analysis whenever you analyze an input stream. Transport rate analysis results appear in the Program Allocation, PID Allocation, and Type Allocation panels of the Statistic view.*

Use this Transport Rate Analysis panel to set probes on selected stream items for transport rates that fall below or exceed limits of your choosing. You must enter a limit value to add a probe.

You can also set and remove transport rate probes through the Hierarchic view and the Statistic view. Refer to Transport Rate Analysis *on page 3–33 for more information.*



The Transport Rate Analysis panel contains the following configuration options:

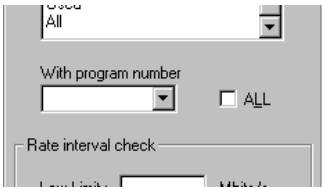
Rate Interval Check In. This box contains the list of stream object types available for you probe.

Probe List. This box contains the list of user-defined transport rate probes.

Rate Interval Check. Use the Low limit and High limit boxes to set user-defined transport rate interval values. You must enter a limit value to add a probe.

Setting User-Defined Transport Rate Probes. To set user-defined transport rate probes through the Transport Rate Analysis panel, perform the following steps:

1. In the **Rate Interval Check In** list, select (highlight) the type of stream object that you want to monitor. When appropriate, an additional **With PID** or **With program number** drop-down list box appears below the Rate Interval Check In list as shown below.



2. If necessary, select a PID or Program from the new list box or click **All** to select all items in the list.
3. Enter the desired error threshold(s) in the **Low Limit** and **High Limit** fields. If you do not want to set either a low or high limit, leave that field blank. You must enter at least one limit to add a probe.
4. Click **Add** to enter the stream item and limits in the **Probe List**.
5. Repeat steps 1 through 4 for all items that you want to check for user-defined low or high transport rate errors.
6. To begin monitoring the selected items for transport rate errors, click **Apply**; to begin monitoring and also close the Settings window, click **OK**.

Changing a User-Defined Transport Rate Probe. Perform these steps to change one or both of the user-defined error thresholds for a stream item:

1. Click on (highlight) the item entry in the **Probes List**. The existing limits for the selected probe appear in the **Low Limit** and **High Limit** fields.
2. Change the **Low Limit** and **High Limit** as desired. To remove a threshold (the list entry becomes “Not defined”), double-click in the field and then press **DELETE**.
3. Click **Add** to enter the new limits in the **Probe List**.
4. To begin monitoring with the new transport rate error limits, click **Apply**; to begin monitoring and also close the Settings window, click **OK**.

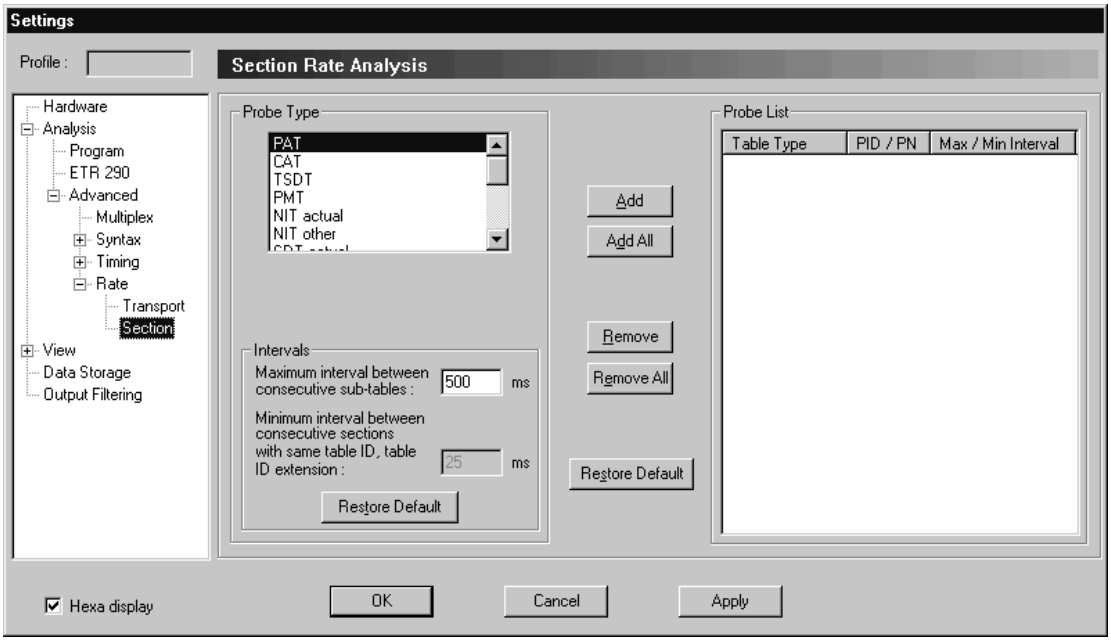
Removing a User-Defined Transport Rate Probe. To remove user-defined transport rate probes using the Transport Rate Analysis panel, perform the following steps:

1. To remove one user-defined transport rate probe, click on (highlight) the item in the **Probe List** that you want to remove, and then click **Remove** or double-click the item.
2. To remove all user-defined transport rate probes, click **Remove All**.
3. To begin monitoring with the new transport rate error limits, click **Apply**; to begin monitoring and also close the **Settings** window, click **OK**.

Analysis:Advanced: Rate:Section Panel

Select **Analysis:Advanced:Rate:Section** in the Settings window hierarchy to open the Section Rate Analysis configuration panel (shown below). Use this panel to specify the maximum acceptable interval between consecutive sub-table sections of each table type and the minimum interval between consecutive sections. User-defined intervals appear on the ETR 290 Detailed view. Refer to *ETR 290 Detailed View* on page 2–54 for more information.

***NOTE**. The Analysis Type setting in the Analysis configuration panel controls which stream items appear in the Probe Type list. Refer to* Analysis Panel *on page 3–50.*



The Section Rate Analysis panel contains the following configuration options:

Probe Type. This box contains the list of available section rate probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

Probe List. This box contains the list of user-defined section rate probes. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

***NOTE**. The two **Intervals** settings listed below determine the threshold for errors reported on the ETR 290 view. The default settings are consistent with ETR 290 recommendations. Do not change these settings if you plan to use ETR 290 tests to judge DVB compliance of the input stream.*

Intervals. The Intervals box contains the following two available options:

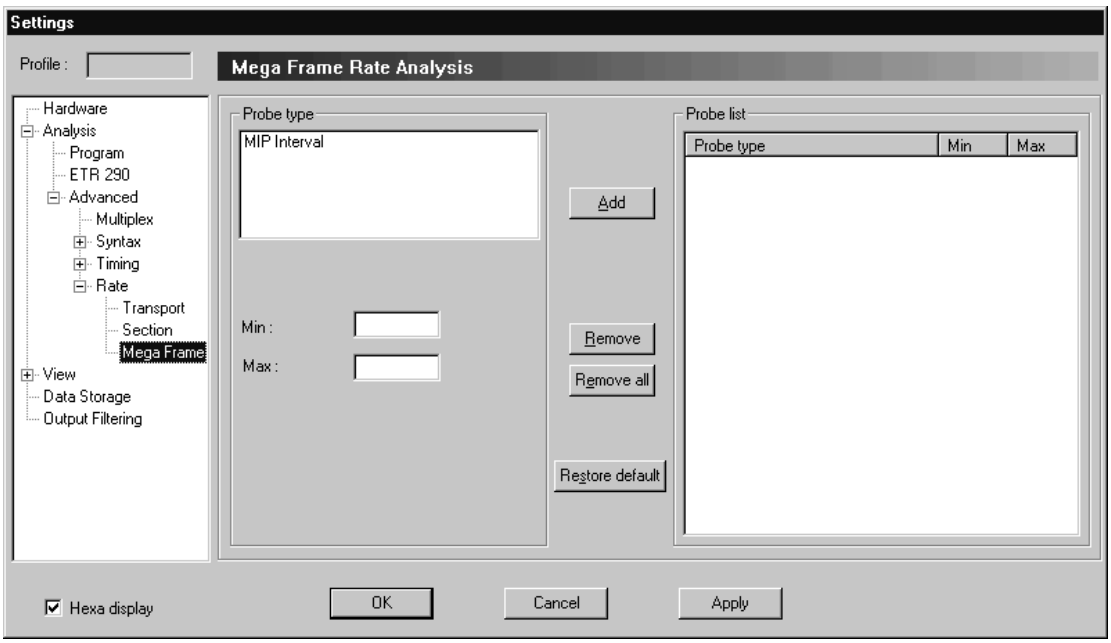
- When you select a section rate probe from the Probe Type list, the ETR 290 recommended value for the **Maximum interval between consecutive sub-tables** is displayed. You can enter a user-defined value if necessary.
- The **Minimum interval between consecutive sections with the same table ID, table ID extension** box displays that 25 ms is the minimum permissible interval between consecutive sections. This interval value cannot be changed by the user.

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

Analysis:Advanced: Rate:Mega Frame Panel

Select **Analysis:Advanced:Rate:Mega Frame** in the Settings window hierarchy to open the Mega Frame Rate Analysis configuration panel (shown below). Use this panel to set the MIP interval probe.

NOTE. *The Mega Frame Rate Analysis panel is available only when you have specified DVB-T analysis on the Analysis settings panel (refer to* Analysis Panel *on page 3–50).*



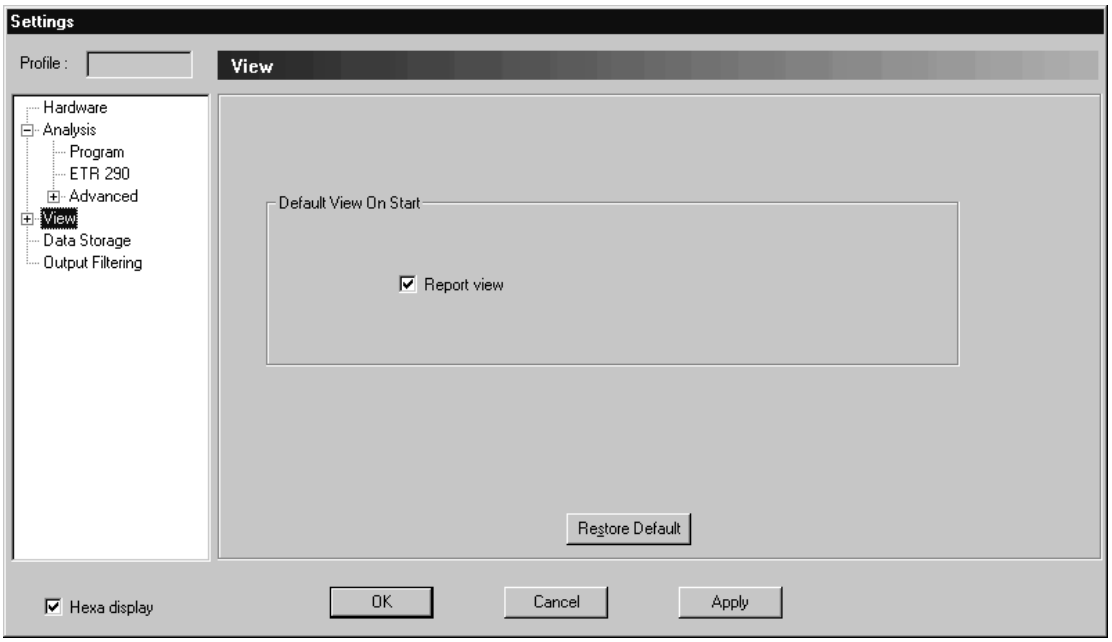
Use the MIP interval probe to check that the difference between the PIA time stamps (the arrival time of the packets) of two consecutive MIPs remains within a user-defined interval, and to report warnings every time the limits are exceeded.

The MIP interval probe has two parameters: the **Min:** and **Max:** values allowed (expressed in 100 nanosecond units). Typically the MIP interval should remain within the (0.5, 0.61) seconds interval.

You must enter a **Min:** and/or **Max:** value to add the MIP interval probe. Refer to *Probe Operating Conventions* on page 3–4 for instructions on setting, changing, and removing probes.

View Panel

Select **View** in the Settings window hierarchy to open the View configuration panel (shown below). Use this view to turn the RTA Report window on or off when you start the RTA application.



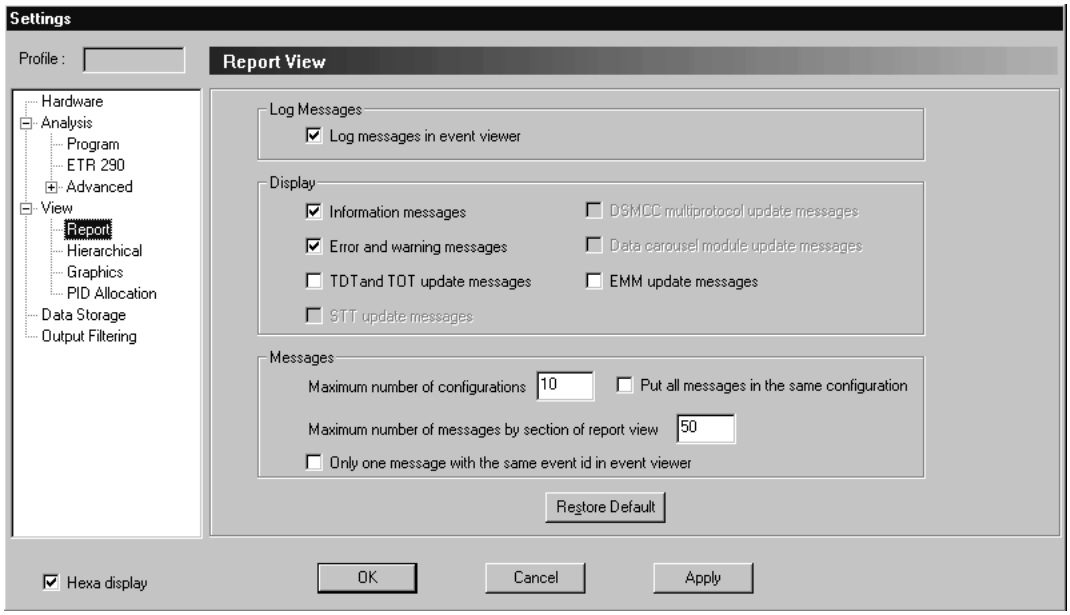
The View panel contains the following configuration options:

Default View On Start. Select or deselect the Report view to be visible when the RTA application is started. When cleared, this option causes only the Hierarchy and Client windows to occupy the RTA application window when you start the RTA application.

Restore Default. Click **Restore Default** to restore the standard view selection.

View:Report

Select **View:Report** in the Settings window hierarchy to open the Report View configuration panel (shown below). Use this view to set options that apply to all Message views.



The Report View panel contains the following configuration options:

Log Messages. Select the **Log messages in event viewer** 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 but 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 2–37. Also consult the Windows NT documentation and the Event Viewer online Help.

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

- 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**, 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 in the various configuration panels of the Settings window.
- **TDT and TOT Update message** is not selected in the standard configuration. Select this option to see and log information messages that report TDT (time and date table) and TOT (time offset table) updates.
- **STT update messages** is only valid when ATSC/PSIP mode is selected in the Analysis configuration panel (refer *Analysis Panel* on page 3–50).
- **DSMCC Multiprotocol Update messages** is valid only when SIDAT 360 mode is selected in the Analysis configuration panel (refer *Analysis Panel* on page 3–50). Select this option to inform you of errors and events detected in a SIDAT 360 stream. Deselect this option when the message rate is too high.
- **Data Carousel Module Update messages** is valid only when SIDAT 360 mode is selected in the Analysis configuration panel (refer *Analysis Panel* on page 3–50). Select this option to inform you of errors and events detected in a SIDAT 360 stream. Deselect this option when the message rate is too high.
- **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.

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

- The **Maximum number of configurations** option sets the maximum number of configurations the Report window displays. The default number of configurations is 10. Select **Put all messages in the same configuration** to limit the number of Report window configurations to one.
- The **Maximum number of messages by sub-part of the report view** option allows you to limit 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 is 50 messages.

  This setting does not affect the capacity of the Windows NT Event Viewer application log.
- Select **Only one message with the same event id in Event Viewer** to limit the amount of message detail logged to the Event Viewer.

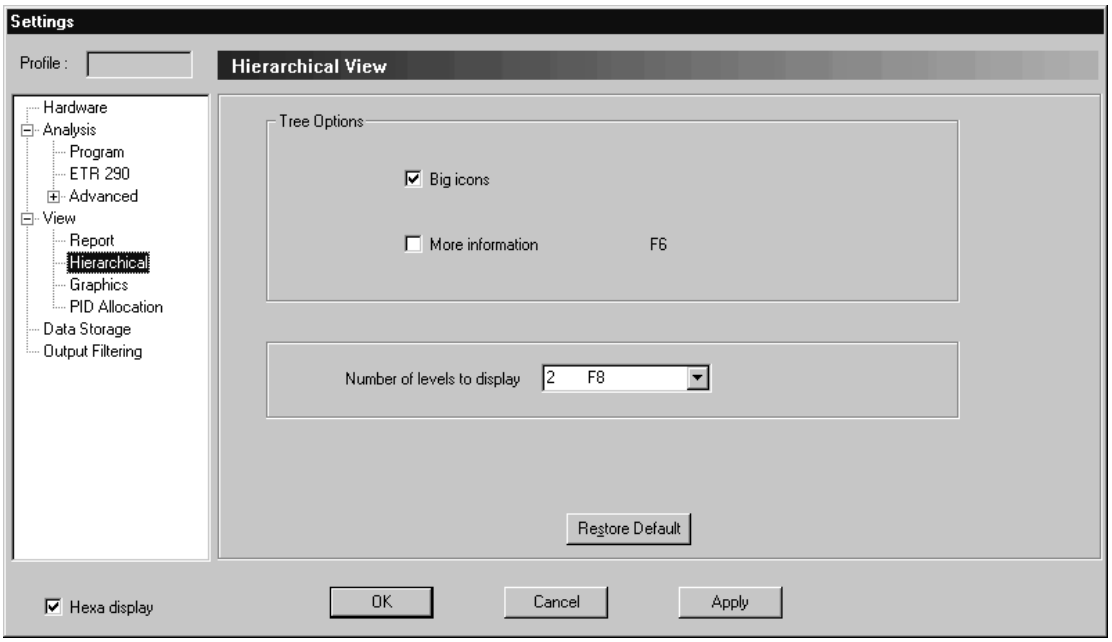
  The RTA posts only one general message for each event ID in the Message views. In reality, a Message view entry can represent many error or information messages. In the standard configuration, all information or error detail represented by the general message is logged to the Event Viewer.

  Double-clicking on the message opens a window that provides access to the event details. If the **Only one message with the same event id in Event Viewer Only** option is selected, only one message would appear in the **Event viewer messages** window for each event ID.

NOTE. *When you monitor 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 in the Event viewer, select the* ***Only one message with the same event id in Event Viewer*** *option.*

View:Hierarchical Panel

Select **View:Hierarchical** in the Settings window hierarchy to open the Hierarchical View configuration panel (shown below). Use this view to set options that apply only to the Hierarchic view.



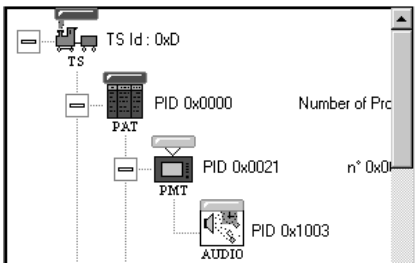
The Hierarchical View panel contains the following configuration options:

Tree Options. Tree options provide two hierarchical display options:

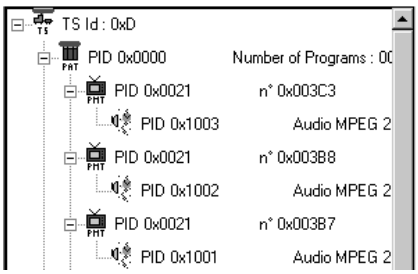
- Select **Big Icons** (the default setting) to cause the RTA to use the larger of the two available icon sizes in the Hierarchic view. See the following screen captures for a comparison of the two icon sizes.

  Clear the Big Icons selection to use small icons. This setting change will not take effect until you exit and restart the RTA application.

Big hierarchy icons

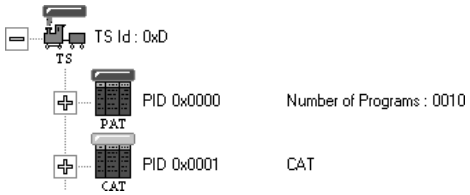


Small hierarchy icons

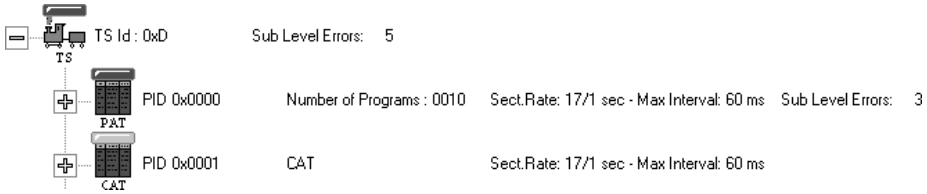


- Select **More information** to control the Hierarchic view display of additional information to the right of the standard icon information. During normal operation, you can press F6 to toggle this selection. The **More information** option is not selected in the standard configuration.

The standard configuration:

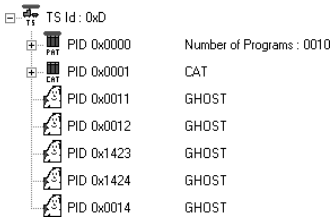


With **More information** selected:

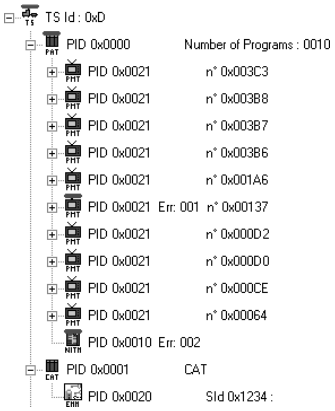


Number of Levels to Display. This option controls how many hierarchy levels are shown in the Hierarchic view. Click the arrow to reveal the choices; each choice includes the keyboard F-key equivalent, which you can use to expand or collapse the hierarchy during normal operation. The default selection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

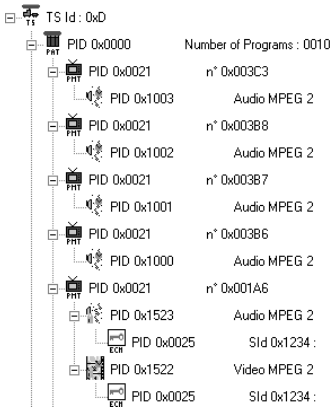
Select **1 F7** or press F7 to hide all but the top-level hierarchy items.



Select **2 F8** or press F8 to show only the top two hierarchy levels.



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

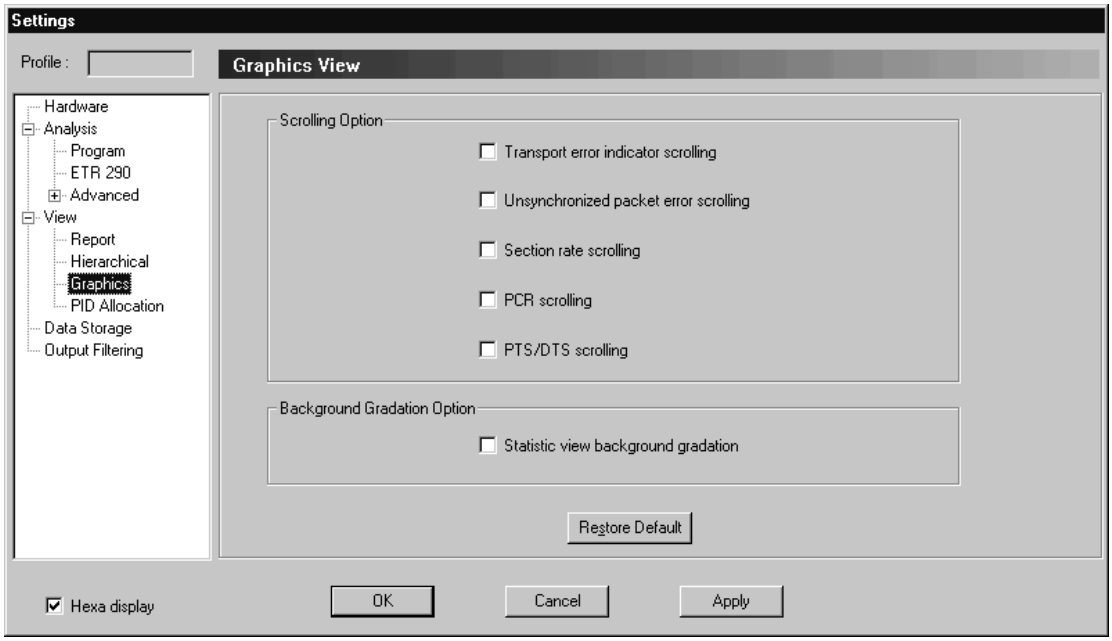


Restore Default. Click **Restore Default** to restore the standard selections.

View:Graphics Panel

Select **View:Graphics** in the Settings window hierarchy to open the Graphics View configuration panel (shown below). Use this view to set options that determine how the RTA updates the various analysis graphs.

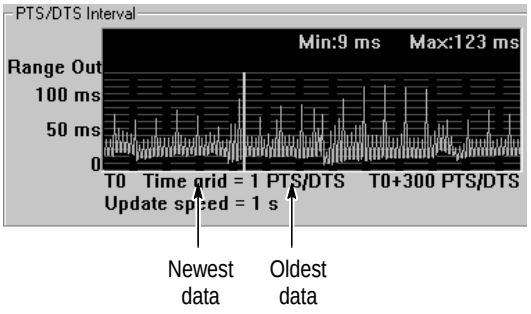
In the standard configuration, scrolling is disabled for all graph types.



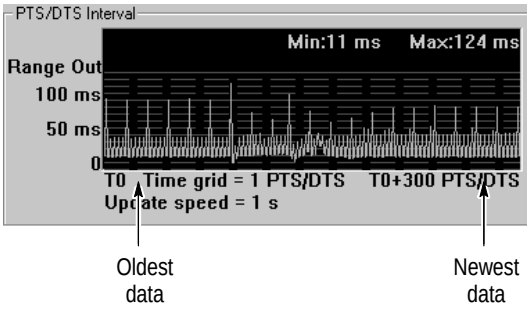
The Graphics View panel contains the following configuration options:

Scrolling Option. When scrolling is disabled for a graph, the passage of time is indicated with a moving cursor that 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.

Scrolling disabled



Scrolling enabled



When scrolling is enabled for a graph, 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.

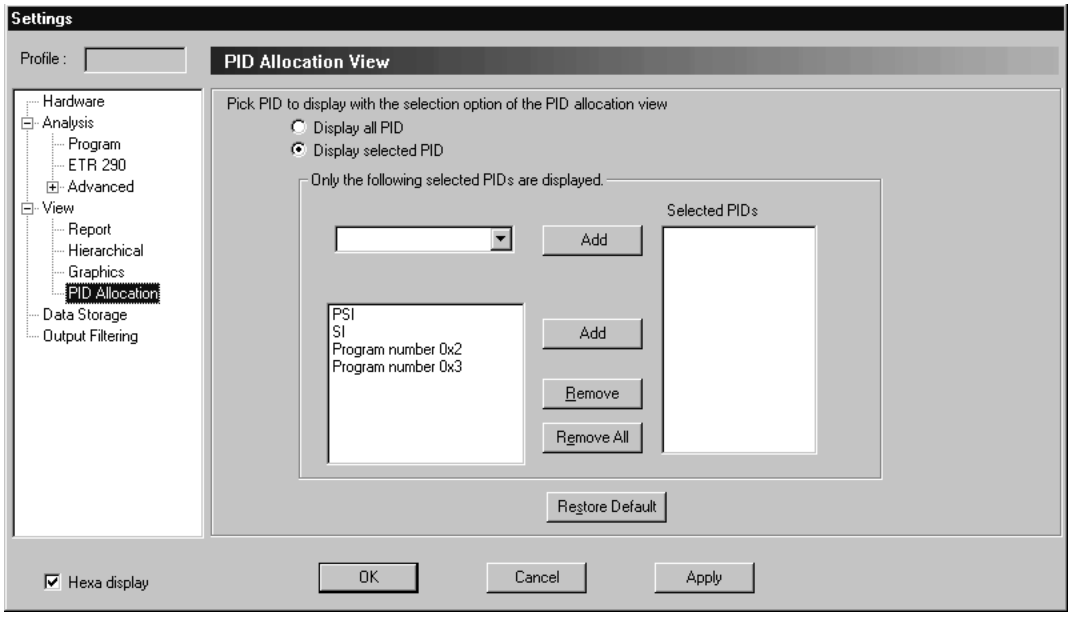
Background Graduation Option. Select this option to enable or disable Statistic view background gradation.

Restore Default. Click **Restore Default** to restore the standard selections.

View:PID Allocation Panel

Select **View:PID Allocation** in the Settings window hierarchy to open the PID Allocation View configuration panel (shown below). Use this panel to select which PIDs are displayed in the PID Allocation panel when Selection is selected (refer to *PID Allocation Panel* on page 2–46). You will free RTA resources by limiting the number of displayed PIDs.

When you click the **Selection** button in the PID Allocation panel, the PIDs referenced in this PID Allocation View panel are displayed. You can add and remove PIDs from the PID Allocation panel by performing a drag-and-drop action on stream icons between the Hierarchic view and the PID Allocation panel in the Client view. Doing so will automatically update this configuration panel.



The PID Allocation View panel contains the following configuration options:

Pick PID to Display with the Selection Option of the PID Allocation View.

- Select **Display all PID** to display all PIDs
- Select **Display selected PID** to enable the lower portion of the panel where you select which PIDs to display

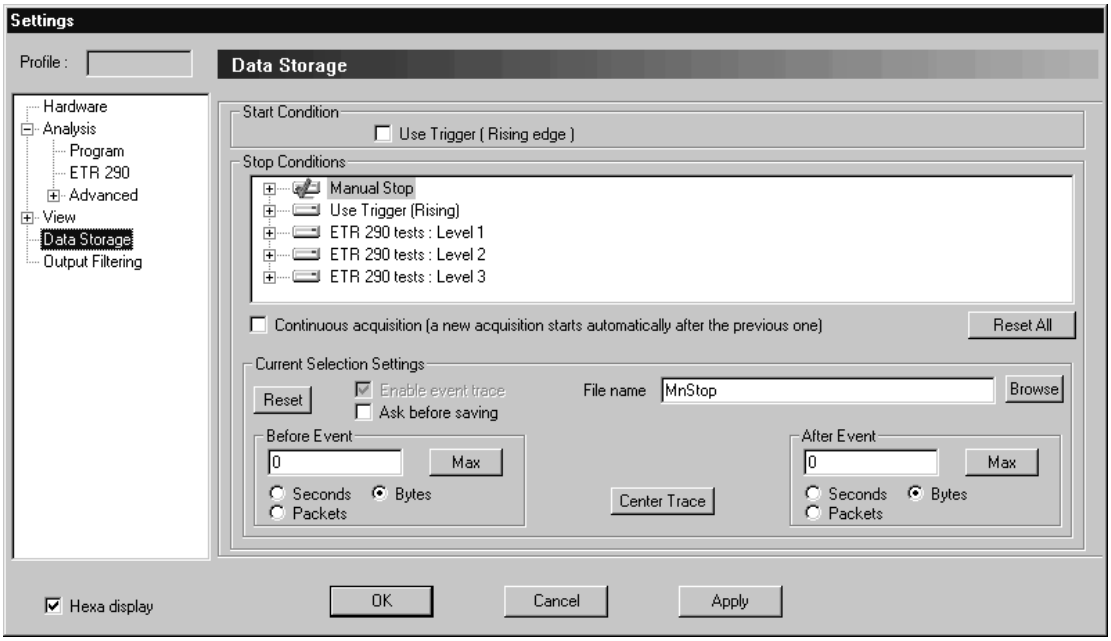
Only the Following Selected PIDs are Displayed. This portion of the panel becomes active only after you have selected **Display selected PID** in the above option. You can then select an individual PID number from the top list box or you can select a group of PIDs from the bottom list box.

Restore Default. Click **Restore Default** to restore the standard selections.

Data Storage Panel (MTS 215 Only)

Select **Data Storage** in the Settings window hierarchy to open the Data Storage configuration panel (shown below). This panel is present only in the MTS 215, which contains both the RTA and the Data Store system. Use the Data Storage 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.

Refer to *Capturing Input Streams (MTS 215 only)* on page 2–96 for complete instructions on how to capture input streams.



The Data Storage panel contains the following configuration options:

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 RTA 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 (*Rising/Falling* edge)** to also make it possible to initiate acquisition with a rising or falling TTL-level signal applied to the RTA Trigger input. The selection between a rising- or falling-edge trigger signal is set using the Hardware configuration panel and its setting appears after Use Trigger. Refer to *Hardware Panel* on page 3–48 for additional information.

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

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

- External TTL-level trigger
- All level 1 ETR 290 tests
- Individual level 1 ETR 290 tests
- All level 2 ETR 290 tests
- Individual level 2 ETR 290 tests
- All level 3 ETR 290 tests conducted by the RTA
- Individual level 3 ETR 290 tests

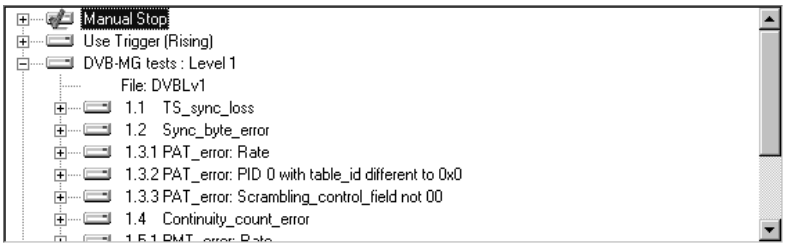
NOTE. *A selected Stop condition must be detected by the RTA to cause data storage. Always confirm that the related analysis or probe is enabled before beginning data acquisition. To confirm that a ETR 290 test is enabled, open the ETR 290 view and verify that the test indicator is colored green, orange, 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.

Continuous Acquisition. 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 **Continuous acquisition**. 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 continuous acquisition is enabled.

To select Stop conditions,

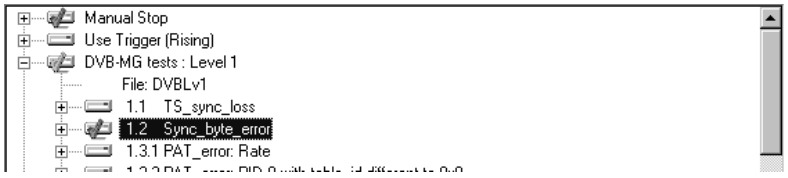
1. If necessary, click the appropriate "+" box to expand the hierarchy and then click the hard disk icon of the desired Stop condition. You can click the "ETR 290 tests: Level *n*" icon to select all ETR 290 tests in the level.



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 "ETR 290 tests: Level *n*" disk icon to show that one of the tests in that level is selected.

You can also select Stop conditions by selecting **Enable event trace** when the desired test is highlighted in the Stop conditions hierarchy.



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* on page 3–89 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 3–90 for more information.

3. Repeat steps 1 and 2 for each Stop condition that you want to detect and trace.

4. Select **Continuous acquisition**, 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 settings and close the window.

File Name. 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 an ETR 290 error, you can later examine the event trace file with the Deferred Time Analyzer application to determine the causes or effects of the error.

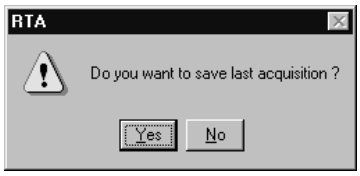
- An event trace file name is automatically assigned when you select a Stop condition. For example, the file name for an ETR 290 1.1 (TS_sync_loss) error trace is ETR11*nn*.trp, where "*nn*" is a hexadecimal number assigned when the file is created. When the first ETR 290 1.1 error is detected, the RTA saves ETR1100.trp. File names increment (ETR1101.trp, ETR1102.trp, etc.) 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 (ETR11*.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).

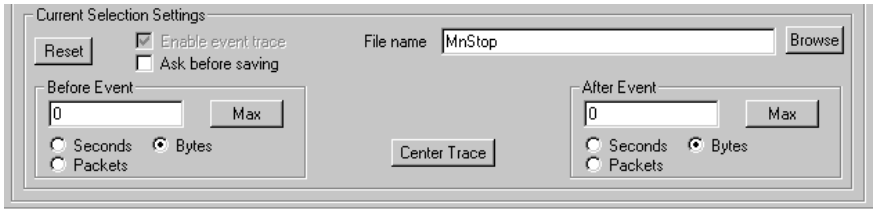
Enable Event Trace. When you click **Enable event trace**, the selection status (selected or not selected) of the currently highlighted Stop condition toggles.

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 Output Filtering configuration panel (refer to *Output Filtering* on page 3–94).



- 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 ETR 290 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 Output Filtering settings panel, select **No PID filtered**.
   b. On the Data Storage settings panel, 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 RTA saves the specified portion of the input stream to the file MnStop*nn*.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 MnStop*nn*.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.[5] 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 ETR 290 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.

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2. To capture the 5 Mbytes of data immediately preceding the first level 1 ETR 290 error in the stream:
   a. Select **ETR 290 view** from the View menu and then click **Detailed**. Confirm that all Priority 1 tests are active (no indicators are gray).
   b. On the Output Filtering settings panel, select **No PID filtered**.

5 Refer to the *MTS200 Series MPEG-2 DVB/ATSC System Analyzer User Manual, Tektronix part number 071-0532-XX*, for additional information about file management on the data store disks.

c. On the Data Storage settings panel, click **Reset All** and then click the "ETR 290 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** from the Data Storage menu (or click the **Start acquisition** toolbar button).

When the next Priority 1 ETR 290 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 ETRLv1*nn*.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 (ETR 290 3.1.1), an SDT_error (ETR 290 3.5.2), or an EIT_error (ETR 290 3.6.2):

a. Select **ETR 290 view** from the View menu and then click **Detailed**. Confirm that NIT_error (ETR 290 3.1.1), SDT_error (ETR 290 3.5.2), and EIT_error (ETR 290 3.6.2) tests are active.

b. On the Output Filtering settings panel, 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 **Add** button; highlight SI in the left-hand list and again click **Add**.

c. On the Data Storage panel, click **Reset All**; then, in the **Stop conditions** list, click the "+" box next to the "ETR 290 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** from the Data Storage menu (or click the **Start acquisition** toolbar 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 ETR 290 3.1.1 error are stored on the Single shot partition of the Data Store disks as ETR311*nn*.trp.
- Files for ETR 290 3.5.2 errors are named ETR352*nn*.trp.
- Files for ETR 290 3.6.2 errors are named ETR362*nn*.trp.

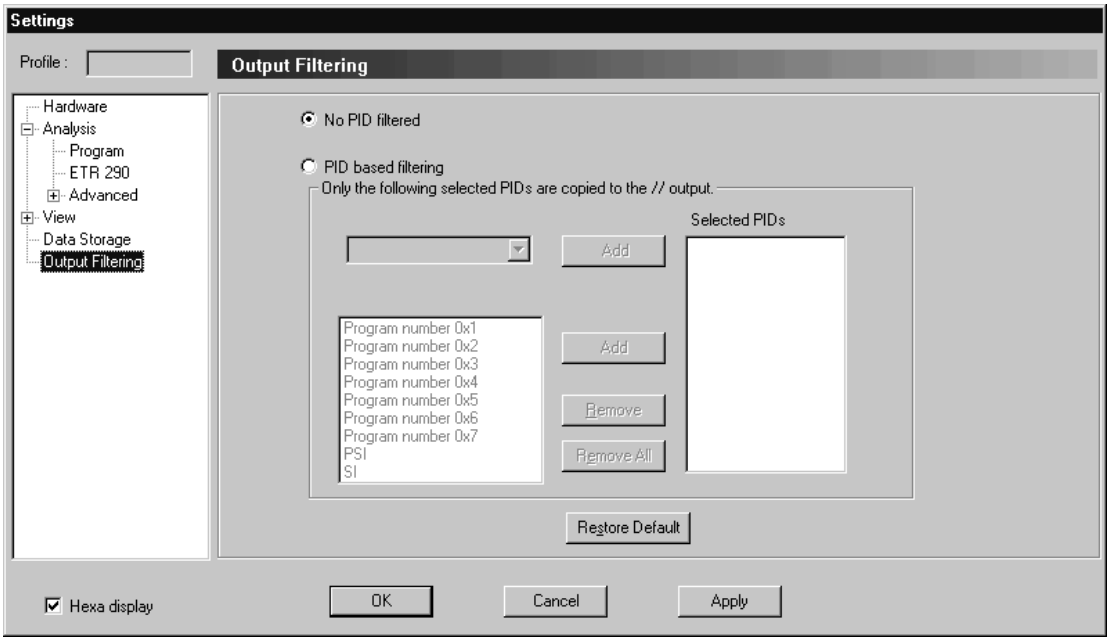
In each of the above file names, "*nn*" is a hexadecimal number that is 00 for the first file saved and increments for each subsequent file with the same root name (ETR352, for example).

h. To stop acquisition, select **Stop** from the Data Storage menu (or click the **Stop acquisition** toolbar button).

i. The RTA saves the last 5 Mbytes of acquisition to MnStop*nn*.trp, also on the Single shot Data Store partition.

Output Filtering Panel

Select **Output Filtering** in the Settings window hierarchy to open the Output Filtering configuration panel (shown below). Use this panel to 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.



The Output Filtering panel contains the following configuration options:

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

PID Based Filtering. When you select **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 list box and click the adjacent (upper) **Add** 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 list box and click the upper **Add** 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 list box and click the adjacent (lower) **Add** 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 list box and click the lower **Add** 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**.

Restore Default. Click **Restore Default** to restore the standard selections.

Appendices

Appendix A: ETR 290 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 (RTA) performs most first, second, and third priority ETR 290 measurements at user request. Table A–1 lists the measurements recommended in ETR 290 and indicates how the RTA performs each one.

Table A–1: ETR 290 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		●	
3.3	Buffer error			●

Table A–1: ETR 290 tests in the RTA (Cont.)

Test number	Test name	Automatic	User-requested	Not performed
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 *MTS200 Series MPEG-2 System Analyzer User Manual* for more information.

First Priority Measurements

The DVB-MG has identified the ETR 290 first priority parameters as .necessary for decodability.

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.

TS_Sync_Loss is the only ETR 290 parameter that is always monitored by the Real-Time Analyzer.

Error Precondition. 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 Sync Byte of every packet in the transport stream for correct contents.

Error Precondition. The precondition for a Sync_Byte_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

RTA Configuration. To configure the RTA to monitor for Sync_byte errors, activate the following probe:

ETR 290	Probe name	Settings window panel
1.2	Unsynchronized Packet Error	Analysis:Multiplex

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.

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for PAT errors, activate the following probes:

ETR 290	Probe name	Settings window panel
1.3.1	Maximum Interval Between Consecutive PAT Sections	Analysis:Rate:Section
1.3.2	Table ID Error (PAT)	Analysis:Syntax:Section
1.3.3	Reserved PID with TSC Error	Analysis:Syntax:Transport

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 used primarily 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.

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for continuity count errors, activate the following probe:

ETR 290	Probe name	Settings window panel
1.4	Continuity Counter Error	Analysis:Syntax:Transport

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.

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for PMT errors, activate the following probes:

Probe name	Settings window panel
Maximum Interval Between Consecutive PMT Sections	Analysis:Rate:Section
PMT PID with TSC Error	Analysis:Syntax:Transport

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 when you set the "Absence of reference PID" probe through the Multiplex Analysis configuration panel of the Settings window (refer to *Analysis:Advanced:Multiplex Panel* on page 3–55).

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for PID errors, activate the following probe:

ETR 290	Probe name	Settings window panel
1.6	Absence of Referenced PID Error	Analysis:Multiplex

Second Priority Measurements

The DVB-MG recommends "continuous or periodic" monitoring of second priority ETR 290 parameters.

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.

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for non-zero Transport_Error_indicator fields, activate the following probe:

ETR 290	Probe name	Settings window panel
2.1	Transport Error Indicator	Analysis:Syntax:Transport

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).

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for CRC errors, activate the following probe:

ETR 290	Probe name	Settings window panel
2.2	CRC Error	Analysis:Syntax:Section

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.

Error Precondition. 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.

RTA Configuration. To configure the RTA to monitor for PCR errors, activate the following probe:

ETR 290	Probe name	Settings window panel
2.3	PCR Timing Analysis[1]	Analysis:Timing:PCR[2]

1 This probe also monitors the selected program(s) for PCR_accuracy errors.

2 Can also activate through Hierarchic view PMT shortcut menus.

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.*

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for PCR_accuracy errors, activate the following probe:

ETR 290	Probe name	Settings window panel
2.4	PCR Timing Analysis[1]	Analysis:Timing:PCR[2]

1 **This probe also monitors the selected program(s) for PCR errors.**

2 **Can also activate through Hierarchic view PMT shortcut menus.**

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.

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for PTS errors, activate the following probe:

ETR 290	Probe name	Settings window panel
2.5	PTS/DTS Timing Analysis	Analysis:Timing:PTS/DTS[1]

1 **Can also activate through Hierarchic view Audio and Video stream shortcut menus.**

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.

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

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

RTA Configuration. To configure the RTA to monitor for CAT errors, activate the following probes:

ETR 290	Probe name	Settings window panel
2.6.1	Scrambling without CAT Error	Analysis:Multiplex
2.6.2	CAT Table ID Error	Analysis:Syntax:Section

Third Priority Measurements

The RTA continuously monitors the following third priority parameters. You can check the three remaining third priority parameters with the MTS 215 Deferred-Time Analyzer application.

NIT_error (3.1)
SDT_error (3.5)
EIT_error (3.6)
RST_error (3.7)
TDT_error (3.8)

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.

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 using the Section Rate Analysis configuration panel of the Settings window (refer to *Analysis:Advanced:Rate:Section Panel* on page 3–74). Do not change any Maximum interval settings, however, if you plan to use ETR 290 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.**

Error Precondition. 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 (for example 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

RTA Configuration. To configure the RTA to monitor for SI Table ID errors, activate the following probes:

ETR 290	Probe name	Settings window panel
3.1.1	NIT Table ID Error	Analysis:Syntax:Section
3.5.2	SDT Table ID Error	Analysis:Syntax:Section
3.6.2	EIT Table ID Error	Analysis:Syntax:Section
3.7	RST Table ID Error	Analysis:Syntax:Section
3.8.2	TDT Table ID Error	Analysis:Syntax:Section

To configure the RTA to monitor for NIT, SDT, EIT, RST, and TDT Repetition errors, activate the following probes:

ETR 290	Probe name	Settings window panel
3.1.2	All NIT section rate probes	Analysis:Rate:Section
3.5.1	All SDT section rate probes	Analysis:Rate:Section
3.6.2	All EIT section rate probes	Analysis:Rate:Section
3.8.1	All TDT section rate probes	Analysis:Rate:Section

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 using the Section Rate Analysis panel of the Settings window (refer to *Analysis:Advanced:Rate:Section Panel* on page 3–74). Do not change any Maximum interval settings, however, if you plan to use ETR 290 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.**

Error Precondition. 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

RTA Configuration. To configure the RTA to monitor for SI Repetition errors, activate the following probes:

ETR 290	Probe name	Settings window panel
3.2	Max/Min Interval Between Consecutive SI Sections (All SI tables, all PIDs)	Analysis:Rate:Section (Select **Add all**)

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).

Error Precondition. 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.

RTA Configuration. To configure the RTA to monitor for Unreferenced PID errors, activate the following probe:

ETR 290	Probe name	Settings window panel
3.4	Ghost Packets Error	Analysis:Multiplex

Appendix B: ATSC Program Paradigm

The ATSC program paradigm specifies the method to be used for allocating the values of the Packet Identifier (PID) field of the transport packet header in a systematic manner. Within one transport multiplex, television programs that follow the ATSC program paradigm are assigned a program number ranging from 1 to 255. The binary value of the program number is used to form b_{11} through b_4 of the PID. Programs adhering to the paradigm shall have b_{12} equal to '0'. Programs not adhering to the paradigm shall have b_{12} equal to '1'.

Additionally: base_PID = program number <<4, where the program number refers to each program within one transport multiplex and corresponds to the 16-bit program_number identified in the PAT and PMT. The b_0 through b_3 of the PID are assigned according to Table B–1.

The paradigm to identify the transport bit streams containing certain elements of the program is defined in Table B–1.

Table B–1: PID assignment for the elementary streams of a program

Name	PID definition	Description
PMT_PID	base_PID+0x0000	PID for the bit stream containing the program_map_table for the program.
Video_PID	base_PID+0x0001	PID for the bit stream containing the video for the program.
PCR_PID	base_PID+0x0001	Implies the video bit stream also carries the PCR values for the program.
Audio_PID	base_PID+0x0004	PID for the bit stream containing the primary audio for the program. The primary audio shall be a complete main audio service (CM) as defined by ATSC Standard A/52 and shall contain the complete primary audio of the program including all required voice-overs and emergency messages.
Data_PID	base_PID+0x000A	PID for the bit stream containing the data for the program.

The program_map_table must be decoded to obtain the PIDs for services not defined by the paradigm but included within the program (such as a second data channel). According to the program paradigm, every 16th PID is a PMT_PID and may be assigned to a program. If a PMT_PID is assigned to a program by the program paradigm, the next 15 PIDs after that PMT_PID are reserved for elements of that program and shall not be otherwise assigned.

Table B–2 lists the program paradigm errors for programs adhering to the program paradigm b_{12}=0.

Table B–2: Program paradigm errors

Error	Requirement	A/53 Annex C Paragraph 5.3
Bad program number assignment	program_number shall be ranged from 1 to 255.	A_PSI_PRPA_001
Bad PMT_PID assignment	PMT_PID shall be equal to 'base_PID+0x0000.'	A_PSI_PRPA_002
Bad Video_PID assignment	If a program contains only one Video ES, this one shall be assigned to base_PID+0x0001. The PID of the other Video ES must be in the range [base_PID+0x0002; base_PID+0x000F], except the values (base_PID+0x0004, base_PID+0x000A).	A_PSI_PRPA_003
Bad PCR_PID assignment	If a program contains PCR data, this one shall be assigned to base_PID+0x0001.	A_PSI_PRPA_004
Bad Audio_PID assignment	If a program contains only one Audio ES, this one shall be assigned to base_PID+0x000f. The PID of the other Audio ES must be in the range [base_PID+0x0002; base_PID+0x000F], except the value base_PID+0x000f, base_PID+0x000A).	A_PSI_PRPA_005
Bad Data_PID assignment	If a program contains only one Data ES, this one shall be assigned to base_PID+0x000A. The PID of the other Data ES must be in the range [base_PID+0x0002; base_PID+0x000F], except the value (base_PID+0x0004, base_PID+0x000A).	A_PSI_PRPA_006
PID reserved by a program adhering to the program paradigm	The PID range from 0x0XX0 to 0x0XXF are reserved by programs adhering to the program paradigm with program_number = XX. These PIDs cannot be used elsewhere in the multiplex.	A_PSI_PRPA_007

Appendix C: Using the Private Syntax Interpreter

You can use the Private Syntax Interpreter to create and compile private syntax definitions for use with the Real-Time Analyzer (RTA). When you load the compiled definition through the RTA Syntactic Analysis panel of the Settings window, the RTA uses the definition to monitor and analyze the syntax of the corresponding private sections or private data descriptors that are contained in the input stream. Refer to *Analysis:Advanced:Syntax Panel* on page 3–57 for more information.

The Private Syntax Interpreter interface makes it possible to construct private syntax definitions of short private sections (section_syntax_indicator = 0), long private sections (section_syntax_indicator = 1), and private data descriptors.

These are the basic steps you use to construct and use private syntax definitions:

1. Open the desired private syntax template or existing file
2. Change parameters of existing syntax items (such as fields, loops, and if-then branches)
3. Add and edit syntax items in the template or existing file as necessary
4. Save the private syntax definition to a text file
5. Compile the text file to create a binary data file for use with the RTA
6. Load the binary data file into the RTA using the Syntactic Analysis panel of the Settings window

This appendix contains the following information:

Private Syntax Interpreter Interface

This section provides information describing how to start the Private Syntax Interpreter application and how to use the elements of the application display.

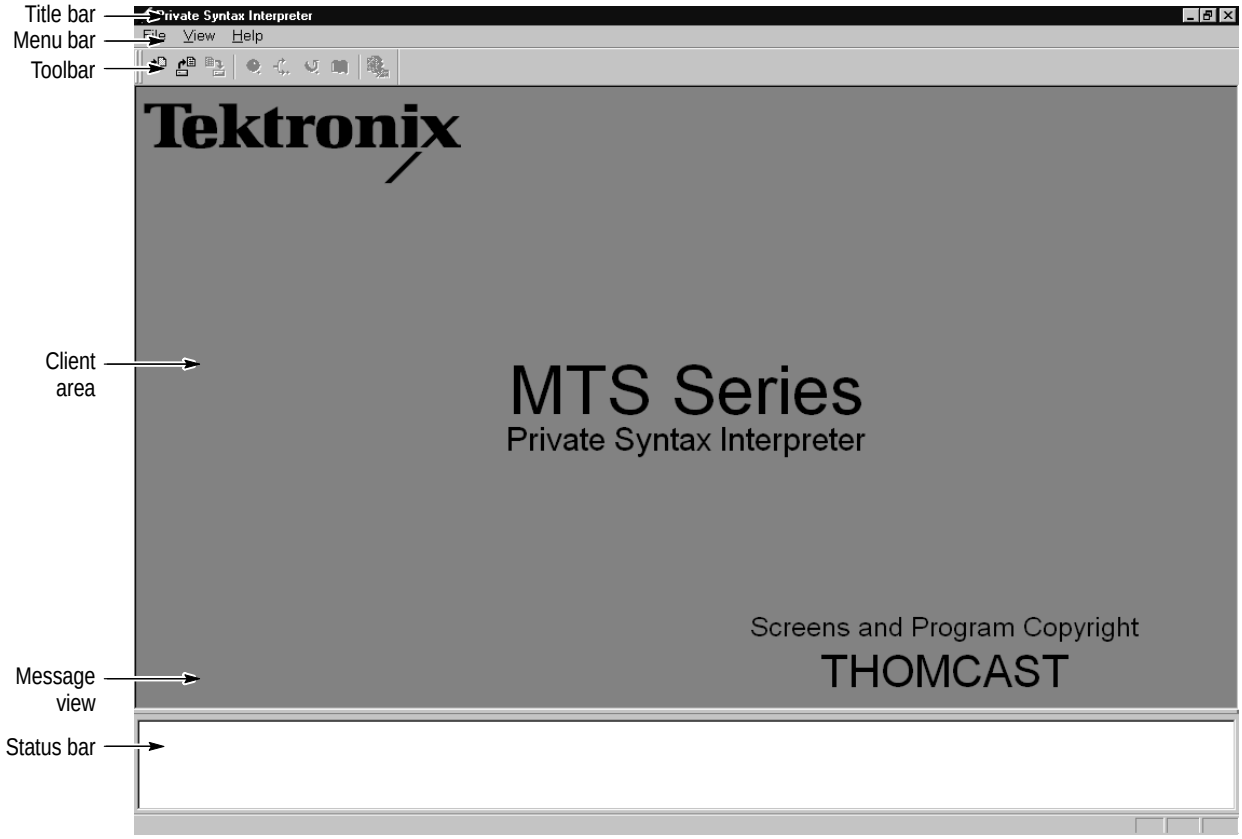
Starting the Application

Once you have logged in to the MTS200 Series system, you can start the Private Syntax Interpreter application using one of the following two methods:

- Select **Private Syntax Interpreter** from the Windows NT Start menu
- Double-click the **Private Syntax Interpreter** icon in the **Tektronix MPEG Test System** window

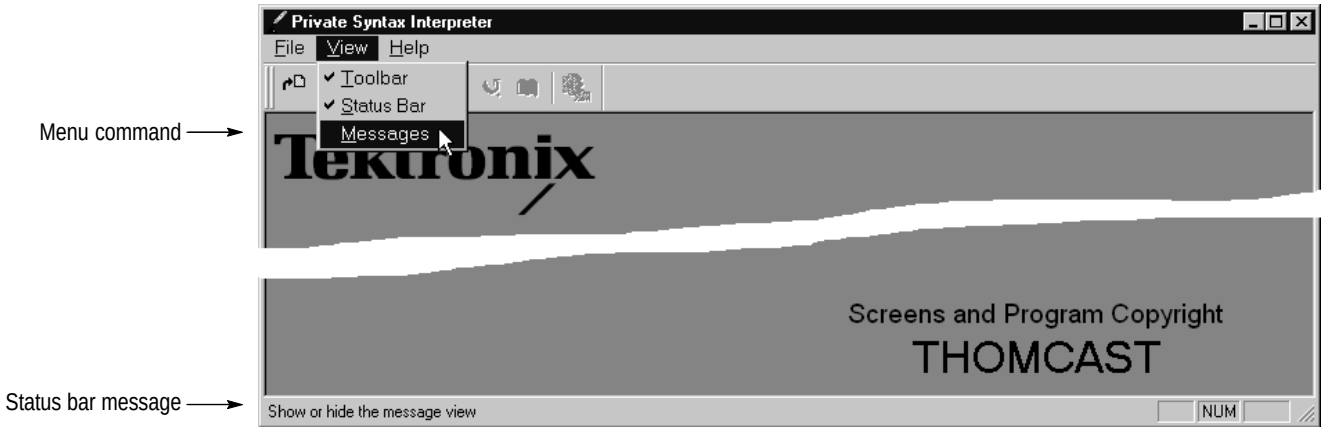
Elements of the Application Window

The Private Syntax Interpreter application window is shown below.



The Private Syntax Interpreter window contains the following elements:

- **Title Bar.** In addition to identifying the Private Syntax Interpreter application, the title bar indicates which private syntax text file is open, or if more than one text file is open, the title bar indicates which text file is currently selected.
- **Menu Bar.** The menu bar provides access to the various Private Syntax Interpreter command menus. Refer to *Menu Bar* on the following page for descriptions of the menu functions available within the menu bar.
- **Toolbar.** The toolbar contains graphical command buttons for many of the most-used menu commands. Refer to *Toolbar* on page C–6 for more information.
- **Client Area.** The Client area provides the workspace for creating and editing private syntax table or descriptor definitions.
- **Message View.** The Message view provides a place for operational messages to be displayed. This area is not displayed except when appropriate (refer to *Message View* on page C–11 for more information). You can manually display this area by selecting Messages from the View menu.
- **Status Bar.** The status bar displays first-level help messages about the Private Syntax Interpreter menus and icons pointed to by the mouse (as shown below).



Menu Bar. The menu bar contains the Private Syntax Interpreter menus. Listed below are the functions available in each of the menus.

- **File Menu.** The File menu contains standard Windows NT file management commands. Table C–1 describes the menu selections available in the File menu.

Table C–1: Menu bar File menu

Menu selection	Function
New	Create a new table/descriptor text file
Open	Open an existing table/descriptor text file
Close	Close the active table/descriptor text file
Close all	Close all table/descriptor text files
Save	Save the active table/descriptor text file
Save as	Save the active table/descriptor text file with a new name
Print	Print the active document
Print setup	Change the printer and printing options
Exit	Exit the application; will prompt to save documents

- **Edit Menu.** The Edit menu is present only when a private syntax editing window is open. This menu contains commands for editing the various syntax components and for compiling the syntax definition. Table C–2 describes the menu selections available in the Edit menu.

Table C–2: Menu bar Edit menu

Menu selection	Function
Undo	Undo the last action
Add field	Add a new field to the active table/descriptor text file
Add condition	Add a new condition to the active table/descriptor text file
Add loop	Add a new loop to the active table/descriptor text file
Add descriptor	Add a new descriptor to the active table/descriptor text file
Compile	Compile the active table/descriptor text file
Delete	Delete the selection
Copy	Copy the selection and put it on the Clipboard
Paste	Paste the Clipboard contents

- **View Menu.** The View menu contains commands for changing the appearance of the Private Syntax Interpreter application window. Table C–3 describes the menu selections available in the View menu.

Table C–3: Menu bar View menu

Menu selection	Function
Toolbar	Display or hide the toolbar
Status bar	Display or hide the status bar
Messages	Display or hide the message view

- **Window Menu.** The Window menu, present only when one or more syntax windows are open in the Client area, contains commands for managing the various syntax windows. Table C–4 describes the menu selections available in the Window menu.

Table C–4: Menu bar Window menu

Menu selection	Function
Cascade	Arrange the Client area windows so that they overlap
Tile	Arrange the Client area windows as non-overlapping tiles
Arrange icons	Arrange the icons at the bottom of the Client area if you have reduced the Client area windows to icons

- **Help Menu.** The Help menu provides access to Private Syntax Interpreter online help and version information. Table C–5 describes the menu selections available in the Help menu.

Table C–5: Menu bar Help menu

Menu selection	Function
Help topics	Open the Private Syntax Interpreter help window
About Private Syntax Interpreter	Display program information, version number, and copyright

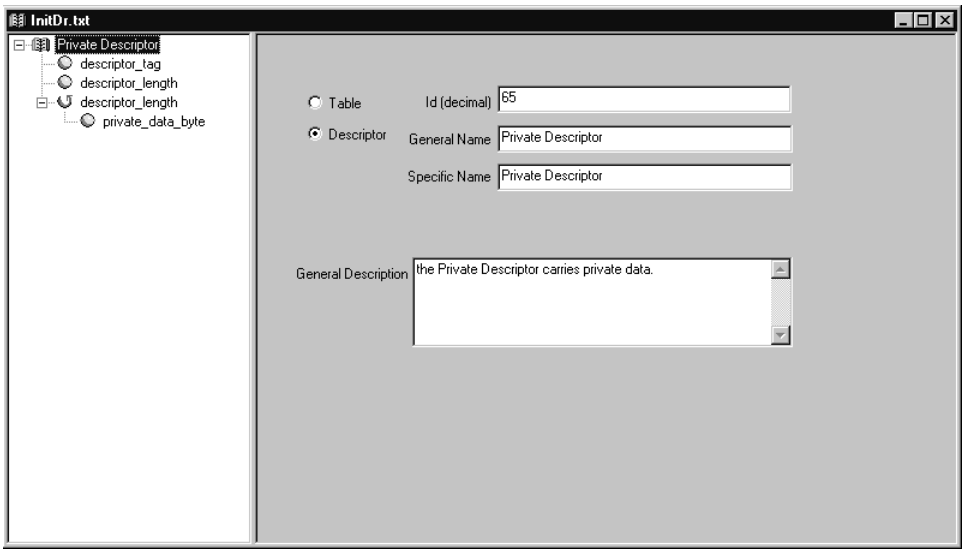
Toolbar. The toolbar command buttons are shortcuts to various menu commands. Table C–6 describes the functions available in the toolbar.

Table C–6: Private Syntax Interpreter toolbar buttons

Button	Equivalent menu command	Function
	File menu: New	Create a new table/descriptor text file
	File menu: Open	Open an existing table/descriptor text file
	File menu: Save	Save the active table/descriptor text file
	Edit menu: Add Field	Add a new field to the active table/descriptor text file
	Edit menu: Add Condition	Add a new condition to the active table/descriptor text file
	Edit menu: Add Loop	Add a new loop to the active table/descriptor text file
	Edit menu: Add Descriptor	Add a new descriptor to the active table/descriptor text file
	Edit menu: Compile	Compile the active table/descriptor text file

Table/Descriptor Window

The Table/Descriptor window (shown below) is used for assembling and editing tables or descriptors syntax. The window is divided into two portions: the Hierarchic view and the Characteristics view. The Characteristics view displays different panels depending on which Hierarchic view icon is selected.



Hierarchic View. The Hierarchic view displays all the items related to making a table/descriptor pattern as well as the labels associated to each item. An item can be the root of the table/descriptor pattern, a field of the private syntax, a loop of items, a conditional branch of items, or a descriptor space reservation.

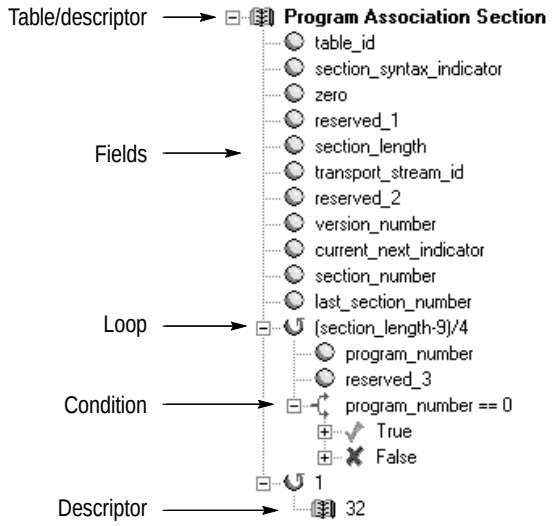


Table C–7 lists the icon types found in the Hierarchic view and the meaning of their associated labels.

Table C–7: Hierarchic view icons and label descriptions

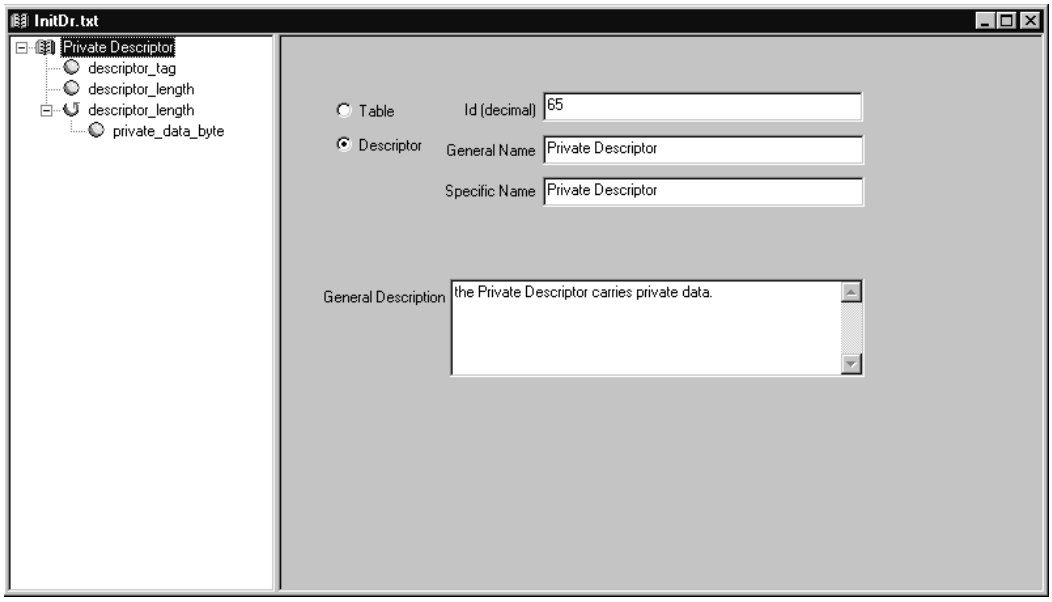
Icon type	Description
Table/descriptor	This icon gathers the characteristics of the table/descriptor when located at the top of the tree. The label is then the name of the table/descriptor. If not at the top of the tree, the descriptor icon represents a space reserved for a descriptor and the label indicates the length in bytes.
Field	The field icon labels are the unique field ID for the associated field.
Loop	The loop icon label indicates the number of iterations of this branch.
Condition	The condition icon label indicates the validity of the conditional branch.
True	The true icon indicates the conditional branch in case the previous condition expression is valid.
False	The false icon indicates the conditional branch in case the previous condition expression is valid.

Table Panel. The Table panel (shown below) appears in the Characteristics view when you select the root icon in the Hierarchic view.

After you have defined the type of private syntax by selecting **Table** or **Descriptor**, enter the **Id (decimal)** value (table ID or descriptor tag) of the private syntax you are editing.

***NOTE**. Table or descriptor ID decimal values cannot exceed 255. In addition, decimal values cannot be one of the following because they are reserved: 0 (PAT); 1 (CAT); 2 (TSDT); 66 and 70 (SDT); 200 and 201 (VCT).*

The **General Name**, **Specific Name**, and **General Description** fields are optional fields to let you enter more information about the private syntax you are editing.

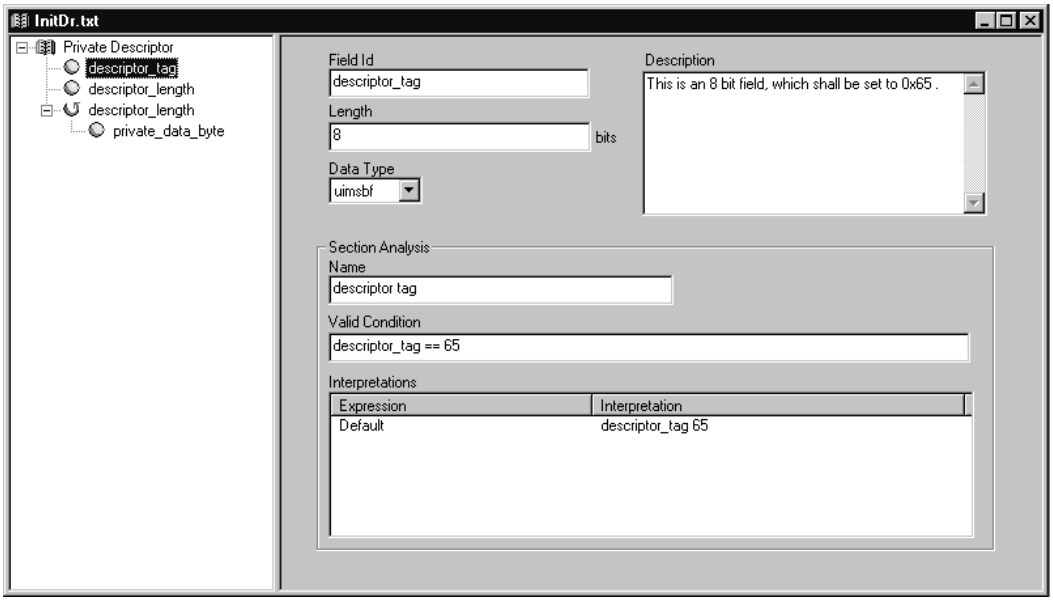


Field Panel. The Field panel (shown at the top of the following page) appears in the Characteristics view when you select a field icon in the Hierarchic view. This panel allows you to enter the unique **Field Id**. The panel provides the **Length** in bits of the field. In addition, the **Name** and **Description** fields give more information about the selected field icon.

The **Data Type** selection determines the interpretation of field data bits according to their type and order of transmission. Select the appropriate interpretation from the drop-down list (bslbf, rpchof, tbsv, or uimsbf).

The **Valid Condition** field declares the condition under which a field shall be considered valid or not.

At the bottom of the Field panel appears the list of **Interpretations**, which is a list of pairs (expression, interpretation). They are checked following the top-to-bottom order that they are listed. The interpretations indicate what descriptor will appear to the right of the item in the Section Analysis view of the RTA application.

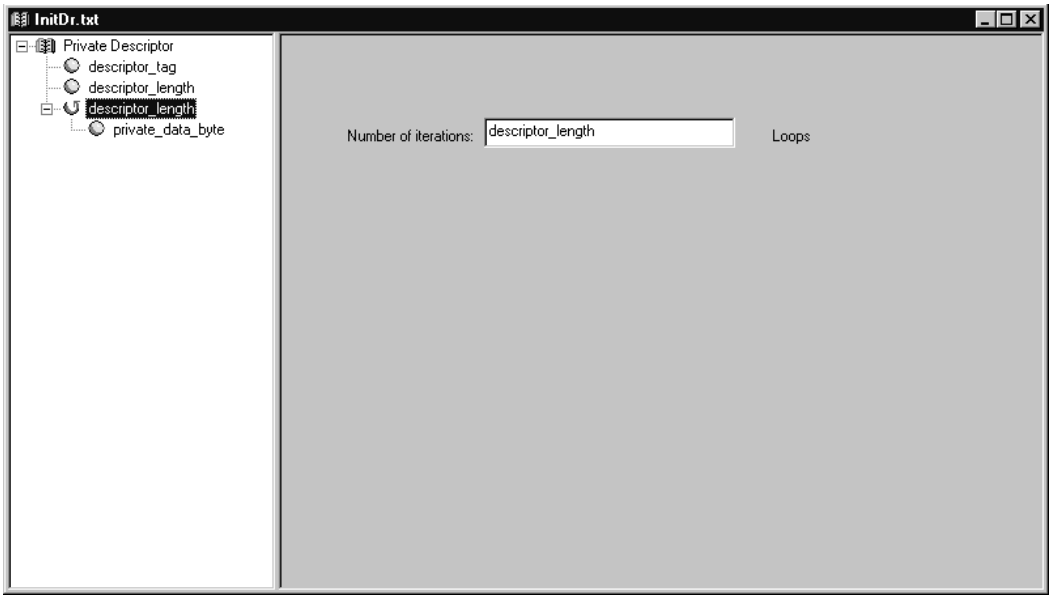


Expression Panel. The Expression panel (shown below) appears in the Characteristics view when you select a Condition, Loop, or Descriptor icon not located at the top of the Hierarchic view.

When you select a Condition icon in the Hierarchic view, the expression field is the test of the condition. The calculation of this field will determine whether the condition is true or false.

When you select a Loop icon in the Hierarchic view, the expression field indicates the number of iterations of the loop.

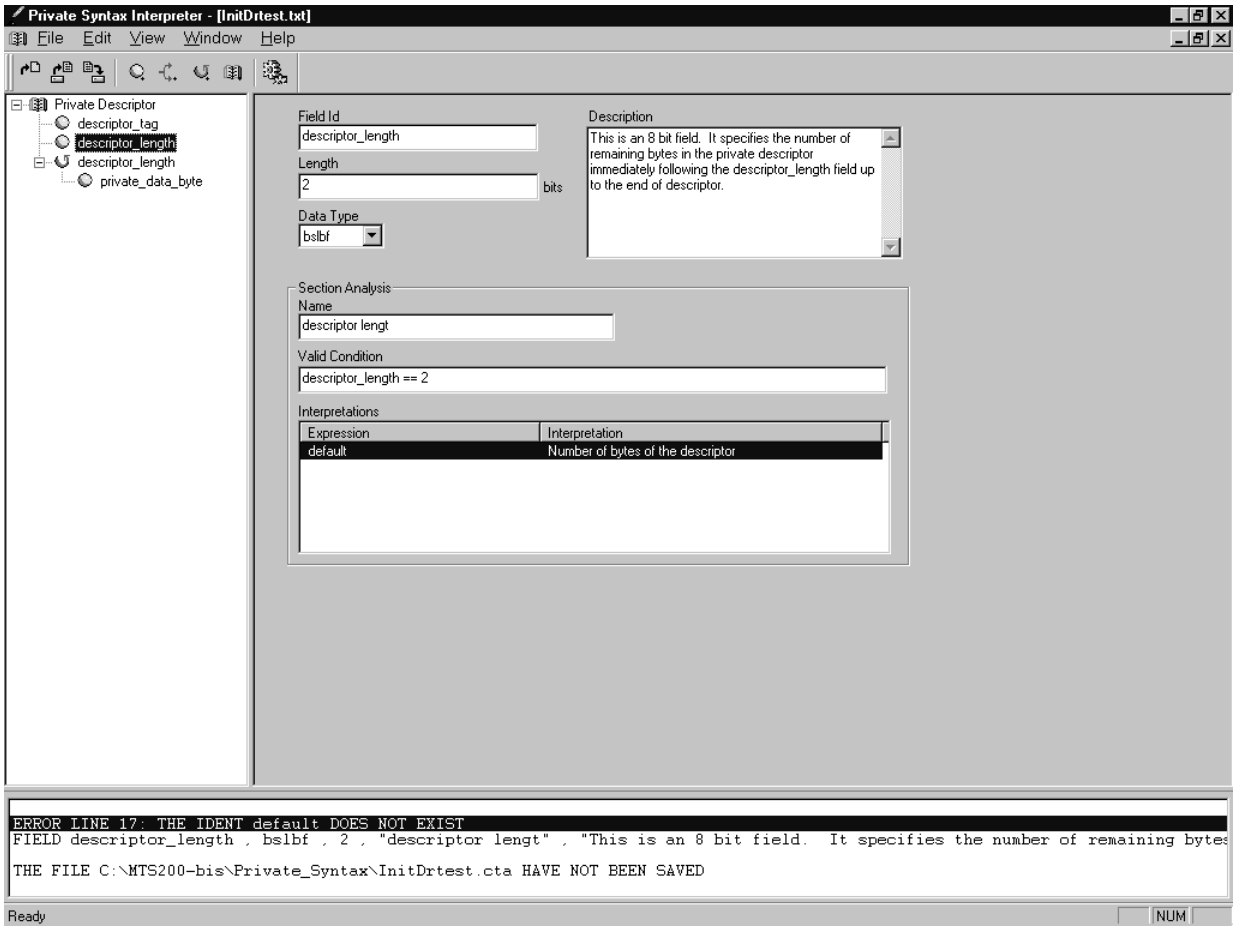
When you select a Descriptor icon in the Hierarchic view, the expression field indicates the space in bytes occupied by this item.



Message View

The Message view (as shown below) appears on the bottom of the application window when you compile the private syntax you are editing.

If any errors occur during compiling, the Message view displays appropriate error messages. If you double-click on an error message that contains the text: ERROR LINE <*number*>, the application highlights the erroneous item in the Hierarchic view.



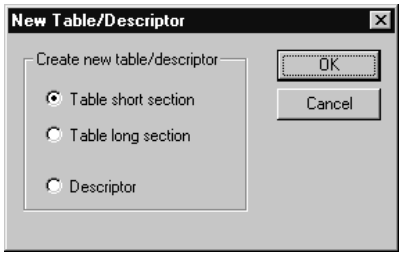
Editing Private Syntax Definitions

The editing of a private syntax definition consists of creating, modifying, and saving the pattern of a syntax definition. This pattern is made of syntax fields organized around loops, conditional branches, and space reservation for descriptors.

Private syntax definitions reside in text (.txt) files. The application uses standard Windows NT file management techniques to create, open, and save private syntax definition files.

Creating a New Private Syntax Definition File

To create a new private syntax definition, select **New** from the File menu or click the **New** toolbar button (refer to *Toolbar* on page C–6). The following **New Table/Descriptor** dialog box appears.



Select **Table short section** to define a new short private section syntax with the section_syntax_indicator field set to ‘0’.

Select **Table long section** to define a new long private section syntax with the section_syntax_indicator field set to ‘1’.

Select **Descriptor** to define a private syntax descriptor.

Click **OK** to open a section or descriptor template in the Private Syntax Interpreter. Client area.

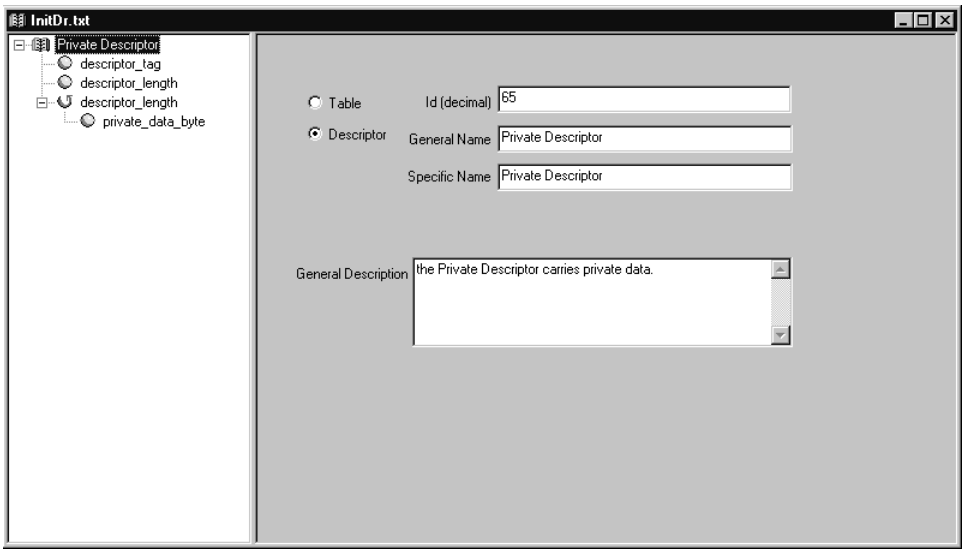
CAUTION. *Always save new syntax definitions under a new, unique filename. It is possible to modify and replace the default template files (InitDr, InitLg, and InitSt). Do not do so without saving a backup of the original template. Refer to* Saving a Private Syntax File *on page C–20 for instructions.*

Editing an Existing Private Syntax Definition File

To open an existing private syntax definition, select **Open** from the File menu or click the **Open** toolbar button (refer to *Toolbar* on page C–6). The standard Windows NT **Open** dialog box appears. Enter or select the file name and then click **OK** to open the private syntax definition window in the Client area.

Private Syntax Definition Window

When you create or open a private syntax definition, a Private Syntax Definition window appears within the application window. The Private Syntax Definition window is divided into two portions: the Hierarchic view and the Characteristics view. The Characteristics view contains the parameters that define the selected Hierarchic view icon. The Characteristics view displays different definition panels depending on which Hierarchic view icon is selected.



To completely expand the Hierarchic view, press the numeric keypad asterisk (*) key. To expand hierarchy items designated with a "+" symbol, click the symbol. The long private section, short private section, and descriptor template hierarchies expand as shown below.

The private syntax hierarchies are consistent with the ISO/IEC presentation of section syntax (refer to Table C–13 on page C–24). Use standard Windows NT mouse and cursor-key techniques to navigate within the hierarchies.

Table long section

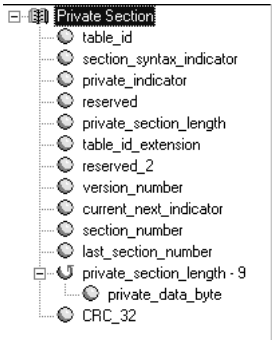
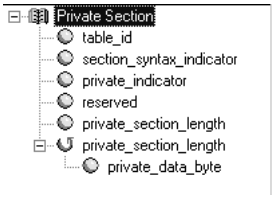
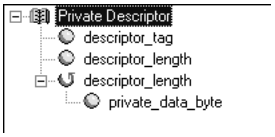


Table short section

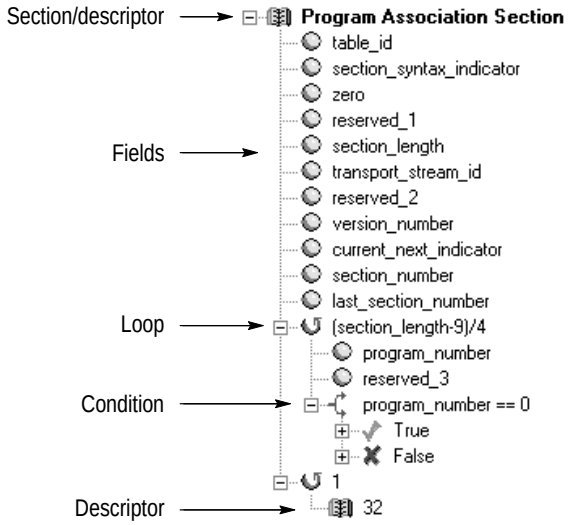


Descriptor



Adding and Editing Hierarchy Items

The hierarchy is a collection of syntax fields organized around loops and conditional branches as well as descriptors. The hierarchy root is a table item and is the only mandatory hierarchy item.

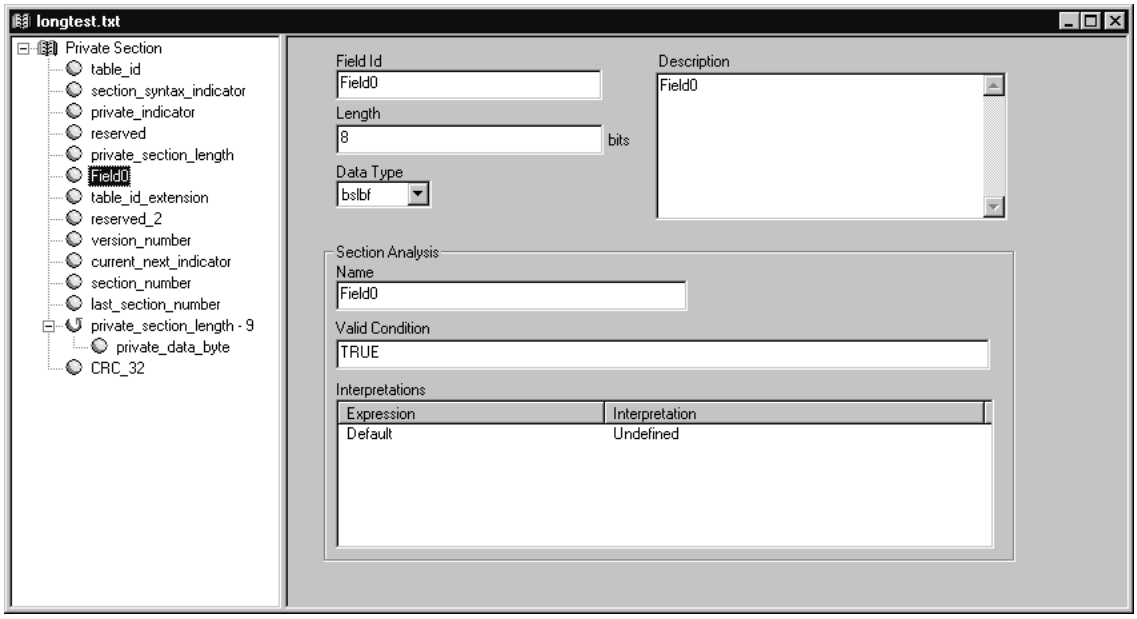


To add a new item to the section or descriptor, select (highlight) the hierarchy item that is to be the parent of the new item. Then choose **Add Field** from the Edit menu or click the **Add Field** toolbar button (refer to *Toolbar* on page C–6). Table C–8 lists the position in the hierarchy that added items appear.

Table C–8: Hierarchy position of added items

Selected item	Position of added item
Section/descriptor	Right after the selected item if it is a descriptor; at the end of the hierarchy if the table is a root item
Field	Immediately following the selected field
Condition	Immediately following the conditional branch
(Condition) True	Last item of the true conditional branch
(Condition) False	Last item of the false conditional branch
Loop	Last item of the loop branch

You can copy or delete existing hierarchy items using the Edit menu Delete, Copy, and Paste commands. You can also move existing hierarchy items by performing a drag-and-drop action on the item.



When you add a field hierarchy item, the Field panel appears in the Characteristics view as shown above. The default parameters for added field items are listed in Table C–9.

Table C–9: Default parameters for added private syntax fields

Field parameter	Default value
Field ID	Field <*n*>[1]
Length	8 bits
Data type	bslbf
Description	Field <*n*>[1]
Name	Field <*n*>[1]
Valid condition	True
Interpretations	
Expression	Default
Interpretation	Undefined

1 **The number <*n*> starts at 0 for the first added field and increments with each new field insertion.**

Data Types. The four available data types are defined in Table C–10. These are the different data types supported by digital television standards and the application.

Table C–10: Private syntax data type definitions

Data type	Definition
bslbf	Bit string, left bit first
rpchof	Remainder polynomial coefficients, highest order first
tbsv	Text bit string value
uimsbf	Unsigned integer, most significant bit first

Expressions. An interpretation expression is a Boolean combination of operators and terminals. Table C–11 defines the operators you can use.

You can express conditional values in either hexadecimal or decimal base; that is, the following expressions are equivalent:

```
program_number == 422
program_number == 0x1A6
```

Table C–11: Private syntax expression operators and terminals

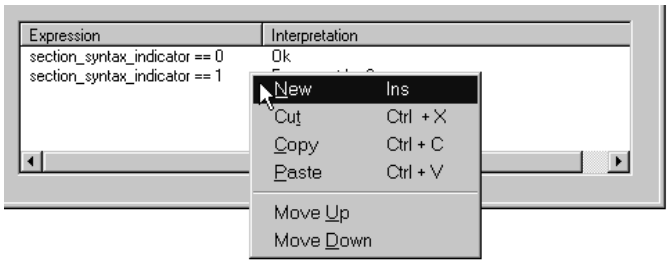
Type	Definition
Operators	
<	less than
>	greater than
<=	less than or equal
>=	greater than or equal
==	equal
!=	different
+	addition
–	subtraction
*	multiplication
/	division
||	OR
&&	AND
!	NOT
Terminals	
integer	
field ID	Unique identifier of a field
TRUE	
FALSE	
API_COMPUTE_CRC_32	Computed value of the CRC32 for the section
API_GET_VALIDITY	True if CRC32 is OK
Default	For always applicable interpretation

Table C–12 lists examples of interpretation expressions with their definitions.

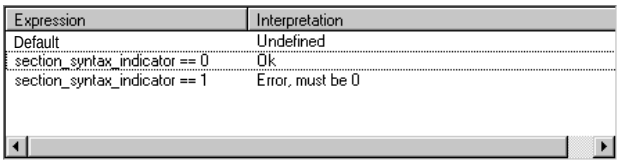
Table C–12: Private syntax example interpretation expressions

Expression	Definition
CRC_32==API_COMPUTE_CRC_32	Value of field CRC_32 is equal to the computed CRC32 value of the section
private_section_length<=4093	private_section_length field value is less than or equal to 4093
(section_length–9)/4	Number equal to the section_length field value minus 9, all divided by 4

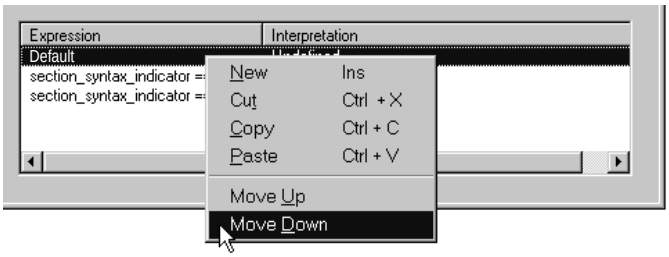
Adding Interpretations. The RTA checks the conditions in this list to determine the interpretation text to display on the Section Analysis view. To add an entry to the interpretations list, right-click on the background of the interpretations box and then choose **New** from the resulting menu**.**



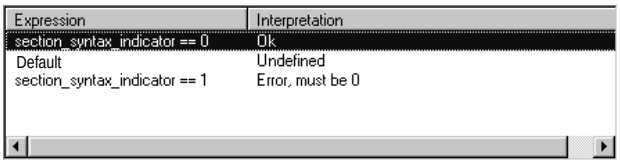
A new, default interpretation appears immediately after the selected item. Because the RTA checks conditions in top-to-bottom order, you may want to move the new condition/interpretation pair below one or more of the existing entries.



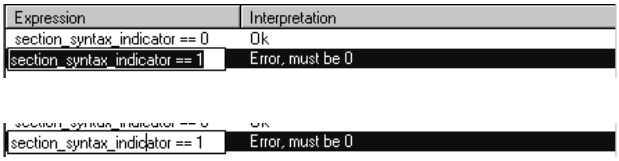
Changing Interpretation Order. To change the interpretation order within a field, right-click on the background of the list of interpretations box, and choose **Move Up** or **Move Down** from the menu**.**



The selected condition/interpretation moves down one position as shown below. You can reselect the item and repeat the command to move the item to the bottom of the list.

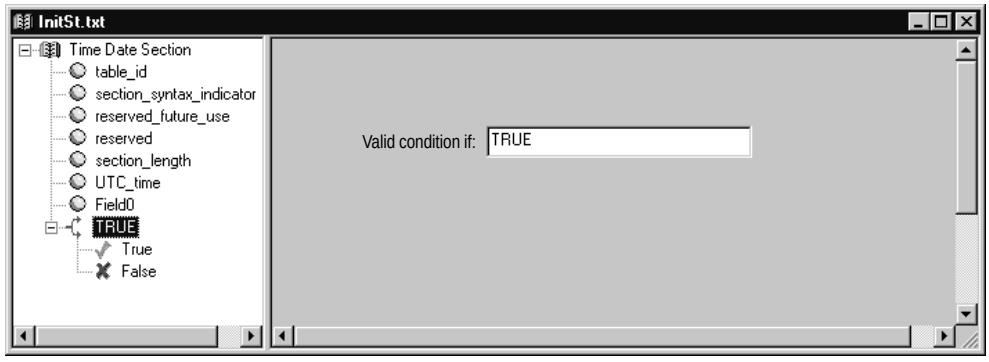


Editing an Expression/Interpretation. Click once on an expression/interpretation line to select it. Click on the expression or interpretation portion of the selected expression/interpretation to position the cursor at the end of the expression or interpretation and to enable text entry as shown below. You can then double-click a word to select it.

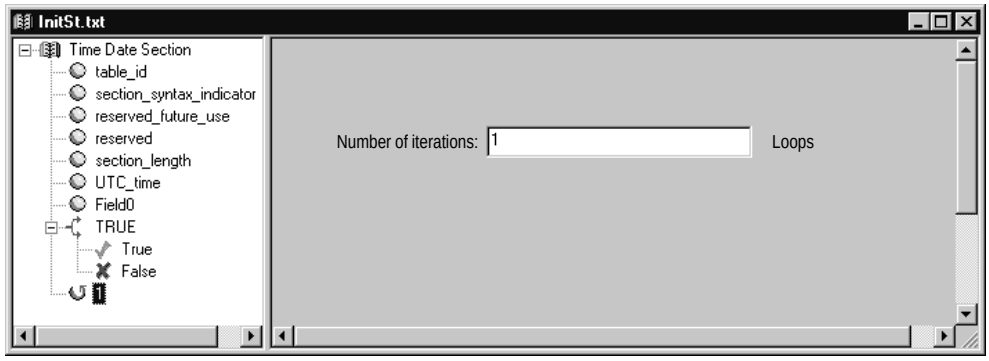


Once you have selected the expression or interpretation text to edit, you can right-click to open a shortcut menu. You can use the **Cut**, **Copy**, **Paste**, **Delete**, and **Select All** commands to edit the selected text. The **Undo** command lets you undo the previous text-editing action.

Adding a New Conditional Branch. To add a new conditional branch, select **Add Condition** from the Edit menu or click the **Add Condition** toolbar button (refer to *Toolbar* on page C–6). The default **Valid condition** is TRUE.



Adding a New Loop. To add a new loop, select **Add Loop** from the Edit menu or click the **Add Loop** toolbar button (refer to *Toolbar* on page C–6). The default **Number of iterations** is 1 loop.



Adding a New Descriptor. To add a new descriptor, select **Add Descriptor** from the Edit menu or click the **Add Descriptor** button (refer to *Toolbar* on page C–6). The default **Descriptor Size** is 8 bytes.

Changing the Hierarchy. Items or branches of the hierarchy can be moved within the hierarchy by selecting and dragging the associated icon.

Items or branches of the hierarchy can be copied from one position to another by holding the **CTRL** key down while dragging the selected icon.

To delete selected items or branches from the hierarchy, select **Delete** from the Edit menu or press the **DEL** button on your keyboard.

Saving a Private Syntax File

To save a private syntax definition in text file format, select **Save** from the File menu or click the **Save** toolbar button (refer to *Toolbar* on page C–6).

When you save a new syntax definition file, the standard Windows NT **Save As** dialog box appears. Enter a file name with a .txt extension and then click **OK**.

To save an existing syntax definition file under a new name, select **Save As** from the Edit menu.

NOTE. *If you are using an existing syntax definition as a template for a new definition, it is good practice to always select* ***Save As*** *to create the new file before you make any changes to the original definition.*

Compiling Private Syntax Definitions

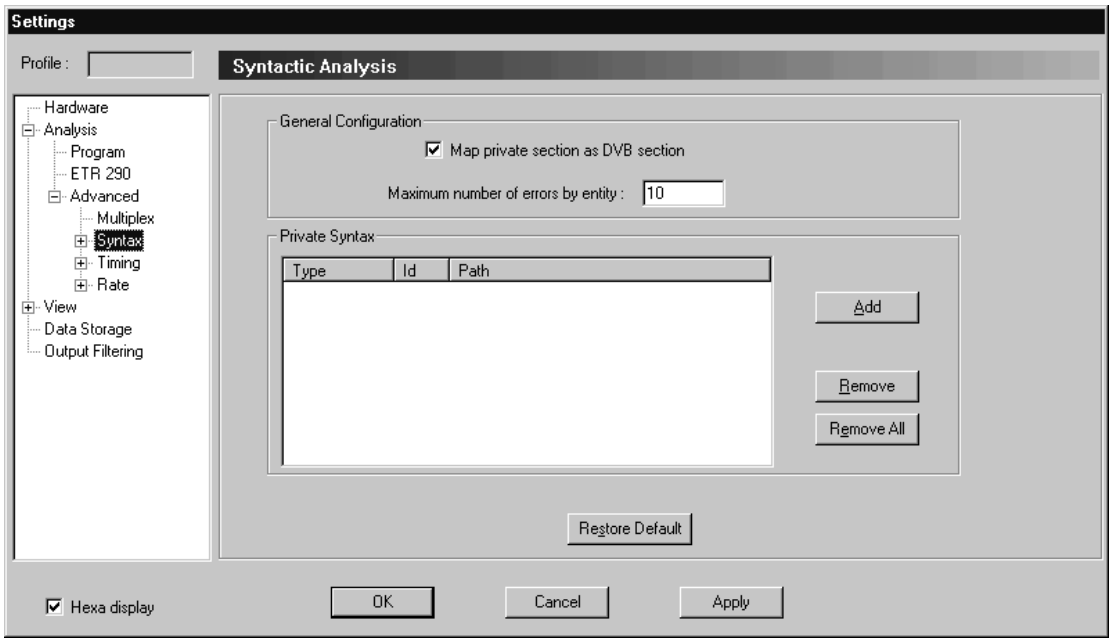
To compile a private syntax definition, select **Compile** from the Edit menu or click the **Compile** toolbar button (refer to *Toolbar* on page C–6).

The Message view opens at the bottom of the Private Syntax Interpreter window. If there is no compiling error, a file containing the private syntax table, with the extension .cta, is created in the same directory as the table file.

Analyzing Private Syntax with the RTA

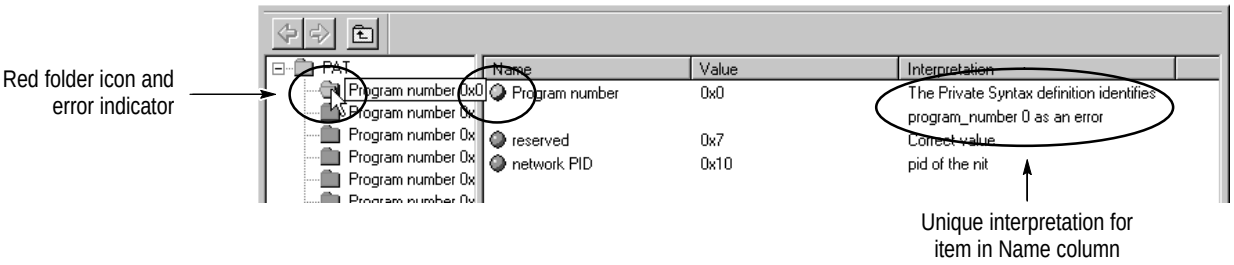
Once you have created, saved, and compiled a private syntax definition, use the following procedure to monitor private data sections or descriptors in the RTA input stream:

1. With the RTA running but with analysis stopped, select **Settings** from the RTA Configuration menu to open the Settings window.
2. Select **Analysis:Advanced:Syntax** in the Settings window hierarchy to open the Syntactic Analysis configuration panel (shown below).



3. Click **Add**. A standard Windows **Open** window appears, with only .cta files displayed.

4. Change the the appropriate directory, if necessary, and then select the desired binary syntax definition file (either double-click the file name or highlight the file name and click **Open**).
5. Repeat steps 3 and 4 for every private syntax definition you want to use.
6. Click **Apply** on the bottom of the Syntactic Analysis configuration panel to confirm your additions; click **OK** to confirm the additions and close the Settings window.
7. Start RTA analysis.
8. Open a section analysis view of the appropriate table. Refer to *Section Analysis View* on page 2–56 for instructions.



You can run the Private Syntax Interpreter and the Real-Time Analyzer applications simultaneously. You can therefore use the following technique to experiment with the effects of different private syntax definition parameters on known sections or descriptors:

1. Load the private syntax description in the RTA and begin analysis as described above. Open a section analysis window to see how the RTA analyzes and reports the contents of the private section or descriptor.
2. Edit the private syntax text file as necessary.
3. Compile the syntax definition. The new definition overwrites the original definition.
4. Stop and then restart RTA analysis. When you restart analysis, the RTA reads the new contents of the binary definition (.cta) file.
5. Open a section analysis window to see how the RTA analyzes and reports the contents of the private section or descriptor.

Private Data Reference

The Private Syntax Interpreter application builds tables and descriptors as defined in *ISO/IEC 13818-1, Generic coding of moving pictures and associated audio information: Systems*, July 1996.

Refer to the standard for additional parameter value information. Tektronix MPEG Test Systems include much of ISO/IEC 13818-1 in Windows Help format; to open the Help system, double-click the **MPEG-2 Help** icon in the **Tektronix MPEG Test System** program group window or select the corresponding Windows NT Start menu item.

The following information is taken from ITU-T Rec. H.222.0 (ISO/IEC 13818-1).

Private Section Types

The private_section provides a further means to carry private data also in two forms. This type of elementary stream may be identified under stream_type as private_data in PSI sections. The short type of private_section() includes only the first five defined fields, and is followed by private data. For this structure the section_syntax_indicator shall be set to a value of ’0’. For the long type, the section_syntax_indicator shall be set to a value of ’1’ and the full syntax up to and including last_section_number shall be present, followed by private_data_bytes and ending with the CRC_32.

Syntax of the Private Section

When private data is sent in Transport Stream packets with a PID value designated as a Program Map Table PID in the Program Association Table, the private_section shall be used. The private_section allows data to be transmitted with a minimum of structure while enabling a decoder to parse the stream. The sections may be used in two ways: if the section_syntax_indicator is set to ’1’, then the whole structure common to all tables shall be used; if the indicator is set to ’0’, then only the fields ’table_id’ through ’private_section_length’ shall follow the common structure syntax and semantics and the rest of the private_section may take any form the user determines.

A private table may be made of several private_sections, all with the same table_id (see Table C–13).

Table C–13: Private section

Syntax	No. of bits	Mnemonic
private_section() {		
table_id	8	uimsbf
section_syntax_indicator	1	bslbf
private_indicator	1	bslbf
reserved	2	bslbf
private_section_length	12	uimsbf
if (section_syntax_indicator = = '0') {		
for (i = 0; i < N; i++) {		
private_data_byte	8	bslbf
}		
}		
else {		
table_id_extension	16	uimsbf
reserved	2	bslbf
version_number	5	uimsbf
current_next_indicator	1	bslbf
section_number	8	uimsbf
last_section_number	8	uimsbf
for (i = 0; i < private_section_length–9; i++) {		
private_data_byte	8	bslbf
}		
CRC_32	32	rpchof
}		

Semantic Definition of Private Section Fields

The following paragraphs describe the various private section fields.

table_id - This 8-bit field, the value of which identifies the Private Table this section belongs to. Only values from 0x40 through 0xFE may be used.

section_syntax_indicator - This is a 1-bit indicator. When set to "1", it indicates that the private section follows the generic section syntax beyond the private_section_length field. When set to "0", it indicates that the private_data_bytes immediately follow the private_section_length field.

private_indicator - This is a 1-bit user definable flag that shall not be specified by ITU-T | ISO/IEC in the future.

private_section_length - A 12-bit field. It specifies the number of remaining bytes in the private section immediately following the private_section_length field up to the end of the private_section. The value in this field shall not exceed 4093 (0xFFD).

private_data_byte - The private_data_byte field is user definable and shall not be specified by ITU-T | ISO/IEC in the future.

table_id_extension - This is a 16-bit field. Its use and value are defined by the user.

version_number - This 5-bit field is the version number of the private_section. The version_number shall be incremented by 1 modulo 32 when a change in the information carried within the private_section occurs. When the current_next_indicator is set to "0", then the version_number shall be that of the next applicable private_section with the same table_id and section_number.

current_next_indicator - A 1-bit field, which when set to "1" indicates that the private_section sent is currently applicable. When the current_next_indicator is set to "1", then the version_number shall be that of the currently applicable private_section. When the bit is set to "0", it indicates that the private_section sent is not yet applicable and shall be the next private_section with the same section_number and table_id to become valid.

section_number - This 8-bit field gives the number of the private_section. The section_number of the first section in a private table shall be 0x00. The section_number shall be incremented by 1 with each additional section in this private table.

last_section_number - This 8-bit field specifies the number of the last section (that is, the section with the highest section_number) of the private table of which this section is a part.

CRC_32 - This is a 32-bit field that contains the CRC value that gives a zero output of the registers in the CRC decoder defined in ITU-T Rec. H.222.0 Annex A after processing the entire private section.

Private Descriptors

Descriptors exist within Program Streams and Transport Streams. A range of private descriptors may be defined by the user (see Table C–14). These descriptors shall commence with descriptor_tag and descriptor_length fields. For private descriptors, the value of descriptor_tag may take the values 64–255. These descriptors may be placed within a program_stream_map(), a CA_section(), a TS_program_map_section(), and in any private section(). Specifically private_data_bytes also appear in the CA_descriptor().

Table C–14: Private descriptor

Syntax	No. of bits	Mnemonic
private_descriptor() {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
for (i = 0; i < descriptor_length; i++) {		
private_data_byte	8	uimsbf
}		
}		

descriptor_tag - This 8-bit field identifies the private descriptor. Values from 64–255 (0x40 through 0xFF) may be used.

descriptor_length - An 8-bit field. It specifies the number of remaining bytes in the descriptor immediately following the descriptor_length field.

Appendix D: 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.

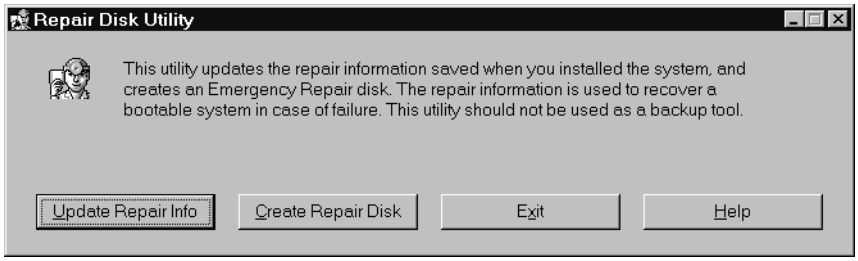
CAUTION. *The files on the Emergency Repair Disk are test system-specific; that is, the disk shipped with your test system is the* **ONLY** *disk that will work with your system. Do not lose this disk. If you lose the Emergency Repair Disk provided with your test system, create a new one as described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

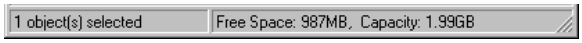
Uninstalling the Software

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 V3.0** 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

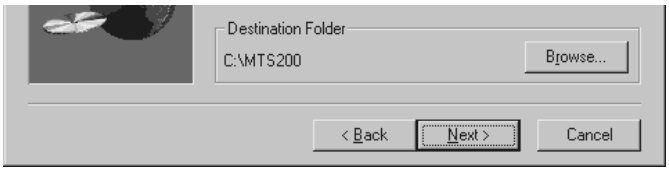
1. Double-click the **My Computer** icon on your Windows NT desktop and, in the resulting **My Computer** window, select the (C:) disk icon. Check the window status bar to verify that the system disk has at least 100 MB of free space. The program will not install if the system disk has less than 100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

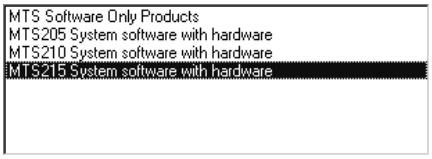
5. Read the window text and then click **Next** to proceed to the **Choose Destination Directory** window.



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.

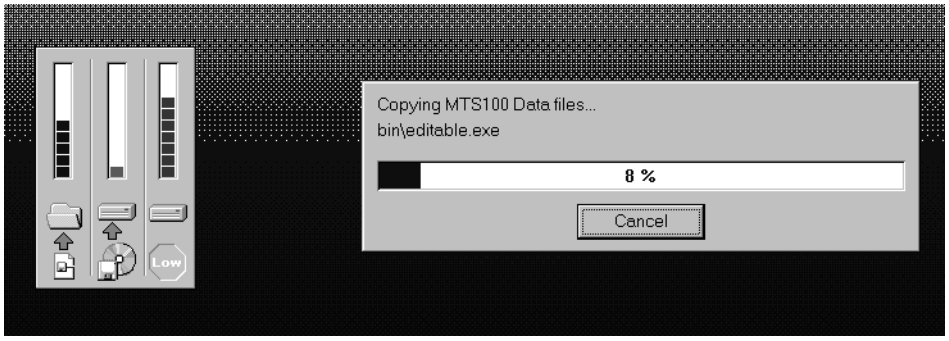
9. Select the option that applies to your test system and then click **Next**.

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.

***NOTE**. 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 in the Tektronix MPEG Test System window 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.

Glossary

Glossary

ACTS (Advanced Communications Technologies and Services)
A set of telecommunication research projects financed by the European Union.

ASI
Asynchronous Serial Interface, the DVB serial data protocol.

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.

Configuration
In the Real-Time Analyzer report view, a collection of all analysis results gathered between the establishment of synchronization to the subsequent loss of synchronization.

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.

DSM-CC
Digital Storage Media Command and Control, defined in ISO/IEC 13818 part 6.

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.)

DVB-T
Terrestrial Digital Video Broadcasting.

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.

Ghost
One or more packets found in the transport stream but not referenced in any appropriate table. For example, a packet identified as a Program Map Table (PMT, table_id = 0x02) but not referred to by PID in the Program Allocation Table (PAT).

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, QUOVADIS 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.

SIDAT 360
Also known as SI-DAT 360, the DVB specification for data broadcasting. Equivalent to the ETSI standard EN 301 192.

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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