RTX100B Series
RF Signal Generators

Quick Start User Manual

Tektronix

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Contacting Tektronix

Warranty

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such 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. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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[W2 – 15AUG04]

Warranty

Tektronix warrants that the media on which this software product is furnished and the encoding of the programs on the media will be free from defects in materials and workmanship for a period of three (3) months from the date of shipment. If any such medium or encoding proves defective during the warranty period, Tektronix will provide a replacement in exchange for the defective medium. Except as to the media on which this software product is furnished, this software product is provided "as is" without warranty of any kind, either express or implied. Tektronix does not warrant that the functions contained in this software product will meet Customer's requirements or that the operation of the programs will be uninterrupted or error-free.

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[W9b – 15AUG04]

Customer may not:

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b. Transfer the Program to any person or organization outside of Customer or the corporation of which Customer is a part without the prior written consent of Tektronix, except in connection with the transfer of the equipment within which the programs are encoded or incorporated;

c. Export or re-export, directly or indirectly, the program, any associated documentation, or the direct product thereof, to any country to which such export or re-export is restricted by law or regulation of the United States or any foreign government having jurisdiction without the prior authorization, if required, of the Office of Export Administration, Department of Commerce, Washington, D.C. and the corresponding agency of such foreign government;

d. For object-code Programs only, reverse compile or disassemble the Program for any purpose; or

e. Copy the documentation accompanying the Program.

For Programs designed to reside on a single-machine and support one or more additional machines, either locally or remotely, without permitting the Program to be transferred to an additional machine for local execution, the additional machines shall be considered within the definition of "single machine". For programs permitting the Program to be transferred to an additional machine for local execution, a separate license shall be required for each such machine with which the Program may be used, or each concurrent user authorized under a floating-user license.

Title to the Program and all copies thereof, but not the media on which the Program or copies may reside, shall be and remain with Tektronix or others for whom Tektronix has obtained a respective licensing right.

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Any portion of the Program modified by Customer or merged with another program shall remain subject to these terms and conditions.

If the Program is acquired by or for an agency of the U.S. Government, the Program shall be considered computer software developed at private expense and the license granted herein shall be interpreted as granting Customer restricted rights in the Program and related documentation as defined in the applicable acquisition regulation.

THE PROGRAM MAY NOT BE USED, COPIED, MODIFIED, MERGED, OR TRANSFERRED TO ANOTHER EXCEPT AS EXPRESSLY PERMITTED BY THESE TERMS AND CONDITIONS.

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LIMITED WARRANTY.   Tektronix warrants that the media on which the Program is furnished and the encoding of the Program on the media will be free from defects in materials and workmanship for a period of three (3) months from the date of shipment. If any such medium or encoding proves defective during the warranty period, Tektronix will provide a replacement in exchange for the defective medium. Except as to the media on which the Program is furnished, the Program is provided "as is" without warranty of any kind, either express or implied. Tektronix does not warrant that the functions contained in the Program will meet Customer's requirements or that the operation of the Program will be uninterrupted or error-free.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period. If Tektronix is unable to provide a replacement that is free from defects in materials and workmanship within a reasonable time thereafter, Customer may terminate the license for the Program and return the Program and any associated materials for credit or refund.

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Neither this Agreement nor the license granted herein is assignable or transferable by Customer without the prior written consent of Tektronix.

This Agreement and the license granted herein shall be governed by the laws of the state of Oregon.

All questions regarding this Agreement or the license granted herein should be directed to the nearest Tektronix Sales Office.

ADDITIONAL LICENSE GRANT FOR VIDEO TEST SEQUENCES.   The Software Product may include certain test patterns, video test sequences and video clips (together "Video Test Sequences"). If so, the following terms describe Your rights to the Video Test Sequences:

You may use, copy and modify the Video Test Sequences and display or distribute copies of individual Video Test Sequences in connection with Your video testing activity.

You are not licensed to do any of the following:

■   You may not distribute the collection of Video Test Sequences, except in connection with the sale of original equipment containing the Video Test Sequences, without prior written permission from Tektronix.

■   You may not permit third parties to distribute copies of the Video Test Sequences.

■   You may not sell, license or distribute copies of the Video Test Sequences on a standalone basis or as part of any collection, product, or service where the primary value of the product or service is the Video Test Sequences.

You must indemnify, hold harmless, and defend Tektronix from and against any claims or lawsuits, including attorneys' fees, that arise from or result from the use or distribution of Video Test Sequences as modified by You.

You must include a valid copyright notice on Your products and services that include copies of the Video Test Sequences.

Table of Contents

General Safety Summary

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

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component 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.

Connect and disconnect properly. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement instrument.

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.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The inputs are not rated for connection to mains or Category II, III, or IV circuits.

Power disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

Do not operate without covers. Do not operate this product with covers or panels removed.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Use proper fuse. 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. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

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.*

Symbols and 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.

The following symbol(s) may appear on the product:

⚠️ CAUTION Refer to Manual
⏚ Protective Ground (Earth) Terminal
⏻ Standby

Compliance

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

EMC Compliance

EC Declaration of Conformity – EMC

Meets intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1 2006. EMC requirements for electrical equipment for measurement, control, and laboratory use [1], [2]

- CISPR 11:2003. Radiated and conducted emissions, Group 1, Class A

- IEC 61000-4-2:2001. Electrostatic discharge immunity

- IEC 61000-4-3:2002. RF electromagnetic field immunity

- IEC 61000-4-4:2004. Electrical fast transient / burst immunity

- IEC 61000-4-5:2001. Power line surge immunity

- IEC 61000-4-6:2003. Conducted RF immunity

- IEC 61000-4-11:2004. Voltage dips and interruptions immunity

EN 61000-3-2:2006. AC power line harmonic emissions

EN 61000-3-3:1995. Voltage changes, fluctuations, and flicker

European Contact.
Tektronix UK, Ltd.
Western Peninsula
Western Road
Bracknell, RG12 1RF
United Kingdom

[1] **This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.**

[2] **Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.**

Australia / New Zealand Declaration of Conformity – EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- CISPR 11:2003. Radiated and Conducted Emissions, Group 1, Class A, in accordance with EN 61326-1:2006.

Safety Compliance

EC Declaration of Conformity – Low Voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities:

Low Voltage Directive 2006/95/EC.

- EN 61010-1: 2001. Safety requirements for electrical equipment for measurement control and laboratory use.

U.S. Nationally Recognized Testing Laboratory Listing

- UL 61010-1:2004, 2nd Edition. Standard for electrical measuring and test equipment.

Canadian Certification

- CAN/CSA C22.2 No. 61010-1:2004. Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1.

Additional Compliances

- IEC 61010-1: 2001. Safety requirements for electrical equipment for measurement, control, and laboratory use.

Equipment Type

Test and measuring equipment.

Safety Class

Class 1 – grounded product.

Pollution Degree Description

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution Degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.

- Pollution Degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.

- Pollution Degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.

- Pollution Degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution Degree

Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.

Environmental Considerations

This section provides information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

Equipment Recycling.   Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

This symbol indicates that this product complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive.

Preface

This manual provides operational instructions for both the RTX100B and the RTX130B products.

The RTX100B ISDB-T RF Signal Generator converts a broadcast transport stream into an RF signal and outputs it. In addition to the RF signal output feature, the generator records and plays MPEG-2 transport streams that are compliant with ATSC, DVB, and ARIB standards.

The RTX130B QAM & VSB RF Signal Generator generates QAM, 8VSB, and DMB-T modulated signals that are compliant with the DVB-C/ITU-T J.83 Annex A/B/C, and ATSC standards. In addition to the RF signal output feature, the Generator records and plays MPEG-2 transport streams that are compliant with ATSC, DVB, and ARIB standards.

NOTE. When the instrument sends or receives a stream for a long time, the stream may be intermittent because of a processing condition of the hard disk or the Windows XP system process.

Key Features

Common Features for Both the RTX100B Generator and the RTX130B Generator

- Data rate: 200 Mbps maximum (RAM mode); 256 Kbps minimum

- Hierarchy display of stored or captured transport streams

- 188, 204, 208 bytes packet size,

- S-TMCC, M-TMCC, nontransport stream, and partial transport stream output formats

- Real-time updating of stream parameters: continuity_counter, PCR/PTS/DTS, TOT/TDT/STT, NPT, and Reed Solomon (ISDB-T only)

- Continuous recording of captured streams

- PCR jitter insertion

- Triggered stream capture

- Full remote control using Ethernet interface

- Scheduler application for automated stream playout and record (Option SC only)

- Two IP versions namely IPv4 and IPv6 are supported

- Stream replication (IP) with some attributes of the stream incremented by a certain value

- IP stress generation capabilities

- Tclips MPEG Test Streams

Specific Features for RTX100B Generator

- Play interface: IP and RF/ASI/310M interfaces

- RF modulated output of broadcast transport streams

  UHF: 13 channel to 62 channel (473 MHz to 767 MHz)

- Direct RF output of ASI input signals

Specific Features for RTX130B Generator

- Play interface: IP and QAM/VSB/DMB-T

- 16/64/256QAM and 8VSB modulation formats

- Modulation frequency range: 50 MHz to 860 MHz

- 44 MHz or 36 MHz IF output

- Supports the following standards:

  - DVB-C/ITU-T J.83 Annex A (Option M1)

  - ITU-T J.83 Annex B (Option M2)

  - ITU-T J.83 Annex C (Option M3)

  - ATSC (Option M4)

The RTX100B Series includes the ReMux application software that provides the capability to create a transport stream of super frame structure defined in the ISDB-S systems from an MPEG-2 transport stream.

Documentation

The following information is available for this product:

Table i: Product documentation

Item	Purpose	Location
RTX100B Series RF Signal Generators Quick Start User Manual (071-2595-xx English, 071-2596-xx Japanese)	Provides installation and high-level operational overviews	
RTX100B Series RF Signal Generators Specifications and Performances Verification Technical Reference Manual (077-0193-xx)	Provides complete product specifications and a procedure for verifying the operation of the instrument	
RTX100B Series RF Signal Generators Technical Reference Manual (077-0192-xx)	Provides in-depth operating information	
RTX100B Series RF Signal Generators Service Manual (077-0194-xx)	Optional manual supporting module-level servicing of the instrument	
MTX/RTX Release Notes (077-0195-xx)		
Tclips Technical Reference Manual (077-0074-xx)	Provides in-depth operating information	

Terms Used in This Manual

This manual uses the following terms:

- **Stream:** Generic term for transport streams and data streams of Non-TS format (data format other than transport stream format).

- **S-TMCC** (Single TMCC): Transport stream to which TMCC (Transmission and Multiplexing Configuration Control) information is inserted into the 8 bytes in its Reed-Solomon code area (16 bytes). It is defined in the ISDB-S (Integrated Services Digital Broadcasting-Satellite) system.

- **M-TMCC** (Multi TMCC): Transport stream to which TMCC information is inserted into the sync byte area, and has super frame structure. It is defined in the ISDB-S system.

- **Broadcast transport stream:** Transport stream defined in ARIB STD-B31.

- **RTX130B (QAM & VSB RF Signal Generator)** references in the document refer to the information that is specific to the RTX130B instrument.

- **RTX100B (ISDB-T RF Signal Generator)** references in the document refer to the information that is specific to the RTX100B instrument.

- **RTX100B Series** references in the document refer to information that is shared between the RTX100B generator and the RTX130B generator.

Installation

Before Installation

Perform the following product inspection procedure when you receive your instrument:

1. Inspect the shipping carton for external damage, which indicates possible damage to the instrument.

2. Remove the generator from the shipping carton.

3. Check that the instrument has not been damaged in transit. The exterior should not have any scratches or impact marks. Before shipment the instrument is thoroughly inspected for mechanical defects.

NOTE. Save the shipping carton and packaging materials for instrument repackaging in case shipment becomes necessary. Refer to the RTX100B Series Technical Reference manual for instructions on repackaging the instrument.

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4. Verify that the shipping carton contains the instrument, the standard accessories, and any optional accessories that you ordered. (See page 73, *Accessories and Options.*)

5. Perform the functional check procedure after installing the instrument. (See page 7, *Functional Check.*)

Contact your local Tektronix Field Office or representative if there is a problem with your instrument or if your shipment is incomplete.

Operating Considerations

Before you install the instrument, refer to the General Safety Summary section at the front of this manual for power source, grounding, and other safety information.

Environment Operating Requirements

Verify that the location of your installation has the proper operating environment. Refer to the following table:

⚠ *CAUTION. Damage to the instrument can occur if this instrument is powered on at temperatures outside of the specified temperature range.*

Table 1: Environmental operating requirements

Characteristics	Specifications
Ambient temperatures	From +5 °C to +40 °C
Relative humidity	From 20% to 80%
Maximum operating altitude	3000 m
Clearance on top	5.0 cm (2 in)
Clearance on left side	5.0 cm (2 in)

Table 1: Environmental operating requirements (cont.)

Characteristics	Specifications
Clearance on right side	5.0 cm (2 in)
Clearance in rear (from the fan guard)	5.0 cm (2 in)

NOTE. If you are installing the instrument in a dedicated rack, refer to the instruction sheet that comes with the rack mounting kit for proper installation procedures. When the generator is mounted in a 19-inch rack, verify that there is at least one unit of clearance above the generator.

AC Line Voltage Requirement

Check that your location provides the proper electrical power requirements. Refer to the following table.

Table 2: AC line power requirement

Parameter	Description
Line voltage range	100 to 240 V

Table 2: AC line power requirement (cont.)

Parameter	Description
Line frequency	50/60 Hz
Maximum power	180 VA

⚠️ *CAUTION. The instrument does not have a power switch, but does have an on/standby switch. When you connect the power cable to the AC line connector, power is applied to the power supply standby circuit of the instrument. Read the power application instructions before plugging the power cable into a power source. (See page 4, Powering on the Instrument.)*

Power Cord Requirement

Verify that you are using the proper power cord for your location. (See Table 18 on page 74.) Connect the power cord from the rear-panel power connector to the power system.

⚠️ *CAUTION. The instrument is shipped with a power cord appropriate for use with your power systems (normal 115 V power system or 230 V power system). If the instrument is to be used with a power system other than that specified in the order, the power cord must be replaced with one appropriate for the power source used.*

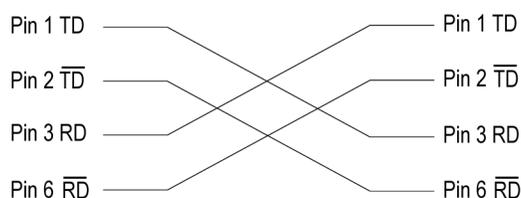# Connecting to the Instrument

Refer to *Rear Panel Connectors* for information about connecting to the instrument. (See page 11.)

Connecting the RTX100B Series Generator to a PC

The generator uses the rear-panel LAN port to communicate with a PC or MTS400.

Use one of the following methods to connect the generator to your PC or MTS400:

1. If you are connecting the generator directly to a single PC, use a crossover Ethernet cable to connect between the LAN port on the generator and the Ethernet port on the PC. If you need to construct your own crossover cable, change the pin connections on a straight cable as shown in the figure to product a crossover cable.

Pin 1 TD	Pin 1 TD
Pin 2 $\overline{\text{TD}}$	Pin 2 $\overline{\text{TD}}$
Pin 3 RD	Pin 3 RD
Pin 6 $\overline{\text{RD}}$	Pin 6 $\overline{\text{RD}}$

2. If you are connecting the generator to your local Ethernet network, use a straight Ethernet cable to connect between the LAN port on the generator and the Ethernet hub port of your local network. By connecting to an Ethernet network, you can access the generator using any PC on the network.

Powering on the Instrument

**1.** After you have verified the operating environment, AC line, and power cord requirements, plug the power cord into the power connector on the rear panel, and then plug the power cord into the local power source.

Power connector
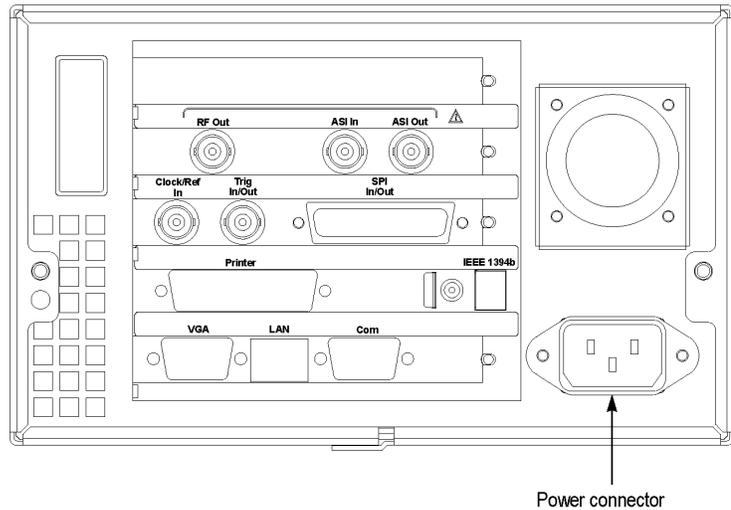
2. Press the **On/Standby** switch to power on the instrument. After you power on the instrument, verify that the fan on the rear panel is operating. To verify that the fan is operating, place your hand behind the right side of the instrument. You should be able to feel the fan's air flow.

⚠ *CAUTION. Do not operate the instrument if the cooling fan does not operate when you turn on the instrument. Serious damage to your instrument can occur from overheating if the cooling fan is not operating*

On/Standby switch
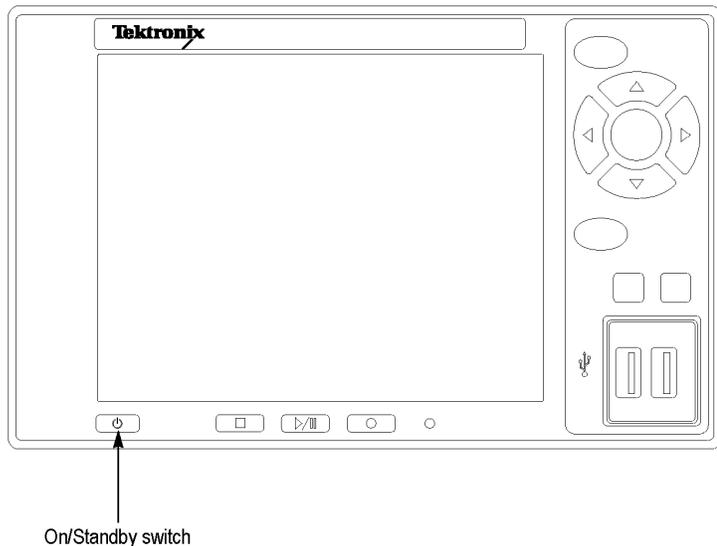
Powering Off the Instrument

Always power off the instrument using the Windows XP shutdown process (select **Start** > **Shut down**… or **Start** > **Turn off computer**). The system (including applications) will shut down automatically. When prompted, push the front panel On/Standby switch to remove power from the unit.

Alternatively, push the front panel On/Standby switch for two seconds and release. The system will shut down and power off automatically with no further intervention.

Licensing the Software

During first-time power on, you need to license the software by entering the option key that was shipped with the instrument as described in the following procedure.

NOTE. The instrument is shipped with a parallel security key dongle. You must connect the dongle to the printer port before starting the instrument in order for the instrument software to be enabled.

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1. Attach the software key dongle to the printer port on the rear panel of the instrument. (See page 11, *Rear Panel Connectors*.)

2. Power on the instrument.

3. When the instrument is started, the Option Key Wizard must be started, select **Start** > **Programs** > **Tektronix MTX100B** >**Option Key Wizard**.

4. In the Tektronix Option Update dialog box, enter the Option Key String supplied with the installation documentation in the Key String field.

5. Click **Apply**.
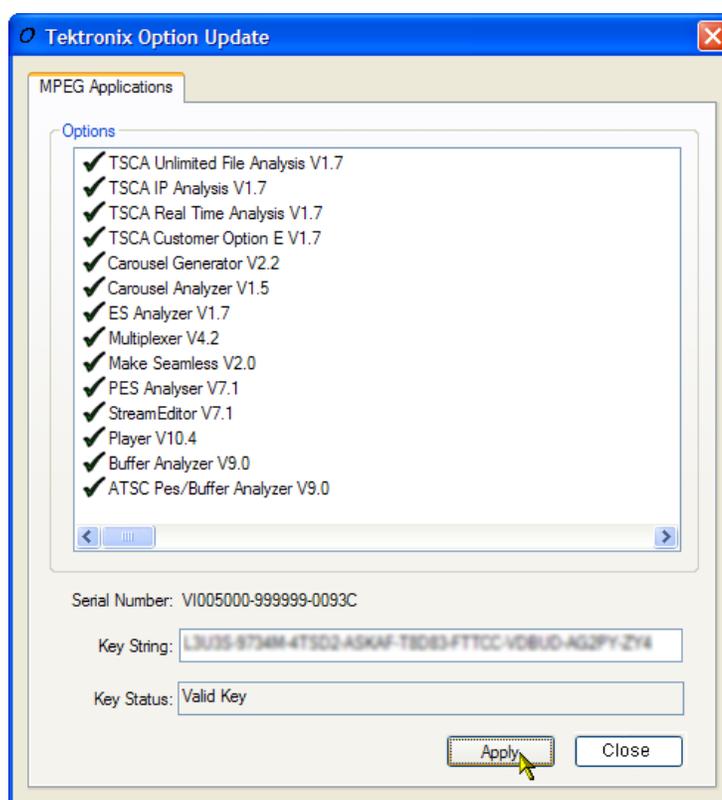
6. Inspect and verify the list of licensed options.

NOTE. Operational access to features is controlled by the licenses that are available on the software key. Applications and features can be installed, but will not be available unless the appropriate license has been obtained. Notification of these is provided when the product or additional licenses are purchased.

7. Close the Option Key Wizard. The licensed instrument is now available in the Windows Start menu.

Functional Check

Perform the following procedure if you are operating the instrument for the first time (to verify that the instrument shipped without damage) or if you suspect that the instrument is not working properly.

1. Connect the generator to a power source, and then turn on the instrument using the **On/Standby** switch.

2. Press the front-panel **Menu** button to display the File menu command list.

NOTE. Ensure that a dongle is connected and a valid option key has been provided using Option Wizard.

3. Press the up (▲) or down (▼) arrow button to select **Open** from the list, and then press the **Enter** button to open the Select File dialog box.
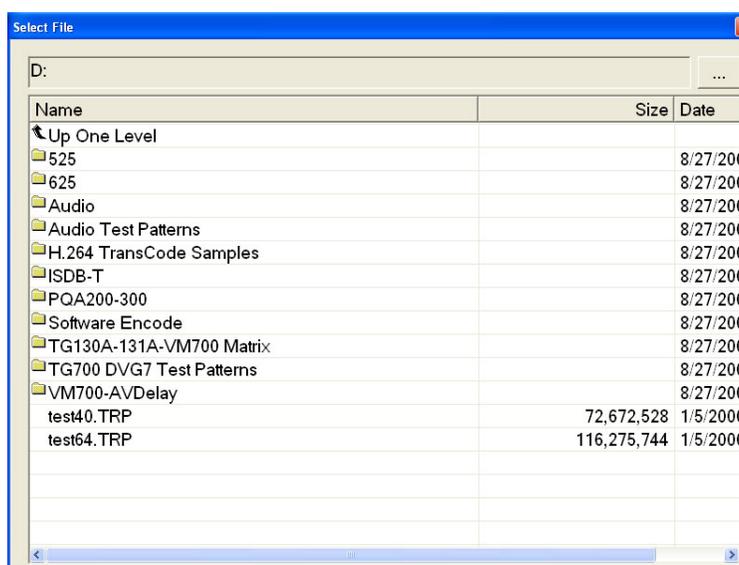
4. Press the up (▲) or down (▼) arrow button to select the **test64.TRP** file, and then press the **Enter** button. The hierarchy view of the transport stream file will be displayed on the screen.

NOTE. You can select the test40.TRP file in step 4 of this procedure if you need to decrease the bit rate of the transport stream due to performance restrictions in your decoder.

5. Connect the interface cable provided with the instrument between the **SPI In/Out** connector on the generator rear panel and the **SPI In** connector on an MPEG decoder.

6. Connect the decoder to a picture monitor.

7. Press the generator **Play/Pause** button to start the transport stream output. When transport stream output is started, the Play Status indicator appears on the screen.

8. Check that the picture from the transport stream is displayed correctly on the picture monitor.

RTX100B rear panel

Interface cable

MPEG decoder

SPI in

Output

Picture monitor

Input
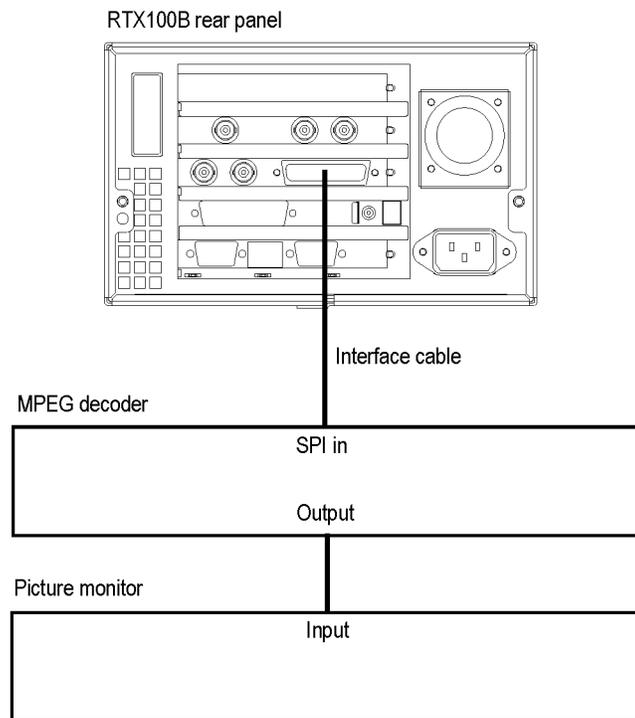
Operation

This section gives you a functional overview and provides descriptions of basic menu operations for the generator. For more detailed operating instructions and descriptions of the generator interface and controls, refer to the *RTX100B Series RF Signal Generators Technical Reference* manual.

Front Panel Controls and Connectors
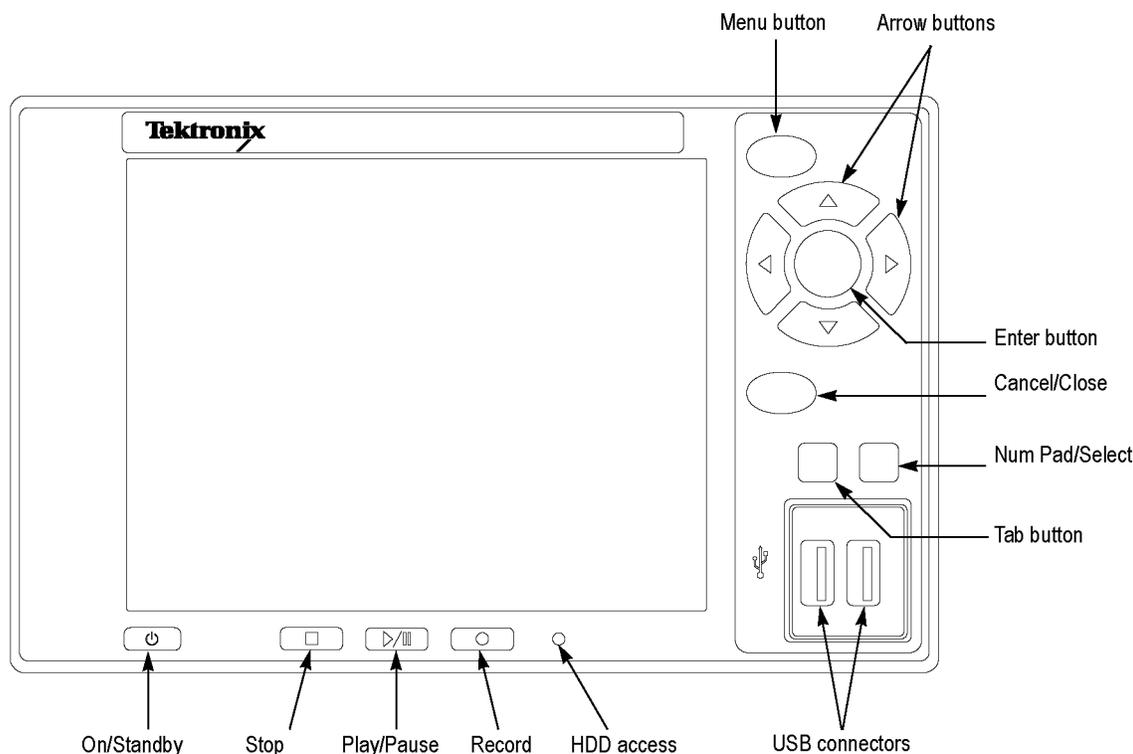
CAUTION. *If you power off the instrument using the On/Standby switch, the current instrument settings are not saved (this operation corresponds to an emergency shutdown in Windows XP). To prevent data loss, use the Shutdown command from the File menu to power off the instrument.*

Table 3: Front panel controls and connectors

Button	Function
On/Standby Switch	Powers on or off the instrument.
Stop Button	■ If you press this button while a stream data is being output, the data output stops.
	■ If you press this button while the pretrigger portion is filled and the instrument waits for a trigger event or the posttrigger portion is being recorded, the recorded data is stored in a file.
HDD Access Indicator	Indicator illuminates when the hard disk drive is in operation.

Table 3: Front panel controls and connectors (cont.)

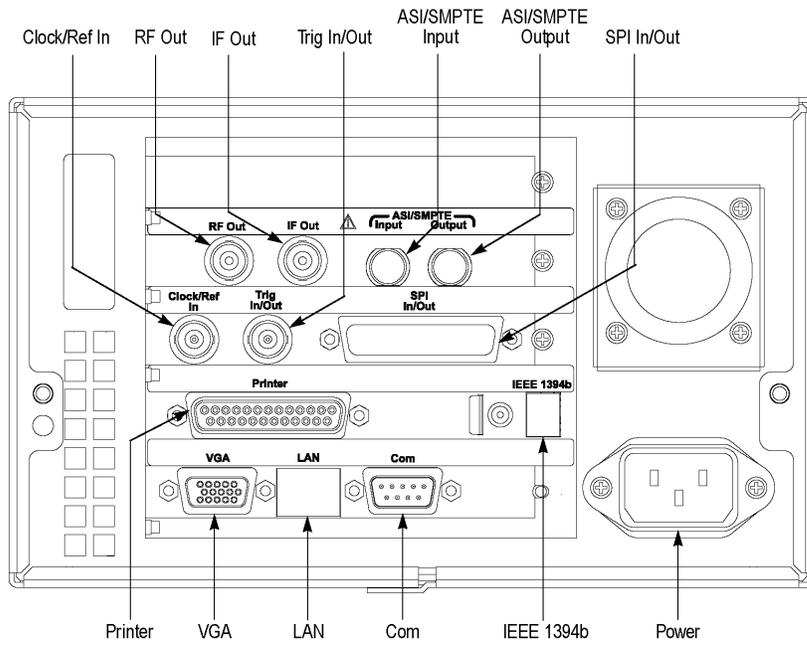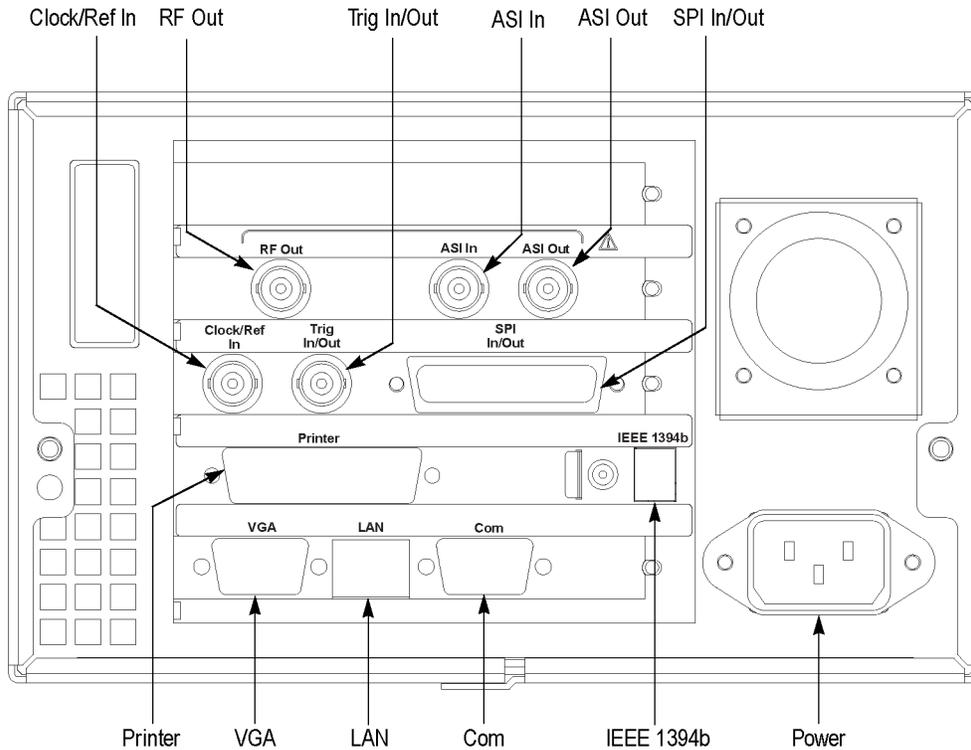| Button	Function
Menu Button	Toggles the display of the menu command list on or off.
Play/Pause Button	■ Press this button to output the data.
	■ If you press this button the Record screen is displayed, it switches to the Play screen.
	■ If you press this button while a stream data is being output, the data output pauses. Press the button again to start the stream output.
	When an M-TMCC transport stream is selected, generator outputs the stream from the start packet in the super frame to the maximum number of packets that can be looped as an integral multiple of the number of super frames. When an ISDB-T transport stream is selected, generator outputs the stream from the start packet in the OFDM (Orthogonal Frequency Division Multiplexing) frame to the maximum number of packets that can be looped as 2 X N of the number of OFDM frames. If any of the transport streams within the ISDB-T transport stream have different modulation parameters, select Non-TS from the Packet Size command in the Play menu.
	The status indicator light in the button illuminates when stream data is being output. The light blinks when the stream output pauses.
Record Button	■ Press this button to record the stream data that is being applied.
	■ If you press this button while the Play screen is displayed, it switches to the Record screen.
	■ Press this button to start the RF output of the modulated signal when a broadcast transport stream is applied to the ASI In connector.
	The status indicator light in the button blinks when a sync word is being detected, or when the pretrigger portion of the stream data has been recorded.
Arrow Buttons	Move the icon cursor on the LCD display.
Enter Button	Executes the selected menu command or enable all setting changes in a dialog box.
Cancel/Close Button	Cancels the selected operation and closes any open menu command list temporarily.
Tab Button	Moves through the dialog box.
Num Pad/Select Button	Enables or disables any setting changes in a dialog box. You can also open the keypad to enter numeric values for a text box.
	When an ISDB-T file is selected in the Play screen or an ISDB-T signal is captured in the Record screen, pressing this button causes the ISDB-T Information dialog box to appear.
USB Connectors	Connects the keyboard and mouse provided with the instrument for Windows operations.

Rear Panel Connectors

Figure 1: RTX130B rear panel

Figure 2: RTX100B rear panel

Table 4: Rear panel connectors

Connector	Function
RF Out	Output an RF signal.
	NOTE. The RF signal output is only available when a broadcast transport stream is being output or applied.
ASI In	Input an ASI signal.
ASI Out	Output an ASI signal.
Clock/Ref In	Input an external reference signal or a clock signal to the generator.
	NOTE. Use a continuous signal for an external reference or a clock signal.
Trig In/Out	Input an external trigger event for stream recording or output a 27 MHz reference clock signal or an ISDB-T frame pulse signal.
SPI In/Out	Input and Output an SPI signal.
Printer	Connect to a printer.
IEEE1394b	Connect an IEEE 1394b device such as an external hard disk drive.
LAN(10/100/1000 Base-T)	Use this connector to connect the generator to your local Ethernet network.
Com	This 9-pin D-sub connector provides a serial interface for instrument control.

Table 4: Rear panel connectors (cont.)

Connector	Function
VGA	Display the instrument screen to an external monitor.
	The VGA output is automatically enabled only when you power on the instrument with an external monitor connected. If you want to enable the VGA output after powering on the instrument, perform the following steps:
	1. Minimize the Play screen to display the Windows XP desktop.
	2. Click the **Intel(R) Extreme Graphics 2M** icon (see below) at the right side of the taskbar.
	3. Select **Graphic Options > Output To > Intel(R) Dual Display Clone > Monitor+Notebook** from the displayed menu.
Power Connector	Use this connector to apply power to the instrument using the supplied power cord.

Windows Operations

All the functions of the generator are performed as an application on the Windows XP operating system. Therefore, if you connect the keyboard and mouse provided with the instrument to the front-panel USB connectors, you can operate the generator with the same environment as a Windows PC.

Operation on the Play/Record Screen

When you connect a keyboard and mouse to the instrument, you can use them to make menu selections and parameter settings in the Play/Record screen. These operations behave in the same manner as the other Windows applications.

Displaying the Windows Screen (Desktop)

To display the Windows screen (Desktop), select Minimize or Exit from the File menu in the Play screen or Record screen. When you click Minimize, the generator application window minimizes and the Windows XP desktop appears. When you click Exit, the generator application exits and the Windows XP desktop appears.

File Operation

There are no menu commands to manage file operations in the generator application. Perform file operations such as copy, delete, or upload/download on Windows. Refer to Windows XP Online Help or other documentation about file operations.

The generator application is placed in the C:\ProgramFiles\Tektronix\MpegPlayer folder. The sample transport stream files are placed on the D: drive (Volume D).

System Settings

This manual describes only the settings for connecting to an Ethernet network. Refer to Windows XP Online Help or other documentation for information about other system settings.

Display Elements

There are two types of display screens to operate the generator: the Play screen and the Record screen.

- The Play screen is used to output the selected stream.

- The Record screen is used to record the input stream.

NOTE. When you press the REC/Play button or select the Record/Play command from the File menu while the Play/Record screen is displayed, the screen switches to the Record/Play screen.

The following figure shows the location of display elements of the Play screen. The display elements of the Record screen are the same as that of the Play screen.
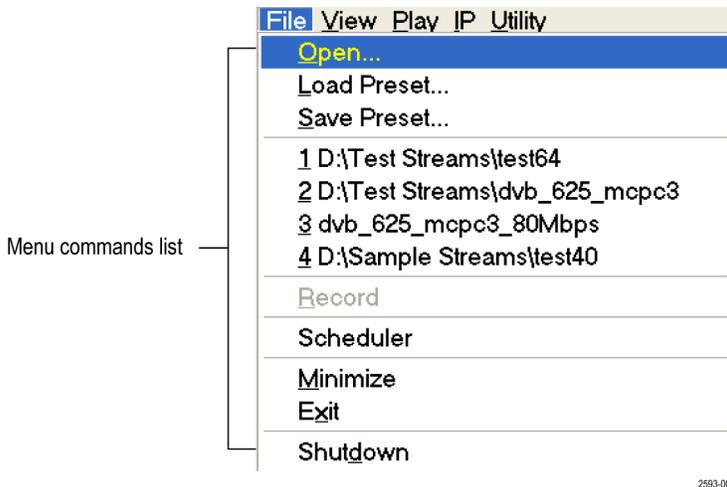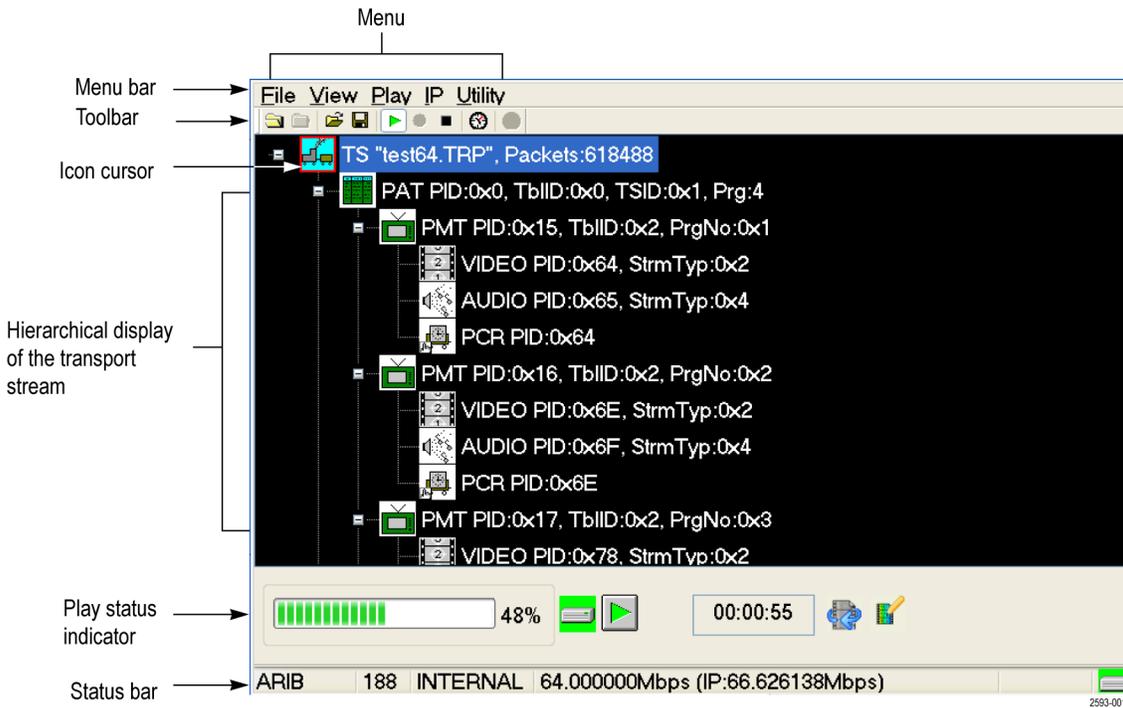
Menu Bar

The Menu bar displays the names of the menus that can be used in the Play or Record screen. Press the Menu button to enable or disable the menus.

Toolbar

The toolbar provides shortcut buttons for many of the most often used menu commands. Click a toolbar button to select the corresponding command. You can toggle the toolbar display on and off using the Toolbar command in the View menu.

Hierarchy Display

Each icon in the hierarchy display represents an element of the stream. The hierarchy text contains a description of the associated icon.

Icon Cursor. The icon cursor appears as a red box around an icon in the hierarchy to indicate the currently selected icon.

Use the up (▲) or down (▼) arrow button to move the icon cursor between icons. When the icon cursor is at the top or bottom of the hierarchy display, the hierarchy scrolls to show additional elements of the stream when applicable.

Play/Record Status Indicator

The play/record status indicator is displayed while the selected stream is being output as shown in the following figure. It shows the output status of the selected stream: the progress of the stream output, the output source, the operational status, and the elapsed time.

The play/record status indicator is displayed while the input stream is being played/recorded. It shows the play/record status of the input stream: the progress of the stream record, the record target, and the elapsed time.
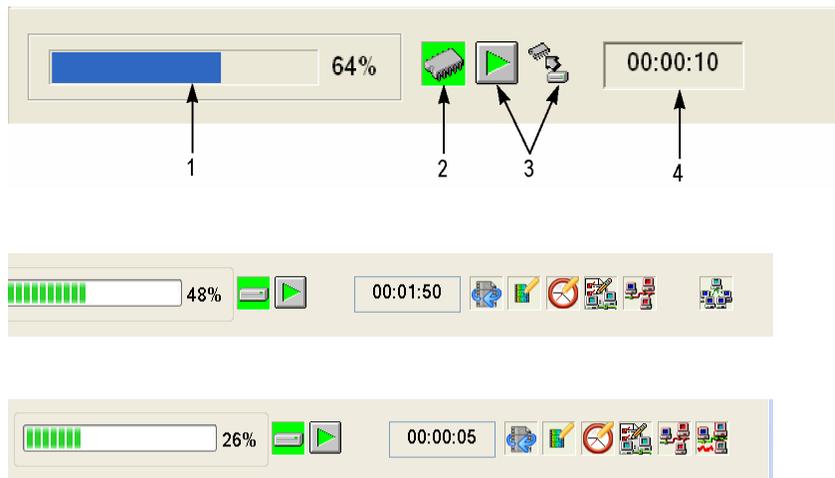
The play/record status indicator shows the following information:

1. **Position Indicator.** In the Play screen, this indicator shows the progress of the stream output using the duration gauge. In the Record screen, this indicator shows the progress of the stream record using the duration gauge.

   The duration gauge is updated every 1 second. If you output a stream with a repetition rate of around 3 seconds, the gauge might not be displayed correctly.

2. **Output Source/Record Target.** In the Play screen, this indicator shows the output source used to output the selected stream. In the Record screen, this indicator shows the record target used to record the input stream. show the current operation status of the instrument. One of the icons mentioned under *Output Source/Record Target* in the following table is displayed according to the selected output source or record target. (See Table 5.)

3. **Operation Status.** Shows the current operation status of the instrument.

Table 5: Operation status icons

Icon	Description
Output Source/Record Target	
	This icon shows that the hard disk is the output source or record target.
	This icon shows that the RAM is the output source or record target.
Record Screen	
	This icon shows that the captured stream is being recorded.
	This icon shows that the stream record is stopped.
	This icon shows that the generator is waiting for a trigger event.
	This icon shows that a trigger event is occurring.
	This icon shows that the captured stream is being processed on the hard disk.
	This icon shows that the captured stream is being saved from the RAM to the hard disk.
Play Screen	
	This icon shows that the selected stream is being output.
	This icon shows that the stream output is stopped.
	This icon shows that the selected stream is being read from the hard disk to the RAM.
	This icon shows that the stream is continuously output using the loop method.
	This icon indicates that the stream parameters are updated.
	This icon shows that the PCR accuracy is enabled.
	This icon (only in IP mode) shows that the Advanced Protocol Settings is enabled and applied to the stream.

Table 5: Operation status icons (cont.)

|	
	This icon (only in IP mode) shows that the Stream Replication Settings is enabled and applied to the stream.
	This icon (only in IP mode) shows that the errors are inserted in the stream.
	This icon (only in IP mode) shows that the parametric settings are enabled and applied to the stream. *NOTE. The transport stream cannot be played if the parametric settings and the stream replication settings are enabled at a time. It displays an error as shown in the following figure.*
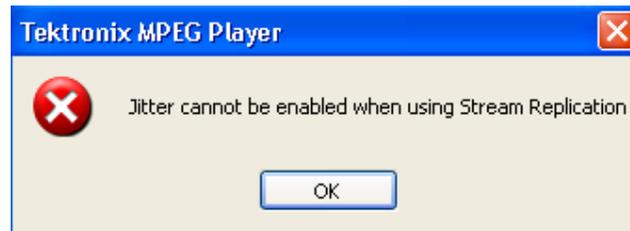
Remote Connection Status

	This shows that the TCP/IP connection for remote control is established.
	This shows that the TCP/IP connection for remote control is established and the front-panel buttons and mouse input are locked by the `:SYSTem:KLOCk:STATe ON` command.

4. **Elapsed Time.** In the Play screen, this box displays the elapsed time of the current stream data output. In the Record screen, this box displays the elapsed time since the input stream was recorded.

Scroll Bar. The scroll bar appears when there is a hierarchy display to show the relative position of the hierarchy of the stream.

NOTE. After you scroll a hierarchy display in the Record screen, the display may be out of focus. If this is the case, select an icon cursor on the display to refocus.

Status Bar. The status bar contains several indicators that display general information about the transport stream output or record status.
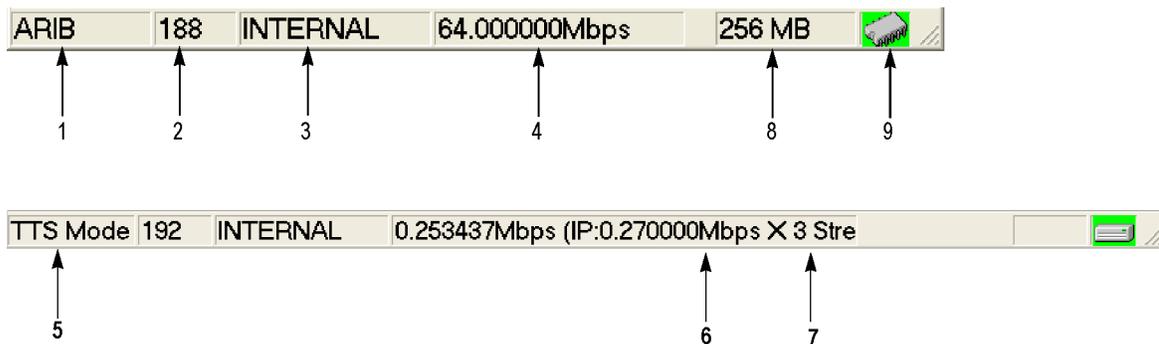
The Status bar shows the following information:

1. **Standard.** In the Play screen, this indicator shows the standard used to display the selected stream (MPEG-2, ARIB, DVB, ATSC, S-TMCC, M-TMCC, or Non-TS). In the Record screen, this indicator shows the standard used to display the input stream.

2. **Packet Size.** In the Play screen, this indicator displays the packet size in bytes (188, 204, 208, Non-TS, or Partial TS (Option 05 only)) of the stream output. In the Record screen, this indicator displays the packet size in bytes of the input stream.

3. **Clock Source.** This indicator displays the source of the reference clock (internal or external) used for the stream output.

4. **Bit Rate.** In the Play screen, this indicator displays the bit-rate (in Mbps) of the stream output. In the Record screen, this indicator displays the bit-rate (in Mbps) of the input stream.

5. **TTS Mode.** In the Play screen when IP interface option is selected with the TTS mode enabled, this indicator displays that the TTS mode is enabled for the playout. The Record screen is disabled for the IP interface option.

6. **IP Bit Rate.** In the Play screen when the IP interface option is selected, this indicator displays the bit rate (Mbps) of the IP stream output. The Record screen is disabled for the IP interface option.

7. **Free RAM space.** In the Play screen, this indicator shows the free RAM space that can be used to output the selected stream. In the Record screen, this indicator shows the free RAM space that can be used to record the input stream.

8. **Output Source/Record Target.** In the Play screen, this indicator shows the source used to output the selected stream. In the Record screen, this indicator shows the target used to record the input stream.

   This indicator is the same as the output source/record target indicator of the Play/Record Status indicator.

RF Status Display.   Displays a parameter and an icon related to the RF output.

1. This indicator displays the center frequency (UHF channel number) for the RF output. This value can be set using the RF Parameter command in the ISDB-T/ISDTV/ASI menu.

2. This icon appears while outputting an RF signal.

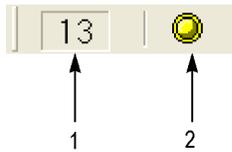**Remote Connection Status Icons.**   The remote connection status icons appear when a TCP/IP connection for remote control is established. The right icon shows the status of the TCP/IP connection (this icon is always displayed when the TCP/IP connection is established), and the left icon shows the lock status of the front-panel buttons and mouse input.

There are two display states:

This shows that the TCP/IP connection for remote control is established.

This shows that the TCP/IP connection for remote control is established and the front-panel buttons and mouse input are locked by the `:SYSTem:KLOCk:STATe` ON command.

To reset the lock status, send the `:SYSTem:KLOCk:STATe OFF` command or press the **Cancel/Close** button on the front panel (if a keyboard is connected, press the **Esc** key).

When the TCP/IP connection is closed, the remote status icons disappear.

Toolbar Buttons

The toolbar provides shortcut buttons for many of the often used menu commands. Click the appropriate button to implement one of the functions described in Table 6.

NOTE. To access the toolbar buttons, you need to connect a USB mouse to the USB connector on the front panel.

Table 6: Toolbar button descriptions

| Icon	Name	Function
	LOAD TS file	Opens the Select File dialog box. Equivalent to the **Open** command in the File menu. This button is available when the Play screen is displayed.
	SAVE TS file	Opens the Save as dialog box. Equivalent to the **Save** command in the File menu. This button is available when the Record screen is displayed.
	Load Preset	Opens the Open dialog box. Equivalent to the **Load Preset** command in the File menu.

Table 6: Toolbar button descriptions (cont.)

Icon	Name	Function
	Save Preset	Opens the Save as dialog box. Equivalent to the **Save Preset** command in the File menu.
	Play	Outputs the selected stream. Equivalent to the **Play/Pause** button on the front panel.
	Record	Records the acquired stream. Equivalent to the **Record** button on the front panel.
	Stop	Stops the stream output or stream record. Equivalent to the **Stop** button on the front panel.
	Clock	Opens the Clock dialog box. Equivalent to the **Clock** command in the Play menu. This button is available when the Play screen is displayed.
	Target	Opens the **Target** dialog box. Equivalent to the Target command in the Record menu. This button is available when the Record screen is displayed.

Procedures

Accessing Menu Commands

1. To access any menu command, do the following:

   ▪ Press the Menu button. The File menu command list opens. Use the up (▲) or down (▼) arrow button to move through the command list. Press the Enter button to execute the selected command.

   ▪ Use the left (◄) or right (►) arrow button to select the desired menu. Press the Cancel/Close button to close the command list temporarily.

2. Press the Menu button again to close the menu command list.

   NOTE. When you press the left arrow button while the File menu is displayed or when you press the right arrow button while the Utility menu is displayed, the Windows Control menu appears.

Arrow buttons

Menu button

Cancel/Close button

Tab button

Enter button

Num Pad/Select button
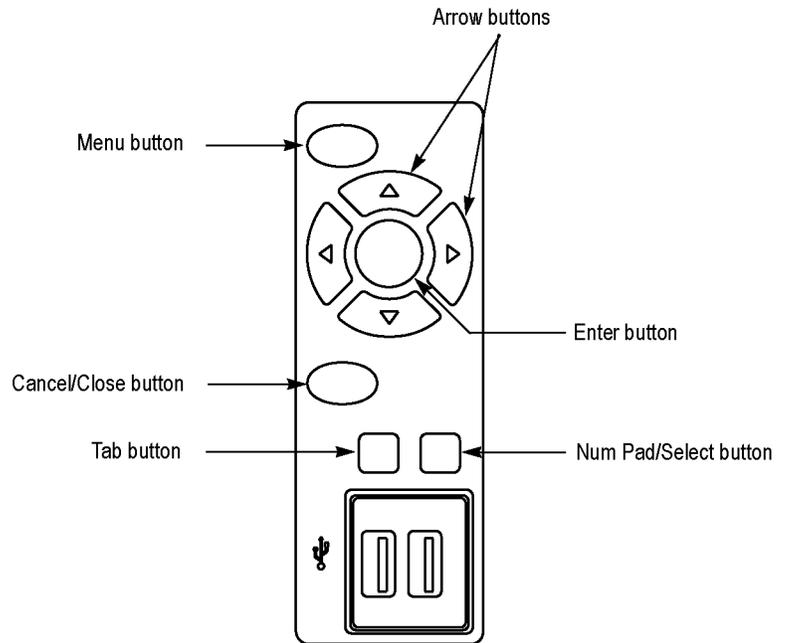
Display States of the Menu Commands

The menu commands can have the following three display states.

- A command followed by "▶ " indicates that a corresponding submenu will be displayed after you press the Enter button or the right (▶) arrow button.

- A command followed by an ellipsis (...) indicates that a corresponding dialog box will open after you press the Enter button.

- A command name by itself will be executed after you press the Enter button.

Packet Size ▶ ◄── A corresponding submenu will be executed

Clock... ◄── A corresponding dialog box will be executed

Record ◄── The displayed command will be executed

Entering Numeric Data

Using the Keypad

1. Open a dialog box in which you want to change a parameter.

2. Press the **Tab** button repeatedly to select (highlight) the numeric parameter that you want to change in the open dialog box.

3. Press the **Num Pad/Select** button to open the keypad.

Numeric input box

Clear key

Backspace

Cancel key

Enter key

4. Press the **Tab** button or the arrow buttons to move to the number you want to input (when the keypad first opens, the dotted line box is located on the ENT key).

5. Press the **Num Pad/Select** button. This displays the selected number in the numeric input box.

6. Repeat steps 4 and 5 to input the desired parameter value.

7. Press the **Enter** button (or select the **ENT** key and then press the **Num Pad/Select** button). This saves the new value in the numeric input box and closes the keypad.

Using the Arrow Buttons

1. Open the dialog box in which you want to change a parameter.

2. Press the **Tab** button repeatedly to select the numeric parameter that you want to change in the open dialog box.

3. Press the left (◄) arrow button to begin editing the parameter. This highlights the last digit.

4. Press the left (◄) or right (►) arrow button to move the highlighted cursor to the value you want to change

5. Press the up (▲) or down (▼) arrow button to increase or decrease the value.

6. Repeat steps 4 and 4 to enter all of the desired values. To add a digit, press the left (◄) arrow button.

7. Press the **Enter** button to save the changed numeric values.

Selecting the Data Output Source

When you output the selected stream data, you can select either the RAM or the hard disk as the output source. This subsection describes the operation of the RTX100B Series when each output source is selected.

RAM

When you select the RAM as the output source, the generator performs the following:

■ When the data output rate is less than or equal to 120 Mbps, the generator outputs the first stream of data while transferring the data from the hard disk to the RAM and then continuously outputs the data from the RAM using looping methods.

■ When the data output rate is more than 120 Mbps, the generator continuously outputs a stream of data from the RAM using looping methods after the data is completely transferred from the hard disk to the RAM.

If you select the RAM as the output source, you cannot output the data over the RAM free space (maximum 256 MB). This RAM free space is displayed on the status bar.

Hard Disk

If you select the hard disk (Disk) as the output source, the generator always outputs the selected stream of data from the hard disk regardless of the data output rate. When the reading speed of the hard disk cannot overtake the data output rate, the message "Error: Output Buffer Empty" appears.

Use the Source command in the Play menu to select the output source. You can see the currently selected output source in the status bar.

Adding Jitter to PCRs

The generator provides the capability to add jitter to PCRs (Program Clock References). Adding jitter to PCRs allows you to simulate transmission delay variations and to test the robustness of decoders under various conditions.

The jitter function adds jitter to the program_clock_reference_base value and the program_clock_reference_extension value in the adaptation field of transport stream packets. You can use this function to modulate the data values of the PCRs away from their correct values.

NOTE. When you use this function, be sure to set PCR/PTS/DTS Update Method in the Select Update Item dialog box to Hardware.
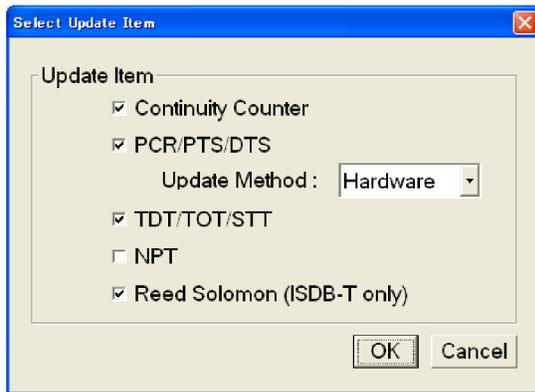

Perform the following procedure to add jitter to PCRs:

1. Use the Icon cursor to select the PCR item in the hierarchy display. If the Icon cursor is not available, press the **Menu** button to enable the Icon cursor.

2. Press the **Num Pad/Select** button.
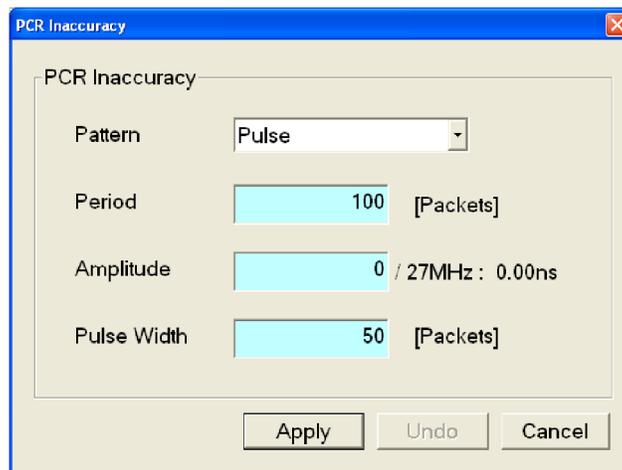
3. You can set the following parameters in the PCR Inaccuracy dialog box:

- ■ **Pattern:** Selects the type of waveform used to add jitter. You can select Sine, Square, Triangle, Pulse, Sawtooth, Random, or Offset

- ■ **Period:** Sets the period of the waveform used to add jitter. You can set the value from 5 to 3000 packets in 1 packet steps.

- ■ **Amplitude:** Sets the amplitude of the waveform used to add jitter. You can set the value from 0/27 MHz to 135000000/27 MHz (0 to 5 s).

- ■ **Pulse Width:** Sets the pulse width of the waveform used to add jitter. You can set the value from 1 to (period–1) packet(s) in 1 packet steps. This Pulse Width parameter is available only when the Pattern parameter is set to Pulse.
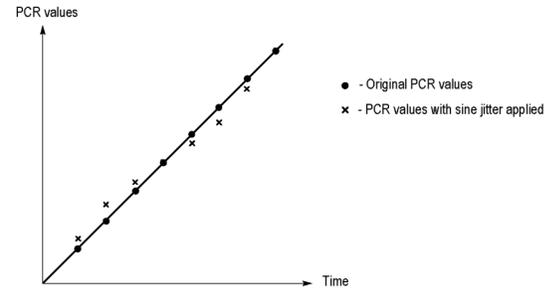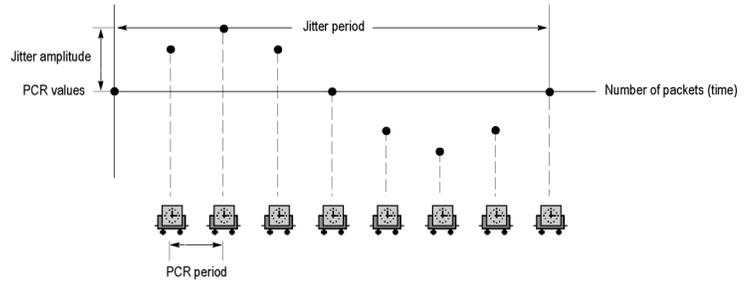
4. After you have set the parameters, press the **Enter** button to enable the jitter function.

The figure on the right side shows the relationship among the parameters and how the PCR values (program_clock_reference_base value and program_clock_reference_extension) change when Sine is selected as a jitter-pattern waveform. The PCR values vary by the value of the sine waveform defined by the amplitude and period. The PCR period does not change.

Performing Continuous Recording

The Continuous Recording feature allows you to record multiple stream files continuously on the hard disk or RAM.

This section describes the features and basic actions of continuous recording, and tells how to use it to record stream files.

Overview

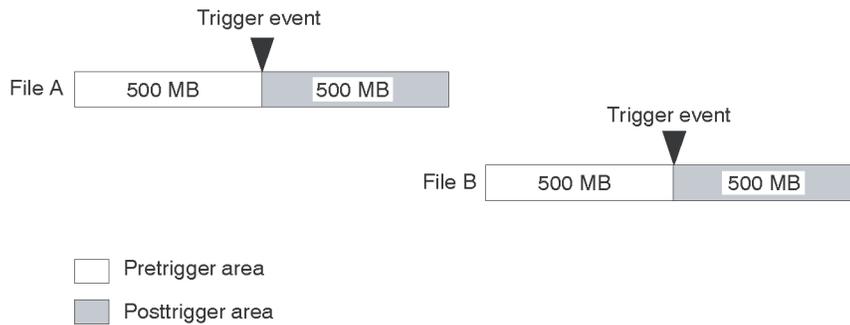Continuous recording has the following features:

- Records multiple stream files continuously on the hard disk

- Operates variable file sizes

- Records timestamp information of the first trigger event in a file as the updated date property of the file

- Records file in Disk or RAM recording mode

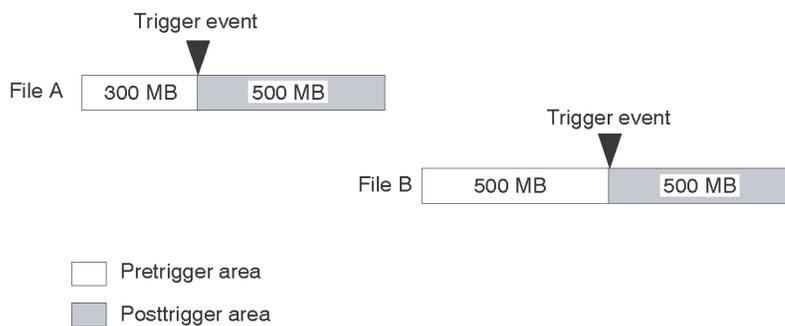## Basic Action of Continuous Recording

This section describes how files are recorded by locating trigger events in continuous recording.

In the following explanation, both pretrigger and posttrigger sizes must be set to 500 MB.

- In general, each trigger event occurs intermittently. In this case, each file has one trigger event, and the pretrigger and posttrigger areas have the specified sizes.

```
                          Trigger event
                               ▼
File A  [   500 MB   |   500 MB   ]
                                        Trigger event
                                             ▼
                        File B  [   500 MB   |   500 MB   ]


        [ ] Pretrigger area
        [ ] Posttrigger area
```

- If a trigger event occurs while the pretrigger area is filled with data, the pretrigger area becomes smaller than the specified size. However, the posttrigger area stays the specified size. In this case, File A is smaller than the specified size.

```
            Trigger event
                 ▼
File A  [ 300 MB | 500 MB ]
                              Trigger event
                                   ▼
            File B  [  500 MB  |  500 MB  ]


        [ ] Pretrigger area
        [ ] Posttrigger area
```

■ If a second trigger event occurs while the posttrigger area is filled with data, the second trigger event is ignored.

Trigger events

File A | 500 MB | 500 MB |

Trigger event

File B | 500 MB | 500 MB |

☐ Pretrigger area

▨ Posttrigger area
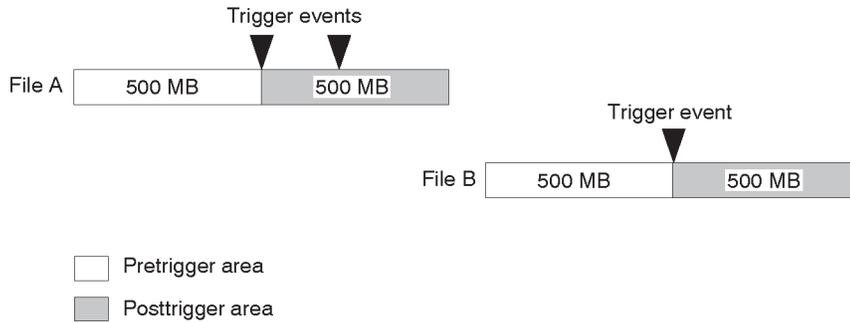
NOTE. If the trigger position is set to 0 (%), both files are created whenever a trigger event occurs.

Use the following procedure to perform continuous recording:

1. Press the front-panel **Record** button to display the Record screen.

2. Select **File > Save** to open the Save as dialog box.

3. In the dialog box, select the folder where stream files are to be saved.

4. Select **Record > Target** to open the Target dialog box.

NOTE. Ensure that the TS hierarchy of the recording stream is available before invoking the Target window.

5. In the dialog box, enable the **Continuous Recording** check box.

Continuous Recording
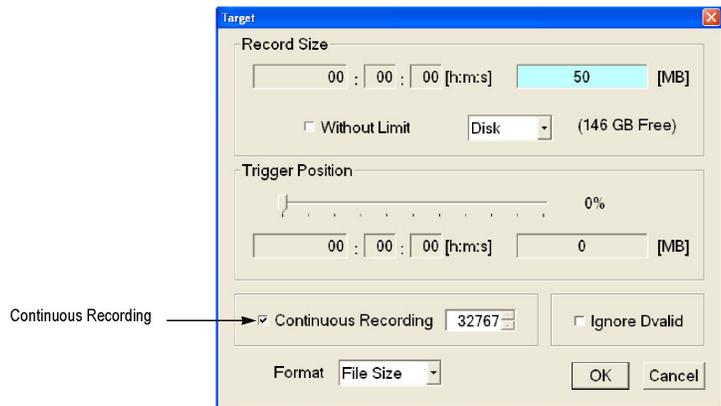
6. Set the number of files to record using continuous recording. After the specified number of files are created, stream capture stops automatically.

7. In the Record Size field, set the file size to be recorded.

8. In the Trigger Position field, set the trigger position.

9. If you want to start recording using a trigger signal on the Trig In/Out connector:

    ■ Select **Record** > **Other** to open the Others dialog box.

    ■ Select **Rise** or **Fall** in the **Ext Record Start** field.

10. Press the front-panel **Record** button to start continuous recording.

    While Continuous Recording is running, the total number of captured files are displayed in the file counter on the record status indicator.

When the specified number of files are created or you press the front-panel Stop button, stream capture stops.

After the stream capture stops, recording of the captured streams starts. The file counter value decreases every time the recording of each file is complete. The recording starts from the last captured file. If you press the Stop button while the captured streams are recording, the recording terminates at the file currently being recorded.

NOTE. The error message Drive Full appears when there is no space to record a captured file with the specified file size on the hard disk.

Saving and Loading a Preset File

The generator provides the capability to save the user-defined instrument settings as a preset file and load the saved instrument settings. This section describes the contents of the instrument settings saved as a preset file and tells how to save and load a preset file.

Contents of the Preset File

The preset file can be created from either the Play screen or the Record screen. In the Play screen, you can save settings for stream output. In the Record screen, you can save settings for stream record.

■ In the Play screen, all of the parameter settings available in the Play menu are saved as a preset file. If any of the interface options are installed, the output parameter settings of the module are also saved.

■ In the Record screen, all of the parameter settings available in the Record menu are saved as a preset file. If any of the interface options are installed, the input parameter settings of the module are also saved.
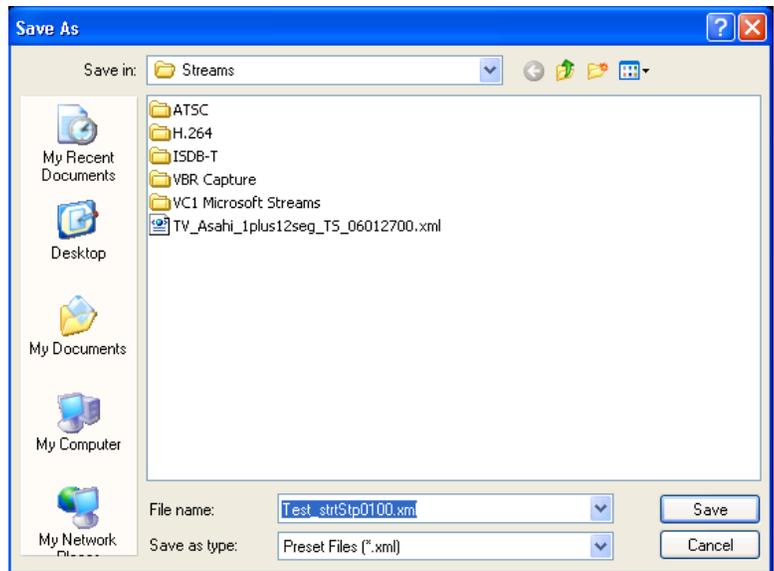
Use this procedure to save the current instrument settings as a preset file:

1. Set the instrument settings that you want to save.

2. Select **File > Save Preset**, and then press the **Enter** button.

In the File name text box, the following default file name is displayed automatically:

■ In the Play Screen, a two-digit serial number is added to the selected file name (for example, if the selected file name is Test_TS, the default file name becomes Test_TS00).

■ In the Record Screen, Preset## is used as a file name (## represents a two-digit serial number).

When a keyboard is connected to the USB connector, you can enter the desired file name.

3. Press the **Enter** button. This saves the instrument settings as a preset file.

Use this procedure to load instrument settings that are saved as a preset file:

1. Select **File > Load Preset**, and then press the **Enter** button
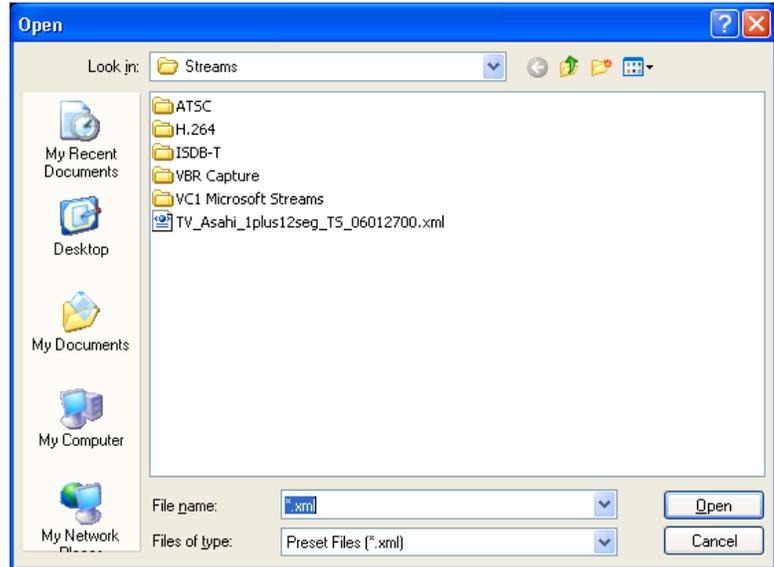
2. Press the **Tab** button repeatedly to select the file displayed at the top of the file list.

3. Press the up (▲) or down (▼) arrow button to select the preset file that you want to load. The selected file name is displayed in the File name text box.

4. Press the **Enter** button. This loads the preset file onto the instrument.

Setting Ethernet Network Parameters

You can set the network parameters for the generator using the Control Panel of Windows XP.

NOTE. The following procedure requires that you are familiar with the basics of using the Windows XP operating system. If necessary, review the Windows XP documentation.

Perform the following procedure to set the network parameters for the generator:

1. Connect the keyboard and mouse provided with the instrument to the USB connectors on the front panel. You can connect them to either of the connectors.

2. Select **File > Minimize** or **File > Exit** to close the Play (or Record) screen. The Windows XP desktop appears.

3. Select **Settings** > **Control Panel** from the **Start** menu. The Control Panel window appears.

4. Double-click the **Network Connections** icon in the window. The Network Connections window appears.
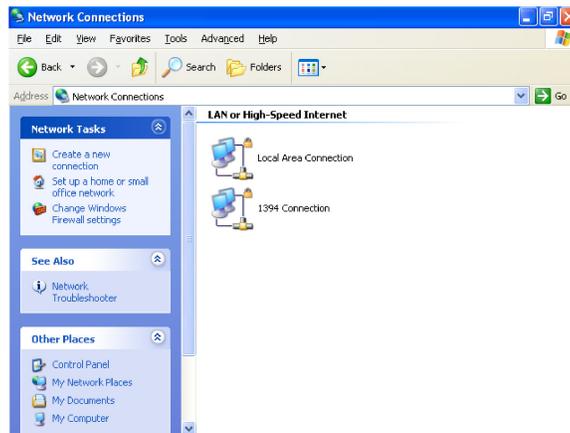
5. Double-click the **Local Area Connection** icon. The Local Area Connection Status dialog box appears.
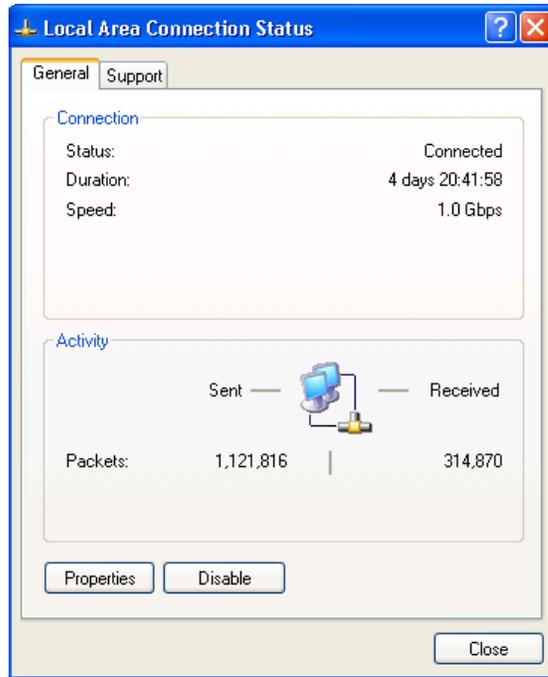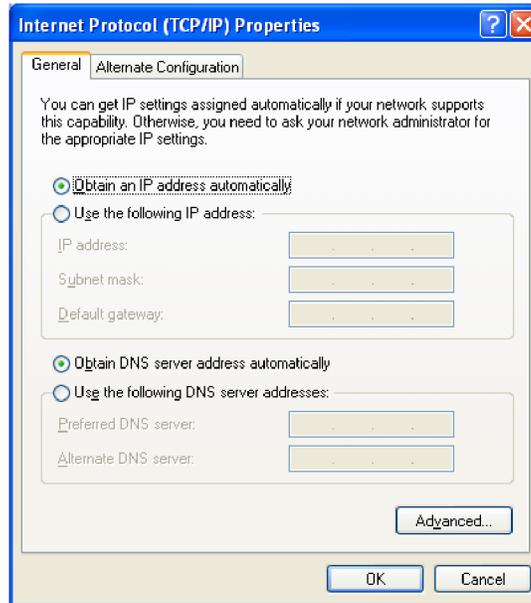
6. Click the **Properties** button. The Local Area Connection Properties dialog box appears.
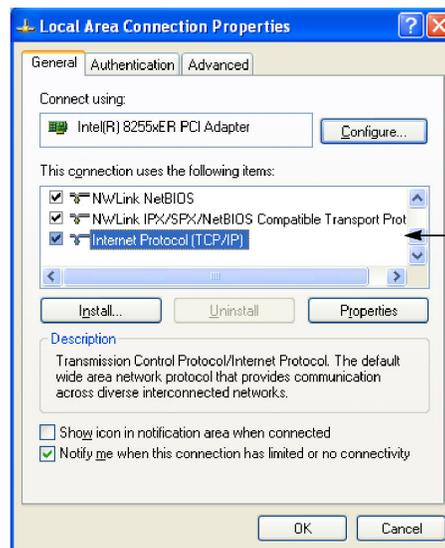
Network component field

7. In the network component field, click **Internet Protocol (TCP/IP)**.

8. Click the **Properties** button. The Internet Protocol (TCP/IP) Properties dialog box appears.

The settings in the dialog box depend on whether a DHCP (Dynamic Host Configuration Protocol) server is in the network connected to the generator.

When the DHCP Server is in the Network.   If the DHCP server is in the network, perform steps 9 and 10, otherwise skip to step 11.

9. In the dialog box, select **Obtain an IP address automatically** and **Obtain DNS server address automatically**.

10. Click the **OK** button.

The generator accesses the DHCP server and obtains the addresses automatically when connected to the network.

Refer to the user documentation supplied with your server OS for detailed information about DHCP server functions.

NOTE. In some network environments, the generator may not be able to obtain the IP address automatically from a DHCP server. In this case, you need to enter the appropriate address value in each submenu item.

When the DHCP Server is not in the Network. If the DHCP server is not in the network, perform the following procedure to set the network parameters.

11. If you connect the generator directory to a single PC:

    a. In the dialog box, select **Use the following IP address**.

    b. Set the **IP address** parameter to be the same IP address as the PC's address except for the last number. The last number must be different from the last number in the PC's IP address.

    c. Set the **Subnet mask** parameter to be the same net mask (subnet mask) used by the PC. Do not enter a number if the PC does not have a net mask.

    d. You do not need to enter a **Default gateway** if you are directly connected to a single PC.

12. If you connect the generator to your local Ethernet network:

    a. In the dialog box, select **Use the following IP address**.

    b. Ask your local network administrator and set the appropriate addresses.

⚠️ *CAUTION. To prevent communication conflicts on your Ethernet network, ask your local network administrator for the correct numbers to enter in the dialog box if you connect the generator to your local Ethernet network.*

13. Verify the Ethernet connection by using a ping command from the PC.

## Checking Remote Command Operation

To check remote command operation of the generator, perform the following steps:

1. Connect the generator to your PC using an Ethernet cable.

2. Click the Windows **Start** button and select **Run** from the start menu. The Run dialog box appears as shown.
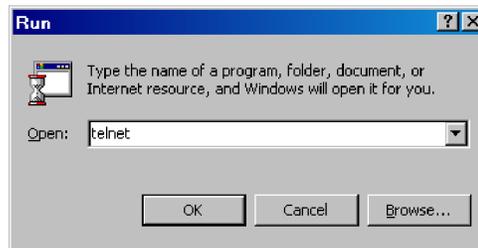
3. In the Open text box, type `telnet` and then click **OK**.

4. At the command line prompt, type `set local_echo` and press **Enter**. This sets the local echo mode to On.
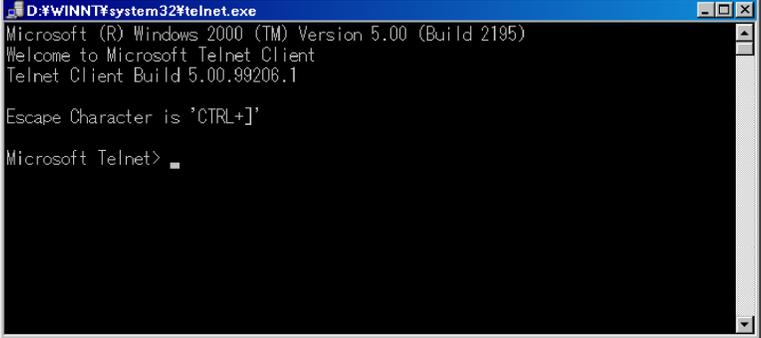
```
D:¥WINNT¥system32¥telnet.exe
Microsoft (R) Windows 2000 (TM) Version 5.00 (Build 2195)
Welcome to Microsoft Telnet Client
Telnet Client Build 5.00.99206.1

Escape Character is 'CTRL+]'

Microsoft Telnet>
```

5. At the command line prompt, type `open <host name> <port number>` and press **Enter**. <host name> is a computer name of the generator to be connected and <port number> is the port number set in the Communication dialog box (default value: 49152).

6. At the command line prompt, type `*IDN?` and press the **Enter** key.

7. Check that the following ID information of the generator appears: `TEKTRONIX, RTX100B, Vx.xx, Hxx, Cxx`.

Refer to *RTX100B Series RF Signal Generators Technical Reference manual* for the list of Remote and SCPI commands.

Application Examples

This section provides examples to familiarize you with the basic functions of the generator:

- Outputting a transport stream

- Recording a transport stream

- Outputting an RF modulated broadcast transport stream

NOTE. These tutorials do not cover all the features and functions of the generator. The tutorials are intended to introduce you to the operations required to execute the basic instrument functions.

Before you perform these tutorials, make sure that the generator is properly installed.

Required Equipment

The following table lists the equipment required to perform the tutorials. If alternative equipment is used, its accuracy should equal or exceed that of the example instruments and accessories.

Table 7: Recommended test equipment and accessories

| Item	Qty	Requirement	Example
MPEG test system	1	Real-time transport stream analyzer	Tektronix MTS400 Series MPEG Test Systems or equivalent
ISDB-T receiver	1		
75 Ω BNC cable	1	Length: 42 inches	Tektronix part number 012-0074-00
QAM or ATSC receiver	1		

Outputting a Transport Stream

The hard disk drive of the generator is shipped with files containing factory-supplied samples of transport streams. This tutorial opens one of these sample files and outputs the transport stream.

Perform the following steps to select and output a stored transport stream:

1. Press the front-panel **Play/Pause** button to display the Play screen.

2. Press the **Menu** button to open the **File** menu.

3. Press the up (▲) or down (▼) arrow button to select **Open** from the menu, and then press the **Enter** button to open the Select File dialog box.
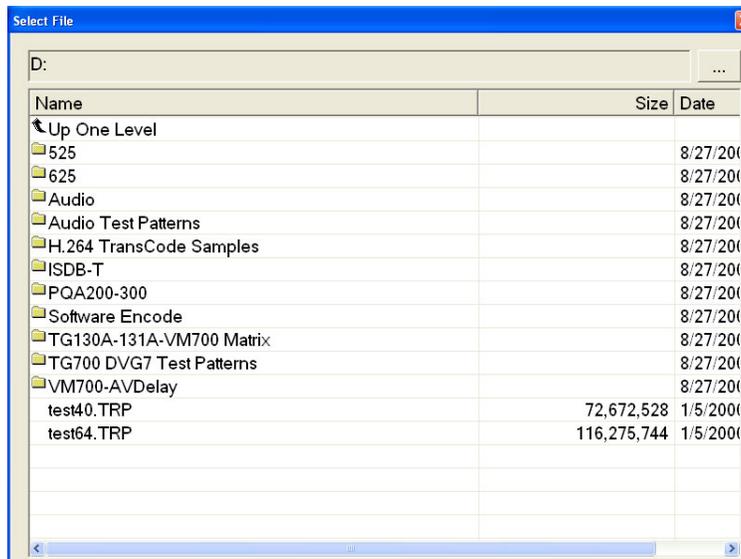

4. Press the up (▲) or down (▼) arrow button to select the file, and then press the **Enter** button. This displays the hierarchy view of the transport stream file.
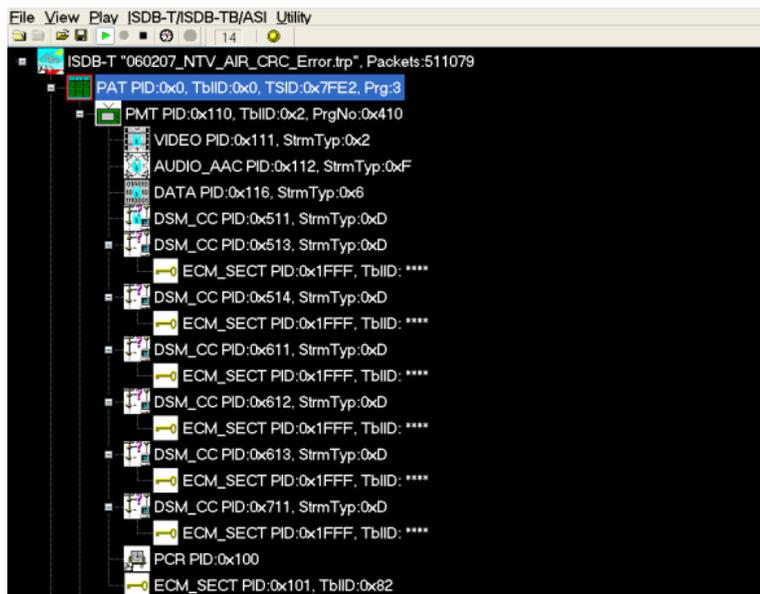
5. Connect the 75 Ω BNC cable between the **ASI Out** connector on the generator rear panel and the **ASI In** connector of the MPEG test system.

6. Press the generator's **Play/Pause** button to start the transport stream output. When transport stream output is started, the play status indicator appears and the indicator button lights.

7. Set up the MPEG test system to monitor the transport stream output from the generator.

8. Press the **Stop** button on the generator to stop the transport stream output. Observe that the Play Status indicator disappears.
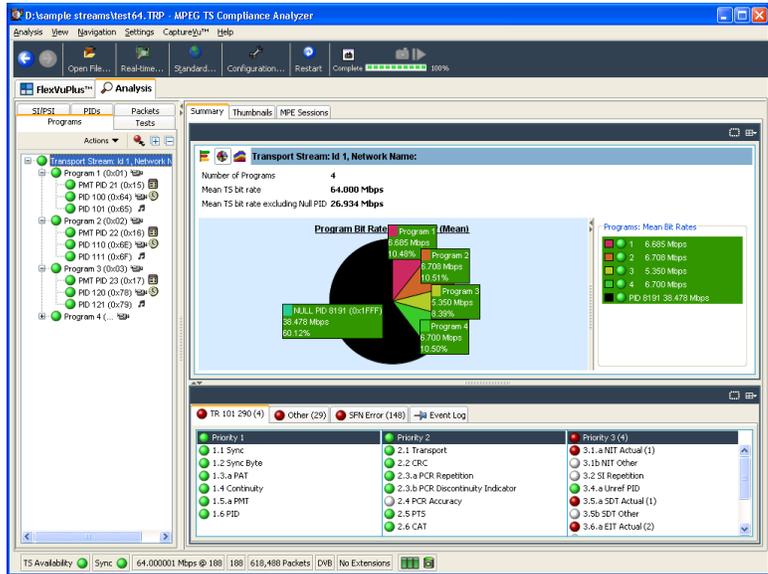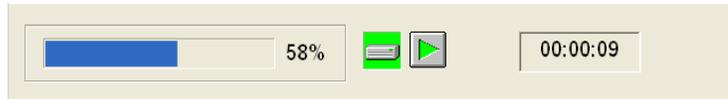
Recording a Transport Stream

This example captures a transport stream being applied into the ASI In connector and records it on the hard disk as a file.

NOTE. *The IP interface mode does not support the Record functionality and hence the Record option is disabled for IP.*

Perform the following steps to capture a transport stream and record it on the hard disk as a file:

1. Press the front-panel **Record** button to display the Record screen. Since no signal is being applied at this time, the No Signal message appears at the top of the screen.

2. For RTX130B generator, connect the 75 Ω BNC cable between the **ASI/SMPTE Input** connector on the generator rear panel and the **ASI OUT** connector of the MPEG test system.

3. For RTX100B generator, connect the 75 Ω BNC cable between the **ASI In** connector on the generator rear panel and the **ASI OUT** connector of the MPEG test system.

4. Output a transport stream from the MPEG test system. When transport stream output is started, the hierarchy view of the transport stream is displayed on the Record screen of the generator.

5. Press the generator **Record** button. When you press the button, the record status indicator appears and the indicator button illuminates.

After the transport stream record is completed, the record status indicator disappears, and the transport stream is saved with a file name that shows the current date (yy:mm:dd).

Outputting an RF Modulated Broadcast Transport Stream

The hard disk drive of the generator is shipped with files containing factory-supplied samples of broadcast transport streams. This example converts a broadcast transport stream into an RF signal and outputs it from the RF Out connector.

Using RTX100B Generator

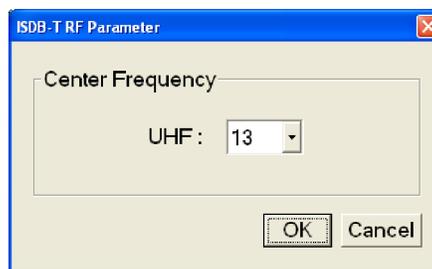Follow these steps to output RF modulated broadcast transport stream from generator:

1. Press the front-panel **Play/Pause** button to display the Play screen.

2. Select the **Open** command from the **File** menu to open the Select File dialog box.

3. Press the up (▲) or down (▼) arrow button to select the ISDB-T folder, and press the **Enter** button. This displays the content of the ISDB-T folder.

4. Press the up (▲) or down (▼) arrow button to select ISDB_T_M1.rmx, and press the **Enter** button. This displays the hierarchy view of the selected transport stream file.

You can display ISDB-T parameters of the transport stream by pressing the front-panel Num Pad/Select button or by pressing the space key of the key board (if it is connected).

5. If necessary, change RF parameters:

■ Select **RF Parameter** from the **ISDB-T/ASI** menu to open the ISDB-T RF Parameter dialog box shown.

■ In the dialog box, select a center frequency. You can select from channel 14 to channel 65. (See Table 9.) The table gives you information about the available UHF channels and their frequencies.
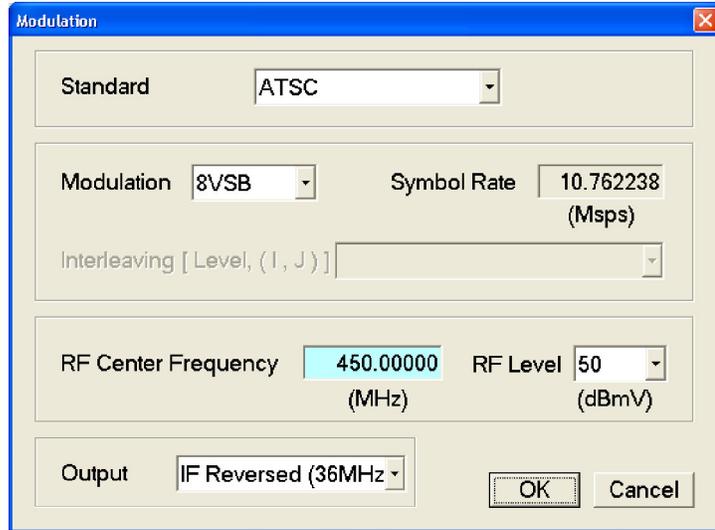
6. Connect the 75 Ω BNC cable between the **RF Out** connector on the RTX100B Generator rear panel and the **RF INPUT** connector on the ISDB-T receiver.

7. Press the RTX100B generator**Play/Pause** button to start the transport stream output.

8. Use the ISDB-T receiver to check that the RF modulated broadcast transport stream is output from the RF Out connector.

Using RTX130B Generator

1. Press the front-panel Play/Pause button to display the Play screen.

2. Select the **Open** command from the **File** menu to open the Select File dialog box.

3. Press the up (▲) or down (▼) arrow button to select the **525** folder, and press the **Enter** button. This displays the content of the 525T folder.

4. Press the up (▲) or down (▼) arrow button to select the **Flower.rmx** folder and press the **Enter** button. This displays the hierarchy view of the selected transport stream file.

5. Select **QAM/VSB** > **RF Output** > On to enable the RF output.

6. Select **QAM/VSB** > **Modulation** to open the Modulation dialog box.

7. Set the RF modulation parameters in the dialog box to meet your modulation standard.

8. Connect the 75 Ω BNC cable between the **RF Out** connector on the generator rear panel and the **RF INPUT** connector on the RF receiver.

9. Press the RTX130B generator **Play/Pause** button to start the transport stream output.

10. Use the RF receiver to check that the RF modulated transport stream is output from the RF Out connector.

Table 8: UHF channel number and frequency (ISDB-T)

Channel	Frequency (MHz)	Channel	Frequency (MHZ)	Channel	Frequency (MHz)
13	473.143	30	575.143	47	677.143
14	479.143	31	581.143	48	683.143
15	485.143	32	587.143	49	689.143
16	491.143	33	593.143	50	695.143
17	497.143	34	599.143	51	701.143
18	503.143	35	605.143	52	707.143
19	509.143	36	611.143	53	713.143
20	515.143	37	617.143	54	719.143
21	521.143	38	623.143	55	725.143
22	527.143	39	629.143	56	731.143
23	533.143	40	635.143	57	737.143
24	539.143	41	641.143	58	743.143

Table 8: UHF channel number and frequency (ISDB-T) (cont.)

Channel	Frequency (MHz)	Channel	Frequency (MHZ)	Channel	Frequency (MHz)
25	545.143	42	647.143	59	749.143
26	551.143	43	653.143	60	755.143
27	557.143	44	659.143	61	761.143
28	563.143	45	665.143	62	767.143
29	569.143	46	671.143	---	----------

Table 9: UHF channel number and frequency (ISDB-TB)

Channel	Frequency (MHz)	Channel	Frequency (MHZ)	Channel	Frequency (MHz)
14	473.143	34	593.143	54	713.143
15	479.143	35	599.143	55	719.143
16	485.143	365	605.143	56	725.143
17	491.143	37	611.143	57	731.143
18	497.143	38	617.143	58	737.143
19	503.143	39	623.143	59	743.143
20	509.143	40	629.143	60	749.143
21	515.143	41	635.143	61	755.143
22	521.143	42	641.143	62	761.143
23	527.143	43	647.143	63	767.143
24	533.143	44	653.143	64	773.143
25	539.143	45	659.143	65	779.143
265	545.143	46	665.143	66	785.143
27	551.143	47	671.143	67	791.143
28	557.143	48	677.143	68	797.143
29	563.143	49	683.143	69	803.143
30	569.143	50	689.143	---	----------
31	575.143	51	695.143	---	---
32	581.143	52	701.143	---	---
33	587.143	53	707.143	---	---

Notes for RF Modulation Output

When you output a broadcast transport stream from the generator, note the following:

- You cannot perform RF modulation for transport streams other than broadcast transport streams.

- If there are a number of modulation parameters in the broadcast transport stream currently being output, the RF modulation is distorted for about two seconds at the parameter changing points.

- The generator does not support DPQSK modulation. If DPQSK modulation is used in the selected broadcast transport stream, the stream is modulated to QPSK and then output.

IP Stress Test

Perform the following steps to set up and to demonstrate the RTX100B or RTX130B IP stress generation capabilities using the portable PC.

NOTE. You can perform the IP stress test for the instruments only if the MTS400 Series TSCA option is installed on the RTX100B Series instrument.

Set Up

1. Connect the Ethernet cable to the LAN port of the portable PC and the LAN port on the generator.

2. Power on both the RTX100B Series generator and the portable PC.

3. Start the **MPEG Player** application on the RTX100B Series generator. Ensure that security dongle is attached to the laptop and start the TSCA application.

4. In the MPEG Player application, select **Play** > **Interface** > **IP**.
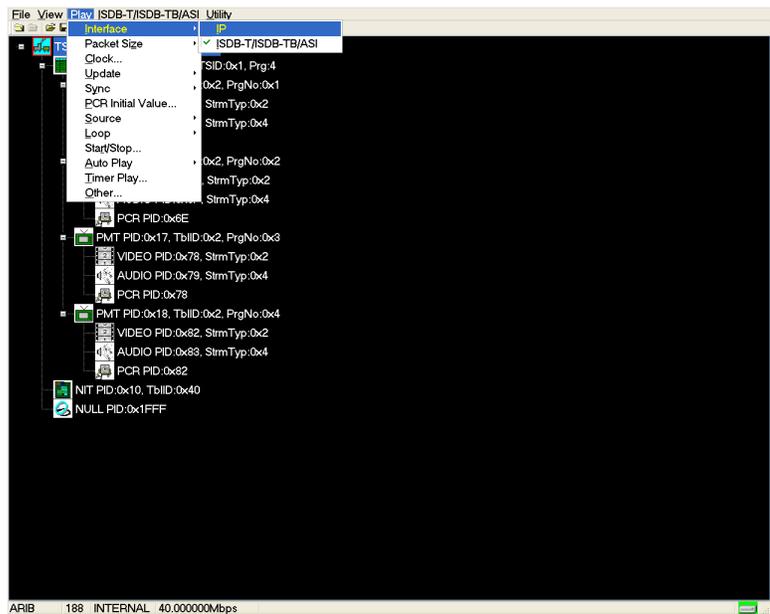
5. Select **IP** > **Configuration**.

Note the Source IP address and ensure that the **Transmission Mode** is set to **Multicast**.
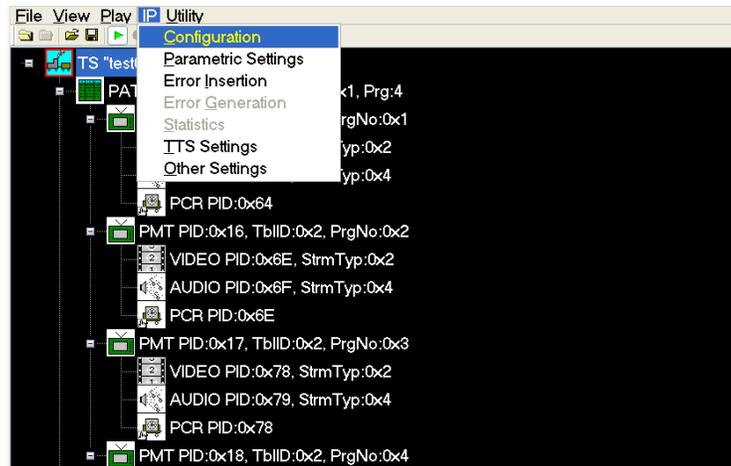
6. Select **OK** on the RTX configuration menu and select a test stream file from the D: drive.

7. Press the **PLAY** button on the RTX to start playing the selected stream file.

8. Open the **TSCA** application and verify that the Stream Interpretation is set appropriately for the demo.

9. In the TSCA, select **Real-time..** and then select **Browse**.

A single flow should be seen with same source IP address as the generator Configuration window showed. This means TSCA can see the generator traffic.
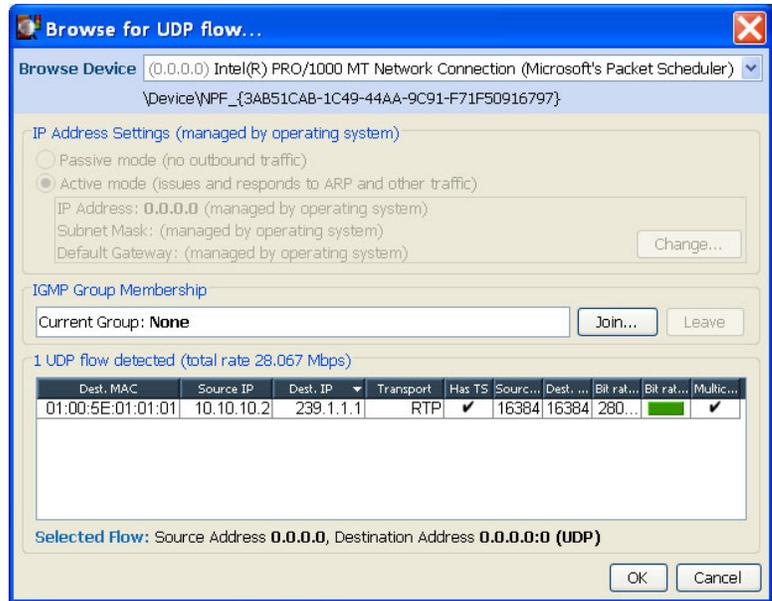
10. In the Browser for UDP flow dialog box, select the flow and click **OK**. Click **OK** in the Select Real time Interface dialog box.

Real time analysis of the stream will be displayed in TSCA. If the stream has no errors, then everything on the TSCA is green.

Outputting the IP Stress Test (Multicast)

This procedure involves playing the MPEG Player in IP mode and analyzing the output stream using a TSCA. If the stream has no errors, then everything on the TSCA is green.

1. In the TSCA, select **Now Playing** and select the **Play** button under one of the thumbnails. This will start VLC to show decoded video.

This is analogous to the way an STB would decode the video.

2. To see cross-layer timing graphs, do the following:

- Select **PCR PID** in the left pane of the hierarchical view.

- Select **Timing Graphs** in the right pane, and then add **PCR Arrival Interval**, **PTS Arrival Interval**, **PCR Inaccuracy,** and **PIT**.

- Click on one of the graphs to see cursor and values displayed at the same time on all the three graphs.

3. Select **PCR PID** in the RTX hierarchy display and right-click. In the PCR Inaccuracy dialog box, do the following to add the jitter:

- Set **Period** to **100** packets.

- Set **Amplitude** to **5/27Mhz** (within 500ns limit).

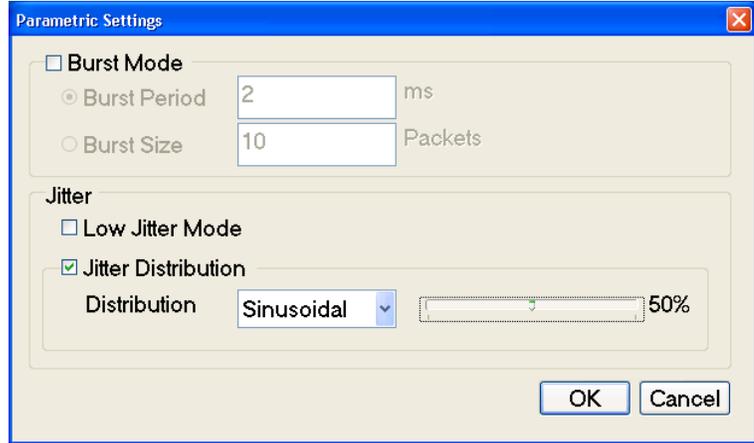View the effects in the timing graphs.
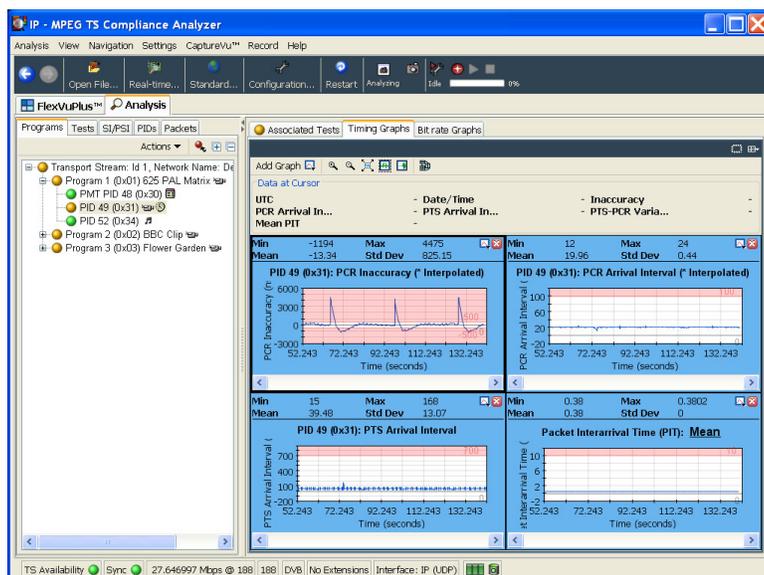
4. In the PCR Inaccuracy dialog box, change **Amplitude 20/27MHz** to **740 ns**.

PCR Accuracy test 2.4 will fail but note that VLC video decode is largely unaffected by this level of PCR Inaccuracy.

This is representative of a good video delivery network with IP packets being delivered by the network as they should be, but errors in the PCR values were introduced during the encoding and/or multiplexing process.

**5.** In the RTX application, do the following:

- Select **IP** > **Parametric Settings** .

- In the Parametric Settings dialog box, set Jitter Distribution to **Sinusoidal** and duration to **50%**.

 This represents 50% max variation from normal Ethernet inter packet gap.

6. Observe the effects in the timing graphs. The values for Min and Max PCR Arrival Interval, PTS Arrival Interval, and Packet Inter-arrival time will be increased due to the varying timing of packets arriving.

This represents poor network performance and shows the effect that the network can have on MPEG stream timing.

RTX100B Series RF Signal Generators Quick Start User Manual
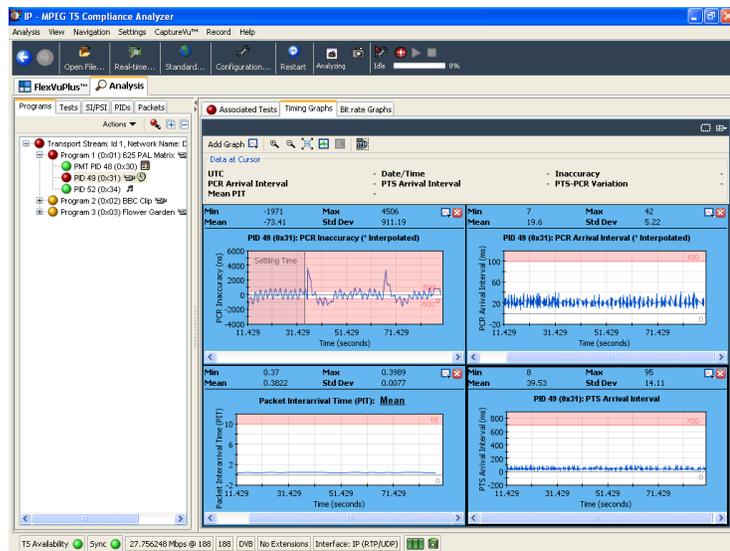
7. In the Parametric Settings dialog box, change the Jitter Distribution duration to **100%**.

The values for Min and Max PCR Arrival Interval, PTS Arrival Interval and Packet Inter-arrival time will increase.
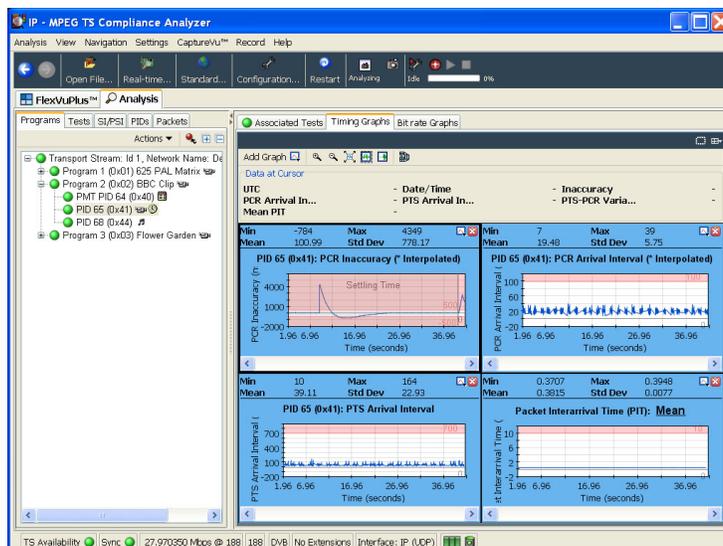
8. To observe the effects in VLC decoded video, do the following:

- ▪ Select the **Program** tab, **Transport Stream** node on the left side and **Now Playing** tab on the right.

- ▪ Click **Play**.

Using these graphs, you can determine the threshold at which IP packet jitter will cause the device under test to cease decoding the video. This is very important when designing for resilience against IP Network timing problems.

9. Select **IP** > **Error Generation** to select manual error generation from within the generator IP menu. Click on the different types of errors and observe the effects of packet loss, checksum errors, and sequence errors in TSCA tests view. (Look at Other – IP node in the TSCA test tree and expand it.) Also, observe the effects in the VLC decoded video.

These effects are typical of packet loss or corruption in IP video networks.

10. In the Error Insertion dialog box, select **Enable Error Insertion** check box, select **Packet Loss** and enter **10 packets/1000 packets**.

This represents 1% packet loss and typical design criteria specifications for designers to ensure that the equipment can protect against. Show the effects in TSCA (look for priority 1 CC errors and IP dropped packet errors). Also, observe the effects in the VLC decoded video.
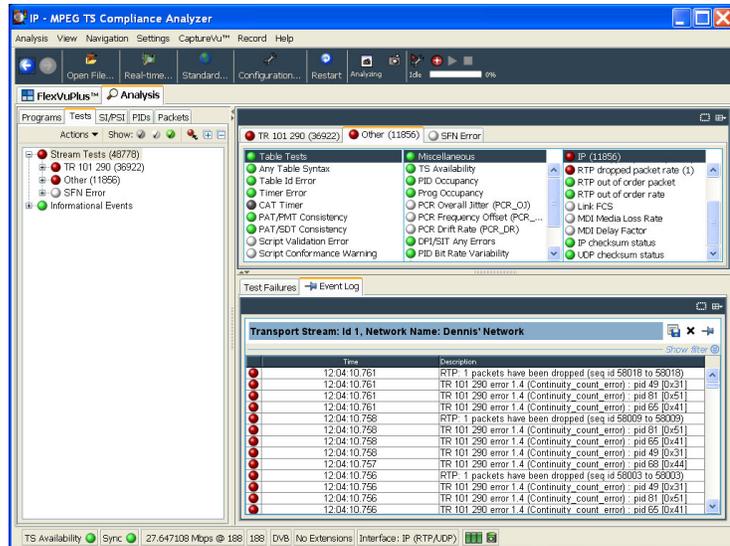
11. In the RTX application, select **IP** > **Configuration** > **Stream replication**. In the Number of replicated streams field, enter **4**, change the destination address, and increment the value from 0.0.0.0 to 0.0.0.1. This will play the selected file out on 4 additional flows, each with a destination address incremented by 1.
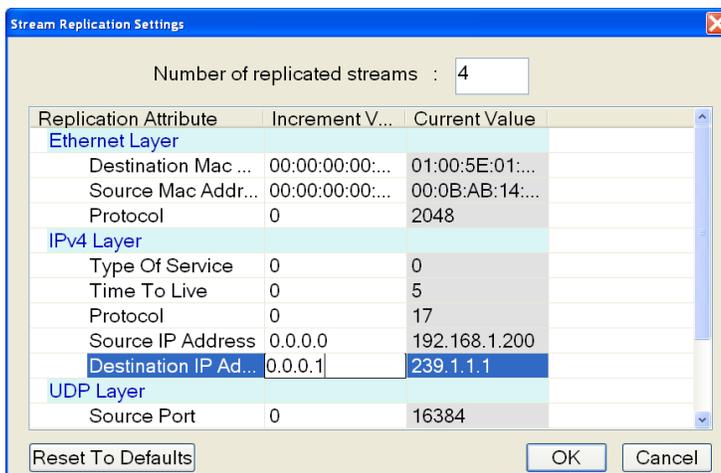
12. In the TSCA, select **Open File** > **Real-time..** > **Browse**. Observe that there are now multiple flows available for selection.

Generating multiple flows in this way is representative of real world IPTV multicast environment where multiple SPTS are transmitted.

Jitter and packet errors that are introduced are distributed across the packet flow to have an equal chance of impacting any particular session. This effect can be demonstrated by selecting any one of the flows for analysis. You can also demonstrate the impact of the above generator stress test cases for IP jitter and packet loss/corruption.
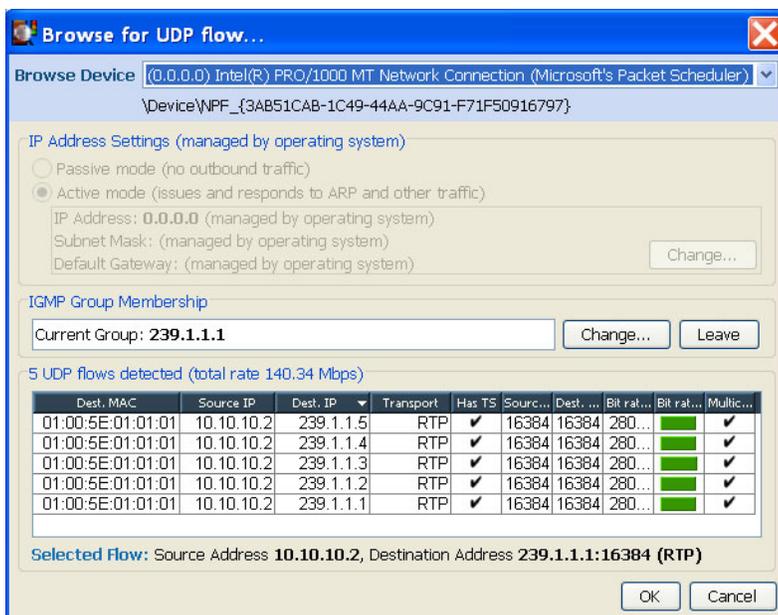
Outputting the IP Stress Test (Unicast)

1. Perform steps 1 through 4 of *Set Up*.
(See page 46.)

2. In step 5 of *Set Up*, set the **Transmission Mode** to **Unicast**.

3. Select **Control Panel** >
Network Connection > **Local Area Connection** > **Properties** > **Internet Protocol**.

The Internet Protocol (TCP/IP) Properties dialog box appears.

4. In the dialog box, select **Use the following IP address**.

5. Enter an IP address that is on the same segment as the generator Source IP address noted in step 5of *Set Up*. (See page 46.)The easiest way is to increment the IP address by 1.
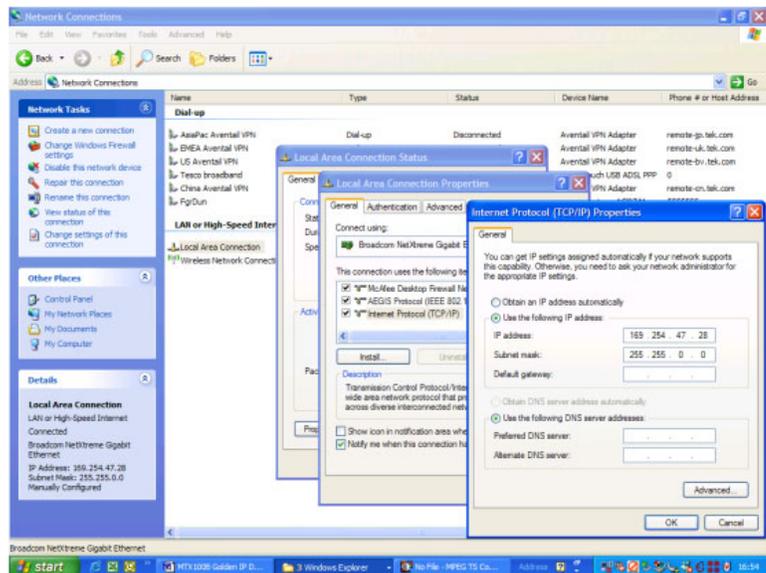
6. Perform steps 6 through 10 Set Up. (See page 46.)This will set up the test and perform the steps listed in *Outputting the IP Stress Test (Multicast)* to demonstrate the test. (See page 48.)

Scheduler (Option SC Only)

The Scheduler is a software application that provides scheduling capability for the generator. The application enables you to create a schedule list of streams for subsequent play or record.

NOTE. *The Scheduler software application is available only if the SC option is installed on the generator.*

This section describes the functions of the Scheduler applications and how to create a schedule list, play and record streams within the list.

NOTE. *When the RF Output of the generator is set to On, be sure to select Custom in the Playout Properties field in the Play Properties dialog box and set the bit rate to be the same bit rate that is calculated from the RF parameters (this value is displayed in the status bar).*


Starting and Exiting Scheduler

To start the Scheduler application on the generator, select **File** > **Scheduler** in the Play or Record screen.

- **In the Play screen:** Starts Scheduler in the schedule play mode. This mode allows you to create a schedule list and play streams.

- **In the Record screen:** Starts Scheduler in the schedule record mode. This mode allows you to create a schedule list and record streams.

To exit (quit) the Scheduler application, select **File** > **Exit** or click the **Close** button in the upper-right corner of the application window.

Elements of the Scheduler Display

The Scheduler application window contains a title bar, a menu bar, a toolbar, a status/control panel, a schedule list, and a status bar as shown in the following figure.
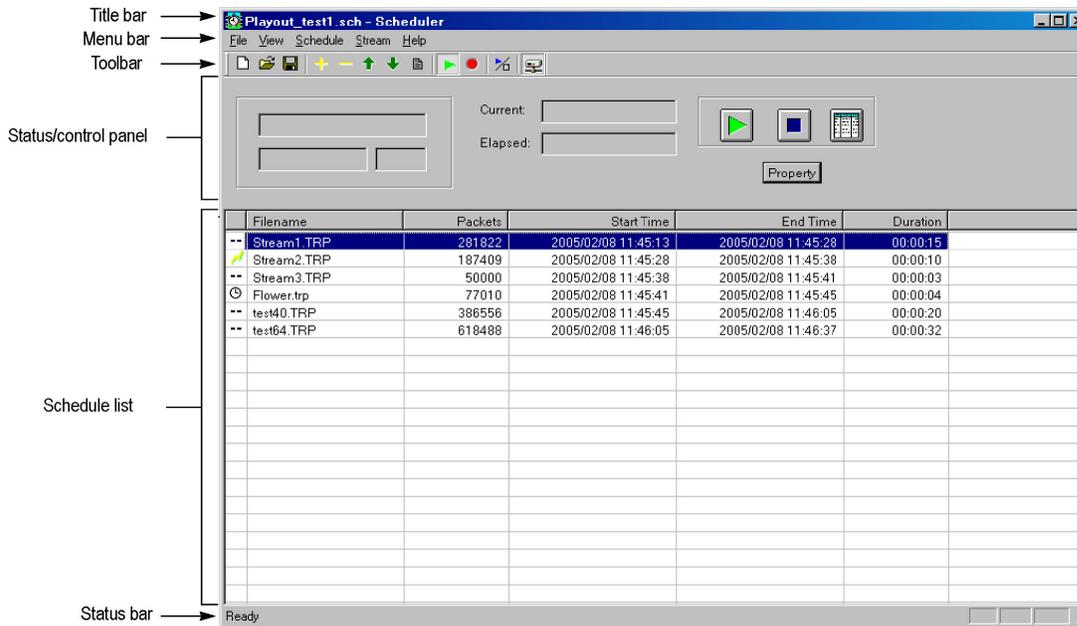
Title Bar

The title bar displays the file name of the currently selected schedule list and the name of the application. It also contains the standard window-sizing boxes for Windows.

Menu Bar

The menu bar displays the names of the drop-down menus.

Toolbar

The Toolbar provides shortcut buttons for many of the most often used menu commands. Click a toolbar button to select the corresponding command. You can toggle the toolbar display on and off using the Toolbar commands in the View drop-down menu.

Table 10: Toolbar button descriptions

Icon	Name	Function
	New	Equivalent to the New command in the File menu.
	Open	Equivalent to the Open command in the File menu.
	Save	Equivalent to the Save command in the File menu.
	Add	Equivalent to the Add command in the Stream menu.
	Delete	Equivalent to the Delete command in the Stream menu.
	Move up	Equivalent to the Move Up command in the Stream menu.
	Move down	Equivalent to the Move Down command in the Stream menu.
	Properties	Equivalent to the Properties command in the Stream menu.
	Play	Equivalent to the Play command in the Schedule menu.
	Record	Equivalent to the Record command in the Schedule menu.
	Execute	Equivalent to the Execute command in the Schedule menu.
	Connect	Equivalent to the Connect command in the Schedule menu.

Status/Control Panel

The status/control panel appears when you select the **Execute** command from the Schedule menu or click the **Execute** button on the toolbar. This panel allows you to set properties for the whole schedule list, and start/stop stream playout or record stream.

Schedule List

Lists the streams currently included in the schedule. The schedule list is composed of the following items:

■ **Schedule icon:** The following icons are displayed in front of the file name:

Table 11: Schedule icon description

Icon	Description
--	This icon shows that no start time or triggered start has been specified for the stream.
⊕	This icon shows that the start time has been specified for the stream.
⩘	This icon shows that a triggered start has been specified for the stream.

These icons change depending on the Start Time option setting in the Play Properties or the Record Properties dialog box.

■ **Filename:** Shows the file name of the stream.

■ **Packets:** Shows the number of packets contained in the stream (For a Non-TS stream, it shows the number of bytes). This item does not appear in the schedule record mode.

■ **Start time:** Shows the start date/time for the stream.

■ **End time:** Shows the end date/time for the stream.

■ **Duration:** Shows the duration time of the stream.

To select a stream, click the stream name. You can select one stream at a time. When you start playing or recording streams, the background of the schedule list changes to gray, and the stream currently being played or recorded is highlighted.

Status Bar

The status bar displays a short explanation of the currently selected command and information related to the operation. You can toggle the status bar display on and off using the Status Bar command in the View drop-down menu.

Using the Scheduler Menus

The Menu bar displays the names of the five pull-down menus. This section describes the function of each selection in these menus.

File Menu

The File menu contains commands for managing file operations and for exiting the Scheduler application. (See Table 12.)

Table 12: File menu commands

Command	Function
New	Opens a new (blank) schedule.
Open	Opens the Open dialog box where you can select a schedule list file (*.sch).

Table 12: File menu commands (cont.)

Command	Function
Save	Saves the currently selected schedule list.
Save As	Opens the Save As dialog box where you can save the currently selected schedule list.
1 xxx.sch .... 4 xxx.sch	Lists up to four of the most recently opened schedule list files. When you select a file name, the schedule opens.
Exit	Exits the application.

View Menu

The View menu contains commands that control the appearance of the application window. (See Table 13.)

Table 13: View menu commands

| Command	Function
Show message	Opens the Show error message dialog box that lists all errors that have occurred in the generator.
Toolbar	Toggles the display of the Toolbar on and off in the application window. A check mark precedes the command in the menu when the toolbar is selected for display.
Status Bar	Toggles the display of the Status bar on and off in the application window. A check mark precedes the command in the menu when the status bar is selected for display.

Schedule Menu

The Schedule menu contains commands that control the remote connection to the generator and changes between the play mode and record mode. (See Table 14.)

Table 14: Schedule menu commands

| Command	Function
Connect	Opens the MTX/RTX Host Name dialog box.
Disconnect	Closes the connection to the generator.
Play	Sets the schedule play mode.
Record	Sets the schedule record mode.
Settings	Opens the Scheduler Settings dialog box.
Execute	Displays the status/control panel in the application window.

MTX/RTX Host Name Dialog Box. When you select the **Connect** command from the Schedule menu, the MTX/RTX Host Name dialog box appears.
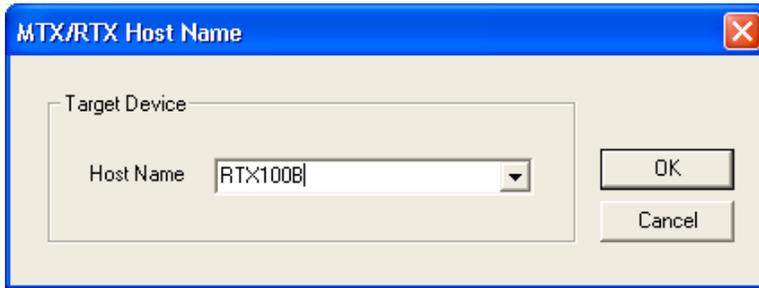
You can select the host name generator to which the Scheduler is connected.

Scheduler Settings Dialog Box. When you select the **Settings** command from the Schedule menu, the Scheduler Settings dialog box appears.

The Schedule Settings dialog box has three tabs: New Schedule, Add Stream, and Miscellaneous.
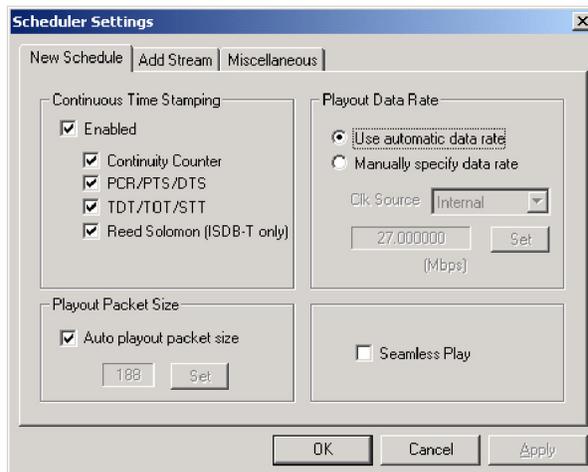
New Schedule tab

■ **Continuous Time Stamping**: Specify the parameters in the transport stream that should be modified when looping a transport stream to simulate continuous playout. After selecting the **Enabled** check box, select the appropriate parameter(s) you intend to modify. The parameters are updated by the system hardware (27 MHz clock).

■ **Playout Packet Size**: When you select the Auto playout packet size check box, the default packet size displayed is derived from the first stream added to the schedule list. However, if the first stream in the schedule list is a Non-TS stream, the packet size of subsequent streams is set to 188 bytes.

If you clear the **Auto playout packet size** check box, the **Set** button becomes available. When you click the **Set** button, the Set Custom Clock dialog box appears. In this dialog box, you can set the appropriate packet size.
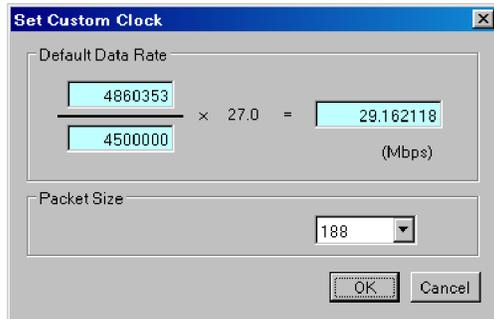
- ▬ **Default Data Rate**: Set the default bit rate.

- ▬ **Packet Size**: Set the default packet size. You can select 188, 204, and 208.

■ **Playout Data Rate**: Set the playout bit rate for the overall schedule.

- ▬ **Use automatic playout data rate**: Uses the bit rate derived from the first stream in the schedule list.

- ▬ **Manually specify a playout data rate**: Uses a clock source and bit rate that you specify. When you select this option, the Clk Source list box and the Set button become available. Use the Clk Source list box to select a clock source for the stream playout. You can select Internal, ExtRef 10M, ExtRef 27 M, ExtRef IFFT, Ext P Clk, or Ext S Clk. Refer to the *RTX100B Series RF Signal Generators Technical Reference* manual. When you click the **Set** button, the Set Custom Clock dialog box appears. In this dialog box, you can set the appropriate bit rate.

■ **Seamless Play**: Set whether the streams in the schedule list are played continuously. Normally, stream output stops at every file, changing points if each stream has different bit rate. When this option is checked, all the streams are played using the same bit rate set by the Playout Bitrate options.

NOTE. You cannot play a Non-TS or M-TMCC stream using the Seamless Play mode.

Before you play streams that have different packet sizes using the Seamless Play mode, clear the Enabled check box in the Continuous Time Stamping field.

If you play streams that have different bit rates using the Seamless Play mode, the Fixed ES Rate setting in the generator does not work properly.

Add Stream tab

■ **Playout Properties**: Set the default playout properties (bit rate and packet size) to be used when a stream is added to a schedule list.
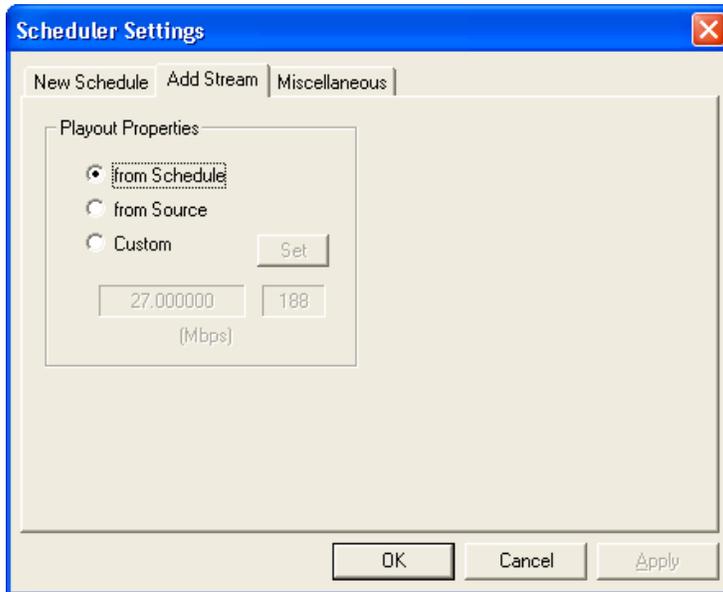
- **from Schedule**: Uses the settings in the dialog box.

- **from Source**: Uses the default bit rate and packet size derived from the original stream.

- **Custom**: Uses the custom bit rate and packet size set in the tab. When you select this option, the Set Custom Clock dialog box appears.

Miscellaneous tab

■ **Loop Mode**: Set whether the schedule is run in the loop mode. When this option is checked, the current schedule is restarted when it reaches the end of the last stream.

NOTE. You cannot use the loop mode if the stream has a time or triggered start specified in a schedule list.

■ **Local lock out**: Set whether the front-panel lockout function is enabled or not. When this option is checked, all front-panel buttons are disabled.

■ **Port**: Set the port number of the generator to which Scheduler is connected. The default value is 49152.

Stream Menu

The Stream menu contains commands to add, delete, and move a stream in the schedule list. It also contains the command to view and set the stream properties of the currently selected stream.

Table 15: Stream menu commands

Command	Function
Move up	Moves the currently selected stream one position up in the schedule list. If the stream is currently at the top of the list, this command has no effect.
Move down	Moves the currently selected stream one position down in the schedule list. If the stream is currently at the bottom of the list, this command has no effect.
Add	■ For the schedule play mode: Opens the Open dialog box where you can select a stream to be added to the schedule list.
	■ For the schedule record mode: Opens the Save as dialog box where you can specify a path and file name for the stream file to be recorded.
Delete	Deletes the currently selected stream from the schedule list.
Properties	■ For the schedule play mode: Opens the Play Properties dialog box for the selected stream.
	■ For the schedule record mode: Opens the Record Properties dialog box for the selected stream.

Play Properties Dialog Box. If scheduler is set to the schedule play mode, when you select the **Properties** command from the Stream menu, the Play Properties dialog box appears. This dialog box allows you to display the properties for the selected stream, and set the start/stop position and the start time of the stream. This dialog box can be displayed by selecting Properties from the right-click menu or by double-clicking the stream name.
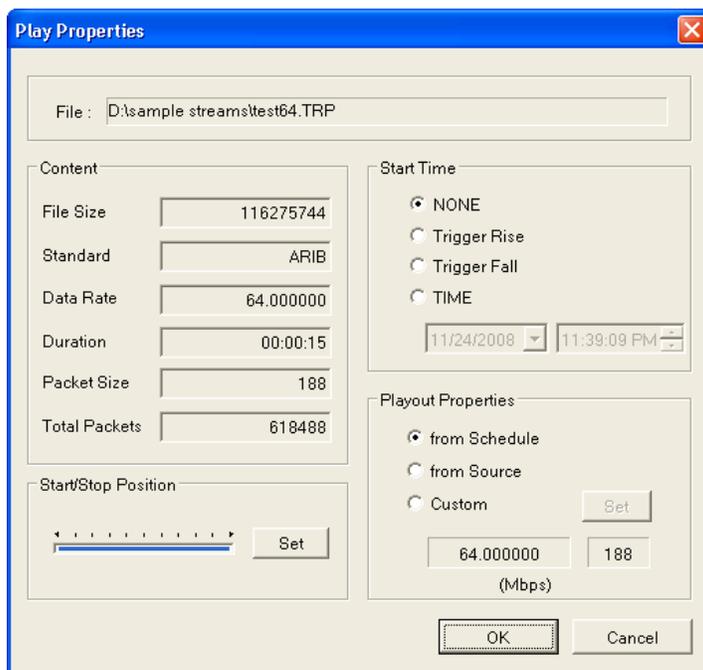
■ **File**: Shows the name and location of the stream.

■ **Content**: Shows the content of the stream.

    ▬ **File Size**: Shows the file size of the stream in bytes.

    ▬ **Standard**: Shows the standard of the stream (MPEG-2, ARIB, DVB, ATSC, S-TMCC, M-TMCC, ISDB-T, or NON-TS).

    ▬ **Data Rate**: Shows the bit rate derived from the PCRs in the stream.

    ▬ **Duration**: Shows the duration of the stream.

    ▬ **Packet Size**: Shows the packet size of the stream. For a Non-TS file, a dash is displayed.

    ▬ **Total Packets**: Shows the total number of the packets in the stream. For a No-TS file, a dash is displayed.

■ **Start/Stop Position**: Set the start and stop positions of the stream. When you click the Set button, the Start/Stop Position dialog box allows you to set the start/stop position.
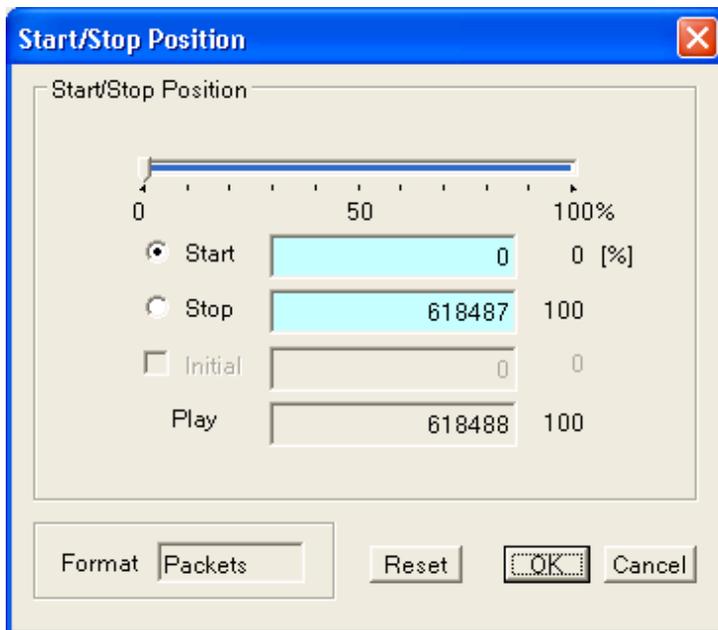
    ▬ **Start**: Set the start position of the stream by the number of packets (the number of super frames for an M-TMCC file, or the number of bytes for a Non-TS file).

    ▬ **Stop**: Set the stop position of the stream by the number of packets (the number of super frames for an M-TMCC file, or the number of bytes for a Non-TS file).

    ▬ **Play**: Shows the actual number of packets (the number of super frames for an M-TMCC file, or the number of bytes for a Non-TS file) that is calculated using the Start and Stop values.

    ▬ **Format**: Shows the unit of the start and stop positions of the stream. It shows Packets for a transport stream file, SF (super frame) for an M-TMCC file, and Bytes for a Non-TS file.

    For an ISDB-T file, the start packet is defined as the first-appearing packet including an OFDM frame start flag after the specified start position. The stop packet is defined as the packet before the last-appearing packet including an OFDM frame start flag before the specified stop position. At this time, if the number of OFDM frames between the start packet and stop packet is not an even number, the packet in the last OFDM frame becomes the stop packet.

First, specify the format setting in the **Format list** box. Click **Start** or **Stop**, and set the number of packets or time using the slider. You can directly enter the desired values in the text boxes.

▬ **Start Time**: Specify the time at which the stream will start to play within a schedule. If the Seamless Play option is selected in the Schedule Settings dialog box, this field is disabled.

NOTE. If the trigger does not occur within a specified time, the subsequent stream will be played out.

▬ **TIME**: The stream playout starts at an absolute time. When you select this option, boxes to set date and time become available.

▬ **NONE**: The stream is integrated into the schedule and obeys the overall timing of the schedule. It will follow on from the previous stream without a break in the playout bit stream.

▬ **Trigger Rise**: The stream playout starts on the rising edge (low to high transition) of the trigger signal applied to the Trig In/Out connector. When you select this option, the boxes used to set date and time are available.

▬ **Trigger Fall**: The stream playout starts on the falling edge (high to low transition) of the trigger signal applied to the Trig In/Out connector. When you select this option, the boxes used to set date and time are available.

■ **Playout Properties**: Set the playout bit rate and packet size of the stream. If the Seamless Play option is selected in the Schedule Settings dialog box, this field is disabled.

▬ **from Source**: Uses the original bit rate and packet size of the stream.

▬ **from Schedule**: Uses the values from the Schedule Settings dialog box.

▬ **Custom**: Uses the bit rate and packet size specified in the Play Properties dialog box. When you select this option, the Set button becomes available. Click the **Set** button, and then set the appropriate bit rate and packet size in the resulting Set Custom Clock dialog box.

NOTE. When the RF Output of the RTX130B Generator is set to On, be sure to select Custom and set the bit rate to be the same bit rate that is calculated from the RF parameters (this value is displayed in the status bar).

Save as Dialog Box. If the Scheduler is set to the schedule record mode, when you select the Add command from the Stream menu, the Save as dialog box appears.
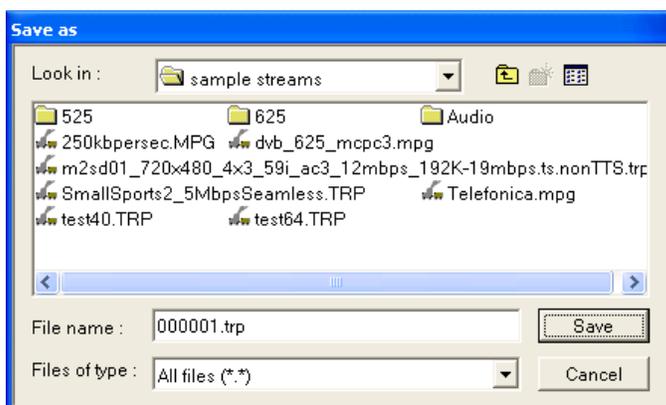
Use this dialog box to do the following:

1. Select the appropriate drive and directory for the stream file you are going to record.

2. Specify a file name for the stream. You can use the default file name that is automatically displayed in the File name text box. Do not user the following characters in a file name: \ / : , ; * ? " < > |.

3. Click the **Save** button to add the stream file to a schedule list.

When you click the **Save** button, the Record Properties dialog box appears.

Record Properties Dialog Box.   If the Scheduler is set to the schedule record mode, when you select the **Add** command from the Stream menu and click the **Save** button on the Save as dialog box, the Record Properties dialog box appears. This dialog box allows you to set the start time, record time, and stop time for the stream to be recorded. This dialog box can be displayed by selecting Properties from the right-click menu, the Stream menu, or by double-clicking the stream name.
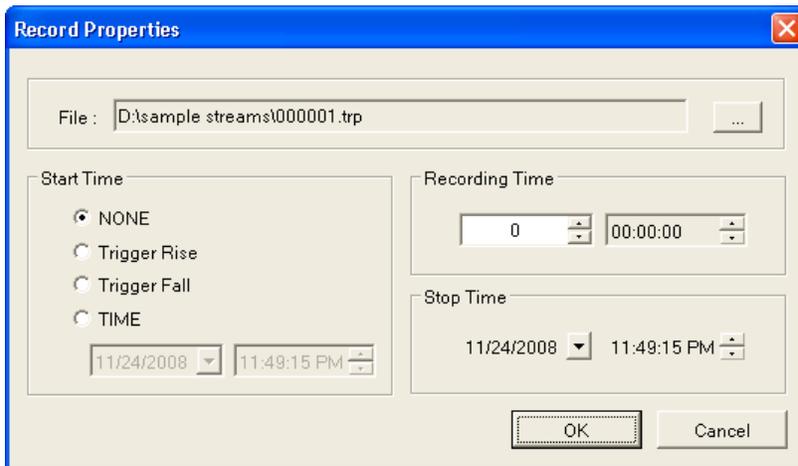
- ■ **File**: Shows the directory path and file name for the stream to be recorded.

- ■ **Start Time**: Specify the time at which a stream will start to record. The choices are:

  - ▬ **NONE**: The stream is integrated into the schedule and obeys the overall timing of the schedule. It will follow on from the previous stream without a break.

  - ▬ **Trigger Rise**: The stream record starts on the rising edge (low to high transition) of the trigger signal applied to the Trig In/Out connector. When you select this option, the boxes used to set date and time are available.

  - ▬ **Trigger Fall**: The stream record starts on the falling edge (high to low transition) of the trigger signal applied to the Trig In/Out connector. When you select this option, the boxes used to set date and time are available.

NOTE. If the trigger does not occur within a specified time, the subsequent stream will be recorded.


- ■ **Recording Time**: Specifies the recording time for the stream.

- ■ **TIME**: The stream record starts at an absolute time. When you select this option, boxes to set date and time become available.

- ■ **Stop Time**: Specifies the time at which a stream will stop recording. When you click the down arrow (▼) at the right side of the date spin box, a calendar allows you to set a date.

Help Menu

The About Scheduler command displays information including the Scheduler software version number and the copyright information.

Status/Control Panel

The status/control panel appears when you select the Execute command from the Schedule menu or click the Execute button on the toolbar. This panel allows you to set properties for the whole schedule list. You can start and stop the stream playing and recording.
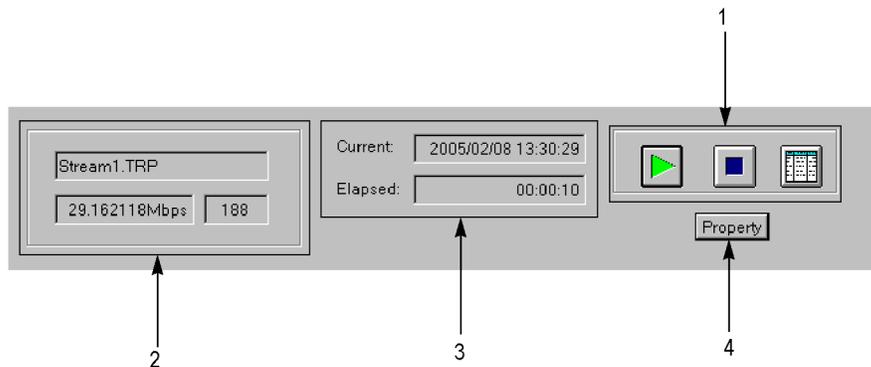
1. **Control buttons**: Controls the schedule play, record, and the application window display.

| Button	Description
	Play button: Starts the schedule playing. This button is displayed in the schedule play mode.
	Record button: Starts the schedule recording. This button is displayed in the schedule record mode.
	Stop button: Stops the schedule playing or recording.
	Schedule list button: Closes the status control panel.

2. **Stream information**: Shows the file name, bit rate, and packet size of the stream currently being played or recorded.

3. **Playout or record status**: Shows the following time information:

   - **Current**: Shows the current date and time.

   - **Elapsed**: Shows the elapsed time from the start of the stream being played or recorded.

4. Property button. Displays the Schedule Property dialog box.
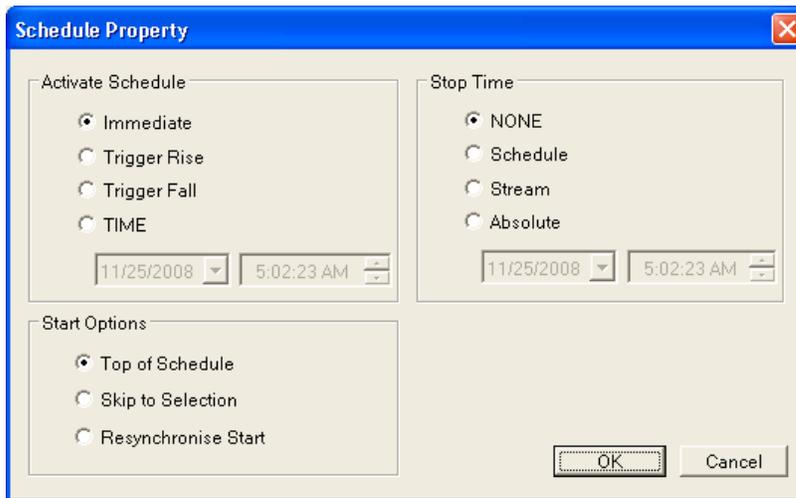
■ **Activate Schedule**: Sets the way in which the schedule is activated. The setting in this field affects the Start Time setting of a stream at the top of the schedule list.

- **Immediate**: In the schedule play mode, the schedule playing starts as soon as you click the **Play** button in the status/control panel. In the schedule record mode, the schedule recording starts as soon as you click the **Record** button in the status/control panel.

- **Trigger Rise**: The schedule playing or recording starts on the rising edge (low to high transition) of the trigger signal applied to the Trig In/Out connector. When you select this option, boxes to set date and time become available.

- **Trigger Fall**: The schedule playing or recording starts on the falling edge (high to low transition) of the trigger signal applied to the Trig In/Out connector. When you select this option, boxes to set date and time become available.

NOTE. If the trigger does not occur within a specified time, the subsequent stream will be played out or recorded.

- **Time**: The schedule playing or recording starts by an absolute starting time. When you select this option, boxes to set date and time become available.

■ **Start Options**: Sets the actual time when the schedule starts.

- **Top of Schedule**: The schedule playing or recording starts with the first stream in the schedule list.

- **Skip to Selection**: The schedule playing or recording starts at the currently highlighted stream. If no stream is highlighted, the schedule will start at the top of the schedule list. This option is available only when you select Immediate in the Active Schedule field.

- **Resynchronize Start**: The start time of the first stream is adjusted to equal to the current time (the first stream must have an absolute Start Time specified). This option is available only when you select Immediate in the Active Schedule field.

■ **Stop Time**: Set the way in which the schedule stops playing or recording.

　　－ **NONE**: The schedule plays or records according to the start and stop times of each stream.

　　－ **Schedule**: The schedule playing or recording stops at the specified date and time but not until the current (schedule) pass is completed. When you select this option, the boxes used to set date and time are available.

　　－ **Stream**: The schedule playing or recording stops at the specified date and time but not until the current stream is completed. When you select this option, the boxes used to set date and time are available.

　　－ **Absolute**: The schedule playing or recording stops immediately at the specified date and time. When you select this option, the boxes used to set date and time are available.

Scheduler Tutorials

This section describes the basics of operating the Scheduler application. The application has the following two operating modes:

■ Schedule play mode

■ Schedule record mode

Schedule Play Mode

The schedule play mode allows you to create a schedule list of streams (defined playout properties) and playout up to 256 streams continuously. You can set the start and stop positions, absolute start time, bit rate, and packet size as playout properties for each stream.

In the schedule play mode, you can play five kinds of stream files:

■ Transport stream (188/204/208) file

■ S-TMCC file

■ M-TMCC file

■ ISDB-T file

■ Non-TS file

Managing a Schedule List in Play Mode

Perform the following procedure to create a schedule list and play streams:

1. Select **Schedule** > **Play** or click the **Play** button on the toolbar to set Scheduler to the schedule play mode.

2. Select **Schedule** > **Settings** to open the Scheduler Settings dialog box.

3. In the **New Schedule** tab, set parameters to be updated, playout packet size, and playout bit rate. You can also set whether or not the streams in the schedule list are played without discontinuities.

4. Click the **Add Stream** tab.

5. In the **Add Stream** tab, set the playout properties used when a stream is added to the schedule.

6. Click the **Miscellaneous** tab.

7. In the **Miscellaneous** tab, set the loop mode, the local lock out status, and the port number. The port number needs to be the same port number as the generator.

8. Click the **OK** button to confirm the changes and close the dialog box.

9. Select **Stream** > **Add** or click the **Add** button on the toolbar to open the Open dialog box.

10. In the **Open** dialog box, select a file to be added to the schedule list and click the **Open** button.

11. Repeat steps 9 and 10 until all the stream files you want to play are added to the schedule list. You can add up to 256 files in a single schedule.

12. Select **Schedule** > **Execute** or click the **Execute** button on the toolbar to open the status/control panel.

13. Click the **Property** button on the panel to open the Schedule Property dialog box.

14. In the **Schedule Property** dialog box, set conditions to activate, start, and stop the schedule.

15. If you want to set properties for an individual stream, use the following methods to open the Play Properties dialog box.

   - Highlight the stream name you want to set (by clicking the name on the schedule list), and then select **Properties** from the Stream menu.

   - Double-click the stream name you want to set.

   - Right-click the stream name you want to set, and select **Properties** from the pop-up menu.

16. In the **Play Properties** dialog box, set the start/stop positions, start time, and playout properties for the stream.

Schedule Playout Timing

Schedule playout timing is determined by the Active Schedule setting in the Schedule Property dialog box and the Start Time setting in the Play Properties dialog box.

- When you add a stream to a new schedule list with no Active Schedule date/time set, the Start Time is set to the current date/time. The start time of streams subsequently added to the schedule list are cumulative.

	Filename	Packets	Start Time	End Time	Duration
--	Stream1.TRP	281822	2005/02/09 9:23:48	2005/02/09 9:24:03	00:00:15
--	Stream2.TRP	187409	2005/02/09 9:24:03	2005/02/09 9:24:13	00:00:10
--	Stream3.TRP	50000	2005/02/09 9:24:13	2005/02/09 9:24:16	00:00:03
--	test40.TRP	386556	2005/02/09 9:24:16	2005/02/09 9:24:36	00:00:20
--	test64.TRP	618488	2005/02/09 9:24:36	2005/02/09 9:25:08	00:00:32

- If you set an Active Schedule date/time (for example, 2005/2/12 12:00:00) in the Schedule Property dialog box, this is applied to all streams.

	Filename	Packets	Start Time	End Time	Duration	
--	Stream1.TRP	281822	2005/02/12 12:00:00	2005/02/12 12:00:15	00:00:15	
--	Stream2.TRP	187409	2005/02/12 12:00:15	2005/02/12 12:00:25	00:00:10	
--	Stream3.TRP	50000	2005/02/12 12:00:25	2005/02/12 12:00:28	00:00:03	
--	test40.TRP	386556	2005/02/12 12:00:28	2005/02/12 12:00:48	00:00:20	
--	test64.TRP	618488	2005/02/12 12:00:48	2005/02/12 12:01:20	00:00:32	

■ If you set a Start Time (for example, 2005/2/10 15:00:00) in the Play Properties dialog box for an individual stream, the start date or time of all subsequent streams are changed. This does not affect the preceding streams.

	Filename	Packets	Start Time	End Time	Duration	
--	Stream1.TRP	281822	2005/02/09 9:34:38	2005/02/09 9:34:53	00:00:15	
--	Stream2.TRP	187409	2005/02/09 9:34:53	2005/02/09 9:35:03	00:00:10	
⏱	Stream3.TRP	50000	2005/02/10 15:00:00	2005/02/10 15:00:03	00:00:03	
--	test40.TRP	386556	2005/02/10 15:00:03	2005/02/10 15:00:23	00:00:20	
--	test64.TRP	618488	2005/02/10 15:00:23	2005/02/10 15:00:55	00:00:32	

NOTE. If there is an inconsistent time setting between the Schedule Property and Play Properties dialog boxes or between two streams, an error message appears.

Saving a Schedule List. In the **Play Properties** dialog box, set the start/stop positions, start time, and playout properties for the stream.

■ Select **Save** > **File** to save a new schedule list or an existing schedule list.

■ Select **Save As** > **File** to save a schedule list under a different name.

Playing Streams. Click the **Play** button (▶) on the status/control panel to start the schedule.

Managing a Schedule List in Record Mode

The schedule record mode allows you to create a schedule list for stream files to be recorded and to record an input stream continuously on the hard disk drive of the generator. You can set record properties for each stream, and record up to 256 stream files.

Creating a Schedule List. Perform the following procedure to create a schedule list and record streams.

1. Select **Schedule** > **Record** or click the **Record** button on the toolbar to set the schedule record mode.

2. Select **Stream** > **Add** or click the **Add** button on the toolbar to open the Save as dialog box.

3. In the **Save as** dialog box, specify the appropriate drive, directory, and file name for the stream file to be recorded. You can use the default file name that is automatically displayed in the file name text box.

4. Click the**Save** button to open the Record Properties dialog box.

5. In the **Record Properties** dialog box, set the start time and stop time (or recording time) for the stream.

6. Repeat steps 2 through 5 for all the files that you want to record.

7. Select **Schedule** > **Execute** or click the **Execute** button on the toolbar to open the status/control panel.

8. Click the **Property** button on the panel to open the Schedule Property dialog box.

9. In the **Schedule Property** dialog box, set conditions to activate, start, and stop the schedule.

Schedule Record Timing.   Schedule record timing is determined by the Active Schedule setting in the Schedule Property dialog box and the Start Time setting in the Record Properties dialog box. Set the timing using the same method as described in Schedule Playout Timing. (See page 70.)

Recording Streams.   Click the **Record** button (●) on the status/control panel to start the schedule.

NOTE. You cannot change a property in the schedule while a schedule is running.

If you try to run a schedule with past time assigned, an error message appears. If this happens, change the Start Time setting of the corresponding stream(s).

If you continuously output streams that have different bit rates, the instrument requires the start and end time to accumulate a certain amount of data in FIFO and output the last data from FIFO to output each stream in a specific bit rate. Therefore, the actual start and end time of streams are slightly different from the displayed Start and End time in a schedule list.

Any discontinuity may be caused by streams that have different playout properties.

If you output streams from the SMPTE 310 interface (Option 07), set the bit rate to 19.392658 Mbps and set the packet size to 188 bytes.

In the schedule record mode, the Without Limit feature of the generator is automatically set to On.

Accessories and Options

Accessories

Standard Accessories

Table 16: RTX100B Series standard accessories

Description		Tektronix part number
RTX100B Series RF Signal Generators QSUM	English (Option L0)	071-2595-xx
	Japanese (Option L5)	071-2596-xx
Interface cable (D-sub 25-pin, twisted pair)		012-A220-00
Two RF attenuators		011-0185-00 (RTX100B only)
USB keyboard		119-B146-00
USB mouse		119-6936-00
Front cover		200-4716-xx
Software option key document		NA
Parallel port option dongle		119-6962-xx
MTX100B and RTX100B Series Product Documentation CD-ROM		063-4114-xx
MTX100B and RTX100B Series Application Software USB flash drive		063-4085-xx
Tclips MPEG Test Streams Software Media Kit		020-2965-xx

Power Cords. All Generators are shipped with one of the power cord options listed in *Power Cord options* section. Power cords for use in North America are UL listed and CSA certified. Cords for use in areas other than North America are approved by at least one authority acceptable in the country to which the product is shipped. (See Table 18.)

Optional Accessories

Table 17: RTX100B Series optional accessories

Description	Tektronix part number
WFM7F05 Option NN rackmount kit	NA
1700F06 blank panel	333-4518-xx

Options

The generator can be ordered with the following options.

Table 18: RTX100B Series options

Options		Description
Modulation Mode Options		
RTX100B	M1	DVB-C/ITU-T J.83 Annex A modulation mode
	M2	ITU-T J.83 Annex B modulation mode
	M3	ITU-T J.83 Annex C modulation mode
	M4	ATSC modulation mode
Service Options		
RTX100B	C3	Provides calibration services for 3 years
	C5	Provides calibration services for 5 years
	D1	Provides calibration data report
	D3	Provides calibration data report for 3 years (with option C3)
	D5	rovides calibration data report for 5 years (with option C5)
	R3	Repair Service 3 years (including warranty)
	R5	Repair Service 5 years (including warranty)
	CA1	Provides a single calibration event or coverage
	R1PW	Repair Service coverage 1 year post warranty
	R2PW	Repair service coverage 2 years post warranty
	R3DW	Repair service coverage 3 years (includes product warranty period); 3 year period starts at time of customer instrument purchase
	R5DW	Repair service coverage 5 years (includes product warranty period); 5 year period starts at time of customer instrument purchase
Power Cord Options		
RTX100B	A0 (Standard)	North America 115 V
	A1	Universal Euro 220 V
	A2	United Kingdom 240 V
	A3	Australia 240 V
	A4	North America 250 V
	A5	Switzerland 240 V
	A6	Japan 100 V
	A10	China 240 V
	A11	India
	A99	No Power Cord or AC Adapter

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