Service Manual

Tektronix

MTS300
MPEG Test System

071-0668-00

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

www.tektronix.com

Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

Hardware Warranty

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

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.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Software 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 a 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.

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 this software product and return this software product and any associated materials for credit or refund.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX’ RESPONSIBILITY TO REPLACE DEFECTIVE MEDIA OR REFUND CUSTOMER’S PAYMENT IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Table of Contents

General Safety Summary ..... **ix**

Service Safety Summary ..... **xi**

Preface ..... **xiii**

Manual Structure xiii
Manual Conventions xiv
Related Documents xvi
MPEG Test System Applications xvi
Contacting Tektronix xxi

Specifications

Product Description **1-1**

Characteristic Tables **1-11**

Monitoring Characteristics 1-11
Interface Platform Characteristics 1-12
I/O Port Electrical Characteristics 1-12
Power Characteristics 1-21
Environmental Characteristics 1-21
Mechanical (Physical) Characteristics 1-22
Certifications and Compliances 1-22

Operating Information

Installation

Hardware Installation 2-1
Connecting MTS300 System I/O Ports 2-7
Networking 2-12

Operating Information **2-19**

Starting the MTS300 System 2-20
Shutting Down the MTS300 System 2-25
Application Overviews 2-28
Front Panel Controls 2-39

Tutorial **2-43**

Preliminary Setup 2-43
Starting and Configuring the Master Client 2-44
Assigning Servers and Generating a Transport Stream 2-47
Monitoring a Transport Stream Input 2-48
Configuring the Analysis Server 2-51
Configuring the Data Logging Function 2-54
Analyzing a Transport Stream 2-55
Recording a Transport Stream Input 2-58

Theory of Operation

Mainframe Operation 3-1
MTS300 System Modules Operation 3-5

Performance Verification

10 MHz Reference Clock 4-1
I/O System 4-10
MPEG-2 Software Components 4-17
TMCC Software Components 4-29

Adjustment Procedures

Maintenance

Maintenance 6-1
Servicing Preparation 6-1
Cleaning and Preventive Maintenance 6-3
Repackaging for Shipment 6-6
Power-on Diagnostics and Troubleshooting 6-10
Network Troubleshooting 6-14
Troubleshooting the SCSI Drives 6-22
Software Repair and Recovery 6-23
Software Repair Strategy 6-23
Restoring System Settings 6-25
Restoring Device Drivers 6-39
Restoring the Operating System and Application Software 6-45
Removal and Replacement Procedures 6-53
Replaceable Modules 6-53
Recommended Tools 6-54
Accessing Replaceable Modules 6-54
Replacing MTS300 Test System Modules 6-58
Replacing Mainframe Modules 6-70

Options

Replaceable Electrical Parts

Diagrams

Replaceable Mechanical Parts

Parts Ordering Information 10-1
Module Servicing 10-2
Using the Replaceable Parts List 10-2

List of Figures

Figure 1-1: MTS300 MPEG Test System 1-2
Figure 1-2: Parallel data timing, 188-byte packets 1-15

Figure 2-1: Typical MTS300 test system rear panel connectors 2-2
Figure 2-2: Keyboard and mouse alternative connections 2-3
Figure 2-3: Software Key 2-4
Figure 2-4: Rear-panel configuration with one ASI/M2S (Option AS) interface installed 2-8
Figure 2-5: Rear-panel configuration with two ASI/M2S (Option AS) interfaces installed 2-8
Figure 2-6: Rear-panel configuration with ASI/M2S (Option AS) and SSI (Option SS) interfaces installed 2-9
Figure 2-7: Rear-panel configuration with ASI/M2S (Option AS) and DHEI (Option DE) interfaces installed 2-9
Figure 2-8: Rear-panel configuration with ASI/M2S (Option AS) and SPI (Option LV) interfaces installed 2-10
Figure 2-9: Rear-panel configuration with one SSI (Option SS) interface installed 2-10
Figure 2-10: Rear-panel configuration with two SSI (Option SS) interfaces installed 2-11
Figure 2-11: Rear-panel configuration with SSI (Option SS) and ASI/M2S (MTS3FAS) interfaces installed 2-11
Figure 2-12: Network dialog box showing TCP/IP Protocol item . . 2-14
Figure 2-13: IP tab parameters 2-15
Figure 2-14: DNS tab parameters 2-16
Figure 2-15: On/Stby switch 2-20
Figure 2-16: The Master client application window 2-29
Figure 2-17: The Expert client application window 2-30
Figure 2-18: The Configuration client application window 2-32
Figure 2-19: The Stream Player client application window 2-33
Figure 2-20: Stream Recorder client application window 2-34
Figure 2-21: TMCC Expert Client display 2-37
Figure 2-22: TMCC Configuration Client display 2-38
Figure 2-23: Front-panel elements 2-39
Figure 2-24: Initial setup for the tutorial 2-44
Figure 2-25: Initial Master Client application window 2-45
Figure 2-26: Master Client connected to the local Server Manager . 2-45

Figure 2-27: Changing the analysis display options 2-46
Figure 2-28: Assigning servers to I/O ports 2-47
Figure 2-29: Stream Player client 2-48
Figure 2-30: Monitoring a transport stream 2-49
Figure 2-31: Services panel details view 2-50
Figure 2-32: Configuration Client display 2-51
Figure 2-33: Setting ETR290 probes 2-52
Figure 2-34: Changing the message level 2-53
Figure 2-35: Data Logging configuration panel 2-54
Figure 2-36: Launching the Expert Client 2-55
Figure 2-37: Expert Client display showing errors 2-56
Figure 2-38: ETR290 view panel in the Expert Client 2-57
Figure 2-39: Stream Recorder client application window 2-58

Figure 3-1: Mainframe simplified block diagram 3-2

Figure 4-1: Removing the right-side handle screws 4-3
Figure 4-2: Removing the rear-panel feet 4-3
Figure 4-3: Removing the circuit board retaining plate 4-4
Figure 4-4: Location of 10 MHz clock test point 4-5
Figure 4-5: Removing the PIA+ module 4-7
Figure 4-6: Adjusting the 10 MHz reference clock 4-8
Figure 4-7: Typical initial equipment setup 4-11
Figure 4-8: Tektronix MPEG Test System program window 4-12
Figure 4-9: Connect to local Server Manager 4-12
Figure 4-10: Start the testing routine 4-13
Figure 4-11: Begin the self test routine 4-13
Figure 4-12: Window showing sample test results summary 4-14
Figure 4-13: Message box with connection requirements 4-15
Figure 4-14: Connections for trigger test 4-16
Figure 4-15: Connections for clock test 4-16
Figure 4-16: ASI cabling 4-17
Figure 4-17: Initial Master Client application window 4-18
Figure 4-18: Connecting to the local Server Manager 4-18
Figure 4-19: Master Client window showing no assigned ports 4-19
Figure 4-20: Port Manager panel showing Analysis Server selected 4-20
Figure 4-21: Selecting Launch Stream Player Client 4-20
Figure 4-22: Stream Player Application window 4-21

Figure 4-23: C:\MTS300\Cfg-Trp directory 4-22
Figure 4-24: Starting transport stream analysis 4-23
Figure 4-25: Master Client in Analysis mode 4-23
Figure 4-26: Expert Client application window 4-24
Figure 4-27: Setup for testing second input 4-25
Figure 4-28: Exit Expert Client application 4-25
Figure 4-29: Expert Client application window 4-27
Figure 4-30: Rear panel connections for I/O #3 test procedure 4-28
Figure 4-31: Probes added in the TMCC Configuration Client 4-29
Figure 4-32: TMCC Expert Client 4-30

Figure 6-1: Repackaging the program monitor 6-7
Figure 6-2: Placement of bottom spacer pad in inner shipping box 6-8
Figure 6-3: Incorrect IP address 6-15
Figure 6-4: Incorrect subnet mask 6-16
Figure 6-5: Incorrect default gateway IP address 6-17
Figure 6-6: Ping.exe command window 6-19
Figure 6-7: Tracert.exe command window 6-20
Figure 6-8: Command prompt with nslookup results 6-21
Figure 6-9: Deleting partitions using the Disk Administrator utility 6-28
Figure 6-10: Software Protection key 6-47
Figure 6-11: Checking the free disk space 6-48
Figure 6-12: Removing the cabinet handle 6-55
Figure 6-13: Removing the cabinet feet 6-55
Figure 6-14: Circuit board retaining plate 6-58
Figure 6-15: Easily damaged capacitor on the PIA+ module 6-59
Figure 6-16: Clock and trigger cable connections for the ASI or SSI board on the PIA+ module 6-61
Figure 6-17: Attaching the SSI or ASI trigger and clock cables to the rear-panel bracket 6-61
Figure 6-18: Installing an optional SSI or ASI board on the PIA+ module 6-62
Figure 6-19: Clock and trigger cable connections on an additional SSI or ASI board 6-63
Figure 6-20: Additional ASI or SSI interface installation 6-63
Figure 6-21: Installing the DHEI board on the PIA+ module 6-64
Figure 6-22: Installing the ribbon cable on the DHEI board 6-65
Figure 6-23: Optional DHEI interface installation 6-65
Figure 6-24: Installing the SPI board on the PIA+ module 6-66

Figure 6-25: Assembling the SPI rear-panel brackets and cables .. 6-67
Figure 6-26: Connecting the ribbon cables on the SPI board 6-68
Figure 6-27: Optional SPI interface installation 6-69
Figure 6-28: LCD Display assembly removal 6-70
Figure 6-29: Keypad assembly removal 6-72
Figure 6-30: Floppy disk drive and CD audio connector installation 6-73
Figure 6-31: Chassis screw locations for CD drive 6-74
Figure 6-32: Chassis screw locations for the floppy disk drive 6-75
Figure 6-33: Speaker installation 6-77
Figure 6-34: Front panel interface circuit board connectors 6-79
Figure 6-35: Screw locations for the Front Panel Interface board .. 6-80
Figure 6-36: Routing of fan and speaker wires to Front Panel Interface board 6-81
Figure 6-37: Removing the IDE hard drive 6-83
Figure 6-38: Power supply long and short screw locations 6-85
Figure 6-39: Controller board orientation and screw locations 6-87
Figure 6-40: Installing the Processor I/O board into slot 10 6-89
Figure 6-41: Installing the Processor I/O board into the backplane 6-90
Figure 6-42: Processor I/O board to Controller board interconnections - top connectors 6-90
Figure 6-43: Processor I/O board to Controller board interconnections - bottom connectors 6-91
Figure 6-44: Top connection to Controller board 6-92
Figure 6-45: Location of J220 connections and wiring orientation . 6-92
Figure 6-46: Backplane orientation and screw locations 6-94
Figure 6-47: SCSI hard drive removal 6-96
Figure 6-48: Configuring the SCSI drive jumpers 6-97
Figure 6-49: Installing the mounting brackets on the SCSI drive .. 6-98

Figure 10-1: Modules 10-6
Figure 10-2: Front panel and associated parts, Backplane board, and disk drives 10-9
Figure 10-3: Cables and hard drives 10-12
Figure 10-4: Cabinet parts and accessories 10-14

List of Tables

Table i: Tektronix MPEG Test System version 6.1 applications . . . xiii

Table 1-1: Platform characteristics 1-12
Table 1-2: ASI 1-12
Table 1-3: SPI-LVDS parallel (Option MTS3FLV) 1-13
Table 1-4: LVDS parallel data pin connections 1-15
Table 1-5: SSI (Option SS) 1-16
Table 1-6: DHEI-Digicipher II 1-17
Table 1-7: DHEI Expansion In pin connections 1-19
Table 1-8: DHEI Expansion Out pin connections 1-20
Table 1-9: AC power source characteristics 1-21
Table 1-10: Environmental characteristics 1-21
Table 1-11: Mechanical characteristics 1-22
Table 1-12: Certifications and compliances 1-22
Table 1-13: Environmental limits and use classification for safety certification compliance 1-23

Table 2-1: Rear-panel connectors 2-1
Table 2-2: Electrical operating requirements 2-5
Table 2-3: Power cord identification 2-6
Table 2-4: Default user names and passwords 2-21
Table 2-5: Front panel-key controls 2-40
Table 2-6: Touch screen techniques 2-41

Table 4-1: Adjustment table for 10 MHz reference clock 4-9

Table 6-1: Static susceptibility 6-2
Table 6-2: Packaging material 6-7
Table 6-3: Troubleshooting power-on failures 6-10
Table 6-4: Power-up error messages 6-11
Table 6-5: MTS300 system COM port settings 6-30
Table 6-6: Touchscreen driver hardware settings 6-44

Table 7-1: MTS300 test system options 7-1
Table 7-2: Possible interface configurations 7-2
Table 7-3: MTS300 test system upgrades 7-3

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.

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.

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.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

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

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

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.

Symbols and Terms

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

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

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

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

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

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

CAUTION indicates a hazard to property including the product.

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

CAUTION
Refer to Manual

Protective Ground
(Earth) Terminal

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Preface

This document describes how to service the Tektronix MTS300 MPEG Test System. Basic operating information is included to aid you in the servicing of the instrument.

If you purchased a Tektronix MTS300 MPEG Test System and are looking for detailed installation instructions or first-time operation procedures, refer to the *MTS300 MPEG Test System Hardware and Software Installation Technical Reference*, Tektronix part number, 071-0667-XX.

Manual Structure

This service manual is organized into the following sections:

Specifications. This section contains a brief product description and lists the specification tables describing the performance characteristics of the MTS300 MPEG Test System.

Operating Information. This section contains installation and operating information related to the servicing of the instrument.

Theory of Operation. This section contains a description of how the MTS300 MPEG Test System operates to the level needed to perform module-level servicing of the instrument.

Performance Verification. This section contains procedures to verify that the instrument is performing according to the specifications.

Adjustment Procedures. This section contains procedures to adjust the instrument so that the instrument can perform according to the specifications.

Maintenance. This section contains procedures for inspecting and cleaning the instrument, instructions for removing and replacing internal modules and components, procedures for troubleshooting the instrument, and other information useful for maintaining or repairing the instrument.

Options. This section lists the options that may be installed in the instrument.

Replaceable Electrical Parts. This section lists the replaceable electrical assemblies and components of the instrument.

Diagrams. This section contains interconnect diagrams for the instrument.

Replaceable Mechanical Parts. This section lists the replaceable mechanical assemblies and components of the instrument.

Glossary. The *Glossary* contains definitions of new, uncommon, and/or unique terms used in this manual.

Manual Conventions

Throughout this manual the following typographic, symbolic, and terminology conventions apply:

Typographic Conventions

In this manual the following typographic conventions apply:

- **Bold** terms are found in procedures and denote interface items that you need to select in order to cause an event to occur. For instance, to configure default directories the procedure would read as follows:

  Select **Directories** from the Options menu.

  In this example, even though the Options menu is an interface element, the Directories selection is the element that displays the needed dialog box (causes an event to occur) and is the only bold term in the step. When interface items are referred to outside of procedures, the terms are not boldface.

- Manual names, manual section names, and words that are defined in the text are *italicized*.

- Specific input that you need to make is indicated in the text using `mono-spaced font`. Unless otherwise stated, do not enter punctuation at the end of a mono-spaced font entry.

Symbols and Terminology Conventions

This manual uses symbols and terminology consistent with the following publications:

- For PSI elements, ISO/IEC Standard 11172 and 13818 (parts 1, 2, and 3)
- For DVB elements, ETSI Publication prETS 300 468
- For DVB-T elements, ETSI Publication TS 101 191 V1.2.1
- For ATSC elements, ATSC Document A/65
- For Windows elements, *The Microsoft Manual of Style for Technical Publications,* 2nd ed.

The following ARIB (Association of Radio Industries and Business) and ITU-R (International Telecommunications Union) standards were used to develop the added ARIB and TMCC enhancements to the stream creation applications:

- ARIB STD-B10 (1.2), 1999, *Service Information for Digital Broadcasting System*
- ARIB STD-B16 (1.1), 1999, *Digital Receiver Commonly Used for Digital Satellite Broadcasting Services Using Communication Satellites*
- ARIB STD–B20 (1.1), *1999, Digital Broadcasting System and Related Operational Guidelines for Broadcasting Satellites*
- ITU-R BO. 1408, *Transmission System for Advanced Multimedia Services Provided by Integrated Services Digital Broadcasting in A Broadcasting Satellite Channel*

In cases where terms, symbols, or references are or may be ambiguous, check the *Glossary* located at the back of this manual for definitions. Also, refer to the *Glossary* for definitions unique to the MTS300 test system and applications.

Refer to the your Windows documentation for definitions and explanations of Windows specific terminology.

Related Documents

For additional information about using MTS300 software to monitor, analyze, and generate MPEG-2, DVB, and ATSC data streams, refer to the following manuals:

- The *MTS300 MPEG Test System Real-Time Analysis User Manual*, Tektronix part number 071-0658-XX, contains information about using the real-time MPEG-2 System Analyzer application.
- The *MTS300 MPEG Test System MPEG-2 DVB/ATSC System Analyzer User Manual*, Tektronix part number 071-0659-XX, contains information about using the deferred-time MPEG-2 System Analyzer.
- The *MTS300 MPEG Test System Program Stream Analyzer User Manual*, Tektronix part number 071-0662-XX, contains information about using the deferred-time Program Stream Analyzer application.
- The *MTS300 MPEG Test System Dolby Digital Audio Stream Analyzer User Manual*, Tektronix part number 071-0661-XX, contains information about using the deferred-time AC-3 Audio Stream Analyzer application.
- The *MTS300 MPEG Test System MPEG Audio Stream Analyzer User Manual*, Tektronix part number 071-0663-XX, contains information about using the deferred-time MPEG Audio Stream Analyzer application.
- The *MTS300 MPEG Test System Video Stream Analyzer User Manual*, Tektronix part number 071-0664-XX, contains information about using the deferred-time MPEG Video Stream Analyzer application.

MPEG Test System Applications

The applications that appear in your MTS300 MPEG test System depend on the software version and the options installed in the instrument. Table i summarizes all of the test system applications available in software version 6.1.

Table i: Tektronix MPEG Test System version 6.1 applications

Icon	Application title	Function	User document
 Master Client	Master Client	Continuously monitor an input bitstream for compliance with the MPEG-2, DVB-SI, ATSC PSIP, and ISDB/ARIB digital television standards. Use this client to start or assign to an input/output the following real-time applications and servers: **Analysis Server**, used to perform real-time analysis on a transport stream input **TMCC Analysis Server**, used to perform real-time analysis on a TMCC transport stream input **Expert Client**, used display the results of real-time transport stream analysis performed by an analysis server. **TMCC Expert Client**, used to display the results of real-time transport stream analysis performed by a TMCC analysis server. **Configuration Client**, used to configure analysis servers for specific errors. **TMCC Configuration Client**, used to configure TMCC analysis servers for specific errors. **Stream Player**, used to generate transport streams from a local file. **Stream Recorder**, used to capture transport stream input. **OpenMux**, used to configure and generate transport streams from local transport stream and elementary stream files	MTS300 MPEG Test System Real-Time Analysis User Manual 071-0658-XX
 Hardware Diagnostic	Hardware Diagnostic	Perform onboard self-tests for the MPEG Test System.	MTS300 MPEG Test System Hardware and Software Installation Technical Reference 071-0667-XX (Information repeated in both manuals)
 Private Syntax Interpreter	Private Syntax Interpreter	Create table definitions used by the Real-Time Analyzer to interpret private syntax sections.	

Table i: Tektronix MPEG Test System version 6.1 applications (Cont.)

Icon	Application title	Function	User document
 Deferred-Time Analyzer	MPEG-2 DVB/ATSC System Analyzer	Analyze transport streams and packetized elementary streams saved to the system disks.	MTS300 MPEG Test System MPEG-2 DVB/ATSC System Analyzer User Manual 071-0659-XX
 DVB Channel	DVB Channel Coding and Decoding	Code and decode transport stream files to DVB specifications.	MTS300 MPEG Test System Stream Creation Applications User Manual 071-0778-XX (Information repeated in both manuals)
 Program Strea...	Program Stream Analyzer	Analyze MPEG program stream files.	MTS300 MPEG Test System Program Stream Analyzer User Manual 071-0662-XX
 Video Stream Analyzer	MPEG Video Stream Analyzer	Analyze MPEG-1 and MPEG-2 video elementary streams files or streams extracted from the MPEG-2 System Analyzer or Program Stream Analyzer.	MTS300 MPEG Test System Video Stream Analyzer User Manual 071-0664-XX
 Audio Stream Analyzer	MPEG Audio Stream Analyzer	Analyze MPEG-1 and MPEG-2 audio elementary streams files or streams extracted from the MPEG-2 System Analyzer or Program Stream Analyzer.	MTS300 MPEG Test System Audio Stream Analyzer User Manual 071-0663-XX
 Dolby Digital Analyzer	Dolby Digital Audio Stream Analyzer	Analyze Dolby Digital (AC-3) audio elementary stream files or streams extracted from the MPEG-2 System Analyzer.	MTS300 MPEG Test System Dolby Digital Audio Stream Analyzer User Manual 071-0661-XX
 Multiplexer	MPEG-2 Transport Stream Multiplexer	Create transport stream files from PSI/SI/PSIP table files, elementary stream files, and data files.	MTS300 MPEG Test System Stream Creation Applications User Manual 071-0778-XX
 DVB Table Editor	DVB Table Editor	Create and edit PSI and DVB SI table files for use with the transport stream multiplexer.	
 ATSC Table Editor	ATSC Table Editor	Create and edit PSI and ATSC PSIP table files for use with the transport stream multiplexer.	
 ARIB Table Editor	ARIB Table Editor	Create and edit PSI and ISDB ARIB table files for use with the transport stream multiplexer. You also use this editor to create and modify the SIT and DIT.	
 Jitter Adder	Jitter Adder	Add jitter to PCR data in MPEG-2 transport stream files.	
 Error Injector	Error Injector	Insert or correct errors in transport stream packets.	

Table i: Tektronix MPEG Test System version 6.1 applications (Cont.)

Icon	Application title	Function	User document
	TMCC Combiner	Adds TMCC information to a multiplex to generate a valid ISDB-S transport stream file.	MTS300 MPEG Test System Stream Creation Applications User Manual 071-0778-XX
 License Manager	Tektronix Software Protection	Enter or reenter the general password to enable licensed applications.	Read This First, MTS300 MPEG Test System Software V6.1 071-0666-XX
 MPEG-2 Help	MPEG2_Part1 (ISO/IEC 13818-1)	The international MPEG-2 system standard in Windows Help format.	none
 Uninstall MTS	Uninstall MTS	Remove MPEG Test System software from the system disk.	MTS300 MPEG Test System User Manuals

Other Information Sources

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

For the latest information about MTS300 Series Real-Time Analyzer features and bugs, refer to the *MTS300 Series Software Version 6.1 Read This First* document that accompanied your Tektronix MPEG Test System product.

Two sources of online information are provided with the MTS300 MPEG Test System Stream Creation Applications: the application online help files and an online help file of the MPEG-2, Part 1 (Systems) document. You can access these sources of information using the following techniques:

- Access help topics by selecting **Contents** from the Help menu.
- To display the help, double click the **MPEG-2** icon in the *Tektronix MPEG Test System* program group window.

Included on the software application CD-ROM is a Read Me file for the software. This file lists the application files included with the software installation types and other important information.

The following URLs access the websites for the standards organizations listed (the URLs listed were valid as of January, 2001):

- MPEG-2 standards (International Organization for Standards)

  http://www.iso.ch/

- DVB standards (European Technical Standards Institute)

  http://www.etsi.org/

- ATSC standards (Advanced Television Systems Committee)

  http://www.atsc.org/

Contacting Tektronix

Phone	1-800-833-9200*
Address	Tektronix, Inc. Department or name (if known) 14200 SW Karl Braun Drive P.O. Box 500 Beaverton, OR 97077 USA
Web site	www.tektronix.com
Sales support	1-800-833-9200, select option 1*
Service support	1-800-833-9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1-800-833-9200, select option 3* 6:00 a.m. – 5:00 p.m. Pacific time

* **This phone number is toll free in North America. After office hours, please leave a voice mail message.**
Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.

Product Description

This *Specifications* section contains a product description and lists the characteristic tables for the MTS300 MPEG Test system.

Refer to *Options* on page 7–1 for a list of the options you may find installed in the instrument. Refer to *Replaceable Mechanical Parts* on page 10–1 for a list of the standard and optional accessories available with the instrument.

Product Overview

The MTS300 MPEG Test System is a component of the Video Quality of Service (VQoS) products offered by Tektronix. The MTS300 system (see Figure 1–1) is a high-performance MPEG protocol diagnostic and analysis tool that provides you with innovative solutions to meet the challenges of designing, verifying, and characterizing products and systems using MPEG-2 technology.

The MTS300 system offers powerful acquisition and computational capabilities for analyzing designs based on MPEG, DVB, ATSC, and ISDB standards. These flexible and expandable capabilities include real-time monitoring, data rate analysis, and Tektronix-exclusive timing analysis to help diagnose the most challenging problems and characterize real-time performance.

***NOTE**. Refer to the MPEG-2, DVB, ATSC, and ISDB-S/ARIB standards for detailed information about the syntax and semantics of each system.*

The deferred-time (off-line) analysis provided by the MTS300 system helps you fully verify compliance to standards and diagnose problems in complex transport streams. Easy-to-use transport stream capture, playout, and on-line storage lets you build extensive suites of test streams, and then use these streams to exercise your designs. Additional stream editing capability, with error and jitter injection and real–time multiplexing, gives you the ability to create and playout test sequences that fully stress and characterize design parameters.

Each test system can monitor up to two transport stream inputs simultaneously and accepts inputs in the following electrical formats:

- ASI/M2S (the test system automatically detects the format)
- SPI (LVDS parallel); available when you order the MTS3FLV upgrade
- DHEI (GI Digicipher II): available when you order the MTS3FDE upgrade
- SSI (SMPTE 310M); available when you order the MTS3FSS upgrade

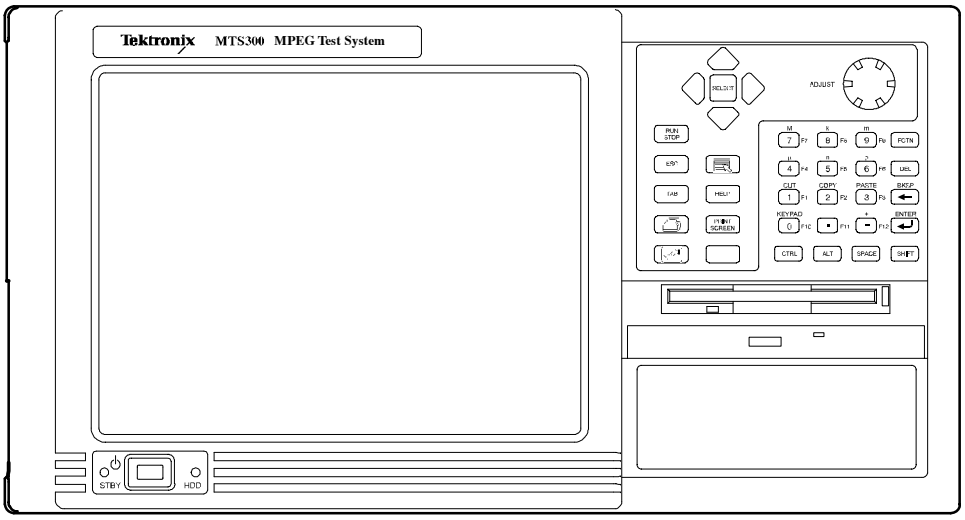


Figure 1-1: MTS300 MPEG Test System

Primary Applications

The MTS300 system was designed for the following applications:

- Evaluation and verification of MPEG, DVB, ATSC and ISDB designs
- Design and verification of digital-video set-top boxes (STBs)
- Stress and characterization of electrical circuits and ICs developed for products using MPEG-2 compressed digital-video technology

Key Features

The MTS300 system provides the following key features:

- Real-time monitoring and compliance testing of MPEG, DVB, ATSC and ISDB transport streams for complete application flexibility
- Dolby Digital AC-3 compliance testing and AAC stream monitoring for testing advanced audio capabilities
- Tektronix-exclusive PCR overall jitter, drift and offset measurements allow you to diagnose the most challenging real-time performance problems
- Real-time analysis of transport streams used in data broadcasting applications based on ISO/IEC 13818-6 (DSM-CC) and EN 301 192 standards
- Analysis of Mega-frame Initialization Packets (MIPs), specified in the DVB TS 101 191 standard
- Detailed off-line analysis of transport streams, program streams and elementary streams available to fully verify design performance
- Logging of user-selected analysis events to tab-delimited text files for record keeping and further analysis

- ASI/M2S, SPI (LVDS), SMPTE310M, and DHEI interfaces available to support a variety of design configurations
- SNMP agent allows you to control the instrument from a remote location
- Private syntax table editor allows you to describe the syntax of a private table
- Optional real-time multiplexing of elementary and transport streams provides flexible real-time manipulation of stream content and parameters
- Optional TMCC data testing and transport stream creation for ISDB environments
- Capture (manual and triggered), playback, and on-line storage of transport, program and elementary streams
- Optional editing capability allows you to create custom transport streams and inject errors or jitter to fully stress your design
- Modular architecture allows you to easily upgrade in the future
- Rackmount configuration kit included
- Microsoft NT operating system provides robust networking, performance and functionality

System Architecture

The MTS300 system uses a client/server architecture consisting of a Server Manager, two Analysis Server pairs (each pair consists of one MPEG analysis server and one TMCC analysis server), and the following client applications: Master Client, Expert Client, Configuration Client, Stream Recorder, Stream Player, TMCC Expert Client, and TMCC Configuration Client

Combined, these client/server modules enable you to monitor multiple transport stream inputs simultaneously, perform in-depth analyses on one transport stream input, and to configure the monitoring and reporting parameters. The system is tightly integrated, making it easy to use for experts and non-experts alike.

Server Manager. The Server Manager is the process that makes the results of the Analysis Servers and other real-time application servers available to Master Clients. The Server Manager starts automatically when you start the transport monitor. Only one Server Manager can run on a test system.

The Server Manager process interacts with the following entities:

- The Analysis Server sends analysis results (called *traps*) to the Server Manager.
- The Stream Player, Stream Recorder, and optional OpenMux (MTS300, Option OM) servers send state traps to the Server Manager. Unlike the Analysis Server traps, the traps sent by these servers is limited to
- The Master Client displays the data collected by the Server Manager.

Analysis Servers. The Analysis Server is the process that actually analyzes transport stream inputs. Each Analysis Server process consists of one MPEG Analysis Server and one TMCC Analysis Server. Each MTS300 system can support up to two Analysis Server processes of each type simultaneously.

The Analysis Server processes interact with the following entities:

- The Server Manager collects the Analysis Server results (called *traps*).
- The Expert Client displays the results of the MPEG Analysis Server directly. Likewise, the TMCC Expert Client displays the results of the TMCC Analysis Server.
- The Configuration Client sets the monitoring and analysis parameters for each MPEG Analysis Server process operating on the inputs to the MTS300 system. Likewise, the TMCC Configuration Client sets the monitoring and analysis parameters for each TMCC Analysis Server process.

Master Client. The Master Client application provides an intuitive interface for controlling and monitoring the status of the I/O ports on the MTS300 system. You can run only one Master Client on each MTS300 system. In a network environment, if a remote MTS300 system has a Master Client open, you must shut down the remote Master Client before you can connect your local Master Client to the Server Manager running on the system.

***NOTE**. Each MTS300 system is limited to operating two Analysis Server processes of each type at a time, and can run only one Stream Player, one Stream Recorder, and one OpenMux application at a time. In addition, the MTS300 system is limited to an aggregate data rate of 140 Mbs between all operating applications.*

From the Master Client, you can perform the following tasks:

- Monitor and analyze MPEG transport streams in real time using the Expert Client and Configuration client applications.
- Monitor and analyze single- and multi-program TMCC transport streams in real time using the TMCC Expert Client and TMCC Configuration Client applications.
- Record and playback MPEG and TMCC transport streams using the Stream Recorder and Stream Player applications.
- Generate multiplexed transport streams in real time using the OpenMux application (MTS300, Option OM).

The Master Client uses three areas to display different type of information:

- The I/O Port Manager panel displays icons representing real-time application servers and the input and output ports configured on your test system.
- The Services panel displays icons for the services (also called programs) encoded in the transport stream you are monitoring.
- The Details panel displays icons indicating the type, status, and severity of errors on a transport stream or service.

Expert Client. The Expert Client application allows you to analyze a single MPEG transport stream in greater detail. You will use the Expert Client as your primary tool to help troubleshoot errors in your digital transmission system.

The Expert Client characteristics are shown in the following list:

- Graphical displays that show the structure (hierarchy) of the input transport stream and display characteristics of each component of the input stream (for example: PID and type allocation, section rate analyses, and timing analyses).
- Report views that indicate the types of errors recorded by the Analysis Server and the characteristics of the input stream.
- Error views that show specific errors recorded for the various components of the transport stream; for instance, PMT section rate errors and ETR290 errors.

The Expert Client can display the results of only one MPEG Analysis Server (input) at a time.

Configuration Client. The Configuration Client allows you to perform the following tasks:

- Specify to which standard you are testing: MPEG-2, DVB, ATSC, or ISDB.
- Set, remove, or modify the probes that test transport streams for valid syntax and semantics and rates.
- Specify the way in which errors are reported in both the Expert and Master Clients. You can configure each probe to report an error as Critical, Major, Minor, Warning, or as information only.
- Specify the types of transport stream events that are recorded using the Data Logging function. You can also set the maximum file size and time period of each log file.
- Stop and restart an MPEG Analysis Server running on a MTS300 system.
- Set passwords on specific inputs that prevent others from changing the Analysis Server configuration for that input.
- Set parameters for capturing part of an input transport stream.

Stream Recorder Client. The Stream Recorder application allows you to record a transport stream onto the hard drive of the MTS300 system using a VTR-like interface. You can specify the stream format, duration, file name, and location of the recorded file.

The Stream Recorder is governed by the following MTS300 system limits:

- Only one Stream Recorder can be launched at a time on each MTS300 system.
- The Stream Recorder can only record transport stream files with data rates between 1 Mbs and 140 Mbs onto the hard drive of the MTS300 system on which the application was launched. You cannot record remote transport stream files or use a remote Stream Recorder to record a local transport stream file.

***NOTE**. It is recommended that you store transport stream files on the SCSI hard drives (E: drive) of the MTS300 system. The response time of the C: drive on the MTS300 system is limited and may affect the performance of the Stream Recorder and Stream Player applications when you try to capture or play back streams with bitrates greater than 30 Mbs.*

- If the SCSI hard drives (E:) are 90% or more full, it is recommended that you use a defrag utility to defragment the SCSI drives. You can use any defrag utility that is compatible with the Microsoft Windows NT 4.0 operating system.
- The MTS300 system is limited to an aggregate data rate of 140 Mbs between all operating applications. You may have to shut down other MTS300 applications if you need to record a transport stream with high data rates.

Stream Player Client. The Stream Player application allows you to play back transport streams saved on the hard disk of the MTS300 system using a VTR-like interface. You can specify which portion of the transport stream to play back, the rate of the transport stream (you can also apply an external clock to set the rate), the format (ASI or M2S) of the transport stream, and the playback mode (one time or loop).

The Stream Player is governed by the following MTS300 system limits:

- Only one Stream Player can be launched at a time on each MTS300 system.
- The Stream Player can only play back transport stream files with data rates between 1 Mbs and 140 Mbs stored on the hard drive of the MTS300 system on which the application was launched. You cannot play back remote transport stream files or use a remote Stream Player to play back a local transport stream file.

NOTE. *It is recommended that you store transport stream files on the SCSI hard drives (E: drive) of the MTS300 system. The response time of the C: drive on the MTS300 system is limited and may affect the performance of the Stream Recorder and Stream Player applications when you try to capture or play back streams with bitrates greater than 30 Mbs.*

- If the SCSI hard drives (E:) are 90% or more full, it is recommended that you use a defrag utility to defragment the SCSI drives. You can use any defrag utility that is compatible with the Microsoft Windows NT 4.0 operating system.
- The MTS300 system is limited to an aggregate data rate of 140 Mbs between all operating applications. You may have to shut down other MTS300 applications if you need to play back a transport stream with high data rates.

TMCC Expert Client. The TMCC (Transmission and Multiplexing Configuration Control) Expert Client application allows you analyze the TMCC data of an ISDB-S/ARIB-compliant transport stream input in real time. You can also analyze an ISDB-S/ARIB-compliant transport stream file stored on your local disk.

The TMCC Expert client has the following characteristics:

- Indicates the presence of sync bytes (0x47 for TMCC basic streams and W1, W2, or W3 sync bytes for TMCC data streams)
- Displays the syntax of TMCC data
- Displays Slot, TSID, TS Name, and Modulation mode information
- Displays information, warning, and error messages
- Indicates the presence of TMCC alarm and update flags in the transport stream
- Displays the overall stream rate

The TMCC Expert Client displays the results of only one TMCC Analysis Server (input) at a time. You can connect more than one TMCC Expert Client to the same TMCC Analysis Server input from your own instrument, or you can connect to an Analysis Server from a remote MTS300 system.

TMCC Configuration Client. The TMCC (Transmission and Multiplexing Configuration Control) Configuration Client is used to configure the analyses performed by the TMCC Analysis Server. The results of the analyses are displayed in the TMCC Expert Client.

***NOTE**. Only one TMCC Configuration Client at a time can set parameters on a TMCC Analysis Server. If a TMCC Configuration Client is already connected to a TMCC Analysis Server, you can view the current settings, but you cannot change them.*

The settings in the TMCC Configuration Client only configure the measurements made by the TMCC Analysis Server, which are displayed in the TMCC Expert Client application. The TMCC Configuration Client settings do not affect the configuration settings in the Configuration Client, which is used to configure the measurements made by the MPEG Analysis Server.

The TMCC Configuration Client has the following characteristics:

- Uses multiple configuration panels to group related configuration functions.
- Uses a hierarchic navigation panel to select one of the multiple configuration panels.
- Configures the TMCC Analysis Servers to operate in either TMCC basic or TMCC data stream modes
- Enables you to specify a transport stream ID to analyze using the MPEG-2 Analysis Server (only in the TMCC data stream mode)

SNMP Capabilities

The MTS300 system includes SNMP management information bases (MIB) installed at the following directory location: C:\Mib\. The Tektronix MIB is a textual description of the Analysis Server objects (functions and parameters) that can be monitored and controlled via SNMP. Refer to the user manual or the online help for more information about the networking requirements of the MTS300 system.

The MIB files are used by the real-time analysis applications and the Stream Player, Stream Recorder, and OpenMux (MTS300, Option OM only) applications.

The MIB file pairs for each application, for example, the RTAv1.mib and RTAv2.mib files, are used for SNMPv1 and SNMPv2 systems respectively.

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

Characteristic Tables

This section lists the electrical, environmental, and physical specifications of the MTS300 system. All specifications are guaranteed unless labeled *typical*. Typical specifications are provided for your convenience and are not guaranteed. Electrical characteristics apply to test systems operating within the environmental conditions specified in Table 1–10.

To verify performance of the test system, use the procedures in the performance verification section of the *MTS300 MPEG Test System Service Manual*, an optional accessory. Contact your Tekronix representative for ordering information.

Monitoring Characteristics

MPEG Characteristics:

- Supports MPEG–2, DVB, and ATSC protocols.
  Monitors transport and multiplex errors.
- Monitors PSI, SI, and PSIP table syntax and consistency errors.
  Monitors transport signal for sync loss.
- Generates MPEG transport streams (including ATSC and DVB–SI).

Data Rate Characteristics:

- Up to 140 Mbps with one input or 240 Mbps total using 2 to 4 inputs.
  For example, Port 1 can run at 100 Mbps while port 2 is running at 140 Mbps for a total of 240 Mbps.

Number of Inputs:

- Standard Inputs: Two ASI/M2S input/output pairs
- Optional inputs: Two SPI (LVDS parallel), two SMPTE310M (SSI), or two DHEI (GI-Digicypher) input/output pairs.

Interface Platform Characteristics

Table 1-1: Platform characteristics

Characteristic	Description	Supplemental information
Operating system	Windows NT 4.0 (Service pack 6)	
Disk space	System: 10 GB MPEG Storage: 27 GB	
COM Port	RS-232	
Ethernet	10/100-base T; RJ45	
Mouse	Mini DIN	
Keyboard	Mini DIN	
SVGA	15-pin, High density, Sub-D	
RAM	256MB	
CD-ROM drive	8x	
Display	LCD, 800 x 600	
Character input	Touch screen and keyboard	
Printer Port	IEEE P1284	

I/O Port Electrical Characteristics

Table 1-2: ASI

Characteristic	Description	Supplemental information
Input Port (ASI/M2S)		
Connector	BNC	
Bit Rate	270 Mbps ±100 ppm	
Transport Stream Data rate	Maximum: 140 Mbps Minimum: 1 Mbps	
Signal Amplitude	Maximum: 800 mV_{p-p} Minimum:: 200 mV_{p-p}	
Termination	75 Ω nominal	
Return Loss	17 dBm minimum from 27 MHz to 270 MHz	
Output Port (ASI/M2S)		
Connector	BNC	
Bit Rate	270 Mbps ±100 ppm	

Table 1-2: ASI (Cont.)

Characteristic	Description	Supplemental information
Transport Stream Data Rate	Maximum: 140 Mbps Minimum: 1 Mbps	
Signal Amplitude	Maximum: 880 $mV_{p-p,}$ typical Minimum: 500 $mV_{p-p,}$ typical	
Termination	75 Ω	
Format	Can be configured as ASI Burst, ASI Packet, or M2S	
Rise and Fall times	1.2 ns maximum, typical	20% to 80%
External Clock Input Port		Clocks the stream player output byte rate
Voltage Levels	TTL Low: < 0.8 V. typical High: > 2.0 V, typical	
Termination	50 Ω resistive nominal	
Frequency Range	125 kHz to 17.5 MHz	
External Trigger Input Port		Initiates a capture of a transport stream input
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	

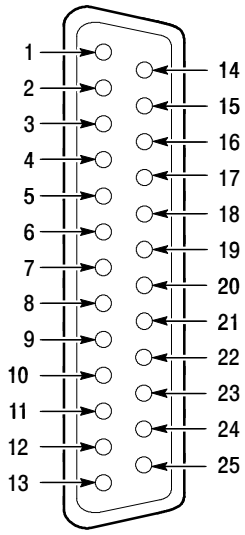
Table 1-3: SPI-LVDS parallel (Option MTS3FLV)

Characteristic	Description	Supplemental information
Input Port		See Table 1-4 on page 1-15 for pin descriptions. See Figure 1-2 on page 1-15 for the timing diagram.
Connector	25-pin sub D-type	
Data Rate	Maximum: 140 Mbps Minimum: 1 Mbps	
Signal Amplitude	LVDS	
Termination	100 Ω resistive nominal, line-to-line	
Timing reference	Rising edge of clock	

Table 1-3: SPI-LVDS parallel (Option MTS3FLV) (Cont.)

Characteristic	Description	Supplemental information
Clock-to-Data Timing	Data must be stable ±5 ns of rising clock edge	
Output Port		See Table 1-4 on page 1-15 for pin descriptions. See Figure 1-2 on page 1-15 for the timing diagram.
Connector	25-pin sub D-type	
Data Rate	Maximum: 140 Mbps Minimum: 1 Mbps	
Signal Amplitude (LVDS)	Maximum: 454 mV_{p-p}, typical Minimum: 247 $mV_{p-p,}$ typical	
Termination	100 Ω resistive nominal, line-to-line	
Signal Common-Mode Range (LVDS)	1.125 V to 1.375 V, typical	
External Clock Input Port		Clocks the stream player output byte rate
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	
Frequency Range	125 KHz to 17.5 MHz	
External Trigger Input Port		Initiates a capture of a transport stream input
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	

Table 1-4: LVDS parallel data pin connections

LVDS/ECL/RS422 parallel port	Pin	Function	Pin	Function
	1	DCLK	14	$\overline{\text{DCLK}}$
	2	Ground	15	Ground
	3	DATA 7	16	$\overline{\text{DATA 7}}$
	4	DATA 6	17	$\overline{\text{DATA 6}}$
	5	DATA 5	18	$\overline{\text{DATA 5}}$
	6	DATA 4	19	$\overline{\text{DATA 4}}$
	7	DATA 3	20	$\overline{\text{DATA 3}}$
	8	DATA 2	21	$\overline{\text{DATA 2}}$
	9	DATA 1	22	$\overline{\text{DATA 1}}$
	10	DATA 0	23	$\overline{\text{DATA 0}}$
	11	DVALID	24	$\overline{\text{DVALID}}$
	12	PSYNC	25	$\overline{\text{PSYNC}}$
	13	Shield		

$\overline{\text{Asserted Low}}$ differential signal.

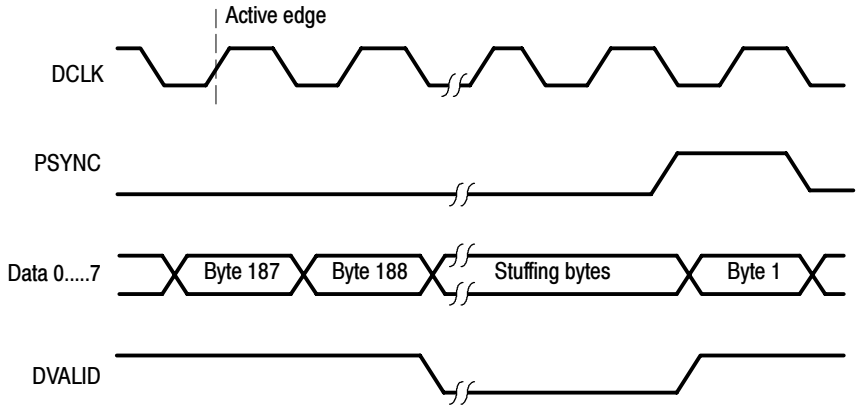


Figure 1-2: Parallel data timing, 188-byte packets

Table 1-5: SSI (Option SS)

Characteristic	Description	Supplemental information
SSI input (SMPTE310M)		
Connector	BNC, Female	
Input bit rate	19,392,658.5 bps ±1000 bps (typical) 38,785,316.9 bps ±1000 bps (typical)	
Synchronization	0x47	Synchronization will occur when the sync_byte is 0x47
Data format	Compliant with SMPTE310M	
Packet length	188 byte	
Signal amplitude	880 mV_{p-p}, maximum 720 mV_{p-p}, minimum	
Signal DC offset	±0.5 VDC, maximum	
Termination	75 Ω	
Return loss	–17 dB, 100 kHz to 77.6 MHz	
SSI output (SMPTE310M)		
Connector	BNC, Female	
Output bit rate	19,392,658.5 bps (nominal) or 38,785,316.9 bps (nominal)	Same as the input when the output is a loop through of the input
Data format	Compliant to SMPTE310M	
Signal amplitude	880 mV_{p-p} maximum 720 mV_{p-p} minimum	
Signal DC offset	±0.5 VDC, maximum	
Signal rise and fall times	0.4 ns minimum 5.0 ns maximum	Rise and fall times shall not differ by more than 1.6 ns, measured between 20% and 80%
Signal overshoot	10% of maximum signal amplitude	
Output impedance	75 Ω	
Return loss	–17 dB, 100 kHz to 77.6 MHz	

Table 1-5: SSI (Option SS) (Cont.)

Characteristic	Description	Supplemental information
External Clock Input Port		Clocks the stream player output bit rate
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	
Frequencies	19.393 MHz 38.785 MHz	
External Trigger Input Port		Initiates a capture of a transport stream input
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	

Table 1-6: DHEI-Digicipher II

Characteristic	Description	Supplemental information
Expansion Input Port		
Connector	26-pin D, HD-22 Series	See Table 1-7 on page 1-19 for the pin descriptions
Data Rate	Maximum: 40 Mbps Minimum: 1 Mbps	
Signal Amplitude	ECL	
Termination	120 Ω resistive nominal, line-to-line	
Timing reference	Falling Edge of clock	
Clock-to-Data Timing	Data must be stable ±5 ns of falling clock edge	
Output Port		See Table 1-8 on page 1-20 for the pin descriptions
Connector	26-pin D, HD-22 Series	
Data Rate	Maximum: 40 Mbps Minimum: 1 Mbps	
Signal Amplitude	ECL	

Table 1-6: DHEI-Digicipher II (Cont.)

Characteristic	Description	Supplemental information
Termination	120 Ω resistive nominal, line-to-line	
External Clock Input Port		Clocks the stream player output bit rate
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	
Frequency range	1 MHz to 40 MHz	
External Trigger Input Port		Initiates a capture of a transport stream being input to the real-time analyzer
Voltage Levels	TTL Low: < 0.8 V High: > 2.0 V	
Termination	50 Ω resistive nominal	

Table 1-7: DHEI Expansion In pin connections

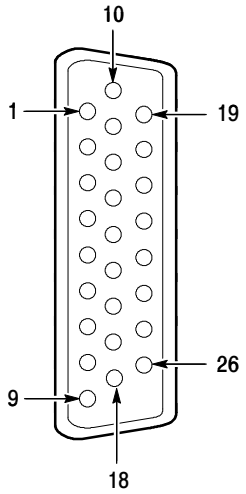
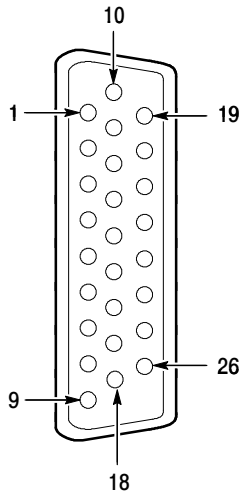
DHEI 26-pin connector	Pin	Function	Description
	1	PROTOGND	Protective or shield ground
	2	SENSEAIR	Enable sense A input return
	3	PSYNCAI-	Packet sync A input (-)
	4	PDATAI-	Packet data A input (-)
	5	PCLKAI+	Packet clock A input (+)
	6	PCLKAI-	Packet clock A input (-)
	7	REFCLKAI+	Ref_clock A input (+)
	8	REFCLKAI-	Ref_clock A input (-)
	9	SIGND	Signal or circuit ground reference
	10	RSVD	DHEI reserved
	11	SENSEAIL	Enable sense A loop input
	12	PSYNCAI+	Packet sync A input (+)
	13	PDATAI+	Packet data A input (+)
	14	RSVD	DHEI reserved
	15	PDATBO-	Packet data B output (-)
	16	PSYNCBO-	Packet sync B output (-)
	17	SENSEBOR	Enable sense B output return
	18	RSVD	DHEI reserved
	19	REFCLKBO+	Ref_clock B output (+)
	20	REFCLKBO-	Ref_clock B output (-)
	21	PCLKBO+	Packet clock B output (+)
	22	PCLKBO-	Packet clock B output (-)
	23	PDATBO+	Packet data B output (+)
	24	PSYNCBO+	Packet sync B output (+)
	25	SENSEBOL	Enable sense B loop output
	26	RSVD	DHEI reserved

Table 1-8: DHEI Expansion Out pin connections

DHEI 26-pin connector	Pin	Function	Description
	1	PROTOGND	Protective or shield ground
	2	SENSEAOR	Enable sense A output return
	3	PSYNCAO-	Packet sync A output (-)
	4	PDATAO-	Packet data A output (-)
	5	PCLKAO+	Packet clock A output (+)
	6	PCLKAO-	Packet clock A output (-)
	7	REFCLKAO+	Ref_clock A output (+)
	8	REFCLKAO-	Ref_clock A output (-)
	9	SIGND	Signal or circuit ground reference
	10	RSVD	DHEI reserved
	11	SENSEAOL	Enable sense A loop output
	12	PSYNCAO+	Packet sync A output (+)
	13	PDATAO+	Packet data A output (+)
	14	RSVD	DHEI reserved
	15	PDATBI-	Packet data B input (-)
	16	PSYNCBI-	Packet sync B input (-)
	17	SENSEBIR	Enable sense B input return
	18	RSVD	DHEI reserved
	19	REFCLKBI+	Ref_clock B input (+)
	20	REFCLKBI-	Ref_clock B input (-)
	21	PCLKBI+	Packet clock B input (+)
	22	PCLKBI-	Packet clock B input (-)
	23	PDATBI+	Packet data B input (+)
	24	PSYNCBI+	Packet sync B input (+)
	25	SENSEBIL	Enable sense B loop input
	26	RSVD	DHEI reserved

Power Characteristics

Table 1-9: AC power source characteristics

Characteristic	Description
Source Voltage	100 VAC to 240 VAC 47 Hz to 63 Hz, continuous range CAT II
Maximum Power Consumption	170 Watts, typical

Environmental Characteristics

Table 1-10: Environmental characteristics

Characteristic	Description
Cooling Airflow	Intake is from the front and sides of the instrument. Exhaust is to the bottom and rear of the instrument.
Required Clearance	2 in (50 mm) air space adjacent to the bottom of the instrument is required.
Use Rating	Rated for indoor use only.
Atmospherics	
Temperature:	
Operating	+5° C to +40° C, 30° C/hr max gradient, noncondensing (derated 1° C per 1,000 ft above 5,000 ft altitude)
Nonoperating	-20° C to 60° C, 30° C/hr max gradient (without disk media installed in disk drives)
Humidity	
Operating	20% to 80% relative humidity, noncondensing. Max wet bulb temperature: 29° C (derates relative humidity to ~22% at 50° C)
Nonoperating	8% to 80% relative humidity, noncondensing. Max wet bulb temperature: 40° C (derates relative humidity to ~55% at 50° C)
Altitude	
Operating	Up to 10,000 ft (3,040 m), (derated 1°C per 1,000 ft above 5,000 ft altitude)
Nonoperating	Up to 40,000 ft (12,190 m)

Mechanical (Physical) Characteristics

Table 1- 11: Mechanical characteristics

Characteristic	Description
Classification	Transportable platform intended for either rackmount or bench applications
Overall Dimensions	
Height	8.9 in (w/o feet) (22.6 cm)
Width	17 in (43.2 cm)
Depth	22 in (56 cm)
Weight	38 lb (17.3 kg)
Rack Space	5 rack units, standard length

Certifications and Compliances

Table 1- 12: Certifications and compliances

Category	Standard
EC Declaration of Conformity-EMC	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliances was demonstrated using EN 61326: 1997 EMC Product Family Standard for Electrical Equipment for Measurement, Control, and Laboratory use. Emissions[1]: EN 61326 Class A Radiated and Conducted Emissions IEC 61000-3-2 Conducted Power Line Harmonic Current Immunity[1]: IEC 61000-4-2 Electrostatic Discharge Immunity IEC 61000-4-3 Radiated RF Electromagnetic Field Immunity[2] IEC 61000-4-4 Electrical Fast Transient/Burst Immunity IEC 61000-4-5 Power Line Surge Immunity IEC 61000-4-6 Conducted RF Immunity[2] IEC 61000-4-11 Voltage Dips and Short Interruptions Immunity
Australia/New Zealand declaration of conformity	Complies with EMC Framework and demonstrated per Emission standard: AS/NZS 2064 Industrial, Scientific, and Medical Equipment.
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits

1 **Compliance demonstrated using high quality, shielded interface cables.**
2 **Performance Criterion: Product continues to operate properly and display remains readable.**

Table 1-13: Environmental limits and use classification for safety certification compliance

Category	Standards or description	
Safety Certification Compliance		
Temperature, operating	+5° C to +40° C	
Altitude (maximum operating)	2000 meters	
Equipment Type	Test and measuring	
Safety Class	Class 1 (as defined in IEC 61010-1, Annex H) - grounded product	
Installation (Overvoltage) Category	Overvoltage Category II (as defined in IEC 61010-1, Annex J)	
Pollution Degree	Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.	
Supply Voltage Range	100 VAC to 240 VAC, 50/60 Hz, single phase	
Fuse Rating	Mains fuse is 10A, 250V, Fast; Not operator replaceable. Refer servicing to qualified service personnel.	
Current Rating	6.0 Amps maximum	
Relative Humidity (maximum operating)	80 % for temperatures up to 31° C, decreasing linearly to 50 % at 40° C	
Pollution Degree Definition	A measure of the contaminates 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 environment. 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.
European Union Compliance	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:	
	Low Voltage Directive 73/23/EEC, amended by 93/68/EEC	
	EN 61010-1/A2	Safety Requirements for Electrical Equipment for Measurement Control and Laboratory Use.
Listing by a U.S. Nationally Recognized Testing Laboratory	ANSI/ISA S82.01	Safety Standard for Electrical and Electronic Test, Measuring, Controlling, and Related Equipment., 1994.
Canadian Certification	CAN/CSA C22.2 No. 1010.1	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

Table 1-13: Environmental limits and use classification for safety certification compliance (Cont.)

Category	Standards or description	
Additional Compliance	UL3111-1	Standard for Electrical Measuring and Test Equipment.
	IEC61010-1/A2	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
Installation (Overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:	
	CAT III	Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.
	CAT II	Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.
	CAT I	Secondary (signal level) or battery operated circuits of electronic equipment.
Laser Classification	This product contains a CD ROM drive which utilizes a Class 1 laser and complies with EN60825-1:94, as well as with the U.S. FDA regulations. The drive is marked with the laser's classification and the date of manufacture, as well as the following information: Complies with the DHHS rules 21 CFR Chapter 1, Subchapter J applicable at the date of manufacture.	

Installation

This *Operating Information* section contains installation and operating information related to the servicing of the instrument.

Hardware Installation

This subsection provides instructions for installing the MTS300 system and making the necessary electrical connections. Also provided are repackaging instructions, including part numbers for replacement packaging.

The MTS300 system can be operated from a bench or installed in a rack using the optional rack-mount kit. The rack-mount kit includes installation instructions for the rackmounting hardware.

CAUTION. *For proper cooling, provide at least two inches (5.1 cm) of clearance at the rear and to the sides of the test system, and ensure that the air temperature at all air intake vents (inside of the rack) does not exceed 40° C.*

Use the two collapsible front feet on the bottom of the MTS300 system to change the height of the front panel.

Test System Interconnections

The location of the connectors on a typical test system rear panel is shown in Figure 2–1. Table 2–1 describes the transport stream, network, and peripheral device connectors. Refer to *Connecting the MTS300 System I/O Ports* on page 2–7 for illustrations of the various rear-panel connector configurations.

Table 2-1: Rear-panel connectors

Connector	Description
Transport stream input/output	Each format includes two input/output pairs
ASI/M2S Input/Output	
SPI (LVDS) Input/Output	
DHEI (GI Digicypher) Input/Output	
SSI Input/Output	
Monitor	15-pin female high density-D-sub connector for SVGA monitor

Table 2- 1: Rear-panel connectors (Cont.)

Connector	Description
Keyboard	Mini-DIN connectors for PS2 compatible keyboard (on rear and side panels)
Mouse	Mini-DIN connectors for PS2 compatible mouse (on rear and side panels)
Printer	25-pin sub-D connector for parallel communication
LAN (Ethernet)	10 Base-T/100 Base-T, RJ45 connector for Ethernet communications
RS-232/422	9-pin D-sub type connector for serial communication
SCSI	Standard, PC compatible Ultra-Wide SCSI port, 68 Pins

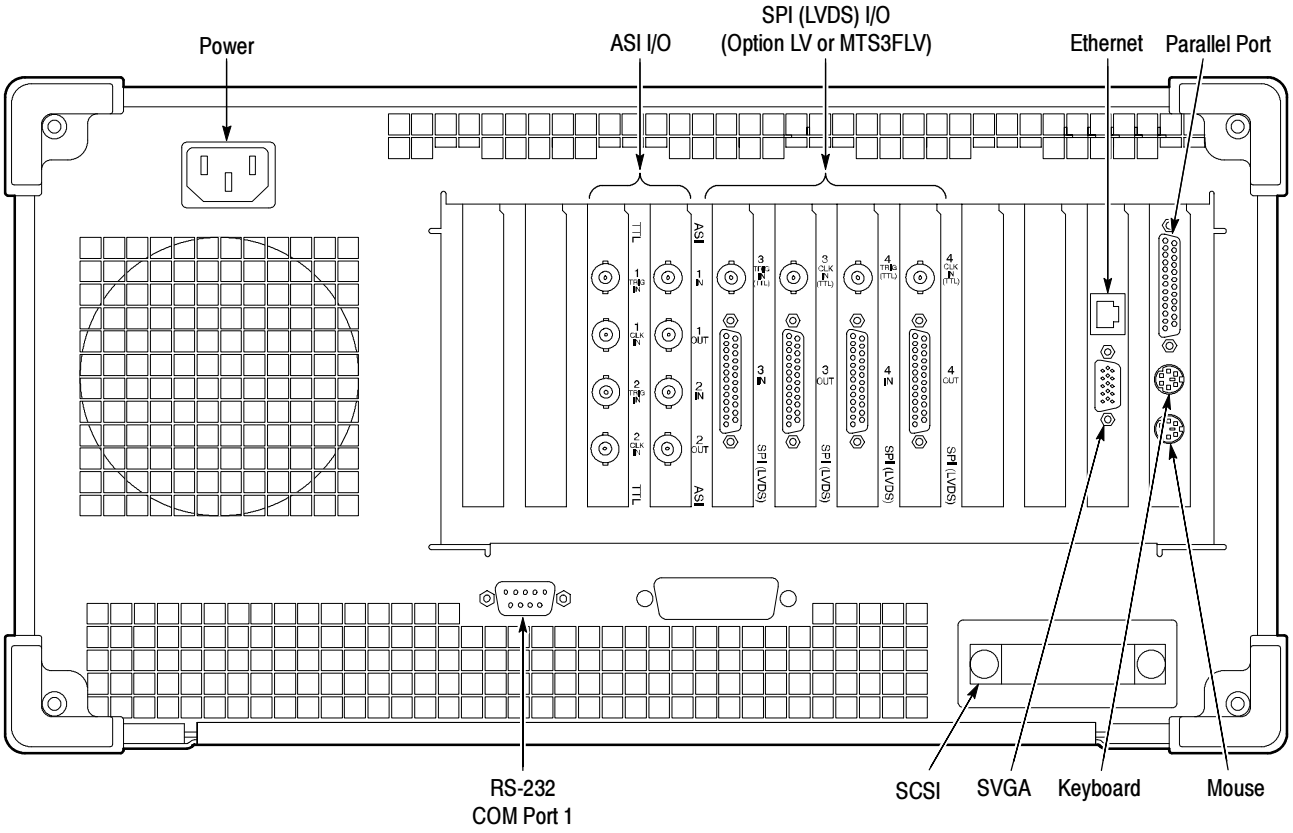


Figure 2- 1: Typical MTS300 test system rear panel connectors

The following procedure identifies the electrical connections.

1. Plug in the keyboard and mouse to the proper rear panel connectors. Refer to Figure 2–1. Figure 2–2 shows alternative connectors for a mouse and keyboard. The optional connections are located on the instrument side panel.

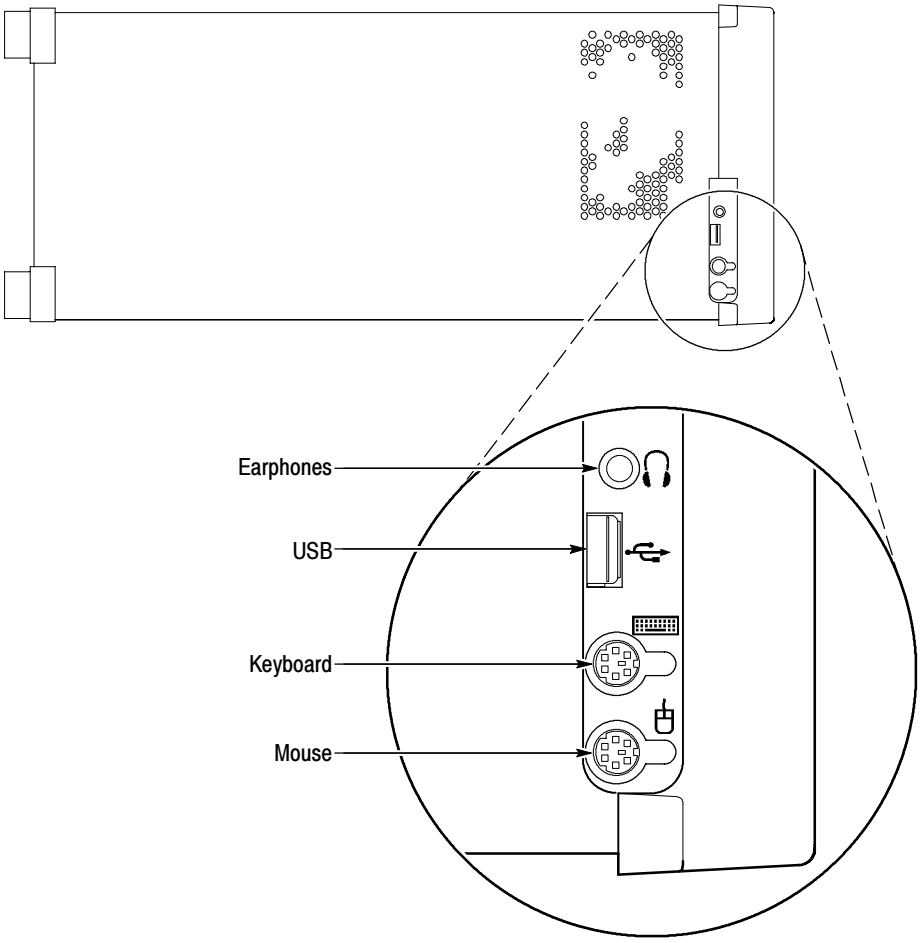


Figure 2-2: Keyboard and mouse alternative connections

2. Install the Software Key on the rear panel Parallel port. MTS300 MPEG Test System software applications will not run without the Software Key installed; do not remove or misplace the Software Key.

   To use the Parallel port with the Software Key installed, attach any parallel port cables (such as a printer) directly to the Software Key. The Software Key does not interfere with parallel communications.

***NOTE**. To run MTS300 MPEG Test System applications, the Software Key must be on the computer Parallel port. If you return the test system to a Tektronix Service Center for upgrade or repair, include the Software Key.*

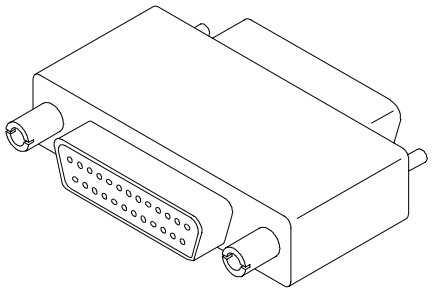


Figure 2-3: Software Key

Supplying Power

The MTS300 MPEG Test System platform is designed to operate from a single-phase power source having one of its current carrying conductors at or near earth ground (the neutral conductor). Power sources that have both current carrying conductors live with respect to ground, such as phase-to-phase or multiphase systems, are not recommended. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation. The electrical operating requirements are listed in Table 2–2.

Table 2-2: Electrical operating requirements

Requirement	Specification
Source Voltage	100 VAC to 240 VAC 47 Hz to 63 Hz
Fuse Rating	10 A Fast / 250 V
Maximum Power Consumption	170 Watts typical
Inrush Surge Current	36 Amps maximum
Power Factor Correction	Yes

After you have installed the MTS300 system and completed making the signal, network, and peripheral connections, plug the power cord into the mains. See Figure 2–1 for location of power connector.

CAUTION. *Do not supply power to the instrument until all connections have been made.*

WARNING. *The test system is designed for connection to an earth-grounded AC outlet. To avoid risk of electrical shock or equipment damage, do not disable the grounding plug.*

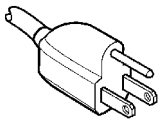
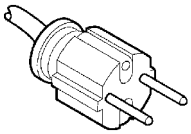
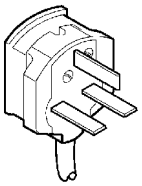
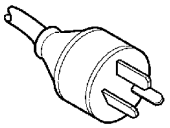
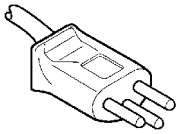
Mains Voltage Range. You can power the test system computer and monitor from mains that supply between 100 VAC and 240 VAC without setting a voltage selection switch.

Mains Frequency. The test system computer and monitor operate on either 50 Hz or 60 Hz line frequencies.

CAUTION. *To prevent damage, protect the system computer from power fluctuations and temporary interruptions with a regulating noninterruptible power supply. This device protects the hardware from damage caused by power surges and voltage spikes. In addition, it allows the system to operate temporarily during a power failure.*

Power Cord Options. Unless a specific power cord option is ordered, the system computer and monitor come standard with a power cord for North American 60 Hz, 115 VAC supplies. Table 2–3 lists the power cord options.

Table 2-3: Power cord identification

Plug configuration	Normal usage	Option number
	North America 125 V/15A Plug NEMA 5-15P	Standard
	Europe 230 V	A1
	United Kingdom 230 V	A2
	Australia 230 V	A3
	Switzerland 230 V	A5

Connecting MTS300 System I/O Ports

Figure 2–4 through Figure 2–11 show the available input and output (I/O) connector configurations on the MTS300 rear panel. For I/O port specifications, refer to the *Specifications* section beginning on page 3-1. Use the I/O ports that best suit your operating environment and signal sources. A description of each connector type follows.

Input

You must provide input to the MTS300 system to monitor an MPEG-2, DVB, or ATSC bit stream. The MTS300 system I/O ports can be ASI serial, SPI (LVDS), DHEI (GI-Digicypher), or SSI (SMPTE310M). To change the configuration, refer to *Configuration Client Reference* in the *MTS300 MPEG Test System Real-Time Analysis User Manual*.

Trigger Input

The trigger input accepts a TTL level (0 V to +5 V) signal you can use to control capture of the MTS300 system input stream to the system disks. You can configure the system to start/stop data capture on either the rising edge (low to high transition) or the falling edge (high to low transition) of the trigger signal. Refer to the *MTS300 MPEG Test System Real-Time Analysis User Manual* for further information on capturing transport stream inputs.

Clock Input

Each output port has a corresponding clock input which can be used to clock the transport stream output when using Stream Player. The clock rate is at the byte rate of the transport stream for the ASI/M2S and SPI (LVDS) formats. The clock rate is at the bit rate of the transport stream for the SMPTE310M (SSI) and DHEI (GI Digicypher) formats.

Output to Other Equipment

Applications generating an output will do so on the I/O port to which the application has been assigned. Applications requiring an input have an output activation option that will loop-through the input signal to the output connector on the assigned I/O port.

When an output port is used to generate signals using the Stream Player or OpenMux applications, the corresponding input port cannot be used.

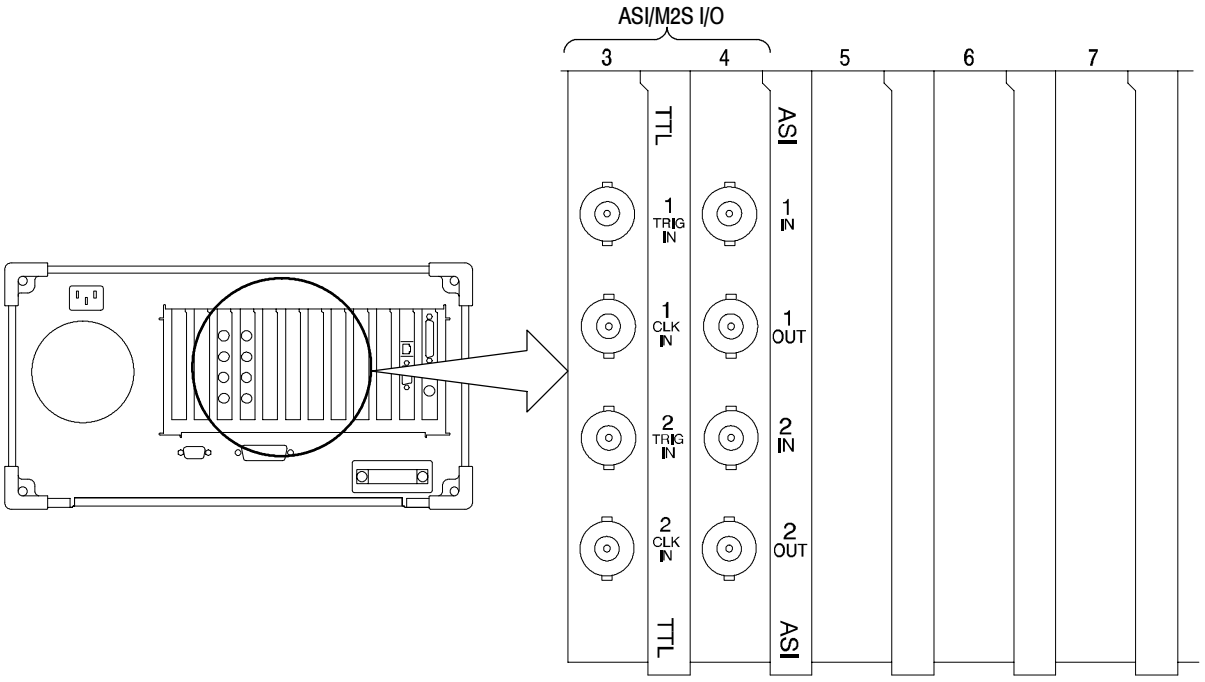


Figure 2- 4: Rear-panel configuration with one ASI/M2S (Option AS) interface installed

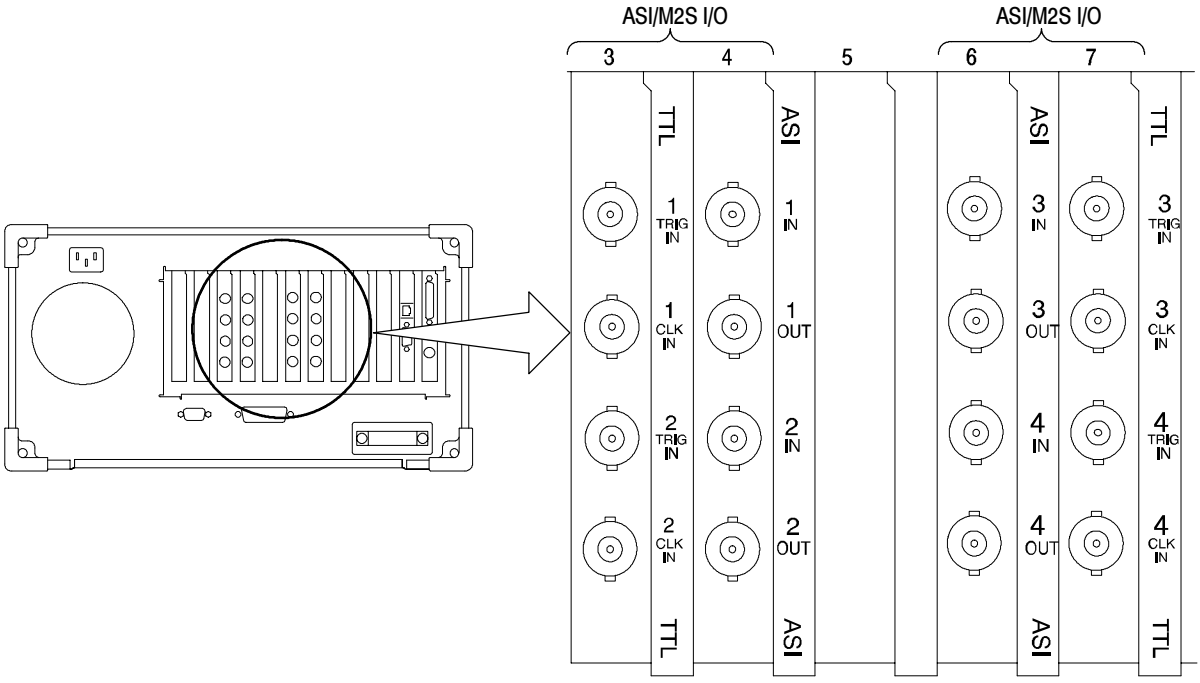


Figure 2- 5: Rear-panel configuration with two ASI/M2S (Option AS) interfaces installed

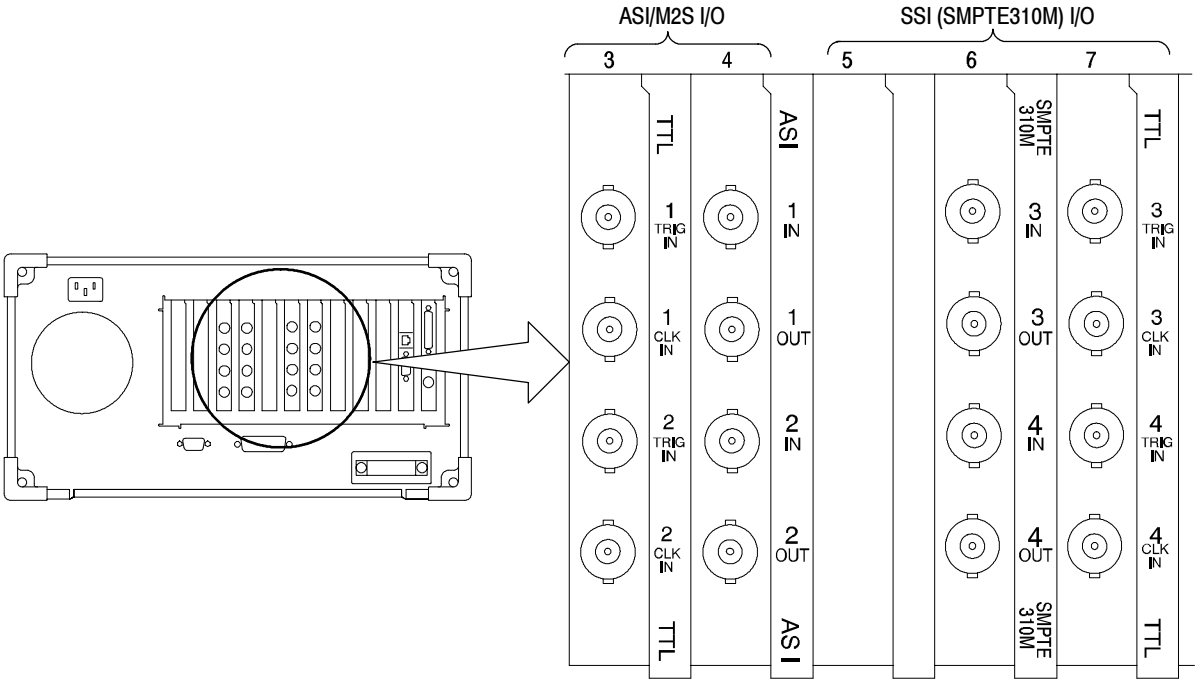


Figure 2-6: Rear-panel configuration with ASI/M2S (Option AS) and SSI (Option SS) interfaces installed

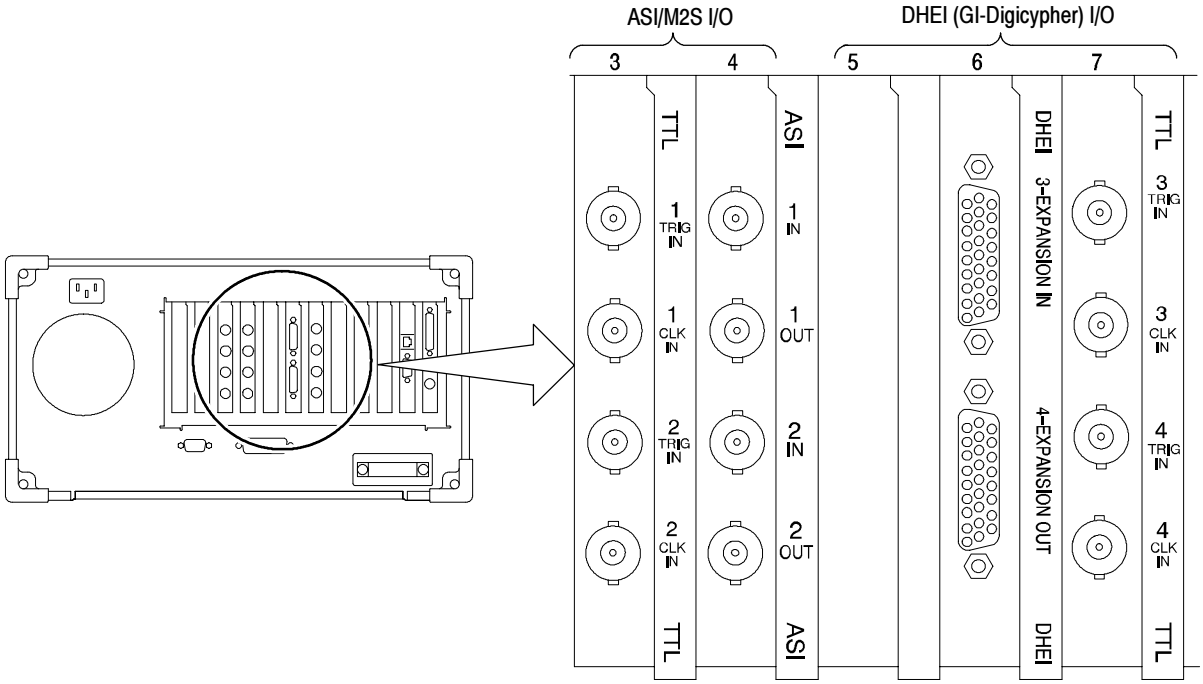


Figure 2-7: Rear-panel configuration with ASI/M2S (Option AS) and DHEI (Option DE) interfaces installed

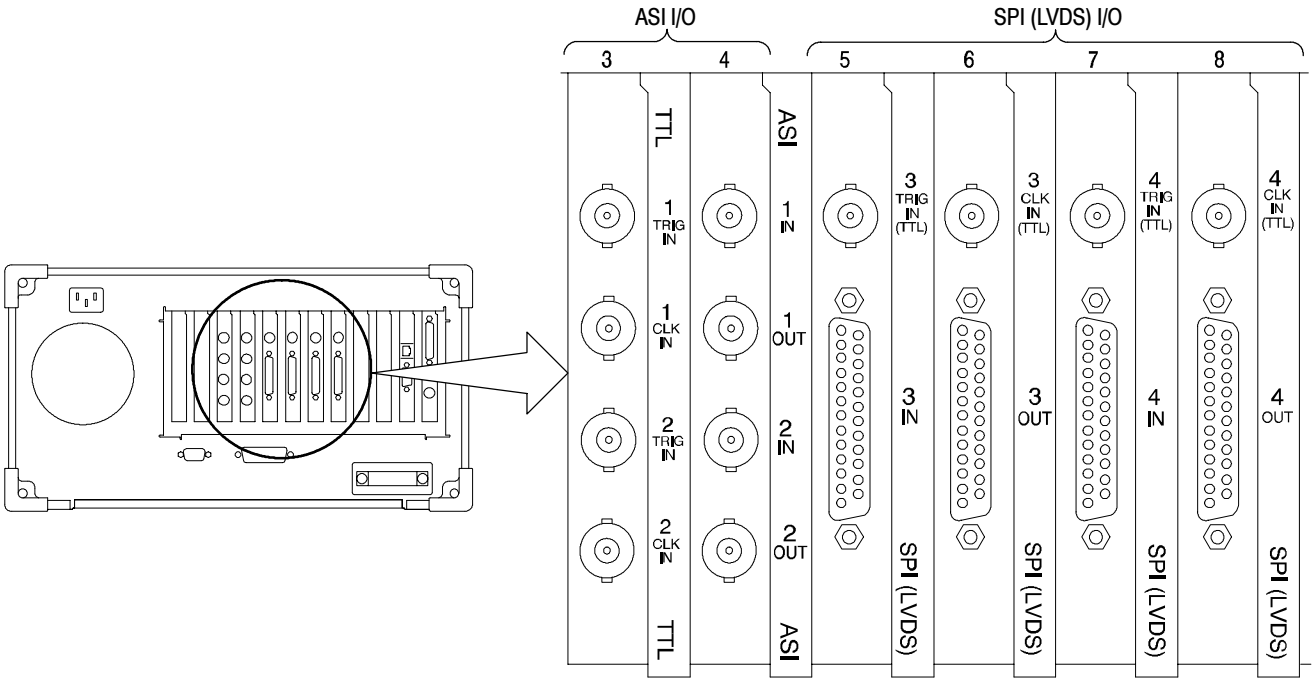


Figure 2- 8: Rear-panel configuration with ASI/M2S (Option AS) and SPI (Option LV) interfaces installed

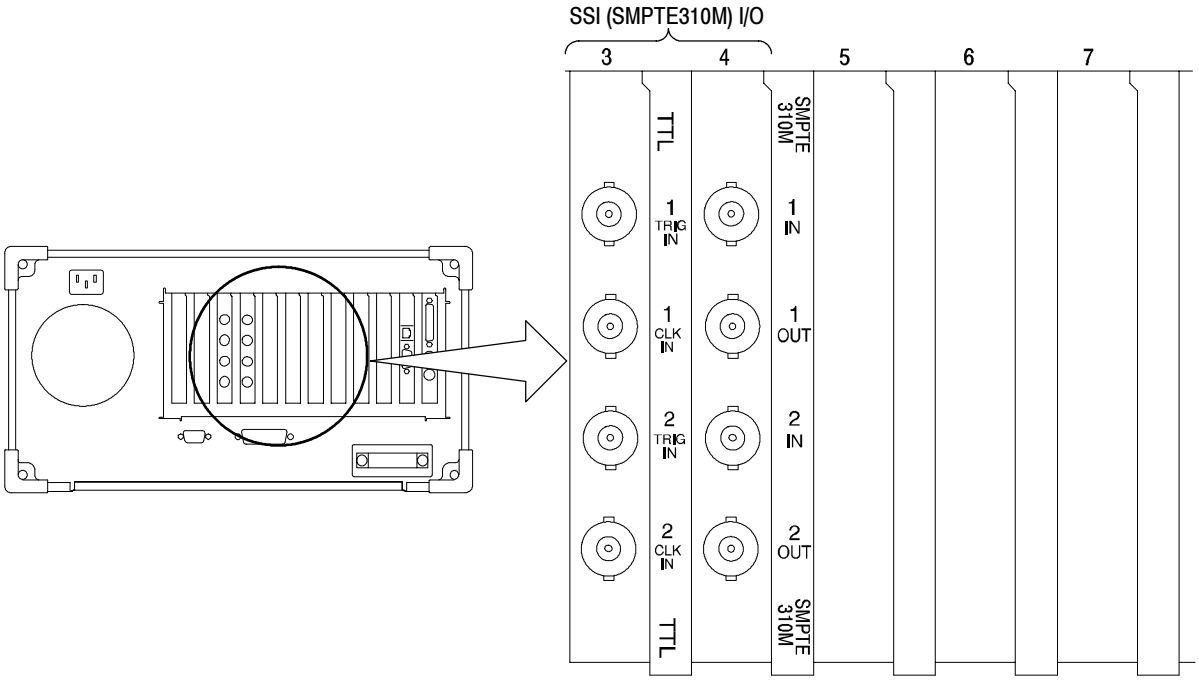


Figure 2- 9: Rear-panel configuration with one SSI (Option SS) interface installed

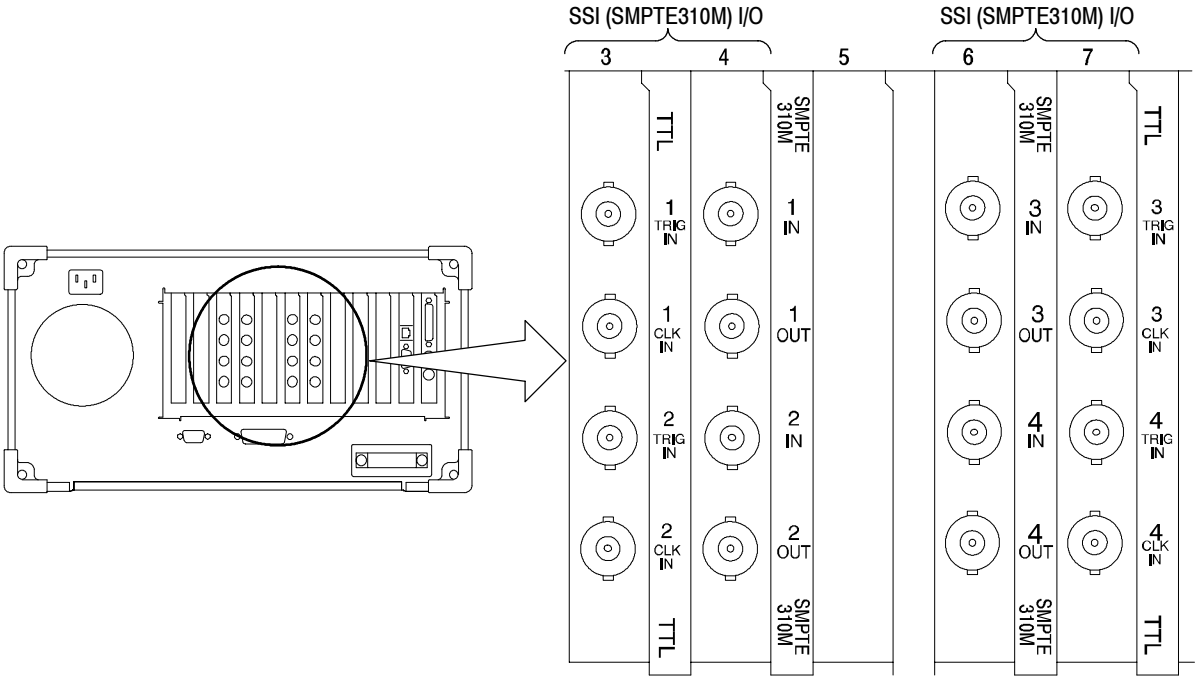


Figure 2-10: Rear-panel configuration with two SSI (Option SS) interfaces installed

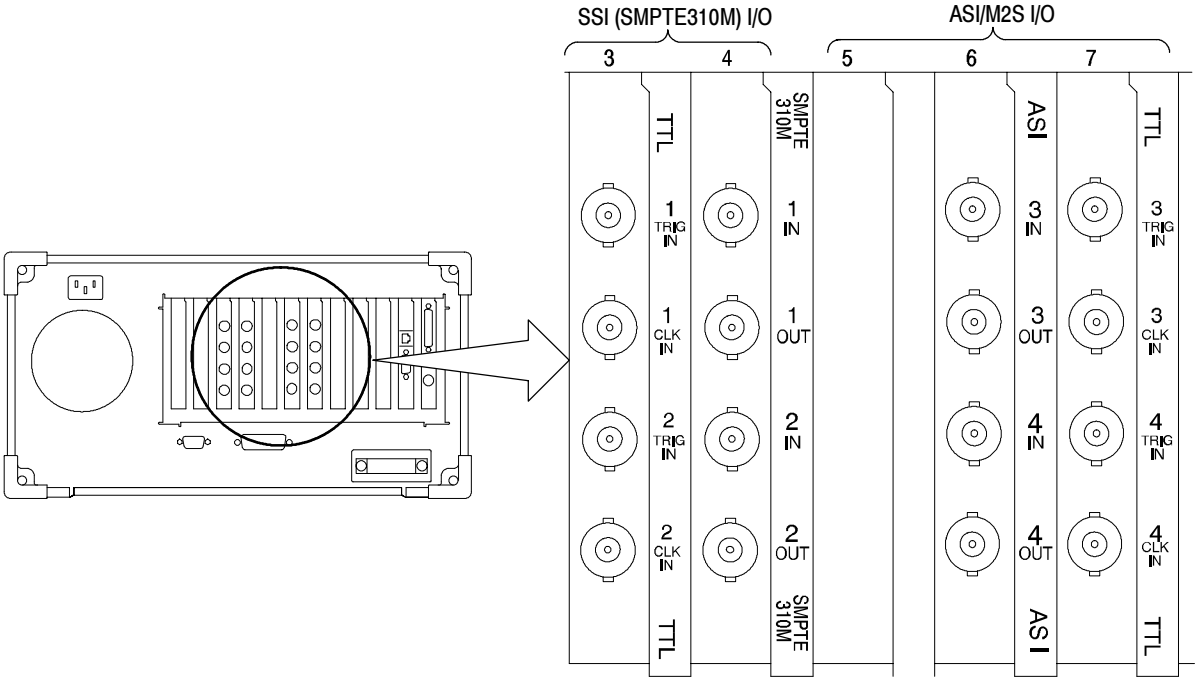


Figure 2-11: Rear-panel configuration with SSI (Option SS) and ASI/M2S (MTS3FAS) interfaces installed

Networking

This subsection provides the following information:

- Network requirements for the Tektronix MTS300 MPEG Test System
- Network installation procedures for configuring the TCP/IP and SNMP parameters of your test system
- Network troubleshooting techniques for solving basic networking issues common to many network installations

Refer to *Network Troubleshooting* on page 6–14 for information to help you solve problems with installing the MTS300 system on your network.

Network Requirements

The Transmission Control Protocol/Internet Protocol (TCP/IP) protocol stack is pre-loaded on Tektronix MTS300 MPEG Test Systems. The open nature of TCP/IP allows you to create networks using various protocols and signaling techniques. This section lists the physical and network requirements for using test systems over a network.

Physical Requirements. The following list describes the physical requirements for networking MTS300 systems:

- Ethernet network or subnetwork to the MTS300 system
- 10Base-T / 100Base-T network drop to your local MTS300 system
- Network interface card (NIC) and driver

NOTE. *The Intel EtherExpress Pro/100B Adapter NIC and E100BT.sys adapter driver are pre-loaded on all test systems; this combination of NIC and adapter driver is the only one supported by the test system.*

Network management stations do not have requirements beyond basic connectivity between two points; the network adapter at a network management station can be of any type that allows it to communicate over a TCP/IP network. The routers installed in the network convert data to the appropriate format for the protocols used in your network.

Minimum Network Requirements. To use the test system over a network, you must install it in a TCP/IP network. TCP/IP networks have specific addressing and routing requirements that your network administrator will typically have already configured. Use this section as a checklist for the TCP/IP parameters that your network administrator assigns to your test system.

- Unique IP address
- Unique host name
- Subnet mask (if you are installing the test system in a network with multiple subnets)
- Default gateway IP address (if your environment uses multiple networks or subnets)
- DNS server IP address(es) (if you use the DNS service to resolve Internet addresses; some networks use multiple DNS servers)
- WINS server IP address(es) (if your system uses WINS to resolve computer names to IP addresses; some networks use multiple WINS servers)

***NOTE**. In order to use test systems over a network, your network administrator needs to assign your host machine an IP address: you cannot use the test system with Dynamic Host Configuration Protocol (DHCP).*

Network Installation

This section describes how to set the parameters listed in *Minimum Network Requirements*, and how to configure test systems to be managed in an SNMP-based network management environment. The information in this section will not replace the value added by networking professionals and describes only basic network installation procedures.

Setting TCP/IP Parameters. Each network uses specific values for such parameters as IP addresses and default gateways, so the parameter values used in the examples for this section are for illustrative purposes only unless otherwise specified. You can configure test systems as stand-alone instruments which need only minimal network parameters set, or you can configure them to be installed into a LAN or WAN (local or wide area network, respectively).

Display the Microsoft TCP/IP Properties dialog box.

1. Click the **Start** button on the taskbar, point to **Settings** and then **Control Panel**. (Alternatively, right-click the **Network Neighborhood** icon and select **Properties** from the shortcut menu. Skip to step 3.)
2. Double-click the **Network** icon.
3. Select the **Protocols** tab from the Network dialog box as shown in Figure 2–12.

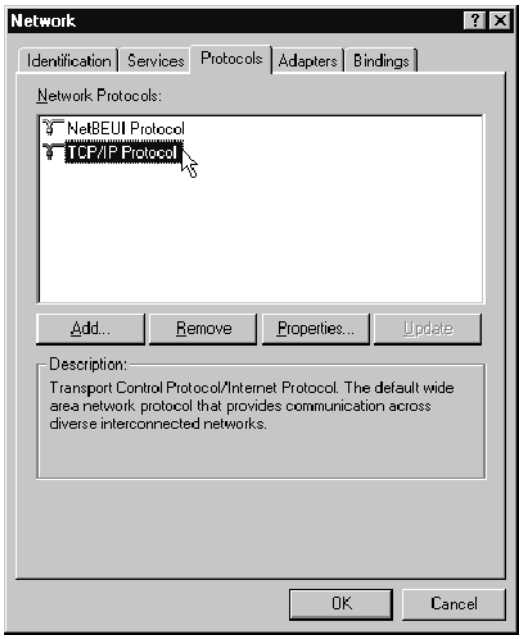


Figure 2-12: Network dialog box showing TCP/IP Protocol item

4. Highlight **TCP/IP Protocol** from the Network Protocol selection box, and then click **Properties**.

The TCP/IP Properties dialog box is displayed showing the IP Address tab. See Figure 2–13 on page 2–15.

Set IP Address tab parameters.

5. Set the following IP Address tab parameters as shown in Figure 2-13 and described below:

   a. Select the Intel EtherExpress Pro Adapter (it should be the only option available for MTS300 systems).

   b. Select **Specify an IP Address**.

   c. Enter the IP address for your MTS300 system. If not already specified, obtain the IP address from your network administrator. IP addresses must be unique.

   d. If necessary, enter the subnet mask value and default gateway, both of which, you obtain from your network administrator.

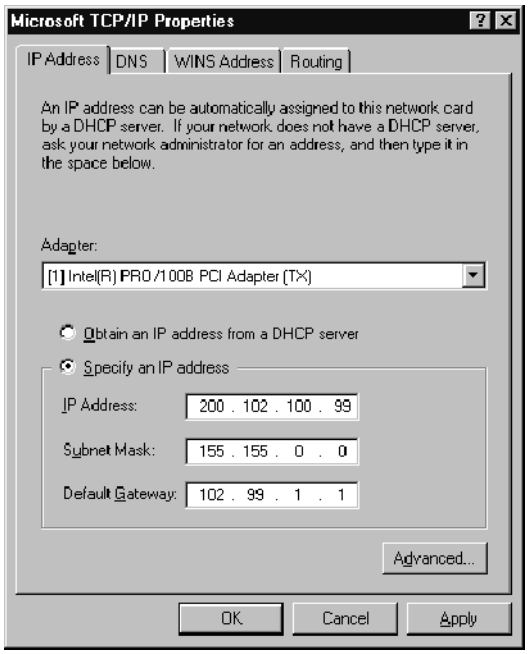


Figure 2-13: IP tab parameters

Incorrect values for any one of these parameters can make your MTS300 system behave unpredictably over a network. Refer to *IP Parameters* beginning on page 6-15 for more information about these values.

6. Click Apply, and then click the DNS tab.

Set DNS tab parameters.

7. Set the following DNS values as indicated in Figure 2–14:

***NOTE**. Do not set DNS parameters unless your network uses the DNS service. Setting these parameters when your network does not use this service will make your host machine run very slowly when trying to resolve network addresses.*

a. Enter your host machine name provided by your network administrator into the Host name text box. Host/domain name pairs must be unique.

b. Enter the name of the domain of which your MTS300 system is a member in the Domain text box as directed by your network administrator.

c. Click **Add** in the DNS Service Search Order group, and then enter the IP address of the Domain Name System server in the TCP/IP DNS Server dialog box.

d. Click **Add** to accept your changes and dismiss the TCP/IP DNS Server dialog box.

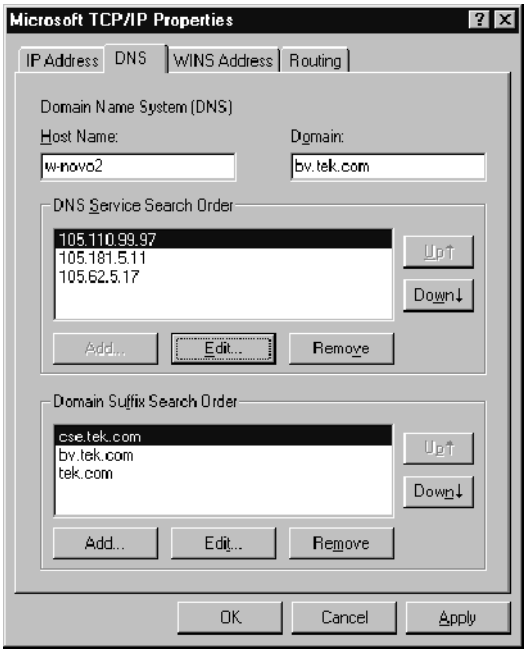


Figure 2- 14: DNS tab parameters

It should not be necessary to configure the parameters on the WINS Address or the Routing tabs.

8. Click **OK** when you are finished configuring the IP Address and DNS tab parameters and are certain that all of the values correct.

9. Restart your MTS300 system or network management station for the TCP/IP changes to take effect.

SNMP Network Management

SNMP is a communication protocol built on the top of UDP/IP. It implements a set of commands consisting of operations and variables. Equipment or applications (such as the MTS300 test system MTS300 system) that support SNMP present a set of variables that you can modify or consult as well as a set of notifications. All of these parameters are grouped into a Management Information Base (MIB).

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

Accessing the MIB files. The Tektronix MIB is a textual description of the Analysis Server objects (functions and parameters) that can be monitored and controlled via SNMP. The MIB text files are installed at the following location:

```
C:\Mib\
```

The MIB files are used by the real-time analysis applications and the Stream Player, Stream Recorder, and OpenMux (MTS300, Option OM only) applications.

The MIB file pairs for each application, for example, the RTAv1.mib and RTAv2.mib files, are used for SNMPv1 and SNMPv2 systems respectively.

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

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

For instance, from a DOS prompt window you can run the following command to check that the Analysis Server is running on the first input:

```
getone -v2c <machineName> rta0 rtaStartStop.0
```

Where `<machineName>` is the network name of the test system for which you are trying to determine the Analysis Server status.

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

For instance, from a DOS prompt window you can run the following command (all on one line) to stop analysis on the first input of a named MTS300 system:

```
setany -v2c <machineName> rta0 rtaStartStop.0
 -i stop
```

Where `<machineName>` is the network name of the MTS300 system for which you are trying to start the Analysis Server.

To restart the Analysis Server, use the same syntax, but change the `-i` switch parameter to `start`.

```
setany -v2c <machineName> rta0 rtaStartStop.0
 -i start
```

Event Reporting. The SNMP event reporting operation is called TRAP. It specifies an event and a list of pairs. A *pair* consists of the identity of a variable and its value or values. This operation reports the occurrence of events on a managed system to a list of managers configured to receive events.

Operating Information

This subsection provides basic operating information so that you can perform service on the instrument. The following information is provided:

- *Starting the MTS300 System* page 2–20
- *Shutting Down the MTS300 System* page 2–25
- *Application Overviews* page 2–28
- *Front Panel Controls* page 2–39
- *Tutorial* page 2–43

Refer to *Installation* starting on page 2–1 for information about the external connectors and I/O ports on the MTS300 system.

Refer to *Supplying Power* on page 2–4 for instructions on how to power on the MTS300 system.

Starting the MTS300 System

Perform the following procedure to power on the MTS300 system:

1. Connect the power cord to the rear-panel power connector.
2. Press the **On/Stby** switch to power on the instrument. Figure 2–15 shows the switch location.

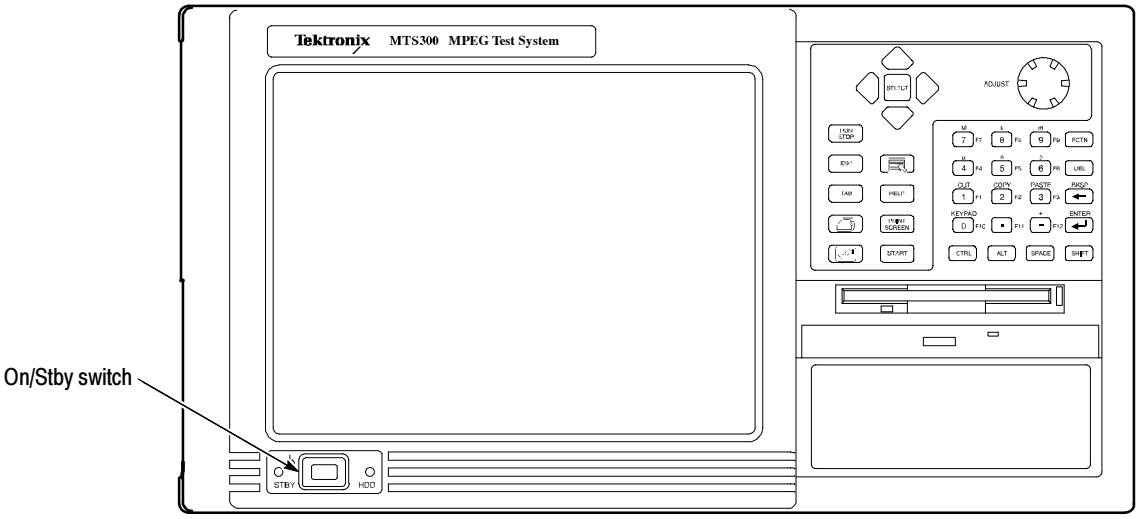


Figure 2- 15: On/Stby switch

3. The Windows NT initialization process takes up to two minutes. Under normal circumstances, no action is required until the Begin Logon message appears.
4. When the Begin Logon message appears, simultaneously press the **CTRL + ALT + Delete** keys to open the Logon Information dialog box.
5. Perform the procedure in *Logging On* starting on page 2–21.

Logging On

The MTS300 system provides three user name/password combinations you can use to logon to the instrument. Table 2–4 lists the default user name and passwords supplied with the MTS300 system.

Table 2-4: Default user names and passwords

User name	Password	Description
MTS300	No password	Intended for the standard user and for normal instrument operation. Users logging on as "MTS300" have full access to files and applications.
Guest	No password	Intended for users with limited system knowledge. Users logging on as "Guest" have limited access to files and applications.
Administrator	MPEG2	Intended for the master user responsible for software upgrades or installations. Users logging on as "Administrator" have full administrative rights to all system files and applications. You must use this user name and password to perform any software upgrades or reinstallations.

CAUTION. *To prevent potential network conflicts, it is strongly recommended that you do not use the Administrator user name and password for normal instrument operation. The administrator user logon includes all administrative privileges and may allow administrative access within the network.*

To log on to the test system the first time, use these steps:

1. Enter **MTS300** in the User name box.
2. Leave the Password box blank, and press **ENTER** (these are the default values set at the factory). Use this user name for most of your work.

Changing the Passwords. After you logon to the MTS300 system using a user name and password combination, you can change the password for that user name. Refer to the Windows NT online help for instructions.

Refer to *Setting, Resetting, and Disabling Auto Logon* on page 2–22 if you want to enable automatic logon to Windows NT when you power-on the instrument.

Setting, Resetting, and Disabling Auto Logon

The Auto Logon option allows you to select a user name and password that the MTS300 system will use to automatically log on to Windows NT when you power-on the instrument. This section contains two procedures. The first procedure initializes the Auto Logon option and changes an existing Auto Logon user name and password. The second procedure disables the Auto Logon option (requiring the entry of a user name and password each time the instrument is powered on).

Setting and Resetting Auto Logon. Perform the following procedure to set or reset the automatic logon option:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Run** from the Windows NT Start menu, and then click **Browse** in the Run dialog box.
3. The Auto Logon utility is located in two directory locations:
   - **D:\Tools\Autologn.exe** of the *MTS300 MPEG Test System Operating System Recovery* CD
   - **C:\Mts300\Bin\AutoLogon.exe** on the MTS300 system
4. In the Browse dialog box, specify one of the directory paths shown above, and then click **Open**.
5. Click **OK** in the Run dialog box to run the selected Auto Logon utility. The Auto Logon dialog box will open.

CAUTION. *If the MTS300 system is already setup to Auto Logon, entering a new user name and password will overwrite the existing user name and password used by the MTS300 system to Auto Logon.*

To prevent potential network conflicts, it is strongly recommended that you do not use the Administrator user name and password for Auto Logon.

6. Use the Auto Logon dialog box to enter the user name and password that the MTS300 system will use to automatically logon to Windows NT when the instrument boots.
7. Click **OK** to apply the Auto Logon setting. The next time the MTS300 system boots, the new Auto Logon settings will be used.

Disabling Auto Logon. Perform the following procedure to disable Auto Logon (requiring the entry of a user name and password each time the instrument is powered on):

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Run** from the Windows NT Start menu.
3. Enter **regedt32** in the Run dialog box, and then click **Open**. This opens the Registry Editor window.
4. In the Registry Editor window, select the **HKEY_LOCAL_MACHINE on Local Machine** panel.
5. In the HKEY_LOCAL_MACHINE on Local Machine panel, select **Winlogon** in the following directory path:

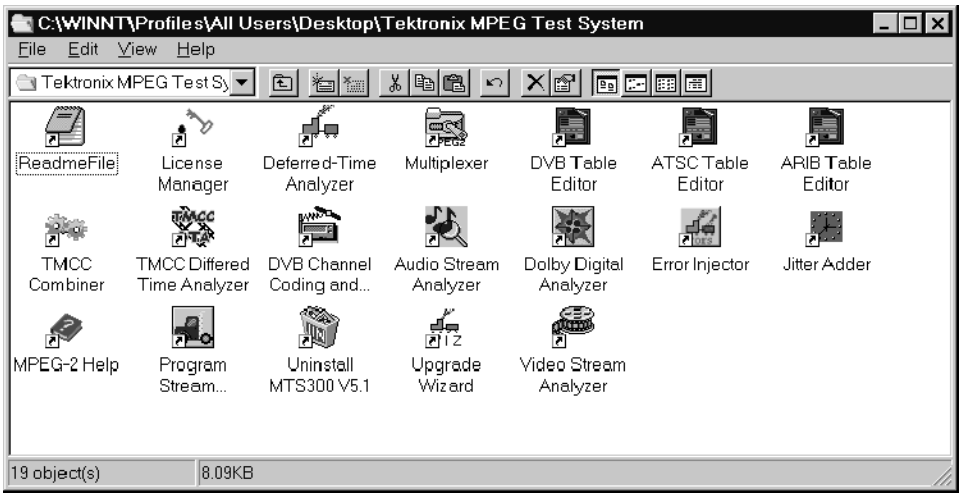
   HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion
6. After you select Winlogon, the right pane of the HKEY_LOCAL_MACHINE on Local Machine panel displays the contents of the file. Highlight the line in the right pane that starts **DefaultUserName:**, and then select **Edit | Delete** from the menu.
7. Click **Yes** in the Warning message box.
8. Highlight the line in the right pane that starts **DefaultPassword:**, and then select **Edit | Delete** from the menu.
9. Click **Yes** in the Warning message box.
10. Select **Registry | Exit** from the menu to close the Registry Editor window.
11. The next time the MTS300 system boots, Auto Logon will be disabled and the user will be asked for user name and password to logon to Windows NT.

CAUTION. *To prevent the loss of data, if you change the default user names and passwords, secure the new names in a safe place. If you forget your user-defined user names and passwords and cannot logon to the MTS300 system, you will have to reinstall the operating system software which will result in the loss of all data on the hard drives of the MTS300 system.*

Starting MTS300 System Applications

After you have logged on, the Tektronix MPEG Test System program group window appears as shown below. Double-click the appropriate application icon to launch the desired application.

***NOTE**. The example below shows an MTS300 system program group with most of the available options installed. Depending on which options you ordered with your MTS300 system, your program group may not contain all of the application icons shown below.*



***NOTE**. You must open the Master Client application to access the Expert Client, Configuration Client, Stream Recorder, and Stream Player applications.*

Refer to *Tutorial* beginning on page 2–43 for procedures on connecting to a Server Manager and configuring a workspace.

Shutting Down the MTS300 System

This section contains information about how to exit MTS300 system applications and how to shutdown the MTS300 system.

Exiting MTS300 System Applications

To exit an program monitor application, select **Exit/Quit** from the File menu or click the close button in the upper-right corner of the application window.

Shutting Down the MTS300 System

There are three methods to shut down the MTS300 system: soft power down, standard Windows NT power down, and hard power down. For the standard and hard power-down methods, it is strongly recommended that you exit all MTS300 applications prior to initiating an instrument power down.

Soft Power Down. The MTS300 system is shipped from the factory with a soft power-down capability enabled. The soft power-down capability allows you to directly exit Windows NT without closing the MTS300 applications first. The MTS300 system will automatically close all open applications and put the instrument into standby mode.

To soft power-down the MTS300 system, perform the following steps:

1. Press and release the **On/Stby** switch to initiate the soft power-down process. Some applications will prompt you to save unsaved data before exiting.
2. After the MTS300 system goes into standby mode, you can restart the instrument by pressing the On/Stby switch.
3. To completely remove power to the instrument, disconnect the power cord at the rear panel.

***NOTE**. If the soft power-down feature does not work properly, you can restore the Soft Power-Off Driver by performing the procedure located in the* MTS300 MPEG Test System Hardware and Software Installation Technical Reference *manual (Tektronix part number 071-0667-XX) supplied with the MTS300 system.*

Standard Windows NT Power Down. To power down the MTS300 system during normal instrument operations, perform the following standard Windows NT power down procedure:

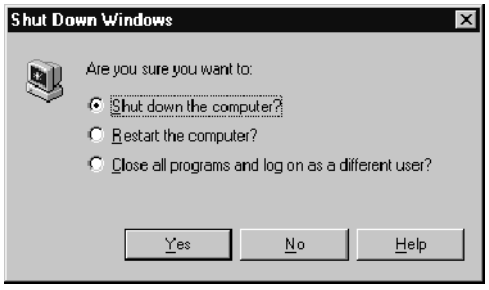
1. Exit all open MTS300 applications.

CAUTION. *To prevent data loss, exit all open MTS300 applications before powering down the instrument. Some applications will prompt you to save unsaved data before exiting.*

2. After the MTS300 applications are closed, shut down Windows NT by selecting **Shut Down** from the Windows NT Start menu as shown below.

CAUTION. *To prevent data loss and possible system problems during subsequent Windows NT initializations, always exit Windows NT before you power down the MTS300 system. Wait until the message "It is now safe to turn off your computer" appears before you press the On/Stby switch.*

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



4. After the Shutdown Computer window appears with the message "It is now safe to turn off your computer," press the **On/Stby** switch to put the MTS300 system into standby mode.

5. After the MTS300 system goes into standby mode, you can restart the instrument by pressing the On/Stby switch.

6. To completely remove power to the instrument, disconnect the power cord at the rear panel.

Hard Power Down. You can use the hard power-down capability to immediately power-down the MTS300 system in an emergency situation such as fire.

CAUTION. *To prevent data loss and the corruption or deletion of application and system files, do not perform this procedure. Use the following procedure only if all other attempts to shut down the MTS300 system have failed.*

Using this hard power down procedure will likely cause file problems. When you use this method to power down the MTS300 system, the next time the instrument is powered on, the operating system will use the Scan Disk utility to perform a check for missing or corrupt files. You may be prompted to reinstall the operating system or application software.

To hard power-down the MTS300 system, perform the following steps:

1. Press and hold the **On/Stby** button for about 3 or 4 seconds.
2. After the MTS300 system goes into standby mode, you can restart the instrument by pressing the On/Stby switch. Read the power-on messages for information about possible missing or corrupted files.
3. To completely remove power to the instrument, disconnect the power cord at the rear panel.

Application Overviews

***NOTE**. If you are not familiar with the Windows NT 4.0 operating system, review the Windows NT online help.*

This section provides a functional overview of the MTS300 MPEG Test System client modules.

Application Overviews describes the following MTS300 applications:

- The *Master Client* application monitors transport stream inputs at various levels of detail. page 2–29
- The *Expert Client* application analyzes in detail the characteristics of a transport stream input and the errors occurring on that input. page 2–30
- The *Configuration Client* application sets analysis probes on transport stream inputs. page 2–32
- The *Stream Player Client* application outputs a transport stream using the MTS300 rear-panel outputs. page 2–33
- The *Stream Recorder Client* application captures part of a transport stream to the SCSI drives. page 2–34
- The *TMCC Expert Client* application analyzes in detail the characteristics of a TMCC transport stream input and the errors occurring on that input. page 2–36
- The *TMCC Configuration Client* application sets analysis probes on TMCC transport stream inputs. page 2–38
- *Front Panel* describes the front-panel controls. page 2–39

Online Help

Each of the MTS300 system applications allow you to access detailed information about the application using online help. You can access the online help using the following methods:

- For the Master Client, Expert Client, and Configuration Client, select the appropriate command from the Help menu
- For the Stream Player Client and the Stream Recorder Client, right-click in the Title bar and select Help Topics from the menu
- For the TMCC Expert Client and the TMCC Configuration Client, click on the Help icon

Master Client

The Master client views and elements enable you to monitor the results of the analyses being performed by Analysis Servers one or two transport stream inputs. See Figure 2–16.

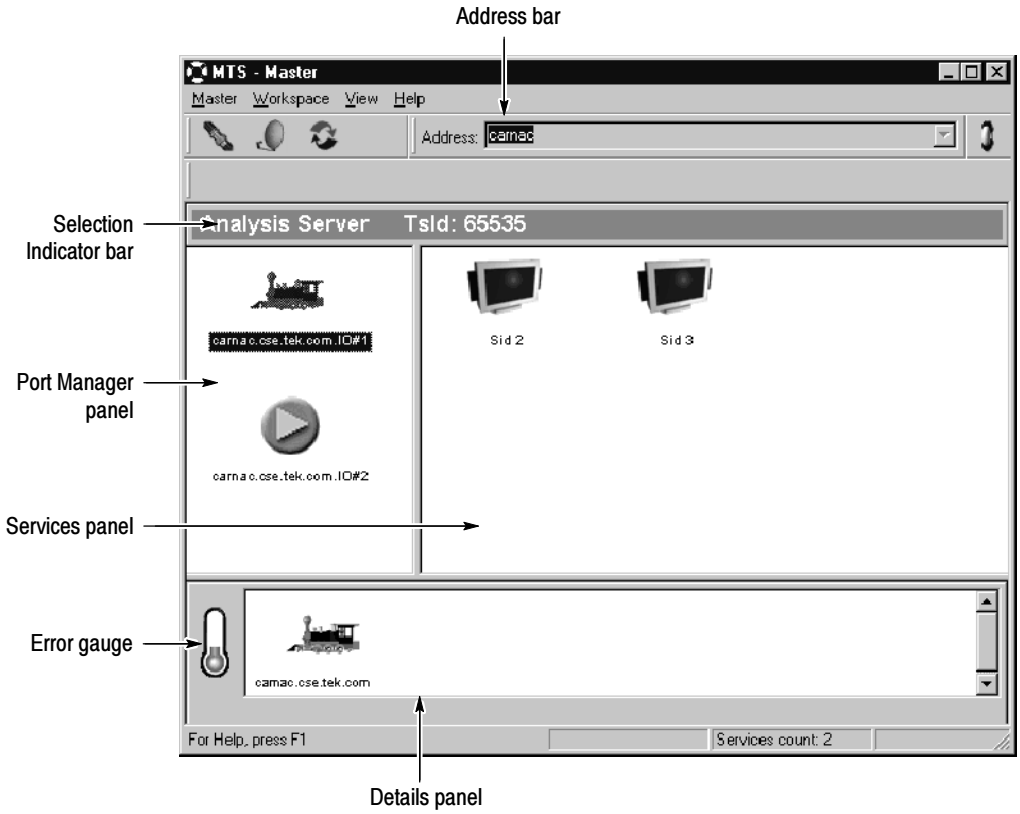


Figure 2-16: The Master client application window

Note the following characteristics of the Master client window in Figure 2–16:

- The Port Manager panel shows the inputs configured for the test system to which you are connected. In Figure 2–16, an Analysis Server is on I/O#1 is monitoring a transport stream being generated by the Stream Player on I/O#2.
- The Address bar shows that the Master client is connected to the Server Manager running on `carnac`.
- The Selection Indicator bar shows the currently selected items in the Port Manager and Services panels.
- The Services panel shows the services encoded on the input selected in the Multiplex panel.

- The Details panel shows the status, types, and severity of errors occurring on the currently selected service or multiplex.
- The Error gauge displays the severity of the most recent error for the service (or multiplex) displayed in the Details panel.

See the tutorial later in this section for an introduction to using the Master client.

Expert Client

The Expert client views and elements show the detailed results of analyses being performed on one transport stream input. See Figure 2–17.

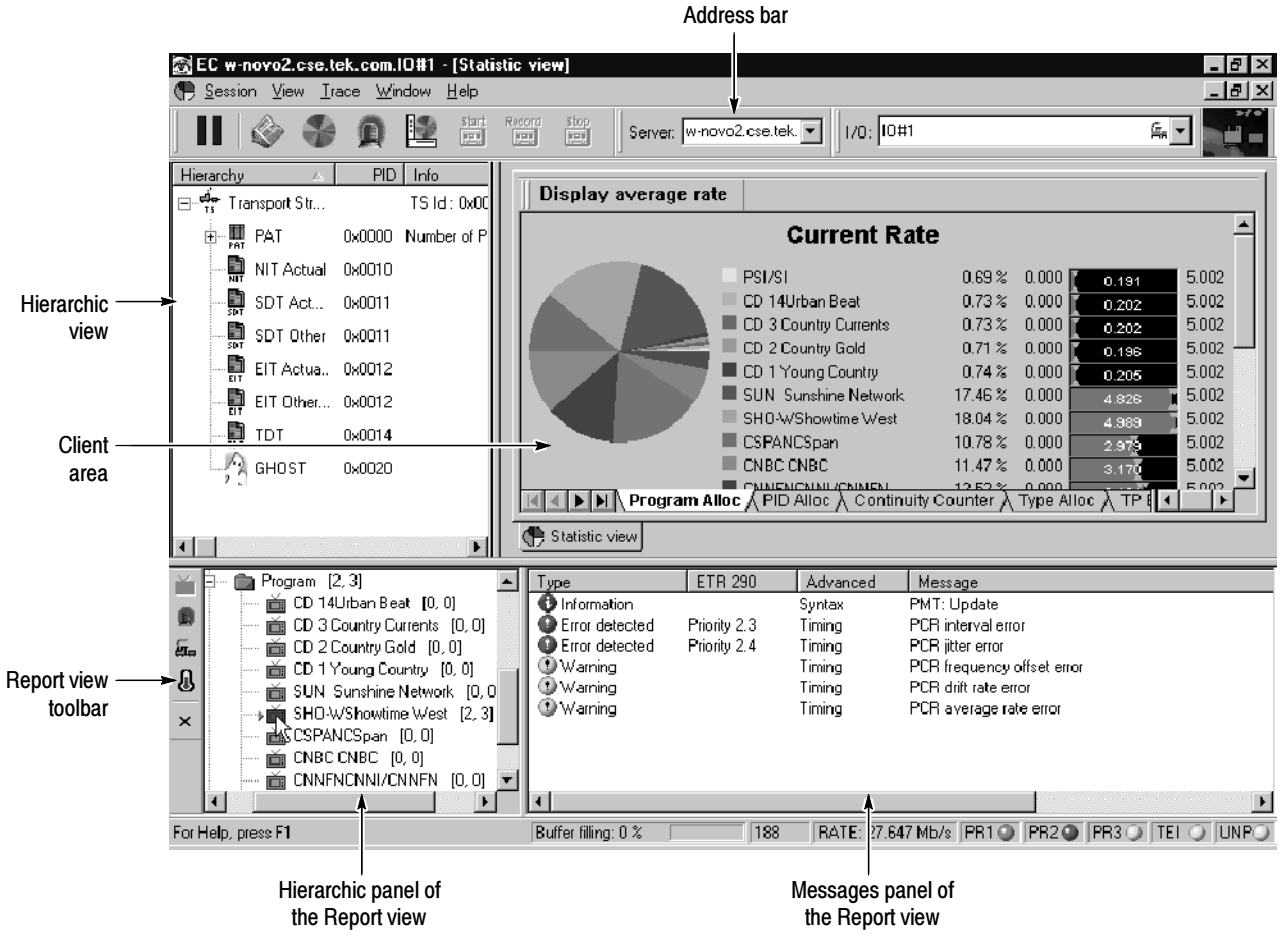


Figure 2-17: The Expert client application window

Note the following characteristics of the Expert Client window in Figure 2–17:

- The Hierarchic view shows the structure of the transport stream you are monitoring. The hierarchy shown is based on the transport stream elements. For instance, since the Program Map Table (PMT), and the program elements the PMT references, are referenced by the Program Allocation Table (PAT), the PMT icons are shown subordinate to the PAT icon.
- The Address bar shows that the Expert client is connected to the Analysis Server analyzing the transport stream being input through I/O#1 on novo2.
- The Client area is displays the Program Allocation panel, which is one of the panel in the Statistics view. The Statistics view panels display statistical information about the input stream to which the Expert client is connected. Other views can also be displayed in the Client area. These views are accessed using shortcut menus displayed when you right-click an icon in the Hierarchic view.
- The Messages panel of the Report view shows the errors occurring on the input selected in the Hierarchic panel of the Report view. You can display more detail about a specific error by double-clicking the line on which the error is reported.
- The Hierarchic panel of the Report view allows you to select different ways, or modes, of displaying errors or statistics about the transport stream being analyzed. The mode of the Report view is determined using the toolbar to the left. The current mode is Program and `FUN TV` is selected.
- The Report view toolbar allows you to change the mode of the Report view. Using this toolbar you can display errors grouped in one of four logical modes: by program, ETR290 priority, error type, or error severity.

Configuration Client

The Configuration client views and elements allow you to quickly and easily set, modify, and remove probes for analyzing and monitoring transport stream inputs. See Figure 2–18.

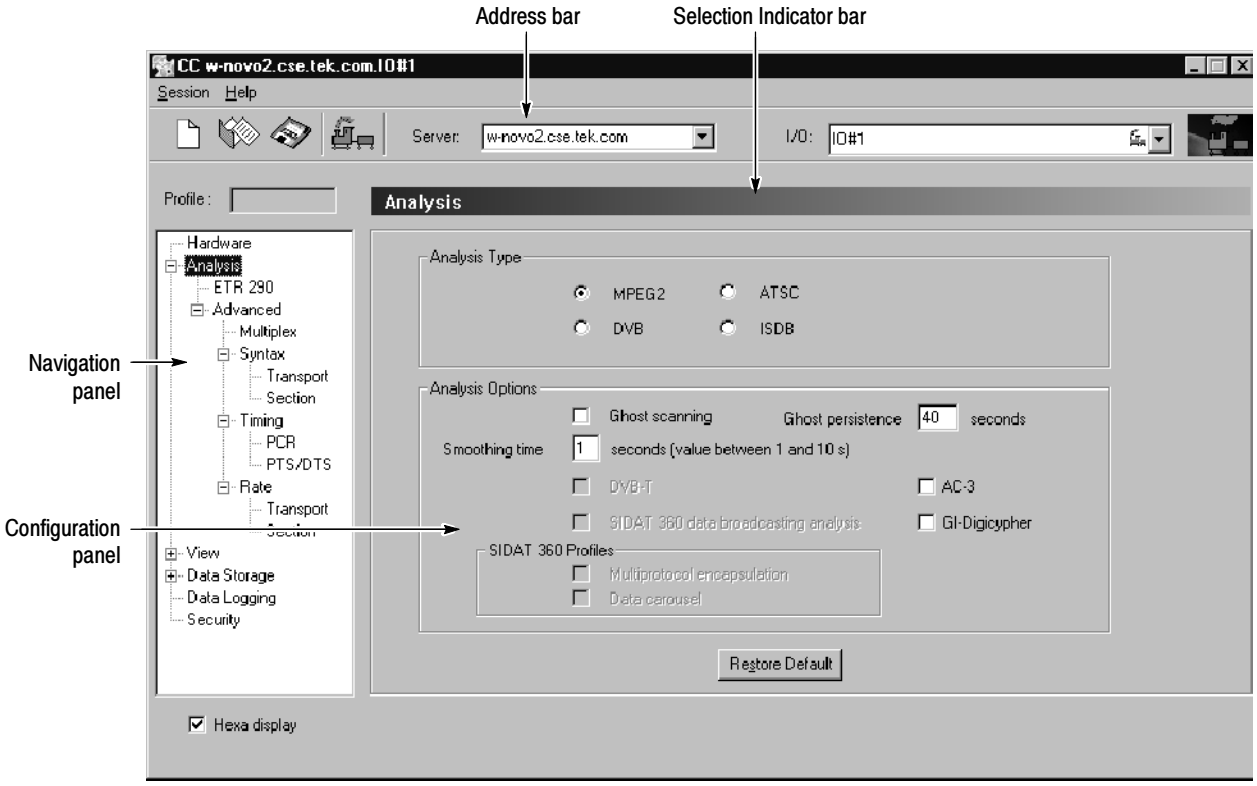


Figure 2-18: The Configuration client application window

Note the following characteristics of the Configuration client window in Figure 2–18:

- The Navigation panel allows you to quickly choose the category of error for which you want the Analysis Server to probe.
- The Address bar shows that the Configuration client is connected to the Analysis Server that is analyzing the transport stream being input through I/O#2 on oxford6.
- The Selection Indicator bar shows the item currently selected in the Navigation panel.
- The Configuration panel allows you to specify probes or configure analyses for the Analysis Server indicated in the address bar. This panel changes depending on the item selected in the Navigation panel.

Stream Player Client

The Stream Player application allows you to play back transport streams saved on the hard disk of the MTS300 system using a VTR-like interface. See Figure 2–19. You can specify which portion of the transport stream to play back, the rate of the transport stream (you can also apply an external clock to set the rate), the format (ASI or M2S) of the transport stream, and the playback mode (single play or loop play).

Figure 2-19: The Stream Player client application window

Note the following characteristics of the Stream Player client window in Figure 2–19:

- The Server address boxes contain the name or IP address of the server and the I/O port number to which the Stream Player is connected. You can use the text boxes to connect to a different MTS300 system or to a different I/O port number.
- The Filename indicates the name and location of the transport stream file currently being output.
- The Start Time and End Time are editable fields that you can use to limit the part of the transport stream file that you will output. The default is to output the complete file.
- The Duration indicates how long the specified section will play.

- The Rate, Packet Size, and the Format and Mode are extracted from the transport stream file. If you change the Start or End time, you can edit the Rate field.

  When you select the External Clock option, the Rate box displays EXT CLK. To reset the rate, browse to the transport stream file and reselect it.

- The Slide Bar and Selector Buttons allow you to control which portion of the file will be played back.

- Playback Time. When a stream output is in progress, the Stream Player displays the current position in time (hours, minutes, seconds, and hundredths of a second) of the output in progress.

- Control Buttons. The three Control buttons (from left to right: Stop, Play, and Loop Play) allow you to control the stream output. Click on a Control button to perform the desired task.

Stream Recorder Client

The Stream Recorder application provides a VTR-like display that allows you to control the recording of a transport stream input. The display includes the following items:

The Stream Recorder application allows you to record an MPEG transport stream onto the hard drive of the MTS300 system using a VTR-like interface. You can specify the stream format, duration, file name, and location of the recorded file. See Figure 2–20.

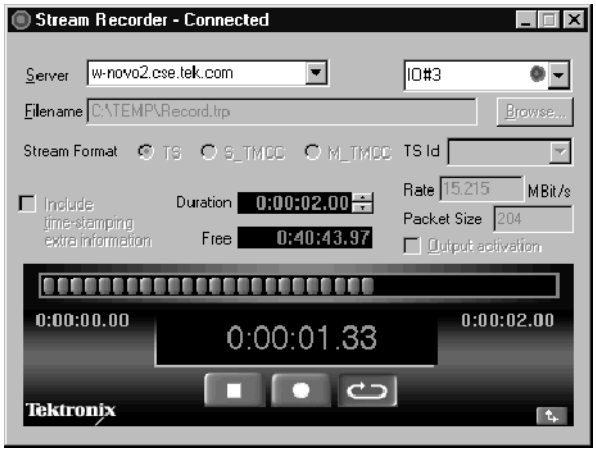


Figure 2-20: Stream Recorder client application window

Note the following characteristics of the Stream Recorder client window:

- Server Address. If you launch the Stream Recorder from the Master Client, the Server address boxes contain the name or IP address of the server and the I/O port number to which the Stream Recorder is connected. You can use the text boxes to connect to a different MTS300 system or to a different I/O port number.

***NOTE**. Store transport stream files on the E: drive of the MTS300 system. The response time of the MTS300 system C: drive is limited and may affect the performance of the Stream Recorder and Stream Player when you try to capture or playback streams with bitrates greater than 30 Mbps.*

- Filename. The Filename box list the directory path and filename of the file you will capture with the Stream Recorder.
- Stream Format. Select the format you will record the input in:
  - Select TS to record MPEG-2, DVB, or ATSC transport streams.
  - Select S_TMCC for single transport stream TMCC multiplexes.
  - Select M_TMCC for multiple transport stream TMCC multiplexes.

    When M_TMCC is selected, you can choose to acquire the whole stream by selecting All in the list box to the right, or you can select only an MPEG-2 stream of the multiplex. To record only a portion of the multiple stream format, select the appropriate TS ID from the TS ID list box.
- Duration and Free. Use the Duration box to set the size of the transport stream file you are capturing. You can set the duration time (hours, minutes, seconds, and hundredths of a second) to any value not exceeding the value listed in the Free box.

  The Free box displays the amount of memory available (hours, minutes, seconds, and hundredths of a second) to record a transport stream file on the hard drive you selected in the Filename box.
- Rate and Packet Size. The bitstream rate and the packet size of the input transport stream are displayed in these boxes.
- Output Activation. When you select the Output Activation option, the transport stream on the I/O port input to which the Stream Recorder is connected is looped through to the output connector of that I/O port.

- Progress Bar. The Progress bar displays the progress of an active recording process. The display elements in the Progress bar light up from left to right to indicate how far the capture process of the Stream Recorder has proceeded.
- Recording Time. When a stream capture is in progress, the Stream Recorder displays the beginning time (0:00:00.00), the ending time (as set in the Duration box), and the current duration of the recording in progress.
- Control Buttons. The three Control buttons (from left to right: Stop, Record, and Loop Record) allow you to control the stream capture. Click a Control button to perform the desired task.
- Minimize/Maximize Button. Click the Minimize/Maximize button to remove or add the setup portion of the Stream Recorder display. When you minimize the Stream Recorder setup display, the Stream Recorder appears as shown below.

TMCC Expert Client

The TMCC (Transmission and Multiplexing Configuration Control) Expert Client application allows you analyze the TMCC data of an ARIB-compliant transport stream input real time. See Figure 2–21. You can also analyze an ARIB-compliant transport stream file stored on your local disk.

Note the following characteristics of the TMCC Expert Client window:

- Address Bar. The Address bar shows that the TMCC Expert client is connected to the Analysis Server analyzing the transport stream being input through I/O#2A on oxford6.
- Slots View. The Slots view displays the properties of each slot using three columns. The first column lists the slot numbers (1 through 48). The second column shows the TSID (transport stream identifier) associated with each slot. The third column lists the modulation mode for each slot and the number of effective slots. Each modulation mode is represented by a different color.

NOTE. *When the modulation mode and the number of slots are not consistent, the Modulation column information is displayed in red.*

- Syntax View. The Syntax view displays the content of the TMCC data in a hierarchic list, including the length, value, and description of the hierarchic item. Each hierarchic item is represented by a colored icon. A green icon indicates the field value is correct or that all fields of a group are correct. A red icon indicates an error exists in the field value of the item or in one of the subitems of a group.

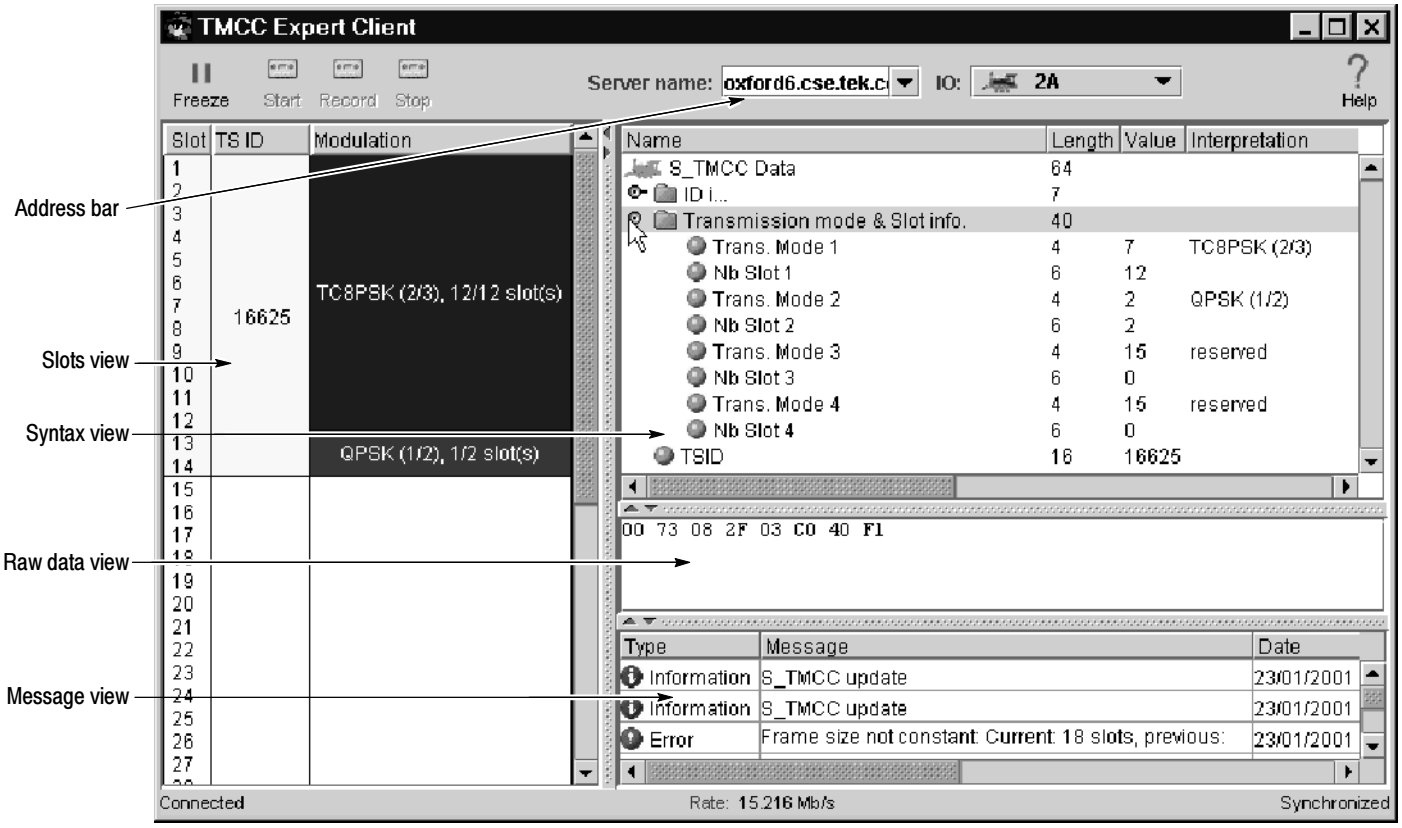


Figure 2-21: TMCC Expert Client display

Raw Data View

The Raw Data view displays the hexadecimal values of the TMCC data. You can use standard Windows NT methods for selecting and copying the data to a text file.

Message View

The Message view displays error, warning, and information messages for the TMCC analysis in progress. The messages include the message type (error, warning, and information), the message content, and the time of the message. The maximum number of displayed messages is 1000. Additional messages are handled on a first in first out basis.

You can right-click in the Message view to open a dialog box where you can sort and clear messages, and set the number of lines allowed for each message. You can set the Message view for 1, 2, or 3 lines per message.

***NOTE**. Some messages are too long to display within three lines; in this case, double-click the message to display a window containing the complete message.*

TMCC Configuration Client

The TMCC (Transmission and Multiplexing Configuration Control) Configuration Client is used to configure the analyses performed by the TMCC Analysis Server. See Figure 2–22. The results of the analyses are displayed in the TMCC Expert Client and the Master Client.

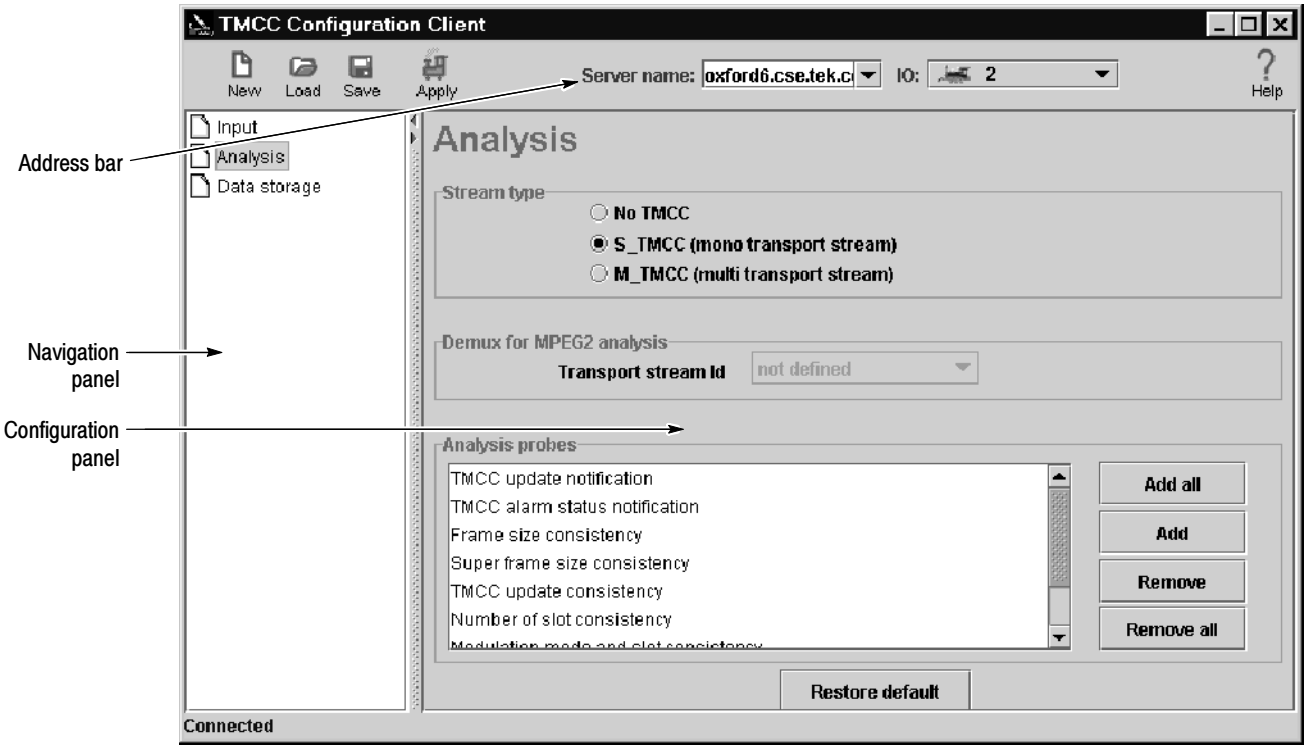


Figure 2-22: TMCC Configuration Client display

Note the following characteristics of the TMCC Configuration client window:

- The Address bar shows that the TMCC Configuration client is connected to the Analysis Server that is analyzing the transport stream being input through I/O#2 on oxford6.
- The Navigation panel allows you to quickly choose the category of error for which you want the Analysis Server to probe.
- The Configuration panel allows you to specify probes or configure analyses for the Analysis Server indicated in the address bar. This panel changes depending on the item selected in the Navigation panel.

Front Panel Controls

The MTS300 MPEG Test System front-panel controls allow you to control the MTS300 applications using either the keypad or the touch screen when a keyboard and mouse are not available. See Figure 2–23.

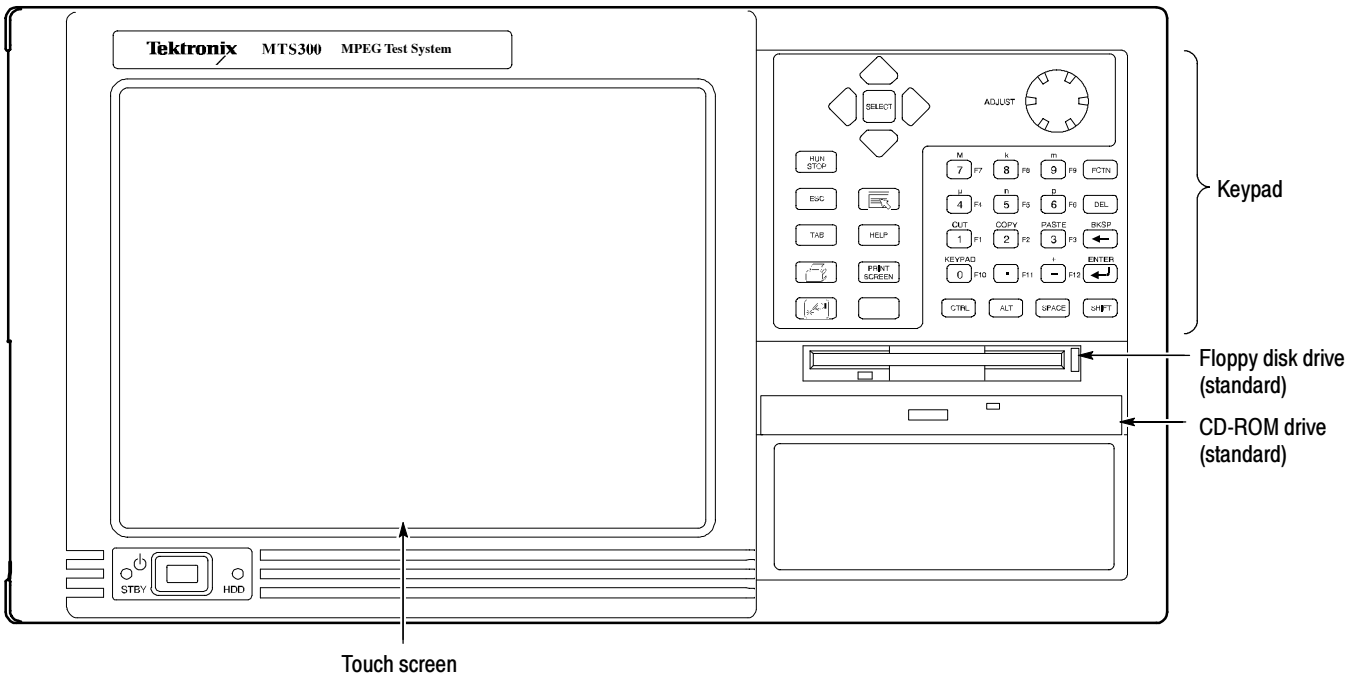


Figure 2-23: Front-panel elements

This section shows how to use the touch screen features. Table 2–5 describes the keypad controls, Table 2–6 lists touch screen techniques for working with the Master client. Use similar techniques for the other client applications.

CAUTION. *Do not use sharp or abrasive objects to perform operations using the touch screen. Using sharp or abrasive objects can damage the LCD display.*

Included as a standard accessory with all test systems is a stylus that gives you more precise control over the items you touch on the touch screen.

Table 2-5: Front panel-key controls

Control name	Mechanism	Description
Up Arrow	Button	Use to navigate and change focus from one window function to another.
Left Arrow	Button	
Right Arrow	Button	
Down Arrow	Button	
Select	Button	Same as the space key.
Adjust Knob	Knob (Rotary encoder)	Not enabled.
Run/Stop	Button	Not enabled.
Esc	Button	Standard Escape key.
Tab	Button	Standard Tab key.
Print	Button	Prints the current display.
Touch	Button (w/hand icon)	Toggle function not enabled. The touch screen is always on.
Menu (Application key)	Button (w/pointer icon)	Displays shortcut menus for selected items.
Help	Button	Opens the Help contents. Standard F1 key.
Print Screen	Button (w/printer icon)	Copies the screen to the clipboard. Alt plus Print Screen copies the active window.
START Key	Button (w/Windows logo)	Opens the Windows Start menu.
Numbers 0 to 9, . (period), and - (minus)	Buttons	Standard number keys, most have second (Shift) and third (Function) functions.
Fctn	Button with LED	Modifier for numeral keys to create keys F1 through F12. LED indicates when active.
Del	Button	Deletes selected text or object.
←	Button	Backspace key.
↵	Button	Enter key.
Ctrl	Button with LED	Control key. LED indicates when keypad is in control mode.
Alt	Button with LED	Alternate key. LED indicates when keypad is in alternate mode.
Space	Button	Use it like a keyboard space bar or use it as mouse button 1.
Shift	Button with LED	Shift key. LED indicates when keypad is in shift mode. Locked mode key feature.

***NOTE**. Some of the functions of the Expert and Configuration clients require the use of an external keyboard and mouse.*

Table 2- 6: Touch screen techniques

Task	Action
Highlighting an item	Touch the item.
Selecting an item	
Making a menu selection	Touch the menu name, and then touch the menu item.
Moving a window	Touch and drag the title bar of the window without lifting the stylus from the touch screen.
Displaying shortcut menus	Touch an icon that has a shortcut menu associated with it (for instance, a multiplex or service icon) and press the Menu button from the keypad.
Checking or clearing option boxes	Touch the option name or check box.
Entering values in text boxes	Touch the text box until a cursor appears in the text box, and then enter values using the keypad. (Only numeric values and the letters *M*, *k*, *m*, *u*, *n*, and *p* can be entered from the keypad.)
Scrolling through a list	Touch the scrolling list until a cursor appears in the list, and then press the Down Arrow button from the keypad.
Scrolling a window	Touch and drag a scroll bar without lifting the stylus from the touch screen.
Resizing windows	Touch and drag the lower right corner of the window to the desired size without lifting the stylus from the touch screen.
Following links in the online help	Touch the link text.
Expanding or collapsing a hierarchy	Double-tap the touch screen item at the point you want to expand or collapse a hierarchical display, or touch the Expand/Collapse control next to the item name.
Copying text or other values	Touch and drag over the area you want to copy, and then press the Shift button followed by the Copy button on the keypad.
Pasting text or other values	Touch the area into which you want to paste the contents of the clipboard, and then press the Shift button followed by the Paste button on the keypad.

Tutorial

This tutorial will introduce you to the capabilities and features of the MTS300 system client modules. Refer to the *Reference* section for detailed operating information for each client module.

Perform this tutorial with your own input stream, and then spend some time experimenting with the various monitoring, configuration, and analysis options. The sections of the tutorial begin on the following pages:

- *Preliminary Setup* page 2–43
- *Starting and Configuring the Master Client* page 2–44
- *Assigning Servers and Generating a Transport Stream* page 2–47
- *Monitoring a Transport Stream Input* page 2–48
- *Configuring the Analysis Server* page 2–51
- *Configuring the Data Logging Function* page 2–54
- *Analyzing a Transport Stream* page 2–55
- *Recording a Transport Stream Input* page 2–58

***NOTE**. If you are not familiar with the Windows NT 4.0 operating system, review the Windows NT online help.*

Preliminary Setup

1. Connect the output of I/O port 2 to the input of I/O port 1 using a 75 Ω BNC cable as shown in Figure 2–24.
2. Power up and log on to the MTS300 system as described in *Starting the MTS300 System* on page 2–20.

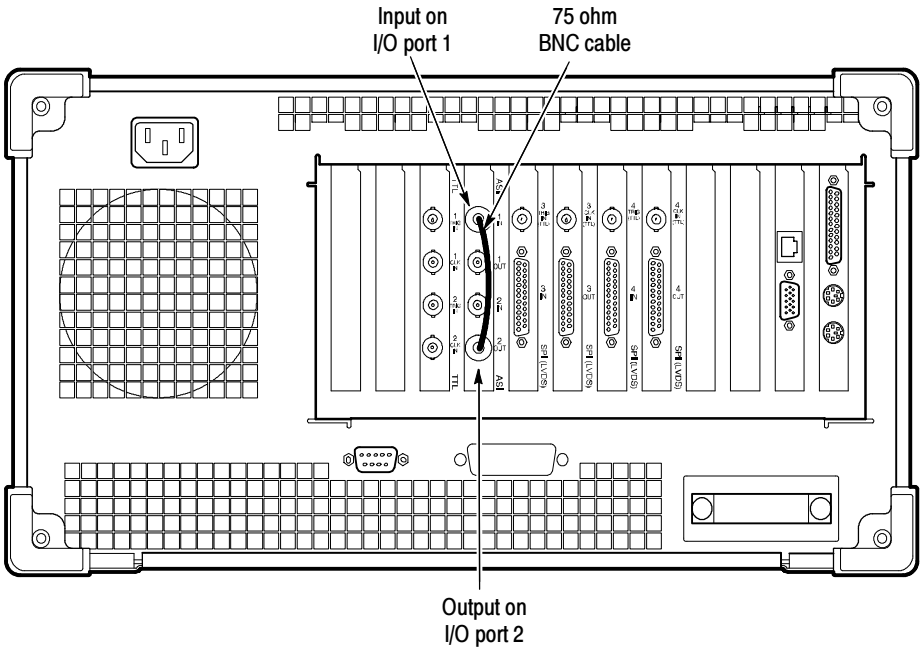


Figure 2-24: Initial setup for the tutorial

Starting and Configuring the Master Client

Use the following procedure to start and configure the Master Client:

1. From the Windows NT start menu, select **Programs | Tektronix MPEG Test System | Master Client**. An empty Master Client window is displayed as shown in Figure 2–25.

   You can also start the Master Client by double-clicking the Master Client icon in the Tektronix MPEG Test System program group.

Before you can start monitoring inputs, you must connect the Master Client to a Server Manager. The Server Manager (represented by the life preserver icon in the system tray) collects the information generated by the Analysis Servers about the transport stream errors and statistics. There are several methods you can use to connect to a local Server Manager, but for this tutorial, use the simplest technique:

2. Click the **Home** button on the Master Client toolbar as shown in Figure 2–25. The toolbar changes and the Server Manager to which you are connected is displayed in the Address bar (see Figure 2–26).

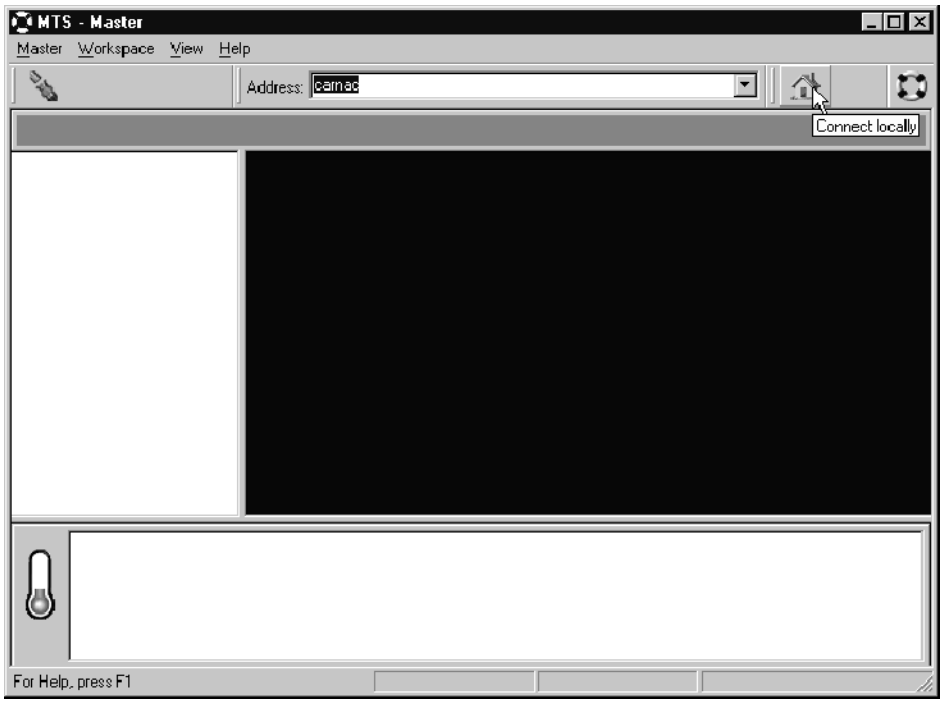


Figure 2-25: Initial Master Client application window

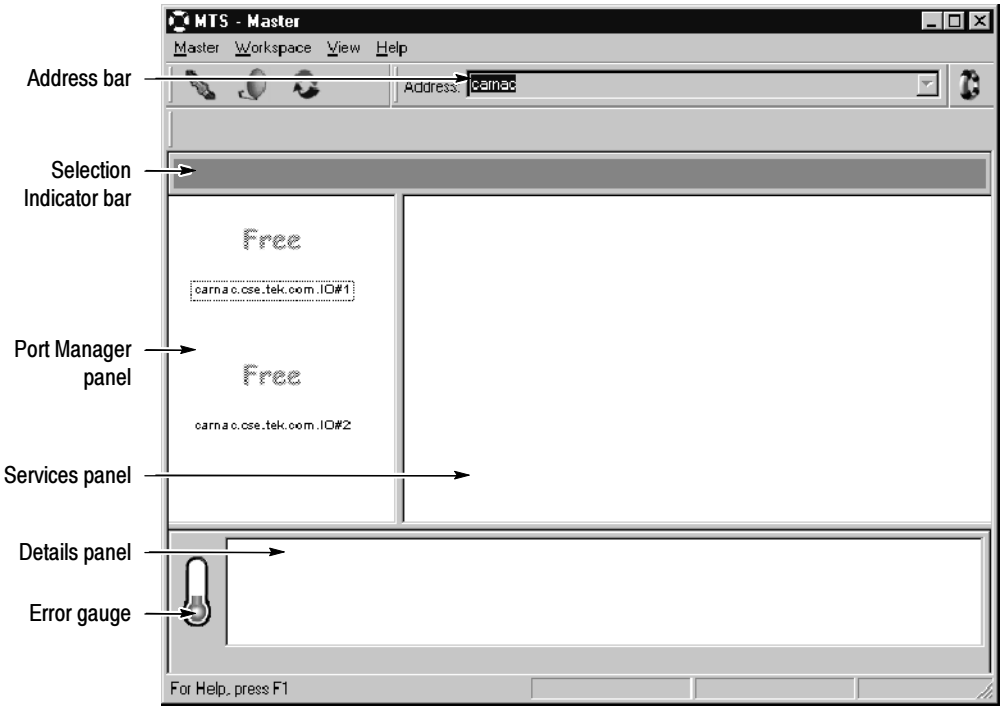


Figure 2-26: Master Client connected to the local Server Manager

Using the Workspace dialog box, you can specify the manner in which the Master Client reports errors and displays icons.

3. Select **Edit** from the Workspace menu to open the Workspace dialog box.
4. Select **Graphics** in the Navigation panel to open the Graphics panel.
5. Change the Analysis display options to show only Critical and Major errors as shown in Figure 2–27.
6. Click **OK** to apply your changes and return to the Master Client. After creating a workspace, the Master Client window should look similar to Figure 2–26.

   Experiment with the other options available in the Workspace dialog box. Return to the Master Client when you are ready to continue with the tutorial.

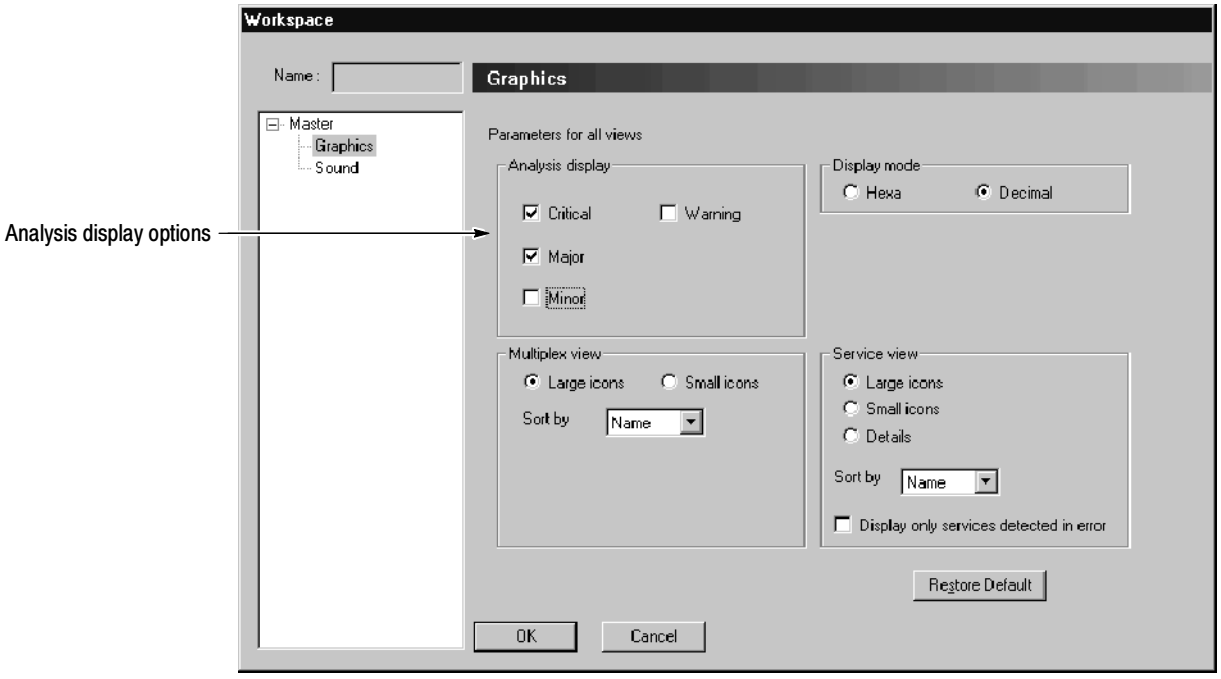


Figure 2-27: Changing the analysis display options

Assigning Servers and Generating a Transport Stream

In this part of the tutorial, you will assign servers to specific I/O ports, and then you will generate a transport stream that you will monitor and analyze later in this tutorial. These steps assume you have performed the steps in the *Starting and Configuring the Master Client* procedure starting on page 2–44.

1. Right click the **Free** icons in the Port Manager panel, and then assign an Analysis Server to I/O#1 and the Stream Player to I/O#2 as shown in Figure 2–28.

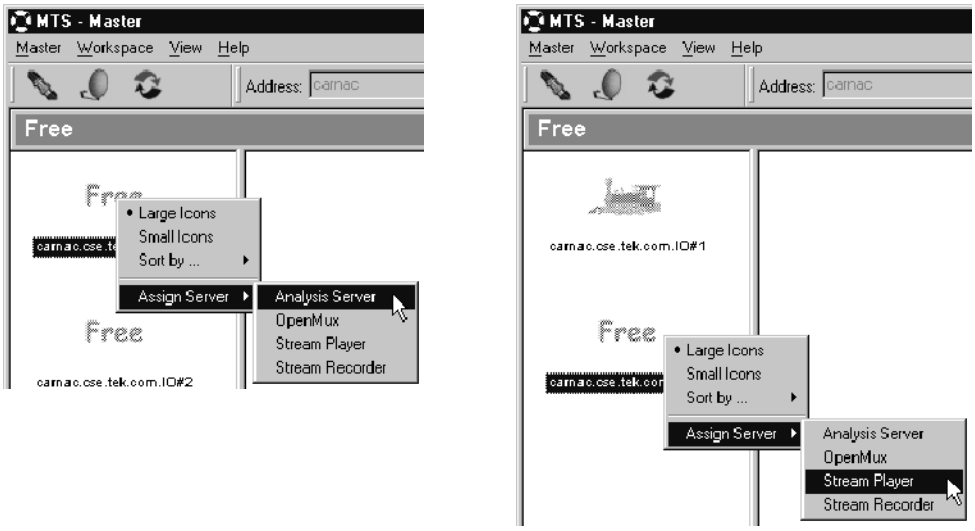


Figure 2-28: Assigning servers to I/O ports

2. Click on the icons and white space in the Port Manager panel and notice how the Details panel and Selection Indicator bar change.

3. Right-click the Stream Player icon and select **Launch Stream Player Client** from the shortcut menu. The Stream Player client is displayed and will look similar to Figure 2–29 on page 2–48.

4. Click the Browse button, and then navigate to and open a suitable MPEG-2, DVB, or ATSC transport stream file. You can select any transport stream file on your local MTS300 system to output using the Stream Player.

5. When you return to the Stream Player client, accept all of the default settings and click the Loop Play button to begin generating the transport stream in loop mode. In Figure 2–29, the file `DVBT002a.trp` is playing in loop mode and is 9.11 seconds into a 28.55 second loop.

6. Minimize the Stream Player client and return to the Master Client. Notice the change in the Stream Player client icon appearance.

Figure 2- 29: Stream Player client

Monitoring a Transport Stream Input

In this part of the tutorial you will learn how to interpret the icons used by the Master Client, and you will learn how the different Master Client panels allow you to see different levels of error details. These steps assume you have performed the steps in the *Assigning Servers and Generating a Transport Stream* procedure starting on page 2–47.

1. Right-click the Analysis Server icon (the train icon) and select **Start Analysis** from the shortcut menu. The Services panel (to the right of the Port Manager panel) should update showing the services that are part of the transport stream you are now monitoring. The display should now look similar to Figure 2–30.

2. Experiment with the icons by right-clicking each and familiarizing yourself with the contents of the shortcut menus.

If your input is displaying any critical or major errors, you will see error icons overlaying the icons in the Port Manager and Services panels. Refer to the online help for descriptions of the error icons.

3. Select one of the icons in the Port Manager panel. Notice the changes to the Details panel and the Selection Indicator bar. Notice also that when you select an icon in the Port Manager panel that the Error gauge changes.

   The Error gauge shows you the severity of errors being recorded on the selected item. In step 5 on page 2–46, you set the Master Client workspace to show only critical or major errors. Refer to the online help for descriptions of the error icons.

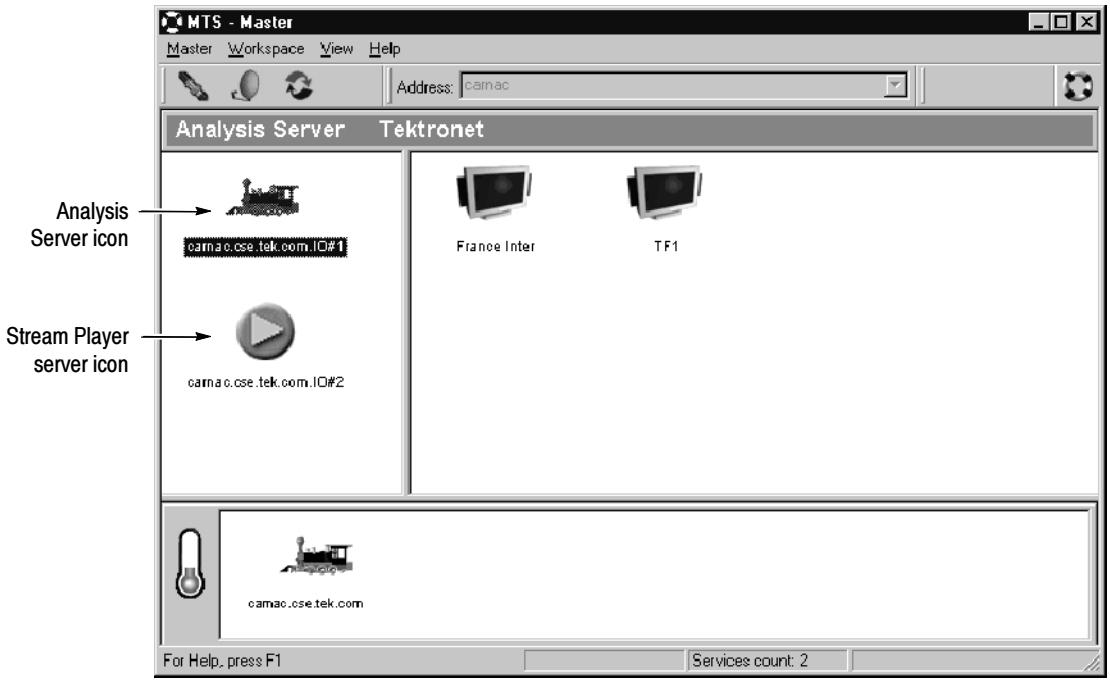


Figure 2-30: Monitoring a transport stream

4. Click one of the icons in the Services panel experiencing errors. As you roll your cursor over an icon in the Services panel, a tool tip is displayed showing you the transport stream ID and service ID pair for the service.

   Notice the changes to the Details panel and the Selection Indicator bar. The Details panel shows a different set of icons than those that were displayed when an Multiplex icon was selected.

5. Right-click an icon in the service panel, and then select **Associate Logo** from the shortcut menu as shown below.

6. Navigate to the Logos folder (`C:\MTS300\Bin\Logos`) and choose a `*.jpg` or `*.bmp` file that you want to associate with the selected service.

7. Click **OK**. You are returned to the Master Client, and the logo is displayed in place of the default service icon.

***NOTE**. Some service providers do not allow their logos to be used without permission. Check with the service provider before you use their logo.*

You can also go to the following URL to download logos for satellite services: `http://www.satlogo.com/`. This link was valid as of June, 2000.

Refer to the online help for information about restoring the default service icon to a service.

8. Right-click again in the service panel and choose **Details** from the shortcut menu. The Services panel changes to show a tabular display that lists the more information about each service. See Figure 2–31.

9. Click and drag the left border of the Services panel to display all of the columns in the Details view. You can sort the inputs shown in this view by clicking on the column headers.

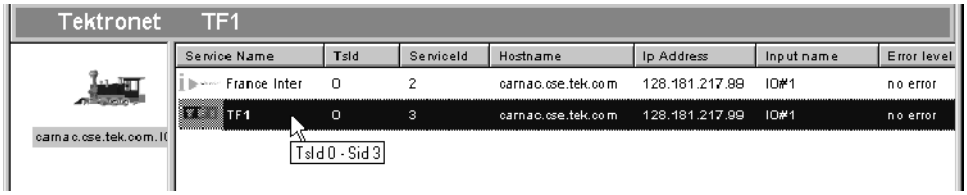


Figure 2- 31: Services panel details view

10. Experiment with some of the other Services panel shortcut menu items, and then set the Services panel to display **Large Icons** when you are finished and ready to proceed with the tutorial.

11. Select the Analysis Server icon and notice again the change to the Details panel. The icons in this panel indicate the types, severity, and status of errors occurring on the multiplex at the transport stream level. Refer to the online help for a description of the icons displayed in the Details panel when a Multiplex icon is selected.

12. Select a Services panel icon and note again the changes to the Details panel.

When a Services icon is selected the Details panel icons show the type, severity, and status of the errors occurring on the multiplex at the service, or program level. Refer to the online help for descriptions of the error icons.

Configuring the Analysis Server

In this part of the tutorial, you will learn how to start the Configuration Client from the Master Client and how to change the configuration of the Analysis Server on the input selected in the Master Client. These steps assume you have performed the steps in the *Monitoring a Transport Stream Input* procedure starting on page 2–48.

1. Right-click an Analysis Server icon in the Port Manager panel and select Configuration Client from the shortcut menu. The Configuration Client is displayed and is connected to the Analysis Server you selected in the Master Client. See Figure 2–32.

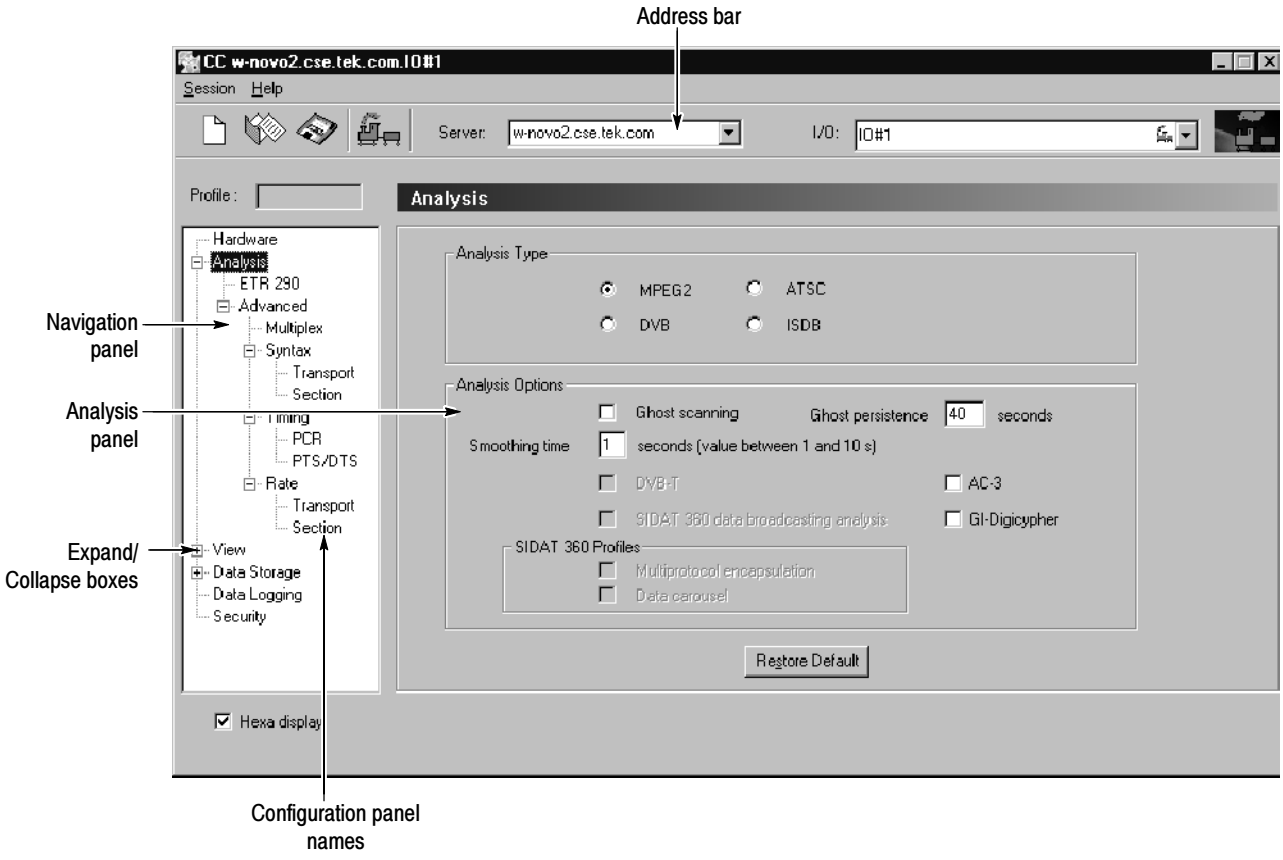


Figure 2–32: Configuration Client display

Refer to *Configuration Client* on page 2–32 for an overview of the Configuration Client display elements. Refer to the online helpfor detailed information about the Configuration Client instructions for setting probes.

2. Expand the hierarchy in the Navigation panel so that it looks similar to Figure 2–32 by clicking the expand/collapse boxes next to the Configuration panel names.
3. Highlight **Analysis**, and then select MPEG-2, DVB, ATSC, or ISDB in the Analysis panel as appropriate for the sample stream you are analyzing.
4. Highlight **ETR 290** in the Navigation panel to display the ETR 290 panel. This panel includes probes for the ETR 290 recommendations.
5. Click **Add All** and notice the change to the Probe List selection box.
6. In the Probe List selection box, remove all ETR290 priority 3 probes by double-clicking the probe name.
7. Click **Apply** to apply the changes you have made to the Analysis Server, which in the case of Figure 2–33 is analyzing `I/0#1` on `carnac`.

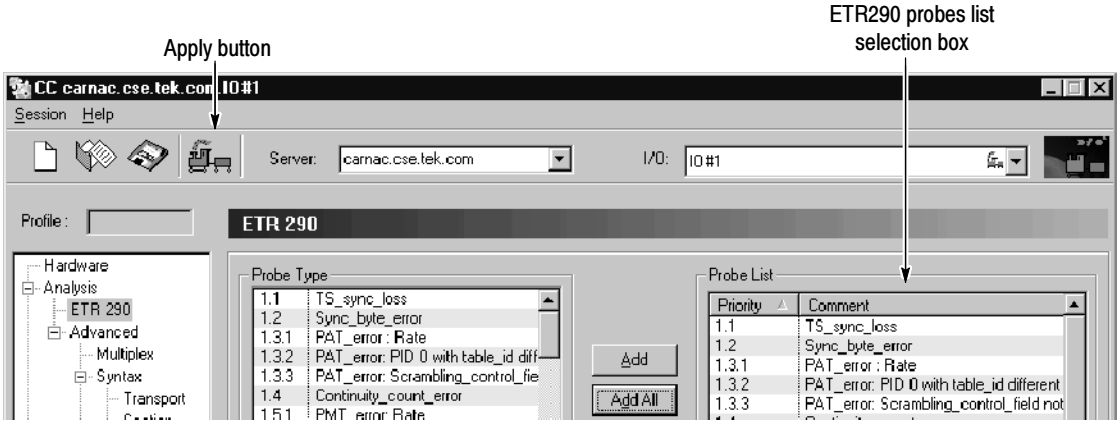


Figure 2-33: Setting ETR290 probes

8. Expand the View hierarchy in the Navigation panel, and then select **Message level**.
9. Scroll down the list of probes in the Report Message Level panel and highlight **Continuity counter**.

   The default for this display is to show the probes in alphabetical order by probe name. You can change this sort order by clicking one of the column headers.
10. Right-click in the **Message level** column on the highlighted row as shown in Figure 2–34, and then select **Major** from the shortcut menu. This changes the level at which a continuity counter error is displayed in the Master Client and in the Report view of the Expert Client.

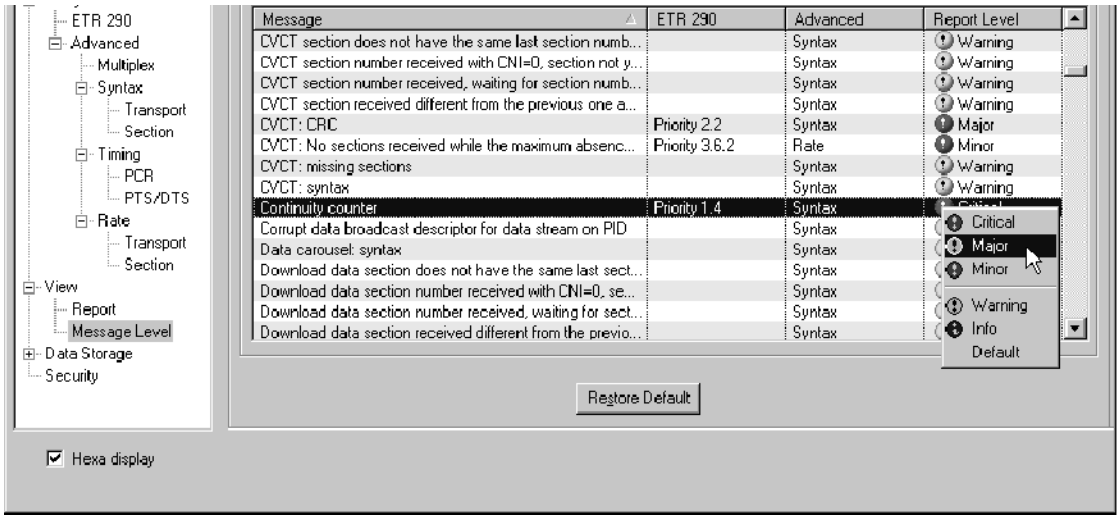


Figure 2-34: Changing the message level

11. Change all Critical errors to Major errors using the following procedure:

a. Click the **Report Level** column header. This will sort all of the probes by error severity (the level the errors are reported by the Analysis Servers).

b. Left-click on all of the Critical error icons in the Report Level column. Each click steps through the list of error levels. Since you are clicking the Critical errors, the report level changes to Major errors.

12. Click the **Apply** toolbar button to apply your changes to the Configuration Client (do not close it yet).

13. Click the Master Client window to display the application.

14. Select **Edit** from the Workspace menu, and then highlight **Graphics** in the Workspace Navigation panel.

15. Deselect **Major** in the Analysis Display group, and then click **OK**.

16. Click the **Acknowledge Errors** button on the Master Client toolbar. Any error indicators in the Master Client should go away.

17. Return to the Configuration Client and restore the factory-default settings by clicking **Restore Default** at the bottom of the Report Message Level panel. Do not forget to apply your changes before minimizing the Configuration Client (do not close it yet if you are continuing with the Tutorial).

Configuring the Data Logging Function

The Data Logging function allows you to write a record of selected analysis events to tab-delimited text files on the instrument hard drive. The Configuration Client enables and sets the parameters of the events that are recorded. Refer to the online help for more information.

1. Open the Configuration Client from the Master Client window.
2. Select **Data Logging** in the Navigation Panel of the Configuration Client to open the Data Logging panel shown in Figure 2-35.
3. Click on **Enable Data logging** to enable the Data Logging function.
4. Click on the various **Report Selection** and **Field Selection** boxes to select which type of analysis events will trigger a log entry.
5. Use the **Logging Management** boxes to set the maximum size of each log file and to set the time span for each log file.
6. Click the **Apply** button to apply your changes. Your specified transport stream events will now be written to a text file in the following directory: C:\MTS300\DataLogging.

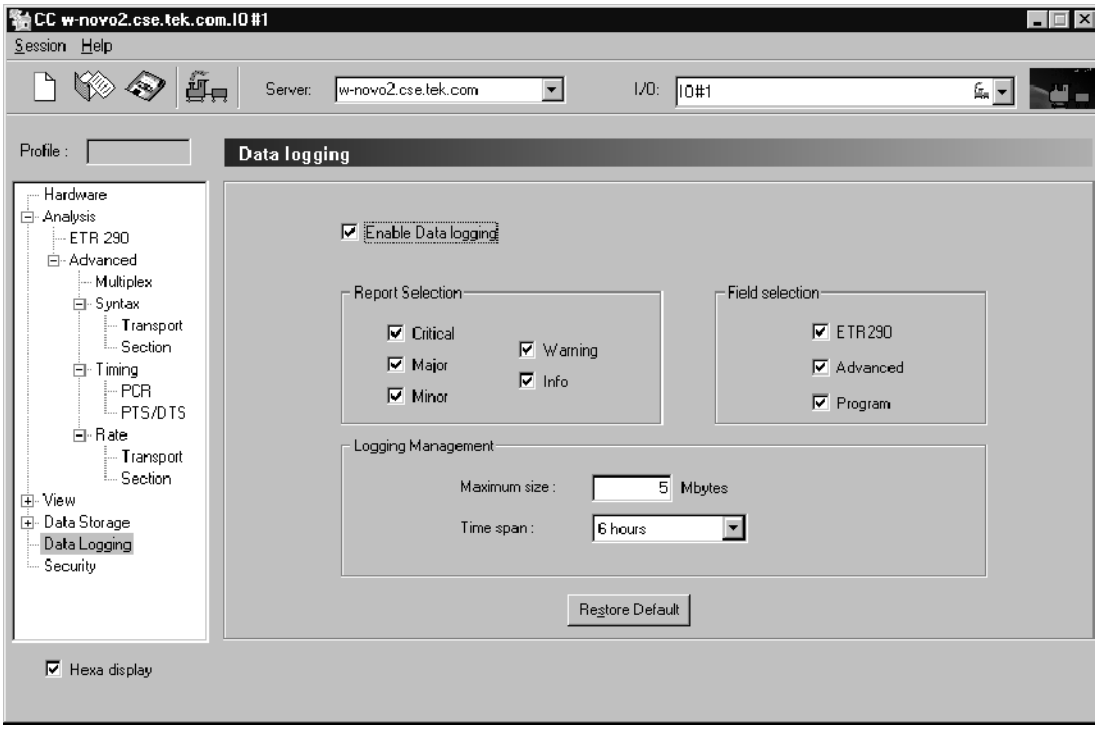


Figure 2-35: Data Logging configuration panel

Analyzing a Transport Stream

The Expert Client allows you to examine a specific input in more detail than is possible using the Master Client. Refer to *Expert Client* on page 2–30 for an overview of the Expert Client. Refer to the online help for more detailed information about the Expert Client and how to use it to analyze transport stream inputs. These steps assume you have performed the steps in the *Configuring the Analysis Server* procedure starting on page 2–51.

1. Click the Analysis Server icon in the Port Manager panel, and then right-click a service icon in the Services panel. If possible, select a service icon that is displaying errors as shown in Figure 2–36.

Figure 2-36: Launching the Expert Client

2. Select Expert Client from the shortcut menu. The Expert Client is displayed showing the errors occurring on the selected service (if any). See Figure 2–37.

   Your Expert Client display will look different in the details, but there are several items to note as you look at the Expert Client:

   - The Address bar shows which Analysis Server you are connected to.
   - The Hierarchic panel of the Report view indicates which service (program) you selected when you started the Expert Client.
   - The Messages panel of the Report view displays the errors that are occurring on the service indicated in the Hierarchic panel.

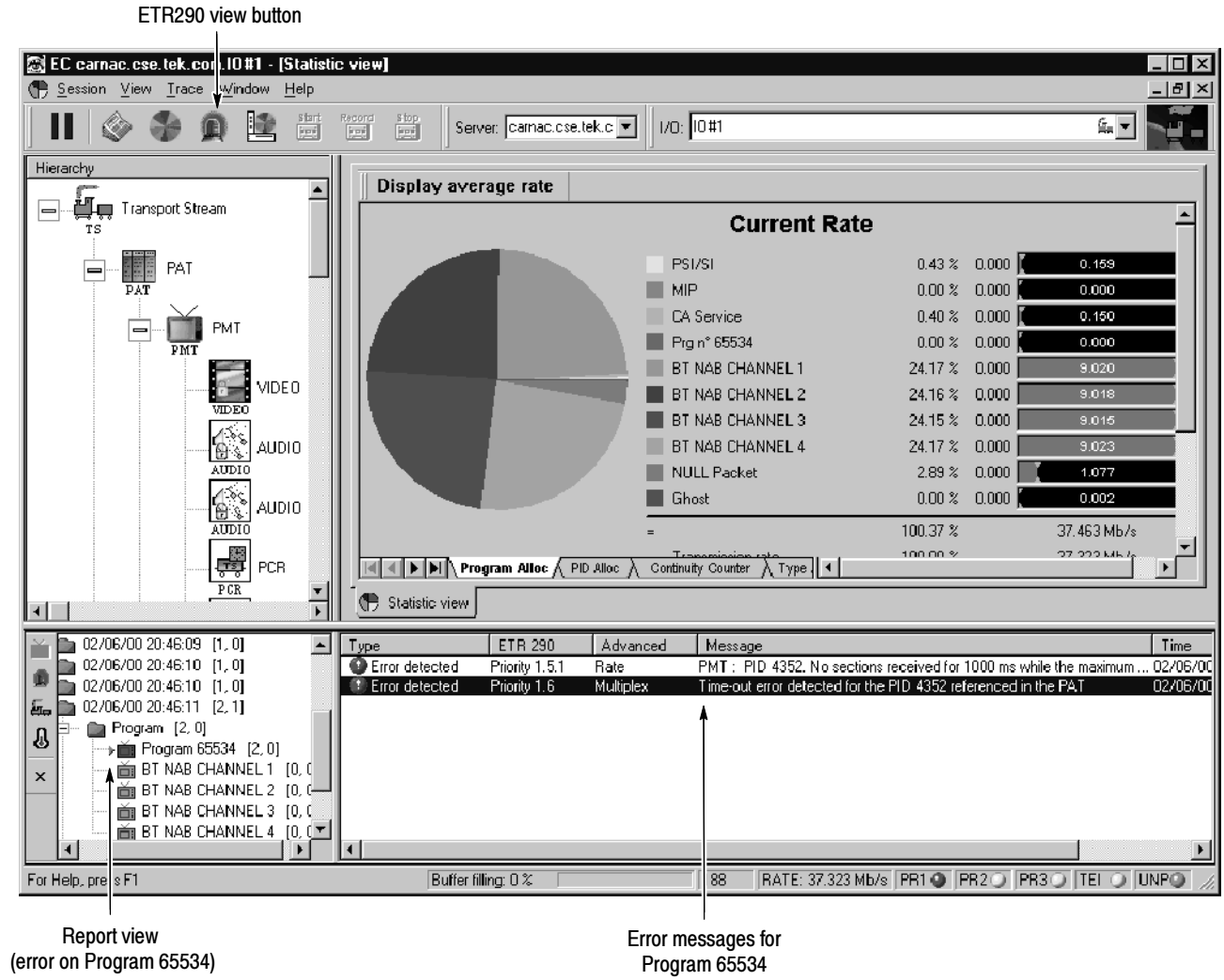


Figure 2- 37: Expert Client display showing errors

3. Click the ETR290 view button to display the ETR290 view in the Client area (see Figure 2–38).

   Note any error LEDs displayed. If you had chosen an MPEG-2 standard, there would not be a Priority 3 column for this display, as shown in Figure 2–38; for ATSC, the Priority 3 column probes address ATSC PSIP tables rather than DVB SI tables.

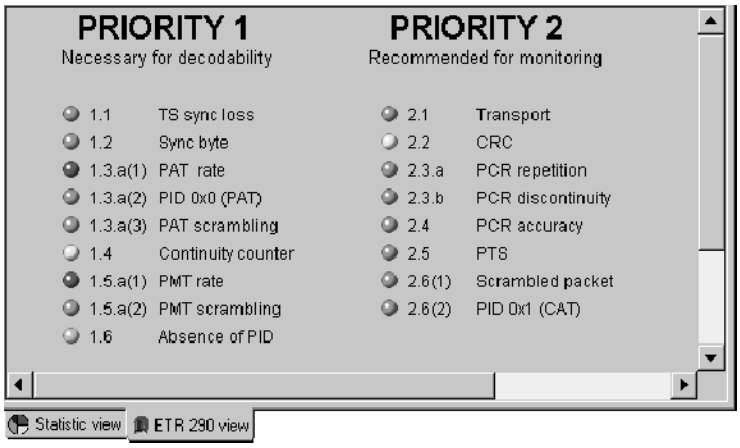


Figure 2-38: ETR290 view panel in the Expert Client

4. Return to the Configuration Client, and then select **ETR290** in the Navigation panel to display the ETR290 configuration panel.

5. Click **Restore Default**. This removes all ETR290 probes on the input.

6. Click **Apply** in the Configuration Client and return to the Expert Client. Notice that all of the ETR290 recommendations are grayed out, with the exception of TS_sync_loss, which is the only probe always set in the Expert Client.

7. Exit the Expert Client.

Recording a Transport Stream Input

In this part of the tutorial, you will record a portion of the stream you have been analyzing using the Stream Recorder Client. You can manually capture input using the Configuration Client and Expert Clients. Refer to the online help for more details about manually capturing input.

These steps assume you have performed the steps in the *Analyzing a Transport Stream* procedure starting on page 2–55.

1. Right-click the Analysis Server icon in the Master Client and select **Stop Analysis** from the shortcut menu.
2. Right-click the Analysis Server icon again and select **Free I/O** from the shortcut menu. The I/O port icon will change to Free.
3. Right-click the Free icon and select **Assign Server | Stream Recorder** from the shortcut menu.
4. Right-click the Stream Recorder icon and select **Launch Stream Recorder** from the shortcut menu. The application looks very similar to the Stream Player. See Figure 2–39.

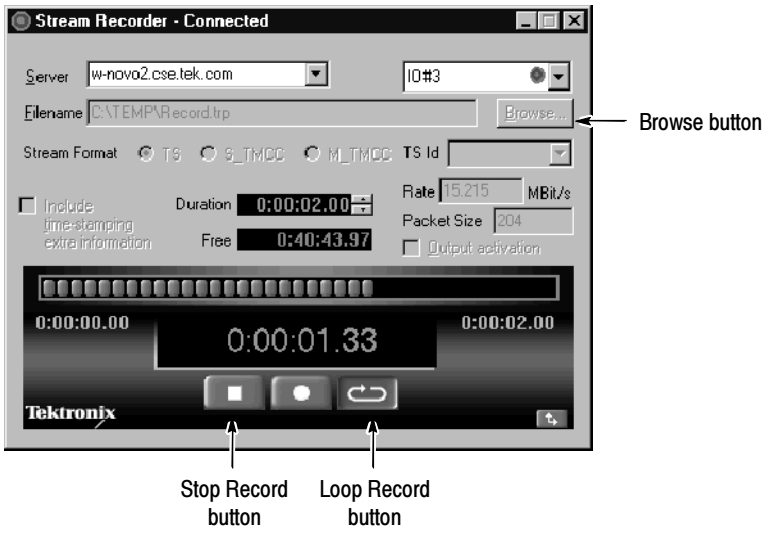


Figure 2- 39: Stream Recorder client application window

The default file name and path for the .TRP file you will record is shown in the Filename text box. You can change this by clicking the Browse button and specifying a different file name and path for the transport stream file. For this tutorial, use the default name and path.

5. Select the format of the stream you are going to record. For this tutorial, select **TS** stream format.
6. Enter a duration in the Duration box that is less than the value in the Free box. Both boxes use the following format:

   ```
   Hours: Minutes: Seconds. hundredths
   ```

7. Ensure that the Output activation box is not selected, and then click the **Loop Record** button.
8. Watch as the Stream Recorder syncs to the signal being input on I/O#1, and records the input.
9. Click the **Stop Record** button and then exit the Stream Player client.
10. Reassign I/O#1 to the Analysis Server (free the I/O first); output the new transport stream file using the Stream Player, and monitor and analyze the transport stream using the techniques you learned earlier in this tutorial.
11. Stop generating a transport stream and stop the analysis on the input.
12. Exit all of the client applications, saving the Master Client workspace if you wish.

This completes the tutorial.

Theory of Operation

The MTS300 system can be used to capture, playback, monitor and analyze MPEG Transport Streams. The MTS300 system consists of modules that are installed in a mainframe platform that is based on a PC architecture. The mainframe processor has the capability to make the calculations and data transfers required to perform the signal measurements. The mainframe circuitry also provides the power and interface connections to the installed modules. The MTS300 system modules accept external transport stream signals as well as trigger and clock signals.

The description of the functional operation of the MTS300 system is divided between the mainframe components and the MTS300 system modules.

Mainframe Operation

This subsection describes the operation of the primary components of the mainframe. A simplified block diagram of the mainframe is shown in Figure 3–1.

System Bus

The System Bus is contained in a backplane circuit board, The bus directly connects to all applications modules shown in the block diagram. Full system bus connections to the application modules are provided. Power and control signal connections are provided for all the plug in modules and other modules installed in the mainframe lower compartment.

The System Bus contains three sub-busses plus other signal wires:

- Power Sub-Bus. This sub-bus carries power and ground to the applications modules.
- Control Sub-Bus. The control bus is a PCI bus.
- Audio Bus. This bus provides a way to route an audio signal generated on any Application Module to the Internal Speaker and the Headphone Jack.

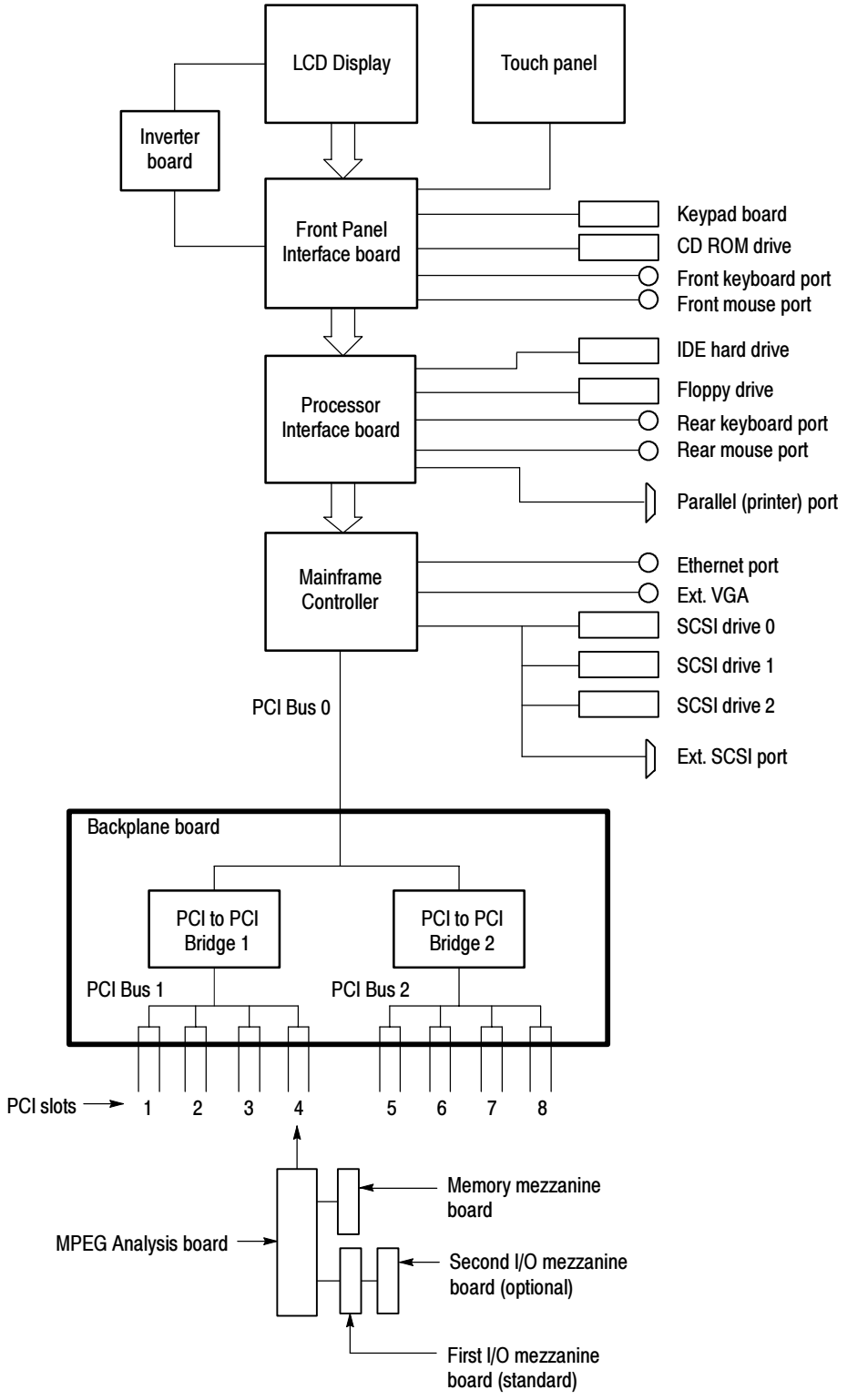


Figure 3-1: Mainframe simplified block diagram

Power Supply

The Power Module consists of the Power Conditioning board, the AC supply connector with line filter, and the power supply cooling fan. The Power Module supplies the PCI bus voltages through the backplane connectors that engage when the module is bolted in place. Other voltages are provided to the mainframe modules through connectors and ribbon cables.

The Power Conditioning board distributes power from the main power supply to the backplane, to the front panel, and to the SCSI drive connector. The +5 V and +12 V from the main supply are distributed through current limit circuits to meet safety specifications. Voltages to sensitive circuits in the acquisition circuitry are filtered to provide clean voltages. Six additional voltages are generated by DC-to-DC converters on the power conditioning circuit board. These voltages are the +7.5 V, –7.5 V, +3.3 V, +15 V, –15 V, and +33 V supplies. The power conditioning board also does the power on/off switching, generates the line trigger, provides the fan drive voltage, and drives the power good indication circuitry.

A shorted or overcurrent condition on any of the outputs of the main supply will cause a shutdown and cycling of the main power supply. The DC-to-DC converters will fold back for an overcurrent condition and will also cause shutdown of the main supply for a shorted output.

Mainframe Controller

The mainframe controller is a high-performance single board computer that includes SVGA graphics and I/O circuitry and conforms to the PICMG backplane standard. The Internal controller mounts vertically at the left of the mainframe card cage and connects into the PCI backplane through a standard 32-bit PCI connector. A 64-bit PCI connector is used for additional I/O communication to the backplane. Interconnection to other instrument components and rear panel ports is through a Processor I/O board.

PCI Backplane

The PCI backplane supports up to 8 standard PCI modules in addition to the mainframe controller. Custom application modules installed in the module bay provide the MTS300 system application features and functionality. The backplane also interconnects the power supply output voltages to the remainder of the system, including the fans. The precision 33 MHz system clock is distributed on the backplane, and all communication to, from, and between the system modules is supported.

Front Panel Interface

The front panel interface assembly interconnects the system controller with the the floppy disk drive, the CD drive, and the mouse, keyboard, and external USB (universal serial bus) ports. The PC speaker audio is also routed from the controller to the speaker through the front panel interface circuit board. The optional mainframe user interface: display, touch panel, and key-pad assembly, are also routed through the front panel interface assembly when installed.

IDE Hard Drive

The IDE Hard Drive is a portable, form-factor drive mounted behind the LCD front, flat panel. It is the main drive for the PC, the C: drive. The Windows NT operating system and MTS300 system application software are stored on this hard drive.

SCSI Hard Disk Drives

The three hard disk drives (HDD) are standard 9 GB SCSI drives that interface directly to the system controller through a Small Computer Serial Interface (SCSI) extension of the PCI bus. The hard drives are mounted in the Acquisition compartment of the chassis.

In the MTS300 system, the three SCSI drives are used exclusively for the storage of files containing MPEG transport streams. The data is striped onto the three drives to achieve high read/write rates. The drives operate as single drive and are designated as the E: drive.

The transport streams are typically captured using the MTS300 system in the Record Mode. The transport streams are input to the instrument through the MTS300 system applications board. The MTS300 system applications board sends the data over the PCI bus to the mainframe controller. The mainframe controller manages the storage of the data onto the SCSI drives.

External SCSI Port

There is an external SCSI port located on the rear of the instrument. The port is a Wide-SCSI, 68 pin connector. This port can be used to attach an additional SCSI storage device to increase storage capacity or for file transfer. When no external SCSI devices are attached to the port, the port must be terminated with the terminator supplied with the MTS300 system.

Floppy Disk Drive

The floppy disk drive is a standard one-half inch drive that supports 3.5-inch, 1.44 Mbyte high-density, double sided floppy disks.

CD Drive

The CD drive is a half-height drive similar to standard lap top computers. A CD caddy is not needed. The CD drive drawer is manually operated to insert and extract a CD disc from the drive.

Mouse and Keyboard Ports

You can plug in a PS2-compliant mouse and keyboard to the ports on the mainframe. These ports are interfaced through the front-panel processors to the mainframe controller.

LCD Flat-Panel Display

The flat-panel display is a backlighted 10.4-inch diagonal Active Matrix Thin Film Transistor (TFT) LCD panel. To extend the life of the backlight and prevent burning of the TFT LCD screen, the cold-cathode fluorescent backlight can be dimmed to 60% of its maximum brightness with a custom screen-saver or mainframe utilities applet. A DC switching regulator board, included as part of the display assembly, provides the backlight high voltage supply. The LCD display connects to the front panel interface board through a display adapter board in the display assembly.

Touch Panel. The touch panel is a standard 10.4 inch panel mounted over the surface of the flat-panel display. The touch panel is active at the same time as the mouse. A second front panel processor combines the mouse and touch screen signals to generate and receive standard mouse scan-codes from the system controller.

MTS300 System Modules Operation

This section describes the operation of the primary MTS300 system modules.

MPEG Processing Board

The processes involved with monitoring, analyzing, recording, and playing back MPEG transport streams occur on the MPEG Processing board, which is a PCI form-factor board. Installed on the MPEG Processing board are one or two Input/Output (I/O) mezzanine boards to receive and output the transport streams. There are four types of I/O mezzanines, for use with different signal formats, which can be installed on the MPEG Processing board. Each I/O mezzanine board has two inputs and two outputs, which provide either a looped-through output of the input signal or the signal output from the stream player. The MPEG Processing board can simultaneously monitor and analyze up to four transport stream inputs.

Much of the processing on the MPEG Processing board involves compiling data and analyzing the contents of the packets of the PIDs contained in a transport stream. The MPEG processing is achieved by several FPGAs and a high-speed DSP (a 320C6201). The results of the processing are sent to the mainframe controller over the 32-bit, 33 MHz PCI bus. An AMCC PCI Matchmaker integrated circuit manages the PCI bus communication. The mainframe controller manages the processing results for display on the VGA display or sending the results over a network connection.

On-Board Clock. Packets containing PCRs are time stamped with the time they arrived at the instrument. The clock used for the time stamping is derived from a precision 10 MHz OCXO located on the MPEG Processing board. The frequency of the OCXO can be adjusted by a multiturn potentiometer as described in the *Performance Verification* section of this manual.

A software algorithm compares the arrival time stamps with the PCR values contained in the packets, performs calculations and filtering, and presents the results as graphs. The graphs include the PCR arrival time, jitter, frequency offset, and drift rate. The accuracy of Frequency Offset measurement is directly proportional to the accuracy of the 10 MHz OCXO. The OCXO should be adjusted to 10 MHZ +/- 1 ppm (10 Hz) to maintain a Frequency Offset measurement accuracy of 1 ppm.

Memory Mezzanine. There is a memory mezzanine attached to the MPEG Processing board that contains 128MB of SDRAM. This memory mezzanine is used as an on-board memory buffer during the Stream Player and Stream Recorder modes of operation. The memory buffer assists in achieving an uninterrupted and continuous flow of MPEG data as the data is transferred across the PCI bus between the MPEG Processing board and the SCSI drives, which are used for storage of the MPEG streams. A portion of the memory is also used by the FPGAs and DSP during signal processing.

I/O Mezzanine Boards

There are four types of I/O mezzanine boards, for use with different signal formats, which can be installed on the MPEG Processing board. Table 7-2 on page 7-2 lists the possible I/O mezzanine configurations you may encounter.

ASI Mezzanine Board. A mezzanine which supports the ASI format can be installed on the MPEG processing board, part number 116-0246-00. On this mezzanine, the ASI input is transformer coupled to the input of a ASI receiver integrated circuit, CY7B933. The receiver integrated circuit extracts the MPEG data and presents it as parallel data on it's output. The parallel data is a common format which all the input/output mezzanines use to transfer the MPEG stream to the MPEG processing board.

The ASI Input/Output board can also provide an active loop through output of the input. Or the output can be from the stream player. The parallel data is presented to a ASI transmitter integrated circuit, CY7B923 which converts the data to the ASI format. The ASI stream is transformer coupled to the output BNC connector.

SMPTE310M (SSI) Mezzanine Board. A mezzanine which supports the SMPTE301M format can be installed on the MPEG processing board, part number 116-0247-00. On this mezzanine, the SMPTE310M input is transformer coupled to the input of a receiver integrated circuit, CLC014. The output of

the receiver integrated circuit is presented to a phase lock loop which locks to the clock frequency contained in the input stream. The phase lock loop uses a crystal to achieve high stability. The clock from the phase lock loop is used in the process that extracts the MPEG data from the SMPTE310 stream. The serial data is then converted to a parallel format. The parallel data is a common format which all the input/output mezzanines use to transfer the MPEG stream to the MPEG processing board.

The SMPTE310M Input/Output board can also provide an active loop through output of the input. Or the output can be from the stream player. The data is clocked using the clock derived from the phase lock loop and presented to the output BNC through a capacitor.

LVDS (Parallel) Mezzanine Board. A mezzanine which supports the DVB SPI (Synchronous Parallel Interface) format which uses LVDS signaling levels can be installed on the MPEG processing board, part number. The received differential data is input to AM26C32C differential data receiver integrated circuits. There is a 110 Ω terminating resistor between each differential data input line. The outputs of the AM26C32C data receiver integrated circuits is non-differential parallel data which is the common format which all the input/output mezzanines use to transfer the MPEG stream to the MPEG processing board.

The LVDS Input/Output board can also provide an active loop through output of the input. Or the output can be from the stream player. The differential output data lines are driven by DS90C31 differential LVDS line driver integrated circuits. Each output data line is passed through a LC filter before it is routed to the output connector to reduce EMI.

DHEI Mezzanine Board. A mezzanine which supports the DHEI (Digital Head End Interface) format which uses ECL signaling levels can be installed on the MPEG processing board, part number 116-0994-00. The received differential data is input to AM26C32C differential data receiver integrated circuits. There is a 110 ohm terminating resistor between each differential data input line. The outputs of the AM26C32C data receiver integrated circuits is non-differential parallel data which is the common format which all the input/output mezzanines use to transfer the MPEG stream to the MPEG processing board.

The DHEI Input/Output board can also provide an active loop through output of the input. Or the output can be from the stream player. The differential output line are driven by 100324 ECL line driver integrated circuits. On each output data line there is a 390 Ω pull down resistor to a -5 V supply. The -5 V supply is created on the mezzanine by a switching inverter supply powered from the +5 V supply. Each output data line is passed through a LC filter before it is routed to the output connector to reduce EMI.

Performance Verification

You can verify the performance of the MTS300 test system to the published specifications by performing the following procedures:

- *10 MHz Reference Clock*
- *I/O System*
- *MPEG-2 Software Components*
- *TMCC Software Components*

***NOTE**. The* 10 MHz Reference Clock *procedure requires a qualified technician to remove the instrument cabinet and to apply a probe to a test point on the PIA+ circuit board. If the reference clock is out of tolerance, a procedure is provided to instruct the technician how to remove the PIA+ board and to adjust the reference clock. This test must be performed in a static-free workspace.*

If you do not have access to a qualified technician or to a static-free work space, you can perform only the last three procedures. If the instrument passes the last three procedures, you can have a high level of confidence that all of the major functions of the instrument are functioning properly.

10 MHz Reference Clock

***CAUTION.** To prevent potential damage to the MTS300 test system, only perform this procedure to verify the accuracy of the 10 MHz reference clock if you are a qualified technician and are working in a static-free work space.*

Recommended Tools

You will need the following tools to verify the 10 MHz reference clock:

- An anti-static wrist strap for safe handling of assemblies containing static sensitive devices
- A screwdriver with T10, T15, and T20 Torx tips to remove the cabinet cover and the module mounting screws.
- A 1/4 inch or larger flat blade screwdriver.

- An 8 inch adjustable wrench or appropriate size open-end wrench (an aid for cabinet removal).
- A digital frequency counter to measure the 10 MHz clock. Accuracy: ± 2 Hz at 10 MHz. Example: Tegam DC5010 with an external frequency reference.

NOTE. *Some frequency counters require an external signal reference to attain the required accuracy.*

- A 10X probe for use with the frequency counter. Example: Tektronix P6109B.
- If you need to adjust the 10 MHz reference clock, you will need a small, narrow adjustment tool.

Remove the Instrument Cabinet

The cabinet must be removed to access the test point for the 10 MHz reference clock on the PIA+ board. Use the following procedure to remove the cabinet:

1. Put on a static grounding wrist strap.
2. Before removing the cabinet, shut down the test system and unplug the power cord.
3. Disconnect any cables connected to the rear panel connectors of the test system. Note their locations for reinstallation.
4. Put the protective front cover on the test system and sit the cabinet upright on the working surface with the rear panel up.
5. Remove the two screws from the handle on the right side of the cabinet (see Figure 4-1). These screws attach to posts mounted on the power supply module.
6. Remove the screws from the four feet on the rear of the mainframe chassis (see Figure 4-2).
7. Use either an adjustable wrench or appropriate size open-end wrench as a lever to pry the cabinet loose from the chassis. Loosen each side alternately until the cabinet is released from the EMI gasket.
8. Slide the cabinet up and off the chassis.

CAUTION. *Use care when touching the EMI shielding strips around the front of the chassis. The fingers of the strip are easily bent and any protruding sharp edges become a potential cutting hazard when you handle the chassis to position it during the remaining procedure.*

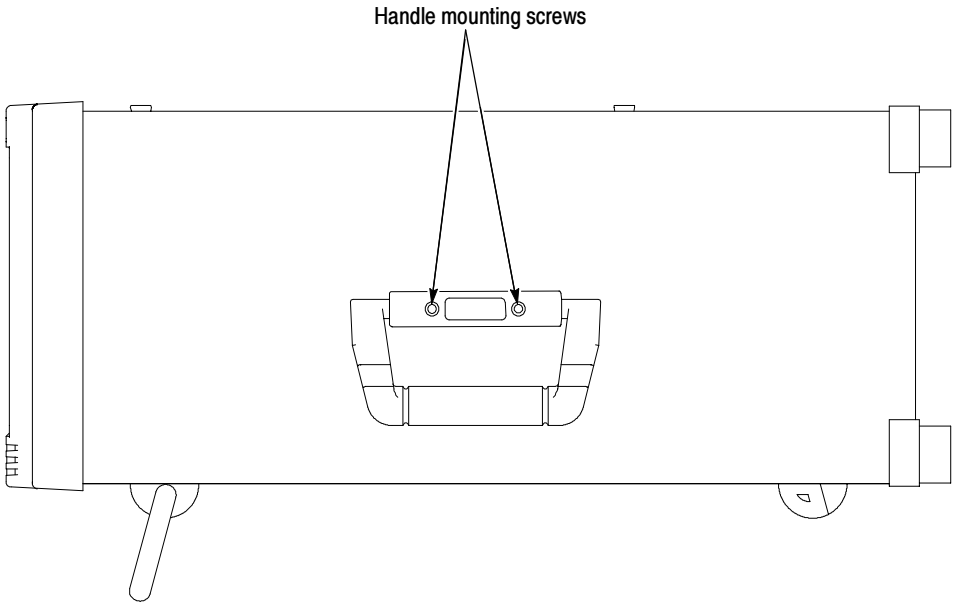


Figure 4-1: Removing the right-side handle screws

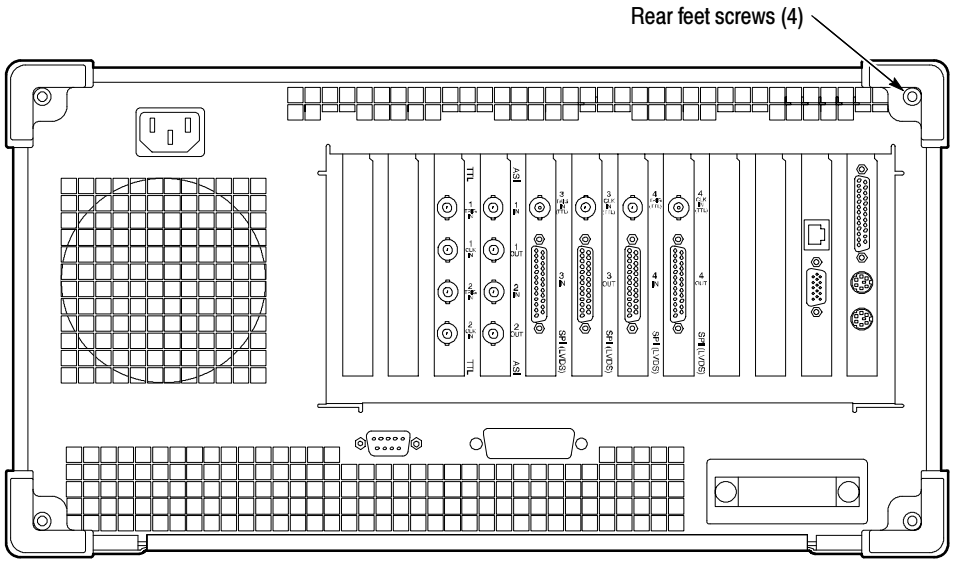


Figure 4-2: Removing the rear-panel feet

Remove the Circuit Board Retaining Plate

Remove the circuit board retaining plate (see Figure 4–3).

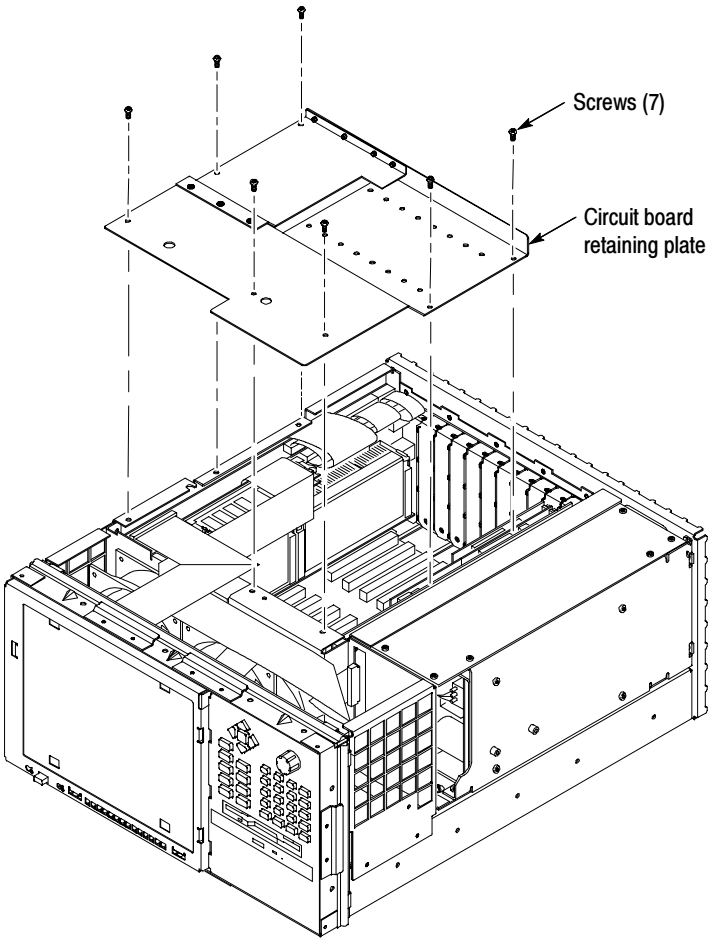


Figure 4-3: Removing the circuit board retaining plate

Check the Clock Frequency

Perform the following steps to check the 10 MHz reference clock frequency.

***NOTE**. Be sure that the counter accuracy is within ± 2 Hz at 10 MHz.*

1. Reconnect power to the instrument and reboot the test system.
2. Allow the instrument to warm up for 20 minutes.
3. Connect a 10X probe to the input of the frequency counter. Set the frequency counter for AC coupling and high impedance input (1 MΩ).
4. Touch the 10X probe to the 10 MHz clock output on the PIA+ board (be sure that the probe ground clip is connected to a suitable point). See Figure 4-4.

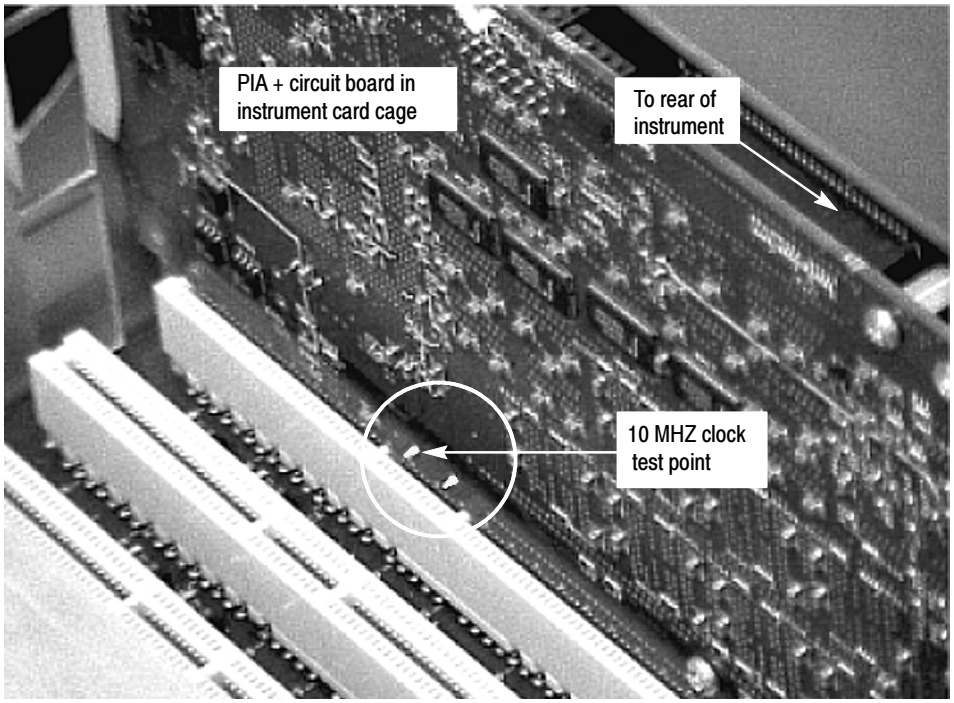


Figure 4-4: Location of 10 MHz clock test point

5. Adjust the frequency counter as necessary to trigger on the clock signal.
6. Check that the clock frequency is within 1.0/ppm or ± 10Hz of 10 MHz.

If the clock frequency is within ± 10 Hz of 10 MHz, proceed to *I/O System* on page 4-10. Otherwise perform the procedure in *Adjust the Clock Frequency* starting on page 4-6.

Adjust the Clock Frequency

Perform the following steps to adjust the frequency of the 10 MHz reference clock.

***NOTE**. Only perform this procedure if the 10 MHz reference clock was measured to be out of tolerance in the preceding procedure.*

1. Note the measured clock frequency from step 6 on page 4–5.
2. Power down the MTS300 test system and remove the power cord.

***NOTE**. To adjust the reference clock, you must remove the PIA+ module from the instrument. If there is an optional interface installed on the PIA+ module (two interfaces installed), you will also have to remove the second interface with the PIA+ module.*

3. Remove the retaining screws from the top and bottom of the PIA+ module (see Figure 4–5) and from the top and bottom of the brackets for any optional interfaces that may be installed.
4. Loosen the retaining screws from the top and bottom of any brackets adjacent to the module brackets you are removing.
5. Carefully pull up on the PIA+ board to loosen it from the backplane module connectors. You may have to alternate lifting up on the front and the rear of the board to work it loose from the connectors and the card bay.
6. When the PIA+ board is loose from the connector, lift the module out of the module bay.
7. Place the removed PIA+ board on a static-free work surface.

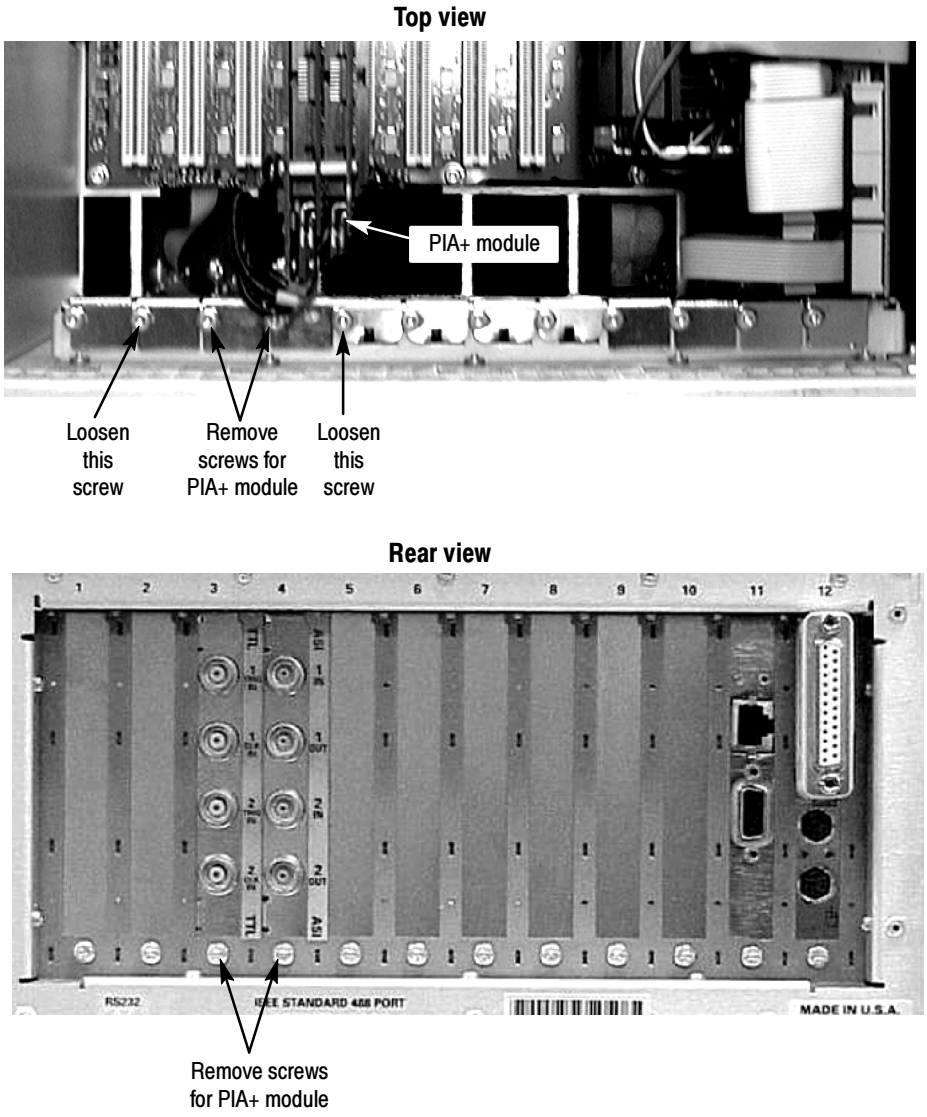


Figure 4-5: Removing the PIA+ module

8. Locate R500 (a 10 turn pot) on the PIA+ board (see Figure 4-6). R500 is located just behind J10 next to Y501.

***NOTE**. It is possible to adjust R500 without removing the Mezzanine board from the PIA+ board if you use caution. If you need to remove the Mezzanine board to make this adjustment, remove the three screws shown in Figure 4-6, and then carefully remove the Mezzanine board from the three connectors on the PIA+ board (J10, J501, and J502).*

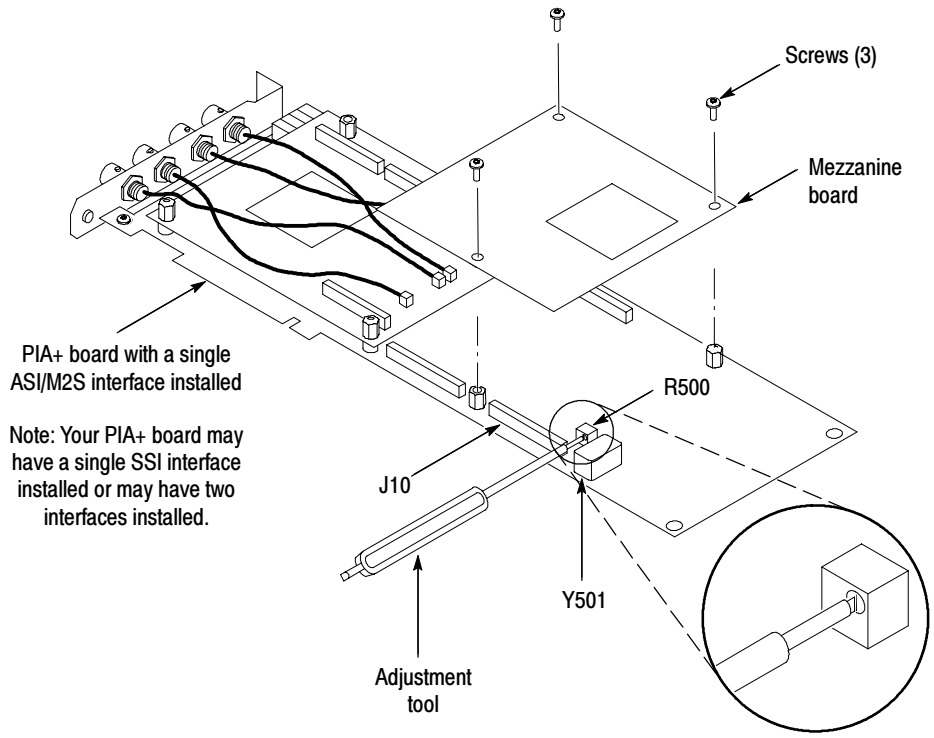


Figure 4-6: Adjusting the 10 MHz reference clock

9. Adjust R500 using the values in Table 4–1 and the measured clock frequency from step 6 on page 4–5.

Table 4-1: Adjustment table for 10 MHz reference clock

Measured frequency	Error	Error in PPM	Rotation required to correct (CW or CCW) [1]
10.000984 MHz	-16 Hz	-1.6 ppm	2 turns CCW
10.000988 MHz	-12 Hz	-1.2 ppm	1.5 turns CCW
10.000992 MHz	-8 Hz	-0.8 ppm	1.0 turn CCW
10.000996 MHz	-4 Hz	-0.4 ppm	0.5 turn CCW
10.000000 MHz	0 Hz	0 ppm	0 turns
10.000004 MHz	+4 Hz	+0.4 ppm	0.5 turn CW
10.000008 MHz	+8 Hz	+0.8 ppm	1.0 turn CW
10.000012 MHz	+12 Hz	+1.2 ppm	1.5 turns CW
10.000016 MHz	+16 Hz	+1.6 ppm	2.0 turns CW

[1] **One turn in the CW or CCW direction will change the frequency by 8 Hz or 0.8 ppm**

10. After you have adjusted R500, reinstall the PIA+ board by inserting the module into the module bay at the correct slot position.

11. Carefully align the PIA+ board edge connector with the backplane connectors.

12. Apply firm pressure to completely seat the PIA+ board in the connectors.

13. Replace the retaining screws which secure the PIA+ board in the card bay (the ones you remove in step 3 on page 4–6).

14. Torque the screws to 8 in-lbs (including the ones you loosened in step 4 on page 4–6.

15. Reconnect power to the MTS300 test system and reboot the instrument.

16. Allow the instrument to warm up for 20 minutes.

17. Perform the procedure in *Check the Clock Frequency* on page 4–5 and repeat this clock adjustment procedure as necessary until the measured clock frequency is within tolerance.

Reinstall the Circuit Board Retaining Plate

Power down the instrument, remove the power cord, and then install the circuit board retaining plate (see Figure 4–3 on page 4–4).

Reinstall the Instrument Cabinet

Reinstall the instrument cabinet by performing the procedure in *Remove the Instrument Cabinet* starting on page 4–2 in reverse order.

I/O System

Use the following procedure to verify the hardware components of the MTS300 system.

Recommended Tools

You will need the following tools to perform this I/O system test:

- Interface cables for each type of I/O port installed in the MTS300 system (75 Ω BNC cables for ASI/M2S and SSI (SMPTE310M) interfaces, and appropriate cables if you have a DHEI (GI Digicypher) or SPI (LVDS) interface installed)
- 50 Ω BNC cable (for use with the signal generator)
- BNC T-connector
- Digital frequency counter. Accuracy: ± 2 Hz at 10 MHz.
- Signal generator with 50 Ω output of TTL-level signals

Initial Setup

1. Connect all the inputs to the corresponding outputs as shown in Figure 4–7. (Your rear-panel configuration may differ from the illustration.) For the BNC connectors, use 75 Ω cables.
2. Power up and log on to the MTS300 system.
3. Once you have correctly logged on, double-click the Tektronix MPEG Test System program group icon on the desktop.
4. The Tektronix MPEG program group window similar to that shown in Figure 4–8 on page 4–12 will be displayed.

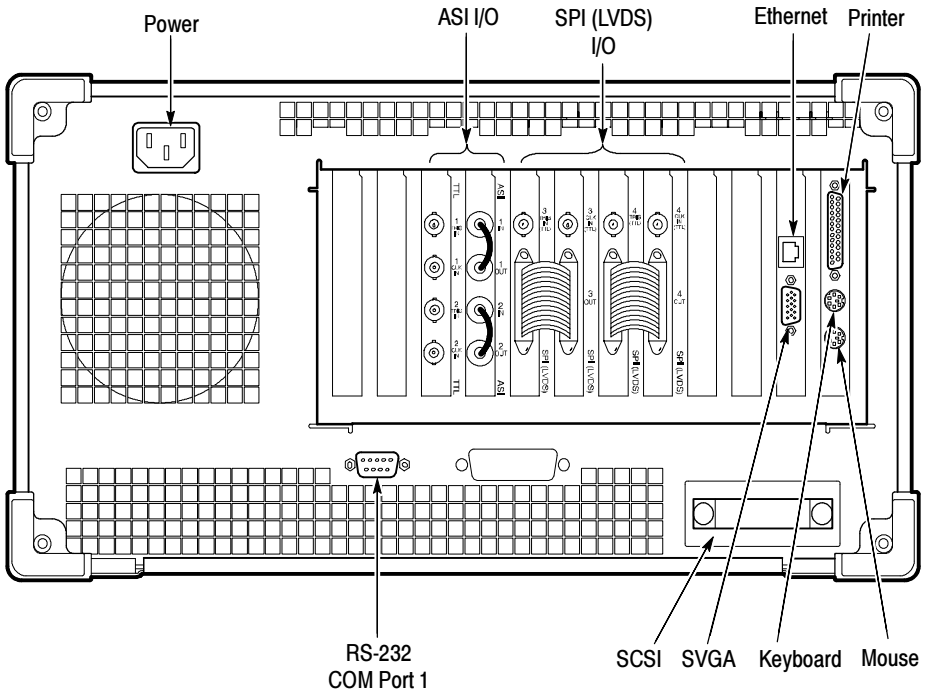


Figure 4-7: Typical initial equipment setup

Verify the Performance of Hardware Components

Each test system is shipped with a Hardware Diagnostic application that verifies the performance of the hardware components of the MTS300 system. Using this tool, you check the following parameters:

- Board access
- Process paths
- Stream paths
- I/O parameters
- External connections
- Trigger and Clock

Diagnostic Self Test

1. Start the Hardware Diagnostic by double-clicking the **Hardware Diagnostic** icon in the Tektronix MPEG Test System program window.

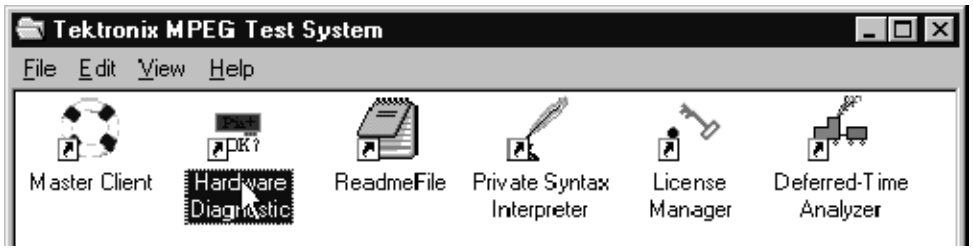


Figure 4-8: Tektronix MPEG Test System program window

2. Initially, the Hardware Diagnostic window is blank (see Figure 4–9). To start the diagnostic, you must first connect to the local Server Manager.

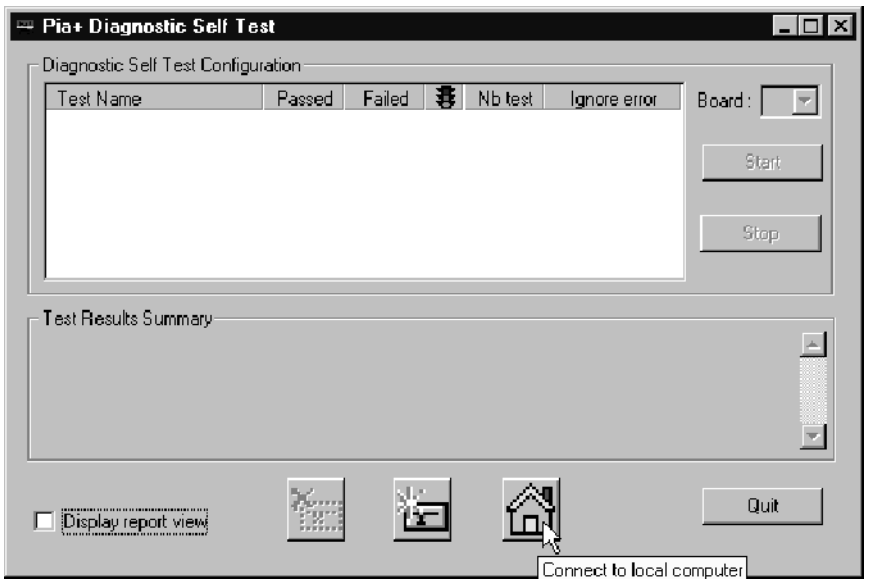


Figure 4-9: Connect to local Server Manager

3. Select all of the tests to be performed by clicking all of the appropriate boxes under **Test Name** as shown in Figure 4–10.

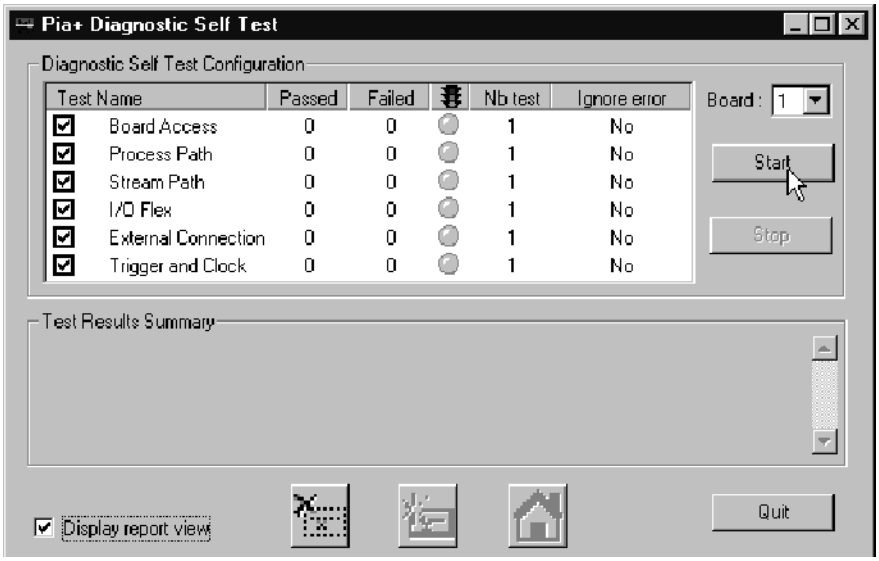


Figure 4-10: Start the testing routine

4. Select Display Report View, and then click **Start**.

5. The following message is displayed. Click **Yes** to begin the routine.

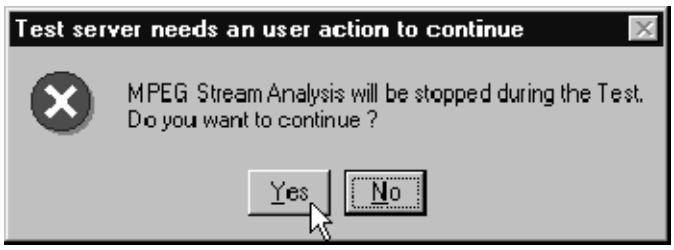


Figure 4-11: Begin the self test routine

6. As the routine continues, the display records the results as shown in Figure 4–12.

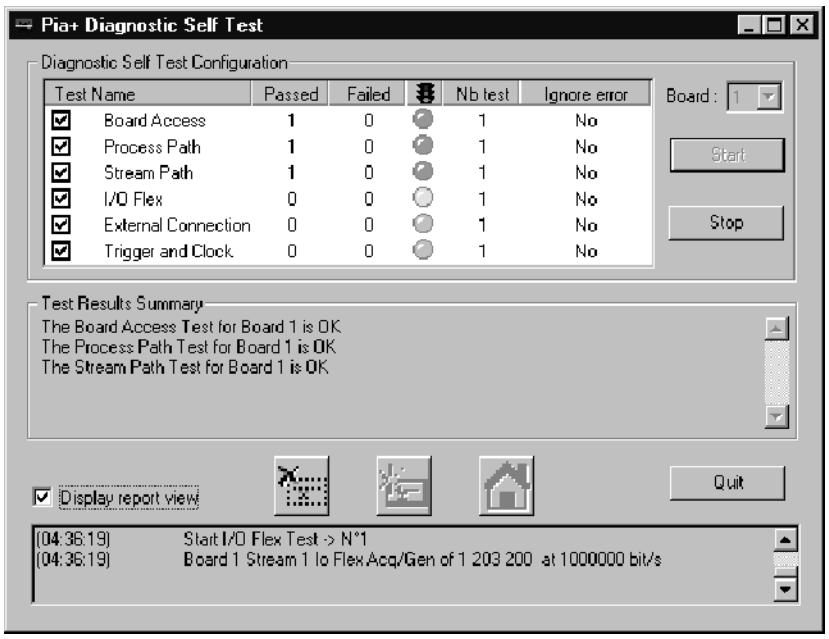


Figure 4- 12: Window showing sample test results summary

The Diagnostic Self Test Configuration area indicates which tests are being performed and the progress of each test:

- A yellow LED icon indicates the test is in process.
- A green LED icon indicates that the test is completed and passed.
- A red LED icon indicates that the test failed, and the self test stops.

The Test Results Summary area displays a summary of each test checked in the test control area. This section updates with a summary of the test results when all tests for that set of diagnostics has been performed.

The Report View area records details about each test as it is being performed.

7. If the corresponding input and output connections have not been made as shown in Figure 4–7 on page 4–11, the routine will stop at the beginning of the **External Connection** test and the following message will appear.

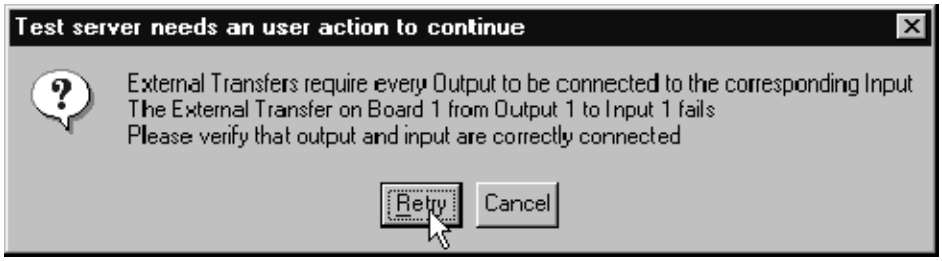


Figure 4-13: Message box with connection requirements

8. Connect the cabling as prompted by the message box. To continue the routine click **Retry** once the connection has been made.

***NOTE**. If you connect all the I/O's at this time each I/O test will be performed without interruption. If you connect only one, then the message will appear at the conclusion of each test. Move the cable to the next I/O as prompted in the message box.*

Trigger and Clock

1. Connect the output from the signal generator to the I/O #1 Trigger input on the rear panel of the MTS300 as shown in Figure 4–14. Use a 50 Ω BNC coaxial cable to make the connection.

***NOTE**. All input signals to the MTS300 must be at TTL levels and the trigger and clock inputs must come from 50 Ω sources.*

2. Follow the on-screen procedure.

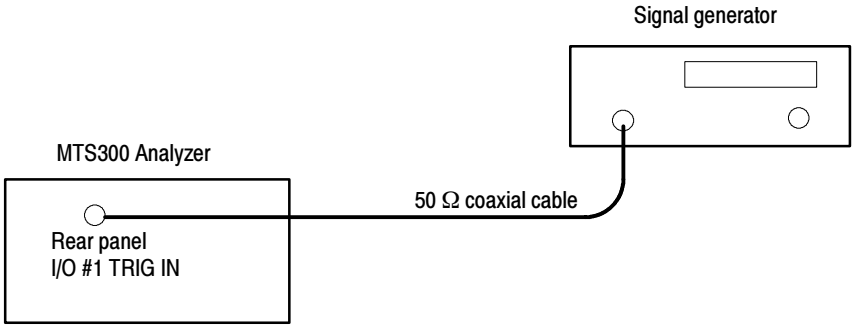


Figure 4-14: Connections for trigger test

3. Connect the output from the signal generator to the I/O #1 Clock input on the rear panel of the MTS300 and to a frequency counter as shown in Figure 4–15. Use a BNC T-connector and a 50 Ω BNC coaxial cable to make the connection.

4. Follow the on-screen procedure.

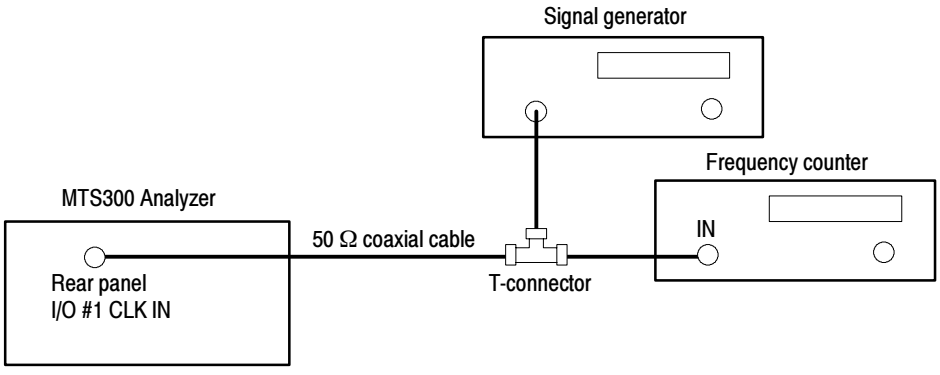


Figure 4-15: Connections for clock test

5. This concludes the Hardware Diagnostics. Click Quit to end the routine.

MPEG-2 Software Components

Use this procedure to verify the operation of the MPEG-2 software components of the MTS300 system.

Monitoring an Input

1. Connect the input of I/O #1 to the output of I/O #2 as shown in Figure 4–16. Use a 75 Ω BNC cable to make the connection.

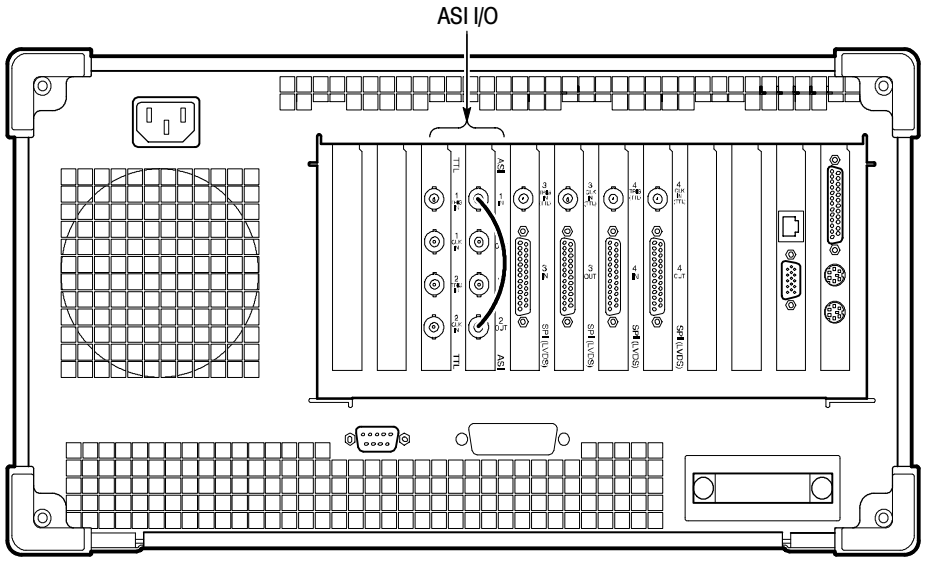
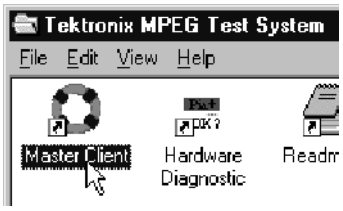


Figure 4-16: ASI cabling

2. Start the Master Client by double-clicking the **Master Client** icon in the Tektronix MPEG Test System program window.



3. Initially, the Master Client window is blank as shown in Figure 4–17. To start monitoring an input, you must first connect to the local Server Manager.

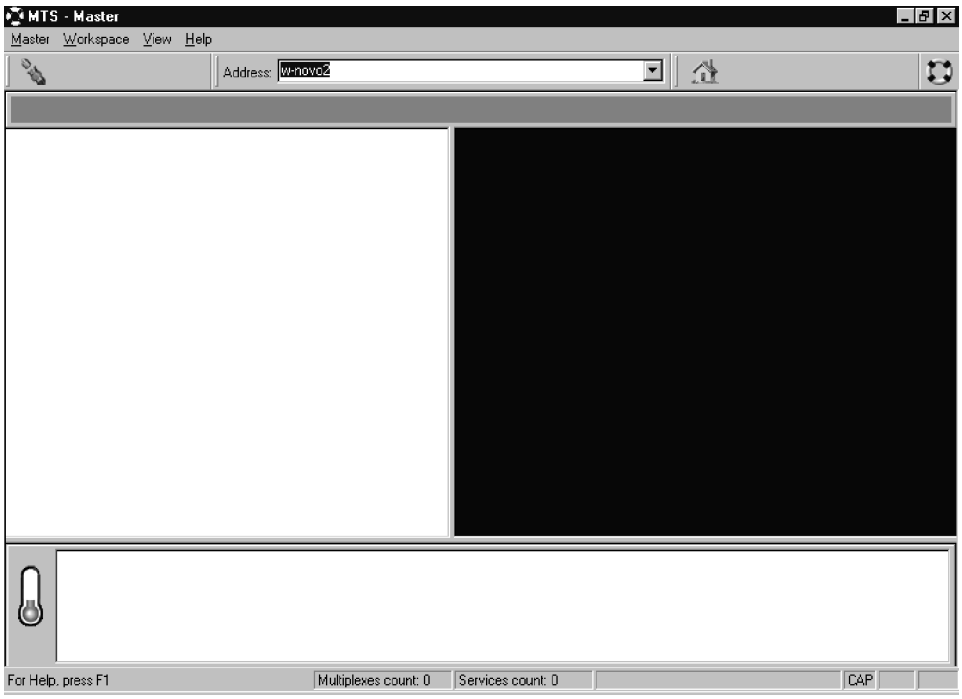


Figure 4-17: Initial Master Client application window

4. Connect to the local Server Manager by selecting **Master | Connect locally**.

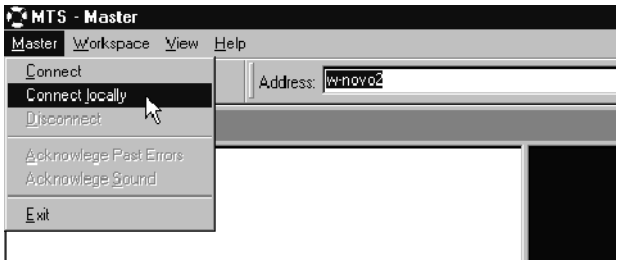


Figure 4-18: Connecting to the local Server Manager

5. Once you have connected to the local Server Manager, the Master Client appears as in Figure 4–19 with the I/O ports labeled Free in the Port Manager panel. You are now ready to assign the I/O ports to an Analysis Server and application.

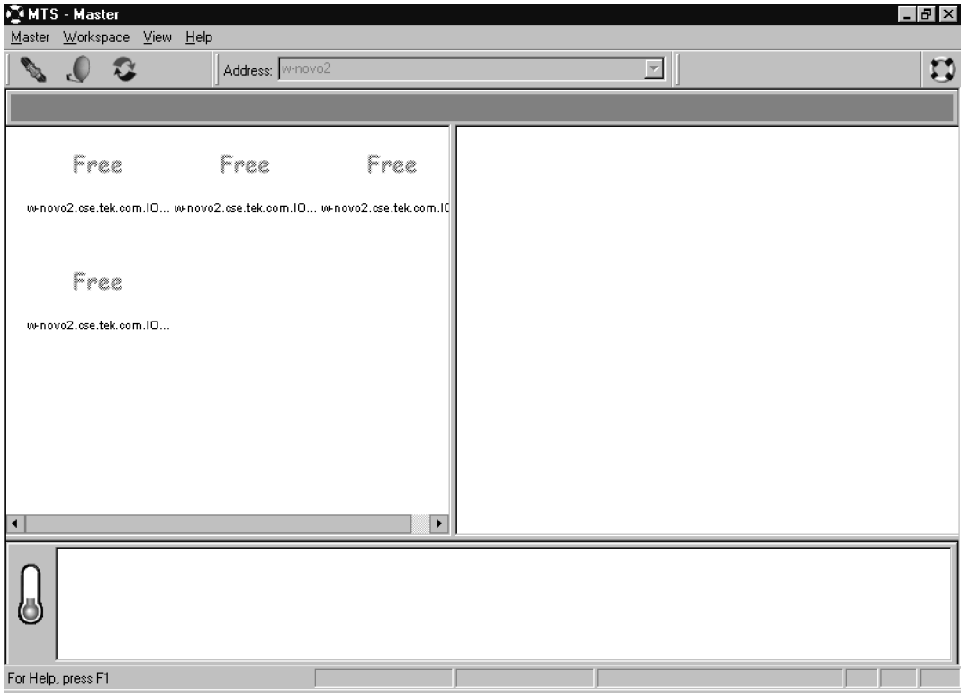


Figure 4-19: Master Client window showing no assigned ports

6. Select I/O #1 in the Port Manager panel, right click, and then select **Assign Server | Analysis Server** from the shortcut menu.

Figure 4-20: Port Manager panel showing Analysis Server selected

7. Select I/O #2 in the Port Manager panel, right click, and then select **Assign Server | Stream Player** from the shortcut menu.

8. Select the Stream Player icon (I/O #2), right click, and then select **Launch Stream Player Client** from the shortcut menu.

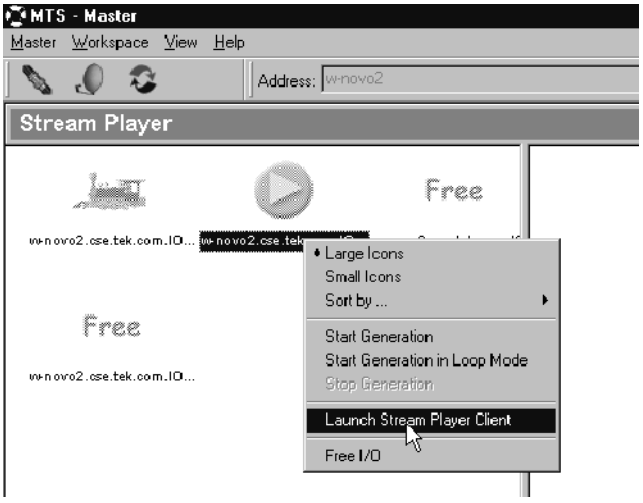


Figure 4-21: Selecting Launch Stream Player Client

9. Click the **Browse** button to select a transport stream file (*.trp) from the MTS300 system hard drive.

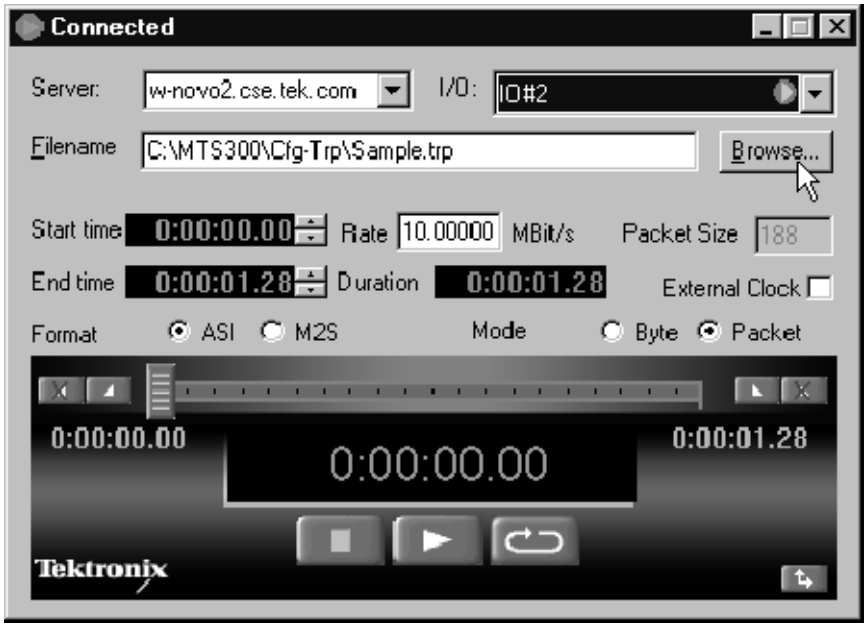


Figure 4-22: Stream Player Application window

10. Browse to C:\MTS300\Cfg-Trp directory, and then highlight the *Sample.trp* file. Click **Open** to load the file into the Stream Player.

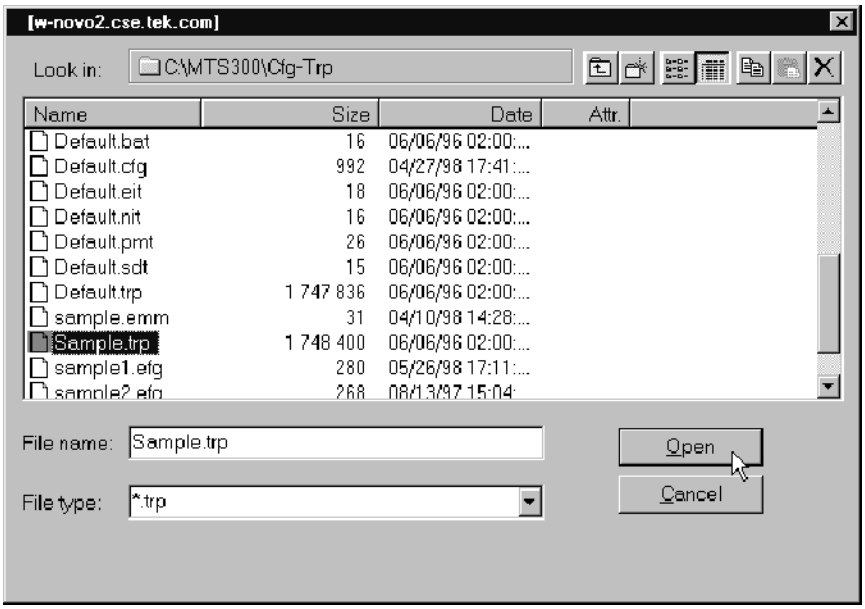


Figure 4-23: C:\MTS300\Cfg-Trp directory

11. Click the loop play  button in the Stream Player window to begin output of the transport stream. See also Figure 4–22.

12. Minimize the Stream Player application window.

13. Select the Analysis Server icon (I/O #1), right click, and then select **Start Analysis** from the shortcut menu.

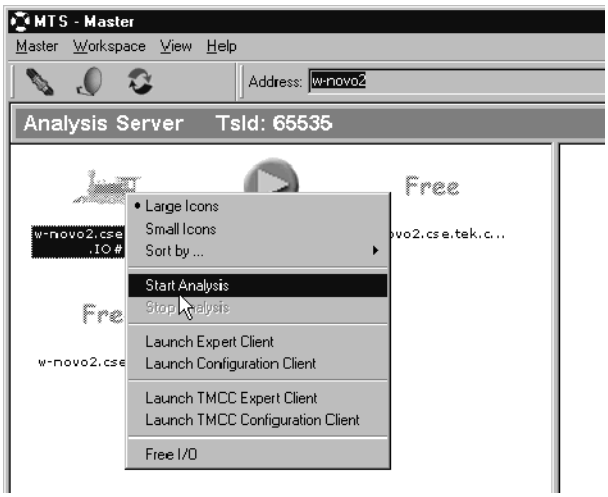


Figure 4-24: Starting transport stream analysis

14. After you start the analysis, an icon representing the service in the Sample.trp file appears in the Services panel.

15. Select the Analysis Server icon, right-click, and then select **Launch Expert Client**.

Figure 4-25: Master Client in Analysis mode

16. The Expert Client applications window opens. A typical display is shown in Figure 4–26.

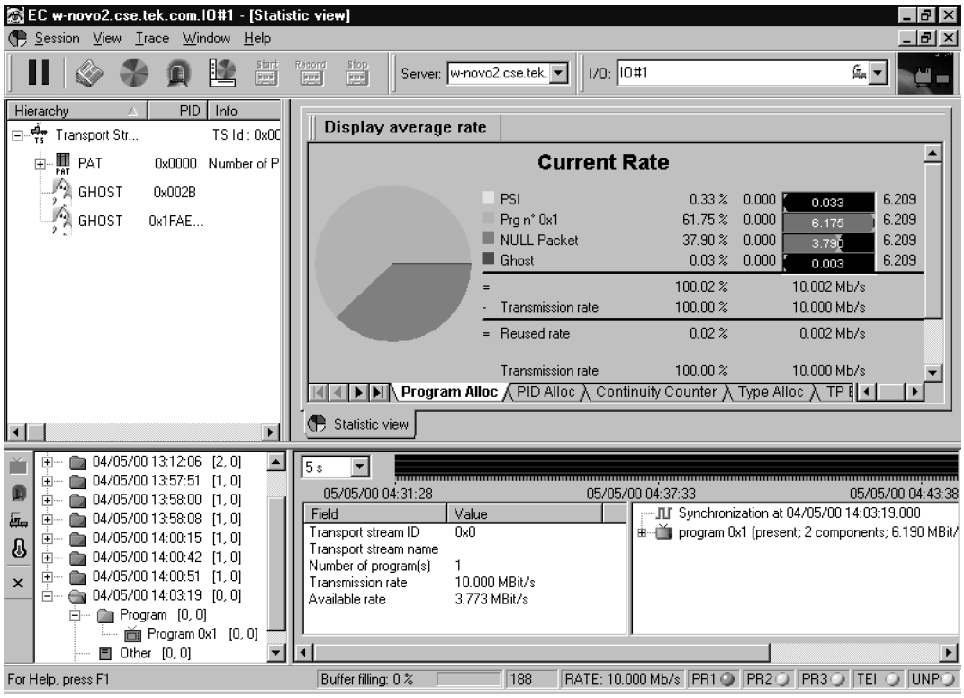


Figure 4-26: Expert Client application window

17. Verify proper operation.

- Check that stream is acknowledged on Port 1.
- Confirm that the Program Allocation pie chart correctly shows one program slice. (The PSI slice is too small to display.)

2nd I/O Pair Setup Procedure

1. Connect the output of I/O #1 to the input of I/O #2 as shown in Figure 4-27. Use a 75 Ω BNC cable to make the connection.

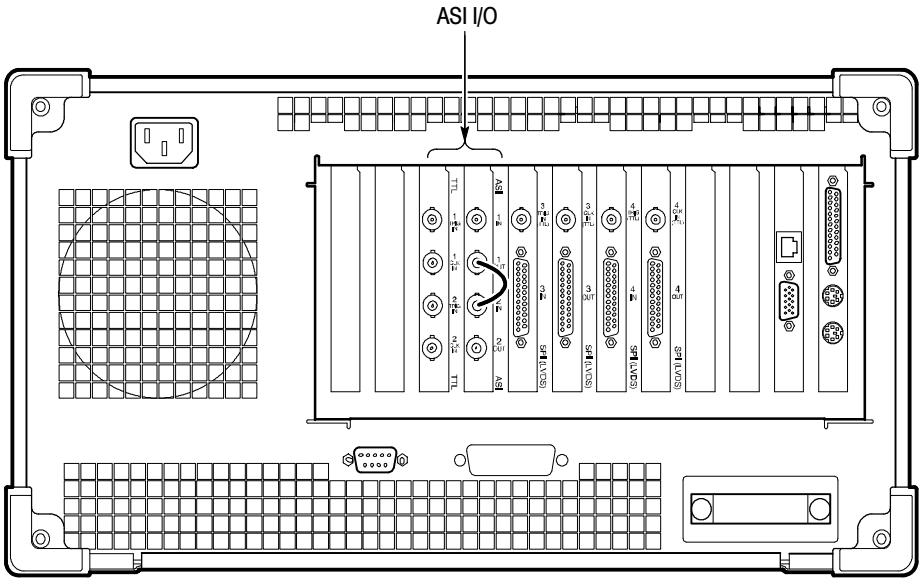


Figure 4-27: Setup for testing second input

2. Exit the Expert Client application window.

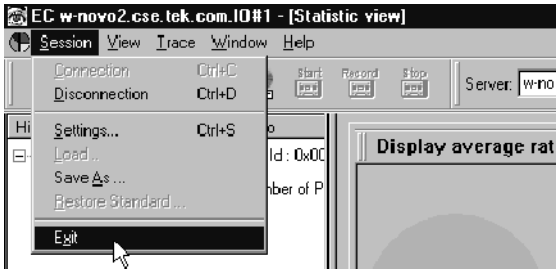


Figure 4-28: Exit Expert Client application

3. Select I/O #1 in the Port Manager panel, right click, and then select **Stop Analysis** from the shortcut menu.

4. Select I/O #1 in the Port Manager panel, right click, and then select **Free I/O** from the shortcut menu.

5. Select I/O #2 in the Port Manager panel, right click, and then select **Stop generation** from the shortcut menu.

6. Exit the Stream Player Client application.
7. Select I/O #2 in the Port Manager panel, right click, and then select **Free I/O** from the shortcut menu.
8. Select I/O #2 in the Port Manager panel, right click and then select **Assign Server | Analysis Server** from the shortcut menu.
9. Select I/O #1 in the Port Manager panel, right click, and then select **Assign Server | Stream Player** from the shortcut menu.
10. Select the Stream Player icon (I/O #1), right click, and then select **Launch Stream Player Client** from the shortcut menu.
11. Click the **Browse** button to select a transport stream file (*.trp) from the MTS300 system hard drive.
12. Browse to C:\MTS300\Cfg-Trp directory, and then highlight the *Sample.trp* file. Click **Open** to load the file into the Stream Player.
13. Click the loop play  button in the Stream Player window to begin output of the transport stream.
14. Minimize the Stream Player application window.
15. Select the Analysis Server icon (I/O#2), right click, and then select **Start Analysis** from the shortcut menu.
16. After you start the analysis, an icon representing the service in the Sample.trp file appears in the services panel.
17. Select the Analysis Server icon, right-click, and then select **Launch Expert Client**.

18. The Expert Client applications window opens. A typical display is shown in Figure 4–29.

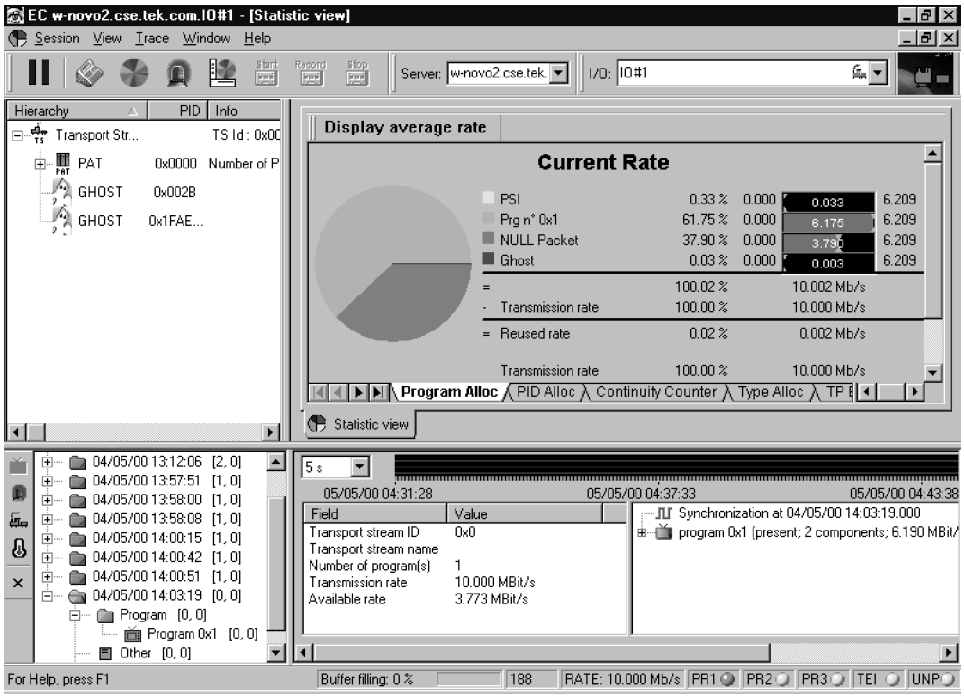


Figure 4-29: Expert Client application window

19. Verify proper operation:

- Check that stream is acknowledged on Port 2.
- Confirm that the Program Allocation pie chart correctly shows one program slice.

If the analyzer successfully checks Sample.trp, functionality of the Analysis Server, Stream Player Client and Stream Player Server, and the Expert Client is confirmed. If the program allocation display does not show the pie chart or report transmission rates correctly, switch the MTS300 system off and verify that the PIA+ board is firmly seated in the PCI connector (slot 4 of the test system card cage).

3rd and 4th I/O Pair Setup Procedure

1. If you have one of the I/O options installed, repeat the procedure that you have just completed for the remaining I/O pairs (I/O #3 and I/O #4).
2. Connect the input to the corresponding output. Figure 4–30 shows the connections using the rear panel with the SPI (LVDS) I/O option installed.

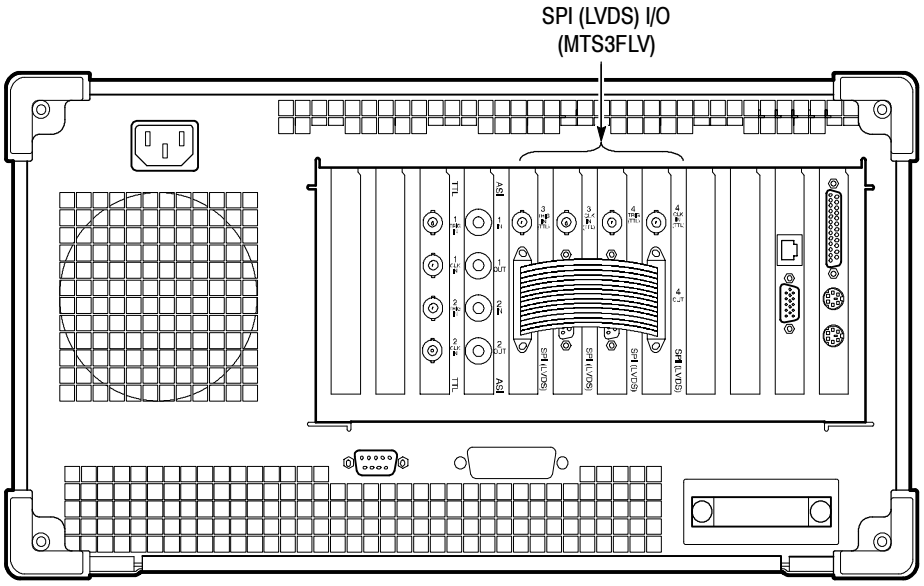


Figure 4- 30: Rear panel connections for I/O #3 test procedure

If your MTS300 test system has software version 6.0 or higher and you are operating in a TMCC environment, proceed with *TMCC Software Components* beginning on page 4–29.

Otherwise, after a successful functional check, exit the Expert Client, Stream Player, and Master Client and shut down the test system.

TMCC Software Components

Perform the following steps only if you are operating the MTS300 system in a TMCC environment.

Setup

1. Remove any signal cables that may still be connected to the MTS300 test system rear panel from the previous procedure.
2. Connect a TMCC transport stream input signal to the I/O #1 input connector.
3. Select I/O #1 in the Port Manager panel, right click, and then select **Assign Server | Analysis Server** from the shortcut menu.

Set TMCC Probes

1. Right-click the multiplex icon representing the TMCC transport stream input (I/O #1), and then select **TMCC Configuration Client** from the submenu.
2. After the TMCC Configuration Client is displayed, click **Analysis** in the navigation panel to open the Analysis configuration panel shown in Figure 4–31.
3. Click the appropriate stream type for the type of TMCC transport stream you are monitoring.

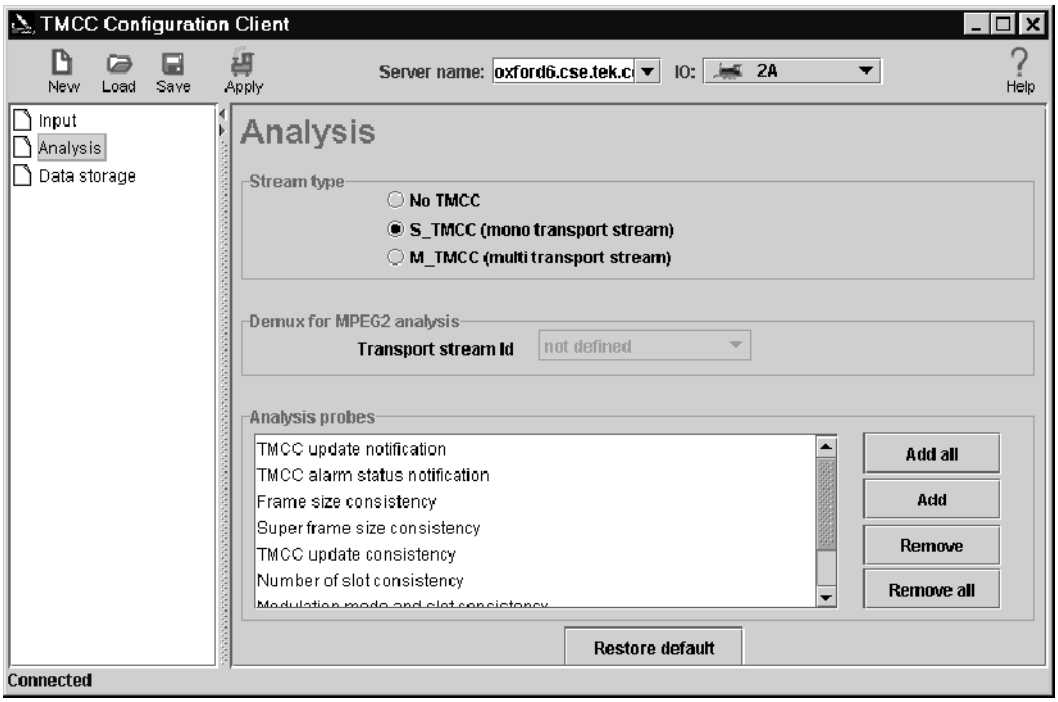


Figure 4-31: Probes added in the TMCC Configuration Client

4. Click **Add All** and notice that a number of probes are added to the List of Probes selection box. See Figure 4–31.

   The exact number of probes added will vary depending on whether you are analyzing a TMCC basic or TMCC data stream. Data streams are analyzed for the TMCC Update counter, whereas basic streams are not.

5. Click **OK** to save your changes, close the TMCC Configuration Client and return to the Master Client.

Display the TMCC Expert Client

6. Right-click the Multiplex icon for the input you just configured, and then select **TMCC Expert Client** from the submenu.

7. Confirm that the TMCC Expert Client displays with data in the Slots, Syntax, Dump, and Report view frames. See Figure 4–32.

8. Close the TMCC Expert Client and return to the Master Client.

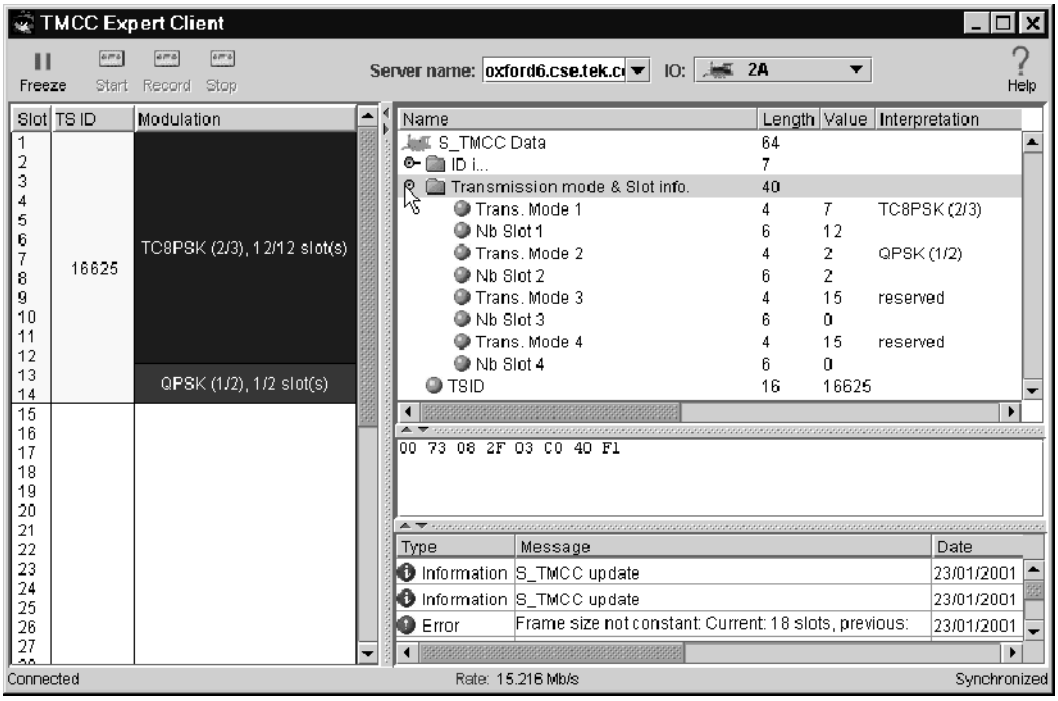


Figure 4-32: TMCC Expert Client

Set ARIB Table Probes

9. Right-click the Multiplex icon for the input you just configured, and then select **Configuration Client** from the submenu.
10. In the Analysis Panel of the Configuration Client, select **ISDB** (this panel is the default panel displayed when first starting the Configuration Client).
11. Select **Rate | Section** in the Navigation panel, and configure the Analysis Server to check that the DCT is updated at least every .0001 seconds (the rate, 0.1 Mbps, is a much higher rate than standard and will generate errors from the Analysis Server.)
12. Apply your changes, restarting the Analysis Server when prompted, and then exit the Configuration Client.
13. Confirm that errors are being reported for the input you just modified.

Display the Section Rate using the MPEG-2 Expert Client

14. In the Master Client, click the Multiplex icon for the input you just configured, and then right-click the TMCC Service icon displaying an error and select **Expert Client** from the submenu.
15. When the Expert Client is displayed, locate a DCT icon in the Hierarchic view.
16. Right-click the DCT icon select **Section Rate** from the submenu.
17. In the dialog box that is displayed, select one of the section numbers and click **OK**.
18. Confirm that the client area of the Expert Client changes to show the section rate analysis of the selected element.
19. Quit the Expert Client.

After a successful functional check, exit the Master Client and shut down the test system.

Adjustment Procedures

The MTS300 system contains only one adjustment. The procedure for this adjustment is included as part of the 10 MHz reference clock performance verification procedure. Perform the procedure in *10 MHz Reference Clock* on page 4-1 to make this adjustment.

Maintenance

This section contains the following maintenance information for the MTS300 system:

- *Servicing Preparation* page 6–1
- *Cleaning and Preventive Maintenance* page 6–3
- *Repackaging for Shipment* page 6–6
- *Power-on Diagnostics and Troubleshooting* page 6–10
- *Network Troubleshooting* page 6–14
- *Software Repair and Recovery* page 6–23
- *Removal and Replacement Procedures* page 6–53

Servicing Preparation

CAUTION. *Maintenance procedures should be performed only by qualified service personnel. Performing these procedures incorrectly could result in damage to the instrument.*

Before you begin to service this instrument, perform the following steps:

- Read the *General Safety Summary* and the *Service Safety Summary* at the front of this manual.
- Read the *Operating Information* section of this manual.
- Read the instructions in *Preventing Electro-Static Damage* located on the following page.

Preventing Electro-Static Damage

This instrument contains electrical components that are susceptible to damage from electro-static discharge. Static voltages 1 kV to 30 kV are common in unprotected environments. Table 6–1 shows the relative static discharge susceptibility of various semiconductor classes.

Table 6-1: Static susceptibility

Relative susceptibility levels [1]	Voltage
MOS and CMOS	100 - 500 V
ECL	200 - 500 V
Schottky Signal Diodes	250 V
Schottky TTL	500 V
HF Bipolar Transistors	400 - 600 V
JFETs	600 - 800 V
Linear microcircuits	400 - 1,000 V (est.)
Low-Power Schottky TTL	900 V
TTL	1,200 V

[1] **Voltage equivalent for levels (voltage discharged from a 100 pF capacitor through a 100 Ω resistance.**

Observe the following precautions to avoid damage:

- Minimize handling of static-sensitive components.
- Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive components or assemblies.
- Discharge the static voltage from your body by wearing a wrist grounding strap while handling these components.
- Nothing capable of generating or holding a static charge should be allowed on the work station surface.
- Keep the component leads shorted together whenever possible.
- Pick up the components by the body, never by the leads.
- Do not slide the components over any surface.
- Servicing static-sensitive assemblies or components should be done only at a static-free work station. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
- Use a soldering iron that is connected to earth ground. Use only special antistatic, suction, or wick-type desoldering tools.

Cleaning and Preventive Maintenance

This subsection describes general care and service procedures for the MTS300 system.

General Care

Protect the instrument from adverse weather conditions. The instrument is not waterproof.

CAUTION. *To avoid damage to the instrument, do not expose it to sprays, liquids, or solvents.*

Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Preventive Maintenance

Check the electrical performance and the instrument accuracy certified (calibrated) once a year.

Preventive maintenance mainly consists of periodic cleaning. Periodic cleaning reduces instrument breakdown and increases reliability. Clean the instrument as needed, based on the operating environment.

Clean the entire MTS300 system often enough to prevent dust and dirt from accumulating. Dirt can act as a thermal insulating blanket that prevents effective heat dissipation. In addition, dust buildup can provide high-resistance electrical leakage paths between conductors or components in a humid environment.

Cleaning the Instrument Exterior

Clean the exterior surfaces of the instrument, including the LCD display and keypad with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use abrasive compounds on any part of the instrument.

CAUTION. *Avoid getting moisture inside the instrument during external cleaning; and use only enough solution to dampen the cloth or swab. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.*

Do not wash the front-panel On/Standby switch. Cover the switch while washing the instrument.

Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Cleaning the CD-ROM Drive

The compact disc (CD-ROM) drive requires routine maintenance to operate at maximum efficiency. Compact discs can be damaged if dirt and dust accumulate on the surface. To prevent damage, a CD should be properly stored in its protective container when not in use.

CAUTION. *Electrostatic discharge (ESD) can damage components in the CD-ROM drive. Do not touch the lens or exposed metal parts on the platter.*

Clean the face of the CD-ROM drive monthly with a dampened cloth.

CAUTION. *Do not allow moisture to enter the CD-ROM drive. When power is applied, the internal components may be damaged.*

Cleaning the Keyboard

The keyboard may require occasional cleaning to remove lint or oil buildup. Use the following procedure to clean the keyboard.

1. If the product is operating, stop any running applications and shut down the operating system.
2. Unplug the keyboard from the mainframe.
3. Clean all lint and loose debris from the keyboard with either clean, dry, low velocity air or with a clean, soft brush.
4. Clean the external surfaces with a soft cloth dampened with a solution of mild detergent and water. Do not allow solution to run into the keyboard.

CAUTION. *If liquids such as coffee or soft drinks have gotten into the keyboard, intermittent operation can occur. If this has happened, consider replacing the keyboard.*

5. Reconnect the keyboard to the either keyboard connector (on the left side of the mainframe or to the rear panel I/O board) as needed for your application.

Cleaning the Mouse

Occasional cleaning of the mouse interior is necessary to remove accumulated lint, which hampers smooth ball movement. Use the following procedure to clean the inside of the ball cavity. If the mouse is damaged, replace it.

1. Unplug the mouse from the mainframe.
2. Turn over the mouse and loosen the ball retaining ring by inserting your fingers into the slots and turn in the direction indicated by the arrows (counterclockwise) approximately 45 degrees.
3. Turn the mouse right side up, cupping the bottom of the mouse in your hand, and gently tap until the retaining ring and ball drop into your hand.
4. Clean all lint and loose debris from the ball cavity with either clean, dry, low velocity air or with a clean, soft brush. Next, clean any remaining foreign material from the ball cavity with a soft, clean cloth. Do not use hydrocarbon or chemical-based cleaning solutions inside the ball cavity.
5. Replace the mouse ball and retaining ring. Rotate the retaining ring clockwise (opposite direction to the arrows) until the ring locks into place.
6. Reconnect the mouse to the mouse connector on the left side of the mainframe.

Cleaning the Optional SVGA Monitor

Clean the monitor CRT using a soft cloth dampened with deionized water to remove accumulated dust or fingerprints. Refer to the monitor service manual for any additional cleaning procedures and preventative maintenance servicing.

WARNING. *To avoid any potential of electrical shock, disconnect power before removing the cabinet.*

Cleaning the Instrument Interior

Examine the interior of the mainframe for dust build up. If the interior needs cleaning, use low-velocity, dry air to blow away dust or lint. If air alone does not remove all of the dust and lint, use a soft brush to complete the task. Exercise extreme care not to disturb components on the plug-in circuit boards during cleaning.

CAUTION. *This instrument contains static sensitive devices that can be damaged by static discharge. Wear a wrist grounding strap when working on or with modules inside the mainframe cabinet.*

Repackaging for Shipment

The MTS300 system is shipped in cartons designed to protect the instrument. If you ship the instrument use these cartons, spacer pads, protective bag, and instrument support inserts to provide adequate protection.

If an instrument is to be shipped to a Tektronix field office for repair, attach a tag to the instrument showing the following:

- Owner's name and address
- Serial number
- Description of the problem(s) encountered and/or service required.

CAUTION. *To prevent the loss of your instrument's warranties, Tektronix strongly recommends that you use a MTS300 system shipping carton (one that is in good condition) when you ship your instrument to another location or when you return the instrument to a Tektronix service center for repair.*

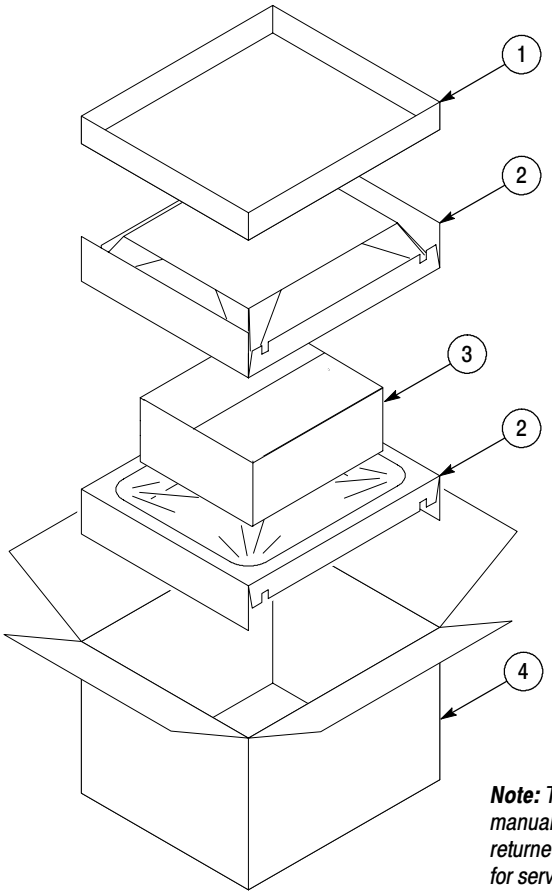
Tektronix cannot honor the instrument's warranties if the MTS300 system arrives at the service center damaged and it was not shipped in its original carton or in a replacement carton (and its supporting packaging material) purchased from Tektronix. If you lose your original packaging material, contact your Tektronix representative to obtain replacement packaging. Table 6-2 lists the part numbers to use when ordering replacement parts.

Replacement Packaging

New packaging material is available from Tektronix. The packaging part numbers are shown in Table 6-2 and in the *Replaceable Mechanical Parts List*. The packaging components are shown in Figure 6-1. Each component of the illustration has an index number, which also appears in Table 6-2. To obtain these items, contact your nearest Tektronix office or representative.

Table 6-2: Packaging material

Item	Tektronix part number	Figure 6-1 Index number
Complete shipping carton (contains all subparts)	710-9423-00	
Top tray (cardboard insert)	004-4912-00	1
Instrument support inserts (2); top and bottom	004-4913-00	2
Inner shipping box (without internal subparts)	004-4926-00	3 (See Figure 6-2)
Outer shipping box (without internal subparts)	004-4914-01	4
Spacer pad (makes two pads for inner shipping box)	004-4925-01	See Figure 6-2
Accessory tray	004-4851-00	Not shown
Accessory tray	004-4852-01	Not shown
Protective bag	006-8164-00	Not shown



Note: *The keyboard, mouse, and manual boxes do not need to be returned with the MTS300 system for servicing.*

Figure 6-1: Repackaging the program monitor

Repackaging Instructions

When the MTS300 system is shipped, it is important to package it well to protect the instrument. Figure 6–2 shows how to repackage the test system for shipment. It is not necessary to have the accessories received with the MTS300 system in the package for reshipment to repair. If you are shipping to another site for reinstallation, the accessories are packed last in accessory trays at the top of the box.

The inner shipping box, pads, and protective bag provide the necessary protection to allow the shipping materials of the outer shipping box to correctly support the product for shipment. Pack the inner shipping box as follows:

1. If you have the original packaging material, start by placing one of the spacer pads in the bottom of the inner box. Position the side of the pad with the smaller, square holes against the side of the box as shown in Figure 6–2.
2. Place the protective front cover on the front of the instrument.

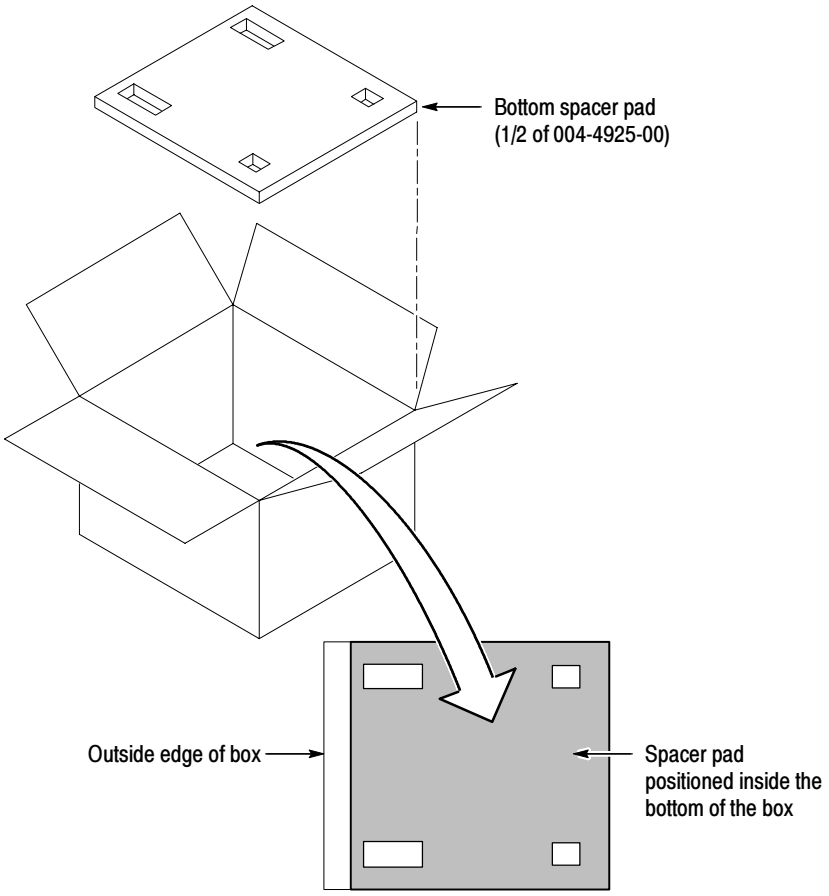


Figure 6-2: Placement of bottom spacer pad in inner shipping box

3. Place the MTS300 system in the protective bag. The bag prevents dust, moisture, or other debris from entering the cabinet.

4. Fold the top of the bag neatly over the top of the MTS300 system to make it as flat as possible and seal with packing tape.

5. Place the bagged MTS300 system in the inner shipping box. The small feet on the bottom of the cabinet go in the square holes in the spacing pad and the larger feet near the front of the MTS300 system go in the larger rectangular holes. The bezel end of the cabinet fits over the edge of the spacer pad.

6. Place the other spacer pad on top of the MTS300 system. Place the side with the small square holes against the side of the box. The protective front cover on the bezel of the MTS300 system is not covered by the top spacer pad.

7. Close and tape the inner shipping box.

8. Place one of the support inserts in the bottom of the outer shipping box, film side up as shown in Figure 6–1.

9. Place the sealed inner shipping box in the center of the bottom support insert in the outer shipping box.

10. Put the second support insert over the inner shipping box, film side down.

***NOTE**. If you are using new packing material purchased from Tektronix, pre-stretch the film in the support inserts by pushing down firmly several times on the top support insert.*

---

11. Place the top tray in the box. If you are not shipping accessories with the test system, close and tape the outer shipping box.

12. When shipping the accessories, place the two accessory trays in the top tray, arrange the accessories in the trays, and then close and tape the outer shipping box.

13. Attach the appropriate shipping documents needed to ship the MTS300 system to its destination.

Power-on Diagnostics and Troubleshooting

This subsection addresses problems that you may encounter while using the MTS300 system. This section does not identify specific problems related to performance verification or adjustments. The diagnostic procedures for the MTS300 system modules provided in this section can help you isolate problems to a specific module.

Power-on Diagnostics

Power-on diagnostics run when you first power on the instrument to start the MTS300 system applications. These diagnostics check the operating system and hardware for correct operation. If error messages occur during the power-on diagnostics, there may be a system error that prevents the MTS300 system software modules from starting.

Table 6–3 lists some of the symptoms of hardware problems (related to the operating system and peripheral devices) and possible solutions.

Table 6–4 lists the power-up error messages you may encounter and lists the associated defective module.

Table 6-3: Troubleshooting power-on failures

Symptom	Possible causes and recommended actions
Instrument does not power on	Verify that the power cord is connected to the instrument and to the power source. Check that the instrument receives power when you press the On/Standby switch; check that fans start. Check that power is available at the power source. Contact your local Tektronix service center.
Instrument powers on but does not complete the power-on sequence	Check for and remove any disk in the floppy disk drive; make sure instrument boots from the hard disk drive.
Power-on diagnostics fail	Isolate problem to faulty platform or to faulty module (see *Transport Monitor Hardware Diagnostics)*. Contact your local Tektronix service center.
Instrument does not recognize accessories such as monitor, printer, or keyboard	Check that accessories are properly connected or installed. Contact your local Tektronix service center.
Instrument will not power off with On/Standby switch	If the MTS300 system has a monitor, keyboard, and mouse connected, try powering off the instrument using the Windows NT shutdown procedure. If the instrument still does not power off, use the task manager to close down tasks. Finally, try the hard shutdown procedure; push and hold the On/Standby switch for five seconds to power off the instrument.

Table 6- 4: Power-up error messages

Error number	Test name	Error meaning and corrective action	Defective Module
0x00000001	EPLD PCI test Fail	EPLD PCI test Fail	PIA + board
		▪ No 3.3V (DC Supply board NOK not correctly configure)	
		▪ EPLD PCI not correctly downloaded	
		▪ Bad Connection EPLD PCI ↔Amcc5933	
		▪ Bad Buffer PC	
0x00000002	DPRAM to PCI access (DMA mode)	DPRAM PCI access form PC in I/O mode fail	PIA + board
		▪ Bad Connection EPLD PCI ↔ Amcc5933	
		▪ Bad Connection DPRAM PCI ↔ Amcc5933	
		▪ Buffer PC NOK	
		▪ Bad DPRAM PCI	
0x00000004	DSP start	DPRAM PCI access form PC in DMA mode fail	PIA + board
		▪ Bad Connection EPLD PCI ↔ Amcc5933 (IRQ)	
		▪ Bad Connection Amcc5933 ↔ PCI Bus (IRQ)	
0x00000008	DSP environment initialization	DSP didn't start	PIA + board
		▪ No 2.5C (DC Supply board NOK)	
		▪ Bad Connection DSP ↔ DSP Flash memory	
		▪ Bad Connection DSP ↔ DSP program SDRAM	
		▪ DSP Oscillator NOK	
0x00000010	DSP to EPLD	DSP environment can't be initialized	PIA + board
		▪ Bad Connection DSP ↔ EPLD PCI	
0x00000020	DSP Test of EPLD	DSP Test of EPLD DSP fail	PIA + board
		▪ Bad Connection DSP ↔ EPLD DSP	
0x00000040	DSP Test of SDRAM	DSP Test of its SDRAM Fail	PIA + board
		▪ Bad Connection DSP ↔ DSP program SDRAM	
0x00000100	DSP Flash memory	DSP Test of its Flash Memory	PIA + board
		▪ Bad Connection DSP ↔ DSP Flash memory	
0x00000600	Board management FPGA download	Download of Board Management FPGA Fail	PIA + board
		▪ Bad Download connection EPLD DSP ➔ Board Management FPGA	
		▪ Bad FPGA supply	

Table 6- 4: Power-up error messages (Cont.)

Error number	Test name	Error meaning and corrective action	Defective Module
0x00000A00	Hard processing FPGA download	Download of Hard Processing FPGA Fail	PIA + board
		▪ Bad Download connection Board Management FPGA ➔ Hard Processing FPGA	
		▪ Bad FPGA supply	
0x00001200	I/O board 1 FPGA download	Download of I/O board 1 FPGA Fail	PIA + board or I/O mezzanine 1
		▪ Bad Download connection Board Management FPGA ➔ I/O board 1 FPGA	
		▪ Bad FPGA supply	
0x00002100	I/O board 2 FPGA download (if a second I/O board is installed)	Download of I/O board 2 FPGA Fail	PIA + board or I/O mezzanine 2
		▪ Bad Download connection Board Management FPGA ➔ I/O board 2 FPGA	
		▪ Bad FPGA supply	
0x00004100	PCI alignment FPGA download	Download of PCI Alignment FPGA Fail	PIA + board
		▪ Bad Download connection Board Management FPGA ➔ PCI Alignment FPGA	
		▪ Bad FPGA supply	
0x00008100	Memory buffer FPGA download	Download of Memory Buffer FPGA Fail	PIA + board
		▪ Bad Download connection Board Management FPGA ➔ Memory Buffer FPGA FPGA	
		▪ Bad FPGA supply	
0x00000400	Board management FPGA	Test of Board Management FPGA Fail	PIA + board
		▪ Bad connection DSP ↔ Board Management FPGA	
		▪ Buffer DSP NOK	
0x00000800	Hard Processing FPGA	Test of Hard Processing FPGA Fail	PIA + board
		▪ Bad connection DSP ↔ Hard Processing FPGA	
		▪ Buffer DSP NOK	
0x00001000	I/O board 1 FPGA	Test of I/O board 1 FPGA Fail	I/O mezzanine 1
		▪ Bad connection DSP ↔ I/O board 1 FPGA	
		▪ Buffer DSP NOK	

Table 6- 4: Power-up error messages (Cont.)

Error number	Test name	Error meaning and corrective action	Defective Module
0x00002000	I/O board 2 FPGA	Test of I/O board 2 FPGA Fail	I/O mezzanine 2
		▪ Bad connection DSP ↔ I/O board 2 FPGA	
		▪ Buffer DSP NOK	
0x00004000	PCI Alignment FPGA	Test of PCI Alignment FPGA Fail	PIA + board
		▪ Bad connection DSP ↔ PCI Alignment FPGA	
		▪ Buffer DSP NOK	
0x00008000	Memory Buffer FPGA	Test of Memory Buffer FPGA Fail	PIA + board
		▪ Bad connection DSP ↔ Memory Buffer FPGA	
		▪ Bad connection Memory Buffer FPGA ↔ BIFIFO	
		▪ Memory EPLD not correctly download	
		▪ Bad connection Memory Buffer FPGA ↔ Memory EPLD	
		▪ Buffer DSP NOK	
0x00010000	Hard Processing DPRAM	Test of Hard Processing DPRAM Fail	PIA + board
		▪ Bad connection DSP ↔ Hard Processing DPRAM	
		▪ Buffer DSP NOK	
0x00020000	PCI DPRAM by DSP	Test access of PCI DPRAM by DSP Fail	PIA + board
		▪ Bad connection DSP ↔ Hard Processing DPRAM	
		▪ Buffer DSP NOK	
0x00040000	PCI Alignment FPGA	Test access to PCI Alignment FPGA by PC Fail	PIA + board
		▪ Bad connection Amcc5933 ↔ PCI Alignment FPGA	
		▪ PCI Alignment FPGA NOK	
0x00080000	PC to DSP	Test command from PC to the DSP fail	PIA + board
		▪ Bad connection DPRAM PCI ➔ EPLD PCI (IRQ)	
		▪ Bad connection DPRAM PCI ➔ EPLD DSP (IRQ)	
0x00200000	Transfer Data in Memory Buffer	Test Transfer Data in memory Buffer Fail	PIA + board
		▪ Bad connection BIFIFO PCI ↔ PCI Alignment FPGA	
		▪ Bad connection BIFIFO PCI ↔ FPGA Memory	

Software Problems

Your MTS300 system comes with software already installed. For any suspected software problems, try to isolate the problem to the MTS300 test system application software or to other installed software.

Many software problems are due to corrupted or missing software files. In most cases the easiest way to solve software problems is to reinstall the software and follow the on-screen instructions. See *Software Repair and Recovery* starting on page 6–23.

If you suspect networking problems, see *Network Troubleshooting* beginning on page 6–14.

Hardware Diagnostics

Hardware problems can have several causes. Review the installation instructions in this manual to verify that you have properly installed the instrument. If you are certain that you have installed the instrument correctly, run the Hardware Diagnostics application to identify problems with the individual MTS300 system modules.

The MTS300 system ships with a Hardware Diagnostic application that tests several MTS300 system hardware components. If you think that you have a problem associated with the one of the following hardware components of the MTS300 system, use the procedure described in the *Performance Verification* section of this manual to run the Hardware Diagnostic application:

- Analysis board
- I/O board
- I/O connectors

Network Troubleshooting

Networks are based on standards; however, there are many unique characteristics of each network (LAN or WAN) that make it difficult to troubleshoot without a thorough knowledge of the specific network. Consequently, in-depth network troubleshooting should be performed by an expert who knows your network characteristics.

This subsection provides some basic procedures that can eliminate some of the more common sources of network errors. The information in this section is organized as indicated in the following list:

- *Basic Requirements*
- *IP Parameters*
- *Common Troubleshooting Procedures*
- *Sources of Information*

If you cannot resolve problems using the procedures described in this section, see your network administrator.

Refer to *Networking* on page 2–12 for information about installing the MTS300 system into a network.

Basic Requirements

Fulfill the following requirements before troubleshooting your host machines:

- Configure your MTS300 MPEG Test System for use on the network as described in *Network Requirements* on page 2–12.
- Ensure that any applications that you may have loaded on your test system since receiving it are not using the ports assigned to the test system components.

IP Parameters

The illustrations in this section depict how each IP parameter (IP address, subnet mask, and default gateway) can negatively impact network connectivity.

Incorrect IP address. If the IP address for your test system is incorrect (not unique), then you may, or may not be able to communicate over the network. In Figure 6–3, TVTest_1 uses the same IP address as Rennes. If Rennes is started first, TVTest_1 will recognize the IP address conflict and will not load TCP/IP; consequently, the MTS300 system will not be reachable over the network.

If your IP address is incorrect, and the IP address does not exist on your subnet, you may be able to communicate from the device (MTS300 system or monitoring station), but you may not be able to communicate with the device.

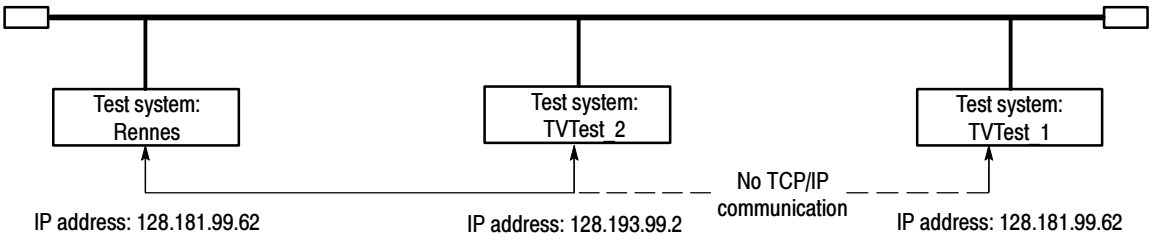


Figure 6-3: Incorrect IP address

Incorrect subnet mask. Subnets and subnetting networks is complex and requires a thorough understanding of IP addressing. Call your network administrator if you think your networking problem involves subnets. Figure 6–4 shows a simple (and fairly common) subnet mask problem.

In Figure 6–4, the subnet mask for TVTest_1 indicates that the network address is contained in the first two bytes of the IP address. In dotted decimal notation, the network address is 128.181. This information allows the device to communicate with any other device with the same network address without being routed through a default gateway.

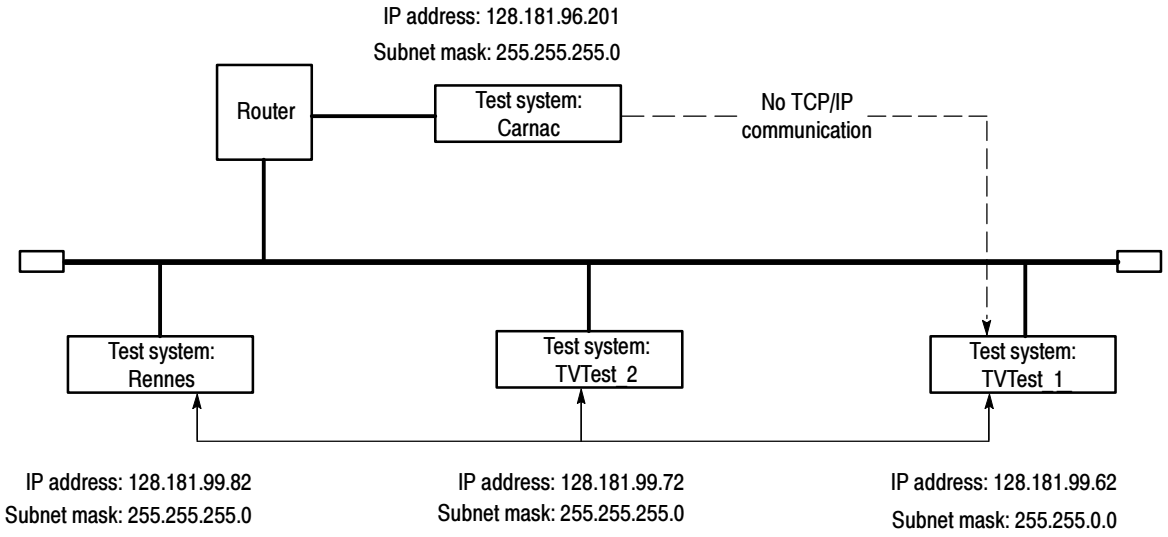


Figure 6-4: Incorrect subnet mask

TVTest_1 cannot communicate with Carnac, because, according to the subnet mask on TVTest_1, Carnac and TVTest_1 are logically on the same network. Consequently, messages sent from TVTest_1 to Carnac are never routed. Because these two devices do not share a medium, TVTest_1 will never find the correct address for the network card on Carnac and will not be able to reach Carnac.

TVTest_1 can communicate with TVTest_2 and Rennes because these three devices share a medium, so messages from TVTest_1 do not need to be routed. TVTest_1 is therefore able to find the correct addresses for TVTest_2 and Rennes in spite of having an incorrect subnet mask.

Incorrect default gateway IP address. The default gateway you have specified in the TCP/IP Properties dialog box is the device that "knows about" your subnetwork and others on your network. When you send messages (for instance traps from your MTS300 system) to a device on another subnet, the default gateway is able to route the message to the appropriate subnet. If the IP address specified in the TCP/IP Properties dialog box is incorrect, messages to devices on other subnets will not reach their destination (because they never made it to the default gateway).

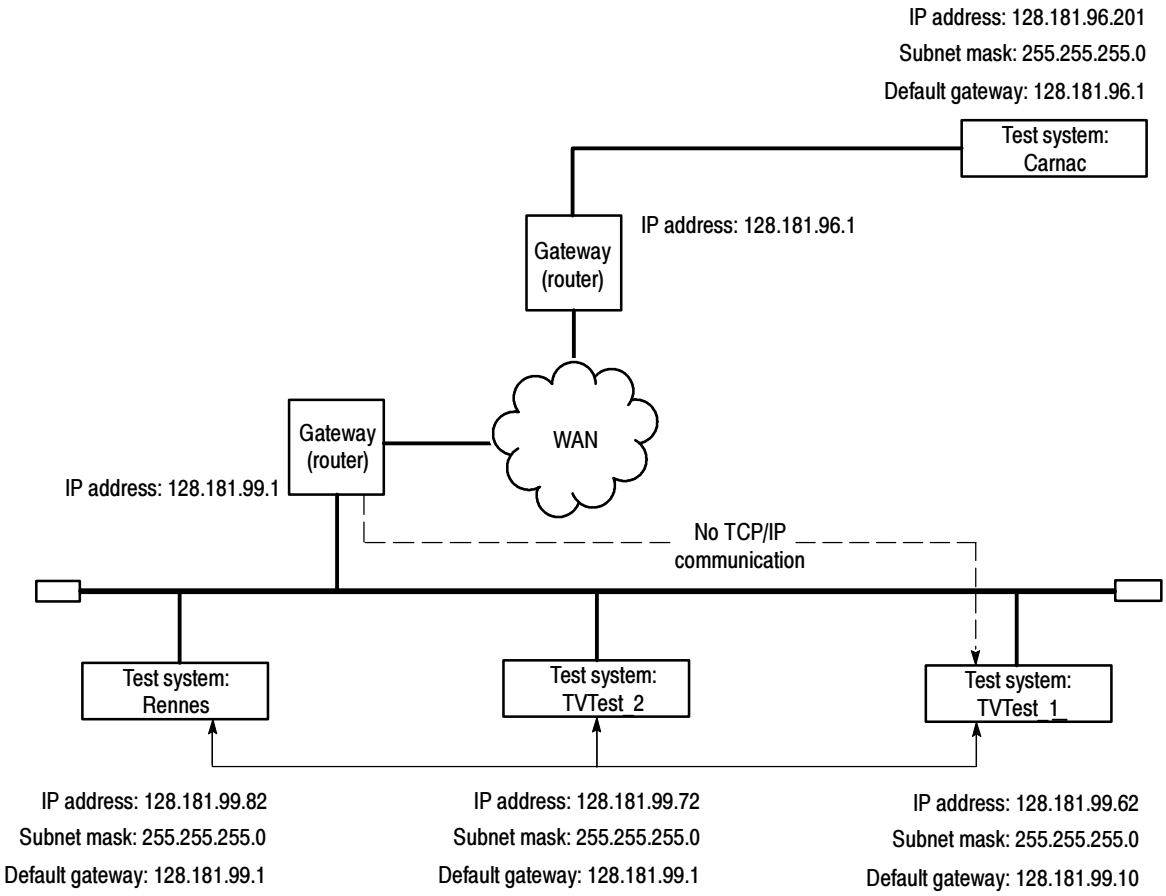


Figure 6-5: Incorrect default gateway IP address

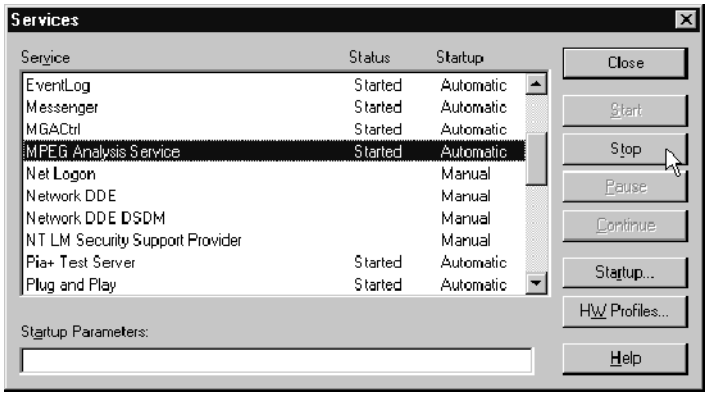
Common Troubleshooting Procedures

Many of the procedures performed in the following sections are common tasks. Use these procedures when called for in the following sections.

Stopping and restarting the MPEG Analysis Services. Usually the MPEG servers start automatically when the MTS300 system starts. However, sometimes what may at first seem to be a network problem can be cleared simply by stopping and restarting the MPEG Analysis Service.

Use the following procedure to perform this task:

1. From the NT desktop, point to **Start**, click **Settings**, and then select **Control Panel** from the submenu.
2. Double-click the Services icon. The Services Dialog box is displayed.
3. Scroll down in the list box until you can see MPEG Analysis Service.
4. Highlight this item, and then click the Stop button.



5. Click **Yes**, in the message box that appears. Notice the server icons in the system tray (the lower left of the standard test system desktop) disappearing.

6. After the services are stopped, click **Start** to restart the server processes. The Server Manager icon and the Analysis Server icons for all of your inputs will reappear in the system tray.

Finally, you can restart your MTS300 system, which will automatically restart the Server Manager and Analysis Server processes.

Pinging a host machine. One of the utilities provided with all TCP/IP installations is `Ping.exe`. (Look in the `C:\winnt\system32\` directory.) This utility allows you to send communication packets to and record the response from an indicated host machine. This, in essence, determines whether or not your packets arrived at the destination. To run ping, use the following procedure:

1. Select Run from the Start menu. The Run dialog box appears.
2. Type one of the following into the Run text box:

   ```
   ping machineName
   ```

   ```
   ping IPaddress
   ```

   In the examples, `machineName` and `IPaddress` represent the host machine name and IP address, respectively, of the networked device you are trying to ping.
3. Click OK.

   A DOS window appears indicating whether or not the destination is responding to the ping. In Figure 6-6 the destination machine (Oxford4) is not responding.

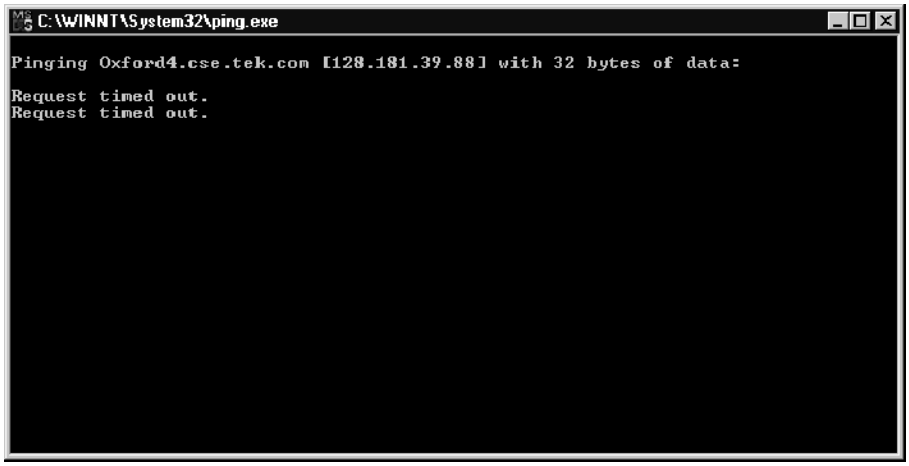


Figure 6-6: Ping.exe command window

Ping only runs briefly, and the DOS window closes when the process is complete.

Tracing the route of TCP/IP packets. Sometimes it is helpful to know how far your packets made it on the way to a destination machine and which devices the packets pass through on the way. The utility that provides this functionality is `tracert.exe`. Tracert can also indicate a congested point in the network. To run tracert, use the following procedure:

1. Select Run from the Start menu. The Run dialog box appears.
2. Type one of the following into the Run text box:

   `tracert machineName`

   `tracert IPaddress`

   In the examples, `machineName` and `IPaddress` represent the host machine name and IP address, respectively, of the networked device you are trying to reach.
3. Click OK.

   A DOS window appears (see Figure 6–7) indicating the progress of your packets. The far right column indicates the IP address of the nodes on the network that successfully pass your tracert packets. This information indicates the last good node on the path to the destination device.

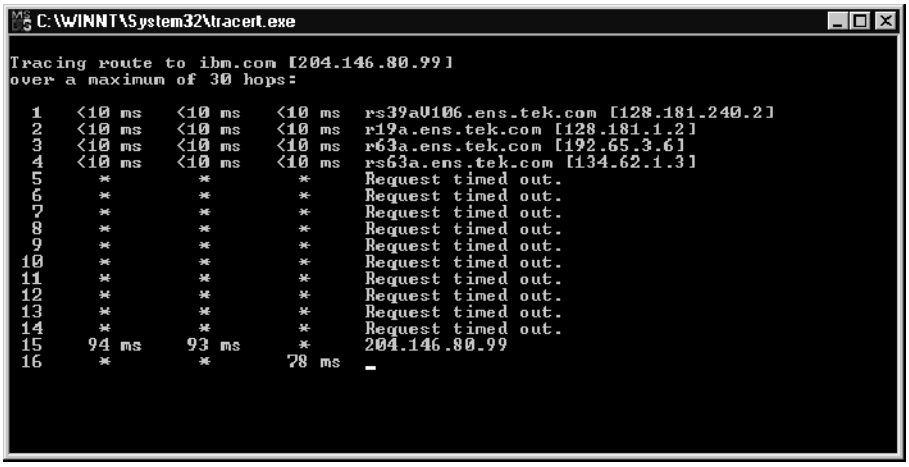


Figure 6- 7: Tracert.exe command window

Finding IP addresses for devices on your network. At times, you may need to find or confirm the IP address of a computer on your network (or, conversely, the network name if all you have is an IP address). You may want to find this information to ensure that IP addresses and network names you use in the Hosts file are correct. The utility that will display this information is `nslookup.exe`. Use nslookup as described below:

1. Point to the Start button and then select **MSDOS**. The command line interface appears.
2. Enter one of the the following and press **Enter**, where `machineName` or `IP address` is the network name or IP address, respectively, of the device you are trying to lookup.
   - `nslookup machineName`
   - `nslookup IP address`

   The network name and IP address of the device you are trying to lookup is displayed. If your network uses DNS, the IP address and network name of the DNS server is also displayed. See Figure 6-8.

Figure 6-8: Command prompt with nslookup results

Sources of Network Information

If you need more information about network troubleshooting, some potential resources are listed below.

NOTE. *These resources may provide you with more information. Most of this information is supplied as is, with no warranty as to its fitness, written or implied. The best source of network troubleshooting help is your network administrator.*

- Cisco Systems, Inc. http://www.cisco.com/

  This site is particularly useful for networks that use Cisco devices. (This URL was valid as of November, 1999.)

- Dulaney, E; Lawrence, S; Scrimger, R; Tilke, A; White, J; Williams, R; Wolford, K. *MCSE Training Guide: TCP/IP.* Indianapolis, IN. New Riders, 1998

  This is a training guide for Microsoft Certified Systems Engineer certification, and covers TCP/IP and network troubleshooting.

- Taylor, E. *Network Troubleshooting Handbook.* New York, NY. McGraw-Hill, 1999

Troubleshooting the SCSI Drives

To identify which one of the three SCSI drives is broken, perform the following steps:

1. Listen to the drives when power is supplied to the instrument. The drives should be spinning.
2. Use the Disk Administrator to unstripe the three drives, and then run the check disk utility to verify each individual drive.
3. Swap a known good SCSI drive for each of the three drives until the defective drive is identified.

Software Repair and Recovery

The MTS300 system is shipped with a 3 1/2 in floppy disk and two CD-ROMs that you will use to restore the system software and configuration when the MTS300 system has operating system or application software problems.

Use the *MTS300 MPEG Test System Operating System Recovery* CD to restore the Windows NT operating system, device drivers, and services. This CD is bootable from the CD-ROM drive of the MTS300 system.

Use the *MTS300 MPEG Test System Application Software Recovery* CD to reinstall the MTS300 application software.

Software Repair Strategy

Depending on the severity of the problem, you may need to restore only a portion of the MTS300 system software. Repair suspected software problems in the following order:

1. Restore the individual device driver or configuration setting that appears corrupt.
2. Restore the MTS300 system application software.
3. Restore the MTS300 operating system. Since restoring the operating system destroys all data on the IDE hard drive, you will have to restore the complete MTS300 system application software, restripe the SCSI hard drives, and reenter the MTS300 General License password.

The software recovery procedures in this section are divided into three sections: System Settings, Device Drivers, and Operating System and MTS300 Application Software.

Troubleshooting

Use the following troubleshooting techniques to identify drivers or services that need to be restored:

1. Restore the indicated service or driver when you observe an error message or if an attempted action fails to start.
2. When a device driver or service fails to start, Windows NT will log an event about the problem in the Event Viewer. If you suspect a software problem, but have not seen an error message, open the Event Viewer by selecting Start | Administrative Tools | Event Viewer from the Windows NT Start menu.

For example, if the audio device driver fails, an event in the log says: "The following boot-start or system-start driver(s) failed to load: auddrive."

Reinstalling the device driver or service indicated in the Event Viewer will repair most driver or service problems of this kind.

3. If new components of Windows NT are installed, such as SNMP service, some DLL file versions may not match. If you observe an error message about missing or corrupt DLL files, start by restoring the Windows NT service pack (see *Restoring Microsoft Windows NT Service Pack 6a* beginning on page 6–38).

Restoring System Settings

You can restore the following system settings using the *MTS300 MPEG Test System Operating System Recovery* CD:

Restoring the Boot Order page 6–25
Restoring the BIOS Settings page 6–26
Restoring the SCSI Drive Controller Settings page 6–27
Restoring the SCSI Drive Stripe Set page 6–28
Restoring the Display Setting page 6–29
Restoring the COM Port Settings page 6–30
Restoring the Taskbar Auto-Hide Setting page 6–31
Restoring the Event Viewer Setting page 6–31
Restoring the Windows NT Explorer Settings page 6–32
Restoring the Boot Initialization Countdown page 6–32
Setting, Resetting, and Disabling Auto Logon page 6–33
Restoring NetBEUI Protocol page 6–35
Restoring the Microsoft TCP/IP Printing Service page 6–36
Restoring the SNMP Service page 6–37
Restoring Microsoft Windows NT Service Pack 6a page 6–38

Restoring Device Drivers

You can restore the following device drivers using the *MTS300 MPEG Test System Operating System Recovery* CD:

Restoring the Sound Chip Driver page 6–39
Restoring the Display Driver page 6–40
Restoring the Soft Power-Off Driver page 6–41
Restoring the PCI Adapter Driver page 6–41
Restoring the Touch Screen Driver page 6–43

Restoring the Operating System and MTS300 Application Software

You can restore the operating system and MTS300 application software using the following procedures:

Restoring the Operating System Software page 6–45
Restoring the MTS300 Application Software page 6–47
Entering the MTS300 General License Password page 6–51

Restoring System Settings

This section contains procedures for restoring the following system settings: boot order, BIOS, SCSI drive controller, SCSI drive stripe set, display, COM port, taskbar auto-hide, event viewer, Windows NT Explorer, boot initialization countdown, Auto Logon, NetBEUI protocol, Microsoft TCP/IP printing service, SNMP service, and Windows NT service pack 6a.

Restoring the Boot Order

By factory default, the boot order of the MTS300 system is set to the following:

1. Removable devices
2. CD-ROM drive
3. Hard drive
4. Network

By factory default, the hard disk boot order of the MTS300 system is set to the following:

1. <disk brand name and model> (IDE drive)
2. Bootable add-in cards (SCSI drives)

If either boot-order has been changed on your MTS300 system, use the following procedure to restore the factory-default boot options in the system BIOS:

1. Reboot the MTS300 system (without a recovery CD in the CD-ROM drive).

2. Press the **F2 function key** to enter the BIOS Setup utility when you are prompted in the MTS300 system start-up messages. The message will appear in the lower left of the display.

3. In the System BIOS utility window, highlight **F4-BOOT OPTIONS** and press **Enter**.

4. If the items in the BOOT ORDER list and the HARD DISK ORDER list do not match the factory-default orders listed above, use the **Up/Down** arrow keys to select a device in the desired list, and then use the **Left/Right** arrow keys to move the selected device to the factory-default position in the list.

5. After you have corrected the order of the boot lists, press the **ESC key** to return to the main menu.

6. Highlight **F10-EXIT** and press **Enter** to access the Exit menu.

7. Select **Exit Saving Changes** and press **Enter** to exit the BIOS setup utility and save changes. The MTS300 system will continue its power-on process using the new settings.

Restoring the BIOS Settings

To help restore the MTS300 system BIOS settings, the *MTS300 MPEG Test System Operating System Recovery* CD contains a CMOS NVRAM Read/Write utility program and the factory-default BIOS image.

Perform the following steps to restore the MTS300 system BIOS settings:

1. Insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system, and then reboot the instrument.
2. When the MTS300 system has booted from the recovery CD-ROM, a readme text file will be displayed. The readme text file contains instructions on how to perform various commands.
3. Type the following command in the DOS window to reprogram the CMOS NVRAM back to the factory-default setting for the BIOS:

   ```
   RESTBV14.BAT
   ```

4. When the BIOS has been successfully restored, an array of BIOS values will be displayed on the screen.
5. Reboot the MTS300 system after the BIOS value array is displayed.

Restoring the SCSI Drive Controller Settings

The MTS300 system is equipped with 3 ultra-wide SCSI hard disks. The SCSI controller must be configured with the Ultra SCSI Speed option enabled to ensure the required data-access performance to and from the SCSI hard disks.

By default, the SCSI controller has this option disabled. The MTS300 system is shipped from the factory with this option enabled. If the Ultra SCSI Speed option has been changed, either manually or by resetting the SCSI host adapter, you must restore the factory default SCSI controller settings and enable the Ultra SCSI Speed option to ensure proper performance.

Perform the following procedure to restore the SCSI controller settings back to the factory-default values and to enable the Ultra SCSI Speed option:

1. Reboot the MTS300 system without a recovery disk in the CD-ROM drive.
2. Press **CTRL+A** when you are prompted to access the SCSI Select Utilities.
3. Select **Configure/View Host Adapter Settings** in the utility window and press **Enter**.
4. Press the **F6 function key** to reset the Host Adapter settings back to the factory-default values.
5. Select **Yes** to confirm loading all of the default configuration settings.
6. Select **Advanced Configuration Options** in the utility window and press **Enter**.
7. Select the **Support for Ultra SCSI Speed** option and press **Enter**.
8. Select **Enabled** and press **Enter**.
9. Press **ESC** to return to the previous menu.
10. Press **ESC** again to return to the main utility menu.
11. Select **Yes** in the Save Changes Made? dialog box and press **Enter**.
12. Press **ESC**, and then select **Yes** in the Exit Utility? dialog box to exit the SCSI Select utility.
13. Press any key to reboot the MTS300 system using the new settings.

Restoring the SCSI Drive Stripe Set

If the three SCSI hard drives have their striped-set condition corrupted, or you have restored the operating system, all transport stream data stored on them is lost and cannot be recovered. You can use the Disk Administrator utility to restore the striped-set condition of the SCSI hard drives so that you can store new data on them.

***NOTE**. This restoration procedure will only be effective if each of the three SCSI hard drives are still functional.*

Perform the following steps to format the SCSI hard drives into a striped set:

1. Select **Start | Programs | Administrative Tools | Disk Administrator** in the Windows NT Start menu to open the Disk Administrator utility.

   The Disk Administrator will display information about each of the drives of the MTS300 system. In the utility display, disk 0 (C:) is the IDE drive containing the operating system software. Disks 1, 2, and 3 (E:) are the striped-set SCSI hard drives containing the transport stream data. The CD-ROM drive (D:) is shown at the bottom of the display.

2. Select all three SCSI hard drives (disks 1, 2, and 3). Click within the large box next to the Disk 1 label to select the disk (the outline of the box will highlight).

3. If all three SCSI disk drives do not highlight as shown in Figure 6-9, hold down the CTRL key and left-click the other two drive boxes to select all three disk drives.

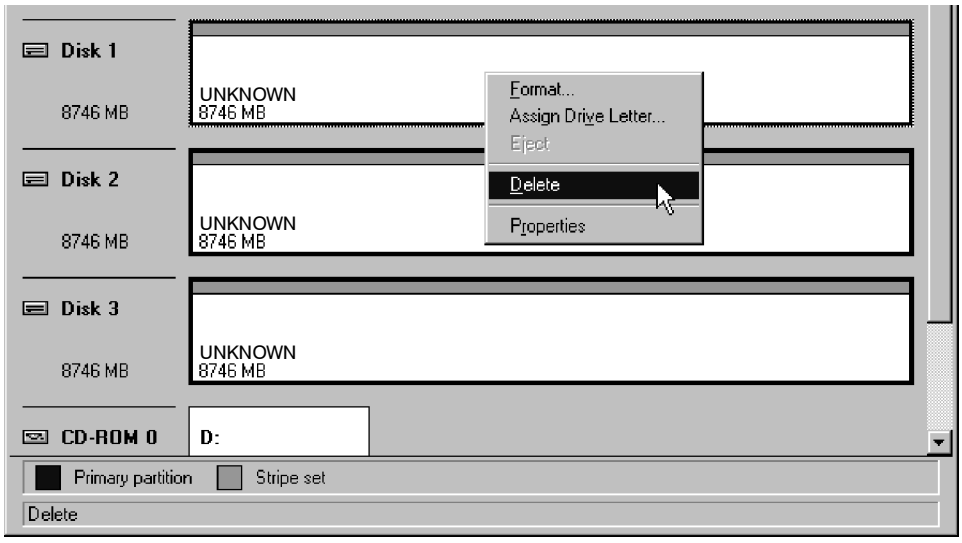


Figure 6-9: Deleting partitions using the Disk Administrator utility

4. Right-click within one of the highlighted boxes of the selected SCSI drives, and select **Delete** from the shortcut menu to delete any existing partitions on the three SCSI hard drives. Click **Yes** in the Confirm dialog box to continue.
5. Reselect the three SCSI hard drives as described above, and then select **Create Stripe Set** from the shortcut menu.
6. Click **OK** in the Create Stripe Set dialog box to create a stripe set of maximum size (the default setting in the dialog box).
7. Verify that the striped set should be displayed as unformatted logical drive E: and the CD-ROM as logical drive D:. If the drive letters are labeled incorrectly, use the menu selection **Assign Drive Letter** to change them.
8. Select the unformatted striped-set SCSI hard drives. All three drives should highlight when you click one of the drive boxes.
9. Select **Format** from the Tools menu to open the Format dialog box.
10. In the Format dialog box, select **NTFS File System**, verify that no Format Options are selected, and then click **Start**.
11. Click **OK** in the Warning dialog box to continue the formatting process. The Format dialog box will show the formatting progress. The process will take several minutes.
12. When the formatting is complete, click **OK** in the Format Complete dialog box, and then click **Close** to close the Format dialog box.
13. Exit the Disk Administrator utility.

Restoring the Display Setting

Perform the following procedure to restore the resolution and color palette settings for the display:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click **Display** in the Control Panel window to open the Display Properties dialog box.
4. Select the **Settings** tab, and then click **Display Type** to open the Display Type dialog box.
5. Set the **Desktop Area** option to **800 by 600 pixels**.
6. Set the **Color Palette** option to **16777216 colors**.
7. Click **Test** to verify the changes, and then click **OK** to apply the changes and exit the Display Properties dialog box.

Restoring the COM Port Settings

The MTS300 system uses the COM1, COM3, and COM4 ports. COM2 is not used by the MTS300 system.

Perform the following procedure to restore the COM port settings:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click **Ports** in the Control Panel window to open the Ports dialog box. The COM ports that are configured are listed in the Ports list box.
4. Delete any listed COM port other than COM1, COM3, and COM4. For example, if COM2 appears in the Ports list, highlight **COM2**, click **Delete**, and then click **OK** in the Ports Control Panel dialog box.
5. If COM1, COM3, or COM4 are not in the Ports list, click **Add** to open the Advanced Settings for New Port dialog box.
6. Use the COM Port Number list box to select the COM port number (1, 3, or 4) that the MTS300 system does not have configured.
7. Use Table 6–5 to set the proper Base I/O Port address and Interrupt Request Line (IRQ) parameter values for the selected COM port.
8. Click **OK** in the Advanced Settings for New Port dialog box. The System Setting Change dialog box will appear asking you to restart Windows NT.
9. Click **Don't Restart Now** to continue setting the remaining COM port parameters.
10. After you set the parameters for COM1, COM3, and COM4, close the Ports dialog box and reboot the MTS300 system (without a recovery CD in the CD-ROM drive) to use the new COM port settings.

Table 6-5: MTS300 system COM port settings

Parameter	COM1	COM3	COM4
Base I/O port address	03F8-03FF	03E8-03EF	02E8-02EF
Interrupt request line (IRQ)	10	04	03
FIFO	Enabled	Enabled	Enabled
Baud rate	9600	2400	9600
Data bits	8	8	8
Parity	None	None	None
Stop bits	1	1	1
Flow control	None	None	None

Restoring the Taskbar Auto-Hide Setting

The MTS300 system is shipped with the Taskbar auto-hide option enabled. This option hides the Taskbar and requires you to move the mouse cursor to the bottom of the screen to display the Taskbar. Perform the following procedure to restore the Auto-Hide setting for the Microsoft Windows NT Taskbar:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Taskbar** from the Windows NT Start menu.
3. Select the **Taskbar Options** tab of the Taskbar properties dialog box.
4. Click the **Auto hide** check box to select the option (check mark in the box).
5. Click OK to close the dialog box and apply the setting change.

Restoring the Event Viewer Setting

Perform the following procedure to restore the log size and file overwrite settings for the Event Viewer:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Programs | Administrative Tools | Event Viewer** from the Windows NT Start menu.
3. Select **Log Settings** from Log menu in the Event Viewer window to open the Event Log Settings dialog box.
4. In the Event Log Settings dialog box, select **Application** in the Change Settings For list box.
5. Set the **Maximum Log Size** option to **20480** Kilobytes.
6. Click the **Overwrite Events as Needed** option box to select the option.
7. Select **System** from the Change Settings For list box.
8. Click the **Overwrite Events as Needed** option box to select the option.
9. Select **Security** from the Change Settings For list box.
10. Click the **Overwrite Events as Needed** option box to select the option.
11. Click **OK** to close the Event Log Settings dialog box, and then select **Exit** from the Log menu to close the Event Viewer window.

Restoring the Windows NT Explorer Settings

Perform the following procedure to restore the file display settings for Windows NT Explorer:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Programs | Windows NT Explorer** from the Windows NT Start menu.
3. Select **Options** from the View menu in the Explorer window.
4. Select the View tab of the Options dialog box.
5. Select the **Show all files** option, and then deselect the **Hide file extensions for known file types** option.
6. Click **OK** to close the Options dialog box, and then select **Close** from the File menu in the Explorer window.

Restoring the Boot Initialization Countdown

The Boot Initialization Countdown setting controls the amount of time the OS Loader waits for the user to select which operating system to load while the instrument boots. The factory default setting is 3 seconds. Perform the following procedure to restore the operating system boot initialization countdown:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click the **System** icon to open the System Properties dialog box.
4. Select the **Startup/Shutdown** tab.
5. Select **3 seconds** in the **Show list for** list box.
6. Click **OK** to close the System Properties dialog box and apply the setting change.

Setting, Resetting, and Disabling Auto Logon

The Auto Logon option allows you to select a user name and password that the MTS300 system will use to automatically log on to Windows NT when you power-on the instrument. This feature is enabled at the time the instrument was manufactured. This section contains two procedures. The first procedure initializes the Auto Logon option and changes an existing Auto Logon user name and password. The second procedure disables the Auto Logon option (requiring the entry of a user name and password each time the instrument is powered on).

Setting and Resetting Auto Logon. Perform the following procedure to set or reset the automatic logon option:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Run** from the Windows NT Start menu, and then click **Browse** in the Run dialog box.
3. The Auto Logon utility is located in two directory locations:
   - **D:\Tools\Autologn.exe** of the *MTS300 MPEG Test System Operating System Recovery* CD
   - **C:\Mts300\Bin\AutoLogon.exe** on the MTS300 system
4. In the Browse dialog box, specify one of the directory paths shown above, and then click **Open**.
5. Click **OK** in the Run dialog box to run the selected Auto Logon utility. The Auto Logon dialog box will open.

CAUTION. *Entering a new user name and password will overwrite the existing user name and password used by the MTS300 system to Auto Logon.*

The default user name and password for the auto-logon feature are `Administrator` *and* `MPEG2`*, respectively.*

6. Use the Auto Logon dialog box to enter the user name and password that the MTS300 system will use to automatically logon to Windows NT when the instrument boots. The factory defaults are `Administrator` (user name) and `MPEG2` (password).
7. Click **OK** to apply the Auto Logon setting. The next time the MTS300 system boots, the new Auto Logon settings will be used.

Disabling Auto Logon. Perform the following procedure to disable Auto Logon (requiring the entry of a user name and password each time the instrument is powered on):

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Run** from the Windows NT Start menu.
3. Enter **regedt32** in the Run dialog box, and then click **Open**. This opens the Registry Editor window.
4. In the Registry Editor window, select the **HKEY_LOCAL_MACHINE on Local Machine** panel.
5. In the HKEY_LOCAL_MACHINE on Local Machine panel, select **Winlogon** in the following directory path:

   HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion
6. After you select Winlogon, the right pane of the HKEY_LOCAL_MACHINE on Local Machine panel displays the contents of the file. Highlight the line in the right pane that starts **DefaultUserName:**, and then select **Edit | Delete** from the menu.
7. Click **Yes** in the Warning message box.
8. Highlight the line in the right pane that starts **DefaultPassword:**, and then select **Edit | Delete** from the menu.
9. Click **Yes** in the Warning message box.
10. Select **Registry | Exit** from the menu to close the Registry Editor window.
11. The next time the MTS300 system boots, Auto Logon will be disabled and the user will be asked for user name and password to logon to Windows NT.

Restoring the NetBEUI Protocol

The NetBEUI protocol is a network protocol for small local networks. The NetBEUI protocol allows users to browse on a network without setting TCP/IP parameters. Perform the following procedure to restore the NetBEUI protocol:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click the **Network** icon to open the Network dialog box, and select the **Protocols** tab.
4. If **NetBEUI Protocol** is already in the Network Protocols list, highlight it and click **Remove**.
5. Click **Yes** in the message box, and then click **Close** in the Network dialog box.
6. Click **Yes** in the Network Settings Change message box to reboot the MTS300 system (without a recovery CD in the CD-ROM drive).
7. After the system has rebooted and you have logged on, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
8. Select **Settings | Control Panel** from the Windows NT Start menu.
9. Double-click the **Network** icon to open the Network dialog box, and select the **Protocols** tab.
10. In the Select Network Protocol dialog box, select **NetBEUI Protocol** in the list, and then click **OK**.
11. Verify that **D:\1386** is the path shown in the Windows NT Setup dialog box, and then click **Continue**.
12. After the protocol is installed, click **Close** to close the Network dialog box, and then remove the recovery CD from the CD-ROM drive.

***NOTE**. If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

13. Click **Yes** in the Network Settings Change message box to reboot the MTS300 system using the new settings.
14. After the MTS300 system reboots, you must perform the procedure in *Restoring Microsoft Windows NT Service Pack 6a* on page 6–38.

Restoring the Microsoft TCP/IP Printing Service

The TCP/IP printing service allows users to print over their network. Perform the following procedure to restore the Microsoft TCP/IP printing service:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click the **Network** icon to open the Network dialog box, and then select the **Services** tab.
4. If **Microsoft TCP/IP Printing** is already in the Network Services list, highlight it and click **Remove**.
5. Click **Yes** in the message box, and then click **Close** in the Network dialog box.
6. Click **Yes** in the Network Settings Change message box to reboot the MTS300 system (without a recovery CD in the CD-ROM drive).
7. After the system has rebooted and you have logged on, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
8. Select **Settings | Control Panel** from the Windows NT Start menu.
9. Double-click the **Network** icon to open the Network dialog box, and then select the **Services** tab.
10. In the Select Network Service dialog box, select **Microsoft TCP/IP Printing** in the list, and then click **OK**.
11. Verify that **D:\1386** is the path shown in the Windows NT Setup dialog box, and then click **Continue**.
12. After the service is installed, click **Close** to close the Network dialog box, and then remove the recovery CD from the CD-ROM drive.

***NOTE**. If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

---

13. Click **Yes** in the Network Settings Change message box to reboot the MTS300 system using the new settings.
14. After the MTS300 system reboots, you must perform the procedure in *Restoring Microsoft Windows NT Service Pack 6a* on page 6–38.

Restoring the SNMP Service

SNMP service is required if you are connecting the MTS300 system to your local network. Perform the following procedure to restore the SNMP service:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click the **Network** icon to open the Network dialog box, and then select the **Services** tab.
4. If **SNMP Service** is already in the Network Services list, highlight it and click **Remove**.
5. Click **Yes** in the message box, and then click **Close** in the Network dialog box.
6. Click **Yes** in the Network Settings Change message box to reboot the MTS300 system (without a recovery CD in the CD-ROM drive).
7. After the system has rebooted and you have logged on, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
8. Select **Settings | Control Panel** from the Windows NT Start menu.
9. Double-click the **Network** icon to open the Network dialog box, and then select the **Services** tab.
10. In the Select Network Service dialog box, select **SNMP Service** in the list, and then click **OK**.
11. Verify that **D:\1386** is the path shown in the Windows NT Setup dialog box, and then click **Continue**.
12. After the SNMP service is installed, the Microsoft SNMP Properties dialog box is displayed. Click **OK** to accept the default SNMP properties, or enter the specific SNMP management settings for your network. Contact your network administrator if you need assistance setting SNMP properties.
13. Click **Close** to close the Network dialog box, and then remove the recovery CD from the CD-ROM drive.

***NOTE**. If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

---

14. Click **Yes** in the Network Settings Change message box to reboot the MTS300 system using the new settings.
15. After the MTS300 system reboots, you must perform the procedure in *Restoring Microsoft Windows NT Service Pack 6a* on page 6–38.

Restoring Microsoft Windows NT Service Pack 6a

Perform the following procedure to restore the Microsoft Windows NT service pack 6a:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. After the MTS300 system boots, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
3. Select **Run** from the Windows NT Start menu.
4. Click **Browse** in the Run dialog box.
5. In the Browse dialog box, specify **d:\sp6a\sp6i386.exe** as the file you want to run and click **Open**.
6. Click **OK** in the Run dialog box to run the sp6i386.exe file. The Extracting Files dialog box displays the progress of the program.
7. Read the Windows NT Service Pack Setup license agreement. Click the **Accept the License Agreement** box, and then click **Install.**
8. The Extracting Files dialog box displays continued program progress.

CAUTION. *To prevent system problems, click* ***No*** *if you see a message about overriding the E100B.SYS file.*

9. After the installation is complete, the Windows NT Service Pack Setup dialog box appears.
10. Remove the recovery CD from the CD-ROM drive.

NOTE*. If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

11. Click **Restart** in the Windows NT Service Pack Setup dialog box to reboot the MTS300 system.

Restoring Device Drivers

This section contains procedures for restoring the following device drivers: sound chip, display, soft power-off, PCI adapter, and touch screen.

Restoring the Sound Chip Driver

Perform the following procedure to restore the ESS Technology ES1869 sound chip driver:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. Select **Settings | Control Panel** from the Windows NT Start menu.
3. Double-click **Multimedia** in the Control Panel window to open the Multimedia Properties dialog box.
4. Select the **Devices** tab, and then double-click **Audio Devices** to display the available selections.
5. Select **ES1879/1869/1878/1868/1887/1888 AudioDrive**, and then click **Remove**. Click **Yes** to remove the existing audio driver.
6. Click **Restart now** to reboot the MTS300 system.
7. After the MTS300 system reboots, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
8. Double-click **Multimedia** in the Control Panel window, and then select the **Devices** tab.
9. Select **Audio Devices**, and then click the **Add** button.
10. Select **Unlisted or Updated Driver** from the list of drives in the Add dialog box, and then click **OK**.
11. Click **Browse** in the Install Driver dialog box.
12. Select **D:** in the Drives list box, and then specify the following directory path: **D:\drivers\essaudio**.
13. Click **OK** to return to the Install Driver dialog box, and then click **OK** in the Add Unlisted or Updated Driver box to install the sound-chip driver.
14. Click **New** in the Driver Exists dialog box to use the new auddrive.dll driver.
15. Remove the operating system recovery CD from the CD-ROM drive.
16. Click **Restart now** to reboot the MTS300 system using the new ES1869 sound chip driver.

Restoring the Display Driver

Perform the following procedure to restore the Chip & Technology 69000 display driver:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. After the MTS300 system boots, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
3. Select **Settings | Control Panel** from the Windows NT Start menu.
4. Double-click **Display** in the Control Panel window to open the Display Properties dialog box.
5. Select the **Settings** tab, and then click **Display Type** to open the Display Type dialog box.
6. Click the **Change** button, and then click the **Have Disk** button in the Change Display dialog box.
7. Select **D:** in the Copy manufacturer's files from list box, and then click the **Browse** button. Select the directory path **D:\Drivers\Chipstec** in the Locate File dialog box, and then click **Open**.
8. Click **OK** in the Install From Disk dialog box (the MTS300 system will find the correct driver), and then click **OK** in the Change Display dialog box to start the driver installation.
9. After the driver is successfully installed, remove the operating system recovery CD from the CD-ROM drive.
10. Close the Display Properties dialog box, and then click **Yes** in the System Settings Change dialog box to reboot the MTS300 system using the new display driver.

NOTE. *If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

11. After the MTS300 system reboots, you must perform the procedure in *Restoring the Display Setting* on page 6–29 to restore the display setting.

Restoring the Soft Power-Off Driver

Perform the following procedure to restore the soft power-off driver:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. After the MTS300 system boots, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
3. Select **Programs | Command Prompt** from the Windows NT Start menu.
4. At the command prompt, type **d:** and press **Enter**.
5. At the command prompt, type **cd drivers\poweroff** and press **Enter**. The command prompt should read D:\DRIVERS\POWEROFF.
6. At the command prompt, type **regini jamshut.ini** and press **Enter**.
7. At the command prompt, type **copy jamshut.sys c:\winnt\system32\drivers** and press **Enter**.
8. At the command prompt, type **regini jamsrv.ini** and press **Enter**.
9. At the command prompt, type **copy jamsrv.exe c:\winnt\system32** and press **Enter**.
10. After the command prompt returns, close the Command Prompt window and remove the recovery CD from the CD-ROM drive.

***NOTE**. If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

---

11. Reboot the MTS300 system (without a recovery CD in the CD-ROM drive) to use the new soft power-off driver.

Restoring the PCI Adapter Driver

Perform the following procedure to restore the Intel EtherExpress PRO/100B PCI Adapter driver:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. After the MTS300 system boots, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
3. Select **Programs | Command Prompt** from the Windows NT Start menu.

CAUTION. *To prevent installation problems with the EtherExpress driver, follow this procedure and copy the driver from the CD to a location on the MTS300 system hard drive before you install the driver. Installing the driver directly from the recovery CD may result in the PCI adapter driver not functioning properly.*

4. At the command prompt, type **copy d:\drivers\etherexp c:\temp** and press **Enter**.
5. Select **Settings | Control Panel** from the Windows NT Start menu.
6. Double-click **Network** in the Control Panel window to open the Network dialog box, and the select the **Adapters** tab.
7. Select the displayed driver and click **Remove**. Click **Yes** in the Warning dialog box.
8. Remove the operating system recovery CD from the CD-ROM drive.

NOTE*. If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

9. Close the Network dialog box and click **Yes** in the Network Settings Change dialog box to reboot the MTS300 system.
10. While the MTS300 system boots, click **OK** to continue through any service or driver error messages that appear.
11. After the MTS300 system boots, select **Settings | Control Panel** from the Windows NT Start menu.
12. Double-click **Network** in the Control Panel window to open the Network dialog box, and the select the **Adapters** tab.
13. Click **Add** in the Network dialog box, and then click **Have Disk** in the Select Network Adapter dialog box.
14. Type **c:\temp**, click **OK** in the Inset Disk dialog box, and then click **OK** in the Select OEM Option dialog box.
15. Select **(1) Intel(R) PRO/100B PCI Adapter (TX)** in the Network Adapters list and click **Update**.
16. Specify **c:\temp** as the directory location for the driver in the Windows NT Setup dialog box, and then click **Continue**.
17. Click the **Bindings** tab in the Network dialog box to update the Network bindings, and then click the **Protocols** tab.

18. Select **TCP/IP Protocol** in the Network Protocols list, and then click **Properties** to open the Microsoft TCP/IP Properties dialog box.
19. Select the **IP Address** tab, and then select **(1) Intel(R) PRO/100B PCI Adapter (TX)** in the Adapter list box.
20. If you are not going to use the MTS300 system on a network, enter **1.1.1.1** in the IP Address box.
21. If you are using the MTS300 system on a local network, enter the network IP address, subnet mask, and default gateway your network administrator assigned to your MTS300 system.
22. After you enter your network IP address parameters, click **Apply** to apply the changes, and then click **Close** to close the Network dialog box.
23. Reboot the MTS300 system (without a recovery CD in the CD-ROM drive).

Restoring the Touch-Screen Driver

Perform the following procedure to restore the Touch-Base SC3 Touch-Screen driver:

1. Boot up the MTS300 system (without a recovery CD in the CD-ROM drive).
2. After the MTS300 system boots, insert the *MTS300 MPEG Test System Operating System Recovery* CD into the CD-ROM drive of the MTS300 system.
3. Select **Run** from the Windows NT Start menu.
4. Click **Browse** in the Run dialog box.
5. In the Browse dialog box, specify **d:\drivers\touchbas\tnsetup.exe** as the file you want to run and click **Open**.
6. Click **OK** in the Run dialog box to run the tnsetup.exe file. The TNdriver Setup window opens.
7. Click **OK** to select **c:\win32app** (default selection) as the directory location for the touchscreen control files to be located.
8. Read the License Agreement and then click **Agree** to continue.
9. Select **Dynapro – Serial, SC3** in the Select Touchscreen dialog box, and then click **OK**.
10. Click **OK** to select **Touch** (default selection) as the group where the touchscreen control program will be located.
11. Click **OK** in the Hardware Configuration dialog box to open the Hardware Controls (Serial) dialog box.

12. Use Table 6–6 to set the touchscreen parameters in the Hardware Controls (Serial) dialog box, and then click **OK**.

Table 6-6: Touchscreen driver hardware settings

Parameter	Setting
Com Port	Com 3
Configuration address	3E8
Configuration Irq	4
Baud rate	2400
Parity	None
Data bits	8
Stop bits	1

13. Read the Readme file, click **OK**, and then click **OK** in the Installation complete dialog box.

14. Remove the operating system recovery CD from the CD-ROM drive, and then reboot the MTS300 system.

NOTE. *If you do not remove the operating system recovery CD from the CD-ROM drive, the MTS300 system will boot using the recovery CD.*

15. After the MTS300 system reboots, select **Programs | Touch | Touchscreen Control** from the Windows NT Start menu.

16. In the resulting Touch Screen Control Program window, click **Calibrate**.

17. Follow the displayed instructions to calibrate the touch screen. Click **OK** when the calibration is complete.

18. Click **User Controls** in the Touch Screen Control Program window to display the User Controls dialog box.

19. In the User Controls dialog box, click the **Sound** option box to deselect the option (no check mark in the Sound box), and then click **OK** to close the User Controls dialog box.

NOTE. *Having the Sound option deselected (no sound) is the factory-default setting. You can select the Sound option if you want the MTS300 system to beep each time you make a touchscreen selection.*

20. Select **File | Exit** to close the Touch Screen Control Program window.

Restoring the Operating System and Application Software

In some situations, such as a power interruption or accidental deletion of files, the MTS300 system may fail to boot from the hard drive. To recover, you must use the *MTS300 MPEG Test System Operating System Recovery* CD to restore the hard drives back to their factory-default installation status.

The MTS300 system contains one IDE hard drive with a single partition, and three SCSI hard drives that are striped as a single logical drive to obtain high data-storage rates. The IDE hard drive is used to store the MTS300 system and application software. The SCSI hard drives are used to store and generate transport streams. The SCSI drive stripe-set and the IDE hard drive are formatted using the NTFS file system.

***NOTE**. If you restore the Microsoft Windows NT operating system, you must also restripe the SCSI hard drives, restore the MTS300 system applications, and enter the General License password for the MTS300 system.*

Software Repair Strategy

Depending on the severity of the suspected software problem, you may only need to restore a portion of the MTS300 system software. Since restoring the operating system destroys all data on the IDE hard drive, the procedure in this section should be used only as a last resort.

It is recommended that you attempt to repair suspected operating system problems in the following order:

1. Restore the individual device driver or configuration setting that appears to be not functioning properly.
2. Restore the MTS300 system application software.
3. Restore the MTS300 operating system. Since restoring the operating system destroys all data on the IDE hard drive, you will have to restore the complete MTS300 system application software, restripe the SCSI hard drives, and reenter the MTS300 General License password.

Restoring the Microsoft Windows NT Operating System

This procedure will be effective only if the IDE hard drive is still functional. If the MTS300 system does not boot after you perform this procedure, contact a Tektronix, Inc. representative for assistance.

CAUTION. *Restoring the MTS300 operating system software will destroy all existing data on the MTS300 system IDE hard drive and will restore only the operating system(s) that were originally factory installed on the MTS300 system.*

If you restore the operating system, you must also perform the procedures listed below in the order indicated:

1. *Installing the MTS300 System Applications* *page 6–47*
2. *Entering the General License Password* *page 6–51*
3. *Restoring the SCSI Drive Stripe Set* *page 6–28*

To restore the content of the MTS300 system IDE hard drive, which includes the Microsoft Windows NT 4.0 operating system and the MTS300 MPEG Test System applications, perform the following steps:

1. Install the *MTS300 MPEG Test System Operating System Recovery* CD in the CD-ROM drive of the MTS300 system, and then boot the MTS300 system.

NOTE. *If the MTS300 system does not boot from the CD-ROM drive, verify that the MTS300 system boot order is properly set. Refer to* Restoring the Boot Order *on page 6–25. If the MTS300 system still does not boot from the CD-ROM drive, contact a Tektronix, Inc. representative for assistance.*

2. After you read the displayed instructions, enter **RESTSYS** at the DOS prompt and press the **Enter** key to run the RESTSYS.BAT file.
3. Read the PowerQuest (R) EasyRestore (TM) End User License Agreement. You can press any key to continue reading through the software license.
4. After you finish reading the license agreement, click **Continue** to start the software recovery process, or click **Cancel** to exit the recovery program.
5. A Warning dialog appears to warn you that continuing the recovery process will destroy all data on the MTS300 system IDE hard drive. This is your last opportunity to exit the operating system recovery process. Click **Yes** to continue the recovery process or click **No** to exit the process.
6. When the operating system recovery starts, a window displays the progress of the recovery process. The DOS prompt returns when the process is completed. The restore process should take less than 15 minutes.

7. Remove the operating system recovery CD from the CD-ROM drive, and then reboot the MTS300 system.

8. After the MTS300 system reboots, you must perform the procedures listed in the previous *Caution* note.

Installing the MTS300 System Application Software

This section describes how to reinstall the MTS300 application software. You must install the application software if you have restored the MTS300 operating system software.

***NOTE**. You must install the Software Protection key supplied with your MTS300 system before you install the MTS300 application software. Install the Software Protection key (see Figure 6–10) on the rear-panel printer port of the MTS300 system (see Figure 2–1 on page 2–2).*

Make sure that you have the General License Password document that was supplied with your MTS300 system. You may be prompted to enter the General License password after you complete the MTS300 application software installation.

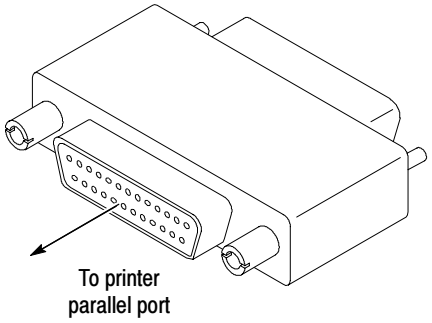


Figure 6-10: Software Protection key

Uninstalling the Existing MTS300 Application Software. If you are reinstalling the MTS300 application software without having reinstalled the operating system software, you must first uninstall the MTS300 application software before you can reinstall the software.

Perform the following steps to uninstall the MTS300 application software:

1. Boot the MTS300 system if necessary (without a recovery CD in the CD-ROM drive), or exit all open applications if the instrument is already booted.

2. Double-click the **Uninstall MTS300** icon in the Tektronix MPEG Test System program group to remove existing MTS300 application files.
3. Click **Yes** in the Confirm File Deletion message box. Click **OK** if you are notified that SNMP is being stopped.
4. Click **OK** in the Remove Programs From Your Computer dialog box when the software files have been removed, and then click **OK** in the reboot message box.

Installing the MTS300 Application Software. If you are reinstalling the MTS300 application software without having reinstalled the operating system software, you must first uninstall the existing MTS300 applications. If necessary, perform the previous uninstall procedure before you reinstall the MTS300 application software.

NOTE. *The Install shield application checks for the Java run-time environment before installing the MTS300 software. If you are prompted to install this software, run the executable in the* jre *directory on the Application CD before you perform this procedure.*

Perform the following steps to reinstall the MTS300 application software:

1. Log on to the MTS300 system using the Administrator user name and password. Refer to *Logging On* on page 2-21 for more information.
2. Select **Programs | Windows NT Explorer** from the Windows NT Start menu to open the Explorer window.
3. In the Exploring window, select **(C:)** in the drive list box, and then verify that the hard disk has at least 150 MB of free space (see Figure 6-11). You cannot install the MTS300 application software on a disk that has less than 150 MB of free space. Close the Explorer window.

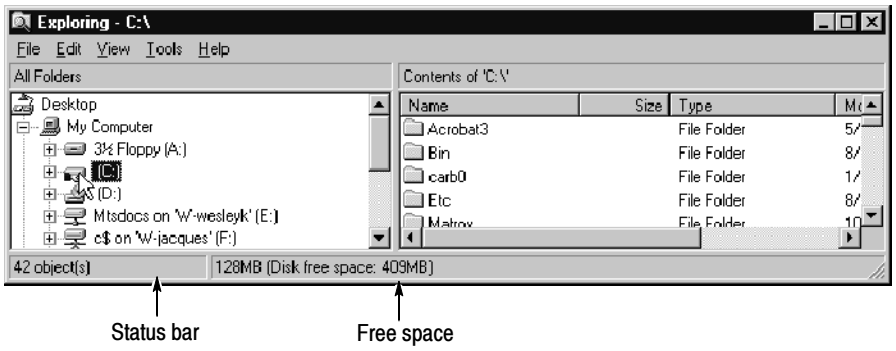


Figure 6-11: Checking the free disk space

4. Insert the *MTS300 MPEG Test System Application Software Recovery* CD into the CD-ROM drive of the MTS300 system.
5. Select **Run** from the Windows NT Start menu.
6. Enter **d:\setup.exe** in the Run dialog box, and then click **OK**.
7. Read the copyright and licensing agreement, and then click **Next**.
8. Select **MPEG Test System** in the Setup Type dialog box to restore the complete MTS300 application software, and then click Next.
9. After some files are copied, click OK in the Install message box to reboot the MTS300 system. Leave the application software recovery CD in the CD-ROM drive.
10. After the MTS300 system reboots, log on again as the Administrator as you did in step 1.
11. Click **Next** in the Second Phase of MTS300 Installation window. The installation program will show progress while files are copied.
12. Click **Yes** in the Auto Logon dialog box if you want to enable the Auto Logon feature. Click **No** if you want a manual logon process for your MTS300 system.

***NOTE**. The Auto Logon option allows you to select a user name and password that the MTS300 system will use to automatically logon to Windows NT when you power-on the instrument. You can change the Auto Logon behavior later by selecting the Auto Logon icon in the program group directory.*

---

13. If you selected the Auto Logon option, enter the Auto Logon user name and password you want to use (for example, `MTS300` with no password, which is a login supplied with all test systems), and then click **OK**.
14. Click **OK** in the Registry Editor message box.
15. In the Number of I/O Ports dialog box, select **2 I/O Ports (1 Mezzanine)** or select **4 I/O Ports (2 Mezzanines)** depending on the number of I/O ports your MTS300 system has installed
16. After you select the number of I/O ports, click **Next**, and then click **OK** in the Registry Editor message box.

17. A Command Line Interpreter (CLI) window appears indicating that DSP files are being loaded. At times while this window is displayed, you may not see any activity (this can last up to two minutes).

CAUTION. *To prevent damage to the MTS300 application software, do not close the displayed CLI window while the installation is in progress. You will be able to continue when you see the* ***Press any key to continue*** *message in the window.*

18. Press any key to continue the installation program when you see the **Press any key to continue** message in the CLI window.

19. Verify that the Software Protection key is installed on the MTS300 printer port, and then click **OK** when the Information box asks you to verify that a dongle is installed.

20. Click Finish to finish the application software installation. Select the **Readme file** option to read last minute updates to the software and to read a list of known software bugs. (You can choose to view the Readme file now, or later. It is installed in `C:\MTS300\Bin`.)

21. After you read the readme file, select the **Yes, I want to restart my computer now** option.

22. Remove the *MTS300 MPEG Test System Application Software Recovery* CD from the CD-ROM drive, and then click **Finish** to reboot the MTS300 system.

NOTE*. You must reboot the MTS300 system before you can enter the General License password or before you can use the software.*

23. The software is now installed. After the MTS300 system reboots, log on again as the Administrator as you did in step 1 on page 6–48.

Entering the General License Password

When you first receive your MTS300 system, the General License password is already installed. You will have to reenter the General License password only when you restore the MTS300 operating system software, or when you purchase a software upgrade.

Perform the remaining steps to enter the General License password:

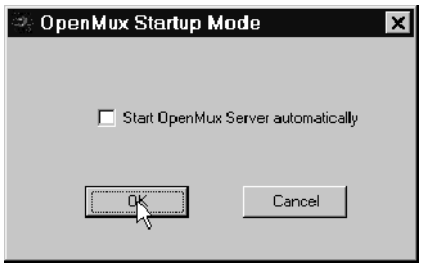
1. Double-click the **License Manager** icon in the Tektronix MPEG Test System window to start the application. The Tektronix Software Protection window appears.
2. Consult the password document supplied with your MTS300 system and identify the General License password.
3. Enter the three 6-character Hexadecimal numbers of the password in the corresponding **Tektronix Software Protection** window entry fields (lowercase characters are acceptable) and then click **OK**. A License message window appears.
4. If the password is correct, click **OK** to acknowledge the message. If you made an error entering the password, click **OK** to acknowledge the error message and return to step 2.

After you enter the correct General License password, the installation of the MTS300 application software is complete.

OpenMux Startup Mode

The OpenMux server and client are installed on each MTS300 system. If you need to reinstall the application software, the default behavior of the OpenMux server is to start when the MTS300 system boots. If your system is not licensed for this application, you need to disable this feature using the following procedure:

1. Double-click the **OpenMux Mode.exe** file located in the `C:\MTS300\Bin` directory. The OpenMux Startup Mode dialog box is displayed.
2. Clear the checkbox and click **OK** as shown in the following illustration.



Now, when the MTS300 system starts, the OpenMux server will not start with the rest of the MPEG Analysis Services.

Removal and Replacement Procedures

The following procedures tell you how to remove and replace the MTS300 system modules. Part numbers for the replaceable modules are located in the *Replaceable Mechanical Parts* section of this manual.

Replaceable Modules

The procedures for replacing the various modules of the MTS300 instrument are divided between the Mainframe modules and the MTS300 Test System modules.

MTS300 Test System Modules

In compliance with the PCI standard, the MTS300 system modules are located in the card bay of the mainframe. Procedures are provided to replace the following MTS300 Test System modules:

- PIA+ Analysis board
- I/O interface boards, including the following interfaces: ASI/M2S, SSI (SMPTE310M), DHEI (GI Digicypher), and SPI (LVDS)

Mainframe Modules

Procedures are provided to replace the following mainframe modules and assemblies:

- LCD Display assembly
- Front-panel keypad module
- Floppy disk drive/CD-ROM drive assembly
- Speaker
- Front Panel Interface board
- IDE hard disk drive
- Power supply module
- Controller board
- Processor I/O board
- Backplane board
- SCSI hard disk drives (three)

Recommended Tools

The following tools are recommended for MTS300 system module assembly removal and replacement:

- An anti-static wrist strap for safe handling of assemblies containing static sensitive devices
- A screwdriver with T10, T15, and T20 Torx tips to remove the cabinet cover and the module mounting screws.
- A 1/4 inch or larger flat blade screwdriver.
- An 8 inch adjustable wrench or appropriate size open-end wrench (an aid for cabinet removal).
- Smooth jaw pliers (example, KLEIN D306–51/2C).

Accessing Replaceable Modules

To access the replaceable modules, you must first remove either the instrument cabinet or the front-panel bezel trim ring. The replacement procedures for specific modules will refer you to the appropriate access procedure.

Removing the Cabinet

You will remove the instrument cabinet to access most of the mainframe modules and the MTS300 system application modules. Use the following procedure to remove the cabinet:

1. Put on a static grounding wrist strap.
2. Before removing the cabinet, shut down the MTS300 system and unplug the power cord.
3. Disconnect any cables connected to the rear panel connectors of the MTS300 system. Note their locations for reinstallation.
4. Put the protective front cover on the MTS300 system and sit the cabinet upright on the working surface with the rear panel facing up.
5. Remove the two screws from the handle on the right side of the instrument (see Figure 6–12). These screws attach to posts mounted on the power supply module.
6. Remove the screws from the four feet on the rear of the instrument (see Figure 6–13).

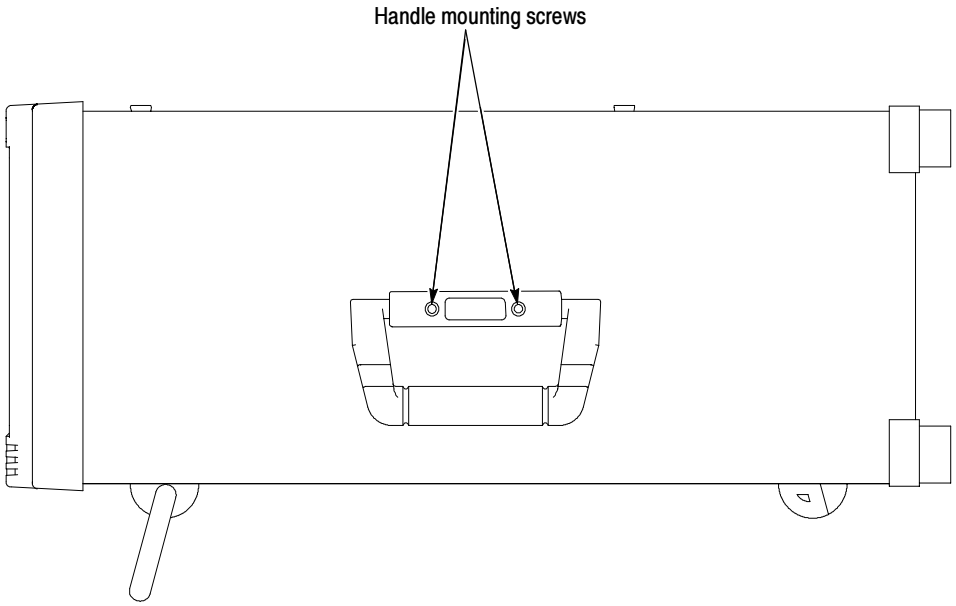


Figure 6-12: Removing the cabinet handle

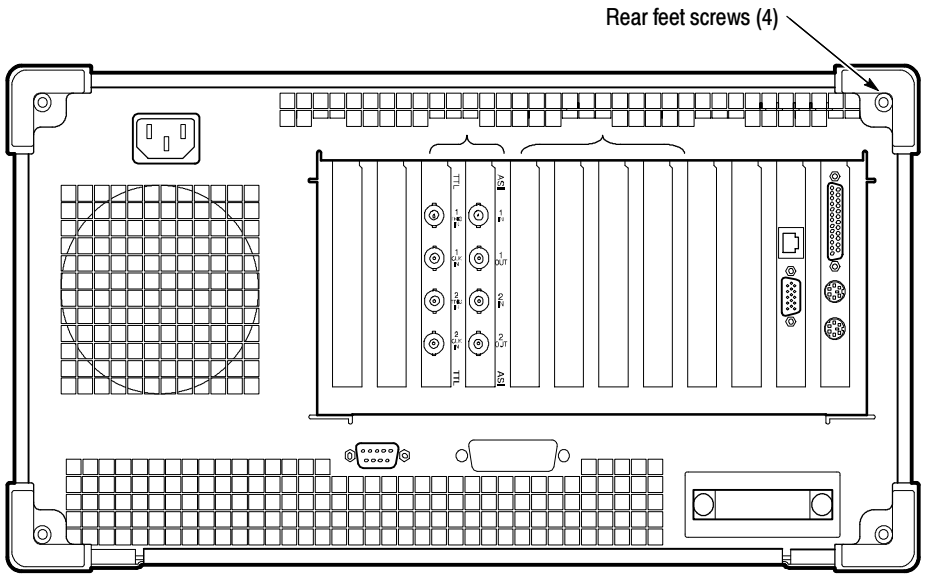


Figure 6-13: Removing the cabinet feet

7. Use either an adjustable wrench or appropriate size open-end wrench as a lever to pry the cabinet loose from the chassis. Loosen each side alternately until the cabinet is released from the EMI gasket.
8. Slide the cabinet up and off the chassis.

CAUTION. *Use care when touching the EMI shielding strips around the front of the chassis. The fingers of the strip are easily bent and any protruding sharp edges become a potential cutting hazard when you handle the chassis to position it during the remaining remove and replace procedures.*

Replacing the Cabinet

Perform the following procedure to replace the instrument cabinet:

1. Place the protective front cover on the face of the MTS300 system.
2. Position the MTS300 system face down on a stable working surface with enough head room to install the cabinet.
3. Position the cabinet correctly to install it, and slide the cabinet over the end of the mainframe chassis.
4. Slide the cabinet evenly down on the chassis making sure all the internal cables are clear and do not catch.
5. When the front of the cabinet comes in contact with the cabinet retaining tabs around the front of the chassis, make sure the edges of the cabinet go under the tabs. You may have to push on the sides of the cabinet to get all the edges under the tabs and over the EMI strips around the front of the chassis.
6. At the rear of the chassis, you may have to push on the sides of the cabinet to get the rear of the cabinet to fit over the edges of the chassis and EMI gasketing.
7. When the cabinet is completely in place on the chassis, install the four rear feet.
8. Position the handle on the left side of the chassis and replace the two screws that attach the handle to the chassis (see Figure 6–12).

Removing the Bezel Trim Ring

You will remove the front-panel bezel trim ring to gain access to the the keypad assembly, the Interface circuit board, and the CD/floppy disk drive assembly.

The front-panel bezel snaps onto the chassis. There are three snaps across the top and three across the bottom. Remove the front-panel bezel as follows:

1. Use smooth-jaw pliers to grasp the On/Stby key. Pull straight out on the key to disconnect the key cap from the switch.
2. Use your fingers to lift up on the back edge at the top of the bezel to release the bezel from the snaps. If you use a tool for leverage, be careful not to bend the fingers of the EMI shielding strips.
3. After you have released the snaps across the top, pull the top of the bezel toward you slightly to clear the chassis. This should release the bottom of the bezel from the chassis.
4. Lift the bezel off the front of the chassis.

Replacing the Bezel Trim Ring

There are three snaps across the top and three across the bottom that hold the front-panel bezel to the cabinet. Replace the front-panel bezel as follows:

1. Position the bezel trim ring over the front of the cabinet and engage the three snaps across the top of the cabinet first.
2. After you have engaged the snaps across the top, firmly press the bottom of the bezel onto the cabinet to engage the snaps across the bottom of the bezel.
3. Press on the top of the bezel again to make sure the top snaps are all completely engaged.
4. Using smooth jaw pliers to hold the key cay, position the On/Stby key cap on the switch shaft. Push straight in on the key cap to press it onto the switch shaft.
5. Insert the light pipes in the light pipe holes and snap them into place.

Replacing MTS300 Test System Modules

The MTS300 Test System modules are located in the module bay of the mainframe. The three SCSI hard disk drives are located in the compartment at the bottom of the mainframe.

Removing a Test System Module

Perform the following steps to remove an MTS300 Test System module from the mainframe module bay.

1. Remove the mainframe cabinet (see *Removing the Cabinet* on page 6–54 for the removal procedure).
2. Remove the circuit board retaining plate (see Figure 6–14).

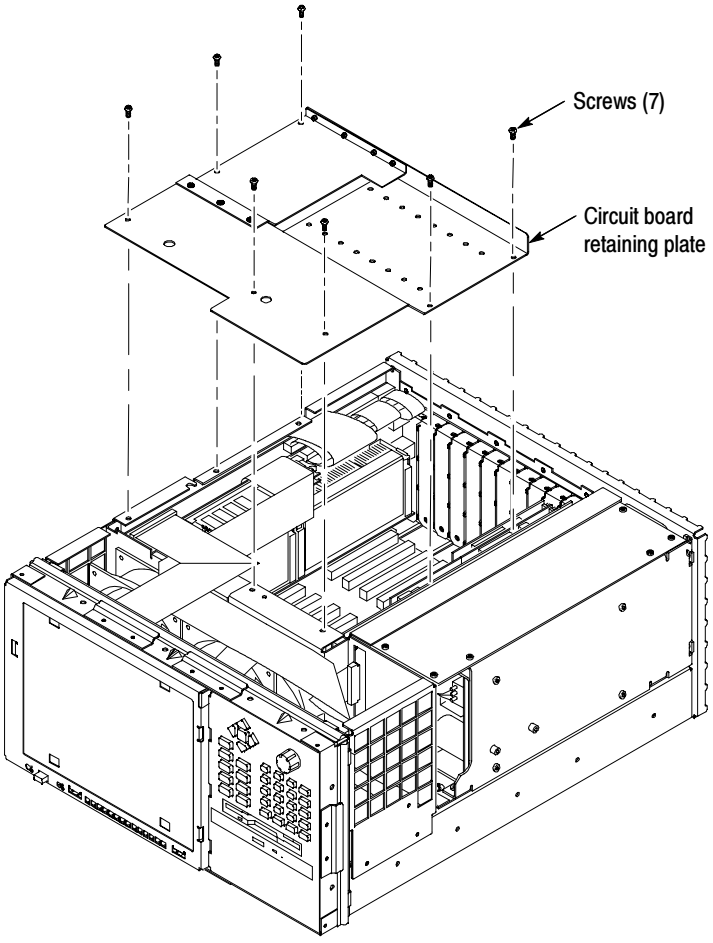


Figure 6-14: Circuit board retaining plate

3. Remove the holding screws from the top and bottom of the plug-in module you are going to remove. Also remove the holding screws for any of the I/O port connectors that may be connected to the plug-in module.
4. Carefully pull up on the module to loosen it from the backplane module connectors. You may have to alternate lifting on the front and the rear of the module to work it loose from the from the connectors and the card bay.
5. When the module is loose from the connector, lift the module out of the module bay.
6. Place the removed module on a static-free work surface or in an anti-static protection bag.

Replacing a Test System Module

Perform the following steps to reinstall an MTS300 Test System module into the mainframe module bay.

1. Insert the module into the module bay at the correct slot position.

CAUTION. *To prevent damage to the PIA+ module, be sure to properly align the module with the slot guides and to use minimum pressure when you are reinstalling the module. Figure 6–15 shows a surface-mount capacitor on the PIA+ module that can easily be damaged from improper installation.*

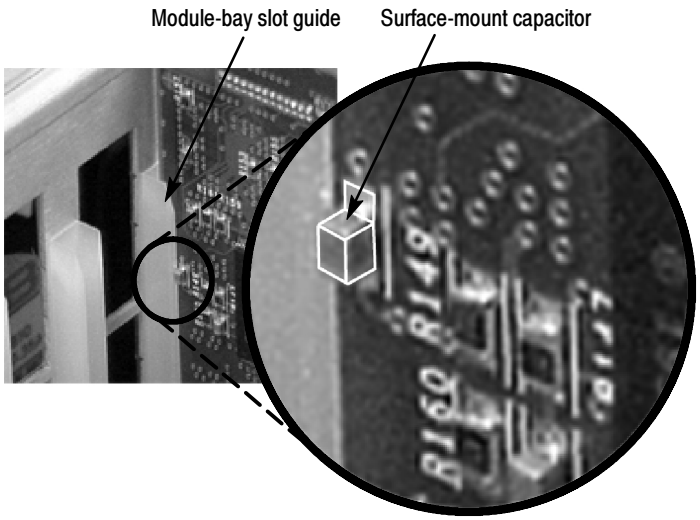


Figure 6-15: Easily damaged capacitor on the PIA+ module

2. Carefully align the module edge connector with the backplane connectors.
3. Apply firm pressure to completely seat the module in the connectors.
4. Replace the module holding screws to hold the module in the card bay. Also replace the holding screws for any of the I/O port connectors that may be connected to the plug-in module.
5. Torque the screws to 8 in-lbs.
6. Replace the circuit board retaining plate.
7. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6-56).

I/O Port Connector Configurations

Depending on which I/O port options are installed in your MTS300 system, the configuration of the I/O ports and their connections to the PIA+ module will vary. This subsection provides detailed pictures and descriptions of the various configurations so that you can reinstall the test system modules correctly.

Figure 2-4 through Figure 2-11 starting on page 2-8 show the available input and output (I/O) connector configurations on the MTS300 rear panel.

ASI/M2S or SSI (SMPTE310M) Interfaces. All MTS300 systems are shipped with either an ASI/M2S interface or an SSI (SMPTE310M) interface mounted on the PIA+ module. The PIA+ module is always installed in slot 4 of the card bay.

Figure 6-16 shows the proper connections of the clock and trigger cables for an ASI or SSI board on the PIA+ module as a reference should any of the cables come loose while you install the SPI module.

The bracket with the clock and trigger connectors mounts into the slot 3 position on the rear panel. Figure 6-17 shows the cables installed in the bracket.

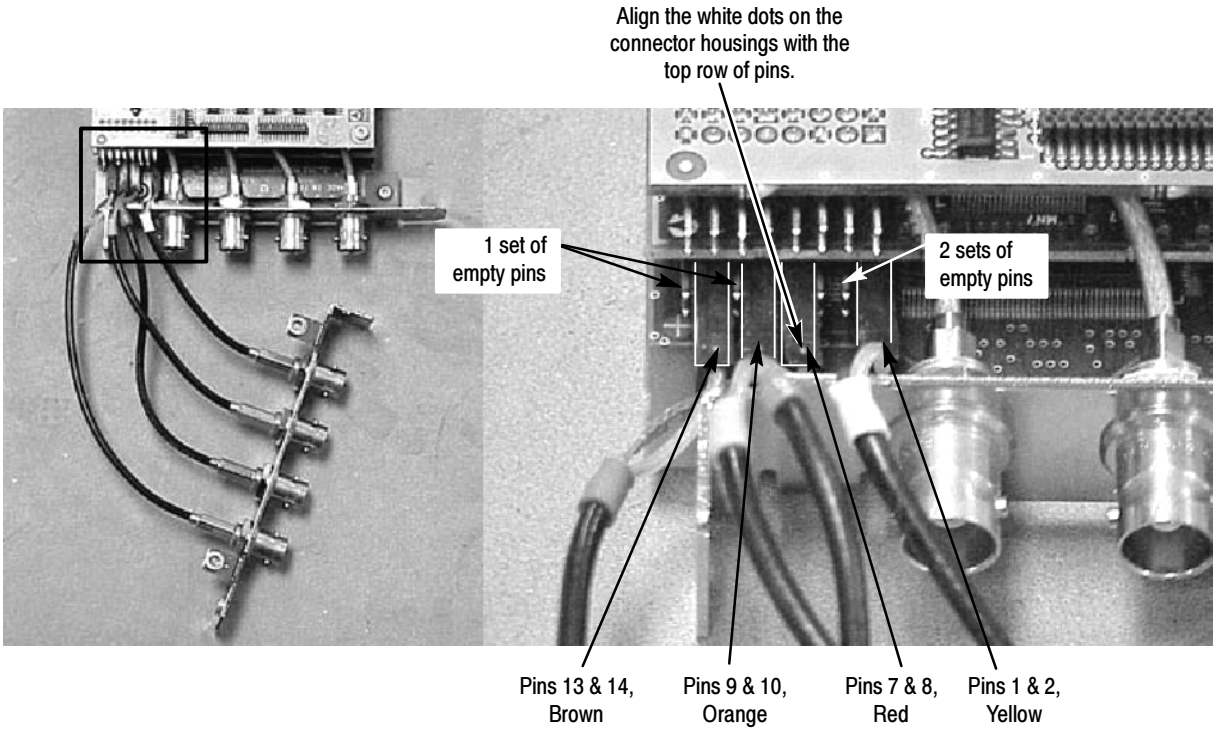


Figure 6-16: Clock and trigger cable connections for the ASI or SSI board on the PIA+ module

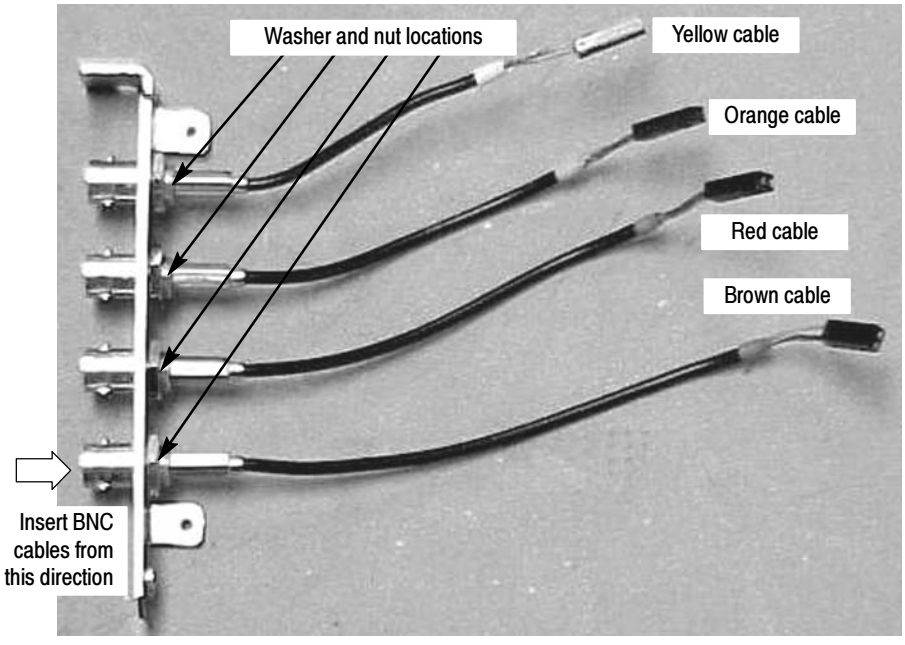


Figure 6-17: Attaching the SSI or ASI trigger and clock cables to the rear-panel bracket

For MTS300 systems with additional ASI or SSI interfaces installed (two interface pairs are possible), Figure 6-18 shows how to mount the additional interface onto the PIA+ module.

Figure 6-19 shows how to connect the clock and trigger cables to the additional interface.

Figure 6-20 shows the completed installation of an additional SSI or ASI board and rear-panel connectors.

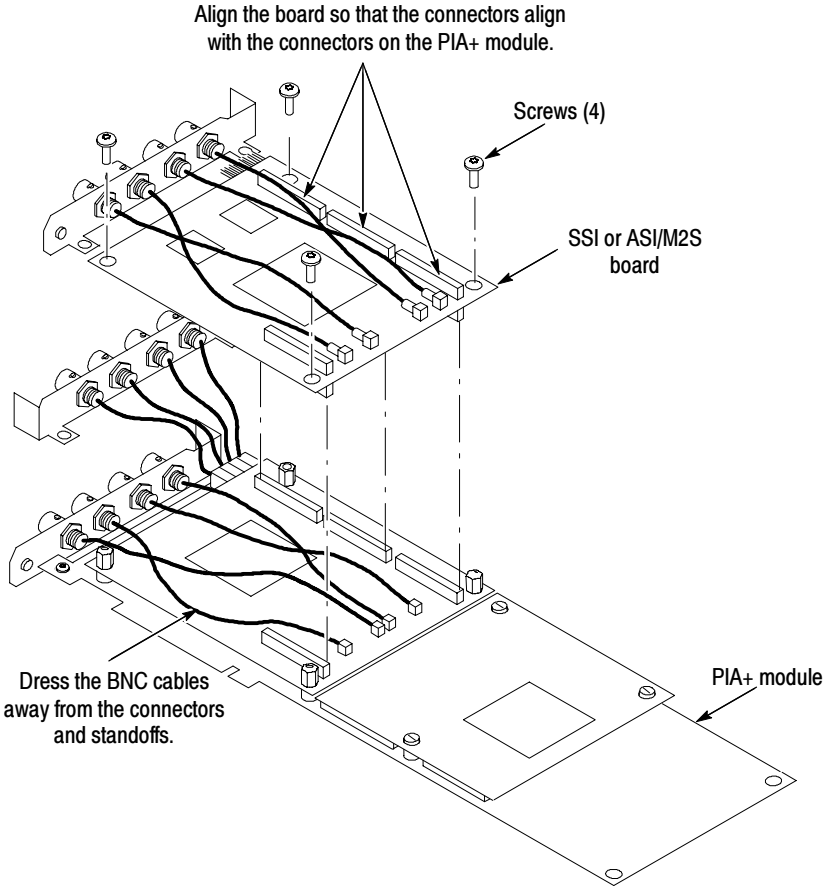


Figure 6-18: Installing an optional SSI or ASI board on the PIA+ module

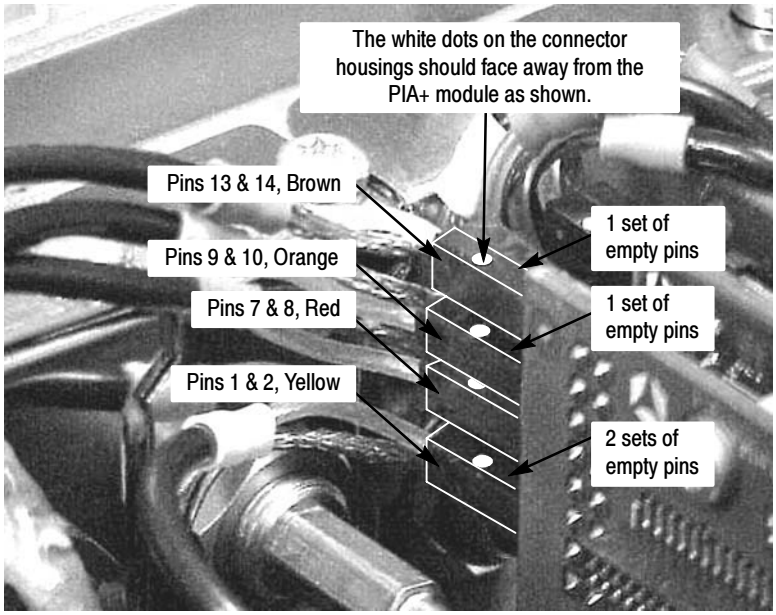


Figure 6-19: Clock and trigger cable connections on an additional SSI or ASI board

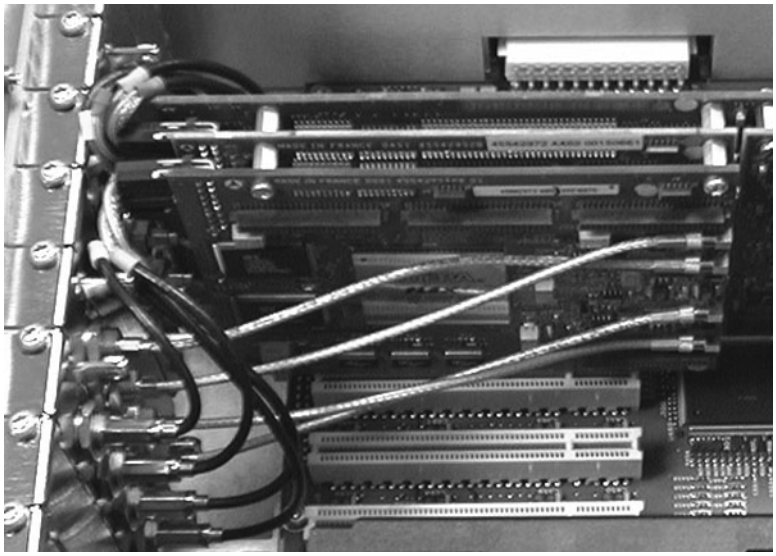


Figure 6-20: Additional ASI or SSI interface installation

DHEI (GI Digicypher) Interface. Your MTS300 system may have a DHEI interface installed in addition to an ASI or SSI interface. Figure 6-21 shows how to mount the additional interface onto the PIA+ module.

Figure 6-22 shows how to install the DHEI ribbon cable onto the DHEI board.

Figure 6-19 on page 6-63 shows how to connect the clock and trigger cables to the additional interface.

Figure 6-20 shows the completed installation of the optional DHEI board and rear-panel connectors.

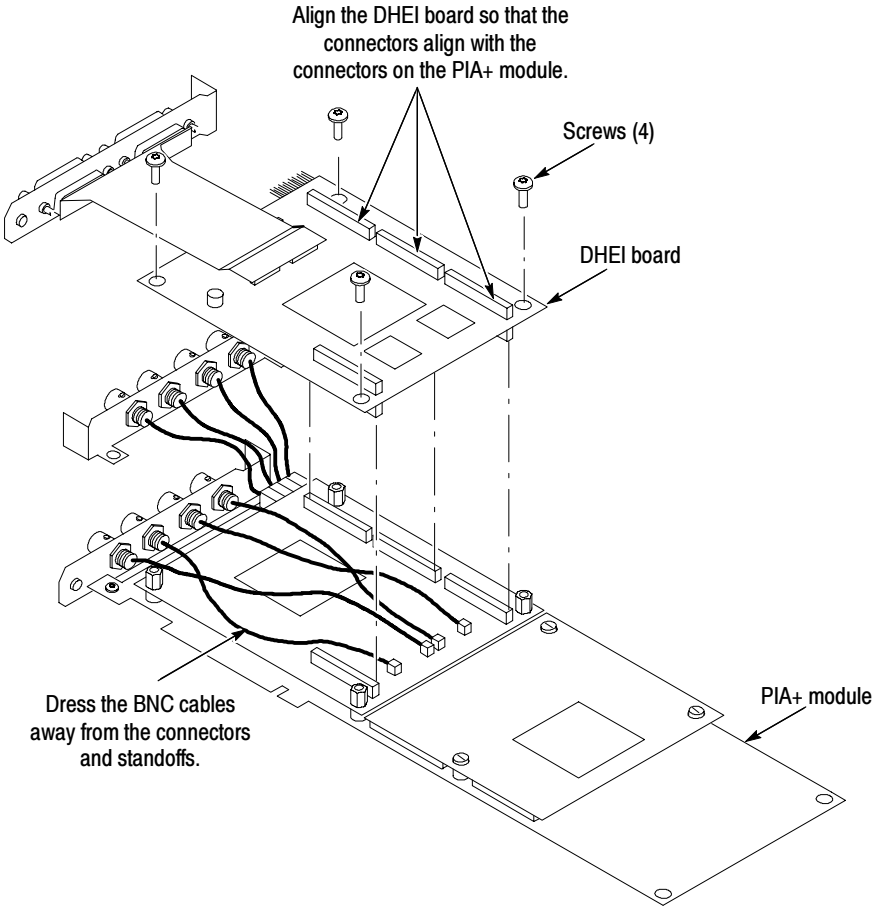


Figure 6-21: Installing the DHEI board on the PIA+ module

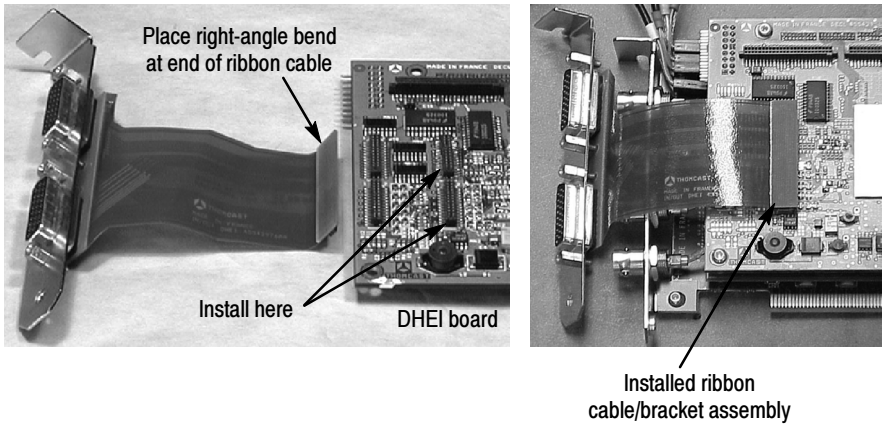


Figure 6-22: Installing the ribbon cable on the DHEI board

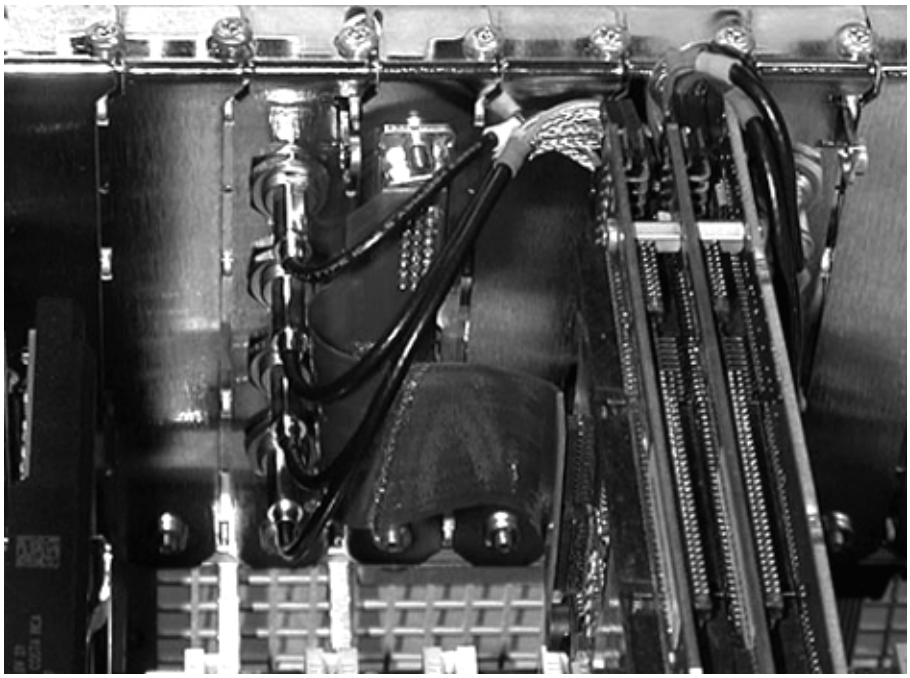


Figure 6-23: Optional DHEI interface installation

SPI (LVDS) Interface. Your MTS300 system may have an SPI (LVDS) interface installed in addition to an ASI or SSI interface. Figure 6–24 shows how to mount the additional interface onto the PIA+ module.

Figure 6–25 shows how to install the SPI I/O port cables to the rear-panel brackets.

Figure 6–26 shows how to install the SPI ribbon cables onto the SPI board.

Figure 6–19 on page 6–63 shows how to connect the clock and trigger cables to the additional interface.

Figure 6–27 shows the completed installation of the optional SPI board and rear-panel connectors.

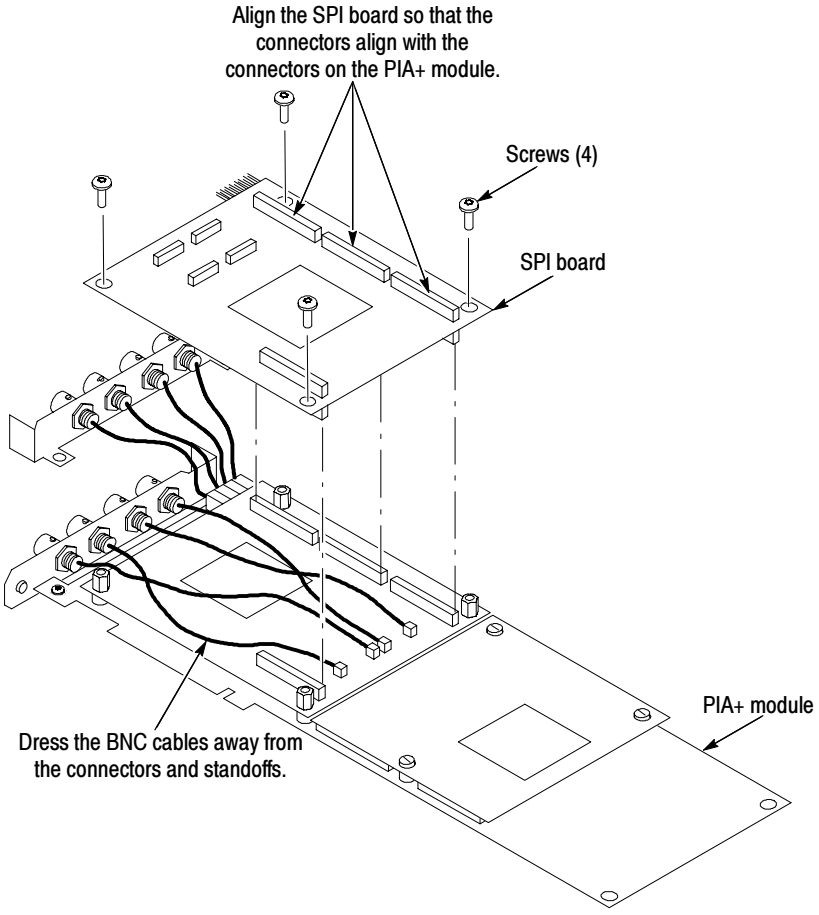


Figure 6-24: Installing the SPI board on the PIA+ module

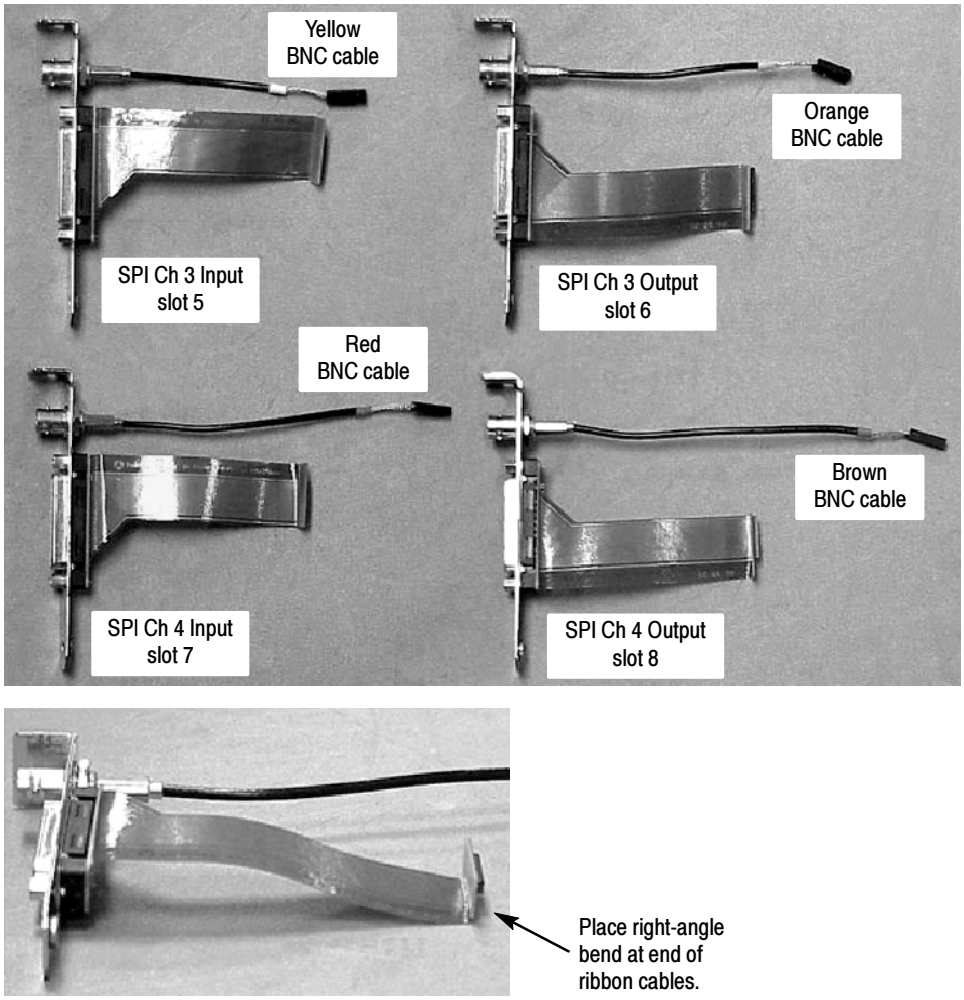


Figure 6-25: Assembling the SPI rear-panel brackets and cables

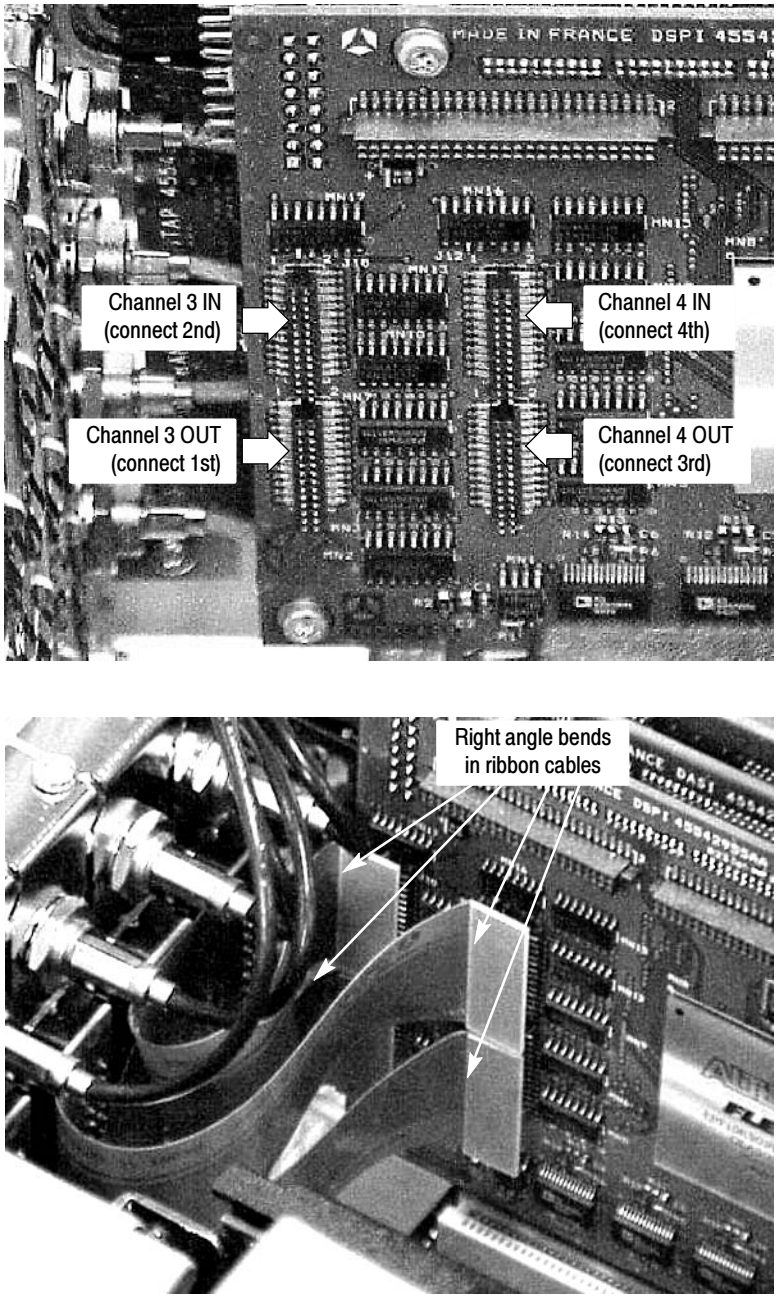


Figure 6-26: Connecting the ribbon cables on the SPI board

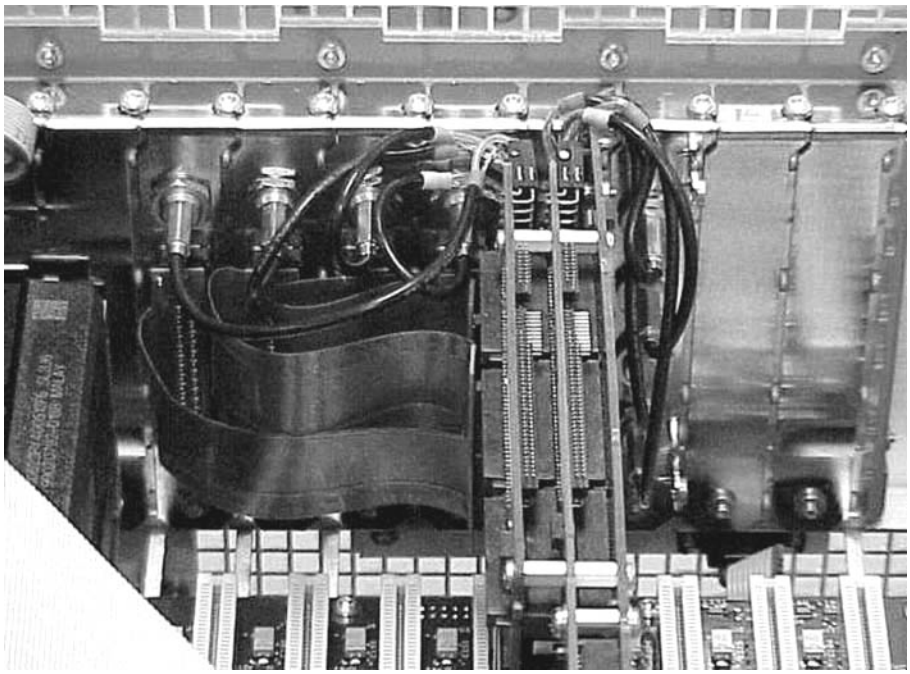


Figure 6-27: Optional SPI interface installation

Replacing Mainframe Modules

The front panel components can be removed and replaced without removing the mainframe cabinet. Removing the bezel permits access to the retaining screws that hold the covers in place.

Removing the LCD Display Assembly

Remove the LCD Display assembly as follows:

1. Remove the front-panel bezel trim ring (refer to *Removing the Bezel Trim Ring* on page 6–57).
2. Remove the six screws attaching the LCD Display assembly to the chassis. There are two screws at the top, two at the bottom, and two at the left side of the assembly (see Figure 6–28).
3. Pull the cover assembly away from the chassis.
4. Disconnect the ribbon cable from the Front Panel Interface board.

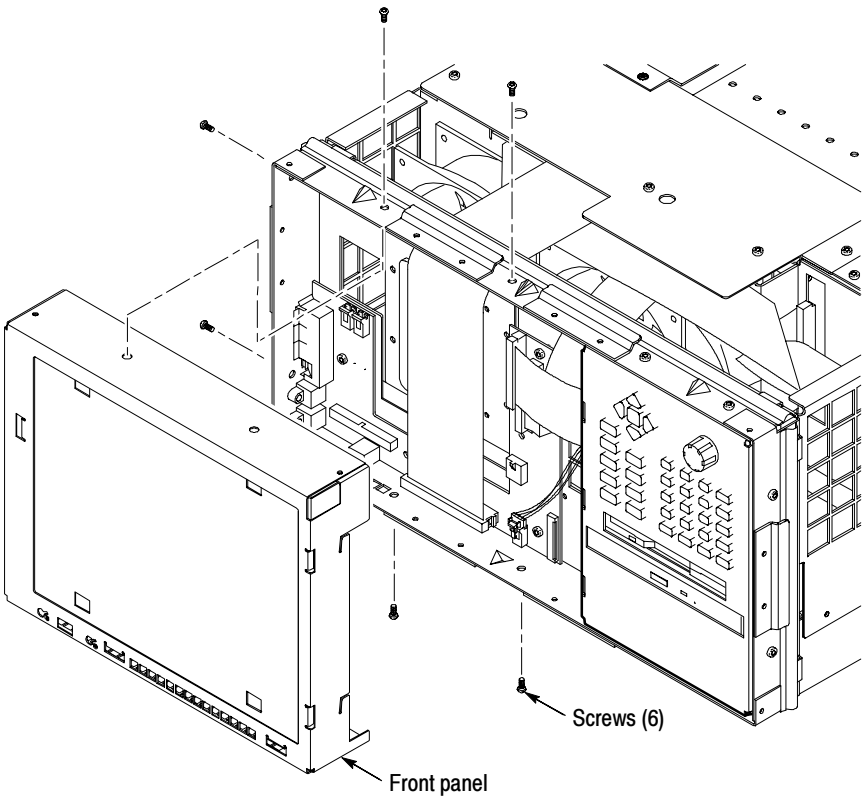


Figure 6-28: LCD Display assembly removal

Replacing the LCD Display Assembly

Make sure all of the cables to the Front Panel Interface board are properly connected before replacing the LCD Display assembly. Perform the following procedure to replace the LCD Display assembly:

1. Connect the ribbon cable to the Front Panel Interface board (see Figure 6–34 on page 6–79).
2. Carefully slide the LCD Display assembly into the chassis to align it with the mounting screw holes.
3. Install the six attaching screws; two on the top, two on the side, and two on the bottom of the chassis. Torque to 8 in-lbs.
4. Replace the front-panel bezel trim ring (refer to *Replacing the Bezel Trim Ring* on page 6–57).

Removing the Keypad Assembly

Remove the keypad circuit assembly as follows:

1. Remove the front-panel bezel trim ring (refer to *Removing the Bezel Trim Ring* on page 6–57).
2. Remove the six screws holding the keypad assembly to the mainframe chassis. There are two across the top, two across the bottom, and two on the right side of the assembly (see Figure 6–29).
3. Slide the keypad assembly out of the chassis far enough to access the interconnection cable connector on the back of the keypad circuit board.
4. Disconnect the keypad assembly cable to the Front Panel Interface board.

Replacing the Keypad Assembly

Replace the keypad assembly as follows:

1. Position the keypad assembly to slide it into the chassis.
2. Connect the keypad assembly interconnection ribbon cable to the keypad connector on keypad circuit board.
3. Carefully slide the keypad assembly into place and align the mounting screws holes.
4. Install the six attaching screws.
5. Replace the front-panel bezel trim ring (refer to *Replacing the Bezel Trim Ring* on page 6–57).

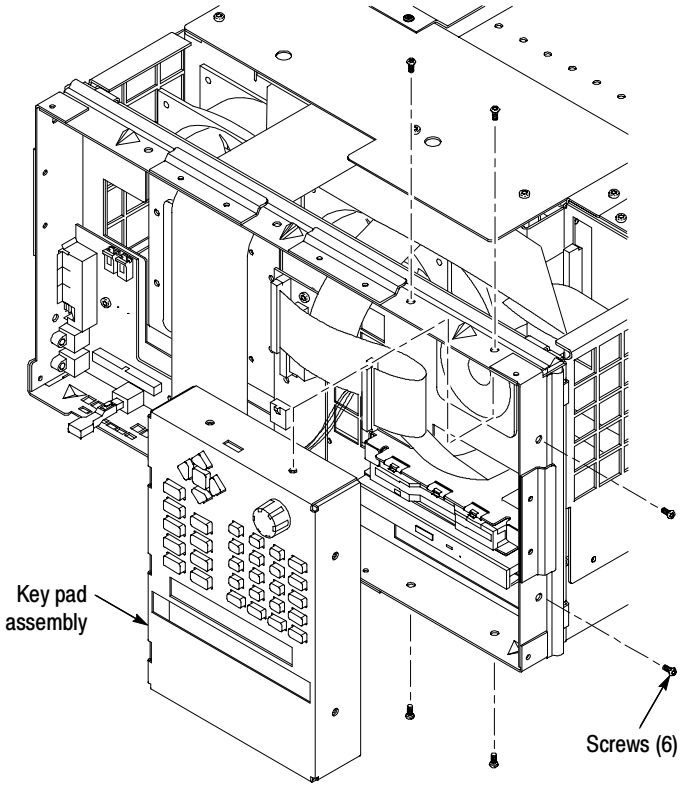


Figure 6-29: Keypad assembly removal

Removing the CD-ROM and Floppy Disk Drive Assembly

Remove the CD-ROM and floppy disk drive assembly as follows:

1. Remove the mainframe cabinet (refer to *Removing the Cabinet* on page 6–54).
2. Remove the front panel bezel (refer to *Removing the Bezel Trim Ring* on page 6–57).
3. Remove the LCD Display assembly (refer to *Removing the LCD Display Assembly* on page 6–70).
4. Remove the keypad assembly (refer to *Removing the Keypad Assembly* on page 6–71).
5. Remove the three screws attaching the CD-ROM and floppy disk drive assembly to the chassis. There are two screws on the front of the assembly and one on the rear inside the front panel compartment of the chassis.
6. Disconnect the floppy-drive cable from the floppy-drive connector. Lift up the locking latch on the floppy-drive connector to release the interconnection cable and pull up on the cable to separate it from the connector.

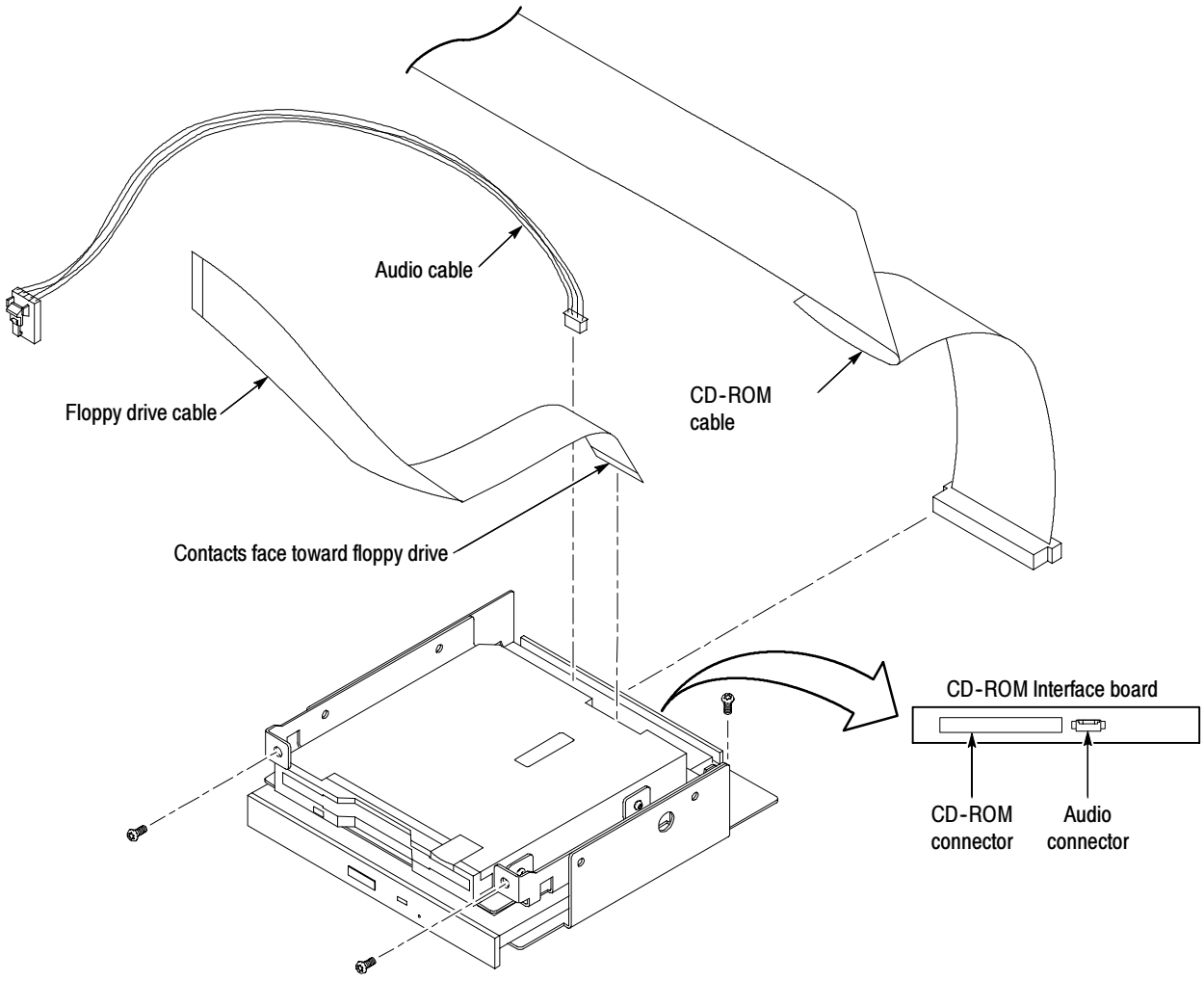


Figure 6-30: Floppy disk drive and CD audio connector installation

7. Disconnect the audio cable from the CD-ROM drive, four-pin connector (see Figure 6–30).
8. Disconnect the CD-ROM drive cable from the Controller board.
9. Slide the CD and Floppy Disk Drive assembly out through the front of the chassis. You may have to lift the front of the assembly slightly to clear the EMI shielding fingers.
10. When the CD drive cable connector is clear of the front of the chassis, carefully disconnect it from the CD drive connector adapter board.

Removing the CD-ROM Drive. The floppy disk drive and the CD-ROM drive are assembled in the same unit, but can be separately replaced. Perform the following procedure to remove the CD-ROM drive:

1. Remove the four crosstip screws that hold the CD-ROM drive to the chassis.
2. Slide the CD-ROM drive out of the lower bay of CD-ROM and floppy drive chassis.

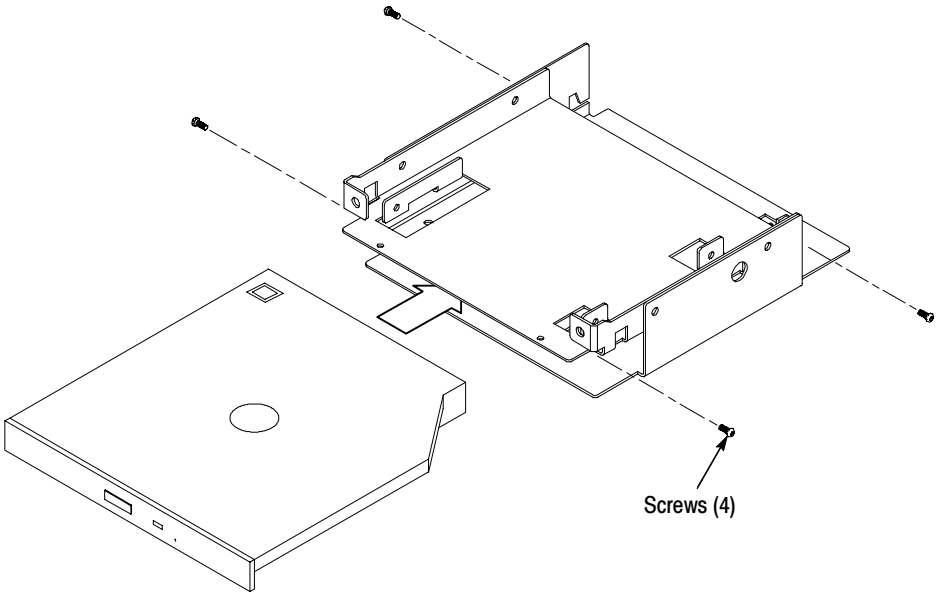


Figure 6-31: Chassis screw locations for CD drive

Replacing the CD-ROM Drive. Perform the following procedure to replace the CD-ROM drive:

1. Insert CD-ROM drive into lower bay of CD-ROM and floppy drive chassis.
2. Align CD-ROM drive mounting holes with chassis holes.
3. Attach CD-ROM drive to chassis with four crosstip screws. Torque the screws to 2 in-lbs.

Removing the Floppy Disk Drive. The floppy disk drive and the CD-ROM drive are assembled in the same unit, but can be separately replaced. Perform the following procedure to remove the floppy disk drive:

1. Remove the four cross tip screw holding the floppy disk drive to the assembly.
2. Lift the floppy disk drive up off the chassis as shown in Figure 6–32.

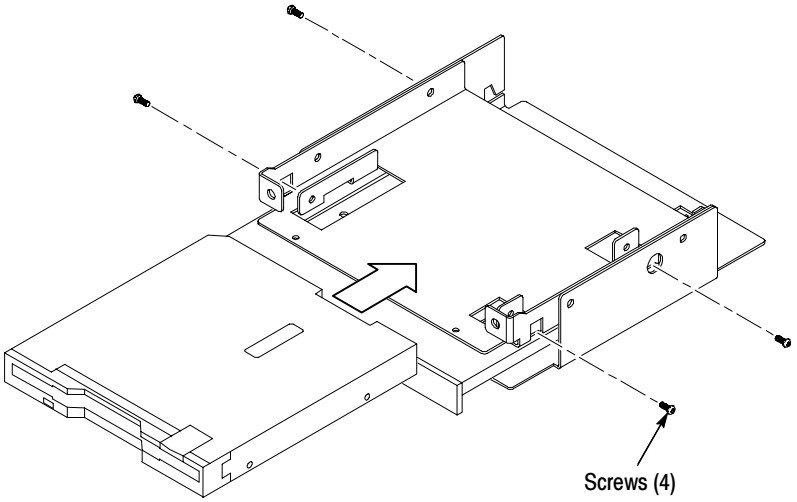


Figure 6-32: Chassis screw locations for the floppy disk drive

Replacing the Floppy Disk Drive. Perform the following procedure to replace the floppy disk drive:

1. Place the replacement floppy drive onto the chassis / CD-ROM drive as shown in Figure 6–32.
2. Attach the floppy drive to chassis with four crosstip screws. Torque each screw to 2 in-lbs.

Replacing the CD-ROM and Floppy Disk Drive Assembly

Perform the following procedure to reinstall the CD-ROM and floppy disk drive assembly into the chassis:

1. Align the assembly with the slot in the chassis.
2. Connect the CD-ROM drive cable to the CD-ROM drive connector adapter board.
3. Slide the assembly into the compartment and line up the attaching screw holes.
4. Install the three attaching screws, two in the front and one in the rear of the assembly.
5. Attach the audio cable to CD-ROM drive, four-pin connector.
   a. Align the audio cable white colored dot with pin 1 of CD-ROM drive four pin connector.
   b. Plug the audio cable onto the CD-ROM drive connector (see Figure 6–30)
6. Attach the floppy drive cable to the floppy drive connector.
   a. Lift up floppy drive connector locking latch.
   b. With the contacts of the short end of floppy drive cable facing towards the floppy drive, insert cable into floppy drive connector as shown in Figure 6–30.
   c. While supporting the circuit board, push the locking latch closed.
7. Replace the keypad assembly (refer to *Replacing the Keypad Assembly* on page 6–71).
8. Replace the LCD Display assembly (refer to *Replacing the LCD Display Assembly* on page 6–71).
9. Replace the front-panel bezel trim ring (refer to *Replacing the Bezel Trim Ring* on page 6–57).
10. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6–56).

Removing the Speaker

Perform the following procedure to remove the speaker.

1. Remove the bezel trim ring (refer to *Removing the Bezel Trim Ring* on page 6–57 for the removal procedure).
2. Remove the Front Panel Interface board cover (refer to *Removing the Interface Board Cover* on page 6–70 for the removal procedure).
3. Remove the keypad assembly (refer to *Removing the Keypad Assembly* on page 6–71 for the removal procedure).
4. Disconnect the speaker connector from the Front Panel Interface board.
5. Note the routing of the speaker cable for reinstallation.
6. Remove the four T15 screws that attach the speaker to the chassis and remove the speaker from the chassis.

Replacing the Speaker

1. Route the speaker wire harness through mainframe chassis hole as shown in Figure 6–33.
2. Attach the speaker to the chassis with four T15 screws. Torque the screws to 8 in-lbs.

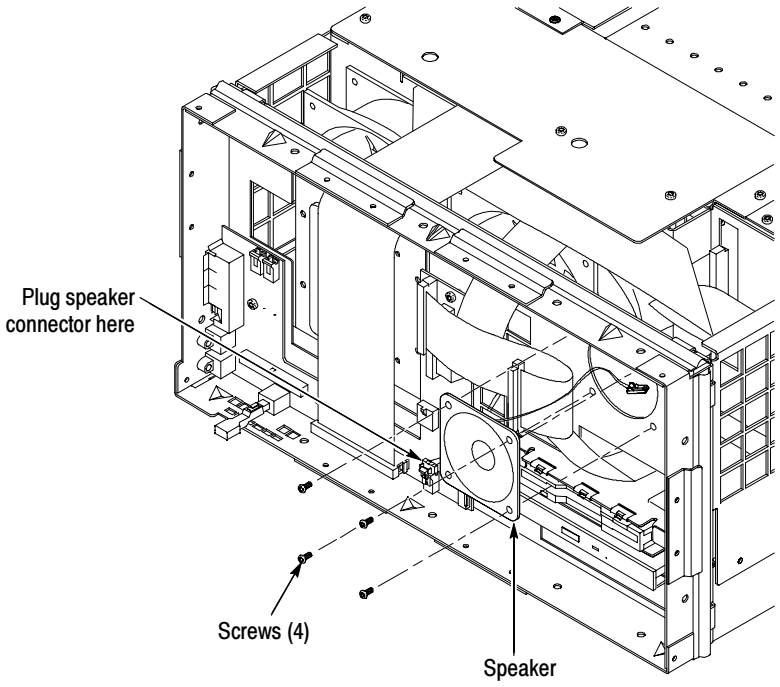


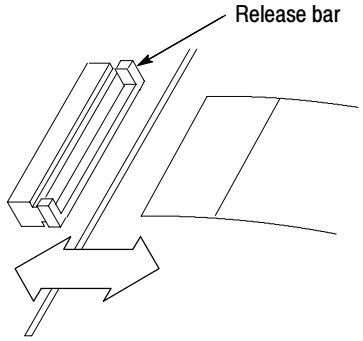
Figure 6-33: Speaker installation

3. Reconnect the speaker wire to J980 on the Front Panel Interface board (see Figure 6–34).
4. Replace the keypad assembly (refer to *Replacing the Keypad Assembly* on page 6–71).
5. Replace the LCD Display assembly (refer to *Replacing the LCD Display Assembly* on page 6–71).
6. Replace the front-panel bezel trim ring (refer to *Replacing the Bezel Trim Ring* on page 6–57).

Removing the Front Panel Interface Board

Use the following procedure to remove the Front Panel Interface board:

1. Remove the bezel trim ring (refer to *Removing the Bezel Trim Ring* on page 6–57 for the removal procedure).
2. Remove the Front Panel Interface board cover (refer to *Removing the Interface Board Cover* on page 6–70 for the removal procedure).
3. Disconnect the speaker wire from the Front Panel Interface board J980 connector (see Figure 6–34).
4. Disconnect the right-side fan wire from the Front Panel Interface board J420 (right FAN) connector.
5. Disconnect the left side fan wire from the Front Panel Interface board J410 (left FAN) connector.
6. Disconnect the disk drive flexible circuit board from the Front Panel Interface board.
   a. Release the locking latch on the flexible circuit board connector.



   b. Pull the flexible circuit board straight out of the connector.

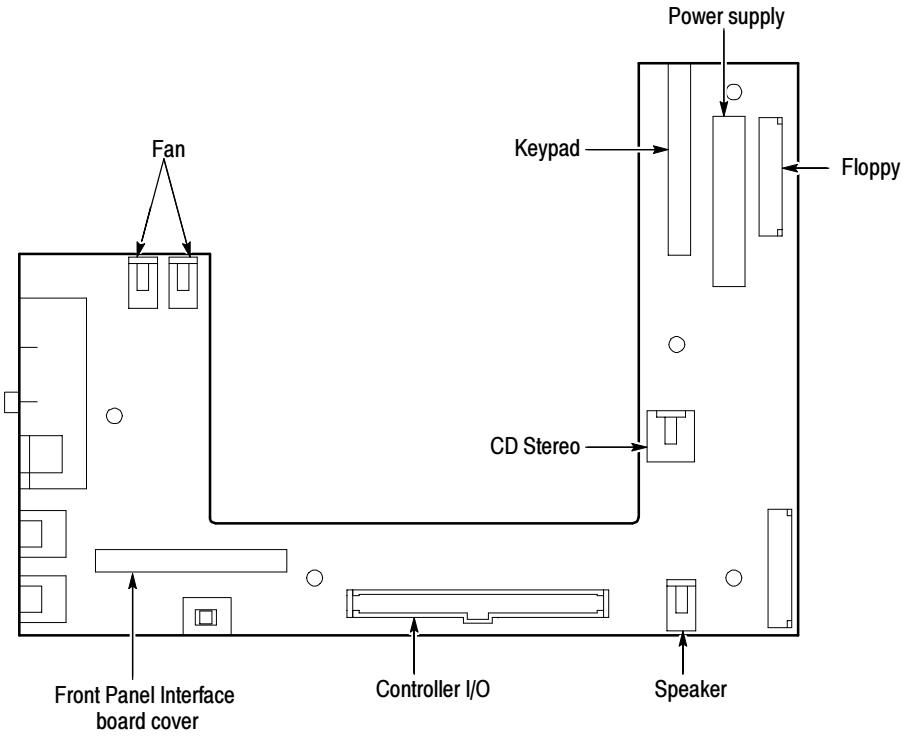


Figure 6-34: Front panel interface circuit board connectors

7. Disconnect the Controller I/O ribbon cable from the Front Panel Interface board.
8. Disconnect the keypad ribbon cable from the Front Panel Interface board.
9. Remove the five T15 screws from the front of the board and the two metric screws on the left side that attach the Front Panel Interface board to the chassis (see Figure 6–35 for the screw locations).

Replacing the Front Panel Interface Board

Perform the following procedure to install the Front Panel Interface board onto the mainframe chassis as shown in Figure 6–35.

1. Orient the Front Panel Interface board so that the board components are facing up and the mouse/keyboard connectors are to the left.
2. Align the board mounting holes with the chassis studs and place the board onto the chassis.

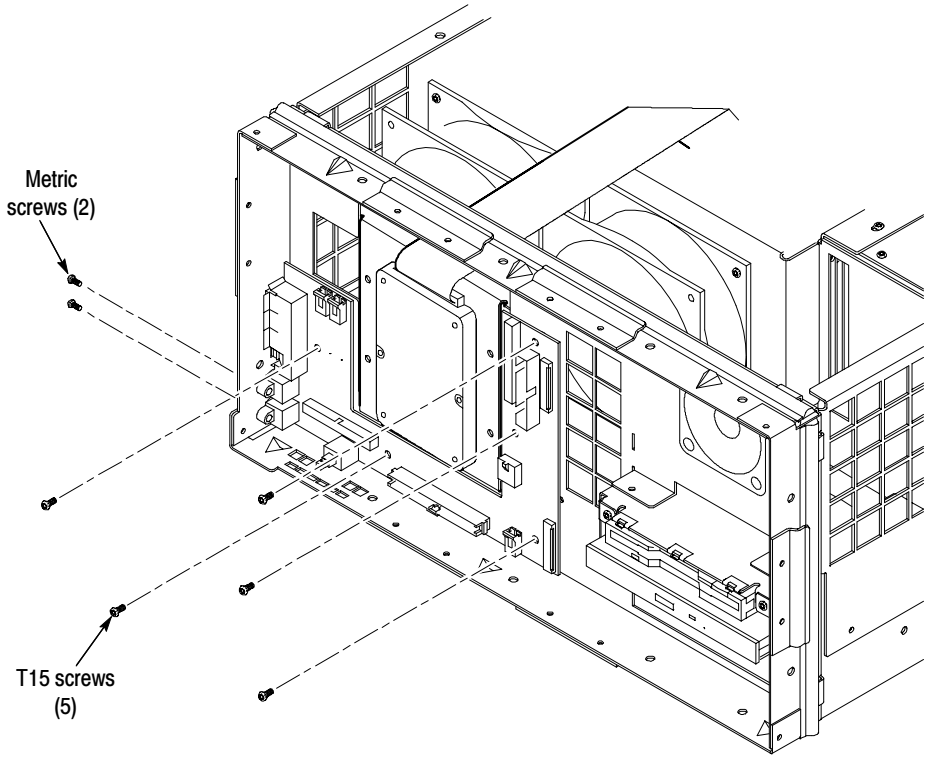


Figure 6- 35: Screw locations for the Front Panel Interface board

3. Attach the Front Panel Interface board to the chassis with five T15 screws through the front of the board and two metric screws at the side connectors. Torque the T15 screws to 8 in-lbs. Torque the metric screws to 2 in-lbs.
4. Route both fan wire harnesses through the slot in the chassis as shown in Figure 6–36.
5. Plug the left-side fan wire harness into the Front Panel Interface board J410 (left FAN) connector (see Figure 6–36).
6. Plug the right-side fan wire harness into the Front Panel Interface board J420 (right FAN) connector (see Figure 6–36).

7. Route the speaker wire harness through the top/right chassis ventilation hole (see Figure 6–36).

8. Plug the speaker wire harness into the Front Panel Interface board J980 connector (see Figure 6–36).

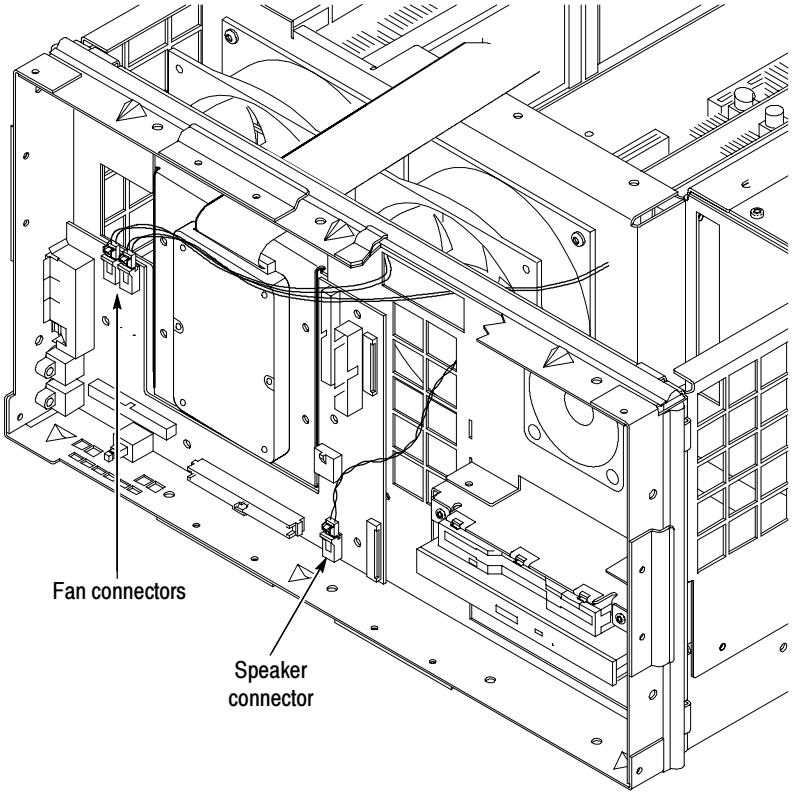


Figure 6-36: Routing of fan and speaker wires to Front Panel Interface board

9. Connect the disk drive flexible circuit board to the Front Panel Interface board disk drive connector.

10. Connect the ribbon cable connector from the Controller I/O to the Front Panel Interface board (see Figure 6–34 on page 6–79).

11. Connect the ribbon cable connector from the keypad assembly to the Front Panel Interface board (see Figure 6–34 on page 6–79).

12. Replace the LCD Display assembly (refer to *Replacing the LCD Display Assembly* on page 6–71).

13. Replace the front-panel bezel trim ring (refer to *Replacing the Bezel Trim Ring* on page 6–57).

Removing the IDE Hard Drive

The IDE hard drive is located behind the front panel. Perform the following steps to remove the IDE hard drive:

CAUTION. *If you replace the IDE hard drive, you will lose all data stored on the MTS300 system, including any transport streams stored on the E: drive. You will have to perform the following steps:*

- *Reload the Operating System software*
- *Reload the MTS300 Test System application software*
- *Reformat the SCSI hard drives*

Be sure that you back-up any data you want to save and locate the software recovery CD-ROMs for your instrument before you remove the IDE hard drive.

1. Remove the mainframe cabinet (refer to *Removing the Cabinet* on page 6–54).
2. Remove the front panel bezel (refer to *Removing the Bezel Trim Ring* on page 6–57).
3. Remove the LCD Display assembly (refer to *Removing the LCD Display Assembly* on page 6–70).
4. Disconnect the Processor I/O ribbon cable from the Front Panel Interface board (see Figure 6–37).
5. Remove the two screws attaching the IDE hard drive bracket to the chassis (see Figure 6–37).
6. Slide the bracket up and out of the chassis.
7. Remove the four screws attaching the IDE hard drive to the bracket.
8. Disconnect the ribbon cable from the connector on the IDE hard drive.

Replacing the IDE Hard Drive

Refer to the preceding *Caution* note. Perform the following steps to replace the IDE hard drive (see Figure 6–37):

1. Connect the ribbon cable to the connector on the IDE hard drive.
2. Attach the IDE hard drive to the bracket using the four screws.
3. Slide the bracket into the chassis. Be sure that the bottom of the bracket slips into the slot in the chassis.
4. Attach the bracket to the chassis using two screws.
5. Attach the Processor I/O ribbon cable to the Front Panel Interface board.

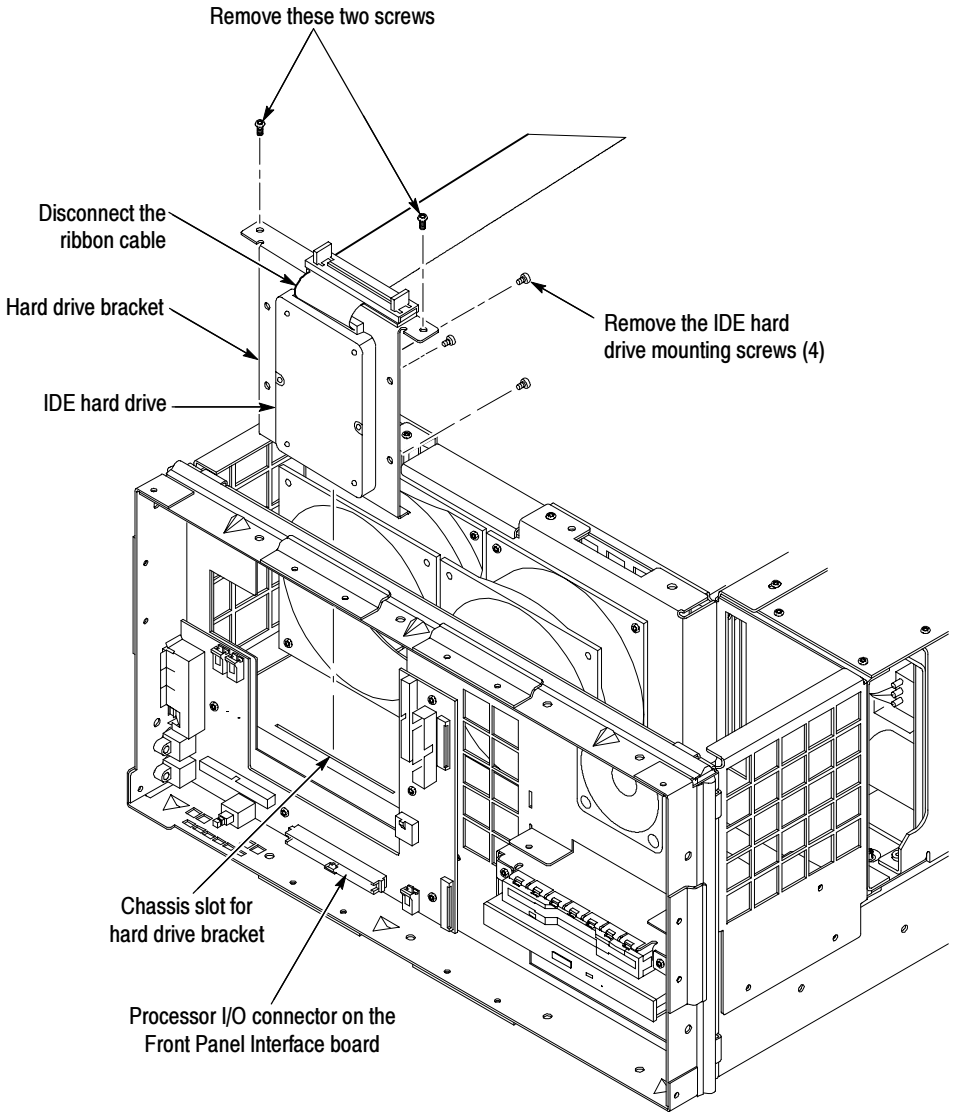


Figure 6-37: Removing the IDE hard drive

6. Replace the LCD Display assembly (refer to *Replacing the LCD Display Assembly* on page 6–71).
7. Replace the front-panel bezel trim ring (refer to *Replacing the Bezel Trim Ring* on page 6–57).
8. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6–56).
9. Perform the procedures in *Restoring the Operating System and Application Software* starting on page 6–45.

Removing the Power Supply Module

Perform the following steps to remove the Power Supply module:

1. Shut down the mainframe and unplug the power cord.
2. Remove the MTS300 system cabinet (refer to *Removing the Cabinet* on page 6–54 for the removal instructions).
3. Remove the keypad assembly (refer to *Removing the Keypad Assembly* on page 6–71 for the removal procedure).
4. Remove the five short and two long T15 screws that attach the Power Supply module to the chassis (see Figure 6–38 for the screw locations).
   a. At the front of the power supply module, remove one short T15 screw. Use a long shafted screwdriver to access the front screw through the hole in the chassis.
   b. At the top of the power supply, remove two short T15 screws.
   c. At the rear of the power supply, remove two short screws and two long T15 screws.
5. Disconnect the backplane ribbon cable from the Power Supply module connector.
6. Release the connector latches on the wide ribbon cable housing and disconnect the front panel ribbon cable from the front of the Power Supply module.
7. Disconnect the SCSI hard disk drive power cable from the front of the Power Supply module.
8. Slide the power supply module out of the chassis. Use a flat blade screwdriver as a lever if needed to disconnect the power supply connectors from the backplane connectors.

Replacing the Power Supply Module

Perform the following steps to reinstall the Power Supply module:

1. Align the power supply connectors with backplane connectors as shown in Figure 6–38.
2. Press the Power Supply module onto the backplane connectors/main chassis.

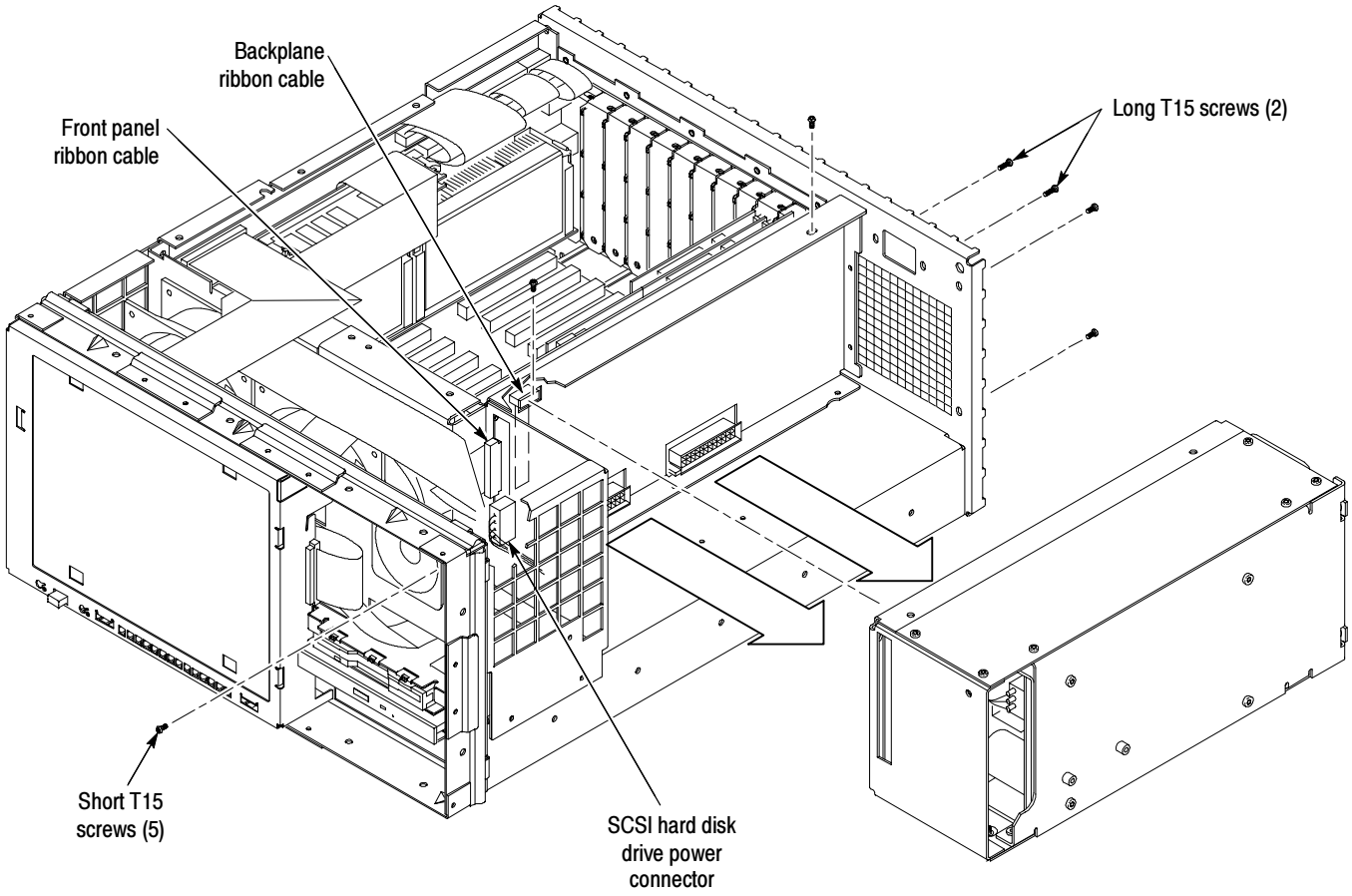


Figure 6-38: Power supply long and short screw locations

3. Attach the Power Supply module to the chassis with five short and two long T15 screws (see Figure 6–38). Torque the screws to 8 in-lbs.

   a. At the front of the Power Supply module, attach the power supply to the chassis with one short T15 screw.

   b. Attach the top of the power supply to the chassis with two short T15 screws.

***NOTE**. The long T15 screws are used for attaching the power supply to the chassis at either side of the line filter opening.*

   c. At the rear of the power supply, attach the power supply to the chassis with two short screws and two long T15 screws.

4. Plug in the backplane ribbon cable on the side of the power supply.
5. Plug the wide ribbon cable onto the Power Supply module connector on the front of the power supply.

CAUTION. *The power supply ribbon cable connector is difficult to fully plug on. Make sure both retaining latches are fully closed over the connector housing.*

6. Plug the SCSI power cable onto the power supply connector located beneath the large ribbon cable connector on the front of the power supply chassis.
7. Replace the keypad assembly (refer to *Replacing the Keypad Assembly* on page 6–71).
8. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6–56).

Removing the Controller Board

Perform the following procedure to remove the Controller board from slot 9:

1. Remove the mainframe cabinet (see *Removing the Cabinet* on page 6–54 for the removal procedure).
2. Remove the circuit board retaining plate (see Figure 6–14 on page 6–58).
3. Remove the two T15 screws that hold the Controller board to the mainframe chassis (see Figure 6–39 for the screw locations).
4. Disconnect the SCSI disk drive ribbon cable from the Controller board (see Figure 6–43 on page 6–91).
5. Disconnect the two 10-pin connectors (from J290 and J190 on the I/O circuit board) from the Controller board.
6. Disconnect the 26-pin connector (from J170 on the I/O circuit board) from the bottom 26-pin connector on the Controller board.
7. Carefully pull up on the Controller board to loosen it from the backplane connectors.
8. When the board is loose from the backplane connectors, lift the assembly up and out of the module bay. Place the removed circuit board on a static-free surface or in a protective anti-static bag.

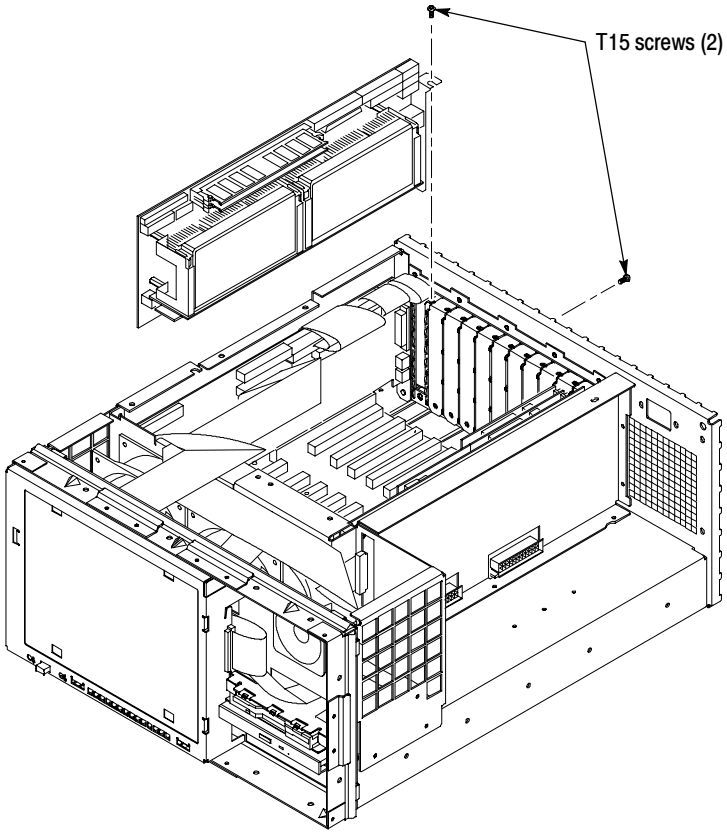


Figure 6- 39: Controller board orientation and screw locations

Replacing the Controller Board

Perform the following procedure to reinstall the Controller board into slot 9:

1. Position the Controller board in the card bay in slot 9, the second slot from the right (when looking at the rear of the mainframe chassis).

CAUTION. *While handling and installing the controller board, do not press on the memory SIMMs (single inline memory modules).*

2. Lower the Controller board into the mainframe while dressing the I/O board-to-Controller board wiring harnesses away from the slot position.
3. Align the Controller board edge connectors with the backplane slot connectors and press down firmly on the top edge of the circuit board to seat the Controller board in the backplane connectors.
4. Attach the Controller board bracket to the mainframe chassis with two T15 screws. Torque the screws to 8 in-lbs.

5. Reconnect the cables between the I/O board and the Controller board. Refer to *Connecting the Processor I/O Board to the Controller Board* on page 6–90 for the cable-connection sequence.
6. Replace the circuit board retaining plate (see Figure 6–14 on page 6–58).
7. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6–56).

Removing the Processor I/O Board

Perform the following procedure to remove the Processor I/O board from slot 10:

1. Remove the mainframe cabinet (see *Removing the Cabinet* on page 6–54 for the removal procedure).
2. Remove the circuit board retaining plate (see Figure 6–14 on page 6–58).
3. Remove the two T15 screws that hold the Processor I/O board to the mainframe chassis (one on top and the other in the rear panel).
4. Disconnect the SCSI disk drive ribbon cable from the Controller board (see Figure 6–41).
5. Disconnect the two 10-pin connectors (from J290 and J190 on the Processor I/O board) from the Controller board.
6. Disconnect the 26-pin connector (from J170 on the Processor I/O board) from the bottom 26-pin connector on the Controller board.
7. Carefully pull up on the Processor I/O board to loosen it from the backplane connectors.
8. When the board is loose from the backplane connectors, lift the assembly up to gain access to the remaining interconnection cables.
9. Disconnect the CD-ROM drive ribbon cable from J250 of the Processor I/O board.

Replacing the Processor I/O Board

Perform the following steps to replace the Processor I/O board into slot 10 of the mainframe card bay:

1. Dress both of the Controller board wire harnesses so that you can insert the Processor I/O board into slot 10 as shown in Figure 6–40.
2. Hold the SCSI ribbon cable against the side of the mainframe and insert the Processor I/O board into slot 10. Align the front end of the circuit board with the guide rail on the front of the card bay.
3. Lower the Processor I/O board into the mainframe slot but do not press the board into the backplane connector.

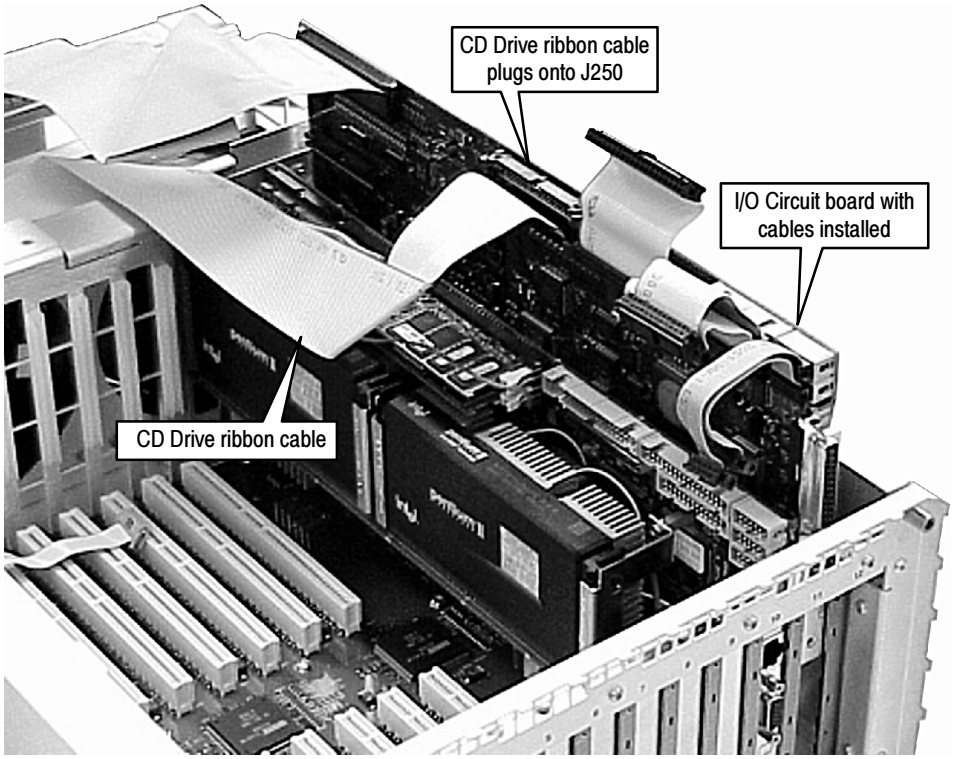


Figure 6-40: Installing the Processor I/O board into slot 10

4. Route the CD-ROM drive ribbon cable over the Processor I/O board.
5. Lift up the Processor I/O board (with one hand bracing the circuit board on the backside) and plug the CD-ROM drive ribbon cable onto J250 of the Processor I/O board.
6. Place your fingers on the top of the Processor I/O board at the locations indicated in Figure 6–41 (directly over the J11 backplane connector) and press down to seat the board into the backplane connector.

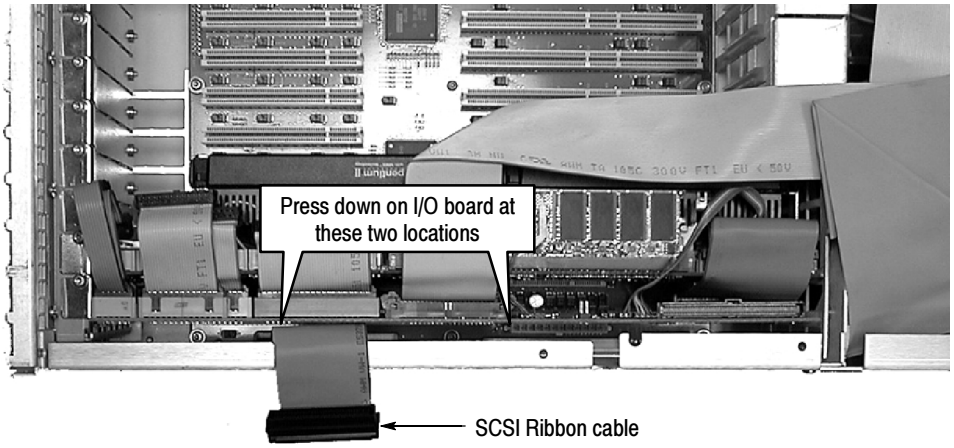


Figure 6-41: Installing the Processor I/O board into the backplane

Connecting the Processor I/O Board to the Controller Board. The signal cables between the Processor I/O board and the Controller board have to be connected in a sequence that permits all of the cables to be attached. Perform the following steps to make the cable connections:

1. Plug the ribbon cable from J290 of the Processor I/O board to the center 10-pin connector on the Controller board as shown in Figure 6–42.

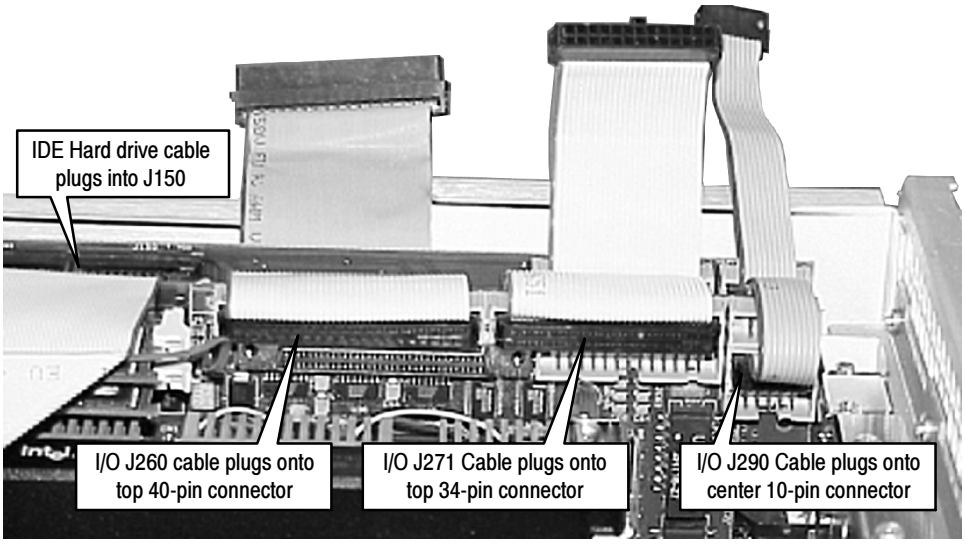


Figure 6-42: Processor I/O board to Controller board interconnections - top connectors

2. Plug the ribbon cable from J271 of the Processor I/O board to the top 34-pin connector of the Controller board.
3. Plug the ribbon cable from J260 of the Processor I/O board to the top 40-pin connector of the Controller board.
4. Plug the ribbon cable from J190 of the Processor I/O board to the bottom 10-pin connector as shown in Figure 6–43.
5. Plug the ribbon cable from J170 of the Processor I/O board to the bottom 26-pin connector.
6. Plug the SCSI ribbon cable to the Controller board bottom connector (see Figure 6–43).

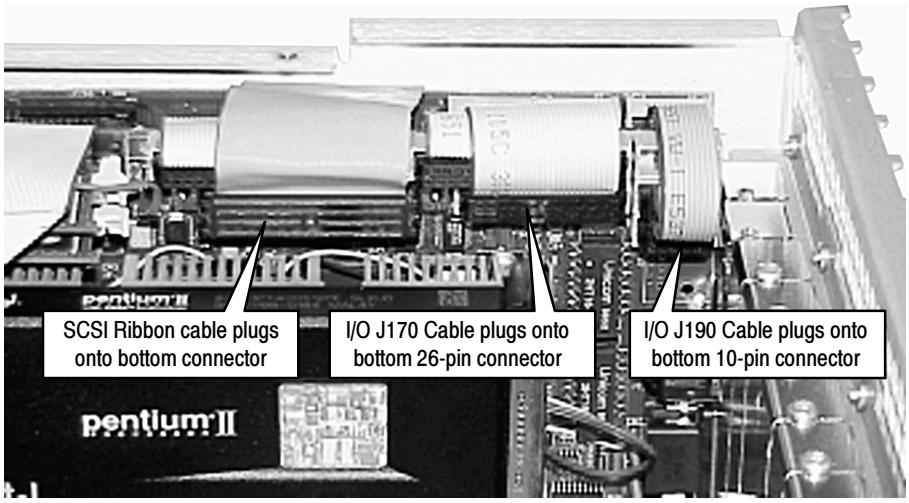


Figure 6-43: Processor I/O board to Controller board interconnections - bottom connectors

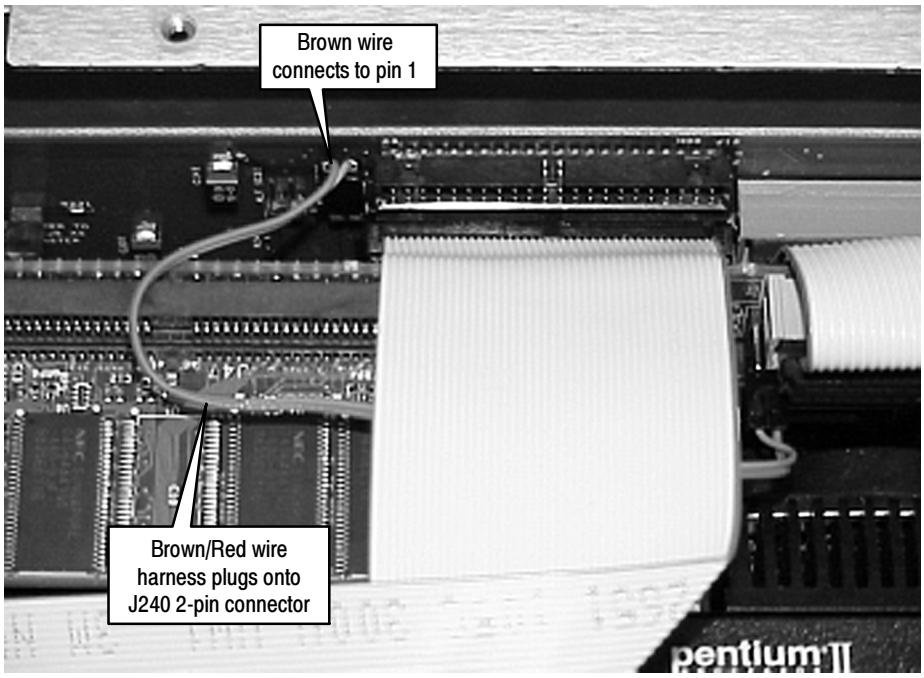


Figure 6- 44: Top connection to Controller board

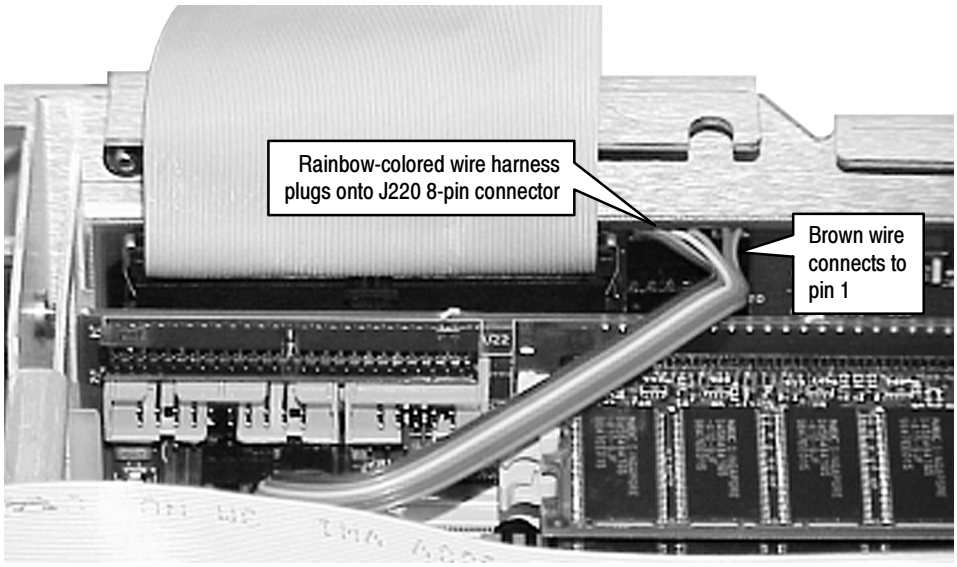


Figure 6- 45: Location of J220 connections and wiring orientation

Removing the Backplane Board

To remove the Backplane board, the power supply and all of the plug in circuit boards must first be removed.

1. Remove the MTS300 system cabinet (refer to *Removing the Cabinet* on page 6–54 for the removal instructions).
2. Remove the Power Supply module (refer to *Removing the Power Supply Module* on page 6–84).
3. Remove all of the plug in modules from the card bay. Refer to the following procedures as needed:
   - *Replacing MTS300 Test System Modules* starting on page 6–58
   - *Removing the Controller Board* starting on page 6–86
   - *Removing the Processor I/O Board* starting on page 6–88
4. Disconnect the RS-232 cable connector from the backplane circuit board.
5. Remove the 15 screws holding the backplane board assembly to the chassis with a T15 screw tip screwdriver (see Figure 6–46 for the screw locations).
6. Lift the back plane board assembly out of the chassis.

Replacing the Backplane Board

Use the following procedure to reinstall the backplane circuit board into the mainframe card bay:

1. Place the Backplane board into the mainframe chassis. See Figure 6–46 for the orientation of the Backplane board to the chassis.
2. Attach the Backplane board assembly to the chassis with 15 screws (T15). Torque the screws to 8 in-lbs.
3. Connect the RS-232 cable connector to the Backplane board.
4. Reinstall all of the plug in modules into the card bay. Refer to the following procedures as needed:
   - *Replacing MTS300 Test System Modules* starting on page 6–58
   - *Replacing the Controller Board* on page 6–87
   - *Replacing the Processor I/O Board* starting on page 6–88
5. Reinstall the circuit board retaining plate (see Figure 6–14 on page 6–58).

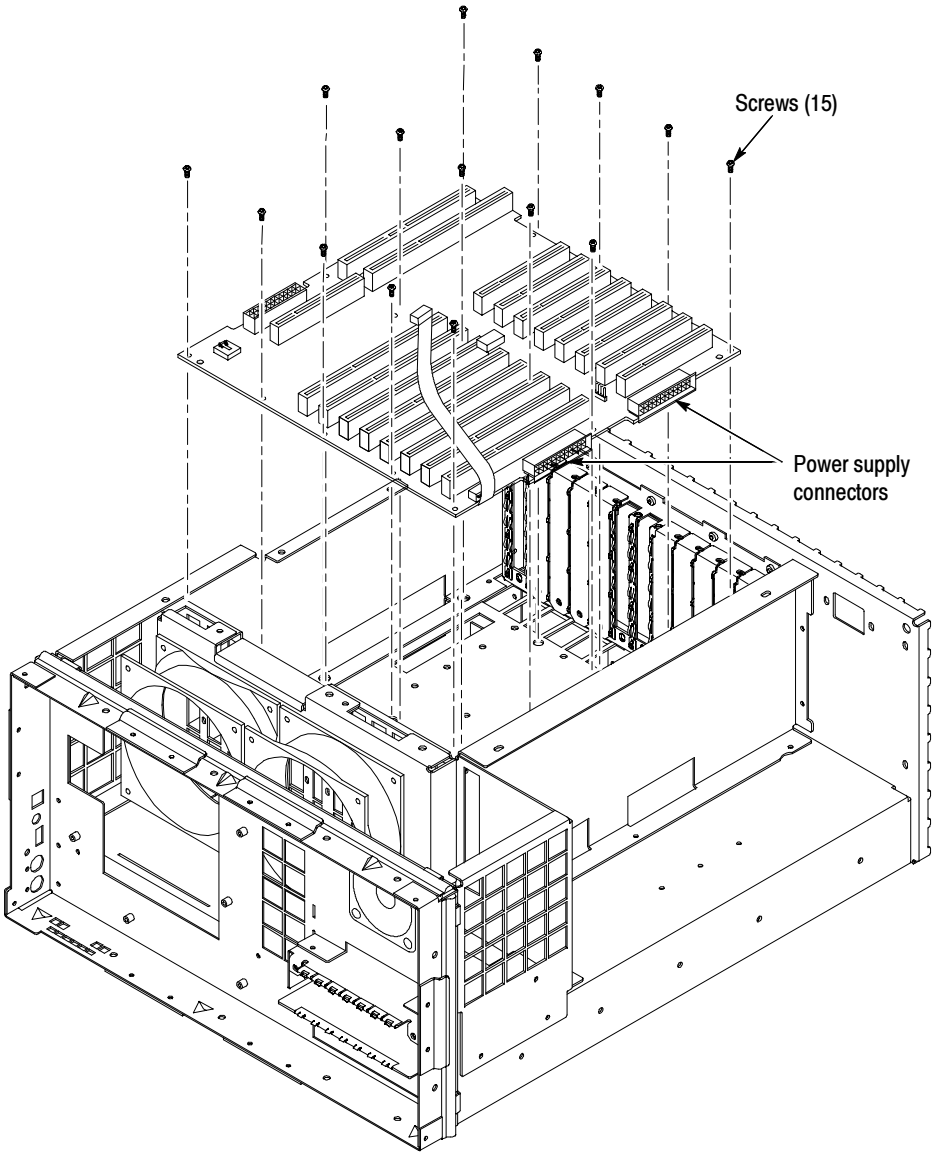


Figure 6-46: Backplane orientation and screw locations

6. Reinstall the Power Supply module (refer to *Replacing the Power Supply Module* on page 6–84).

7. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6–56).

Removing the SCSI Hard Disk Drives

The SCSI hard disk drives contain any transport stream loaded on the MTS300 system. The SCSI drives are installed in the lower compartment of the mainframe chassis. Perform the following steps to remove the SCSI hard drives:

CAUTION. *If you replace one of the SCSI hard drives, you will lose all transport streams stored on the MTS300 system E: drive. You will have to reformat the SCSI hard drives after you replace the hard drive.*

Be sure that you back-up any transport stream data you want to save before you remove a SCSI hard drive.

1. Remove the MTS300 system cabinet (refer to *Removing the Cabinet* on page 6–54 for the removal instructions).
2. Place the mainframe chassis on the work surface so that the bottom side, with the SCSI disk drive assemblies, is facing up.
3. Remove the cable-retaining bracket on the disk drive cable for the SCSI drive you are going to replace (see Figure 6–47), and then disconnect the disk drive cable from the SCSI drive. Note the routing and cable dress for reinstallation.
4. Disconnect the power-supply cable from the SCSI drive you are replacing.
5. Remove the four T-15 Torx screws that hold the hard disk drive to the mainframe chassis and lift the hard drive drive out of the mainframe (see Figure 6–47).
6. Remove the four T-15 Torx screws holding the mounting brackets to the SCSI drive (two screws on each bracket).

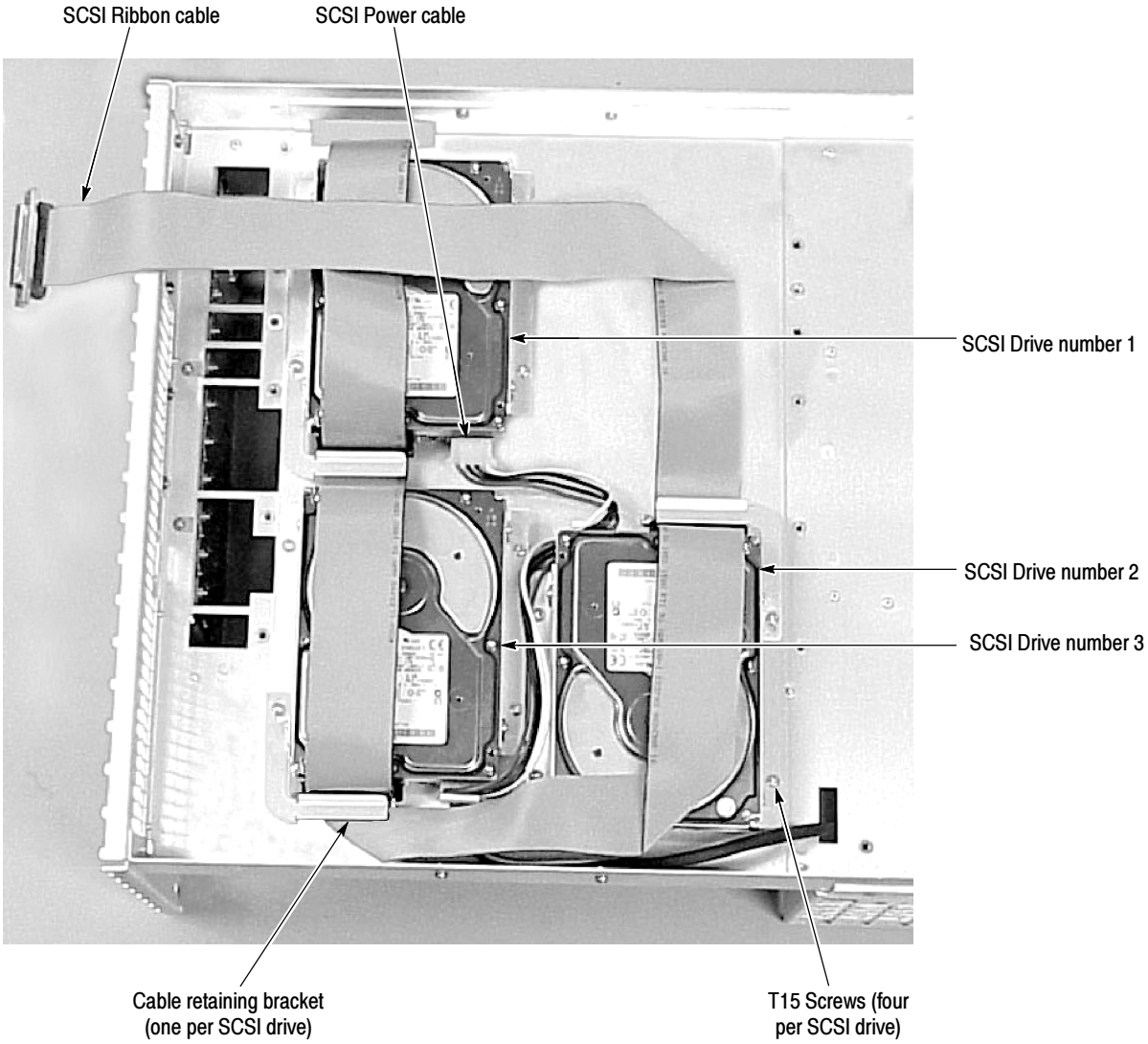


Figure 6-47: SCSI hard drive removal

Replacing the SCSI Hard Disk Drives

Use the following procedure to replace the SCSI disk drive assembly:

1. Place the mainframe chassis on the work surface so that the bottom side is facing up.
2. Configure the jumpers on the replacement SCSI drive as shown in Figure 6–48. The drives are numbered according to their position in the chassis as shown in Figure 6–47.

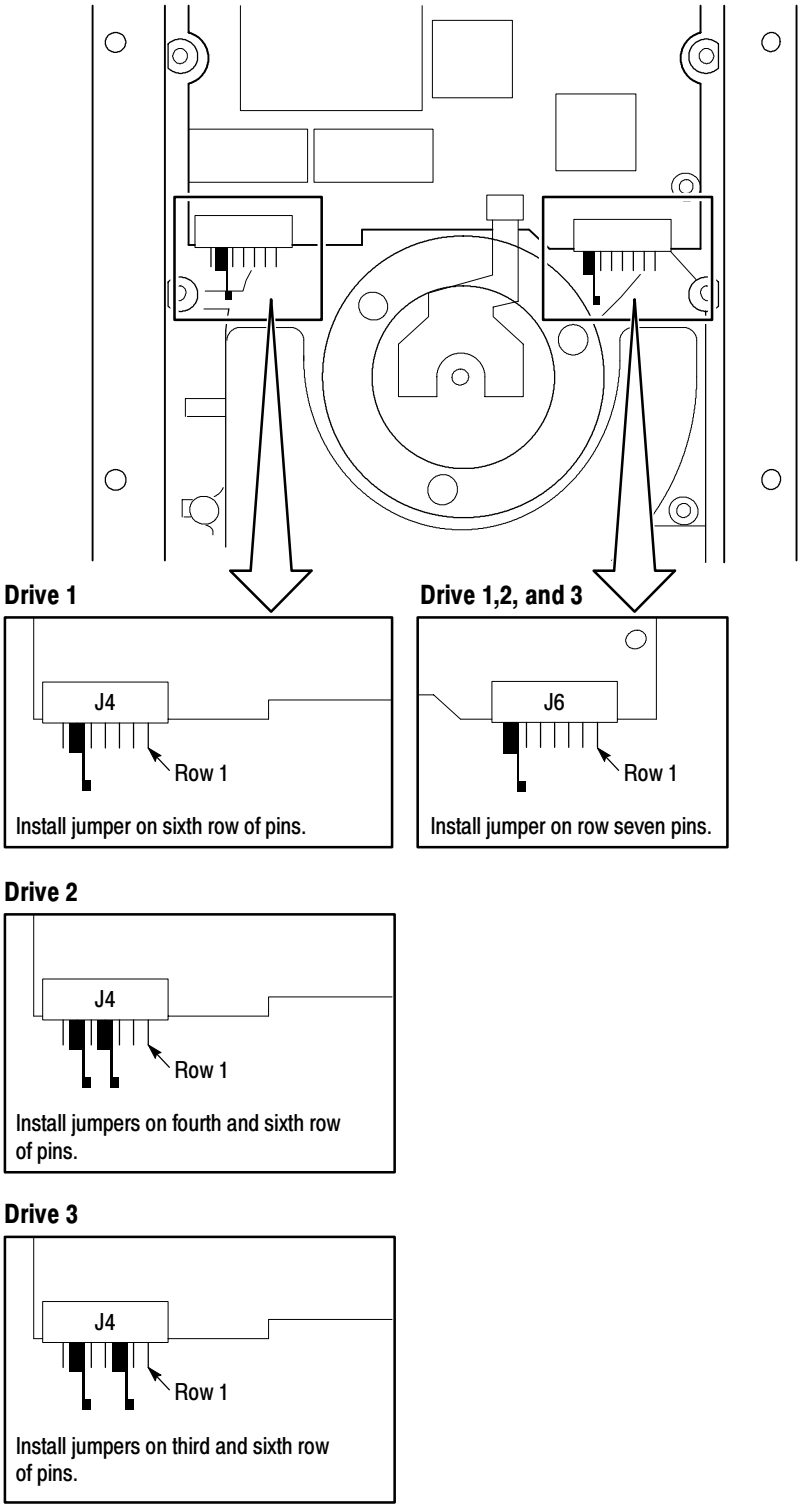


Figure 6-48: Configuring the SCSI drive jumpers

3. Install the mounting brackets on the SCSI drive (see Figure 6–49).

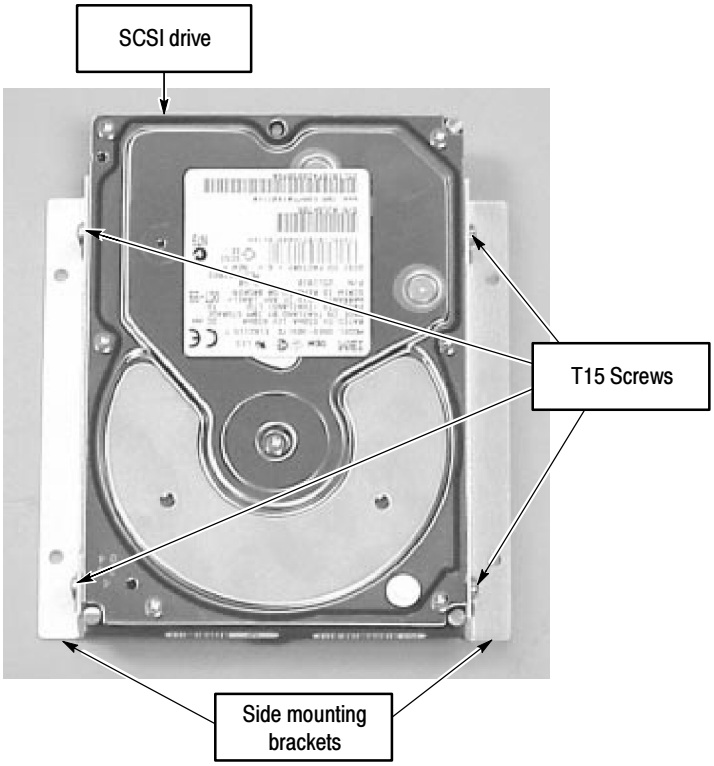


Figure 6- 49: Installing the mounting brackets on the SCSI drive

4. Insert the hard disk drive into the chassis compartment and line up the mounting screw holes in the mounting brackets with the screw holes in the chassis mainframe.

5. Install the four T-15 Torx screws that hold the SCSI drive to the mainframe chassis. Tighten the four screws to 8 inch pounds of torque.

6. Connect the power supply cable to the SCSI drive.

7. Reconnect the SCSI cable connector to the SCSI drive. Dress the ribbon cable flat against the mainframe (see Figure 6–47).

8. Install the cable-retaining bracket on the disk drive cable (see Figure 6–47).

9. Replace the mainframe cabinet (refer to *Replacing the Cabinet* on page 6–56).

10. Perform the following two procedures: *Restoring the SCSI Drive Controller Settings* starting on page 6–27 and *Restoring the SCSI Drive Stripe Set* starting on page 6–28.

Options

This section lists the options and upgrades that are available for the MTS300 system.

Table 7–1 lists the options available when you purchase the MTS300 system. Table 7–2 lists the possible interface configurations.

Table 7-1: MTS300 test system options

Category	Option	Description
MTS300	Basic instrument	Test System with at least one user-selected interface and the following client applications: Master Client Expert Client TMCC Expert Client Configuration Client TMCC Configuration Client Stream Player Client Stream Recorder Client The MTS300 also comes with the Private Syntax Interpreter and the Jitter Adder applications.
Interface[1]	Option AS	ASI/M2S asynchronous serial interface
	Option DE	DHEI (GI-Digicypher) interface[2]
	Option LV	SPI (LVDS) synchronous parallel interface[2]
	Option SS	SSI (SMPTE310M) synchronous serial interface

Table 7-1: MTS300 test system options (Cont.)

Category	Option	Description
Software	Option DT	Deferred-Time Analysis System (user manual 071-0659-XX), which includes the following applications: MPEG-2 DVB/ATSC/ISDB-S/ARIB System Analyzer TMCC Deferred-Time Analyzer MPEG-2 DVB/ATSC/ISDB-S/ARIB Multiplexer DVB Table Editor ATSC Table Editor ARIB Table Editor DVB Channel Coding and Decoding Error Injector
	Option AC3	Dolby Digital (AC-3) Analyzer (user manual 071-0661-XX)
	Option OC	ViAccess Conditional Access (requires Option DT)
	Option OM	OpenMux™ Real-Time Multiplexer (user manual 071-0778-XX)
	Option ES	MPEG Audio and MPEG Video Elementary Stream Analyzers (user manuals 071-0663-XX and 071-0664-XX)
	Option PS	Program Stream Analyzer (user manual 071-0662-XX)
	Option TM	TMCC Combiner

1 Each hardware interface option adds two input/output pairs, clock, and trigger connections. The test system maximum capacity is any two interface options except as noted in Table 7-2.

2 The SPI (LVDS) and DHEI (GI-Digicypher) interfaces can only be ordered when you order an ASI/M2S interface.

Table 7-2: Possible interface configurations

First mezzanine	Second mezzanine (one of the following)
ASI/M2S interface	None
	ASI/M2S interface
	SMPTE310M (SSI) interface
	DHEI (GI-Digicypher) interface[1]
	SPI (LVDS) interface[1]
SSI (SMPTE310M) interface	None
	SSI (SMPTE310M) interface
	ASI/M2S interface[2]

1 The SPI (LVDS) and DHEI (GI-Digicypher) interfaces can only be ordered when you order an ASI/M2S interface.

2 This configuration is only available when you install the MTS3FAS hardware upgrade into an existing MTS300 with an SSI (SMPTE310M) interface.

Table 7–3 lists the upgrades available for an existing MTS300 MPEG Test System. You can order some of these upgrades when you purchase your instrument and they will be installed at the factory.

***NOTE**. All of the MTS300 upgrade kits require that you run the Sales Wizard file MTS3WIZ.ZIP. The latest version is available from www.tektronix.com.*

Table 7-3: MTS300 test system upgrades

Category	Part number	Description
Interface[1]	MTS3FAS	Adds ASI/M2S interface to existing MTS300
	MTS3FDE	Adds DHEI (GI-Digicypher) interface to existing MTS300
	MTS3FLV	Adds SPI (LVDS) synchronous parallel interface to existing MTS300
	MTS3FSS	Adds SSI (SMPTE310M) synchronous serial interface to existing MTS300
Software	MTS3FDT	Adds Deferred-Time Analysis System to existing MTS300
	MTS3FAC	Adds Dolby Digital (AC-3) Analyzer to existing MTS300
	MTS3FOC	Adds ViAccess Conditional Access to existing MTS300
	MTS3FOM	Adds Real-Time Multiplexing (Open Mux) to existing MTS300
	MTS3FES	Adds MPEG Audio/Video Elementary Stream Analyzers to existing MTS300
	MTS3FPS	Adds Program Stream Analyzer to existing MTS300
	MTS3FTM	Adds TMCC Combiner to existing MTS300

[1] **Each interface option adds two input/output pairs, clock, and trigger connections. The test system maximum capacity is any two interface options except as noted in Table 7-2.**

Replaceable Electrical Parts

The replaceable electrical modules for the MTS300 system are included in the *Replaceable Mechanical Parts* section of this manual. Since component-level repair is not supported in this instrument, individual electrical components are not listed.

Diagrams

Refer to Figure 3–1 on page 3–2 for the block diagram of the MTS300 test system.

Refer to *Replaceable Mechanical Parts* starting on page 10–1 for exploded views identifying the replaceable components of the instrument.

Refer to *Removal and Replacement Procedures* starting on page 6–53 for more detailed illustrations of various assemblies.

Replaceable Mechanical Parts

This section contains a list of the replaceable modules for the MTS300 system. Use this list to identify and order replacement parts. Replacement parts in the part list are arranged by option, starting with the base instrument with one analysis board and one input/output board. Each subsequent section lists the additional parts for the specified option or options.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Module Servicing

Modules can be serviced through one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

Module Exchange

In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-TEK-WIDE, extension 6630.

Module Repair and Return

You may ship your module to us for repair, after which we will return it to you.

New Modules

You may purchase replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for this product. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts List Column Descriptions

Column	Column Name	Description
1	Figure & Index Number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial Number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entries indicates the part is good for all serial numbers.
5	Qty	This indicates the quantity of parts used.
6	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
7	Mfr. Code	This indicates the code of the actual manufacturer of the part.
8	Mfr. Part Number	This indicates the actual manufacturer's or vendor's part number.

Abbreviations

Abbreviations conform to American National Standard ANSI Y1.1-1972.

Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
00779	AMP INC.	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105-3608
060D9	UNITREK CORPORATION	3000 COLUMBIA HOUSE BLVD, SUITE 1 20	VANCOUVER, WA 98661
06915	RICHCO	5825 N TRIPP AVE P.O. BOX 804238	CHICAGO, IL 60646
0B445	ELECTRI-CORD MFG CO INC	312 EAST MAIN STREET	WESTFIELD, PA 16950
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214-4657
0KB05	NORTH STAR NAMEPLATE INC	5750 NE MOORE COURT	HILLSBORO, OR 97124-6474
12136	PHC INDUSTRIES INC	1643 HADDON AVE PO BOX 1448	CAMDEN, NJ 08103
1AW87	LEWIS SCREW CO.	4300 SOUTH RACINE AVENUE	CHICAGO, IL 60609
3M099	PORTLAND SCREW COMPANY	6520 N BASIN AVE	PORTLAND, OR 97217
46628	LOGITECH INC	6505 KAISER DR	FREMONT, CA 94555
50356	TEAC AMERICA INC	7733 TELEGRAPH RD PO BOX 750	MONTEBELLO, CA 90640-6537
5Y400	TRIAX METAL PRODUCTS INC	1880 SW MERLO DRIVE	BEAVERTON, OR 97006
74594	COMPONENT RESOURCES INC	BUSSMAN PARTS C/O CASEY LAKEY 14525 SW WALKER ROAD	BEAVERTON, OR 97006
76096	ELMA ELECTRONICS INC	41440 CHRISTY ST	FREMONT, CA 94538
7X318	KASO PLASTICS INC	5720-C NE 121ST AVE, STE 110	VANCOUVER, WA 98682
6874	DYNACLEAR THIN FILM PRODUCTS	7025 WEST MARCIA RD.	MILWAUKIE, WI 53223
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
93907	CAMCAR DIV OF TEXTRON INC	ATTN: ALICIA SANFORD 516 18TH AVE	ROCKFORD, IL 611045181
9Z609	CYBER RESEARCH INC	25 BUSINESS PARK DRIVE	BRANFORD, CT 06405
TK0AT	AMP, INC	7-15-14 ROPPONGI MINATO-KU	TOKYO JAPAN,
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303
TK2172	WYLE ELECTRONICS INC	10300 SW NIMBUS AVE BLDG P, SUITE B	PORTLAND, OR 97223
TK2250	ARROW ELECTRONICS INC.	9500 SW NIMBUS AVE, BLDG E	BEAVERTON, OR 97008-7163
TK2385	METALCAST ENGINEERING INC	4800 COLISEUM WAY	OAKLAND, CA 94601
TK2411	TEKTRONIX HONG KONG	8/F MAPPIN HOUSE 98 TEXACO RD	TSUEN WAN, N. T., HONG KONG CN
TK2480	WILLAMETTE PLASTIC	1111 NW 5TH PLACE	CANBY, OR 97013
TK2548	XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON, OR 97005

Manufacturers cross index (cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
TK2647	INSTRUMENT SPECIALTIES CO INC.	C/O TEMCO NW 1336 SE 51ST STREET	HILLSBORO, OR 97123
TK6108	KENT H LANDSBERG CO	27929 SW 95TH, SUITE 101	WILSONVILLE, OR 97070
TK6159	ARROW/RICHEY ELECTRONICS	ARROW/RICHEY VALUE ADDED 3601 SW MURRY BLVD SUITE 60	BEAVERTON, OR 97005
TK6181	IMC PLASTICS INC	19400 SW TETON AVE	TUALATIN, OR 97062
05791	LYN-TRON INC	SOUTH 6001 THOMAS MALLEN RD	SPOKANE, WA 99204

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-1							
1	343-1652-00			1	RETAINER:CIRCUIT BOARD	TK1943	343-1652-00
2	211-0722-00			122	SCREW,MACHINE:6-32 X 0.250,PNH,STL,CDPL, T-15 TORX DR	0KB01	ORDER BY DESCRIPTION
3	671-4793-00			1	CIRCUIT BD ASSY:PROCESSOR,IO,679-4793-00 TESTED,389-2844-00 WIRED	80009	671-4793-00
4	407-4699-00			1	BRACKET:PCI PROCESSOR I/O BOARD,18 GA CRS	TK1943	407-4699-00
5	672-1551-00			1	CIRCUIT BD ASSY:PICMG PCI,CONTROLLER, 039-0072-00	80009	672-1551-00
6	407-4705-00			1	BRACKET,PCI:18 GA CRS,DTI PROCESSOR	TK1943	407-4705-00
7	131-0890-01			4	CONN,HARDWARE:DSUB,JACK SCREW,4-40 X 0.312 L HEX HD,STL CD PL,W/O WASHERS & NUT	00779	205818-2
8	407-4569-00			1	BRACKET;0.044 C1010/1020 CRS,ZI PLT, BLANK PCI, NO EARS;SAFETY CONTROLLED	TK1943	407-4569-00
9	174-4511-00			1	CA ASSY,RF:TRIGGER AND CLOCK CABLE (COMES IN A SET OF 4)	060D9	174-4511-00
10	407-4775-00			2	BRACKET,REAR:PANEL,18 GA CRS,BRIGHT NICKEL OVER COPPER FLASH	TK1943	407-4775-00
11	116-0994-50			1	DHEI BOARD; TESTED CONTAINS 2 INPUTS AND OUTPUTS OF THE DHEI INTERFACE FORMAT, SAFETY CONTROLLED (OPTION DE ONLY)	80009	116-0994-50
12	407-4849-00			1	PANEL; EXPANSION IN, EXPANSION OUT (OPTION DE ONLY)	TK1943	407-4849-00
13	116-0946-50			1	SPI BOARD; TESTED; CONTAINS 2 INPUTS AND OUTPUTS OF THE SPI/LVDS INTERFACE FORMAT, SAFETY CONTROLLED (OPTION LV ONLY)	80009	116-0946-50
14	407-4821-00			4	BRACKET, REAR; PCI, SAFETY CONTROLLED (OPTION LV ONLY)	TK1943	407-4821-00
15	116-0247-50			1	MEZZANINE ASSY:SSI MEZZANINE BOARD, 116-0247-00 TESTED	80009	116-0247-50
16	116-0246-51			1	MEZZANINE ASSY:ASI MEZZANINE BOARD, 116-0246-00 TESTED	80009	116-0246-51
17	116-0245-50			1	PIA+ BOARD:MPEG PROCESSING,116-0245-00 TESTED	80009	116-0245-50
18	211-1117-00			4	SCREW, MACHINE:4-40 X 0.187, PAN HEAD, STL, CD PL, T-10, TORX DR	0KB01	211-1117-00
19	211-0721-00			2	SCREW,MACHINE:6-32 X 0.375,PNH,STL,CDPL, T-15 TORX DR	0KB01	ORDER BY DESCRIPTION
20	650-3760-00		B020022	1	PWR SUPPLY ASSY	80009	650-3760-00
	650-3760-01	B020023		1	PWR SUPPLY ASSY	80009	650-3760-01
21	441-2180-00			1	CHASSIS ASSY:AL,ETCH & CHROMATE	TK1943	441-2180-00
22	174-3795-00			1	CABLE ASSY,SP:SPEAKER,CPD,30-26AWG,10.0 L, 1X2,0.1CTR,RCPT,FEMALE,LATCHING, PLZ,MTE	060D9	174-3795-00

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					Rear Panel Labels - SPI (LVDS) Interface		
	335-0419-00			1	MARKER,IDENT:LABEL,REAR PANEL, MKD 3 IN; 0.250 X 4.00,LEXAN,MTS300	0KB05	335-0419-00
	335-0420-00			1	MARKER,IDENT:LABEL,REAR PANEL,MKD 3 OUT, 0.250 X 4.00,LEXAN,MTS3FLV	0KB05	335-0420-00
	335-0421-00			1	MARKER,IDENT:LABEL,REAR PANEL,MKD 4 IN, 0.250 X 4.00,LEXAN,MTS3FLV	0KB05	335-0421-00
	335-0422-00			1	MARKER,IDENT:LABEL,REAR PANEL,MKD 4 OUT, 0.250 X 4.000,MTS3FLV	0KB05	335-0422-00
					Rear Panel Labels - DHEI (GI Digicypher) Interface		
	335-0476-00			1	MARKER, IDENT; LABEL, REAR PANEL, MKD DHEI, MTS3FDE	0KB05	335-0476-00
	335-0477-00			1	MARKER, IDENT; LABEL, REAR PANEL, MKD TTL, MTS300	0KB05	335-0477-00
					Rear Panel Labels - SSI (SMPTE 310M) Interface		
	335-0484-00			1	MARKER, IDENT; LABEL, REAR PANEL, MKD SMPTE 310M, MTS3FSS	0KB05	335-0484-00
	335-0477-00			1	MARKER, IDENT; LABEL, REAR PANEL, MKD TTL, MTS300	0KB05	335-0477-00
					Rear Panel Labels - ASI/M2S Interface		
	335-0652-00			1	MARKER, IDENT; LABEL, REAR PANEL, MKD ASI IN/OUT, MTS3FAS	0KB05	335-0652-00
	335-0477-00			1	MARKER, IDENT; LABEL, REAR PANEL, MKD TTL, MTS300	0KB05	335-0477-00

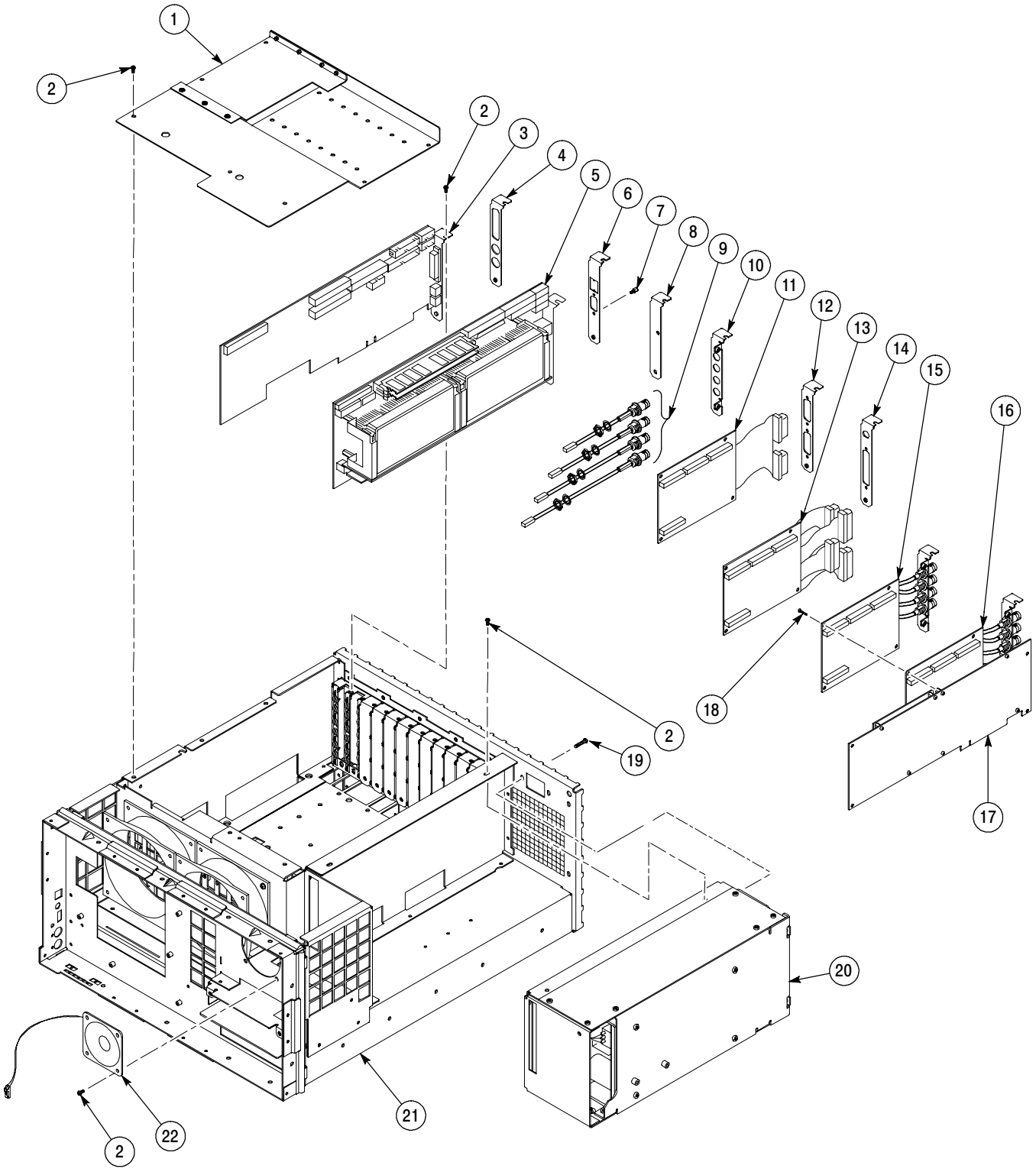


Figure 10-1: Modules

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-2							
1	211-0722-00			122	SCREW,MACHINE:6-32 X 0.250,PNH,STL,CDPL, T-15 TORX DR	0KB01	ORDER BY DESCRIPTION
2	671-4778-00		B220208	1	CIRCUIT BD ASSY:PICMG BACKPLANE, 679-4778-00 TESTED,389-2828-00 WIRED	80009	671-4778-00
	671-4778-01	B220209		1	CIRCUIT BD ASSY:PICMG BACKPLANE, 679-4778-00 TESTED,389-2828-00 WIRED	80009	671-4778-01
3	131-0890-01			4	CONN,HARDWARE:DSUB,JACK SCREW,4-40 X 0.312 L HEX HD,STL CD PL,W/O WASHERS & NUT	00779	205818-2
4	174-3761-00			1	CA ASSY,SP:RIBBON,RS232,IDC,9,3.5 L END TO END,(DSUB,MALE,RTANG,9 POS,0.109 CTR	060D9	174-3761-00
5	348-1576-00			13	SHIELD, GASKET; FINGER TYPE, 4.4LX0.27W, BECU C17200, THO2 (HALF HARD), ZINC CHRO-MATE/CLEAR PL;I/O BRACKET, SAFETY CON-TROLLED	TK1943	348-1576-00
6	407-4721-00			1	BRACKET ASSY:DRIVE MOUNTING,0.040 AL,ALLOY 5052 H32,ETCH/CHROMATE	TK1943	407-4721-00
	407-4721-01		B210156	1	BRACKET ASSY:DRIVE MOUNTING,0.040 AL,ALLOY 5052 H32,ETCH/CHROMATE	TK1943	407-4721-01
	407-4721-02	B210157		1	BRACKET ASSY:DRIVE MOUNTING,0.040 AL,ALLOY 5052 H32,ETCH/CHROMATE	TK1943	407-4721-02
7	211-1079-00			3	SCREW,MACHINE:2.6 X 0.45 MM,3.0L,PNH,STL, NICKEL PL,PHILLIPS,JCIS	0KB01	10310188-0
8	211-0950-00		B210160	4	SCREW,MACHINE:M2X3MM,PHL, PNH, STL NI PL	0KB01	0310248-0
	211-1070-00	B0210161		4	SCREW,MACHINE:M2X2MM,PHL, PNH, STL NI PL	0KB01	211-1070-00
9	348-1432-00			1	FOOT:6.5MM W X 43.50MM L,2MM THK, RUBBER, BLACK,INSTRUMENT SUPPORT	TK2411	348-1432-00
10	671-4377-00			1	CIRCUIT BD ASSY:CD ROM INTERFACE, 389-2561-00 WIRED	80009	671-4377-00
11	119-5728-00		B210156	1	DISK DRIVE:OPTICAL,644MB,CD-ROM,16.7 MB/SEC,IDE/ATAPI	50356	CD-224E-903
	119-5728-01	B210157		1	DISK DRIVE:OPTICAL,644MB,CD-ROM,16.7 MB/SEC,IDE/ATAPI	50356	CD-224E-B94
12	119-6106-00			1	DISK DRIVE:FLOPPY,3.5INCH,1.44 MB,0.5 IN HIGH, BLACK BEZEL,DDDS,96 X 126 X 12.7MM, FD-05HF563	TK2250	FD-05HF5630
13	407-4495-00			1	BRACKET:KEYPAD MTG,0.050 ALUMINUM,ALLOY 5052 H34	TK1943	407-4495-00
14	671-4125-01			1	CIRCUIT BD ASSY:KEYPAD,TESTED,389-2407-00 WIRED	80009	671-4125-01
15	260-2691-00			1	SWITCH,KEYPAD:ELASTOMEC,TV GRAY & TRANSLUCENT,RESISTANCE>1000OHMS	TK2376	260-2691-00
16	614-0943-01		B010149	1	KEYPAD ASSY	80009	614-0943-01
	614-0943-02	B010150		1	KEYPAD ASSY	80009	614-0943-02

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
17	366-0790-00			1	KNOB:TV GRAY,0.920 ID X 0.9250 OD X 0.4750 H,PC/ABS BAYBLEND FR110	TK1163	366-0790-00
18	200-4384-00			1	BEZEL:PC ABS,9 X 17 X 1.50	TK2385	FRONT TRIM, HOUSING
19	334-9582-00			1	MARKER,IDENT:LABEL,POWER BUTTON,2.000 X 0.735	0KB05	334-9582-00
20	335-0399-00			1	MARKER, INDENT; LABEL, MKD TEKTRONIX MTS300 MPEG TEST SYSTEM, 5.775 X 0.530, 0.010 POLY, GE LEXAN, W/ADHESIVE	0KB05	335-0399-00
21	352-1068-00			2	LENS,LIGHT:CLEAR,ACRYLIC,LIGHT PIPE,1.729 X 0.140	7X318	352-1068-00
22	366-0791-00			1	KEYCAP:POWER,0.2X0.4X1.326,POLYCARBONATE	7X318	366-0791-00
23	650-4004-01			1	DISPLAY ASSY:SAFETY CONTROLLED	80009	650-4004-01
24	119-5632-00			1	TOUCH SCREEN: TOUCH PANEL ASSEMBLY, 8-WIRE, ANALOG RESISTIVE, FOR 10.4 INCH DISPLAY, DYNACLEAR-8	6874	9504 REV E
25	211-0895-00			2	SCREW,MACH:M2.6 X 0.45 X 8MM,PHILLIPS, PNH,ZINC YELLOW	0KB01	211-0895-00
26	671-4952-00			1	CIRCUIT BD ASSY:INTERFACE,TESTED, 389-2955-00 WIRED	80009	671-4952-00
27	211-0721-00			8	SCREW,MACHINE:6-32 X 0.375,PNH,STL,CDPL, T-15 TORX DR	0KB01	ORDER BY DESCRIPTION
28	119-5695-00			2	FAN, DC; TUBEAXIAL; 12 V, 3.24W, 2300 RPM, 83 CFM, 119MM X 38MM, 35 DBA, W/2 PIN CONNECTOR, SAFETY CONTROLLED	58500	FBA12G92M9A
29	407-4700-00			1	BRACKET ASSY:FAN MOUNTING	TK1943	407-4700-00

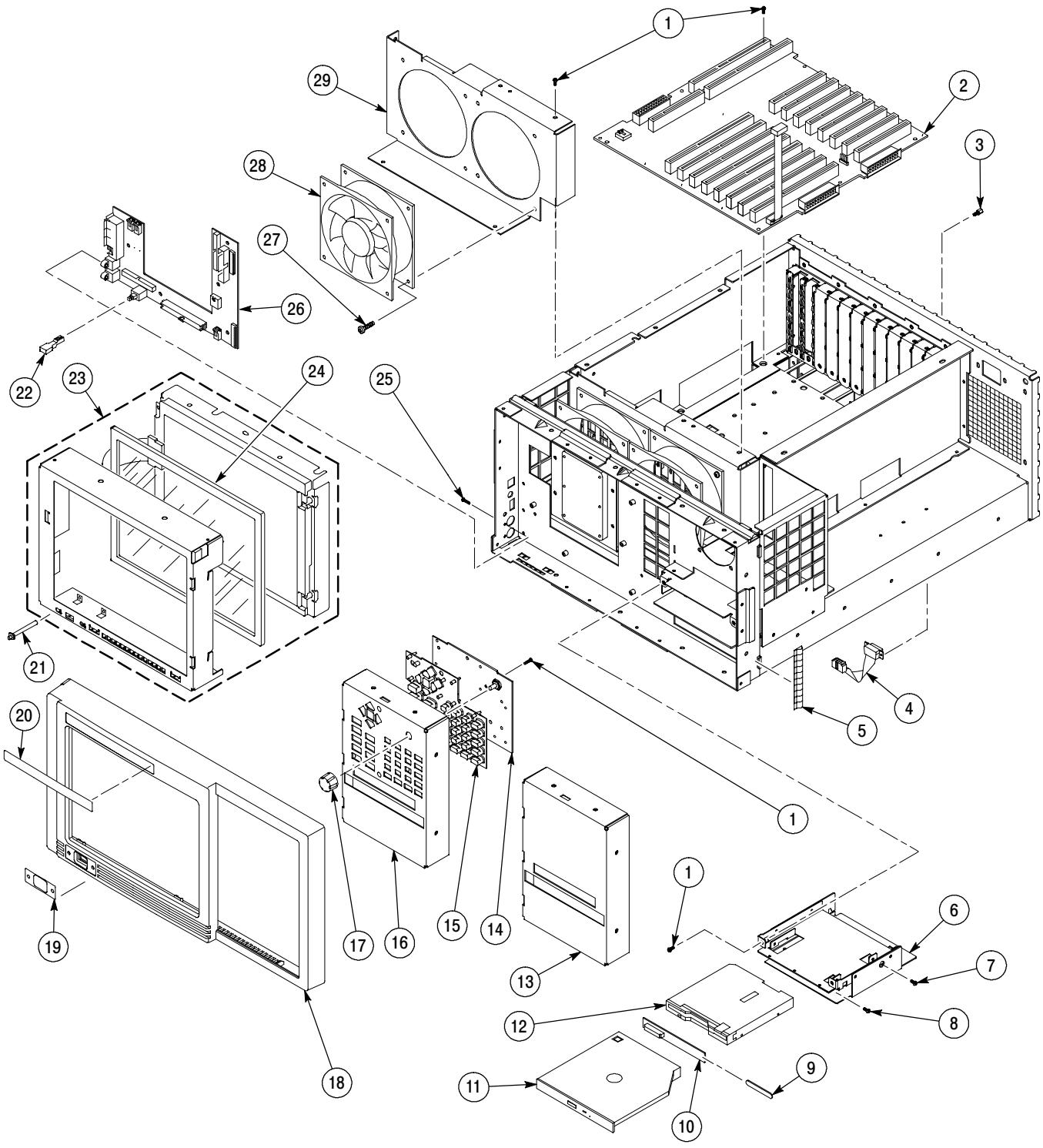


Figure 10-2: Front panel and associated parts, Backplane board, and disk drives

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-3							
1	211-0722-00			122	SCREW,MACHINE:6-32 X 0.250,PNH, STL, CDPL, T-15 TORX DR	0KB01	ORDER BY DESCRIPTION
2	174-4240-00			1	CA ASSY:RIBBON,IDC,28AWG,4.450L,BOX,FEMALE, RTANG,50POS,2MM CTR CONN	060D9	174-4240-00
3	174-4262-00			1	CA ASSY:RIBBON,SCSI LED,26 AWG,6.500L,2X BERG P/N 65039-35	060D9	174-4262-00
4	174-4229-00			1	CABLE ASSEMBLY:PARALLEL PORT,2.500 INCHES	060D9	174-4229-00
5	174-4226-00			1	CABLE ASSEMBLY:LPT PARALLEL PORT,2 X 13,2.50 INCHES	060D9	174-4226-00
6	174-4227-00			1	CABLE ASSEMBLY:FLOPPY,2 X 17,2.500 INCHES	060D9	174-4227-00
7	174-4225-00			2	CABLE ASSEMBLY:KEYBOARD/MOUSE,COM1,2 X 5,3.850 INCHES	060D9	174-4225-00
8	407-4841-00			3	BRACKET; HARD DRIVE, CABLE RETAINER, 0.050 AL	TK1943	407-4841-00
9	011-0175-00			1	TERMINATOR; SCSI III, SINGLE ENDED, ACTIVE;SHIELDED, 68 POS, MALE, 0.05 CTR, W/JACKSCREWS	TK0AT	869516-1
10	333-4328-00			1	PANEL, REAR; 3.560 X 1.550, 0.062 AL, ETCH AND CHROMATE, SCSI CONNECTOR, SAFETY CONTROLLED	TK1943	333-4328-00
11	213-1087-00			2	SPACER, POST; 0.562 L, W/4-40 THD 0.405 L, 2-56 INT THD, 0.157 STAND O.157 STANDOFF, ACCOM SCSI CONNECTOR, SST	00779	749087-1
12	174-4361-00			1	CA ASSY, SP; RIBBON, SCSI, IDC, 0.025 CTR, 4 X 68 POS MALE, 1 X 68 POS FEMALE	060D9	174-4361-00
13	174-4362-00			1	CA ASSY; DESCRETE, CPD, SCSI, 4, 16 AWG, 26.5L, 1X4 BOX X 1X4 BOX	060D9	174-4362-00
14	407-4710-01			1	BRACKET; SCSI DRIVE MTG, 15.580 X 10.250, 0.062 AL, SAFETY CONTROLLED	5Y400	407-4710-01
15	407-4715-00			6	BRACKET; SIDE MOUNTING, 5.0L X 0.750, 0.062 AL, ETCH/CHROMATE	TK1943	407-4715-00
16	119-6361-00		B210179	3	DISK DRIVE:PRGM 119-6175-00,WINCHESTER,3.5 INCH,9 GBYTE,SCSI,25L1810	80009	119-6361-00
	119-6361-01	B210180		3	DISK DRIVE:WINCHESTER,3.5 INCH,9.1 GBYTE, SCSI, 07N3220	9F560	07N3220
17	174-3786-00			1	CA ASSY,SP,ELEC:HIGH DENSITY,FLOPPY DRIVE, ZIF,26,0.039 CTR,TIN PLATED END	060D9	174-3786-00
18	174-3814-00			1	CA ASSY,SP,ELEC:RIBBON,IDC,4,26-30 AWG,15.0 L,(FEMALE,STR,2 X 2,0.079 CTR (2MM),BERG 69307-004)	060D9	174-3814-00
19	174-4223-00			1	CABLE ASSEMBLY:FRONT PANEL INTERFACE,2 X 50,15.0 INCHES	060D9	174-4223-00
20	119-6381-01			1	DISK DRIVE:WINCHESTER,2.5 IN,10GB,IDE,07N4390,BASE PART 119-6493-00	80009	119-6381-01

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
21	407-4515-01			1	BRACKET:HARD DRIVE MTG,0.050THK,AL,ALLOY 5052 H32	TK1943	407-4515-01
22	211-0910-00			4	SCREW,MACHINE:M3 X 0.5 X 4MM,PNH,STL ZI PLT, PHL	74594	210-0910-00
23	174-4228-01			1	CA ASSY:IDE TO HARDDRIVE FROM PIO,2MM,2 X 22,2.0 INCHES	060D9	174-4228-01
24	343-1627-00			1	CABLE,CLAMP:0.5H X 2.98L,0.625 W,NYLON 6-6,ADHESIVE,COVER 343-1636-00,	06915	FCRCS-21B-4A-RT
25	343-1636-00			1	CLAMP, COVER; FLT CABLE ROUTING CLAMP, 343-1627-00 BASE	06915	FCRC-21C
26	174-3787-00			1	CA ASSY,SP,ELEC:RIBBON, DISPLAY ADAPTOR BOARD,FLX,50,28AWG,6.5 L,(RCPT,2 X 50, FEMALE, STR,0.079 C	060D9	174-3787-00
27	174-3789-00			1	CA ASSY,SP,ELEC:RIBBON,FRT PNL POWER, IDC,30,28AWG,PVC,3 FOLDS (2.25 L, 8.5 L,5.5L, 2.5L)	060D9	174-3789-00
28	174-4237-00			1	CA ASSY:SP,BR,RIBBON,USB/SPEAKER,26 AWG,1 X 6 0.1 CTR X 2 - 1 X 4 0 .1 CTR	060D9	174-4237-00
29	174-4224-01			1	CABLE ASSEMBLY:PIO TO CD ROM,11.200 X 10.400 X 6.800 X 2.850	060D9	174-4224-01

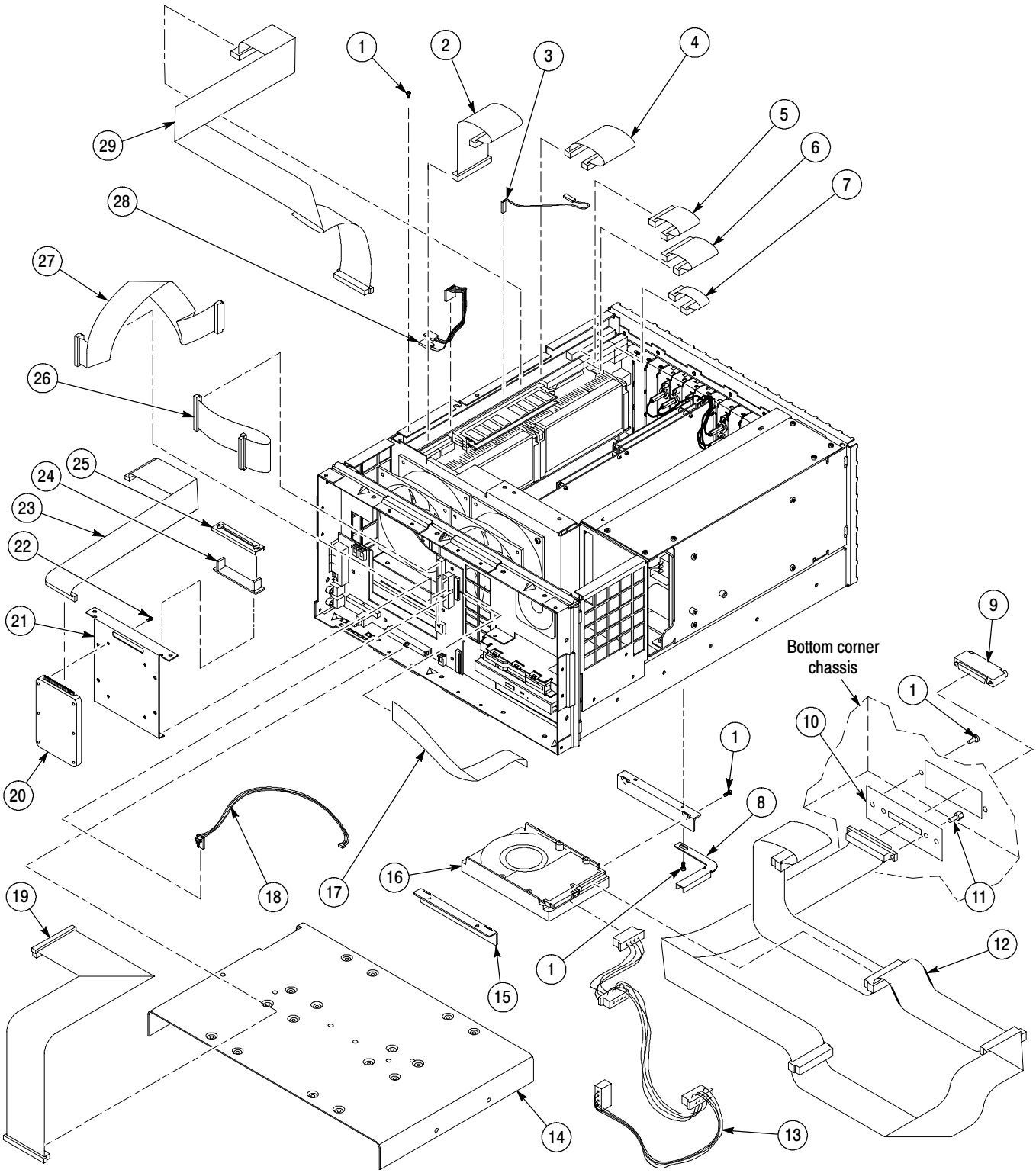


Figure 10-3: Cables and hard drives

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-4							
1	200-4408-00			1	COVER:PROTECTIVE,0.125 ABS,BLACK,HAIRCELL TEXTURED GSE,W/ADHESIVE FOAM	TK2480	200-4408-00
2	348-1154-01			4	FOOT,CABINET:POLYCARBONATE,LEXAN940, EARTH BROWN	80009	348-1154-01
3	211-0738-00			4	SCREW,MACHINE:6-32 X 0.625,PNH,STL BLK ZI,TORX	93907	ORDER BY DESCRIPTION
4	367-0477-00			1	HANDLE,CARRYING:DUAL DUROMETER MOLDED HANDLE, POLYPROPYLENE HANDLE VINYL GRIP SECTION	12136	PT 3170
5	212-0213-00			2	SCREW,MACHINE:8-32 X 0.75 L,PNH,STL, BLACK OXIDE PL,TORX	0KB01	212-0213-00
6	161-0066-00			1	CA ASSY,PWR:3,18 AWG,250V/10A,98 IN,STR, RCPT X NEMA 5-15P,IEC320,US,SAFTEY CONTROLLED	0B445	ECM-161-0066-00
7	390-1176-00			1	CABINET,WRAPAROUND:WITH HANDLE AND FEET, 0.050 ALUMINUM,SAFETY CONTROLLED	TK1943	390-1176-00
8	348-1515-00			1	FEET,CABINET:CABINET FEET,BLACK,GLASS-FIBRE REINFORCED PLASTIC,SET OF 4 FEET, 4 SUBBER INSERT	76096	63-526

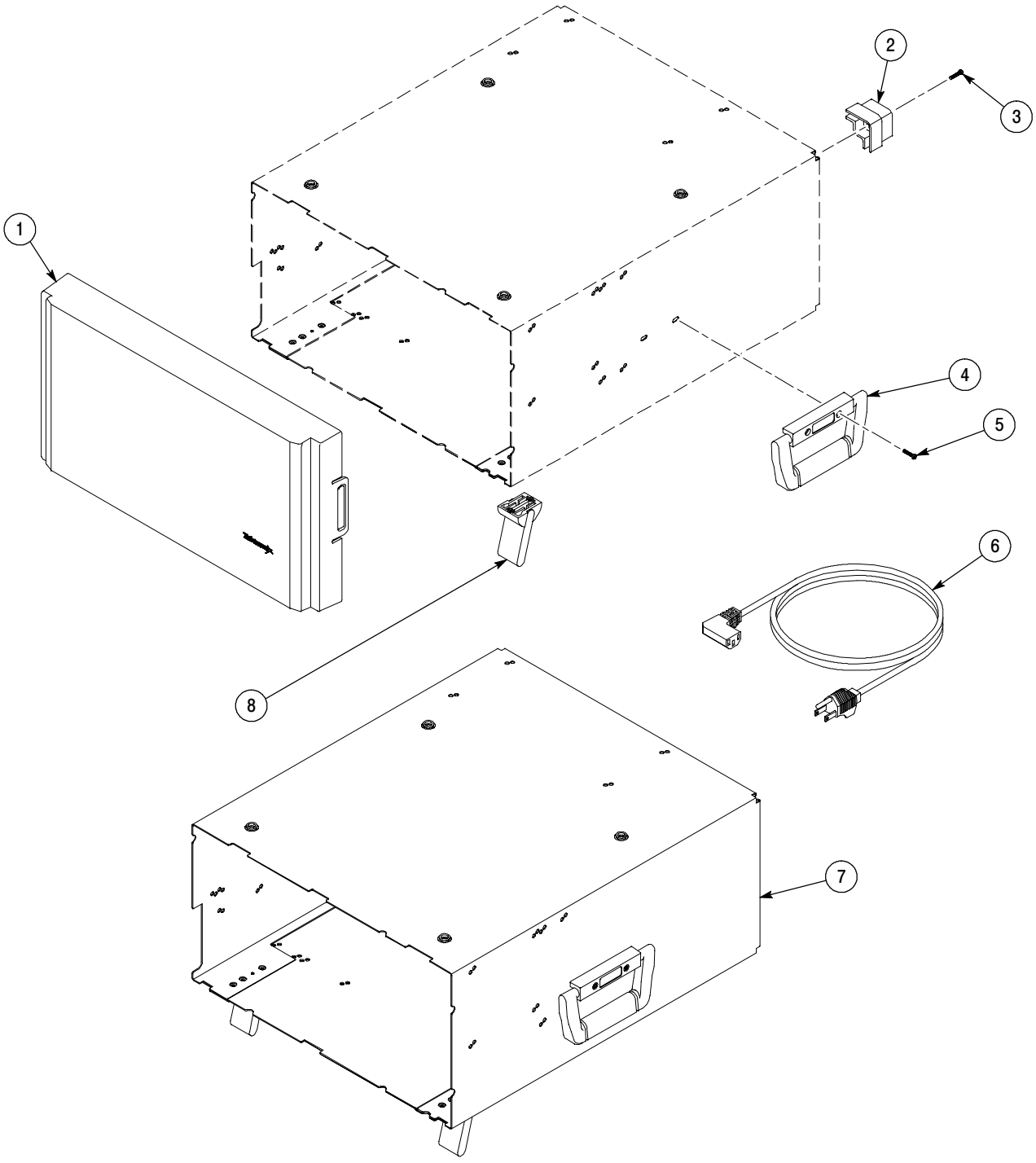


Figure 10- 4: Cabinet parts and accessories

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					MTS300 Standard Accessories (Not Shown)		
	016-1691-01			1	RACKMOUNT KIT:W/075-0372-01 INSTRUCTIONS	5Y400	016169101
	063-3366-00		Nov. 2000	1	SOFTWARE PKG; MPEG TEST SYSTEM OPERATING SYSTEM RECOVERY, CD, MTS300	TK2548	063-3366-00
	063-3366-01	Nov. 2000		1	SOFTWARE PKG; MPEG TEST SYSTEM OPERATING SYSTEM RECOVERY, CD, MTS300	TK2548	063-3366-01
	063-3325-00		July 2000	1	SOFTWARE PKG; MPEG TEST SYSTEM APPLICATION SOFTWARE, RECOVERY CD, MTS300	TK2548	063-3325-00
	063-3325-01	July 2000	Jan. 2001	1	SOFTWARE PKG; MPEG TEST SYSTEM APPLICATION SOFTWARE V5.0, RECOVERY CD, MTS300	TK2548	063-3325-01
	063-3325-02	Jan. 2001	Sept. 2001	1	SOFTWARE PKG; MPEG TEST SYSTEM APPLICATION SOFTWARE V5.1, RECOVERY CD, MTS300	TK2548	063-3325-02
	063-3325-03	Sept. 2001	Dec. 2001	1	SOFTWARE PKG; MPEG TEST SYSTEM APPLICATION SOFTWARE V6.0, RECOVERY CD, MTS300	TK2548	063-3325-03
	063-3325-04	Dec. 2001		1	SOFTWARE PKG; MPEG TEST SYSTEM APPLICATION SOFTWARE V6.1, RECOVERY CD, MTS300	TK2548	063-3325-04
	063-3158-00			1	DATA SHEET; SOFTWARE KEY INFORMATION	TK2548	063-3158-00
	071-0666-00		Jul. 2000	1	MANUAL,TECH:READ THIS FIRST, MTS300	TK2548	071-0666-00
	071-0666-01	Jul. 2000	Jan. 2001	1	MANUAL,TECH:READ THIS FIRST V5.0, MTS300	TK2548	071-0666-01
	071-0666-02	Jan. 2001	Sept. 2001	1	MANUAL,TECH:READ THIS FIRST V5.1, MTS300	TK2548	071-0666-02
	071-0666-03	Sept. 2001	Dec. 2001	1	MANUAL,TECH:READ THIS FIRST V6.0, MTS300	TK2548	071-0666-03
	071-0666-04	Dec. 2001		1	MANUAL,TECH:READ THIS FIRST V6.1, MTS300	TK2548	071-0666-04
	071-0667-00		Jan. 2001	1	MANUAL, TECH; TECHNICAL REFERENCE, MPEG TEST SYSTEM HARDWARE & SOFTWARE INSTALLATION; MTS300	TK2548	071-0667-00
	071-0667-01	Jan. 2001	Sept. 2001	1	MANUAL, TECH; TECHNICAL REFERENCE, MPEG TEST SYSTEM HARDWARE & SOFTWARE INSTALLATION; MTS300	TK2548	071-0667-01
	071-0667-02	Sept. 2001		1	MANUAL, TECH; TECHNICAL REFERENCE, MPEG TEST SYSTEM HARDWARE & SOFTWARE INSTALLATION; MTS300	TK2548	071-0667-02
	071-0658-00		Sept. 2001	1	MANUAL, TECH; USER;MTS300 MPEG TEST SYSTEM	TK2548	071-0658-00
	071-0658-01	Sept. 2001	Dec. 2001	1	MANUAL, TECH; USER;MTS300 MPEG TEST SYSTEM	TK2548	071-0658-01
	071-0658-02	Dec. 2001		1	MANUAL, TECH; USER;MTS300 MPEG TEST SYSTEM	TK2548	071-0658-02
	071-0778-00		Sept. 2001	1	MANUAL, TECH; USER, STREAM CREATION APPLICATIONS; MTS300	TK2548	071-0778-00
	071-0778-01	Sept. 2001		1	MANUAL, TECH; USER, STREAM CREATION APPLICATIONS; MTS300	TK2548	071-0778-01

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					MTS300 Standard Accessories (Cont.)		
	119-6107-00			1	STYLUS:STYLUS FOR TOUCH SCREEN, T1100	03ZT7	T1100
	118-9402-00			1	KEYBOARD ASSY:83 KEY NOTEBOOK KEYBOARD, IBM AT OR PS/2 COMPATIBLE,GRAY	01963	684-4100PAU
	119-4330-02			1	POINTER ASSY:MOUSE,400 DP MOUSE,LOGITECH, SAD35-6MD	46628	850448-0001
					MTS300 Option DT Accessory		
	071-0659-00		Sept. 2001	1	MANUAL, TECH; USER;MTS300 MPEG-2 DVB/ATSC SYSTEM ANALYZER	TK2548	071-0659-00
	071-0659-00	Sept. 2001		1	MANUAL, TECH; USER;MTS300 MPEG-2 DVB/ATSC SYSTEM ANALYZER	TK2548	071-0659-01
					MTS300 Option AC3 Accessory		
	071-0661-00			1	MANUAL, TECH; USER; MTS300, AC-3 STREAM ANALYZER	TK2548	071-0661-00
					MTS300 Option OM Accessory		
	071-0778-00		Sept. 2001	1	MANUAL, TECH; USER, STREAM CREATION APPLICATIONS; MTS300	TK2548	071-0778-00
	071-0778-01	Sept. 2001		1	MANUAL, TECH; USER, STREAM CREATION APPLICATIONS; MTS300	TK2548	071-0778-01
					MTS300 Option ES Accessories		
	071-0663-00			1	MANUAL, TECH; USER, AUDIO STREAM ANALYZ-ER; MTS300	TK2548	071-0663-00
	071-0664-00			1	MANUAL, TECH; USER, VIDEO STREAM ANALYZ-ER; MTS300	TK2548	071-0664-00
					MTS300 Option PS Accessory		
	071-0662-00			1	MANUAL, TECH; USER, PROGRAM STREAM ANALYZER;MTS300	TK2548	071-0662-00
					MTS300 Optional Accessory		
	071-0668-00			1	MANUAL,TECH:SERVICE, MTS300	TK2548	071-0668-00

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					Power Cord Options		
	161-0066-09			1	CA ASSY, PWR; 3, 0.75MM SQ, 250V/10A, 99 INCH, STR, IEC320, RCPT, EUROPEAN, SAFETY CONTROLLED; A1	2W733	ORDER BY DESCRIPTION
	161-0066-10			1	CA ASSY, PWR; 3, 1.0 MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT X 13A, FUSED UK PLUG(13A FUSE), UNITED KINGDOM, SAFETY CONTROLLED; A2	TK2541	ORDER BY DESCRIPTION
	161-0066-11			1	CA ASSY, PWR; 3, 1.0MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT, AUSTRALIA, SAFETY CONTROLLED; A3	80126	ORDER BY DESCRIPTION
	161-0154-00			1	CA ASSY, PWR; 3, 1.0MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT, SWISS, SAFETY CONTROLLED; A5	5F520	ORDER BY DESCRIPTION

Glossary

AC-3
Audio coding scheme developed by Dolby Laboratories, Inc. and adopted by ATSC.

Analysis Server
The Analysis Server is the process that performs the actual analyses on transport stream inputs. Each Analysis Server process includes one MPEG Analysis Server and one TMCC Analysis Server. Each MTS300 system can support up to two Analysis Server processes simultaneously. The Analysis Server sends analysis results to the Server Manager.

ARIB (Association of Radio Industries and Business)
ARIB is a body of broadcasters, manufacturers, and communication carriers who are responsible for preparing standards on radio spectrum use in Japan.

ATSC (Advanced Television Systems Committee)
The Advanced Television Systems Committee was formed to establish voluntary technical standards for advanced television systems, including digital high definition television (HDTV).

BAT (Bouquet Association Table: DVB SI)
Describes the bouquets (collections of services) carried by one or more transport streams.

BIT (Broadcaster Information Table)
ARIB only.

Bouquet
A group of transport streams in which programs are identified by the network ID and PID pair of values.

CAT (Conditional Access Table: MPEG-2 PSI)
Associates one or more EMM (Entitlement Management Message) streams to specific PID values.

See also ECM.

Client/Server

The client / server software architectural model allows software to be developed into two or more modules:

- The server module performs CPU intensive operations, runs in the background (or remotely), and responds to "requests" from clients. Usually requests are due to some action you have taken.
- The client module is often a graphical user interface that allows you to configure or display the status of the server module.

Compression Layer

The compression layer is the compressed elementary stream and associated metadata that describes the elementary stream. Usually this layer is organized into variable length packets with headers and payloads of data, in which case the bitstream is called a packetized elementary stream, or PES.

See the appropriate MPEG-2, DVB, or ATSC standards for more information.

See also System Layer.

CRC (Cyclic Redundancy Check)

One of the fields described in the MPEG2 standard, used to check the accuracy of data in PSI and SI tables.

CVCT (Cable Virtual Channel Table)

One of the tables defined by ATSC PSIP; contains a list of attributes for virtual channels carried in the TS for a cable system.

Data Broadcast Descriptor

The key to data broadcasting protocols that fall within the scope of DVB SIDAT 360. The data_broadcast_descriptor that can be found in the SDT and DVB EIT. The data_broadcast_descriptor is the key to identifying data piping and synchronous/asynchronous data streaming.

DCT (Download Control Table)

ARIB only.

DDB (Download Data Block)

The DownloadDataBlock table is a table that carries chunks of a module. DDBs are referenced by DSIs.

DII (Download Info Indication)

The DownloadInfoIndication table is a Data Carousel specific table that defines a group of modules. DIIs may be referenced either by the data_broadcast_descriptor of the Data Carousel (one-layer Data Carousels), or by the associate DSI (two-layer Data Carousels).

DIT (Discontinuity Information Table)
This DVB structure is only used with partial transport streams; it is never part of a transport stream used for broadcast.

DLT (Download Table)
ARIB only.

DSI (Download Server Initiate)
The DownlardServerInitiate table is a Data Carousel specific table that defines a super-group of modules. It is referenced by the data_broadcast_descriptor of the Data Carousel (2-layer).

DSM-CC (Digital Storage Media Command and Control)
The Digital Storage Media Command and Control specification is a set of protocols which provides the control functions and operations specific to managing ISO/IEC 11172 (MPEG-1) and ISO/IEC 13818 (MPEG-2) bit streams, although the concepts and protocols are considered to apply to more general use. DSM-CC is defined in ISO/IEC 13818-6. The strength of DSM-CC is that it enables a single DSM (in the server) to serve clients on these and other network topologies with one common protocol. DSM-CC messages are encapsulated in MPEG-2 sections whose format is compliant with the private section format defined in ISO/IEC 13818-1.

DTS (Decoding Time Stamp)
One of the fields described in the MPEG2 standard; may be present in a PES packet header that indicates the time that an access unit is decoded in the T-STD.

DVB (Digital Video Broadcast)
A project group of the European Broadcasting Union (EBU).

DVB IRD (Digital Video Broadcasting Integrated Receiver Decoder)
A receiving decoder that can automatically configure itself using the MPEG-2 Program Specific Information (PSI).

DVB-MG
Digital Video Broadcasting Measurement Guidelines

DVB-SI
Digital Video Broadcasting Service Information.

DVB-T
Digital Video Broadcasting Terrestrial.

ECM (Entitlement Control Message: MPEG-2 PSI)
The ECM is private conditional access information that specifies control words and possibly other, typically stream-specific, scrambling and/or control parameters.

See also EMM and CAT.

EIT (Event Information Table: DVB SI and ATSC PSIP)

DVB

Provides information about the chronological order of events carried by the transport stream.

ATSC

Provides information about the programs (or data broadcasting sessions) defined for the virtual channels.

EMM (Entitlement Management Message: MPEG-2 PSI)

The EMM is private conditional access information that identifies the authorization levels or the services of specific decoders.

See also ECM and CAT.

Elementary Stream

An ordered series of bytes representing compressed audio, video, or data including associated control data. Elementary streams are described in the MPEG-2 standards.

EPG (Electronic Program Guide)

The EPG gives the content of the current program.

ETM (Extended Text Message)

An ETM is a multiple string data structure. Thus, it may represent a description of an event or channel in several different languages (each string corresponding to one language).

ETR (ETSI Technical Report)

One of the types of documents released by ETSI.

ETS (European Telecommunication Standard)

One of the types of documents released by ETSI.

ETSI

European Telecommunication Standards Institute

ETT (Extended Text Table: ATSC PSIP)

Provides detailed textual information about the virtual channels and events (programs) carried by the transport stream.

Frame

An ISDB-S/ARIB structure comprised of 48 slots. *See Slot* and *Super frame*.

GPS

Global Positioning System

Input

See Multiplex.

IRD (Integrated Receiver/Decoder)
A receiving decoder that can automatically configure itself using the MPEG-2 Program Specific Information (PSI).

ISO (International Organization for Standardization)
Organization responsible for establishing standards at the world wide level.

Mega-Frame
A mega-frame is a set of OFDM frames, defined in such a way that the number of packets contained in a mega-frame does not depend on the transmission mode (2K or 8K).

MGT (Master Guide Table: ATSC PSIP)
Provides PID values for all PSIP tables carried in the transport stream (except for the STT).

MIP
Mega-frame Initialization Packet

Modulation Modes
The ISDB-S/ARIB standards define different modulation modes and how they are used in ISDB-S/ARIB systems. Modulation mode parameters are checked by the TMCC Analysis Servers,and the results are displayed in both the Slots panel and Syntax panel of the TMCC Expert client.

MPEG
Moving Picture Experts Group

M_TMCC
An ISDB-S/ARIB compliant multiplex with multiple transport streams. *See TMCC*.

Multiplex (Input)
A Multiplex, as used in this online help system, is any single or multiple program transport stream. The terms Input and Multiplex are interchangeable when discussing a monitored bitstream.

NIT (Network Information Table: MPEG-2 PSI)
Describes the physical network over which the transport stream is carried. The DVB and ATSC standards extend the MPEG-2 definition of the NIT.

PAT (Program Association Table: MPEG-2 PSI)
Associates program numbers and PMT PIDs.

PCR (Program Clock Reference)
One of the fields defined in the MPEG2 standard, a time stamp in the TS from which the decoder timing is derived.

PES (Packetized Elementary Stream)
One of the structures defined by the MPEG2 standard, used to carry elementary stream data.

PIA (Processing Interface Adapter)
One of the boards designed by THOMCAST. The PIA+ board filters and analyzes the input transport stream for compliance to MPEG-2, DVB, and ATSC TS standards.

PID (Packet Identifier)
One of the fields described in the MPEG2 standard; a unique integer value used to identify elementary streams of a program in a single or multi-program TS.

PMT (Program Map Table: MPEG-2 SI)
Lists the PID values of program elements (for instance, elementary stream PID(s) and the PID of the clock references for the program elements).

Program
The following structures are elements of MPEG-2 programs (or services): PES packets, PMT, ECM. Program elements may, or may not, have a common time base.

Program paradigm
In ATSC environments, the program paradigm specifies the method that shall be used for systematically allocating PID values of transport packets.

PSI (Program Specific Information)
Program Specific Information is used to describe the structure of a transport stream encoded using the MPEG-2 standards. PSI is carried in the following MPEG-2 table structures: CAT, NIT, PAT, PMT, and TSDT.

PSIP (Program and System Information Protocol)
Program and System Information Protocol is used to describe the structure of a transport stream encoded using the ATSC standards. PSIP is carried in the following ATSC table structures: EIT, ETT, MGT, RRT, STT, and VCT

PTS (Presentation Time Stamp)
One of the fields described in the MPEG2 standard; it may be present in a PES packet header that indicates the time that a presentation unit is presented in the T-STD.

RRT (Rating Region Table: ATSC PSIP)
Provides rating information pertaining to a specified geographic region.

RST (Running Status Table: ATSC PSIP)
Allows quick updates to the timing information for the transport stream.

SDT (Service Description Table: DVB PSI)
Describes the services carried by the transport stream.

SDTT (Software Download Trigger Table)
ARIB only.

Service
A service, also called a program, is a collection of program elements that may, or may not have a common time base.

See also Program.

SFN (Single Frequency Network)
SFN is an extension of the DVB system in which all transmitted signals are identical; therefore, the MPEG-2 TS inputs to the various DVB-T modulators have to be bit identical.

SI (Service Information)
Service information is used to describe the structure of a transport stream encoded using the DVB standards. SI is carried in the following DVB table structures: BAT, EIT, NIT, RST, SDT, TDT, and TOT.

SID (Service ID)
The parameter used to uniquely identify a service within a transport stream.

SIT (Selection Information Table)
DVB-SI table. This DVB structure is only used with partial transport streams; it is never part of a transport stream used for broadcast.

Slot
An ISDB-S/ARIB structure corresponding to one, 204-byte error coded packet. *See Frame* and *Super frame*.

SNMP (Simple Network Management Protocol)
SNMP is the most common protocol used in network management systems. SNMP is built on top of UDP/IP (User Datagram Protocol / Internet Protocol) and provides a common interface between all the various devices on a network and central network management stations. Network management stations use network software to monitor network traffic and respond to errors reported by devices on the network.

S_TMCC
An ISDB-S/ARIB compliant multiplex with only one transport stream. *See TMCC*.

STS Interval
The STS interval measurement is obtained by calculating the difference between the STS of the current MIP and the STS of the previous MIP, modulo one second.

STT (System Time Table: ATSC PSIP)
Provides time and date information for the transport stream, as well as offset and daylight savings time data.

Super frame
An ISDB-S/ARIB structure comprised of eight frames. *See Frame* and *Slot.*

System Layer

The system layer is the transport stream with program data and associated metadata that describes the composition and organization of the transport stream.

MPEG-2 system layer information includes synchronization bytes, PID numbers, scrambling information, and other indicators, including the start of the transport packet payload. Transport packets can be PES packet, a PSI table, or other private data. ATSC and DVB transport streams are MPEG-2 compatible because the required ATSC and DVB system layer data are MPEG-2 private data structures. See the appropriate MPEG-2, DVB, or ATSC standards for more information.

TDT (Time and Date Table: DVB SI)

Provides the time and date information (in UCT) for the transport stream.

TMCC (Transmission and Multiplexing Configuration and Control)

TMCC information is used to control transmission parameters in ISDB-S environments where the multiplex includes transport streams from multiple broadcasters and the services encoded in the various transport streams require different modulation schemes. TMCC information is encoded in the first eight bytes of the 16-byte Reed-Solomon area of 204-byte packet transport streams. TMCC information includes modulation modes, slot assignments, and alarms.

TOT (Time Offset Table: DVB SI)

Provides time offset information for the transport stream.

Traps

Traps are SNMP messages generated by the Analysis Server. These messages are sent to one or more Server Managers (which you specify using the Router utility). Ultimately, the traps regarding errors on the transport stream are displayed as various error icons using the Master client.

Transport Stream

A transport stream is an ordered series of bytes representing valid MPEG-2, DVB, ATSC, or ISDB-S/ARIB elements used to deliver video, audio, or data. A transport stream may be composed of one or more elementary streams.

The following MPEG-2, DVB, and ATSC structures are transport stream elements: Program elements (including elementary streams and time stamps), and PSI, SI, and PSIP tables.

TS

See Transport Stream

TSC

Transport Scrambling Control

TSDT (Transport Stream Descriptor Table: MPEG-2 PSI)
The TSDT uses descriptors to provide information about the transport stream; for instance, information about the elementary streams, system clock, bit rate, and other parameters.

TSID (Transport Stream ID)
The parameter that uniquely identifies a transport stream within an original network.

TVCT
VCT for terrestrial broadcast environments.

T-STD (Transport Stream - System Target Decoder)
Described by the MPEG2 standard; a hypothetical reference model of a decoding process used to define the semantics of a TS.

VCT (Virtual Channel Table: ATSC PSIP)
There are two types of VCT: Terrestrial and Cable. Both describe attributes of the virtual channels defined for the transport stream including the transmission system and data about the services and programs for the network.