Service Manual

Tektronix
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**MTX100A
MPEG Recorder & Player**

071-1754-00

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- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

Warranty 2

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Batteries are excluded from this warranty. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

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

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

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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 Operate Without Covers. Do not operate this product with covers or panels removed.

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.

No Power Switch. Power supply cord is considered the disconnecting device, disconnect the main power by means of the power cord.

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	WARNING High Voltage	Double Insulated	Protective Ground (Earth) Terminal	Not suitable for connection to the public telecommunications network

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, disconnect the mains power by means of the power cord or, if provided, the power switch.

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.

Environmental Considerations

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

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

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

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

Mercury Nortification. This product uses an LCD backlight lamp that contains mercury. Disposal may be regulated due to environmental considerations. Please contact your local authorities or, within the United States, the Electronics Industries Alliance (www.eiae.org) for disposal or recycling information.

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead, cadmium, mercury, and hexavalent chromium.

Preface

This is the service manual for the MTX100A MPEG Recorder & Player. This manual contains information needed to service an MTX100A to the module level.

Manual Structure

This manual is divided into sections, such as *Specifications* and *Theory of Operation*. Further, some sections are divided into subsections, such as *Product Description* and *Removal and Installation Procedures*.

Sections containing procedures also contain introductions to those procedures. Be sure to read these introductions because they provide information needed to do the service correctly and efficiently. The following are brief descriptions of each manual section.

- *Specifications* contains a description of the MTX100A and the characteristics that apply to it.

- *Theory of Operation* contains circuit descriptions that support service to the module level.

- *Performance Verification* contains procedures for confirming that an MTX100A functions properly and meets warranted characteristics.

- *Maintenance* contains information and procedures for performing preventive and corrective maintenance of an MTX100A. These instructions include cleaning, module removal and installation, and fault isolation to the module level.

- *Options* contains descriptions of factory-installed options and field-upgradable options.

- *Diagrams* contains block diagrams and interconnection diagrams of the MTX100A and the optional interface modules.

- *Replaceable Parts List* includes a table of all replaceable modules, their descriptions, and their Tektronix part numbers.

Manual Conventions

This manual uses certain conventions with which you should become familiar.

Some sections of the manual contain procedures for you to perform. To keep those instructions clear and consistent, this manual uses the following conventions:

- Names of front panel controls and menus appear in the same case (initial capitals, all uppercase, and so forth) in the manual as is used on the MTX100A front panel and menus.

- Instruction steps are numbered unless there is only one step.

- **Bold** text refers to specific interface elements that you are instructed to select, click, or clear.

  Example: To power on the MTX100A, press the **ON/STBY** switch.

- *Italic* text refers to document names or sections. Italics are also used in NOTES, CAUTIONS, and WARNINGS.

  Example: The *Diagrams* section, beginning on page 6-1, includes a block diagram and an interconnect diagram.

Modules Throughout this manual, any replaceable component, assembly, or part of the MTX100A is referred to generically as a module. In general, a module is an assembly (like a circuit board), rather than a component (like a resistor or an integrated circuit). Sometimes a single component is a module. For example, the chassis of the MTX100A is a module.

Safety Symbols and terms related to safety appear in the *General Safety Summary* and *Service Safety Summary* near the beginning of this manual.

Finding Other Information

Other documentation for the MTX100A includes:

- The MTX100A MPEG Recorder & Player *User Manual* contains a tutorial to quickly describe how to operate the MTX100A. It also includes an in-depth discussion on how to more completely use the MTX100A features.

Introduction

This manual contains information needed to properly service the MTX100A
MPEG Recorder & Player, as well as general information critical to safe and
effective servicing.

To prevent personal injury or damage to the MTX100A, consider the following
before attempting service:

■ The procedures in this manual should be performed only by a qualified
   service person.

■ Read the *General Safety Summary* and the *Service Safety Summary,*
   beginning on page vii.

When using this manual for servicing be sure to follow all warnings, cautions,
and notes.

Performance Check Interval

Generally, the performance check described in section 3, *Performance Verifica-
tion*, should be done every 12 months. In addition, a performance check is
recommended after module replacement.

If the MTX100A does not meet performance criteria, repair is necessary.

Strategy for Servicing

Throughout this manual, the term "module" refers to any field-replaceable
component, assembly, or part of the MTX100A.

This manual contains all the information needed for periodic maintenance of the
MTX100A (examples of such information are procedures for checking perfor-
mance).

Further, this manual contains all information for corrective maintenance down to
the module level. To isolate a failure to a module, use the fault isolation
procedures found in *Troubleshooting*, part of section 4, *Maintenance*. To remove
and replace any failed module, follow the instructions in *Removal and Installa-
tion Procedures*, also part of section 4. After isolating a faulty module, replace it
with a fully-tested module obtained from the factory. Section 7, *Replaceable
Parts List,* contains part number and ordering information for all replaceable
modules.

Tektronix Service Offerings

Tektronix provides service to cover repair under warranty as well as other services that may provide a cost-effective answer to your service needs.

Whether providing warranty repair service or any of the other services listed below, Tektronix service technicians are well trained to service the MTX100A. They have access to the latest information on improvements to the MTX100A as well as the latest new options.

Warranty Repair Service   Tektronix warrants this product for one year from date of purchase. The warranty appears after the title page in this manual. Tektronix technicians provide warranty service at most Tektronix service locations. The Tektronix product catalog lists all worldwide service locations or you can visit our web site for service information: www.tektronix.com.

Self Service   Tektronix supports repair to the module level by providing Module Exchange.

Module Exchange. This service reduces down-time for repair by allowing you to exchange most modules for remanufactured ones. Each module comes with a 90-day service warranty.

For More Information. Contact your local Tektronix service center or sales engineer for more information on any of the repair or adjustment services just described.

Specifications

Product Overview

The MTX100A MPEG Recorder & Player records and plays MPEG-2 transport streams that are compliant with ATSC, DVB, and ARIB standards.

The MTX100A provides the following features:

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

- Hierarchy display of the stored or captured transport stream

- 188, 204, 208 bytes packet size, S-TMCC, M-TMCC, non transport stream, and partial transport stream output formats

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

- Continuous recording of captured streams

- PCR jitter insertion

- Triggered stream capture

- Full remote control using Ethernet interface

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

- Optional ASI, universal parallel/serial, IEEE1394/ASI, and SMPTE310M/ASI/SPI interfaces available

The MTX100A includes the ReMux application software that provides the capability to create a transport stream of super frame structure defined in the ISDB-S systems from an MPEG2 transport stream.

Specifications

Tables 1-1 through 1-8 list the functional, electrical, mechanical, and environmental characteristics of the MTX100A. Table 1-9 lists the national and international standards to which the MTX100A complies.

All listed specifications are guaranteed unless labeled with "typical". Typical specifications are provided for your convenience but are not guaranteed.

Performance Conditions

The electrical characteristics listed on the following pages are valid under the following conditions:

- The MTX100A must be in an environment where the temperature, altitude, humidity, and vibration conditions are within the operating limits described in Table 1-8 on page 1-14.

- The MTX100A must have a warm-up period of at least 20 minutes.

- The MTX100A must be operating at an ambient temperature between +5 °C to +40 °C, unless otherwise noted.

Functional Specifications

Table 1-1: Functional specifications

Characteristics	Description
System configuration	
System OS	Windows XP Professional
CPU	1.3 GHz
System memory	512 MB
Display	640 x 480 VGA resolution with 256 K colors
Storage device	
Hard disk drive	160 GB
DVD ± RW drive	Read and write: DVD+R, DVD+RW, DVD-R, DVD-RW, CD-R, and CD-RW Read only: DVD--ROM and CD--ROM
Expansion slot	1 - PCI slot

Electrical Specifications

Table 1-2: Mainframe

Characteristics	Description
Maximum output rate	
Hard disk	$\geq$ 120 Mbps
RAM	$\geq$ 200 Mbps
Maximum record rate	
Hard disk	$\geq$ 120 Mbps (File size: $<$ 4 GB, just after disk format operation) $\geq$ 90 Mbps (File size: 33 GB, just after disk format operation)
RAM	$\geq$ 200 Mbps
Internal reference clock	For Output_clock, PCR/PTS/DTS, packet operation timing, and TDT/STT time.
Reference clock	27 MHz $\pm$ 1 ppm
External reference/clock input	
Connector type	BNC
Input impedance, typical	50 Ω
Reference input	
Frequency	8.129698 MHz, 10 MHz, 27 MHz
Input level, typical	Sine wave: 0 $\pm$ 6 dBm Vp-p Square wave: 0.5 Vp-p to 3.0 Vp-p
Clock input	
Frequency	160 kHz to 25 MHz (parallel clock) 1.28 MHz to 32 MHz (serial clock)
Input level, typical	0.5 V to 3.0 V
External trigger input/MISC output	
Connector type	BNC
Input impedance, typical	1 kΩ
Threshold level	Rising and falling edges are programmable.
High level	$>$ 3.5 V (maximum input voltage: 7 V)
Low level	$<$ 0.8 V
Output level	
High level	$>$ 2.2 V (with 50 Ω termination)
Low level	$<$ 0.8 V (with 50 Ω termination)
Output impedance	50 Ω

Table 1-2: Mainframe (Cont.)

Characteristics	Description
PLL	
Frequency	50 MHz to 100 MHz, Locked to reference clock
Output clock	50 MHz maximum (serial clock) 26.75 MHz maximum (parallel clock)
Output rate	214 Mbps maximum 64 Kbps minimum
TS clock (Internal and external reference, 27 MHz and 10 MHz)	TS clock = $(X / (2 * Y * Z))$ * 27 MHz $15362 < X < 31248$ $1686 < Y < 3376$ $2 \leq Z \leq 65536$
(External parallel clock)	TS clock = $(X / (2 * Y * Z))$ * external parallel clock, 214 MHz maximum $15632 < X < 31248$ $1 < Y < 16383$ $2 \leq Z \leq 65536$
(External serial clock)	TS clock = $(X / (2 * Y * Z))$ * external serial clock / 8,32 MHz maximum $15632 < X < 31248$ $1 < Y < 16383$ $2 \leq Z \leq 65536$
P/N and Jitter (serial clock)	< -104 dBc/Hz at 21.455707 MHz +20 kHz (RBW=300 Hz)
SPI interface	
Connector type	D-sub, 25 pin
Data rate	256 Kbps to 214 Mbps
Pin assignments	1　　　　　　DCLK 2　　　　　　GND 3 to 10　　　DATA 7 to DATA 0 11　　　　　DVALID 12　　　　　PSYNC 13　　　　　Shield 14　　　　　$\overline{\text{DCLK}}$ 15　　　　　GND 16 to 23　　$\overline{\text{DATA 7}}$ to $\overline{\text{DATA 0}}$ 24　　　　　$\overline{\text{DVALID}}$ 25　　　　　$\overline{\text{PSYNC}}$
Output	
Output level, typical	330 mV to 550 mV (termination: internal 100 Ω. external 100 Ω), bus LVDS with 50 Ω termination
Offset	1.1 V to 1.5 V
Output resistance, typical	100 Ω, between differential outputs (output off)

Table 1-2: Mainframe (Cont.)

Characteristics	Description
Data delay, typical	± 5 ns from the falling edge of DCLK (see Figure 1-1.)
Input	
Input level, typical	$>$ +100 mV, $<$ -100 mV, (RI+)-(RI-) with 100 Ω termination
Input resistance, typical	100 Ω (between differential inputs)
Clock pulse width, typical	T/2 ± T/10, T=1/f (f=byte clock frequency) (see Figure 1-1.)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, Data are latched on DCLK rising edge) (see Figure 1-1.)
VGA output	
Connector type	D-sub, 15 pin
Pin assignments	1 RED 9 NC 2 GREEN 10 GND 3 BLUE 11 NC 4 NC 12 NC 5 GND 13 HSYNC 6 GND 14 VSYNC 7 GND 15 NC 8 GND
Printer port	Supports SPP (Standard Parallel Port), EPP (Enhanced Parallel Port), and ECP (Extended Capabilities Port) modes.
Connector type	D-sub, 25 pin
Pin assignments	1 STROBE 14 AUTOLF 2 D0 15 ERR 3 D1 16 INIT 4 D2 17 SELECT 5 D3 18 GND 6 D4 19 GND 7 D5 20 GND 8 D6 21 GND 9 D7 22 GND 10 ACK 23 GND 11 BUSY 24 GND 12 Paper Empty 25 GND 13 SELECT
USB 2.0 interface	
Number of connectors	2
Pin assignments	1 VCC 2 -DATA 3 +DATA 4 GND

Table 1-2: Mainframe (Cont.)

Characteristics	Description
LAN interface	10/100/1000 Base-T Ethernet interface
Connector type	RJ45
Pin assignments	1 MDI_0+ 5 MDI_2– 2 MDI_0– 6 MDI_1– 3 MDI_1+ 7 MDI_3+ 4 MDI_2+ 8 MDI_3–
Serial interface (Com)	RS-232C
Connector type	D-sub, 9 pin
Pin assignments	1 DCD 6 DSR 2 RX 7 RTS 3 TX 8 CTS 4 DTR 9 RI 5 GND
IEEE1394B interface	
Compliant	IEEE1394B–2002
Pin assignments	1 TPB– 6 VG 2 TPB+ 7 NC 3 TPA– 8 VP 4 TPA+ 9 TPB (R) 5 TPA (R)
AC line power	
Rating Voltage	100 VAC to 240 VAC, CAT II
Voltage Range	90 VAC to 250 VAC
Frequency Range	50 Hz to 60 Hz
Maximum power	180 VA
Maximum current	1.3 A
Main fuse data	5 A Time–delayed, 250 V (not operator replaceable) 2 A Time–delayed, 250 V (not operator replaceable)

Table 1-3: ASI interface (Option 01)

Characteristics	Description
Standard conformance	EN50083-9 Annex B
Connector type	BNC
Impedance, typical	75 Ω
Data rate	256 Kbps to 214 Mbps
Output	
Number of outputs	2
Output voltage	800 mV ± 10%
Jitter	$\leq$ 0.2 UI (p-p)
Rise/fall time (20% to 80%)	$\leq$ 1.2 ns
Return loss	< –17 dB (5 MHz to 270 MHz) into 75 Ω load
Input	
Number of inputs	1 (with active loop-through output)
Input voltage	200 mV to 800 mV
Return loss	< –17 dB (5 MHz to 270 MHz) into 75 Ω load
Data format	Accepts both burst and packet modes ASI

Table 1-4: Universal parallel/serial interface (Option 02)

Characteristics	Description
Parallel interface mode	
Connector type	D-sub, 25 pin (the same connector as serial output)
Data rate	256 Kbps to 214 Mbps
Pin assignments	1 DCLK 2 GND 3 to 10 DATA 7 to DATA 0 11 DVALID 12 PSYNC 13 Shield 14 $\overline{\text{DCLK}}$ 15 GND 16 to 23 $\overline{\text{DATA 7}}$ to $\overline{\text{DATA 0}}$ 24 $\overline{\text{DVALID}}$ 25 $\overline{\text{PSYNC}}$

Table 1-4: Universal parallel/serial interface (Option 02) (Cont.)

Characteristics	Description
Output level, typical	Note: Do not connect the $\overline{\text{Asserted Low}}$ pins for single-end use.
TTL without termination	LO: 0 V HI: 3.3 V
LVDS without termination	0.66 Vp-p to 1.1 Vp-p (amplitude) 1.1 V to 1.5 V (offset)
ECL without termination	LO: –2.1 V HI: –0.5 V
Output impedance, typical	50 Ω ± 5% (per pin, single-end)
Output resistance, typical	≥ 1 kΩ (when the output is off, per pin, single-end)
Data delay, typical	0 ± 5 ns from the falling edge of DCLK (see Figure 1-1 on page 1-13)
Single-end input level, typical	
TTL with termination	LO: 0.0 V to 0.5 V HI: 1.2 V to 5.0 V
ECL with termination	LO: –5.2 V to –1.05 V HI: –0.25 V to 0.0 V
Differential input level, typical	0.4 V to 1.0 Vp–p (between +pin and -pin without termination) 0.2 V to 1.0 Vp–p (between +pin and -pin with termination)
Input resistance, typical	50 Ω ± 5% to GND pin (single end termination: ON) 110 Ω ± 5% (differential termination: ON) ≥ 1 kΩ to GND (termination: OFF)
Clock pulse width, typical	T/2 ± T/10, T=1/f (f=byte clock frequency) (see Figure 1-1 on page 1-13)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, data are latched on DCLK rising edge) (see Figure 1-1 on page 1-13)
Serial interface mode	
Connector type	D-sub, 25 pin (uses a common connector with parallel interface)
Data rate	256 Kbps to 40 Mbps
Pin Assignments	1 DCLK 2 GND 3 to 9 Not managed 10 DATA 0 11 DVALID 12 PSYNC 13 Shield 14 $\overline{\text{DCLK}}$ 15 GND 16 to 22 Not managed 23 $\overline{\text{DATA 0}}$ 24 $\overline{\text{DVALID}}$ 25 $\overline{\text{PSYNC}}$

Table 1-4: Universal parallel/serial interface (Option 02) (Cont.)

Characteristics	Description
Output level, typical	Note: Do not connect the $\overline{\text{Asserted Low}}$ pins for single-end use.
TTL without termination	LO: 0 V HI: 3.3 V
LVDS without termination	0.66 Vp-p to 1.1 Vp-p (amplitude) 1.1 V to 1.5 V (offset)
ECL without termination	LO: –2.1 V HI: –0.5 V
Output impedance, typical	50 Ω ± 5% (per pin, single-end)
Output resistance, typical	≥ 1 kΩ (when the output is off, per pin, single-end)
Data delay, typical	0 ± 5 ns from the falling edge of DCLK (see Figure 1-1 on page 1-13)
Single-end input level, typical	
TTL with termination	LO: 0.0 V to 0.5 V HI: 1.2 V to 5.0 V
ECL with termination	LO: –5.2 V to –1.05 V HI: –0.25 V to 0.0 V
Differential input level, typical	0.4 V to 1.0 Vp–p (between +pin and –pin without termination) 0.2 V to 1.0 Vp–p (between +pin and –pin with termination)
Input resistance, typical	50 Ω ± 5% to GND pin (single end termination: On) 110 Ω ± 5% (differential termination: On) ≥ 1 kΩ to GND pin (termination: Off)
Clock pulse width, typical	T/2 ± T/10, T=1/f (f=byte clock frequency) (see Figure 1-1 on page 1-13)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, data are latched on DCLK rising edge.) (see Figure 1-1 on page 1-13)
Event output (EVENT OUT)	
Connector type	BNC
Output level, typical	TTL without termination LO: < 0.4 V HI: > 2.4 V
Output impedance, typical	50 Ω

Table 1-5: IEEE1394/ASI interface (Option 05)

Characteristics	Description
IEEE1394 interface	
Standard conformance	IEEE Std 1394-1995 IEEE Standard for High Performance serial Bus
Number of connectors	2
Serial interface rate	S-400
Maximum TS rate	40 Mbps
ASI interface	
Standard conformance	EN 50083-9 Annex B
Connector type	BNC
Impedance, typical	75 Ω
Data rate	256 Kbps to 214 Mbps
Input vlotage, typical	200 mV to 800 mV
Output voltage	800 mV $\pm$ 10%
Return loss	$<$ –17 dB (5 MHz to 270 MHz) into 75 Ω load

Table 1-6: SMPTE310M/ASI/SPI interface (Option 07)

Characteristics	Description
SMPTE310M interface	Uses common input/output connectors with the ASI interface.
Standard conformance	SMPTE310M
Connector type	BNC
Impedance	75 Ω
Data rate	19.392658 Mbps (8 VSB, 188 bytes packet size)
Output	
Number of outputs	1
Output voltage	800 mV $\pm$ 10%
Jitter	$\leq$ 0.2 UI p–p
Rise/fall time	0.4 ns to 5.0 ns (20% to 80%)
Frequency range, typical	$\pm$ 3%
Input	
Number of input	1
Input voltage, typical	800 mV $\pm$ 10%
Frequency range, typical	$\pm$ 3%

Table 1-6: SMPTE310M/ASI/SPI interface (Option 07) (Cont.)

Characteristics	Description
ASI interface	Uses common input/output connectors with the SMPTE310M interface.
Standard conformance	EN 50083-9 Annex B
Connector type	BNC
Impedance	75 Ω
Data rate	256 Kbps to 214 Mbps
Output	
Number of outputs	1
Output voltage	800 mV ± 10%
Jitter	$\leq$ 0.2 UI p–p
Rise/fall time	$\leq$ 1.2 ns (20% to 80%)
Return loss	$<$ –17 dB (5 MHz to 270 MHz) into 75 Ω load
Input	
Number of input	1
Input voltage, typical	200 mV to 800 mV
Return loss	$<$ –17 dB (5 MHz to 270 MHz) into 75 Ω load
SPI interface	
Connector type	D-sub, 25 pin
Data rate	256 Kbps to 214 Mbps
Pin assignments	1 DCLK 2 GND 3 to 10 DATA 7 to DATA 0 11 DVALID 12 PSYNC 13 Shield 14 $\overline{\text{DCLK}}$ 15 GND 16 to 23 $\overline{\text{DATA 7}}$ to $\overline{\text{DATA 0}}$ 24 $\overline{\text{DVALID}}$ 25 $\overline{\text{PSYNC}}$
Input	
Input level, typical	$>$ +100 mV, $<$ –100 mV, (RI+)–(RI–) with 100 Ω termination
Input resistance, typical	100 Ω (between differential inputs)
Clock pulse width, typical	T/2 ± T/10, T=1/f (f=byte clock frequency) (see Figure 1-1 on page 1-13)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, Data are latched on DCLK rising edge) (see Figure 1-1 on page 1-13)

Output data delay

Input clock pulse width

$Th = T/2 \pm T/10$: SPI and universal parallel interfaces

$Th = T/5 \pm T/10$: universal serial interface

* In the universal parallel/serial interface,
  the polarity of DCLK can be inverted.

Input data hold time

Figure 1-1: Timing diagram of the SPI and universal parallel/serial interfaces

Mechanical (Physical) Characteristics

Table 1-7: Mechanical characteristics

Characteristics	Description
Net weight	
Standard	Approximately 6 kg
Dimensions	
Height	132 mm (without feet)
Width	214 mm
Length	435 mm

Environmental Characteristics

Table 1-8: Environmental characteristics

Characteristics	Description
Temperature	
Operating	+5 °C to +40 °C
Non-operating	–20 °C to +60 °C
Relative humidity	
Operating	20% to 80% (No condensation)
	Maximum wet-bulb temperature 29 °C
Non-operating	5% to 90% (No condensation)
	Maximum wet-bulb temperature 29 °C
Altitude	
Operating	Up to 4.5 km (15,000 feet)
	Maximum operating temperature decreases 1 °C each 300 m above 1.5 km
Non-operating	Up to 15 km (50,000 feet)
Dynamics	
Vibration	
Operating	2.65 m/s^2 rms (0.27 Grms), 5 Hz to 500 Hz, 10 min, three axes
Non-operating	22.3 m/s^2 rms (2.28 Grms), 5 Hz to 500 Hz, 10 min, three axes
Shock	
Non-operating	294 m/s^2 (30 G), half-sine, 11 ms duration
Installation requirements	
Power dissipation	100 W maximum. Maximum line current is 1.3 A$_{rms}$ at 50 Hz

Table 1-8: Environmental characteristics (Cont.)

Characteristics	Description
Surge current	$\leqq$ 12 A peak for less than 5 line cycles at 25°C after product has been off for at least 30 seconds
Cooling clearance	
Top clearance	5 cm
Side clearance	5 cm
Rear clearance	5 cm (from the fan guard)

Certifications and Compliances

Table 1-9: Certifications and compliances

Category	Standards or description	
EC Declaration of Conformity	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:	
	EMC Directive 89/336/EEC:	
	EN 55011	EMC requirement for Class A electrical equipment for measurement, control and laboratory use
	EN 61000-3-2	AC Power Line Harmonic Emissions
	IEC 61000-4-2	Electrostatic Discharge Immunity (Performance Criterion B)
	IEC 61000-4-3	RF Electromagnetic Field Immunity (Performance Criterion A)
	IEC 61000-4-4	Electrical Fast Transient / Burst Immunity (Performance Criterion B)
	IEC 61000-4-5	Power Line Surge Immunity (Performance Criterion B)
	IEC 61000-4-6	Conducted RF Immunity (Performance Criterion A)
	IEC 61000-4-11	Voltage Dips and Interruptions Immunity (Performance Criterion B)
	Low Voltage Directive 73/23/EEC: Amended by 93/68/EEC:	
	EN 61010-1: 2001	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use
Australia/New Zealand Declaration of Conformity – EMC	Complies with EMC provision of Radio Communications Act per the following standard(s):	
	AS/NZS 2064.1/2	Industrial, Scientific, and Medical Equipment: 1992

Table 1-9: Certifications and compliances (Cont.)

Category	Standards or description
Safety	Complies with the following safety standards/regulations:
	UL 61010-1 Standard for Electrical Measuring and Test Equipment.
	CAN/CSA C22.2 No.61010-1-04 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
	EN 61010-1:2001 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.
Overvoltage Category	Overvoltage Category II (as defined in IEC 61010-1)
Pollution Degree	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. 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 2 Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
Pollution Degree	Pullution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.
IEC Characteristics	Equipment type:
	Test and Measuring Safety Class 1 – grounded product

Theory of Operation

Theory of Operation

This section describes the basic operation of the major circuit blocks or modules in the MTX100A. The *Diagrams* section, beginning on page 6-1, includes a block diagram and an interconnect diagram.

A12 Main Board

The A12 Main board consists of the following blocks:

PCI Interface

The PCI interface consists of a PCI target and a PCI master. The PCI target has three base address register areas. The PCI master has two DMA controllers used to transfer data from the A12 Main board to the system memory or from the system memory to the A12 Main board.

Mega FIFO

The Mega FIFO is a FIFO of each 32 M byte for playing and recording a stream data. It consists of two 256 M bit synchronous DRAM and FPGA. This FIFO is used to compensate for non-realtime operation of Windows XP.

TS Controller

The TS controller consists of the following blocks:

TS Packet Type Controller. This controller sets a packet size of 188, 204, 208, and Non TS (free length) as a TS packet type. For a Non TS format, the controller also sets a packet length (16-255) and data length (16-255). The data length shows an effective data length in one TS packet.

Data Valid Controller. This block generates a data valid signal that synchronizes with the first byte of a TS packet when stream output is started.

Psync Controller. Psync is a signal to identify the sync byte in a transport stream. When the controller is not the Psync Regeneration mode, Psync is recognized as the first byte of a transport stream. In this case, Psync is output in the constant interval even when the sync byte is rewritten in the value except for 47h. For the Super Frame mode, Psync is output only once in 384 packets.

Psync Regenerator. This block becomes active when the Psync Regeneration mode is set. The block detects the sync byte (47h) in a data stream and regenerates a Psync signal. The psync generator supports 188, 204, 208 TS packets only.

PCR/DTS Updater. This block consists of a PCR counter and update logic. The PCR counter is a complex counter, which consists of a 300-notation counter and 33-bit counter. The counter counts the 27 MHz standard frequency. The update logic replaces the PCR and PTS/DTS values in a transport stream with the sum of the original value and the PCR counter value.

Receive Rate Counter. This 24-bit counter is used for receive-rate calculation on recording process. When used a data valid signal (DVALID), the counter counts byte data rate. When not used DVALID, the counter counts receive clock.

Transmit Byte Counter. This 32-bit counter counts transmitted bytes. This counter can be read by the control software.

Receive Rate Counter. This circuit detects receive rate. Its status is updated every 50 ms.

Interrupt Controller

The interrupt controller sends the following interruption signals to the CPU: Play FIFO empty, Record FIFO full, external trigger, 10 Hz, Playout DMA transfer finished, and Record DMA transfer finished. These interruptions can be disabled by the MTX100A application software. At power on, all interruptions are disabled.

TS Clock Generator

The TS clock generator consists of a VCO (Voltage Control Oscillator), phase detector, frequency divider. The VCO is used for generating a TS clock, and it covers frequencies of 400 MHz to 800 MHz. The frequency divider divides the clock by 65536 to 1.

Reference Clocks

The reference clocks consist of 27 MHz TCXO and half-divided output of 54 MHz clock generator. These clocks are used to compare the frequency of the TS Clock Generator.

A20 PCI Backplane Board

The A20 PCI Backplane board consists of the following connectors and circuitries:

PCI and ISA Connectors

The J100, J110, and J120 connectors are PCI slots for 5 V. The J130 connector is a PCI slot for 3.3 V and is reserved in the future. The J100 connector is the system slot and is used to install the CPU board (single board computer: SBC). The J110 and J120 connectors are used to install the A12 Main board and a optional interface board.

ATX Power Control Circuit　　The PWR_Button line (Pins 9 and 10 of J310) of the SBC is connected to the power switch on the A35 Power Switchboard through the A30 Front Panel board. When the power switch is pressed, the SBC causes the PSON# signal to go Low. When the PSON# signal becomes Low, Q10 turns on and +12 V main power is also on. When the power switch is pressed again, its status is sent to BIOS and the PSON# signal turns High. This circuit includes a +12 V to +5 V DC-DC converter, a +12 V to +3.3 V converter, and a +12 V to −12 V converter.

Interconnect Circuit　　There are four connectors in the interconnect circuit: J230, J240, J290, and J310. J230 is used to connect the board to the LCD interface on the CPU board. J290 is used to connect the board to COM2 on the CPU board. J310 is used to connect the board to the hard disk drive LED and reset/power button on the CPU board. J240 is used to connect the board to the A30 Front Panel board. This circuit also has a RS-232C level converter.

Fan Speed Control Circuit　　U700 (PIC Micro) controls the internal fan revolution. It gets the temperature data from the sensors (U720 and U730) through 12C BUS and controls the supply voltage to the fan (7 V to 11.5 V).

IEEE1394b Interface　　The IEEE1394 interface consists of the 1394b link-layer device (U110), cable transcriver/arbiter (U120), oscillator (Y100), serial EEPROM (U140), regulators (U130 and U230), and IEEE1394b connector (J140).

A30 Front Panel Board

The A30 Front Panel board consists of the front panel processor circuit, LVDS receiver for FPD (flat panel display) link, video inverter circuit, rubber contact switches, three connectors, and three LEDs.

Front-panel Key Interface and LED Control　　The state of the front-panel keys are read by the one chip processor on the board and any setting changes are reported to the SBC through COM2. The processor also controls the LED on/off state.

LVDS Receiver for FPD Link　　The LVDS receiver converts the four LVDS data streams back into parallel 28 bits of CMOS/TTL data (24 bits of RGB and 4 bits of Hsync, Vsync, DE, and CNTL).

Video Inverter Circuit　　The video inverter circuit consists of an FPGA and SRAM. The circuit converts the display data upside down because the LCD display is attached to the chassis upside down.

A35 Power Switch Board

The A35 Power Switch board is connected to the A20 PCI Backplane board through the A30 Front Panel board. There are two USB connectors on the board that are directly connected to the USB2.0 interface connector on the CPU board. The board also has the power supply module for the LCD back light.

A40 AC Distributer Board

The A40 AC Distributer board supplies standby power (5VSB) to the SBC and the ATX power control circuit on the A20 Backplane board.

A50 Disk I/F board

The A50 disk I/F board interfaces between the secondary IDE connector on the CPU board and the DVD drive module.

A100 ASI Interface Module (Option 01)

The A100 ASI Interface module consists of the following blocks:

Local Bus Interface The local bus interface communicates with the A12 Main board. There are two sets of 16-bit signal lines for Rx and Tx: 8-bit data lines for single-end connection, 4-bit control lines for single-end connection, and 4-bit control lines for differential connection. These lines are connected to the A12 Main board individually.

FPGA The FPGA consists of an FIFO and a PCI interface. The FIFO is used to output a stream data in packet mode. In this mode, a stream data from the A12 Main board is stored in it, and then the data is output synchronously with the PSYNC signal. In the burst mode, the FIFO is used only to synchronize with the clock signal. There is a 32-bit resistor in the PCI interface and it controls the board operation.

Packet Controller   Two operational modes are available to output data from the ASI interface: Packet mode and Byte mode.

Difference between Packet and Byte Modes. Data rate of the ASI interface is up to 216 Mbps, and the data with rates lower than 216 Mbps are transmitted intermittently. The Data Valid signal, which indicates the location in which the data exists, is also sent together with the data, it is possible to reconfigure the received data as a serial data string from the intermittently transmitted data.

When the data rate from the MTX100A storage (hard disk or RAM) is lower than 216Mbps, it is possible to select whether to sparsely output all the data or to output the data on a packet-by-packet basis as the ASI output. The first mode in which the data is sparsely output is called Byte mode, and the second mode in which the data is output on a packet-by-packet basis is called Packet mode. In Byte mode, the data sent from the A12 board are output as they are. In Packet mode, data processing is required.

Packet Mode Operation. The FIFO shift register is used to output the data on a packet-by-packet basis. This FIFO has 9 bits of width, and its depth is 512 stages. The content of 9-bit width is 8 bits for data, and 1 bit for Sync Bit. The Sync bit indicates the location of sync pattern (47h) in the data.

The data sent from the A12 board is fed to the FIFO. The FIFO output port searches for a Sync Bit. When a Sync Bit is detected, data output from the FIFO is stopped, and the data that follows the Sync Bit is stored in the FIFO.

The FIFO input port also searches for a Sync Bit. When the port detects a Sync Bit in the next packet, it sends the detection to the read-out controller at the FIFO output port. When the FIFO output port receives the Sync Bit detection signal from the input port, the output port reads out the signals until the next packet Sync Bit is detected. The data rate of FIFO input port is equal to the data transfer rate of MTX100A, and that of output port is 216 Mbps (with the clock of 27 MHz), which is used for the ASI output.

HOTLink transmitter and Cable Drivers   The HOTLink transmitter converts parallel signals from the FIFO to a serial signal. The converted signal is output to the BNC connectors through the cable drivers.

Cable Equalizer and HOTLink Receiver   The signal applied to the BNC connector is equalized by the cable equalizer, and is converted to parallel signals by the HOTLink receiver. In addition, the equalized signal is applied to the cable driver, and is output to the ASI through output.

2.5 V Regulator   The regulator supplies power for internal circuitry in the FPGA.

A110 Universal Parallel/Serial Interface Module (Option 02)

The A110 Universal Parallel/Serial Interface module consists of the following blocks:

Local Bus Interface   The local bus interface communicates with the A12 Main board. There are two sets of 16-bit signal lines for Rx and Tx: 8-bit data lines for single-end connection, 4-bit control lines for single-end connection, and 4-bit control lines for differential connection. These lines are connected to the A12 Main board individually.

FPGA   The FPGA consists of an 8-bit-to-1-bit shift register for parallel to serial conversion, a 1-bit-to-8-bit shift register for serial to parallel conversion, and a PCI interface. The shift registers are not used in the parallel data input/output mode. There is a 32-bit resistor in the PCI interface. It controls the board operation.

Pin Drivers   The pin drivers convert output signals from the FPGA into the signals with the selected level. Two drivers per 1 bit are always working: two drivers are used for differential mode and one driver is used for single-end mode.

Receivers   The receivers use two comparators per 1 bit. One is used to receive a single-end signal and the other is used to receive a differential signal. One of the comparator is always disabled in operation and is in hold mode.

D/A Converter   The D/A converter is used to set the amplitude and offset of the output signal. It also sets the threshold voltage of the comparator for single-end receiving.

2.5 V Regulator   The regulator supplies power for internal circuitry in the FPGA.

A140 IEEE 1394/ASI Interface Module (Option 05)

Packet Controller   Two operational modes are available to output data from the ASI interface: Packet mode and Byte mode.

Difference between Packet and Byte Modes. Data rate of the ASI interface is up to 216 Mbps, and data with rates lower than 216 Mbps is transmitted intermittently. The Data Valid signal, which indicates the location in which the data exists, is also sent together with the data; it is possible to reconfigure the received data as a serial data string from the intermittently transmitted data.

When the data rate from the MTX100A storage (hard disk or RAM) is lower than 216Mbps, it is possible to select whether to sparsely output all the data or to output the data on a packet-by-packet basis as the ASI output. The first mode in which the data is sparsely output is called Byte mode, and the second mode in which the data is output on a packet-by-packet basis is called Packet mode.

In Byte mode, the data sent from A12 board is output as they are. In Packet mode, data processing is required. The data is organized into a packet within the Link chip and then output. The Packet controller is not used in this process. The Packet controller must be set to Byte mode.

In through mode where the data is sent from the ASI input to the ASI output, the data does not pass through the packet controller circuit and are output with the same timing as the ASI input.

Packet Mode Operation. The FIFO shift register is used to output the data on a packet-by-packet basis. This FIFO has 9 bits of width, and its depth is 512 stages. The content of 9-bit width is 8 bit for data, and 1 bit for Sync Bit. The Sync Bit indicates the location of sync pattern (47h) in the data.

The data sent from the A12 board is fed to the FIFO. The FIFO output port searches for a Sync Bit. When a Sync Bit is detected, data output from the FIFO is stopped, and the data that follows the Sync Bit is stored to the FIFO.

The FIFO input port also searches for a Sync Bit. When the port detects a Sync Bit in the next packet, it sends the detection to the read-out controller at the FIFO output port. When the FIFO output port receives the Sync Bit detection signal from the input port, the output port reads out the signals until the next packet Sync Bit is detected. The data rate of FIFO input port is equal to the data transfer rate of MTX100A, and that of the output port is 216 Mbps (with a clock of 27 MHz), which is used for the ASI output.

Partial TS Controller

The partial transport stream is a bit stream generated by removing the transport packets unrelated to selected audio/video program(s) from MPEG-2 transport packets. In transmitting/receiving multiple numbers of audio/video programs with a lower data rate through a high-speed data line, the packets in a single audio/video program are transmitted as intermittent packets compressed along the time axis. In this case, the period of time between the packets has some meaning. When recording data in the MTX100A, all the packets are recorded as a serial data. When reproducing such data, the time information between packets are lost and the data becomes a serial data.

To resolve the problem mentioned above, the period of time between the received packets are measured, and the timing information is added before the Sync byte of each packet as 4 bytes data. In reproducing the data, the timing information located before the next packet is derived after the packet is output.

The next packet is output after waiting for the period of time as written in this four bytes of data.

Partial TS Controller 1. The Partial TS Controller 1 picks up 4 bytes of data located before sync byte from the data stream sent from A12 board, and counts down the value written in this 4 bytes data with the 27 MHz clock. When the count becomes zero, the controller starts the processing on the next packet. While waiting for the next sync byte, the controller outputs The Busy signal to stop the operation of A12 board. The packet size that can be handled by the Partial TS Controller 1 is fixed to 192 bytes/packet (188 + 4). When sending packets of other sizes, turn the Partial TS processing off. This board uses only 24 bits out of 32 bits (4 bytes) of Time Stamp information. The upper 8 bits are ignored.

Partial TS Controller 2. This controller performs the opposite operation to that of the Partial TS Controller 1. It counts the period of time between the packets being received with the 27 MHz clock, and adds the result of counting to the top of the next packet as the time information of 4 bytes. Because a 24-bit counter is used, the first byte of 4 bytes of data becomes zero. While 4 bytes of information is output, the controller stops input of packets. The controller has the FIFO shift register of 9 bit x 256 to retain the data during the suspension period.

Sync Detector   Although the packets received from IEEE1394 or from ASI contain Sync Pattern (47h), the 47h may be contained within data or the 47h may be missing because of an error. The sync detector reconfigures information indicating the sync location and delivers the information to the next block together with the data. In the output circuit of IEEE1394, the packets are generated based upon this sync location information. In the Partial TS Controller, the measurements of time interval between packets are performed based upon this information.

Sync Detector 1. The Sync Detector 1 produces sync location information to be delivered to IEEE1394 output circuit. This information is also used to send the received packet size to the application. This circuit is compatible with the packet sizes of 188, 204, and 208. After repeated confirmation that "47h" is located at the same location (188, 204, or 208) for five (5) times, the circuit starts to output the sync location information. When the circuit failed to find the location of "47h" for three consecutive times, it stops outputting the sync location information. The circuit sends information of 1, 2, or 3 to the application when the packet size is 188, 204, or 208, respectively. Otherwise, it sends information of zero (0). This information is needed to use the through mode for the IEEE1394 output.

Sync Detector 2. This circuit produces the sync location information to be delivered to the Partial TS Control 2 circuit. The circuit is compatible only with the packet size of 188 bytes/packet. Should a packet having a size other than 188 bytes/packet be input even if Partial TS processing is specified, the circuit stops the output to the A12 board.

A170 SMPTE310M/ASI/PSI Interface Module (Option 07)

SMPTE310M   The SMPTE310M format supports data with a bit rate of 8-VSB (19.39 Mbps). Because the SMPTE310M uses Biphase-mark coding, a clock with twice the data bit rate (40 MHz) is required for decoding and encoding processes. The receiver passes the received data signal through a delay line to generate a clock signal with twice the data bit rate from the received data signal. The transmitter receives the clock signal with twice the data bit rate from A12 board for data encoding. Because this optional board is unable to recognize the difference of data bit rates, the current data bit rate must be specified from the application.

Packet Controller   Two operational modes are available to output data from the ASI interface: Packet mode and Byte mode.

Difference between Packet and Byte Modes. Data rate of the ASI interface is up to 216 Mbps, and the data with rates lower than 216 Mbps are transmitted intermittently. The Data Valid signal, which indicates the location in which the data exists, is also sent together with the data. It is possible to reconfigure the received data as a serial data string from the intermittently transmitted data.

When the data rate from the MTX100A storage (hard disk or RAM) is lower than 216Mbps, it is possible to select whether to sparsely output all the data or to output the data on a packet-by-packet basis as the ASI output. The first mode in which the data is sparsely output is called Byte mode, and the second mode in which the data is output on a packet-by-packet basis is called Packet mode. In Byte mode, the data sent from the A12 board are output as they are. In Packet mode, data processing is required.

Packet Mode Operation. The FIFO shift register is used to output the data on a packet-by-packet basis. This FIFO has 9 bits of width, and its depth is 512 stages. The content of 9-bit width is 8 bits for data, and 1 bit for Sync Bit. The Sync bit indicates the location of sync pattern (47h) in the data.

The data sent from the A12 board is fed to the FIFO. The FIFO output port searches for a Sync Bit. When a Sync Bit is detected, data output from the FIFO is stopped, and the data that follows the Sync Bit is stored in the FIFO.

The FIFO input port also searches for a Sync Bit. When the port detects a Sync Bit in the next packet, it sends the detection to the read-out controller at the FIFO output port. When the FIFO output port receives the Sync Bit detection signal from the input port, the output port reads out the signals until the next packet Sync Bit is detected. The data rate of FIFO input port is equal to the data transfer rate of MTX100A, and that of the output port is 216 Mbps (with a clock of 27 MHz), which is used for the ASI output.

A12 Board I/O   When receiving SMPTE310M or ASI data, both the enabling and 27 MHz clock signal are delivered to the A10 board. The option 06 can convert the data from SMPTE310M into ASI, however it is unable to convert the ASI data into the SMPTE310M format.

To transmit data in the SMPTE310M format, an enabling signal and clock signal (approximately 77.56 MHz) for encoding the Biphase-mark are required. When transmitting data in the ASI format, the enabling signal, the signal indicating the location of sync bit, and the transport stream clock are generated from the A10 board.

Performance Verification

Performance Verification

This section provides procedures to verify the performance and functionality of the MTX100A.

Equipment Required

Table 3-1 lists the test equipment required to perform all of the performance verification procedures. The table identifies examples of recommended equipment and lists the required precision where applicable. If you substitute other test equipment for the examples listed, the equipment must meet or exceed the listed tolerances.

Table 3-1: Equipment required for performance verification

Item	Qty.	Minimum requirements	Recommended equipment
Frequency counter	1	Frequency range: 27 MHz Precision: 8 digits or higher	Agilent Technologies 53181A
MPEG analyzer	1		Tektronix MTS430 or MTS400
Function generator	1	Frequency: 40 M clock pattern Amplitude: 3 V Outputs: 2 channnel	Tektronix AFG3102
Oscilloscope	1	Bandwidth: 1 GHz or higher	Tektronix TDS5104B
D-VHS digital recorder	1		JVC HM‒DH5U
MPEG recorder and player	1		Tektronix MTX100A Option 02
Video monitor	1		Sony LMD-1420
Probe	1		Tektronix P5050
75 Ω signal adapter	1	Bandwidth: 1 GHz Amplitude precision: ‒3 dB	Tektronix AMT75
50 Ω BNC cable	2	Length: 42 inches	Tektronix part number 012-0057-01
75 Ω BNC cable	2	Length: 42 inches	Tektronix part number 012-0074-00
Parallel interface cable	1	25-pin, D-type	Tektronix part number 012-A220-00 (supplied with the MTX100A)
IEEE1394b cable	1	9 pin-9 pin	
IEEE1394 cable	1	4 pin-4 pin	
RCA(Ma)-to-BNC(Fe) adapter	1		Zifor Enterprise BJ-7071
IEEE1394b hard disk drive	1		Novac NV-HD352WB and hard disk drive (Tektronix part number 119-7146-00)
Test streams CD-ROM	1		Tektronix part number 063-3907-XX

Procedures

The following conventions are used in the performance verification procedures:

■ Each test lists the characteristic that is being tested and the equipment required to perform the test.

■ Each test contains complete setup instructions, which allows you to perform each test individually or in order.

■ The equipment connection illustrations are specific to the recommended equipment (equipment nomenclature is labeled). If you are using substitute equipment, the location of your signal connections may vary from those in the illustrations.

NOTE. Before you begin the performance verification procedures, be sure that the MTX100A is operating in an environment that is within the operating limits described in Table 1-8 on page 1-14.

In addition, the MTX100A and the test equipment must be warmed up for at least 20 minutes to ensure accurate test results.

Internal Clock Output Level and Frequency Accuracy

This test verifies the internal clock output level and frequency accuracy.

Equipment required	Oscilloscope
	Frequency counter
	50 Ω BNC cable

1. Use the 50 Ω BNC cable to connect the Trig In/Out connector on the MTX100A to the oscilloscope CH1 input. See Figure 3-1.

Oscilloscope (TDS5104B)

MTX100A rear panel

50 Ω BNC cable
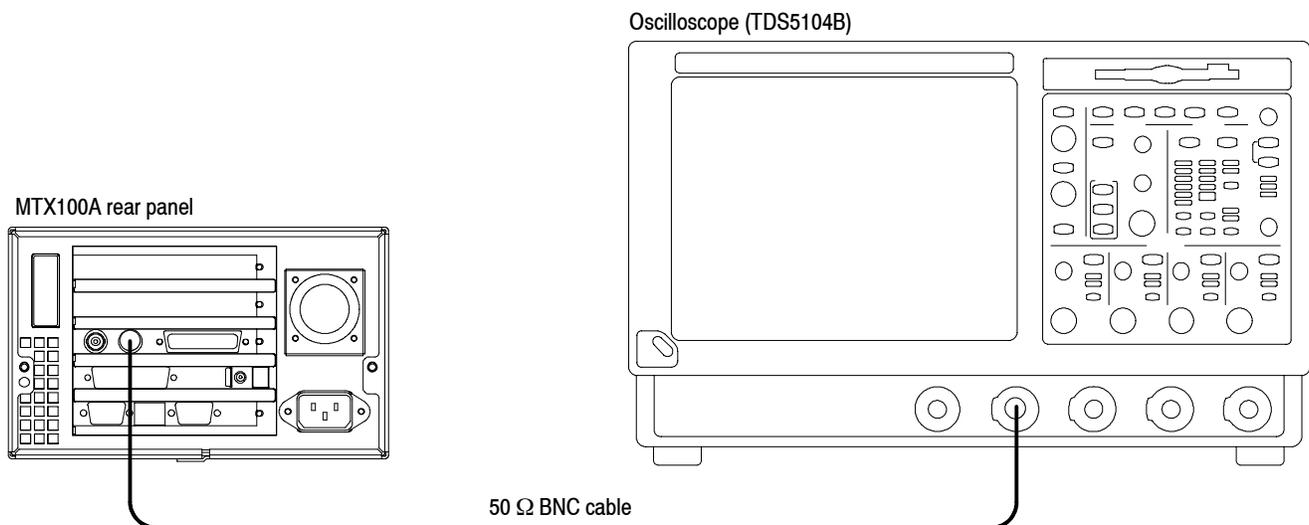
Figure 3-1: Equipment connection for verifying the internal clock output level

2. Set the oscilloscope settings as indicated below:

    Vertical scale . . . . 1 V/div (CH1)
    Input impedance . . . . . 50 Ω
    Horizontal scale . . . . . 10 ns/div
    Trigger position 50%
    Acquire mode . . . . Average 16
    Trigger mode . . . . Auto
    Trigger level . . . . 1.20 V
    Trigger source CH1
    Trigger slope . . . . Rising Edge
    Input coupling . . . . DC
    Measure . . . . High Level, Low level

3. Select **Play > Others** on the MTX100A to open the **Others** dialog box.

4. In the dialog box, select the **Ext Trigger BNC** button to open the Ext Trigger BNC dialog box.

5. In the dialog box, set **BNC IN/OUT** to **Output** and **BNC OUT Selection** to **27MHz**.

6. Verify that the measured values are as follows:

High Level: > 2.2 V
Low Level: < 0.8 V

7. Disconnect the 50 Ω BNC cable from the oscilloscope CH1 input, and then connect the BNC cable to the CH1 connector on the frequency counter. See Figure 3-2.

MTX100A rear panel

Frequency counter (53181A)

50 Ω BNC cable

Figure 3-2: Equipment connection for verifying the internal clock frequency

8. Set the frequency counter settings as indicated below:

MEASURE Frequency1
Gate Time: 0.20 s
CHANNEL1 . . . . Coupling: DC
Impedance: 50
Trigger: AUTO TRIG ON

9. Verify that the frequency counter reading falls within the range of 26.999973 MHz to 27.000027 MHz (< 1.0 ppm).

10. In the Ext Trigger BNC dialog box, change **BNC IN/OUT** to **Input**.

11. Disconnect the BNC cable from the MTX100A and frequency counter.

SPI Interface   This test verifies that transport stream data is correctly played from and recorded through the SPI In/Out connector on the MTX100A.

Equipment required	MPEG analyzer
	Parallel interface cable
	test40.TRP file

Checking the Play Operation.

1. Use the parallel interface cable to connect the SPI In/Out connector on the MTX100A to the DVB SPI In connector on the MPEG analyzer. See Figure 3-3.

MPEG analyzer rear panel (MTS430)

MTX100A rear panel

Parallel interface cable
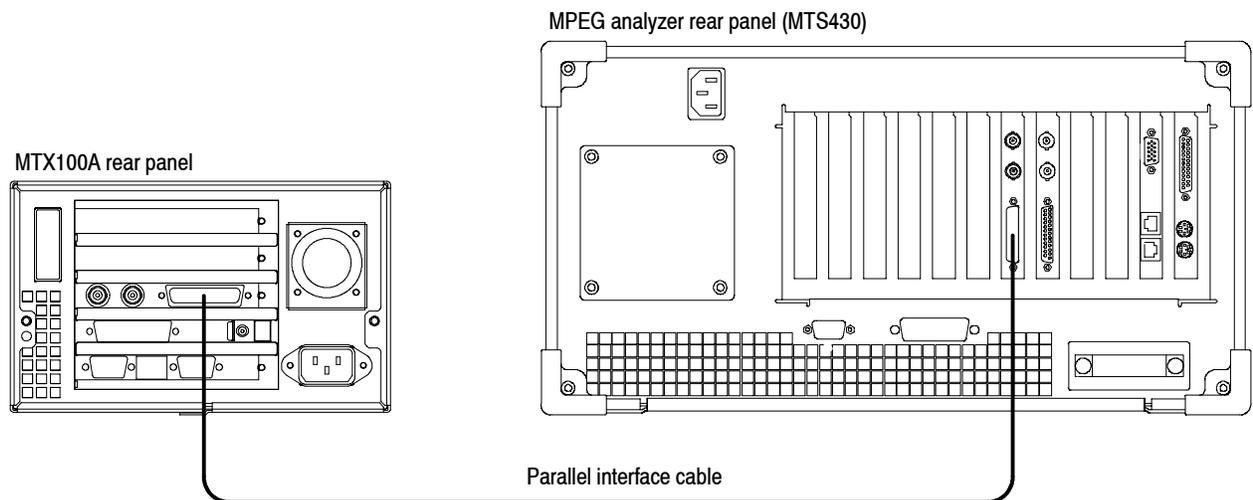
Figure 3-3: Equipment connection for verifying the SPI interface

2. Start the **MPEG Player** application on the MPEG analyzer.

3. Set the application to the Record mode.

4. Set the MPEG analyzer settings as indicated below:

> **Record**
> Source . . . . SPI
> Target . . . . RAM, Size: 100 MB
>
> **File**
> Save Mode . . . . . Overwrite
> Save . . . . E:\MTXRTX_Test streams\Record_Files\
>   SPI214Mbps

5. Open the **test40.TRP** file on the MTX100A.

   a. Select **File > Open** in the Play screen to open the **Select File** dialog box.

   b. In the dialog box, select the **test40.TRP** file.

6. In the **Play** menu, make the following settings:

   > Clock . . . . Data Rate: 214 Mbps
   > Update . . . . Off
   > Source . . . . RAM

7. Press the **PLAY** button on the MTX100A to start playing the test40.TRP file.

8. Verify that the hierarchic view is displayed on the MPEG analyzer screen. In addition, verify that the bit rate is **214 Mbps** and the packet size is **188** bytes.

9. Click the **Record** button on the MPEG Player application to record the file.

10. After recording is completed, press the **STOP** button on the MTX100A .

Checking the Record Operation.

11. Change the interface cable connection from DVB/SPI In connector to DVB/SPI Out connector on the MPEG analyzer.

12. Press the **REC** button on the MTX100A to display the Record screen.

13. On the MTX100A, make the following settings:

Record menu
Source . . . . SPI
Target . . . . RAM
Record Size . . . . . 100 MB
Save Mode . . . . . Over Write

File menu
Save Mode . . . . . Over Write
Save Mode . . . . . D:\Record_Files\SPI214Mbps

14. Change the MPEG analyzer to the Play mode.

15. Select **File > Open** on the MPEG analyzer to display the **Open** dialog box.

16. In the dialog box, navigate to the **E:\MTXRTX_Test streams\
Record_Files**, and then select the **SPI214Mbps.trp** file.

17. Set the MPEG analyzer settings as indicated below:

Data Rate . . . . . . 214 Mbps
Update . . . . Off
Source . . . . RAM

18. Click the **PLAY** button on the MPEG Analyzer to start playing the
SPI214Mbps.trp file.

19. Verify that the hierarchic view is displayed on the MTX100A screen. In
addition, verify that the bit rate display is **214 Mbps** and the packet size
display is **188** bytes.

20. Press the **REC** button on the MTX100A to record the file.

21. After recording is completed, click the **Stop** button on the MPEG analyzer.

22. Exit the MPEG Player application on the MPEG analyzer.

Checking the Recorded File.

23. Change the interface cable connection from the DVB/SPI Out connector to
the DVB/SPI In connector on the MPEG analyzer.

24. Start the **TS Compliance Analyzer** on the MPEG analyzer.

25. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and
then make the following settings

Interfaces . . . . DVB Parallel
Interface Settings . . . . Time Stamping

26. Click the **OK** button.

27. Press the **PLAY** button on the MTX100A to display the Play screen.

28. Select **File > Open** to open the **Select File** dialog box.

29. In the dialog box, navigate to the **D:\ Record_Files** directory, and then select the **SPI214Mbps.trp** file.

30. Select **Play > Update > On**.

31. Press the **PLAY** button on the MTX100A to start playing the SPI214Mbps.trp file.

32. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **40 Mbps** and that the transport stream packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the Navigation view because these are caused by the original test40.TRP file.

---

33. Press the **STOP** button on the MTX100A.

34. Close the TS Compliance Analyzer window.

External Clock/Reference and External Trigger Inputs

This test verifies that the external clock/reference input (Clock/Ref In) and external trigger input (Trig In/Out) on the MTX100A are functioning correctly.

Equipment required	MPEG analyzer
	Function generator
	Two 50 Ω BNC cables
	Parallel interface cable
	test64.TRP file

1. Use a 50 Ω BNC cable to connect the Clock/Ref In connector on the MTX100A to the Ch1 connector on the function generator. See Figure 3-4.

1. Use the 50 Ω BNC cable to connect the Trig In/Out connector on the MTX100A to the Ch2 connector on the function generator. See Figure 3-4.

2. Use the parallel interface cable to connect the SPI In/Out connector on the MTX100A to the DVB/SPI In connector on the MPEG analyzer. See Figure 3-4.
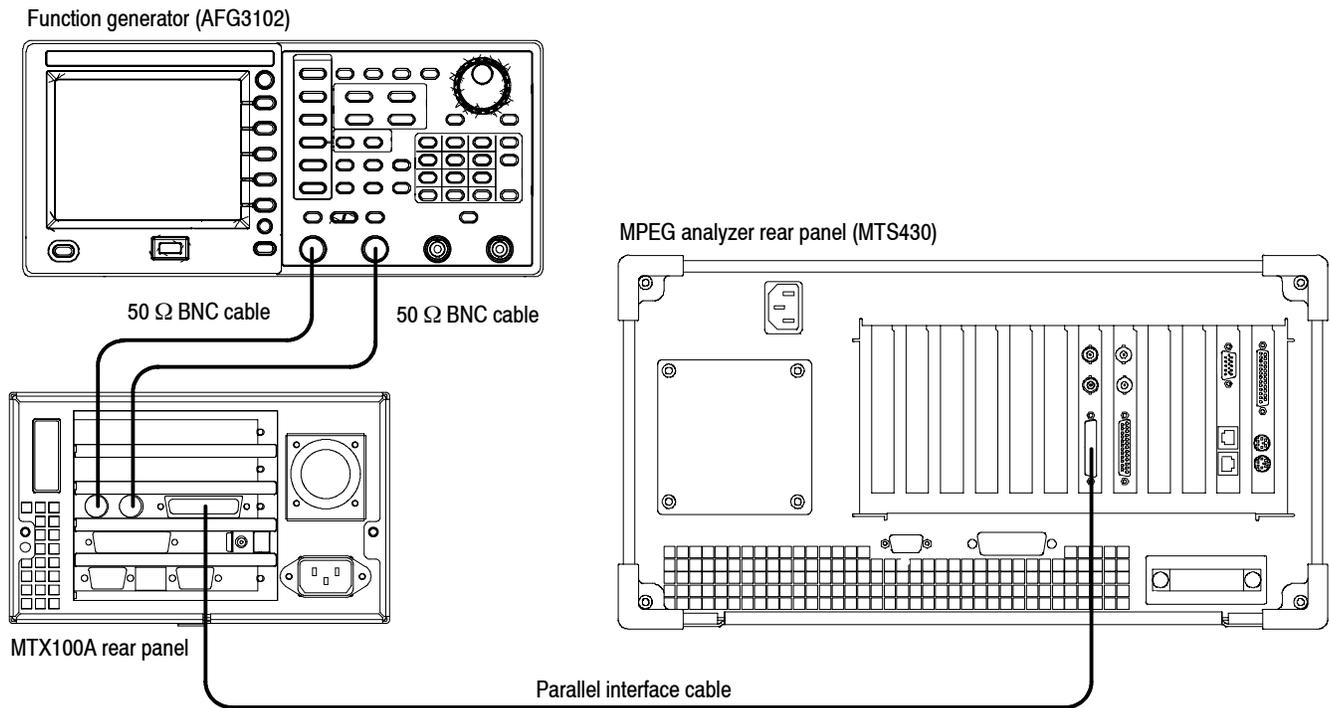
Figure 3-4: Equipment connections for verifying the external clock/reference and trigger inputs

3. Set the function generator settings as indicated below:

Ch 1 output
Function .... Square
Run Mode .... Continuous
Frequency .... 10 MHz
Output Amplitude .... 0.5 V
Output Offset .... 2.0 V

Ch 2 output
Function .... Arb (Edit: Point Number: 100,
                          All Data: 16382)
Run Mode .... Continuous
Output Menu .... Load Impedance: 1 kΩ
Output Amplitude .... 1.75 V
Output Offset .... 0.875 V

4. Press the **On** button of the Ch1 output on the function generator.

5. Open the **test64.TRP** file on the MTX100A.

   a. Select **File > Open** in the Play screen to open the Select File dialog box.

   b. In the dialog box, select the **test64.TRP** file.

6. Select **Play > Update > On**.

7. Select **Play > Clock** to open the **Clock** dialog box.

8. In the dialog box, select **ExtRef 10**.

9. Press the **PLAY** button on the MTX100A to start playing the test64.TRP file.

10. Verify that PLL unlock error does not occur on the MTX100A.

11. Start the **TS Compliance Analyzer** on the MPEG analyzer.

12. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings:

    Interfaces . . . . DVB Parallel
    Interface Settings . . . . Time Stamping

13. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the data rate is **64 Mbps** and the packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the Navigation view because these are caused by the original test40.TRP file.

14. Change the clock source setting on the MTX100A and output frequency setting on the function generator with the following and then repeat step 13.

Clock source setting (MTX100A)	Output frequency setting (function generator)
ExtRef 27	27 MHz
Ext Ref 8.126984 MHz	8.126984 MHz
Ext P Clk	8 MHz

15. Change the output frequency of the function generator to 32 MHz.

16. Select **Play > Clock** on the MTX100A to open the **Clock** dialog box.

17. In the dialog box, select **Ext S Clk**.

18. Repeat step 13 and verify that all items in the **Priority 1** row are green.

NOTE. Ignore 2.3.a PCR Repetition and 2.5 PTS errors in the Priority 2 row.

19. Press the **STOP** button on the MTX100A to stop the stream output.

20. Select **Play > Clock** on the MTX100A to open the **Clock** dialog box.

21. In the dialog box, select **Internal**.

22. Press the **On** button of the Ch1 output on the function generator to stop the signal output.

23. Press the **On** button of the Ch2 output on the function generator to start the signal output.

24. Select **Play > Others** on the MTX100A to open the **Others** dialog box.

25. In the dialog box, set **Ext Play Start** to **Rise**.

26. Verify that the MTX100A starts playing when the **Output** menu is set to **Invert** on the function generator.

27. Press the **STOP** button on the MTX100A to stop the stream output.

28. Press the **On** button of the Ch2 output on the function generator to stop the signal output.

29. Return **Ext Play Start** to **Off** on the MTX100A.

30. Disconnect all cables from the MTX100A, function generator, and MPEG analyzer.

IEEE1394b Interface   This test verifies that the IEEE1394b interface is functioning correctly.

Equipment required	IEEE1394b hard disk drive
	IEEE1394b cable (9 pin–9 pin)
	test40.TRP file

1. Use the IEEE1394b cable to connect the IEEE1394b connector on the MTX100A to the IEEE1394b hard disk drive. See Figure 3-5.

MTX100A rear panel

IEEE1394b hard disk drive

IEEE1394b cable
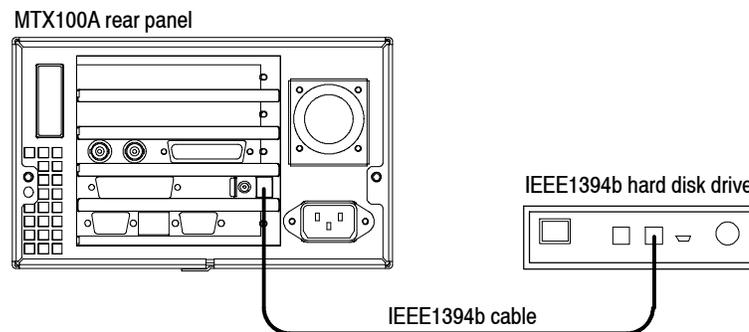
Figure 3-5: Equipment connection for verifying the IEEE1394b interface

2. Select **Play** > **Minimize** to minimize the MTX100A application.

3. Power on the IEEE1394b hard disk drive.

4. Double-click the **My Computer** icon on the Windows desktop to open the My Computer window.

5. In the Window, verify that the hard disk drive is recognized as the **F:** (or **G:**) drive.

6. Use the windows file copy operation to copy the **test40.TRP** file on the **D:** drive to **F:** (or **G:**) drive.

7. Verify that the test40.TRP file is copied to the F: (or G:) drive correctly.

8. Delete the test40.TRP file from the F: (or G:) drive.

9. Power off the IEEE1394b hard disk drive.

ASI Interface (Option 01 Only)

This test verifies that transport stream data is correctly output from and is recorded through the ASI interface on the MTX100A Option 01.

Equipment required	MPEG analyzer
	Oscilloscope
	Two 75 Ω BNC cable
	75 Ω signal adapter
	test40.TRP file

Checking the Output Signal.

1. Use a 75 Ω BNC cable and the 75 Ω signal adapter to connect the ASI Out 1 connector on the MTX100A Option 01 to the oscilloscope CH1 input. See Figure 3-6.

Oscilloscope (TDS5104B)

MTX100A Option 01 rear panel

75 Ω signal adapter

75 Ω BNC cable
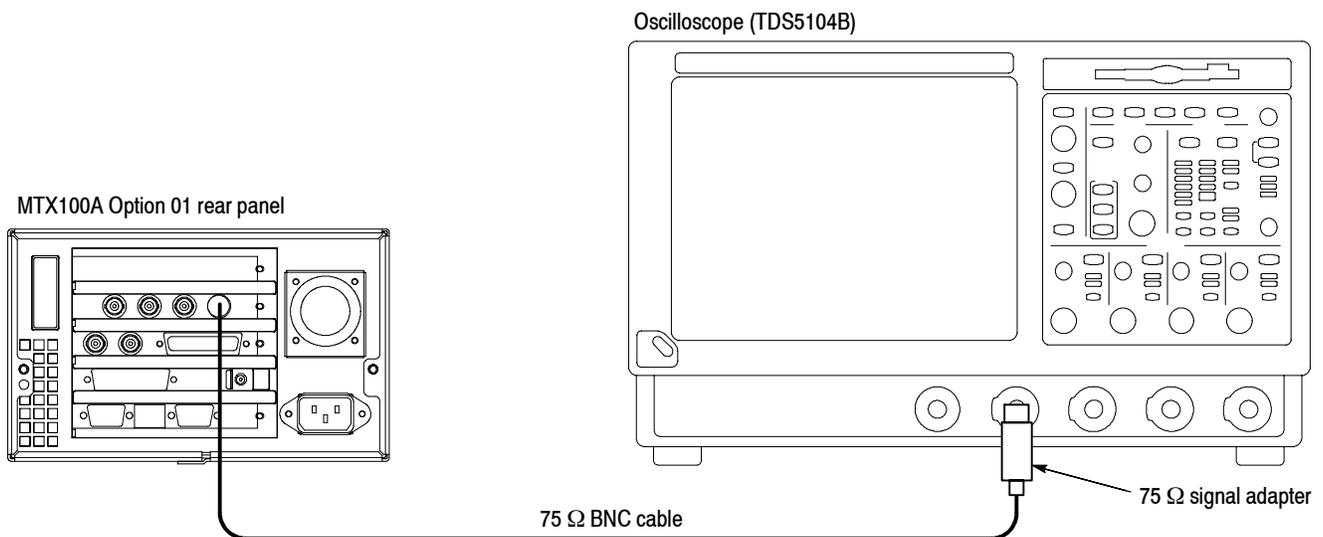
Figure 3-6: Equipment connection for verifying the output signal- ASI interface

2. Set the oscilloscope settings as indicated below:

   Vertical scale . . . . 200 mV/div
   Input impedance . . . . . 50 Ω
   Horizontal scale . . . . . 1.25 ns/div
   Trigger position 50%
   Acquire mode . . . . Average 32
   Trigger mode . . . . AUTO
   Trigger source CH1
   Trigger level . . . . 0 V
   Trigger slope . . . . Rising Edge
   Input coupling . . . . DC
   Measure . . . . Amplitude, Rise Time, Fall Time
   Gating . . . . Cursor Curs1 Pos1: –2.5 ns/Curs2: 2.75 ns

3. Open the test40.TRP file on the MTX100A Option 01.

   a. Select **File > Open** in the Play screen to open the **Select File** dialog box.

   b. In the dialog box, select the **test40.TRP** file.

4. Press the **PLAY** button to start playing the test40.TRP file.

5. Use the oscilloscope to measure that the amplitude, rise and fall times are as follows:

   Amplitude: 740 mV to 860 mV
   Rise and fall time: ≤ 1.2 ns

6. Move the BNC cable connection from the ASI Out 1 connector to the ASI Out 2 connector on the MTX100A Option 01 and then repeat step 5.

7. Move the BNC cable connection from ASI Out 2 connector to the through output of the ASI In connector.

8. Connect the ASI Out 1 connector to the ASI In connector on the MTX100A Option 01 using the 75 Ω BNC cable.

9. Select **ASI/IF > Through Out > On** on the MTX100A Option 01 and then repeat step 5.

Checking the Play Operation.

10. Disconnect the BNC cable from the 75 Ω signal adapter on the oscilloscope, and then connect the cable to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-7.
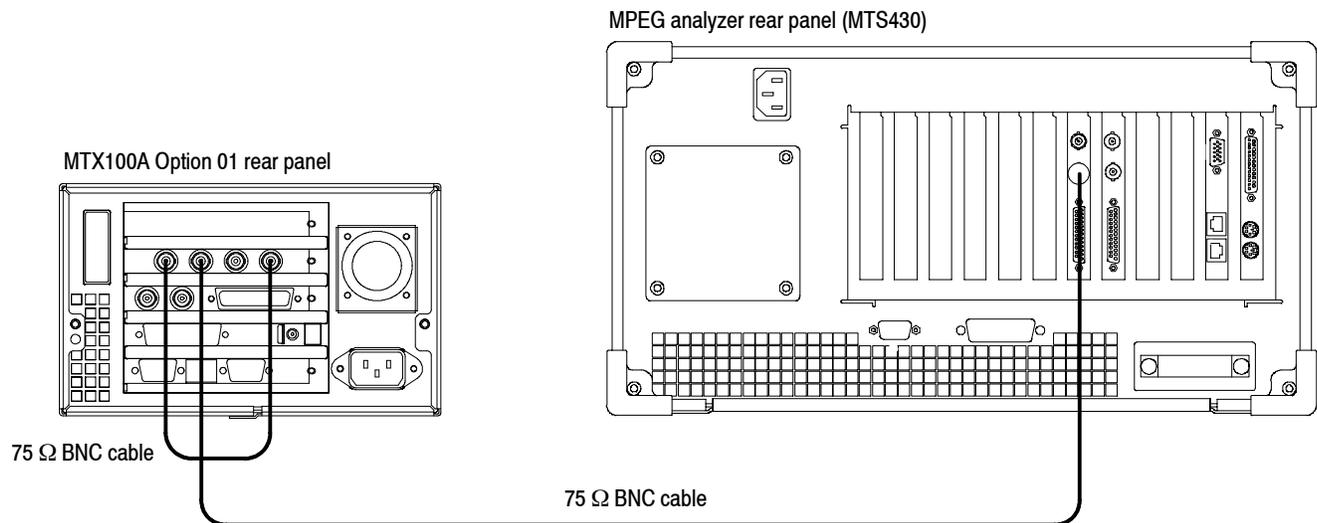
Figure 3-7: Equipment connections for verifying the play operation‐ASI interface

11. Start the **MPEG Player** application on the MPEG analyzer.

12. Set the application to the **Record** mode.

13. Set the MPEG analyzer settings as indicated bellow:

> **Record menu**
> Source SPI/ASI/310M
> Target . . . . RAM, Record Size: 100 MB
>
> **SPI/ASI/310M menu**
> Input Port . . . . . . BNC
> BNC Port . . . . . . ASI
>
> **File menu**
> Save Mode . . . . . Overwrite
> Save . . . . E:\MTXRTX_Test streams\Record_Files\
>   ASI214Mbps.trp

14. In the **Play** menu on the MTX100A Option 01, make the following settings:

Clock . . . . Data Rate: 214 Mbps
Update . . . . . . Off
Source . . . . . . RAM

15. Select **ASI I/F > Through Out > On**.

16. Press the **PLAY** button on the MTX100A Option 01 to start playing the test40.TRP.

17. Verify that the hierarchic view is displayed on the MPEG analyzer screen. In addition, verify that the bit rate is **214 Mbps** and the packet size is **188** bytes.

18. Click the **Record** button on the MPEG Player application to record the file.

19. After recording is completed, press the **STOP** button on the MTX100A Option 01.

20. Disconnect the 75 Ω BNC cables from the MTX100A Option 01 and MPEG analyzer.

Checking the Record Operation.

21. Use a 75 Ω BNC cable to connect the ASI In connector on the MTX100A Option 01 to the ASI/SMPTE Out connector on the MPEG analyzer. See Figure 3-8.
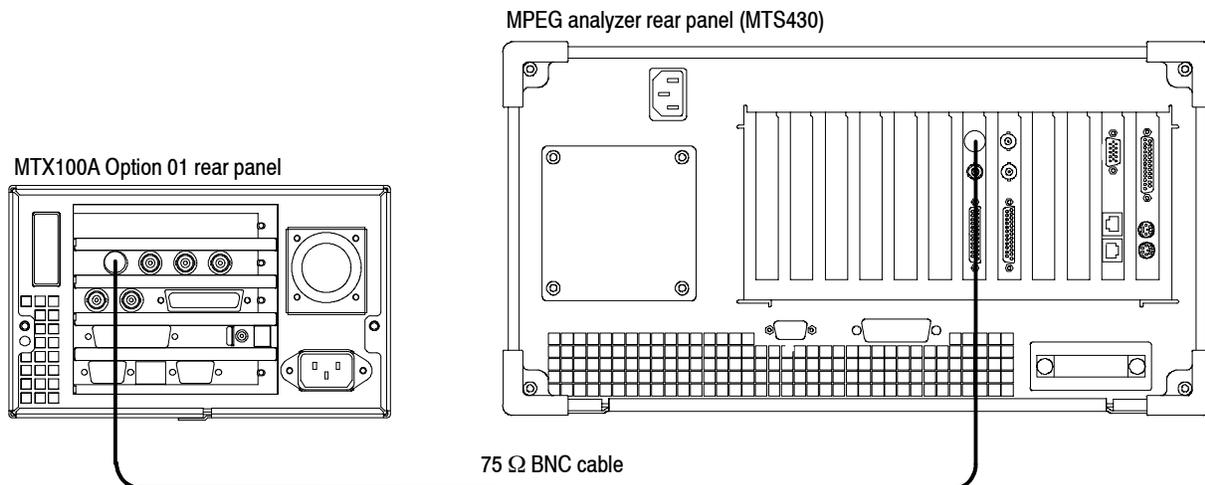
Figure 3-8: Equipment connection for verifying the record operation- ASI interface

22. Press the **REC** button on the MTX100A Option 01 to display the Record screen.

23. On the MTX100A Option 01, make the following settings:

> **Record menu**
> Source . . . . ASI
> Record size . . . . . 100 MB
> Target . . . . RAM
>
> **File menu**
> Save Mode . . . . . Overwrite
> Save . . . . D:\Record_Files\ASI214Mbps.trp

24. Set the MPEG analyzer to the Play mode.

25. Select **File > Open** on the MPEG analyzer to display the Open dialog box.

26. In the dialog box, navigate to the **E:\MTXRTX_Test Streams\ Record_Files** directory, and then select the **ASI214Mbps.trp** file.

27. Set the following settings on the MPEG analyzer:

> **Play menu**
> Clock . . . . Data Rate: 214 Mbps
> Update . . . . Off
> Source . . . . RAM
>
> **SPI/ASI/310M menu**
> BNC Port . . . . . . ASI
> Through Out . . . . Off

28. Click the **Play** button on the MPEG analyzer to start playing the ASI214Mbps.trp file.

29. Verify that the hierarchic view is displayed on the MTX100A Option 01 screen. In addition, verify that the bit rate is **214 Mbps** and packet size is **188** bytes.

30. Press the **REC** button on the MTX100A Option 01 to record the file.

31. After recording is completed, click the **Stop** button on the MPEG analyzer.

32. Exit the MPEG Player application on the MPEG analyzer.

33. Disconnect the 75 Ω BNC cable from the MTX100A Option 01 and MPEG analyzer.

Checking the Recorded File.

34. Use the 75 Ω BNC cable to connect the ASI Out 2 connector on the MTX100A Option 01 to the ASI/SMPTE In connector on the MPEG test system. See Figure 3-9.

MPEG test system rear panel (MTS430))

MTX100A Option 01 rear panel

75 Ω BNC cable
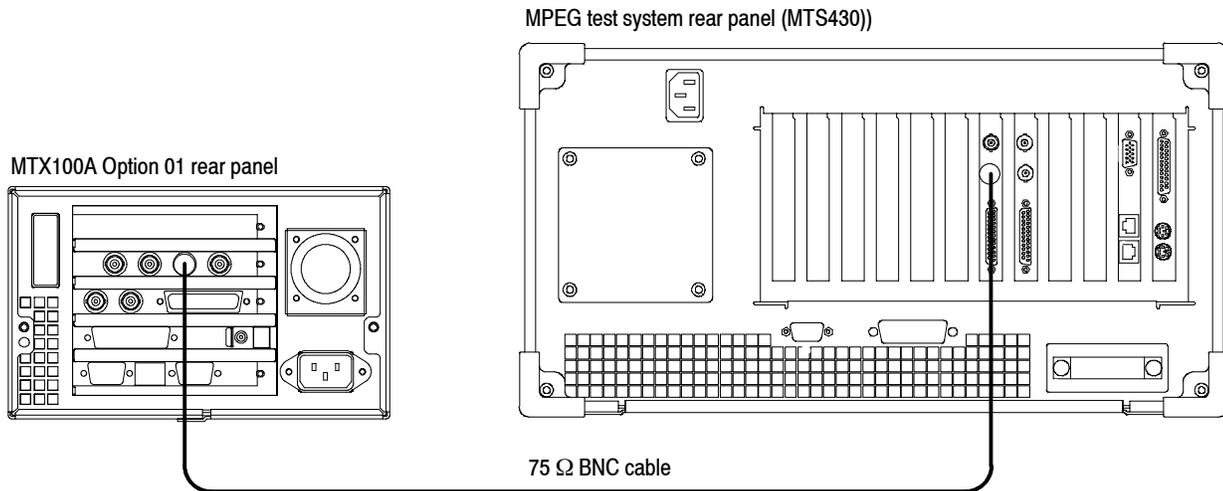
Figure 3-9: Equipment connection for verifying the recorded file- ASI interface

35. Press the **PLAY** button on the MTX100A Option 01 to display the Play screen.

36. Select **Play > Update > On**.

37. Open the ASI214Mbps file on the MTX100A Option 01.

    a. Select **File > Open** to open the **Select File** dialog box.

    b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **ASI214Mbps.trp** file.

38. Press the **PLAY** button to start playing the file.

39. Start the **TS Compliance Analyzer** on the MPEG analyzer.

40. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings

    Interfaces . . . . ASI
    Interface Settings   . . . . Time Stamping

41. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **40** Mbps and that the transport stream packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the Navigation view because these are caused by the original test40.TRP file.

**42.** Press the **STOP** button on the MTX100A Option 01 to stop the stream output.

43. Disconnect the 75 Ω BNC cable from the MTX100A Option 01 and MPEG analyzer.

Universal Parallel/Serial Interface (Option 02 Only)

This test verifies that transport stream data is correctly output from and is recorded through the Universal Parallel/Serial interface on the MTX100A Option 02.

Equipment required	MPEG analyzer
	MPEG recorder and player (MTX100A Option 02)
	Oscilloscope
	Probe
	50 Ω BNC cable
	Parallel interface cable
	test40.TRP file

Checking the Output Signals.

1. Connect the probe to the oscilloscope CH1 input. See Figure 3-10 on page 3-20.

Oscilloscope (TD5104B)

MTX100A Option 02 rear panel

Probe
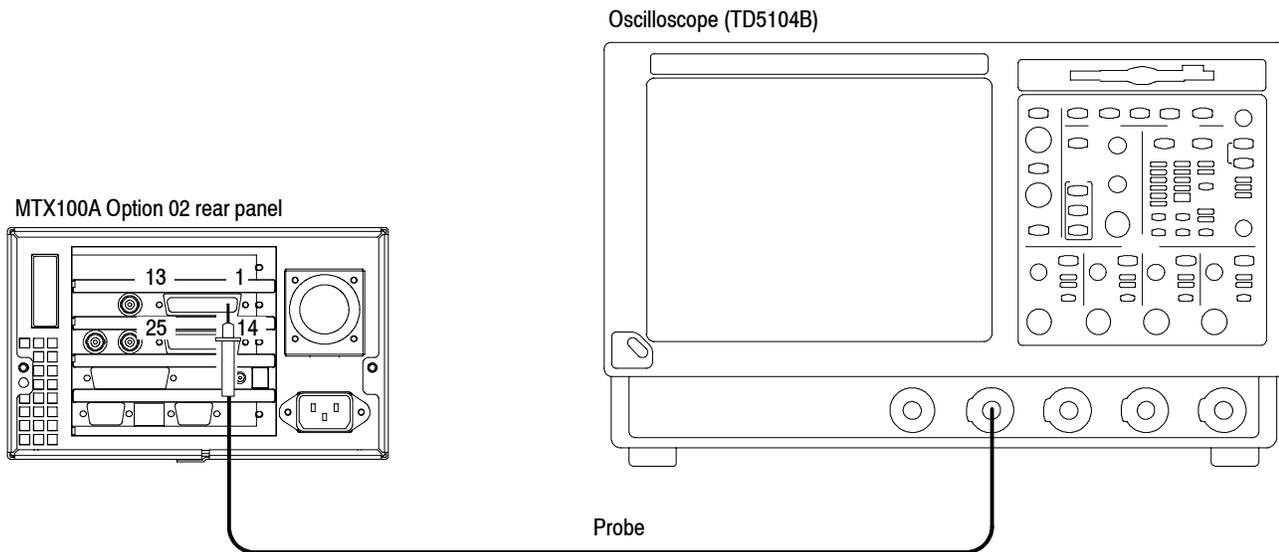
Figure 3-10: Equipment connection for verifying the output signals- universal parallel/serial interface

2. Set the oscilloscope settings as indicated below:

   Vertical scale . . . . 500 mV/div
   Vertical offset . . . . –1.3 V
   Horizontal scale . . . . . 400 ns/div
   Horizontal position . . . Center
   Trigger source CH1
   Trigger level . . . . –1.3 V (at ECL level)
   1.4 V (at TTL level)
   1.2 V (at LVDS level)

3. Press the **PLAY** button on the MTX100A Option 02 to display the Play screen.

4. Open the **test40.TRP** file on the MTX100A Option 02.

   a. Select **File > Open** to open the **Select File** dialog box.

   b. In the dialog box, select the **test40.TRP** file.

5. Select **Play > Clock** to open the **Clock** dialog box.

6. In the dialog box, set **Data Rate** to **10 Mbps**.

7. Select **Univ I/F > Level > ECL**.

8. Press the **PLAY** button to start playing the test40.TRP file.

9. Attach the probe tip to **pin 1** of the Universal In/Out connector on the MTX100A Option 02.

10. Use the oscilloscope to measure that the ECL high and low levels of pin 1 are as follows:

> High level: –0.5 V
> Low level: –2.1 V

11. Move the probe tip attachment from pin 1 to pin 14, and measure that the ECL high and low levels correspond to the values shown in Table 3-2.

12. Repeat step 11 for all other pins.

Table 3-2: Output level of each connector pin

Pin number	ECL		TTL		LVDS	
	High	**Low**	**High**	**Low**	**High**	**Low**
1, 14 (CLK)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
3, 16 (DATA 7)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
4, 17 (DATA 6)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
5, 18 (DATA 5)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
6, 19 (DATA 4)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
7, 20 (DATA 3)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
8, 21 (DATA 2)	-0.5 V	-2.1 V	3.3 V	0.1 V	1.6 V	0.8 V
9, 22 (DATA 1)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
10, 23 (DATA 0)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V
11 (DVALID)	-0.5 V	-----	3.3 V	-----	1.6 V	-----
14 ($\overline{\text{DVALID}}$)	-----	-2.1 V	-----	0.0 V	-----	0.8 V
12, 25 (PSYNC)	-0.5 V	-2.1 V	3.3 V	0.0 V	1.6 V	0.8 V

13. Select **Univ I/F > Level > TTL** on the MTX100A Option 02.

14. Use the oscilloscope to measure that TTL High and Low levels of all the pins correspond to the values shown in Table 3-2.

15. Select **Univ I/F > Level > LVDS** on the MTX100A Option 02.

16. Use the oscilloscope to measure that LVDS High and Low levels of all the pins correspond to the values shown in Table 3-2.

Checking the Play Operation (Parallel Mode).

1. Use the parallel interface cable to connect the Universal In/Out connector on the MTX100A Option 02 to the Universal In/Out connector on the MPEG recorder and player. See Figure 3-11.

MPEG recorder and player
(MTX100A Option 02) rear panel

MTX100A Option 02 rear panel

Parallel interface cable
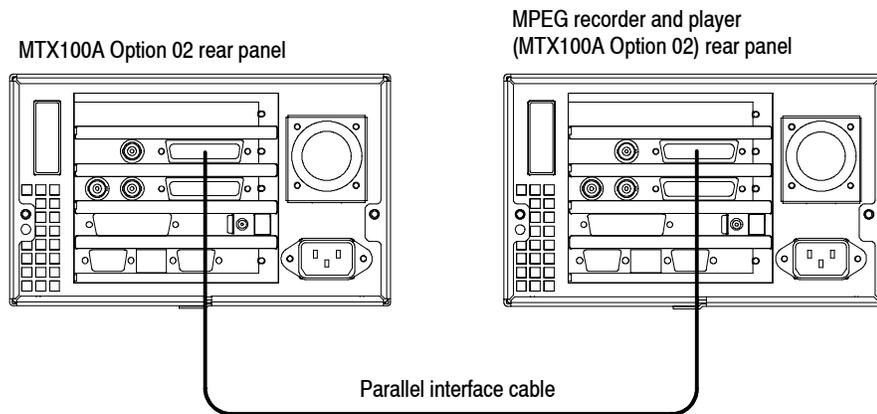
Figure 3-11: Equipment connection for verifying the play operation- universal parallel/serial interface

2. Press the **PLAY** button on the MTX100A Option 02 to display the Play screen.

3. On the MTX100A Option 02, make the following settings:

> **Play menu**
> Data rate . . . . 214 Mbps
> Update . . . . Off
> Source . . . . RAM
>
> **Univ I/F menu**
> Level . . . . LVDS
> Format . . . . Parallel

4. Press the **REC** button on the MPEG recorder and player to display the Record screen.

5. On the MPEG recorder and player, make the following settings:

> **Record menu**
> Source . . . . Univ I/F
> Record size . . . . . 100 MB
> Target . . . . RAM

Univ I/F menu
Level . . . . LVDS
Format . . . . Parallel
Receive . . . . Differential
Termination . . . . . On

File menu
Save Mode . . . . . Overwrite
Save . . . . E:\Record_Files\Parallel_LVDS.trp

6. Press the **PLAY** button on the MTX100A Option 02 to start playing the test40.TRP file.

7. Verify that the hierarchic view is displayed on the MPEG recorder and player screen. In addition, verify that the bit rate display is **214 Mbps** and packet size is **188** bytes.

8. Press the **REC** button on the MPEG recorder and player to record the file.

9. After recording is completed, press the **STOP** button on the MTX100A Option 02.

Checking the Play Operation (Serial Mode).

10. Select **Play > Clock** on the MTX100A Option 02 to open the **Clock** dialog box.

11. In the dialog box, set **Data Rate** to **40 Mbps**.

12. Select **Univ I/F > Format > Serial** on the MTX100A Option 02.

13. Press the **REC** button on the MPEG recorder and player to display the Record screen.

14. On the MPEG recorder and player, make the following settings:

Univ I/F menu
Format . . . . Serial

File menu
Save . . . . D:\Record_Files\Serial_LVDS.trp

15. Press the **PLAY** button on the MTX100A Option 02 to start playing the test40.TRP file.

16. Verify that the hierarchic view is displayed on the MPEG recorder and player screen. In addition, verify that the bit rate display is **40 Mbps** and the packet size is **188** bytes.

17. Press the **REC** button on the MPEG recorder and player to record the file.

18. After recording is completed, press the **STOP** button on the MTX100A Option 02.

Checking the Record Operation (Parallel Mode).

19. Press the **REC** button on the MTX100A Option 02 to display the Record screen.

20. On the MTX100A Option 02, make the following settings:

Record menu
Source . . . . Univ I/F
Record size . . . . . 100 MB
Target . . . . RAM

Univ I/F menu
Level . . . . LVDS
Format . . . . Parallel
Receive . . . . Differential
Termination . . . . . On

File menu
Save Mode . . . . . Overwrite
Save . . . . D:\Record_Files\Parallel_LVDS.trp

21. Press the **PLAY** button on the MPEG recorder and player to display the Play screen.

22. Open the **Parallel_LVDS.trp** file on the MPEG recorder and player.

 a. Select **File > Open** to open the **Select File** dialog box.

 b. In the dialog box, navigate to the **E:\Record_Files** directory, and then select the **Parallel_LVDS.trp** file.

23. On the MPEG recorder and player, make the following settings:

Play menu
Data rate . . . . 214 Mbps
Update . . . . . . Off
Source . . . . . . RAM

24. Press the **PLAY** button on the MPEG recorder and player to start playing the file.

25. Verify that the hierarchic view is displayed on the MTX100A Option 02 screen. In addition, verify that the bit rate display is **214 Mbps** and the packet size is **188** bytes.

26. Press the **REC** button on the MTX100A Option 02 to record the file.

27. After recording is completed, press the **STOP** button on the MPEG recorder and player.

Checking the Record Operation (Serial Mode).

28. On the MTX100A Option 02, make the following settings:

> **Univ I/F menu**
> Format . . . . . . Serial
>
> **File menu**
> Save . . . . D:\Record_Files\Serial_LVDS.trp

29. Open the **Serial_LVDS.trp** file on the MPEG recorder and player.

   a. Select **File > Open** to open the Select File dialog box.

   b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **Serial_LVDS.trp** file.

30. Select **Play > Clock** on the MPEG recorder and player to open the **Clock** dialog box.

31. In the dialog box, set **Data Rate** to **40 Mbps**.

32. Press the **PLAY** button on the MPEG recorder and player to start playing the file.

33. Verify that the hierarchic view is displayed on the MTX100A Option 02 screen. In addition, verify that the bit rate display is **40 Mbps** and the packet size is **188** bytes.

34. Press the **REC** button on the MTX100A Option 02 to record the file.

35. After recording is completed, press the **STOP** button on the MPEG recorder and player.

Checking signal acquisition for ECl and TTL Levels.

36. On the MTX100A Option 02, make the following settings:

> **Univ I/F menu**
> Level . . . . ECL
> Format . . . . . . Parallel

37. Open the **test40.TRP** file on the MPEG recorder and player.

   a. Select **File > Open** to open the Select File dialog box.

   b. In the dialog box, navigate to the **E:** drive, and then select the **test40.TRP** file.

38. On the MPEG recorder and player, make the following settings:

> **Play menu**
> Clock . . . . Data Rate: 214 Mbps
> Update . . . . . . Off
>
> **Univ/I/F menu**
> Level . . . . ECL
> Format . . . . . . Parallel
> Receive . . . . . Differential

39. Press the **PLAY** button on the MPEG recorder and player to start playing the test40.TRP file.

40. Verify that no **Non-TS** and **No Signal** messages appear on the MTX100A Option 02 screen. In addition, the hierarchic view and the bit rate are displayed correctly (214 Mbps and 188).

41. Select **Univ I/F > Receive > Single** on the MTX100A Option 02, and then repeat step 40.

42. Select **Univ I/F > Level > TTL** on the MPEG recorder and player.

43. Select **Level > TTL** and **Receive > Differential** in the **Univ I/F** menu on the MTX100A Option 02, and then repeat step 40.

44. Select **Univ I/F > Receive > Single** on the MTX100A Option 02, and then repeat step 40.

45. On the MTX100A Option 02, make the following settings:

> **Univ I/F menu**
> Level . . . . ECL
> Format . . . . . . Serial
> Receive . . . . . Differential

46. On the MPEG recorder and player, make the following settings:

> **Play menu**
> Clock . . . . Data Rate: 40 Mbps
> Receive . . . . . Differential
>
> **Univ I/F menu**
> Format . . . . . . Serial
> Receive . . . . . Differential

47. Press the **PLAY** button on the MPEG recorder and player to start playing the file.

48. Repeat step 40.

49. Select **Univ I/F > Receive > Single** on the MTX100A Option 02, and then repeat step 40.

50. Select **Univ I/F > Level > TTL** on the MPEG recorder and player.

51. Select **Level > TTL** and **Receive > Differential** from the **Univ I/F** menu on the MTX100A Option 02, and then repeat step 40.

52. Select **Univ I/F > Receive > Single** on the MTX100A Option 02, and then repeat step 40.

53. Press the **STOP** button on the MPEG recorder and player to stop the stream output.

54. Disconnect the parallel interface cable from the MTX100A Option 02 and MPEG recorder and player.

Checking the Recorded File.

55. Use the parallel interface cable to connect the Universal In/Out connector on the MTX100A Option 02 to the DVB/SPI In connector on the MPEG test system. See Figure 3-12.

MPEG test system rear panel (MTS430)

MTX100A Option 02 rear panel

Parallel interface cable
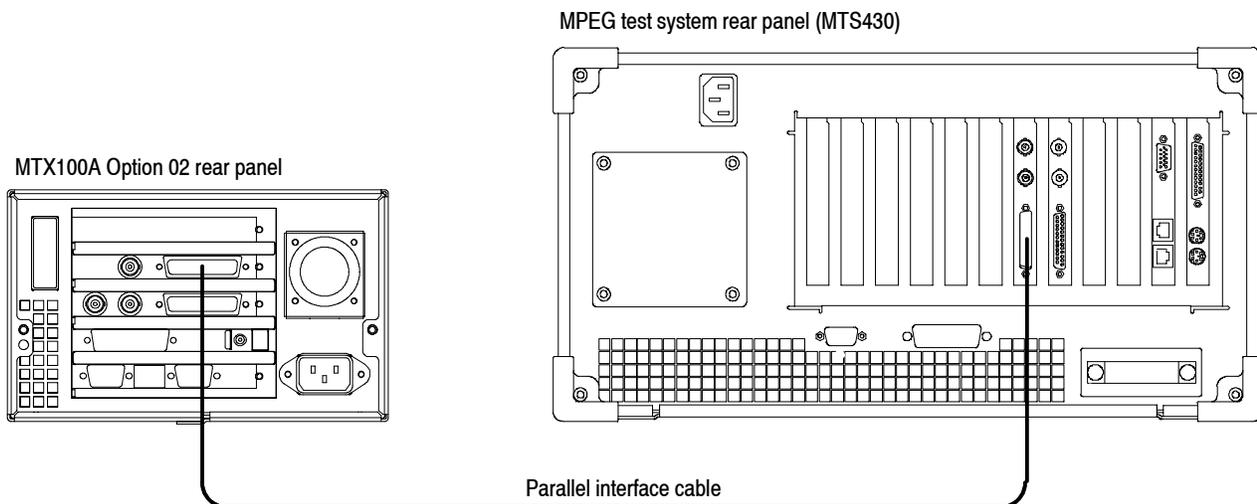
Figure 3-12: Equipment connection for verifying the recorded file- universal parallel/serial interface

56. Press the **PLAY** button on the MTX100A Option 02 to display the Play screen.

57. Select **Play > Update > On**.

58. Select **Univ I/F > Level > LVDS**.

59. Select **Univ I/F > Format > Parallel**.

60. Open the **Parallel_LVDS.trp** file on the MTX100A Option 02.

    a. Select **File > Open** to open the **Select File** dialog box.

    b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **Parallel_LVDS.trp** file.

61. Press the **PLAY** button on the MTX100A Option 02 to start playing the file.

62. Start the **TS Compliance Analyzer** on the MPEG analyzer.

63. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings:

    Interfaces . . . . DVB Parallel
    Interface Settings . . . . Time Stamping

64. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **40 Mbps** and that the transport stream packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the hierarchical view because these are caused by the original test40.TRP file.

---

65. Press the **STOP** button on the MTX100A Option 02 to stop the stream output.

66. Open the **Serial_LVDS.trp** file on the MTX100A Option 02.

    a. Select **File > Open** to open the Select File dialog box.

    b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **Serial_LVDS.trp** file.

67. Press the **PLAY** button on the MTX100A Option 02 to start playing the file.

68. Restart analysis on the MPEG analyzer.

69. Repeat steps 64 and 65.

70. Disconnect the parallel interface cable from the MTX100A Option 02 and the MPEG analyzer.

Checking the Event Output.

71. Use the 50 Ω BNC cable to connect the Event Out connector on the MTX100A Option 02 to the oscilloscope CH1 input. See Figure 3-13.

Oscilloscope (TDS5104B)

MTX100A Option 02 rear panel

50 Ω BNC cable
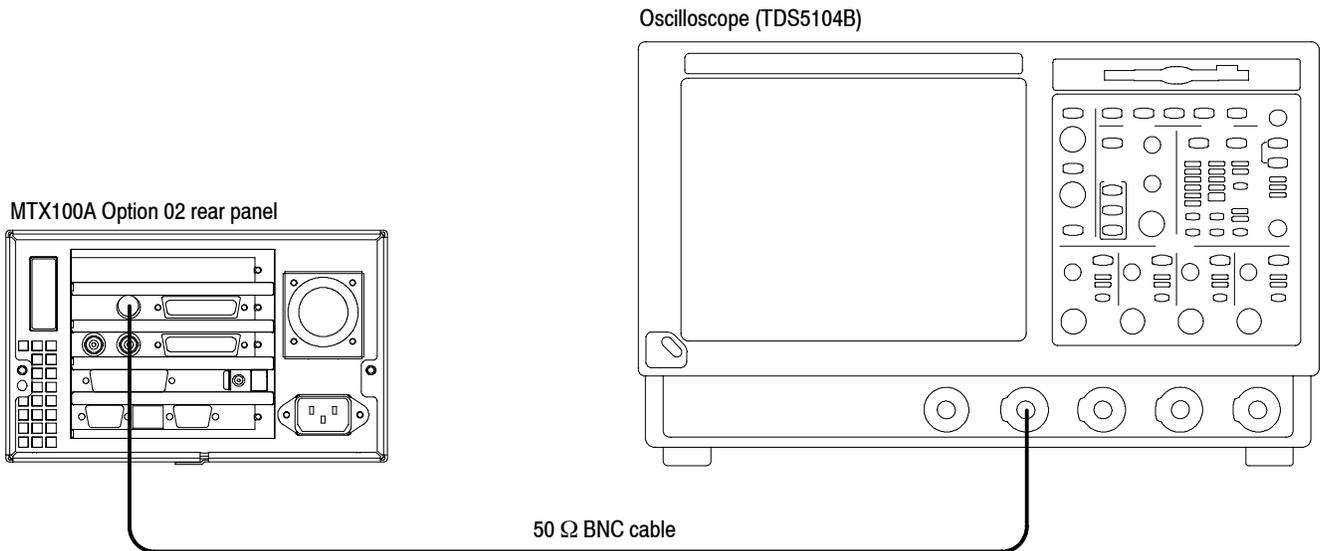
Figure 3-13: Equipment connection for verifying the Event output

72. Set the oscilloscope settings as indicated below:

Vertical scale . . . . 1 V/div
Horizontal scale . . . . . 80 ns/div
Horizontal position . . . Center
Acquire mode . . . . Average 16
Trigger level . . . . 1.20 V
Trigger source CH1
Trigger position5 . . . . 0 %
Trigger slope . . . . Rising Edge
Trigger mode . . . . AUTO
Input coupling . . . . DC
Input impedance . . . . . 1 MΩ
Measure . . . . High Level, Low Level

73. Open the **test40.TRP** file on the MTX100A Option 02.

   a. Select **File > Open** in the Play screen to open the **Select File** dialog box.

   b. In the dialog box, select the **test40.TRP** file.

74. Press the **PLAY** button on the MTX100A Option 02 to start playing the test40.TRP file.

75. Use the oscilloscope to measure that the high and low levels of the Event output are as follows:

High level: > 2.4 V
Low level: < 0.4 V

76. Press the **STOP** button on the MTX100A Option 02 to stop the stream output.

IEEE1394/ASI Interface (Option 05 Only)

This test verifies that transport stream data is correctly output from and is recorded through the IEEE1394/ASI interface on the MTX100A Option 05.

Equipment required	MPEG analyzer
	Oscilloscope
	D-VHS digital recorder
	Video monitor
	75 Ω BNC cable
	IEEE1394 cable (4 pin-4 pin)
	75 Ω signal adapter
	RCA(Ma)-to-BNC(Fe) adapter
	test40.TRP file

Checking the Output Signal.

1. Use the 75 Ω BNC cable and 75 Ω signal adapter to connect the ASI Output connector on the MTX100A Option 05 to the oscilloscope CH1 input. See Figure 3-14.

Oscilloscope (TDS5104B)

MTX100A Option 05 rear panel

75 Ω signal adapter

75 Ω BNC cable
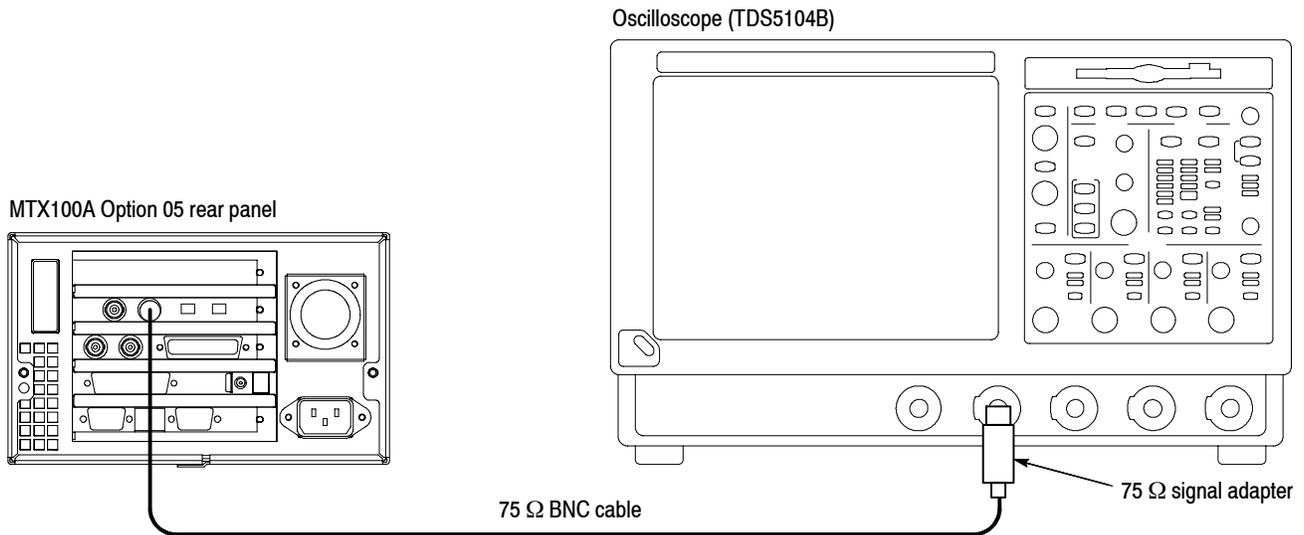
Figure 3-14: Equipment connection for verifying the output signal- IEEE1394/ASI interface

2. Set the oscilloscope controls as indicated below:

Vertical scale . . . . 200 mV/div
Horizontal scale . . . . . 1.25 ns/div
Acquire mode . . . . Average 32
Trigger mode . . . . AUTO
Trigger level . . . . 0 V
Trigger source CH1
Trigger position 50%
Trigger slope . . . . Rising Edge
Input impedance . . . . . 50 Ω
Measure . . . . Amplitude, Rise Time, Fall Time
Ref Level . . . . High Ref 80%, Low Ref 20%
Gating . . . . Cursor Curs1 Pos1: −2.5 ns/Curs2: 2.75 ns

3. Open the **test40.TRP** file on the MTX100A Option 05.

   a. Select **File > Open** to open the **Select File** dialog box.

   b. In the dialog box, select the **test40.TRP** file.

4. Press the **PLAY** button on the MTX100A Option 05 to start playing the
   test40.TRP file.

5. Use the oscilloscope to verify that the amplitude, rise and fall times are
   within the following range.

   Amplitude: 740 mV to 860 mV
   Rise and fall time: ≤ 1.2 ns

6. Disconnect the 75 Ω BNC cable from the MTX100A Option 05 and oscilloscope.

Checking the Play Operation.

7. Disconnect the BNC cable from the 75 Ω signal adapter on the oscilloscope, and then connect the cable to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-15.

MPEG test system rear panel (MTS430)

MTX100A Option 05 rear panel

75 Ω BNC cable
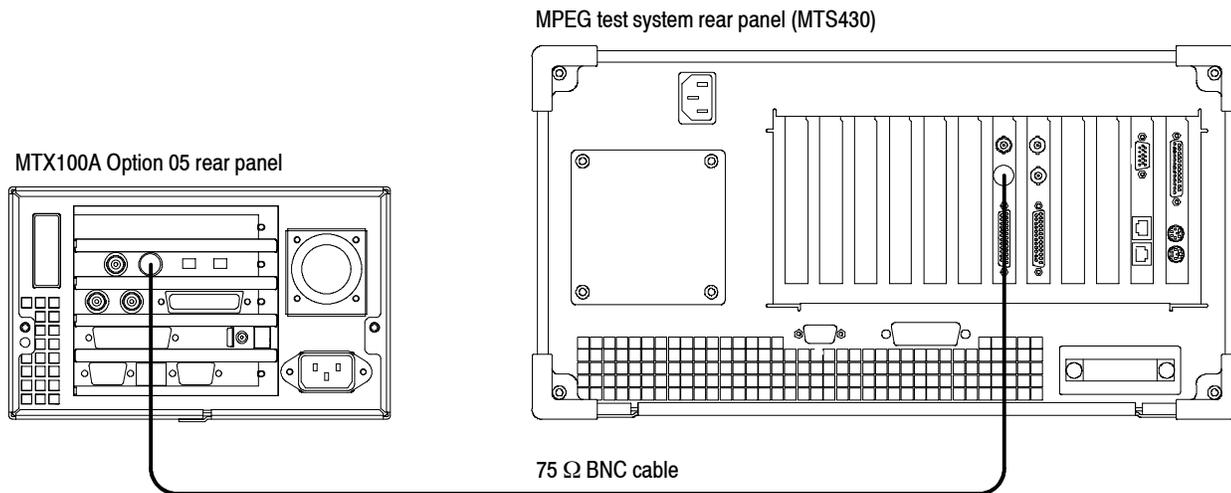
Figure 3-15: Equipment connection for verifying the play operation- IEEE1394/ASI interface

8. Start the **MPEG Player** application on the MPEG analyzer.

9. Set the application to the **Record** mode.

10. Set the MPEG analyzer settings as indicated bellow:

   Record
   Source SPI/ASI/310M
   Target   . . . . RAM, Record Size: 100 MB

   SPI/ASI/310M
   Input Port . . . . . . BNC
   BNC Port   . . . . . . ASI

   File
   Save Mode . . . . . Over write
   Save . . . .   E:\MTXRTX_Test streams\Record_Files\
   ASI214Mbps.trp

11. On the MTX100A Option 05, make the following settings:

> **Play menu**
> Clock . . . . Data Rate: 214 Mbps
> Update . . . . . . Off
> Source . . . . . . RAM

12. Press the **PLAY** button on the MTX100A Option 05 to start playing the test40.TRP.

13. Verify that the hierarchic view is displayed on the MPEG analyzer screen. In addition, verify that the bit rate is **214 Mbps** and the packet size is **188** bytes.

14. Click the **Record** button on the MPEG Player application to record the file.

15. After recording is completed, press the **STOP** button on the MTX100A Option 05.

16. Disconnect the 75 Ω BNC cable from the MTX100A Option 05 and MPEG analyzer.

Checking the Record Operation.

17. Use the 75 Ω BNC cable to connect the ASI In connector on the MTX100A Option 05 to the ASI/SMPTE Out connector on the MPEG analyzer. See Figure 3-16.

MPEG analyzer rear panel (MTS430)

MTX100A Option 05 rear panel

75 Ω BNC cable
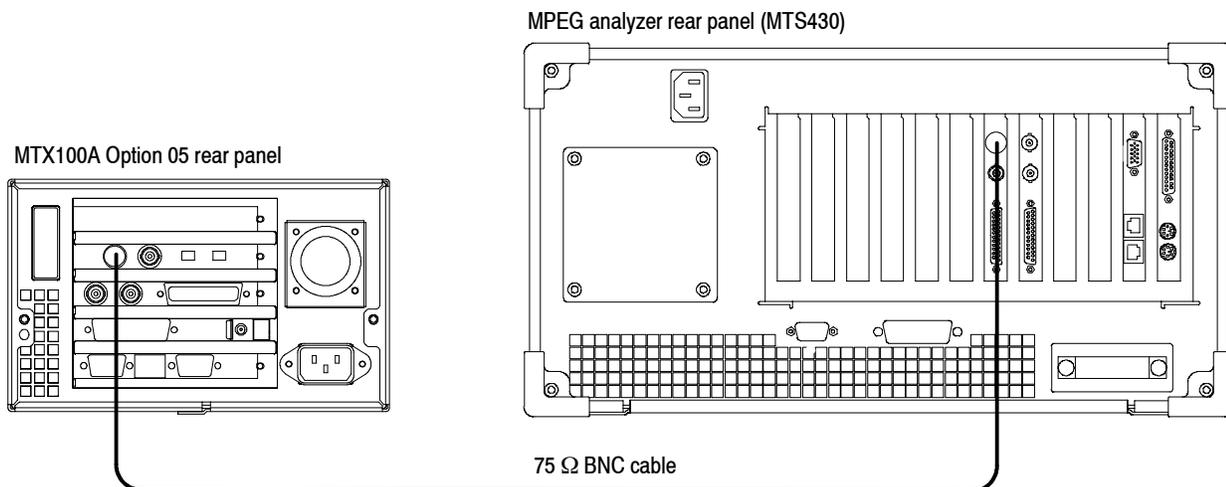
Figure 3-16: Equipment connection for verifying the record operation- IEEE1394/ASI interface

18. Press the **REC** button on the MTX100A Option 05 to display the Record screen.

19. On the MTX100A Option 05, make the following settings:

> **Record menu**
> Source ASI/1394
> Record size . . . . . 100 MB
> Target . . . . RAM

> **File menu**
> Save Mode . . . . . Over Write
> Save . . . . D:\Record_Files\ASI214Mbps.trp

20. Set the MPEG analyzer to the Play mode.

21. Select **File > Open** on the MPEG analyzer to display the **Open** dialog box.

22. In the dialog box, navigate to the **E:\MTXRTX_Test Streams\Record_Files** directory, and then select the **ASI214Mbps.trp** file.

23. Set the following settings on the MPEG analyzer:

> **Play**
> Clock . . . . Data Rate: 214 Mbps
> Update . . . . Off
> Source . . . . RAM

> **SPI/ASI/310M**
> BNC Port . . . . . . ASI
> Through Out . . . . Off

24. Click the **Play** button on the MPEG analyzer to start playing the ASI214Mbps.trp file.

25. Verify that the hierarchic view is displayed on the MTX100A Option 05 screen. In addition, verify that the bit rate is **214 Mbps** and packet size is **188** bytes.

26. Press the **REC** button on the MTX100A Option 05 to record the file.

27. After recording is completed, click the **Stop** button on the MPEG analyzer.

28. Exit the MPEG Player application on the MPEG analyzer.

29. Disconnect the 75 Ω BNC cable from the MTX100A Option 05 and MPEG analyzer.

Checking the Recorded File.

30. Use the 75 Ω BNC cable to connect the ASI Output connector on the MTX100A Option 05 to the ASI/SMPTE In connector on the MPEG test system. See Figure 3-17.

MPEG test system rear panel (MTS430)

MTX100A Option 05 rear panel

75 Ω BNC cable
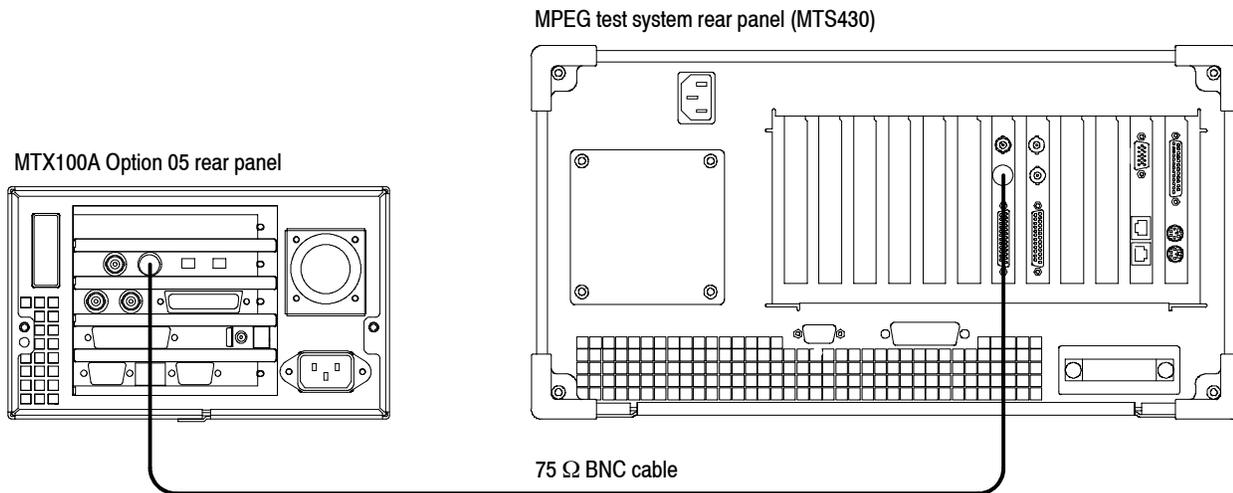
Figure 3-17: Equipment connection for verifying the recorded file- IEEE1394/ASI interface

31. Press the **PLAY** button on the MTX100A Option 05 to display the Play screen.

32. Select **Play > Update > On**.

33. Open the **ASI214Mbps** file on the MTX100A Option 05.

    a. Select **File > Open** to open the **Select File** dialog box.

    b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **ASI214Mbps.trp** file.

34. Press the **PLAY** button on the MTX100A Option 05 to start playing the file.

35. Start the **TS Compliance Analyzer** on the MPEG analyzer.

36. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings

    Interfaces . . . . ASI
    Interface Settings . . . . Time Stamping

37. Verify that the hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the bit rate is **40 Mbps** and that the packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the hierarchical view because these are caused by the original test40.TRP file.

38. Press the **STOP** button on the MTX100A Option 05 to stop the stream output.

39. Disconnect the 75 Ω BNC cable from the MTX100A Option 05 and MPEG analyzer.

Checking the IEEE1394 Output Signal.

1. Use the IEEE1394 cable to connect the IEEE1394 port on the MTX100A Option 05 to the i.LINK IN/OUT connector of the D-VHS digital recorder. See Figure 3-18.

2. Use the 75 Ω BNC cable and RCA(Ma)-to-BNC(Fe) adopter to connect the VIDEO OUTPUT connector on the D-VHS digital recorder to the video input on the video monitor. See Figure 3-18.

Video monitor (LMD-1420)

MTX100A Option 05 rear panel

75 Ω BNC cable and
  RCA(Ma)-to-BNC(Fe) adopter

D-VHS digital recorder(HM-DH5U)

IEEE1394 cable
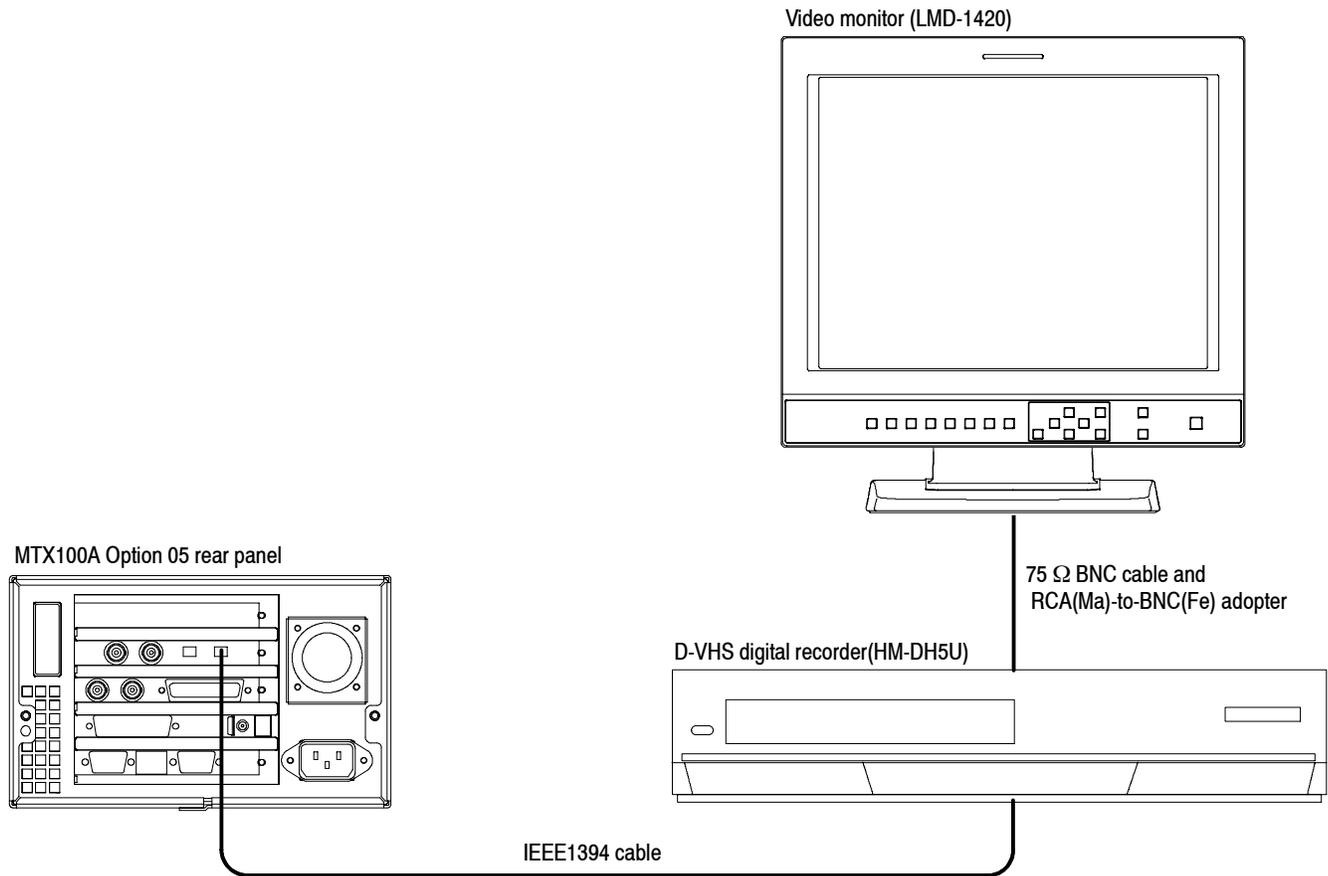
Figure 3-18: Equipment connection for verifying the IEEE1394 output signal

3. Make the following i.LINK setup on the D-VHS digital recorder:

   a. Press the **MENU** button on the remote controller that is provided with the D-VHS digital recorder to display the Main Menu screen.

   b. Press the left or right arrow button on the remote controller to move the arrow to **INITIAL SET UP**, and then press the **OK** button.

   c. Press the left or right arrow button to move the arrow to **OTHER**, and then press the **OK** button.

   d. Press the up or down arrow button to move the arrow to **LINK**, and then press left or right arrow button to set to **AUTO**.

   e. Press the **MENU** button to return to Main Menu screen.

4. Press the **PLAY** button on the MTX100A Option 05 to display the Play screen.

5. Open the **Flower.trp** file on the MTX100A Option 05.

   a. Select **File > Open** to open the **Select File** dialog box.

   b. In the dialog box, navigate to the **D:\525** directory, and then select the **Flower.trp** file.

6. Select **ASI/1394 > 1394Mode > PtoP Connect** on the MTX100A Option 05 to open the **IEEE1394** dialog box.

7. In the dialog box, select **JVC HM-DH5** in the **Instrument** list box.

8. In the dialog box, select the **Connect** button, and then select the **OK** button.

9. Press the **TV/VCR CH +/−** button on the remote controller to select **I** as a recording channel.

10. Press the **PLAY** button on the MTX100A Option 05 to start playing the Flower.trp file.

11. Press the **REC** button on the D-VHS digital recorder.

12. Verify that any block noise does not appear on the video monitor.

13. After about 30 seconds recording, press the **STOP** button on the D-VHS digital recorder.

14. Press the **REW** (◀◀) button on the D-VHS digital recorder.

15. Press the **REC** button on the MTX100A Option 05 to display the Record screen.

16. Select **Record > Source > ASI/1394** on the MTX100A Option 05.

17. Select **ASI/1394 > Input Port > 1394** on the MTX100A Option 05.

18. Select **ASI/1394 > 1394 Mode > PtoP Connect** to open the **IEEE1394** dialog box.

19. In the dialog box, select the **Disconnect** button, and then select the **OK** button.

20. Select **ASI/1394 > 1394 Mode > PtoP Connect** to open the IEEE1394 dialog box.

21. In the dialog box, select the **Connect** button, and then select the **OK** button.

22. Press the **PLAY** button on the D-VHS digital recorder.

23. Verify that correct hierarchy display appears on the MTX100 Option 05 screen.

24. Disconnect all the cables from the MTX100 Option 05, D-VHS digital recorder, and video monitor.

**SMPTE310M/ASI/SPI Interface (Option 07 Only)**

This test verifies that transport stream data is correctly output from and is recorded through the SMPTE310M/ASI/SPI interface on the MTX100A Option 07.

Equipment required	Oscilloscope
	MPEG analyzer
	75 Ω precision termination
	75 Ω BNC cable
	75 Ω signal adapter
	Test Streams CD-ROM
	test40.TRP file

NOTE. Before you begin the following procedures, create a holder named 8VSB on the D: drive of the MTX100A Option 07 and copy the 8VSB_test.TRP file from the Test Streams CD-ROM to the folder.

Checking the Output Signal.

1. Use the 75 Ω BNC cable and the 75 Ω signal adapter to connect the SMPTE310M/ASI Output connector on the MTX100A Option 07 to the oscilloscope CH1 input. See Figure 3-19 on page 3-40.
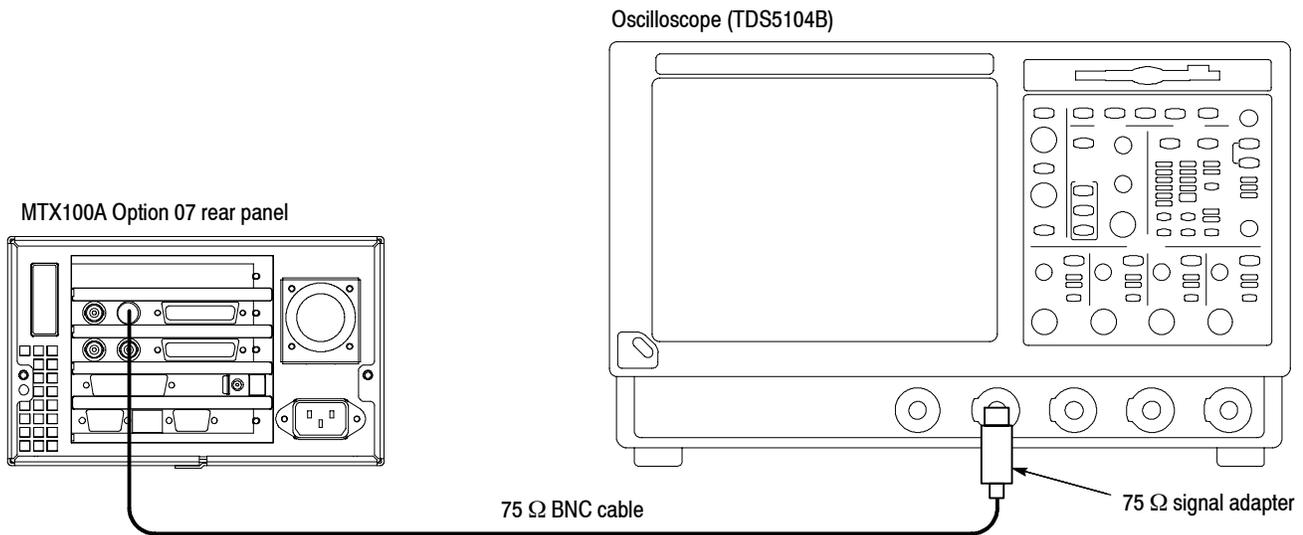
Figure 3-19: Equipment connection for verifying output signal- SMPTE310M interface

2. Set the oscilloscope settings as indicated below:

    Vertical scale . . . . 200 mV/div
    Horizontal scale . . . . . 1.25 ns/div
    Trigger position 50%
    Acquire mode . . . . Average 32
    Trigger mode . . . . AUTO
    Trigger source CH1
    Trigger level . . . . 0 V
    Trigger slope . . . . Rising Edge
    Input impedance . . . . . 50 Ω
    Measure . . . . Amplitude, Rise Time, Fall Time
    Gating . . . . Cursor   Curs1 Pos1: -2.5 ns/Curs2: 2.75 ns

3. Open the **test40.TRP** file on the MTX100A Option 07.

    a. Select **File > Open** to open the **Select File** dialog box.

    b. In the dialog box, select the **test40.TRP** file.

4. Press the **PLAY** button on the MTX100A Option 07 to start playing the
    test40.TRP file.

5. Use the oscilloscope to measure that the amplitude, rise and fall times are as
    follows:

    Amplitude: 740 mV to 860 mV
    Rise and fall time: ≤ 1.2 ns

Checking the ASI Play Operation.

6. Disconnect the BNC cable from the 75 Ω signal adapter on the oscilloscope input, and then connect the cable to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-20.
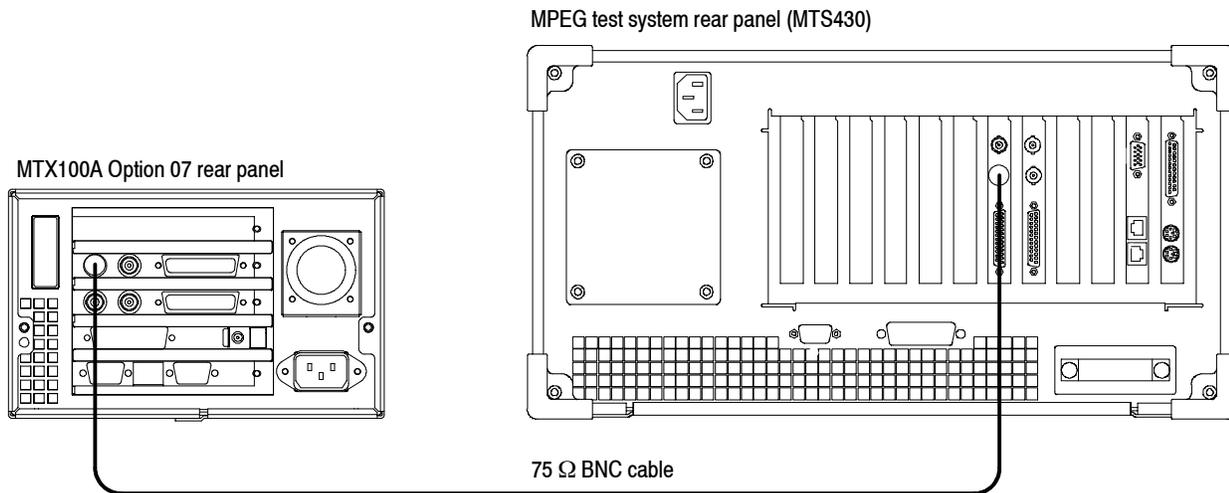
Figure 3-20: Equipment connection for verifying the ASI play operation

7. Start the **MPEG Player** application on the MPEG analyzer.

8. Set the application to the **Record** mode.

9. Set the MPEG analyzer settings as indicated bellow:

> **Record menu**
> Source SPI/ASI/310M
> Target   . . . .   RAM, Record Size: 100 MB
>
> **SPI/ASI/310M menu**
> Input Port   . . . . . .   BNC
> BNC Port   . . . . . .   ASI
>
> **File menu**
> Save Mode   . . . . .   Over write
> Save . . . .   E:\MTXRTX_Test streams\Record_Files\
> ASI214Mbps.trp

10. On the MTX100A Option 07, make the following settings:

> **Play menu**
> Clock . . . . Data Rate: 214 Mbps
> Update . . . . Off
> Source . . . . RAM
>
> **310M/ASI/SPI menu**
> BNC Port . . . . . . ASI
> Through Out . . . . Off

11. Press the **PLAY** button on the MTX100A Option 07 to start playing the test40.TRP.

12. Verify that the hierarchic view is displayed on the MPEG analyzer screen. In addition, verify that the bit rate is **214 Mbps** and the packet size is **188** bytes.

13. Click the **Record** button on the MPEG Player application to record the file.

14. After recording is completed, press the **STOP** button on the MTX100A Option 07.

15. Disconnect the 75 Ω BNC cable from the MTX100A Option 07 and MPEG analyzer.

Checking the ASI Record Operation.

16. Use the 75 Ω BNC cable to connect the SMPTE/ASI Input connector on the MTX100A Option 07 to the ASI/SMPTE Out connector on the MPEG analyzer. See Figure 3-21.

MPEG analyzer rear panel (MTS430)

MTX100A Option 07 rear panel

75 Ω BNC cable
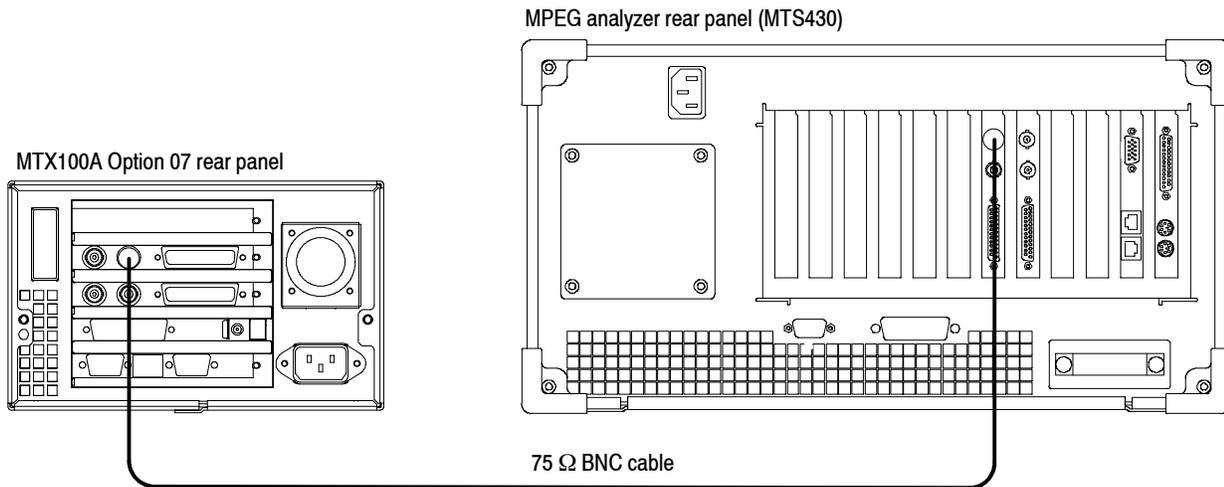
Figure 3-21: Equipment connection for verifying the ASI record operation

17. Press the **REC** button on the MTX100A Option 07 to display the Record screen.

18. On the MTX100 Option 07, make the following settings:

Record menu
Source 310M/ASI/SPI
Record size . . . . . 100 MB
Target . . . . RAM

310M/ASI/SPI menu
Input Port . . . . . . BNC
BNC Port . . . . . . ASI

File menu
Save Mode . . . . . Over Write
Save . . . . D:\Record_Files\ASI214Mbps.trp

19. Set the MPEG analyzer to the Play mode.

20. Select **File > Open** on the MPEG analyzer to display the Open dialog box.

21. In the dialog box, navigate to the **E:\MTXRTX_Test Streams\Record_Files** directory, and then select the **ASI214Mbps.trp** file.

22. Set the following settings on the MPEG analyzer:

    Play menu
    Clock . . . . Data Rate: 214 Mbps
    Update . . . . Off
    Source . . . . RAM

    SPI/ASI/310M menu
    BNC Port . . . . . . ASI
    Through Out . . . . Off

23. Click the **Play** button on the MPEG analyzer to start playing the
    ASI214Mbps.trp file.

24. Verify that the hierarchic view is displayed on the MTX100A Option 07
    screen. In addition, verify that the bit rate is **214 Mbps** and packet size is
    188 bytes.

25. Press the **REC** button on the MTX100A Option 07 to record the file.

26. After recording is completed, click the **Stop** button on the MPEG analyzer.

27. Exit the MPEG Player application on the MPEG analyzer.

28. Disconnect the BNC cable from the MTX100A Option 07 and MPEG
    analyzer.

Checking the Recorded File.

29. Use the 75 Ω BNC cable to connect the SMPTE310M/ASI Output connector
    on the MTX100A Option 07 to the ASI/SMPTE In connector on the MPEG
    analyzer. See Figure 3-22.

MPEG analyzer rear panel (MTS430)

MTX100A Option 07 rear panel

75 Ω BNC cable

Figure 3-22: Equipment connection for verifying the recorded file- ASI interface

30. Press the **PLAY** button on the MTX100A Option 07 to display the Play screen.

31. Select **Play > Update > On**.

32. Open the **ASI214Mbps** file on the MTX100A Option 07.

    a. Select **File > Open** to open the **Select File** dialog box.

    b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **ASI214Mbps.trp** file.

33. Press the **PLAY** button to start playing the file.

34. Start the **TS Compliance Analyzer** on the MPEG analyzer.

35. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings:

    Interfaces . . . . ASI
    Interface Settings . . . . Time Stamping

36. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **40 Mbps** and that the packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the hierarchical view because these are caused by the original test40.TRP file.

37. Press the **STOP** button on the MTX100A Option 07 to stop the stream output.

38. Disconnect the 75 Ω BNC cable from the MTX100A Option 07 and MPEG analyzer.

Checking the 8VSB Play Operation.

39. Use the 75 Ω BNC cable to connect the SMPTE310M/ASI Output connector on the MTX100A Option 07 to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-23.

MPEG analyzer rear panel (MTS430)

MTX100A Option 07 rear panel

75 Ω BNC cable
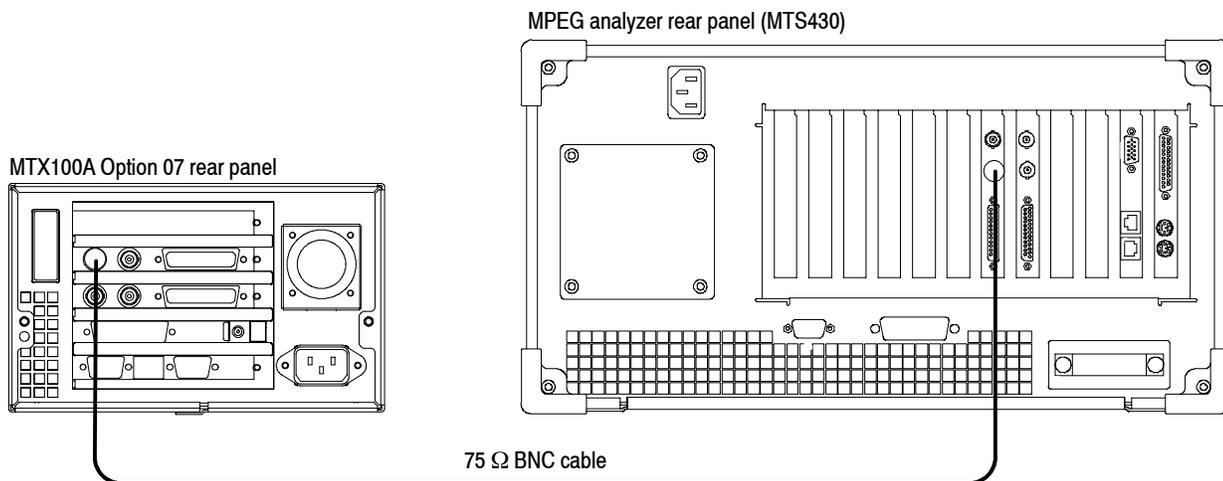
Figure 3-23: Equipment connection for verifying the 8VSB play operation

40. Start the **MPEG Player** application on the MPEG analyzer.

41. Set the application to the **Record** mode.

42. Set the MPEG analyzer settings as indicated bellow:

Record menu
Source SPI/ASI/310M
Target . . . . RAM, Record Size: 100 MB

SPI/ASI/310M menu
Input Port . . . . . . BNC
BNC Port 310M

File menu
Save Mode . . . . . Over write
Save . . . . E:\MTXRTX_Test streams\Record_Files\
                        S310M.trp

43. Open the **8VSB_test.TRP** file on the MTX100A Option 07.

    a. Select **File > Open** to open the **Select File** dialog box.

    b. In the dialog box, navigate to the **D:\8VSB** directory, and then select the **8VSB_test.TRP** file.

44. On the MTX100A Option 07, make the following settings:

    Play menu
    Update . . . . Off
    Source . . . . RAM

    310M/ASI/SPI menu
    BNC Port 310M 8VSB
    Through Out . . . . Off

45. Press the **PLAY** button on the MTX100A Option 07 to start playing the 8VSB_test.TRP file.

46. Verify that the hierarchic view is displayed on the MPEG analyzer screen. In addition, verify that the bit rate is **19.392 Mbps** and packet size is **188** bytes.

47. Click the **Record** button on the MPEG Player application to record the file.

48. After recording is completed, press the **STOP** button on the MTX100A Option 07.

49. Disconnect the 75 Ω BNC cable from the MTX100A Option 07 and MPEG analyzer.

Checking the 8VSB Record Operation.

50. Use the 75 Ω BNC cable to connect the SMPTE310M/ASI Input connector on the MTX100A Option 07 to the ASI/SMPTE Out connector on the MPEG analyzer. See Figure 3-24.

MPEG analyzer rear panel (MTS430)

MTX100A Option 07 rear panel

75 Ω BNC cable
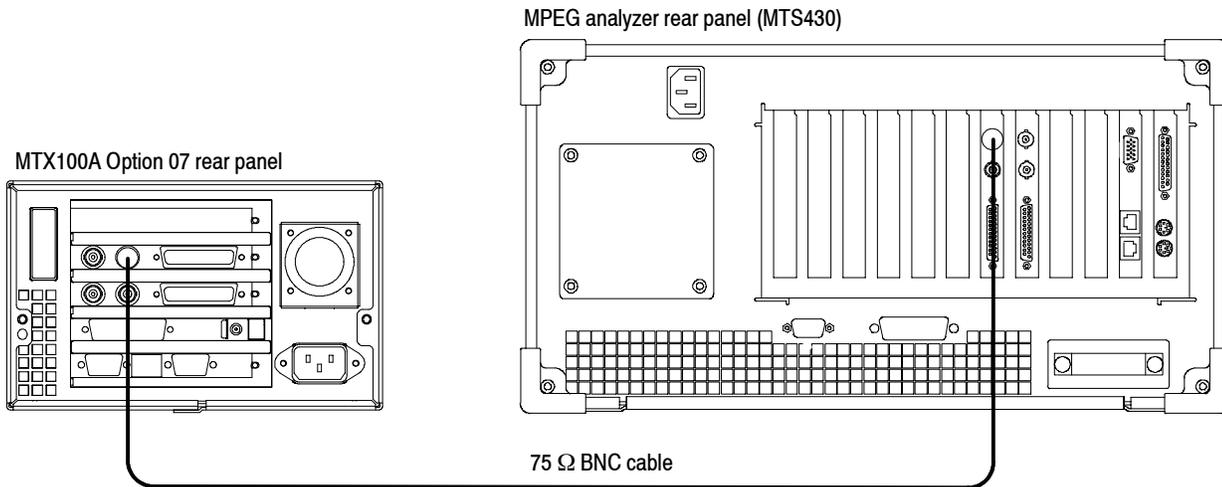
Figure 3-24: Equipment connection for verifying the 8VSB record operation

51. Press the **REC** button on the MTX100A Option 07 to display the Record screen.

52. On the MTX100 Option 07, make the following settings:

> **Record menu**
> Source 310M/ASI/SPI
> Record size . . . . . 100 MB
> Target . . . . RAM
>
> **310M/ASI/SPI menu**
> Input Port . . . . . . BNC
> BNC Port 310M
>
> **File menu**
> Save Mode . . . . . Over Write
> Save . . . . D:\Record_Files\S310M.trp

53. Set the MPEG analyzer to the Play mode.

54. Select **File > Open** on the MPEG analyzer to display the Open dialog box.

55. In the dialog box, navigate to the **E:\MTXRTX_Test Streams\Record_Files** directory, and then select the **S310M.trp** file.

56. On the MPEG player, make the following settings:

> **Play menu**
> Update . . . . Off
> Source . . . . RAM
>
> **SPI/ASI/310M menu**
> BNC Port 310M 8VSB
> Through Out . . . . Off

57. Click the **Play** button on the MPEG analyzer to start playing the S310M.trp file.

58. Verify that the hierarchic view is displayed on the MTX100A Option 07 screen. In addition, verify that the bit rate is **19.392 Mbps** and packet size is **188** bytes.

59. Press the **REC** button on the MTX100A Option 07 to record the file.

60. After recording is completed, click the **Stop** button on the MPEG analyzer.

61. Exit the MPEG Player application on the MPEG analyzer.

62. Disconnect the 75 Ω BNC cable from the MTX100A Option 07 and MPEG analyzer.

Checking the Recorded File.

63. Use the 75 Ω BNC cable to connect the SMPTE310M/ASI Output connector on the MTX100A Option 07 to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-25.
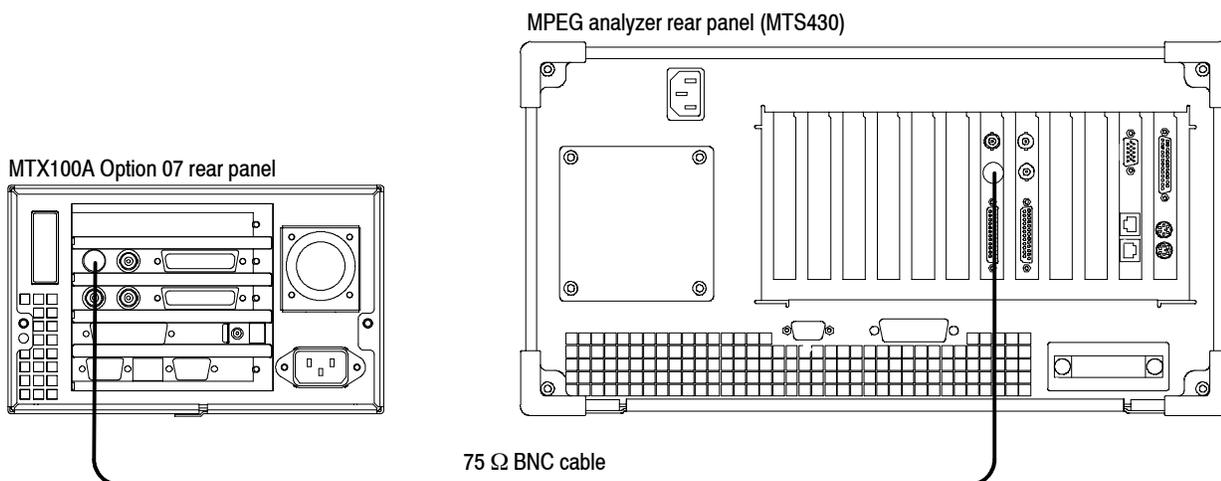
Figure 3-25: Equipment connection for verifying the recorded file- ASI interface

64. Press the **PLAY** button on the MTX100A Option 07 to display the Play screen.

65. Open the **310M.trp** file on the MTX100A Option 07.

    a. Select **File > Open** to open the Select File dialog box.

    b. In the dialog box, navigate to the **D:\Record_Files** directory, and then select the **310M.trp** file.

66. Select **Play > Update > On**.

67. Press the **PLAY** button to start playing the file.

68. Start the **TS Compliance Analyzer** on the MPEG analyzer.

69. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings:

    Interfaces . . . . ASI
    Interface Settings   . . . . Time Stamping

70. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **19.392 Mbps** and that the packet size is **188** bytes.

NOTE. Ignore 3.4.a Unref PID error in the Priority 3 row.

71. Press the **STOP** button on the MTX100A Option 07 to stop the stream output.

72. Disconnect the 75 Ω BNC cable from the MTX100A Option 07 and MPEG analyzer.

Checking the SPI Record Operation.

1. Use the parallel interface cable to connect the SPI Input connector on the MTX100A Option 07 to the DVB SPI Out connector on the MPEG analyzer. See Figure 3-26.

MPEG analyzer rear panel (MTS430)

MTX100A Option 07 rear panel

Parallel interface cable
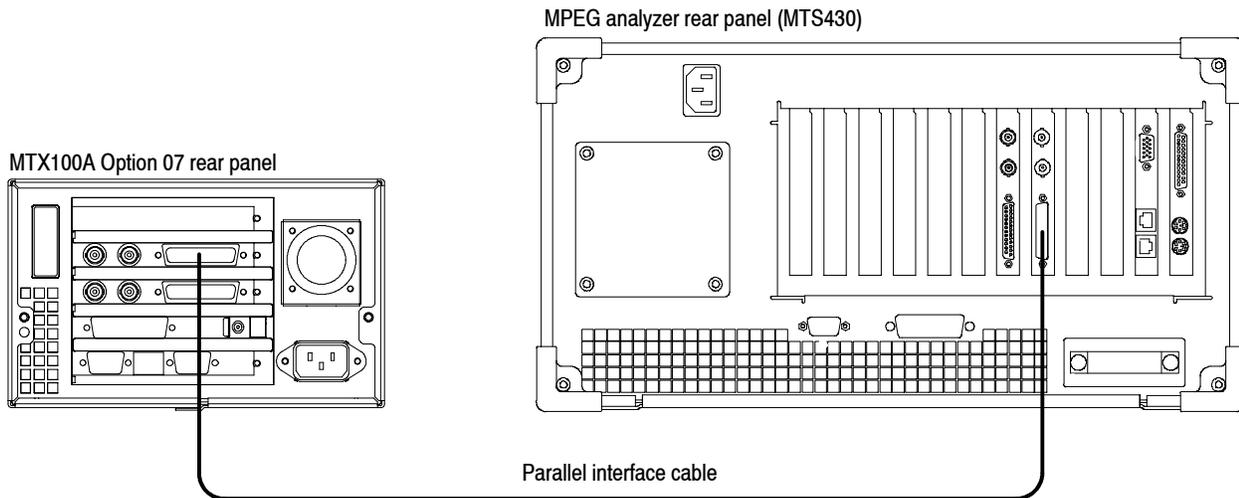
Figure 3-26: Equipment connection for verifying the SPI record operation

2. Press the **REC** button on the MTX100A Option 07 to display the Record screen.

3. On the MTX100A Option 07, make the following settings:

   Record menu
   Source . . . . . . SPI
   Target . . . . . . RAM
   Record Size . . 100 MB

   File menu
   Save Mode . . . . . Over Write
   Save Mode . . . . . D:\Record_Files\SPI214Mbps

4. Change the MPEG analyzer to Play mode.

5. Select **File > Open** on the MPEG analyzer to display the Open dialog box.

6. In the dialog box, navigate to the **E:\MTXRTX_Test streams\ Record_Files**, and then select the **SPI214Mbps.trp** file.

7. On the MPEG analyzer, make the following settings:

   Play menu
   Clock . . . . Data Rate: 214 Mbps
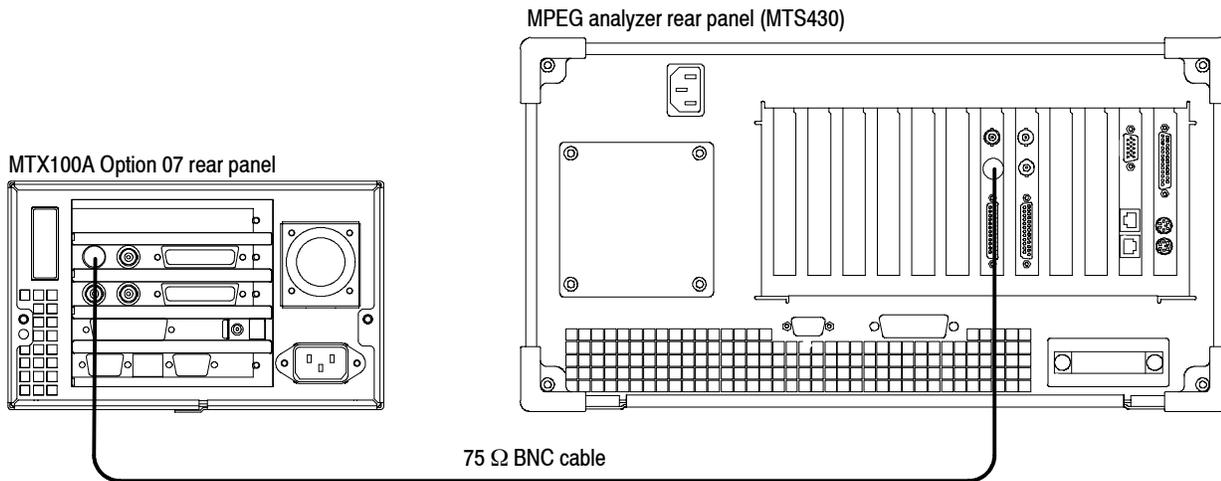   Update . . . . . . Off
   Source . . . . . . RAM

8. Click the **PLAY** button on the MPEG Analyzer to start playing the **SPI214Mbps.trp** file.

9. Verify that the hierarchic view is displayed on the MTX100A Option 07 screen. In addition, verify that the bit rate display is **214 Mbps** and the packet size display is **188** bytes.

10. Press the **REC** button on the MTX100A Option 07 to record the file.

11. After recording is completed, click the **Stop** button on the MPEG analyzer.

12. Exit the MPEG Player application on the MPEG analyzer.

Checking the Recorded File.

13. Change the interface cable connection from DVB/SPI Out connector to DVB/SPI In connector on the MPEG analyzer.

14. Start the **TS Compliance Analyzer** on the MPEG analyzer.

15. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings:

    Interfaces . . . . ASI
    Interface Settings . . . . Time Stamping

16. Press the **PLAY** button on the MTX100A Option 07 to display the Play screen.

17. Select **File > Open** to open the **Select File** dialog box.

18. In the dialog box, navigate to the **D:\ Record_Files** directory, and then select the **SPI214Mbps.trp** file.

19. Select **Play > Update > On**.

20. Press the **PLAY** button on the MTX100A Option 07 to start playing the SPI214Mbps.trp file.

21. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **40 Mbps** and that the transport stream packet size is **188** bytes.

NOTE. Ignore Program 3 and PID 120 (0x78) errors in the hierarchical view because these are caused by the original test40.TRP file.

22. Press the **STOP** button on the MTX100A Option 07.

23. Close the TS Compliance Analyzer window.

This completes the MTX100A performance verification.

Maintenance

Maintenance

This section contains the information needed to do periodic and corrective maintenance on the MTX100A. The following subsections are included:

- *Preparation* — Introduction plus general information on preventing damage to internal modules when doing maintenance.

- *Inspection and Cleaning* — Information and procedures for inspecting the MTX100A and cleaning its external and internal modules.

- *Removal and Installation Procedures* — Procedures for the removal of defective modules and replacement of new or repaired modules.

- *Troubleshooting* — Information for isolating and troubleshooting failed modules. Troubleshooting trees are included.

- *Using the Recovery Discs* — Procedures for reinstalling the Windows XP operating system and the MTX100A application if the MTX100A does not boot.

Related Maintenance Procedures

The following sections contain information and procedures related to maintenance.

- Section 2, *Theory of Operation*, contains a circuit description at the module or block level.

- Section 3, *Performance Verification*, contains procedures that may be useful in isolating problems to modules by testing the MTX100A performance.

- Section 6, *Diagrams*, contains a block diagram using individual modules as blocks and an interconnection diagram showing connections between the modules.

- Section 7, *Replaceable Parts List,* lists all field replaceable modules by part number.

Preparation

Before servicing this product, read the *General Safety Summary, Safety Summary, Introduction* at the front of the manual, and the ESD information below.

⚠️ *CAUTION. Static discharge can damage any semiconductor component in the MTX100A.*

Preventing ESD When performing any service which requires internal access to the MTX100A, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge (ESD).

1. Minimize handling of static-sensitive modules.

2. Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive modules.

3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules. Perform service of static-sensitive modules only at a static-free work station.

4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.

5. Handle circuit boards by the edges when possible.

6. Do not slide the modules over any surface.

7. Avoid handling modules in areas that have a floor or work-surface covering capable of generating a static charge.

Inspection and Cleaning

Inspection and Cleaning describes how to inspect for dirt and damage. It also describes how to clean the exterior and interior of the MTX100A. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent the MTX100A from malfunctioning and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the MTX100A and using general care when operating it.

How often preventative maintenance should be performed depends on the severity of the environment in which the MTX100A is used.

General Care   The cabinet helps keep dust out of the MTX100A, and is needed to meet EMI and cooling requirements. The cabinet should be in place when operating the MTX100A. The front cover protects the front panel and display from dust and damage. Install the front cover when storing or transporting the MTX100A.

Inspection and Cleaning Procedures   Inspect and clean the MTX100A as often as operating conditions require. The collection of dirt on components inside can cause them to overheat and break-down. (Dirt acts like an insulating blanket, preventing efficient heat dissipation.) Dirt also provides an electrical conduction path that could cause an MTX100A failure, especially under high-humidity conditions.

> ⚠ *CAUTION. Avoid the use of chemical cleaning agents that might damage the plastics used in this MTX100A. Use only deionized water when cleaning the menu buttons or front-panel buttons. Use an ethyl alcohol solution as a cleaner and rinse with deionized water.*

Inspection — Exterior. Inspect the outside of the MTX100A for damage, wear, and missing parts, using Table 4-1 as a guide. An MTX100A that appears to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and performance. Immediately repair defects that could cause personal injury or lead to further damage to the MTX100A.

Table 4-1: External inspection check list

Item	Inspect for	Repair action
Cabinet, front panel, and cover	Cracks, scratches, deformations, damaged hardware or gaskets.	Repair or replace defective module.
Front-panel buttons	Missing, damaged, or loose buttons.	Repair or replace missing or defective buttons.
Connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Repair or replace defective modules. Clear or wash out dirt.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Repair or replace damaged or missing items, frayed cables, and defective modules.

Cleaning Procedure — Exterior. To clean the MTX100A exterior, perform the following steps:

1. Remove loose dust on the outside of the MTX100A with a lint free cloth.

2. Remove remaining dirt with a lint free cloth dampened in a general purpose detergent-and-water solution. Do not use abrasive cleaners.

3. Clean the light filter protecting the monitor screen with a lint-free cloth dampened with a gentle, general purpose detergent-and-water solution.

CAUTION. To prevent getting moisture inside the MTX100A during external cleaning, use only enough liquid to dampen the cloth or applicator.

Inspection — Interior. To access the inside of the MTX100A for inspection and cleaning, refer to the *Removal and Installation Procedures* in this section.

Inspect the internal portions of the MTX100A for damage and wear, using Table 4-2 as a guide. Defects found should be repaired immediately.

⚠ *CAUTION. To prevent damage from electrical arcing, ensure that circuit boards and components are dry before applying power to the MTX100A.*

Table 4-2: Internal inspection check list

Item	Inspect for	Repair action
Circuit boards	Loose, broken, or corroded solder connections. Burned circuit boards. Burned, broken, or cracked circuit-run plating.	Remove failed module and replace with a fresh module.
Resistors	Burned, cracked, broken, blistered condition.	Remove failed module and replace with a fresh module.
Solder connections	Cold solder or rosin joints.	Resolder joint and clean with isopropyl alcohol.
Capacitors	Damaged or leaking cases. Corroded solder on leads or terminals.	Remove damaged module and replace with a fresh module from the factory.
Semiconductors	Loosely inserted in sockets. Distorted pins.	Firmly seat loose semiconductors. Remove devices that have distorted pins. Carefully straighten pins (as required to fit the socket), using long-nose pliers, and reinsert firmly. Ensure that straightening action does not crack pins, causing them to break off.
Wiring and cables	Loose plugs or connectors. Burned, broken, or frayed wiring.	Firmly seat connectors. Repair or replace modules with defective wires or cables.
Chassis	Dents, deformations, and damaged hardware.	Straighten, repair, or replace defective hardware.

Cleaning Procedure — Interior. To clean the MTX100A interior, perform the following steps:

1. Blow off dust with dry, low-pressure, deionized air (approximately 9 psi).

2. Remove any remaining dust with a lint-free cloth dampened in ethyl alcohol and rinse with warm deionized water. (A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.)

STOP. If, after performing steps 1 and 2, a module is clean upon inspection, skip the remaining steps.

3. If steps 1 and 2 do not remove all the dust or dirt, the MTX100A may be spray washed using a solution of ethyl alcohol by performing steps 4 through 8.

4. Gain access to the parts to be cleaned by removing easily accessible shields and panels (see *Removal and Installation Procedures*).

5. Spray wash dirty parts with the ethyl alcohol and wait 60 seconds for the majority of the alcohol to evaporate.

6. Use hot (120° F to 140° F) deionized water to thoroughly rinse them.

7. Dry all parts with low-pressure, deionized air.

8. Dry all components and assemblies in an oven or drying compartment using low-temperature (125° F to 150° F) circulating air.

Lubrication. There is no periodic lubrication required for the MTX100A.

Removal and Installation Procedures

This subsection contains procedures for removal and installation of all mechanical and electrical modules.

Preparation

⚠️ *WARNING. Before performing this or any other procedure in this manual, read the* Safety Summary *found at the beginning of this manual. Also, to prevent possible injury to service personnel or damage to components of the MTX100A, read* Installation *in Section 2, and* Preventing ESD *in this section.*

This subsection contains the following items:

■   Preparatory information that you need to properly perform the procedures that follow.

■   List of tools required to remove and disassemble all modules.

■   Three module locator diagrams for finding the External modules (see Figure 4-2 on page 4-11), Board modules (see Figure 4-3 on page 4-12), and Internal modules (see Figure 4-4 on page 4-13) .

■   Procedures for removal and reinstallation of the electrical and mechanical modules.

■   A disassembly procedure for removal of all the major modules from the MTX100A at one time and for reassembly of those modules into the MTX100A. Such a complete disassembly is normally only done when completely cleaning the MTX100A. (Instructions for doing the actual cleaning are found under *Inspection and Cleaning* at the beginning of this section.)

⚠️ *WARNING. Before performing any procedure in this subsection, disconnect the power cord from the line voltage source. Failure to do so could cause serious injury or death.*

General Instructions   Read these general instructions before removing a module.

First read over the *Summary of Procedures* that follows to understand how the procedures are grouped. Then read *Equipment Required* for a list of the tools needed to remove and install modules in the MTX100A.

If you are removing a module for service, begin by performing the procedure *Access Procedure* (page 4-14). By following the instructions in that procedure, you remove the module to be serviced while removing the minimum number of additional modules.

Summary of Procedures   The procedures are described in the order in which they appear in this section. In addition, you can look up any procedure for removal and reinstallation of any module in the *Table of Contents* of this manual.

■   The *Access Procedure* on page 4-14 first directs you to the procedure(s) (if any) that are required to access the module to be serviced, then it directs you to the procedure to remove that module.

Table 4-3: Summary of procedures

Procedure	Module		Page
Procedures for External Modules	■ Cabinet ■ Right-side cover ■ Left-side cover	■ Front-panel unit ■ Front-panel assembly	4-15
Procedures for Board Modules	■ A12 Main board ■ CPU board ■ A20 PCI Backplane board	■ Interface board (Optional) ■ Printer connector	4-21
Procedures for Internal Module	■ DVD drive ■ Hard disk drive ■ Internal and external fans	■ 12 V main power supply ■ A40 AC Distributer board ■ RFI filter	4-26

Required Equipment. Most modules in this MTX100A can be removed with a screwdriver handle mounted with a size T-10 Torx screwdriver tip. *Use this tool whenever a procedure step instructs you to remove or install a screw unless a different size screwdriver is specified in that step.* All equipment required to remove and reinstall each module is listed in the first step of its procedure.

Table 4-4: Tools required for module removal

Item No.	Name	Description	Tektronix part number
1	Screwdriver handle	Accepts Torx®-driver bits	
2	T-10 Torx® tip	Torx®-driver bit for T-10 size screw heads	
3	T-15 Torx® tip	Torx®-driver bit for T-15 size screw heads	
4	Nut driver, $^1/_4$ inch	Standard tool	

MTX100A Orientation   In this manual, procedures refer to "front," "back," and "top" of the MTX100A. Figure 4-1 shows how the sides are referenced. Figures 4-2 through 4-4 shows the modules that make up the MTX100A.
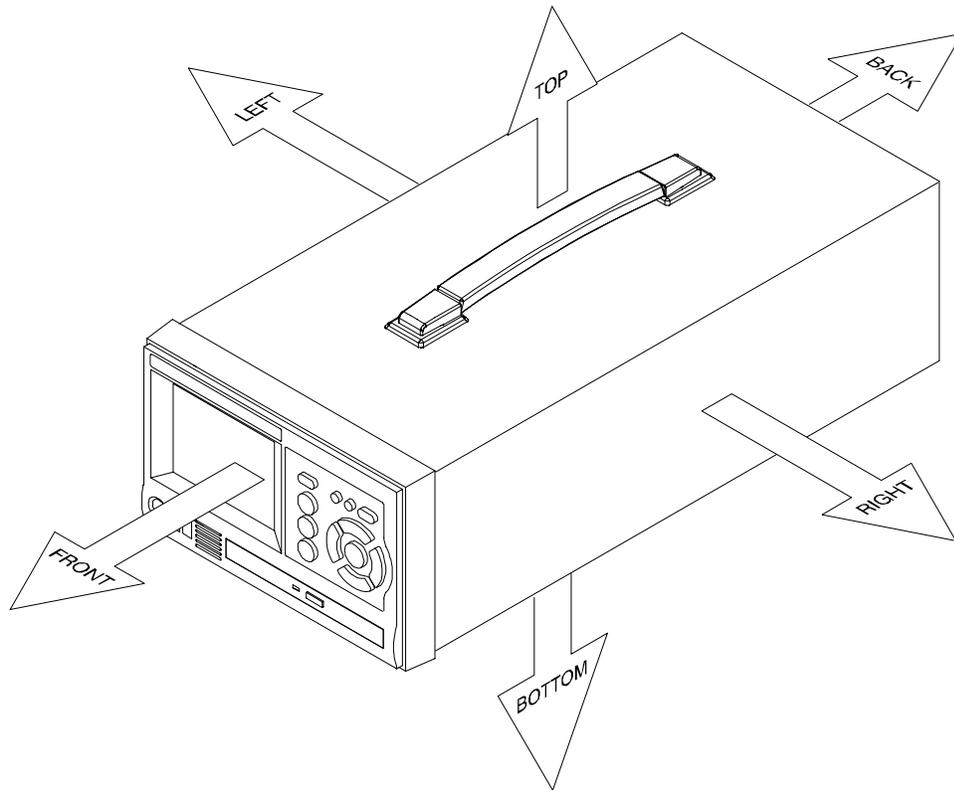
Figure 4-1: MTX100A orientation
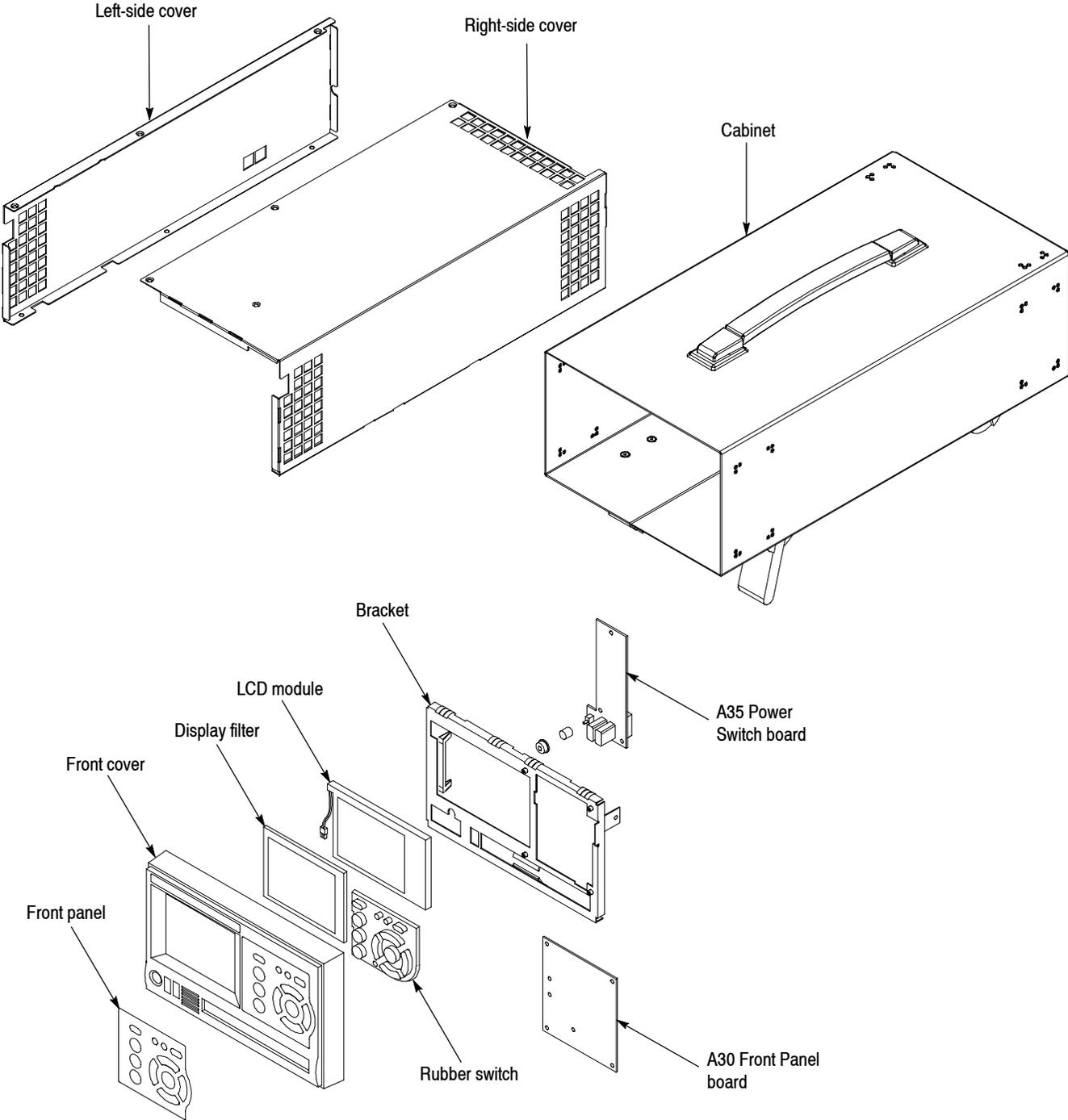
Figure 4-2: External modules

Printer connector

Blank panel

A20 PCI Backplane board

Interface board (Optional)

A12 Main board

CPU board
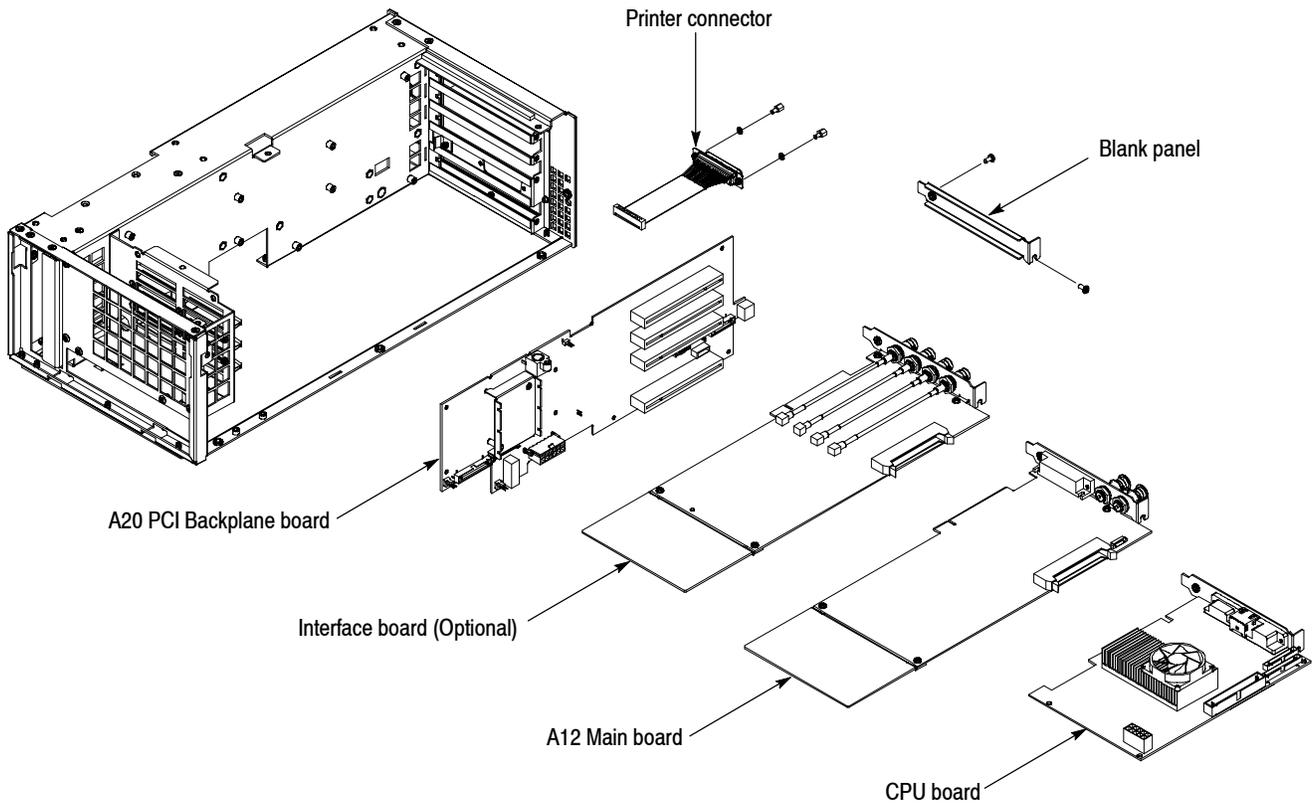
Figure 4-3: Board modules
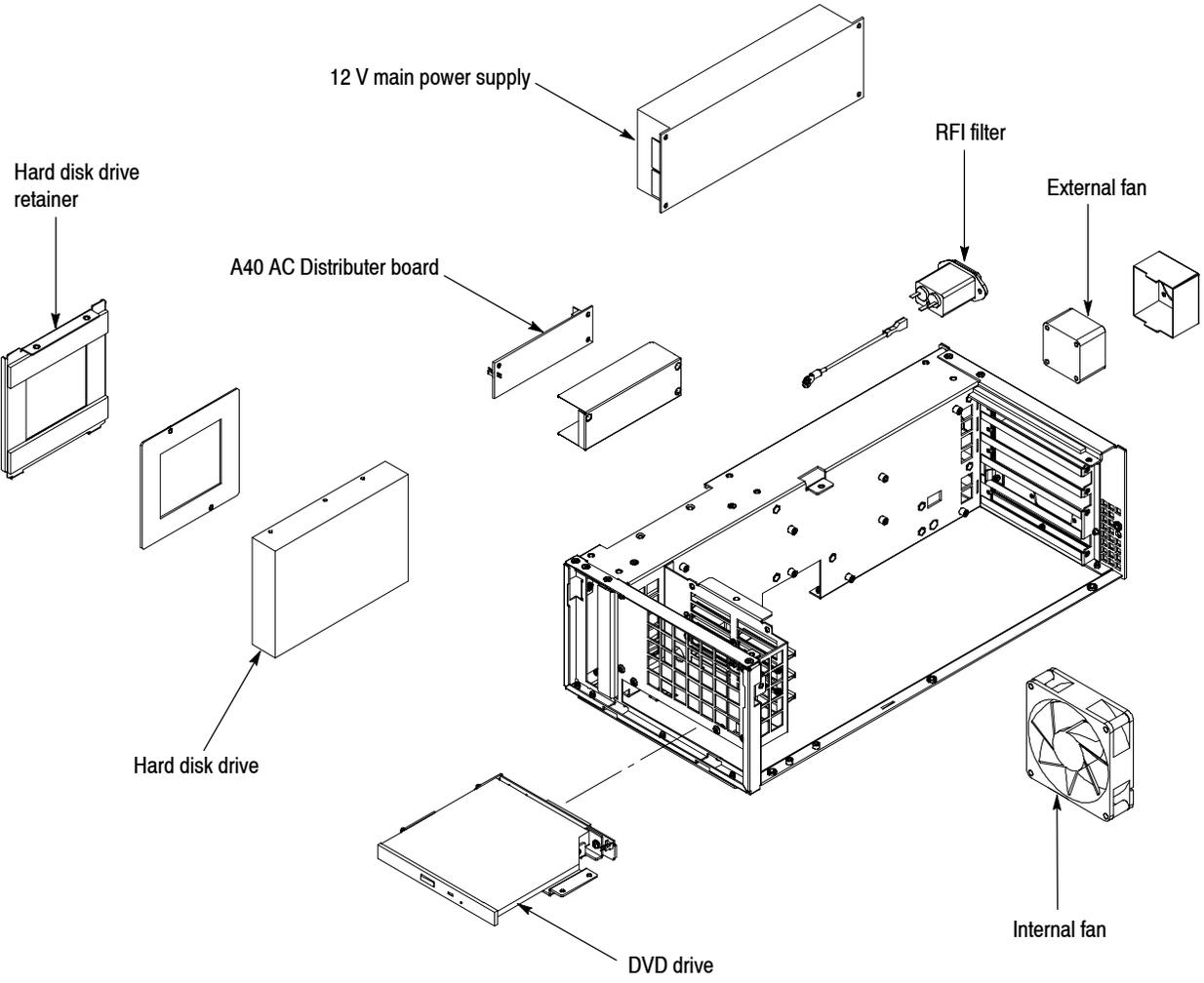
Figure 4-4: Internal modules

Access Procedure

When you have identified the module to be removed for service, read *General Instructions* found on page 4-8. Then use the flowchart in Figure 4-5 to determine which procedures to use for removing the module. The removal procedures end with installation instructions.
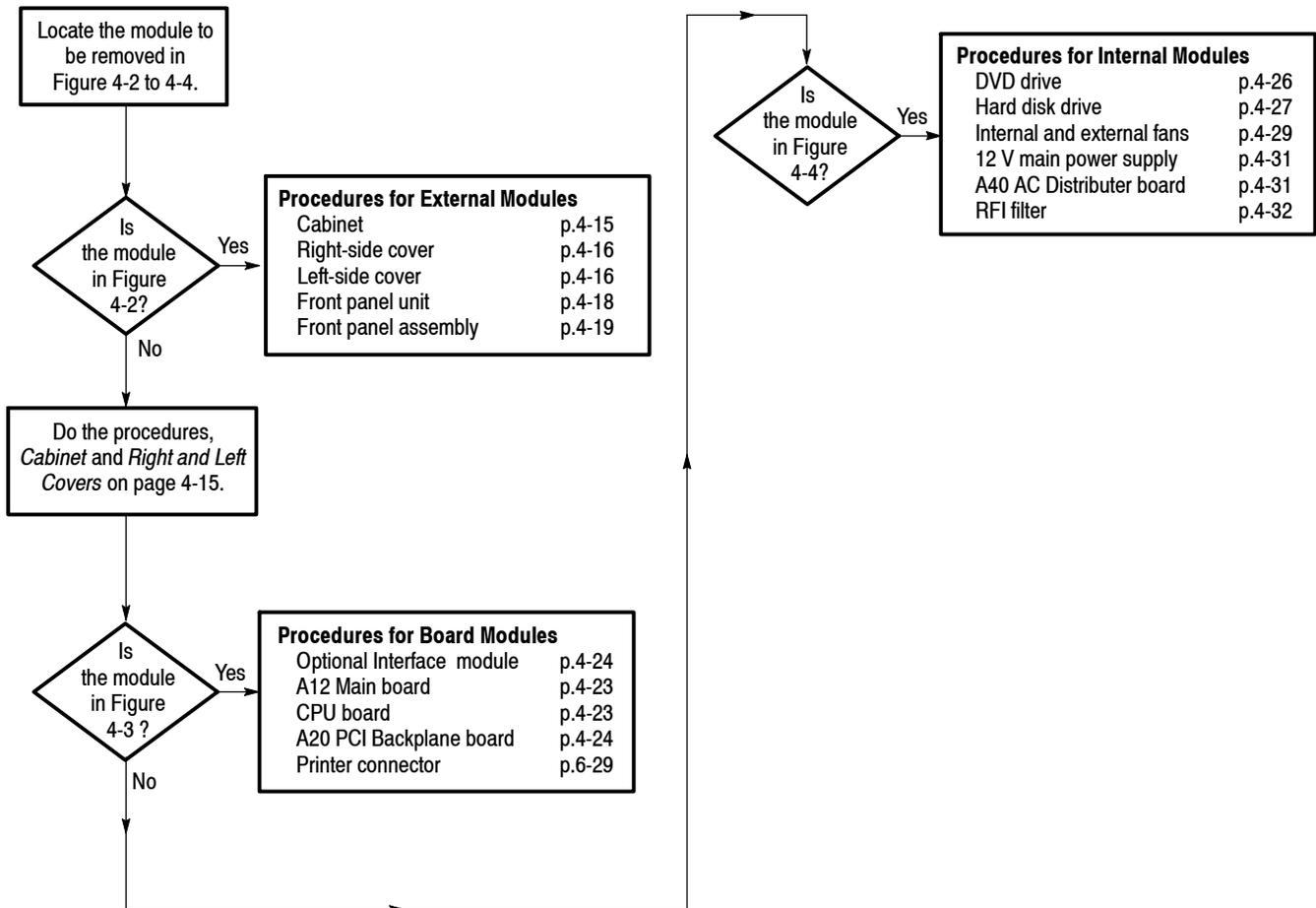
Figure 4-5: Guide to removal procedures

Procedures for External Modules

Do the *Access Procedure* (page 4-14) before doing any procedure in this group. This group contains the following procedures:

- *Cabinet*

- Right-side cover

- Left-side cover

- *Front-panel unit*

- *Front-panel assembly*

Cabinet
1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-15 Torx tip.

   b. Locate the cabinet in the locator diagram *External modules*, Figure 4-2, on page 4-11.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its rear is facing you.

3. Use a screwdriver with a T-15 Torx tip to remove the two screws securing the cabinet to the MTX100A. See Figure 4-6 on page 4-16.

4. Grasp the right and left edges of the cabinet toward the back. Push the chassis rear panel, toward the front of the MTX100A, to separate it from the cabinet.

5. Slide the cabinet off the MTX100A.

6. *Reinstallation:* Perform steps 3 through 5 in reverse order to reinstall the cabinet.
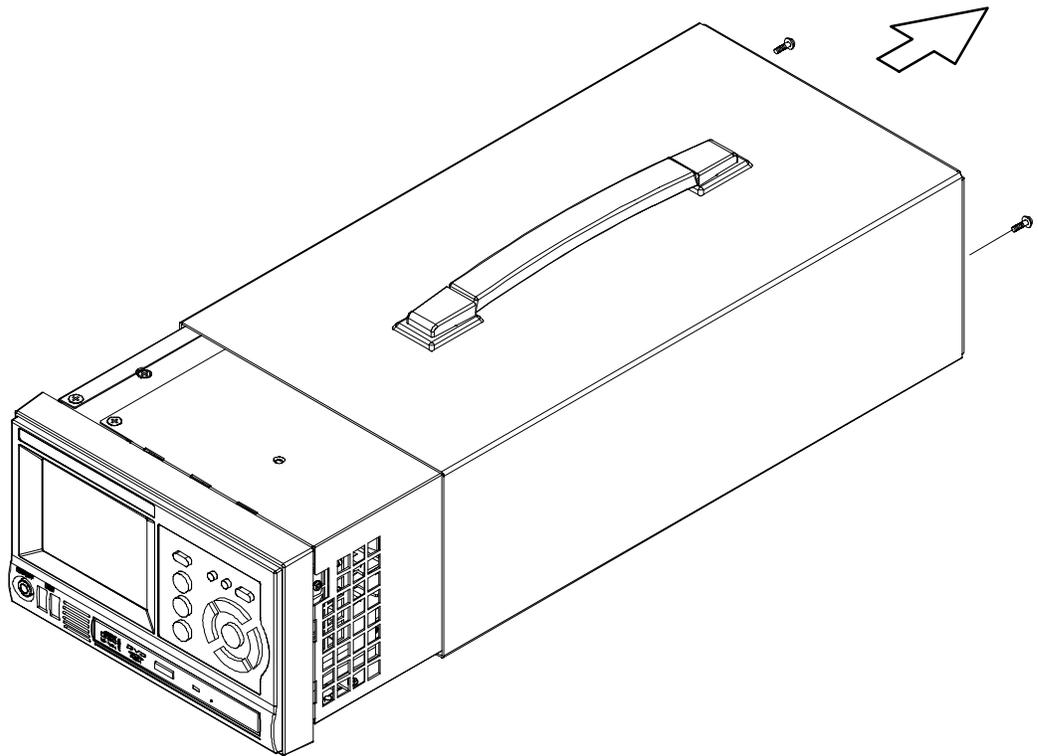
Figure 4-6: Cabinet removal

Right-Side Cover   1. *Assemble equipment and locate module to be removed:*

    a. You need a screwdriver with a T-10 Torx tip.

    b. Locate the right-side cover in the locator diagram *External modules*, Figure 4-2, on page 4-11.

2. *Orient the instrument:* Set the MTX100A so its left side is down on the work surface and its front is facing you.

3. Use a screwdriver with a T-10 Torx tip to remove the seven screws securing the right-side cover to the top and bottom of the chassis. See Figure 4-7.

4. Remove the right-side cover from the chassis.

5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the right-side cover.

Left-Side Cover   1. *Assemble equipment and locate module to be removed:*

    a. You need a screwdriver with a T-10 Torx tip.

b. Locate the left-side cover in the locator diagram *External modules*, Figure 4-2, on page 4-11.

2. *Orient the instrument:* Set the MTX100A so its right side is down on the work surface and its front is facing you.

3. Use a screwdriver with a T-10 Torx tip to remove the six screws securing the left-side cover to the top and bottom of the chassis. See Figure 4-7.

4. Remove the left-side cover from the chassis.

5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the left-side cover.

Figure 4-7: Right-side and left-side covers removal

Front-Panel Unit   1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the front-panel unit in the locator diagram *External modules*, Figure 4-2, on page 4-11.

2. *Orient instrument:* Set the MTX100A so its bottom is down on the work surface and its front is facing you.

3. *Remove front-panel unit:* See Figure 4-8.

   a. Use a screwdriver with a T-10 Torx tip to remove the four screws securing the front-panel unit to the chassis.

   b. Grasp the front-panel unit and pull it forward.

   c. Disconnect the cables from J100 on the A30 Front Panel board.

   d. Disconnect the cable from J100 on the A35 Power Switch board.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the front-panel unit.
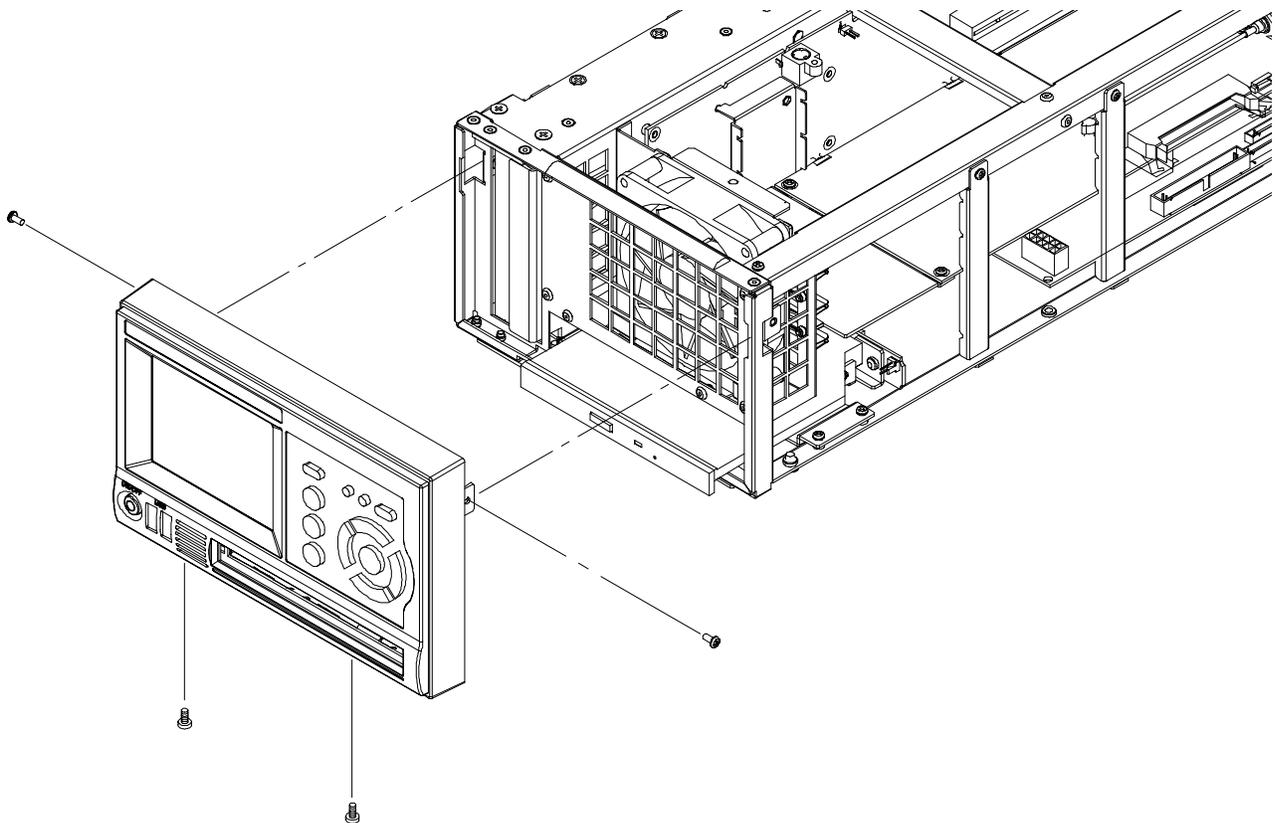
Figure 4-8: Front-panel unit removal

Front-Panel Assembly 1. *Assemble equipment and locate modules to be removed:*

    a. You need a screwdriver with a T-10 Torx tip.

    b. Locate the front-panel assembly in the locator diagram *External modules*, Figure 4-2, on page 4-11.

2. *Remove the front cover:* See Figure 4-9 on page 4-20.

    a. Press the two latches at the bottom of the front cover to release it from the front cover bracket.

    b. Pull the front cover forward, away from the front cover bracket.

3. *Remove the A30 Front Panel board:* See Figure 4-9 on page 4-20.

    a. Disconnect the cables from J100, J300, and J320 on the A30 Front Panel board.

    b. Use a screwdriver with with a T-10 Torx tip to remove the four screws securing the A30 Front Panel board to the front cover bracket.

    c. Lift the board away.

4. *Remove the A35 Power Switch board:* See Figure 4-9 on page 4-20.

    a. Disconnect the cables from J100, J130, and CN1 on the A35 Power Switch board.

    b. Use a screwdriver with a T-10 Torx tip to remove the three screw securing the A35 Power switch board to the front cover bracket.

    c. Lift the board away.

5. Now hand disassemble the front-panel assembly components using Figure 4-9 as a guide. Reverse the procedure to reassemble.

6. *Reinstallation:* Perform steps 2 through 5 in reverse order to reinstall the front-panel assembly.

Figure 4-9: Disassembly of front-panel assembly

Procedure for Board Modules

Perform the *Access Procedure* (on page 4-14) before doing any procedure in this group. The procedures are:

- *Top frame and board retainers*

- *Optional interface module (if installed)*

- *A12 Main board*

- *CPU board*

- *A20 PCI Backplane board*

- *Printer connector*

Top Frame and Board Retainers

1. *Assemble equipment and locate modules to be removed:*

   - You need a screwdriver with a T-10 Torx tip.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its right side is facing you.

3. *Remove the board retainers:* See Figure 4-10 on page 4-22.

   a. Use a screwdriver a T-10 Torx tip to remove the two screws securing the board retainers to the chassis.

   b. Lift the retainers away from the chassis.

4. *Remove the top frame:* See Figure 4-10 on page 4-22.

   a. Use a screwdriver with a T-10 Torx tip to remove the three screws securing the top frame to the chassis.

   b. Lift the top frame away from the chassis.
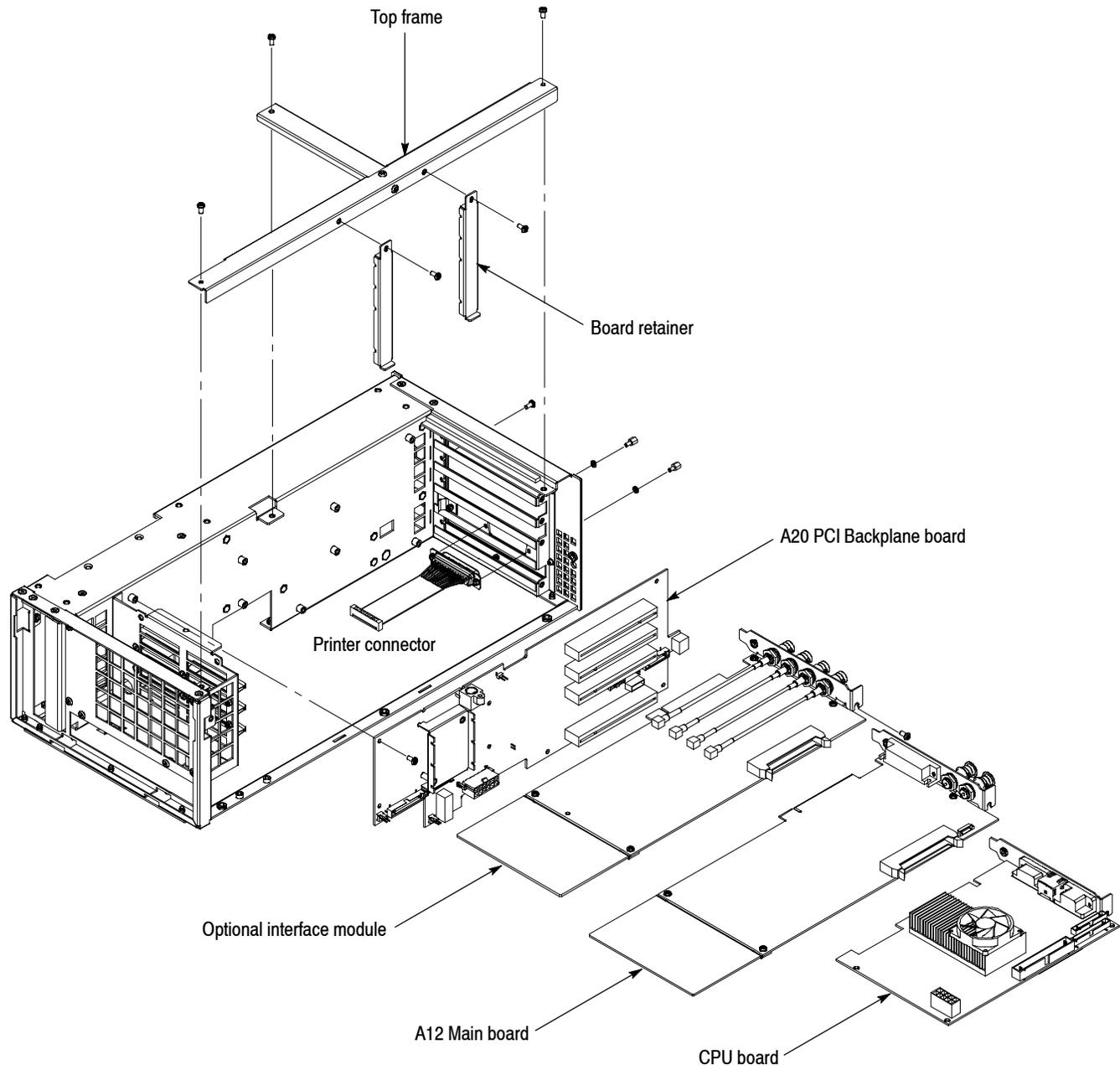
Figure 4-10: Interface module, A12 Main board, CPU board, and A20 PCI Backplane board removal

Optional Interface Module

1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the interface module in the locator diagram *Board modules*, Figure 4-3, on page 4-12.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its right side is facing you.

3. *Remove the interface module:* See Figure 4-10 on page 4-22.

   a. Disconnect the cable from the A12 Main board.

   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the board bracket to the chassis. See Figure 4-10 on page 4-22.

   c. Grasp the board and slide it out.

4. *Reinstallation*: Do step 3 in reverse order to reinstall the interface module.

NOTE. If you replace the A12 Main board, you must return the instrument to your local Tektronix Service Center to have instrument-specific information installed on the new board.

A12 Main Board

1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the A12 Main board in the locator diagram *Board modules*, Figure 4-3, on page 4-12.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its right side is facing you.

3. *Remove the A12 Main board:* See Figure 4-10 on page 4-22.

   a. If an optional interface module is installed, disconnect the cable from the interface module.

   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the board bracket to the chassis. See Figure 4-10 on page 4-22.

   c. Grasp the board and slide it out.

4. *Reinstallation*: Do step 3 in reverse order to reinstall the A12 Main board.

CPU Board

1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the CPU board in the locator diagram *Board modules*, Figure 4-3, on page 4-12.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its right side is facing you.

3. *Remove the CPU board:* See Figure 4-10 on page 4-22.

   a. Disconnect these cables:

      ■ The cable from the hard disk drive at CN1.

      ■ The cable from the Printer connector at CN3.

      ■ The cable from the A50 Disk I/F Board at CN4.

      ■ The cable from the A20 PCI Backplane board at CN5, CN6, CN9, and CN14.

      ■ The cable from the A35 Power Switch board at CN7.

   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the board bracket to the chassis. See Figure 4-10.

   c. Grasp the board and slide it out.

4. *Reinstallation*: Do step 3 in reverse order to reinstall the CPU board.

NOTE. After you replace the CPU board, you must set the BIOS configuration. Refer to Setting BIOS Configuration *on page 4-35.*

NOTE. If you replace the A20 PCI Backplane board, you must return the instrument to your local Tektronix Service Center to have instrument-specific information installed on the new board.
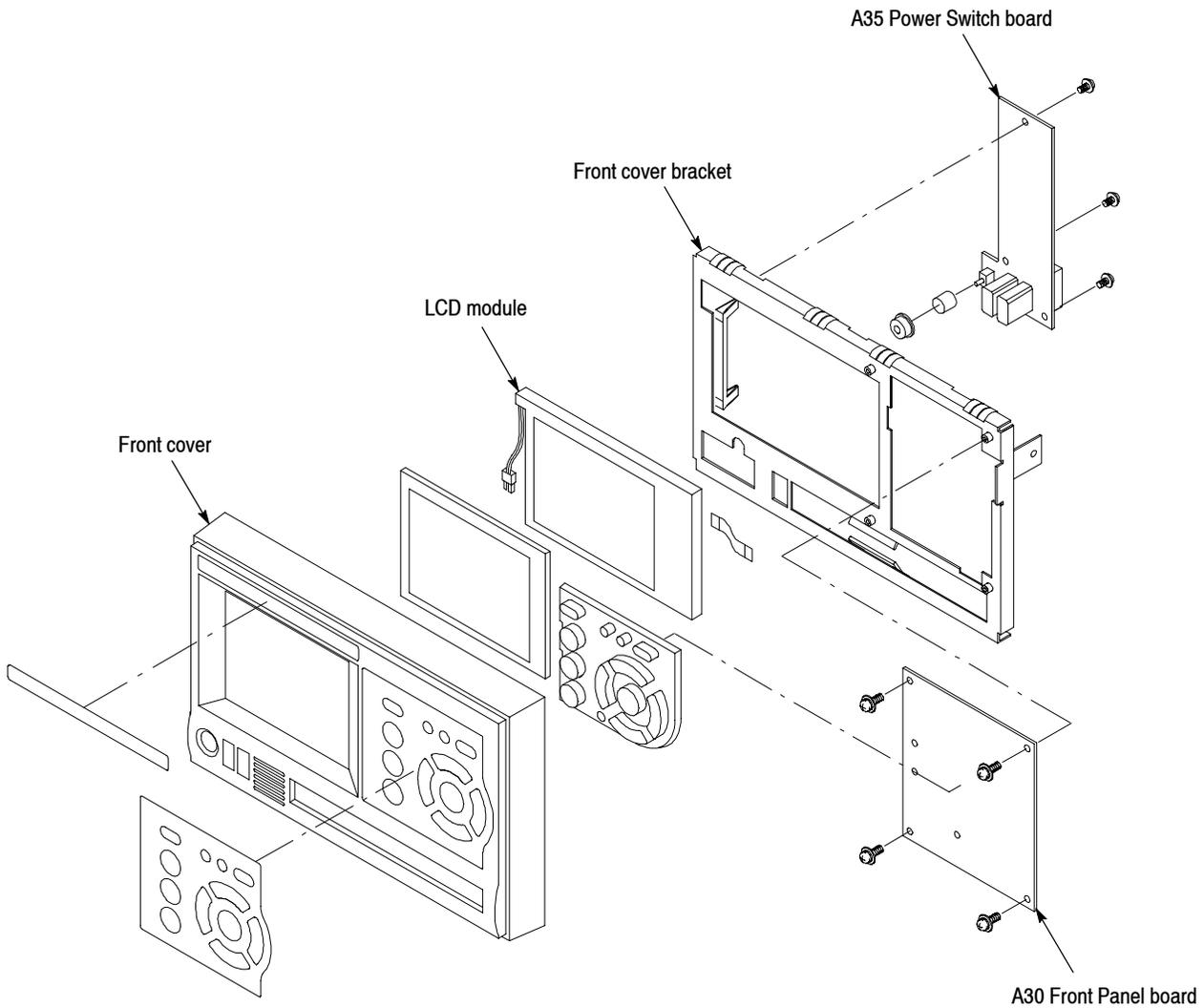

A20 PCI Backplane Board

1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the A20 PCI Backplane board in the locator diagram *Board modules*, Figure 4-3, on page 4-12.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its right side is facing you.

3. *Remove the A20 PCI Backplane board:* See Figure 4-10 on page 4-22.

    a. Remove the interface module as described on page 4-23 (if needed).

    b. Remove the A12 Main board as described on page 4-23.

    c. Remove the CPU board as described on page 4-24.

    d. Disconnect these cables:

        ■ The cable from the A40 AC Distributer board at J220.

        ■ The cable from the 12 V main power supply at J160 and J170.

        ■ The cable from the external fan at J190.

        ■ The cable from the internal fan at J180.

        ■ The cables from the A30 Front Panel board at J240 and J250.

        ■ The cable from the hard disk drive.

    e. Use a screwdriver with a T-10 Torx tip to remove the ten screws securing the A20 PCI Backplane board to the chassis.

    f. Lift the board up and away from the chassis.

4. *Reinstallation*: Do step 3 in reverse order to reinstall the A20 PCI Backplane board.

Printer Connector

1. *Assemble equipment and locate modules to be removed:*

    a. You need a screwdriver with a $1/4$ inch nut driver.

    b. Locate the connector in the locator diagram Board *modules,* Figure 4-3, page 4-12.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its rear is facing you.

3. *Remove the Printer connector:* See figure 4-10 on page 4-22.

    a. Remove the interface module as described on page 4-23 (if needed).

    b. Remove the A12 Main board as described on page 4-23.

    c. Disconnect the cable from CN3 on the CPU board.

    d. Use a $1/4$ inch nut driver to unscrew the two hex-headed mounting posts securing the connector to the chassis.

    e. Pull the connector away from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the Printer connector.

Procedure for Internal Modules

Perform the *Access Procedure* (on page 4-14) before doing any procedure in this group. The procedures are:

■ *DVD drive*

■ *Hard disk drive*

■ *Internal and external fans*

■ *12 V main power supply*

■ *A40 AC Distributer board*

■ *RFI filter*

DVD Drive

1. *Assemble equipment and locate modules to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the DVD drive in the locator diagram *Internal modules,* Figure 4-4, page 4-13.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its front is facing you.

3. *Remove the DVD drive:* See Figure 4-11.

   a. Remove the front-panel unit as described on page 4-18.

   b. Disconnect the cables from J100 and J120 on the A50 Disk I/F board.

   c. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the DVD drive mount bracket to the chassis.

   d. Lift up the DVD drive with the bracket and A50 Disk I/F board from the chassis.

4. *Remove the DVD drive from the bracket and the board:* Remove the four screws securing the DVD drive to the bracket and the board.

5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the DVD drive.
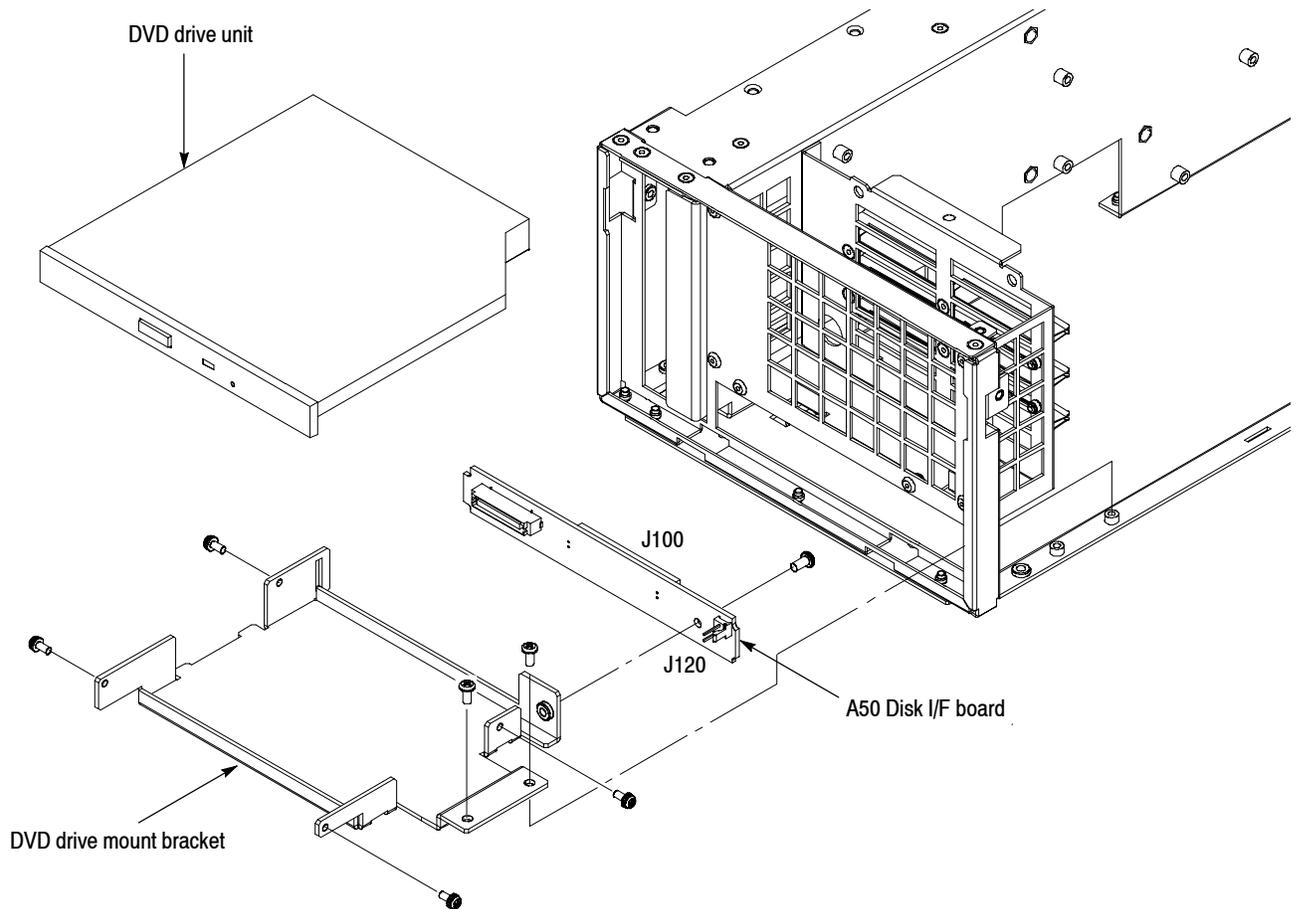
Figure 4-11: DVD drive removal

Hard Disk Drive

1. *Assemble equipment and locate module to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the hard disk drive in the locator diagram *Internal modules,* Figure 4-4, page 4-13.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its left side is facing you.

3. *Remove the hard disk drive:* See Figure 4-12 on page 4-28.

   a. Disconnect two cables from the hard disk drive.

   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the hard disk drive retainer to the chassis.

    c. Grasp the hard disk drive with the plate, and pull it gently away from the chassis.

    d. Remove the two screws securing the plate to the hard disk drive.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the hard disk drive.

Hard disk drive unit

Plate

Hard disk drive retainer
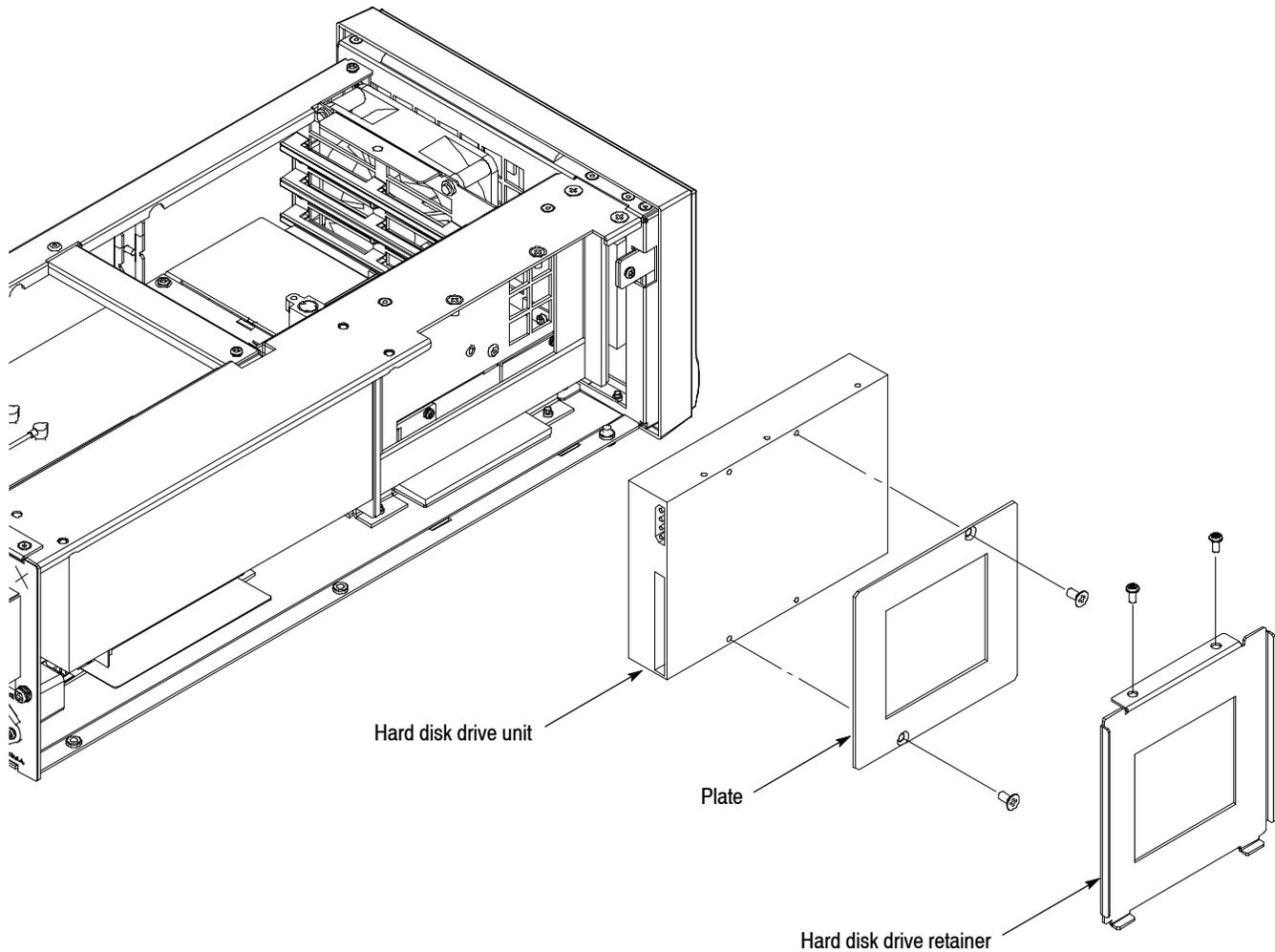
Figure 4-12: Hard disk drive removal

Doing the Performance Verification and Running Sysprep. If you replace the hard disk drive, you must perform the following steps:

■ Do the performance verification procedures (refer to *Performance Verification* on page 3-1)

■ Run the sysprep batch file:

1. Select **File > Exit** to exit the MTX100A application. The Windows XP desktop appears.

2. Select **Start > Run** to open the Run dialog box.

3. Click the **Browse** button.

4. Select **C:\Sysprep\sysprep.bat**.

5. Click the **OK** button.

NOTE. After you replace the hard disk drive, you need to copy sample stream files from the Sample Streams CD-ROM on the D: drive of the hard disk drive.

Internal and External Fans

1. *Assemble equipment and locate modules to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the fans in the locator diagram *Internal modules,* Figure 4-4, page 4-13.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its front is facing you.

3. *Remove the internal fan:* See Figure 4-13 on page 4-30.

   a. Disconnect the cable from J180 on the A20 PCI Backplane board.

   b. Remove the two rivets securing the fan to the chassis.

   c. Lift the fan up out of the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the internal fan.

5. *Remove the external fan:* See Figure 4-13 on page 4-30.

   a. Set the MTX100A so its bottom is down on the work surface and its rear is facing you.

   b. Disconnect the cable from J190 on the A20 PCI Backplane board.

   c. Use a screwdriver with a T-10 Torx tip to remove the four screws securing the fan and fan cover to the chassis.

6. *Reinstallation:* Perform step 5 in reverse order to reinstall the external fan.
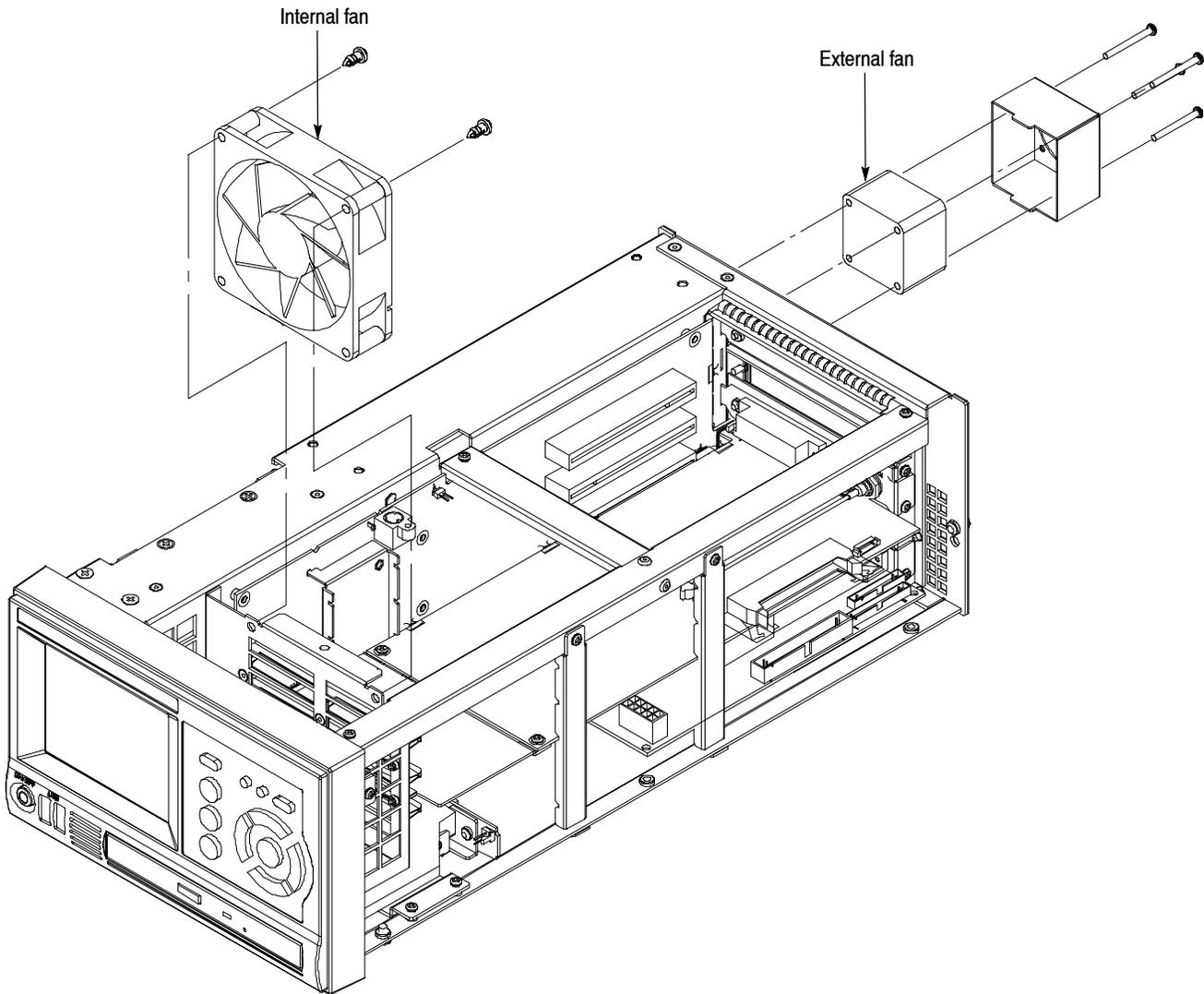
Figure 4-13: Internal and external fan removal

12 V Main Power Supply

1. *Assemble equipment and locate modules to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the 12 V main power supply in the locator diagram *Internal modules,* Figure 4-4, page 4-13.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its left side is facing you.

3. *Remove the 12 V main power supply:* See Figure 4-14 on page 4-32.

   a. Disconnect the cables from CN1, CN2, CN3, and CN4.

   b. Use a screwdriver with a T-10 Torx tip to remove the four screws securing the 12 V main power supply to the chassis.

   c. Lift the power supply away from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the 12 V main power supply.

A40 AC Distributer Board

1. *Assemble equipment and locate modules to be removed:*

   a. You need a screwdriver with a T-10 Torx tip.

   b. Locate the A40 AC Distributer board in the locator diagram *Internal modules,* Figure 4-4, page 4-13.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its left side is facing you.

3. *Remove the A40 AC Distributer board:* See Figure 4-14 on page 4-32.

   a. Disconnect the cables from J100, J110, and J120.

   b. Use a screwdriver with a T-10 Torx tip to remove the three screws securing the A40 AC Distributer board to the chassis.

   c. Lift the board away from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the A40 AC Distributer board.
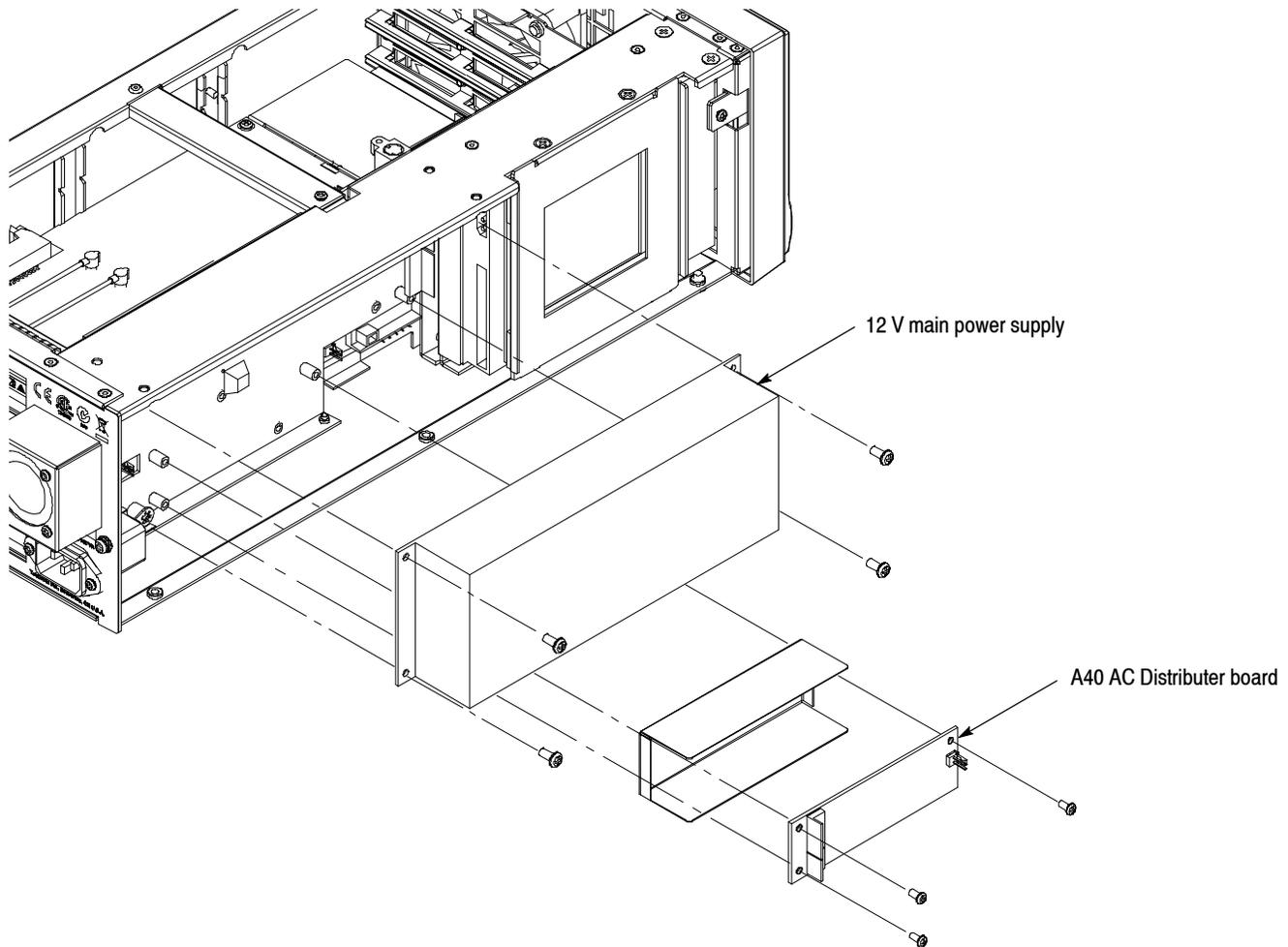
Figure 4-14: 12 V main power supply and A40 AC Distributer board removal

RFI filter

1. *Assemble equipment and locate modules to be removed:*

   a. You need a screwdriver handle, a T-10 Torx tip, and a T-15 Torx tip.

   b. Locate the RFI filter in the locator diagram *Internal modules,* Figure 4-4, page 4-13.

2. *Orient the instrument:* Set the MTX100A so its bottom is down on the work surface and its rear is facing you.

3. *Remove the RFI filter:* See Figure 4-15.

    a. Disconnect the two cables from the RFI filter.

    b. Use a screwdriver with a T-15 Torx tip to remove the screw securing the ground lead to the chassis.

    c. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the RFI filter to the chassis.

    d. Pull the RFI filter away from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the RFI filter.

To J110 on the A40
AC Distributer board
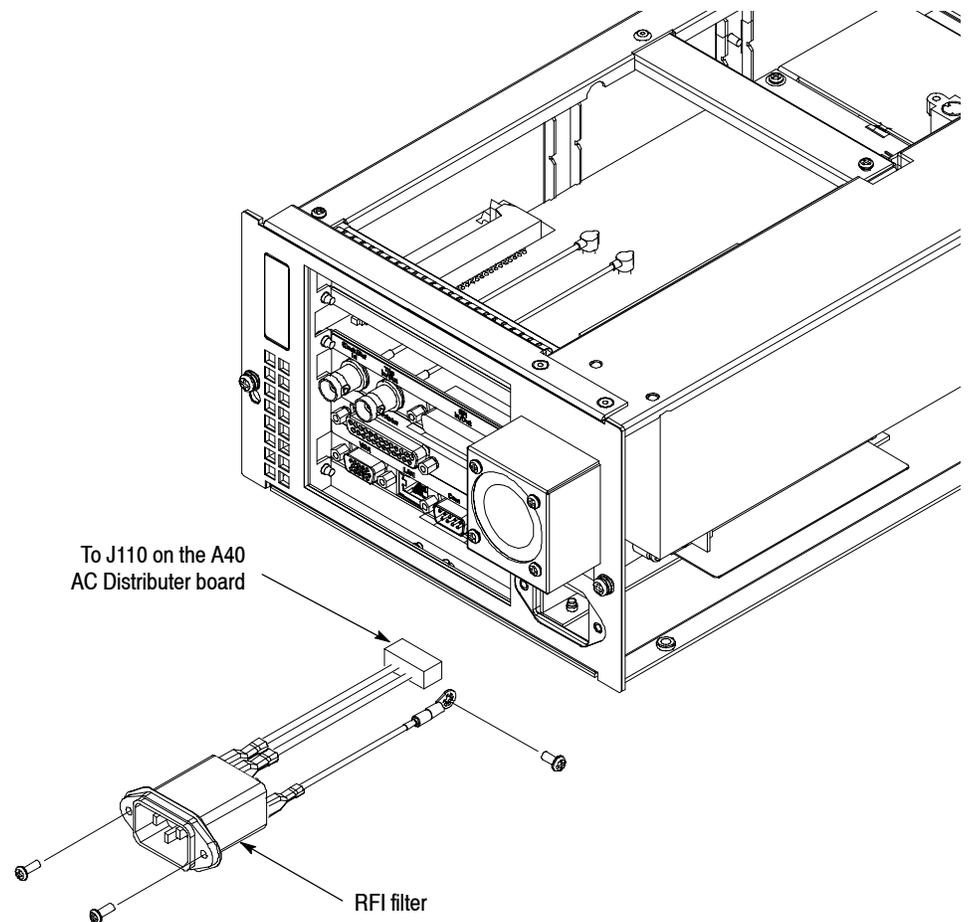
RFI filter

Figure 4-15: RFI filter removal

Setting the BIOS Configuration

This section provides information needed to set the BIOS configuration after you change the CPU board.

Procedure

⚠️ *CAUTION. It is very important to follow this procedure exactly or the instrument will not operate correctly.*

Perform the following procedure to set the BIOS configuration:

1. Connect the USB keyboard to the USB connector on the front panel.

2. Power on the instrument, and then press the **Del** key immediately. The **AwardBIOS CMOS Setup Utility screen** appears.

3. Use the arrow keys to select **Load Optimized Defaults**, and then press the **Enter** key. The Load Optimized Defaults (Y/N)? message appears.

4. Enter **Y**, and then press the **Enter** key.

5. Set the BIOS configuration as follows. Use the arrow keys to highlight each item, and then press the **Enter** key to select it.

   Standard CMOS Features

Data (mm:dd:yy)	: Set the current date.
Time (hh:mm:ss)	: Set the current time.
Drive A	: **None**

   Advanced BIOS Features

First Boot Device	: **USB-FDD**
Second Boot Device	: **CDROM**
Third Boot Device	: **HDD-0**

   Advanced Chipset Features

Boot Display	: **CRT+LFT**

   Integrated Peripherals

Super IO Device	: Onboard FDC Controller : **Disabled**
Onboard Serial Port 2	: **Disabled**
Onboard Serial Port 4	: **Disabled**

PC Health Status

CPU Warning Temperature   : **66 °C/151 °F**
Shutdown Temperature   : **70 °C/158 °F**

6. Use the arrow keys to select **Save & Exit Setup**, and then press the **Enter** key. The Save to CMOS and Exit (Y/N)? message appears.

7. Enter **Y**, and press the **Enter** key.

Troubleshooting

This subsection contains information about troubleshooting trees designed to isolate faulty modules in the MTX100A.

Troubleshooting Trees

Figures 4-16 through 4-21 show the troubleshooting procedure for the MTX100A.

Figure 4-16: Troubleshooting procedure (1)

Figure 4-17: Troubleshooting procedure (2)

```
                          ┌──────────────────┐
                          │       (A)        │
                          └────────┬─────────┘
                                   │
                                   ▼
         ╱╲                                        ┌────────────────────────────────┐
        ╱  ╲  Is +5 VSB line at pin 9      No      │ ■ Check the cable 174-5172-00. │
       ╱    ╲ of J170* on the A20 PCI   ─────────▶ │                                │
       ╲    ╱ Backplane board correct            │ ■ Check the 5 V main power supply│
        ╲  ╱  (4.9 V to 5.30 V)?                    │   module on the A40 AC Distributer│
         ╲╱                                         │   board.                       │
                                                    └────────────────────────────────┘
         │  * See Figure 4-23 on page 4-44.
       Yes
         │
         ▼
         ╱╲                                        ┌────────────────────────────────┐
        ╱  ╲  When the ON/STBY            No      │ ■ Check the 174-5185-00, 174-5220-00,│
       ╱    ╲ switch is pressed, is the ─────────▶ │   and 174-5173-00 cables.      │
       ╲    ╱ voltage at pin 10 of J240*           │                                │
        ╲  ╱  about 5 V?                           │ ■ Check the ON/STBY switch on the│
         ╲╱                                         │   A35 Power switch board.      │
                                                    └────────────────────────────────┘
         │  * See Figure 4-24 on page 4-45.
       Yes
         │
         ▼
         ╱╲                                        ┌────────────────────────────────┐
        ╱  ╲  Is PWON# line at pin 10     No      │ ■ Check the 174-5174-00 cable.  │
       ╱    ╲ of J170 on the A20 PCI   ─────────▶ │                                │
       ╲    ╱ Backplane board about              │ ■ Replace the CPU board.        │
        ╲  ╱  0 V ?                               └────────────────────────────────┘
         ╲╱
         │
       Yes
         │
         ▼
         ╱╲                                        ┌────────────────────────────────┐
        ╱  ╲  Are all the voltages of     No      │ Remove the A12 Main board or the│
       ╱    ╲ +5 V, +3.3 V, +12 V, and ─────────▶ │ optional interface module (if installed)│
       ╲    ╱ -12 V correct ?                      │ from the A20 PCI Backplane board.│
        ╲  ╱                                       └────────────────┬───────────────┘
         ╲╱                                                          │
         │                                                           ▼
       Yes                                                          ╱───╲
         │                                                         │  2  │
         ▼                                                          ╲───╱
  ┌──────────────────┐
  │ Replace the CPU  │
  │     board.       │
  └──────────────────┘
```

Figure 4-18: Troubleshooting procedure (3)

Figure 4-19: Troubleshooting procedure (4)

2

Are all the voltages
(+5 V, +3.3 V, +12 V, and
−12 V) correct ?

No

Yes

■ If the +12 V line is faulty, check the
174-5177-00 and 174-5178-00 cables
or replace the main power supply.

■ If the other voltage is faulty, replace the
A20 PCI Backplane board.

Change the A12 Main board or the
optional interface module (if installed)
which affects the power supply.

```
          ┌──────────────────────┐
          │         (B)          │
          └──────────┬───────────┘
                     │
          ┌──────────▼───────────┐
          │ Connect a VGA monitor│
          │ to the VGA connector │
          │ on the rear panel.   │
          └──────────┬───────────┘
                     │
          ┌──────────▼───────────┐
          │ Restart the MTX100A. │
          └──────────┬───────────┘
                     │
                     ▼
             Are any images         No    ┌─────────────────────────┐
             displayed on the  ─────────▶ │ Replace the CPU board.   │
               monitor?                   └─────────────────────────┘
                     │ Yes
                     ▼
             Does the backlight     No    ┌─────────────────────────────────┐
                light ?        ─────────▶ │ ■ Check the 174-5184-00 and     │
                     │                    │   174-5220-00 cables.           │
                     │ Yes                │ ■ Replace the A35 Power switch  │
                     ▼                    │   board.                        │
   ┌─────────────────────────────┐       └─────────────────────────────────┘
   │ ■ Check the 259-A002-00 cable.│
   │ ■ Replace the A30 Front Panel board.│
   │ ■ Replace the LCD module.   │
   └─────────────────────────────┘
```

Figure 4-20: Troubleshooting procedure (5)

(C)

Have the LEDs on the
front panel gone off?

No →

- Check the 174-5186-00 and 174-5220-00 cables.
- Replace the A30 Front Panel board.
- Reinstall the MTX100A application.
- Verify the BIOS settings for Com2.
- Replace the CPU board.
- Replace the A20 PCI Backplane board.

Yes

Reinstall the Windows XP operating
system and the MTX100A application.

(D)

Is the SPI Output
Enable check box in
the Others dialog box
selected?

No → Select the SPI Output Enable check
box.

Yes

Can a stream data
be output from the SPI
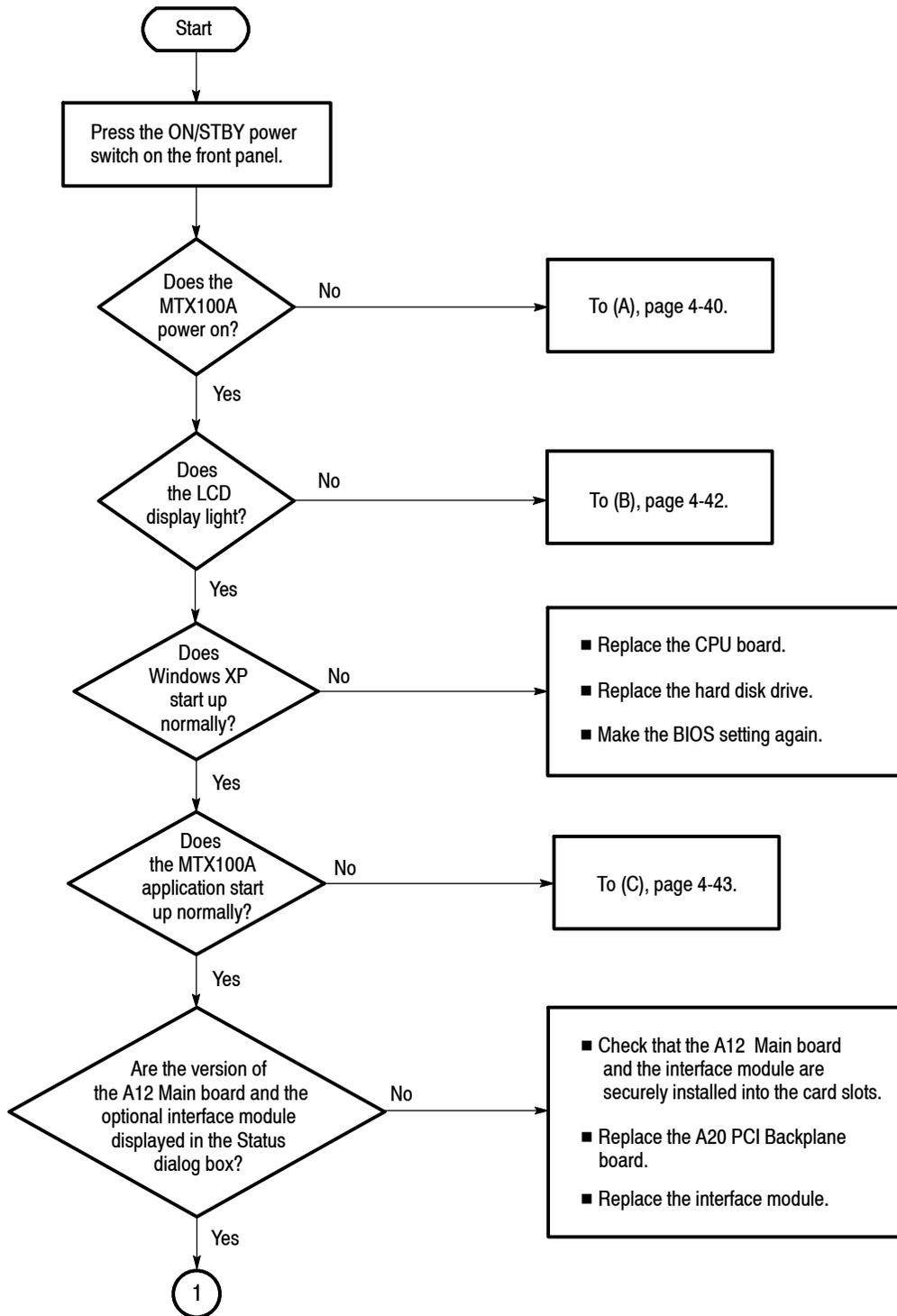In/Out connector?

No

Yes

Replace the A12 Main board.

Done.

Figure 4-21: Troubleshooting procedure (6)
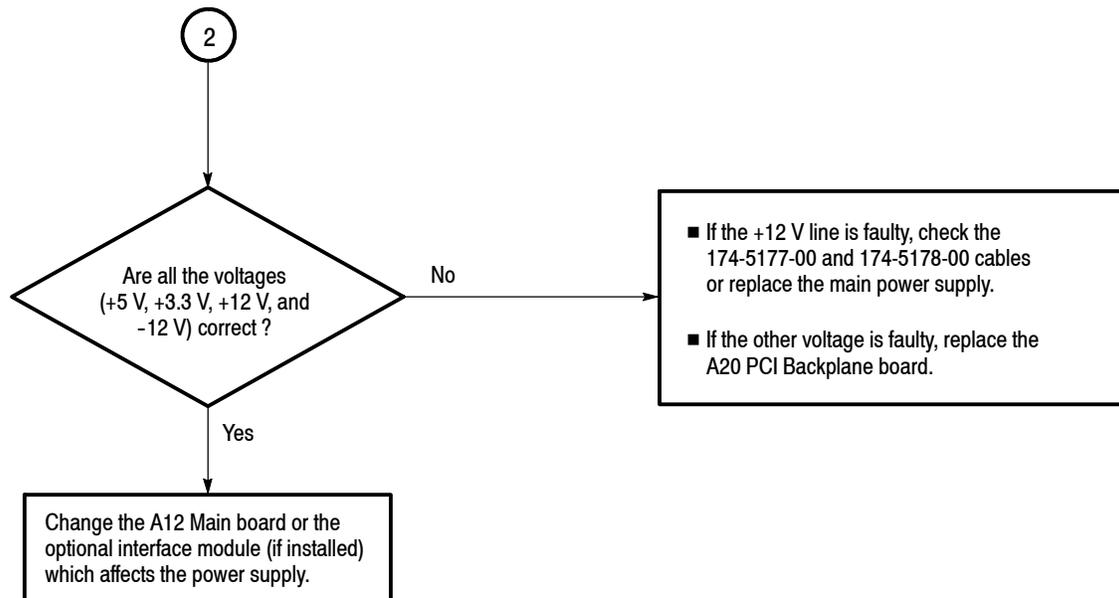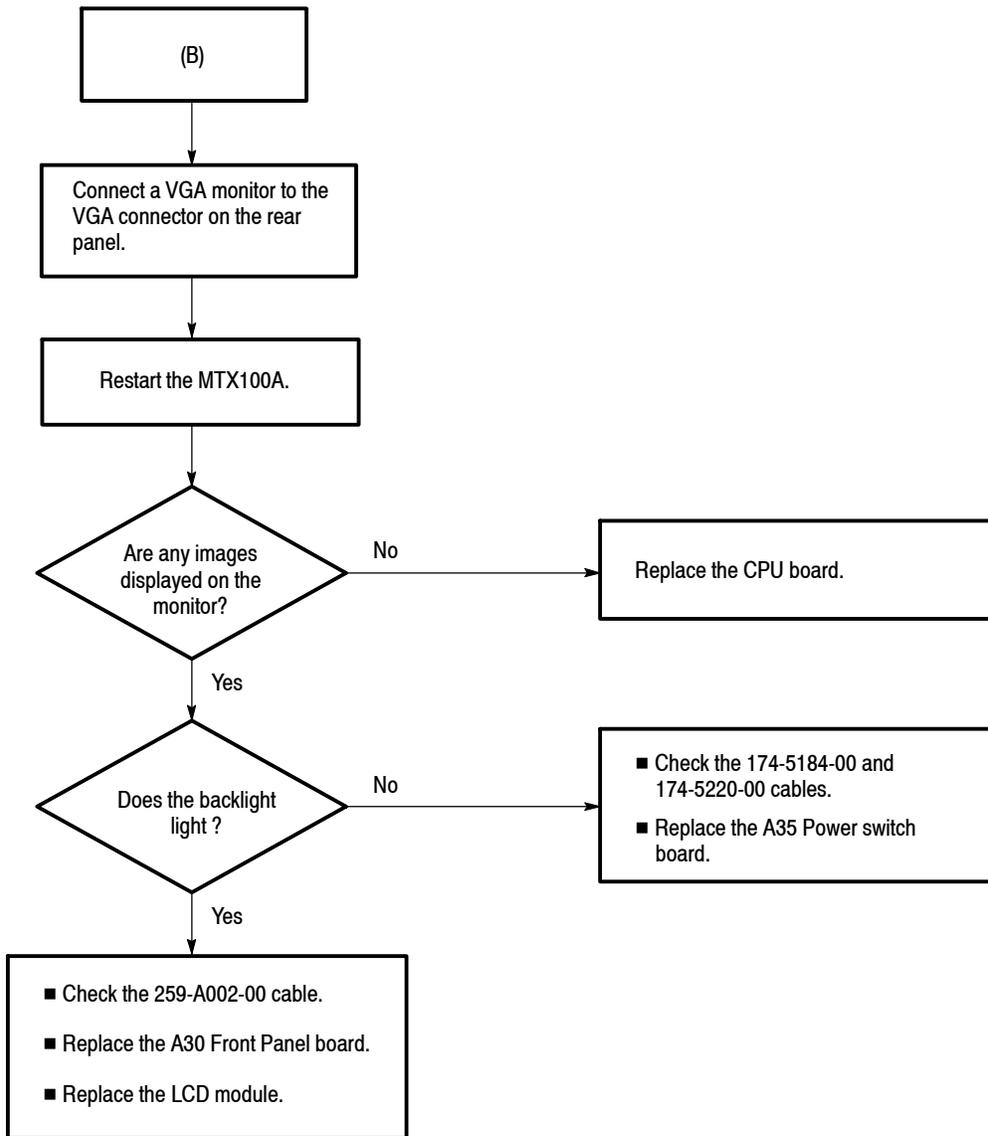
Figure 4-22: Troubleshooting procedure (7)

Figure 4-23: A20 PCI Backplane board view- back side

Figure 4-24: A20 PCI Backplane board view- right side

Using the Recovery Discs

If the MTX100A does not boot, you can reboot it by using the recovery discs provided with the instrument. Use the procedures in this section to reinstall the Windows XP operating system and the MTX100A application software.

Reinstalling Windows XP

NOTE. Before beginning this procedure, connect the keyboard and mouse provided with the instrument to the front-panel USB connectors.

Perform the following procedure to reinstall the Windows XP operating system:

1. Insert the **Windows XP Professional Operating System Recovery Disc** into the DVD drive.

2. Turn off, then turn on the instrument. The MTX100A runs from the disc.

3. Follow the installing instructions on the screen.

4. When the **Easy Restore** window appears, click **Continue** to start the recovery process.

5. Click **Yes** in the **Warning** dialog box to continue the process. The process takes about 10 minutes.

6. When the Message dialog box appears, press the eject button of the DVD drive, and then press any key to reboot the instrument.

7. When the Windows XP Professional Setup dialog box appears, follow the installing instructions on the screen.

When all settings for Windows XP are completed, the Windows desktop appears.

Reinstalling the MTX100A Application

Perform the following procedure to reinstall the MTX100A application software:

1. Insert the **MTX100A & RTX100A Application Software Recovery Disc** into the DVD drive.

2. Double-click the **E:** drive icon (substitute your DVD drive letter if it is different than E).

3. Double-click the **Application_Software** folder.

4. Double-click the **setup.exe** icon. This installs the MTX100A application software.

Installing the Parallel Driver (Option SC Only)

Perform the following procedure to reinstall the parallel driver:

1. Double-click the **Driver** folder in the **MTX100A & RTX100A Application Software Recovery Disc**.

2. Double-click the **SSD5411-32bit.exe** icon.

3. Click **Next** in the resulting window. The **License Agreement** window appears.

4. Select **I accept the terms in the license agreement**, and then click **Next**. The **Destination Folder** window appears.

5. Click **Next**. The **Setup Type** window appears.

6. Select **Complete** and click **Next**. The **Ready to Install Program** window appears.

7. Click **Install** to proceed with installation.

8. When the **InstallShield Wizard Completed** window appears, click **Finish** to complete the installation.

Restoring the IEEE1394b Port Speed Setting

The IEEE1394 port speed of the MTX100A is set to S400/S800 at the factory. However, when you reinstall the Windows XP operating system, this setting returns to the default value (S400). After you reinstall the operating system, perform the following procedure to restore the IEEE1394b port speed setting:

1. Select **Start > Run** to open the Run dialog box.

2. Enter **regedit** in the Run dialog box, and then click **OK**. This opens Registry Editor window.

3. In the Registry Editor window, select the following directory path:

   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Enum\
   PCI\VEN_104C&DEV_8025&SUBSYS_80251268&REV\
   5&23d05aab&0&3068F0\Device Parameters

4. In the file list on the right side of the window, double‐click thed **SidSpeed** icon. This opens the Edit DWORD Value dialog box.

5. In the Edit DWORD Value dialog box, enter **3** in the **Value data** text box.

6. Click **OK** to close the Edit DWORD Value dialog box and apply the setting change.

7. Click the close button on the title bar to close the Registry Editor window.

Options

Options

This section describes options that are available for the MTX100A.

The following options are available:

Options	Description
Interface options	
Option 01	Adds the ASI interface
Option 02	Adds the universal parallel/serial interface
Option 05	Adds the IEEE1394/ASI interface
Option 07	Adds the SMPTE310M/ASI/SPI interface
Software option	
Option SC	Adds the Scheduler application
Service options	
Option D1	Provides calibration data
Option D3	Provides calibration data for 3 years
Option D5	Provides calibration data for 5 years
Option C3	Provides calibration services for 3 years
Option C5	Provides calibration services for 5 years
Option R3	Extends the instrument warranty to 3 years
Option R5	Extends the instrument warranty to 5 years
Power cord options	
Option A0	North America power cord
Option A1	Universal Euro power cord
Option A2	United Kingdom power cord
Option A3	Australia power cord
Option A4	240 V North America power cord
Option A5	Switzerland power cord
Option A6	Japan power cord
Option A10	China power cord
Option A99	No power cord

Diagrams

Diagrams

This section contains the following diagrams:

■ Block diagram of the MTX100A

■ Interconnect diagram of the MTX100A

Block diagrams show the modules and functional blocks in the MTX100A. Interconnect diagrams show how the modules in the MTX100A connect together.
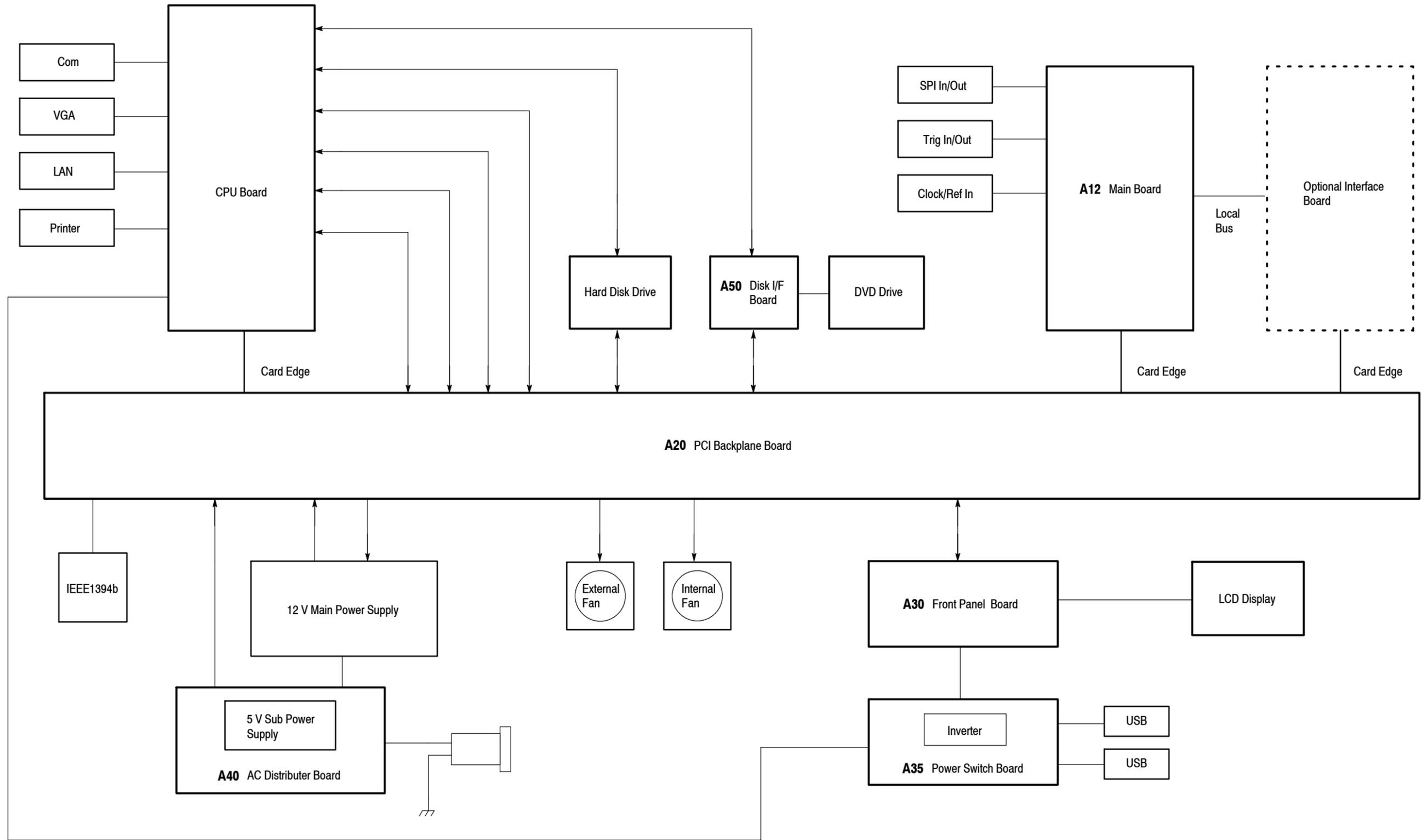
Figure 6-1: MTX100A block diagram
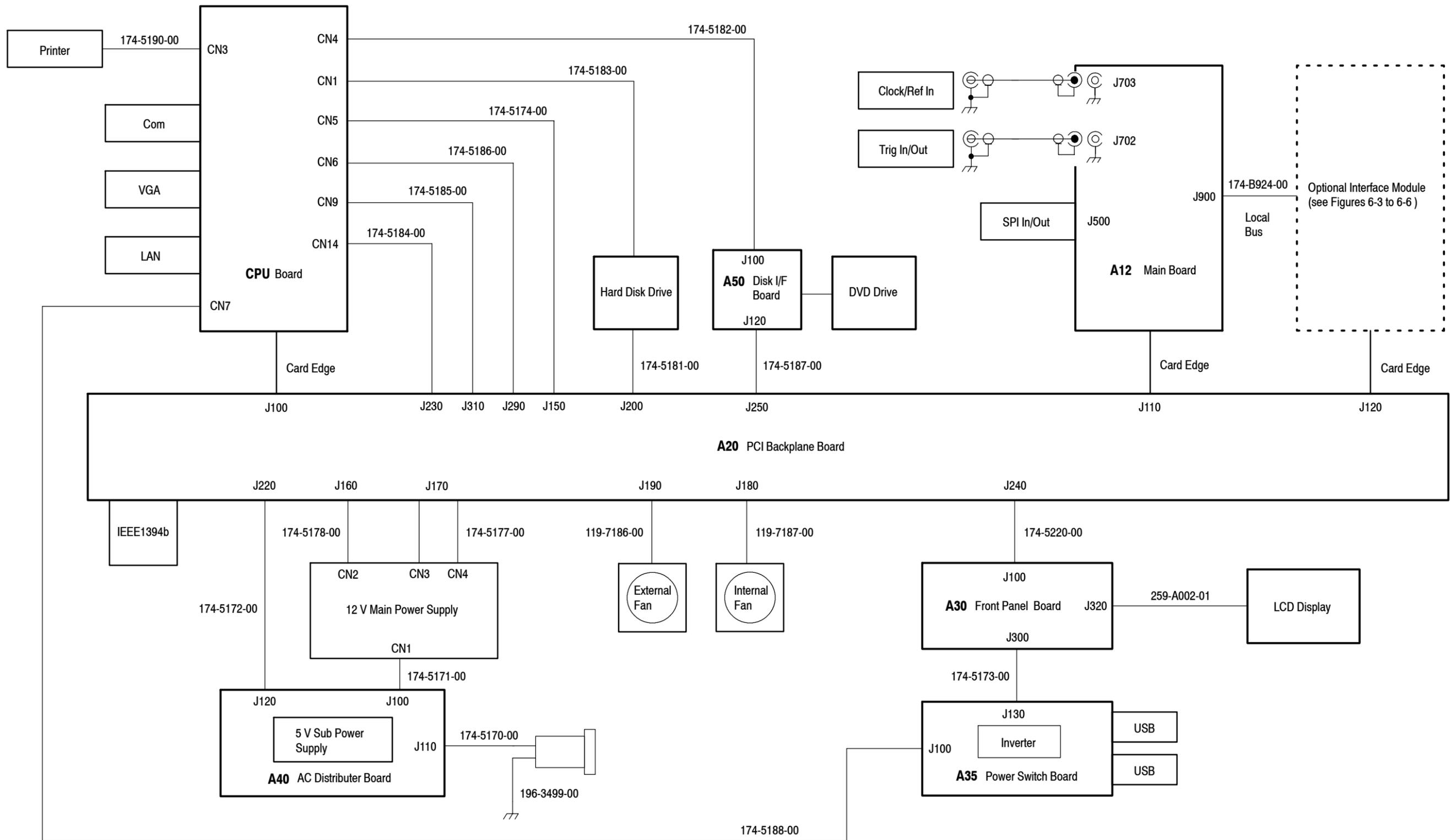
Figure 6-2: MTX100A interconnect diagram

Diagrams of the Optional Modules

This section contains the interconnect diagrams of the optional interface modules.

A100 ASI Interface Module (Option 01)

Figure 6-3 shows the A100 ASI Interface module and how it interconnects with the A20 PCI Backplane board and the A12 Main board.
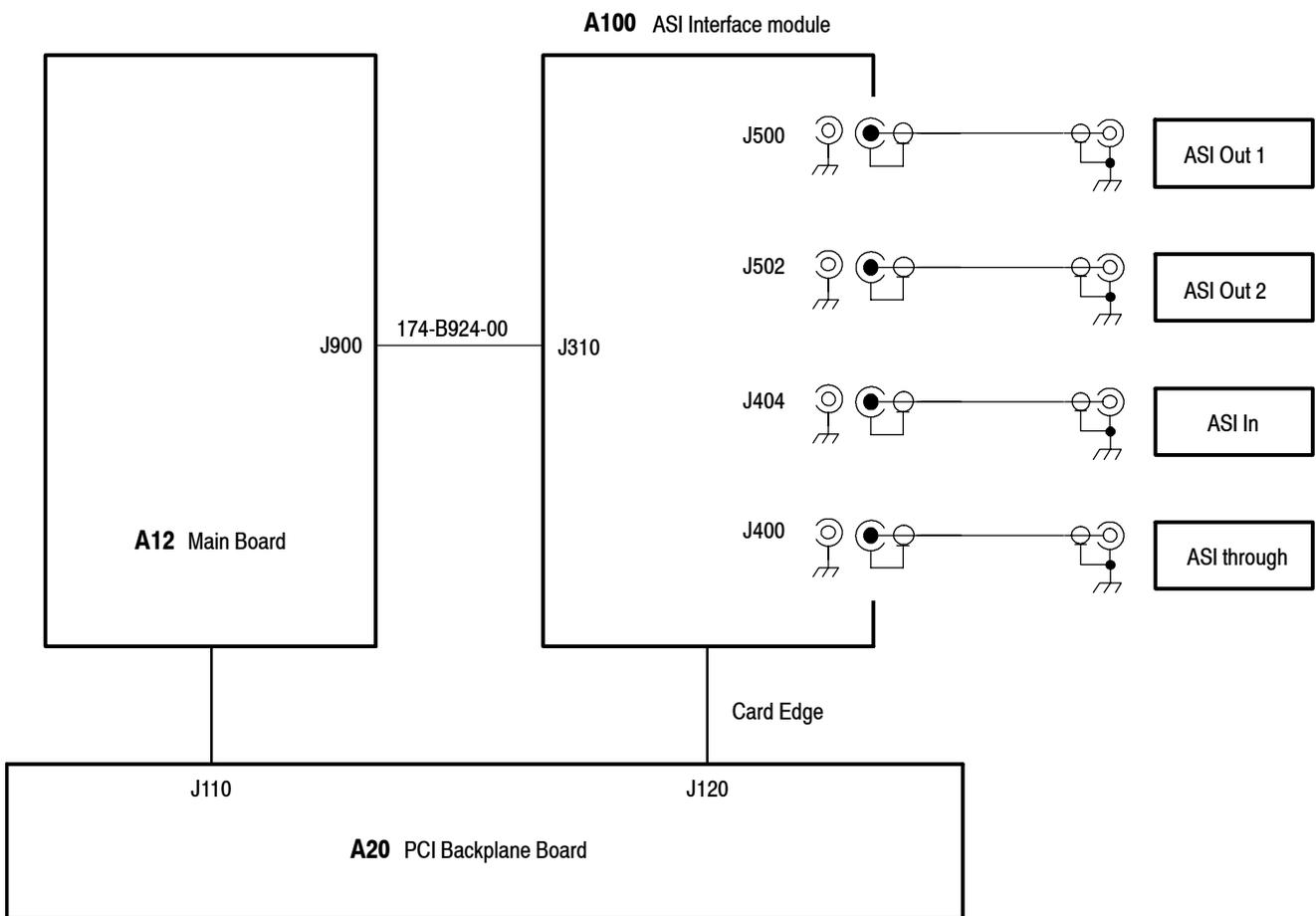
Figure 6-3: A100 ASI Interface module connections

A110 Universal Parallel/Serial Interface Module (Option 02)

Figure 6-4 shows the A110 Universal Parallel/Serial Interface module and how it interconnects with the A20 PCI Backplane board and the A12 Main board.
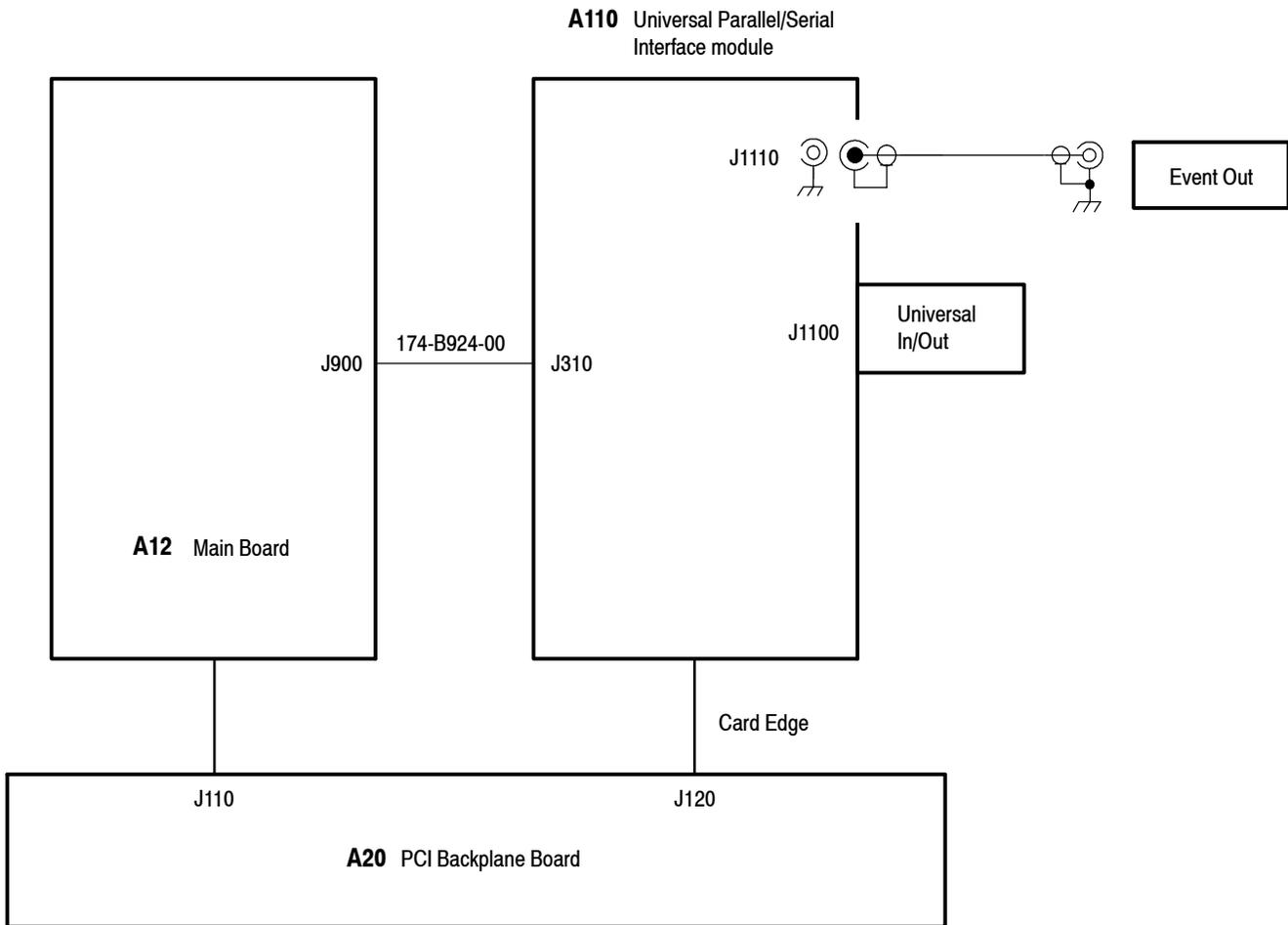
Figure 6-4: A110 Universal Parallel/Serial Interface module connections

A140 IEEE1394/ASI Interface Module (Option 05)

Figure 6-5 shows the A140 IEEE1394/ASI Interface module and how it interconnects with the A20 PCI Backplane board and the A12 Main board.
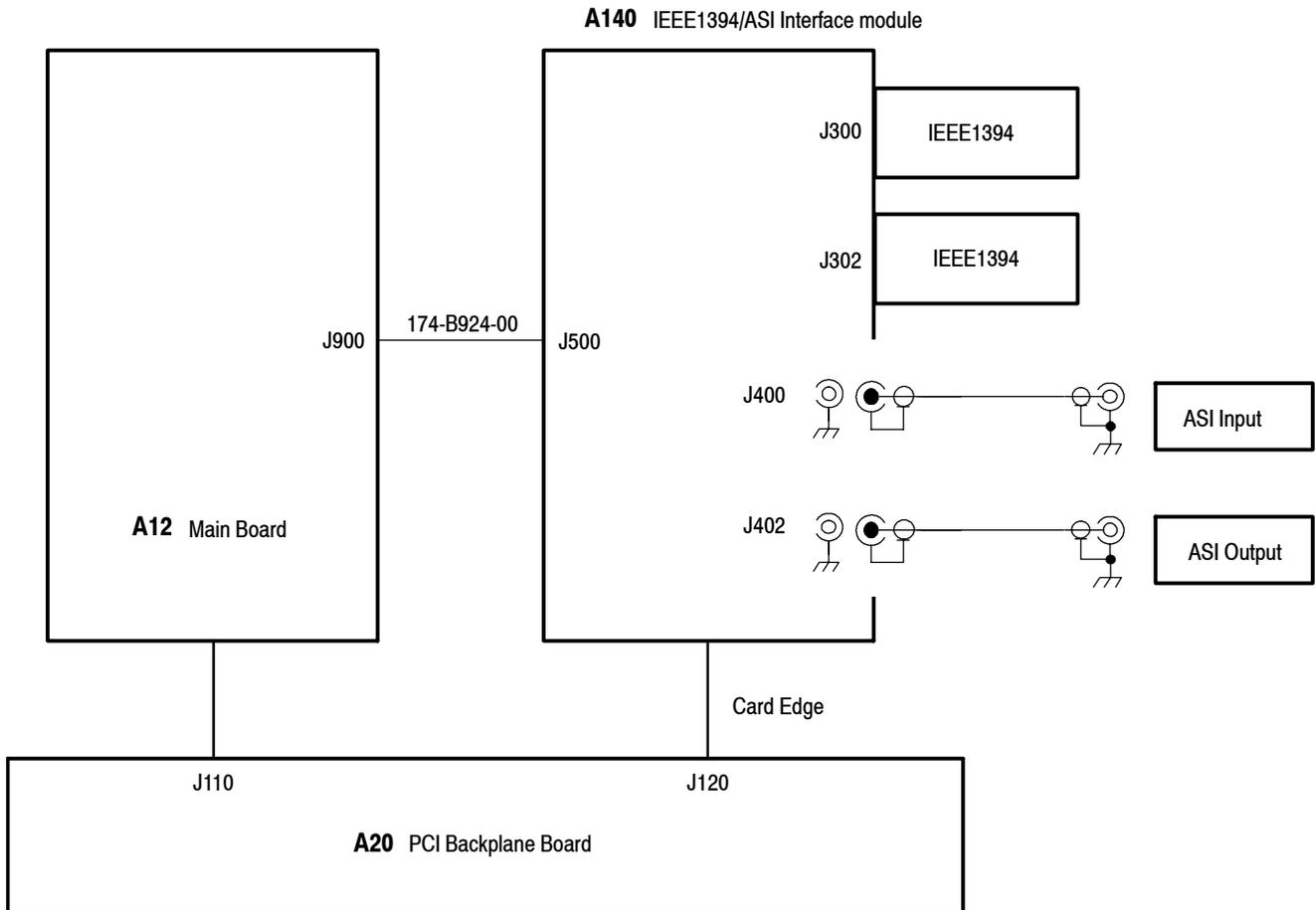
Figure 6-5: A140 IEEE1394/ASI Interface module connections

A170 SMPTE310M/ASI/SPI Interface Module (Option 07)

Figure 6-6 shows the A170 SMPTE310M/ASI/SPI Interface module and how it interconnects with the A20 PCI Backplane board and the A12 Main board.
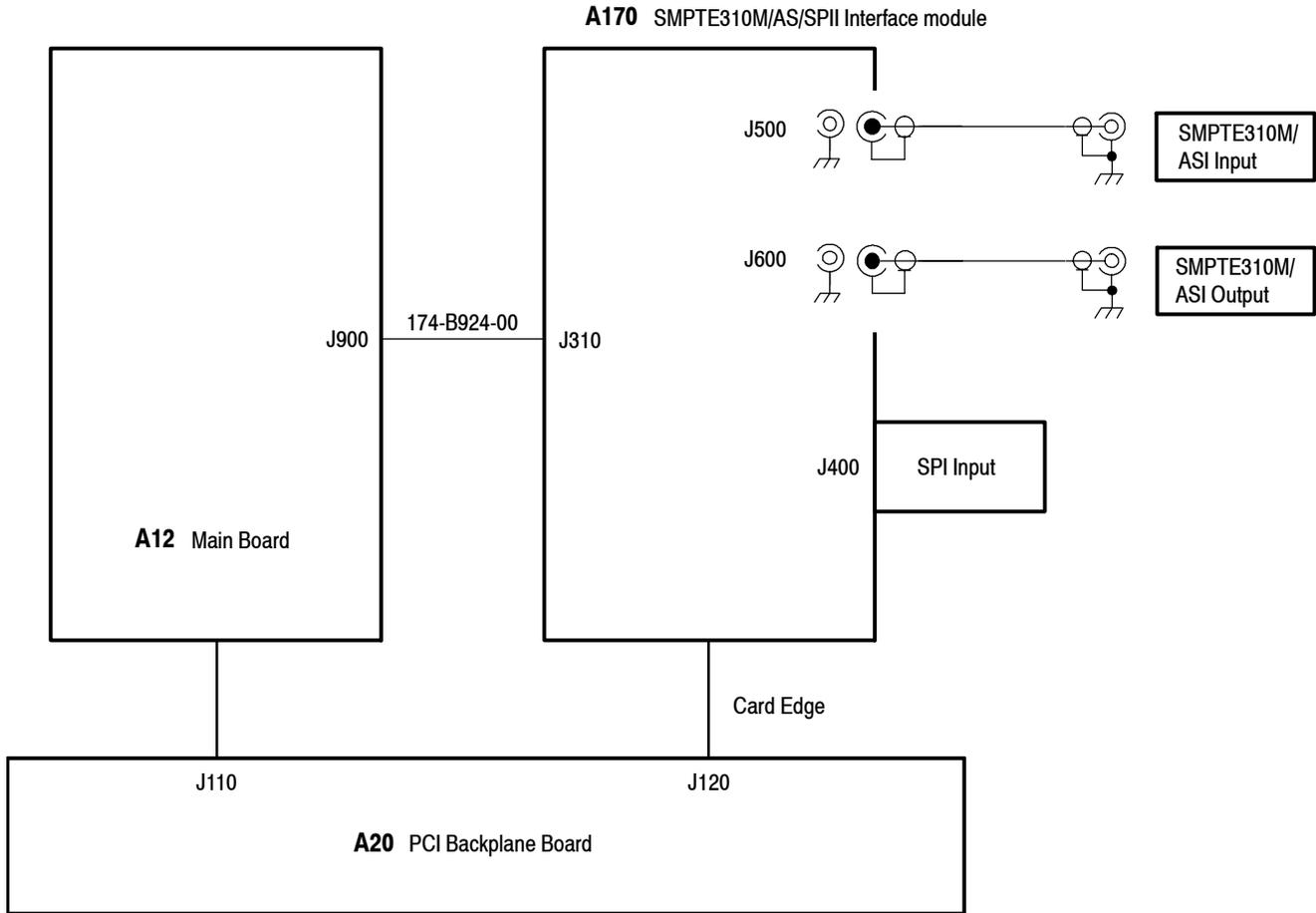
Figure 6-6: A170 SMPTE310M/ASI/SPI Interface module connections

Replaceable Parts List

Replaceable Parts List

This section contains a list of the replaceable modules for the MTX100A. Use this list to identify and order replacement parts.

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 (see Part Number Revision Level below)

- 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.

Change information, if any, is located at the rear of this manual.

Part Number Revision Level Tektronix part numbers contain two digits that show the revision level of the part. For most parts in this manual, you will find the letters XX in place of the revision level number.

Part Number Revision Level

Revision Level May Show as XX

670-7918-03

670-7918-XX

When you order parts, Tektronix will provide you with the most current part for your product type, serial number, and modification (if applicable). At the time of your order, Tektronix will determine the part number revision level needed for your product, based on the information you provide.

Module Servicing   Modules can be serviced by selecting 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 1–800–833–9200. Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices: www.tektronix.com

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 the MTX100A. 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
S3109	FELLER	72 VERONICA AVE UNIT 4	SUMMERSET NJ 08873
TK2432	UNION ELECTRIC	15/F #1, FU-SHING N. ROAD	TAIPEI, TAIWAN ROC
2W733	BELDEN CORPORATION	2200 US HIGHWAY 27 SOUTH PO BOX 1980	RICHMOND IN 47375-0010
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
7-1-1	211-0374-00			6	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX	80009	
-2	337-4345-00			1	SHIELD,ELEC:COVER,LEFT,MTX100A,AL	80009	
-3	390-1212-01			1	CABINET ASSY;WRAP AROUND HOUSING,0.050 AL,SILVER GRAY,W/FEET&HANDLE,SAFETY CONTROLLED	80009	
-4	211-0711-00			2	SCR,ASSEM WSHR;6-32X0.250,PNH,STL,CDPL,T-15 TORX DR,MACHINE,W/SQ CONE WASHER	80009	
-5	335-1374-00			1	MARKER,IDENT;LABEL,MKD WARNING TO AVOID ELECTRIC,50.8MMX25.4MM,0.002 POLYESTER(3M 7982), OVER LAMINATE W/0.001 FLEVCON,W/ADHESIVE BACK, SAFETY CONTROLLED	80009	
-6	063-3868-00			1	SOFTWARE PKG;MICROSOFT WINDOWS XP PROFESSIONAL,INCLUDES SERVICE PACK 2,1-2 PROCESSOR VERSION;CERTIFICATE OF AUTHENTICITY	80009	
-7	337-4346-00			1	SHIELD,ELEC:COVER,RIGHT,MTX100A,AL	80009	
-8	211-0374-00			7	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX	80009	

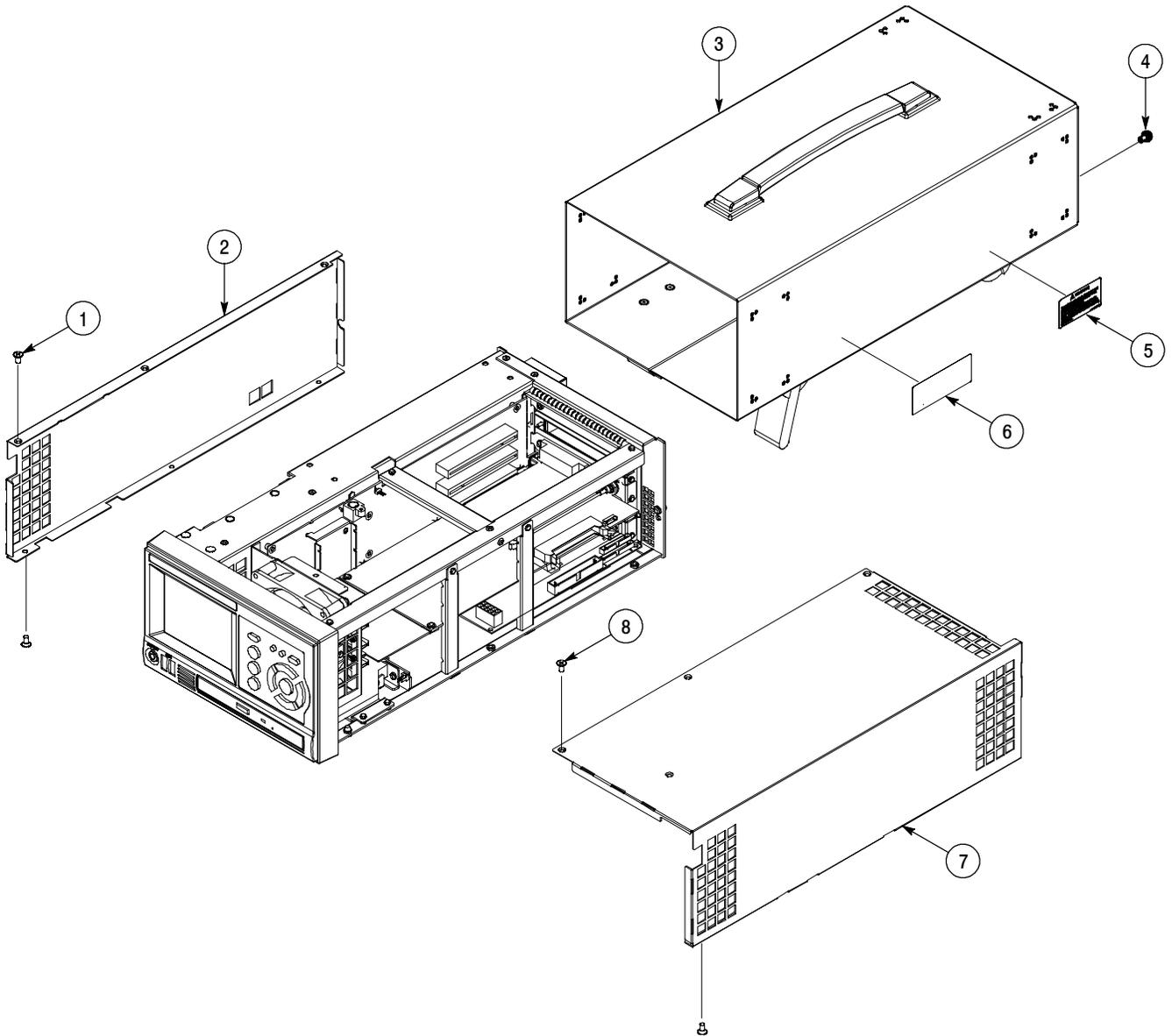**Figure 7-1: Cabinet and covers**

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
7-2-1	211-0734-00			2	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1, T10 TORX	80009	
-2	211-0373-00			2	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-3	343-1708-00			1	RETAINER:HARD DISK DRIVE,W/POLYURETHANE, MTX100A,AL	80009	
-4	211-0734-00			2	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1, T10 TORX	80009	
-5	211-0734-00			2	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX	80009	
-6	386-7460-00			1	PLATE:HDD,AL	80009	
-7	119-7146-00			1	HARD DISK DRIVE:160GB,3.5 INCH,7200RPM,ATA-100	80009	
-8	211-0373-00			3	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-9	671-5979-00			1	CIRCUIT BD ASSY;A40,SUB POWER,389-3738-00 WIRED	80009	
-10	342-1138-00			1	INSULATOR:CKT BOARD,POLYCARBONATE,A40 BOARD	80009	
-11	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-12	119-7147-00			1	POWER SUPPLY;85V-264VAC IN,12VDC 12.5A OUT, LEA150F-12-R,COSEL	80009	
-13	211-0711-00			1	SCR,ASSEM WSHR;6-32X0.250,PNH,STL,CDPL,T-15 TORX DR,MACHINE,W/SQ CONE WASHER	80009	
-14	196-3496-00			1	LEAD,ELECTRICAL;18 AWG,4.0 L,5-4 SAFETY CON- TROLLED	80009	
-15	119-6009-00			1	FILTER,RFI;3A,250VAC,0.5,MA,0.15OHM;SAFETY CONTROLLED	80009	
-16	211-0372-00			2	SCREW,MACHINE:4-40X0.312,PNH,STL ZN-CM1,T10 TORX	80009	
-17	200-4974-00			1	COVER,FAN;REAR,MTX100A,AL	80009	
-18	211-1161-00			4	SCREW,MACHINE;4-40X1.500,PNH HEAD,T-10 TORX, ZINC PL	80009	
-19	119-7186-00			1	CABLE,ASSEMBLY,4,18AWG,60MM L,HDD POWER (40 SQ FAN)	80009	
-20	335-1365-00			1	MARKER,IDENT:MKD CONNECTORS FOR A100	80009	
	335-1366-00			1	MARKER,IDENT:MKD CONNECTORS FOR A110	80009	
	335-1367-00			1	MARKER,IDENT:MKD CONNECTORS FOR A140	80009	
	335-1368-00			1	MARKER, IDENT:MKD CONNECTORS FOR A170	80009	
-21	335-1364-00			1	MARKER,IDENT:MKD CONNECTORS FOR A12, POLYCARBONATE	80009	
-22	335-1363-00			1	MARKER,IDENT:MKD CONNECTORS PRINTER&IEEE1394B, POLYCARBONATE	80009	
-23	335-1362-00			1	MARKER,IDENT:MKD CONNECTORS FOR CPU BD, POLYCARBONATE	80009	
-24	335-0133-00			1	MARKER,IDENT;BLANK LABEL FOR MES LINES; THT-37-483-10MONOCHROME DISPLY;TDS300,TDS400 SERIES,SAFETY CONTROLLED	80009	
-25	441-2404-00			1	CHASSIS,ASSY;MAIN,MTX100A,AL	80009	
-26	210-0164-000			2	RIVET,SOLID:0.163 ODX0.415 L,PANEL RANGE HEAD STYLE,NYLON	80009	
-27	119-7187-00			1	FAN 119569400 W/CABLE 18CM L(92 SQ FAN)	80009	
-28	211-0373-00			2	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	

DVD drive
See Figure 7-5 on
page 7-12 for
detailed view.

Front panel unit
See Figure 7-4 on
page 7-11 for
detailed view.

Figure 7-2: Internal modules (1)

Replaceable parts list

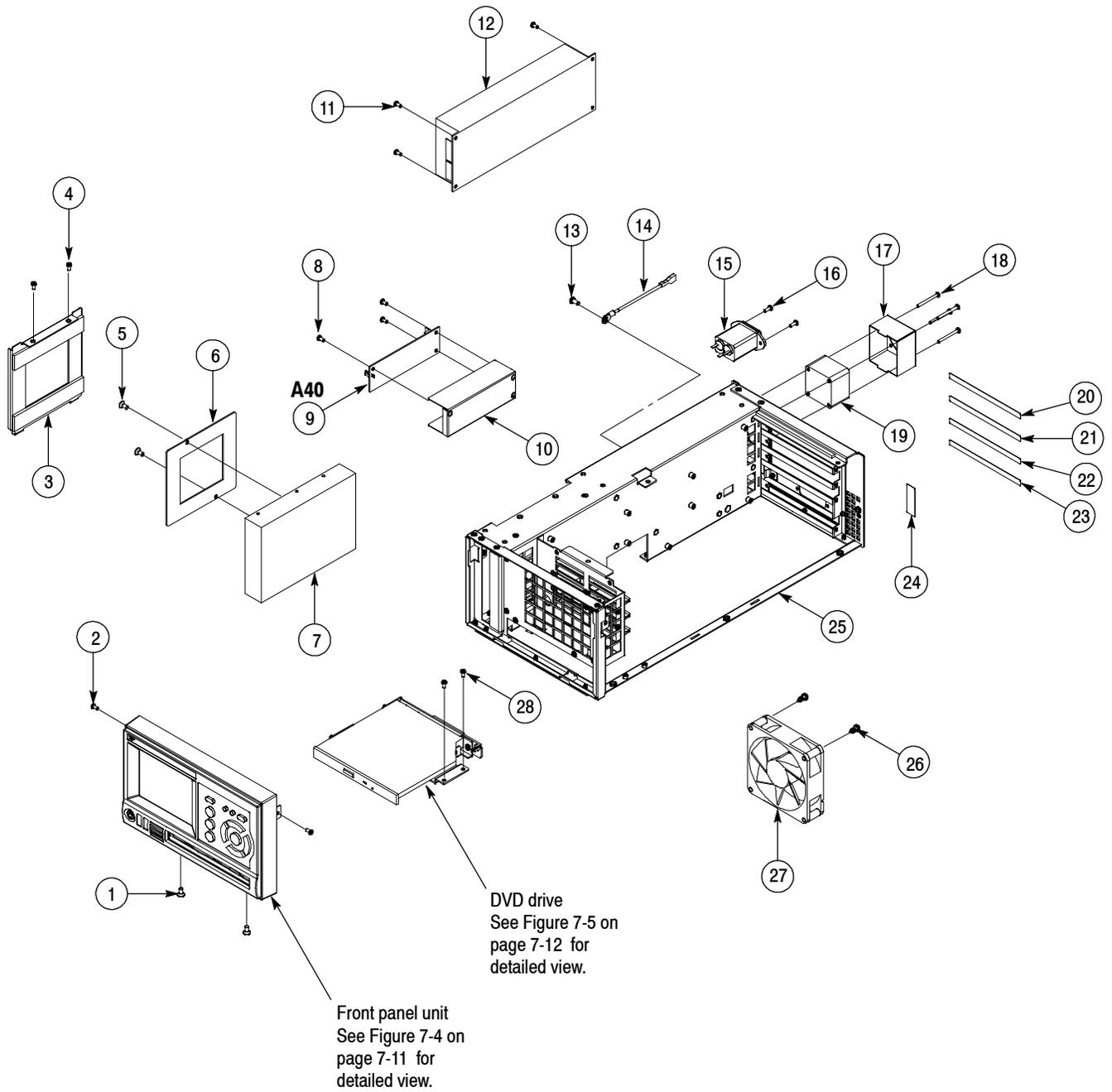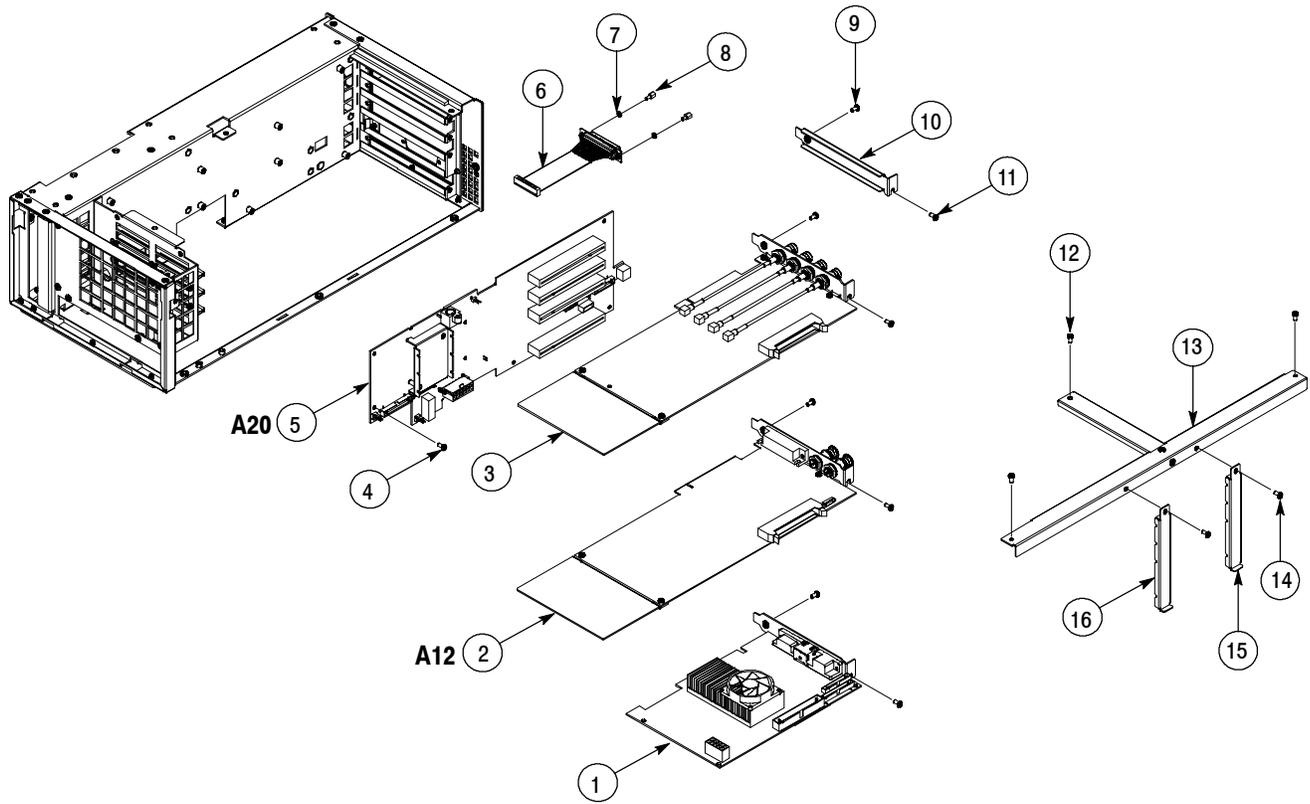| Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
7-3-1	650-4933-00			1	PROCESSOR MODULE W/BRACKET+LABEL 334A48100	80009	
-2	671-5975-00			1	CIRCUIT BD ASSY;A12,MAIN,389-3734-00 WIRED	80009	
-3	671-6118-00			1	CIRCUIT BD ASSY;A100(OPTION 01)	80009	
	671-6119-00			1	CIRCUIT BD ASSY;A110(OPTION 02)	80009	
	671-6120-00			1	CIRCUIT BD ASSY;A140(OPTION 05)	80009	
	671-6141-00			1	CIRCUIT BD ASSY;A170(OPTION 07)	80009	
-4	211-0373-00			10	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-5	671-5976-00			1	CIRCUIT BD ASSY;A20,PCI BACK PANEL,389-3735-00 WIRED	80009	
-6	174-5190-00			1	CABLE ASSEMBLY,28AWG FLAT,1.27CTR,W/CONN D-SUB25&2X13	80009	
-7	210-0054-00			2	WASHER,LOCK;#4 SPLIT,0.025 THK STL CD PL	80009	
-8	214-3903-01			2	SCREW,JACK:4-40X0.312 EXT THD,4-40 INT THD,0.188 HEX,STEEL,CAD PLATE	80009	
-9	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-10	333-4518-00			1	PANEL,PCI:BLANK,NI PL,STL	80009	
-11	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-12	211-0373-00			3	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-13	426-2624-00			1	FRAME,SECTION:TOP,MTX100A,STL	80009	
-14	211-0373-00			2	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-15	343-1697-00			1	RETAINER:CKT BD,PCI,MTX100A,STL	80009	
-16	343-1697-00			1	RETAINER:CKT BD,PCI,MTX100A,STL	80009	

Figure 7-3: Internal modules (2)

Replaceable parts list

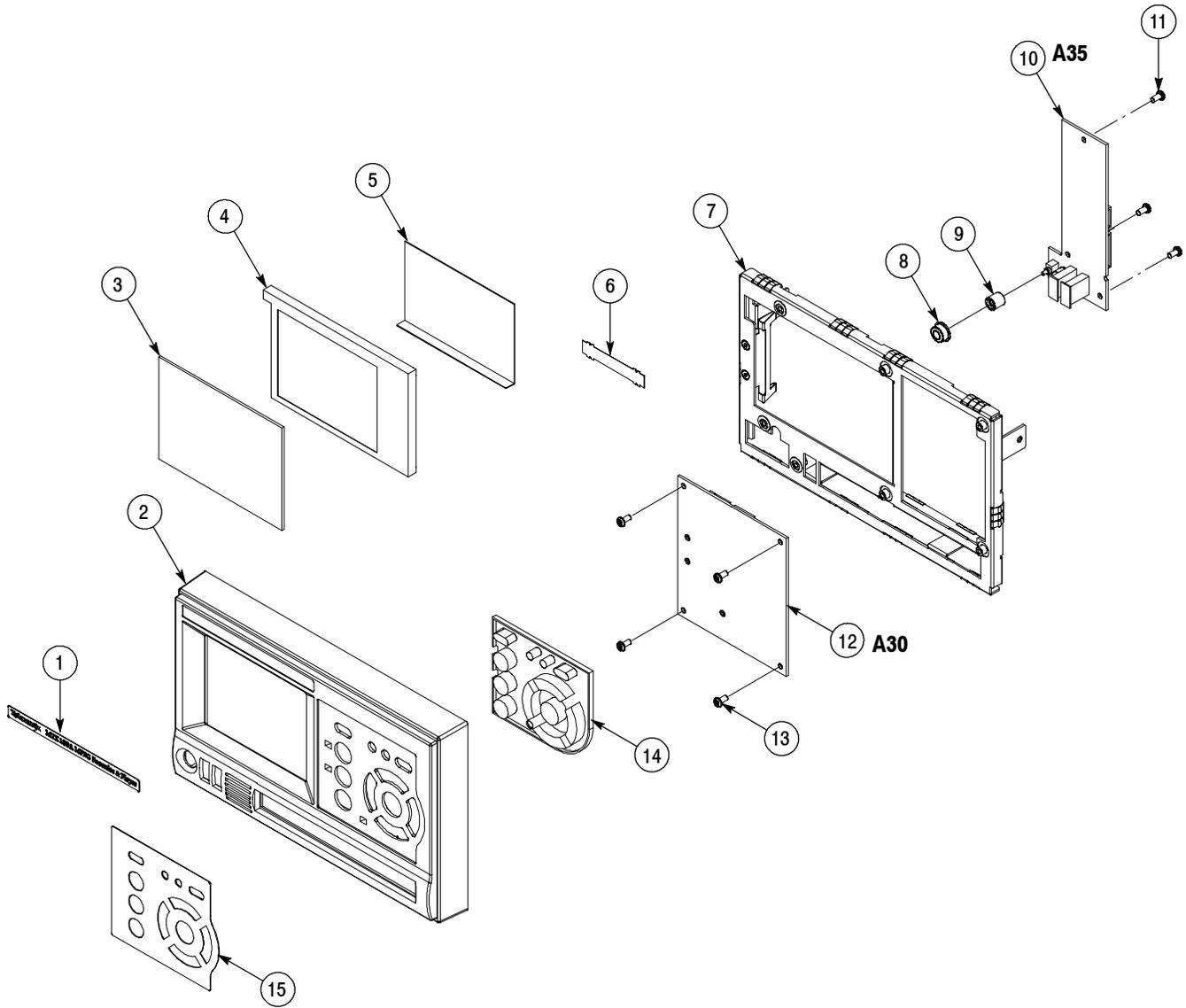| Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
7-4-1	334-A437-00			1	MARKER,IDENT:MKD MTX100A,POLYCARBONATE,TO.25	80009	
-2	200-4983-00			1	COVER,FRONT:ABS,TV GRAY,WITH CONDUCTIVE	80009	
-3	378-A048-01			1	FILTER,LCD:ACRYL,MTX100	80009	
-4	650-4802-00			1	LCD MODULE:4 INCH,TFT,VGA [LTMO4C380K]	80009	
-5	200-4910-00			1	COVER,SHIELD:PACKING LCD REAR,PORYCARBONATE SHEET,T0.5	80009	
-6	259-A002-01			1	FLEX CIRCUIT:A60,LCD I/F	80009	
-7	407-5048-00			1	BRACKET,ASSY:FRONT COVER,STL & SST,MTX100	80009	
-8	366-A046-00			1	PUSH BUTTON,POWER:SILVER GRAY,ABS	80009	
-9	384-A222-00			1	EXTENSION SHAFT:POWER BUTTON,POLYACETAL,MTX100	80009	
-10	671-5978-XX			1	CIRCUIT BD ASSY:A35 POWER SW,389-3737-00 WIRED	80009	
-11	211-0373-00			3	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-12	671-5977-XX			1	CIRCUIT BD ASSY:A30 FRONT PANEL,389-3736-00 WIRED	80009	
-13	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-14	260-A148-00			1	SWITCH,RUBBER:SILICON,FRONT PANEL	80009	
-15	333-A437-00			1	PANEL,FRONT:KEYBOARD,MTX100,POLYCARBONATE,TO.25	80009	

Figure 7-4: Front panel unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
7-5-1	119-7123-00			1	DISK DRIVE;OPTICAL,CD-RW/DVD-R/RW DVD+R/RW,16.7 MB/SEC,650MEG/8.5GIG,IDE/ATAPI;TEAC MODEL DV-W28E-793	80009	
-2	671-5980-XX			1	CIRCUIT BD ASSY:A50 DISK I/F,389-3739-00 WIRED	80009	
-3	211-0373-00			1	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX	80009	
-4	211-A269-00			4	SCREW,MACHINE:M2X4MM L,PNHSTL ZN-C,CROSS REC,W/FLAT (6MM OD) WASHER	80009	
-5	407-5049-00			1	BRACKET:DVD DRIVE,MTX100A,AL	80009	

Figure 7-5: DVD drive unit
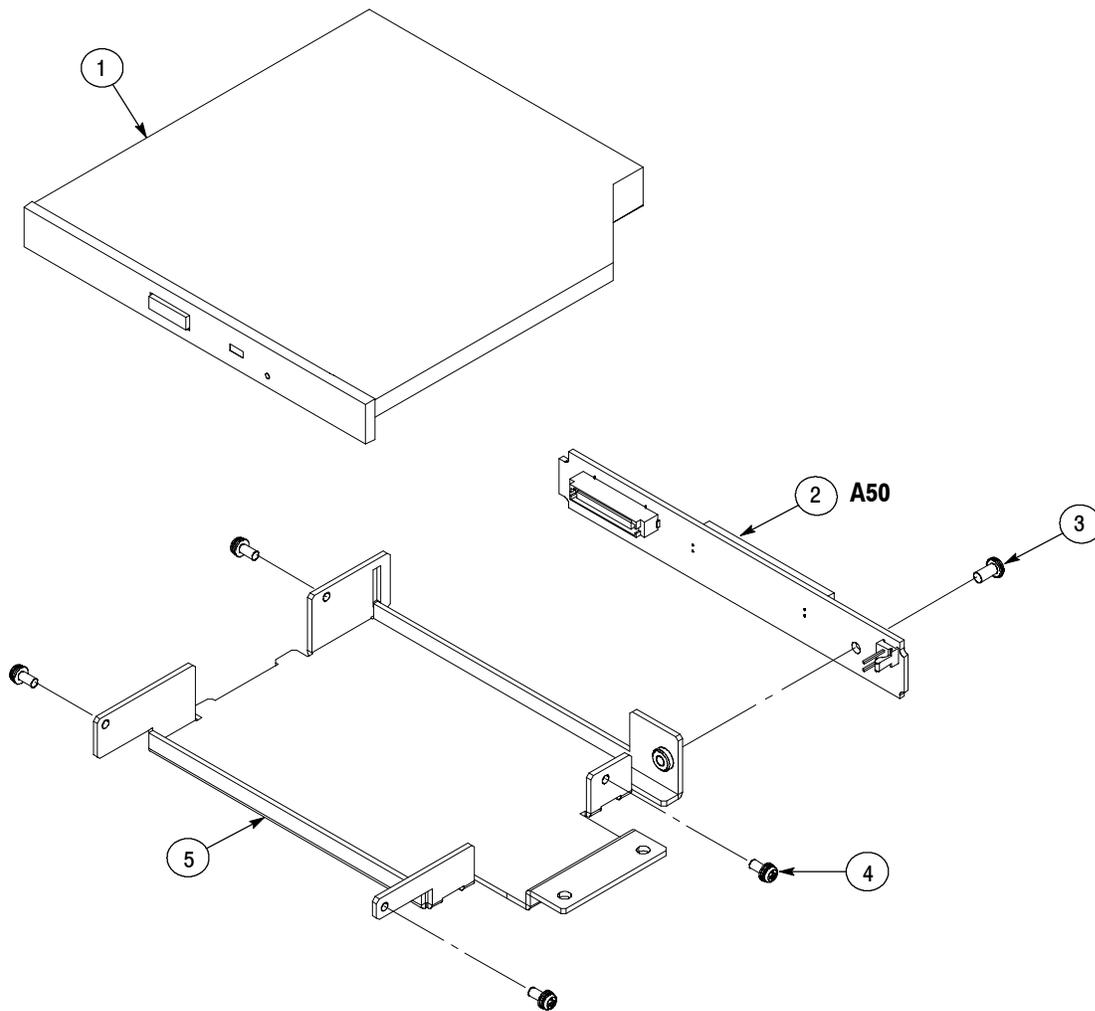
Replaceable parts list

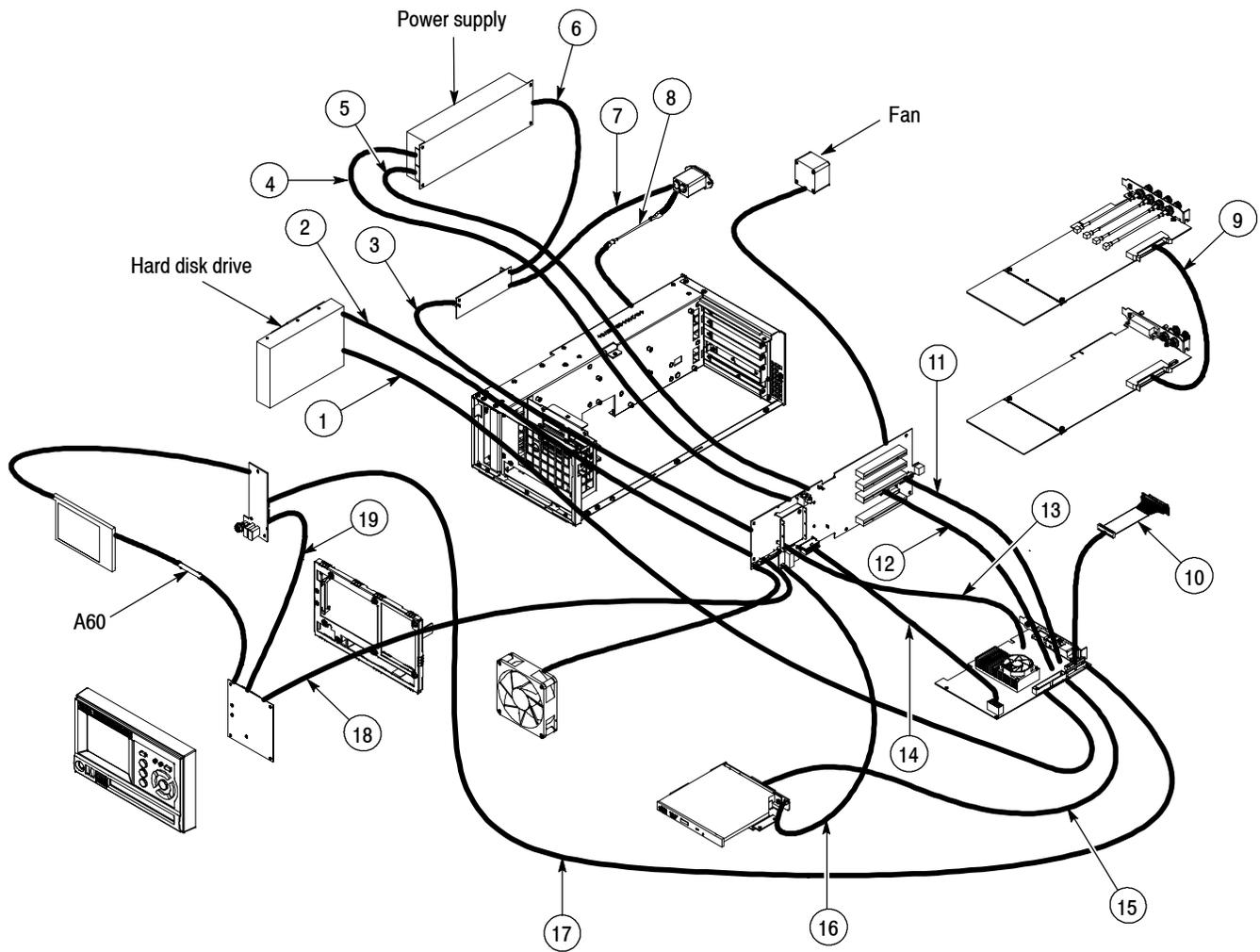| Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
7-6-1	174-5183-00			1	CABLE,ASSEMBLY,2X20,FLAT,430MM L,ULTRA ATA (CPU-HDD,HDD IDE)	80009	
-2	174-5181-00			1	CABLE,ASSEMBLY,4,18AWG,60MML,HDD POWER (HDD-A20,POWER)	80009	
-3	174-5172-00			1	CABLE,ASSEMBLY,2,22AWG,50MM L,W/CONN 22-01-3027 (MOLEX),(A20-A4-,5V STAND-BY)	80009	
-4	174-5177-00			1	CABLE,ASSEMBLY,7,18AWG,50MM I;VHR-10N&VHR-7N+ XHP-2(JST),(P/S-A20,POWER&CONTROL)	80009	
-5	174-5178-00			1	CABLE,ASSEMBLY,6,18AWG,110MM L,W/CONN VHR-6N (JST),(P/S-A20,GND)	80009	
-6	174-5171-00			1	CABLE,ASSEMBLY,2,18AWG,130MM I,W/CONN VHR-5N(JST) (P/S-A40)	80009	
-7	174-5170-00			1	CABLE,ASSEMBLY,2,18AWG,40MM I,AC INLET to A40 (INLET-A40)	80009	
-8	196-3449-00			1	LEAD,ELECTRICAL;18AWG,4.0 L,5-4 SAFETY CONTROLLED	80009	
-9	174-B924-00			1	CABLE,ASSEMBLY,SP,ELEC:80,30AWG,5CM L,FLAT,W/CONN (YAMAICHI)	80009	
-10	174-5190-00			1	CABLE,ASSEMBLY,28AWG FLAT,1.27CTR,W/CONN D-SUB25&2X13(DSUB25-CPU)	80009	
-11	174-5186-00			1	CABLE,ASSEMBLY,2X10,28AWG FLAT,1MM CTR,130MM L, RS232C SLOT PC TO A20(CPU-A20,RS2-232C)	80009	
-12	174-5185-00			1	CABLE,ASSEMBLY,2X5,28AWG FLAT,1MM CTR,120MM L, PANNEL SLOT PC TO A20(CPU-A20,PANEL CONTROL)	80009	
-13	174-5184-00			1	CABLE,ASSEMBLY,14,30AWG 7TWISTED PAIRS,270MM L, LVDS SLOT PC TO A20,(CPU-A20,LCD LVDS)	80009	
-14	174-5174-00			1	CABLE,ASSEMBLY,12,18AWG,150MM L,SLOT PC POWER (CPU-A20,CPU POWER)	80009	
-15	174-5182-00			1	CABLE,ASSEMBLY,2X22,28AWG FLAT,1MM CTR,350MM L, W/CONN ATA CABLES(CPU-A50,DVD IDE)	80009	
-16	174-5187-00			1	CABLE,ASSEMBLY,22AWG,180MM L,W/CONN 22-01-3027 (MOLEX),DVD-ROM POWER(A20-A50,DVD POWER)	80009	
-17	174-5188-00			1	CABLE,ASSEMBLY,SP,ELEC;10,60CM L,26AWG AND 28 AWG(CPU-A35,USB)	80009	
-18	174-5220-00			1	CABLE,ASSEMBLY,2X15,28AWG FLAT,1MM CTR,300MM L,A20 TO A30	80009	
-19	174-5173-00			1	CABLE,ASSEMBLY,5,26AWG RBN,120MM L,W/CONN PHR-5(JST)(A30-A35)	80009	

Figure 7-6: Cables

Replaceable parts list

Compo-nent number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					STANDARD ACCESSORIES		
	071-1731-XX			1	MANUAL,TECH,USER,MTX100A,ENGLISH (OPTION L0)	80009	
	071-1753-XX			1	MANUAL,TECH,USER,MTX100A,JAPANESE (OPTION L5)	80009	
	063-3864-XX			1	SOFTWARE PKG:WINDOWSXP PROFESSIONAL RECOVERY,DVD-ROM	80009	
	063-3865-XX			1	SOFTWARE PKG:SAMPLE STREAM,CD-ROM	80009	
	063-3866-XX			1	SOFTWARE PKG:APPLICATION RECOVERY	80009	
	012-A220-00			1	CABLE,INTCON:D-SUB 25,MALE TO MALE,STR,TWIST,2M L,SCREW 4-40	80009	
	119-6936-00			1	POINTER ASSY:OPTICAL MOUSE,USB,WHITE,OPTICAL THREE BUTTON WHEELED,W/USB to PS2 ADAPTER,ABS,SAFETY CONTROLLED	80009	
	119-B146-00			1	KEYBOARD:USB;MTX100,SAFETY CONTROLLED	80009	
	200-4853-00			1	COVER,FRONT;PROTECTIVE,PC/ABS FR110,W/TAPE;TV GRAY	80009	
	161-0066-00			1	CABLE ASSY,PWR; 3,18 AWG,250V/10A,98.0 L,STR,IEC320, RCPT X NEMA 5-15P,US,SAFETY CONTROLLED	S3109	
	161-0066-09			1	CABLE ASSY,PWR; 3,0.75MM SQ,250V/10A,99.0 L,STR, IEC320,RCPT,EUROPEAN,SAFETY CONTROLLED	S3109	
	161-0066-10			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,RCPT X 13A,FUSED UK PLUG(13A FUSE), UNITED KINGDOM,SAFETY CONTROLLED	S3109	
	161-0066-13			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,RCPT,AUSTRALIA,SAFETY CONTROLLED	S3109	
	161-0066-12			1	CABLE ASSY,PWR;3,18 AWG,250V/10A,98.0 L,STR,RCPT X NEMA 6-15P,US,SAFETY CONTROLLED	2W733	
	161-0154-00			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,RCPT,SWISS,SAFETY CONTROLLED	S3109	
	161-0298-00			1	CABLE ASSY,PWR; 3,125V/7A,JAPAN,98 LONG,STR,NEMA 5-15P PLUG X IEC320/C-13 RECEPTACLE,SAFETY CONTROLLED		
	161-0304-00			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,3C CERTIFICATION,RCPT,CHINA,SAFETY CONTROLLED	S3109	
					OPTIONAL ACCESSORIES		
	071-1754-XX			1	MANUAL,TECH:SERVICE,MTX100A	80009	
	-----------			1	1700F05 SIDE-BY-SIDE RACK ADAPTER	80009	
	-----------			1	1700F06 BLANK PANEL	80009	