Service Manual

Tektronix

MTX100
MPEG Recorder & Player

070-A835-51

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

www.tektronix.com

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WARRANTY

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

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

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

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

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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.*

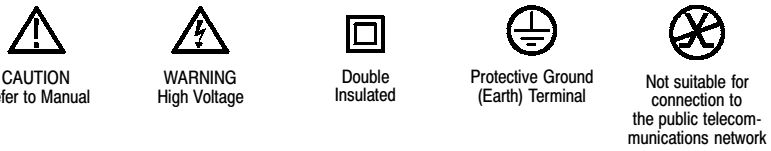
Terms on the Product. These terms may appear on the product:

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:



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.

Preface

This is the service manual for the MTX100 MPEG Recorder & Player. This manual contains information needed to service an MTX100 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 MTX100 and the characteristics that apply to it.
- *Operating Information* includes general information and operating instructions.
- *Theory of Operation* contains circuit descriptions that support service to the module level.
- *Performance Verification* contains procedures for confirming that an MTX100 functions properly and meets warranted characteristics.
- *Adjustment Procedures* contains a statement explaining that no adjustment is needed for the MTX100.
- *Maintenance* contains information and procedures for performing preventive and corrective maintenance on an MTX100. These instructions include cleaning, module removal and installation, and fault isolation to the module level.
- *Options* contains descriptions of available options for the MTX100.
- *Electrical Parts List* contains a statement referring you to the *Mechanical Parts List* section, where both the electrical and mechanical modules are listed.
- *Diagrams* contains block diagrams and interconnection diagrams of the MTX100 and the optional interface modules.
- *Mechanical Parts List* includes a table of all replaceable modules, their descriptions, and their Tektronix part numbers.

Manual Conventions

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

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, etc.) in the manual as is used on the MTX100 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 MTX100, 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 9-1, includes a block diagram and an interconnect diagram.

Modules

Throughout this manual, any replaceable component, assembly, or part of the MTX100 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 MTX100 is a module.

Safety

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

Finding Other Information

Other documentation for the MTX100 includes:

- The MTX100 MPEG Recorder & Player *User Manual* contains a tutorial to quickly describe how to operate the MTX100. It also includes an in-depth discussion on how to more completely use the MTX100 features.

Contacting Tektronix

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Web site	www.tektronix.com
Sales support	1-800-833-9200, select option 1*
Service support	1-800-833-9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1-800-833-9200, select option 3* 6:00 a.m. – 5:00 p.m. Pacific time

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

Introduction

This manual contains information needed to properly service the MTX100 MPEG Recorder & Player, as well as general information critical to safe and effective servicing.

To prevent personal injury or damage to the MTX100, 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 ix.
- Read *Installation* in section 2, *Operating Information*.

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 4, *Performance Verification*, should be done every 12 months. In addition, a performance check is recommended after module replacement.

If the MTX100 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 MTX100.

This manual contains all the information needed for periodic maintenance of the MTX100 (Examples of such information are procedures for checking performance).

Further, it 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 6, *Maintenance*. To remove and replace any failed module, follow the instructions in *Removal and Installation Procedures*, also part of section 6. After isolating a faulty module, replace it with a fully-tested module obtained from the factory. Section 10, *Mechanical 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 MTX100. They have access to the latest information on improvements to the MTX100 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.

Product Overview

The MTX100 MPEG Recorder & Player generates and captures MPEG-2 transport streams that are compliant with ATSC, DVB, and ARIB standards.

The MTX100 provides the following features:

- Data rate: 200 Mbps maximum; 1 Kbps minimum
- Hierarchy display of the stored or captured transport stream
- 188, 204, 208 byte packet-length, S-TMCC, M-TMCC and non transport stream (TS) output formats
- Real-time updating of transport stream time stamps and time tables (PCR, PYS/DTS, TOT/TDT/STT, and continuity_counter value)
- PCR jitter insertion
- Trigger capture
- CD-ROM drive for downloading user-created data
- Optional ASI, universal parallel/serial, BNC serial, and DHEI interface available

The MTX100 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 1-10 list the functional, electrical, mechanical, and environmental characteristics of the MTX100. Table 1-11 lists the national and international standards to which the MTX100 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 MTX100 must be in an environment where the temperature, altitude, humidity, and vibration conditions are within the operating limits described in Table 1-10 on page 1-17.
- The MTX100 must have a warm-up period of at least 20 minutes.
- The MTX100 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 2000 Professional
CPU	850 MHz Pentium III processor
System memory	768 MB
Display	640 x 480 VGA resolution with 256 K colors
Storage device	
Hard disk drive	40 GB IDE HDD
CD-ROM drive	PC compatible half height IDE CDROM drive
Expansion slot	1 - PCI slot

Electrical Specifications

Table 1-2: Mainframe

Characteristics	Description
Output rate in Play mode	
Hard disk	≥ 120 Mbps
RAM	≥ 200 Mbps
Record rate in Record mode	
Hard disk	≥ 120 Mbps (File size: < 4 GB, Just after disk format operation) ≥ 90 Mbps (File size: 33 GB, Just after disk format operation)
RAM	≥ 200 Mbps
Internal reference clock	For Output_clock, PCR/PTS/DTS, Packet operation timing, and TDT/STT time.
Reference clock	27 MHz ± 1 ppm
External reference/clock input	
Connector type	BNC
Input impedance, typical	50 Ω
Reference input	
Frequency	10, 27 MHz
Input level, typical	2.0 Vp-p to 4.0 Vp-p (Sine wave) 1.0 Vp-p to 3.0 Vp-p (Square wave)
Input offset, typical	2 V ± 0.5 V
Clock input	
Frequency	160 kHz to 25 MHz (Parallel clock) 1.28 MHz to 64 MHz (Serial clock)
Input level, typical	1.0 V to 3.0 V
Input offset, typical	2 V ± 0.5 V
External trigger input	
Connector type	BNC
Input impedance, typical	1 kΩ
Threshold level	Rising and falling edges are programmable. > 3.5 V (high level) < 1.0 V (low level)
PLL	
Frequency	64 MHz to 128 MHz, Locked to reference clock
Output clock	64 MHz maximum (serial clock) 25 MHz maximum (parallel clock)
Output rate	200 Mbps maximum 1 Kbps minimum

Table 1-2: Mainframe (Cont.)

Characteristics	Description
PLL divide ratio (Internal and external reference, 27 MHz)	Output Clock = (X / (Y * Z)) * 27 MHz 512 < X < 131071 3400 < Y < 6000 (3400 is the best value.) 2 ≤ Z ≤ 65536
(External clock) Parallel clock (160 kHz ≤ f ≤ 25 MHz)	27 MHz-500 Hz ≤ fref ≤ 27 MHz+500 Hz 8 ≤ Y ≤ 16383 f_{cmp}=Clock/(2*Y), 10kHz ≤ f_{cmp} ≤ 40 kHz 512 ≤ X ≤ 131071 f_{ref} (Typical 27 MHz)=f_{cmp}*X/2
Serial clock (1.28 MHz ≤ f ≤ 64 MHz)	8 ≤ Y ≤ 16383 f_{cmp}=Clock/(16*Y), 10kHz ≤ f_{cmp} ≤ 40 kHz 512 ≤ X ≤ 131071 f_{ref} (Typical 27 MHz)=f_{cmp}*X/2
P/N and Jitter (serial clock)	< -104 dBc/Hz at 21.455707 MHz +20 kHz (RBW=300 Hz)
DVB-SPI interface	
Connector type	D-sub, 25 pin
Data rate	1 Kbps to 200 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)
Data delay, typical	± 5 ns from the falling edge of DCLK
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)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, Data are latched on DCLK rising edge)

Table 1-2: Mainframe (Cont.)

Characteristics	Description
Serial interface (COM2)	
Connector type	D-sub, 9 pin
Pin assignments	RS-232C: 1 DCD, 2 RX, 3 TX, 4 DTR, 5 GND, 6 DSR, 7 RTS, 8 CTS, 9 RI RS-422: 1 TX-, 2 TX+, 3 RX+, 4 RX-, 5 GND, 6 RTS-, 7 RTS+, 8 CTS+, 9 CTS- RS-485: 1 DATA-, 2 DATA+, 3 NC, 4 NC, 5 GND, 6 NC, 7 NC, 8 NC, 9 NC
Parallel interface (PRINTER)	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, 2 D0, 3 D1, 4 D2, 5 D3, 6 D4, 7 D5, 8 D6, 9 D7, 10 ACK, 11 BUSY, 12 Paper Empty, 13 SELECT, 14 AUTOLF, 15 ERR, 16 INIT, 17 SELECT, 18 GND, 19 GND, 20 GND, 21 GND, 22 GND, 23 GND, 24 GND, 25 GND

Table 1-2: Mainframe (Cont.)

Characteristics	Description
SCSI interface	Ultra2 SCSI
Data transfer rate	80 MByte/sec with 16 bit mode
Connector type	D-sub, 68 pin
Pin assignments	1 LVDP12 35 LVDM12 2 LVDP13 36 LVDM13 3 LVDP14 37 LVDM14 4 LVDP15 38 LVDM15 5 LVDPHP 39 LVDPHP 6 LVDP0 40 LVDM0 7 LVDP1 41 LVDM1 8 LVDP2 42 LVDM2 9 LVDP3 43 LVDM3 10 LVDM4 44 LVDM4 11 LVDM5 45 LVDM5 12 LVDM6 46 LVDM6 13 LVDM7 47 LVDM7 14 LVDPLP 48 LVDPLM 15 GND 49 GND 16 DEFSENSE 50 LVEXT68 17 GND 51 LVTRMPWR 18 LVTRMPWR 52 LVTRMPWR 19 LVTRMPWR 53 NC 20 GND 54 GND 21 LVATNP 55 LVATNM 22 GND 56 GND 23 LVBSYP 57 LVBSYM 24 LVACKP 58 LVACKM 25 LVRSTP 59 LVRSTM 26 LVMSGP 60 LVMSGM 27 LVSELP 61 LVSELM 28 LVCDP 62 LVCDM 29 LVREQP 63 LVREQM 30 LVIOP 64 LVIOM 31 LVDP8 65 LVDM8 32 LVDP9 66 LVDM9 33 LVDP10 67 LVDM10 34 LVDP11 68 LVDM11
Keyboard interface	
Connector type	USB (A type, 4 pin)
Pin assignments	1 VCC 2 -DATA 3 +DATA 4 GND

Table 1-2: Mainframe (Cont.)

Characteristics	Description
Mouse interface	
Connector type	USB (A type, 4 pin)
Pin assignments	1 VCC 2 –DATA 3 +DATA 4 GND
Ethernet interface (100/10 BASE-T)	
Connector type	RJ45
Pin assignments	1 TD+ 5 NC 2 TD– 6 RD– 3 RD+ 7 NC 4 NC 8 NC
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
AC line power	
Rating Voltage	100 V to 240 VAC, CAT II
Voltage Range	90 V to 250 VAC
Frequency Range	50 Hz to 60 Hz
Maximum power	120 VA
Maximum current	1.3 A

Table 1-3: ASI interface (Option 01)

Characteristics	Description
Standard	Complies with EN50083-9 Annex B.
Connector type	BNC
Impedance, typical	75 Ω ± 10 %
Data rate	1 Kbps to 200 Mbps
Output	
Number of output	2
Output voltage	≤ 800 mV ± 10%
Jitter	≤ 0.2 UI (p-p)
Rise/fall time (20% to 80%)	≤ 1.2 ns
Return loss	> 15 dB (5 MHz to 270 MHz)
Transmission format	Data packets (Insert Packet unit) Data bursts (Insert Byte unit)
Input	
Number of input	1 (with active loop-through output)
Input voltage	800 mV ± 10%
Return loss	> 15 dB (5 MHz to 270 MHz)

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	1 Kbps to 200 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 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, par pin, single-end)
Data delay, typical	0 ± 5 ns from the falling edge of DCLK
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)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, Data are latched on DCLK rising edge)
Serial interface mode	
Connector type	D-sub, 25 pin (the same connector as Parallel output)
Data rate	1 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, par pin, single-end)
Data delay, typical	0 ± 5 ns from the falling edge of DCLK
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)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, data are latched on DCLK rising edge)
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: BNC serial interface (Option 03)

Characteristics	Description
Data rate	1 Kbps to 40 Mbps
Output	
Connector type	BNC
Number of output	4 (DATA, CLOCK, PSYNC, and ENABLE)
Output level, typical	
TTL without termination	LO: 0 V HI: 3.3 V
ECL without termination	LO: -2.1 V HI: -0.5 V
Output impedance, typical	75 Ω ± 10 %
Data delay, typical	0 ± 5 ns from the falling edge of DCLK
Input	
Connector type	BNC
Number of input	4 (DATA, CLOCK, PSYNC, and ENABLE)
Single end input level, typical	
ECL 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
Input resistance, typical	75 Ω ± 5 % to GND (Termination: On)
Clock pulse width, typical	T/2 ± T/10, T=1/f (f=byte clock frequency)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, Data are latched on DCLK rising edge)

Table 1-6: DHEI interface (Option 04)

Characteristics	Description
Standard	Complies with SCTE DVS/110
Connector type	HD-22, 26 pin
Data rate	1 Kbps to 40 Mbps
Pin assignments	Duplex expansion Out: 1 PROTGND 14 RSVD 2 SENSEAOR 15 PDATABI- 3 PSYNCAO- 16 PSYNCBI- 4 PDATAO- 17 SENSEBIR 5 PCLKAO+ 18 RSVD 6 PCLKAO+ 19 REFCLKBI+ 7 REFCLKAO+ 20 REFCLKBI- 8 REFCLKAO- 21 PCLKBI+ 9 SIGND 22 PCLKBI- 10 RSVD 23 PDATABI+ 11 SENSEAOL 24 PSYNCBI- 12 PSYNCAO+ 25 SENSEBIL 13 PDATAO+ 26 RSVD Duplex expansion In: 1 PROTGND 14 RSVD 2 SENSEAIR 15 PDATABO- 3 PSYNCAI- 16 PSYNCBO- 4 PDATAI- 17 SENSEBOR 5 PCLKAI+ 18 RSVD 6 PCLKAI- 19 REFCLKBO+ 7 REFCLKAI+ 20 REFCLKBO- 8 REFCLKAI- 21 PCLKBO+ 9 SIGND 22 PCLKBO- 10 RSVD 23 PDATABO+ 11 SENSEAIL 24 PSYNCBO+ 12 PSYNCAI+ 25 SENSEBOL 13 PDATAI+ 26 RSVD
Output	
Output level, typical	-1.8 V to - 0.9 V (ECL, without termination)
Output resistance, typical	410 Ω ± 5 %
Data delay, typical	0 ± 3 ns from the falling edge of DCLK
Input	
Input level, typical	> 0.5 Vp-p (between +pin and -pin)
Input resistance, typical	120 Ω ± 5 % (between +pin and -pin)

Table 1-7: 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
ASI interface	
Standard conformance	EN 50083-9 Annex B
Connector type	BNC
Impedance, typical	75 Ω ± 10%
Data rate	1 Kbps to 200 Mbps
Input vlotage, typical	800 mV
Output voltage	800 mV ± 10%
Return loss	> 15 dB (5 MHz to 270 MHz)

Table 1-8: SMPTE310M/ASI interface (Option 06)

Characteristics	Description
SMPTE310M interface	Uses the same input/output connectors as 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 output	2
Output voltage	800 mV ± 10%
Jitter	≤ 0.2 UI p-p
Rise/fall time	0.4 ns ≤ A ≤ 5.0 ns (20% to 80%)
Frequency range, typical	± 3%
Input	
Number of input	1 (with active loop-through output)
Input voltage, typical	800 mV ± 10%
Frequency range, typical	± 3%

Table 1-8: SMPTE310M/ASI interface (Option 06) (Cont.)

Characteristics	Description
ASI interface	Uses the same input/output connectors as the SMPTE310M interface.
Standard conformance	EN 50083-9 Annex B
Connector type	BNC
Impedance	75 Ω
Data rate	1 Kbps to 200 Mbps
Output	
Number of output	2
Output voltage	800 mV ± 10%
Jitter	≤ 0.2 UI p-p
Rise/fall time	≤ 1.2 ns (20% to 80%)
Return loss	> 15 dB (5 MHz to 270 MHz)
Transmission format	Data packets (Insert Packet unit) Data bytes (Insert Byte unit)
Input	
Number of input	1 (with active loop-through output)
Input voltage, typical	800 mV ± 10%
Return loss	> 15 dB (5 MHz to 270 MHz)

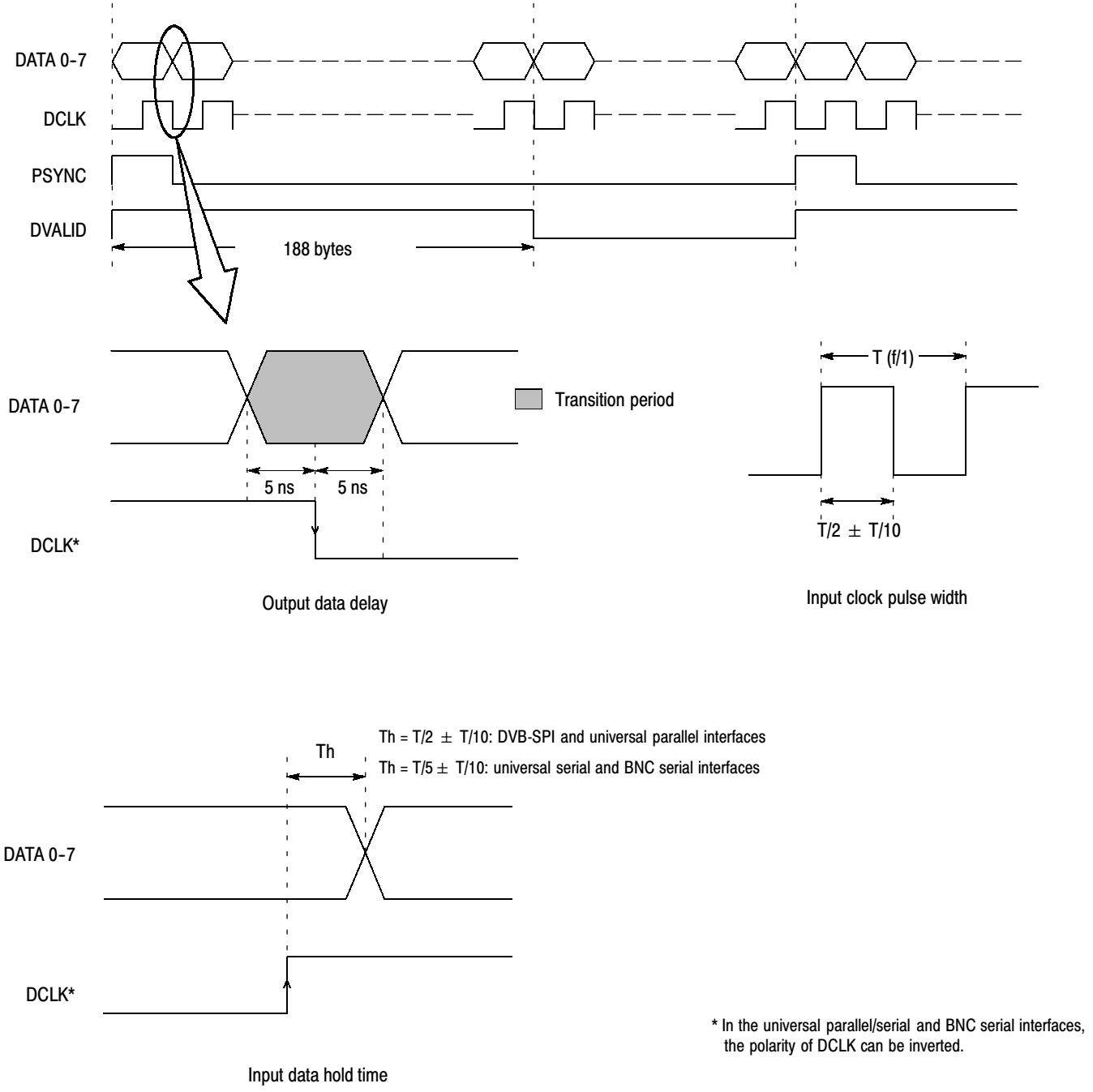


Figure 1-1: Timing diagram of the DVB-SPI, universal parallel/serial, and BNC serial interfaces

Mechanical (Physical) Characteristics

Table 1-9: Mechanical characteristics

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

Environment Characteristics

Table 1-10: 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 29.4° C
Non-operating	5 % to 90 % (No condensation) Maximum wet-bulb temperature 40.0° 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 1-10: Environmental characteristics (Cont.)

Characteristics	Description
Surge current	≦ 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

Certifications and Compliances

Table 1-11: 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/A2: 1995	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 1-11: Certifications and compliances (Cont.)

Category	Standards or description	
Safety	Complies with the following safety standards/regulations:	
	UL 3111-1, First Edition	Standard for electrical measuring and test equipment.
	CAN/CSA C22.2 No.1010.1-92	Safety requirements for electrical equipment for measurement, control, and laboratory use.
	EN 61010-1/A2:1995	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.
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 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.
IEC Characteristics	Equipment type:	
	Test and Measuring Installation Category II (as defined in IEC 61010-1, Annex J) Pollution Degree 2 (as defined IEC 61010-1) Safety Class 1 (as defined in IEC 61010-1, Annex H)-grounded product	

Installation

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

Supplying Operating Power

***NOTE**. Read all information and heed all warnings in this subsection before connecting the MTX100 to a power source.*

***WARNING.** AC POWER SOURCE AND CONNECTION. The MTX100 operates from a single-phase power source. It has a three-wire power cord and two-pole, three-terminal grounding type plug. The voltage to ground (earth) from either pole of the power source must not exceed the maximum rated operating voltage, 250 volts.*

Before making connection to the power source, be sure the MTX100 has a suitable two-pole, three-terminal grounding-type plug.

GROUNDING. This instrument is safety Class 1 equipment (IEC designation). All accessible conductive parts are directly connected through the grounding conductor of the power cord to the grounded (earthing) contact of the power plug.

***WARNING.** The power input plug must be inserted only in a mating receptacle with a grounding contact where earth ground has been verified by a qualified service person. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric shock hazard.*

For electric shock protection, the grounding connection must be made before making connection to the instrument's input or output terminals.

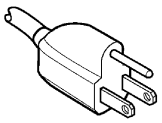
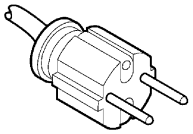
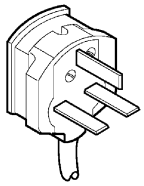
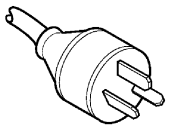
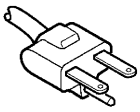
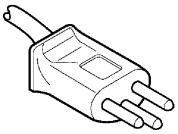
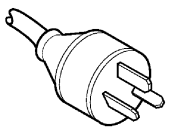
Power Cord Information

A power cord with the appropriate plug configuration is supplied with each MTX100. Table 2-1 gives the color-coding of the conductors in the power cord. If you require a power cord other than the one supplied, refer to Table 2-2, Power cord identification.

Table 2-1: Power-cord conductor identification

Conductor	Color	Alternate color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Light Blue	White
Grounded (Earthing)	Green/Yellow	Green

Table 2-2: Power cord identification

Plug configuration	Normal usage	Option number
	North America 125 V	Standard
	Europe 230 V	A1
	United Kingdom 230 V	A2
	Australia 230 V	A3
	North America 230 V	A4
	Switzerland 230 V	A5
	China 230 V	AC

Operating Voltage

The MTX100 operates with any line voltage from 100–240 VAC_{RMS} with any line frequency from 50–60 Hz. Before plugging the cord into the outlet, be sure that the line voltage is in the proper range.

Operating Environment

The following environmental requirements are provided to ensure proper operation and long instrument life.

Operating Temperature

Operate the MTX100 where the ambient air temperature is from +5° C to +40° C with no disc in the CD-ROM drive. Store the MTX100 in ambient temperatures from –20° C to +60° C with no disc in the CD-ROM drive. After storage at temperatures outside the operating limits, allow the chassis to stabilize at a safe operating temperature before applying power. See Table 2-3 for ventilation requirements.

Table 2-3: Ventilation requirements

Characteristics	Specifications
MTX100 ambient temperatures	from +5° C to +40° C
MTX100 relative humidity	from 20% to 80%
Clearance on top	5.0 cm (2in)
Clearance on left side	5.0 cm (2in)
Clearance on right side	5.0 cm (2in)
Clearance in rear	5.0 cm (2in)

***NOTE**. If you are installing the instrument in a dedicated rack, refer to the instruction sheet that comes with the rackmounting kit for proper installation procedures.*

When the MTX100 is mounted in a 19-inch rack, verify that there is at least one unit of clearance above the MTX100.

Applying and Interrupting Power

Consider the following information when you power on or power off the MTX100, or when external power loss occurs.

Connect Power Cable

Connect the proper power cord from the rear panel power connector to the power system. Refer to Table 2-2 for power cord identification.

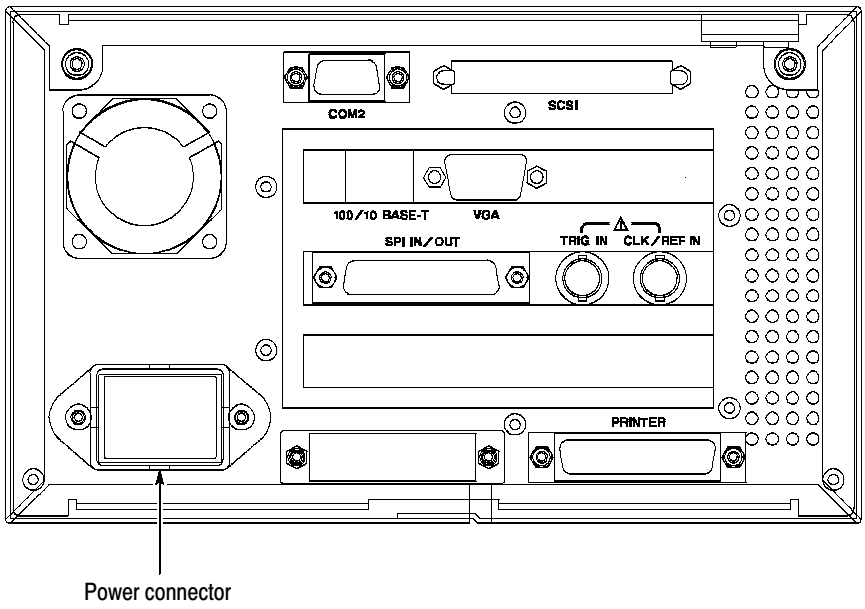


Figure 2-1: Rear panel power connector

CAUTION. *The instrument does not have a principal power switch. When you connect the power cable to the AC line connector, power is applied to the power supply standby circuit of the instrument.*

Power On

Press the **ON/STBY** switch on the lower left side of the front panel to power on the instrument. Refer to Figure 2-2.

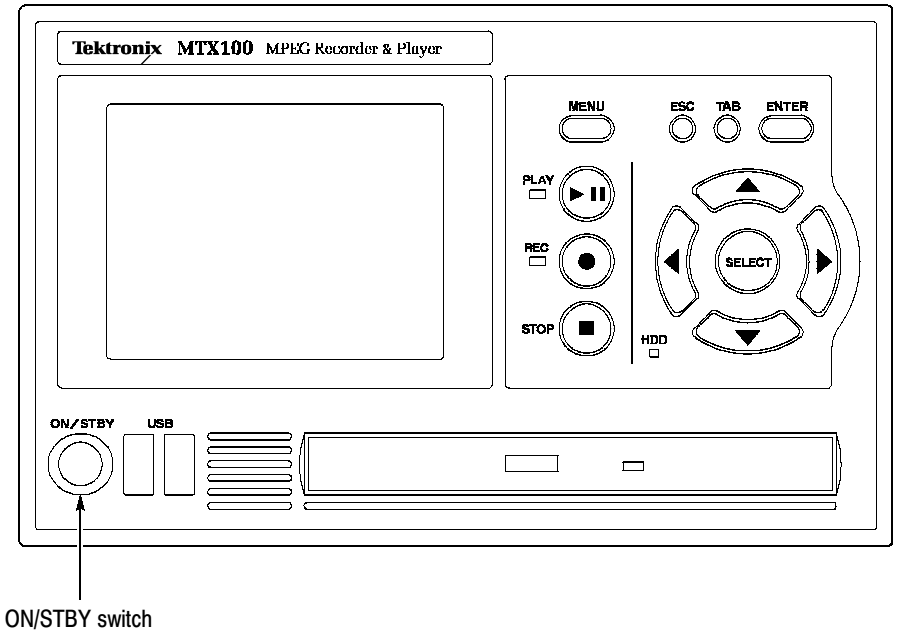


Figure 2-2: Front panel ON/STBY switch

Power Off

To power off the MTX100, press the **ON/STBY** switch.

If you connect the USB mouse and keyboard provided with the instrument to the USB connectors, you can shutdown the instrument by using the Shutdown command from the File menu. In the shutdown process, all of the instrument settings are saved.

Repackaging Instructions

If you ship the MTX100, pack it in the original shipping carton and packing material. If the original packing material is not available, package the instrument as follows:

1. Obtain a corrugated cardboard shipping carton with inside dimensions at least 15 cm (6 inches) taller, wider, and deeper than the instrument. The shipping carton must be constructed of cardboard with 170 kg (375 pound) test strength.
2. If you are shipping the instrument to a Tektronix field office for repair, attach a tag to the instrument showing the instrument owner and address, the name of the person to contact about the instrument, the instrument type, and the serial number.

3. Wrap the instrument with polyethylene sheeting or equivalent material to protect the finish.
4. Cushion the instrument in the shipping carton by tightly packing dunnage or urethane foam on all sides between the carton and the MTX100. Allow 7.5 cm (3 in) on all sides, top, and bottom.
5. Seal the shipping carton with shipping tape or an industrial stapler.

Installed Options

Your instrument may be equipped with one or more instrument options. Except for the line-cord options described by Table 2-2 on page 2-2, all options are listed and described in Section 7, *Options*. For further information and prices of instrument options, see your Tektronix Products catalog or contact your Tektronix Field Office.

Operating Instructions

Before servicing the MTX100, read the following operating instructions. These instructions are at the level appropriate for servicing the MTX100. The user manual contains complete operator instructions.

Display Elements

There are two types of screens to operate the MTX100; Play screen and Record screen.

- Play screen is used to output the selected stream. When you power on the instrument, this screen will display the last screen showing, previous to powering down.
- Record screen is used to record the input stream. When you press the REC button or select the Record command from the File menu while the Play screen is displayed, the screen switches to the Record screen.

Figure 2-3 shows the location of display elements of the Play screen. The display elements of the Record screen is the same as that of the Play screen.

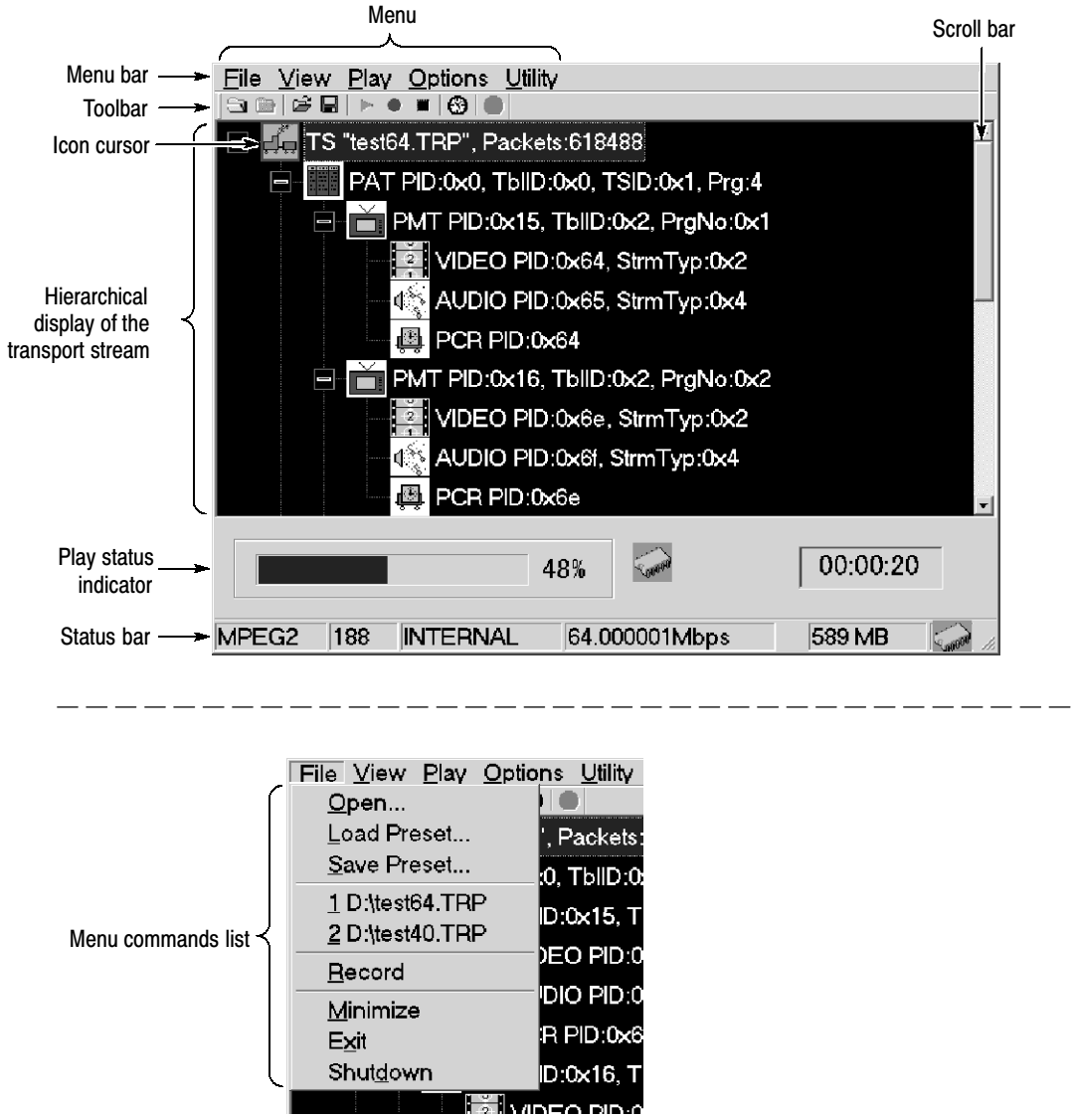


Figure 2-3: Elements of the Play screen

Basic Menu Operation

This section describes the basics of using the MTX100's menu and the methods for entering numeric input in the various dialog boxes.

The menus are displayed in the menu bar at the top of the Play or Record screen. You can operate these menus using the front panel MENU button, ESC button, TAB button, ENTER button, and the arrow buttons (see Figure 2-4).

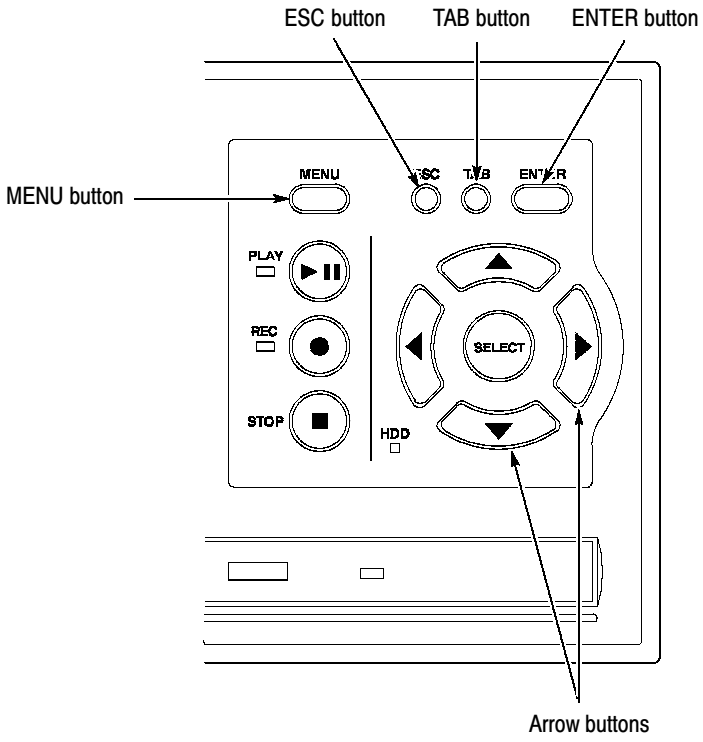


Figure 2-4: Front panel showing the menu controls

Accessing Menu Commands. To access any menu command, press the MENU button. When you press the MENU button, the File menu command list first opens.

Use the up (▲) or down (▼) arrow button to move through the command list. Press the ENTER button to execute the selected command.

Use the left (◀) or right (▶) arrow button to select the desired menu. Press the ESC button to close the command list temporarily.

Press the MENU button again to close the menu command list.

***NOTE**. When you press the left arrow button while the File menu is displayed or when you press the right arrow button while the Utility menu is displayed, the command list for window operation of the MTX100 application is displayed.*

Display States of the Menu Commands. The menu commands can have the following three display states as shown in Figure 2-5:

- A command followed by "▶" indicates a corresponding submenu will be displayed after you press the ENTER button or the right (▶) arrow button.
- A command followed by "..." indicates that a corresponding dialog box will open after you press the ENTER button.
- If a command name is only displayed, the command will be executed after you press the ENTER button.

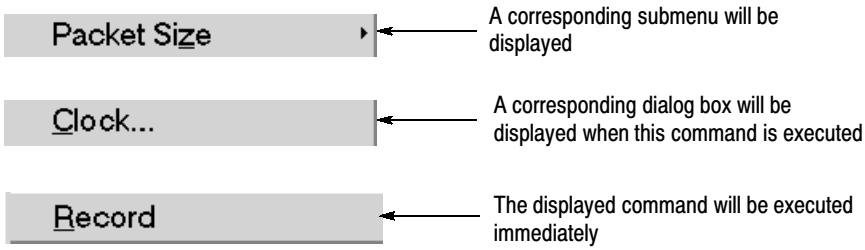


Figure 2-5: Display states of the menu commands

Numeric Input

You can enter numeric values in displayed dialog boxes by using the 10 key Pad or by using the arrow buttons.

Numeric Input Using the 10 Key Pad. Perform the following procedure to input numeric values by using the 10 Key Pad. Figure 2-6 shows the 10 key Pad.

1. Open a dialog box including the text box in which you want to change a parameter.
2. Press the **TAB** button repeatedly to select (highlight) the numeric parameter you want to change in the open dialog box.
3. Press the **SELECT** button to open the 10 Key Pad (see Figure 2-6).

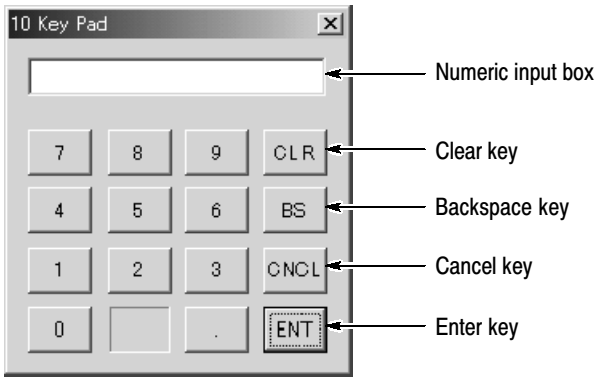


Figure 2-6: 10 key Pad

4. Press the **TAB** button or the arrow buttons to move the dotted line box on the number you want to input (when the key pad first opens, the box is located on the ENT key).
5. Press the **SELECT** button. This displays the selected number in the numeric input box.
6. Repeat steps 4 and 5 to input the desired parameter value.
7. Press the **ENTER** button (or select the **ENT** key and then press the **SELECT** button). This enables the new value in the numeric input box and closes the 10 Key Pad.

Numeric Input Using the Arrow buttons. Perform the following procedure to change a value by using the arrow buttons:

1. Open a dialog box including the text box that you want to change a parameter.
2. Press the **TAB** button repeatedly to select the numeric parameter you want to change in the open dialog box.
3. Press the left (◀) arrow button to begin editing the parameter. This highlights the last digit.
4. Press the left (◀) or right (▶) arrow button to move the highlighted cursor to the value you want to change.
5. Press the up (▲) or down (▼) arrow button to increase or decrease the value.
6. Repeat steps 4 and 5 to enter all of the desired values. If you add an input digit, press the left (◀) arrow button.
7. After you change all of the values, press the **ENTER** button.

About the Data Output Source

When you output the selected stream data, you can select either the hard disk or the RAM as an output source. This subsection describes the operation of the MTX100 when each output source is selected.

RAM When you select the RAM as an output source, the MTX100 performs the following:

- When data output rate is less than or equal to 120 Mbps, the MTX100 outputs the first stream data while transferring the data from the hard disk to the RAM and then continuously outputs the data from the RAM using looping methods.
- When data output rate is more than 120 Mbps, the MTX100 continuously outputs a stream data from the RAM using looping methods after the data is completely transferred from the hard disk to the RAM.

If you select the RAM as an output source, you cannot output the data over the RAM free space for the data output. This RAM free space is displayed on the status bar.

Hard Disk If you select the hard disk (Disk) as an output source, the MTX100 always outputs the selected stream data from the hard disk regardless of the data output rate. When the reading speed of the hard disk cannot overtake the data output rate, the error message “Error: Output Buffer Empty” appears.

Use the Source command in the Play menu to select the output source.

You can see the currently selected output source in the status bar.

Theory of Operation

This section describes the basic operation of the major circuit blocks or modules in the MTX100. The *Diagrams* section, beginning on page 9-1, includes a block diagram and an interconnect diagram.

A10 Main Board

The A10 Main board consists of the following six blocks:

PCI Interface The PCI interface consists of a target and an initiator. In the target, the control port of the A10 Main board is mapped. The initiator has two DMA controllers which read the data from and write the data to the system RAM.

Mega FIFO The FIFO consists of two 8-MB SDRAMs. Each of the SDRAMs is used for outputing and recording a stream data respectively. This FIFO is used to compensate for non-realtime operation of Windows 2000.

TS Controller The TS controller consists of PSYNC Generator, DVALID Generator, PCR Counter, PCR DTS/PTS Inserter, and the peripheral circuit.

Interrupt Controller The interrupt controller sends the following interruption signals to the CPU: External Trigger, Play FIFO Empty, Record FIFO Full, and 100 ms timer.

TS Clock Generator The TS clock generator consists of two types of clock generators for stream output: Low Band clock generator and High Band clock generator. The Low Band clock generator generates the clock signal ranges from 64 MHz to 96 MHz. The High Band clock generator generates the clock signal ranges from 96 MHz to 128 MHz. The output signals of these clock generators are divided by the dividing circuit, and they are output as a serial or parallel clock.

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 Back Plane Board

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

PCI and ISA Connectors

The connectors J400 and J410 are the system slots and are used to insert the CPU board. The connectors J420 and J430 are the PCI card slots for the A10 Main board and the optional interface module.

ATX Power Control Circuit

The POWER_SW line is connected to the power switch on the front panel. When the power switch is pressed, the line causes K200 to go on. When K200 is on, +5 V main power is also on, and its status is sent to BIOS on the A20 CPU board. When the power switch is pressed again, its status is sent to BIOS and the K200 turns off. The +5 V main power is off when the K200 is off. This circuit includes a +5 V to +12 V DC-DC converter, a –12 V power supply, and a +3.3 V power supply.

Interconnect Circuit

There are four connectors in the interconnect circuit: J130, J140, J160, and J170. J130 is used to connect the board to the LCD interface on the CPU board. J140 is used to connect the board to COM1 on the CPU board. J160 is used to connect the board to the USB connectors on the A35 Power Switch board. J170 is used to connect the board to the A30 Front Panel board. This circuit also has a RS-232C level converter.

A30 Front Panel Board

The A30 Front Panel board consists of the front panel processor circuit, video inverter circuit, rubber contact switches, three connectors, and two LEDs.

A35 Power Switch Board

The A35 Power Switch board is connected to the A20 PCI Back Plane board through the A30 Front Panel board. There are two USB connectors on this board.

A100 ASI Interface Module (Option 01)

The A100 ASI Interface module consists of the following five blocks:

Local Bus Interface The local bus interface communicates with the A10 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 A10 Main board in one-on-one.

FPGA The FPGA consists of an FIFO and PCI interface. The FIFO is used to output a stream data in packet mode. In this mode, a stream data from the A10 Main board is stored in it, and then the data is output in synchronism 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.

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 six blocks:

Local Bus Interface The local bus interface communicates with the A10 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 A10 Main board in one-on-one.

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 par 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 comparator par 1 bit. One is used to receive a single-end signal and the other is used to receive a differential signal. Either of the comparators is 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.

A120 BNC Serial Interface Module (Option 03)

The A120 BNC Serial Interface module consists of the following six blocks:

Local Bus Interface The local bus interface communicates with the A10 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 A10 Main board in one-on-one.

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. There is a 32-bit register in the PCI interface. It controls the board operation.

Pin Drivers The pin drivers convert output signals from the FPGA into the signals with selected level.

Receivers Each of the receivers uses a comparator par 1 bit.

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 comparators.

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

A130 DHEI Interface Module (Option 04)

The A130 DHEI Interface module consists of the following five blocks:

Local Bus Interface The local bus interface communicates with the A10 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 A10 Main board in one-on-one.

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. There is a 32-bit resistor in the PCI interface. It controls the board operation.

Drivers The drivers drive the output signals from the FPGA.

Receivers Each of the receivers uses one comparator par one input to receive a differential signal.

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

A140 IEEE 1394 Interface Module (Option 05)

Packet Controller

Two operational modes are available to output data stored in the MTX100: 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 rate 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 MTX100 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 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 packet-by-packet basis is called Packet mode.

In Byte mode, the data sent from A10 board is output as they are. In Packet mode, the 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 packet-by-packet basis. This FIFO has 9 bit 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 A10 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 of 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 MTX100, and that of output port is 216 Mbps (with the 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 with selected audio/video program(s) from MPEG-2 transport packets. In transmitting/receiving multiple numbers of audio/video programs with 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 the data in the MTX100, all the packets are recorded as a serial data. When reproduced 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 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 A10 board, and counts down the value written in this 4 bytes data with 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 Busy signal to stop the operation of A10 board. The size of packet possible to be handled by 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 operation reversal to that of Partial TS Controller 1. It counts the period of time between the packets being received with 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 one byte of 4 bytes data becomes zero. While 4 bytes 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 lack 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 for the purpose 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 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 A10 board.

A160 SMPTE310M/ASI Interface Module (Option 06)

SMPTE310M

The SMPTE310M format supports data with bit rate of 8-VSB (19.39 Mbps). Because the SMPTE310M uses Biphase-mark coding, a clock with twofold of the data bit rate (i.e., 40MHz) is required for decoding and encoding processes. The receiver passes the received data signal through a delay line to generate a clock signal with twofold of the data bit rate from the received data signal itself. The transmitter receives the clock signal with twofold of the data bit rate from A10 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.

Difference between Packet and Byte Modes. Data rate of the ASI interface is up to 216 Mbps, and the data with rate 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 MTX100 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 in 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 in packet-by-packet basis is called Packet mode. In Byte mode, the data sent from A10 board are output as they are. In Packet mode, the data processing is required.

Packet Mode Operation. The FIFO shift register is used to output the data on packet-by-packet basis. This FIFO has 9 bit 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 A10 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 of 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 MTX100, and that of output port is 216 Mbps (with the clock of 27 MHz), which is used for the ASI output.

A10 Board I/O

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

Performance Verification

This section provides procedures that verify the performance of the MTX100. These tests confirm performance and functionality when the following conditions are met:

- The MTX100 must be operating in an environment that is within the operating limits described in Table 1-10 on page 1-17.
- The MTX100 and test equipment must have had a warm-up period of at least 20 minutes.

Equipment and Test Signals Required

Table 4-1 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 4-1: Equipment required for performance verification

Item	No.	Minimum requirements	Recommended equipment
Frequency counter	1	Frequency range: 0.1 Hz to 1250 MHz Precision: 7 digits or higher	ANRITSU MF 1603A and Tektronix DC5009
MPEG recorder & player	1	Data rate: 200 Mbps SPI, ASI, Universal parallel/serial, BNC serial, DHEI, and SMPTE310M interfaces	Tektronix MTX100 Option 01, 02, 03, 04, and 06
Data generator	1	Frequency: 40 M clock pattern Amplitude: 3 V	Tektronix DG2030 or Tegam PG502
Oscilloscope	1	Bandwidth: 1 GHz or higher	Tektronix TDS784D
Tuner	1	BS Digital	Panasonic TU-BHD100
MPEG test system	1	Master Client application	Tektronix MTS300 option LV (or the MTSF3LV upgrade) and MTS215
75 Ω to 50 Ω minimum loss attenuator	1	Bandwidth: 1 GHz Amplitude precision: -3 dB	Tektronix AMT75
75 Ω precision termination	1		Tektronix part number 011-0163-00
Probe	1	X 1	Tektronix P6101B
BNC cable	1	Impedance: 50 Ω Length: 42 inches	Tektronix part number 012-0057-01
BNC cable	4	Impedance: 75 Ω Length: 42 inches	Tektronix part number 012-0074-00

Table 4-1: Equipment required for performance verification (Cont.)

Item	No.	Minimum requirements	Recommended equipment
High definition cable	1	26-pin, D-type for DHEI interface option 04	GI/Motorola 415406-003
i-Link cable	1	2 m	---
Parallel interface cable	1	25-pin, D-type	Tektronix part number 012-A220-00, (supplied with the MTX100)

The MTX100 is shipped from the factory with sample MPEG test files loaded on the hard disk. Two of these files are required to perform the performance verification procedures. Table 4-2 lists the required test files and the performance verification tests that require these files.

Table 4-2: MPEG test files required for performance verification

File name	Performance verification tests
test40.TRP	SPI Interface, ASI Interface (Option 01 only), Universal Parallel/Serial Interface (Option 02 only), BNC Serial Interface (Option 03 only), and DHEI Interface (Option 04 only)
test64.TRP	Internal Clock Frequency and External Clock/Reference Input
TS1394.TRP	IEEE1394 Interface (Option 05 only)
8VSB_test.TRP	SMPTE310M Interface (Option 06 only)

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 perform the performance verification procedures, be sure that the MTX100 is operating in an environment that is within the operating limits described in Table 1-10 on page 1-17.*

In addition, the MTX100 and the test equipment must be warmed up for at least 20 minutes to ensure accurate test results.

The performance verification procedures appear in the following order:

1. Internal clock frequency
2. External clock/reference input
3. External trigger input
4. SPI interface
5. ASI interface (Option 01 only)
6. Universal parallel/serial interface (Option 02 only)
7. BNC serial interface (Option 03 only)
8. DHEI interface (Option 04 only)
9. IEEE1394/ASI interface (Option 05 only)
10. SMPTE310M/ASI interface (Option 06 only)

Internal Clock Frequency

This test verifies the frequency of the MTX100's internal clock. The following equipment and MPEG test signal is required for this test:

- Frequency counter
- Probe
- test64.TRP MPEG test signal

Perform the following procedure to verify the internal clock frequency of the MTX100:

1. Connect the probe to the input of the frequency counter, and then attach the probe tip to **pin 1** of the SPI IN/OUT connector on the MTX100 as shown in Figure 4-1.

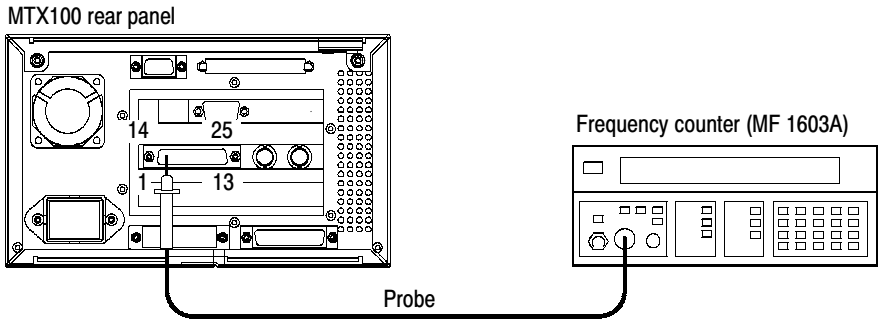


Figure 4-1: Equipment connection for verifying the internal clock frequency

2. Set the frequency counter to the frequency measurement mode (if necessary), and then set the Gate Time to > 0.2 s.
3. Open the test64.TRP file on the MTX100.
   a. Select **Open** from the **File** menu.
   b. In the resulting **Select File** dialog box, select the **test64.TRP** file, and then press the **ENTER** button.
4. Press the **PLAY** button on the MTX100 to start the signal output of the test64.TRP file.
5. Verify that the indicator at the left side of the PLAY button is illuminated.
6. Set the frequency counter to trigger on the input, and then confirm that the displayed frequency is within the range of 7.999992 MHz to 8.000008 MHz.
7. Press the **STOP** button on the MTX100 to stop the signal output, and then remove the probe tip from the SPI IN/OUT connector.

External Clock/Reference Input

This test confirms that the external clock/reference input (CLK/REF IN input) on the MTX100 is functioning correctly. The following equipment and MPEG test signal is required for this test:

- MPEG test system
- Data generator
- 50 Ω BNC cable
- Parallel interface cable
- test64.TRP MPEG test signal

Perform the following procedure to verify that the external clock/reference input (CLK/REF IN input) on the MTX100 is functioning correctly:

1. Use the 50 Ω BNC cable to connect the CLK/REF IN connector on the MTX100 to the CH0 connector on the front panel of the data generator as shown in Figure 4-2.
2. Use the parallel interface cable to connect the SPI IN/OUT connector on the MTX100 to the SPI (LVDS) 3 IN connector on the rear panel of the MPEG test system as shown in Figure 4-2.

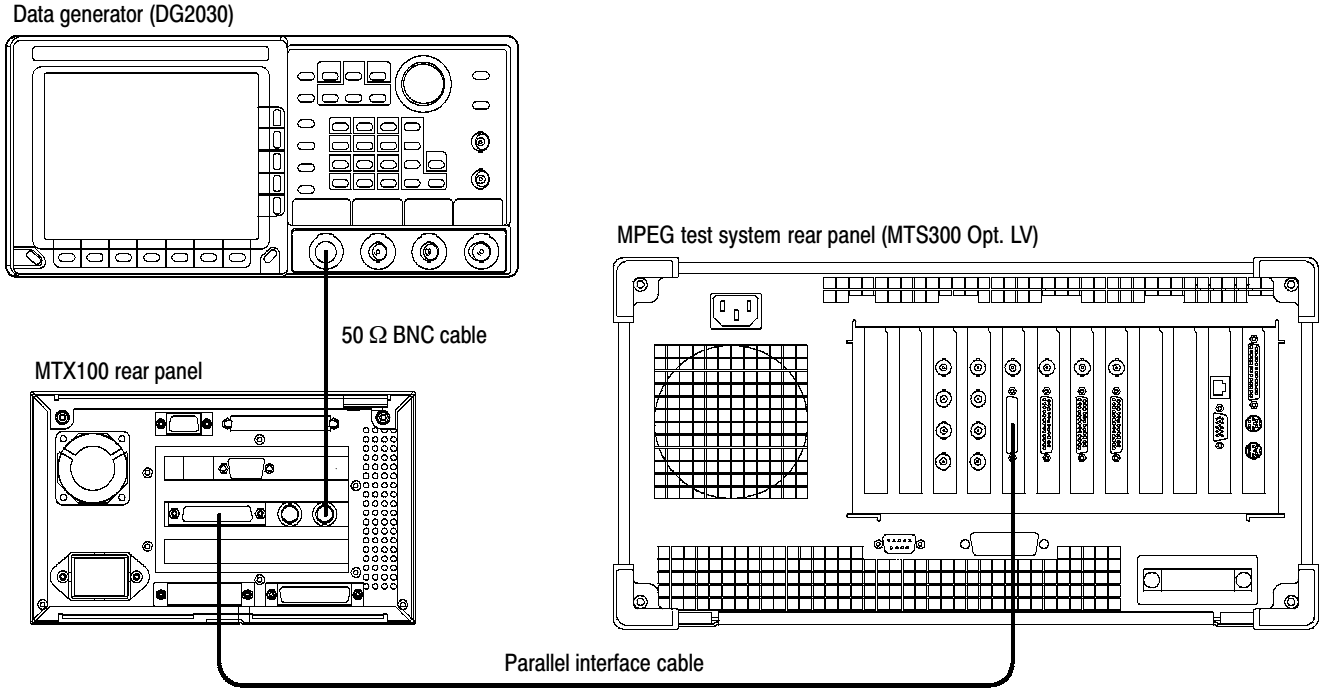


Figure 4-2: Equipment connections for verifying the external clock/reference input

3. Set the data generator controls as indicated below:

   Internal clock frequency . . . . . 20 MHz on DG2030 or 10 MHz on PG502
   Output pattern data . . . . . Clock pattern
   Output High level . . . . . 3.0 V
   Output Low level . . . . . 1.0 V

4. Open the test64.TRP file on the MTX100.

   a. Select **Open** from the **File** menu.

   b. In the resulting **Select File** dialog box, select the **test64.TRP** file, and then press the **ENTER** button.

5. Set **Update** to **On** from the **Play** menu on the MTX100.

6. Select **Clock** from the **Play** menu on the MTX100 to open the Clock dialog box.

7. Select **ExtRef 10** in the Clock dialog box, and then press the **ENTER** button.

8. Press the **START/STOP** button on the data generator to start the pattern data output.

9. Press the **PLAY** button on the MTX100 to start the signal output of the test64.TRP file.

10. Verify that the indicator at the left side of the PLAY button is illuminated.

11. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

12. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

13. Select I/O #3 in the Port Manager panel, right click, and then select **Assign ▶ Analysis Server** from the shortcut menu.

14. Select the Analysis Server icon (I/O #3), right click, and then select **Start Analysis** from the short cut menu.

15. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

17. Change the clock source setting on the MTX100 and internal clock frequency setting on the data generator with the following and repeat step 16.

Clock Source setting (MTX100)	Internal Clock Frequency setting
ExtRef 27	54 MHz (DG2030) / 27 MHz (PG502)
Ext P Clk	16 MHz (DG2030) / 8 MHz (PG502)
Ext S Clk	128 MHz (DG2030) / 64 MHz (PG502)

18. Select the Analysis Server icon (I/O #3), right click, and then select **Stop Analysis** from the shortcut menu.

19. Select **Clock** from the **Play** menu on the MTX100 to open the Clock dialog box.

20. Select **Internal** in the Clock dialog box, and then press the **ENTER** button.

21. Press the **STOP** button on the MTX100 to stop the signal output.

External Trigger Input

This test confirms that the external trigger input (TRIG IN input) on the MTX100 is functioning correctly. The following equipment is required for this test:

- Data generator
- 50 Ω BNC cable

Perform the following procedure to verify that the external trigger input (TRIG IN input) on the MTX100 is functioning correctly:

1. Use the 50 Ω BNC cable to connect the TRIG IN connector on the MTX100 to the CH0 connector on the front panel of the data generator as shown in Figure 4-3.

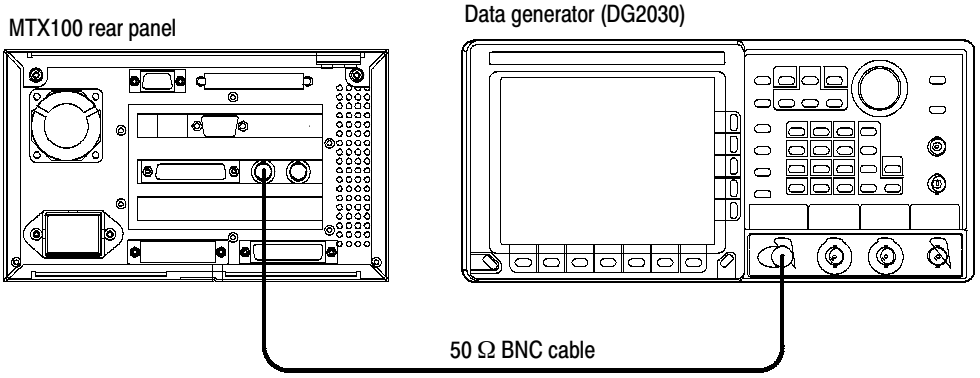


Figure 4-3: Equipment connection for verifying the external trigger input

2. Set the data generator controls as indicated below:

   Internal clock frequency . . . . . 20 MHz
   Output pattern data . . . . . Clock pattern
   Output High level . . . . . 2.0 V
   Output Low level . . . . . 0.0 V
   Run mode . . . . . Step

3. Press the **REC** button on the MTX100 to display the Record screen.
4. Select **Other** from the **Record** menu on the MTX100 to open the Others dialog box.
5. Set **Ext Record Start** to **Rise** in the Others dialog box, and then press the **ENTER** button.
6. Press the **START/STOP** button on the data generator to start the pattern data output.

7. Press the **STEP/EVENT** button twice on the data generator and verify that the indicator at the left side of the REC button on the MTX100 is illuminated.
8. Select **Other** from the **Record** menu on the MTX100 to open the Others dialog box.
9. Set **Ext Record Start** to **Fall** in the Others dialog box, and then press the **ENTER** button.
10. Repeat step 7.
11. Press the **START/STOP** button on the data generator to stop the pattern data output.
12. Press the **PLAY** button on the MTX100 to display the Play screen.

SPI Interface

This test verifies that transport stream data is correctly output from and recorded through the SPI IN/OUT connector on the MTX100. The following equipment and MPEG test signal is required for this test:

- MPEG recorder & player (MTX100 Option 01)
- MPEG test system
- Parallel interface cable
- test40.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is correctly output from and recorded through the SPI IN/OUT connector on the MTX100:

1. Use the parallel interface cable to connect the SPI IN/OUT connector on the MTX100 to the SPI IN/OUT connector on the MPEG recorder & player as shown in Figure 4-4.

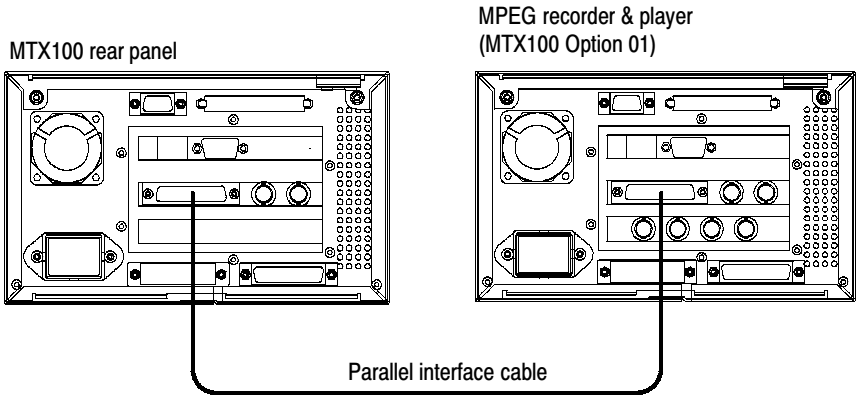


Figure 4-4: Initial equipment connection for verifying the SPI interface

Checking the Play Operation.

2. Open the test40.TRP file on the MTX100.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

3. In the **Play** menu on the MTX100, make the following settings:

Data rate . . . . 120 Mbps
Update . . . . . Off
Source . . . . . Disk

4. Press the **REC** button on the MPEG recorder & player to display the record screen.

5. In the **Record** menu on the MPEG recorder & player, make the following settings:

Source . . . . . SPI
Record size . . 100 MBytes
Target . . . . . RAM

6. Press the **PLAY** button on the MTX100 to start the signal output of the test 40.TRP file.

7. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 120 Mbps.

8. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

9. In the dialog box, enter **SPI120MD** for the file name that is used to save the test file, and then press the **ENTER** button.

10. Press the **REC** button on the MPEG recorder & player to record the test file.

11. Change the MTX100 settings as follows:

    Data rate . . . . 200 Mbps
    Source . . . . . . RAM

12. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 200 Mbps.

13. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

14. In the dialog box, enter **SPI200MR** for the file name that is used to save the test file, and then press the **ENTER** button.

15. Press the **REC** button on the MPEG recorder & player to record the test file.

16. Press the **STOP** button on the MTX100 to stop the stream output.

Checking the Record Operation.

17. Press the **REC** button on the MTX100 to display the Record screen.

18. In the **Record** menu on the MTX100, make the following settings:

    Source . . . . . . SPI
    Record size . . 4000 MBytes
    Target . . . . . . Disk

19. Press the **PLAY** button on the MPEG recorder & player to display the Play screen.

20. In the **Play** menu on the MPEG recorder & player, make the following settings:

    Data rate . . . . 120 Mbps
    Update . . . . . . Off
    Source . . . . . . RAM

21. Open the SPI120MD file on the MPEG recorder & player.

    a. Select **Open** from the **File** menu.

    b. In the resulting **Select File** dialog box, select the **SPI120MD** file, and then press the **ENTER** button.

22. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

23. Verify that the hierarchic view is displayed on the screen of the MTX100. In addition, verify that the bit rate display is 120 Mbps.

24. Select **Save** from the **File** menu on the MTX100 to open the **Save As** dialog box.

25. In the dialog box, enter **SPI120MD** for the file name that is used to save the test file, and then press the **ENTER** button.

26. Press the **REC** button on the MTX100 to record the **SPI120MD** file.

27. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

28. Change the data rate settings of the MPEG recorder & player to 200 Mbps.

29. Change the MTX100 settings as follows:

Record size . . 100 Mbyte
Source . . . . . RAM

30. Open the SPI200MR file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **SPI200MR** file, and then press the **ENTER** button.

31. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

32. Verify that the hierarchic view is displayed on the screen of the MTX100. In addition, verify that the bit rate display is 200 Mbps.

33. Select **Save** from the **File** menu on the MTX100 to open the **Save As** dialog box.

34. In the dialog box, enter **SPI200MR** for the file name that is used to save the test file, and then press the **ENTER** button.

35. Press the **REC** button on the MTX100 to record the **SPI200MD** file.

36. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

Checking the Recorded Files.

37. Disconnect the parallel interface cable from the SPI IN/OUT connector on the MPEG recorder & player, and then connect the parallel interface cable to the SPI (LVDS) 3 IN connector on the MPEG test system as shown in Figure 4-5.

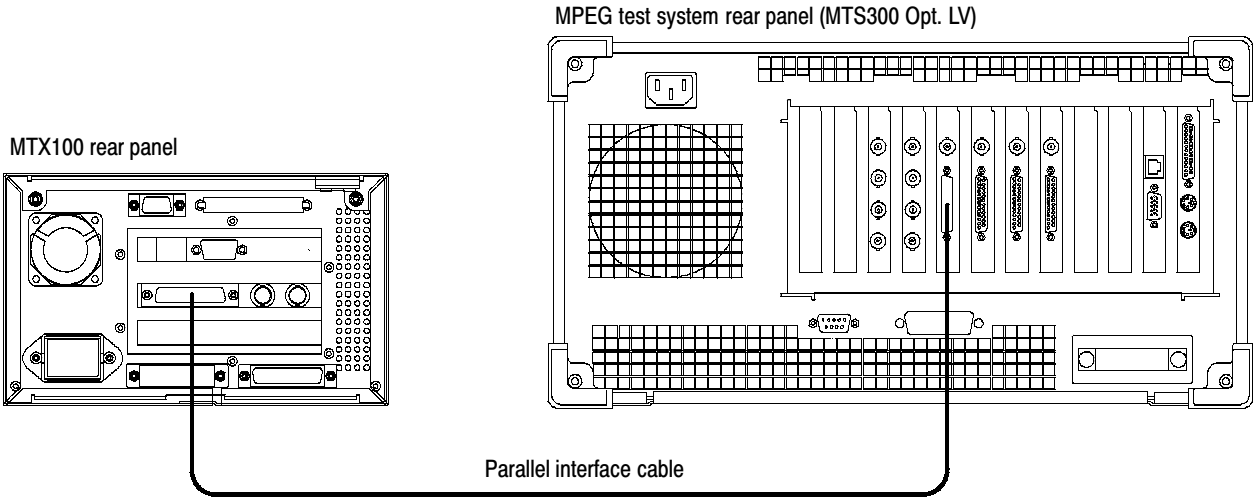


Figure 4-5: Second equipment connection for verifying the SPI interface

38. Press the **PLAY** button on the MTX100 to display the Play screen.

39. Change **Update** to **On** from the **Play** menu on the MTX100.

40. Open the SPI120MD file on the MTX100.

- **a.** Select **Open** from the **File** menu.
- **b.** In the resulting **Select File** dialog box, select the **SPI120MD** file, and then press the **ENTER** button.

41. Press the **PLAY** button on the MTX100 to start the signal output of the file.

42. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

43. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

44. Select I/O #3 in the Port Manager panel, right click, and then select **Assign ▶ Analysis Server** from the shortcut menu.

45. Select the Analysis Server icon (I/O #3), right click, and then select **Start Analysis** from the short cut menu.

46. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

47. Verify that the Hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the transmission rate is 40 Mbps and that the transport stream packet size is 188 bytes.

48. Press the **STOP** button on the MTX100 to stop the stream output.

49. Open the SPI200MR file on the MTX100.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **SPI200MR** file, and then press the **ENTER** button.

50. Press the **PLAY** button on the MTX100 to start the signal output of the file.

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

52. Press the **STOP** button on the MTX100 to stop the stream output.

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 MTX100 Option 01. The following equipment and MPEG test signal is required for this test:

- MPEG recorder & player (MTX100 Option 01)
- MPEG test system
- Oscilloscope
- Two 75 Ω BNC cables
- 75 Ω to 50 Ω minimum loss attenuator
- test40.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is output from and is recorded through the SPI IN/OUT connector on the MTX100 Option 01:

Checking the Output Signals.

1. Use the 75 Ω BNC cable and the 75 Ω to 50 Ω minimum loss attenuator to connect the ASI OUT 1 connector on the MTX100 Option 01 to the oscilloscope CH1 input as shown in Figure 4-6.

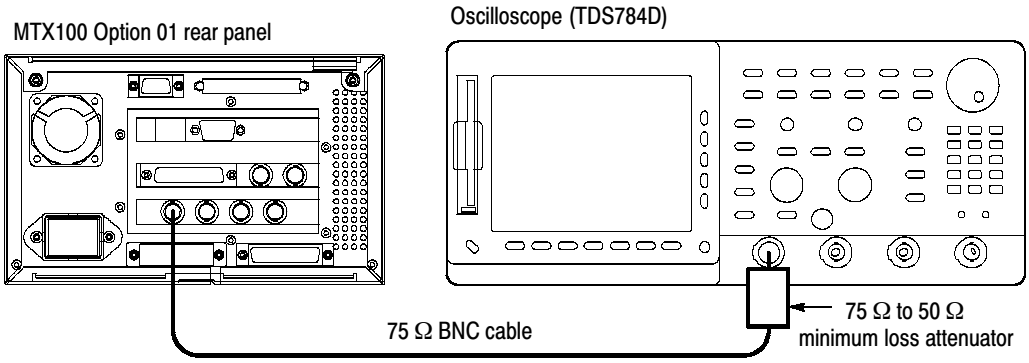


Figure 4-6: Initial equipment connection for verifying the ASI interface

2. Set the oscilloscope controls as indicated below:

   Displayed channel CH1
   Vertical scale . . . . . 200 mV/div
   Horizontal scale . . . . . 500 ps/div
   Horizontal position . . . . Center
   Acquire mode . . . . . Average 64
   Trigger mode . . . . . Auto
   Trigger level . . . . . 0 V
   Trigger source CH1
   Trigger position 50%
   Trigger slope . . . . . Rising Edge
   Input coupling . . . . . DC
   Input impedance . . . . . 50 Ω
   Measure . . . . . Amplitude, Rise Time, Fall Time
   Level Setup Histogram . High Ref 80%, Low Ref 20%

3. Open the test40.TRP file on the MTX100 Option 01.

   a. Select **Open** from the **File** menu.

   b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

4. Press the **PLAY** button on the MTX100 Option 01 to start the signal output of 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 MTX100 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 MTX100 Option 01 using the 75 Ω BNC cable.

9. Set **Through Out** to **On** from **ASI I/F** menu on the MTX100 Option 01 and then repeat step 5.

Checking the Play Operation.

10. Disconnect the BNC cable from the 75 Ω to 50 Ω minimum loss attenuator on the oscilloscope's input, and then connect the BNC cable to the ASI IN connector on the MPEG recorder & player as shown in Figure 4-7.

11. Disconnect the BNC cable from the through output of the ASI IN connector on the MTX100 Option 01, and then connect the BNC cable to the ASI OUT 2 connector on the MTX100 Option 01 rear panel as shown in Figure 4-7.

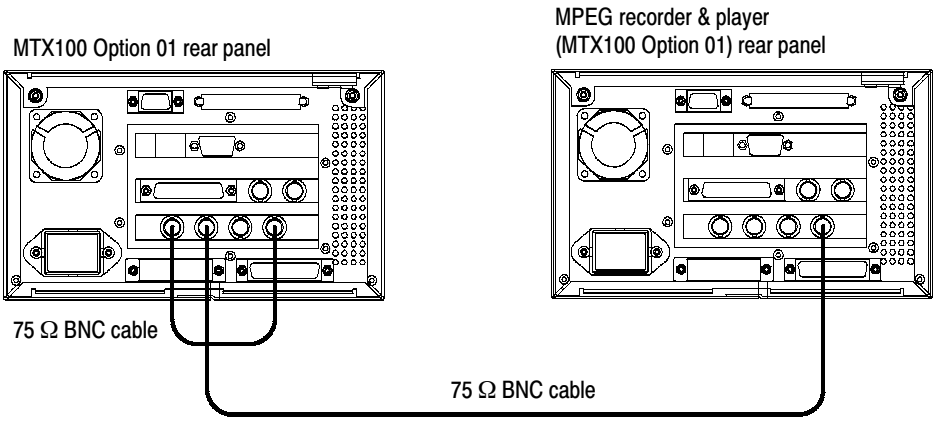


Figure 4-7: Second equipment connections for verifying the ASI interface

12. In the **Play** menu on the MTX100 Option 01, make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

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

14. In the **Record** menu on the MPEG recorder & player, make the following settings:

Source . . . . . ASI
Record size . . 100 MBytes
Target . . . . . RAM

15. Press the **PLAY** button on the MTX100 Option 01 to start the signal output of the test 40.TRP file.

16. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 200 Mbps.

17. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

18. In the dialog box, enter **ASItest** for the file name that is used to save the test file, and then press the **ENTER** button.

19. Press the **REC** button on the MPEG recorder & player to record the test file.

20. Move the BNC cable connection from the ASI OUT 2 connector to the through output of the ASI IN connector.

21. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 200 Mbps.

22. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

23. In the dialog box, enter **Looptest** for the file name that is used to save the test file, and then press the **ENTER** button.

24. Press the **REC** button on the MPEG recorder & player to record the test file.

25. Press the **STOP** button on the MTX 100 Option 01 to stop the stream output.

26. Disconnect the two BNC cables from the MTX100 Option 01 and MPEG recorder & player.

Checking the Record Operation.

27. Use a 75 Ω BNC cable to connect the ASI OUT1 connector on the MPEG recorder & player to the ASI IN connector on the MTX100 Option 01 as shown in Figure 4-8.

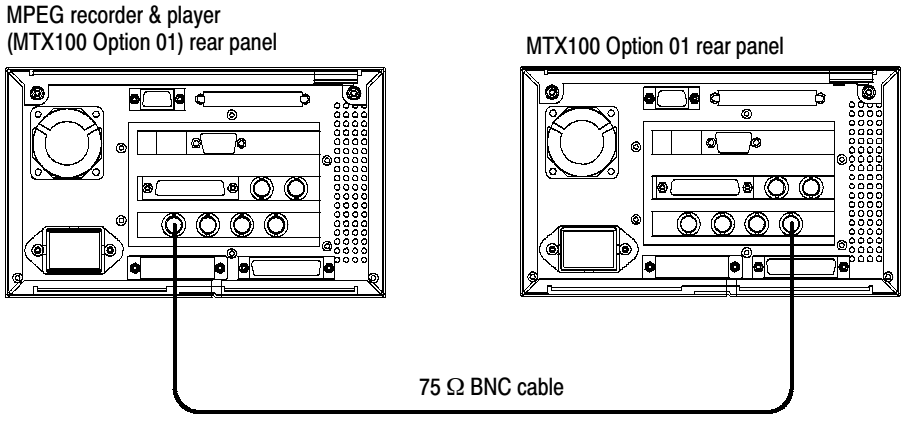


Figure 4-8: Third equipment connection for verifying the ASI interface

28. Press the **REC** button on the MTX100 Option 01 to display the Record screen.

29. In the **Record** menu on the MTX100 Option 01, make the following settings:

Source . . . . . ASI
Record size . . 100 MBytes
Target . . . . . RAM

30. Press the **PLAY** button on the MPEG recorder & player to display the Play screen.

31. In the **Play** menu on the MPEG recorder & player, make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

32. Open the ASItest file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **ASItest** file, and then press the **ENTER** button.

33. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

34. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 01. In addition, verify that the bit rate display is 200 Mbps.

35. Select **Save** from the **File** menu on the MTX100 Option 01 to open the **Save As** dialog box.

36. In the dialog box, enter **ASItest** for the file name that is used to save the test file, and then press the **ENTER** button.

37. Press the **REC** button on the MTX100 Option 01 to record the **ASItest** file.

38. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

39. Open the Looptest file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Looptest** file, and then press the **ENTER** button.

40. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

41. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 01. In addition, verify that the bit rate display is 200 Mbps.

42. Select **Save** from the **File** menu on the MTX100 Option 01 to open the **Save As** dialog box.

43. In the dialog box, enter **Looptest** for the file name that is used to save the test file, and then press the **ENTER** button.

44. Press the **REC** button on the MTX100 Option 01 to record the **Looptest** file.

45. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

46. Disconnect the BNC cable from the ASI IN connector on the MTX100 Option 01.

Checking the Recorded Files.

47. Use the 75 Ω BNC cable to connect the ASI OUT1 connector on the MTX100 Option 01 to the ASI 1 IN connector on the MPEG test system as shown in Figure 4-9.

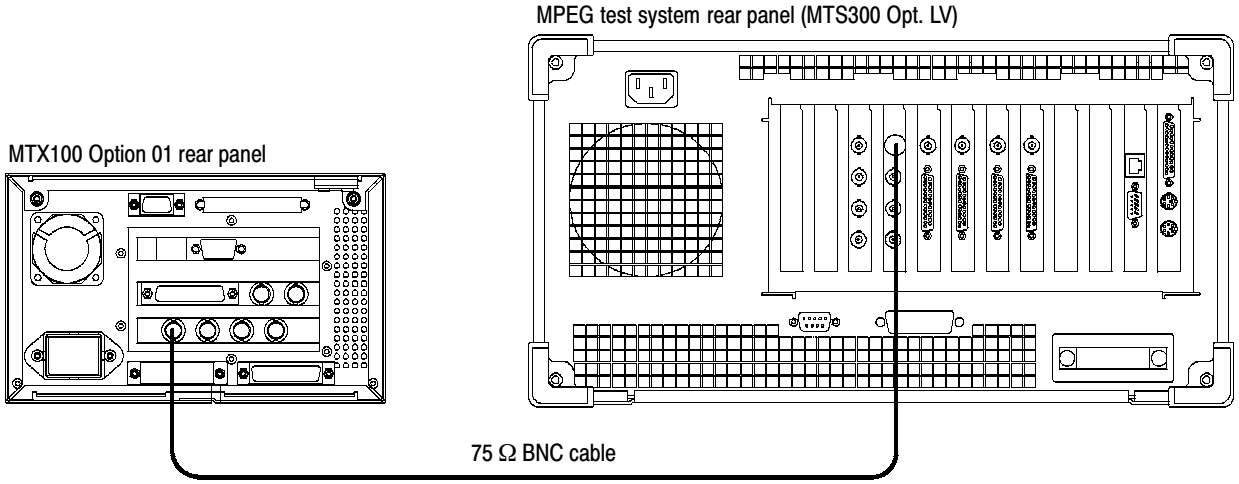


Figure 4-9: Fourth equipment connection for verifying the ASI interface

48. Press the **PLAY** button on the MTX100 Option 01 to display the Play screen.

49. Change **Update** to **On** from the **Play** menu on the MTX100 Option 01.

50. Open the ASItest file on the MTX100 Option 01.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **ASItest** file, and then press the **ENTER** button.

51. Press the **PLAY** button on the MTX100 Option 01 to start the signal output of the file.

52. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

53. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

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

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

56. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

58. Press the **STOP** button on the MTX100 Option 01 to stop the stream output.

59. Open the Looptest file on the MTX100 Option 01.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Looptest** file, and then press the **ENTER** button.

60. Press the **PLAY** button on the MTX100 Option 01 to start the signal output of the file.

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

62. Press the **STOP** button on the MTX100 Option 01 to stop the stream output.

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 MTX100 Option 02. The following equipment and MPEG test signal is required for this test:

- MPEG recorder & player (MTX100 Option 02)
- MPEG test system
- Oscilloscope
- Probe
- 50 Ω BNC cable
- Parallel interface cable
- test40.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is output from and is recorded through the UNIVERSAL IN/OUT connector on the MTX100 Option 02:

Checking the Output Signals.

1. Connect the probe to the oscilloscope CH1 input as shown in Figure 4-10.

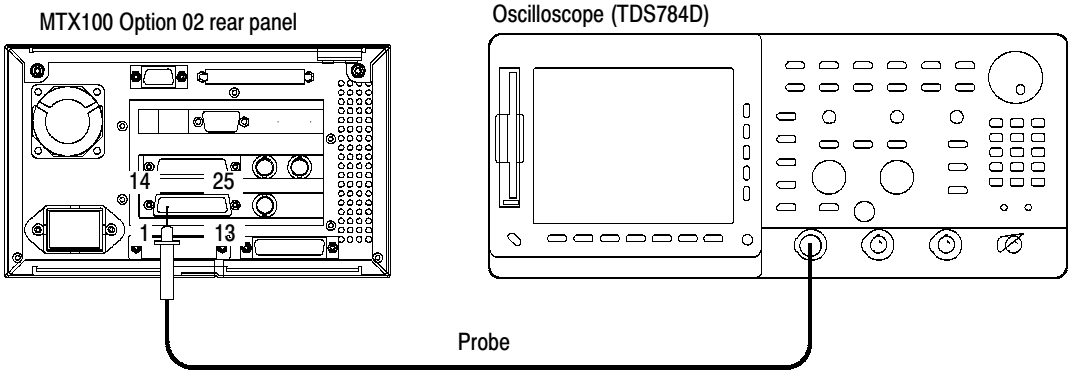


Figure 4-10: Initial equipment connection for verifying the universal parallel/serial interface

2. Set the oscilloscope controls as indicated below:

   Displayed channel CH1
   Vertical scale . . . . . 1 V/div
   Horizontal scale . . . . . 200 ns/div
   Horizontal position . . . . Center
   Acquire mode . . . . . Average 2
   Trigger mode . . . . . Auto
   Trigger level . . . . . 0 V
   Trigger source CH1
   Trigger position 50%
   Trigger slope . . . . . Rising Edge
   Input coupling . . . . . DC
   Input impedance . . . . . 50 Ω
   Measure . . . . . Amplitude

3. Press the **PLAY** button on the MTX100 Option 02 to display the Play screen.

4. Open the test40.TRP file on the MTX100 Option 02.

   a. Select **Open** from the **File** menu.

   b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

5. Select **Clock** from the **Play** menu on the MTX100 Option 02 to open the Clock dialog box.

6. Set **Data Rate** to **10 Mbps** in the Clock dialog box, and then press the **ENTER** button.

7. Set **Level** to **ECL** from the **Univ I/F** menu on the MTX100 Option 02.

8. Press the **PLAY** button on the MTX100 Option 02 to start the signal output of the test40.TRP file.

9. Attach the probe tip to **pin 1** of the UNIVERSAL IN/OUT connector on the MTX100 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 4-3.

12. Repeat step 11 for all other pins.

Table 4-3: Output level of each connector pin

	ECL		TTL		LVDS	
Pin number	**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. Change **Level** to **TTL** from the **Univ I/F** menu on the MTX100 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 4-3.

15. Change **Level** to **LVDS** from the **Univ I/F** menu on the MTX100 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 4-3.

Checking the Play Operation.

1. Use the parallel interface cable to connect the UNIVERSAL IN/OUT connector on the MTX100 Option 02 to the UNIVERSAL IN/OUT connector on the MPEG recorder & player as shown in Figure 4-11.

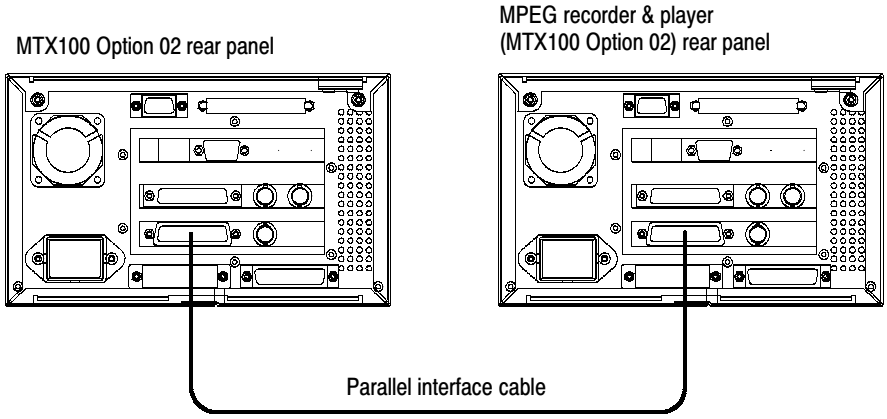


Figure 4-11: Second equipment connection for verifying the Universal parallel/serial interface

2. Press the **PLAY** button on the MTX100 Option 02 to display the Play screen.

3. In the **Play** menu on the MTX100 Option 02, make the following settings:

   Data rate . . . . 200 Mbps
   Update . . . . . Off
   Source . . . . . RAM

4. In the **Univ I/F** menu on the MTX100 Option 02, make the following settings:

   Level . . . . . LVDS
   Format . . . . . Parallel

5. Press the **REC** button on the MPEG recorder & player to display the Record screen.

6. In the **Record** menu on the MPEG recorder & player, make the following settings:

   Source . . . . . Univ I/F
   Record size . . 100 MBytes
   Target . . . . . RAM

7. In the **Univ I/F** menu on the MPEG recorder & player, make the following settings:

   Level . . . . . LVDS
   Format . . . . . Parallel
   Receive . . . . . Differential
   Termination . . On

8. Press the **PLAY** button on the MTX100 Option 02 to start the signal output of the test 40.TRP file.

9. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 200 Mbps.

10. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

11. In the dialog box, enter **UNIpara** for the file name that is used to save the test file, and then press the **ENTER** button.

12. Press the **REC** button on the MPEG recorder & player to record the test file.

13. Press the **STOP** button on the MTX100 Option 02 to stop the stream output.

14. Change **Data Rate** to **40 Mbps** from the **Play** menu on the MTX100 Option 02.

15. Change **Format** to **Serial** from the **Univ I/F** menu on the MTX100 Option 02.

16. Press the **REC** button on the MPEG recorder & player to display the Record screen.

17. Change **Format** to **Serial** from the **Univ I/F** menu on the MPEG recorder & player.

18. Press the **PLAY** button on the MTX100 Option 02 to start the signal output of the test 40.TRP file.

19. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 40 Mbps.

20. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

21. In the dialog box, enter **UNIseri** for the file name that is used to save the test file, and then press the **ENTER** button.

22. Press the **REC** button on the MPEG recorder & player to record the test file.

23. Press the **STOP** button on the MTX100 Option 02 to stop the stream output.

Checking the Record Operation.

24. Press the **REC** button on the MTX100 Option 02 to display the Record screen.

25. In the **Record** menu on the MTX100 Option 02, make the following settings:

Source . . . . . Univ I/F
Record size . . 100 MBytes
Target . . . . . RAM

26. In the **Univ I/F** menu on the MTX100 Option 02, make the following settings:

Level . . . . . LVDS
Format . . . . . Parallel
Receive . . . . . Differential
Termination . . On

27. Press the **PLAY** button on the MPEG recorder & player to display the Play screen.

28. In the **Play** menu on the MPEG recorder & player, make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

29. In the **Univ I/F** menu on the MPEG recorder & player, make the following settings:

Level . . . . . LVDS
Format . . . . . Parallel

30. Open the UNIpara file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **UNIpara** file, and then press the **ENTER** button.

31. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

32. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 02. In addition, verify that the bit rate display is 200 Mbps.

33. Select **Save** from the **File** menu on the MTX100 Option 02 to open the **Save As** dialog box.

34. In the dialog box, enter **UNIpara** for the file name that is used to save the test file, and then press the **ENTER** button.

35. Press the **REC** button on the MTX100 Option 02 to record the **UNIpara** file.

36. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

37. Change **Format** to **Serial** from the **Univ I/F** menu on the MTX100 Option 02.

38. Change **Data Rate** to **40 Mbps** from the **Play** menu on the MPEG recorder & player.

39. Change **Format** to **Serial** from the **Univ I/F** menu on the MPEG recorder & player.

40. Open the UNIseri file on the MPEG recorder & player.

    a. Select **Open** from the **File** menu.

    b. In the resulting **Select File** dialog box, select the **UNIseri** file, and then press the **ENTER** button.

41. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

42. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 02. In addition, verify that the bit rate display is 40 Mbps.

43. Select **Save** from the **File** menu on the MTX100 Option 02 to open the **Save As** dialog box.

44. In the dialog box, enter **UNIseri** for the file name that is used to save the test file, and then press the **ENTER** button.

45. Press the **REC** button on the MTX100 Option 02 to record the **UNIseri** file.

46. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

Checking signal acquisition for ECI and TTL Levels.

47. In the **Play** menu on the MPEG recorder & player, make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

48. In the **Univ I/F** menu on the MPEG recorder & player, make the following settings:

Level . . . . . ECL
Format . . . . . Parallel

49. In the **Univ I/F** menu on the MTX100 Option 02, make the following settings:

Level . . . . . ECL
Format . . . . . Parallel
Receive . . . . . Differential
Termination . . On

50. Open the test40.TRP file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

51. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the test40.TRP file.

52. Verify that no **Non-TS** and **No Signal** messages appear on the screen of the MTX100 Option 02. In addition, the hierarchic view and the bit rate are displayed correctly.

53. Change **Receive** to **Single** from the **Univ I/F** menu on the MTX100 Option 02, and then repeat step 52.

54. Change **Level** to **TTL** from the **Univ I/F** menu on the MPEG recorder & player.

55. Change **Level** to **TTL** and **Receive** to **Differential** from the **Univ I/F** menu on the MTX100 Option 02, and then repeat step 52.

56. Change **Receive** to **Single** from the **Univ I/F** menu on the MTX100 Option 02, and then repeat step 52.

57. Change **Data Rate** to **40 Mbps** from the **Play** menu on the MPEG recorder & player.

58. Change **Level** to **ECL** and **Format** to **Serial** from the **Univ I/F** menu on the MPEG recorder & player.

59. In the **Univ I/F** menu on the MTX100 Option 02, make the following settings:

Level . . . . . ECL
Format . . . . . Serial
Receive . . . . . Differential

60. Repeat step 52.

61. Change **Receive** to **Single** from the **Univ I/F** menu on the MTX100 Option 02, and then repeat step 52.

62. Change **Level** to **TTL** from the **Univ I/F** menu on the MPEG recorder & player.

63. Change **Level** to **TTL** and **Receive** to **Differential** from the **Univ I/F** menu on the MTX100 Option 02, and then repeat step 52.

64. Change **Receive** to **Single** from the **Univ I/F** menu on the MTX100 Option 02, and then repeat step 52.

65. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

66. Disconnect the parallel interface cable from the MTX100 Option 02 and MPEG recorder & player.

Checking the Recorded Files.

67. Use the parallel interface cable to connect the SPI IN/OUT connector on the MTX100 Option 02 to the SPI (LVDS) 3 IN connector on the MPEG test system as shown in Figure 4-12.

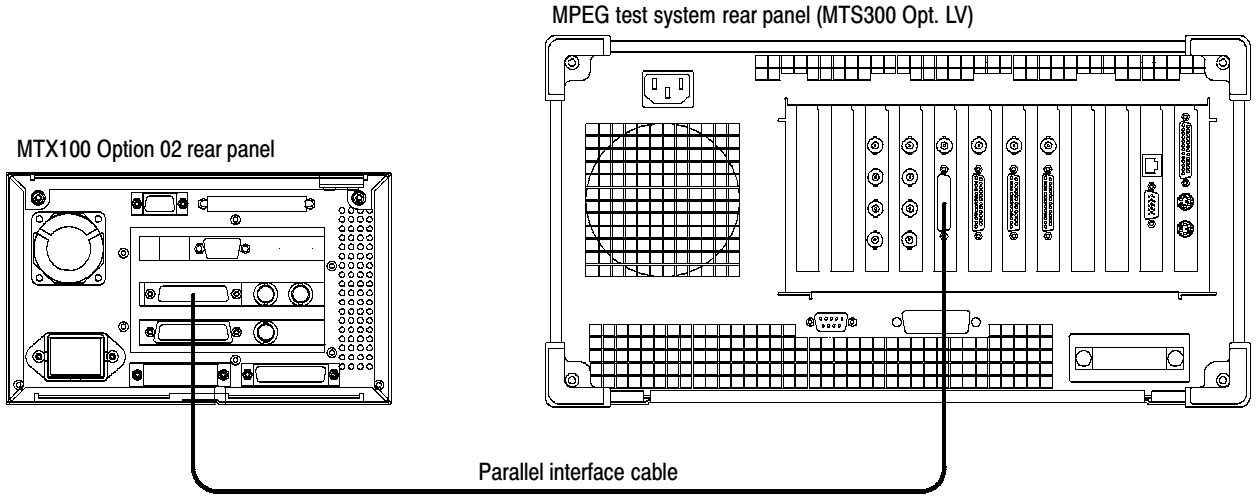


Figure 4-12: Third equipment connection for verifying the universal parallel/serial interface

68. Press the **PLAY** button on the MTX100 Option 02 to display the Play screen.

69. Change **Update** to **On** from the **Play** menu on the MTX100 Option 02.

70. Change **Level** to **LVDS** and **Format** to **Parallel** from the **Univ I/F** menu on the MTX100 Option 02.

71. Open the UNIpara file on the MTX100 Option 02.

- **a.** Select **Open** from the **File** menu.
- **b.** In the resulting **Select File** dialog box, select the **Unipara** file, and then press the **ENTER** button.

72. Press the **PLAY** button on the MTX100 Option 02 to start the signal output of the file.

73. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

74. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

75. Select I/O #3 in the Port Manager panel, right click, and then select **Assign ▶ Analysis Server** from the shortcut menu.

76. Select the Analysis Server icon (I/O #3), right click, and then select **Start Analysis** from the short cut menu.

77. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

79. Press the **STOP** button on the MTX100 Option 02 to stop the stream output.

80. Open the UNIseri file on the MTX100 Option 02.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **UNIseri** file, and then press the **ENTER** button.

81. Press the **PLAY** button on the MTX100 Option 02 to start the signal output of the file.

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

83. Disconnect the parallel interface cable from the MTX100 Option 02 and the MPEG test system.

Checking the EVENT output.

84. Use the 50 Ω BNC cable to connect the EVENT OUT connector on the MTX100 Option 02 to the oscilloscope CH1 input as shown in Figure 4-13.

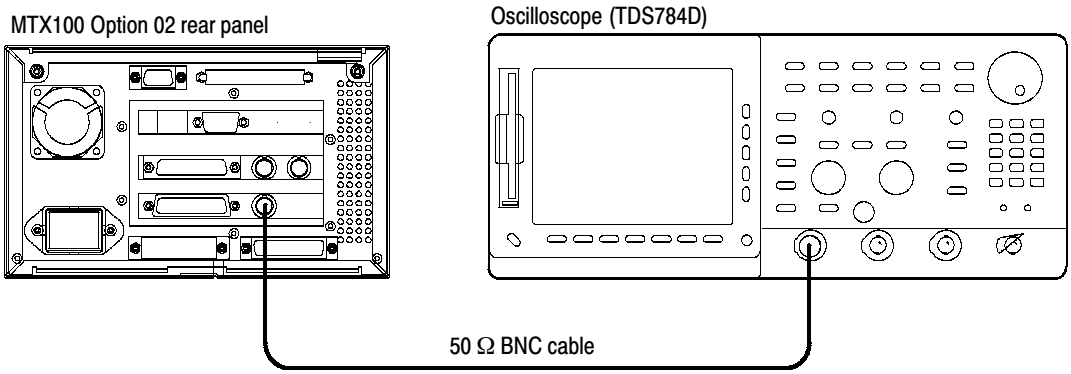


Figure 4-13: Equipment connection for verifying the EVENT output

85. Set the oscilloscope controls as indicated below:

Displayed channel CH1
Vertical scale . . . . . 1 V/div
Horizontal scale . . . . . 100 ns/div
Horizontal position . . . . Center
Acquire mode . . . . . Average 2
Trigger mode . . . . . Auto
Trigger level . . . . . 0 V
Trigger source CH1
Trigger position . . . . . 50 %
Trigger slope . . . . . Rising Edge
Input coupling . . . . . DC
Input impedance . . . . . 50 Ω
Measure . . . . . Amplitude

86. Use the oscilloscope to measure that the high and low levels of the EVENT output are as follows.

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

BNC Serial Interface (Option 03 Only)

This test verifies that transport stream data is correctly output from and is recorded through the BNC serial interface on the MTX100 Option 03. The following equipment and MPEG test signal is required for this test:

- MPEG recorder & player (MTX100 Option 03)
- MPEG test system
- Oscilloscope
- Four 75 Ω BNC cables
- Parallel interface cable
- test40.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is correctly output from and is recorded through the BNC serial interface on the MTX100 Option 03:

Checking the Output Signals.

1. Use the 75 Ω BNC cable to connect the DATA connector on the MTX100 Option 03 to the oscilloscope CH1 input as shown in Figure 4-14.

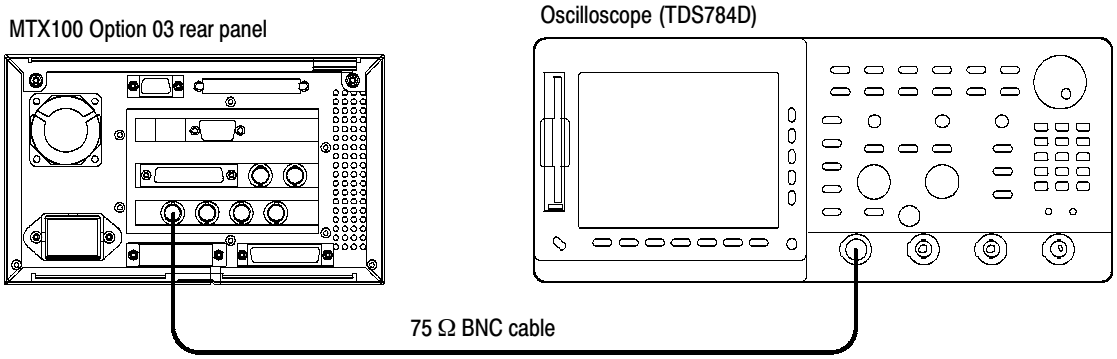


Figure 4-14: Initial equipment connection for verifying the BNC serial interface

2. Set the oscilloscope controls as indicated below:

   Displayed channel CH1
   Vertical scale . . . . . 1 V/div
   Horizontal scale . . . . . 25 ns/div
   Horizontal position . . . . Center
   Acquire mode . . . . . Average 64
   Trigger mode . . . . . Auto
   Trigger level . . . . . 0 V
   Trigger source CH1
   Trigger position 50%
   Trigger slope . . . . . Rising Edge
   Input coupling . . . . . DC
   Input impedance . . . . . 50 Ω

3. Press the **PLAY** button on the MTX100 Option 03 to display the Play screen.

4. Open the test40.TRP file on the MTX100 Option 03.

   a. Select **Open** from the **File** menu.

   b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

5. Select **Clock** from the **Play** menu on the MTX100 Option 03 to open the Clock dialog box.

6. Set the **Data Rate** to **10 Mbps** in the Clock dialog box, and then press the **ENTER** button.

7. Set **Level** to **ECL** from the **BNC I/F** menu on the MTX100 Option 03.

8. Press the **PLAY** button on the MTX100 Option 03 to start the signal output of the test40.TRP file.

9. Use the oscilloscope to measure that the ECL high and low levels of the DATA output are as follows.

   High level: -0.5 V
   Low level: -2.1 V

10. Move the BNC cable connection from the DATA connector to the CLOCK connector, and measure that the ECL high and low levels of the CLOCK output correspond to the values shown in Table 4-4.

11. Repeat step 10 for the PSYNC and ENABLE outputs.

Table 4-4: Output level of each connector

	ECL		TTL	
Connector name	**High**	**Low**	**High**	**Low**
DATA	-0.5 V	-2.1 V	3.3 V	0.0 V
CLOCK	-0.5 V	-2.1 V	3.3 V	0.0 V
PSYNC	-0.5 V	-2.1 V	3.3 V	0.0 V
ENABLE	-0.5 V	-----	3.3 V	-----

12. Set **Level** to **TTL** from the **BNC I/F** menu on the MTX100 Option 03.

13. Use the oscilloscope to measure that TTL High and low levels of all of the connectors correspond to the values shown in Table 4-4.

Checking the Play Operation.

14. Use the four 75 Ω BNC cables to connect the DATA, CLOCK, PSYNC, and ENABLE connectors on the MTX100 Option 03 to the DATA, CLOCK, PSYNC, and ENABLE connector on the MPEG recorder & player respectively as shown in Figure 4-15.

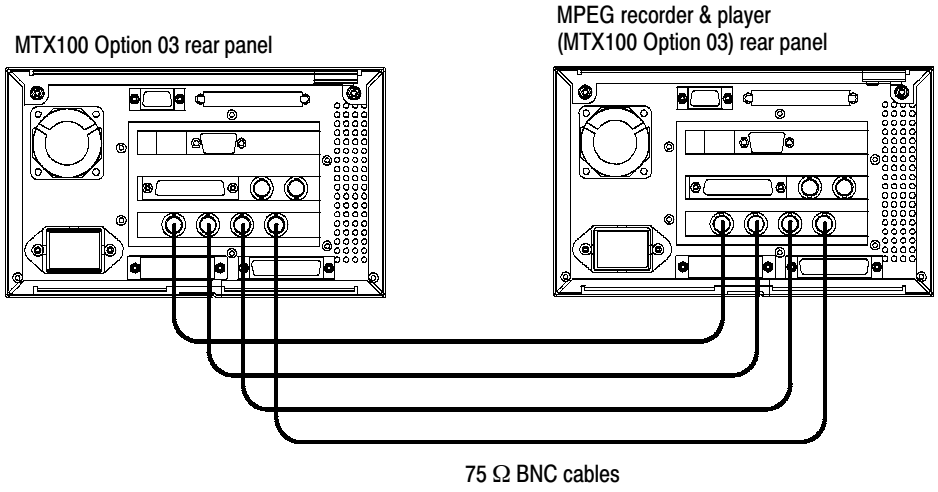


Figure 4-15: Second equipment connection for verifying the BNC serial interface

15. In the **Play** menu on the MTX100 Option 03, make the following settings:

Data rate . . . . 40 Mbps
Update . . . . . Off
Source . . . . . RAM

16. Set **Level** to **ECL** from the **BNC I/F** menu on the MTX100 Option 03.

17. Press the **REC** button on the MPEG recorder & player to display the record screen.

18. In the **Record** menu on the MPEG recorder & player, make the following settings:

Source . . . . . BNC I/F
Record size . . 100 MBytes
Target . . . . . RAM

19. Set **Level** to **ECL** from the **BNC I/F** menu on the MPEG recorder & player.

20. Press the **PLAY** button on the MTX100 Option 03 to start the signal output of the test 40.TRP file.

21. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 40 Mbps.

22. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

23. In the dialog box, enter **BNCecl** for the file name that is used to save the test file, and then press the **ENTER** button.

24. Press the **REC** button on the MPEG recorder & player to record the applied test file.

25. Set **Level** to **TTL** from the **BNC I/F** menu on the MTX100 Option 03.

26. Set **Level** to **TTL** from the **BNC I/F** menu on the MPEG recorder & player.

27. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 40 Mbps.

28. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

29. In the dialog box, enter **BNCttl** for the file name that is used to save the test file, and then press the **ENTER** button.

30. Press the **REC** button on the MPEG recorder & player to record the applied test file.

31. Press the **STOP** button on the MTX100 Option 03 to stop the stream output.

Checking the Record Operation.

32. Press the **REC** button on the MTX100 Option 03 to display the Record screen.

33. In the **Record** menu on the MTX100 Option 03, make the following settings:

Source . . . . . BNC I/F
Record size . . 100 MBytes
Target . . . . . RAM

34. In the **BNC I/F** menu on the MTX100 Option 03, make the following settings:

Level . . . . . ECL
Use Psync . . . Off

35. Press the **PLAY** button on the MPEG recorder & player to display the Play screen.

36. In the **Play** menu on the MPEG recorder & player, make the following settings:

Data rate . . . . 40 Mbps
Update . . . . . Off
Source . . . . . RAM

37. Set **Level** to **ECL** from the **BNC I/F** menu on the MPEG recorder & player.

38. Open the BNCecl file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **BNCecl** file, and then press the **ENTER** button.

39. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

40. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 03. In addition, verify that the bit rate display is 40 Mbps.

41. Select **Save** from the **File** menu on the MTX100 Option 03 to open the **Save As** dialog box.

42. In the dialog box, enter **BNCecl** for the file name that is used to save the test file, and then press the **ENTER** button.

43. Press the **REC** button on the MTX100 Option 03 to record the test file.

44. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

45. Set **Level** to **TTL** from the **BNC I/F** menu on the MTX100 Option 03 and the MPEG recorder & player.

46. Open the BNCttl file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **BNCttl** file, and then press the **ENTER** button.

47. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

48. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 03. In addition, verify that the bit rate display is 40 Mbps.

49. Select **Save** from the **File** menu on the MTX100 Option 03 to open the **Save As** dialog box.

50. In the dialog box, enter **BNCttl** for the file name that is used to save the test file, and then press the **ENTER** button.

51. Press the **REC** button on the MTX100 Option 03 to record the **BNCttl** file.

52. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

53. Disconnect all of the BNC cables from the MTX100 Option 03 and MPEG recorder & player.

Checking the Recorded Files.

54. Use the parallel interface cable to connect the SPI IN/OUT connector on the MTX100 Option 03 to the SPI (LVDS) 3 IN connector on the MPEG test system as shown in Figure 4-16.

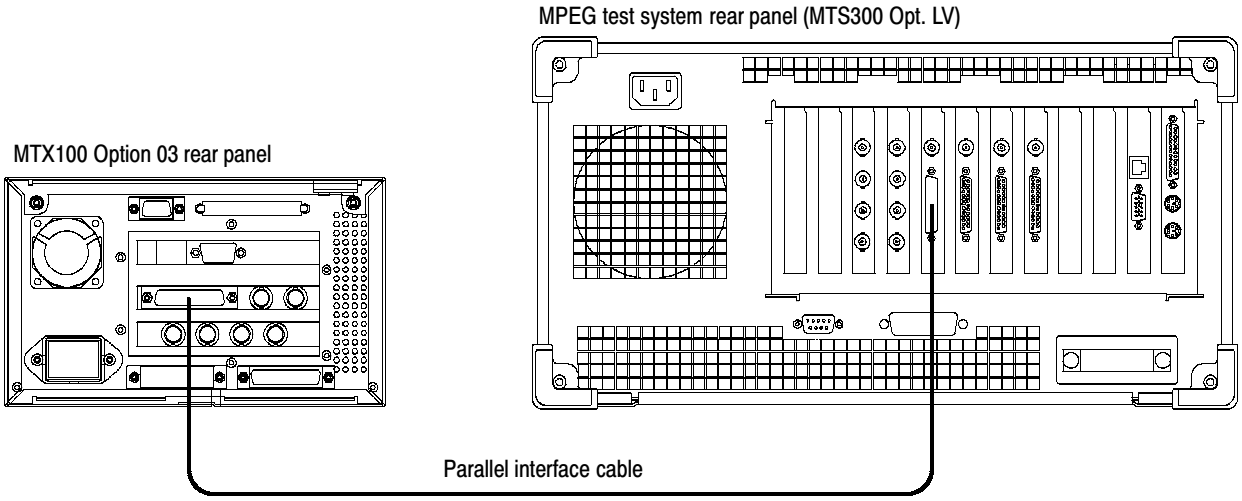


Figure 4-16: Third equipment connections for verifying the BNC interface

55. Press the **PLAY** button on the MTX100 Option 03 to display the Play screen.

56. Change **Update** to **On** from the **Play** menu on the MTX100 Option 03.

57. Open the BNCecl file on the MTX100 Option 03.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **BNCecl** file, and then press the **ENTER** button.

58. Press the **PLAY** button on the MTX100 Option 03 to start the signal output of the file.

59. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

60. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

61. Select I/O #3 in the Port Manager panel, right click, and then select **Assign ▶ Analysis Server** from the shortcut menu.

62. Select the Analysis Server icon (I/O #3), right click, and then select **Start Analysis** from the short cut menu.

63. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

65. Press the **STOP** button on the MTX100 Option 03 to stop the stream output.

66. Open the BNCttl file on the MTX100 Option 03.

    a. Select **Open** from the **File** menu.

    b. In the resulting **Select File** dialog box, select the **BNCttl** file, and then press the **ENTER** button.

67. Press the **PLAY** button on the MTX100 Option 03 to start the signal output of the file.

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

69. Press the **STOP** button on the MTX100 Option 03 to stop the stream output.

DHEI Interface (Option 04 Only)

This test verifies that transport stream data is correctly output from and is recorded through the DHEI interface on the MTX100 Option 04. The following equipment and MPEG test signal is required for this test:

- MPEG recorder & player (MTX100 Option 04)
- MPEG test system
- High definition interface cable, GI/Motorola (415406-003)
- Parallel interface cable
- test40.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is correctly output from and is recorded through the DHEI interface on the MTX100 Option 04:

Checking the Play Operation Using EXPANSION OUT.

1. Use the high definition interface cable to connect the EXPANSION OUT connector on the MTX100 Option 04 to the EXPANSION IN connector on the MPEG recorder & player as shown in Figure 4-17.

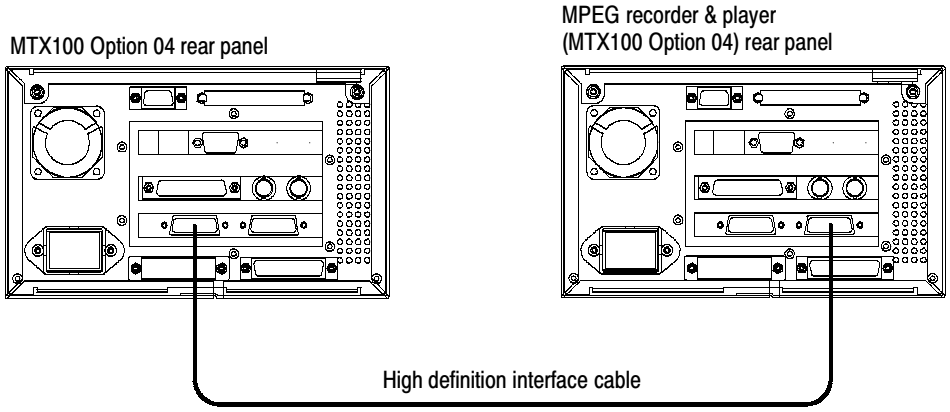


Figure 4-17: Initial equipment connection for verifying the DHEI interface

2. Open the test40.TRP file on the MTX100 Option 04.

   a. Select **Open** from the **File** menu.

   b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

3. In the **Play** menu on the MTX100 Option 04, make the following settings:

   Data rate . . . . 40 Mbps
   Update . . . . . Off
   Source . . . . . RAM

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

5. In the **Record** menu on the MPEG recorder & player, make the following settings:

   Source . . . . . DHEI
   Record size . . 100 MBytes
   Target . . . . . RAM

6. Set **Input Port** to **Expansion In** from the **DHEI I/F** menu on the MTX100 Option 04.

7. Press the **PLAY** button on the MTX100 Option 04 to start the signal output of the test 40.TRP file.

8. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 40 Mbps.

9. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

10. In the dialog box, enter **DHEIout** for the file name that is used to save the test file, and then press the **ENTER** button.

11. Press the **REC** button on the MPEG recorder & player to record the **DHEIout** file.

12. Press the **STOP** button on the MTX100 Option 04 to stop the stream output.

Checking the Record Operation Using EXPANSION OUT.

13. Press the **REC** button on the MTX100 Option 04 to display the Record screen.

14. In the **Record** menu on the MTX100 Option 04, make the following settings:

    Source . . . . . DHEI
    Record size . . 100 MBytes
    Target . . . . . RAM

15. Set **Input Port** to **Expansion Out** from the **DHEI I/F** menu on the MTX100 Option 04.

16. Press the **PLAY** button on the MPEG recorder & player to display the Play screen.

17. In the **Play** menu on the MPEG recorder & player, make the following settings:

    Data rate . . . . 40 Mbps
    Update . . . . . Off
    Source . . . . . RAM

18. Open the DHEIout file on the MPEG recorder & player.

    a. Select **Open** from the **File** menu.

    b. In the resulting **Select File** dialog box, select the **DHEIout** file, and then press the **ENTER** button.

19. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

20. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 04. In addition, verify that the bit rate display is 40 Mbps.

21. Select **Save** from the **File** menu on the MTX100 Option 04 to open the **Save As** dialog box.

22. In the dialog box, enter **DHEIout** for the file name that is used to save the test file, and then press the **ENTER** button.

23. Press the **REC** button on the MTX100 Option 04 to record the **DHEIout** file.

24. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

Checking the Play Operation Using EXPANSION IN.

25. Move the high definition interface cable connection from EXPANSION OUT connector to the EXPANSION IN connector on the MTX100 Option 04 as shown in Figure 4-18.

26. Move the high definition cable connection from EXPANSION IN connector to the EXPANSION OUT connector on the MPEG recorder & player as shown in Figure 4-18.

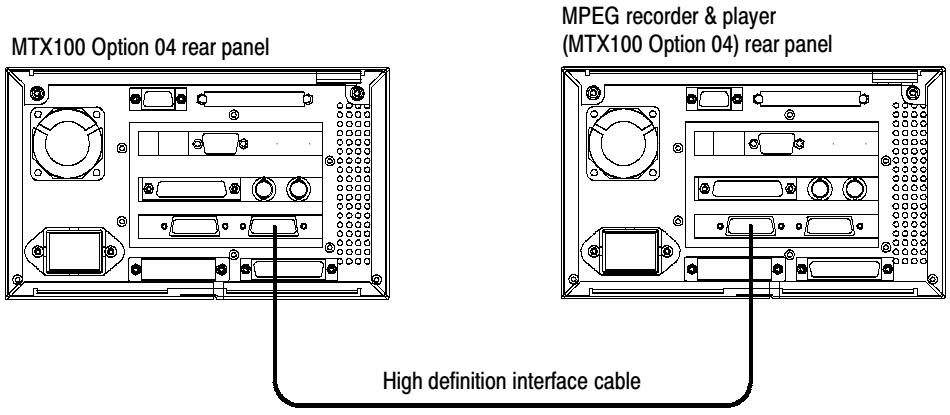


Figure 4-18: Second equipment connection for verifying the DHEI interface

27. Press the **PLAY** button on the MTX100 Option 04 to display the Play screen.

28. Open the test40.TRP file on the MTX100 Option 04.

- **a.** Select **Open** from the **File** menu.
- **b.** In the resulting **Select File** dialog box, select the **test40.TRP** file, and then press the **ENTER** button.

29. In the **Play** menu on the MTX100 Option 04, make the following settings:

Data rate . . . . 40 Mbps
Update . . . . . Off
Source . . . . . RAM

30. Press the **REC** button on the MPEG recorder & player to display the Record screen.

31. In the **Record** menu on the MPEG recorder & player, make the following settings:

Source . . . . . DHEI
Record size . . 100 MBytes
Target . . . . . RAM

32. Set **Input Port** to **Expansion out** from the **DHEI I/F** menu on the MPEG recorder & player.

33. Press the **PLAY** button on the MTX100 Option 04 to start the signal output of the test 40.TRP file.

34. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate display is 40 Mbps.

35. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

36. In the dialog box, enter **DHEIin** for the file name that is used to save the test file, and then press the **ENTER** button.

37. Press the **REC** button on the MPEG recorder & player to record the **DHEIin** file.

38. Press the **STOP** button on the MTX100 Option 04 to stop the stream output.

Checking the Record Operation Using EXPANSION IN.

39. Press the **REC** button on the MTX100 Option 04 to display the Record screen.

40. In the **Record** menu on the MTX100 Option 04, make the following settings:

Source . . . . . DHEI
Record size . . 100 MBytes
Target . . . . . RAM

41. Select **Input Port ▸ Expansion in** from the **DHEI I/F** menu on the MTX100 Option 04.

42. Press the **PLAY** button on the MPEG recorder & player to display the Play screen.

43. In the **Play** menu on the MPEG recorder & player, make the following settings:

Data rate . . . . 40 Mbps
Update . . . . . Off
Source . . . . . RAM

44. Open the DHEIin file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **DHEIin** file, and then press the **ENTER** button.

45. Press the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

46. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 04. In addition, verify that the bit rate display is 40 Mbps.

47. Select **Save** from the **File** menu on the MTX100 Option 04 to open the **Save As** dialog box.

48. In the dialog box, enter **DHEIin** for the file name that is used to save the test file, and then press the **ENTER** button.

49. Press the **REC** button on the MTX100 Option 04 to record the **DHEIin** file.

50. Press the **STOP** button on the MPEG recorder & player to stop the stream output.

51. Disconnect the high definition cable from the MTX100 Option 04 and the MPEG recorder & player.

Checking the Recorded Files.

52. Use the parallel interface cable to connect the SPI IN/OUT connector on the MTX100 Option 04 to the SPI (LVDS) 3 IN connector on the MPEG test system as shown in Figure 4-19.

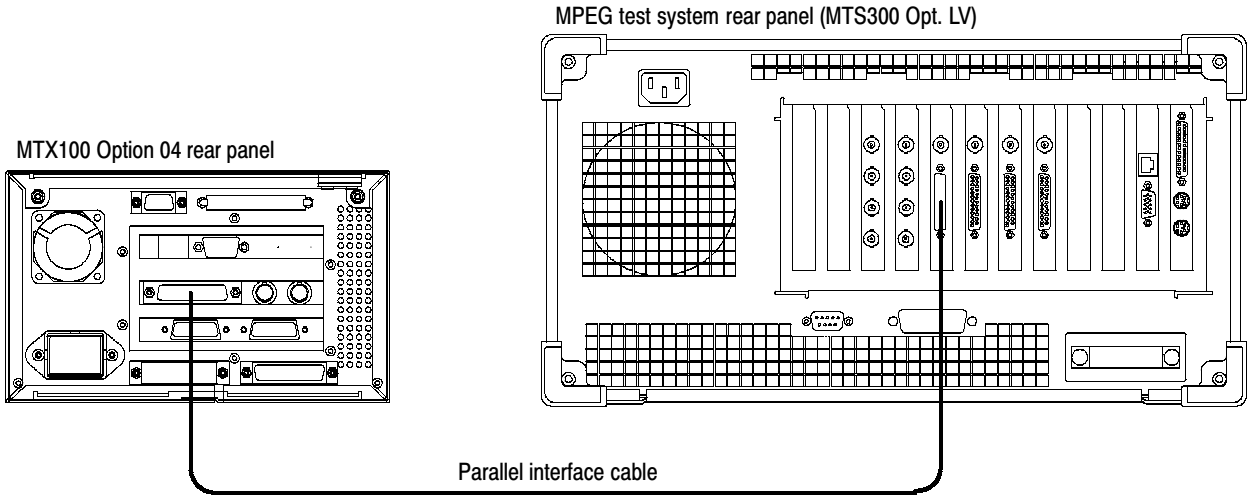


Figure 4-19: Third equipment connection for verifying the DHEI interface

53. Press the **PLAY** button on the MTX100 Option 04 to display the Play screen.

54. Change **Update** to **On** from the **Play** menu on the MTX100 Option 04.

55. Open the DHEIout file on the MTX100 Option 04.

- **a.** Select **Open** from the **File** menu.
- **b.** In the resulting **Select File** dialog box, select the **DHEIout** file, and then press the **ENTER** button.

56. Press the **PLAY** button on the MTX100 Option 04 to start the signal output of the file.

57. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

58. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

59. Select I/O #3 in the Port Manager panel, right click, and then select **Assign ▶ Analysis Server** from the shortcut menu.

60. Select the Analysis Server icon (I/O #3), right click, and then select **Start Analysis** from the short cut menu.

61. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

63. Press the **STOP** button on the MTX100 to stop the stream output.

64. Open the DHEIin file on the MTX100 Option 04.

- **a.** Select **Open** from the **File** menu.
- **b.** In the resulting **Select File** dialog box, select the **DHEIin** file, and then press the **ENTER** button.

65. Press the **PLAY** button on the MTX100 Option 04 to start the signal output of the file.

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

67. Press the **STOP** button on the MTX100 Option 04 to stop the stream output.

IEEE1394 Interface (Option 05 Only)

This test verifies that transport stream data is correctly output from and is recorded through the IEEE1394 interface on the MTX100 Option 05. The following equipment and MPEG test signals are required for this test:

- MPEG recorder & player (MTX100 Option 05)
- MPEG test system
- Oscilloscope
- Tuner
- i-Link cable
- 75 Ω BNC cable
- 75 Ω to 50 Ω minimum loss attenuator
- test40.TRP MPEG test signal
- TS1394.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is output from and is recorded through the IEEE1394 connector on the MTX100 Option 05:

Checking the Output Signals.

1. Use a 75 Ω BNC cable and a 75 Ω to 50 Ω minimum loss attenuator to connect the ASI OUT connector on the MTX100 Option 05 to the oscilloscope CH1 input, as shown in Figure 4-20.

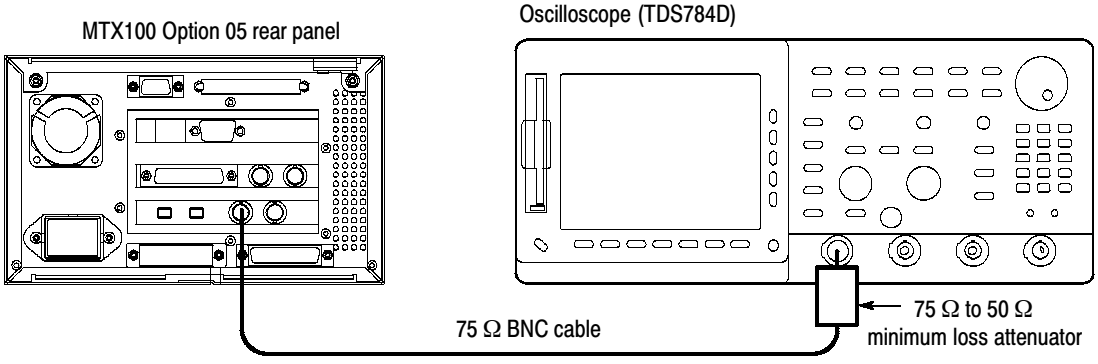


Figure 4-20: IEEE1394/ASI interface test initial hookup

2. Set the oscilloscope controls as indicated below:

   Displayed channel CH1
   Vertical scale . . . . . 200 mV/div
   Horizontal scale . . . . . 500 ps/div
   Acquire mode . . . . . Average 64
   Trigger mode . . . . . Auto
   Trigger level . . . . . 0 V
   Trigger source CH1
   Trigger position 50%
   Trigger slope . . . . . Rising Edge
   Input coupling . . . . . DC
   Input impedance . . . . . 50 Ω
   Measure . . . . . Amplitude, Rise Time, Fall Time
   Level Setup Histogram . High Ref 80%, Low Ref 20%

3. Open the test40.TRP file on the MTX100 Option 05.

   a. Select **Open** from the **File** menu.

   b. In the resulting **Select File** dialog box, select the **test40.TRP** file, and then push the **ENTER** button.

4. Push the **PLAY** button on the MTX100 Option 05 to start the signal output of 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

Checking the Play Operation.

6. Disconnect the BNC cable from the 75 Ω to 50 Ω minimum loss attenuator on the oscilloscope input connector, and then connect the BNC cable to the ASI IN connector on the rear panel of MPEG recorder & player, as shown in Figure 4-21.

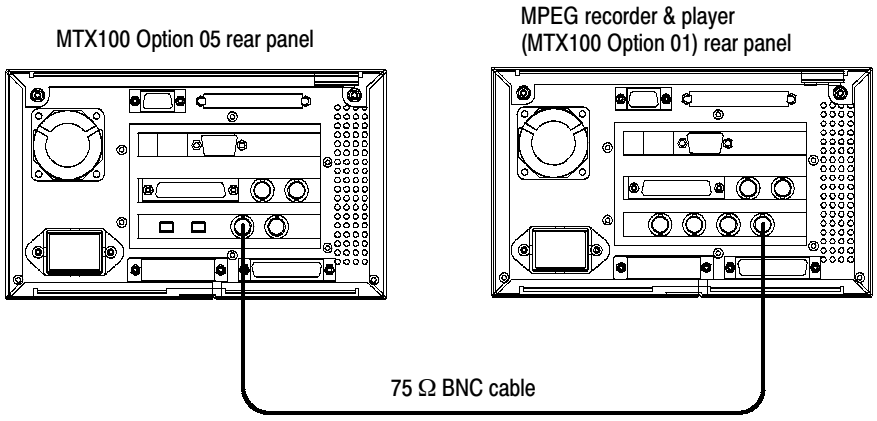


Figure 4-21: ASI interface Play operation test

7. In the **Play** menu on the MTX100 Option 05, make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

8. Push the **REC** button on the MPEG recorder & player to display the Record screen, and then make the following settings:

Source . . . . . ASI
Record size . . 100 MBytes
Target . . . . . RAM

9. Push the **PLAY** button on the MTX100 Option 05 to start the signal output of the test 40.TRP file.

10. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate indicates 200 Mbps.

11. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

12. In the dialog box, enter **ASItest** for the file name that is used to save the test file, and then push the **ENTER** button.

13. Push the **REC** button on the MPEG recorder & player to record the test file.

14. Push the **STOP** button on the MTX 100 Option 05 to stop the stream output.

15. Disconnect the BNC cable from the MTX100 Option 05 and MPEG recorder & player.

Checking the Record Operation.

16. Use a 75 Ω BNC cable to connect the ASI OUT1 connector on the MPEG recorder & player to the ASI IN connector on the MTX100 Option 05, as shown in Figure 4-22.

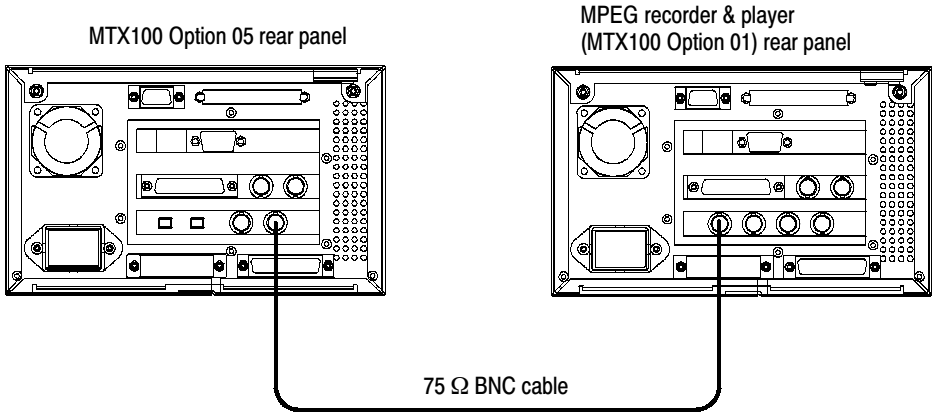


Figure 4-22: ASI interface Record operation test

17. Push the **REC** button on the MTX100 Option 05 to display the Record screen, and then make the following settings:

Source . . . . . ASI
Record size . . 100 MBytes
Target . . . . . RAM

18. Push the **PLAY** button on the MPEG recorder & player to display the Play screen, and then make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

19. Open the ASItest file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **ASItest** file, and then push the **ENTER** button.

20. Push the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

21. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 05. In addition, verify that the bit rate indicates 200 Mbps.

22. Select **Save** from the **File** menu on the MTX100 Option 05 to open the **Save As** dialog box.

23. In the dialog box, enter **ASItest** for the file name that is used to save the test file, and then push the **ENTER** button.

24. Push the **REC** button on the MTX100 Option 05 to record the **ASItest** file.

25. Push the **STOP** button on the MPEG recorder & player to stop the stream output.

26. Disconnect the BNC cable from the ASI IN connector on the MTX100 Option 05.

Checking the Recorded Files.

27. Use a 75 Ω BNC cable to connect the ASI OUT connector on the MTX100 Option 05 to the ASI 1 IN connector on the MPEG test system, as shown in Figure 4-23.

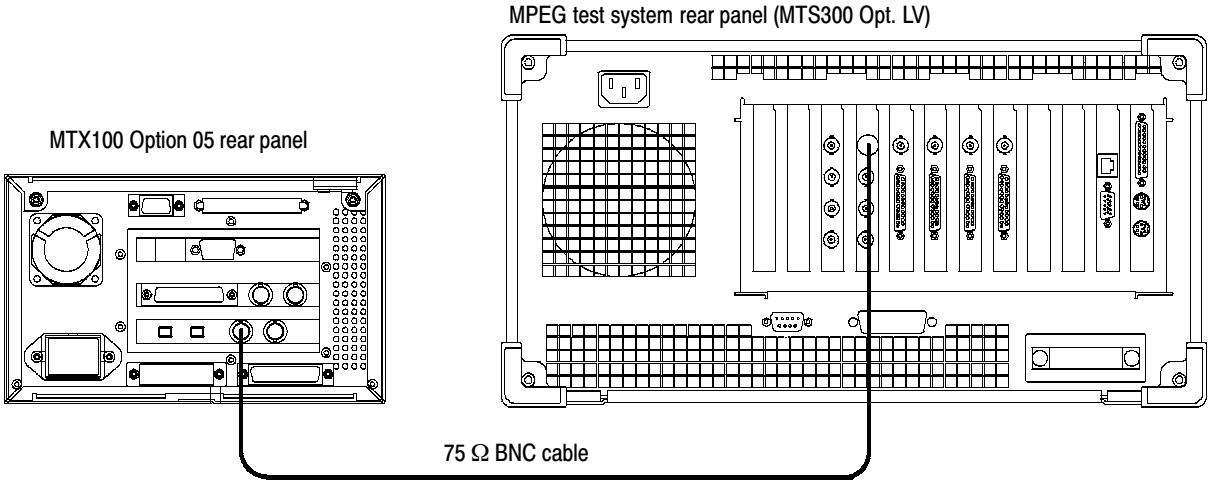


Figure 4-23: ASI interface recorded files check

28. Push the **PLAY** button on the MTX100 Option 05 to display the Play screen.

29. Change **Update** to **On** from the **Play** menu on the MTX100 Option 05.

30. Open the ASItest file on the MTX100 Option 05.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **ASItest** file, and then push the **ENTER** button.

31. Push the **PLAY** button on the MTX100 Option 05 to start the signal output of the file.

32. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

33. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

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

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

36. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

38. Push the **STOP** button on the MTX100 Option 05 to stop the stream output.

Checking the IEEE1394 Output Signals

1. Use a 75 Ω BNC cable to connect the ASI OUT1 connector on the MPEG recorder & player to the ASI IN connector on the MTX100 Option 05, as shown in Figure 4-24.
2. Use an i-Link cable to connect the IEEE1394 port #1 on the MTX100 Option 05 to the IEEE1394 port of the Tuner.

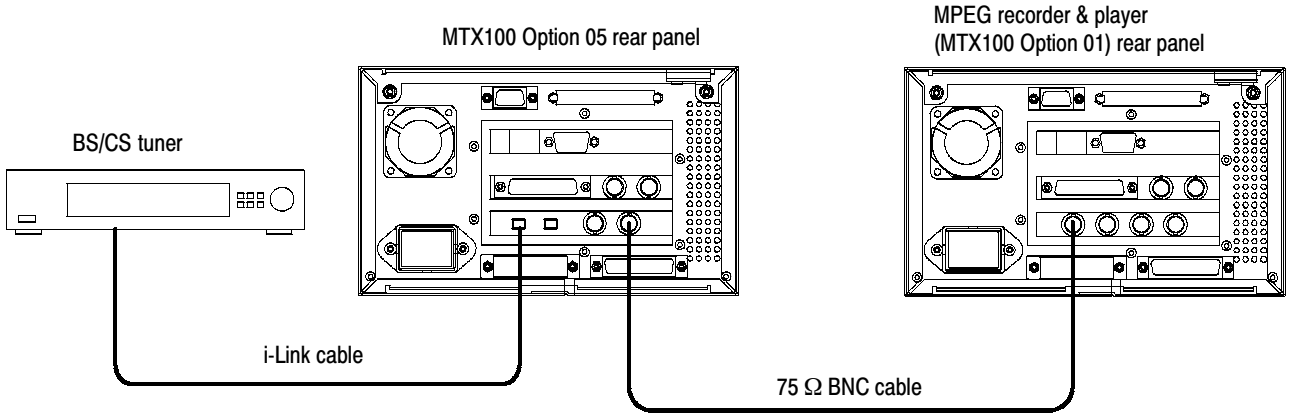


Figure 4-24: IEEE1394 interface test

3. Push the **REC** button on the MPEG Option 05 to display the Record screen, and then make the following settings:

   Record > Source ASI/1394
   ASI/1394 > Input Port . . . . . ASI
   ASI/1394 > Partial TS . . . . . ON
   ASI/1394 > 1394Mode . . . . . PtoP Connect...

4. The IEEE1394 dialog box appears.
5. Select the name of connected Tuner, such as **TU-BHD100**, from the Instrument pull-down menu, and then select the **Connect** button.
6. Verify that the i-Link lamp of Tuner lights when you click the **OK** button.
7. Push the **PLAY** button on the MPEG recorder & player to start the signal output of the TS1394.TRP file.
8. Verify the following on the Record screen:
   a. **Partial TS** and **192** are displayed on the Status bar.
   b. The hierarchic structure is properly displayed in the Hierarchy Display.

9. Open the ASItest file on the MTX100 Option 05.
   a. Select **Open** from the **File** menu.
   b. In the resulting **Select File** dialog box, select the **ASItest** file, and then push the **ENTER** button.
10. Push the **REC** button on the MTX100 Option 05 to record the **ASItest** file (Over Write).
11. Change the MTX100 Option 05 to PLAY Mode.
12. Click the **PtoP Connect** button to disconnect the IEEE1394 connection.
13. Disconnect the i-Link cable from the IEEE1394 port #1 connector and then connect it to the IEEE1394 port #2 connector on the MTX100 Option 05.
14. Click the **PtoP Connect** button to establish the IEEE1394 connection.
15. Push the **PLAY** button to activate the signal output.
16. Verify that **Partial TS** and **192** are displayed on the Status bar.

SMPTE310M Interface (Option 06 Only)

This test verifies that transport stream data is correctly output from and is recorded through the SMPTE310M interface on the MTX100 Option 06. The following equipment and MPEG test signals are required for this test:

- MPEG recorder & player (MTX100 Option 06)
- MPEG test system
- Oscilloscope
- 75 Ω precision termination
- two 75 Ω BNC cables
- 75 Ω to 50 Ω minimum loss attenuator
- test40.TRP MPEG test signal
- 8VSB_test.TRP MPEG test signal

Perform the following procedure to verify that transport stream data is output from and is recorded through the SPI IN/OUT connector on the MTX100 Option 06:

Checking the Output Signals.

1. Use a 75 Ω BNC cable and a 75 Ω to 50 Ω minimum loss attenuator to connect the OUTPUT 1 connector on the rear panel of the MTX100 Option 06 to the oscilloscope CH1 input, as shown in Figure 4-25.

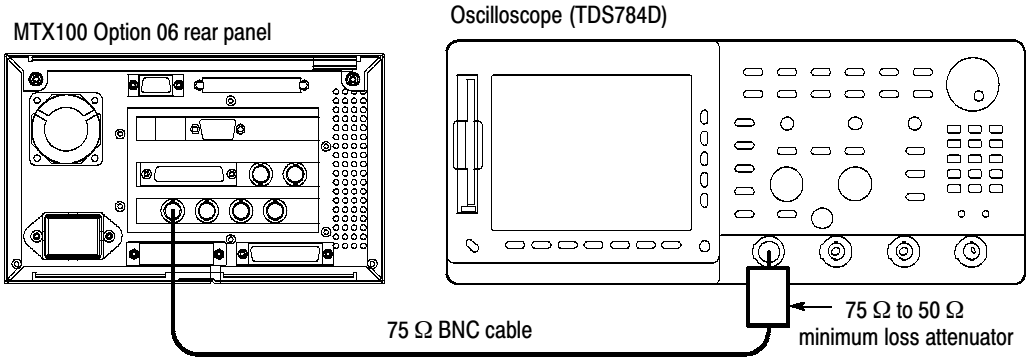


Figure 4-25: Initial equipment connection for verifying the SMPTE310M interface

2. Attach a 75 Ω precision termination to the OUTPUT 2 connector on the rear panel of the MTX100 Option 06.

3. Set the oscilloscope controls as indicated below:

Displayed channel CH1
Vertical scale . . . . . 200 mV/div
Horizontal scale . . . . . 1 ns/div
Trigger position 30%
Acquire mode . . . . . Average 64
Trigger mode . . . . . Auto
Trigger source CH1
Trigger slope . . . . . Rising Edge
Input coupling . . . . . DC
Input impedance . . . . . 50 Ω
Measure . . . . . Amplitude, Rise Time, Fall Time
Level Setup Histogram . High Ref 80%, Low Ref 20%

4. Set the MTX100 Option 06 output to **ASI**.

ASI/310M > Port : 8VSB

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 OUTPUT 1 connector to the OUTPUT 2 connector on the MTX100 Option 06.

7. Remove the 75 Ω precision termination from the OUTPUT 2 connector, and then attach it to the OUTPUT 1 connector.

8. Repeat step 5.

9. Remove the 75 Ω precision termination from the OUTPUT 1 connector.

10. User another 75 Ω BNC cable to connect the OUTPUT 1 connector and the INPUT connector on the MTX100 Option 06.

11. Disconnect the BNC cable from the OUTPUT 2 connector, and then connect it to the through output of INPUT connector.

12. Repeat step 5.

Checking the ASI Play Operation.

13. Disconnect the BNC cable from the 75 Ω to 50 Ω minimum loss attenuator on the oscilloscope input, and then connect it to the INPUT connector on the MPEG recorder & player.

14. Disconnect the BNC cable from the through output of the INPUT connector, and then connect it to the OUTPUT 2 connector on the MTX100 Option 06, as shown in Figure 4-26.

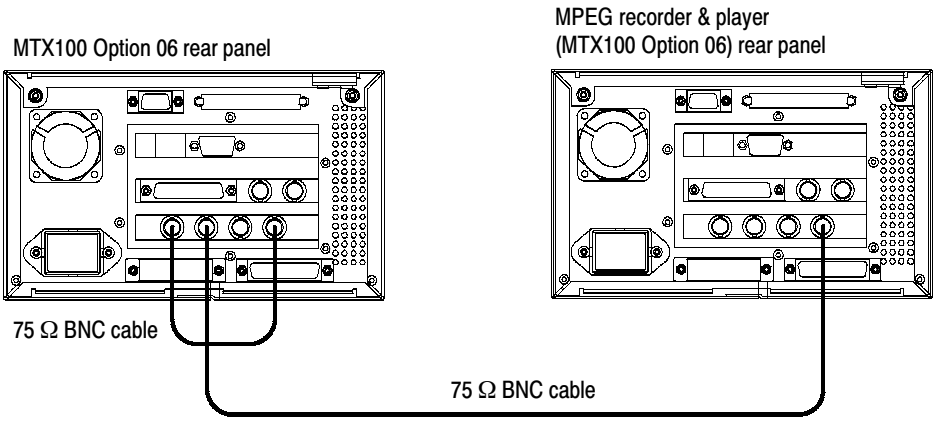


Figure 4-26: SMPTE310M/ASI interface test

15. In the **Play** menu on the MTX100 Option 06, make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

16. Push the **REC** button on the MPEG recorder & player to display the Record screen, and then make the following settings:

Source ASI/310M
Record size . . 100 MBytes
Target . . . . . RAM

17. Push the **PLAY** button on the MTX100 Option 06 to start the signal output of the test 40.TRP file.

18. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate indicates 200 Mbps.

19. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

20. In the dialog box, enter **Out2test** for the file name that is used to save the test file, and then push the **ENTER** button.

21. Push the **REC** button on the MPEG recorder & player to record the test file.

22. Move the BNC cable connection from the OUTPUT 2 connector to the through output of the INPUT connector on the MTX100 Option 06.

23. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player. In addition, verify that the bit rate indicates 200 Mbps.

24. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

25. In the dialog box, enter **Looptest** for the file name that is used to save the test file, and then push the **ENTER** button.

26. Push the **REC** button on the MPEG recorder & player to record the test file.

27. Push the **STOP** button on the MTX 100 Option 06 to stop the stream output.

28. Disconnect the two BNC cables from the MTX100 Option 06 and MPEG recorder & player.

Checking the ASI Record Operation.

29. Use a 75 Ω BNC cable to connect the OUTPUT 1 connector on the MPEG recorder & player to the INPUT connector on the MTX100 Option 06, as shown in Figure 4-27.

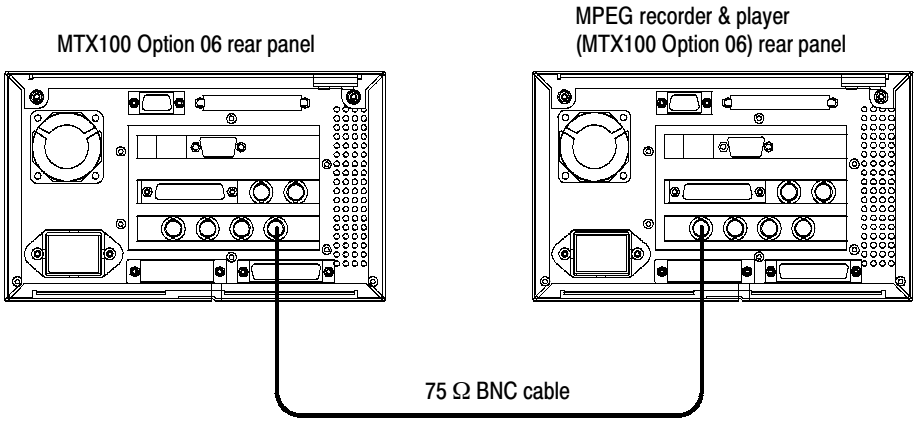


Figure 4-27: SMPTE310M/ASI interface Record operation test

30. Push the **REC** button on the MTX100 Option 06 to display the Record screen, and then make the following settings:

Source ASI/310M
Record size . . 100 MBytes
Target . . . . . RAM

31. Push the **PLAY** button on the MPEG recorder & player to display the Play screen, and then make the following settings:

Data rate . . . . 200 Mbps
Update . . . . . Off
Source . . . . . RAM

32. Open the Out2test file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Out2test** file, and then push the **ENTER** button.

33. Push the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

34. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 06. In addition, verify that the bit rate indicates 200 Mbps.

35. Select **Save** from the **File** menu on the MTX100 Option 06 to open the **Save As** dialog box.

36. In the dialog box, enter **Out2test** for the file name that is used to save the test file, and then push the **ENTER** button.

37. Push the **REC** button on the MTX100 Option 06 to record the **Out2test** file.

38. Push the **STOP** button on the MPEG recorder & player to stop the stream output.

39. Open the Looptest file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Looptest** file, and then push the **ENTER** button.

40. Push the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

41. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 06. In addition, verify that the bit rate indicates 200 Mbps.

42. Select **Save** from the **File** menu on the MTX100 Option 01 to open the **Save As** dialog box.

43. In the dialog box, enter **Looptest** for the file name that is used to save the test file, and then push the **ENTER** button.

44. Push the **REC** button on the MTX100 Option 06 to record the **Looptest** file.

45. Push the **STOP** button on the MPEG recorder & player to stop the stream output.

46. Disconnect the BNC cable from the INPUT connector on the MTX100 Option 06.

Checking the Recorded Files.

47. Use a 75 Ω BNC cable to connect the OUTPUT1 connector on the MTX100 Option 06 to the ASI 1 IN connector on the MPEG test system as shown in Figure 4-28.

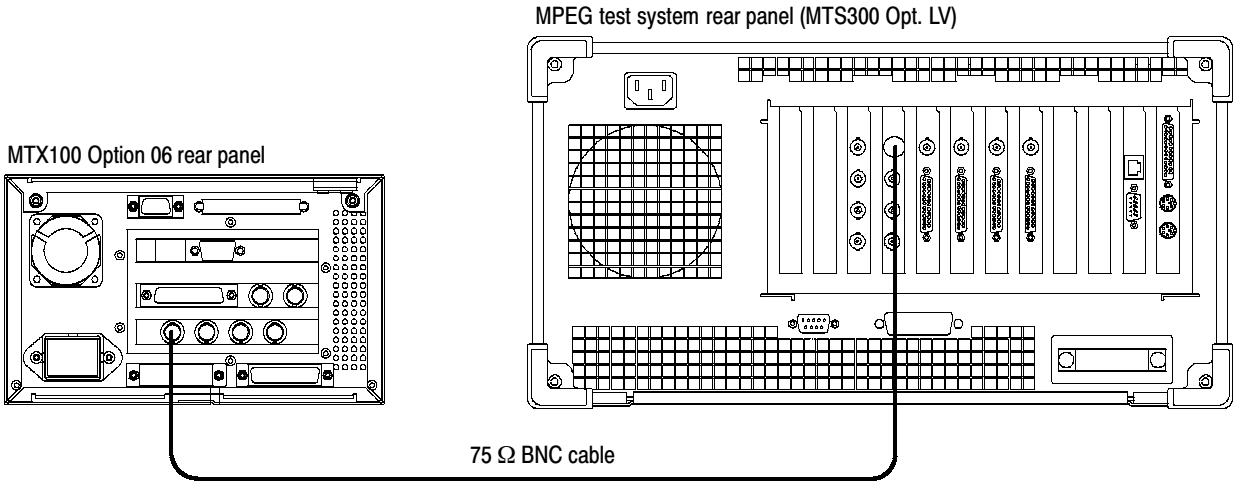


Figure 4-28: ASI interface recorded files check

48. Push the **PLAY** button on the MTX100 Option 06 to display the Play screen.

49. Change **Update** to **On** from the **Play** menu on the MTX100 Option 06.

50. Open the Out2test file on the MTX100 Option 06.

    a. Select **Open** from the **File** menu.

    b. In the resulting **Select File** dialog box, select the **Out2test** file, and then push the **ENTER** button.

51. Push the **PLAY** button on the MTX100 Option 06 to start the signal output of the file.

52. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

53. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

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

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

56. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

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

58. Push the **STOP** button on the MTX100 Option 06 to stop the stream output.

59. Open the Looptest file on the MTX100 Option 06.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Looptest** file, and then push the **ENTER** button.

60. Push the **PLAY** button on the MTX100 Option 06 to start the signal output of the file.

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

62. Push the **STOP** button on the MTX100 Option 06 to stop the stream output.

63. Disconnect the BNC cable from the INPUT connector on the MTX100 Option 06.

Checking the 8VSB Play Operation.

1. Use a 75 Ω BNC cable to connect the OUTPUT 1 and the INPUT connectors on the MTX100 Option 06.
2. Use another 75 Ω BNC cable to connect the OUTPUT 2 connector on the rear panel of the MTX100 Option 06 and INPUT connector of MPEG recorder & player, as shown in Figure 4-29.

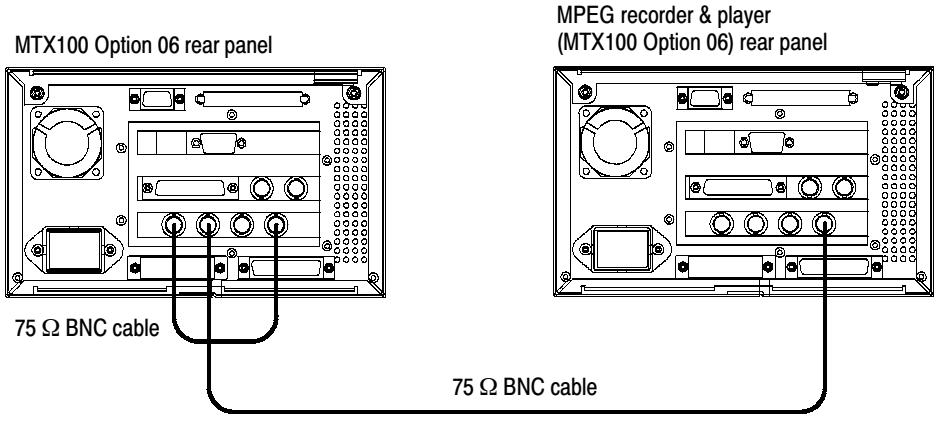


Figure 4-29: SMPTE310M/8VSB interface test

3. In the **Play** menu on the MTX100 Option 06, make the following setting:

   Update . . . . . Off

4. Push the **REC** button on the MPEG recorder & player to display the Record screen, and then make the following settings:

   Source 310M/8VSB
   Record size . . 100 MBytes
   Target . . . . . Disk

5. Push the **PLAY** button on the MTX100 Option 06 to start the signal output of the 8VSB_test.TRP file.
6. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player.
7. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.
8. In the dialog box, enter **Out2test** for the file name that is used to save the test file, and then push the **ENTER** button.
9. Push the **REC** button on the MPEG recorder & player to record the test file.

10. Move the BNC cable connection from the OUTPUT 2 connector to the through output of the INPUT connector on the MTX100 Option 06.

11. Verify that the hierarchic view is displayed on the screen of the MPEG recorder & player.

12. Select **Save** from the **File** menu on the MPEG recorder & player to open the **Save As** dialog box.

13. In the dialog box, enter **Looptest** for the file name that is used to save the test file, and then push the **ENTER** button.

14. Push the **REC** button on the MPEG recorder & player to record the test file.

15. Push the **STOP** button on the MTX 100 Option 06 to stop the stream output.

16. Disconnect the two BNC cables from the MTX100 Option 06 and MPEG recorder & player.

Checking the 8VSB Record Operation.

17. Use a 75 Ω BNC cable to connect the OUTPUT 1 connector on the MPEG recorder & player to the INPUT connector on the MTX100 Option 06, as shown in Figure 4-30.

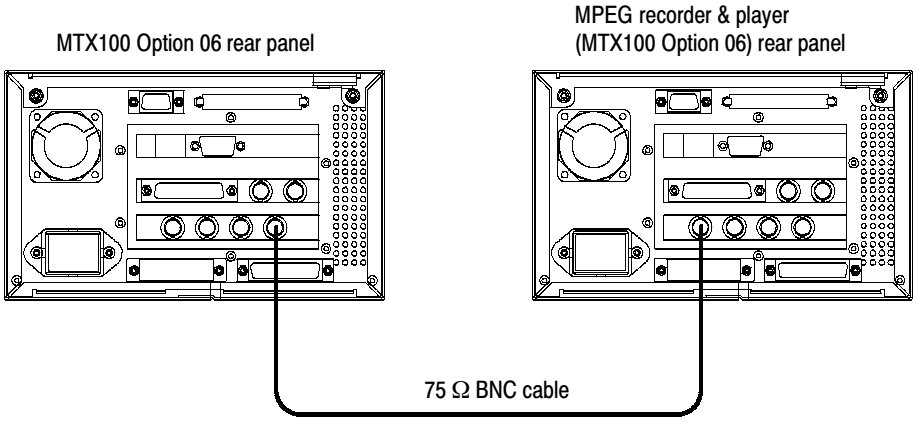


Figure 4-30: SMPTE310M/8VSB interface Record operation test

18. Push the **REC** button on the MTX100 Option 06 to display the Record screen, and then make the following settings:

Source 310M/8VSB
Record size . . 100 MBytes
Target . . . . . RAM

19. Push the **PLAY** button on the MPEG recorder & player to display the Play screen, and then make the following settings:

Update . . . . . Off

20. Open the Out2test file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Out2test** file, and then push the **ENTER** button.

21. Push the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

22. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 06.

23. Select **Save** from the **File** menu on the MTX100 Option 06 to open the **Save As** dialog box.

24. In the dialog box, enter **Out2test** for the file name that is used to save the test file, and then push the **ENTER** button.

25. Push the **REC** button on the MTX100 Option 06 to record the **Out2test** file.

26. Push the **STOP** button on the MPEG recorder & player to stop the stream output.

27. Open the Looptest file on the MPEG recorder & player.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Looptest** file, and then push the **ENTER** button.

28. Push the **PLAY** button on the MPEG recorder & player to start the signal output of the file.

29. Verify that the hierarchic view is displayed on the screen of the MTX100 Option 06.

30. Select **Save** from the **File** menu on the MTX100 Option 01 to open the **Save As** dialog box.

31. In the dialog box, enter **Looptest** for the file name that is used to save the test file, and then push the **ENTER** button.

32. Push the **REC** button on the MTX100 Option 06 to record the **Looptest** file.

33. Push the **STOP** button on the MPEG recorder & player to stop the stream output.

34. Disconnect the BNC cable from the INPUT connector on the MTX100 Option 06.

Checking the Recorded Files.

35. Use a 75 Ω BNC cable to connect the OUTPUT1 connector on the MTX100 Option 06 to the ASI 1 IN connector on the MPEG test system, as shown in Figure 4-31.

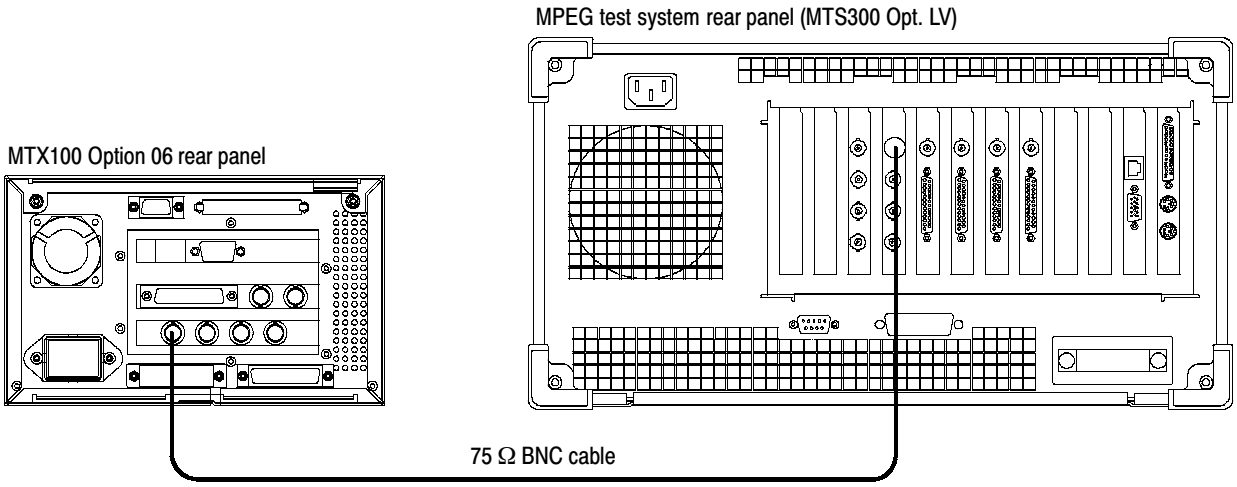


Figure 4-31: 8VSB interface recorded files check

36. Push the **PLAY** button on the MTX100 Option 06 to display the Play screen.

37. Change **Update** to **On** from the **Play** menu on the MTX100 Option 06.

38. Open the Out2test file on the MTX100 Option 06.

- **a.** Select **Open** from the **File** menu.
- **b.** In the resulting **Select File** dialog box, select the **Out2test** file, and then push the **ENTER** button.

39. Push the **PLAY** button on the MTX100 Option 06 to start the signal output of the file.

40. Double-click the **Master Client** icon in the Tektronix MPEG Test System program group window on the MPEG test system to start the application.

41. Select **Connect locally** from the **Master** menu to connect to the local Server Manager.

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

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

44. Select the Analysis Server icon, right click, and then select **Launch Expert Client**. The Expert Client applications Window opens.

45. Verify that the hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the transmission rate is 19.392 Mbps and that the transport stream packet size is 188 bytes.

46. Push the **STOP** button on the MTX100 Option 06 to stop the stream output.

47. Open the Looptest file on the MTX100 Option 06.

a. Select **Open** from the **File** menu.

b. In the resulting **Select File** dialog box, select the **Looptest** file, and then push the **ENTER** button.

48. Push the **PLAY** button on the MTX100 Option 06 to start the signal output of the file.

49. Verify that the hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the transmission rate is 19.392 Mbps and that the transport stream packet size is 188 bytes.

50. Push the **STOP** button on the MTX100 Option 06 to stop the stream output.

Adjustment Procedures

The MTX100 does not require any adjustments.

Maintenance

This section contains the information needed to do periodic and corrective maintenance on the MTX100. 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 MTX100 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. Included is troubleshooting trees.
- *Using the Recovery Discs* — Procedures for reinstalling the Windows 2000 operating system and the MTX100 application if the MTX100 does not boot.
- *Selecting the Serial Interface Standard* — Procedures for setting the serial interface standard (RS-232C, RS-422, or RS-485) for COM2 port on the rear panel.

Related Maintenance Procedures

The following sections contain information and procedures related to maintenance.

- Section 2, *Operating Information*, covers instructions useful when operating the MTX100 in order to troubleshoot it.
- Section 3, *Theory of Operation*, contains a circuit description at the module or block level.
- Section 4, *Performance Verification*, contains procedures that may be useful in isolating problems to modules by testing the MTX100 performance.
- Section 9, *Diagrams*, contains a block diagram using individual modules as blocks and an interconnection diagram showing connections between the modules.
- Section 10, *Mechanical Parts List,* lists all field replaceable modules by part number.

Preparation

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

CAUTION. *Static discharge can damage any semiconductor component in the MTX100.*

Preventing ESD

When performing any service which requires internal access to the MTX100, 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.

Susceptibility to ESD

Table 6-1 lists the relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Table 6-1: Relative susceptibility to static-discharge damage

Semiconductor classes	Relative susceptibility levels [1]
MOS or CMOS microcircuits or discrete circuits, or linear microcircuits with MOS inputs (most sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFET	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (least sensitive)	9

[1] **Voltage equivalent for levels (voltage discharged from a 100 pF capacitor through resistance of 100 ohms**):

1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V (est.)
8 = 900 V
9 = 1200 V

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 MTX100. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent the MTX100 from malfunctioning and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the MTX100 and using general care when operating it.

How often preventative maintenance should be performed depends on the severity of the environment in which the MTX100 is used. A proper time to perform preventive maintenance is just before the MTX100 adjustment.

General Care

The cabinet helps keep dust out of the MTX100, and is needed to meet EMI and cooling requirements. The cabinet should be in place when operating the MTX100. The MTX100's front cover protects the front panel and display from dust and damage. Install the front cover when storing or transporting the MTX100.

Inspection and Cleaning Procedures

Inspect and clean the MTX100 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 MTX100 failure, especially under high-humidity conditions.

CAUTION. *Avoid the use of chemical cleaning agents that might damage the plastics used in this MTX100. 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 MTX100 for damage, wear, and missing parts, using Table 6-2 as a guide. An MTX100 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 MTX100.

Table 6-2: 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 MTX100 exterior, perform the following steps:

1. Remove loose dust on the outside of the MTX100 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 MTX100 during external cleaning, use only enough liquid to dampen the cloth or applicator.*

Inspection — Interior. To access the inside of the MTX100 for inspection and cleaning, refer to the *Removal and Installation Procedures* in this section.

Inspect the internal portions of the MTX100 for damage and wear, using Table 6-3 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 MTX100.*

Table 6-3: 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 MTX100 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 MTX100 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 MTX100.

Removal and Installation Procedures

This subsection contains procedures for removal and installation of all mechanical and electrical modules. Any electrical or mechanical module, assembly, or part listed in Section 10 of this manual is a module.

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 the MTX100's components, 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.
- Four module locator diagrams for finding the External modules (see Figure 6-2, on page 6-13), Board modules (see Figure 6-3, on page 6-14), Internal modules (see Figure 6-4, on page 6-15), and Rear Panel modules (see Figure 6-5, on page 6-16) in the MTX100.
- Procedures for removal and reinstallation of the electrical and mechanical modules.
- A disassembly procedure for removal of all the major modules from the MTX100 at one time and for reassembly of those modules into the MTX100. Such a complete disassembly is normally only done when completely cleaning the MTX100. (Instructions for doing the actual cleaning are found under *Inspection and Cleaning* at the beginning of this section.)
- Module disassembly procedures.

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.*

List of Modules

Section 10 lists all modules.

General Instructions

***STOP**. 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 MTX100.*

If you are removing a module for service, begin by performing the procedure Access Procedure *(page 6-17). 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 6-17 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 6-4: Summary of procedures

Procedure	Module		Page
Procedures for External Modules	■ Line cord ■ Cabinet and protective cover	■ Front-panel unit ■ Front-panel assembly	6-18
Procedures for Board Modules	■ CPU board ■ A10 Main board ■ A20 PCI Back Plane board	■ Interface board (Optional)	6-23
Procedures for Internal Module	■ Hard disk drive ■ CD-ROM drive ■ Internal and external fans	■ 5 V main power supply ■ A40 AC Distributer board ■ RFI filter	6-27
Procedures for Rear Panel Module	■ COM2 connector ■ SCSI connector	■ PRINTER connector	6-36

Equipment Required. Most modules in this MTX100 can be removed with a screwdriver handle mounted with a size #2, Phillips 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 6-5: Tools required for module removal

Item No.	Name	Description	Tektronix part number
1	Screwdriver handle	Accepts Phillips-driver bits	
2	#1 Phillips tip	Phillips-driver bit for #1 size screw heads	
3	#2 Phillips tip	Phillips-driver bit for #2 size screw heads	
4	Screwdriver handle	Accepts Torx®-driver bits	
5	T-15 Torx® tip	Torx®-driver bit for T-15 size screw heads	
6	Nut driver, $^1/_4$ inch	Standard tool	
7	Nut driver, 7 mm	Standard tool	

MTX100 Orientation

In this manual, procedures refer to “front,” “back,” “top,” etc. of the MTX100. Figure 6-1 shows how the sides are referenced.

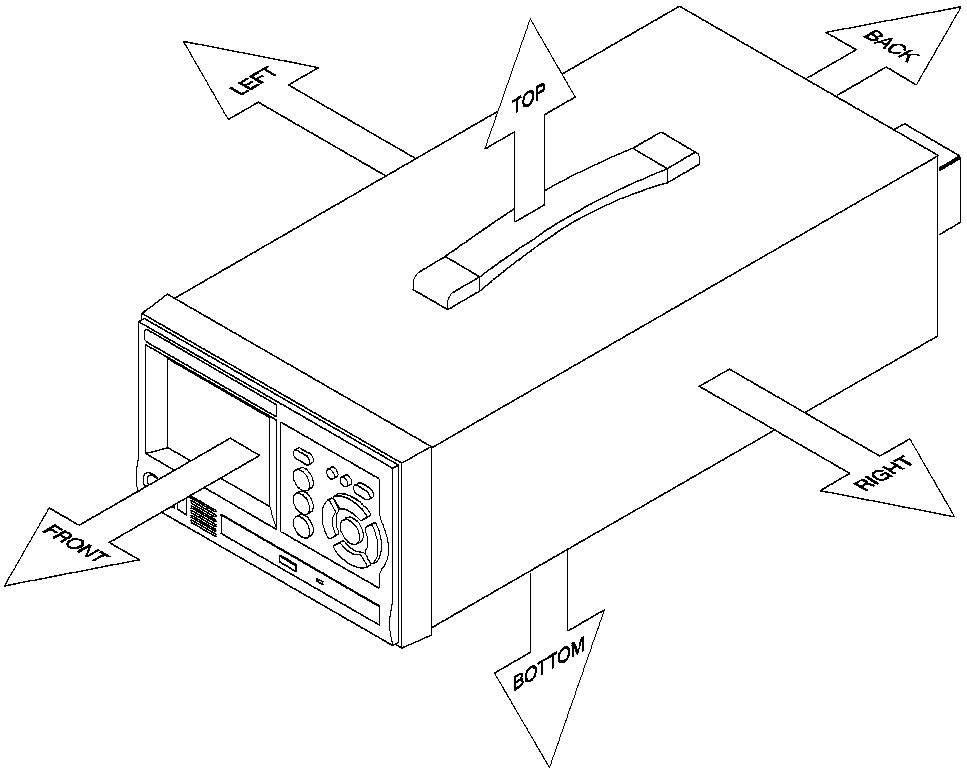


Figure 6-1: MTX100 orientation

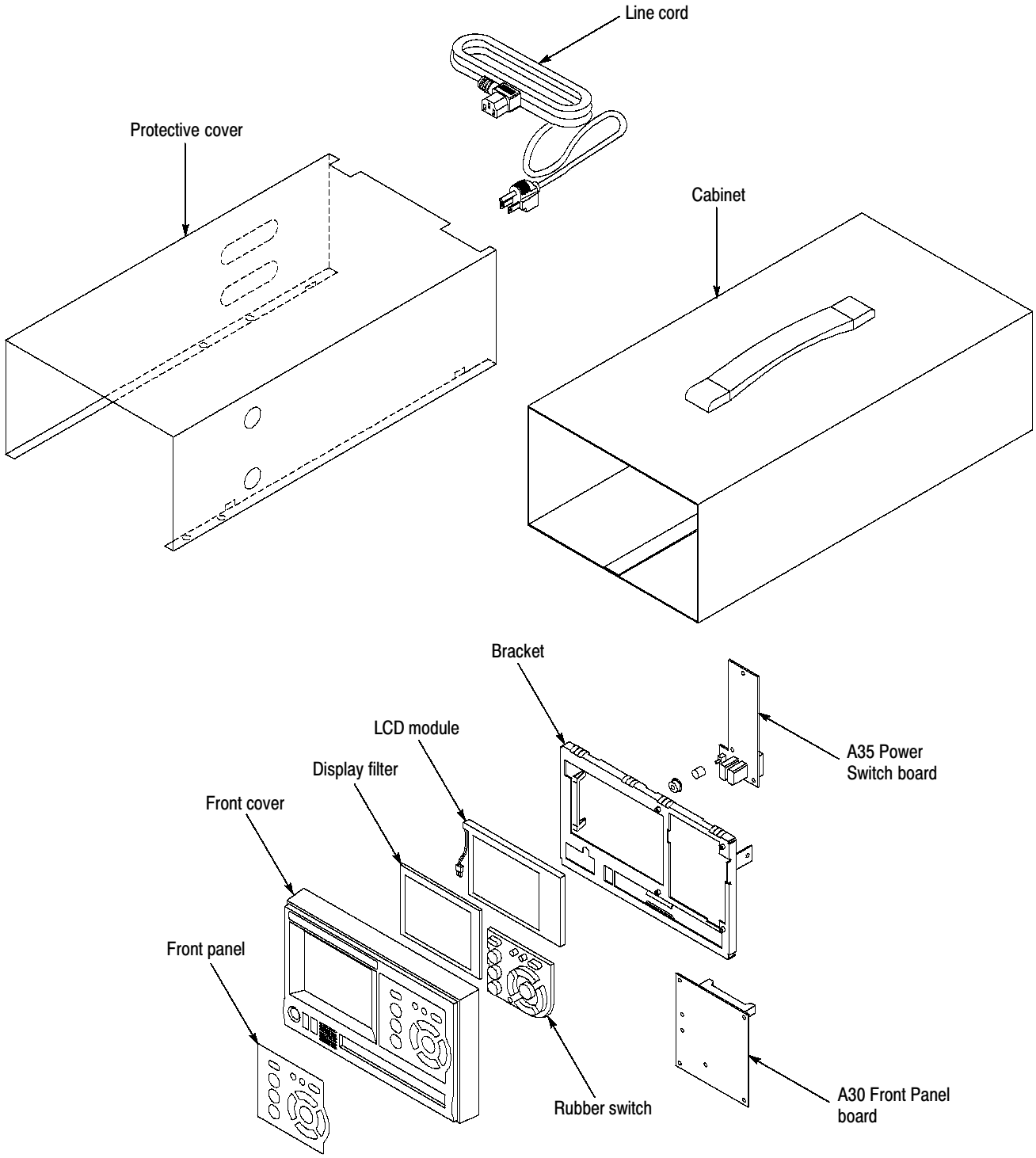


Figure 6-2: External modules

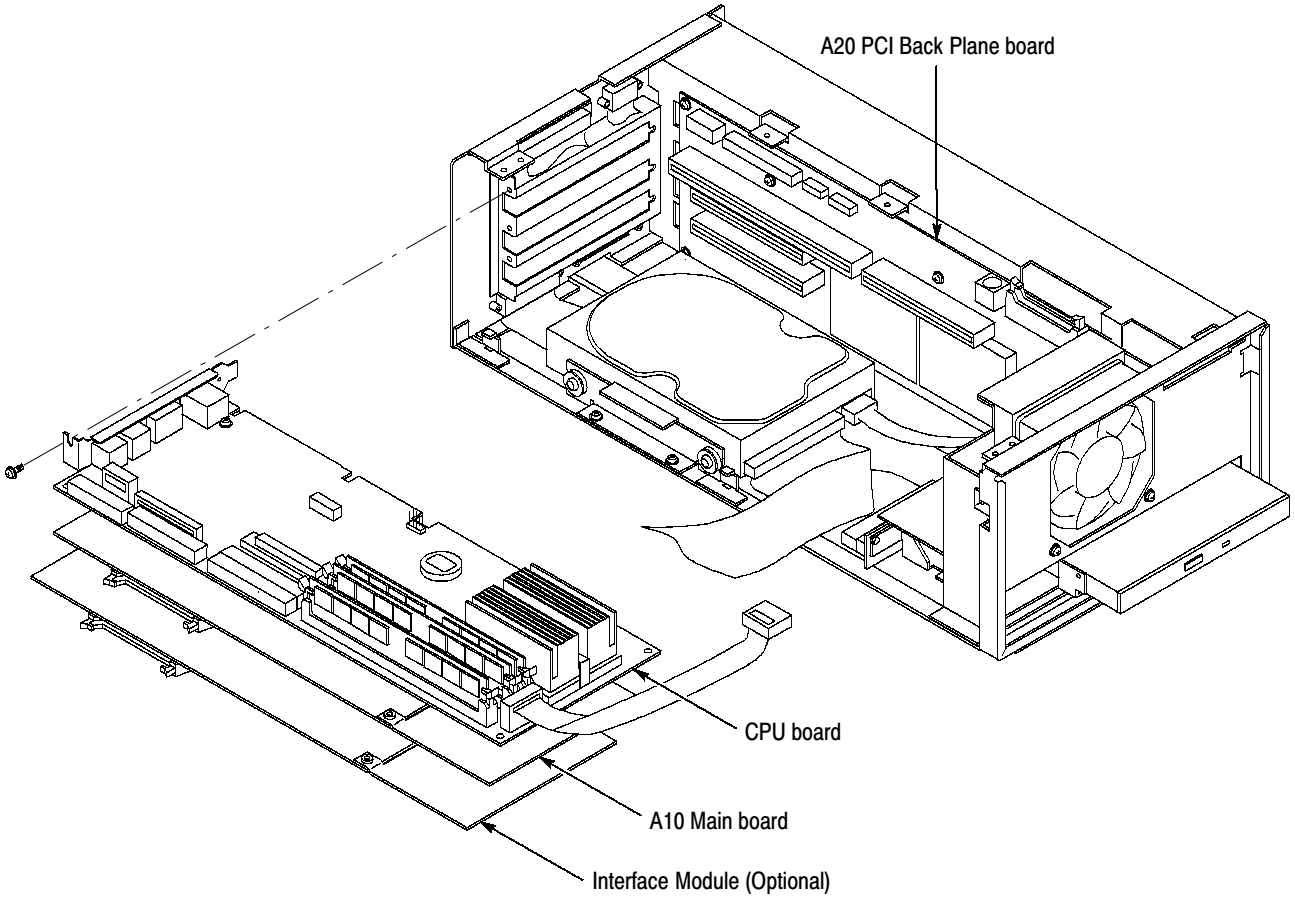


Figure 6-3: Board modules

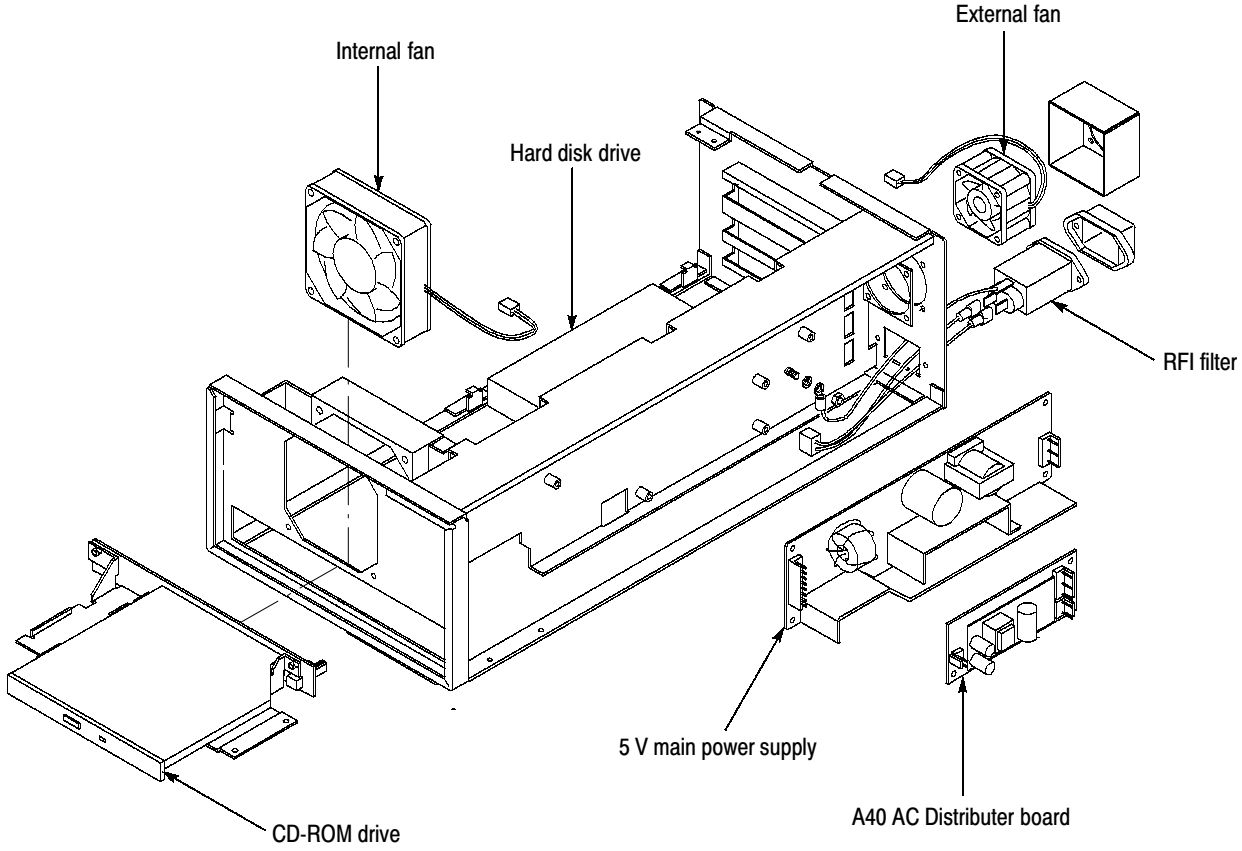


Figure 6-4: Internal modules

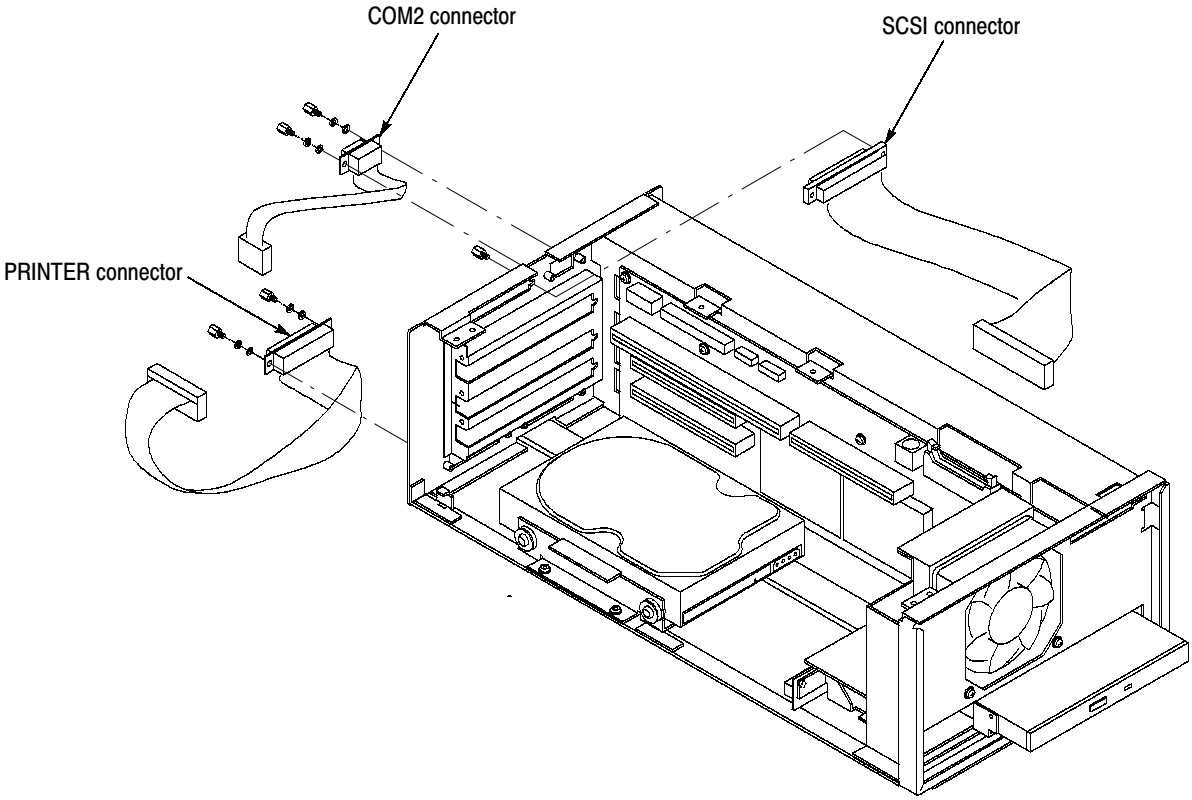


Figure 6-5: Rear panel modules

Access Procedure

When you have identified the module to be removed for service, read *General Instructions* found on page 6-10. Then use the flowchart in Figure 6-6 to determine which procedures to use for removing the module. The removal procedures end with installation instructions.

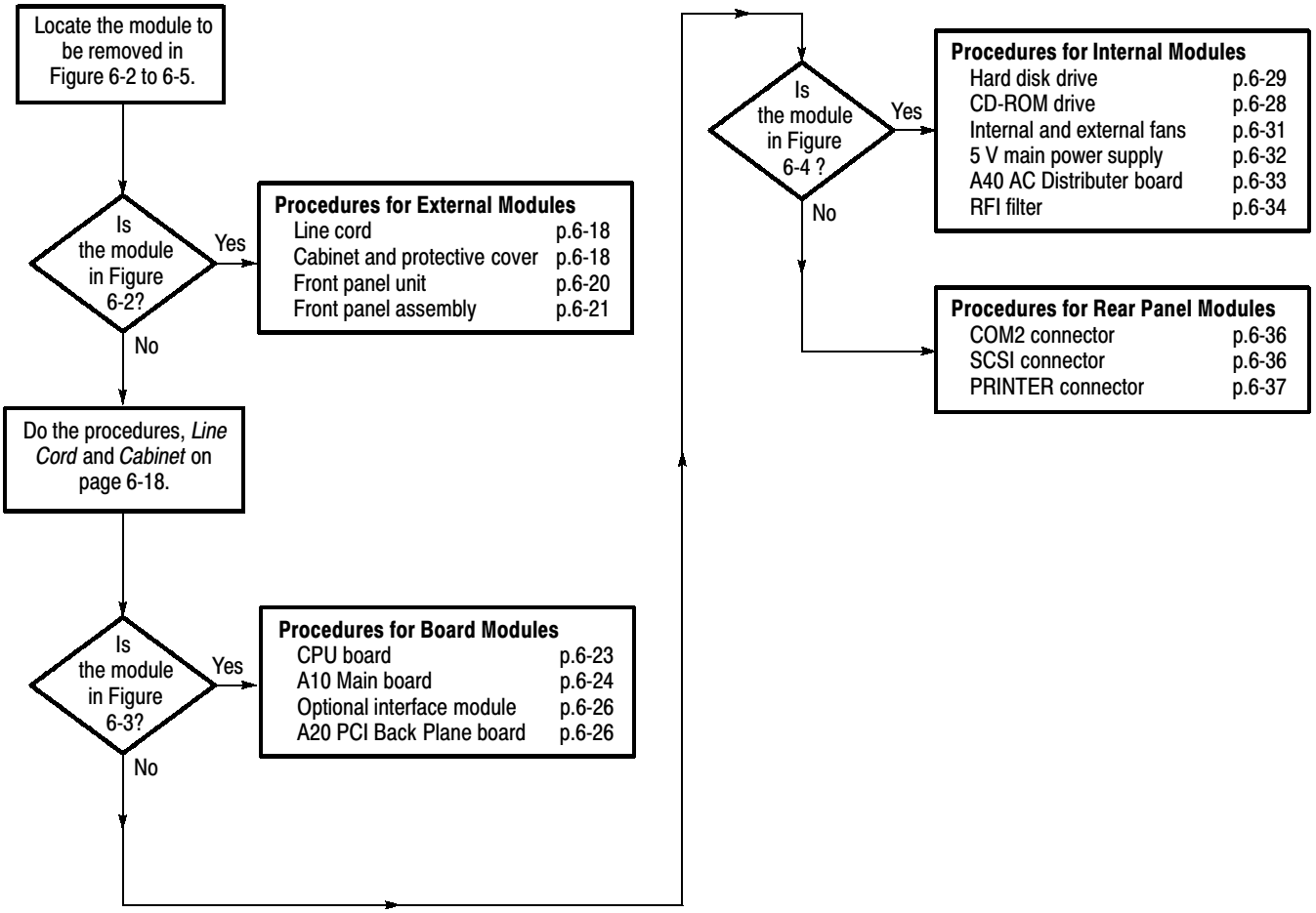


Figure 6-6: Guide to removal procedures

Procedures for External Modules

Do the *Access Procedure* (page 6-17) before doing any procedure in this group. This group contains the following procedures:

- *Line Cord*
- *Cabinet and Protective Cover*
- *Front-Panel Unit*
- *Front-Panel Assembly*

Line Cord

1. *Assemble equipment and locate modules to be removed:* You need no equipment. Locate the line cord in the location diagram *External modules*, Figure 6-2, page 6-13.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its rear is facing you.
3. *Remove line cord:* Find the line cord on the rear panel. Grasp the plug and pull the line cord and clamp away to complete the removal. Reverse procedure to reinstall.

Cabinet and Protective Cover

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a T-15 Torx tip (Items 4 and 5).
   b. Locate the modules to be removed in the locator diagram *External modules*, Figure 6-2, page 6-13.
2. *Orient instrument:* Set the MTX100 so its bottom is down on the work surface and its rear is facing you.
3. *Disconnect line cord:* Unplug the line cord from its receptacle at the rear panel.
4. *Remove cabinet and protective cover:* See Figure 6-7.
   a. Use a screwdriver with a T-15 Torx tip to remove the two screws securing the cabinet to the MTX100.
   b. Grasp the right and left edges of the cabinet toward the back. Push the chassis rear panel, toward the front of the MTX100, to separate it from the cabinet.
   c. Slide the cabinet off the MTX100. Take care not to bind or snag the cabinet on internal cabling as you remove it.
   d. Pull the protective cover out and away from the instrument.

5. *Reinstall cabinet and protective cover:*

   a. Perform step 4 in reverse order to reinstall the cabinet and protective cover. Take care not to bind or snag the cabinet on internal cabling; redress cables as necessary.

   b. Plug the line cord into its receptacle on the rear panel. This completes the MTX100 reassembly.

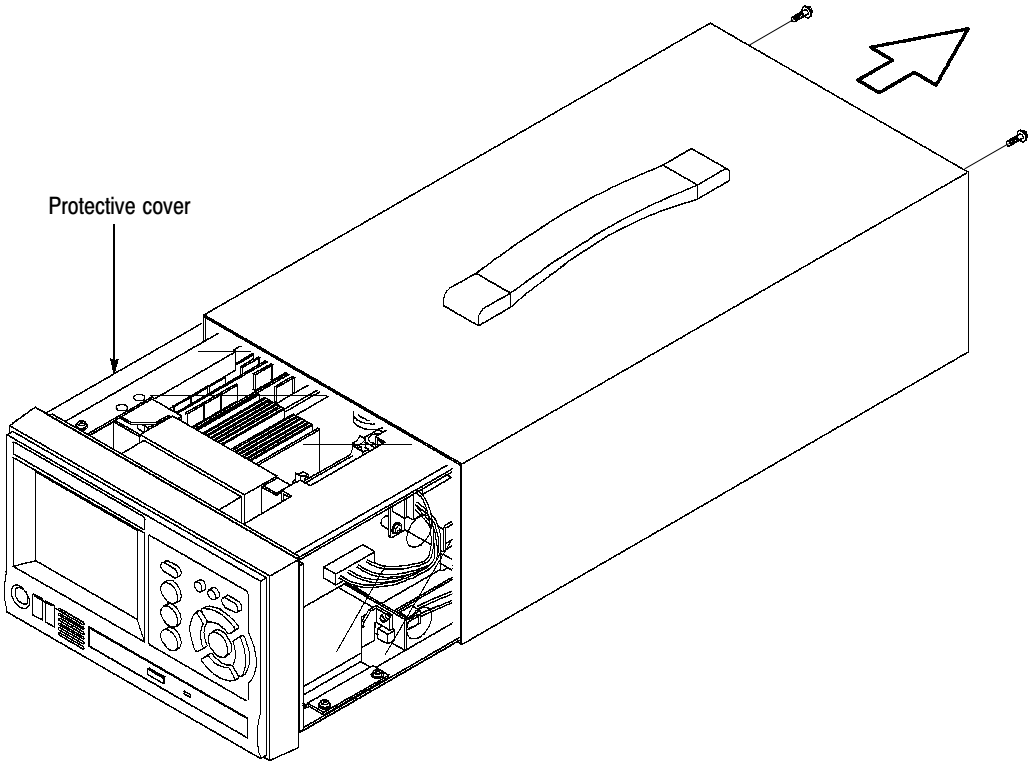


Figure 6-7: Cabinet and protective cover removal

Front-Panel Unit

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a #2 Phillips tip (Items 1 and 3).
   - **b.** Locate the module to be removed in the locator diagram *External modules*, Figure 6-2, on page 6-13.
2. *Orient instrument:* Set the MTX100 so its bottom is down on the work surface and its front is facing you.
3. *Remove front-panel unit:* See Figure 6-8.
   - **a.** Using a screwdriver with a #2 Phillips tip, remove the two screws securing the front-panel unit to the chassis.
   - **b.** Grasp the front-panel unit and pull it forward while pushing the two latches at the bottom of the chassis.
   - **c.** Unplug the cable at J310 on the A30 Front Panel board.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the front-panel unit.

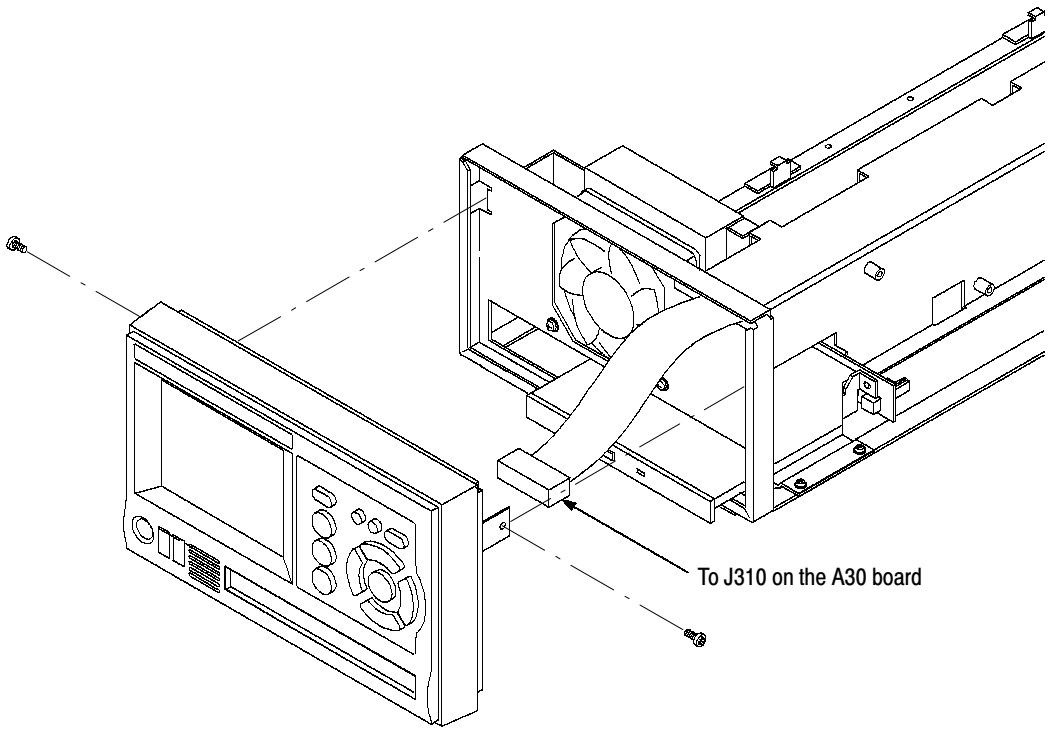


Figure 6-8: Front-panel unit removal

Front Panel Assembly

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a size #1 Phillips tip (Items 1 and 3).
   b. Locate the module to be removed in the locator diagram *External modules*, Figure 6-2, on page 6-13.
2. *Remove the front cover:* See Figure 6-9.
   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 6-9.
   a. Use a screwdriver with a #1 Phillips tip to remove the four screws securing the A30 Front panel board to the front cover bracket.
   b. Unplug the cable from the A35 Power Switch board at J300.
   c. Lift the board away.
4. *Remove the A35 Power Switch board:* See Figure 6-9.
   a. Use a screwdriver with a #1 Phillips tip to remove the two screw securing the A35 Power switch board to the front cover bracket.
   b. Unplug the cables from the A30 Front Panel board at the J100 and from the LCD module.
   c. Lift the board away.
5. Now hand disassemble the front-panel assembly components using Figure 6-9 as a guide. Reverse the procedure to reassemble.
6. *Reinstallation:* Perform steps 2 through 5 in reverse order to reinstall the front-panel assembly.

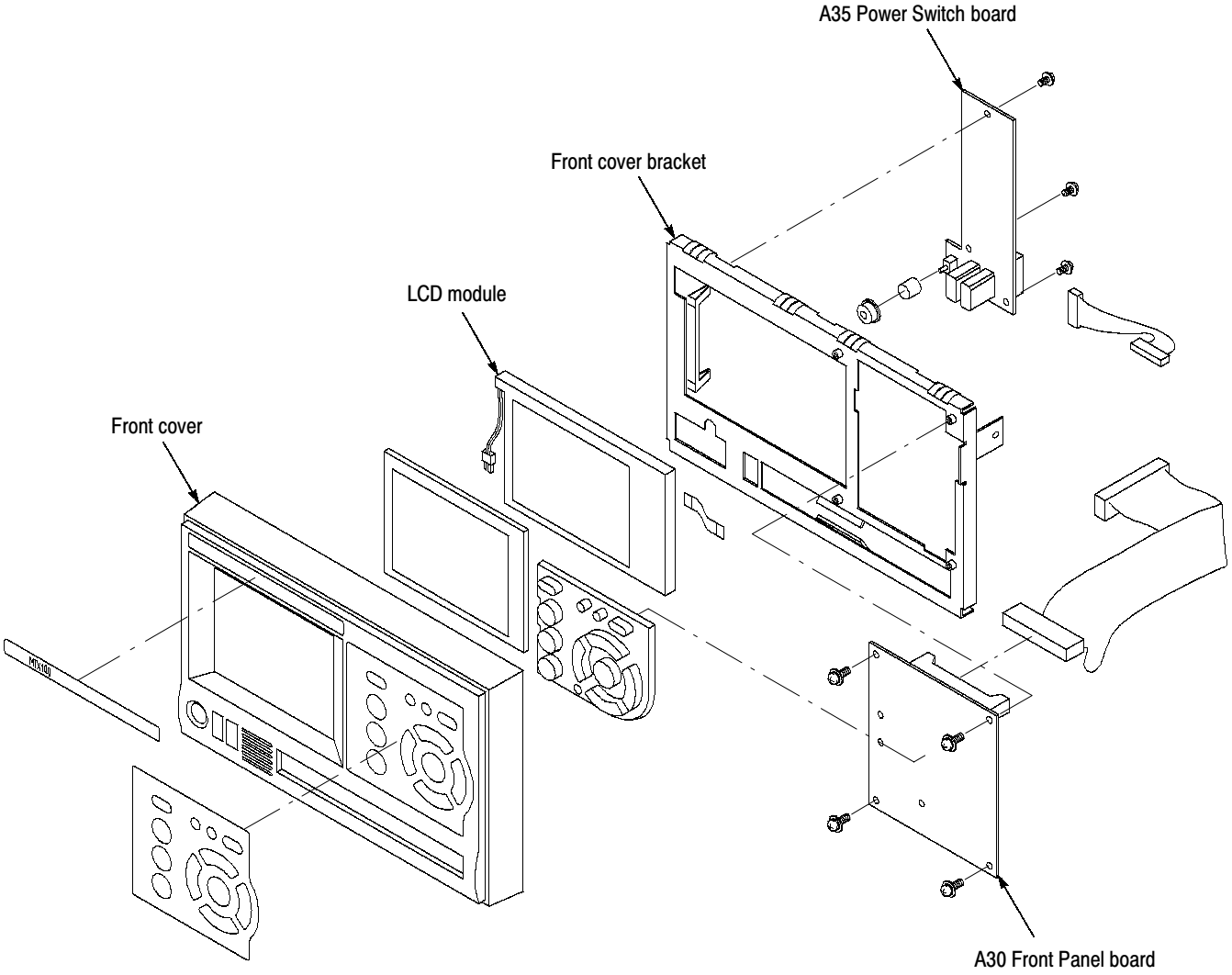


Figure 6-9: Disassembly of front-panel assembly

Procedure for Board Modules

Perform the *Access Procedure* (on page 6-17) before doing any procedure in this group. The procedures are:

- *CPU board*
- *A10 Main board*
- *Optional interface module (if installed)*
- *A20 PCI Back Plane board*

CPU Board

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a #2 Phillips tip (Items 1 and 3).
   b. Locate the board in the locator diagram *Board modules,* Figure 6-3, on page 6-14.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its left side is facing you.
3. *Remove the board retainers:* See Figure 6-10.
   a. Remove the two screws securing the board retainers to the chassis.
   b. Lift the retainers away from the chassis.
4. *Remove the top frame with shield bracket:* See Figure 6-10.
   a. Remove the four screws securing the top frame with shield bracket to the chassis.
   b. Lift the top frame with shield bracket up and away from the chassis.
5. Remove the CPU board: See Figure 6-10.
   a. Unplug these cables. See Figure 6-10.
      - The cable from the A20 PCI Back Plane board at J1.
      - The cable from the A20 PCI Back Plane board at J2.
      - The cable from the hard disk drive at J3.
      - The cable from the A50 Disk I/F Board at J4.
      - The cable from the A20 PCI Back Plane board at J6.
      - The cable from the PRINTER connector at J7.
      - The cable from the A20 PCI Back Plane board at J8.

- The cable from the COM2 connector at J9.
- The cable from the SCSI connector at J12.
- The cable from the A20 PCI Back Plane board at J15.
- The cable from the A20 PCI Back Plane board at J23 and 24.

b. Remove the two screws securing the board bracket to the chassis. See Figure 6-10.

c. Grasp the board and slide it out.

6. *Reinstallation*: Do steps 3 and 5 in reverse order to reinstall the CPU board.

A10 Main Board

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

a. You need a screwdriver with a #2 Phillips tip (Items 1 and 3).

b. Locate the board in the locator diagram *Board modules,* Figure 6-3, on page 6-14.

2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its left side is facing you.

3. *Remove the board retainers:* See Figure 6-10.

a. Remove the two screws securing the board retainers to the chassis.

b. Lift the retainers away from the chassis.

4. *Remove the top frame with shield bracket:* See Figure 6-10.

a. Remove the four screws securing the top frame with shield bracket to the chassis.

b. Lift the top frame with shield bracket up and away from the chassis.

5. Remove the A10 Main board: See Figure 6-10.

a. Unplug these cables.

- The cable from the PRINTER connector at J7 on the CPU board.
- The cable from the hard disk drive at J3 on the CPU board.
- The cable from the A50 Disk I/F Board at J4 on the CPU board.

b. If an optional interface module is installed, unplug the cable from the interface module.

c. Remove the two screws securing the board bracket to the chassis. See Figure 6-10.

d. Grasp the board and slide it out.

6. *Reinstallation*: Do steps 3 and 5 in reverse order to reinstall the A10 Main board.

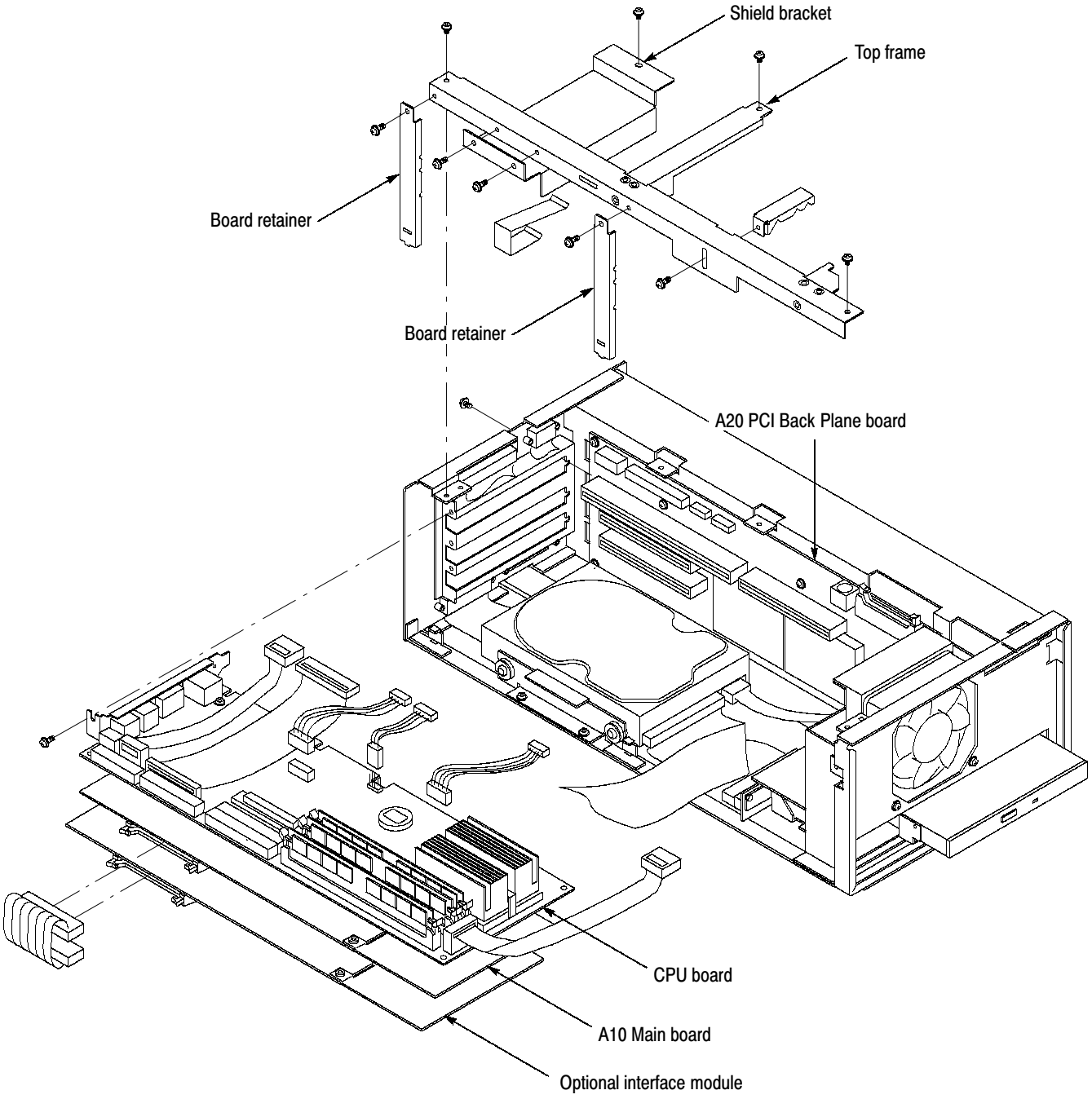


Figure 6-10: CPU board, A10 Main board, interface module, and A20 PCI Back Plane board removal

Optional Interface Module

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a #2 Phillips tip (Items 1 and 3).
   b. Locate the board in the locator diagram *Board modules,* Figure 6-3, page 6-14.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its left side is facing you.
3. *Remove the board retainers:* See Figure 6-10.
   a. Remove the two screws securing the board retainers to the chassis.
   b. Lift the retainers away from the chassis.
4. *Remove the top frame with shield bracket:* See Figure 6-10.
   a. Remove the four screws securing the top frame with shield bracket to the chassis.
   b. Lift the top frame with shield bracket up and away from the chassis.
5. Remove the interface module: See Figure 6-10.
   a. Unplug these cables.
      - The cable from the PRINTER connector at J7 on the CPU board.
      - The cable from the hard disk drive at J3 on the CPU board.
      - The cable from the A50 Disk I/F Board at J4 on the CPU board.
   b. Unplug the cable from the A10 Main board.
   c. Remove the two screws securing the board bracket to the chassis. See Figure 6-10.
   d. Grasp the board and slide it out.
6. *Reinstallation*: Do steps 3 and 5 in reverse order to reinstall the interface module.

A20 PCI Back Plane Board

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a #1 Phillips tip (Items 1 and 2).
   b. Locate the board in the locator diagram *Board modules,* Figure 6-3, page 6-14.

2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its left side is facing you.
3. Remove the A20 PCI Back Plane board: See Figure 6-10.
   a. Remove the CPU board as described on page 6-23.
   b. Remove the A10 Main board as described on page 6-24.
   c. Remove the interface module as described on page 6-26 (if needed).
   d. Unplug these cables.
      - The cable from the A40 AC Distributer board at J40.
      - The cable from the 5 V main power supply at J50.
      - The cable from the external fan at J200.
      - The cable from the internal fan at J205.
      - The cable from the A30 Front Panel board at J170.
   e. Remove the nine screws securing the A20 PCI Back Plane 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 interface module.

Procedure for Internal Modules

Perform the *Access Procedure* (on page 6-17) before doing any procedure in this group. The procedures are:

- *CD-ROM drive*
- *Hard disk drive*
- *Internal and external fans*
- *5 V main power supply*
- *A40 AC Distributer board*
- *RFI filter*

CD-ROM Drive

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a #1 Phillips tip (Items 1 and 2).
   b. Locate the CD-ROM drive in the locator diagram *Internal modules,* Figure 6-4, page 6-15.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its front is facing you.
3. *Remove the CD-ROM drive:* See Figure 6-11.
   a. Remove the front-panel unit as described on page 6-20.
   b. Unplug the cables from the A20 PCI Back Plane board and from the CPU board.
   c. Remove the two screws securing the CD-ROM mount bracket to the chassis.
   d. Lift up the CD-ROM drive with the bracket and A50 Disk I/F board from the chassis.
4. *Remove the CD-ROM drive from the bracket and the board:* Remove the four screws securing the CD-ROM drive to the bracket and the board.
5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the CD-ROM drive.

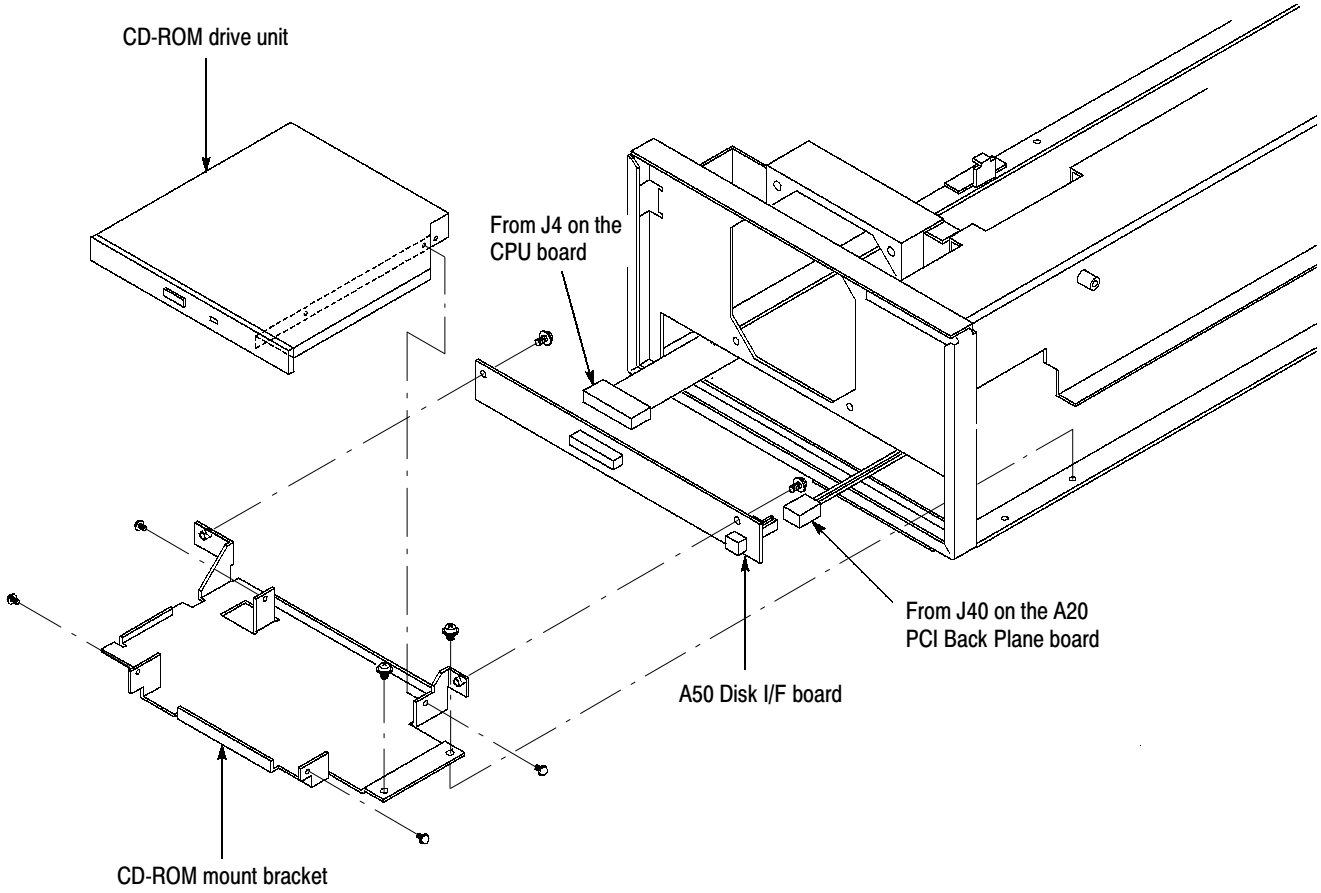


Figure 6-11: CD-ROM drive removal

Hard Disk Drive

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a #1 Phillips tip (Items 1 and 2).
   - **b.** Locate the hard disk drive in the locator diagram *Internal modules,* Figure 6-4, page 6-15.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its left side is facing you.
3. *Remove the hard disk drive:* See Figure 6-12.
   - **a.** Remove the CPU board as described on page 6-23.
   - **b.** Remove the A10 Main board as described on page 6-24.
   - **c.** Remove the interface module as described on page 6-26 (if needed).

d. Unplug these cables.

- The cable from J60 on the A20 PCI Back Plane board.
- The cable from J3 on the CPU board.

e. Remove the two screws securing the hard disk drive bracket to the chassis.

f. Lift up the hard disk unit with bracket from the chassis.

4. *Remove the hard disk drive from the bracket:* Remove the four screws securing the hard disk drive to the bracket.

5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the hard disk drive.

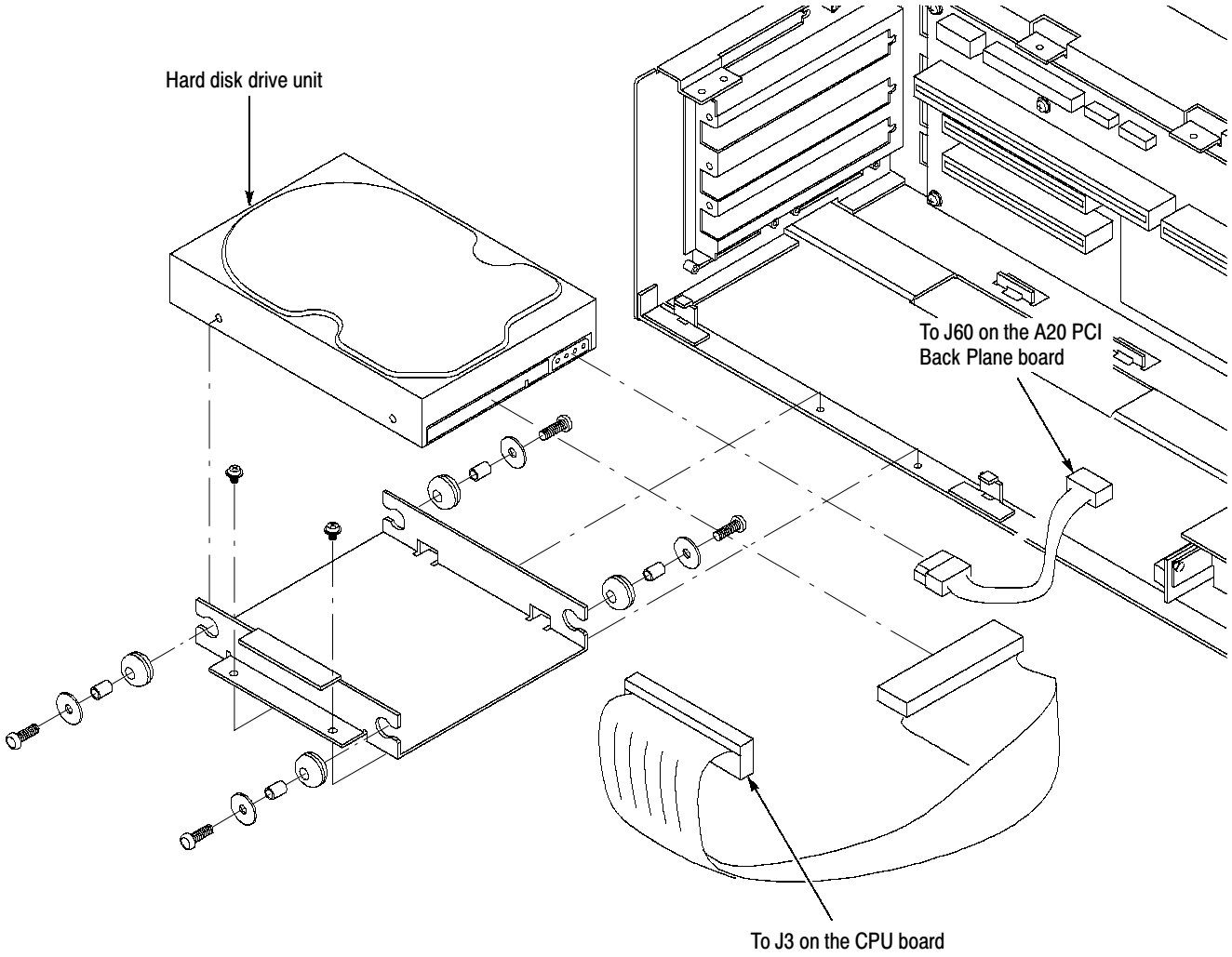


Figure 6-12: Hard disk drive removal

Internal and External Fans

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a #1 Phillips tip (Items 1 and 2).
   b. Locate the fans in the locator diagram *Internal modules,* Figure 6-4, page 6-15.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its front is facing you.
3. *Remove the internal fan:* See Figure 6-13.
   a. Remove the front-panel unit as described on page 6-20.
   b. Unplug the cable from J205 on the A20 PCI Back Plane board.
   c. Remove the four screws securing the fan to the chassis.
   d. 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 6-13.
   a. Set the MTX100 so its bottom is down on the work surface and its rear is facing you.
   b. Unplug the cable from J200 on the A20 PCI Back Plane board.
   c. 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.

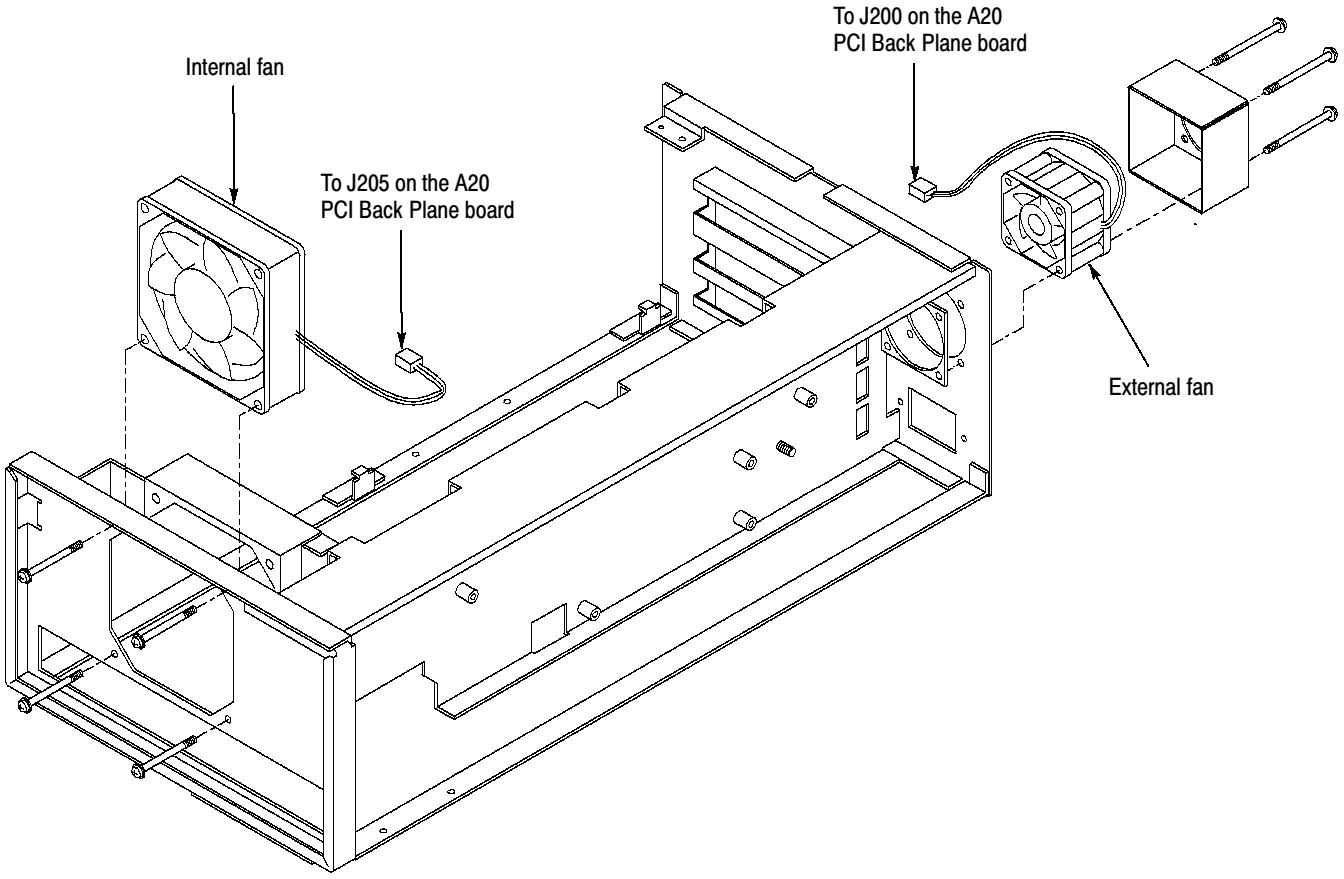


Figure 6-13: Internal and external fans removal

5 V Main Power Supply

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a #1 Phillips tip (Items 1 and 2).
   - **b.** Locate the 5 V main power supply in the locator diagram *Internal modules,* Figure 6-4, page 6-15.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its right side is facing you.
3. *Remove the 5 V main power supply:* See Figure 6-14.
   - **a.** Unplug these cables:
     - The cable from the A20 PCI Back Plane board at CN2 and CN3.
     - The cable from the A40 AC Distributer board at CN1.

b. Remove the four screws securing the 5 V main power supply to the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the 5 V main power supply.

A40 AC Distributer Board

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

a. You need a screwdriver with a #1 Phillips tip (Items 1 and 2).

b. Locate the A40 AC Distributer board in the locator diagram *Internal modules,* Figure 6-4, page 6-15.

2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its right side is facing you.

3. *Remove the A40 AC Distributer board:* See Figure 6-14.

a. Unplug these cables:

- The cable from the A20 PCI Back Plane board at J120.
- The cable from the 5 V main power supply at J110.
- The cable from the RFI filter at J100.

b. Remove the three screws securing the A40 AC Distributer board to the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the A40 AC Distributer board.

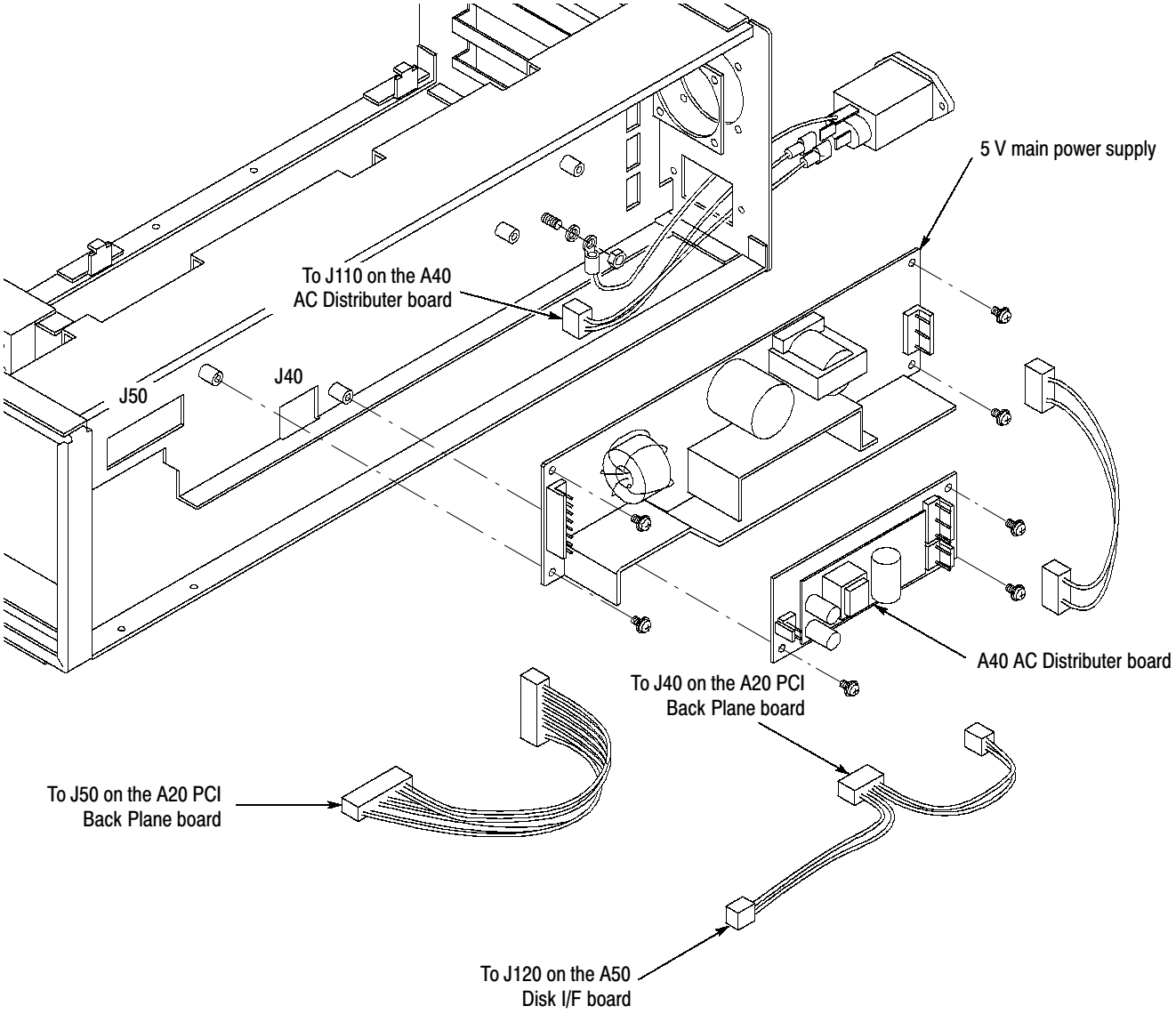


Figure 6-14: 5 V main power supply and A40 AC Distributer board removal

RFI filter

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

   a. You need a screwdriver with a #1 Phillips tip (Items 1 and 2), and a 7 mm nut driver (item 7).

   b. Locate the RFI filter in the locator diagram *Internal modules,* Figure 6-4, page 6-15.

2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its rear is facing you.

3. *Remove the RFI filter:* See Figure 6-15.
   a. Unplug the two cables from the RFI filter.
   b. Use a 7 mm nut driver to remove the nut securing the ground lead to the chassis.
   c. Remove the two screws securing the RFI filter to the chassis.
   d. Pull the RFI filter away.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the RFI filter.

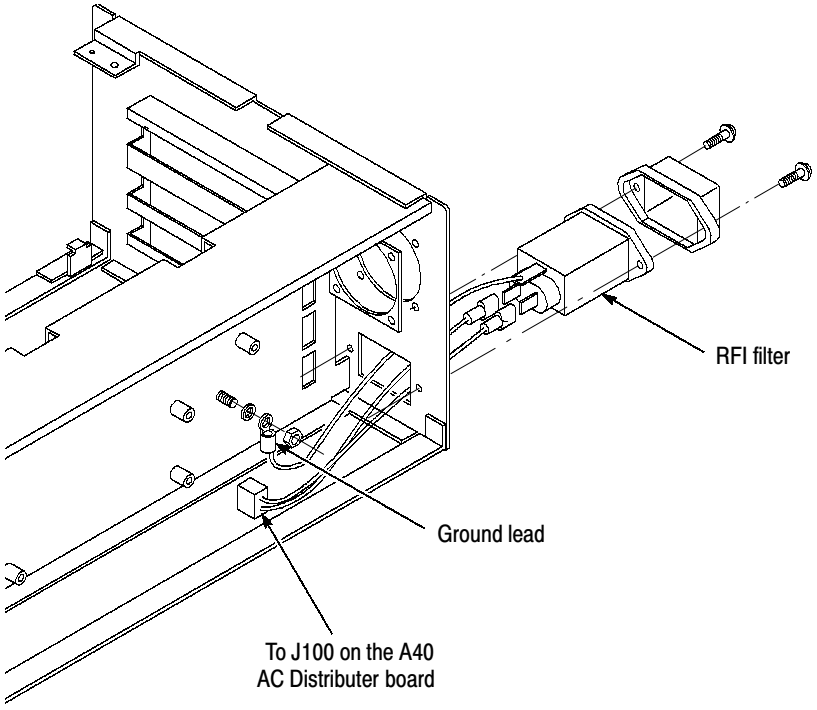


Figure 6-15: RFI filter removal

Procedure for Rear Panel Modules

Perform the *Access Procedure* (on page 6-17) before doing any procedure in this group. The procedures are:

- *COM2 connector*
- *SCSI connector*
- *PRINTER connector*

COM2 Connector

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a $^1/_4$ inch nut driver (Items 1 and 6).
   b. Locate the connector in the locator diagram *Rear Panel modules,* Figure 6-5, page 6-16.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its rear is facing you.
3. *Remove the COM2 connector:* See Figure 6-16.
   a. Unplug the cable from J9 on the CPU board.
   b. Use a $^1/_4$ inch nut driver to unscrew the two hex-headed mounting posts securing the connector to the chassis. Pull the connector away.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the COM2 connector.

SCSI Connector

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a $^1/_4$ inch nut driver (Items 1 and 6).
   b. Locate the connector in the locator diagram *Rear Panel modules,* Figure 6-5, page 6-16.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its rear is facing you.
3. *Remove the SCSI connector:* See Figure 6-16.
   a. Unplug the cable from J7 on the CPU board.
   b. Use a $^1/_4$ inch nut driver to unscrew the two hex-headed mounting posts securing the connector to the chassis. Pull the connector away.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the SCSI connector.

PRINTER Connector

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a $^1/_4$ inch nut driver (Items 1 and 6).
   b. Locate the connector in the locator diagram *Rear Panel modules,* Figure 6-5, page 6-16.
2. *Orient the instrument:* Set the MTX100 so its bottom is down on the work surface and its rear is facing you.
3. *Remove the PRINTER connector:* See Figure 6-16.
   a. Unplug the cable from J7 on the CPU board.
   b. Use a $^1/_4$ inch nut driver to unscrew the two hex-headed mounting posts securing the connector to the chassis. Pull the connector away.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the PRINTER connector.

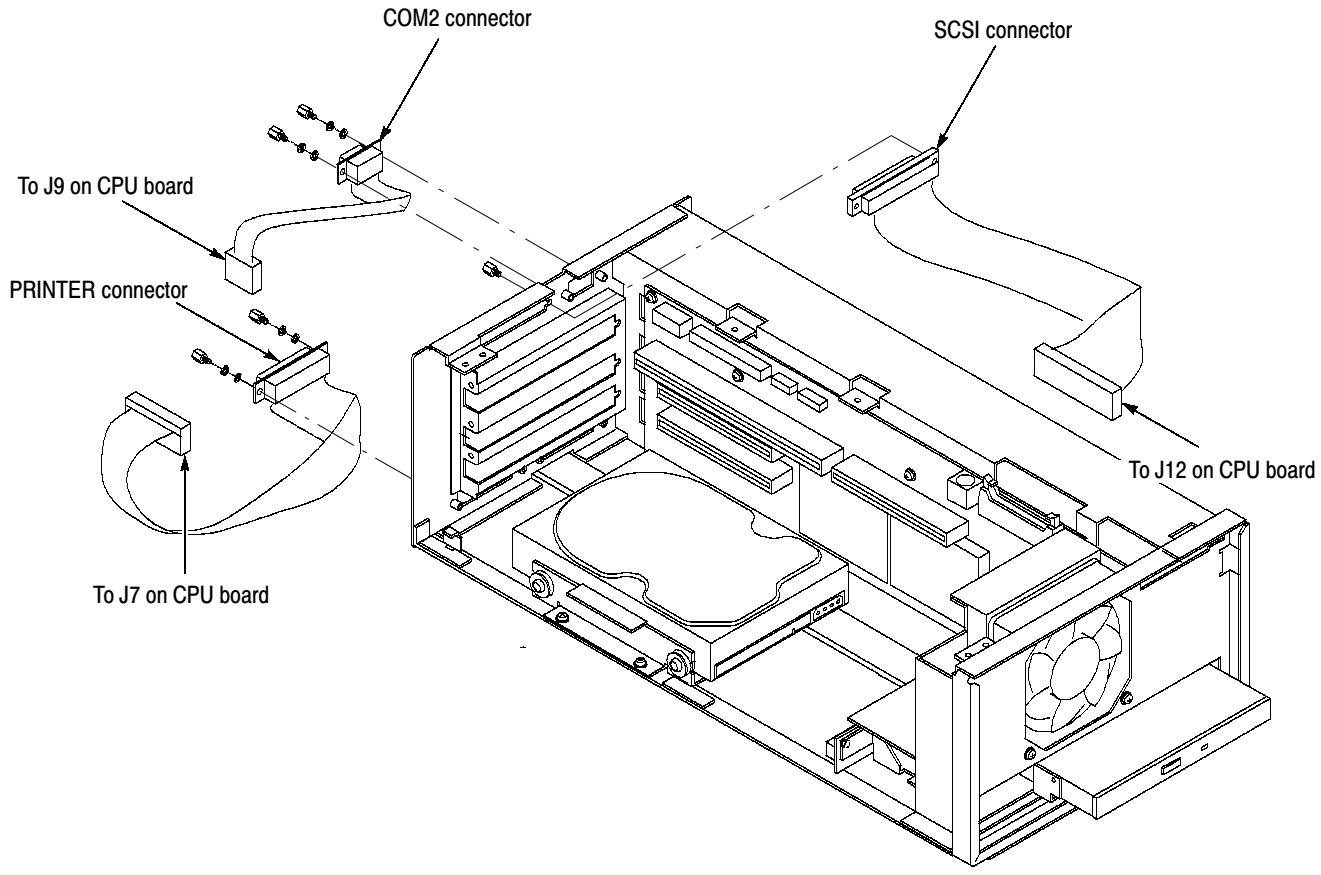


Figure 6-16: Rear panel modules removal

Troubleshooting

This subsection contains information about troubleshooting trees designed to isolate faulty modules in the MTX100.

Troubleshooting Trees

Figures 6-17 through 6-21 show the troubleshooting procedure of the MTX100.

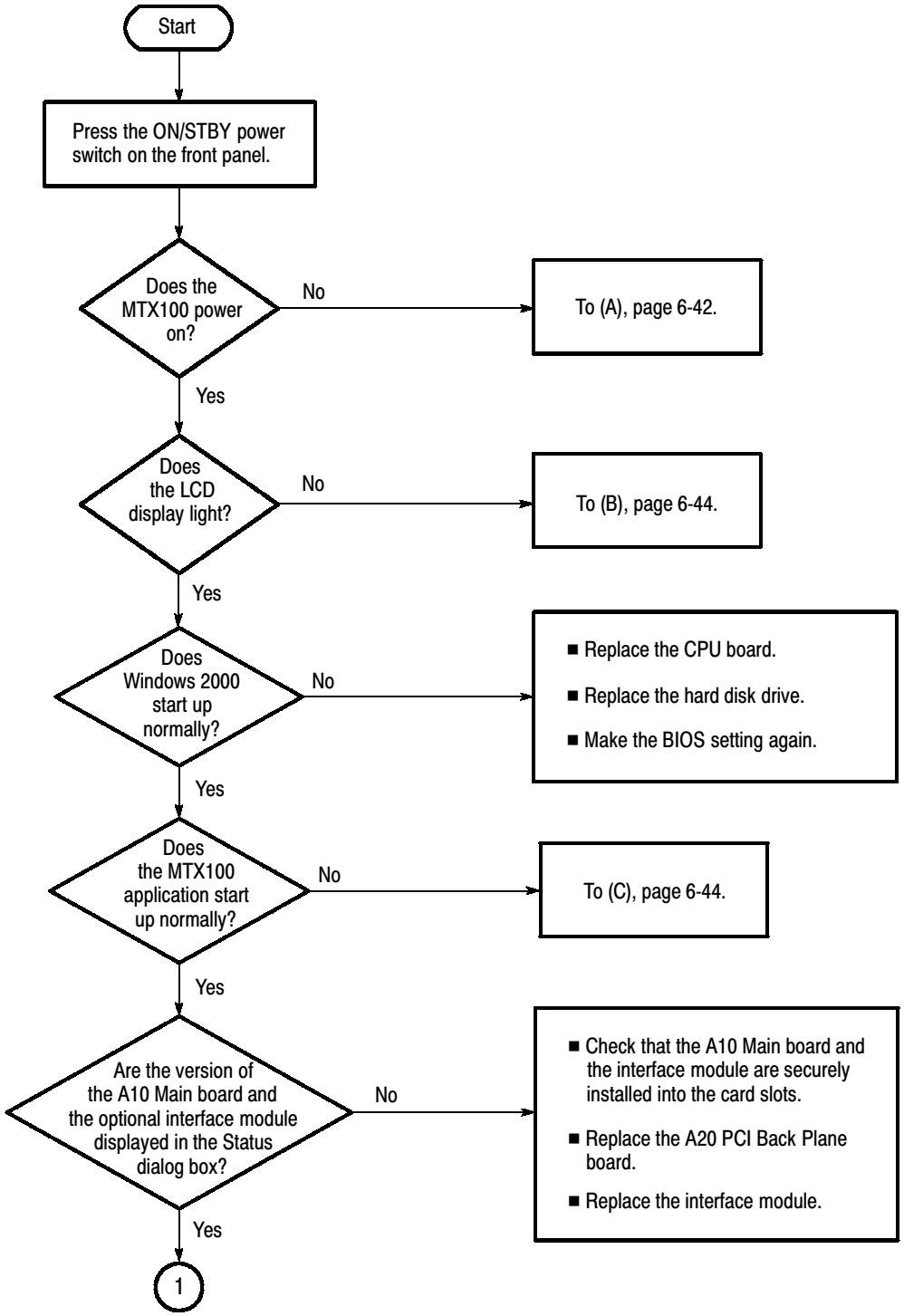


Figure 6-17: Troubleshooting procedure (1)

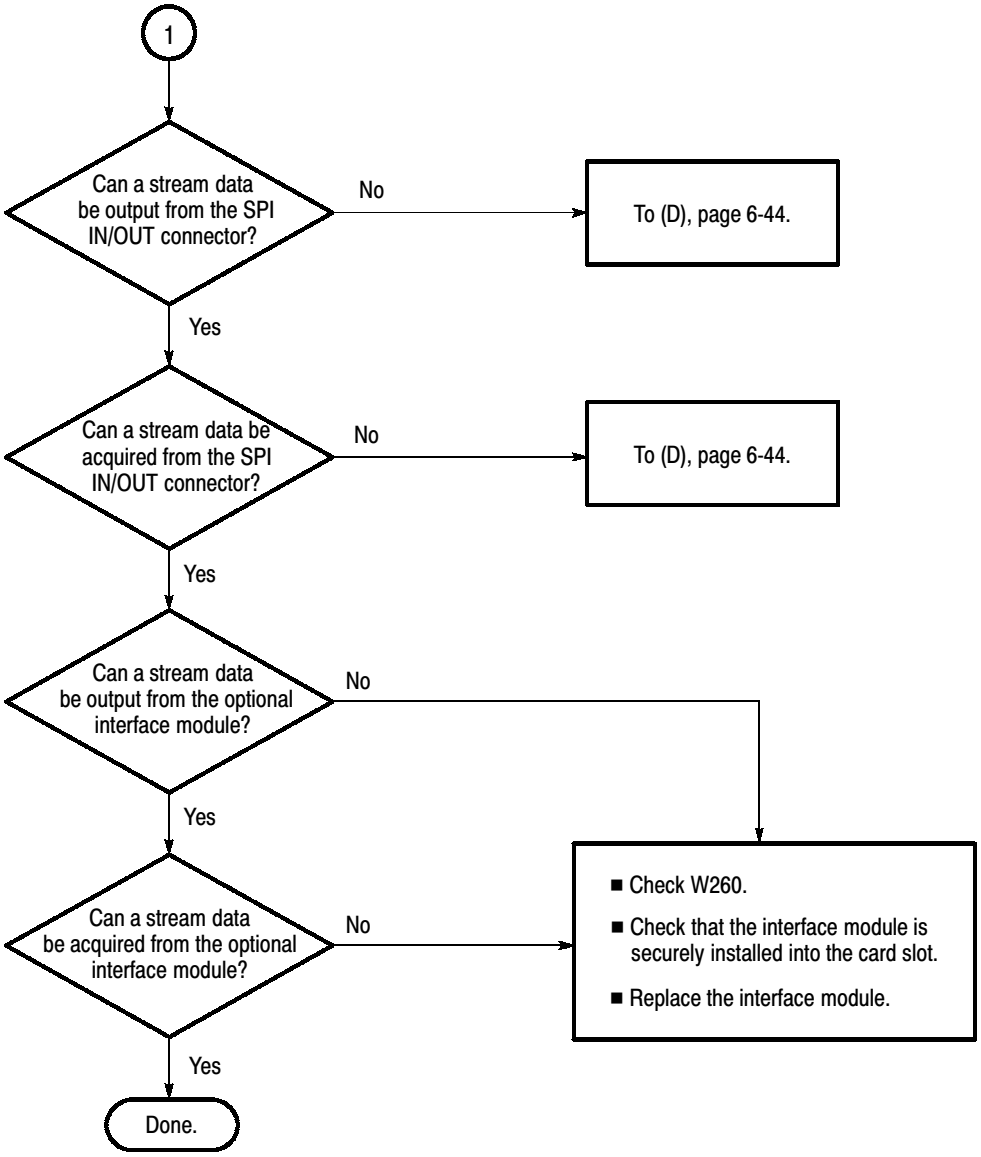


Figure 6-18: Troubleshooting procedure (2)

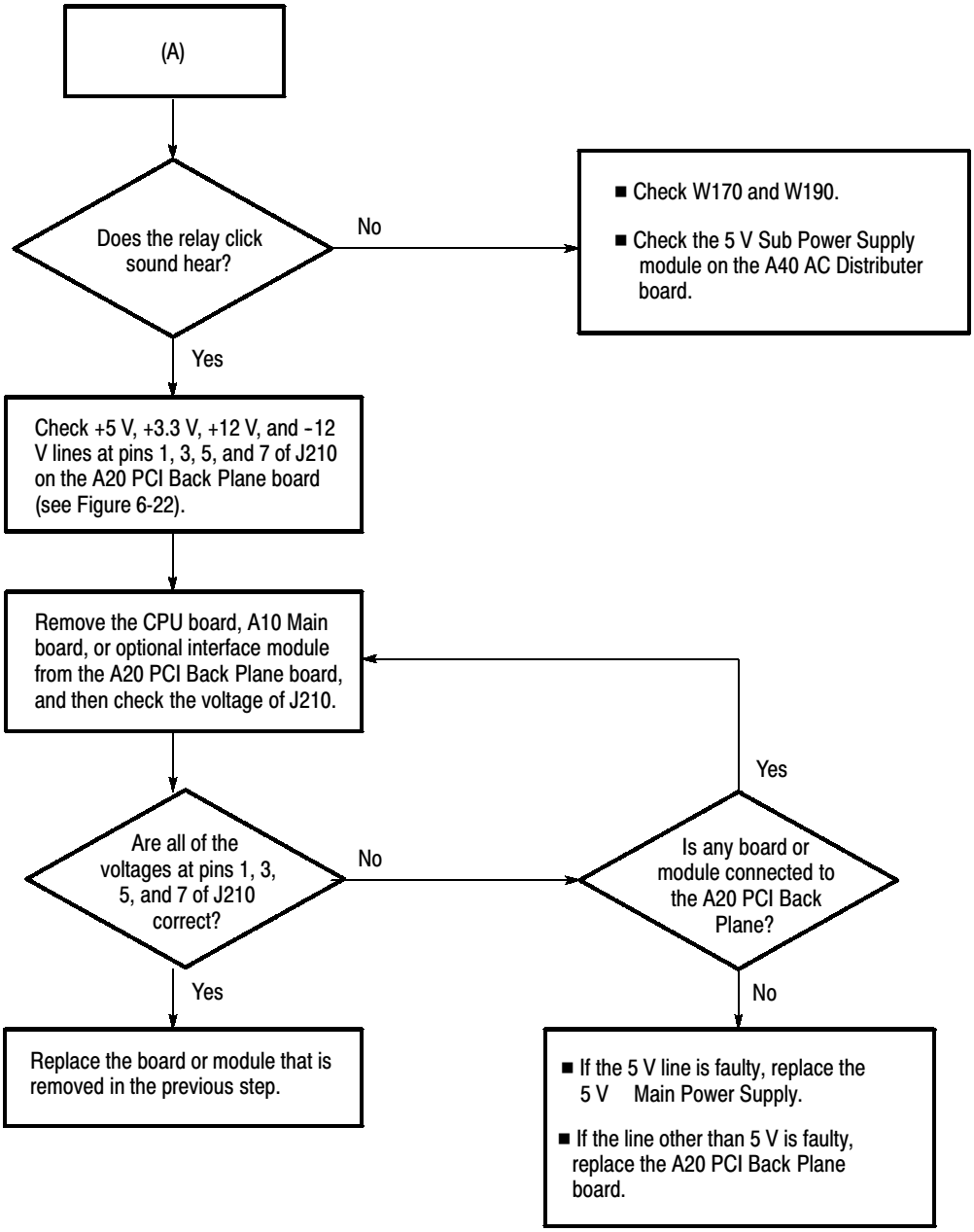


Figure 6-19: Troubleshooting procedure (3)

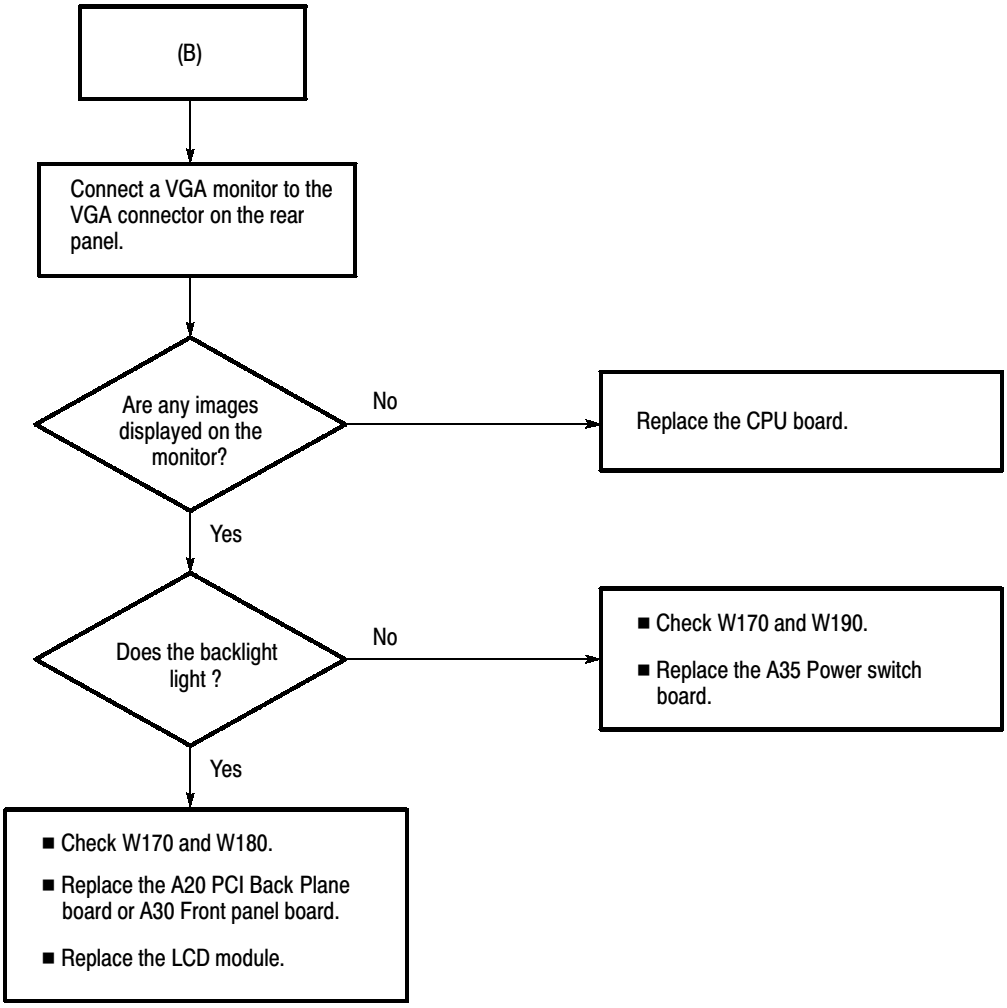
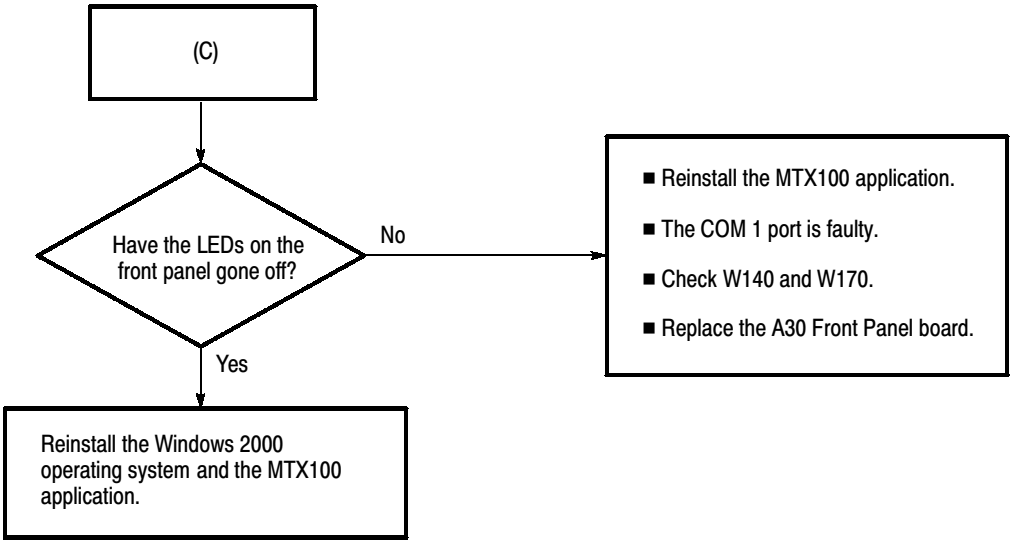


Figure 6-20: Troubleshooting procedure (4)



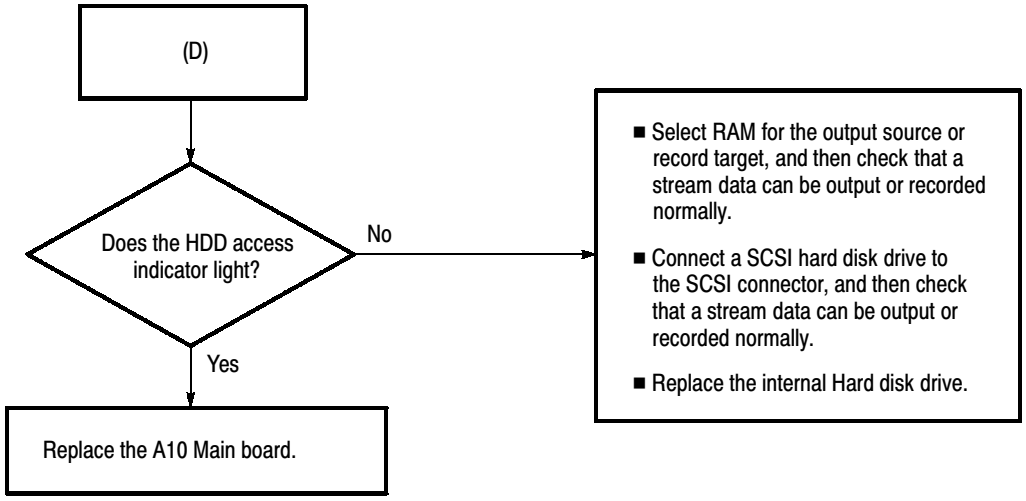


Figure 6-21: Troubleshooting procedure (5)

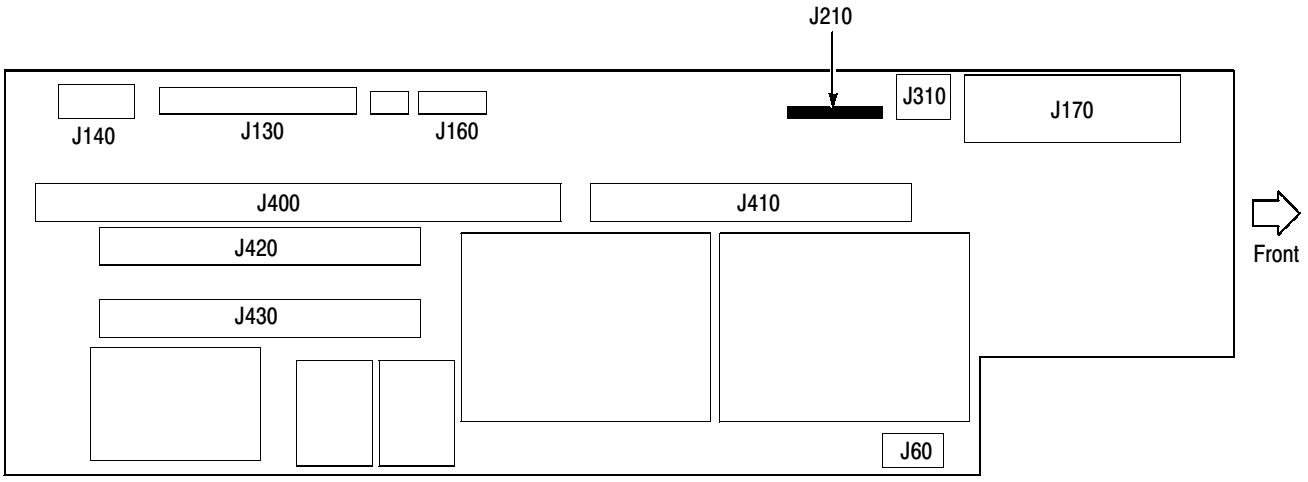


Figure 6-22: A20 PCI Back Plane board view

Using the Recovery Discs

In the event the MTX100 does not boot, you can reboot the MTX100 by using the recovery discs provided with the instrument. Use the procedures in this section to reinstall the Windows 2000 operating system and the MTX100 application software.

Reinstalling Windows 2000

***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 2000 operating system:

1. Insert the **Windows 2000 Professional Operating System Recovery Disc** into the CD-ROM drive.
2. Turn off and then turn on the instrument. The MTX100 runs from the disc.

   The **Power Quest EasyRestore End User License Agreement** dialog box appears.
3. Press any key. The first dialog box of Easy Restore appears.
4. Press the **TAB** key to move to the **Continue** button, and then press the **Enter** key. The first Warning dialog box appears.

***NOTE**. The mouse is disabled in this step.*

5. Press the **Enter** key. The second Warning dialog box appears.
6. Press the **Enter** key. The Entire and Copying Progress bars appear.
7. When **A:\>** appears at the upper left corner of the screen, simultaneously press the **Control + Alt + Delete** keys to restart the instrument, and then immediately press the eject button of the CD-ROM drive.

   The **Windows 2000 Professional Setup** dialog box appears.
8. Click **Next**.

   The **Licence Agreement** dialog box appears.

9. Read the agreement. When you agree to the content, select **I accept this agreement**, and then click **Next**.

   The **Regional Settings** dialog box appears.

10. Check that the settings are correct for your locate. If necessary, click the first **Customize** button to change system or user locate settings, and click the second **Customize** button to change the keyboard layout.

11. Click **Next**.

    The **Personalize Your Software** dialog box appears.

12. Type your name and organization. You must type in a name, but the organization text box is optional.

13. Click **Next**.

    The **Your Product Key** dialog box appears.

    The Product Key, or Product ID number, is the bar code number on the sticker that is located on the side of the instrument cabinet.

14. Type your Product Key, and then click **Next**.

    The **Computer Name and Administrator Password** dialog box appears.

    A suggested name for the instrument appears in the **Computer name** text box that you can change or accept. The computer name is used to identify the instrument on a network, and it must be unique to the network. It can be up to 15 characters in length.

    The **Administrator password** text box is used to enter the administrator password. This password is pre-defined as **MTX100** at the factory. Therefore, you do not need to enter the password. Even if you enter a password other than MTX100, it is disabled.

15. Click **Next**.

    The **Date and Time Settings** dialog box appears.

16. Check that the settings are correct for your date, time, and time zone, then click **Next**.

    The **Network Settings** dialog box appears. You may choose whether to use typical or custom settings. Consult your network administrator if you need to add custom settings at this point.

17. Click **Next** to accept the default typical settings.

    The **Workgroup or Computer Domain** dialog box appears. You may add a workgroup name, but it is not required. Consult your network administrator if you need to add a computer domain.

18. Click **Next**.

    The **Completing the Windows 2000 Setup Wizard** dialog box appears.

19. Click **Finish**.

    When you click Finish, the instrument restarts automatically. The **Welcome to the Network Identification Wizard** dialog box appears.

20. Click **Next**.

    The **Users of This Computer** dialog box appears.

    You can change settings as indicated on the screen or enter a user password for the name entered earlier in the setup. If you click the second option button, you do not need to enter a password when you logon to the instrument.

21. Click **Next**.

    The **Completing the Network Identification Wizard** dialog box appears.

22. Click **Finish**. The **Getting Started with Windows 2000** dialog box appears.

23. Click **Exit** to close the dialog box.

Reinstalling the MTX100 Application

Perform the following procedure to reinstall the MTX100 application software:

1. Insert the **MTX100 Application Software Recovery Disc** into the CD-ROM drive.

2. Double-click the **D: drive** icon (Substitute your CD-ROM drive letter if it is different than D).

3. Double-click the **Setup.exe** icon. This installs the MTX100 application software.

Selecting the Serial Interface Standard

The MTX100 provides the capability to select one of the following serial interface standards for COM2 port by changing the internal jumper settings.

- RS-232C
- RS-422
- RS-485

This section describes how to set the jumpers for selecting each serial interface standard.

Setting the Jumpers

***NOTE**. To change the jumper settings, you must first remove the cabinet and protective cover. For removal and installation procedures for the cabinet and protective cover, refer to* Cabinet and Protective Cover *on page 6-18.*

Each interface standard can be enabled using the **JP9** connector on the **CPU** board. Figure 6-23 shows the location of the **JP9** connector.

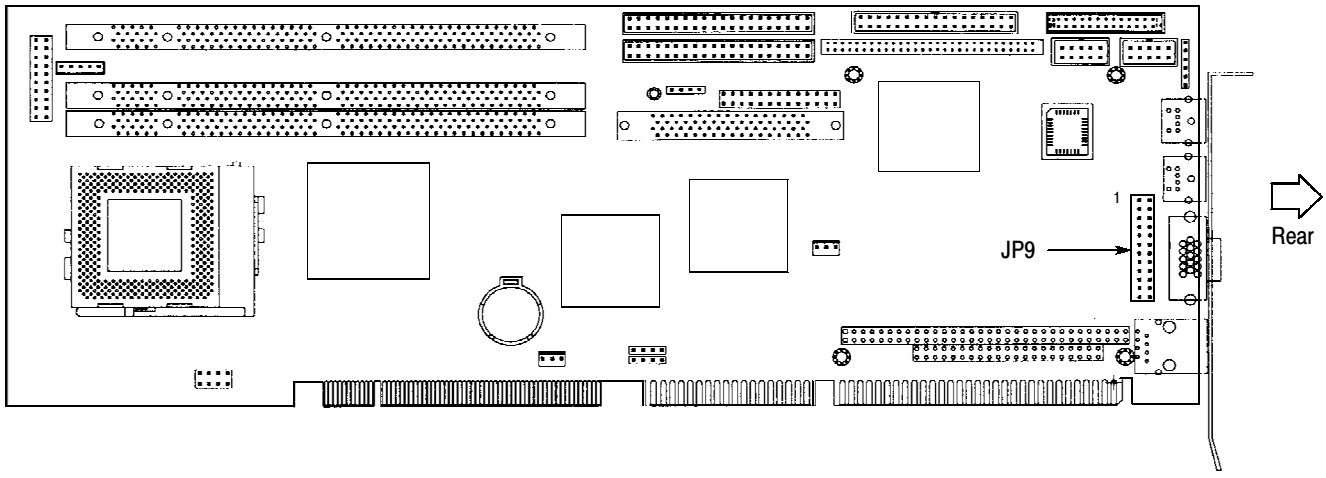
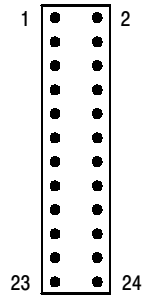
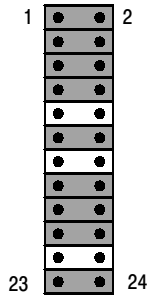
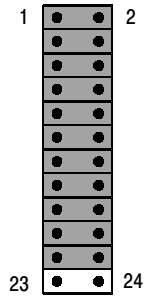


Figure 6-23: Location of the JP9 connector

Table 6-6 shows the jumper settings of the JP9 connector. By default, all of the pins are open (RS-232C).

Refer to *Specifications* (in section 1) for the pin assignments of each interface.

Table 6-6: Jumper settings of the JP9 connector

Selectable Standard	Description	Jumper illustration
RS-232C (factory default setting)	Open all of the pins.	
RS-422	Close all of the pins other than pins 9–10, 13–14, and 21–22.	
RS-485	Close all of the pins other than pins 23–24.	

Options

This section describes options that are available for the MTX100.

The following options are available:

Options	Description
Option 01 (ASI Interface)	The MTX100 is equipped with the ASI (Asynchronous Serial Interface) interface when this option is specified.
Option 02 (Universal Parallel/Serial Interface)	The MTX100 is equipped with the universal parallel/serial interface when this option is specified.
Option 03 (BNC Serial Interface)	The MTX100 is equipped with the BNC serial interface when this option is specified.
Option 04 (DHEI Interface)	The MTX100 is equipped with the DHEI (Digital Headend Equipment Interface) interface when this option is specified.
Option 05 (IEEE1394/ASI Interface)	The MTX100 is equipped with the IEEE1394/ASI interface when this option is specified.
Option 06 (SMPTE310M/ASI Interface)	The MTX100 is equipped with the SMPTE310M/ASI interface when this option is specified.
Option D1 (Test data report)	A calibration data test result report comes with the MTX100 when this option is specified.

Electrical Parts List

The modules that make up this instrument are often a combination of mechanical and electrical subparts. Therefore, all replaceable modules are listed in section 10, *Mechanical Parts List.* Refer to that section for part numbers when using this manual.

Diagrams

This section contains the following diagrams:

- Block diagram of the MTX100
- Interconnect diagram of the MTX100

Block diagrams show the modules and functional blocks in the MTX100. Interconnect diagrams show how the modules in the MTX100 connect together.

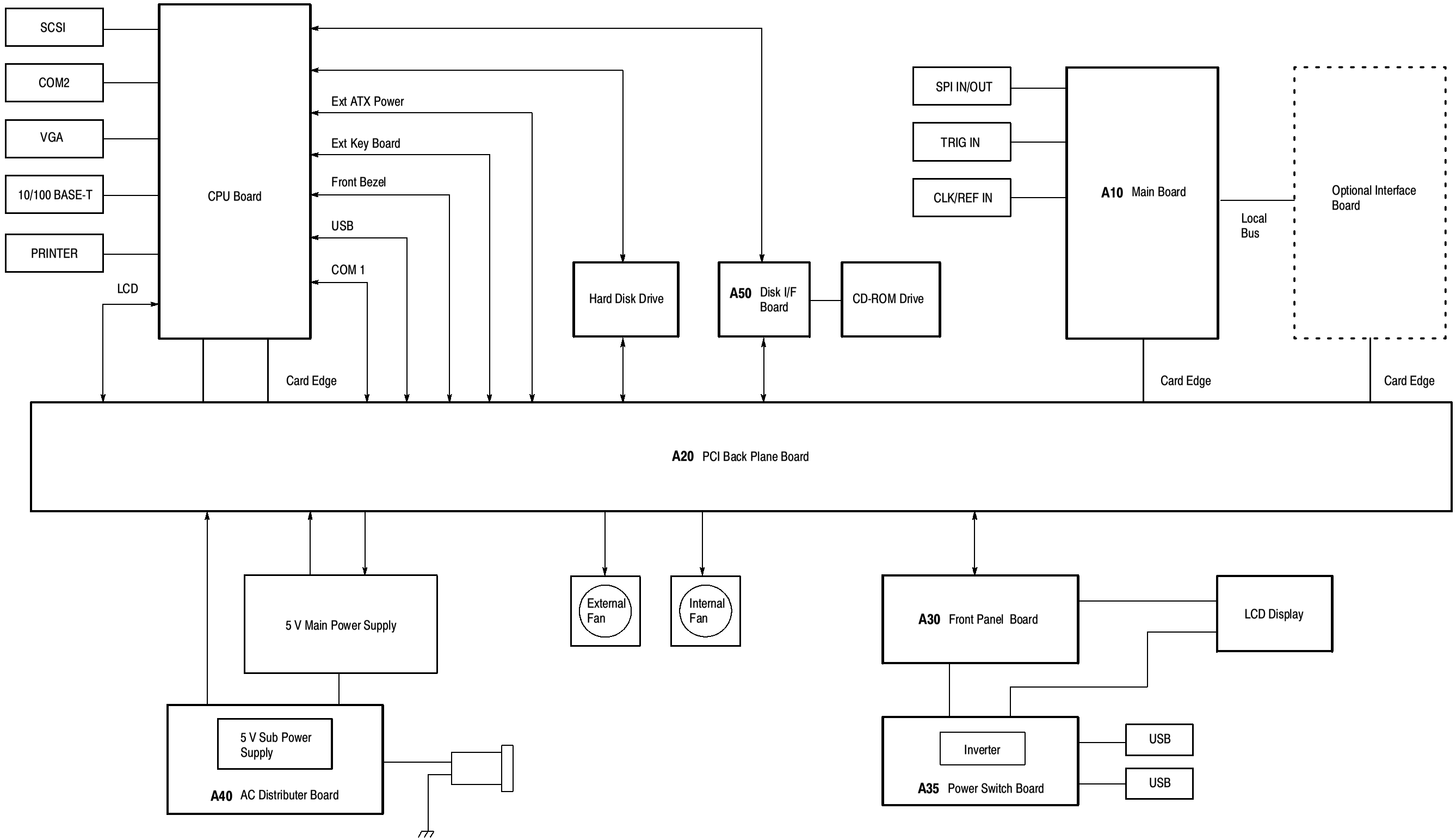


Figure 9-1: MTX100 block diagram

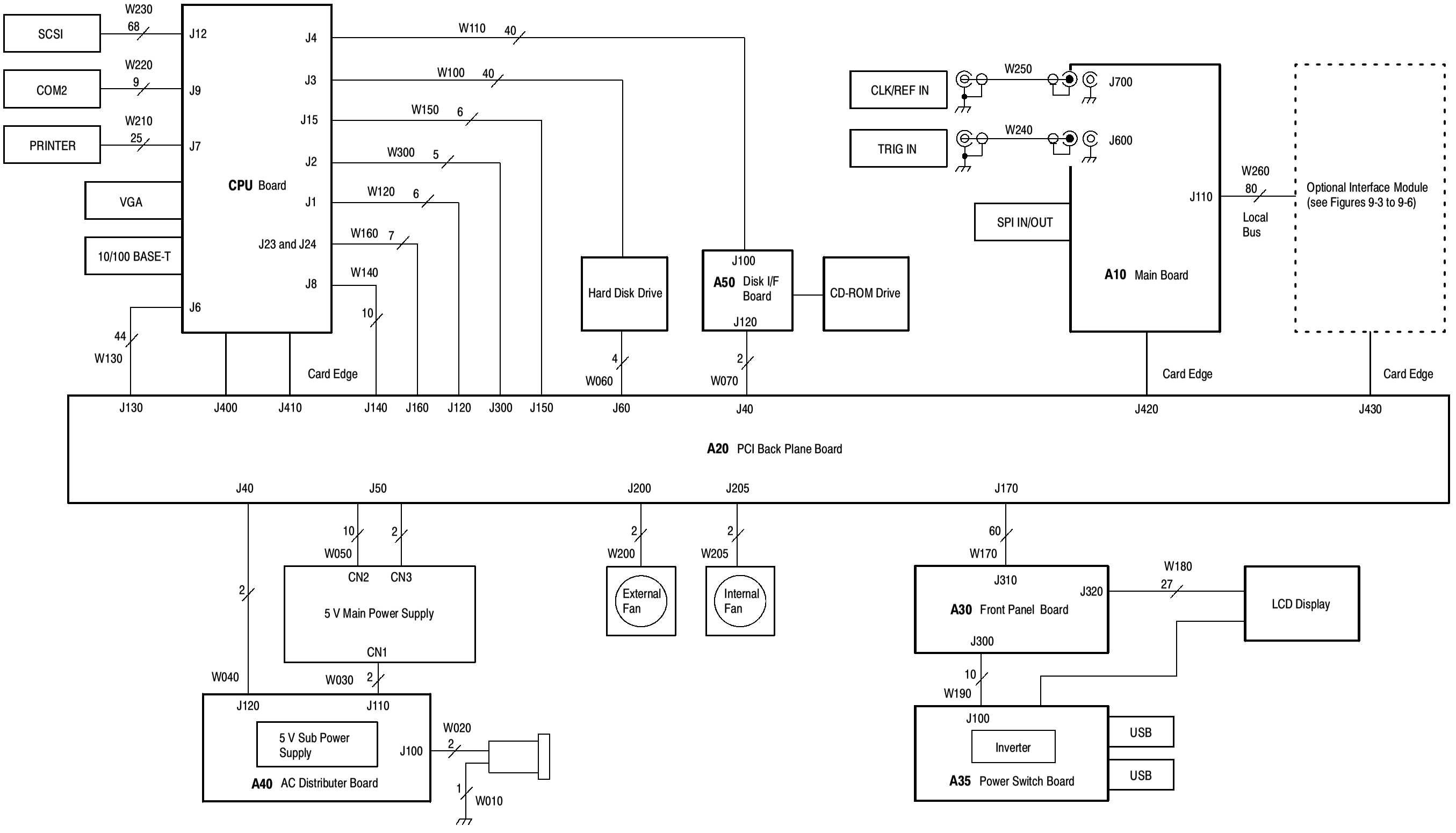


Figure 9-2: MTX100 interconnect diagram

Diagrams of the Optional Modules

This section contains the interconnect diagrams of the optional interface modules.

A100 ASI Interface Module (Option 01)

Figure 9-3 shows the A100 ASI Interface module and how it interconnects with the A20 PCI Back Plane board and the A10 Main board.

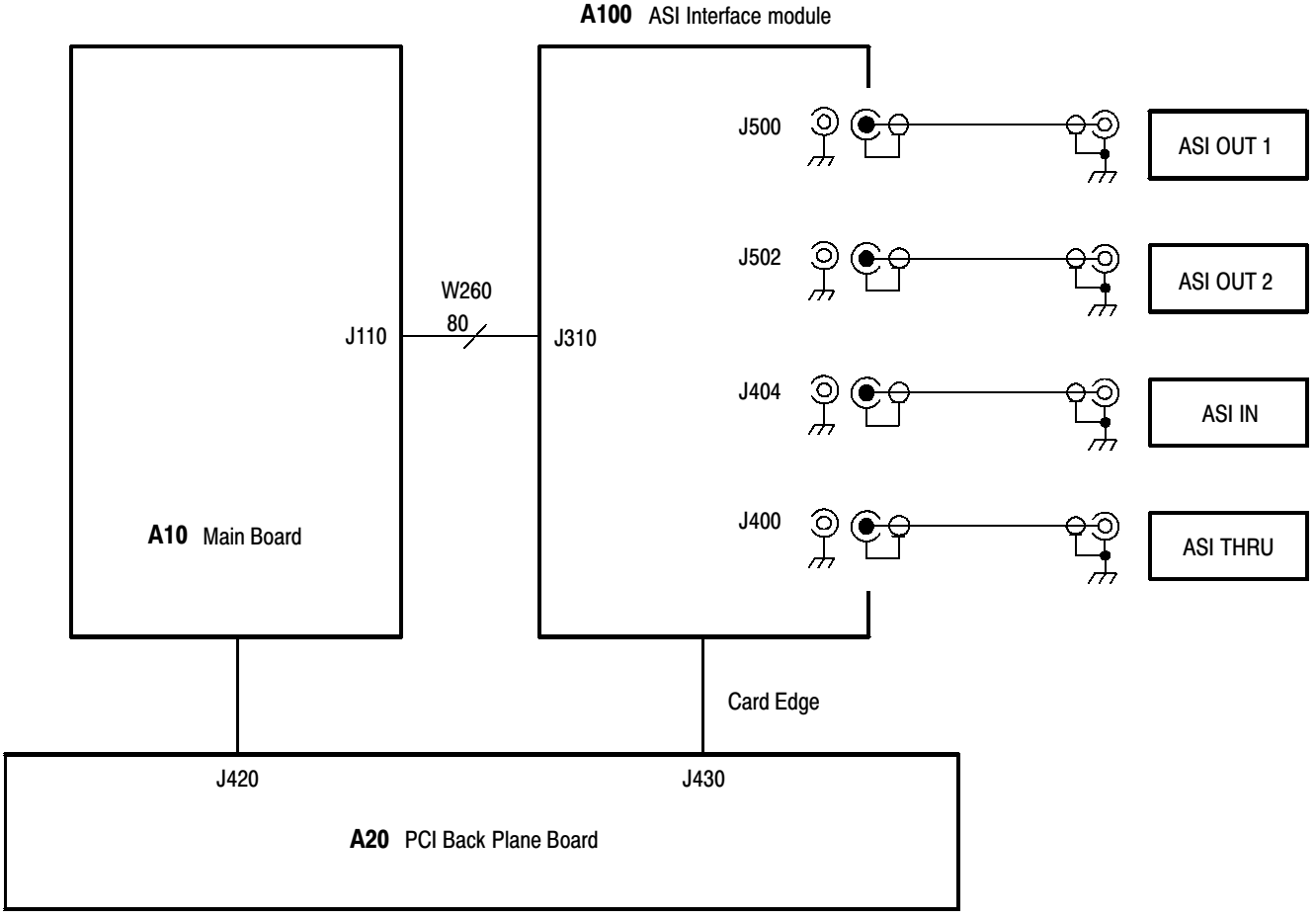


Figure 9-3: A100 ASI Interface module connections

A110 Universal Parallel/Serial Interface Module (Option 02)

Figure 9-4 shows the A110 Universal Parallel/Serial Interface module and how it interconnects with the A20 PCI Back Plane board and the A10 Main board.

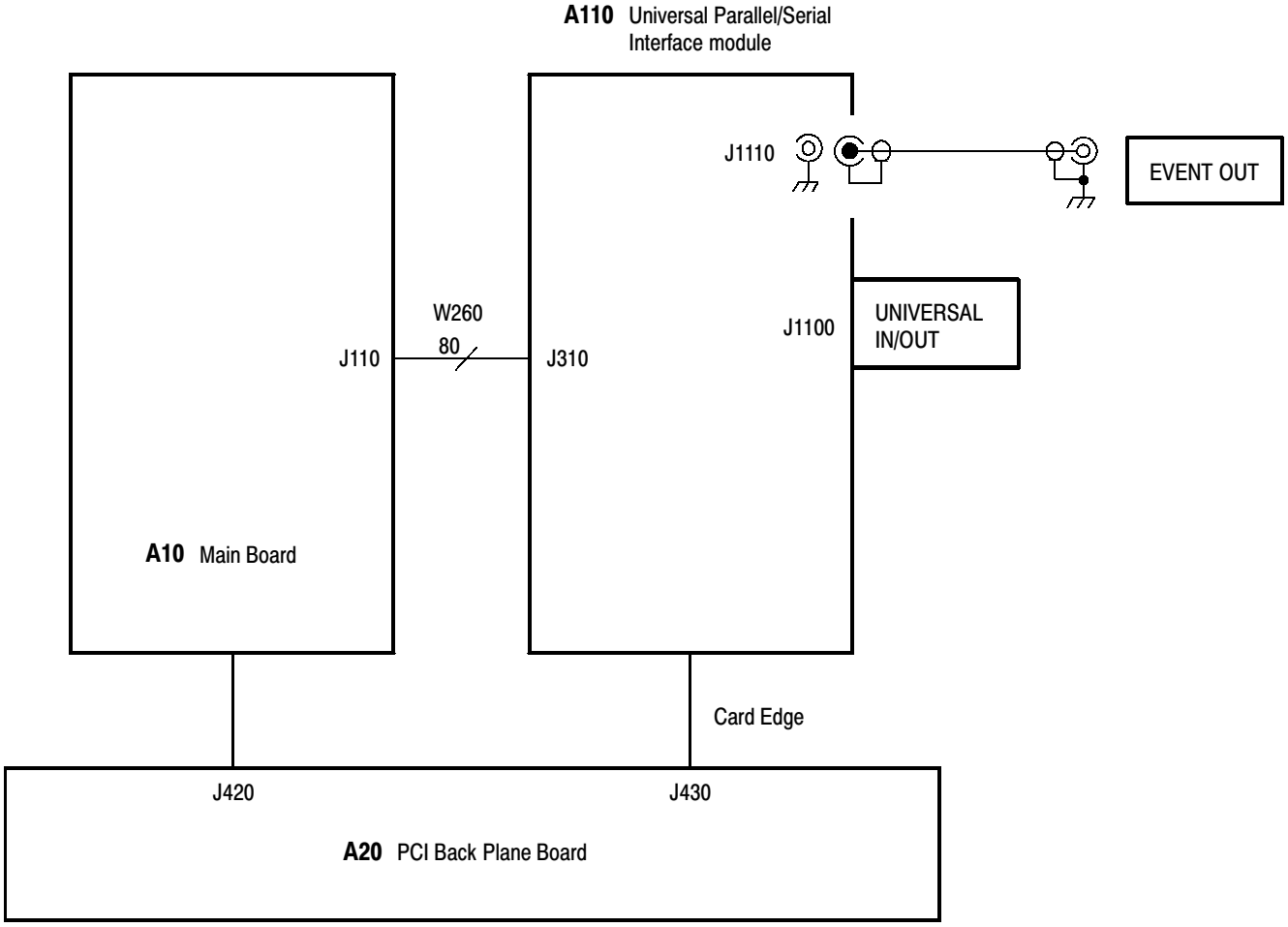


Figure 9-4: A110 Universal Parallel/Serial Interface module connections

A120 BNC Serial Interface Module (Option 03)

Figure 9-5 shows the A120 BNC serial interface module and how it interconnects with the A20 PCI Back Plane board and the A10 Main board.

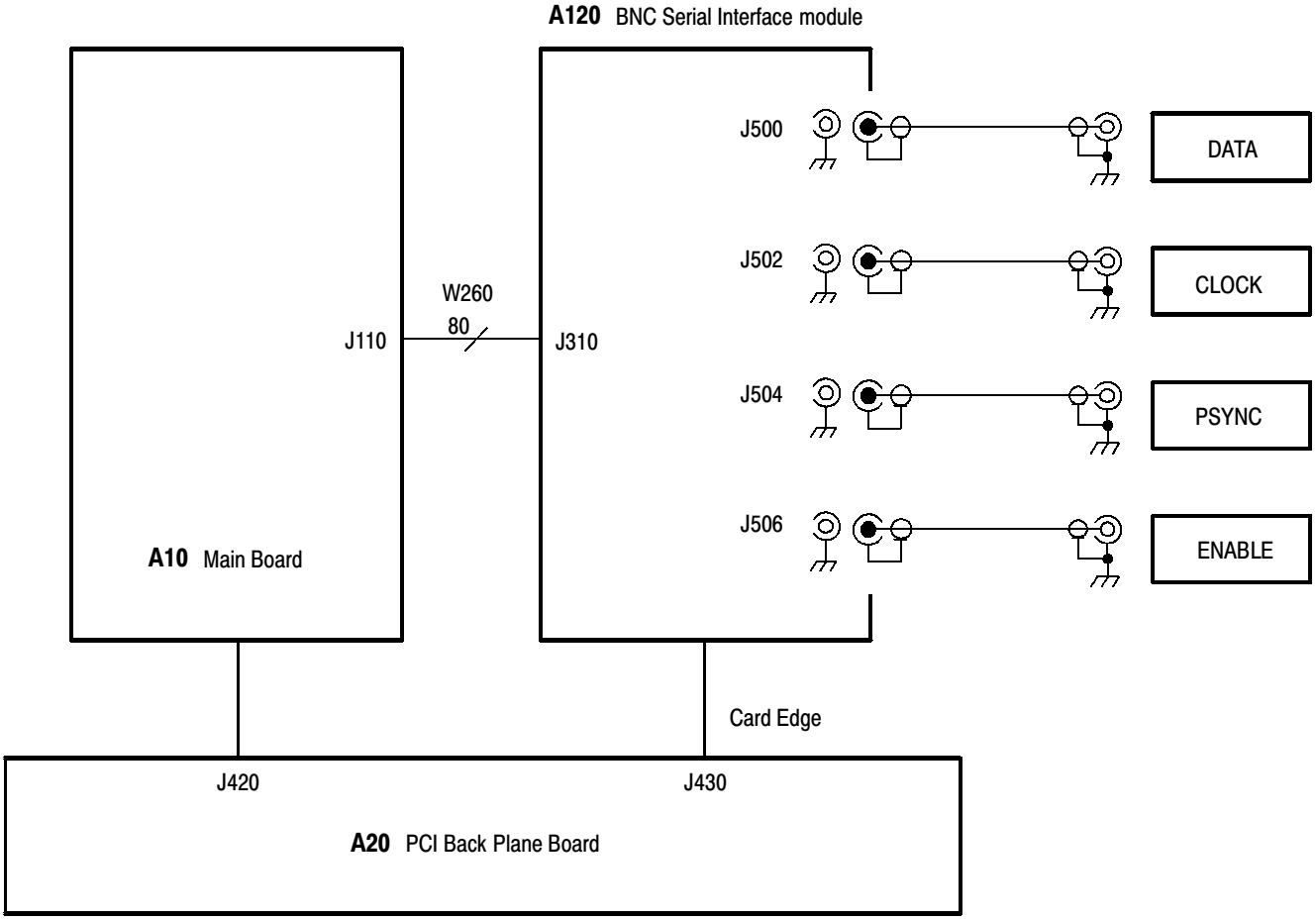


Figure 9-5: A120 BNC Interface module connections

A130 DHEI Interface Module (Option 04)

Figure 9-6 shows the A130 DHEI Interface module and how it interconnects with the A20 PCI Back Plane board and the A10 Main board.

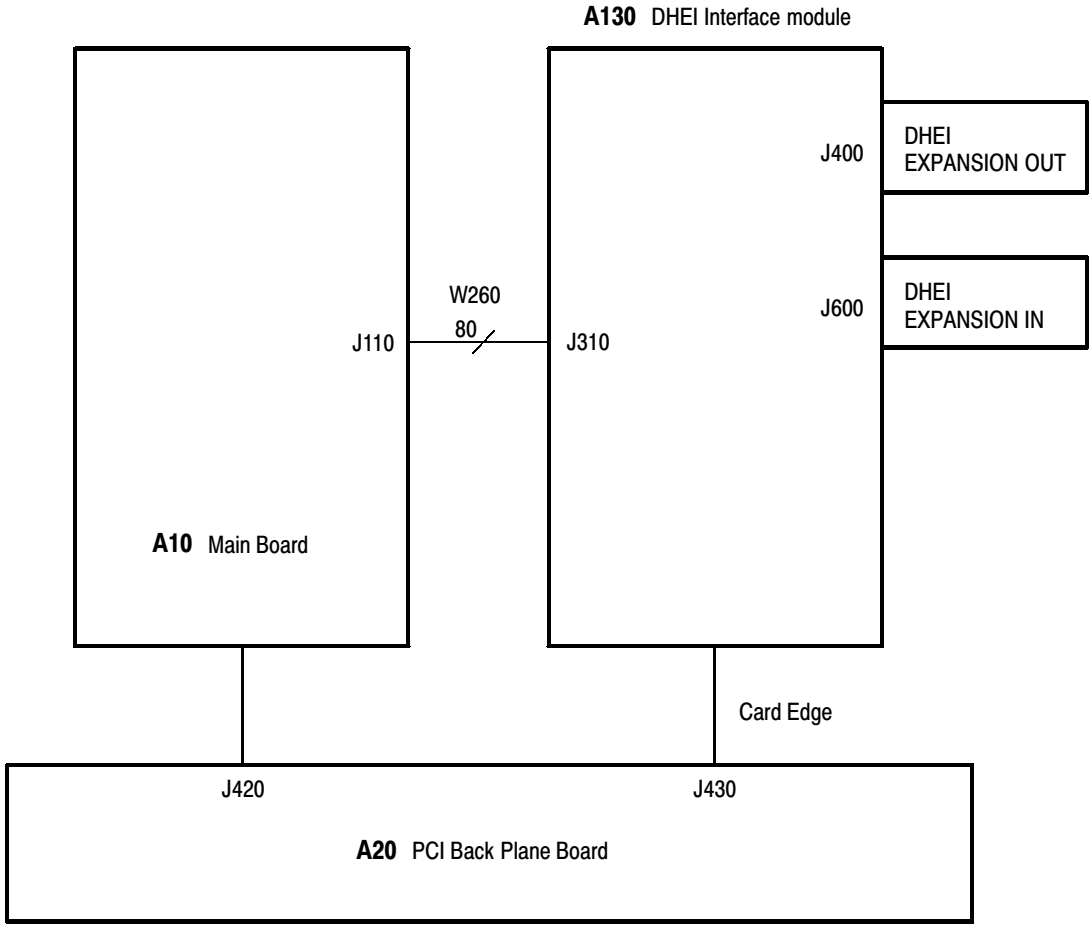


Figure 9-6: A130 DHEI Interface module connections

A140 IEEE1394/ASI Interface Module (Option 05)

Figure 9-7 shows the A140 IEEE1394/ASI Interface module and how it interconnects with the A20 PCI Back Plane board and the A10 Main board.

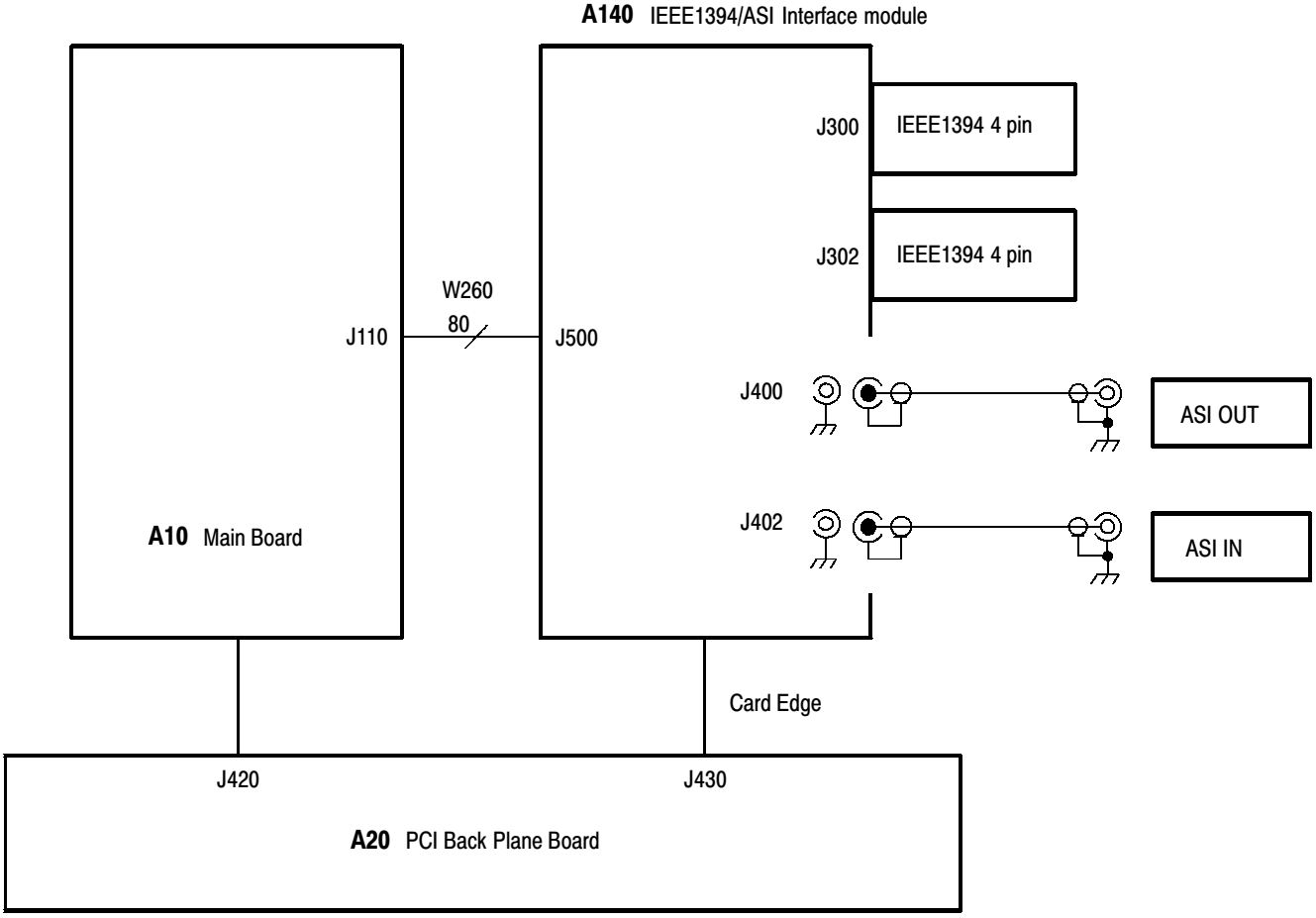


Figure 9-7: A140 IEEE1394/ASI Interface module connections

A160 SMPTE310M/ASI Interface Module (Option 06)

Figure 9-8 shows the A160 SMPTE310M/ASI Interface module and how it interconnects with the A20 PCI Back Plane board and the A10 Main board.

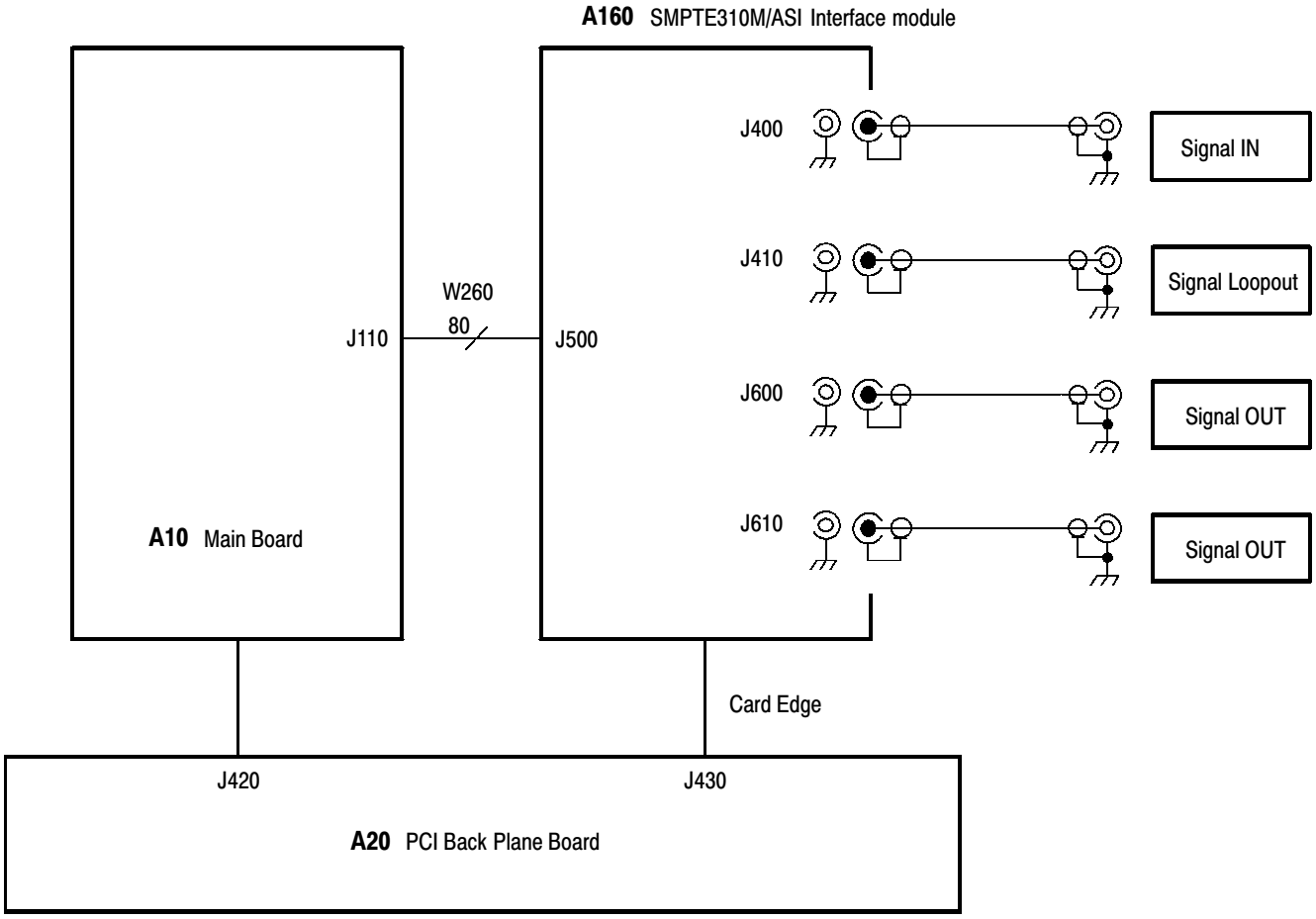


Figure 9-8: A160 SMPTE310M/ASI Interface module connections

Mechanical Parts List

This section contains a list of the replaceable modules for the MTX100. 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:

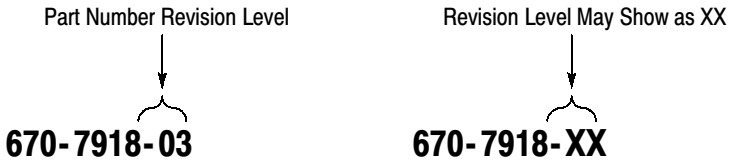
- Part number (see Part Number Revision Level below)
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

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.



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 MTX100. 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
TK0191	TEKTRONIX JAPAN	PO BOX 5209 TOKYO INTERNATIONAL	TOKYO JAPAN 100-31
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
10-1-1	348-1644-00			7 CM	SHLD GASKET,ELEK:CONDUCTIVE URETHANE FORM W/ADHESIVE TAPE [UC-3E0414]	80009	
-2	348-1644-00			10 CM	SHLD GASKET,ELEK:CONDUCTIVE URETHANE FORM W/ADHESIVE TAPE [UC-3E0414]	80009	
-3	200-A520-00			1	COVER,PC:AIR FLOW,AROUND CHASSIS, POLYCARBONATE,MTX100	80009	
-4	161-0216-00			1	CABLE ASSY,PWR,:3,18 AWG,2.5M L,BLACKSAFETY CONTROLLED (STANDARD ACCESSORY)	TK2432	ORDER BY DESC
-5	390-A083-00			1	CABINET ASSY:17XX AL	80009	
-6	211-0720-01			2	SCREW,MACHINE:6-32X0.50,PNH,STL ZN-CM1,T15 TORX,W/SLOT	80009	
-7	334-A574-00			1	MARKER,IDENT:MKD WARNING,POLYESTER	80009	
-8	334-3388-01			1	MARKER,IDENT:MKD TEKTRONIX JAPAN, LTD. MADE IN JAPAN	80009	

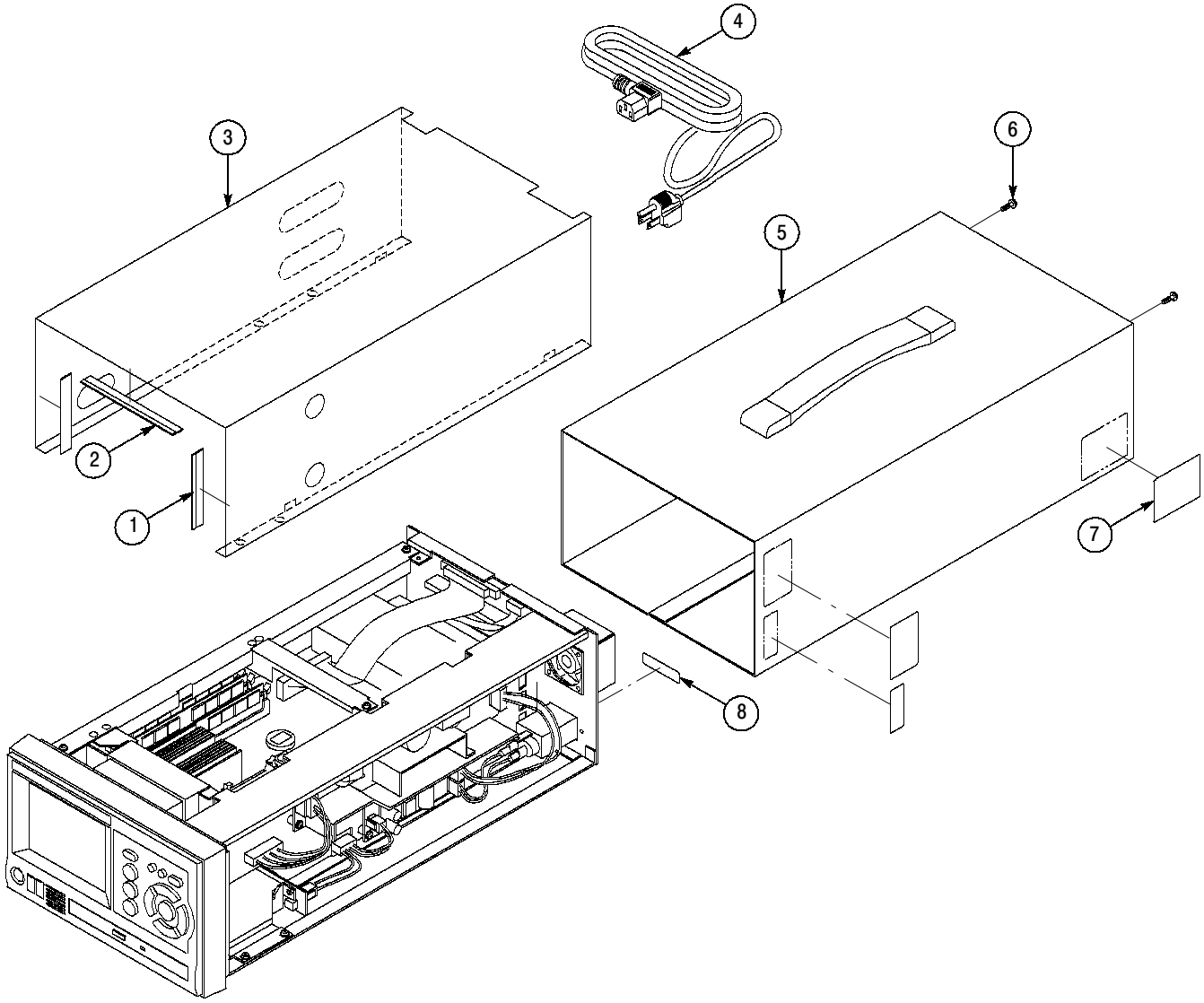


Figure 10-1: Cabinet

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-2-1	334-A581-00			1	MARKER,IDENT:MKD MTX100,POLYCARBONATE,TO.25	80009	
-2	200-A519-00			1	COVER,FRONT:ABS,TV GRAY,WITH CONDUCTIVE	80009	
-3	378-A048-00			1	FILTER,LCD:ACRYL,MTX100	80009	
-4	119-B114-00			1	LCD MODULE:4 INCH,TFT,VGA [LTMO4C380K]	80009	
-5	407-A669-01			1	BRACKET,ASSY:FRONT COVER,STL & SST,MTX100	80009	
-6	366-A046-00			1	PUSH BUTTON,POWER:SILVER GRAY,ABS	80009	
-7	384-A222-00			1	EXTENSION SHAFT:POWER BUTTON,POLYACETAL,MTX100	80009	
-8	671-B121-XX			1	CIRCUIT BD ASSY:A35 POWER SW,389-B130-01 WIRED	80009	
-9	211-0871-00			3	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
-10	174-B918-00			1	CA ASSY,SP,ELEC:10,26A WG,11CM L,W/CONN(JST)	80009	
-11	174-B917-00			1	CA ASSY,SP,ELEC:60,30A WG,15CM L,FLAT,W/CONN(YAMAICHI)	80009	
-12	348-1644-00			6 CM	SHLD GASKET,ELEK:CONDUCTIVE URETHANE FORM W/ADHESIVE TAPE [UC-3E0414]	80009	
-13	259-A002-01			1	FLEX CIRCUIT:A60,LCD I/F	80009	
-14	671-B120-XX			1	CIRCUIT BD ASSY:A30 FRONT PANEL,389-B129-01 WIRED	80009	
-15	211-0871-00			4	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
-16	260-A148-00			1	SWITCH,RUBBER:SILICON,FRONT PANEL	80009	
-17	333-A437-00			1	PANEL,FRONT:KEYBOARD,MTX100,POL YCARBONATE,TO.25	80009	

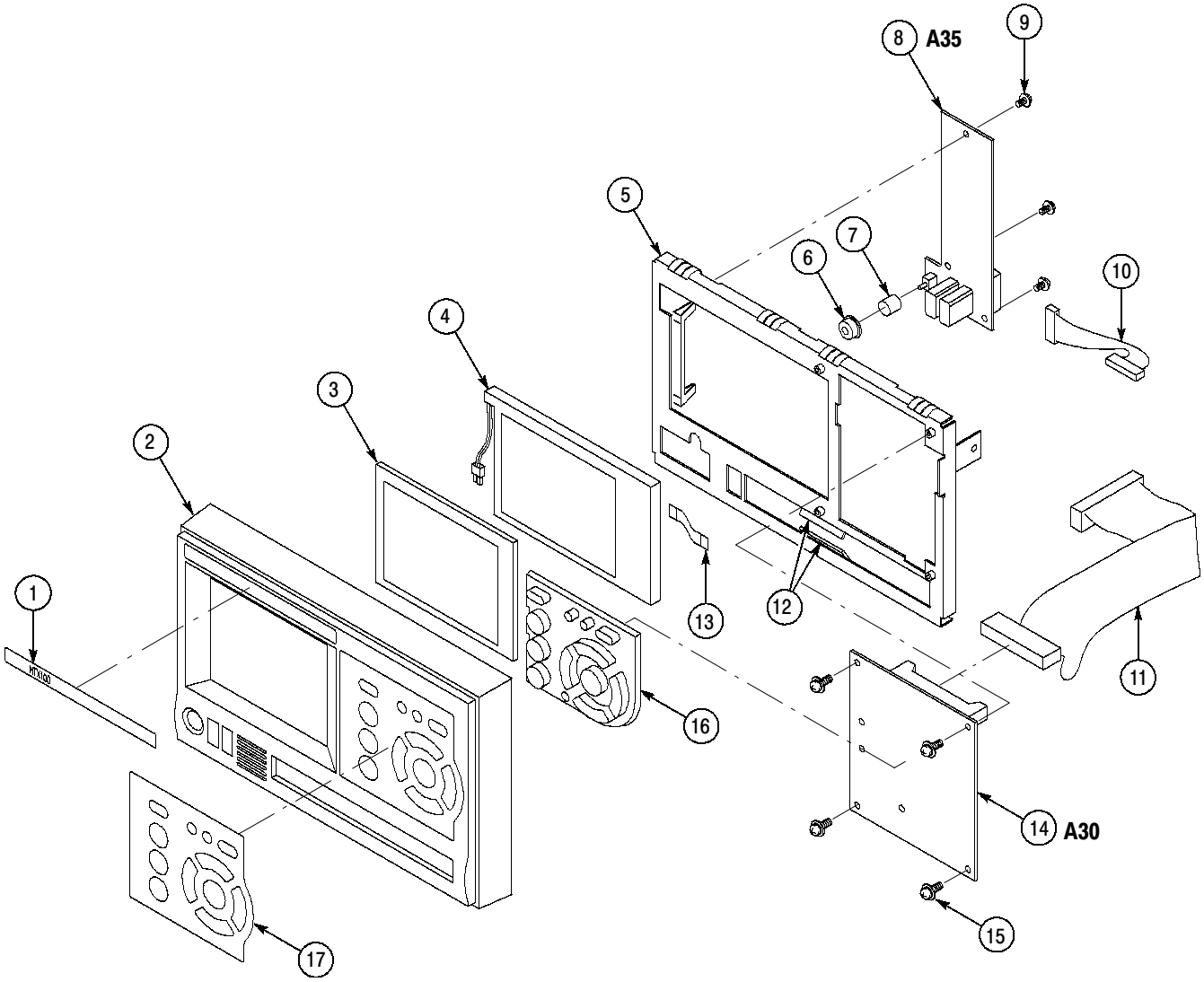


Figure 10-2: Front panel unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-3-1	211-A234-00			4	SCRW,MACHINE:M3X35MM L,PNH,STL,ZN-C,CROSS REC,W/M PLAIN & SPLIT WASHER	80009	
-2	211-0871-00			9	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-3	671-B115-XX			1	CIRCUIT BD ASSY:A20 PCI MOTHER,389-B123-01	80009	
-4	119-B137-00			1	FAN,TUBE AXIAL:119-B123-00 W/CONN,10CM L	80009	
-5	334-A576-00			1	MARKER,IDENT:A100,MTX100,POLYCARBONATE	80009	
	334-A577-00			1	MARKER,IDENT:A110,MTX100,POLYCARBONATE	80009	
	334-A578-00			1	MARKER,IDENT:A120,MTX100,POLYCARBONATE	80009	
	334-A579-00			1	MARKER,IDENT:A130,MTX100,POLYCARBONATE	80009	
-6	334-A575-00			1	MARKER,IDENT:A10,MTX100,POLYCARBONATE	80009	
-7	119-B059-00			1	FAN,TUBE AXIAL:119-B055-00 W/CONN.10CM L	80009	
-8	200-A521-00			1	COVER,FAN:REAR,AL,MTX100	80009	
-9	211-A234-00			4	SCRW,MACHINE:M3X35MM L,PNH,STL,ZN-C,CROSS REC,W/M PLAIN & SPLIT WASHER	80009	
-10	211-A266-00			2	SCREW,MACHINE:M3X12MM L,PNH,STL,NI PL,CROSS REC,W/KOGATAMARU & LOCK WASHER	80009	
-11	131-4131-00			1	CONN,PLUG,ELEC:MALEW/LOCKINGADPTR,EXTMTG	80009	
-12	119-2683-00			1	FILTER,RFI:6A,250VAC,50/60HZ,LEAK=0.4MA, DCRES=0.1OHM [ZUB2206H-F]	80009	
-13	174-B905-00			1	CA ASSY,SP,ELEC:2,18AWG,7CM L,W/CONN,FOR INLET	80009	
-14	220-A172-01			1	NUT,PLATE:STL,FOR P/S FAN	80009	
-15	195-3990-00			1	LEAD,ELECTRICAL:AWG18,100MM L,5-4,W/LUG [195-2990-00]	80009	
-16	210-0008-00			1	WASHER,LOCK:#8INTL,0.02THK,STLCDPL	80009	
-17	220-0193-00			1	NUT,PLAIN,HEX:M4X7MM HEX,STL,ZN-C	80009	
-18	211-0871-00			4	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-19	174-B906-00			1	CA ASSY,SP,ELEC:2,18AWG,12CM L,W/CONN,AC DISTRIBUTION	80009	
-20	211-0871-00			3	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-21	671-B116-XX			1	CIRCUIT BD ASSY:A40 AC DISTRIBUTOR,389-B124-00 WIRED	80009	
-22	119-B116-00			1	POWER SUPPLY:IN 85-264VAC,OUT 5VDC,20A [LEA100F-5-R]	80009	
-23	174-B907-00			1	CA ASSY,SP,ELEC:2,18AWG,6CM L/9CML,W/CONN	80009	
-24	174-B908-00			1	CA ASSY,SP,ELEC:10,22AWG,10CM L,W/CONN	80009	
-25	610-A010-00			1	CHASSIS,ASSY:BOTTOM,FRONT,PANEL REAR & BRACKET, MTX100	80009	
-26	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	

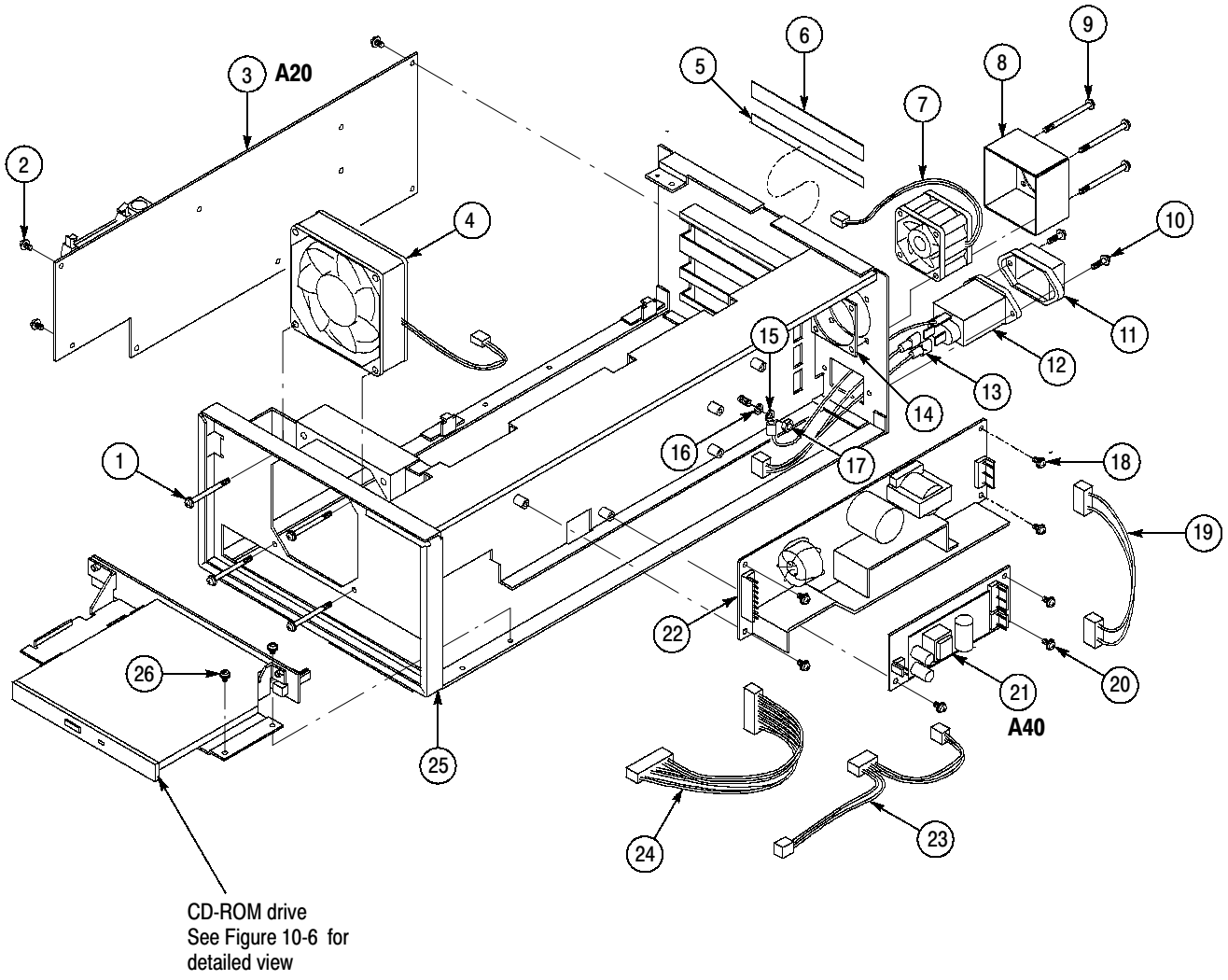


Figure 10-3: Internal modules (1)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-4-1	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-2	174-B919-00			1	CA ASSY,SP,ELEC:25,28A WG,15CM L,FLAT,W/CONN (D-SUB TO 2X13) & PULL TAB	80009	
-3	214-3903-01			2	SCREW,JACK:4-40X0.312 EXT THD,4-40 INT THD,0.1888 HEX,STEEL,CAD PLATE	80009	
-4	210-A015-00			2	WASHER,LOCK:#3,SPLIT ,STL MFZN-C	80009	
-5	210-A007-00			2	WASHER,PLAIN:#3,6MM OD,STL MFZN-C,KOGATAMARU	80009	
-6	174-B920-00			1	CA ASSY,SP,ELEC:9,28A WG,12CM L,FLAT,W/CONN (D-SUB TO 2X5) & PULL TUB	80009	
-7	386-A850-00			1	PLATE:BRANK,D-SUB,25CONN,STL	80009	
-8	211-0661-00			2	SCR,ASSEM WSHR:4-40X0.25,PNH,STL ZN-CM1,POZIDRIV MACHINE	80009	
-9	214-3903-01			2	SCREW,JACK:4-40X0.312 EXT THD,4-40 INT THD,0.1888 HEX,STEEL,CAD PLATE	80009	
-10	210-A015-00			2	WASHER,LOCK:3,SPLIT ,STL MFZN-C	80009	
-11	210-A007-00			2	WASHER,PLAIN:#3.6MM OD.STL MFZN-C,KOGATAMARU	80009	
-12	129-A591-00			2	SPACER,POST:4-40X0.189 EXT THD,2-56X0.142 INT THD,0.187 HEX [NHS-01#NT]	80009	
-13	174-B921-00			1	CA ASSY,SP,ELEC:68,30A WG,19CM L,FLAT,W/CONN (YAMAICHI),SCSI	80009	
-14	407-A672-00			1	BRACKET,CKT BD:GUIDE FOR PCI CARD,STL,MTX100	80009	
-15	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-16	174-B911-00			1	CA ASSY,SP,ELEC:40,28A WG,27CM L,FLAT,W/CONN & PULL TUB	80009	
-17	174-4116-00			1	CA ASSY,SP,ELEC:4,18A WG,15CM L,W/CONN FOR HDD,W77	80009	
-18	174-B910-00			1	CA ASSY,SP,ELC:40,28A WG,27CM L,FLAT,IULTRA ATA,W/CONN & PULL TUB	80009	

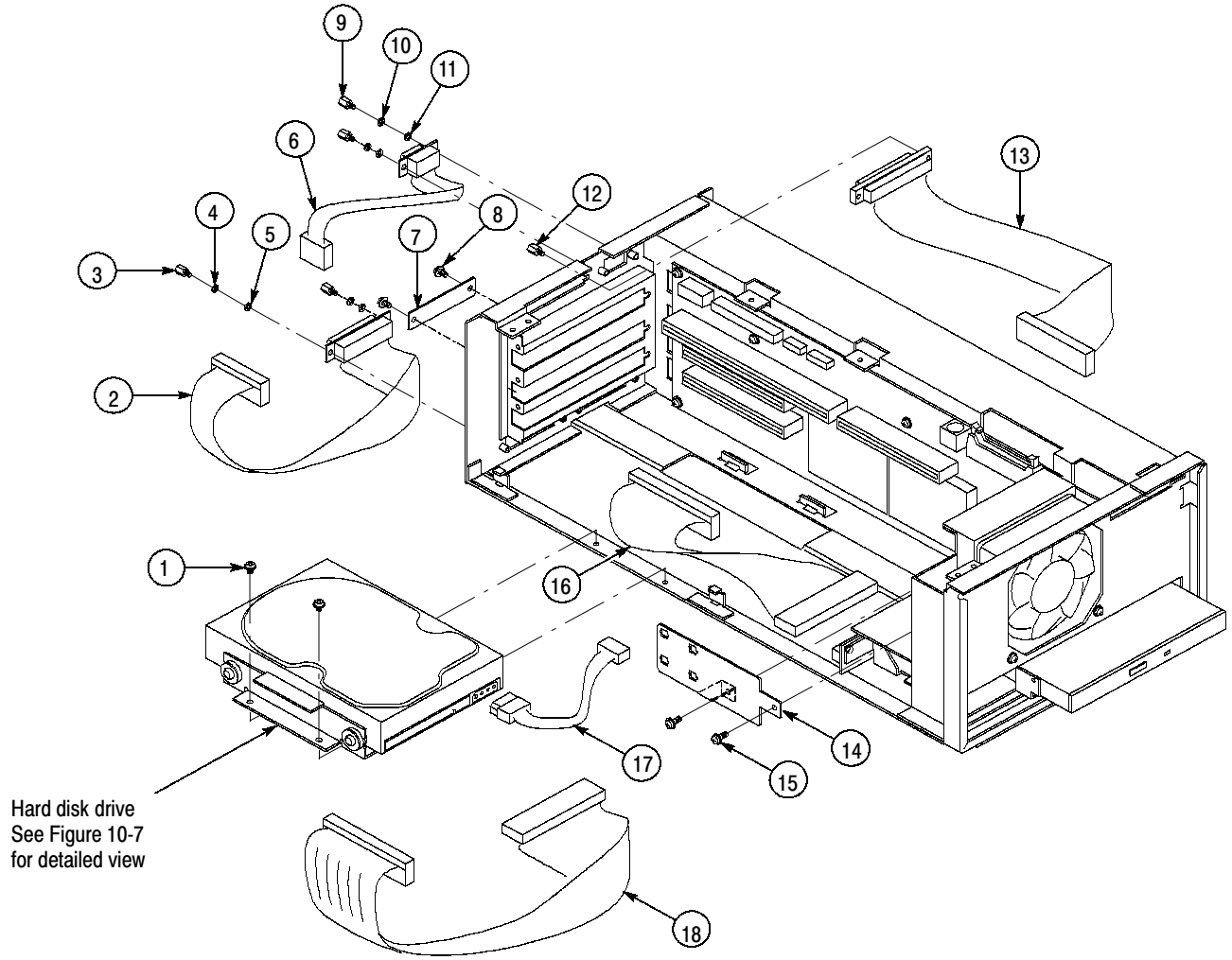


Figure 10-4: Internal modules (2)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-5-1	211-0871-00			3	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-2	333-A444-00			1	PANEL,PCI:BLANK,STL,MTX100	80009	
-3	174-B914-00			1	CA ASSY,SP,ELEC:10,28A WG,11CM L,FLAT,W/CONN & PULL TUB	80009	
-4	174-B913-00			1	CA ASSY,SP,ELEC:10,28A WG,11CM L,FLAT,W/CONN (HIROSE)	80009	
-5	174-B915-00			1	CA ASSY,SP,ELEC:6,26A WG,7CM L,W/CONN (JST,PH TO XH)	80009	
-6	174-B916-00			1	CA ASSY,SP,ELEC:7,26A WG,7CM L,W/CONN,2X4 (FUJITU) TO 1X7 (JST)	80009	
-7	174-B925-00			1	CA ASSY,SP,ELEC:5,26A WG,25CM L,W/CONN (JST)	80009	
-8	211-0871-00			3	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-9	343-A349-00			2	RETAINER,CKT BD:STL,MTX100	80009	
-10	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-11	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-12	343-A350-00			1	RETAINER,CONN:SCSI & IDE,SST,MTX100	80009	
-13	211-0871-00			3	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-14	407-A673-00			1	BRACKET:SHIELD,AL,MTX100	80009	
-15	426-A193-00			1	FRAME,TOP:FRAME ASSY,STL,MTX100	80009	
-16	343-A351-01			1	RETAINER,CKT BD:MEMORY BD,SST,MTX100	80009	
-17	211-0871-00			1	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-18	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
-19	174-B912-00			1	CA ASSY,SP,ELEC:20,28A WG,25CM L,FLAT,W/CONN & PULL TAB	80009	
-20	119-B160-00			1	CPU CARD:PICMG(ISA/PCI9,SKT370,CELERON/PENIII, 300-800MHZ,W/LAN/LCD/SCSI,W/O SOUND [C17BMO]	80009	
-21	671-B114-XX			1	CIRCUIT BD ASSY:A10 MAIN I/O,389-B122-01 WIRED	80009	
-22	671-B139-XX			1	CIRCUIT BD ASSY:A100 ASI,389-B142-01 WIRED	80009	
	671-B140-XX			1	CIRCUIT BD ASSY:A110 UNIVERSAL PARALLEL/SERIAL IF,389-B143-01 WIRED	80009	
	671-B141-XX			1	CIRCUIT BD ASSY:A120 BNC SERIAL IF,389-B144-01 WIRED	80009	
	671-B142-XX			1	CIRCUIT BD ASSY:A130 DHEI,389-B145-01 WIRED	80009	
	671-B246-XX			1	CIRCUIT BD ASSY:A140 IEEE1394,389-B237-XX WIRED	80009	
	671-B277-XX			1	CIRCUIT BD ASSY:A160 SMPTE310M,389-B270-XX WIRED	80009	
-23	174-B924-00			1	CA ASSY,SP,ELEC:80,30A WG,5CM L,FLAT,W/CONN (YAMAICHI)	80009	

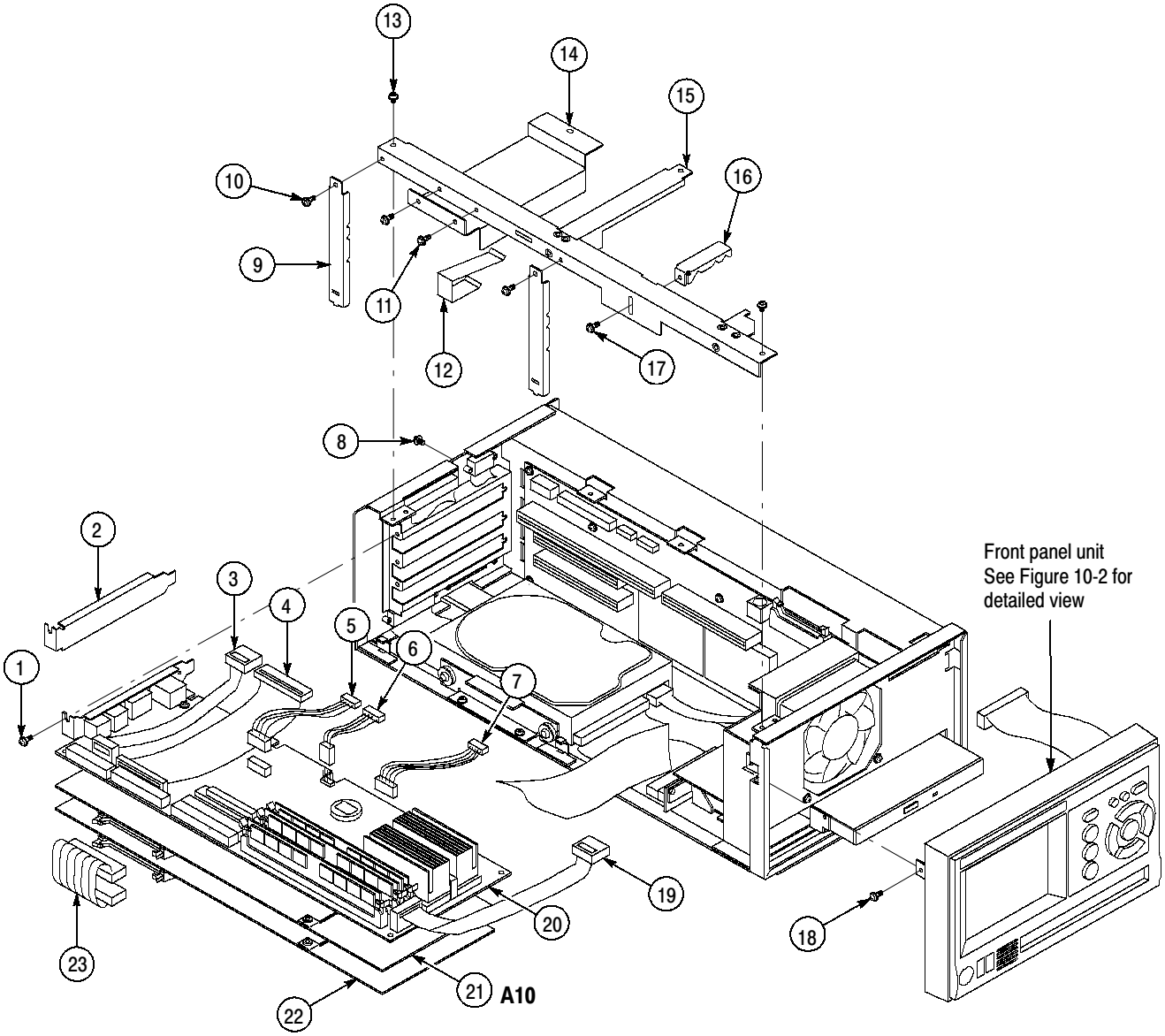


Figure 10-5: Internal modules (3)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-6-1	119-B115-00			1	CD-ROM DRIVE UNIT:12/8CM,CD/CD-ROM [CD-224E-B93]	80009	
-2	211-0871-00			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
-3	671-B119-XX			1	CIRCUIT BD ASSY:A50 DISK I/F,389-B127-01 WIRED	80009	
-4	211-A269-00			4	SCREW,MACHINE:M2X4MM L,PNHSTL ZN-C,CROSS REC,W/FLAT (6MM OD) WASHER	80009	
-5	407-A663-02			1	BRACKET:CD-ROM MOUNT,AL,MTX100	80009	

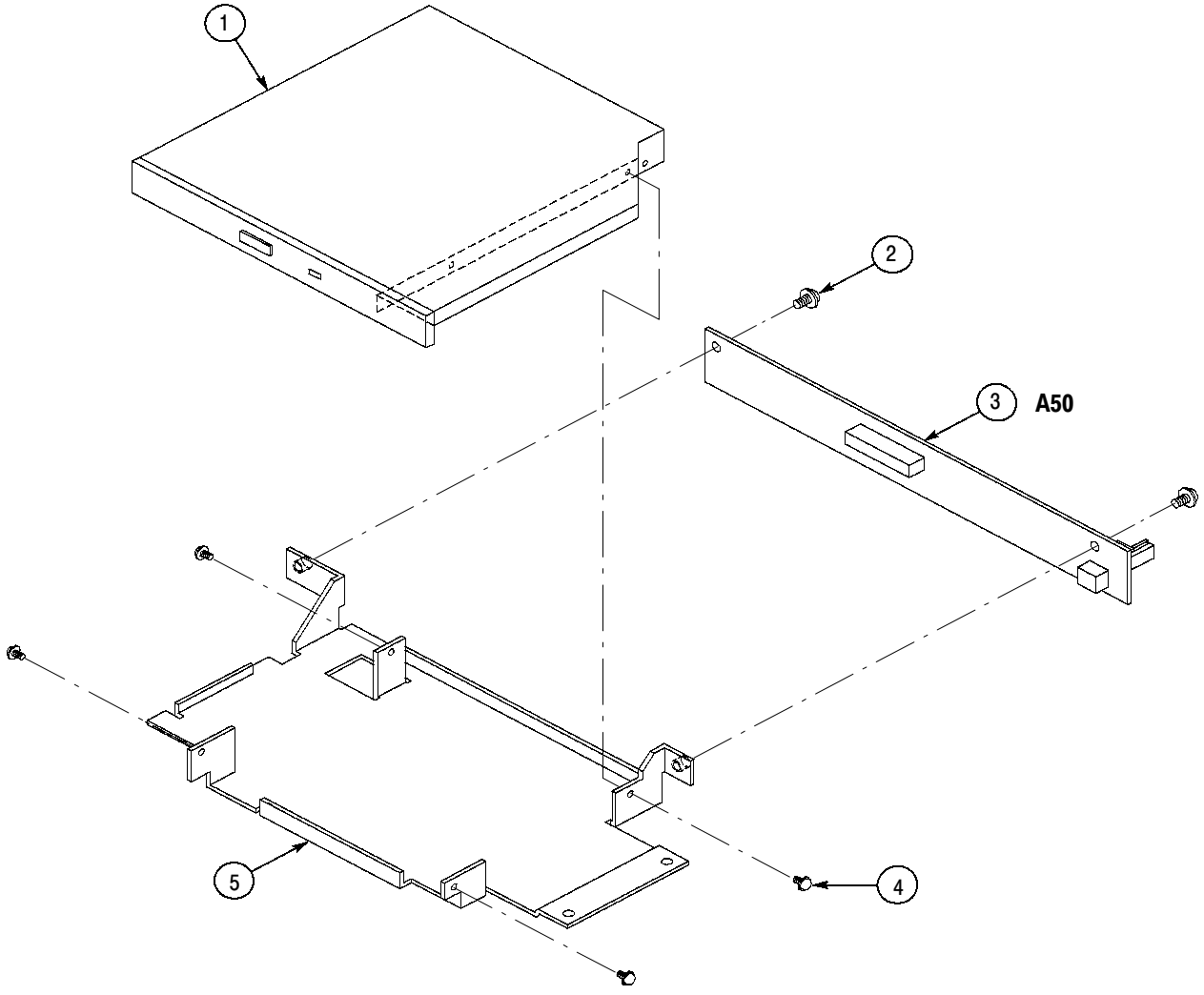


Figure 10-6: CD-ROM unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-7-1	211-0511-00			4	SCREW,MACHINE:6-32X0.5,PNH,STL ZN-CM1,POZIDRIV	80009	
-2	210-0949-00			4	WASHER,FLAT:0.141 IDX0.5 0DX0.062,BRSNP	80009	
-3	129-1527-00			4	SPACER,SLEEVE:7.5MM LX4MM ID X5.3MM OD,STL, MFZN-C [3382309-40075]	80009	
-4	214-4924-00			4	PAD,CUSHIONING:14.3MM DIAX8MM H,POLYURETHANE [G-411-6]	80009	
-5	119-B144-00			1	HARD DISK UNIT:40GB,3.5INCH,ATA-100 [IC35L040AVER07-01]	80009	
-6	407-A659-00			1	BRACKET:HDD MOUNT,AL,MTX100	80009	

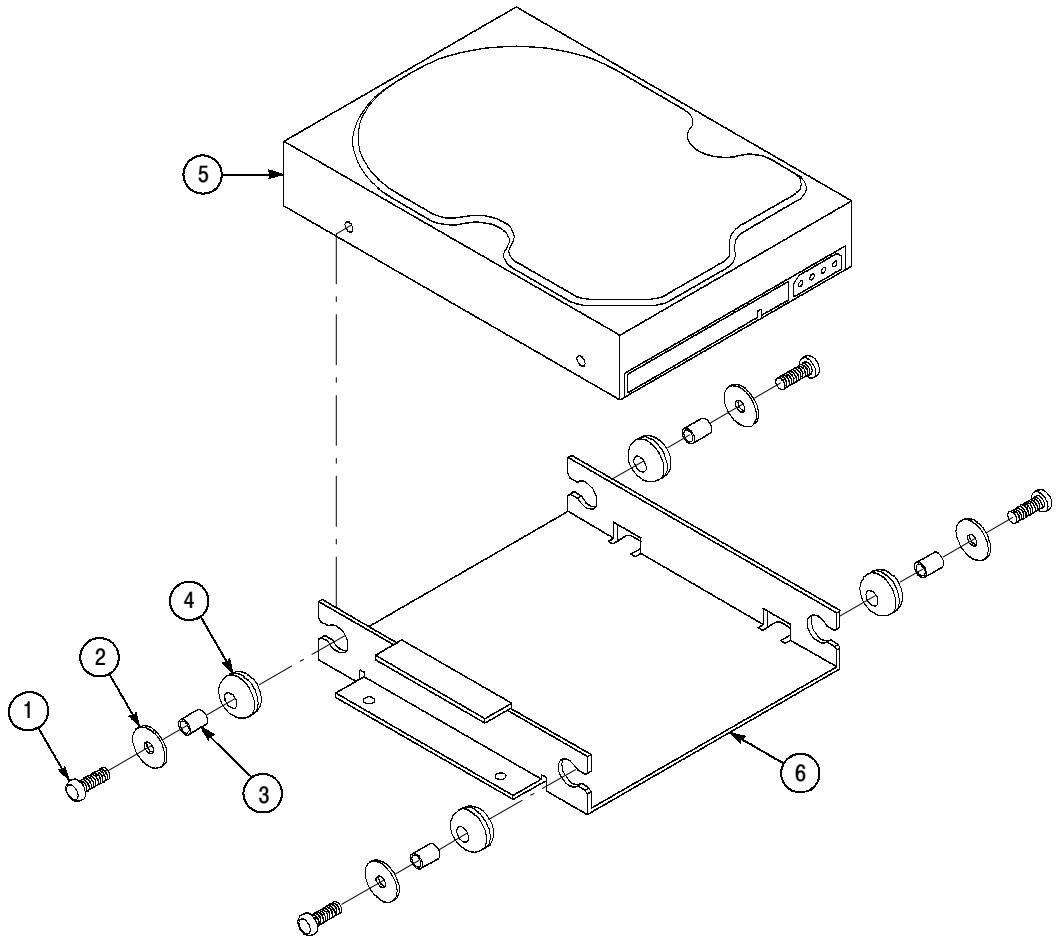


Figure 10-7: Hard Disk Drive unit

Replaceable parts list

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					STANDARD ACCESSORIES		
	070-A834-XX			1	MANUAL,TECH,USER,MTX100	TK0191	
	062-A275-XX			1	SOFTWARE PKG:WINDOWS2000 PROFESSIONAL RECOVERY,CD-ROM	80009	
	062-A276-XX			1	SOFTWARE PKG:SAMPLE STREAM,CD-ROM	80009	
	062-A279-XX			1	SOFTWARE PKG:MTX100 APPLICATION RECOVERY	80009	
	012-A220-00			1	CABLE,INTCON:D-SUB 25,MALE TO MALE,STR,TWIST,2M L,SCREW 4-40	TK0191	
	119-B145-00			1	POINTER ASSY:OPTICAL MOUSE,USB [D6600016WHEEL MOUSE OPTICAL]	80009	
	119-B146-00			1	KEYBOARD:USB [PD-KB200W/U]	80009	
	200-3897-00			1	COVER,FRONT:1700F02	80009	
	----------			1	CABLE ASSY,PWR,:3,18 AWG,2.5M L,BLACKSAFETY CONTROLLED (STANDARD CABLE-SEE FIG 10-1-4)	80009	
	161-0215-00			1	CABLE ASSY,PWR,:3,1.0MM SQ,220V/10A,2.5M (OPTION A1-EUROPEAN)	S3109	198-010
	161-0066-10			1	CABLE ASSY,PWR,:3,1.0MM SQ,240 V/10A,2.5 M (OPTION A2-UNITED KINGDOM)	S3109	209010
	161-0066-11			1	CABLE ASSY,PWR,:3,1.0MM SQ,,240V/10A,2.5M (OPTION A3-AUSTRALIAN)	S3109	198-010
	161-0066-12			1	CABLE ASSY,PWR,:3,18 AWG,240/10A,98 INCH L (OPTION A4-NORTH AMERICAN)	2W733	ORDER BY DESC
	161-0154-00			1	CABLE ASSY,PWR,:3.0 X 0.75,6A,220V ,2.5M L (OPTION A5-SWITZERLAND)	S3109	ORDER BY DESC
	161-0304-00			1	CABLE ASSY,PWR,:3,1.0MM SQ,,240V/10A,2.5M (OPTION AC-CHINA)	S3109	198-010
					OPTIONAL ACCESSORIES		
	070-A835-XX			1	MANUAL,TECH:SERVICE,MTX100	TK0191	
	----------			1	1700F05 SIDE-BY-SIDE RACK ADAPTER	80009	
	----------			1	1700F06 BRANK PANEL	80009	