Service Manual

Tektronix

RTX100B
ISDB-T RF Signal Generator

071-1932-00

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

www.tektronix.com

Contacting Tektronix

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USA

For product information, sales, service, and technical support:

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

Warranty 2

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

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

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

THIS WARRANTY IS GIVEN BY TEKTRONIX WITH RESPECT TO THE PRODUCT 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 F 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.

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

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

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

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

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

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

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

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

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

CAUTION indicates a hazard to property including the product.

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

CAUTION
Refer to Manual

WARNING
High Voltage

Protective Ground
(Earth) Terminal

Service Safety Summary

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

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

Disconnect Power. To avoid electric shock, disconnect the mains power by means of the power cord or, if provided, the power switch.

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

To avoid electric shock, do not touch exposed connections.

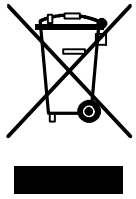
Environmental Considerations

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

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

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



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

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

Restriction of Hazardous Substances

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

Preface

This is the service manual for the RTX100B ISDB-T RF Signal Generator. This manual contains information needed to service an RTX100B to the module level.

Manual Structure

This manual is divided into sections, such as *Specifications* and *Theory of Operation*. Furthermore, 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 RTX100B and the characteristics that apply to it.
- *Theory of Operation* contains circuit descriptions that support service to the module level.
- *Performance Verification* contains procedures for confirming that an RTX100B functions properly and meets warranted characteristics.
- *Adjustment Procedures* contains procedures for adjusting the RTX100B to meet warranted characteristics.
- *Maintenance* contains information and procedures for performing preventive and corrective maintenance of an RTX100B. These instructions include cleaning, module removal and installation, and fault isolation to the module level.
- *Options* contains descriptions of factory-installed options and field-upgradable options.
- *Diagrams* contains the block diagram and interconnection diagram.
- *Replaceable Parts List* includes a table of all replaceable modules, their descriptions, and their Tektronix part numbers.

Manual Conventions

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

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

- Names of front panel controls and menus appear in the same case (initial capitals, all uppercase, and so forth) in the manual as is used on the RTX100B 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: Press the **Menu** button to open the **File** menu.
- *Italic* text refers to document names or sections. Italics are also used in NOTES, CAUTIONS, and WARNINGS.

  Example: The *Diagrams* section, beginning on page 7-1, includes a block diagram and an interconnect diagram.

Modules

Throughout this manual, any replaceable component, assembly, or part of the RTX100B 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 RTX100B is a module.

Safety

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

Finding Other Information

Other documentation for the RTX100B includes:

- The *RTX100B ISDB-T RF Signal Generator User Manual* (Tektronix part number 071-1930-XX) contains a tutorial to quickly describe how to operate the RTX100B. It also includes an in-depth discussion on how to use the RTX100B features.

Introduction

This manual contains information needed to properly service the RTX100B ISDB-T RF Signal Generator, as well as general information critical to safe and effective servicing.

To prevent personal injury or damage to the RTX100B, consider the following before attempting service:

- The procedures in this manual should be performed only by a qualified service person.
- Read the *General Safety Summary* and the *Service Safety Summary,* beginning on page vii.

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

Performance Check Interval

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

If the RTX100B does not meet performance criteria, repair is necessary.

Strategy for Servicing

This manual contains all the information needed for periodic maintenance of the RTX100B.

This manual also 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 5, *Maintenance*. To remove and replace any failed module, follow the instructions in *Removal and Installation Procedures*, also part of Section 5. After isolating a faulty module, replace it with a fully-tested module obtained from the factory. Section 8, *Replaceable Parts List,* contains part number and ordering information for all replaceable modules.

Tektronix Service Offerings

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

Whether providing warranty repair service or any of the other services listed below, Tektronix service technicians are well trained to service the RTX100B. They have access to the latest information on improvements to the RTX100B 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 these repair or adjustment services.

Specifications

Product Overview

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

The RTX100B provides the following features:

- RF modulated output of broadcast transport streams
  UHF: 13 channel to 62 channel (473 MHz to 767 MHz)
- Direct RF output of ASI input signals
- Data rate: 200 Mbps maximum (RAM mode); 256 Kbps minimum
- Hierarchy display of stored or captured transport streams
- 188, 204, 208 bytes packet size, S-TMCC, M-TMCC, non transport stream, and partial transport stream output formats
- Real-time updating of stream parameters; continuity_counter, PCR/PTS/DTS, TOT/TDT/STT, NPT, and Reed Solomon (ISDB-T only)
- Continuous recording of captured streams
- PCR jitter insertion
- Triggered stream capture
- Full remote control using Ethernet interface
- Scheduler application for automated stream playout and record (Option SC only)

The RTX100B 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 1-4 list the functional, electrical, mechanical, and environmental characteristics of the RTX100B. Table 1-5 lists the national and international standards to which the RTX100B complies.

All listed specifications are guaranteed unless labeled “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 RTX100B must be in an environment where the temperature, altitude, humidity, and vibration conditions are within the operating limits described in Table 1-4 on page 1-11.
- The RTX100B must have a warm-up period of at least 20 minutes.
- The RTX100B must be operating at an ambient temperature between +5 °C to +40 °C, unless otherwise noted.

Functional Specifications

Table 1-1: Functional specifications

Characteristics	Description
System configuration	
System OS	Windows XP Professional
CPU	1.3 GHz
System memory	1 GB
Display	6.3 inch, XGA (1024 x 768), Windows Control Panel setting is SVGA (800 x 600)
Hard disk drive	160 GB
Expansion slot	1 - PCI slot

Electrical Specifications

Table 1-2: Mainframe

Characteristics	Description
Maximum output rate	
Hard disk	≥ 120 Mbps
RAM	≥ 200 Mbps
Maximum record rate	
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	8.129698 MHz, 10 MHz, and 27 MHz
Input level, typical	Sine wave: 0 ± 6 dBm Square wave: 0.5 Vp-p to 3.0 Vp-p
Clock input	
Frequency	160 kHz to 25 MHz (parallel clock) 1.28 MHz to 32 MHz (serial clock)
Input level, typical	0.5 V to 3.0 V
External trigger input/MISC output	
Connector type	BNC
Input impedance, typical	1 kΩ
Threshold level	Rising and falling edges are programmable.
High level	> 3.5 V (maximum input voltage: 7 V)
Low level	< 0.8 V
Output level	
High level	> 2.2 V (with 50 Ω termination)
Low level	< 0.8 V (with 50 Ω termination)
Output impedance	50 Ω

Table 1-2: Mainframe (Cont.)

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

Table 1-2: Mainframe (Cont.)

Characteristics	Description
Data delay, typical	± 5 ns from the falling edge of DCLK (see Figure 1-1 on page 1-10)
Input	
Input level, typical	> +100 mV, < -100 mV, (RI+)-(RI-) with 100 Ω termination
Input resistance, typical	100 Ω (between differential inputs)
Clock pulse width, typical	T/2 ± T/10, T=1/f (f=byte clock frequency) (see Figure 1-1 on page 1-10)
Data hold time, typical	T/2 ± T/10, T=1/f (f=byte clock frequency, data are latched on DCLK rising edge) (see Figure 1-1 on page 1-10)
ASI interface	
Standard conformance	EN 50083-9 Annex B
Connector type	BNC
Impedance	75 Ω
Data rate	256 Kbps to 214 Mbps
Output	
Number of outputs	1
Output voltage	800 mV ± 10%
Jitter	≤ 0.2 UI p-p
Rise/fall time	≤ 1.2 ns (20% to 80%)
Return loss	< -17 dB (5 MHz to 270 MHz) into 75 Ω load
Input	
Number of inputs	1
Input voltage, typical	200 mV to 800 mV
Return loss	< -17 dB (5 MHz to 270 MHz) into 75 Ω load
Internal RF reference clock	
Reference clock	27 MHz ± 1 ppm
External RF reference input	
Connector type	BNC
Input impedance, typical	50 Ω
Reference input	
Frequency	10 MHz, 27 MHz 8.126948 MHz
Input level, typical	160 kHz to 26.75 MHz (parallel clock) 1.28 MHz to 32 MHz (serial clock)
RF output	
Connector type	BNC
Output impedance, typical	75 Ω

Table 1-2: Mainframe (Cont.)

Characteristics	Description
Digital modulation	
Standard	ARIB B31 V1.1
Mode	1/2/3
Bandwidth	6 MHz
Number of segments	13
Number of layers	Maximum 3
Carrier modulation	QPSK, 16 QAM, 64 QAM NOTE: DPQSK is not supported. If DPQSK modulation is used in a broadcast transport stream, the stream is modulated into QPSK. However, the signal output from the ASI connector is not modulated into QPSK.
Inner coding	Vitervi (1/2, 2/3, 3/4, 5/6, 7/8)
Outer coding	Reed Solomon (204, 188)
Time interval	0,1, 2, 4, 8, 16
Guard interval	1/4, 1/8, 1/16, 1/32
UHF output	
Frequency	470 to 770 MHz (channel plan steps)
Output amplitude	Mode 1: -21 dBm to -29 dBm at 13 ch Mode 2: -18 dBm to -26 dBm at 13 ch Mode 3: -15 dBm to -23 dBm at 13 ch
Bit error rate, typical	< 2.0 -E4 after Vitervi

Channel	Frequency	Channel	Frequency	Channel	Frequency
13	473.143	30	575.143	47	677.143
14	479.143	31	581.143	48	683.143
15	485.143	32	587.143	49	689.143
16	491.143	33	593.143	50	695.143
17	497.143	34	599.143	51	701.143
18	503.143	35	605.143	52	707.143
19	509.143	36	611.143	53	713.143
20	515.143	37	617.143	54	719.143
21	521.143	38	623.143	55	725.143
22	527.143	39	629.143	56	731.143
23	533.143	40	635.143	57	737.143
24	539.143	41	641.143	58	743.143
25	545.143	42	647.143	59	749.143
26	551.143	43	653.143	60	755.143
27	557.143	44	659.143	61	761.143
28	563.143	45	665.143	62	767.143
29	569.143	46	671.143		

(Frequency: MHz)

Table 1-2: Mainframe (Cont.)

Characteristics	Description
VGA output	
Connector type	D-sub, 15 pin
Pin assignments	1 RED, 2 GREEN, 3 BLUE, 4 NC, 5 GND, 6 GND, 7 GND, 8 GND, 9 NC, 10 GND, 11 NC, 12 NC, 13 HSYNC, 14 VSYNC, 15 NC
Printer port	Supports SPP (Standard Parallel Port), EPP (Enhanced Parallel Port), and ECP (Extended Capabilities Port) modes.
Connector type	D-sub, 25 pin
Pin assignments	1 STROBE, 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
USB 2.0 interface	
Number of connectors	2
Pin assignments	1 VCC, 2 -DATA, 3 +DATA, 4 GND
LAN interface	10/100/1000 Base-T Ethernet interface
Connector type	RJ45
Pin assignments	1 MDI_0+, 2 MDI_0-, 3 MDI_1+, 4 MDI_2+, 5 MDI_2-, 6 MDI_1-, 7 MDI_3+, 8 MDI_3-

Table 1-2: Mainframe (Cont.)

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

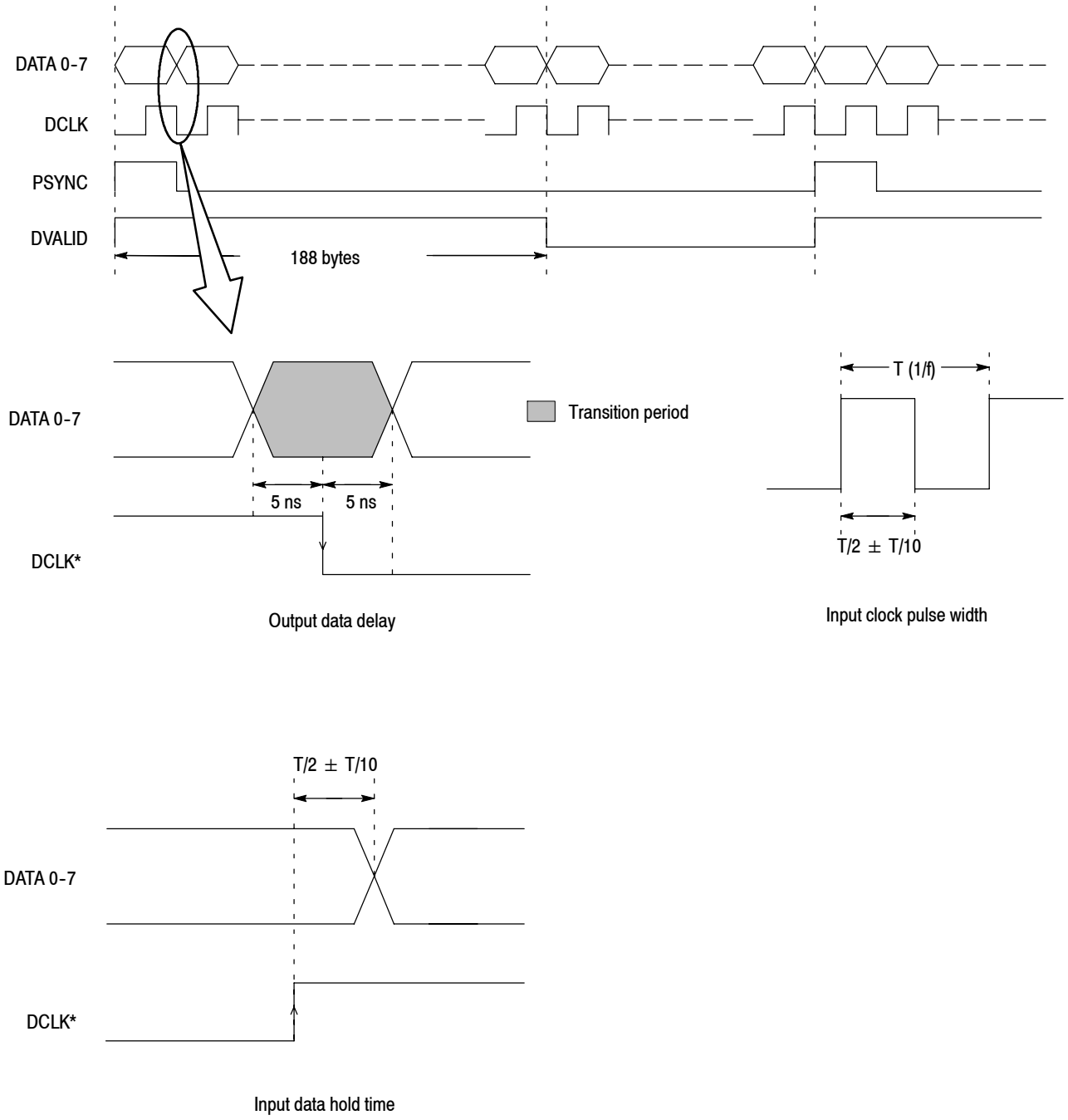


Figure 1-1: Timing diagram of the SPI interface

Mechanical (Physical) Characteristics

Table 1-3: Mechanical characteristics

Characteristics	Description
Net weight	
Standard	Approximately 6 kg (13.2 lb)
Dimensions	
Height	132 mm (5.2 in), without feet
Width	214 mm (8.4 in)
Length	435 mm (17.1 in)

Environmental Characteristics

Table 1-4: Environmental characteristics

Characteristics	Description
Temperature	
Operating	+5 °C to +40 °C
Non-operating	-20 °C to +60 °C
Relative humidity	
Operating	20% to 80% (No condensation) Maximum wet-bulb temperature 29 °C
Non-operating	5% to 90% (No condensation) Maximum wet-bulb temperature 29 °C
Altitude	
Operating	Up to 3 km (approximately 10,000 feet) Maximum operating temperature decreases 1 °C each 300 m above 1.5 km
Non-operating	Up to 15 km (approximately 50,000 feet)
Dynamics	
Vibration	
Operating	2.65 m/s^2 rms (0.27 $Grms_l$), 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 1-4: 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 (2 in)
Side clearance	5 cm (2 in)
Rear clearance	5 cm (2 in) from the fan guard

Certifications and Compliances

Table 1-5: Certifications and compliances

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

Table 1-5: Certifications and compliances (Cont.)

Category	Standards or description	
Safety	Complies with the following safety standards/regulations:	
	UL 61010-1	Standard for Electrical Measuring and Test Equipment.
	CAN/CSA C22.2 No.61010-1-04	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
	EN 61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
Installation (Overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:	
	CAT III	Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.
	CAT II	Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.
	CAT I	Secondary (signal level) or battery operated circuits of electronic equipment.
Overvoltage Category	Overvoltage Category II (as defined in IEC 61010-1)	
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.	
	Pollution Degree 1	No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
	Pollution Degree 2	Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
	Pollution Degree 2	Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
Pollution Degree	Pullution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.	
IEC Characteristics	Equipment type: Test and Measuring Installation Category II (as defined in IEC 61010-1, Annex J) Pollution Degree 2 (as defined in IEC 61010-1) Safety Class I - grounded product	

Theory of Operation

Theory of Operation

This section describes the basic operation of the major circuit blocks or modules in the RTX100B. The *Diagrams* section, beginning on page 7-1, includes a block diagram and an interconnect diagram.

A12 Main Board

The A12 Main board consists of the following blocks:

PCI Interface

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

Mega FIFO

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

TS Controller

The TS controller consists of the following blocks:

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

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

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

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

PCR/DTS Updater. This block consists of a PCR counter and update logic. The PCR counter is a complex counter, which consists of a 9-bit counter (range 0-299) and 33-bit counter. The counter counts the 27 MHz standard frequency. The update logic replaces the PCR and PTS/DTS values in a transport stream with the sum of the original value and the PCR counter value.

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

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

Interrupt Controller

The interrupt controller sends the following interruption signals to the CPU: Play FIFO empty, Record FIFO full, external trigger, 10 Hz, Playout DMA transfer finished, and Record DMA transfer finished. These interruptions can be disabled by the RTX100B application software. At power on, all interruptions are disabled.

TS Clock Generator

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

Reference Clocks

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

A20 PCI Backplane Board

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

PCI and ISA Connectors

The J100, J110, and J120 connectors are PCI slots for 5 V. The J130 connector is a PCI slot for 3.3 V and is reserved in the future. The J100 connector is the system slot and is used to install the CPU board (single board computer: SBC). The J110 and J120 connectors are used to install the A12 Main board and the A150 ISDB-T RF Output board.

ATX Power Control Circuit

The PWR_Button line (Pins 9 and 10 of J310) of the SBC is connected to the power switch on the Keypad board through the Front-Panel Processor board. When the power switch is pressed, the SBC causes the PSON# signal to go low. When the PSON# signal becomes low, Q10 turns on and +12 V main power is also on. When the power switch is pressed again, its status is sent to BIOS and the PSON# signal turns high. This circuit includes a +12 V to +5 V DC-DC converter, a +12 V to +3.3 V converter, and a +12 V to –12 V converter.

Interconnect Circuit

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

Fan Speed Control Circuit

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

IEEE1394b Interface

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

A150 ISDB-T RF Output Board

The A150 ASI ISDB-T RF Output board consists of the following blocks:

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

ASI RX and ASI Decoder This block changes an ASI signal received from the ASI In connector into parallel transport stream data.

ASI Encoder and ASI TX This block changes parallel transport stream data into an ASI signal and output the signal.

PCI Interface FPGA This block consists of an FPGA of ALTERA. It is the interface for PCI and interchange of an incoming transport stream signal. It also generates an interrupt signal when an IIP of a transport stream is decoded and Mode is changed.

Channel Coding FPGA This block performs coding of ISDB-T. It has four synchronous SRAMs as buffers for interleaving.

OFDM Modulation FPGA This block performs OFDM modulation using IFFT.

Digital PLL FPGA This is a digitally controlled PLL, which synchronizes the reference clock (VCXO) with an internal reference clock or an external clock. This block has a feature to pass the U600 output to U1100.

RF DAC This block converts OFDM modulated data to an analog signal. It has an oversampling circuit and digital filter for reducing spurious events. The block also has two A/D converters for I and Q signals.

RF Carrier Synthesizer This block generates a carrier signal for the RF output. It directly generates a career frequency of UHF.

Quadrature Modulator This block performs I/Q modulation to a carrier signal from the A/D converter output.

RF Matching Attenuator This block steps down an RF output level to the antenna input level of a receiver and matches the impedance with 75 Ω.

Front-Panel Processor Board

The Front-Panel Processor board consists of the following circuitries and connectors:

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

LVDS Data for LCD The LVDS data from the SBC is routed through the board to the LCD.

Backlight Power Control When the Window OS puts the instrument into power saver mode, the LVDS data from the SBC stops and the LCD backlight needs to be turned off or a rainbow display will occur. When the LVDS data stops, the common mode voltage of the data lines changes from the normal + 1.25 V to 0 V. The comparator U10 senses this voltage change and turns off the power MOSFET switch Q10 and the power to the backlight inverter board.

LCD Brightness Control The potentiometer R301 could be used to dim the LCD backlight brightness. But R302 is not installed, so the adjustment has no effect and the backlight is at maximum brightness.

USB Ports There are two USB connectors on the board that are connected through a cable to the USB 2.0 interface connector on the CPU board.

Keypad Board

The Keypad board contains the switch patterns for the elastomer keys and the front-panel LEDs. The board is connected to the Front-Panel Processor board by the board-to-board connectors J10 and J11.

A40 AC Distributor Board

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

Performance Verification

Performance Verification

This section provides procedures to verify the performance and functionality of the RTX100B.

Equipment Required

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

Table 3-1: Equipment required for performance verification

Item	Qty.	Minimum requirements	Recommended equipment
Frequency counter	1 ea.	Frequency range: 0.1 Hz to 1.25 GHz Precision: 8 digits or higher	Agilent Technologies 53181A Option 015
MPEG analyzer	1 ea.		Tektronix MTS430 or MTS400
Function generator	1 ea.	Frequency: 40 M clock pattern Amplitude: 3 V Outputs: 2 channel	Tektronix AFG3102
Oscilloscope	1 ea.	Bandwidth: 1 GHz or higher	Tektronix TDS5104B
ISDB-T analyzer	1 ea.		Panasonic VP8480A
Spectrum analyzer	1 ea.	Resolution bandwidth: 10 Hz	Agilent Technologies E4402B-COM
MPEG-2 measurement decoder	1 ea.		Rohde & Schwarz DVMD
Video monitor	1 ea.	SD-SDI video input	Sony LMD-1420 and BKM-320D (SDI input adapter)
Probe	1 ea.		Tektronix P5050
75 Ω signal adapter	1 ea.	Bandwidth: 1 GHz Amplitude precision: -3 dB	Tektronix AMT75
50 Ω BNC cable	2 ea.	Length: 42 inches	Tektronix part number 012-0057-01
50 Ω SMA cable	1 ea.		Candox Systems 5B-010-19-19-1000
75 Ω BNC cable	2 ea.	5C-2V, 1 m	Canare DH5C01-S-SA
Parallel interface cable	1 ea.	25-pin, D-type	Tektronix part number 012-A220-00 (supplied with the RTX100B)
IEEE1394b cable	1 ea.	9 pin-9 pin	
50 Ω N(Fe)-to-75 Ω N(Fe) adapter	1 ea.	Bandwidth: 2 GHz or higher	Agilent Technologies 11852B
75 Ω BNC(Ma)-to-NC(Fe) adapter	1 ea.		Stack Electronics BA045

Table 3-1: Equipment required for performance verification (Cont.)

Item	Qty.	Minimum requirements	Recommended equipment
50 Ω N(Ma)-to-SMA(Fe) adapter	2 ea.		Stack Electronics BA057
IEEE1394b hard disk drive	1 ea.		Novac NV-HD352WB and hard disk drive (Tektronix part number 119-7146-00)

RTX100B Test Record

Photocopy this page and use it to record the performance test result.

Table 3-2: RTX100B test record

Serial Number:	Cal Date:	Temperature:	Humidity:

Performance Test	Minimum	Measured	Maximum
Internal Clock Frequency	26.999973 MHZ	MHz	27.000027 MHz

Procedures

The following conventions are used in the performance verification procedures:

- Each test lists the characteristic that is being tested and the equipment required to perform the test.
- Each test contains complete setup instructions, which allows you to perform each test individually or in order.
- The equipment connection illustrations are specific to the recommended equipment (equipment nomenclature is labeled). If you are using substitute equipment, the location of your signal connections may vary from those in the illustrations.

***NOTE**. Before you begin the performance verification procedures, be sure that the RTX100B is operating in an environment that is within the operating limits described in Table 1-4 on page 1-11.*

In addition, the RTX100B and the test equipment must be warmed up for at least 20 minutes to ensure accurate test results.

Internal Clock Output Level and Frequency Accuracy

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

Equipment required	Oscilloscope Frequency counter 50 Ω BNC cable

1. Use the 50 Ω BNC cable to connect the Trig In/Out connector on the RTX100B to the oscilloscope CH1 input. See Figure 3-1.

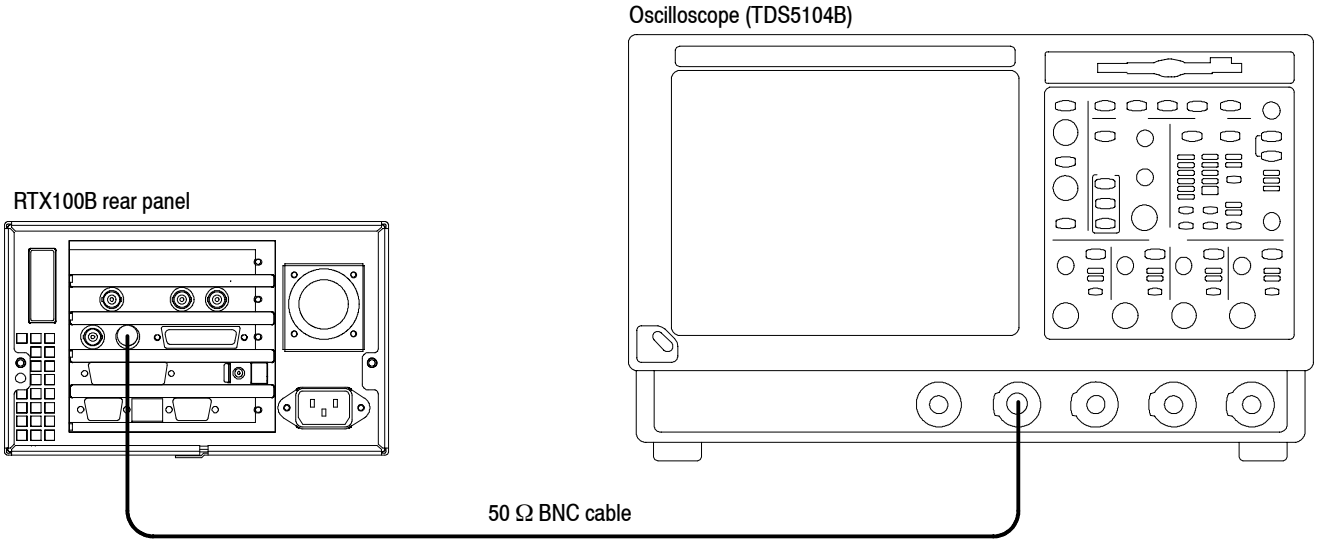


Figure 3-1: Equipment connection for checking the internal clock output level

2. Select **Play > Others** on the RTX100B to open the **Others** dialog box.
3. In the dialog box, select the **Ext Trigger BNC** button to open the Ext Trigger BNC dialog box.
4. In the dialog box, set **BNC IN/OUT** to **Output** and **BNC OUT Selection** to **27MHz**.

5. Set the oscilloscope as indicated below:

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

6. Verify that the measured values are as follows:

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

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

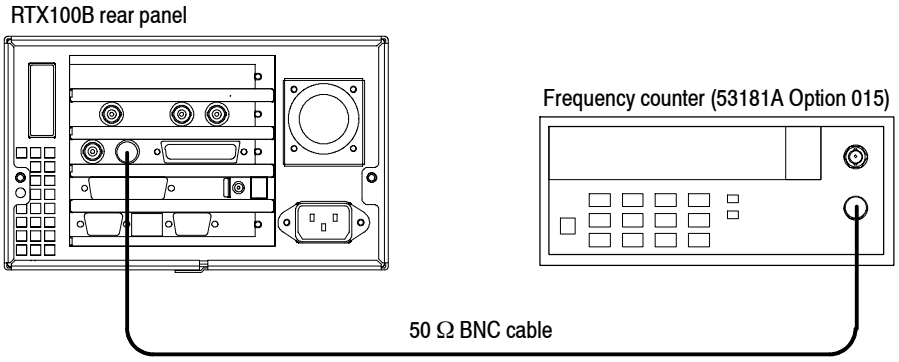


Figure 3-2: Equipment connection for checking the internal clock frequency

8. Set the frequency counter as indicated below:

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

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

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

11. Disconnect the BNC cable from the RTX100B and frequency counter.

SPI Interface

This test verifies that transport stream data is correctly played from and recorded through the SPI In/Out connector on the RTX100B.

Equipment required	MPEG analyzer Parallel interface cable test40.TRP file

Checking the Play Operation.

1. Use the parallel interface cable to connect the SPI In/Out connector on the RTX100B to the DVB SPI In connector on the MPEG analyzer. See Figure 3-3.

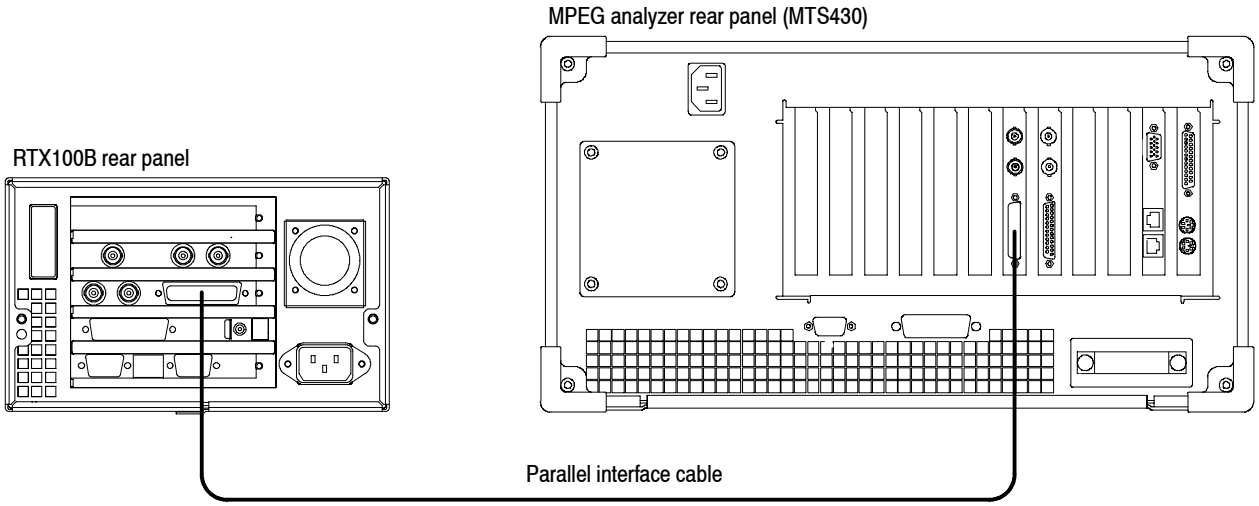


Figure 3-3: Equipment connection for checking the play operation- SPI interface

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

3. Set the application to the Record mode.

4. Open the **test40.TRP** file on the RTX100B.

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

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

5. On the RTX100B, make the following settings:

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

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

   Record
   Source . . . . . SPI
   Target . . . . . RAM, Size: 100 MB

   File
   Save Mode . . Overwrite
   Save . . . . . E:\MTXRTX_Test streams\Record_Files\SPI214Mbps

7. Press the **Play**/**Pause** button on the RTX100B to start playing the test40.TRP file.

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

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

10. After recording is completed, press the **Stop** button on the RTX100B.

Checking the Record Operation.

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

12. Press the **Record** button on the RTX100B to display the Record screen.

13. On the RTX100B, make the following settings:

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

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

14. Change the MPEG analyzer to the Play mode.

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

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

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

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

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

19. Verify that the hierarchic view is displayed on the RTX100B screen. In addition, verify that the bit rate display is **214 Mbps** and the packet size display is **188** bytes.

20. Press the **Record** button on the RTX100B to record the file.

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

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

Checking the Recorded File.

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

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

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

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

26. Click the **OK** button.

27. Press the **Play/Pause** button on the RTX100B to display the Play screen.

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

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

30. Select **Play > Update > On** on the RTX100B.

31. Press the **Play/Pause** button on the RTX100B to start playing the SPI214Mbps.trp file.

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

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

33. Press the **Stop** button on the RTX100B.

34. Close the TS Compliance Analyzer window.

External Clock/Reference and External Trigger Inputs

This test confirms that the external clock/reference input (Clock/Ref In) and external trigger input (Trig In/Out) on the RTX100B are functioning correctly.

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

1. Use a 50 Ω BNC cable to connect the Clock/Ref In connector on the RTX100B to the Ch1 connector on the function generator. See Figure 3-4.

2. Use the 50 Ω BNC cable to connect the Trig In/Out connector on the RTX100B to the Ch2 connector on the function generator. See Figure 3-4.

3. Use the parallel interface cable to connect the SPI In/Out connector on the RTX100B to the DVB/SPI In connector on the MPEG analyzer. See Figure 3-4.

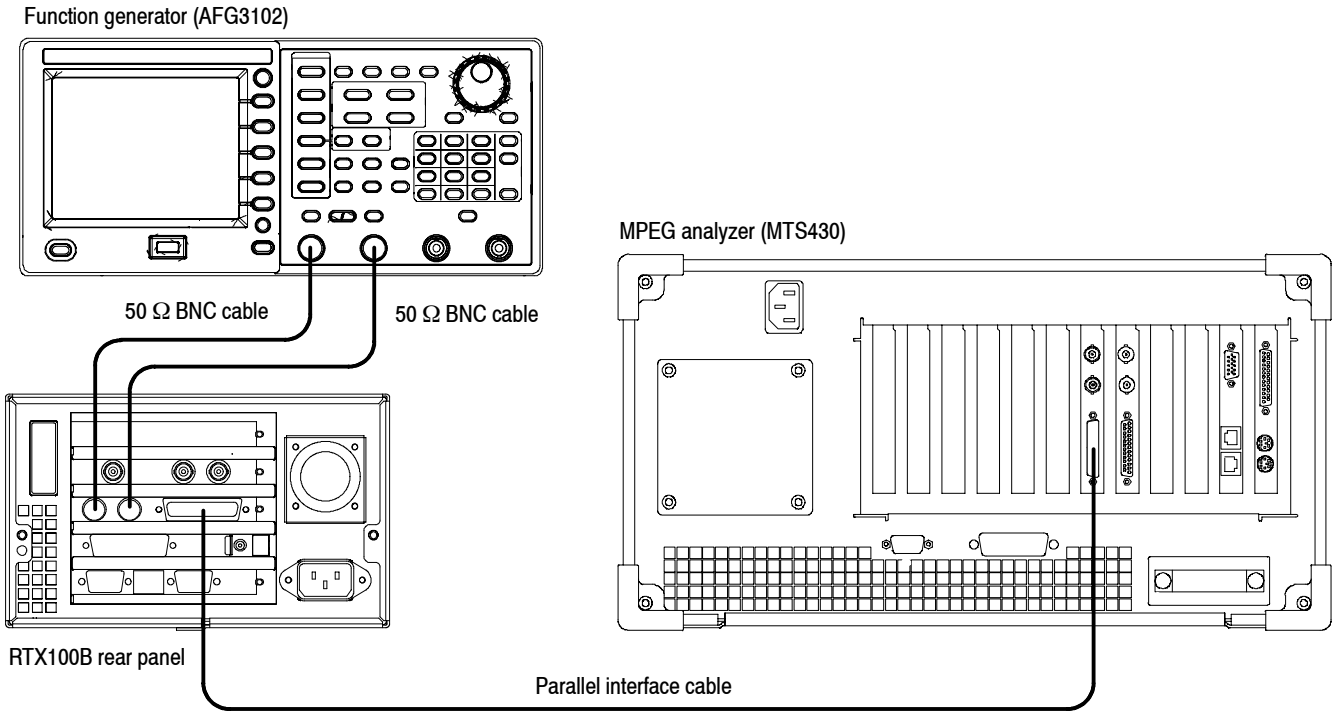


Figure 3-4: Equipment connections for checking the external clock/reference and trigger inputs

4. Set the function generator as indicated below:

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

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

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

6. Open the **test64.TRP** file on the RTX100B.

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

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

7. Set **Play > Update > On**.
8. Select **Play > Clock** to open the **Clock** dialog box.
9. In the Clock dialog box, select **ExtRef 10**.
10. Press the **Play**/**Pause** button on the RTX100B to start playing the test64.TRP file.
11. Verify that PLL unlock error does not occur on the RTX100B.
12. Start the **TS Compliance Analyzer** on the MPEG analyzer.
13. In the **Open Transport Stream** dialog box, select **Real-time Analysis**, and then make the following settings

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

14. Click the **OK** button.
15. Verify that the hierarchic view is displayed on the MPEG analyzer screen and that no error messages appear. In addition, verify that the bit rate is **64 Mbps** and the packet size is **188** bytes.

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

16. Change the clock source setting on the RTX100B and output frequency setting on the function generator with the following and then repeat step 15.

Clock source setting (RTX100B)	Output frequency setting (function generator)
ExtRef 27	27 MHz
Ext Ref 8.126984 MHz	8.126984 MHz
Ext P Clk	8 MHz

17. Change the output frequency of the function generator to 32 MHz.
18. Select **Play > Clock** on the RTX100B to open the **Clock** dialog box.
19. In the dialog box, select **Ext S Clk**.
20. Repeat step 15 and verify that all items in the **Priority 1** row are green.

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

21. Press the **Stop** button on the RTX100B to stop the stream output.
22. Select **Play > Clock** on the RTX100B to open the **Clock** dialog box.
23. In the dialog box, select **Internal**.
24. Press the **On** button of the Ch1 output on the function generator to stop the signal output.
25. Press the **On** button of the Ch2 output on the function generator to start the signal output.
26. Select **Play > Others** on the RTX100B to open the **Others** dialog box.
27. In the dialog box, set **Ext Play Start** to **Rise**.
28. Verify that the RTX100B starts playing when the **Output** menu is set to **Invert** on the function generator.
29. Press the **Stop** button on the RTX100B to stop the stream output.
30. Press the **On** button of the Ch2 output on the function generator to stop the signal output.
31. Return **Ext Play Start** to **Off** on the RTX100B.
32. Disconnect all cables from the RTX100B, function generator, and MPEG analyzer.

ASI Interface

This test verifies that transport stream data is correctly played from and is recorded through the ASI interface on the RTX100B.

Equipment required	MPEG analyzer
	Oscilloscope
	MPEG-2 measurement decoder
	Video monitor
	Two 75 Ω BNC cables
	75 Ω signal adapter
	test40.TRP file

Checking the Output Signal.

1. Use the 75 Ω BNC cable and the 75 Ω signal adapter to connect the ASI Out connector on the RTX100B to the oscilloscope CH1 input. See Figure 3-5.

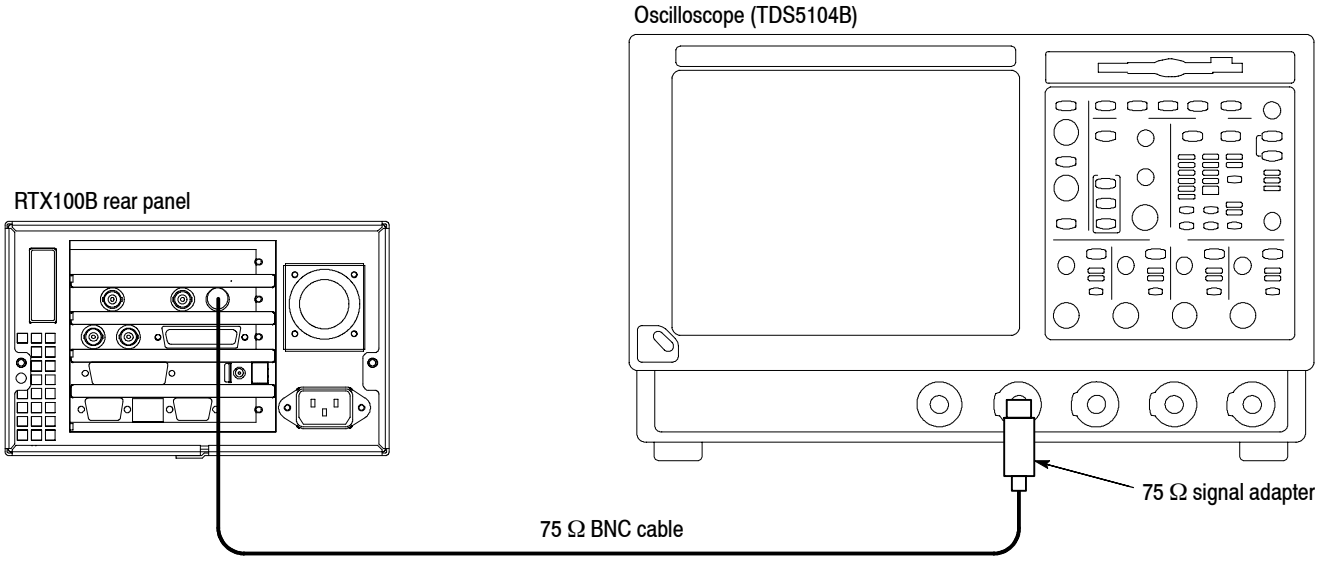


Figure 3-5: Equipment connection for checking the output signal- ASI interface

2. Set the oscilloscope as indicated below:

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

3. Open the **test40.TRP** file on the RTX100B.

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

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

4. Press the **Play**/**Pause** button to start playing the test40.TRP file.

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

   Amplitude: 720 mV to 880 mV
   Rise and fall time: ≤ 1.2 ns

Checking the Play Operation.

6. Disconnect the BNC cable from the 75 Ω signal adapter on the oscilloscope, and then connect the cable to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-6.

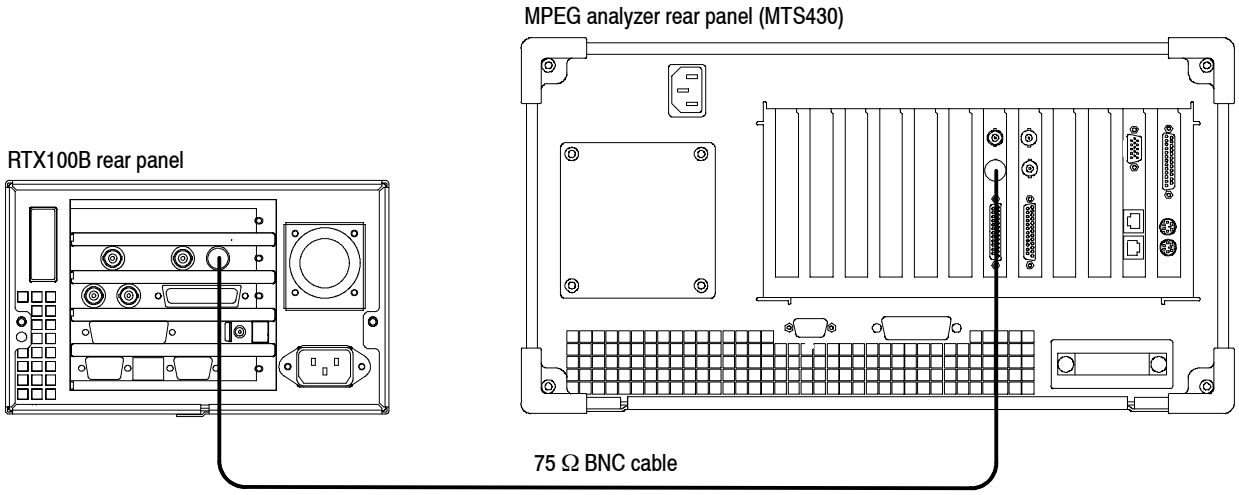


Figure 3-6: Equipment connections for checking the play operation- ASI interface

7. Start the **MPEG Player** application on the MPEG analyzer.
8. Set the application to the Record mode.
9. Set the MPEG analyzer as indicated below:

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

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

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

10. On the RTX100B, make the following settings:

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

11. Press the **Play**/**Pause** button on the RTX100B to start playing the test40.TRP.

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

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

14. After recording is completed, press the **Stop** button on the RTX100B.

15. Disconnect the 75 Ω BNC cable from the RTX100B and MPEG analyzer.

Checking the Record Operation.

16. Use the 75 Ω BNC cable to connect the ASI In connector on the RTX100B to the ASI/SMPTE Out connector on the MPEG analyzer. See Figure 3-7.

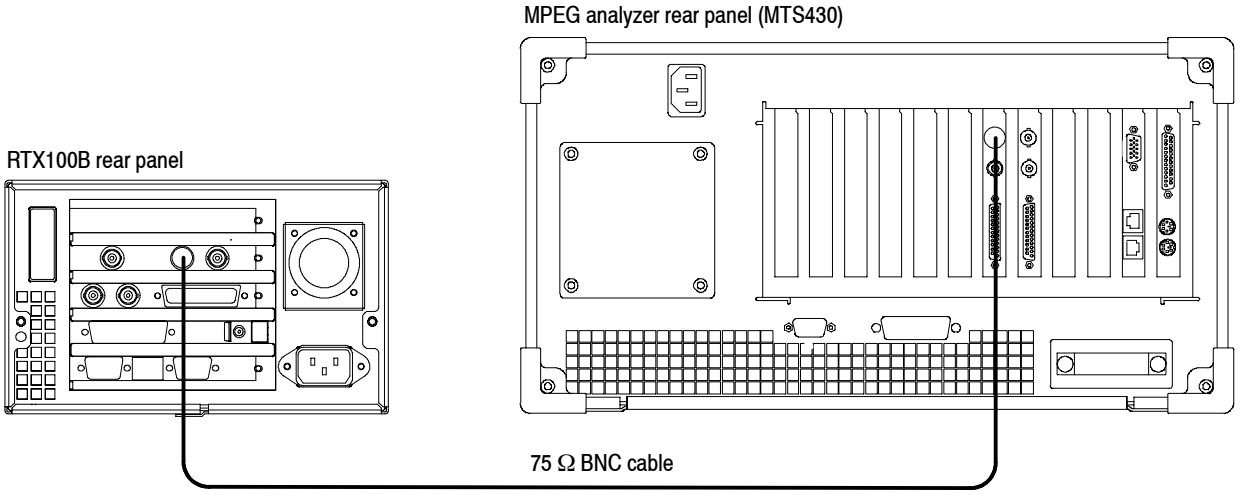


Figure 3-7: Equipment connection for checking the record operation- ASI interface

17. Press the **Record** button on the RTX100B to display the Record screen.

18. On the RTX100B, make the following settings:

Record menu
Source . . . . . ASI
Record size . . . . . 100 MB
Target . . . . . RAM

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

19. Set the MPEG analyzer to the Play mode.

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

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

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

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

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

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

24. Verify that the hierarchic view is displayed on the RTX100B screen. In addition, verify that the bit rate is **214 Mbps** and packet size is **188** bytes.

25. Press the **Record** button on the RTX100B to record the file.

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

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

28. Disconnect the 75 Ω BNC cable from the RTX100B and MPEG analyzer.

Checking the Recorded File.

29. Use the 75 Ω BNC cable to connect the ASI Out connector on the RTX100B to the ASI/SMPTE In connector on the MPEG analyzer. See Figure 3-8.

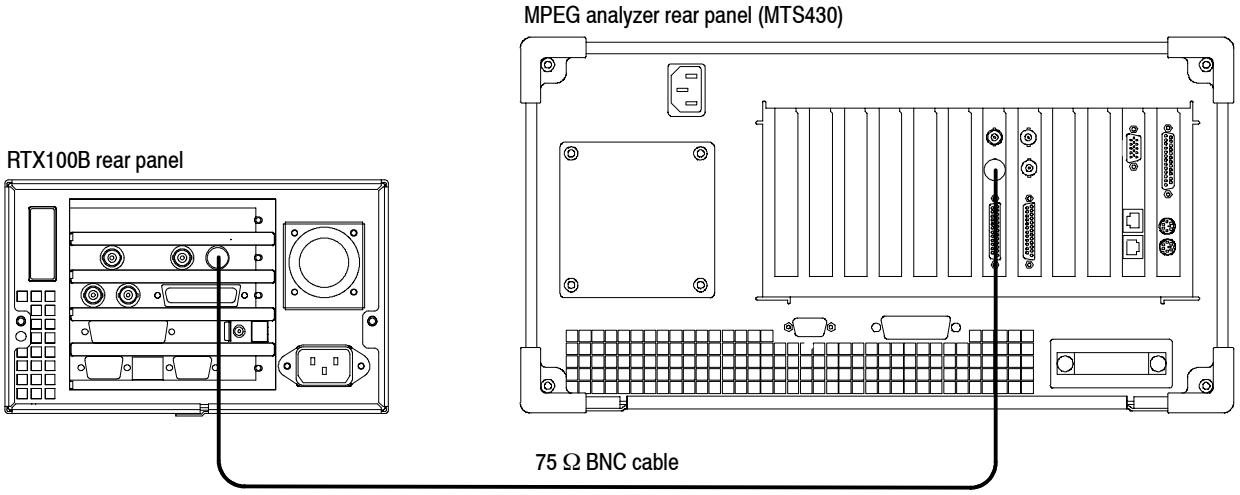


Figure 3-8: Equipment connection for checking the recorded file- ASI interface

30. Press the **Play/Pause** button on the RTX100B to display the Play screen.

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

32. Open the **ASI214Mbps** file on the RTX100B.

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

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

33. Press the **Play/Pause** button to start playing the file.

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

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

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

36. Click the **OK** button.

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

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

38. Press the **Stop** button on the RTX100B to stop the stream output.

39. Disconnect the 75 Ω BNC cable from the RTX100B and MPEG analyzer.

Checking a Moving Picture.

40. Use a 75 Ω BNC cable to connect the ASI Out connector on the RTX100B to the TS ASI connector on the MPEG-2 measurement decoder. See Figure 3-9.

41. Use the 75 Ω BNC cable to connect the SER75 Ω connector on the MPEG-2 measurement decoder to the SDI input on the video monitor. See Figure 3-9.

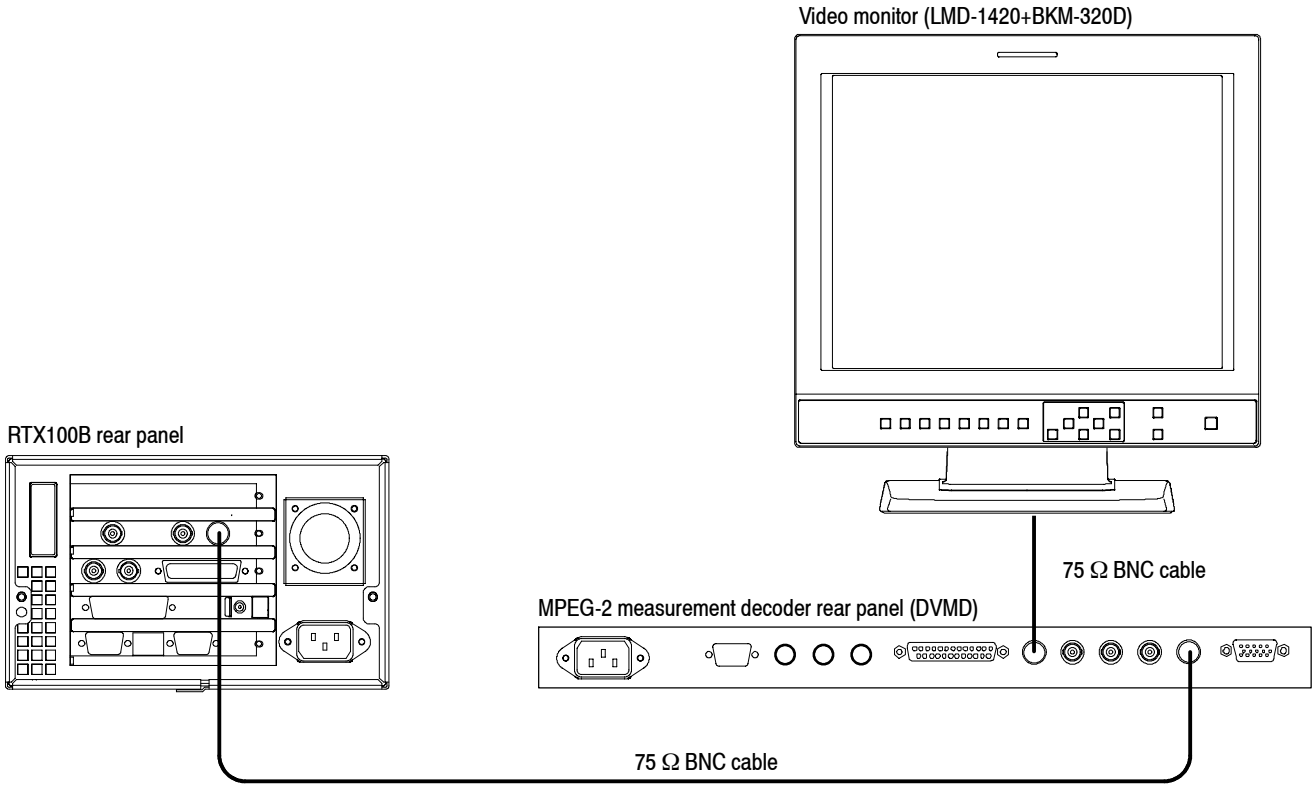


Figure 3-9: Fifth equipment connection for checking the ASI interface

42. Set **TS INPUT** to **SERIAL REAR** on the decoder.

43. Select **Play > Update > Off** on the RTX100B.

44. Press the **Play**/**Pause** button on the RTX100B to start playing the ASI214Mbps.trp file.
45. Verify that a moving picture is displayed on the video monitor. In addition, verify that there is no flicker or block noise in the displayed picture.
46. Press the **Stop** button on the RTX100B to stop the stream output.
47. Disconnect 75 Ω BNC cables from the RTX100B, MPEG-2 measurement decoder, and video monitor.

RF Output

This test verifies the carrier frequency, carrier leakage, and output level/error of the RF output. The following equipment is required for this test:

Equipment required	Frequency counter
	Spectrum analyzer
	ISDB-T analyzer
	75 Ω BNC cable
	50 Ω SMA cable
	50 Ω N(Fe)-to-75 Ω N(Ma) adapter
	75 Ω BNC(Ma)-to-NC(Fe) adapter
	Two 50 Ω N(Ma)-to-SMA(Fe) adapters
	ISDB_T_M1.rmx, ISDB_T_M2.rmx, and ISDB_T_M3.rmx files

Checking the Output Signal.

1. Use the 75 Ω BNC cable to connect the RF Out connector on the RTX100B to the CH2 connector on the frequency counter. See Figure 3-10.

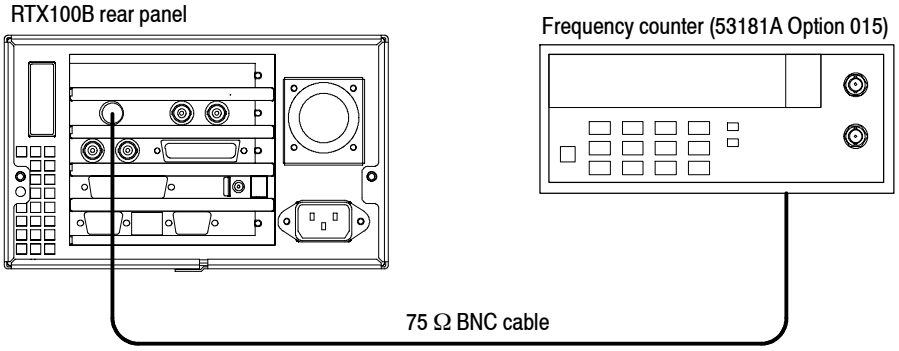


Figure 3-10: Equipment connection for checking the RF output signal

2. Select **ISDB-T/ASI > Calibration** on the RTX100B.
3. In the resulting dialog box, enter **rtx100cal** for a password. The **ISDB-T Calibration** dialog box appears.
4. In the dialog box, set **Reference Frequency** to **13**, and then select the **Cal Signal** check box.
5. Set the frequency counter as indicated below:

   MEASURE Frequency2
   Gate Time: 0.20 s

6. Verify that the frequency counter reading falls within the range of 473.1426 MHz to 473.1434 MHz.
7. Set **Reference Frequency** to **38**.
8. Verify that the frequency counter reading falls within the range of 623.1424 MHz to 623.1436 MHz.
9. Set **Reference Frequency** to **62**.
10. Verify that the frequency counter reading falls within the range of 767.1423 MHz to 767.1437 MHz.
11. Clear the **Cal Signal** check box.
12. Disconnect the 75 Ω BNC cable from the RTX100B and frequency counter.

Checking the Carrier Leakage.

13. Use the 75 Ω BNC(Ma)-to-NC(Fe) adapter, 50 Ω N(Fe)-to-75 Ω N(Ma) adapter, 50 Ω SMA cable, and two 50 Ω N(Ma)-to-SMA(Fe) adapters to connect the RF Out connector on the RTX100B to the RF Input on the spectrum analyzer. See Figure 3-11.

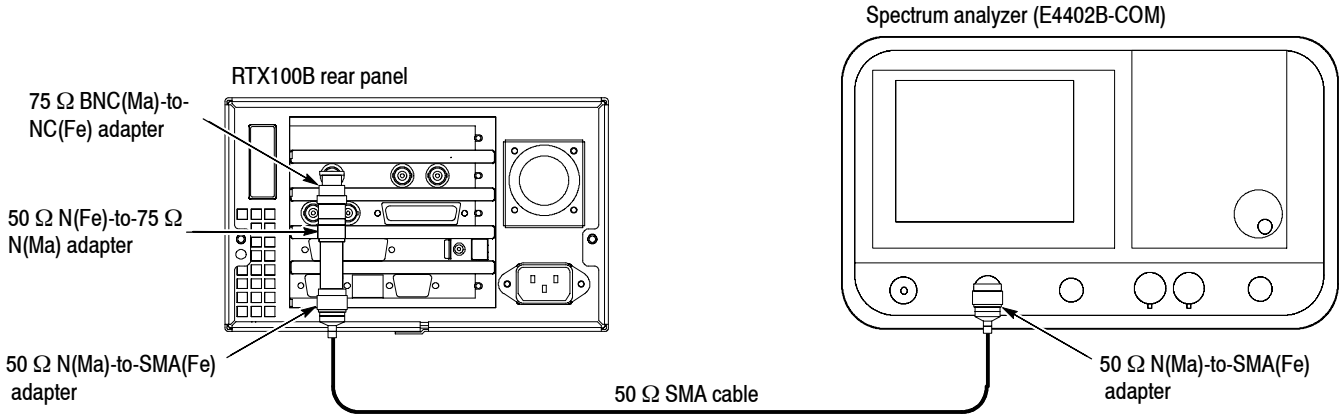


Figure 3-11: Equipment connection for checking the carrier leakage

14. Set the spectrum analyzer as indicated below:

CENTER FREQ . . . . . 473.143 MHz
FREQ SPAN . . . . . 2 MHz
RBW . . . . . 10 kHz
VBW . . . . . 300 Hz
SWP Speed . . . . . 2.0 s
REF Level . . . . . –20 dBm
ATT . . . . . 10 dB

15. Select **ISDB-T/ASI > Calibration** on the RTX100B. The **ISDB-T Calibration Password** dialog box appears.

16. In the dialog box, enter **rtx100cal** for a password. The **ISDB-T Calibration** dialog box appears.

17. In the dialog box, set **Reference Frequency** to **13**.

18. Verify that the carrier leakage value on the spectrum analyzer is less than –80 dBm.

19. Change Reference Frequency (output channel) on the RTX100B and center frequency on the spectrum analyzer as listed in Table 3-3, and then verify that the carrier leakage value is less than –80 dB.

Table 3-3: Output channel and center frequency settings

CH	Center Frequency (MHz)	CH	Center frequency (MHz)	CH	Center frequency (MHz)
13	473.143	30	575.143	47	677.143
14	479.143	31	581.143	48	683.143
15	485.143	32	587.143	49	689.143
16	491.143	33	593.143	50	695.143
17	497.143	34	599.143	51	701.143
18	503.143	35	605.143	52	707.143
19	509.143	36	611.143	53	713.143
20	515.143	37	617.143	54	719.143
21	521.143	38	623.143	55	725.143
22	527.143	39	629.143	56	731.143
23	533.143	40	635.143	57	737.143
24	539.143	41	641.143	58	743.143
25	545.143	42	647.143	59	749.143
26	551.143	43	653.143	60	755.143
27	557.143	44	659.143	61	761.143
28	563.143	45	6665.143	62	767.143
29	569.143	46	671.143	---	----------

Checking the Spectrum Mask.

20. Select **ISDB-T/ASI > RF Parameter** on the RTX100B to open the **ISDB-T RF Parameter** dialog box.

21. In the dialog box, set **Center Frequency** to **13**.

22. Open the **ISDB_T_M3.rmx** file on the RTX100B.

- **a.** Select **File > Open** to open the **Select File** dialog box.
- **b.** In the dialog box, navigate to the **D:\ISDB-T** directory, and then select the **ISDB_T_M3.rmx** file.

23. Press the **Play/Pause** button to start playing the file.

24. Set the spectrum analyzer as indicated below:

CENTER FREQ . . . . . 473.143 MHz
FREQ SPAN . . . . . 15 MHz
RBW . . . . . 10 kHz
VBW . . . . . 300 Hz
SWP Speed . . . . . 10 s
REF Level . . . . . –30 dBm (None)
ATT . . . . . 0 dB
Average 10

25. Use the delta marker to measure the difference between the marker frequency set in step 24 and the specified frequency offset of each marker, and verify that each value meets the condition as follows:

Delta marker–Marker 1 (–2.86 MHz): < –20 dB
Delta marker–Marker 2 (–3.00 MHz): < –27 dB
Delta marker–Marker 3 (–4.36 MHz): < –49 dB

26. Change frequency offset of each marker, and verify that each value meets the condition as follows:

Delta marker–Marker 1 (2.86 MHz): < –20 dB
Delta marker–Marker 2 (3.00 MHz): < –27 dB
Delta marker–Marker 3 (4.36 MHz): < –49 dB

27. Change **Center Frequency** to **38** on the RTX100B.

28. Change the Center Frequency to **623.143 MHz** on the spectrum analyzer.

29. Repeat steps 25 and 26.

30. Change **Center Frequency** to **62** on the RTX100B.

31. Change the Center Frequency to **767.143 MHz** on the spectrum analyzer.

32. Repeat steps 25 and 26.

33. Disconnect the 75 Ω BNC (Ma)-to-NC(Fe) adapter, 50 Ω SMA cable, and 50 Ω N(Ma)-to-SMA(Fe) adapter from the RTX100B and spectrum analyzer.

Checking the Output Level and Error.

34. Use the 75 Ω BNC cable to connect the RF Out connector on the RTX100B to the RF INPUT on the ISDB-T analyzer. See Figure 3-12.

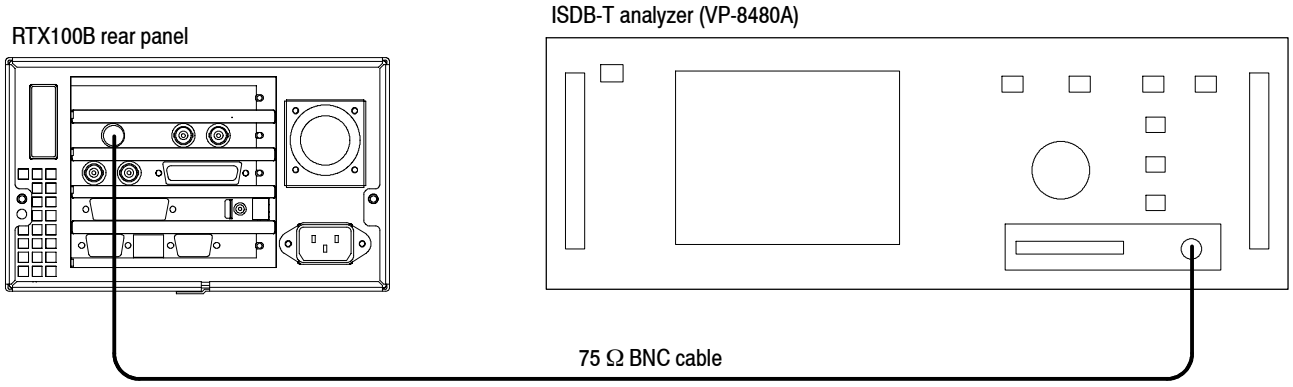


Figure 3-12: Equipment connection for checking the output level and error

35. Select **ISDB-T/ASI > RF Parameter** on the RTX100B to open the **ISDB-T RF Parameter** dialog box.

36. In the dialog box, set **Center Frequency** to **13**.

37. Open the **ISDB_T_M3.rmx** file on the RTX100B.

- **a.** Select **File > Open** to open the Select File dialog box.
- **b.** In the dialog box, navigate to the **D:\ISDB-T** directory, and then select the **ISDB_T_M3.rmx** file.

38. Press the **Play/Pause** button to start playing the file.

39. Set the ISDB-T analyzer demodulation (DEMODSET) as indicated below:

Mode 3
GI 1/4
Data . . . . . AIR
RS . . . . . ON
Carrier . . . . . ALL (Loss: OFF)

40. Set the ISDB-T analyzer other settings as indicated below:

Display . . . . . Constellation
Measurement mode . . . REPEAT Mode
Input CH 13

41. After the Synchronization Detect status is “locked”, start the measurement.

42. Verify that the measurement values are as follows:

POWER (Mode 3):	–22 to –16 dBm
POWER (Mode 2):	–25 to –19 dBm
POWER (Mode 1):	–28 to –22 dBm
Plane A, B (BER):	0.00E–7 (8)
Plane C (BER):	< 8.00E–5
Plane A, B, C (VIT):	0.00E–7 (8)

***NOTE**. If errors occur over Planes A to C when a bit error (BER) is detected, stop the measurement and then restart.*

43. Change **Center Frequency** to **14** (Channel 14) on the RTX100B.

44. Change **Input CH** to **14** on the ISDB-T analyzer.

45. Repeat steps 41 and 42.

46. Repeat steps 43 through 45 for Channel **15** to Channel **62**.

47. Change the demodulation (DEMODSET) settings to **Mode: 2** on the ISDB-T analyzer.

48. Open the **ISDB_T_M2.rmx** file on the RTX100B.

- **a.** Select **File > Open** to open the Select File dialog box.
- **b.** In the dialog box, navigate to the **D:\ISDB-T** directory, and then select the **ISDB_T_M2.rmx** file.

49. Press the **Play/Pause** button on the RTX100B to start playing the file.

50. Repeat steps 41 and 42.

51. Change the demodulation (DEMODSET) settings to **Mode: 1** on the ISDB-T analyzer.

52. Open the **ISDB_T_M1.rmx** file on the RTX100B.

- **a.** Select **File > Open** to open the Select File dialog box.
- **b.** In the dialog box, navigate to the **D:\ISDB-T** directory, and then select the **ISDB_T_M1.rmx** file.

53. Press the **Play/Pause** button on the RTX100B to start playing the file.

54. Repeat steps 41 and 42.

IEEE1394b Interface

This test verifies that the IEEE1394b interface is functioning correctly.

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

1. Use the IEEE1394b cable to connect the IEEE1394b connector on the RTX100B to the IEEE1394b hard disk drive. See Figure 3-13.

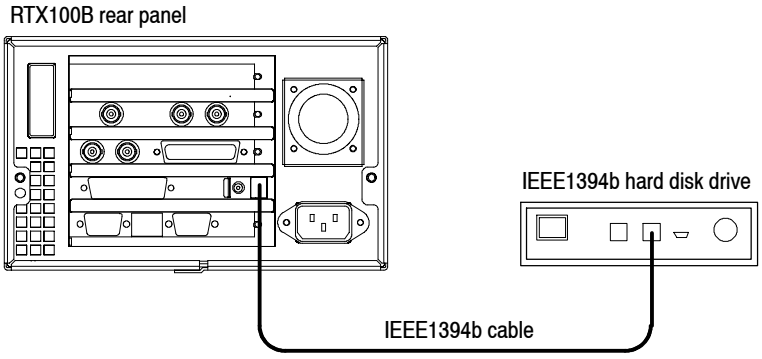


Figure 3-13: Equipment connection for checking the IEEE1394b interface

2. Select **Play** > **Minimize** to minimize the RTX100B application.
3. Power on the IEEE1394b hard disk drive.
4. Double-click the **My Computer** icon on the Windows desktop to open the My Computer window.
5. In the Window, verify that the hard disk drive is recognized as the **F:** (or **G:**) drive.
6. Use the windows file copy operation to copy the **test40.TRP** file on the **D:** drive to **F:** (or **G:**) drive.
7. Verify that the test40.TRP file is copied to the F: (or G:) drive correctly.
8. Delete the test40.TRP file from the F: (or G:) drive.
9. Power off the IEEE1394b hard disk drive.

This completes the RTX100B performance verification.

Adjustment Procedures

Adjustment Procedures

This section contains information needed to adjust the RTX100B.

The only adjustment in the RTX100B is for the carrier leakage.

Requirement for Adjustment

Before proceeding, note the following requirement:

Warm-up Period

The RTX100B requires a 20 minute warm-up time in a +20 °C to +30 °C environment before it is adjusted. Adjustment done before the operating temperature has stabilized may cause errors in performance.

In addition, the spectrum analyzer requires appropriate warm-up time to meet the specification.

Equipment Required

Table 4-1 lists the test equipment required to adjust the carrier leakage. 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

Item	Qty.	Minimum requirements	Recommended equipment
Spectrum analyzer	1 ea.	Resolution bandwidth: 10 Hz	Agilent Technologies E4402B-COM
50 Ω SMA cable	1 ea.		Candox Systems 5B-010-19-19-1000
50 Ω N(Fe)-to-75 Ω N(Fe) adapter	1 ea.	Bandwidth: 2 GHz or higher	Agilent Technologies 11852B
50 Ω N(Ma)-to-SMA(Fe) adapter	2 ea.		Stack Electronics BA057
75 Ω BNC(Ma)-to-NC(Fe) adapter	1 ea.		Stack Electronics BA045

Carrier Leakage Adjustment

Procedure Perform the following procedure to adjust the carrier leakage:

1. Use the 75 Ω BNC(Ma)-to-NC(Fe) adapter, 50 Ω N(Fe)-to-75 Ω N(Ma) adapter, 50 Ω SMA cable, and two 50 Ω N(Ma)-to-SMA(Fe) adapter to connect the RF Out connector on the RTX100B to the RF Input on the spectrum analyzer. See Figure 4-1.

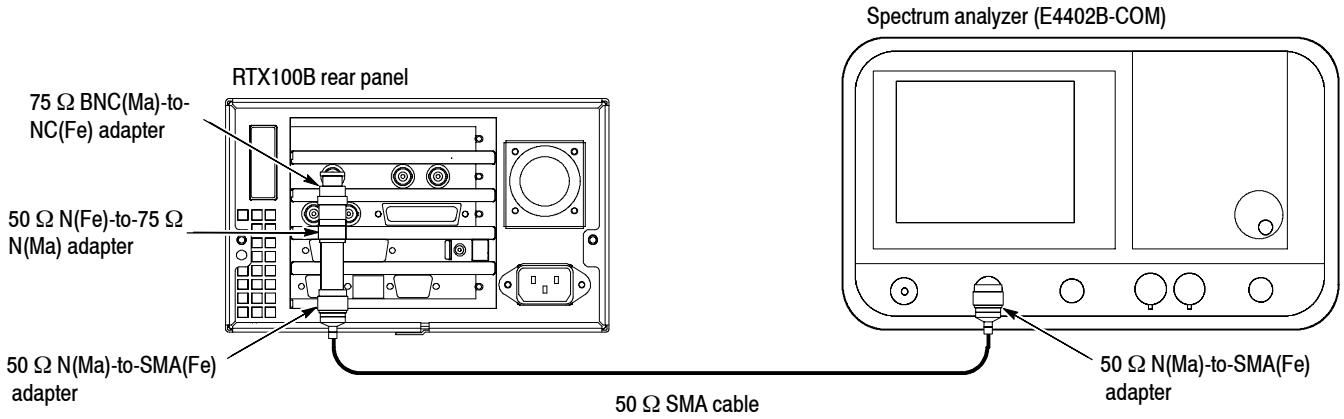


Figure 4-1: Equipment connection for adjusting the carrier leakage

2. Set the spectrum analyzer as indicated below:

   CENTER FREQ . . . . . 479.143 MHz
   FREQ SPAN . . . . . 15 MHz
   RBW . . . . . 30 kHz
   VBW . . . . . 300 Hz
   SWP Speed . . . . . 0.5 s (Meas Uncal)
   REF Level . . . . . 0 dBm
   ATT . . . . . 10 dB

3. Select **ISDB-T/ASI > Calibration** on the RTX100B. The **ISDB-T Calibration Password** dialog box appears.
4. In the dialog box, enter **rtx100cal** for a password. The **ISDB-T Calibration** dialog box appears.
5. In the dialog box, set **Reference Frequency** to **13**.
6. Set **DAC(I) Gain** and **DAC(Q) Gain** to **15**.
7. Select the **Cal Signal** check box.

8. Use the Peak Search function of the spectrum analyzer to verify that the carrier appears at **473.143 MHz** on the screen.

9. Turn off the Carrier output of the spectrum analyzer.

10. Adjust the **DAC(I) Offset** and **DAC(Q) Offset** values so that the carrier leakage on the spectrum analyzer is less than –80 dBm.

11. Change Reference Frequency (output channel) on the RTX100B and center frequency on the spectrum analyzer as listed in Table 4-2, and repeat steps 5 through 10.

***NOTE**. The center frequency settings for the spectrum analyzer are indicated by boldface in the Table 4-2.*

Table 4-2: Output channel and center frequency settings

CH	Center Frequency (MHz)	CH	Center frequency (MHz)	CH	Center frequency (MHz)
13	473.143	30	575.143	47	**677.143**
14	**479.143**	31	581.143	48	683.143
15	485.143	32	**587.143**	49	689.143
16	491.143	33	593.143	50	**695.143**
17	**497.143**	34	599.143	51	701.143
18	503.143	35	**605.143**	52	707.143
19	509.143	36	611.143	53	**713.143**
20	**515.143**	37	617.143	54	719.143
21	521.143	38	**623.143**	55	725.143
22	527.143	39	629.143	56	**731.143**
23	**533.143**	40	635.143	57	737.143
24	539.143	41	**641.143**	58	743.143
25	545.143	42	647.143	59	**749.143**
26	**551.143**	43	653.143	60	755.143
27	557.143	44	**659.143**	61	761.143
28	563.143	45	665.143	62	**767.143**
29	**569.143**	46	671.143	---	----------

Maintenance

Maintenance

This section contains the information needed to do periodic and corrective maintenance on the RTX100B. The following subsections are included:

- *Preparation*
- *Inspection and Cleaning*
- *Removal and Installation Procedures*
- *Verifying the BIOS Configuration*
- *Troubleshooting*
- *System Software Recovery*
- *Using the Rescue Disc*

Related Maintenance Procedures

The following sections contain information and procedures related to maintenance.

- Section 2, *Theory of Operation*, contains a circuit description at the module or block level.
- Section 3, *Performance Verification*, contains procedures that may be useful in isolating problems to modules by testing the RTX100B performance.
- Section 7, *Diagrams*, contains a block diagram using individual modules as blocks and an interconnection diagram showing connections between the modules.
- Section 8, *Replaceable Parts List,* lists all field replaceable modules by part number.

Preparation

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

CAUTION*. Static discharge can damage any semiconductor component in the RTX100B.*

Preventing ESD

When performing any service that requires internal access to the RTX100B, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge (ESD).

1. Minimize handling of static-sensitive modules.
2. Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive modules.
3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules. Perform service of static-sensitive modules only at a static-free work station.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Handle circuit boards by the edges when possible.
6. Do not slide the modules over any surface.
7. Avoid handling modules in areas that have a floor or work-surface covering capable of generating a static charge.

Inspection and Cleaning

Inspection and Cleaning describes how to inspect for dirt and damage. It also describes how to clean the exterior and interior of the RTX100B. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent the RTX100B from malfunctioning and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the RTX100B and using general care when operating it.

How often preventative maintenance should be performed depends on the severity of the environment in which the RTX100B is used. A proper time to perform preventive maintenance is just before the RTX100B adjustment.

General Care

The cabinet helps keep dust out of the RTX100B, and is needed to meet EMI and cooling requirements. The cabinet should be in place when operating the RTX100B. The front cover protects the front panel and display from dust and damage. Install the front cover when storing or transporting the RTX100B.

Inspection and Cleaning Procedures

Inspect and clean the RTX100B 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 RTX100B failure, especially under high-humidity conditions.

***CAUTION**. Avoid the use of chemical cleaning agents that might damage the plastics used in this RTX100B. 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 RTX100B for damage, wear, and missing parts, using Table 5-1 as a guide. An RTX100B 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 RTX100B.

Table 5-1: External inspection check list

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

Cleaning Procedure — Exterior. To clean the RTX100B exterior, perform the following steps:

1. Remove loose dust on the outside of the RTX100B 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 RTX100B during external cleaning, use only enough liquid to dampen the cloth or applicator.*

Inspection — Interior. To access the inside of the RTX100B for inspection and cleaning, refer to the *Removal and Installation Procedures* in this section.

Inspect the internal portions of the RTX100B for damage and wear, using Table 5-2 as a guide. Defects found should be repaired immediately.

***CAUTION**. To prevent damage from electrical arcing, ensure that circuit boards and components are dry before applying power to the RTX100B.*

Table 5-2: Internal inspection check list

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

Cleaning Procedure — Interior. To clean the RTX100B 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 RTX100B 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 RTX100B.

Removal and Installation Procedures

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

Preparation

***WARNING**. Before performing this or any other procedure in this manual, read the* Safety Summary *found at the beginning of this manual. Also, to prevent possible damage to components of the RTX100B, read* Preventing ESD *in this section.*

This subsection contains the following items:

- Preparatory information that you need to properly perform the procedures that follow.
- List of tools required to remove and disassemble all modules.
- Three module locator diagrams for finding the External modules (see Figure 5-2 on page 5-11), Board modules (see Figure 5-3 on page 5-12), and Internal modules (see Figure 5-4 on page 5-13).
- Procedures for removal and reinstallation of the electrical and mechanical modules.
- A disassembly procedure for removal of all the major modules from the RTX100B at one time and for reassembly of those modules into the RTX100B. Such a complete disassembly is normally only done when completely cleaning the RTX100B. (Instructions for doing the actual cleaning are found under *Inspection and Cleaning* at the beginning of this section.)

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

General Instructions

Read these general instructions before removing a module.

First read over the *Summary of Procedures* that follows to understand how the procedures are grouped. Then read *Equipment Required* for a list of the tools needed to remove and install modules in the RTX100B.

If you are removing a module for service, begin by performing the procedure *Access Procedure* (page 5-14). By following the instructions in that procedure, you remove the module to be serviced while removing the minimum number of additional modules.

Summary of Procedures

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

- The *Access Procedure* on page 5-14 first directs you to the procedure(s) (if any) that are required to access the module to be serviced, then it directs you to the procedure to remove that module.

Table 5-3: Summary of procedures

Procedure	Module		Page
Procedures for External Modules	■ Cabinet ■ Right-side cover ■ Left-side cover	■ Front-panel unit ■ Front-panel assembly	5-15
Procedures for Board Modules	■ A150 ISDB-T RF output board ■ A12 Main board ■ CPU board	■ A20 PCI Backplane board ■ Printer connector	5-21
Procedures for Internal Module	■ Hard disk drive ■ Internal and external fans ■ 12 V main power supply	■ A40 AC Distributor board ■ RFI filter	5-26

Required Equipment. Most modules in this RTX100B can be removed with a screwdriver handle mounted with a size T-10 Torx screwdriver tip. *Use this tool whenever a procedure step instructs you to remove or install a screw unless a different size screwdriver is specified in that step.* All equipment required to remove and reinstall each module is listed in the first step of its procedure.

Table 5-4: Tools required for module removal

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

RTX100B Orientation

In this manual, procedures refer to “front,” “rear,” and “top” of the RTX100B. Figure 5-1 shows how the sides are referenced. Figures 5-2 through 5-4 show the modules that make up the RTX100B.

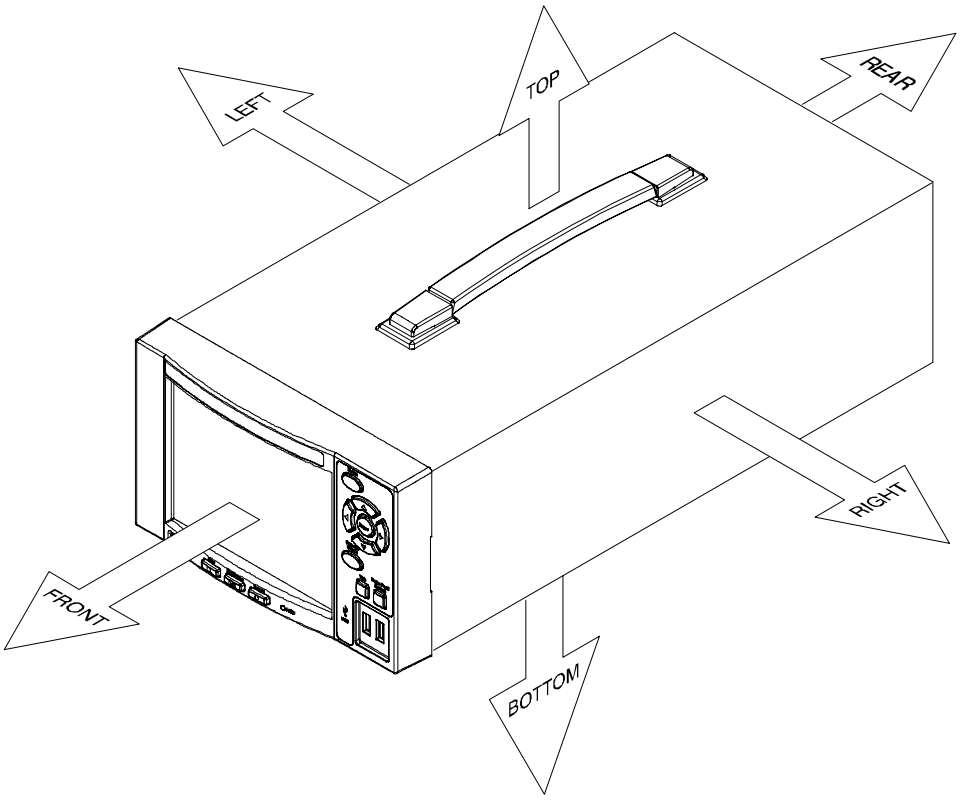


Figure 5-1: RTX100B orientation

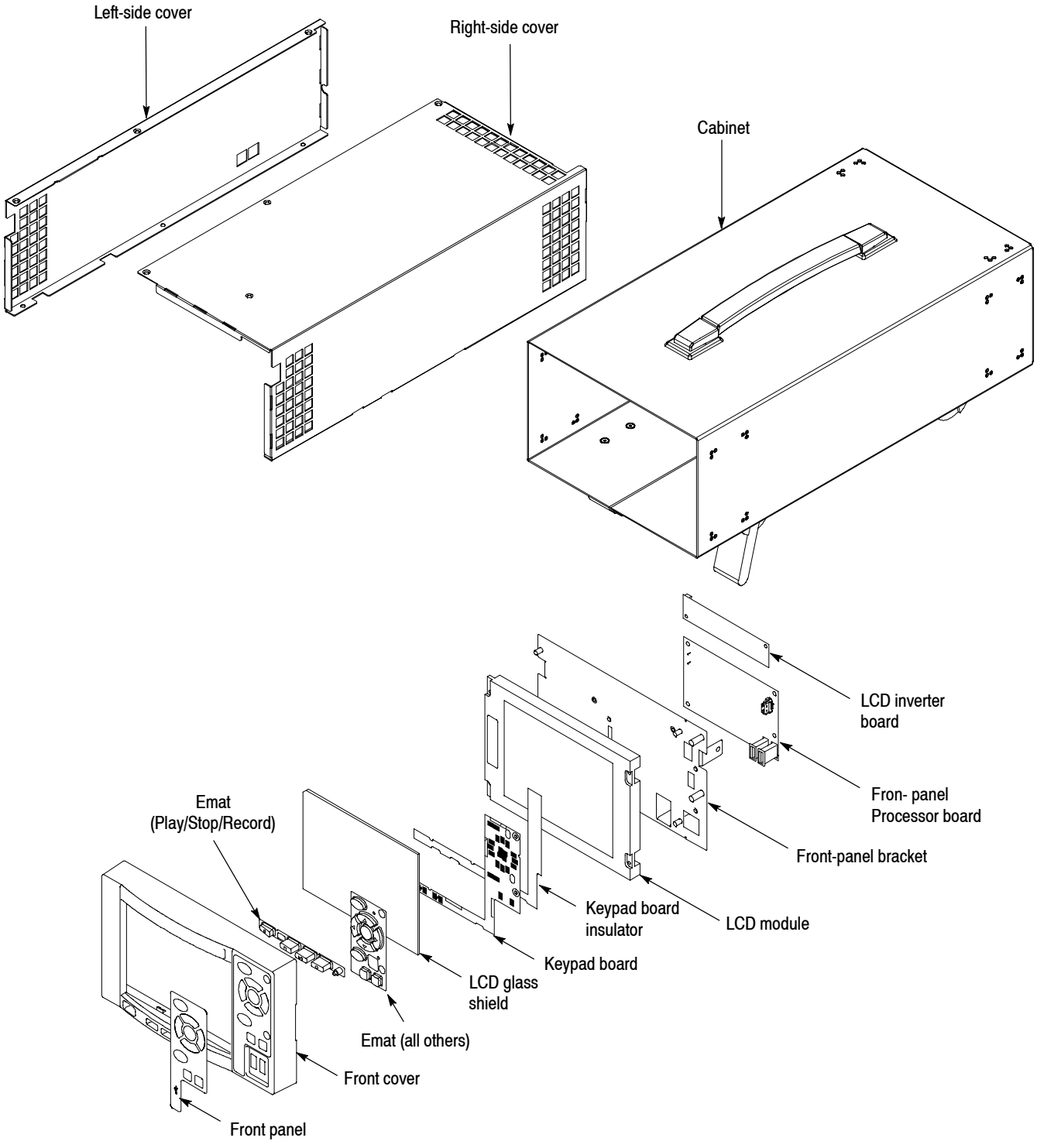


Figure 5-2: External modules

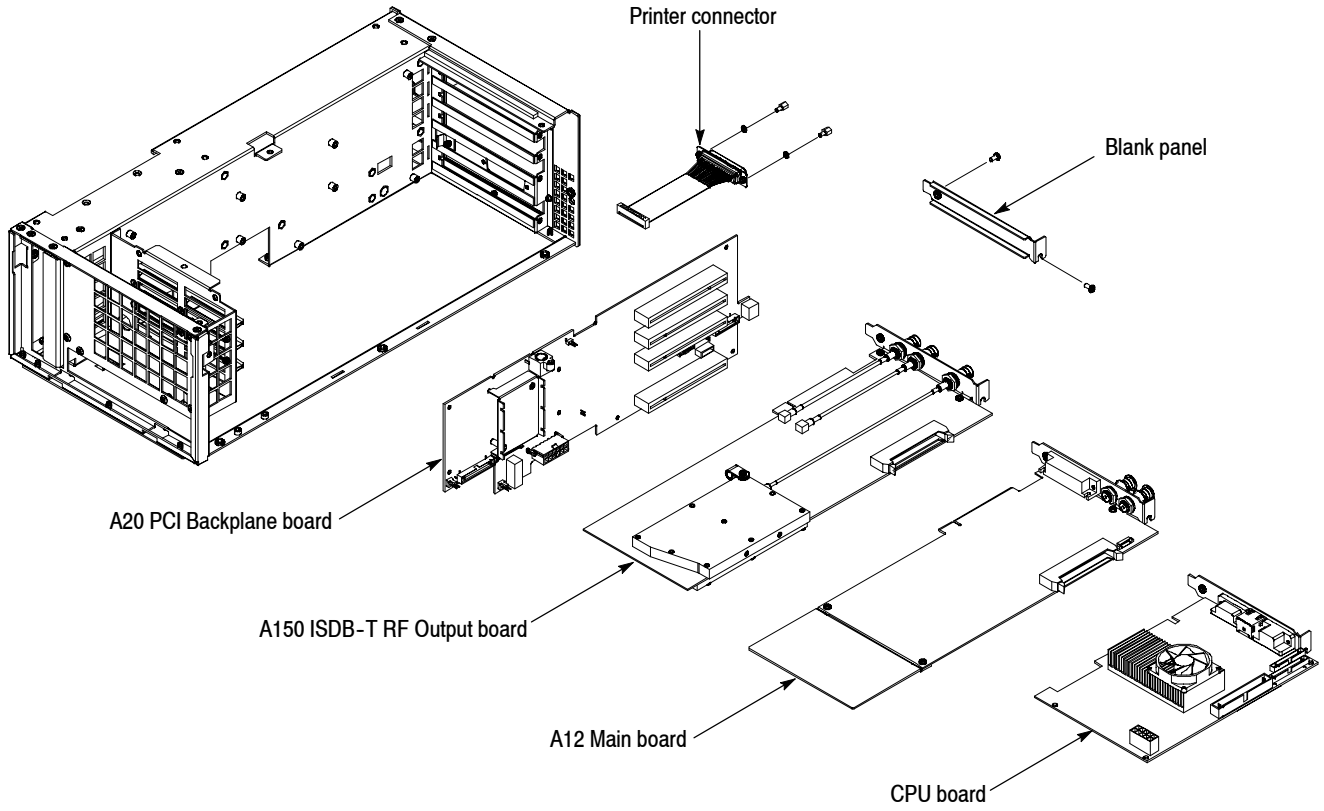


Figure 5-3: Board modules

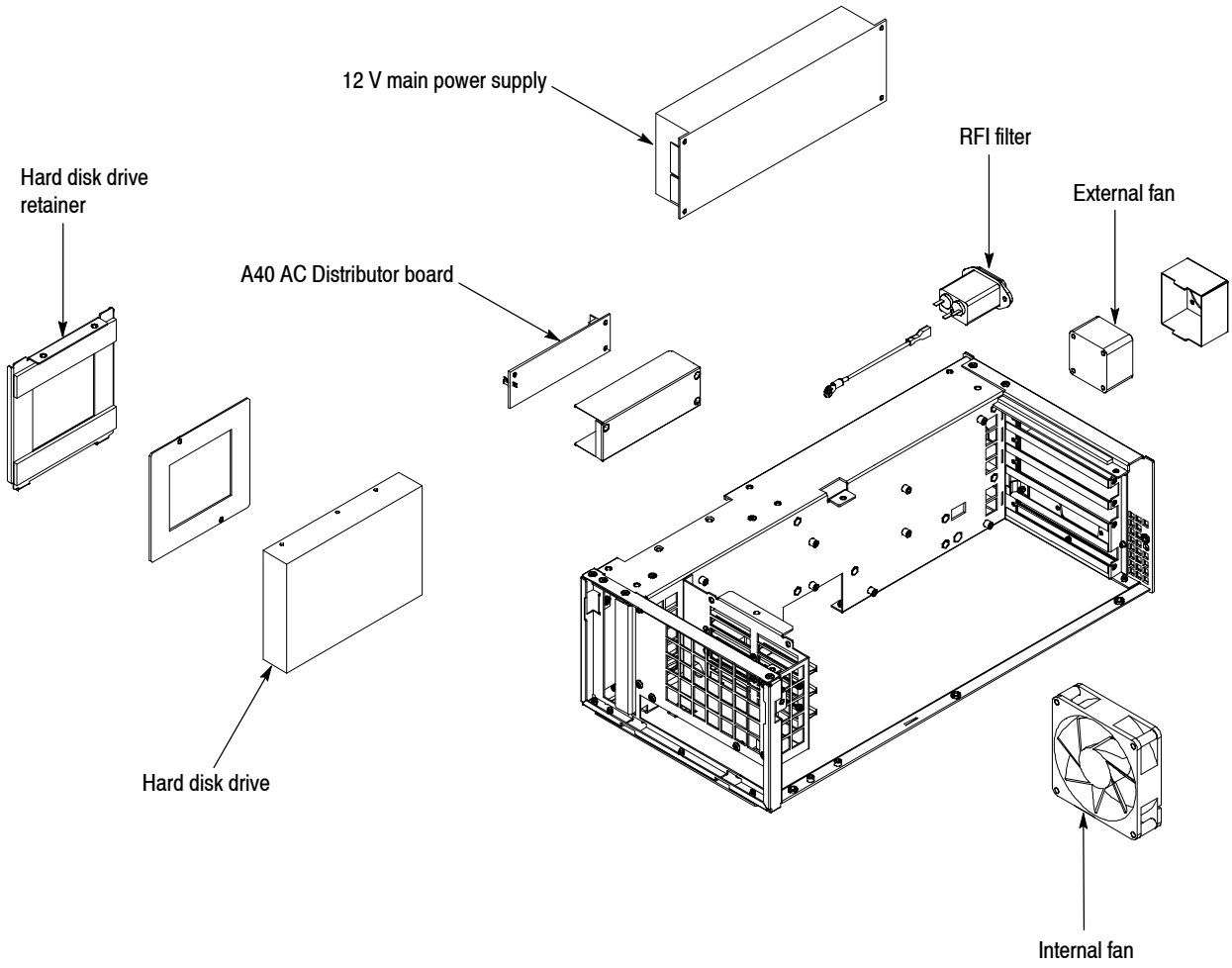


Figure 5-4: Internal modules

Access Procedure

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

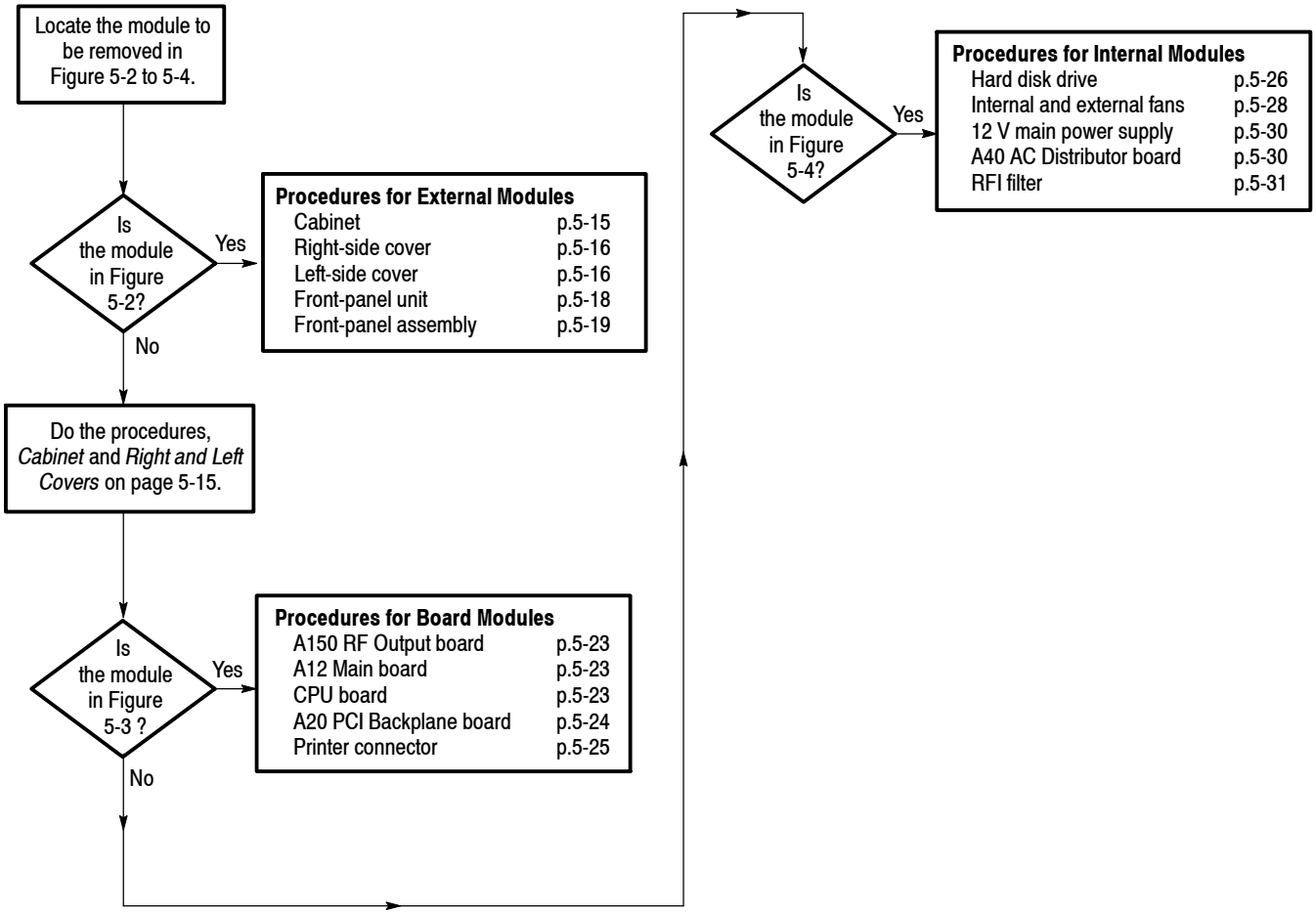


Figure 5-5: Guide to removal procedures

Procedures for External Modules

Perform the *Access Procedure* (page 5-14) before performing any procedure in this group. This group contains the following procedures:

- *Cabinet*
- *Right-side cover*
- *Left-side cover*
- *Front-panel unit*
- *Front-panel assembly*

Cabinet

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-15 Torx tip.
   b. Locate the cabinet in the locator diagram *External modules*, Figure 5-2, page 5-11.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its rear is facing you.
3. Use a screwdriver with a T-15 Torx tip to remove the two screws securing the cabinet to the RTX100B. See Figure 5-6 on page 5-16.
4. Grasp the right and left edges of the cabinet toward the back. Push the chassis rear panel toward the front of the RTX100B to separate it from the cabinet.
5. Slide the cabinet off the RTX100B.
6. *Reinstallation:* Perform steps 3 through 5 in reverse order to reinstall the cabinet.

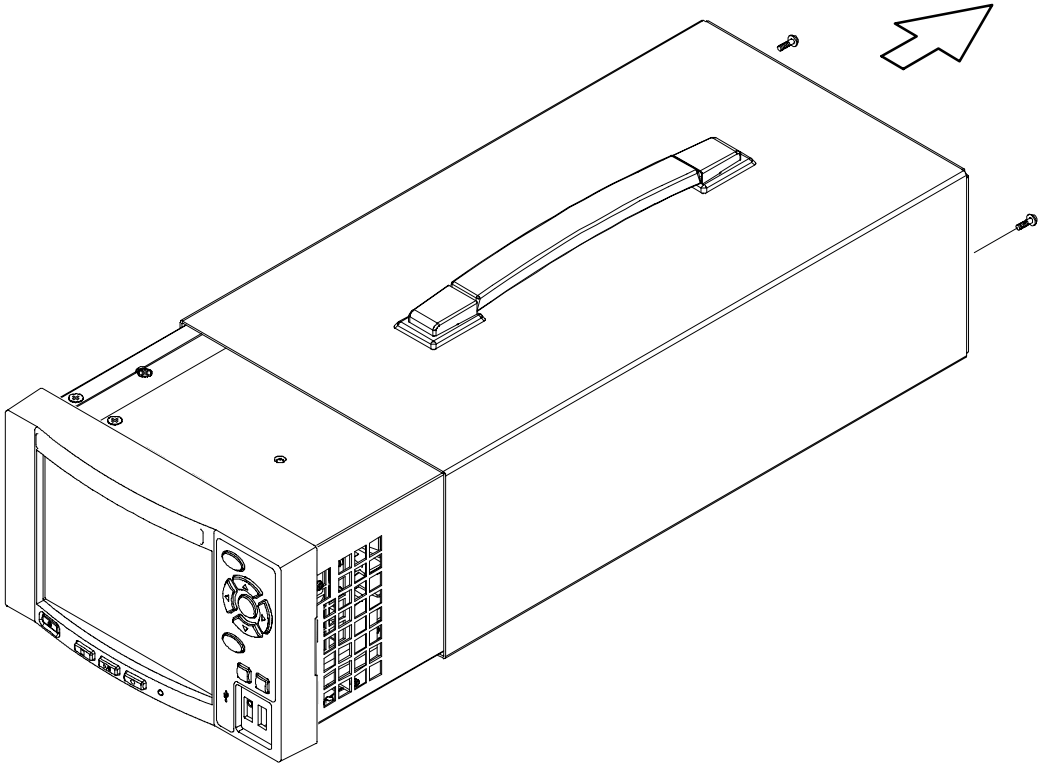


Figure 5-6: Cabinet removal

Right-Side Cover

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the right-side cover in the locator diagram *External modules*, Figure 5-2, page 5-11.
2. *Orient the instrument:* Set the RTX100B so its left side is down on the work surface and its front is facing you.
3. Use a screwdriver with a T-10 Torx tip to remove the seven screws securing the right-side cover to the top and bottom of the chassis. See Figure 5-7.
4. Remove the right-side cover from the chassis.
5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the right-side cover.

Left-Side Cover

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.

b. Locate the left-side cover in the locator diagram *External modules*, Figure 5-2, page 5-11.

2. *Orient the instrument:* Set the RTX100B so its right side is down on the work surface and its front is facing you.

3. Use a screwdriver with a T-10 Torx tip to remove the six screws securing the left-side cover to the top and bottom of the chassis. See Figure 5-7.

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

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

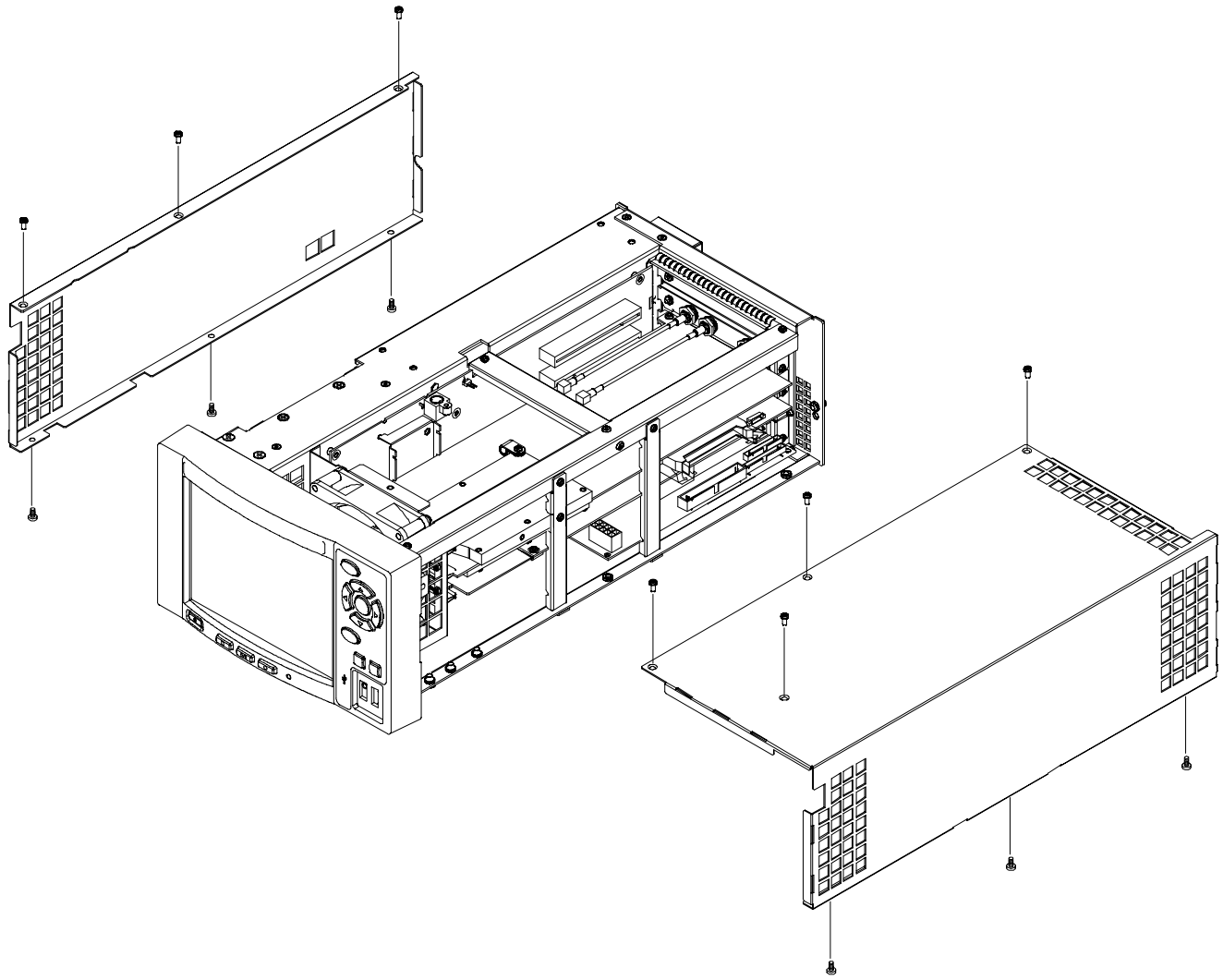


Figure 5-7: Right-side and left-side covers removal

Front-Panel Unit

1. *Assemble equipment and locate module to be removed:*
   - **a.** You need a screwdriver with a T-10 Torx tip.
   - **b.** Locate the front-panel unit in the locator diagram *External modules*, Figure 5-2, page 5-11.
2. *Orient instrument:* Set the RTX100B so its bottom is down on the work surface and its front is facing you.
3. *Remove front-panel unit:* See Figure 5-8.
   - **a.** Use a screwdriver with a T-10 Torx tip to remove the four screws securing the front-panel unit to the chassis.
   - **b.** Grasp the front-panel unit and pull it forward.
   - **c.** Disconnect the cable from J100 on the Front-Panel Processor board.
   - **d.** Disconnect the cable from J105 on the Front-Panel Processor board.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the front-panel unit.

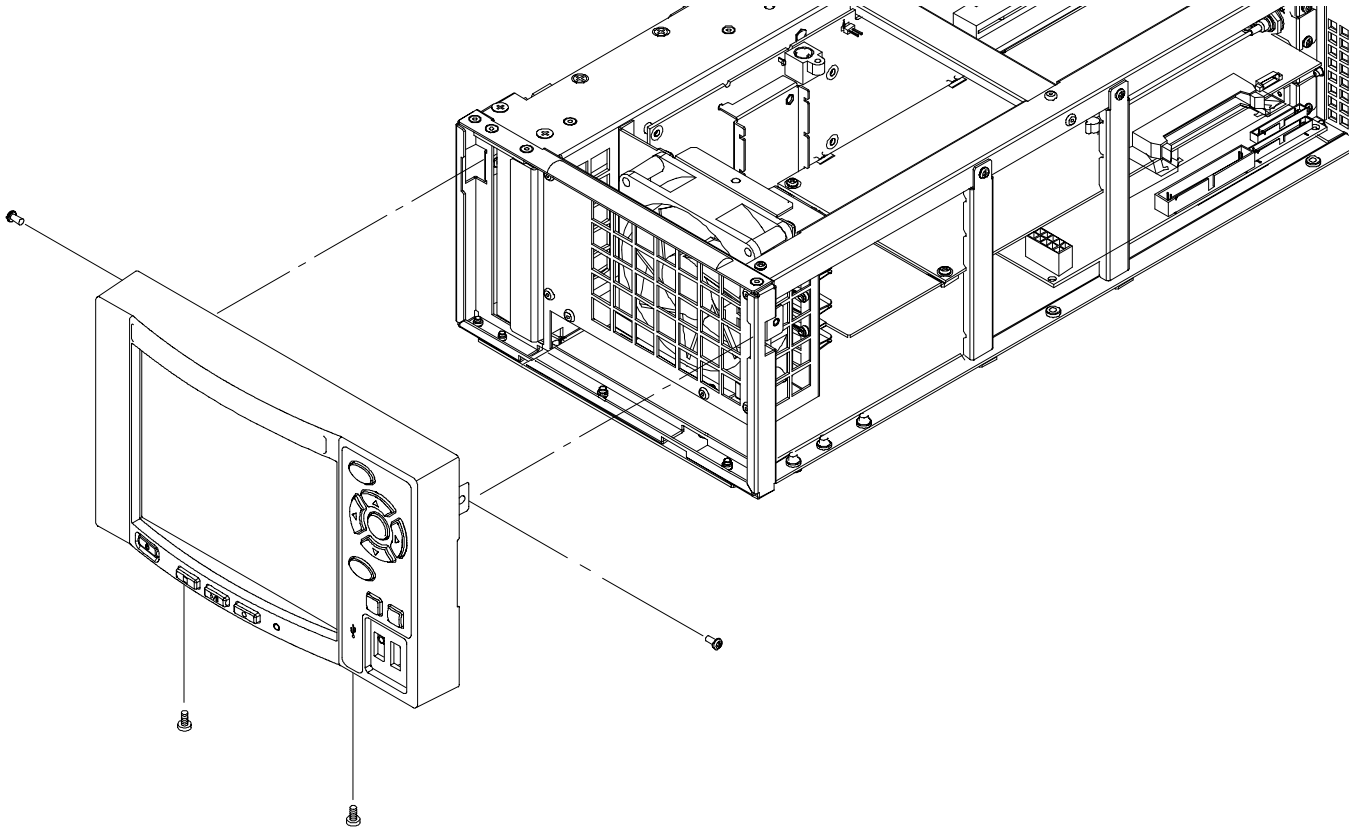


Figure 5-8: Front-panel unit removal

Front-Panel Assembly

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the front-panel assembly in the locator diagram *External modules*, Figure 5-2, page 5-11.
2. *Remove the front cover:* See Figure 5-9 on page 5-20.
   a. Press the two latches at the bottom of the front cover to release it from the front cover bracket.
   b. Pull the front cover forward, away from the front-panel bracket.
3. *Remove the Front-Panel Processor board:* See Figure 5-9 on page 5-20.
   a. Disconnect the cables from J11, J301, and J321 on the Front-Panel Processor board.
   b. Use a screwdriver with with a T-10 Torx tip to remove the four screws securing the Front-Panel Processor board to the front-panel bracket.
   c. Lift the board away.
4. *Remove the Keypad board:* See Figure 5-9 on page 5-20.
   a. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the Keypad board to the front-panel bracket.
   b. Lift the board away.
5. *Remove the LCD module:* See Figure 5-9 on page 5-20.
   a. Use a screwdriver with with a T-10 Torx tip to remove the four screws securing the LCD module to the front-panel bracket.
   b. Lift the LCD module away.
6. Now manually disassemble the front-panel assembly components using Figure 5-9 as a guide. Reverse the procedure to reassemble.
7. *Reinstallation:* Perform steps 2 through 6 in reverse order to reinstall the front-panel assembly.

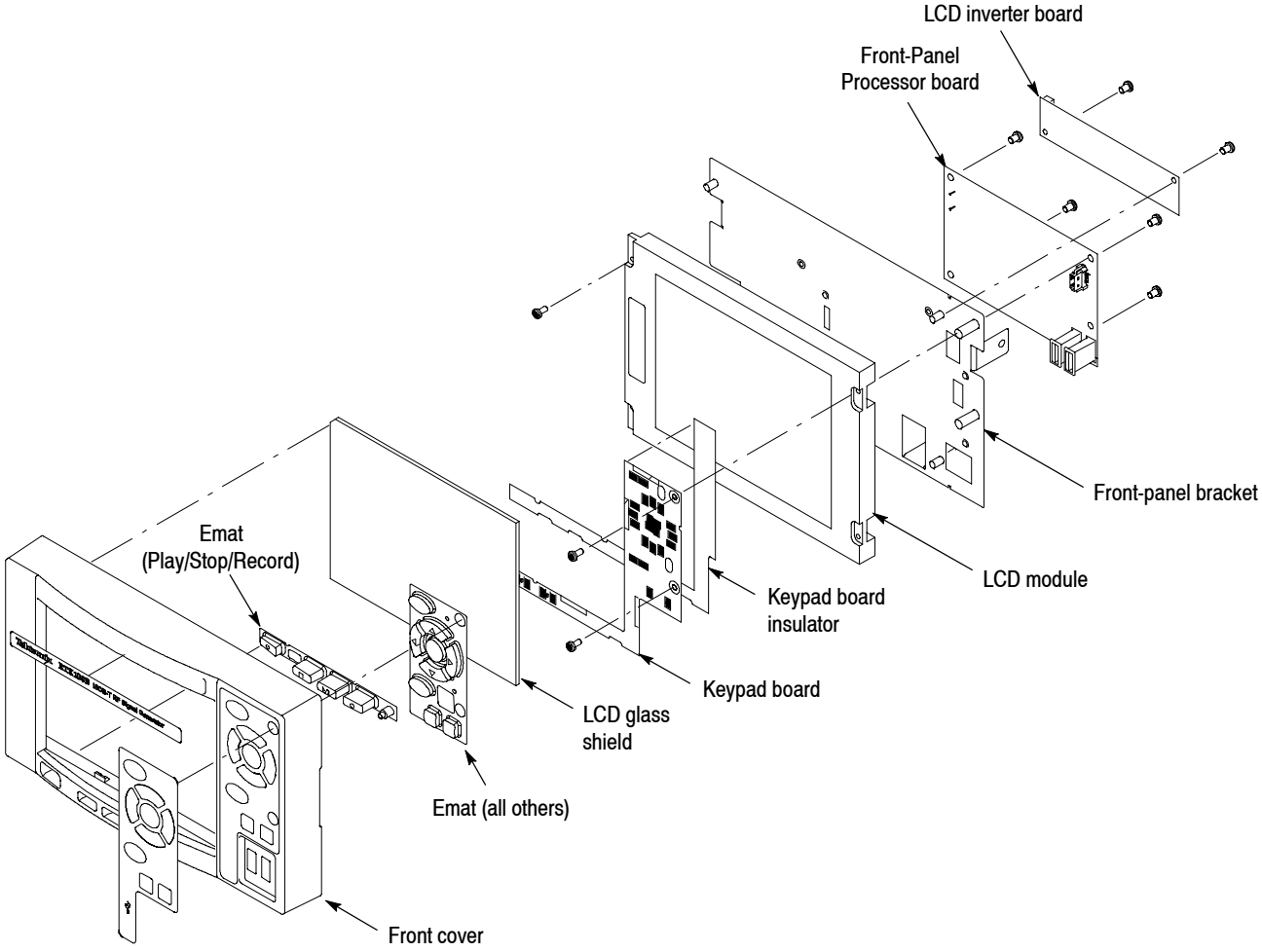


Figure 5-9: Disassembly of front-panel assembly

Procedure for Board Modules

Perform the *Access Procedure* (on page 5-14) before doing any procedure in this group. The procedures are:

- *Top frame and board retainers*
- *A150 ISDB-T RF Output board*
- *A12 Main board*
- *CPU board*
- *A20 PCI Backplane board*
- *Printer connector*

Top Frame and Board Retainers

1. *Assemble equipment and locate modules to be removed:*
   - You need a screwdriver with a T-10 Torx tip.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its right side is facing you.
3. *Remove the board retainers:* See Figure 5-10 on page 5-22.
   a. Use a screwdriver a T-10 Torx tip to remove the three screws securing the board retainers to the chassis.
   b. Lift the retainers away from the chassis.
4. *Remove the top frame:* See Figure 5-10 on page 5-22.
   a. Use a screwdriver with a T-10 Torx tip to remove the three screws securing the top frame to the chassis.
   b. Lift the top frame away from the chassis.

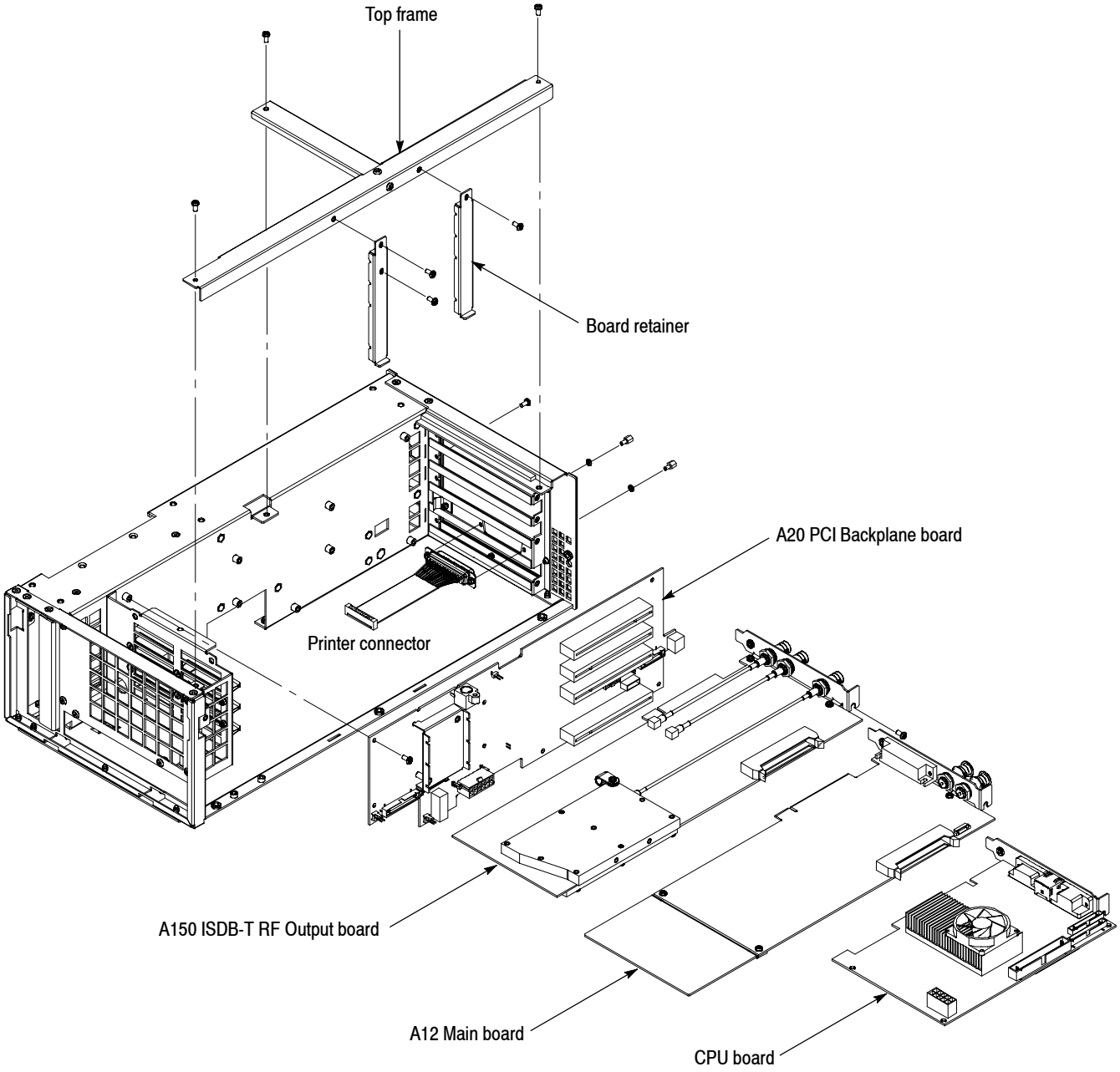


Figure 5-10: A150 RF Output board, A12 Main board, CPU board, and A20 PCI Backplane board removal

A150 ISDB-T RF Output Board

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the A150 ISDB-T RF Output board in the locator diagram *Board modules*, Figure 5-3, page 5-12.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its right side is facing you.
3. *Remove the interface module:* See Figure 5-10 on page 5-22.
   a. Disconnect the cable from the A12 Main board.
   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the board bracket to the chassis. See Figure 5-10 on page 5-22.
   c. Grasp the board and slide it out.
4. *Reinstallation*: Perform step 3 in reverse order to reinstall the interface module.

A12 Main Board

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the A12 Main board in the locator diagram *Board modules*, Figure 5-3, page 5-12.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its right side is facing you.
3. *Remove the A12 Main board:* See Figure 5-10 on page 5-22.
   a. Disconnect the cable from the A150 ISDB-T RF Output board.
   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the board bracket to the chassis. See Figure 5-10 on page 5-22.
   c. Grasp the board and slide it out.
4. *Reinstallation*: Perform step 3 in reverse order to reinstall the A12 Main board.

CPU Board

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the CPU board in the locator diagram *Board modules*, Figure 5-3, page 5-12.

2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its right side is facing you.
3. *Remove the CPU board:* See Figure 5-10 on page 5-22.
   a. Disconnect these cables:
      - The cable from the hard disk drive at CN1.
      - The cable from the Printer connector at CN3.
      - The cable from the A20 PCI Backplane board at CN5, CN6, CN9, and CN14.
      - The cable from the Front-Panel Processor board at CN7.
   b. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the board bracket to the chassis. See Figure 5-10 on page 5-22.
   c. Grasp the board and slide it out.
4. *Reinstallation*: Perform step 3 in reverse order to reinstall the CPU board.

A20 PCI Backplane Board

1. *Assemble equipment and locate module to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the A20 PCI Backplane board in the locator diagram *Board modules*, Figure 5-3, page 5-12.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its right side is facing you.
3. *Remove the A20 PCI Backplane board:* See Figure 5-10 on page 5-22.
   a. Remove the A150 ISDB-T RF Output board as described on page 5-23.
   b. Remove the A12 Main board as described on page 5-23.
   c. Remove the CPU board as described on page 5-23.
   d. Disconnect these cables:
      - The cable from the A40 AC Distributor board at J220.
      - The cable from the 12 V main power supply at J160 and J170.
      - The cable from the external fan at J190.
      - The cable from the internal fan at J180.
      - The cables from the Front-Panel Processor board at J240.

- The cable from the hard disk drive.

e. Use a screwdriver with a T-10 Torx tip to remove the ten screws securing the A20 PCI Backplane board to the chassis.

f. Lift the board up and away from the chassis.

4. *Reinstallation*: Perform step 3 in reverse order to reinstall the A20 PCI Backplane board.

Printer Connector

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

a. You need a screwdriver with a $^1/_4$ inch nut driver.

b. Locate the connector in the locator diagram Board *modules,* Figure 5-3, page 5-12.

2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its rear is facing you.

3. *Remove the Printer connector:* See Figure 5-10 on page 5-22.

a. Remove the A150 ISDB-T RF Output board as described on page 5-23.

b. Remove the A12 Main board as described on page 5-23.

c. Disconnect the cable from CN3 on the CPU board.

d. Use a $^1/_4$ inch nut driver to unscrew the two hex-headed mounting posts securing the connector to the chassis.

e. Pull the connector away from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the Printer connector.

Procedure for Internal Modules

Perform the *Access Procedure* (on page 5-14) before doing any procedure in this group. The procedures are:

- *Hard disk drive*
- *Internal and external fans*
- *12 V main power supply*
- *A40 AC Distributor board*
- *RFI filter*

Hard Disk Drive

1. *Assemble equipment and locate module to be removed:*
   - **a.** You need a screwdriver with a T-10 Torx tip.
   - **b.** Locate the hard disk drive in the locator diagram *Internal modules,* Figure 5-4, page 5-13.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its left side is facing you.
3. *Remove the hard disk drive:* See Figure 5-11 on page 5-27.
   - **a.** Disconnect two cables from the hard disk drive.
   - **b.** Use a screwdriver with a T-10 Torx tip to remove the two screws securing the hard disk drive retainer to the chassis.
   - **c.** Remove the two screws securing the plate to the hard disk drive.
   - **d.** Grasp the hard disk drive and pull it gently away from the chassis.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the hard disk drive.

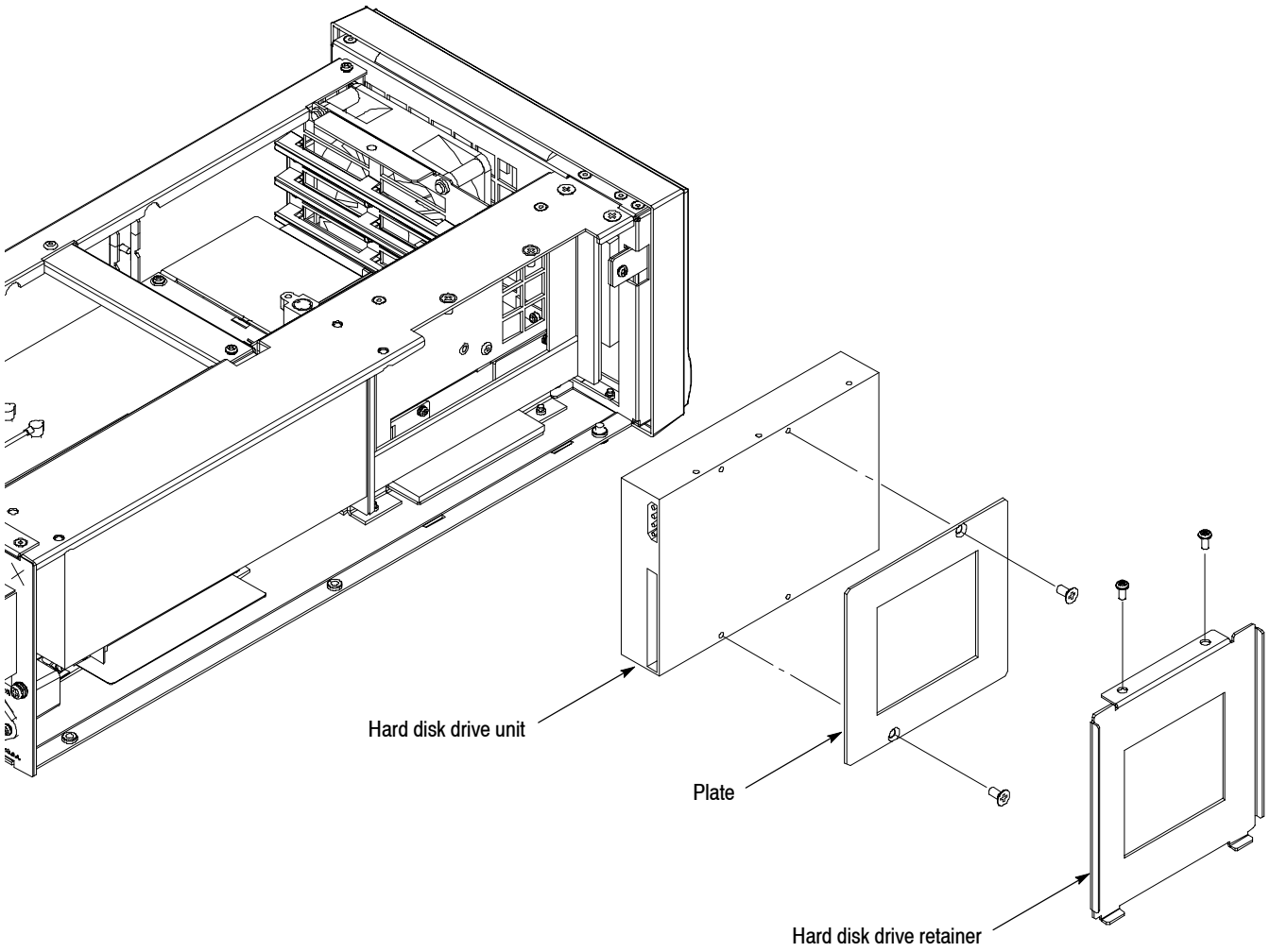


Figure 5-11: Hard disk drive removal

Doing the Performance Verification and Running Sysprep. If you replace the hard disk drive, you must perform the following steps:

1. Perform the performance verification procedures (refer to *Performance Verification* on page 3-1).
2. Run the sysprep batch file:
   a. Select **File > Exit** to exit the RTX100B application. The Windows XP desktop appears.
   b. Select **Start > Run** to open the Run dialog box.
   c. Click the **Browse** button.
   d. Select **C:\Sysprep\sysprep.bat**.
   e. Click the **OK** button.

Internal and External Fans

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the fans in the locator diagram *Internal modules,* Figure 5-4, page 5-13.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its front is facing you.
3. *Remove the internal fan:* See Figure 5-12 on page 5-29.
   a. Disconnect the cable from J180 on the A20 PCI Backplane board.
   b. Remove the two rivets securing the fan to the chassis.
   c. Lift the fan up out of the chassis.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the internal fan.
5. *Remove the external fan:* See Figure 5-12 on page 5-29.
   a. Set the RTX100B so its bottom is down on the work surface and its rear is facing you.
   b. Disconnect the cable from J190 on the A20 PCI Backplane board.
   c. Use a screwdriver with a T-10 Torx tip to remove the four screws securing the fan and fan cover to the chassis.
6. *Reinstallation:* Perform step 5 in reverse order to reinstall the external fan.

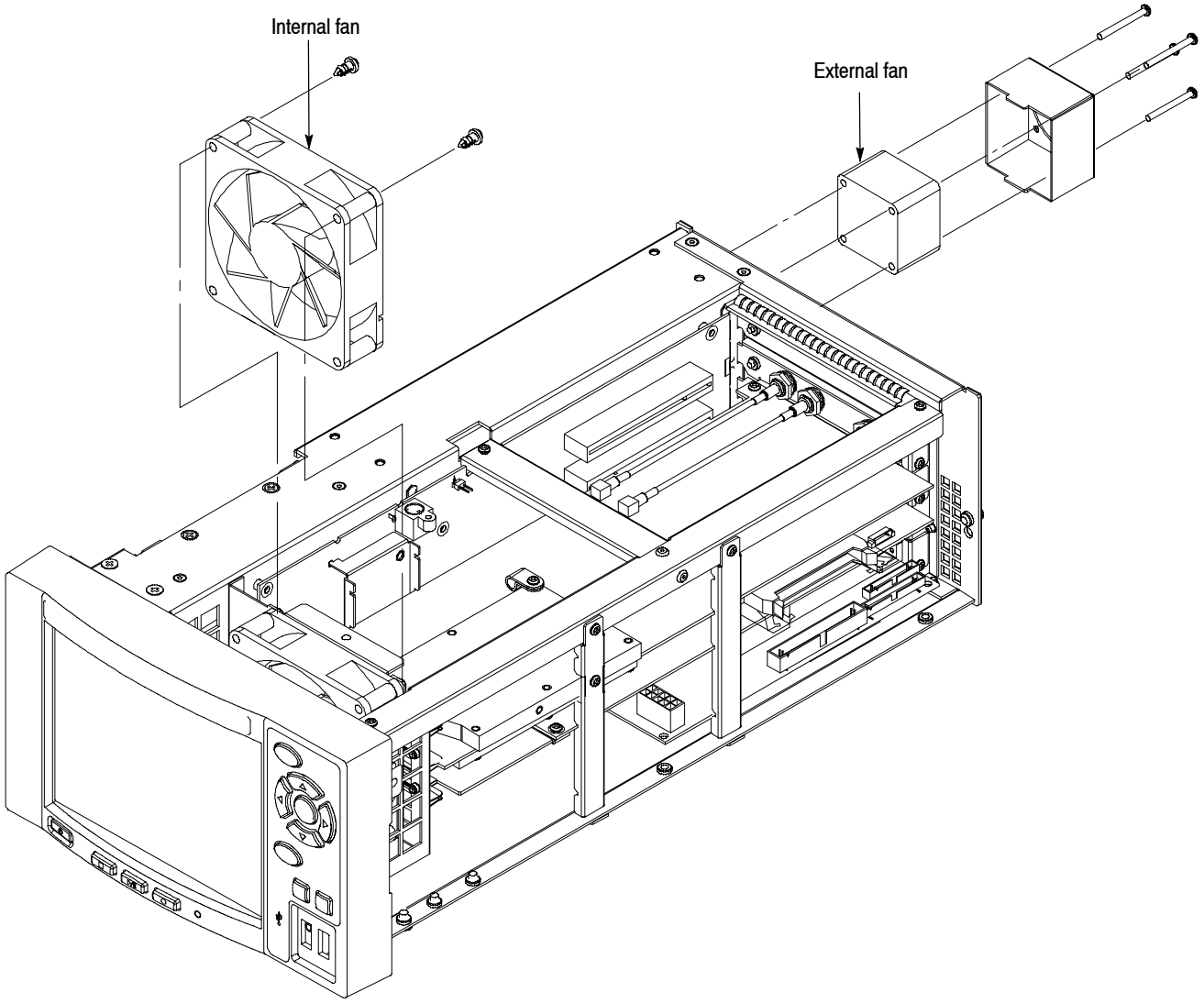


Figure 5-12: Internal and external fan removal

12 V Main Power Supply

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the 12 V main power supply in the locator diagram *Internal modules,* Figure 5-4, page 5-13.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its left side is facing you.
3. *Remove the 12 V main power supply:* See Figure 5-13 on page 5-31.
   a. Disconnect the cables from CN1, CN2, CN3, and CN4.
   b. Use a screwdriver with a T-10 Torx tip to remove the four screws securing the 12 V main power supply to the chassis.
   c. Lift the power supply away from the chassis.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the 12 V main power supply.

A40 AC Distributor Board

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a T-10 Torx tip.
   b. Locate the A40 AC Distributor board in the locator diagram *Internal modules,* Figure 5-4, page 5-13.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its left side is facing you.
3. *Remove the A40 AC Distributor board:* See Figure 5-13 on page 5-31.
   a. Disconnect the cables from J100, J110, and J120.
   b. Use a screwdriver with a T-10 Torx tip to remove the three screws securing the A40 AC Distributor board to the chassis.
   c. Lift the board away from the chassis.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the A40 AC Distributor board.

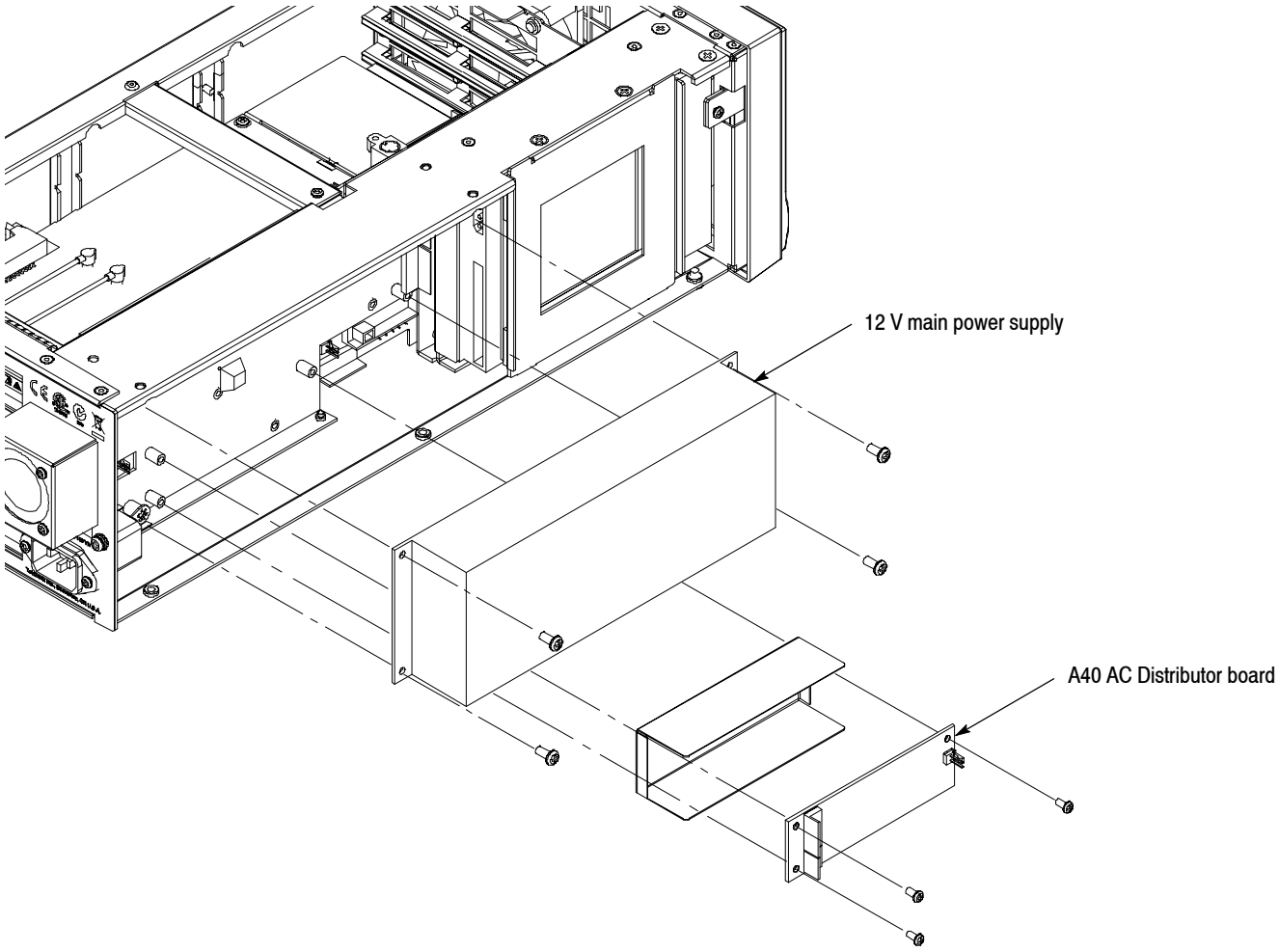


Figure 5-13: 12 V main power supply and A40 AC Distributor board removal

RFI filter

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver handle, a T-10 Torx tip, and a T-15 Torx tip.
   b. Locate the RFI filter in the locator diagram *Internal modules,* Figure 5-4, page 5-13.
2. *Orient the instrument:* Set the RTX100B so its bottom is down on the work surface and its rear is facing you.
3. *Remove the RFI filter:* See Figure 5-14.
   a. Disconnect the two cables from the RFI filter.
   b. Use a screwdriver with a T-15 Torx tip to remove the screw securing the ground lead to the chassis.

c. Use a screwdriver with a T-10 Torx tip to remove the two screws securing the RFI filter to the chassis.

d. Pull the RFI filter away from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the RFI filter.

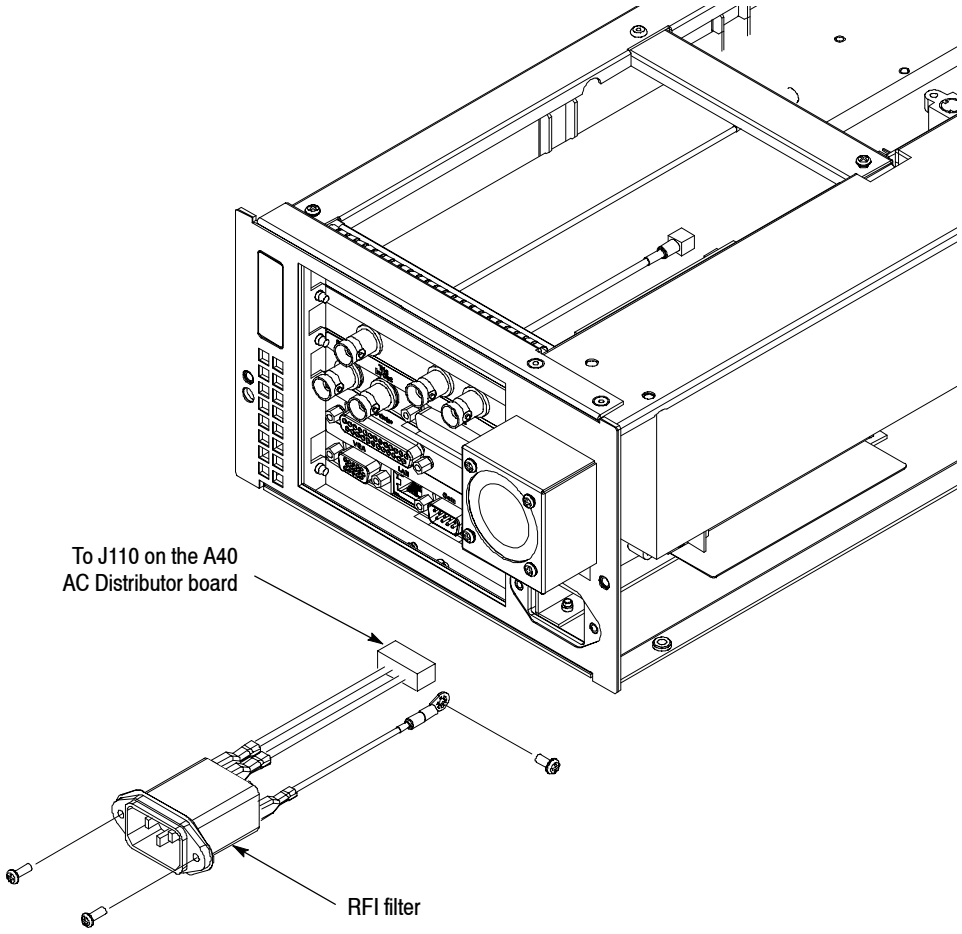


Figure 5-14: RFI filter removal

Verifying the BIOS Configuration

This section provides information needed to verify or set the BIOS configuration.

Procedure

***CAUTION**. It is very important to follow this procedure exactly or the instrument will not operate correctly.*

Perform the following procedure to set the BIOS configuration:

1. Connect the USB keyboard to the USB connector on the front panel.
2. Power on the instrument, and then press the **Del** key immediately.
   The **AwardBIOS CMOS Setup Utility screen** appears.
3. Set the BIOS configuration as follows. Use the arrow keys to highlight each item, and then press the **Enter** key to select it.

   Under Standard CMOS Features

Drive A	: **None**

   Advanced Bios Features

First Boot Device	: **HDD-0**
Second Boot Device	: **USB-CDROM**
Third Boot Device	: **USB-HDD**

   Advanced Chipset Features

Boot Display	: **CRT+LFP**
Panel Number	: **1024X768**

   Integrated Peripherals

Super IO Device	: Onboard FDC Controller : **Disabled**
Onboard Serial Port 2	: **Disabled**
Onboard Serial Port 4	: **Disabled**

   PC Health Status

CPU Warning Temperature	: **Disabled**
Shutdown Temperature	: **Disabled**

4. Use the arrow keys to select **Save & Exit Setup**, and then press the **Enter** key. The Save to CMOS and Exit (Y/N)? message appears.
5. Enter **Y**, and press the **Enter** key.

Troubleshooting

This subsection contains troubleshooting trees designed to isolate faulty modules in the RTX100B.

Troubleshooting Trees

Figures 5-15 through 5-24 show the troubleshooting procedure for the RTX100B.

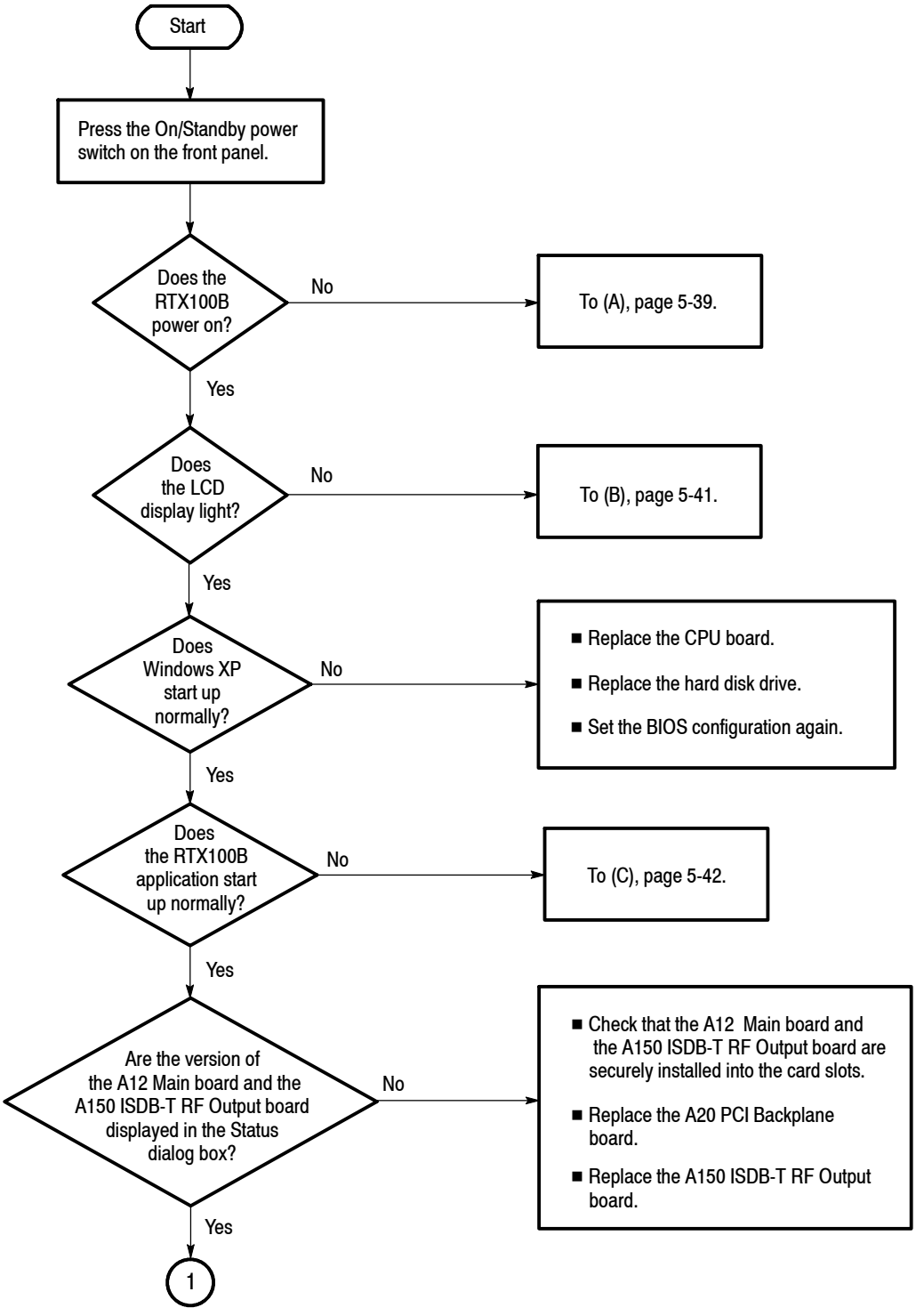


Figure 5-15: Troubleshooting procedure (1)

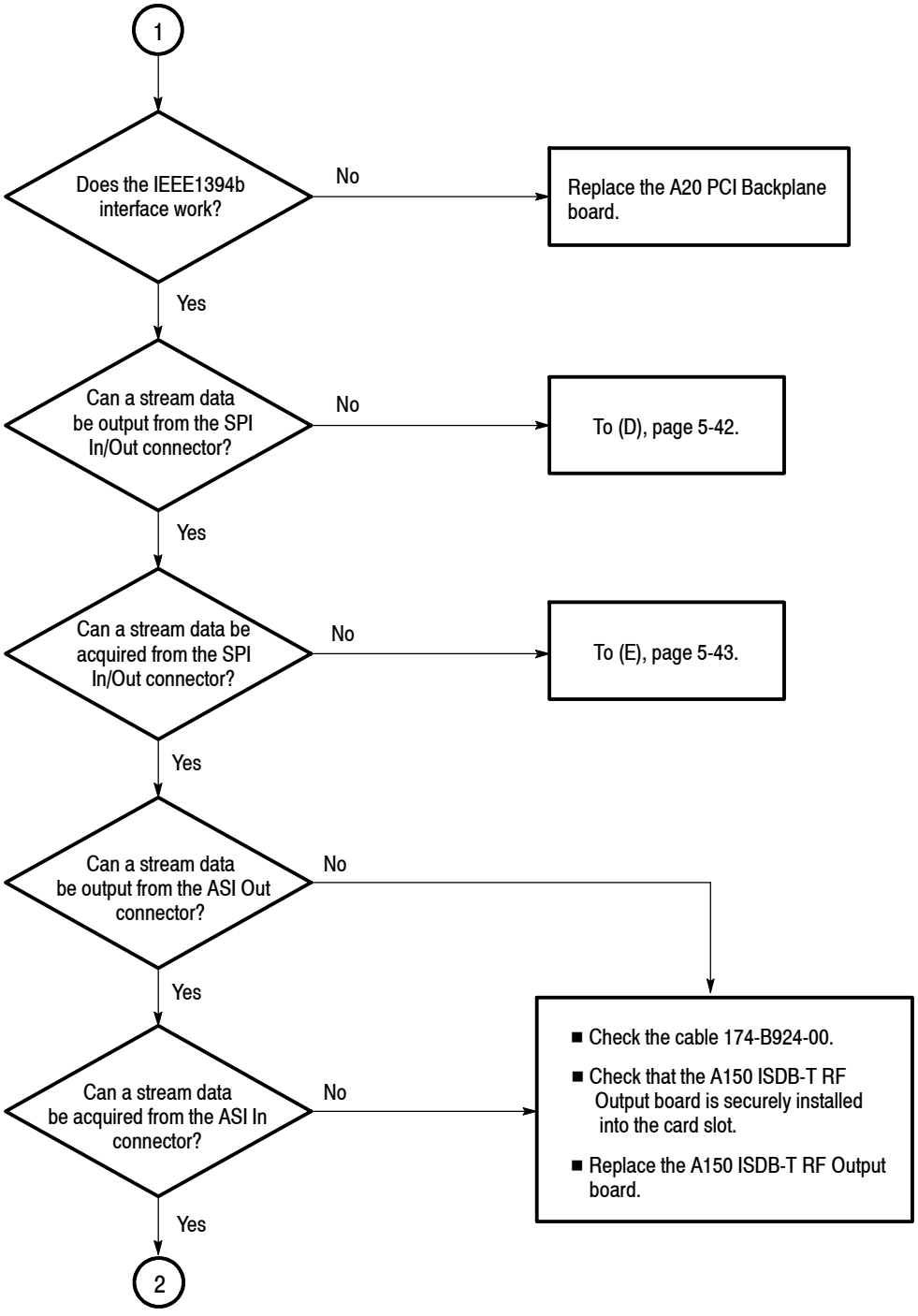


Figure 5-16: Troubleshooting procedure (2)

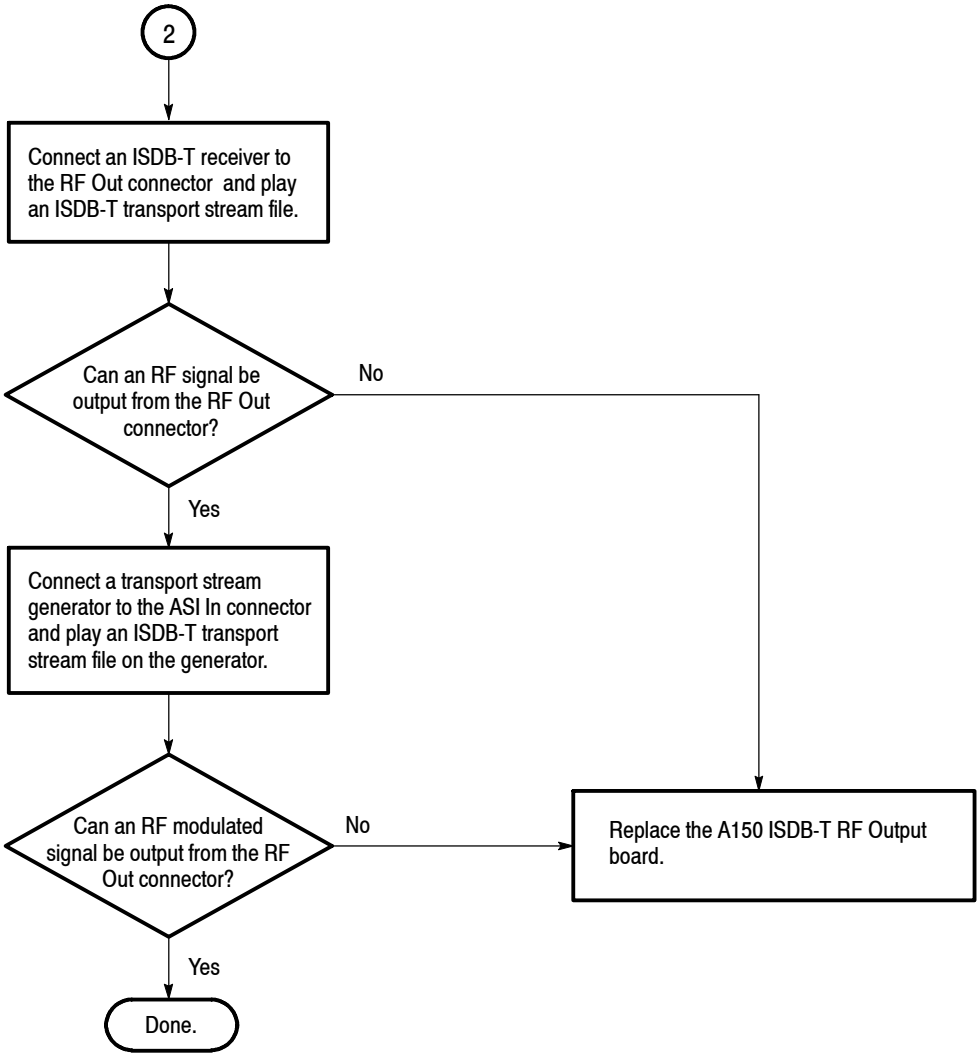


Figure 5-17: Troubleshooting procedure (3)

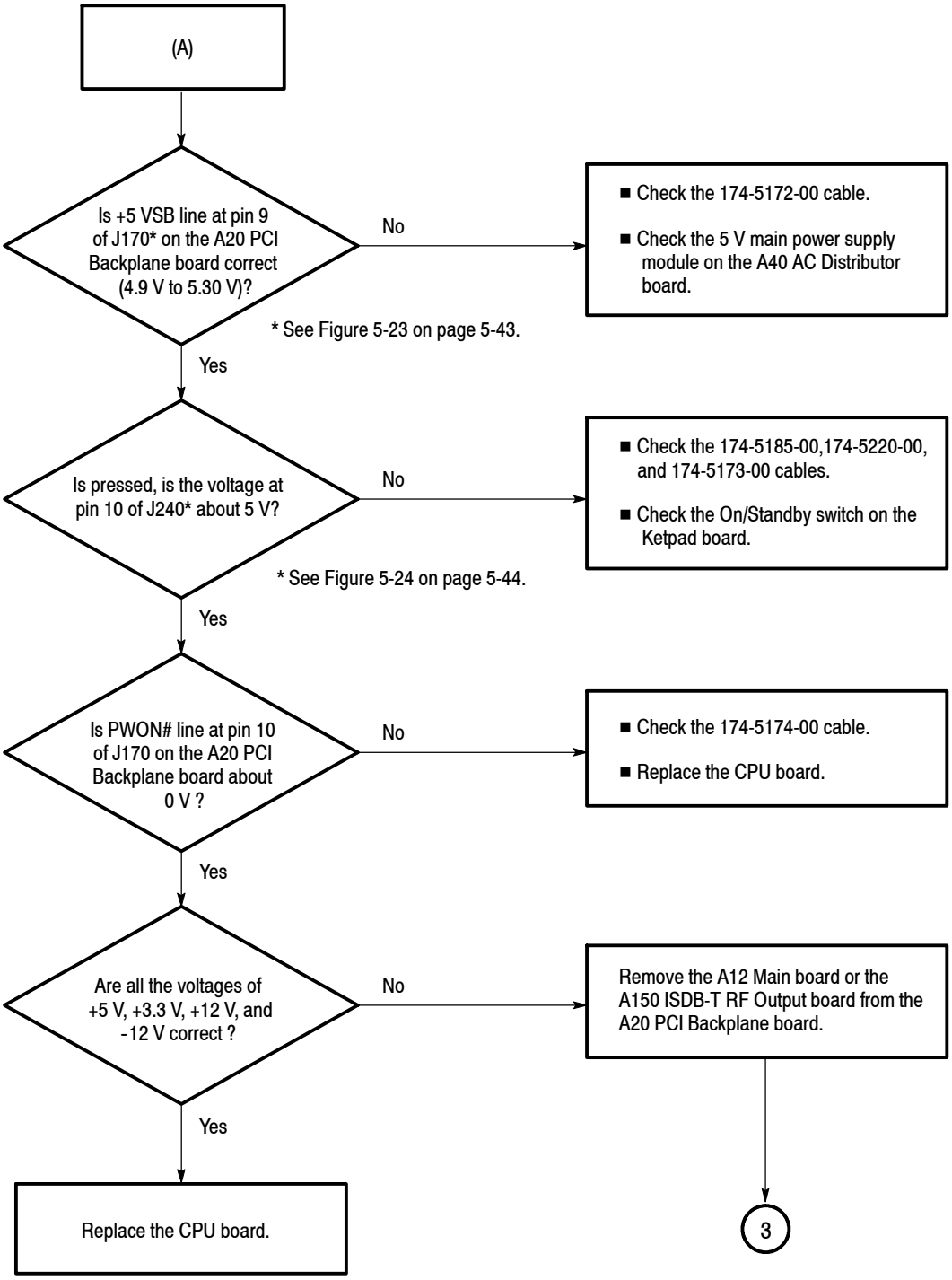


Figure 5-18: Troubleshooting procedure (4)

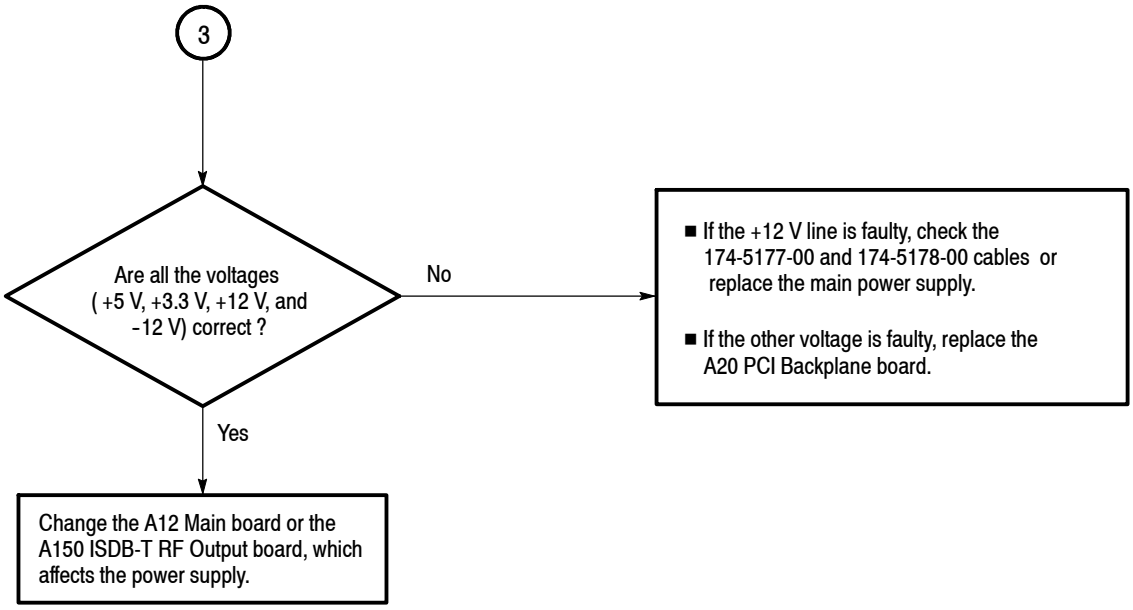


Figure 5-19: Troubleshooting procedure (5)

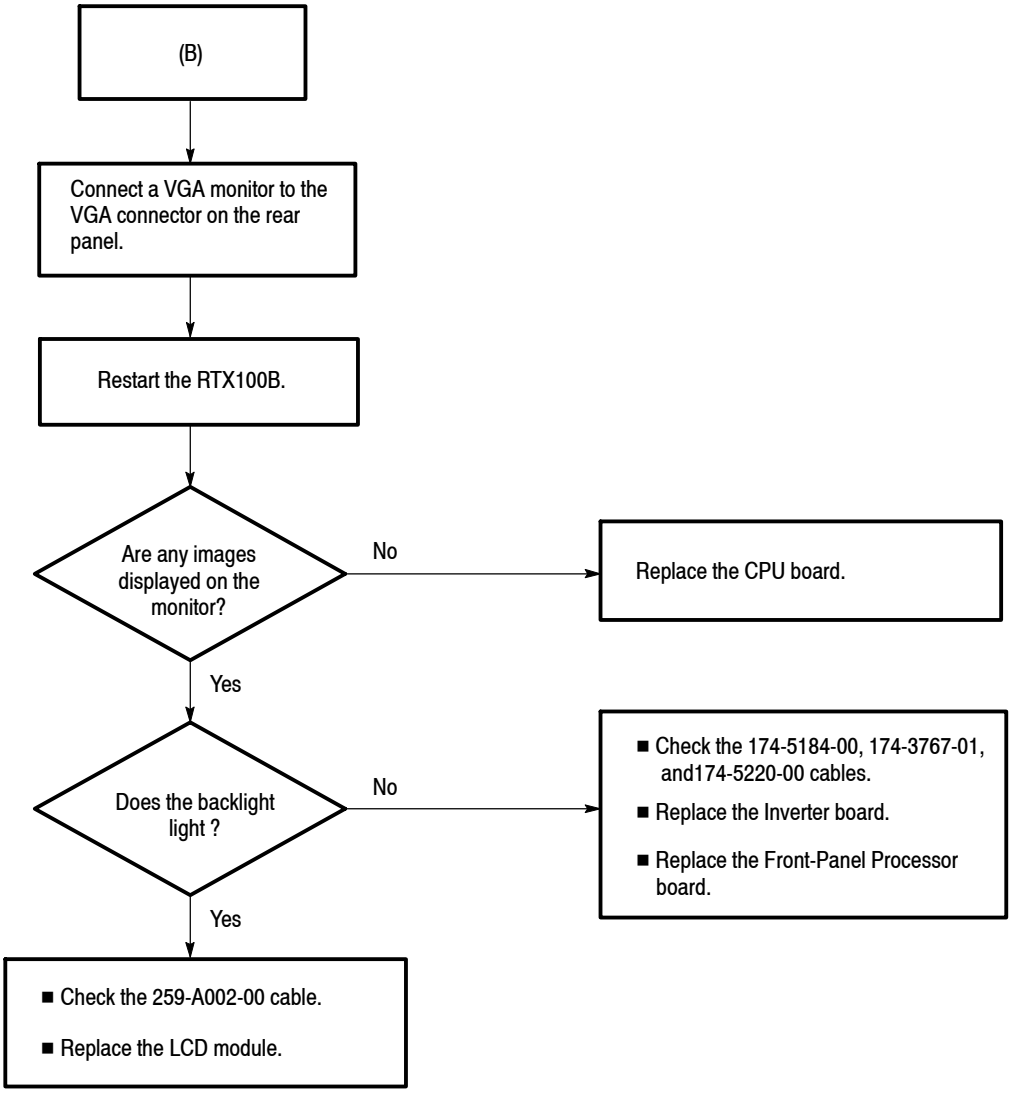


Figure 5-20: Troubleshooting procedure (6)

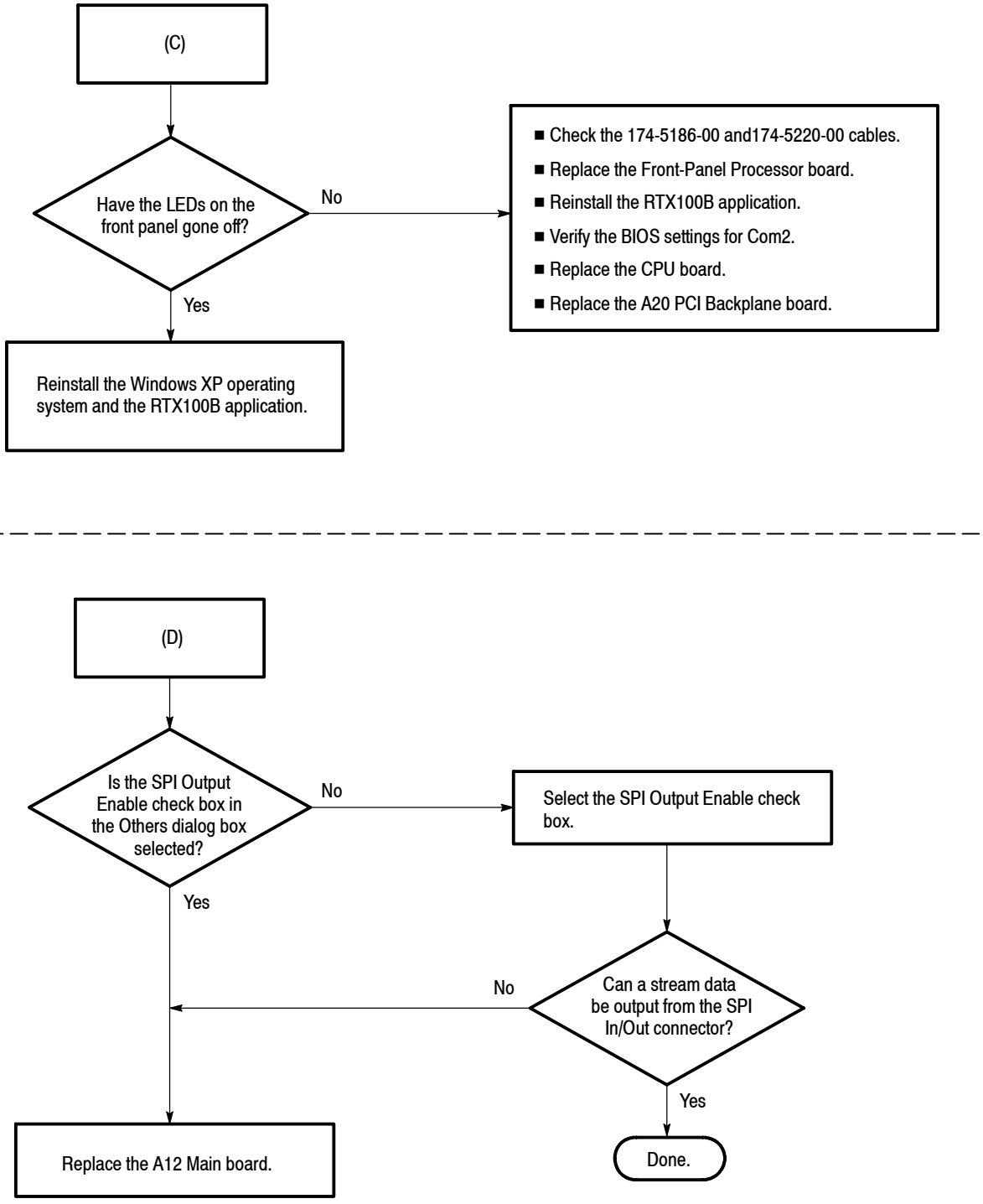


Figure 5-21: Troubleshooting procedure (7)

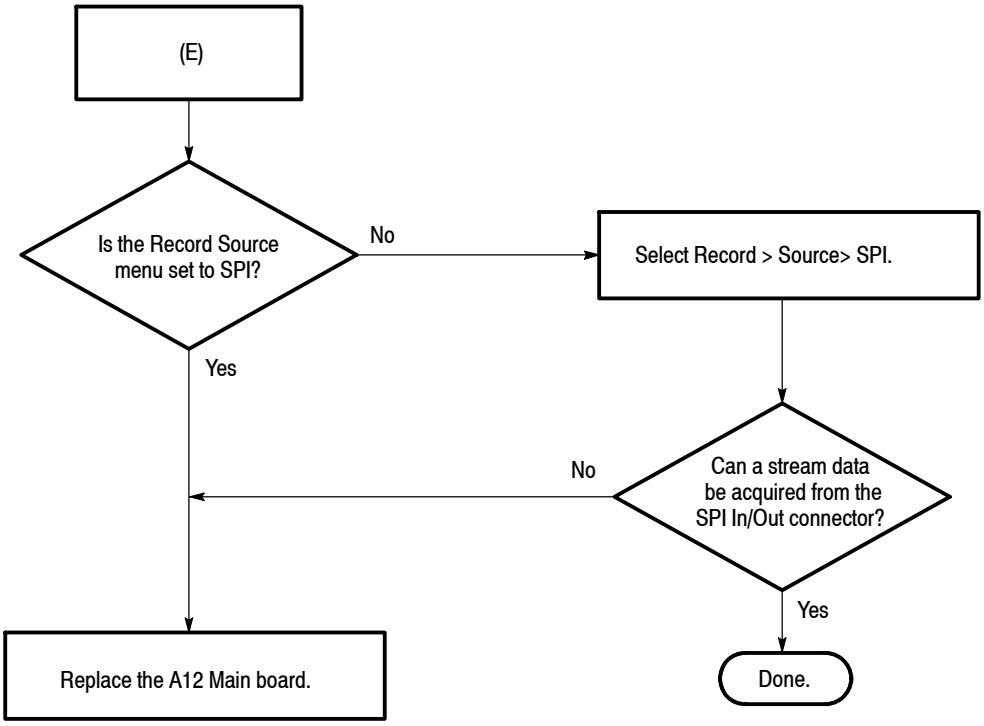


Figure 5-22: Troubleshooting procedure (8)

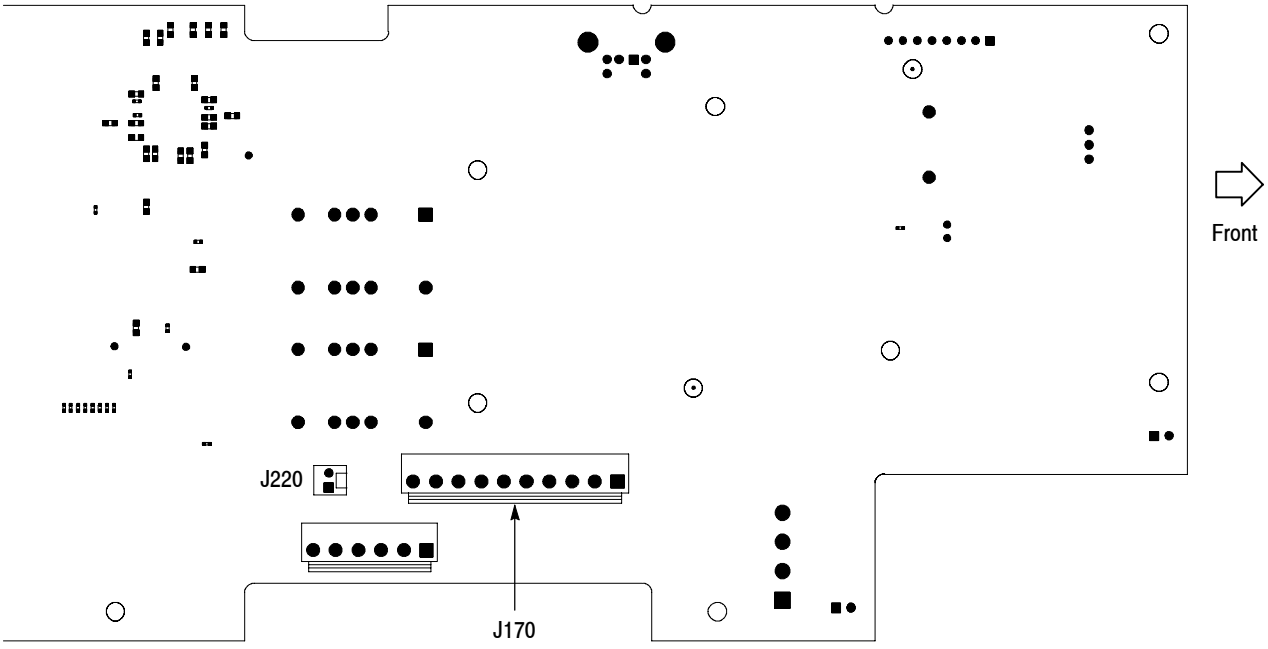


Figure 5-23: A20 PCI Backplane board view- back side

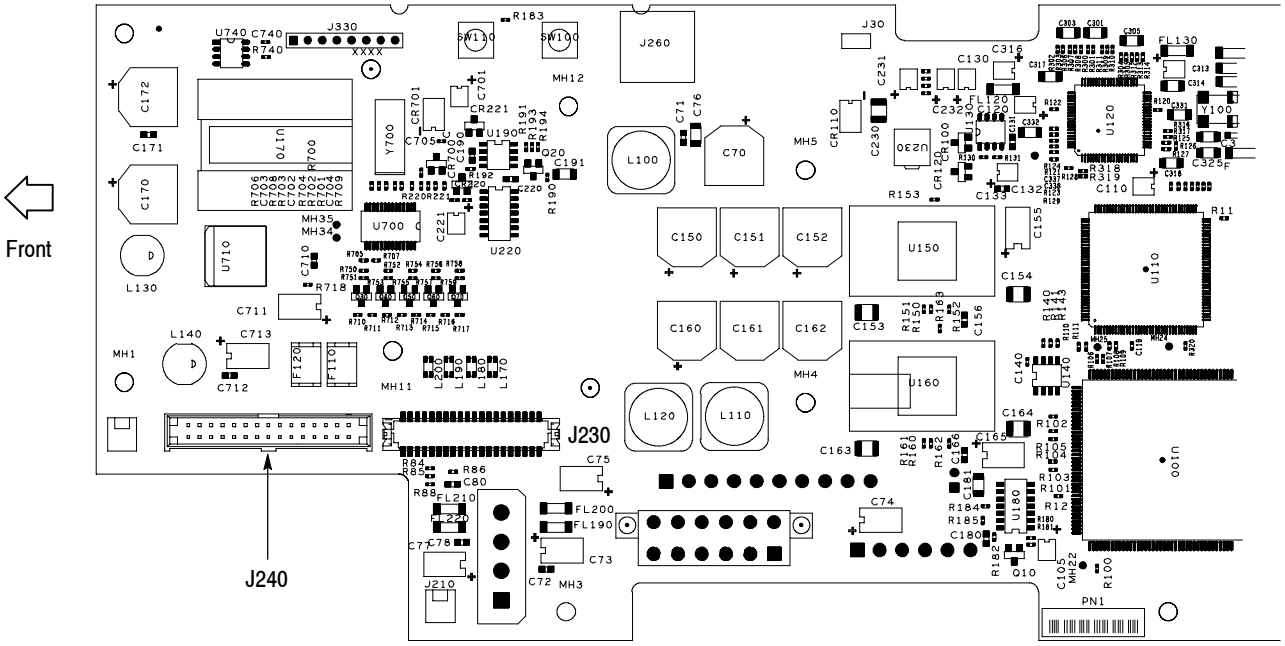


Figure 5-24: A20 PCI Backplane board view- right side

System Software Recovery

If the RTX100B does not boot up or is corrupted, you can recover the system software by using this recovery procedure.

***CAUTION**. Running the recovery procedure overwrites all the contents of the hard disk drive and resets the system to the factory defaults.*

The recovery can be performed in two ways:

- Recover Boot Partition: This permanently overwrites the contents of your boot partition. This mode of recovery is preferred if you want to keep your old data files on the D drive.
- Recover Entire Drive: This permanently overwrites the contents of your entire hard disk drive and resets the system to the factory defaults.

Recovery Procedure

Perform the following procedure to recover the Windows XP and RTX100B application software:

1. Restart your system and press the **F4** key as soon as the BIOS tests are complete. This opens the Phoenix Always screen with the following options:
   - Restore System
   - System Information
2. Click **Restore System > Phoenix Recover Pro 6**.
3. Click **Advanced > Factory Restore** to replace the Windows XP and RTX100B application software from the backup created when the system was manufactured. A confirmation dialog box is displayed.
4. Click **OK** to restart your system and display the Phoenix Recover Pro 6 screen. This screen allows you to perform one of the following operations:
   - Click **Recover Boot Partition** or **Recover Entire Drive** to overwrite the data according to your requirements. A confirmation dialog box is displayed. Click **Yes** to continue.

     A screen showing the progress of the recovery appears with the details of the time elapsed, time remaining, amount of data recovered, and total data to recover.

***CAUTION**. Do not Cancel the recovery process once initiated. Cancelling the process will leave your hard disk drive in a partially recovered, unstable state.*

Immediately after the data is recovered, the system restarts and the Windows XP setup wizard is displayed.

- Click **Cancel and Exit** to cancel the recovery process and exit from the Phoenix Recovery Pro 6 application.

5. Click the **Next** button of the wizard until Windows XP is installed. The system restarts after the installation of Windows XP to display the RTX100B application screen.

Using the Rescue Disc

The information in this section helps you to reinstall the Microsoft Windows XP and the RTX100B application software using the rescue DVD disc.

The prerequisites for the recovery procedure are as follows:

- Sony DRX-810UL external USB DVD drive
- Rescue DVD disc, Tektronix part number 063-3931-XX
- USB keyboard
- USB mouse

Recovery Procedure

***NOTE**. The rescue disc recovery procedure works only with the MTX100B, RTX100B, and RTX130B.*

Before you start the rescue disc recovery procedure make sure to check for the BIOS settings. Follow these steps to set the BIOS settings for booting from an external USB DVD drive:

1. Press **Del** when the initial BIOS screen appears.
2. Select **Advanced CMOS Feature** and set it to the following configuration:

   First Boot Device=(USB_CDROM)

   Second Boot Device=(USB_HDD)

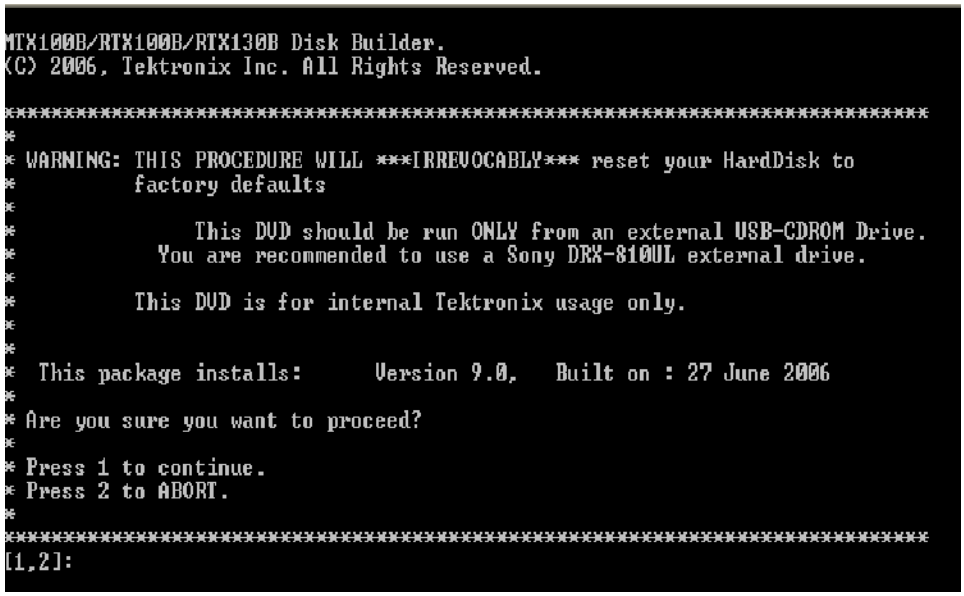
   Third Boot Device=(HDD_0)
3. Press **F10** to save the CMOS configuration.

   A message asking you to press Y to exit and N to continue is displayed.
4. Press **Y** to exit and restart the instrument.

Follow these steps to restore the Windows XP and RTX100B application software using the rescue disc:

1. Insert the rescue disc into the external USB DVD drive.
2. Connect the external USB DVD drive to port 1 and the USB keyboard to port 2 of the instrument, and then restart.

After the BIOS screens, the CD boots and scans for the USB drive. The following screen is displayed within a short period. You can press 1 to continue and 2 to abort the procedure and turn off the instrument. By default, option 2 is selected after a delay of 20 seconds.



3. Press **1** to proceed as soon as you see the screen.

***NOTE**. The approximate time taken to restore the Windows XP and RTX100B application is 1 hr to 1.5 hr.*

4. Press any key to turn off the instrument once the restoration is complete.
5. Disconnect the external USB DVD drive from the instrument and restart.

   The Windows XP setup wizard is displayed.
6. Click the **Next** button of the wizard until Windows XP is installed. The system restarts after the installation of Windows XP to display the RTX100B application screen.

Options

Options

This section describes options that are available for the RTX100B.

The following options are available:

Options	Description
Software option	
Option SC	Adds the Scheduler application
Service options	
Option D1	Provides calibration data
Option D3	Provides calibration data for 3 years
Option D5	Provides calibration data for 5 years
Option C3	Provides calibration services for 3 years
Option C5	Provides calibration services for 5 years
Option R3	Extends the instrument warranty to 3 years
Option R5	Extends the instrument warranty to 5 years
Power cord options	
Option A0	North America power cord
Option A1	Universal Euro power cord
Option A2	United Kingdom power cord
Option A3	Australia power cord
Option A4	240 V North America power cord
Option A5	Switzerland power cord
Option A6	Japan power cord
Option A10	China power cord
Option A99	No power cord

Diagrams

Diagrams

This section contains the following diagrams:

- Block diagram of the RTX100B
- Interconnect diagram of the RTX100B

Block diagram shows the modules and functional blocks in the RTX100B. Interconnect diagram shows how the modules in the RTX100B connect together.

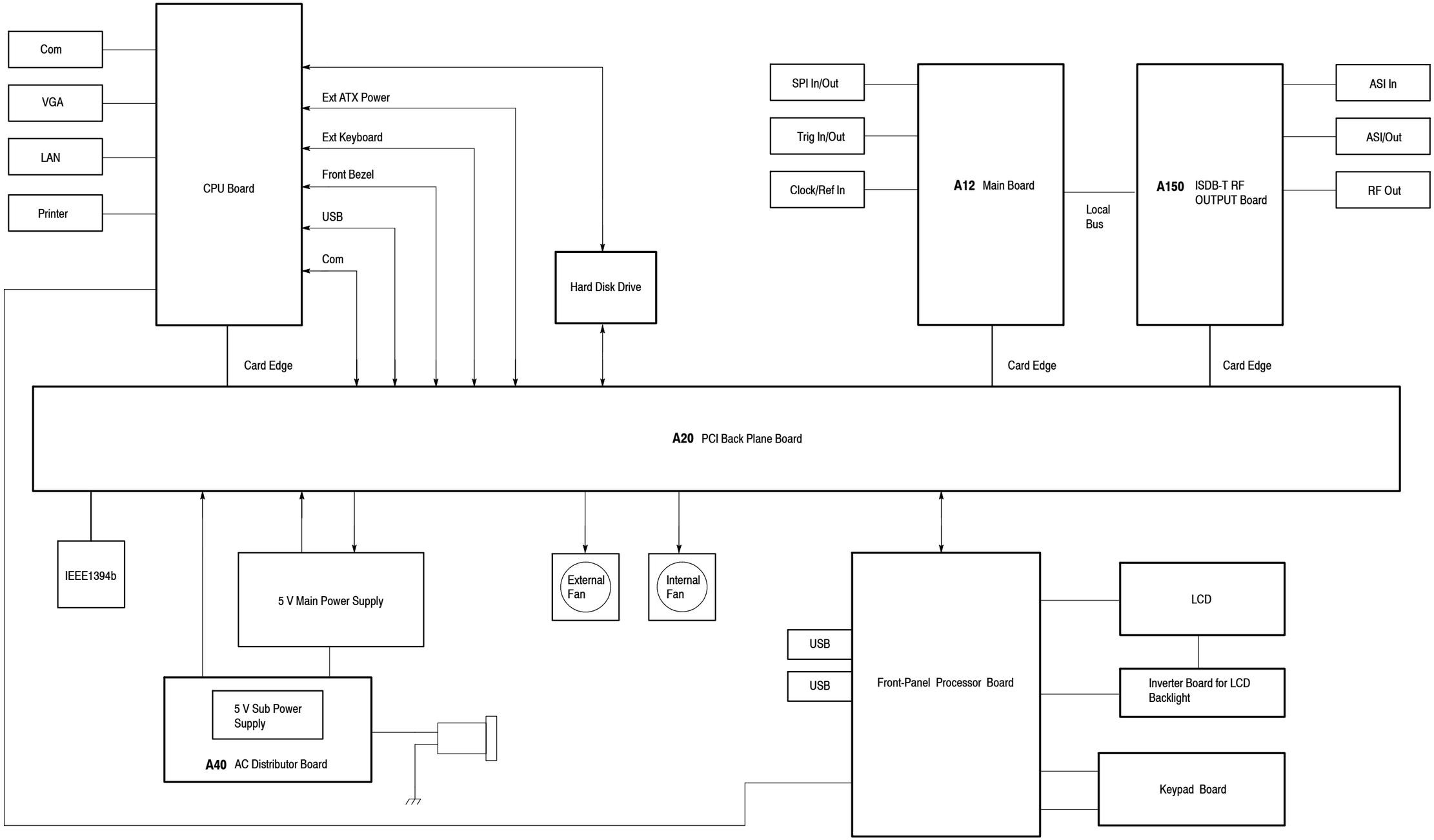


Figure 7-1: RTX100B block diagram

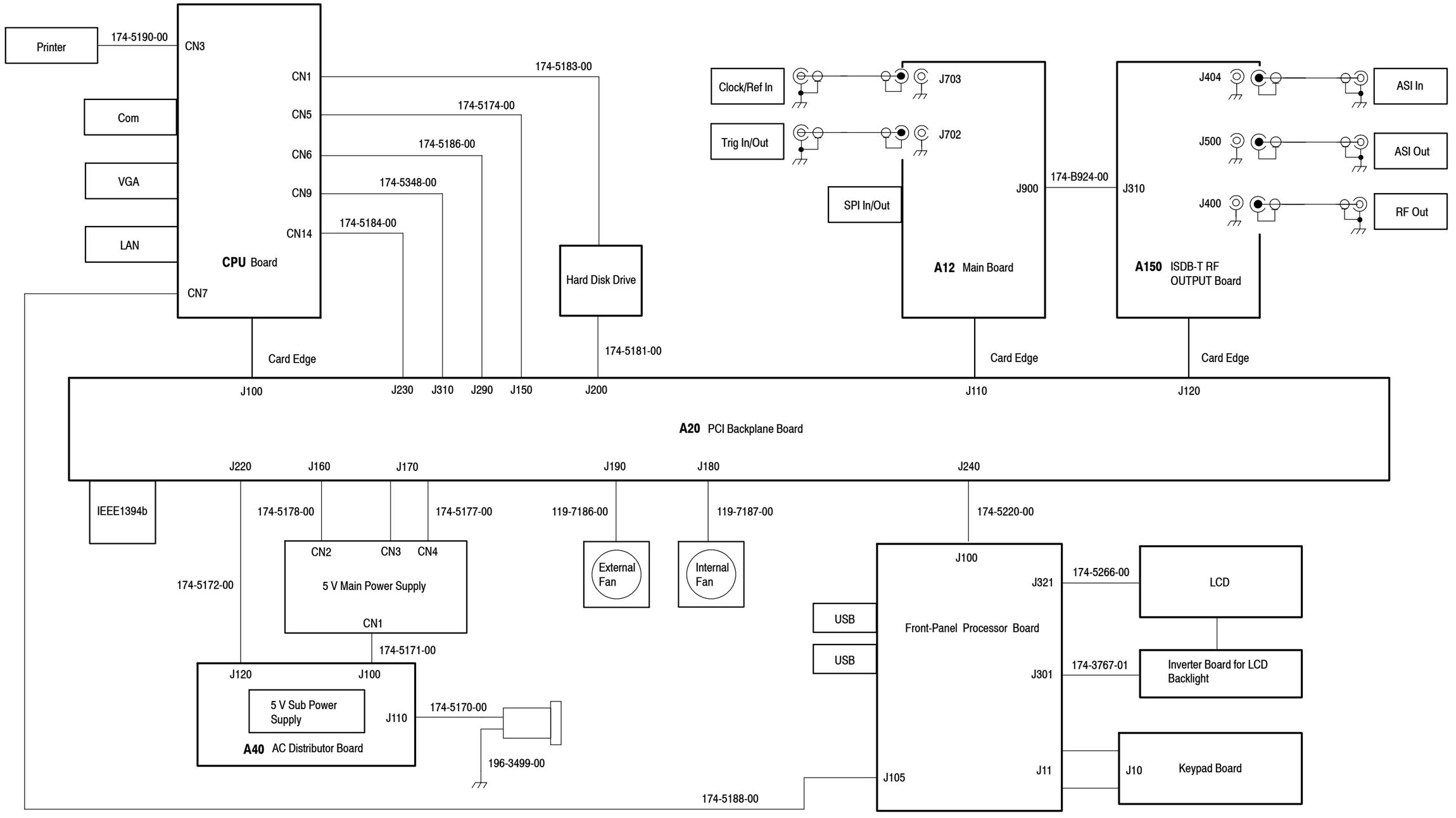


Figure 7-2: RTX100B interconnect diagram

Replaceable Parts List

Replaceable Parts List

This section contains a list of the replaceable modules for the RTX100B. 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:

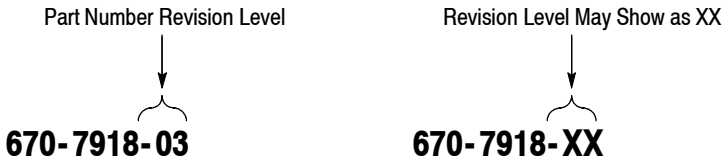
- Part number (see Part Number Revision Level below)
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

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 RTX100B. 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.

Abbreviations Abbreviations conform to American National Standard ANSI Y1.1-1972.

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
8-1-1	211-0374-00			6	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX
-2	337-4345-00			1	SHIELD,ELEC:COVER,LEFT,MTX100A,AL
-3	390-1212-01			1	CABINET ASSY;WRAP AROUND HOUSING,0.050 AL,SILVERGRAY,W/FEET&HANDLE, SAFETY CONTROLLED
-4	211-0711-00			2	SCR,ASSEM WSHR;6-32X0.250,PNH,STL,CDPL,T-15 TORX DR,MACHINE,W/SQ CONE WASHER
-5	335-1374-00			1	MARKER,IDENT;LABEL,MKD WARNING TO AVOID ELECTRIC,50.8MMX25.4MM,0.002 POLYESTER(3M 7982),OVER LAMINATE W/0.001 FLEVCON,W/ADHESIVE BACK, SAFETY CONTROLLED
-6	063-3868-00			1	SOFTWARE PKG;MICROSOFT WINDOWS XP PROFESSIONAL,INCLUDES SERVICE PACK 2,1-2 PROCESSOR VERSION;CERTIFICATE OF AUTHENTICITY
-7	337-4346-00			1	SHIELD,ELEC:COVER,RIGHT,MTX100A,AL
-8	211-0374-00			7	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX

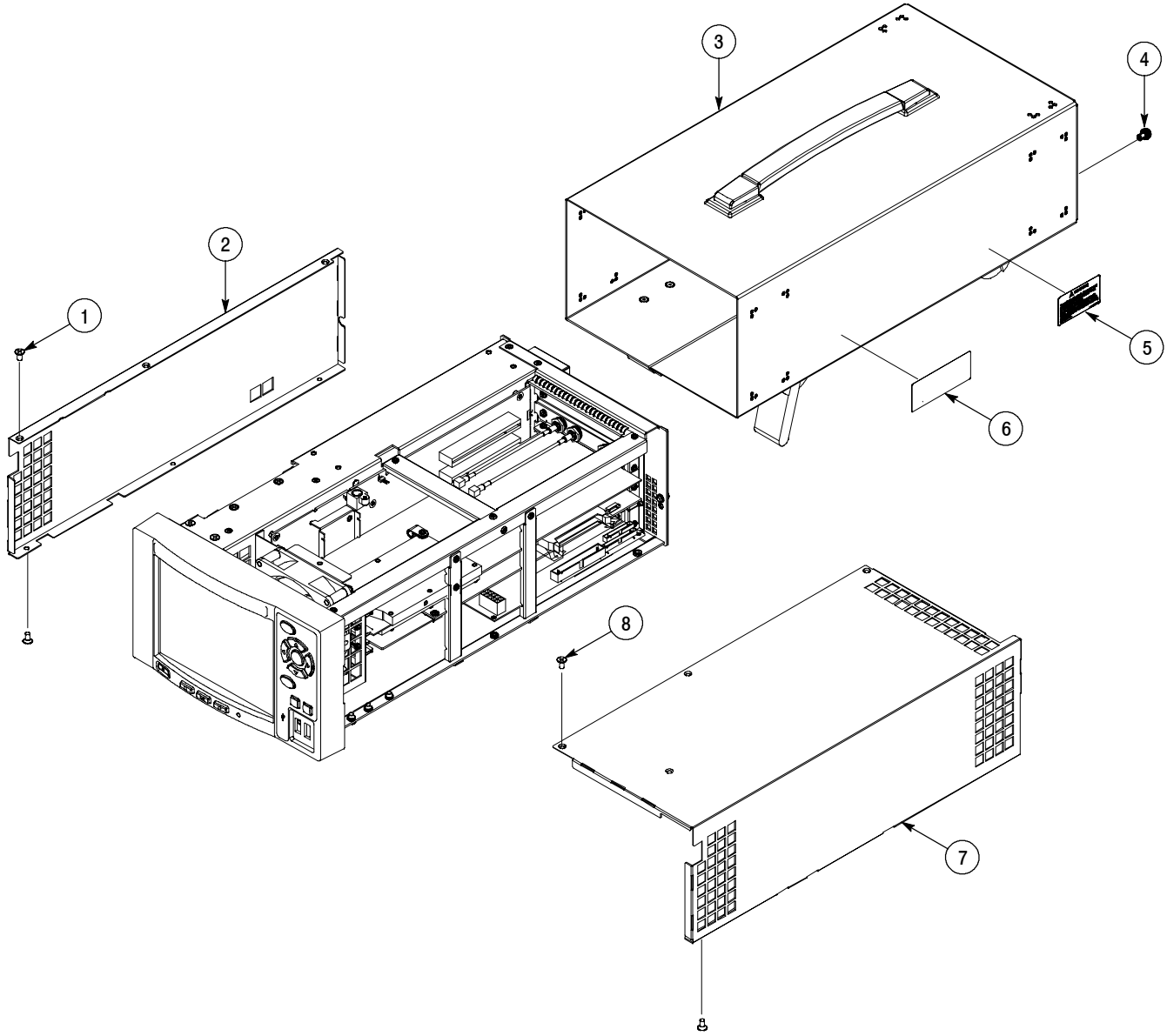


Figure 8-1: Cabinet and covers

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
8-2-1	211-0734-00			2	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX
-2	211-0373-00			2	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-3	343-1708-00			1	RETAINER:HARD DISK DRIVE,W/POLYURETHANE,MTX100A,AL
-4	211-0734-00			2	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX
-5	211-0734-00			2	SCREW,MACHINE:6-32X0.25,FLH,100 DEG,STL ZN-CM1,T10 TORX
-6	386-7460-00			1	PLATE:HDD,AL
-7	650-4862-00			1	HARD DISK DRIVE:160GB,3.5 INCH,7200RPM,ATA-100
-8	211-0373-00			3	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-9	671-5979-00			1	CIRCUIT BD ASSY;A40,SUB POWER,389-3738-00 WIRED
-10	342-1138-00			1	INSULATOR:CKT BOARD,POLYCARBONATE,A40 BOARD
-11	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-12	119-7147-00			1	POWER SUPPLY;85V-264VAC IN,12VDC 12.5A OUT,LEA150F-12-R,COSEL
-13	211-0711-00			1	SCR,ASSEM WSHR;6-32X0.250,PNH,STL,CDPL,T-15 TORX DR,MACHINE,W/SQ CONE WASHER
-14	196-3496-00			1	LEAD,ELECTRICAL;18 AWG,4.0 L,5-4 SAFETY CONTROLLED
-15	119-6009-00			1	FILTER,RFI;3A,250VAC,0.5,MA,0.15OHM;SAFETY CONTROLLED
-16	211-0372-00			2	SCREW,MACHINE:4-40X0.312,PNH,STL ZN-CM1,T10 TORX
-17	200-4974-00			1	COVER,FAN;REAR,MTX100A,AL
-18	211-1161-00			4	SCREW,MACHINE;4-40X1.500,PNH HEAD,T-10 TORX,ZINC PL
-19	119-7186-00			1	CABLE,ASSEMBLY,4,18AWG,60MM L,HDD POWER(40 SQ FAN)
-20	335-1369-00			1	MARKER,IDENT:MKD CONNECTORS FOR A150
-21	335-1364-00			1	MARKER,IDENT:MKD CONNECTORS FOR A12,POLYCARBONATE
-22	335-1363-00			1	MARKER,IDENT:MKD CONNECTORS PRINTER&IEEE1394B,POLYCARBONATE
-23	335-1362-00			1	MARKER,IDENT:MKD CONNECTORS FOR CPU BD,POLYCARBONATE
-24	335-0133-00			1	MARKER,IDENT;BLANK LABEL FOR MES LINES; THT-37-483-10MONOCHROME DISPLY;TDS300,TDS400 SERIES,SAFETY COTROLLED
-25	441-2404-00			1	CHASSIS,ASSY;MAIN,MTX100A,AL
-26	210-0164-000			2	RIVET,SOLID;0.163 ODX0.415 L,PANEL RANGE HEAD STYLE,NYLON
-27	119-7187-00			1	FAN 119569400 W/CABLE 18CM L(92 SQ FAN)

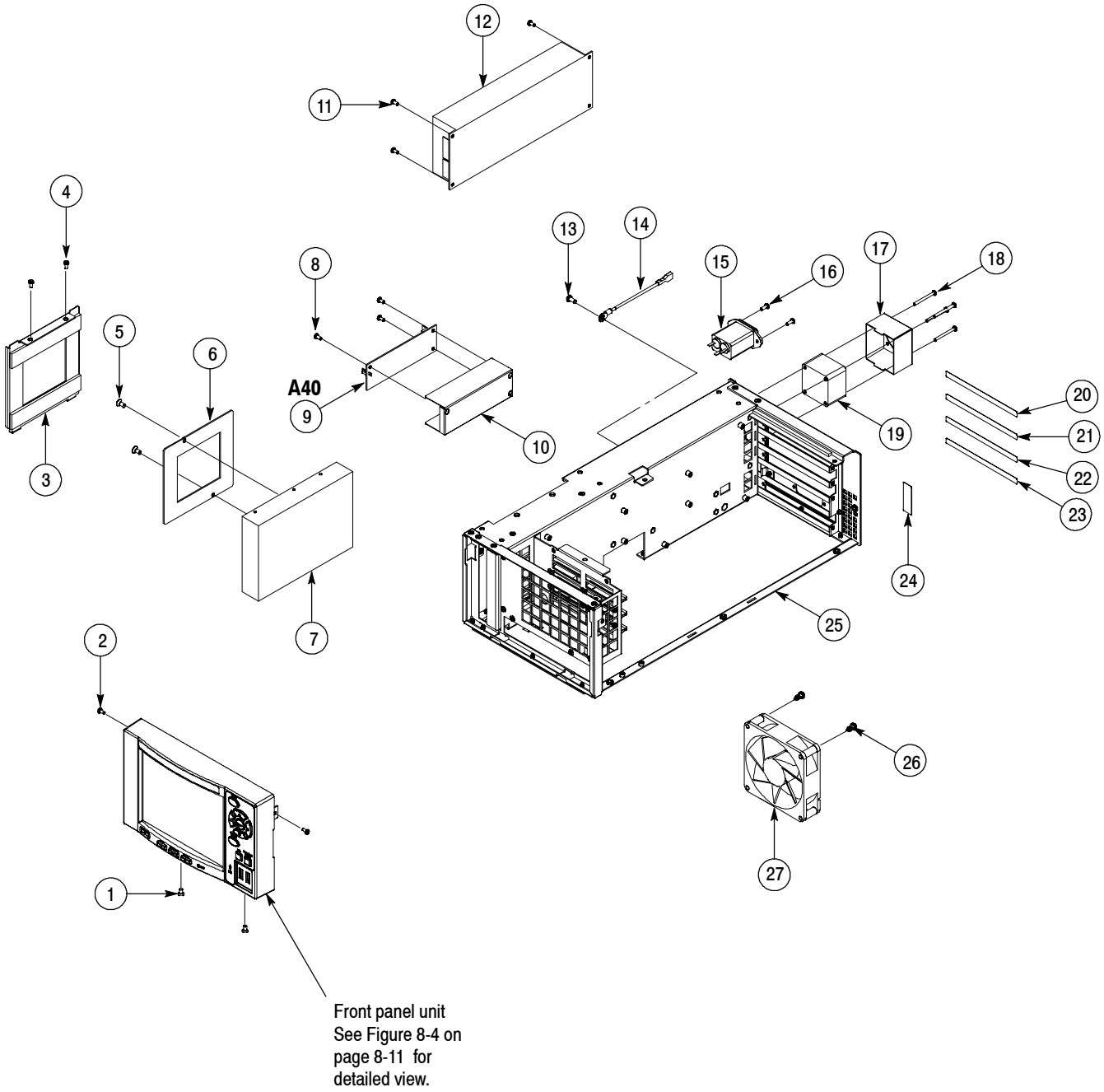


Figure 8-2: Internal modules (1)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
8-3-1	650-4981-00			1	PROCESSOR MODULE W/BRACKET+LABEL 334A48100
-2	671-5975-00			1	CIRCUIT BD ASSY;A12,MAIN,389-3734-00 WIRED
-3	671-B272-XX			1	CIRCUIT BD ASSY;A150
-4	211-0373-00			10	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-5	671-5976-00			1	CIRCUIT BD ASSY;A20,PCI BACK PANEL,389-3735-00 WIRED
-6	174-5190-00			1	CABLE ASSEMBLY,28AWG FLAT,1.27CTR,W/CONN D-SUB25&2X13
-7	210-0054-00			2	WASHER,LOCK;#4 SPLIT,0.025 THK STL CD PL
-8	214-3903-01			2	SCREW,JACK:4-40X0.312 EXT THD,4-40 INT THD,0.188 HEX,STEEL,CAD PLATE
-9	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-10	333-4518-00			1	PANEL,PCI:BLANK,NI PL,STL
-11	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-12	211-0373-00			3	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-13	426-2624-00			1	FRAME,SECTION:TOP,MTX100A,STL
-14	211-0373-00			2	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-15	343-1697-00			1	RETAINER:CKT BD,PCI,MTX100A,STL
-16	343-1700-00			1	RETAINER:CKT BD,PCI,RTX100A,STL

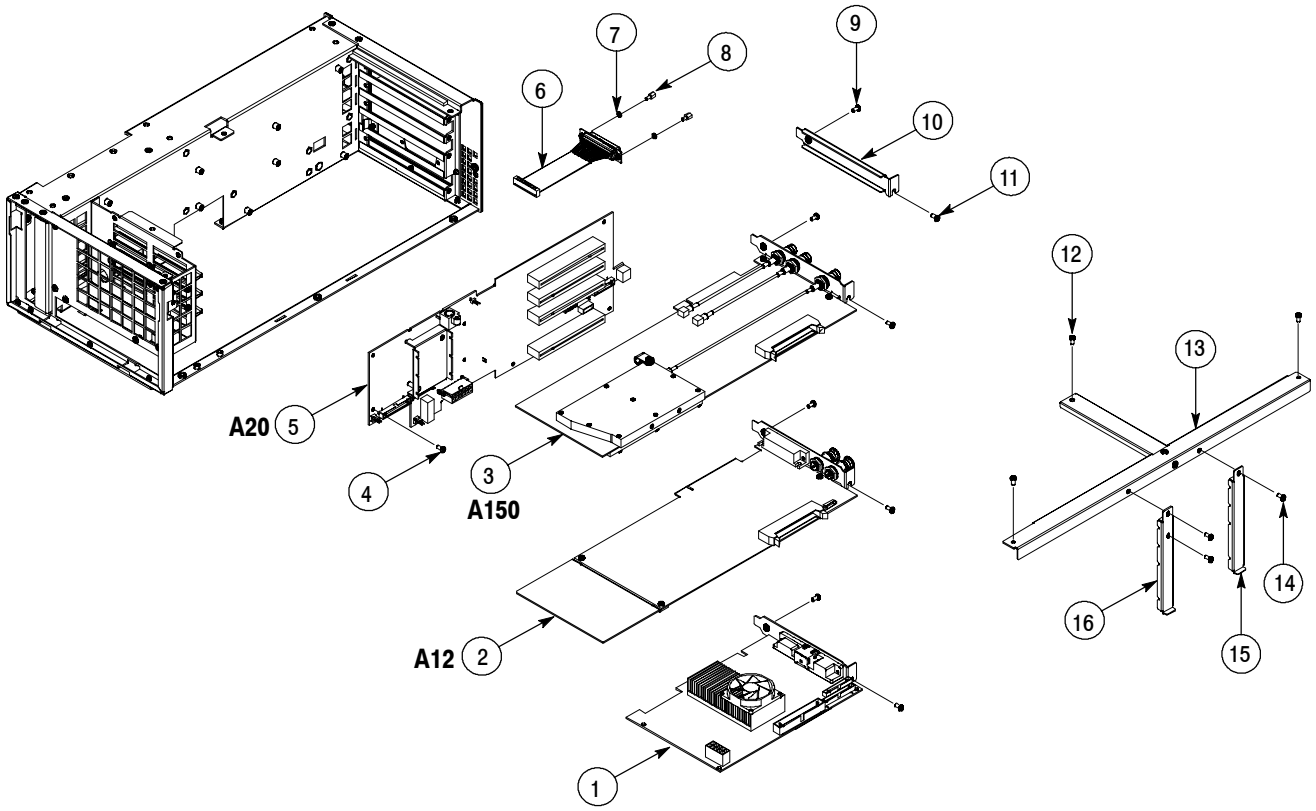


Figure 8-3: Internal modules (2)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
8-4-1	335-1597-00			1	MARKER,IDENT:LABEL,RTX100B,POLYCARBONATE,SAFETY CONTROLLED
-2	101-0175-00			1	TRIM;FRONT BEZEL,PC/ABS,TV GRAY,MTX100B,SAFETY CONTROLLED
-3	337-4389-00			1	SHIELD,DISPLAY;5.568 X 4.221,0.090 THICK,0.050 THICK GLASS,0.040 BLACK PORON W/0.002 THK ADHESIVE;MTX100B
-4	211-0373-00			4	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-5	119-7205-00			1	DISPLAY MODULE;LCD,COLOR;1024X768 (XGA),6.3 DIAG,TFT,8/6-BIT LVDS,250 NIT BACK LIGHT,0.125 MM PIXEL PITCH,21MS,FRONT MOUNT,NL10276BC-02,SAFETY CONTROLLED
-6	407-5197-00			1	BRACKET;DISPLAY/FRONT PANEL,AL,MTX100B
-7	174-5266-00			1	CA ASSY;RIBBBON ADAPTER TO XGA DISPLAY,20 PIN,3.5IN
-8	174-3767-01			1	CABLE ASSY,SP;DISCRETE,BACKLIGHT,IDC,26 AWG,5.0 L,PCB,1 X 6,0.079 CTR (2MM),SHRINK WRAPPED
-9	119-5999-00			1	POWER SUPPLY;INVERTOR BOARD,REPLACEMENT FOR LCD 119-5659-00 6.5 LCD
-10	211-1117-00			2	SCREW,MACHINE;4-40 X 0.187,PAN HEAD,STL,CD PL,T-10,TORX DR
-11	335-0577-00			1	LABEL,MANUFACTURED;PRODUCT ID,2.5 IN X 1.5 IN,SAFETY CONTROLLED
-12	211-1117-00			4	SCREW,MACHINE;4-40 X 0.187,PAN HEAD,STL,CD PL,T-10,TORX DR
-13	679-6251-00			1	CIRCUIT BD ASSY,UNTESTED,389388900 WIRED;FRONT PANEL PROCESSOR, MTX100B
-14	337-4390-00			1	SHIELD ELEC;KEYPAD BOARD,0.020 THK POLYCARBONATE,LEXAN FR60,MTX100B, SAFETY CONTROLLED
-15	679-6250-00			1	CIRCUIT BD ASSY,UNTESTED,389388800 WIRED;KEYBOARD;L-SHAPE,MTX100B
-16	211-0373-00			2	SCREW,MACHINE:4-40X0.25,PNH,STL ZN-CM1,T10 TORX
-17	260-2834-00			1	SWITCH,KEYPAD;ELASTOMERIC FRONT PANEL MTX100B
-18	260-2835-00			1	SWITCH,ELASTOMERIC,POWER AND PLAY BUTTONS;FRONT PANEL MTX100B
-19	335-1595-00			1	LABEL,FRONT PANEL CONTROL,MTX100B

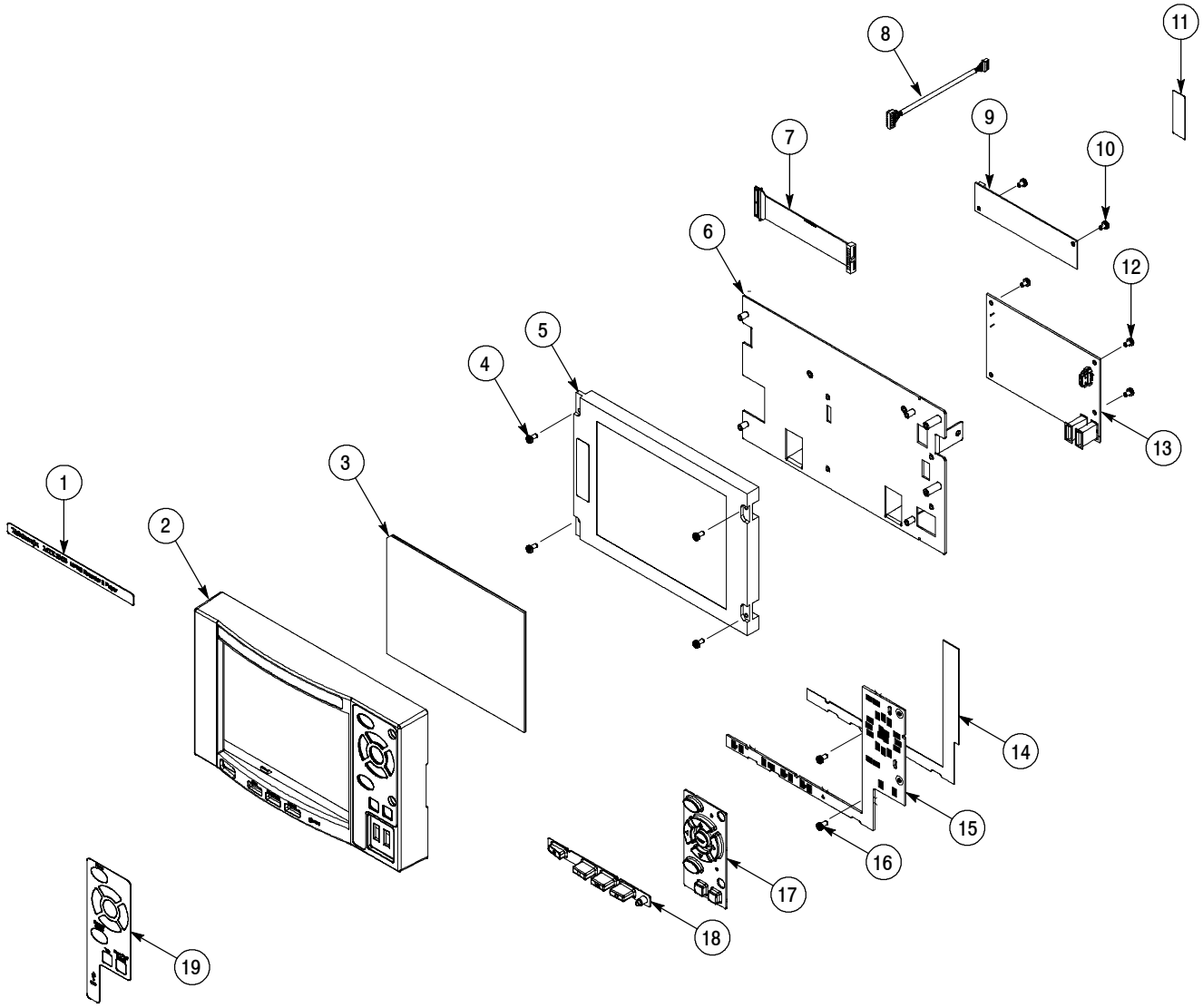


Figure 8-4: Front panel unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
8-5-1	174-5183-00			1	CABLE,ASSEMBLY,2X20,FLAT,430MM L,ULTRA ATA (CPU-HDD,HDD IDE)
-2	174-5181-00			1	CABLE,ASSEMBLY,4,18AWG,60MML,HDD POWER (HDD-A20,POWER)
-3	174-5172-00			1	CABLE,ASSEMBLY,2,22AWG,50MM L,W/CONN 22-01-3027(MOLEX), (A20-A4-,5V STAND-BY)
-4	174-5177-00			1	CABLE,ASSEMBLY,7,18AWG,50MM l;VHR-10N&VHR-7N+XHP-2(JST), (P/S-A20,POWER&CONTROL)
-5	174-5178-00			1	CABLE,ASSEMBLY,6,18AWG,110MM L,W/CONN VHR-6N(JST),(P/S-A20,GND)
-6	174-5171-00			1	CABLE,ASSEMBLY,2,18AWG,130MM l,W/CONN VHR-5N(JST) (P/S-A40)
-7	174-5170-00			1	CABLE,ASSEMBLY,2,18AWG,40MM l,AC INLET to A40(INLET-A40)
-8	196-3449-00			1	LEAD,ELECTRICAL;18AWG,4.0 L,5-4 SAFETY CONTROLLED
-9	119-7186-00			1	CABLE,ASSEMBLY,SP,ELEC;FAN 119B05500 W/CABLE,10CM L (40 SQ FAN)
-10	174-B924-00			1	CABLE,ASSEMBLY,SP,ELEC:80,30AWG,5CM L,FLAT,W/CONN(YAMAICHI)
-11	174-5190-00			1	CABLE,ASSEMBLY,28AWG FLAT,1.27CTR,W/CONN D-SUB25&2X13(DSUB25-CPU)
-12	174-5186-00			1	CABLE,ASSEMBLY,2X10,28AWG FLAT,1MM CTR,130MM L,RS232C SLOT PC TO A20 (CPU-A20,RS2-232C)
-13	174-5348-00			1	CABLE,ASSEMBLY,2X5,28AWG FLAT,1MM CTR,120MM L,PANNEL SLOT PC TO A20 (CPU-A20,PANEL CONTROL)
-14	174-5184-00			1	CABLE,ASSEMBLY,14,30AWG 7TWISTED PAIRS,270MM L,LVDS SLOT PC TO A20, (CPU-A20,LCD LVDS)
-15	174-5174-00			1	CABLE,ASSEMBLY,12,18AWG,150MM L,SLOT PC POWER(CPU-A20,CPU POWER)
-16	119-7187-00			1	CABLE,ASSEMBLY,SP,ELEC;FAN 119569400 W/CABLE 18CM L (92 SQ FAN)
-17	174-5188-00			1	CABLE,ASSEMBLY,SP,ELEC;10,60CM L,26AWG AND 28 AWG(CPU-A35,USB)
-18	174-5220-00			1	CABLE,ASSEMBLY,2X15,28AWG FLAT,1MM CTR,300MM L,A20 TO A30
-19	174-3767-01			1	CABLE,ASSEMBLY,SP;DISCRETE,BACKLIGHT,IDC,26 AWG,5.0 L,PCB,1 X 6,0.079 CTR (2MM),SHRINK WRAPPED
-20	174-5266-00			1	CABLE,ASSEMBLY;RIBBON ADAPTER TO XGA DISPLAY,10 PIN,3.5IN

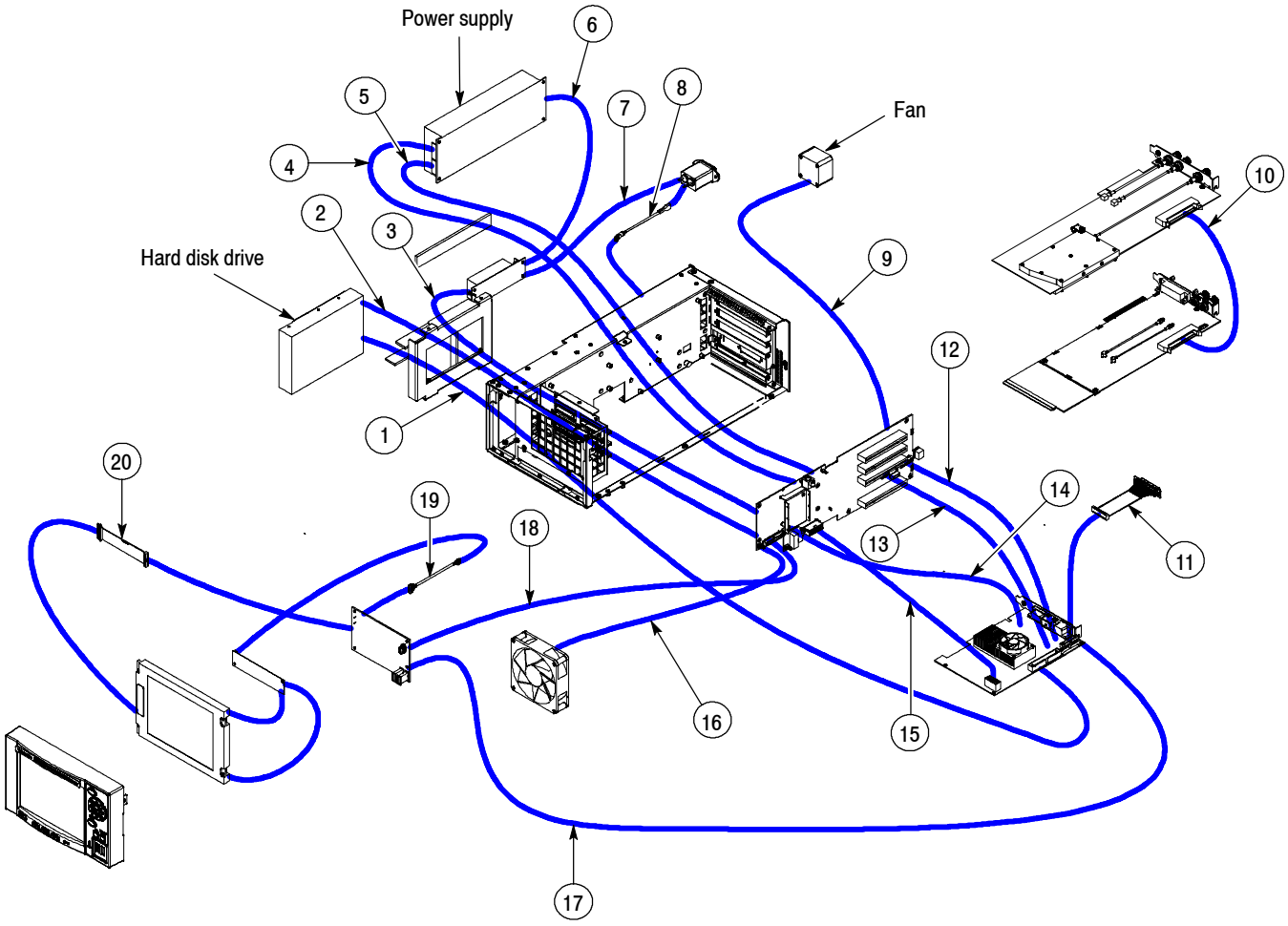


Figure 8-5: Cables

Replaceable parts list

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
					STANDARD ACCESSORIES
	071-1930-XX			1	MANUAL,TECH,USER,RTX100B,ENGLISH (OPTION L0)
	071-1931-XX			1	MANUAL,TECH,USER,RTX100B,JAPANESE (OPTION L5)
	063-3932-XX			1	SOFTWARE PKG:SAMPLE STREAM,CD-ROM
	012-A220-00			1	CABLE,INTCON:D-SUB 25,MALE TO MALE,STR,TWIST,2M L,SCREW 4-40
	119-6936-00			1	POINTER ASSY:OPTICAL MOUSE,USB,WHITE,OPTICAL THREE BUTTON WHEELED,W/USB to PS2 ADAPTER,ABS,SAFETY CONTROLLED
	119-B146-00			1	KEYBOARD:USB;MTX100,SAFETY CONTROLLED
	200-4716-00			1	COVER,FRONT;PROTECTIVE,PC/ABS FR110,W/TAPE;TV GRAY
	161-0066-00			1	CABLE ASSY,PWR; 3,18 AWG,250V/10A,98.0 L,STR,IEC320, RCPT X NEMA 5-15P,US,SAFETY CONTROLLED
	161-0066-09			1	CABLE ASSY,PWR; 3,0.75MM SQ,250V/10A,99.0 L,STR, IEC320,RCPT,EUROPEAN,SAFETY CONTROLLED
	161-0066-10			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER,STR,IEC320,RCPT X 13A,FUSED UK PLUG(13A FUSE),UNITED KINGDOM,SAFETY CONTROLLED
	161-0066-13			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,RCPT,AUSTRALIA,SAFETY CONTROLLED
	161-0066-12			1	CABLE ASSY,PWR;3,18 AWG,250V/10A,98.0 L,STR,RCPT X NEMA 6-15P,US,SAFETY CONTROLLED
	161-0154-00			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,RCPT,SWISS,SAFETY CONTROLLED
	161-0298-00			1	CABLE ASSY,PWR; 3,125V/7A,JAPAN,98 LONG,STR,NEMA 5-15P PLUG X IEC320/C-13 RECEPTACLE,SAFETY CONTROLLED
	161-0304-00			1	CABLE ASSY,PWR;3,1.0MM SQ,250V/10A,2.5 METER, STR,IEC320,3C CERTIFICATION,RCPT,CHINA,SAFETY CONTROLLED
					OPTIONAL ACCESSORIES
	071-1932-XX			1	MANUAL,TECH:SERVICE,RTX100B
	----------			1	1700F05 SIDE-BY-SIDE RACK ADAPTER
	----------			1	1700F06 BLANK PANEL