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Service Manual

Tektronix

MTG100 & MTG300
MPEG Generator

071-0616-50

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

www.tektronix.com

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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.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

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

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

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:



WARNING
High Voltage



Protective Ground
(Earth) Terminal



CAUTION
Refer to Manual



Double
Insulated

Service Safety Summary

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

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

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

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

To avoid electric shock, do not touch exposed connections.

Preface

This is the service manual for the MTG100 and MTG300 MPEG Generators. This manual contains information needed to service an MPEG generator to the module level.

Manual Structure

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

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

- *Specifications* contains a description of the MPEG generator and the characteristics that apply to it.
- *Operating Information* includes general information and operating instructions.
- *Theory of Operation* contains circuit descriptions that support service to the module level.
- *Performance Verification* contains procedures for confirming that an MPEG generator functions properly and meets warranted characteristics.
- *Adjustment Procedures* contains procedures for adjusting an MPEG generator to meet warranted characteristics.
- *Maintenance* contains information and procedures for performing preventive and corrective maintenance of an MPEG generator. These instructions include cleaning, module removal and installation, and fault isolation to the module level.
- *Options* contains descriptions of factory-installed options and optional accessories.
- *Electrical Parts List* contains a statement referring you to the *Mechanical Parts List* section, where both the electrical and mechanical modules are listed.
- *Diagrams* contains a block diagram and an interconnection diagram.

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

Manual Conventions

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

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

- Names of front panel controls and menus appear in the same case (initial capitals, all uppercase, etc.) in the manual as is used on the MPEG generator front panel and menus.
- Instruction steps are numbered unless there is only one step.
- **Bold** text refers to specific interface elements that you are instructed to select, click, or clear.

  Example: To power off the MPEG generator, press the **ON/STBY** switch.
- *Italic* text refers to document names or sections. Italics are also used in NOTES, CAUTIONS, and WARNINGS.

  Example: The *Diagrams* section, beginning on page 9-1, includes a block diagram and an interconnect diagram..

Modules

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

Safety

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

Finding Other Information

Other documentation for the MPEG generator includes:

- The MTG100 & MTG300 MPEG Generator *User Manual* contains a tutorial to quickly describe how to operate the MPEG generator. It also includes an in-depth discussion on how to more completely use the MPEG generator features.

Contacting Tektronix

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

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

Introduction

This manual contains information needed to properly service the MTG100 and MTG300 MPEG Generators, as well as general information critical to safe and effective servicing.

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

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

Performance Check Interval

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

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

Strategy for Servicing

Throughout this manual, the term “module” refers to any field-replaceable component, assembly, or part of the MPEG generator.

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

Further, it contains all information for corrective maintenance down to the module level. To isolate a failure to a module, use the fault isolation procedures found in *Troubleshooting*, part of section 6, *Maintenance*. To remove and replace any failed module, follow the instructions in *Removal and Installation Procedures*, also part of section 6. After isolating a faulty module, replace it with a fully-tested module obtained from the factory. Section 10, *Mechanical Parts List*, contains part number and ordering information for all replaceable modules.

Tektronix Service Offerings

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

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

Warranty Repair Service

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

Self Service

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

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

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

Product Overview

The MTG100 and MTG300 MPEG Generators store and playback MPEG-2 transport streams that are compliant with ATSC, DVB, and ARIB standards. The MPEG generators can automatically update the time stamp values of the transport stream in real time to support long term playout. Table 1-1 lists the main features of the MPEG generators.

You can output transport streams stored in the MPEG generators to perform the following tasks:

- Evaluate IRD/STB designs and manufacturing processes
- Evaluate performance of MPEG-2 equipment
- Perform conformance testing of MPEG-2 systems
- Provide substitute signal generation for digital television transmitters

The MTG300 MPEG Generator facilitates complete stress testing by providing comprehensive capabilities to customize stored transport streams. In addition, the MTG300 MPEG Generator allows you to effectively monitor receiver operation by inserting PSI/SI/PSIP tables into the transport stream.

Table 1-1: Main product features

Feature	MTG100	MTG300
Storage and output of MPEG-2 transport streams up to 36 GB in size	●	●
Real-time updating of transport stream time stamps and time tables (PCR, PTS/DTS, and continuity_counter values)	●	●
188, 204, and 208 byte packet-length output formats	●	●
Output interfaces: Serial: ASI (burst and non-burst), SSI, ECL, LVDS, and TTL Parallel: ECL, LVDS, and TTL	●	●
Data rate: 64 Mbps maximum; 1 Mbps minimum	●	●
Sample transport streams provided for DVB and ATSC	●	●
Remote control via RS–232 or Ethernet interface	●	●
Downloading of transport stream files via an Ethernet interface	●	●
Hierarchy display of the stored transport stream	●	●
PSI/SI/PSIP editor		●
Real-time dynamic insertion of PSI/SI/PSIP tables		●
PCR jitter insertion		●

Specifications

This section is divided into two subsections. *General Characteristics* lists the functional, electrical, mechanical, and environmental characteristics of the MPEG generator. *Certifications and Compliances* lists the national and international standards to which the MPEG generator complies.

General Characteristics

This section lists the functional, electrical, mechanical, and environmental characteristics of the MPEG generator.

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

Performance Conditions

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

- The MPEG generator must be in an environment where the temperature, altitude, humidity, and vibration conditions are within the operating limits described in Table 1-5 on page 1-10.
- The MPEG generator must have a warm-up period of at least 20 minutes.
- The MPEG generator must have been calibrated and adjusted at an ambient temperature between +20° C and +30° C.
- The MPEG generator must be operating at an ambient temperature between +5° C to +40° C, unless otherwise noted.

Table 1-2: Functional characteristics

Characteristics	Description
General	
Analyzed TS standard	MPEG-2, DVB, ARIB, ATSC
Supported Packet format	188, 204, 208 bytes
Loop mode	
No Update	Transport stream is output with no editing functions available.
Auto Update	Transport stream is output with the following timing information updated: PCR, PTS/DTS, Continuity_counter, UTC_time (TDT/TOT) / system_time, DS_status, DS_day_of_month, DS_hour (STT)
Stress (MTG300 only)	Transport stream is output with all editing functions available.
TDT/STT Insertion	MTG300 only
Section Interval	0.5 s to 120.0 s (100 ms resolution)
External SI file insertion	MTG300 only
Start time	0 s to 24:59:59:999 hr (1 ms resolution) TDT, TOT, or STT is used as a reference (DVB, ARIB, and ATSC mode only).
Continuous time	50 ms to 24:59:59:999 hr (1 ms resolution) or Infinite TDT, TOT, or STT is used as a reference (DVB, ARIB, and ATSC mode only).
Section interval	100 ms to 30.00 s (10 ms resolution)
Packet interval	0 to 1000 packets
Packetized mode	Single, Multi
External TS file insertion	MTG300 only
Start time	0 s to 24:59:59:999 hr (1 ms resolution) TDT, TOT, or STT is reference (DVB, ARIB, and ATSC mode only).
Continuous time	50 ms to 24:59:59:999 hr (1 ms resolution) or Infinite TDT, TOT, or STT is used as a reference (DVB, ARIB, and ATSC mode only).
File interval	100 ms to 30.00 s (10 ms resolution)
Packet interval	0 to 1000 packets
External SI file replacement	MTG300 only
Start time	0 s to 24:59:59:999 hr (1 ms resolution) TDT, TOT, or STT is used as a reference (DVB, ARIB, and ATSC mode only).
Continuous time	50 ms to 24:59:59:999 hr (1 ms resolution) or Infinite TDT, TOT, or STT is used as a reference (DVB, ARIB, and ATSC mode only).
Section interval	100 ms to 30.00 s (10 ms resolution)
Packet interval	0 to 1000 packets
Packetized mode	Single, Multi

Table 1-2: Functional characteristics (Cont.)

Characteristics	Description
Delete packet	MTG300 only
Target packet	Deletes the selected item from the transport stream. If other items with the same PID value as the selected item exist in the transport stream and they are contained in one packet, they are also deleted from the transport stream (except for the PCR).
PCR interval setting	MTG300 only
PCR interval	20 ms to 10.000 s (1 ms resolution)
PCR interval jitter adder	MTG300 only
Target PCR	Selected one PCR
Reference period	20 ms to 10.000 s (1 ms resolution)
Jitter Pattern	sine, rectangle, triangle, pulse, ramp, and random
Jitter Duty	1 to (period–1) packet(s) (available for pulse)
Jitter Period	5 to 3000 packets
Jitter Amplitude	0 to 5.00 s (10 ms resolution)
PCR value jitter adder	MTG300 only
Target PCR	Selected one PCR.
Jitter Pattern	sine, rectangle, triangle, pulse, ramp, random, and offset
Jitter Duty	1 to (period–1) packet(s) (only available for pulse jitter pattern)
Jitter Period	5 to 3000 packets (except for the offset mode)
Jitter Amplitude	0 to 5.00 s (resolution of 37 ns, 27 MHz clock)
TS header change	MTG300 only
Number of packets	0 to 65535 packets (on every manual operation) 0 value means that the selected operation is executed infinitely.
Target of change word operation	Sync_Byte (8) Transport_error_indicator (1) payload_unit_start_indicator (1) transport_priority (1) PID (13) transport_scrambling_control (2) adaptation_field_control (2) Target packet is all the items or one selected item.
Target of Lack/Duplicate operation	continuity_counter (4) Target packet is one selected item.

Table 1-2: Functional characteristics (Cont.)

Characteristics	Description
SI header change	MTG300 only
Target packets	One selected item. If two or more sections are contained in one packet, all of the sections are changed by the operation.
Number of packets	1 to 65535 packets (on every manual operation)
Target of change word operation	reserved (2)
DTS value change	MTG300 only
Target packet	One selected PID including Video PES (except for the scrambled PES)
Number of packets	Continuous
Add time	0 ms to 50 ms (90 kHz resolution)

Table 1-3: Electrical characteristics

Characteristics	Description
Clock	
Reference clock	For Output_clock, PCR/PTS/DTS, Packet operation timing, and TDT/STT time.
Internal	27 MHz ± 1 ppm
External	27 MHz
Output clock	
Frequency	1 MHz to 64 MHz, Locked to Reference clock.
PLL divide ratioFYID	Output Clock = (X / (Y * Z)) * 27 MHz
Internal and External Reference	1024 < X < 65536 4500 < Y < 9000 Z = 4 (32 MHz < Output clock ≤ 64 MHz) Z = 8 (16 MHz < Output clock ≤ 32 MHz) Z = 16 (8 MHz < Output clock ≤ 16 MHz) Z = 32 (4 MHz < Output clock ≤ 8 MHz) Z = 64 (2 MHz < Output clock ≤ 4 MHz) Z = 128 (1 MHz < Output clock ≤ 2 MHz)
External clock: Output clock < 24 MHz	Output Clock = (Y / X) * 216 MHz 1024 < X < 65536 8 < Y < 16383 Output clock / 6000 < Y < Output clock / 3000
External clock: Output clock ≥ 24 MHz	Output Clock = (Y / X) * 432 MHz 1024 < X < 65536 8 < Y < 16383 Output clock / 12000 < Y < Output clock / 6000
P/N and Jitter	< –104 dBc/Hz at 20 kHz (< 32 MHz) < –97 dBc/Hz at 20 kHz (< 64 MHz)

Table 1-3: Electrical characteristics (Cont.)

Characteristics	Description
External reference input	
Connector type	BNC
Frequency	27 MHz, 1 ppm recommended.
Input level, typical	800 mV ± 200 mV (p-p)
Input impedance, typical	50 Ω (at 27 MHz)
ECL control input	
Connector type	D-sub, 9 pin
Frequency	125 kHz to 8 MHz, select parallel output. 1 MHz to 64 MHz, select serial output.
Input level, typical	Differential ECL
Termination, typical	110 Ω, line to line.
Pin assignment	1 DCLK 2 GND 3 PSYNC 4 CHCLKEN 5 Shield 6 $\overline{\text{DCLK}}$ 7 $\overline{\text{GND}}$ 8 $\overline{\text{PSYNC}}$ 9 $\overline{\text{CHCLKEN}}$
ECL/TTL/LVDS output (parallel)	
Connector type	D-sub, 25 pin (the same connector as Serial output)
Output level (Output on) (J310101 and above)	Note: Do not connect the $\overline{\text{Asserted Low}}$ pins for single-end use.
TTL	0 V to 2.8 V (without termination)
LVDS	0.8 V to 1.60 V (without termination)
ECL*	–1.8 V to –0.9 V (without termination)
Output resistance, typical (Output off)	350 Ω at 5 V to GND pin (When the output is off, the power of the buffer amplifier is cut off.)
Data rate	1 Mbps to 64 Mbps
Pin assignment	1 DCLK 2 GND 3 to 10 DATA 7 to DATA 0 11 DVALID 12 PSYNC 13 Shield 14 $\overline{\text{DCLK}}$ 15 $\overline{\text{GND}}$ 16 to 23 $\overline{\text{DATA 7}}$ to $\overline{\text{DATA 0}}$ 24 $\overline{\text{DVALID}}$ 25 $\overline{\text{PSYNC}}$

Table 1-3: Electrical characteristics (Cont.)

Characteristics	Description
ECL/TTL/LVDS output (serial)	
Connector type	D-sub, 25 pin (the same connector as Parallel output)
Output level (Output on) (J310101 and above)	Note: Do not connect the $\overline{\text{Asserted Low}}$ pins for single-end use. Do not connect the "Not Managed" pins to GND pins.
TTL	0 V to 2.8 V (without termination)
LVDS	0.8 V to 1.60 V (without termination)
ECL*	–1.8 V to –0.9 V (without termination)
Output resistance, typical (Output off)	350 Ω at 5 V to GND pin (When the output is off, the power of the buffer amplifier is cut off.)
Data rate	1 Mbps to 64 Mbps
Pin Assignment	1 DCLK 2 GND 3 to 9 Not managed 10 DATA 0 11 DVALID 12 PSYNC 13 Shield 14 $\overline{\text{DCLK}}$ 15 GND 16 to 22 Not managed 23 $\overline{\text{DATA 0}}$ 24 $\overline{\text{DVALID}}$ 25 $\overline{\text{PSYNC}}$
ASI output	Complies with EN50083-9 Annex B.
Connector type	BNC
Impedance, typical	75 Ω
Output voltage	800 mV ± 10%
Deterministic Jitter	10% (p-p)
Random Jitter	8% (p-p)
Rise/fall time (20% to 80%)	< 1.2 ns
Transmission format	Data packets (Insert Packet unit), Data Bursts (Insert Word unit)

Table 1-3: Electrical characteristics (Cont.)

Characteristics	Description
SSI output	Complies with SMPTE 310M.
Connector type	BNC
Impedance	75 Ω
Data rate	1 Mbps to 40 Mbps (Not managed when the data frequency is more than 40 Mbps.)
Output voltage	800 mV ± 10 %
Return loss	> 30 dB , 100 kHz to 80 MHz
Drift and wander	< 0.028 ppm/s, < 1 kHz
Jitter	< 2 ns, 1 kHz to 800 kHz
Rise/fall time (20 % to 80%)	0.4 ns to 5.0 ns < 1.6 ns (difference between rise and fall time)
Condition	This output cannot be used with the external clock input.
Display	
Display area	Width: 13.2 cm (5.2 inches) Height: 9.9 cm (3.9 inches)
Resolution	Horizontal: 640 pixels Vertical: 480 pixels
AC line power	
Rating Voltage	100 to 240 VAC
Voltage Range	90 to 250 VAC
Frequency Range	48 to 63 Hz
Maximum power	200 W
Maximum current	2 A
Installation Category	CAT II

Table 1-4: Mechanical characteristics

Characteristics	Description
Net weight	
Standard	Approximately 14 kg
Dimensions	
Height	132 mm (without front feet extended)
Width	430 mm
Length	560 mm

Table 1-5: Environmental characteristics

Characteristics	Description
Temperature	
Operating	+5° C to +40° C
Non-operating	–20° C to +60° C
Relative humidity	
Operating	20% to 80% (No condensation) Maximum wet-bulb temperature 29.4° C
Non-operating	5% to 90% (No condensation) Maximum wet-bulb temperature 40.0° C
Altitude	
Operating	To 4.5 km (15,000 feet). Maximum operating temperature decreases 1° C each 300 m above 1.5 km.
Non-operating	To 15 km (50,000 feet).
Dynamics	
Vibration	
Operating	0.27 g_{rms}, 5 to 500 Hz, 10 min, three axes
Non-operating	2.28 g_{rms}, 5 to 500 Hz, 10 min, three axes
Shock	
Non-operating	294 m/s^2 (30 G), half-sine, 11 ms duration.
Installation requirements	
Power consumption	200 W maximum. Maximum line current is 2 A_{rms} at 50 Hz.
Dissipation (fully loaded)	90 V line, with 5% clipping
Surge current	≦ 30 A peak for less than 5 line cycles at 25°C after product has been off for at least 30 s.
Cooling clearance	
Top clearance	5.0 cm
Side clearance	15 cm
Rear clearance	7.5 cm

Certifications and Compliances

This subsection lists the national and international standards to which the MPEG generator complies.

Table 1-6: Certifications and compliances

Category	Standards or description
EC Declaration of Conformity – EMC	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 61000-3-2 AC Power Line Harmonic Emissions
	EN 61000-3-3 Voltage Fluctuations and Flicker Emissions
	EN 61326-1 EMC requirement for Class A electrical equipment for measurement, control and laboratory use.
	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 61000-4-8 Power Frequency Electromagnetic Field Immunity (Performance Criterion A)
	IEC 61000-4-11 Voltage Dips and Interruptions Immunity (Performance Criterion B)
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
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits.
Safety	Complies with the following safety standards/regulations:
	UL 3111-1, First Edition[1] Standard for electrical measuring and test equipment.
	CAN/CSA C22.2 No.1010.1-92[1] Safety requirements for electrical equipment for measurement, control, and laboratory use.
	IEC 61010-1/A2:1995[1] Safety requirements for electrical equipment for measurement, control,and laboratory use.
	Low Voltage Directive 73/23/EEC: Amended by 93/68/EEC:
	EN 61010-1/A2 Safety requirements for electrical equipment for measurement, control,and laboratory use.

[1] **UL3111-1 First Edition, CSA C22.2 No.1010.1-92, and IEC61010-1/A2:1995 Safety Certification Compliance Altitude (maximum operating): 2000 meters**

Table 1-6: Certifications and compliances (Cont.)

Category	Standards or description	
Installation (Overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:	
	CAT III	Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.
	CAT II	Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.
	CAT I	Secondary (signal level) or battery operated circuits of electronic equipment.
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.	
	Pollution Degree 2	Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.

Installation

Supplying Operating Power

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



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

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

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



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

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

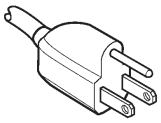
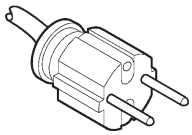
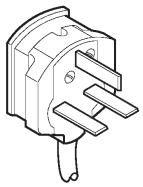
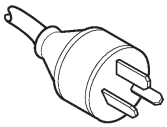
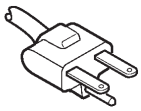
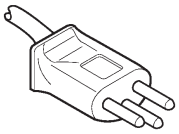
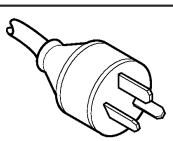
Power Cord Information

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

Table 2-1: Power-cord conductor identification

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

Table 2-2: Power cord identification

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

Operating Voltage

This MPEG generator operates with any line voltage from 100–240 VAC_{RMS} with any line frequency from 48–63 Hz. Before plugging the cord in the outlet, be sure that the power supply voltage is proper.

Operating Environment

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

Operating Temperature

Operate the MPEG generator where the ambient air temperature is from +5° C to +40° C with no diskette in the floppy drive. Store the MPEG generator in ambient temperatures from –20° C to +60° C with no diskette in the floppy drive. After storage at temperatures outside the operating limits, allow the chassis to stabilize at a safe operating temperature before applying power.

Ventilation Requirements

Verify that there is at least 5.0 cm (2 inch) of clearance on top and bottom, 15.0 cm (6 inches) on the left and right sides, and 7.5 cm (3 inches) at the rear of the instrument to allow for heat dissipation. Verify that the air intake holes on the sides and bottom of the cabinet are not obstructed.

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

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

Applying and Interrupting Power

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

Connect Power Cable

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

Standby Power

Apply power to the standby circuit of the instrument by pushing the **PRINCIPAL POWER SWITCH** on the rear panel of the instrument. Refer to Figure 2-1.

NOTE. After the instrument is installed, leave the **PRINCIPAL POWER SWITCH** on and use the **ON/STBY** switch as the power switch.

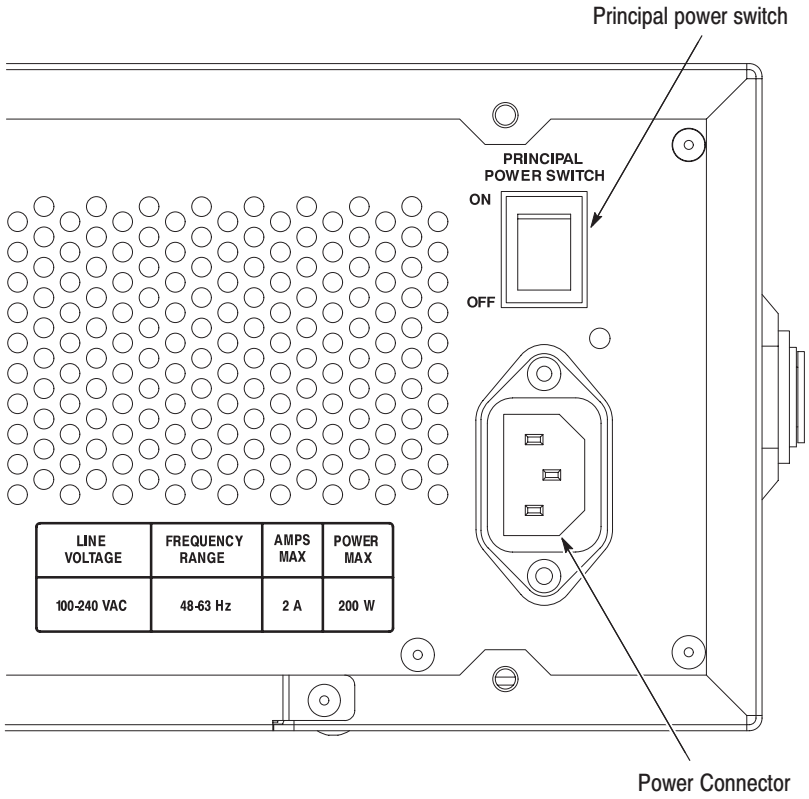


Figure 2-1: Rear panel power connector and power switch

Power On

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

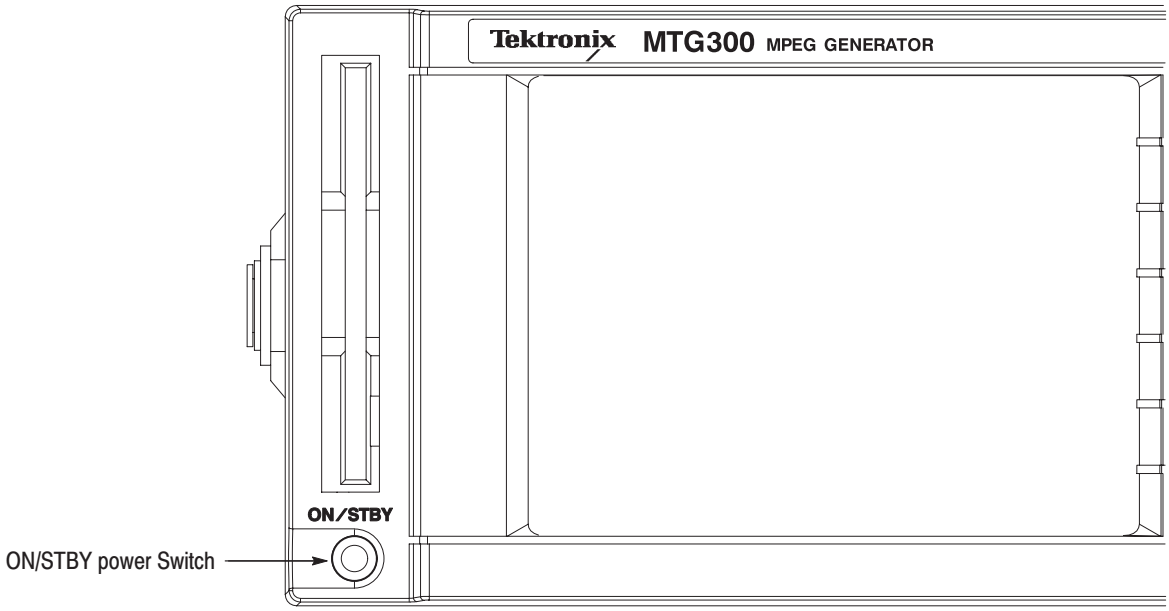


Figure 2-2: Front panel power switch

Start-Up Diagnostics

The MPEG generator automatically runs diagnostics when the instrument is powered on from the ON/STBY switch. These diagnostics check whether the instrument is performing within its defined operating characteristics. If all the diagnostic items have been completed without error, the instrument displays the menu bar and status bar.

If the diagnostics detect an error, the MPEG generator displays the error code. To exit the diagnostics menu, press any key; then the system displays the menu bar and status bar. See the *Maintenance:Troubleshooting* section, beginning on page 6-49 for information on diagnostics and fault isolation.

Power Off

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

NOTE. The **ON/STBY** switch disables the outputs of the power supply. The **PRINCIPAL POWER SWITCH** on the rear panel disconnects the instrument from the primary voltage source.

Repackaging Instructions

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

1. Obtain a corrugated cardboard shipping carton with inside dimensions at least 15 cm (6 inches) taller, wider, and deeper than the instrument. The shipping carton must be constructed of cardboard with 170 kg (375 pound) test strength.
2. If you are shipping the instrument to a Tektronix field office for repair, attach a tag to the instrument showing the instrument owner and address, the name of the person to contact about the instrument, the instrument type, and the serial number.
3. Wrap the instrument with polyethylene sheeting or equivalent material to protect the finish.
4. Cushion the instrument in the shipping carton by tightly packing dunnage or urethane foam on all sides between the carton and the MPEG generator. Allow 7.5 cm (3 in) on all sides, top, and bottom.
5. Seal the shipping carton with shipping tape or an industrial stapler.

NOTE. *Do not ship the instrument with a diskette inside the floppy disk drive. When the diskette is inside the drive, the disk release button sticks out. This makes the button more prone to damage than otherwise.*

Installed Options

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

Operating Instructions

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

Using the Menu System

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

The menu system on the MPEG generator provides access to instrument settings and to operational functions such as the selection of transport stream output parameters. The menu system is comprised of two types of menus: the four pull-down menus displayed in the Menu bar and the Bezel menu which is displayed at the right side of the screen. See Figure 2-3.

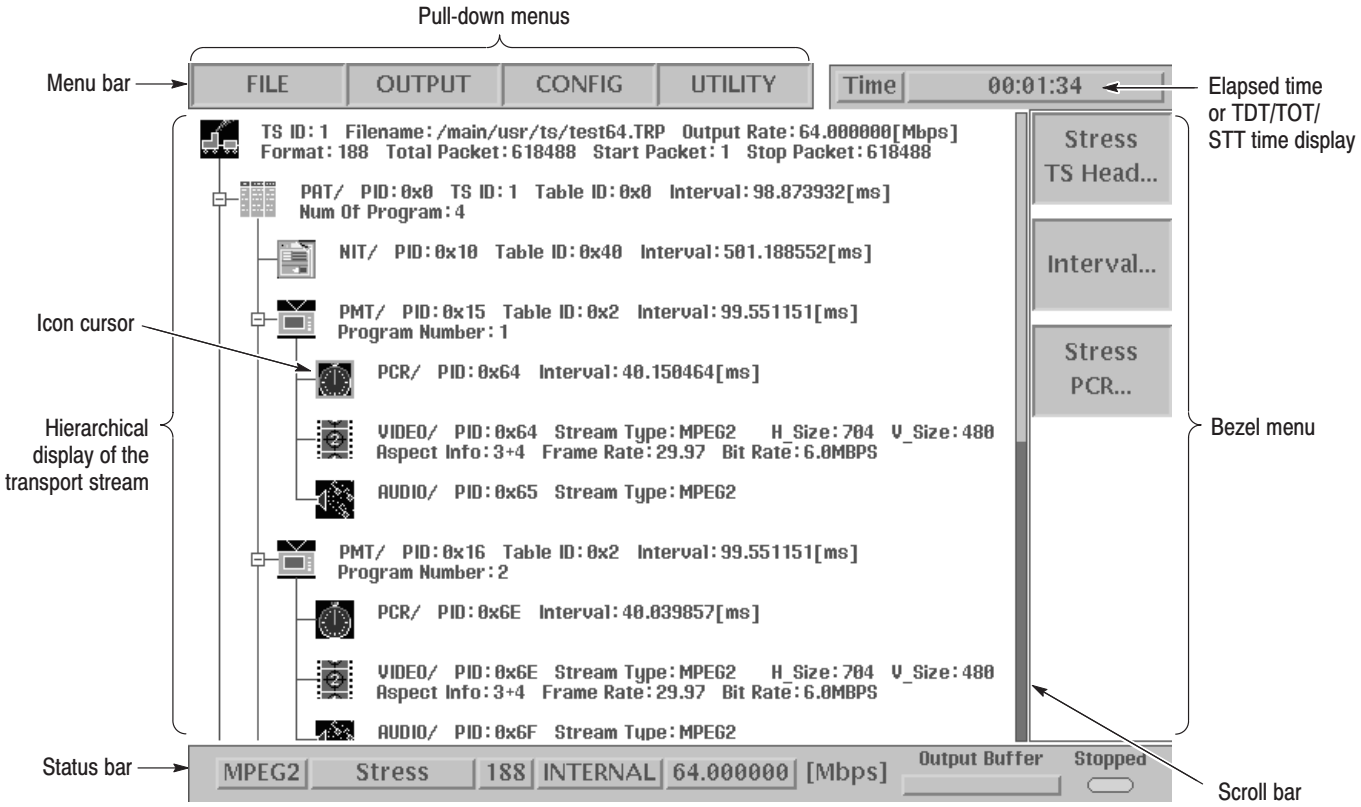


Figure 2-3: Elements of the menu system

Pull-down Menus

The pull-down menus are displayed in the Menu bar at the top of the screen. You can operate these menus using the front panel MENU button, the right and left control buttons, the arrow buttons, and the rotary knob (see Figure 2-4).

Accessing Pull-down Menu Commands. The MENU button toggles display control between the Icon cursor (used to select icons in the hierarchy display) and the pull-down menus. When the Icon cursor is enabled (displayed), press the MENU button to enable the pull-down menus. When the pull-down menus are enabled or displayed, press the MENU button to close any open pull-down menu and to enable (display) the Icon cursor.

When the pull-down menus are enabled, the Icon cursor is not displayed and the currently selected pull-down menu name is highlighted in the Menu bar. Use the arrow buttons to select (highlight) the desired pull-down menu name. Press the left or right control buttons to open the selected menu (see Figure 2-5).

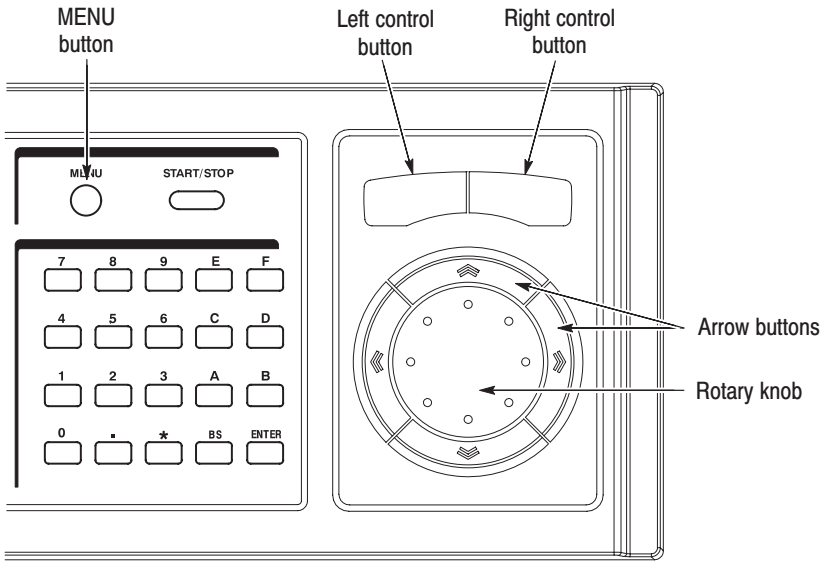


Figure 2-4: Front panel showing the pull-down menu controls

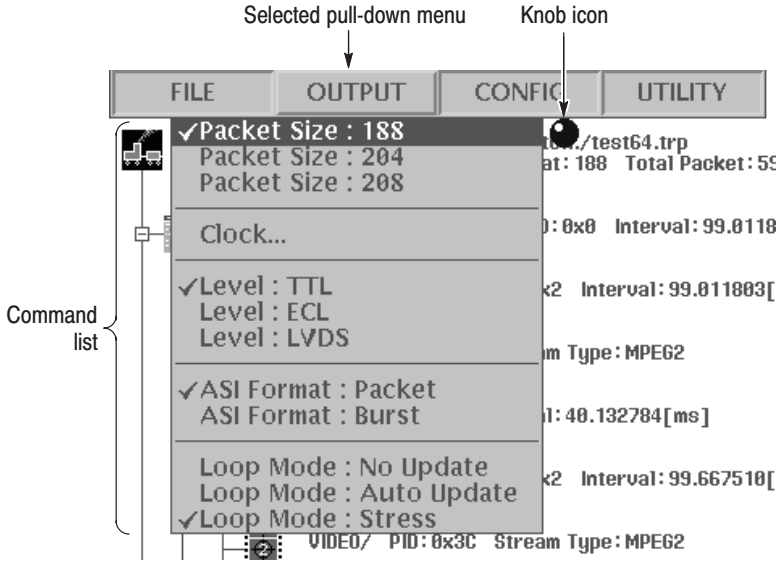


Figure 2-5: Example of a displayed pull-down menu

When a pull-down menu is displayed, the knob icon is displayed at the upper-right side of the command list. The knob icon represents the capability of the rotary knob to move the highlighting (selecting) bar through the command list. You can also move through the command list using the arrow buttons. Press the left control button or the OK bezel button to execute the highlighted command.

Display States of the Pull-down Menu Commands. The pull-down menu commands can have the following two display states as shown in Figure 2-6:

- A command followed by "..." indicates that a dialog box will open after you execute the command.
- A command preceded by a check mark (✓) represents the selected command in a command list subsection. You can select only one command at a time in a subsection, which is represented by a separation line in the command list.

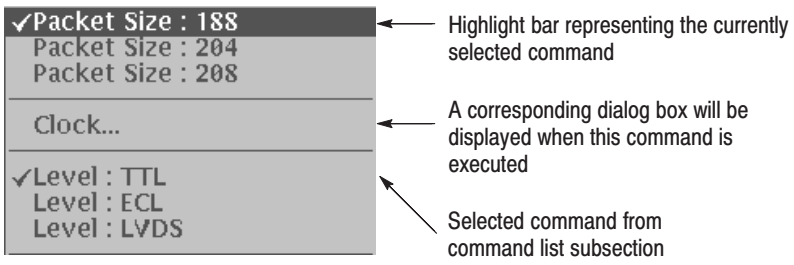


Figure 2-6: Display states of the pull-down menu commands

Bezel Menu

The Bezel menu displays a variety of commands. The commands change to correspond to the transport stream item selected by the Icon cursor in the hierarchy display, or to correspond to functions in a displayed dialog box.

Accessing Bezel Menu Commands. The Bezel menu appears at the right side of the screen. When you move the Icon cursor through the hierarchy items in the display, the Bezel menu commands change to correspond with the selected transport stream item. Select the desired Bezel menu command by pressing the associated bezel button (see Figure 2-7).

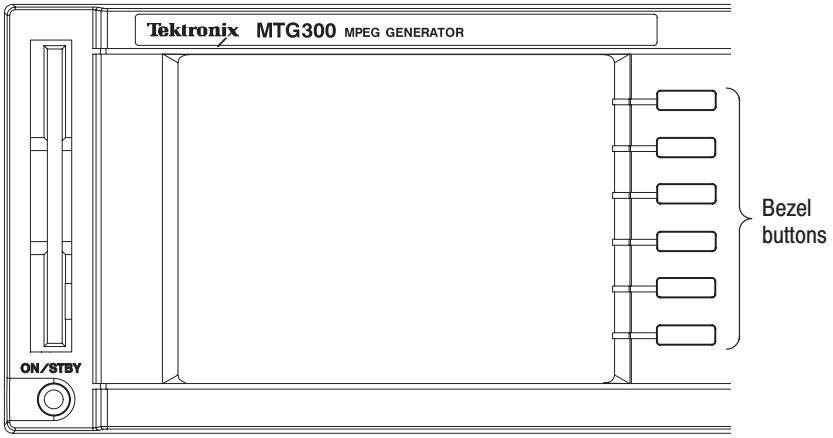


Figure 2-7: Front panel showing the Bezel menu controls

Display States of the Bezel Menu Commands. The Bezel menu commands can have the three display states shown in Table 2-3.

Table 2-3: Display states of the Bezel menu commands

Menu command	Description
Reset Replace	Pressing the associated bezel button will execute the displayed function immediately.
Stress PCR...	Pressing the associated bezel button will display the corresponding dialog box. A menu command followed by "..." indicates that a dialog box will open after you execute the command.
Del Packet Inactive Active	Pressing the associated bezel button will toggle the selected state of the function. In this example, the highlight bar represents that the Delete Packet function is set to Inactive. The function will toggle to Active if you press the associated bezel button.

Numeric Input

You can enter numeric values in displayed dialog boxes by using the hexadecimal keypad or by using the rotary knob.

Numeric Input Using the Hexadecimal Keypad. Perform the following procedure to input numeric values. Figure 2-8 shows the hexadecimal keypad.

1. Select the numeric parameter you want to change in an open dialog box.
2. Input the desired parameter value using the numeric keys on the keypad, and then press the keypad **ENTER** key.
3. Press the **Apply** or **OK** bezel button associated with the dialog box for your value changes to take effect.

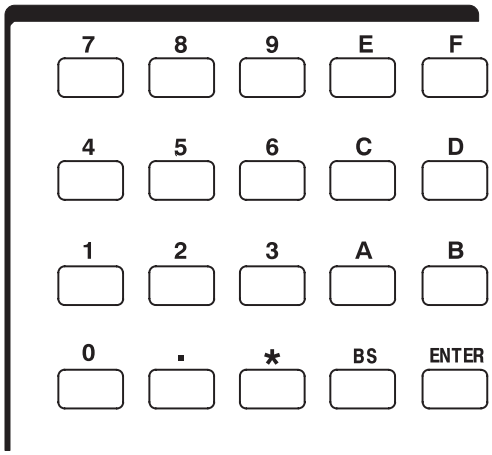


Figure 2-8: Hexadecimal keypad

Numeric Input Using the Rotary Knob. The knob icon is displayed next to a selected dialog box parameter when you can use the rotary knob to change the parameter value. Figure 2-9 shows a dialog box that can use the rotary knob to enter numeric values.

You can use the rotary knob to change the value of the numeric digit indicated by the underscore character. Use the arrow buttons to select any digit value to change with the knob. Rotating the knob to the left decreases the value and rotating it to the right increases the value.

You do not need to use the front panel ENTER key to confirm a value when using the rotary knob to change a value. The input value is confirmed automatically without pressing the ENTER key.

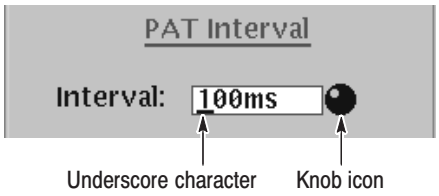


Figure 2-9: Dialog box showing knob icon and underscore character

Perform the following procedure to change a value using the rotary knob:

1. Select the numeric parameter you want to change in an open dialog box.
2. Use the left and right arrow buttons to move the underscore character to the digit value you want to modify.
3. Change the value by turning the rotary knob.

Text Input

Text input is required to enter the names for new folders and for entering text for other dialog box parameters. When text input is required, the MPEG generator automatically brings up a dialog box such as the one shown in Figure 2-10.

Perform the following procedure to enter text input:

1. Use the rotary knob to highlight the desired character in the letter/digit matrix, and then press the front-panel **ENTER** button enter the character in the text box.
2. Continue as in step 1 until the name is entered in the text box. Use the front-panel **BS** (back space) key to erase incorrect input. The position where the character will be inserted is indicated with an input cursor (|). Use the left and right arrow buttons to change the position of the input cursor.
3. After you enter all of the desired characters, press the **OK** bezel button to complete the text entering process. Press the **Cancel** bezel button to cancel text input and return to the previous display.

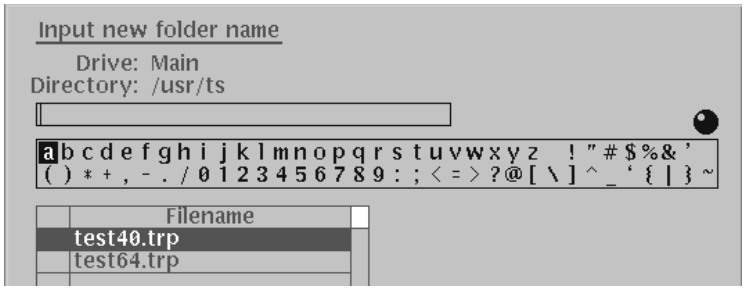


Figure 2-10: Dialog box for text input

Pop-up Message Box

The MPEG generator displays a pop-up message box that prompts you to confirm operations that will be difficult to recover from. An example of a pop-up message box is shown in Figure 2-11, which shows the message box for confirming that you want to defragment the TS drive. Press the **OK** bezel button to execute the operation displayed in the box. Press the **Cancel** bezel button to cancel the operation and return to the state prior to selecting the menu command that displayed the message box.

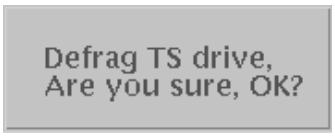


Figure 2-11: Pop-up message box

Output Loop Modes

The MPEG generator continuously outputs a transport stream using one of three user-selected looping methods: No Update, Auto Update, or Stress (MTG300 only). You can set the output loop mode using the Output pull-down menu.

NOTE*. If any consistency error is included in the output transport stream, only the Auto Update and Stress (MTG300 only) loop modes can be selected.*

No Update Mode

In the No Update loop mode, the MPEG generator outputs the transport stream with no changes allowed except setting the start packet and stop packet of the transport stream. Time information values are not updated. You cannot make any changes to the transport stream items and the Bezel menu functions are disabled except for the TS Item menu where you set the start and stop packets for the transport stream.

Auto Update Mode

In the Auto Update loop mode, you can change the following timing values: PCR (Program Clock Reference), continuity_counter, PTS (Presentation Time Stamp) / DTS (Decoding Time Stamp), and TDT (Time and Data Table) / STT (System Time Table).

Stress Mode (MTG300 Only)

The Stress loop mode is only available with the MTG300 MPEG Generator. In the Stress loop mode, all of the real-time transport stream stress functions are available.

Theory of Operation

This section describes the basic operation of the major circuit blocks or modules in the MPEG generator. The *Diagrams* section, beginning on page 9-1, includes a block diagram and an interconnect diagram. Figure 9-1 shows the modules and functional blocks of the MPEG generator. Figure 9-2 shows how the modules interconnect.

A10 Main Board

The A10 Main board consists of the following seven blocks.

Hard Disk Controller (SCSI HDD X 2)

This block consists of two SCSI controllers, two 1 MB SRAMs, HDC_CPU (SH-3) and the peripheral circuit, and a FIFO buffer to transfer data. Since the SCSI controllers are connected to the Ultra Wide SCSI disks in single end, this provides a maximum data transfer rate of 20 MW/s (40 MB/s) X 2. The data read from the SCSI disks is transferred to the SRAM and then transferred to the Change Packet block through the FIFO buffer. The SRAM can be accessed from the PCI or HDC_CPU. When these disks are accessed, the HDD LED on the front panel lights.

Change Packet

This block consists of the CP_CPU (SH-3) and peripheral circuit, FPGA, and 4 MB SRAM for data insertion. It executes packet operation. There are two 64X32-bit buffers in the FPGA and they can receive packets from the hard disk controllers alternately. The content of the packets is examined by the CP_CPU, and then the contents are changed. In addition, the 10 Hz pulse produced by the 27 MHz clock is input into the CP_CPU, it is used to insert the TDT or STT packets.

Change Word

This block consists of the CW_CPU (SH-3) and peripheral circuit, and FPGA. It executes operation for the internal value of transport stream packets. There are two 64X32-bit buffers in the FPGA, and they can receive packets from the hard disk controllers alternately. The content of the packets is examined by the CW_CPU, and then the contents are changed. In addition, the 10 Hz pulse produced by the 27 MHz clock is input into the CW_CPU, which is used to renew the time information of the TDT or STT.

Output Buffer

This block forms a large FIFO buffer with the 1 MB SRAM and FPGA. It converts the burst data to constant data and transfers it to the next circuit block. It also multiplexes 32-bit/word data to 8-bit/word data. After data output is

started, the BUFFER LED on the front panel lights, unless the output buffer empty.

Inserter This block updates the PCR and PTS/DTS values, interfaces the peripheral circuit of the output buffer/clock and the CPU module, and converts parallel format data to SSI format data. For updating the PCR value, when the PCR packet is detected, the value of the packet is added to the value of the 27 MHz counter in the FPGA.

Output This block outputs the control signals produced by the PLL section, such as clock, the data signal from the inserter, PSYNC, and DVALID in single-end or differential 50 Ω. These signals are converted to TTL, ECL, or LVDS levels. This block also produces SSI and ASI signals based on DATA signals from inserter, control signals, and the 27 MHz system reference signal, and outputs them at 75 Ω. These output signals can be High Z under control of the CPU.

Clock This block generates four types of clock signals and supplies them to the A10 Main board: 27 MHz clock signal as a system reference, 1–64 MHz clock signal, [(1–64) * 2] MHz clock signal, and [(1–64) / 8] MHz clock signal. To generate these four types of clock signals, this block has three operation modes: Internal Reference mode, External Reference mode and External Clock mode. When the External Reference or External Clock mode is selected from the menu, the EXT LED on the front panel lights. The PLL LED also lights when the PLL is locked.

CPU Unit

The CPU Unit consists of the CPU board, A20 Interface board, LAN board, and backplane.

Backplane The backplane has five PCI bus slots. This board receives power from the A40 MISC (Power Distribution & Interface) board and routes it to each board.

CPU Board The first and second slots of the Backplane contain the CPU board, which is based on an Intel Pentium processor and runs Vx Works. The CPU board controls the user interface, display, each hardware block, and the downloading and uploading of data through the Ethernet interface. This board also has a flash disk, a 3.5 inch floppy disk drive, and a IDE hard disk drive as peripheral devices.

A20 PCI Interface Board The third slot of the Backplane has the PCI Interface board that consists of the PCI interface chip and its peripheral circuit, and an FPGA that works as an

address decoder. The PCI Interface board provides the communication between the CPU module and A10 board and A40 board.

LAN Board The fourth slot of the Backplane contains the Ethernet LAN interface board. The MPEG generator has a 100 BASE-T/10 BASE-T connector on the rear panel.

A30 Front Panel Board

The A30 Front Panel board consists of the CPU to create key codes, rubber contact switches, rotary encoder, and four LEDs. The key codes are transferred to the CPU unit with the keyboard control CPU through the RS-232C interface.

A35 Power Switch

The power switch is a push-type switch with ground closure. It is connected to the A40 MISC (Power Distribution & Interface) board through the A30 Front Panel board.

A40 MISC (Power Distribution & Interface) Board

The A40 MISC (Power Distribution & Interface) board distributes the +3.3 V and –5 V power supply voltage derived from the +5 V and + 12V power supplied from the Power Supply. It supplies them to the each board and module, fans, and hard disk drives. It also provides interface between the LCD module, floppy disk drive, A30 Front Panel board and the CPU unit.

A50 SCSI Termination Boards

The SCSI bus termination for the Data HDDs consists of the two termination regulators and termination resistors.

Power Supply

The Power Supply derives the +5V and +12 V power supply voltages from the AC line and supplies them to the A40 MISC (Power Distribution & Interface) board.

Performance Verification

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

- The MPEG generator must be operating in an environment that is within the operating limits described in Table 1-5 on page 1-10.
- The MPEG generator and test equipment must have had a warm-up period of at least 20 minutes.

Equipment and Test Signals Required

Table 4-1 lists the test equipment required to perform all of the performance verification procedures. The table identifies examples of recommended equipment and lists the required precision where applicable. If you substitute other test equipment for the examples listed, the equipment must meet or exceed the listed tolerances.

Table 4-1: Equipment required for performance verification

Item	No.	Minimum requirements	Recommended equipment
Frequency counter	1	Frequency range: 0.1 Hz to 1250 MHz Precision: 7 digits or higher	ANRITSU MF 1603A
Signal generator	1	Frequency: 27 MHz ±1 ppm Amplitude: 0.0 dBm	HP 8648
Oscilloscope	1	Bandwidth: 1 GHz or higher	Tektronix TDS784D
MPEG analyzer	1	Real Time Analyzer, Deferred Time Analyzer, and Data Store Administrator applications	Tektronix MTS205 or MTS215 option SS
75 Ω to 50 Ω minimum loss attenuator	1	Bandwidth: 1 GHz Amplitude precision: –3 dB	Tektronix AMT75
Probe	1	X 1	Tektronix P6101B
BNC cable	1	Impedance: 50 Ω Length: 42 inches	Tektronix part no. 012-0057-01
BNC cable	1	Impedance: 75 Ω Length: 42 inches	Tektronix part no. 012-0074-00
N-to-BNC adapter	1		Tektronix part no. 103-0045-00
Custom interface cable	1	Type: 9-pin, D-type (male) – to – 25-pin, D-type (male), see Figure 4-1 Length: 1 m to 2 m (as needed)	Custom interface cable, see Figure 4-1.
Parallel interface cable	1	25-pin, D-type, twisted pair	Tektronix part no. 174-3882-01, (supplied with the MPEG generator)

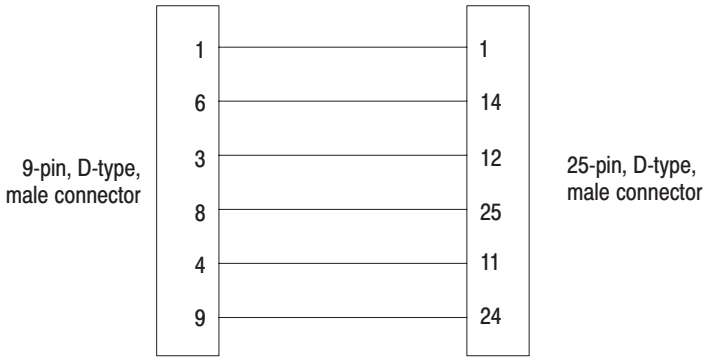


Figure 4-1: Custom cable with 9-pin and 25-pin, D-type connectors

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

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

File name	Performance verification tests
test40.trp	SSI Output and External Clock Input
test64.trp	Internal Clock Frequency, ASI Output, Parallel Output, Serial Output, and External Reference Input

Procedures

The following conventions are used in the performance verification procedures:

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

***NOTE**. Before you perform the performance verification procedures, be sure that the MPEG generator is operating in an environment that is within the operating limits described in Table 1-5 on page 1-10.*

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

The performance verification procedures appear in the following order:

1. Internal clock frequency
2. ASI output
3. SSI output
4. Parallel output
5. Serial output
6. External clock input
7. External reference input

Internal Clock Frequency

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

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

Perform the following procedure to verify the internal clock frequency of the MPEG generator:

1. Connect the probe to the input of the frequency counter, and then attach the probe tip to **pin 1** of the ECL/TTL/LVDS OUT connector on the MPEG generator as shown in Figure 4-2.
2. Set the frequency counter to the frequency measurement mode (if necessary). and then set the Gate Time to > 0.2 s.

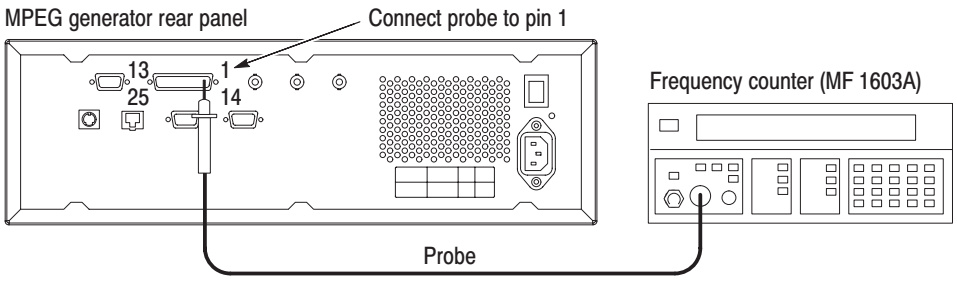


Figure 4-2: Equipment connection for verifying the internal clock frequency

3. Open the test64.trp file on the MPEG generator.
   a. Select **Open TS File...** from the **FILE** pull-down menu.
   b. In the resulting **Select TS File** dialog box, select the **test64.trp** file, and then press the **OK** bezel button.
4. Press the **START/STOP** button on the MPEG generator to start the signal output of the test64.trp file.
5. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, and HDD.
6. Set the frequency counter to trigger on the input, and then confirm that the displayed frequency is within the range of 7.999992 MHz to 8.000008 MHz.
7. Press the **START/STOP** button on the MPEG generator to stop the signal output, and then remove the probe tip from the ECL/TTL/LVDS OUT connector.

ASI Output

This test verifies that transport stream data is output correctly from the ASI OUT connector on the MPEG generator. The following equipment and MPEG test signal is required for this test:

- Oscilloscope
- MPEG test system
- 75 Ω BNC cable
- 75 Ω to 50 Ω minimum loss attenuator
- test64.trp MPEG test signal

Perform the following procedure to verify that transport stream data is output correctly from the ASI OUT connector on the MPEG generator:

1. Connect the ASI OUT connector on the MPEG generator to the oscilloscope CH1 input using a 75 Ω BNC cable and the 75 Ω to 50 Ω minimum loss attenuator as shown in Figure 4-3.
2. Set the oscilloscope controls as indicated below:

   Displayed channel CH1
   Vertical axis . . . . . 200 mV/div
   Horizontal axis . . . . . 5 ns/div
   Horizontal position . . . . Center
   Record length 500
   Acquire mode . . . . . Sample
   Acquire sequence . . . . . RUN/STOP button only
   Trigger mode . . . . . Auto
   Trigger level . . . . . 0 V
   Trigger source CH1
   Trigger position . . . . . 50 %
   Trigger slope . . . . . Rising Edge
   Trigger coupling . . . . . DC
   Display style . . . . . Dots
   Input coupling . . . . . DC
   Input impedance . . . . . 50 Ω
   Measure . . . . . Amplitude

3. Open the test64.trp file on the MPEG generator.
   a. Select **Open TS File...** from the **FILE** pull-down menu.
   b. In the resulting **Select TS File** dialog box, select the **test64.trp** file, and then press the **OK** bezel button.
4. Press the **START/STOP** button on the MPEG generator to start the signal output of the test64.trp file.

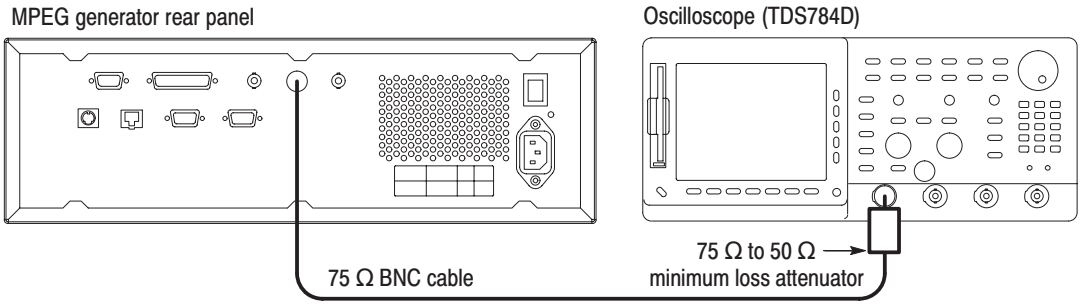


Figure 4-3: Initial equipment connection for verifying the ASI output

5. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, and HDD.
6. Use the oscilloscope to measure that the signal amplitude is within the range of 720 mV to 880 mV.
7. Disconnect the BNC cable from the 75 Ω to 50 Ω minimum loss attenuator on the oscilloscope's input, and then connect the BNC cable to the ASI IN connector on the MPEG test system's Real Time Analyzer as shown in Figure 4-4.
8. Double-click the **Real Time Analyzer** icon in the MPEG test system's Program Group window to start the application.
9. In the Real Time Analyzer window on the MPEG test system, select **Settings...** from the **Configuration** menu to open the Settings window.
10. In the Settings window, select **Hardware Configuration** to open the Hardware Configuration window.
11. In the Hardware Configuration window, click the **Restore Defaults** button, click the **Apply** button, and then select **DVB-PI ASI** as the Input Type.
12. In the Settings window, select **ETR290** to open the ETR290 configuration window.
13. In the ETR290 window, click the **Restore Defaults** button, click the **Apply** button, and then click **OK** to close the Settings window.

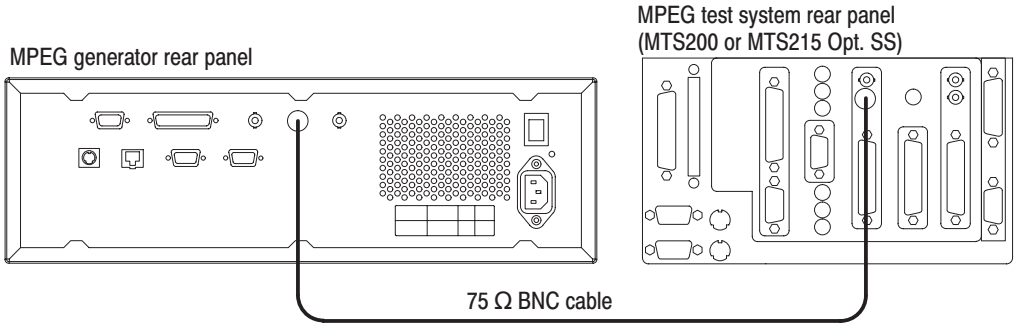


Figure 4-4: Second equipment connection for verifying the ASI output

14. In the Real Time Analyzer window, click the **Start Analysis** toolbar button.

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

16. In the Real Time Analyzer window, click the **Stop Analysis** toolbar button to stop analysis.

17. Press the **START/STOP** button on the MPEG generator to stop the signal output, and then remove the BNC cable from the ASI OUT connector.

SSI Output

This test verifies that transport stream data is output correctly from the SSI OUT connector on the MPEG generator. The following equipment and MPEG test signal is required for this test:

- Oscilloscope
- MPEG test system
- 75 Ω BNC cable
- Parallel interface cable
- 75 Ω to 50 Ω minimum loss attenuator
- test40.trp MPEG test signal

Perform the following procedure to verify that transport stream data is output correctly from the SSI OUT connector on the MPEG generator:

1. Connect the SSI OUT connector on the MPEG generator to the oscilloscope CH1 input using a 75 Ω BNC cable and the 75 Ω to 50 Ω minimum loss attenuator as shown in Figure 4-5.

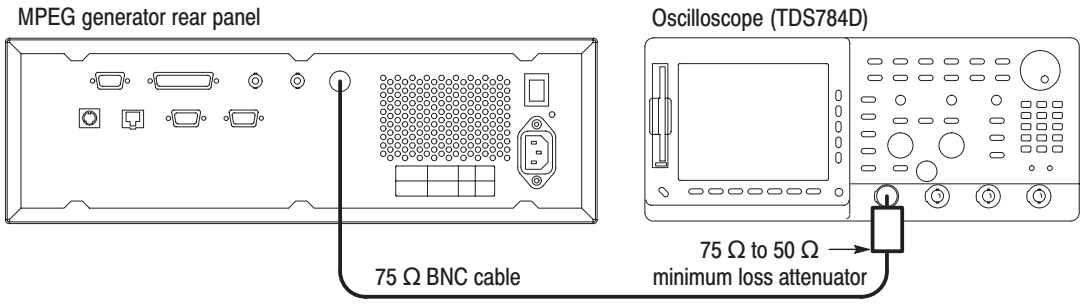


Figure 4-5: Initial equipment connection for verifying the SSI output

2. Set the oscilloscope controls as indicated below (only the horizontal axis setting is different from the setup in the ASI Output test):

Displayed channel CH1
Vertical axis . . . . . 200 mV/div
Horizontal axis . . . . . 10 ns/div
Horizontal position . . . . Center
Record length 500
Acquire mode . . . . . Sample
Acquire sequence . . . . . RUN/STOP button only
Trigger mode . . . . . Auto
Trigger level . . . . . 0 V
Trigger source CH1
Trigger position . . . . . 50 %
Trigger slope . . . . . Rising Edge
Trigger coupling . . . . . DC
Display style . . . . . Dots
Input coupling . . . . . DC
Input impedance . . . . . 50 Ω
Measure . . . . . Amplitude

3. Open the test40.trp file on the MPEG generator.

a. Select **Open TS File...** from the **FILE** pull-down menu.

b. In the resulting **Select TS File** dialog box, select the **test40.trp** file, and then press the **OK** bezel button.

4. Press the **START/STOP** button on the MPEG generator to start the signal output of the test40.trp file.

5. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, and HDD.

6. Use the oscilloscope to measure that the signal amplitude is within the range of 720 mV to 880 mV.

7. Disconnect the BNC cable from the 75 Ω to 50 Ω minimum loss attenuator on the oscilloscope's input, and then connect the BNC cable to the SSI IN connector on the MPEG test system's Real Time Analyzer as shown in Figure 4-6.

8. Use the parallel interface cable to connect the SSI parallel output to the Real Time Analyzer parallel input on the MPEG test system rear panel as shown in Figure 4-6.

9. Double-click the **Real Time Analyzer** icon in the MPEG test system's Program Group window to start the application.

10. In the Real Time Analyzer window on the MPEG test system, select **Settings...** from the **Configuration** menu to open the Settings window.

11. In the Settings window, select **Hardware Configuration** to open the Hardware Configuration window.

12. In the Hardware Configuration window, click the **Restore Defaults** button, click the **Apply** button, and then select **DVB-PI SPI (LVDS//) or ECL/** as the Input Type.

13. In the Settings window, select **ETR290** to open the ETR290 configuration window.

14. In the ETR290 window, click the **Restore Defaults** button, click the **Apply** button, and then click **OK** to close the Settings window.

15. In the Real Time Analyzer window, click the **Start Analysis** toolbar button.

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

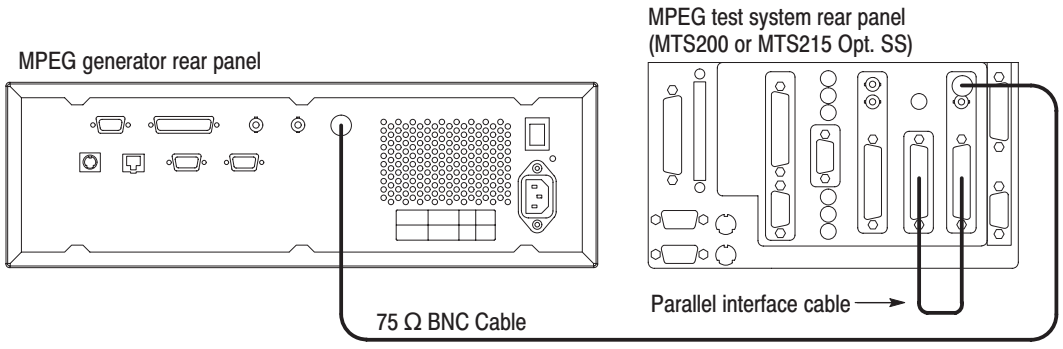


Figure 4-6: Second equipment connections for verifying the SSI output

17. In the Real Time Analyzer window, click the **Stop Analysis** toolbar button to stop analysis.

18. Press the **START/STOP** button on the MPEG generator to stop the signal output, and then remove the BNC cable from the SSI OUT connector.

Parallel Output

This test confirms that transport stream data is output correctly in parallel format from the ECL/TTL/LVDS OUT connector on the MPEG generator. The following equipment and MPEG test signal is required for this test:

- MPEG test system
- Parallel interface cable
- test64.trp MPEG test signal

Perform the following procedure to verify that transport stream data in parallel format is output correctly from the ECL/TTL/LVDS OUT connector on the MPEG generator:

1. Use the parallel interface cable to connect the ECL/TTL/LVDS OUT connector on the MPEG generator to the LVDS/ECL/RS422 Level In connector on the MPEG test system rear panel as shown in Figure 4-7.

2. Open the test64.trp file on the MPEG generator.

   a. Select **Open TS File...** from the **FILE** pull-down menu.

   b. In the resulting **Select TS File** dialog box, select the **test64.trp** file, and then press the **OK** bezel button.

3. Select **Level : ECL** from the **OUTPUT** menu on the MPEG generator, and then press the **OK** bezel button.

4. Select **Interface : Parallel** from the **OUTPUT** menu on the MPEG generator, and then press the **OK** bezel button.

5. Press the **START/STOP** button on the MPEG generator to start the signal output of the test64.trp file.

6. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, and HDD.

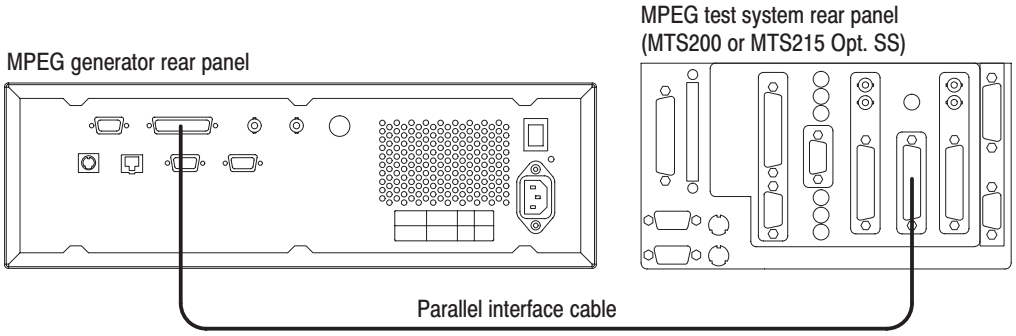


Figure 4-7: Equipment connection for verifying the parallel output

7. Double-click the **Real Time Analyzer** icon in the MPEG test system's Program Group window to start the application.
8. In the Real Time Analyzer window on the MPEG test system, select **Settings...** from the **Configuration** menu to open the Settings window.
9. In the Settings window, select **Hardware Configuration** to open the Hardware Configuration window.
10. In the Hardware Configuration window, click the **Restore Defaults** button, click the **Apply** button, and then select **DVB-PI SPI (LVDS//) or ECL//** as the Input Type.
11. In the Settings window, select **ETR290** to open the ETR290 configuration window.
12. In the ETR290 window, click the **Restore Defaults** button, click the **Apply** button, and then click **OK** to close the Settings window.
13. In the Real Time Analyzer window, click the **Start Analysis** toolbar button.
14. Verify that the Hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the transmission rate is 64 Mbps and that the transport stream packet size is 188 bytes.
15. In the Real Time Analyzer window, click the **Stop Analysis** toolbar button to stop analysis.
16. Press the **START/STOP** button on the MPEG generator to stop the signal output.

Serial Output

This test confirms that transport stream data is output correctly in serial format from the ECL/TTL/LVDS OUT connector on the MPEG generator. The following equipment and MPEG test signal is required for this test:

- MPEG test system
- Parallel interface cable
- test64.trp MPEG test signal

Perform the following procedure to verify that transport stream data in parallel format is output correctly from the ECL/TTL/LVDS OUT connector on the MPEG generator:

1. Use the parallel interface cable to connect the ECL/TTL/LVDS OUT connector on the MPEG generator to the ECL PARALLEL/SERIAL I/O connector on the MPEG test system rear panel as shown in Figure 4-8.
2. Open the test64.trp file on the MPEG generator.
   a. Select **Open TS File...** from the **FILE** pull-down menu.
   b. In the resulting **Select TS File** dialog box, select the **test64.trp** file, and then press the **OK** bezel button.
3. Select **Level : ECL** from the **OUTPUT** menu on the MPEG generator, and then press the **OK** bezel button.
4. Select **Interface : Serial** from the **OUTPUT** menu on the MPEG generator, and then press the **OK** bezel button.
5. Press the **START/STOP** button on the MPEG generator to start the signal output of the test64.trp file.
6. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, and HDD.

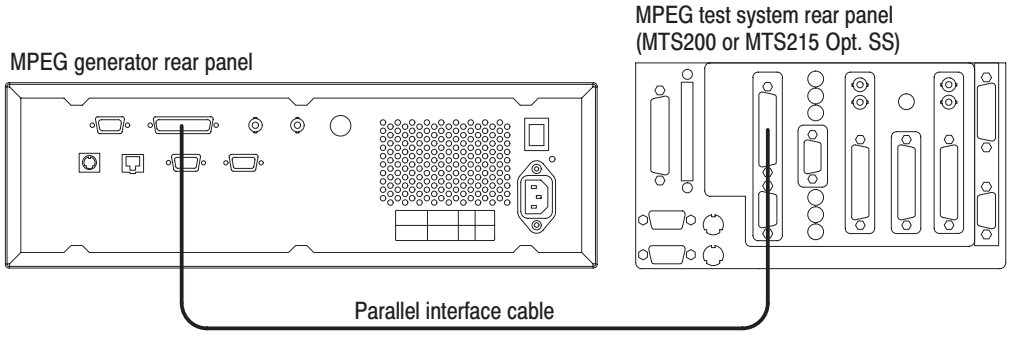


Figure 4-8: Equipment connection for verifying the serial output

7. Double-click the **Data Store Administrator** icon in the MPEG test system's Program Group window to start the application.

8. In the Data Store Administrator window, click the **A** (acquisition) command button to open the Acquisition settings window.

9. In the Acquisition settings window, enter the following selections:

   Board File . . . test.trp (or unique file name)
   Partition . . . . Single shot (this selection appears if the hard drive of the MPEG test system is partitioned)
   Size . . . . . 10,000,000 (bytes)
   Synchronization Lock . . . . . Psync
   Port . . . . . Serial ECL
   MSB First box Check (this selection appears after the port is set to Serial ECL)

10. In the Acquisition settings window, click **Start** to start the acquisition.

11. Click **OK** after the "Transfer is finished" message appears.

12. Select **Exit/Quit** from File menu or click the close box in the upper-right corner of the application window to exit the Data Store Administrator application.

13. Double-click the **Deferred Time Analyzer** icon in the MPEG test system's Program Group window to start the application.

14. In the Deferred Time Analyzer window, select **Open** from the **File** menu or click the **Open** command button in the upper toolbar to open the Open dialog box.

15. Select the **C:\Carb0\mono\test.trp** (or your unique file name) file in the Open dialog box, and then click **Open** to open the test.trp file.

16. In the Deferred Time Analyzer window, select **Consistency Check** from the **Analysis** menu to check for consistency within the stream file.

17. Verify that the **No Error Found** dialog box appears after the stream file is checked by the Deferred Time Analyzer application.

18. Press the **START/STOP** button on the MPEG generator to stop the signal output, and then remove the parallel interface cable from the rear panel.

External Clock Input

This test confirms that the external clock input (ECL CONTROL input) on the MPEG generator is functioning correctly. The following equipment and MPEG test signal is required for this test:

- MPEG test system
- 75 Ω BNC cable
- Custom 9-pin to 25-pin, D-type interface cable
- test40.trp MPEG test signal

Perform the following procedure to verify that the external clock input (ECL CONTROL input) on the MPEG generator is functioning correctly:

1. Use the 75 Ω BNC cable to connect the ASI OUT connector on the MPEG generator to the ASI IN connector on the rear panel of the MPEG test system as shown in Figure 4-9.
2. Use the custom interface cable (see Figure 4-1 on page 4-2) to connect the ECL CONTROL connector on the MPEG generator to the ECL PARALLEL/SERIAL I/O connector on the MPEG test system rear panel as shown in Figure 4-9.
3. Open the test40.trp file on the MPEG generator.
   a. Select **Open TS File...** from the **FILE** pull-down menu.
   b. In the resulting **Select TS File** dialog box, select the **test40.trp** file, and then press the **OK** bezel button.

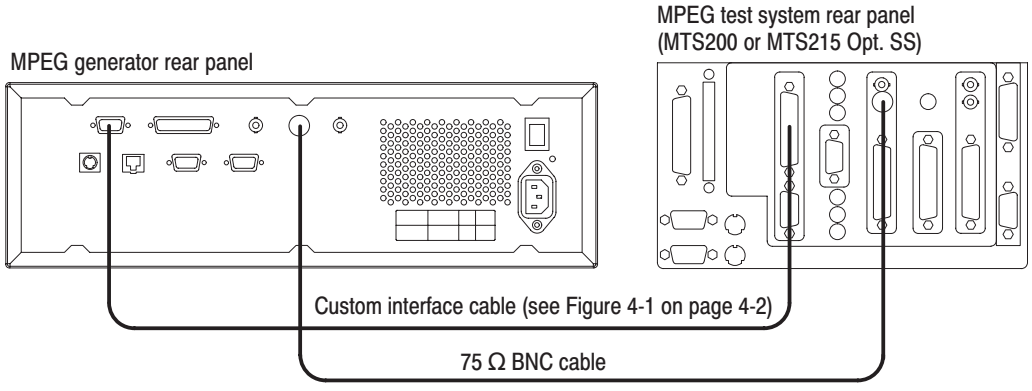


Figure 4-9: Equipment connections for verifying the external clock input

4. Select **Clock...** from the **OUTPUT** menu on the MPEG generator to open the Clock dialog box.

5. Select **EXT CLOCK** in the Clock dialog box, and then press the **OK** bezel button.

6. Select **Interface : Serial** from the **OUTPUT** menu on the MPEG generator, and then press the **OK** bezel button.

7. Double-click the **Data Store Administrator** icon in the MPEG test system's Program Group window to start the application.

8. In the Data Store Administrator window, select any file from the File information list, and then right-click to open the shortcut menu.

9. Click **Generation** to open the Generation settings window.

10. In the Generation settings window, make the following selections:

    Port . . . . . Serial ECL
    Frequency . . . 40,000,000
    Loop . . . . . Check (select)

11. In the Generation settings window, click **Start** to begin signal generation.

12. Press the **START/STOP** button on the MPEG generator to start the signal output of the test40.trp file.

13. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, EXT, and HDD.

14. Double-click the **Real Time Analyzer** icon in the MPEG test system's Program Group window to start the application.

15. In the Real Time Analyzer window on the MPEG test system, select **Settings...** from the **Configuration** menu to open the Settings window.

16. In the Settings window, select **Hardware Configuration** to open the Hardware Configuration window.

17. In the Hardware Configuration window, click the **Restore Defaults** button, click the **Apply** button, and then select **DVB-PI ASI** as the Input Type.

18. In the Settings window, select **ETR290** to open the ETR290 configuration window.

19. In the ETR290 window, click the **Restore Defaults** button, click the **Apply** button, and then click **OK** to close the Settings window.

20. In the Real Time Analyzer window, click the **Start Analysis** toolbar button.
21. Verify that the Hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the transmission rate is 40 Mbps and that the transport stream packet size is 188 bytes.
22. Select **Interrupt transfer** from the **Acq/Gen** menu in the Data Store Administrator window stop the signal generation.
23. In the Real Time Analyzer window, click the **Stop Analysis** toolbar button to stop analysis.
24. Press the **START/STOP** button on the MPEG generator to stop the signal output.

External Reference Input

This test confirms that the EXT 27 MHz REFERENCE IN input on the MPEG generator is functioning correctly. The following equipment and MPEG test signal is required for this test:

- MPEG test system
- Signal generator
- 75 Ω BNC cable
- 50 Ω BNC cable
- N-to-BNC adapter
- test64.trp MPEG test signal

Perform the following procedure to verify that the EXT 27 MHz REFERENCE IN input on the MPEG generator is functioning correctly:

1. Use the 75 Ω BNC cable to connect the ASI OUT connector on the MPEG generator to the ASI IN connector on the rear panel of the MPEG test system as shown in Figure 4-10.
2. Use the 50 Ω BNC cable and the N-to-BNC adapter to connect the EXT 27 MHz REFERENCE IN connector on the MPEG generator to the OUTPUT connector on the signal generator as shown in Figure 4-10.
3. Set the signal generator output for a 27.0000 MHz, 0.0 dBm signal.
4. Open the test64.trp file on the MPEG generator.
   a. Select **Open TS File...** from the **FILE** pull-down menu.
   b. In the resulting **Select TS File** dialog box, select the **test64.trp** file, and then press the **OK** bezel button.

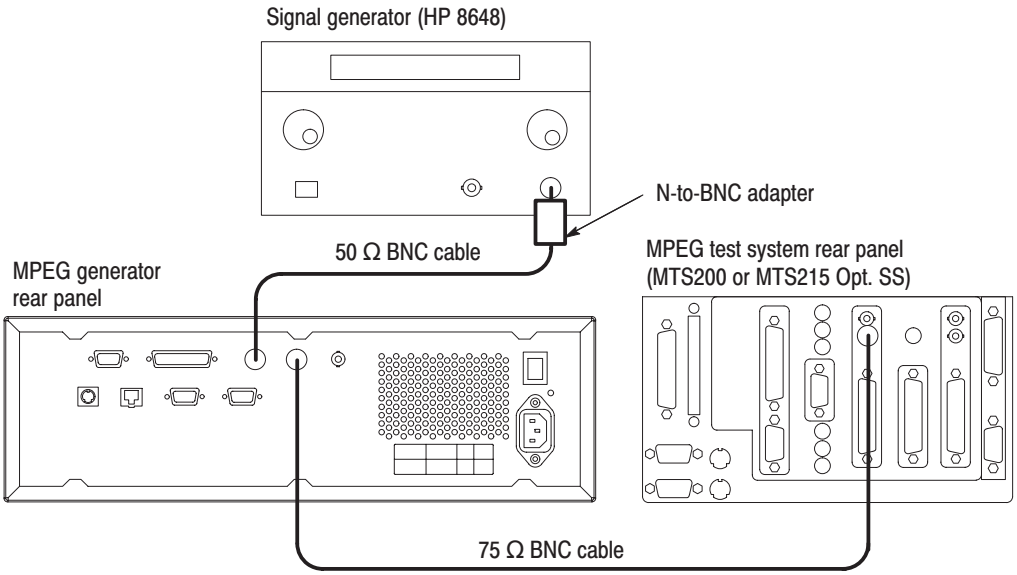


Figure 4-10: Equipment connections for verifying the external reference input

5. Select **Clock...** from the **OUTPUT** menu on the MPEG generator to open the Clock dialog box.
6. Select **EXT REF** in the Clock dialog box, and then press the **OK** bezel button.
7. Press the **START/STOP** button on the MPEG generator to start the signal output of the test64.trp file.
8. Verify that the following LEDs on the MPEG generator's front panel are illuminated: PLL, BUFFER, EXT, and HDD.
9. Double-click the **Real Time Analyzer** icon in the MPEG test system's Program Group window to start the application.
10. In the Real Time Analyzer window on the MPEG test system, select **Settings...** from the **Configuration** menu to open the Settings window.
11. In the Settings window, select **Hardware Configuration** to open the Hardware Configuration window.
12. In the Hardware Configuration window, click the **Restore Defaults** button, click the **Apply** button, and then select **DVB-PI ASI** as the Input Type.
13. In the Settings window, select **ETR290** to open the ETR290 configuration window.
14. In the ETR290 window, click the **Restore Defaults** button, click the **Apply** button, and then click **OK** to close the Settings window.

15. In the Real Time Analyzer window, click the **Start Analysis** toolbar button.
16. Verify that the Hierarchic view is displayed on the screen and that no error messages appear. In addition, verify that the transmission rate is 64 Mbps and that the transport stream packet size is 188 bytes.
17. In the Real Time Analyzer window, click the **Stop Analysis** toolbar button to stop analysis.
18. Press the **START/STOP** button on the MPEG generator to stop the signal output.

Adjustment Procedures

This section contains information needed to adjust the MPEG generator.

The only adjustment in the MPEG generator is for the clock frequency.

Requirements for Adjustment

Before doing the adjustment, note the following requirements.

Personnel This procedure is only to be performed by trained service technicians.

Warm-Up Period This MPEG generator 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.

Access When adjusting the internal clock frequency, you need to remove the cabinet. For removal and installation procedures for the cabinet, refer to *Cabinet* on page 6-18.

Equipment Required

Table 5-1 lists the equipment required to adjust the internal clock frequency.

Table 5-1: Equipment required

Item	No.	Required precision	Recommended equipment
Frequency counter	1	Frequency range: 0.1 Hz to 1250 MHz Accuracy: < 0.6 ppm	Anritsu MF1603A
Probe	1	X 10	Tektronix P6139A

Clock Frequency Adjustment

Preparation

To perform the clock frequency adjustment, you must first remove the cabinet. For removal and installation procedures for the cabinet, refer to *Cabinet* on page 6-18.

After you have removed the cabinet, find the test point and adjustment pod on the A10 Main board. See Figure 5-1.

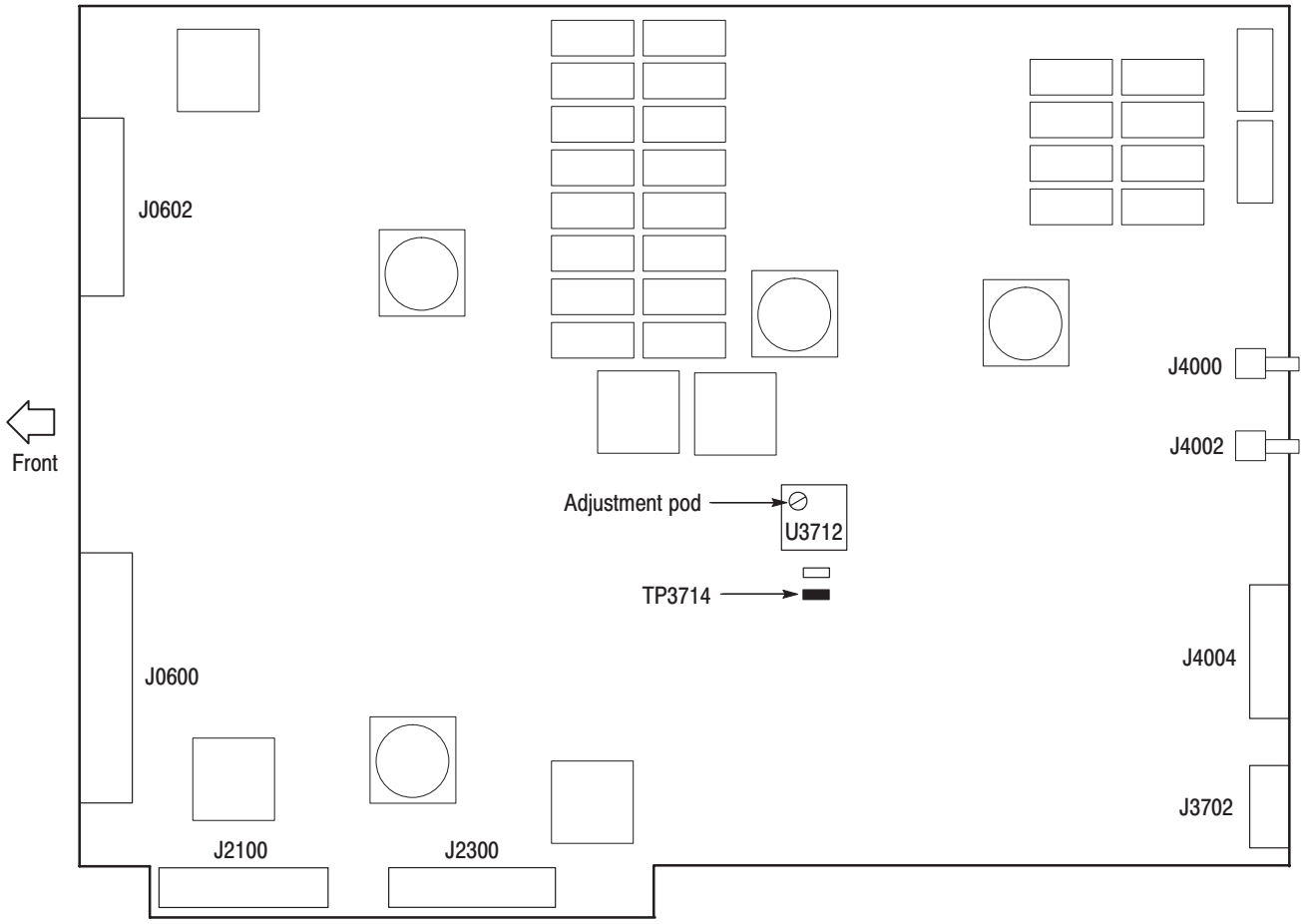


Figure 5-1: A10 Main board view

Adjustment



WARNING. *To avoid serious injury, do not touch exposed connections or components when operating the instrument with the protective enclosure removed. Dangerous potentials exist at several points within the MPEG generator.*

Initial Setups.

Frequency counter:

Function . . . . . Freq A

Gate Time . . . . . > 0.2 s

Procedure.

1. Connect the power cord to the MPEG generator, and power on the instrument. Remember to allow at least 20 minutes for the instrument to warm-up before making any adjustment.
2. Connect the P6139A probe to the frequency counter input (INPUT A).
3. Locate the test point TP3714 and U3712 on the A10 Main board. See Figure 5-1.
4. Adjust the clock frequency:
   a. Attach the probe tip to the TP3714.
   b. Turn the adjustment pod on U3712 clockwise or counterclockwise so that the frequency at the test point is in the range of 26.999984 MHz to 27.000016 MHz (< 0.6 ppm).

Maintenance

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

- *Preparation* — Introduction plus general information on preventing damage to internal modules when doing maintenance.
- *Inspection and Cleaning* — Information and procedures for inspecting the MPEG generator and cleaning its external and internal modules.
- *Removal and Installation Procedures* — Procedures for the removal of defective modules and replacement of new or repaired modules.
- *Troubleshooting* — Information for isolating and troubleshooting failed modules. Included are instructions for operating the MPEG generator's internal diagnostic routines and troubleshooting trees.

Related Maintenance Procedures

The following sections contain information and procedures related to maintenance.

- Section 2, *Operating Information*, covers instructions useful when operating the MPEG generator in order to troubleshoot it. It also details the service strategy and lists options for obtaining maintenance service and for replacing failed modules.
- Section 3, *Theory of Operation*, contains a circuit description at the module or block level.
- Section 4, *Performance Verification*, contains procedures that may be useful in isolating problems to modules by testing the MPEG generator performance.
- Section 5, *Adjustment Procedures*, addresses after repair adjustment and the interval between periodic adjustments. It contains a procedure for adjusting the internal circuits of the MPEG generator.
- Section 9, *Diagrams*, contains a block diagram using individual modules as blocks and an interconnection diagram showing connections between the modules.
- Section 10, *Mechanical Parts List*, lists all field replaceable modules by part number.

Preparation

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



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

Preventing ESD

When performing any service which requires internal access to the MPEG generator, 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. Do service of static-sensitive modules only at a static-free work station.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Handle circuit boards by the edges when possible.
6. Do not slide the modules over any surface.
7. Avoid handling modules in areas that have a floor or work-surface covering capable of generating a static charge.

Susceptibility to ESD

Table 6-1 lists the relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Table 6-1: Relative susceptibility to static-discharge damage

Semiconductor classes	Relative susceptibility levels [1]
MOS or CMOS microcircuits or discrete circuits, or linear microcircuits with MOS inputs (most sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFET	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (least sensitive)	9

[1] **Voltage equivalent for levels (voltage discharged from a 100 pF capacitor through resistance of 100 ohms**):

1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V (est.)
8 = 900 V
9 = 1200 V

Inspection and Cleaning

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

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

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

General Care

The cabinet helps keep dust out of the MPEG generator and should normally be in place when operating the MPEG generator. The MPEG generator's front cover protects the front panel and display from dust and damage. Install it when storing or transporting the MPEG generator.

Inspection and Cleaning Procedures

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



CAUTION. *Avoid the use of chemical cleaning agents that might damage the plastics used in this MPEG generator. Use only deionized water when cleaning the menu buttons or front-panel buttons. Use a 75% ethyl alcohol solution as a cleaner and rinse with deionized water.*

Inspection — Exterior. Inspect the outside of the MPEG generator for damage, wear, and missing parts, using Table 6-2 as a guide. MPEG generators that appear 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 MPEG generator.

Table 6-2: External inspection check list

Item	Inspect for	Repair action
Cabinet, front panel, and cover	Cracks, scratches, deformations, damaged hardware or gaskets.	Repair or replace defective module.
Front-panel knobs	Missing, damaged, or loose knobs.	Repair or replace missing or defective knobs.
Connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Repair or replace defective modules. Clear or wash out dirt.
Carrying handle, bail, cabinet feet.	Correct operation.	Repair or replace defective module.
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 MPEG generator exterior, perform the following steps:

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

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

Inspect the internal portions of the MPEG generator for damage and wear, using Table 6-3 as a guide. Defects found should be repaired immediately.



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

Table 6-3: Internal inspection check list

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

Cleaning Procedure — Interior. To clean the MPEG generator 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 isopropyl alcohol (75% solution) 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 MPEG generator may be spray washed using a solution of 75% isopropyl 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 isopropyl 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 MPEG generator.

Removal and Installation Procedures

This subsection contains procedures for removal and installation of all mechanical and electrical modules. Any electrical or mechanical module, assembly, or part listed in Section 10 of this manual is a module.

Preparation

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

This subsection contains the following items:

- Preparatory information that you need to properly perform the procedures that follow.
- List of tools required to remove and disassemble all modules.
- Four module locator diagrams for finding the External modules (see Figure 6-2), Internal modules (see Figure 6-3), Board modules and CPU unit (see Figure 6-4), and Rear panel modules (see Figure 6-5) in the MPEG generator.
- Procedures for removal and reinstallation of the electrical and mechanical modules.
- A disassembly procedure for removal of all the major modules from the MPEG generator at one time and for reassembly of those modules into the MPEG generator. Such a complete disassembly is normally only done when completely cleaning the MPEG generator. (Instructions for doing the actual cleaning are found under *Inspection and Cleaning* at the beginning of this section.)
- Module disassembly procedures.

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

List of Modules

Section 10 lists all modules.

General Instructions

***STOP**. Read these general instructions before removing a module.*

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

If you are removing a module for service, begin by performing the procedure Access Procedure *(page 6-17). By following the instructions in that procedure, you remove the module to be serviced while removing the minimum number of additional modules.*

Summary of Procedures

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

- The *Access Procedure* on page 6-17 first directs you to the procedure(s) (if any) that are required to access the module to be serviced, then it directs you to the procedure to remove that module.

Table 6-4: Summary of procedures

Procedure	Module		Page
Procedures for External Modules	■ Line cord ■ Cabinet	■ Front-panel unit ■ Front-panel assembly	6-18
Procedures for Internal Modules	■ Fan ■ Floppy disk drive ■ Data hard disk drive	■ System hard disk drive ■ Display module ■ Power supply unit	6-25
Procedures for Board Modules and CPU Unit	■ A10 Main board ■ A40 MISC (Power Distribution & Interface board)	■ CPU unit	6-37
Procedures for Rear Panel Modules	■ BNC cable assembly ■ ECL/TTL/LVDS OUT connector	■ BNC connector ■ ECL CONTROL connector	6-44

Equipment Required. Most modules in this MPEG generator can be removed with a screwdriver handle mounted with a size #2, Phillips tip. *Use this tool whenever a procedure step instructs you to remove or install a screw unless a different size screwdriver is specified in that step.* All equipment required to remove and reinstall each module is listed in the first step of its procedure.

Table 6-5: Tools required for module removal

Item No.	Name	Description	Tektronix part number
1	Screwdriver handle	Accepts Phillips-driver bits	
2	#1 Phillips tip	Phillips-driver bit for #1 size screw heads	
3	#2 Phillips tip	Phillips-driver bit for #2 size screw heads	
4	Flat-bladed screwdriver	Screwdriver for removing standard-headed screws	
5	Hex wrench, 0.05 inch	Standard tool	
6	Hex wrench, $^{1}/_{16}$ inch	Standard tool	
7	Open-end wrench, $^{1}/_{2}$ inch	Standard tool	
8	Open-end wrench, $^{5}/_{16}$ inch	Standard tool	
9	Nut driver, $^{1}/_{2}$ inch	Standard tool	
10	Nut driver, $^{1}/_{4}$ inch	Standard tool	
11	Nut driver, $^{5}/_{16}$ inch	Standard tool	
12	Nut driver, 5 mm	Standard tool	
13	Angle-tip tweezers	Standard tool	
14	Needle-nose pliers	Standard tool	

MPEG Generator Orientation

In this manual, procedures refer to “front,” “back,” “top,” etc. of the MPEG generator. Figure 6-1 shows how the sides are referenced.

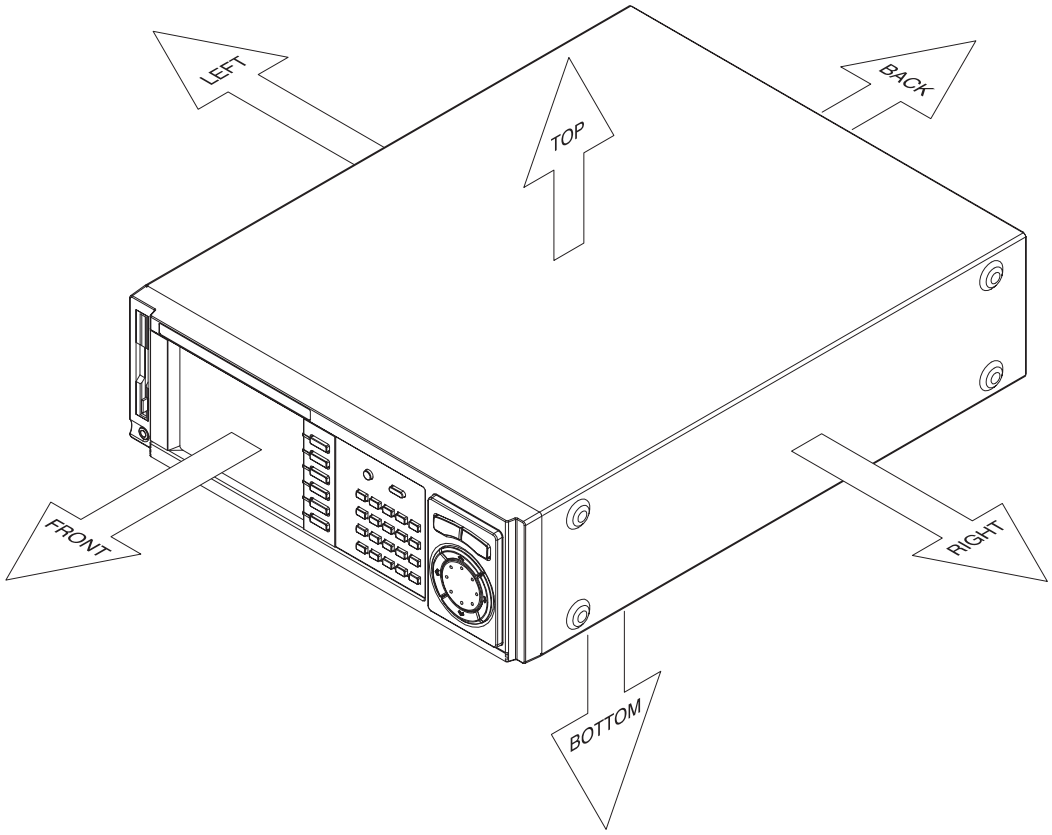


Figure 6-1: MPEG generator orientation

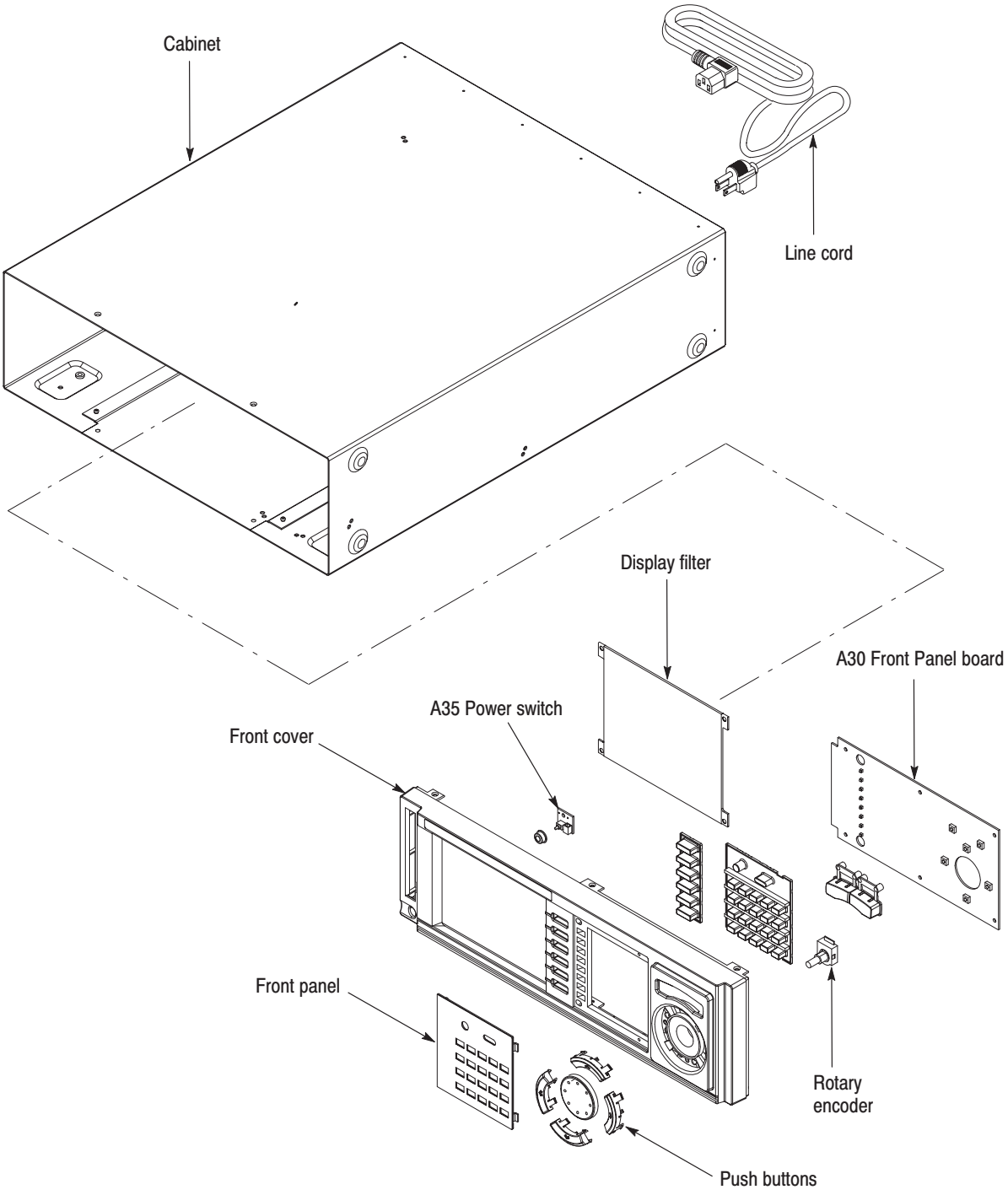


Figure 6-2: External modules

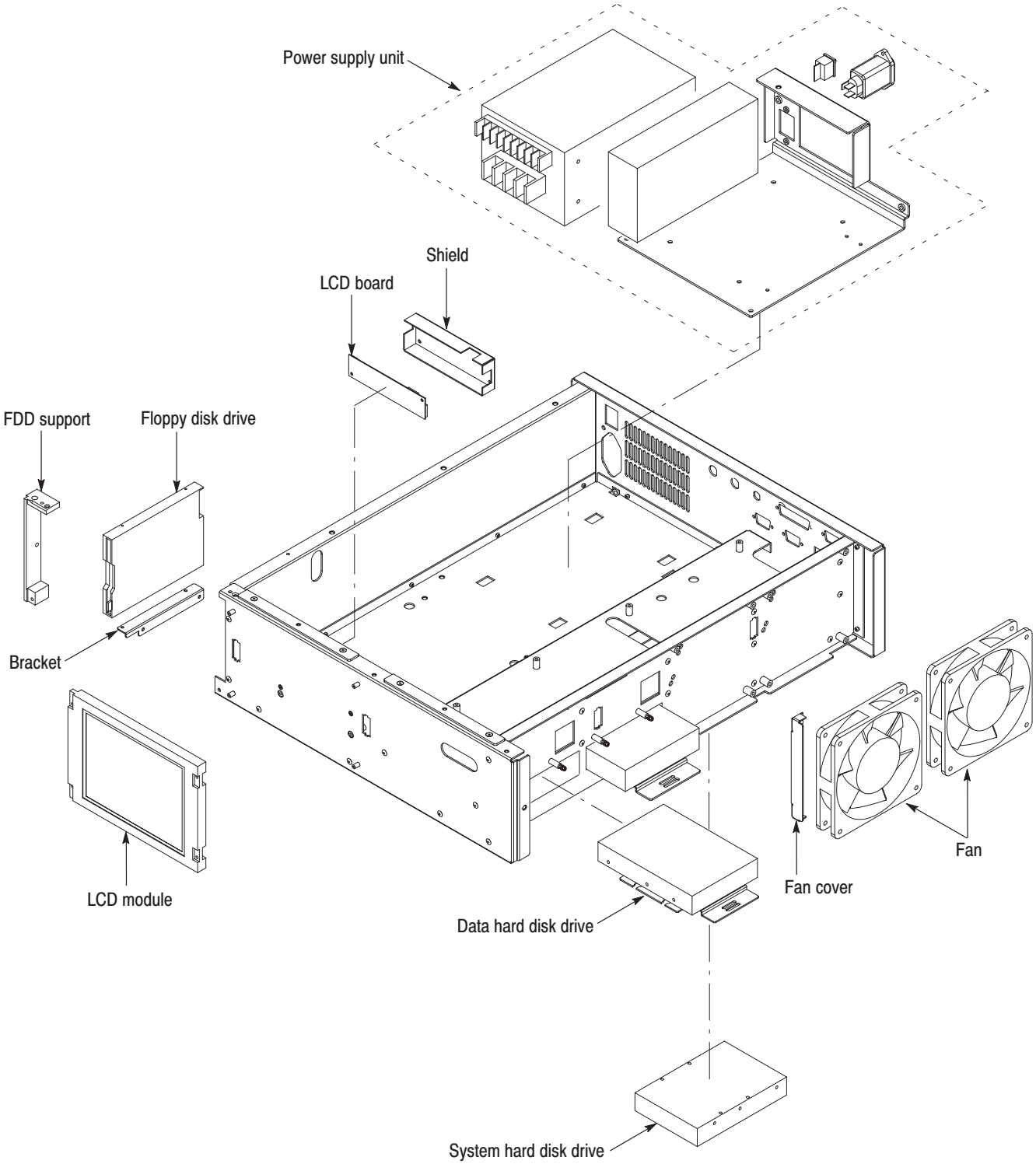


Figure 6-3: Internal modules

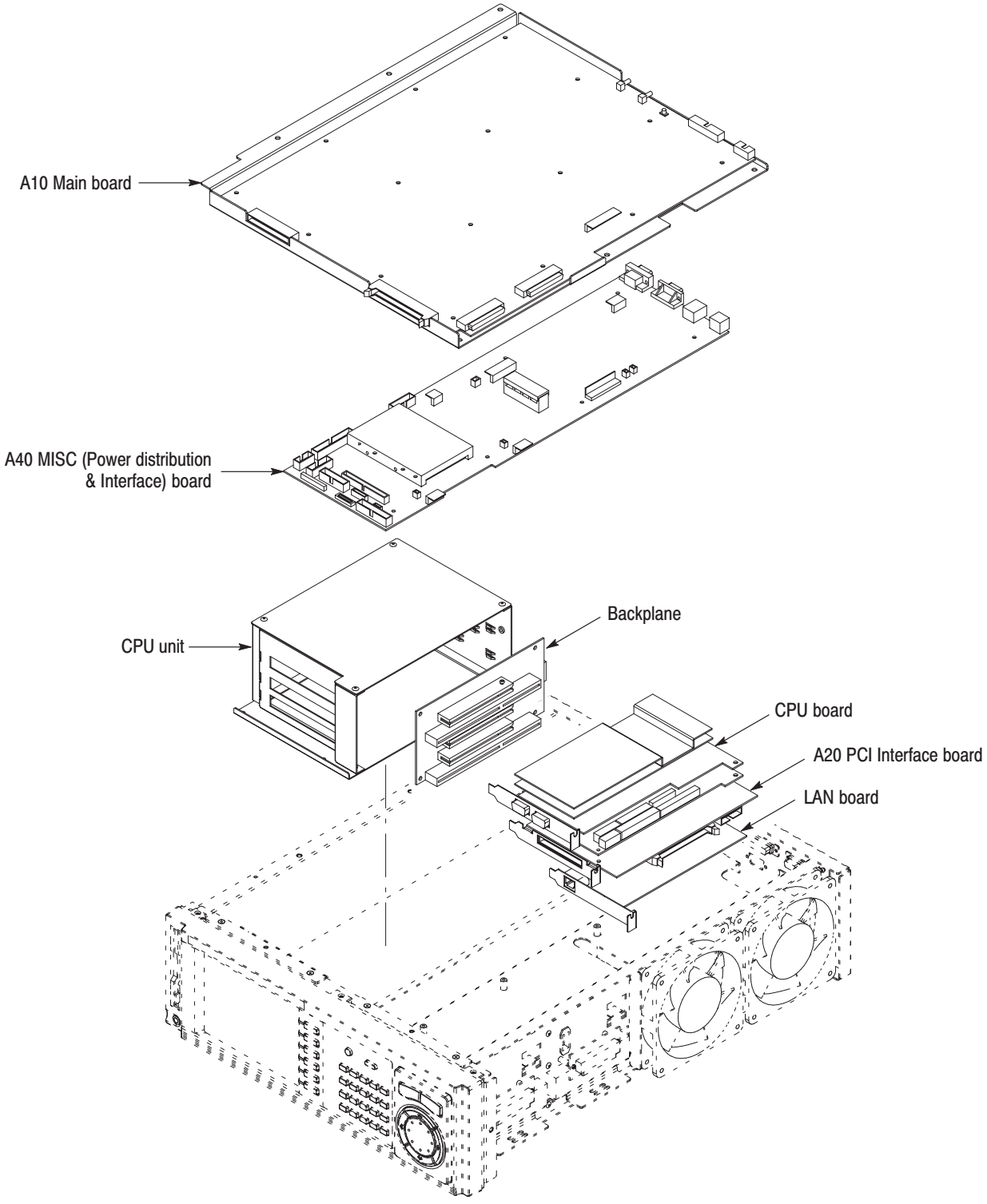


Figure 6-4: Board modules and CPU unit

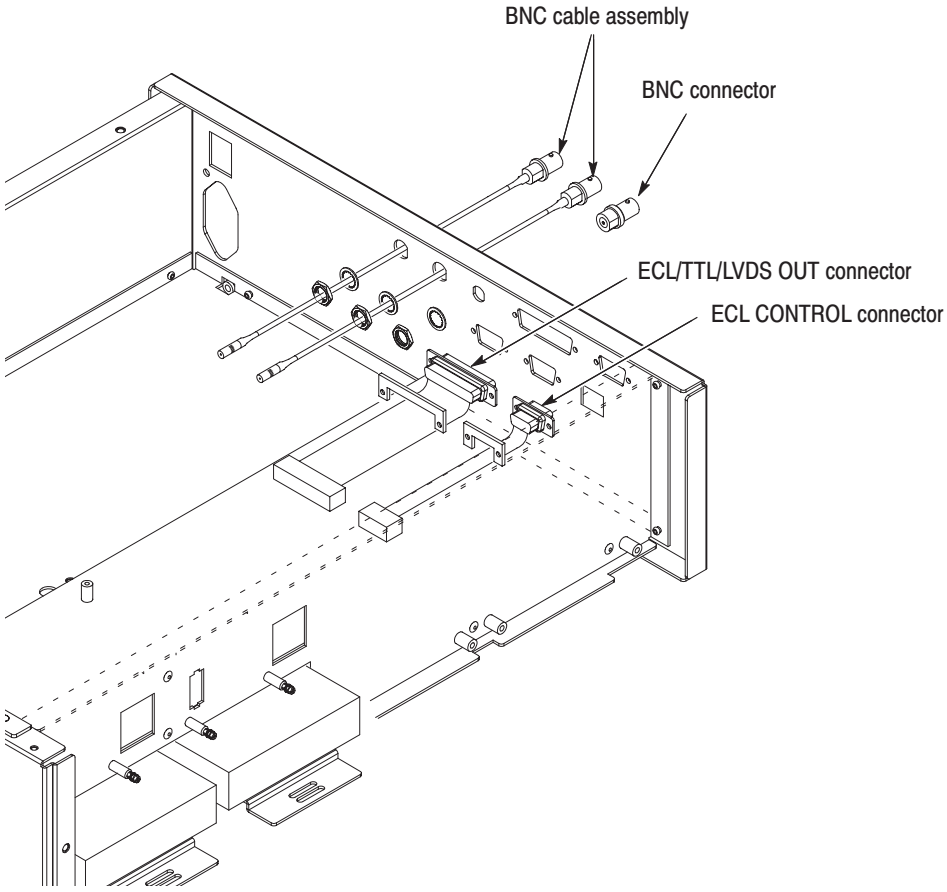


Figure 6-5: Rear panel modules

Access Procedure

When you have identified the module to be removed for service, read *General Instructions* found on page 6-10. Then use the flowchart in Figure 6-6 to determine which procedures to use for removing the module. The removal procedures end with installation instructions.

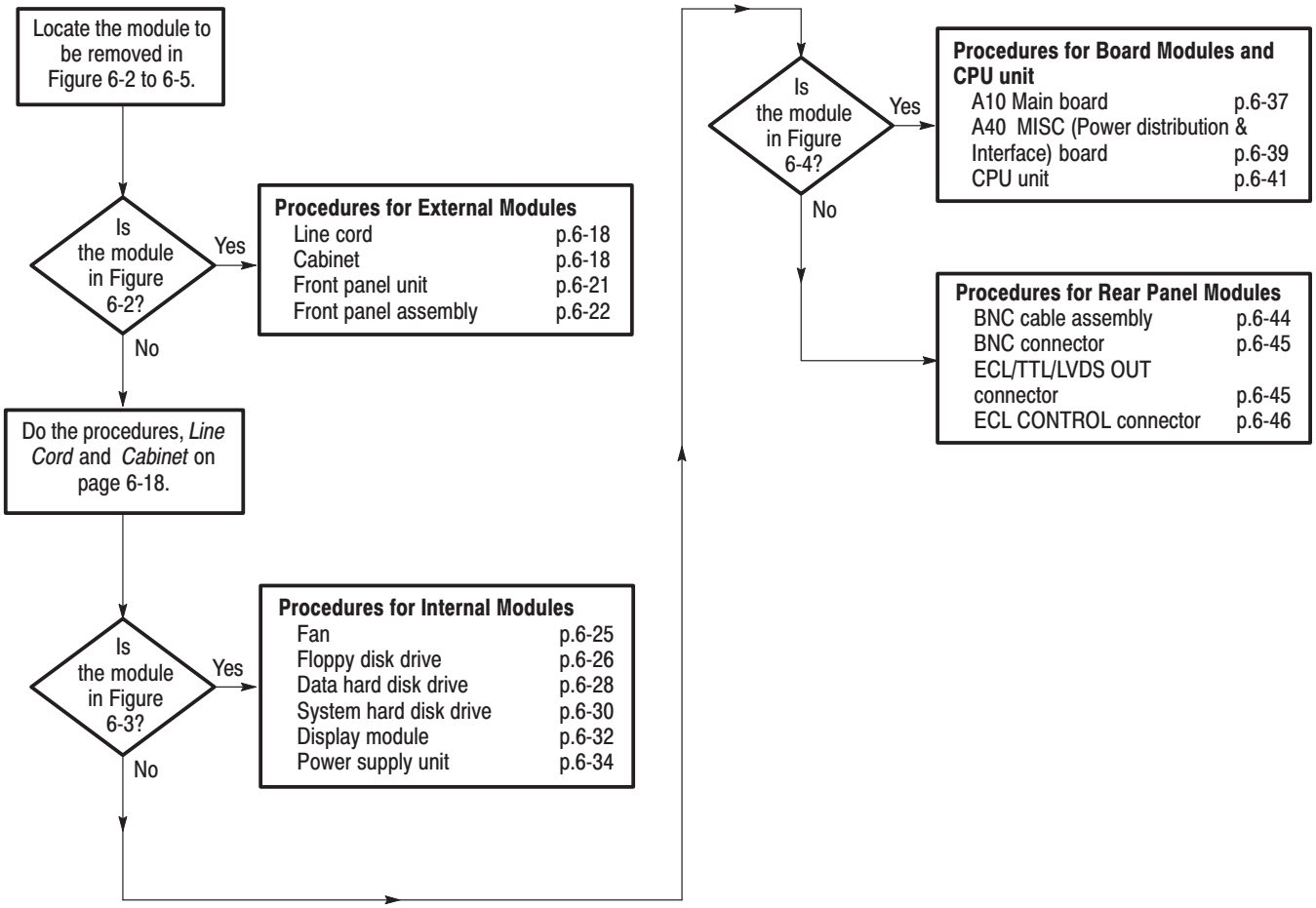


Figure 6-6: Guide to removal procedures

Procedures for External Modules

Do the *Access Procedure* (page 6-17) before doing any procedure in this group. This group contains the following procedures:

- *Line Cord*
- *Cabinet*
- *Front-Panel Unit*
- *Front-Panel Assembly*

Line Cord

1. *Assemble equipment and locate modules to be removed:* You need no equipment. Locate the line cord in the location diagram *External Modules*, Figure 6-2, page 6-13.
2. *Orient the instrument:* Set the MPEG generator so its bottom is down on the work surface and its rear is facing you.
3. *Remove line cord:* Find the line cord on the rear panel. Grasp the plug and pull the line cord and clamp away to complete the removal. Reverse procedure to reinstall.

Cabinet

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a size #2 Phillips tips (Items 1 and 3).
   b. Locate the modules to be removed in the locator diagram *External modules*, Figure 6-2, page 6-13.
2. *Orient instrument:* Set the MPEG generator so its right is down on the work surface and its rear is facing you.
3. *Disconnect line cord:* Unplug the line cord from its receptacle at the rear panel.
4. *Remove cabinet:*
   a. Using a screwdriver with a size #2 Phillips tip, remove the four screws securing the front of the cabinet to the MPEG generator.
   b. Using a screwdriver with a size #2 Phillips tip, remove the six screws securing the rear of the cabinet to the MPEG generator.
   c. Set the MPEG generator so its bottom is down on the work surface and its front is facing you.

d. Grasp the right and left edges of the cabinet toward the back. Push against the chassis rear panel, toward the front of the MPEG generator, to separate it from the cabinet.

e. Slide the cabinet off the MPEG generator. Take care not to bind or snag the cabinet on internal cabling as you remove it.

5. *Reinstall cabinet:*

a. Perform step 4 in reverse order to reinstall the cabinet. Take care not to bind or snag the cabinet on internal cabling; redress cables as necessary.

b. Plug the line cord into its receptacle on the rear panel. This completes the MPEG generator reassembly.

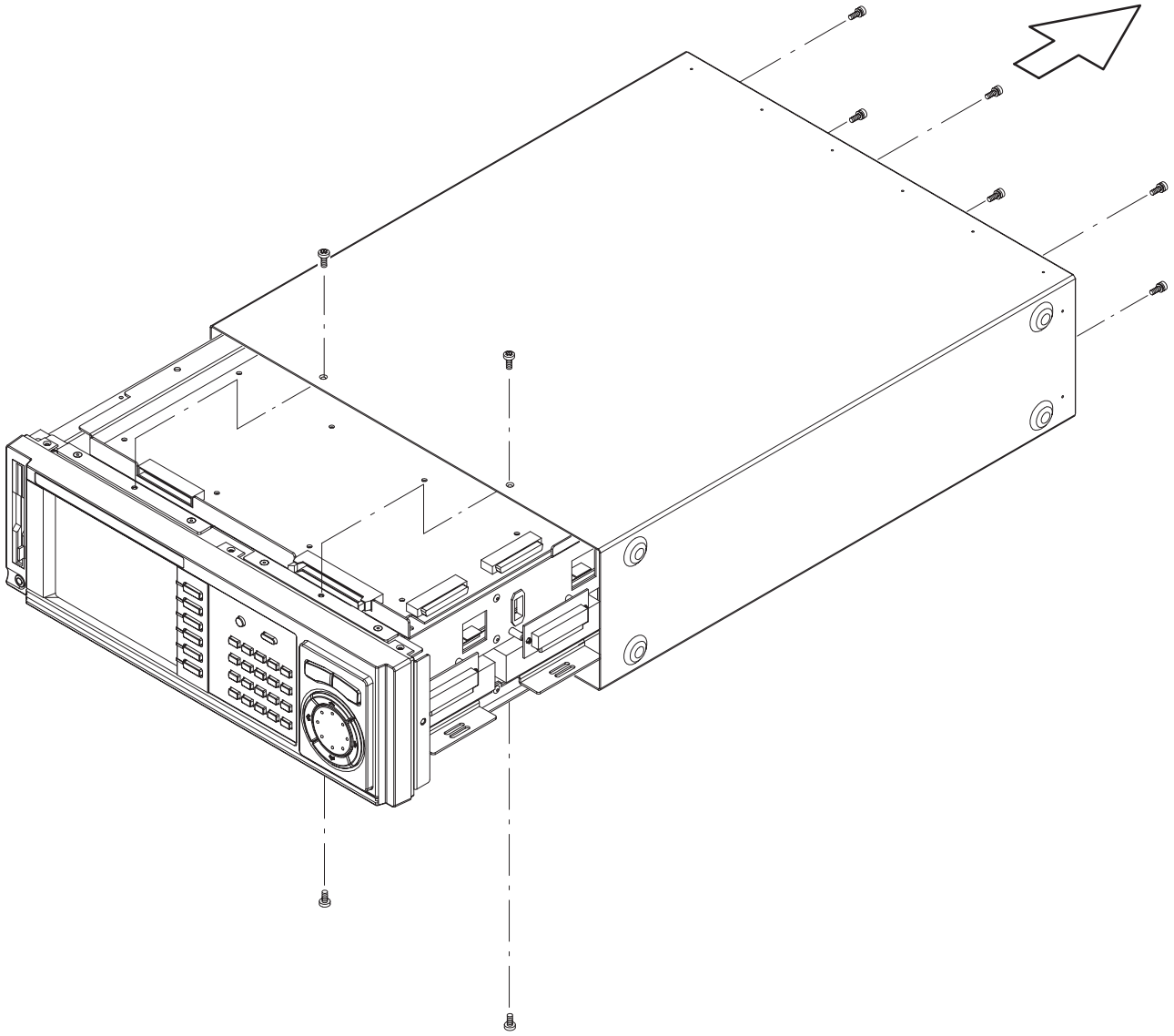


Figure 6-7: Cabinet removal

Front-Panel Unit

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a size #2 Phillips tips (Items 1 and 3).
   - **b.** Locate the module to be removed in the locator diagram *External modules*, Figure 6-2, page 6-13.
2. *Orient instrument:* Set the MPEG generator so its right side is down on the work surface and its front is facing you.
3. *Remove front-panel unit:* See Figure 6-8.
   - **a.** Using a screwdriver with a size #2 Phillips tip, remove the six screws securing the front-panel unit to the chassis.
   - **b.** Set the MPEG generator so its bottom is down on the work surface and its front is facing you.
   - **c.** Grasp the front-panel unit and pull it forward.
   - **d.** Unplug the cable at J250 of the A30 Front Panel board.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the front-panel unit.

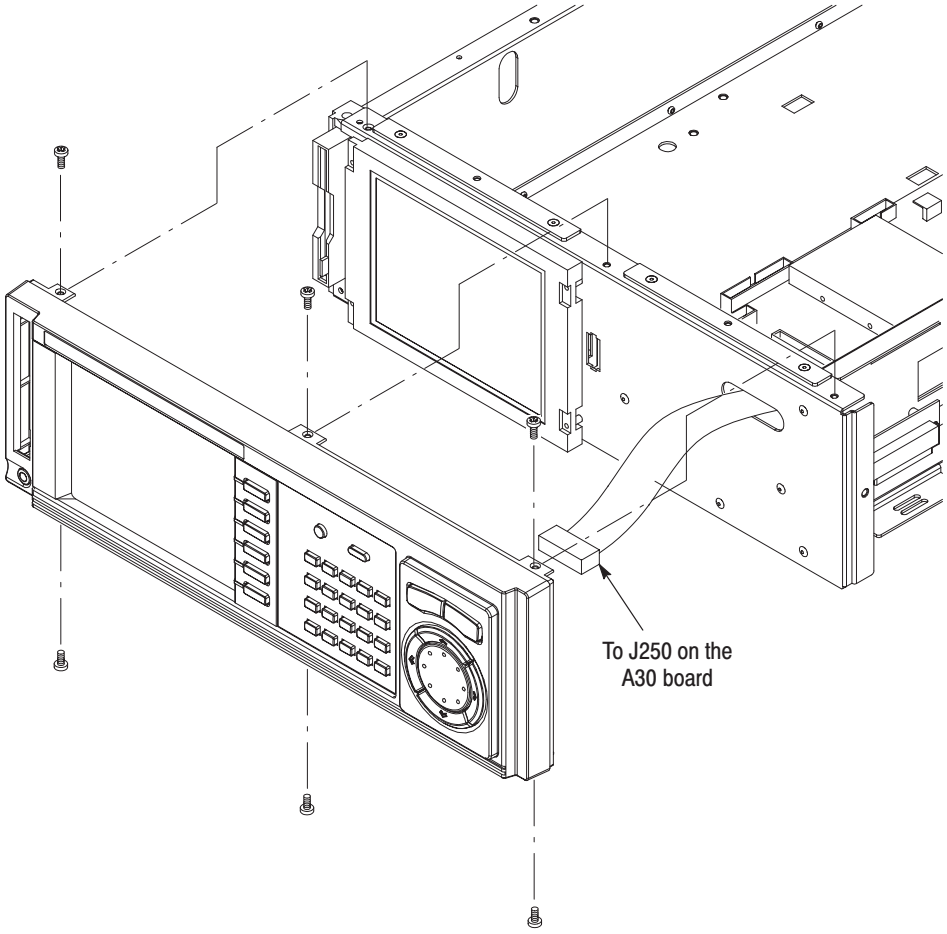


Figure 6-8: Front-panel unit removal

Front Panel Assembly

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

   a. You need a 1/16 inch hex wrench (Item 19) and a screwdriver with a size #2 Phillips tips (Items 1 and 3).

   b. Locate the module to be removed in the locator diagram *External modules*, Figure 6-2, page 6-13.

2. *Remove the A30 Front Panel board:* See Figure 6-9.

   a. Using a screwdriver with a size #2 Phillips tip, remove the six screws securing the A30 board to the front panel cover.

   b. Unplug the cable from the rotary encoder at J300.

   c. Unplug the cable from the power switch at J310.

   d. Lift the board away.

3. *Remove the A35 Power Switch:* See Figure 6-9.

   a. Using a screwdriver with a size #2 Phillips tip, remove the screw securing the A35 board to the front cover.

   b. Unplug the cable from the A30 Front Panel board.

   c. Lift the board away.

4. *Remove the rotary encoder:* See Figure 6-9. Using the 12 mm nut driver (Item 9), remove the nut securing the rotary encoder to the front cover.

5. *Remove the subpanel:* See Figure 6-9. Using a screwdriver with a size #2 Phillips tip, remove the two screws securing the sub panel to the front cover.

6. Now hand disassemble the front-panel assembly components using Figure 6-9 as a guide. Reverse the procedure to reassemble.

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

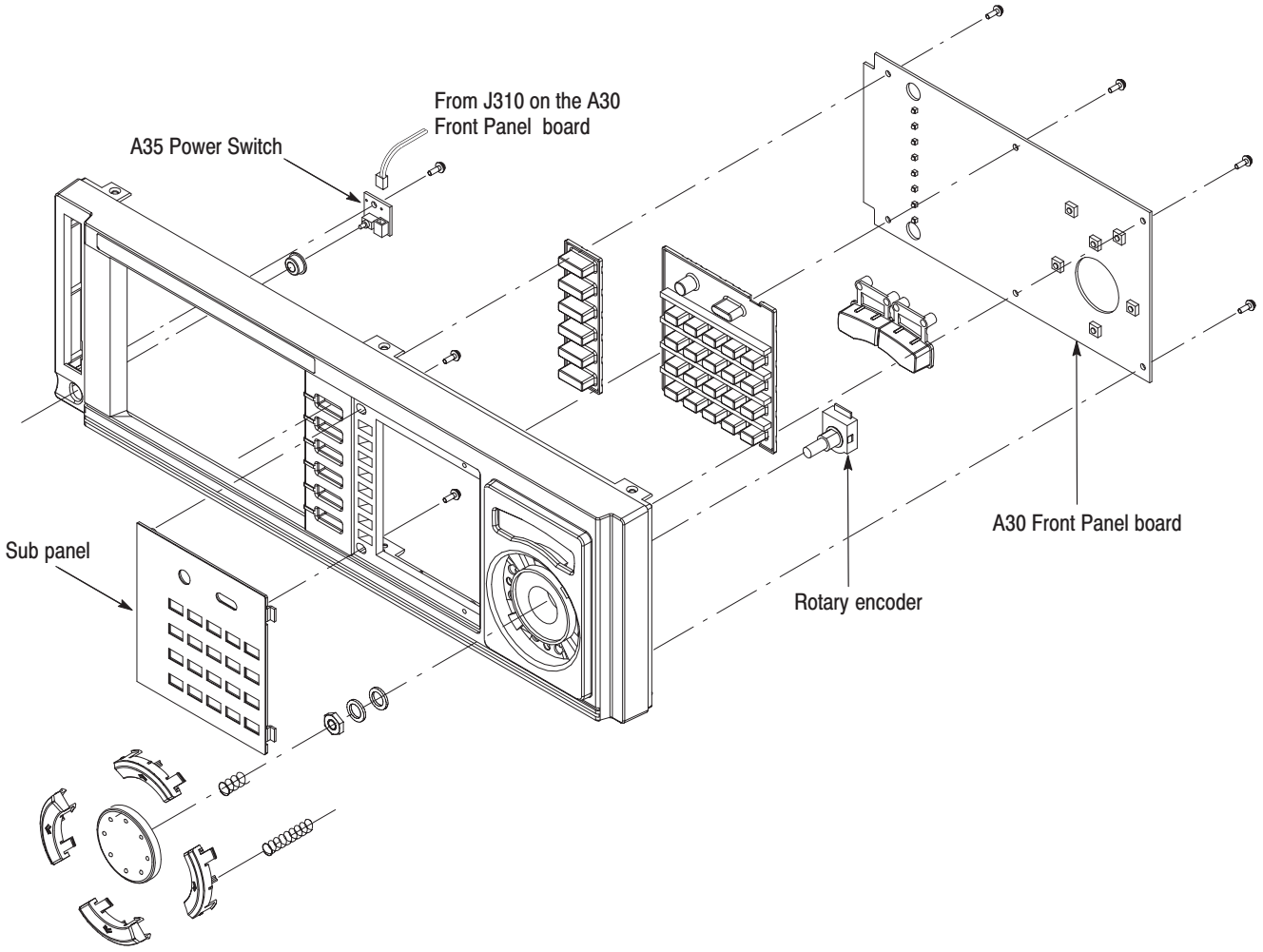


Figure 6-9: Disassembly of front-panel assembly

Procedure for Internal Modules

Perform the *Access Procedure* (on page 6-17) before doing any procedure in this group. The procedures are presented in the order listed:

- *Fan*
- *Floppy Disk Drive*
- *Data Hard Disk Drive*
- *System Hard Disk Drive*
- *Display module*
- *Power supply unit*

Fan

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a size #2 Phillips tip (Items 1 and 3).
   b. Locate the fan in the locator diagram *Internal modules,* Figure 6-3, page 6-14.
2. *Orient the instrument:* Set the MPEG generator so its bottom is down on the work surface and its right side is facing you.
3. *Remove the fan:* See Figure 6-10.
   a. Remove the A10 Main board as described on page 6-37.
   b. Unplug the two fan's power cables from J290 and J295.
   c. Remove the four screws securing the fan and side cover to the chassis, and lift the fan away from the chassis. When removing the other fan, remove the four screws securing the fan and side cover to the chassis.
4. *Reinstallation*: Do step 3 in reverse order to reinstall the fans.

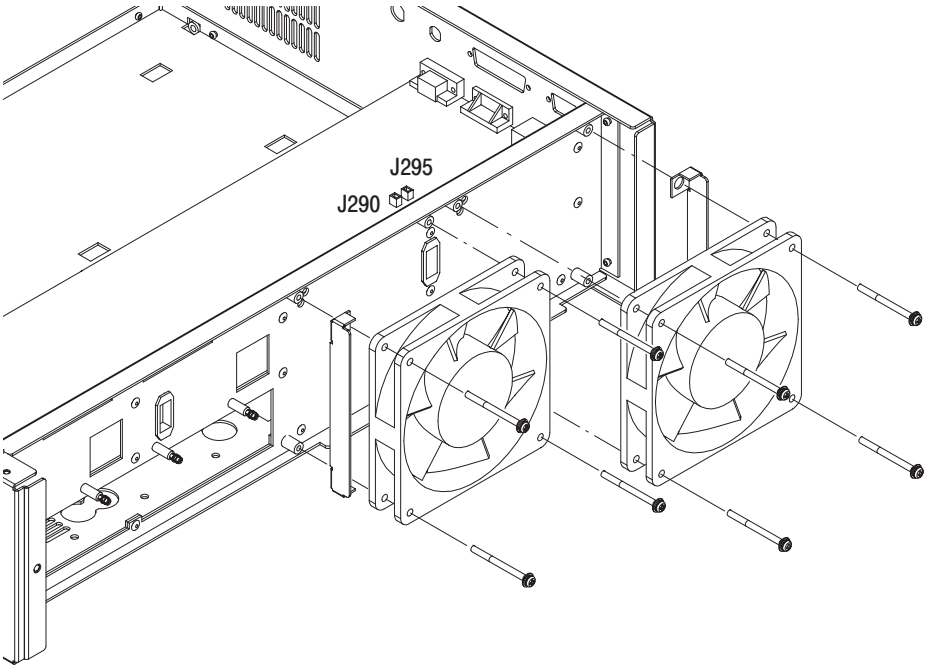


Figure 6-10: Fan removal

Floppy Disk Drive

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a size #1 and a size #2 Phillips tips (Items 1, 2, and 3).
   - **b.** Locate the module to be removed in the locator diagram *Internal modules*, Figure 6-3, page 6-14.
2. *Orient the instrument:* Set the MPEG generator so its bottom is down on the work surface and its front is facing you.
3. *Remove floppy disk drive:* See Figure 6-11.
   - **a.** Remove the A10 Main board as described on page 6-37.
   - **b.** Unplug the flat cable at J280 on the A40 board.
   - **c.** Using a screwdriver with a size #2 Phillips tip, remove the two screws securing the floppy disk drive support to the chassis.
   - **d.** Using a screwdriver with a size #1 Phillips tip, remove the two screws securing the floppy disk drive to the top of the chassis.
   - **e.** Using a screwdriver with a size #2 Phillips tip, remove the two screws securing the floppy disk drive to the left side of the chassis.

f. Unplug the floppy disk connector (ribbon interconnect cable) that connects the disk drive to the A40 MISC (Power Distribution & Interface) board.

4. *Remove floppy disk drive from bracket:* Using a screwdriver with a size #1 Phillips tip, remove the two screws securing the floppy disk drive to the bracket.

5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the floppy disk drive.

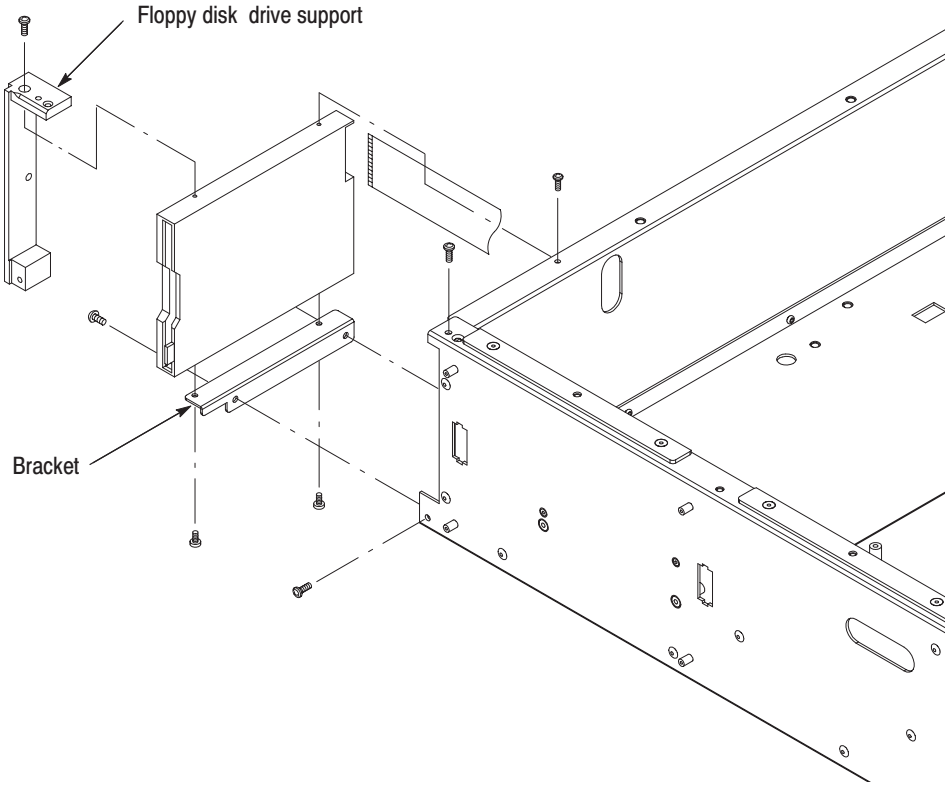


Figure 6-11: Floppy disk drive removal

Data Hard Disk Drive

NOTE. *Read* Replacing the Hard Disk Drive(s) *on page 6-71, before performing the following procedures.*

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a size Phillips #2 tip (Items 1 and 3).
   b. Locate the modules to be removed in the locator diagram *Internal modules,* Figure 6-3, page 6-14.
2. *Orient instrument:* Set the MPEG generator so its left side is down on the work surface and its bottom is facing you.
3. *Remove the data hard disk drive with bracket:* See Figure 6-12.
   a. Remove the two screws securing the supporter to the data hard disk drive bracket.
   b. Remove the SCSI Termination card from its supports.
   c. Unplug these cables:
      - The cables from J2100 and J2300 on the A10 Main board.
      - The SCSI HDD power cables at J010 and J020 on the A40 MISC (Power Distribution & Interface) board.
      - The cables connected to J015 and J025 on the A40 MISC (Power Distribution & Interface) board.
   d. Remove the two screws securing the data hard disk drive bracket to the chassis.
   e. Lift up the data hard disk drive with the bracket from the chassis. When removing the other hard disk drive, remove the two screws securing the drive to the chassis, and lift it up from the chassis.
4. *Remove the hard disk drive from bracket:* Remove the four screws securing the hard disk drive to the bracket.
5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the data hard disk drives. Check that the hard disk drives are mounted to the bottom chassis as shown in Figure 6-13.

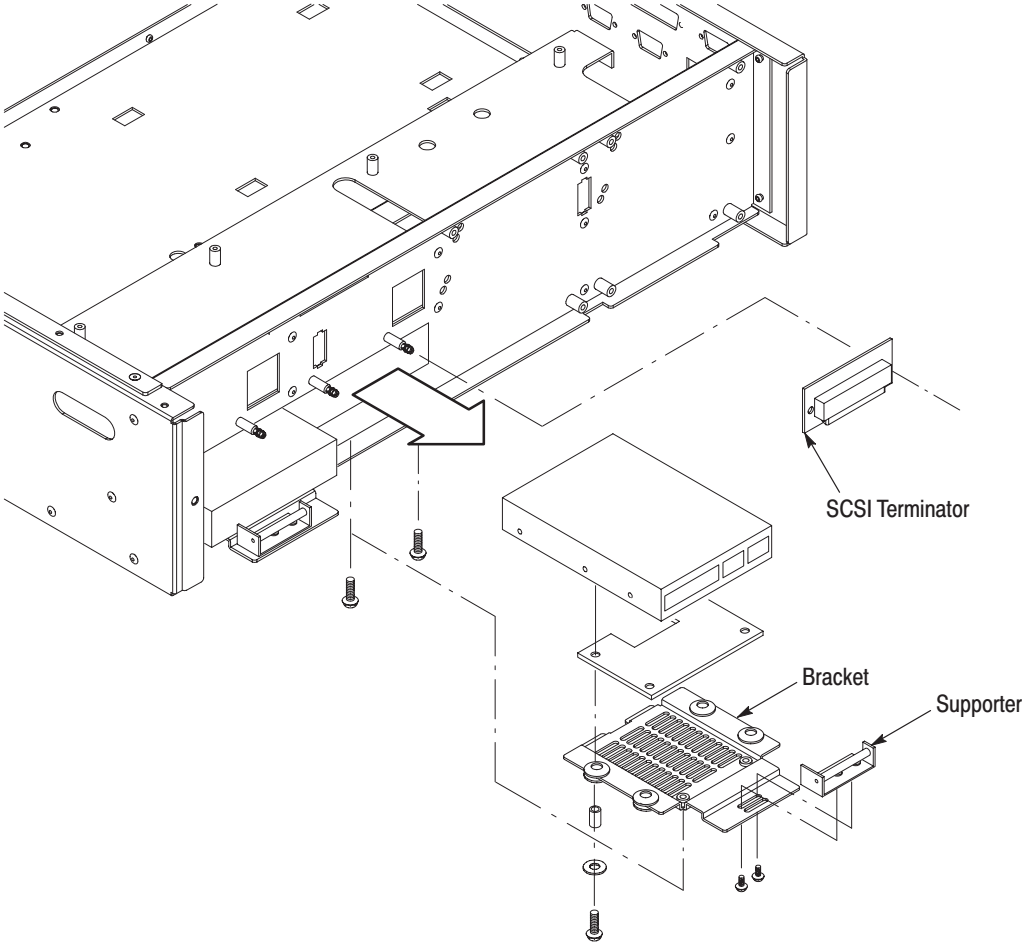


Figure 6-12: Data hard disk drive removal

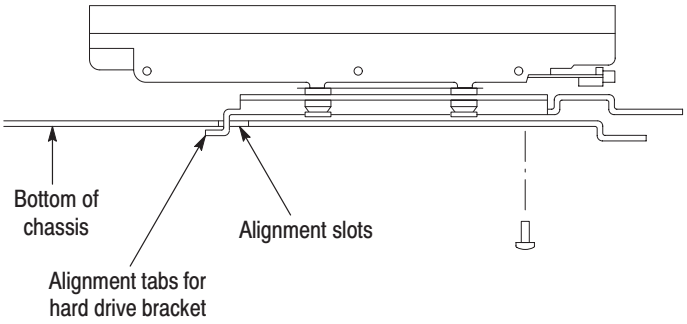


Figure 6-13: Attaching the data hard disk to the chassis

System Hard Disk Drive

NOTE. *Read* Replacing the Hard Disk Drive(s) *on page 6-71, before performing the following procedures.*

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a size Phillips #2 tip (Items 1 and 3).
   b. Locate the modules to be removed in the locator diagram *Internal modules,* Figure 6-3, page 6-14.
2. *Orient instrument:* Set the MPEG generator so its left side is down on the work surface and its bottom is facing you.
3. *Remove the bottom plate*: Remove the four screws securing the bottom plate to the chassis.
4. *Remove the system hard disk drive:* See Figure 6-14.
   a. Remove the A10 Main Board as described on page 6-37.
   b. Remove the A40 MISC (Power Distribution & Interface) board as described on page 6-39.
   c. Remove the clear plastic shield beneath the A40 circuit board.
   d. Unplug the cables from the solid state disk and J050 on the A40 MISC (Power Distribution & Interface) board.
   e. Remove the four screws securing the system hard disk drive to the chassis.
   f. Lift the system hard disk drive away from the chassis.
5. *Reinstallation:* Perform steps 3 and 4 in reverse order to reinstall the system hard disk drive.

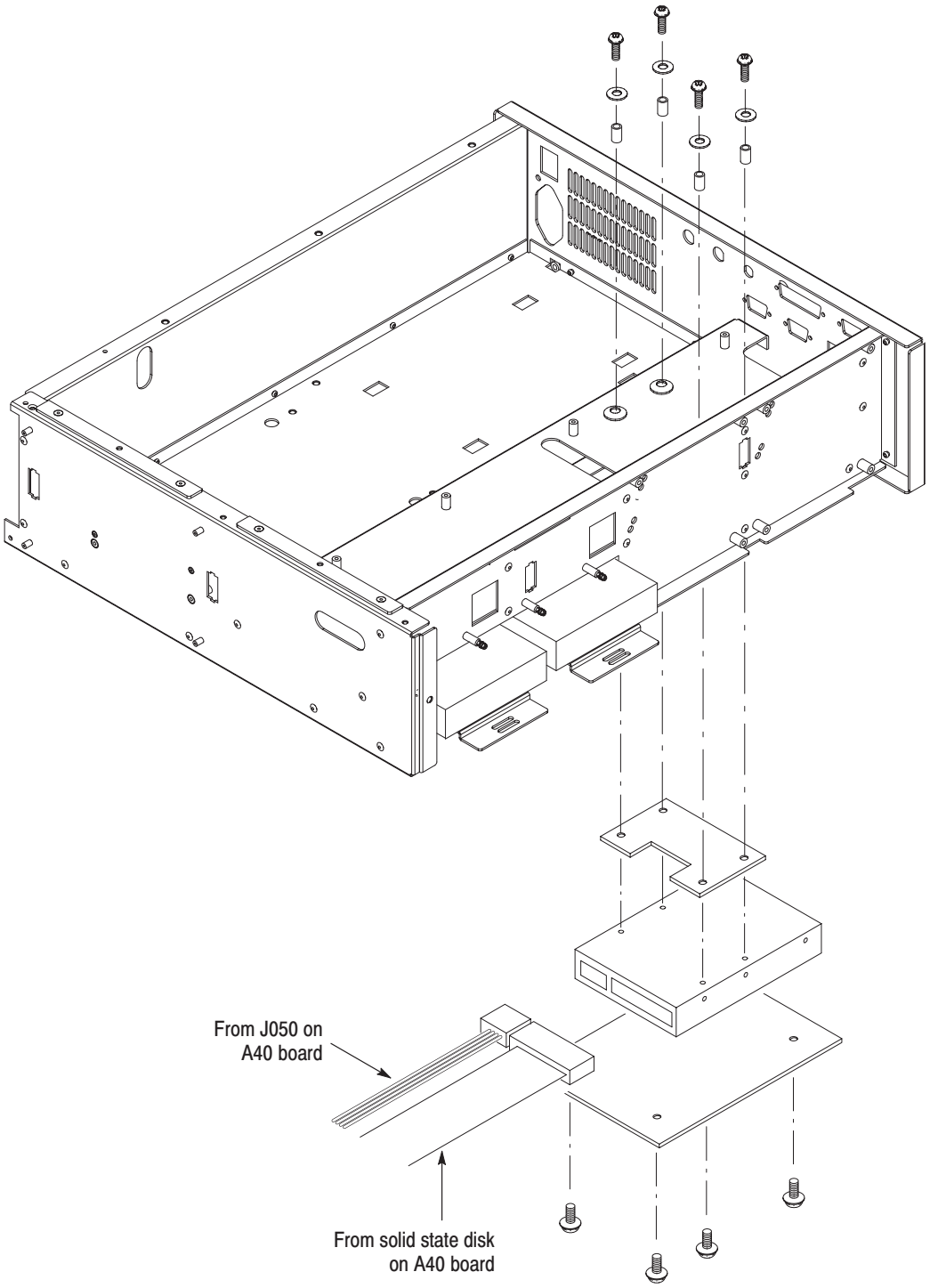


Figure 6-14: System hard disk drive removal

Display Module

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a size #1 and a size #2 Phillips tips (Items 1, 2, and 3).
   - **b.** Locate the module to be removed in the locator diagram *Internal modules,* Figure 6-3, page 6-14.
2. *Orient the instrument:* Set the MPEG generator so its bottom is down on the work surface and its front is facing you.
3. Remove the Front Panel Unit as described on page 6-21.
4. *Remove the LCD:* See Figure 6-15.
   - **a.** Unplug the cable at J140, and two cables at the connectors on the LCD board.
   - **b.** Using a screwdriver with a size #1 Phillips tip, remove the four screws securing the LCD to the chassis.
5. *Reinstallation:* Perform step 4 in reverse order to reinstall the LCD.
6. *Remove the LCD board:* See Figure 6-15.
   - **a.** Remove the CPU Unit as described on page 6-41.
   - **b.** Unplug the three cables from the LCD board.
   - **c.** Using a screwdriver with a size #2 Phillips tip, remove the two screws securing the shield to the chassis.
   - **d.** Using a screwdriver with a size #1 Phillips tip, remove the two screws securing the LCD board to the chassis.
7. *Reinstallation:* Perform step 6 in reverse order to reinstall the LCD board.

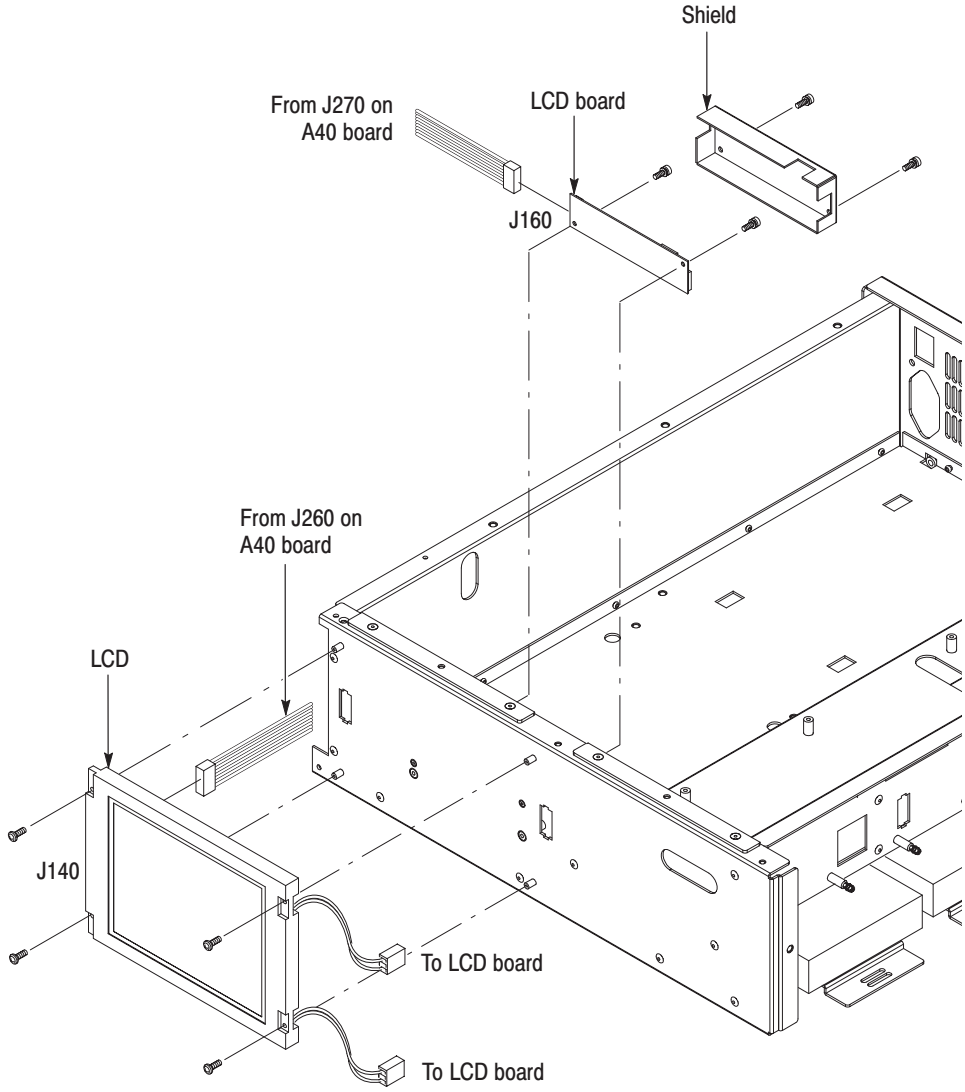


Figure 6-15: Display module removal

Power Supply Unit

This procedure describes how to remove these modules:

- *5 V Power Supply*
- *12 V Power Supply*
- *Power Switch*
- *RFI Filter*

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

a. You need a screwdriver with a size #2 Phillips tip (Items 1 and 3).

b. Locate the module to be removed in the locator diagram *Internal modules*, Figure 6-3, page 6-14.

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

3. *Remove the power supply unit:* See Figure 6-16.

a. Remove the A10 Main board as described on page 6-37.

b. Unplug the power cables from J030 and J040 on the A40 board, and then loosen the four screws on J041 and disconnect the four cables.

c. Remove the two screws securing the power supply unit to the rear of the chassis.

d. Remove the two screws securing the power supply unit to the bottom of the chassis.

e. Lift the unit up out of the chassis to complete removal.

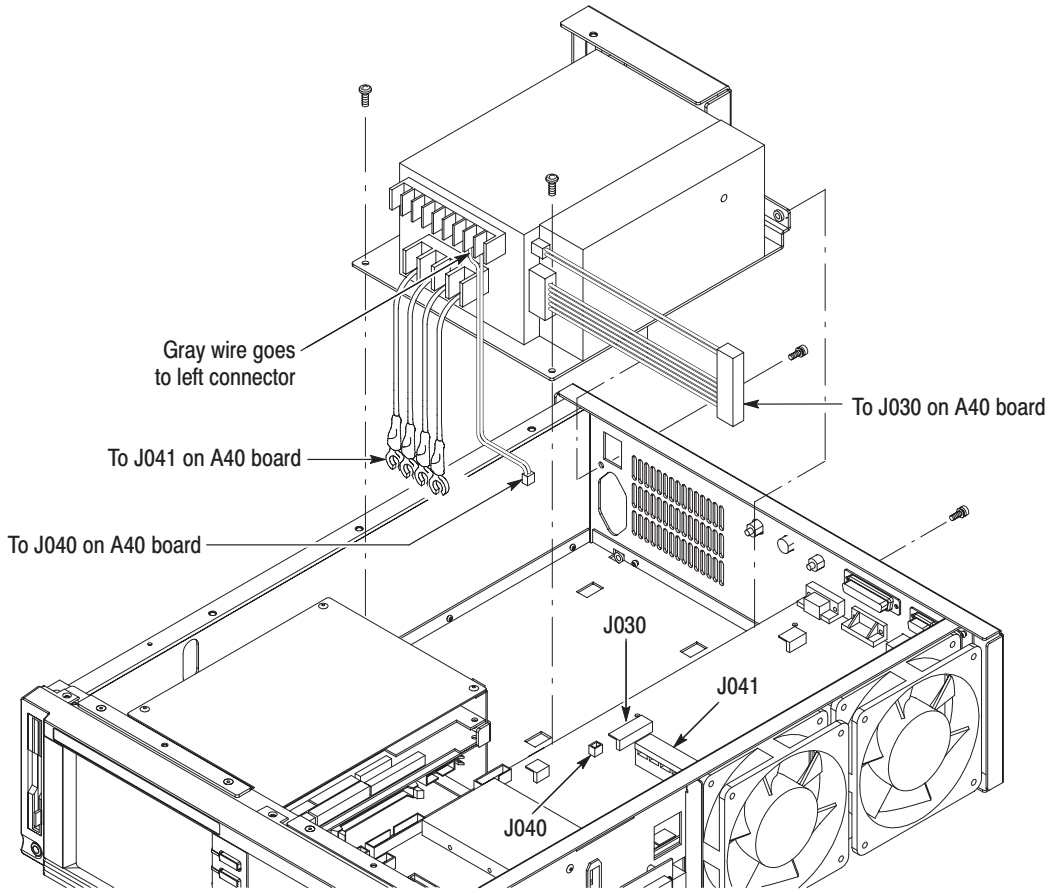


Figure 6-16: Power supply unit removal

4. *Remove the **5 V Power supply**:* See Figure 6-17.

   a. Unplug the two cables at the connectors on the power switch and one cable at CN1 on the 12 V Power supply.

   b. Using a screwdriver with a size Phillips #2 tip, remove the four screws securing the 5 V Power supply to the bracket.

5. *Remove the **12 V Power supply**:* See Figure 6-17.

   a. Unplug the cable from the 5 V Power supply.

   b. Using a screwdriver with a size Phillips #2 tip, remove the three screws securing the 12 V Power supply to the bracket.

6. *Remove the **Power switch**:* See Figure 6-17.

   a. Unplug the four cables from the power switch.

b. Use a flat–bladed screwdriver to press down on top of the power switch and push the switch out of the Bracket.

7. *Remove the **RFI filter**:* See Figure 6-17.

a. Unplug the two cables from the RFI filter.

b. Using a screwdriver with a size Phillips #2 tip, remove the screw securing the ground lead to the bracket.

c. Using a screwdriver with a size Phillips #2 tip, remove the two screws securing the inlet to the bracket. Pull the RFI filter away.

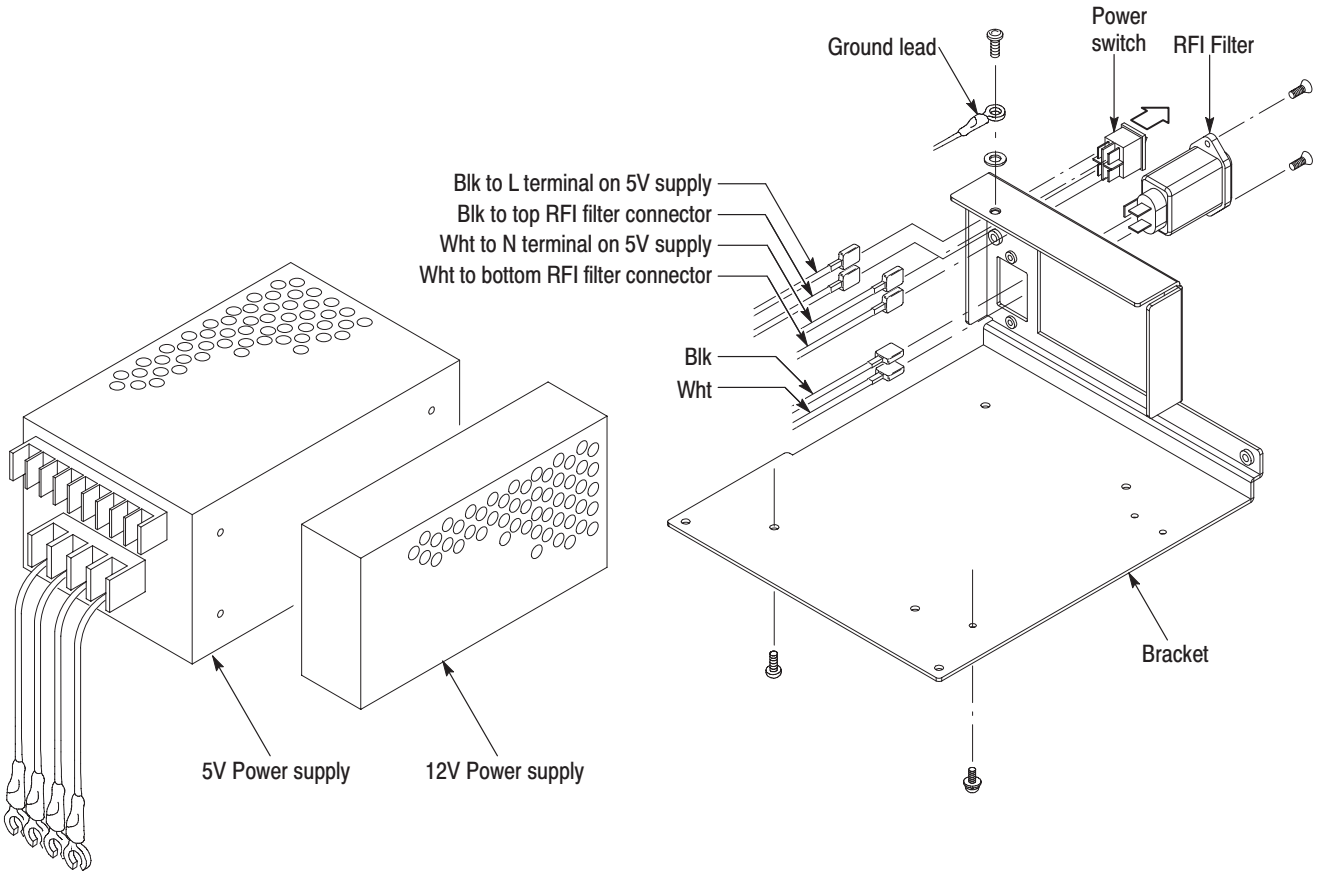


Figure 6-17: 5 V power supply, 12 V power supply, power switch, and inlet removal

8. *Reinstallation*:

a. Perform steps 4 through 7 in reverse order to reinstall all the modules.

b. Perform step 3 in reverse order to reinstall the power supply unit.

Procedure for Board Modules and CPU Unit

Perform the *Access Procedure* (on page 6-17) before performing any procedure in this group. The procedures are presented in the order listed:

- *A10 Main Board*
- *A40 MISC (Power Distribution & Interface) Board*
- *CPU Unit*
  - *CPU Board*
  - *A20 Interface Board*
  - *LAN Board*
  - *Backplane*

A10 Main Board

1. *Assemble equipment and locate modules to be removed:*
   - **a.** You need a screwdriver with a size Phillips #2 tip (Items 1 and 3).
   - **b.** Locate the modules to be removed in the locator diagram *Board modules and CPU unit*, Figure 6-4, page 6-15.
2. *Orient the instrument:* Set the MPEG generator so its bottom is down on the work surface and its front is facing you.
3. *Remove the A10 Main Board:*
   - **a.** Unplug these cables. See Figure 6-18 as a guide.
     - The cables from the A20 Interface board at J0602 and J0600.
     - The cables from the data hard disk drive at J2100 and J2300.
     - The cable from the A40 MISC (Power Distribution & Interface) board at J0740.
     - The cables from the ECL CONTROL connector at J3702 and ECL/TTL/LVDS OUT connector at J4004.
     - The coaxial cables from the SSI OUT connector at J4000, the ASI OUT connector at J4002 and the EXT 27 MHz REF IN connector at J3700.
   - **b.** Using a screwdriver with a size Phillips #2 tip, remove the six screws securing the A10 Main board to the chassis.
   - **c.** Lift the board up and away from the chassis to complete the removal.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the A10 Main board.

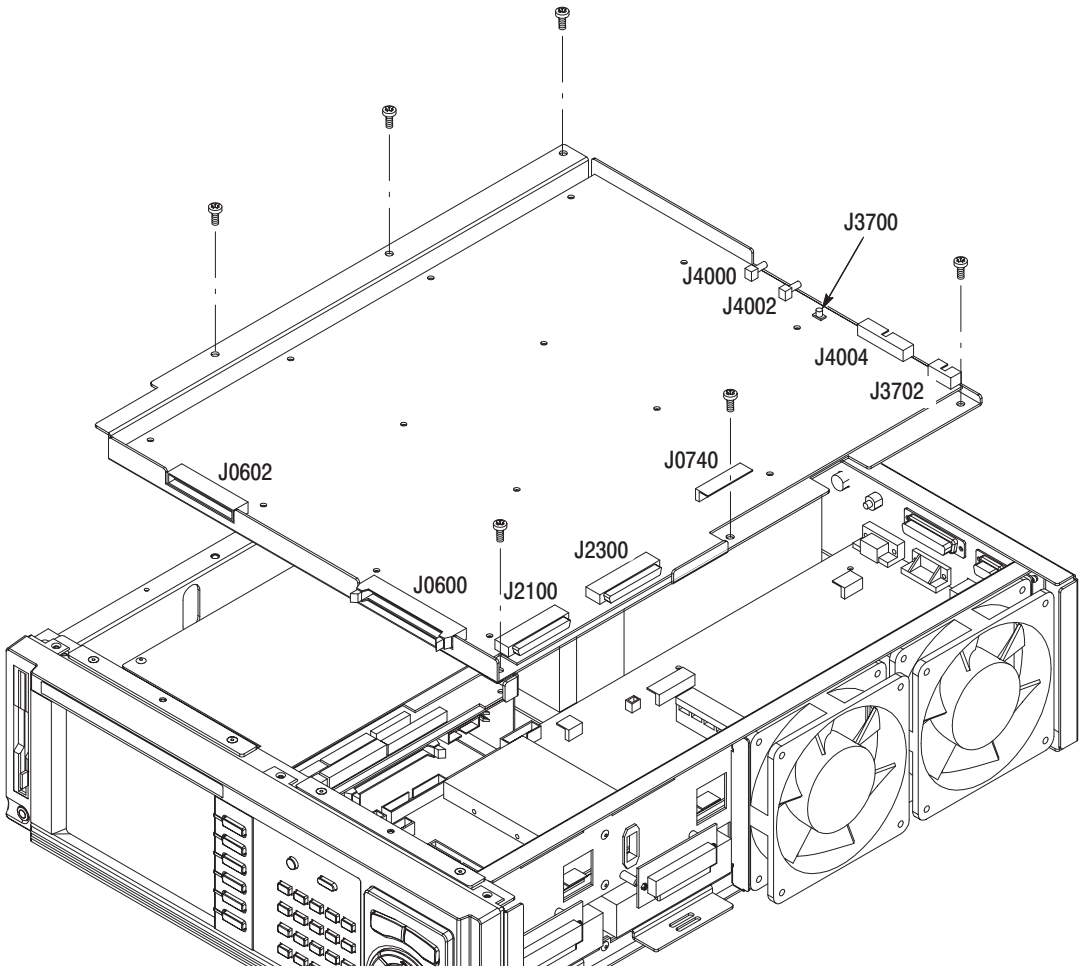


Figure 6-18: A10 Main board removal

A40 MISC (Power Distribution & Interface) Board

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

   a. You need a screwdriver with a size Phillips #2 tip (Items 1 and 3) and a 5 mm size nut driver (Item 12).

   b. Locate the modules to be removed in the locator diagram *Board modules and CPU unit*, Figure 6-4, page 6-15.

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

3. *Remove the A40 MISC (Power Distribution & Interface) Board:*

   a. Unplug these cables. See Figure 6-19.

   - The cable from the system hard disk drive at J050.
   - The cables from the fan at J290 and J295.
   - The cable to A10 Main board at J0740.
   - The cables from the data hard disk drives at J010 and J020.
   - The cables from the data hard disk drives at J015 and J025.
   - The cable from the system hard disk drive at the solid state disk.
   - The cable from A30 front panel board at J250.
   - The cables from LCD module at J260 and backlight board at J270.
   - The cable from the floppy disk drive at J280.
   - The cable from the LAN board at J150.
   - The cables from the CPU board at J100, J110, J120, J130, and J140.
   - The cable from the A20 Interface board at J160.
   - The cable from the back plane at J060.
   - The cables from the power supply module at J030 and J040, and then loosen the four screws on J041 and disconnect the cables.

   b. Using a screwdriver with a size Phillips #2 tip, remove the eight screws securing the A40 MISC (Power Distribution & Interface) board to the chassis.

   c. Using a 5 mm size nut driver, remove the four binding posts securing the SERIAL connector and VGA connector to the chassis.

   d. Lift the board up and away from the chassis to complete the removal.

4. *Reinstallation*: Perform step 3 in reverse order to reinstall the A40 MISC (Power Distribution & Interface) board.

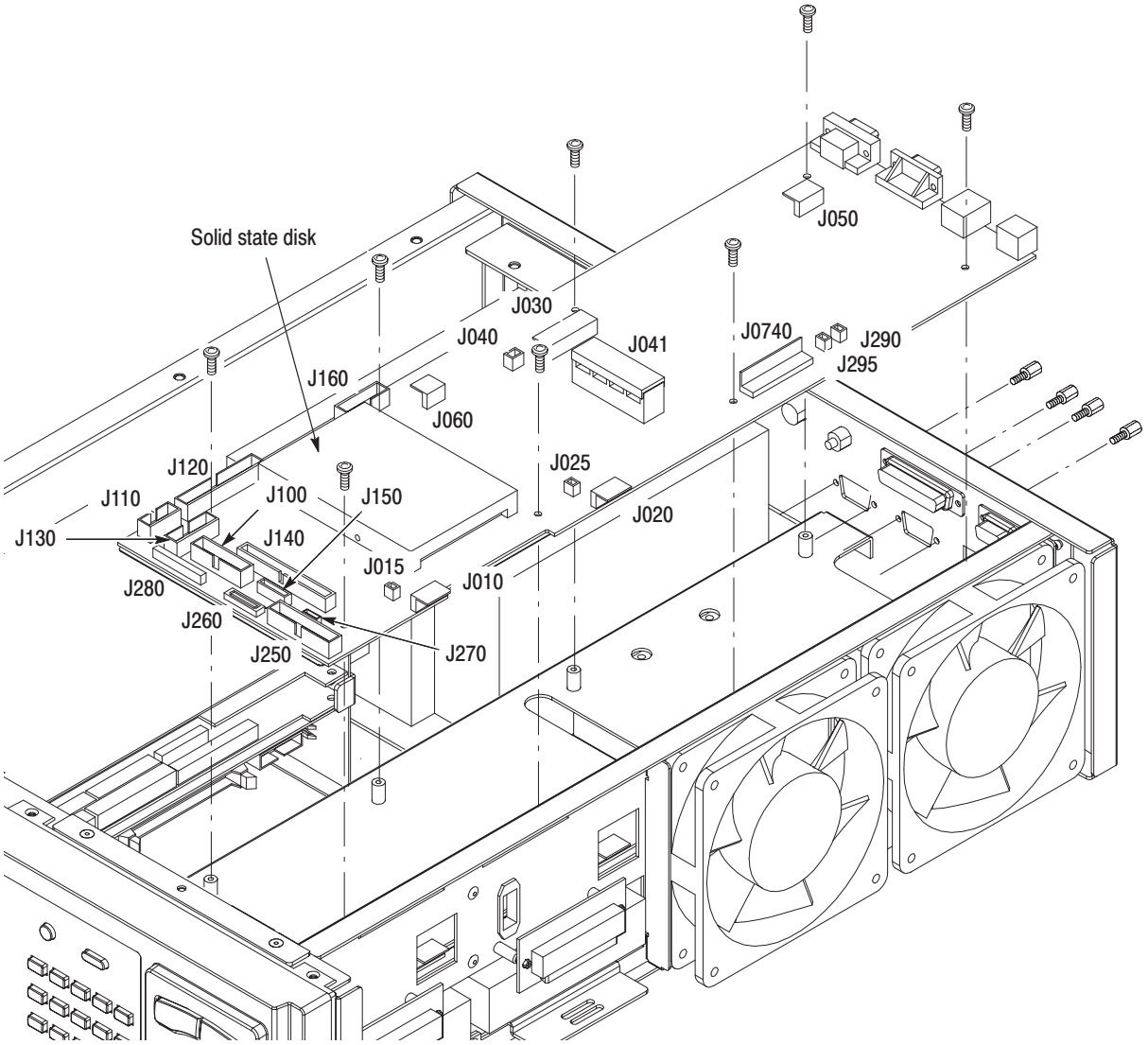


Figure 6-19: A40 MISC (Power Distribution & Interface) board removal

CPU Unit

This procedure describes how to remove these circuit boards contained in the CPU unit:

- *CPU Board*
- *A20 Interface Board*
- *LAN Board*
- *Backplane*

1. *Assemble equipment and locate modules to be removed*:
   a. You need a screwdriver with a size Phillips #2 tip (Items 1 and 3).
   b. Locate the modules to be removed in the locator diagram, *Board modules and CPU unit*, in Figure 6-4, page 6-15.
2. *Orient the instrument*: Set the MPEG generator so its bottom is down on the work surface and the right side facing you.
3. *Remove the CPU unit*: See Figure 6-20.
   a. Remove the A10 Main board as described on page 6-37.
   b. Unplug the cables from J60, J100, J110, J120, J130, J140, J150, and J160 on the A40 MISC (Power Distribution & Interface) board.
   c. Remove the four screws securing the CPU unit to the chassis.
   d. Lift the CPU unit up away from the main chassis.

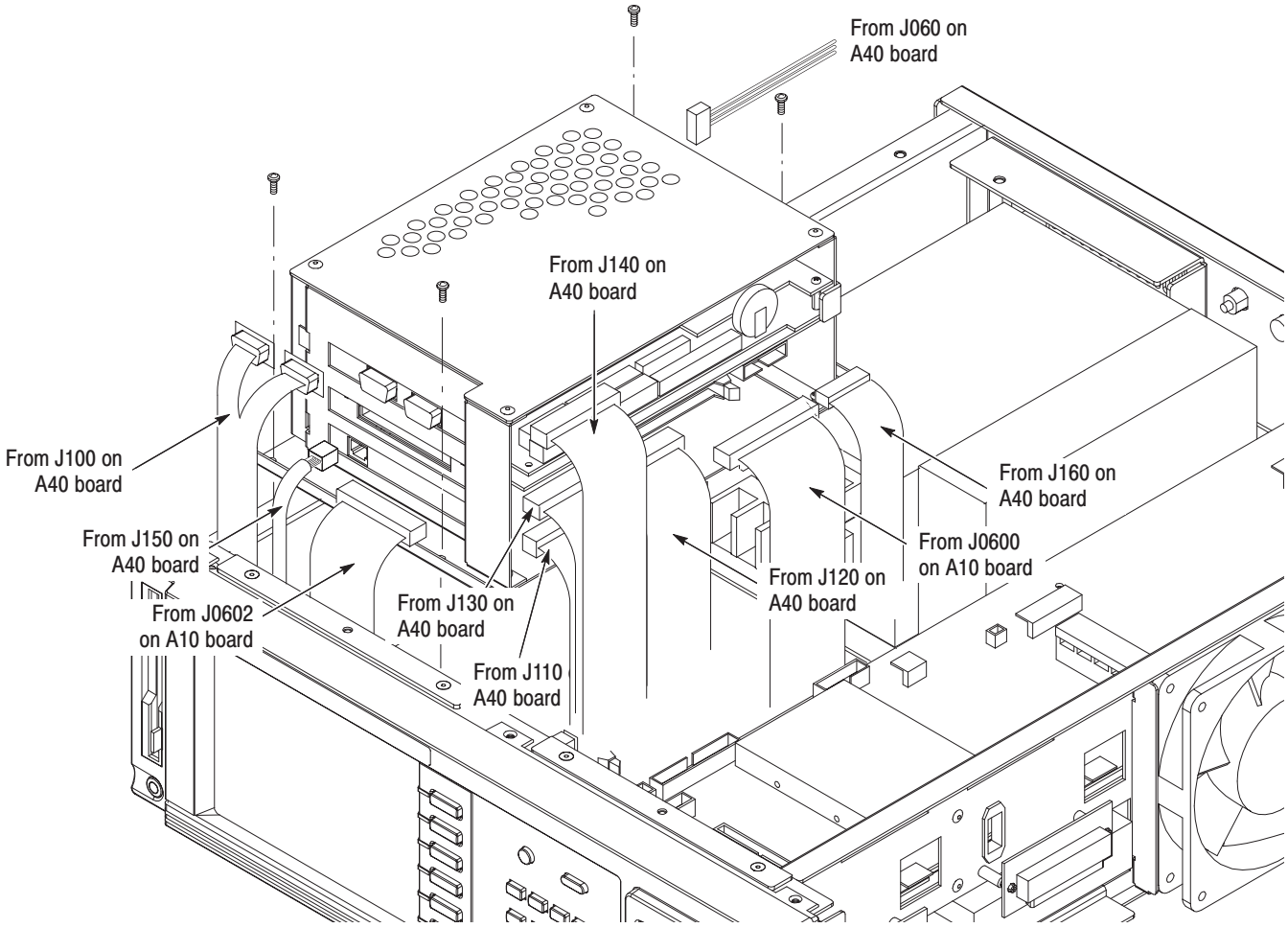


Figure 6-20: CPU unit removal

4. *Remove the **CPU Board***: See Figure 6-21.

   a. Using a screwdriver with a size Phillips #2 tip , remove the screw securing the CPU board to the frame with a retainer on the right side of the unit.

   b. Remove the screw on the left side of the CPU board.

   c. Grasp the board and slide it out of the unit.

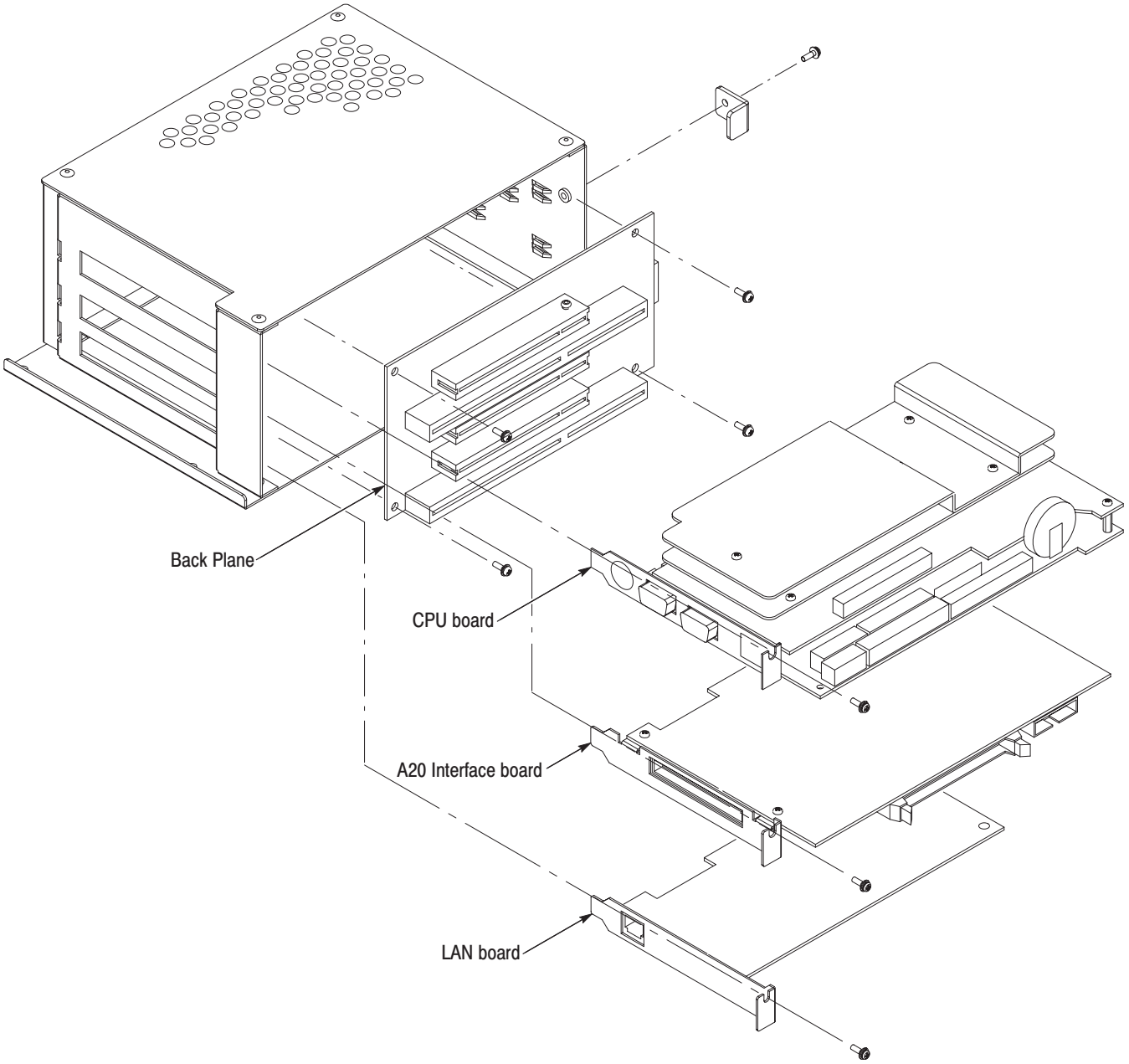


Figure 6-21: CPU, A20 Interface, and LAN boards removal

5. *Remove the **A20 Interface Board***:

   a. Using a screwdriver with a size Phillips #2 tip, remove the screw on the left side of the A20 Interface board. See Figure 6-21.

   b. Grasp the board and slide it out.

6. *Remove the **LAN Board***:

   a. Using a screwdriver with a size Phillips #2 tip, remove the screw on the left side of the LAN board. See Figure 6-21.

   b. Grasp the board and slide it out.

7. *Remove the **Backplane***:

   a. Unplug the power cable on the right side of the Backplane.

   b. Using a screwdriver with a size Phillips #2 tip, remove the four screws securing the board to the frame. See Figure 6-21.

   c. Grasp the board and lift it out.

8. *Reinstallation*:

   a. Perform steps 4 through 7 in reverse order to reinstall the all boards in the CPU unit.

   b. Perform step 3 in reverse order to reinstall the CPU unit.

Procedures for Rear Panel Modules

Perform the *Access Procedure* (page 6-17) before performing any procedure in this group. This group contains the following procedures:

- *BNC Cable Assembly* (SSI OUT and ASI OUT)
- *BNC Connector* (EXT 27 MHz REF IN)
- *ECL/TTL/LVDS OUT Connector*
- *ECL CONTROL Connector*

BNC Cable Assembly (SSI OUT and ASI OUT)

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

   a. You need a $^{1}/_{2}$–inch open–end wrench (Item 7).

   b. Locate the modules to be removed in the locator diagram *Rear panel modules* , Figure 6-5, page 6-16.

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

3. *Remove the BNC cable assembly:* See Figure 6-22.

   a. Unplug the cables at J4000 (SSI OUT) and J4002 (ASI OUT) on the A10 Main board.

b. Using the open-end wrench, unscrew the nut securing the BNC connector to the chassis.

c. Pull out the BNC cables from the chassis.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the BNC cable assembly.

BNC Connector (EXT 27 MHz REF IN)

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

a. Have handy a $^1/_2$–inch open-end wrench (Item 7).

b. Locate the modules to be removed in the locator diagram *Rear panel modules* , Figure 6-5, page 6-16.

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

3. *Remove the BNC connector:* See Figure 6-22.

a. Unplug the cable from the connector.

b. Using the open-end wrench, unscrew the nut securing the BNC connector to the chassis. Pull the BNC connector away.

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

ECL/TTL/LVDS OUT Connector

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

a. You need a screwdriver with a 1/4–inch nut driver (Item 5).

b. Locate the modules to be removed in the locator diagram *Rear panel modules* , Figure 6-5, page 6-16.

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

3. *Remove the ECL/TTL/LVDS OUT connector:* See Figure 6-22.

a. Unplug the cable from the A10 Main board.

b. Using a 1/4-inch nut driver, unscrew the two hex-headed mounting posts securing the connector to the chassis. Pull the connector away.

4. *Reinstallation:* Perform step 3 in reverse order to reinstall the ECL/TTL/LVDS OUT connector.

ECL CONTROL Connector

1. *Assemble equipment and locate modules to be removed:*
   a. You need a screwdriver with a 1/4–inch nut driver (Item 5).
   b. Locate the modules to be removed in the locator diagram *Rear panel modules* , Figure 6-5, page 6-16.
2. *Orient instrument:* Set the MPEG generator so its bottom is down on the work surface and its rear is facing you.
3. *Remove the ECL CONTROL connector:* See Figure 6-22.
   a. Unplug the cable from the A10 Main board.
   b. Using a 1/4-inch nut driver, unscrew the two hex-headed mounting posts securing the connector to the chassis. Pull the connector away.
4. *Reinstallation:* Perform step 3 in reverse order to reinstall the ECL CONTROL connector.

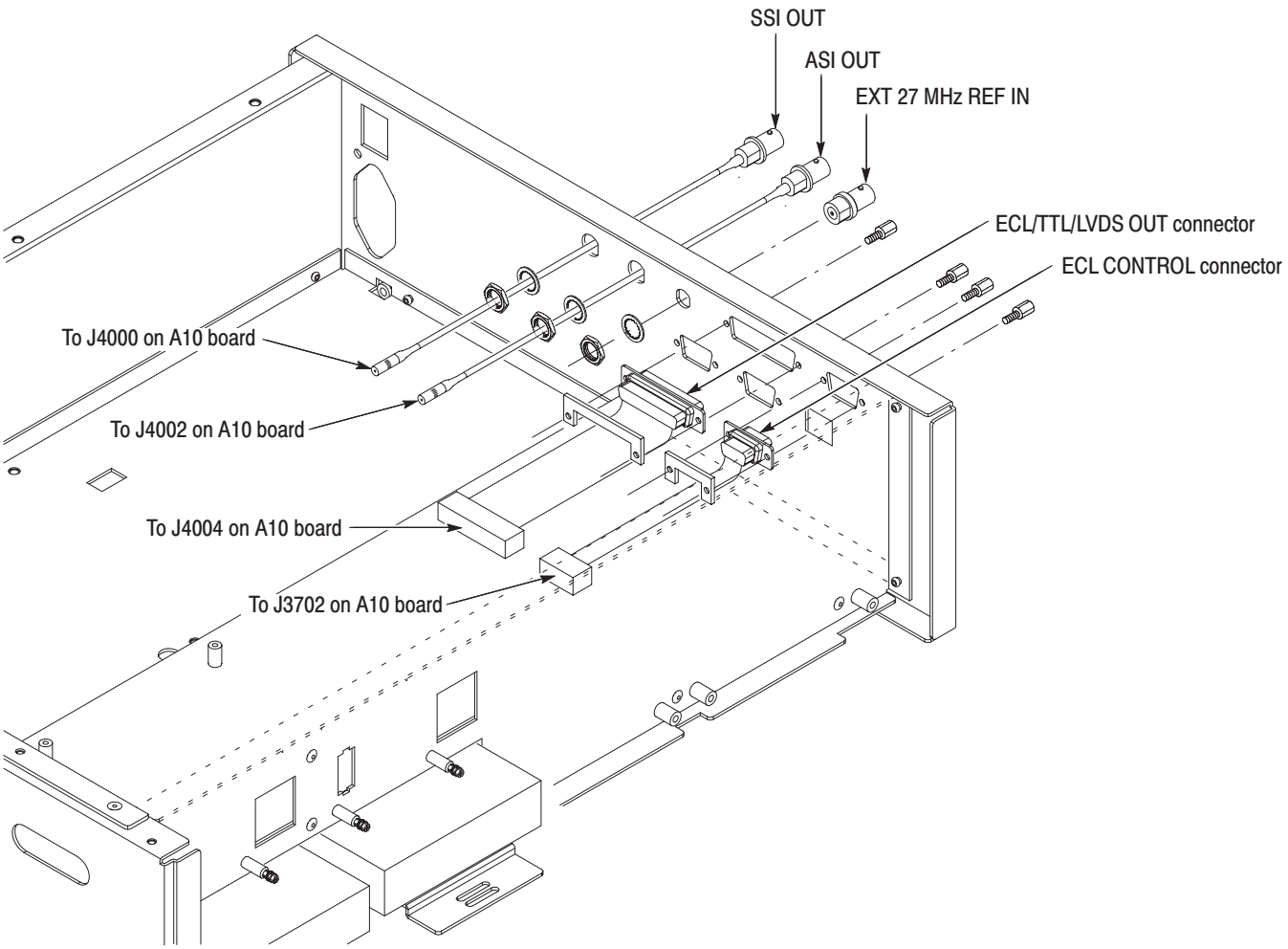


Figure 6-22: Rear panel modules removal

Troubleshooting

This subsection contains information about diagnostics and the Service menu, and troubleshooting trees designed to isolate faulty modules in the MPEG generator.

Diagnostics

The MPEG generator has internal diagnostics that verify circuit functionality. The diagnostics are automatically executed at power-on.

If errors are detected, the following error message(s) is(are) displayed on the screen.

Table 6-6: Error messages at power on diagnostics

Error messages		Solution
Front Panel Error!		Check and replace the W250 cable assembly. See Figure 9-2. If the error still occurs, replace the A30 Front Panel board.
Front panel fail		
Front panel configuration		
Front panel communication		
Front panel RAM		
Front panel ROM		
Front panel A/D		
Front panel timer		
CP H/W Error!	Diag fail	Update the system software using the Maintenance CD-R. Refer to *System Software Updates* on page 6-67. If the error still occurs, replace the A10 Main board.
CP H/W Error!	Communication fail	Check and replace the W330 and W331 cable assemblies. See Figure 9-2.
CW H/W Error!	Diag fail	Update the system software using the Maintenance CD-R. Refer to *System Software Updates* on page 6-67. If the error still occurs, replace the A10 Main board.

Table 6-6: Error messages at power on diagnostics (Cont.)

Error messages	Solution
CW H/W Error! Communication fail	Check and replace the W330 and W331 cable assemblies. See Figure 9-2.
HDC Logical Error! Directory error. You need to format the TS data disks and execute Scan Disk with utility menu after system up.	Execute the Scandisk or Format command in the Service menu. If the error still occurs, replace the data hard disk drives.
HDC H/W Error! Diag fail	Update the system software using the Maintenance CD-R. Refer to *System Software Updates* on page 6-67. If the error still occurs, replace the A10 Main board.
HDC H/W Error! Communication fail	Check and replace the W330 and W331 cable assemblies. See Figure 9-2.
Hdc initialize was not complete. There is a possibility that SCSI cables are incorrect.	Check and replace the W320 and W321 cable assemblies. See Figure 9-2.

Service Menu

The MPEG generator has a Service menu for servicing and maintenance. This menu enables you to format and check the data hard disk drives, test the LCD display and front panel controls, and update the system software. Refer to *System Software Updates* on page 6-67 for the procedures on updating the system software.

This subsection explains how to access the Service menu and the menu items in the Service menu.

1. Press the front-panel **MENU** button to enable the pull-down menu display
2. Use the arrow buttons to select the **UTILITY** menu name, and then press either the left or right control button to display the Utility pull-down menu.
3. Use the rotary knob or the arrow buttons to select **Service...** from the menu, and then press the **OK** bezel button to open the **Enter Password:** dialog box.
4. Input “3341344803” in the dialog box to open the **Service** dialog box.
5. Select one of the menu groups (TS Drive..., Tools..., or Update System Software) from the bezel menus. If you press the **Exit** bezel button, the Service menu closes.

6. Select the bezel menu item you want to execute.

Table 6-7 lists all the bezel menu items in the Service menu.

Table 6-7: Bezel menu items in the Service menu

Bezel menu items	Descriptions
TS Drive...	
Quick Format	Initializes the file tables of the MTG file system. All the data on the data hard disk drives are erased. Perform this command after you have changed the system hard disk drive or data hard disk drives.
Standard Format	Formats the data hard disk drives. All the data on the disks are completely erased. The defect block data is updated.
Simple Scandisk	Scans through the hard disks and check whether read errors are not detected. If errors are detected, for unused sectors, they are registered in the bad sector tables. For used sectors, they are scanned repeatedly, and if they are able to read, they are registered in the bad sector tables and then the data is written in the alternative sectors.
Normal Scandisk	Executes read/write test for the hard disks. For unused sectors, test data is written to the sector and then read back, to verify that the writing and reading succeeded. For used sectors, data in the sectors is temporarily stored in RAM while the a read/write test is executed, and then the data in RAM is written back to the sectors.
Tools...	
LCD Display	Displays a sequence of test patterns (white, black, gray scale, red, green and blue) for checking the LCD display. Pressing the bottom bezel button changes the test pattern.
Front Panel Key Test	Used to verify that the front panel controls work properly. Pressing the bezel button displays an illustration of the front panel on the screen. You then press each button and verify that it is highlighted on the illustration in the display.
ASI/SSI	When you select Disable, the carrier signal of the currently set output frequency is output with no modulation from the ASI OUT and SSI OUT connectors. You can use this signal for C/N measurement.
Update System Software...	
Update User Program...	Updates the user program of the instrument (mtg).
Update Operating System...	Updates the operating system of the instrument (mtg.os).
Update Hardware Control...	Update the software that controls the instrument hardware (hdc.mot, hdc.ttf, cp.mot, cp.ttf, cw.mot, cw.ttf. ins.ttf, and out.ttf).

Scandisk Output File

When you execute the **Simple Scandisk** or **Normal Scandisk** command, the test result is saved as a file (/ide0/scandisk.res). Using this test result, you can check the number of clusters where errors were detected and clusters where errors were recovered. This file is not deleted when the hard disks are formatted.

The scandisk output file uses the following form:

```
1999/12/16 10:10:35,SIMPLE,T:11111111,R1:22222222,
E1:33333333,F1:44444444,R2:55555555,E2:66666666,F2:77777777
```

- **1999/12/16 10:10:35** : Shows the time when the scandisk operation was completed.
- **SIMPLE** or **NORMAL** : Shows the type of the executed scandisk command.
- **T:11111111** : Shows the number of clusters for checking.
- **R1:22222222** : Shows the number of clusters from which errors were recovered on disk 1.
- **E1:33333333** : Shows the number of clusters in which errors were detected on disk 1.
- **F1:44444444** : Shows the number of clusters from which errors were not recovered on disk 1.
- **R2:55555555** : Shows the number of clusters from which errors were recovered on disk 2.
- **E2:66666666** : Shows the number of clusters in which errors were detected on disk 2.
- **F2:77777777** : Shows the number of clusters from which errors were not recovered on disk 2.

Troubleshooting Trees

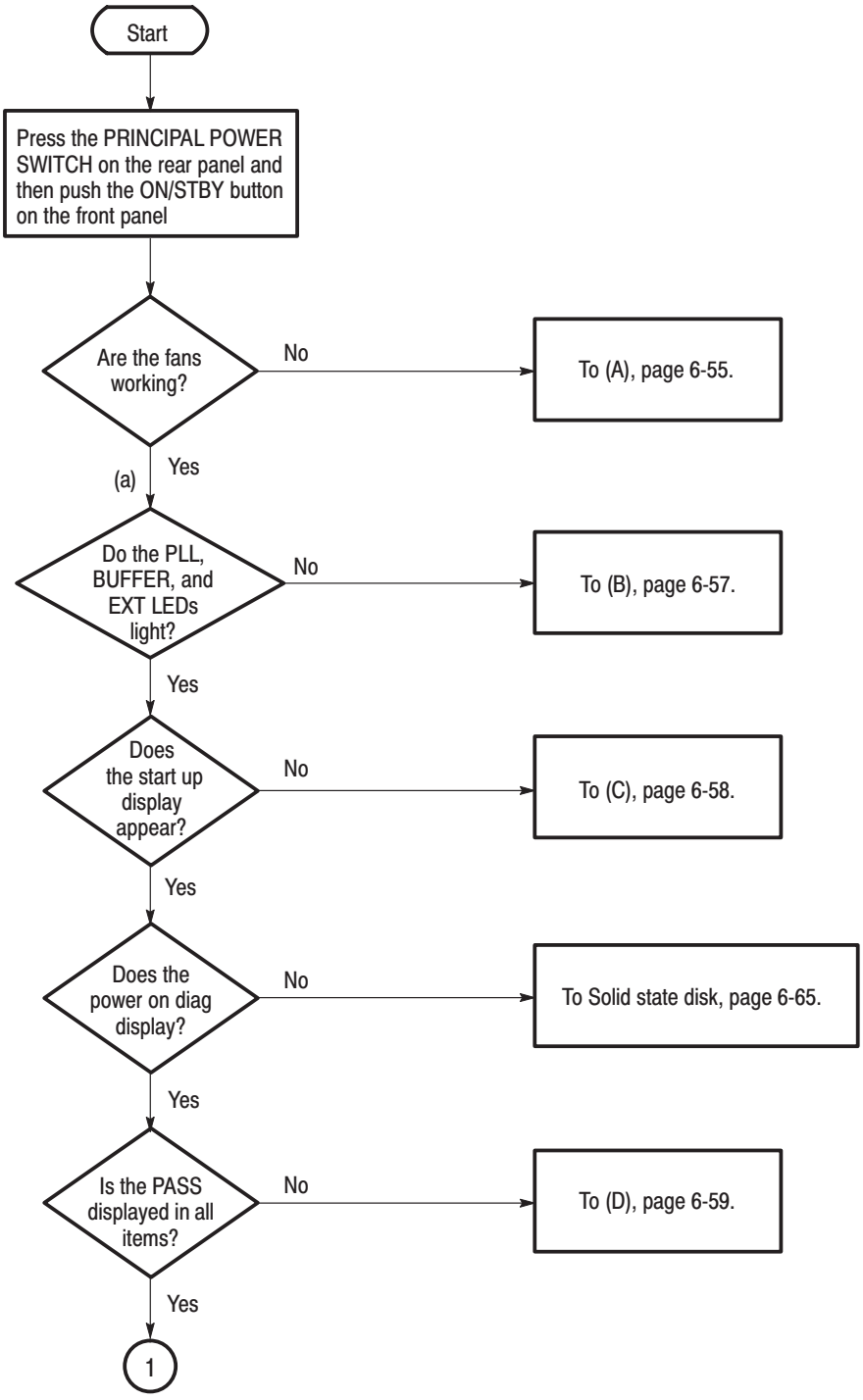


Figure 6-23: Troubleshooting procedure (1)

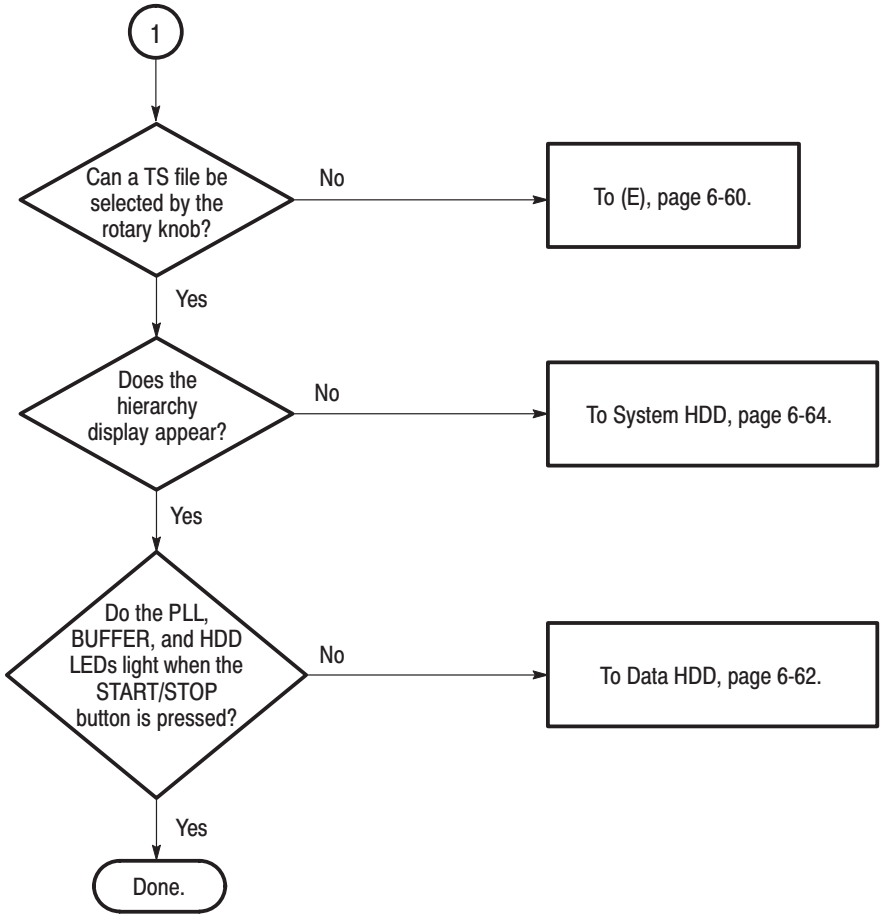


Figure 6-24: Troubleshooting procedure (2)

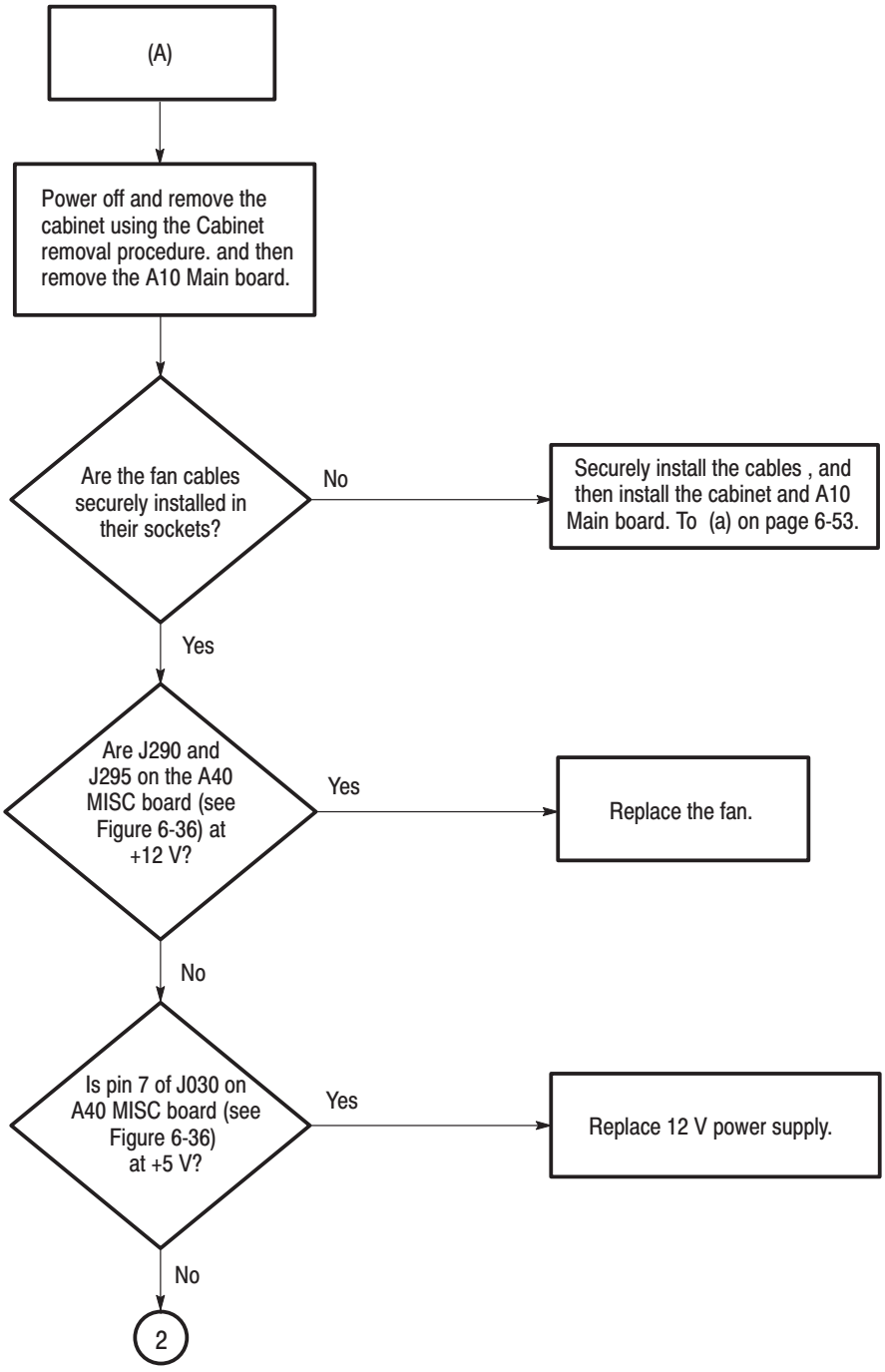


Figure 6-25: Troubleshooting procedure (3)

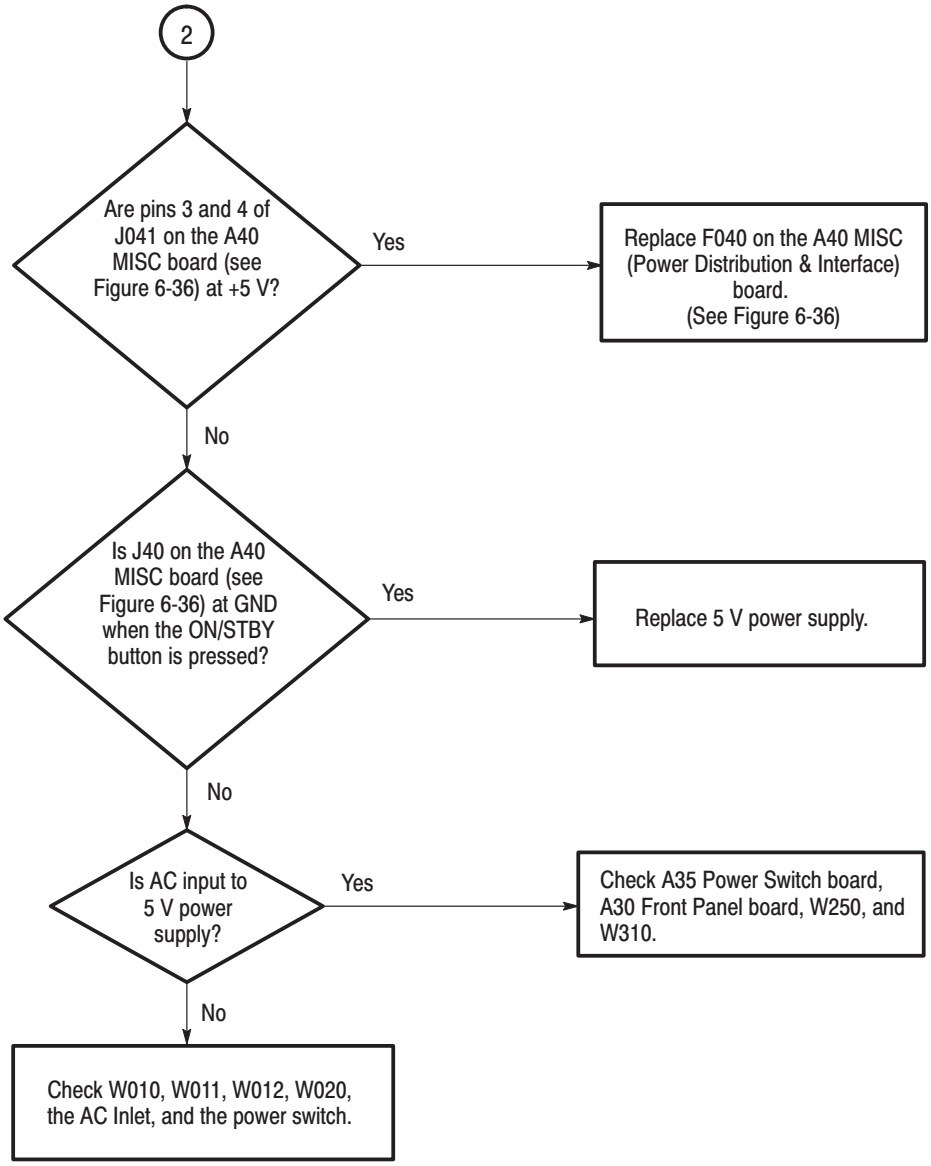


Figure 6-26: Troubleshooting procedure (4)

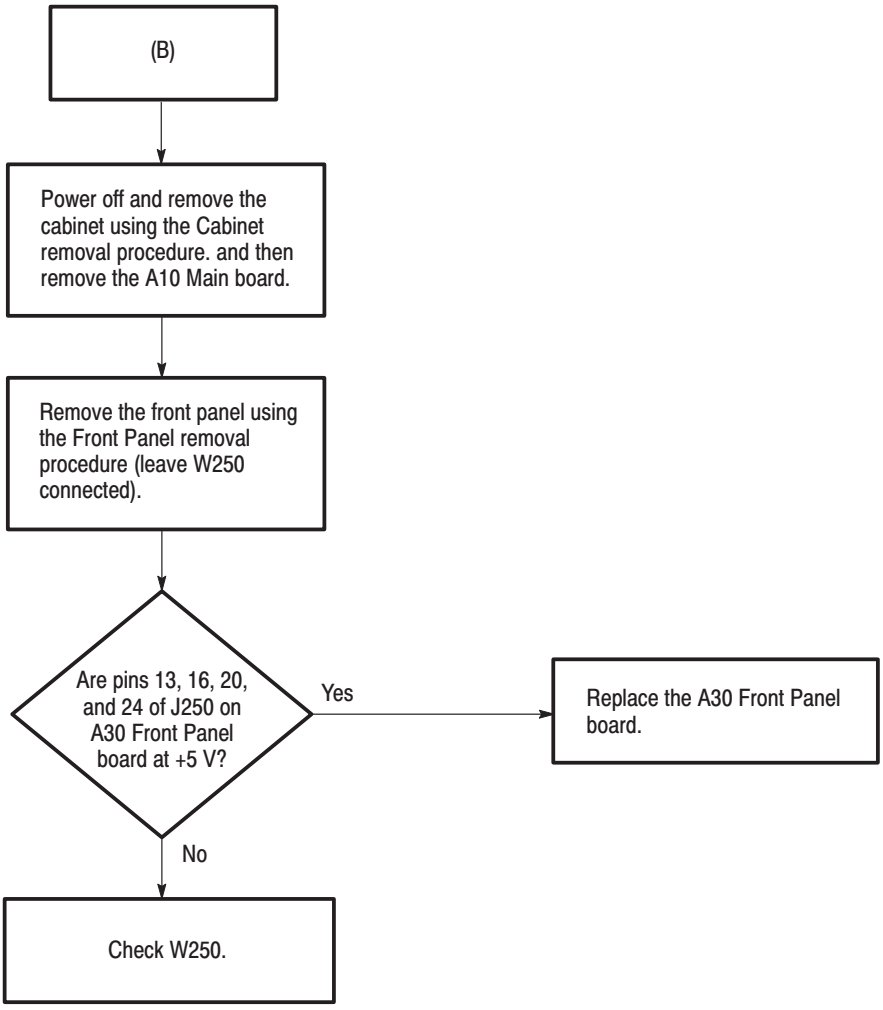


Figure 6-27: Troubleshooting procedure (5)

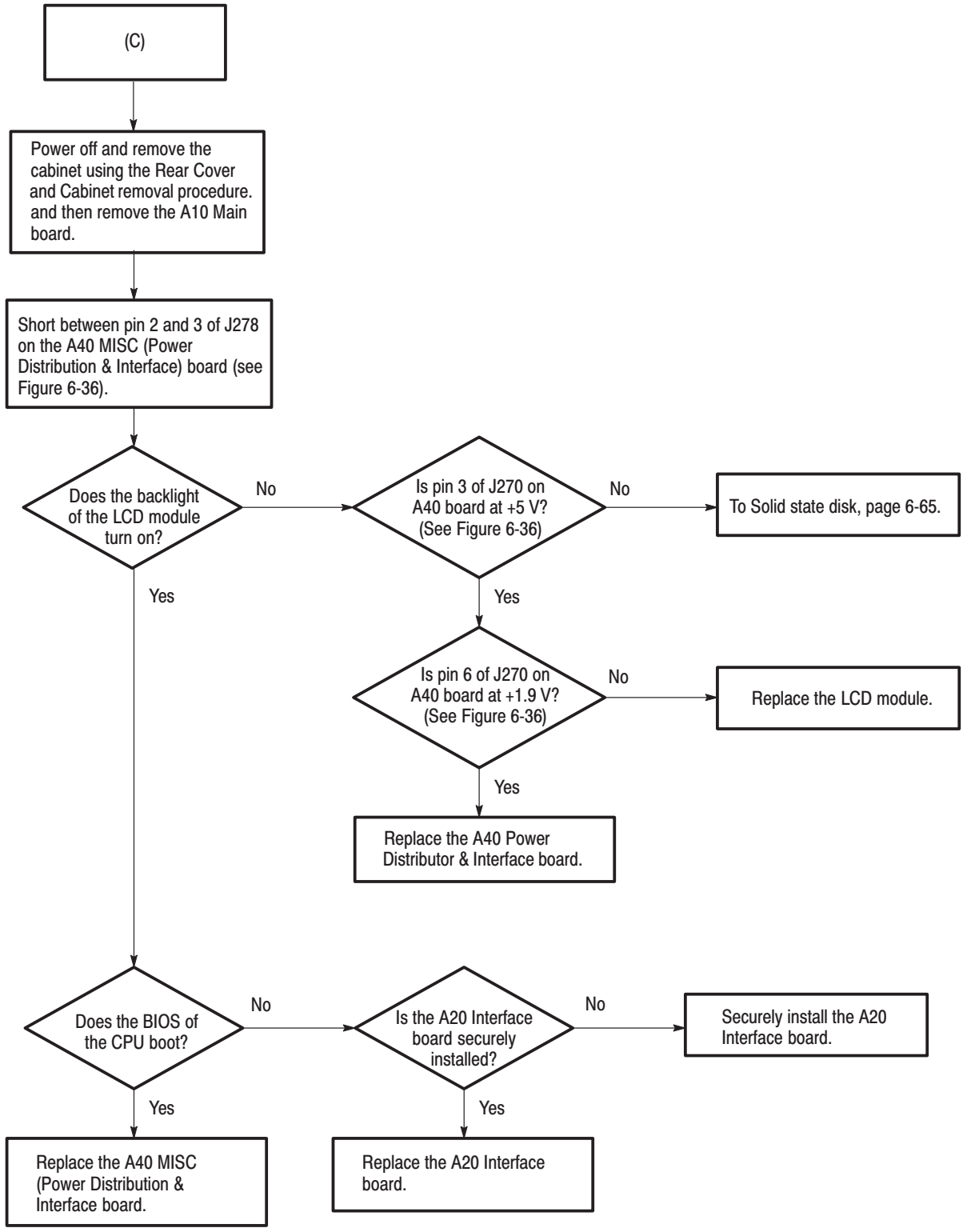


Figure 6-28: Troubleshooting procedure (6)

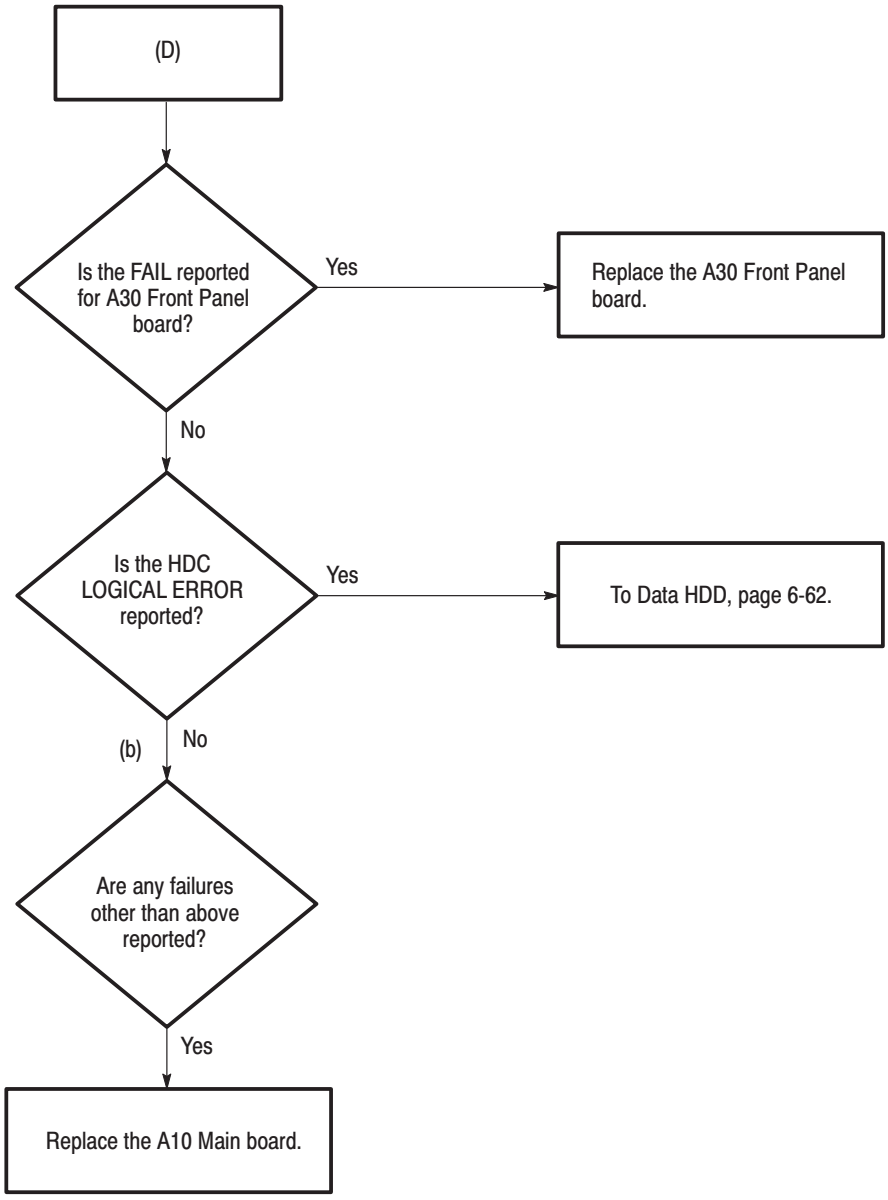


Figure 6-29: Troubleshooting procedure (7)

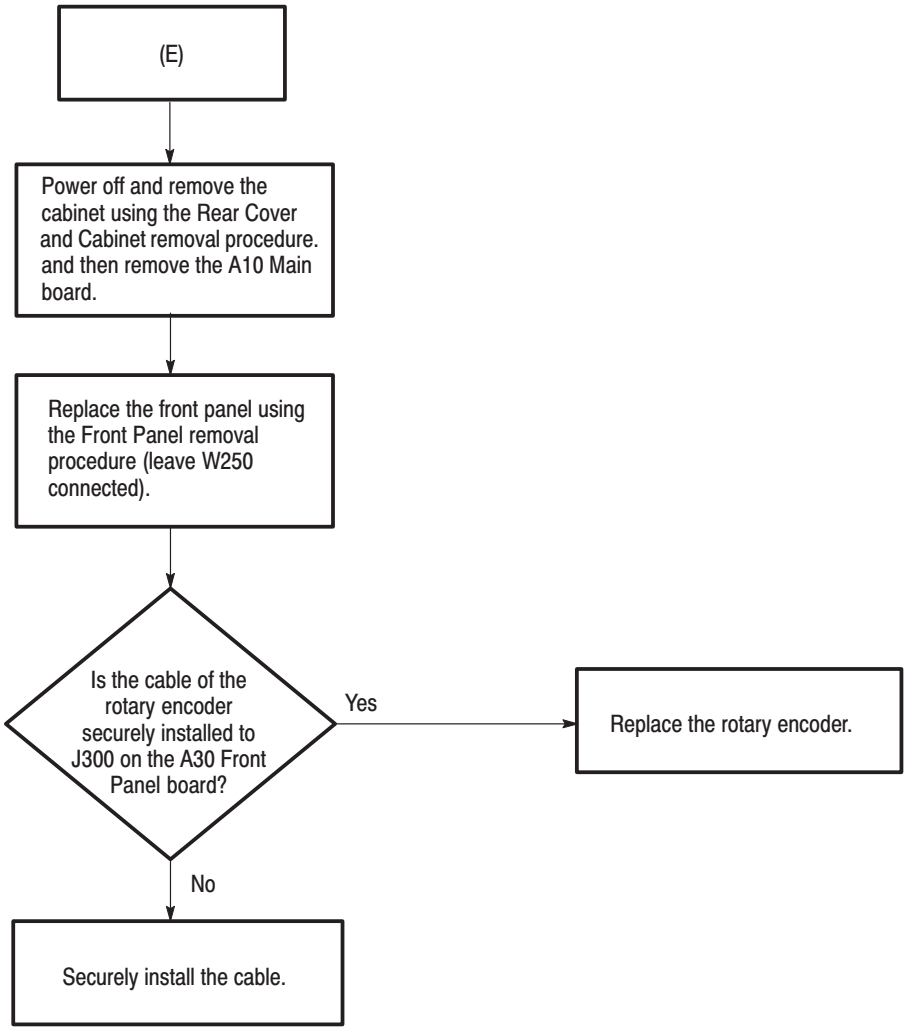


Figure 6-30: Troubleshooting procedure (8)

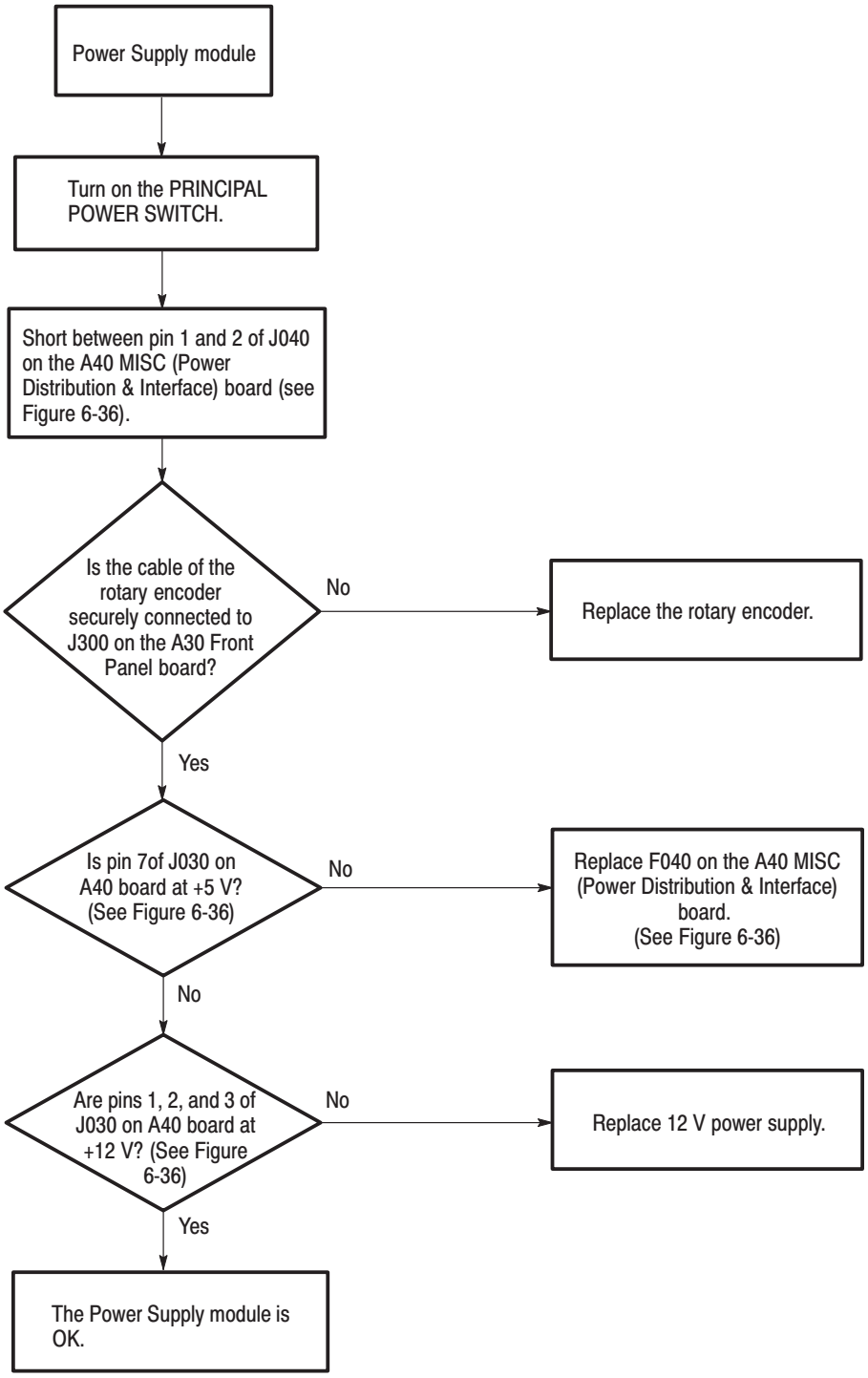


Figure 6-31: Troubleshooting procedure (8)

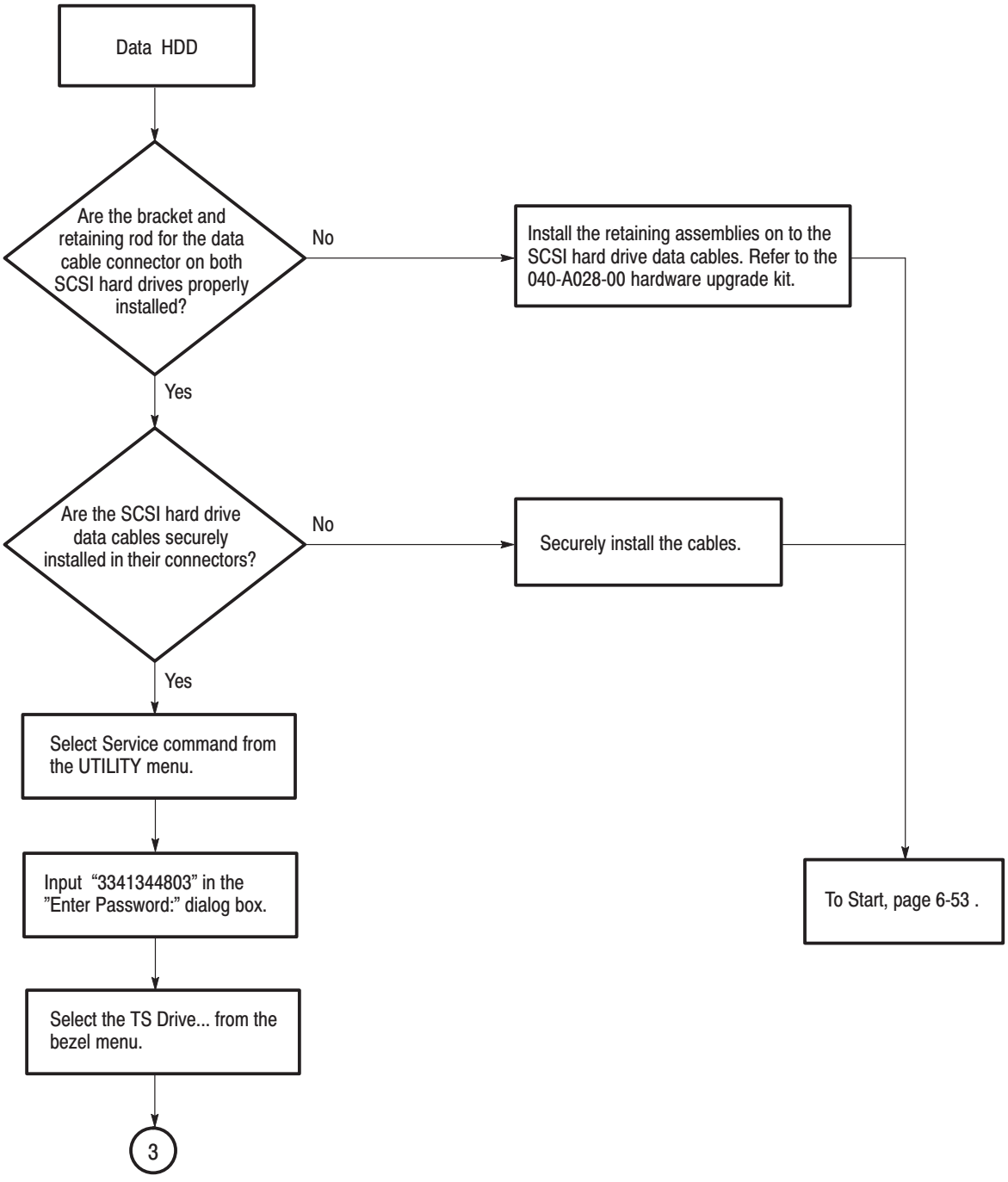


Figure 6-32: Troubleshooting procedure (9)

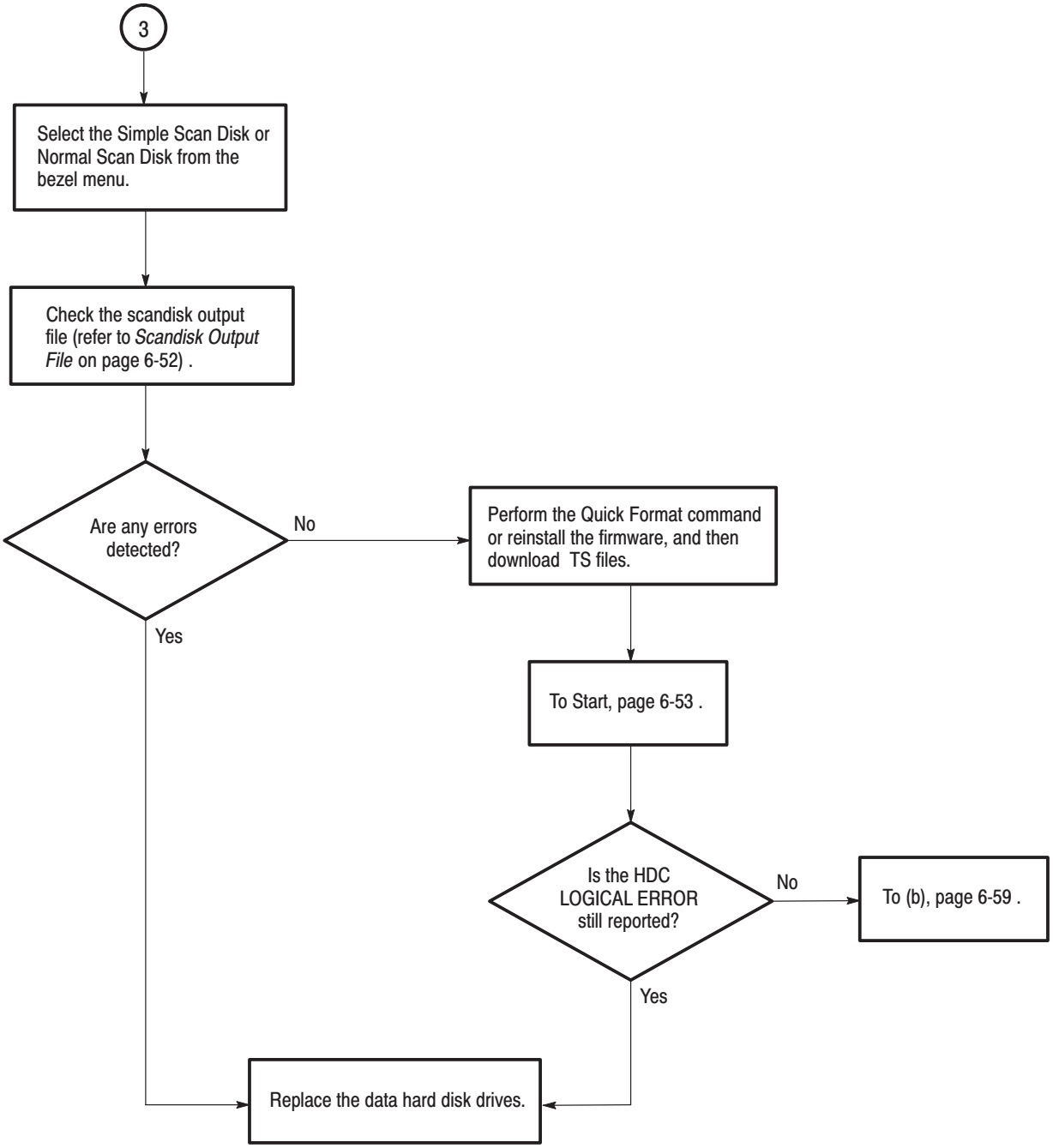


Figure 6-33: Troubleshooting procedure (10)

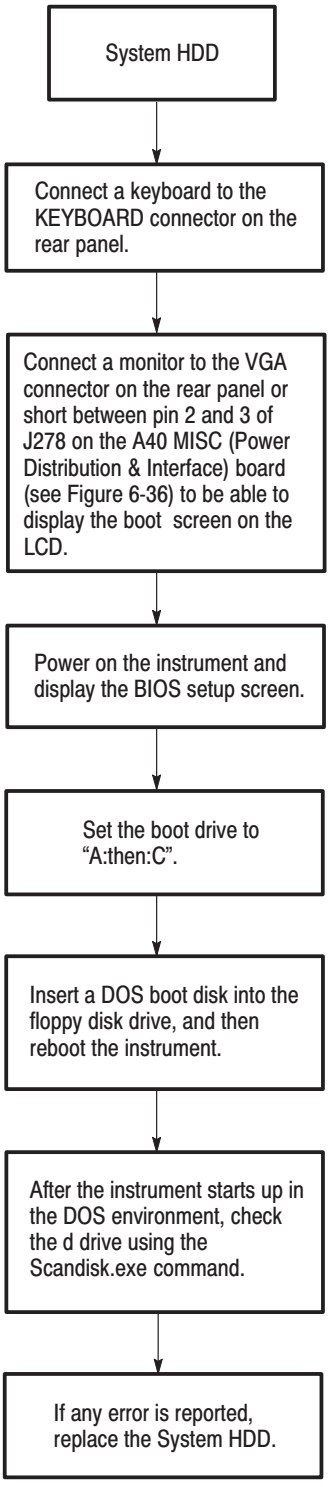


Figure 6-34: Troubleshooting procedure (11)

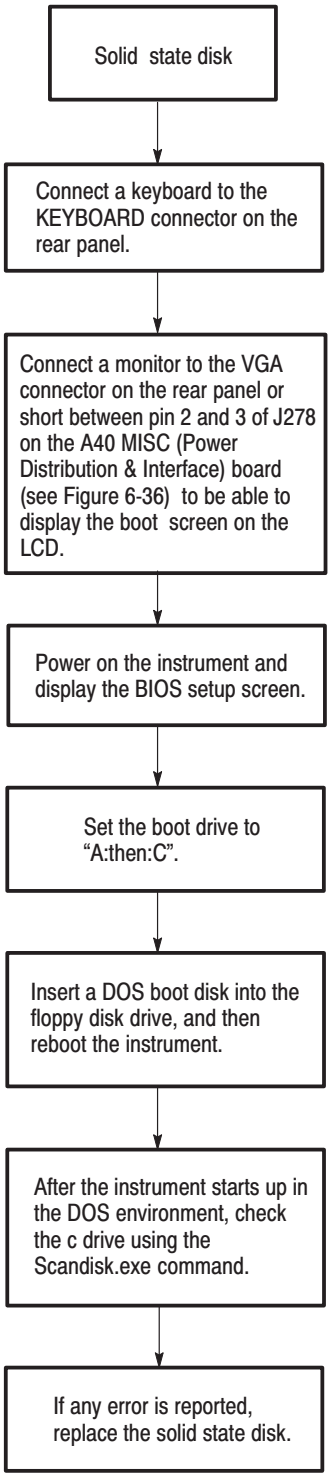
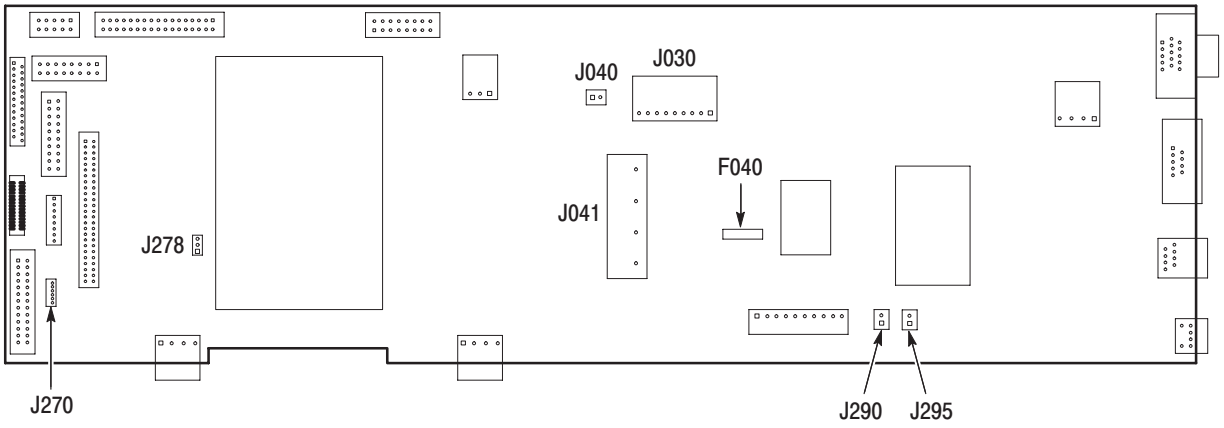


Figure 6-35: Troubleshooting procedure (12)



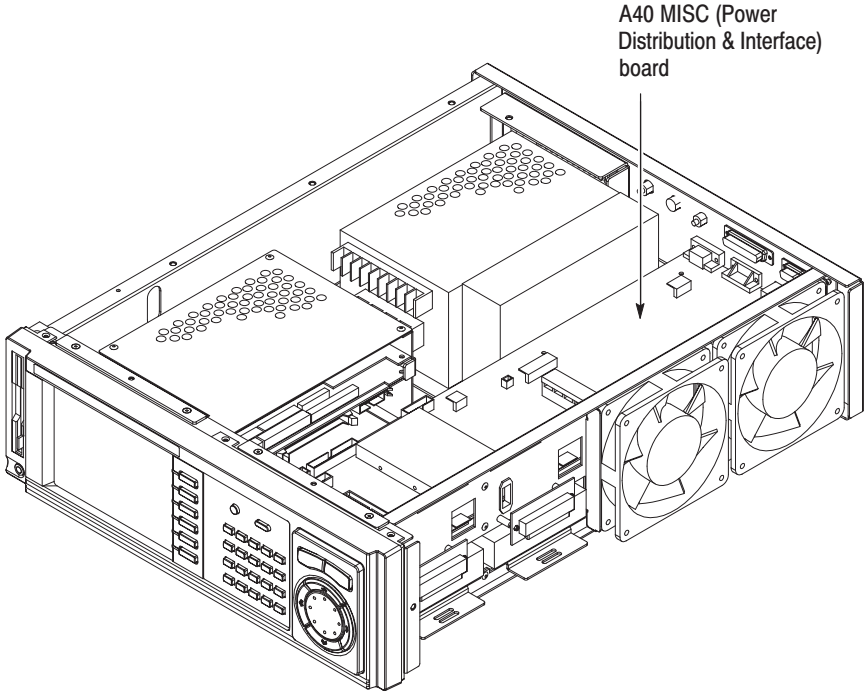


Figure 6-36: Location of the A40 MISC (Power Distribution & Interface) board

Firmware Updates

The MPEG generator firmware can be updated when troubleshooting indicates it is needed or when the firmware has been updated.

This subsection explains how to update the firmware.

Equipment Required

Table 6-8 lists the equipment required to update the firmware.

Table 6-8: Equipment required

Item	No.	Requirements	Recommended equipment
PC	1	Windows NT 4.0 and Ethernet interface installed	
Ethernet cable	1	10BASE-T crossover cable	
Maintenance CD-R	1	Tektronix part no. 063-3347-XX	

Update Procedure

Update procedures compose of two main processes:

- Transferring the files to the MPEG generator
- Checking the firmware version

Transferring the Files to the MPEG generator

1. Connect the ETHERNET connector on the MPEG generator rear panel to the Ethernet port on your PC using the Ethernet cable.
2. Power on the MPEG generator and your PC.
3. Set the network parameters of the MPEG generator in the UTILITY pull-down menu. For detailed information about how to set the parameters, refer to the *MTG100 & MTG300 MPEG Generator User Manual*.
4. Insert the Maintenance CD-R into the CD-ROM drive on your PC.
5. Double-click the **My Computer** icon on your PC.
6. Double-click the **CD-ROM drive** icon. This will display the contents of the Maintenance CD-R.

7. Double-click the **Fw** folder in the list. This will display the contents of the folder.

8. Double-click the **Versionup.exe** in the list. This will open the **MTG Series Firmware Update** dialog box shown in Figure 6-37.

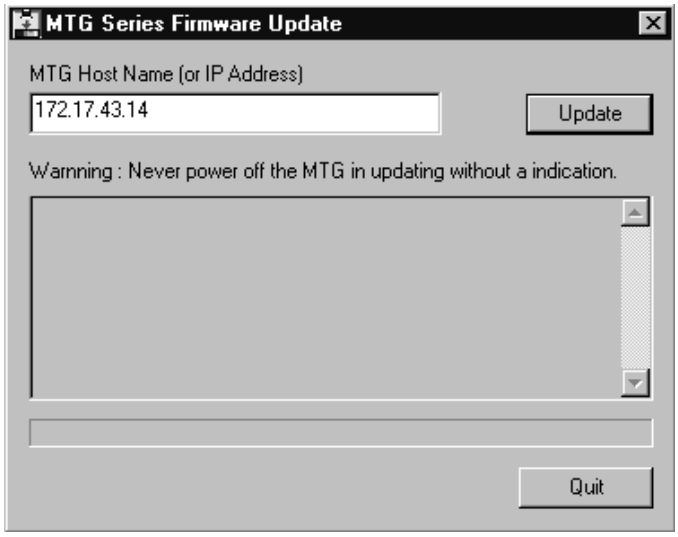


Figure 6-37: MTG Series Firmware Update dialog box

9. In the dialog box, enter the IP address that you assigned to your MPEG generator.

10. Click the **Update** button.

***NOTE**. For version 1.11, skip steps 11 through 13.*

11. When the file transfer is complete, the message box shown in Figure 6-39 appears.

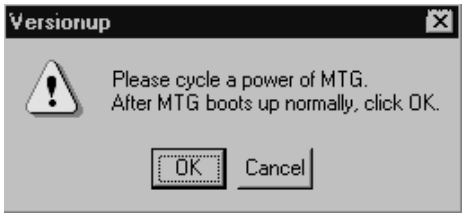


Figure 6-38: Message box appearing after the file transfer is complete.

***NOTE**. For version 1.00, the error message "Internal error occurred:" is displayed on the MPEG generator's screen. However, this does not mean that the trouble is detected during transferring the files.*

12. Power off the MPEG generator and then power it on again.

13. Click the **OK** button in the message box.

14. When the upgrade is complete, the message box shown in Figure 6-39 appears.



Figure 6-39: Message box appearing after the update is complete

15. Click the **OK** button in the message box.

16. Power off the MPEG generator and then power it on again.

The message box shown in Figure 6-40 appears on the screen.

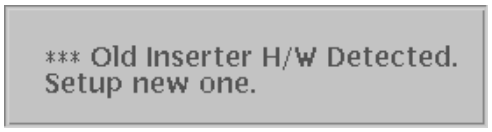


Figure 6-40: Message box appearing after turn on the instrument

17. Press the **OK** bezel button.

The message "Internal error occurred : 0x15410300" appears on the screen.

18. Press the **OK** bezel button.

Checking the Firmware Version

1. Select the **System...** from the **UTILITY** pull-down menu, and then press the **OK** bezel button. This will open the **System** dialog box shown in Figure 6-41.

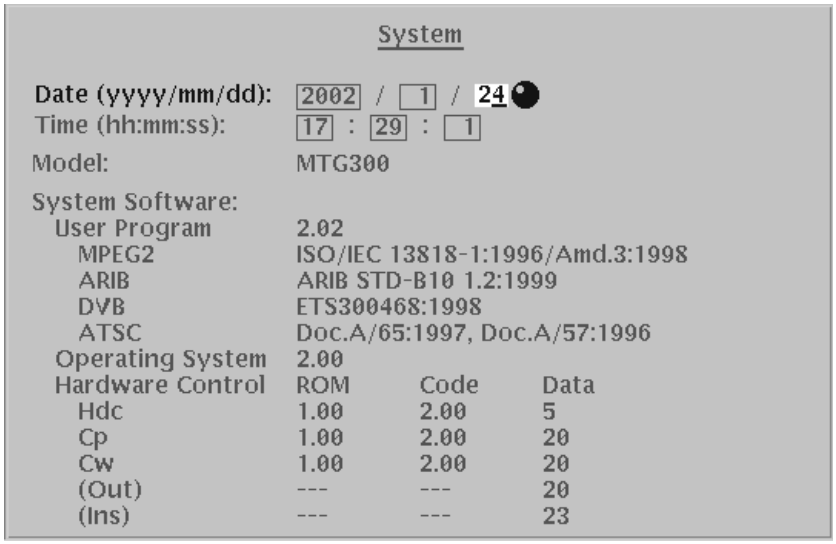


Figure 6-41: System dialog box

2. In the dialog box, check whether the new version of the firmware is properly installed.

Replacing the Hard Disk Drive(s)

When you replace the data hard disk drives (SCSI hard disk drives) or system hard disk drive (IDE hard disk drive) for servicing, you must perform the following tasks:

- Data hard disk drives:
  - Back up the files stored on the data hard disks
  - Set the jumpers before installation
  - Format the data hard disks
  - Reinstall the factory-supplied files on the data hard disks
- System hard disk drive:
  - Back up the files stored on the data hard disks
  - Format the data hard disks
  - Reinstall the factory-supplied files on the data hard disks

NOTE. *Refer to* Removal and Installation Procedures *in this section for removing and installing the data hard disk drives and system hard disk drive.*

Equipment Required

Table 6-9 lists the equipment required to reinstall the factory-supplied files and backup the downloaded (stored) files on the data hard disks.

Table 6-9: Equipment required

Item	No.	Requirements	Example
PC	1	Microsoft Windows NT 4.0 operating system and Ethernet interface (MTG Comm application must be installed)	
Ethernet cable	1	10BASE-T crossover cable	
Maintenance CD-R	1		Tektronix p/n 063-3347-XX

Data Hard Disk Drives

***NOTE**. Whenever replacing the data hard disk drives, be sure to replace both of the disk drives at the same time.*

Backing up the Files Stored on the Data Hard Disks

Before removing the data hard disk drives, you should save all the transport stream, insertion, and preset files (except for the factory-supplied files) stored on the data hard disks to the hard disk on the PC.

Perform the following steps to upload a transport stream file, insertion file, or preset file from the MPEG generator to the PC:

***NOTE**. Refer to the* Appendix B: Using MTG Comm+ for File Transfer *in the* MTG100 & MTG300 MPEG Generator User Manual *for setting the Ethernet network parameters and operating the MTG Comm+ application.*

1. Connect your PC and MPEG generator using a 10BASE-T crossover Ethernet cable, and then set the Ethernet network parameters for the MPEG generator and MTG Comm+ application.
2. Start the MTG Comm+ application.
3. In the List view of the MTG Comm+ application, select the file you want to upload to the PC.
4. Select **MTG to PC...** from the **File** pull-down menu to open the Save As dialog box.
5. In the Save As dialog box, specify the destination folder for the file you are going to upload to your PC.
6. Click the **Save** button to upload the file from the MPEG generator to your PC.
7. Repeat steps 3 through 6 as required until you have backed up all the files you want to save.

Setting the Jumpers before Installation

Before installing the new data hard disk drives into the MPEG generator, you should set the configuration jumpers of the disk drives.

If you use the hard disk drives listed in the Replaceable parts list in *Section 10* (Tektronix p/n 119-B084-XX), disconnect all the jumpers from the connector pin located on the back of the drive.

If you use the hard disk drives other than above, set the jumpers to obtain the following configuration:

- SCSI ID : 0
- Terminator Power Supply : Off
- Auto Spin Up : Off
- Internal SCSI Terminator : Off
- Auto Start Delay : Off

Formatting the Data Hard Disks

After you have installed the data hard disk drives properly, perform the following procedure to format the data hard disks:

1. Select **Service...** from the Utility pull-down menu of the MPEG generator. This will open the **Enter Password:** dialog box.
2. In this dialog box, enter "3341344803", and then press the **OK** bezel button. This will open the **Service** dialog box.
3. Press the **TS Drive...** bezel button, and then press the **Quick Format** bezel button to format the disk drive. This will open the confirmation dialog box. Press the **OK** bezel button to execute the operation.

   During the operation, the message "**Executing... xx %**" will appear.
4. Press the **Previous** bezel button, and then press the **Exit** bezel button to exit the Service menu.

Reinstalling the Factory-supplied Files

Perform the following procedure to reinstall the factory-supplied files (test40.trp, test64.trp, sample1.trp, sample2.trp, and insert.eit) on the data hard disks:

1. Insert the Maintenance CD-R into the CD-ROM drive on the PC.
2. Using the file transfer command (PC to MTG...) of the MTG Comm$^+$ application, download the following four files to **/main/usr/ts** directory in the MPEG generator:
   - test40.trp
   - test64.trp
   - sample1.trp
   - sample2.trp

3. Using the file transfer command (PC to MTG...) of the MTG Comm+ application, download the following one file to **/main/usr/insert** directory in the MPEG generator:

   - insert.eit

System Hard Disk Drive

NOTE. *When you replace the system hard disk drive, none of the files stored on the data hard disks can be recognized. Therefore, when you replace the system hard disk drive only, you must also reformat the data hard disks and reinstall all the files on them.*

Backing up the Files Stored on the Data Hard Disks

Before removing the system hard disk drive, you should save all the transport stream, insertion, and preset files (except for the factory-supplied files) stored on the data hard disks to the hard disk on the PC.

Perform the following steps to upload a transport stream file, insertion file, or preset file from the MPEG generator to the PC:

NOTE. *Refer to the* Appendix B: Using MTG Comm+ for File Transfer *in the* MTG100 & MTG300 MPEG Generator User Manual *for setting the Ethernet network parameters and operating the MTG Comm+ application.*

1. Connect your PC and MPEG generator using a 10BASE-T crossover Ethernet cable, and then set the Ethernet network parameters for the MPEG generator and MTG Comm+ application.
2. Start the MTG Comm+ application.
3. In the List view of the MTG Comm+ application, select the file you want to upload to the PC.
4. Select **MTG to PC...** from the **File** pull-down menu to open the Save As dialog box.
5. In the Save As dialog box, specify the destination folder for the file you are going to upload to your PC.
6. Click the **Save** button to upload the file from the MPEG generator to your PC.
7. Repeat steps 3 through 6 as required until you have backed up all the files you want to reinstall later.

Formatting the Data Hard Disks

After you have installed the system hard disk drive properly, perform the following procedure to format the data hard disks:

1. Select **Service...** from the Utility pull-down menu of the MPEG generator. This will open the **Enter Password:** dialog box.
2. In this dialog box, enter "3341344803", and then press the **OK** bezel button. This will open the **Service** dialog box.
3. Press the **TS Drive...** bezel button, and then press the **Quick Format** bezel button to format the disk drive. This will open the confirmation dialog box. Press the **OK** bezel button to execute the operation.

   During the operation, the message "**Executing... xx %**" will appear.
4. Press the **Previous** bezel button, and then press the **Exit** bezel button to exit the Service menu.

Reinstalling the Factory-supplied Files

Perform the following procedure to reinstall the factory-supplied files (test40.trp, test64.trp, sample1.trp, sample2.trp, and insert.eit) on the data hard disks.

1. Insert the Maintenance CD-R (Tektronix part no. 063-3347-XX) into the CD-ROM drive on the PC.
2. Using the file transfer command (PC to MTG...) of the MTG Comm$^+$ application, download the following four files to **/main/usr/ts** directory in the MPEG generator:
   - test40.trp
   - test64.trp
   - sample1.trp
   - sample2.trp
3. Using the file transfer command (PC to MTG...) of the MTG Comm$^+$ application, download the following one file to **/main/usr/insert** directory in the MPEG generator:
   - insert.eit

Hardware Device Error Codes

This subsection describes the hardware device error codes displayed on the screen during operation. These error codes appear in the dialog box as a error message with the following form:

"Internal error occurred : <error code>"

The hardware device error code is composed of a 32-bit number and can be divided into four blocks as shown in Figure 6-42.

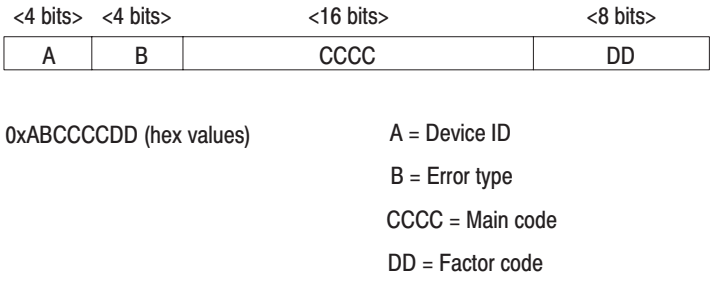


Figure 6-42: Organization of the device error codes

The device ID and error type are classified as follows:

- Device ID :

  1 – Hard Disk Controller

  2 – Change Packet

  3 – Change Word

- Error type :

  1 – Communication errors

  2 – File operation errors

  3 – Syntax errors

  4 – Command execution errors

  5 – Device execution errors

  F – Other errors

Table 6-10 lists the hardware device error codes.

Table 6-10: Hardware device error codes

Error code	Symptom	Possible Causes	Solution
Common with Hard Disk Controller, Change Packet, and Change Word			
0xX1XXXX01	The device is not ready.	(1) The MPU system of the device does not work properly. (2) The buffer memory for communication is faulty.	Reset the instrument. If this error occurs frequently, replace the A10 Main board.
0xX1XXXX02	The device is busy.		
0xX1XXXX04	Communication error 1 occurs.		
0xX1XXXX08	Communication error 2 occurs.		
0xX1XXXX10	Communication time-out occurs.		
0x2XXXX00– 0xX2XXXXFF	Cannot access the system hard disk drive.	(1) The temporary file created when the firmware, FPGA data, and SI data is downloaded could not be created. (2) The specified data file could not be opened when the firmware, FPGA data, and SI data was downloaded.	Reset the instrument. If this error occurs frequently, replace the system hard disk drive.
0xX3XXXX00– 0xX3XXXXFF	Command syntax error occurs.	A command was implemented incorrectly (software bugs).	Update the related programs.
0xX3XXXXFF	An undefined command is published.		
0xX4XXXX00– 0xX4XXXXFF	A command aborts.	(1) A command execution quitted unexpectedly. (2) The GUI, operating system, firmware, and FPGA data was not written in the flash ROM normally when they were updated.	Reset the instrument. If this error occurs frequently, replace the A10 Main board.
Hard Disk Controller			
0x15400000	An unknown error occurs.	An error in the firmware.	
0x15400100	A command for the data hard disk drives aborts.	A bus error or interface error in the hard disk controller was occurred.	
0x15410100	An error occurs at the SCSI interface.	The data hard disk drives or interconnection cables are faulty.	Check the interconnection cables between the data hard disk drives and A10 or A40 boards (W320, W051, W340, W321, W052, and W341). See Figure 9-2.
0x15410200	Response from the data hard disk drives is too slow.	The data hard disk drives are faulty.	Perform the Scandisk commands from the Service menu to check and restore the disk drives. If this error occurs frequently, replace the data hard disk drives.
0x15410300	An logical error occurs in the file system used in the data hard disk drives.	Data area that manages transport stream file information is faulty.	(1) Perform the Scandisk commands from the Service menu. (2) Perform the Format commands from the Service menu. (3) Replace the data hard disk drives.

Table 6-10: Hardware device error codes (Cont.)

Error code	Symptom	Possible Causes	Solution
Change Packet			
0x25400100	A non-transport stream packet is detected.	A non-transport stream packet data was transferred to the input buffer of the Change Packet.	Reset the instrument.
0x25400200	Packet transfer time-out occurs.	A packet could not be transferred from the input buffer of the Change Packet or SI RAM to the input buffer of the Change Word in the specified time.	Reset the instrument. If this error occurs frequently, replace the A10 Main board.
0x25400300	Input data can not be flushed.	The flush operation of the data in the input buffer of the Change Packet did not end in the specified time.	Reset the instrument. If this error occurs frequently, replace the A10 Main board.
0x25400400, 0x25400500	There are too many tasks to operate.	The number of tasks that the Change Packet can handle exceeded the maximum value (255).	Reduce the tasks.
Change Word			
0x35400100	A non-transport stream packet is detected.	A non-transport stream packet data was transferred to the input buffer of the Change Word.	Reset the instrument.
0x35400200	Packet transfer time-out occurs.	A packet could not be transferred from the input buffer of the Change Word to the output buffer of the Change Word in the specified time.	Reset the instrument. If this error occurs frequently, replace the A10 Main board.
0x35400300	Input data can not be flushed.	The flush operation of the data in the input buffer of the Change Word did not end in the specified time.	Reset the instrument. If this error occurs frequently, replace the A10 Main board.

Error Messages

Table 6-11 lists instrument error messages that appear during operation. These messages are displayed in the pop-up message box.

If any of these errors is detected while a transport stream is output, the output is stopped. Press the **OK** bezel button or **START/STOP** button to restart the output.

Table 6-11: Error messages

Error message
“Over absolute max”;
“Under absolute min”;
“Over max”;
“Under min”;
“Not selectable”;
“No legal value”;
“Data too big”;
“No data”;
“Element number”;
“Data format”;
“Cannot open file”;
“Cannot read from file”;
“Cannot write to file”;
“Cannot seek”;
“Cannot delete file”;
“Invalid operation to system file”;
“Invalid character in filename”;
“File not found”;
“Directory not found”;
“Destination is same as source”;
“Directory cannot be copied”;
“Directory cannot be moved”;
“Illegal file format”;
“Path name is too long”;

Table 6-11: Error messages (cont.)

Error message
“File name is too long”;
“Drive not available”;
“Drive busy”;
“Disk not inserted”;
“Disk full”;
“File already exists”;
“Illegal file name”;
“Illegal path name”;
“Illegal drive name”;
“Cannot delete root directory”;
“Not a directory”;
“The file is read only”;
“The disk is write protected”;
“Root directory full”;
“Directory not empty”;
“Bad disk”;
“Unknown file system error”;
“Permission denied”;
“Memory full”;
“No answer from”;
“Illegal IP address”;
“Network is unreachable”;
“Unknown network error”;
“Unknown error”;
“TS file loading error”;
“INS file loading error”;
“PRESET file loading error”;
“PRESET file saving error”;
“Newer file format”;
“Cannot find property file”;
“Illegal attribute file format”;
“TS file is not loaded”;
“Exceed insertion limit”;

Table 6-11: Error messages (cont.)

Error message
“Hardware control update failure”;
“Cannot create SI template”;
“Cannot load SI template”;
“PID already exist”;
“PID not exist”;
“Cannot reject”;
“Exceed replace limitation”;
“Already replaced”;
“Cannot detect packet size”;
“Output buffer not ready”;
“HDC cannot start”;
“CP cannot start”;
“CW cannot start”;
“Stopped by PLL unlocked”;
“Stopped by output buffer empty”;
“Internal error occurred : <hardware device error code>”; For detailed information about the hardware device error code, refer to *Hardware Device Error Codes* on page 6-77.

Options and Accessories

This section describes the various options as well as the standard and optional accessories that are available for the MTG100 and MTG300 MPEG Generator.

Options

The options available for the MTG100 and MTG300 MPEG Generators are shown in Table 7-1.

Table 7-1: Options

Options	Description
Option 1R (Rackmount)	MPEG generator comes configured for installation in a 19 inch wide instrument rack. For later field conversions, order kit # 040-1665-XX.
Option D1 (Test data report)	A report with the calibration test data for the instrument is provided when this option is specified. (Test equipment used is calibrated according to Japanese national standards. Most metrology labs recognize the Japanese standards as equivalent to U. S. NIST standards.)

Standard Accessories

The MPEG generator comes standard with the accessories listed in Table 7-2.

Table 7-2: Standard accessories

Accessory	Part number
User manual	071-0615-XX
MTG Comm file transfer application software disk , 3.5 inch	063-3276-XX
Interface cable, D-sub 25-pin, twisted pair	174-3882-01
U.S. power cord	161-0230-01

Optional Accessories

You can also order the optional accessories listed in Table 7-3.

Table 7-3: Optional accessories

Accessory	Part number
Service manual	071-0616-XX
Rackmounting kit (for field conversion)	040-1665-XX
Maintenance CD-R	063-3347-XX

Electrical Parts List

The modules that make up this instrument are often a combination of mechanical and electrical subparts. Therefore, all replaceable modules are listed in section 10, *Mechanical Parts List.* Refer to that section for part numbers when using this manual.

Diagrams

This section contains the following diagrams:

- Block Diagram of the MPEG generator.
- Interconnect Diagram of the MPEG generator.

Block diagrams show the modules and functional blocks in the MPEG generator. Interconnect diagrams show how the modules in the MPEG generator connect together.

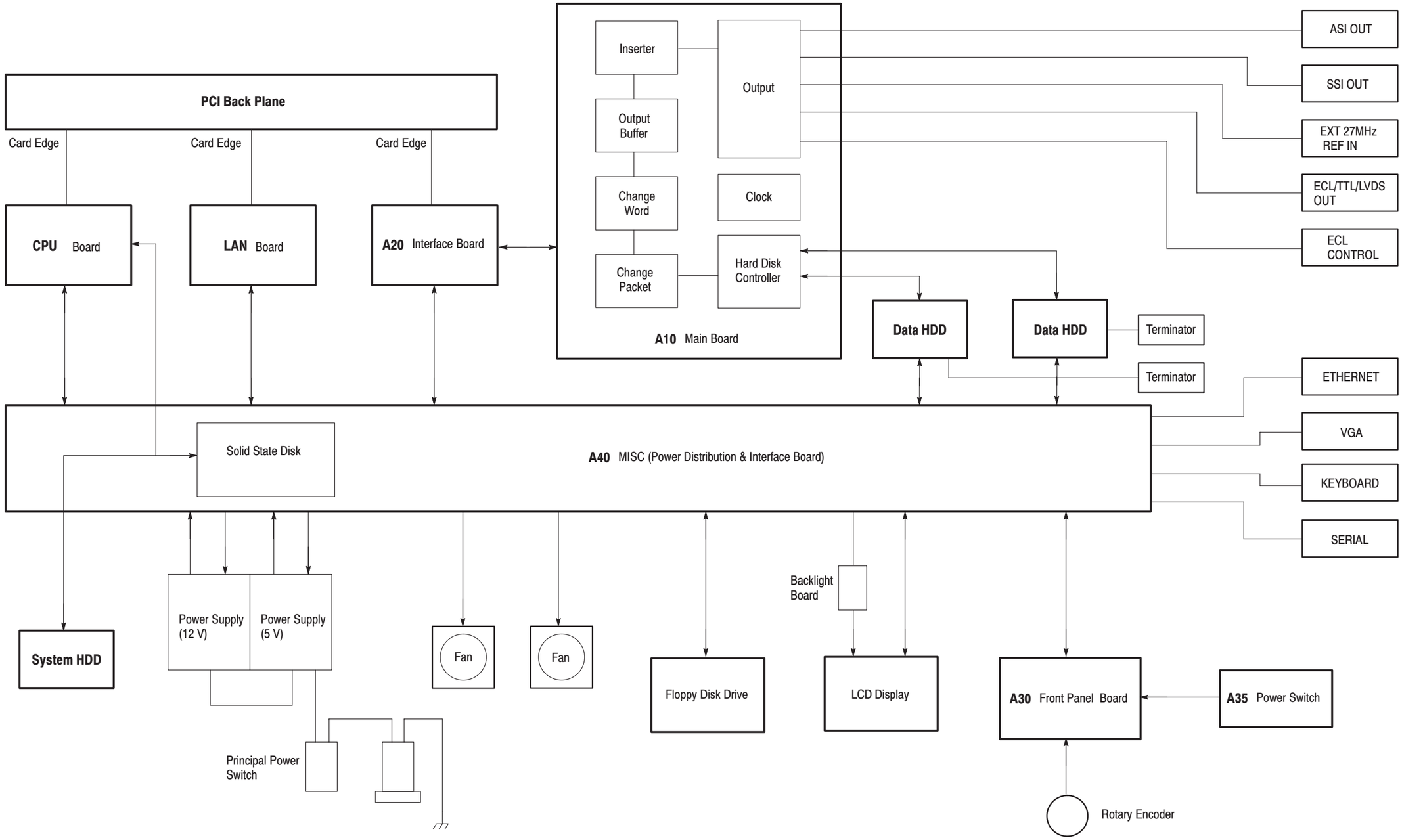


Figure 9-1: MTG100 and MTG300 block diagram

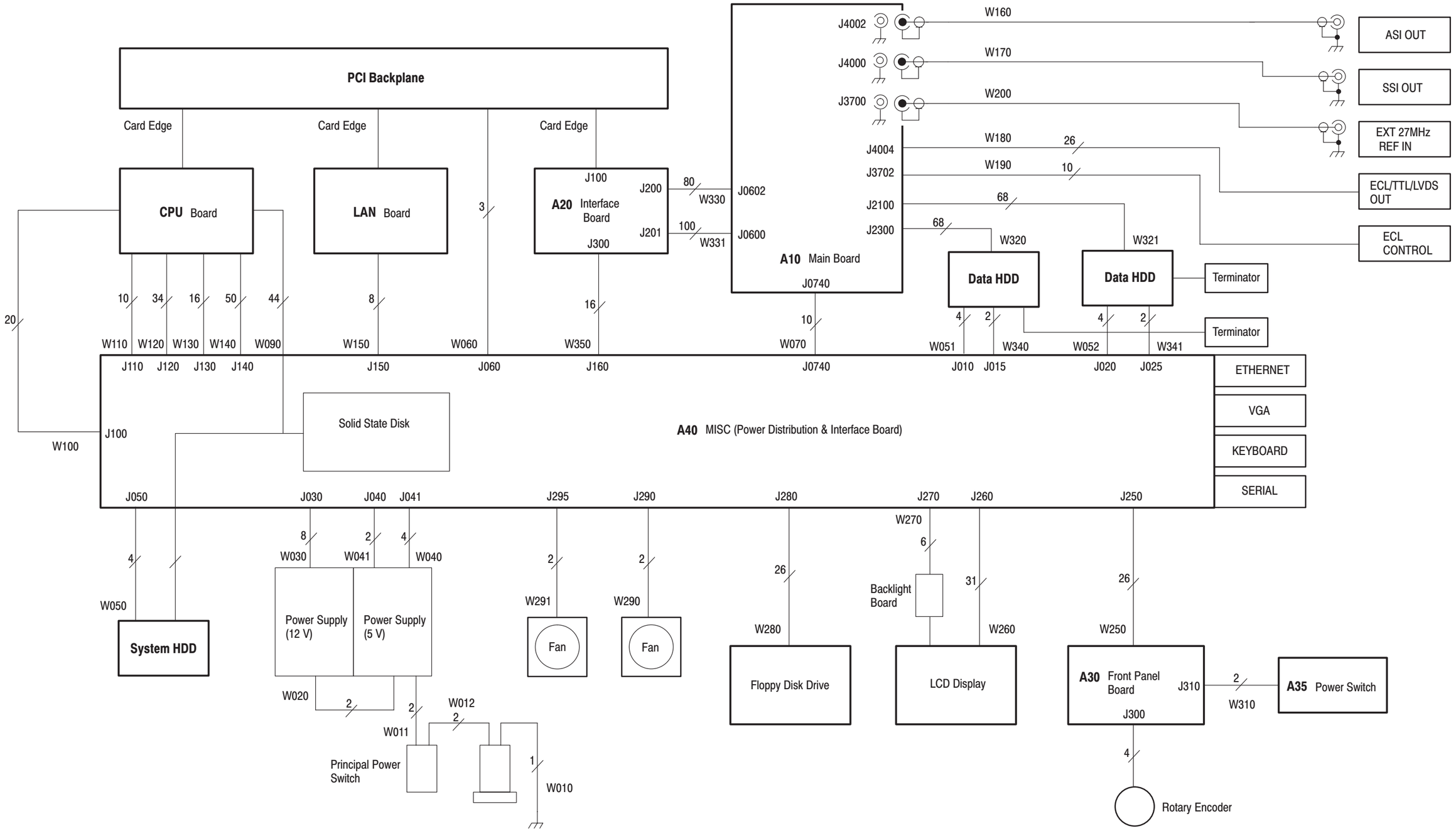


Figure 9-2: MTG100 and MTG300 interconnect diagram

Mechanical Parts List

This section contains a list of the replaceable modules for the MPEG generator. 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 MPEG generator. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts list column descriptions

Column	Column name	Description
1	Figure & Index Number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial Number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entries indicates the part is good for all serial numbers.
5	Qty	This indicates the quantity of parts used.
6	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6–1 for further item name identification.
7	Mfr. Code	This indicates the code of the actual manufacturer of the part.
8	Mfr. Part Number	This indicates the actual manufacturer's or vendor's part number.

Abbreviations

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

Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
S3109	FELLER	72 VERONICA AVE UNIT 4	SUMMERSET NJ 08873
TK0191	TEKTRONIX JAPAN	PO BOX 5209 TOKYO INTERNATIONAL	TOKYO JAPAN 100–31
TK2432	UNION ELECTRIC	15/F #1, FU–SHING N. ROAD	TAIPEI, TAIWAN ROC
2W733	BELDEN CORPORATION	2200 US HIGHWAY 27 SOUTH PO BOX 1980	RICHMOND IN 47375–0010
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–1–1	390–1202–XX			1	CABINET,ASSY:MTG100/300,AL	80009	
–2	211–0945–XX			6	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–3	334–1378–XX			1	MARKER,IDENT:MKD SERIAL NO.	80009	
–4	161–0230–01			1	CABLE ASSY,PWR,:3,18 AWG,92 L,SVT,TAN,60 DEG (STANDARD ACCESSORY)	TK2432	ORDER BY DESC
–5	348–1644–XX			35 CM	GASKET,SHIELD,BE–CU,609.6MM L,W/ADHESIVE	80009	
–6	335–0047–XX			1	MARKER,IDENT:MKD,MTG300,POLYCARBONATE	80009	
	335–0082–XX			1	MARKER,IDENT:MKD,MTG100,POLYCARBONATE	80009	
–7	211–0941–XX			6	SCREW,MACHINE:M3X6MM L,FLH,STL,MFZN–C,CROSS REC	80009	
–8	211–0785–XX			4	SCREW,MACHINE:M3X6MM L,FLH,STL,BLK ZN PL,CROSS REC	80009	
–9	348–A125–XX			1	FOOT,CABINET:FOOT SET,W/STAND	80009	

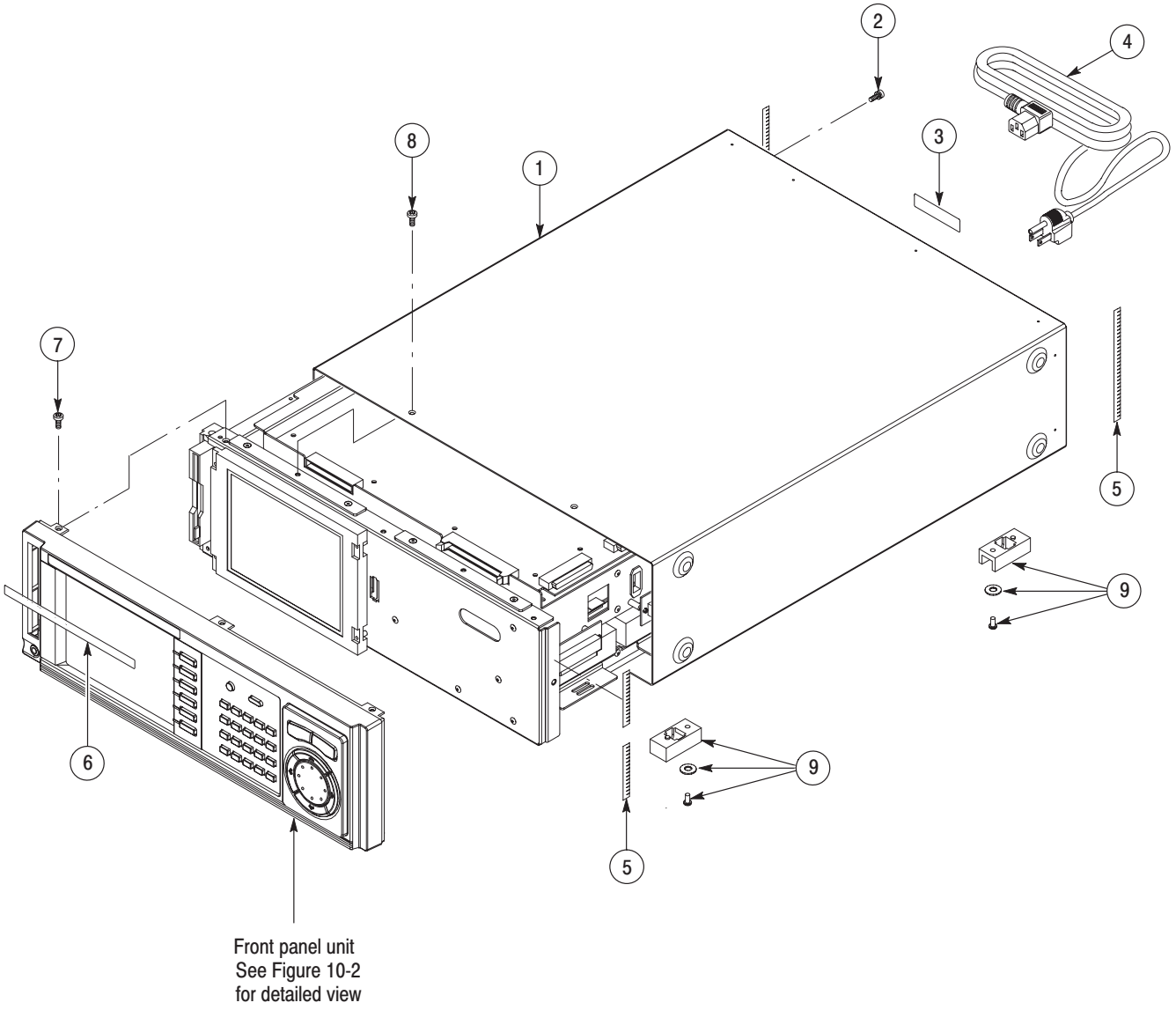


Figure 10-1: Cabinet

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–2–1	200–4562–XX			1	COVER,FRONT:TV GRAY,ABS	80009	
–2	366–0811–XX			1	PUSH BUTTON:SET,SILVER GRAY,ABS	80009	
–3	671–4908–XX			1	CIRCUIT BD ASSY:A35 PW_SWITCH,389–A928–00 WIRED	80009	
–4	253–A010–XX			2 CM	TAPE;PRESS SENS,PTFE,0.18 MM THK X 25MM W X 10CM L	80009	
–5	213–1127–XX			1	SCREW,TPG:M3X8MM L,PNH,STL,BLK ZN PL,CROSS REC	80009	
–6	378–0472–XX			1	FILTER,LT,CRT:SMOKE GRAY,ACRILIC,WITH AR FILM	80009	
–7	213–1126–XX			4	SCREW,TPG:M3X8MM L,FLH,STL,BLK ZN PL,CROSS REC	80009	
–8	366–0812–XX			1	PUSH BUTTON,RUBBER SWITCH:SET,SILVER GRAY,SILICON RUBBER	80009	
–9	213–1127–XX			6	SCREW,TPG:M3X8MM L,PNH,STL,BLK ZN PL,CROSS REC	80009	
–10	671–4907–XX			1	CIRCUIT BD ASSY:A30 FRONT,389–A926–XX WIRED	80009	
–11	260–2701–XX			1	SWITCH,ROTARY	80009	
–12	214–3953–XX			1	SPRING,KNOB:9.3MM ODX2.4MM L,SST	80009	
–13	214–4938–XX			8	SPRING,HLCPS:5MM ODX19MM L,SST	80009	
–14	333–4342–XX			1	PANEL,FRONT:KEYBOARD,MTG100,POLYCARBONATE	80009	
	333–4353–XX			1	PANEL,FRONT:KEYBOARD,MTG300,POLYCARBONATE	80009	
–15	386–7159–XX			1	SUBPANEL,FRONT:AL	80009	
–16	211–0871–XX			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	

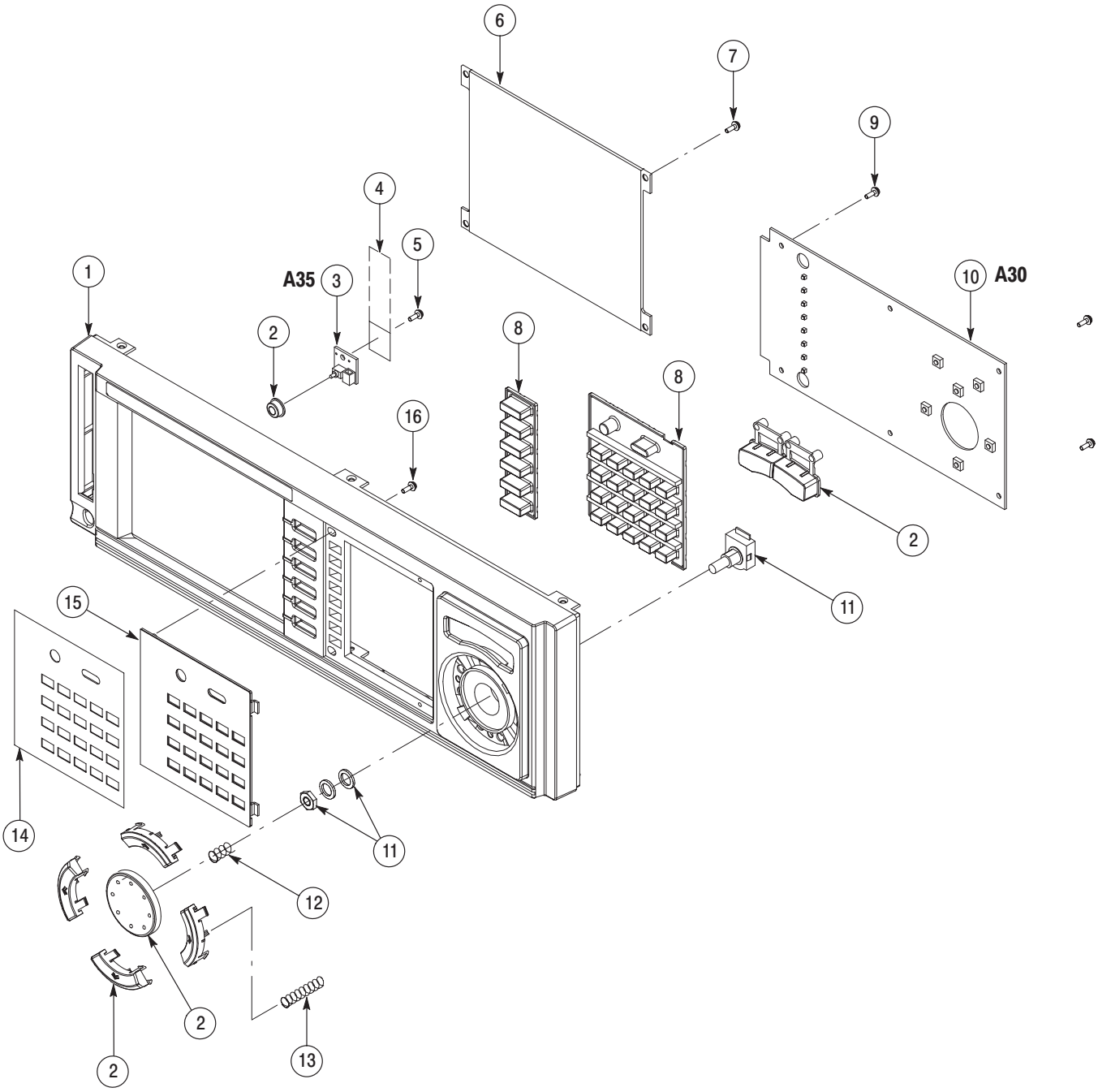


Figure 10-2: Front panel unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–3–1	386–7162–XX			1	SUPPORT,FDD:FRONT LEFT,AL	80009	
–2	211–0871–XX			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
–3	119–5953–XX			1	FLOPPY DISK DRIVE:3.5 INCH	80009	
–4	407–4737–XX			1	BRACKET,FDD:AL	80009	
–5	211–0854–XX			2	SCREW,MACHINE:M2.6X4MM L,BDGH,STL,MFZN–C,CLOSS REC,JIS B1111	80009	
–6	253–A010–XX			5 CM	TAPE;PRESS SENS,PTFE,0.18 MM THK X 25MM W X 10CM L	80009	
–7	211–0941–XX			1	SCRE,MACHINE:M2.5X8MM L, PNH,STL,MFZN–C,CROSS REC	80009	
–8	211–0854–XX			2	SCREW,MACHINE:M2.6X4MM L,BDGH,STL,MFZN–C,CLOSS REC,JIS B1111	80009	
–9	255–1107–XX			8 CM	PLASTIC CHANNEL:1.7MMX3.7MMX4.0MM,NATURAL,NYLON	80009	
–10	343–1182–XX			2	CLAMP,LOOP:10MM ID,66NYLON	80009	
–11	343–1084–XX			2	CLAMP,FLAT CABLE:NYLON	80009	
–12	119–B122–XX			1	INVERTER UNIT:5V,1.9W,FOR LCD MODULE	80009	
–13	211–A152–XX			2	SCREW,MACHINE:M2.5X8MM L,PNH,STL,NI PL,CROSS REC,W/KOGATAMARU & LOCK WASHER	80009	
–14	337–4215–XX			1	SHIELD,ELEC:LCD HV BOARD,AL	80009	
–15	211–0871–XX			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT (7MM OD) & LOCK WASHER	80009	
–16	441–2195–XX			1	CHASSIS ASSY:MAIN,AL	80009	
–17	334–0472–XX			5	BUSHING,NYLON,GRAY	80009	
–18	174–4029–XX			2	CA ASSY,RF:75OHM COAX,10CM L,BLACK	80009	
–19	174–4306–XX			1	CA ASSY,RF:50OHM COAX,60MM L,8–N	80009	
–20	174–4304–XX			1	CABLE ASSY:DSUB 25P	80009	
–21	174–4305–XX			1	CABLE ASSY:DSUB 9P	80009	
–22	129–1051–XX			4	SPACER,POST:4.8MM L,4–40INT/4–40EXT,STL 4.8MM HEX W/WASHER	80009	
–23	220–0242–XX			1	NUT,PLATE:D–SUB 25,#4–40,AL	80009	
–24	220–0241–XX			1	NUT,PLATE:D–SUB 9,#4–40,AL	80009	
–25	174–4311–XX			2	CA ASSY,SP,ELEC:2,15CM L,W/FAN	80009	
–26	211–1096–XX			8	SCREW,MACHINE:M4X30MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT & LOCK WASHER	80009	
–27	200–4573–XX			2	COVER,AIR:CHAMBER,AL	80009	
–28	671–4953–XX			2	CIRCUIT BD ASSY:A50 SCSI TERMINATION,MTG300, 389–B004–XX WIRED	80009	
–29	211–0945–XX			4	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–30	255–1107–XX			26 CM	PLASTIC CHANNEL:1.7MMX3.7MMX4.0MM,NATURAL,NYLON	80009	
–31	255–1107–XX			12 CM	PLASTIC CHANNEL:1.7MMX3.7MMX4.0MM,NATURAL,NYLON	80009	
–32	211–0905–XX			1	SCREW,MACHINE:M3X6MM L,PNH,STL MFZN–C,CROSS REC	80009	
–33	119–B121–XX			1	LCD MODULE:6.4 INCH,TFT,640X480,VGA	80009	

Replaceable parts list (Cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
–34	211–A152–XX			4	SCREW,MACHINE:M2.5X8MM L,PNH,STL,NI PL,CROSS REC,W/KOGATAMARU & LOCK WASHER	80009	
–35	348–A120–XX			12 CM	GASKET,SHIELD; CONDUCTIVE URETHAN FOAM, 2MM X 4MM, W/ADHESIVE SIWD	80009	

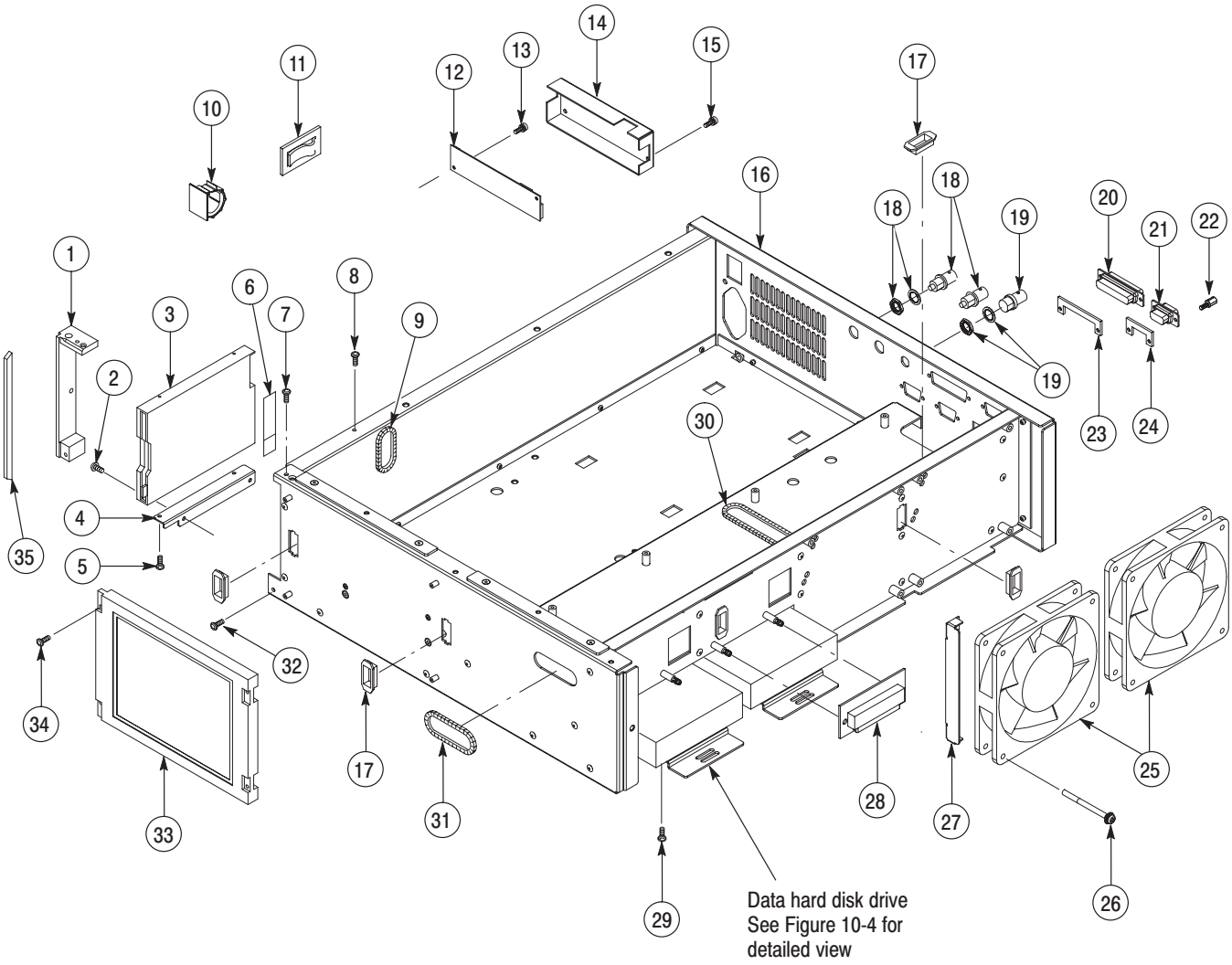


Figure 10-3: Internal modules and rear connectors

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–4–1	119–B084–XX			2	HARD DISK UNIT:18GB,3.5INCH,ULTRA SCSI	80009	
–2	386–7230–XX			2	PLATE:3.5" HARD DISK,AL	80009	
–3	407–4761–XX			2	BRACKET,HDD:MOUNTING,AL	80009	
–4	214–4924–XX			8	PAD,CUSHIONING:14.3MM DIA X 8MM H,POLYURETHANE	80009	
–5	129–1527–XX			8	SPACER,SLEEVE:7.5MM L X 4MM ID X 5.3MM OD,STL,MFZN–C	80009	
–6	210–0949–XX			8	WASHER,FLAT:0.141 ID X 0.5 OD X 0.062,BRS NP	80009	
–7	211–0511–XX			8	SCREW,MACHINE:6–32 X 0.5,PNH,STL CD PL,POZ	80009	
–8	211–0871–XX			4	SCREW,MACHINE:M3X6MM L,STL,MFZN–C,CROSS REC	80009	
–9	407–A629–XX			2	BRACKET,SCSI CONN	80009	
–10	384–A220–XX			2	SHAFT,SCSI CONN	80009	
–11	211–0946–XX			4	SCREW,MACHINE:M3X10MM L,STL,MFZN–C,CROSS REC	80009	
–12	211–0945–XX			4	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–13	386–7175–XX			1	PLATE:CHASSIS,BOTTOM	80009	
–14	119–B187–XX			1	HARD DISK UNIT:3.5INCH,41.17GB,ATA–100,7200RPM	80009	
–15	386–7230–XX			1	PLATE:3.5" HARD DISK:AL	80009	
–16	214–4924–XX			4	PAD,CUSHIONING:14.3MM DIA X 8MM H,POLYURETHANE	80009	
–17	129–1527–XX			4	SPACER,SLEEVE:7.5MM L X 4MM ID X 5.3MM OD,STL,MFZN–C	80009	
–18	210–0949–XX			4	WASHER,FLAT:0.141 ID X 0.5 OD X 0.062,BRS NP	80009	
–19	211–0511–XX			4	SCREW,MACHINE:6–32 X 0.5,PNH,STL CD PL,POZ	80009	

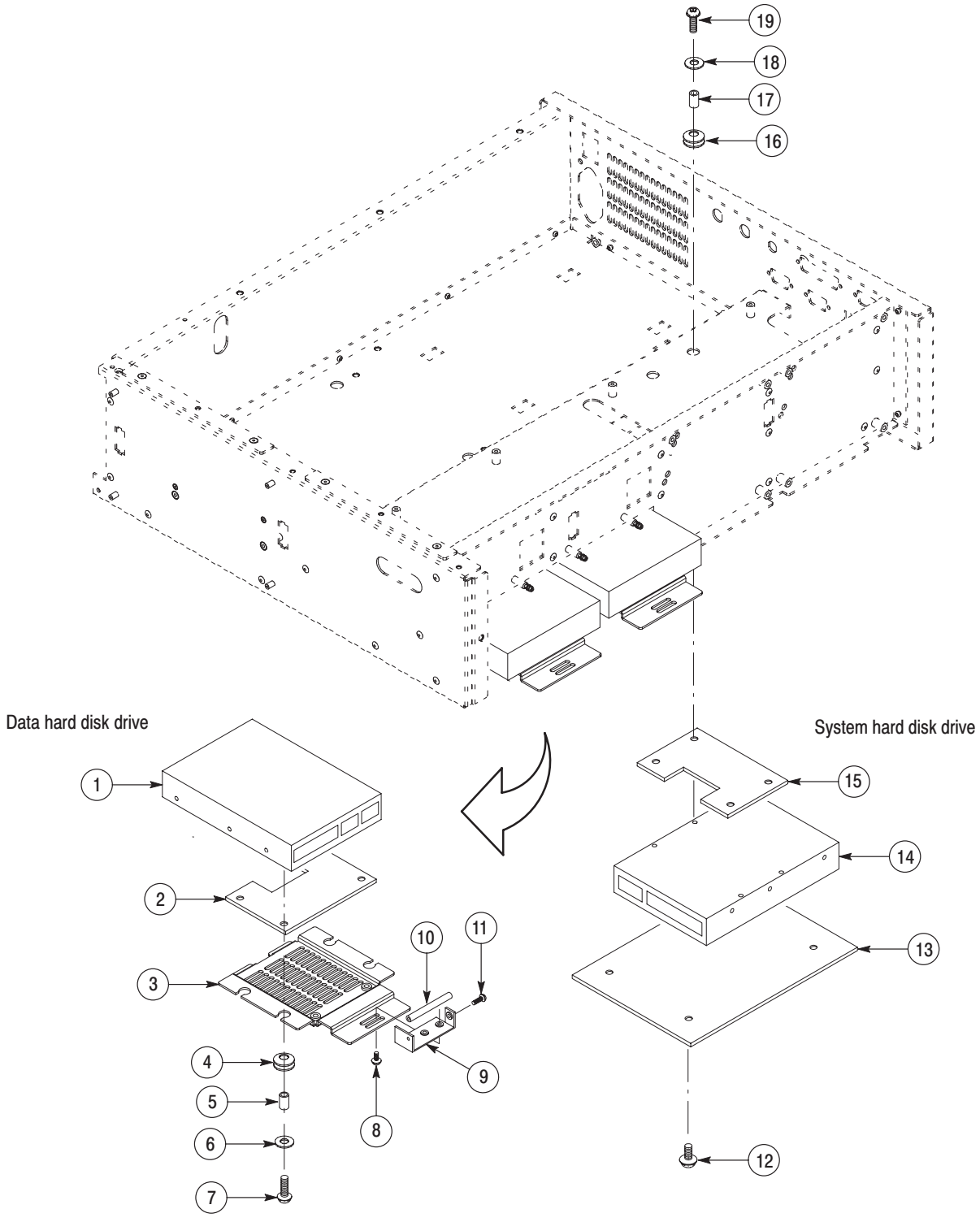


Figure 10-4: Hard disk drives

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–5–1	671–4905–XX			1	CIRCUIT BD ASSY:A10,MAIN,389–A923–00 WIRED	80009	
–2	211–0871–XX			16	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
–3	441–2196–XX			1	CHASSIS ASSY:TOP,AL	80009	
–4	119–6141–XX			1	PRE–SET:MEMORY MODULE,AX–SSD–10D	80009	
–5	671–4909–XX			1	CIRCUIT BD ASSY:A40,MISC,389–A925–XX WIRED	80009	
–6	342–1070–XX			1	INSULATOR,PLATE:A40 BOARD,POLYCARBONETE	80009	
–7	211–0946–XX			4	SCREW,MACHINE:M3X10MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	

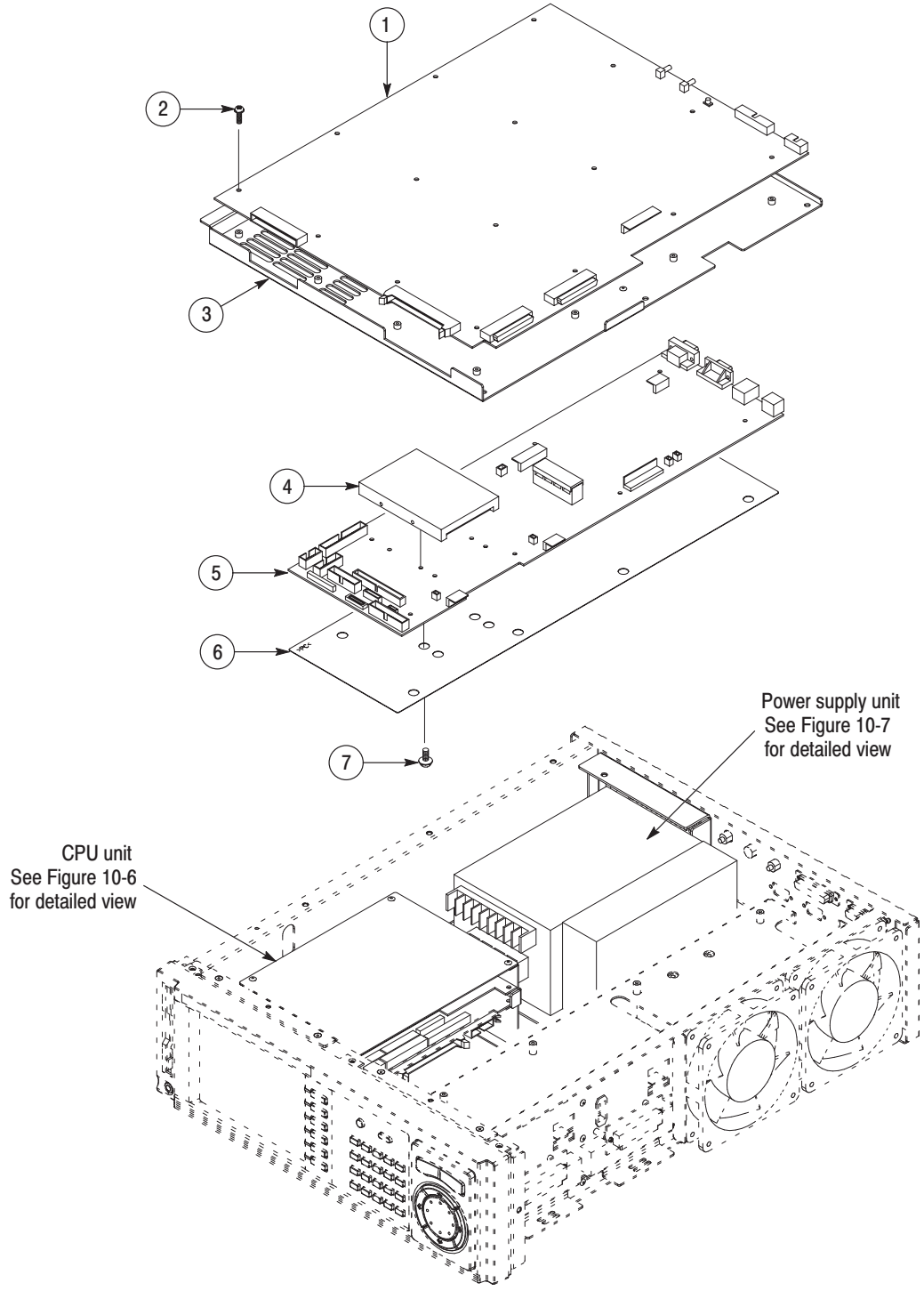


Figure 10-5: Board modules and inner units

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–6–1	441–2197–XX			1	CSASSIS ASSY:CPU,AL	80009	
–2	343–1651–XX			1	RETAINER,BOARD:CPU	80009	
–3	211–0751–XX			1	SCREW,ASSEM WSHR:M3X8MM,PNH,STL ZN PL,W/FLAT & LOCK WSHR	80009	
–4	211–0871–XX			4	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
–5	119–6139–XX			1	COMPUTER KIT:BACK PLANE BD,3SLOT,PCI BUS	80009	
–6	119–6137–XX			1	PRE–SET COMPUTER KIT:CPU BD,HALF SIZE,119–A973–00 PRE–SET	80009	
–7	119–6138–XX			1	COMPUTER KIT:LAN BD,10BASE–T,PCI,HALF SIZE	80009	
–8	211–0871–XX			3	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
–9	671–4906–XX			1	CIRCUIT BD ASSY:A20,PCI_INTERFACE,MTG300, 389–A924–XX WIRED	80009	
–10	211–0871–XX			2	SCREW,MACHINE:M3X6MM L,PNH,STL,ZN PL,CROSS REC,W/FLAT(7MM OD) & LOCK WASHER	80009	
–11	407–4736–XX			1	BRACKET,BOARD:CKT BD A20,AL	80009	

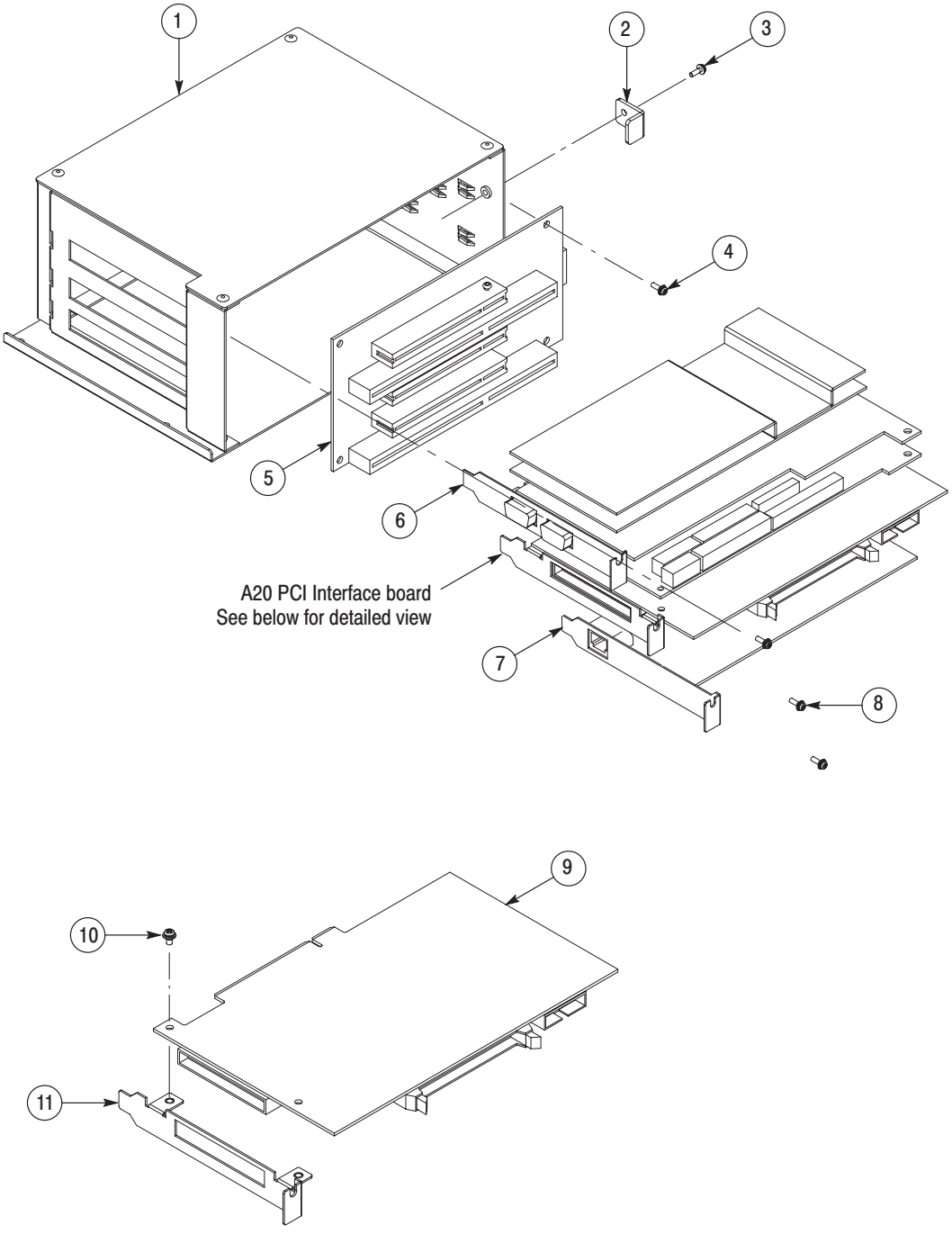


Figure 10-6: CPU unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–7–1	119–6143–XX			1	POWER SUPPLY:INPUT 85–264VAC,OUTPUT 5VDC,60A	80009	
–2	343–1182–XX			1	CLAMP,LOOP:10MM ID,66NYLON	80009	
–3	119–6144–XX			1	POWER SUPPLY:INPUT 85–264VAC,OUTPUT 12VDC,6.3A	80009	
–4	211–0945–XX			1	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–5	210–0008–XX			1	WASHER,LOCK:#8 INTL,0.02 THK,STL CD PL	80009	
–6	260–2740–XX			1	SWITCH,ROCKER:DPST,250VAC,6A W/I–O MKD	80009	
–7	119–2683–XX			1	FILTER,RFI:6A,250VAC,50/60HZ	80009	
–8	211–1040–XX			2	SCREW,MACHINE:M3X8MM L,FLH,STL,MFZN–C,CROSS REC	80009	
–9	407–4735–XX			1	BRACKET,ANGLE:POWER SUPPLY,AL	80009	
–10	211–0751–XX			3	SCREW,,ASSEM WSHR:M3X8MM,PNH,STL ZN PL,W/FLAT & LOCK WSHR	80009	
–11	211–0945–XX			4	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	

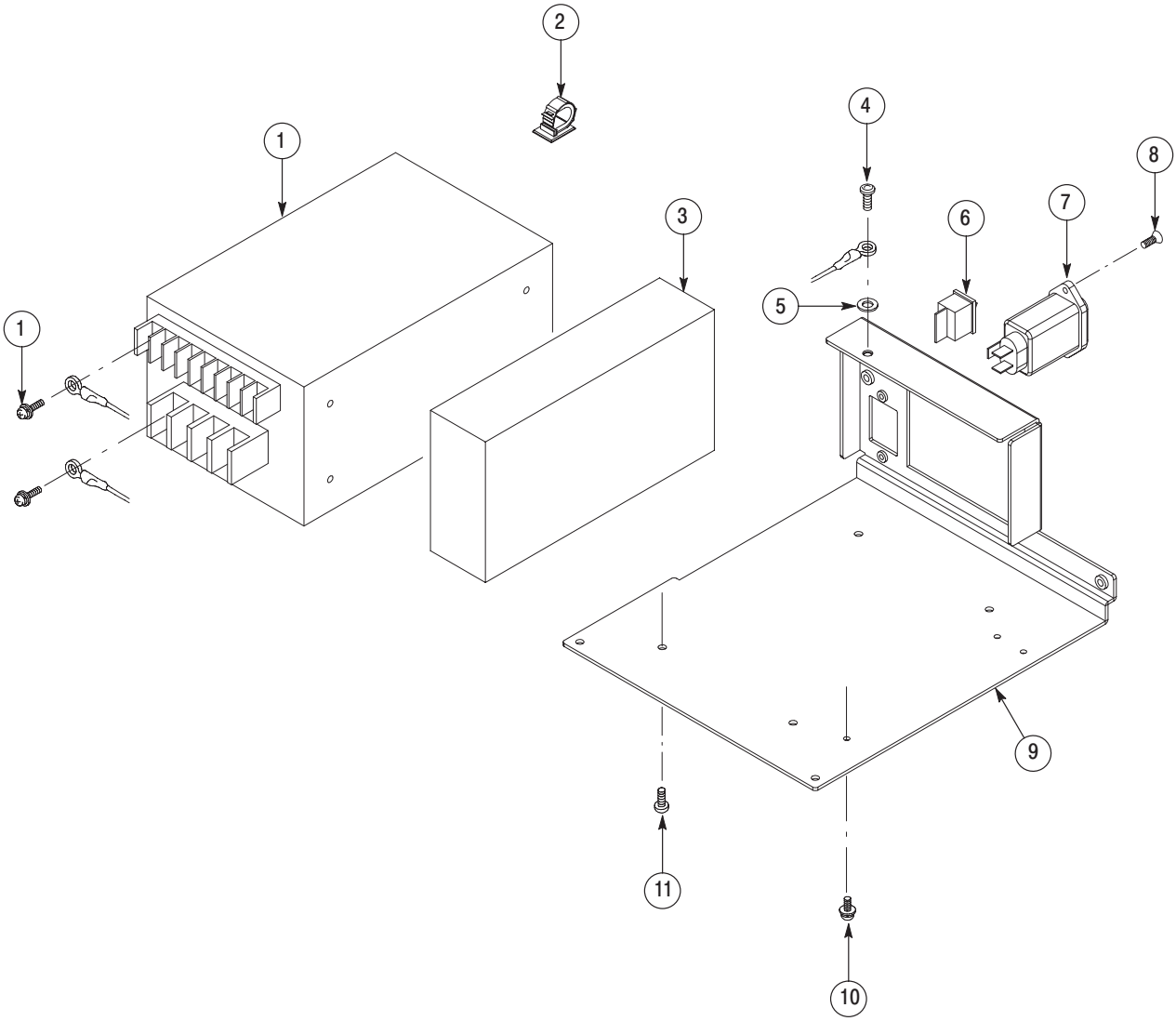


Figure 10-7: Power supply unit

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–8–1	351–0623–XX			1	SLIDE,DWR,EXT:22.0X1.54,STEELSAFETY CONTROLLED	80009	
–2	211–0945–XX			6	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–3	367–0520–XX			2	HANDLE,BOW:100MM L,BLACK,BRASS	80009	
–4	407–4760–XX			2	BRACKET,ANGLE:SIDE,RACKMOUNT,AL	80009	
–5	212–A009–XX			4	SCREW,MACHINE:M5X10MM L,FLH,STL,NI PL,CROSS REC	80009	
–6	211–0945–XX			8	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–7	351–0104–XX			1	SL SECT,DWR EXT:12.625 L,W/OHARDWARESAFETY CONTROLLED	80009	
–8	390–1203–XX			1	CABINET,ASSY:RACKMOUNT,AL	80009	
–9	211–0785–XX			4	SCREW,MACHINE:M3X6MM L,FLH,STL,BLK ZN PL,CROSS REC	80009	
–10	211–0945–XX			6	SCREW,MACHINE:M4X8MM L,STL,MFZN–C,CROSS REC	80009	
–11	334–1377–XX			1	MARKER,IDENT:MKD TEKTRONIX JAPAN, LTD. MADE IN JAPAN	80009	

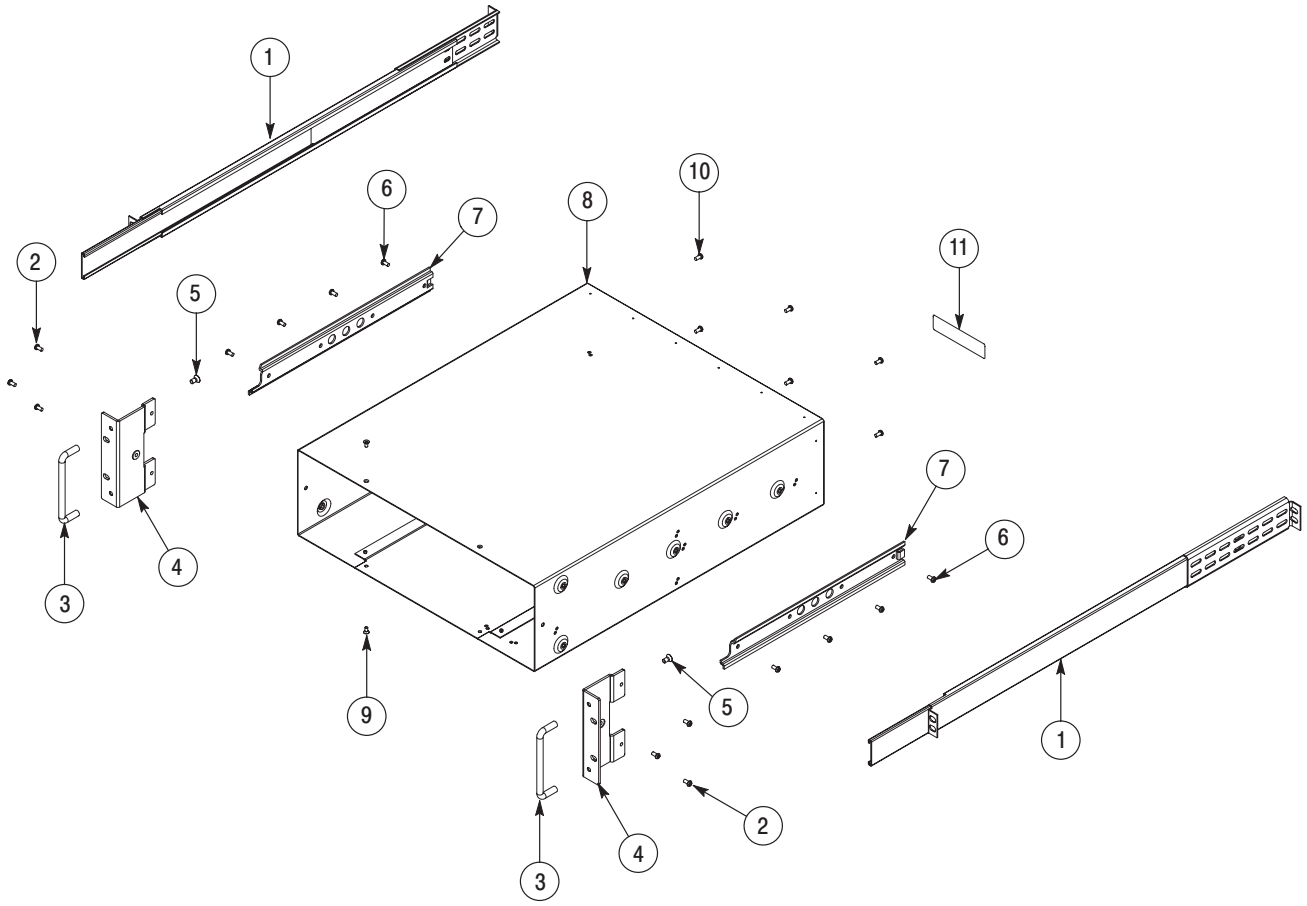


Figure 10-8: Rack mount

Replaceable parts list

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					CABLE ASSEMBLIES **		
W010	196-3112-XX			1	LEAD,ELECTRICAL:18AWG,6.0L,5-4,W/LUG TERM	80009	
W011	174-4288-XX			1	CA ASSY,SP,ELEC:2,18AWG,30CM L,W/CONN	80009	
W012	174-4317-XX			1	CA ASSY,SP,ELEC:2,AWG18,12CM L/W/FASTON	80009	
W020	174-4289-XX			1	CA ASSY,SP,ELEC:2,AWG18,20CM L,W/CONN	80009	
W030	174-4290-XX			1	CA ASSY,SP,ELEC:8,AWG18-22,15CM L,W/CONN	80009	
W040	174-4291-XX			1	CA ASSY,SP,ELEC:4,AWG12,28CM L,W/LUG	80009	
W041	174-4292-XX			1	CA ASSY,SP,ELEC:2,AWG26,20CM L,W/CONN	80009	
W050	174-4293-XX			1	CA ASSY,SP,ELEC:4,AWG18,20CM L,W/CONN	80009	
W051	174-4294-XX			1	CA ASSY,SP,ELEC:4,AWG18,10CM L,W/CONN	80009	
W052	174-4294-XX			1	CA ASSY,SP,ELEC:4,AWG18,10CM L,W/CONN	80009	
W060	174-4295-XX			1	CA ASSY,SP,ELEC:3,AWG18,25CM L,W/CONN	80009	
W070	174-4296-XX			1	CA ASSY,SP,ELEC:10,AWG18,15CM L,W/CONN	80009	
W090	174-4297-XX			1	CA ASSY,SP,ELEC:44,AWG28,IDE CABLE,50 CM	80009	
W100	174-4298-XX			1	CA ASSY,SP,ELEC:20CON/9CON/15CON,AWG26,23CM L	80009	
W110	174-4299-XX			1	CA ASSY,SP,ELEC:10,AWG28,10CM L,FLAT	80009	
W120	174-4300-XX			1	CA ASSY,SP,ELEC:34,AWG28,10CM L,FLAT	80009	
W130	174-4301-XX			1	CA ASSY,SP,ELEC:16,AWG28,15CM L,FLAT	80009	
W140	174-4302-XX			1	CA ASSY,SP,ELEC:50,AWG28,20CM L,FLAT,1MM	80009	
W150	174-4303-XX			1	CA ASSY,SP,ELEC:8,AWG28,30CML,W/TMP88P-88P	80009	
W160	174-4029-XX			1	CA ASSY,RF:75 OHM COAX,10CM L,BLACK	80009	
W170	174-4029-XX			1	CA ASSY,RF:75 OHM COAX,10CM L,BLACK	80009	
W180	174-4304-XX			1	CA ASSY,SP,ELEC:26,AWG28,10CM L,FLAT,W/D-SUB	80009	
W190	174-4305-XX			1	CA ASSY,SP,ELEC:10,AWG28,10CM L,FLAT,W/D-SUB	80009	
W200	174-4306-XX			1	CA ASSY,RF:50OHM COAX,60MM L,8-N	80009	
W250	174-4307-XX			1	CA ASSY,SP,ELEC:26,AWG28,10CM L,FLAT	80009	
W260	174-4308-XX			1	CA ASSY,SP,ELEC:31,AWG28,35CM L,W/CONN	80009	
W270	174-4309-XX			1	CA ASSY,SP,ELEC:6,AWG26,35CM L,RIBBON,W/HOLDER, 1MM PIT	80009	
W280	174-4310-XX			1	CA ASSY,SP,ELEC:26,450MM L,FLAT FLEX	80009	
W290	174-4311-XX			1	CA ASSY,SP,ELEC:2,15CM L,W/FAN	80009	
W291	174-4311-XX			1	CA ASSY,SP,ELEC:2,15CM L,W/FAN	80009	
W310	174-4312-XX			1	CA ASSY,SP,ELEC:2,AWG26,25CM L	80009	
W320	174-4313-XX			1	CA ASSY,SP,ELEC:68,AWG30,15CM L,FLAT	80009	
W321	174-4313-XX			1	CA ASSY,SP,ELEC:68,AWG30,15CM L,FLAT	80009	
W330	174-4314-XX			1	CA ASSY,SP,ELEC:80,AWG32,15CM L,FLAT	80009	
W331	174-4315-XX			1	CA ASSY,SP,ELEC:100,AWG32,30CM L,FLAT	80009	
W340	174-4316-XX			1	CA ASSY,SP,ELEC:2,AWG28,20CM L,W/CONN	80009	
W341	174-4316-XX			1	CA ASSY,SP,ELEC:2,AWG28,20CM L,W/CONN	80009	
W350	174-4301-XX			1	CA ASSY,SP,ELEC:16,AWG28,15CM L,FLAT	80009	

****** **For cable interconnections, see Figure 9-2.**

Replaceable parts list (Cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					STANDARD ACCESSORIES		
	063–3276–XX			1	SOFTWARE PKG:3.5 INCH DISK,DOWNLOADER	TK0191	
	071–0615–XX			1	MANUAL,TECH:USERS	TK0191	
	174–3882–01			1	CA ASSY,SP,ELEC:12 PAIR TWIST,W/SHIELD,100CM L	80009	174388201
	----------			1	CABLE ASSY,PWR,:3,18 AWG,92 L (STANDARD CABLE–SEE FIG 10–1–4)	80009	
	161–0104–05			1	CABLE ASSY,PWR,:3,1.0MM SQ,,250V/10A,2.5M (OPTION A3–AUSTRALIAN)	S3109	198–010
	161–0104–06			1	CABLE ASSY,PWR,:3,1.0MM SQ,250V/10A,2.5M (OPTION A1–EUROPEAN)	S3109	198–010
	161–0104–07			1	CABLE ASSY,PWR,:3,1.0MM SQ,240 V/10A,2.5 M (OPTION A2–UNITED KINGDOM)	S3109	209010
	161–0104–08			1	CABLE ASSY,PWR,:3,18 AWG,250/10A,98 INCH L (OPTION A4–NORTH AMERICAN)	2W733	ORDER BY DESC
	161–0167–00			1	CABLE ASSY,PWR,:3.0 X 0.75,6A,240V,2.5M L (OPTION A5–SWITZERLAND)	S3109	ORDER BY DESC
					OPTIONAL ACCESSORIES		
	040–1665–XX			1	MODULAR KIT:OP–1R,MTG100/300,RACK MOUNT KIT	80009	
	071–0616–XX			1	MANUAL,TECH:SERVICE,MTG100/300	TK0191	
	063–3347–XX			1	MAINTENANCE DISK,CD–R,MTG100/300	TK0191	

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