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Service Guide

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For Safety information, Warranties, and Regulatory information, see the pages at the end of the book.

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Agilent Technologies 16700A/16702A Logic Analysis System and 16701A Expansion Frame

Agilent Technologies 16700A/16702A Logic Analysis System and 16701A Expansion Frame Service Guide

The 16700A and 16702A are the mainframes of the Logic Analysis System, and the 16701A is the Expansion Frame. The 16700A/16701A/16702A are of a modular structure using plug-in cards with a wide range of data acquisition and stimulus capabilities.

Features

Some of the main features of the logic analysis system are as follows:

- Modular mainframe with five card slots for measurement modules and two card slots for emulation modules
- Expansion frame, which expands the total system card slots to ten measurement modules and four emulation modules
- 4.3-Gbyte hard disk drive
- High-density 3.5-inch floppy disk drive
- Keyboard (front panel keyboard on 16702A)
- 800 x 600 LCD display (16702A only)
- Mouse interface
- Intermodule triggering and time correlation of acquired data
- RS-232-C or Centronics interfaces for hard copy output to a printer or RS-232-C or LAN controller interface
- SCSI interface for connecting to optional CD-ROM drive
- Target Control

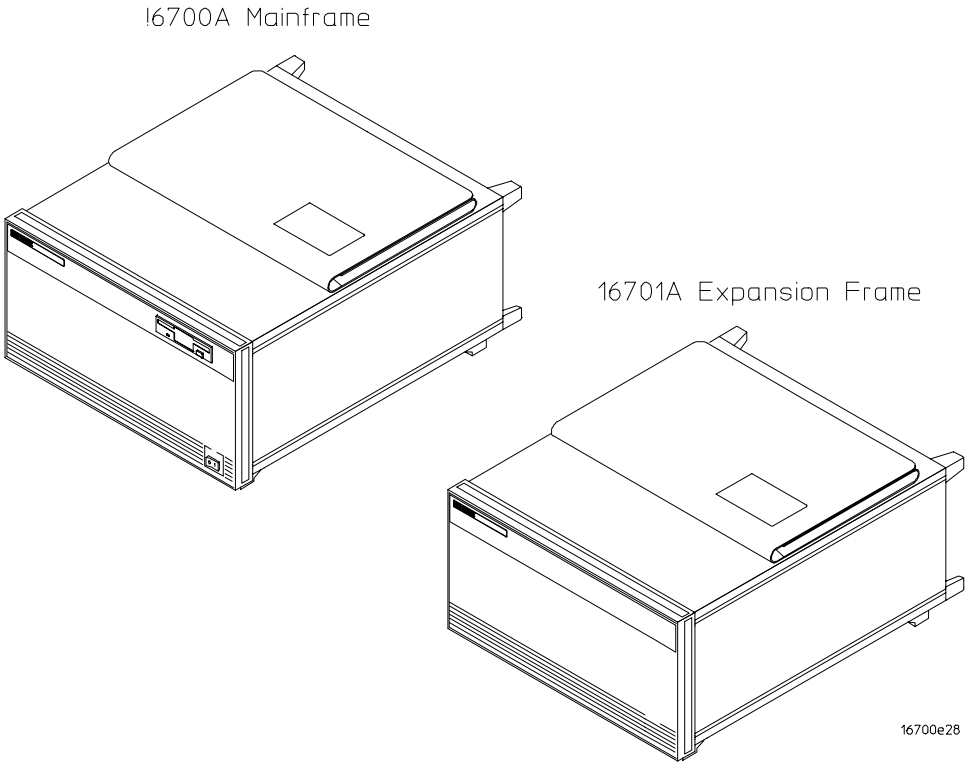
Options (16700A and 16702A)

- Color monitor
- CD-ROM drive

Service Strategy

The service strategy for this instrument is the replacement of defective assemblies. This service guide contains information for finding a defective assembly by testing and servicing the 16700A/16701A/16702A.

This instrument can be returned to Agilent Technologies for all service work, including troubleshooting. Contact your nearest Agilent Technologies Sales Office for more details.


16700A Mainframe
16701A Expansion Frame
16700e28

In This Book

This book is the service guide for the 16700A/16701A/16702A Logic Analysis System and is divided into eight chapters.

Chapter 1 contains information about the instrument and includes accessories for the instrument, specifications and characteristics of the instrument, and a list of the equipment required for servicing the instrument.

Chapter 2 tells how to prepare the instrument for use.

Chapter 3 gives instructions on how to test the performance of the instrument.

Chapter 4 contains calibration instructions for the instrument.

Chapter 5 contains self-tests and flowcharts for troubleshooting the instrument.

Chapter 6 tells how to replace the instrument and assemblies of the instrument, and how to return them to Agilent Technologies.

Chapter 7 lists replaceable parts, shows an exploded view, and gives ordering information.

Chapter 8 explains how the instrument works and what the self-tests are checking.

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General Information

General Information

This chapter lists the accessories, the specifications and characteristics, and the recommended test equipment.

Accessories

The following accessories are supplied with the 16700A/16701A/16702A Logic Analysis System.

Accessories Supplied	Qty
Installation Guide	1
Installation Placemat	1
Mouse	1
Keyboard	1
Power cord	1
CD-ROM containing backup composite software	1
Filler Panels	Quantity depends on how many modules are ordered with the 16700A/16701A/16702A

Specifications

The specifications are the performance standards against which the product is tested. There are no specifications for the 16700A/16701A/16702A.

Characteristics

These characteristics are not specifications, but are included as additional information. These characteristics are typical for 16700A/16701A/16702A.

Power Requirements

16700A 610 W maximum

16702A 630 W maximum

16701A 545 W maximum

Line Voltage 115 V / 230 V, autoselect

Frequency 48 - 66 Hz

CAT II, Pollution degree 2
Indoor Use Only

Operating Environment

Indoor Use Only

Temperature

Instrument 0 °C to 50 °C (+32 °F to 122 °F).

Disk Media 10 °C to 40 °C (+50 °F to 104 °F).

Probes and Cables 0 °C to 65 °C (+32 °F to 149 °F).

Humidity

Instrument, disk and media 8% to 80% relative humidity at 40 °C (104 °F).

Altitude Up to 3000 m (10,000 ft).

Vibration

Operating Random vibration 5-500Hz, 10 minutes per axis, ~ 0.3 g (rms).

Non-operating Random vibration 5-500Hz, 10 minutes per axis, ~ 2.41 g (rms); and swept sine resonant search, 5-500Hz, 0.75g (0-peak), 5-minute resonant dwell at 4 resonances per axis.

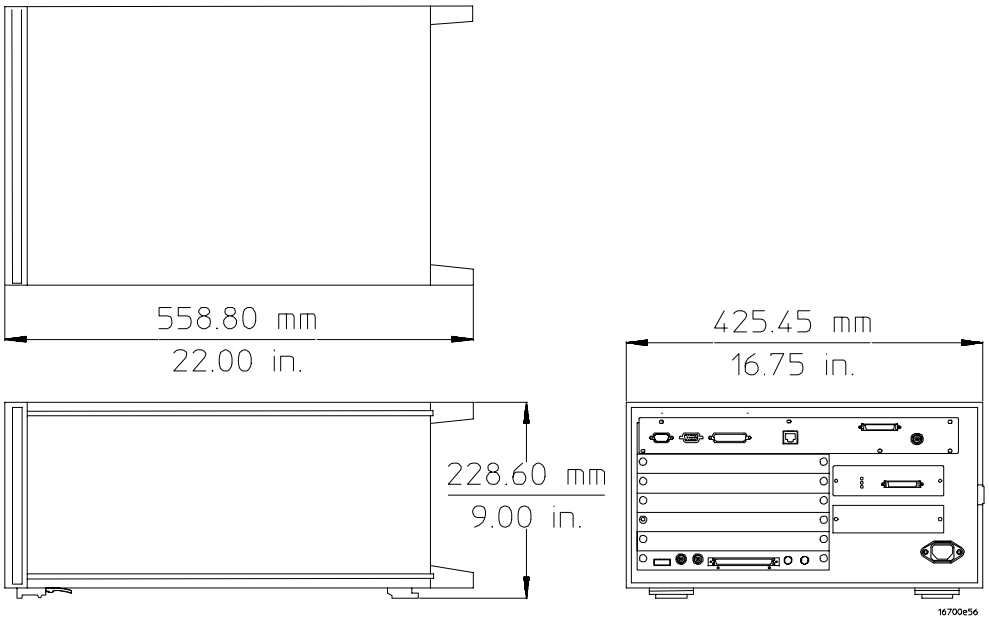
Weight

Model	Max Net	Max Shipping
16700A	12.7 kg (27.0 lbs)	34.2 kg (75.4 lbs)
16701A	10.4 kg (23.0 lbs)	32.0 kg (70.6 lbs)
16702A	15.2 kg (32.4 lbs)	36.7 kg (80.8 lbs)

The weight of modules ordered with mainframes will add 0.9 kg (2.0 lb) per module.

Dimensions

Refer to the following figure for dimensional detail. The dimensions are given in millimeters and inches.



Dimensions Detail

Recommended test equipment

Equipment Required

Equipment	Critical Specifications	Recommended Model/Part	Use*
Oscilloscope	100 MHz Bandwidth	Agilent Technologies 54600B	T
Voltmeter		Agilent Technologies E2373A	T

*T = Troubleshooting

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Preparing for Use

Preparing for Use

This chapter gives you instructions for preparing the logic analysis system for use.

Power Requirements

The 16700A/16702A logic analysis system mainframe requires a power source of 115 Vac to 230 Vac, -22% to +10%, single phase, 48 to 66 Hz, 630 Watts maximum power. The line voltage is autodetected by the instrument.

The 16701A logic analysis system mainframe requires a power source of 115 Vac to 230 Vac, -22% to +10%, single phase, 48 to 66 Hz, 545 Watts maximum power. The line voltage is autodetected by the instrument.

Operating Environment

The operating environment is listed in chapter 1. Note the noncondensing humidity limitation below. Condensation within the instrument can cause poor operation or malfunction. Provide protection against internal condensation.

The logic analysis system will operate at all specifications within the temperature and humidity range given in chapter 1. However, reliability is enhanced when operating it within the following ranges:

- Temperature: +20 °C to +35 °C (+68 °F to +95 °F)
- Humidity: 20% to 80% noncondensing

Storage

Store or ship the logic analysis system in environments within the following limits:

- Temperature: -40 °C to + 75 °C
- Humidity: Up to 90% at 65 °C
- Altitude: Up to 3,000 meters (10,000 feet)

Protect the system from temperature extremes which cause condensation on the instrument.

To inspect the logic analysis system

1 Inspect the shipping container for damage.

If the shipping container or cushioning material is damaged, keep them until you have checked the contents of the shipment and checked the instrument mechanically and electrically.

WARNING **Hazardous voltages exist in this instrument. To avoid electrical shock, do not apply power to a damaged instrument.**

2 Check the supplied accessories.

Accessories supplied with the logic analysis system are listed in "Accessories" in chapter 1.

3 Inspect the product for physical damage.

Check the logic analysis system and the supplied accessories for obvious physical or mechanical defects. If you find any defects, contact your nearest Agilent Technologies Sales Office. Arrangements for repair or replacement are made, at Agilent Technologies' option, without waiting for a claim settlement.

To apply power

1 Connect the power cord to the instrument and to the power source.

This instrument autodetects the line voltage from 115 VAC to 230 VAC. It is equipped with a three-wire power cable. When connected to an appropriate AC power outlet, this cable grounds the instrument cabinet. The type of power cable plug shipped with the instrument depends on the country of destination. Refer to chapter 7, "Replaceable Parts," for option numbers of available power cables.

2 Turn on the power switch located on the front panel.

To configure the monitor

Perform the following steps the first time you set up an 16700A. These steps are not required for an 16702A unless you are connecting an external monitor. After you complete these steps the monitor should display properly.

1 Connect the monitor, keyboard, and mouse to their rear panel ports.

2 Connect the power cord to the instrument. Apply power to the instrument.

3 Initiate the Monitor Selection mode.

a When the LED on the NUMLOCK key on the keyboard illuminates and remains lit for approximately two seconds, press the [TAB] key (this occurs very soon after power is applied).

b When the Monitor Selection mode is enabled, press the [TAB] key. The CPU will then cycle through the monitor settings.

If none of the monitor selections result in a readable display, it is likely that the monitor is not supported by the instrument.

c When the monitor is readable and the resolution shown matches the resolution of the monitor, press the [ENTER] key, then answer "Y" at the query to confirm the monitor selection.

The instrument will continue the boot process, and a logic analysis session will autolaunch.

To connect the 16701A Expansion Frame

The 16701A Expansion Frame includes an interface cable to connect to the 16700A/16702A mainframe. To install the expansion frame, you need to connect the cable from the mainframe to the expansion frame.

CAUTION **Electrostatic discharge can damage electronic components. Use grounded wrist straps and mats when performing any service to this card.**

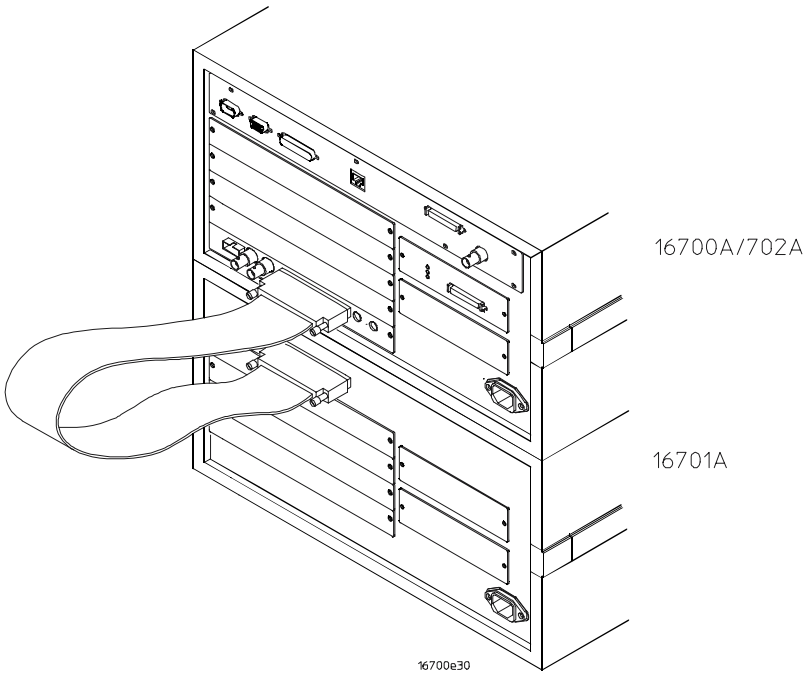
1 Exit all logic analysis sessions.

In the Session Manager, select **Shutdown**. In the Powerdown window that appears, select **Powerdown**.

2 When the "OK to power down" message appears, turn off the power switch, then unplug the power cord. Disconnect any input connections.

3 Connect the interface cable to the expansion frame and to the I/O board in the mainframe.

To ensure correct insertion, the 68-pin "D" connectors on each end of the interface cable are asymmetric in shape. They only fit into their respective ports on the cards when oriented to match the shape of the ports.



4 Turn on the system.

a Connect a power cord to each frame.

b Turn on the power switch located on the front panel of the mainframe.

When the power-up tests are complete, the System window on the display will show two tabs; one is labeled "16700A" and the other is labeled "Expansion Frame".

To install measurement modules

The following steps give general instructions for installing emulation modules into the mainframe or the expansion frame of the system.

CAUTION **Electrostatic discharge can damage electronic components. Use grounded wrist straps and mats when performing any service to modules.**

1. Exit all logic analysis sessions.

   In the Session Manager, select **Shutdown**. In the Powerdown window that appears, select **Powerdown**.

2. When the "OK to power down" message appears, turn off the power switch, then unplug the power cord. Disconnect any input or output connections.
3. Plan your module configuration.

   Refer to the manuals of individual modules for configuration information.

4. Starting from the top, loosen the thumb screws on filler panels and cards that need to be moved.

   Cards or filler panels below the slots intended for installation do not have to be removed.

5. Starting from the top, pull the cards and filler panels that need to be moved halfway out.

   All multi-card modules will be cabled together. To prevent damage to the cables and connectors, pull these cards out together.

6. Remove the cards and filler panels that are in the slots intended for the module installation.

   Some modules for the logic analysis system require an operational accuracy calibration if you move them to a different slot. Refer to the manuals of individual modules for calibration information.

7. Install the module.

   You may need to push all other cards into the card cage, but not completely in, to get them out of the way for installing the module.

   Refer to the manuals of individual modules for cabling information.

8. Slide the complete module into the frame, but not completely in.

   Each card is firmly seated and tightened one at a time in step 10.

9 Position all cards and filler panels so that the endplates overlap.

10 Seat the cards and tighten the thumbscrews.

Starting with the bottom card, firmly seat the cards into the backplane connector of the mainframe. Keep applying pressure to the center of the card endplate while tightening the thumbscrews finger-tight. Repeat this for all cards and filler panels starting at the bottom and moving to the top.

CAUTION **For correct air circulation, filler panels must be installed in all unused card slots. Correct air circulation keeps the instrument from overheating. Keep any extra filler panels for future use.**

11 Plug in the system, then turn it on.

When you turn on the power switch, the logic analysis system performs power-up tests. After the power-up tests are complete, the screen will show your system configuration.

See Also The Service Guides for the individual modules.

To install emulation modules

The following steps give general instructions for installing emulation modules into the mainframe or the expansion frame of the system. You will need T10 and T15 Torx screwdrivers (supplied with the emulation module). Refer to chapter 6 for additional details on assembly/disassembly procedures.

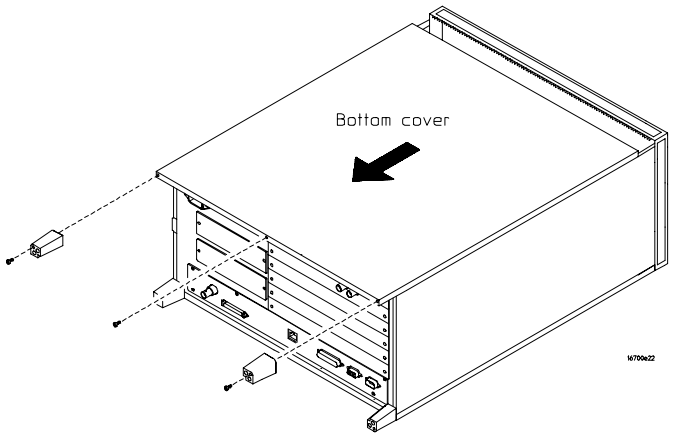
1 Exit all logic analysis sessions.

In the Session Manager, select **Shutdown**. In the Powerdown window that appears, select **Powerdown**.

2 When the "OK to power down" message appears, turn off the power switch, then unplug the power cord. Disconnect any input or output connections.

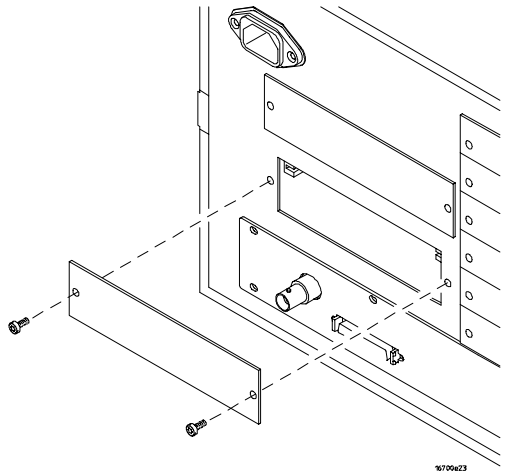
3 Turn the logic analysis system frame upside-down.

4 Remove the bottom cover.

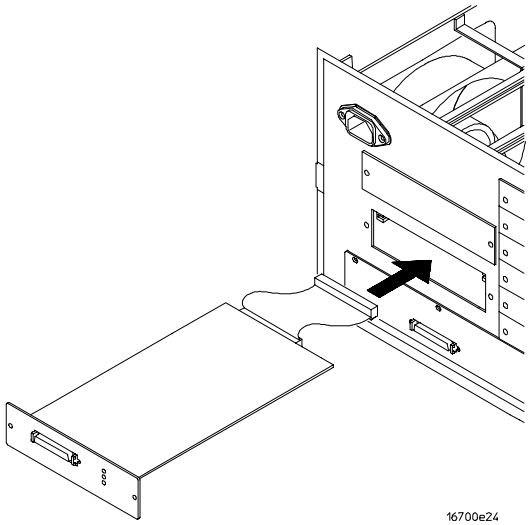


5 Remove the slot cover.

You may use either slot.

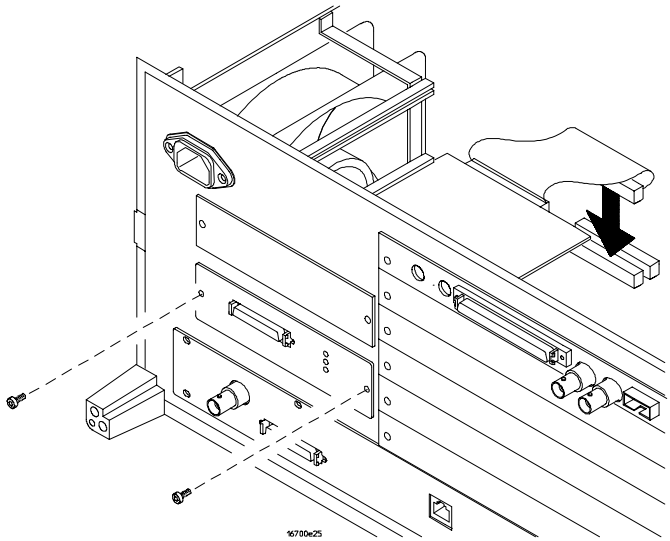


6 Install the emulation module.



7 Connect the cable and re-install the screws.

You may connect the cable to either of the two connectors. If you have two emulation modules, note that many debuggers will work only with the "first" module, the one toward the top of the frame ("Slot 1"), plugged into the connector nearest the back of the frame.



8 Re-install the bottom cover, then turn the frame right-side-up.

9 Plug in the power cord, reconnect the other cables, and turn on the logic analysis system.

The new emulation module will be shown in the system window.

See Also

The "Solutions" manual supplied with your emulation module for information on giving the emulation module a "personality" for your target processor.

Refer to chapter 6 for additional details on assembly/disassembly procedures.

To clean the logic analysis system

With the instrument turned off and unplugged, use mild soap and water to clean the front and cabinet of the system. Harsh soap might damage the water-base paint.

To test the logic analysis system

The logic analysis mainframe and expansion frame do not require calibration or adjustment.

- If you require a test to initially accept the operation, perform the self-tests in chapter 3, "Testing Performance."
- If the logic analysis system does not operate correctly, go to the beginning of chapter 5, "Troubleshooting."

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Testing Performance

Testing Performance

To ensure the logic analysis system is operating correctly, you can perform software tests (self-tests) on the system. Directions for performing the software tests are given in this chapter.

This chapter normally tells you how to test the performance of the logic analysis system against the specifications listed in chapter 1. Because there are no specifications for the 16700A/16701A/16702A, there are no performance verification tests.

Self-Tests

The self-tests listed in this chapter check the functional operation of the mainframe and the expansion frame. Self-tests for the optional modules installed in the frames are listed in the individual module Service Guides.

There are two types of self-tests: self-tests that automatically run at powerup, and self-tests that you select on the screen. For descriptions of the tests, refer to chapter 8, "Theory of Operation."

Perform the self-tests as an acceptance test when receiving the logic analysis system or when the logic analysis system is repaired.

If a test fails, refer to chapter 5, "Troubleshooting."

Test Interval

There is no recommended test interval for the 16700A/16702A mainframes or the 16701A expansion frame. However, each of the supported modules has performance verification tests and therefore require a periodic verification of specifications. Refer to the Service Guides of the individual modules for more information.

To perform the power-up tests

The logic analysis system automatically performs power-up tests when you apply power to the instrument. Any errors are reported in the boot dialogue. Serious errors will interrupt the boot process.

The power-up tests are designed to complement the instrument on-line Self-Tests. Tests that are performed during powerup are not repeated in the Self-Tests.

The monitor (16700A only), keyboard and mouse must be connected to the mainframe to observe the results of the power-up tests.

1 **Disconnect all inputs and exit all logic analysis sessions.**

In the Session Manager, select **Shutdown**. In the Powerdown window, select **Powerdown**.

2 **When the "OK to power down" message appears, turn off the power switch.**

3 **After a few seconds, turn the power switch back on. Observe the boot dialogue for the following:**

- Ensure all of the installed memory is recognized
- Any error messages
- Interrupt of the boot process with or without error message

A complete transcript of the boot dialogue is in chapter 8, "Theory of Operation."

4 **During initialization, check for any failures.**

If an error or an interrupt occurs, refer to chapter 5, "Troubleshooting."

To perform the self-tests

The self-tests verify the correct operation of the logic analysis system. Self-tests can be performed all at once or one at a time. While testing the performance of the logic analysis system, run the self-tests all at once.

1 Launch the Self-Tests.

   a In the System window, click on **System Admin**.

   b Under the Admin tab, click on the **Self-Test...** selection.

   c In the query pop-up menu, select **Yes** to exit the current session.

   The Self-Test closes down the current session because the test algorithms leave the system in an unknown state. Re-launching a session at the end of the tests will ensure the system is properly initialized.

2 In the Self-Test window select **Test All**.

   When the tests are finished, the Status will change to TEST passed or TEST failed. You can find detailed information about the test results in the Status Message field of the Self-Test window.

   The System CPU Board test returns Untested because the CPU tests require user action. To test the CPU Board, select CPU Board, then select each test individually.

   For more information on the tests that are not executed, refer to chapter 8.

3 Select **Quit** to exit the Test menu.

4 In the Session Manager, select **Start Session This Display** to re-launch a logic analysis session.

Calibrating and Adjusting

Calibrating and Adjusting

This chapter normally gives you instructions for calibrating and adjusting the logic analysis system. However, the 16700A/16702A mainframes and the 16701A expansion frame do not require calibration or adjustments.

Calibrations and Adjustments for Modules

The individual modules that plug into the 16700A, 16701A and 16702A may require calibration, operational accuracy calibration, or adjustments. Refer to the appropriate documentation for the individual modules for recommended calibration, operational accuracy calibration intervals and procedures, and adjustment procedures.

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Troubleshooting

Troubleshooting

This chapter helps you troubleshoot the logic analysis system to find defective assemblies. The troubleshooting consists of flowcharts, self-test instructions, and tests. This information is not intended for component-level repair.

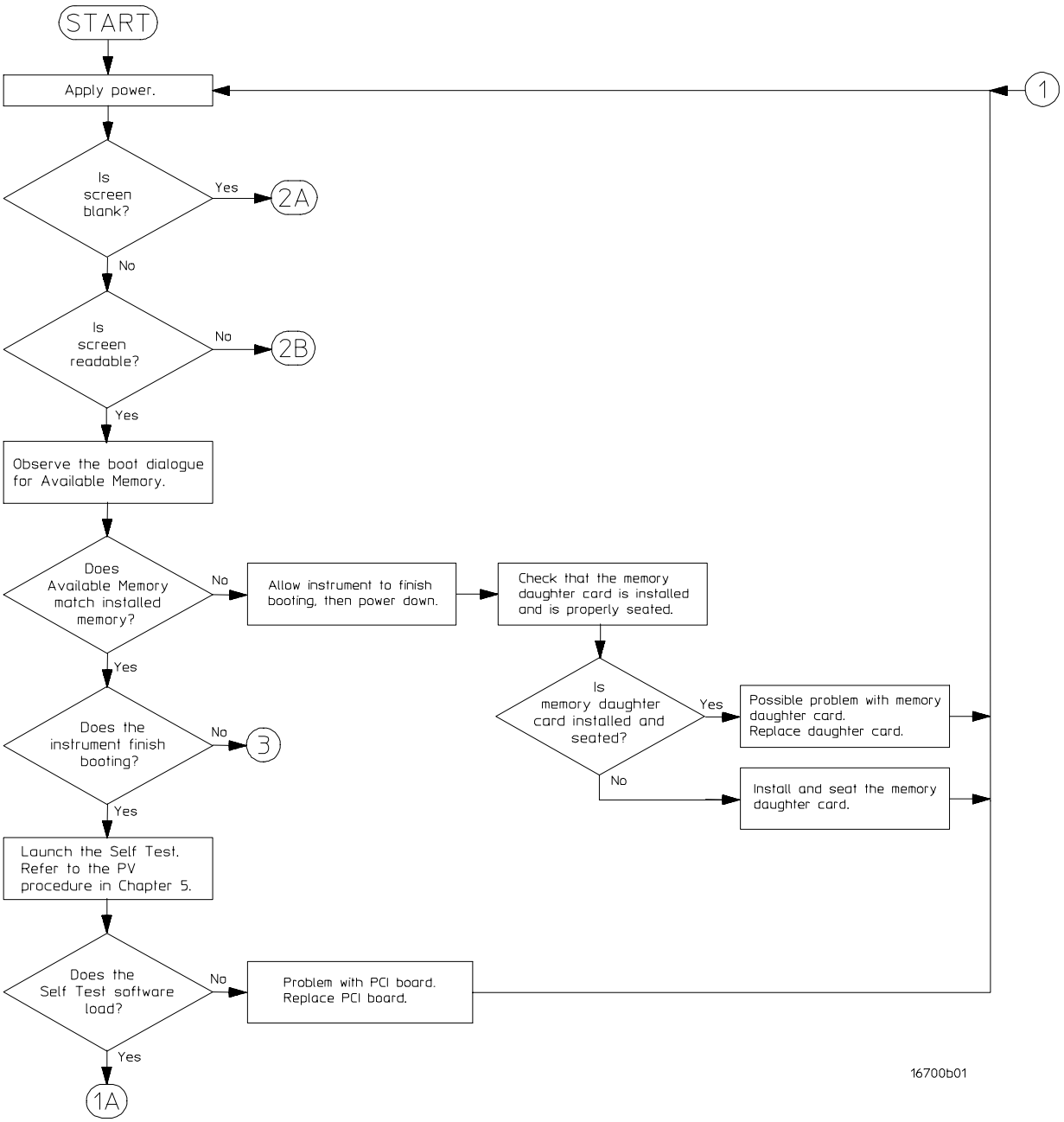
If you suspect a problem, start at the top of the first flowchart. During the troubleshooting instructions, the flowcharts will direct you to perform other tests. The other tests are located in this chapter after the flowcharts.

The service strategy for this instrument is the replacement of defective assemblies. This instrument can be returned to Agilent Technologies for all service work, including troubleshooting. Contact your nearest Agilent Technologies Sales Office for more details.

CAUTION **Electrostatic discharge can damage electronic components. Use grounded wrist straps and mats when you perform any service to this instrument or to the cards in it.**

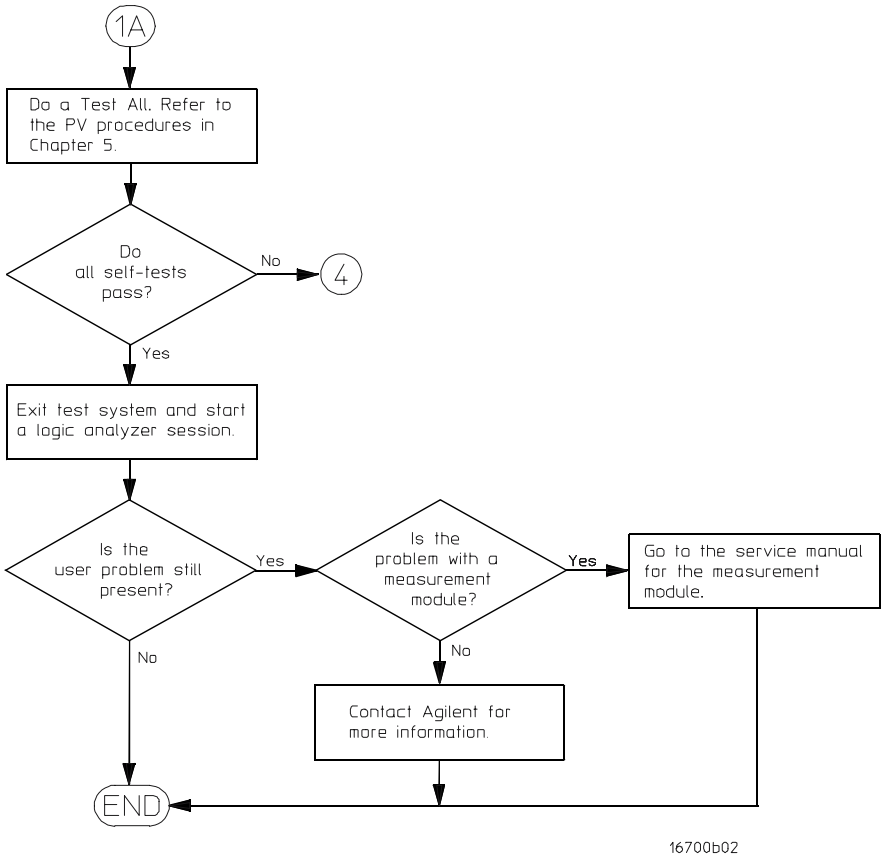
To use the flowcharts

Flowcharts are the primary tool used to isolate defective assemblies. The flowcharts refer to other tests to help isolate the trouble. The circled alphanumeric references on the charts indicate connections with the other flowcharts. Start your troubleshooting at the top of the first flowchart.

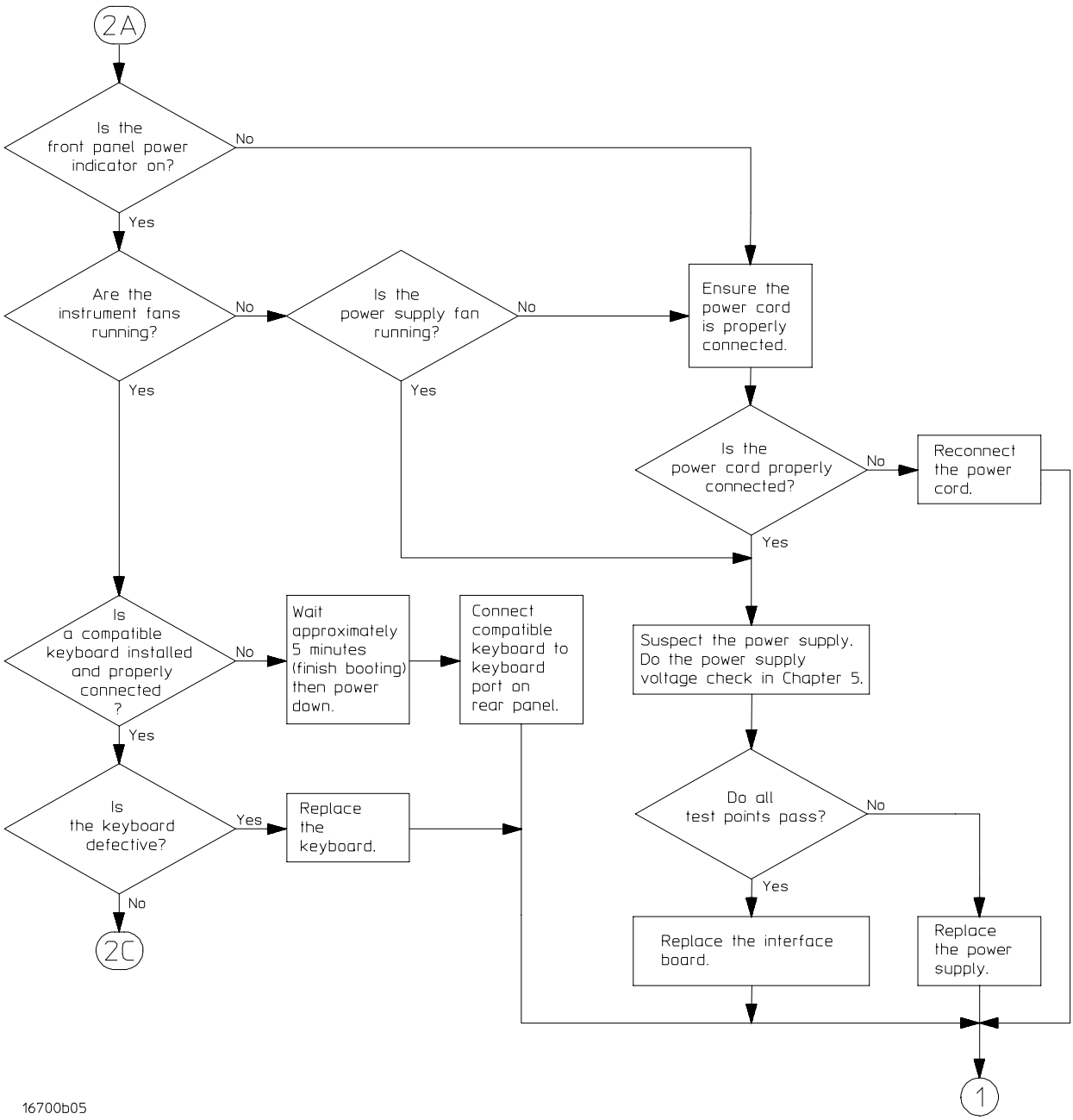


Troubleshooting Flowchart

To use the flowcharts

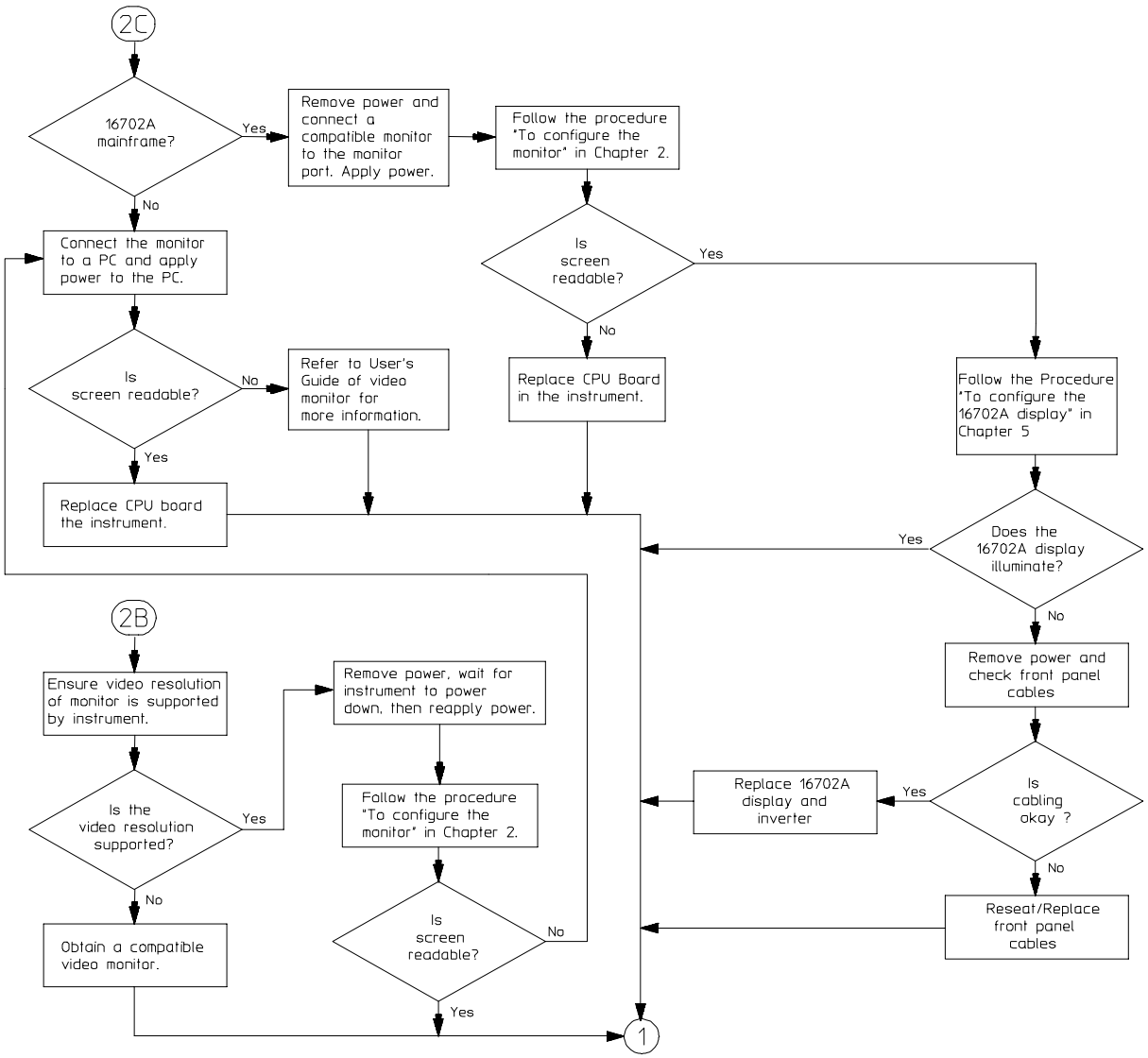


Troubleshooting Flowchart



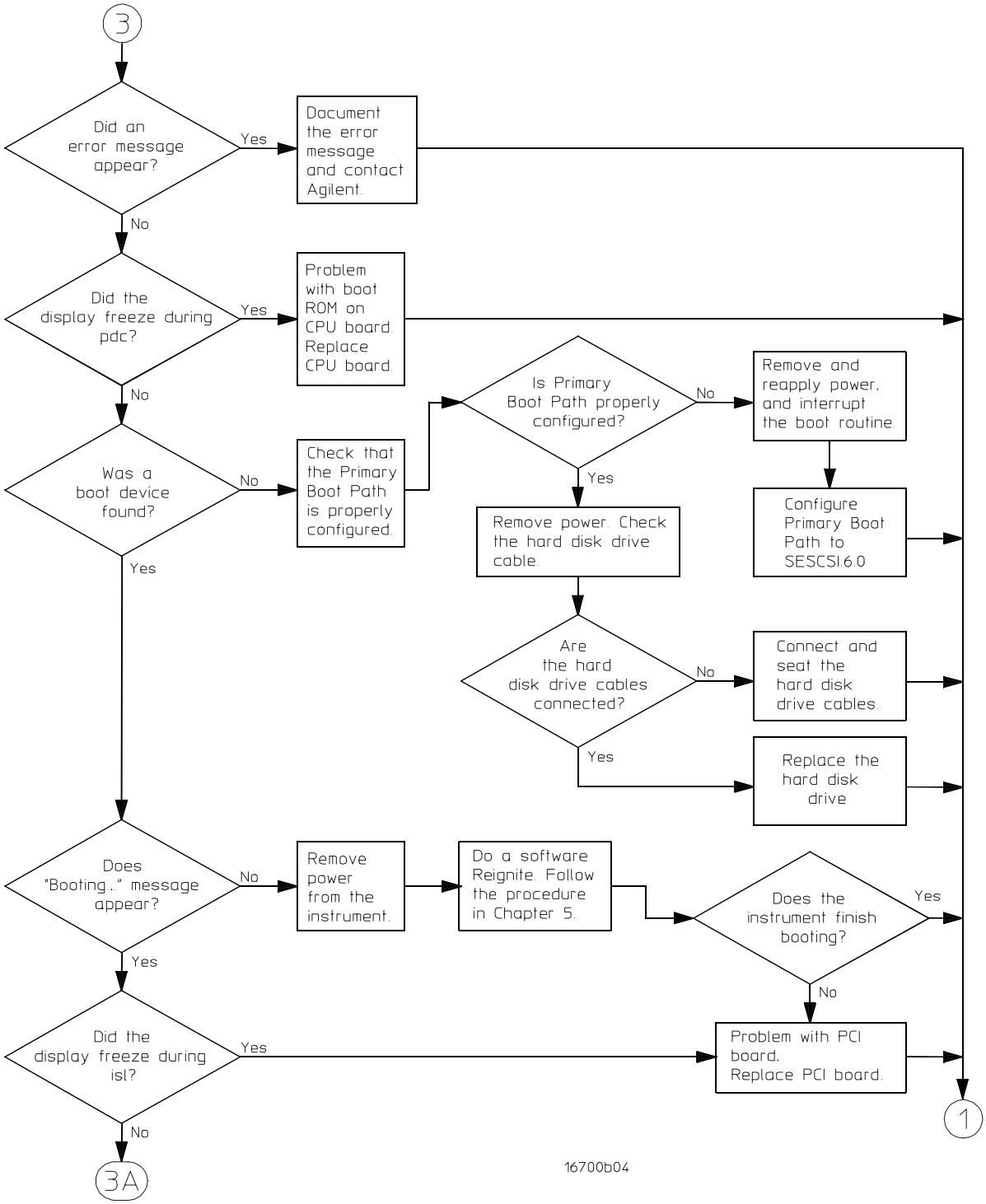
Troubleshooting Flowchart

To use the flowcharts

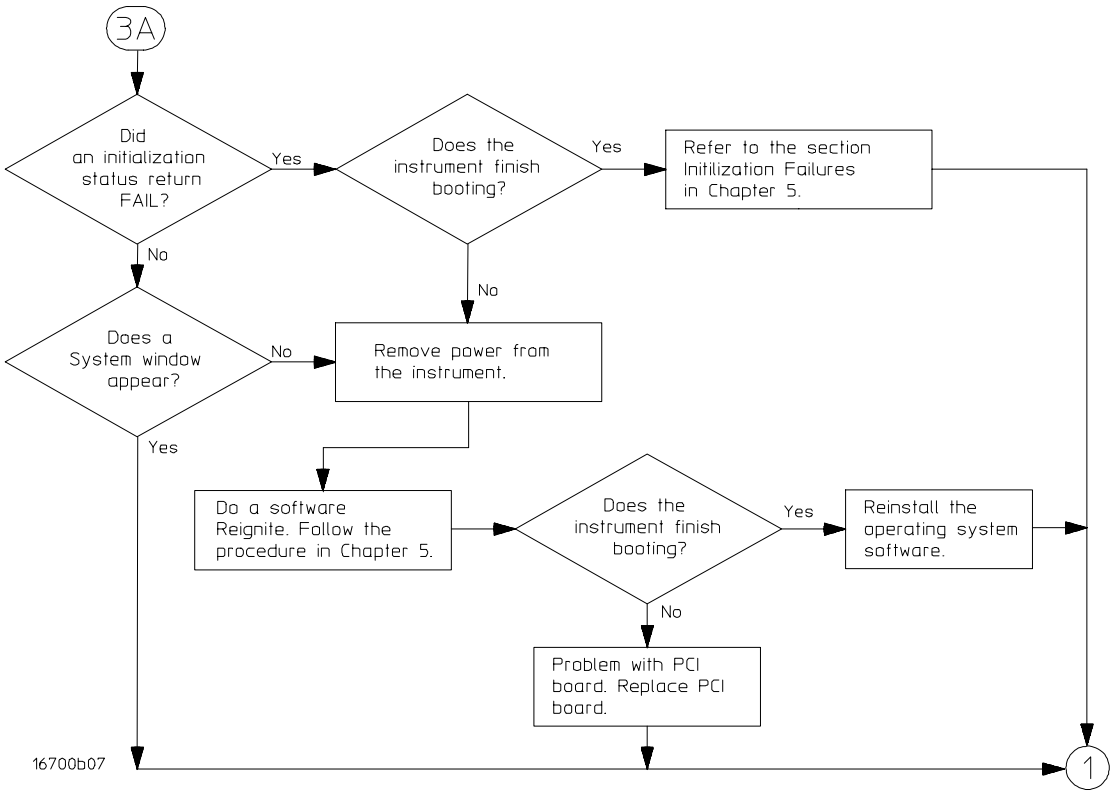


16700b21

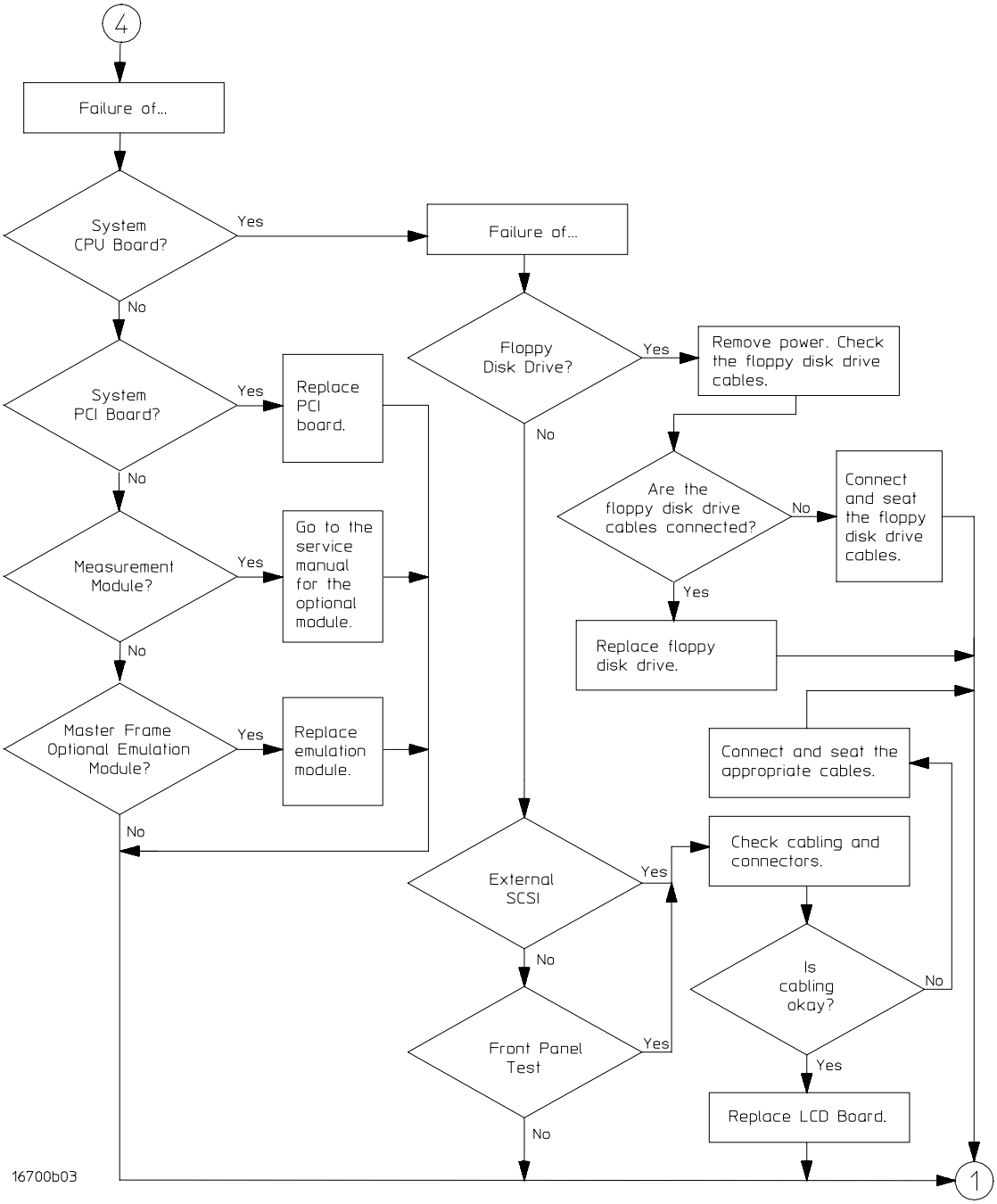
Troubleshooting Flowchart



Troubleshooting Flowchart



Troubleshooting Flowchart



Troubleshooting Flowchart

To perform the power-up tests

The logic analysis system automatically performs power-up tests when you apply power to the instrument. Any errors are reported in the boot dialogue. Serious errors will interrupt the boot process.

The power-up tests are designed to complement the instrument on-line Self-Tests. Tests that are performed during powerup are not repeated in the Self-Tests.

The monitor (16700A only), keyboard and mouse must be connected to the mainframe to observe the results of the power-up tests.

1 Disconnect all inputs and exit all logic analysis sessions.

In the Session Manager, select **Shutdown**. In the Powerdown window, select **Powerdown**.

2 When the "OK to power down" message appears, turn off the power switch.

3 After a few seconds, turn the power switch back on. Observe the boot dialogue for the following:

- Ensure all of the installed memory is recognized
- Any error messages
- Interrupt of the boot process with or without error message

A complete transcript of the boot dialogue is in chapter 8, "Theory of Operation."

4 During initialization, check for any failures.

See Also

"The Power-Up Routine" in chapter 8.

To run the self-tests

Self-tests identify the correct operation of major functional subsystems of the instrument. You can run all self-tests without accessing the interior of the instrument. If a self-test fails, refer to the troubleshooting flowcharts to change a component of the instrument. To run the self-tests:

1. In the System window, select **System Admin**.
2. Under the Admin tab, select **Self-Test**. At the Test Query window, select **Yes**.

   You can run the tests individually, or you can run all of the tests by selecting Test All at the bottom of the Self Test window. Note that if Test All is selected, tests requiring user action will not be run. For more information, refer to chapter 8. These procedures instruct you how to perform the tests individually.
3. In the Self Test window, select **System CPU Board**.
4. Run the Floppy Drive Test.
   a. In the Self Test: System CPU Board window, select **Floppy Drive Test**.
   b. Insert a DOS-formatted floppy disk with 300 KB of available space in the mainframe floppy disk drive.
   c. In the Test Query window, select **OK**.

      The Test Query window instructs you to insert the floppy disk into the floppy disk drive. The other System CPU Board tests require similar user action to successfully run the test.
5. In the Self Test: System CPU Board window, select **Close** to close the window.
6. In the Self Test window, select **PCI Board**. You can run the individual PCI Board tests individually without any user action.
7. In the Self Test window, select the **Master Frame** tab. You can run individual tests on each installed measurement module and emulation module in the Master Frame.
8. If an expander frame is installed, select the **Expander Frame** tab in the Self Test window. Individual tests can be run on each installed measurement module and emulation module in the Expander Frame.

   Refer to chapter 8 for more information on tests that are not executed. The service manuals for applicable measurement modules will have information on tests that are not executed.

Reignite: Re-installing the operating system

Read this section carefully before you attempt to re-install the operating system using this procedure.

CAUTION **Everything on the hard disk drive will be overwritten, including the user configuration, data files, and license passwords.**

A batch process is used to autoload the software and then reboot the instrument. The batch process waits for only a short timeout period for user interaction to abort the process. Otherwise, the hard disk drive will be initialized, the operating system will be uploaded, and the instrument will reboot.

The Reignite process takes approximately one hour depending on the speed of the attached CD-ROM.

See Also "To save the license file" in chapter 6 for information on saving the license password.

To reignite:

1. Set up the instrument.
   - **a** Connect the monitor, keyboard, and mouse to their rear panel ports.
   - **b** Connect a SCSI CD-ROM drive to the SCSI port on the rear of the instrument.

     Ensure the CD-ROM drive is set to a SCSI address in the range 1-5.
   - **c** Apply power to the CD-ROM drive.
   - **d** Insert the CD-ROM containing the instrument operating system into the CD-ROM drive.

     Allow a couple of minutes for the CD-ROM drive to settle after inserting the media.
   - **e** If the LAN cable is connected, disconnect it from the instrument.
2. Connect the power cord to the instrument, then apply power.
3. If needed, initiate the monitor selection mode.
   - **a** When the LED on the NUMLOCK key on the keyboard illuminates and remains lit for approximately two seconds, press the [TAB] key. (This happens very soon after power is applied).
   - **b** When the monitor selection mode is enabled, repeatedly press the [TAB] key until the display is readable.
   - **c** Press the [ENTER] key, then answer "Y" at the query to confirm the monitor selection.

4 Interrupt the boot process and begin the Reignite process.

a Repeatedly press the [ESC] key on the keyboard to terminate the boot process.

b When the boot process is terminated, at the Main Menu: Enter command prompt, enter:

```
Main Menu: Enter command > SEArch
```

The instrument will search for all viable boot devices on the bus. The display will then show the boot devices:

```
Path Number     Device Path          Device Type
-----------     -----------------    -----------
P0              SESCSI.6.0           QUANTUM FIREBALL ST4.3S
P1              SESCSI.4.0           IBM     CDRM00201     !F
```

c At the Main Menu: Enter command > prompt, enter

```
Main Menu: Enter command > BOot P1
Interact with IPL (Y, N, Q)?> N
```

d After about 30 seconds you will see the message:

```
WARNING: The configuration information calls for a non-
interactive installation.

Press <Return> within 10 seconds to cancel batch-mode
installation:
```

If you want to abort the Reignite process, go immediately to Step 5.

If you do nothing within the 10 second timeout, the Reignite process will begin. The instrument will completely reload the operating system software onto the hard disk drive. After the software has been uploaded, the instrument will reboot.

5 To abort the Reignite process at this point:

a Press [Return] within 10 seconds.

b At the confirmation, press [Return] again.

c At the language prompt, enter 45. Press [RETURN] at the confirmation prompt.

d Enter “b” to reboot the system from the beginning.

To configure the 16702A display

1 Disconnect all inputs and exit all logic analysis sessions.

In the Session Manager, select **Shutdown**. In the Powerdown window, select **Powerdown**.

2 When the "OK to power down" message appears, turn off the power switch.

3 Connect a compatible PS2 keyboard to the keyboard port on the rear of the instrument.

4 Connect a compatible monitor to the monitor port on the rear of the instrument. Then re-apply power.

5 Immediately interrupt the power-up routine by repeatedly pressing the [Esc] button on the external keyboard.

6 At the "Main Menu: Enter Command >" prompt, enter the command

```
COnfiguration MOnitor GRAPHICS(0) 21
```

and press [Enter]. The LCD display should illuminate, and the external monitor should now be unreadable.

7 At the "Main Menu: Enter Command >" prompt, type the "Boot" command, then answer "n" at the ISL query to finish booting.

8 Remove power from the instrument and disconnect both the keyboard and external monitor.

Unlike an external monitor, the LCD display will not light up at all unless the correct resolution and refresh rate are configured. The correct resolution and refresh rate are configured when monitor mode "21" is entered.

If the display did not illuminate after the procedure in this section completed, there is a problem with either the cabling or the display. Remove the front panel and make sure that all cables are properly seated. If the cables are properly seated, you should suspect the display.

When replacing the display

When replacing the display, the Inverter board that is attached to the LCD board is also replaced.

To check the power supply voltages

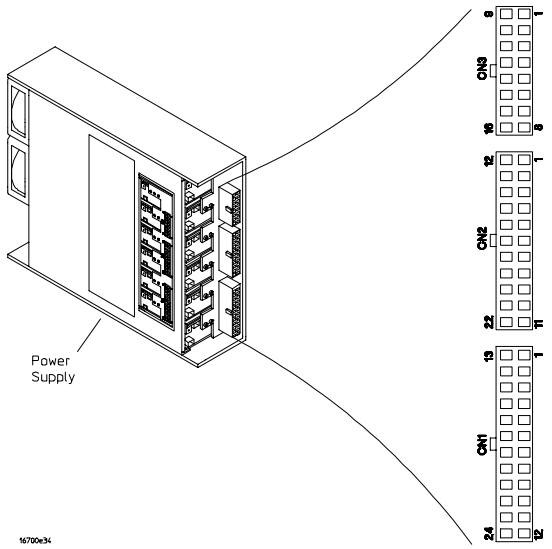
Refer to chapter 6, "Replacing Assemblies," for instructions to remove or replace covers and assemblies.

WARNING **Hazardous voltages exist on the power supply. This procedure is to be performed by service-trained personnel aware of the hazards involved, such as fire and electrical shock.**

1. Turn off the instrument, disconnect the power cord, then remove the top cover.
2. Apply power to the instrument.
3. Using a DVM, measure the power supply voltages.
4. Note problems with the power supply, then return to the flowchart.

Power Supply Voltages

CN1 Pin	Voltage	CN2 Pin	Voltage	CN3 Pin	Voltage
1-7	+5 V	1-10	+3.3 V	1-2	+12 V
8-9	COM	11	COM	3-8	COM
10-12	-5.2 V	12	+3.3 V	9	-12 V
13-20	COM	13-16	COM	10-11	COM
21-24	-12 V	17-19	+3.3 V	12-16	-3.3 V
		20-22	COM		



Power Supply Voltages

To test the floppy disk drive voltages

Refer to chapter 6, "Replacing Assemblies," for instructions to remove or replace covers and assemblies.

WARNING **Hazardous voltages exist on the power supply. This procedure is to be performed by service-trained personnel aware of the hazards involved, such as fire and electrical shock.**

Equipment Required

Equipment	Critical Specification	Recommended Model/Part
Digitizing Oscilloscope	> 100 MHz Bandwidth	54600B

1. Turn off the instrument, then remove the power cable. Remove the top cover of the mainframe.
2. Disconnect both the power cable and the data cable from the floppy drive.
3. Remove the two screws that secure the floppy drive to the frame and remove the floppy drive (refer to chapter 6).
4. Reconnect the power and data cables to the floppy drive. Position the floppy drive so that it does not contact any of the other subassemblies or circuit boards inside the mainframe.
5. Reconnect the power cable to the instrument and apply power.
6. When the instrument completes the boot process, enter the Self Test menu and repetitively run the Floppy Drive Test.
   a. In the System menu, select **System Admin**.
   b. In the System Admin window, select **Self Test**. Select **Yes** at the confirmation dialogue box.
   c. When the Self Test window appears, select the **System** tab.
   d. In the Self Test window, select **Options**, **Repeat Mode**, and **Run Repeatedly**.
   e. Insert a DOS-formatted floppy disk with at least 300 KB of available space into the floppy disk drive.
   f. Select System CPU Board. In the System CPU Board window, select **Floppy Drive Test**. At the Test Query window, select **OK**.

      The floppy drive test will now run repetitively. Use an oscilloscope to probe the floppy disk drive signal pins (see the following table) to ensure that the digital signals are appearing.

Disk Drive Voltages

Pin	Signal Description	Pin	Signal Description	Pin	Signal Description
1	NC	13	Ground	24	Write Gate
2	Mode Select	14	NC	25	Ground
3	NC	15	Ground	26	Track 00
4	HD Out	16	Motor On	27	Ground
5	NC	17	Ground	28	Write Protect
6	NC	18	Direction	29	Ground
7	Ground	19	Ground	30	Read Data
8	Index	20	Step	31	Ground
9	Ground	21	Ground	32	Side One Select
10	NC	22	Write Data	33	Ground
11	Ground	23	Ground	34	Disk Change
12	Drive Select				

When you have completed probing the floppy disk drive signals, select **OK** in the Stop window to halt the Floppy Drive Test.

7 If the floppy disk drive signals appear as indicated, then the floppy disk drive should be replaced. If the signals do not appear, then either the data cable or the CPU board is suspect.

You can probe J6 of the interface board in the same manner as described earlier to check for the same signals.

8 Remove power from the mainframe and disconnect the power cable. Replace the defective assembly.

9 Re-assemble the mainframe.

To test the hard disk drive voltages

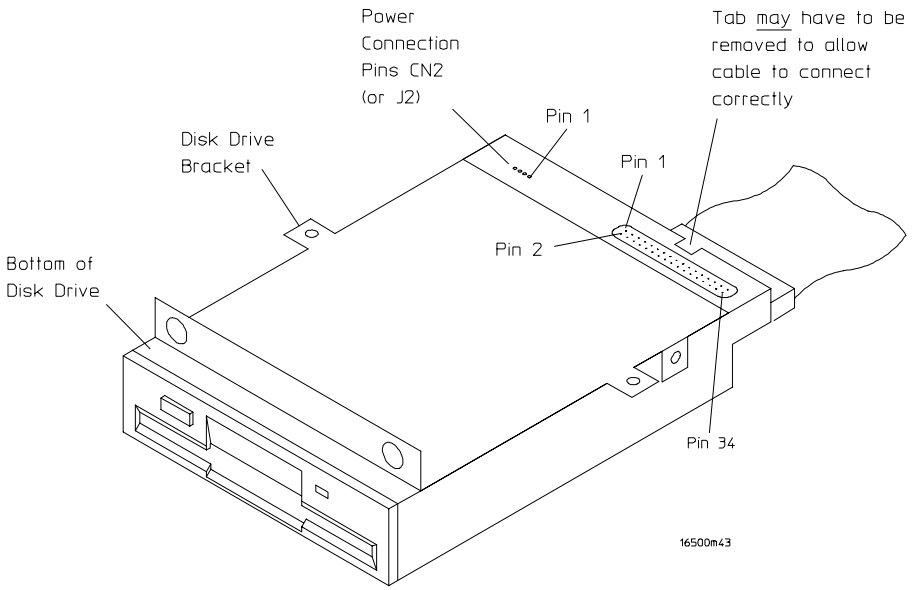
Refer to chapter 6, "Replacing Assemblies," for instructions to remove or replace covers and assemblies.

WARNING **Hazardous voltages exist on the power supply. This procedure is to be performed by service-trained personnel aware of the hazards involved, such as fire and electrical shock.**

Equipment Required

Equipment	Critical Specification	Recommended Model/Part
Digitizing Oscilloscope	> 100 MHz Bandwidth	54600B

1. Turn off the instrument, then remove the power cable. Remove the top cover of the mainframe.
2. Disconnect both the power cable and the data cable from the hard drive.
3. Remove the two screws that secure the hard drive to the frame and remove the hard drive (refer to chapter 6).
4. Remove four screws that secure the mounting plate to the hard drive and remove the mounting plate.
5. Reconnect the power and data cables to the hard drive. Position the hard drive so that it does not contact any of the other subassemblies or circuit boards inside the mainframe.



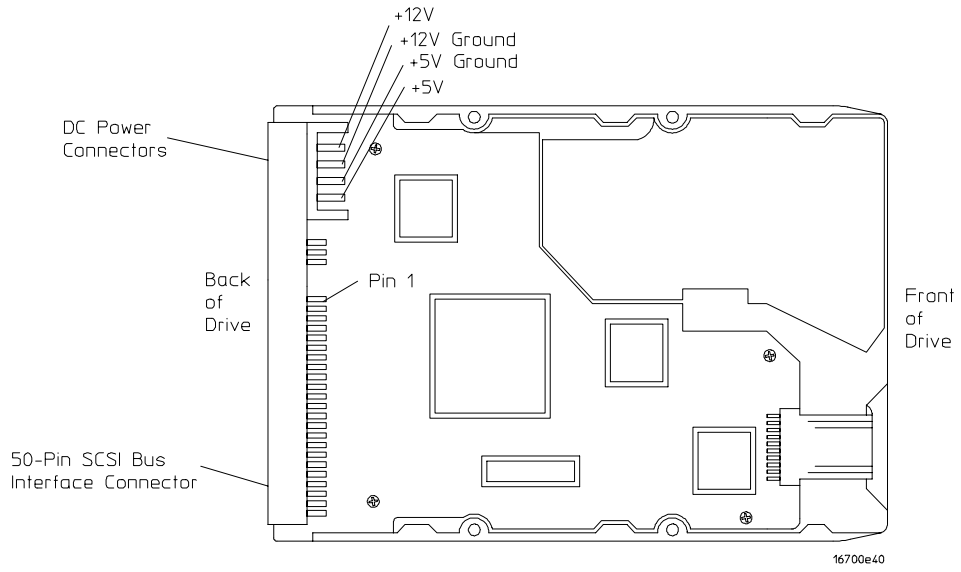
6 Reconnect the power cable to the instrument and apply power.

7 Using an oscilloscope, check for digital activity on the pins while the instrument is booting. Probe the voltages on the hard disk drive circuit board where the data cable connector is soldered. Pin 1 of the connector is marked on the circuit board and is on the side of the connector closest to the power cable (see the following table and illustration).

Disk Drive Voltages

Pin	Signal Description	Pin	Signal Description
2	DB0	28	NC
4	DB1	30	Ground
6	DB2	32	ATN
8	DB3	34	Ground
10	DB4	36	BSY
12	DB5	38	ACK
14	DB6	40	RST
16	DB7	42	MSG
18	DBP	44	SEL
20	Ground	46	C/D
22	Ground	48	REQ
24	NC	50	I/O
26	Terminator Power		

All odd-numbered pins except 23, 25, and 27 are grounded at the drive. Pins 24 and 28 are "No Connect" at the drive.



Interface Connectors and Power Supplies

8 If the hard disk drive signals appear as indicated, then the hard disk drive should be replaced. If the signals do not appear, then either the data cable or the CPU board is suspect.

   You can probe J1 and J10 of the PCI board in the same manner as described earlier in this procedure to check for the same signals.

9 Remove power from the mainframe and disconnect the power cable. Replace the defective assembly.

10 Re-assemble the mainframe.

To troubleshoot initialization failures

By the time the logic analysis system reaches the initialization phase during the boot process, the core subsystems have been tested and are operating. During initialization, the system is being configured to run the operating system software.

A FAIL status during initialization does not necessarily mean there is a serious problem or catastrophic failure of the hardware. Failures are often generated because of changes in the configuration of the hardware or of the system. Occasionally a FAIL status is caused by software file corruption.

If the logic analysis system is part of an equipment pool that is shared among a number of users, then some of the network-related initializations can result in a FAIL status as some users utilize the networking capabilities of the instrument.

If a FAIL status is reported during initialization, then most likely the system is still usable if initialization completes, the entire boot process completes, and the System window appears. If the boot process halts (with or without an error message), then a system problem must be corrected before the logic analysis system is usable.

On the logic analysis system display, the initialization phase of the boot process looks like this:

```
HP-UX Start-up in progress                          Status
_________________________                           ______
Mount file systems ............................... [ OK ]
Setting hostname ................................. [ OK ]
Enable auxiliary swap space ...................... [ OK ]
Start syncer daemon .............................. [ OK ]
Configure LAN interfaces ......................... [ OK ]
Start Software Distributor agent daemon ....... [ OK ]
Clean up old log files ........................... [ OK ]
Start system message logging daemon ........... [ OK ]
Configure Ethernet interfaces .................... [ OK ]
Configure LAN interfaces ......................... [ OK ]
Start NFS core subsystem ......................... [ OK ]
Start NFS client subsystem ....................... [ OK ]
Start Internet services daemon ................... [ OK ]
Start time synchronization ....................... [N/A ]
Start print spooler .............................. [ OK ]
Start clock daemon ............................... [ OK ]
Set X11 Device Configuration ..................... [ OK ]
Start 16700 Processor Run Control daemon ...... [ OK ]
Start NFS server subsystem ....................... [ OK ]
Start Lngrd daemon ............................... [ OK ]
```

HP-UX Startup Process	Result or Cause of Failure
Mount file systems	The most likely cause is a hard disk drive hardware failure that was not found earlier in the boot process. A secondary cause of a FAIL status is that the hard disk drive cables are not properly seated in the disk drive or in the PCI board.
Setting hostname	The most likely cause is a change of network configuration.
Enable auxiliary swap space	This is an unlikely failure.
Start syncer daemon	This is an unlikely failure.
Configure LAN interfaces	The most likely cause is a hardware failure of the CPU board that was not found earlier in the boot process, or a hardware failure of the PCI board. If a LAN cable is not connected to the 10BaseT port, or if a 50-ohm termination is not connected to the 10Base2 port, a FAIL status may also be reported.
Start Software Distributor agent daemon	The most likely cause is a networking or port configuration. A secondary cause of a FAIL status is corrupted software.
Clean up old log files	This is an unlikely failure.
Start system message logging daemon	This is an unlikely failure.
Configure Ethernet interfaces	The most likely cause is the networking configuration.
Configure LAN interfaces	More LAN configuration is performed here. The failure modes are the same as mentioned earlier.
Start NFS core subsystem	This is an unlikely failure.
Start NFS client subsystem	A FAIL status is returned when the instrument is connected to a LAN, the networking configuration is not correct (especially the IP address and subnet mask), and/or a remote workstation that was mounted to the instrument file system configured as Mount Always is no longer available. The quickest workaround of a FAIL status is to disconnect the LAN cable if the instrument will not be networked.
Start Internet services daemon	The most likely cause is the networking configuration.
Start time synchronization	Always returns N/A because this feature is disabled.
Start print spooler	The most likely cause of failure is a hardware failure of the CPU parallel port. An N/A status is caused when the print spooler is disabled.

HP-UX Startup Process	Result or Cause of Failure
Start clock daemon	This is an unlikely failure.
Set X11 Device Configuration	This is an unlikely failure.
Start 16700 Processor Run Control daemon	The most likely cause of failure is a corrupted configuration file for the emulation module. A secondary cause of a FAIL status is a hardware failure of the PCI board or of the emulation module itself, if installed.
Start NFS server subsystem	The most likely cause is the networking configuration.
Start Lngrd daemon	The most likely cause is the networking configuration.

6

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Replacing Assemblies

Replacing Assemblies

This chapter contains the instructions for removing and replacing the assemblies of the logic analysis system. Also in this chapter are instructions for returning assemblies.

WARNING **Hazardous voltages exist on the power supply. To avoid electrical shock, disconnect the power from the instrument before performing the following procedures. After disconnecting the power, wait at least six minutes for the capacitors on the power supply board to discharge before servicing the instrument.**

CAUTION **Damage can occur to electronic components if you remove or replace assemblies when the instrument is on or when the power cable is connected. Never attempt to remove or install any assembly with the instrument on or with the power cable connected.**

Replacement Strategy

These replacement procedures are organized as though you are disassembling the complete instrument, from the first assembly to be removed to the last. Some procedures tell you to remove other assemblies of the instrument, but do not give complete instructions. In these cases, refer to the procedure for that specific assembly for the instructions.

CAUTION **Electrostatic discharge can damage electronic components. Use grounded wrist straps and mats when performing any service to this logic analysis system.**

Tools Required

T10, T15, T25 TORX screwdrivers
#1 Posidrive screwdriver
1/8-inch screwdriver
13/16-inch, deep-well nutdriver
3/16-inch nutdriver
3/8-inch deep-well nutdriver

To save the license file

Before doing any major repairs to the instrument, it is recommended that you back up the license file if possible. You will need a backup copy if you encounter any problems that require a software Reignite.

The license file has all of the licenses for the toolsets and user registration. If, for some reason, you lose the license file, you can obtain new license codewords from the Agilent Technologies Password Center.

To save the license file:

1. Obtain a formatted floppy disk and insert it in the floppy disk drive.
2. In the System window, select **File Manager**.
3. In the "licensing" subdirectory, copy the license.dat file to the floppy disk.

To recover passwords

The password file /logic/licensing/license.dat file may be lost under any of the following circumstances:

- Catastrophic failure of the hard disk drive.
- Software Reignite.
- User error.
- Instrument sent to an Agilent Technologies Service Center with Secure mode enabled.

To avoid losing the license.dat file, back up the file onto a floppy disk and keep the disk in a safe place. The license.dat file can also be archived in any DOS or HP-UX environment.

If the license.dat file (which includes the passwords) is lost, any activated toolsets will become unavailable and the User Registration window will again become visible. To recover the passwords and re-create a license.dat file, you must contact the Agilent Technologies Password Center. Provide the instrument ID number to the Password Center, and they will re-issue your passwords.

An Agilent Technologies Service Center can contact the Agilent Technologies Password Center after an instrument repair to recover toolset passwords. The Agilent Technologies Service Center must provide the instrument ID number to the Agilent Technologies Password Center to recover the toolset passwords. However, you must contact the Agilent Technologies Password Center to recover your User Registration password.

To obtain the instrument ID

The instrument ID can be found in the System Administration window by clicking on the **About** button under the **Admin** tab.

16700A/16702A Mainframe Assembly/Disassembly

The procedures in the following sections cover assembly and disassembly of the 16700A/16702A logic analysis system mainframes. For 16701A expansion frame procedures, see "16701A Expansion Frame Assembly/Disassembly."

To remove and replace optional modules or filler panels

The procedures for removing and replacing optional modules or filler panels is the same for the 16700A/16701A/16702A.

1. **Remove power from the instrument.**
   - **a** Exit all logic analysis sessions. In the session manager, select **Shutdown**.
   - **b** At the query, select **Powerdown**.
   - **c** When the "OK to power down" message appears, turn the instrument off.
2. **To reconfigure your system later in this procedure, note the configuration of your system now.**

   Some modules for the logic analysis system require an operational accuracy calibration if you move them to a different slot.
3. **Starting from the top, loosen the thumb screws on filler panels and cards in the mainframe or the expansion frame. Starting from the top, pull the cards and filler panels out.**

   All multi-card modules will be cabled together. To prevent damage to the cables and connectors, pull all multi-card modules out together.
4. **To replace the modules, reposition all cards and filler panels so that the endplates overlap properly.**
5. **Firmly seat the bottom card into the backplane connector of the mainframe. Keep applying pressure to the center of the card endplate while tightening the thumb screws finger tight. Repeat for all cards and filler panels in a bottom-to-top order.**

   For correct air circulation, filler panels *must* be installed in all unused card slots. Correct air circulation keeps the instrument from overheating. Keep any extra filler panels for future use.

See Also Service Guides for each individual module.

To remove and replace 16700A/16702A top and bottom covers (for serial number prefixes US3849 and less)

This procedure applies to mainframes that have serial number prefix US3849 and less. If your mainframe serial number prefix is US3907 or greater, see the next procedure.

1 Remove power from the instrument.

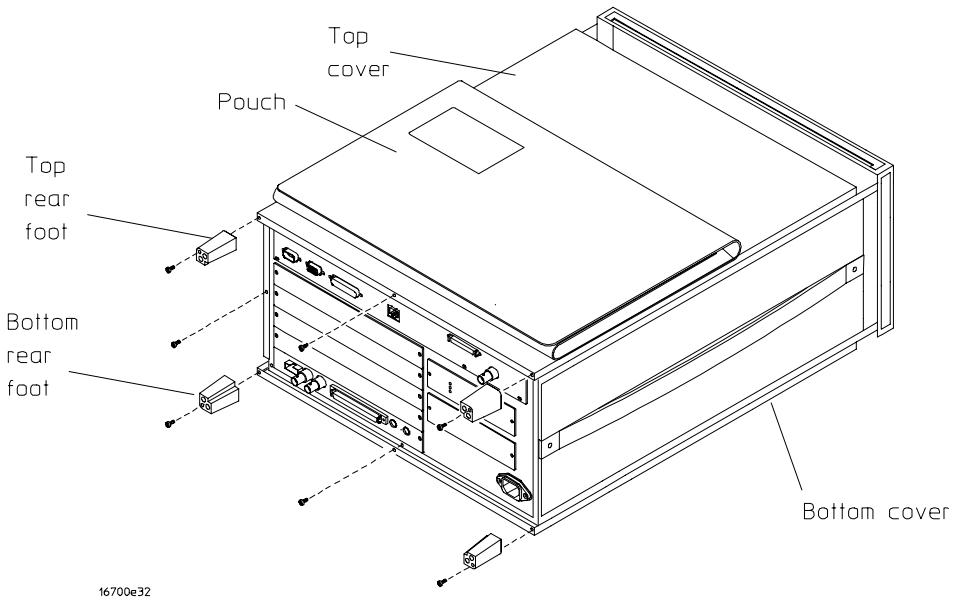
- **a** Exit all logic analysis sessions. In the session manager, select **Shutdown**.
- **b** At the query, select **Powerdown**.
- **c** When the "OK to power down" message appears, turn the instrument off.

2 Disconnect the power cable and all data and peripheral cables from the rear panel.

3 Move the instrument to a static-safe work area before beginning any disassembly.

If only the bottom cover is being removed, go directly to step 7.

4 Using a Torx T10 screwdriver, remove the screws that secure each of the top rear feet to the rear panel.



5 Using a Torx T15 screwdriver, remove the one screw at the center rear of the cover that secures the top cover to the frame.

6 Slide the top cover toward the rear of the instrument and away.

Complete steps 7 through 10 only if it necessary to remove the bottom cover.

7 Lay the instrument on its side so the handle is up.

8 Use a Torx T10 screwdriver to remove the screws that secure each of the bottom rear feet to the rear panel.

9 Using a Torx T15 screwdriver, remove the one screw at the center rear of the cover that secures the bottom cover to the frame.

10 Slide the bottom cover toward the rear of the instrument and away.

11 Reverse this procedure to install the bottom and top covers.

Check that all assemblies are properly installed before installing the cover.

To remove and replace 16700A/16702A top and bottom covers (for serial number prefixes US3907 and greater)

This procedure applies to mainframes that have serial number prefix US3907 and greater. If your mainframe serial number prefix is US3849 or less, see the previous procedure.

1 Remove power from the instrument.

a Exit all logic analysis sessions. In the session manager, select **Shutdown**.

b At the query, select **Powerdown**.

c When the "OK to power down" message appears, turn the instrument off.

2 Disconnect the power cable and all data and peripheral cables from the rear panel.

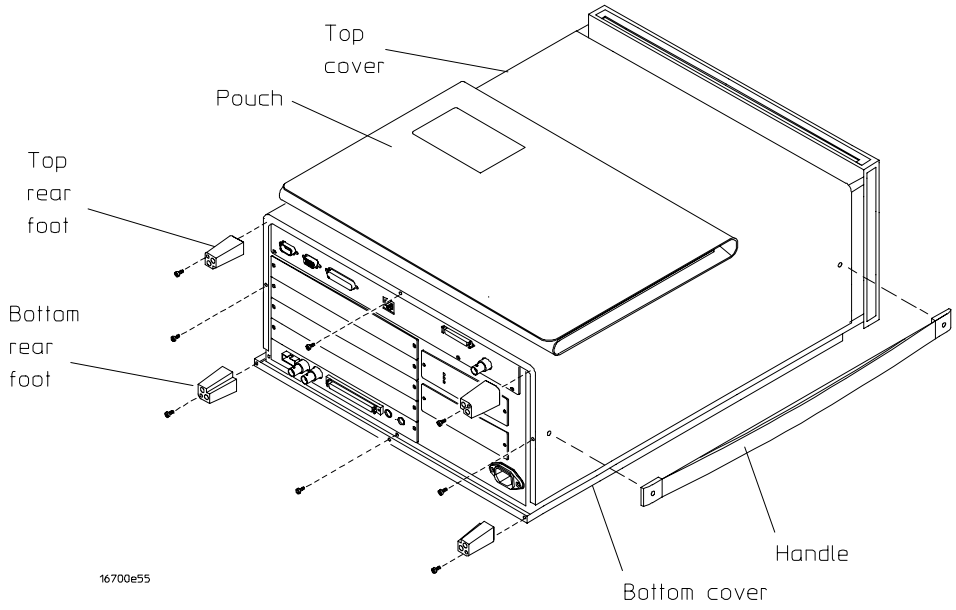
3 Move the instrument to a static-safe work area before beginning any disassembly. If only the bottom cover is being removed, go directly to step 8.

4 Using a Torx T10 screwdriver, remove the screws that secure each of the rear feet to the rear panel.

5 Using a Torx T20 screwdriver, remove the two screws that secure the handle assembly to the side of the instrument.

6 Using a Torx T15 screwdriver, remove the three screws that secure the top cover to the frame. There is one screw at the center rear and one on each side of the cover.

7 Slide the top cover toward the rear of the instrument and away.



Complete steps 8 through 11 only if it necessary to remove the bottom cover.

8 Lay the instrument on its side so the handle side is up.

9 Using a Torx T15 screwdriver, remove the one screw at the center rear of the cover that secures the bottom cover to the frame.

10 Slide the bottom cover toward the rear of the instrument and away.

11 Reverse this procedure to install the bottom and top covers.

Check that all assemblies are properly installed before installing the cover.

To remove and replace the 16700A/16702A hard disk drive

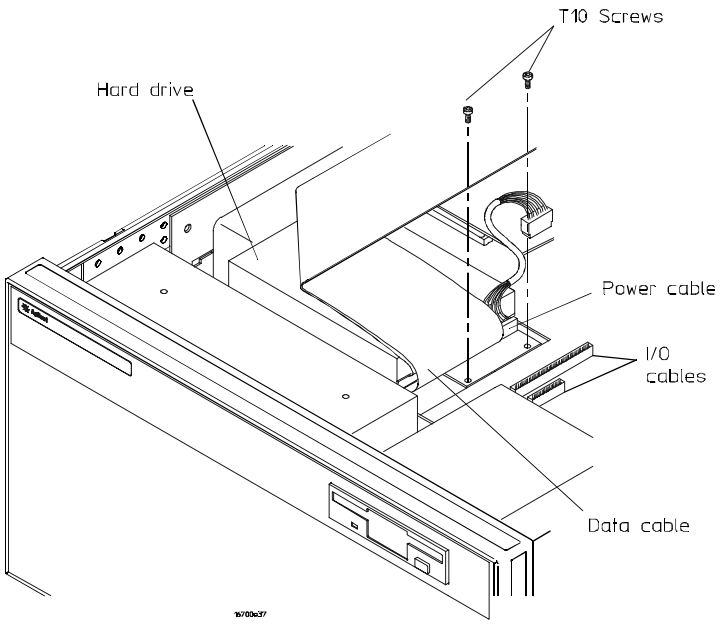
1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Disconnect two I/O cables from the interface board connectors J13 and J14. Remove the I/O cables from the cable clamp on the hard disk drive and move the cables to gain access to the hard disk drive.

The I/O cables have tabs on the ends of each connector. Squeeze the connector tabs with thumb and forefinger while disconnecting each cable.

3 Disconnect the hard disk drive power cable and data cable from the rear of the hard disk drive.



4 Using a Torx T10 screwdriver, remove the two screws that secure the hard disk drive bracket to the frame (see the preceding illustration).

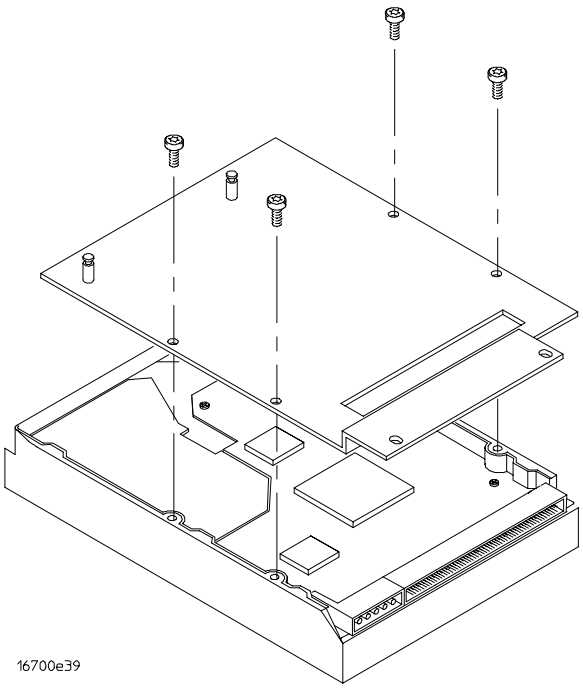
5 Slide the hard disk drive away from the fans approximately 0.5 cm.

6 Lift the hard disk drive out of the instrument.

7 Remove the hard disk drive bracket from the hard disk drive.

a Using a Torx T15 screwdriver, remove the four screws that secure the hard disk drive bracket to the hard disk drive.

b Remove the bracket from the hard disk drive.



8 Reverse this procedure to install the hard disk drive.

When installing the hard disk drive/bracket assembly onto the frame, ensure that the metal slide standoff posts are properly seated in the corresponding holes in the frame.

9 Before installing the hard disk drive, ensure that the following assemblies are properly installed:

- Side Fan

After replacing the hard disk drive and re-assembling the instrument, follow the procedure "Catastrophic Failure Recovery" in this chapter to reload the hard drive.

To remove and replace the 16700A/16702A floppy disk drive

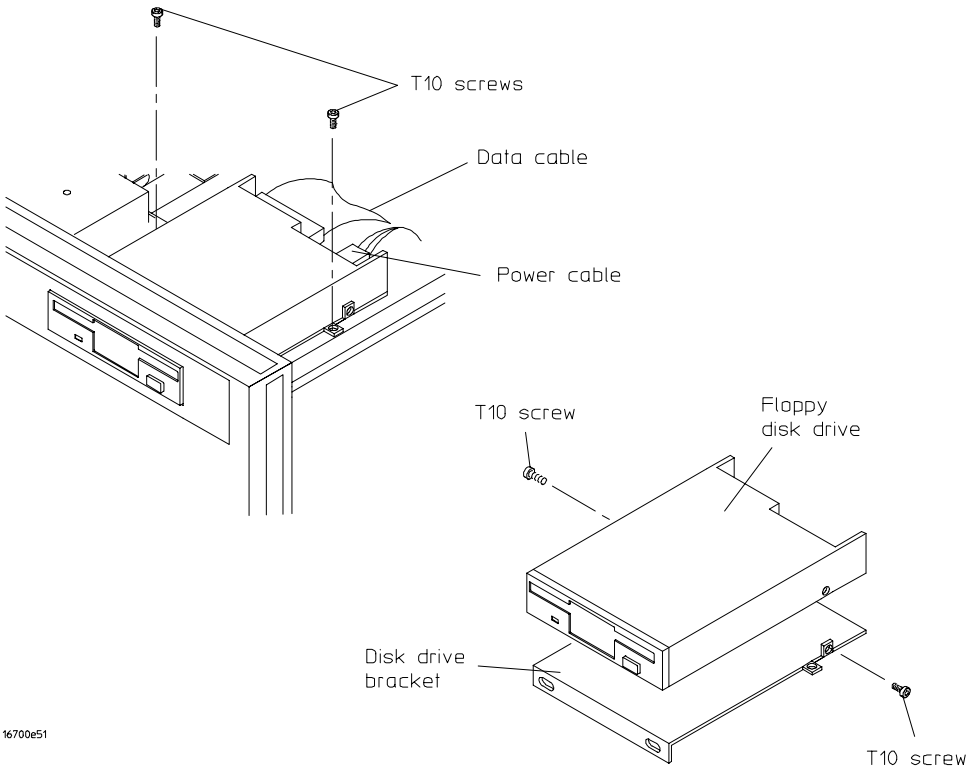
1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Disconnect the floppy disk drive power cable and data cable from the rear of the floppy disk drive.

The floppy disk drive power cable connector has a tab. Lift up slightly on the rear of the connector while disconnecting the cable from the floppy disk drive.

3 Using a Torx T10 screwdriver, remove the two screws that secure the floppy disk drive bracket to the frame.



4 Slide the floppy disk drive toward the rear of the instrument approximately 0.5 cm.

5 Tilt up the rear of the floppy disk drive, then lift the floppy disk drive out of the instrument.

6 Remove the floppy disk drive bracket from the floppy disk drive.

a Using a Torx T10 screwdriver, remove the two screws that secure the floppy disk drive bracket to the floppy disk drive (see the preceding illustration).

b Remove the bracket from the floppy disk drive.

7 Reverse this procedure to install the floppy disk drive.

Before installing the floppy disk drive, ensure that the following assemblies are properly installed:

- Module Interface Board

To remove and replace the 16700A/16702A PCI board

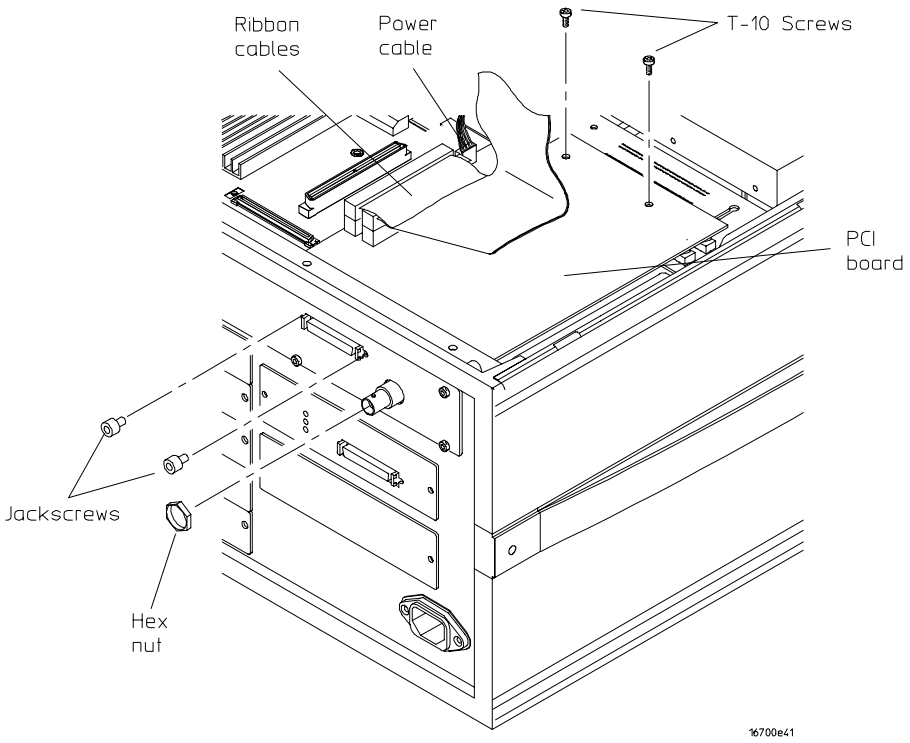
1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Using a 1/8-inch, flat-blade screwdriver, remove the jackscrews that secure the SCSI connector to the rear panel (see the following illustration).

3 Using a deep-well 13/16-inch nutdriver, remove the hex nut that secures the LAN BNC to the rear panel.

4 Using a Torx T10 screwdriver, remove the two screws that secure the PCI board to the standoffs on the interface board.

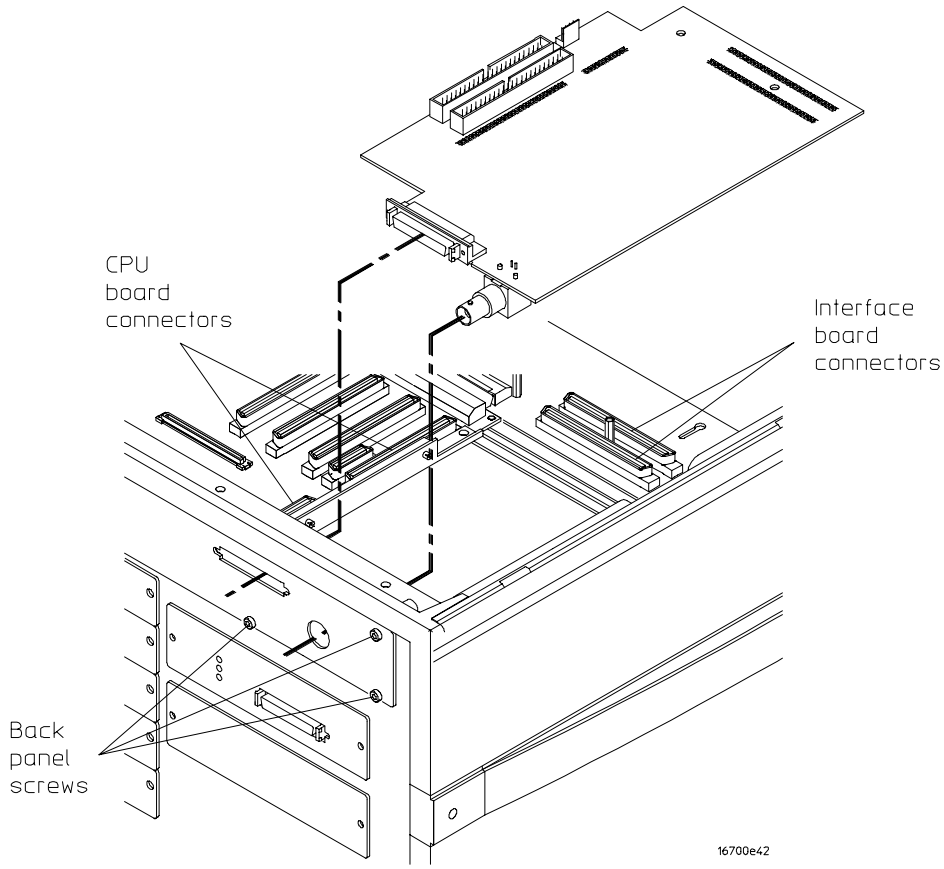


5 Gently lift up the edge of the board that is toward the front of the instrument.

The PCI board does not come right out of the instrument. There are four interface connectors on the bottom of the board that connect the PCI board to both the CPU board and the interface board.

6 After the interface connectors have disengaged from the CPU board and interface board, lift the PCI board out the instrument.

You might have to loosen the screws in the CPU back panel to remove the PCI board.



7 Reverse this procedure to install the PCI board. Before installing the PCI board, ensure that the following assemblies are properly installed:

- Interface Board
- CPU Board

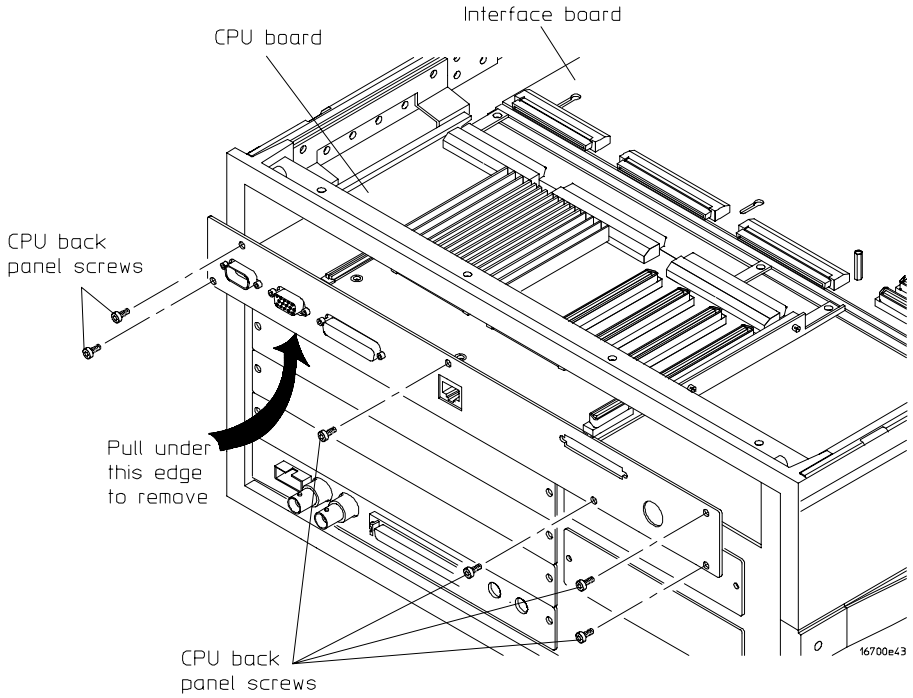
When installing the PCI board, first align the four interface connectors on the bottom of the PCI board to the corresponding connectors on the CPU board and interface board. A slight pressure of the PCI board against the rear panel may be necessary to begin the alignment of the connectors.

To remove and replace the 16700A/16702A CPU board

1 Using previous procedures, remove the following assemblies:

- Top Cover
- PCI Board

2 Using a Torx T10 screwdriver, remove the six screws that secure the CPU back panel to the rear panel of the instrument.



3 Slide the CPU board out the rear of the instrument. As you remove the CPU board, it will disconnect from the interface board.

You might want to remove the card or blank panel directly below the CPU board to gain additional leverage for removing the CPU board.

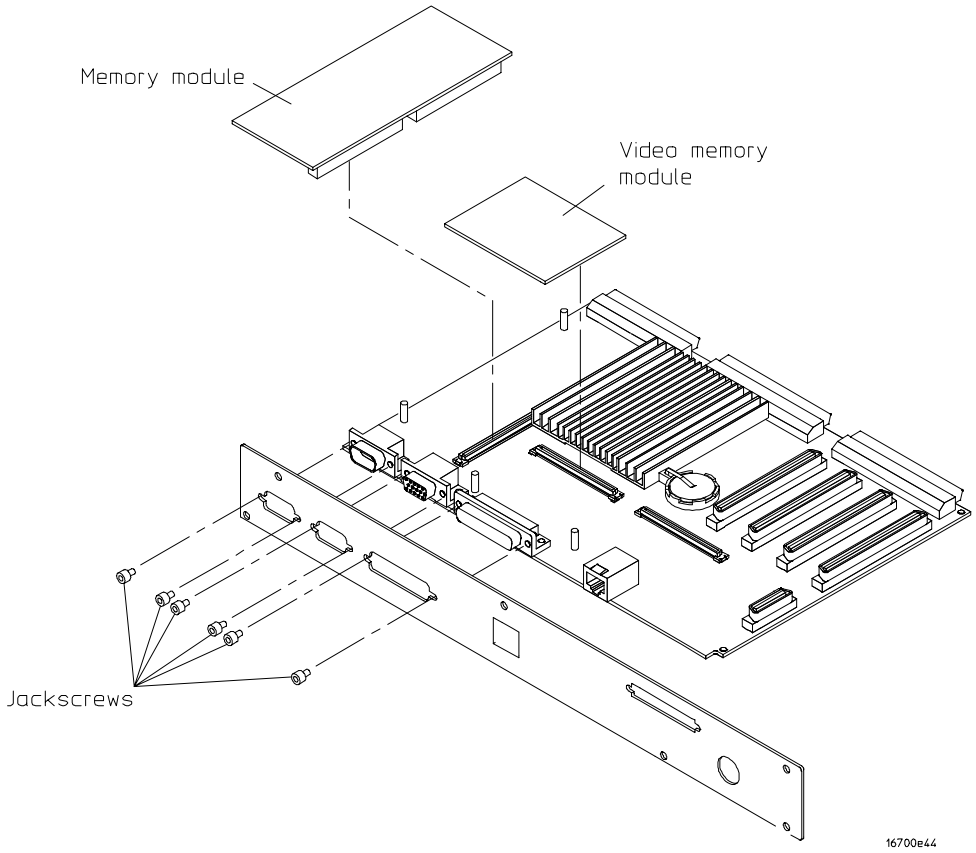
CAUTION **Do not use component heat sinks as leverage in removing the CPU board. Damage to the CPU board components will result.**

CAUTION **Do not pry the CPU board from the interface board by inserting a flat-blade screwdriver and twisting the screwdriver. Damage to the circuit boards will result.**

4 If needed, remove the CPU back panel from the CPU board.

a Using a 3/16-inch nutdriver, remove the jackscrews that secure the RS-232-C, video, and parallel printer connectors from the CPU rear panel (see the following illustration).

b Remove the rear panel from the CPU board.



5 Exchange System RAM and Video RAM (if installed) between the defective and replacement CPU boards.

a Remove the System RAM daughter card by lifting the daughter card off of the CPU board.

b If the Video RAM card is installed, remove it by lifting the card off of the CPU board.

c Position the daughter card taken from the defective CPU board over the replacement CPU board. Align the connectors and the standoffs on the CPU board with the connectors and holes on the daughter card.

d Repeat step c for the Video RAM, if installed.

e Repeat steps c and d to install the daughter card and the Video RAM card from the replacement CPU board onto the defective CPU board.

6 Reverse this procedure to install the CPU board.

Before installing the CPU board, ensure that the following assemblies are properly installed:

- Interface Board

After replacing the CPU board and re-assembling the instrument, see "Catastrophic Failure Recovery" in this chapter to reconfigure the CPU board.

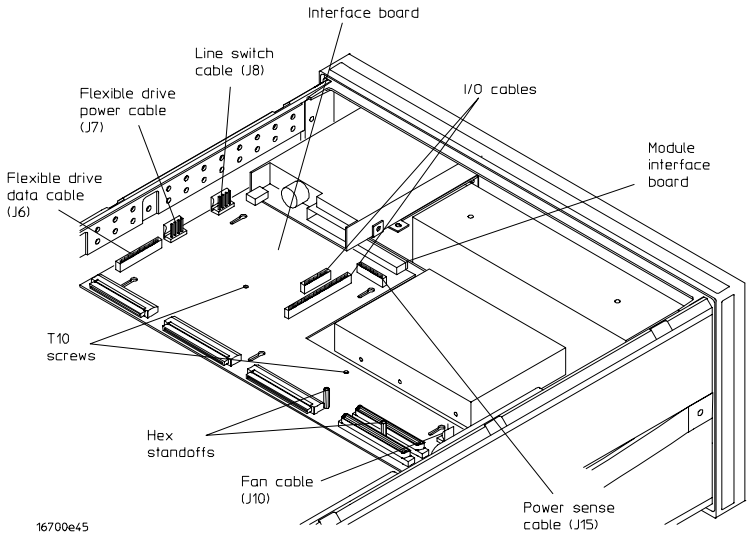
To remove and replace the 16700A/16702A interface board

1 Using previous procedures, remove the following assemblies:

- Top Cover
- PCI Board
- CPU Board

2 Disconnect the following cables:

- I/O Cables
- Floppy Drive Power Cable (J7)
- Line Switch Cable (J8)
- Fan Cable (J10)
- Fan Cables (J21, J22 on serial number prefix US3849 and greater)
- Power Sense Cable (J15)



3 Using a Torx T10 screwdriver, remove the two screws that secure the interface

board to the frame.

4 Using a 3/16-inch nutdriver, remove the two hex standoffs from the side of the interface board closest to the fans.

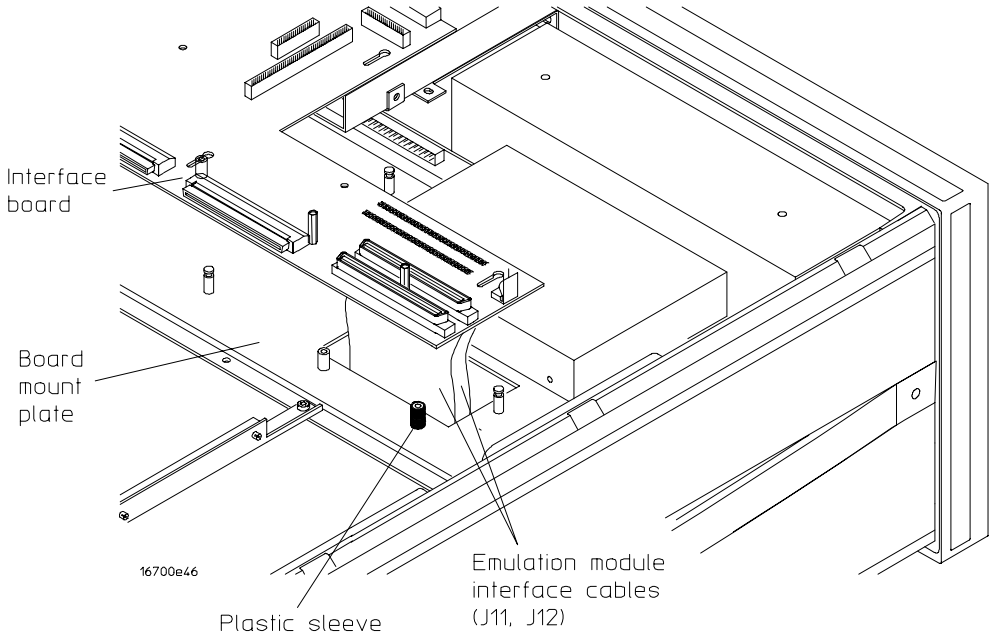
5 Slide the interface board toward the rear of the instrument approximately 1.5 cm. While sliding the interface board, it will disengage from the module interface board.

6 If needed, disconnect the emulation module board(s) from the interface board connectors J11 and J12 (see the following illustration).

a Lift the interface board up enough to gain access to the underside of the board.

b Reach underneath the interface board and disconnect the emulation module interface cables from the interface board.

The emulation module interface cables have tabs on the ends of each connector. Squeeze the connector tabs with thumb and forefinger while disconnecting each cable.



7 Reverse this procedure to install the interface board.

Before installing the interface board, ensure that the plastic sleeve is installed on the thread insert of the board mounting plate that is closest to the fan.

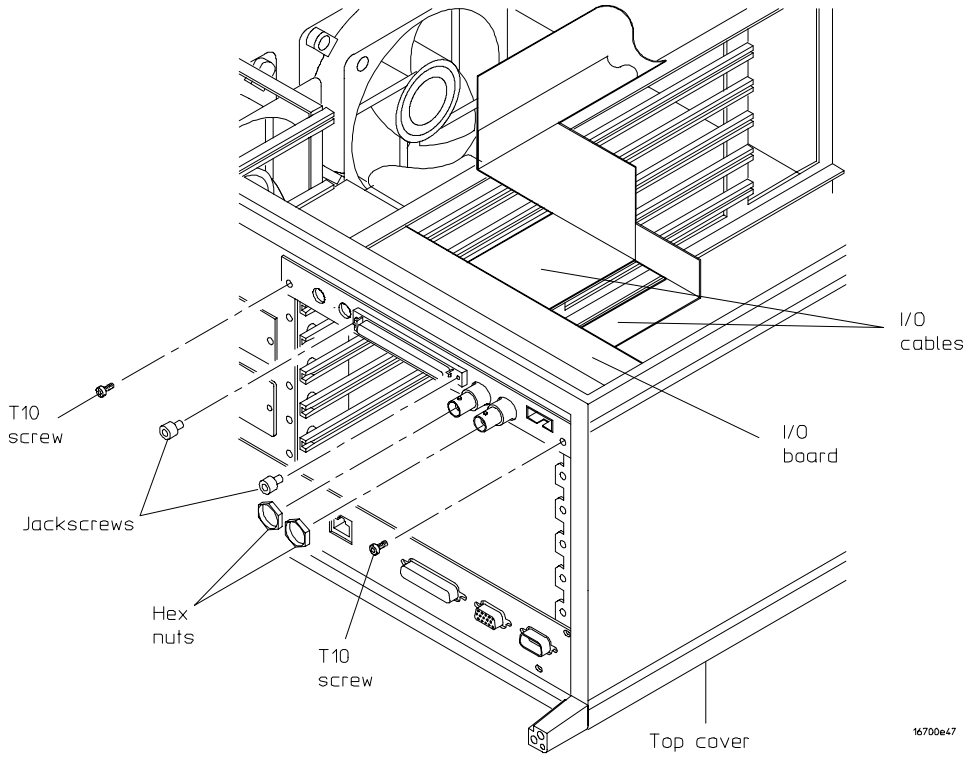
To remove and replace the 16700A/16702A I/O board

1 Using previous procedures, remove the following assemblies:

- Bottom Cover

2 Disconnect the I/O cables from the I/O board (see the following illustration).

The I/O cables have tabs on the ends of each connector. Squeeze the connector tabs with thumb and forefinger while disconnecting each cable.



3 Using a Torx T10 screwdriver, remove the two screws that secure the I/O board to the rear panel.

4 Slide the I/O board out of the rear of the instrument.

5 Using a deep-well 13/16-inch nutdriver, remove the hex nut that secures the Port In and Port Out BNC connectors to the rear panel.

6 Using a 1/8-inch, flat-blade screwdriver, remove the jackscrews that secure the expansion frame connector to the rear panel.

7 Remove the rear panel from the I/O board.

8 Reverse this procedure to install the I/O board.

To remove and replace an emulation module in the 16700A/16702A

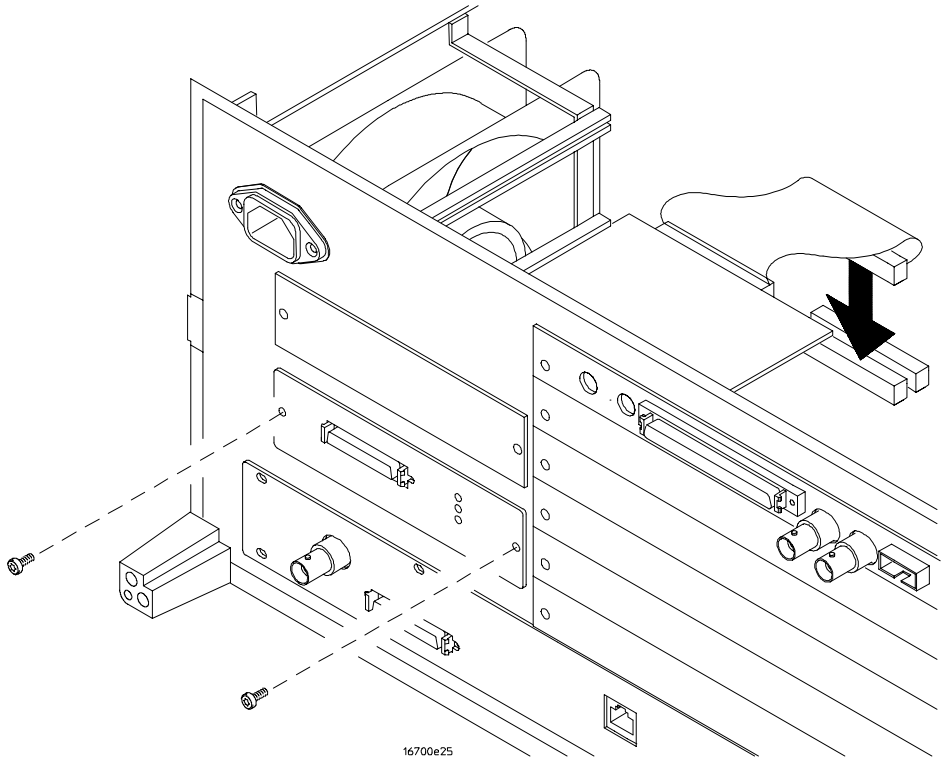
1 Using previous procedures, remove the following assemblies:

- Bottom Cover

2 Using a Torx T10 screwdriver, remove the two screws that secure the emulation module to the instrument rear panel (see the following illustration).

3 Disconnect the interface cables from the emulation module.

The interface cables have tabs on the ends of each connector. Squeeze the connector tabs with thumb and forefinger while disconnecting each cable.



4 Slide the emulation module out the rear of the instrument.

5 Reverse this procedure to install the emulation module.

To remove and replace the 16700A/16702A fans (for serial number prefixes US3836 and less)

This procedure applies to mainframes that have serial number prefix US3836 and less. If your mainframe serial number prefix is US3849 or greater, see the next two procedures.

1 Using previous procedures, remove the following assemblies:

- Top and Bottom Covers

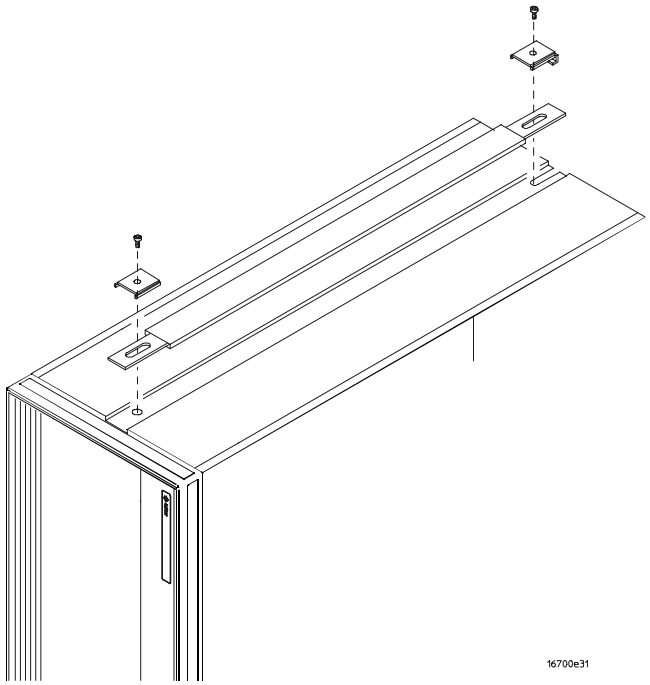
2 Before you can remove the fans, you must first remove the side panel from the frame.

a Lay the instrument on its side so the handle is facing up.

b Using a Torx T25 screwdriver, remove the two screws that secure each of the two handle endcaps, one per endcap.

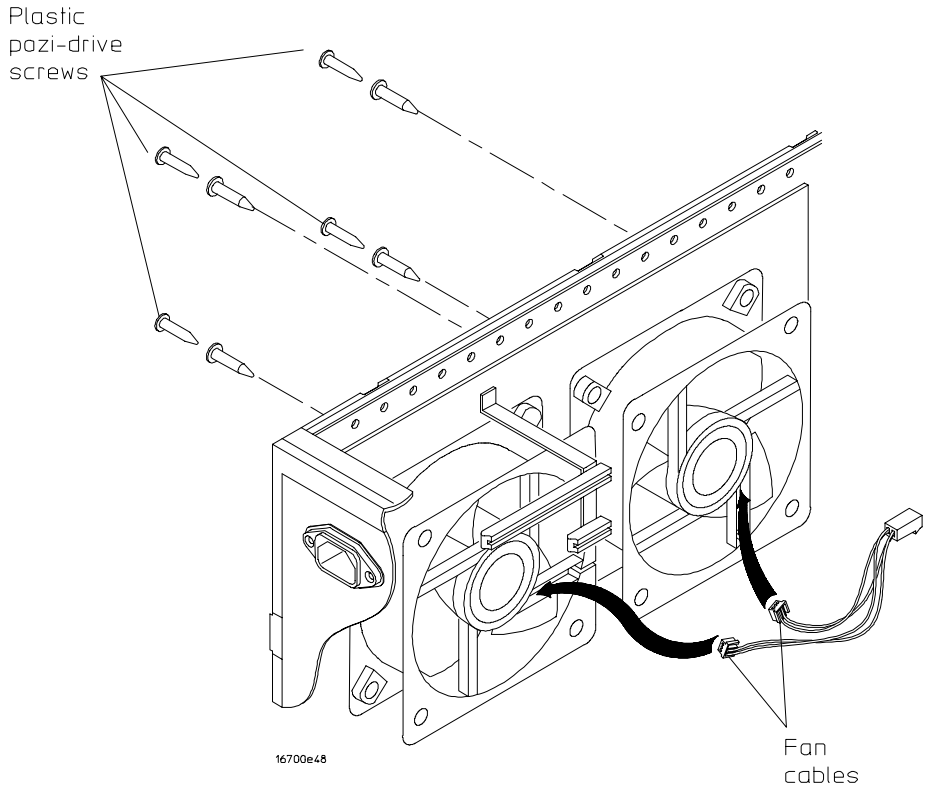
c Remove the endcaps and the handle.

d Slide the side panel toward the rear of the instrument approximately 1.0 cm and remove the side panel.



3 Disconnect the fan cable from the fan to be replaced. After the connector disengages from the connector pins on the fan, pull the connector out and away from the fan.

4 Using a #1 Posidrive screwdriver, remove the four screws that secure the fan to the side of the chassis. There is one screw at each corner of the fan (see the following illustration).



5 Using a 1/8-inch, flat-blade screwdriver, push out the screw inserts enough to be able to grab them with a thumb and forefinger.

6 While holding the fan, remove the four screw inserts, one at each corner of the fan.

7 Reverse this procedure to install the fan. When installing the fan, ensure that:

- The cable notch on the fan assembly is pointing toward the middle of the instrument.
- The fan rotation is toward the rear of the instrument.
- Airflow is toward the inside of the instrument.

To remove and replace the 16700A/16702A side panel fan (for serial number prefixes US3849 and greater)

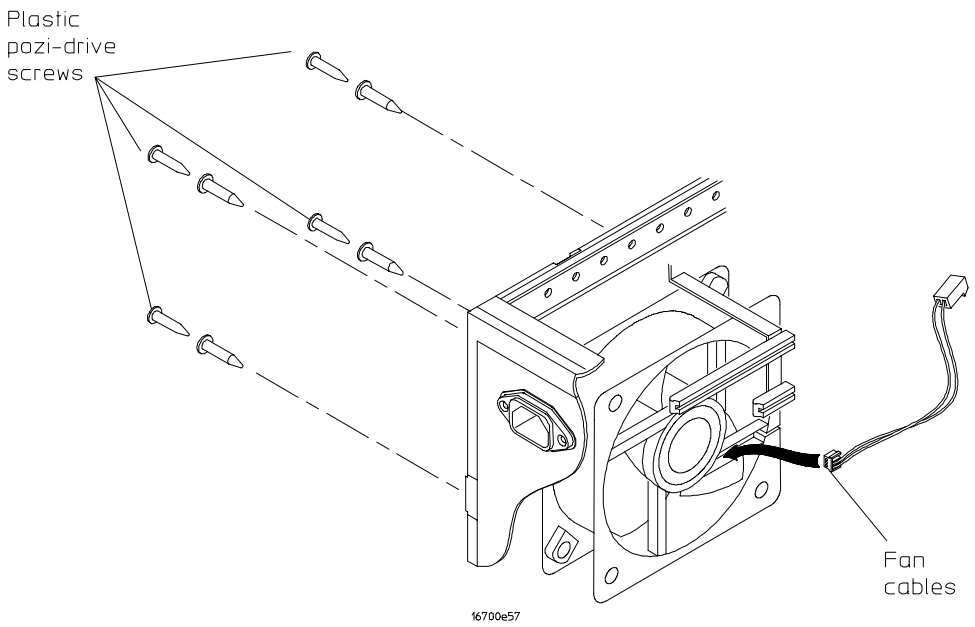
This procedure applies to mainframes that have serial number prefix US3849 and greater. If your mainframe serial number prefix is US3836 or less, see the previous procedure. Follow these steps to remove the fan from the side panel.

1 Using previous procedures, remove the following assemblies:

- Top and Bottom Covers

2 Disconnect the fan cable from the side panel fan. After the connector is disengaged from the connector pins on the fan, pull the connector out and away from the fan.

3 Using a #1 Posidrive screwdriver, remove the four screws that secure the fan to the side of the chassis. There is one screw at each corner of the fan.



4 Using a 1/8-inch, flat-blade screwdriver, push out the screw inserts enough to be able to grab them with a thumb and forefinger.

5 While holding the fan, remove the four screw inserts at each corner of the fan.

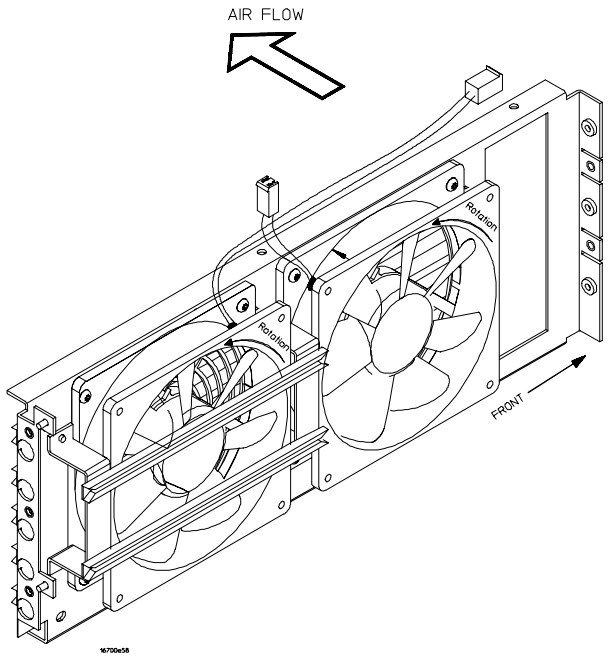
6 Reverse this procedure to install the fan. When installing the fan, ensure that:

- The cable notch on the fan assembly is pointing toward the middle of the instrument.
- The fan rotation is toward the rear of the instrument.
- Airflow is toward the inside of the instrument.

To remove a fan from the 16700A/16702A center strut (for serial prefixes US3849 and greater)

This procedure applies to mainframes that have serial number prefix US3849 and greater. If your mainframe serial number prefix is US3836 or less, see the previous procedure "To remove and replace the 16700A/16702A fans (for serial number prefixes US3836 and less)."

1. On the fan to be replaced, disconnect the fan cable from the interface board.
2. Using a Torx T10 screwdriver, remove the four screws that secure the fan to the center strut.
3. Remove the fan from the center strut.
4. Reverse this procedure to install the fan (see the following illustration). When installing the fan, ensure that:
   - The cable of the front-most fan is pointing toward the top of the instrument.
   - The cable of the rear-most fan is pointing toward the front of the instrument.
   - The fan rotation is toward the rear of the instrument.
   - Airflow is toward the card cage.



To remove and replace the front panel (16700A)

1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Lay the instrument on its side with the handle facing up (see the following illustration).

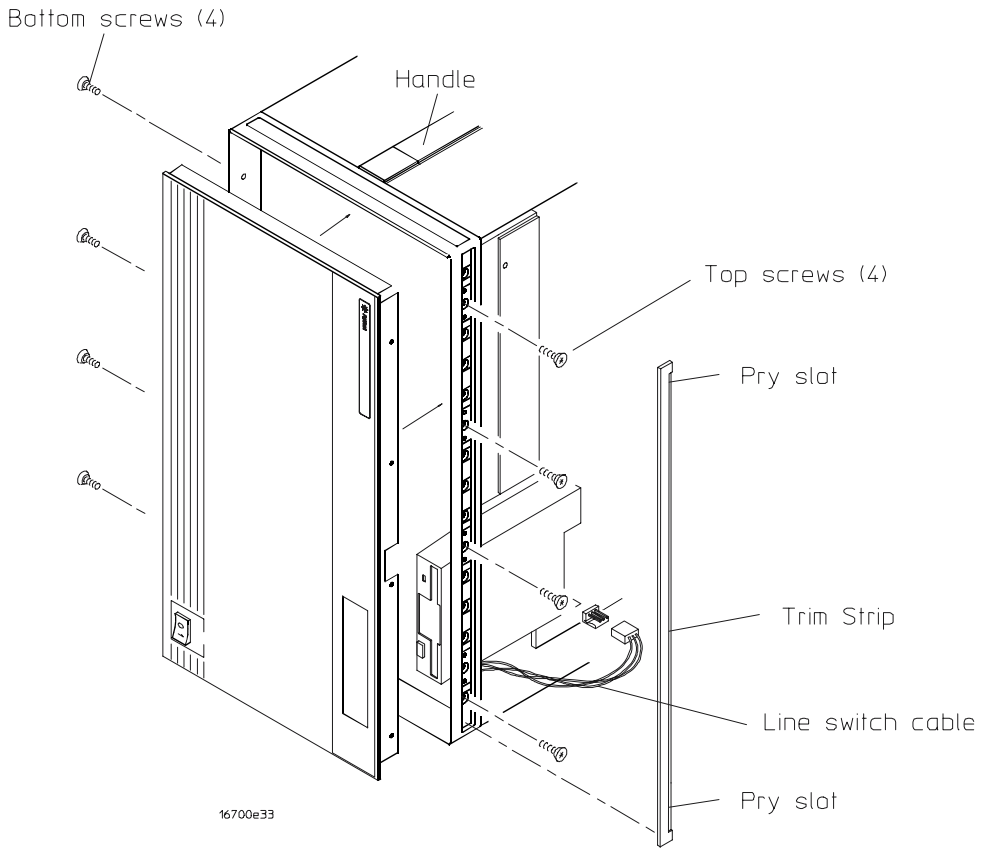
3 Disconnect the line switch cable from the interface board connector J8.

4 Remove the trim strip from the top edge of the front panel frame.

5 Using a Torx T15 screwdriver, remove the screws that secure the front panel to the instrument frame. There are four screws on the top and four screws on the bottom.

6 Remove the front panel away from the instrument.

7 Reverse this procedure to install the front panel.



To remove and replace the front panel (16702A)

1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Lay the instrument on its side with the handle facing up.

3 Disconnect the line switch cable from the interface board connector J8.

4 Disconnect the video interface cable from the CPU board connector J16.

5 Remove the trim strip from the top edge of the front panel frame.

6 Using a Torx T15 screwdriver, remove the screws that secure the front panel to the instrument frame. There are four screws on the top and four screws on the bottom.

7 Remove the front panel away from the instrument.

8 Reverse this procedure to install the front panel.

To disassemble the front panel assembly (16702A)

This procedure shows you how to disassemble the 16702A front panel assembly, including removing the LCD board, flat panel display, and intensity adjustment. To remove the keyboard, see the next procedure.

1 Disconnect the following cables from the LCD board:

- Intensity Cable
- LCD Cable
- Keyboard Interface Cable
- Video Interface Cable
- 3-wire Display Bias Cable

See the illustration following the next procedure.

2 Using a Torx T6 screwdriver, remove the two screws that secure the inverter board to the LCD board. Then remove the inverter board from the LCD board.

The inverter board is part of the LCD flat panel display. The inverter board is not part of the LCD board. The flat panel display and the inverter board are replaced as one unit.

3 Remove the LCD board (optional if only the flat panel display is being replaced).

a Using a Torx T10 screwdriver, remove the one screw that secures the LCD board to the LCD bracket.

b Slide the LCD board toward the bottom of the front panel approximately 1 cm.

c Remove the LCD board from the LC bracket.

4 Using a Torx T10 screwdriver, remove the four screws that secure the LCD bracket to the front panel.

5 Remove the intensity cable (optional if only the flat panel display is being replaced).

a Using a 3/8-inch, deep-well nutdriver, remove the spacer from the intensity cable.

b Remove the intensity cable from the LCD bracket.

When installing the spacer onto the intensity cable, ensure that the threads of the spacer are towards the LCD bracket.

6 Lift the flat panel display out of the front panel assembly.

Be careful to handle the flat panel display by the edges of the display. To re-install the flat panel display, reverse the steps in this procedure.

To remove the keyboard (16702A)

This procedure shows you how to remove the keyboard. To remove the LCD board, flat panel display, and intensity adjustment, see the preceding procedure "To disassemble the front panel assembly (16702A)."

1 Disconnect the following cables from the keyboard circuit board:

- Keyboard Interface Cable

2 Using a Torx T10 screwdriver, remove the six screws that secure the keyboard to the front panel assembly.

3 Remove the keyboard subassemblies from the front panel assembly (see the following illustration):

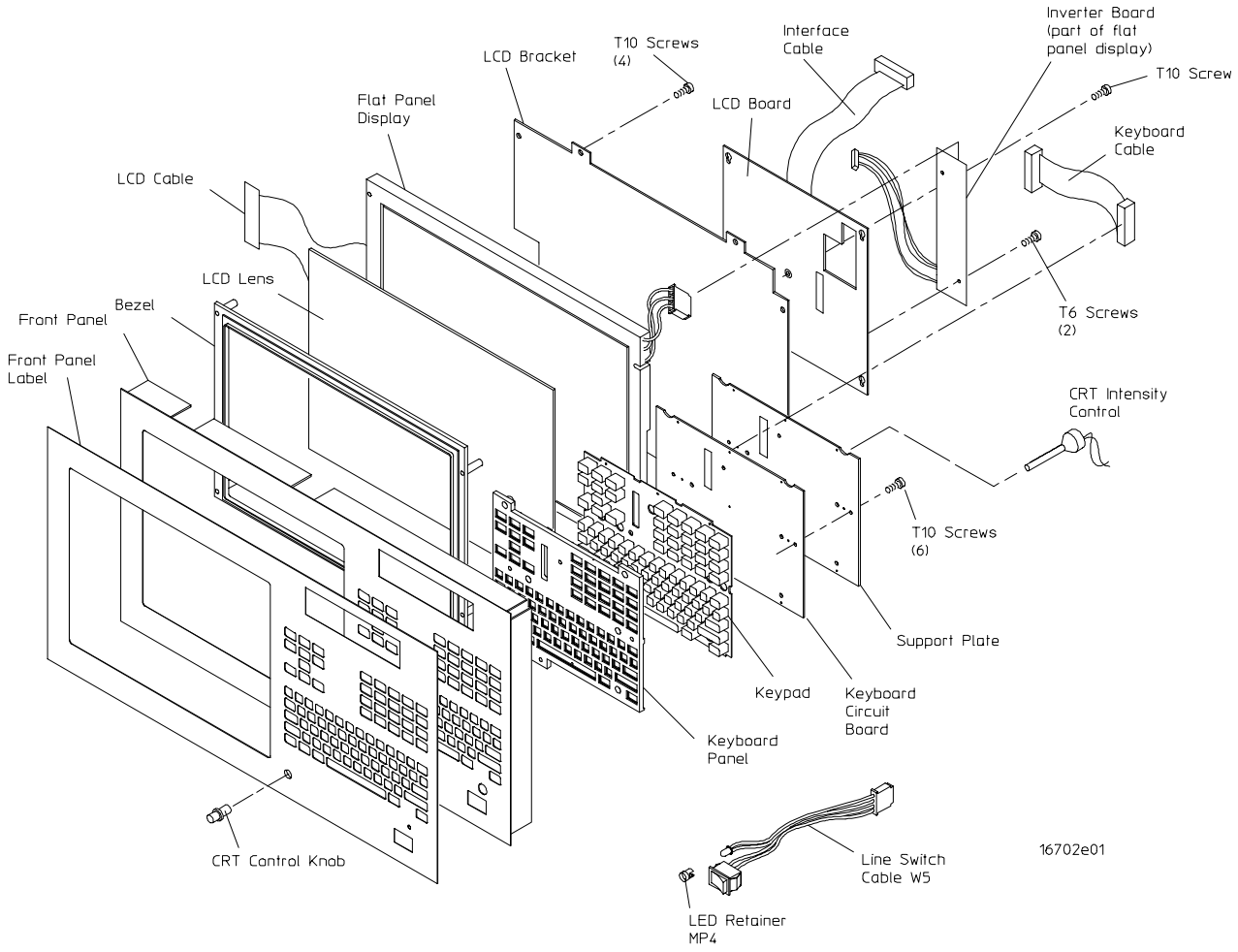
- Support Plate (clear plastic)
- Keyboard Circuit Board
- Keypad

CAUTION **Do not touch the gold contacts on the keyboard circuit board, because they can become contaminated, which can result in poor operation.**

CAUTION **Be careful of the LED on the keyboard circuit board that is on the side opposite the connector. It is fragile and can be easily broken.**

CAUTION **Do not touch the back of the keypad.**

To re-install the keyboard, reverse the steps in this procedure. Pins on the keyboard panel will guide the orientation of the keyboard circuit board and the support plate.



To remove and replace the 16700A/16702A power supply

WARNING **Hazardous voltages exist on the power supply. To avoid electrical shock, disconnect the power from the instrument before performing the following procedures. After disconnecting the power, wait at least six minutes for the capacitors on the power supply board to discharge before servicing the instrument.**

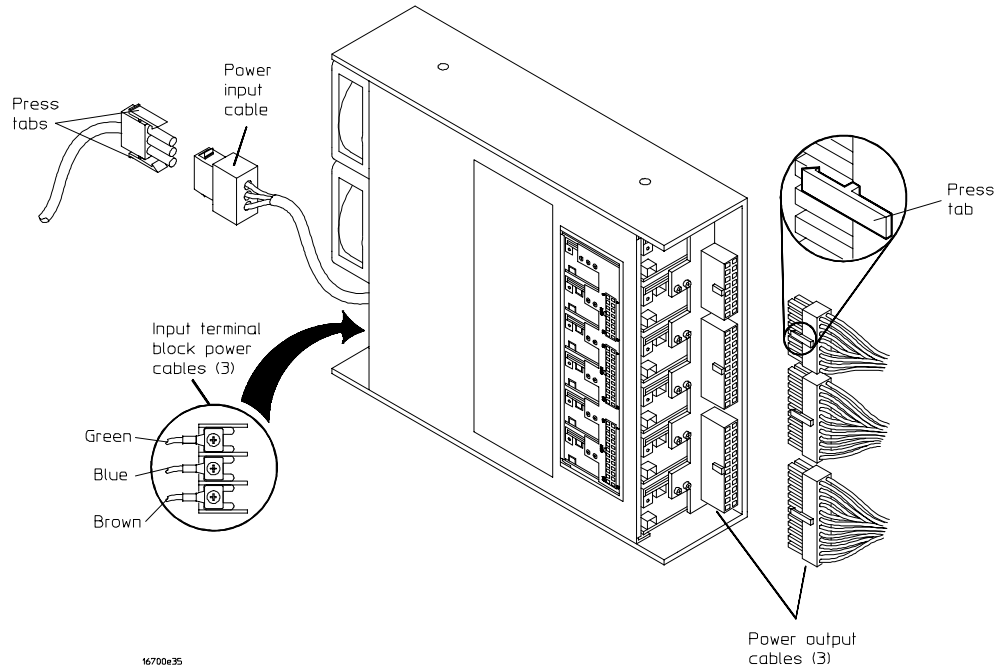
1 Using previous procedures, remove the following assemblies:

- Top and Bottom Covers
- Front Panel

2 Ensure that the instrument is on its side with the handle side facing up.

3 Disconnect the power output cables (large gauge black, blue, and white) from the output connectors on the power supply (see the following illustration).

The power cables have a lock at the top of each connector. Press the tab at the rear of the connector to release the lock while disconnecting each cable.

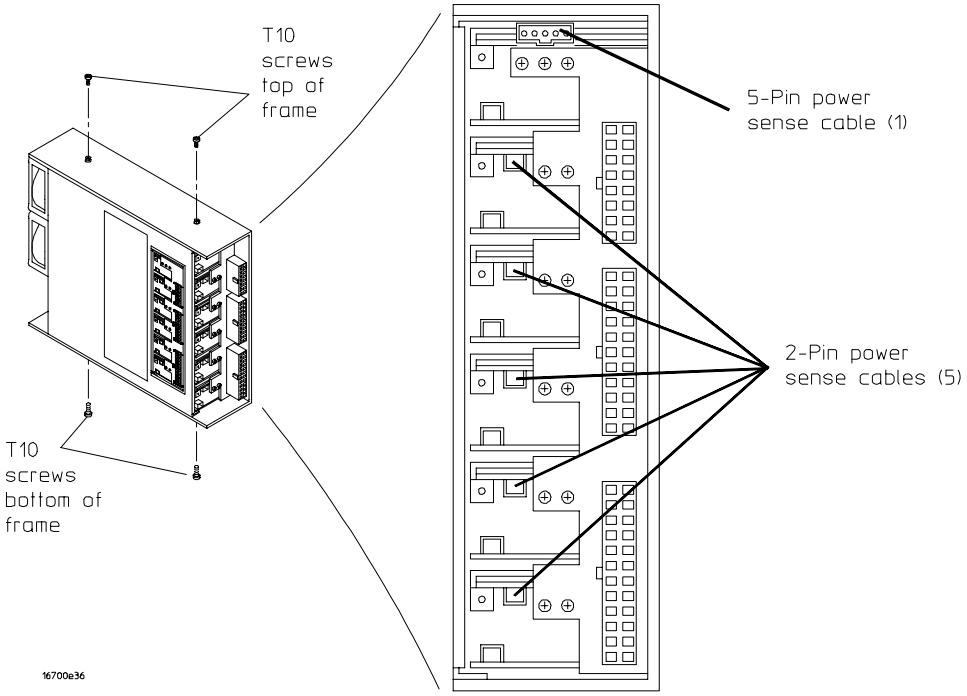


4 Using a #1 Posidrive screwdriver, remove the power input cable from the power supply input terminal block.

5 While holding the power supply, use a Torx T15 screwdriver to remove the two screws that secure the power supply to the top of the frame, and the two screws that secure the power supply to the bottom of the frame (see the following illustration).

6 Remove the power supply out of the front of the instrument.

7 Mark the five 2-pin power sense cables so that you can re-connect them to the same connectors when installing the power supply. Remove all six power sense cables from the power supply.



8 Reverse this procedure to install the power supply. Use the preceding illustration to install the power sense cables.

If the five 2-pin power sense cables are not connected to the proper connectors, the instrument will not power up.

To remove and replace the 16700A/16702A line switch assembly

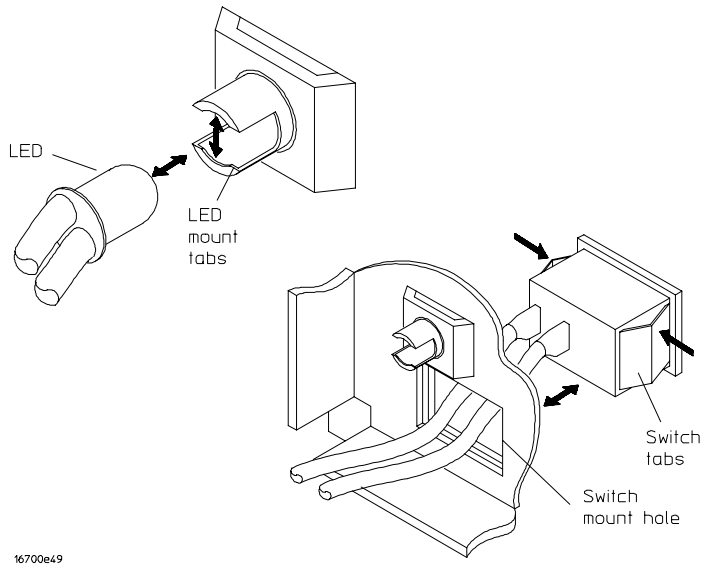
The line switch and power indicator LED are removed and replaced as a single assembly.

1 Using previous procedures, remove the following assemblies:

- Top Cover
- Front Panel

2 Gently spread apart the tabs that hold the LED to the LED mount, then pull the power indicator LED toward the rear of the instrument (see the following illustration).

Be careful not to push the LED mount through the front panel hole. If this happens, you must peel back the front panel label to access the LED mount, then re-insert the mount into its hole.



3 Using a 1/8-inch, flat-blade screwdriver, push against the line switch mount tabs while pushing the line switch out the front of the instrument.

4 Feed the cable through the line switch mounting hole.

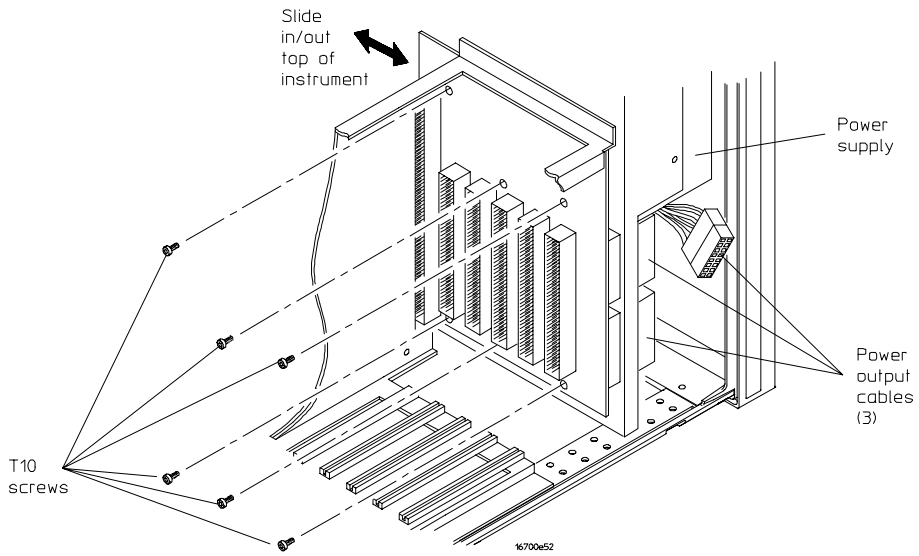
5 Reverse this procedure to install the line switch assembly.

When installing the line switch assembly, the line switch is inserted in the front panel with the "1" to the right (that is, outboard).

To remove and replace the 16700A/16702A module interface board

1. Using previous procedures, remove the following assemblies:
   - Top and Bottom Covers
   - Front Panel
   - Floppy Disk Drive
   - PCI Board
   - CPU Board
   - Interface Board
2. Ensure that the instrument is on its side with the handle facing up.
3. Disconnect the power output cables from the connectors on the module interface board (see the following illustration).

   The power cables have a lock at the top of each connector. Press the tab at the rear of the connector to release the lock while disconnecting each cable.
4. Using a Torx T10 screwdriver, remove the six screws that secure the module interface board to the frame.



5. Remove the module interface board out the top of the instrument.
6. Reverse this procedure to install the module interface board.

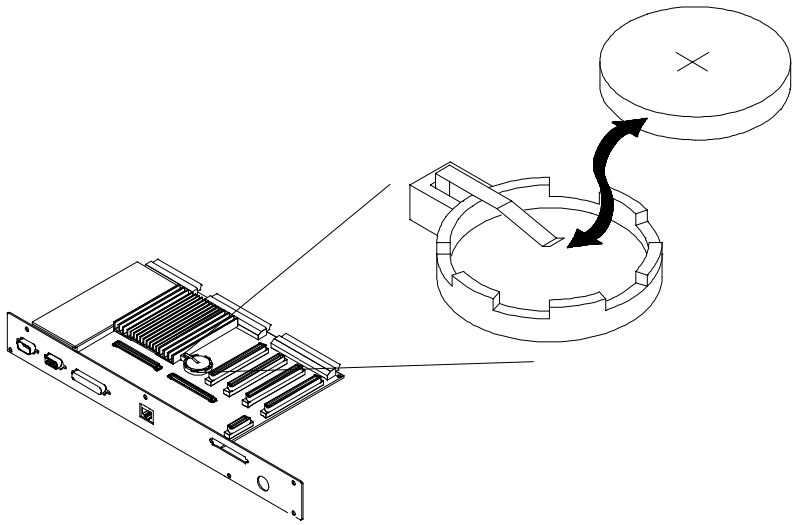
   The power output cables can be accidentally installed backwards. The power output cables are properly installed when the free end of each of the cables is pointed toward the power supply power output connectors.

To remove and replace the 16700A/16702A CPU battery

1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Using a 1/8-inch, flat-blade screwdriver, gently pry the battery from the battery receptacle (see the following illustration).



3 Insert a new battery (Panasonic BR2325 or equivalent) into the battery receptacle.

4 Re-install the top cover.

Catastrophic Failure Recovery

The procedures in this section are only required the first time the instrument is turned on after a failure and replacement of these assemblies:

- CPU Board
- Hard Disk Drive

To recover from a CPU board failure

1. After re-assembling the instrument, connect the monitor, keyboard (for 16700A only), and mouse to their rear panel ports.
2. Connect the power cord to the instrument, then apply power.
3. The monitor selection mode will be automatically enabled. Wait until the monitor is readable and the resolution displayed matches the actual resolution of the monitor. Press [ENTER], then answer "Y" at the query.
4. When the boot process auto-terminates, type in the following commands at the Main Menu: Enter Command > prompt exactly as they appear (CAPS indicate command abbreviations):

```
MAin                            [ ENTER ]
COnfiguration AUto BOot ON      [ ENTER ]
COnfiguration AUto SEArch OFF   [ ENTER ]
COnfiguration BootTimer 0       [ ENTER ]
COnfiguration FastBoot OFF      [ ENTER ]
COnfiguration SECure OFF        [ ENTER ]
```

5. If the CPU board has been replaced in an 16702A, enter the following command exactly as it appears (CAPS indicate command abbreviations):

```
COnfiguration MOnitor GRAPHICS(0) 21  [ ENTER ]
```

   The front panel display should light up and the attached monitor should now be unreadable. Disconnect the attached monitor from the 16702A.

6. At the Main Menu: Enter Command > prompt, type the Boot command:

```
BOOT    [ ENTER ]
```

   When the Boot command is entered, the instrument will complete the boot process.

To recover from a hard disk drive failure

1. After replacing the hard disk drive, re-assemble the instrument.
2. Go to “Reignite: Re-installing the operating system” in chapter 5 to re-install the operating system.

16701A Expansion Frame Assembly/Disassembly

The procedures in the following sections cover assembly and disassembly of the 16701A logic analysis system expansion frame. For 16700A/16702A procedures, refer to "16700A/16702A Mainframe Assembly/Disassembly" earlier in this chapter.

To remove and replace optional modules or filler panels

The procedures for removing and replacing optional modules or filler panels is the same for each of the 16700A/16701A/16702A instruments.

1 Remove power from the instrument.

   a Exit all logic analysis sessions. In the session manager, select **Shutdown**.

   b At the query, select **Powerdown**.

   c When the "OK to power down" message appears, turn the instrument off.

2 To reconfigure your system later in this procedure, note the configuration of your system now.

   Some modules for the logic analysis system require an operational accuracy calibration if you move them to a different slot.

3 Starting from the top, loosen the thumb screws on filler panels and cards in the mainframe or the expansion frame. Starting from the top, pull the cards and filler panels out.

   All multi-card modules will be cabled together. To prevent damage to the cables and connectors, pull all multi-card modules out together.

4 To replace the modules, reposition all cards and filler panels so that the endplates overlap properly.

5 Firmly seat the bottom card into the backplane connector of the mainframe. Keep applying pressure to the center of the card endplate while tightening the thumb screws finger tight. Repeat for all cards and filler panels in a bottom-to-top order.

   For correct air circulation, filler panels *must* be installed in all unused card slots. Correct air circulation keeps the instrument from overheating. Keep any extra filler panels for future use.

See Also Service Guides for each individual module.

To remove and replace the 16701A top and bottom covers (for serial number prefixes US3849 and less)

This procedure applies to expander frames that have serial number prefix US3849 and less. If your expander frame serial number prefix is US3907 or greater, see the next procedure.

1 Remove power from the instrument.

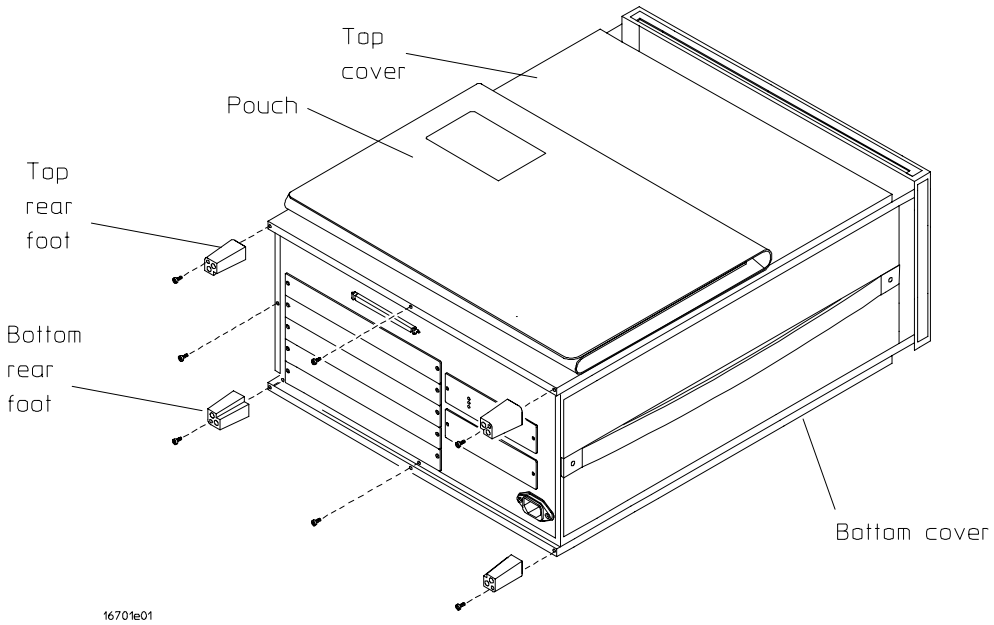
- **a** Exit all logic analysis sessions. In the session manager, select **Shutdown**.
- **b** At the query, select **Powerdown**.
- **c** When the "OK to power down" message appears, turn the instrument off.

2 Disconnect the power cable and all data and peripheral cables from the rear panel.

3 Move the instrument to a static-safe work area before beginning any disassembly.

If only the bottom cover is being removed, go directly to step 7.

4 Using a Torx T10 screwdriver, remove the screws that secure each of the top rear feet to the rear panel.



5 Using a Torx T15 screwdriver, remove the one screw at the center rear of the cover that secures the top cover to the frame.

6 Slide the top cover toward the rear of the instrument and away.

Complete steps 7 through 10 only if it is necessary to remove the bottom cover.

7 Lay the instrument on its side so the handle is up.

8 Use a Torx T10 screwdriver to remove the screws that secure each of the bottom rear feet to the rear panel.

9 Using a Torx T15 screwdriver, remove the one screw at the center rear of the cover that secures the bottom cover to the frame.

10 Slide the bottom cover toward the rear of the instrument and away.

11 Reverse this procedure to install the bottom and top covers.

Check that all assemblies are properly installed before installing the cover.

To remove and replace the 16701A top and bottom covers (for serial prefixes US3907 and greater)

This procedure applies to expander frames that have serial number prefix US3907 and greater. If your expander frame serial number prefix is US3849 or less, see the preceding procedure.

1 Remove power from the instrument.

- **a** Exit all logic analysis sessions. In the session manager, select **Shutdown**.
- **b** At the query, select **Powerdown**.
- **c** When the "OK to power down" message appears, turn the instrument off.

2 Disconnect the power cable and all data and peripheral cables from the rear panel.

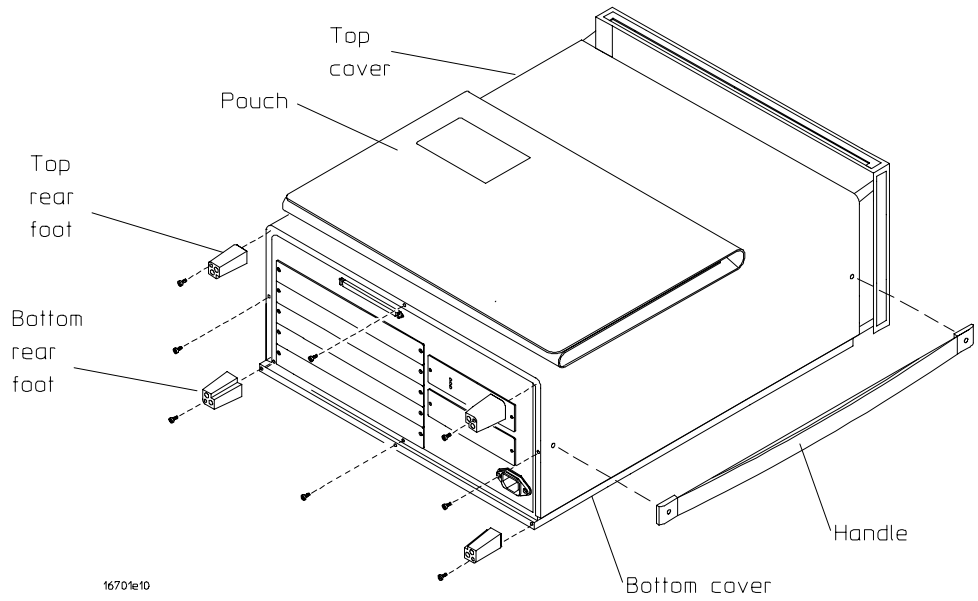
3 Move the instrument to a static-safe work area before beginning any disassembly. If only the bottom cover is being removed, then go directly to step 8.

4 Using a Torx T10 screwdriver, remove the screws that secure each of the rear feet to the rear panel.

5 Using a Torx T20 screwdriver, remove the two screws that secure the handle assembly to the side of the instrument.

6 Using a Torx T15 screwdriver, remove the three screws that secure the top cover to the frame. There is one screw at the center rear and one on each side of the cover.

7 Slide the top cover toward the rear of the instrument and away.



Complete steps 8 through 11 only if it necessary to remove the bottom cover.

8 Lay the instrument on its side so the handle side is up.

9 Using a Torx T15 screwdriver, remove the screw at the center rear of the cover that secures the bottom cover to the frame.

10 Slide the bottom cover toward the rear of the instrument and away.

11 Reverse this procedure to install the bottom and top covers.

Check that all assemblies are properly installed before installing the cover.

To remove and replace the 16701A interface board

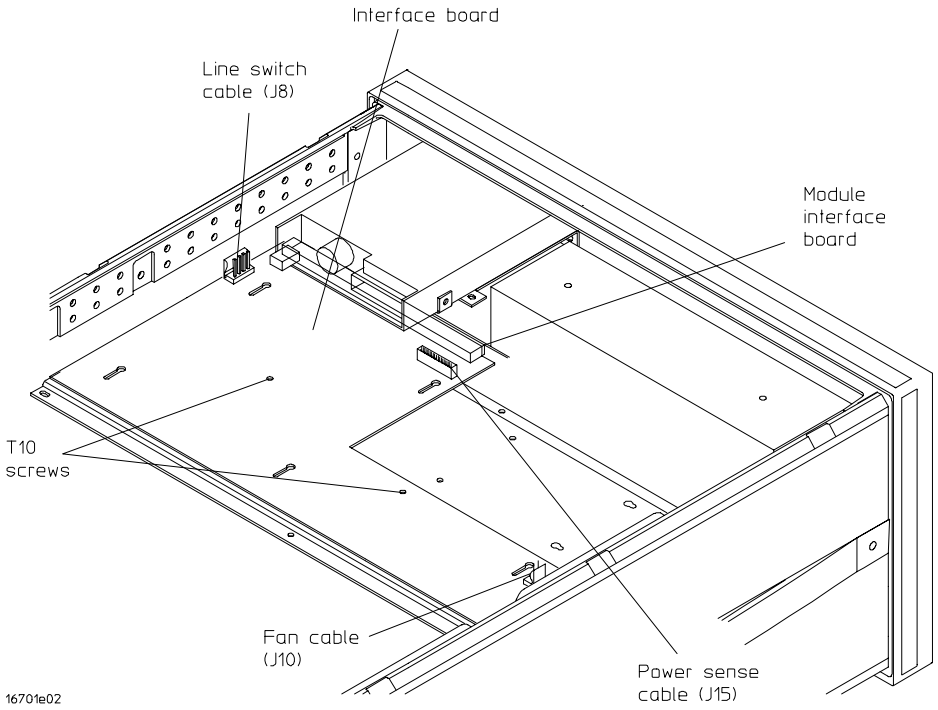
1 Using previous procedures, remove the following assemblies:

- Top Cover

2 Disconnect the following cables:

- Interface Cable (J4)
- Line LED Cable (J5)
- Fan Cable (J1)
- Fan Cables (J21, J22 on serial number prefix US3849 and greater)
- Power Sense Cable (J7)

3 Using a Torx T10 screwdriver, remove the two screws that secure the interface board to the frame.



4 Using a 3/16-inch nutdriver, remove the two hex standoffs from the side of the interface board closest to the fans.

5 Slide the interface board toward the rear of the instrument approximately 1.5 cm. While sliding the interface board, it will disengage from the module interface board.

6 If needed, disconnect the emulation module board(s) from the interface board connectors J2 and J3.

a Lift the interface board up enough to gain access to the underside of the board.

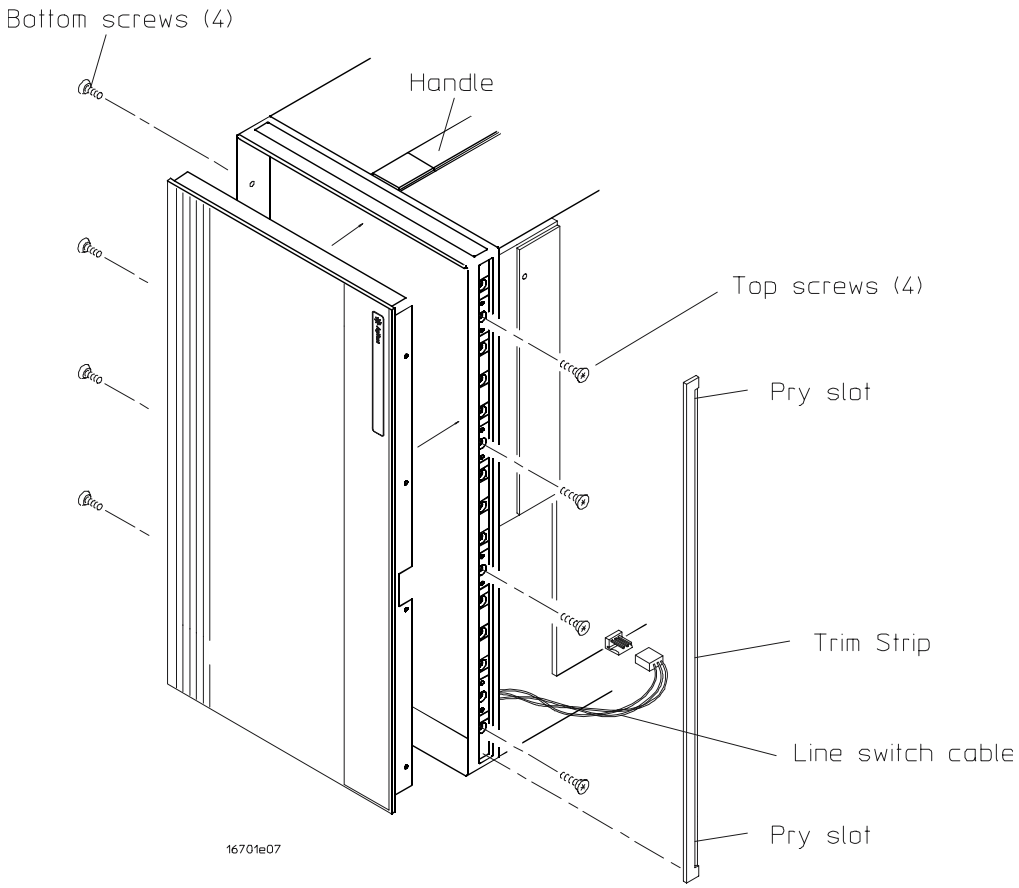
b Reach underneath the interface board and disconnect the emulation module interface cables from the interface board.

The emulation module interface cables have tabs on the ends of each connector. Squeeze the connector tabs with thumb and forefinger while disconnecting each cable.

7 Reverse this procedure to install the interface board.

To remove and replace the 16701A front panel

1. Using previous procedures, remove the following assemblies:
   - Top Cover
2. Lay the instrument on its side with the handle facing up.
3. Disconnect the line LED cable from the interface board connector J8 (see the preceding illustration).
4. Remove the trim strip from the top edge of the front panel frame (see the following illustration).
5. Using a Torx T15 screwdriver, remove the screws that secure the front panel to the instrument frame. There are four screws on the top and four screws on the bottom.



6. Remove the front panel away from the instrument.
7. Reverse this procedure to install the front panel.

To remove and replace the 16701A power supply

WARNING **Hazardous voltages exist on the power supply. To avoid electrical shock, disconnect the power from the instrument before performing the following procedures. After disconnecting the power, wait at least six minutes for the capacitors on the power supply board to discharge before servicing the instrument.**

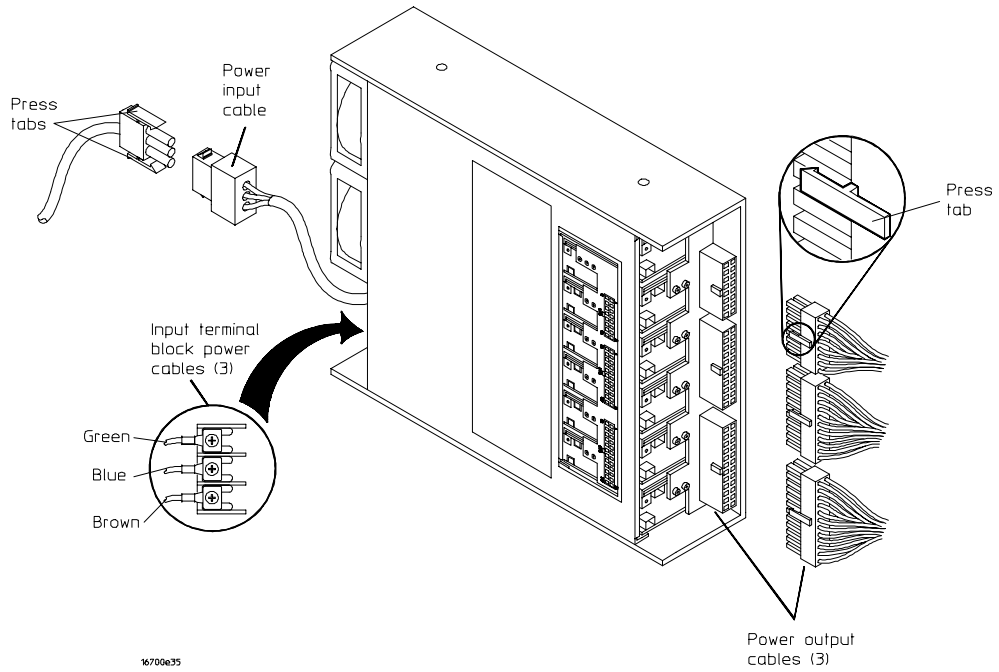
1 Using previous procedures, remove the following assemblies:

- Top and Bottom Covers
- Front Panel

2 Ensure that the instrument is on its side with the handle side facing up.

3 Disconnect the power output cables (large gauge black, blue, and white) from the output connectors on the power supply (see the following illustration).

The power cables have a lock at the top of each connector. Press the tab at the rear of the connector to release the lock while disconnecting each cable.

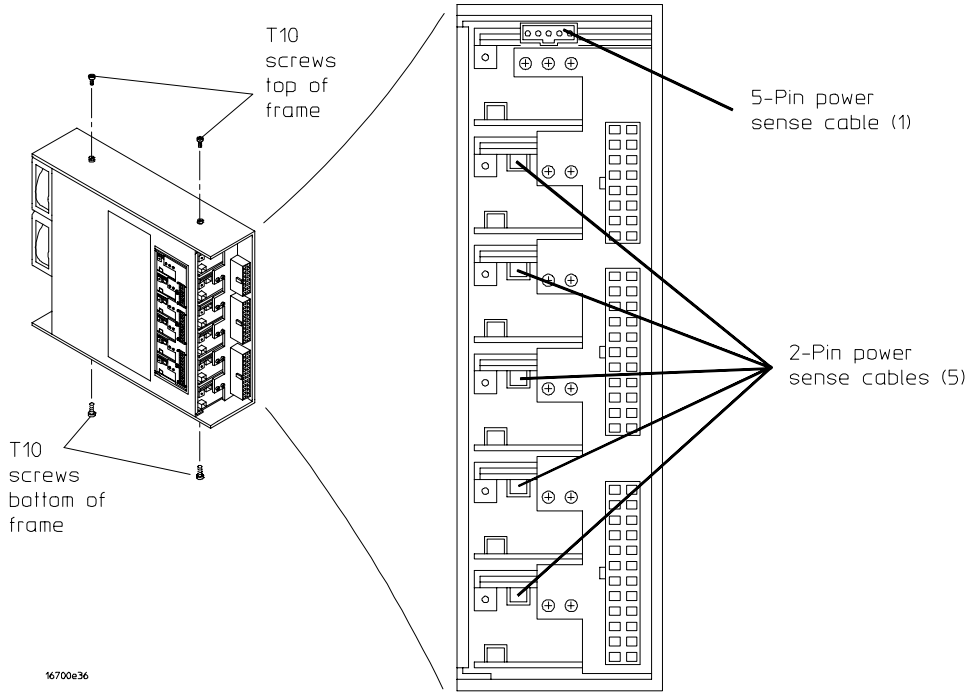


4 Using a #1 Posidrive screwdriver, remove the power input cable from the power supply input terminal block.

5 While holding the power supply, use a Torx T15 screwdriver to remove the two screws that secure the power supply to the top of the frame and the two screws that secure the power supply to the bottom of the frame.

6 Remove the power supply out of the front of the instrument.

7 Mark the five 2-pin power sense cables so that you can re-connect them to the same connectors when installing the power supply. Remove all six power sense cables from the power supply.



8 Reverse this procedure to install the power supply. Use the preceding illustration to install the power sense cables.

If the five 2-pin power sense cables are not connected to the proper connectors, the instrument will not power up.

To remove and replace the 16701A fans (for serial number prefixes US3830 and less)

This procedure applies to expander frames that have serial number prefix US3830 and less. If your expander frame serial number prefix is US3849 or greater, see the next procedure.

1 Using previous procedures, remove the following assemblies:

- Top and Bottom Covers

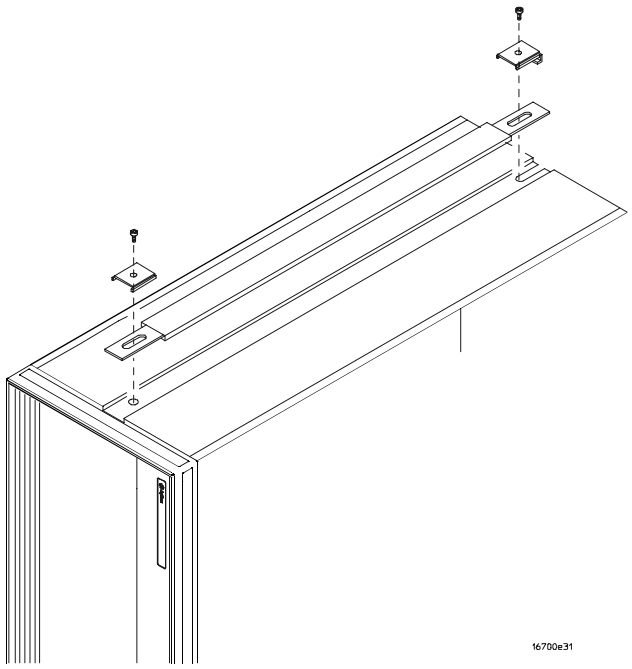
2 Before you can remove the fans, you must first remove the side panel from the frame.

a Lay the instrument on its side so the handle is facing up.

b Using a Torx T25 screwdriver, remove the two screws that secure each of the two handle endcaps, one per endcap.

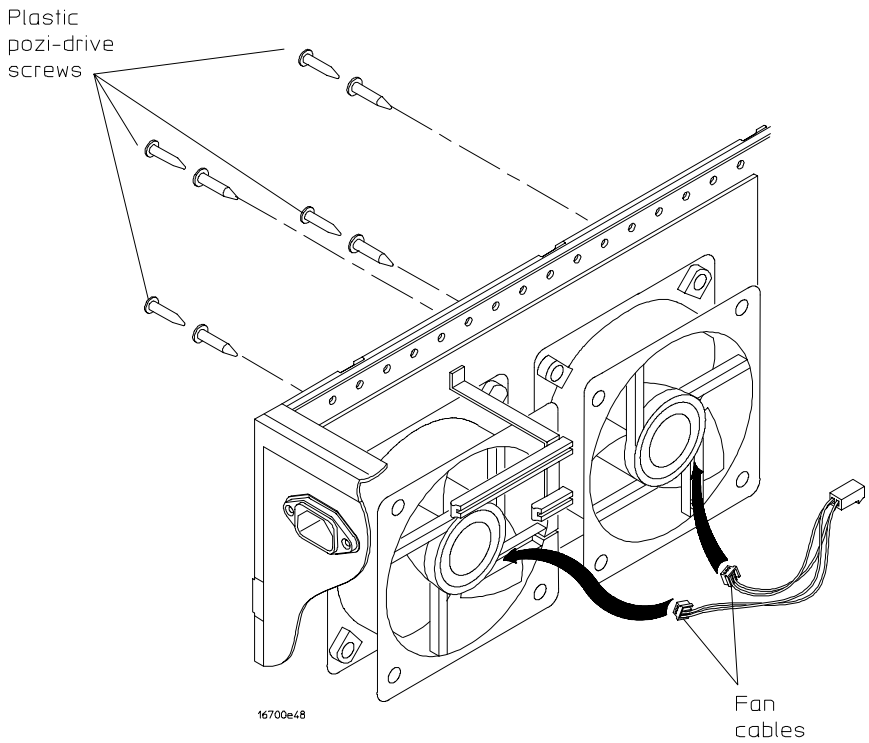
c Remove the endcaps and the handle.

d Slide the side panel toward the rear of the instrument approximately 1.0 cm and remove the side panel.



3 Disconnect the fan cable from the fan to be replaced. After the connector disengages from the connector pins on the fan, pull the connector out and away from the fan.

4 Using a #1 Posidrive screwdriver, remove the four screws that secure the fan to the side of the chassis. There is one screw at each corner of the fan (see the following illustration).



5 Using a 1/8-inch, flat-blade screwdriver, push out the screw inserts enough to be able to grab them with a thumb and forefinger.

6 While holding the fan, remove the four screw inserts, one at each corner of the fan.

7 Reverse this procedure to install the fan.

When installing the fan, ensure that:

- The cable notch on the fan assembly is pointing toward the middle of the instrument.
- The fan rotation is toward the rear of the instrument.
- Airflow is toward the inside of the instrument.

To remove and replace the 16701A side panel fan (for serial number prefixes US3849 and greater)

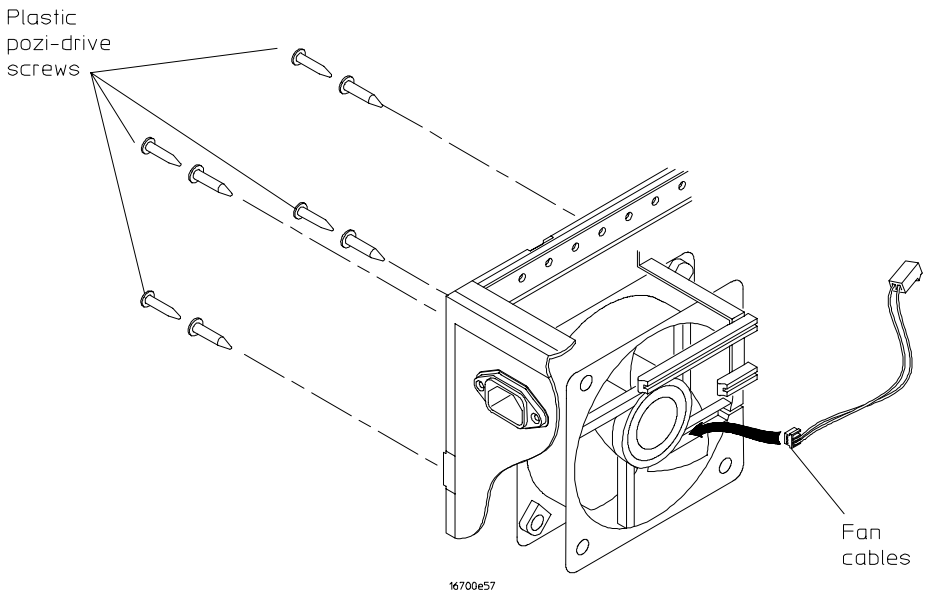
This procedure applies to expander frames that have serial number prefix US3849 and greater. If your expander frame serial number prefix is US3830 or less, see the previous procedure. Follow these steps to remove the fan from the side panel.

1 Using previous procedures, remove the following assemblies:

- Top and Bottom Covers

2 Disconnect the fan cable from the side panel fan. After the connector is disengaged from the connector pins on the fan, pull the connector out and away from the fan.

3 Using a #1 Posidrive screwdriver, remove the four screws that secure the fan to the side of the chassis. There is one screw at each corner of the fan.



4 Using a 1/8-inch, flat-blade screwdriver, push out the screw inserts enough to be able to grab them with a thumb and forefinger.

5 While holding the fan, remove the four screw inserts at each corner of the fan.

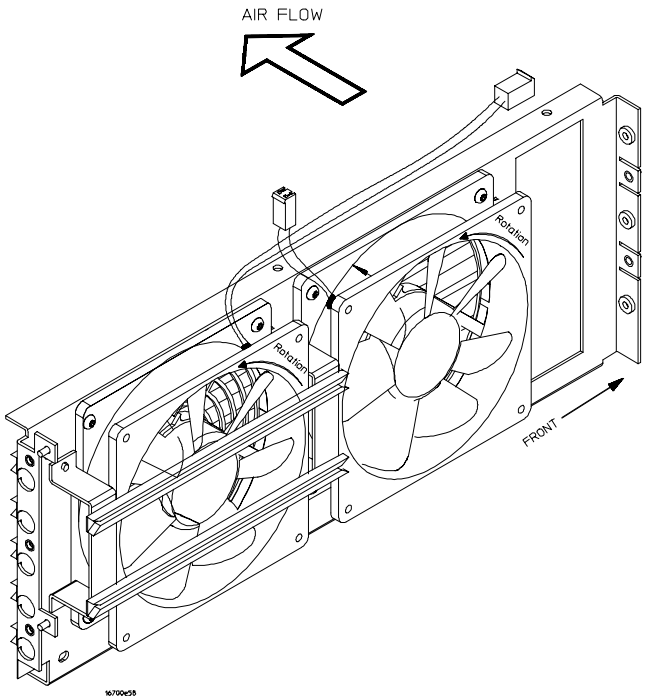
6 Reverse this procedure to install the fan. When installing the fan, ensure that:

- The cable notch on the fan assembly is pointing toward the middle of the instrument.
- The fan rotation is toward the rear of the instrument.
- Airflow is toward the inside of the instrument.

To remove a fan from the 16701A center strut (for serial prefixes US3849 and greater)

This procedure applies to expander frames that have serial number prefix US3849 and greater. If your expander frame serial number prefix is US3830 or less, see the previous procedure "To remove and replace the 16701A fans (for serial number prefixes US3830 and less)."

1. On the fan to be replaced, disconnect the fan cable from the interface board.
2. Using a Torx T10 screwdriver, remove the four screws that secure the fan to the center strut. There is one screw at each corner of the fan.
3. Remove the fan from the center strut.
4. Reverse this procedure to install the fan. When installing the fan, ensure that:
   - The cable of the front-most fan is pointing toward the top of the instrument.
   - The cable of the rear-most fan is pointing toward the front of the instrument.
   - The fan rotation is toward the rear of the instrument.
   - Airflow is toward the card cage.

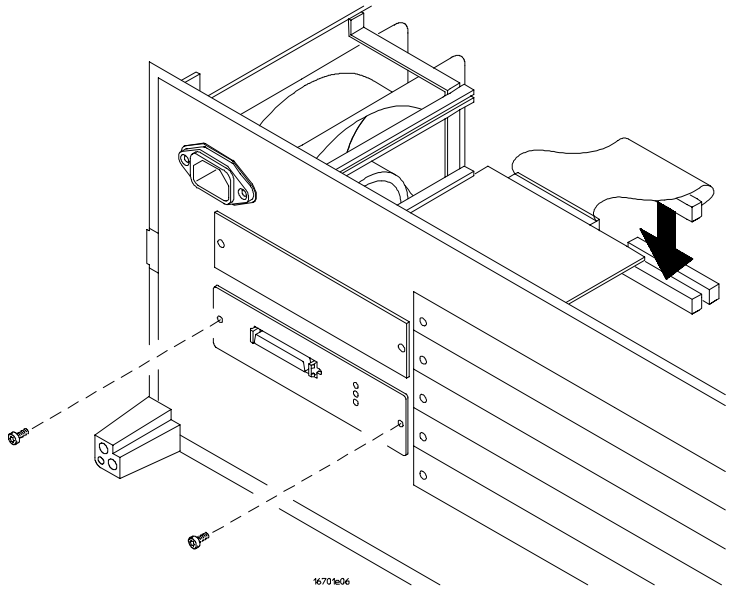


To remove and replace the optional emulation module in the 16701A

1 Using previous procedures, remove the following assemblies:

- Bottom Cover

2 Using a Torx T10 screwdriver, remove the two screws that secure the emulation module board to the instrument rear panel (see the following illustration).



3 Disconnect the emulation module cables from the emulation module.

The emulation module cables have tabs on the ends of each connector. Squeeze the connector tabs with thumb and forefinger while disconnecting each cable.

4 Slide the emulation module out the rear of the instrument.

5 Reverse this procedure to install the emulation module.

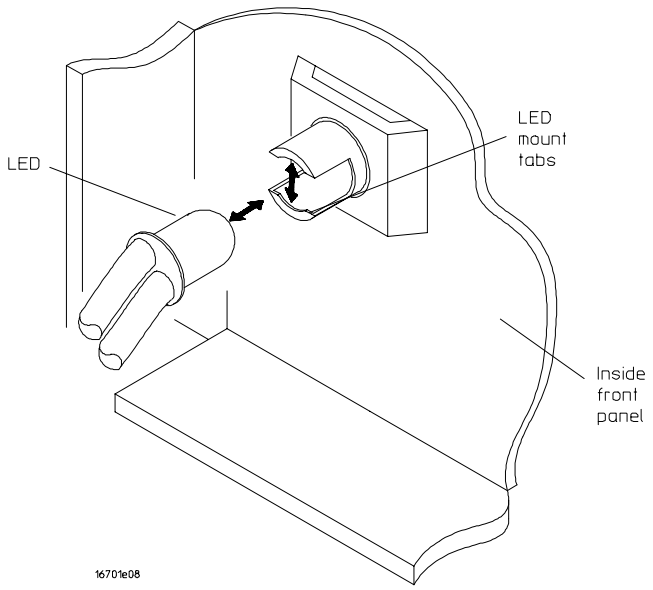
To remove and replace the line 16701A LED assembly

1 Using previous procedures, remove the following assemblies:

- Top Cover
- Front Panel

2 Using a 1/8-inch, flat-blade screwdriver, gently spread apart the tabs that hold the LED to the LED mount, then pull the power indicator LED toward the rear of the instrument (see the following illustration).

Be careful not to push the LED mount through the front panel hole. If this happens, you must peel back the front panel label to access the LED mount, then re-insert the mount into its hole.



3 To install the LED, position the LED onto the mount and gently apply force until LED snaps into the mount. A little gentle wiggling of the LED will help the process along, too.

To remove and replace the 16701A module interface board

1 Using previous procedures, remove the following assemblies:

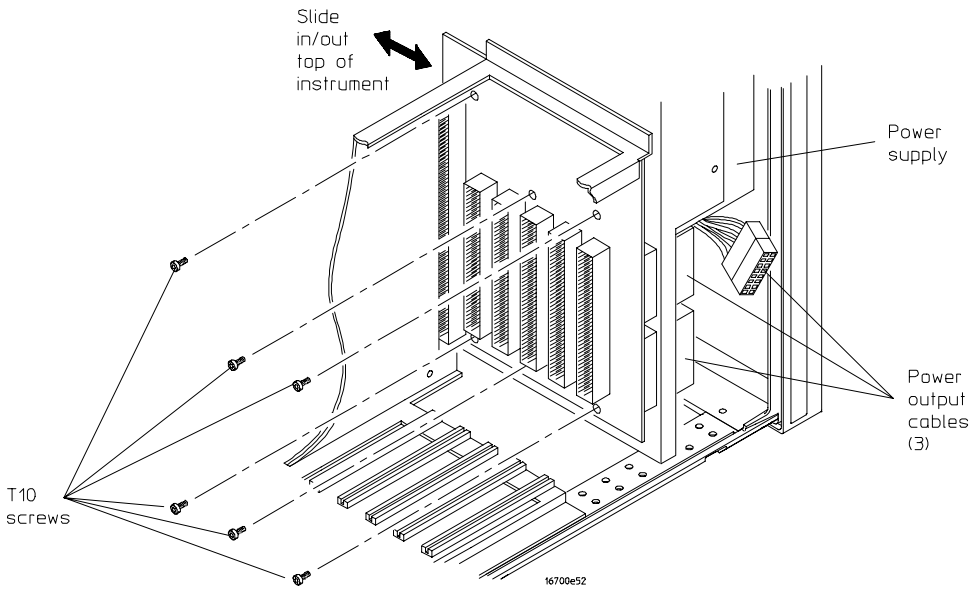
- Top and Bottom Covers
- Front Panel
- Interface Board

2 Ensure that the instrument is on its side with the handle facing up.

3 Disconnect the power output cables from the connectors on the module interface board.

The power cables have a lock at the top of each connector. Press the tab at the rear of the connector to release the lock while disconnecting each cable.

4 Using a Torx T10 screwdriver, remove the six screws that secure the module interface board to the frame.



5 Remove the module interface board out the top of the instrument.

6 Reverse this procedure to install the module interface board.

Ensure that the power output cables are not installed backwards. The power output cables are properly installed when the free end of each of the cables is pointed toward the power supply power output connectors.

Returning Assemblies

Before shipping the logic analysis system or assemblies to Agilent Technologies, contact your nearest Agilent Technologies Sales Office for additional details.

1 Write the following information on a tag and attach it to the part to be returned.

- Name and address of owner
- Model number
- Serial number
- Description of service required or failure indications

2 Remove accessories from the logic analysis system.

Only return accessories to Agilent Technologies if they are associated with the failure symptoms.

3 Package the logic analysis system or assemblies.

You can use either the original shipping containers, or order materials from an Sales Office.

CAUTION **For protection against electrostatic discharge, package the logic analysis system in electrostatic material.**

4 Seal the shipping container securely, and mark it FRAGILE.

7

Replaceable Parts 7-2
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Replaceable Parts List Description 7-3
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16701A exploded view and replaceable parts 7-11

Replaceable Parts

Replaceable Parts

This chapter contains information for identifying and ordering replaceable parts for your logic analysis system.

Replaceable parts ordering

Parts listed

To order a part on the list of replaceable parts, quote the Agilent Technologies part number, indicate the quantity desired, and address the order to the nearest Agilent Technologies Sales Office.

Parts not listed

To order a part that is not on the list of replaceable parts, include the model number and serial number of the module, a description of the part (including its function), and the number of parts required. Address the order to your nearest Agilent Technologies Sales Office.

Direct mail order system

Within the USA, Agilent Technologies can supply parts through a direct mail order system. The advantages to the system are direct ordering and shipment from the Agilent Technologies Part Center. There is no maximum or minimum on any mail order. (There is a minimum amount for parts ordered through a local Agilent Technologies Sales Office when the orders require billing and invoicing.) Transportation costs are prepaid (there is a small handling charge for each order) and there are no invoices.

In order for Agilent Technologies to provide these advantages, a check or money order must accompany each order. Mail order forms and specific ordering information are available through your local Agilent Technologies Sales Office. Addresses and telephone numbers are located in a separate document at the back of the Service Guide.

Exchange Assemblies

Some assemblies are part of an exchange program with Agilent Technologies. The exchange program allows you to exchange a faulty assembly with one that has been repaired and performance verified by Agilent Technologies.

After you receive the exchange assembly, return the defective assembly to Agilent Technologies. A United States customer has 30 days to return the defective assembly. If you do not return the defective assembly within the 30 days, Agilent Technologies will charge you an additional amount. This amount is the difference in price between a new assembly and that of the exchange assembly. For orders not originating in the United States, contact your nearest Agilent Technologies Sales Office for information.

See Also "Returning Assemblies" in chapter 6.

Replaceable Parts List Description

The replaceable parts lists in this chapter are organized by reference designation. The exploded views do not show all of the parts in the replaceable parts lists.

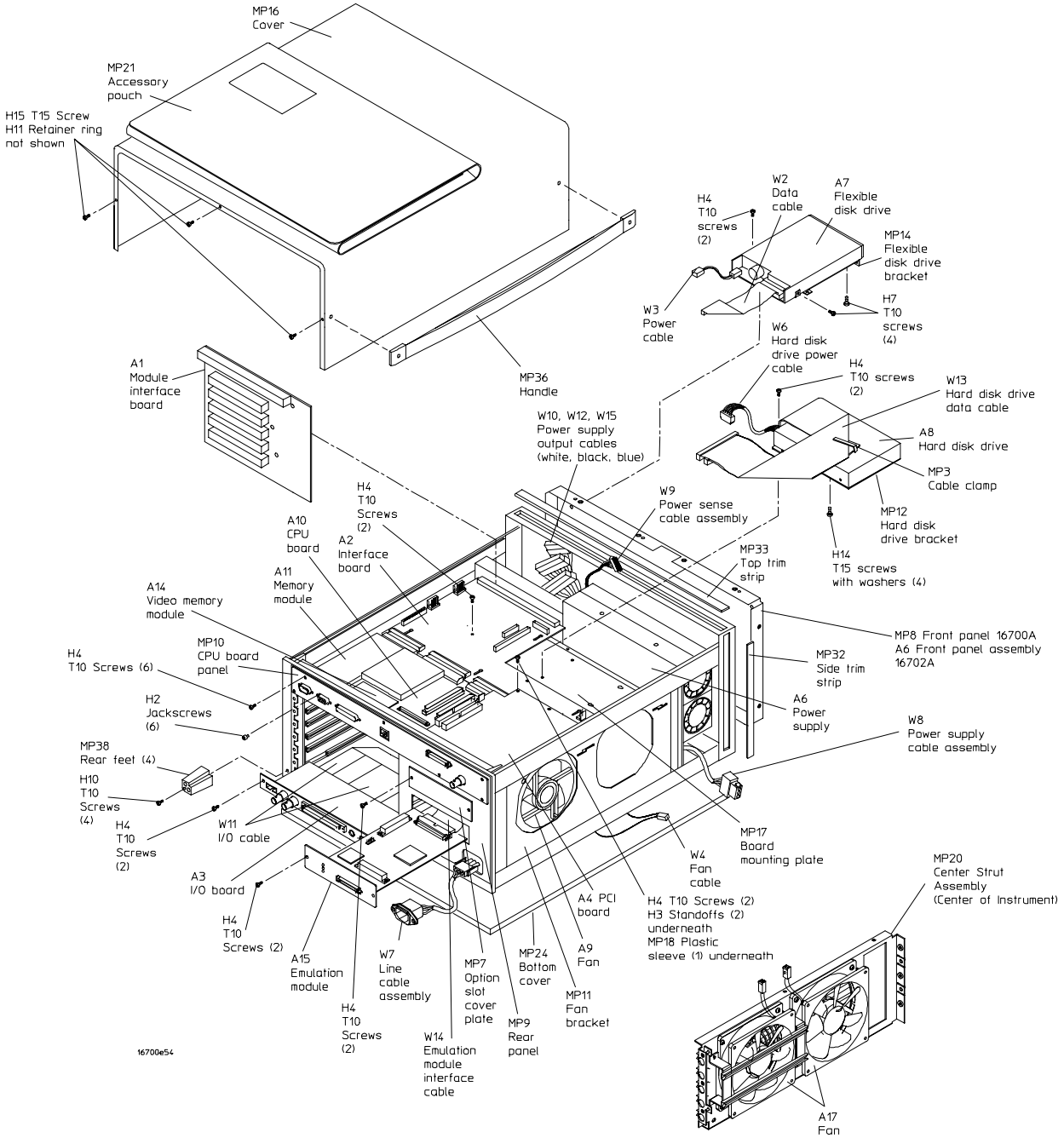
Information included for each part in the list consists of the following:

- Reference designator
- Agilent Technologies part number
- Total quantity included with the instrument (Qty)
- Description of the part

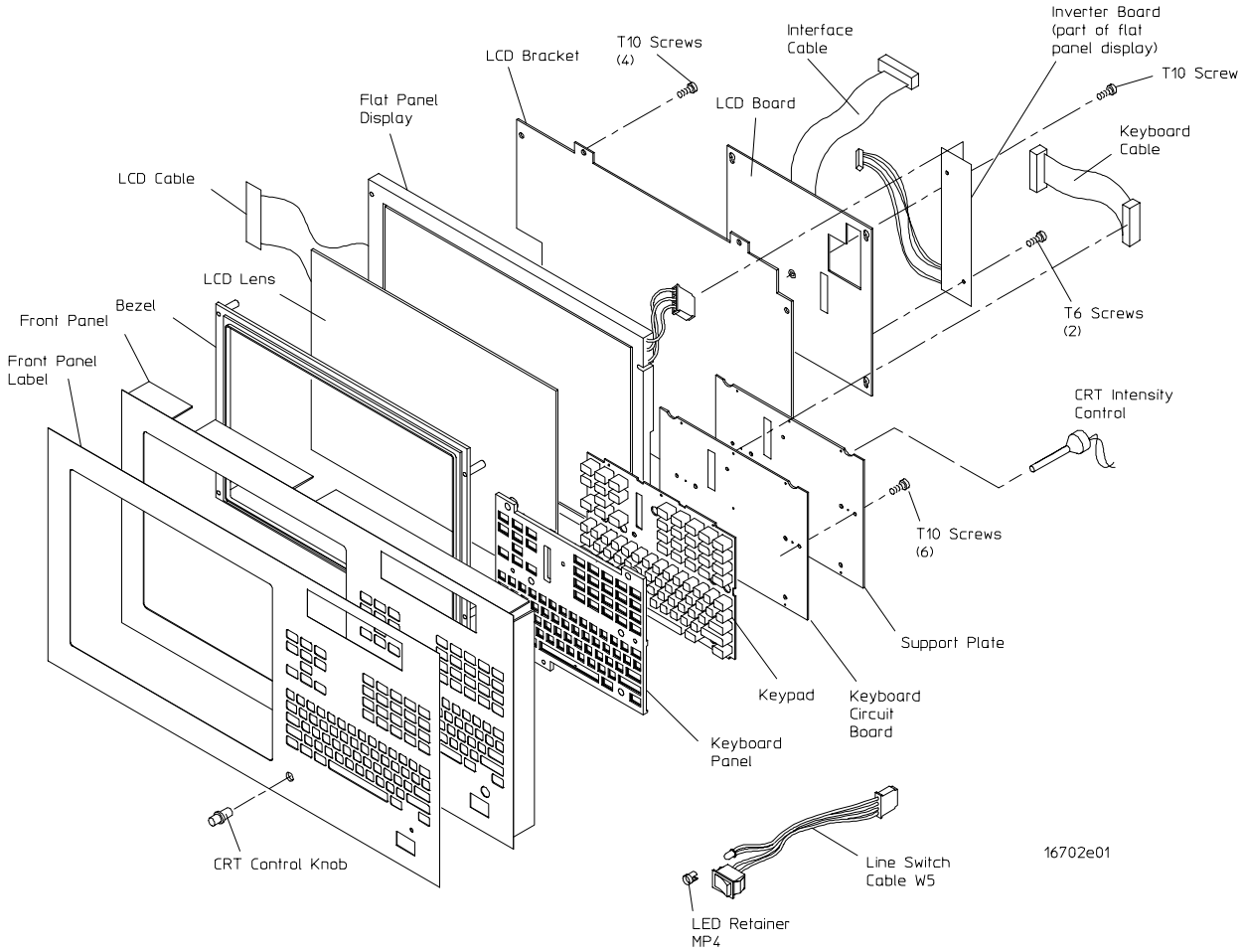
Reference designators used in the parts lists include:

- A — Assembly
- E — Miscellaneous Electrical Part
- F — Fuse
- H — Hardware
- MP — Mechanical Part
- W — Cable

16700A/16702A exploded view and replaceable parts



Exploded view of the 16700A/16702A



Exploded View of the 16702A Front Panel Assembly

16700A/16702A Replaceable Parts

Ref. Des.	Part Number	QTY	Description
Exchange Assemblies			
	16600-69517		Exchange CPU Board
	16700-69501		Exchange Power Supply
	16700-69504		Exchange PCI Board
Replacement Assemblies			
A1	16700-66501	1	Module Interface Board
A2	16700-66502	1	Interface Board (for serial number prefix US3836 and less)
A2	16700-66507	1	Interface Board (for serial number prefix US3849 and greater)
A3	16700-66503	1	I/O Board
A4	16700-66504	1	PCI Board
A5	16702-68701	1	Front Panel Assembly (16702A)
Exploded Front Panel	16500-47401	1	CRT Control Knob
	16702-00201	1	Front Panel
	16702-01202	1	LCD Bracket
	16702-24101	1	Support Plate
	16702-24701	1	CRT Control Spacer
	16702-40501	1	Keyboard Panel
	16702-41901	1	Keypad
	16702-42201	1	Bezel
	16702-61601	1	Keyboard Cable (24 POS)
	16702-61602	1	LCD Cable (41 POS)
	16702-61603	1	Interface Cable (50 POS)
	16702-61604	1	Inverter (5)
	16702-61605	1	CRT Intensity Control Cable
	16702-66501	1	LCD Board
	16702-66502	1	Keyboard Circuit Board
	16702-87101	2	Round Gasket
	16702-88001	1	LCD Lens
	2090-0364	1	Flat Panel Display
A6	0950-3402	1	Power Supply
A7	0950-2787	1	Floppy Disk Drive
A8	0950-3434	1	Hard Disk Drive
A9	3160-1013	2	Fan (for serial number prefix US3836 and less)
A9	3160-1013	1	Fan (for serial number prefix US3849 and greater)

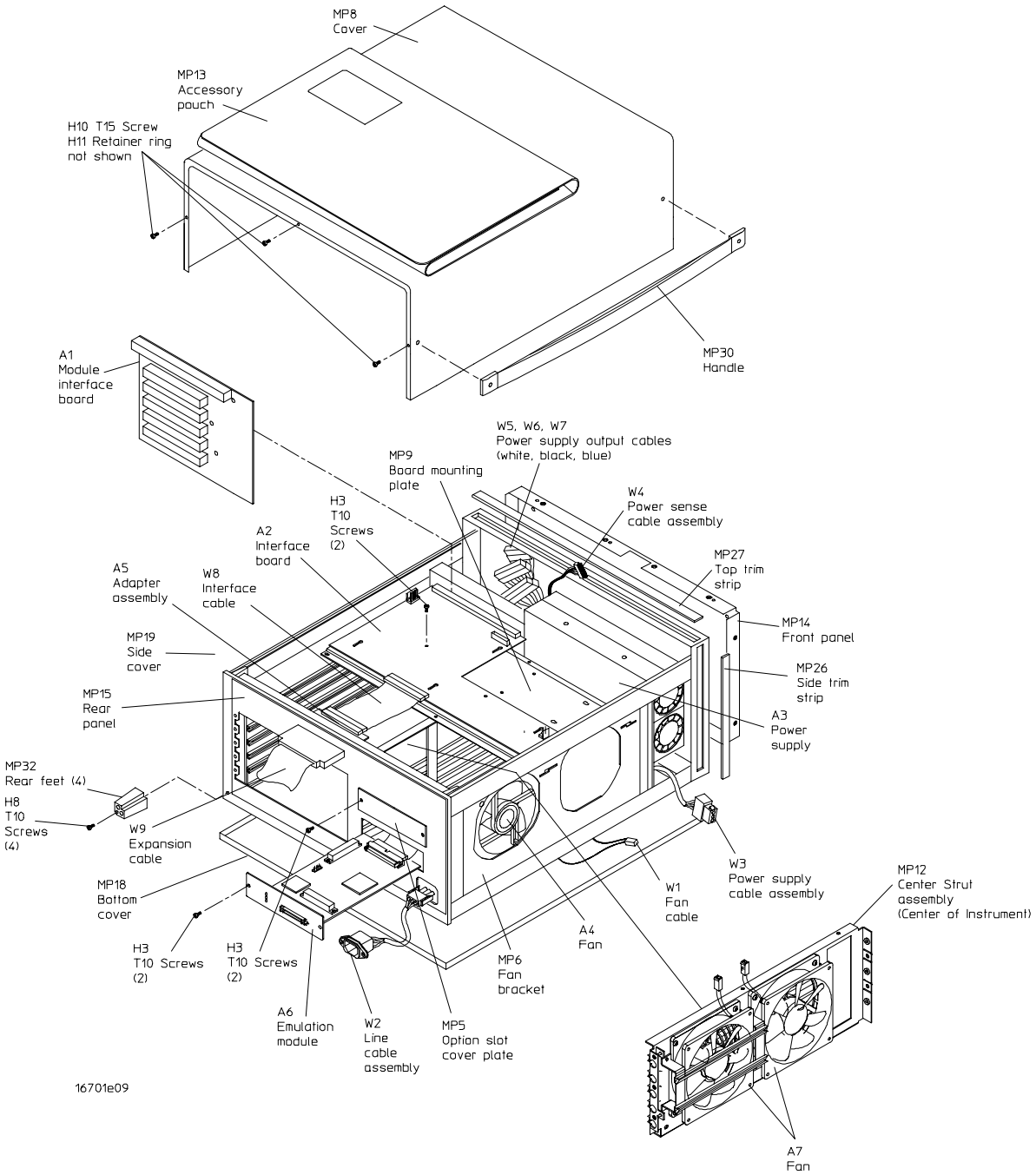
Ref. Des.	Part Number	QTY	Description
A10	5063-1648	1	CPU Board
A11	5063-9261	1	32MB System RAM
A11	5063-9262	0	128MB System RAM (Option #003)
A12	C3757-60401	1	Keyboard
A13	C4728-60101	1	Mouse
A14	16600-66518	0	Video Memory (Option #003)
A15	16600-66515	0	Emulation Module
A16	E3496-66502	0	Emulation Module Loopback Connector
A17	3160-0910	2	Fan (for serial number prefix US3849 and greater)
H1	0361-1272	8	Plastic Push Fastener (Fan to fan bracket)
H2	0380-1858	6	Jackscrew with Lock (RS-232-C, Monitor, and Parallel Printer ports to CPU rear panel)
H3	0380-4628	2	Hex Standoff (Interface board to board mounting plate)
H4	0515-0372	36	M3.0 X 0.50; 8 mm T10 PH (Interface board to board mounting plate, CPU bracket to rear panel, CPU bracket to board mounting plate, CPU panel to rear panel, hard disk drive bracket to board mounting plate, I/O board to rear panel, Line Cable Assembly ground wire to rear panel, floppy disk drive to front strut, PCI board to standoffs on Interface board, Emulation module or Option module cover plate to rear panel, board mounting plate to center strut, center strut to front strut, Module Interface Board to frame, board mounting plate to card cage)
H5	0515-1035	5	M3.0 X 0.50; 8 mm T10 90deg FH (Rear panel to center strut, Line cable assembly to rear panel)
H6	0515-1269	8	M4.0 X 0.70 ANSI B1.13M; 10mm T15 90deg FH (Front panel to front panel frame)
H7	0515-1363	4	M3.0 X 0.50; 5 mm T10 TH (floppy disk drive to floppy disk drive bracket)
H8	0515-1384	2	M5.0 X 0.80; 10 mm T25 90deg FH (handle to side cover)
H9	0515-1403	20	M4.0 X 0.70; 6 mm T15 90deg FH (Accessory pouch to top cover, corner struts to rear frame, Corner struts to front panel frame)
H10	0515-1444	4	M3.5 X 0.60 ANSI B1.13M; 25.40 mm T10 PH (rear feet to frame)

Ref. Des.	Part Number	QTY	Description
H11	0515-2143	28	M4.0 X 0.70; 6 mm T15 PH (Fan bracket to frame, card cage bracket to frame, rear panel to frame, power supply to center strut, frame to front strut)
H12	1250-2075	1	9/16 in hex; 1/2-28 UNEF; 2B Threads; 0.95 in thick; Ni plated brass (LAN BNC)
H13	1252-5828	1	Jack Screw Kit (SCSI port)
H14	2360-0462	4	6-32 0.250 in T15 PH with washer (hard disk drive to hard disk drive bracket)
H15	0515-1245	4	M3.5 X 0.60; 12 mm T15 90deg FH (Captive screw for covers)
H16	0510-1253	4	Retainer Ring (Captive screw for covers)
MP1	1400-0611	1	Cable Clamp, 1 in x 1 in, adhesive backed (16700A, Line cable to fan bracket)
MP1	1400-0611	2	Cable Clamp, 1 in x 1 in, adhesive backed (16702A, Line cable to fan bracket, Video interface cable to power supply)
MP2	1400-2224	2	Cable Clamp, 4 in x .5 in, adhesive backed (I/O cable to center strut)
MP3	1400-2225	1	Cable Clamp, 2.33 in x .75 in, plastic over steel, adhesive backed (hard disk drive data cable and I/O cable to top of hard disk drive)
MP4	1450-0625	1	LED Retainer
MP5	1460-1345	2	Tilt Stand
MP6	16500-40502	3	Filler Panel
MP7	16600-04105	1	Option Slot Cover Plate
MP8	16700-00201	1	Front Panel (16700A)
MP9	16700-00203	1	Rear Panel
MP10	16700-00205	1	CPU Board Panel
MP11	16700-01201	1	Fan Bracket
MP12	16700-01202	1	Hard Disk Drive Bracket
MP13	16700-01203	1	Card Cage Bracket
MP14	16700-01204	1	Floppy Disk Drive Bracket
MP15	16700-01205	1	CPU Board Bracket
MP16	16700-04101	1	Top Cover (for serial number prefix US3849 and less)
MP16	16700-04106	1	Top Cover (for serial number prefix US3907 and greater)
MP17	16700-04102	1	Board Mounting Plate
MP18	16700-23201	1	Plastic Sleeve (Board Mounting Plate)
MP19	16700-04701	1	Front Strut
MP20	16700-04703	1	Center Strut

Ref. Des.	Part Number	QTY	Description
MP21	16700-84501	1	Accessory Pouch
MP22	16700-94301	1	Front Panel Label (16700A)
MP22	16702-94301	1	Front Panel Label (16702A)
MP23	16700-94302	1	ID Label (16700A)
MP23	16702-94302	1	ID Label (16702A)
MP24	5002-1088	1	Bottom Cover
MP25	5002-3972	1	Side Cover (without handle; for serial number prefix US3849 and less)
MP26	16700-04104	1	Side Cover (with handle; for serial number prefix US3849 and less)
MP27	5021-5808	1	Rear Frame
MP28	5021-5837	4	Corner Strut
MP29	5022-1190	1	Front Frame
MP30	5041-9167	2	Bottom Foot (Front)
MP31	5041-9168	2	Bottom Foot (Non-skid, Rear)
MP32	5041-9173	2	Side Trim Strip
MP33	5041-9176	1	Top Trim Strip
MP34	5041-9186	1	Handle Endcap (Front; for serial number prefix US3849 and less)
MP35	5041-9187	1	Handle Endcap (Rear; for serial number prefix US3849 and less)
MP36	5063-9210	1	Handle (for serial number prefix US3849 and less)
MP36	16700-60004	1	Handle (for serial number prefix US3907 and greater)
MP37	5090-4370	1	Stock Label
MP38	54110-40502	4	Rear Foot
MP39	8160-0551	6	EMI Shielding (Side Covers)
MP40	8160-1226		RFI Shielding (Front panel, two 390 mm length and four 50 mm length, adhesive backed)
MP41	16702-87101	3	RFI Foam Gaskets
MP42	16702-87102	1	RFI Rectangle Gasket
MP43	16500-47401	1	Intensity Knob (16702A)
MP44	0460-2010		Foam Tape (hard disk drive data cable to hard disk drive, 250 mm length)
W1	16500-61621	1	Target Control Cable
W2	16600-61603	1	Floppy Disk Drive Data Cable
W3	16600-61604	1	Floppy Disk Drive Power Cable
W4	16600-61605	1	Fan Cable (for serial number prefix US3836 and less)

Ref. Des.	Part Number	QTY	Description
W4	01660-61613	1	Fan Cable (for serial number prefix US3849 and greater)
W5	16600-61606	1	Line Switch Cable
W6	16600-61611	1	Hard Disk Drive Power Cable (for serial number prefix US3849 and less)
W7	16700-61601	1	Line Cable Assembly (attaches to rear panel)
W8	16700-61602	1	Power Supply Cable Assembly (attaches to power supply)
W9	16700-61603	1	Power Sense Cable Assembly
W10	16700-61604	1	Power Supply Output Cable (White)
W11	16700-61605	1	I/O Cable
W12	16700-61606	1	Power Supply Output Cable (Black, 24-pos)
W13	16700-61607	1	Hard Disk Drive Data Cable
W14	16700-61608	0	Emulation Module Interface Cable (included with Emulation Module)
W15	16700-61609	1	Power Supply Output Cable (Blue, 22-pos)
W16	8120-1521	1	Power cord - United States (7.5 ft)
W16	8120-1703	1	Power cord (Option 900-UK)
W16	8120-0696	1	Power cord (Option 901-Austl)
W16	8120-1692	1	Power cord (Option 902-Eur)
W16	8120-2296	1	Power cord (Option 906-Swit)
W16	8120-2957	1	Power cord (Option 912-Den)
W16	8120-4600	1	Power cord (Option 917-Africa)
W16	8120-4754	1	Power cord (Option 918-Japan)
W16	8120-8377	1	Power cord (Option 922-China)

16701A exploded view and replaceable parts



Exploded view of the 16701A

16701A Replaceable Parts

Ref. Des.	Part Number	QTY	Description
Exchange Assemblies			
	16700-69501		Exchange Power Supply
Replacement Assemblies			
A1	16700-66501	1	Module Interface Board
A2	16701-66502	1	Interface Board Assembly (for serial number prefix US3830 and less)
A2	16701-66503	1	Interface Board Assembly (for serial number prefix US3849 and greater)
A3	0950-3402	1	Power Supply
A4	3160-1013	2	Fan (for serial number prefix US3830 and less)
A4	3160-1013	1	Fan (for serial number prefix US3849 and greater)
A5	16701-63201	1	Adapter Assembly
A6	16600-66515	0	Emulation Module
A7	3160-0910	2	Fan (for serial number prefix US3849 and greater)
H1	0361-1272	8	Plastic Push Fastener (Fan to fan bracket)
H2	0380-4066	2	Standoff (Adapter assembly to rear panel)
H3	0515-0372	24	M3.0 X 0.50; 8 mm T10 PH (Center strut to front strut, Module interface board to frame, Line cable assembly ground wire to rear panel, Board mounting plate to card cage, Board mounting plate to center strut, Rear panel to center strut, Emulation module or Option module cover plate to rear panel)
H4	0515-1035	5	M3.0 X 0.50; 8 mm T10 90deg FH (Rear panel to center strut, Line cable assembly to rear panel)
H5	0515-1269	8	M4.0 X 0.70 ANSI B1.13M; 10mm T15 90deg FH (Front panel to front panel frame)
H6	0515-1384	2	M5.0 X 0.80; 10 mm T25 90deg FH (handle to side cover)
H7	0515-1403	20	M4.0 X 0.70; 6 mm T15 90deg FH (Accessory pouch to top cover, corner struts to rear frame, Corner struts to front panel frame)
H8	0515-1444	4	M3.5 X 0.60 ANSI B1.13M; 25.40 mm T10 PH (rear feet to frame)

Ref. Des.	Part Number	QTY	Description
H9	0515-2143	28	M4.0 X 0.70; 6 mm T15 PH (Fan bracket to frame, card cage bracket to frame, rear panel to frame, power supply to center strut, frame to front strut)
H10	0515-1245	4	M3.5 X 0.60; 12 mm T15 90deg FH (Captive screw for covers)
H11	0510-1253	4	Retainer Ring (Captive screw for covers)
MP1	1400-0611	1	Cable Clamp, 1 in x 1 in, adhesive backed (Line cable to fan bracket)
MP2	1450-0625	1	LED Retainer
MP3	1460-1345	2	Tilt Stand
MP4	16500-40502	3	Filler Panel
MP5	16600-04105	1	Option Slot Cover Plate
MP6	16700-01201	1	Fan Bracket
MP7	16700-01203	1	Card Cage Bracket
MP8	16700-04101	1	Top Cover (for serial number prefix US3849 and less)
MP8	16700-04106	1	Top Cover (for serial number prefix US3907 and greater)
MP9	16700-04102	1	Board Mounting Plate
MP10	16700-23201	1	Plastic Sleeve
MP11	16700-04701	1	Front Strut
MP12	16700-04703	1	Center Strut
MP13	16700-84501	1	Accessory Pouch
MP14	16701-00201	1	Front Panel
MP15	16701-00202	1	Rear Panel
MP16	16701-94301	1	Front Panel Label
MP17	16701-94302	1	ID Label
MP18	5002-1088	1	Bottom Cover
MP19	5002-3972	1	Side Cover (without handle; for serial number prefix US3849 and less)
MP20	16700-04104	1	Side Cover (with handle; for serial number prefix US3849 and less)
MP21	5021-5808	1	Rear Frame
MP22	5021-5837	4	Corner Strut
MP23	5022-1190	1	Front Frame
MP24	5041-9167	2	Bottom Foot (Front)
MP25	5041-9168	2	Bottom Foot (Non-skid, Rear)
MP26	5041-9173	2	Side Trim Strip
MP27	5041-9176	1	Top Trim Strip
MP28	5041-9186	1	Handle Endcap (Front; for serial number prefix US3849 and less)

Ref. Des.	Part Number	QTY	Description
MP29	5041-9187	1	Handle Endcap (Rear; for serial number prefix US3849 and less)
MP30	5063-9210	1	Handle (for serial number prefix US3849 and less)
MP30	16700-60004	1	Handle (for serial number prefix US3907 and greater)
MP31	5090-4370	1	Stock Label
MP32	54110-40502	4	Rear Foot
MP33	8160-0551	6	EMI Shielding (Side Covers)
MP34	8160-1226		RFI Shielding (Front panel, two 390 mm length and four 50 mm length, adhesive backed)
MP35	16701-81201	1	RFI Gasket
MP36	16702-87101	3	RFI Foam Gaskets
MP37	16702-87102	1	RFI Rectangle Gasket
W1	16600-61605	1	Fan Cable (for serial number prefix US3830 and less)
W1	01660-61613	1	Fan Cable (for serial number prefix US3849 and greater)
W2	16700-61601	1	Line Cable Assembly (attaches to rear panel)
W3	16700-61602	1	Power Supply Cable Assembly (attaches to power supply)
W4	16700-61603	1	Power Sense Cable Assembly
W5	16700-61604	1	Power Supply Output Cable (White)
W6	16700-61606	1	Power Supply Output Cable (Black, 24-pos)
W7	16700-61609	1	Power Supply Output Cable (Blue, 22-pos)
W8	16701-61601	1	Interface Cable (between Adapter Assembly and Interface Board)
W9	16701-61602	1	Expansion Cable
W10	16701-61603	1	Line LED Cable
W11	8120-1521	1	Power cord - United States (7.5 ft)
W11	8120-1703	1	Power cord (Option 900-UK)
W11	8120-0696	1	Power cord (Option 901-Austl)
W11	8120-1692	1	Power cord (Option 902-Eur)
W11	8120-2296	1	Power cord (Option 906-Swit)
W11	8120-2957	1	Power cord (Option 912-Den)
W11	8120-4600	1	Power cord (Option 917-Africa)
W11	8120-4754	1	Power cord (Option 918-Japan)
W11	8120-8377	1	Power cord (Option 922-China)

8

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Theory of Operation

Theory of Operation

This chapter tells the theory of operation for the logic analysis system and describes the self-tests. The information in this chapter is to help you understand how the logic analysis system operates and what the self-tests are testing. This information is not intended for component-level repair.

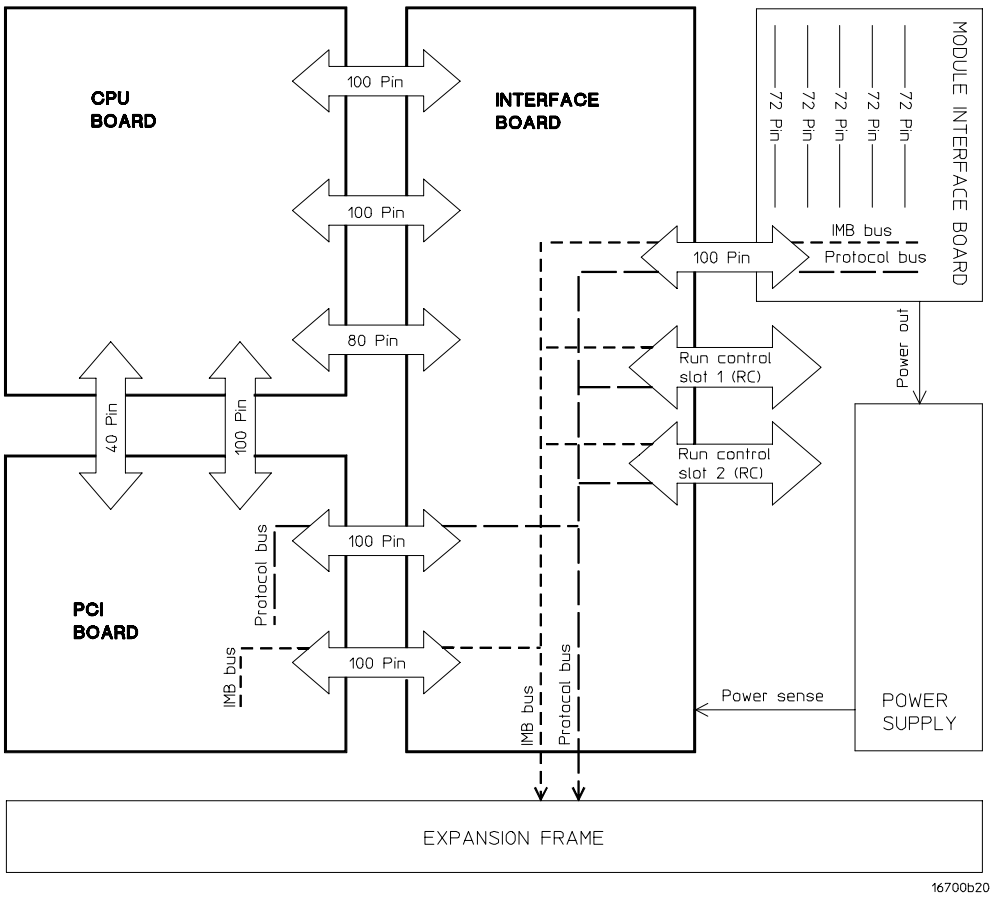
Block-Level Theory

The block level theory includes the theory of operation of the 16700-series logic analysis system in terms of the major subsystems.

The 16700-series logic analysis system

The system level block diagram shown here includes the following subsystems:

- CPU Board
- PCI Board
- Interface Board
- Measurement Module Backplane
- Emulation Module Interface
- Power Supply



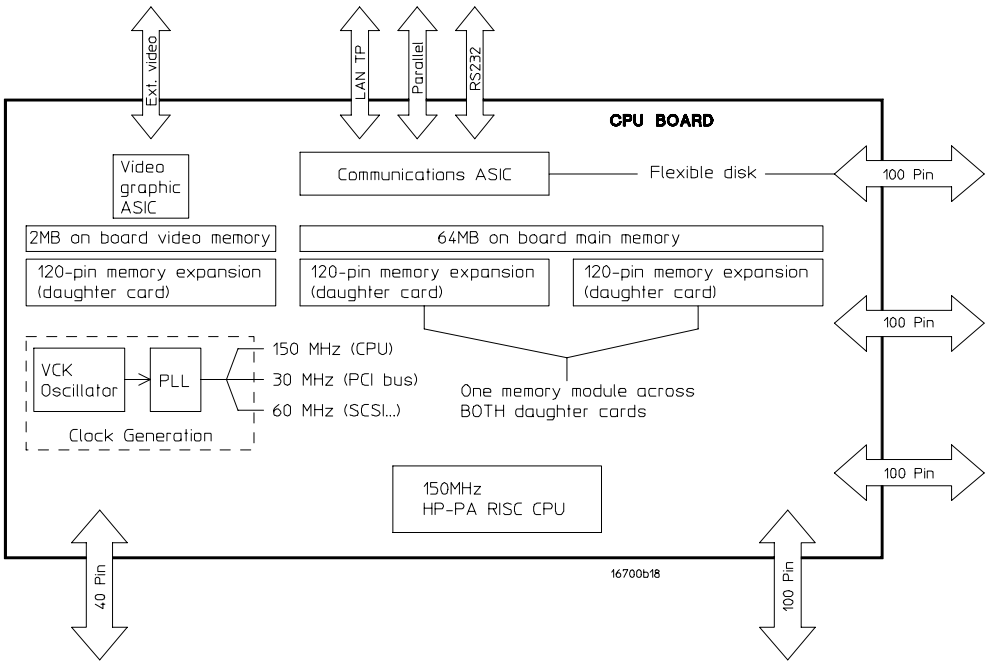
The Logic Analysis System

Subsystem overview theory

This section discusses the subsystems and the components that make up each subsystem.

CPU Board

The CPU is a 150 MHz PA-RISC workstation processor. The CPU board, working with both the PCI board and Interface board, manages the data flow between the mainframe components and both the measurement modules and emulation modules.



The CPU is supported by the following components:

Clock Circuitry

A 30 MHz on-board crystal oscillator is on the CPU board. The 30 MHz frequency is divided by 2, then upconverted to by a PLL clock distribution IC to also create 60 MHz and 150 MHz. The 15 MHz, 30 MHz, and 60 MHz frequencies are utilized by buses and backplanes. The 150 MHz frequency is utilized by the processor.

System RAM

A total of 64 MB of system RAM is available in the factory default configuration. 32 MB of base on-board system memory is present, plus a 32 MB proprietary memory daughter card is added.

I/O

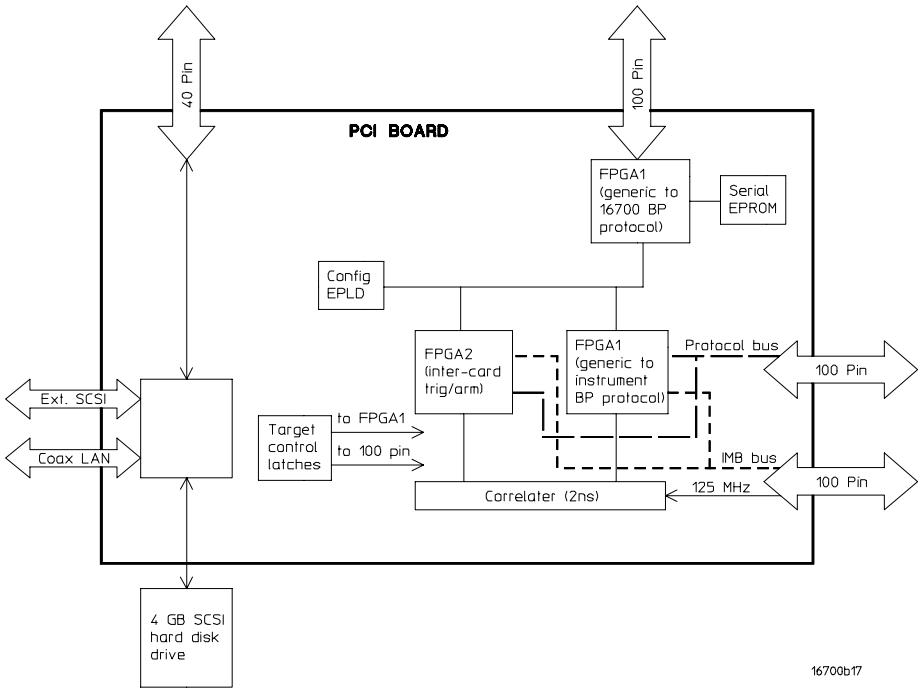
Most of the I/O ports are directly managed by the CPU board. These include the LAN (10BaseT twisted pair), PS/2, RS-232-C, Centronics, floppy disk drive, and the display. Proprietary ASICs are used as device interfaces to the I/O components.

Graphics

The Graphics, or display, is a proprietary graphics accelerator ASIC supported by 2 MB of Synchronous Graphics RAM. The Graphics ASIC has two video outputs. One video output is an RBG signal routed to the I/O Board. The second video output is a digital video signal which is routed to a connector on the CPU board. The digital video signal is utilized by the 16702A mainframe flat panel display.

PCI Board

The PCI board bridges the PCI backplane of the CPU board to an instrument backplane that interfaces with the measurement modules. Instrument backplane control is managed by the PCI board.



PCI control functionality includes:

- Intermodule bus (IMB) with fixed and mixed trigger event inputs, module ARM, and port in/out
- 2 ns data time correlation across measurement modules
- Intermodule signaling bus
- Interframe signaling bus
- Target control bus
- Synchronous module data acquisition

Additionally, the PCI board provides I/O port capability that is not available on the CPU board. The I/O port capability is extended to the I/O board. I/O port capability includes:

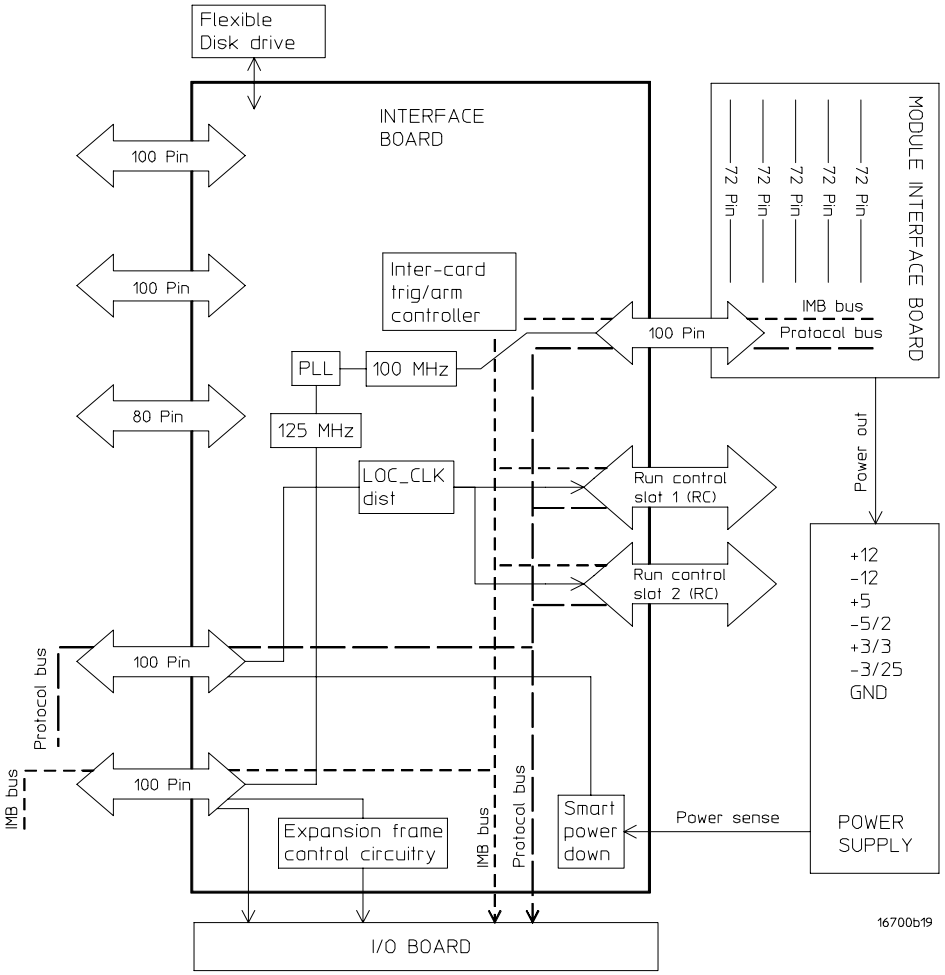
- External single-ended SCSI
- Internal SCSI
- LAN (10Base2)
- Port In/Out

Because it is the interface between the CPU and the instrument measurement front end, the PCI board hardware is suspect in the event the PV software (Self-Test) fails to load when initiated.

Interface Board

The interface board distributes most of the signals from both the CPU board and the PCI board throughout the system. Additionally, the interface board provides additional functionality not found on either the CPU or PCI board.

The interface board includes circuitry to synchronize the 100 MHz backplane module sample clock with the 500 MHz sample correlation clock to improve sample time correlation. It also includes the audio beeper and the fan speed control.



Measurement Module Backplane

The measurement module backplane is the same backplane used in the Agilent Technologies 16500-series logic analysis system. Consequently most of the 16500-series modules existing at the time of the Agilent Technologies 16600-series and 16700-series releases will operate in those mainframes. Additional enhancements are also present to accommodate newer 16700-series modules. Enhancements include a common sample clock to improve measurement time correlation and an optional handshaked transfer and 16-bit multiplexed address/data bus transfer to speed data transfer from the modules to system memory.

Emulation Module Interface

Processor run control, provided by the Emulation Module, is used to control the target system processor execution and allow access to target system resources. Target system processors viable for use with the Emulation Module will include some form of N-wire control. Access to the Emulation Module will be through the mainframe interface.

The Emulation Module is a Motorola 68332 system. The 68332 processor is used to control the N-wire and JTAG protocols for the target system processor.

The Emulation Module will physically reside on the measurement module backplane. Communications between the mainframe CPU and the Emulation Module is managed by a run control server on the CPU board. The server manages the interrupts to and communications with the 68332 processor on the Emulation Module. Memory-mapped I/O allows the CPU to communicate with the Module for data transfers.

Power Supply

The power supply provides all power to the logic analysis system. The input voltage is autoselecting with respect to both voltage and frequency. The DC output voltage provided includes -12 V, -5.2 V, -3.25 V, +3.4 V, +5.1 V, and +12 V. The mainframe itself consumes 100 W of power. Each measurement module has an 80 W power budget, and each emulation module has a 25 W power budget. Maximum power consumed in a fully loaded mainframe is 630 W. The flat panel display in the 16702A mainframe consumes only 6 W of power.

Power Control

The front panel power switch does not directly control the line voltage. The power switch manages a control circuit through the CPU. When power is applied, the control circuitry immediately responds to input from the power switch. When the instrument is turned off without initiating a Shutdown, the power switch asserts an interrupt to the CPU. The CPU then begins system cleanup in preparation for powerdown. When system cleanup is completed, the instrument then powers down.

Note that if the front panel switch is disconnected from the interface board, the instrument will never power down.

Power Sense

The Power Sense circuitry, managed by the CPU, directly controls the state of the power supply. A control signal is directed to the power supply through the power sense cable. When the control signal is asserted, the power supply will activate. The power supply will then deactivate when the control signal is de-asserted.

Note that if the power sense cable is disconnected from the interface board, the instrument will never power up.

The Power-Up Routine

When power is applied to the 16700-series logic analysis system mainframe, a series of tasks called the power-up routine is performed to initialize and to verify operation of the mainframe. The mainframe display reports the progress and status of the power-up routine. Each of the tasks of the power-up routine is scrolled onto the mainframe display as the task is being performed.

The following is a complete listing of the power-up routine dialogue (or boot dialogue). The parts of the power-up routine dialogue are then discussed. Some of the details may vary slightly depending on the firmware revisions.

```
Firmware Version  1.1

Simple Console IO Dependent Code [IODC] Revision 1

Memory Test/Initialization Completed


To select a new Graphics Monitor Type press the [TAB] key now, otherwise EXIT by
entering any other key (or will time out in 15 seconds)...


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Processor   Speed            State           Coprocessor State  Cache Size
  ---------  --------   --------------------  -----------------  ----------
      0      150 MHz    Active                  Functional          64 KB

  Available memory (bytes)    :  67108864
  Good memory required (bytes):  67108864

  Primary boot path:    SESCSI.6.0
  Alternate boot path:  SESCSI.1.0
  Console path:         GRAPHICS(0)
  Keyboard path:        PS2

Processor is booting from first available device.

To discontinue, press any key within 2 seconds.

2 seconds expired.
Proceeding...

Trying Primary Boot Path
------------------------

Booting...
BOOT IO Dependent Code (IODC) revision 153

HARD Booted.

ISL Revision A.00.38  OCT 26, 1994

ISL booting  hpux

boot
 disk(8/16/5.6.0.0.0.0.0;0)/stand/vmunix
 3526196 + 315392 + 298272 start 0x192368

vuseg=a13000
 inet_site:ok  inet_cots:ok starship_attach: vendor id=103c, device id=1650

    System Console is on the ITE
Networking memory for fragment reassembly is restricted to 5378040 bytes
Logical volume 64, 0x3 configured as ROOT
Logical volume 64, 0x2 configured as SWAP
```

```
Logical volume 64, 0x2 configured as DUMP
   Swap device table:  (start & size given in 512-byte blocks)
       entry 0 - major is 64, minor is 0x2; start = 0, size = 1540096
Checking root file system.
File system is clean - log replay is not required
Rook check done.
Starting the STREAMS daemons.
   B23528 HP-UX (B.10.20) #1 Sun Jun  9 08:03:38 PDT 1996

Memory Information
   physical: page size = 4096 bytes, logical page size = 4096 bytes
   Physical: 65536 Kbytes, lockable: 39088 Kbytes, available 47856 Kbytes

/abin/ioinitrc:

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             #        #    #  #    #    #   #    #
             #######   ####    ####     #    ####

                                Logic Analysis System


/sbin/bcheckrc:
Checking for LVM volume groups and Activating (if any exist)
Volume group '/dev/vg00' has been successfully changed.
vxfa fsck: sanity check: root file system OK (mounted read/write)
/sbin/itemap: WARNING! An attempt to write keyboard mapping entries past
/sbin/itemap: the end of the buffer.  Further writes will be ignored.
Checking hfs file systems /sbin/fsclean:
/dev/vg00/lvell (mounted) ok
HFS file systems are OK, not running fsck
```

```
Checking vxfs file systems
/dev/vg00/lvol3 :
vxfa fsck: sanity check: root file system OK (mounted read/write)
/dev/vg00/lvol4 :
vxfa fsck: sanity check: /dev/vg00/lvol4 OK
/dev/vg00/lvol5 :
vxfa fsck: sanity check: /dev/vg00/lvol5 OK

/sbin/auto_parms, checking network for DHCP server (see /etc/autoparms.log)

     HP-UX Start-up in progress                    Status
     ___________________________                   ______

     Mount file systems ........................... [ OK ]
     Setting hostname ............................. [ OK ]
     Enable auxiliary swap space .................. [ OK ]
     Start syncer daemon .......................... [ OK ]
     Configure LAN interfaces ..................... [ OK ]
     Start Software Distributor agent daemon ...... [ OK ]
     Clean up old log files ....................... [ OK ]
     Start system message logging daemon .......... [ OK ]
     Configure Ethernet interfaces ................ [ OK ]
     Configure LAN interfaces ..................... [ OK ]
     Start NFS core subsystem ..................... [ OK ]
     Start NFS client subsystem ................... [ OK ]
     Start Internet services daemon ............... [ OK ]
     Start time synchronization ................... [N/A ]
     Start print spooler .......................... [ OK ]
     Start clock daemon ........................... [ OK ]
     Set X11 Device Configuration ................. [ OK ]
     Start 16700 Processor Run Control daemon ..... [ OK ]
     Start NFS server subsystem ................... [ OK ]
     Start Lngrd daemon ........................... [ OK ]

The system is ready.
Starting Logic Analysis System ...
```

Booting from the boot ROM - Processor Dependent Code (pdc)

The following segment of the boot dialogue is created by the boot ROM. The boot ROM is managing the boot process during this stage of the power-up routine.

```
Firmware Version  1.1

Simple Console IO Dependent Code [IODC] Revision 1

Memory Test/Initialization Completed


To select a new Graphics Monitor Type press the [TAB] key now, otherwise EXIT by
entering any other key (or will time out in 15 seconds)...

-------------------------------------------------------------------------------
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-------------------------------------------------------------------------------

  Processor   Speed            State           Coprocessor State  Cache Size
  ---------  --------   ---------------------  -----------------  ----------
      0      150 MHz    Active                 Functional          64 KB

  Available memory (bytes)    :  67108864
  Good memory required (bytes):  67108864

  Primary boot path:    SESCSI.6.0
  Alternate boot path:  SESCSI.1.0
  Console path:         GRAPHICS(0)
  Keyboard path:        PS2

Processor is booting from first available device.

To discontinue, press any key within 2 seconds.

2 seconds expired.
Proceeding...

Trying Primary Boot Path
------------------------
```

During the boot ROM stage of the power-up routine, the CPU board is first tested and the device path configuration is loaded. As part of the CPU board test, system RAM is tested. The following text shows the available system memory recognized by the boot ROM:

```
  Available memory (bytes)    :  67108864
  Good memory required (bytes):  67108864
```

The boot ROM then configures the device paths, tests the device at the Primary boot path to see that it is a viable boot device, and then attempts to boot from the device. The device associated with the Primary boot path is the hard disk drive.

```
  Primary boot path:    SESCSI.6.0
  Alternate boot path:  SESCSI.1.0
  Console path:         GRAPHICS(0)
  Keyboard path:        PS2

Processor is booting from first available device.
```

Booting from the boot device - Initial System Loader (isl)

After the boot ROM stage of the power-up routine, the instrument will boot from the device at the Primary boot path address, the hard disk drive. The hard disk drive is now managing the boot process during this stage of power-up.

```
Booting...
BOOT IO Dependent Code (IODC) revision 153

HARD Booted.

ISL Revision A.00.38  OCT 26, 1994

ISL booting  hpux

boot
  disk(8/16/5.6.0.0.0.0.0;0)/stand/vmunix
  3526196 + 315392 + 298272 start 0x192368

vuseg=a13000
  inet_site:ok  inet_cots:ok starship_attach: vendor id=103c, device id=1650

    System Console is on the ITE
Networking memory for fragment reassembly is restricted to 5378040 bytes
Logical volume 64, 0x3 configured as ROOT
Logical volume 64, 0x2 configured as SWAP
Logical volume 64, 0x2 configured as DUMP
   Swap device table:  (start & size given in 512-byte blocks)
       entry 0 - major is 64, minor is 0x2; start = 0, size = 1540096
Checking root file system.
File system is clean - log replay is not required
Rook check done.
Starting the STREAMS daemons.
   B23528 HP-UX (B.10.20) #1 Sun Jun  9 08:03:38 PDT 1996

Memory Information
   physical: page size = 4096 bytes, logical page size = 4096 bytes
   Physical: 65536 Kbytes, lockable: 39088 Kbytes, available 47856 Kbytes

/abin/ioinitrc:

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            #
            #         ####    ####     #    ####
            #        #    #  #    #    #   #    #
            #        #    #  #         #   #
            #        #    #  #  ###    #   #
            #        #    #  #    #    #   #    #
            #######   ####    ####     #    ####

                                Logic Analysis System


/sbin/bcheckrc: Checking for LVM volume groups and Activating (if any exist)
Volume group '/dev/vg00' has been successfully changed.
vxfa fsck: sanity check: root file system OK (mounted read/write) /sbin/itemap:
WARNING! An attempt to write keyboard mapping entries past /sbin/itemap: the end
of the buffer.  Further writes will be ignored. Checking hfs file systems /sbin/
fsclean: /dev/vg00/lvell (mounted) ok
HFS file systems are OK, not running fsck
Checking vxfs file systems
/dev/vg00/lvol3 :
vxfa fsck: sanity check: root file system OK (mounted read/write)
/dev/vg00/lvol4 :
vxfa fsck: sanity check: /dev/vg00/lvol4 OK
/dev/vg00/lvol5 :
vxfa fsck: sanity check: /dev/vg00/lvol5 OK
/sbin/auto_parms, checking network for DHCP server (see /etc/autoparms.log)
```

When the `Booting...` message appears, the instrument is beginning to load the operating system, and the scope of powerup and configuration begins to move from just the CPU board to the subsystems on the instrument CPU backplane.

```
boot
 disk(8/16/5.6.0.0.0.0.0;0)/stand/vmunix
 3526196 + 315392 + 298272 start 0x192368
```

The operating system kernel, including device configurations, is being loaded into memory. This signifies that the CPU board, memory, and boot device are operational.

```
vuseg=a13000
 inet_site:ok  inet_cots:ok starship_attach: vendor id=103c, device id=1650
```

The PCI board has now been recognized, and the CPU now has a path to the CPU backplane and the system devices on the backplane.

The file system on the hard drive is then checked.

```
Checking root file system.
File system is clean - log replay is not required
```

If the system was previously powered down abnormally, then the file system would include a journal file. The instrument would then replay the detected journal file in an attempt to recover the instrument state prior to the abnormal shutdown. During the remainder of the boot routine in this case, the text "Log replay in progress" appears repeatedly in the boot dialogue.

The system memory is again tested. If 64 MB of system memory was installed, the following message appears:

```
Memory Information
   physical: page size = 4096 bytes, logical page size = 4096 bytes
   Physical: 65536 Kbytes, lockable: 39088 Kbytes, available 47856 Kbytes
```

For the remainder of the isl boot stage, the file system is further checked. The devices on the backplane are also checked and configured.

Initialization

During initialization, all of the hardware subsystems and supporting software processes are initialized and started. Most failures at this point will be caused by software or configuration errors.

```
HP-UX Start-up in progress                    Status
______________________________                ______

Mount file systems ............................ [ OK ]
Setting hostname .............................. [ OK ]
Enable auxiliary swap space ................... [ OK ]
Start syncer daemon ........................... [ OK ]
Configure LAN interfaces ...................... [ OK ]
Start Software Distributor agent daemon ....... [ OK ]
Clean up old log files ........................ [ OK ]
Start system message logging daemon ........... [ OK ]
Configure Ethernet interfaces ................. [ OK ]
Configure LAN interfaces ...................... [ OK ]
Start NFS core subsystem ...................... [ OK ]
Start NFS client subsystem .................... [ OK ]
Start Internet services daemon ................ [ OK ]
Start time synchronization .................... [N/A ]
Start print spooler ........................... [ OK ]
Start clock daemon ............................ [ OK ]
Set X11 Device Configuration .................. [ OK ]
Start 16700 Processor Run Control daemon ...... [ OK ]
Start NFS server subsystem .................... [ OK ]
Start Lngrd daemon ............................ [ OK ]
```

Logic Analysis System load

After the instrument core subsystems are tested and configured, the final stage of the power-up routine begins. During the final stage, the logic analysis system software is loaded. The logic analysis system software includes the mainframe and module software, and toolset licenses.

```
The system is ready. Starting Logic Analysis System ...
```

The CPU and the devices on the CPU backplane that form the infrastructure of the system are tested and are operational. Now the CPU polls the devices on the measurement module backplane. After reading the ID codes of the installed modules, the CPU then loads the appropriate measurement module software from the boot device into system memory. After the module software is downloaded into memory, the modules are initialized and calibration factors are loaded (for modules requiring cal factors from an operational accuracy calibration).

The session manager autolaunches, which in turn autolaunches a local logic analysis session. When the System window appears, the instrument is ready for use. Any module configuration errors appear in a status window when the System window is opened.

Self-Tests Description

Performance Verification, or Self Test is made up of a series of software routines that exercise instrument subsystems to verify that the subsystems are operational.

Performance Verification is performed at two levels: on boot, and using the performance verification software (PV software). The two levels of performance verification are designed to be complimentary. That is, if a subsystem is tested during boot, there will not be a user-initiated performance verification test in the PV software to operationally verify the same subsystem. Likewise, the PV software is designed to test the operation of instrument subsystems that have not been tested on boot.

When you initiate the PV software, the measurement session will be exited, discarding all measurement configurations. You will be warned of this prior to entering the PV software to give you the opportunity to cancel loading of the software. The measurement session is exited since the PV software tests will leave the hardware in an unknown state. Restarting the measurement session after running the PV software is required to properly re-initialize the hardware to again run measurements.

Performance Verification on boot

During powerup, both the CPU and system memory are tested as part of the initial firmware execution. This occurs very early in the power-up boot routine. After the CPU and memory tests are complete, the display will show that the firmware recognizes both the CPU and system memory.

When the memory has been tested and passes, the display will show the following message:

```
Memory Test/Initialization Completed
```

When the CPU has been tested and passes, the display will show the following report about the CPU:

```
Processor   Speed           State           Coprocessor State  Cache Size
---------  --------  --------------------  -----------------  ----------
    0      150 MHz   Active                Functional          64 KB

Available memory (bytes)    :  67108864
Good memory required (bytes):  67108864
```

This shows that 64 MB of system memory is installed and recognized by the boot ROM. If 160 MB of system memory is installed, then the number of available bytes would be 167772160. However, if the CPU system memory daughter card is not installed or not properly seated, then only the base 32 MB system memory would be recognized, and the boot dialogue would show only 33554432 bytes available.

The hard disk drive is then tested during this phase of the power-up boot routines. During the initial firmware execution, the hard disk drive is searched for. When the hard disk drive is found, the display will report:

```
Trying Primary Boot Path
------------------------
Booting...
```

The instrument then attempts to boot from the hard disk drive. Operation of the hard disk drive is verified, after which the instrument loads the operating system. The following message is displayed when the operating system begins to load:

```
ISL booting  hpux
boot
  disk(8/16/5.6.0.0.0.0.0;0)/stand/vmunix
  3526196 + 315392 + 298272 start 0x192368
```

When the above message appears, it implies that the instrument central processor, system memory (RAM), and hard disk drive are operational. If any of these subsystems are not operational, an error message will appear and the boot process will halt. Refer to the troubleshooting flowcharts for more information on boot errors.

Performance Verification using the PV software

The PV software (Self Test) provides additional confidence in the operation of the instrument by verifying subsystems that are not tested as part of the boot routines. The tests are divided between System Tests and Frame Tests.

System Tests

The System Tests verify the operation of the logic analysis system core that have not been tested during power-up boot routines. Verified during the System Tests are the PCI board and parts of the CPU board not tested during boot.

When "Test All" is selected, some of the tests will not run, and will return a "Not Executed" status because operator action is required. You must select and run these tests individually. When the tests requiring user action are run, you are prompted for the specific action that is needed for successful completion of the test. When the indicated user action is performed, and the tested subsystem is operational, the specific test will return a "Passed" status.

For the CPU board, the tests that require user action are:

Test:	User Action:
Floppy Drive Test	A DOS-formatted floppy must be in the drive.
External SCSI Test	A powered-up CD-ROM drive must be on the bus.
Parallel Port Test	A parallel port loopback connector must be installed.

Passing the System Tests (CPU Test and PCI Test) implies that the CPU board is fully operational and can communicate with the rest of the instrument, with peripherals, and with other networked devices.

Front Panel Tests (16702A only)

Because the 16702A mainframe includes a front panel keypad and display, a front panel test is included as part of the system tests. The front panel test is not launched when Test All is selected. User action is required to launch the test.

When the front panel test is launched, a graphic of the front panel is displayed on the instrument display. You then press each of the front panel keys, which toggles the color of the corresponding key graphic. At the conclusion of the test, you determine whether the test passes or fails.

Frame Tests

The Frame Tests verify the operation of the measurement modules installed in the logic analysis system.

In the 16700-series, module tests are available for modules installed in the mainframe and in the expander frame (if installed). In the Self Test window, one tab is labeled Master Frame. A second tab, labeled Expander Frame, appears if an expander frame is installed in the system. The slots are designated:

Master Frame tab
Slots A-E - Installed Measurement Modules
Slots 1,2 - Installed Emulation Modules

Master Frame tab
Slots F-J - Installed Measurement Modules
Slots 3,4 - Installed Emulation Modules

The installed measurement modules are listed under the selection tabs. Each module can be selected to yield a list of tests available for that module. Some of the measurement modules are composed of multiple cards, where one card is called the master and the other cards are called expanders. PV for a multiple-card set is always tested through the master card. Test results for the expander cards will track results for the master card. In some cases, the PV software can distinguish between problems on the expander cards and the master card. In this

case, the failure counts shown on an expander card may differ from those shown for a master card. For more information, refer to the service manual of the specific measurement module of interest.

When "Test All" is selected, some of the tests will not run and will return a "Not Executed" status because operator action is required. You must select and run these tests individually. When the tests requiring user action are run, you are prompted for the specific action that is needed for successful completion of the test. When the indicated user action is performed, and the tested subsystem is operational, the specific test will return a "Passed" status.

For the Agilent Technologies 16610A Emulation Module, the test requiring user action is:

Test	User Action
Internal PV Test	A loopback connector must be installed.

For the existing 16500-series measurement modules, the tests requiring user action are:

16517A Timing Module

Test	User Action
Skew Adjust	Not a test; used for operational accuracy calibration (de-skew).

16522A Stimulus Module

Test	User Action
Output Stimulus	Not a test; provides continuous signal output Vectors.

16534A/33A Oscilloscope Module

Test	User Action
ADC Test	There must be no stimulus on the scope inputs.

16550A State and Timing Module

Test	User Action
Show Activity	Not a test; provides continuous output of signal input levels.

Passing the Frame Tests implies that all installed measurement modules are fully

operational and can communicate with the rest of the instrument.

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