

**MSO70000/C, MSO5000 Series Mixed Signal Oscilloscopes  
DSA70000B/C Series Digital Signal Analyzers  
DPO70000B/C Series Digital Phosphor Oscilloscopes  
DPO7000, DPO5000 Series Digital Phosphor Oscilloscopes  
Service Manual**



077-0076-04

**Tektronix**



**MSO70000/C, MSO5000 Series Mixed Signal Oscilloscopes  
DSA70000B/C Series Digital Signal Analyzers  
DPO70000B/C Series Digital Phosphor Oscilloscopes  
DPO7000, DPO5000 Series Digital Phosphor Oscilloscopes  
Service Manual**

This document applies to firmware version 1.0 and above.

**Warning**

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

[www.tektronix.com](http://www.tektronix.com)

077-0076-04

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- In North America, call 1-800-833-9200.
- Worldwide, visit [www.tektronix.com](http://www.tektronix.com) to find contacts in your area.

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

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

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

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# General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

*Only qualified personnel should perform service procedures.*

## To Avoid Fire or Personal Injury

**Use proper power cord.** Use only the power cord specified for this product and certified for the country of use.

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

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

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

The inputs are not rated for connection to mains or Category II, III, or IV circuits.

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

**Power disconnect.** The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

**Do not operate without covers.** Do not operate this product with covers or panels removed.

**Do not operate with suspected failures.** If you suspect that there is damage to this product, have it inspected by qualified service personnel.

**Avoid exposed circuitry.** Do not touch exposed connections and components when power is present.

**Do not operate in wet/damp conditions.**

**Do not operate in an explosive atmosphere.**

**Keep product surfaces clean and dry.**

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

**Terms in This Manual** These terms may appear in this manual:



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

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

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**Symbols and Terms on the Product**

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbol(s) may appear on the product:



# Service Safety Summary

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

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

**Disconnect Power.** To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

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

To avoid electric shock, do not touch exposed connections.





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# Preface

This manual contains service information for your instrument. Read this preface to learn how this manual is structured, the conventions it uses, and where to find additional supplemental information related to servicing this product.

You should also read the General and Service safety summaries before servicing the product.

## Manual Structure

This manual is divided into sections, which are made up of related subordinate topics. These topics can be cross referenced as sections.

Be sure to read the introductions to all procedures. These introductions provide important information needed to perform the service correctly, safely, and efficiently.

## Manual Conventions

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

### Product-Specific Information

This manual contains information that is necessary to service the following products:

- MSO5000 Series
- MSO70000 Series
- MSO70000C Series
- DSA70000B Series
- DSA70000C Series
- DPO5000 Series
- DPO7000 Series
- DPO70000B Series
- DPO70000C Series

Check for a specific product designation in the header at the top of the page, in a heading, table or figure title, or within text. Material that does not have any specific product designation applies to all products in the manual.

### Modules

Throughout this manual, any replaceable component, assembly, or part is referred to as a *module*.

**Replaceable Parts** This manual refers to any field-replaceable assembly or mechanical part specifically by its name or generically as a replaceable part. In general, a replaceable part is any circuit board or assembly, (such as the hard disk drive), or a mechanical part, (such as the I/O port connectors), that is listed in the replaceable parts list. (See page 5-1, *Replaceable Parts Overview*.)

**Safety** Symbols and terms related to safety appear in the *Service Safety Summary*.

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# Getting Started



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## Where to Find Operating Information

For information on installing, operating, and networking the instrument, refer to the online help or user manual that was provided with your oscilloscope. You can also find the manual at [www.tektronix.com/manuals](http://www.tektronix.com/manuals), by searching for your product.



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# Theory of Operation





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# Theory of Operation

This section describes the electrical operation of the instrument. The following figures show the module interconnections. (See Figure 2-1 on page 2-4.)

## Logic Conventions

The instrument contains many digital logic circuits. This manual refers to these circuits with standard logic symbols and terms. Unless otherwise stated, all logic functions are described using the positive-logic convention: the more positive of the two logic levels is the high (1) state, and the more negative level is the low (0) state. Signal states may also be described as "true" meaning their active state or "false" meaning their nonactive state. The specific voltages that constitute a high or low state vary among the electronic devices.

## Module Overviews (DPO7000 Series, DSA/DPO70000B/C Series)

Module overviews describe the basic operation of each functional circuit block.

A Microsoft Windows processor system is the primary controller of the instrument. The instrument features an XGA resolution flat-panel display, a transparent touch screen, and a front-panel with direct access to commonly used instrument functions. You can also make complete use of the instrument with a mouse and keyboard.

### Input Signal Path

A signal enters the instrument through a connection to the input connector on the front panel.

**Acquisition Board.** The acquisition board conditions the input signals and converts them to digital signals, then processes the data into a form that is handled by the display system. The acquisition system includes the multi-source trigger system, a timebase, and acquisition control circuitry, as well as a calibration reference system for internal calibration purposes. The acquisition board is located in the bottom compartment of the instrument. All input channels feature a probe interface system with the ability to recognize the probe type for proper unit display and for calibration out to the probe tip.

**Processor System.** The processor system contains a processor board with microprocessor that controls the entire instrument. The basic configuration supports input channels, provides an external trigger input, a trigger output, and a probe compensation output.

Each acquisition channel is equipped with a processor that uses its own host interface which communicates with the command interface processor.

**Display Panel** Waveforms and menus are displayed on a color, active-matrix LCD display with touch panel.

**Display System.** Text and menu image information from the Windows system is merged with the waveform images and processed by the display circuitry. The display system sends the combined graphical image to the active-matrix LCD display.

**Touch Panel.** The touch information from the touch screen is processed by a Windows driver, actively placing the pointer at the touched location. Actions from a mouse and actions from the touch panel are interchangeable, and treated alike by the user interface software.

**Front Panel** Front-panel push-button and knob encoder switches are read by an embedded micro controller, which sends the button and knob change information to the Windows system over the Universal Serial Bus path.

**ON/STBY.** The ON/STBY switch in the lower left corner of the instrument front is connected directly to the  $\mu$ ATX board which, in turn, controls the off-line power supply system. This allows Windows to control the power based on standard Windows operating behavior.

**$\mu$ ATX Board** The  $\mu$ ATX board provides standard Windows functionality and I/O port interfaces on a side or rear panel. This includes RS-232, Centronics, and Ethernet ports, as well as four USB ports, including a USB2.0 port placed in the lower right corner of the instrument front.

The  $\mu$ ATX board receives input from the Front Panel and Touch Panel, and implements the appropriate changes. Video display data, containing waveform and graphical menu information, is transferred to the Windows system through the PCIe bus interface.

The hard drive is connected to the  $\mu$ ATX board through the SATA interface, while the CD/DVD is connected to the Windows system through the IDE parallel interface. The hard drive and CD provide access to stored waveform data and software to customize your instrument with your measurement needs.

**Interface Board** This board coordinates the flow of data through the Windows PCI port from the various devices that communicate with the  $\mu$ ATX system. The devices include the display system, GPIB, TekLink, and a direct DMA path to the acquisition system.

The GPIB permits external control of the instrument both as a controller and as a slave device.

The acquisition system analog power supplies are generated on this interface board, from DC voltages supplied by the off-line power supply unit.

**Power System** The off-line power supply is a switching power converter with active power factor control. It auto detects the line voltage. It supplies power to all of the circuitry in the instrument.

No switch completely disconnects the line power from the instrument. The ON/STBY switch controls the power to the instrument through the  $\mu$ ATX board circuitry. When in the "power off" condition, there is still a low power standby circuit to allow the system to monitor the ON/STBY switch.

**Fans** For cooling, the instrument fans draw air out of the instrument, for a negatively pressured instrument. The fans are controlled by an embedded processor on the acquisition board and are regulated by monitoring the temperature of the acquisition board circuitry. Cooling air enters the instrument through specific locations on the covers, where it flows directly over the heat sinks of each high wattage component.

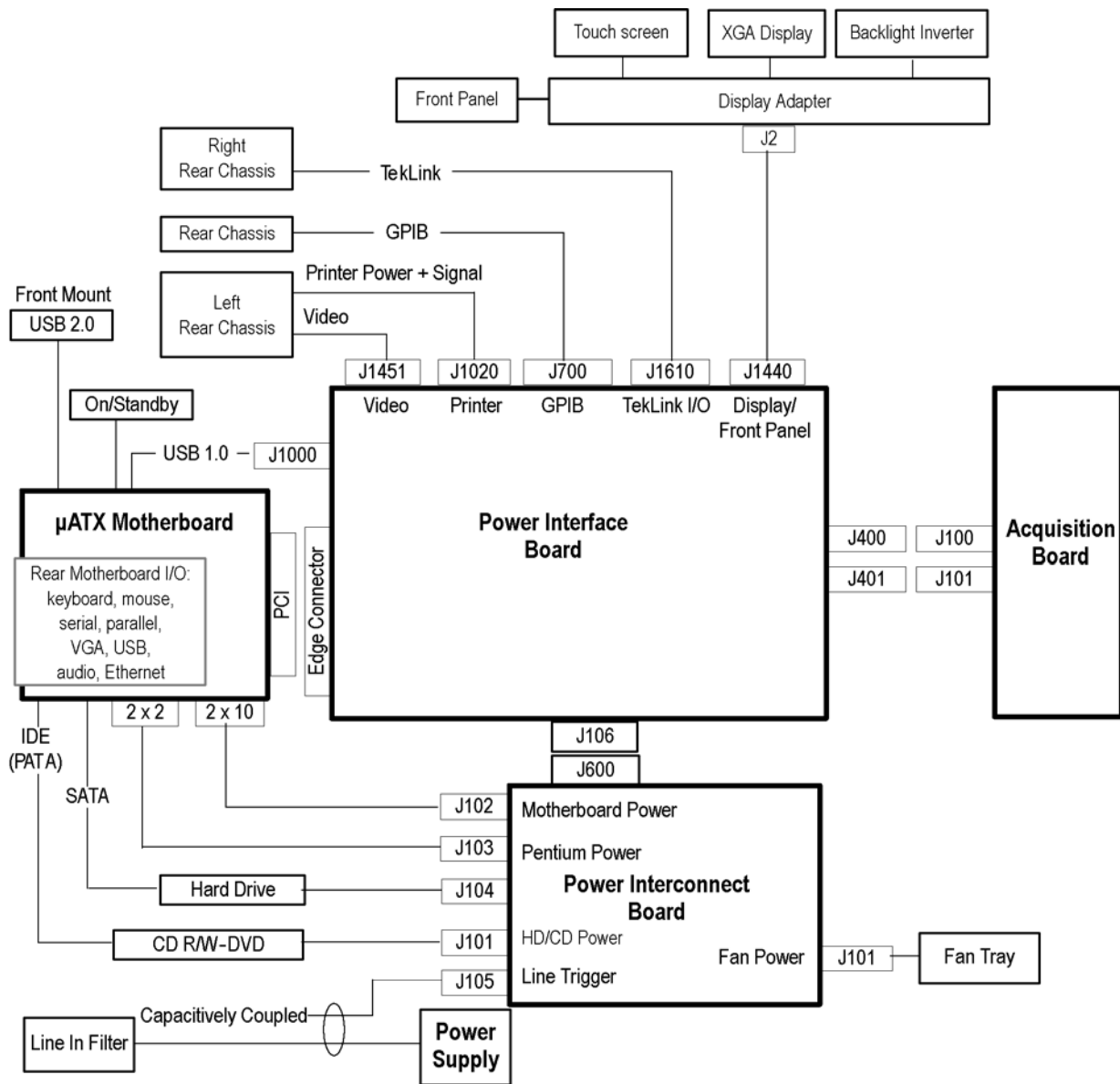


Figure 2-1: Block diagram (DPO7000 Series)

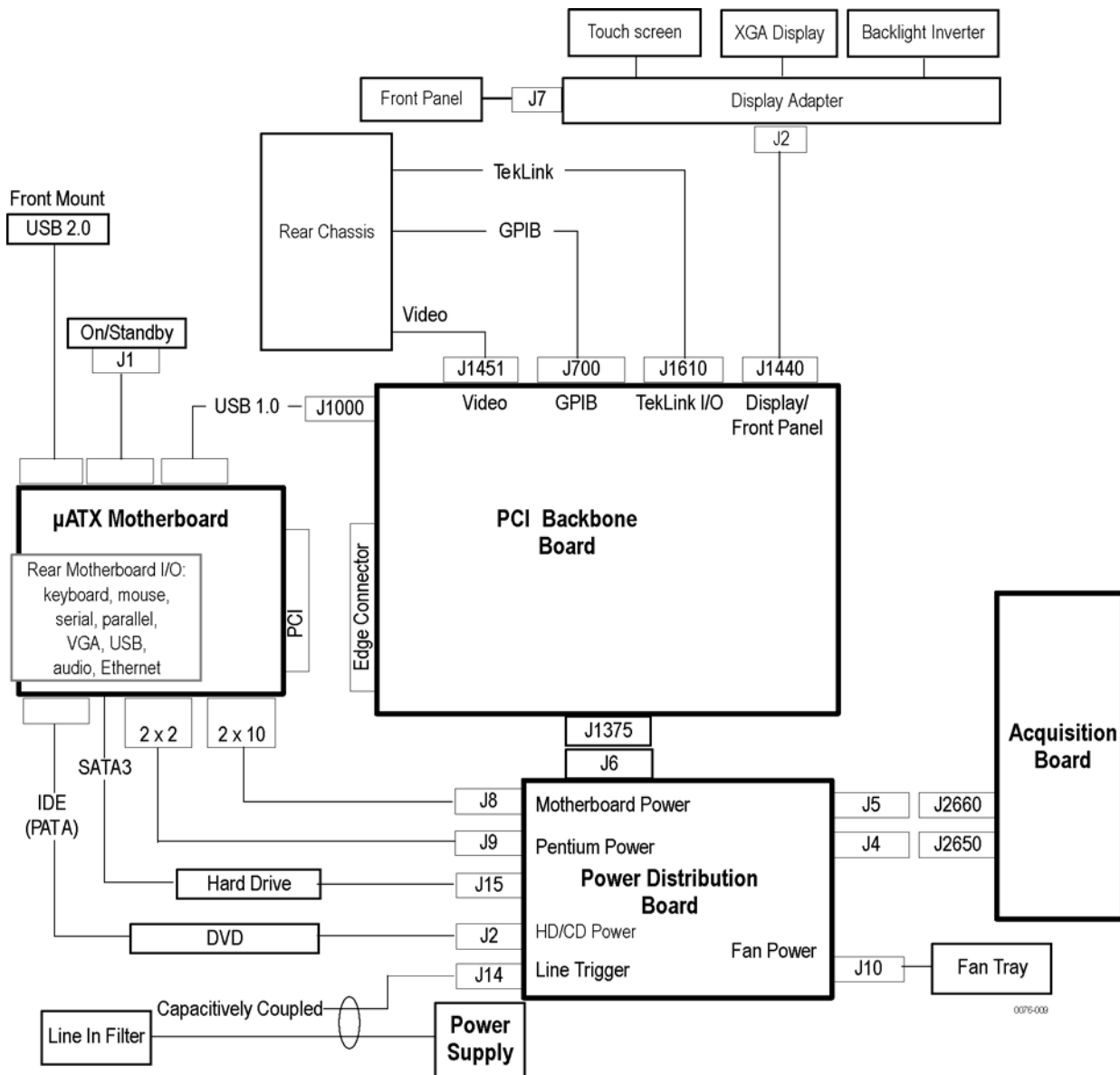


Figure 2-2: Block diagram (DSA7/DSA7000B/C Series)

## Module Overviews (MSO70000/C Series)

Module overviews describe the basic operation of each functional circuit block. (See Figure 2-3 on page 2-9.)

A Microsoft Windows processor system is the primary controller of the instrument. The instrument features a flat-panel display, a transparent touch screen, and a front-panel with direct access to commonly used instrument functions. You can also make complete use of the instrument with a mouse and keyboard.

### Input Signal Path

An analog signal enters the instrument through a connection to the input connector on the front panel.

**Acquisition Board.** The acquisition board conditions the input signals and converts them to digital signals, then processes the data into a form that is handled by the display system. The acquisition system includes the multi-source trigger system, a timebase, and acquisition control circuitry, as well as a calibration reference system for internal calibration purposes. The acquisition board is located in the bottom compartment of the instrument. All input channels feature a probe interface system with the ability to recognize the probe type for proper unit display and for calibration out to the probe tip.

**Processor System.** The processor system contains a processor board with microprocessor that controls the entire instrument. The basic configuration supports input channels, provides an external trigger input, a trigger output, and a probe compensation output.

Each acquisition channel is equipped with a processor that uses its own host interface which communicates with the command interface processor.

**MSO Module.** The MSO module contains a digital acquisition system and a word recognizer. This module processes digital signals obtained by the 17-channel Logic Probe (16 data channels, 1 Clk/Q channel). The logic channels from the front panel are applied to the word recognizer, and are also routed to the analog acquisition board. The MSO module applies each channel to three paths:

- An analog path, which goes to an analog multiplexer that selects any four of the 17 logic probe channels to use for the iCapture display.
- A digital path, which acquires a digitized version of each of the channels and stores it in memory.
- A digital WORD trigger path, where the user can specify a trigger condition that will trigger the oscilloscope. This trigger condition, or word, can consist of any boolean combination (using AND, NAND, OR, and NOR) of the 16 digitally acquired channels. In addition, the Clk/Q channel can be used to qualify the WORD trigger.

The word trigger pattern values are 0, 1, and DON'T CARE.

For more information on using the WORD trigger, please refer to the online help or user manual, which were provided with your product. You can also find the manual at [www.Tektronix.com/manuals](http://www.Tektronix.com/manuals), by searching for your product.

- Display Panel** Waveforms and menus are displayed on a color, active-matrix LCD display with touch panel.
- Display System.** Text and menu image information from the Windows system is merged with the waveform images and processed by the display circuitry. The display system sends the combined graphical image to the active-matrix LCD display.
- Touch Panel.** The touch information from the touch screen is processed by a Windows driver, actively placing the pointer at the touched location. Actions from a mouse and actions from the touch panel are interchangeable, and treated alike by the user interface software.
- Front Panel** Front-panel push-button and knob encoder switches are read by an embedded micro controller, which sends the button and knob change information to the Windows system over the Universal Serial Bus path.
- ON/STBY.** The ON/STBY switch in the lower left corner of the instrument front is connected directly to the  $\mu$ ATX board which, in turn, controls the off-line power supply system. This allows Windows to control the power based on standard Windows operating behavior.
- $\mu$ ATX Board** The  $\mu$ ATX board provides standard Windows functionality and I/O port interfaces on the rear panel. This includes DVI-1 video, RS-232, Centronics, and Ethernet ports, as well as four USB ports, including a USB2.0 port placed in the lower right corner of the instrument front.
- The  $\mu$ ATX board receives input from the Front Panel and Touch Panel, and implements the appropriate changes. Video display data, containing waveform and graphical menu information, is transferred to the Windows system through the PCIe bus interface.
- The hard drive and the CD/DVD are connected to the  $\mu$ ATX board through SATA interfaces. The hard drive and CD provide access to stored waveform data and software to customize your instrument with your measurement needs.
- Interface Board** This board coordinates the flow of data through the Windows PCIe port from the various devices that communicate with the  $\mu$ ATX system. The devices include the display system, GPIB, TekLink, and a direct DMA path to the acquisition system.
- The GPIB permits external control of the instrument both as a controller and as a slave device.

The acquisition system analog power supplies are generated on this interface board, from DC voltages supplied by the off-line power supply unit.

**Power System** The off-line power supply is a switching power converter with active power factor control. It auto detects the line voltage. It supplies power to all of the circuitry in the instrument.

No switch completely disconnects the line power from the instrument. The ON/STBY switch controls the power to the instrument through the  $\mu$ ATX board circuitry. When in the "power off" condition, there is still a low power standby circuit to allow the system to monitor the ON/STBY switch.

**Fans** For cooling, the instrument fans draw air out of the instrument, for a negatively pressured instrument. The fans are controlled by an embedded processor on the acquisition board and are regulated by monitoring the temperature of the acquisition board circuitry. Cooling air enters the instrument through specific locations on the covers, where it flows directly over the heat sinks of each high wattage component.



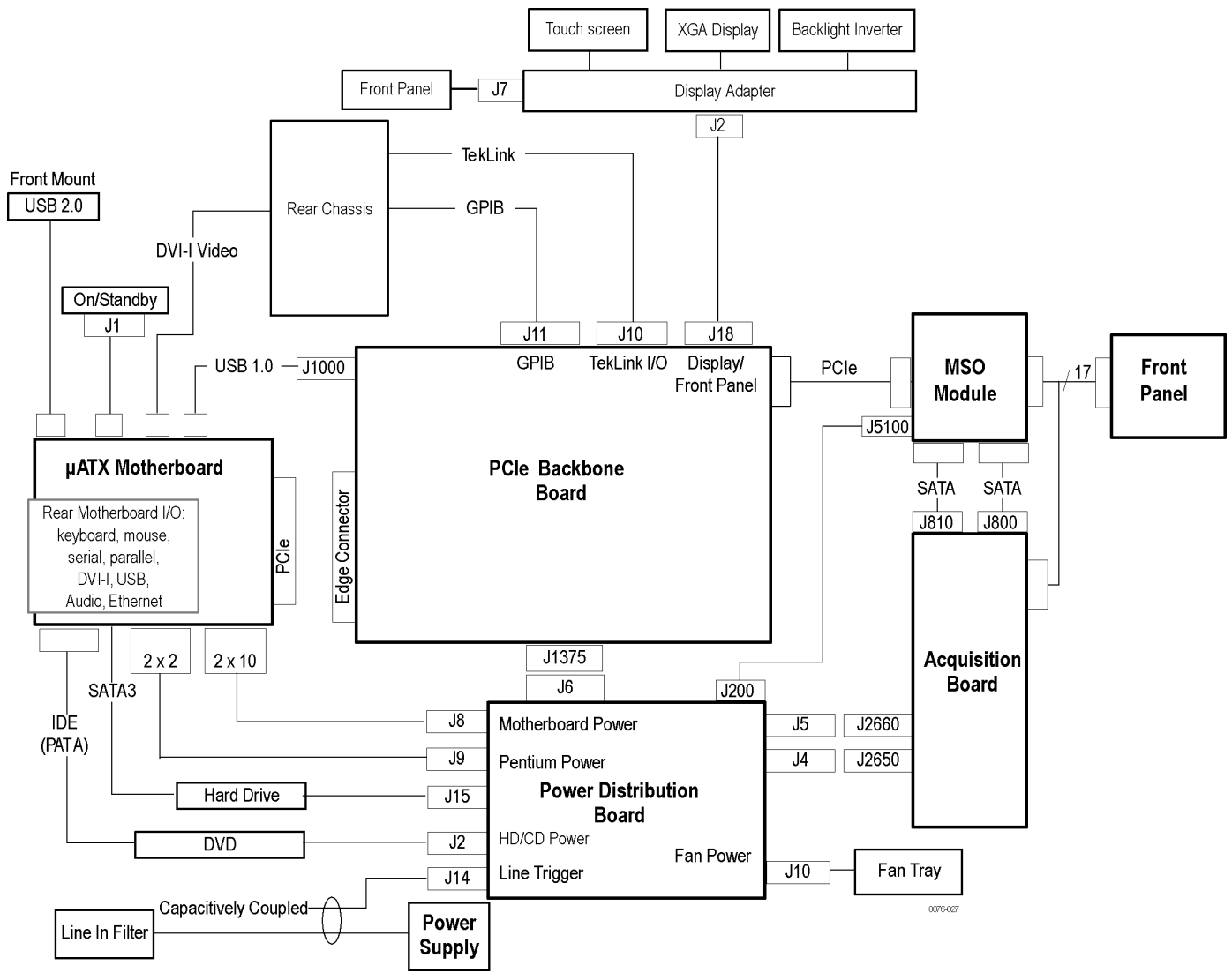


Figure 2-3: Block diagram (MSO7000/C Series)

## Module Overviews (MSO/DPO5000 Series)

The module overviews describe the basic operation of each functional circuit block. (See Figure 2-4 on page 2-13.)

A Microsoft Windows processor system is the primary controller of the instrument. The instrument features a flat-panel display, a transparent touch screen, and a front-panel with direct access to commonly used instrument functions. You can also make complete use of the instrument with a mouse and keyboard.

### Input Signal Path

An analog signal enters the instrument through a connection to an input connector on the front panel.

#### Main Acquisition Board.

Each channel on the Analog board comes onto the Main board and is routed to two of the analog-to-digital converters (A/Ds) on the Main board. Triggers from the Analog board go to the trigger ASIC. The A/D digitizes your signal and sends it to one or two of the four demuxes on the Main board. The demux sends the data to on-board DDR2 acquisition memory.

The demuxes are tied together through two busses, an LVDS ring bus (IDC) and a 3.3 V parallel bus (PA). The demux interacts with the trigger ASIC and also performs display functions. For MSO models, the trigger ASIC also performs the acquisition function for the digital probe, which connects directly to the Main board. The acquisition data and display data are sent by the IDC and PA buses to the SMIA FPGA, which controls various acquisition functions. The SMIA controls acquisition devices through the SPI, IIC, PA, IDC, and GPIO busses. The SMIA communicates through a local bus to the PLX device. The PLX device provides a PCIe interface to the host computer module. The Main board contains many local switching power supplies to support all of the acquisition and trigger ASICs.

#### Analog Acquisition Board.

The signal enters the instrument through a front-panel BNC connector, which is connected to the Analog board. The Analog board contains the 50  $\Omega$  and 1M  $\Omega$  paths to the pre-amp ASIC (preamp). The higher bandwidth boards have two preamps per channel, and the lower bandwidth boards have one preamp per channel. The 1M  $\Omega$  path has an attenuator network, which allows the routing of various gain settings into the preamp.

The Analog board has a calibrated voltage reference (CVR), which is used to calibrate the signal path. The Analog board has a microprocessor that handles various communication and calibration algorithms. The Analog board is controlled through the SPI bus. The preamp has outputs that go to the A/D and the trigger ASIC on the Main board. Hardware filters limit the bandwidth of the instrument on the output of the preamps before the signal goes off board to the A/D.

**Display Panel** Waveforms and menus are displayed on a color, active-matrix LCD display with touch panel.

**Display System.** Text and menu image information from the Windows system is merged with the waveform images and processed by the display circuitry. The display system sends the combined graphical image to the active-matrix LCD display.

**Touch Panel.** The touch information from the touch screen is processed by a Windows driver, actively placing the pointer at the touched location. Actions from a mouse and actions from the touch panel are interchangeable, and treated alike by the user interface software.

**Front Panel** The Front-panel board takes input from buttons and knobs and controls the status LEDs. The Front-panel board communicates to the Main board and to the host through an IIC interface. A microcontroller on the Front-panel board performs all of the I/O functions. The Front-panel board interacts with and provides power for the probes, through the VPI interface. The Front-panel board also generates probe calibration and compensation signals.

**Power.** The power switch in the lower left corner of the instrument front is connected via a flex circuit to the Front-panel board, which, in turn, controls the off-line power supply system. This allows Windows to control the power based on standard Windows operating behavior.

**COM-E Interface Board** The COM-E Interface board implements the PC I/O functions, such as USB, PS/2, VGA, and Audio. This board also routes the PCIe interface to the Main board for the acquisition system. The instrument hard drive connects directly to this board. The Interface board takes bulk 12 volts power from the power supply and routes it to the Main board. External VPI power is routed through this board, as are the Ref In, Aux Out, and USB device ports. The 5 volt and 3.3 volt local switching power supplies are located on this board. A microcontroller controls power sequencing and power supply monitoring. This microcontroller communicates to devices on the Main board through the IIC interface.

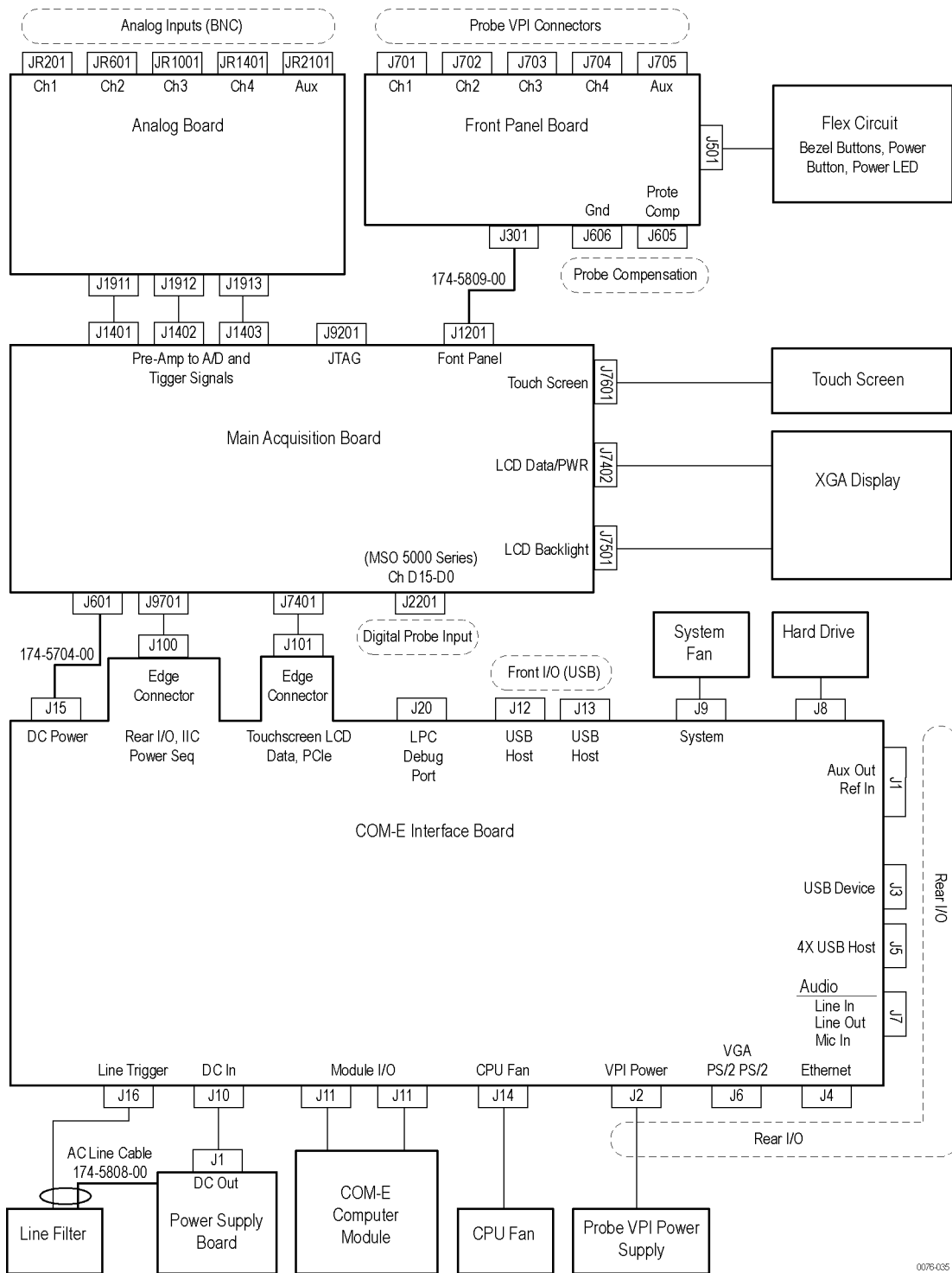
The COM-E Interface board is a carrier board for a COM-E module.

**COM-E Module.** This module implements the PC that is integrated into the instrument. This module connects to the COM-E Interface board. The module contains the CPU, Memory, and Peripheral Controller Hubs (such as PCH, North Bridge, and/or South Bridge). The module conforms to the COM-E specification maintained by the PCMIG consortium with a Type-2 connector system. The module is connected to the system through two board-to-board 220-pin mezzanine connectors. The power, PCIe, USB, and video connect to the COM-E Interface board through this connector. A high-performance heat sink cools the main heat-generating devices on this board.

**Power System** A 250 W power supply generates a switched 12 volt bulk supply as well as a 5 volt standby supply.

No switch completely disconnects the line power from the instrument. The power switch controls the power to the instrument through the COM-E board circuitry. When the instrument is in the "power off" condition, there is still a low power standby circuit to allow the system to monitor the power switch.

**Fans** There are two instrument fans: the system fan, which is mounted on the rear chassis, and a smaller fan, which is mounted on the COM-E module. For cooling, the system fan draws air into the instrument, for a positively pressured instrument. The system fan is controlled by an embedded processor on the Main board and is regulated by monitoring the temperature of the Analog acquisition board circuitry. Cooling air enters the instrument through specific locations on the covers, where it flows directly over the heat sinks of each high wattage component. The COM-E fan cools the COM-E module.



0076-035

Figure 2-4: Block diagram (MSO/DPO5000 Series)



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# Adjustment Procedures





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# Adjustment Procedures

This chapter contains information about instrument adjustment.

## Adjustment Interval

The voltage and timing references inside the instrument are very stable over time and should not need routine adjustment.

If the instrument fails the performance tests in the Specifications and Performance Verification manual, adjustment may be required. This manual was provided with your product, and can also be found at [www.tektronix.com/manuals](http://www.tektronix.com/manuals) by searching for your product.

If periodic calibration is one of your requirements, a general rule is to verify performance and make adjustments (only if needed) every 2000 hours of operation or once a year if the instrument is used infrequently.

## Adjustment After Repair

After removal and replacement of a module, you must perform the Performance Verification procedure, found in the Specifications and Performance Verification manual. This manual was provided with your product, and can also be found at [www.tektronix.com/manuals](http://www.tektronix.com/manuals) by searching for your product.

If the instrument fails the Performance Verification tests, it must be returned to Tektronix for calibration.

## Adjustment

Adjustment can be performed only by a Tektronix Service Center. See Contacting Tektronix, following the title page in this manual, for information on contacting Tektronix Service Support.



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# Maintenance



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# Maintenance

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

- *Preventing ESD* – General information on preventing damage by electrostatic discharge.
- *Inspection and Cleaning* – Information and procedures for inspecting the instrument and cleaning its external and internal modules.
- *Repackaging Instructions* – Information on returning an instrument for service.
- *Removal and Installation Procedures* – Procedures for the removal of defective modules and replacement of new or repaired modules. Also included is a procedure for disassembly of the instrument for cleaning.
- *Troubleshooting* – Information for isolating and troubleshooting failed modules. Included are instructions for operating the instrument diagnostic routines and troubleshooting trees. Most of the trees make use of the internal diagnostic routines to speed fault isolation to a module.

## Preventing ESD

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



**CAUTION.** *Static discharge can damage any semiconductor component in this instrument.*

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

1. Minimize handling of static-sensitive circuit boards and components.
2. Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive boards.
3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules. Service static-sensitive modules only at a static-free work station.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Handle circuit boards by the edges when possible.

6. Do not slide the circuit boards over any surface.
7. Avoid handling circuit boards in areas that have a floor or work-surface covering capable of generating a static charge.

## Inspection and Cleaning

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

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

How often to perform maintenance depends on the severity of the environment in which the instrument is used. A proper time to perform preventive maintenance is just before instrument adjustment.

**General Care** The cabinet helps keep dust out of the instrument and should normally be in place when operating the instrument.

**Interior Cleaning** Use a dry, low-velocity stream of air to clean the interior of the chassis. Use a soft-bristle, non-static-producing brush for cleaning around components. If you must use a liquid for minor interior cleaning, use a 75% isopropyl alcohol solution and rinse with deionized water.



**WARNING.** To avoid electric shock or damage to the instrument, remove instrument power. Before performing any procedure that follows, power down the instrument and disconnect it from line voltage.

---

**Exterior Cleaning** Clean the exterior surfaces of the chassis with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, use a cloth or swab dipped in a 75% isopropyl alcohol solution. Use a swab to clean narrow spaces around controls and connectors. Do not use abrasive compounds on any part of the chassis that may damage the chassis.

Clean the On/Standby switch using a dampened cleaning towel. Do not spray or wet the switch itself.



**CAUTION.** Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use only deionized water when cleaning the menu buttons or front-panel buttons. Use a 75% isopropyl alcohol solution as a cleaner and rinse with deionized water. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

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**Inspection – Exterior.** Inspect the outside of the instrument for damage, wear, and missing parts. (See Table 4-1.) Immediately repair defects that could cause personal injury or lead to further damage to the instrument.

**Table 4-1: External inspection checklist**

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

### Flat Panel Display Cleaning

The display is a soft plastic display and must be treated with care during cleaning.



**CAUTION.** *Improper cleaning agents or methods can damage the flat panel display.*

*Avoid using abrasive cleaners or commercial glass cleaners to clean the display surface.*

*Avoid spraying liquids directly on the display surface. Avoid scrubbing the display with excessive force.*

Clean the flat panel display surface by gently rubbing the display with a clean-room wipe (such as Wypall Medium Duty Wipes, #05701, available from Kimberly-Clark Corporation).

If the display is very dirty, moisten the wipe with distilled water or a 75% isopropyl alcohol solution and gently rub the display surface. Avoid using excess force or you may damage the plastic display surface.



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

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

Inspect the internal portions of the instrument for damage and wear. (See Table 4-2.) Defects should be repaired immediately.

If any circuit board is repaired or replaced, you must perform the Performance Verification procedure in the specifications and performance verification manual, which was provided with your instrument. This manual is also available at [www.tektronix.com/manuals](http://www.tektronix.com/manuals), by searching for your product name. If the instrument fails the Performance Verification tests, it must be returned to Tektronix for calibration.



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

**Table 4-2: Internal inspection checklist**

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



**Cleaning Procedure – Interior.** To clean the instrument interior, perform the following steps:

1. Blow off dust with dry, low-pressure, deionized air (approximately 9 psi).
2. Remove any remaining dust with a lint-free cloth dampened in isopropyl alcohol (75% solution) and rinse with warm deionized water. (A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards).

---

**NOTE.** *If, after doing steps 1 and 2, a module is clean upon inspection, skip the remaining steps.*

---

3. If steps 1 and 2 do not remove all the dust or dirt, the instrument may be spray washed using a solution of 75% isopropyl alcohol by doing steps 4 through 8.
4. Gain access to the parts to be cleaned by removing easily accessible shields and panels. (See page 4-7, *Removal and Installation Overview*.)
5. Spray wash dirty parts with the isopropyl alcohol and wait 60 seconds for the majority of the alcohol to evaporate.
6. Use hot (120 °F to 140 °F) deionized water to thoroughly rinse them.
7. Dry all parts with low-pressure, deionized air.
8. Dry all components and assemblies in an oven or drying compartment using low-temperature (125 °F to 150 °F) circulating air.

**Lubrication.** There is no periodic lubrication required for this instrument.

## Returning the Instrument for Service

When repacking the instrument for shipment, use the original packaging. If the packaging is unavailable or unfit for use, contact your local Tektronix representative to obtain new packaging.

Seal the shipping carton with an industrial stapler or strapping tape.

Before returning the instrument for service, contact the Service Center to get an RMA (return material authorization) number, and any return or shipping information you may need.

If the instrument is being shipped to a Tektronix Service Center, enclose the following information:

- The RMA number.
- The owner's address.
- Name and phone number of a contact person.
- Type and serial number of the instrument.
- Reason for returning.
- A complete description of the required service.

Mark the address of the Tektronix Service Center and the return address on the shipping carton in two prominent locations.

# Removal and Installation Overview

This section contains information about removal and installation of all modules.

## Preparation



**WARNING.** Before performing this or any other procedure in this manual, read the safety summaries found at the beginning of this manual. Also, to prevent possible injury to service personnel or damage to the instrument components, read *Installation*, and *Preventing ESD* in this section.

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

**NOTE.** Read the cleaning procedure before disassembling the instrument for cleaning.

**Required Equipment.** Most modules in the instrument can be removed with a screwdriver handle mounted with a size T-15, Torx® screwdriver tip. All equipment required to remove and reinstall the modules is listed in the following table.

**Table 4-3: Required equipment for module removal**

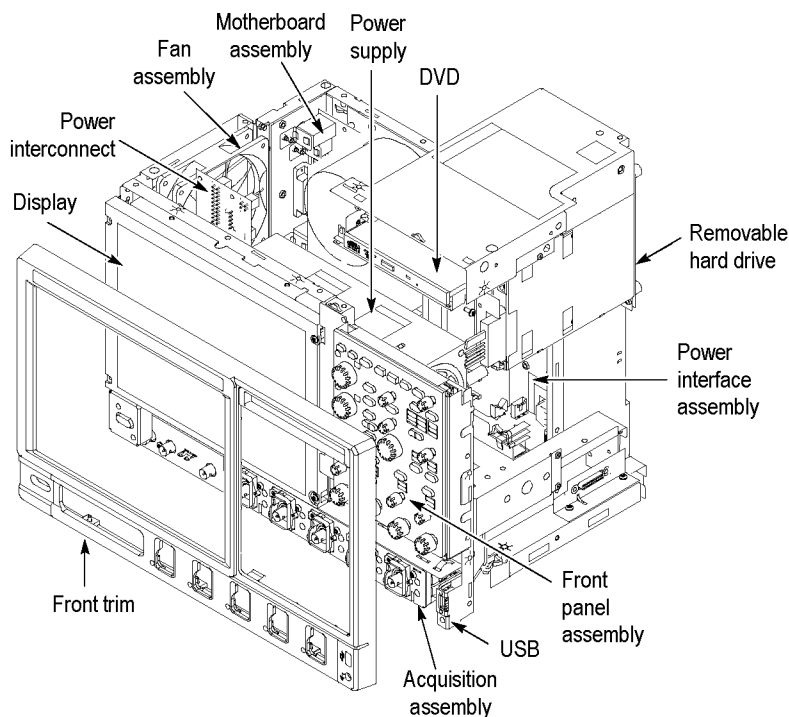
Item no.	Name	Description	General Tool number
1	Screwdriver handle	Accepts Torx-driver bits	620-440
2	T-10 Torx tip	Used for removing instrument screws. Torx-driver bit for T-10 size screw heads	640-235
3	T-15 Torx tip	Used for removing most instrument screws. Torx-driver bit for T-15 size screw heads	640-247
4	1/8 inch flat-bladed screwdriver	Screwdriver for unlocking cable connectors	Standard tool
5	#0 Phillips screwdriver	Screwdriver for removing small Phillips screws, CDRW & hard drive	Standard tool
6	Angle-Tip Tweezers	Used to remove front panel knobs	Standard tool
7	3/16 inch open-end wrench	Used to remove nut posts	Standard tool
8	9/32 inch open-end wrench	Used to remove nut posts	Standard tool
9	MA-800G Soldering Aid	Used to remove the front panel trim	Standard tool

## Module Removal (DPO7000 Series)

To remove a module, refer to the module locator. (See Figure 4-1.)

You can also refer to the exploded view diagrams.(See page 5-2, *Using the Replaceable Parts List.*)

To access the modules, refer to the module removal table. (See Table 4-4 on page 4-9.)



**Figure 4-1: DPO7000 Series module locations**

Table 4-4: DPO7000 Series module removal

	You must first remove					
	Trim & covers	DVD	Hard drive	Acquisition assembly	Power supply	Power interface
Front panel	X					
Display	X					
Front USB	X					
DVD	X					
Hard drive	X	X				
uATX motherboard	X			X		X
Power interface	X			X		
Acquisition assembly	X					
Power supply	X	X	X			
Power interconnect	X	X	X		X	
Fan assembly	X					
Power button	X					

## Module Removal (DSA/DPO70000B Series)

To remove a module, refer to the module locator. (See Figure 4-2.)

You can also refer to the exploded view diagrams. (See page 5-2, *Using the Replaceable Parts List*.)

To access the modules, refer to the module removal table. (See Table 4-5 on page 4-11.)

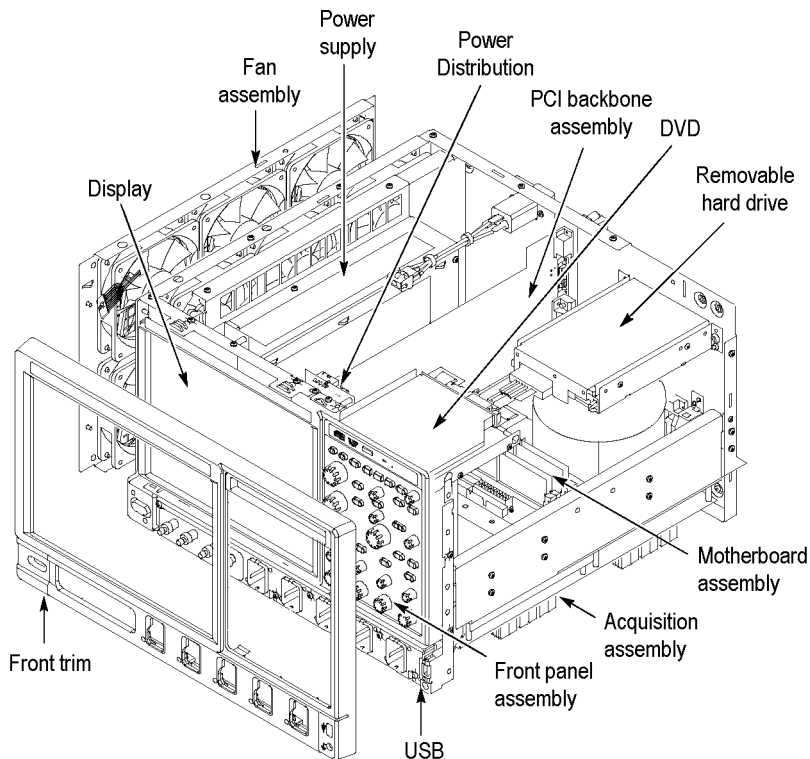


Figure 4-2: Module locations (DSA/DPO70000B Series)

**Table 4-5: Module removal (DSA/DPO70000B Series)**

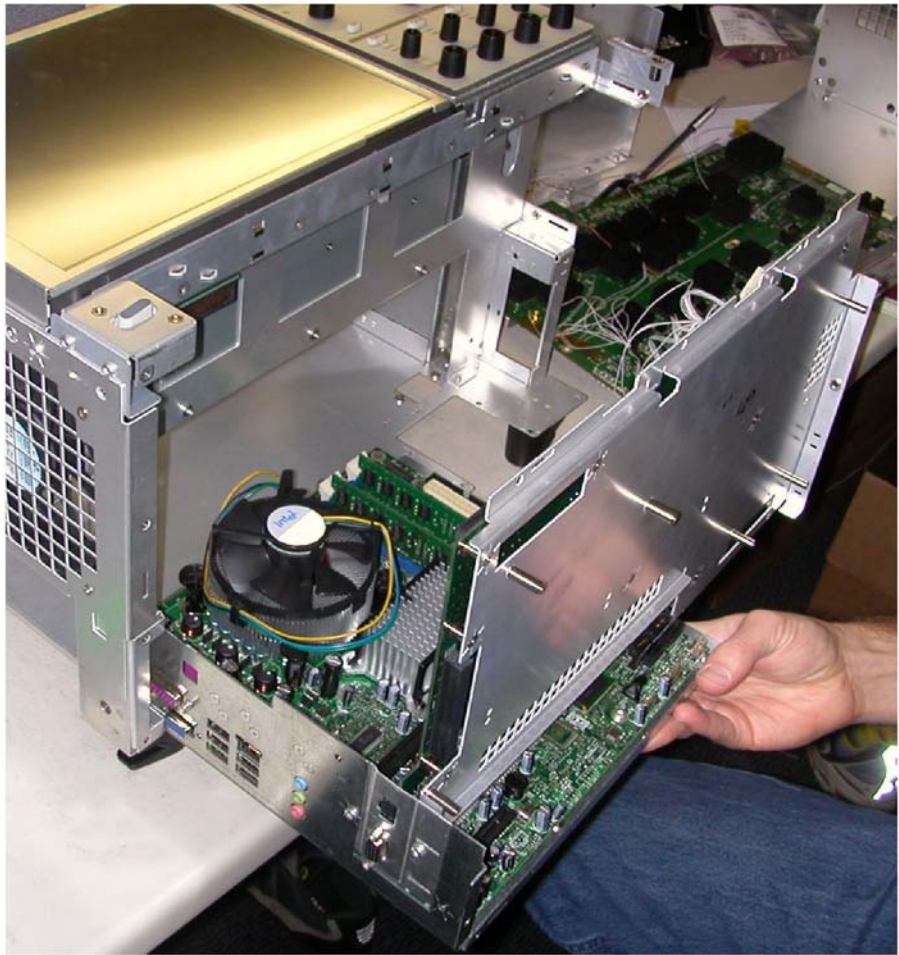
	<b>You must first remove</b>						
	Trim & cosmetic covers	ESD (electrostatic discharge) Covers	DVD	Hard drive	Acquisition assembly	Power supply	PCI backbone
Front panel and Display	X						
Front USB	X	Bottom			X		
DVD	X	Top					
Hard drive cable and bracket	X	Top					
µATX motherboard	X	Top					X
PCI backbone	X	Top					
Acquisition assembly	X	Bottom					
Power supply	X	Top					
Power distribution	X	Both			X	X	X
Fan assembly	X						
Power button	X	Bottom					

## μATX and Power Interface Removal (DPO7000 Series)

Removal of the μATX motherboard and the Power Interface assembly is a complex process. To access or replace either one, remove both the μATX motherboard and the Power Interface board as an assembly. This procedure assumes the Acquisition board has been removed.

1. Working from the top of the instrument, unplug the cables connecting the μATX and Power interface boards to other parts of the instrument. Note where each cable connects.
2. Remove the screw securing the μATX board to the chassis on the right side of the instrument, near the TekLink connector.
3. Remove the eight screws securing the μATX board to the chassis through the back of the instrument.
4. Remove the three screws securing the μATX board to the chassis on the left side of the instrument.
5. Position the instrument on its back, with the bottom facing you.
6. Remove the three screws securing the Power Interface assembly to the chassis, along the top edge of the assembly.
7. Pull the μATX/Power Interface assembly out of the instrument. (See Figure 4-3.) It may take some force to pull it free. Use a soldering aid to pry the assembly free of the connectors near the top corners of the assembly, if necessary.





**Figure 4-3: Removing the μATX/Power Interface assembly**

8. Install the μATX/Power Interface assembly by performing these steps in reverse order.

## Module Removal (MSO/DPO5000 Series)

To work on the instrument, place it face down in its protective front cover. You can remove the tabs from the cover if you want to make it easy to move the instrument in and out of the cover while working on it.

To remove a module, refer to the module locator. (See Figure 4-4.) You can also refer to the exploded view diagrams and parts lists. (See page 5-54, *Replaceable Parts (MSO/DPO5000 Series)*.) The parts lists show how many of each type of screw are used to attach each replaceable assembly.

Requirements when removing assemblies:

- To remove any of the assemblies, except the removable hard drive, you must first remove the rear cover and separate the front chassis from the rear chassis.
- To remove the COM-E Interface board assembly (which includes the COM-E module), you must first disconnect the bracket under the board from the rear chassis. Screws attach this bracket from both the top and the bottom. You should not need to separate the COM-E module from the COM-E Interface board; however, the module fan is replaceable. The part numbers and attaching screws are shown in the replaceable parts list. (See Table 5-28 on page 5-58.)
- To remove the Front Panel board assembly or the front panel case assembly, you must first remove the Main board, the Analog board, and the front chassis.

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**NOTE.** *Contact Tektronix if troubleshooting shows that you need to have either the Analog board or the Main board replaced. The instrument must be returned to Tektronix to have the board or boards replaced.*

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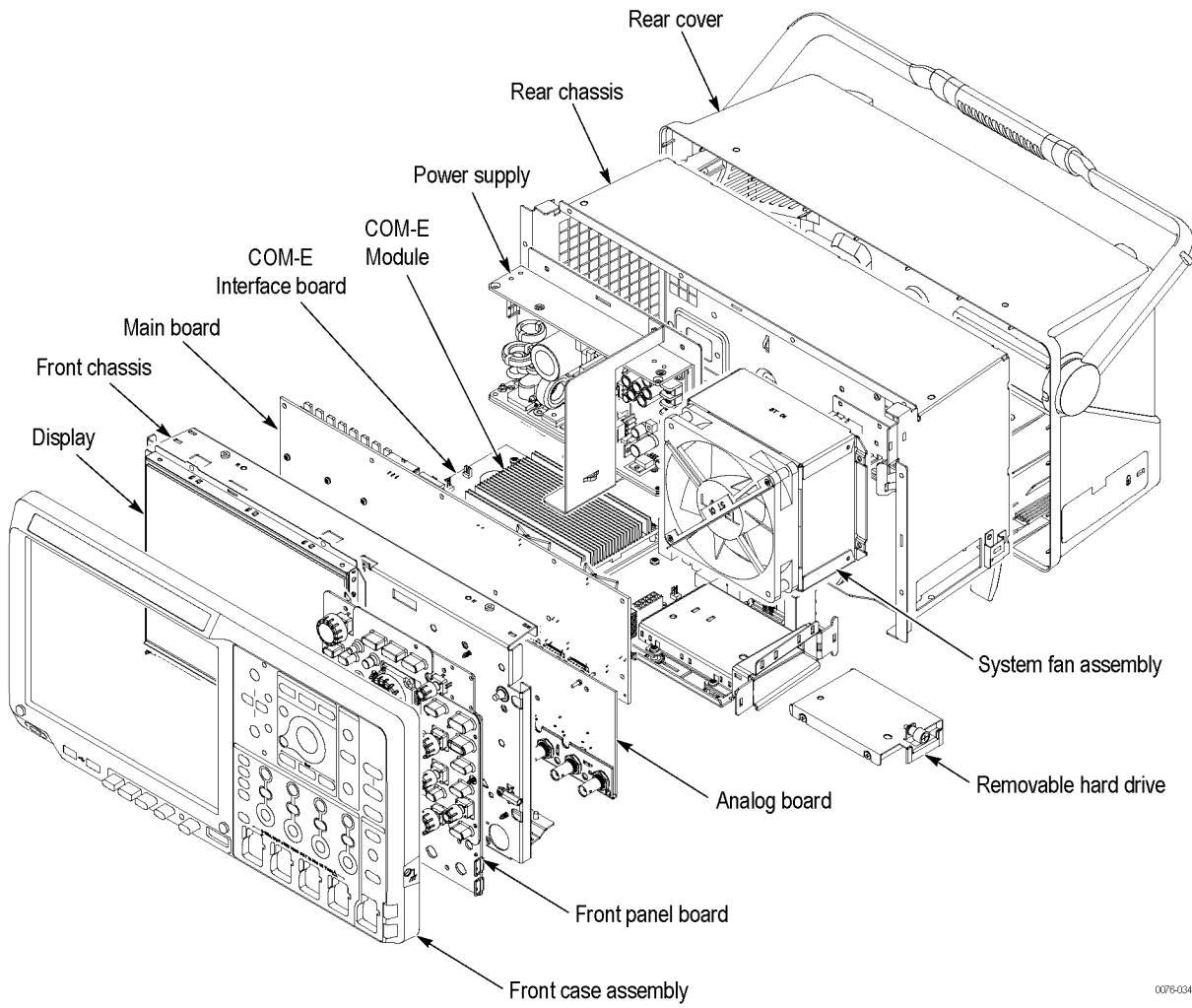


Figure 4-4: Module locations (MSO/DPO5000 Series)

# Troubleshooting (DPO7000 Series, MSO70000/C Series, DSA/DPO70000B/C Series)



**CAUTION.** Before performing this or any other procedure in this manual, read the General Safety Summary and Service Safety Summary found at the beginning of this manual.

To prevent possible injury to service personnel or damage to electrical components, please read information on Preventing ESD. (See page 4-1, Preventing ESD.)

---

This section contains information and procedures designed to help you isolate faults to a module.

This section requires that service personnel have the appropriate skills to work on this instrument, including PC troubleshooting and Microsoft Windows operating system skills. Details of PC and Windows operation and service are not in this manual.

For assistance, contact your local Tektronix Service Center.

## Service Level

This subsection contains information and procedures designed to help you isolate faulty modules in the instrument. If a module needs to be replaced, follow the Removal and Installation Procedures located in this section.

## Check for Common Problems

Use the following table to quickly isolate possible failures. The table lists problems and possible causes. The list is not exhaustive, but it may help you eliminate a problem that is quick to fix, such as a blown fuse or loose cable.

**Table 4-6: Failure symptoms and possible causes**

Symptom	Possible cause(s)
Instrument will not power on	<ul style="list-style-type: none"><li>■ Power cord not plugged in</li><li>■ Faulty power supply</li><li>■ Faulty power interconnect board</li></ul>

---

**Table 4-6: Failure symptoms and possible causes (cont.)**

<b>Symptom</b>	<b>Possible cause(s)</b>
Front panel light comes on (instrument powers on), but one or more fans will not operate	<ul style="list-style-type: none"> <li>■ Faulty fan cable</li> <li>■ Defective fan assembly</li> <li>■ Faulty power supply</li> <li>■ Faulty <math>\mu</math>ATX Motherboard</li> <li>■ Faulty CPU</li> <li>■ <math>\mu</math>ATX Motherboard power problem</li> </ul>
Hard disk drive related symptoms	<ul style="list-style-type: none"> <li>■ Defective hard disk drive</li> <li>■ Incorrect hard disk type selected in the BIOS setup</li> <li>■ Replaceable hard disk drive not installed</li> <li>■ Power supply failure</li> <li>■ Corrupted BIOS module firmware, reinstall firmware</li> <li>■ Loose cable</li> <li>■ Corrupted OS image</li> </ul>
DVD-ROM related symptoms	<ul style="list-style-type: none"> <li>■ Defective CDRW-ROM</li> <li>■ Defective CDRW-ROM drive cable</li> <li>■ Defective CDRW-ROM board</li> <li>■ Incorrect CDRW-ROM configuration in the BIOS setup</li> </ul>
Flat-panel display blank	<ul style="list-style-type: none"> <li>■ Video adapter set to Integrated (connect monitor to <math>\mu</math>ATX VIDEO port, enter BIOS, set Video Adapter = PCI)</li> <li>■ BIOS setting not Advance &gt; Video Configuration &gt; Primary Video Adapter = PCI</li> <li>■ Defective cable from display adapter board to power interface board</li> <li>■ Defective cable from inverter board to display adapter board</li> <li>■ Defective cable from inverter board to backlighting display lamp</li> <li>■ Defective backlighting display lamp</li> <li>■ Faulty display</li> <li>■ Faulty power interface board</li> <li>■ Faulty power interconnect board</li> <li>■ Faulty inverter board</li> <li>■ Faulty display adapter board</li> </ul>
BIOS error messages	<ul style="list-style-type: none"> <li>■ Refer to the BIOS error message information</li> </ul>

**Equipment Required** You will need a digital voltmeter to check power supply voltages.

**Fault Isolation Procedure** Follow the primary troubleshooting tree for fault isolation. (See Figure 4-5.) This tree calls for you to run the diagnostics programs, and check for BIOS errors.

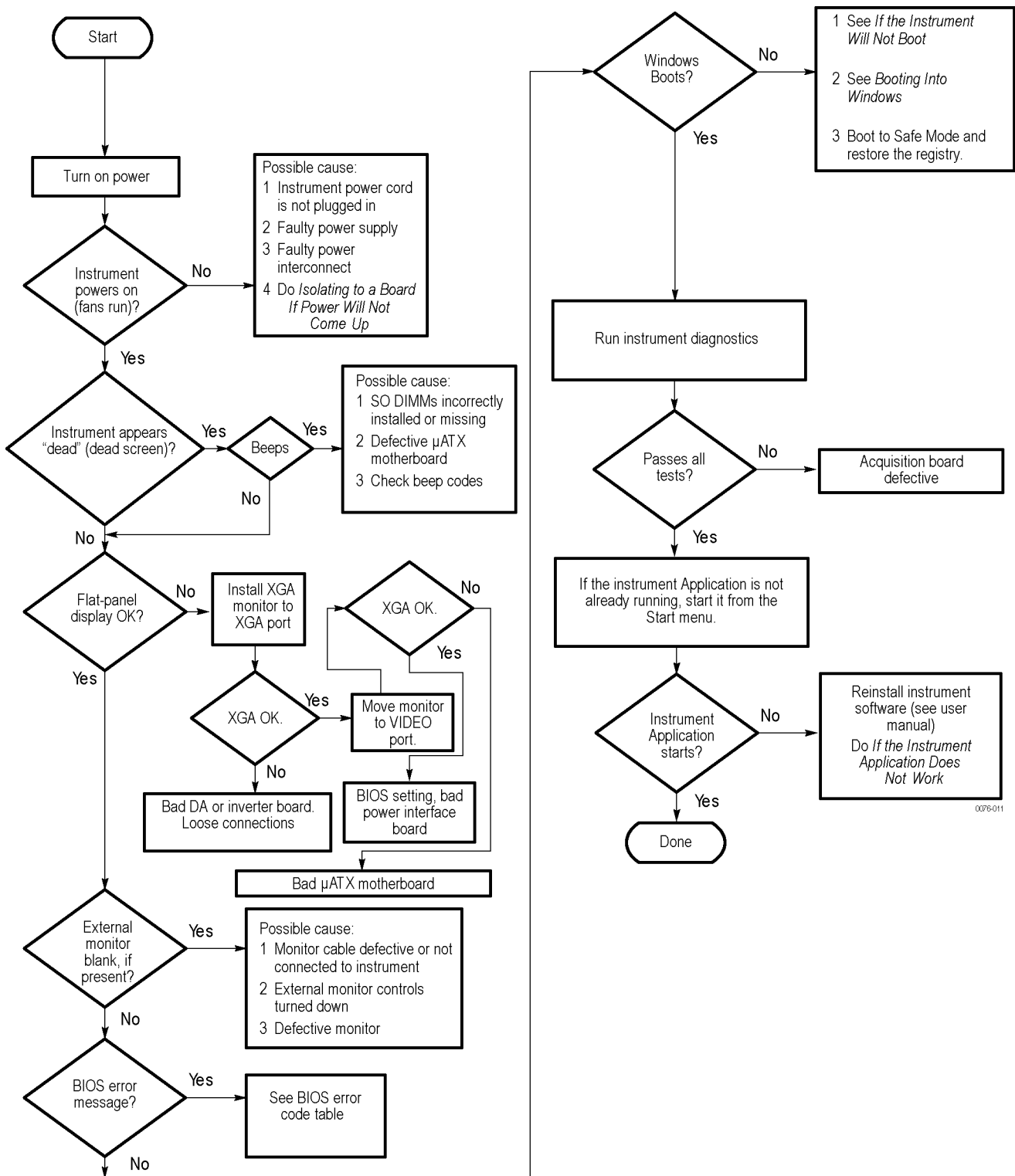
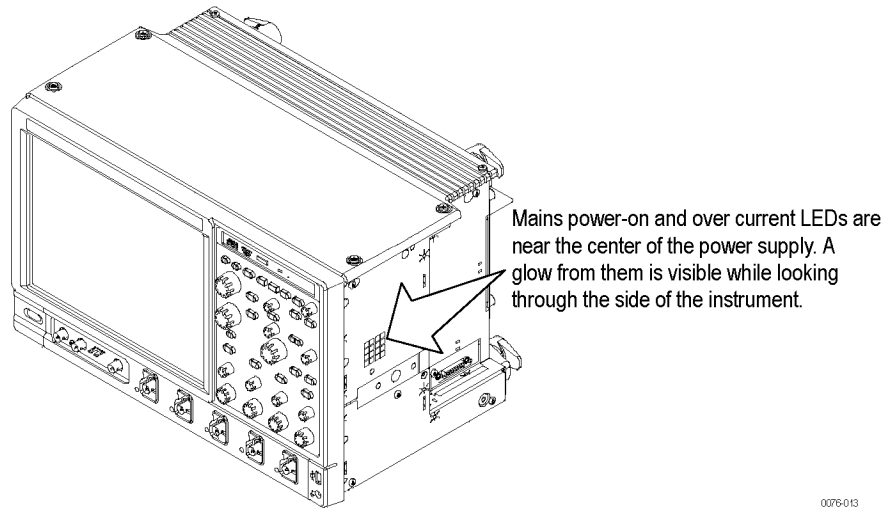


Figure 4-5: Primary troubleshooting tree

**Isolating to a Board if Power Will Not Come Up, DPO7000 Series.** If the instrument is in standby mode (plugged in, but not turned on), a red light is visible through the right side of the instrument. The location of the red light is shown in the following illustration. (See Figure 4-6.)

If the instrument is On, the red light should be off. A red light when the instrument is On means that there is a problem with one of the power supplies.



0076-013

**Figure 4-6: Location of power-on and over-current LEDs**

**Table 4-7: Power-on and over-current LEDs**

LED	Supply	Description
DS200	+15 VA	Green when supply is operating within tolerance.
DS201	+5 VA	Green when supply is operating within tolerance.
DS202	N/A	Red if any of the supplies (+15 VA, +5 VA, +1.8 VD, -15 VA, and -5 VA) are out of tolerance.
DS203	-5 VA	Green when supply is operating within tolerance.
DS204	-15 VA	Green when supply is operating within tolerance.
DS330	+1.8 VD	Green when supply is operating within tolerance.

Remove boards one at a time to locate a fault (the Display board, Acquisition board, Power interface board, and the  $\mu$ ATX board). If this does not identify the problem, check the IEC power cable.

If this process did not correct the problem, replace the power supply.

**Isolating to a Board if Power Will Not Come Up, DPO70000B and DSA70000B Series.** Remove boards one at a time to locate a fault (the Display board, Acquisition board, Power distribution board, PCI backbone board, and the  $\mu$ ATX board). If this does not identify the problem, check the IEC power cable.

If this process did not correct the problem, replace the power supply.



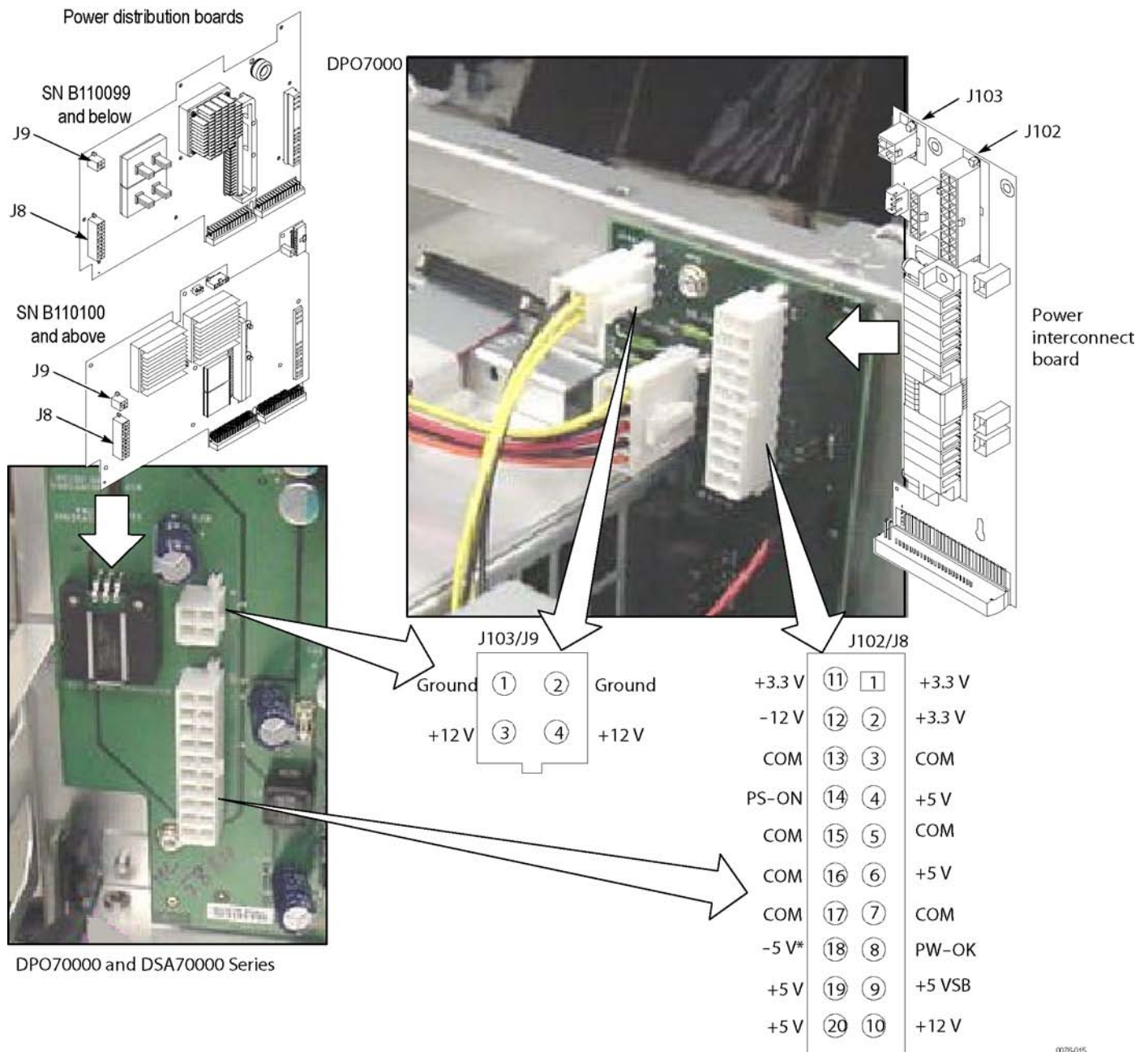
**Checking the Power Supply Voltages.** To check the power supply voltages, power on the instrument and connect the reference lead of a digital voltmeter to chassis ground, such as the top of the power supply.

Attach a 0.025 inch square pin to the probe tip of the other lead and insert it into a pin on one of the connectors. The following table shows the voltage you should find on each pin of J102 or J8 and J103 or J9. (See Figure 4-7 on page 4-22.)

Measure the power supply voltages with the voltmeter and compare each reading to the values listed in the table. If the voltages are within about 5% of the nominal voltages, your power supply is functional.

**Table 4-8: Power supply voltages**

<b>Power interconnect board (J102) Power distribution board (J8)</b>	<b>Voltage</b>	<b>Power interconnect board (J103) Power distribution board (J9)</b>	<b>Voltage</b>
Pins 1, 2, 11	+3.3 V	Pins 1, 2	COM
Pin 12	-12 V	Pins 3, 4	+12 V
Pin 10	+12 V		
Pin 18	-5 V*		
Pins 4, 6, 19, 20	+5 V		
Pin 9	+5 VSB		
Pins 3, 5, 7, 13, 15, 16, 17	COM		
Pin 14	PS-ON		
Pin 8	PW-OK		



0076-015

Figure 4-7: Power supply test points

**If the Instrument Will Not Boot.** If nothing is displayed, check that the display is turned on. At boot time, and while using an external monitor connected to the  $\mu$ ATX external video port, press F2 to enter the BIOS setup. The Advanced Video Configuration menu lets you select PCI (LCD) or Integrated (the  $\mu$ ATX VIDEO port on the rear panel). The lower XVGA port on the rear panel is the PCI video port (driven by the same video controller as the LCD).

If there is a display on the XVGA port, but not on the LCD, check the power supply voltages. If the voltages are okay but there is still no display on the LCD, replace the display assembly (LCD, lamps, and cable).

**Booting Into Windows.** If the instrument will not start, run the CMOS restore utility. (See page 4-43, *Update/Restore the  $\mu$ ATX Board CMOS.*)

If the instrument starts, finds the hard disk, but locks up while displaying the Windows splash screen:

1. Select the Integrated video port using the setup menu.
2. Disable the buses and disconnect the PPC board by installing J111.
3. If the system boots (It will only boot to Windows, the instrument application will not run) to the external  $\mu$ ATX video port, replace the Power Interface board.

**If the Instrument Application Does Not Work.** If the instrument starts Windows, but the instrument application does not work (the DPO Main graphic is displayed), check the following:

1. The application software.
2. The Acquisition board.
3. The Power Interface board (try removing and reinstalling the Power Interface board).
4. Did someone exit the application using Task Manager and then try to reenter the application without rebooting?
5. If the relays click, the acquisition is running.
6. On the Settings tab of the desktop properties, select Advanced and then the Performance tab. Hardware Acceleration must be set to Full for video merge to work. If you change the setting, restart.

## Instrument Diagnostics

The primary diagnostics for the instrument are accessible through the oscilloscope application software. Procedures for running these diagnostics are described next.

The Instrument diagnostics check the basic functionality of the acquisition system at every power on.

The Instrument Diagnostics run after Windows has booted up and run its own set of system checks. If any failures occur at power on, a pop-up message indicates that a failure has occurred and provides a choice to go directly to the diagnostic results window to view the specific failures, or to ignore them and continue directly into the oscilloscope application.

Several diagnostic tests are available. (See Table 4-9 on page 4-25.) The table indicates which tests run automatically at power-up, and which tests are run manually.

The power on tests ensure that the hardware is installed and can be accessed by the software. The tests provide limited diagnostic information, and provide no performance information.

If there are no failures, you can view the results of the tests in the Instrument Diagnostics page, under the Utilities menu.

To run the instrument Diagnostics, perform these steps:

1. Turn off all other applications.
2. From the menu bar, touch Utilities and then select Instrument Diagnostics; the Diagnostics control panel appears. (See Figure 4-8.)



Figure 4-8: Diagnostics control panel

**Table 4-9: Diagnostic tests**

Component	Group & test	Error codes	Power on	Manual	Instrument	
Processor	Memory	111 DRAMWalk1	✓		All	
		112 DRAMCell			All	
		113 DRAMMarch			All	
		114 DRAMCal			MSO70000/C only	
Registers	PCI	211 MIA	✓		All	
	Acquisition	221 ACL	✓		All	
		222 PCL				
		223 Preamp				
		224 TrkHld				
		225 ADC				
		226 DAC				
		227 Demux				
	Trigger	231 SBTL	✓		All	
		232 SGTL			All	
		233 TrigComp			All	
		234 CommTrig			All	
		235 FTL			MSO70000/C only	
	Misc	241 FanCtrl	✓		All	
		242 Tek04			MSO70000/C only	
243 DigCtrl				MSO70000/C only		
Acquisition	Demux	311 RunAB	✓		All	
		312 AcqDone				
		313 SysRdy				
		314 Interrupt				
		315 IdcLoSpeed				
		316 IdcHiSpeed				
		317 IdcAcqDataXfr				
		318 IdcDispDataXfr				
	DMA	321 PaDMA	✓		All	
		322 IdeAcqDMA				
	Memory	331 MemData	✓		All	
		332 MemAddr	✓			
		333 MemSpeed		✓		
	Vertical	341 Preamp Inputs			✓	All
		342 TH Inputs	✓			
		343 ADC Inputs			✓	
		344 ADC Outputs			✓	
		345 50 OhmOvld	✓			
		346 LFComp			✓	
	PLL	351 Clock Freq	✓		All	
	HFSource	361 SINE			✓	DPO7000 only
362 SINE33					All	
363 SQUARE					All	

**Table 4-9: Diagnostic tests (cont.)**

Component	Group & test	Error codes	Power on	Manual	Instrument	
Acquisition (Cont.)	AcqProcessor	371 SPI	✓		All	
		372 INT Line			All	
		373 Interrupt			All	
		374 RelayDrive			DPO/DSA70000B only	
		375 TWI			All	
		376 PrbInterrupts			All	
		377 TCpowerCtrl			DPO/DSA70000B only	
		378 MAX517			All	
Trigger	Inputs	411 CH1	✓		All	
		412 CH2			All	
		413 CH3			All	
		414 CH4			All	
		415 Line			All	
		416 Video			DPO7000 only	
		417 Events			All	
		418 Serial			All	
		419 HSMeta			MSO70000/C only	
	Outputs	421 523TrgOut	✓			DPO7000 only
		422 523Cpulnt	✓			DPO7000 only
		423 Fedge	✓			All
		424 Ftrig	✓			All
		425 TrigInfo			✓	
	Timers	431 Delay			✓	All
		432 Delta				
		433 Holdoff				
		434 PostTrig				
		435 PreTrig				
		436 Timeout				
Word	441 Compare	✓			MSO70000/C only	
	442 Delay					
	443 Clk Qualify					
	444 Formed LSST					
TekLink	Topology	511 Signals <sup>1</sup>		✓	All	
	Trigger	521 Path <sup>1</sup>		✓	All	
	Reference	531 Path <sup>1</sup>		✓	All	

<sup>1</sup> Requires external test fixture.

### Software Updates

To update the application software, install the firmware CD in your instrument and follow the displayed instructions or the instructions that accompany the CD.

If you want to order a software update, contact your Tektronix service center. See *Contacting Tektronix* on the back of the title page.

**After Repair** After removal and replacement of a module, you must perform the Performance Verification procedure, found in the instrument *Specifications and Performance Verification* manual, which was provided with the instrument. This manual is also available on the Tektronix Web site ([www.tektronix.com/manuals](http://www.tektronix.com/manuals)).

If the instrument fails the Performance Verification tests, it must be returned to Tektronix for adjustment.

**µATX BIOS Error Messages** When the µATX board powers on, the BIOS runs power-on self-tests (POST) to check the board. The BIOS writes error codes to location 80h and tries to write the codes to the display. If the error is fatal, the POST code indicates the last successful checkpoint reached. The following table lists the error messages that are displayed by the BIOS. Another table lists the POST codes displayed by the BIOS. (See Table 4-12 on page 4-31.)

Once the display is enabled, errors are written to the display as text messages. These messages are always displayed unless the board is configured for silent startup or headless operation (no keyboard, mouse, or display).

**Table 4-10: µATX BIOS error messages**

Item no.	Error message	Description
1	GA20 Error	Error when switching to protected mode during the memory test.
2	Pri Master HDD Error, Pri Slave HDD Error Sec Master HDD Error, Sec Slave HDD Error	Could not read sector.
3	Pri Master Drive - ATAPI Incompatible PRI Slave Drive - ATAPI Incompatible Sec Master Drive - ATAPI Incompatible Sec Slave Drive - ATAPI Incompatible	Drive not an ATAPI device. Run setup, and make sure the device is set up correctly.
4	A: Drive Error	No response from the drive.
5	Cache Memory Bad	Memory may be bad.
6	CMOS Battery Low	Replace the battery.
7	CMOS Display Type Wrong	Check the setup to make sure the type is correct.
8	CMOS Checksum Bad	Run the setup to reset values.
9	CMOS Settings Wrong	Settings corrupted or the battery has failed.
10	CMOS Date/Time Not Set	Run the setup to correct values.
11	DMA Error	Error during read/write test of controller.
12	FDC Failure	Error while trying to access controller.
13	HDC Failure	Error while trying to access controller.
14	Checking NVRAM. . . .	NVRAM is being checked.
15	Update OK!	Invalid NVRAM has been updated.
16	Update Failed	Unable to update invalid NVRAM.
17	Keyboard Error	Make sure the keyboard is connected properly.
18	Keyboard/Interface Error	Keyboard test failed.



**Table 4-10:  $\mu$ ATX BIOS error messages (cont.)**

Item no.	Error message	Description
19	Memory Size Decreased	If no memory was removed, the memory may be bad.
20	Memory Size Increased	If no memory was added, the system may have a problem.
21	Memory Size Changed	If no memory was added or removed, the memory may be bad.
22	No Boot Device Available	Boot device not found.
23	Off Board Parity Error	Parity error occurred on an off-board card.
24	On Board Parity Error	Parity error occurred in on-board memory.
25	Parity Error	Error occurred in on-board memory at an unknown address.
26	NVRAM/CMOS/PASSWORD cleared by Jumper	Turn off power and remove the jumper.
27	<CTRL_N> Pressed	CMOS is ignored and NVRAM is cleared. Enter Setup.

**Table 4-11: 039-0173-xx and 065-0745-xx  $\mu$ ATX POST codes**

Item no.	Module	Displayed POST code	Description
1	Host Processor	10	Power-on initialization of the host processor (Boot Strap Processor)
		11	Host processor Cache initialization (including APs)
		12	Starting Application processor initialization
		13	SMM initialization
2	Chipset	21	Initializing a chipset component
3	Memory	22	Reading SPD from memory DIMMs
		23	Detecting presence of memory DIMMs
		24	Programming timing parameters in the memory controller and the DIMMs
		25	Configuring memory
		26	Optimizing memory settings
		27	Initializing memory, such as ECC init
4	PCI Bus	28	Testing memory
		50	Enumerating PCI busses
		51	Allocating resources to PCI bus
		52	Hot Plug PCI controller initialization
		53 - 57	Reserved for PCI Bus
5	USB	58	Resetting USB bus
		59	Reserved for USB



**Table 4-11: 039-0173-xx and 065-0745-xx  $\mu$ ATX POST codes (cont.)**

Item no.	Module	Displayed POST code	Description
6	ATA/ATAPI/SATA	5A	Resetting PATA/SATA bus and all devices
		5B	Reserved for ATA
7	SMBus	5C	Resetting SMBUS
		5D	Reserved for SMBUS I went on Monday
8	Local Console	70	Resetting the VGA controller
		71	Disabling the VGA controller
		72	Enabling the VGA controller
9	Remote Console	78	Resetting the console controller
		79	Disabling the console controller
		7A	Enabling the console controller
10	Keyboard (PS2 or USB)	90	Resetting keyboard
		91	Disabling keyboard
		92	Detecting presence of keyboard
		93	Enabling keyboard
		94	Clearing keyboard input buffer
		95	Instructing keyboard controller to run Self Test (PS2 only)
11	Mouse (PS2 or USB)	98	Resetting mouse
		99	Disabling mouse
		9A	Detecting presence of mouse
		9B	Enabling mouse
12	Fixed Media	B0	Resetting fixed media
		B1	Disabling fixed media
		B2	Detecting presence of a fixed media (IDE hard drive detection etc.)
		B3	Enabling/configuring a fixed media
13	Removable media	B8	Resetting removable media
		B9	Disabling removable media
		BA	Detecting presence of a removable media (IDE, CD-ROM detection, etc.)
		BC	Enabling/configuring a removable media
14	BDS	Dy	Trying boot selection y (y=0 to 15)
15	PEI Core	E0	Started dispatching PEIMs (emitted on first report of EFI_SW_PC_INIT_BEGIN EFI_SW_PEI_PC_HANDOFF_TO_NEXT
		E2	Permanent memory found
		E1, E3	Reserved for PEI/PEIMs

**Table 4-11: 039-0173-xx and 065-0745-xx  $\mu$ ATX POST codes (cont.)**

<b>Item no.</b>	<b>Module</b>	<b>Displayed POST code</b>	<b>Description</b>
16	DXE Core	E4	Entered DXE phase
		E5	Started dispatching drivers
		E6	Started connecting drivers
17	DXE Drivers	E7	Waiting for user input
		E8	Checking password
		E9	Entering BIOS setup
		EA	TBD - Flash Update
		EB	Calling Legacy Option ROMs
		EE	TBD - Calling INT 19. One beep unless silent boot is enabled.
		EF	TBD - Unrecoverable Boot failure/S3 resume failure
		18	Runtime Phase/EFI OS Boot
F5	Exiting Sleep state		
F8	EFI boot service ExitBootServices ( ) has been called		
F9	EFI runtime service SetVirtualAddressMap ( ) has been called		
FA	EFI runtime service ResetSystem ( ) has been called		
19	PEIMs/Recovery	30	Crisis Recovery has initiated per User request
		31	Crisis Recovery has initiated by software (corrupt flash)
		34	Loading recovery capsule
		35	Handing off control to the recovery capsule
		3F	Unable to recover

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes**

Item no.	Module	Displayed POST code	Description
1	Turn Off Chipset and CPU test	C0	OEM Specific-Cache control cache Processor Status (1FLAGS) Verification. Tests the following processor status flags: Carry, zero, sign, overflow. The BIOS sets each flag and verifies that they are set, then turns each flag off and verifies that it is off. Read/Write/Verify all the CPU registers except SS, SP, and BP with data pattern FF and 00. RAM must be periodically refreshed to keep the memory from decaying. This function ensures that the memory refresh function is working properly.
2	Memory Presence	C1	First block memory detect OEM Specific-Test to size on-board memory Early chip set initialization Memory presence test OEM chip set routines Clear low 64K of memory Test first 64K memory
3	Early Memory Initialization	C2	OEM Specific-Board Initialization
4	Extend Memory DRAM select	C3	OEM Specific-Turn on extended memory Initialization Cyril CPU initialization Cache initialization
5	Special Display Handling	C4	OEM Specific-Display/Video Switch Handling so that the Switch Handling display switch errors never occur
6	Early Shadow	C5	OEM specific-Early shadow enable for fast boot
7	Cache presence test	C6	External cache size detection
8	CMOS Check	CF	CMOS checkup
9	Spurious	B0	If interrupt occurs in protected mode.
10	Unclaimed NMI	B1	If unmasked NMI occurs, display Press F1 to disable NMI, F2 reboot.
11	Program Chip Set	BF	To program chipset from defaults values

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)**

Item no.	Module	Displayed POST code	Description
12	Setup Pages	E1–EF	E1- Page 1, E2 - Page 2, and so on
	Force load Default to chipset	1	Chipset defaults program
	Reserved	2	
	Early Superio Init	3	Early Initialize of the super IO
	Reserved	4	
	Blank video	5	Reset the Video controller
	Reserved	6	
	Init KBC	7	Keyboard controller init
	KB test	8	Test the keyboard
	Reserved	9	
	Mouse Init	A	Initialize the mouse
	Onboard Audio init	B	Initialize the onboard audio controller if it exists
	Reserved	C	
	Reserved	D	
	Checksum Check	E	Check the integrity of the ROM, BIOS, and message
	Reserved	F	
	Auto detect EEPROM	10	Check the Flash type and copy flash write/erase routines to 0F000h segments
	Reserved	11	
	CMOS Check	12	Check CMOS Circuitry and reset CMOS
	Reserved	13	
	Chipset Default load	14	Program the chipset registers with CMOS values
	Reserved	15	
Clock Init	16	Init onboard clock generator	
Reserved	17		
Identify the CPU	18	Check the CPU ID and init L1/L2 cache	
Reserved	19		
Reserved	1A		
Setup Interrupt Vector Table	1B	Initialize first 120 interrupt vectors with SPURIOUS_INT_HDLR and initialize INT 00h-1Fh according to INT_TBL	
Reserved	1C		
Early PM Init	1D	First step initialize if single CPU onboard	
Reserved	1E		
Re-initial KB	1F	Re-init KB	
Reserved	20		
HPM init	21	If support HPM, HPM get initialized here	
Reserved	22		

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)**

<b>Item no.</b>	<b>Module</b>	<b>Displayed POST code</b>	<b>Description</b>
12	Test CMOS Interface and Battery Status	23	Verifies CMOS is working correctly and detects bad battery. If failed, load CMOS defaults and load into chipset
	Reserved	24	
	Reserved	25	
	Reserved	26	
	KBC final Init	27	Final Initial KBC and setup BIOS data area
	Reserved	28	
	Initialize Video Interface	29	Read CMOS location 14h to find out type of video in use. Detect and Initialize Video Adapter.
	Reserved	2A	
	Reserved	2B	
	Reserved	2C	
	Video memory test	2D	Test video memory, write sign-on message to screen. Setup shadow RAM - Enable shadow according to Setup.
	Reserved	2E	
	Reserved	2F	
	Reserved	30	
	Reserved	31	
	Reserved	32	
	PS2 Mouse setup	33	Set up PS2 Mouse and reset KB
	Reserved	34	
	Test DMA Controller 0	35	Test DMA channel 0
	Reserved	36	
	Test DMA Controller 1	37	Test DMA channel 1
	Reserved	38	
	Test DMA Page Registers	39	Test DMA Page Registers.
	Reserved	3A	
	Reserved	3B	
	Test Timer Counter 2	3C	Test 8254 Timer 0 Counter 2.
	Reserved	3D	
	Test 8259-1 Mask Bits	3E	Verify 8259 Channel 1 masked interrupts by alternately turning off and on the interrupt lines.
	Reserved	3F	
	Test 8259-2 Mask Bits	40	Verify 8259 Channel 2 masked interrupts by alternately turning off and on the interrupt lines.
	Reserved	41	
	Reserved	42	

Table 4-12: 039-0185-xx µATX POST codes (cont.)

Item no.	Module	Displayed POST code	Description
12	Test Stuck 8259's Interrupt Bits	43	Turn off interrupts then verify no interrupt mask register is on.
	Test 8259 Interrupt Functionality		Force an interrupt and verify the interrupt occurred.
	Reserved	44	
	Reserved	45	
	Reserved	46	
	Set EISA Mode	47	If EISA non-volatile memory checksum is good, execute EISA initialization. If not, execute ISA tests and clear EISA mode flag.
	Reserved	48	
	Size Base and Extended Memory	49	Size base memory from 256K to 640K and extended memory above 1 MB.
	Reserved	4A	
	Reserved	4B	
	Reserved	4C	
	Reserved	4D	
	Test Base and Extended Memory	4E	Test base memory from 256K to 640K and extended memory above 1 MB using various patterns. <b>NOTE.</b> This test is skipped in EISA mode and can be skipped with ESC key in ISA mode.
	Reserved	4F	
	USB init	50	Initialize USB controller
	Reserved	51	
	Memory Test	52	Test all memory of memory above 1 MB using Virtual 8086 mode, page mode, and clear the memory
	Reserved	53	
	Reserved	54	
	CPU display	55	Detect CPU speed and display CPU vendor-specific version string and turn on all necessary CPU features
	Reserved	56	
	PnP Init	57	Display PnP logo and PnP early init
	Reserved	58	
	Setup Virus Protect	59	Setup virus protect according to Setup
	Reserved	5A	
	Awdflash Load	5B	If required, will auto load Awdflash.exe in POST
	Reserved	5C	
	Onboard I/O Init	5D	Initializing onboard super IO

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)**

<b>Item no.</b>	<b>Module</b>	<b>Displayed POST code</b>	<b>Description</b>
12	Reserved	5E	
	Reserved	5F	
	Setup enable	60	Display setup message and enable setup functions
	Reserved	61	
	Reserved	62	
	Initialize & Install Mouse	63	Detect if mouse is present, initialize mouse, install interrupt vectors
	Reserved	64	
	PS2 Mouse special	65	Special treatment to PS2 Mouse port
	Reserved	66	
	ACPI init	67	ACPI sub-system initializing
	Reserved	68	
	Setup Cache Controller	69	Initialize cache controller
	Reserved	6A	
	Setup Entering	6B	Enter setup check and auto-configuration check up
	Reserved	6C	
	Initialize Floppy Drive & Controller	6D	Initialize floppy disk drive controller and any drives.
	Reserved	6E	
	FDD install	6F	Install FDD and set up BIOS data area parameters
	Reserved	70	
	Reserved	71	
	Reserved	72	
	Initialize Hard Drive & Controller	73	Initialize hard drive controller and any drives.
	Reserved	74	
	Install HDD	75	IDE device detection and install
	Reserved	76	
	Detect & Initialize Serial/Parallel	77	Initialize any serial and parallel ports (also game port)
	Reserved	78	
	Reserved	79	

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)**

Item no.	Module	Displayed POST code	Description
12	Detect & Initialize Math Coprocessor	7A	Initialize math coprocessor
	Reserved	7B	
	HDD Check for Write protection	7C	HDD check out
	Reserved	7D	
	Reserved	7E	
	POST error check	7F	Check POST error and display them and ask for user intervention
	Reserved	80	
	Reserved	81	
	Security Check	82	Ask password security (optional)
	Write CMOS	83	Write all CMOS values back to RAM and clear screen
	Pre-boot Enable	84	Enable parity checker Enable NMI, enable cache before boot.
	Initialize Option ROMs	85	Initialize any option ROMs present from C8000h to EFFFFh. <b>NOTE.</b> When FSCAN option is enabled, ROMs initialize from C8000h to F7FFFh.
	Reserved	86	
	Reserved	87	
	Reserved	88	
	Reserved	89	
	Reserved	8A	
	Reserved	8B	
	Reserved	8C	
	Reserved	8D	
	Reserved	8E	
	Reserved	8F	
	Reserved	90	
	Reserved	91	
	Reserved	92	
	Boot Medium detection	93	Read and store boot partition head and
	Final Init	94	Final init for last micro details before boot
	Special KBC patch	95	Set system speed for boot Setup NumLock status according to Setup
	Boot Attempt	96	Set low stack Boot via INT 19h.
	Boot	FF	



Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)

Item no.	Module	Displayed POST code	Description
<b>Quick POST Codes</b>			
13	Init onboard device	65	Early Initialized the super IO Reset Video controller Keyboard controller init Test the Keyboard Initialized the mouse Onboard audio controller initialize if exist Check the integrity of the ROM, BIOS, and message Check Flash type and copy flash write/erase routines to 0F000h segments Check CMOS Circuitry and reset CMOS Program the chipset registers with CMOS values Init onboard clock generator
	Early System setup	66	Check the CPU ID and init L1/L2 cache Initialize first 120 interrupt vectors with SPURIOUS_INT_HDLR and initialize INT 00h-1Fh according to INT_TBL First step initialize if single CPU onboard. Re-init KB If support HPM, HPM get initialized here
	KBC and CMOS Init	67	Verifies CMOS is working correctly detects bad battery If failed, load CMOS defaults and load into chipset Final Initial KBC and setup BIOS data area.
	Video Init	68	Read CMOS location 14h to find out type of video in use. Detect and Initialize Video Adapter. Test video memory, write sign-on message to screen. Setup shadow RAM - Enable shadow according to Setup.
	8259 Init	69	Init 8259 channel 1 and mask IRQ 9

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)**

Item no.	Module	Displayed POST code	Description
13	Memory test	6A	Quick Memory Test
	CPU Detect and IO init	6B	Detect CPU speed and display CPU vendor specific version string and turn on all necessary CPU features Display PnP logo and PnP early init Setup virus protect according to Setup. If required, will auto load Awdflash.exe in POST Initializing onboard super IO
	Reserved	6C	
	Reserved	6D	
	Reserved	6E	
	Reserved	6F	
	Setup Init	70	Display setup message and enable setup functions Detect if mouse is present, initialize mouse, install interrupt vectors Special treatment to PS2 Mouse port ACPI sub-system initializing
	Setup Cache Controller	71	Initialize cache controller
	Install FDD	72	Enter setup check and auto-configuration check up Initialize floppy disk drive controller and any drives Install FDD and setup BIOS data area parameters
	Install HDD	73	Initialize hard drive controller and any drives IDE device detection and install Initialize any serial and parallel ports (also game port)
	Detect & Initialize Math Coprocessor	74	Initialize math coprocessor
	HDD Check for Write protection	75	HDD check out
	Reserved	76	
	Display POST error	77	Check POST error and display them and ask for user intervention Ask password security (optional)
	CMOS and Option ROM Init	78	Write all CMOS values back to RAM and clear screen Enable parity checker Enable NMI Enable cache before boot.

Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)

Item no.	Module	Displayed POST code	Description
13			Initialize any option ROMs present from C8000h to EFFFFh  <b>NOTE.</b> When FSCAN option is enabled, ROMs initialize from C8000h to F7FFFh.
	Reserved	79	
	Reserved	7A	
	Reserved	7B	
	Reserved	7C	
	Boot Medium detection	7D	Read and store boot partition head and cylinders values in RAM
	Final Init	7E	Final init for last micro details before boot
	Special KBC patch	7F	Set system speed for boot Setup NumLock status according to Setup
	Boot Attempt	80	Set low stack Boot via INT 19h
	Boot	FF	
<b>S4 POST Codes</b>			
14	Early Chipset Init	5A	Early Initialized the super IO Reset Video controller Keyboard controller init Test the Keyboard Initialized the mouse
	Cmos Check	5B	Check CMOS Circuitry and reset CMOS
	Chipset default Prog	5C	Program the chipset registers with CMOS values. Init onboard clock generator
	Identify the CPU	5D	Check the CPU ID and init L1/L2 cache
	Setup Interrupt Vector Table	5E	Initialize first 120 interrupt vectors with SPURIOUS_INT_HDLR and INT 00h-1Fh according to INT_TBL First step initialize if single CPU Onboard Re-init KB If support HPM, HPM get initialized here.
	Test CMOS Interface and Battery status	5F	Verifies CMOS is working correctly detects bad battery. If failed, load CMOS defaults and load into chipset
	KBC final Init	60	Final Initial KBC and setup BIOS data area
	Initialize Video Interface	61	Read CMOS location 14h to find out type of video in use Detect and Initialize Video Adapter

**Table 4-12: 039-0185-xx  $\mu$ ATX POST codes (cont.)**

Item no.	Module	Displayed POST code	Description
14	Video memory test	62	Test video memory, write sign-on message to screen Setup shadow RAM - Enable shadow according to Setup
	Setup PS2 mouse and test DMA	63	Setup PS2 Mouse and reset KB Test DMA channel 0
	Test 8259	64	Test 8259 channel 1 and mask IRQ 9
	Init Boot Device	65	Detect if mouse is present, initialize mouse, install interrupt vectors Special treatment to PS2 Mouse port ACPI sub-system initializing Initialize cache controller
	Install Boot Devices	66	Enter setup check and auto-configuration check up Initialize floppy disk drive controller and any drives Install FDD and setup BIOS data area Parameters Initialize hard drive
	Cache Init	67	Cache init and USB init
	PM init	68	PM initialization
	PM final Init and issue SMI	69	Final init Before resume
	Full on	FF	
<b>BootBlock POST Codes</b>			
15	Base memory test	1	Clear base memory area (0000:0000-9000:ffffh)
	KB init	5	Initialized KBC
	Install interrupt vectors	12	Install int. vector (0-77) and initialized 00-1fh to their proper place
	Init Video	0D	Video initializing
	Init FDD	41	Scan floppy and media capacity for onboard super IO
	Boot	FF	Load boot sector

## BIOS Beep Codes

When the  $\mu$ ATX board powers on, a number of the BIOS checkpoints generate an audible ‘beep’ code on failure using the standard PC speaker (also routed through the board audio system). The beep codes are listed in the following table. Codes are also written to I/O port 80h and the video adapters. External ROM modules may issue a series of tones on error detection.

The BIOS generates one short beep if the power on self tests complete without error.

If your instrument does not contain a speaker, attach a speaker to the display-adaptor board square pins to hear the codes.

**Table 4-13: 039-0173-xx and 065-0745-xx  $\mu$ ATX beep codes**

Item no.	Beep code	Error message
1	3 (long)	Memory error (beep freq = 1280 Hz)
2	4 (alternating hi-low)	Thermal warning (beep freq - high = 2 kHz, low = 1.5 kHz)
3	1	Refresh failure
4	2	Cannot reset parity
5	3	Memory failure, first 64 KB
6	4	Timer failure
7	5	Not used
8	6	Cannot toggle 8042 Gate A20
9	7	Exception interrupt error
10	8	Display memory R/W error
11	9	Not used
12	10	CMOS Shutdown register test error
13	11	Cache memory error

**Table 4-14: 039-0185-xx  $\mu$ ATX beep codes**

Item no.	Beep code	Error message	Description
1	1 long, 2 short	Video adapter error	Bad video adapter or a bad connection to the video adapter. Ensure that the monitor cable is connected properly.
2	Repeating endless loop	Memory error	Check for improperly seated or missing memory.
3	1 long, 3 short	No video card or bad video RAM	Reseat or replace the video card.
4	High frequency beeps while running	Overheated CPU	Check the CPU fan for proper operation and check the case for proper air flow.
5	Repeating High/Low	CPU	Either the CPU is not seated properly or it is damaged. The problem can also be due to excess heat. Check the CPU fan or BIOS settings for proper fan speed.

**Table 4-15: 039-0188-xx  $\mu$ ATX beep codes**

Item no.	Number of Beeps	Error message	Description
1	1	Memory refresh timing error	Check for improperly seated or missing memory.
2	2	Parity error	
3	3	Main memory read/write test error	
4	8	Display memory error	Reseat the video adapter. If the condition persists, replace the module.
5	4	Motherboard timer not operational	Fatal error. Remove all expansion cards except any video adapter.
6	5	Processor error	
7	6	Keyboard controller BAT test error	■ If the beep code is generated with no connected adapter cards, replace the $\mu$ ATX.
8	7	General exception error	
9	9	ROM checksum error	■ If the beep code is not generated with no connected adapter cards, replace the cards one at a time until the problem recurs. This should reveal the malfunctioning card or module.
10	10	CMOS shutdown register read/write error	
11	11	Cache memory bad	Replace that card or module.

### Update/Restore the $\mu$ ATX Board CMOS

If the CMOS parameters become corrupted, restore the CMOS memory using one of the following procedures:



**CAUTION.** *Install only CMOS parameters from Tektronix. CMOS parameters from other manufactures may make your instrument inoperable.*

If you cannot restore the CMOS memory, replace the battery.

Restore the CMOS as follows:

1. Press the **F2** key during reboot to enter the BIOS SETUP UTILITY.
2. In the BIOS SETUP UTILITY, press the **F9** key.
3. Press the **Enter** key to Load Optimal Defaults.
4. In the BIOS SETUP UTILITY, press the **F10** key.
5. Press the **Enter** key to Save configuration changes and exit.

### Installing an Authorization Key

If you add new options, you must install a new authorization key. Install the authorization key using the following procedure:

1. From the instrument menu bar, touch the **Utilities** menu, select **Option Installation**, and then touch **Continue**.
2. Enter the new key using an attached keyboard.
3. Touch **Continue**.

### Hard Disk Drive Repair

Use the same procedures to maintain the instrument hard disk drive that you use to maintain a hard disk drive in a personal computer.

Using ScanDisk, you may be able to repair the disk without destroying data on the disk. To use ScanDisk, perform the following steps:

1. Remove the hard disk drive from the instrument.
2. Install the hard disk drive into a personal computer.
3. Power on the computer and run ScanDisk. Set ScanDisk to perform a thorough surface scan and to automatically fix errors.
  - Using Microsoft Windows 2000: select My Computer\File\Properties\Tools\Error-checking
  - Using Microsoft MSDOS: enter SCANDISK *drive:* /SURFACE /AUTOFIX

4. If ScanDisk cannot repair the disk, format the hard disk drive using the File Utilities Format command. Format will destroy all data currently on the disk.
5. If reformatting the hard disk and reloading the software does not repair the disk, install a new hard disk drive.



# Troubleshooting (MSO/DPO5000 Series)



**WARNING.** Before performing this or any other procedure in this manual, read the safety summaries at the beginning of this manual. Also, to prevent possible injury to service personnel or damage to the instrument components, read *Installation, and Preventing ESD* in this section. (See page 4-1, *Preventing ESD*.)

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

This section contains information and procedures designed to help you isolate faults to a module.

This section requires that service personnel have the appropriate skills to work on this instrument, including PC troubleshooting and Microsoft Windows operating system skills. Details of PC and Windows operation and service are not in this manual.

For assistance, contact your local Tektronix Service Center.

## Software Updates

You can install the latest firmware in one of the following ways:

**Connect to the Internet.** You can connect your oscilloscope to the Internet and download the new firmware from [www.tektronix.com/software](http://www.tektronix.com/software).

**USB CD-ROM.** You can download the new firmware from [www.tektronix.com/software](http://www.tektronix.com/software) to a USB CD-ROM and load it from there to your oscilloscope.

**USB Flash Drive.** You can download the new firmware from [www.tektronix.com/software](http://www.tektronix.com/software) to a USB flash drive and load it from there to your oscilloscope.

If you want to contact your Tektronix service center, see *Contacting Tektronix* on the back of the title page.

## After Repair

After removal and replacement of a module, you must perform the Performance Verification procedure, found in the instrument *Specifications and Performance Verification* manual, which was provided with the instrument. This manual is also available on the Tektronix Web site ([www.tektronix.com/manuals](http://www.tektronix.com/manuals)).

If the instrument fails the Performance Verification tests, it must be returned to Tektronix for adjustment.

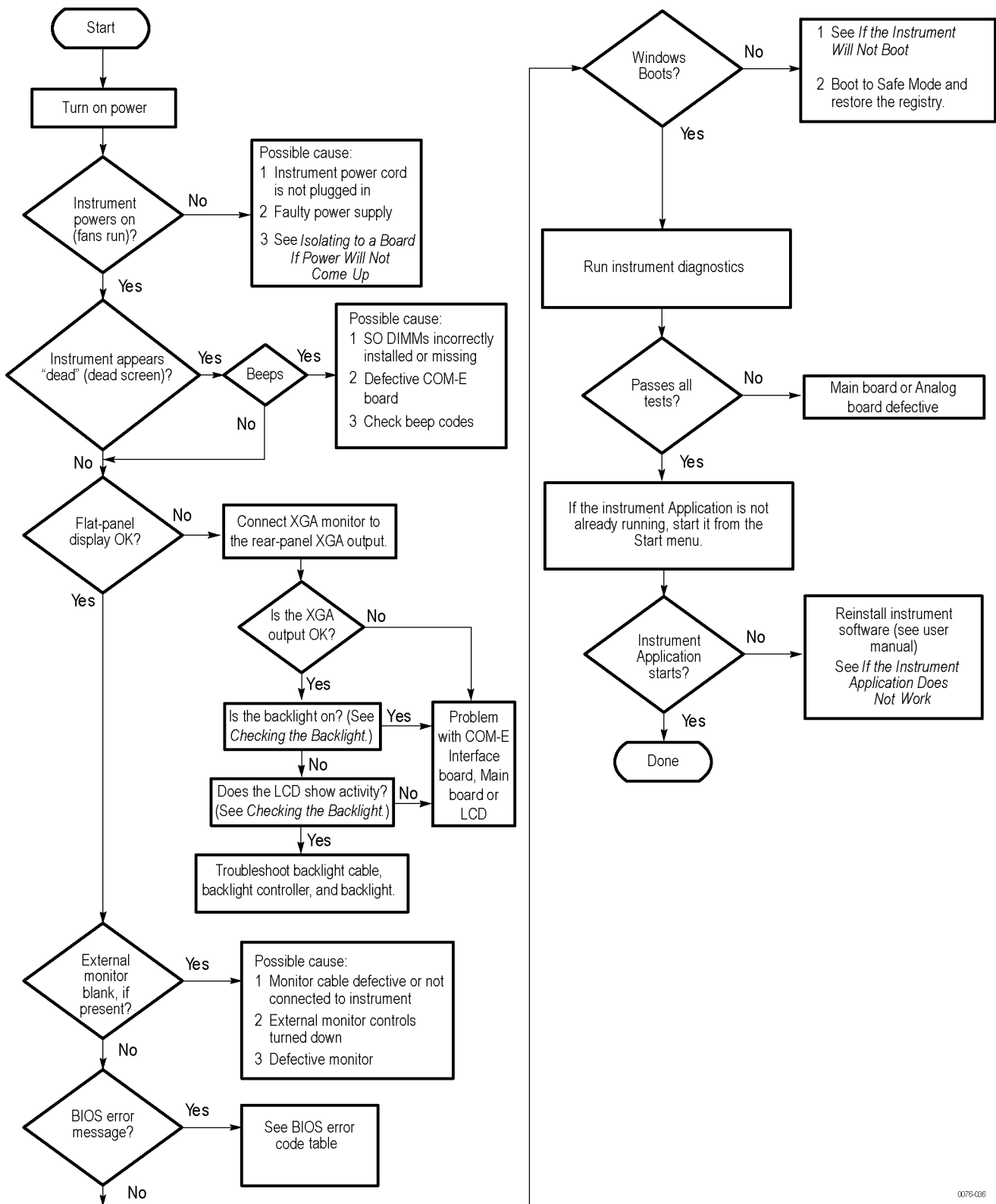
**Service Level** This section contains information and procedures designed to help you isolate faulty modules in the MSO5000 Series and DPO5000 Series instruments. If a module needs to be replaced, follow the instruction provided in this section. (See page 4-14, *Module Removal (MSO/DPO5000 Series)*).

**Check for Common Problems** Use the following table to quickly identify common problems, such as a blown fuse or loose cable.

**Table 4-16: Failure symptoms and possible causes**

Symptom	Possible cause(s)
Instrument will not power on	<ul style="list-style-type: none"> <li>■ Power cord not plugged in</li> <li>■ Faulty power supply</li> <li>■ Faulty COM-E Interface board</li> </ul>
Front panel light comes on (instrument powers on), but one or more fans will not operate	<ul style="list-style-type: none"> <li>■ Faulty fan cable</li> <li>■ Defective fan assembly</li> <li>■ Faulty power supply</li> <li>■ Faulty Main board</li> <li>■ Faulty COM-E module</li> </ul>
Hard disk drive related symptoms	<ul style="list-style-type: none"> <li>■ Defective hard disk drive</li> <li>■ Incorrect hard disk type selected in the BIOS setup</li> <li>■ Replaceable hard disk drive not installed</li> <li>■ Power supply failure</li> <li>■ Corrupted BIOS module firmware, reinstall firmware</li> <li>■ Corrupted OS image</li> </ul>
Flat- panel display blank	<ul style="list-style-type: none"> <li>■ Defective cable from Main board to display</li> <li>■ Defective cable from Main board to backlighting display lamp</li> <li>■ Defective backlighting display lamp</li> <li>■ Faulty display</li> <li>■ Faulty COM-E module</li> <li>■ Faulty COM-E Interface board</li> </ul>
BIOS error messages	<ul style="list-style-type: none"> <li>■ Refer to the BIOS error message information.</li> </ul>

**Fault Isolation Procedure** Use the troubleshooting tree for fault isolation. (See Figure 4-9 on page 4-47.)



0076-036

Figure 4-9: Troubleshooting tree (MSO/DPO5000 Series)

**Isolating to a Board if Power Will Not Come Up.** If the instrument is in standby mode (plugged in, but not turned on), a green light is visible through the right side of the instrument, and the front-panel Power button is amber.

When you press the power switch, the switch turns green and the instrument should boot. If this does not happen, isolate the problem to a module as follows:

- Remove boards one at a time to locate a fault (the COM-E Interface board with module, Main board, Analog board, and Front-panel board).
- If the previous step did not identify the problem, check the IEC power cable.
- If the previous step did not correct the problem, replace the power supply.

**If the Instrument Will Not Boot.** If nothing is displayed, check that the display is turned on. At boot time, and while using an external monitor connected to the external video port, press the **Del** key on a connected keyboard to enter the BIOS setup.

If the instrument will not start, press the **Del** key on the connected keyboard. Go into CMOS setup and select “Load optimized defaults.”

**If the Instrument Application Does Not Work.** If the instrument starts Windows, but the instrument application does not work (the DPO Main graphic is displayed), check the following:

1. The diagnostic LEDs. (See the following section). Check to see if the PCIe locked LED is lit.
2. The application software.
3. The Analog board.
4. The COM-E Interface board.
5. Did someone exit the application using Task Manager and then try to reenter the application without rebooting?
6. If the relays click, the acquisition is running.

**Checking the Backlight.** If the instrument display is not working, shine a flashlight directly at the display while the instrument is on and the fans are running. Move the flashlight around and look at the screen from different angles to determine whether you can see any activity on the LCD. If you see the expected display but it is not visible without the flashlight, check for a problem with the backlight or associated circuitry or cables.

If there is a display on the external video port, but not on the LCD, check the power supply voltages. If the voltages are okay but there is still no display on the LCD, replace the display assembly (LCD, lamps, and cable). (See Figure 4-9 on page 4-47.)

## Diagnostic LEDs

There are several LEDs in the MSO/DPO5000 Series oscilloscopes. Most of them can be viewed without removing the instrument covers. After getting familiar with them, you can peer through the cooling holes on the side of the instrument and determine much of the instrument status and operational health based on these LEDs.

**Power Switch LED.** The front-panel power switch LED has three conditions: off, amber, and green.

- LED off indicates one of the following conditions:
  - AC power is not connected.
  - The main power supply has failed.
  - Front-panel circuits that drive the LED have failed.
- LED amber indicates that the instrument is in standby state and ready to be turned on by pushing the power switch.
- LED green indicates that the instrument is on.

There are two beep codes:

- A single long beep followed by two short beeps = video error.
- A single long beep that repeats = DRAM error.

## Main Board LEDs.

- DS7301: PLX PCIe Link OK LED (Orange)

This is the first LED on the Main board to turn on during a power up. The PLX bridge is what connects to the COM-E Computers PCIe connection. When the bridge establishes that the link is working, this light comes on. This does not indicate that the PLX is fully functional but it is a good indication of functional digital power supplies on the Main board as well as a functional COM-E Module.

- DS7302: FPGA Loaded (Green)

When this light comes on, it means that the Tektronix Acquisition Driver has loaded and the FPGA is configured and ready for use. This is typically the second LED to come on during a bootup sequence. This generally indicates that the path from the COM-E module through the PLX and to the FPGA is working properly.

- DS9004: ACQ Activity (Green)

This light flashes when any activity occurs between the acquisition system and the COM-E computing system. Register reads and writes as well as Data DMA transfers cause this light to illuminate. This is generally a good indicator that the oscilloscope application software is running and talking to the acquisition system correctly.

**COM-E Interface Board LEDs.** If DS19, DS18, or DS10 on the COM-E Interface board lights, use the following information to determine the meaning. If none of these LEDs come on, it is likely a power supply issue or a faulty COM-E Interface board (corrupted firmware in the MCU). The table and the following text provide details about these LED conditions.

**Table 4-17: LED Definitions**

LED	Color	Definition
DS19	Green	On if all of the DC/DC converters are operating properly.
DS18	Green	On if the PS_ON signal to the COM-E board is high. (Power is off.)
DS10	Red	On if a fault was detected (see the following information about DS10 conditions).

■ **DS19: DC-DC OK (Green)**

This light comes on after the oscilloscope power button is pressed and the oscilloscope is in the normal operating mode. If this light is on, it means that all of the COM-E Interface board power supplies are up and within spec. It also indicates that all of the DC power supplies on the Main board are working. It does not check the power supplies on the Main board to see if they are within tolerance or working correctly.

■ **DS18: PS\_ON (Green)**

This light comes on when the Standby power supply is plugged in and the oscilloscope is in the Off state. (It is plugged into an AC outlet but not turned on.) This light goes out when DC-DC OK turns on. This light is also typically on when the front-panel power button is amber.

■ **DS10: Fault (Red)**

This LED indicates a problem with the system. When it flashes, it generally means something is wrong on the COM-E Interface board (typically the power supply). It can also indicate a communication problem between the COM-E Interface board and other systems. This LED will flash after a fault is discovered on the board, unless the error is a CRC failure (bad FLASH memory). Each error uses a different flash period and delay between flash bursts.

The speed of the flashes determines the error number, which defines the error type (for example, very slow flashing indicates Error 1.) Error 1 is fatal during startup or shutdown. During normal operation, Error 1 is a warning indicating that a converter is operating near the tolerance limits. (See Table 4-18 on page 4-51.)

The number of flashes points to the problematic DC/DC converter or circuit. A DC/DC converter has a startup or shutdown failure if it fails to cross

a predefined threshold in a specific amount of time. (See Table 4-19 on page 4-51.)

- Example 1: A series of four flashes with a period of 500 ms and a four-second pause before the four flashes repeat indicates that the +3.3 V DC/DC converter had an output voltage that went out of tolerance. To protect the system, all supplies would have been shut down as a result of this fault.
- Example 2: A series of seven flashes with a period of 500 ms and a four-second pause before the seven flashes repeat indicates that the internal VPI probe 12 V current limit was exceeded.

**Table 4-18: DS10 Errors by speed and duration**

Period	LED "On" time	Delay before flash pattern is repeated	Error number	Error type
0	0	LED always on. No flashes.	0	Microcontroller code is corrupt. Internal CRC verification failed.
2 s	1 s	16 s	1	Startup or shutdown failed or output voltage is out of tolerance.
1 s	500 ms	8 s	2	Output voltage is high.
500 ms	250 ms	4 s	3	Output voltage is low.

**Table 4-19: DS10 Errors by number of flashes, with related voltages**

Number of flashes	Channel	Under (Error 3)	Low (Error 1)	High (Error 1)	Over (Error 2)
1	+12 V	9.8 V	10.8 V	13.2 V	14.4 V
2	+12 VM (switched +12 V to COM-E module and SATA HDD)	9.8 V	10.8 V	13.2 V	14.4 V
3	+5 V	4.1 V	4.5 V	5.5 V	6 V
4	+3.3 V	2.6 V	3 V	3.6 V	4 V
6	VPI probe power external 12 V	8.2 V	10.2 V	14 V	16.2 V
7	VPI probe power internal 12 V load current	200 mA	500 mA	1.2 A	1.5 A
11	ADT7476 requested a shut down because temperature is too high				
12	ADT7476 fan controller did not respond to programming				

## BIOS Error Messages

When the COM-E Interface board powers on, the BIOS runs power-on self-tests (POST) to check the board and writes error codes to location 80h. To read these error codes, an external LPC-based port 80 decoder is required. Connect the decoder to J20 on the COM-E board. An example of an LPC-based port 80 decoder is the Tektronix test board, G2834XA. A PCI port 80 decoder is not compatible with this product.

If the error is fatal, the POST code indicates the last successful checkpoint reached. The following table lists the POST codes displayed by the BIOS. (See Table 4-20.)

Once the display is enabled, errors are written to the display as text messages. These messages are always displayed unless the board is configured for silent startup or headless operation (no keyboard, mouse, or display).

**Table 4-20: BIOS POST codes: ECM-945GM Series**

Module	Displayed POST code	Description
Turn Off Chipset and CPU test	C0	OEM Specific-Cache control cache Processor Status (1FLAGS) Verification Tests the following processor status flags: Carry, zero, sign, overflow. The BIOS sets each flag and verifies that they are set, then turns each flag off and verifies that it is off Read/Write/Verify all the CPU registers except SS, SP, and BP with data pattern FF and 00. RAM must be periodically refreshed to keep the memory from decaying. This function ensures that the memory refresh function is working properly.
Memory Presence	C1	First block memory detect OEM Specific-Test to size on-board memory Early chip set initialization Memory presence test OEM chip set routines Clear low 64K of memory Test first 64K memory
Early Memory Initialization	C2	OEM Specific-Board Initialization
Extend Memory DRAM select	C3	OEM Specific-Turn on extended memory Initialization Cyrix CPU initialization Cache initialization
Special Display Handling	C4	OEM Specific-Display/Video Switch Handling so that the Switch Handling display switch errors never occur
Early Shadow	C5	OEM specific-Early shadow enable for fast boot
Cache presence test	C6	External cache size detection
CMOS Check	CF	CMOS checkup



**Table 4-20: BIOS POST codes: ECM-945GM Series (cont.)**

<b>Module</b>	<b>Displayed POST code</b>	<b>Description</b>
Spurious	B0	If interrupt occurs in protected mode.
Unclaimed NMI	B1	If unmasked NMI occurs, display Press F1 to disable NMI, F2 reboot.
Program Chip Set	BF	To program chipset from defaults values
Setup Pages	E1-EF	E1- Page 1, E2 - Page 2, and so on
Force load Default to chipset	1	Chipset defaults program
Reserved	2	
Early Superio Init	3	Early Initialize of the super IO
Reserved	4	
Blank video	5	Reset the Video controller
Reserved	6	
Init KBC	7	Keyboard controller init
KB test	8	Test the keyboard
Reserved	9	
Mouse Init	A	Initialize the mouse
Onboard Audio init	B	Initialize the onboard audio controller if it exits
Reserved	C	
Reserved	D	
Checksum Check	E	Check the integrity of the ROM, BIOS, and message
Reserved	F	
Auto detect EEPROM	10	Check the Flash type and copy flash write/erase routines to 0F000h segments
Reserved	11	
CMOS Check	12	Check CMOS Circuitry and reset CMOS
Reserved	13	
Chipset Default load	14	Program the chipset registers with CMOS values
Reserved	15	
Clock Init	16	Init onboard clock generator
Reserved	17	
Identify the CPU	18	Check the CPU ID and init L1/L2 cache
Reserved	19	
Reserved	1A	
Setup Interrupt Vector Table	1B	Initialize first 120 interrupt vectors with SPURIOUS_INT_HDLR and initialize INT 00h-1Fh according to INT_TBL
Reserved	1C	

**Table 4-20: BIOS POST codes: ECM-945GM Series (cont.)**

<b>Module</b>	<b>Displayed POST code</b>	<b>Description</b>
Early PM Init	1D	First step initialize if single CPU onboard
Reserved	1E	
Re-initial KB	1F	Re-init KB
Reserved	20	
HPM init	21	If support HPM, HPM get initialized here
Reserved	22	
Test CMOS Interface and Battery Status	23	Verifies CMOS is working correctly and detects bad battery. If failed, load CMOS defaults and load into chipset
Reserved	24	
Reserved	25	
Reserved	26	
KBC final Init	27	Final Initial KBC and setup BIOS data area
Reserved	28	
Initialize Video Interface	29	Read CMOS location 14h to find out type of video in use. Detect and Initialize Video Adapter.
Reserved	2A	
Reserved	2B	
Reserved	2C	
Video memory test	2D	Test video memory, write sign-on message to screen. Set up shadow RAM - Enable shadow according to Setup.
Reserved	2E	
Reserved	2F	
Reserved	30	
Reserved	31	
Reserved	32	
PS2 Mouse setup	33	Set up PS2 Mouse and reset KB
Reserved	34	
Test DMA Controller 0	35	Test DMA channel 0
Reserved	36	
Test DMA Controller 1	37	Test DMA channel 1
Reserved	38	
Test DMA Page Registers	39	Test DMA Page Registers.
Reserved	3A	
Reserved	3B	
Test Timer Counter 2	3C	Test 8254 Timer 0 Counter 2.

**Table 4-20: BIOS POST codes: ECM-945GM Series (cont.)**

Module	Displayed POST code	Description
Reserved	3D	
Test 8259-1 Mask Bits	3E	Verify 8259 Channel 1 masked interrupts by alternately turning off and on the interrupt lines.
Reserved	3F	
Test 8259-2 Mask Bits	40	Verify 8259 Channel 2 masked interrupts by alternately turning off and on the interrupt lines.
Reserved	41	
Reserved	42	
Test Stuck 8259's Interrupt Bits	43	Turn off interrupts then verify no interrupt mask register is on.
Test 8259 Interrupt Functionality		Force an interrupt and verify the interrupt occurred.
Reserved	44	
Reserved	45	
Reserved	46	
Set EISA Mode	47	If EISA non-volatile memory checksum is good, execute EISA initialization. If not, execute ISA tests and clear EISA mode flag.
Reserved	48	
Size Base and Extended Memory	49	Size base memory from 256K to 640K and extended memory above 1 MB.
Reserved	4A	
Reserved	4B	
Reserved	4C	
Reserved	4D	
Test Base and Extended Memory	4E	Test base memory from 256K to 640K and extended memory above 1 MB using various patterns.  <b>NOTE.</b> This test is skipped in EISA mode and can be skipped with ESC key in ISA mode.
Reserved	4F	
USB init	50	Initialize USB controller
Reserved	51	
Memory Test	52	Test all memory of memory above 1 MB using Virtual 8086 mode, page mode, and clear the memory
Reserved	53	
Reserved	54	
CPU display	55	Detect CPU speed and display CPU vendor- specific version string and turn on all necessary CPU features
Reserved	56	

**Table 4-20: BIOS POST codes: ECM-945GM Series (cont.)**

<b>Module</b>	<b>Displayed POST code</b>	<b>Description</b>
PnP Init	57	Display PnP logo and PnP early init
Reserved	58	
Setup Virus Protect	59	Set up virus protect according to Setup
Reserved	5A	
Awdflash Load	5B	If required, will auto load Awdflash.exe in POST
Reserved	5C	
Onboard I/O Init	5D	Initializing onboard super IO
Reserved	5E	
Reserved	5F	
Setup enable	60	Display setup message and enable setup functions
Reserved	61	
Reserved	62	
Initialize & Install Mouse	63	Detect if mouse is present, initialize mouse, install interrupt vectors
Reserved	64	
PS2 Mouse special	65	Special treatment to PS2 Mouse port
Reserved	66	
ACPI Init	67	ACPI Sub-system initializing
Reserved	68	
Setup Cache Controller	69	Initialize cache controller
Reserved	6A	
Setup Entering	6B	Enter setup check and auto-configuration check up
Reserved	6C	
Initialize Floppy Drive & Controller	6D	Initialize floppy disk drive controller and any drives.
Reserved	6E	
FDD install	6F	Install FDD and set up BIOS data area parameters
Reserved	70	
Reserved	71	
Reserved	72	
Initialize Hard Drive & Controller	73	Initialize hard drive controller and any drives.
Reserved	74	
Install HDD	75	IDE device detection and install
Reserved	76	
Detect & Initialize Serial/Parallel	77	Initialize any serial and parallel ports (also game port)

**Table 4-20: BIOS POST codes: ECM-945GM Series (cont.)**

Module	Displayed POST code	Description
Reserved	78	
Reserved	79	
Detect & Initialize Math Coprocessor	7A	Initialize math coprocessor
Reserved	7B	
HDD Check for Write protection	7C	HDD check out
Reserved	7D	
Reserved	7E	
POST error check	7F	Check POST error and display them and ask for user intervention
Reserved	80	
Reserved	81	
Security Check	82	Ask password security (optional)
Write CMOS	83	Write all CMOS values back to RAM and clear screen
Pre-boot Enable	84	Enable parity checker Enable NMI, enable cache before boot.
Initialize Option ROMs	85	Initialize any option ROMs present from C8000h to EFFFFh. <b>NOTE.</b> When FSCAN option is enabled, ROMs initialize from C8000h to F7FFFh.
Reserved	86	
Reserved	87	
Reserved	88	
Reserved	89	
Reserved	8A	
Reserved	8B	
Reserved	8C	
Reserved	8D	
Reserved	8E	
Reserved	8F	
Reserved	90	
Reserved	91	
Reserved	92	
Boot Medium detection	93	Read and store boot partition head and cylinders values in RAM
Final Init	94	Final init for last micro details before boot
Special KBC patch	95	Set system speed for boot. Set up NumLock status according to Setup.
Boot Attempt	96	Set low stack Boot via INT 19h.
Boot	FF	

## BIOS Beep Codes

When the COM-E board powers on, a number of the BIOS checkpoints generate an audible ‘beep’ code on failure using the standard PC speaker (also routed through the board audio system). The beep codes are listed in the following table. Codes are also written to I/O port 80h and the video adapters. External ROM modules may issue a series of tones on error detection.

**Table 4-21: BIOS beep codes**

Beep code	Error message
1 short beep	Self test has completed without error.
3 beeps	Memory

## Hard Disk Drive Repair

Use the same procedures to maintain the instrument hard disk drive that you use to maintain a hard disk drive in a personal computer.

Using ScanDisk, you may be able to repair the disk without destroying data on the disk. To use ScanDisk, perform the following steps:

1. Remove the hard disk drive from the instrument.
2. Install the hard disk drive into a personal computer.
3. Power on the computer and run ScanDisk. Set ScanDisk to perform a thorough surface scan and to automatically fix errors.
  - Using Microsoft Windows: select My Computer\File\Properties\Tools\Error-checking
  - Using Microsoft MSDOS: enter SCANDISK *drive:* /SURFACE /AUTOFIX
4. If ScanDisk cannot repair the disk, format the hard disk drive using the File Utilities Format command. Format will destroy all data currently on the disk.
5. If reformatting the hard disk and reloading the software does not repair the disk, install a new hard disk drive.

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# Replaceable Parts





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# Replaceable Parts Overview

This section contains a separate subsection for the 7000 series, the 70000 series, and the 5000 series products. Use the lists in the appropriate section to identify and order replacement parts for your product.

**Standard Accessories.** Standard accessories for these products are listed in your user manual. The user manual is available at [www.tektronix.com/manuals](http://www.tektronix.com/manuals).

## Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

### Module Servicing

Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

**Module Exchange.** In some cases, you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-833-9200. Outside North America, contact a Tektronix sales office or distributor; see the Tektronix Web site ([www.tektronix.com](http://www.tektronix.com)) for a list of offices.

**Module Repair and Return.** You may ship your module to us for repair, after which we will return it to you.

**New Modules.** You may purchase replacement modules in the same way as other replacement parts.

## Using the Replaceable Parts List

This section contains a list of the replaceable mechanical and/or electrical components. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

### Parts list column descriptions

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

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

# Replaceable Parts (DPO7000 Series)

Table 5-1: Replaceable parts – External (DPO7000 Series)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-1</b>	<b>EXTERNAL PARTS</b>				
-1	016-1966-00			1	POUCH; ACCESSORIES, BLACK, SNAP-ON
-2	200-4956-00			1	COVER, TOP; COSMETIC
-3	211-1224-00			8	SCREW, MACHINE: 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-4	200-4954-00			1	COVER; EMI TOP, SAFETY CONTROLLED
-5	348-1861-00			4	FOOT; REAR, ASSY. W/ CORD WRAP, THERMOPLASTIC, SRY
-6	174-5227-00			1	CABLE ASSY; LINE FILTER; SAFETY CONTROLLED
-7	200-4958-00			1	COVER, LEFT; COSMETIC STINGRAY
-8	212-0232-00				SCREW, MACHINE: 8-32 X 1.125L, PNH, STL, BLACK OXIDE, T-20
-9	367-0528-00			1	HANDLE, CARRYING; DUAL DUROMETER MOLDED, POLYPROPYLENE, VINYL GRIP SECTION, SAFETY CONTROLLED
	407-4887-00			1	BRACKET: HANDLE BASE, PC/ABS ALLOY, BAYER BAYBLEND FR-110,TEK BLUE
-10	200-4955-00			1	COVER; EMI BOTTOM, SAFETY CONTROLLED
-11	101-0172-00			1	TRIM, ACQUISITION INSERT (VPI ONLY)
	101-0173-00			1	TRIM, ACQUISITION INSERT (HPI ONLY)
-12	200-4963-00			1	COVER, FRONT; PC/ABS ALLOY BAYBLEND
-13	335-1757-00			1	MARKER, IDENT; LABEL, IDENTIFICATION; (7354 ONLY)
	335-1520-00			1	MARKER,IDENT; LABEL,IDENTIFICATION; (7254 ONLY)
	335-1551-00			1	MARKER, IDENT; LABEL, IDENTIFICATION; (7104 ONLY)
	335-1552-00			1	MARKER, IDENT; LABEL, IDENTIFICATION; (7054 ONLY)
-14	101-0174-00			1	TRIM, DVD
-15	101-0171-00			1	TRIM RING; FR110, PC/ABS
-16	200-4957-00			1	COVER, RIGHT; COSMETIC STINGRAY
-17	355-0303-00			4	STUD.SNAP: 0.570 DIA, 0.165 THK, STAINLESS STEEL
-18	211-0721-00			4	SCREW,MACHINE: 6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR
-19	335-1517-00			1	LABEL, REAR, LEXAN, MOTHERBOARD TAPPEN, SAFETY CONTROLLED, 039-0173-xx
	335-2011-00				LABEL, REAR, LEXAN, MOTHERBOARD ADVANTECH AIMB-562, SAFETY CONTROLLED, 039-0185-xx

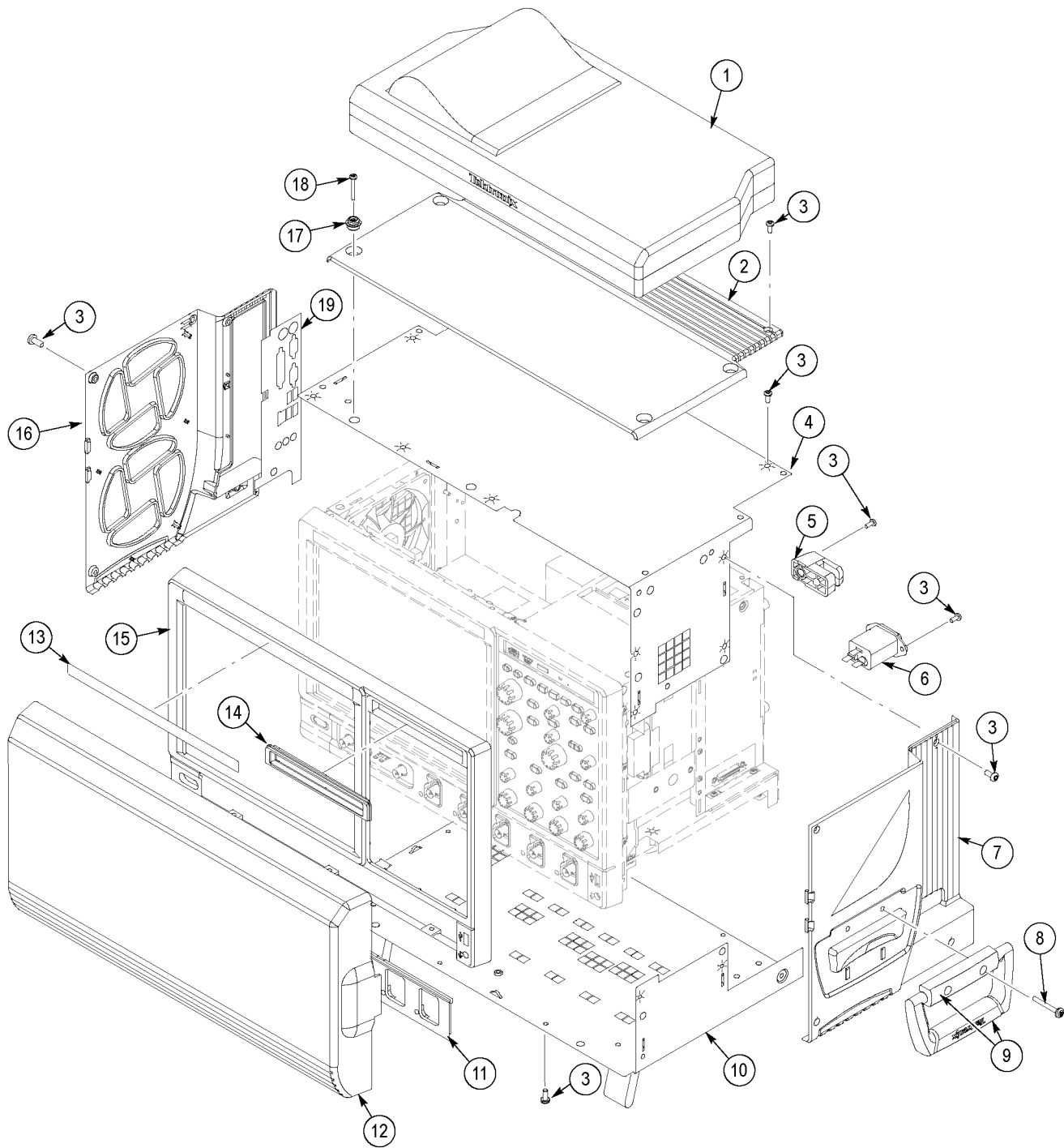


Figure 5-1: External parts (DPO7000 Series)

**Table 5-2: Replaceable parts – Front panel and display (DPO7000 Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-2</b>					<b>FRONT PANEL AND DISPLAY</b>
-1	174-5165-00			1	CABLE ASSY; POWER SWITCH
-2	211-1221-00			2	SCREW; M2.0 6-MM LONG PHILLIPS FLATHEAD ZINC-PLATED
-3	671-6107-00			1	CIRCUIT BOARD ASSY; USB
-4	211-1050-00			4	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-5	174-5164-00			1	CA ASSY; USB 2.0
-6	065-0756-01			1	MODULAR ASSY, FRONT PANEL, TERMINATOR
-7	407-5140-00			1	BRACKET; TRIM, FRONT PANEL, SHEET METAL, SAFETY CONTROLLED
-8	065-0760-01			1	CIRCUIT BD ASSY; FRONT PANEL; TERMINATOR
-9	671-6062-00			1	CIRCUIT BD ASSY; FRONT PANEL ENCODER; TERMINATOR
-10	366-0859-01			1	ASSEMBLY, KNOB; 470 DIAMETER, SOFT TOUCH
-11	366-0860-01			1	ASSEMBLY, KNOB; .685 DIAMETER, SOFT TOUCH
-12	366-0861-01			1	ASSEMBLY, KNOB; .925 DIAMETER, SOFT TOUCH
-13	174-5162-00			1	CABLE ASSY; DISPLAY ADAPTER TO FRONT PANEL BOARD
-14	211-0747-00			8	SCREW, MACHINE; 6-32 X 0.188, PNH, STL, CDPL, T-15 TORX DR
-15	211-0721-00			4	SCREW, MACHINE; 6-32 X 0.375, PNH, STL, CDPL, T-15 TORX DR
-16	065-0742-00			1	MODULE ASSY; SERVICE REPLACEMENT, TOUCH PANEL W/ PACKAGING
-17	065-0766-01			1	MODULE ASSY; SERVICE REPLACEMENT, LCD, INTERCONNECT DISPLAY ADAPTER BOARD W/PACKAGING
-18	174-5160-00			1	CABLE ASSY; DISPLAY ADAPTER TO DISPLAY
-19	065-0746-01			1	POWER BUTTON ASSEMBLY

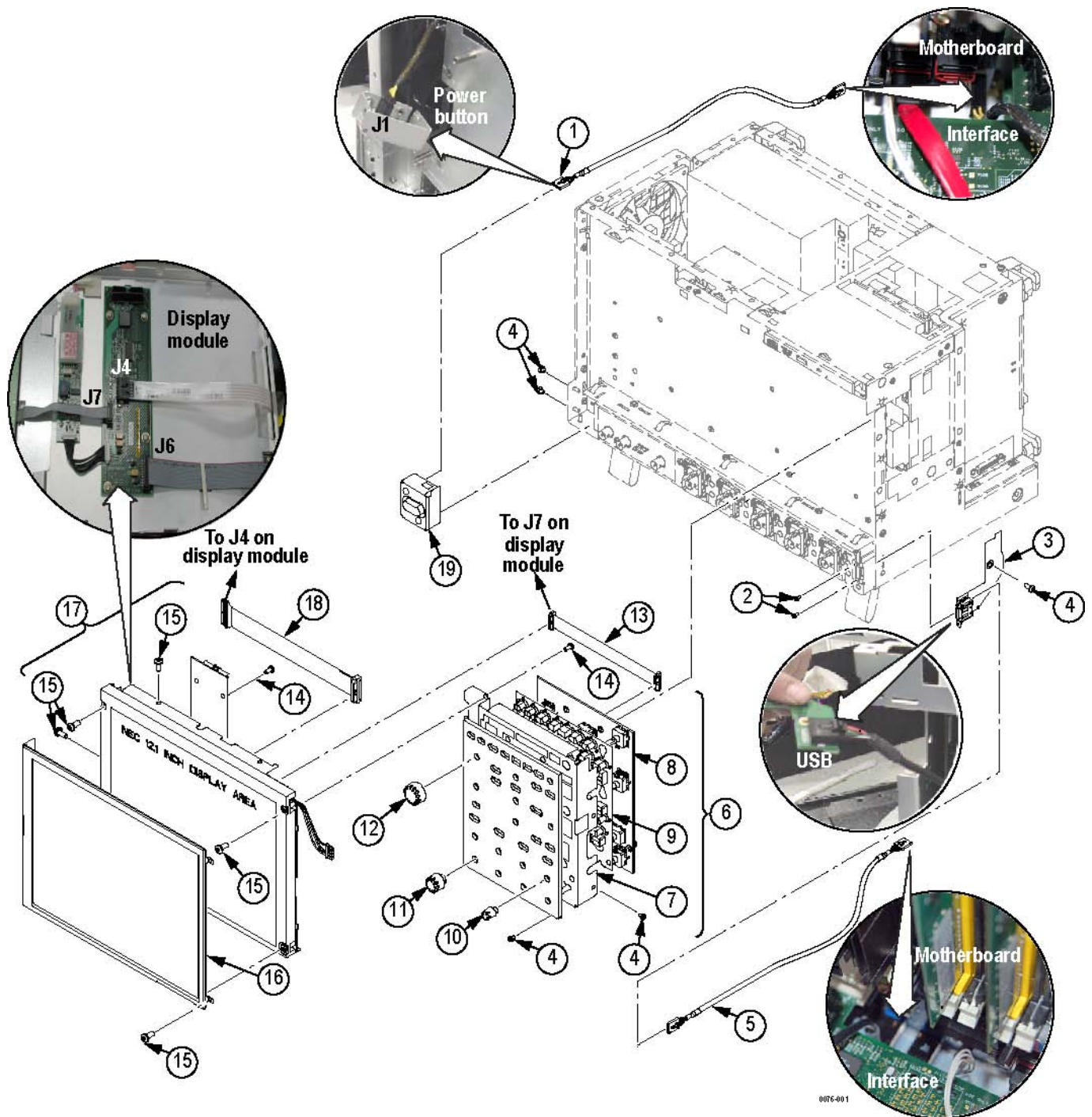


Figure 5-2: Front panel and display (DPO7000 Series)

**Table 5-3: Replaceable parts – Power supply and fans (DPO7000 Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-3</b>					<b>POWER SUPPLY AND FANS</b>
-1	119-6982-xx			1	POWER SUPPLY; AC-DC; 460W; +3.3V 40A, +5V 34A, +12V 25A, -12V 1A, +5VSB, 2A; 90-264VAC, 47-63HZ; BERG 51624-XX001; 9.5X4.9X3.8IN, SAFETY CONTROLLED
-2	407-5089-00			1	BRACKET; LVPS, SAFETY CONTROLLED
-3	211-1050-00			9	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-4	436-0421-00			1	TRAY, FAN; CHASSIS ASSY, W/FANS MOUNTED; STINGRAY, SAFETY CONTROLLED
-5	441-2435-00			1	CHASSIS; MAIN; AL, SAFETY CONTROLLED
-6	671-5930-00			1	CIRCUIT BD SUBASSY; POWER INTERCONNECT; 389-3659-00; WIRED; SAFETY CONTROLLED
-7	343-1584-00			4	CLAMP; WIRE ROUTING, 0.51 H X 0.625W, NYLON
-8	335-1515-00			1	LABEL, CHASSIS, REAR, SAFETY CONTROLLED



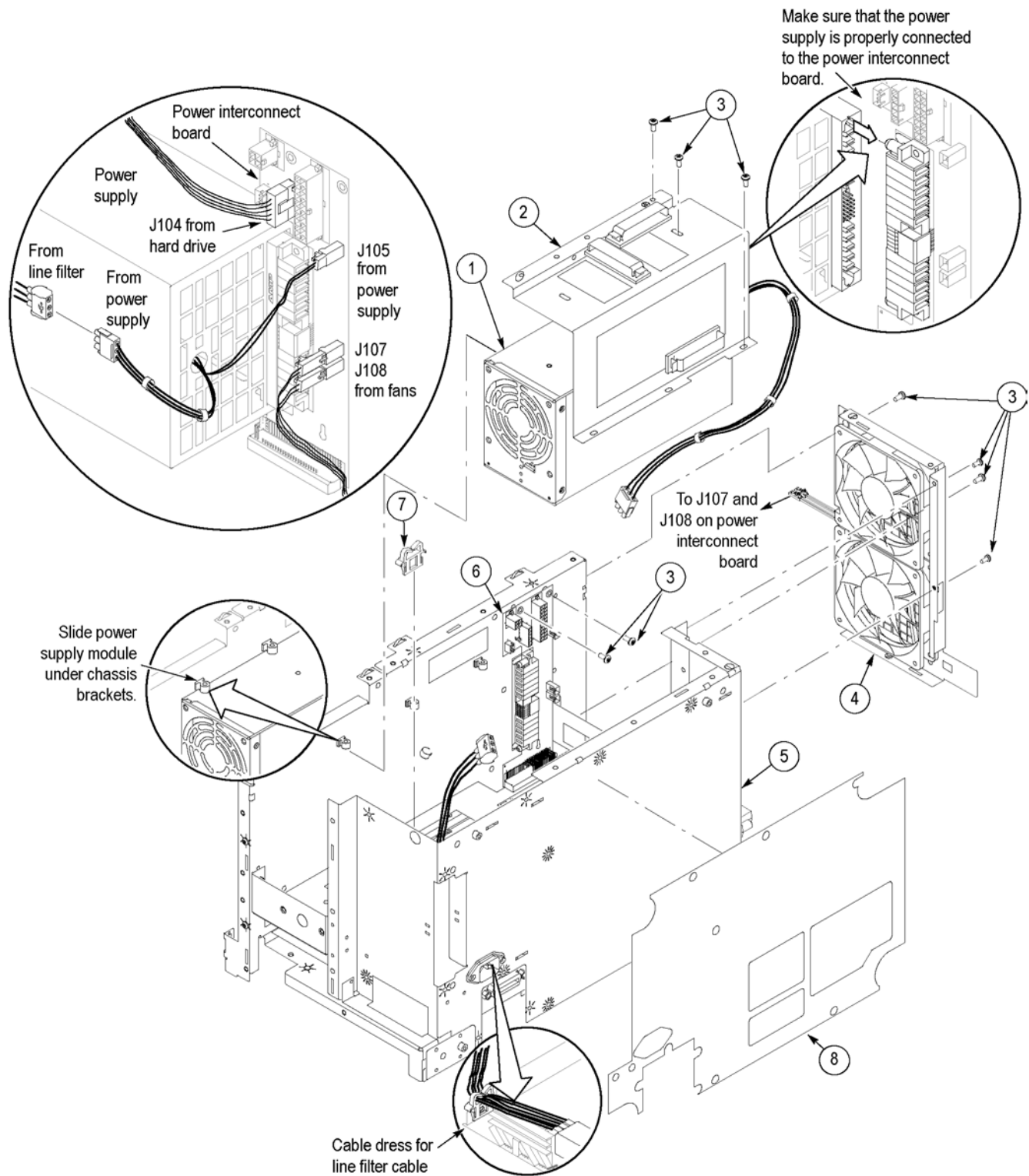


Figure 5-3: Power supply and fans (DPO7000 Series)



**Table 5-4: Replaceable parts –  $\mu$ ATX Motherboard (DPO7000 Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discount'd	Qty	Name & description
<b>5-4 and 5-5</b>					
<b>MOTHERBOARD</b>					
-1	050-3723-00			1	PARTS REPLACEMENT KIT; AIMB562VG-00A1E, BIOS 562X12AN.BIN, ALC888 AUDIO CODEC, 039018601 WITH 063425400 AIMB-562 AUDIO DRIVER, ADVANTECH VERSION 5.10.0.5324
	167-0657-00			1	PROCESSOR; PENTIUM 4, 3.4 GHZ INTERNAL CLOCK, 400MHZ BUS, SOCKET 478 COMPATIBLE, W/O FAN HEATSINK, JM80547PG0961M
-2	119-7333-00			1	FAN AND HEAT SINK WITH BRACKET
-3				1	BRACKET FOR FAN AND HEATSINK (PART OF ITEM 2 IN THIS LIST)
-4	167-0428-00	B010100	B010856	4	IC, MEMORY; 64M X 64, 512 MB DDR2, 1.8V, 3-3-3; MT16HTF6464AY-40E, DIMM240, DS1
	167-1048-00	B010857		2	IC, MEMORY; 128M X 64, 1 GB DDR2, 1.8V, 3-3-3; MT16HTF12864AY-40E, DIMM240, DS1
-5	174-5271-00			1	IDE CABLE WITH STRAIN RELIEF & PULL-TAB
-6	211-1050-00			5	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-7	174-4797-00			1	CA ASSY; 20 PIN ATX POWER, SAFETY CONTROLLED
-8	174-4865-00			1	CA ASSY; 4 PIN P4 POWER, 9.5 L, MOTHER BOARD TO INTERFACE BOARD, SAFETY CONTROLLED
-9	441-2466-01			1	CHASSIS; REAR PROCESSOR, 039-0173-xx
	441-2551-00			1	ATX CHASSIS; MOTHERBOARD ADVANTECH AIMB-562, 039-0185-xx
	065-0826-00	B110100		1	DISK DRIVE ASSY;SERVICE REPLACEMENT, UNPROGRAMMED HARD DRIVE 1197524XX W/ PACKAGING; DPO/DSA70000B

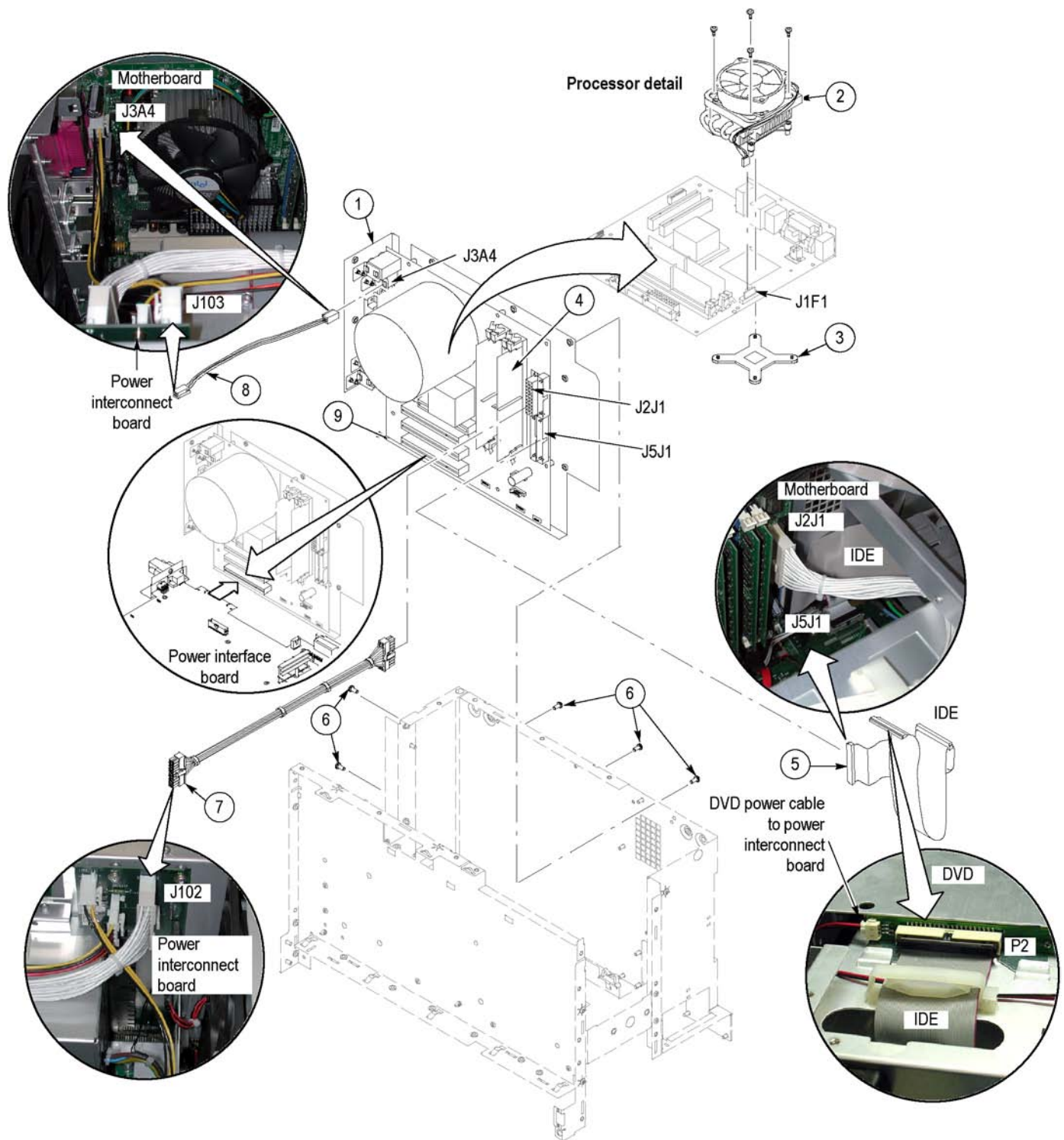


Figure 5-4: 039-0173-xx and 065-0745-xx μATX Motherboard (DPO7000 Series)

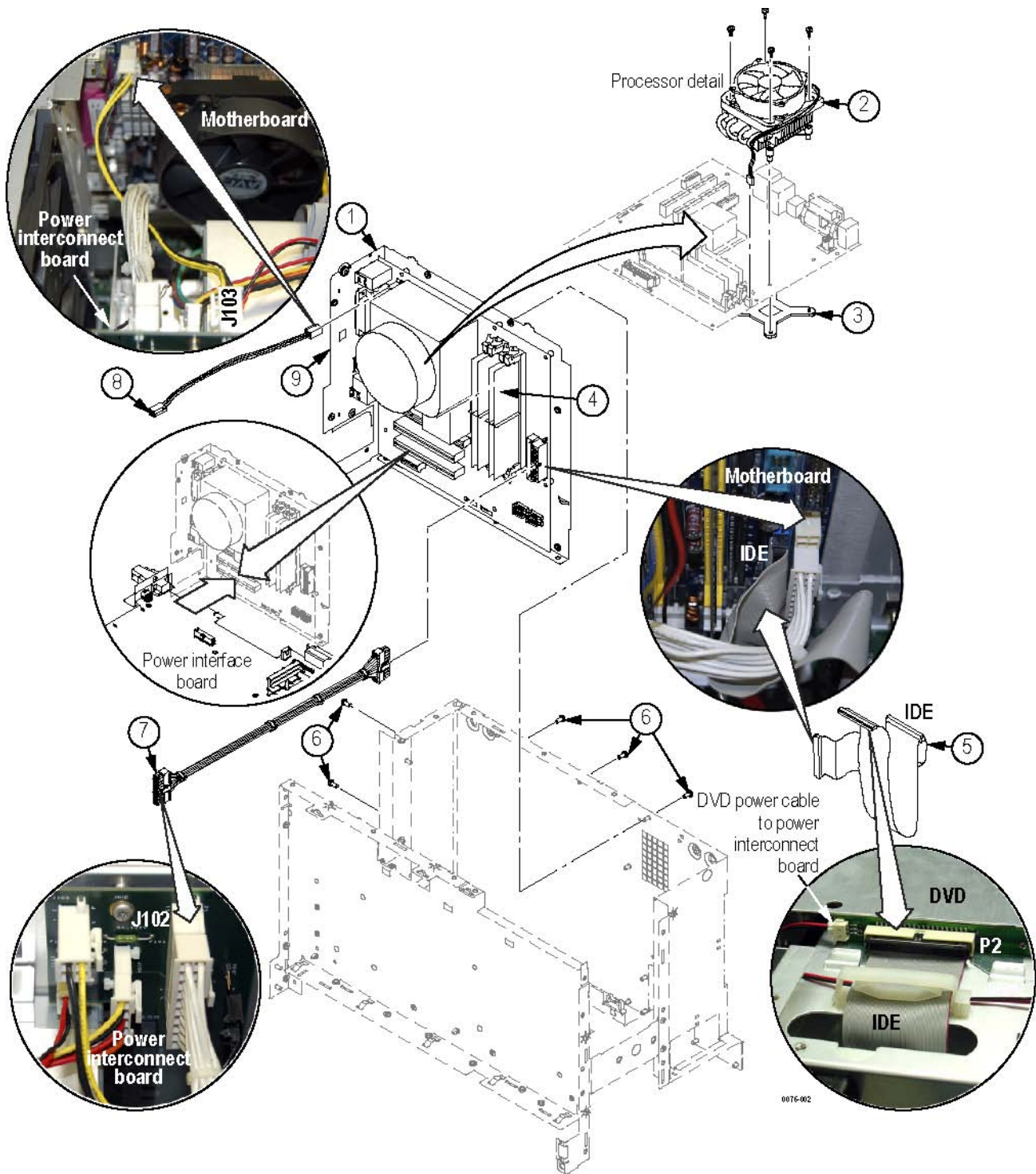


Figure 5-5: 039-0185-xx μATX Motherboard (DPO7000 Series)

**Table 5-5: Replaceable parts – Power interface and Acquisition assemblies (DPO7000 Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-6</b>	<b>POWER INTERFACE AND ACQUISITION ASSEMBLIES</b>				
-1	211-1050-00			19	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-2	174-5048-00			1	CA ASSY; USB 1.0
-3	174-5159-00			1	CABLE ASSY; GPIB
-4	335-1518-00			1	LABEL, TEKLINK, SAFETY CONTROLLED
-5	211-1206-00			2	SCREW, JACK; 2-56 ID X 4-40 OD., 188 HEX, SS
-6	671-5912-02			1	CIRCUIT BD ASSY; POWER INTERFACE, 6795912XX, TESTED; WIRED, 389352600
-7	213-1061-00			2	JACKSCREW; 6-32 X 0.320 EXT THD, M3.5 X 0.6-6 INT THD X 0.215L, GPIB, BLACK OXIDE, BULK PACK
-8	211-0747-00			3	SCREW, MACHINE; 6-32 X 0.188, PNH, STL, CDPL, T-15 TORX DR
-9	672-5819-54			1	CIRCUIT BD ASSY; ACQ, 6725819XX, TESTED; WIRED, (DPO7254 ONLY)
	672-6166-54			1	CIRCUIT BD ASSY; ACQ, 6726166XX, TESTED; WIRED, (DPO7104, DPO7054 ONLY)
	672-6172-50			1	CIRCUIT BD ASSY; ACQ, 6726172XX, TESTED; WIRED, (DPO7354 ONLY)
-10	441-2436-00			1	CHASSIS; ACQ; AL, SAFETY CONTROLLED
-11	174-5161-00			1	CABLE ASSY; DISPLAY ADAPTER TO PCI BOARD



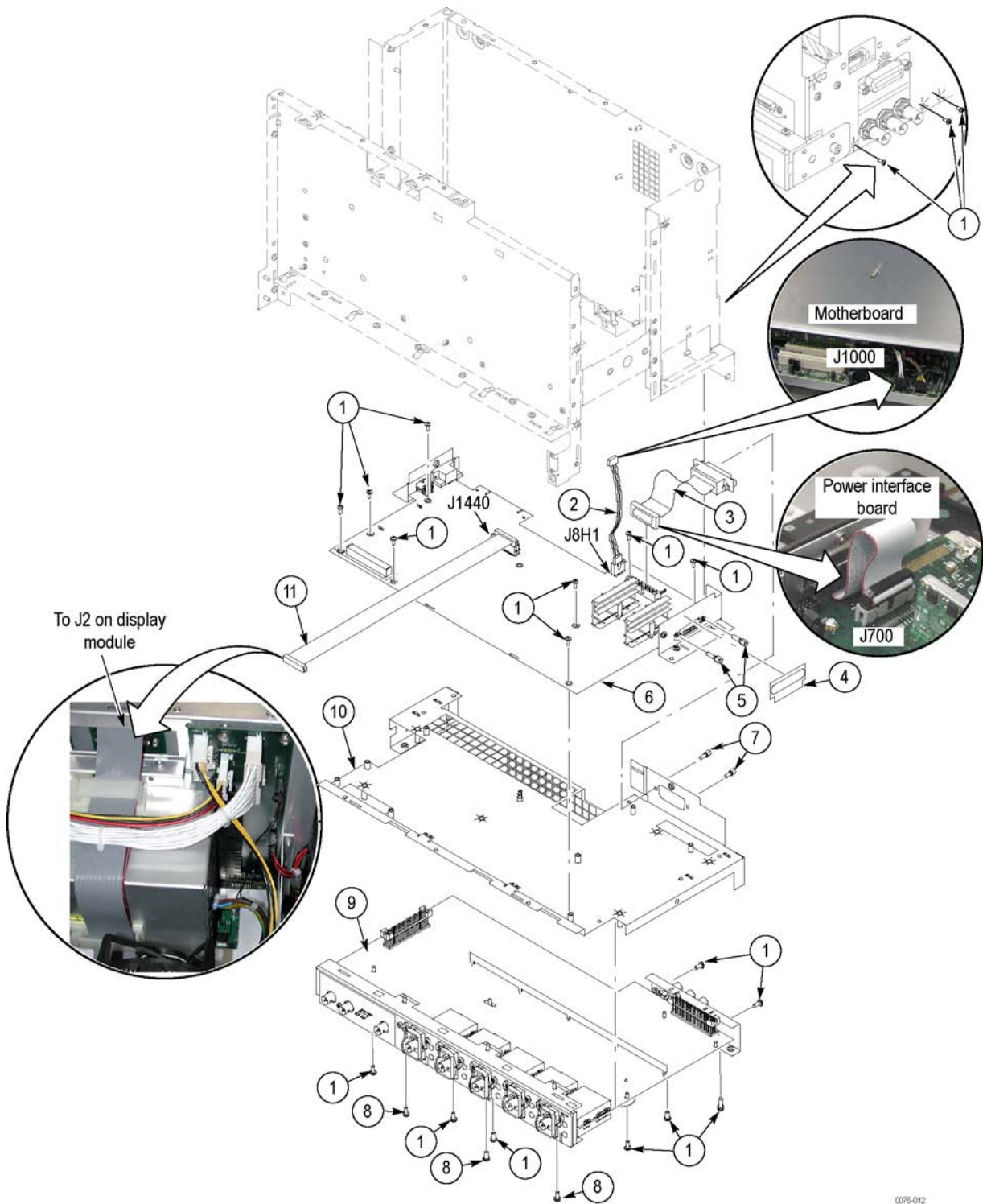


Figure 5-6: Power interface and Acquisition assemblies (DPO7000 Series)

**Table 5-6: Replaceable parts – Drives (DPO7000 Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-7</b>					<b>DRIVES</b>
-1	065-0744-00			1	DISK DRIVE ASSY; SERVICE REPLACEMENT W/O SOFTWARE, W/ PACKAGING
-2	211-1050-00			11	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	407-5069-00			1	BRACKET, RHDD; SATA COMBO CABLE, 3.5 INCH REMOVABLE HARD DISK DRIVE RECEPTACLE
-4	174-5169-00			1	CABLE ASSY; SATA COMBO, HARD DRIVE CABLE
-5	679-5915-00			1	CKT BD SUBASSY; DVD-CD/RW ADAPTER, UNTESTED, 389-3689-00 WIRED
-6	129-1618-00			1	SPACER; DVD-CD/RW SLIMLINE DRIVE ADAPTER, PLASTIC
-7	065-0666-02			1	DISK DRIVE; OPTICAL, 644MB, CD-RW/DVD ROM, COMBO, 16.7 MB/SEC, IDE/ATAPI; DW-224E-C93, SAFETY CONTROLLED
-8	211-0950-00			3	SCREW, MACHINE; M2X.4X3L, PHL, PNH, STL NI PL
-9	407-5156-00			1	BRACKET, DVD-CD/RW, COMBO; ADAPTER FOR DVD-CD/RW, COMBO, SLIMLINE
-10	174-5017-00			1	CABLE ASSEMBLY; DVD POWER

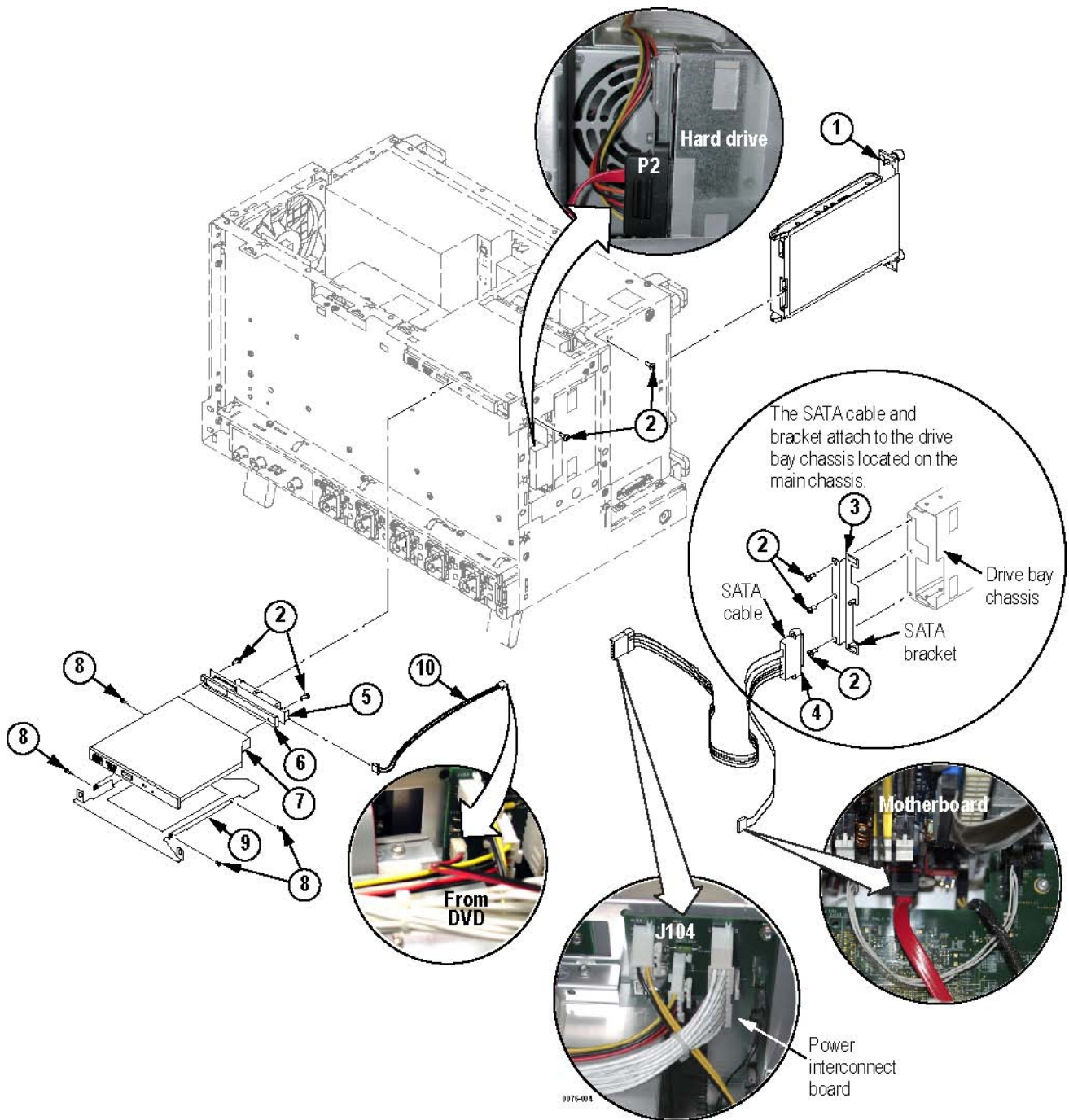


Figure 5-7: Drives (DPO7000 Series)

## Replaceable Parts (DSA/DPO70000B Series)

Table 5-7: Replaceable parts – External 1 (DSA/DPO70000B Series)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discontinued	Qty	Name & description
<b>5-8</b>					<b>EXTERNAL PARTS</b>
-1	016-1441-01			1	ACCESSORY POUCH; BLACK CORDURA
-2	200-5065-00			1	COVER, TOP; COSMETIC
-3	211-1224-00			8	SCREW, MACHINE; 6-32 X 0.375, PNH, STL, CDPL, T-15
-4	355-0298-00			1	STUD.SNAP; 0.570 DIA, 0.165 THK, STAINLESS STEEL
-5	200-5066-00			1	COVER; EMI TOP
-6	211-1050-00			14	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-7	348-1859-00			4	FOOT; REAR, W/ CORD WRAP, THERMOPLASTIC
-8	101-0173-01			1	TRIM, ACQUISITION INSERT
-9	101-0171-00			1	TRIM RING; FR110, PC/ABS
-10	200-4963-00			1	COVER, FRONT; PC/ABS ALLOY BAYBLEND
-11	101-0174-00			1	TRIM, DVD
-12	335-1940-00			1	MARKER, IDENT; DPO70404B
	335-1939-00				MARKER, IDENT; DPO70604B
	335-1938-00				MARKER, IDENT; DPO70804B
	335-1943-00				MARKER, IDENT; DPO71254B
	335-1942-00				MARKER, IDENT; DPO71604B
	335-1941-00				MARKER, IDENT; DPO72004B
	335-1946-00				MARKER, IDENT; DSA70404B
	335-1945-00				MARKER, IDENT; DSA70604B
	335-1944-00				MARKER, IDENT; DSA70804B
	335-1949-00				MARKER, IDENT; DSA71254B
	335-1948-00				MARKER, IDENT; DSA71604B
	335-1947-00				MARKER, IDENT; DSA72004B
-13	348-1817-00			2	FOOT, SKID



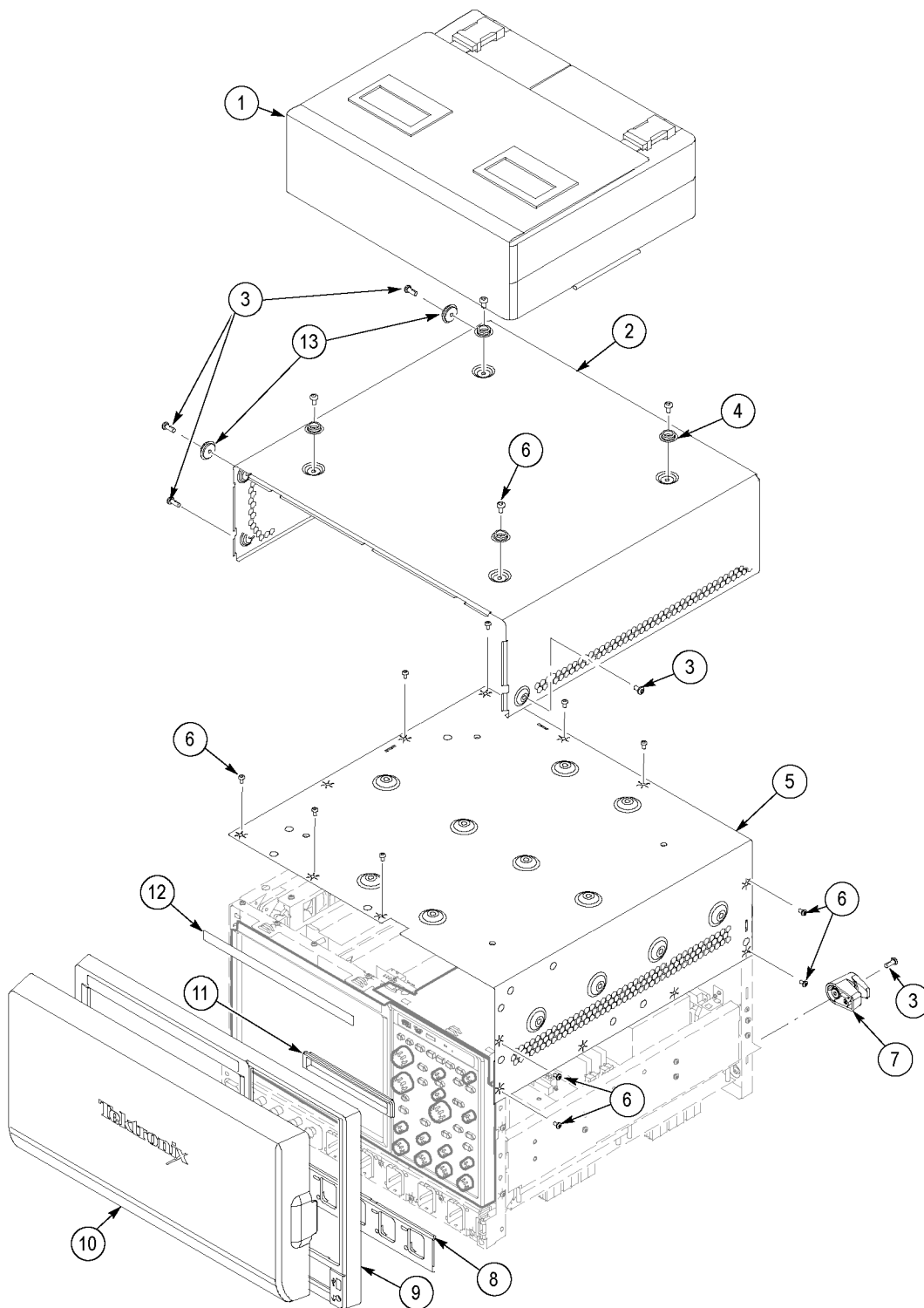


Figure 5-8: External parts 1 (DSA/DPO70000B Series)

**Table 5-8: Replaceable parts – External 2 (DSA/DPO70000B Series)**

<b>Fig. &amp; index number</b>	<b>Tektronix part number</b>	<b>Serial no. effective</b>	<b>Serial no. discont'd</b>	<b>Qty</b>	<b>Name &amp; description</b>
<b>5-9</b>					<b>EXTERNAL PARTS</b>
-1	174-5226-00			1	CABLE ASSY; LINE FILTER
-2	211-1050-00			16	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	200-4936-00			1	COVER; EMI BOTTOM, DPO/DSA70804/70604/70404
	200-5007-00			1	COVER; EMI BOTTOM, DPO/DSA720004/71604/71254
	200-5007-00			1	COVER; EMI BOTTOM, DPO/DSA7
-4	200-5067-00			1	COVER, BOTTOM; COSMETIC; W/FEET
-5	212-0232-00			2	SCREW, MACHINE; 8-32 X 1.125L, PNH, STL, BLACK ZINC SPEC #ASTM B633 TYPE II, T-20
-6	367-0528-00			1	HANDLE, CARRYING; DUAL DUROMETER MOLDED, POLYPROPYLENE, VINYL GRIP SECTION
	407-4887-00			1	BRACKET; HANDLE BASE, PC/ABS ALLOY, BAYER BAYBLEND FR-110, TEK BLUE
-7	348-1515-00			1	FEET, CABINET; BLACK, GLASS-FIBRE REINFORCED PLASTIC, SET OF 4 FEET, 4 RUBBER INSERTS
-8	211-1224-00			4	SCREW, MACHINE, BLACK
-9	348-1817-00			2	FOOT, SKID

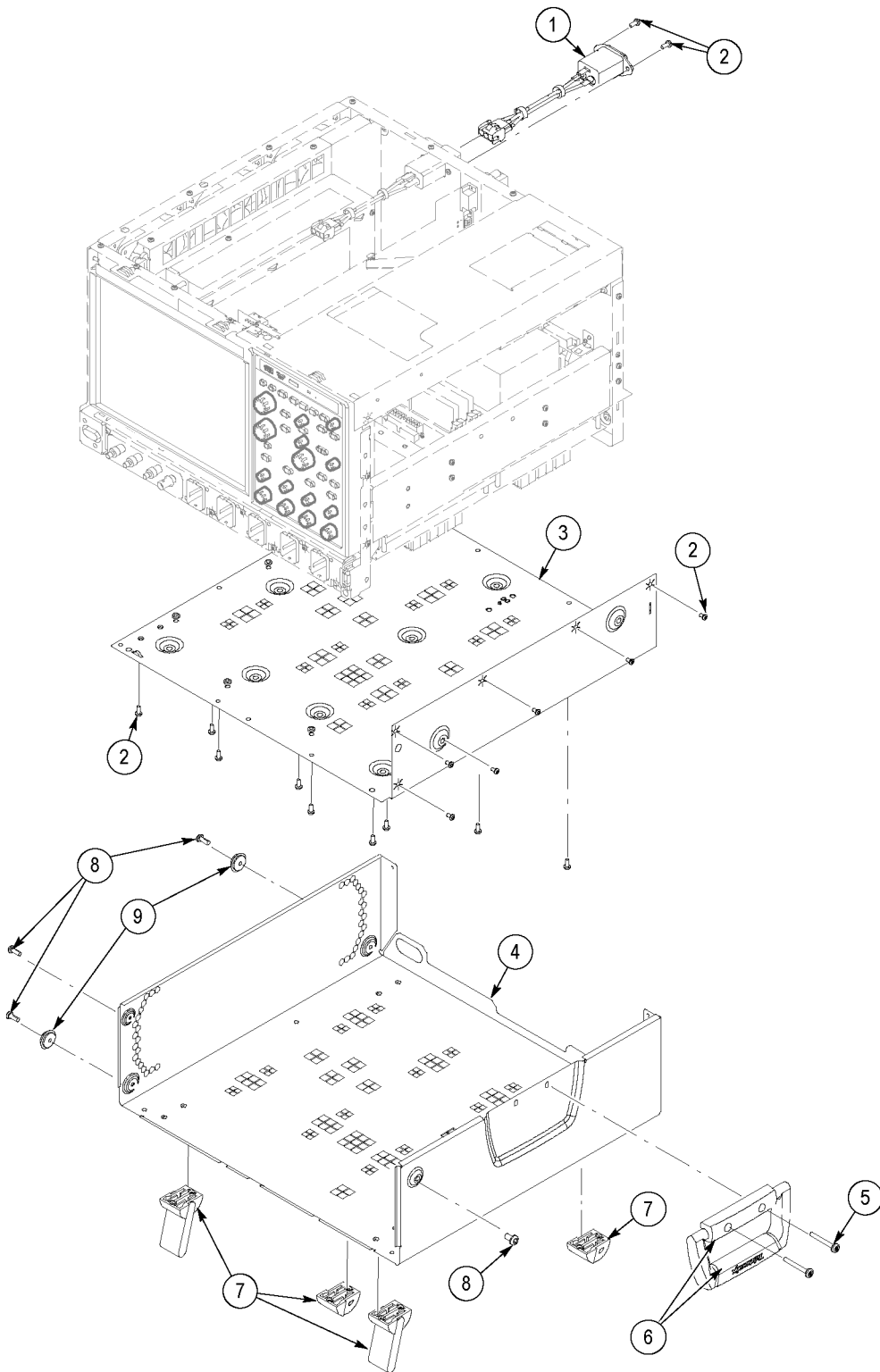


Figure 5-9: External parts 2 (DSA/DPO7000B Series)

**Table 5-9: Replaceable parts – Front panel and display (DSA/DPO70000B Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-10</b>					
<b>FRONT PANEL AND DISPLAY</b>					
-1	174-5165-00			1	CABLE ASSY; POWER SWITCH
-2	065-0756-02			1	MODULE ASSY;SERVICE REPLACEMENT KIT,614104101 FRONT PANEL ASSEMBLY W/ PACKAGING;DPO7000,DPO/DSA70000 SERIES
-3	671-6062-00			1	CIRCUIT BOARD ASSY; FRONT PANEL ENCODER
-4	065-0760-00			1	CIRCUIT BD ASSY; FRONT PANEL MAIN
-5	260-2818-00			1	SWITCH, KEYPAD; ELASTOMER EMAT
-6	211-1150-00			1	SCREW, MACHINE; 6-32 X 0.172, PNH, STL, T-15 TORX DR, BLACK OXIDE
-7	407-5140-00			1	BRACKET; TRIM,FRONT PANEL, SHEET METAL
-8	333-4522-00		Discontinued	1	PANEL ASSEMBLY; FRONT SUBPANEL, W/BRACKET ASSEMBLY, BEZEL & LABEL
	333-4564-00		Discontinued	1	PANEL ASSEMBLY; FRONT SUBPANEL, W/BRACKET ASSEMBLY, BEZEL & LABEL
-9	366-0859-01			1	ASSEMBLY, KNOB; .470 DIAMETER, SOFT TOUCH
-10	366-0860-01			1	ASSEMBLY, KNOB; .685 DIAMETER, SOFT TOUCH
-11	366-0861-01			1	ASSEMBLY, KNOB; .925 DIAMETER, SOFT TOUCH
-12	174-5162-00			1	CABLE ASSY; DISPLAY ADAPTER TO FRONT PANEL BOARD
-13	211-0747-00			4	SCREW, MACHINE; 6-32 X 0.188, PNH, STL, CDPL, T-15
-14	065-0742-00			1	TOUCH SCREEN ASSEMBLY, 12.1 IN, RESISTIVE, 5-WIRE, W/GASKETS, W/BRACKETS
-15	211-0721-00			5	SCREW, MACHINE; 6-32 X 0.375, PNH, STL, CDPL, T-15
-16	065-0743-01			1	COMPONENT KIT; LCD DISPLAY ADAPTER MODULE SUBASSEMBLY, STANDARD
-17	174-5160-00			1	CABLE ASSY; DISPLAY ADAPTER TO DISPLAY
-18	174-5163-00			1	CABLE ASSY; DISPLAY ADAPTER TO INVERTER BOARD
-19	065-0746-01			1	MODULE ASSY; SERVICE REPLACEMENT KIT, POWER BUTTON ASSY
-20	679-6283-01			1	CIRCUIT BOARD ASSY; DISPLAY ADAPTER
-21	119-7016-00			1	CIRCUIT BOARD ASSY; INVERTER

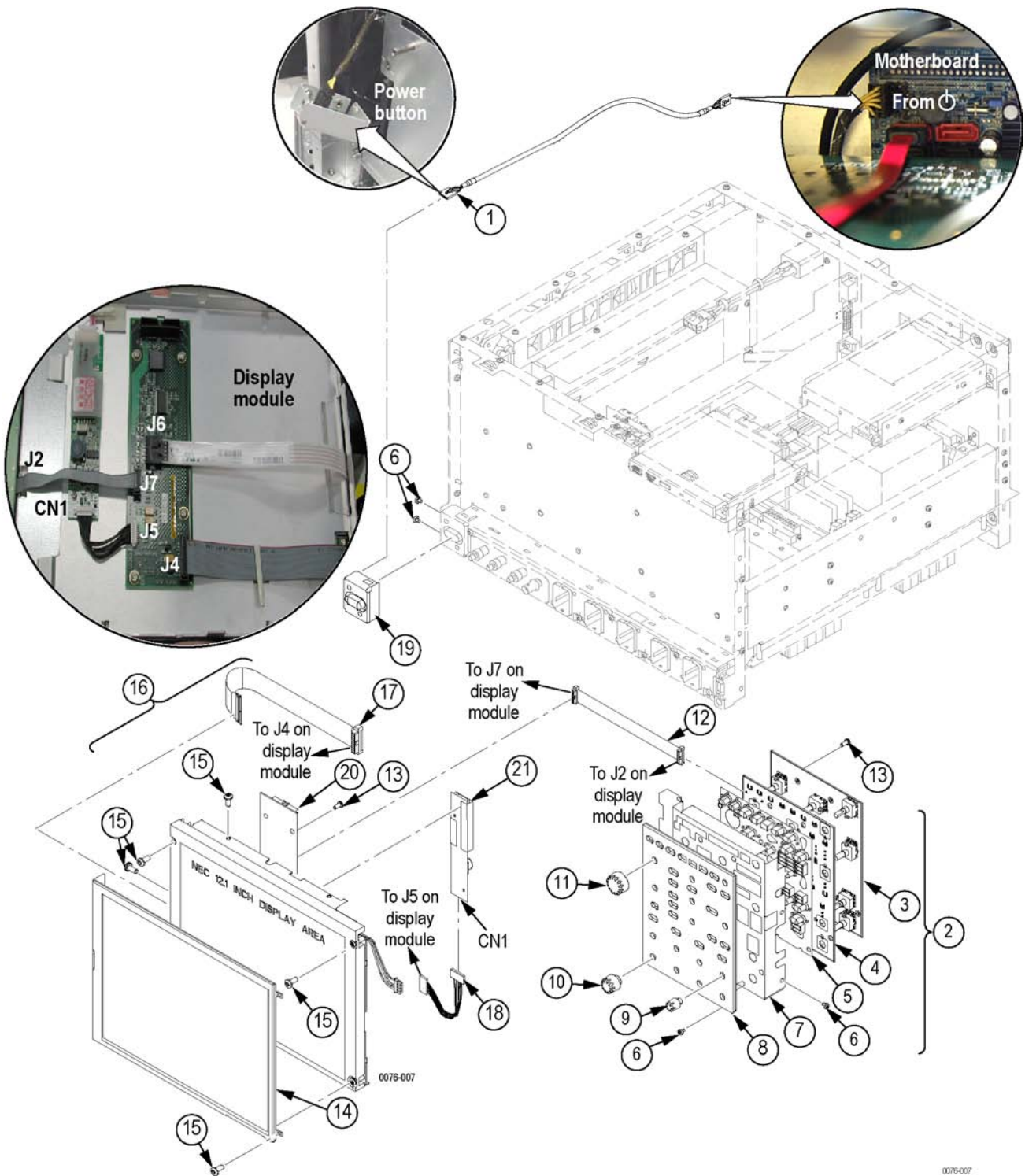
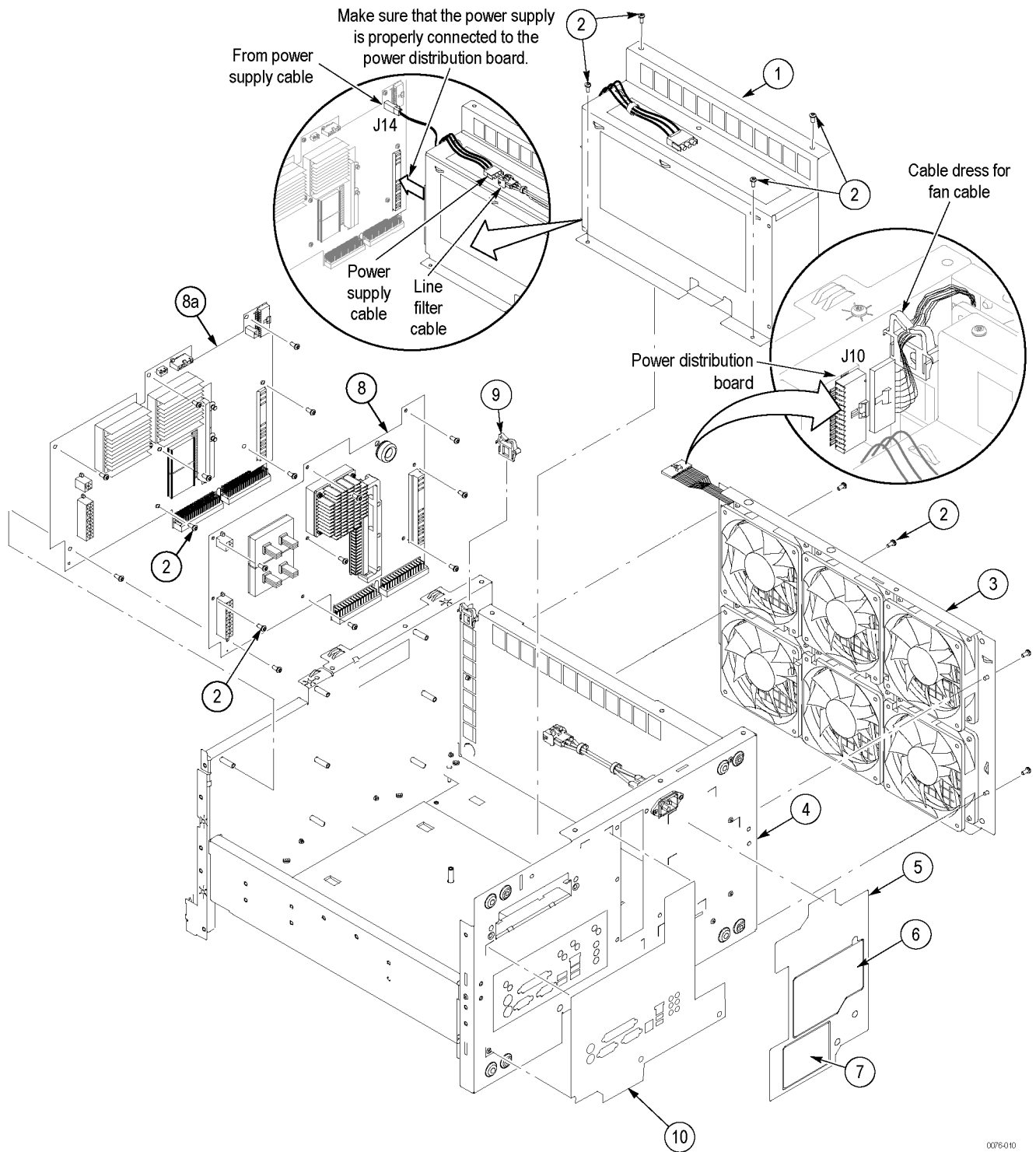


Figure 5-10: Front panel and display (DSA/DPO70000B Series)

**Table 5-10: Replaceable parts – Power supply and fans (DSA/DPO70000B Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-11</b>					
<b>POWER SUPPLY AND FANS</b>					
-1	119-6982-xx			1	POWER SUPPLY; AC-DC; 1200W, +48V 25A, +12V 1A, 85-264VAC, 47-63HZ, ELCON 377-0002-00100A, IEC320-C22; 11.5X6.75X2.75IN; CLOSED CHASSIS
	407-5381-00	B110100			BRACKET;POWER SUPPLY
-2	211-1050-00			12	SCREW, MACHINE; 6-32X0.312 L, PNH, STL CAD PLT, T15
-3	436-0422-00			1	TRAY, FAN; CHASSIS ASSY, W/6 FANS MOUNTED; HAMMERHEAD
-4	441-2563-00			1	CHASSIS ASSEMBLY, MAIN, ADVANTECH AIMB-562 UATX, SAFETY CONTROLLED;DPO70000B SERIES
	407-5366-00			1	BRACKET, IO BACK PANEL PLATE, DPO/DSA7000B SERIES
-5	335-1634-00			1	LABEL, CHASSIS, REAR COSMETIC
-6	335-0263-01			1	MARKER, IDENT; SUPER LABEL, BLANK ROLL STOCK
-7	335-0347-00			1	MARKER,IDENT; REAR PANEL, BLANK, 2.100 X 2.700
-8	065-0759-01	B010100	B110099	1	CIRCUIT BOARD; POWER DISTRIBUTION, DSA70000, DPO70000
-8a	671-6385-00	B110100		1	CIRCUIT BOARD; POWER DISTRIBUTION, DSA70000B, DPO70000B
-9	343-1585-00			1	CLAMP; WIRE ROUTING CLAMP, FLAT CABLE BLIND HOLE MOUNTED, NYLON
-10	335-1604-00			1	LABEL, REAR I/O PLATE, LEXAN



0076-010

Figure 5-11: Power supply and fans (DSA/DPO7000B Series)

**Table 5-11: Replaceable parts –  $\mu$ ATX assembly (DSA/DPO70000B Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-12 and 5-13</b>					<b>MOTHERBOARD</b>
-1	174-4797-00			1	CA ASSY; 20 PIN ATX POWER, SAFETY CONTROLLED
-2	065-0745-02			1	SERVICE KIT FOR CPU BRD, CPU, FAN AND HEAT SINK ASSEMBLY
	167-0657-00			1	PROCESSOR; PENTIUM 4, 3.4 GHZ INTERNAL CLOCK, 400MHZ BUS, W/O FAN HEATSINK, HH80552PG0962M
	119-7333-00			1	FAN, HEATSINK AND BRACKET
-3	211-0935-00			8	SCREW, MACHINE; 6-32 X 0.50, PNH, T-15, SST, PASSIVATED
-4	174-4798-00			1	CA ASSY; 4 PIN P4 POWER
-5	050-3723-00			1	PARTS REPLACEMENT KIT; AIMB562VG-00A1E, BIOS 562X12AN.BIN, ALC888 AUDIO CODEC, 039018601 WITH 063425400 AIMB-562 AUDIO DRIVER, ADVANTECH VERSION 5.10.0.5324; DPO7000, DPO/DSA70000, DPO/DSA7000B, VM6000, DSA8200, TLA5000B SERIES
-6	167-1048-00			2	IC, MEMORY; 128M X 64, 1GB DDR2 1.8V, 3-3-3; MT16HTF12864AY-40E, DIMM240,DS1
-7	119-7333-00			1	HEATSINK AND BRACKET
-8	342-1198-00			1	DAMPENER, PORON FOAM FOR P4 HEATSINK
-9	174-5271-00			1	IDE CABLE WITH STRAIN RELIEF & PULL-TAB



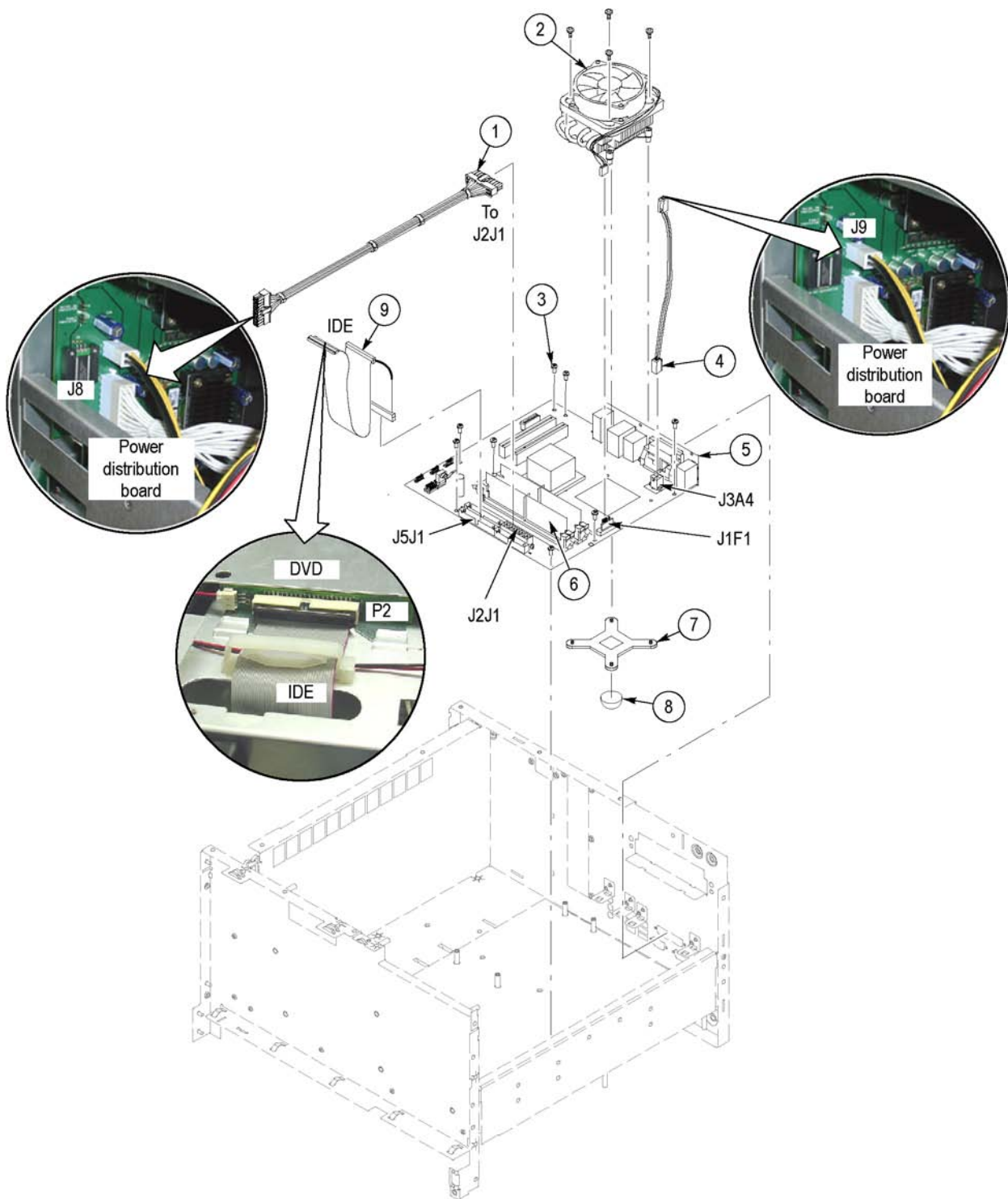


Figure 5-12: 039-0173-xx and 065-0745-xx μATX (DSA/DPO7000B Series)

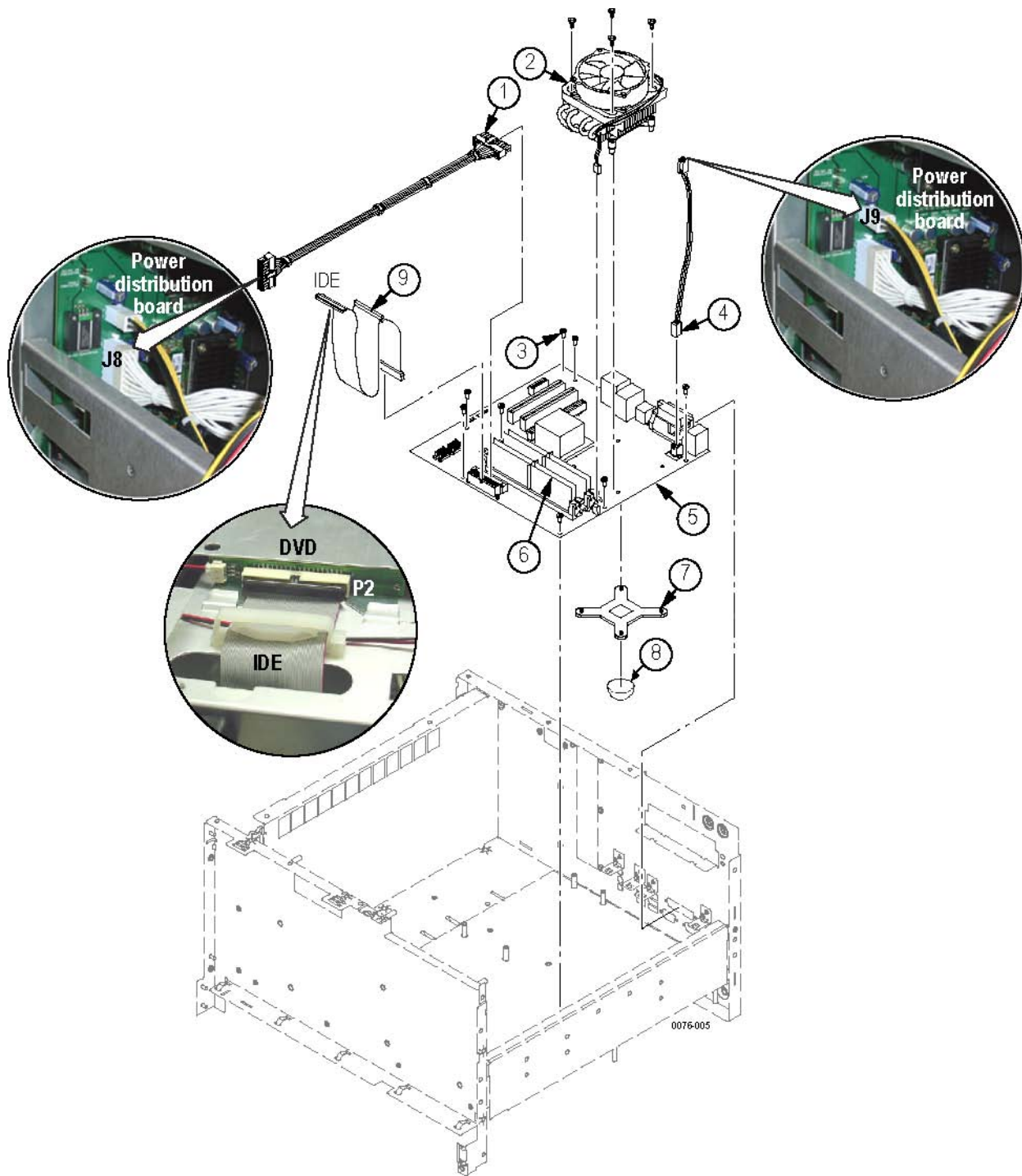


Figure 5-13: 039-0185-xx μATX assembly (DSA/DPO7000B Series)

Table 5-12: Replaceable parts – Acquisition assembly (DSA/DPO70000B Series)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-14</b>					<b>ACQUISITION</b>
-1	214-3903-00			8	SCREW, JACK; 4-40 X 0.312 LONG, 0.188 H HEX HEAD STAND OFF, 4-40 INT THD, X 0.312 THD EXT 4-40
-2	-----			1	ACQUISITION MODULE, RETURN TO TEKTRONIX FOR SERVICE
-3	211-0752-00			10	SCREW,MACHINE; 6-32 X 0.75, PNH, TORX
-4	211-1050-00			7	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15

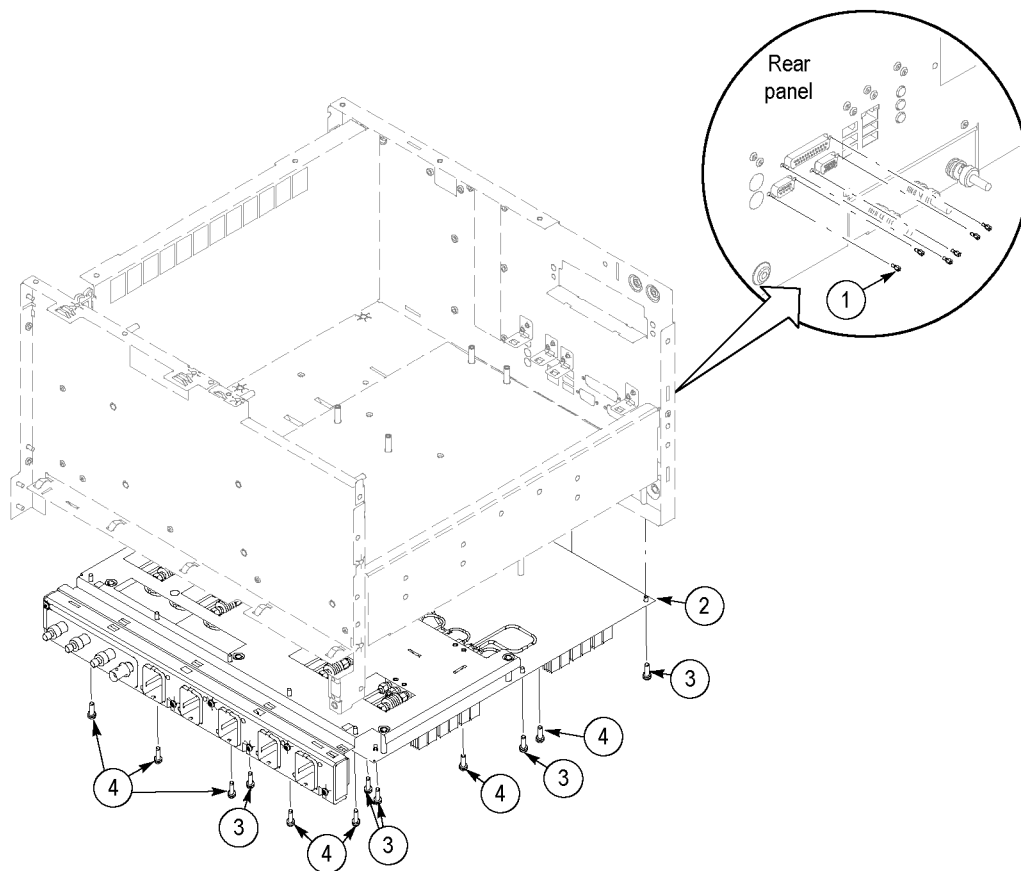


Figure 5-14: Acquisition assembly (DSA/DPO70000B Series)

**Table 5-13: Replaceable parts – Interface board (DSA/DPO70000B Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-15</b>					<b>INTERFACE BOARD</b>
-1	065-0825-00			1	KIT, SERVICE REPLACEMENT, BACKBONE BOARD ASSY, 6646431XX TESTED W/ PACKAGING
					<b>**ATTACHED PARTS**</b>
	386-7536-00			1	BRACKET, STIFFENER FOR PCI PCB
	211-0747-00			5	SCREW, MACHINE; 6-32 X 0.188, PNH, STEEL, ZINC FINISH, T-15 TORX DR
					<b>**END ATTACHED PARTS**</b>
-2	211-1050-00			6	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	335-1604-00			1	LABEL REAR I/O PLATE, SAFETY CONTROLLED
-4	214-3903-00			2	SCREW, JACK; 4-40 X 0.312 LONG, 0.188 H HEX HEAD STAND OFF, 4-40 INT THD, X 0.312 THD EXT 4-40
-5	211-1206-00			2	SCREW, JACK; 2-56 ID X 4-40 OD, 0.188 HEX, SS
-6	214-1061-00			2	CONTACT, ELEC; GROUNDING, CU BE SAFETY CONTROLLED
-7	386-7447-00			1	PLATE; REAR, PCI I/O
-8	174-5164-00			1	CA ASSY; USB 2.0
-9	679-6107-00			1	CIRCUIT BD ASSY; USB
-10	211-1221-00			2	SCREW; M2.0 6-MM LONG PHILLIPS FLATHEAD ZINC-PLATED
-11	174-5048-00			1	CA ASSY; USB 1.0
-12	174-4241-00			1	CABLE ASSY; RIBBON, BUS, IDC, 32 AWG, 16.50 L, 60POS, BOX, IDC, FEMALE, RTANG, 0.050CTR X 2
-13	386-7481-00			1	BRACKET, BRACE BETWEEN PCI PCB AND DRIVE BRACKET

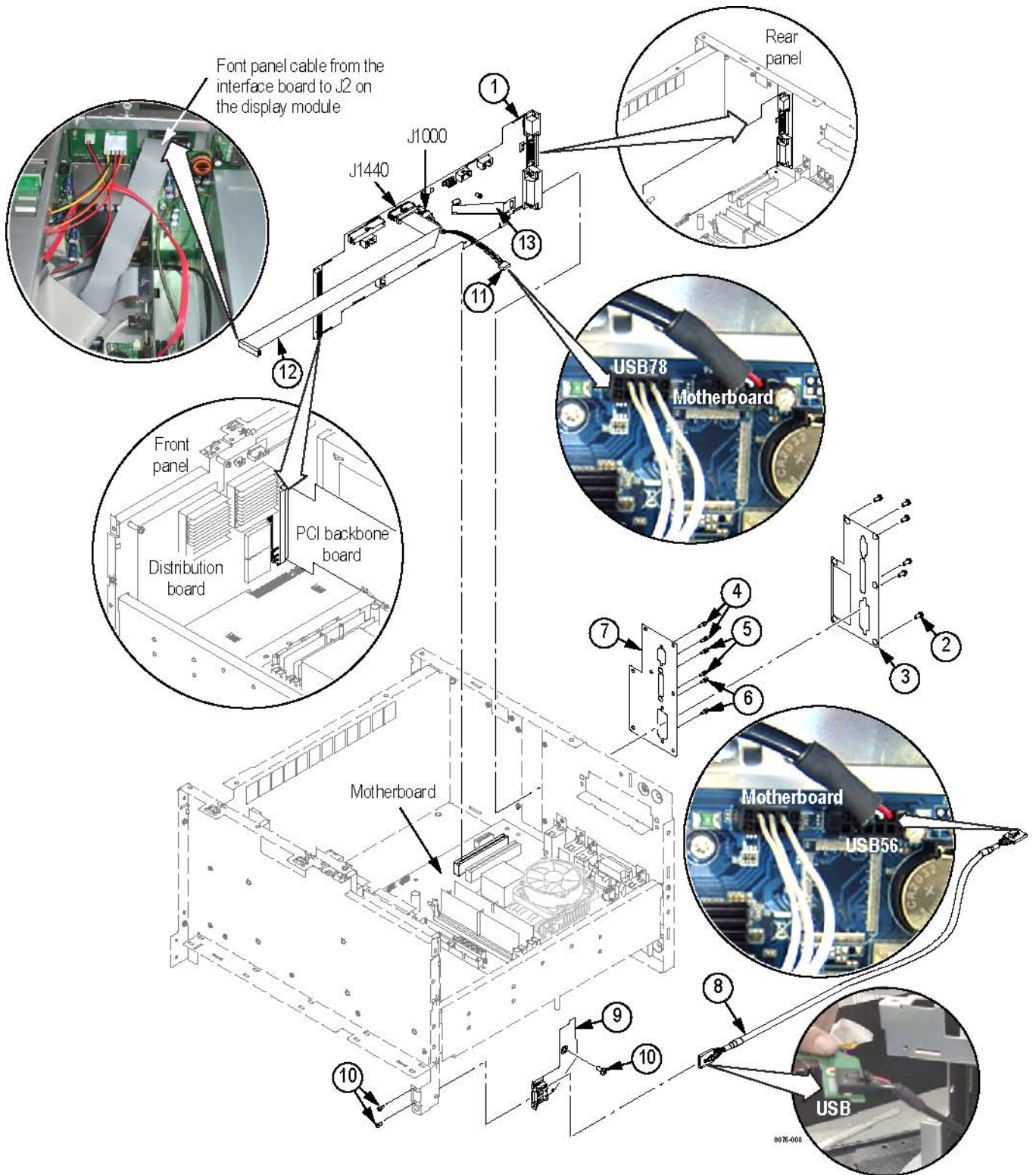


Figure 5-15: Interface board (DSA/DPO70000B Series)



**Table 5-14: Replaceable parts – Drives (DSA/DPO70000B Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discount'd	Qty	Name & description
<b>5-16</b>					<b>DRIVES</b>
-1	065-0851-00			1	DISK DRIVE ASSY;SERVICE REPLACEMENT, PROGRAMMED HARD DRIVE
-2	211-1050-00			8	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	407-5069-00			1	BRACKET, RHDD; SATA COMBO CABLE, 3.5 INCH REMOVABLE HARD DISK DRIVE RECEPTACLE
-4	174-5169-00			1	CABLE ASSY; SATA COMBO, HARD DRIVE CABLE
-5	174-5017-00			1	CABLE ASSEMBLY; DVD POWER
-6	679-5915-00			1	CKT BD SUBASSY; DVD-CD/RW ADAPTER, UNTESTED, 389-3689-00 WIRED
-7	129-1618-00			1	SPACER; DVD-CD/RW SLIMLINE DRIVE ADAPTER, PLASTIC
-8	211-0950-00			4	SCREW, MACHINE; M2X.4X3L, PHL, PNH, STL NI PL
-9	407-5156-00			1	BRACKET, DVD-CD/RW; ADAPTER FOR DVD-CD/RW SLIMLINE
-10	119-7196-00			1	DISK DRIVE; OPTICAL, 644MB, CD-RW/DVD ROM, COMBO, 16.7 MB/SEC, IDE/ATAPI; DW-224E-C93
-11	441-2496-01			1	CHASSIS; DRIVE BAY; METAL

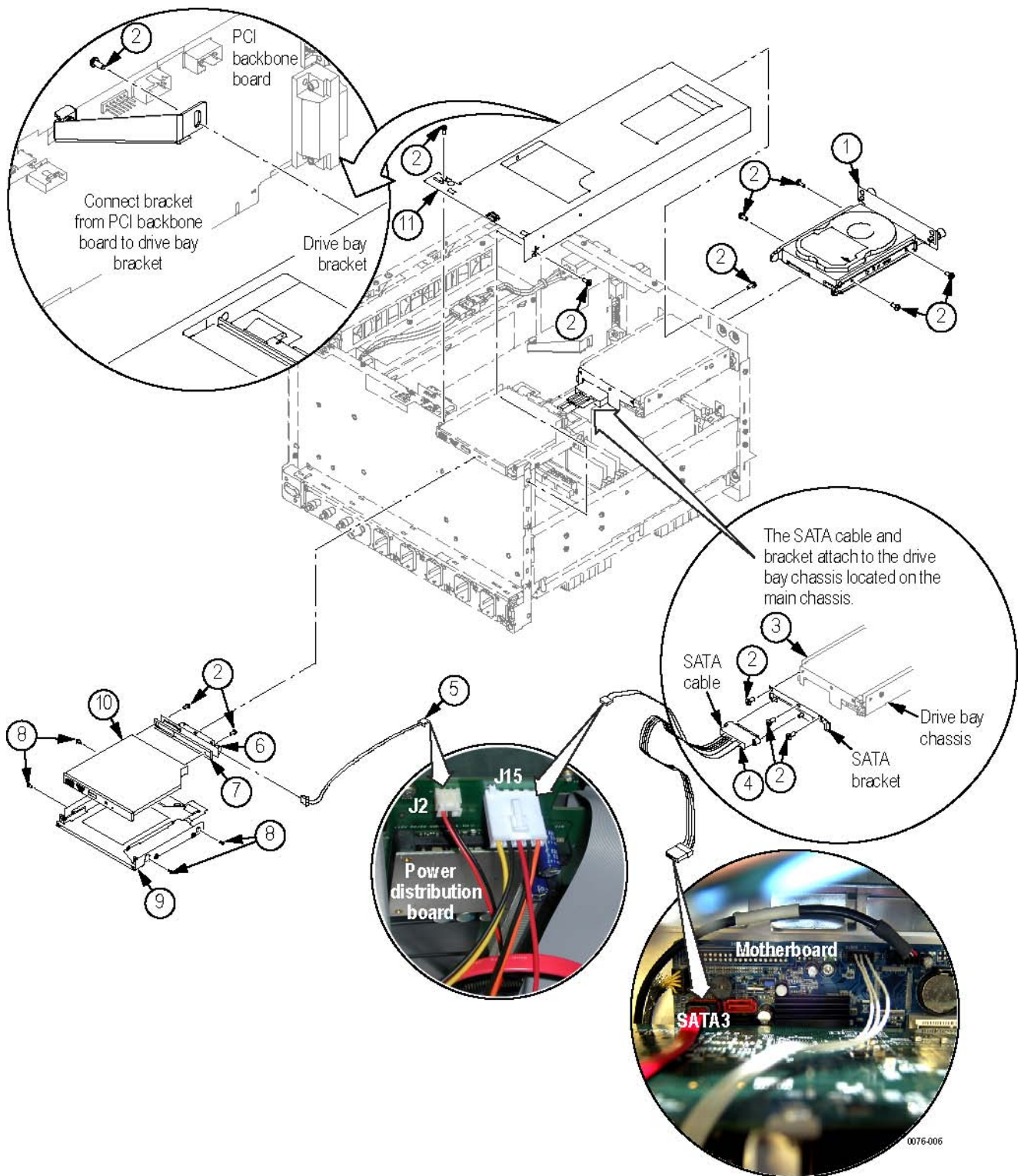


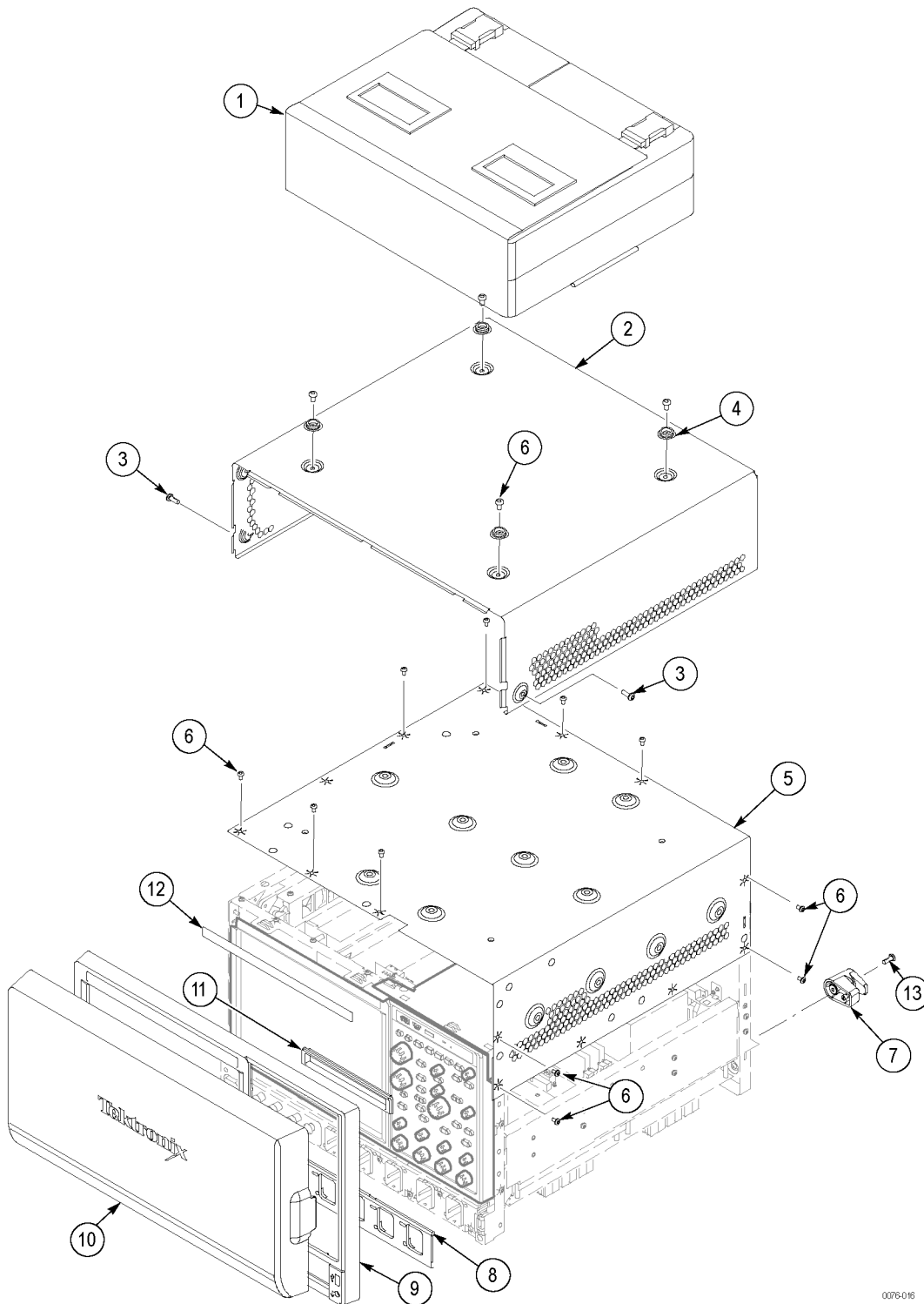
Figure 5-16: Drives (DSA/DPO7000B Series)

## Replaceable Parts (MSO70000/C, DSA/DPO70000C Series)

Table 5-15: Replaceable parts – External 1 (MSO70000/C, DSA/DPO70000C Series)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-17- EXTERNAL PARTS</b>					
-1	016-1441-01			1	ACCESSORY POUCH; BLACK CORDURA
-2	200-5119-00			1	COVER, TOP; COSMETIC
-3	211-0967-00			2	SCREW; 6-32X 0.25,PNH,T-15, W/FLAT WASHER, STEEL, ZINC FINISH
-4	355-0298-00			1	STUD.SNAP; 0.570 DIA, 0.165 THK, STAINLESS STEEL
-5	200-5060-00			1	COVER; EMI TOP
-6	211-1050-00			19	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-7	348-1859-00			4	FOOT; REAR, W/ CORD WRAP, THERMOPLASTIC
-7a	211-0721-00			4	SCREW, MACHINE; 6-32 X 0.375, PNH, STEEL, ZINC FINISH WITH NYLOC PATCH, T-15
-8	101-0173-01			1	TRIM, ACQUISITION INSERT, MSO70000
	101-0184-00			1	TRIM, ACQUISITION INSERT MSO70000C, DSA70000C, DPO70000C
-9	101-0171-00			1	TRIM RING; FR110, PC/ABS
-10	200-4963-00			1	COVER, FRONT; PC/ABS ALLOY BAYBLEND
-11	101-0174-00			1	TRIM, DVD
-12	335-2169-00			1	LABEL, NOMENCLATURE, MSO70404
	335-2170-00			1	LABEL, NOMENCLATURE, MSO70604
	335-2171-00			1	LABEL, NOMENCLATURE, MSO70804
	335-2172-00			1	LABEL, NOMENCLATURE, MSO71254
	335-2173-00			1	LABEL, NOMENCLATURE, MSO71604
	335-2174-00			1	LABEL, NOMENCLATURE, MSO72004
	335-2426-00			1	LABEL, NOMENCLATURE, MSO71254C
	335-2427-00			1	LABEL, NOMENCLATURE, MSO71604C
	335-2428-00			1	LABEL, NOMENCLATURE, MSO72004C
	335-2438-00			1	LABEL, NOMENCLATURE, DSA71254C
	335-2439-00			1	LABEL, NOMENCLATURE, DSA71604C
	335-2440-00			1	LABEL, NOMENCLATURE, DSA72004C
	335-2432-00			1	LABEL, NOMENCLATURE, DPO71254C
	335-2433-00			1	LABEL, NOMENCLATURE, DPO71604C
	335-2434-00			1	LABEL, NOMENCLATURE, DPO72004C
-13	211-0721-00			4	SCREW, MACHINE; 6-32 X 0.375, PNH, STEEL, ZINC FINISH WITH NYLOC PATCH, T-15 TORX DR



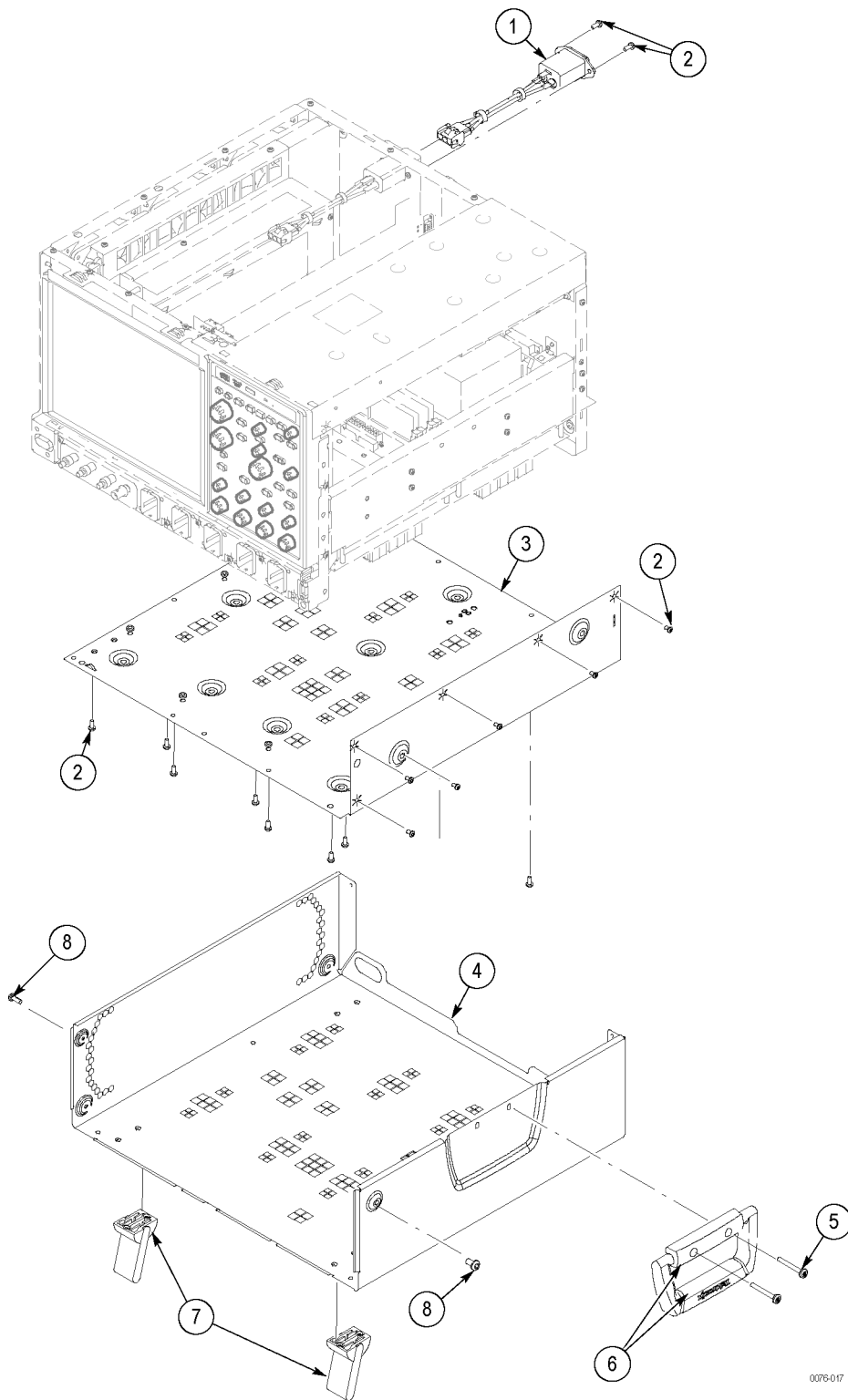


0075-016

Figure 5-17: External 1 (MSO70000/C, DSA/DPO70000C Series)

**Table 5-16: Replaceable parts – External 2 (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-18-</b>					<b>EXTERNAL PARTS</b>
-1	174-5226-00			1	CABLE ASSY; LINE FILTER
-2	211-1050-00			16	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	200-5123-00			1	COVER; EMI BOTTOM, MSO70804/70604/70404
	200-5124-00			1	COVER; EMI BOTTOM, MSO72004/71604/71254
	200-5171-00			1	COVER; EMI BOTTOM, MSO72004C, MSO71604C, MSO71254C, DSA72004C, DSA71604C, DSA71254C, DPO72004C, DPO71604C, DPO71254C,
-4	200-5125-00			1	COVER, BOTTOM; COSMETIC; W/FEET
-5	212-0232-00			2	SCREW,MACHINE; 8-32 X 1.125L, PNH, STL, BLACK ZINC SPEC #ASTM B633 TYPE II, T-20
-6	367-0528-00			1	HANDLE, CARRYING; DUAL DUROMETER MOLDED, POLYPROPYLENE, VINYL GRIP SECTION
	407-4887-00			1	BRACKET; HANDLE BASE, PC/ABS ALLOY, BAYER BAYBLEND FR-110, TEK BLUE
-7	348-1951-00			1	FRONT FOOT ASSEMBLY, FLIP (2), SAFETY CONTROLLED
-8	211-1224-00			2	SCREW, MACHINE, BLACK



0076-017

Figure 5-18: External parts 2 (MSO70000/C, DSA/DPO70000C Series)

**Table 5-17: Replaceable parts – Front panel (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-19-</b>					<b>FRONT PANEL AND DISPLAY</b>
-1	174-5165-00			1	CABLE ASSY; POWER SWITCH
-2	065-0756-02			1	MODULE ASSY;SERVICE REPLACEMENT KIT,614104101 FRONT PANEL ASSEMBLY W/ PACKAGING;DPO7000,DPO/DSA70000 SERIES
-3	366-0859-01			1	ASSEMBLY, KNOB; .470 DIAMETER, SOFT TOUCH
-4	366-0860-01			1	ASSEMBLY, KNOB; .685 DIAMETER, SOFT TOUCH
-5	366-0861-01			1	ASSEMBLY, KNOB; .925 DIAMETER, SOFT TOUCH
-6	174-5162-00			1	CABLE ASSY; DISPLAY ADAPTER TO FRONT PANEL BOARD
-7	065-0827-01			1	COMPONENT KIT; LCD DISPLAY ADAPTER MODULE SUBASSEMBLY, STANDARD
-8	065-0819-00			1	MODULE ASSY;SERVICE REPLACEMENT KIT,POWER BUTTON ASSY W/ PACKAGING, FOR ADVANTECH AIMB-562 MOTHERBOARD
-9	211-1050-00			2	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STEEL, ZINC FINISH, T15

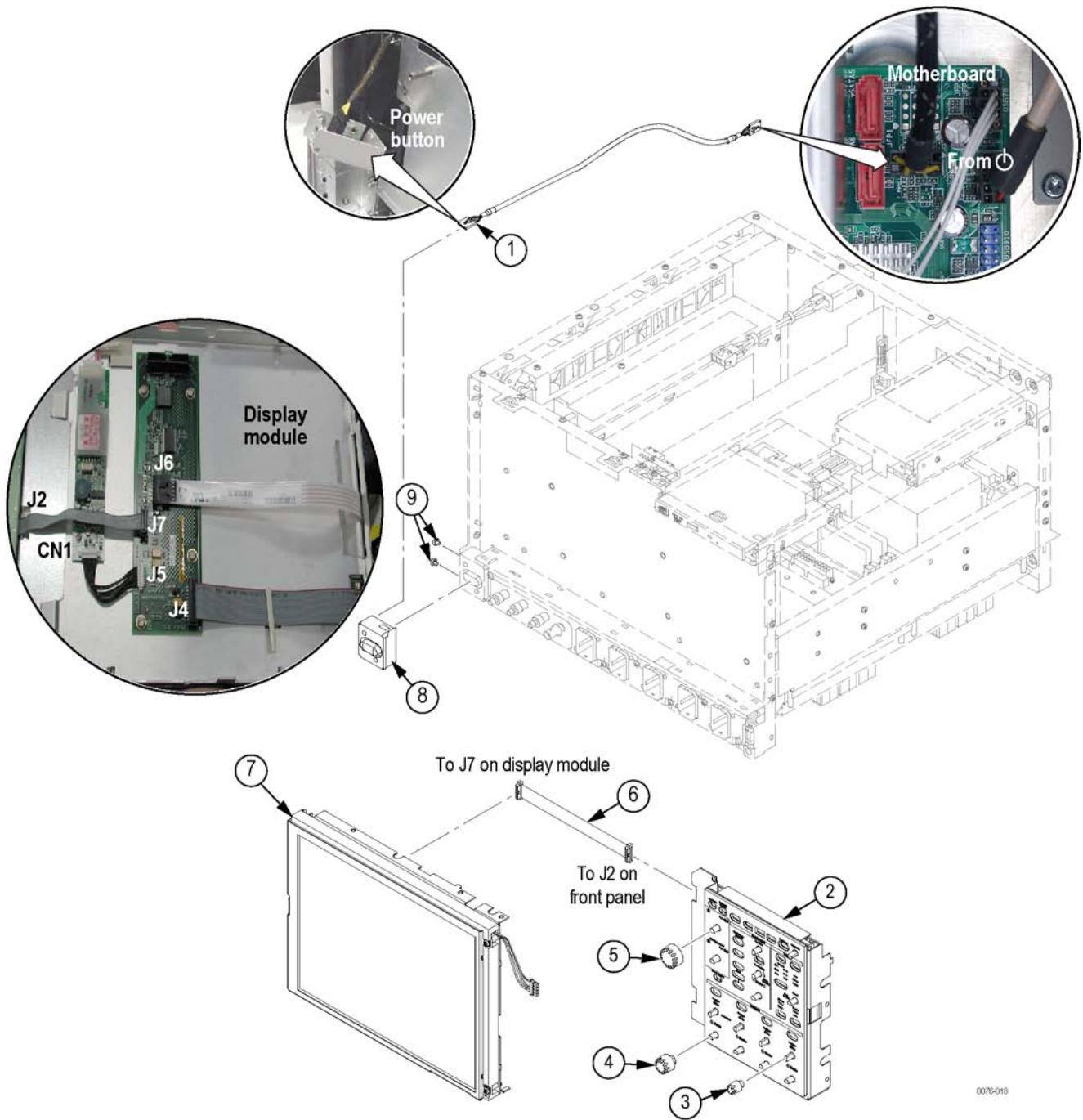
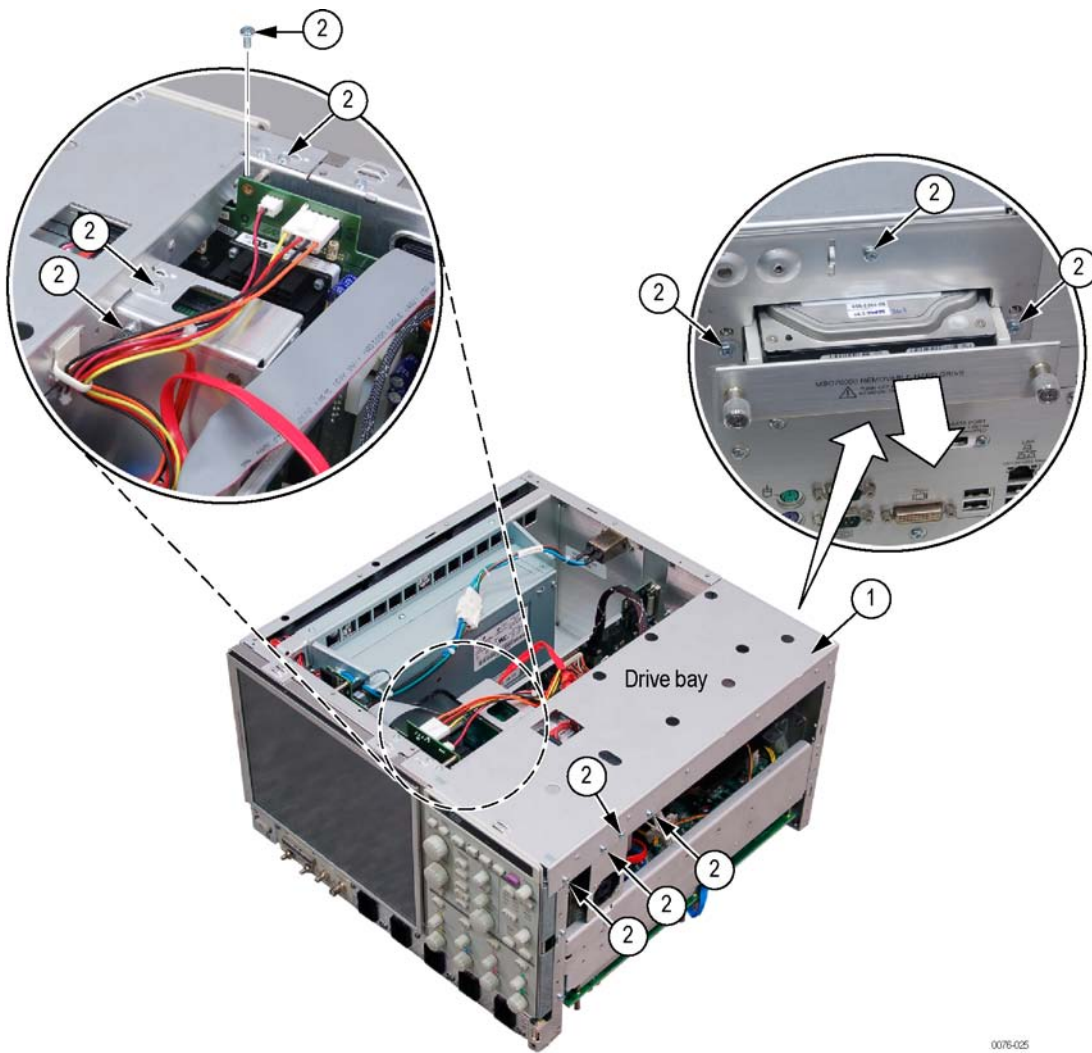


Figure 5-19: Front panel and display (MSO70000/C, DSA/DPO70000C Series)

**Table 5-18: Replaceable parts – Drive bay 1 (MSO70000/C, DSA/DPO70000C Series)**

<b>Fig. &amp; index number</b>	<b>Tektronix part number</b>	<b>Serial no. effective</b>	<b>Serial no. discount'd</b>	<b>Qty</b>	<b>Name &amp; description</b>
<b>5-20-</b>					<b>DRIVE BAY 1</b>
-1	441-2602-00			1	CHASSIS, DRIVE BAYS (DVD AND HD)
-2	211-1050-00			11	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15



0076-025

Figure 5-20: Drive bay 1 (MSO70000/C, DSA/DPO70000C Series)

**Table 5-19: Replaceable parts – Drive bay 2 (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discontin'd	Qty	Name & description
<b>5-21-</b>					<b>DRIVE BAY 2</b>
-1	065-0844-00			1	DRIVE ASSEMBLY, WITH PACKAGING; 6505284XX, PRGM HDD ASSY WITH OS/APPS SW ON HIDDEN PARTITION, FOR ADVANTECH AIMB-566 MOTHERBOARD; MSO70000
	065-0844-01			1	DRIVE ASSEMBLY, WITH PACKAGING; 6505284XX, PRGM HDD ASSY WITH OS/APPS SW ON HIDDEN PARTITION, FOR ADVANTECH AIMB-566 MOTHERBOARD; MSO70000
-2	211-0722-00			8	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	174-5169-00			1	CABLE ASSY; SATA COMBO, HARD DRIVE CABLE
	174-5349-00			1	CABLE ASSY; SATA COMBO, HARD DRIVE CABLE
-4	174-5650-00			1	CABLE ASSY; SATA-DVD, DATA, AND POWER
-5	211-0950-00			4	SCREW, MACHINE; M2X.4X3L, PHL, PNH, STL NI PL
-6	407-5156-00			1	BRACKET, DVD-CD/RW; ADAPTER FOR DVD-CD/RW SLIMLINE
-7	065-0807-00			1	DISK DRIVE; OPTICAL, 644MB, CD-RW/DVD ROM, COMBO, 16.7 MB/SEC, IDE/ATAPI; DW-224E-C93



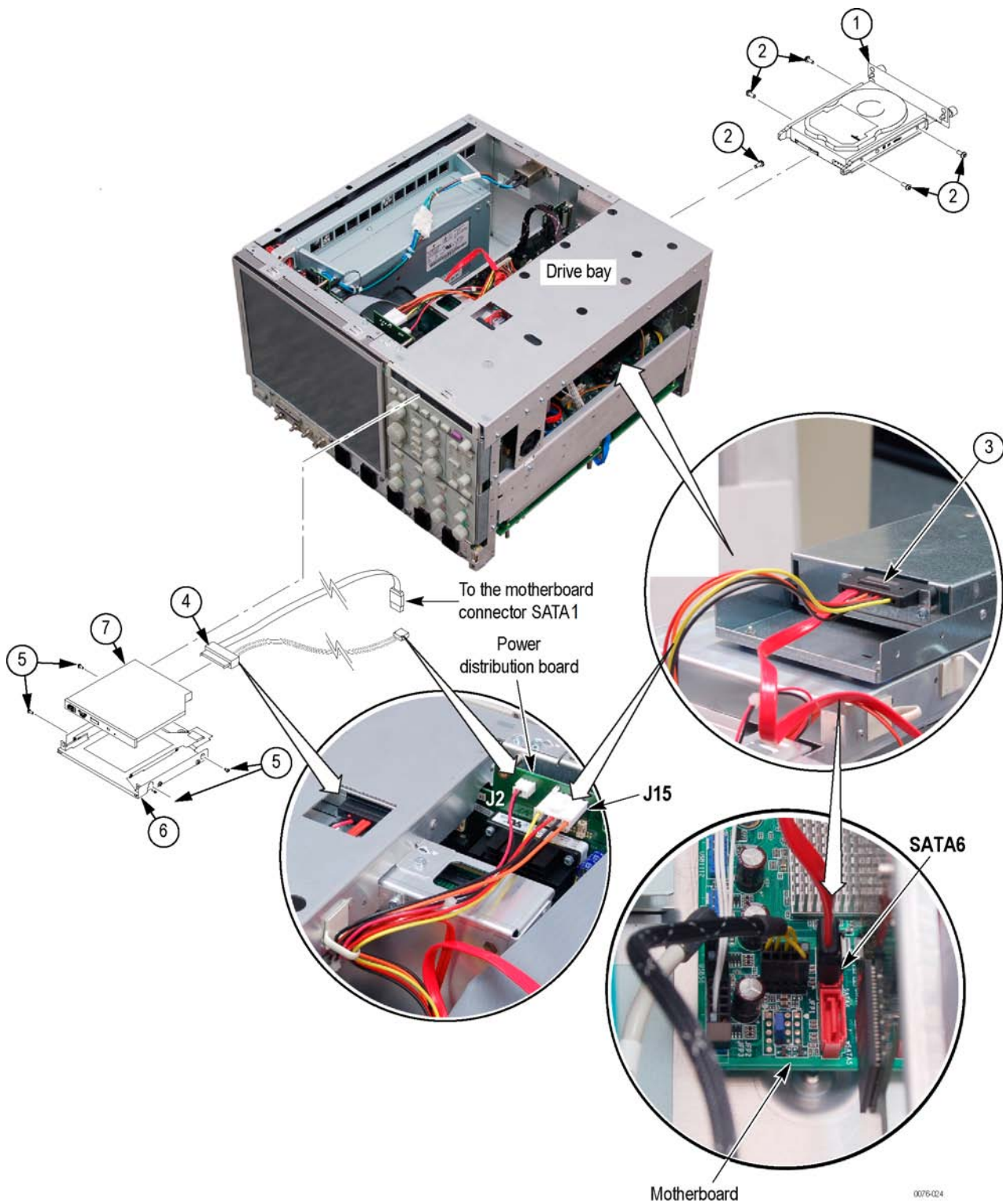


Figure 5-21: Drive bay 2 (MSO70000/C, DSA/DPO70000C Series)

**Table 5-20: Replaceable parts – Interface board (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-22-</b>					<b>INTERFACE BOARD</b>
-1	065-0828-00			1	CIRCUIT BD ASSY; PCIe BACKBONE BOARD, TESTED, MSO70000 SERIES
					<b>**ATTACHED PARTS**</b>
	386-7536-00			1	BRACKET, STIFFENER FOR PCIe PCB
	211-0747-00			5	SCREW, MACHINE; 6-32 X 0.188, PNH, STEEL, ZINC FINISH, T-15 TORX DR
					<b>**END ATTACHED PARTS**</b>
-1	065-0245-00			1	CIRCUIT BD ASSY; PCIe BACKBONE BOARD, TESTED, MSO70000C SERIES, DSA70000C SERIES, DPO70000C SERIES
					<b>**ATTACHED PARTS**</b>
	386-7536-00			1	BRACKET, STIFFENER FOR PCIe PCB
	211-0747-00			5	SCREW, MACHINE; 6-32 X 0.188, PNH, STEEL, ZINC FINISH, T-15 TORX DR
					<b>**END ATTACHED PARTS**</b>
-2	211-1050-00			7	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	335-2152-00			1	LABEL, I/O FOR PCIe PCB (ATTACHES TO PCIe PCB REAR BRACKET)
-4	211-1206-00			2	SCREW, JACK; 2-56 ID X 4-40 OD, 0.188 HEX, SS
	211-1206-01			2	SCREW, JACK; 2-56 ID X 4-40 OD, 0.188 HEX, SS
-5	213-1061-00			2	JACKSCREW; 6-32 EXT THD, M3.5 X 0.6-6 INT THD, 410 SS, PASSIVATE
-6	386-7537-00			1	BRACKET, PCIE PCB MOUNT AND MS WINDOWS LABEL HOLDER, SAFETY CONTROLLED
-7	174-5164-00			1	CA ASSY; USB 2.0
-8	679-6107-00			1	CIRCUIT BD ASSY; USB
-9	211-1221-00			2	SCREW; M2.0 6-MM LONG PHILLIPS FLATHEAD ZINC-PLATED
-10	174-5048-00			1	CA ASSY; USB 1.0
-11	174-4241-00			1	CABLE ASSY; RIBBON, BUS, IDC, 32 AWG, 16.50 L, 60POS, BOX, IDC, FEMALE, RTANG, 0.050CTR X 2

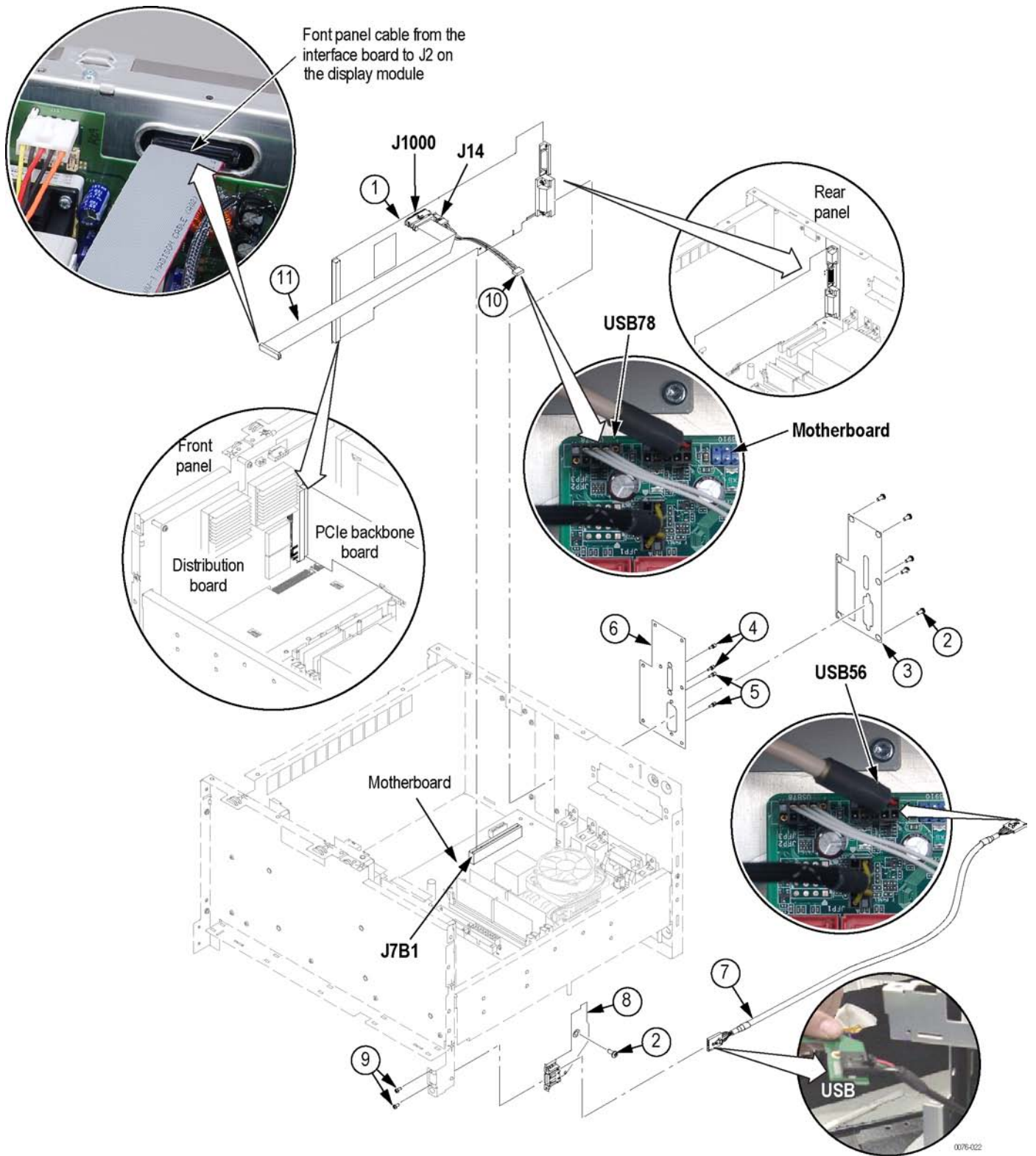
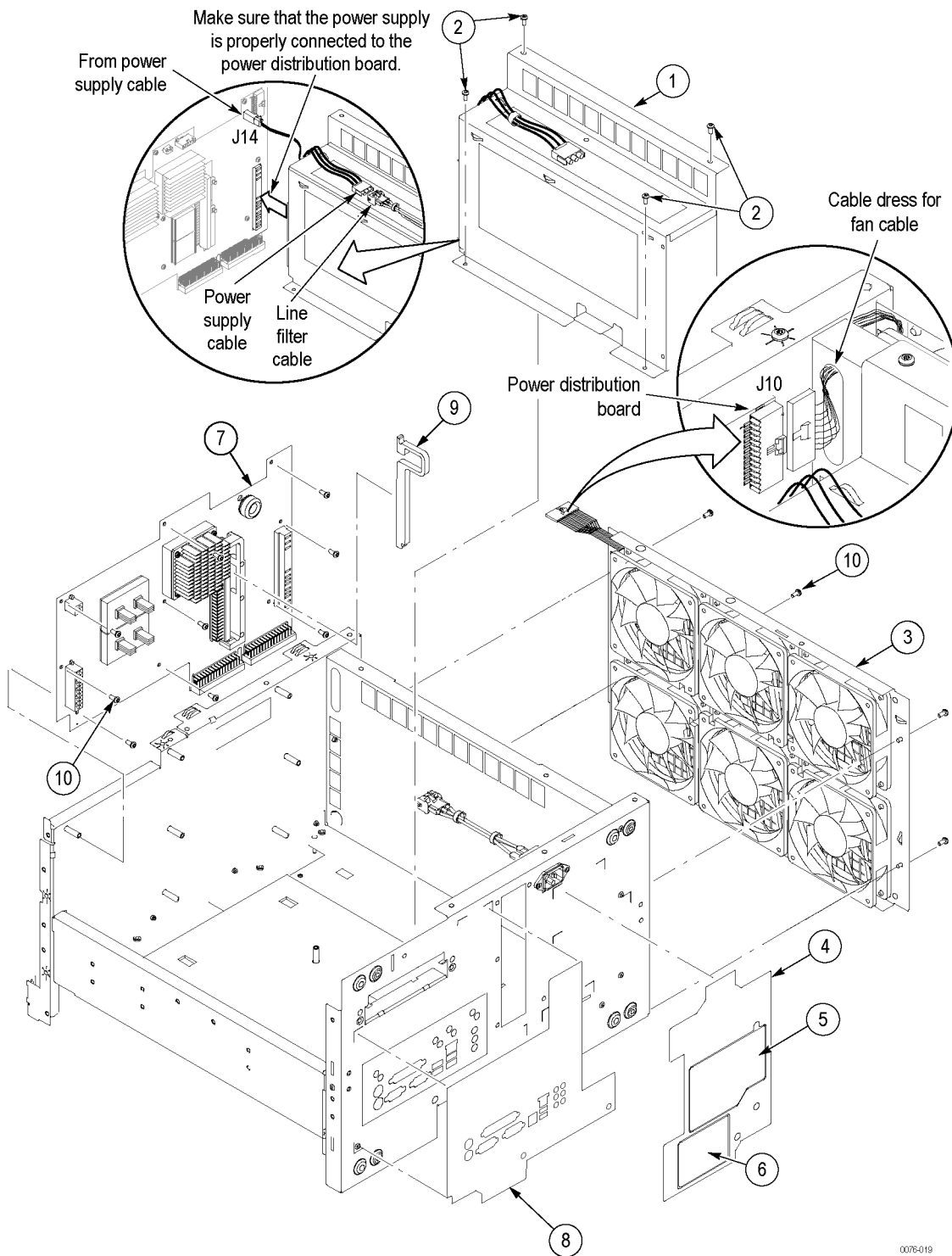


Figure 5-22: Interface board (MSO70000/C, DSA/DPO70000C Series)

**Table 5-21: Replaceable parts – Power supply and fans (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-23-</b>					
<b>POWER SUPPLY AND FANS</b>					
-1	119-6982-xx			1	POWER SUPPLY: AC-DC; 1200W, +48V 25A, +12V 1A, 85-264VAC, 47-63HZ, ELCON 377-0002-00100A, IEC320-C22; 11.5X6.75X2.75IN; CLOSED CHASSIS
<b>**ATTACHED PARTS**</b>					
	407-5381-00				BRACKET;POWER SUPPLY
<b>**END ATTACHED PARTS**</b>					
-2	211-0721-00			12	SCREW, MACHINE; 6-32 X 0.375, PNH, STEEL, ZINC FINISH WITH NYLOC PATCH, T-15 TORX DR
-3	436-0422-00			1	TRAY, FAN; CHASSIS ASSY, W/6 FANS MOUNTED; HAMMERHEAD
-4	335-2167-00			1	LABEL, CHASSIS, REAR COSMETIC
-5	335-0263-01			1	MARKER, IDENT; SUPER LABEL, BLANK ROLL STOCK
-6	335-0347-00			1	MARKER,IDENT; REAR PANEL, BLANK, 2.100 X 2.700
-7	870-0210-00			1	CIRCUIT BOARD ASSY;POWER DISTRIBUTION, 8780210XX TESTED W/ PACKAGING
-8	335-2153-00			1	LABEL, M-BOARD IO, AIMB566
-9	343-1719-00			1	CLIP, PCB RETENTION BRACKET (PWR-DIST TO PCI), SAFETY CONTROLLED
-10	211-1050-00			15	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STEEL, ZINC FINISH, T15



0076-019

Figure 5-23: Power supply (MSO70000/C, DSA/DPO70000C Series)

**Table 5-22: Replaceable parts – Acquisition (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-24-</b>					<b>ACQUISITION</b>
-1	214-3903-00			8	SCREW, JACK; 4-40 X 0.312 LONG, 0.188 H HEX HEAD STAND OFF, 4-40 INT THD, X 0.312 THD EXT 4-40
-2	-----			1	ACQUISITION MODULE, RETURN TO TEKTRONIX FOR SERVICE
-3	211-0752-00			10	SCREW,MACHINE; 6-32 X 0.75, PNH, TORX
-4	211-1050-00			7	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15



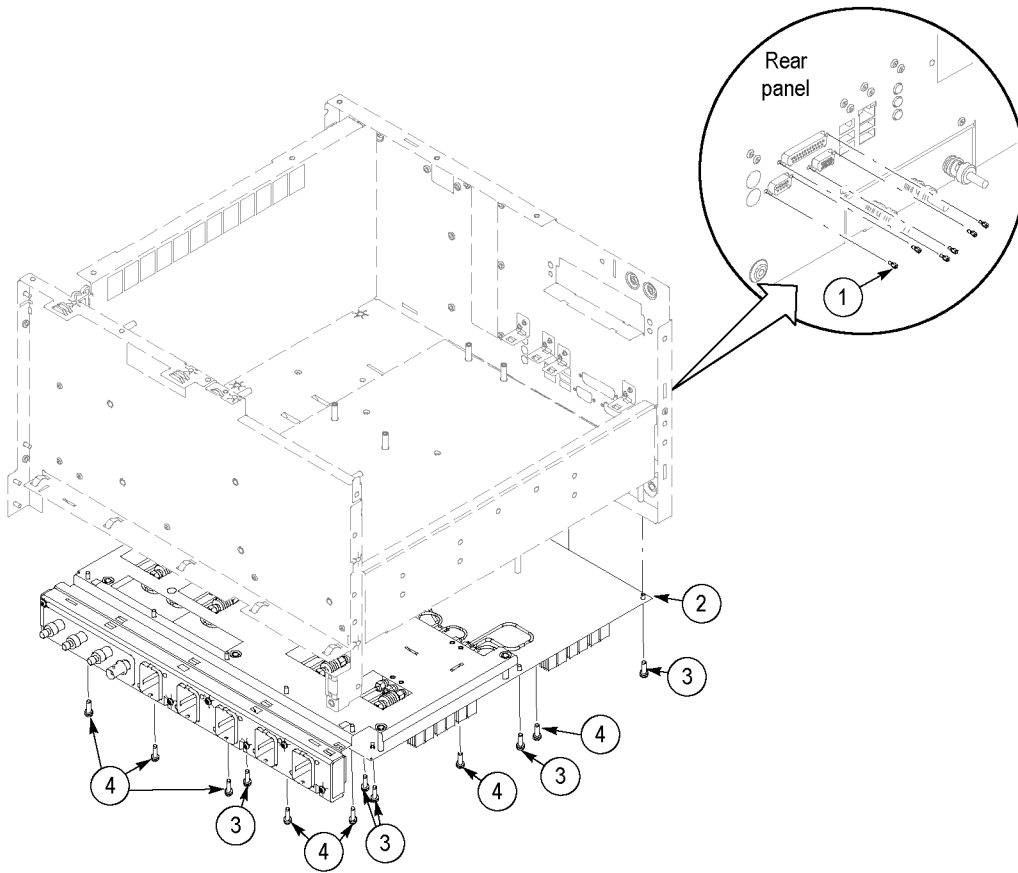


Figure 5-24: Acquisition assembly (MSO70000/C, DSA/DPO70000C Series)

**Table 5-23: Replaceable parts – MSO module (MSO70000/C Series)**

<b>Fig. &amp; index number</b>	<b>Tektronix part number</b>	<b>Serial no. effective</b>	<b>Serial no. discontin'd</b>	<b>Qty</b>	<b>Name &amp; description</b>
<b>5-25-</b>					<b>MSO Module</b>
-1	407-5448-00			1	BRACKET, FAN, PWR DIST PCB
-2	211-1050-00			7	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15
-3	174-5517-00			1	CABLE ASSY;PCIe, STRAIGHT CONNECTOR ON BOTH ENDS, SAFETY CONTROLLED
-2	119-7036-00			1	FAN ASSEMBLY; DC,12V;0.105A,8.6 CFM,30DBA,3 LEAD, TACH OUTPUT, WITH CONN & HOUSING,SAFETY CONTROLLED
-4	-----			1	MSO MODULE, RETURN TO TEKTRONIX FOR SERVICE
-5	174-5516-00			1	CABLE, POWER, 2X4 WITH MINIFIT JR CONNS, SAFETY CONTROLLED



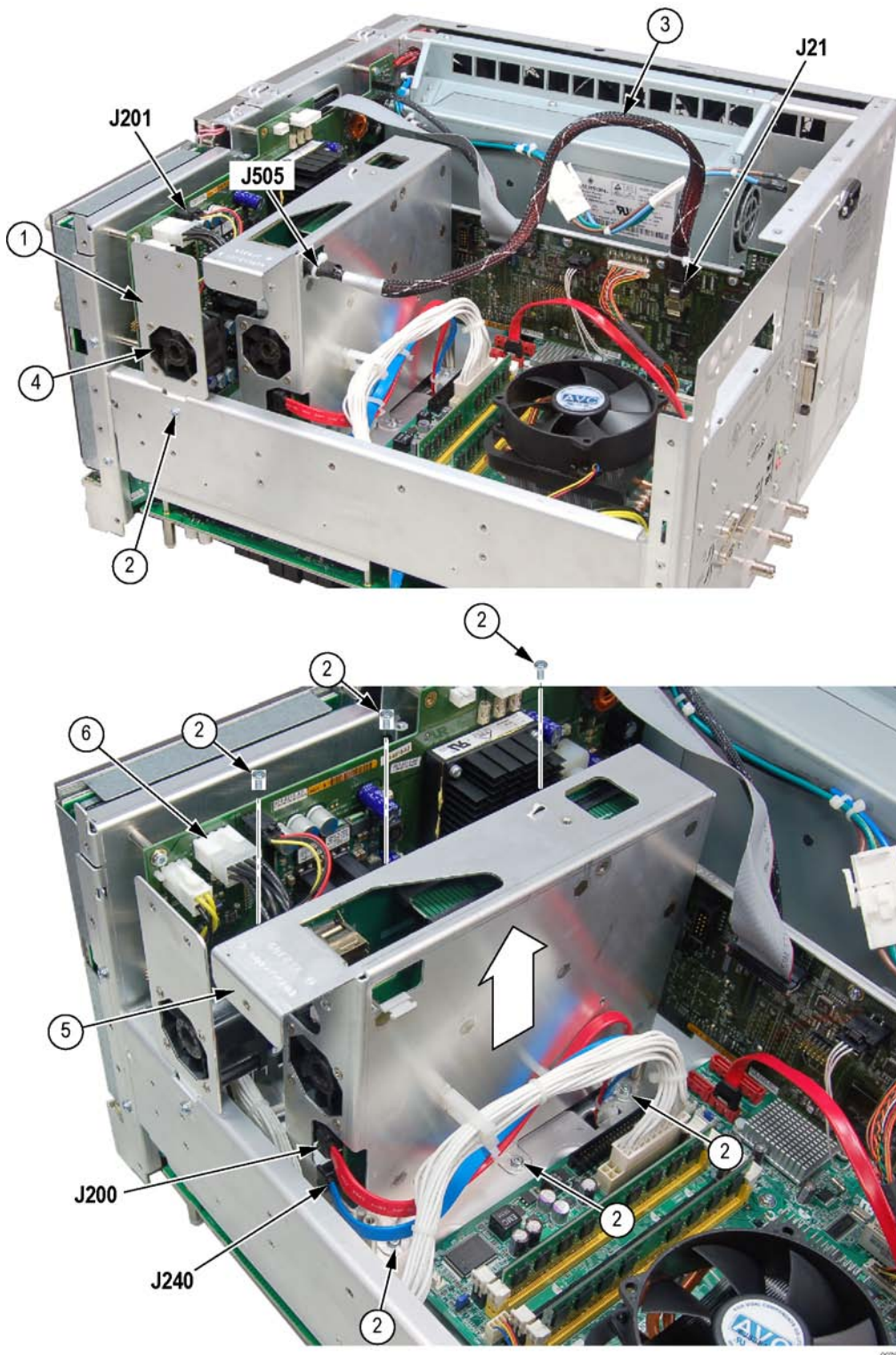
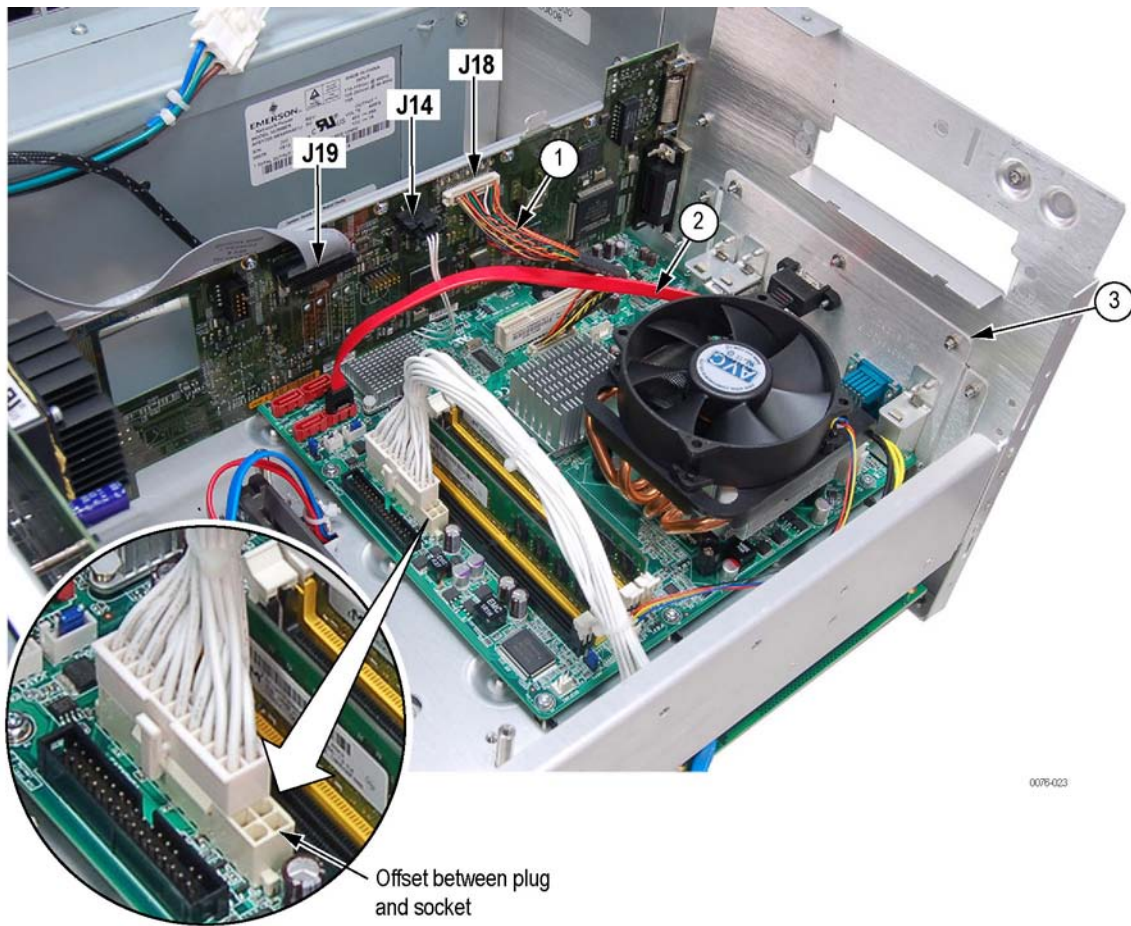


Figure 5-25: MSO module (MSO70000/C Series)

**Table 5-24: Replaceable parts –  $\mu$ ATX 1 (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discontinued	Qty	Name & description
<b>5-26-</b>					<b><math>\mu</math>ATX 1</b>
-1	174-5629-00			1	CABLE, LVDS VIDEO WITH 2X20 HIROSE CONNECTORS;PCIe J18 to $\mu$ ATX LVDS1
-2	174-5763-00			1	CABLE, SATA TO E-SATA, DATA ONLY: RP e-SATA to $\mu$ ATX SATA 2
-3	441-2585-00			1	BRACKET, IO M-BOARD, AMB566, SAFETY CONTROLLED
<b>**ATTACHING PARTS**</b>					
	211-1050-00			10	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STEEL, ZINC FINISH, T15
	214-3903-01			6	SCREW, JACK; 4-40 X 0.312 EXT THD, 4-40 INT THD, 0.188 HEX, ZINC PLATED STEEL
<b>**END ATTACHING PARTS**</b>					



0076-023

Figure 5-26: μATX 1 (MSO70000/C, DSA/DPO70000C Series)

**Table 5-25: Replaceable parts –  $\mu$ ATX 2 (MSO70000/C, DSA/DPO70000C Series)**

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
<b>5-27-</b>					<b><math>\mu</math>ATX 2</b>
-1	174-4797-00			1	CA ASSY; 20 PIN ATX POWER,SAFETY CONTROLLED; PWR DIST J8 to $\mu$ ATX EATXPWR1
-2	119-7333-00			1	P4 LGA775 FAN-SINK-BRACKET FROM AVC. SAFETY CONTROLLED
-3	211-1050-00			8	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STEEL, ZINC FINISH, T15
-4	174-4798-00			1	CA ASSY; 4 PIN P4 POWER,SAFETY CONTROLLED;PWR DIST J9 to $\mu$ ATX 12V
-5	167-1348-00			1	PROCESSOR; INTEL CORE 2 DUO, 3.0 GHZ, WOLFDAL, E8400; 65W; BUS SPD 1333MHZ; FC-LGA775 PKG, W/O FAN and HEATSINK EU80570PJ0806M SLB9J
-6	039-0188-00			1	COMPUTER BOARD;ADVANTECH, MICROATX, LGA 775 CORE 2 DUO, DDR2, PCI-E X4, DUAL CH LVDS, DVI-I, SINGLE GBE LAN; ADVANTECH AIMB-566, SAFETY CONTROLLED
-7	-----			1	HEAT SINK BRACKET PART OF ITEM 2 IN THIS LIST
-8	342-1198-00			1	DAMPENER FOR SHOCK AND VIBRATION, HEMISPHERE GEOMETRY, 1.00 IN DIA SPHERE (.500 IN HEIGHT), SORBOTHANE PN 0510115, BLACK, 30 DUROMETER
-9	167-1493-00			2	IC, MEMORY;256MBIT X 64, 2GB DDR2 1.8V, 6-6-6, 800 MT/S; MT16HTF25664AY-800, DIMM240, PC6400



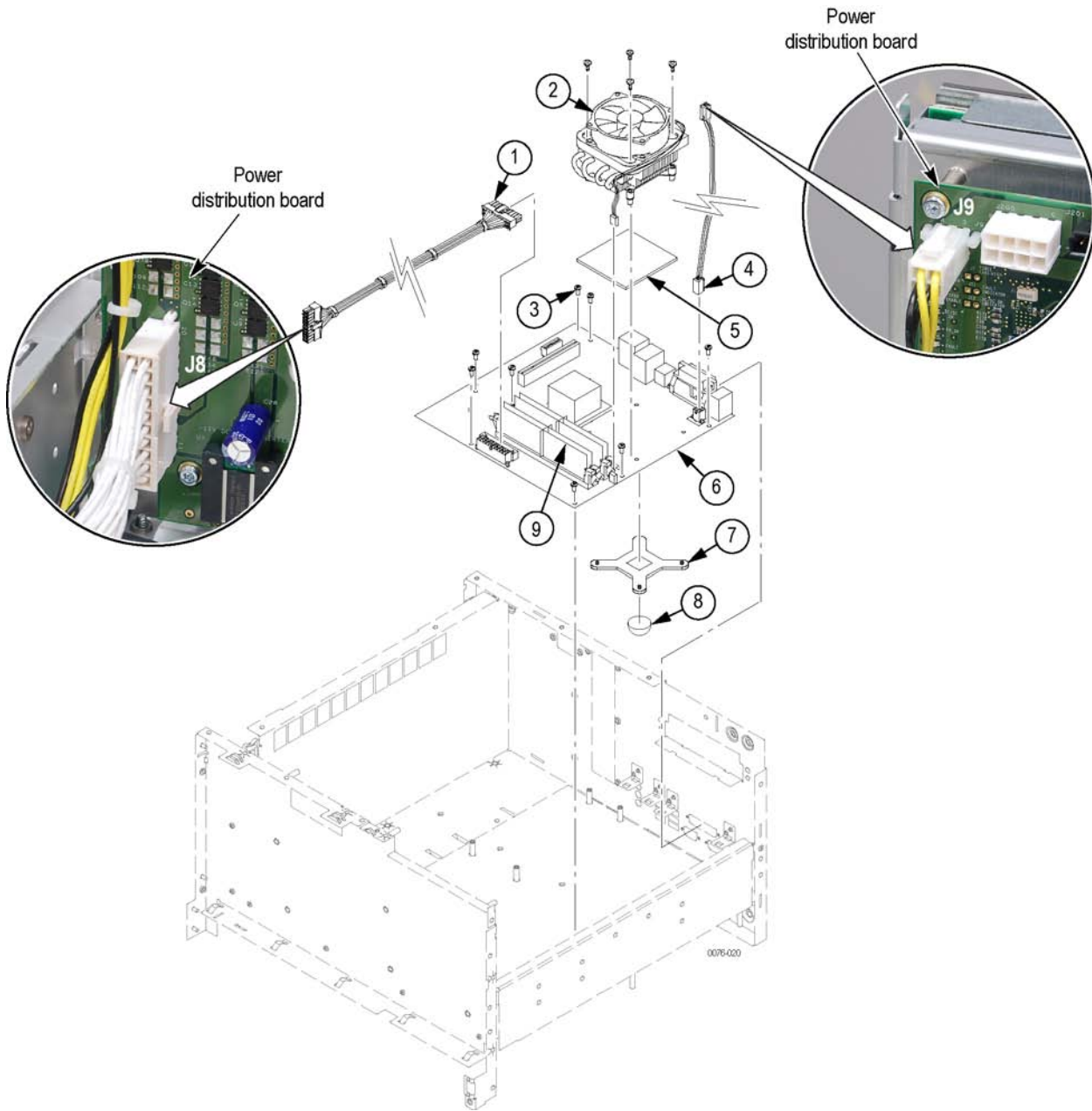


Figure 5-27:  $\mu$ ATX 2 (MSO70000/C, DSA/DPO70000C Series)

## Replaceable Parts (MSO/DPO5000 Series)

The following tables and illustrations show the replaceable parts for the MSO5000 Series and DPO5000 Series products.

Two tables provide the replaceable cable part numbers:

- (See Table 5-30 on page 5-62.)
- (See Table 5-31 on page 5-63.)

Two figures show how to attach the connectors in the instrument:

- (See Figure 5-32 on page 5-62.)
- (See Figure 5-33 on page 5-63.)

**Table 5-26: Replaceable parts – Front panel assembly (MSO/DPO5000 Series)**

Figure and index no.	Tektronix part no.	Serial no. effective	Serial no. discount'd	Qty.	Name and description
<b>5-28-</b>					<b>FRONT PANEL ASSEMBLY</b>
-1	065-0853-00			1	FRONT CASE ASSEMBLY
-2	366-0861-01			2	ASSEMBLY, KNOB: .925 DIAMETER, SOFT TOUCH
-3	366-0865-00			1	KNOB ASSEMBLY, SHUTTLE AND BUSHING
-4	366-0867-01			1	KNOB ASSEMBLY, JOG
-5	366-0859-01			6	ASSEMBLY, KNOB: .470 DIAMETER, SOFT TOUCH
-6	366-0860-01			6	ASSEMBLY, KNOB: .685 DIAMETER, SOFT TOUCH
-7	260-2898-00			1	SWITCH, KEYPAD, ELASTOMERIC, POWER
-8	407-5259-00			1	BRACKET, SUPPORT: POWER SWITCH
-9	211-1273-00			19	SCREW, MACHINE: 6–32 x 0.250, PNH, STL, ZNPL, T-15 TORX DRIVE ----- DISTRIBUTION OF THE 211-1273-00 SCREWS ----- 2 screws attach the Power switch and bracket to the front case assembly. 2 screws attach the Utility switch and bracket to the front case assembly. 10 screws attach the Front panel assembly to the front case assembly – with contact springs (#14). 5 screws across the bottom of the Front panel assembly attach it to the front case assembly – without contact springs.
-10	260-2899-00			1	SWITCH, KEYPAD, ELASTOMERIC, UTILITY
-11	407-2567-00			1	BRACKET, SUPPORT, UTILITY SWITCH
-12	260-2901-00			1	SWITCH, KEYPAD, ELASTOMERIC, FRONT PANEL
-13	877-0277-01			1	CIRCUIT BOARD ASSEMBLY, FRONT PANEL
-14	131-8139-00			10	CONTACT, SPRING: FRONT PANEL ELEC

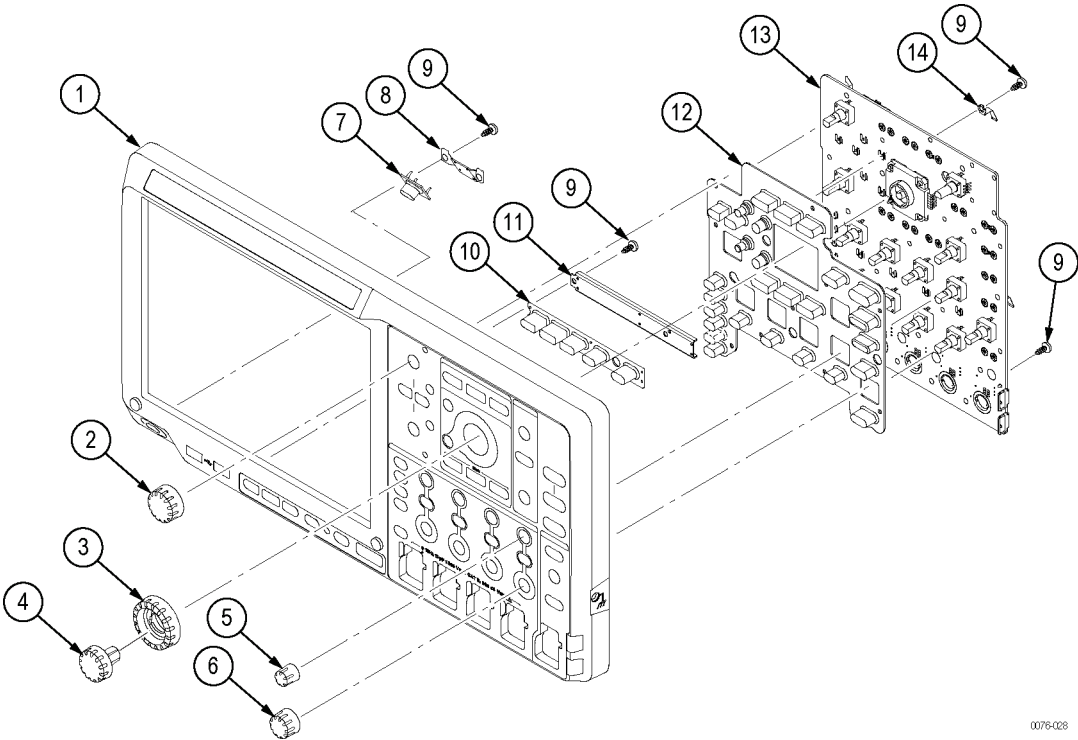
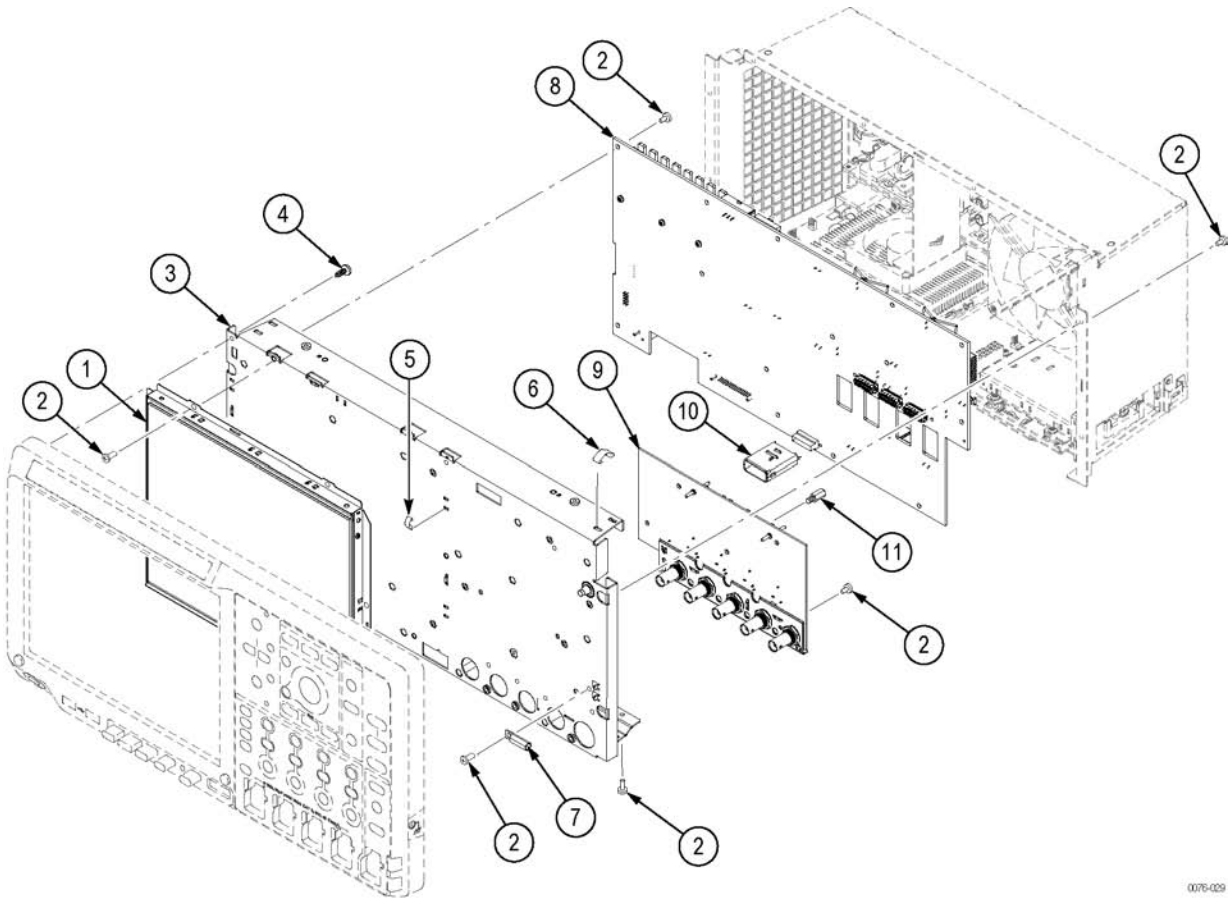


Figure 5-28: Front panel assembly (MSO/DPO5000 Series)

**Table 5-27: Replaceable parts – Display, Analog bd , and Main bd (MSO/DPO5000 Series)**

Figure and index no.	Tektronix part no.	Serial no. effective	Serial no. discount'd	Qty.	Name and description
<b>5-29-</b>					<b>DISPLAY, ANALOG BOARD &amp; MAIN BOARD</b>
-1	850-0130-00			1	FRAME ASSEMBLY, DISPLAY: LCD
-2	211-1272-00			40	SCREW, MACHINE: 6–32 x 0.250, PNH, STL, ZNPL, T-15 TORX DRIVE ----- DISTRIBUTION OF THE 211-1272-00 SCREWS ----- 6 screws attach the LCD assembly to the front chassis. 15 screws attach the Main board assembly to the front chassis. 6 screws attach the Analog board assembly to the front chassis. 12 screws attach the rear chassis to the front chassis: 4 across the top flange of the rear chassis, 2 on each side flange, and 4 across the bottom flange of the front chassis. 1 screw attaches the ground jack to the front chassis.
-3	441-2608-00			1	CHASSIS ASSEMBLY, FRONT
-4	211-1273-00			8	SCREW, PT, K35–1.57, PAN HEAD, STL, ZNPL, T-15 TORX DRIVE
-5	131-6643-00			6	CONTACT, ELEC: GROUNDING, 0.169 L X 0.250 W X 0.320 D, ELECTROLESS NICKEL PLATE
-6	131-6417-00			4	CONTACT, ELEC: GROUNDING, 0.600 L X 0.250 W X 0.220 D, ELECTROLESS NICKEL PLATE
-7	131-7622-00			1	CONN,RECEPT; GROUND JACK
-8	-----			1	MAIN BOARD ASSEMBLY. Return the instrument to Tektronix for service. Must be replaced with the ANALOG BOARD ASSEMBLY.
-9	-----			1	ANALOG BOARD ASSEMBLY. Return the instrument to Tektronix for service. Must be replaced with the MAIN BOARD ASSEMBLY.
-10	351-1134-00			1	DIGITAL PROBE GUIDE
-11	129-1693-00			1	SPACER, POST



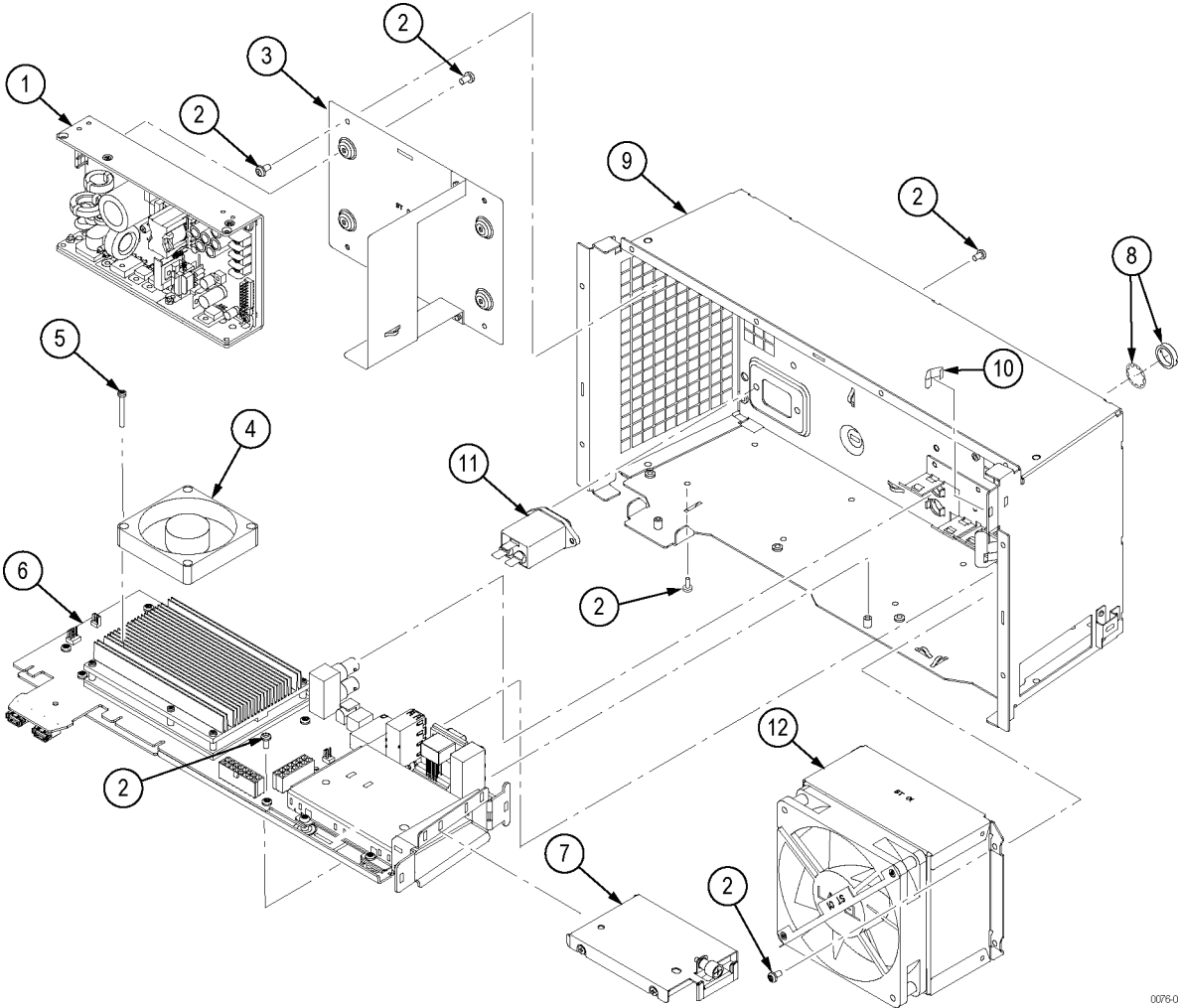


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Figure 5-29: Display, Analog bd, and Main bd assembly (MSO/DPO5000 Series)

**Table 5-28: Replaceable parts – Rear chassis and connecting modules (MSO/DPO5000 Series)**

Figure and index no.	Tektronix part no.	Serial no. effective	Serial no. discont'd	Qty.	Name and description
<b>5-30-</b>					<b>REAR CHASSIS, POWER SUPPLY, COM-E BOARD</b>
-1	065-0859-00			1	CIRCUIT BOARD ASSEMBLY, POWER SUPPLY
-2	211-1272-00			24	SCREW, MACHINE: 6–32 x 0.250, PNH, STL, ZNPL, T-15 TORX DRIVE ----- DISTRIBUTION OF THE 211-1272-00 SCREWS ----- 4 screws attach the Power supply circuit board to the Power supply bracket. 4 screws attach the Power supply assembly to the rear chassis. 2 screws attach the line filter to the rear chassis. 2 screws attach the COM-E Interface assembly to the rear chassis (from the top of the assembly). 4 screws attach the system fan (#12) to the rear chassis. 8 screws attach the COM-E Interface assembly to the rear chassis (from the outside of the instrument).
-3	407-5464-00			1	BRACKET, POWER SUPPLY BOARD MOUNT
-4	119-7683-00			1	FAN, 12 V, TACH OUT, SAFETY CONTROLLED
-5	211-1345-00			5	SCREW, MACHINE, PANHEAD M3 X 0.5 X 26MM, PHILLIPS
-6	878-0472-01			1	COM-E INTERFACE BOARD ASSEMBLY
-7	065-0851-00			1	HARD DISK DRIVE, REPLACEABLE, PROGRAMMED, WITH BRACKET
-8	220-1271-01			2	SPANNER NUT ASSEMBLY WITH WASHER
-9	-----			1	CHASSIS ASSEMBLY, REAR. Return the instrument to Tektronix for replacement.
-10	131-6417-00			1	CONTACT, ELEC: GROUNDING, 0.600 L X 0.250 W X 0.220 D, ELECTROLESS NICKEL PLATE
-11	119-7086-00			1	FILTER, EMI, AC LINE CONNECTOR
-12	065-0857-00			1	SYSTEM FAN ASSEMBLY, 120 MM, TUBEAXIAL, 12 VDC: SAFETY CONTROLLED, WITH BRACKET

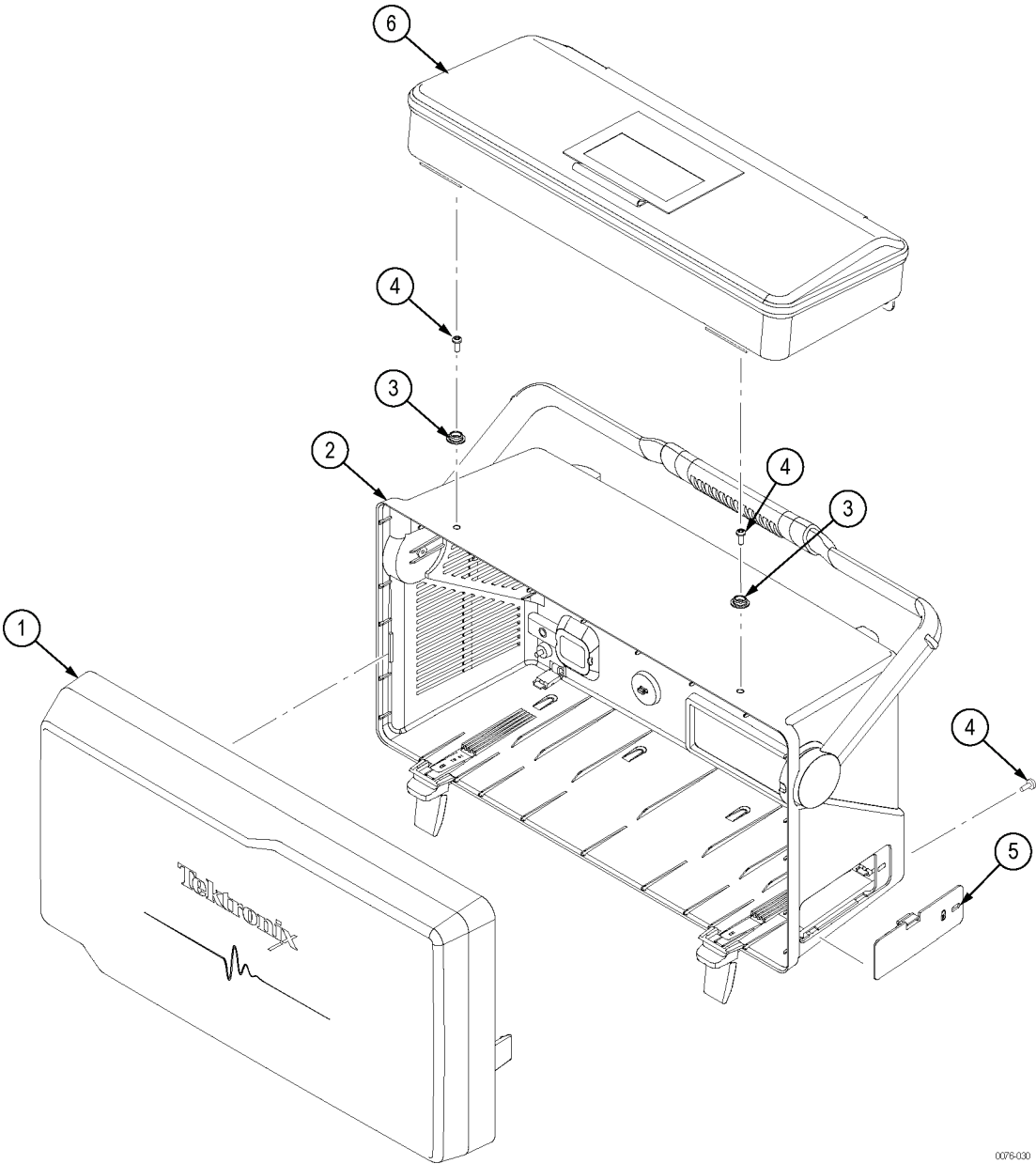


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Figure 5-30: Rear chassis and connecting modules (MSO/DPO5000 Series)

**Table 5-29: Replaceable parts – External parts (MSO/DPO5000 Series)**

Figure and index no.	Tektronix part no.	Serial no. effective	Serial no. discont'd	Qty.	Name and description
<b>5-31-</b>					<b>EXTERNAL PARTS</b>
-1	200-5130-00			1	FRONT PROTECTIVE COVER
-2	065-0858-00			1	REAR CASE
-3	355-0298-00			2	STUD, SNAP: 0.570 DIAMETER, 0.165 THICK, STAINLESS STEEL
-4	211-1272-00			6	SCREW, MACHINE: 6-32 x 0.250, PNH, STL, ZNPL, T-15 TORX DRIVE
					----- DISTRIBUTION OF THE 211-1272-00 SCREWS -----
					2 screws attach the snaps to the top of the rear case
					4 screws attach the rear case to the rear chassis.
-5	200-5155-00			1	COVER, DOOR, HARD DRIVE
-6	016-2029-00			1	POUCH, ACCESSORY, BLACK, SNAP ON

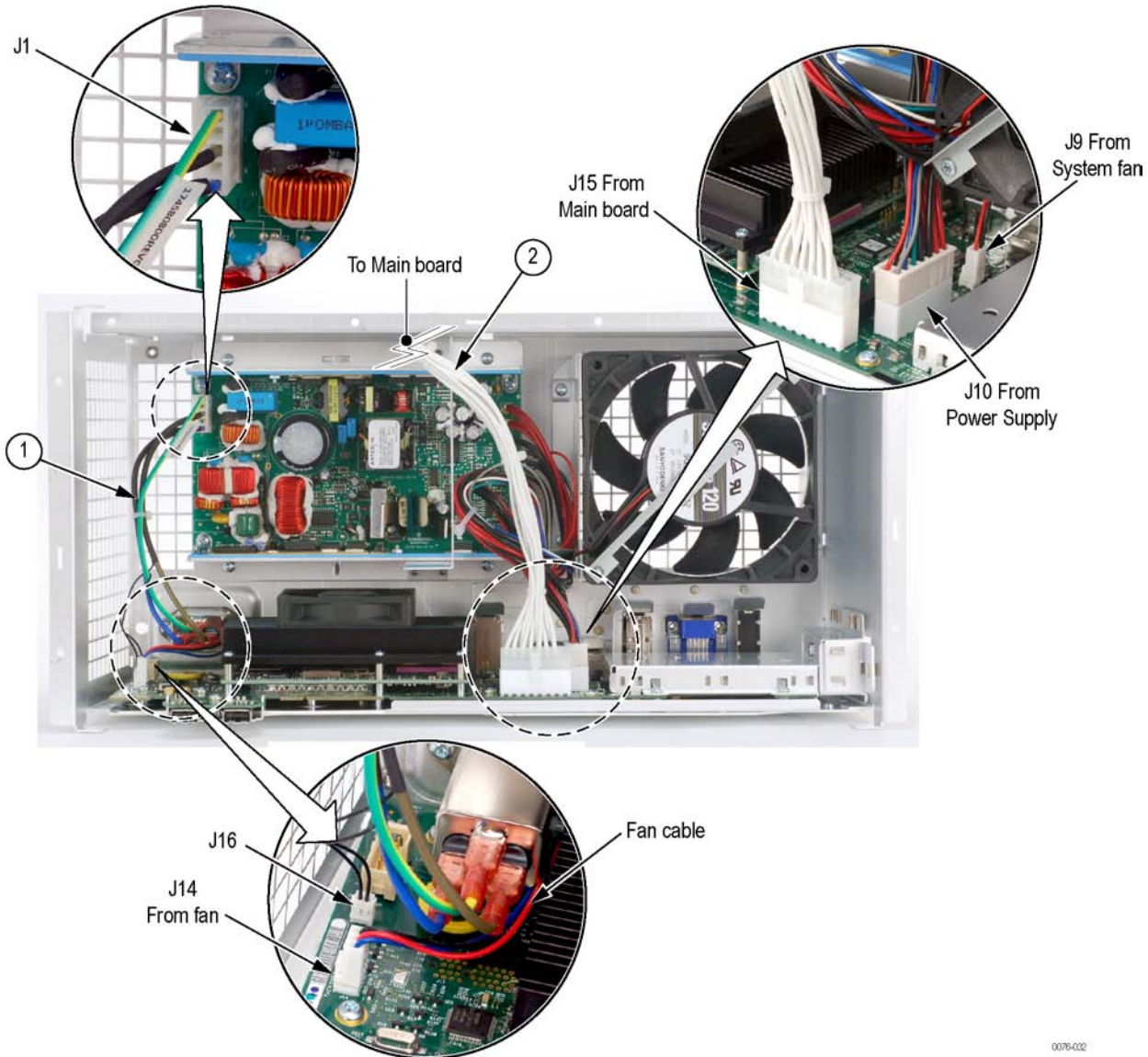


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Figure 5-31: External parts (MSO/DPO5000 Series)

Table 5-30: Replaceable parts – Cable and connectors, rear chassis (MSO/DPO5000 Series)

Figure and index no.	Tektronix part no.	Serial no. effective	Serial no. discont'd	Qty.	Name and description
5-32-					<b>CABLES, REAR CHASSIS</b>
-1	174-5808-00			1	CABLE, IEC TO POWER SUPPLY
-2	174-5704-00			1	CABLE ASSEMBLY, MAIN BOARD TO INTERFACE POWER (COM-E BOARD)



0076-022

Figure 5-32: Rear chassis, showing cables and connectors (MSO/DPO5000 Series)



Table 5-31: Replaceable parts – Cable and connectors, Main board (MSO/DPO5000 Series)

Figure and index no.	Tektronix part no.	Serial no. effective	Serial no. discont'd	Qty.	Name and description
5-33-					<b>Cable, Main Board</b>
-1	174-5809-00			1	CABLE, MAIN BOARD TO FRONT PANEL BOARD

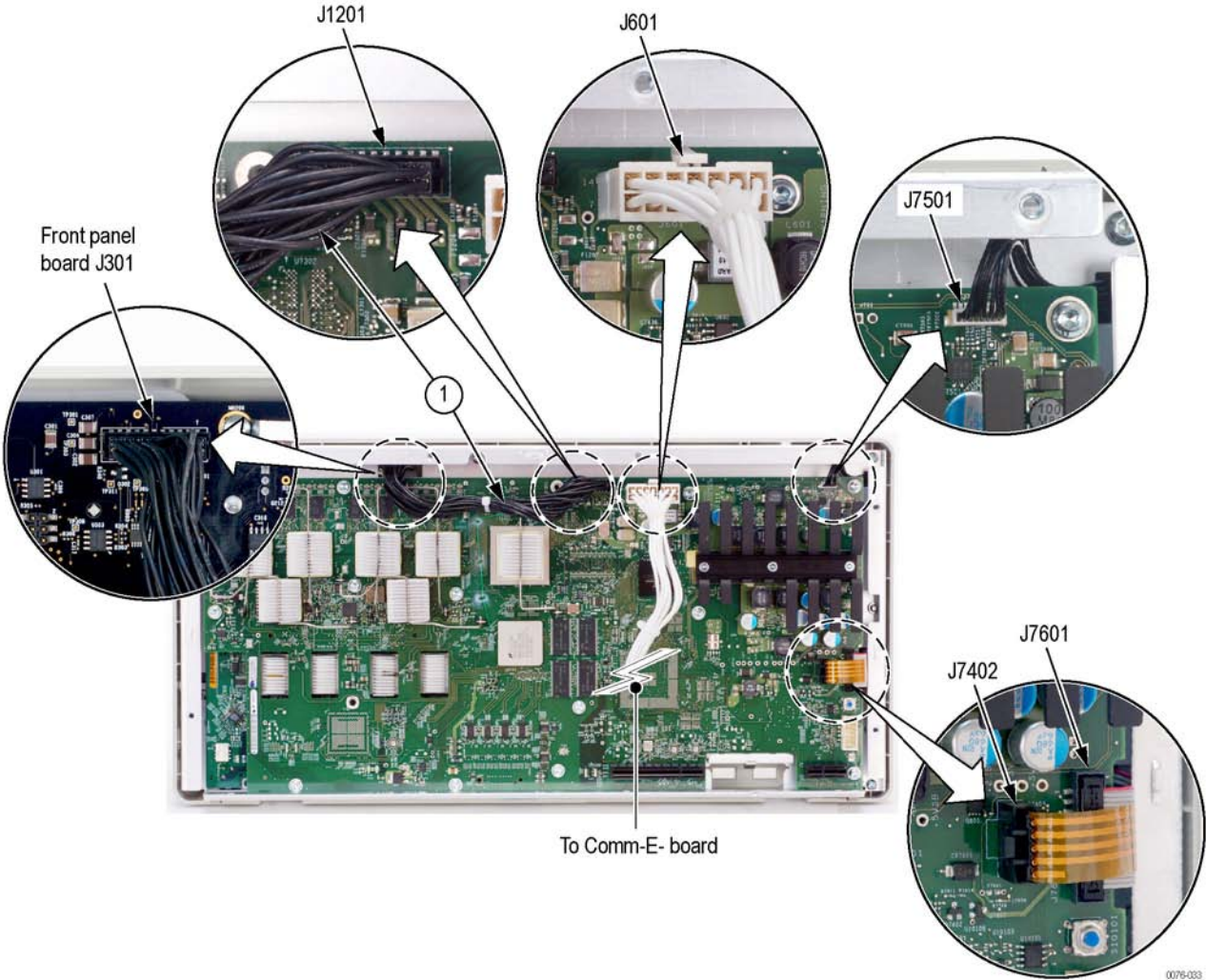


Figure 5-33: Main board, showing cable and connectors (MSO/DPO5000 Series)