



## Apple Cinema HD Display (23-inch DVI)

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Updated August 31, 2004



## Take Apart

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Apple Cinema HD Display (23-inch DVI)



# General Information



## Overview

The main features and service differences between this model and previous displays are:

- 23-inch (viewable image size) screen
- two FireWire 400 ports
- two USB 2.0 ports
- use of a service fixture to remove the display assembly from the housing
- compatible with optional Cinema Display VESA mount adapter
- touch switch controls for power, system sleep, system wake, and brightness on the lower right side of the display.

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## Display Controls



## Back View



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## Tools

The following tools are recommended for servicing the display:

- black stick (Apple part number 922-5065) or other nonconductive nylon or plastic flat-blade tool
- suction cup with handle
- #2 Phillips screwdriver
- jeweler's #1 Phillips screwdriver
- flat-blade screwdriver
- Torx T15 screwdriver or 7/64 hex screwdriver
- 3 mm hex driver
- 3/32 hex screwdriver
- wire cutters
- white cotton gloves (Apple part number 922-1592)
- ESD wrist strap and mat
- Clean, soft, lint-free cloth
- service fixture
- service bumpers

**Important:** The suction cup, service fixture, and service bumpers are new tools. Opening the display housing without properly using the fixture can stress the housing material causing a permanent gap or bowed area. The service bumpers protect the display face when removing the display assembly from the housing. Use the fixture whenever you open the housing. Use the service bumpers whenever you remove or replace the display assembly.

In addition to the listed tools, some procedures—such as removing the display assembly from the housing—require the assistance of a second person.

To replace the same or new end caps, make sure you have the following additional materials:

- 50/50 blend of isopropyl alcohol and water
- clean, lint-free cloths
- 3M Tape Primer 94
- Paintbrush or cotton swabs

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## General Recommendations

**Warning: Never turn on a display unless all of its parts are in place as originally assembled. Operating the display with missing parts can damage the display and cause injury.**

The display housing and LCD panel can retain fingerprints and scratch easily. When handling and servicing the display, follow these precautions:

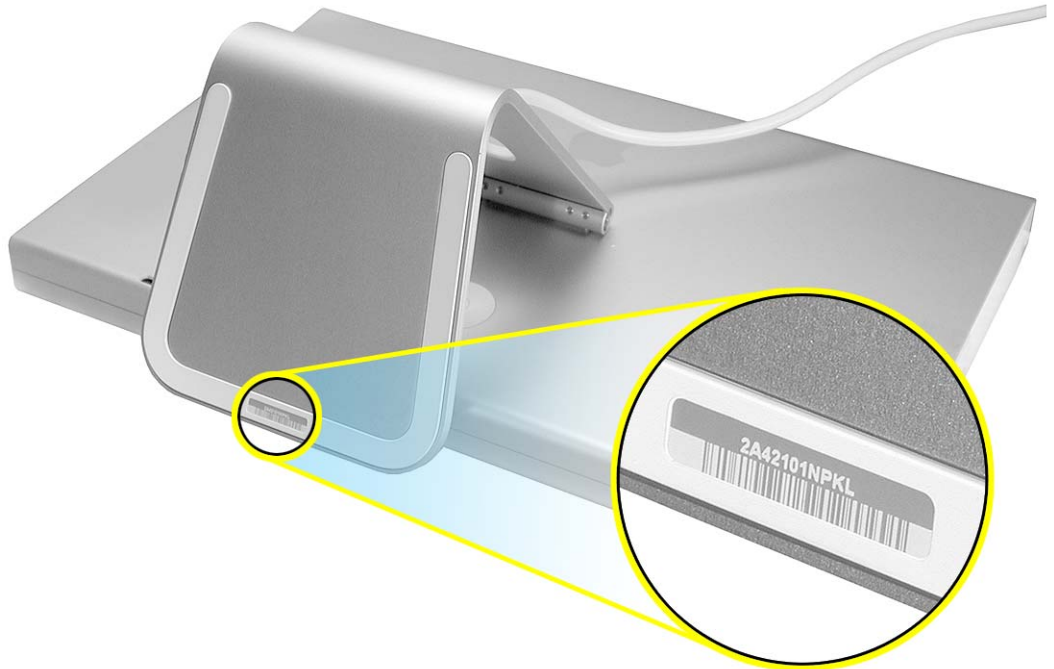
- Be very careful with tools.
- Lay the display and parts only on a clean soft surface.
- Remove jewelry.
- Wear clean white cotton gloves.
- Never open the display without using the fixture.
- When working with metal tools, use a clean cloth to protect the housing.
- Use the service bumpers whenever removing the display assembly from the housing.

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## Serial Number Location

The serial number is located in two places:

- underneath the display on the stand base



- on the back of the display at the stand bracket (visible only with the display stand removed)





# Display Stand

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- soft cloth
- 3mm hex driver

## Part Location



## Preliminary Steps

There are no preliminary steps for this procedure.

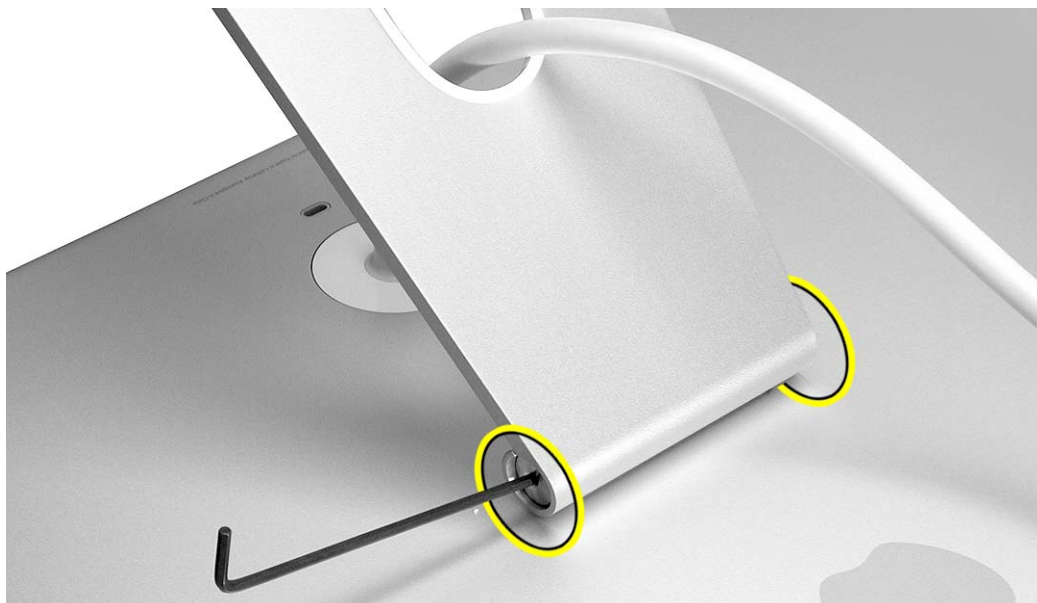


## Procedure

**Warning:** Turn off the display and disconnect the cable.

**Warning:** Use correct lifting techniques when positioning the display. When lifting or carrying the display, grasp the edges. Do not lift the display by the stand or the cable.

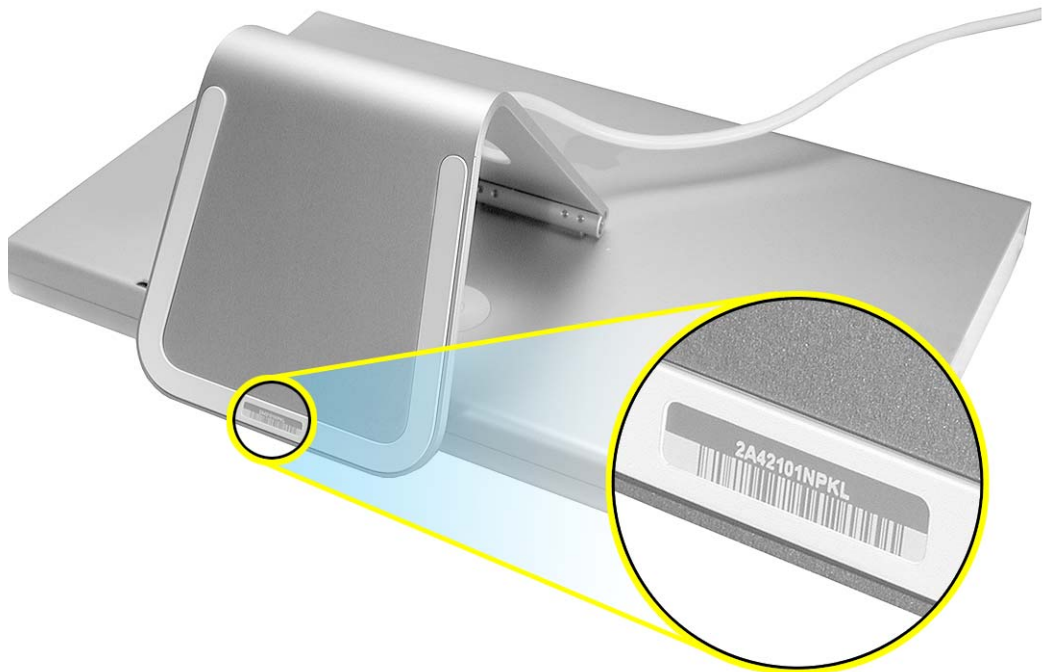
1. Place the display face down on a clean cloth.
4. Remove the screw at each end of the display stand hinge.



5. With the screws removed, grasp the stand, and pull it off of the hinge.



6. Route the display cable through the opening in the stand.
7. **Important:** If you are installing a new replacement stand, be sure to apply a blank label to the stand, and then copy the serial number from the mounting bracket at the back of the display housing to the blank label on the stand.



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8. Install the replacement display stand, and reassemble and test the display.

**Replacement Note:** After the stand is installed, check the operation of the stand. The LCD panel should tilt up and down smoothly.





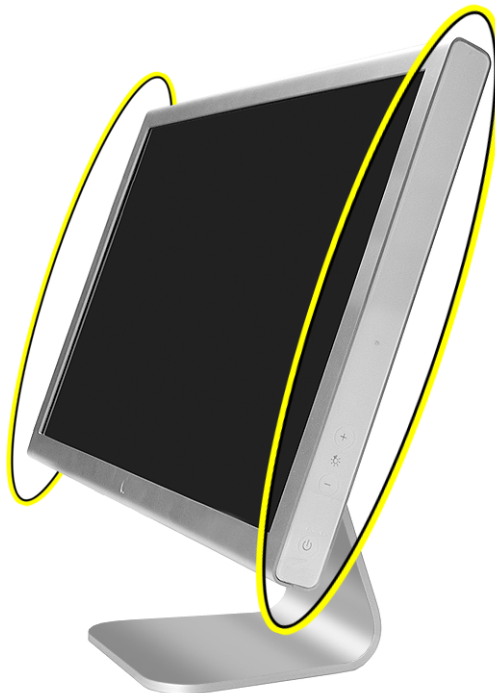
# End Caps

## Tools and Materials

This procedure requires the following:

- black stick (Apple part number 922-5065) or other nonconductive nylon or plastic flat-blade tool
- suction cup with handle
- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- 50/50 blend of isopropyl alcohol and water
- clean, lint-free cloths
- 3M Tape Primer 94
- Paintbrush or cotton swabs
- End cap tape replacement kit

## Part Location



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## Preliminary Steps

There are no preliminary steps for this procedure.

## Removing the End Caps

**Note:** The two end caps are not interchangeable. When the LCD panel is facing you, the end cap on the right side includes the touch switch board (a very thin board that sticks to the inner surface of the end cap and connects with a detachable cable to the main board). The end caps are held in place with adhesive. Use care when removing them.

1. Place the display face down on a clean ESD mat or cloth.
2. Press a suction cup onto the top end of the end cap.

**Note:** The top inch or so of the end cap is not secured with adhesive, so the suction cup can grip that end to start the removal process.



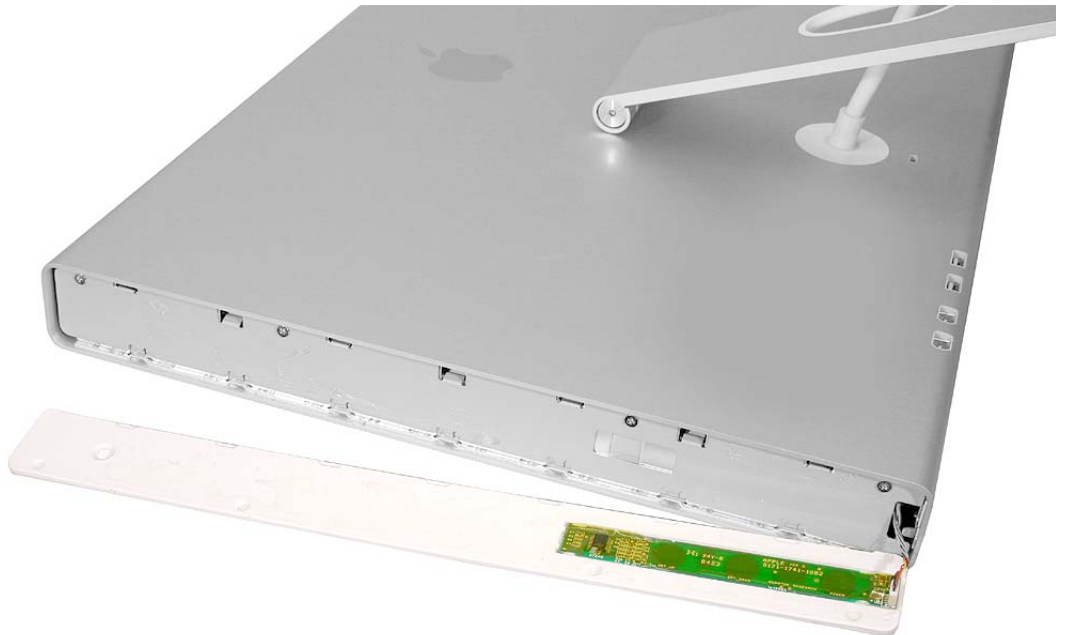
3. Pull the handle on the suction cup to start to loosen the end cap.



- Using a black stick, loosen the rest of the end cap from the display housing.



- Peel off the right end cap, and tilt it away from the display.



6. Disconnect the connector from the touch switch board.



7. If you are also replacing the end cap on the left side of the display, press a suction cup onto the top end of the end cap.



8. Pull the handle on the suction cup to start to loosen the end cap.



9. Use a black stick to loosen and remove the left end cap.





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## Replacing the End Caps

**Warning:** Carefully read and follow manufacturer's precautions and directions for safety when handling cleaning solvents.

To replace the same or new end caps, make sure you have the following materials:

- 50/50 blend of isopropyl alcohol and water
- clean, lint-free cloths
- 3M Tape Primer 94
- Paintbrush or cotton swabs

1. Using a 50/50 blend of isopropyl alcohol and water, moisten a clean, lint-free cloth.

**Important:** To prevent damage to the assembly, make sure the cloth is damp but not wet. Do not allow moisture to enter the assembly.

2. Use the damp cloth to clean and remove any remaining adhesive on the end caps and on the side channels.
3. When the adhesive is fully removed, wipe the surfaces with a dry cloth.
4. Check that the surfaces are completely clean and dry.
5. Using 3M Tape Primer 94 and a paintbrush or swab, apply a thin coat of primer on the inner surface of the end caps and on the side channels.

**Important:** Make sure no primer seeps into the openings in the computer assembly or touches the computer housing.

6. Allow the primer to dry (about five minutes at room temperature).

7. Apply double-sided tape on the side channels.



8. With the tape in place on the side channels, peel off the tape backing.
9. Make sure the notches on the end cap match the slots in the side channel.
10. Stick the matching replacement end cap onto the side channel.

**Replacement Note:** Make sure the end caps are secure and completely level along the length of the sides of the display.



# Side Channels

## Tools

This procedure requires the following tools:

- black stick (Apple part number 922-5065) or other nonconductive nylon or plastic flat-blade tool
- #2 Phillips screwdriver
- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth

## Part Location



## Preliminary Steps

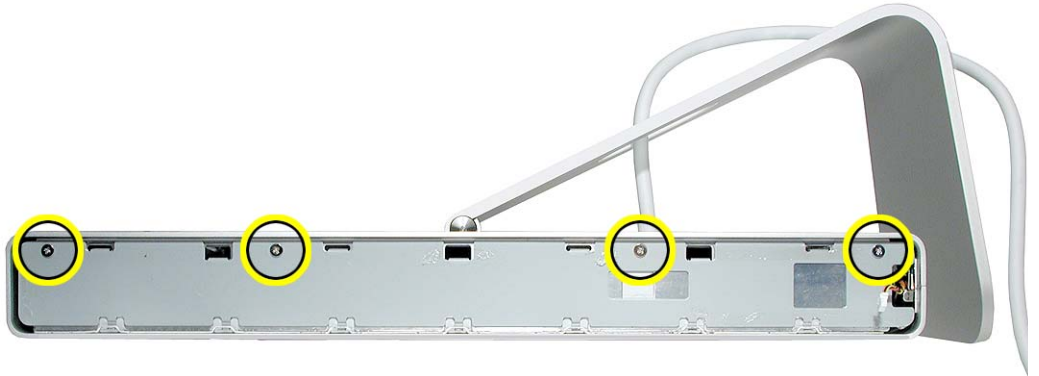
Before you begin, remove the end cap(s).

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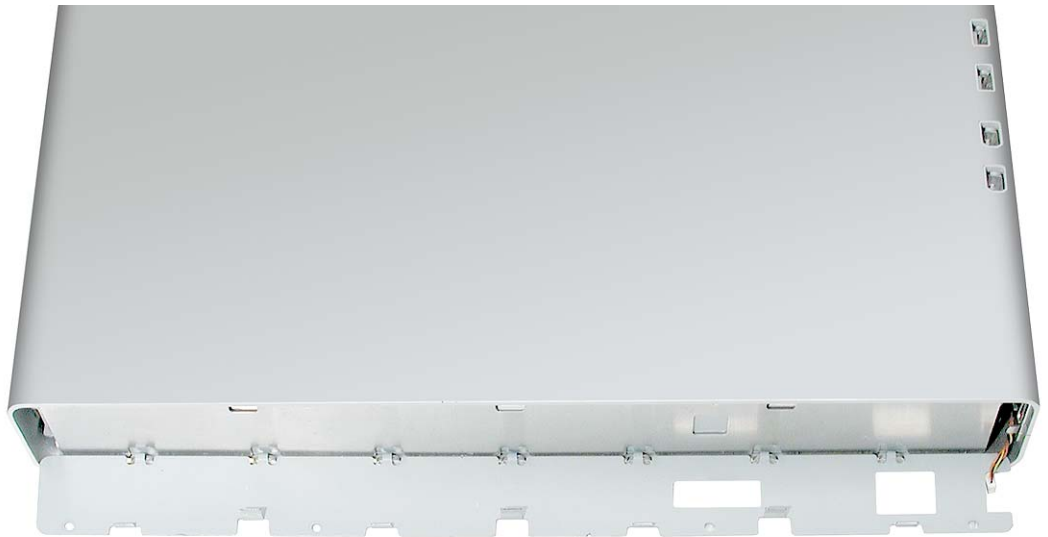
## Procedure

**Note:** The two side channels are not interchangeable. Use care when replacing them.

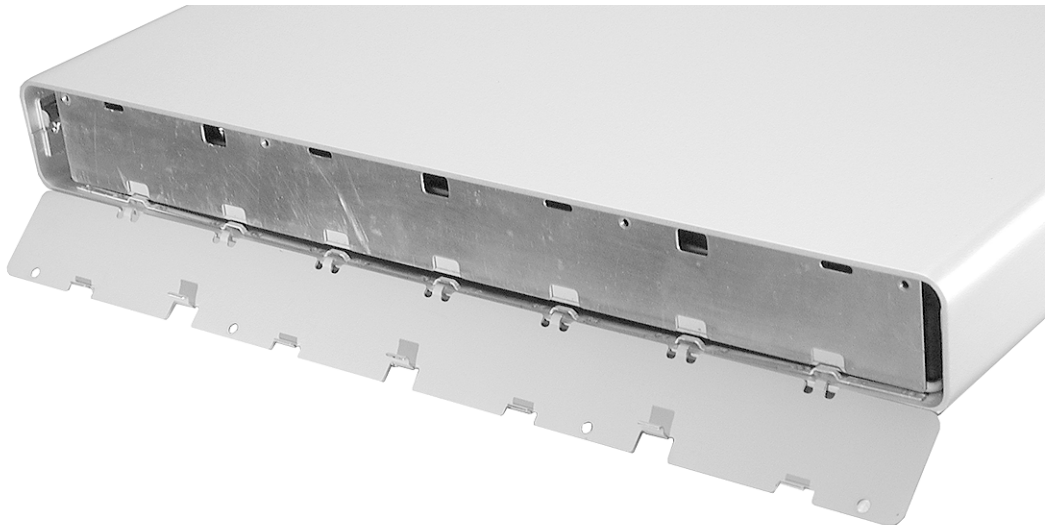
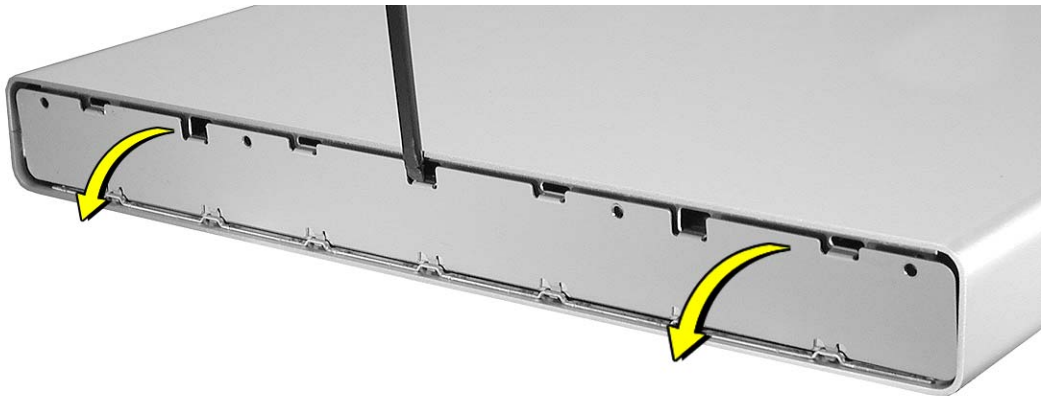
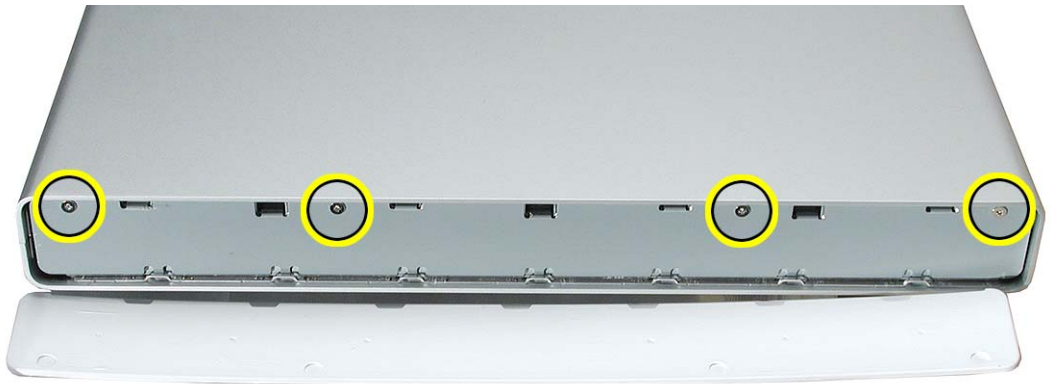
1. With the display face down on a clean ESD mat or cloth, remove the four screws from the side channel:



2. Use a black stick to gently pry out the side channel.



3. Repeat steps 1 and 2 for the other side channel.



4. Install the replacement side channels, and reassemble and test the display.

**Replacement Note:** Make sure the side channels are installed so that the tabs and screw openings align correctly.



# Display Housing

## Tools

This procedure requires the following tools:

- service fixture
- white cotton gloves (Apple part number 922-1592)
- ESD mat or soft cloth
- three service bumpers to protect display face
- needlenose pliers

**Important:** To remove the display assembly from the housing without scratching any surfaces, assistance from a second person is required.

## Part Location



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## Preliminary Steps

Before you begin, remove the following:

- End caps
- Side channels

**Important:** During this procedure handle the display assembly by the outer edges only. Do not strain the cables or touch the face of the LCD panel.

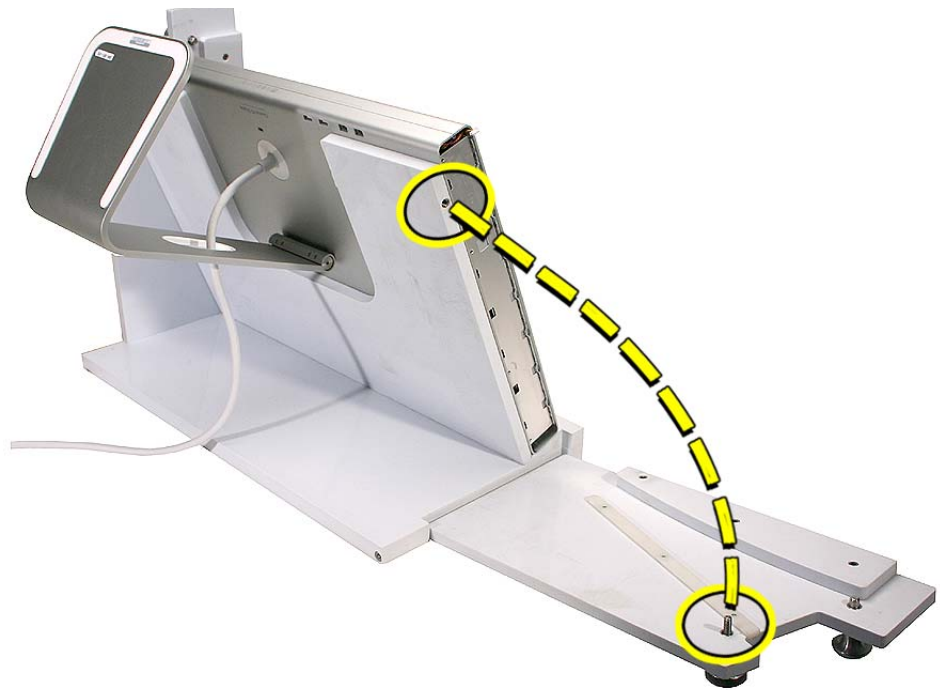
## Procedure

1. Prepare a clean surface with an ESD mat or cloth. (After removing the display housing, you will place the display assembly on the mat.)
2. Open the side arm of the fixture by turning the captive knob counter-clockwise.





3. With both hands, pick up the display at the sides. Turn the display upside down and lower it into the fixture.
4. Swing up the side arm of the fixture, and turn the knob clockwise to secure it shut.



5. Near the housing seam, use a needlenose pliers to grasp the locking latch. Pull the latch out approximately 1/4 inch.

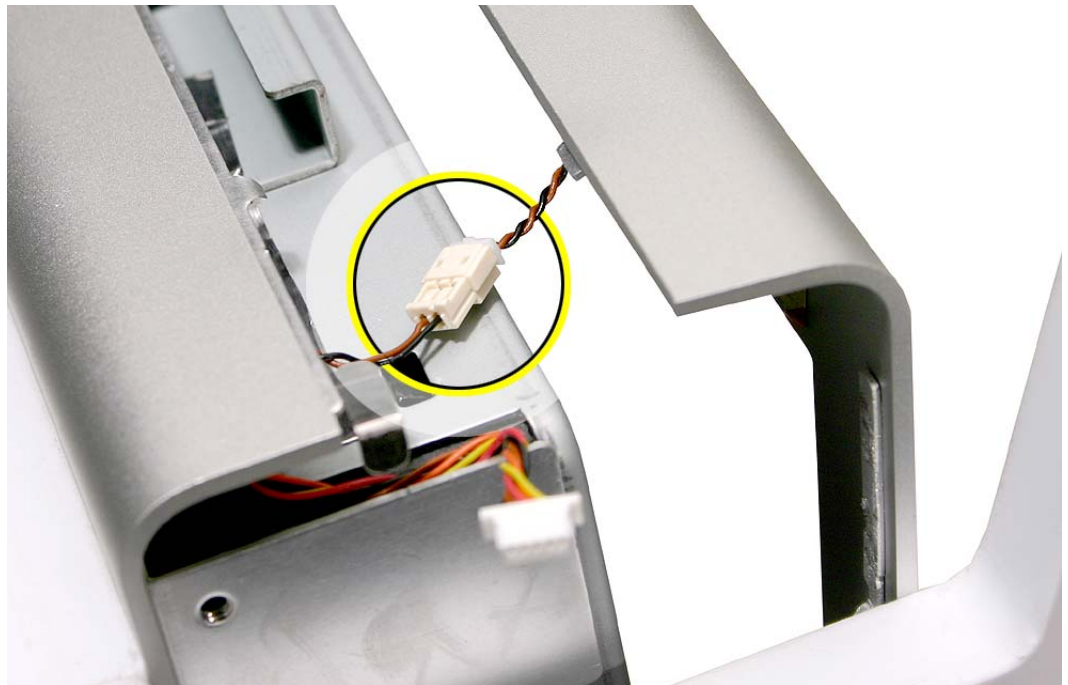
Repeat this step for the second latch on the other end of the housing seam.



6. Spread apart the housing just enough to access the wrapped connector cable.
7. Remove the tape from the connector.



8. Disconnect the LED connector cable.



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9. With the display assembly secure in the fixture, make sure the locking pins on both sides of the fixture are recessed.
  10. Open the housing the rest of the way and secure it in the open position by pressing in on the locking pins on both sides of the fixture.

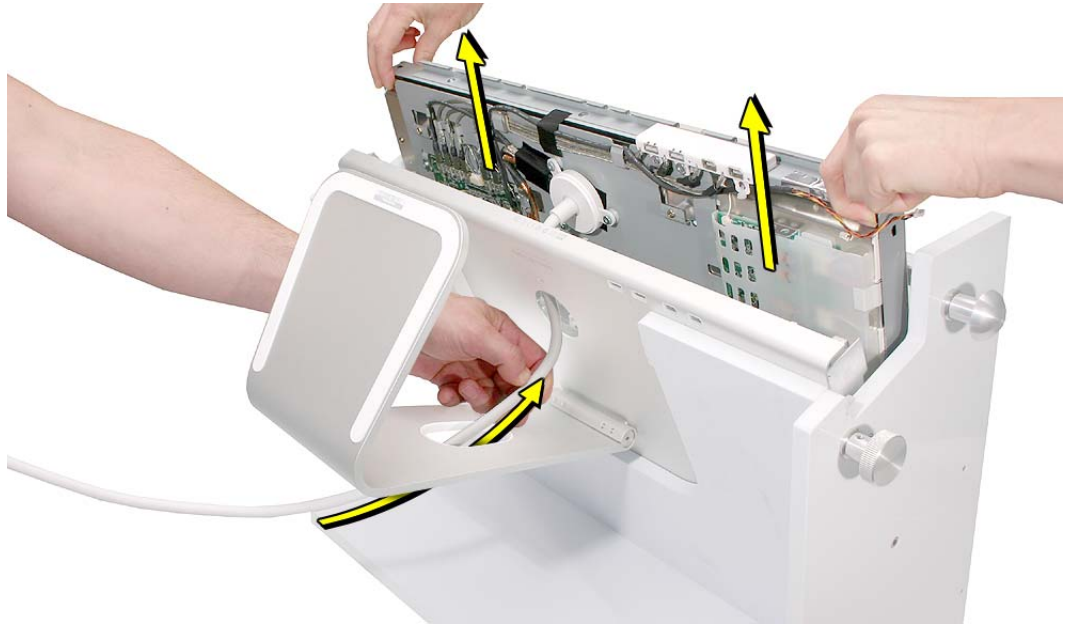


11. **Important:** The LCD panel and display assembly are subject to scratches when removing them from the housing. To prevent damage, make sure you install the service bumpers as shown.

To protect the display face when lifting out the display assembly, first install the three strips of service bumpers along the front edge of the housing.



12. **Important:** Handle the display assembly by the outer edges only. Do not strain the cable or touch the face of the LCD panel
13. Have a second person feed the display cable through the round opening on the back of the housing while you lift the display assembly out of the housing. Try to keep the display assembly from touching the housing as you lift it out.



14. Place the display assembly face down on a clean ESD mat or cloth.
15. Release the locking pins on the fixture, and unlatch the fixture to remove the housing.
16. Install the replacement display housing in the fixture, and reassemble and test the display.



# Mounting Bracket

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- #1 Phillips screwdriver

## Part Location



## Preliminary Steps

Before you begin, remove the following:

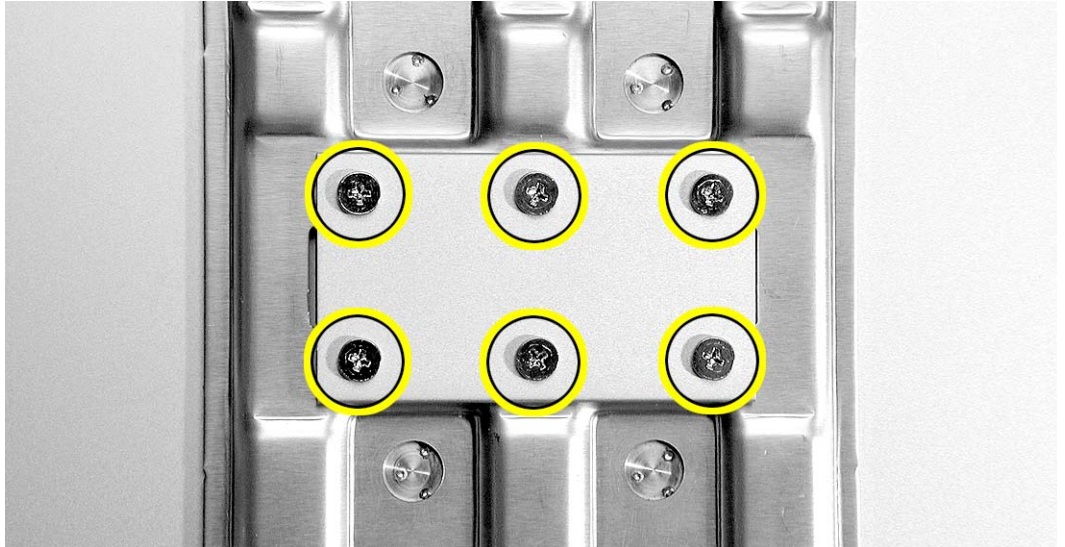
- Display stand
- End caps
- Side channels

- Display housing

## Procedure

**Important:** The housing is subject to bending or flexing if mishandled. Make sure the housing shell remains closed during this procedure.

1. With the housing closed and “face up” on a clean ESD mat or cloth, remove the six screws that secure the mounting bracket to the display housing.

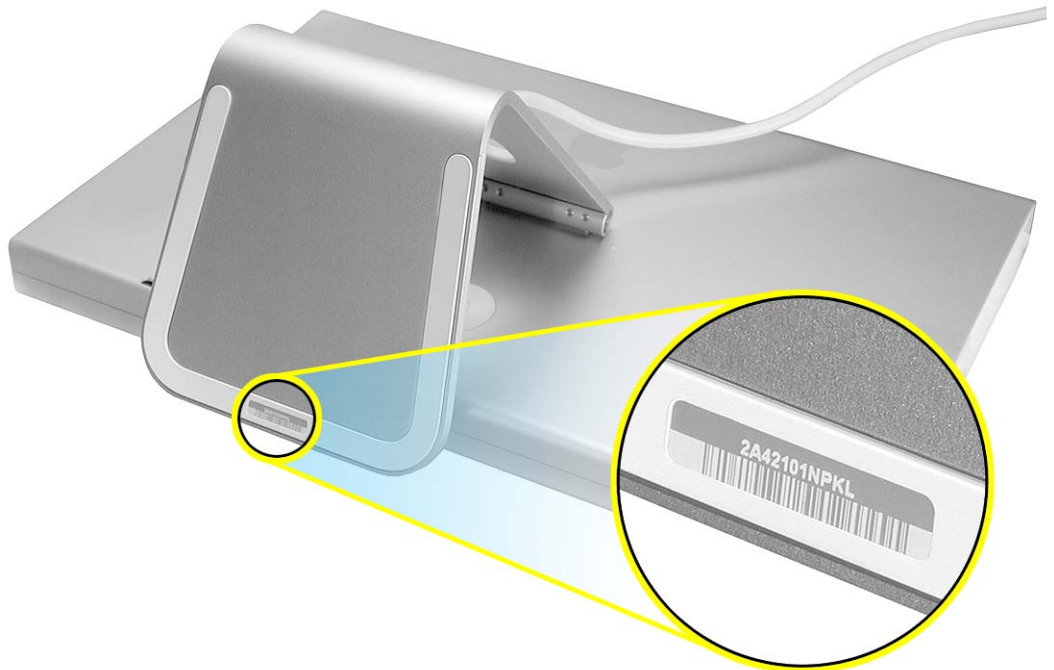


2. Remove the mounting bracket from the housing.





3. **Important:** If you are installing a new replacement mounting bracket, be sure to apply a blank label to the bracket, and then copy the serial number from the display stand to the blank label on the mounting bracket.



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4. Install the replacement mounting bracket, and reassemble and test the display.





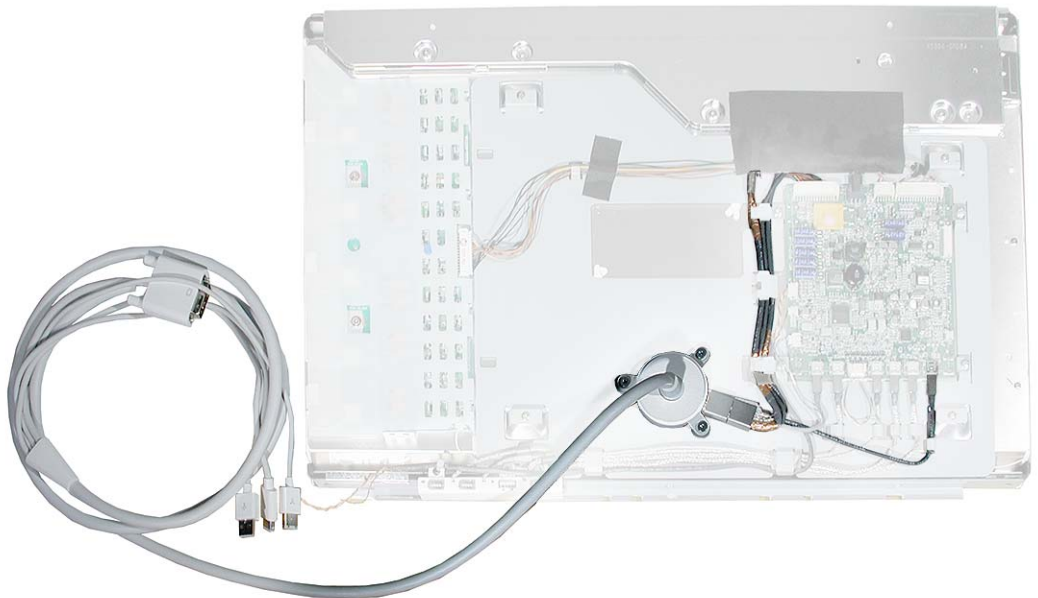
# Display Cable

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- 3/32 hex screwdriver
- needlenose pliers

## Part Location



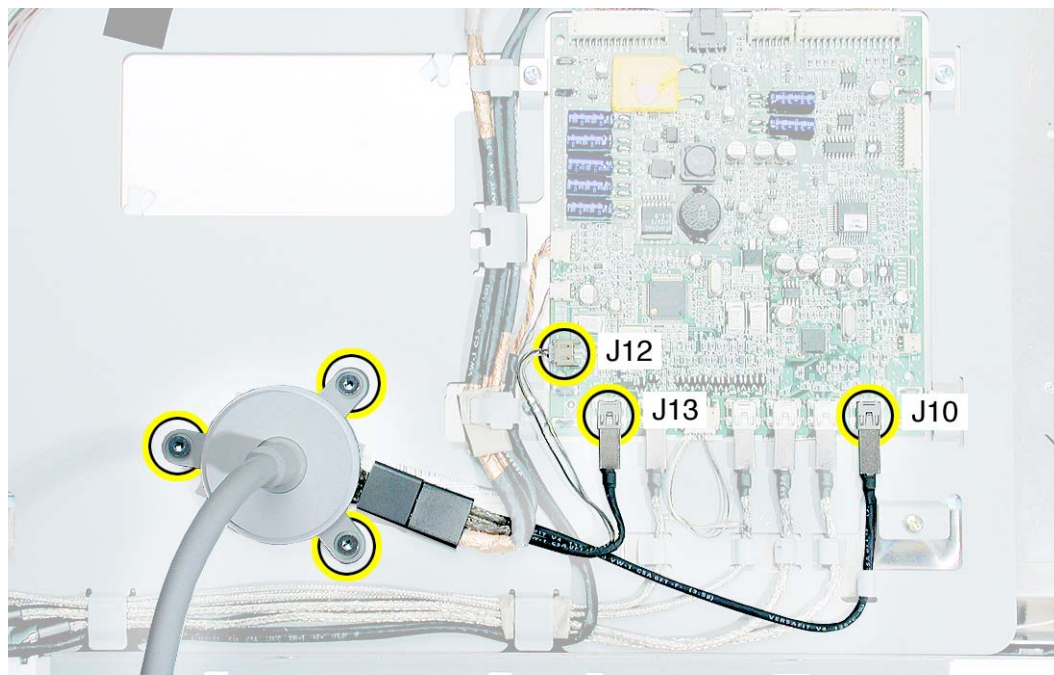
## Preliminary Steps

Before you begin, remove the following:

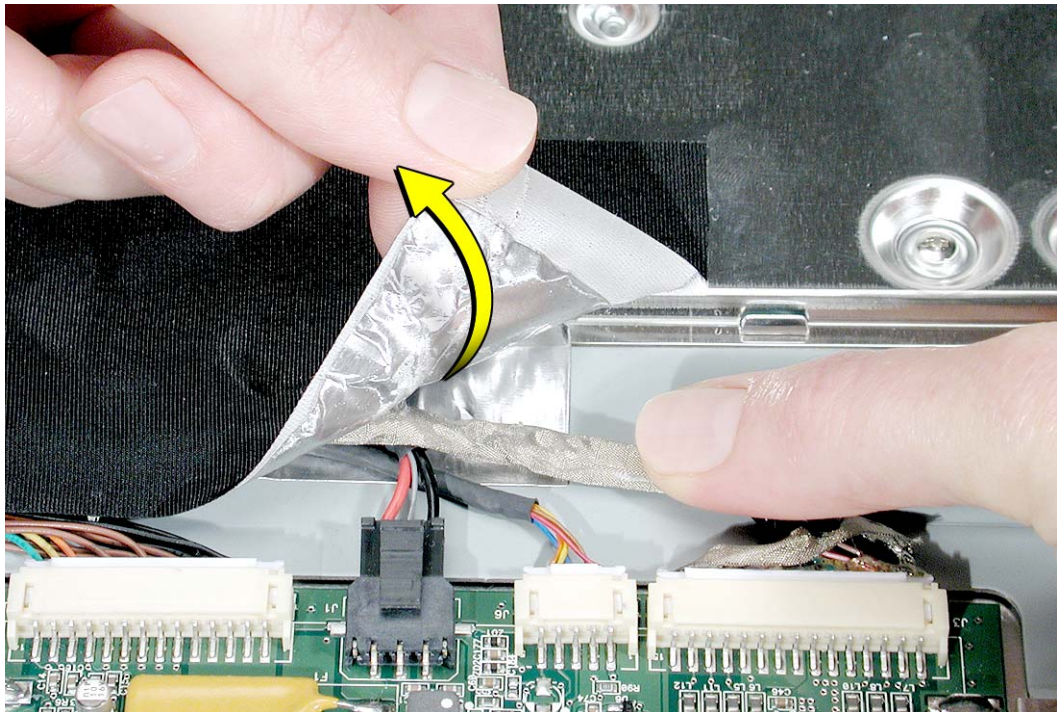
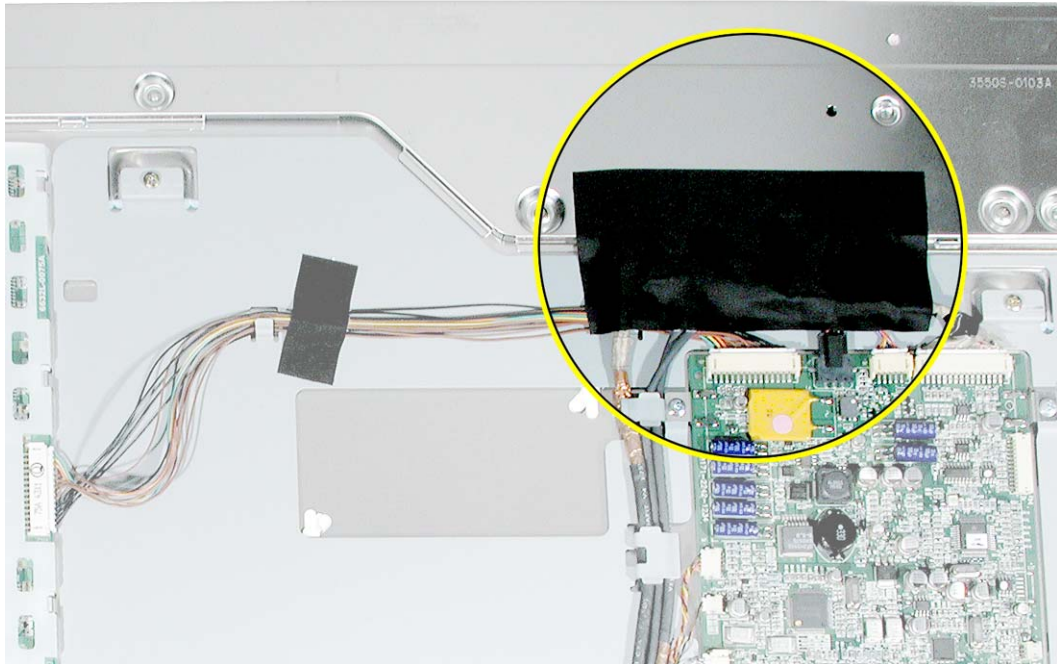
- End caps
- Side channels
- Display housing

## Procedure

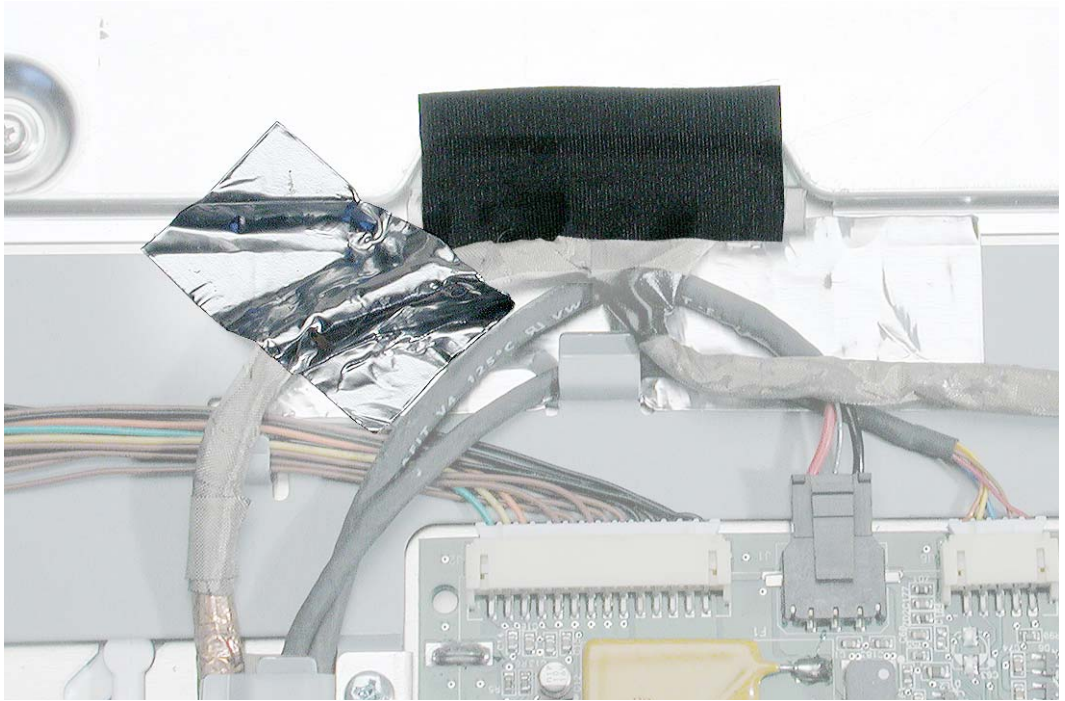
1. With the display face down on an ESD mat or soft cloth, remove the three Phillips screws from the cable anchor at the back of the chassis.
2. Disconnect connectors J10, J12, and J13 from the main board.



3. Carefully remove the large strip of black acetate tape covering the cables. Hold down the cables as you peel up the tape.

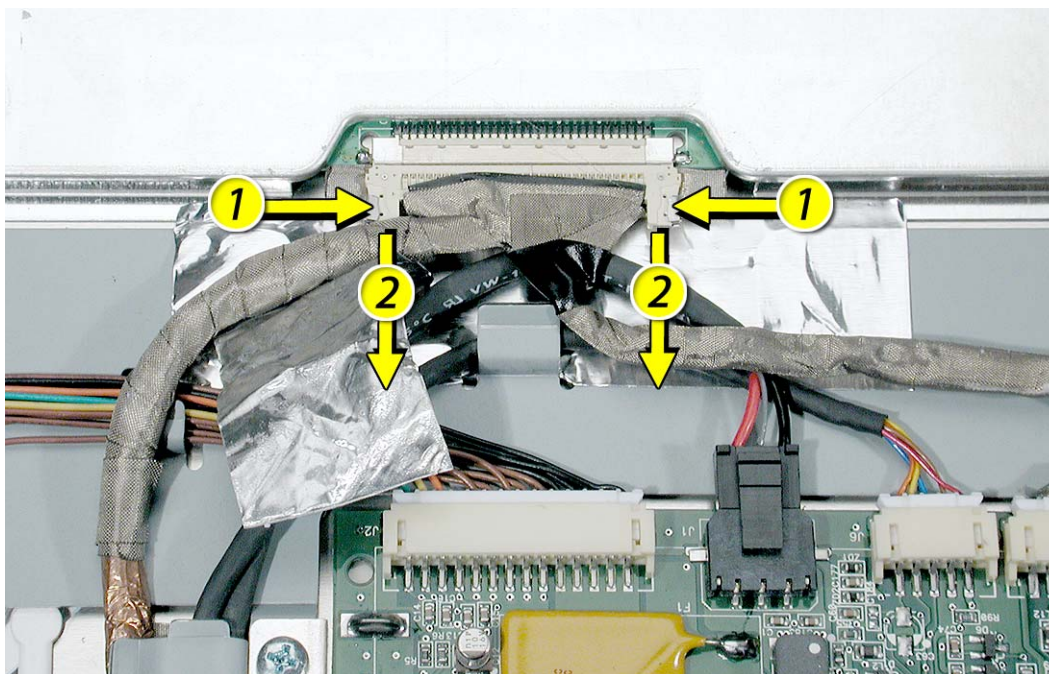


4. Peel up the smaller strips of tape that cover the TMDS connector and cable.



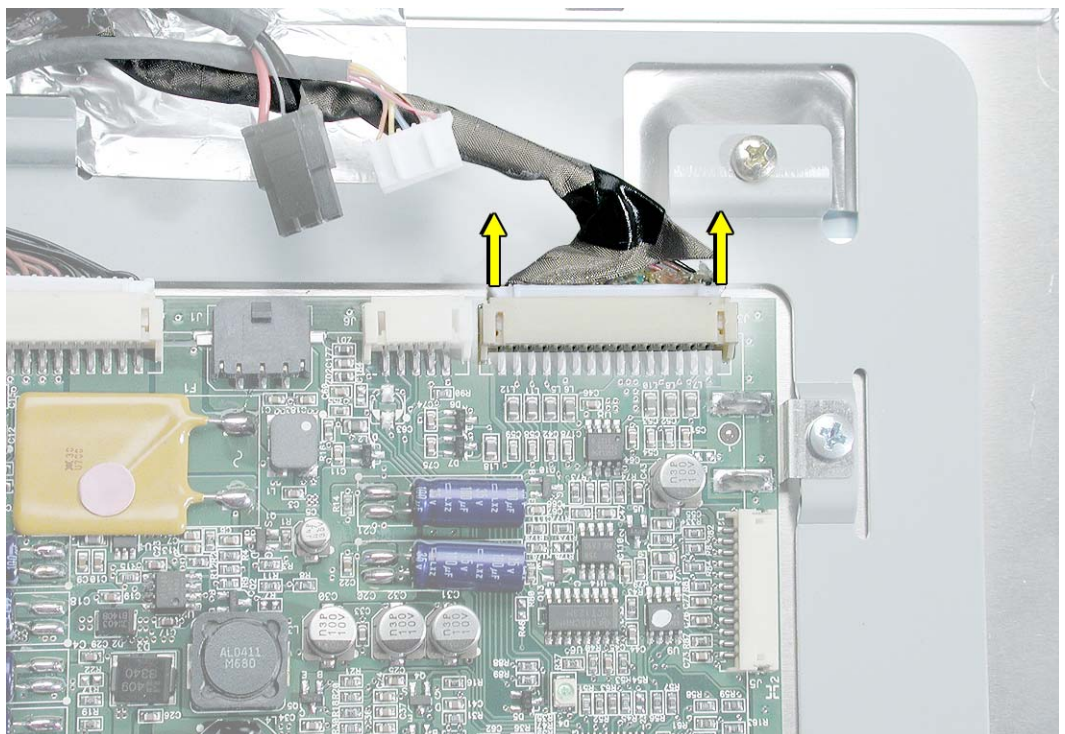
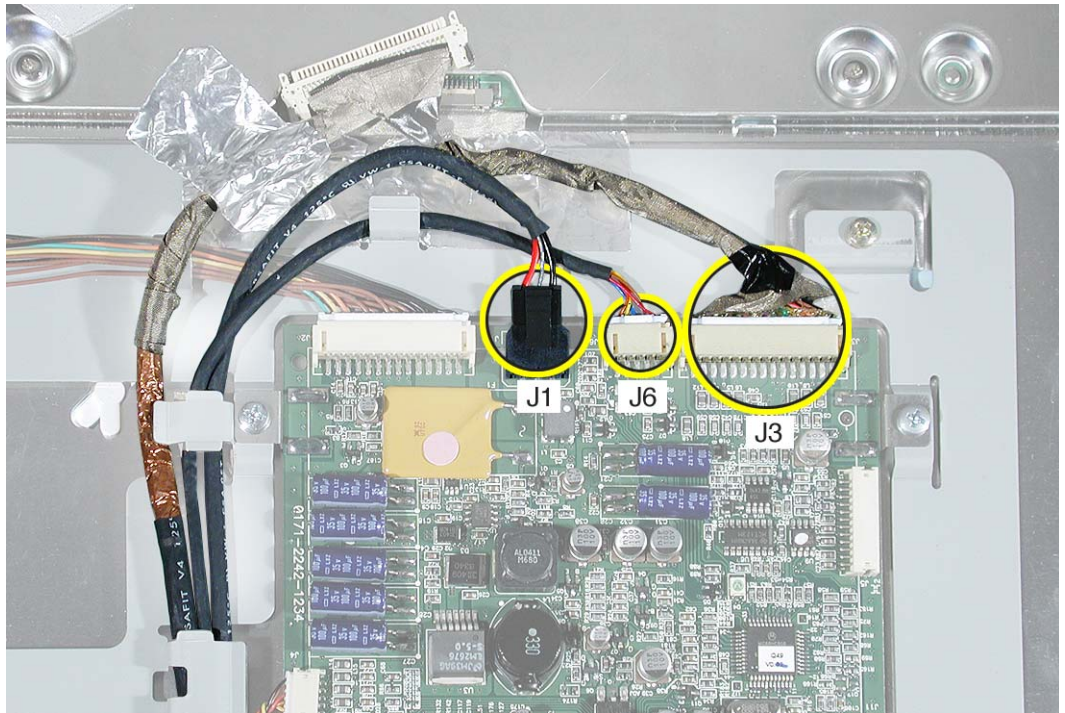
5. Press the ends of the TMDS connector and pull it straight down to disconnect the TMDS cable from the LCD panel.

**Replacement Note:** When installing cables, install this TMDS cable last.



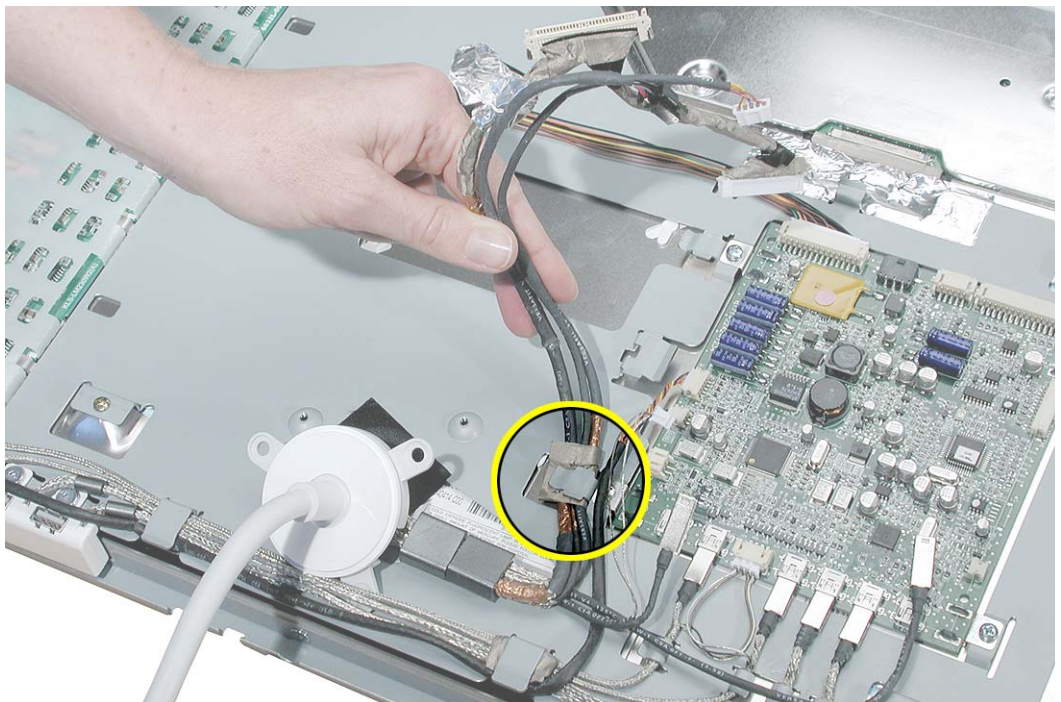
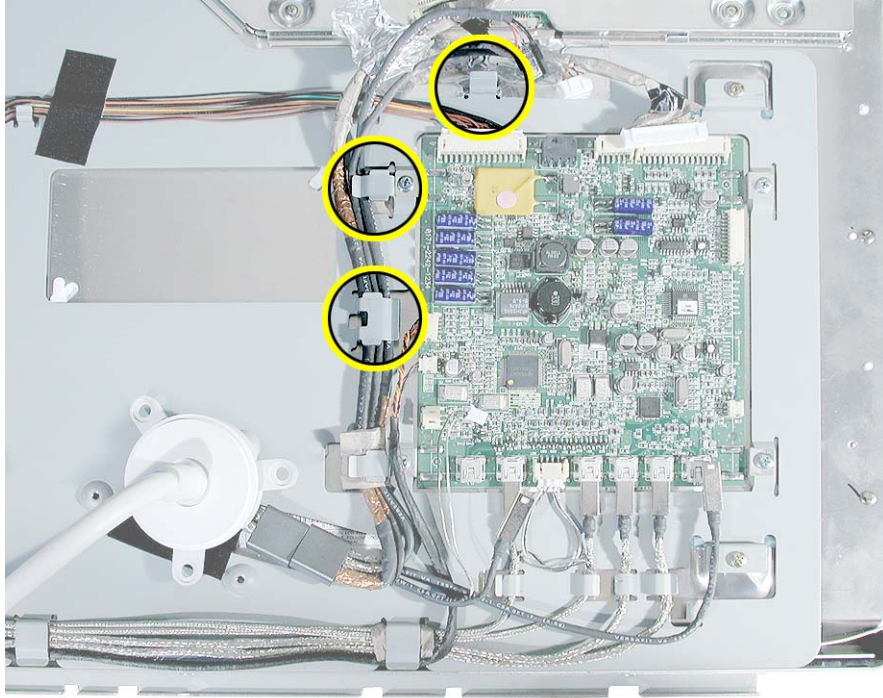
6. Disconnect cable connectors J1, J3, and J6 from the top of the main board.

**Note:** Connector J3 might be difficult to disconnect if the bottom edge of the connector becomes wedged between the board and the chassis. Tilt the connector up slightly while disconnecting it.



- Without tugging on the cables, carefully lift the cables from the cable guides on the back of the chassis.

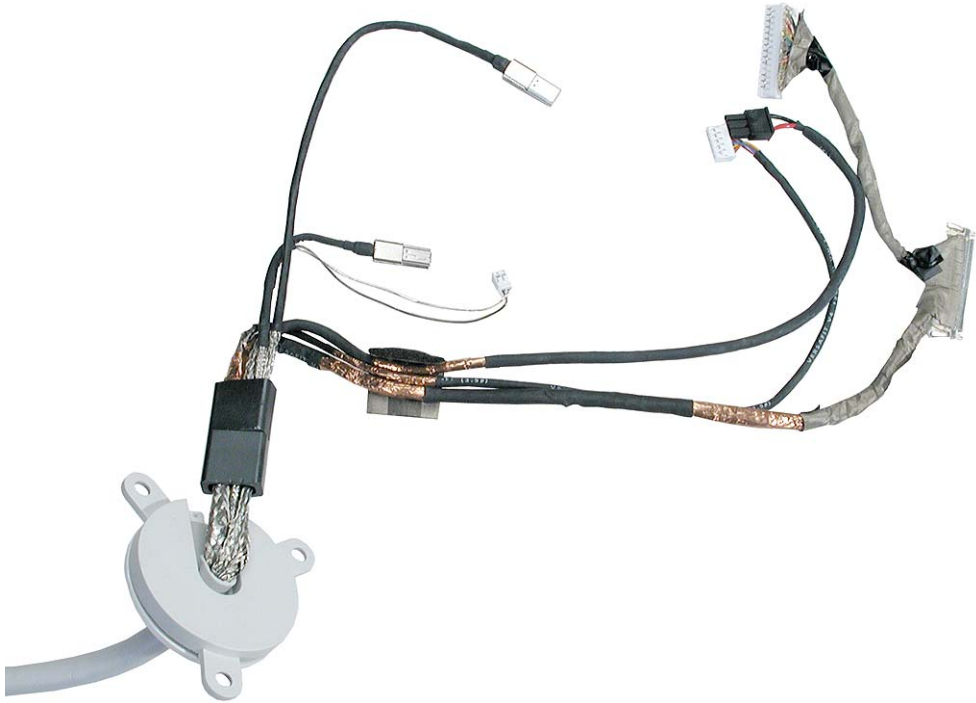
**Note:** The cable guide closest to the cable hub has a folded gasket to harness and protect the cables. Be sure to install it when replacing the cable.



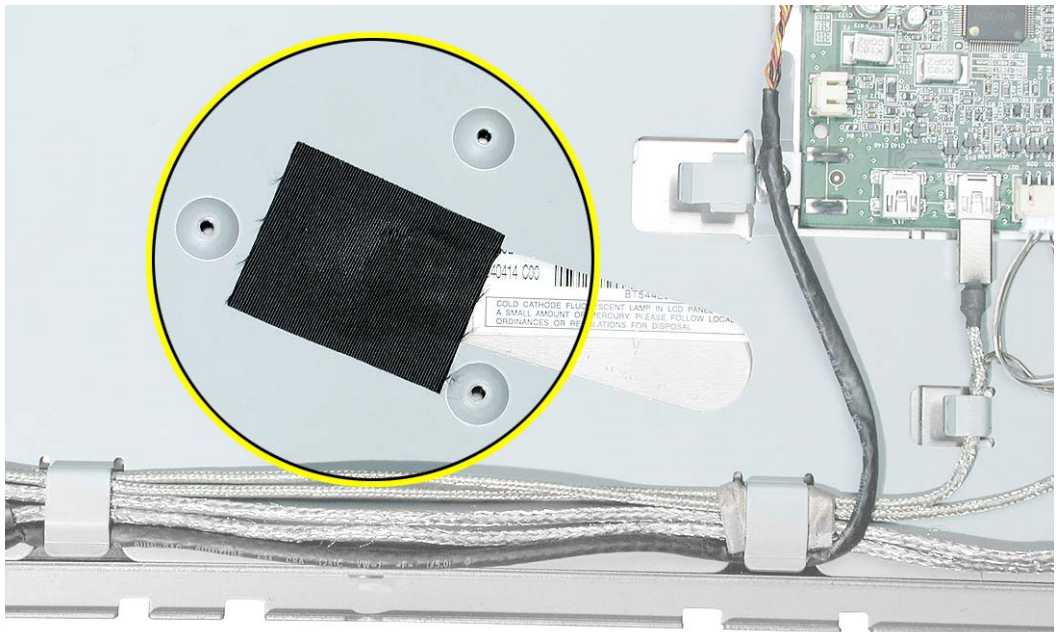


8. Install the replacement display cable, and reassemble and test the display.

**Replacement Note:** The display cables includes the seven internal connectors shown.



**Replacement Note:** Make sure that black acetate tape is installed over the chassis and LCD panel before installing the cable hub.





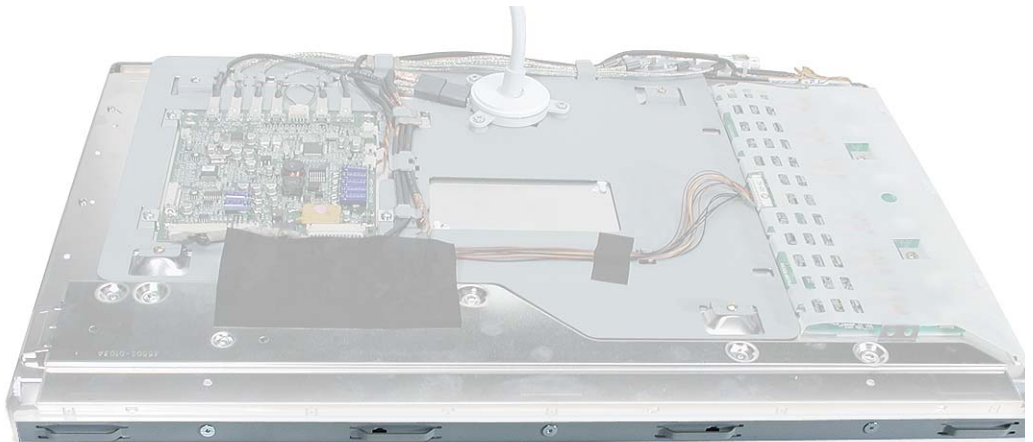
# Top Stabilizer Bar

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- #1 Phillips screwdriver

## Part Location



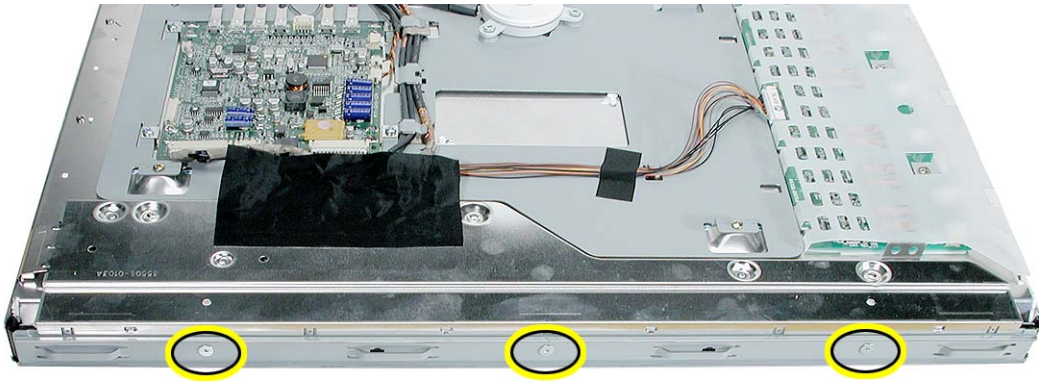
## Preliminary Steps

Before you begin, remove the following:

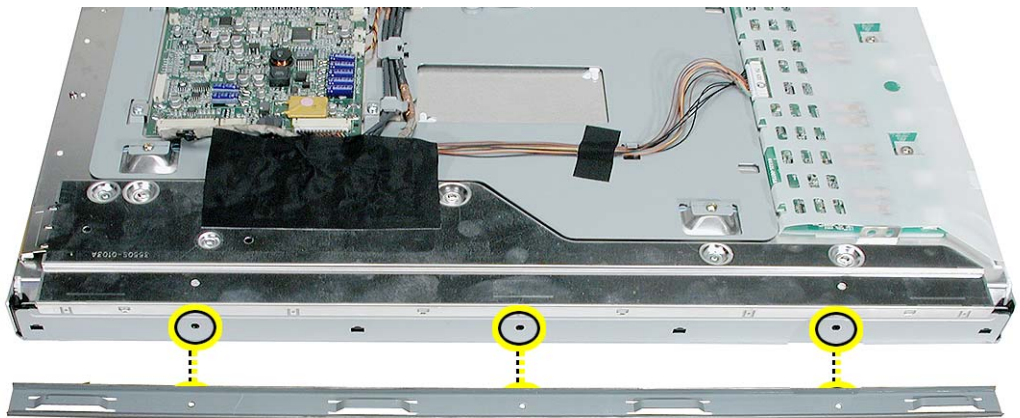
- End caps
- Side channels
- Display housing

## Procedure

1. With the display face down on an ESD mat or soft cloth, remove the three screws from the top stabilizer bar.

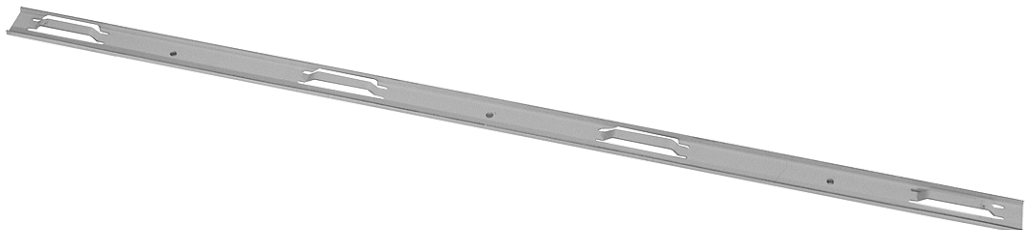


2. Lift up the stabilizer bar from the LCD panel.



3. Install the replacement top stabilizer bar, and reassemble and test the display.

**Replacement Note:** When replacing the stabilizer bar, make sure it is not installed upside down. The raised, cut-metal edge should face out; the flat edge is installed flat against the top edge of the LCD panel.





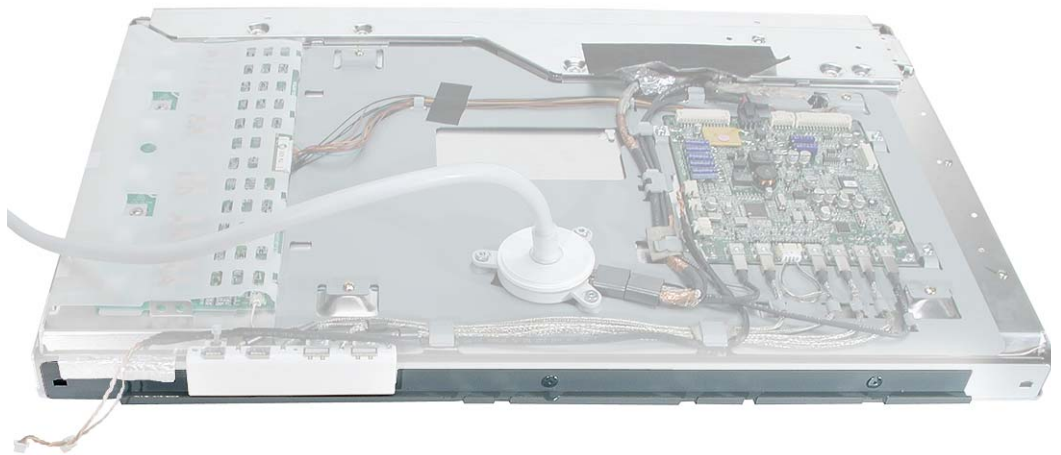
# Bottom Stabilizer Bar

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- #1 Phillips screwdriver

## Part Location



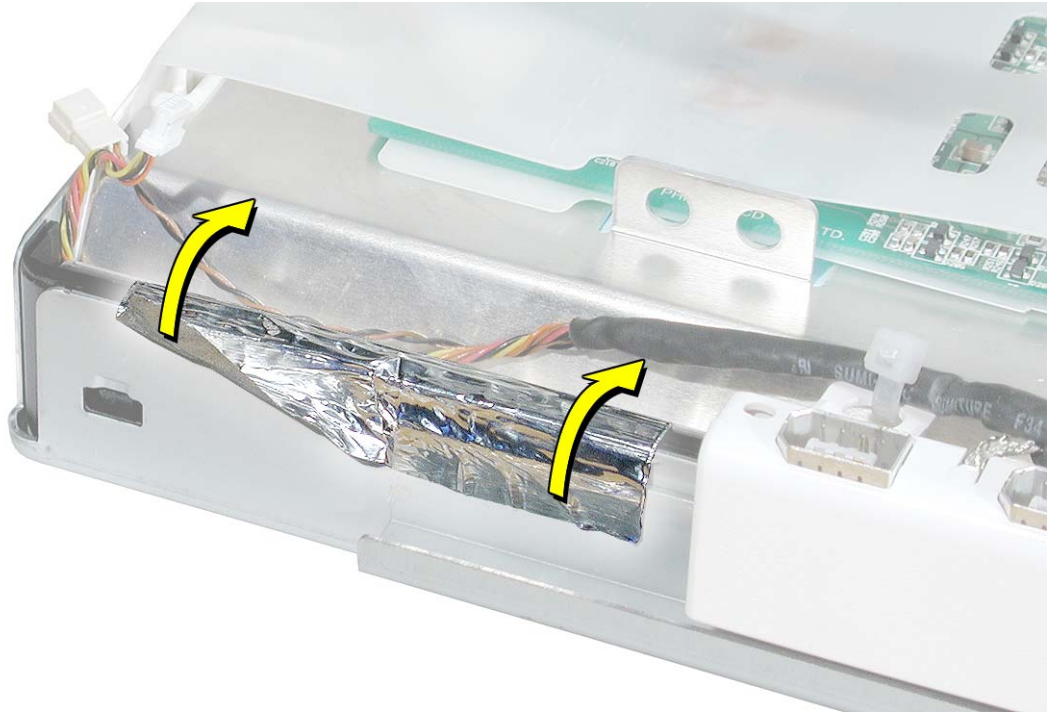
## Preliminary Steps

Before you begin, remove the following:

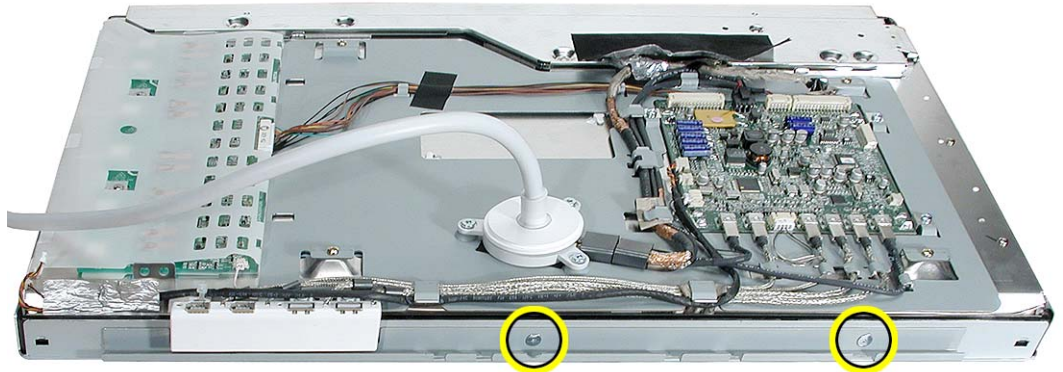
- End caps
- Side channels
- Display housing

## Procedure

1. Peel up the tape at the left end of the stabilizer bar.



2. With the display face down on an ESD mat or soft cloth, remove the two screws from the bottom stabilizer bar.

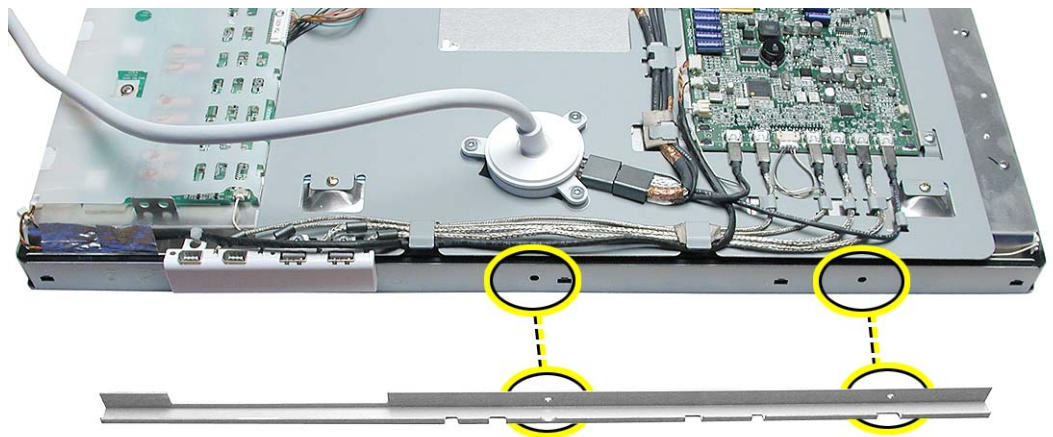


3. While supporting the bar so it does not bend, free the left end. Install the replacement bottom stabilizer bar from the adhesive at that end.

**Note:** Carefully rub off any remnants of adhesive. It does not have to be reapplied when reassembling the display.



4. Install the replacement bottom stabilizer bar, and reassemble and test the display.





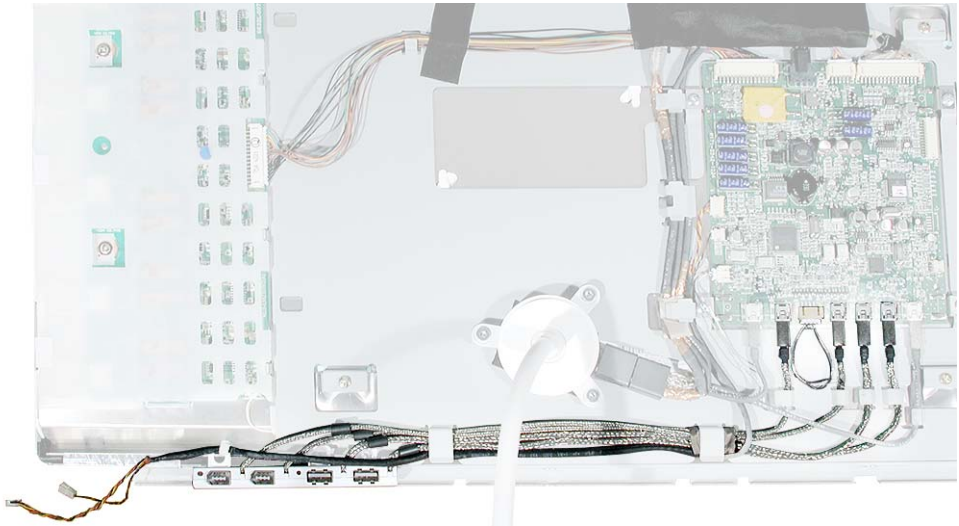
# I/O Panel

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- 3/32 hex screwdriver

## Part Location



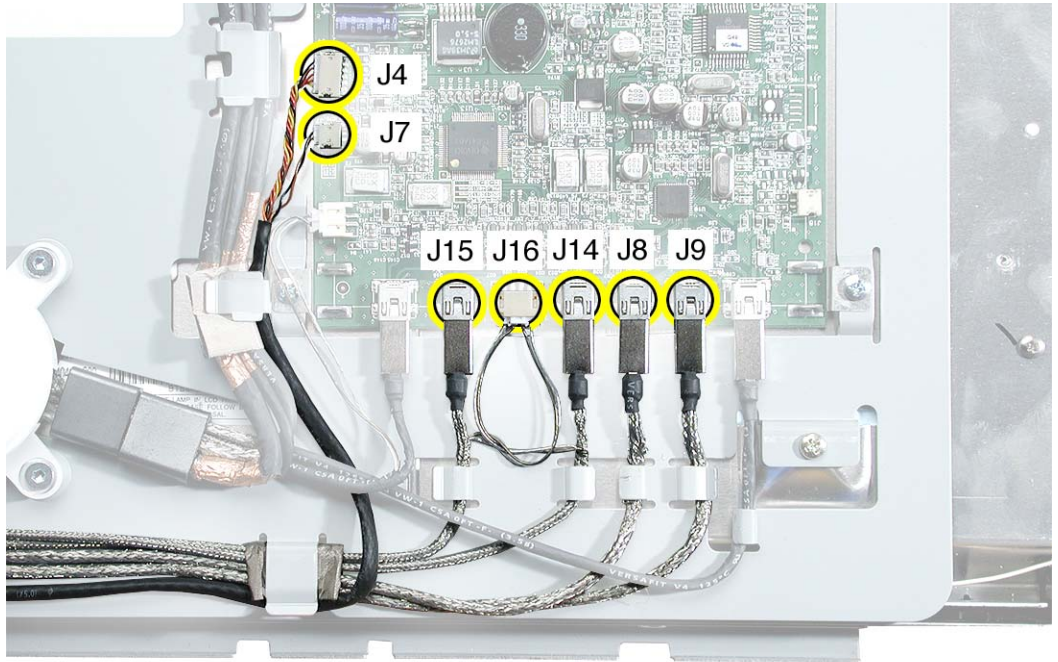
## Preliminary Steps

Before you begin, remove the following:

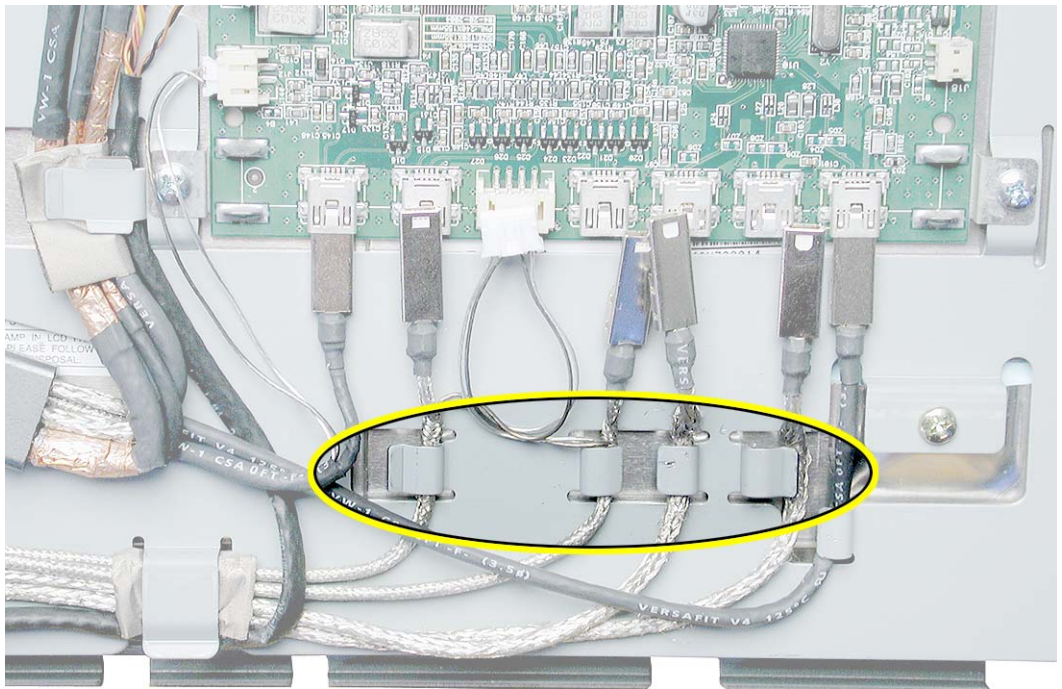
- End caps
- Side channels
- Display housing

## Procedure

1. Disconnect cable connectors J4, J7, J8, J9, J14, J15, and J16 from the main board.



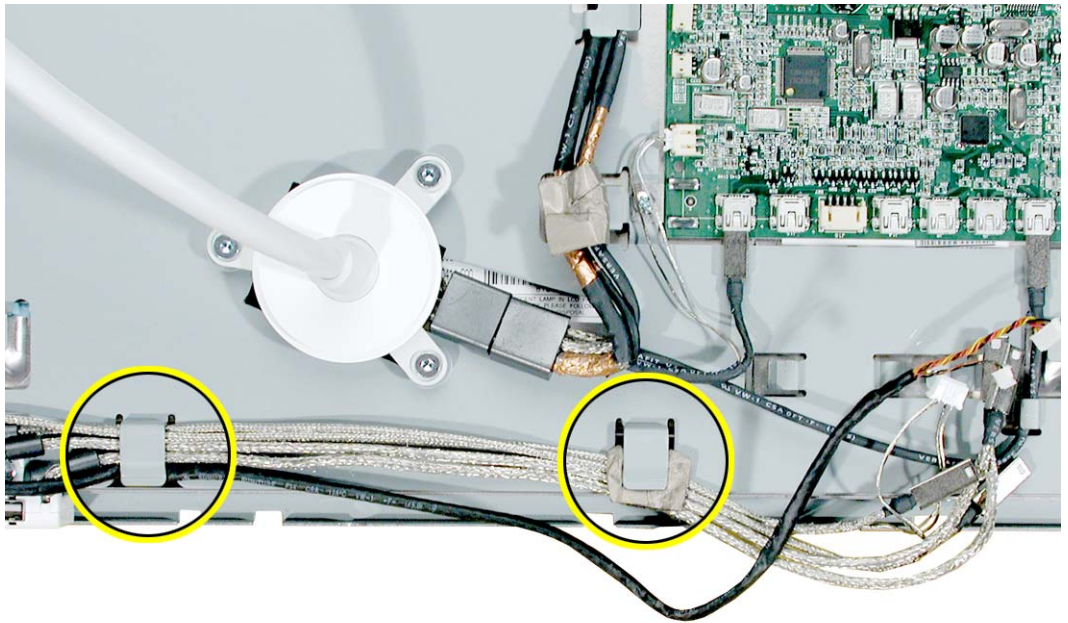
2. **Important:** The cables are delicate, do not tug or pull on the cables. Carefully un-route the disconnected cables from their cable guides.



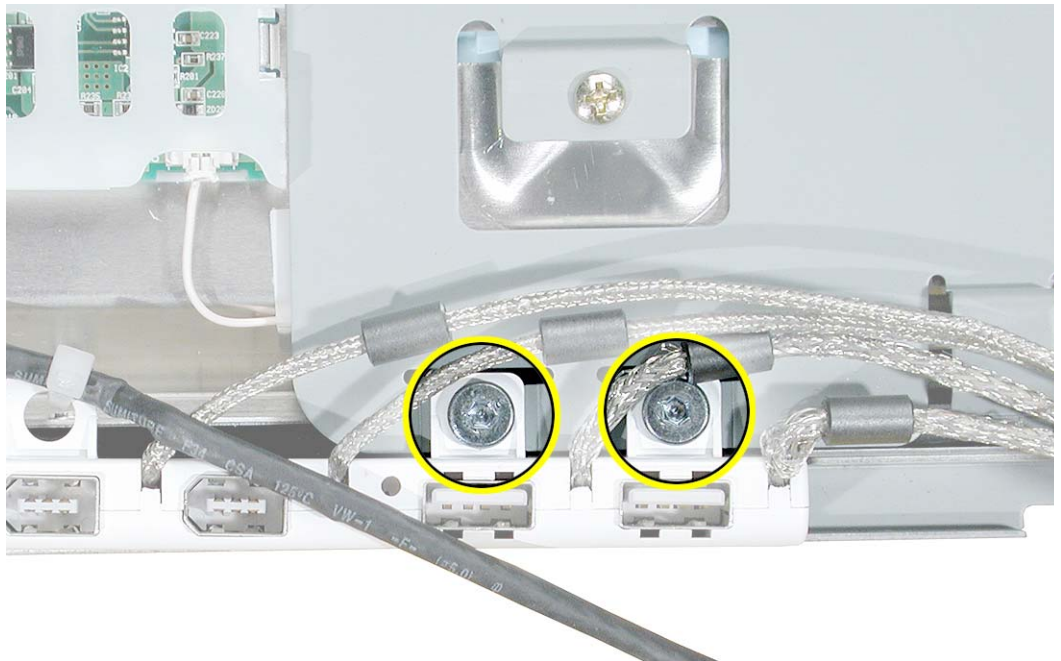


3. Remove the cables from the remaining cable guides.

**Replacement Note:** Re-use the folded gasket material to harness and protect the cable bundle under the right-most cable guide.



4. Remove the two screws that secure the I/O panel to the back chassis.



5. Install the replacement I/O panel, and reassemble and test the display.



# Main Board

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- #2 Phillips screwdriver

## Part Location



## Preliminary Steps

Before you begin, remove the following:

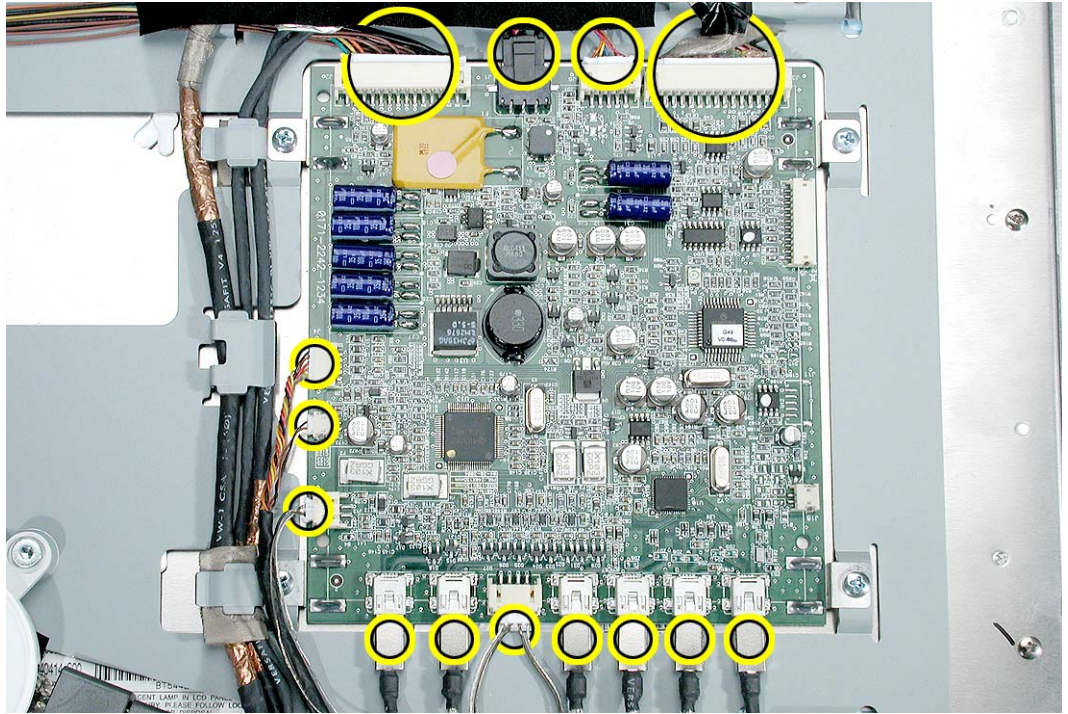
- End caps
- Side channels
- Display housing

## Procedure

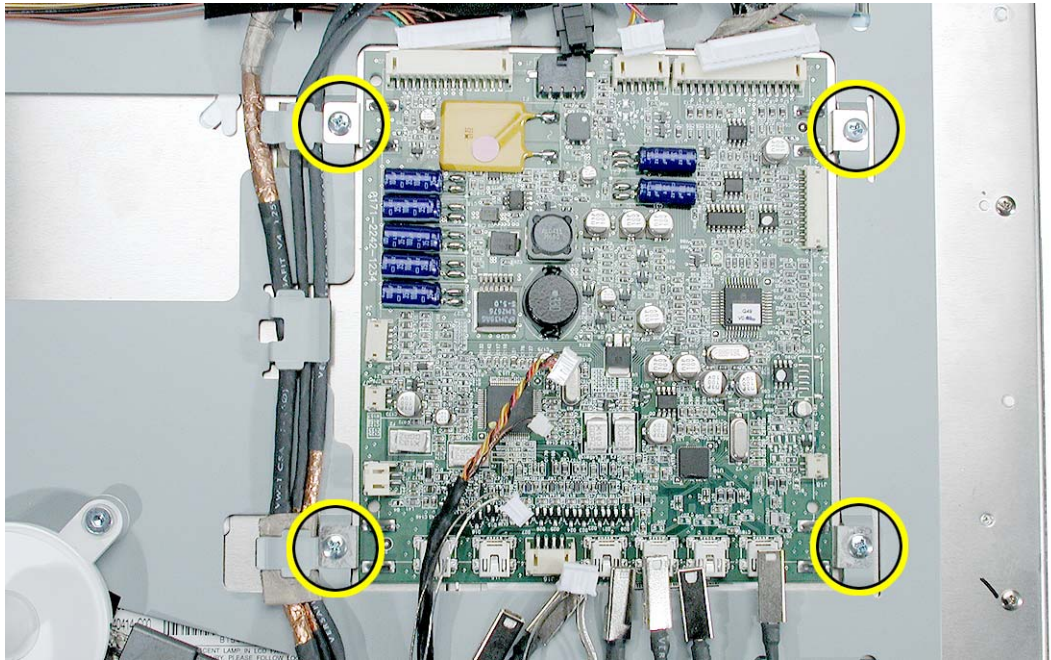
1. Disconnect all cables from the main board.

**Replacement Note:** Wherever necessary to access the cables, peel up tape or remove the cables from their cable guides. Do not strain the cables.

**Replacement Note:** Notice that two connectors on the right side of the board have no cables attached. These connectors should remain empty except for testing purposes during manufacturing.

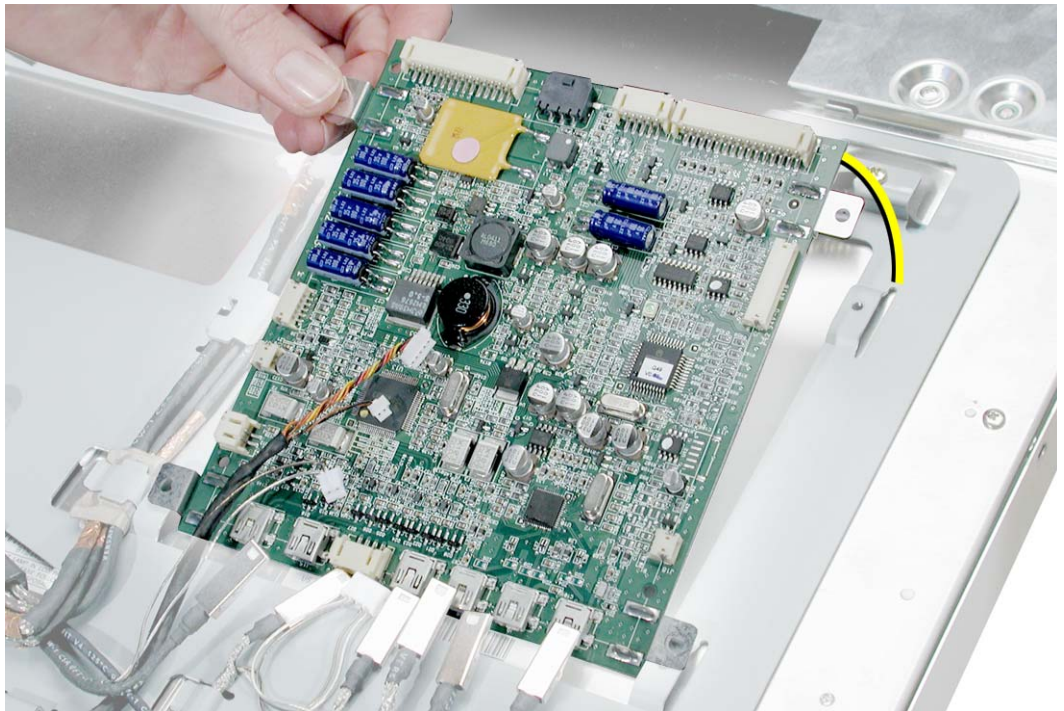


2. Remove the four screws.



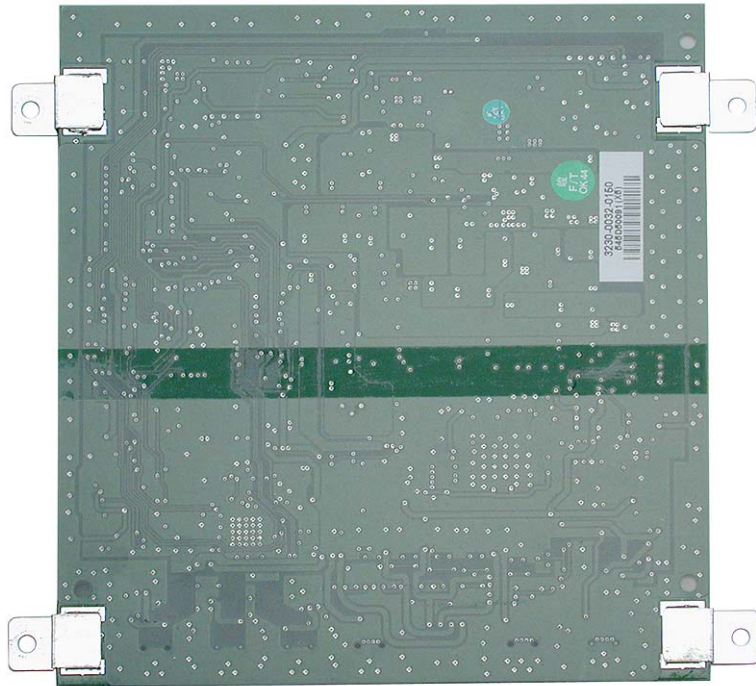
3. Lift off the main board from the chassis.

**Important:** Handle the board by the edges only. Do not put pressure on the components.



4. Install the replacement main board, and reassemble and test the display.

Before installing the board on the chassis, make sure a thin liner and screw clips are attached to the solder side of the board.





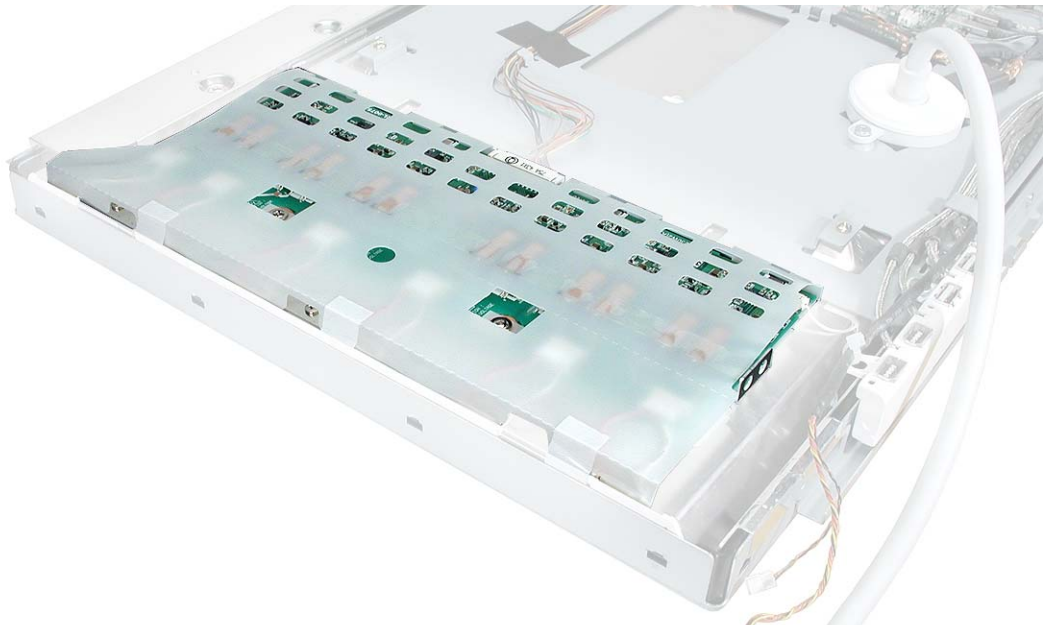
# Inverter Board

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- #1 Phillips screwdriver

## Part Location



## Preliminary Steps

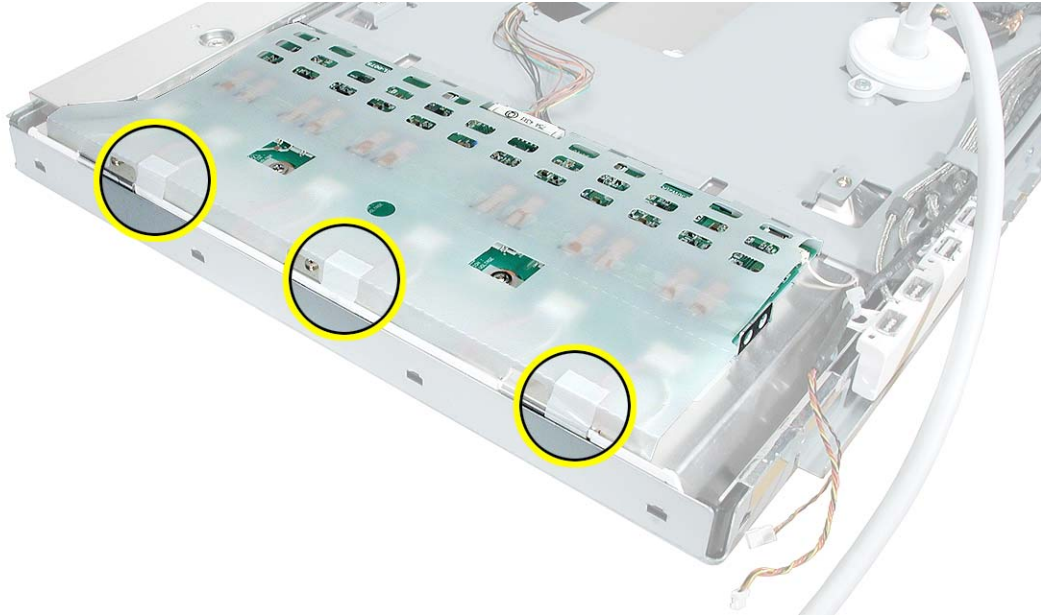
Before you begin, remove the following:

- End caps
- Side channels
- Display housing
- Display cable
- I/O panel

## Procedure

1. Peel up the tape at the left side of the plastic sleeve that covers the inverter board.

**Replacement Note:** When reassembling the display, be sure to tuck in the ends of the plastic sleeve and secure the sleeve with tape.

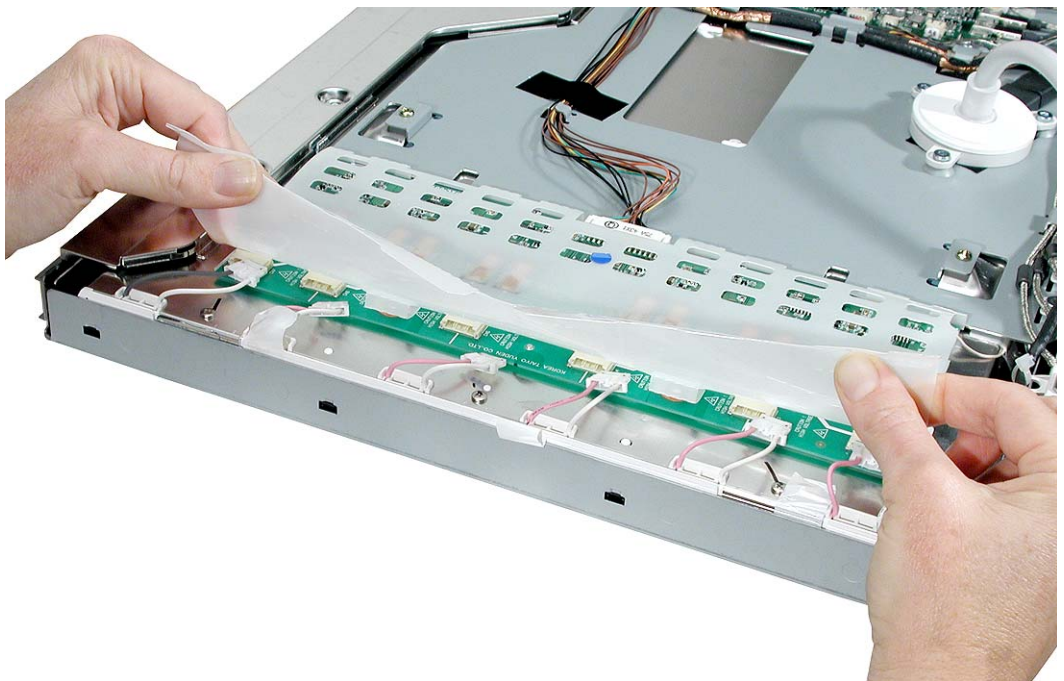
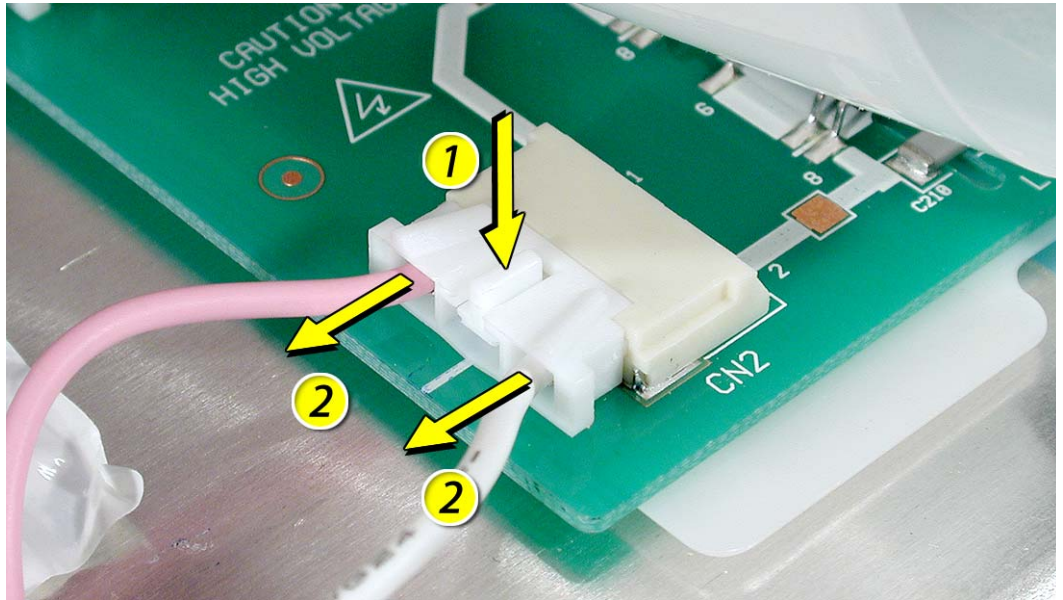


2. Hold up the plastic sleeve to see the six locking cables at the left side of the inverter board.



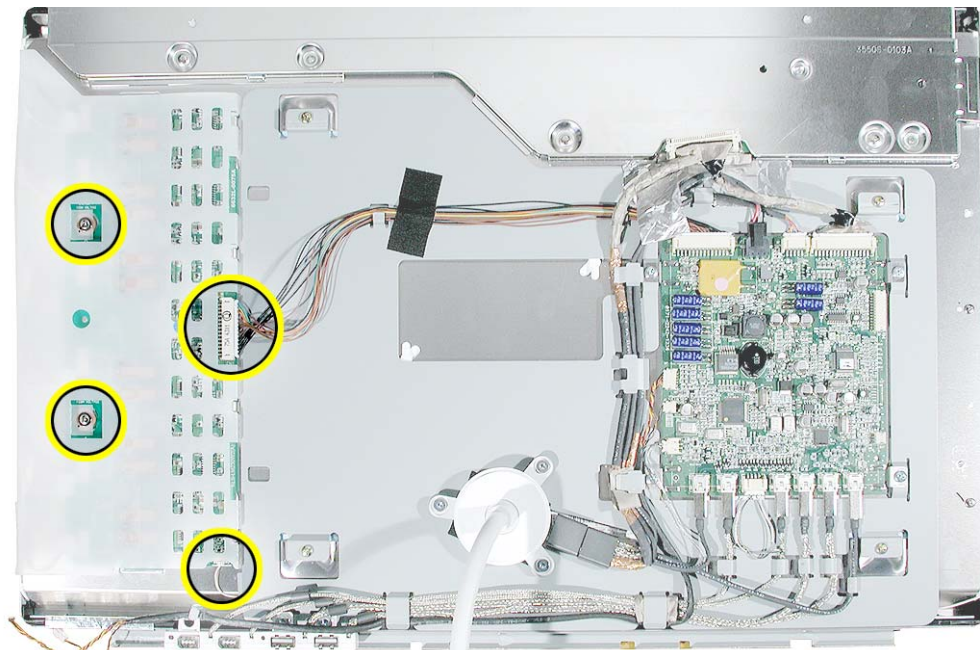
3. To disconnect the locking connectors from the inverter board, hold up the plastic sleeve, press and hold the center button on the connector, and pull the connector from the board.

Be careful not to strain the connector cables or plastic sleeve as you disconnect each of the six connectors.



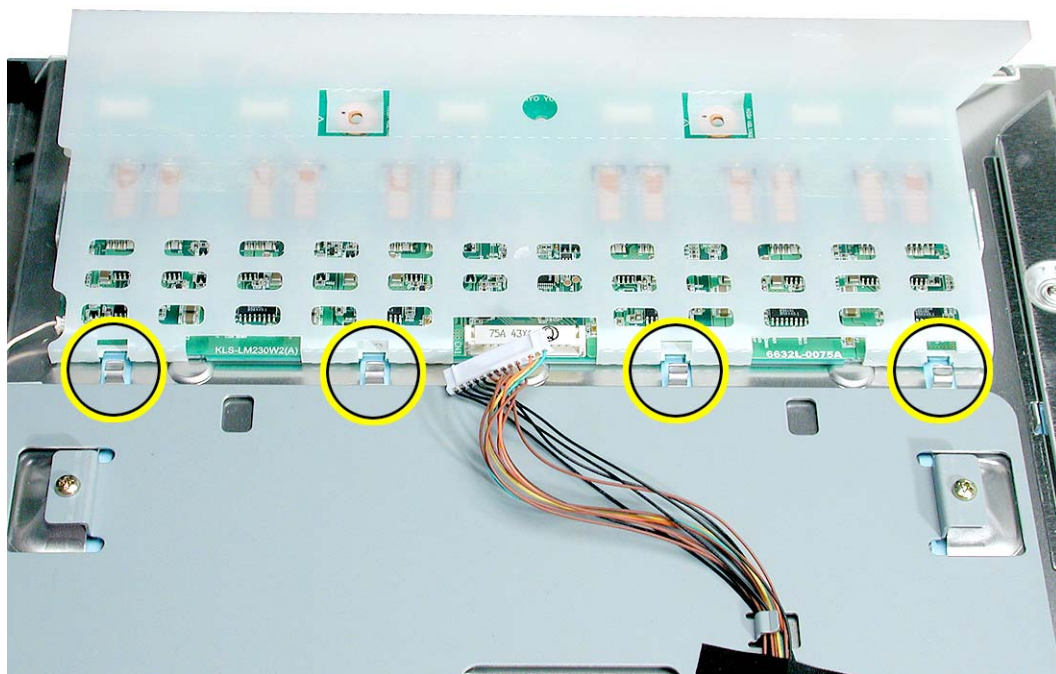


4. Remove the two screws and disconnect the two cables:
  - larger inverter cable at CN1 on the right side of the board
  - small ground cable at the lower right corner of the board



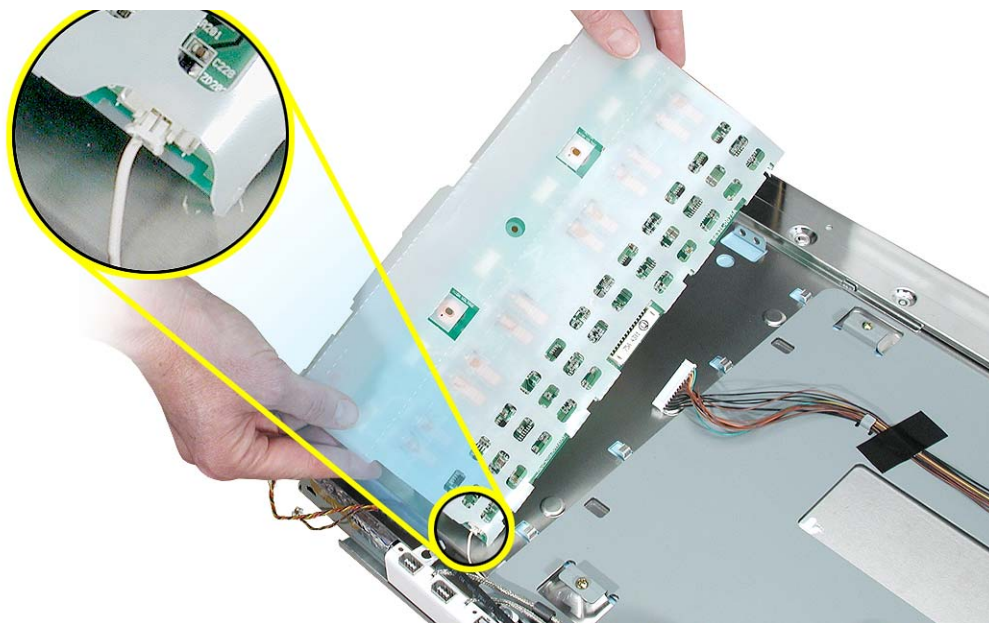
5. Slide the inverter board away from the chassis tabs, and lift it off the LCD panel.

**Important:** Handle the board by the edges only. Do not put pressure on the components.

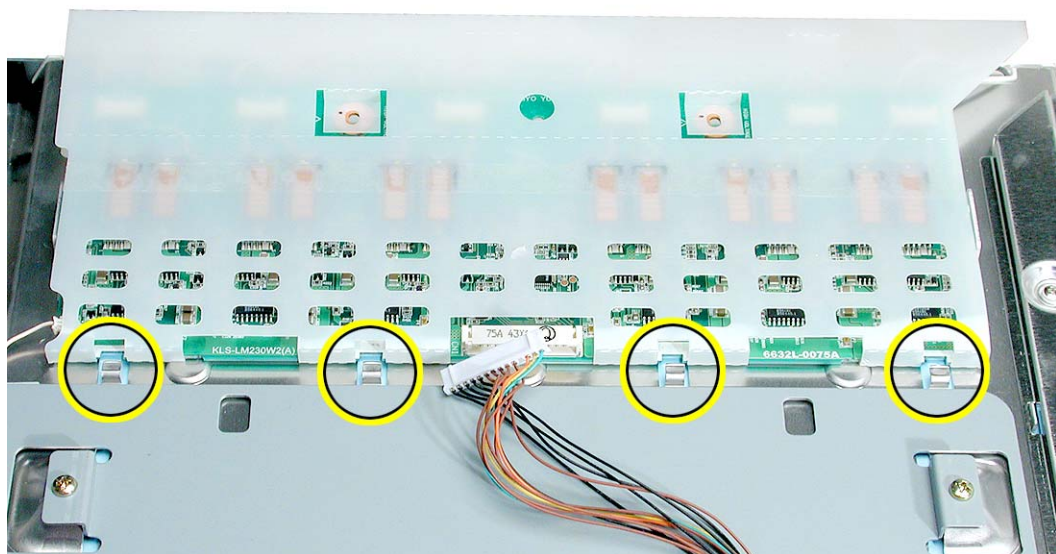


6. Install the replacement inverter board, and reassemble and test the display.

**Replacement Note:** When installing the replacement board, attach the ground cable first.



**Replacement Note:** When installing the replacement board, make sure it slides under the raised tabs at the edge of the chassis.





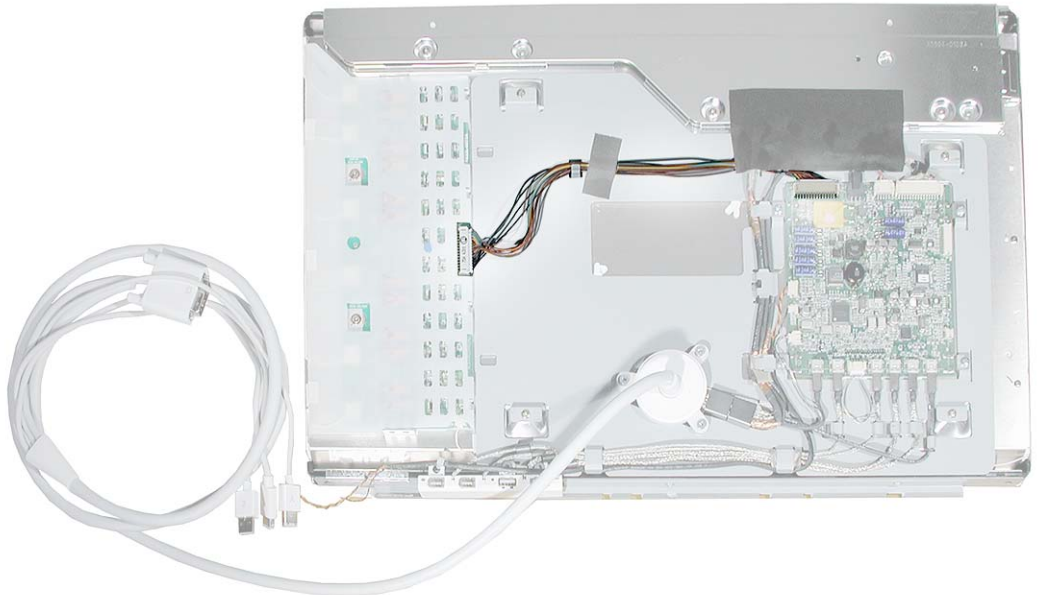
# Inverter Cable

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth

## Part Location



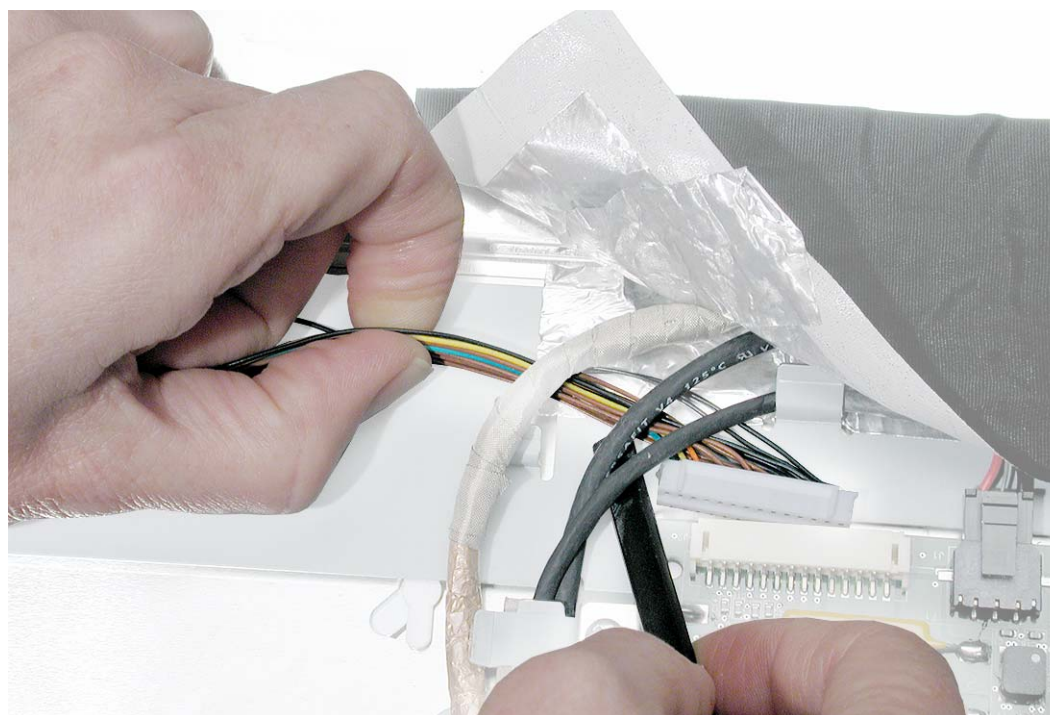
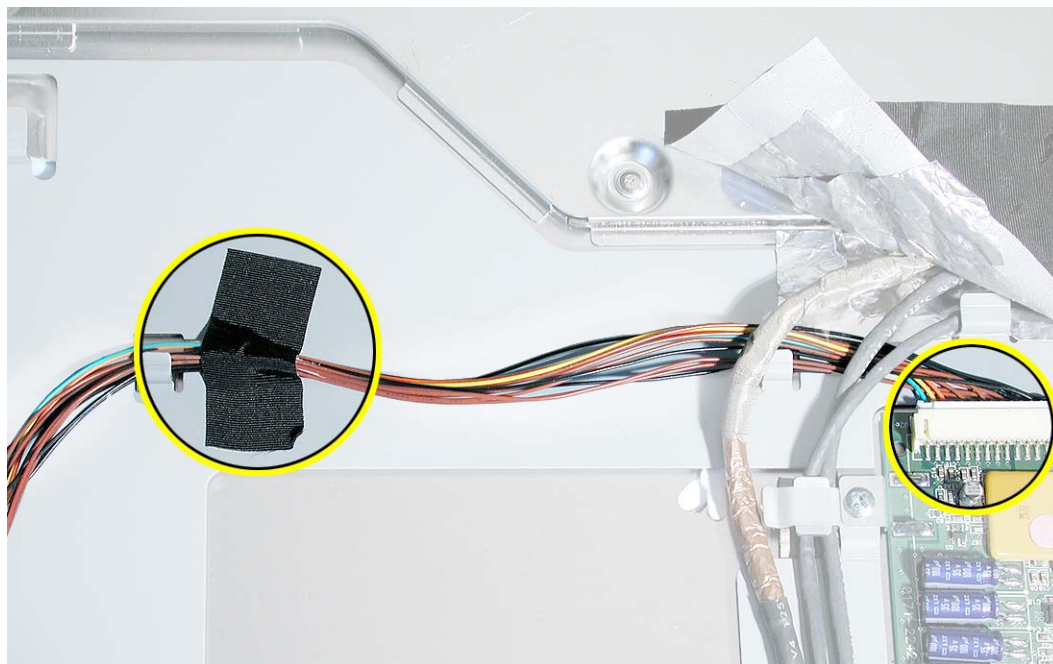
## Preliminary Steps

Before you begin, remove the following:

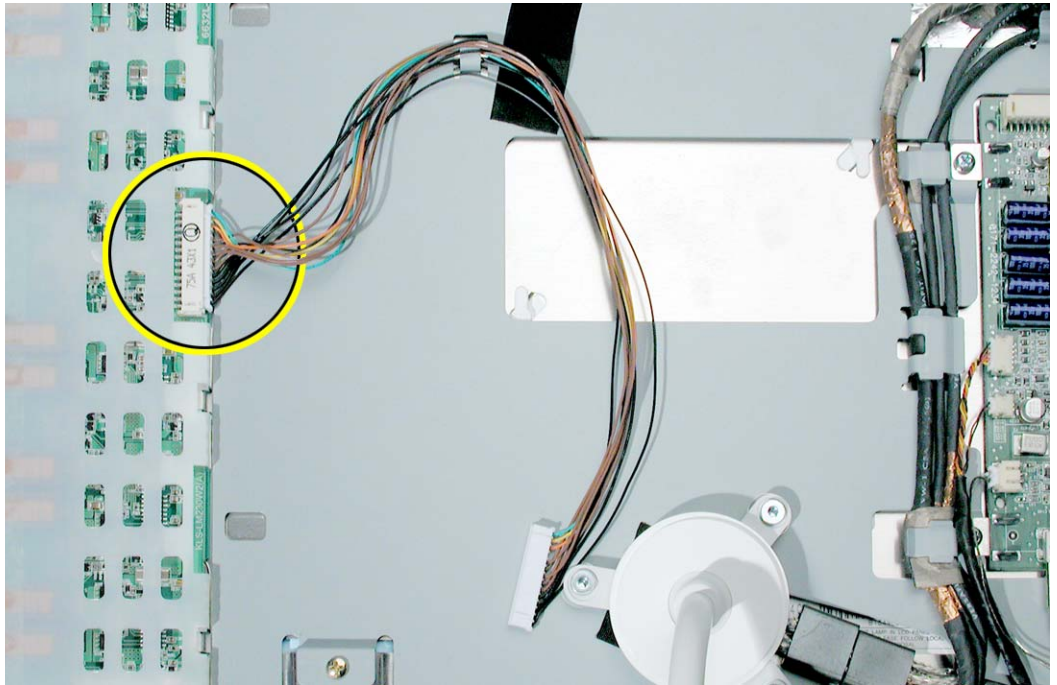
- End caps
- Side channels
- Display housing

## Procedure

1. Peel up the tape that covers the inverter cable.
2. Disconnect the inverter cable from the top of the main board (J2).
3. Carefully route the cable underneath the other cables.

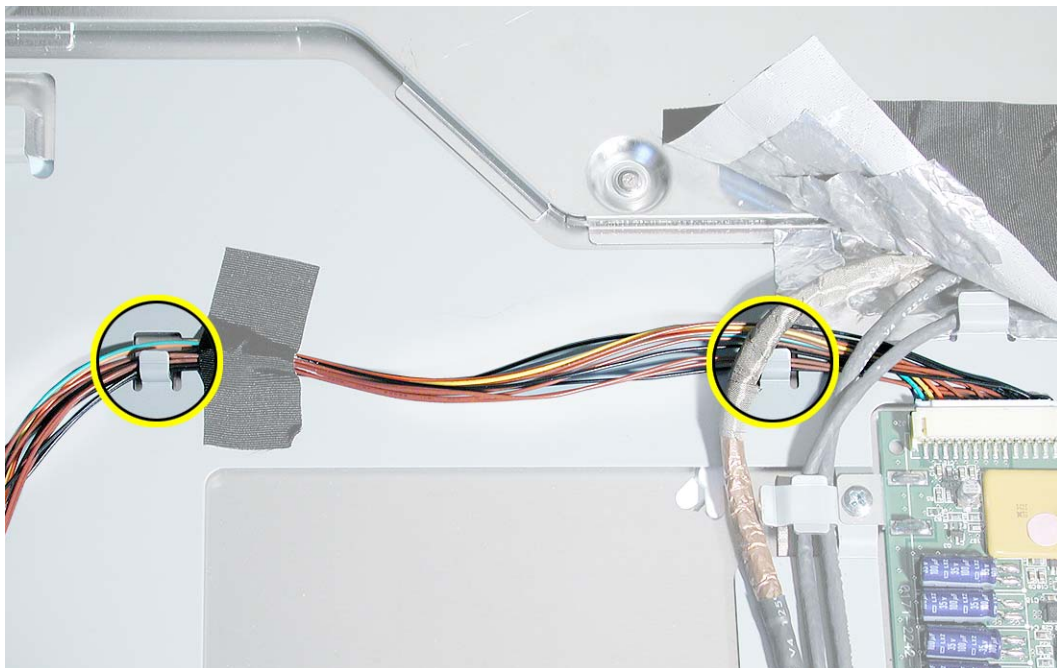


4. Disconnect the inverter cable from the side of the inverter board (CN1).



5. Install the replacement inverter cable, and reassemble and test the display.

**Replacement Note:** Make sure to install the replacement inverter cable so it routes through the chassis guides.





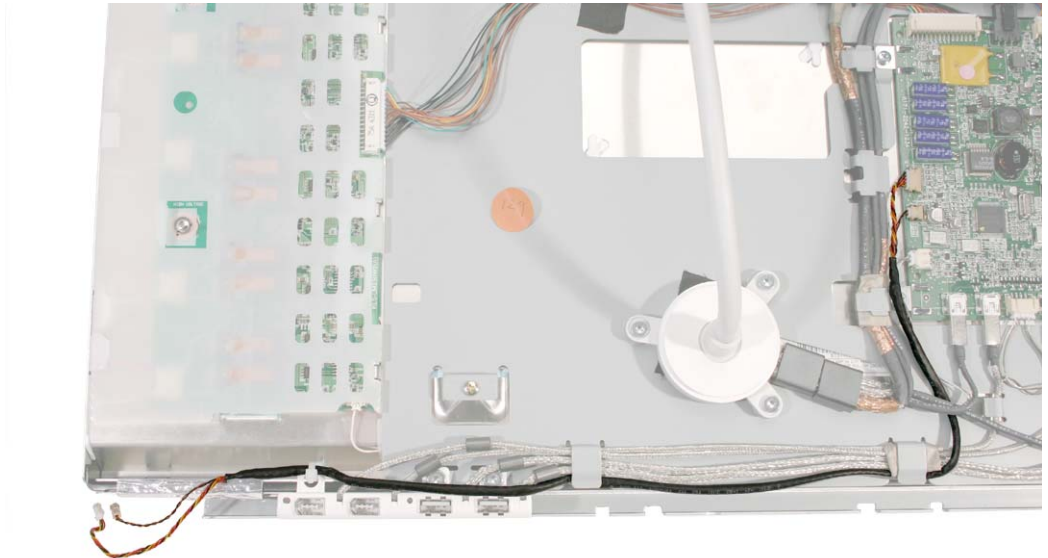
# Touch Switch/LED Cable

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- wire cutters

## Part Location



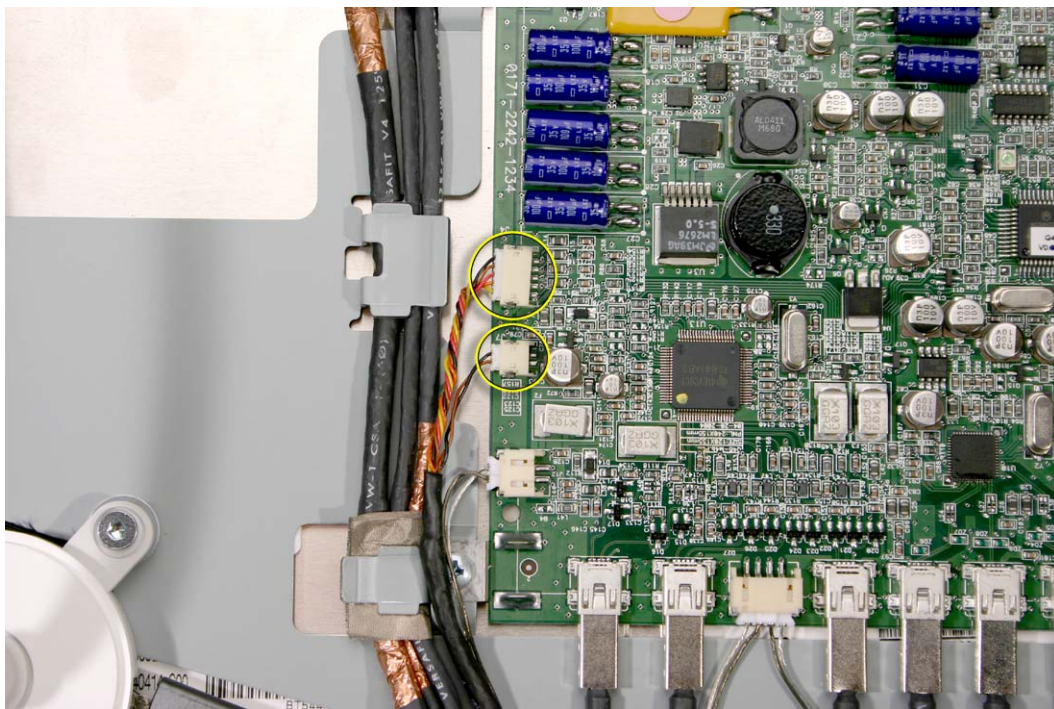
## Preliminary Steps

Before you begin, remove the following:

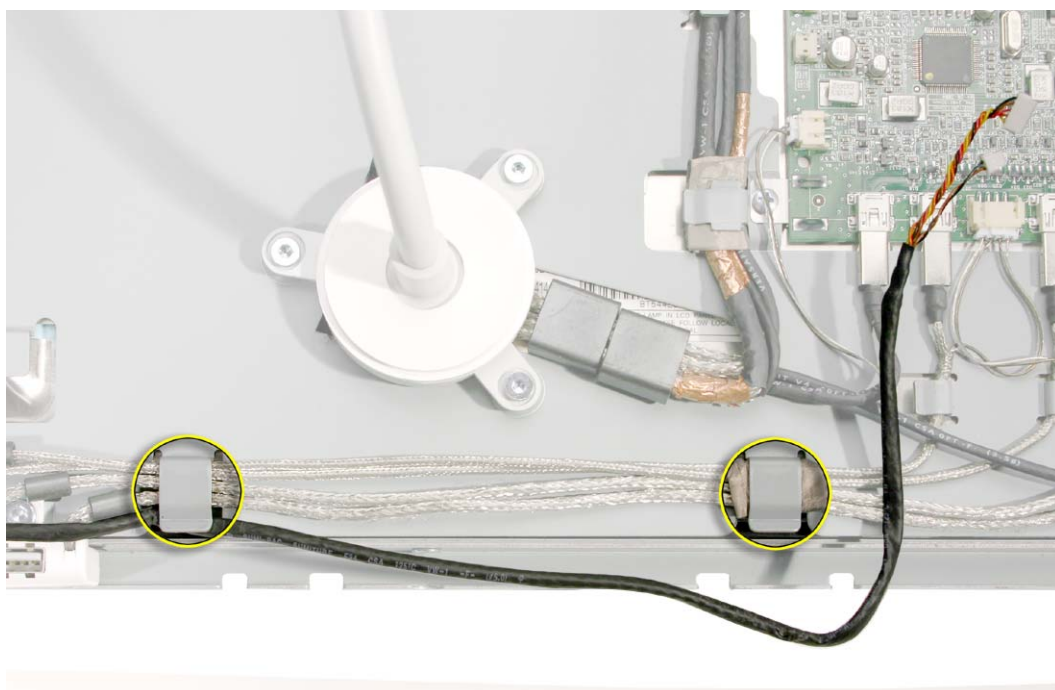
- End caps
- Side channels
- Display housing

## Procedure

1. Disconnect cable connectors J4 and J7 from the side of the main board.



2. Route the disconnected cable under the display cable, and out from the cable guides.



3. Cut the tie wrap that secures the other end of the cable to the I/O port.

**Replacement Note:** Use a new tie wrap to secure the replacement cable.



4. Install the replacement touch switch/LED cable, and reassemble and test the display.





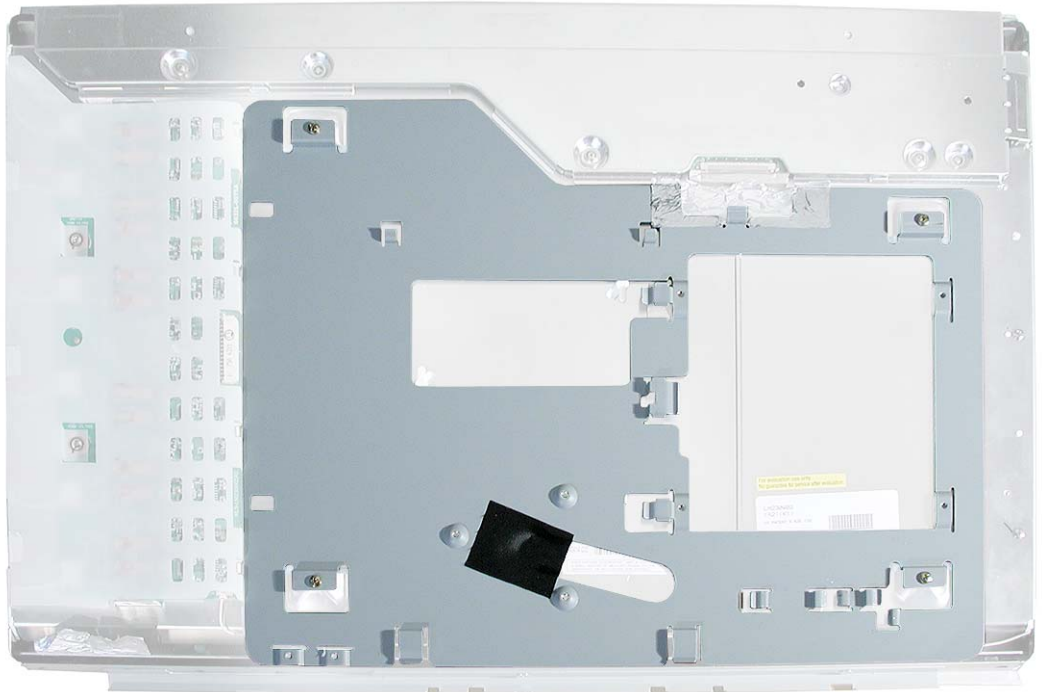
# Chassis

## Tools

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth
- #2 Phillips screwdriver

## Part Location



## Preliminary Steps

Before you begin, remove the following:

- End caps
- Side channels

- Display housing
- Display cable
- I/O panel
- Main board
- Inverter cable

## Procedure

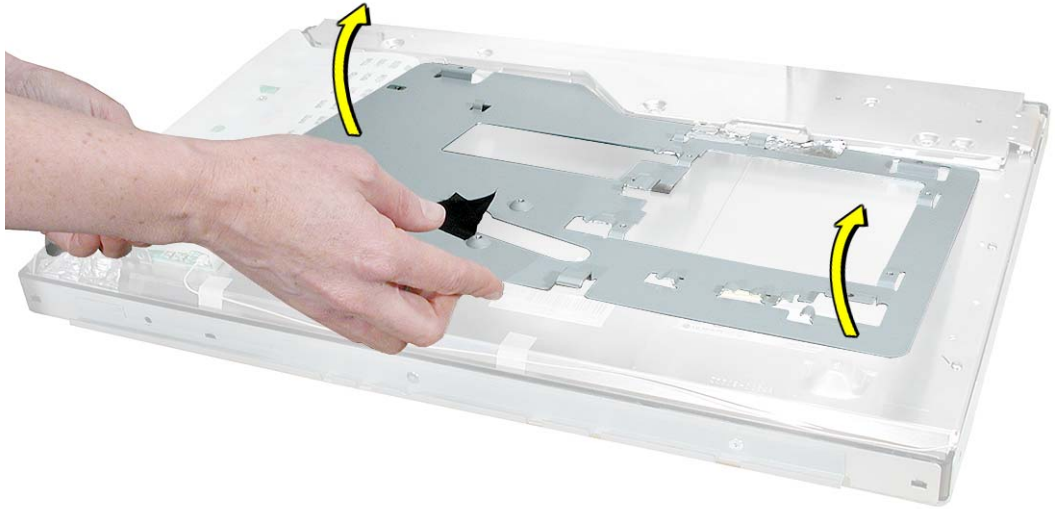
1. Peel up the tape.

**Replacement Note:** If the tape is worn or no longer sticky, apply new adhesive tape.

2. Remove the four screws that secure the chassis to the LCD panel.

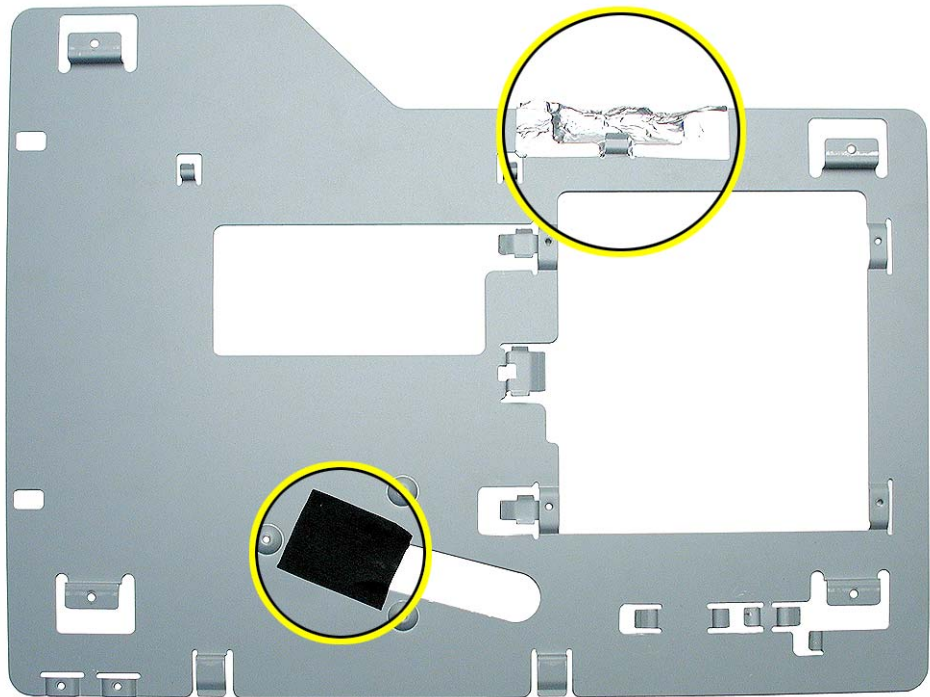


3. Tilt up the chassis, and remove it from the LCD panel.



4. Install the replacement chassis, and reassemble and test the display.

**Replacement Note:** Note the placement of tape when installing the chassis.



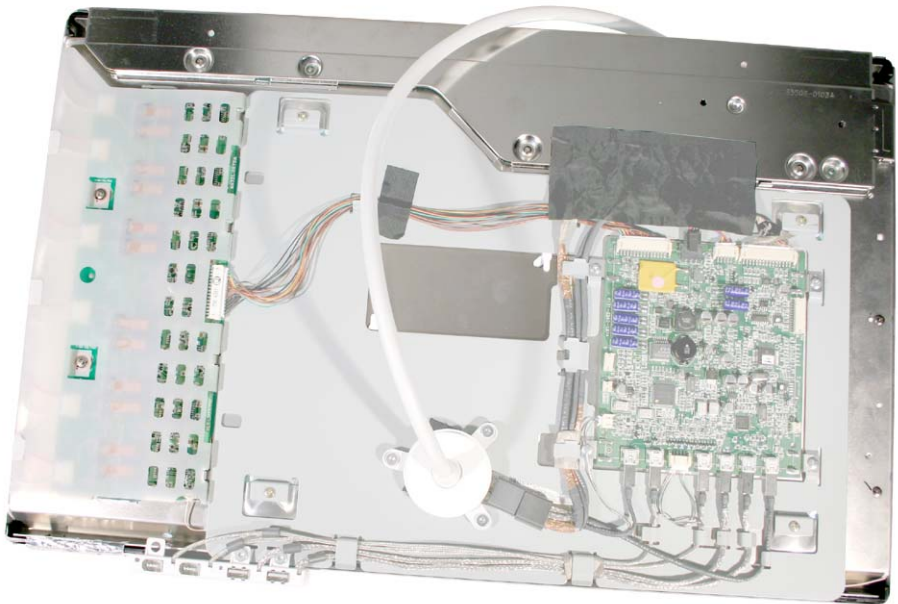


# LCD Panel

This procedure requires the following tools:

- white cotton gloves (Apple part number 922-1592) to prevent fingerprints on cosmetic surfaces
- ESD mat or soft cloth

## Part Location



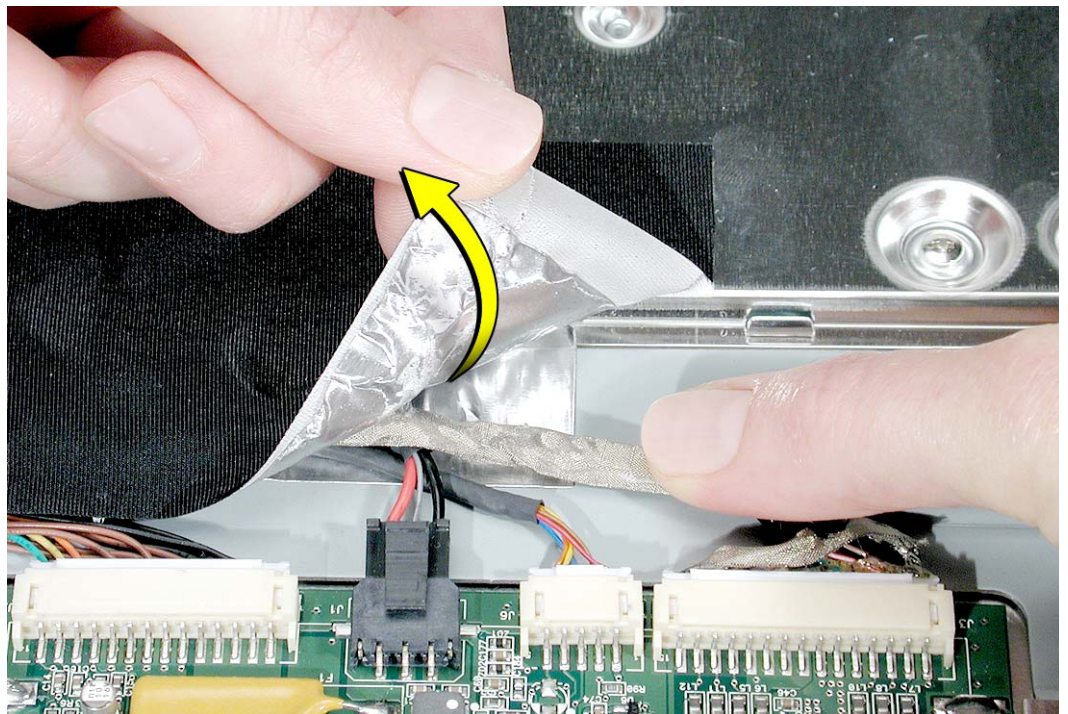
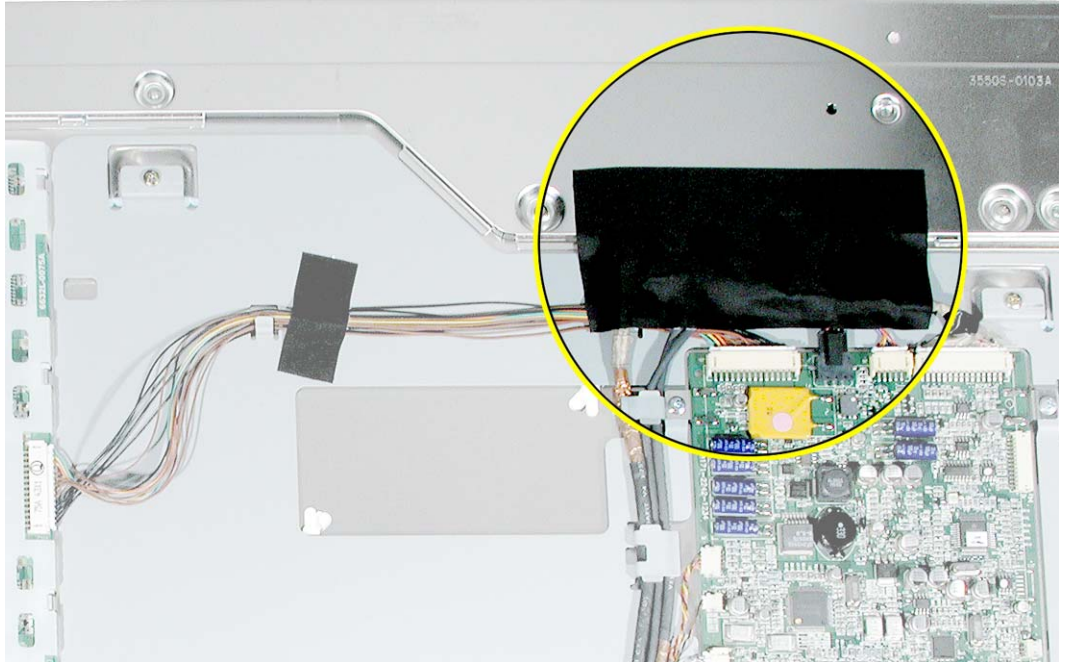
## Preliminary Steps

Before you begin, remove the following:

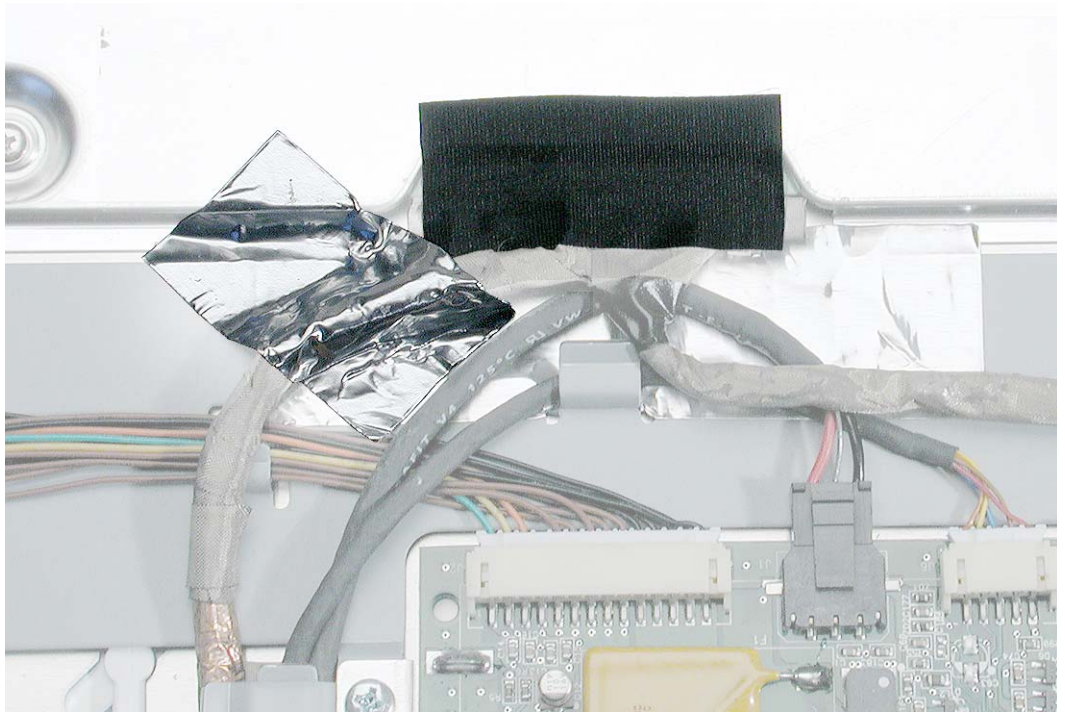
- End caps
- Side channels
- Display housing
- Top stabilizer bar
- Bottom stabilizer bar

## Procedure

1. With the display assembly face down on a soft cloth, carefully remove the large strip of black acetate tape at the TMDS cable. Hold down the cable as you peel up the tape.

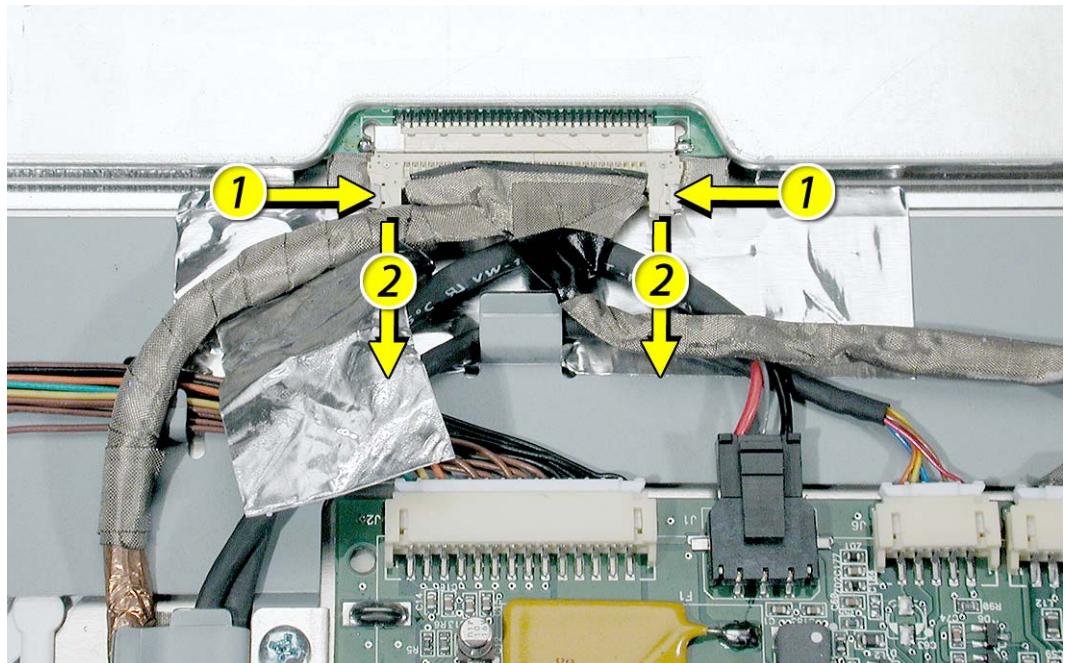


2. Peel up the smaller strips of tape that cover the TMDS connector and cable.

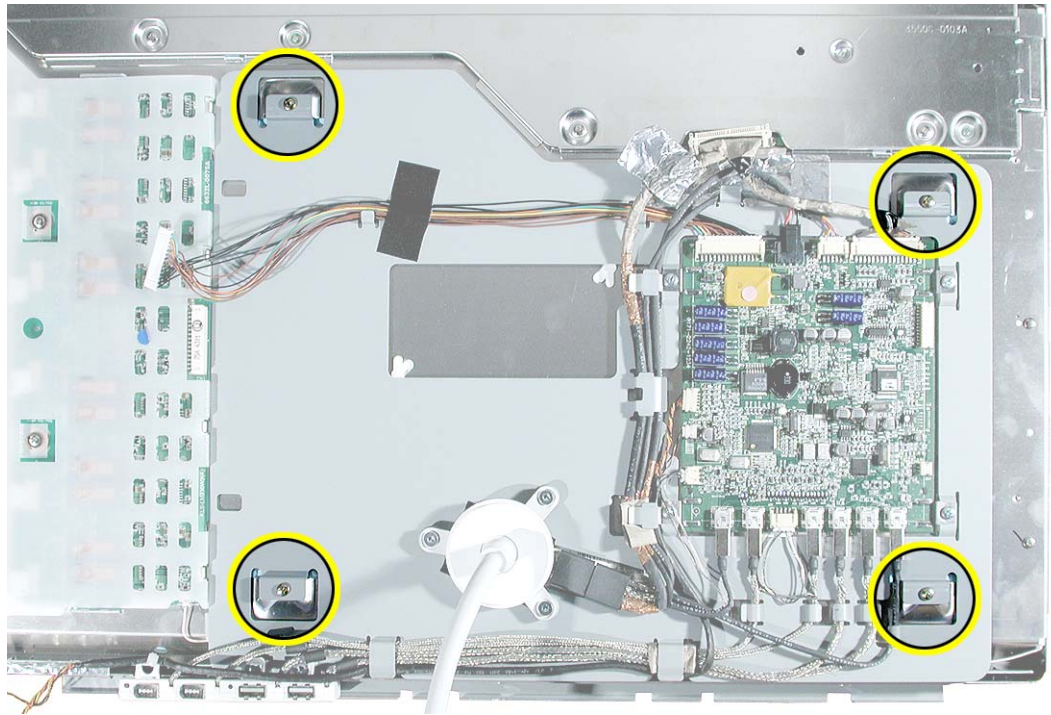


3. Press the ends of the TMDS connector and pull it straight down to disconnect the TMDS cable from the LCD panel.

**Replacement Note:** When installing cables, install this TMDS cable last.

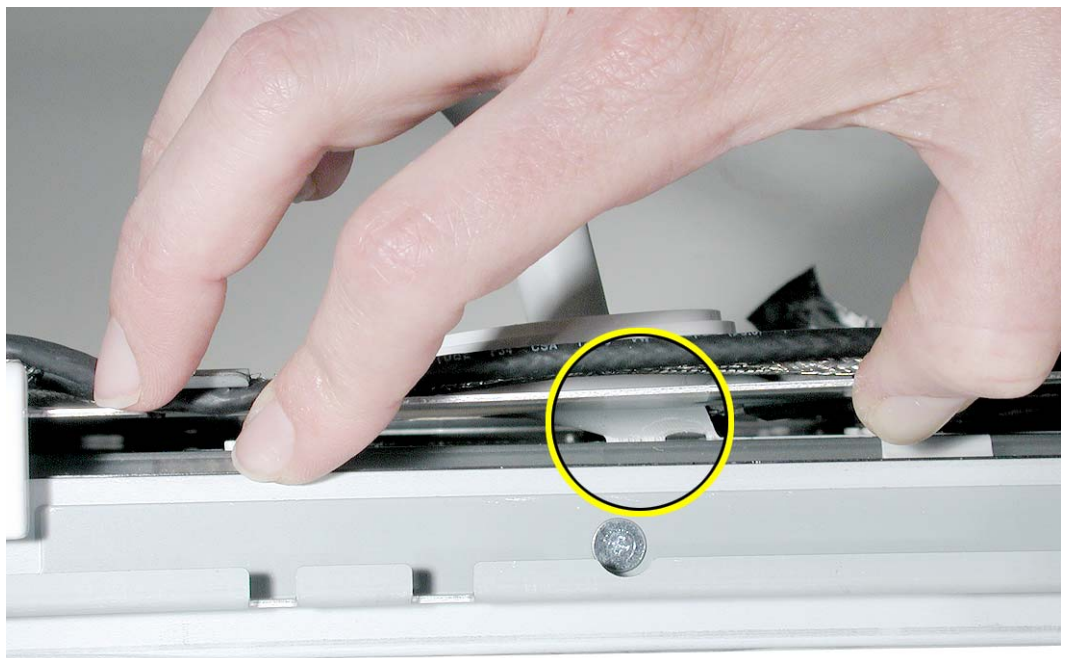
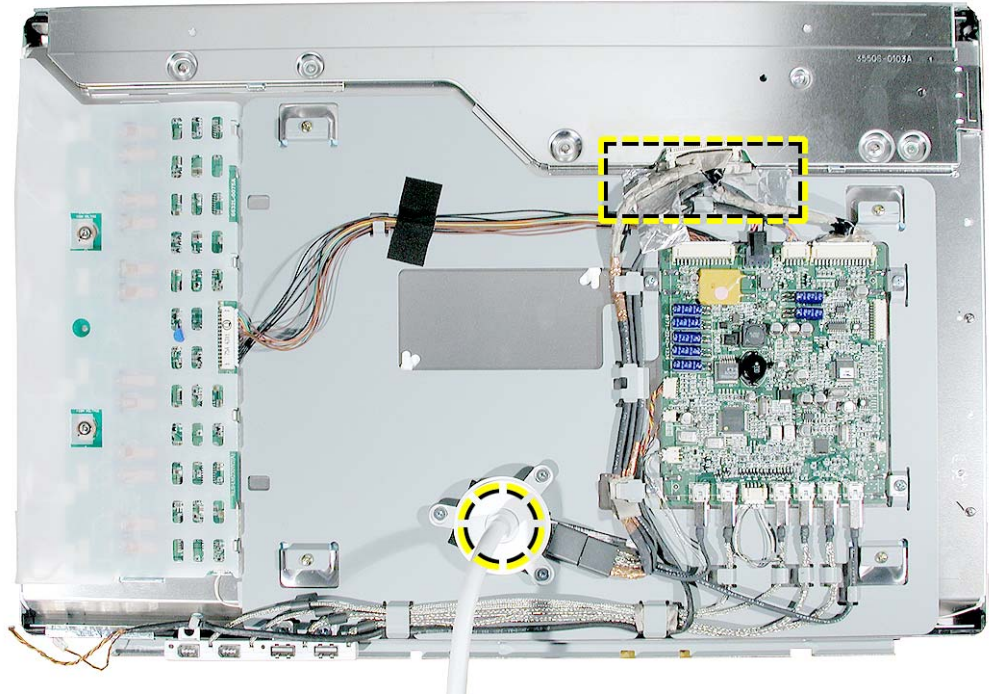


4. Disconnect the large connector at the right side of the inverter board.
5. Remove the four screws at the chassis.



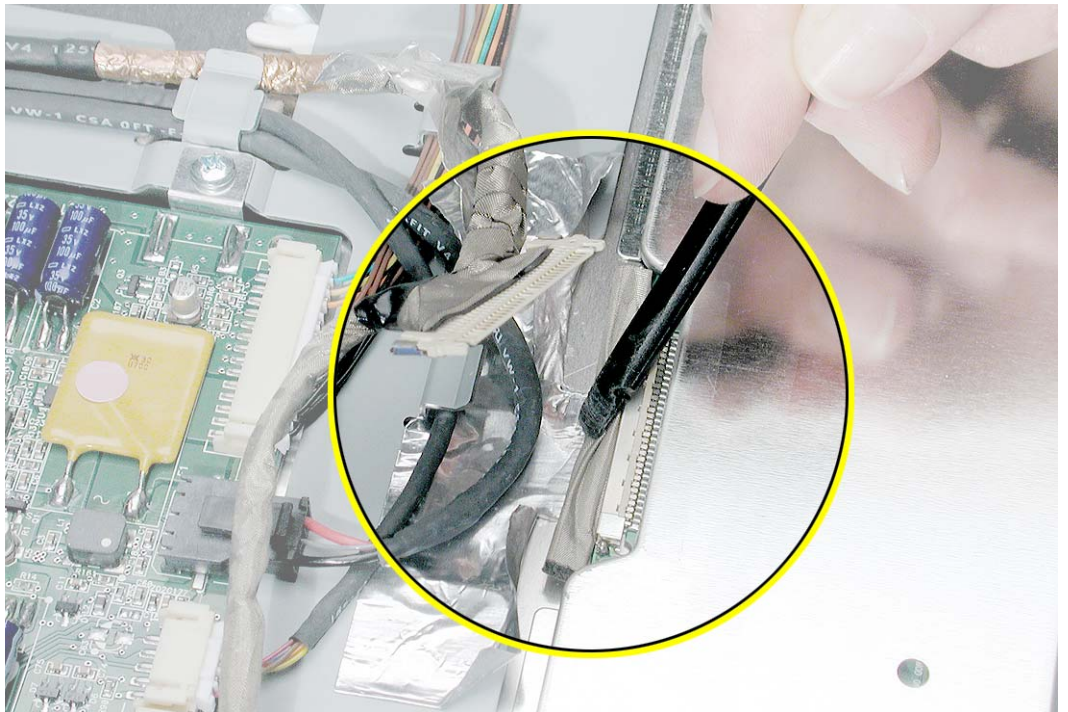
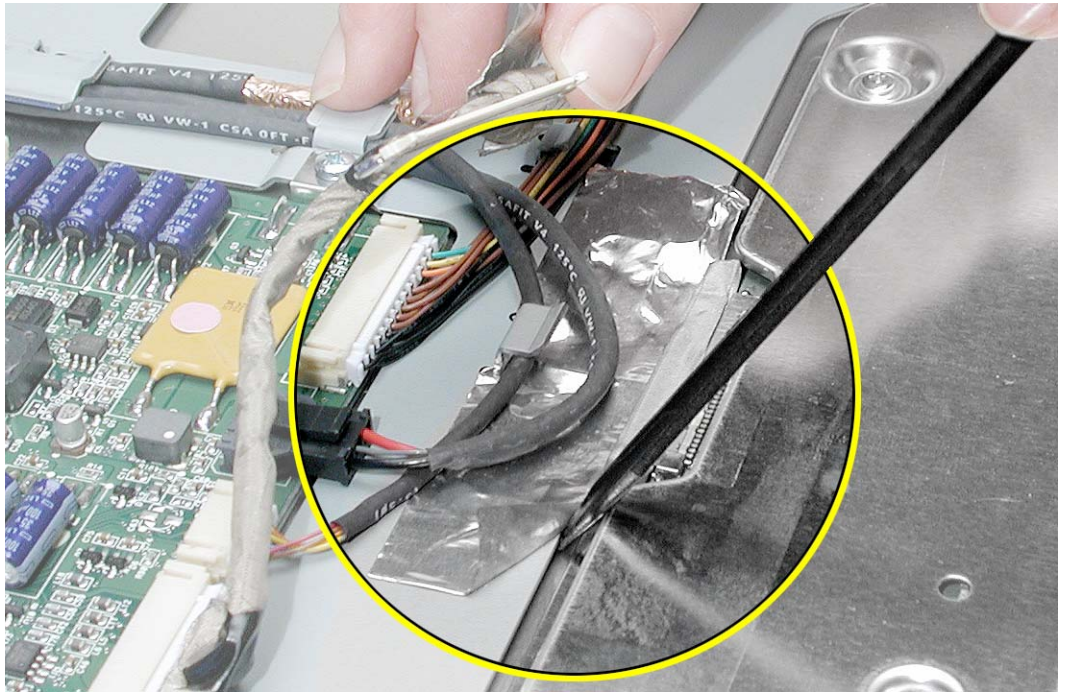
6. **Note:** The chassis is secured to the LCD panel with tape at two places:
- underside of the chassis at the display/power cable
  - under the TMDS connector gasket

Tilt up the bottom of the chassis and use a black stick to loosen the adhesive just under the display/power cable.

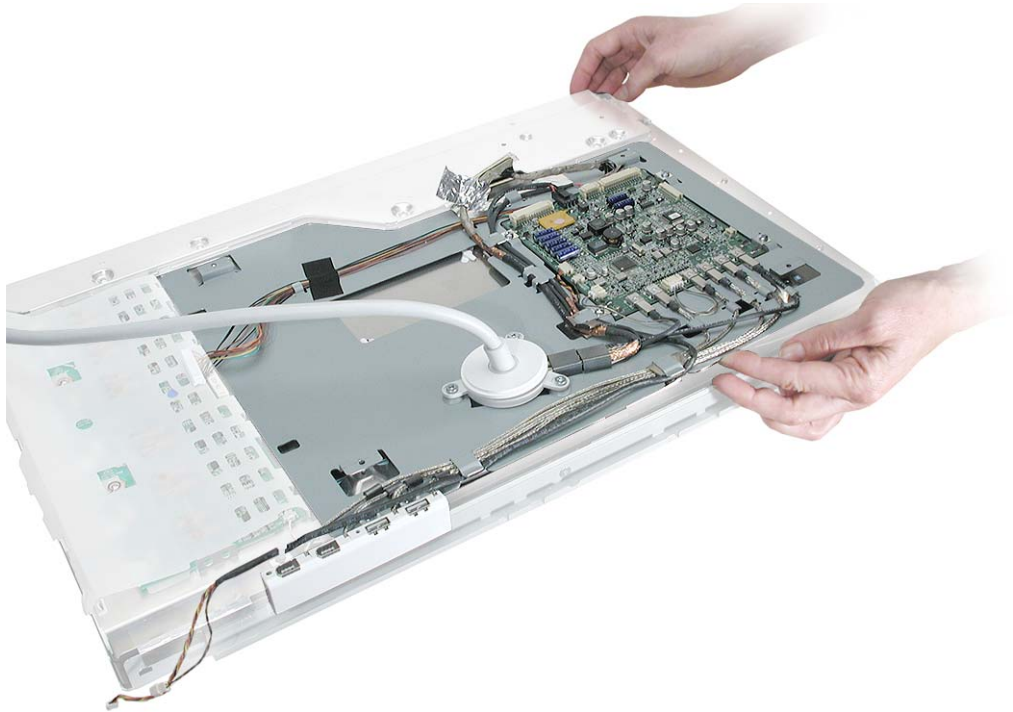




7. Use a black stick to peel up the tape that secures the top of the chassis underneath the TMDS gasket.



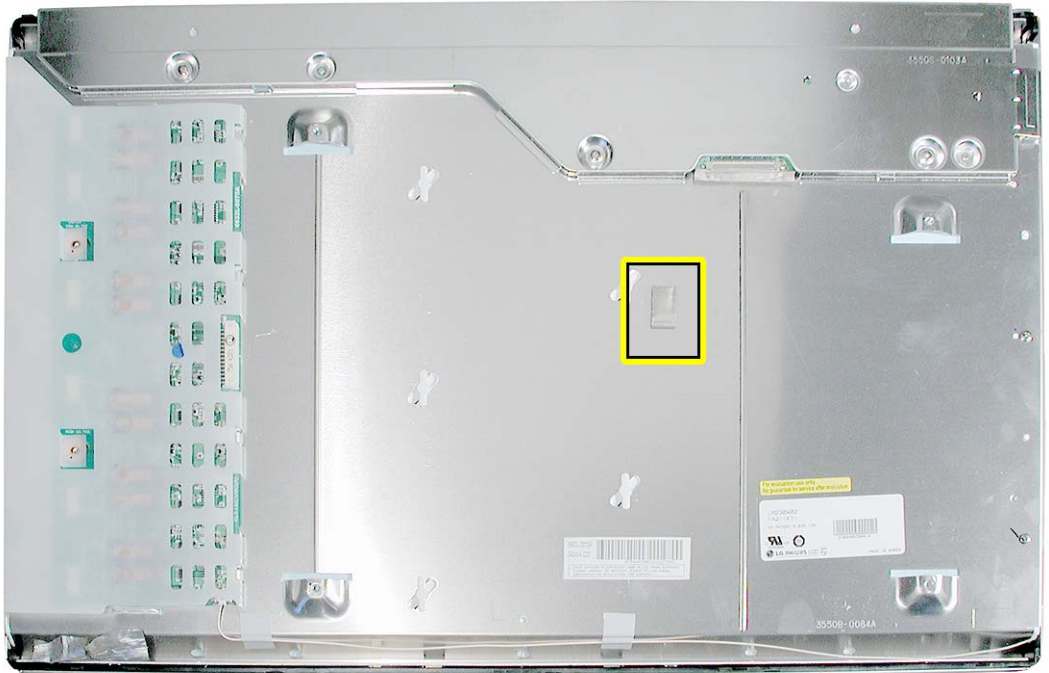
- 
8. Tilt up the chassis (with attached main board, I/O panel, and cables) to remove it from the LCD panel.



9. Install the replacement LCD panel, and reassemble and test the display.

**Replacement Note:** The LCD panel module includes the following:

- inverter board
- ground cable secured by tape
- one gasket, placed near the center of the panel, as shown





Troubleshooting  
Apple Cinema HD Display (23-inch DVI)



# General Information

## LED Indicator Reference Chart

The following chart shows how the display LED indicator behaves depending on the state of the computer (the system state):

<b>System State</b>	<b>LED Indicator Behavior</b>
power disconnected	off
shutdown	on
running	off
display sleep	on
system sleep	on



# Symptom Charts

## How to Use the Symptom Charts

The Symptom Charts included in this chapter will help you diagnose specific symptoms related to the product. Because cures are listed on the charts in the order of most likely solution, try the cures in the order presented. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next cure.

**Note:** If you have replaced a module, reinstall the original module before you proceed to the next cure.

## Power

### Power switch or brightness button not working

1. Refer to Knowledge Base article 58813 to verify that the touch switches have not been disabled.
2. Check connector J4 at the main board. Reseat the cable at the main board and at the touch switch board.
3. Replace the touch switch cable.
4. Replace the right end cap that includes the touch switch board.

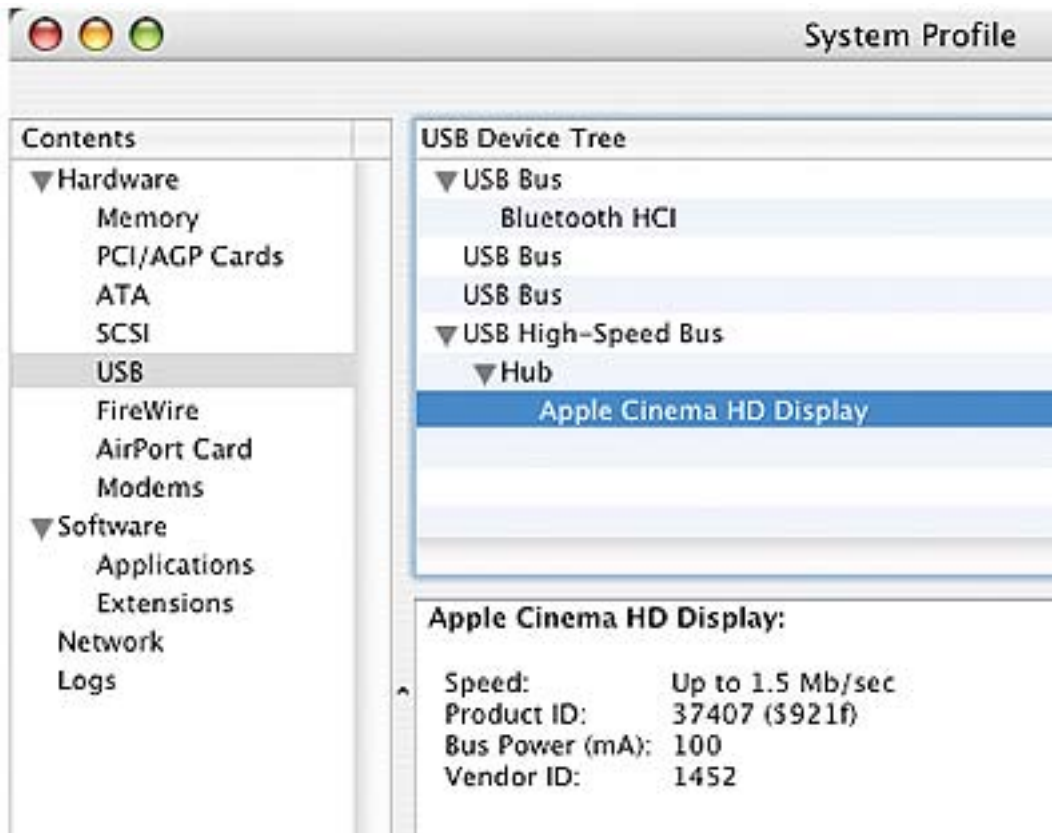
### No power

1. Check the wattage that is printed on the power adapter. See the table below to verify that the power adapter shows the correct power rating for this display. (For more information, refer to Knowledge Base article 86800.)

Display	65 W	90 W	150 W
Apple Cinema Display (20-inch DVI)	yes	yes	yes
Apple Cinema HD Display (23-inch DVI)	no	yes	yes
Apple Cinema HD Display (30-inch DVI)	no	no	yes

2. Use a known-good power adapter, and check all cable connections.

3. Check to see if the computer recognizes the display:
  - Plug the display into a known-good computer with a known-good video card and DVI display port. Connect a second display (or use a PowerBook or iBook). Start up the computer and allow enough time to finish startup.
  - From the desktop, select the hard drive, and under the apple icon click About This Mac. Click the More Info button to open System Profiler. In the System Profile menu under Hardware, check the hub to see if the display is listed.
    - If the display is not listed, replace the main board.
    - If the display is listed, go to the No Video symptom.



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## Video

### No video (blank screen)

1. Check cable connections. Replace all-in-one display cable if damaged.
2. Check for bent pins in the DVI connector. If pins are slightly bent, carefully straighten. If pins are severely bent, replace display cable. Also, inspect or have the customer inspect the display port on the computer for broken pin dividers. If the display port is damaged it must be repaired before inserting the DVI connector.
3. Plug the display into a known-good computer with a known-good video card and DVI display port. Start up the computer and allow enough time to finish startup.
4. If the power LED on the display is flashing, refer to the following chart:

LED Pattern	Meaning
short, short, short	The display is detecting wrong video format or an unsupported resolution. Verify that equipment is compatible and restart the computer. If the issue continues, reset the PRAM.
short, long, short	Make sure you are using the correct power adapter with the display. (Refer to the table in the No Power symptom.)
short, short, long	The display is detecting a backlight error. Check the display's power connections and restart the computer.

5. To check whether the LCD is working,

Turn off or dim the room lights. Shine a bright light with a flashlight, lamp, or sunlight (see Important note, below) onto the screen and at the same time notice whether you can see a faint image of the windows or other desktop items on the screen.

- If desktop items can be seen, the LCD panel is working. The cause may be with the inverter or backlight bulbs or related cables or connectors. Remove the display housing and check the inverter cable connections and the backlight connections.
  - **Warning: The inverter board generates high voltage when the display is plugged in. Do not touch the inverter board components, pins or connectors, when the display is connected to the computer and/or the power adapter.**
- If no desktop items can be seen, remove the display housing and reseat all cable connections to the main board. If the symptom persists,
  - Replace display cable.
  - At J2, verify +24.5 V at pin 1 (pin 8 is ground). If voltage is present replace inverter cable or inverter board. If not present, replace main board.
  - Replace LCD panel.

**Important:** Lights get very hot and can quickly damage the display. To avoid damage, do not allow too much heat next to the screen or other parts of the display; do not allow the light fixture to touch the screen.



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## Partially dim screen

This symptom indicates a problem with the inverter or backlight bulbs (on the side of the display that is dim), or related cables or connectors. This may be caused by the backlight bulbs or the inverter not working properly.

1. Plug the display into a known-good computer with a known-good video card and DVI display port. Start up the computer.
2. Notice whether the power button on the display is flashing, two short flashes then a long flash, in a delayed repeating pattern. This indicates trouble with either the inverter, backlight bulbs or related cables or connectors (this indicator may not always be exhibited). With this in mind, continue with the troubleshooting steps to determine the problem.
3. **Warning: The inverter board generates high voltage when the display is plugged in. Do not touch the inverter board components, pins or connectors, when the display is connected to the computer and/or the power adapter.**

Disconnect the display from the computer and from the power adapter. Then open the display and check for secure connections at the inverter board. This includes CN1 (inverter cable connector at inverter board), CN2 (2-pin ground cable at bottom corner of board), and the six backlight cable connections: CN3, CN4, CN5, CN6, CN7, and CN8.

- If the inverter cable is damaged, replace the inverter cable.
- If any connectors on the inverter board are damaged, replace the inverter board.
- If the CN2 cable or any backlight cable connectors are damaged, replace the LCD panel.

## Display shows pink or magenta tint

The tint may be within Apple's specifications for acceptable appearance, performance, usability and/or functionality. Adjusting the color using the Display Calibrator in Mac OS X may minimize the tint; however, the display can be altered by many factors, such as ambient light, the position and angle of the display, and the age of the display. The Display Calibrator Assistant creates a calibrated color profile for the customer's display.

To calibrate the display,

1. Allow the display to warm up for 15 to 20 minutes before running the Display Calibrator Assistant. This will allow the backlight bulbs inside the display to reach their normal operating temperature.
2. To use the Display Calibrator Assistant in Mac OS X:
  - Open System Preferences and click Displays.
  - Click Color.
  - Click Calibrate. The Display Calibrator Assistant guides you through calibrating the display.

**Note:** For a more detailed calibration of the display, click Expert Mode checkbox.

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## When displaying a single color over the screen area, the LCD panel shows one or more pixels that are not properly lit

Active-matrix LCD technology uses rows and columns of addressable locations (pixels) that render text and images on screen. Each pixel location has three separate subpixels (red, green, and blue) that allow the image to be rendered in full color. Each subpixel has a corresponding transistor responsible for turning the subpixel on or off.

There are typically millions of these subpixels on an LCD display. For example, the LCD panel used in the Apple Cinema HD display is made up of 2.3 million pixels and 6.9 million red, green, and blue subpixels. Occasionally, a transistor does not work perfectly, which may result in the affected subpixel being turned on (bright) or turned off (dark). With the millions of subpixels on a display, it is quite possible to have a low number of faulty transistors on an LCD. Therefore, a certain number of subpixel anomalies is considered acceptable. Rejecting all but perfect LCD panels would significantly increase the retail price for products using LCD displays. These factors apply to all manufacturers using LCD technology—not just Apple products.

To determine whether or not the display has an acceptable number of pixel anomalies, follow the steps below:

1. Set the display image to one of the following colors: all-white display, all-red display, all-green display, or all-blue display.

**Note:** Knowledge Base article 112125: Service Diagnostics Matrix, has the LCD Tester diagnostic utility that will generate these patterns on the screen.

2. Using a jeweler's loupe, pocket microscope, or other magnifying device, identify and count each subpixel anomaly:
  - Bright subpixel anomaly = subpixel that is always on
  - Dark subpixel anomaly = subpixel that is always off
3. **Important:** Check the number of subpixel anomalies with the following chart:

Acceptable Number of Subpixel Anomalies			Replace the Display		
Bright	Dark	Combination	Bright	Dark	Combination
up to 8	up to 10	up to 15	9 or more	11 or more	16 or more

4. If the number of subpixel anomalies exceeds the acceptable number listed in the chart, replace the display panel.
5. If the number of subpixel anomalies is acceptable, explain to the customer that the pixel anomalies are within specifications, and no repair is necessary.

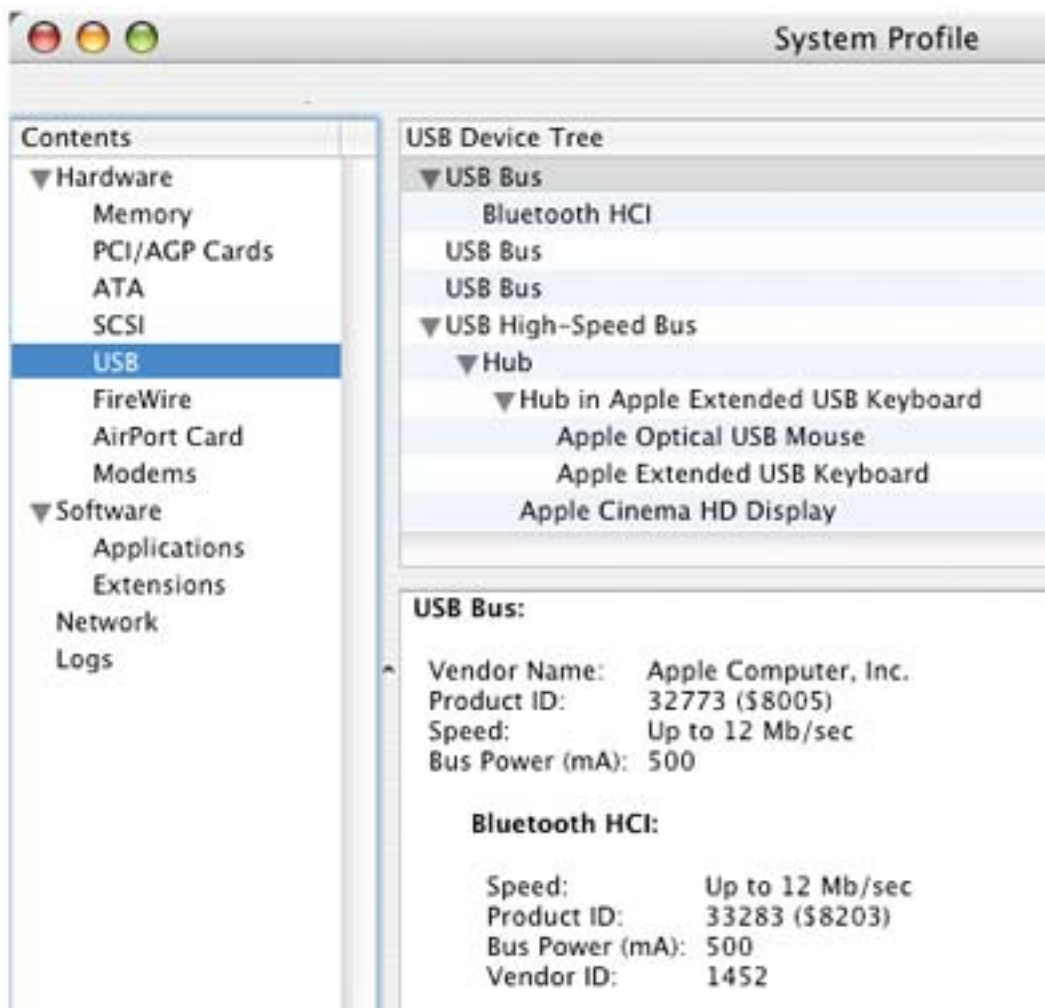
**Important:** Do not release the specifications to customers. Instead, inform them that a certain number of subpixel anomalies is considered acceptable, and these factors apply to all manufacturers using LCD technology—not just Apple products.

## USB Devices

### USB device not working

1. Reseat all external cable connections.
2. Verify that the display's USB cable is connected to a good USB port.
3. Plug the display into a computer with a known-good DVI display port, then start up the computer. On the back of the display, connect a known-good USB device into one of the USB ports, then open System Profiler to see if it is recognized under USB High-Speed Bus: Hub. Check the device in both USB ports.

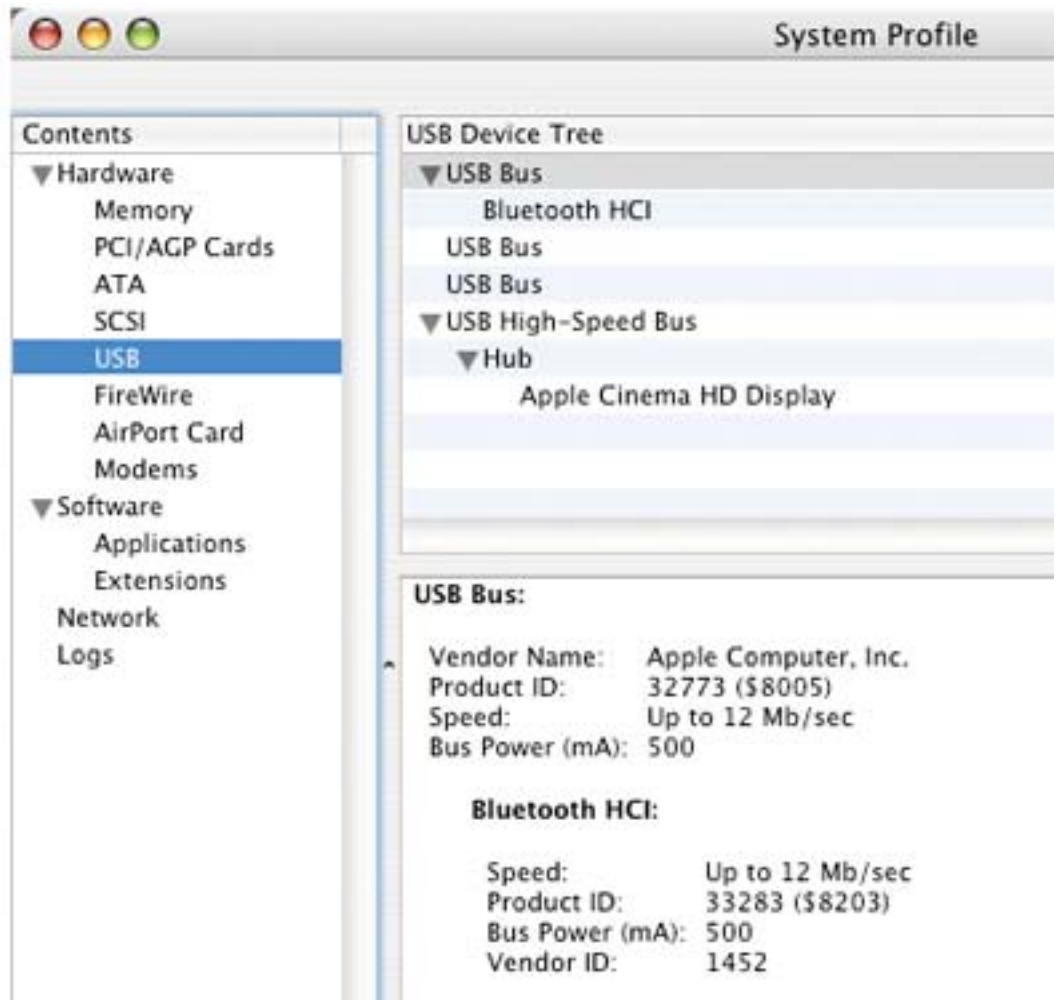
If the USB device is recognized by System Profiler, the customer's USB device may be the issue.



4. If the device is not recognized, the System Profile window lists only the display in the USB High-Speed Bus Hub, as shown below.

In this case, check the J8, J9, and J10 USB connectors on the lower right corner of the main board. Inspect the USB cables for damage.

- If the cables are fine, replace the main board.
- If the cables are damaged, replace the I/O panel.



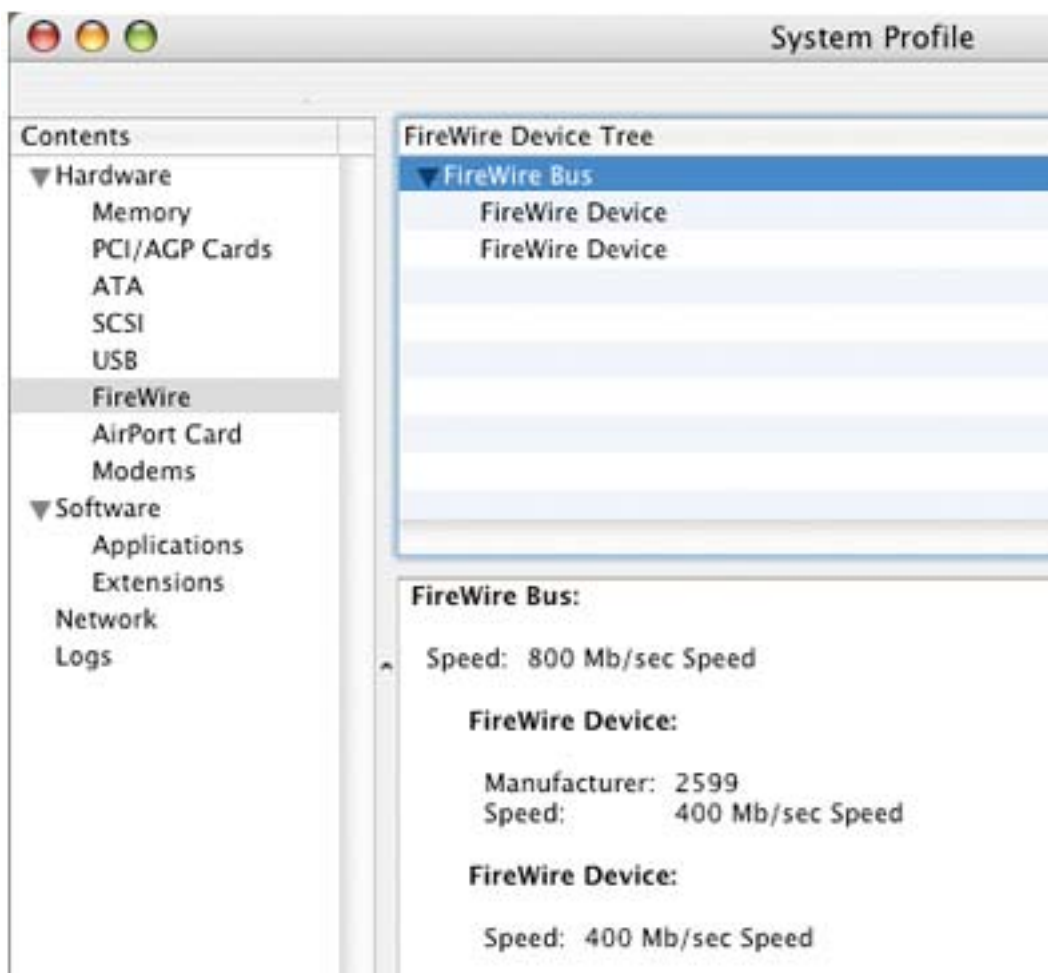
5. If the System Profile window shows nothing under USB High-Speed Bus Hub, check the USB connection to the computer. If the connection is fine, reseal the cable and refresh the window. If there is no change, check the cable connection at J10 on the lower right corner of the main board (black shrink-wrapped cable).
  - If the cable or cable connector is damaged, replace the display cable.
  - If the J10 connector on the main board is damaged, replace the main board.

## FireWire Devices

### FireWire device not working

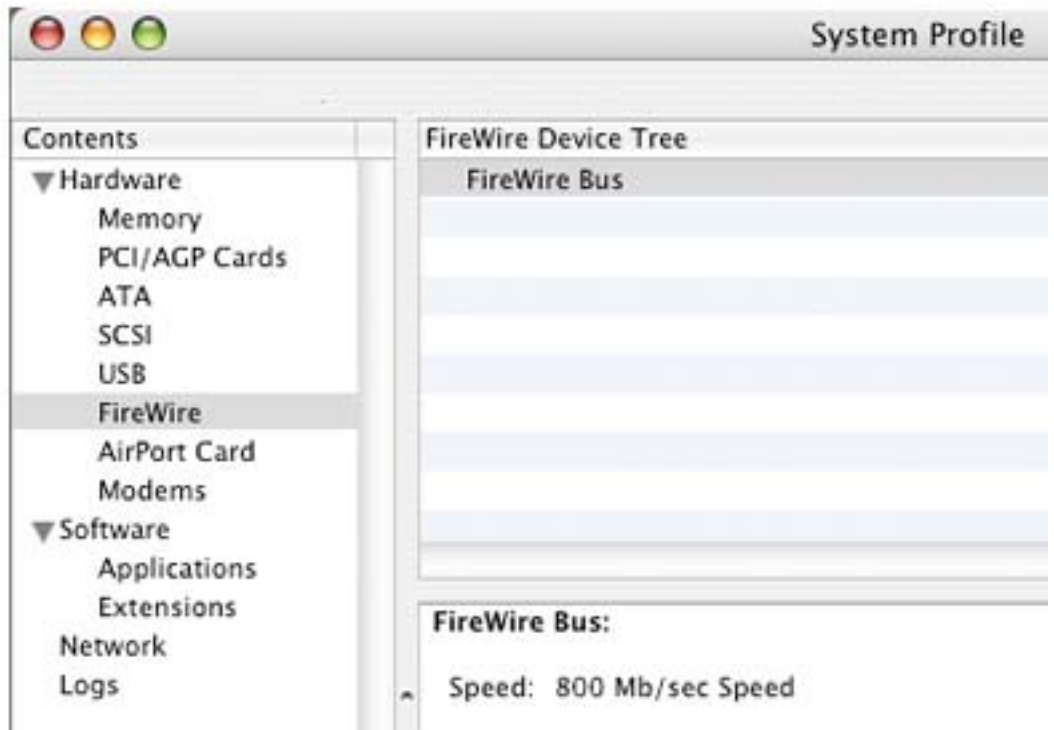
1. Reseat all external cable connections.
2. Verify that the display's FireWire cable is connected to a good FireWire port.
3. Plug the display into a computer with a known-good DVI display port, then start up the computer. On the back of the display, connect a known-good FireWire device into one of the FireWire ports, then open System Profiler to see if it is recognized under FireWire Bus. Refresh the System Profile window as you check both FireWire ports.

If the system is recognizing the device, the System Profile window appears as shown:



4. If the FireWire device is recognized by System Profiler, the customer's FireWire device may be the issue.
5. If the device is not recognized, check the J14, J15, and J16 FireWire connectors on the lower left corner of the main board. Inspect the FireWire cables for damage.

- If the cables are damaged, replace the I/O panel.
  - If the cables are fine, replace the main board.
6. If the System Profile window appears as shown below, check the FireWire connection to the computer. If the connection is fine, reseal the cable and refresh the window. If there is no change, check the cable connection at J13 on the lower left corner of the main board (black shrink-wrapped cable).
- If the cable or cable connector is damaged, replace the display cable.
  - If the J13 connector on the main board is damaged, replace the main board.





## Views

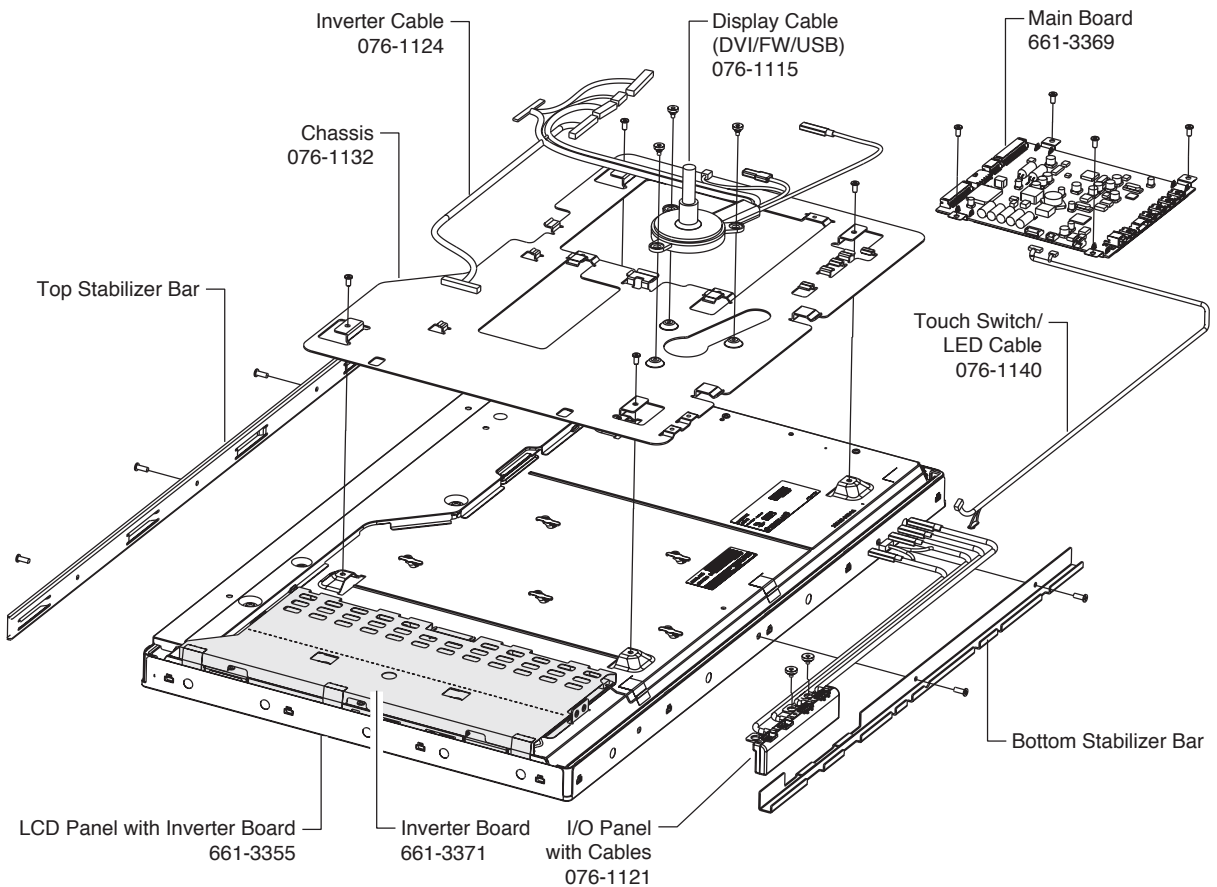
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Apple Cinema HD Display (23-inch DVI)



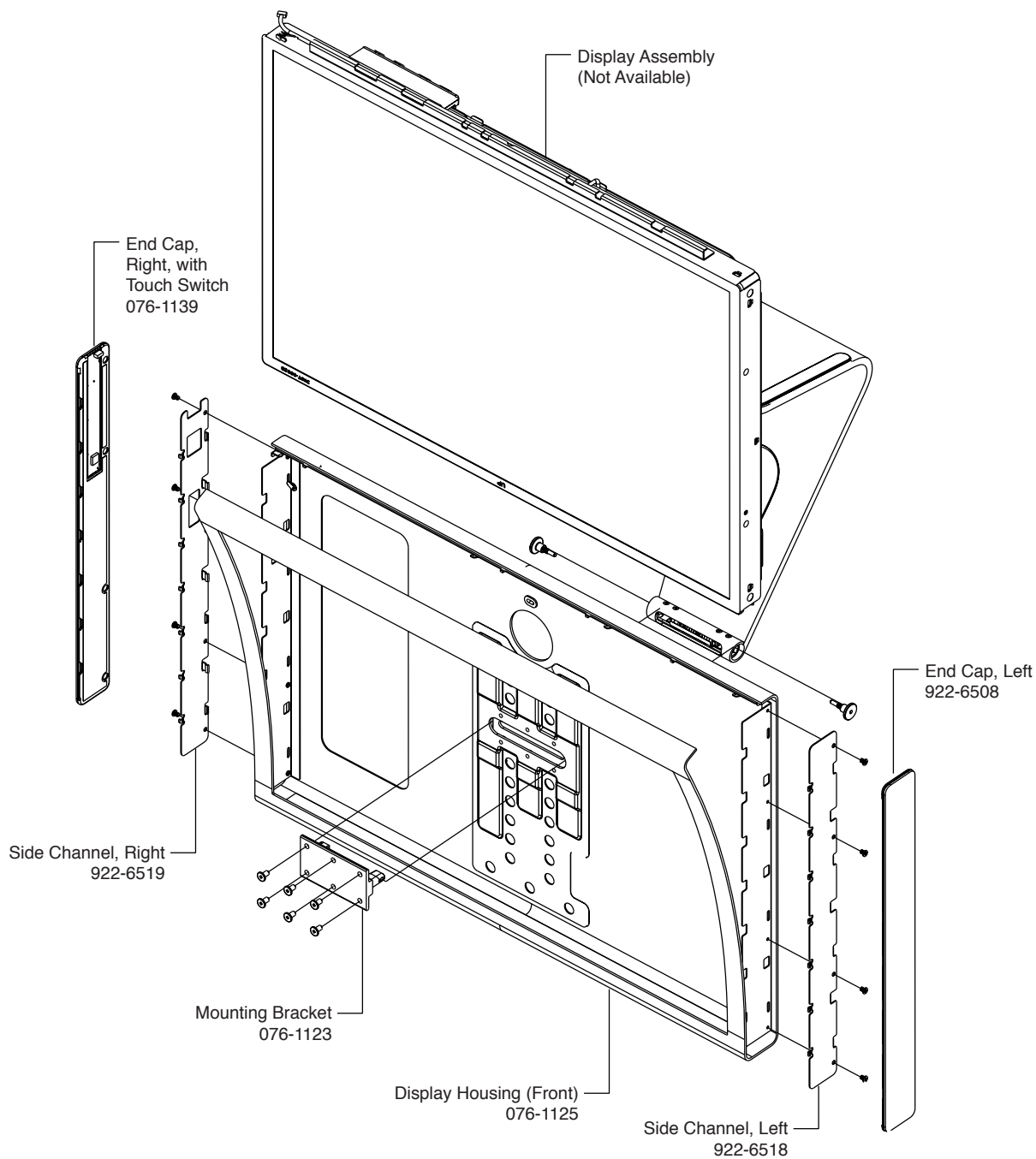
# Exploded Views

## Main Exploded View: Apple Cinema HD Display (23-inch DVI)





## Housing (Front): Apple Cinema HD Display (23-inch DVI)



## Housing (Back): Apple Cinema HD Display (23-inch DVI)

