Touchscreen Kits

Installation Guide

MicroTouch®

The information in this document is subject to change without notice. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of MicroTouch Systems, Inc. MicroTouch may have patents or pending patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. The furnishing of this document does not give you license to these patents, trademarks, copyrights, or other intellectual property except as expressly provided in any written license agreement from MicroTouch.

© 1995-96, 1998 MicroTouch Systems, Inc. All rights reserved.
Printed in the United States of America.

Document Title: *Touchscreen Kits Installation Guide*
Document Number: 19-215, Version 2.2

MicroTouch, the MicroTouch logo, AdLink, ClearTek, DrivePoint, Factura, FinePoint, Ibid, the Ibid logo, KeyPad, Microcal, PicturePad, PrivacyTouch, Prospector, The Public Browser, QuickPoint, ScreenWriter Tablet, SimpleTouch, SurfControl, ThruGlass, TouchMate, TouchPad, TouchPen, TouchWare, TouchTek, TruePoint, TuffTouch, UnLink, UnMouse, WebStation, and WorldService are either registered trademarks or trademarks of MicroTouch Systems Incorporated in the United States and/or other countries.

Apple and Macintosh are registered trademarks, and System 7.0 is a trademark of Apple Computer, Inc.

Microsoft, MS, MS-DOS, and Windows are registered trademarks of Microsoft Corporation.

Contents

About This Manual

What You Need to Know....8
MicroTouch Support Services....8
MicroTouch Technical Support....8
MicroTouch on the World Wide Web....9
MicroTouch Bulletin Board System....9
MicroTouch Corporate Headquarters and Worldwide Offices....10

CHAPTER 1 Getting Started

Installation Warnings and Safety Precautions....12
Supplies and Tools Needed for the Installation....13
Preparing Your Work Space....14
Comfortable Working Area....14
Protective Material....14
Small Containers....14
Styrofoam Blocks....14
Testing the Monitor Video....15
Identifying the Parts in the Touchscreen Kit....16
Optional Accessories for a Serial/SMT Controller....16
Additional Accessories for a PC Bus Controller....17
Optional Accessories for an ADB/SMT Controller....18
Summary of the Installation Procedure....19

CHAPTER 2 Installing a MicroTouch Touchscreen

Two Types of MicroTouch Touchscreens 22
Two Types of Monitor Assemblies 23
Removing the Monitor Cover 24
Checking for Sufficient Space and Clearance 27
Discharging the CRT 28
Disassembling a CRT Attached to the Bezel 31
- Disconnect Wires and Remove Boards 31
- Separate the CRT from the Bezel 35

Disassembling a CRT Attached to the Chassis 37
Modifying the Monitor Bezel 38
Mounting the Touchscreen to the CRT 40
- Practice Positioning the Touchscreen 40
- Attach the Touchscreen to the CRT 42
- Inspect the Mounted Touchscreen 44
- Check the Space Between the Touchscreen and CRT 45
- Cover the Gap 46
- If You Need to Remove the Touchscreen 47

Adding Space and Support Between the Bezel and CRT 50
- Determine the Space to Add 50
- Add Spacers to the Bezel 50
- Inspect the Attached CRT and Bezel 53
- Check the Clearance for Resistive Touchscreens 53

Reconnecting the Bezel and Chassis 54
Preparing the Green, Gray, and Orange Wires 55
- When To Use the Green, Gray, and Orange Wires 55
- Finishing the Green, Gray, and Orange Wires 56

What's Next? 58

CHAPTER 3 Installing the Serial/SMT Controller

Methods for Supplying Power to the Serial/SMT Controller.....60
Drilling Holes in the Monitor Cover 61
Reassembling the CRT and Monitor Cover.....63
Connecting the Serial/SMT Touchscreen Cable 65
Supplying External Power to the Serial/SMT Controller.....67
Using a Keyboard Power Tap Cable 68
Using an External Wall-Mount Power Supply.....69
Turning On Your System 70
What's Next? 70
Installing and Using TouchWare.....70
Calibrating the Touchscreen 71

CHAPTER 4 Installing the PC Bus Controller

Before You Install the PC Bus Controller.....74
Supplying Power to the PC Bus Controller.....74
Drilling a Hole for the PC Bus Cable 75
Threading the Touchscreen Extension Cable.....76
Remounting the Monitor Cover.....77
Installing the Cable Grommet 78
Setting the Jumpers on the PC Bus Controller 79
Handling the PC Bus Controller.....80
Locating the Jumpers.....80
Setting the Communication Port 81
Setting the Interrupt Request.....82
Setting the JP2 Jumper for Proper Operation 83
Installing the PC Bus Controller 84
Connecting the Touchscreen and Monitor 85
Turning On Your System 86
What's Next? 86
Installing and Using TouchWare.....87
Calibrating the Touchscreen 87

CHAPTER 5 Installing the ADB/SMT Controller

Supplying Power to the ADB/SMT Controller 90
Drilling Holes in the Monitor Cover 91
Reassembling the CRT and Monitor Cover 93
Connecting the ADB/SMT Controller to a Macintosh 95
Options for Connecting the Touchscreen 95
How To Connect the Touchscreen to a Macintosh 96
Turning On Your System 97
What's Next? 98
Installing and Using TouchWare for the Macintosh 98
Calibrating the Touchscreen 98

Index

About This Manual

Congratulations on the purchase of your touchscreen kit, and welcome to the world of MicroTouch — a world where using a computer is as simple as touching the screen.

Every kit includes a touchscreen and a controller. Touchscreens are available in a variety of sizes for use on a variety of monitors. A variety of touchscreen controllers, such as the Serial/SMT, PC Bus, TouchPen, and ADB/SMT, are also available for PC and Macintosh platforms.

This manual describes how to complete the following tasks:

- Disassemble your monitor
- Mount the touchscreen to the CRT face
- Install the touchscreen controller

In addition to touchscreen kits, MicroTouch buys and resells a variety of monitors with a touchscreen and all related components fully installed. If you already have a touch monitor, refer to the user documentation for information on how to connect the touchscreen and load the software for your touchscreen.

What You Need to Know

This document assumes you are a qualified monitor technician with experience in assembling and disassembling monitors. You must know the specifics of your monitor and have access to the documentation for your particular monitor.

There are hazardous voltages present in the monitor. If you do not understand monitor electronics, you may injure yourself, damage the touchscreen, or damage the touchscreen controller.

This document assumes you have a monitor, and a PC or Macintosh system. You are now ready to disassemble the monitor, mount the touchscreen to the CRT, and install the touchscreen controller.

MicroTouch Support Services

MicroTouch provides extensive support services through our technical support organization, web site, and bulletin board system (BBS).

MicroTouch Technical Support

Technical Support is available as follows:

- 24 hours a day, Monday through Friday (excluding holidays)
- 9:00 a.m. to 5:00 p.m. Eastern Standard Time, Saturday and Sunday (excluding holidays)

Whenever you contact Technical Support, please provide the following information:

- Part number and serial number from the MicroTouch label on your monitor or touchscreen controller
- Type of MicroTouch touchscreen
- Version number of your MicroTouch TouchWare
- Make and model of your personal computer
- Name and version number of your operating system
- List of peripherals connected to your computer
- List of application software in use

You can contact MicroTouch Technical Support by calling the hot line, sending a fax, or sending electronic mail.

- Technical Support Hot Line: 978-659-9200
- Technical Support Fax: 978-659-9400
- Technical Support E-Mail: support@microtouch.com

MicroTouch on the World Wide Web

You can visit the MicroTouch web site at the following address:

http://www.microtouch.com

You can download MicroTouch touchscreen software and drivers, obtain regularly updated technical information on MicroTouch products, and learn more about our company.

MicroTouch Bulletin Board System

MicroTouch also has a Bulletin Board System (BBS) that you can access 24 hours a day, 7 days a week. You can use the BBS to download updates of the latest drivers and obtain regularly updated technical information on MicroTouch products.

You can reach the MicroTouch BBS at the following numbers:

- 978-659-9250
- 978-683-0358

To connect to the BBS, you need standard communication software and a modem that supports 2400, 4800, 9600, 14400, or 28800 baud. Additionally, the communication parameters must be set as follows:

No parity, 8 data bits, and 1 stop bit (N81)

Once you establish a modem connection with the BBS, the system prompts you to log in using your name. You can register with MicroTouch the first time you log in to the BBS. The menu of available options is self-explanatory.

MicroTouch Corporate Headquarters and Worldwide Offices

United States
MicroTouch Systems, Inc.
300 Griffin Brook Park Drive
Methuen, MA 01844
Main Phone: 978-659-9000
Main Fax: 978-659-9100
Web Site: http://www.microtouch.com
E-Mail: touch@microtouch.com
Tech Support Hot Line: 978-659-9200
Tech Support Fax: 978-659-9400
Tech Support E-Mail: support@microtouch.com

Australia
MicroTouch Australia, Pty Ltd.
797 Springvale Road
Mulgrave Victoria 3170 Australia
Phone: +61 (03) 9561 7799
Fax: +61 (03) 9561 7393
Web Site: http://www.microtouch.com.au
E-Mail: touch@microtouch.com.au
Tech Support E-Mail: support@microtouch.com.au

France
MicroTouch Systems SARL
Europarc de Créteil
19, rue Le Corbusier
94042 Créteil Cedex France
Phone: +33 (1) 45 13 90 30
Fax: +33 (1) 45 13 90 34

Germany
MicroTouch Systems GmbH
Schiess-Str. 55
40549 Düsseldorf Germany
Phone: +49 (0) 211-59907-0
Fax: +49 (0) 211-599 06 55

Hong Kong
MicroTouch Systems, Inc.
Unit D, 9/F, Trust Tower
68 Johnston Road
Wanchai, Hong Kong, China
Phone: +852 2333 6138; +852 2334 6320
Fax: +852 2333 6861

Italy
MicroTouch Systems srl
Via Solferino, 12a
20052 Monza (MI) Italy
Phone: +39 (0) 39-230-2230
Fax: +39 (0) 39-230-2370

Japan
MicroTouch Systems K.K.
Bellevue Mizonokuchi Building 3F,
3-2-3, Hisamoto, Takatsu-ku,
Kawasaki-shi, Kanagawa 213 Japan
Phone: +81 (044) 811-1133
Fax: +81 (044) 811-1143

Korea
MicroTouch Systems, Inc.
#402, 4th Floor, Nam-Kyung Building
769-6 Yeoksam-Dong, Kangnam-Gu
Seoul, Korea
Phone: +82 (2) 552-3198
Fax: +82 (2) 552-3210

Taiwan R.O.C.
MicroTouch Systems, Inc.
3F-12, No. 351, Chung Shan Road, Sec. 2
Chung Ho City, Taipei
Taiwan R.O.C.
Phone: +886 (02) 2226-0875
Fax: +886 (02) 2226-4824

United Kingdom
MicroTouch Systems, Ltd.
163 Milton Park
Abingdon
Oxon OX14 4SD
England
Phone: +44 (0) 1235-444400
Fax: +44 (0) 1235-861603
BBS: +44 (0) 1235-861620

C H A P T E R 1

Getting Started

The MicroTouch touchscreen is the most intuitive pointing device available for the PC and the Macintosh. Touchscreens make using computers as simple as touching the screen. To begin installing your MicroTouch touchscreen, take a few minutes to review this chapter. It holds the secret to a successful installation.

- Pay close attention to the installation warnings and safety precautions. Disassembling a monitor is a dangerous procedure.
- Make sure you have the necessary equipment before starting the installation. You will need a collection of supplies and tools.
- Set up a comfortable and spacious working area. Having room to work makes the installation easy.
- Test your monitor before you install the touchscreen. You do not want to install the touchscreen on a monitor that is not in good working condition.
- Identify the parts in your touchscreen kit and review the summary of the installation procedure. Knowing how all the pieces fit also makes the installation easy.

Installation Warnings and Safety Precautions

MicroTouch recommends that only qualified monitor technicians install the touchscreen for the following reasons:

- Due to the risk of injuring yourself
- Due to the danger of hazardous voltages present in the monitor
- Due to the risk of accidentally damaging the screen
- Due to the risk of altering the delicate alignment of the CRT unit

If you decide to install the touchscreen, take the following precautions:

- Consult the monitor manufacturer to find out whether the original warranty will be affected if you install the touchscreen. Also, determine who will recertify the monitor. Recertification will be necessary to comply with safety and FCC regulations.
- Follow each procedure carefully, work with the system powered off and unplugged, and observe all warnings.
- Be careful. Even with the power disconnected, stored charges on an exposed CRT high-voltage connector and other metal parts can produce a strong shock.
- Wear the proper face, eye, and body protection when removing the monitor cover and while exposed to an unprotected CRT.
- Protect your investment. The touchscreen is a glass product. You must handle it with care.

Supplies and Tools Needed for the Installation

To install a MicroTouch touchscreen to a monitor, you need a variety of supplies and tools. Before starting the installation procedure, check that you have all items listed below.

Supplies You Need

- ☐ Safety glasses
- ☐ Clean, antistatic pad
- ☐ Small containers for holding loose parts
- ☐ Styrofoam blocks
- ☐ Electrical tape (or black acetate tape)
- ☐ Felt-tip pen
- ☐ Soft cloth and isopropyl alcohol (or glass cleaner)
- ☐ Instant adhesive (for example, Loctite® or hot glue)
- ☐ Cable tie-wraps
- ☐ Nylon spacers and washers
- ☐ Replacement screws for mounting CRT to bezel or chassis
- ☐ Extra double-sided foam tape
- ☐ Ring lugs
- ☐ 3/32-inch shrink tubing (or electrical tape)
- ☐ Compressed air (optional)

Tools You Need

- ☐ Flat-blade screwdriver (12-18 inches) with insulated handle
- ☐ Phillips-head screwdriver
- ☐ 3-foot insulated wire with alligator clips at each end
- ☐ Dremel tool or nibbler
- ☐ X-acto® knife or single-edge razor blade
- ☐ Center punch
- ☐ Power drill
- ☐ Variety of drill, tap, and spade bits (for example, #6-32 combination drill and tap bit, 3/4-inch spade bit, and 3/16-inch drill bit)
- ☐ Wire strippers
- ☐ Crimping tool

Preparing Your Work Space

Comfortable Working Area

Select a comfortable working area with adequate space and lighting. MicroTouch recommends an area of at least three square feet. You need this space to handle components safely and to set major components aside during the installation.

Protective Material

Place some protective material, for example 1/2 inch of foam rubber, on the work surface. A padded surface helps protect the equipment from scratches during the installation.

Small Containers

Have several small containers available to hold screws, washers, and other small components once you remove them.

Styrofoam Blocks

Have some Styrofoam blocks available for securing the exposed CRT.

Testing the Monitor Video

Whether you are installing the touchscreen on a new monitor or on a monitor that has been in use, you should test your monitor before installing the touchscreen. You should make sure the monitor is in good working condition and the video output is functioning properly.

Your initial test verifies that the video functioned properly before you installed the touchscreen. You can also compare your results with the results you get after you complete the installation.

▶ To set up and test your monitor:

1. Turn off the power to your computer and all attached peripherals.
2. Position the monitor so you can easily access the back panel.
3. Connect the video cable between the back of the monitor and the back of the computer.
4. Attach the power cable to your monitor and your computer (if necessary). Plug each power cable into a grounded power outlet.
5. Tighten all cable screws to prevent the cables from coming loose.
6. Turn on your monitor first, and then the computer.
7. Look at the video quality and test all external controls.
   - Adjust the contrast and brightness controls.
   - Adjust the horizontal and vertical alignment. Make sure the video image is centered on the screen.

If the monitor is functioning properly, turn off your system and disconnect all cables from the monitor. You are ready to disassemble the monitor and install the touchscreen.

Identifying the Parts in the Touchscreen Kit

Carefully unpack the touchscreen kit and inspect the contents. Always check the contents against the packing list to verify that your order is correct. Identify the following items:

- A touchscreen with a cable attached
- A touchscreen controller
- Touchscreen software and documentation

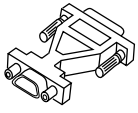
MicroTouch provides one copy of the software and documentation per order. You can purchase additional copies.

Save the invoice, shipping container, and all packing material in case you need to transport the equipment any time in the future.

Optional Accessories for a Serial/SMT Controller

If you are using a controller in the Serial/SMT family, you may need some additional equipment depending on power and port requirements. Serial/SMT controllers include the Serial/SMT2, Serial/SMT3, and Serial/SMT3R controllers.

When installing a Serial/SMT controller, you must supply power to the controller. You can use internal power (that is, tap power from inside the monitor) or use external power. If you decide to use external power, you will need one of power supplies listed in Table 1.



You may also need a 9-pin to 25-pin adapter for connecting the Serial/SMT touchscreen controller to the serial communication port. You need this adapter only if the available port on your PC has 25 pins.

Table 1. Accessories for Serial/SMT Controllers

Optional Power Cables and Adapters	Product Number
Keyboard power tap cable (5-pin) for an IBM AT compatible keyboard	19-356
Keyboard power tap cable (6-pin) for an IBM PS/2 compatible keyboard	19-357
Wall-mount power supply (120 volts)	19-408
Wall-mount power supply (220 volts)	19-409
9-pin to 25-pin serial port adapter	2103601

Additional Accessories for a PC Bus Controller

To connect the touchscreen cable to the PC Bus controller, you need an extension cable. Extension cables are available in 6-foot and 10-foot lengths. Each cable includes a locking clip and a cable grommet to ensure proper installation.

Table 2. PC Bus Extension Cables

Part Number of PC Bus Controller	Extension Cables Available	Label Identifying the Cable Part Number
14-99	19-907 (6-foot cable) 19-908 (10-foot cable)	Located on the cable end outside the monitor.
14-34	19-905 (6-foot cable) 19-906 (10-foot cable)	Located on the cable end inside the monitor.
44-84	19-905 (6-foot cable) 19-906 (10-foot cable)	Located on the cable end inside the monitor.

Optional Accessories for an ADB/SMT Controller

The ADB/SMT controller connects to an ADB port on the Macintosh. If you plan to connect two ADB devices to the same ADB port, you will need an ADB-Splitter cable. Using the ADB-Splitter cable is optional.

Some monitors, such as a Mitsubishi monitor, require an adapter on the video cable in order to connect the monitor to the Macintosh. The adapter you need depends on the model of your monitor as well as the model of your Macintosh. For more information on buying an adapter, contact a MicroTouch sales representative.

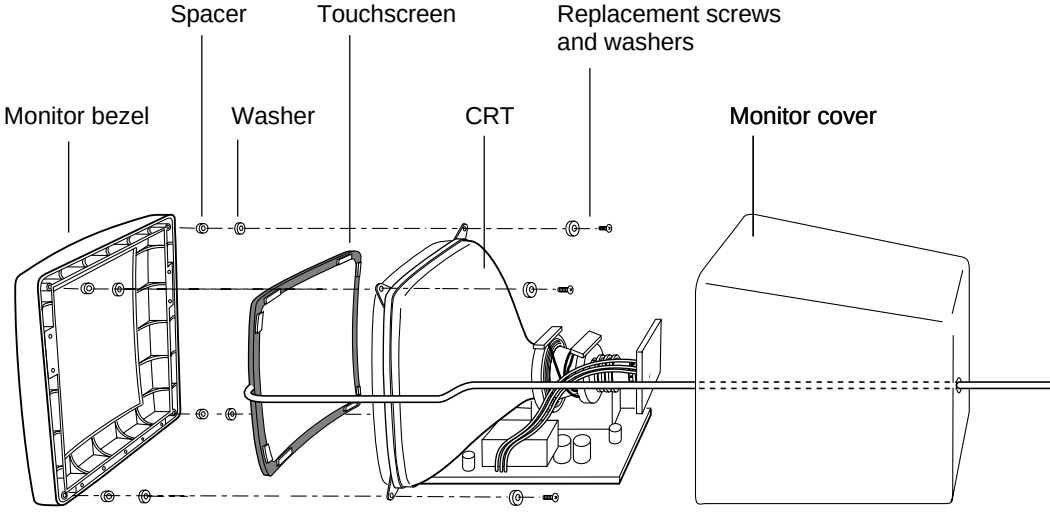
Table 3. Macintosh ADB/SMT Controller Accessories

ADB/SMT Accessories	Product Number
ADB-Splitter Cable	19-342
Macintosh Universal Adapter (SD-2)	2109100

Summary of the Installation Procedure

You can install a MicroTouch touchscreen on most monitors. Although each particular monitor may have some unique integration issues, the basic installation process consists of the following steps:

- Test that the monitor's video works properly
- Disassemble the monitor, including disconnecting and removing the CRT
- Mount the touchscreen to the front of the CRT
- Install the touchscreen controller
- Reassemble the monitor
- Connect the monitor and touchscreen to your computer system



C H A P T E R 2

Installing a MicroTouch Touchscreen

This chapter describes how to install a MicroTouch touchscreen to the front of a monitor.

You can install a MicroTouch touchscreen on many different monitors.

- The information in this chapter pertains to most monitors.
- This chapter does not provide detailed instructions for a specific monitor.
- The procedures are only intended as guidelines and will vary from monitor to monitor.

Two Types of MicroTouch Touchscreens

MicroTouch manufactures both capacitive and resistive touchscreens.

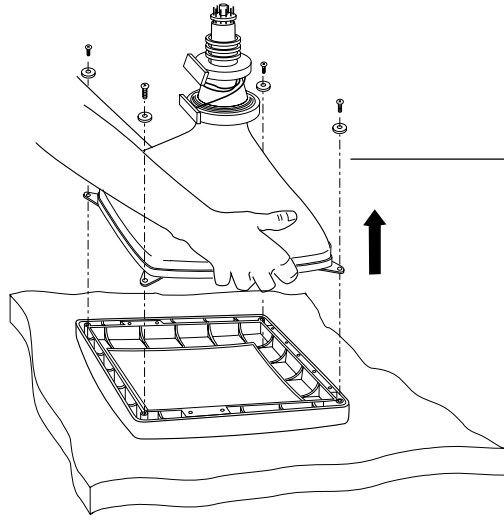
- *Capacitive touchscreens* have a cable harness taped to the edge. The cable exits from the middle of the right side of the screen. This cable connects to the touchscreen controller.
- *Resistive touchscreens* have a small cable tail that also exits from the right side of the screen. Your touchscreen kit includes an extension cable. One end of the extension cable connects to the touchscreen; the other end connects to the touchscreen controller.

Although the touchscreens look slightly different, the process of installing the touchscreen onto a monitor is the same. Note that most illustrations in this document show the capacitive touchscreen.

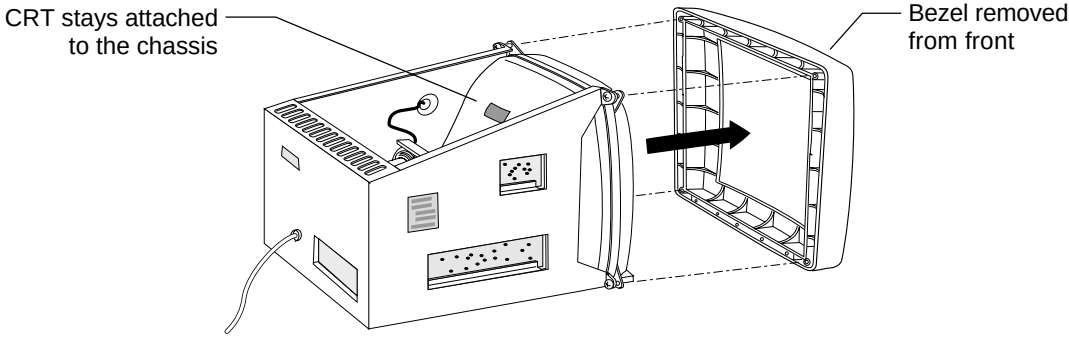
Two Types of Monitor Assemblies

There are two types of monitor assemblies, or housing configurations:

- The CRT is attached to the front bezel. (About 80% of the manufactured monitors are attached to the bezel.)



- The CRT is attached to the chassis. (About 20% of the manufactured monitors are attached to the chassis.)



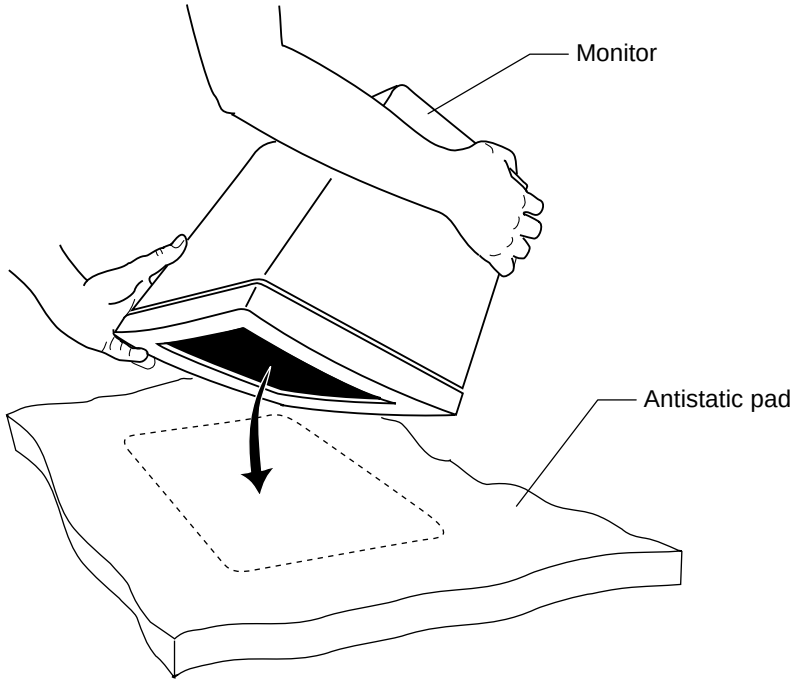
The process of disassembling the CRT is slightly different depending on the monitor. Note that most illustrations in this document show the common monitor assembly (that is, CRT attached to the front bezel).

Removing the Monitor Cover

Most monitors have a case, or cover, surrounding the CRT. (Some monitors, such as rack-mount monitors, may not have a cover.)

▶ To remove the monitor cover:

1. Look at the front of the monitor. Some monitors have a small door that hides the brightness and contrast controls. It is a good idea to tape this door closed to prevent damage when handling the cover.
2. Place the monitor face down on a clean, antistatic pad.

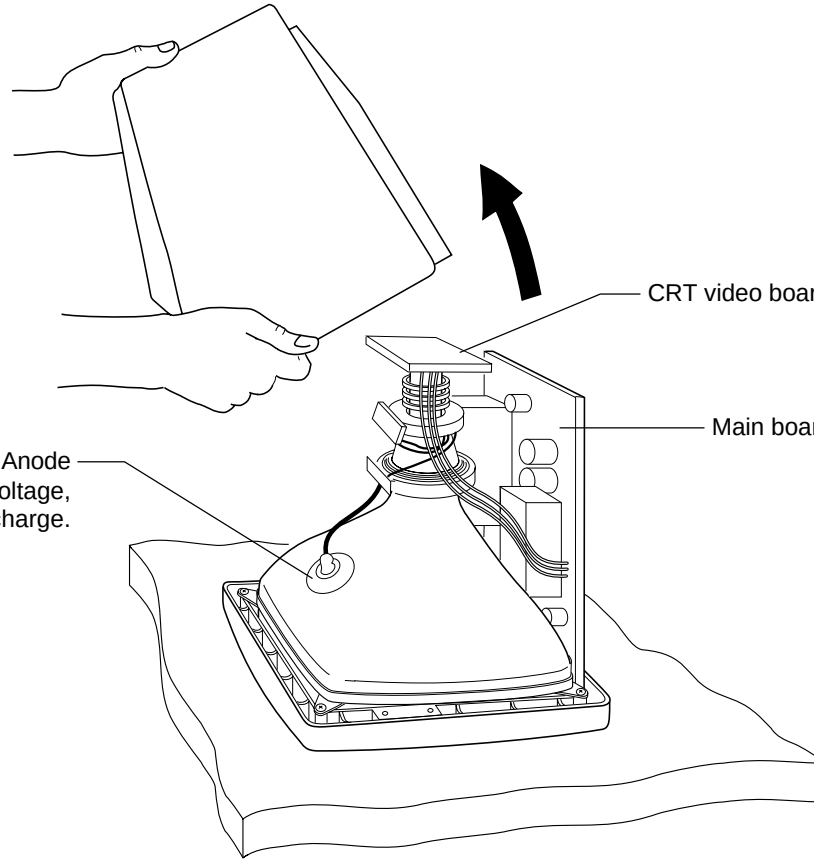


3. Remove the tilt and swivel base, if present, from the bottom of the monitor.

4. Remove the screws that secure the cover to the monitor.

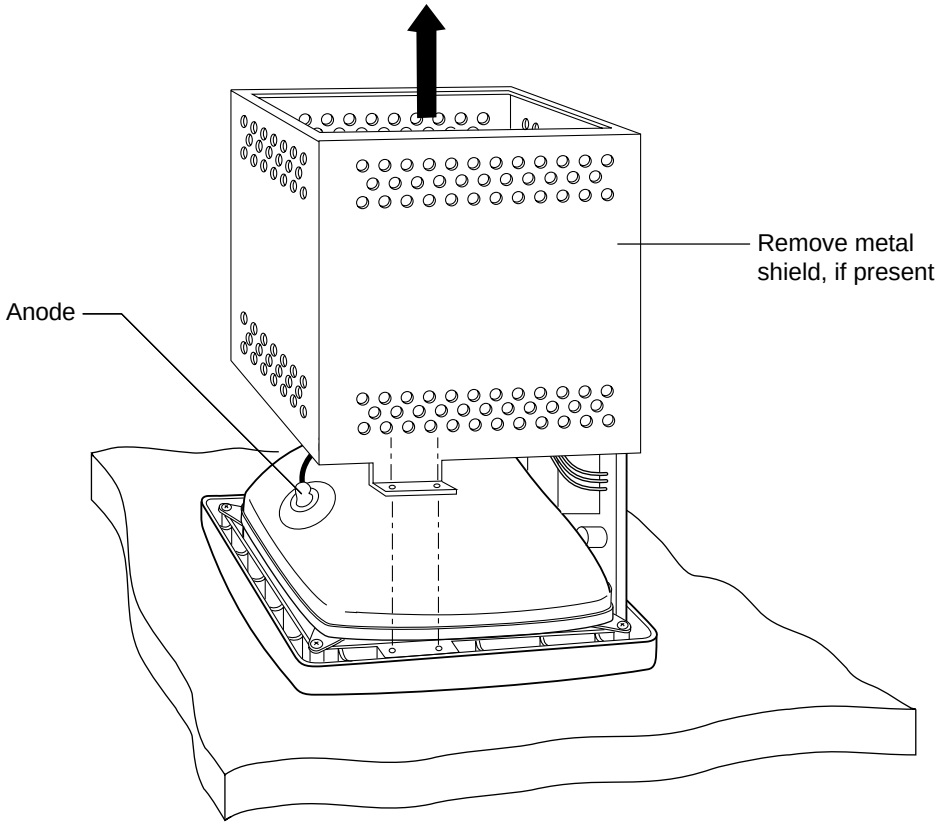
Note: The way in which the cover is attached to the monitor varies from model to model. Monitor manufacturers may use screws, quick-release latches or clips, and release buttons.

5. Lift off the cover.



Caution: As you remove the cover, do not push against the CRT video board. The pins on the end of the CRT are fragile and can break easily.

Also, if the CRT has a shield (sheet metal) around it, remove the shield to expose the CRT, the anode, and all the wires.



Checking for Sufficient Space and Clearance

You need to make sure there is enough space to reassemble the monitor once the touchscreen is installed. You must be able to move the CRT or chassis about 3/8 inches toward the rear of the housing.

▶ To check for adequate space:

1. Get the monitor cover you removed in the previous procedure.
2. Inspect the inside of the monitor cover. Some monitor manufacturers place foam blocks on the inside of the monitor cover to hold the CRT video board in place.
3. Gently lift the cover on and off the CRT.
4. Note the clearance between the rear surface of the cover and the rear of the CRT or chassis. You may be able to look through the vents and openings in the cover to check the available space.

   You must be able to move the CRT or chassis about 3/8 inches toward the rear of the housing. If there is not enough space, you may not be able to reassemble the monitor once the touchscreen is installed. Here are a few solutions:

   - You can remove the foam block, if present, from the inside of the monitor. If you remove the foam block, be sure to apply a flame-retardant silicone (RTV) between the video board and its connector to prevent the board from becoming loose.
   - You can modify the monitor assembly.

Discharging the CRT

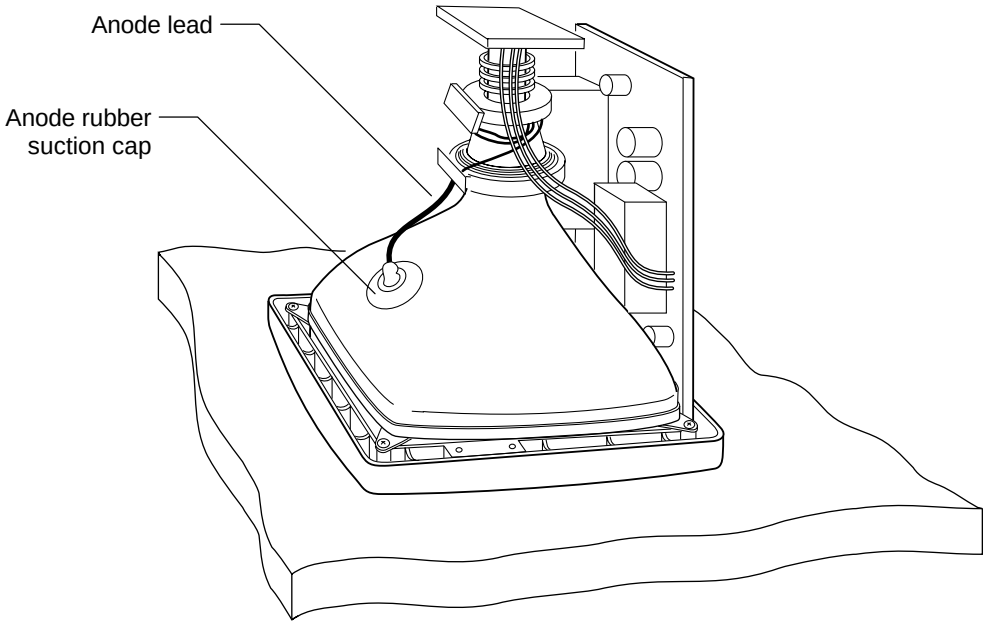
The CRT contains a high voltage charge. Specifically, the anode lead of the display feeds high voltage from the flyback transformer to the anode button on the CRT. To avoid electrical shock, you must thoroughly discharge this voltage.

A CRT can build up a charge even when disconnected from the monitor. Therefore, never touch the anode hole when handling the CRT. To discharge the CRT, you need a long, flat-blade screwdriver with an *insulated handle*. Be sure to keep your fingers on the insulated handle, not on the metal shaft.

▶ To discharge the CRT:

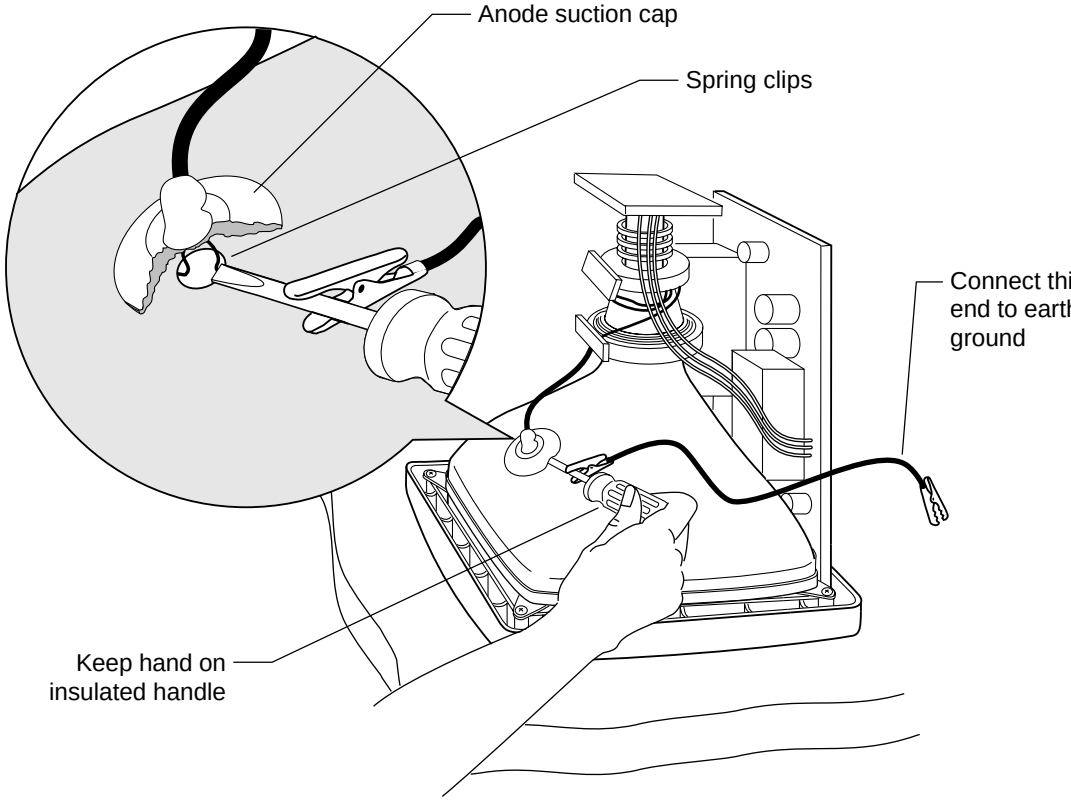
1. Locate the anode. In most displays, the anode is on the tapered face, or bell, of the CRT near the top of the display. The color of the anode lead is usually red, and the actual connection to the anode button is usually covered by a large rubber suction cap.

   Be sure to note the location of the anode for proper CRT orientation during assembly.



2. Check to see if the rubber suction cap has silicone holding it in place. If present, use a blunt tool (such as a wooden spatula) to lift the cap away from the CRT. Be careful not to tear the cap. You must be able to insert a screwdriver underneath the cap.
3. Ground the monitor chassis as follows:
   - Get a 3-foot insulated wire with alligator clips at each end.
   - Attach one end to an earth ground.
   - Attach the other end to the long, flat-blade screwdriver that has an insulated handle.

Caution: Remember to hold the screwdriver by the insulated handle only. Do not hold the metal shaft. Keep both hands clear of all metal while discharging the CRT.



4. Gently tuck the blade of the grounded screwdriver under the anode suction cap and make contact with the spring clips that hold the anode in place.

   Caution: Be careful when applying pressure against the anode spring clips to prevent breakage.

5. Use the screwdriver to pinch the spring clips together and release the anode wire assembly. The entire suction cap pops out. You can leave the cap dangling during the remainder of the installation process.

6. Cover the anode hole on the back of the CRT with a 2-inch piece of electrical tape to avoid possible electrical shock from charge build-up.

Disassembling a CRT Attached to the Bezel

If the CRT is mounted *to the bezel*, use the procedure that follows to disassemble the monitor. If the CRT is mounted *to the chassis*, skip to the next section.

If the CRT is mounted to the bezel, you must disassemble the monitor to the point that the CRT is totally exposed. The disassembling procedure, the location of wires, and the types of cable connections vary from monitor to monitor.

You must be sure to disconnect all cables before you separate the CRT from the bezel. You must also remove the video board, which is attached to the neck of the CRT, and the main board.

Disconnect Wires and Remove Boards

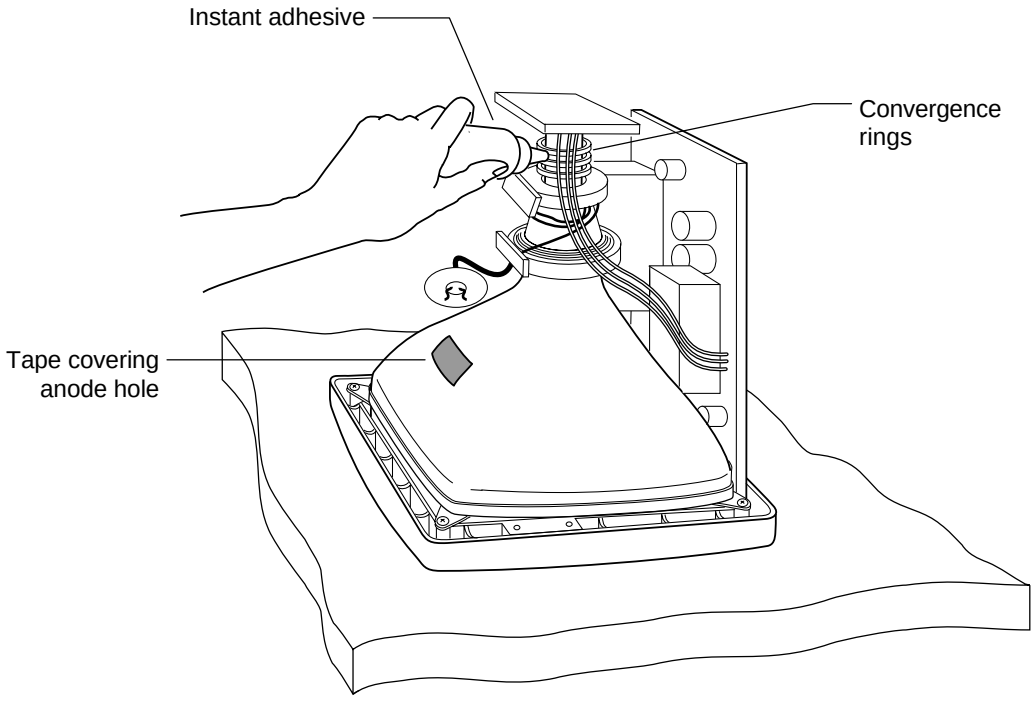
▶ To disconnect the necessary wires and boards:

1. Take a moment to inspect the monitor's internal hardware before you disconnect any wires.
   - Note where each wire is attached and how each wire is routed.
   - Label each wire. Labeling the wires makes the reassembling process easier.

   Most monitor manufacturers connect the major components with detachable cables that have keyed connectors and labels. Also, cables are of such lengths that they usually connect to only one place. However, not all monitors have easy and intuitive cable connections. When in doubt, make notes of all connection points.

2. Apply an instant adhesive (for example, Loctite®, Gylptol® epoxy, or hot glue) to the convergence rings to prevent the rings from moving during the installation procedure.

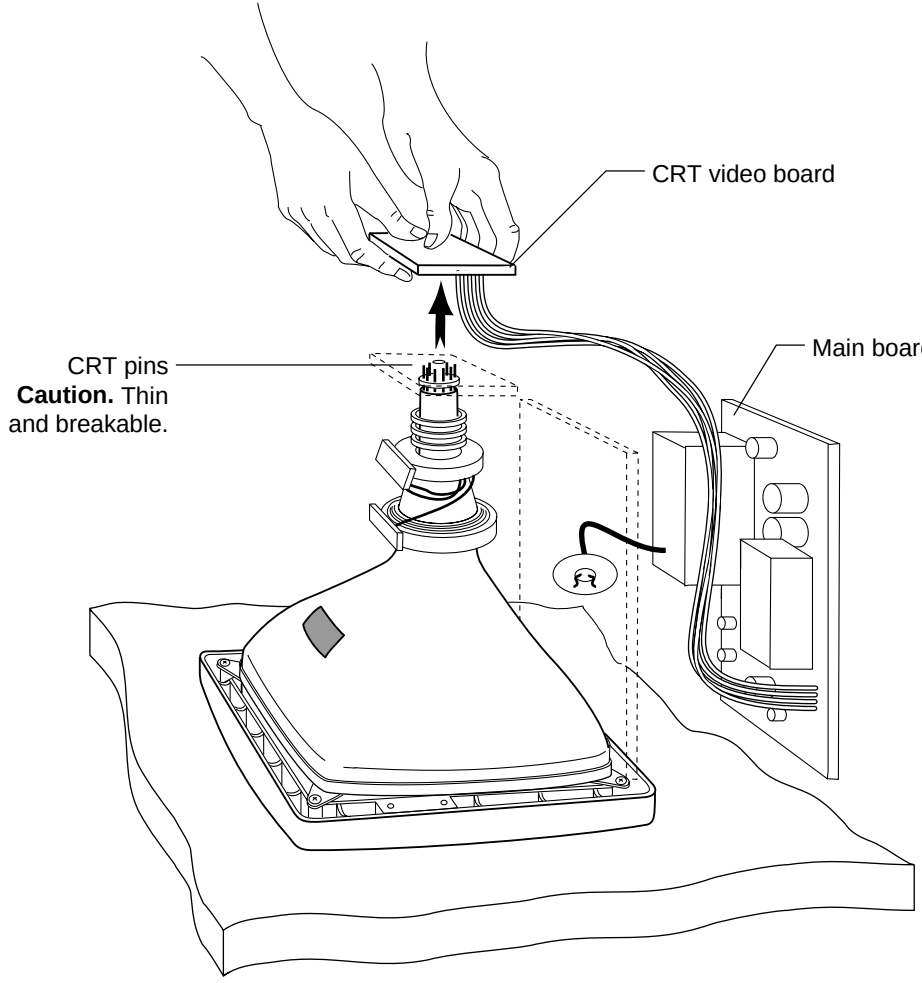
   The convergence rings control the alignment of the video image on the screen. Be careful not to move these adjustments.



3. Locate the video board at the top of the CRT.

Note: The CRT pins are thin and breakable. Be careful when removing the video board.

4. Remove the video board as follows:
   - Disconnect all cables connecting the video board to the CRT.
   - Check to see if the video board has silicone or screws holding it in place. If present, loosen the screws or remove the silicone.
   - Grip the board firmly on both sides.
   - Pull the board straight up and away. Do not twist or bend the board.



5. Disconnect all wires from the CRT to other parts of the monitor assembly (all wires that connect the CRT to the bezel).

   Be sure to note or label where each wire is connected. Common wires include:

   - One or more ground wires to the chassis
   - One or more yoke cables

6. Disconnect any cables connecting the main board to the bezel. For example, you may need to disconnect the following cables:

   - Degaussing cable
   - Power switch cable
   - Horizontal and vertical control-panel cables

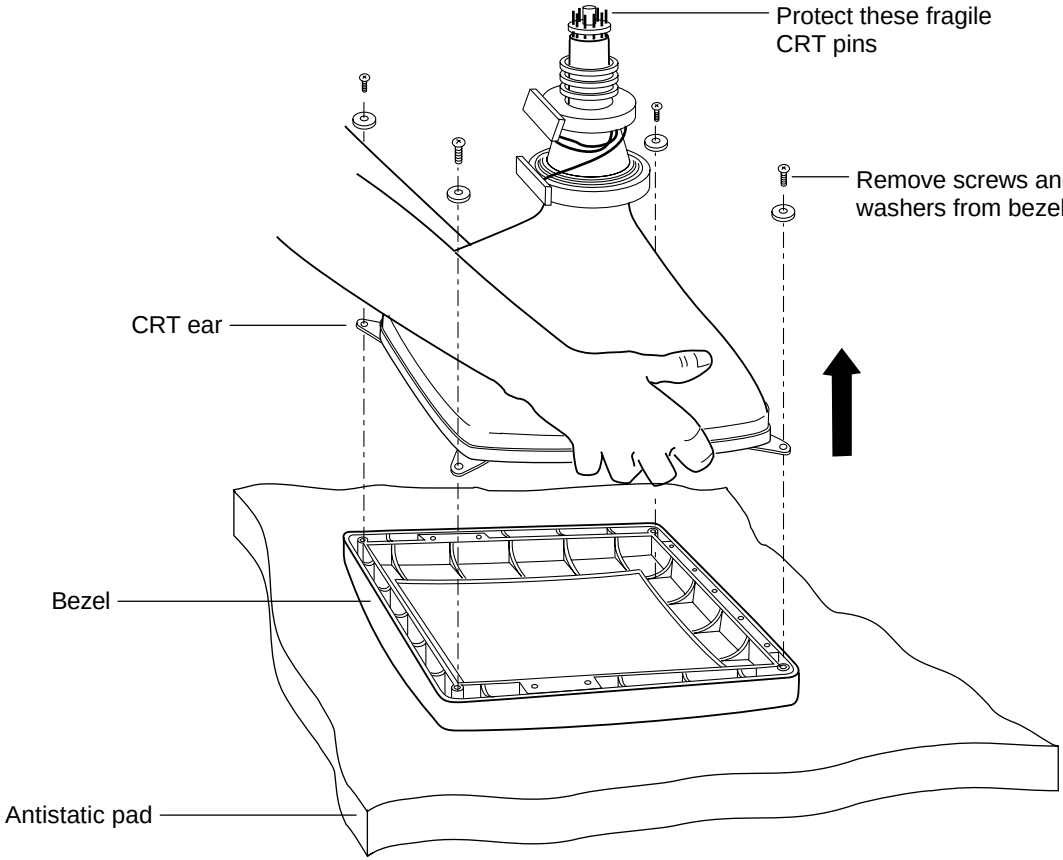
7. Disconnect and remove the main CRT board from the bezel so you can access the screws that hold the CRT in place. Look for screws, clips, and quick-release latches that may be holding the main board in place.

Separate the CRT from the Bezel

▶ To separate the CRT from the bezel:

1. Make sure you have a Styrofoam block ready to hold and protect the CRT. You must keep the neck of the CRT elevated with a foam block to prevent pin breakage.

2. Remove the four screws and washers holding the CRT in place.

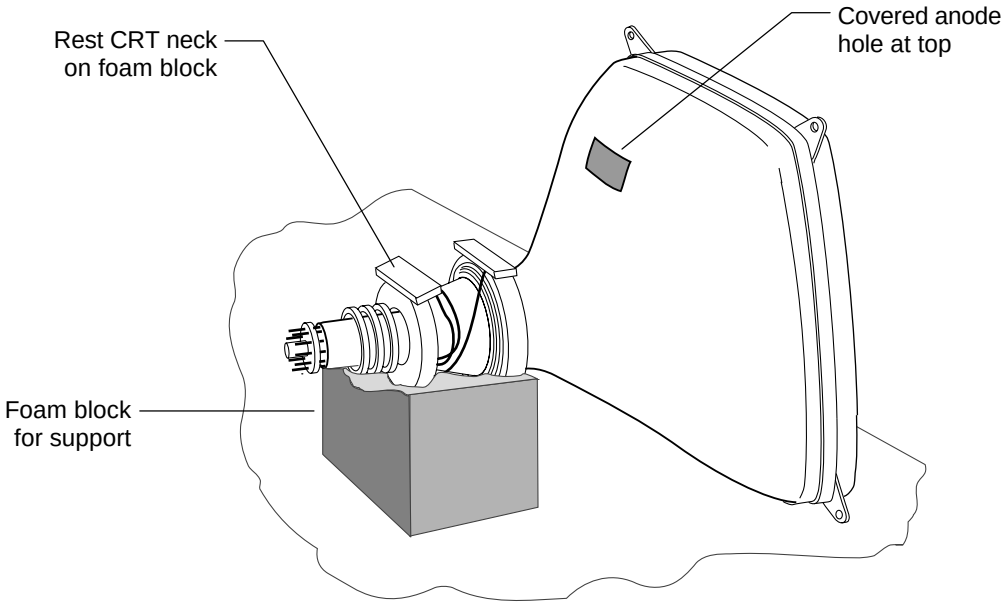


3. Lift the CRT from the bezel. To move the CRT, grasp the front portion (faceplate area) or the mounting tabs (ears). Do not apply pressure to the neck or yoke. The CRT neck is fragile.

4. Place the CRT in its upright position and rest the neck on a Styrofoam block.

Caution: Be careful not to rest any fragile parts or components on the foam block.

Supporting the CRT on a Styrofoam block reduces excessive stress, avoids scratches, and prevents accidental breakage.



Throughout the installation and assembly process, protect the CRT pins. Keep the end of the CRT elevated with a foam block to prevent pin breakage.

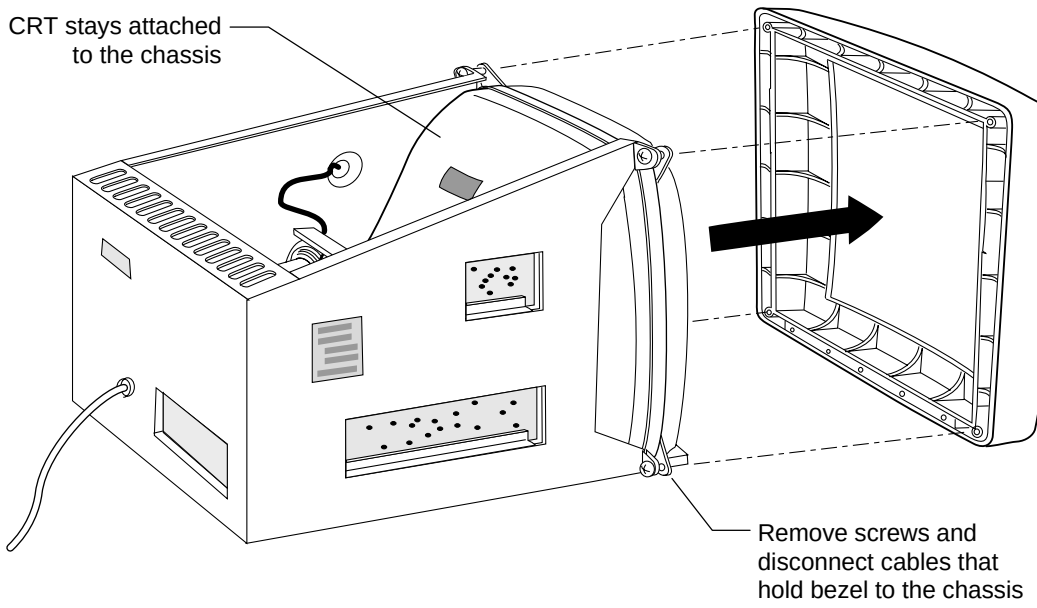
Disassembling a CRT Attached to the Chassis

If the CRT is attached *to the chassis*, use the following procedure. You need to remove the bezel to expose the CRT face. The CRT remains attached to the chassis.

If the CRT is attached *to the bezel*, use the procedure described in the previous section.

▶ To disconnect a CRT that is attached *to the chassis*:

1. Remove the screws that hold the bezel to the chassis. There may also be one or more release clips holding the bezel in place.
2. Disconnect any switches or wires between the bezel and the chassis. Label the wires and switches for proper assembly later. Some common connections include the following cables:
   - Degaussing cable
   - Power switch cable
   - Horizontal and vertical control-panel cables
3. Gently lift the bezel away, and place it aside.



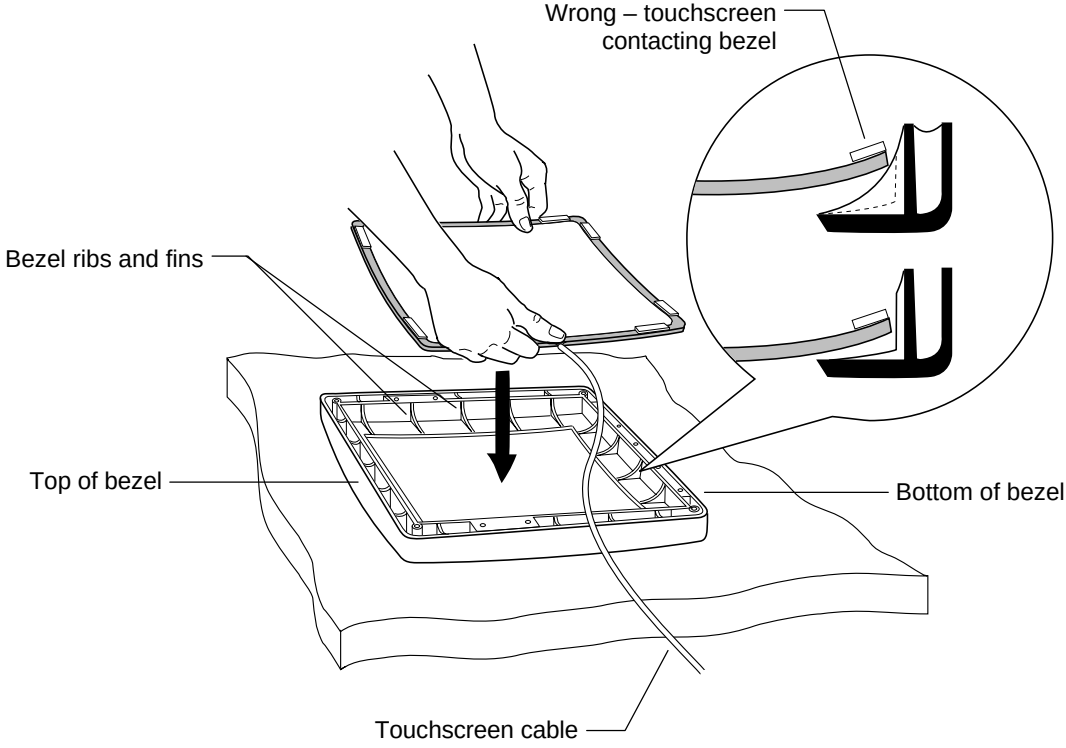
Modifying the Monitor Bezel

You now need to determine if the touchscreen fits into the bezel. If necessary, you must trim the ribs and fins on the bezel that are in direct contact with the touchscreen or the touchscreen cable.

Note: When trimming the bezel, make sure you do not compromise the mechanical integrity of the display.

▶ To trim the ribs and fins on the monitor bezel:

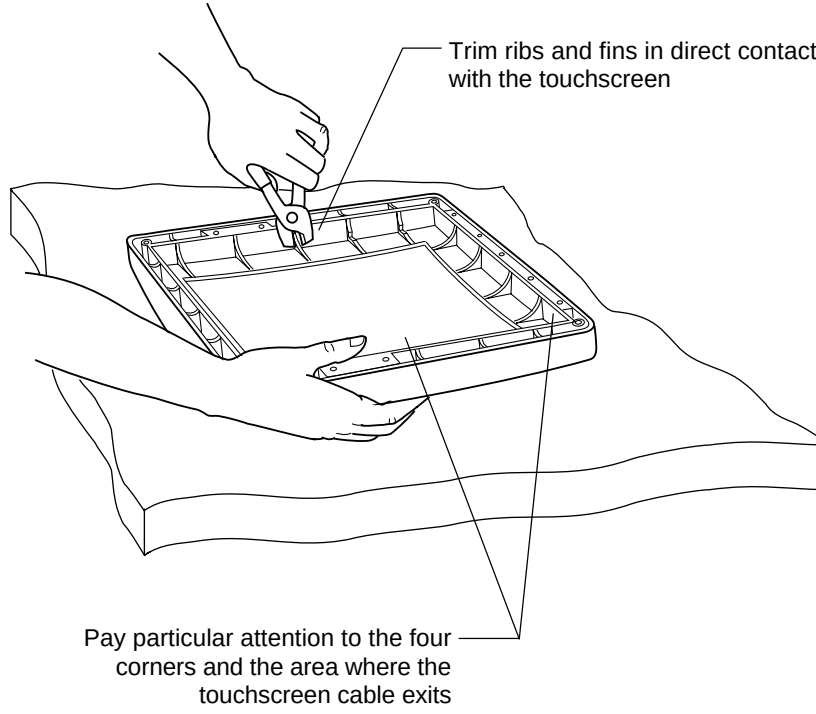
1. Place the bezel face down on an antistatic pad. Be sure to orient the top of the bezel towards you. Refer to illustration below.
2. Place the touchscreen face down against the inside of the bezel opening. Be sure to orient the touchscreen so the cable exits from the right side of the bezel.



3. Align and center the viewing area of the touchscreen. Make sure you keep the taped edges of the touchscreen beyond the bezel opening.

4. Note which ribs and fins of the bezel are in direct contact with the touchscreen. Pay particular attention to the corner areas and to the area where the cable exits from the touchscreen.

5. Carefully cut out a notch in each rib and cut back each fin that contacts the touchscreen.
   - Make sure you remove only enough material to facilitate the installation of the touchscreen.
   - Make sure you preserve the structural integrity in the rest of the rib area.



Mounting the Touchscreen to the CRT

The back of the touchscreen has strips of double-sided foam tape. The foam tape serves the following purposes:

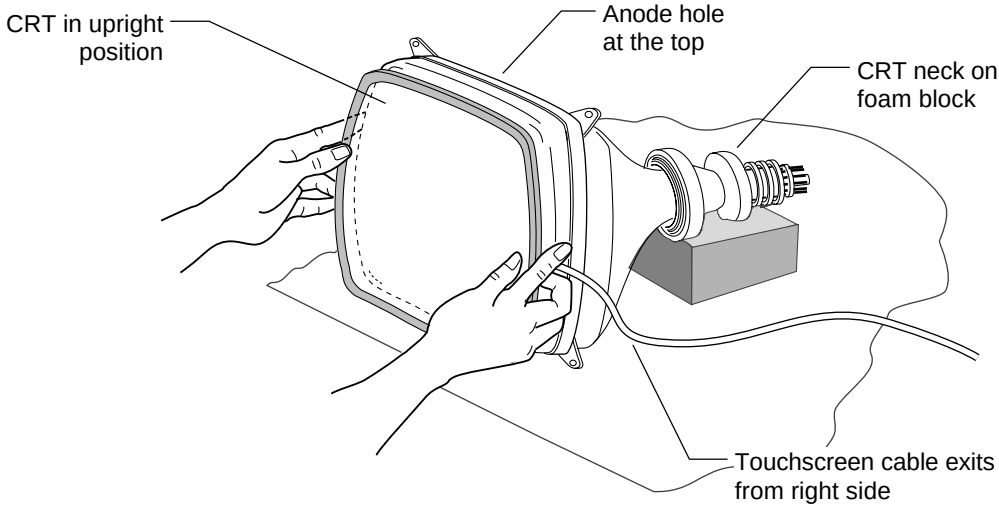
- Holds the touchscreen in place on the CRT
- Maintains a distance between the touchscreen and the CRT
- Cushions the two glass surfaces
- Prevents the touchscreen from contacting any conductive surfaces

Practice Positioning the Touchscreen

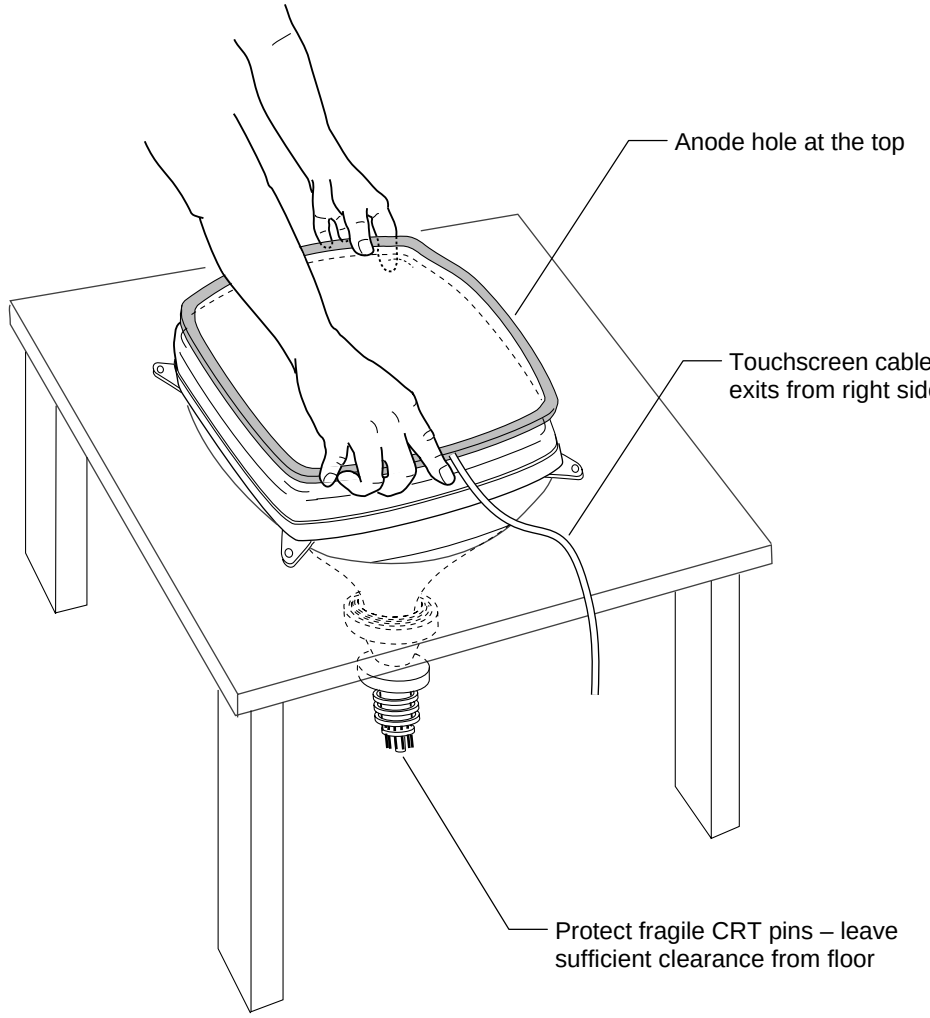
The correct positioning of the touchscreen is extremely important. Before you remove the protective backing from the foam tape, practice positioning the touchscreen to the CRT. You can get a feel for how the touchscreen should be aligned with the horizontal and vertical center of the CRT face.

▶ To practice placing the touchscreen onto the CRT:

1. Decide how to position the CRT for mounting the touchscreen.
   - You can rest the neck of the CRT on foam blocks. Be sure to orient the CRT in its upright position.



- You can also place the CRT in the hole of a properly designed workbench. You must make sure there is sufficient clearance between the CRT pins and the floor. It is easier to mount the touchscreen vertically from the top.



2. Hold the touchscreen so the harness and cable exit from the right side.
3. Practice placing the touchscreen onto the CRT.

4. Continue positioning the screen until you are comfortable with the placement. Check that the touchscreen is straight and centered on the CRT.

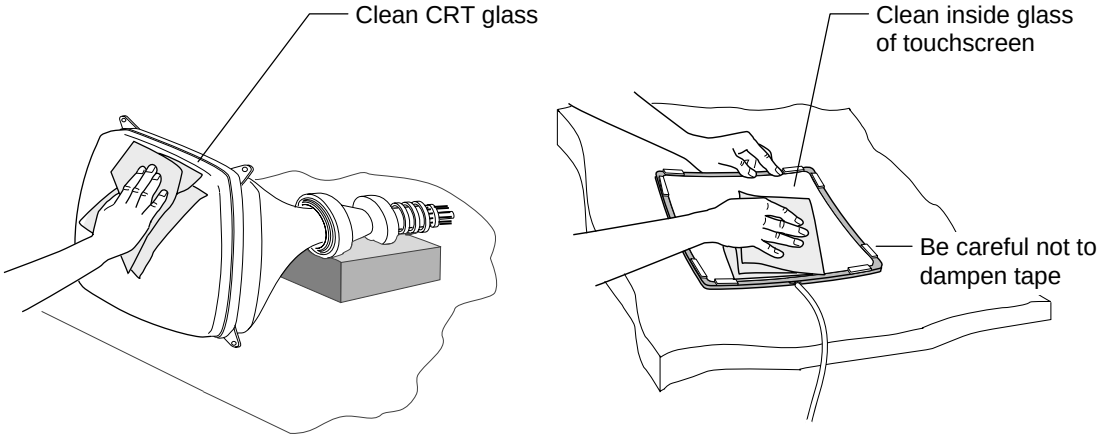
   If possible, use a felt-tip pen to mark the corners of the touchscreen and the CRT for re-orientation.

Attach the Touchscreen to the CRT

Once you feel comfortable with the alignment and positioning of the touchscreen, you are ready to permanently attach the touchscreen to the CRT.

▶ To attach the touchscreen to the CRT:

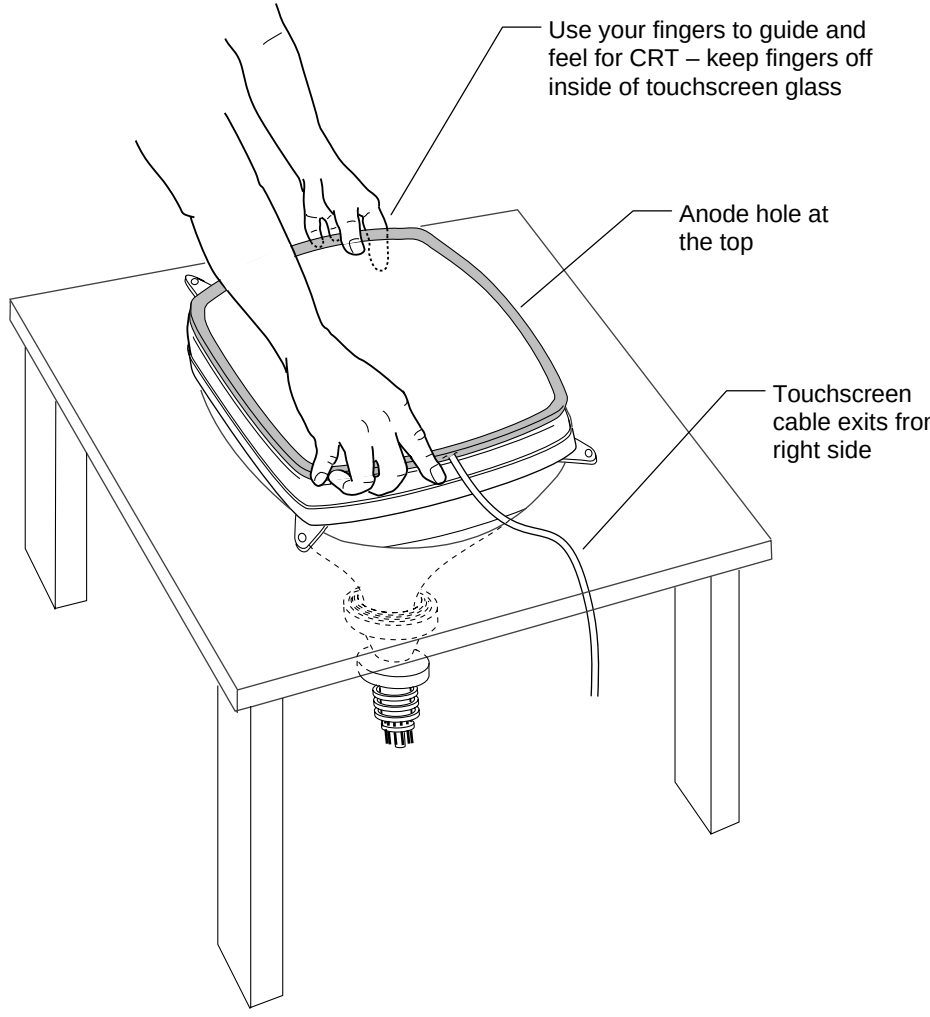
1. Use isopropyl alcohol and a soft, lint-free cloth to clean the touchscreen and CRT glass. Make sure the glass is clean and dry before you attach the touchscreen. Also, avoid dampening the adhesive tape around the inside edge of the touchscreen.



2. Remove the paper from the double-sided tape on the back of the touchscreen.

3. Hold the touchscreen so the cable exits from the right side.

4. Attach the touchscreen onto the CRT with one smooth motion. Use your corner marks, if available, to help with the placement.



Inspect the Mounted Touchscreen

After you mount the touchscreen to the CRT, inspect your results carefully and check that the touchscreen is installed properly.

▶ To inspect your results:

1. Set the CRT in its standard upright position.
2. Look at the front of the CRT.
3. Make sure the touchscreen cable exits from the right side.

   If the cable exits from the left side, the touchscreen is on backwards. You must remove and remount the touchscreen before you can continue with the installation.
4. Check for proper alignment. Make sure the touchscreen is not off-center or crooked. If the touchscreen is not aligned with the CRT, you must remove and remount the touchscreen before you can continue with the installation.
5. Look for trapped dirt and lint. Use compressed air to remove lint and dirt between the CRT and touchscreen as these particles will be visible later.

If any part of the inspection fails, you must remove and remount the touchscreen. Refer to the “If You Need to Remove the Touchscreen” section later in this chapter for more information.

Check the Space Between the Touchscreen and CRT

You need to make sure the space between the touchscreen and the CRT is less than 1/8 of an inch, but not touching.

▶ To test for proper space between the touchscreen and the CRT:

1. Get a piece of poster board about 1/32-inch thick.
2. Cut a strip about 1/2 inch (width) by 12 inches (length).
3. Start at the top and slip the strip between the touchscreen and the CRT. Make sure the strip reaches the bottom of the CRT.
4. Slide the strip from left to right.
5. Check for areas where the CRT and touchscreen may be touching. Make sure the strip moves freely between the two screens.
6. Repeat the process for the other three sides.
   - Insert the strip from right to left, and then slide from top to bottom.
   - Insert the strip from bottom to top, and then slide from left to right.
   - Insert the strip from left to right, and then slide from top to bottom.

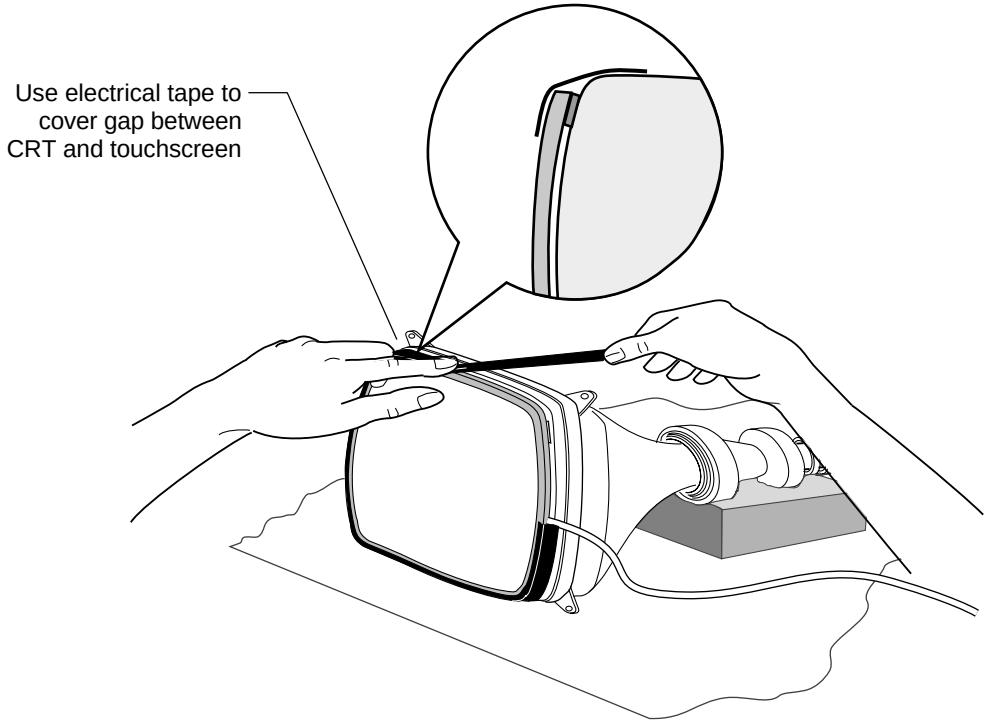
If the touchscreen touches the CRT anywhere, you need remove the touchscreen and build up the tape (or relocate the tape) on the back of the touchscreen. In this case, you need to increase the space between the touchscreen and the CRT.

If the space is greater than 1/8 of an inch, the optical clarity of the monitor may suffer. In this case, you may need a different size touchscreen for your monitor.

Cover the Gap

If the mounted touchscreen passes your inspection, you should cover the gap between the CRT and the touchscreen with electrical tape (or black acetate tape). The tape prevents dust and dirt from accumulating between the touchscreen and the CRT.

- Make sure the tape completely covers the space between the CRT and the touchscreen. Do not leave any gaps or openings.
- Make sure the tape will not be visible once the monitor is reassembled.



If You Need to Remove the Touchscreen

If you successfully mounted the touchscreen and are pleased with your results, skip this section. You do not need to remove the touchscreen.

However, you need to remove the touchscreen if one of the following conditions is true:

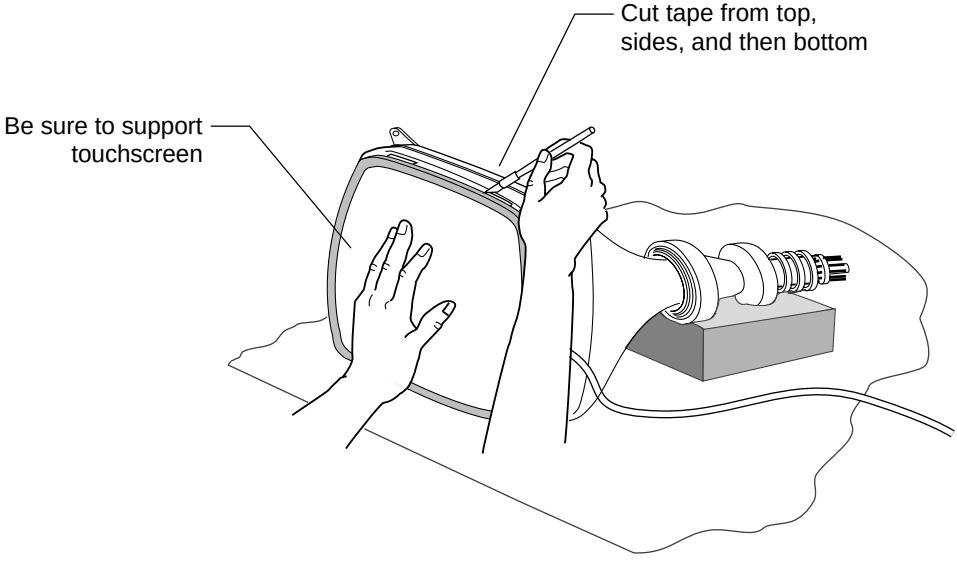
- You installed the touchscreen off-center or crooked.
- There is excessive dirt and lint behind the screen.
- There is not the proper amount of space between the CRT and the touchscreen.

Caution: Do not try to pry the touchscreen off the CRT. You may break the glass and injure yourself or others.

▶ To remove the touchscreen:

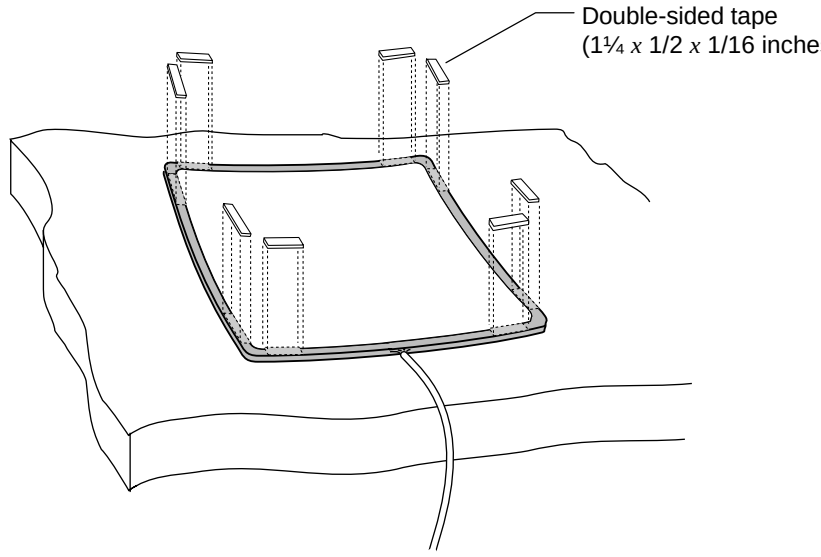
1. Remove the electrical tape, if present, that covers the gap between the CRT and the touchscreen. The tape prevents dust and dirt from accumulating between the touchscreen and the CRT.
2. Dampen the tape adhesive with isopropyl alcohol. It is best to use a Q-Tip or an eye dropper. It is easier to cut the tape if you dampen it first.

3. Use an X-acto knife or a single-edge razor blade to cut through each piece of foam tape.
   - Start at the top of the screen and work down the sides.
   - Be careful not to scratch the CRT or the touchscreen.
   - Be sure to support the touchscreen as it comes away from the CRT.



4. Use isopropyl alcohol to remove the foam tape and adhesive residue from the back of the touchscreen.
5. Get some 1/16-inch thick double-sided foam tape.
6. Cut 8 pieces of tape, 1.25 inches in length.

7. Apply the tape along the back edge of the touchscreen, approximately 1.5 inches from each corner of the screen.



8. Repeat the procedure for attaching the touchscreen to the CRT. Refer to “Mounting the Touchscreen to the CRT” earlier in this chapter for more information.

Adding Space and Support Between the Bezel and CRT

You must insert nylon spacers under each corner of the CRT to keep the bezel away from the touchscreen.

The spacers provide safety clearance for the touchscreen and prevent conductive materials on the bezel from contacting the touchscreen. Do not omit these spacers.

Determine the Space to Add

You need to determine the correct amount of space to add to the bezel. At a minimum, you must add enough space to adjust for the thickness of the touchscreen and the double-sided tape on the back of the touchscreen. The space added between the bezel and the CRT usually ranges from 3/16 to 5/16 of an inch.

Note: If you are installing a resistive touchscreen, you must keep about a 0.05-inch clearance around the entire bezel. If the bezel contacts the touchscreen at any point within its active area, a touch will occur.

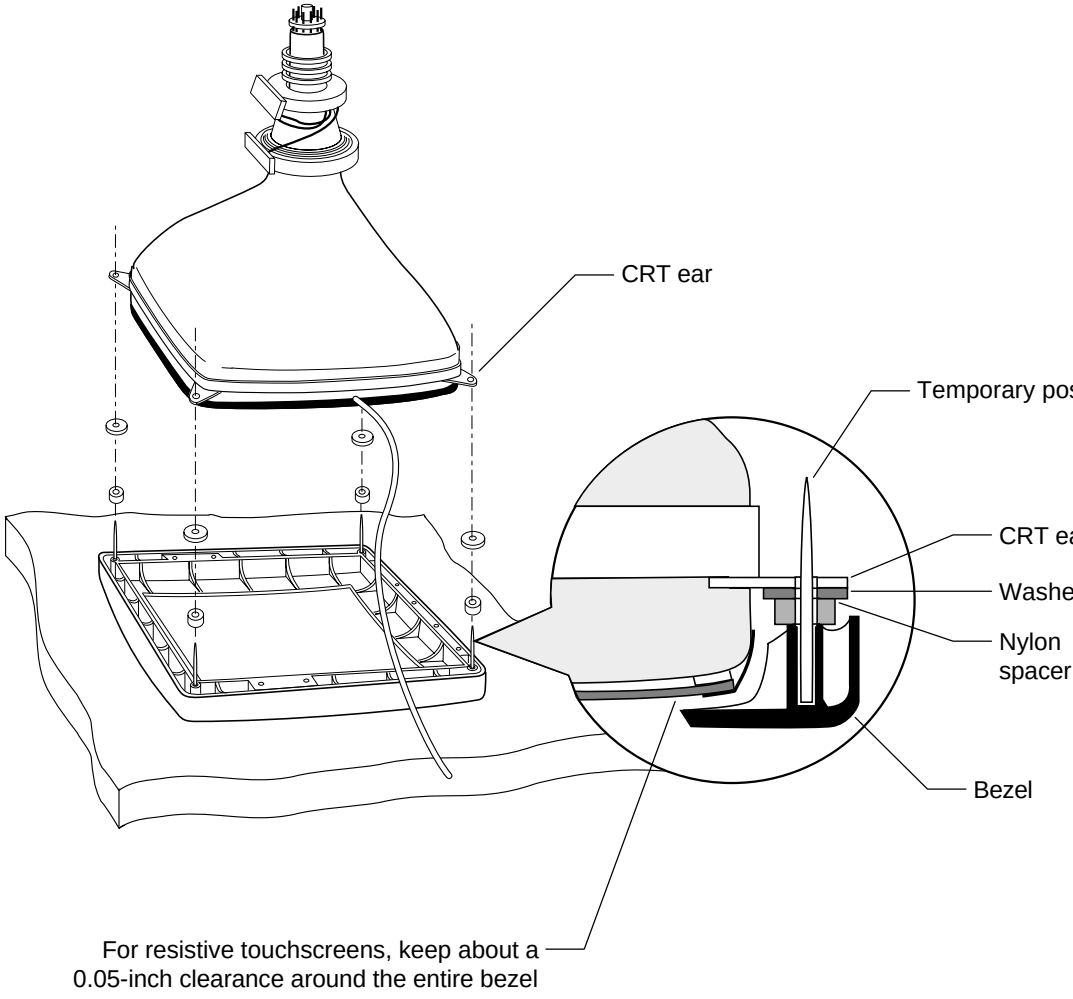
Add Spacers to the Bezel

▶ To add spacers to the bezel:

1. Place the bezel face down on an antistatic pad.
2. Insert a temporary post, such as a cable tie-wrap or toothpick, in each bezel hole. (Use a total of four, one in each corner.)
3. Place one 3/16-inch nylon spacer and then one washer over each temporary post.

   You may need to provide additional spacing and support.

4. Align the CRT ears over the temporary post. Each CRT ear must rest on top of the spacer and washer above the bezel screw hole.



5. Adjust the CRT so that it is centered in the bezel.
6. Add one flat washer on top of each CRT ear.
7. Remove the temporary posts.

8. Select a replacement screw for the factory-installed bezel screws.

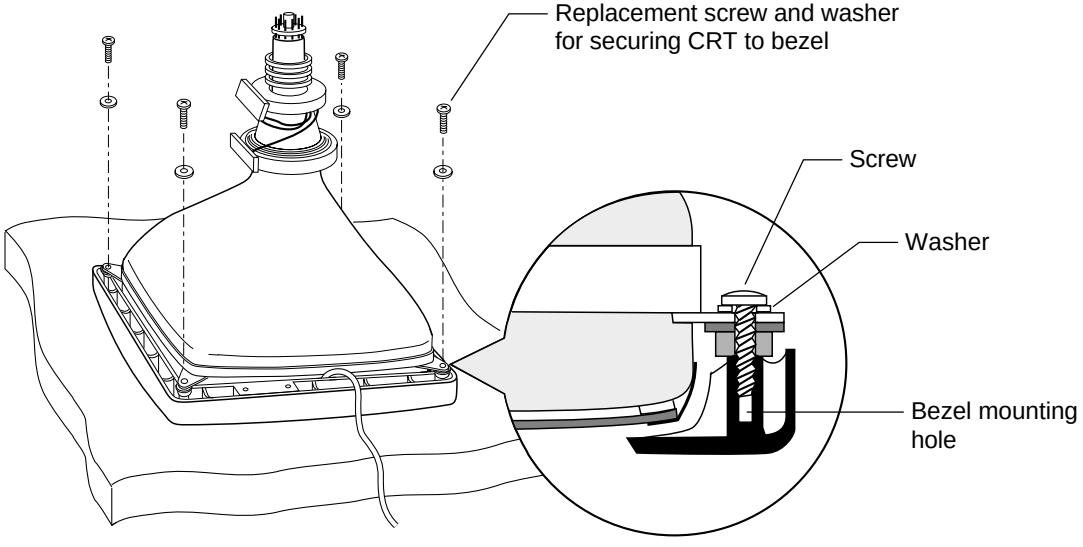
   MicroTouch recommends that you replace the factory CRT screws with longer screws to accommodate the touchscreen thickness and prevent the glass from breaking.

   The replacement screws should be the same type and size as the factory screws, but 3/16-inch to 1/4-inch longer. The size depends on the amount of space you added between the bezel and CRT.

9. Install the replacement screws as follows:
   - Thread the screws into the holes that connect the CRT ears to the bezel.
   - Work diagonally from one corner to the opposite corner.
   - Do not tighten one side all at once.

   You must be able to complete at least three full turns of mating the screw to the original threads.

   If you install the screws correctly, the screws should be seated properly and be a little tighter than finger tight. The screws should not be so tight that they add stress to the CRT. If the bezel starts to warp when you tighten the screws, stop and loosen the screws.



Inspect the Attached CRT and Bezel

Once you attach the CRT and bezel, inspect your results as follows:

- Check the front of the assembly for proper alignment and adjust if necessary.
- Check that each bezel screw is seated properly and a little tighter than finger tight. The screws should not be so tight that they add stress to the CRT. If the bezel is warped, loosen the screws.

  Caution: If the screws are too tight, you may damage the touchscreen, damage the CRT, or bore right through the bezel.

- Adjust the spacers, washers, or screw thickness to get a secure attachment to the bezel without squeezing too tightly. Make sure the bezel ribs and fins do not contact the touchscreen at any point. If necessary, remove the bezel and then trim the ribs and fins. For more information, refer to "Modifying the Monitor Bezel" earlier in this chapter.

Check the Clearance for Resistive Touchscreens

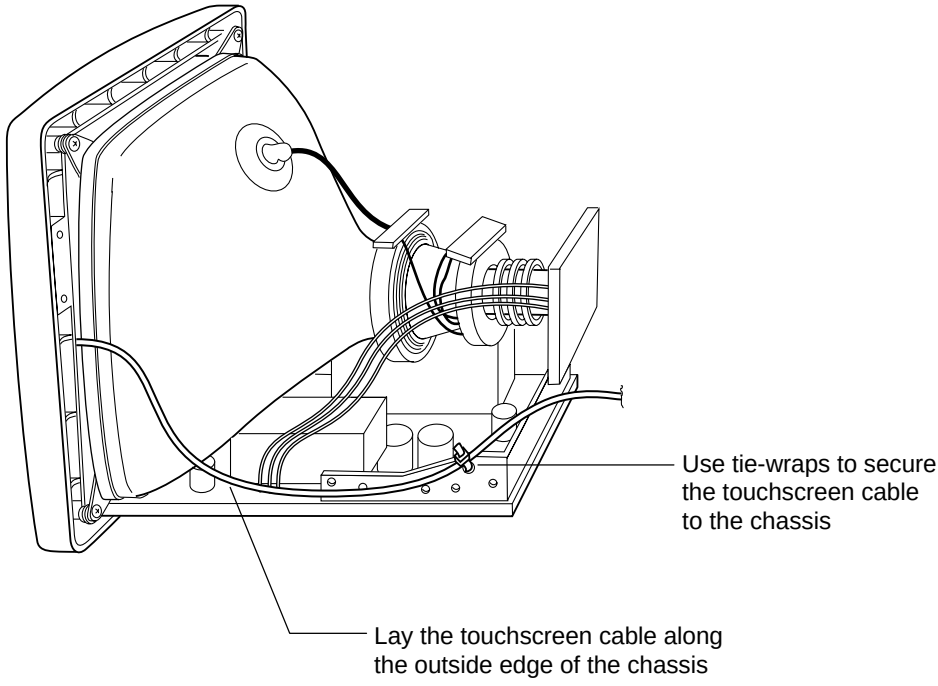
If you installed a resistive touchscreen, there must be approximately a 0.05-inch clearance around the entire bezel. If the bezel contacts the touchscreen at any point within its active area, a touch will occur.

To test for sufficient space, make sure you can freely move a business card along each edge of the bezel. If the bezel contacts the touchscreen at any point, remove the bezel and adjust the spacing.

Reconnecting the Bezel and Chassis

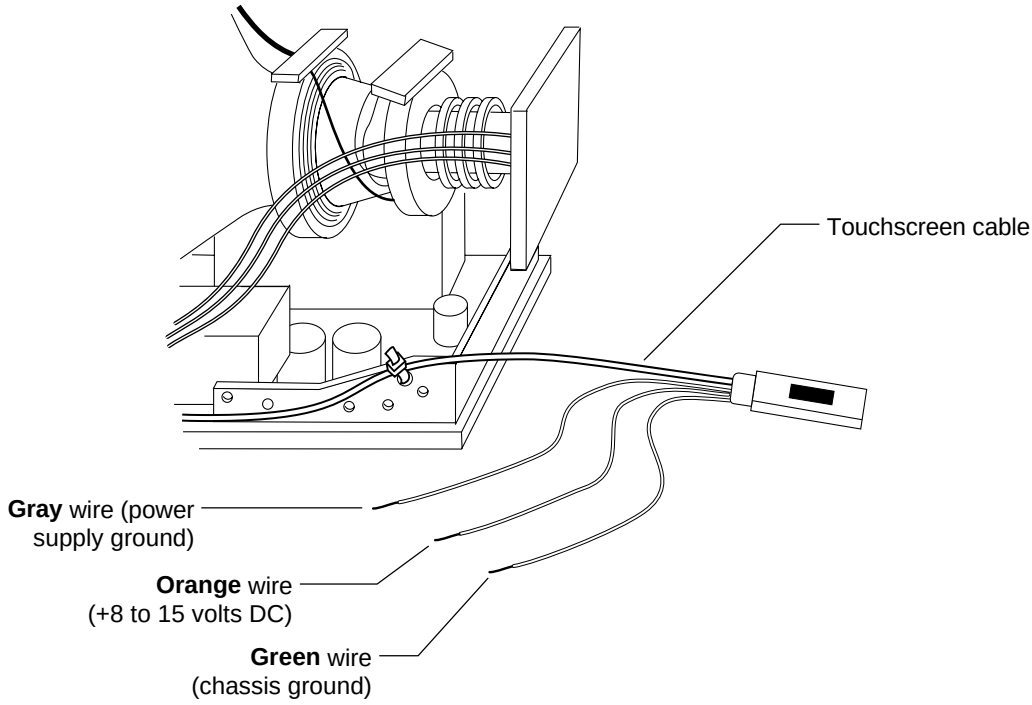
▶ To reconnect the bezel and chassis:

1. Reconnect all wires, cables, and switches.
2. Replace any boards, such as the CRT main and video boards, you removed.
3. Reattach the anode to the CRT by pressing it into place.
4. Lay the touchscreen cable along the outside area of the chassis.
   - Avoid any internal electronics that can affect the performance of the touchscreen.
   - Do not route the touchscreen cable near the horizontal oscillator (coil) or near the high-voltage area of the CRT.
5. Use cable tie-wraps to secure the touchscreen cable to the chassis.



Preparing the Green, Gray, and Orange Wires

The end of the touchscreen cable has a green, a gray, and an orange wire.



When To Use the Green, Gray, and Orange Wires

If you are using a *Serial/SMT-type* controller (for example, Serial/SMT2, Serial/SMT3, and Serial/SMT3R), you must supply power to the controller. You have the following options:

- Tap power from a source inside the monitor. In this case, you use the green, gray, and orange wires to power the controller. Contact MicroTouch Systems for additional information on this procedure.
- Provide power by using an external source, such as a keyboard power tap or a wall-mount power supply. In this case, you need to properly trim and finish the green, gray, and orange wires.

If you are using the *PC Bus* controller or the Macintosh *ADB/SMT* controller, you do not need to supply power to these controllers. The PC Bus controller has built-in power. The ADB/SMT controller receives power from the ADB port. You do, however, need to properly trim and finish the green, gray, and orange wires.

Table 4 summarizes the power options.

Table 4. Power Requirements

Controller Type	Power Option	What To Do with the Green, Gray, and Orange Wires
Serial/SMT	Internal tap from monitor	Use these wires to power the controller. Contact MicroTouch Systems for information.
	External tap (keyboard power tap or wall-mount supply)	Trim and finish the green, gray, and orange wires.
PC Bus	Built-in power	Trim and finish the green, gray, and orange wires.
ADB/SMT	Receives power from the ADB port	Trim and finish the green, gray, and orange wires.

Finishing the Green, Gray, and Orange Wires

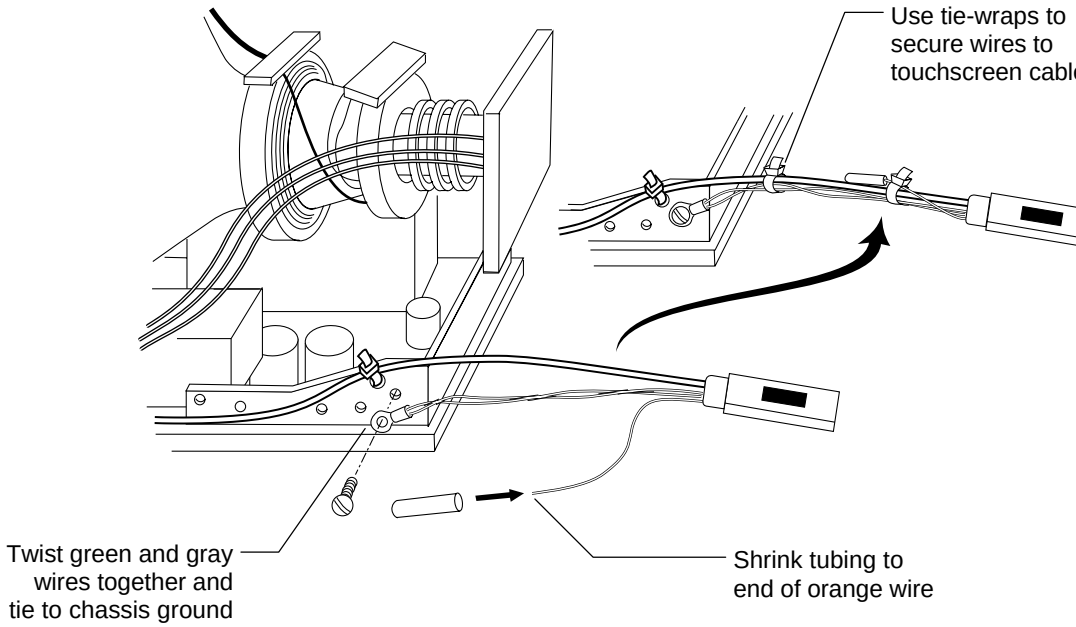
Note: If you have a *Serial/SMT-type* controller and plan to tap power for the controller from a source inside the monitor, **do not** cut and trim the green, gray, and orange wires. You need these wires to tap power for the controller. Contact MicroTouch for more information.

▶ To properly finish the green, gray, and orange wires:

1. Finish the *green* and *gray* wires as follows:
   - Twist the green and gray wires approximately four turns per inch. You can easily twist the wires if you use a power drill.
   - Determine the location of the chassis ground.

- Cut the overall length of the green and gray wires to that point. You must determine the proper length based on your monitor.
- Strip back the insulation on each wire to 3/16 inch.
- Join and twist the ends of the wire.
- Use a crimping tool to attach a ring lug onto the end of the twisted pair. You must determine the proper ring lug size based on your monitor.
- Attach the ring lug to the selected chassis ground.

2. Finish the *orange* wire as follows:
   - Cut the overall length of the orange wire to 2 inches.
   - Cut a piece of 3/32-inch tubing to 1/2 inch.
   - Center the tubing over the end of the orange wire, and then use heat to shrink the tube in place.
3. Use cable tie-wraps to secure the three wires (green, gray, and orange) to the touchscreen cable and prevent them from interfering with other components.



What's Next?

Congratulations! You successfully attached the touchscreen to your monitor.

You are now ready to complete the following tasks:

- Install the touchscreen controller
- Connect the touchscreen cable to its controller
- Replace the monitor cover

Refer to the appropriate chapter for instructions on completing the installation.

Your Touchscreen Controller	Refer To
Serial/SMT for the PC	Chapter 3
PC Bus	Chapter 4
ADB/SMT for the Macintosh	Chapter 5

C H A P T E R 3

Installing the Serial/SMT Controller

This chapter describes how to install the Serial/SMT controller for use with your touchscreen. You may be using the Serial/SMT2, Serial/SMT3, or Serial/SMT3R controller.

This chapter assumes you have already disassembled the monitor and mounted the touchscreen to the front of the CRT. For information on completing these procedures, refer to Chapter 2.

After you attach the touchscreen, return to this chapter for the following information:

- Mounting the Serial/SMT controller to the monitor cover
- Connecting the Serial/SMT controller to the computer
- Providing external power to the Serial/SMT controller

Methods for Supplying Power to the Serial/SMT Controller

As described in Chapter 2, you must supply power to a Serial/SMT-type controller. You can use any of the following methods:

- External power (+5 volts DC) from a keyboard power tap cable
- External power (+5 volts DC) from a wall-mount power supply
- Internal power using +8-15 volts DC (100 mA, 400 mV maximum ripple) power source within the monitor

If you use external power, you must be sure to properly trim and finish the green, gray, and orange wires on the end of the touchscreen cable. Refer to Chapter 2 for more information. Additionally, you need one of the optional power sources listed in Table 5.

If you want to power the controller by tapping a source inside the monitor, you need to use the green, gray, and orange wires. For more information on tapping power, contact MicroTouch.

Table 5. External Power Options for a Serial/SMT Controller

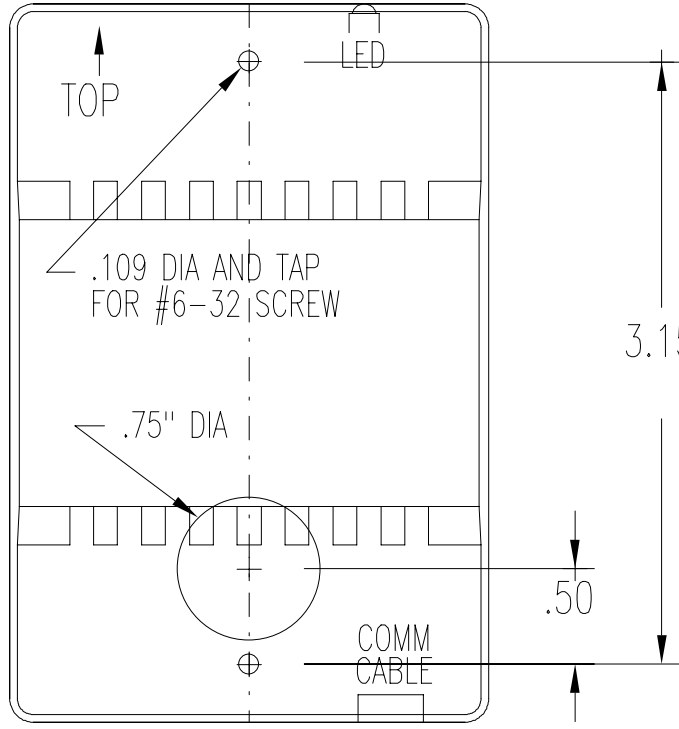
Optional Power Sources	Product Number
Keyboard power tap cable (5-pin) for an IBM AT compatible keyboard	19-356
Keyboard power tap cable (6-pin) for an IBM PS/2 compatible keyboard	19-357
Wall-mount power supply (120 volts)	19-408
Wall-mount power supply (220 volts)	19-409

Drilling Holes in the Monitor Cover

You need to create an opening in the back of the monitor cover for mounting the Serial/SMT controller, which is enclosed in a plastic case.

▶ To drill the holes in the monitor cover for the Serial/SMT controller:

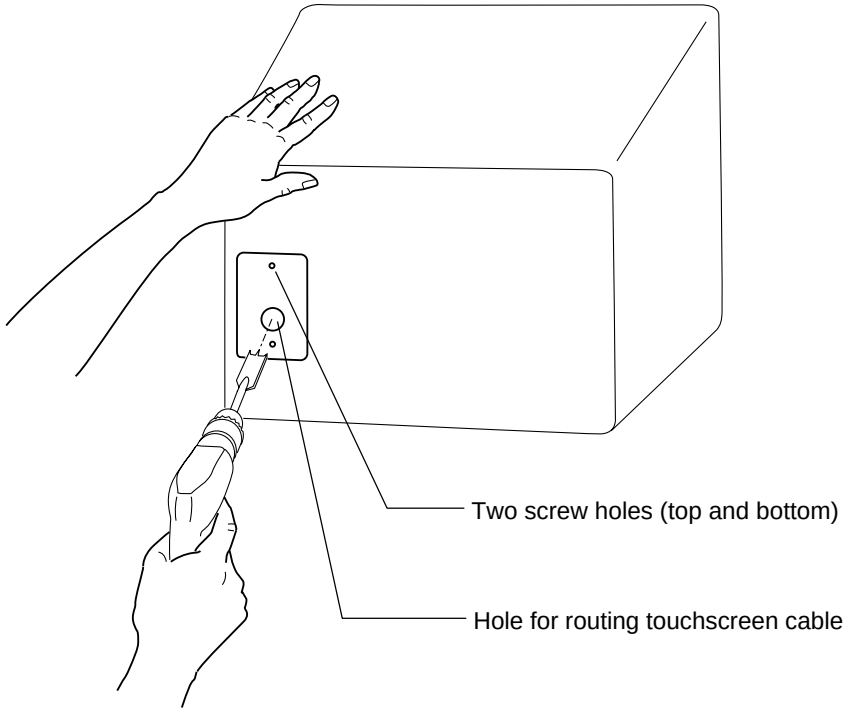
1. Use the following template as a guide when drilling the holes.



2. Select a location for the Serial/SMT controller on the rear of the monitor's cover.
   - The selected location must allow the touchscreen cable to reach the connector on the back of the controller.
   - The selected location should not, if possible, hide the monitor's identification, the monitor's voltage and current requirements, or the DHHS (radiation) information.

3. Use a center punch to place a dimple at the three locations defined on the template.
4. Drill and tap two #6-32 holes. These holes are for the nylon screws that hold the controller case to the monitor cover.

Note: Be careful when tapping these holes. You must use a very slow speed and stop the rotation approximately 1/8 inch before you reach the last threads of the tap. Use the reverse function at a very slow speed to back out the tap.



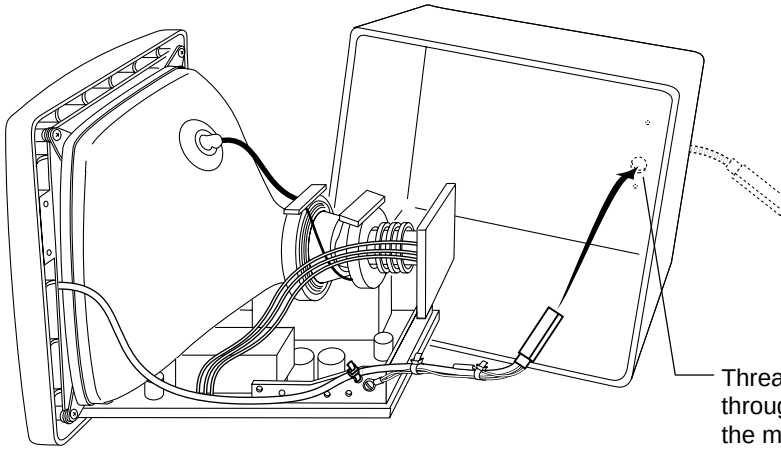
5. Use a 3/4-inch spade bit to drill out a hole for the touchscreen cable.

Reassembling the CRT and Monitor Cover

Once you drill the holes in the monitor cover for the touchscreen cable and controller, you are ready to reassemble the monitor.

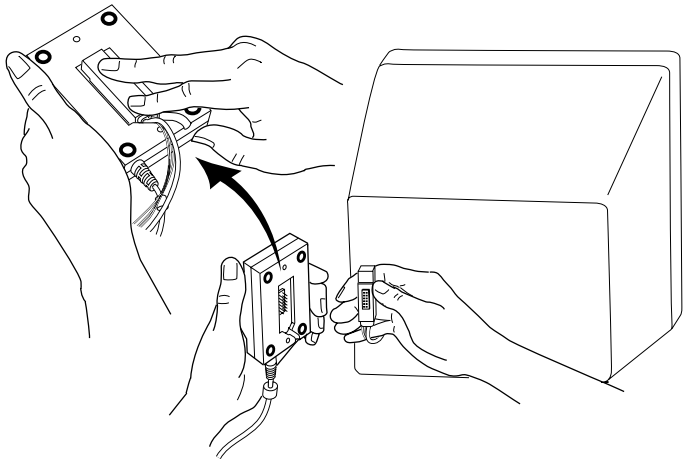
▶ To reassemble the CRT and monitor cover:

1. Check the CRT mounting for proper adjustment. Make sure all wires are properly attached, including the touchscreen's green wire to the chassis ground.
2. Check for video and power cables that originate inside the monitor. If these cables exist, be sure to thread them through the appropriate opening in the monitor cover.
3. Align the monitor cover for reattachment to the chassis and thread the touchscreen cable through the hole.



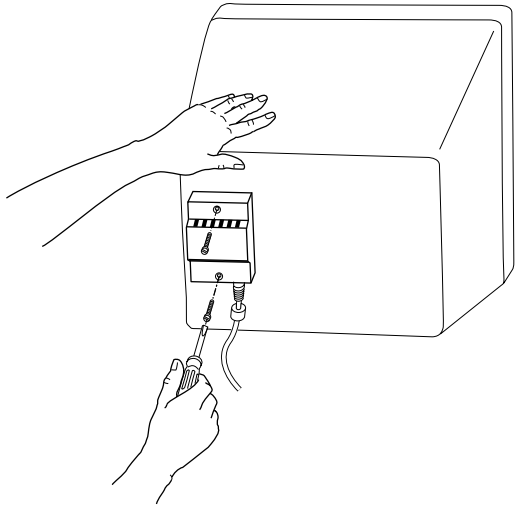
4. Remount the cover to the chassis assembly.
5. Attach the housing screws and knobs you removed when you disassembled the monitor.

6. Plug the touchscreen cable into the back of the controller, and then thread the cable through the recessed channel on the rear side of the controller. The channel reduces strain on the cable.



7. Align the controller over the two mounting holes you drilled in the monitor cover.
8. Use two nylon screws to attach the controller to the monitor.

Note: Do not tighten the screws beyond the "just tight" position. Nylon threads strip easily.

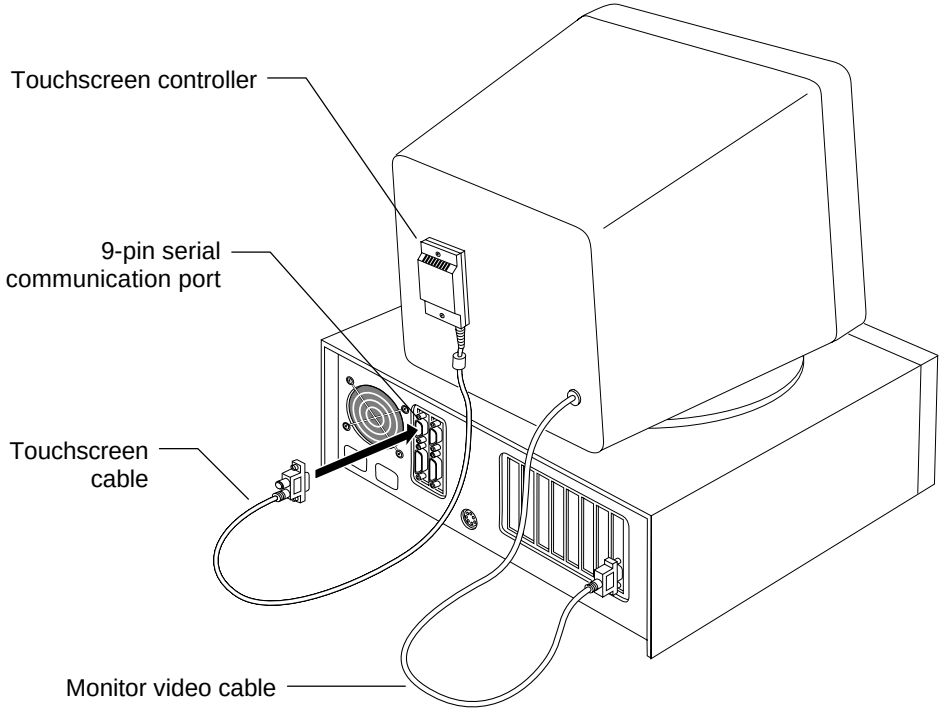


Connecting the Serial/SMT Touchscreen Cable

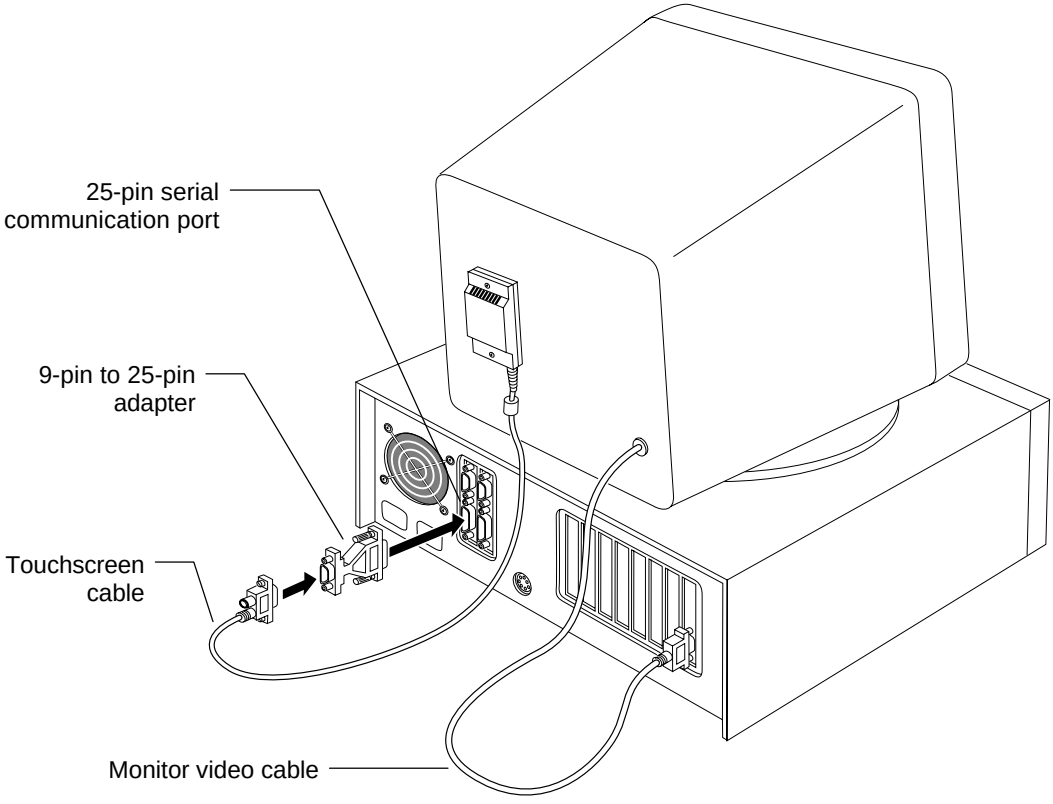
The 9-pin connector on the end of the Serial/SMT touchscreen cable attaches to a serial communication port on your computer.

▶ To connect the Serial/SMT touchscreen cable to your computer:

1. Turn off your computer. You should always turn off your computer before connecting or disconnecting a device.
2. Look at the back of your computer and locate an available serial communication (COM) port. Communication ports can be 9-pin or 25-pin *male connectors*. If you have questions about the COM ports, refer to your computer hardware documentation.
3. Connect the touchscreen cable to a serial communication (COM) port on the back of your computer.
   - If the serial port has a 9-pin connector, connect the touchscreen cable directly to the port.



- If the serial port has a 25-pin connector, attach a 9-pin to 25-pin adapter to the end of the touchscreen cable, and then attach the touchscreen cable to the port.



4. Tighten the two screws holding the cable to the port.
5. Connect the video cable from the monitor to the video controller in your computer.
6. Attach the power cables to your monitor and your computer (if necessary). Plug each power cable into a grounded power outlet.

Supplying External Power to the Serial/SMT Controller

As described earlier in this document, you must supply power to a Serial/SMT controller. You can use internal power **or** external power.

To supply external power to a Serial/SMT controller, you can use either a keyboard power tap cable or a wall-mount power supply. Refer to Table 5 for a list of products and part numbers.

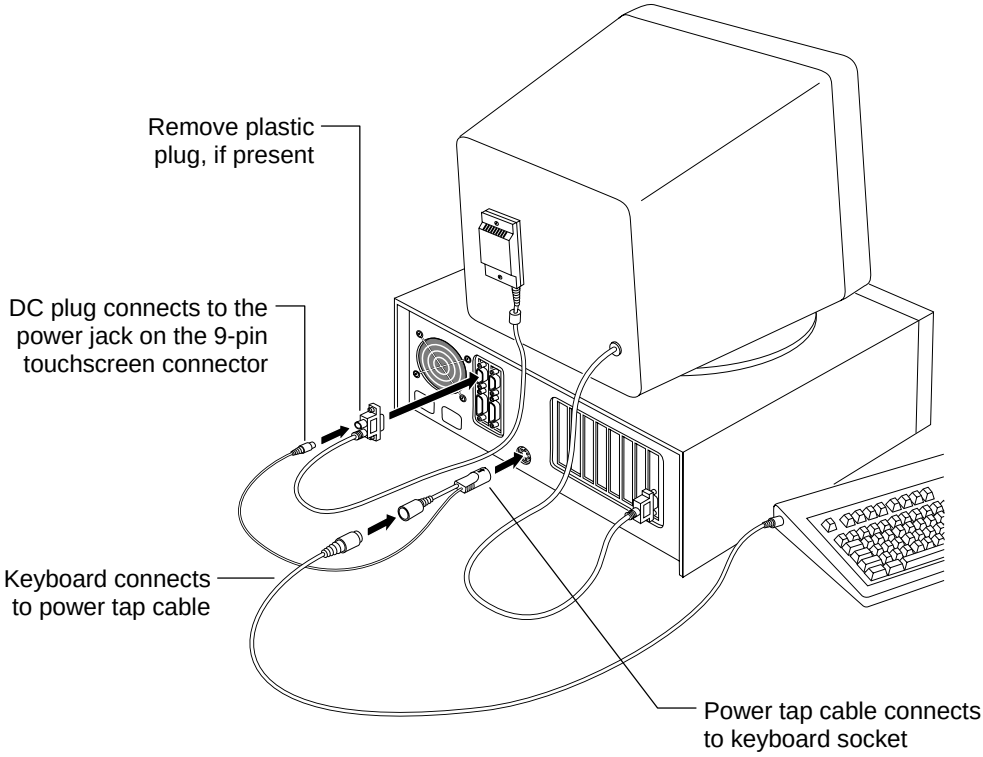
You can also provide power to the controller by tapping power from a source inside the monitor. If you are using this method, skip this section. Do not apply additional external power.

Caution: Do not supply both internal power and external power to the controller. Excess power will damage the controller.

Using a Keyboard Power Tap Cable

▶ To connect a keyboard power tap cable:

1. Disconnect the keyboard cable from the back of your computer.
2. Plug the keyboard cable into the power tap cable.

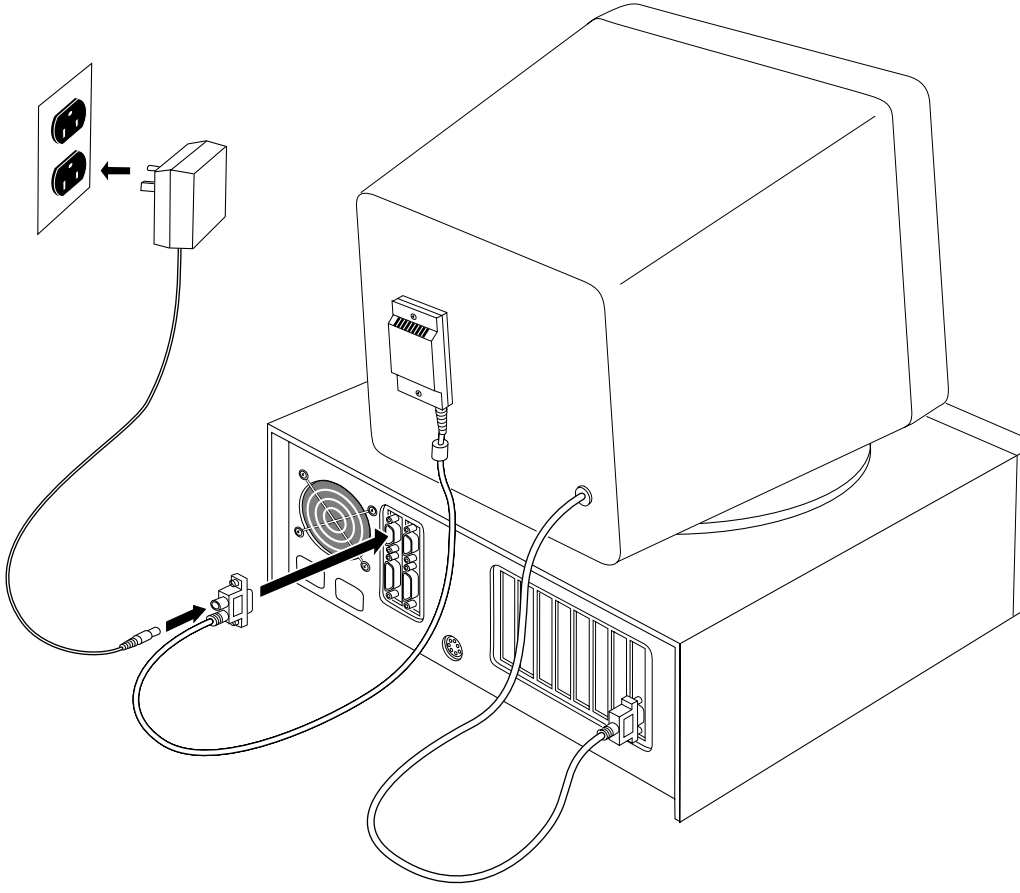


3. Plug the power tap cable into the keyboard socket on the back of your computer.
4. Look at the connector on the touchscreen cable. If necessary, remove the plastic plug covering the power jack.
5. Connect the DC plug from the power tap cable to the jack on the touchscreen cable.

Using an External Wall-Mount Power Supply

▶ To connect an external wall-mount power supply:

1. Look at the connector on the touchscreen cable. If necessary, remove the plastic plug covering the power jack.
2. Connect a DC power plug to the power jack built into the connector on the touchscreen cable.
3. Plug the power supply into a grounded outlet.



Turning On Your System

Before you turn on your system, make sure all cables are connected properly. Be sure to tighten all cable screws.

▶ To start up your system:

1. Turn on your monitor and computer.
2. Adjust the contrast and brightness to suit your personal preference and working environment.
3. Make sure the video image is centered within the screen area. Adjust the horizontal and vertical controls on the monitor, if necessary.

The SMT controller has a light-emitting diode (LED) that provides the status of the touchscreen unit. If the status light is bright, power has been applied and the controller is operating properly. You are now ready to install the touchscreen software and test the installation.

What's Next?

Congratulations! You successfully installed the Serial/SMT controller and connected the touchscreen to your computer. You are now ready to complete the following tasks:

- Install TouchWare, the software for your touchscreen
- Calibrate the touchscreen

Installing and Using TouchWare

TouchWare includes the software driver that lets your touchscreen work with your computer. MicroTouch has touchscreen drivers for many operating systems, including Windows 95, Windows 3.1*x*, MS-DOS, Windows NT, and OS/2. You must be sure to install the touchscreen software for your operating system.

TouchWare also includes a control panel for setting your touchscreen preferences and a diagnostic utility.

If you are experiencing problems with the touchscreen, you can use the Microcal Diagnostic utility to locate the touchscreen controller and test the touchscreen.

For more information on installing and using the Touchscreen control panel and Microcal, refer to the *TouchWare User's Guide*.

Calibrating the Touchscreen

Calibration aligns the touchscreen with the underlying video. Specifically, calibration defines the dimensions of the image area of the touchscreen, determines the edges of the screen's image, and locates the center of the touchscreen. You must calibrate the touchscreen and test the calibration to ensure the successful operation of the touchscreen.

For Serial/SMT2 and Serial/SMT3 controllers (capacitive touchscreens), MicroTouch performs a 25-point calibration at the factory and stores the calibration data in the cable non-volatile memory (NOVRAM). You only need to perform a 2-point calibration. You can use either the Touchscreen control panel or the Microcal Diagnostic utility to calibrate the touchscreen.

For Serial/SMT3R controllers (resistive touchscreens), the cable does not have a NOVRAM. Therefore, you must first perform a 25-point calibration to define the active area of the touchscreen.

C H A P T E R 4

Installing the PC Bus Controller

This chapter describes how to install the PC Bus controller for use with your touchscreen. It assumes you have already disassembled the monitor and mounted the touchscreen to the front of the CRT. For information on completing these procedures, refer to Chapter 2.

After you attach the touchscreen, return to this chapter for the following information:

- Connecting the extension cable
- Reassembling the monitor
- Installing the PC Bus controller
- Connecting the touchscreen cable to the PC Bus controller

Before You Install the PC Bus Controller

The PC Bus controller is an internal serial controller. It includes a serial port, and therefore adds a serial port to the system.

To use the PC Bus controller for a MicroTouch touchscreen:

- You must have an industry-standard PC with a video card for the monitor already installed.
- Your computer must have an available 16-bit ISA (Industry Standard Architecture) expansion slot for the PC Bus controller.
- Your computer must have a *unique* COM port number and interrupt request (IRQ) available to assign to the PC Bus controller. The touchscreen controller cannot share an IRQ with another device.

You first need to install the PC Bus controller into your computer. You then attach the touchscreen cable to the connector on the PC Bus controller.

Supplying Power to the PC Bus Controller

The PC Bus controller has built-in power. There is no separate power supply or power cable needed.

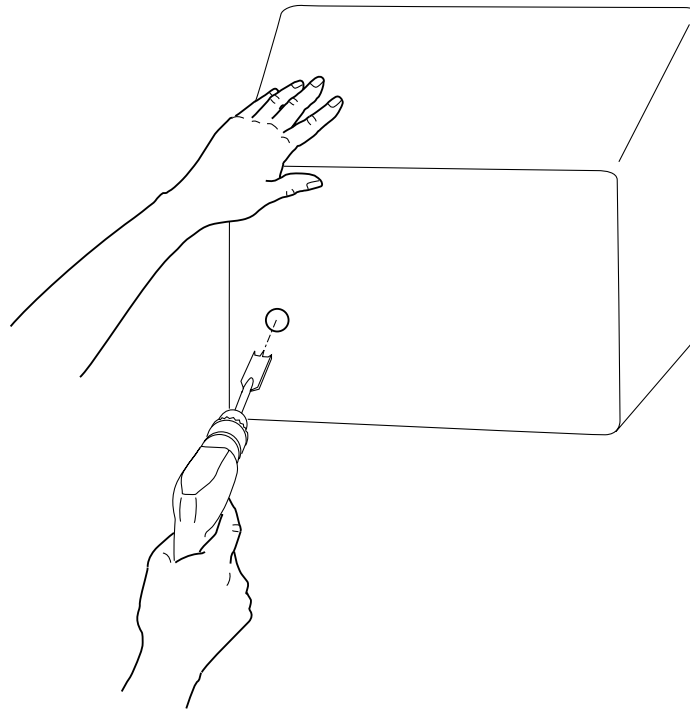
As described in Chapter 2, the touchscreen cable has a green, a gray, and an orange wire. MicroTouch uses these wires to supply power to a Serial/SMT controller. If you are using the PC Bus controller, you do not need the green, gray, and orange wires to supply power. You must, however, properly finish each wire. If you did not properly finish the green, gray, and orange wire, refer to Chapter 2 for complete instructions.

Drilling a Hole for the PC Bus Cable

Before you replace the monitor cover, you must create an opening for the touchscreen cable. You need to drill a hole that is 3/4 inches in diameter.

▶ To modify the monitor cover for the touchscreen cable:

1. Select a location on the rear of the monitor's cover for the touchscreen cable. You need to be able to thread the cable from inside the monitor out through the opening.
2. Use a center punch to place a dimple at the selected location.
3. Drill a hole using a 3/4-inch spade bit.



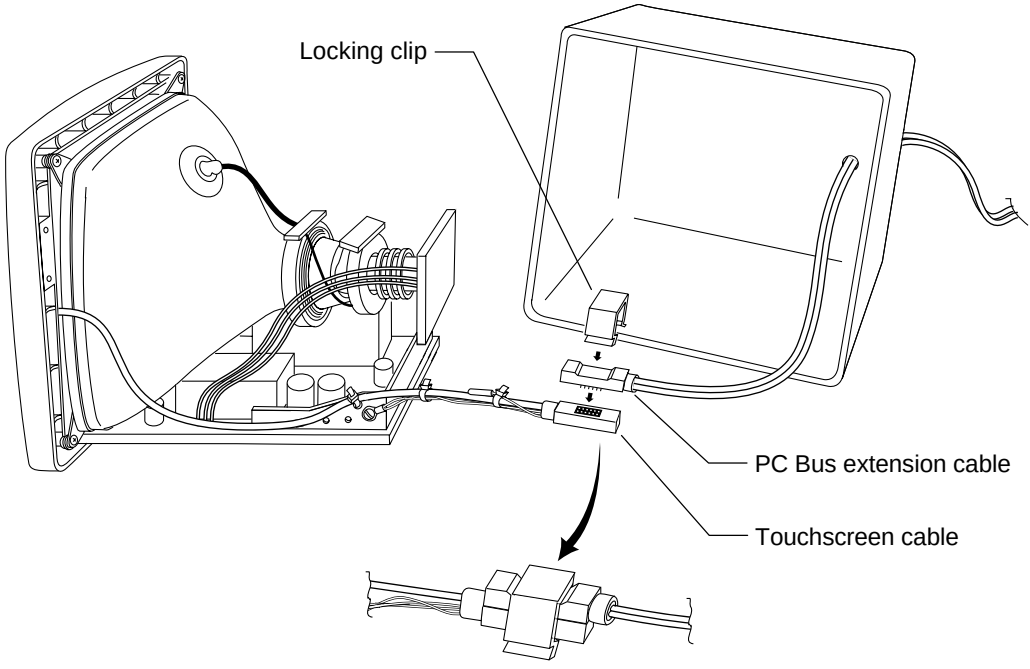
Threading the Touchscreen Extension Cable

To complete the following procedure, you need the touchscreen extension cable and locking clip supplied in the installation kit.

The touchscreen extension cable is available in several lengths. The end with the 12-pin connector attaches to the touchscreen cable inside the monitor. The end with the D connector attaches to the port on the PC Bus touchscreen controller.

▶ To connect the touchscreen cable to the extension cable:

1. Position the CRT so you can easily access the touchscreen cable.
2. Position the monitor cover at the back of the CRT.
3. Get the touchscreen extension cable supplied in the installation kit. Thread the 12-pin connector on this extension cable through to the inside of the housing.



4. Connect the extension cable to the touchscreen cable.

   Be sure you orient and connect the cable properly. It is possible to connect the cable backwards.

5. Get the locking clip supplied in the installation kit. Install the locking clip to secure the connection.

Remounting the Monitor Cover

▶ To remount the monitor cover:

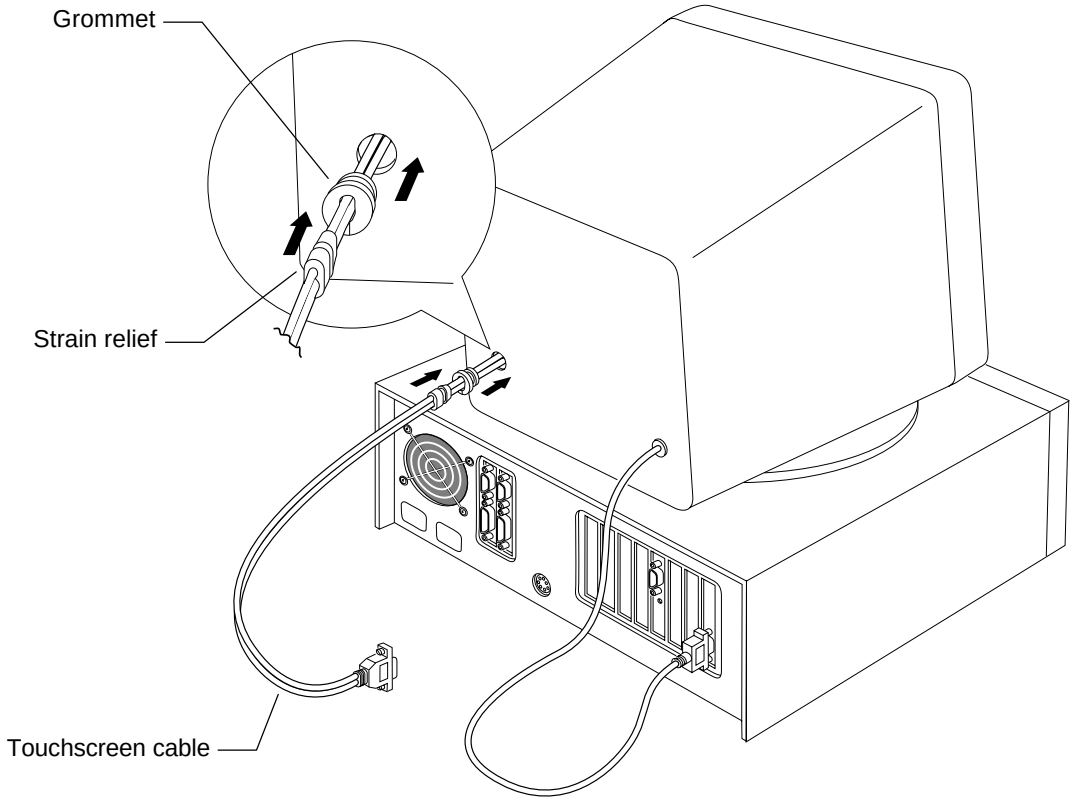
1. Check the CRT mounting for proper adjustment. Make sure all ground wires are properly attached, including the touchscreen's green wire to the chassis ground.
2. Check for video and power cables that originate inside the monitor. If these cables exist, be sure to thread them through the appropriate opening in the monitor cover.
3. Remount the cover to the chassis assembly.
4. Attach the screws and knobs set aside during disassembly.

Installing the Cable Grommet

The PC Bus installation kit also includes a grommet. You place this grommet around the extension cable. The grommet seals the opening between the cable and the monitor cover.

▶ To install the grommet:

1. Get the grommet supplied in the installation kit.
2. Attach the grommet around the extension cable. Be sure to position the grommet between the monitor and the strain relief on the extension cable.



3. Carefully tuck the grommet into the mounting hole using a blunt tool.

Setting the Jumpers on the PC Bus Controller

The PC Bus controller communicates with the computer through an asynchronous serial port on the controller. Every serial device in your PC must use a unique serial communication (COM) port and a unique interrupt request (IRQ).

The PC Bus controller uses the following default settings:

- Communication Port: COM3
- Interrupt Request: IRQ4

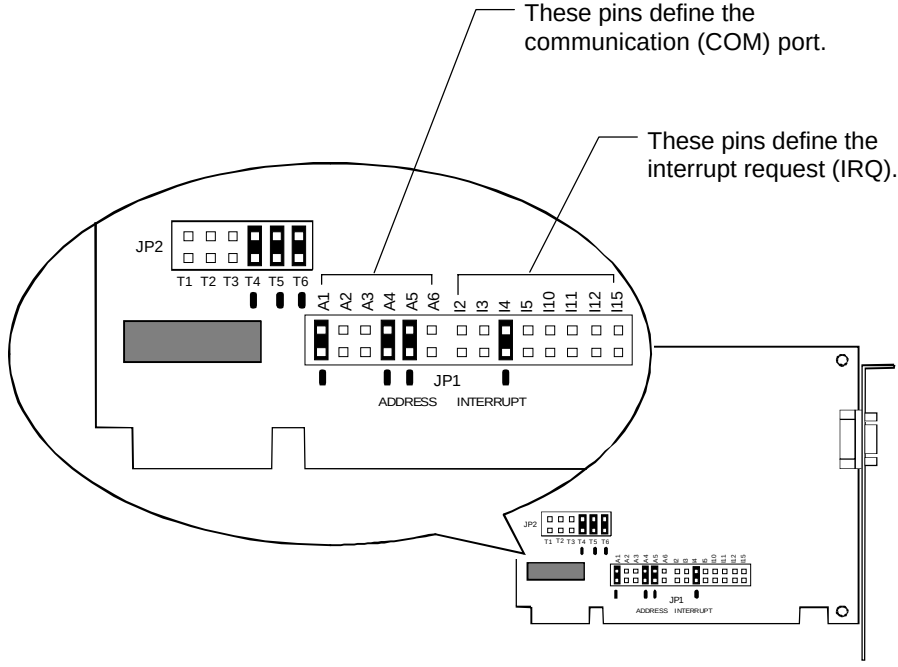
By default, most PC configurations use IRQ4 for COM1 or COM3. If your mouse is already using COM1/IRQ4, you need to change the default IRQ for the PC Bus controller. To use different settings, change the jumpers *before* you install the PC Bus controller into your computer.

Handling the PC Bus Controller

The PC Bus controller is a printed circuit board. Static electricity can damage the controller. Before handling the controller, discharge static electricity from your body by touching bare, grounded metal. While handling the controller, do not walk across carpeting and do not touch materials (plastic, vinyl, Styrofoam) that create static electricity.

Locating the Jumpers

Take a moment to locate the jumpers that define the communication settings for the PC Bus controller.



Setting the Communication Port

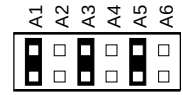
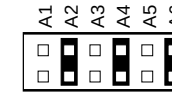
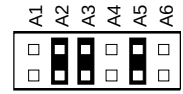
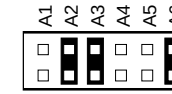
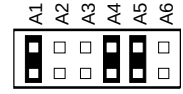
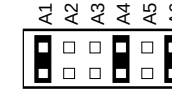
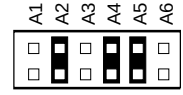
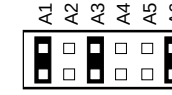
The pins labeled A1 – A6 on JP1 define the serial communication (COM) port for the PC Bus controller.

- Valid ports are COM1 through COM8. Refer to Table 6.
- The default is COM3.

In most PC configurations, the mouse uses COM1. However, if you are using a touchscreen and a mouse, both devices cannot use the same COM port. You must be sure there are no device conflicts.

Note: The PC Bus controller does support COM8. However, most PCs reserve COM8 for a diskette drive. Additionally, the Microcal Diagnostic utility only searches for the touchscreen on COM1 through COM7. Therefore, if you choose COM8, you cannot use Microcal to test the operation of the touchscreen.

Table 6. Setting the Communication Port (JP1)

COM Port (I/O Address)	Jumper Settings	COM Port (I/O Address)	Jumper Settings
COM1 (3F8 – 3FF)		COM5 (2E0 – 2E7)	
COM2 (2F8 – 2FF)		COM6 (2F0 – 2F7)	
COM3* (3E8 – 3EF)		COM7 (3E0 – 3E7)	
COM4 (2E8 – 2EF)		COM8 (3F0 – 3F7)	

* Default

Setting the Interrupt Request

The pins labeled I2 – I15 on JP1 define the interrupt request (IRQ) for the PC Bus touchscreen controller.

- Valid IRQs are 2, 3, 4, 5, 10, 11, 12, and 15. Refer to Table 7.
- The default is IRQ4.

You can use any IRQ for the PC Bus controller as long as another device in your system configuration is not using the same IRQ. The PC Bus controller cannot share an IRQ with another device.

Predefined IRQs

As outlined in Table 7, some IRQs have predefined uses. For example, most PC configurations use IRQs as follows:

- Use IRQ2 for the second Programmable Interrupt Controller (PIC)
- Use IRQ3 for either COM2 or COM4
- Use IRQ4 for either COM1 or COM3
- Use IRQ5 for the second parallel port (LPT2)

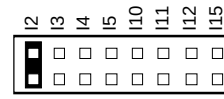
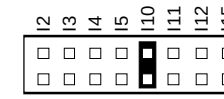
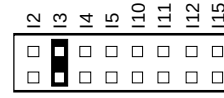
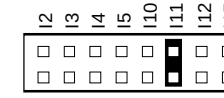
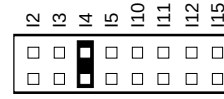
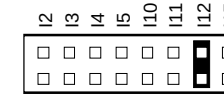
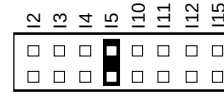
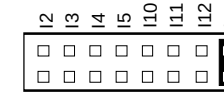
Additionally, some PC configurations may be using IRQ10 – IRQ15 for a modem or a primary/secondary IDE controller (for example, a hard disk controller). You must know the resources that your system devices use.

Preventing Device Conflicts

By default, the PC Bus controller uses COM3/IRQ4. If your system is already using COM1/IRQ4 for an existing device, be sure to change the IRQ that the PC Bus controller will use. The PC Bus controller must use a unique IRQ and cannot share an IRQ with another device.

For example, a mouse typically uses COM1/IRQ4. If you are using a mouse with the touchscreen, the mouse and the controller cannot both use IRQ4. If both devices use the same IRQ, a hardware conflict will result. The mouse or the touchscreen will not work.

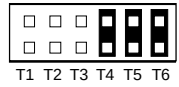
Table 7. Setting the Interrupt Request (JP1)

Interrupt	Jumper Settings	Interrupt	Jumper Settings
IRQ2 (9) (PIC)		IRQ10	
IRQ3 (COM2, COM4)		IRQ11	
IRQ4* (COM1, COM3)		IRQ12	
IRQ5 (LPT2)		IRQ15	

* Default

Setting the JP2 Jumper for Proper Operation

Look at the T1 – T6 pins on the JP2 jumper:



MicroTouch configures each controller at the factory with a jumper on the T4 pin, the T5 pin, and the T6 pin.

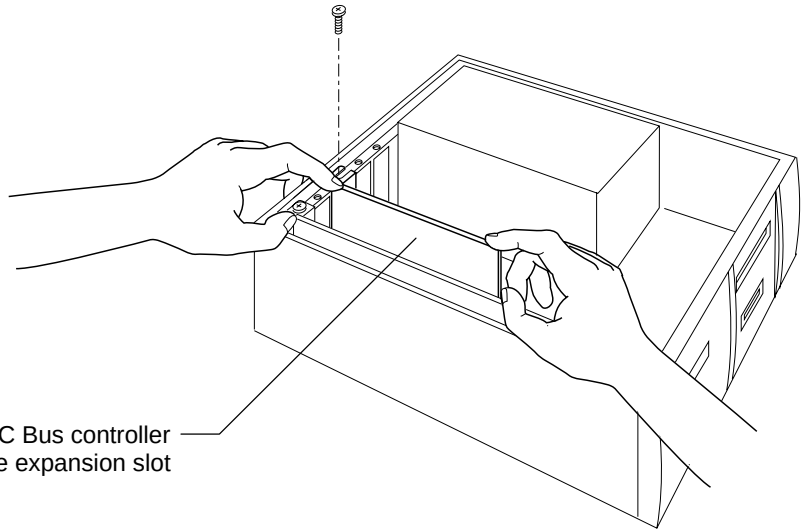
- A jumper must be on the T4 pin and the T5 pin for the PC Bus controller to work properly.
- The jumper on the T6 pin is a spare jumper and does not affect controller operation.

Warning: Placing a jumper on the T1 pin, the T2 pin, or the T3 pin will prevent the PC Bus touchscreen controller from working.

Installing the PC Bus Controller

Once you verify the jumper settings, you are ready to install the PC Bus controller into your computer. Your computer must have an available 16-bit ISA expansion slot to support the PC Bus controller.

1. Turn off your computer. You should always turn off your computer before connecting or disconnecting a device.
2. Follow the manufacturer's instructions for opening the system unit.
3. Select the 16-bit ISA expansion slot you want to use.
4. Remove the screw securing the slot cover, set the screw aside, and remove the slot cover.
5. Position the PC Bus controller over the expansion slot and carefully press the controller into the slot. Some force is required to overcome the initial resistance. The controller should fit snugly.



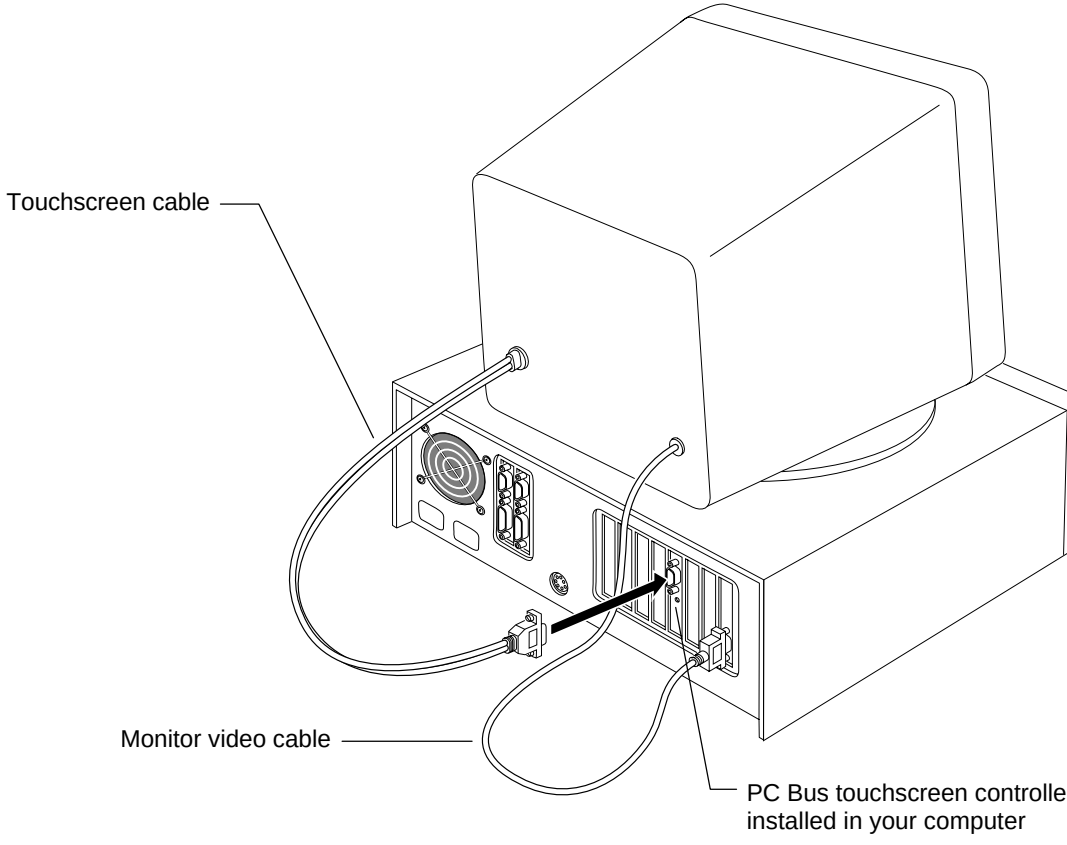
6. Align the controller's metal bracket with the screw hole on top of the system unit. Replace the screw.
7. Replace the unit cover.

Connecting the Touchscreen and Monitor

After you install the PC Bus controller into your computer, you can connect the touchscreen and the monitor to your computer.

▶ To connect the touchscreen and monitor:

1. Connect the touchscreen cable to the 9-pin connector on the PC Bus controller.
2. Tighten the two screws holding the cable to the port.
3. Connect the video cable between the monitor and the computer, and then tighten the screws.
4. Attach the power cables to your monitor and your computer (if necessary). Plug each power cable into a grounded power outlet.



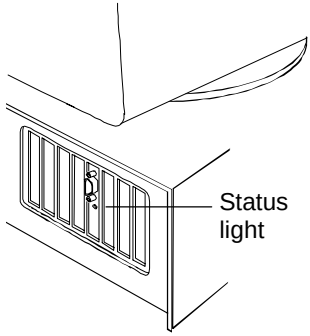
Turning On Your System

Before you turn on your system, make sure all cables are connected properly. Be sure to tighten all cable screws.

▶ To start up your system:

1. Turn on your monitor, and then turn on your computer.
2. Adjust the contrast and brightness to suit your personal preference and working environment.
3. Make sure the video image is centered within the screen area. Use the horizontal and vertical controls to adjust the video, if necessary.

Look at the status light on the PC Bus controller.



- If the status light is on, the controller is receiving power and operating properly. You can now install TouchWare, the software for your touchscreen.
- If the status light is blinking, the controller's internal self-test failed. There may be a problem with the controller hardware. Contact MicroTouch Technical Support for more information.

What's Next?

Congratulations! You successfully installed the PC Bus controller and connected the touchscreen to your computer. You are now ready to complete the following tasks:

- Install TouchWare, the software for your touchscreen
- Calibrate the touchscreen

Installing and Using TouchWare

TouchWare includes the software driver that lets your touchscreen work with your computer. MicroTouch has touchscreen drivers for many operating systems, including Windows 95, Windows 3.1*x*, MS-DOS, Windows NT, and OS/2. You must be sure to install the touchscreen software for your operating system.

TouchWare also includes a control panel for setting your touchscreen preferences and a diagnostic utility.

If you are experiencing problems with the touchscreen, you can use the Microcal Diagnostic utility to locate the touchscreen controller and test the touchscreen.

For more information on installing and using the Touchscreen control panel and Microcal, refer to the *TouchWare User's Guide*.

Calibrating the Touchscreen

Calibration aligns the touchscreen with the underlying video. Specifically, calibration defines the dimensions of the image area of the touchscreen, determines the edges of the screen's image, and locates the center of the touchscreen. You must calibrate the touchscreen and test the calibration to ensure the successful operation of the touchscreen.

For PC Bus controllers, MicroTouch performs a 25-point calibration at the factory and stores the calibration data in the cable non-volatile memory (NOVRAM). You only need to perform a 2-point calibration. You can use either the Touchscreen control panel or the Microcal Diagnostic utility to calibrate the touchscreen.

C H A P T E R 5

Installing the ADB/SMT Controller

This chapter describes how to install the ADB/SMT controller for use with a touchscreen on a Macintosh. It assumes you have already disassembled the monitor and mounted the touchscreen to the front of the CRT. For information on completing these procedures, refer to Chapter 2.

After you attach the touchscreen, return to this chapter for the following information:

- Mounting the ADB/SMT controller to the monitor
- Reassembling the monitor
- Connecting the touchscreen cable to your Macintosh

Supplying Power to the ADB/SMT Controller

The ADB/SMT controller plugs into an Apple Desktop Bus (ADB) port on the Macintosh.

The controller receives power directly from the ADB port. There is no separate power supply or power cable needed.

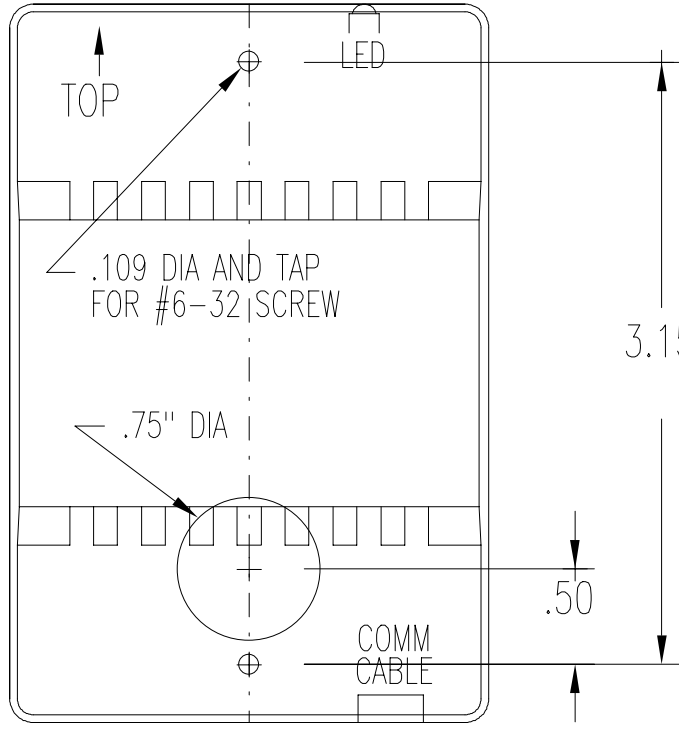
As described in Chapter 2, the touchscreen cable has a green, a gray, and an orange wire. MicroTouch uses these wires to supply power to a Serial/SMT controller. If you are using an ADB/SMT controller, you do not need the green, gray, and orange wires to supply power. You must, however, properly finish each wire. If you did not properly finish the green, gray, and orange wire, refer to Chapter 2 for complete instructions.

Drilling Holes in the Monitor Cover

You need to create an opening in the back of the monitor cover for mounting the ADB/SMT controller, which is enclosed in a plastic case.

▶ To drill the holes in the monitor cover for the ADB/SMT controller:

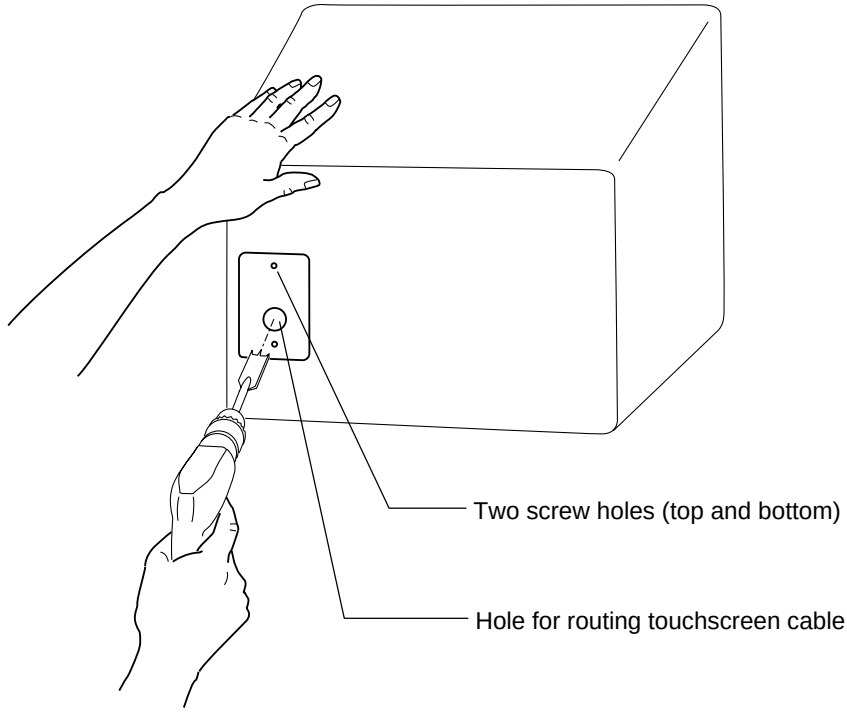
1. Use the following template as a guide when drilling the holes.



2. Select a location for the ADB/SMT controller on the rear of the monitor's cover.
   - The selected location must allow the touchscreen cable to reach the connector on the back of the controller.
   - The selected location should not, if possible, hide the monitor's identification, the monitor's voltage and current requirements, or the DHHS (radiation) information.

3. Use a center punch to place a dimple at the three locations defined on the template.
4. Drill and tap two #6-32 holes. These holes are for the nylon screws that hold the controller case to the monitor cover.

Note: Be careful when tapping these holes. You must use a very slow speed and stop the rotation approximately 1/8 inch before you reach the last threads of the tap. Use the reverse function at a very slow speed to back out the tap.



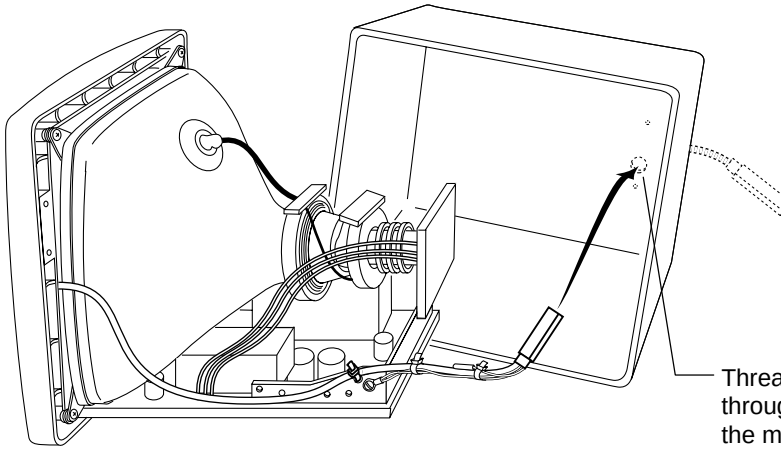
5. Use a 3/4-inch spade bit to drill out a hole for the touchscreen cable.

Reassembling the CRT and Monitor Cover

Once you drill the holes in the monitor cover for the touchscreen cable and controller, you are ready to reassemble the monitor.

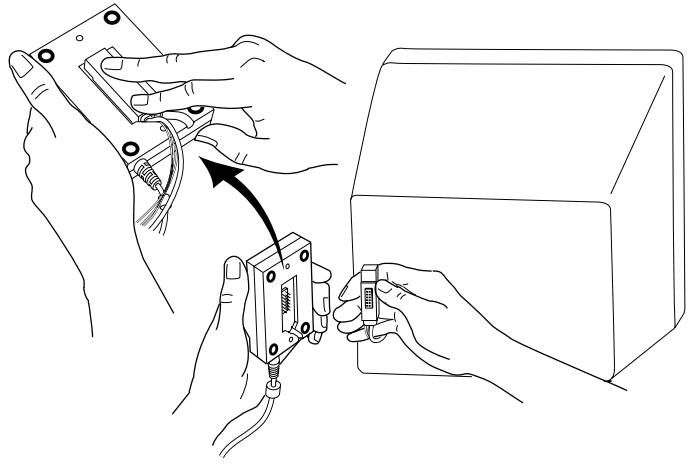
▶ To reassemble the CRT and monitor cover:

1. Check the CRT mounting for proper adjustment. Make sure all wires are properly attached, including the touchscreen green wire to the chassis ground.
2. Check for video and power cables that originate inside the monitor. If these cables exist, be sure to thread them through the appropriate opening in the monitor cover.
3. Align the monitor cover for reattachment to the chassis and thread the touchscreen cable through the hole.



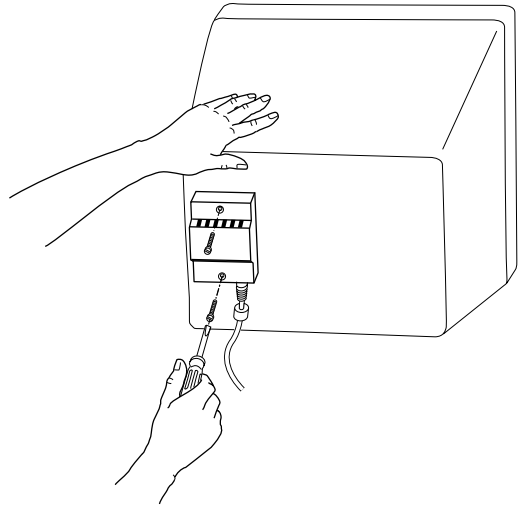
4. Remount the cover to the chassis assembly.
5. Attach the housing screws and knobs you removed when you disassembled the monitor.

6. Plug the touchscreen cable into the back of the controller, and then thread the cable through the recessed channel on the rear side of the controller. The channel reduces strain on the cable.

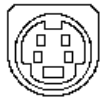


7. Align the controller over the two mounting holes you drilled in the monitor cover.
8. Use two nylon screws to attach the controller to the monitor.

Note: Do not tighten the screws beyond the "just tight" position. Nylon threads strip easily.



Connecting the ADB/SMT Controller to a Macintosh



Every Macintosh has at least one Apple Desktop Bus (ADB) port that you can use to connect an input device such as a touchscreen, a keyboard, or a mouse. Some Macintosh models include two ADB ports on the back of the system unit.

In addition to the ADB ports on the back of the system unit, the standard Macintosh keyboard has an ADB port on each side. You use one port to connect the keyboard to the system unit. You can use the other port to connect another input device, such as a touchscreen or a mouse.

Options for Connecting the Touchscreen

To connect the touchscreen, you simply plug the touchscreen cable into an available ADB port. You have the following options:

- Connect the touchscreen cable to the ADB port on the back of the Macintosh.
- Connect the touchscreen cable to another ADB device, such as the standard Macintosh keyboard.

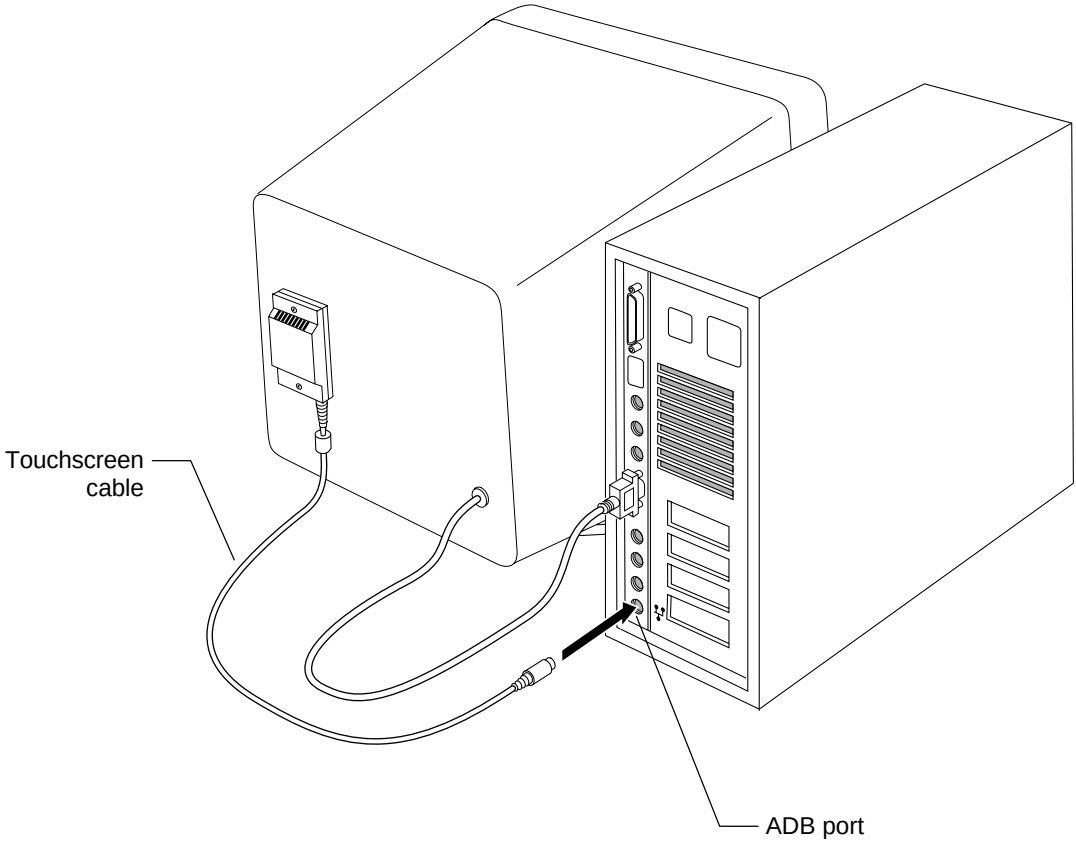
  First, connect the keyboard to the ADB port on the Macintosh system unit. Next, connect the touchscreen to the second ADB port on the keyboard.
- Use an ADB-Splitter cable to connect two ADB devices to the same ADB port. The ADB-Splitter cable is useful if you have several input devices that you must connect to your Macintosh.

  For example, you can connect the ADB-Splitter cable to the ADB port on the back of the system unit; connect the keyboard and the touchscreen to the ADB-Splitter cable; and then connect a mouse, track ball, or joystick to the second ADB port on the keyboard. In this case, you create a daisy-chain of devices.

How To Connect the Touchscreen to a Macintosh

▶ To connect the touchscreen to a Macintosh:

1. Turn off your computer. You should always turn off the computer before connecting or disconnecting a device.
2. Connect the touchscreen cable to an available ADB port.



3. Connect the monitor cable to the video port on the back of the system unit.

Note: Some monitors, such as a *Mitsubishi* monitor, require an adapter on the video cable in order to connect the monitor to the Macintosh. The adapter you need depends on the model of your monitor as well as the model of your Macintosh. For more information on buying an adapter, contact a MicroTouch sales representative.

---

4. Attach the power cable to your monitor and your computer (if necessary). Plug each power cable into a grounded power outlet.

Turning On Your System

Before you turn on your system, make sure all cables are connected properly. Be sure to tighten all cable screws.

▶ To start up your system:

1. Turn on your monitor and computer.
2. Adjust the contrast and brightness to suit your personal preference and working environment.
3. Make sure the video image is centered within the screen area. Adjust the horizontal and vertical controls on the monitor, if necessary.

The ADB/SMT controller has a light-emitting diode (LED) that provides status information. If the status light is bright, power has been applied and the controller is operating properly. You are now ready to install the touchscreen software and test the installation.

What's Next?

Congratulations! You successfully installed the ADB/SMT controller and connected the touchscreen to your computer. You are now ready to complete the following tasks:

- Install TouchWare for the Macintosh, the software for your touchscreen
- Calibrate the touchscreen

Installing and Using TouchWare for the Macintosh

TouchWare for the Macintosh software includes the driver that let your touchscreen work with a Macintosh. It also includes a control panel for setting your touchscreen preferences, a diagnostic utility, and a demonstration program.

If you are experiencing problems with the touchscreen, you can use the Microcal Diagnostic utility to locate the touchscreen controller and test the touchscreen.

For more information on installing and using the Touchscreen control panel and Microcal, refer to the *TouchWare for the Macintosh User's Guide*.

Calibrating the Touchscreen

Calibration aligns the touchscreen with the underlying video. Specifically, calibration defines the dimensions of the image area of the touchscreen, determines the edges of the screen's image, and locates the center of the touchscreen. You must calibrate the touchscreen and test the calibration to ensure the successful operation of the touchscreen.

For ADB/SMT controllers, MicroTouch performs a 25-point calibration at the factory and stores the calibration data in the cable non-volatile memory (NOVRAM). You only need to perform a 2-point calibration. You can use either the Touchscreen control panel or the Microcal Diagnostic utility to calibrate the touchscreen.

Index

A

accessories for
touchscreen controllers 16
adapter
9-pin to 25-pin 17
Macintosh universal 18
ADB port 95
ADB/SMT controller
connecting to Macintosh 96
drilling holes in monitor cover 91
mounting to monitor cover 93
power requirements 90
ADB-Splitter cable
connecting an 95
part number 18
anode 28
assemblies, types of monitor 23

B

bezel
modifying ribs and fins 38
separating from CRT 35
space between CRT and 50
bezel-mount assembly 23, 31
bulletin board system (BBS) 9

C

calibration 71, 87, 98
capacitive touchscreen 22
chassis-mount assembly 23, 37
cleaning touchscreen 42
communication port, defining for PC
Bus controller 81
contents of touchscreen kit 16
convergence rings 32
CRT
disassembling if attached
to bezel 31
disassembling if attached
to chassis 37
discharging 28
mounting touchscreen to 40
separating from bezel 35
space between bezel and 50

D

discharging the CRT 28
drilling holes
    for ADB/SMT controller 91
    for PC Bus cable 75
    for Serial/SMT controller 61

E

E-Mail address 10
external power, for Serial/SMT controller 67

F

FCC regulations 12
fins, bezel 38

G

gap between CRT and touchscreen 46
gray wire 55
green wire 55
grommet for PC Bus controller 78

H

help
    bulletin board system 9
    phone support 8
housing *See* monitor cover

I

inspecting
    CRT and bezel attachment 53
    mounted touchscreen 44
installation
    summary of 19
    supplies and tools 13
    warnings 12
interrupt request 82
IRQ *See* interrupt request

J

jumpers on PC Bus controller 79

K

keyboard power tap cable *See* power tap cable

M

Macintosh software 98
Macintosh universal adapter
    part number 18
    using a 97
main CRT board 34
monitor assemblies, types of 23
monitor cover
    drilling hole for PC Bus cable 75
    drilling holes for ADB/SMT controller 91
    drilling holes for Serial/SMT controller 61
    removing the 24
monitor video, testing 15

O

orange wire 55

P

part number
- 9-pin to 25-pin adapter 17
- ADB-Splitter cable 18
- Macintosh universal adapter 18
- power tap cable 17
- wall-mount power supply 17

parts in touchscreen kit 16
PC Bus controller
- defining communication settings 79
- drilling hole in monitor cover 75
- handling the 80
- installing cable grommet 78
- installing the 84
- power requirements 74

phone support 8
power requirements
- for ADB/SMT controller 90
- for PC Bus controller 74
- for Serial/SMT controller 60
- summary of 56

power supply *See wall-mount or power tap*
power tap cable
- for Serial/SMT controller 68
- part number 17

precautions, safety 12

R

recertification 12
removing touchscreen 47
resistive touchscreen 22
ribs, bezel 38
rings, convergence 32

S

safety precautions 12
Serial/SMT controller
- attaching to monitor 61
- connecting to computer 65
- external power for 67
- power requirements 60

space
- between CRT and bezel 50
- between CRT and housing 27
- between CRT and touchscreen 45
- for resistive touchscreens 53

supplies needed for installation 13
support, technical 8

T

technical support 8
telephone support 8
testing
- for sufficient space 27
- monitor video 15

tools needed for installation 13
touchscreen
- capacitive 22
- covering gap between CRT 46
- inspecting mounted 44
- mounting to CRT 40
- removing the 47
- resistive 22
- space between CRT and 45

touchscreen kit, parts in 16

U

unpacking 16

V

video board 33

W

wall-mount power supply
for Serial/SMT controller 69
part number 17
warnings, installation 12
wires on touchscreen cable 55
work space, preparing 14
World Wide Web site 9

MicroTouch®

MicroTouch Systems, Inc.

Corporate Headquarters
UNITED STATES 978-659-9000, Fax 978-659-9100
World Wide Web: http://www.microtouch.com E-Mail: touch@microtouch.com
FACTURA KIOSKS, a division of MicroTouch Systems, Inc., 716-424-4300, Fax 716-424-4335

MicroTouch Worldwide Offices
AUSTRALIA +61 (03) 9561 7799 • FRANCE +33 (1) 45 13 90 30 • GERMANY +49 (0) 211-59907-0
HONG KONG +852 2333 6138 • ITALY +39 (0) 39-230-2230 • JAPAN +81 (044) 811-1133
KOREA +82 (2) 552-3198 • TAIWAN +886 (02) 2226-0875 • UNITED KINGDOM +44 (0) 1235-444400

Document Number: 19-215