



October 1997

# SERVICE & MAINTENANCE **MANUAL**





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## Preface

Monorail has developed this service and maintenance manual for **qualified service technicians** to use when servicing Monorail computers. Monorail provides training material and technical documentation to select organizations under the Monorail Authorized Service Center program.

Services performed by anyone other than Monorail Authorized Service Center personnel may void the Monorail Limited Warranty. Assistance with problems resulting from unauthorized repairs can be provided by Monorail for a fee.

This manual should be read in its entirety and followed carefully when performing all service operations on the Monorail computer.

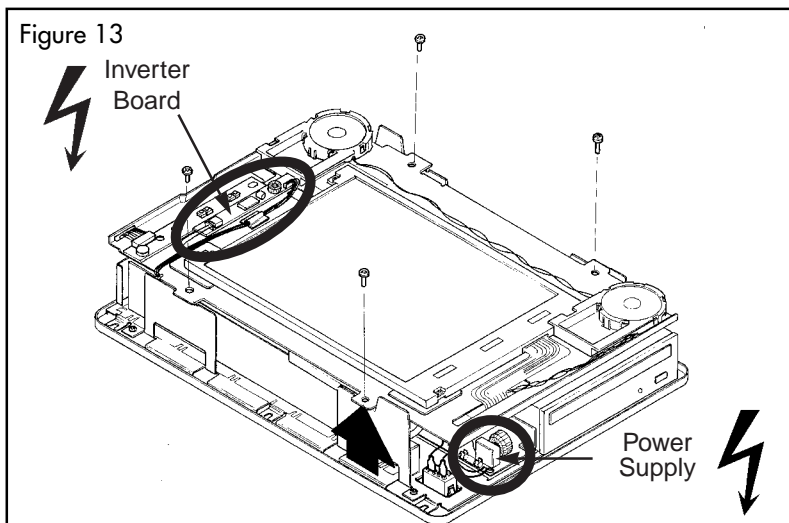
Thank you for your cooperation and thank you for your interest in Monorail!

## Recommended Materials

1. Large flat-blade screwdriver
2. T-10, T-15 Torx drivers
3. Pliers or vice
4. Chip-puller
5. Hex driver
6. Wire cutters
7. Nut driver

## Safety Warning

The interior of the Monorail computer is not a customer access area (open frame power supply and inverter board) and poses a serious risk of electrical shock. Before accessing the interior of the unit, you **MUST** disconnect the power cord from the A/C plug. See the figure below.



## A. Overall System Detail

<b>Detail #</b>	<b>Description</b>	<b>Detail #</b>	<b>Description</b>
1	cam lock	38	inverter board cable and connector (part of system board)
2	cam lock plastic latch	39	hard drive
3	cam lock plastic latch	40	shoulder screw (hard drive mounting screw)
4	metal lock tab (part of base frame)	41	ISA cover plate
5	backlight connector (part of LCD panel)*	42	floppy disk drive
6	inverter board	43	fan
7	LCD panel	44	ISA card connector (part of I/O board)
8	flex circuit connector *	45	screw
9	inverter board cable	46	ISA mounting tab
10	microphone boot	47	ISA plate
11	button board cable	48	screw, ISA mounting tab
12	button board	49	screw, power supply
13	LCD support	50	power switch connector (part of power supply)
14	adhesive tape	51	A/C plug
15	speaker holder	52	grounding wire (part of power supply)
16	speaker connector and connector	53	CD ROM power connector
17	snap (part of speaker holder)	54	floppy drive power connector
18	speaker	55	floppy drive data cable and connector
19	speaker wire hole (part of speaker holder)	56	CD ROM
20	LCD data flex cable connector	57	CD ROM audio cable and connector
21	LCD data flex cable connector tabs	58	CD ROM data cable and connector
22	LCD data flex cable	59	CD ROM mounting plate
23	tab (part of LCD support)	60	I/O cover plate and connectors
24	system board	61	system board DC power cable and connector
25	I/O board	62	adjustment screw, stand
26	Z-clip	63	upper housing
27	ZIF socket	64	I/O connector (part of system board)
28	ZIF socket lever	65	power supply
29	microprocessor	66	power switch
30	processor heat sink	67	power cable management clip
31	processor thermal pad	68	lower housing
32	SIMM memory modules connector	69	video memory
33	SIMM memory modules connector	70	floppy drive plate
34	hard drive power cable and connector		
35	hard drive IDE data cable and connector		
36	microphone cable and connector (part of button board cable)		
37	connector for button board cable and connector		

\* Active Matrix (TFT) and 12.1" Panels use  
a flex circuit adapter board

Diagram 1

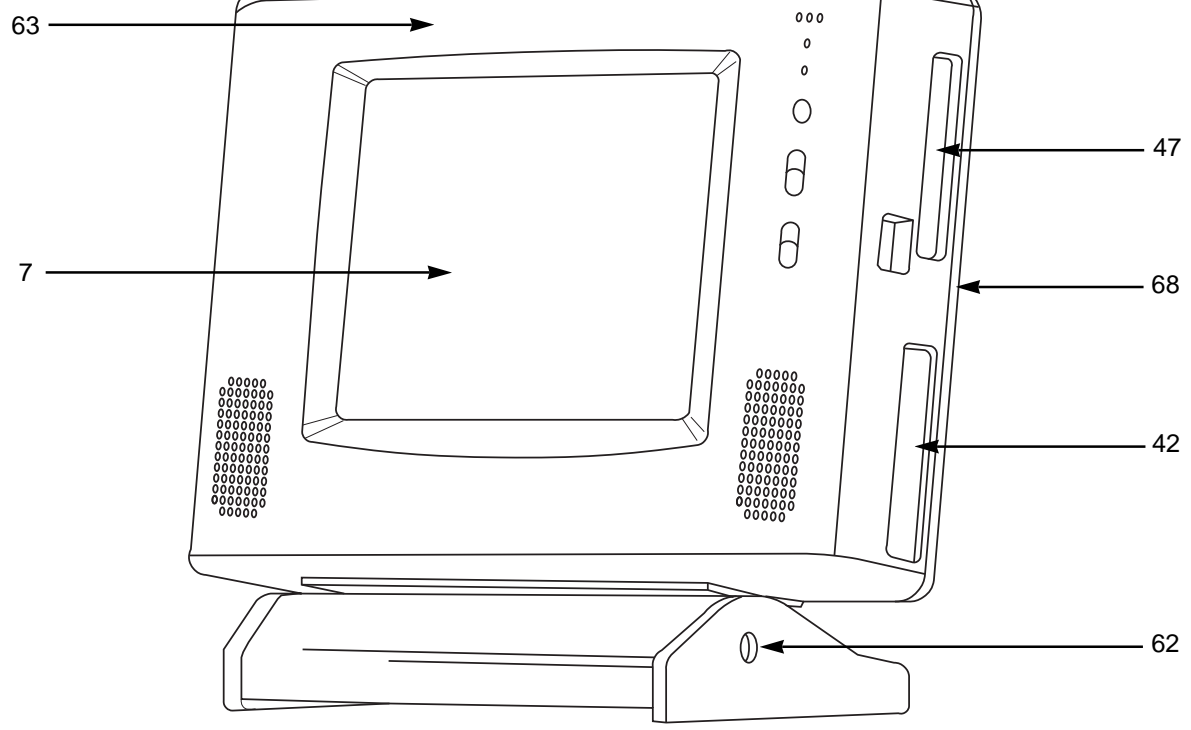
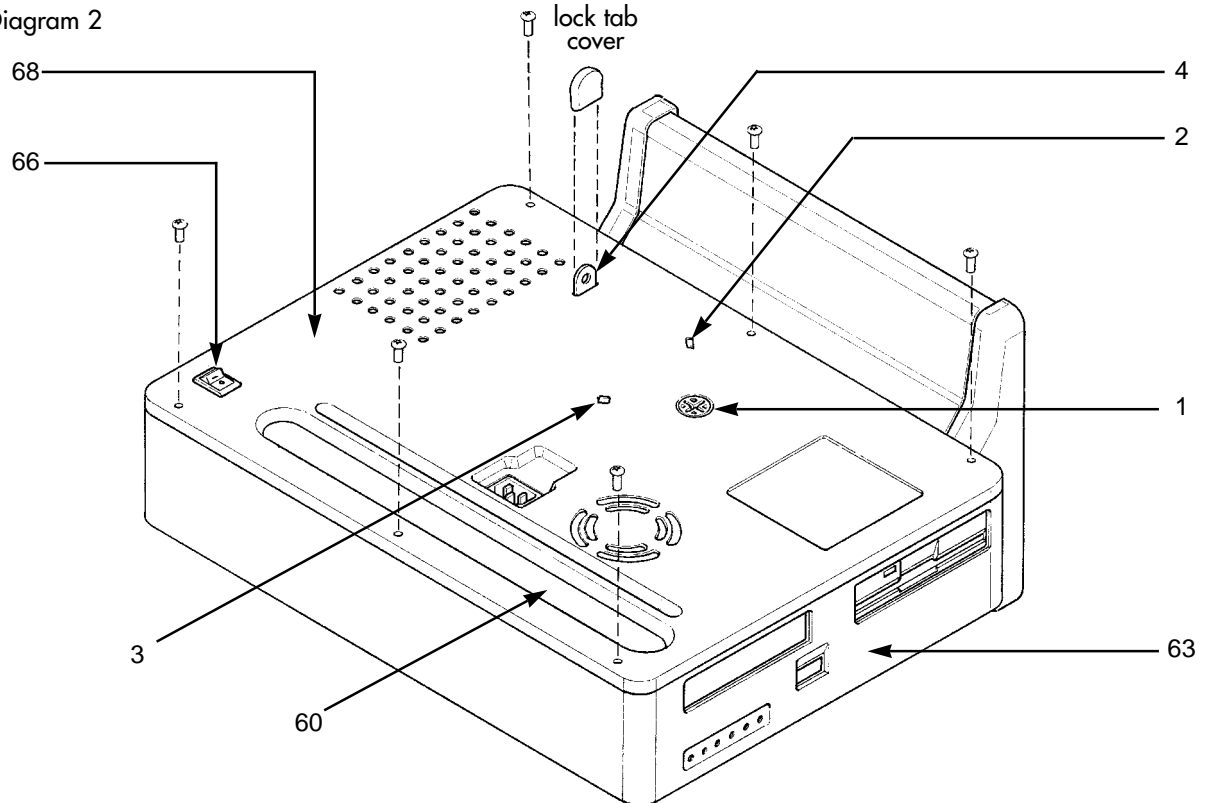


Diagram 2



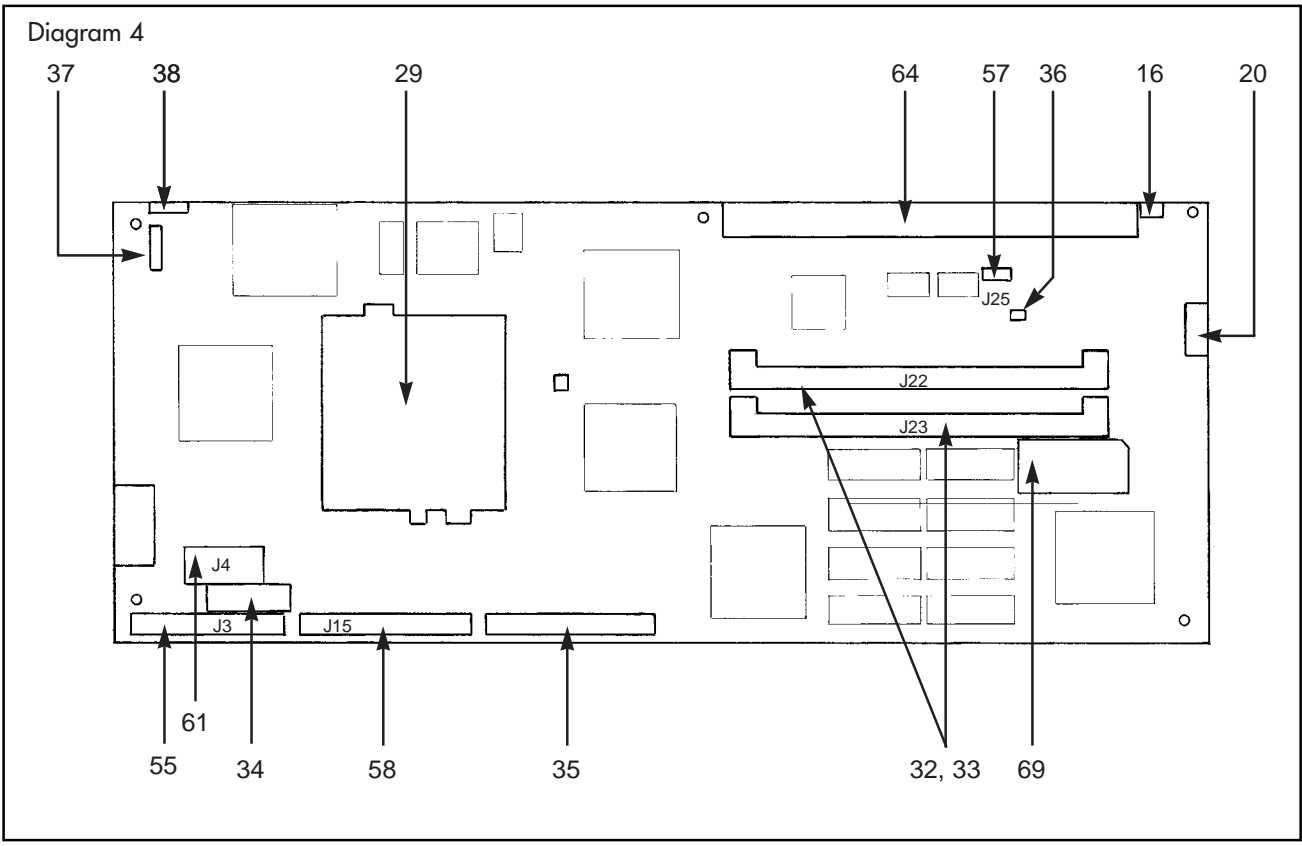
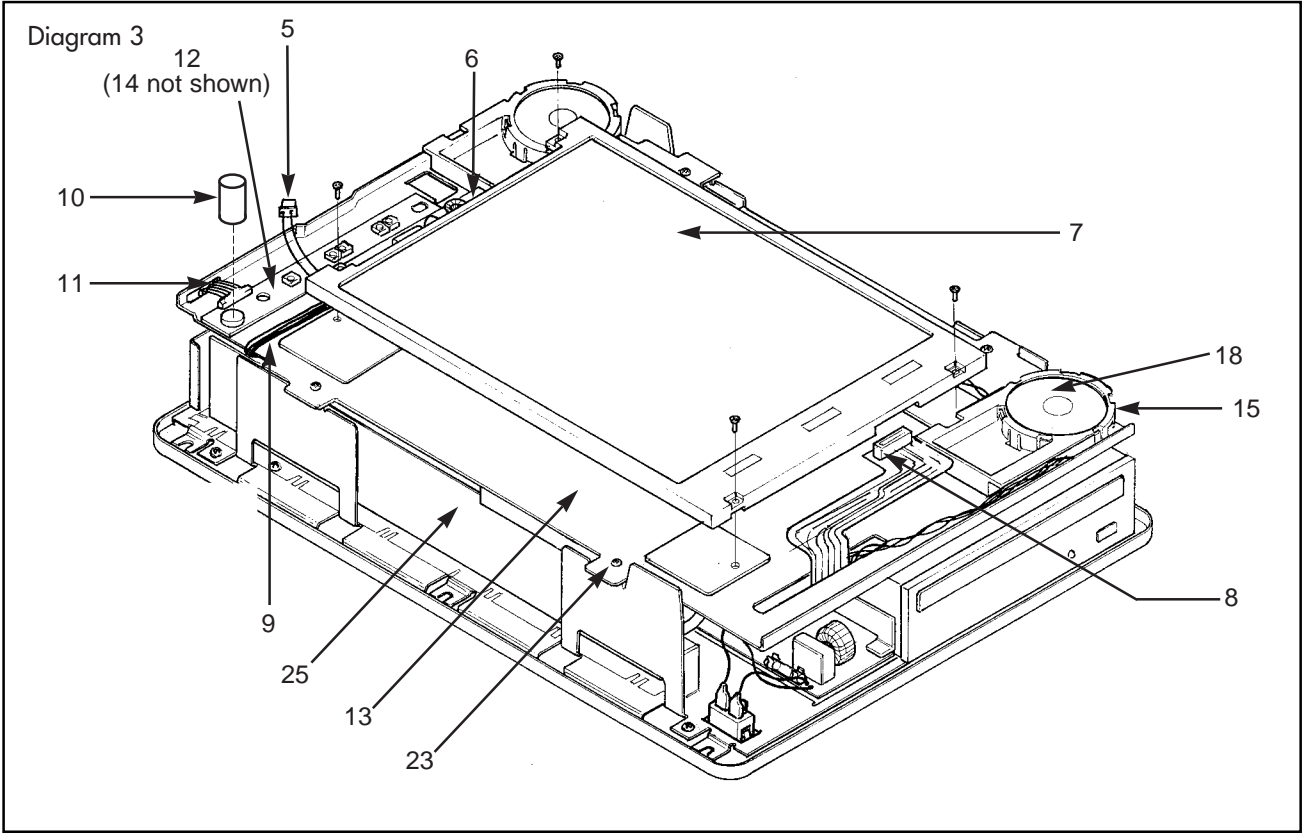
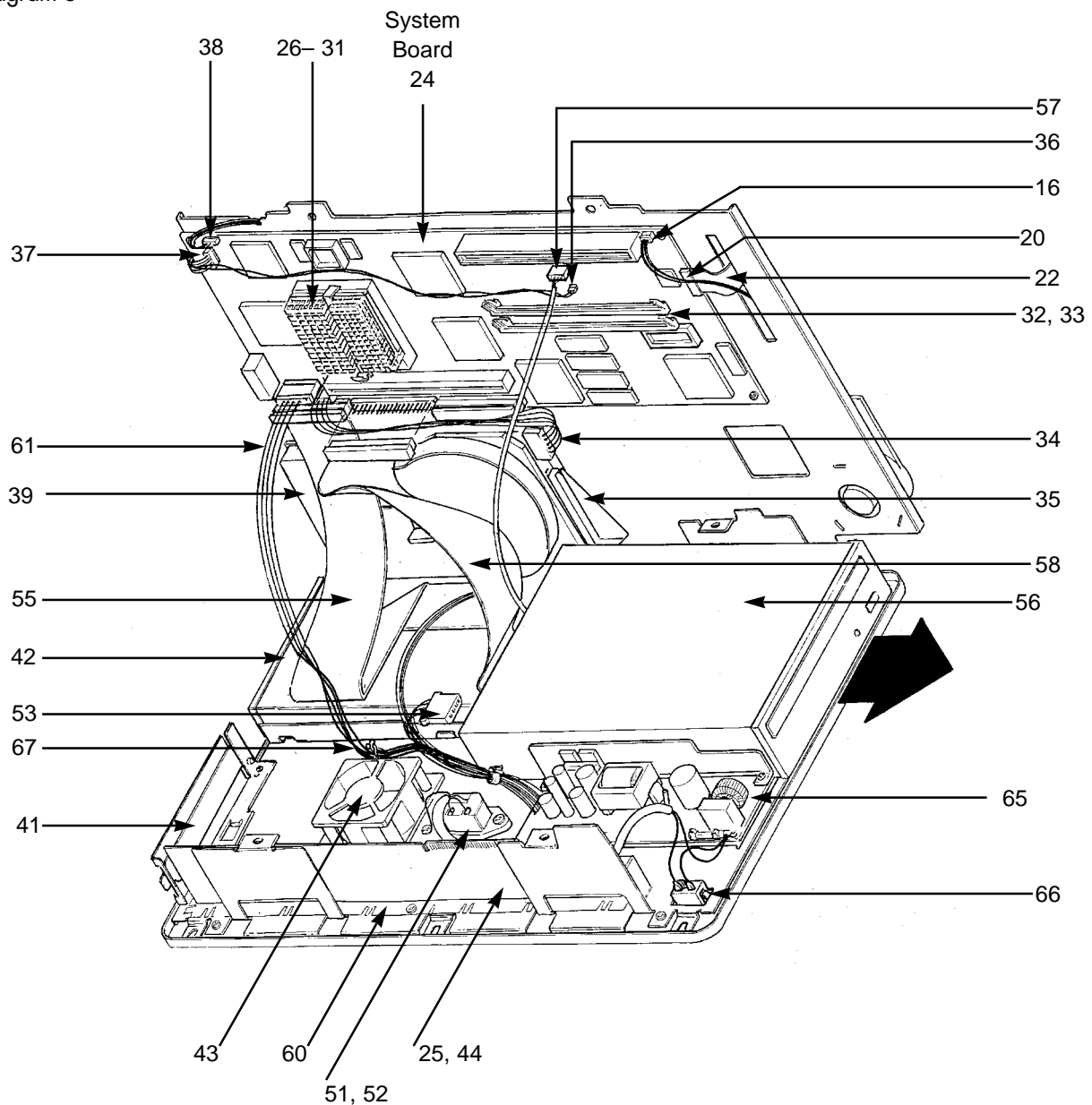


Diagram 5





## B. Tightening the Computer Stand

See Figure 1. If the computer stand is loose, use a screwdriver to turn the screw (Detail 62) on each side of the stand a quarter turn. If the display still seems too loose, repeat this procedure until desired friction is achieved.

## C. Removing the Upper Housing

To perform any operations on this unit, you must remove the upper housing (Detail 63).

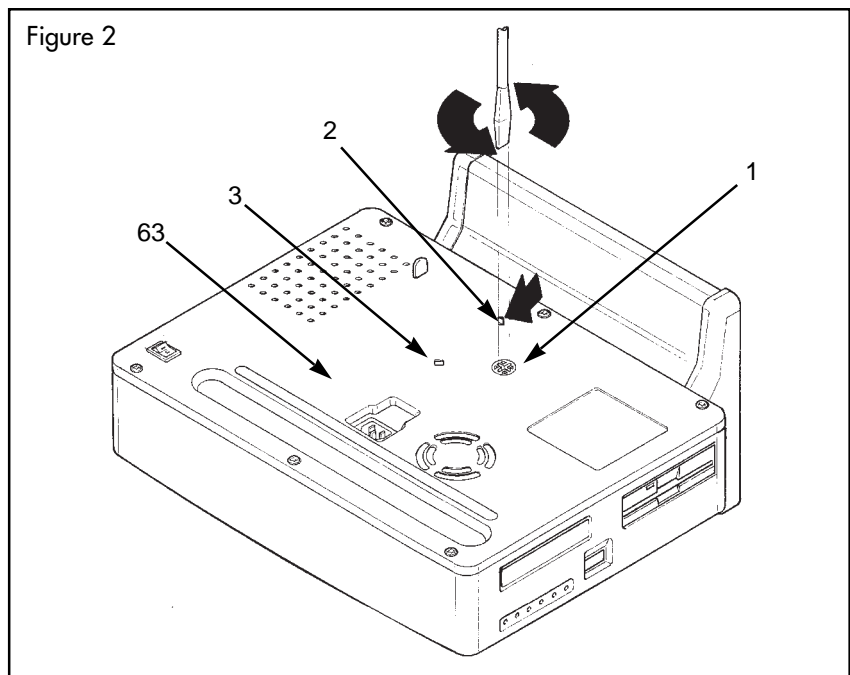
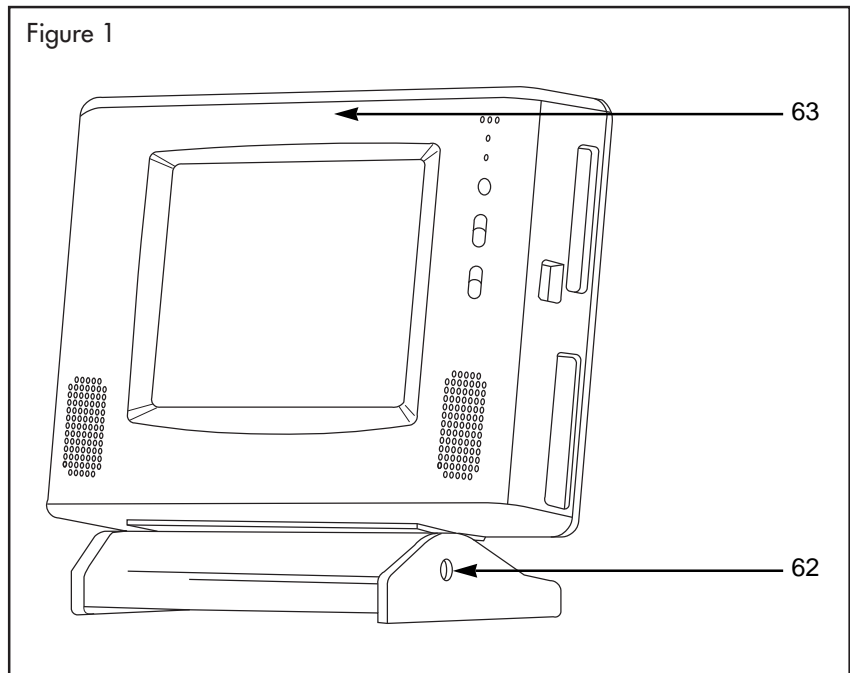
### Step 1

Place the unit face down on a protective foam surface to prevent scratching.

### Step 2

See Figure 2. Insert a large, flat-blade screwdriver into the plastic cross-shaped opening of the cam lock (Detail 1). Push down on the plastic latch (Detail 2) while rotating the cam lock (Detail 1) counter-clockwise 90 degrees.

Once you've finished, the CD ROM and floppy drives will have moved toward the center of the machine (about .1 inch), and the plastic latch will have moved from position (Detail 2) to position (Detail 3). This action recesses the floppy disk drive and CD ROM drive from the upper housing (Detail 63), enabling the computer to be disassembled.



### Step 3

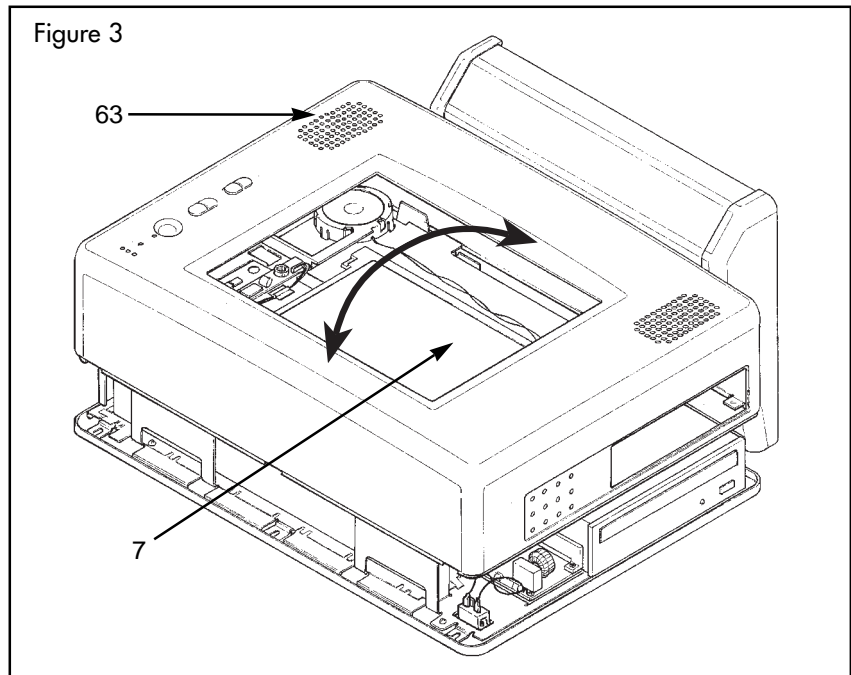
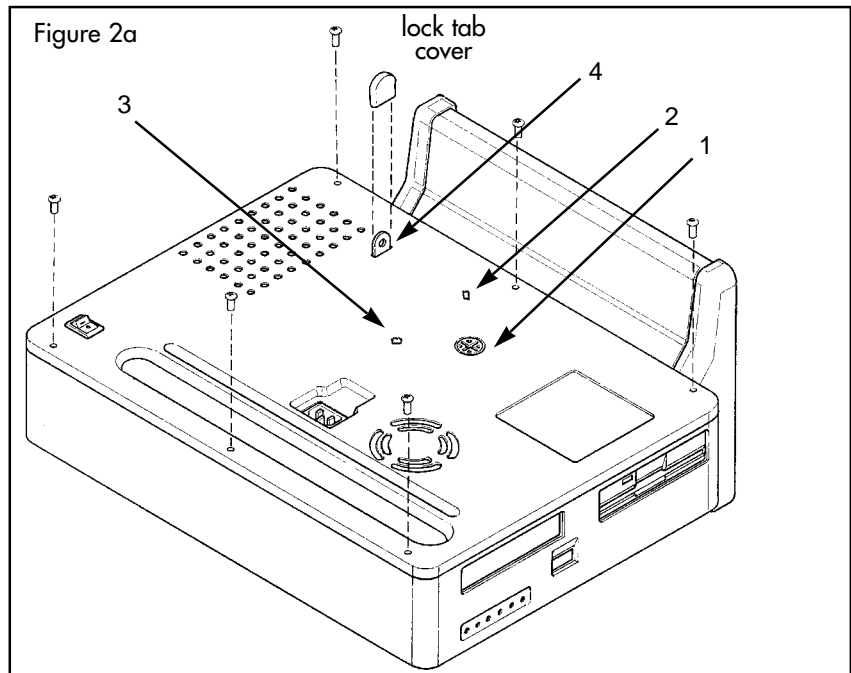
Remove the 6 black pan-head torx screws with a T-15 driver, as shown in Figure 2a.

### Step 4

See Figure 3. Carefully position the unit so that the LCD panel (Detail 7) is face up. Avoid bending the metal lock tab (Detail 4) on the back of the unit.

**NOTE:** Elevating the unit on two boards will prevent damage to the metal lock tab.

Lift the upper housing (Detail 63) from the computer assembly to access the interior. Slightly rotate the stand higher than the top of the LCD panel to release the upper housing (Detail 63) from the computer. (The upper housing fits tightly, so slight rotations, as depicted by the arrow heads in Figure 3, might be required to remove the upper housing completely.)



## D. Removing/ Replacing/Reinstalling:

**Warning:** Before accessing the interior of the unit, you must disconnect the power cord from the A/C plug.

### D.1 LCD Panel

#### Step 1

See Figure 4. Remove the dual pin connector(s) (Detail 5) from the inverter board (Detail 6).

#### Step 2

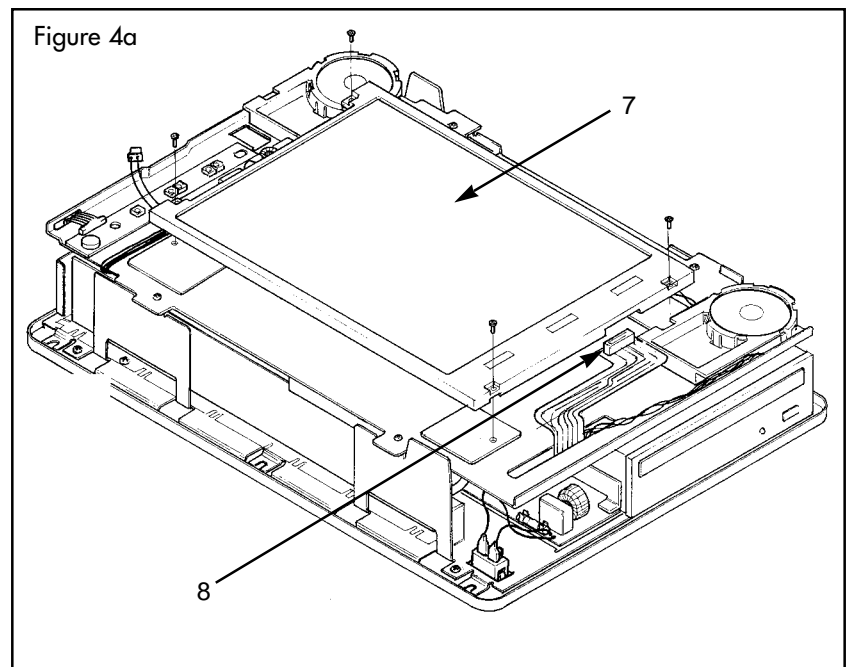
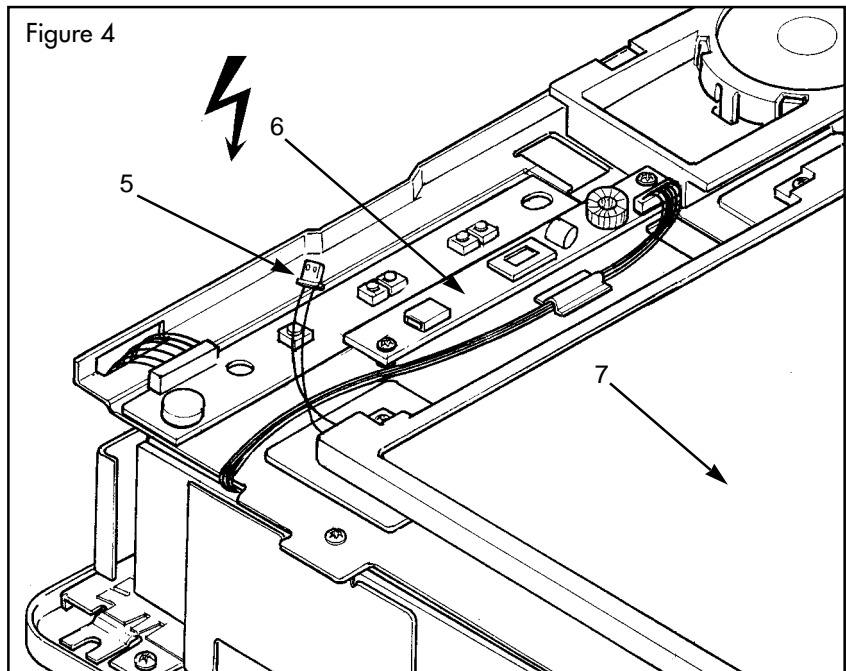
Refer to Figure 4a. Remove the 4 shoulder screws in the corners of the LCD panel (Detail 7), using a flat-blade screwdriver.

#### Step 3

Lift the screen and gently detach the flex circuit connector (Detail 8) from the bottom of the LCD panel (Detail 7) or the LCD adapter board.

**NOTE:** The flex circuit connector is delicate! Handle with care.

**To reinstall:** reverse steps 1–3.



## D.2 Inverter Board

**Warning:** Before accessing the interior of the unit, you must disconnect the power cord from the A/C plug.

### Step 1

Refer to Figure 5. Disconnect the dual pin connector(s) (Detail 5) and the inverter board cable (Detail 9).

### Step 2

Refer to Figure 6. Remove the 2 screws at the opposite ends of the inverter board using a T-10 driver.

**To reinstall:** reverse steps 1 and 2. DO NOT route the inverter board cable (Detail 9) under the inverter board. Replace the tape as originally installed.

Figure 5

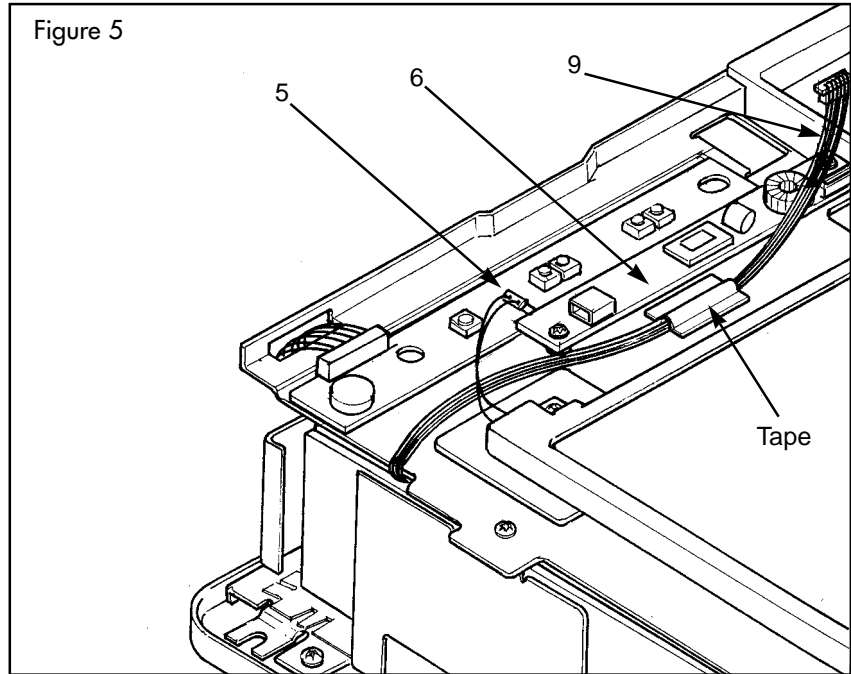
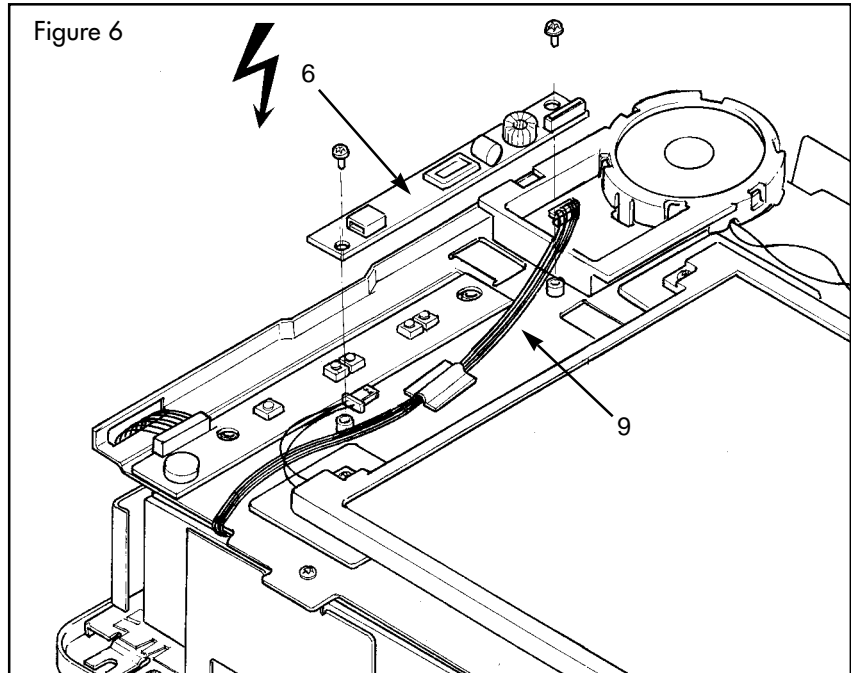


Figure 6



## D.3 Button Board\*

### Step 1

Refer to Figure 7. Remove the microphone boot (Detail 10) at the top of the button board (Detail 12).

### Step 2

Disconnect the button board cable (Detail 11) in the corner of the button board (Detail 12).

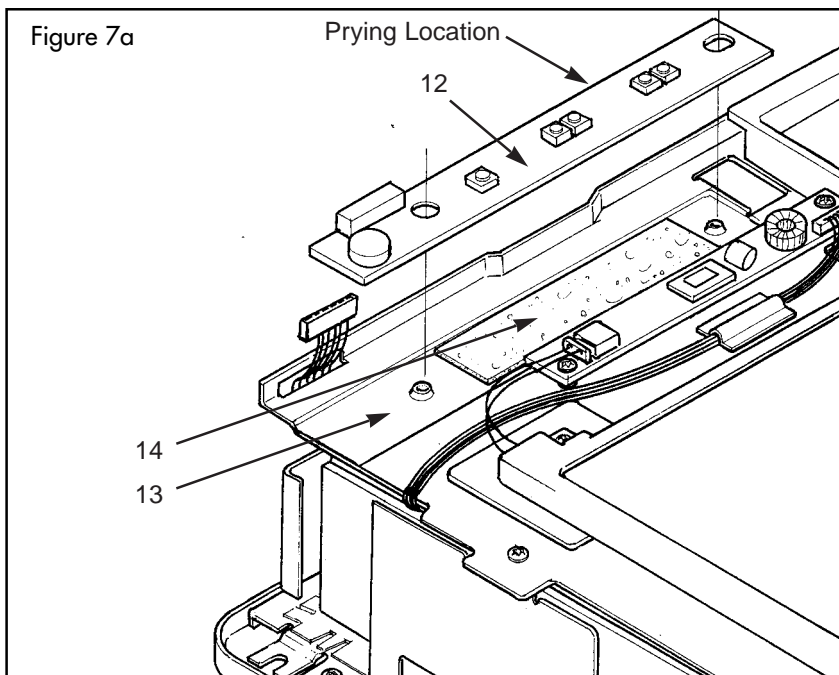
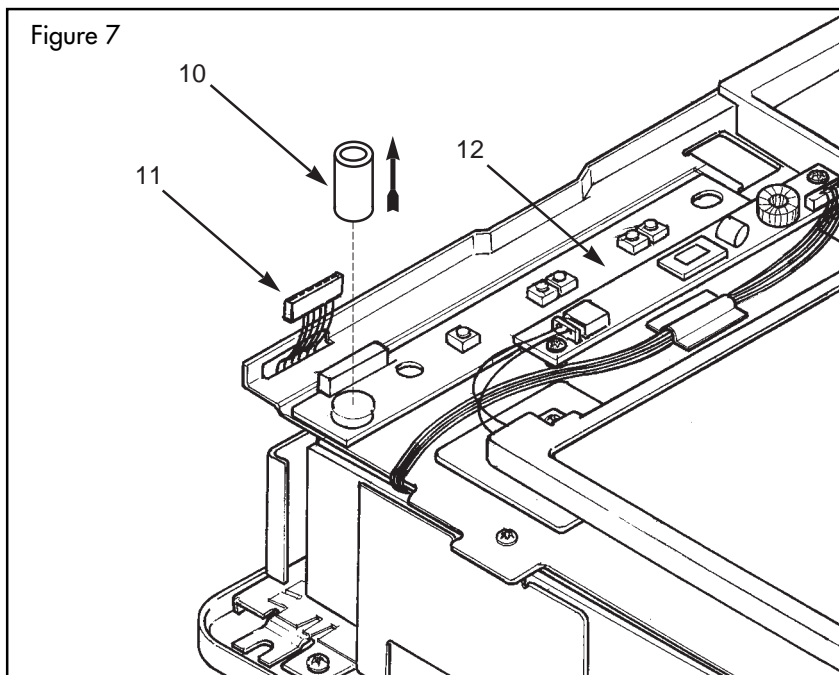
### Step 3

See Figure 7a. Pull on the button board (Detail 12) to release the adhesive (Detail 14) from the LCD support (Detail 13).

**NOTE:** This action can be difficult. Pry as gently as possible with a flat-blade screwdriver at the location shown.

**To reinstall:** reverse steps 1–3. Add new adhesive (3M adhesive number 4921, .016" elastomeric foam) prior to installing the new button board.

\* Not required for PCs with speakers located in the base.



## D.4 Speakers\*

### Step 1

Refer to Figure 8. Press the top snap on each speaker holder (Detail 15) and remove the speaker holders from the LCD support (Detail 13).

### Step 2

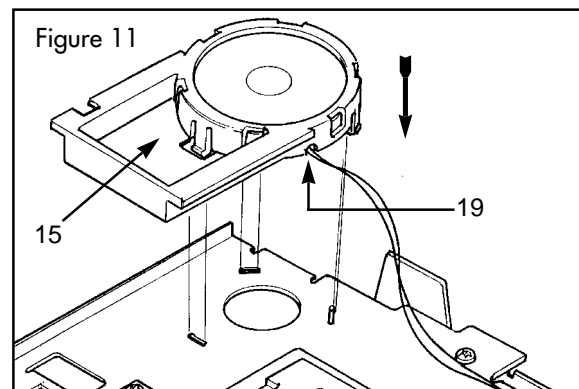
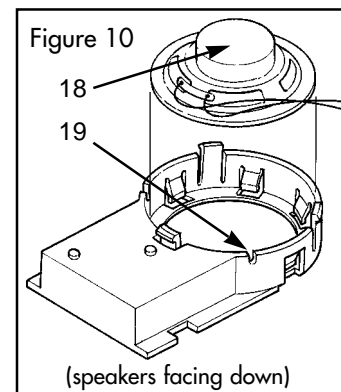
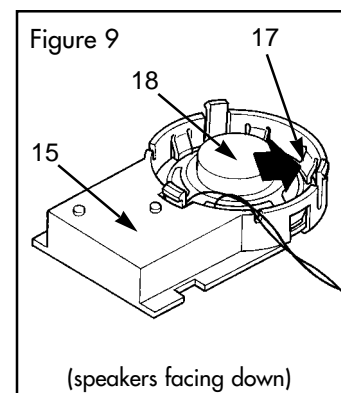
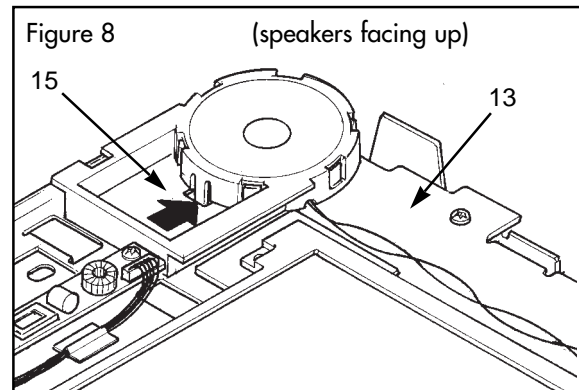
To access the system board, see Section E.

### Step 3

Refer to Figures 9 and 10. To remove the speaker (Detail 18) from the speaker holder (Detail 15), depress the snaps (Detail 17) on each speaker holder.

**To Reinstall:** reverse steps 1-3. Be sure to route the cable through the mouse hole (Detail 19). See Figures 10 and 11.

\*Not required for PCs with speakers located in the base.



## D.5 Flex Circuit\*

**NOTE:** Refer to Section D.1 of this manual (Removing the LCD panel) to perform this function.

### Step 1

Remove the LCD Panel (Detail 7) as shown in Section D.1.

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 3

Locate the system board flex connector (Detail 20) and gently apply force to the connector tabs, horizontal to the system board, (Detail 21) on either side of the flex circuit cable (Detail 22).

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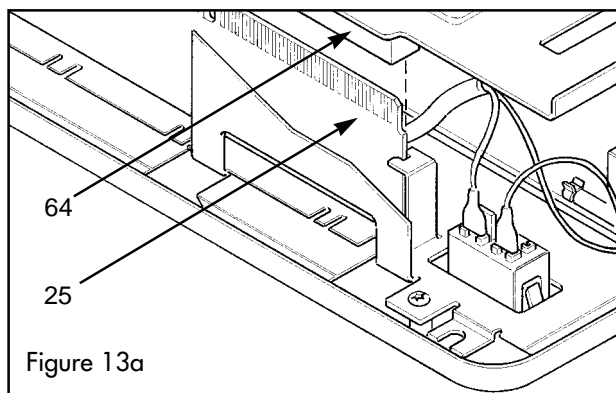
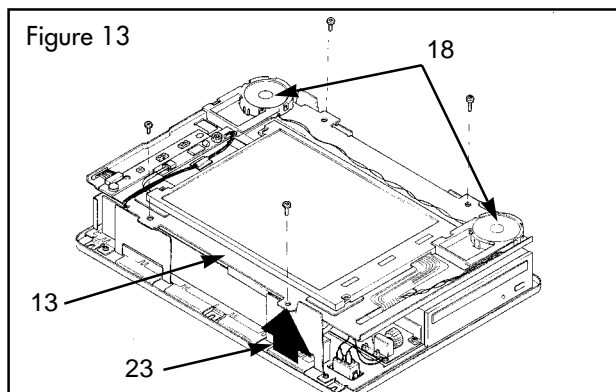
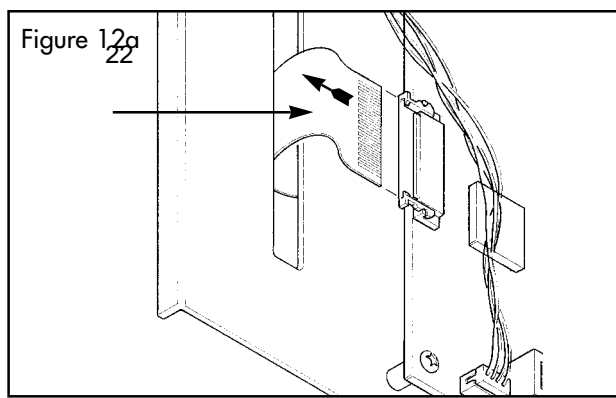
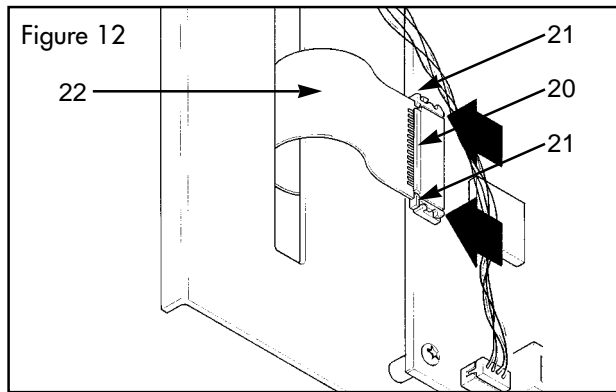
**NOTE:** The connector is easily damaged. Apply force gently!

### Step 4

Remove the flex circuit cable (Detail 22) as shown. The connector is a ZIF connector. The flex circuit should disengage with minimal effort.

**To Reinstall:** reverse steps 1-3.

\* Active Matrix (TFT) and 12.1" Panels use a flex circuit adapter board



## E. Accessing the Internal Components

### E.1 Separating the LCD Support and Base Frame

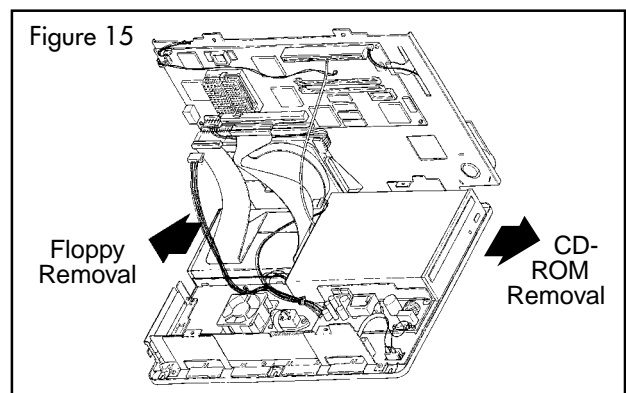
**Step 1** Remove the four T-15 screws from the LCD support (Detail 13) using a T-15 driver.

**Step 2** Refer to Figures 13 and 13a. Separate the LCD support (Detail 13) from the unit by applying pressure at the point (Detail 23) shown. This action will disconnect the system board connector (Detail 64) from the I/O board (Detail 25).

**Note :** Before removing any cables or connections, note all cable routing for re-assembly.

**Step 3** See Figure 15. Partially opening the unit, remove the CD-ROM audio cable (Detail 16) from the system board (Detail 24) connector.

**Step 4** See Figure 15. Open the unit by hinging it away from you, as shown. Disconnect the floppy disk drive data cable, CD-ROM data cable and DC power cable from the system board. Lay the LCD subassembly, LCD screen down, onto a soft scratch resistant, ESD safe surface.



## E.2 Processor Chip

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

See Figure 16. Unhook one edge of the heat sink clip (Detail 26) from the ZIF socket (Detail 27) and remove it.

**NOTE:** One type of clip/heat sink is shown; several types are available.

### Step 2

Raise the lever (Detail 28) of the ZIF socket (Detail 27) in the direction shown and remove the processor chip (Detail 29) and heat sink (Detail 30).

### Step 3

Refer to Figure 16a. Install the new processor chip, paying close attention to the component keying. Be sure to align pin 1.

### Step 4

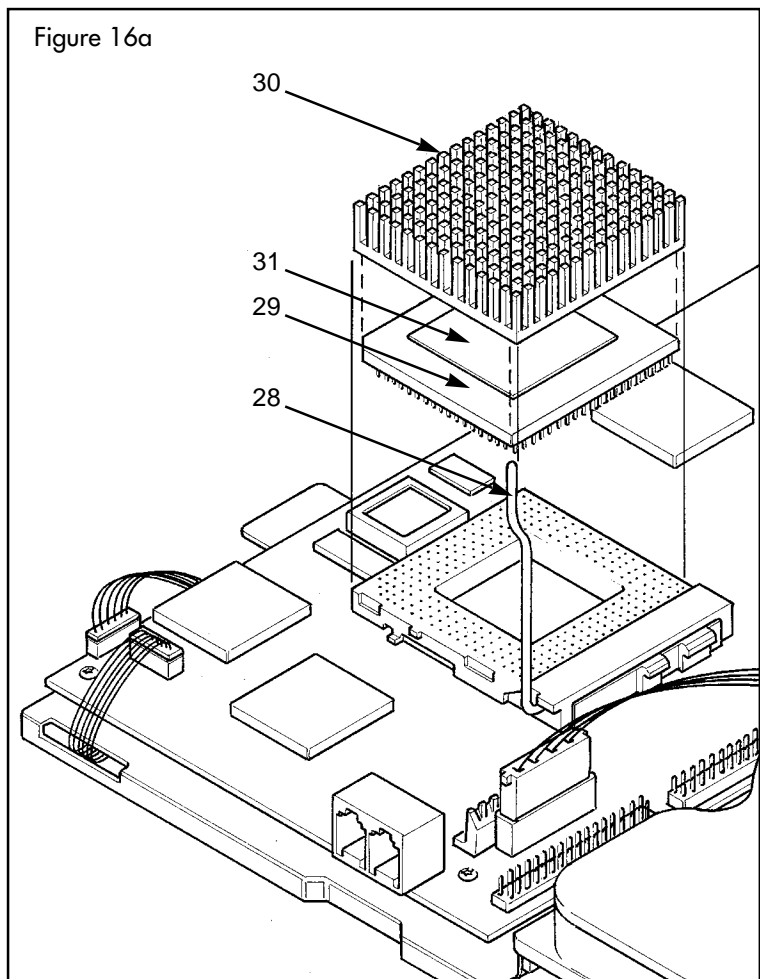
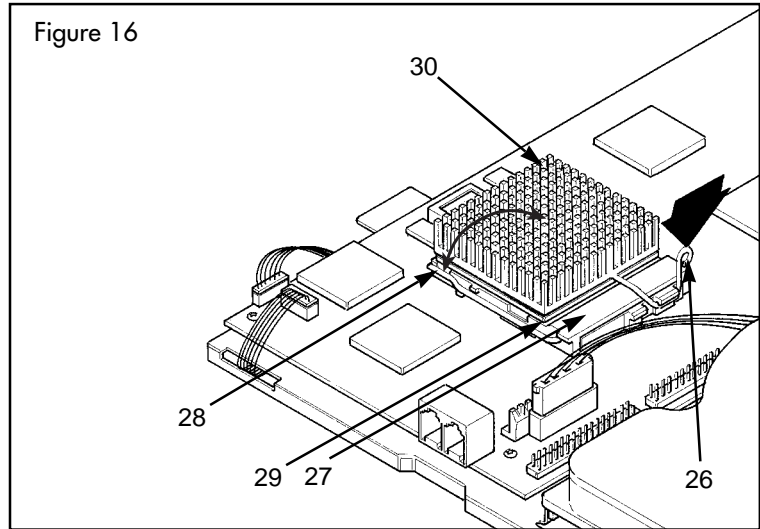
After the processor (Detail 29) is seated flush, lower the lever (Detail 28) of the ZIF socket.

### Step 5

Before reinstalling the heat sink (Detail 30), replace the thermal pad (Detail 31) and heat sink (Detail 30).

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**NOTE:** ZIF stands for Zero Insertion Force. It should take no force to seat the processor properly. If the processor does not seat properly, re-check the pins and key alignment.





## E.3 Jumper Settings

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

See Diagram 6.

### Erasing CMOS (J38)

1) To clear the CMOS, remove the jumper from pins 1 and 2 of J38, and install it on pins 2 and 3 for 10 seconds. Reinstall the jumper on pins 1 and 2 for normal operation.

### BIOS Programming Voltage (J36)

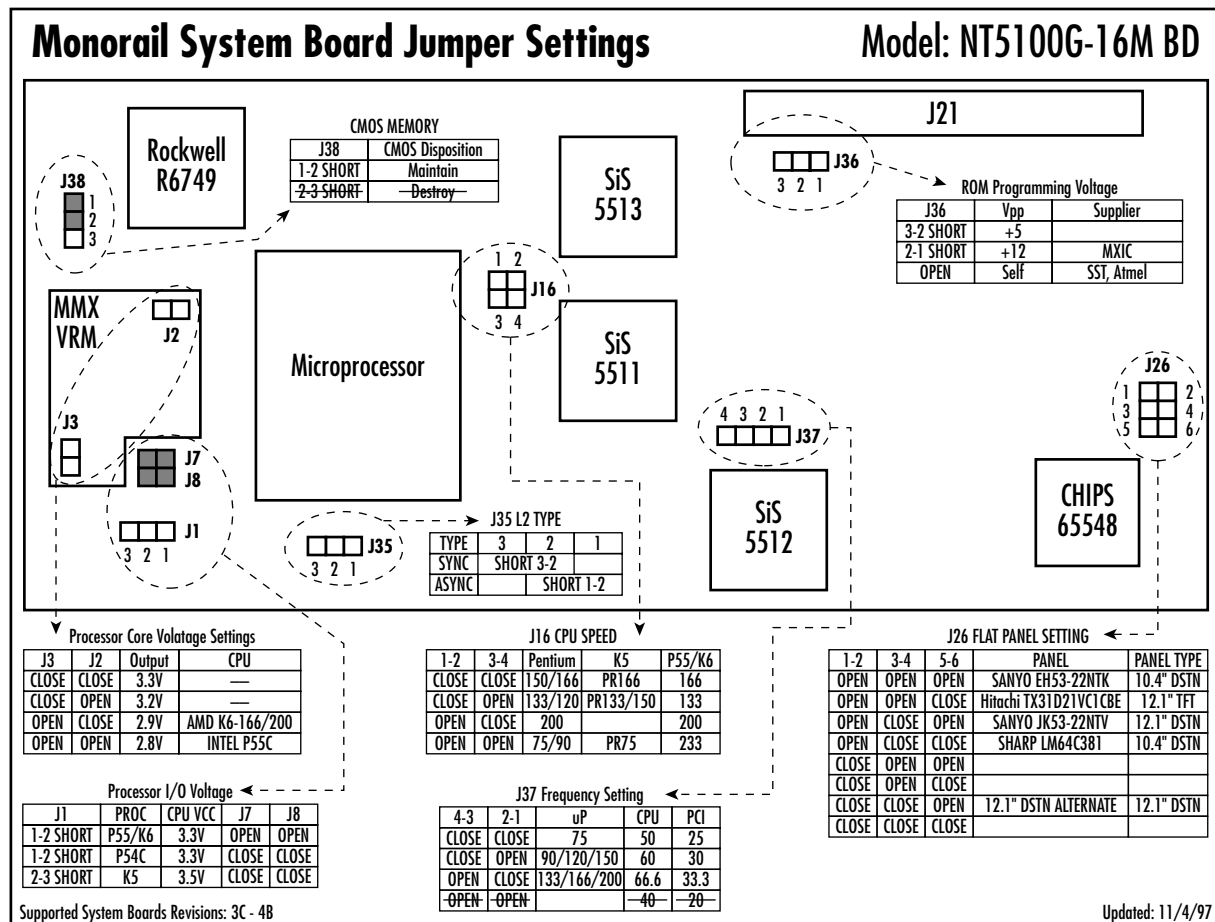
The programming voltage for the ROM BIOS is set from the factory and is dependent on the make of the ROM chip.

### Changing the Processor (J1, J6, J7, J8, J16 & J37)

Jumpers J1, J6, J7, J8, J16 and J37 should be verified against the following tables if the processor is replaced with one of a different speed, make or MMX capable.

**NOTE:** MMX processors require a MMX compatible system board. The MMX system board is identified by a VRM (Voltage Regulator Module) adapter board located to the left of the microprocessor.

Diagram 6



## E.4 Expansion System Memory

**Warning:** Before accessing the interior of the unit, you must disconnect the power cord from the A/C plug.

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Installing

See Figures 17, 18, and 18a. The system memory must be upgraded with two SIMM modules (Detail 32) of the same type. System memory should be upgraded with 72 pin, nonparity, +5.0 volt, 60ns, EDO SIMMs.

Install the upper module (J22) first. See Section E.4.

#### Step 1

Insert the SIMM module (Detail 32) into the socket, with the key to the left, and verify that the SIMM is seated properly in the socket.

#### Step 2

Lightly press on the SIMM in the direction indicated by the arrow and allow it to pivot back into the socket. Stop applying pressure after the lock mechanisms (Detail 33) on both sides of the socket have engaged.

#### Step 3

Repeat steps 1 and 2 for J23. See Section E.4.

### Removing

To remove expanded system memory (Detail 32), lightly apply horizontal pressure to both lock mechanisms (Detail 33) away from the SIMM.

The SIMM is unlocked when it pivots upward from its locked position. The SIMM can be removed at this point.

Remove the SIMM in J23 first. See Section E.4.

**NOTE:** To save system memory changes to CMOS enter BIOS setup and perform a "Save and Exit" from the BIOS setup screen. See Section H (Accessing System BIOS)

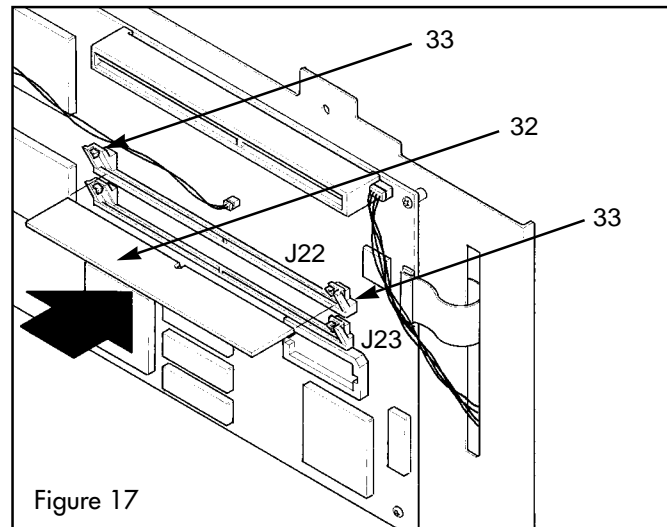


Figure 17

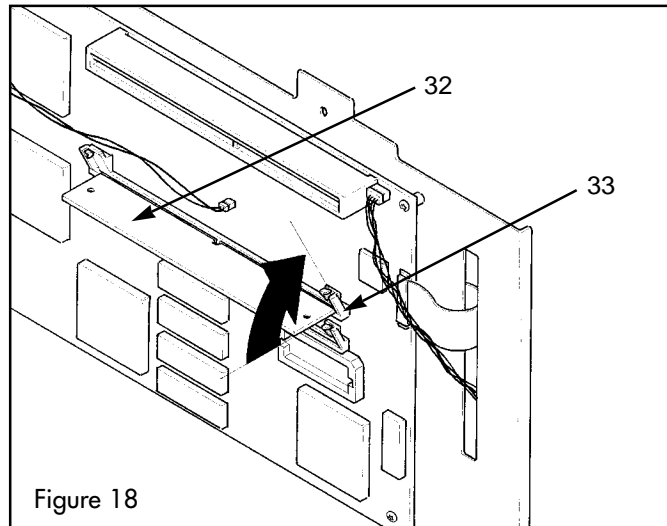


Figure 18

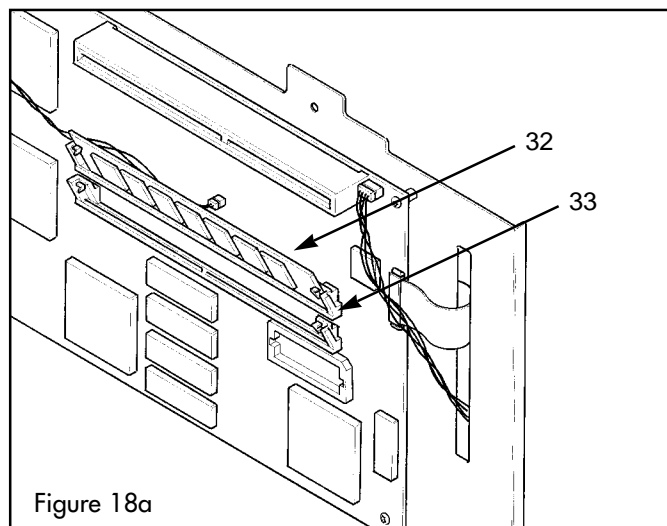


Figure 18a

## E.5 Video Memory

### Step 1

See Figure 19. Visually inspect the video memory chip (Detail 69) so that you can orient it with pin 1 of the socket (identified by a bevel in the corner).

### Step 2

Align the pins and press into place with thumb pressure until seated.

**NOTE:** To remove the video memory upgrade, use a chip-pulling device. See Figure 19a.

**NOTE:** Some models do not have socketed video memory.

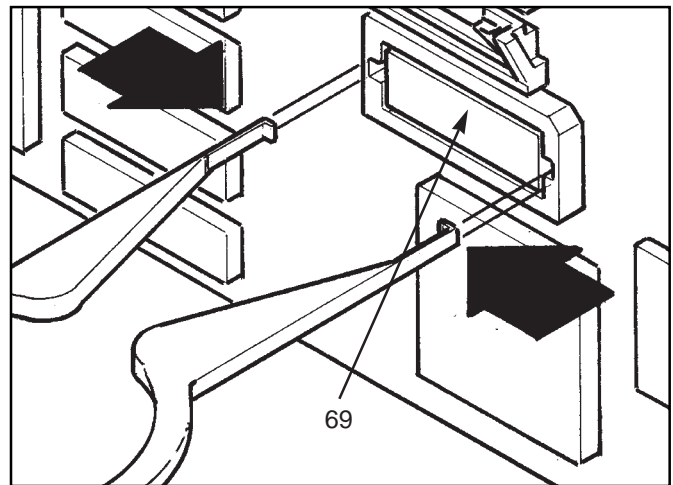


Figure 19

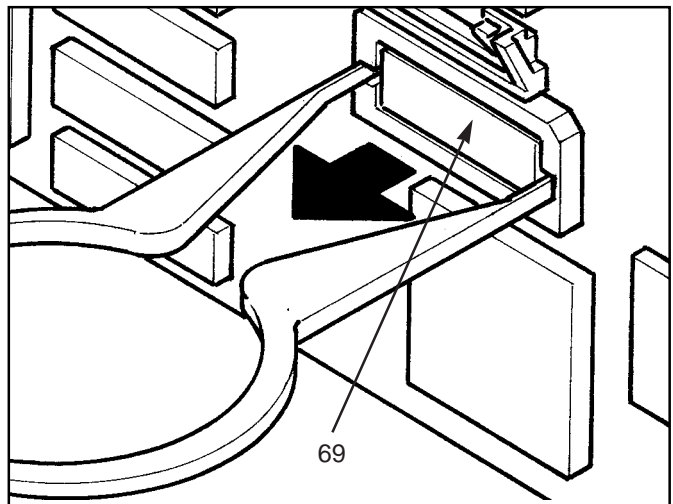


Figure 19a

## E.6 Removing the System Board from the LCD Support Assembly

**Warning:** Before accessing the interior of the unit, you must disconnect the power cord from the A/C plug.

**NOTE:** Refer to Section E (Separating the Base Frame and LCD support) before proceeding.

**Note:** When replacing the system board, remove the microprocessor, modem chip, and video ram chip for reuse.

### Step 1

Refer to Figure 20. Disconnect the hard drive power cable (Detail 34) and the hard drive data cable (Detail 35).

### Step 2

Disconnect the internal speaker cable (Detail 16) and the LCD flex cable (Detail 22).

### Step 3

Disconnect the microphone cable (Detail 36). Not required on some models.

### Step 4

Disconnect the button board cable (Detail 37) and the inverter board cable (Detail 38).

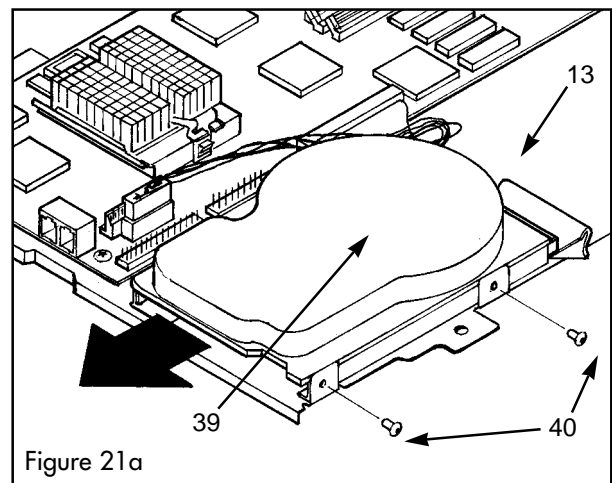
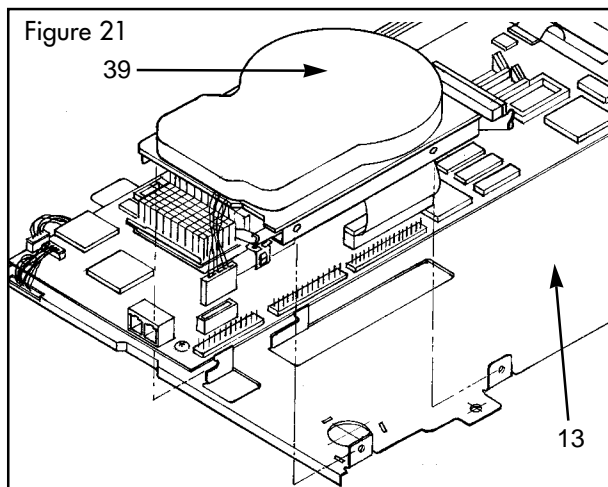
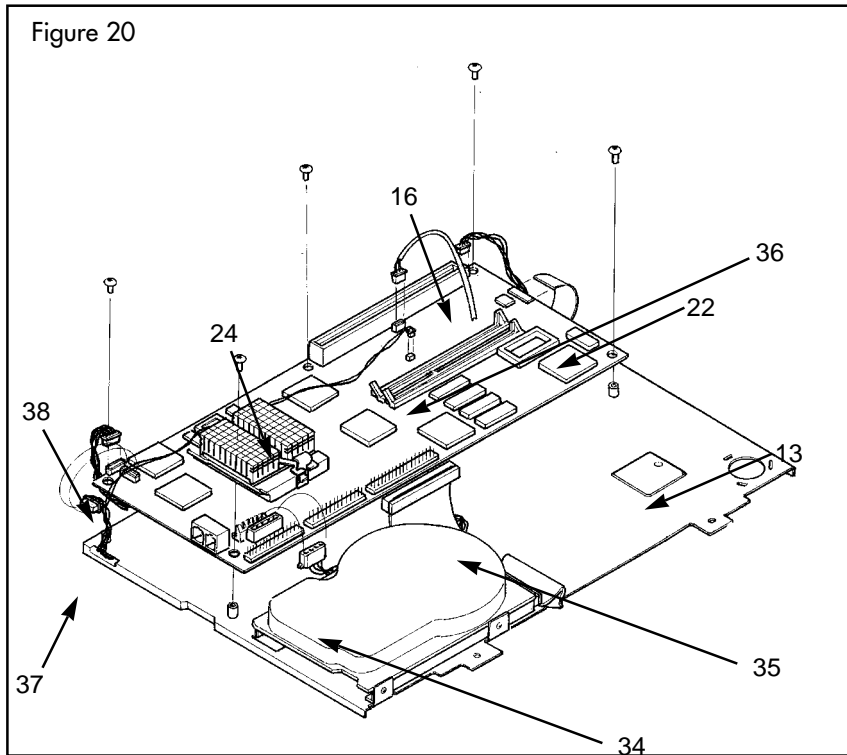
**NOTE:** The following is a list of the cables that should already be removed at this point. See Diagram 4 on page 7.

- CD audio cable (J25) (Detail 57)
- Main power cable (J4) (Detail 61)
- Floppy drive cable (J3) (Detail 55)
- CD ROM data cable (J15) (Detail 58)

### Step 5

See Figure 20. Remove the five M-3 screws using a T-10 driver. Lift the system board from the LCD support.

**To Reinstall:** Reverse steps 1-5.



## E.7 Hard Drive

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

Remove hard drive power cable and data cable from system board.

### Step 2

Refer to Figures 21 and 21a on page 20. Using a T-10 driver, remove the 2 screws (Detail 40) on the side of the hard drive (Detail 39) that faces away from the system board (Detail 24).

### Step 3

Slide out the hard drive (Detail 39) and remove it from the LCD support (Detail 13), as shown in Figure 21a.

### Step 4

Remove hard drive power cable and data cable from the hard drive.

**To reinstall:** reverse steps 1 - 4.

## E.8 ISA Card

At the time this document was printed, Monorail supported the following 2 network ISA cards:

SMC EtherEZ 8416T

3COM 3C509B-TPO (Etherlink III ISA TPO)

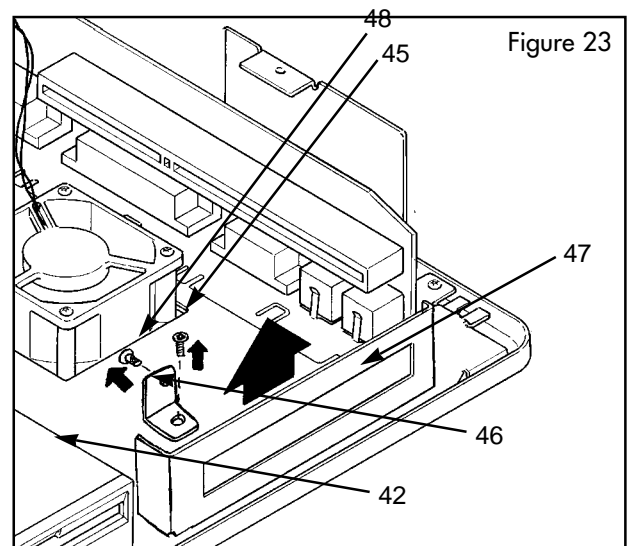
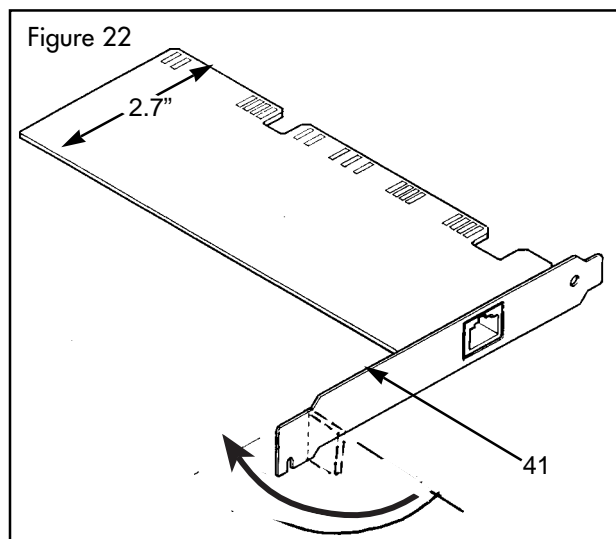
Use of other network ISA cards may void the Monorail warranty.

**Preparing the ISA Card:** See Figure 22. Very carefully, flatten the sheet metal tab on the ISA card bracket (Detail 41). Ensure that the resulting bracket is as flat as possible to make installation easier. Please note the maximum card dimensions as defined in Figure 22. Using ISA cards in excess of the 2.7" dimension will extend over half the fan and cause thermal processor damage due to insufficient air flow.

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

Position the base frame assembly so that the floppy drive (Detail 42) is in the lower right corner. See Figure 23. Using a T-15 driver, remove the screw (Detail 45) that secures both the Monorail ISA custom mounting tab (Detail 46) and the ISA cover plate (Detail 41). Discard the ISA cover plate (Detail 47).



### Step 2

See Figure 24b. Using a T-15 driver, fasten the Monorail custom ISA mounting tab (Detail 46) to the computer base frame using the 6-32 (Detail 45) pan head screw that was removed to fasten in the factory installed plate (Detail 47 on page 21).

### Step 3

See Figures 24 and 24a. Orient the card so that the component side is face down, toward the fan (Detail 43), and insert the gold fingers into the corresponding ISA connector (Detail 44) on the I/O board (Detail 25) (above the fan). Be sure that the ISA gold finger connector is engaged when inserting the card, as shown in Figure 24b.

### Step 4

See Figure 24. Using a T-15 driver, attach the ISA custom mounting tab (Detail 46) to the ISA adapter plate (Detail 41) using the installed screw (Detail 48).

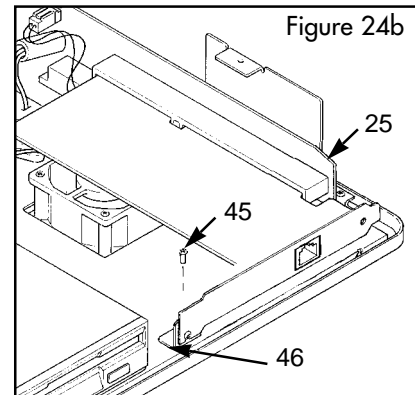
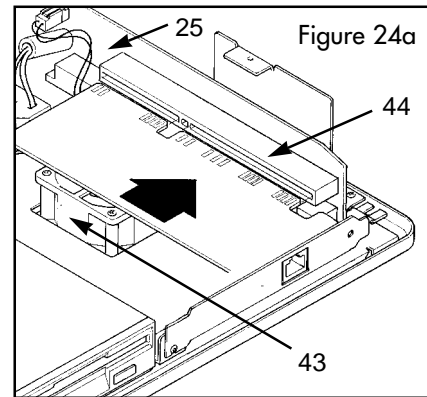
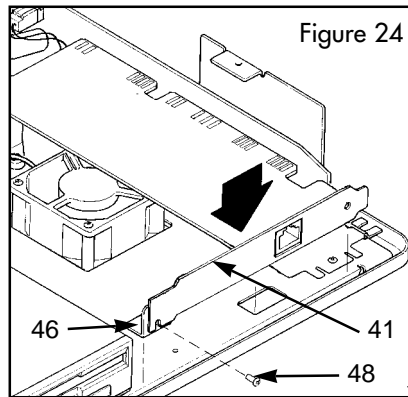


Figure 25

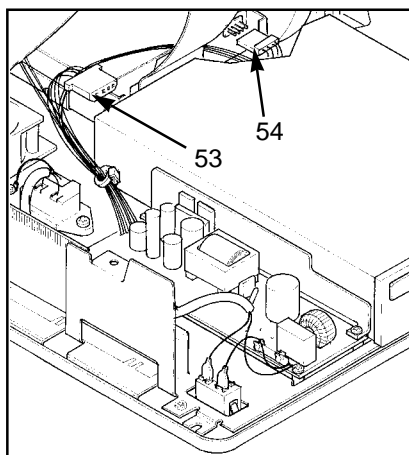
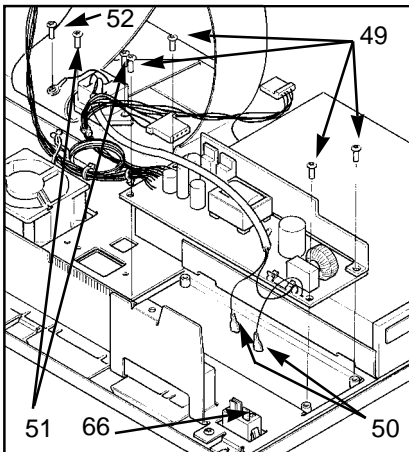


Figure 25a

## E.9 Power Supply

**Warning:** Before accessing the interior of the unit, you must disconnect the power cord from the A/C plug.

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

Remove floppy drive power cable (Detail 54), CD-ROM power cable (Detail 53) and system board power cable from peripherals.

### Step 2

Refer to Figure 25. Remove the 4 PCB mounting screws (Detail 49) using a T-15 driver.

### Step 3

Disconnect the fast-on connectors (Detail 50) from the power switch (Detail 66).

### Step 4

Remove the AC receptacle screws (Detail 51).

### Step 5

Remove the green grounding wire screw (Detail 52). (A grounding symbol stamp is located next to the screw.)

**To Reinstall:** Reverse steps 1-5.

## E.10 FLOPPY DRIVE

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

Slide out the floppy drive (Detail 42) mounted to the floppy drive plate (Detail 70), as shown in Figure 15.

### Step 2

Disconnect the floppy power cable (Detail 54), as shown in Figure 25a, and the floppy data cable (Detail 55), as shown in Figure 26.

### Step 3

See Figure 26. Turn the assembly upside down and remove the 4 screws using a T-10 driver.

### Step 4

Remove the old floppy drive from the floppy drive plate and install the new one.

### Step 5

Reinstall the 4 screws.

### Step 6

Reconnect the floppy data cable (Detail 55), making sure to route it in the same way as the original installation. Re-use the cable routing tape.

### Step 7

Mount the drive back into the bracket (Detail 70), and reconnect the floppy data cable and power cable (Detail 55).

### Step 8

Slide the floppy assembly back into place (in the opposite direction indicated in Section E.1).

Figure 26

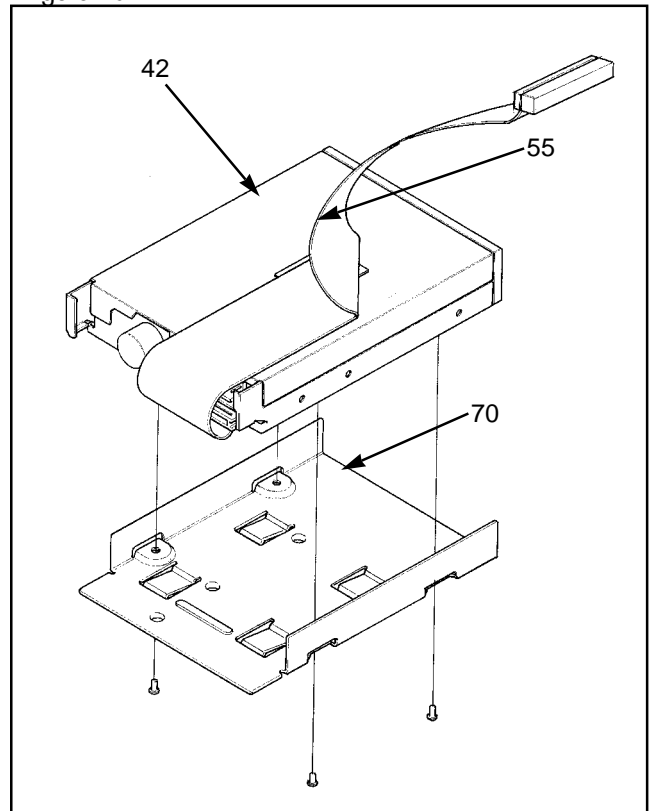
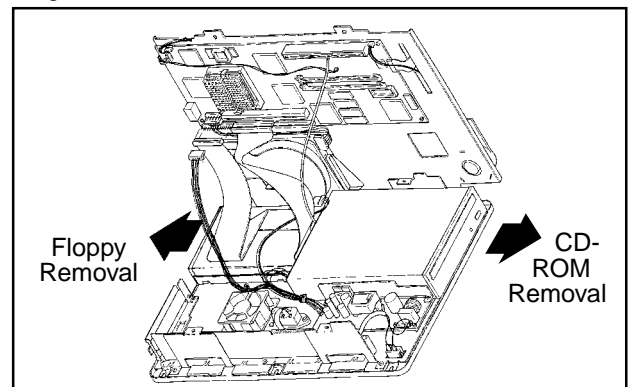


Figure 15



## E.11 CD ROM

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

See Figure 15 and Figure 27. Slide the CD ROM (Detail 56) and disconnect the CD ROM power cable (Detail 53), CD ROM audio cable (Detail 57), and CD ROM data cable (Detail 58).

### Step 2

Remove the 4 screws using a T-10 driver.

### Step 3

Remove the bracket (Detail 59). Replace the old CD ROM with the new CD ROM.

### Step 4

Reinstall the CD ROM bracket and 4 screws.

### Step 5

Reconnect the power, audio, and data cables.

### Step 6

Slide the CD ROM assembly back into place (in the opposite direction indicated in Figure 15) until seated.

Figure 27

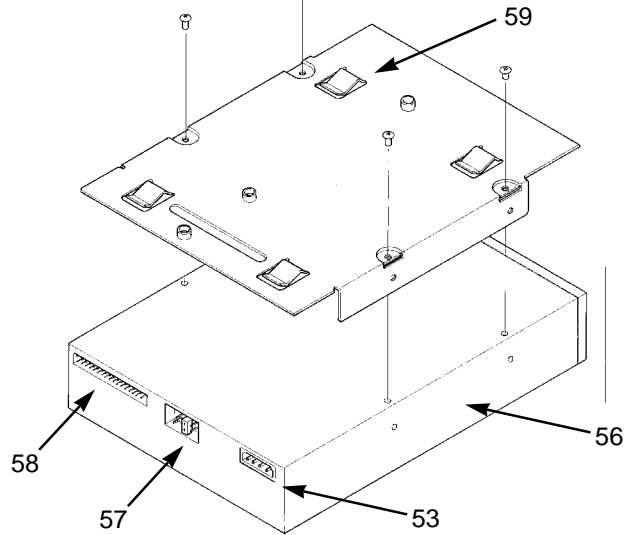
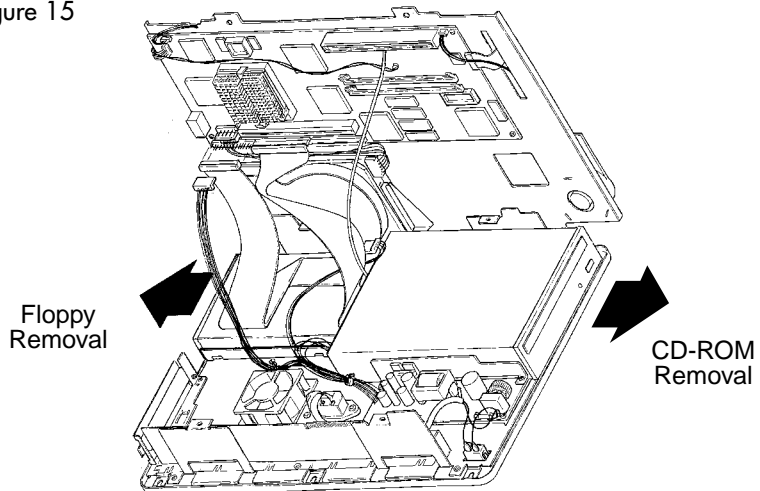


Figure 15





## E.12 Fan

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

Disconnect the power connector from the I/O board (Detail 25).

### Step 2

See Figure 28. Remove the 4 screws in each corner of the fan using a T-10 driver.

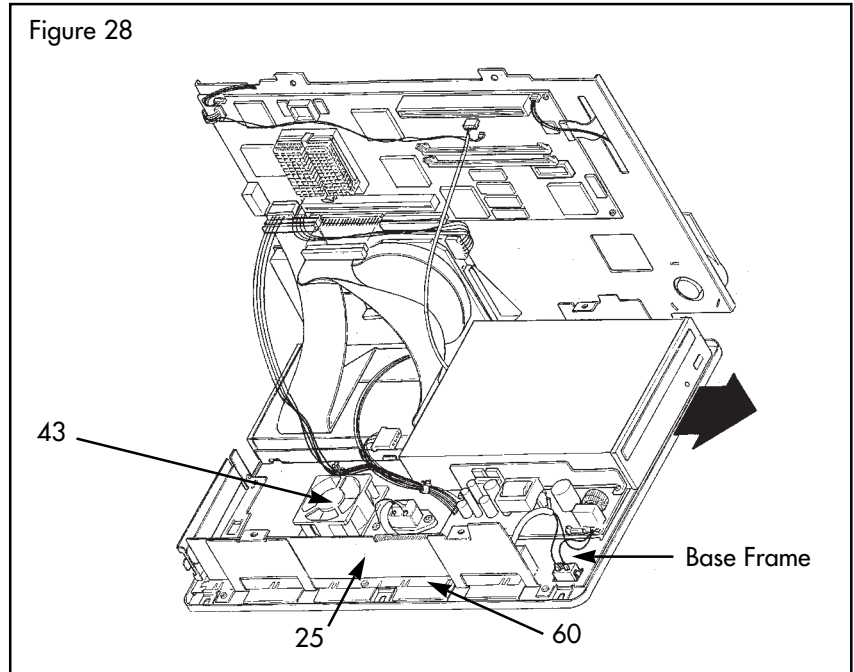
### Step 3

Noting the air flow orientation, remove the old fan (Detail 43) and replace it with the new one.

### Step 4

Reconnect the power connector and the 4 screws.

**NOTE:** The fan connector is keyed and should be installed in the original orientation.



## E.12 I/O Board

**NOTE:** First perform Section E.1 (Separating the Base Frame and LCD Support) before proceeding.

### Step 1

See Figure 28. Disconnect the fan connector from the I/O board (Detail 25).

### Step 2

Remove the five T-15 screws to release the I/O shield (Detail 60) from the base frame.

### Step 3

Using a nut driver, remove each I/O board's connector nuts (total of 8) and audio nuts (total of 3) from the I/O shield (Detail 60).

### Step 4

Place the shield onto the new I/O board (Detail 25) and reinstall the connector nuts.

### Step 5

Install the assembly into the unit as before.

### Step 6

Replace the five T-15 screws.

### Step 7

Reconnect the fan connector to the I/O board.

**NOTE:** The connector is keyed and should be installed in the original orientation.

## F. Reconnecting the Base Frame and the LCD Support

### Step 1

See Diagram 4 on page 7 and Diagram 5 on page 8. Be sure to reconnect all of the following cables in the same manner as were previously installed:

floppy data (Detail 55)	CD ROM data (Detail 58)
main system power (Detail 61)	CD ROM audio (Detail 57)

**NOTE:** Be sure that the floppy data cable (Detail 55) and CD ROM data cable are folded flat (Detail 58) and do not overlap between the floppy drive (Detail 42) and hard drive (Detail 39). Make sure the power cable is routed around the fan.

**WARNING:** No other cables should route between the floppy drive and hard drive. Improper cable routing may result in system failure.

### Step 3

See Diagram 5 on page 8. Align the LCD support (Detail 13), making sure that the system board connector (Detail 64) inserts into the I/O board (Detail 25) gold fingers.

### Step 4

See Figure 13 on page 15. With a T-15 driver, reinstall the 4 screws into the LCD support mounting holes.

**NOTE:** Refer to Section D to reinstall the LCD, inverter board, and button board if necessary.

## G. Reconnecting the Cosmetic Upper Housing

### Step 1

Place the computer on its lower housing and reinstall the cosmetic upper housing. See Figure 3 on page 10.

**NOTE:** Make sure all cabling is retained to prevent pinching or shearing.

### Step 2

Turn the computer onto its upper housing with the LCD display face down. Be careful not to scratch the LCD. Reinstall the 6 screws. See Figure 2a on page 10.

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### Step 3

See Figure 2 on page 9. Place a large, flat-blade screwdriver in the cam lock (Detail 1) and rotate the cam lock clockwise until the plastic latch moves from Detail 3 to Detail 2.

## H. Accessing System BIOS

**NOTE:** *The BIOS has been optimally configured for your Monorail PC.*

### **Delete Key**

Press the Delete key within 1 second of the Monorail splash screen appearing upon boot-up. The Delete key allows access to the BIOS setup and parameters.

### **End Key**

Press the End key immediately upon cold reboot to reset the BIOS to optimal settings.

### **Insert Key**

Press the Insert key upon cold reboot to view a text screen of BIOS recognized hardware settings (processor type, processor speed, installed memory)

**NOTE:** *BIOS updates are available at the Monorail web site, [www.monorail.com](http://www.monorail.com).*