

*Maintenance Manual*

# **Extensa<sup>™</sup> 450 Series Notebook Computers**

**9805725-0001**

**November 1995**



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**Extensa 450 Series Notebook Computers  
Maintenance Manual  
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This manual provides installation, operation and servicing data for the Extensa™ 450 Series Notebook Computers.

## Intended Audience

This manual is primarily intended for use by qualified service technicians but contains information useful to non-technical users.

## Contents

This manual contains six sections and multiple reference appendices including:

- **Section 1: General Description** — Introduces the main features of the notebook; provides a list of physical and electrical specifications.
- **Section 2: Installation** — Describes how to unpack, install options and cable up the notebook computer in a desktop environment.
- **Section 3: Operating Instructions** — Describes the notebook operating controls and indicators and modes of operation.
- **Section 4: Theory of Operation** — Describes detailed theory of operation for Extensa series notebooks.
- **Section 5: Troubleshooting** — Provides troubleshooting procedures for the Extensa 450 series notebooks.
- **Section 6: Field Service** — Provides corrective maintenance procedures for the notebook computer.
- **Appendix A: Self Test Error Messages**
- **Appendix B: Connector Pinouts**
- **Appendix C: PC-Doctor Reference Data**

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**Note:** Additional appendices will be added at a future date to document new members of the Extensa product family.

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## Other Manuals About the System

The following documents provide additional information related to the Extensa 450 series:

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- **Extensa 450 Series Notebook Computer User's Reference Manual**, Part No. 9803942-0001; contains reference information regarding the Extensa 450 series software including the TI custom utilities.
  - **Windows 95 Help** (online)
  - **PC-Doctor Help and Technical Reference** (online)

## **Ordering Parts and Supplies**

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Telephone Toll-free: **1-800-TI TEXAS**



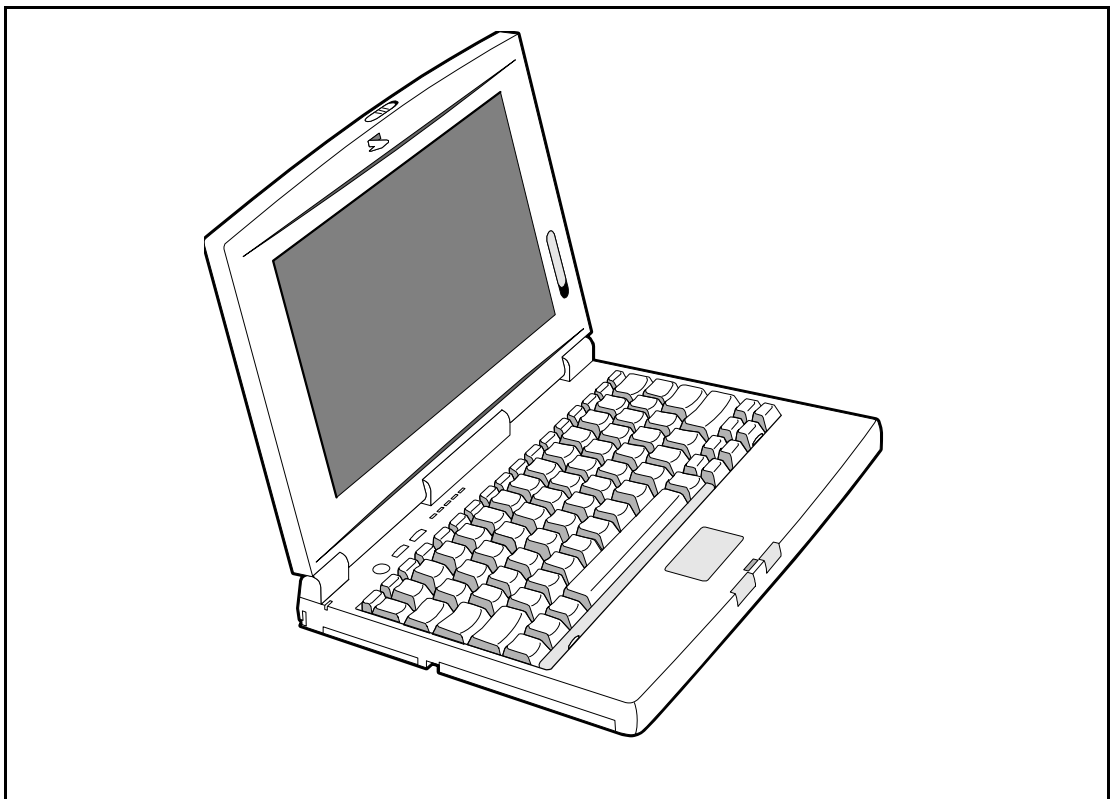
## General Description

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### 1.1 Introduction

This manual contains field and factory level servicing information for the Texas Instruments Extensa<sup>™</sup> 450 Series of Notebook Computers (Figure 1-1).

This section provides a general overview and specifications for the Extensa 450 Series Notebook Computers.



**Figure 1-1 Extensa 450 Series Notebook Computer**

## 1.2 Product Models

Table 1-1 summarizes the features of the product models initially available in the Extensa 450 product line. Basically, the product models offer a choice of either 10.4" Dual Scan Color or 9.4" Active Matrix Color LCDs and a choice of either the basic Windows 95 operating system or Windows 95 plus applications.

**Table 1-1 Extensa 450 Series Notebook Computers**

<b>Model 450</b>	<b>Model 450T</b>	<b>Model 455</b>	<b>Model 455T</b>
10.4" DS LCD	9.4" Active Matrix Color	10.4" DS LCD	9.4" Active Matrix Color
Windows 95	Windows 95	Windows 95 Plus Microsoft Works, Quicken SE, Lotus Organizer, and Microsoft Entertainment Pack	Windows 95 Plus Microsoft Works, Quicken SE, Lotus Organizer, and Microsoft Entertainment Pack

## 1.3 International Product Versions

The Extensa 450 Series Notebooks are available in one of 15 domestic and international configurations as listed in Table 1-2.

**Table 1-2. Notebook Domestic/International Configurations**

<b>Configuration</b>	<b>P/N Suffix</b>	<b>Configuration</b>	<b>P/N Suffix</b>
Domestic	-0001	Swedish	-0010
UK	-0002	Swiss/French	-0011
German	-0003	Danish	-0012
French	-0004	Norwegian	-0013
Spanish	-0005	Finish	-0014
Swiss/German	-0006	Belgium	-0015
Italian	-0007	Austrian	-0016
Portuguese	-0008	Latin American	-0018
Western European	-0009		

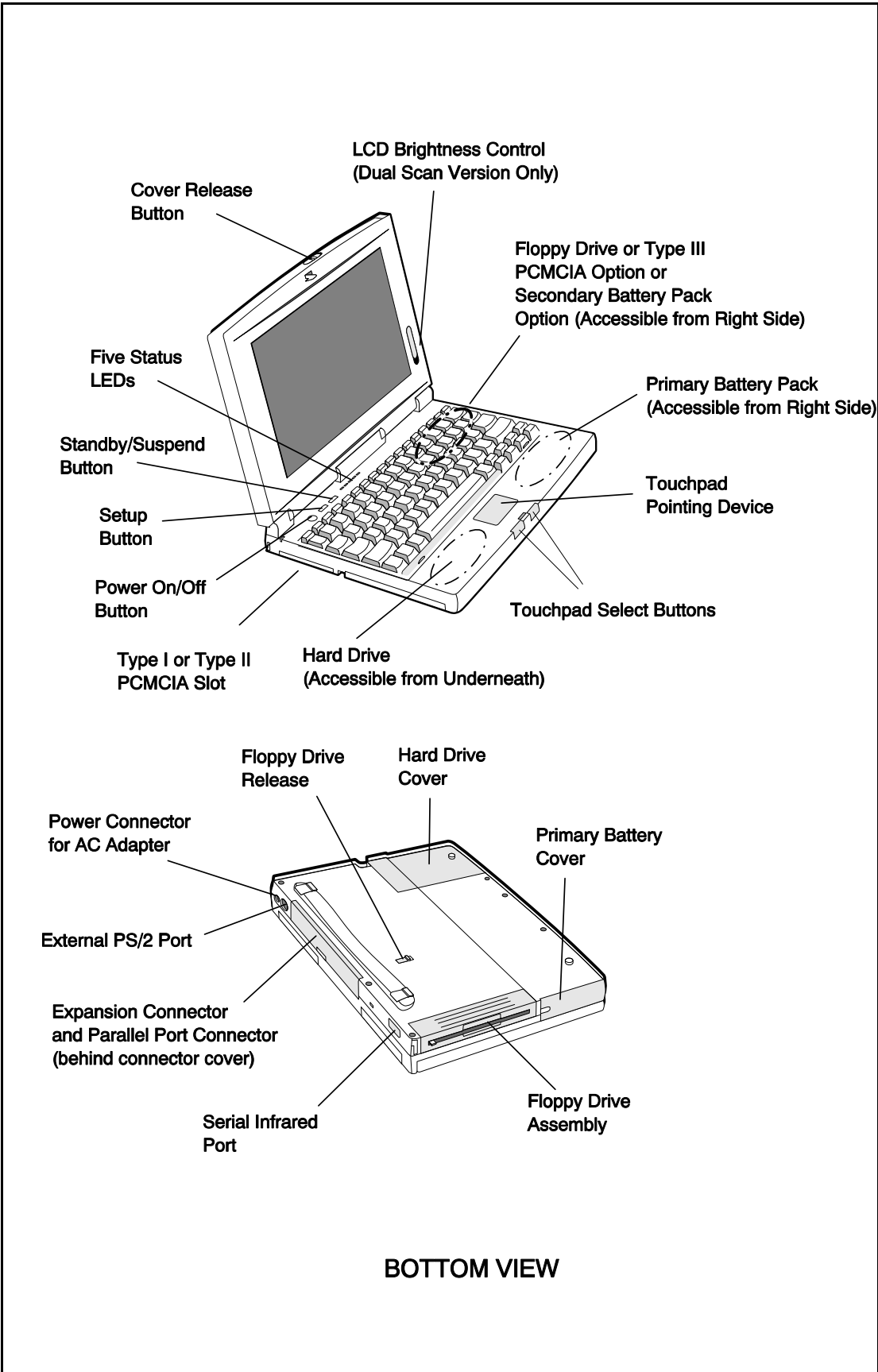
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## 1.4 Product Overview

All members of the Extensa 450 Series are high performance notebooks powered by the 75MHz IntelDX4 processor and Windows 95<sup>™</sup> Operating System software.

As a standard feature, all members of the Extensa 450 family also contain the following features:

- 4MB of RAM memory (user-expandable to 32MB)
- 128 bytes of battery-backed up CMOS RAM
- 512 KB of video RAM
- 340 Million Byte Hard Drive (user replaceable)
- Support for one PCMCIA Type I or II option (Type III if floppy drive is removed with option)
- Ergonomic keyboard with palm rest (2.7 mm travel); built-in touchpad pointing device
- Most standard external device interfaces including serial, parallel, PS/2, external VGA, and serial infrared wireless port
- Removable 3.5", 1.44 MB Floppy Drive (second Lithium Ion battery or a type III PCMCIA device can be installed in its place with option)
- Choice of LCD displays (10.4" Dual Scan Color or 9.4" Active Matrix Color LCD).
- AC Adapter with autosensing (100 VAC to 240 VAC, 50 to 60 Hz); 34 Watts of DC output power
- 10.8 Volt, 2400 mAH capacity, Nickel-Metal Hydride (NiMH) primary battery pack
- Provisions for secondary 10.8V, 1460 mAH capacity, Lithium-Ion Battery Pack (with removal of Floppy Drive)
- Power management features for longer portable operation away from AC power.

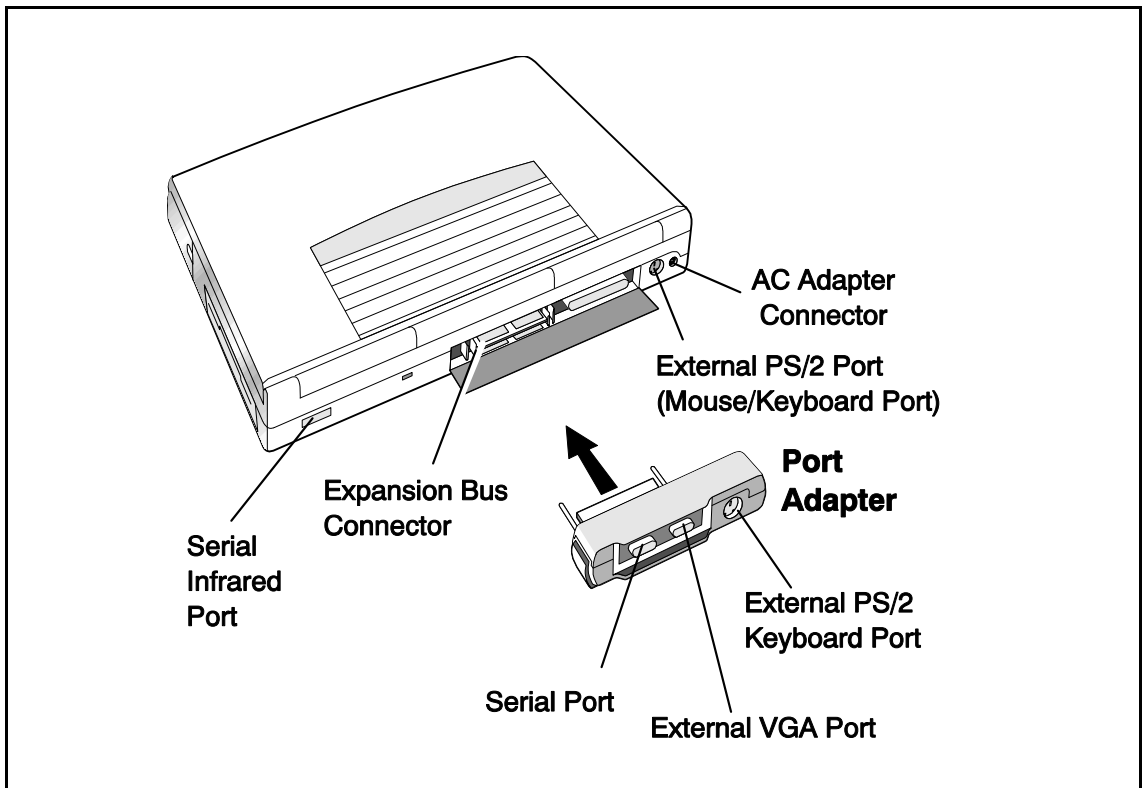


**Figure 1-2 Extensa 450 Series Features**

## 1.4.1 External Ports

As shown in Figure 1-3, the notebook computer contains the following external ports:

- Serial Infrared (SIR) Port for wireless connection with a similarly equipped printer or computer
- 9-Pin Serial Port for attaching any RS-232 type serial device to the Notebook
- 15-Pin External VGA Monitor Port for attaching an external monitor
- 6-Pin PS/2 Port to attach an external Keyboard or Mouse
- Second 6-Pin PS/2 Port for attaching an external Keyboard/Mouse
- AC Adapter Connector for attaching the AC Adapter to the notebook

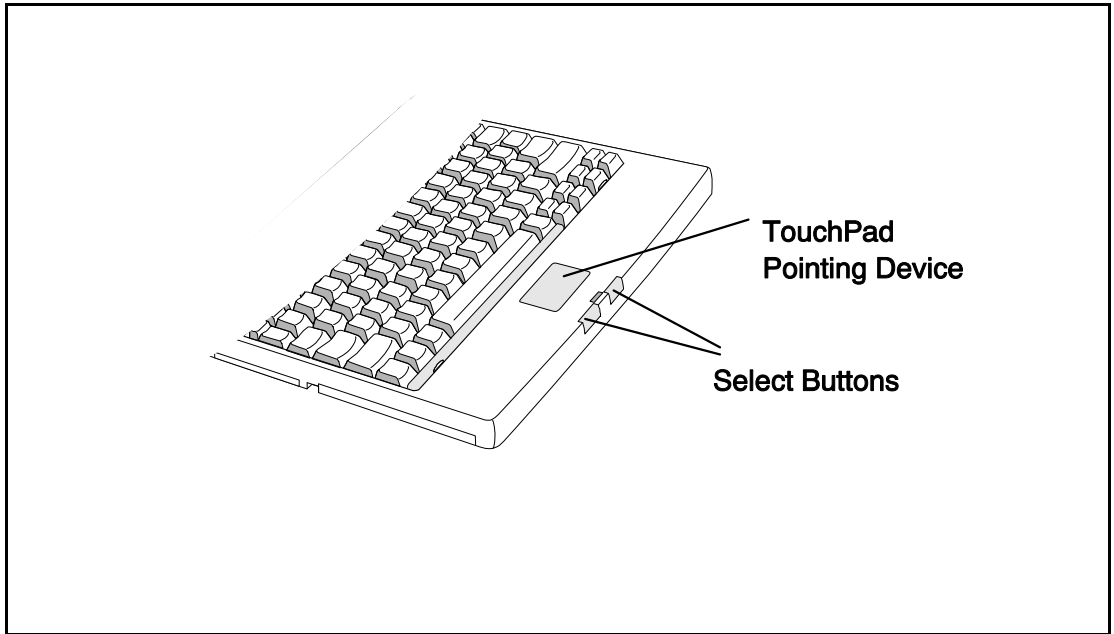


**Figure 1-3 Notebook External Ports**

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## 1.4.2 Touchpad Pointing Device

All members of the Extensa family feature a built-in Touchpad pointing device located near the center of the keyboard's palmrest. With light pressure, the cursor can quickly be positioned to the desired point; a quick double tap on the Touchpad and you have selected an object. Two select buttons (switches) are located along the front edge of the notebook



**Figure1-4 Extensa Touchpad**

## 1.4.3 Keyboard

The Extensa Series Keyboard is an 83/84-key, IBM enhanced-type keyboard with the standard character and function keys plus 12 programmable function keys (F1 through F12).

Using the Special Function (**Fn**) key which assigns multiple functions to keys, the keyboard can emulate the IBM 101/102 keyboards using 83 keys (84 on international models).

The keyboard has a 2.77 mm stroke and features a special keyboard interface chip that can detect multiple levels of key input (good simulation of N-key rollover for up to 10 keys).

Some of the major features of the keyboard include:

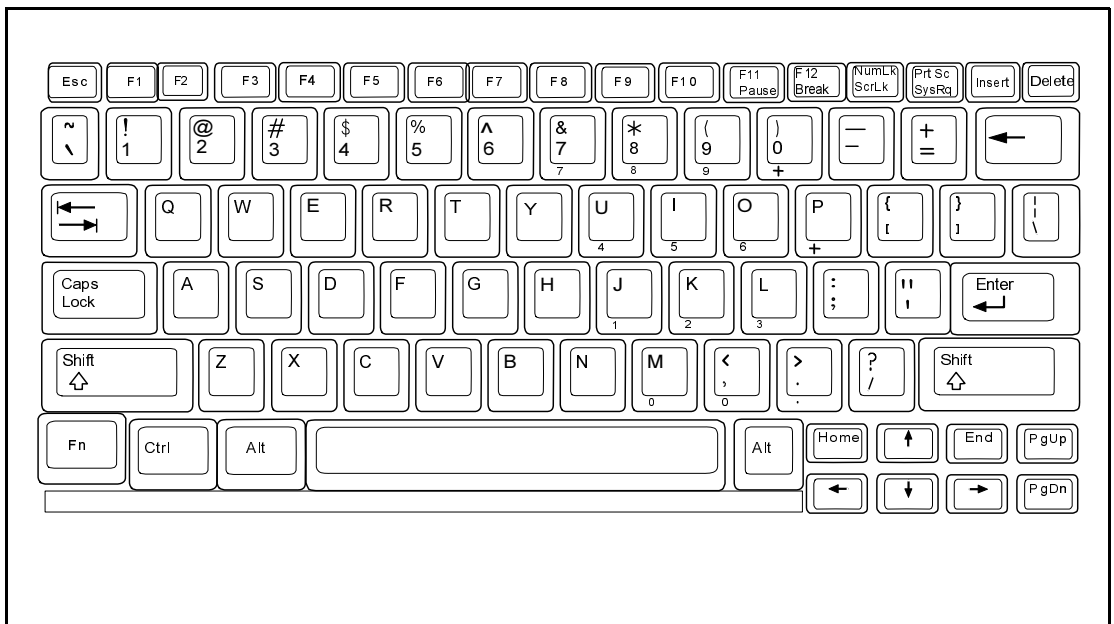
- 2.77-mm Key movement
- Integrated numeric keypad
- "Inverted T" Cursor Control Key layout

The notebook keyboard is available in the following versions:

- U.S. English - This version (also known as the domestic version) has 81 keys and is generally used in the United States and Canada.
- U.K. English - This version (also known as the international version) has 82 keys and is generally used in England, Germany, and other European countries with the appropriate keycap changes.



Note: The Extensa Series Notebook Computer User's Reference Manual contains descriptions of keyboard special function keys. A six-pin Mini-DIN connector can attach to either an external PS/2 keyboard (or 101 Keyboard via an adapter), PS/2 Mouse, or the optional PS/2 Numeric Keypad.



**Figure 1-5 Extensa Keyboard**

### 1.4.3.1 Controls and Indicators

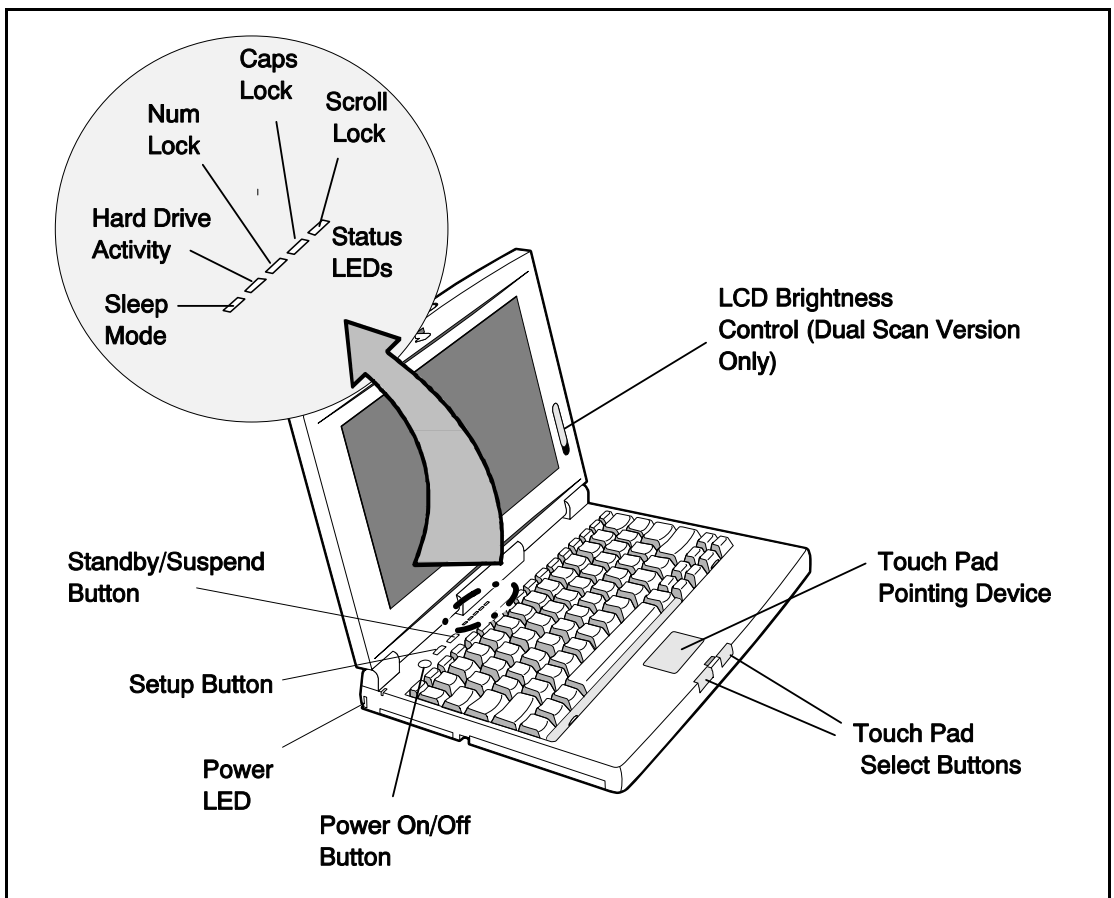
As shown in Figure 1-6, Extensa Series Notebook Computers contain a set of three buttons (switches) and five LED displays just above the keyboard including:

- **Power, Setup, and Standby/Suspend Buttons (Switches)**
- **Caps Lock** indicator. This LED indicates that the keyboard is locked in the uppercase mode. To switch to the lowercase mode, press the **Caps Lock** key.
- **Num Lock** indicator. This LED lights when you press the NumLk key to toggle on the numeric keypad lock function. When the LED is On, the embedded numeric keyboard keys generate AT-keypad characters and functions when pressed in conjunction with the **Shift** key. When the indicator is Off, pressing

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the **Fn** key with the appropriate keys provides cursor movement, paging and other functions in the normal mode.

- **Scroll Lock** indicator. This LED lights to indicate that the keyboard is locked in the scroll mode.
- **Hard Disk Drive Activity** Indicator. Indicates when notebook is accessing the hard drive.
- **Standby** Indicator. Lights when Notebook is in Standby mode.



**Figure1-6 Extensa Series Controls and Indicators**

## **1.4.4 Standard Power Features**

Notebook power for the Extensa 450 Series Notebook Computers is provided by an AC Adapter and a rechargeable 10.8 V, 2400 mAh Duracell nickel metal hydride (NiMH) battery pack that installs in a power bay near the front of the notebook (right side).

A second lithium ion battery may optionally be installed in the Floppy Drive bay when the Floppy Drive is removed from the Notebook.



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All members of the Extensa 450 family feature TI's patented power management subsystem (hardware and software) that provides longer portable operation and protection of files during low battery conditions.

### **1.4.5 Wireless Connection With Serial Infrared Port**

The Extensa series notebooks are equipped with a Serial Infrared (IR) port that offers wireless communication with a variety of IRDA-compliant devices made by other manufacturers.



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Note: Prior to communicating with an external device equipped with a serial infrared interface, the appropriate third-party drivers must be installed on your notebook.

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### **1.4.6 Preloaded Software**

All members of the Extensa 450 Notebook family are preloaded with the Windows 95 Operating System. In addition, Extensa Models 455 and 455T come standard with the following application packages installed:

- Microsoft Works
- Quicken SE
- Lotus Organizer
- Microsoft Entertainment Pack No. 4

### **1.4.7 Notebook Expansion Capabilities**

Expansion capabilities built into the Extensa notebook series include:

- User installable expansion RAM memory (to a maximum of 32 MB)
- By removing the floppy drive, you can add either a second battery pack or a Type III PCMCIA device with option.
- A Cable Connect PS/2 Numeric Keypad option, P/N 2581381-0001, can be attached to either of the two external PS/2 Ports.
- A parallel device can be attached to the notebook's external 25-pin parallel port (EPP/ECP compatible).
- With the port adapter installed (supplied with the notebook), the notebook's expansion bus is adapted to provide the following external ports:
  - Serial RS-232 Port for attaching any serial device
  - External VGA Port for driving an external color monitor
  - Second PS/2 Port for attaching an external keyboard or mouse

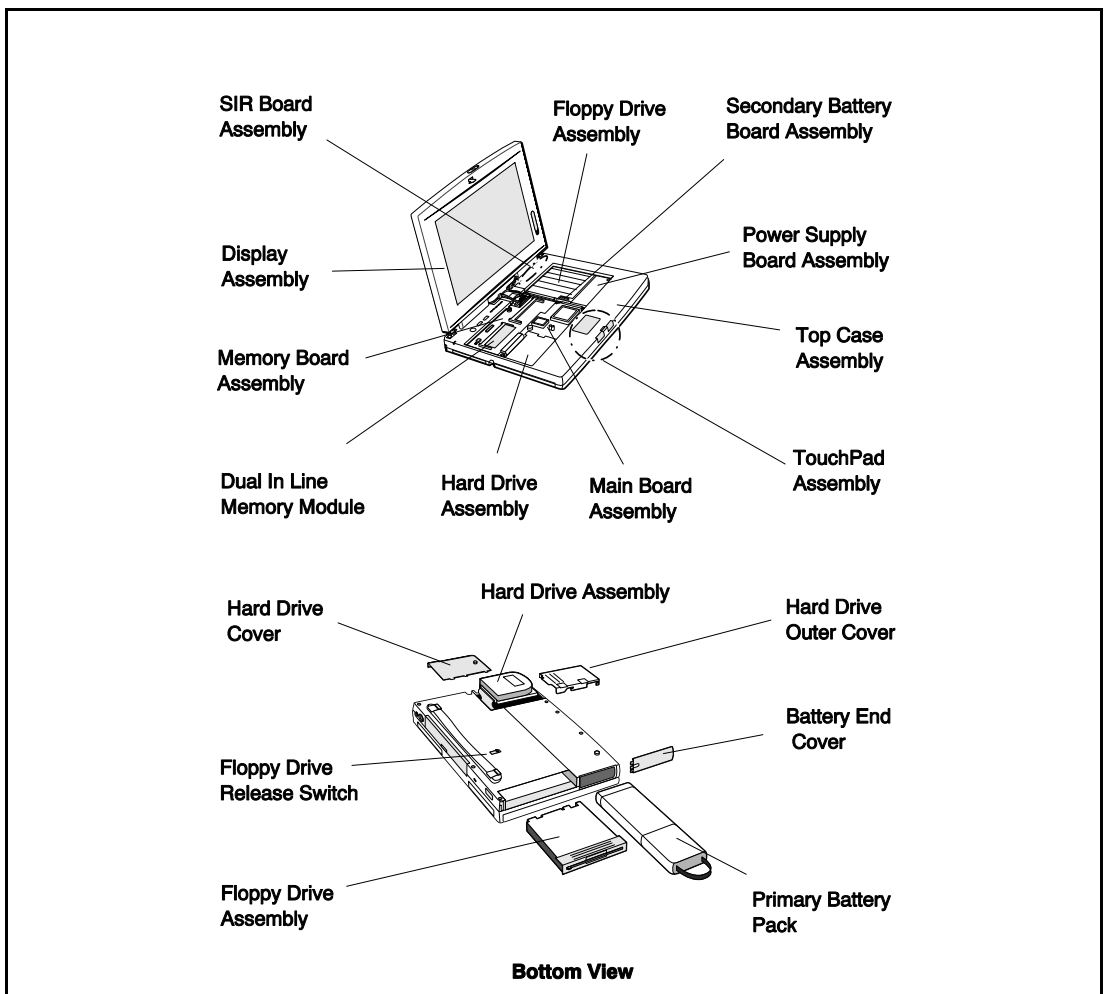
- Third Party External PS/2 keyboard (or external mouse)

## 1.5 Standard Test Features

The Extensa Series Notebook Computers use modular design and built-in test features to reduce the mean time to repair. A power on self-test automatically verifies the operational state of the primary circuits and a powerful suite of diagnostic tests are available to further test selected parts of the system.

## 1.6 Notebook Assemblies and Subassemblies

The Extensa Series Notebooks are modular in design and can be disassembled for maintenance purposes using a standard set of flat-bladed, Phillips-head and hexagonal screwdrivers. The major assemblies that comprise a typical notebook in the Extensa family are shown in Figure 1-7 and briefly described in the following paragraphs.



**Figure 1-7 Notebook Assemblies**

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## **1.6.1 Cover-Display Assembly**

The Cover-Display Assembly contains the LCD screen and associated high voltage power supply and video circuitry. The Cover-Display Assembly contains three field-replaceable components including:

- LCD Assembly
- Inverter Board
- Slide Pot/Converter Board

The Cover-Display Assembly attaches to the System Base Assembly through four top mounted screws and six mounting screws on the bottom of the computer.

## **1.6.2 System Base Assembly**

As shown in Figure 1-7, the majority of the notebook's field replaceable units (FRUs) are located in the system base assembly. These FRUs include:

- Main Board Assembly
- Hard Disk Drive Assembly
- Memory Board Assembly
- Up to two Dual Inline Memory Modules
- Serial Infra-red Board Assembly
- Floppy Drive Assembly
- Secondary Battery Board Assembly
- Power Supply Board Assembly
- Battery Pack Assembly
- Top Case Assembly
- Touchpad Assembly
- Keyboard Assembly (removed in Figure 1-7 for clarity)
- Battery Board Assembly

# 1.7 Extensa 450 Series Notebook Specifications

Specifications for the Extensa 450 Series Notebooks are provided in Table 1-6.

**Table 1-6 Extensa 450 Notebook Features**

<b>Specifications</b>	<b>Models 450/450T</b>	<b>Models 455/455T</b>
<b>Memory:</b>		
<b>Standard:</b>	4MB	4MB
<b>Maximum</b>	32MB	32MB
<b>Display</b>		
<b>LCD Type:</b>	10.4" Dual Scan Color	9.4" Active Matrix Color
<b>Simultaneous LCD/Ext. VGA</b>	Yes	Yes
<b>Video RAM Size:</b>	512 KB	512 KB
<b>Video Bus</b>	VLBUS with Graphics Accelerator	VLBUS with Graphics Accelerator
<b>Keyboard/Pointing Device,</b>		
<b>Ergonomic Keyboard</b>	Yes	Yes
<b>Built-In Touchpad</b>	Yes	Yes
<b>Storage</b>		
<b>Floppy Drive:</b>	3.5", 1.44MB	3.5", 1.44MB
<b>Hard Drive:</b>	340 Million Byte	340 Million Byte
<b>Interfaces</b>		
<b>Serial (RS232) Port</b>	Yes (Port Adapter)	Yes (Port Adapter)
<b>Parallel Port (EPP/ECP), Yes</b>	Yes	
<b>External VGA Port</b>	Yes (Port Adapter)	Yes (Port Adapter)
<b>External PS2 Ports</b>	Yes (2nd PS/2 Port on Adapter)	Yes (2nd PS/2 Port on Adapter)
<b>Serial Infrared Port</b>	Yes	Yes
<b>PCMCIA Support</b>	Type I/II (III Optional)	Type I/II (III Optional)

<b>Specifications</b>	<b>Models 450/450T</b>	<b>Models 455/455T</b>
<b>Software</b>	Windows 95	Windows 95, plus applications
<b>Physical Characteristics</b>		
<b>Weight:</b>	Approx. 5.0 Pounds (2.27kg) *	Approx. 5.0 Pounds (2.27kg)
<b>Dimensions:</b>	11.7" (L) X 1.7" (H) X 8.2" (W)	11.7" (L) X 1.7" (H) X 8.2" (W)
* Wight specifications do not include Floppy Drive, AC Adapter or 2nd Battery		

## **1.8 Agency Approvals**

All Extensa 450 Series products meet the following standards:

- Underwriter's Lab (UL) Standard 1950 (safety)
- Canadian Standards Association (CSA) Standard 220 (safety)
- FCC CFR 47, Part 15, Subpart J, FCC Level B (EMI)
- Canadian Department of Communications (DOC) Certification
- VDE 0871, Class B (EMI)

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# Installation

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## 2.1 Introduction

This section contains unpacking and preparation for use instructions for the Extensa 450 Series Notebook Computers.

## 2.2 Unpacking Instructions

The packaging diagram for the notebook computer is shown in Figure 2-1. Unpack the computer using the following instructions:

1. Carefully cut the tape that seals the top flap of the shipping carton.
2. Remove the computer and the accessories from the main shipping carton.
3. Remove all protective coverings from the computer.
4. Remove the holding tape and open up the accessory box; remove the contents.

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**Note:** Save the shipping containers and packaging for later reuse.

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## 2.3 Installing Notebook Options

If you have no options to install at this time, skip to Paragraph 2.3. Otherwise, continue with Paragraph 2.2.1.

### 2.3.1 Installing Dual Inline Memory Module(s)

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**Note:** If not installing RAM Expansion option at this time, skip to the next paragraph.

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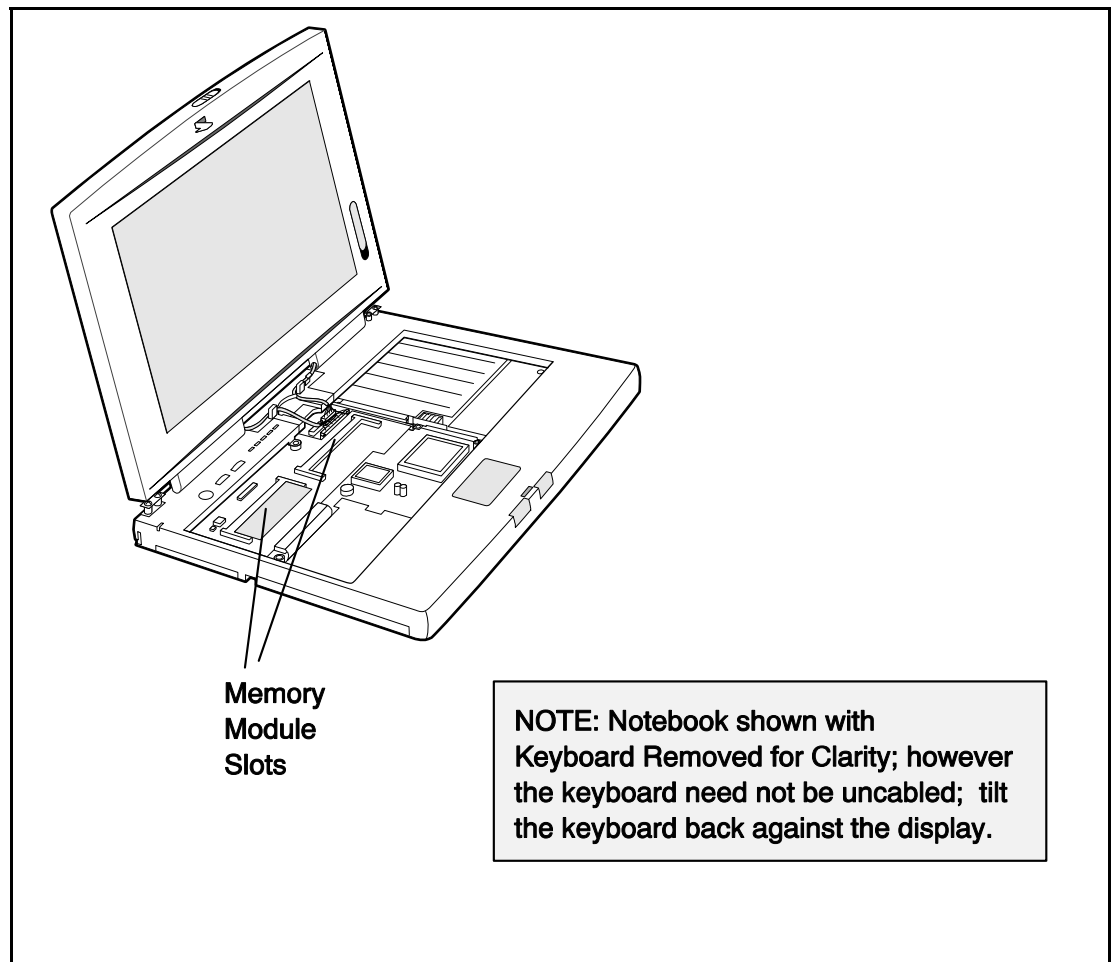
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**Caution:** The Dual Inline Memory Module contains components that are sensitive to static electricity. When handling the module and the internal parts of the computer, protect against static electricity by using wrist or ankle grounding straps and grounded working mats. When moving or storing items, use the anti-static bags supplied with the items.

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1. Ensure that the notebook is powered off and that the AC Adapter and internal battery pack(s) is (are) removed from the notebook.
2. Remove the DIMM module(s) from its shipping container.
3. Release the Keyboard by pulling the keyboard release tabs forward (tabs are located underneath the Ctrl and right arrow keys).
4. Disengage the Keyboard using a straight blade screwdriver and gently lifting up along the front edge of the keyboard.
5. Using the back edge of the keyboard as a hinge, lift the front edge of the keyboard up and lay it against the display.
6. Remove the two Phillips head screws holding heatsink to the Main Board and remove the heatsink by lifting it upwards and out of the unit.
7. Insert the edge of the DIMM Board into the rear of either available connector (see Figure 2-1). Use a rocking motion to fully insert the module. Push downwards on each side of the DIMMs module until it snaps in place.
8. Replace the heatsink, keyboard assembly and any other components removed in step 1.

This completes the expansion memory module installation procedure.

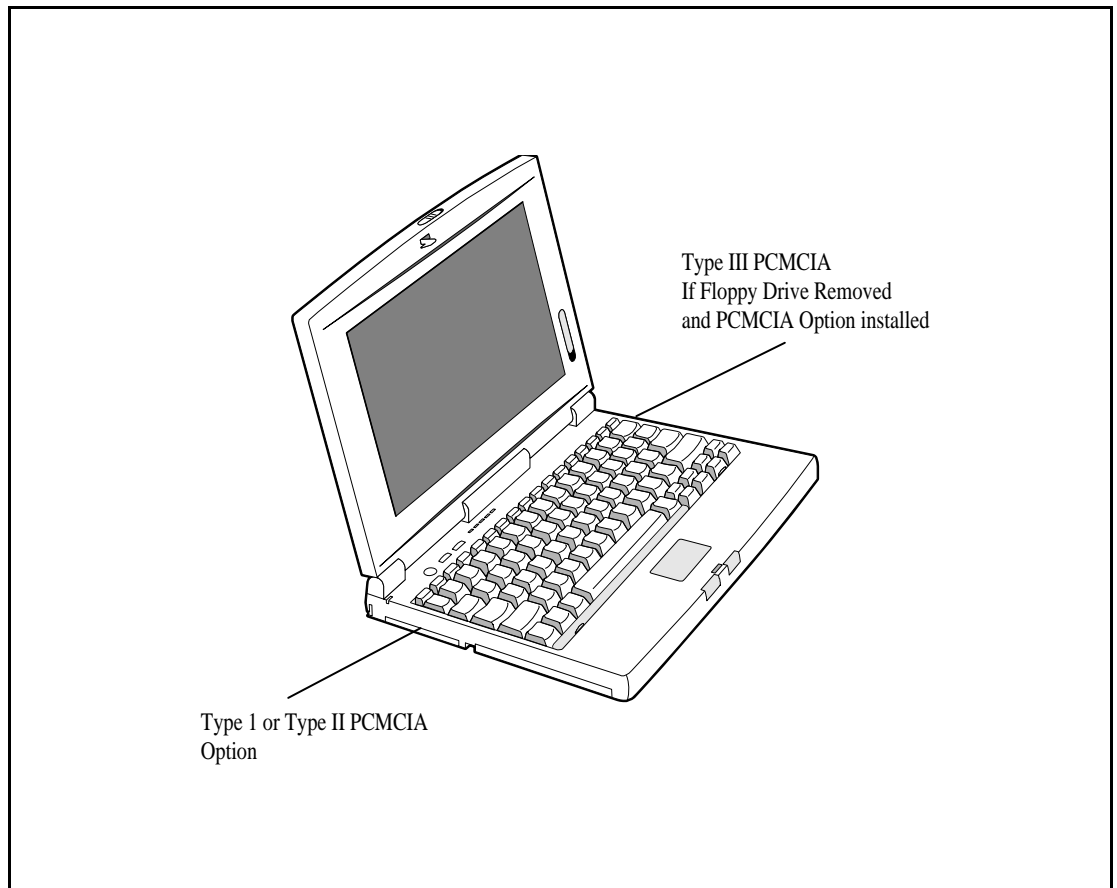


**Figure 2-1 Installing Additional Memory**

## 2.3.2 Installing PCMCIA Options

The Notebook has provisions for one Type I or Type II PCMCIA option card. However, a type III PCMCIA device can be installed if the Floppy Drive is removed from the notebook and the optional PCMCIA Module is installed..

1. Review the installation instructions supplied with the PCMCIA option card(s).
2. Open the Type I/II PCMCIA compartment cover on the left side of the notebook.
3. To insert a PCMCIA card, align the card with the socket and slide the card into the socket until it locks into place. To install a Type III option, you must remove the Floppy Drive from the right side of the notebook and install the PCMCIA Option Assembly..
4. To eject a PCMCIA card, first ensure that the notebook is not accessing the memory card or device. Under Windows 95, go to the Control Panel, PC Card and direct the card to stop before removing card.



**Figure 2-2 Installing PCMCIA Options**



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### 2.3.3 Installing the Port Adapter

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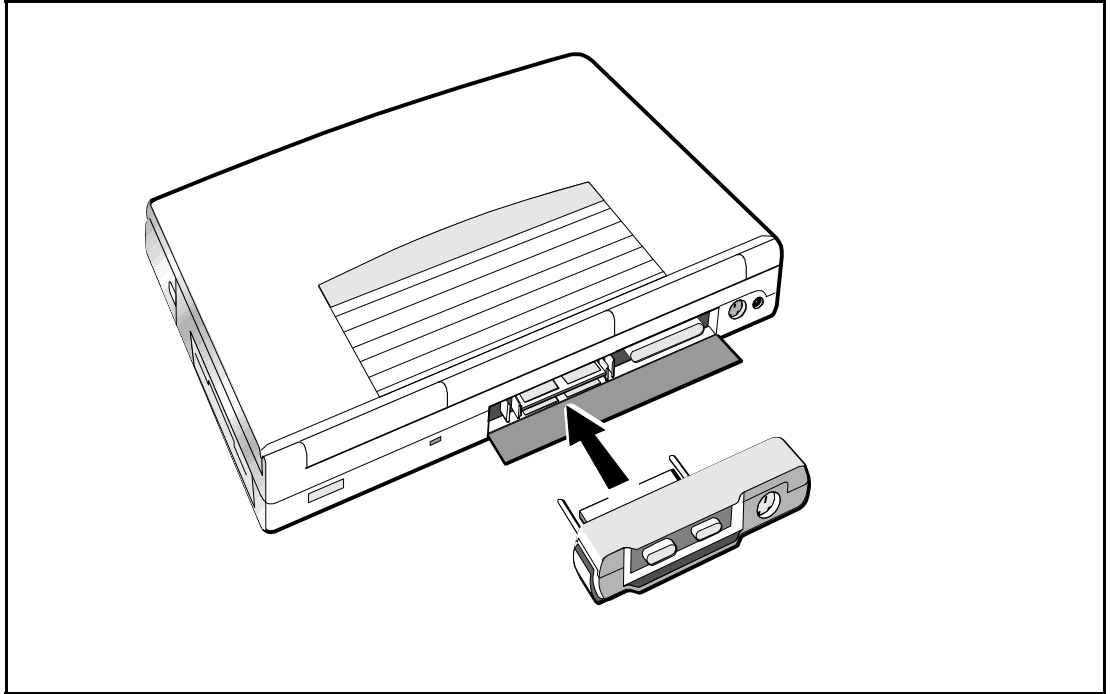
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**Note:** Skip this paragraph if not installing the Port Adapter at this time.

---

To install the Port Adapter, refer to Figure 2-3 and use the following procedure:

- 1 Remove the -port adapter and any accessories from its shipping carton .
- 2 Disconnect the AC Adapter from the notebook (if attached).
- 3 Open the rear connector door on the notebook and attach the Port Adapter to the notebook as shown in Figure 2-3.

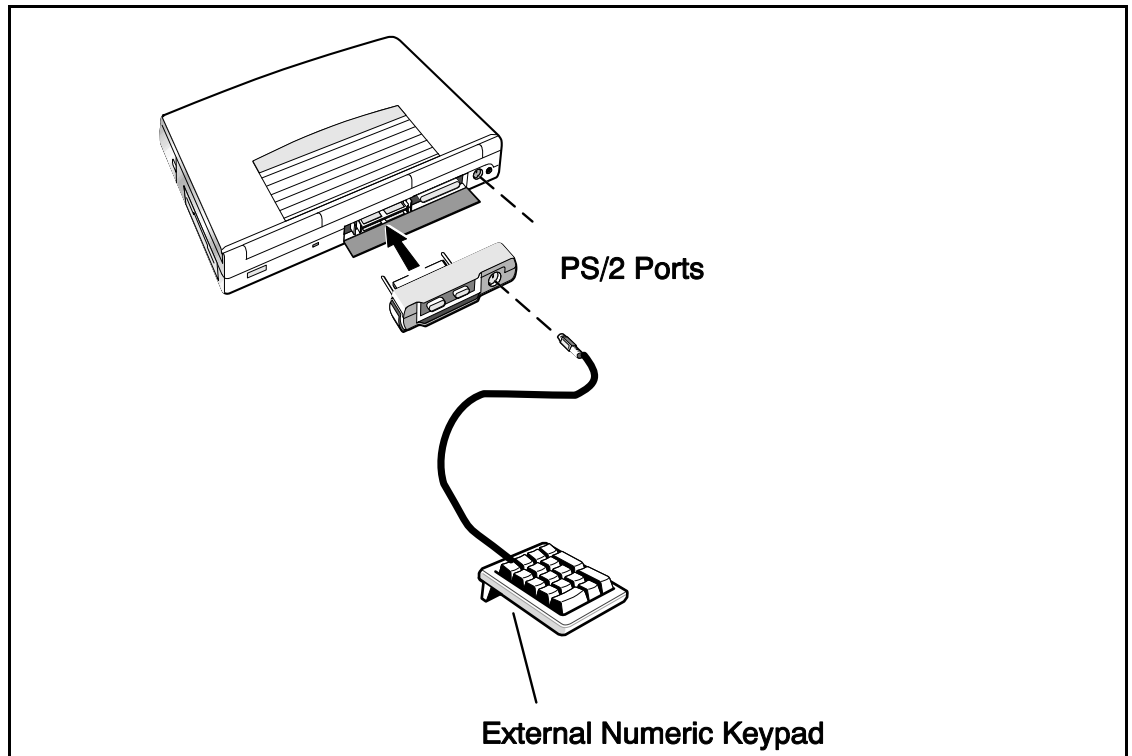


**Figure 2-3 Installing the Port Adapter**

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## 2.3.4 Installing the Optional Numeric Keypad

An optional numeric keyboard can be attached to the notebook via the notebook's PS/2 connector as shown in Figure 2-4.



**Figure 2-4 Installing the Numeric Keypad option**

## 2.4 Installing the Battery Pack(s )

The standard configuration of the Extensa Notebook is equipped with a single battery pack that is inserted from the front right side of the computer. However, if you can do without the Floppy Drive, you can use the floppy drive bay to house a second Lithium Ion battery pack.

To remove or replace the battery pack, follow the steps below.

1. Power off the notebook, being sure to save your data first.
2. Locate the battery door (right side of notebook near the front). Press the battery door inwards and slide the door toward the front of the notebook; remove the battery door.
3. Insert a new or recharged battery pack into the battery compartment bay. Make sure that the contacts are facing up and to the rear of the compartment. Check the label (facing up when inserted) indicating the positive and negative poles of the battery.

# C

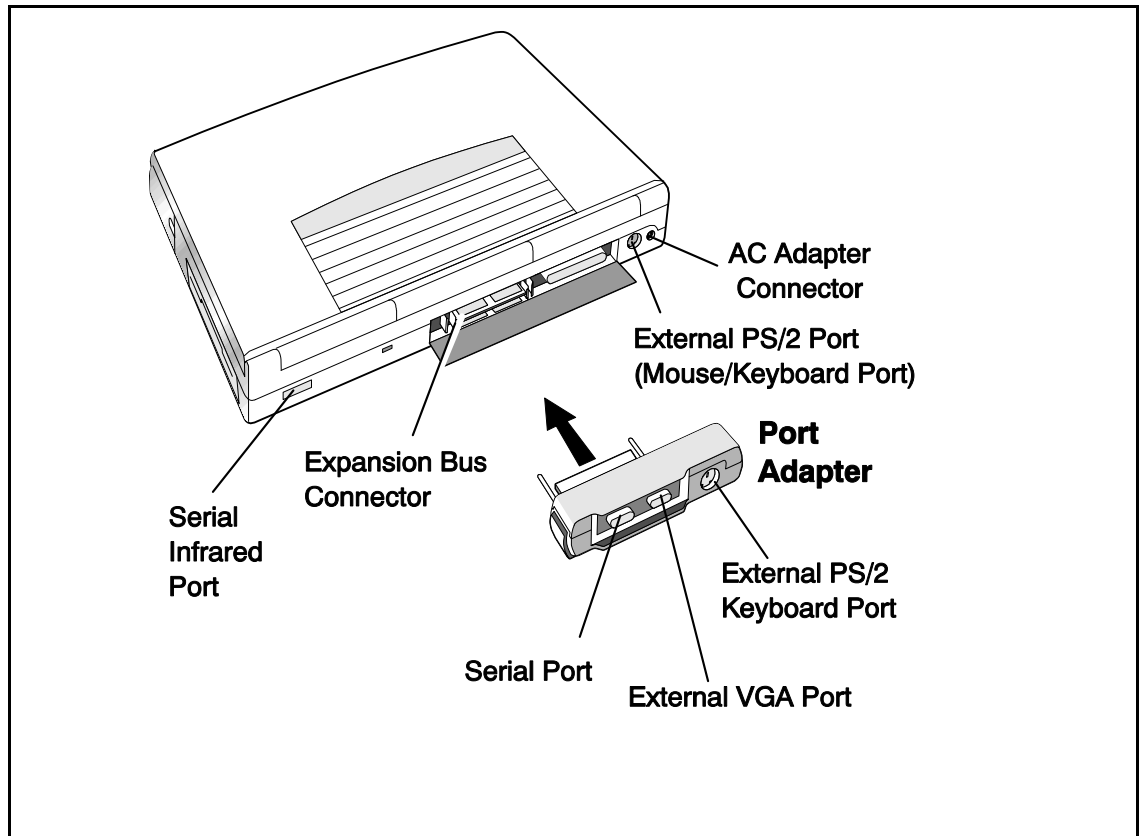
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**Caution:** There is danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

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## 2.5 Installing External Devices

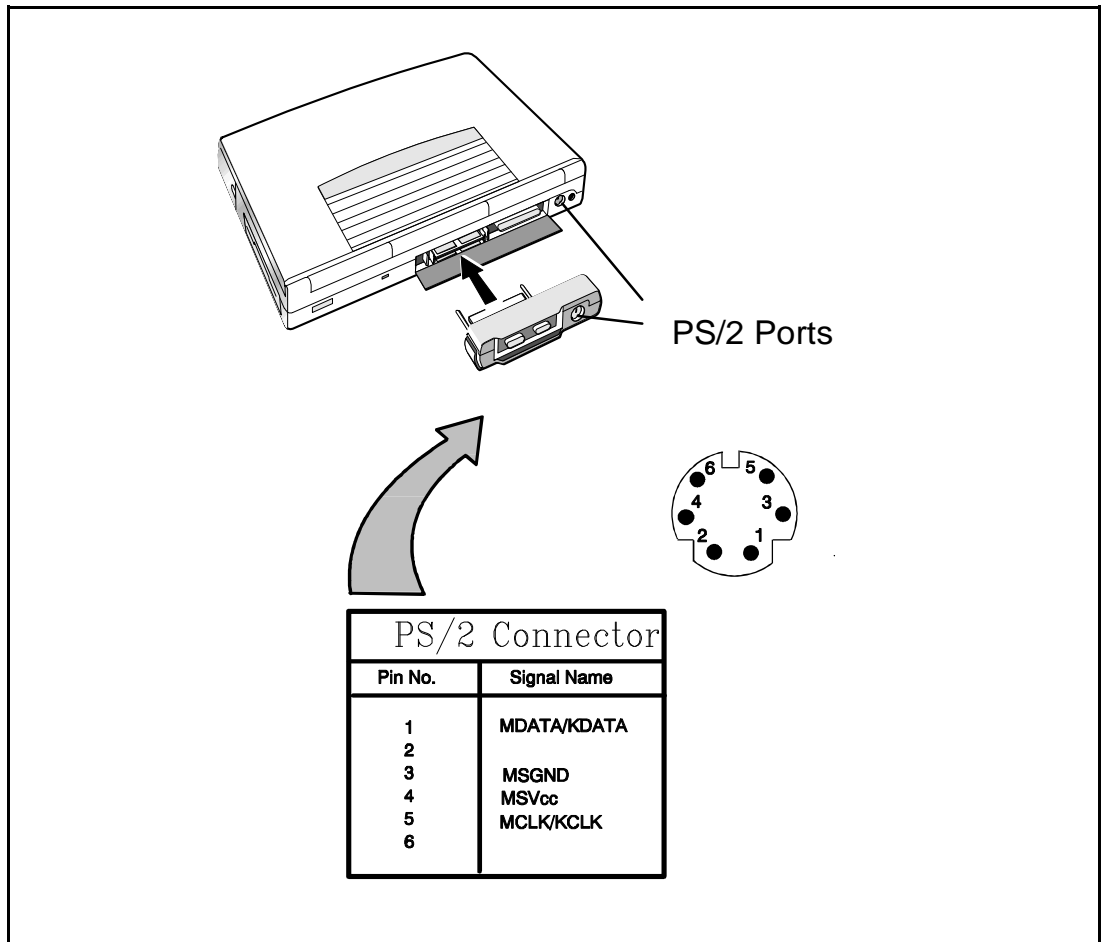
Most external devices connect to the Notebook via the connectors on the rear of the notebook and on the rear of the Port Adapter supplied with the notebook (see Figure 2-5 for port assignments).



**Figure 2-5 Extensa Port Assignments**

### 2.5.1 Installing an External Keyboard/Mouse

As shown in Figure 2-6, the notebook has provisions for two external PS/2 compatible devices (keyboard, mouse, etc.) that may be attached to the notebook. The pinouts for the 6-pin Mini-DIN connectors are also provided in Figure 2-6.



**Figure 2-6 PS/2 Port Assignments/Pinouts**

To install an external keyboard or external PS/2 mouse on the notebook, use the following procedure:

1. Ensure that the notebook is powered off.
2. Locate the external PS/2 ports at the rear of the notebook (see Figure 2-6).
3. Attach the PS/2 cable from your mouse and/or keyboard cable to the PS/2 port(s).
4. Power on any other peripheral devices you may have connected to the notebook, and then power up the notebook.

## 2.5.2 Installing External Parallel Printer

The Notebook is equipped with a bi-directional, ECC/EPP compatible, 25-pin parallel printer port. The connector pinouts and connector location are shown in Figure 2-7.

If you will be using a parallel interface, connect the 25-pin male connector of your printer cable to the 25-pin female parallel port on your notebook. Refer to the manual which accompanied your printer for instructions on configuring your operating environment

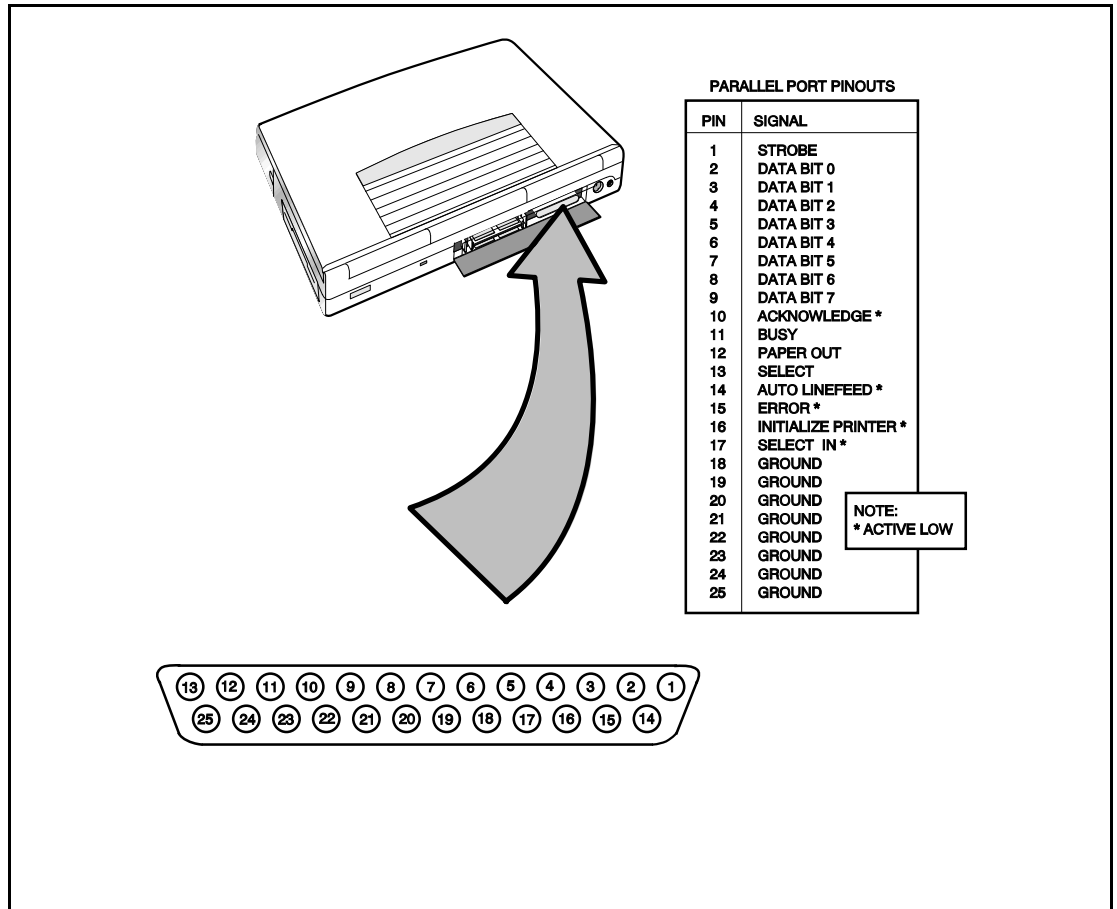


Figure 2-7 Parallel Port Location/Pinouts

## 2.5.3 Installing External Serial Port Device

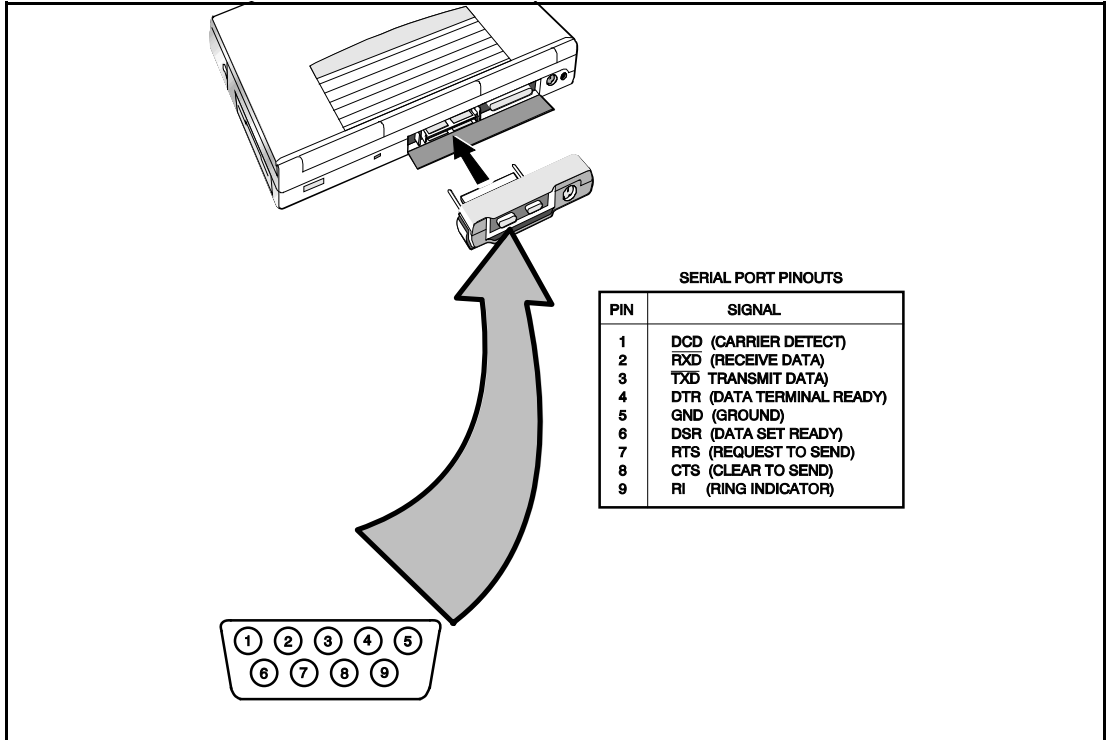
The notebook contains an RS-232 serial port with a male DB-9 connector as shown in Figure 2-8. The serial ports are used to interconnect such devices as:

- External Modem
- Serial Printer
- Any device that uses an RS-232 interface

To connect a printer to the notebook, ensure that both the notebook and the printer are turned off.

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**Caution: Never connect a parallel device to a serial port or a serial device to a parallel port or video port; this may cause damage to the Notebook and/or peripheral device. If you are uncertain of what type connector the external device has, refer to the technical manual for the external device.**



**Figure 2-8 Serial Port Location/Pinouts**

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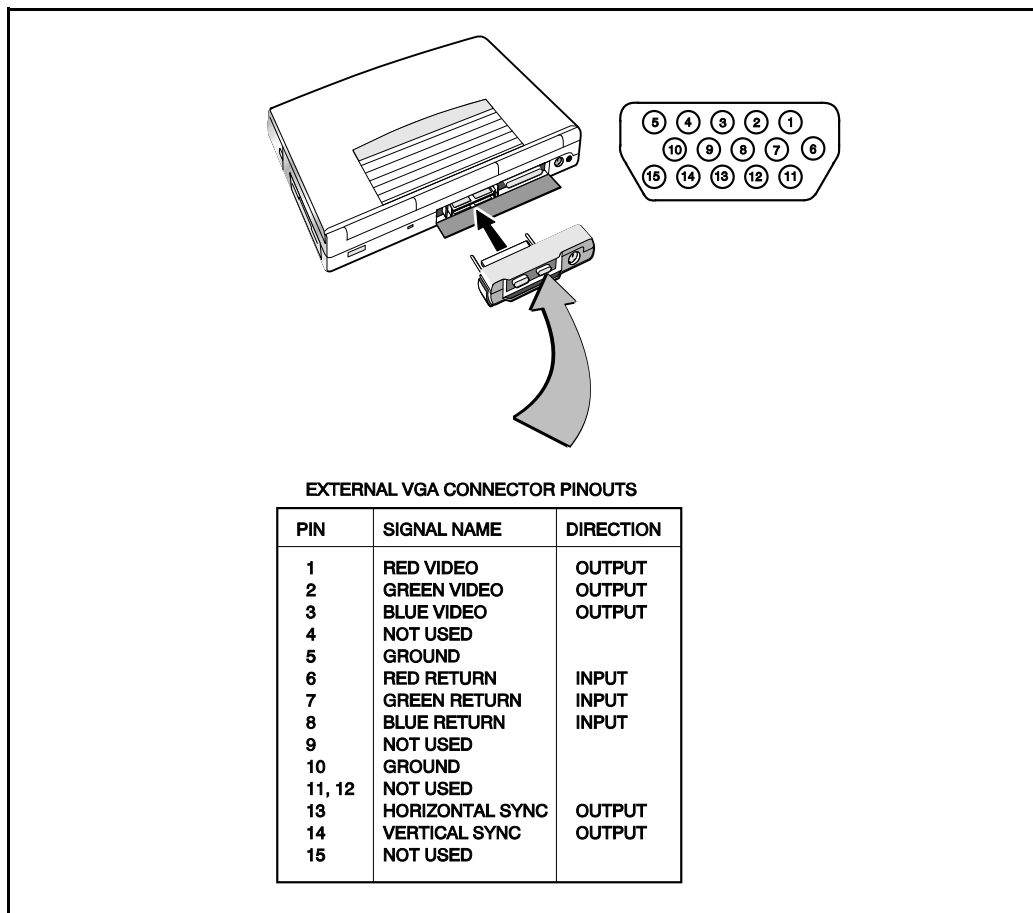
## **2.5.4 Installing External VGA Monitor**

The notebook is capable of driving both its internal LCD display and an external VGA monitor (LCD only, simultaneous, or VGA only). The external monitor connector pinouts and connector locations are shown in Figure 2-9. To install an external monitor with the notebook, use the following steps:

1. Ensure that both the notebook and the external monitor are turned off.
2. Locate the 15-pin female VGA port on the Port Adapter.
3. Attach the appropriate end of the monitor cable to the VGA port on your notebook. If the monitor cable connectors have retaining screws, tighten them down.
4. If necessary, connect the monitor power cable to the monitor, and plug the monitor power cable into an electrical outlet.
5. Power on the monitor, as well as any other peripheral devices connected to the notebook; then power up the notebook

## **2.5.5 Installing SIR Devices**

The Serial Infrared (IR) port offers wireless communication with a variety of IRDA-compliant devices made by other manufacturers. Ensure that the third-party manufacturer supplies you with the appropriate IR drivers before attempting connection.



**Figure 2-9 External Monitor Port Pinouts**

## 2.6 Installing the AC Power Adapter

Use the following procedures to connect the AC Adapter to the system:

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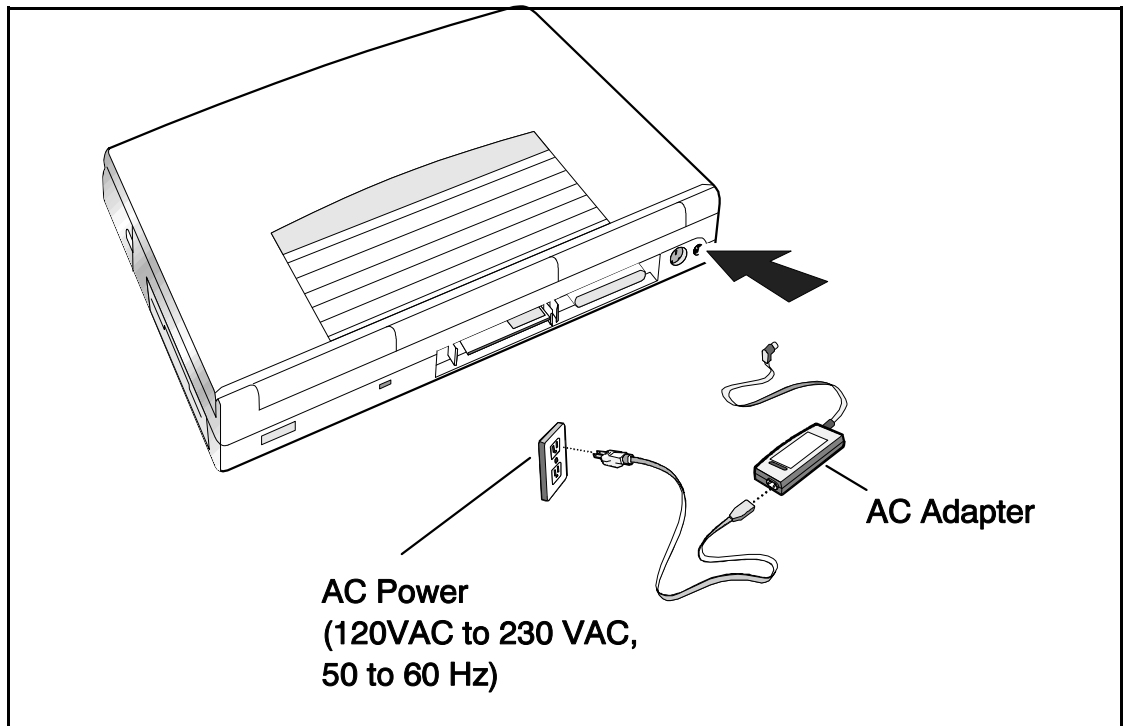
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**Caution: Use only the AC Adapter supplied with the computer; other adapters can damage the unit.**

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1. Remove the AC adapter from the packaging. Connect the round coaxial connector supplied with the notebook to the power receptacle on the rear of the notebook as shown in Figure 2-10.
2. Connect the female side of the AC Power cord to the AC Adapter and connect the male end to a grounded AC outlet.





**Figure 2-10 AC Adapter Installation**

## **2.7 Initial System Checkout**

After you've installed all internal options and external cabling, you're ready for system checkout and software configuration.

To check out the system, set the power switch on the notebook to the On (I) position which initiates the notebook self test. During self test execution, the computer checks the operation of all key hardware including memory and CPU (and displays copyright and version number data during test execution).

Upon successful conclusion of self test, the computer automatically loads its operating system and Windows environment. If self test fails to complete and an error message is displayed, try powering down the computer for a couple of minutes and turning power back on to repeat self test. If the error message persists, see Section 6 for troubleshooting information.

## **2.8 Configuring the System**

The first time you power up the notebook, it automatically runs the Setup Program which prompts you for country name and printer type. You exit Windows and the notebook begins unzipping files and preparing the software for use. Then it gives you the option of keeping or removing the video.

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## **2.9 Making Backups of System Software**

The Notebook is preloaded with Windows 95 operating system software. Prior to extended use of the notebook, create a backup set of system software using the Backup Utility under Windows 95. In the event of a disk problem, you can restore your system using the Restore Utility and the set of backup diskettes you've just created.

## **2.10 Loading Application Software**

For assistance in loading Application Software, refer to Chapter 5 in the Extensa Series Notebook Computer User's Reference Manual.

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# Operating Instructions

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## 3.1 Introduction

The first two subsections describe the Extensa 450 Series Notebook operating controls and indicators. The remainder of this section contains a summary of computer operations related to notebook maintenance including how to restore system software.

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**Note:** For additional operating instructions, see Extensa 450 Series Notebook Computer Users Guide, TI Part No.9803942-0001.

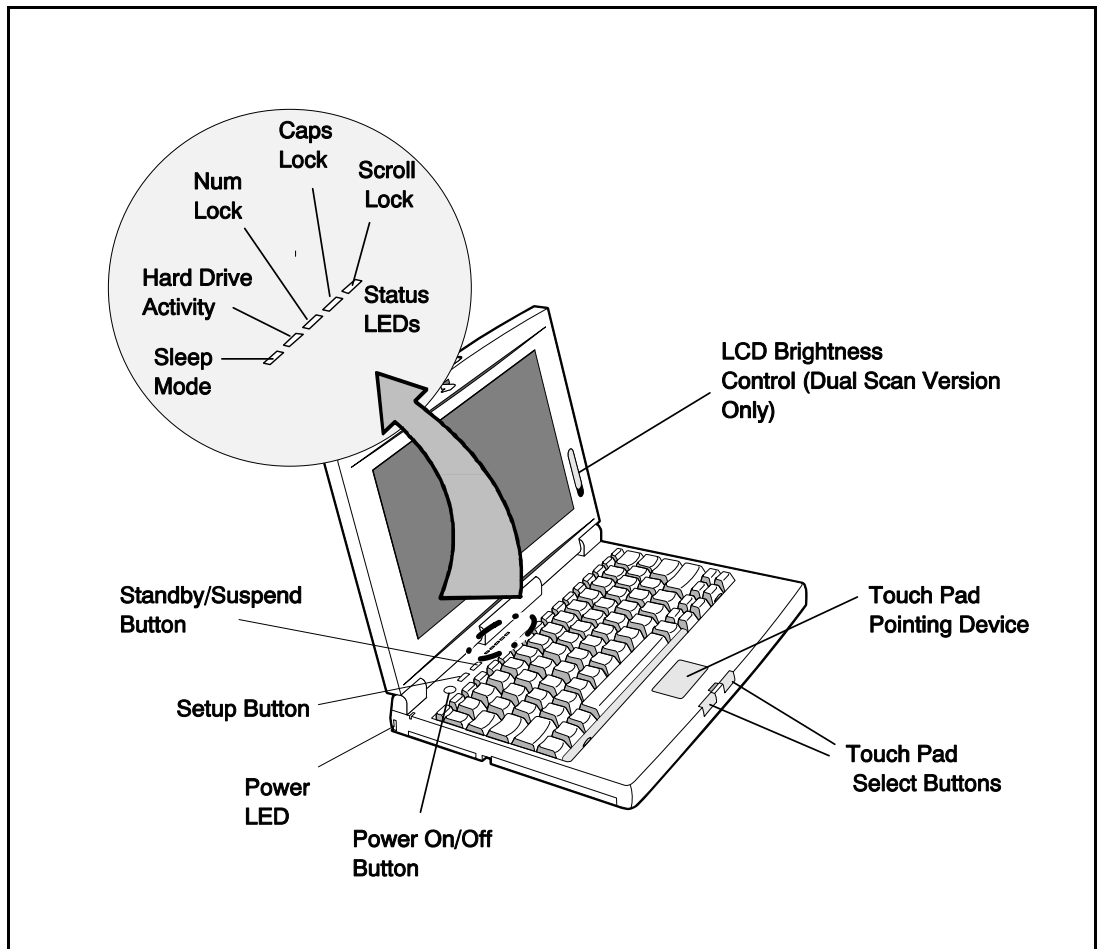
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## 3.2 Notebook Controls and Indicators

The Extensa Series Notebooks are equipped with the following controls and indicators:

- Group of five LEDs just above the keyboard (Sleep Mode, Hard Drive Activity, Num Lock, Caps Lock and Scroll Lock)
- Power, Setup, and Standby/Suspend buttons adjacent to the status LEDs
- Single Power LED on the leftrear corner of the notebook
- Touch Pad and two select buttons at base of keyboard
- Contrast Switch on Display Assembly (Dual Scan models only)

These controls and indicators are shown in Figure 3-1 and described in greater detail in the following paragraphs.



**Figure 3-1 Extensa Series Controls and Indicators**

### **3.2.1 LCD Contrast Control**

The TFT version of the notebook contains no operating controls or indicators. The Dual Scan version of the display contains a contrast switch on the lower right side as shown in Figure 3-1.

### **3.2.2 Button Switches**

The notebook contains two button switches above the keyboard including:

- **Power On/Off Switch-** Alternate action, button type switch that controls power to the unit. Pressing the Power button causes power to be applied to the notebook and power up self test to be run. The **PWR** LED (left rear corner of notebook) glows green and the computer then loads Windows 95. When the Power button is pressed again, the Notebook powers down and all data in RAM memory is lost.
- **Standby/Suspend Button Switch-** an alternate action touch switch that invokes the save to disk feature and places the unit in Standby Mode (if previously On) or On if previously in Standby Mode.

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### 3.2.3 Cover Release Latch

The Notebook contains one Cover Release latch . To open the notebook, slide the Release Mechanism to the right and lift up on the front edge of the notebook cover.

### 3.2.4 Touch Pad Controls

The Extensa 450 Series Notebook Computers are equipped with a built-in mouse device called “the Touchpad” physically located at the bottom of the keyboard (see Figure 3-1).

The cursor is positioned by touching and dragging your finger in the direction you want the cursor to go. The select functions are performed either by tapping the touch pad or by pressing the two buttons (switches) at the bottom of the keyboard.

You can change the operation of the pad by changing values in the mouse section of the Windows 95 Control Panel. Once your cursor is in the proper place and you want to select, use the left button to click or double click just as you would a mouse.

### 3.2.5 Keyboard Mode LEDs

The Notebook contains three “keyboard mode” indicators just above the keyboard on the left side (notebook cover open). These LEDs include:

- **CAP (Caps Lock)** Indicator- this LED indicates that the keyboard is locked in the Uppercase mode. To switch to the Lowercase mode, press the **Caps Lock** key on the keyboard.
- **NUM (Num Lock)** Indicator- This LED lights when you press the **Fn-F7** (NumLk) keys to toggle on the numeric keypad lock function. When the LED is On, the embedded numeric keyboard keys generate AT-keypad characters and functions when pressed in conjunction with the Fn key.

When the NUM indicator is Off, pressing the Fn key with the appropriate keys provides cursor movement, paging and other functions in the normal mode.

When the NUM indicator is On, the embedded numeric keypad becomes a temporary numeric keypad that does not require you to press any other key.

- **SCRL (Scroll Lock)** Indicator- This LED lights to indicate that the keyboard is locked in the scroll mode.

## 3.3 Operating Procedures

Some of the operating features useful for notebook maintenance are provided in the following paragraphs. For additional operating instructions, refer to the *Extensa 450 Series Notebook Computer User's Manual*, Texas Instruments Part No. 9803942-0001.

### 3.3.1 Floppy Drive Operating Procedures

To avoid damaging the floppy drive drive, and to protect data, take the following precautions:

- 
- Never turn off or reset the notebook while the floppy activity indicator is lit.
  - Keep the AC adapter at least 6 inches away from your drive.
  - Insert the floppy into the floppy drive slot with the label side up and the metal-shutter end first. Gently push the floppy into the floppy drive slot until the floppy clicks into place.
  - To remove a floppy, press the eject button until the floppy pops out.
  - Never force open the access shutter on a floppy.
  - Always remove a floppy from the floppy drive before turning off the computer.
  - Never transport the computer with a floppy in the floppy drive. Doing so can damage the drive head.
  - If a floppy appears to be damaged, try to make a copy of it, and immediately discard it.
  - Keep all floppies when not in use in a disk storage box to protect them from damage or loss.

### **3.3.2 Installing/Removing PCMCIA Options**

PCMCIA cards are inserted and ejected in much the same way as diskettes:

- Type I or Type II PCMCIA options may be installed in the compartment on the left side of the notebook. Type III Options may be installed on the right side of the notebook with the Floppy Drive removed and the PCMCIA Option installed.
- To insert a PCMCIA card, align the card with the socket and slide the card into the socket until it locks into place. To install a Type III option, you must remove the Floppy Drive.
- To eject a PCMCIA card, go to the Windows 95 Control Panel, select PC Card and select the card to stop; then press the release button and remove the PCMCIA option.

### **3.3.3 Computer Hot Keys**

The Extensa Series recognizes the following hot key sequences:

- **CTRL-ALT-DEL** (warm boot)
- **CTRL-ALT-ESC** (Enter setup screen); to use, power up notebook and press F8 at "Starting Windows 95" message. Select Command Prompt Only; then press **CTRL-ALT-ESC**.

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### 3.3.4 Responding to Low Battery Conditions

The computer generally will notify you when you are reaching a low battery condition by the following:

- Four short beeps per minute (unless battery warning is disabled)

The battery low warning is automatically disabled when the AC Adapter is installed on the notebook regardless of the charge condition of the battery pack.

If the AC adapter is not plugged in within threeminutes of a detected battery low condition, the notebook enters Suspend mode. When the notebook enters Suspend Mode, it issues one beep,saves contents of RAM to disk and powers down the unit.

The Notebook returns to the normal operating mode when the power switch is activated. Unit then recovers RAM information from the hard drive and restores unit to previous "On" condition.

### 3.3.5 Minimizing Power Usage

The following actions can minimize power usage and protect your work during the critical minutes before you shut the system down or replace on the battery packs with a fully charged pack:

- Press **CTRL-STANDBY** to shut off the alarm (if its enabled)
- Save RAM Disk (if using RAM Disk feature)
- Press **Standby/ Suspend** button to put the computer in Standby/suspend mode whenever you are not actively using the computer. This will save all your work and remember the application and file you were previously using when you return to the On condition.
- Power down the system if you do not need the computer

### 3.3.6 Recharging the Battery Packs

A standalone battery charger option is available to charge notebook battery packs. The battery packs may also be charged in the notebook as follows:

1. Install the battery pack in your computer (if not already installed).
2. Connect the AC Adapter as described in Section 2.
3. To fully charge the battery pack, leave it charging in the Notebook for at least another 90 minutes.

### 3.3.7 Restoring Missing System Files

When you power up the Notebook, it automatically checks for certain key files that must be present for normal system operation. If any of these files are accidentally erased as indicated by error message, insert the Windows 95 Startup Diskette and reboot the system. This will allow you to boot up and troubleshoot your system.

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### **3.3.8 Rebuilding the System Software**

In the event of a hard drive replacement or system board replacement which resulted in loss of system software, you may need to rebuild the entire system software structure.

The following items are required to rebuild the system software:

- Set of backup diskettes of the system software
- Operational Notebook

Insert the Windows 95 Startup Diskette in the Notebook's floppy drive and power up the system.

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Note:For additional operating procedures, refer to to the *Extensa 450 Series Notebook Computer User's Manual*, Texas Instruments Part No. 9803942-0001..

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# Theory of Operation

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## 4.1 Introduction

This section describes the notebook theory of operation.

## 4.2 Notebook Functional Description

Functionally, the notebook computer consists of the following major subsystems:

- Processor and Memory Subsystem
- I/O Subsystem
- Video Subsystem
- Hard Disk Subsystem
- Floppy Disk Subsystem
- PCMCIA Subsystem
- Serial Infrared Subsystem
- Power Subsystem

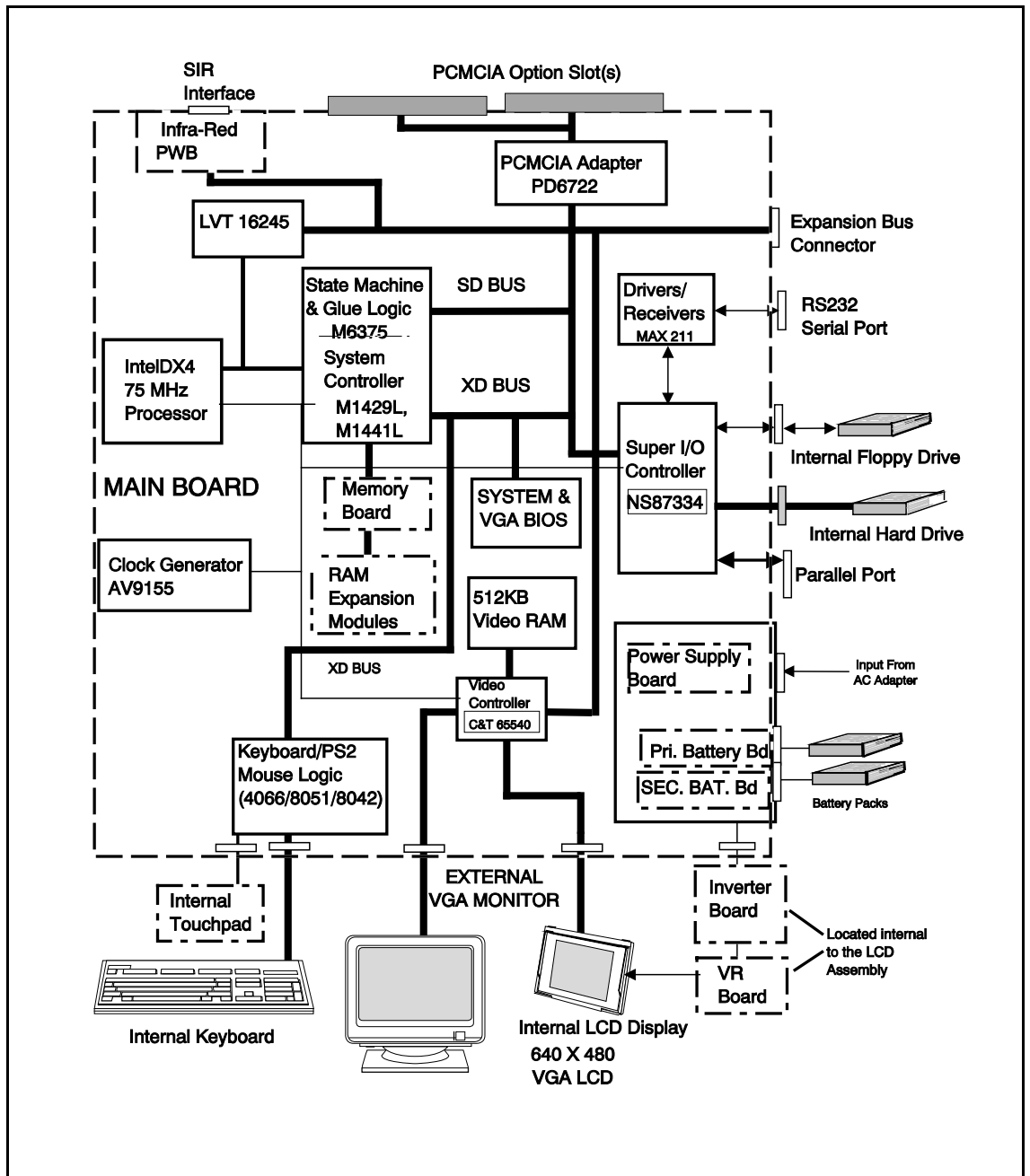
A functional block diagram of the Extensa Notebook is shown in Figure 4-1.

### 4.2.1 Processor/Memory Subsystems

The Processor function, housed on the Main Board, is implemented with a 75mhz IntelDX4 Processor. The processor operates in conjunction with RAM and ROM Memory on the Memory Board and other control logic on the Main Board to process software instructions (BIOS, Windows 95, and Applications).

Primary control for the Processor/Memory subsystem is implemented with the M1429L PC/AT Chipset. Address buffering and real time clock function is implemented with an M1441L.

The memory subsystem, implemented on the Memory Board and optional Dual Inline Memory Modules, provides 4MB (expandable to 32 MB) of fast DRAM memory, 128 bytes of CMOS RAM (battery backed up) and 256 KB of Flash ROM for system and video BIOS storage. Tables 4-1 through 4-3 contain the Notebook I/O address map, DMA channel assignments and IRQ interrupt level assignments respectively.



**Figure 4-1 Notebook Functional Block Diagram**

**Table 4-1 Extensa Series I/O Address Map**

<b>Address Range</b>	<b>Device</b>
000-00F	DMA Controller 1
020-021	Interrupt Controller-1
022-023	M1429 Registers
040-043	Timer 1
060-06E	Keyboard Controller 8742 Chip Select
070-071	Real Time Clock and NMI Mask
080-08F	DMA Page Register
0A0-0A1	Interrupt Controller 2
0C0-0DF	DMA Controller-2
1F0-1F7	Hard Disk Select
178,,17A	6377 Registers
1F0-1F7	Hard Disk Select
3F6,,3F7,	
278-27F	Parallel Port 3
35F, 36F	Special I/O Ports
378,,37A	Parallel Port 2
3BC-3BE	Parallel Port 1
3C0-3C5	
3C6-3C9	Video DAC
3C0-3CF	Enhanced Graphics Display
3D0-3DF	Color Graphics Adapter
3E0-3E1	PCMCIA Controller
3F0-3F7	Floppy Disk Controller
3F8-3FF	Serial Port 1

**Table 4-2 DMA Channels**

<b>Controller</b>	<b>Channel</b>	<b>Address</b>	<b>Function</b>
1	0	0087	Spare
1	1	0083	Spare
1	2	0081	Diskette
1	3	0082	Spare
2	4	Cascade	Cascade
2	5	008B	Spare
2	6	0089	Spare
2	7	008A	Spare

**Table 4-3 IRQ Interrupt Levels**

<b>Priority</b>	<b>Interrupt Number</b>	<b>Interrupt Source</b>
1	SMI	Power management unit
2	NMI	Parity Error Detected,,I/O Channel Error
3	IRQ0	Interval Timer,,Counter 0 Output
4	IRQ1	Keyboard
	IRQ 2	Interrupt from controller 2 (cascade)
5	IRQ8	Real Time Clock
6	IRQ 9	Cascaded to INT 0AH (IRQ 2)
7	IRQ10	Reserved
8	IRQ 11,Reserved 9	IRQ 12,PS/2 Mouse
10	IRQ13	INT from Coprocessor
11	IRQ14	Hard Disk Controller
12	IRQ15	Reserved
13 IRQ3	Serial Comm Port 2	
14	IRQ4	Serial Comm Port 1
15	IRQ5	Reserved
16	IRQ6	Diskette Controller
17	IRQ7	Parallel Port

---

Note: A PCMCIA card can use IRQ 3, 4, 5, 7, 9 and 11 as long as it does not conflict with the interrupt address of any other device.

---

## 4.2.2 I/O Subsystem

The I/O subsystem, implemented with an NS87334 VJG Super I/O Controller Chip, provides for such functions as internal Hard Drive control, floppy drive control, serial and parallel ports and support for the Serial Infrared port. The Super I/O Controller includes the following features: .

- 100 percent compatible with ISA, EISA, and Micro-channel architectures
- Built-in Floppy Disk Controller
- Software compatible with the DP8473, the 765A and N82077
  - 16-byte FIFO (default disabled)
  - Burst and Non-burst modes
  - Perpendicular Recording drive support
  - New high-performance internal digital data separator (no external filter components required)
  - Low-power CMOS with enhanced power-down mode
  - Automatic media-sense support
- Two UARTS
  - Software compatible with the PC16550A and PC16450
  - MIDI compatible
  - Infrared support on UART2 (IrDA-compliant)
- Bidirectional Parallel Port
  - Enhanced Paralle Port (EPP) compatible
  - Extended Capabilities Port (ECP) compatible, including level 2 support
  - Bidirectional under either software or hardware control
  - Compatbile with ISA, EISA, and Micro Channel architectures
  - Ability to multiplex FDC signals on parallel port pins for external FDD

- 
- Includes protection circuit against damage caused when printer is powered up, or operated at higher voltages
  - Integral IDE controller
    - Provides a complete IDE interface with DMA control (except for optional buffers)
  - Integral address decoder- provides selection of all primary and secondary ISA addresses including COM1-4 and LPT1-3.
  - Enhanced Power Management Function
    - Special configuration registers for power down
    - Enhanced programmable power-down and wake-up modes
    - Auto power-down and wake-up modes
    - 3 special pins for power management
    - Typical current consumption during power-down is less than 10A

### **4.2.3 Video Subsystem**

The video subsystem, implemented on the Main Board and on the LCD Display Unit, displays text, graphics and drives an external VGA port. The video subsystem is implemented with a Cirrus Logic 6245 high performance flat panel/RT VGA controller and supporting logic and video RAM (512KB).

The major features of the VGA controller include:

- Highly integrated design (flat panel / CRT VGA controller, RAMDAC, clock synthesizer)
- Multiple Bus Architecture Integrated Interface
  - Local Bus (32-bit CPU Direct and VL)
  - EISA/ISA (PC/AT) 16-bit Bus
- Advanced frame buffer architecture uses available display memory, maximizing integration and minimizing chip count
- Integrated programmable linear address feature accelerates GUI performance
- High performance resulting from zero wait state writes (write buffer) and minimum wait state reads (internal asynchronous FIFO design)
- Supports panel resolutions up to 1280 x 1024 resolution including 800x600 and 1024x768
- SMARTMAP intelligent color to gray scale conversion enhances text legibility
- Text enhancement feature improves white text contrast on flat panel displays
- Fully Compatible with IBM VGA

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### 4.2.3.1 External VGA Drive Capability

On the Extensa 450, the external VGA port is provided by the port adaptor fixture in the form of a 15-pin, female, D-type connector which can be used to drive an external CRT (standard VGA modes with resolutions of 800 X 600 X 256, or 640 X 480 X 256 ).

### 4.2.4 Hard Disk Subsystem

The Hard Disk Subsystem, controlled by the IDE interface compatible NS87334 VJG Super I/O Controller on the Main Board, provides disk storage for all system software and user files. Initially, the 450 Series Notebooks are equipped with a 340 Million Byte hard drive. However, the onboard controller can support high capacity drives.

During the manufacturing process, Texas Instruments formats the hard disk and then loads all supplied software including Windows 95.

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**Caution: Formatting the disk drive erases any data that may be stored on the disk. Therefore do not attempt a format of the hard disk unless the computer self-test and diagnostics confirm that the disk has not been formatted.**

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A Hard Drive activity LED is located along the front edge of the notebook. This LED lights during hard driver read/write accesses.

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**Caution: The notebook should not be moved when the HDD LED is lit to prevent accidental damage to the hard drive.**

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### 4.2.5 Floppy Diskette Drive Subsystem

The Floppy Diskette Drive Subsystem consists of a Floppy Controller and the Floppy Diskette Drive. The Floppy Diskette Drive can read/write standard 3.5-inch minidiskettes.

### 4.2.6 PCMCIA Subsystem

The notebook is equipped with an on-board PCMCIA host adapter (CL-PD6722 PCMCIA Controller) and sockets to support one Type I or Type II option or a Type III option if the Floppy Drive is removed from the unit. The PCMCIA Controller has the following features:

- Single-chip PCMCIA host adapters

- 
- Direct connection to ISA (PC AT) Bus
  - Direct connection to PCMCIA 2.0 Bus
  - PCMCIA 2.0- and JEIDA 4.1-compliant
  - 82365SL-compatible register set, ExCA-compatible
  - Automatic Low-power Dynamic Mode for lowest power consumption
  - Programmable Suspend Mode
  - Five programmable memory windows per socket
  - Two I/O windows per socket
  - Programmable card access cycle timing
  - 8- or 16-bit CPU interface
  - 8- or 16-bit PCMCIA interface support
  - ATA disk interface support
  - Automatic flash memory timing support
  - Easy host interface using ISA I/O addresses 03E0h, 03E1h
  - Mixed-voltage (3.3V or 5V) operation
  - Dual-socket-interface, 208-pin QFP

## **4.2.7 Power Subsystem**

The Power Subsystem consists of the following major parts:

- Power Management (hardware and software components)
- AC Adapter
- Primary Battery Board
- Primary Battery Pack
- Secondary Battery Board
- Secondary Battery Pack

### **4.2.7.1 Power Management**

The notebook is equipped with a power management function that minimizes battery usage for prolonged battery operation and automatically recharges the batteries when the notebook is used with an AC adapter.

The power management modes and warnings include the following:



- LCD standby mode
- Hard disk standby mode
- System standby/suspend mode
- Battery-low warning
- Standby/suspend upon battery low

### 4.2.7.2 AC Adapter

The notebook uses an AC adapter with built in over voltage and short circuit protection.

The adapter can with stand a continuous short-circuit to DC output without damage to the notebook logic components. The adapter operates in shut down mode shorting Vo trail and resets to the normal power mode after the fault condition is removed.

### 4.2.7.3 Primary Battery Pack

The Extensa Series Notebooks use the Duracell DR35 as the primary battery pack. Specifications for the Primary Battery Pack are provided in Table 4-4.

**Table 4-4 Primary Battery Pack Specifications**

<b>Function</b>	<b>Specifications</b>
Battery type	NiMH (Nickel Metal-Hydride)
Cell structure	9 cells per pack (in series)
Nominal voltage	10.8 V
Cell energy capacity, Typical, Minimum	2400 mAH 2500 mAH, 2330 mAH,
Nominal rated capacity	27 Watt-hours
Operating Temperature- Discharge, Charge	-20 to 50°C (at 95%RH), 0 to 45°C (at 95%RH),
Charge and discharge cycles	500 (minimum),
Weight	470 grams
Battery discharge time	3 hours (with APM) Battery charge time

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#### **4.2.7.4 Secondary Battery Pack**

As an optional feature, the Floppy Drive can be removed from the notebook and a Li-Ion (Lithium Ion) secondary battery pack can be installed in the same cavity to provide additional battery operating time.

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# Troubleshooting Procedures

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## 5.1 General

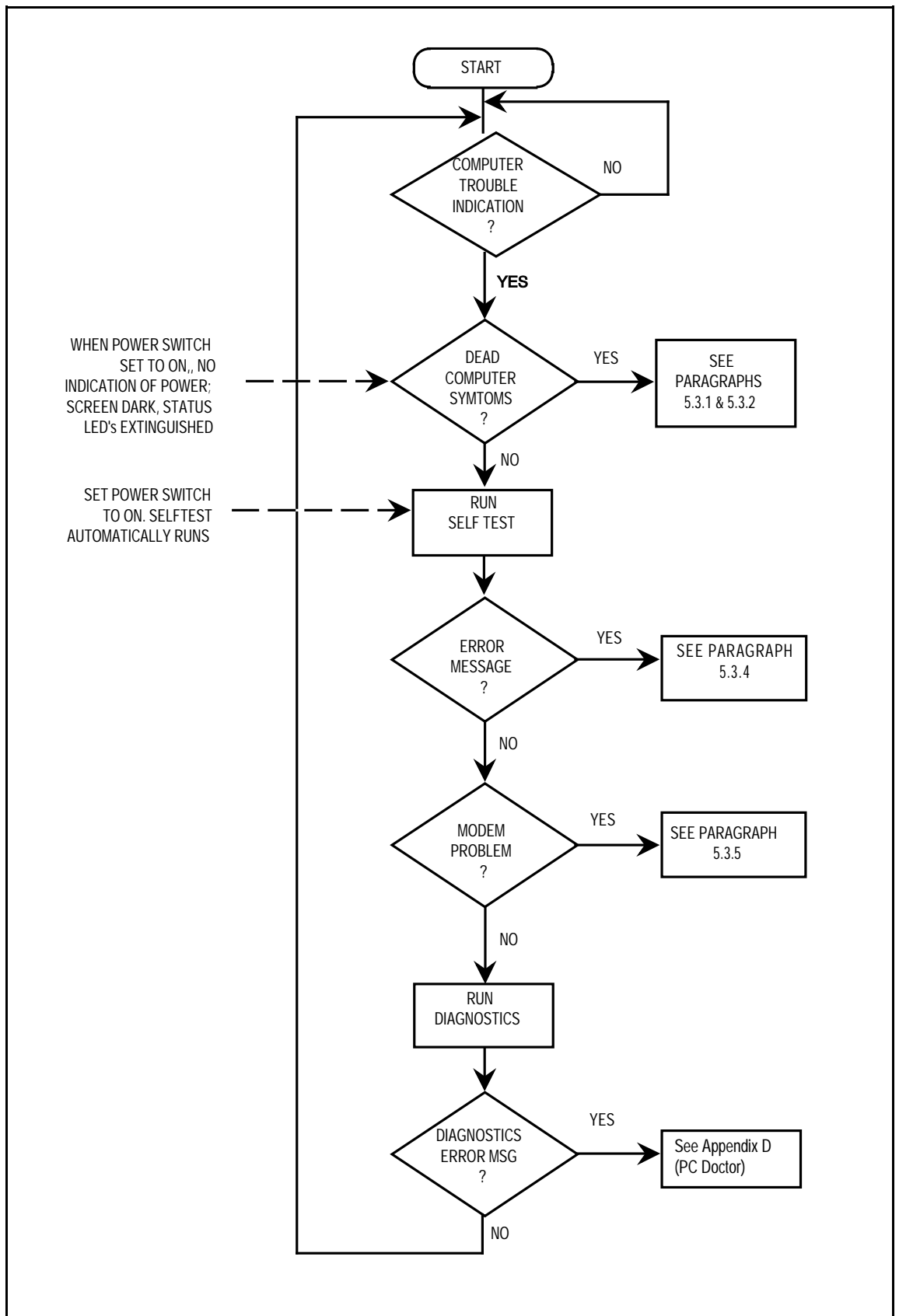
This section provides the following information:

- Overview of the fault isolation process
- Guidelines for isolating computer malfunctions to replaceable subassemblies
- Instructions for executing diagnostics and interpreting error messages.

## 5.2 Overview of Fault Isolation Process

The fault isolation process (summarized in Figure 5-1) consists of the following:

- Quick Check of the following:
  - Notebook power system (including battery packs and AC Adapter connections)- See Paragraph 5.4.
  - Switch settings (ensure **Power** switch is On, and press **Standby** switch to ensure that Notebook is not in Standby mode; press **Shift** to ensure the notebook is not in Auto-Suspend mode.
  - All external cabling (if any)
  - Check LCD Contrast adjustment (Dual Scan version only)
- Record and attempt to resolve any displayed error messages/LED indications (See Paragraph 5.3 and Table 5-1)  
Record and attempt to resolve any series of beeps emitted from the notebook indicating test failure (See Table 5-2)



**Figure 5-1 Troubleshooting Flowchart**

- 
- Try rebooting the system (CTRL-ALT-DEL); restore system from diskettes, if necessary.
  - If the computer is capable of running the Setup program; check the serial and parallel port configurations, and other features that may affect system operation.
  - Run Diagnostics to further isolate problem area (See Paragraph 5.3.5).
  - For indicated hardware failures, cycle power and repeat self test to verify that a hard failure has occurred.
  - Remove and replace suspect hardware (as described in Section 6 of this manual) and retest the system using the diagnostic tests as described in paragraph 5.3.5.

The detailed block diagram, shown in Figure 5-2, is useful in performing fault analysis of various internal subsystems. For example, an LCD hardware problem can be traced to either the LCD, Inverter Board, VR Board, or Battery Board. Other subsystem problems can be isolated in a similar fashion using the detailed block diagram as a troubleshooting tool.

## 5.3 Troubleshooting Procedures

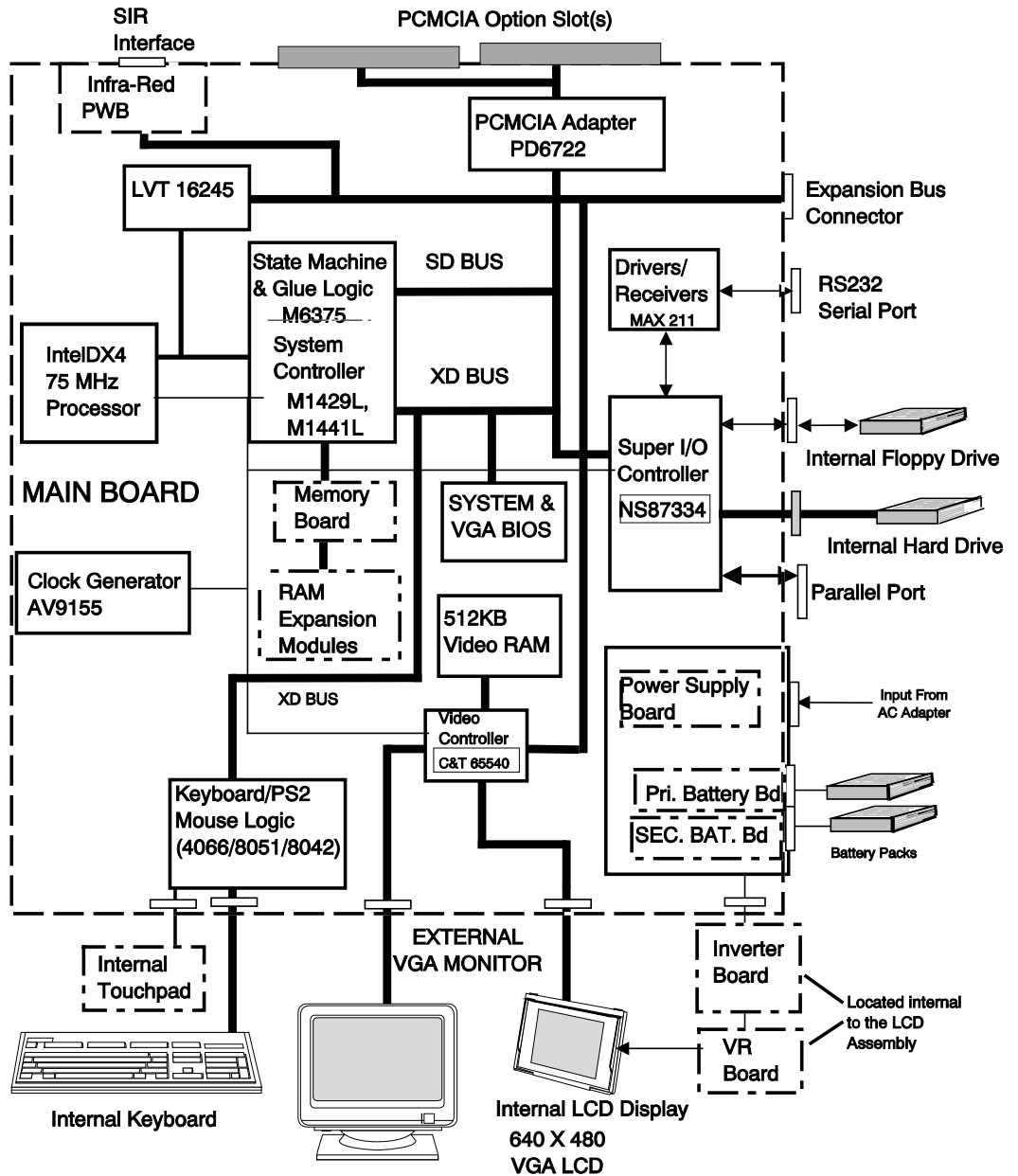
The built-in self test program and the disk resident diagnostics program (PC-Doctor) are useful tools in computer troubleshooting. However, if the computer has a power, keyboard or display problem, you first solve this problem before running diagnostics. If the computer powers up and displays messages on the LCD or emits a series of beeps, skip to Paragraph 5.4.3 for further instructions.

### 5.3.1 Troubleshooting a Power Supply Problem

If the computer does not power up when the Power Switch is set to the ON position, you most likely have a malfunction in the power subsystem (loss of power at the AC Outlet, faulty AC Adapter, discharged Battery Packs, or faulty Power Supply Board). With a power problem, all LEDs are extinguished, the LCD screen is blank, the system does not respond when the standby switch several times consecutively and no drive activity can be heard. The computer is unable to load software and displays no visible signs of activity.

To fault isolate a power problem, check the following:

- AC Adapter and Battery- Plug in the AC adapter and double check all connections on the Adapter and computer. Ensure that the Notebook **Power** switch is set to the On position and that the system is not in Standby or sleep mode.
- Measure the voltage at the AC Outlet or plug in a known good appliance (EG. a lamp) to verify that voltage is present. If the voltage is O.K., try replacing the AC Adapter
- Check to see that the battery pack is installed correctly (try using a recharged battery pack if battery is discharged).



**Figure5-2 Troubleshooting Block Diagram**

- If the AC outlet voltage, AC Adapter, and battery packs test normal but the computer will not power up, replace the Power Supply Board and/or Battery Board as described in Section 6.

### 5.3.2 Troubleshooting a Display Problem

If the LCD remains blank when you turn on the computer, and the status indicators light, check the following controls on the display (See Figure 3-1):

- 
- LCD standby mode - If the LCD backlight remains off, even with the Contrast Control set to its highest position, the LCD may be in **Standby Mode**. Press the **Standby** or **Power** button to power up the system.
  - Notebook Set for External Monitor- use CMOS Setup to reset notebook.
  - LCD - Replace the cover-display assembly as described in Section 6 of this manual.
  - Low battery - Use a fully charged battery.

### 5.3.3 Fault Isolation Using Selftest

When the computer is first powered up, it automatically performs a self-test of its central hardware and memory functions. During self-test (which lasts for a few seconds), the display shows copyright and version number information.

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**Note:** Some procedures in this paragraph require you to use keystroke sequences, such as **Ctrl-Alt-Del**. To execute a keystroke sequence such as this, you must press all three keys simultaneously.

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#### 5.3.3.1 Self Test Error Messages

Upon successful completion of the self-test, the computer automatically loads its operating system and other built-in utilities. If the self-test fails to complete successfully, the display shows one of the error messages described in Appendix A.

### 5.3.4 PCMCIA Modem Problems

If an optional PCMCIA modem does not work properly, check the following items:

- Proper installation of any PCMCIA options (check Modem settings under Control Panel).
- Dialing problem or wrong number - Try dialing a number that you have previously dialed successfully.
- Faulty phone line - Connect a telephone to the line and listen for a dial tone.
- Software program - Check to ensure that you have installed the software correctly.

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## 5.3.5 Fault Isolation Using Diagnostics

PC-Doctor supplied with the Extensa 450 Series Notebooks is a powerful diagnostics tool that can help you scan an internal RAM system for viruses, determine the hardware configuration of a local or remote system, benchmark its performance, analyze the performance of all subsystems, and perform a suite of interactive and non-interactive tests on attached devices. The test results are stored in a log which can be printed out (by pressing F2) or saved in a disk file (by pressing F3).

Features of the diagnostic program are accessed through a series of pull-down menus and basic keyboard keys (cursor keys to move highlighted pointer, Enter key to select a highlighted feature, ESC key to cancel a function and move back one level).

PC-Doctor is typically user friendly but if you don't understand a feature, context-sensitive "help" information is available at any time by pressing the **F1** function key; pressing the **F1** function key twice accesses the online Technical Reference Manual for PC-Doctor.

A powerful set of utilities within PC-Doctor (that can be run locally or remotely) simplify the task of determining system configuration data, allocating and using system memory, IRQ and DMA use, what device drivers are installed, what COM and LPT ports are assigned and what ports are available, identifying partitioning data for fixed disk drive(s), determining the VGA setup information, reading the software interrupts/interrupt vectors, etc.

Functionally, PC-Doctor includes the following:

- Group of nine non-Interactive diagnostic tests that perform a non-destructive test of the major hardware functions in the notebook (Processor, Memory, System board, video section, serial and parallel ports (when loopback adapters are installed), hard disk and floppy disk).
- Group of seven Interactive tests (require operator input) for testing the keyboard, video sections, sound subsystem, mouse, joystick, diskette drive, printer subsystem and SCSI/CD-ROM Drive subsystems.
- Utility that provides detailed system information such as configuration data, allocation and use of system memory, IRQ and DMA use, what device drivers are installed, what COM and LPT ports are assigned and what ports are available, partitioning data for fixed disk drive(s), VGA setup information, software interrupts and interrupt vectors.
- Group of special purpose utilities to run other tests from PC-Doctor, perform a virus scan of the internal RAM system, edit configuration files, surface scan hard drives, measure system performance, open a DOS prompt, provides terminal access to devices connected to serial ports, supports memory debug operations, enables remote operations, permits deep discharge of notebook batteries and provides an extensive test reporting function.

The PC-Doctor diagnostic program contains a group of nine non-Interactive diagnostics, available from the **Diagnostics** heading in the main menu, that permits testing various hardware sections without operator input. You can select one, several, or all tests from the Diagnostics menu. These tests are non-destructive; the serial and parallel port tests require disconnecting external



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devices from your notebook and installing loopback plugs. The Non-Interactive test categories include:

- CPU and Co-Processor Tests
- Base RAM memory test
- System Board test
- Video Test
- Com1 and LPT1 serial port tests
- Parallel Port Test
- Fixed Disk test
- Diskette Drive tests
- Other devices (Sound card, PCMCIA options, etc.)

### **Interactive Tests**

The PC-Doctor diagnostic test includes a suite of seven Interactive tests that require operator input during the course of the test. The **Interactive Tests** category includes:

- **Keyboard**- tests the keyboard keys, LEDs and repeat function
- **Video**-tests the LCD and external VGA character sets, and colors.
- **Speaker**-tests the volume response at different frequencies.
- **Mouse**-tests the mouse driver, buttons and functionality
- **Joystick**- calibrates the external joystick connected to the system and tests the joystick buttons
- **Diskette Drive**- checks diskette drive functionality
- **Maximum System Load**- thoroughly exercises system to the maximum extent possible for performing system “burn-in and test
- **Printer Test**- tests the operation of a connected printer
- **SCSI Test**- sends test codes to attached SCSI devices (requires use of a Docking System with SCSI)
- **CD-ROM Test**- checks out any attached CD-ROM Drive (requires attachment of a Docking System with CD-ROM capability)

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## Supporting Online documentation

The PC-Doctor Diagnostic contains the following online information sources:

- Online Technical Manual- selected at any time by pressing F1 key twice or by clicking on the Question Mark in the upper left hand corner of any PC-Doctor Menu
- On-line Help system that provides context sensitive information from every PC-Doctor screen- accessed by pressing F1 key once (pressing F1 twice gets you into the online manual)

### 5.3.5.1 User Interface to PC-Doctor

PC-Doctor is structured as a text-mode, windowed user interface with pull-down menus. Program operation requires the use of the following keys:

- Cursor Keys- move the highlighted pointer
- ENTER Key- Selects the highlighted option
- ESC Key- Cancels current function and goes back one step
- F1 Key- Activates the context-sensitive help feature (pressing F1 twice in a row calls up the online Technical Reference Manual for PC-Doctor)

Scrolling windows, which show the results of various operations, use the following keys:

- Page Up/Page Down- moves the screen one page at a time
- F2- Prints the log to PRN
- F3- saves the log to a file

You can also use the mouse or Point to interact with PC-Doctor. The leftmost **Select** key is used to choose objects (menu entries and action codes typically enclosed in brackets). The rightmost **Select** key is equivalent to the ESC key which takes you back to your previous step.

### 5.3.5.2 Creating a Bootable Floppy Diskette

Prior to using PC-Doctor, create a bootable floppy diskette using the following procedure:

1. Power up the unit; when unit displays message, "Starting Windows 95", press F8. Choose Command Prompt Only from menu.
2. Using DOS, format a floppy diskette.
3. From the **A:** prompt, copy the basic MS-DOS files to the diskette using the following command:

**Format A: /F:1440 /S**

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Where the value 1440 is the capacity of the diskette (1.44 MB in this example).

4. Get into the PC-Doctor directory ( type **CD C:\PCDR** and press **Enter**)
5. Copy the PC-Doctor files to the bootable diskette using the following command:

**XCOPY C:. A:.**

After completion of this procedure, you should have a bootable diskette containing PC-Doctor.

### 5.3.5.3 Running PC-Doctor

PC-Doctor is a DOS-resident program that can be run from either hard disk or from the bootable diskette you previously created.

1. From the C:\ prompt change directory (type **CD C:\PCDR**) and press **Enter**
2. The Diagnostics Program loads into system memory, and the LCD displays the diagnostics Header.

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**Note:** There are a number of command-line switches that can be entered when starting up PC-Doctor to enable automatic virus scanning, enable loopback testing of serial/parallel ports, work from the remote menu if performing remote operations, etc. To get a listing of the available command-line switches, startup PC-Doctor with the following command:

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**PCDR /? and press Enter.**

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**Note:** If PC-Doctor detects a virus, it will stop with an error message. You must then use one of the standard virus detection and removal programs to remove the virus.

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### 5.3.5.4 Quitting PC-Doctor

To exit PC-Doctor, Select the **Quit** pull down menu and then select the **Quit to DOS** option.

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**Note:** For additional information, press **F1 twice to access the online Reference manual for PC-Doctor.**

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## 6.1 Introduction

This section contains preventive and corrective maintenance procedures for the Extensa 450 Series Notebook Computers. The first part of the section describes the computer cleaning procedures and preferred handling procedures for sensitive components (e.g. disk drives, batteries).

The second part of the section identifies all field replaceable parts; the remainder of the section contains removal and replacement procedures for the field replaceable parts.

## 6.2 Preventive Maintenance

Preventive maintenance is limited to cleaning the plastic case, the keyboard, and the display screen.

### 6.2.1 Cleaning the Computer

When it is necessary to clean the plastic case and keyboard, use a soft, lint-free cloth, slightly dampened with a mild detergent solution or use the contents of any commercially available computer cleaning kit.

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**Caution: Never use alcohol, petroleum-based solvents, or harsh detergents to clean your computer. Also never spray any liquids directly on the computer case, keyboard, or screen. If the liquid-crystal display (LCD) screen has become smeared or dusty, clean the screen by first applying a mild glass cleaner to a soft, clean, lint-free cloth, and gently wipe the glass. Never apply liquids directly on the screen surface.**

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**Caution : Do not use paper towels to clean the display screen. Paper can scratch the display screen matte.**

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## **6.2.2 Protecting the Disk Drives**

To protect the disk drives and data, back up the system disk periodically on floppy diskettes. Periodically use a head-cleaning diskette in the floppy diskette drive to prolong the life of the drive and to help maintain data integrity.

## **6.2.3 Handling the Computer Battery Pack**

The battery pack furnished with the computer requires reasonable care and handling to ensure efficient operation and maximum life. Periodically inspect the battery terminals and the batteries for evidence of corrosion and oxide build-up; clean if necessary.

To ensure that the battery pack endures a normal life cycle, always observe the following precautions when handling the battery pack:

- Do not drop the battery pack or subject it to excessive shock and vibration.
- Do not expose the battery pack to direct sunlight, moisture, or chemical compounds.
- Do not disassemble the battery pack.
- Do not use the battery pack to power other devices.
- Do not short the battery leads or connect the battery with reversed polarity.
- Never attempt to charge the battery pack in any way other than as described in this manual.
- Always charge the battery pack as soon as possible after a low battery indication.

## **6.2.4 Restoring System Software**

The hard drive on the notebook computer is factory loaded with Windows 95 and ready for operation. Supplied with the Windows 95 system is a facility for creating backup diskettes of the system software. In the event of a disk crash or other problem, you can use the Windows 95 Startup diskette to boot the unit and perform troubleshooting.

## **6.3 Required Tools and Equipment**

All notebook computer corrective maintenance procedures can be performed using the following tools: Tweezers

- Small flat-blade screwdriver
- Small Phillips screwdriver
- Hexagonal Screwdriver
- Plastic Stick

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**Caution: All boards, options and peripherals contain components that are sensitive to static electricity. When handling any of these items, protect against static electricity by using wrist or ankle grounding straps and grounded working mats. When moving or storing items, use the anti-static bags supplied with the items.**

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## 6.4 Notebook Field-Replaceable Parts and Assemblies

All members of the Extensa 450 Series Notebook Computers contain two major assemblies including the Cover Display Assembly (upper half of notebook computer) and the System Base Assembly (lower half of the notebook). Each of these two assemblies contain FRUs as described in the following subparagraphs.

### 6.4.1 Cover-Display Assembly

As shown in Figure 6-1, the Cover-Display Assembly contains the LCD screen, Power Inverter Board, and Converter Board.,The DSSTN models also include a Slide Pot Board (not used with the TFT models).

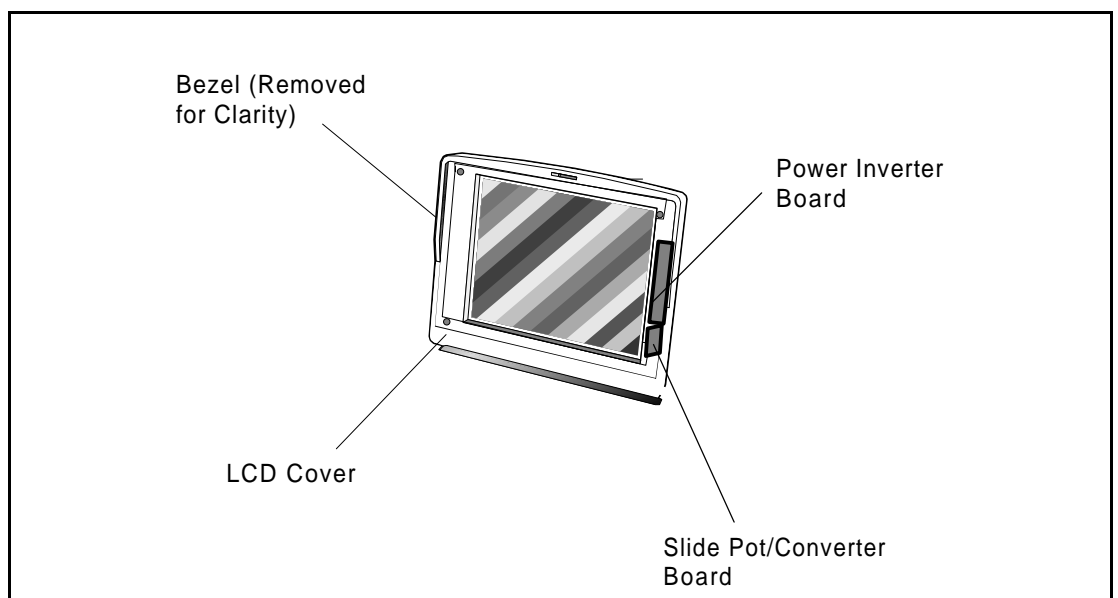
The Field Replaceable Units (FRUs) within the Cover Display Assembly are provided in Table 6-1.

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**Note:** FRU level part numbers are not available at time of publication of this manual. For required part numbers, reference the Field Service Bulletins (FSBs) for the Extensa 450 Series or contact Texas Instruments by dialing **1-800-TI TEXAS**.

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**Figure 6-1 Cover Display Assembly FRUs**

Table 6-1 Cover Display Assembly, Field Replaceable Units (FRUs)

FRU Description	Reference Paragraph No.	FRU Description	Reference Paragraph No.
Inverter Board, DSSTN 10.4"	6.5.9	LCD Cover, DSSTN 10.4", 450	6.5.9
Inverter Board, TFT 9.4"	6.5.9	LCD Cover, TFT 9.4", 450T	6.5.9
Display Assembly, 10.4" DSSTN 450	6.5.8	Bezel, DSSTN 10.4", 450	6.5.9
Display Assembly, 9.4" TFT 450T	6.5.8	Bezel, DSSTN 10.4", 455	6.5.9
Slide Pot Board, DSSTN 10.4"	6.5.9	Bezel, TFT 9.4", 450T	6.5.9
Converter Board, TFT 9.4"	6.5.9	Bezel, TFT 9.4", 455T	6.5.9

## 6.4.2 System Base Assembly

As shown in Figure 6-2, the System Base Assembly houses a variety of field-replaceable subassemblies and components. The FRUs and paragraph references for removal/replacement procedures are listed in Table 6-2. Table 6-3 contains a listing of Customer (non-technical user) replaceable units (CRUs) and associated TI Part Numbers.

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Note: FRU level part numbers are not available at time of publication of this manual. For required part numbers, reference the Field Service Bulletins (FSBs) for the Extensa 450 Series or contact Texas Instruments by dialing **1-800-TI TEXAS**.

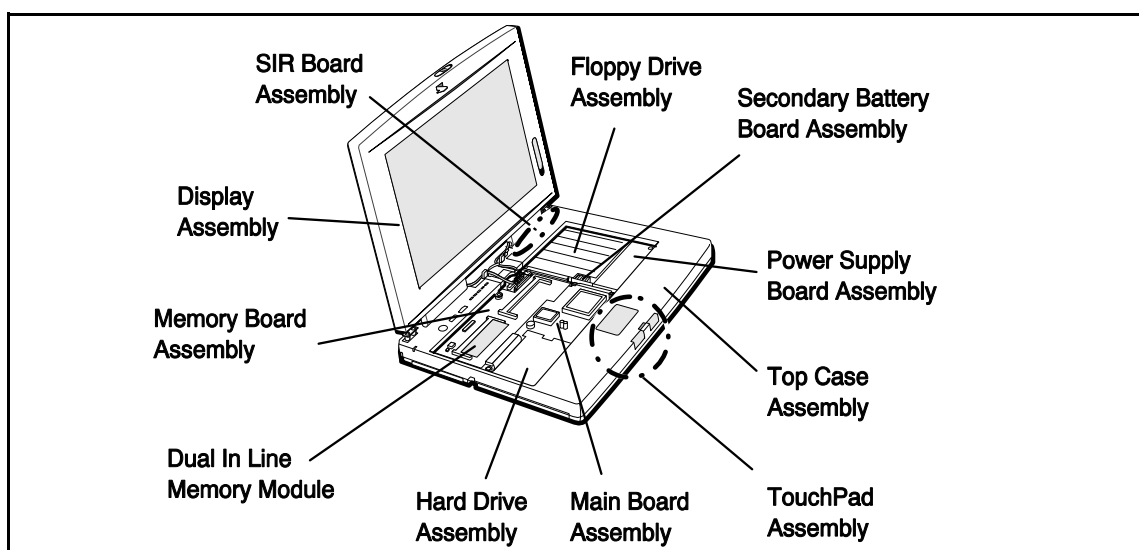


Figure 6-2 Base Assembly FRUs

**Table 6-2 Base Assembly, Field Replaceable Units (FRUs)**

<b>FRU Description</b>	<b>Reference Paragraph No.</b>	<b>FRU Description</b>	<b>Reference Paragraph No</b>
Main Board Assembly	6.5.16	Touch Pad Assembly	6.5.11
Memory Board Assembly	6.5.15	Heat Sink Assembly	6.5.6
Serial IR Board Assembly	6.5.12	HDD Cable	6.5.4
Primary Battery Board Assembly	6.5.13	FDD Cable	6.5.4
Secondary Battery Board Assembly	6.5.17	HDD Cover Assembly	6.5.4
Power Supply Board Assembly	6.5.14	HDD Holder Assembly	6.5.4
Floppy Drive Assembly	6.5.3	Lower Case Assembly	Ref
Hard Disk Drive, 340 Million Byte, 12.5mm	6.5.4	Upper Case Assembly	6.5.10
Keyboard Assembly	6.5.5		

**Table 6-3 Notebook CRUs (Customer Replaceable Units)**

<b>CRU Description</b>	<b>TI Part No.</b>	<b>Reference Paragraph No.</b>
Internal Battery Pack, Ni-MH	9803928-0001	6.5.1
Battery Pack, Li-ION (Option)	9803929-0001	6.5.3
4MB RAM Module	9803932-0001	6.5.7
8MB RAM Module	9803950-0001	6.5.7
16B RAM Module	9803933-0001	6.5.7
External Battery Charger	9803934-0001	Ref.
Port Expander (TravelBud)	9803935-0001	Sec. 2
Full Function Port Replicator	9803936-0001	Ref.
PCMCIA Option	9803930-0001	Sec. 2



## 6.5 Notebook Subassembly Removal and Replacement Procedures

The following paragraphs contain field service-level removal/replacement procedures for the Notebook.

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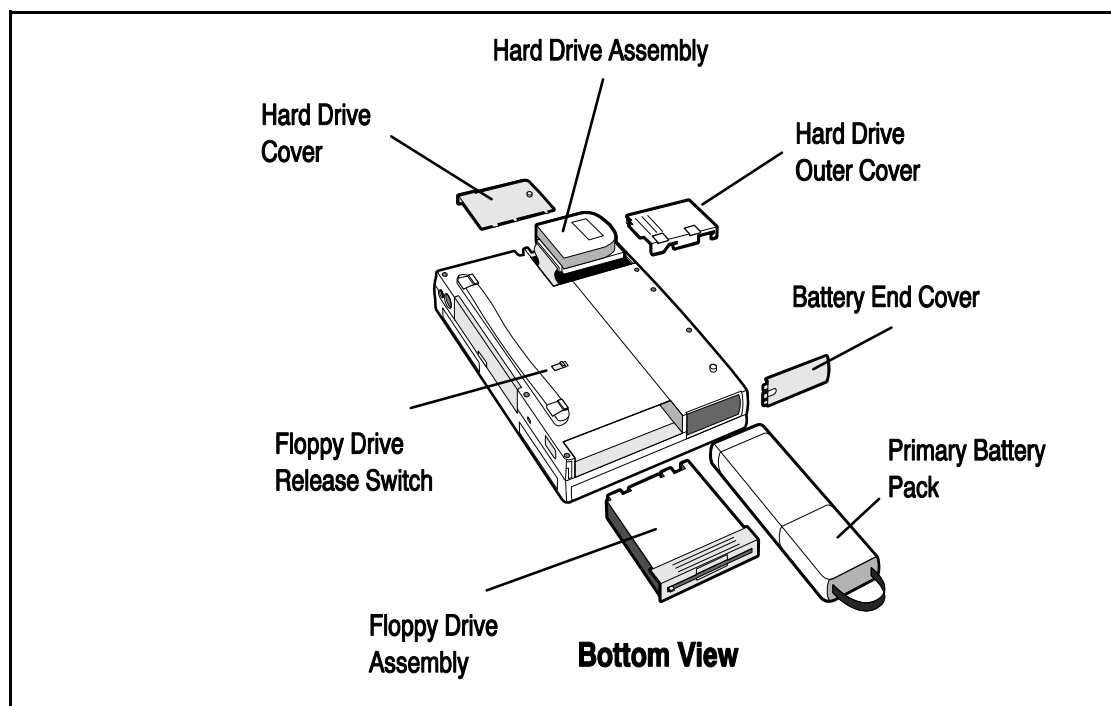
**Caution:** Prior to removing any of the internal FRUs in the notebook, remove the AC Adapter, battery, floppy and hard drives and all external options installed on the notebook.

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### 6.5.1 Removing/Replacing the Notebook Battery Pack

The procedure for removing and replacing the battery pack(s) is as follows:

1. Turn off the computer.
2. Locate the battery door (right side of notebook near the front) (see Figure 6-3). Press the battery door inwards and slide the door toward the front of the notebook; remove the battery door.
3. Grasp the ribbon loop on the battery and pull the battery out of the compartment..
4. When replacing the battery, insert the end opposite the ribbon loop with the battery notches pointing upwards. Slide the battery into the compartment and replace the battery door.



**Figure 6-3 Removing Battery and Disk Drives**

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## 6.5.2 Removing/Replacing PCMCIA Options

The procedure for removing and replacing the PCMCIA options is as follows:

1. Turn off the computer.
2. Remove the PCMCIA device(s).
3. To replace the PCMCIA Device, open the cover door and insert the device. Reinstall any external cabling required for the device.

## 6.5.3 Removing/Replacing the Floppy Drive

To remove and replace the Floppy Drive, perform the following procedure:

1. Remove the battery as described in Paragraph 6.5.1 above.
2. Turn the notebook over so that the bottom is facing up and the floppy drive is on the right side. Lay the notebook on a padded, flat work surface.
3. Locate the Floppy Release Button near the center of the notebook (Figure 6-3).

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**Caution: When removing the Floppy Drive Assembly, grasp it by its sides; otherwise damage to the floppy drive can occur.**

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4. Push the Floppy Release Button toward the front of the notebook and simultaneously pull outwards on the floppy drive by placing your thumb over the ribbed outer edge of the floppy drive assembly. When the floppy drive is released, grasp the assembly by the two sides and remove the assembly from the notebook.
5. The Floppy Drive Assembly can be further disassembled by removing the Phillips-head screws from the sides of the floppy drive assembly; lifting off the cover and lifting out the floppy drive and cable connector (ZIF Connector type). Unplug the cable at the ZIF Connector .

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Note: When reassembling the floppy drive, it's easier to install the shield on the floppy drive before installing the drive into the plastic housing.

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## 6.5.4 Removing/Replacing the Hard Drive

The procedure for removing and replacing the Hard Drive assembly is as follows:

1. Power down the notebook, remove the battery packs, and disconnect the AC Adapter, if installed.
2. Disconnect any peripheral device interface cables from the external interface connectors and remove any installed PCMCIA options.

- 
3. Turn the computer over so that the Hard Drive panel is on your right side (See Figure 6-3). Press down on the circular bump with your thumb to release the hard drive cover; remove the cover and lay aside for later reinstallation.
  4. Using finger pressure, slide the metal cover downwards toward the edge of the notebook; then lift upwards to remove the metal cover.
  5. Insert a small blade straight slot screwdriver into the recess in the plastics and gently lift the frontmost edge of the drive out of the bay.
  6. Lay the hard drive on its back. Then using a small straight slot screw driver, gently pry on each end of the connector on the Disk Drive and rock it back and forth until the connector is removed from the drive assembly.
  7. Replacement is essentially the reverse of steps 1 through 6.

### **6.5.5 Removing/Replacing the Keyboard Assembly**

The procedure for removing and replacing the keyboard assembly is as follows:

1. Turn off the computer and disconnect the ac power adapter (if it is attached).
2. The top edge of the keyboard is held in place by plastic tabs beneath the CTRL and Right Arrow Keys. Pull the tabs toward the front of the notebook (tabs snap into an 1/8 inch recess in the plastics).
3. Using a small straight-blade screwdriver, lift the front edge of the keyboard upwards.
4. Lift the front edge of the keyboard slightly and gently pull the keyboard towards the front of the notebook exposing two cables that connect the keyboard to the main board.
5. Release the two ZIF (zero insertion force ) connectors using a plastic stick or other nonmetallic object and remove the cables from the main board connectors
6. Remove the keyboard assembly from the notebook.
7. When installing the replacement keyboard, essentially reverse the above procedures.

### **6.5.6 Removing/Replacing the Heat Sink**

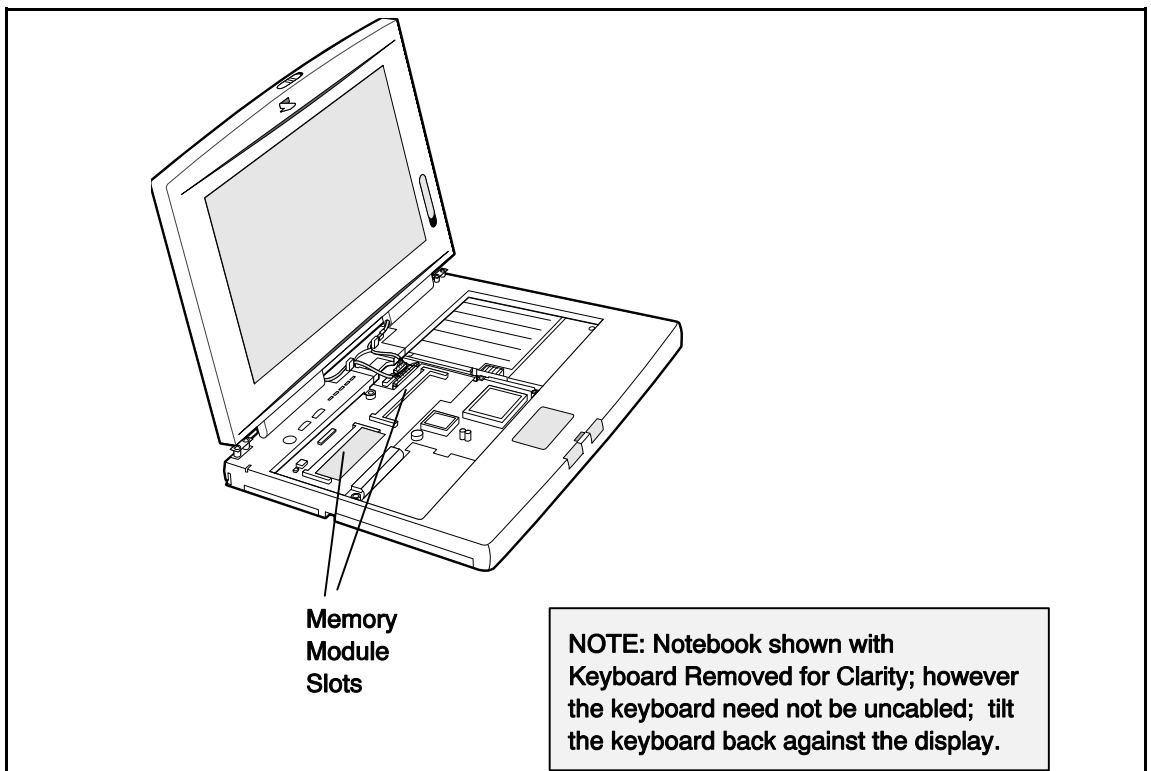
To remove and replace the heat sink, perform the following procedure:

1. Remove the keyboard assembly as described in paragraph 6.5.5.
2. Remove the two Phillips-head screws that secure the heatsink to the main board (note that one of the screws is located near the HDD connector).
3. Lift upwards on the heatsink and remove it from the base.
4. Replacement is the reverse of steps 1 through 3 above.

## 6.5.7 Removing/Replacing Dual Inline Memory Modules (DIMMS)

To remove and replace the expansion memory, use the following procedure:

1. Loosen the keyboard assembly (but do not disconnect keyboard cables) as described in steps 1 through 5 of Paragraph 6.5.5).
2. Remove the Heatsink as described in Paragraph 6.5.6.
3. Using the back edge of the keyboard as a hinge, lift the front edge of the keyboard up and lay it against the LCD assembly.
4. Push the two metal springs away from the board edge and remove the DIMMS board.
5. When installing a DIMMS board, insert the edge of the board into the rear of its connector using a slight rocking motion at an angle to the surface of the board.
6. Once the DIMM is fully inserted in the connector, push downwards on both sides of the board to snap it in place.



**Figure 6-4 Removing/Replacing Expansion RAM**

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## 6.5.8 Removing and Replacing the Cover-Display Assembly

To remove the cover-display assembly, perform the following procedure:

1. Remove the keyboard and heatsink as described in paragraphs 6.5.5 and 6.5.6 respectively.
2. Remove the cable cover below the display by lifting upwards on the front edge of the cover.
4. Unplug the video cable that mates with the Main Board.
5. With the main video cable out of the way, two smaller cables are visible. Unplug the rightmost cable.
6. Using a plastic stick, slide the right and left hinge covers away from the base assembly.
7. Lay the display completely back and remove the four screws that secure the display hinges to the base case assembly.
8. Ensure that the display cables are free from the top case assembly and remove the display assembly.
9. Reinstallation of the Display Assembly is the reverse of steps 1 through 8 above.

## 6.5.9 Removing and Replacing the Inverter Board

To remove and replace the Inverter Board assembly, perform the following procedure:

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**Caution: If the notebook is powered up with the LCD bezel removed, you can be exposed to high voltages which could result in shock and equipment damage. Ensure that the batteries and AC adapter are removed from the notebook when working on the LCD/Display assembly.**

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1. Use a narrow piece of plastic or pointed tweezers to apply light pressure to one edge of the lower screw covers. The lower screw covers will bow outwards and can be removed.
2. Remove the rubber upper screw covers using a pair of tweezers.
3. Remove the six screws that secure the bezel to the display assembly (a small Phillips-head screwdriver is recommended for removing the two screws at the top of the bezel).
4. Pull on the inside edges of the bezel; remove bezel and lay aside for later reinstallation.
5. Peel back the EMI shield along the right side of the display to expose the Inverter Board.
6. Disconnect the connectors at the top and bottom of the Inverter Board.
7. Use the small Phillips-head screwdriver to remove the two screws holding the Inverter Board; remove the Inverter Board Assembly.

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8. Reinstallation of the Inverter Board is the reverse of steps 1 through 7 above.

## **6.5.10 Opening/Replacing the Top Case Assembly**

To remove/replace the Top Case Assembly, perform the following procedure:

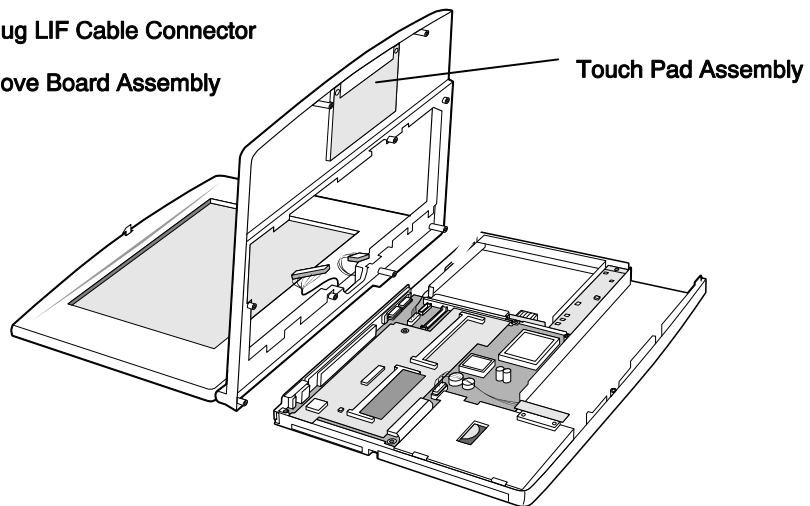
1. Remove the Keyboard Assembly and Heat Sink Assembly as described in Paragraphs 5.5.5 and 5.5.6.
2. Remove the four screws that secure the Top Case Assembly to the base. Note that the screw at the rear of the opening is shorter than the remaining three screws.
3. Using a plastic stick, unlock the ZIF connector located near the glide pad and remove the cable from the connector.
4. Remove the cable cover below the display by lifting upwards on the front edge of the cover.
5. Turn the notebook over and remove the six Phillips-head screws from the bottom of the notebook.
6. Rotate the notebook so that the rear of the unit is facing you; remove the rear door assembly by bowing it outwards.
7. Several recesses are located just above the two rear connectors. Use a small flat-blade screwdriver to disengage the snaps associated with the right and left recesses.
8. Lift and push the Display Assembly forward to disengage it from the Base Assembly.
9. Replacement of the Top Case Assembly is the reverse of steps 1 through 8 above.

## **6.5.11 Removing/Replacing the Touch Pad Assembly**

To remove and replace the Touch Pad Assembly, perform the following procedure:

1. Remove the Top Case Assembly as described in the previous paragraph.
2. Turn the Top Case Assembly over and remove the four screws that secure a metal shield to the plastics.
3. Lift the plastic frame that rests on top of the touch pad.
4. Unplug the flex cable from the connector on the touch pad. Note that the board connector is a LIF (Low insertion force) type; the cable is held in place by friction.
5. Slide the board assembly to the right and remove from the unit.
6. Replacement of the Touch Pad Board Assembly is essentially the reverse of Steps 1 through 5 above.

- ① Remove Top Case Assembly
- ② Remove four screws holding metal shield
- ③ Lift plastic frame that rests on top
- ④ Unplug LIF Cable Connector
- ⑤ Remove Board Assembly

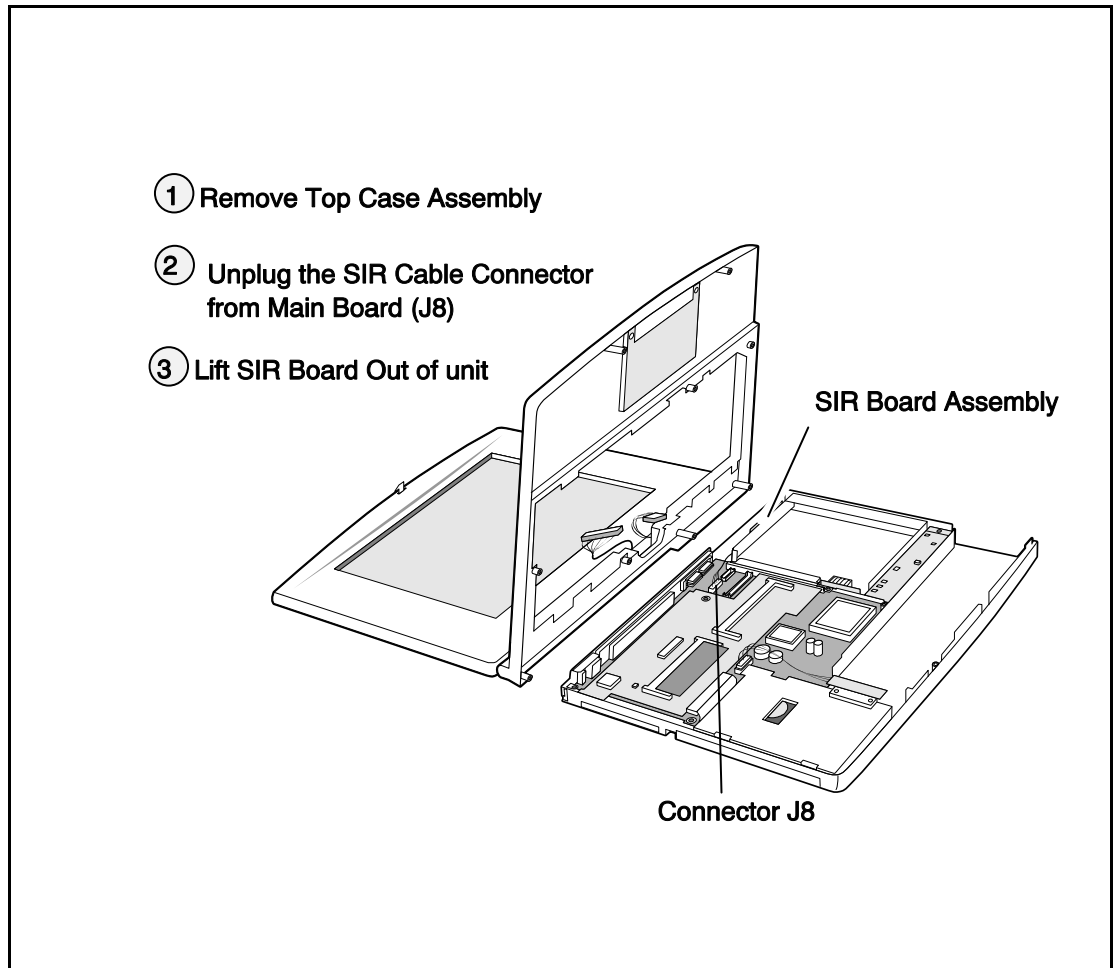


**Figure 6-5 Touchpad Removal/Replacement**

## 6.5.12 Removing/Replacing the SIR Board

To remove and replace the SIR Board, perform the following procedure:

1. Remove the Top Case Assembly as described in paragraph 6.5.10.
2. Unplug the SIR Board cable connector from the Main Board (small leftmost cable connector at J8 as shown in Figure 6-6).
3. Remove the SIR Board from the notebook.
4. Replacement is essentially the reverse of steps 1 through 3 above.



**Figure 6-6 SIR Board Removal/Replacement**



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## 6.5.13 Removing/Replacing the Primary Battery Board

To remove and replace the Primary Battery Board, perform the following procedure:

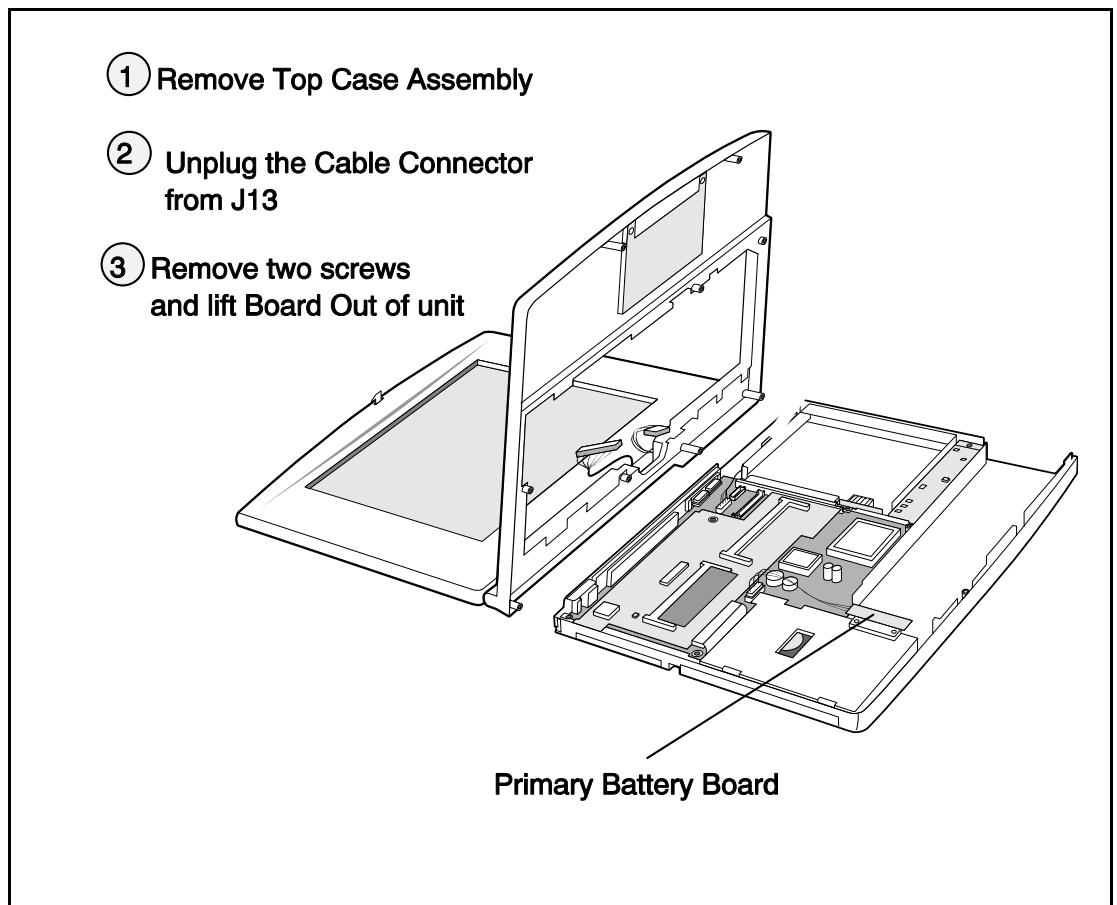
1. Remove the Top Case Assembly as described in paragraph 6.5.10.
2. Disconnect the cable located next to the HDD Connector.
3. Remove the two screws that secure the board to the plastics and remove the board.
4. Replacement is essentially the reverse of steps 1 through 3 above.

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**Note:** When reinstalling the Primary Battery Board, use the battery pack as a guide to ensure that the connector slots properly align with the battery slots.

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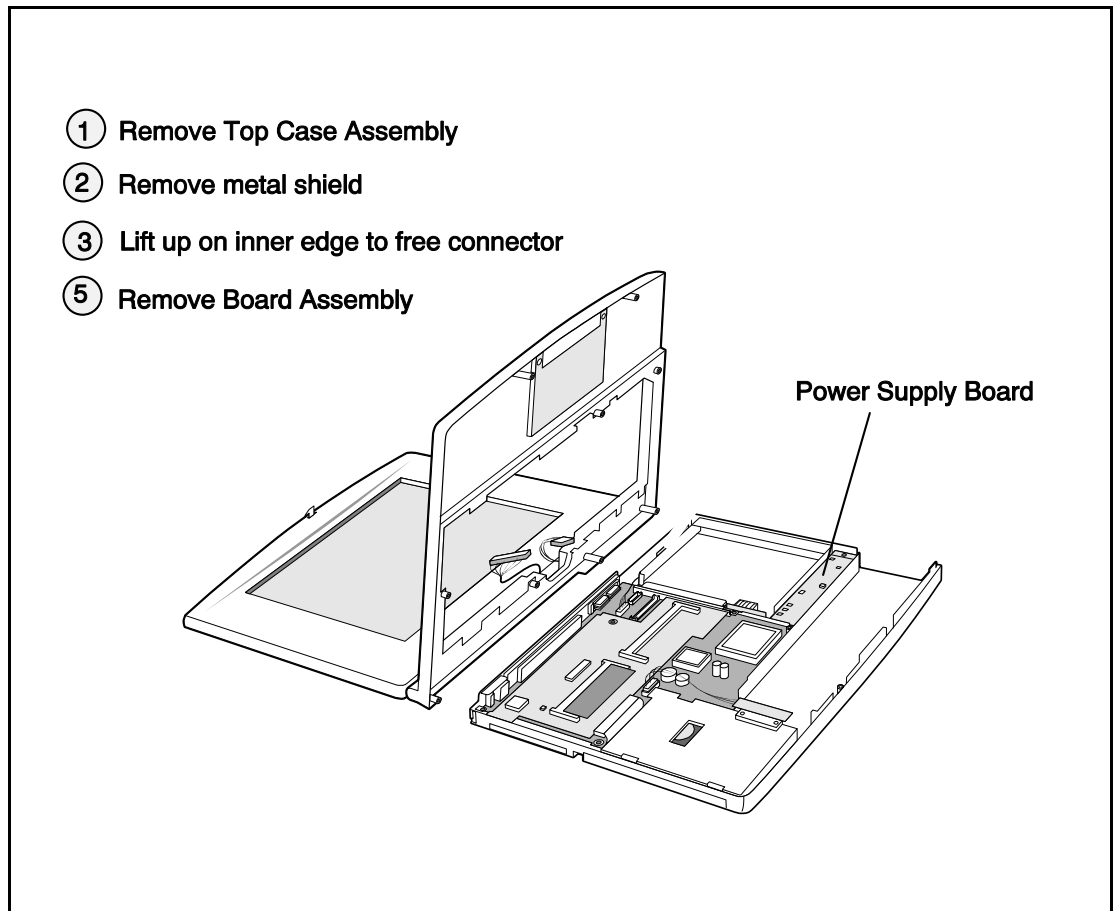


**Figure 6-7 Primary Battery Board Replacement**

## 6.5.14 Removing/Replacing the Power Supply Board Assembly

To remove and replace the Power Supply Board Assembly, perform the following procedure:

1. Remove the Top Case Assembly as described in paragraph 6.5.10.
2. Remove the metal shield that covers the Power Supply Board.
3. Using a plastic stick, lift up on the end of the board that is adjacent to the processor. The board assembly snaps out. Remove board from unit.
4. Replacement is essentially the reverse of steps 1 through 3 above.



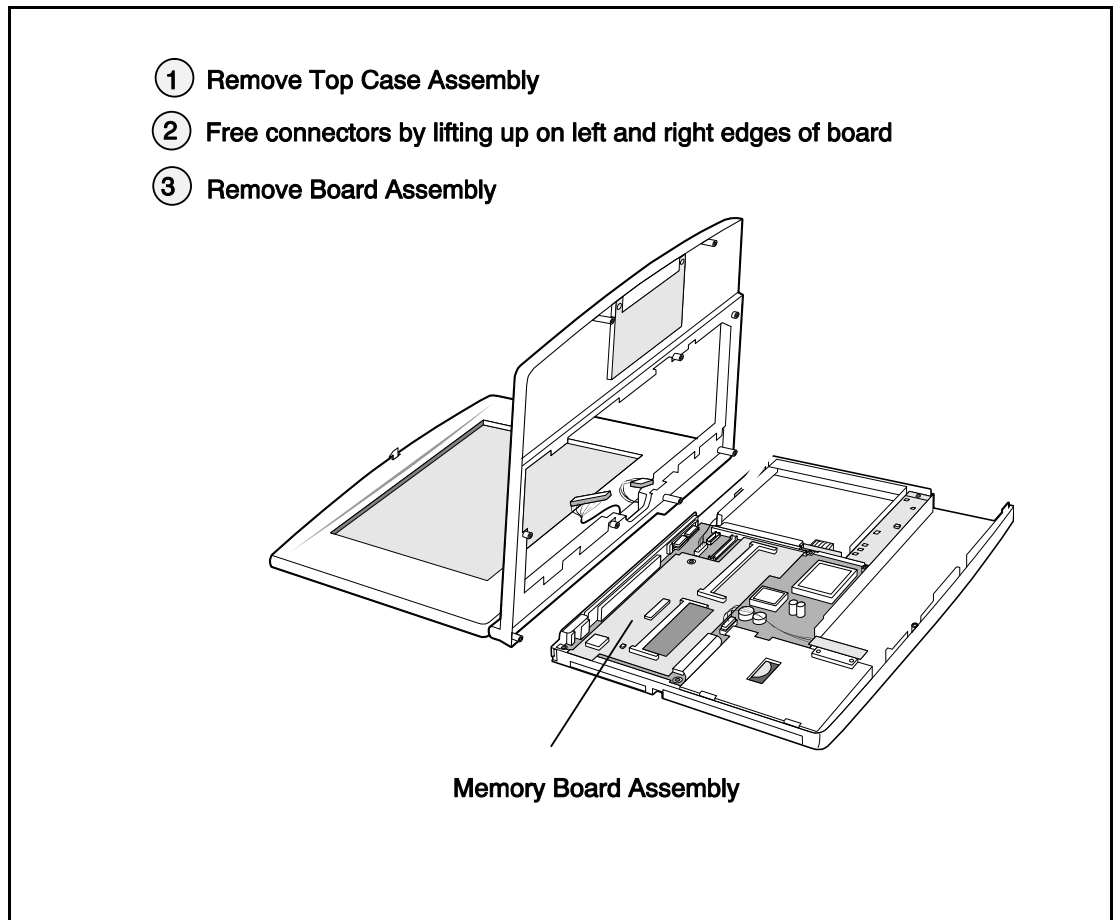
**Figure 6-8 Power Supply Board Removal**

## 6.5.15 Removing/Replacing the Memory Board

To remove and replace the Memory Board Assembly, perform the following procedure:

1. Remove the AC Adapter, Battery Pack, Hard Disk Drive and Floppy Disk Drive from the unit.

2. Remove the Top Case Assembly as described in Paragraph 6.5.10.
3. Using a plastic stick, lift up on the left and right edges of the board. The board assembly snaps out. Lift the board out of the unit.
4. Reassembly is the reverse of steps 1 through 3 above.



**Figure 6-9 Memory Board Removal**

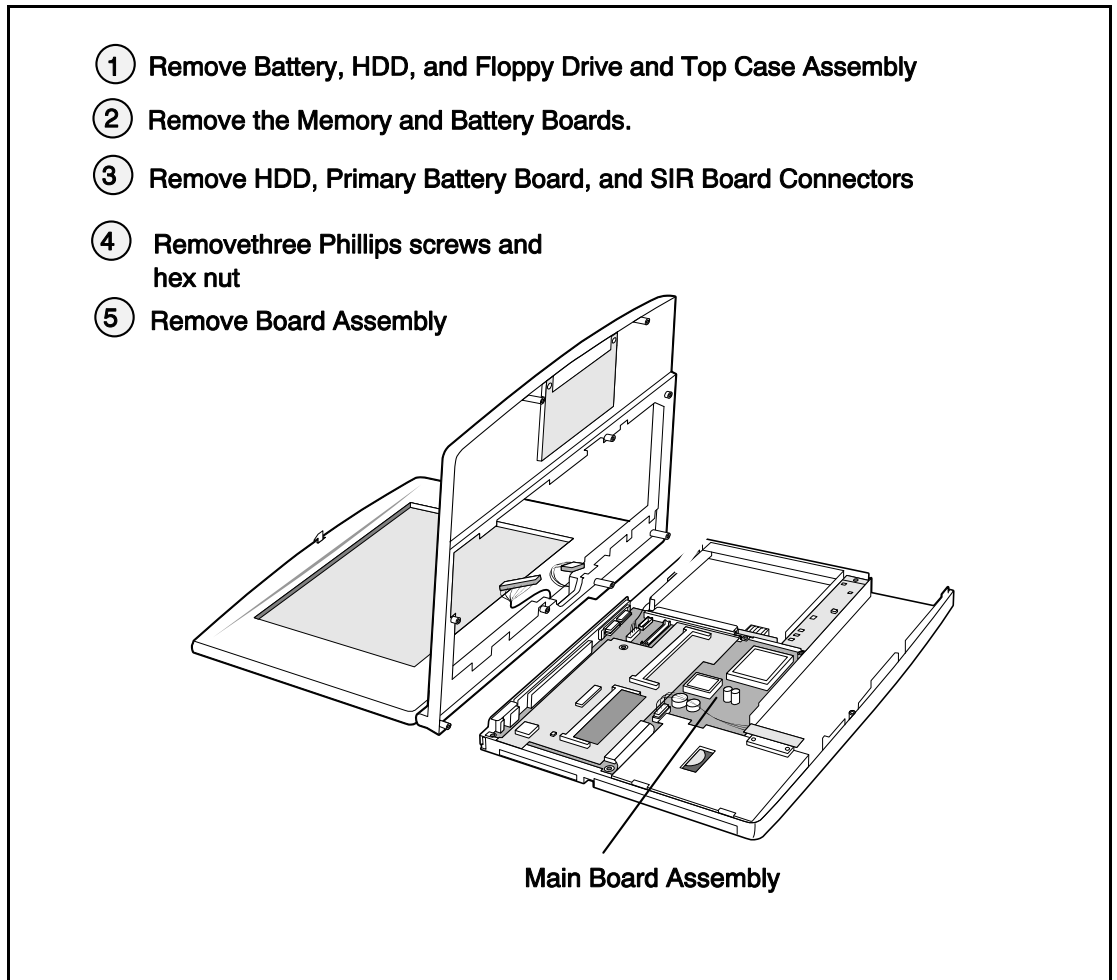
## **6.5.16 Removing/Replacing the Main Board**

To remove and replace the Main Board Assembly, perform the following procedure:

1. Remove the AC Adapter, Battery Pack, Hard Disk Drive and Floppy Disk Drive from the unit.
2. Remove the keyboard assembly as described in Paragraph 6.5.5
3. Remove the Heatsink as described in paragraph 6.5.6.
4. Remove the Power Supply Board as described in paragraph 6.5.14.
5. Remove the Memory Board as described in paragraph 6.5.15.
6. Disconnect all interboard cable connectors (SIR Board Connector from J9; Primary Battery Board Connector from J15, etc).
7. Using a small flat blade screwdriver and apply light pressure in a rocking motion to remove the hard drive cable connector.
8. Remove the three large Phillips-head screws (one near the 25-pin parallel port and two screws near the floppy connector). **Do not remove the smaller**

***Phillips-head screws as they are part of the PCMCIA connector hardware.***

9. Using a 5 mm hex driver, remove the hex nut adjacent to the display cable connectors.
10. Lift up along the front edge of the Main Board Assembly until it clears the hard drive cavity; then pull the board forward and out of the plastics.
11. Remove the secondary Battery and transfer to the replacement Main Board (reference Paragraph 6.5.17).
12. Reassembly is essentially the reverse of steps 1 through 10 above.



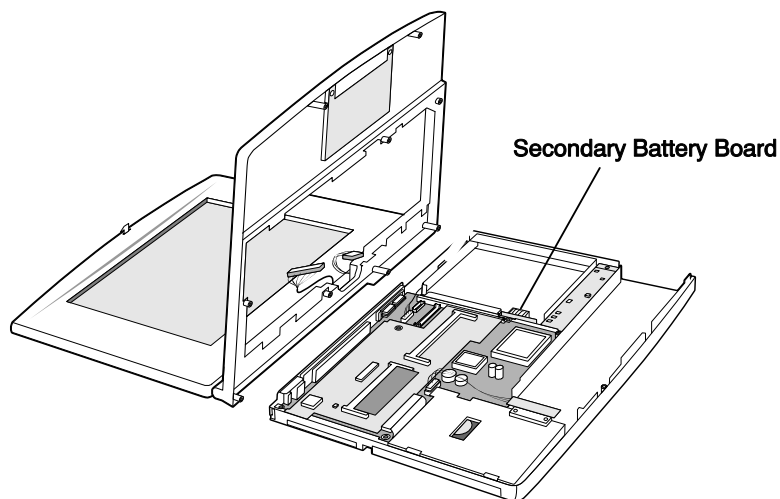
**Figure 6-10 Main Board Removal/Replacement**

### **6.5.17 Removing/Replacing the Secondary Battery Board**

To remove and replace the Secondary Battery Assembly, perform the following procedure:

1. Remove the Main Board Assembly as described in paragraph 6.5.16.
2. Carefully slide the secondary Battery Board Assembly from its right angle connector and remove board from unit.
3. Replacement is the reverse of steps 1 and 2 above.

- ① Remove Battery, HDD, and Floppy Drive and Top Case Assembly
- ② Remove the Main Board.
- ③ Carefully slide the Secondary Battery Board from its right-angleConnector



**Figure 6-11 Secondary Battery Board**

## Self-Test Error Messages

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### A.1 Introduction

This appendix contains reference data useful in diagnosing and correcting self test errors.

**Table A-1 Self-Test Error Messages**

<b>Error Message</b>	<b>Corrective Action</b>
CMOS Battery Bad	Replace Main Board
CMOS Checksum Error	Cycle power to Notebook; if problem persists
Disk Boot Failure	Insert a system disk in drive A
Diskette Drive Controller Error or No Controller Present	Cycle power to Notebook; if problem persists
Diskette Drive Error	Insert Diskette and retry; if problem persists
Diskette Drive Type Mismatch	Press Ctrl-Alt-Esc to reconfigure the system.
Equipment Configuration Error	Press Ctrl-Alt-Esc to reconfigure the system.
Hard Disk 0 Error	Cycle power to Notebook; if problem persists
Hard Disk 0 Extended Type Error.	Cycle power to Notebook; if problem persists, replace Hard Drive
Insert system diskette and press key to reboot	Insert a system disk in drive A
I/O Parity Error	Cycle power to Notebook; if problem persists
Keyboard Error or No Keyboard Connected	Cycle power to Notebook; if problem persists

<b>Error Message</b>	<b>Corrective Action</b>
Keyboard Interface Error	Cycle Power to Notebook. If problem persists
Memory Size Mismatch	Enter and then exit the System Configuration Setup in the Setup utility.
Missing operating system	Correct the HDD type and reboot. Refer to the specification label pasted on the back side of the notebook or attached to hard disk drive.
Non-system disk or disk error. Replace and strike any key when ready	Insert a system disk in drive A and press any key
Pointing Device Error	Cycle Power to Notebook; if problem persists
Pointing Device Interface Error.	Cycle Power to Notebook; if problem persists, open up the notebook and check the touchpad cabling
Protected Mode Test Fail	Cycle power to Notebook
RAM BIOS Bad	Cycle power to Notebook
RAM Parity Error.	Cycle power to Notebook if problem persists
Real-Time Clock Error	Press Ctrl-Alt-Esc to reconfigure the system.
Video RAM BIOS Bad	Cycle power to Notebook

**Table A-2 POST Checkpoint List**

<b>Checkpoint No.</b>	<b>Description</b>
D4h	Normal POST start
FCh	CMOS and BIOS ROM checksum test skip or complete
01h	80286 register test in-progress
02h	CMOS write/read test in-progress or failure
03h	BIOS ROM checksum in-progress or failure
04h	Programmable Interval Timer test in-progress or failure

<b>Checkpoint No.</b>	<b>Description</b>
D4h	Normal POST start
06h	DMA page register write/read test in-progress or fail
08h	RAM refresh verification in-progress or failure
09h	1st 64K RAM test in-progress
0Ah	1st 64K RAM chip or data line failure - multi-bit
0Bh	1st 64K RAM odd/even logic failure
0Ch	1st 64K RAM address line failure
0Dh	1st 64K RAM parity test in_progress or failure
10h	1st 64K RAM chip or data line failure bit 0
20h	Slave DMA register test in-progress or failure
21h	Master DMA register test in-progress or failure
22h	Master interrupt mask register test in-progress or fail
23h	Slave interrupt mask register test in-progress or fail
25h	Interrupt vector loading in-progress
27h	Keyboard controller test in-progress or failure
28h	CMOS power-fail and checksum checks in-progress
29h	CMOS config info validation in-progress
2Bh	Screen memory test in-progress or failure
2Ch	Screen initialization in-progress or failure
2Dh	Screen retrace tests in-progress or failure
2Eh	Search for video ROM in-progress
30h	Screen believed operable:
34h	Timer tick interrupt test in_progress or failure
35h	Shutdown test in_progress or failure
36h	Gate A20 failure
37h	Unexpected interrupt in protected mode
38h	RAM test in_progress or failure above address 0FFFFh



<b>Checkpoint No.</b>	<b>Description</b>
D4h	Normal POST start
3Ah	Interval timer channel 2 test in_progress or failure
3Bh	Time-Of-Day clock test in_progress or failure
3Ch	Serial port test test in_progress or failure
3Dh	Parallel port test test in_progress or failure
3Eh	Math Coprocessor test in_progress or failure
50h	Initial M1429
52h	Dynamic Memory Configuration & check external Cache size
53h	Shadow BIOS
54h	Perform PCI device initialization
55h	Check CMOS checksum
56h	Check CMOS config against actual
57h	Enable/disable external cache
5Fh	Initial PnP device nodes
90h	Enable/disable external cache
70h	For PCI
71h	For PCI
72h	For PCI
73h	For PCI
74h	For PCI
75h	For PCI
76h	Begin PCI devices initialization
77h	Configures PCI VGA devices
78h	Except VGA
79h	Begin PCI service routines
7Ah	PCI Option ROM initialization
E0h	Shadow PCI non-VGA option ROM
E1h	Shadow PCI VGA option ROM to C000 segment
E3h	Start to find PCI option ROM
E4h	Begin to shadow PCI option ROM

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<b>Checkpoint No.</b>	<b>Description</b>
D4h	Normal POST start
1Fh	Begin to configures PCI VGA devices
D1h	Allocate Space for option ROM

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# Appendix B

## Connector Pinouts

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### B.1 Introduction

This appendix contains connector pinout data for the Extensa 450 Series Notebook Computers.

**Table B-1 PS/2 Mouse/Keyboard Port (J2) Pin Assignments**

Pin No.	Pin Name	Pin No.	Pin Name
1	DATA	4	VCC
2	XDATA	5	CLOCK
3	GND	6	XCLOCK

**Table B-2 Parallel Port (J3) Pin Assignments**

Pin No.	Pin Name	Pin No.	Pin Name
1	-Strobe	14	-Auto line feed
2	Data0	15	-Error
3	Data1	16	-Initialize
4	Data2	17	-Select in
5	Data3	18	GND
6	Data4	19	GND
7	Data5	20	GND
8	Data6	21	GND
9	Data7	22	GND
10	-Acknowledge	23	GND
11	Busy	24	GND
12	Paper Empty	25	GND
13	Select		

**Table B-3 LCD VR Board Connector Pin Assignments**

<b>Pin No</b>	<b>Pin Name</b>	<b>Pin No</b>	<b>Pin Name</b>
1	DCBATIN	5	GND
2	CCFT_ON	6	CCFTID
3	FPVEE	7	GND
4	LCDVEE		

**Table B-4 SIR Connector (J8) Pin Assignments**

<b>Main Board Pin No</b>	<b>Pin Name</b>	<b>I/O</b>	<b>SIR Board Pin No</b>	<b>Pin Name</b>
1	VCC	SIR Input	1	VCC
2	N.C.		2	GND
3	DSR2#	SIR Output	3	SIR_RXD
4	DTR2#	SIR Input	4	SIR_TXD
5	SIR_EN	SIR Input	5	SIR_EN
6	N.C.		6	N.C.
7	N.C.		7	N.C.
8	N.C.		8	N.C.

**Table B-5 LCD Signal Connector (J12) Pin Assignments**

<b>Pin No</b>	<b>Pin Name</b>	<b>Pin No</b>	<b>Pin Name</b>
1	N.C.	21	PLD16
2	LCD+5	22	PLC17
3	N.C.	23	PLD18
4	PMOD	24	PLD19
5	GND	25	GND
6	PSLD3	26	PLFS
7	PSLD2	27	PLP
8	PSLD1	28	PSHFCLK
9	PSLD0	29	DISPLAY
10	PSUD7	30	LCD+5
11	PSUD6	31	GND
12	PSUD5	32	LCDVEE
13	PSUD4	33	PUD0
14	GND	34	PUD1
15	GND	35	PUD2
16	N.C	36	PUD3
17	PLD23	37	PLD0
18	PLC22	38	PLD1
19	PLD21	39	PLD2
20	PLD20	40	PLD3

**Table B- 6 FDD Connector (J11) Pin Assignments**

Pin No	Pin Name	Pin No	Pin Name
1	VCC	11	GND
2	INDEX#	12	WDATA#
3	VCC	13	GND
4	DR0#	14	WGATE#
5	VCC	15	TRK0#
6	DSKCHG	16	WRTPRT#
7	MTR0#	17	GND
8	FDIR	18	RDATA#
9	3_MODE	19	INTFDD#
10	STEP#	20	HESEL

**Table B- 7 PCMCIA Connector (J21) Pin Assignments**

Pin No	PC Card Interface Function	ATA Interface Function
21	B_IOWR#	B_IOWR#
22	B_A17	N.C.
23	B_A18	N.C.
24	B_A19	N.C.
25	B_A20	N.C.
26	B_A21	N.C.
27	B_VCC	B_VCC
28	B_VPP2	N.C.
29	B_A22	N.C.
30	B_A23	B_VU
31	B_A24,B_M/S	
32	B_A25	B_CSEL
33	N.C	N.C.
34	B_RESET	B_RESET
35	B_WAIT#	B_IOCHRDY

<b>Pin No</b>	<b>PC Card Interface Function</b>	<b>ATA Interface Function</b>
36	B_INPACK#	
37	B_REG#,	
38	B_SPKR#	B_LED
39	B_STSCHG#	B_PDIAG
40	B_D8	B_D8
41	B_D9	B_D9
42	B_D10	B_D10
43	B_CD2#	B_CD2#
44	GND	GND
45	PCMCIA#,	
46	GND,	
47	GND,	
48	B_D3	B_D3
49	B_CD1#	B_CD1#
50	B_D4	B_D4
51	B_D11	B_D11
52	B_D5	B_D5
53	B_D12	B_D12
54	B_D6	B_D6
55	B_D13	B_D13
56	B_D7	B_D7
57	B_D14	B_D14
58	B_CE1#	B_CS0
59	B_D15	B_D15
60	B_A10	N.C.
61	B_CE2#	B_CS1#
62	B_OE#	0
63	N.C.	N.C.
64	B_A11	N.C.
65	B_IORD#	B_IORD#
66	B_A9	B_CS1

<b>Pin No</b>	<b>PC Card Interface Function</b>	<b>ATA Interface Function</b>
67	B_A8	N.C.
68	B_A13	N.C.
69	B_A14	N.C.
70	B_WE#	N.C.
71	B_IREQ#	B_IREQ
72	B_VCC	B_VCC
73	B_VPP1	N.C.
74	B_A16	N.C.
75	B_A15	N.C.
76	B_A12	N.C.
77	B_A7	N.C.
78	B_A6	N.C.
79	B_A5	N.C.
80	B_A4	N.C.
81	B_A3	N.C.
82	B_A2	B_A2
83	B_A1	B_A1
84	B_A0	B_A0
85	B_D0	B_D0
86	B_D1	B_D1
87	B_D2	B_D2
88	B_IOIS16#	B_IOCS16#
89	GND	GND
90	N.C.	N.C.



**Table B-8 Memory Board Connector Pin Assignments (J13)**

Main Board Pin No	Main Board Pin Name	Main Board I/O	Memory Board Pin No.	Memory Board Pin Name
1	BRAS3#	Output	1	BRAS3#
2	BRAS2#	Output	2	BRAS2#
3	BMA10	Output	3	BMA10
4	BMA9	Output	4	BMA9
5	BMA4	Output	5	BMA4
6	BMA1	Output	6	BMA1
7	BMA2	Output	7	BMA2
8	BMA3	Output	8	BMA3
9	BCAS1#	Output	9	BCAS1#
10	BRAS0#	Output	10	BRAS0#
11	BCAS0#	Output	11	BCAS0#
12	BRAS1#	Output	12	BRAS1#
13	BWE#	Output	13	BWE#
14	BCAS3#	Output	14	BCAS3#
15	BCAS2#	Output	15	BCAS2#
16	BMA0	Output	16	BMA0
17	BMA8	Output	17	BMA8
18	BMA5	Output	18	BMA5
19	BMA6	Output	19	BMA6
20	BMA 7	Output	20	BMA 7
21	VCC	Output	21	VCC
22	VCC	Output	22	VCC
23	VCC	Output	23	VCC
24	GND	--	24	GND
25	GND	--	25	GND
26	GND	--	26	GND
27	N.C.	--	27	N.C.
28	N.C.	--	28	N.C.
29	BHD30	I/O	29	BHD30
30	BHD31	I/O	30	BHD31

Main Board Pin No	Main Board Pin Name	Main Board I/O	Memory Board Pin No.	Memory Board Pin Name
31	BHD29	I/O	31	BHD29
32	BHD28	I/O	32	BHD28
33	BHD27	I/O	33	BHD27
34	BHD26	I/O	34	BHD26
35	BHD25	I/O	35	BHD25
36	BHD24	I/O	36	BHD24
37	BHD23	I/O	37	BHD23
38	BHD22	I/O	38	BHD22
39	BHD21	I/O	39	BHD21
40	BHD20	I/O	40	BHD20
41	BHD19	I/O	41	BHD19
42	BHD18	I/O	42	BHD18
43	BHD17	I/O	43	BHD17
44	BHD16	I/O	44	BHD16
45	BHD15	I/O	45	BHD15
46	BHD14	I/O	46	BHD14
47	BHD13	I/O	47	BHD13
48	BHD12	I/O	48	BHD12
49	BHD11	I/O	49	BHD11
50	BHD10	I/O	50	BHD10
51	BHD9	I/O	51	BHD9
52	BHD8	I/O	52	BHD8
53	BHD7	I/O	53	BHD7
54	BHD6	I/O	54	BHD6
55	BHD5	I/O	55	BHD5
56	BHD4	I/O	56	BHD4
57	BHD3	I/O	57	BHD3
58	BHD2	I/O	58	BHD2
59	BHD1	I/O	59	BHD1
60	BHD0	I/O	60	BHD0

**Table B-9 Memory Board Connector Pin Assignments (J10)**

Main Board Pin No.	Main Board Pin Name	Main Board I/O	Memory Board Pin No.	Memory Board Pin Name
1	KMCLK	Output	1	KMCLK
2	KMDATA	I/O	2	KMDATA
3	KBDATA	I/O	3	KBDATA
4	KBCLK	Output	4	KBCLK
5	XD0	I/O	5	XD0
6	XD1	I/O	6	XD1
7	XD2	I/O	7	XD2
8	XD3	I/O	8	XD3
9	XD4	I/O	9	XD4
10	XD5	I/O	10	XD5
11	XD6	I/O	11	XD6
12	XD7	I/O	12	XD7
13	IRQ1	Input	13	IRQ1
14	IRQ12	Input	14	IRQ12
15	RST0#	Output	15	RST0#
16	GND	--	16	GND
17	KBCS#	Output	17	KBCS#
18	GND	--	18	GND
19	SA2	I/O	19	SA2
20	CLK7M	Output	20	CLK7M
21	GND	--	21	GND
22	TPDATA	I/O	22	TPDATA
23	TPCLK	Output	23	TPCLK
24	SSEIN#	Input	24	SSEIN#
25	SOVSW#	Input	25	SOVSW#
26	GND	26	--	GND
27	SETUP#	Input	27	SETUP#
28	IOW#	I/O	28	IOW#
29	IOR#	I/O	29	IOR#

Main Board Pin No.	Main Board Pin Name	Main Board I/O	Memory Board Pin No.	Memory Board Pin Name
30	GND	--	30	GND
31	VCC	Output	31	VCC
32	HDD_LED#	Output	32	HDD_LED#
33	SLPLED	Output	33	SLPLED
34	M/K#	Output	34	M/K#
35	VCC	Output	35	VCC
36	VCCSB	Output	36	VCCSB
37	SYSREST	Output	37	SYSREST
38	BT2_QCHG	Output	38	BT2_QCHG
39	BT1_QCHG	Output	39	BT1_QCHG
40	VCC	Output	40	VCC
41	LED#	Output	41	LED#
42	AD5V	Output	42	AD5V
43	VCC	Output	43	VCC
44	N.C.	--	44	N.C.
45	VCC	Output	45	VCC
46	N.C.	--	46	N.C.
47	N.C.	--	47	N.C.
48	N.C.	--	48	N.C.
49	N.C.	--	49	N.C.
50	N.C.	--	50	N.C.
51	N.C.	--	51	N.C.
52	N.C.	--	52	N.C.
53	N.C.	--	53	N.C.
54	N.C.	--	54	N.C.
55	N.C.	--	55	N.C.
56	N.C.	--	56	N.C.
57	N.C.	--	57	N.C.
58	N.C.	--	58	N.C.
59	N.C.	--	59	N.C.
60	N.C.	--	60	N.C.



# PC-Doctor Diagnostics

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## C.1 Introduction

The Extensa Series Notebooks are shipped with PC-Doctor, a powerful diagnostics tool that can help you determine the hardware configuration of a local or remote system, benchmark its performance, analyze the performance of all subsystems, and perform a suite of interactive and non-interactive tests on attached devices (such as printers, joystick devices, VGA monitors, SCSI devices, CD-ROM drives). The test results are stored in a log which can be printed out (by pressing **F2**) or saved in a disk file (by pressing **F3**).

Features of the diagnostic program are accessed through a series of pull-down menus and basic keyboard keys (cursor keys to move highlighted pointer, **Enter** key to select a highlighted feature, **ESC** key to cancel a function and move back one level.)

PC-Doctor is typically user friendly but if you don't understand a feature, context-sensitive "help" information is available at any time by pressing the **F1** function key; pressing the **F1** function key twice accesses the online Technical Reference Manual for PC-Doctor.

A powerful set of utilities within PC-Doctor (that can be run locally or remotely) simplify the task of determining system configuration data, allocating and using system memory, IRQ and DMA use, what device drivers are installed, what COM and LPT ports are assigned and what ports are available, identifying partitioning data for fixed disk drive(s), determining the VGA setup information, reading the software interrupts/interrupt vectors, etc.

## C.2 Starting PC-Doctor

PC-Doctor comes pre-installed on your Extensa Series Notebook Computer. To run the utility, reboot your computer.

The system continues the boot process and automatically displays the PC-Doctor Diagnostics main menu.

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## C.3 Keyboard Navigation

The keys shown in Table C-1 can be used to navigate through the PC-Doctor menus:

**Table C-1 PC-Doctor Key Assignments**

<b>Key</b>	<b>Description</b>
Cursor Keys	Moves the highlighted pointer.
<b>ENTER</b>	Selects the highlighted option.
<b>ESC</b>	Cancels current function and goes back one step.
<b>F1</b>	Activates context-sensitive help.
<b>F1</b> (twice)	Activates the online documentation.
<b>PageUp/PageDn</b>	Moves the screen one page at a time
<b>F2</b>	Prints the log.

In addition, when you select **All Tests** from the Diagnostics menu, the Test Selection Menu that appears uses the keys listed in Table C-2:

**Table C-2 Test Selection Menu Special Keys**

<b>Key</b>	<b>Description</b>
Space Bar	Enables/Disables the selected test.
<b>ENTER</b>	Enables/Disables the selected test.
<b>F2</b>	Activates Test Options Menu
<b>F5</b>	Runs the selected tests.
<b>F10</b>	Disables all tests.

## C.4 Mouse Navigation

You can also use a mouse with the user interface. Use the left mouse button to choose objects (menu entries and action codes in square brackets). Use the right mouse button as you would the **ESC** key to take you back to your previous step. Click on the ? in the upper left corner of the screen for context-sensitive help Menus.

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## C.5 PC-Doctor Menus

There are several selections available from the menu bar of the PC-Doctor Diagnostics main menu. These include:

- ?
- Diagnostics
- Interactive Tests
- Hardware Info
- Utility
- Quit

### C.5.1 Online Help (?)

To obtain context sensitive help from any menu, press **F1**. Pressing **F1** twice (or clicking on the question mark in the upper left-hand corner of the menu) provides you with complete online documentation.

### C.5.2 Diagnostics

The Diagnostics menu allows you to run non-destructive tests with little or no operator interaction. Options available from the PC-Doctor Diagnostics Menu include:

- System Test - tests all major aspects of the system except those found in Memory, Hard Disk, Floppy Disk, and the Miscellaneous Test categories.
- Memory Test - tests all types of main memory in the system including base, extended, expanded, and upper memory block (UMB) memory.
- Hard Disk Test - tests all hard disk drives in the system that are either IDE or provide a BIOS command interface.
- Floppy Disk Test - tests all floppy disk drives in the system.
- All Tests - allows you to select which tests to run. You can also specify special testing options. By pressing **F2**, the following options are available:
  - Halt On Errors - interrupts testing if an error is detected.

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**Note:** External serial and parallel port testing requires loopback plugs (not provided with this software).

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- External Loopback - tests external loopback of COM and LPT ports. You can select the type of loopback adapter you want to use.



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- Pass Count - selects how many times tests are repeated. The highest limit is 9999 times.
  - Test Logging - opens the Log Options menu that lets you define how test results are printed or stored to a file during testing. By default, PC-Doctor produces a test result file at the end of testing if an error was detected.
  - Switch LCD - lets you change your video output to either the internal LCD, external monitor, or simulscan mode. If your system does not support simulscan, both the external monitor and the built-in LCD screen go blank.
  - Cache Control - allows you to leave the level 1 and level 2 cache enabled during memory testing. This assists in tracking down cache timing issues.

### **C.5.3 Interactive Tests Menu**

Interactive tests are diagnostics that need user interaction to complete. Interactive tests include:

- Keyboard - tests the keyboard keys, LEDs, and repeat rate
- Video - tests the character sets, colors, monitor, and VGA
- Speaker - tests the volume response at different frequencies
- Mouse - tests the mouse driver, buttons, and functionality
- Joystick - calibrates the joystick and tests the buttons. During the test, the joystick(s) should first be calibrated. To calibrate the joystick, move the stick to the extremes in each direction. PC-Doctor registers the coordinate data and adjusts the screen display accordingly.
- Diskette Drive - checks diskette drive functionality
- Maximum System Load - burn-in tests a system. This function simulates the operating conditions that are produced by operating systems such as OS/2 and Windows NT. Some systems are not compatible with the Maximum system Load test.
- Printer Test - tests for the correct acceptance and execution of common printer control commands. Printer test information is stored in printer test files with an extension of *.PDP*.
- SCSI Test - PC-Doctor contains SCSI device testing features that work if you have an ASPI or CAM device driver loaded. You can select which SCSI host adapter to work with if you have more than one SCSI adapter present.
- CD-ROM Test - tests CD-ROM drives using the Microsoft CD-ROM Extensions (MSCDEX) and the standard CD-ROM device drivers.

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## **C.5.4 Hardware Info Menu**

This menu contains functions that determine and report on the setup of the computer. None of these functions perform diagnostic tests; however any errors are included in the reports. The following functions are available from the Hardware Info menu:

- System Configuration - lists main system configuration data.
- Memory Contents - shows allocation and use of system memory
- IRQ and DMA use - identifies interrupts for all standard IRQ and DMA devices
- Device Drivers - shows all essential data on DOS resident and installable device drivers
- COM and LPT ports - displays information about the installed serial and parallel ports. Only ports that are identified by BIOS are listed
- Physical Disk Drives - shows the basic characteristics for each installed fixed disk drive including the contents of partition tables
- Logical Disk Drives - displays information about each drive that is available and has a disk in it. If Stacker or DoubleSpace disk compression software has been installed, details about each "stacked" or "doubled" drive is shown
- VGA Information - identifies the type of installed VGA chip
- Software Interrupts - displays software interrupt vectors and the area of memory they point to
- SCSI Devices - lists information about SCSI devices and interface cards if a CAM or ASPI compliant SCSI device driver is present

## **C.5.5 Utility Menu**

PC-Doctor has a dedicated menu for utility functions. These functions include:

- Run External Tests - runs other programs from PC-Doctor
- Edit CMOS RAM - gives access to CMOS RAM data
- File Editor - allows editing of configuration files
- Surface Scan Hard Disk - checks for defects on the hard disk
- Benchmark System - measures system performance
- DOS Shell - opens a DOS prompt from within PC-Doctor
- Terminal - gives access to devices connected to a serial port (such as a modem)

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- **Memory Debugger** - displays memory contents in either hexadecimal, decimal, or ASCII form
  - **Remote Operation** - enables remote control if available
  - **Tech Support Form** - allows you to collect information about the current system
  - **Battery Rundown** - quickly deep-discharges the NiMh battery of a laptop computer.

## C.6 Quitting PC-Doctor

You can quit PC-Doctor in the following ways:

- **Exit (Alt-F4)** -
- **Reboot** - performs a cold boot. PC-Doctor flushes all files and attempts to flush write-caches
- **Park HD** - prepares a computer for transport

## C.7 Remote Operation

This selection only appears in the Utility menu if your PC-Doctor supports remote control. This entry opens the Remote Operation menu if you are not yet online, or closes the remote connection if the system is already remotely controlled.

When PC-Doctor is operated remotely, it is possible to perform a remote reboot. Remote rebooting is a complicated procedure that reloads the operating system and makes changes to CMOS RAM and configuration files. For further information on remote operations, refer to online documentation or help.

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