

# HP 2392A DISPLAY TERMINAL



## Self-Paced Hardware Training Guide



**HP Computer Museum**  
**[www.hpmuseum.net](http://www.hpmuseum.net)**

**For research and education purposes only.**

# **HP 2392A Display Terminal Self-Paced Hardware Training Guide**

**First Edition, 1984**



Computer Support Division  
19310 Pruneridge Avenue  
Cupertino, CA 95014

Part Number 02392 + 49A-90001

Printed in U.S.A. (10/84)

## **PRINTING HISTORY**

New editions of this manual will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged into the manual by the user. Each update will be indicated by a revised date at the bottom of the page. A vertical bar in the margin indicates the changes on each page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

First Edition . . . . . October 1984

## **NOTICE**

The information contained in this document is subject to change without notice.

HEWLETT-PACKARD MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

This document contains proprietary information which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another program language without the prior written consent of Hewlett-Packard Company.

Copyright © 1984 by HEWLETT-PACKARD COMPANY

# Contents

	<b>Page</b>		
Introduction _____	i	<b>Lesson 5</b>	
Purpose _____	i	Removal and Replacement _____	5-1
Prerequisites _____	i	Overview _____	5-1
Course Goal _____	i	Objectives _____	5-1
Materials Needed To Take This Course _____	i	Electrostatic Discharge and Safety Procedures _____	5-1
Course Description _____	i	Lab 5-1: Unit Disassembly and Reassembly _____	5-2
How To Take This Course _____	i	Lab 5-1 Answers _____	5-3
Course Structure _____	ii	Assembly Packaging/Unit Packaging _____	5-4
Course Completion Checklist _____	iii		
<b>Lesson 1</b>		<b>Lesson 6</b>	
Getting Acquainted with the HP 2392A _____	1-1	Alignments and Adjustments _____	6-1
Overview _____	1-1	Overview _____	6-1
Objectives _____	1-1	Objectives _____	6-1
Unit Introduction _____	1-1	On-site Procedures _____	6-1
Form and Features _____	1-1	Lab 6-1: Adjustments _____	6-2
Unit Service Philosophy _____	1-2	Lab 6-1 Answers _____	6-3
Controls and Switches _____	1-2		
Options and Accessories _____	1-2	<b>Lesson 7</b>	
Quiz _____	1-2	Troubleshooting _____	7-1
Quiz Answers _____	1-3	Overview _____	7-1
		Objectives _____	7-1
		Lab 7-1: Troubleshooting _____	7-2
		Lab 7-1 Answers _____	7-4
<b>Lesson 2</b>			
Installing the HP 2392A _____	2-1	<b>Lesson 8</b>	
Overview _____	2-1	How to Keep the HP 2392A Running _____	8-1
Objectives _____	2-1	Overview _____	8-1
Required Operating Environment _____	2-1	Objectives _____	8-1
Lab 2-1: Unit Installation and Quick Checks _____	2-2	Terminal Maintenance _____	8-1
		Battery Replacement _____	8-1
<b>Lesson 3</b>		Product Support Considerations _____	8-2
Operating the HP 2392A _____	3-1	Planning For Success _____	8-2
Overview _____	3-1	Elements of a Support Program _____	8-2
Objectives _____	3-1	Determining Need _____	8-2
Operating the HP 2392A _____	3-1	Evaluating Resources _____	8-3
Lab 3-1: Soft Configuration _____	3-2	Planned Maintenance _____	8-4
Lab 3-2: Remote/Local Mode _____	3-3	User Requirements Worksheet _____	8-5
Lab 3-3: Character/Block Mode _____	3-4	Resource Analysis Worksheet (Section I) _____	8-7
Lab 3-4: Editing Functions _____	3-4	Response Time Analysis Summary _____	8-10
Lab 3-5: Self-Tests and Diagnostics _____	3-5	Resource Analysis Worksheet (Section II) _____	8-11
Quiz _____	3-7	Resource Analysis Worksheet (Section III) _____	8-13
Quiz Answers _____	3-8	Uptime Graph: Final Site Plan _____	8-14
		Uptime Graph: Worksheet _____	8-15
		Course Evaluation _____	A-1
<b>Lesson 4</b>			
How the HP 2392A Works _____	4-1		
Overview _____	4-1		
Objectives _____	4-1		
Internal Functional Description _____	4-1		
Assembly by Assembly Functional Description _____	4-1		
Quiz _____	4-3		
Quiz Answers _____	4-4		



# Introduction

## Purpose

This self-paced hardware training course has been designed to optimize the learning time of an HP Customer Engineer or Customer newly introduced to HP repair and service methods.

This guide provides training for the HP 2392A Display Terminal, and should be sufficient for the student to fix 90% of the normal CE-related problems.

## Prerequisites

To successfully complete this self-paced course, you should have:

1. A good understanding of electronics (knowledge of fundamentals).
2. Successfully completed the Electrostatic Discharge Pre-Study (P/N 99070-90101).
3. Successfully completed the Problem Solving Pre-Study (P/N 35140-90002).

NOTE: This guide is intended to be used exclusively by qualified service personnel.

## Course Goal

The primary goal of this self-paced hardware training course is to train you how to repair the 239X series terminals. It does this by guiding you through a series of lectures and learning procedures that include the following information:

- Description of the unit's main features.
- Description of the unit's internal assemblies (structure of the machine).
- Use of self-tests and diagnostics.
- Basic troubleshooting procedures.
- Assembly and disassembly practice.
- Adjustments and alignments practice.

The training is enhanced through hands-on testing and experimenting.

## Materials Needed to Take This Course

1. HP 2392 Display Terminal Self-Paced Hardware Training Package:
  - This *HP 2392 Display Terminal Self-Paced Hardware Training Guide* (02392 + 49A-90001).
  - The *HP 2392A Service Manual* (02390-90003).
  - Final Review Package
2. HP 2392A Reference Manual.
3. Tools and Equipment:
  - Alignment tool (02390-60008).
  - Test module (02390-60010).
  - 6 inch jumper wire with small clip.
  - Pozidriver Screwdriver #1.
  - Medium blade slotdriver.
  - Datacomm Test hood (02620-60062).
  - Antistatic workstation kit (9300-0794).
  - Wrist strap and cord (9300-0791).

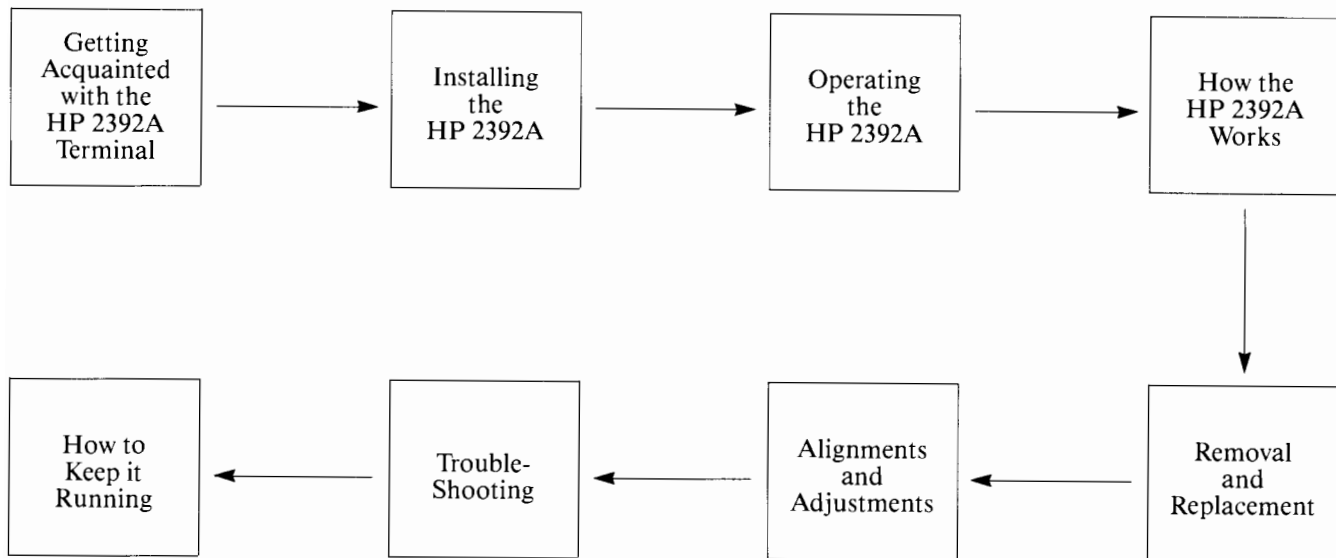
## Course Description

This course covers all Hewlett-Packard 239X series terminals. At the time of printing, this includes only the HP 2392A Terminal.

### How to Take This Course

1. Read each lesson in sequence.
2. Read and observe all CAUTIONS, WARNINGS, and safety guidelines.
3. Follow the instructional program as presented in each lesson, taking each quiz and completing each lab. If you answer all of the questions correctly, go on to the next lesson. If you don't answer all questions correctly, go back and review the material covered by that question before continuing. The quiz answers are located at the end of each lesson.
4. Keep a record of your progress using the Course Completion Checklist on page ii.
5. After completing the course, take the Final Review examination. If you incorrectly answer more than 20 percent of the questions, review those lessons where you were weakest. Then, retake the final examination.

# Course Structure



## Safety Procedures

There are various flags used throughout this course that must be followed to ensure your safety and the safety of the product. Be sure to pay special attention to the following symbols and text:

### **WARNING!**

*The WARNING symbol will be used above text where potential danger to an individual may occur.*

### **CAUTION!**

*The CAUTION symbol will be used above text where potential danger to equipment may occur.*

### **Notice**

*The NOTICE symbol will be used above text where attention to special instructions appear.*



*The STOP symbol will be used above text where student involvement occurs.*



# Course Completion Checklist

## HP 2392A Self-Paced Hardware Training Guide

Lesson Title	Date Completed	Time Required	Supervisor's Initials
1. Getting Acquainted with the HP 2392A	_____	_____	_____
2. Installing the HP 2392A	_____	_____	_____
3. Operating the HP 2392A	_____	_____	_____
4. How the HP 2392A Works	_____	_____	_____
5. Removal and Replacement	_____	_____	_____
6. Alignments and Adjustments	_____	_____	_____
7. Troubleshooting	_____	_____	_____
8. How to Keep the HP 2392A Running	_____	_____	_____

Program Completion Date \_\_\_\_\_

Student's Signature \_\_\_\_\_

Company Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Final Review Administered By: \_\_\_\_\_ Date: \_\_\_\_\_

If your organization is interested in an HP co-operative support program, complete this form and attach your completed final review package. Contact your local HP sales representative for further information.



# Getting Acquainted With The HP 2392A Terminal

## Lesson 1



### Overview

This lesson provides information on the basic features of the unit, and on some of its functional operations, as well as a brief description of its appearance.

### Objectives

At the end of this lesson, you will be able to identify one of the products covered from its general appearance, or roughly describe it. You will also be able to list some of the basic features or characteristics of the terminal. For this, you will be provided reference reading covering terminal features. You will then be expected to answer all the quiz questions pertaining to the terminal features in Lesson 3.

### Unit Introduction

#### Form and features

1. Unit description.

The HP 2392A is basically (primary design goal) a low-cost alphanumeric display terminal.

Its design meets most ergonomic requirements, including:

- Small foot print.
- Display tilt (up/down orientation of the screen) and swivel (rotation).
- User-accessible power-on/off switch and brightness control on the front panel.
- Flat keyboard (same as the HP150 personal computer).

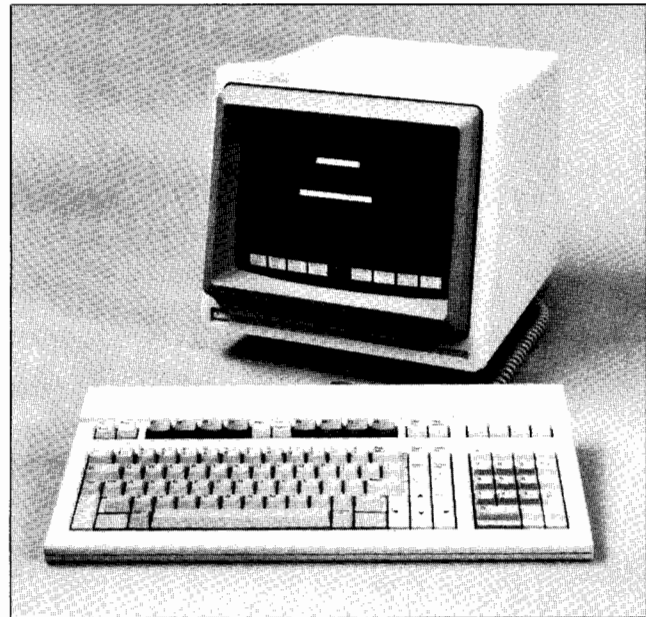


Figure 1: HP 2392A Terminal

2. Unit functions and features.

The HP 2392A includes the following features:

- Soft configuration.  
This means that all the settings needed to configure the desired operating modes (for example, transmission speed, parity, or protocols of communication) are selectable through screen menus accessed from the keyboard. No hardware straps have to be set. The selected configuration is then saved in a non-volatile memory. This memory is powered by two batteries located at the rear of the unit monitor when the terminal is powered off.

- Local/Remote mode.

The terminal can be used either in local mode or remote mode. Local mode means that data entered from the keyboard is processed only in the terminal itself for display on the screen. Remote mode means that data typed on the keyboard is sent to the host computer through the communication port located at the back of the unit (25-pin connector). In this mode, data received from the computer (through the same port) can be displayed on the screen.

- Character/block mode.

When transferring data to the computer, the terminal can be set in 2 modes, character or block. In character mode, data typed on the keyboard is transmitted immediately to the Central Processing Unit (CPU) each time a key is pressed. In block mode, the typed data is simply displayed on the screen, where it can be edited by the user. After it has been edited, the user initiates the transfer to the CPU by pressing the "ENTER" key and all the data is transferred to the CPU at once (in a block).

- Editing functions.

The terminal includes some local edit functions used to correct text displayed on the screen. The functions provided are insertion and deletion of characters in an existing text, and insertion or deletion of entire lines. The terminal also provides the user with the capability of setting margins and tabulations locally, similar to those on a normal typewriter.

- Video enhancements.

The terminal normally displays information using bright characters on a dark background. The user can define fields on the screen where characters are displayed dark on a light background, or in half-bright or underlined. Any combination of these can also be used.

Quiz: It will be done in Lesson 3, where you'll experiment practice of the above mentioned features.

## Unit Service Philosophy

The HP 2392A Terminal is serviced and repaired either on-site or at an HP field repair center to the assembly or socketed component level (if internal self-tests or diagnostics identify a particular component).

Generalized component-level repair, as well as soldering or unsoldering on printed circuit assemblies, are forbidden actions, unless a service note from the responsible division requires it.

The assemblies that are subject to failures in this terminal are subject to 2 possible policies. One, they are either simply scrapped and replaced by a new one; or two they are re-entered into the pipeline of the HP "board exchange program". In this latter case, the new assembly must be purchased from Computer Support Division (CSD) (US and Intercontinental (ICON) offices) or Computer Support Europe (CSE), which are the divisions responsible for this program.

The program used is detailed in the "Parts Price List" (available on microfiche in every HP office), which states the part required to replace any failing assembly. The identification of the failing assembly or socketed component is made using either the self-tests available in the unit or the test module designed to help isolate problems.

## Controls and Switches

The available user controls on the HP 2392A are:

- ON/OFF switch. You can probably see it easily, located at the bottom left corner of the front side of the unit.

- Brightness control.

This is a rotary knob located below the front of the terminal, on the right-hand side. Its location is indicated by the presence of a small drawing under the screen, which represents a shining sun.

## Options and Accessories

Read Sections 1.1, 1.2 and 1.3 of the *HP 2392A Service Manual*.

How many different keyboards are there available for the HP 2392A?.....See the difference with the previous products which had only 7!

*Turn to the next page and correct your answers before going on.*

## **Answer**

1. There are 17 types of keyboards.



# Installing The HP 2392A

## Lesson 2

### Overview

This lesson describes how to install the HP 2392 Terminal, taking into consideration the environment in which the unit will run and be supported.

### Objectives

Upon successful completion of this lesson, you will:

- be aware of the environmental requirements for the installation of the unit.
- have a basic knowledge of the quick checks that have to be done in case of difficulty, prior to intervention.
- have followed installation procedures in your *HP 2392A Service Manual*.

For this you will be provided reference reading and a lab. Successful completion of these objectives will be met when the unit has been installed according to procedures in the service manual.

### Required Operating Environment

The following specifications give the environment in which the unit will best run and be supported.

- Temperature:  
0 to 55 degrees Celsius. Survival (operation not guaranteed)operating: -20 to 65 degrees Celsius.
- Humidity: 5 to 95% (non-condensing) (specified at 40 degrees Celsius).
- Altitude: Sea level to 4570 meters (15000 feet) .
- Power requirements:  
Input voltages:  
115 Volts (+ 10%, -25%) at 47 to 66 Hz.  
230 Volts (+ 10%, -25%) at 47 to 66 Hz.  
Power consumption: 50 watts.  
Batteries: Duracell type MN9100, Union Carbide type E90, or HP P/N 1420-0255. Should be replaced once a year.



*Turn to the next page and perform the lab.*

# Lab 2-1

## Unit Installation and Quick Checks

This lab will familiarize you with the *HP 2392A Service Manual* and guide you through the installation procedures.

Read: Section 2.2 of the service manual.

**Do:** Identify the options in the unit you have, and install the terminal by following the procedures described in the above mentioned section of the service manual. If you cannot succeed in running the terminal as indicated in the documentation, contact your course mentor or coordinator.



# Operating The HP 2392A

## Lesson 3

### Overview

This lesson is designed to complete the elements learned in Lesson 1 by adding basic configuration access information. It uses hands-on experiments and will exercise and demonstrate the features described in Lesson 1. You will also learn some skills in running the self-tests available with the terminal.

### Objectives

During this lesson you will:

- Run the unit, run the self-tests available with this product, and access the terminal configuration menus. For this, you will be provided with 5 labs, which will utilize the *HP 2392A Service Manual*. Completion of this objective will be evidenced when the unit passes self-test.
- Describe roughly the terminal features listed in Lesson 1 by correctly answering all the quiz questions at the end of this lesson.

### Operating The HP 2392A

Now that you have installed the unit, you are ready to experiment with it.



*Turn to the next page and begin the first lab.*

# Lab 3-1

## Soft Configuration

The objective of the following labs is to have you practice what you learned about the terminal in the first lesson. You are encouraged to read through the procedures FIRST BEFORE ATTEMPTING THE LABS.

Check off each step as you complete it.

- \_\_\_\_\_ 1. Use the service manual (Figures 2.1 and 2.5) and locate the battery holder of your HP 2392A. Do not remove it, otherwise you will destroy the configuration that was stored in the terminal.
- \_\_\_\_\_ 2. Now turn on the unit. Let's go to the configuration procedure.
- \_\_\_\_\_ 3. Press the [User/System] key on the keyboard. The labels at the bottom of the screen change to new values.
- \_\_\_\_\_ 4. Press the f8 function key on the keyboard. Since it is the eighth key, it corresponds to the eighth label on the screen (on the far right), which is the [config keys] label. As you press on the key, the labels on the screen change again to new values, which are another level in what is called a "function key tree"

The new values correspond to functions that give you access to the different portions of the terminal configuration. Indeed, you can see that all new labels on the screen include the word "config." You have at least two labels: [datacomm config] and [terminal config].

- \_\_\_\_\_ 5. Press the key associated with the [terminal config] label (f5 on the keyboard).

The screen now shows a menu that contains several fields. Altering the content of these fields changes the terminal operating mode settings. Note that the changes only take effect when the [SAVE CONFIG] key (f1) is pressed.

- \_\_\_\_\_ 6. Now go back to normal operation by pressing on the [config keys] (f8).
- \_\_\_\_\_ 7. In the same manner as for accessing the "terminal config", if you now press the [datacomm config] key (f3), this will bring another menu on the screen that is used to select the terminal communication parameters.

In some units, you may find up to 2 additional labels to do this. They are [ext dev config] (that stands for "external device configuration") and [ANSI config]. They also cause a configuration menu to appear on the screen.

Can you guess in which case these labels appear? (Hint: remember or refer to the option and accessory lists we looked at in Lesson 1).

---

---

---

Check your answer against the correct one at the end of this lesson.

You are not expected to know the meanings of all the fields in the different configuration menus, but you are expected to be able to access the menus as you did previously. However, if you are interested in learning about their meanings, you may later read Section 3 of the service manual, which explains all about configuration.

## Lab 3-2

### Remote/Local Mode

- \_\_\_\_\_ 1. Press the [User/System] key again. Then press the [modes] key (f4). A new level of softkeys is displayed on the screen, namely:

[LINE MODIFY], [MODIFY ALL], [BLOCK MODE], [REMOTE MODE], [SMOOTH SCROLL], [MEMORY LOCK], [DISPLAY FUNCTNS], and [AUTO LF].

An asterisk may appear in some of these labels to indicate that the function corresponding to the label is active, if the previous user enabled it. Pressing the function key associated with a function toggles the asterisk in the label on and off, and respectively activates or deactivates the function. Try it.

- \_\_\_\_\_ 2. Make sure that you have removed all asterisks from the labels, except in the [AUTO LF] label.

Since the “remote” function is off (no asterisk is present in the [REMOTE MODE] label), the terminal is in LOCAL mode. As explained in Lesson 1, this means that the terminal only acts on its own, and no communication with an external computer occurs.

- \_\_\_\_\_ 3. Try it by typing a few characters on the keyboard. They are displayed on the screen as you type them.
- \_\_\_\_\_ 4. Now set the terminal to remote mode by activating the asterisk in the [REMOTE MODE] label (press the f4 key).
- \_\_\_\_\_ 5. Type a few characters again. What happens? Nothing appears on the screen.

Why? Because the terminal now sends the data that you type in to the computer through the datacomm port (connector at the rear of the unit). Since you have no connection to a computer, there is no data sent back (echo) and nothing is displayed. This “echo” is what usually happens with most of the computers (HP3000, HP1000, etc.).

Yes, you have got it now! So remember this: When talking to a computer via a terminal, what you see (in most of the cases) is not directly what you type but what has been echoed by the computer! This allows a simple checking of the quality of the transmission between your terminal and the CPU.



## **Lab 3-3**

### **Character/Block Mode**

- \_\_\_\_\_ 1. Keep the terminal in remote mode and press the [BLOCK MODE] key (f3) to activate block mode.
- \_\_\_\_\_ 2. Type a few characters again. They now appear on the screen even though you are in remote mode! As indicated in Lesson 1, block mode is a mode where the user can type data and edit it BEFORE any transmission to the computer. (By editing, you should understand correcting, formatting, etc.)

Of course, you the user, need to see what you do while editing. Consequently, the terminal automatically sets itself to display what you type, allowing you to visualize what you do.

In a real situation, you would press the ENTER key (located at the left bottom on the keyboard) after you have finished editing, and all the data would be sent at once to the CPU. In this present situation, it won't work because you have no computer to handle the necessary "protocols" required to allow block mode transfers. You are not expected to learn these protocols here, but just to remember that block mode exists.

However, if you are interested in knowing the details, you may read later the "ENTER key" section in the HP 2392A Reference Manual, and the terminal configuration field definitions in the HP 2392A Reference Manual or in the *HP 2392A Service Manual*.

## **Lab 3-4**

### **Editing Functions**

- \_\_\_\_\_ 1. Now get out of remote mode and block mode.
- \_\_\_\_\_ 2. Type a few lines of data. Since the terminal is in local mode (no asterisk in the [REMOTE MODE] label), they appear on the screen.
- \_\_\_\_\_ 3. Find the editing keys on the right hand side of the keyboard. They are "Insert line", "Delete line", "Insert character" and "Delete character".
- \_\_\_\_\_ 4. Try and play with them as if you wanted to perform modifications in your text. Remember that you can move the cursor to any place on the screen with the cursor control keys which are labeled with arrows at the bottom right on the keyboard.

The function of each of the editing keys is pretty straightforward to understand. The only thing you have to know is that when you enable the "Insert character" mode by pressing on the "Insert char" key, you have to press on it again to disable the insertion mode.

If you want to know these functions in more detail, or if you have particular questions about them, you may read later the detailed descriptions in the "Keyboard Control" section of the HP 2392A Reference Manual.

## **Lab 3-5**

### **Self-Tests and Diagnostics**

- \_\_\_\_\_ 1. Read Section 5 of the *HP 2392A Service Manual* and run the different self-tests as they are described. Note any problem you might find and contact your course mentor or coordinator for any specific questions or remarks.



*Turn to the next page and complete the lesson quiz.*



# Quiz

1. List the available self-tests in the HP 2392A.

---

---

2. Explain how to access them (which key sequence).

---

---

---

3. What happens when you run a continued self-test, and you perform

a) a hard reset? \_\_\_\_\_

b) a power-off/on cycle? \_\_\_\_\_

Check your answers against the correct ones on the next page. Before going on, if they were not correct, go back and review the material and lab covered by the question missed.

## Quiz Answers

1. - The [ext device config] label can appear only if a port of communication is dedicated to the connection with a peripheral. The main port (standard) at the back of terminal is normally used for the connection to the computer. Consequently, the [ext dev config] label appears only if a second port of communication is installed in the terminal, i.e., if an option 092, 093 or 094 or an accessory 40210R, 40210P or 40210M was ordered by the user. The [ANSI config] label will appear if an ANSI compatibility option was ordered with the terminal, i.e, if option 049 was delivered with the unit.
2. - Power-on test. Starts automatically when the unit is turned on.
  - Terminal test. Press successively [User/System] key, [service keys] function key, [TERMINAL TEST] function key.
  - Continuous terminal test. Press successively the same keys as for the terminal test, except that the [Shift] key must be pressed simultaneously with the [TERMINAL TEST] function key.
  - Datacomm port 1 test. Press successively the [User/System] key, [service keys] function key, [PORT 1 TEST] function key.
  - Continuous Datacomm port 1 test. Press the same keys as for for the 1 test, except that the [Shift] key must be pressed simultaneously with the [PORT 1 TEST] function key.
  - Datacomm port 2 test. Press successively the [User/ /System] key, [service keys] function key, [PORT 2 TEST] function key. Note that this latter key (and function) will be present only if a second port module is present in the unit.
  - Continuous Datacomm port 2 test. Press the same keys as for the Port 2 test, except that the [Shift] key should be pressed simultaneously with the [PORT 2 TEST] function key. Same remark as for the Port 2 test.
  - Identify ROMS. Press successively the [User/System] key, [service keys] function key, [IDENTIFY ROMS] function key.
  - Manufacturing test. Power-off the unit. Plug in the manufacturing test module in place of the second port module. Select the desired test (single shot or continuous, test card display or not) using the switch located on the module, then turn on the unit.
3. - Continuous tests can only be stopped by pressing the same function key used to initiate them. Performing a hard reset or power-off/on cycle will return the unit to the test loop.



# How The HP 2392A Works

## Lesson 4

### Overview

This section contains a brief description of the functional operation of the HP 2392A Terminal.

### Objectives

At the end of this lesson, you will know the general structure of the unit and distinguish the approximate role of each assembly. For this, you will be asked to list the major assemblies of the terminal and describe in your own words the role and functions of each, without using any reference material.

### Internal Functional Description

The HP 2392A, as stated before, is a display terminal. This indicates that its major role is to provide a means of communication with a computer. Its two main functions are consequently the following:

- to receive information (data) from an input device (the keyboard) and send it to the computer
- to receive data from the computer and show it to the user on an output device.
- In the past, that is, on older models of terminals called teletypes, the output device was a piece of paper where the data was printed by a mechanical principle. Nowadays, the output device is a Cathode Ray Tube (CRT). The technique used is a TV raster method.

The image on the display is created by scanning the screen regularly with an electron beam that is deviated horizontally and vertically. During this scanning, the electron beam is illuminated and extinguished in a proper manner to generate the dots that you can see. (Look very closely to the terminal screen: you can see that the characters are not continuous but made of many individual dots.)

The HP 2392A Terminal is composed of several electronic assemblies.

- sweep PCA
- video PCA
- power supply PCA
- processor PCA (Printed Circuit Assembly)
- external device communication module PCA

### Assembly by Assembly Functional Description

1. The **SWEEP PCA** generates the necessary signals (current ramps) to drive the vertical and horizontal coils of the deflection yoke. This yoke generates, in turn, magnetic fields which deviate the electron beam in the tube. This assembly also generates the proper voltages for the CRT (from the power supply PCA voltages). These are the focus, the grids and the VHT (very high tension) voltages.
2. The **VIDEO PCA** generates the necessary voltages to switch the electron beam on and off, as paced by the electronic logic. It also transfers the voltages for the CRT, from the sweep PCA to the CRT socket connections.
3. The **POWER SUPPLY PCA** generates from the line input all the voltages used by the other PCA's in the unit. The voltages generated are:  $\frac{2}{3}5V$ ,  $\frac{2}{3}12V$ ,  $-12V$  and  $\frac{2}{3}40V$ . Note that the 40V output is used only by the sweep PCA. It also creates the "power-on" signal. This signal is used to reset the logic components when the unit is powered on, and to tell the micro-processor to secure the configuration parameters upon a power-down condition.

The power supply PCA has to be set up (jumper strapping and choice of the fuse on the board) to match the available power source (110V, 230V).

Separate from the power supply are batteries located at the rear of the terminal. These batteries are used to supply the non-volatile memory that contains the configuration while power is off. These batteries should be replaced once a year.

4. The **PROCESSOR PCA** contains all the “intelligence” of the terminal. It is based upon a microprocessor, the 8088, and its architecture looks very much like a computer. Indeed, it uses a “bus” structure, which is a set of data lines used by the microprocessor to access the instructions of the program it executes as well as the other resources, such as Random Access Memory (RAM) and input/output circuits. The unit’s internal program is contained in Read Only Memory circuits (ROM) and is usually referred to as the “firmware” of the unit.

The program instructions tell the microprocessor what actions to perform, such as scanning the keyboard, interpreting the keys according to the configured keyboard layout, and putting the typed characters into memory in an organized manner. It also interprets the commands received either from the CPU or the keyboard, and then executes them. Upon a user CPU request, the microprocessor performs all the transfers of data on the communication line(s), using the proper “handshakes” or protocols configured for the unit. Information is stored in memory in the form of encoded bytes (8 bits).

The video generator chip (also called CRT controller or CRTIC) is the next most important circuit in the processor PCA. It fetches the bytes from memory and generates the appropriate strings of dots that are a dot-by-dot representation of the characters appearing on the screen. While doing this, the video generator chip takes into account any video enhancements specified by the user (which the microprocessor stored in memory in a coded fashion).

Finally, the video generator also generates the synchronization signals used by the sweep PCA (horizontal and vertical). These signals specify the starting point of the lines and of the screen respectively. The image is continuously scanned in this manner at a 60Hz frequency.



*Turn to the next page and complete the lesson quiz.*

# Quiz

Answer the following questions. If you cannot, re-read this lesson.

1. How many output voltages does the power supply PCA generate?

---

---

---

2. With which input mains voltages can the power supply PCA work?

---

---

---



3. What does the sweep PCA generate?

---

---

---

4. What are the 2 major components on the processor PCA?

---

---

---

*Check your answers against the correct ones on the next page. Before going on, if they were not correct, go back and review the material covered by the question missed.*

## Quiz Answers

1. Four voltage outputs are generated by the power supply PCA. They are: + 5V, + 12V, -12V and + 40V.
2. The power supply can work with either 110V or 230V (220 or 240). The power supply PCA has to be set up via fuse value and a selection jumper on the board, to match the mains voltage.
3. The sweep PCA generates mainly the current ramps for the deflection coils. (If you have answered this only, your answer can be considered as correct.) The sweep PCA also generates grids, focus voltages and VHT (very high tension) for the tube (CRT).
4. The 2 major components on the processor PCA are: the microprocessor and the video generator chip (also called CRTIC).

# Removal and Replacement

## Lesson 5

### Overview

This lesson covers the assembly and disassembly procedures for the HP 2392A Terminal.

### Objectives

At the end of this lesson, you will have theoretical and hands-on experience of assembling and disassembling the terminal, and will be aware of the cautions and warnings that apply to these manipulations. You will be expected to perform the disassembly and reassembly of the unit by following the instructions given in the *HP 2392A Service Manual*. You will be provided with equipment and tools. Successful completion will be indicated by proper operation and shape of the terminal.

### Electrostatic Discharge and Safety Protection Procedures

#### CAUTION

*Integrated circuits (IC's) can be damaged by electrostatic discharge (ESD). Use the following precautions:*

- *Do not wear clothing subject to static-charge buildup, such as wool or synthetic materials.*
- *Do not handle IC's in carpeted areas.*
- *Do not remove IC's from their conductive foam pad until you are ready to install them.*

- *Avoid touching circuit leads. Handle IC's by the plastic package only.*
- *Never touch IC's or tracks on PCA's, but handle PCA's by the edges (nonconductive plastic), as for L P records, wherever possible.*
- *Ensure that IC's, work surfaces (table, desk, etc.) and PCA's are all at the same ground potential. This can be done using the antistatic workstation kit and wrist strap and cord (P/N 9300-0791 and 9300-0794).*

*If an antistatic workstation kit is unavailable, the above can be accomplished by touching the foam pad to the PCA, and then touching the foam pad, circuit, and PCA to the work area.*

#### WARNING

*High-voltage areas are present on the power supply, sweep and video PCA's and on the CRT within the unit. Use caution when working near these assemblies. Strictly follow the procedures given in the service manual. Removal and replacement procedures must only be performed by qualified service personnel. In case the unit has to be opened while power is on, heed all WARNING-HAZARDOUS VOLTAGE labels.*



*Turn to the next page and begin lab.*

# Lab 5-1

## Unit Disassembly and Reassembly

The purpose of this lab is to familiarize you with the *HP 2392A Service Manual* and to have you perform disassembly and reassembly procedures. You are encouraged to read through the procedure **FIRST BEFORE ATTEMPTING THE LAB**.

Read: Section 8 in the service manual (except Section 8.3.10).

Do: Perform all disassembly procedures.

Do: Remount the unit by following the service manual procedures.

Is it possible to dismantle the mechanics (the bezel, switches, etc.) without dismounting the electronics? And vice versa? If no, which parts should be dismantled?

---

---

---

## **Lab 5-1 Answers**

It is possible to remove all bezel, switches, top cover, etc. without dismounting the electronic assembly, except disconnecting the video. It is possible to disconnect electronic parts without taking apart any mechanical assembly, except removing the top cover.

## **Assembly Packaging/ Unit Packing**

The electronic assemblies of the unit (the sweep board, the video board, the power supply board, the processor board and any of the external communication modules) must always be packaged in their original containers for transport. In the same manner, the unit should only be transported in its original container. This is required so that shock and vibration specifications for the unit are satisfied.



# Alignments and Adjustments

## Lesson 6

### Overview

This section covers the adjustments and alignments procedures that may be performed in the HP 2392A Terminal.

### Objectives

At the end of this lesson, you will be aware of the adjustment locations in the terminal, and you will know about the cautions and warnings to be observed when performing these alignments and adjustments. You will be expected to list these locations and warnings.

### On-Site Procedures

#### **WARNING**

*Voltage measurements shall only be made using the manufacturing tests module. Never try to obtain measurements directly from the power supply PCA. Failure to do so may result in serious injury.*

#### **WARNING/SHOCK HAZARD**

*Hazardous voltages are present on heat sinks, components and printed circuit assemblies (PCA's) in the power supply, sweep and CRT areas. Never touch these exposed parts when performing alignment and adjustment procedures. Failure to do so can be lethal. Remove rings, watches, or loose jewelry before performing adjustments. Do not use metallic or magnetic tools. Do not use your fingers. ONLY touch the potentiometers with the plastic adjustment tool, and always from the outside of the chassis. If you need to reach a component or tool on the opposite side of the unit, never reach over the chassis; walk around the unit!*

#### **CAUTION**

*Moving the power supply adjustment potentiometer without precautions (monitoring) may result in the destruction of the unit electronics. Read carefully the corresponding section in the service manual before performing any modification to the power supply potentiometer setting.*



*Turn to the next page and begin the lab.*



# Lab 6-1

## Adjustments

The purpose of this lab is to give you hands-on experience with terminal adjustments. You are encouraged to read through the procedures FIRST BEFORE ATTEMPTING THE LAB.

Read: Section 6 of the *HP 2392A Service Manual*.

Do: Follow the instructions given in the service manual and move the different adjustments (focus, width and height) of the sweep PCA.

Do: Observe each adjustment's effect on the display.

Do: Set each adjustment back to its proper setting.

1. Why should you remove ring, watches or loose jewelry before performing a power supply adjustment?

---

---

---

2. Why should you act with extreme care when turning the voltage adjustment potentiometer?

---

---

---

3. Why should you avoid touching the yoke metal portions?

---

---

---

4. How and where should one access the various adjustments on the HP 2392A?

---

---

---

## Lab 6-1 Answers

1. Very high voltages are present on most of the components and heat sinks on the sweep and power supply PCA's.
2. There is no limitation to the voltage adjustment potentiometer. Turning it suddenly, without monitoring the effect, might raise the output voltages of the power supply PCA above the maximum tolerance of the electronic component inside the unit. The result could be the destruction of some unit's assemblies.
3. The yoke is driven via high voltages and currents. Only the plastic part is isolated and provides security.
4. The adjustment potentiometers should be accessed using a special plastic tool only. Never use a metallic or magnetic adjustment tool. Never use your fingers. Access to the parts are given through holes located on each side of the unit's metal chassis.



# Troubleshooting

# Lesson 7

## Overview

This section is intended to provide information on the troubleshooting procedures related to the HP 2392A Terminal. The lab will provide you with practice in locating the most probable causes for a failing assembly or component.

## Objectives

You will be presented with theoretical situations for a failing assembly or component. You will be asked to use the troubleshooting flowcharts in the *HP 2392A Service Manual* to determine the most probable cause. Upon completion of this lesson, you will know where to look for and how to proceed in troubleshooting an HP 2392A Terminal.



*Turn to the next page and begin the lab.*

# Lab 7-1

## Troubleshooting

Refer to the troubleshooting flowcharts and diagnostics in Sections 4 and 5 of your *HP 2392A Service Manual*, and to the self-tests covered in Lesson 3 of this guide. Determine the most probable cause (failing assembly or component) in each of the following theoretical situations. In each case, explain where you found the information.

1. At power-on, the unit does not come up. Instead, it sounds a low and a high beep, followed by 3 beeps, then 4 beeps.

Explain the most probable cause:

---

---

Where did you find this information?

---

---

2. At power-on, the unit does not come up. The unit sounds the normal low and high beeps, then a high beep, at power-on, for normal power on cycle. Power supply LED's on the manufacturing test module come up, and voltage measurements are correct. The manufacturing test, when plugged at the back of the unit, shows the test cycle running, but does not indicate any error. The tube does not crackle at power on. The tube filament does not come up, either.

Explain the most probable cause:

---

---

Where did you find this information?

---

---



*Before continuing this lab, check your answers with those provided at the end.*

You have answered question 2. However, let's consider another possible situation for the problem, because this possibility will provide complementary information.

Suppose that there is no beep at all.

This situation should be thought out logically as follows:

- A. Nothing happening at power-on. This does not provide any information for diagnosis.
- B. Test module results:
- Voltage measurements OK, so power supply is normal.
  - Manufacturing self-test running OK, so most of the logic PCA (processor PCA) is normal.
  - The problem is probably located in the video section.
- C. The next question you should ask: Are there any beeps? Why this question? Because the beeper is physically located on the sweep PCA! It is simply fed by a signal coming from the processor PCA through the connector that is located between the sweep PCA and the processor PCA.



Because there is no beep, you should realize that every single function (VHT, filament, CRT grid voltages) on the sweep PCA does not work, including those beeper parts that are not directly related to the sweep PCA's internal operation. The conclusion becomes obvious: the sweep PCA is disconnected from the processor PCA (or the connector destroyed)!

Note: In this latter case, going through the troubleshooting flowchart would have been useless. The only way to discover this problem, other than this logical process, is by following the troubleshooting section of the service manual. In the preliminary troubleshooting section, checking PCA connectors is required.

This demonstrates two things:

- Troubleshooting logically is extremely important. Instead of jumping directly to the cause of a problem and repairing what you think is wrong, care should be given to describe the trouble, test possible causes against specification, identify the most probable cause, then plan how to verify the cause.
- Using the documentation is helpful only if it is followed completely and in the proper order.

## Lab 7-1 Answers

1. RAM #1 and 2 are bad. The processor PCA should be replaced. Information should be obtained from the Error Messages Summary Chart in Section 5.8 of the service manual.
2. Bad sweep PCA. This information should be obtained from troubleshooting flowcharts in Section 4 of the service manual.



# How To Keep The HP 2392A Running

## Lesson 8

### Overview

This lesson covers both the technical information and the tactical approach needed to provide effective maintenance for the HP 2392A Terminal.

### Objectives

In this lesson, you will learn the necessary elements to plan and perform effective maintenance. You will be asked to list the necessary maintenance procedures required for the HP 2392A terminal (if any).

### Terminal Maintenance

The following summarizes maintenance of the HP 2392A Terminal.

### Cleaning

Cleaning the screen and keyboard is one of the procedures to be performed regularly in order to remove dust and grease, and to keep the unit in proper condition for normal operation.

For specific procedures, refer to the service manual, Section 2.3, Terminal Maintenance Procedures.

### Battery Replacement

The non-volatile portion of memory that contains the terminal's configuration data is protected against loss by 2 batteries that are located on the rear panel of the terminal. For specific procedures, refer to the service manual, Section 2.3, Terminal Maintenance Procedures.

# Product Support Considerations

## Planning for Success

Up to this point in the training program, you have focused on understanding and repairing the HP 2392A. Your progress through this program has been measured by your ability to understand the material presented and your troubleshooting expertise. While these are important aspects of product repair, your true success can only be measured by how well you keep the equipment running, not how well you understand the product or how fast you find the problem. Take, for example, the case of a defective fuse—isolating the problem quickly is of little value if you do not have a spare fuse. Having a large quantity of the wrong fuse neither increases the utilization of the equipment, nor helps you fix it faster. What then is a support program and how do you use it for your success?

## Elements of a Support Program

A successful support program involves 3 major elements:

- Determining Need.
- Evaluating Resources.
- Planned Maintenance.

### 1. Determining Need

The first element, “Definition of the needs,” establishes the goals of the user. None of the key points can be addressed properly until the product application and need of the user is defined.

For instance, is the application one of monitoring on-line manufacturing processes, as in a production line system, or a less critical application in an engineering or research environment? These applications can require very different levels of support and resources. Further, the expectations of the users can vary dramatically.

To identify needs you should find answers to the following questions for each site or user you will support.

- What is the application of the product?  
Know how it is currently used and any new applications planned. These sometimes change the support requirements.
- What type of equipment is being used?  
Different products require more maintenance or interaction with other areas.

- How many hours/day is the equipment expected to be used?  
Will the system be expected to function 24 hours/day or something less?  
What about after normal working hours?
- Are some times more critical than others?  
Most operations have critical times either daily, weekly or monthly when the operation must run. Find out!
- How long can the process be inoperable?  
It is important to establish alternate plans for critical times. Suggest alternatives for the user: back-up procedures, etc.

The User Requirements Worksheet on page 8-5 will help answer some of these questions and should be completed for each site and product that you will support.

For this course, select one site you will support and answer the questions the way you feel the user would answer. (If you wish to use the worksheet for other users, you should make several copies before you complete the form.)



*Complete Steps 1 through 6 of the User Requirements Worksheet located on page 8-5.*

## Product Design

The Hewlett-Packard 2392A has been designed as a high-reliability, minimum-maintenance product. Under normal conditions it requires no scheduled maintenance. Still, you should evaluate the user's particular environment and usage situation to determine preventive measures for optimum product usage.

## User Environment

What type of environment is the equipment subjected to. Is it a manufacturing facility? Computer room environment or office area? Is it subjected to high/low temperature extremes? Power fluctuation? Dirt? Caustic atmosphere, etc.? All of these affect the equipment utilization and should be monitored on a continuing basis.

## Equipment Usage

Equipment usage involves the amount of time the specified product is used, i.e., 2 hrs/day, 10 hrs/day or 24 hrs/day, etc. Generally, the more the equipment is used the higher the probability that mechanical components may wear.



*Complete Section III of the Resource Analysis Worksheet on page 8-13.*

*With the Resource Analysis Worksheet completed, compare your capabilities to these identified in the User's Requirements Worksheet. What do you feel the measurement criteria should be?*

## 2. Evaluating Resources

With steps 1 through 6 completed in the User Requirements Worksheet, you can begin to identify the resources required to meet the user's needs in the areas of response time, repair time, and planned maintenance. These three key areas impact the overall system utilization. You should have a good understanding of each of these areas for your organization for normal working hours, after normal working hours, weekends and holidays.

### Response Time

Response time is a measure of the efficiency of the dispatching process. It is an issue that varies with each organization and location. Consider the effect of the following areas on response time for your organization.

#### Communication

Communication is important. Poor communication can mean long delays in responding to service requests or worse, missed service requests. Consider:

- How are requests for service received?
- Who received them?
- How are service personnel notified?
- What about after normal working hours, weekends or holidays?

#### Availability of Service Personnel

You must understand what procedures your organization follows to best utilize its service personnel. For example:

- How are service requests assigned?
- Can you leave immediately?
- What happens if you can't go immediately?
- Do you have a back-up plan?
- What happens after normal working hours, weekends and holidays?

### Parts/Tools Availability

This area is the most overlooked area of response time, but perhaps the most critical. If you don't have the proper parts and tools, you must get them from somewhere before you can respond. Will they be carried by service personnel, stored in a central location, or will they be available once you arrive? What about access during normal working hours, after normal hours, weekends, and holidays? Valuable time can be wasted if parts are stored miles away from your current location.

#### User's Location

The user's location can definitely affect your ability to respond. For example:

- Distance from support personnel.
- Geographic territory (mountains, etc.)
- Travel time consideration (traffic, etc.)
- Travel method (airplane, etc.)
- Security issues.

Check your situations! How does your organization handle each of these? What is your estimate of the time required for you to receive a service request? What do you feel your response time will be?



*Complete Section I of the Resource Analysis Worksheet on page 8-7.*

### Repair Time

Repair time is mainly a function of your ability to locate and solve the problem once you have arrived at the user's site. Other areas that impact your ability to repair the product are:

- Product availability — Can you begin work on the system immediately once you arrive on site?
- Parts availability — How do you get the part you need when you find the failing assembly?
- Consulting assistance — What about the times you can't isolate the problem? Who is your technical back-up?



*Complete Section II of the Resource Analysis Worksheet on page 8-11.*

### 3. Planned Maintenance

The first portion of this lesson described the preventive maintenance (PM) procedures for the HP 2392A products. You should understand that planned maintenance is a means to an end. Performing PMs 100% of the time would result in the equipment being utilized 0%. No PMs may cause unnecessary failures during critical operations. This raises several questions concerning preventive maintenance. What is a proper PM? How often should they be performed? The answer is dependent on three major factors:

- Product design.
- Environment.
- Equipment usage.

Any successful maintenance program must constantly evaluate each of these major areas to establish a Planned Maintenance program to fit the user's needs.

#### Establishing a Measurement Program

One of the easiest and most comprehensive methods of measuring your results is equipment utilization or uptime. The uptime measurement allows an easy way to set user expectations and graphically identify potential problems or reduced performance.

#### Uptime Calculations

Many definitions and calculations exist for uptime. It is unimportant which definition or formula is used. However, once the criteria have been established, it is important that they remain unchanged.

The general formula for uptime calculations is:

$$\text{Uptime \%} = \frac{\text{PPM} - \text{Downtime}}{\text{PPM}} \times 100$$

PPM = Principal Period of Maintenance per month determined by the number of hours service is provided.

Downtime = the amount of downtime during the covered period.

Table 8-1 shows PPM for typical applications.

Hours of Service Coverage/day	No. of days covered/week		
	5	6	7
8	174	208	242
12	261	312	363
16	348	416	484
24	522	624	728

Table 8-1

Example:

Assume you provide support for a particular system or product for 8 hours/day, 5 days/week (8:00 A.M. to 4:00 P.M. Monday through Friday). Downtime is 6 hours total for the month of January.

$$\text{Monthly Uptime \%} = \frac{\text{PPM} - \text{Downtime}}{\text{PPM}} \times 100$$

$$\text{Monthly Uptime \%} = \frac{174 - 6}{174} \times 100$$

$$\text{Monthly Uptime \%} = 96.6$$

The uptime graphs provided on page 8-14 and 8-15 can be used to record graphically the uptime results for both the site and service person.



Complete Steps 7 through 11 of the User Requirements Worksheet on page 8-5.

You have completed this product's self-paced hardware training course. You must now apply your new theory, practical knowledge, troubleshooting techniques, and then "think beyond the fix." You have been introduced to the key elements for providing a successful support program.

# User Requirements Worksheet

Date: \_\_\_\_\_

Prepared by: \_\_\_\_\_

1. a) User's description of application: (name, purpose, etc.): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Site Name: \_\_\_\_\_ Installation Location: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Telephone Number: \_\_\_\_\_

b) Used in production of process control? Yes \_\_\_\_\_ No \_\_\_\_\_

c) As part of Network System? Yes \_\_\_\_\_ No \_\_\_\_\_

2. HP System Configuration: System Model \_\_\_\_\_ Memory Size \_\_\_\_\_

# of Discs \_\_\_\_\_ Model \_\_\_\_\_

# of Mag Tapes \_\_\_\_\_ Model \_\_\_\_\_

# of Line Printers \_\_\_\_\_ Model \_\_\_\_\_

# of CRTs \_\_\_\_\_ Model \_\_\_\_\_

Other Equipment \_\_\_\_\_

Types of modems: Manufacturer \_\_\_\_\_ SYNC \_\_\_\_\_ ASYNC \_\_\_\_\_ Model \_\_\_\_\_

3. Software used: HP \_\_\_\_\_ O.E.M. \_\_\_\_\_ Other \_\_\_\_\_

4. System Usage:

Hours:

\_\_\_\_\_ 5 days/week: 8 to 5 \_\_\_\_\_ 12 hours/day \_\_\_\_\_ 16 hours/day \_\_\_\_\_ 24 hours/day \_\_\_\_\_

\_\_\_\_\_ 7 days/week. Other \_\_\_\_\_

5. Critical Periods: Days: (circle appropriate days: S M T W TH F S)

Hours: From: \_\_\_\_\_ to: \_\_\_\_\_ Days of month: \_\_\_\_\_ Months of the year: \_\_\_\_\_

Other: \_\_\_\_\_

6. Maximum Downtime/day:

\_\_\_\_\_ Less than 1 hour \_\_\_\_\_ 4 hours \_\_\_\_\_ 10 hours \_\_\_\_\_ 12 hours Other \_\_\_\_\_

7. What service coverage is required to meet the system usage?

5 days/week \_\_\_\_\_ 7 days/week \_\_\_\_\_ Other \_\_\_\_\_

8 hours/day \_\_\_\_\_ 12 hours/day \_\_\_\_\_ 24 hours/day \_\_\_\_\_ Other \_\_\_\_\_

8. What response time is required to meet the users requirements?

\_\_\_\_\_ 4 hours \_\_\_\_\_ 10 hours \_\_\_\_\_ 12 hours \_\_\_\_\_ 24 hours Other \_\_\_\_\_

9. Do you have a service contract with HP? \_\_\_\_\_ No \_\_\_\_\_ Yes

Contract Number \_\_\_\_\_

Type Contract(s): \_\_\_\_\_ Hardware \_\_\_\_\_ Software \_\_\_\_\_ Cooperative

10. Service Information:

Location Providing: \_\_\_\_\_ HP Location Providing: \_\_\_\_\_

Service Telephone # \_\_\_\_\_ HP Service Phone # \_\_\_\_\_

After Hours Phone # \_\_\_\_\_ HP After Hours Phone # \_\_\_\_\_

Site Manager: \_\_\_\_\_ HP District CE Manager: \_\_\_\_\_

Trained Service Personnel: \_\_\_\_\_ HP Account CE: \_\_\_\_\_

11. Special Considerations:

---

---

---

---

---

---

---

---

# Resource Analysis Worksheet

## Section I

### Response Time Analysis

#### Communication System

##### A. Normal Working Hours

1. How are service requests received/recorded?  
 Central location  Other \_\_\_\_\_
2. Requests are recorded by:  Secretary  Dispatcher  
 Service Personnel  Other \_\_\_\_\_
3. How are service personnel notified?  Pager  Phone Message  
 Wait for call in  Other \_\_\_\_\_
4. Estimated average amount of time required to notify service personnel of a pending service request:  
\_\_\_\_\_ hours

##### B. After Hours

1. How are service requests received/recorded?  
 Central location  Other \_\_\_\_\_
2. Requests are recorded by:  Secretary  Dispatcher  
 Service Personnel  Other \_\_\_\_\_
3. How are service personnel notified?  Pager  Phone Message  
 Wait for call in  Other \_\_\_\_\_
4. Estimated average amount of time required to notify service personnel of a pending service request:  
\_\_\_\_\_ hours

##### C. Weekends/Holidays

1. How are service requests received/recorded?  
 Central location  Other \_\_\_\_\_
2. Requests are recorded by:  Secretary  Dispatcher  
 Service Personnel  Other \_\_\_\_\_
3. How are service personnel notified?  Pager  Phone Message  
 Wait for call in  Other \_\_\_\_\_
4. Estimated average amount of time required to notify service personnel of a pending service request:  
\_\_\_\_\_ hours

#### Availability of Service Personnel

##### A. Normal Working Hours

1. How are service requests assigned?  Designated Service Personnel  
 Next Available Service Person  Other \_\_\_\_\_

2. Can you respond immediately?  Yes  No

If no, what happens?  
\_\_\_\_\_

3. Do you have a back-up plan?  No  Yes: What is it?  
\_\_\_\_\_

4. Estimated average amount of time before service person is available: \_\_\_\_\_ hours

### **B. After Normal Working Hours**

1. How are service requests assigned?  Designated Service Personnel

Next Available Service Person  Other \_\_\_\_\_

2. Can you respond immediately?  Yes  No

If no, what happens? \_\_\_\_\_

3. Do you have a back-up plan?  No  Yes: What is it?  
\_\_\_\_\_

4. Estimated average amount of time before service person is available: \_\_\_\_\_ hours

### **C. Weekends/Holidays**

1. How are service requests assigned?  Designated Service Personnel

Next Available Service Person  Other \_\_\_\_\_

2. Can you respond immediately?  Yes  No

If no, what happens? \_\_\_\_\_

3. Do you have a back-up plan?  No  Yes: What is it?  
\_\_\_\_\_

4. Estimated average amount of time before service person is available: \_\_\_\_\_ hours

## **Parts/Tools Availability**

### **A. Normal Working Hours**

#### **Parts Availability**

Parts Available:  On-Site  Carried by Service Personnel

Other \_\_\_\_\_

#### **Tool Availability**

Standard Tools:  On-Site  Carried by Service Personnel

Other \_\_\_\_\_

Estimated average amount of time required to pickup parts and tools per call: \_\_\_\_\_ hours

### **B. After Hours**

#### **Parts Availability**

Parts Available:  On-Site  Carried by Service Personnel

Other \_\_\_\_\_



**Tool Availability**

Standard Tools:  On-Site  Carried by Service Personnel

Other \_\_\_\_\_

Estimated average amount of time required to pickup parts and tools per call: \_\_\_\_\_ hours

**C. Weekends/Holidays**

**Parts Availability**

Parts Available:  On-Site  Carried by Service Personnel

Other \_\_\_\_\_

**Tool Availability**

Standard Tools:  On-Site  Carried by Service Personnel

Other \_\_\_\_\_

Estimated average amount of time required to pickup parts and tools per call: \_\_\_\_\_ hours

**User's Location**

**A. General**

1. Estimated distance to user's site: \_\_\_\_\_miles

2. Geographic territory:  City  Mountainous  Rural  Other \_\_\_\_\_

**B. Normal Working Hours**

1. Travel method used:  Car  Walk  Airplane  Van  Other \_\_\_\_\_

2. Estimated travel time: \_\_\_\_\_ hours

3. What type of security clearance is necessary?  None  Pass

Special  Other \_\_\_\_\_

4. Estimated time delay for acquiring security access to site: \_\_\_\_\_ hours

**C. After Hours**

1. Travel method used:  Car  Walk  Airplane  Van  Other \_\_\_\_\_

2. Estimated travel time: \_\_\_\_\_ hours

3. What type of security clearance is necessary?  None  Pass

Special  Other \_\_\_\_\_

4. Estimated time delay for acquiring security access to site: \_\_\_\_\_ hours

**D. Weekends/Holidays**

1. Travel method used:  Car  Walk  Airplane  Van  Other \_\_\_\_\_

2. Estimated travel time: \_\_\_\_\_ hours

3. What type of security clearance is necessary?  None  Pass

Special  Other \_\_\_\_\_

4. Estimated time delay for acquiring security access to site: \_\_\_\_\_ hours

## Response Time Analysis Summary

### A. Normal Working Hours

Estimated average amount of time required to notify service personnel: \_\_\_\_\_ hours

Estimated amount of time before service person is available: \_\_\_\_\_ hours

Estimated amount of time to pickup parts and tools: \_\_\_\_\_ hours

Estimated travel time: \_\_\_\_\_ hours

Estimated time delay for security access to site: \_\_\_\_\_ hours

**Total Response Hours** \_\_\_\_\_ hours

### B. After Hours

Estimated average amount of time required to notify service personnel: \_\_\_\_\_ hours

Estimated amount of time before service person is available: \_\_\_\_\_ hours

Estimated amount of time to pickup parts and tools: \_\_\_\_\_ hours

Estimated travel time: \_\_\_\_\_ hours

Estimated time delay for security access to site: \_\_\_\_\_ hours

**Total Response Hours:** \_\_\_\_\_ hours

### C. Weekends/Holidays

Estimated average amount of time required to notify service personnel: \_\_\_\_\_ hours

Estimated amount of time before service person is available: \_\_\_\_\_ hours

Estimated amount of time to pickup parts and tools: \_\_\_\_\_ hours

Estimated travel time: \_\_\_\_\_ hours

Estimated time delay for security access to site: \_\_\_\_\_ hours

**Total Response Hours:** \_\_\_\_\_ hours

# Resource Analysis Worksheet

## Section II

### Repair Time Analysis

#### A. Normal Working Hours

##### 1. Product Availability

- a. Is the product or system available to use when you arrive on site?  Yes  No
- b. How long must you normally wait? \_\_\_\_\_ hours
- c. What can you do while you wait? \_\_\_\_\_  
\_\_\_\_\_
- d. What can the user do before you arrive? \_\_\_\_\_  
\_\_\_\_\_

##### 2. Parts Availability

- a. What are the procedures for obtaining a part? \_\_\_\_\_  
\_\_\_\_\_
- b. Estimated average time to receive part: \_\_\_\_\_ hours

##### 3. Consulting Assistance

- a. Is technical assistance available?  Yes  No
- Name \_\_\_\_\_
- Location \_\_\_\_\_
- Phone # \_\_\_\_\_
- b. Estimated amount of time to contact technical back-up: \_\_\_\_\_ hours
- c. Is management assistance available?  Yes  No
- Name \_\_\_\_\_
- Location \_\_\_\_\_
- Phone # \_\_\_\_\_

#### B. After Hours

##### 1. Product Availability

- a. Is the product or system available to use when you arrive on site?  Yes  No
- b. How long must you normally wait? \_\_\_\_\_ hours
- c. What can you do while you wait? \_\_\_\_\_  
\_\_\_\_\_
- d. What can the user do before you arrive? \_\_\_\_\_  
\_\_\_\_\_

##### 2. Parts Availability

- a. What are the procedures for obtaining a part? \_\_\_\_\_  
\_\_\_\_\_
- b. Estimated average time to receive part: \_\_\_\_\_ hours

**3. Consulting Assistance**

a. Is technical assistance available?  Yes  No

Name \_\_\_\_\_

Location \_\_\_\_\_

Phone # \_\_\_\_\_

b. Estimated amount of time to contact technical back-up: \_\_\_\_\_ hours

c. Is management assistance available?  Yes  No

Name \_\_\_\_\_

Location \_\_\_\_\_

Phone # \_\_\_\_\_

**C. Weekends/Holidays**

**1. Product Availability**

A. Is the product or system available to use when you arrive on site?  Yes  No

b. How long must you normally wait? \_\_\_\_\_ hours

c. What can you do while you wait? \_\_\_\_\_

d. What can the user do before you arrive? \_\_\_\_\_

**2. Parts Availability**

a. What are the procedures for obtaining a part? \_\_\_\_\_

b. Estimated average time to receive part: \_\_\_\_\_ hours

**3. Consulting Assistance**

a. Is technical assistance available?  Yes  No

Name \_\_\_\_\_

Location \_\_\_\_\_

Phone # \_\_\_\_\_

b. Estimated amount of time to contact technical back-up: \_\_\_\_\_ hours

c. Is management assistance available?  Yes  No

Name \_\_\_\_\_

Location \_\_\_\_\_

Phone # \_\_\_\_\_

# Resource Analysis Worksheet

## Section III

### Planned Maintenance

#### A. Product Design

1. What is the recommended interval for preventive maintenance? \_\_\_\_\_months
2. Who can best perform the maintenance procedures?  Service Personnel  
 User  Other \_\_\_\_\_

#### B. User Environment

1. What type of environment is the equipment subjected to?  Industrial Manufacturing  
 Office Area  Computer Room  Other \_\_\_\_\_
2. What temperatures will the equipment operate in?  High  Low  
 Moderate  Other \_\_\_\_\_
3. What types of humidity?  High  Low  
 Moderate  Other \_\_\_\_\_
4. What type of atmosphere?  Caustic  Dirt Laden  
 Other (please describe)\_\_\_\_\_
5. What power set-up is available?  Line Conditioned  
 Line-filtered  Other \_\_\_\_\_
6. What is the voltage range? \_\_\_\_\_ Volts to \_\_\_\_\_ Volts

#### C. Equipment Usage

1. The equipment is in constant use for approximately:  2 hours/day  4 hours/day  
 8 hours/day  16 hours/day  Other\_\_\_\_\_

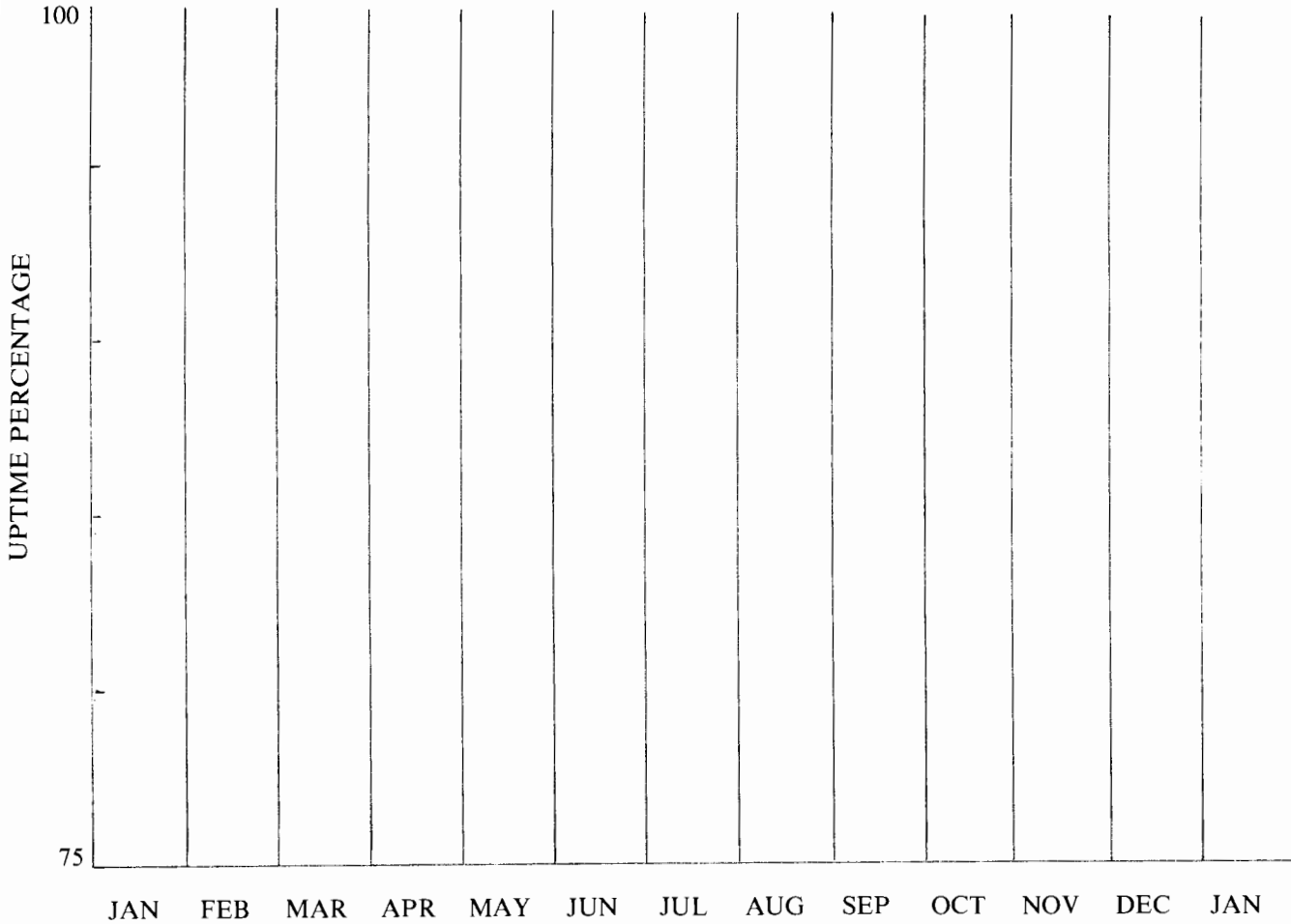
# Uptime Graph Final Site Plan

Service Person \_\_\_\_\_

Name \_\_\_\_\_

Number of Products \_\_\_\_\_

Product Types \_\_\_\_\_



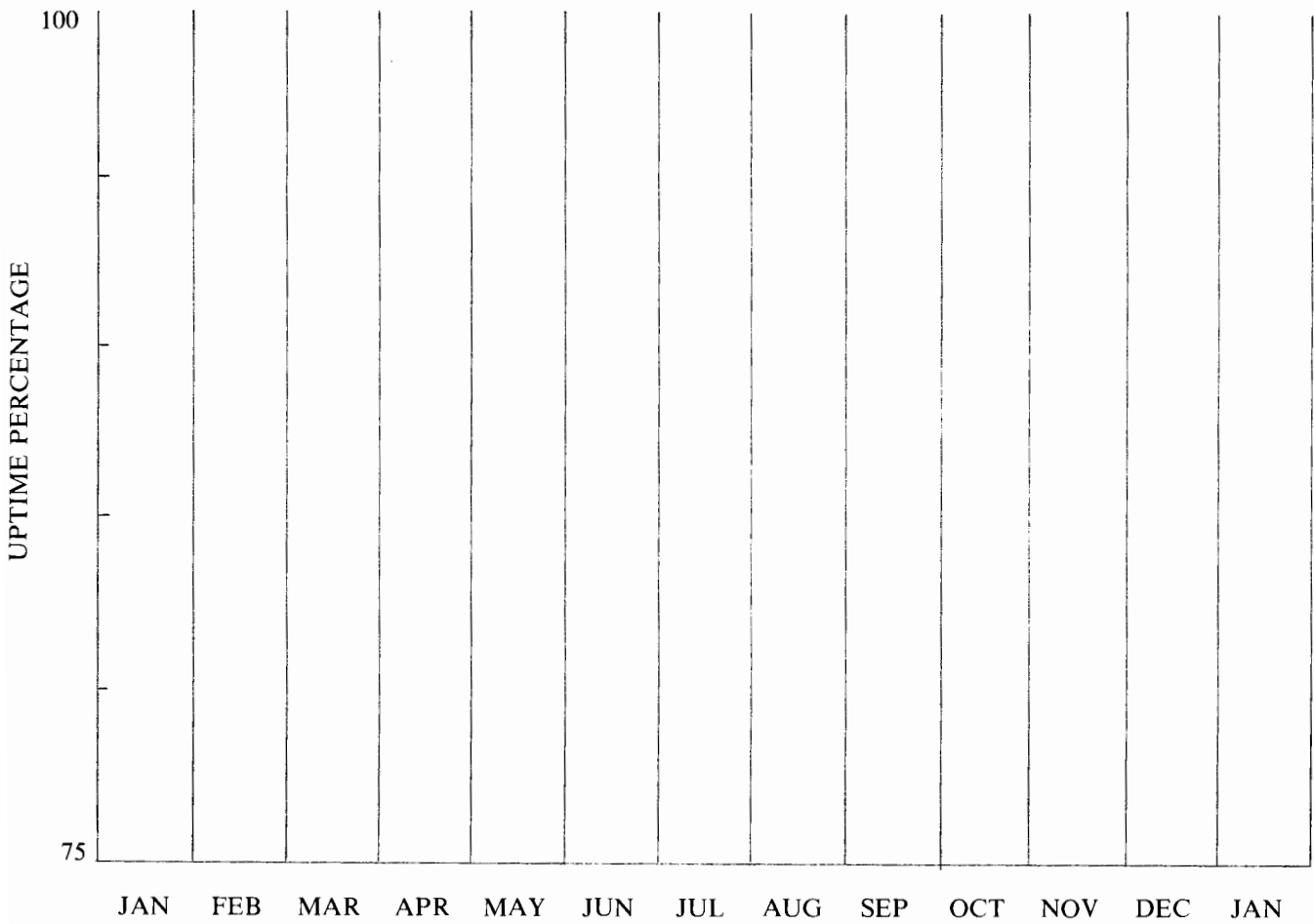
# Uptime Graph Work Sheet

User Name \_\_\_\_\_

Product Type \_\_\_\_\_

Serial # \_\_\_\_\_

Service Person: \_\_\_\_\_







# Course Evaluation

# Appendix **A**

## HP 2392A Display Terminal

Student Name: \_\_\_\_\_ Date: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Service Manager: \_\_\_\_\_

	Yes	No
Do you feel the course objectives were met?	<input type="checkbox"/>	<input type="checkbox"/>
Did you find the course easy to read and understand?	<input type="checkbox"/>	<input type="checkbox"/>
Do you feel you need additional training?	<input type="checkbox"/>	<input type="checkbox"/>
Would you purchase another self-paced course?	<input type="checkbox"/>	<input type="checkbox"/>

How would you rate the following:

(check one)	Excellent	Very Good	Good	Acceptable	Poor
Quality of tests and exercises?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of information provided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quantity of information provided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service Manual provided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diagnostic tests?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of troubleshooting labs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall rating of the course?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Was the level of the course  trivial  just right  too technical?

Would you recommend this program to other people in your organization?  Yes  No

Why (why not)? \_\_\_\_\_

Additional Comments: \_\_\_\_\_

Mail to: Hewlett-Packard, Computer Support Division  
Attention: Training Program Engineer  
Hewlett-Packard Computer Support Division  
19310 Pruneridge Avenue  
Cupertino, CA 95014

