DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

design document for

The Senior Design Document Template

submitted to:

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ECE 4512 (or 4522): Senior Design I (or II)
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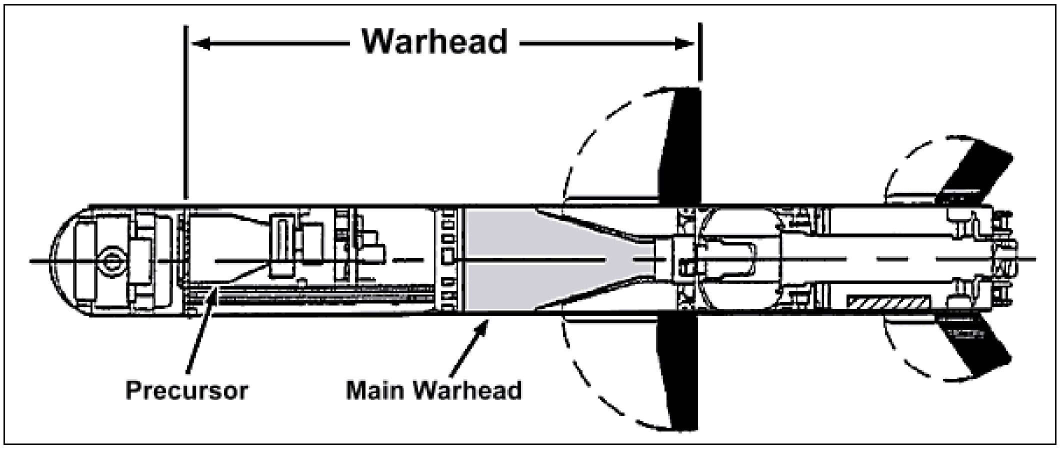

[Image source: http://www.inetres.com/gp/military/infantry/antiarmor/Javelin/Javelin_warhead.gif]

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LIST OF ABBREVIATIONS

AAC – Advanced Audio Coding

ADC – Analog-to-Digital Converter

ANSI – American National Standards Institute

DAC – Digital-to-Analog Converter

DHCP – Dynamic Host Configuration Protocol

DNS – Domain Name System

EULA – End User License Agreement

FCC – Federal Communications Commission

FIFO – First-In-First-Out

GPL – General Public License

GUI – Graphical User Interface

I2C – Inter-Integrated Circuit

IC – Integrated Circuit

IP – Internet Protocol

MIPS – Million Instructions Per Second

MSRP – Manufacturer Suggested Retail Price

OGG – Ogg

PCB – Printed Circuit Board

SPI – Serial Peripheral Interface

TCP – Transmission Control Protocol

UDP – User Datagram Protocol

WTA – WIZnet Tester Application

[NOTE: The text that appears in square brackets and in Arial font throughout this document is explanatory text that should not appear in your final design document. Make sure you delete these bracketed notes before you submit your final documents.]

EXECUTIVE SUMMARY

The ES must be exactly one single-spaced page long – no more, no less. It must consist of four paragraphs. The first paragraph contains an overview of the problem (what need does your design address?).

The second paragraph contains an overview of the design constraints. The goal of this paragraph is to ensure that the reader understands the key design challenges you faced.

The third paragraph contains an overview of the approach you took to solve the problem. Describe how you have met your design constraints. (The second and third paragraphs are the longest paragraphs of the four.)

Finally, the last paragraph contains an overview of the novelty of your design. This is a fairly short paragraph that summarizes innovation in your project (what makes your design unique, what can be done to improve your design, what are the impacts of your design's success, etc.). The fourth paragraph should be about four sentences. The ES must also include one highlight graphic that motivates the reader and is simple but meaningful to the entire summary. The graphic is actually **the most critical part of the executive summary** and should be a conceptual diagram from which the reader can grasp the functionality of the product and its usage in a wider context. A reader will first look at the graphic, then skim the text to determine how the elements of the graphic are explained in the text.

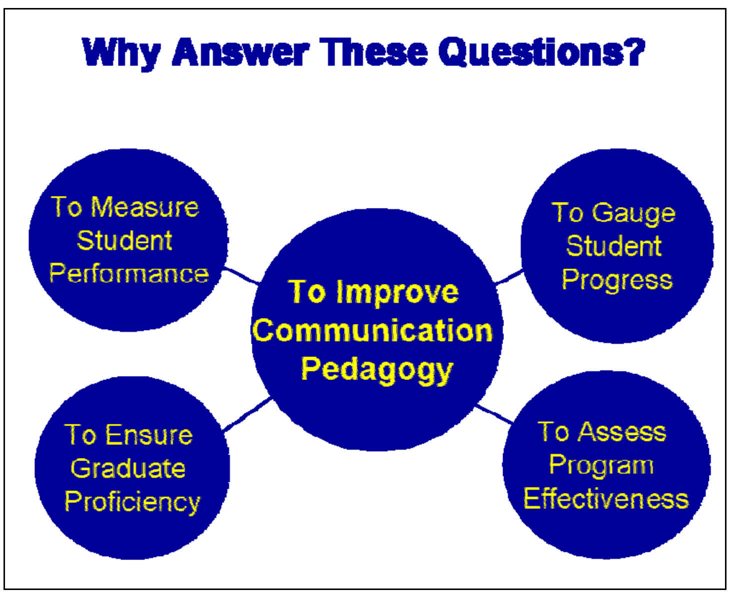

Figure 1. An Example Graphic for the Design Document Executive Summary

TABLE OF CONTENTS

1. PROBLEM [minimum length: two single-spaced pages]

In this section, your group will define the problem you are addressing, explain its significance, and discuss the impact of your solution (not how you are going to solve the problem, but what will happen if you solve the problem. **This document should not include specific technical details about your approach.**). Start with a general problem overview, background, etc., and then get progressively more detailed. This section should consist of four parts (the bulleted format below is not required for student documents):

- *Historical Introduction*: includes an overview of the general technical area you are researching, as well as any societal context impacting this project. (For example, many new products and business opportunities have resulted from significant legislation such as the American Disabilities Act of 1990. A project in this area that was impacted by this legislation should spend time discussing this.) At the end of the historical introduction, include a few sentences to tie this section into your project's overall subject/purpose, basically answering the question, "So what?"
- *Market and Competitive Product Analysis*: includes a market analysis (i.e., Who would want to buy your product? How many people would want to buy it?) and a competitive product analysis (i.e., What other products like yours exist? How much are they? How is your product different?). **Directions for SECON groups**: Instead of writing a market and competitive product analysis, each SECON group will analyze strengths, weaknesses, and threats, answering the following questions: What do you see as the particular strengths/weaknesses of the MSU team in relation to this competition? What threats to success do you see in terms of the competing teams (rules, other factors, etc.)?
- *Concise Problem Statement*: consists of a one- to two-sentence description of the fundamental problem you are attempting to solve that will enable the market you have previously identified, basically stating the flaws in current products on which your design seeks to capitalize. This is followed by a general technical formulation of no specific length of the problem (e.g., must compress a feature-length movie into one 4 Gbyte DVD). (**Note that the one- to two-sentence description of the fundamental problem does not include the general technical formulation of the problem.**) Please keep marketing statements like "Our product is super-duper-wonderful!" out of this section – stick to the facts.
- *Implications of Your Success*: describes how this product will be used if you are successful, how much of the market you might capture for a certain level of performance, etc. For example, if you build an audio amplifier for $100 that outputs 500W, how much of the market for audio amplifiers would you expect to capture? Also, think about any wider changes that will occur if your product is successful. For example, Apple's introduction of iTunes had a significant impact on market sales in traditional music stores. It also had a societal impact in that it helped reduce illegal music sharing: people could now buy individual songs instead of having to purchase an entire album. There is a temptation in this section to simply restate what you have already said using different wording. This section should contain NEW content and not reworded old content.

The final draft of the problem statement should have inline citations (e.g., "Previous approaches resulted in systems whose power consumption was excessive [23].") and should conform to IEEE formatting guidelines for references. Your problem statement is building upon a vast body of engineering knowledge, most of which you have drawn from other resources that must be cited. Source use and IEEE style will be thoroughly discussed in class.

2. DESIGN REQUIREMENTS/CONSTRAINTS [minimum length: three single-spaced pages]

The design requirements section is perhaps the most important section of the design document because it defines the constraints for the group's design. Everything students do in senior design centers on these constraints. Later, the approach section will describe how you built/are building your prototype to meet these constraints, and the evaluation section will then describe the tests used to ensure your prototype met the design constraints.

IMPORTANT NOTES: Focus on the constraints themselves, not on the group's approach; in other words, **avoid discussing the specifics of how you are designing your prototype in this document – write instead about the considerations that lead to (constrain) your particular design.** Think about why you chose a constraint and why it is important that you meet it. In your paragraph description of each constraint, tell the reader the reasoning behind the constraint. If your constraint says, "The device has a measurement accuracy of 0.1 V," then tell the reader why you chose 0.1 V and not 0.5 V or 0.2 V. This is a good place to use equations or external references to provide a justification for the constraint. If you cannot justify why you have chosen a particular number in a constraint, or the reasons for including the constraint itself, then your understanding of the problem is faulty. Also, note that statements like "The device runs for X number of hours using a lithium-ion battery" are also erroneous because "lithium-ion" refers to approach. Instead, think about the constraint itself: If you want the device to run for X hours using a battery, then that is your design constraint. The type of battery you choose to meet that constraint—such as a lithium-ion battery—should be discussed in your approach document.

Some teams have projects that are subsystems within a larger system (e.g., an autopilot for an airplane). The constraints ***must relate to what your team is working on***, and not the larger system. Undoubtedly, there are constraints for the larger system that your subsystem will affect, but these constraints will also be affected by subsystems other than yours. So, instead of providing the constraint for the larger system, provide the constraint for your subsystem that will ultimately impact the constraint for the larger system. For example, a constraint on a car may be that it must be able to accelerate from 0 to 60 in 7 seconds. If you were designing the fuel injector, then you would have a constraint "must provide X amount of fuel per second." The designers of the drive train would have their own constraints. The result of all of these subsystems working together (and meeting their constraints) would be a car that can accelerate from 0 to 60 in 7 seconds.

The format for this section is as follows:

Include an introductory paragraph(s) that provides continuity and flow to the document, briefly reiterating what your product is and what purpose(s) it is intended to serve. The introduction to this document should also note that the document is divided into two major sections: technical design constraints and practical design constraints.

Directions for SECON groups: You need to do more than just list all of the constraints from the rules. You need to generate a minimum of two constraints (and preferably more) for your design based on what it takes to build a design that performs very well in terms of scoring (i.e., finish in the top five for example). If you simply follow the constraints in the rules, you could build a robot that would follow the constraints, but would have no hope of winning the competition.

2.1. Technical Design Constraints

Use simple figure, table, and subsection numbers that are coded for each section; that is, use **Figure 3.2** for the second figure in section 3 and **Table 4.5** for the fifth table in section 4, NOT “Figure 3.2.2.1.a” or “Table 4.5.1.3.c.”]

Each team must have five technical design constraints that adequately constrain the circuit and software design of the system. Technical design constraints typically relate to the performance of the system. List and briefly describe your five technical design constraints using a table like this one, only with five rows instead of four:

Table 2.1. Technical Design Constraints

Name	**Description**
Signal-to-Noise Ratio	The product achieves a signal-to-noise ratio of 30 dB or greater and, therefore, outperforms existing technology on the market.
Accuracy	This system’s incorrect classification rate does not exceed 3.5% on data whose SNR exceeds 15 dB.
Robustness	The imposter acceptance rate does not exceed 3% on data whose SNR exceeds 10 dB.
Transmission Distance	The base station communicates with the server at a maximum distance of 100 feet with a maximum bit error rate of 1e-05.

[In accordance with IEEE standards, put table captions **above** the tables; put figure captions **below** the figures.]

Follow this table with several paragraphs explaining these design constraints in detail. Typically these are explained in groups since design constraints are often interrelated. Use constraints that relate to well-known standards (such as UL or FCC specs), and be sure to explain these specifications. **Technical design constraints must be quantitative and must be testable.**

2.2. Practical Design Constraints

The ABET handbook on accrediting engineering programs states the following:

> Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints that include most of the following considerations: *economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political.*

Choose five of the categories above as practical constraints (you may consider “health” and “safety” as either two separate categories or one combined category), and list and briefly describe them as in the table below, with five rows instead of four:

Table 2.2. Practical Design Constraints

Type	Name	Description
Economic	Cost	The expected retail for this price is $100 based on a parts cost of $25.
Sustainability	Reliability	This system is designed to operate over a five-year period without failure. The expected battery life is seven years, and the battery is the only part requiring regular maintenance.
Manufacturability	Size	The physical dimensions are 3" high, 4" wide, and 6" deep.
Health and Safety	Safety	The product conforms to UL Specification 631, which requires that this unit not deliver an electrical shock to the user under..., and UL Specification 837, which....

After you provide these constraints, some detailed explanation will be required, as in Section 2.1.

Start with an introductory paragraph or two, and then list your specific design constraints, followed by an explanation. This section should be at least three pages long.

3. **APPROACH** [minimum length: 10 single-spaced pages; maximum length: 30 single-spaced pages]

Begin the approach section with a paragraph that provides a general overview of your design, thus providing continuity and flow of this section with the preceding sections (similar to what you did for the design constraints).

The approach document discusses, in great detail, the **hardware** and **software** subsystems used in your design to meet the technical and practical design constraints of your project.

3.1. Hardware

For the hardware subsystems, you must discuss the different approaches to the key technological elements of your design and their **tradeoffs**. In discussing the tradeoffs of each technological approach, present enough **background theory** on each approach so that the reader becomes familiar enough with each approach to understand your **justification** for selecting a particular approach. To reiterate, for the major hardware subsystems in your design used to meet the technical and practical constraints of your design, you must present the theory behind the different technological approaches, the tradeoffs associated with each approach, and your justification for selecting a particular approach. You do not need tradeoffs for each approach if there is an obvious implementation that meets the constraint; however, you must still state how you met a constraint, even if there are no tradeoffs, and justify your decisions to meet the constraint.

Most projects contain a microcontroller. You do not have to provide tradeoffs on the microcontroller choice if a generic microcontroller is sufficient; in this case choosing a microcontroller that you are familiar with (and saying that this is why you chose it) is fine. However, if you need a particular feature in the microcontroller (power consumption, some particular on-chip peripheral, etc), then detailed tradeoffs should be given.

Many projects are battery operated. You must include current draw equations that show that your battery choice meets your operating time specification. At the most basic level, this is simply the current draw of your system divided into the mA hour rating of the battery to get the number of hours that it will run. Most battery-operated projects, though, have a sleep mode and an active mode, and so your equations must show these two contributions. If your active mode has significantly different current draw depending on what the system is doing, then you must sub-divide your active mode into the percentage of time spent doing each task.

3.2. Software

For the software section, please review the lecture titled "Software Engineering" at this link:
http://www.ece.msstate.edu/courses/ece4512/des1_syllabus/current/Software_Engineering.ppt

At a **minimum**, your software section must include the following:

- A few "sunny" and "rainy" day usage cases, along with a model data flow for a couple of representative cases.
- A physical model diagram that shows how the user interacts with your system
- A flow chart that shows the basic top-level state machine for your software
- A discussion of the data types and data storage with which your software interacts

You do not have to present an object model or an object-oriented view of your design; however, you may do this if you are comfortable with this approach.

The approach document must present a **complete** picture of how your project meets all of the technical and practical constraints, as well as the operation of the hardware and software subsystems to provide the functionality needed for your project.

4. EVALUATION [minimum length: 8 single-spaced pages; maximum length: 15 single-spaced pages]

This part of the paper describes in detail the tests you have run to verify your design constraints and the results of those tests. I expect sections for each major subsystem and a section for system test. The introduction (text before Section 4.1) should include a table of your technical constraints to refresh the reader's mind about what these tests are trying to certify. This document must be written in a narrative style as if you have performed the tests on your system, and you are giving the results of those the tests. In your first draft, you may not have all of this information, but you should by the final draft. Also, for any interfaces on your system – USB, I2C, SPI, RS232, parallel interfaces, or A/D inputs – you must show oscilloscope pictures that demonstrate a sample data transfer of this interface and the typical voltage/frequency ranges. Collect screen shots of your tests and include these in the final evaluation document. These oscope shots convince the reader that you have indeed tested the critical signals in your design.

A ‘subsystem’ in this section is anything that provides a subset of the total system’s functionality. There may be both hardware and software components to the subsystem (as in an I^2C temperature sensor and your code for exercising the hardware), or just software (like a GUI that runs on a PC for talking to an external system). Simply describe the method for testing the subsystem and the end results, there is no need to show any test code used to exercise the system.

The following are other general comments for your evaluation document:

a. Think about what a datasheet contains—tables, graphs, and circuits that show how the tables/graphs were obtained. If you make a test, show a circuit diagram of the test setup. You can show a photograph of the test setup in addition to the circuit diagram, but do not leave out the circuit diagram.
b. All of your technical constraints MUST have one or more tests identified for verifying the constraint has been made. When describing the test, explicitly link it to a technical constraint if applicable. There will certainly be some tests that are explicitly linked to a technical constraint.
c. If you have a table of measured data and it makes sense to compare it against expected values, then include a *%error* as (actual – expected)/expected*100%, and use only three digits of precision. You need to have expected values unless you are making a measurement for exploratory purposes.
d. If you have a GUI of some type, you need a screen shot of it.
e. If you have a physical display of some type (LEDs, LCDs, etc.), you need a photograph of the display showing typical operation.
f. For any numbers, use only three significant digits unless you have a very good reason for using more digits.
g. If you have simulated a subsystem (sometimes simulation is appropriate, sometimes it is not) then include a description of the tools used in the simulation and the methodology you used to perform the simulation. Also, use the simulation results as the ‘expected’ results when comparing against experimental results.
h. In your system test, you need to refer back to your sunny and rainy day cases in the approach document and show that you tested those.

The following lists only three subsystems, your design may have more subsystems.

4.1. Test Certification -- Subsystem 1

This describes the tests for Subsystem 1. If you have more than one test for a subsystem, use subsections.

4.2. Test Certification -- Subsystem 2

This describes the tests for subsystem 2.

4.3. Test Certification -- Subsystem 3

This describes the tests for subsystem 3.

4.4. Test Certification – System Test

Describes how you have tested the completed system with all of the subsystems working together. Includes a summary table with test data that shows your technical design constraints and measurements that prove your system meets these specifications. There will probably be multiple subsections under this section to describe each system test and its result.

5. SUMMARY AND FUTURE WORK

This section should be about one page long and review what was accomplished (what worked? what didn't work?), and talk about future extensions of the project (what things could be done better? what things needed to be done differently to overcome problems?).

6. ACKNOWLEDGEMENTS

We wish to acknowledge John Doe of ABC Corporation, Dr. John Smith of the National Institute for Cool Things, and Dr. I.M. Smart of XYZ for their continued support and feedback regarding this project. We also acknowledge the National Science Foundation for its funding of this project, which enables many useful on-line documents to be developed. Mr. Doe's interactions have helped us add features to the system, some of which make this system very unique compared to other systems.

7. REFERENCES

[References must be formatted precisely according to current IEEE guidelines; two convenient locations for these guidelines are the Shackouls TCP's handout on documenting sources in IEEE style (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/documentationguidelinesieee.pdf) and chapter 12.1 of the textbook for GE 3513, *A Writer's Handbook for Engineers*.]

[1] S. Larky, et al, "You've come a long way, USB: history and future of USB port technology," Electronic News, July 2001. [Online]. Available: http://findarticles.com/p/articles/mi_m0EKF/is_30_47/ai_76780475. [Accessed: Sept 7, 2007].

[2] J. M. D. Pereira, "The history and technology of oscilloscopes: an overview of its primary characteristics and working principles," IEEE Instrumentation and Measurement Magazine, pp. 27-35, December 2006. [Online]. Available: http://ieeexplore.ieee.org. [Accessed: Sept. 4, 2007].

[3] Bagley College of Engineering, "Computer Requirements Overview," Bagley College of Engineering, 2007. [Online]. Available: http://www.engr.msstate.edu/prospective_students/computer_initiative. [Accessed: Sept. 5, 2007].

[4] M. T. Gibbons, "Engineering by the Numbers," American Society for Engineering Education, 2007. [Online]. Available: http://www.asee.org/publications/profiles/upload/2006ProfileEng.pdf. [Accessed: Sept. 4, 2007].

[5] Tektronix, "Tektronix Company Overview: Markets, Strategy, and Results," Tektronix Inc., May 2007. [Online]. Available: http://library.corporate-ir.net/library/81/815/81500/items/244554/Company_Presentation_2007_v3.pdf. [Accessed: Sept. 5, 2007].

[6] R. A. Witte, Electronic Test Instruments: Analog and digital measurements, 2nd ed. Upper Saddle River: Prentice Hall, 2002, pp. 79-134.

[7] Cypress Semiconductor Corporation, Datasheet, CY8C21123, CY8C21223, and CY8C21323, PSOC Mixed-Signal Array Final Data Sheet.

[8] Microchip Technology Inc., Datasheet, PIC18F2455/2550/4455/4550, 28/40/44-Pin, High Performance, Enhanced Flash, USB Microcontrollers with nanoWatt Technology.

[9] Cypress Semiconductor Corporation, Datasheet, CY7C024-15AXC, 4K x 16/18 and 8K x 16/18 Dual-

Port Static RAM with SEM, INT, BUSY.

[10] Xilinx Inc., Appl. Note 463, p. 1.

[11] “Design Guide for Xilinx FPGA Power Management Systems,” October 2004, dkc3.digikey.com/PDF/Marketing/FPGA_Xilinx.pdf.

[12] National Semiconductor Corporation, Datasheet, ADC08200, 8-Bit, 20 MSPS to 200 MSPS, 1.05 mW/MSPS A/D Converter with Internal Sample-and-Hold.

[13] National Semiconductor Corporation, Datasheet, ADC08060, 8-Bit, 20 MSPS to 60 MSPS, 1.3 mW/MSPS A/D Converter.

8. APPENDIX: PRODUCT SPECIFICATION

SONY

PCV-RX755

Sony VAIO® Digital Studio™ PC

- CD-RW Drive - Create your own CDs!
- Intel® Pentium® 4 Processor 2A††† GHz†
- 512MB PC-2100 DDR / 60GB†† Hard Drive
- DVD-ROM Drive
- High-speed Internet Ready with 10Base-T/100Base-TX Fast Ethernet
- i.LINK® (IEEE 1394) Interface and USB Connectors[1]

MEMORY STICK   i.LINK® (IEEE 1394)

* Display sold separately.

VAIO
Video Audio Integrated Operation

CD-RW

FEATURES

- Intel® Pentium® 4 Processor 2A††† GHz†
- 512MB PC-2100 DDR (expandable to 1GB)
- 400MHz Front Side Bus
- 60GB†† Ultra ATA/100 Hard Drive
- CD-RW Drive - Create your own CDs!
- DVD-ROM
- Music, Movies, and Photo Software:
  - DVgate
  - MovieShaker™
  - SonicStage™ for VAIO®
  - PowerDVD
- Memory Stick® Media Slot
- Front and Rear Accessible i.LINK (IEEE 1394) Interfaces and USB Connections[1]
- High-Speed Internet Ready with 10 Base-T/100Base-TX Fast Ethernet

SPECIFICATIONS

Model
PCV-RX755

Processor
Intel® Pentium® 4 Processor 2A††† GHz†

Cache Memory
512KB Integrated On-Die Level 2

Front Side Bus Speed
400MHz

Standard RAM
512MB PC-2100 DDR (expandable to 1GB)

Hard Drive
60GB†† Ultra ATA/100 Hard Drive

CD-RW Drive
CD-RW (24X max. write / 10X max. rewrite / 40X max. read)

DVD-ROM Drive
16X max. DVD-ROM Read / 40X max. CD-ROM Read

Floppy Disk Drive
3.5" 1.44 MB Floppy Disk Drive

Video & Graphics
SIS650 Integrated Graphics with Real256™ 2D/3D Graphics Accelerator
32MB Shared Graphics Memory (64MB Max.)

Ethernet
10Base-T/100Base-TX Fast Ethernet

Modem
V.90 compatible data/fax modem

Expansion Slots
One AGP
Three PCI (one occupied by Modem)
Memory Stick® Media Slot

Expansion Bays
Two 5.25" Half-Height (two occupied)
One External 3.5" (occupied)
Two Internal 3.5" (one occupied)

Port Connectors
Four USB (two front/two rear)
Two PS/2® (Mouse/Keyboard)
One VGA monitor port
One Serial / One Parallel
One 6pin i.LINK port (rear)
One 4pin i.LINK port (front)
One Headphone / One Microphone
One Line In

Supplied Accessories
Speakers (Stereo)
VAIO Smart™ Keyboard
PS/2® Wheel Mouse
RJ-11 Phone Cord
Power Cord

Power Requirements
100-120V -3A (50/60Hz)

Power Management
ACPI 1.0 Compliant

Dimensions (CPU)
8.0"(W) x 14.2"(H) x 14.6"(D)

Weight (CPU)
28.5 lbs.

Service
One Year Limited Express Repair Service (upon registration; 90 days without registration)*

Limited Warranty
One Year Parts and Labor (upon registration; 90 days without registration)*

Telephone Support
Hardware: One Year
Software and Operating System: 90 Days

Pre-Installed Software

Operating System
Microsoft® Windows® XP Home Edition
Sony PCs use Genuine Microsoft® Windows® Operating Systems
www.microsoft.com/piracy/howtotell

Sony Original Software
DVgate™
SonicStage™ for VAIO®
MovieShaker™
Smart Capture
DigitalPrint
PowerDVD

Other Software Applications
Corel WordPerfect® Office 2002
Adobe® Photoshop® Elements
Adobe® Acrobat® Reader®
Apple QuickTime®
Intuit Quicken® 2002[2]
Microsoft® Outlook® Express

Anti-Virus & Recovery Software
Trend Micro PC-Cillin®
Sony Application Recovery CD(s)
Sony System Recovery CD(s)

Online Center
VAIO Support Agent
America Online®**
EarthLink TotalAccess™**

real player

† GHz denotes microprocessor internal clock speed; other factors may affect application performance.
†† GB means one billion bytes when referring to Hard Drive capacity. Accessible capacity may vary.
††† Naming of 2GHz, based on .13 micron core and secondary cache of 512KB.
* Certain restrictions apply.
** Requires payment of additional fees or subscription for use.
1 i.LINK is a trademark of Sony used only to designate that a product contains an IEEE 1394 connector. All products with an i.LINK connector may not communicate with each other.
2 Previous Quicken users may require additional upgrade.

Sony Electronics Inc.
Information Technology Product Division
16765 West Bernardo Drive, San Diego, CA 92127
For more information: 1.800.4SONYPC (476-6972)
Web address: http://www.sony.com/vaio

Computer Interface: The computer industry lacks standards, and therefore, there are a multitude of varying software packages and add-on hardware options. This personal computer is not manufactured to any specific software, and Sony does not and cannot make any warranty or representation with respect to the performance of this product with any particular software packages and/or non-Sony add-on hardware option except those mentioned in this document. Sony hereby disclaims any representations or warranty that this product is compatible with any combination of non-Sony products you may choose to connect. While Sony representatives or Sony authorized dealers may be able to assist you and may make recommendations, they are NOT authorized to vary or waive this disclaimer. Purchasers must determine for themselves the suitability and compatibility of the hardware and software in each and every particular instance. Some pre-installed software titles may not include full documentation. Software titles pre-installed on the Sony Desktop Computer are subject to change without notice. Simulated graphic shown on display.

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