

## Table of Contents

Introduction	7
<b>Part 1 PS/2</b>	<b>9</b>
<b>1.1 The Mouse Hardware Interface</b>	<b>11</b>
Experiment	12
<b>1.2 The PS/2 Software Interface</b>	<b>13</b>
Terminology	13
Protocol Sequence	13
Error control mechanisms	14
Protocol timing	15
PS/2 Mouse Command Set	16
<b>1.3 First words in PS/2: Reset-Acknowledge</b>	<b>18</b>
Program Design Overview	18
Program 1	20
Critical timing constraints	22
The next step	22
<b>1.4 Sequences and state machines</b>	<b>25</b>
Host transmission	25
Host reception	27
Program 2	28
Ballistic profiles	33
MPLAB Gotchas	38
<b>1.5 PS/2 as a background task</b>	<b>42</b>
Motivation	42
Mechanisms	42
Program 3	46
<b>1.6 Multi-channel voltage source</b>	<b>51</b>
Instruction manual	51
Hardware Design	52
Software design	54

5

## TABLE OF CONTENTS

<b>Part 2</b>	<b>USB</b>	<b>59</b>
<b>2.1</b>	<b>Some background on USB</b>	<b>61</b>
	Low Speed Device Identification	63
<b>2.2</b>	<b>Hands on the chips</b>	<b>65</b>
	What do I need ?	65
	Implementing a USB mouse controller using FTDI's VNC1L 'Vinculum' chip	66
	Vinculum 'Gotcha'	67
	You will need	68
	Software	69
	System Setup	71
<b>2.3</b>	<b>Testing the Host Controller</b>	<b>74</b>
	Descriptors	78
	HID and Report Descriptors	83
<b>2.4</b>	<b>Using the Host Controller in embedded designs</b>	<b>91</b>
	A simple USB mouse driver	94
	Accessing Disk Drives	102
	Program Description	107
	<b>PART 3 Listings</b>	<b>117</b>
<b>3.1</b>	<b>PS/2 Programs</b>	<b>119</b>
	Program 1 – Reset sequence	119
	Program 2 – PS/2 Core	122
	Program 3 – Interrupt-driven PS/2 comms. Display mouse position & button state on an LCD	129
	Program 4 – Voltage Source Program	167
<b>3.2</b>	<b>USB Programs</b>	<b>178</b>
	Program 1 – Usb 1	178
	Program 2 – Usb2	197
	Webliography	253
	Index	254