

# TABLE OF CONTENTS

---



## Chapter 1: Getting Started

<b>Introduction</b> .....	1-2
Purpose of this Manual .....	1-2
About Getting Started .....	1-2
Online Help Files and Other Documentation .....	1-2
Technical Support .....	1-2
<b>Conventions Used</b> .....	1-3
Key Topics for Each Chapter .....	1-3
<b>Before you begin...</b> .....	1-4
<b>Productivity Suite System Requirements</b> .....	1-5
<b>Step 1: Install Programming Software</b> .....	1-6
<b>Step 2: Launch Programming Software</b> .....	1-11
Online Help .....	1-12
<b>Step 3: Install Hardware</b> .....	1-13
<b>Step 4: Apply Power to PAC</b> .....	1-16
<b>Step 5: Establish PC to PAC Communications</b> .....	1-17
<b>Step 6: Open/Read Hardware Configuration</b> .....	1-18
<b>Step 7: Create a Project</b> .....	1-20
<b>Step 8: Save Project</b> .....	1-26
<b>Step 9: Write Project to PAC</b> .....	1-27
<b>Step 10: Place PAC in RUN Mode</b> .....	1-28
<b>Step 11: Test the Project Using the Monitor Mode</b> .....	1-29

## Chapter 2: Specifications

<b>Overview</b> .....	<b>.2-2</b>
PAC System: .....	.2-2
<b>P3-03B, P3-05B, P3-08B, P3-11B Bases</b> .....	<b>.2-3</b>
<b>P3-01AC and P3-01DC Power Supplies</b> .....	<b>.2-5</b>
P3-01AC Specifications .....	.2-6
P3-01DC Specifications .....	.2-7
Power Connections .....	.2-8
<b>P3-550 CPU Module</b> .....	<b>.2-9</b>
LCD Message Display .....	.2-12
Front Panel LCD Monitoring and Configuration .....	.2-13
Battery (Optional) .....	.2-14
Port Specifications .....	.2-15
USB IN Port .....	.2-15
Ethernet Port .....	.2-16
Remote I/O Port .....	.2-16
USB OUT Port .....	.2-17
EXP I/O OUT Port .....	.2-17
RS-232 Port .....	.2-18
RS-485 Port .....	.2-19
<b>P3-EX Expansion Module</b> .....	<b>.2-20</b>
Port Specifications .....	.2-23
EXP I/O IN Port / EXP I/O OUT Port .....	.2-23
<b>P3-RS Remote Slave Module</b> .....	<b>.2-24</b>
P3-RS Remote Slave Module Front Panel .....	.2-27
LCD .....	.2-28
Setting the Remote Slave Address .....	.2-29
Port Specifications .....	.2-31
USB IN Port .....	.2-31
Remote I/O Port .....	.2-32
EXP I/O OUT Port .....	.2-33
RS-232 Serial Port .....	.2-34
RS-485 Serial Port .....	.2-35

<b>I/O Modules Overview</b>	<b>2-36</b>
<b>Discrete I/O Modules</b>	<b>2-37</b>
P3-16SIM Input Simulator	2-38
P3-08ND3S Isolated Sinking/Sourcing Input	2-39
P3-16ND3 Sinking/Sourcing Input	2-42
P3-32ND3 Sinking/Sourcing Input	2-45
P3-64ND3 Sinking/Sourcing Input	2-47
P3-08NAS AC Isolated Input	2-49
P3-16NA AC Input	2-52
P3-08TD1S Sinking Output	2-55
P3-08TD2S Sourcing Output	2-58
P3-16TD1 Sinking Output	2-61
P3-16TD2 Sourcing Output	2-64
P3-32TD1 Sinking Output	2-67
P3-32TD2 Sourcing Output	2-70
P3-64TD1 Sinking Output	2-73
P3-64TD2 Sourcing Output	2-76
P3-08TAS Isolated AC Output	2-79
P3-16TA AC Output	2-82
P3-08TRS Isolated Relay Output	2-85
P3-16TR Relay Output	2-88
P3-08TRS-1 Isolated Relay Output	2-91

## Chapter 3: Analog I/O Specifications

<b>Analog I/O Modules Overview</b>	<b>3-2</b>
<b>Analog I/O Modules</b>	<b>3-3</b>
P3-04ADS Isolated Analog Input	3-4
P3-08AD Analog Input	3-10
P3-16AD-1 Analog Input	3-15
P3-16AD-2 Analog Input	3-20
P3-08RTD Analog Input	3-25
P3-08THM Analog Input	3-30
P3-04DA Analog Output	3-35
P3-08DA-1 Analog Output	3-41
P3-08DA-2 Analog Output	3-46

## Table of Contents

---

P3-06DAS-1 Isolated Analog Output .....	3-51
P3-06DAS-2 Isolated Analog Output .....	3-56
P3-16DA-1 Analog Output .....	3-61
P3-16DA-2 Analog Output .....	3-66
P3-8AD4DA-1 Analog Input/Output .....	3-71
P3-8AD4DA-2 Analog Input/Output .....	3-77

## Chapter 4: Installation and Wiring

<b>Safety Guidelines .....</b>	<b>4-2</b>
Plan for Safety .....	4-2
Three Levels of Protection .....	4-3
Orderly System Shutdown .....	4-3
System Power Disconnect .....	4-3
Emergency Stop Circuits .....	4-4
<b>Introduction to the Productivity3000 Mechanical Design .....</b>	<b>4-5</b>
<b>Dimensions and Installation .....</b>	<b>4-6</b>
<b>Mounting Guidelines .....</b>	<b>4-7</b>
Enclosures .....	4-7
Mounting Position .....	4-7
Mounting Clearances .....	4-7
Grounding .....	4-7
Temperature Considerations .....	4-7
Power Considerations .....	4-7
Class 1, Division 2 Approval .....	4-9
Agency Approvals .....	4-9
Using Mounting Rails .....	4-10
Installing the Power Supply .....	4-11
Installing the CPU .....	4-12
Installing the I/O Modules .....	4-13
<b>Wiring Guidelines .....</b>	<b>4-14</b>
Wiring to the Power Supply .....	4-14
Grounding .....	4-14
Fuse Protection .....	4-15
<b>I/O Modules Wiring Options .....</b>	<b>4-16</b>

ZIPLink Wiring System . . . . .	4-16
ZIPLink System Compatibility Matrix . . . . .	4-17
Removable Terminal Blocks (Optional) . . . . .	4-20
Planning the I/O Wiring Routes . . . . .	4-21
<b>System Wiring Strategies . . . . .</b>	<b>4-22</b>
PAC Isolation Boundaries . . . . .	4-22
Sinking/Sourcing Concepts . . . . .	4-23
I/O “Common Terminal” Concepts . . . . .	4-24
DC Input Wiring Methods . . . . .	4-25
DC Output Wiring Methods . . . . .	4-25
Relay Outputs - Wiring Methods . . . . .	4-27
Discrete Outputs - Surge Suppression for Inductive Loads . . . . .	4-28
Relay Outputs - Relay Contact Life Extension . . . . .	4-29

## Chapter 5: PLC Communications

<b>Communications: Capabilities . . . . .</b>	<b>5-3</b>
Communication Ports . . . . .	5-3
<b>Communications: Connectivity . . . . .</b>	<b>5-11</b>
Communication Ports . . . . .	5-11
<b>Communications: ASCII and Custom Protocol Functionality . . . . .</b>	<b>5-17</b>
ASCII Instructions . . . . .	5-17
Custom Protocol Instructions . . . . .	5-18
<b>Communications: Ethernet . . . . .</b>	<b>5-20</b>
TCP and UDP Port Numbers . . . . .	5-20
IP Addressing and Subnetting . . . . .	5-20
PC Setup . . . . .	5-21
PAC Setup . . . . .	5-22
TCP Connection Behavior with Modbus TCP and Network Instructions . . . . .	5-23
<b>Communications Modbus Functionality . . . . .</b>	<b>5-24</b>
Master/Client Function Code and Data Type Support . . . . .	5-24
Slave/Server Function Code and Data Type Support . . . . .	5-26
Assigning Modbus Addresses to Tags . . . . .	5-27
Modbus Options . . . . .	5-30
Modbus Instructions . . . . .	5-33

## Table of Contents

---

Network Instructions .....	5-35
Automatic Poll versus Manual Polling and Interlocking .....	5-36
Message Queue .....	5-38
<b>Communications: Remote I/O and GS-Drives .....</b>	<b>5-39</b>
Things to Consider for The Design of Remote I/O Networks .....	5-39
Configuration of Remote Slaves .....	5-40
Configuration of GS-Drive Connections .....	5-43
<b>Communications: Port Configuration .....</b>	<b>5-47</b>
P3-550 and P3-RS Communication Ports Configuration .....	5-47
External Ethernet Port Settings .....	5-47
Local Ethernet Port Settings .....	5-49
P3-550 and P3-RS Communication Serial Configuration .....	5-50
RS-232 and RS-485 Port Settings .....	5-50
<b>Communications: Error Codes .....</b>	<b>5-53</b>
Productivity3000 Communication Error Codes .....	5-53

## Chapter 6: Maintenance & Troubleshooting

<b>Hardware Maintenance .....</b>	<b>6-2</b>
Standard Maintenance .....	6-2
Air Quality Maintenance .....	6-2
CPU Battery Replacement .....	6-2
<b>Diagnostics .....</b>	<b>6-3</b>
Diagnostics .....	6-3
Critical Errors .....	6-3
Non-Critical Errors .....	6-3
Finding Diagnostic Information .....	6-3
Error Codes .....	6-3
<b>CPU Indicators .....</b>	<b>6-4</b>
<b>PWR Indicator .....</b>	<b>6-5</b>
Incorrect Base Power .....	6-5
Faulty CPU .....	6-5
Device or Module Causing the Power Supply to Shutdown .....	6-6
<b>RUN Indicator .....</b>	<b>6-7</b>

<b>CPU Indicator</b>	.6-7
<b>Communications Problems</b>	.6-7
<b>I/O Module Troubleshooting</b>	.6-8
Things to Check	.6-8
Error Codes	.6-8
Some Quick Steps	.6-8
Testing Input Points	.6-9
<b>Noise Troubleshooting</b>	.6-10
Electrical Noise Problems	.6-10
Reducing Electrical Noise	.6-10
<b>Run Time vs. Stop Transfer Instruction</b>	.6-11
Run Time Transfers	.6-12
Stop Mode Transfers	.6-12
<b>Forcing I/O Points</b>	.6-14
Advantages of Forces	.6-14
Enabling Forces	.6-14
Forcing Tags in Your System	.6-15
Identifying Forced Values	.6-17
Forced Values Timing Chart	.6-18

## Appendix A: European Union Directives (CE)

<b>European Union Directives</b>	.A-2
Member Countries	.A-2
Applicable Directives	.A-2
Compliance	.A-2
General Safety	.A-3
Special Installation Manual	.A-4
Other Sources of Information	.A-4
<b>Basic EMC Installation Guidelines</b>	.A-4
Enclosures	.A-4
Mains Filters	.A-5
Suppression and Fusing	.A-5
Internal Enclosure Grounding	.A-5

## Table of Contents

---

Equi-potential Grounding .....	A-5
Communications and Shielded Cables .....	A-6
Analog and RS232 Cables .....	A-7
Multidrop Cables .....	A-7
Shielded Cables Within Enclosures .....	A-7
Analog Modules and RF Interference .....	A-7
Network Isolation .....	A-8
Items Specific to the Productivity3000 .....	A-9

## Appendix B: Productivity3000 Error Codes

Communications Error Codes .....	B-2
Module Error Codes .....	B-3
PAC Error Codes .....	B-5
Project Error Codes .....	B-6
Project Error Messages .....	B-8