

Index

A

ASCII Table, H-2

Auxiliary Functions, 3-8, A-2
 accessing
 with **Direct**SOFT, A-3
 with the Handheld, A-3

B

Bases

- conventional specifications, F-5
- expansion, 4-9, F-8
- installing modules, 2-9, 2-11
- local, 4-9, F-8
- mounting dimensions, 2-10
- power wiring, 2-13
- setting base jumpers, F-10
- setting switches, 4-11, F-10
- Slot Numbering, 2-25
- Specifications, 4-5

Battery

- CPU indicator, 9-2
- replacement, 9-2

I/O Modules, Troubleshooting, 9-13

C

Clock and Calendar, 3-9

Communication

- ports, 3-5
- setting addresses, 3-10

Communications, Problems, 9-12

Configuration

- I/O
 - automatic check, A-5
 - selecting a new configuration, A-5
 - viewing, A-5

I/O examples, F-11–F-19

Convergence Stages, 7-19, 7-25

Conventional I/O Numbering, F-2

CPU

- battery, 9-2
- Battery Backup, 3-6
- clearing memory, 3-9, A-4
- Diagnostics, 3-15
- features, 3-2, 3-4
- Indicators, 9-9
- Mode Operation, 3-12
- Mode Switch, 3-4
- Port 1 Specifications, 3-5
- Port 2 Specifications, 3-5
- Scan Time, 3-18
- setup, 3-7
 - clearing memory, 3-9
 - initializing system memory, 3-9
- Specifications, 3-3
- Status Indicators, 3-4

D

Diagnostics, 9-3

Dimensions, 2-10

DirectNET, 4-22

- Direct**NET Port Configuration, 4-24

- Network Master Operation, 4-30

- Network Slave Operation, 4-25

Discrete Input, specifications, 2-28–2-39

Discrete Output, specifications, 2-40–2-54

DL405 Aliases, 3-30

Drum instructions, 6-12

Drum sequencers, 6-2

Drum step transitions, 6-4

Duplicate Reference Check, A-4

E

Emergency Stop Switch, 2-3

Error Codes

- fatal, 9-3

- listing, B-2-B-9
- non-fatal, 9-3
- Program, 9-8
- special relays assigned to, 9-5
- System, 9-7
- V-memory locations for, 9-4

European Directives, J-2

Expansion Bases, 4-9, 4-10, & F-8 to F-9

F

Fatal Errors, 9-3, 9-7

Forcing I/O, 3-13, 9-24

G

Grounding, 2-6 to 2-7 & 2-8 to 2-9

I

I/O Modules

- address switch (base), 4-11, F-10
- configuration, A-5
 - power up check, A-5
 - viewing, A-5
- configuration history, F-2
- diagnostics, A-5
- discrete input specifications, 2-28-2-39
- discrete output specifications, 2-40-2-54
- example configurations, F-11-F-19
- numbering, F-2, F-3
- placement, 4-3-4-7, F-4-F-6
- point requirements, F-3

I/O Modules Wiring, 2-24, 2-26

I/O Response Time, 3-16

I/O Wiring Strategies, 2-14

Initial Stages, 7-5, 7-23

Input Modules

- specifications, 2-28-2-39
- wiring diagrams, 2-28-2-39

Installation

- base, mounting dimensions, 2-10
- component dimensions, 2-10
- grounding, 2-4-2-5
- installing modules, 2-9, 2-11
- local and expansion bases, 4-9, F-8
- panel design specifications, 2-4

Instruction Set, index table, 5-3

Instructions, 5-2

- execution times, C-2-C-23
- stage, 7-23
- stage programming, 7-2

J

Jump Instruction, 7-7 & 7-24

Jumpers, on bases, F-10

Jumpers, on bases, 4-11

L

Local Bases, 4-9, F-8

M

Masked drums, 6-18

Math Instructions, 5-77

Memory, G-2

- clearing, 3-9
 - program memory, A-4
 - V-memory, A-4

- Control Relay Bit Map, 3-31, 3-33

- DL350 Memory Map, 3-29

- initializing system memory, 3-9

- map, 3-23

- Scratch Pad Memory, 3-9

- Stage Bit Map, 3-35

- X input/Y output map, 3-30, 3-32

MODBUS, 4-22

- MODBUS Port Configuration, 4-23

- Network Master Operation, 4-30

- Network Slave Operation, 4-25

Mode Switch, 3-4

Module Placement, 4-3

Module Power Requirement, 4-5

Mounting

- Guidelines, 2-4

- Panel, 2-5, 2-7

N

Netork Address, A-6

Network Address, 3-10

Non-fatal Errors, 9-3

Number Conversions, 5-103

Numbering Systems

- BCD, I-5

- Binary, I-2

- Floating Point, I-6

- Hexadecimal, I-3

- Octal, I-4

O

Output Modules

- power disconnect, 2-3

- specifications, 2-40-2-54

- wiring diagrams, 2-40-2-54

P

Part Numbering Scheme, 1-8

Password Protection, 3-10

PID

- Analog Filter, 8-54
- Bumpless Transfer, 8-13, 8-27
- Cascade Control, 8-63
 - Tuning, 8-65
- Control Introduction, 8-4
- DirectSOFT** 5 Filter, 8-55
- DL450 Control, 8-6
- Error Flags, 8-18
- Error Term Selection, 8-33
- Example Program, 8-70
- Loop Modes, 8-28, 8-53
- On/Off Control, 8-66
- Operation, 8-9
- Parameters, 8-32
- PID View, 8-49-8-51
- Ramp/Soak, 8-39
- Reset Windup, 8-10, 8-34
- Special Features, 8-52
- Time Proportioning, 8-66

PID Alarms

- Alarm Features, 8-3
- Auto Tuning Error, 8-48
- Hysteresis, 8-13, 8-36, 8-38
- Monitor Limit, 8-35
- Overflow/Underflow Error, 8-38
- Programming Error, 8-38
- PV Deviation, 8-36
- Rate-of-Change, 8-13, 8-37
- Setup Alarms, 8-35

PID Loop

- Alarms, 8-13
- Configure, 8-26
- Features, 8-2, 8-3
- Feedforward Control, 8-68
- Freeze Bias, 8-11, 8-34
- Loop Definitions, 8-21
- Mode, 8-28
- Operating Modes, 8-14
- Special Loop Calculations, 8-14
- Setup, 8-18
- Terminology, 8-74
- Time-Proportioning Control, On/Off Control
 - Example, 8-67
- Transfer Mode, 8-27
- Troubleshooting Tips, 8-72
- Tuning, 8-40
 - Auto, 8-45

Manual, 8-41-8-44

PID Mode 2 Word Description, 8-23

PID Mode Setting 1 Description, 8-22

PID Position Algorithm, 8-9, 8-15

- Position Form, 8-9

PID Velocity Algorithm, 8-9

- Algorithm Form, 8-12
- Velocity Algorithm, 8-15

PLC Numbering System, 3-21

Power Budget, 4-5

- Example, 4-7

Power Indicator, 9-10

Programming

- changing I/O references, A-4
- checking for duplicate references, A-4
- checking the program syntax, A-4
- clearing memory, A-4
- instruction execution times, C-2-C-23
- instruction set index, 5-3

R

Ramp/Soak Generator, 8-56

Controls, 8-59

DirectSOFT Example, 8-61

Flag Bit Description Table, 8-24

Profile Monitoring, 8-60

Table, 8-57

Table Flags, 8-59

Table Location, 8-25

Test the Profile, 8-62

Testing, 8-60

Remote I/O

Port Connections, 4-18

Remote I/O Expansion, 4-16

Retentive Memory, 3-10

RLL^{PLUS}, instructions, 7-23-7-29

Run Relay, F-7

Run Time Edits, 9-22

S

Safety

- emergency switch, 2-3
- guidelines, 2-2-2-3
- levels of protection, 2-2
- output module power disconnect, 2-3
- panel design specifications, 2-4
- planning for, 2-2
- sources of assistance, 2-2

Scan Time, 3-18

Sinking/Sourcing, 2-17

Special Relays, 9-5

Specifications

- component weights, E-2

- discrete input modules, 2-28–2-39
- discrete output modules, 2-40–2-54
- panel design, 2-4

Stage Counter instruction, 7-16

Stage programming, 7-2

- convergence, 7-19
- four steps to writing a stage program, 7-9
- garage door opener example, 7-10
- initial stages, 7-5
- instructions, 7-23–7-29
- introduction, 7-2
- jump instruction, 7-7
- managing large programs, 7-21
- mutually exclusive transitions, 7-14
- parallel processes, 7-12
- parallel processing concepts, 7-19
- power flow transition, 7-18
- program organization, 7-15
- questions and answers, 7-29
- stage view, 7-28
- state transition diagrams, 7-3
- supervisor process, 7-17
- timer inside stage, 7-13
- unconditional outputs, 7-18

Stages, blocks, 7-27

System

- component dimensions, 2-10
- memory initialization, 3-9
- panel design specifications, 2-4
- V-Memory, 3-27

System design strategies, 4-2

T

Timed drum, 6-12

Troubleshooting, 9-16

- cabinet air environment, 9-2
- error codes, B-2
 - special relays for, 9-5
 - V-memory locations for, 9-4
- fatal errors, 9-3
- finding diagnostic information, 9-3
- I/O modules, A-5
 - selecting a new configuration, A-5
- low battery, 9-2
- machine startup and program, 9-17
- non-fatal errors, 9-3

W

Watchdog Timer, A-6

Wiring, base power supply, 2-13

V

Velocity algorithm, 8-30

W

Watchdog Timer, A-6

Wiring, base power supply, 2-11