

ACNAC DRIVE USER MANUAL TABLE OF CONTENTS



ACN USER MANUAL TOC

WARNINGS AND TRADEMARKS	W-1
~ WARNING ~	W-1
Trademarks.	W-1
~ AVERTISSEMENT ~	W-2
Marques de commerce	W-2
Warnings	W-3
ACN SERIES DRIVES MANUAL REVISION HISTORY	H-1
ACN AC DRIVE USER MANUAL TABLE OF CONTENTS	TOC-1
CHAPTER 1: GETTING STARTED	1-1
User Manual Overview	1-2
Overview of this Publication	1-2
Who Should Read This Manual.	1-2
Supplemental Publications	1-2
Technical Support	1-2
Special Symbols	1-2
Purpose of AC Drives	1-3
Selecting the Proper Drive Rating	1-3
Determine Motor Full-Load Amperage (FLA)	1-3
Determine Motor Overload Requirements	1-3
Determine Application Type; Constant Torque or Variable Torque	1-3
Parts Locator	1-4
Continuous Rated Current Derating	1-5
Heat Emission	1-7
Watt Loss and Efficiency	1-7
IRONHORSE ACN Series AC Drive Environmental Information.	1-7
Storage and Transportation.	1-7
Environmental Conditions	1-8
IRONHORSE ACN SERIES AC Drive Specifications.	1-9
230V Class – (Model Specifications)	1-9
230V Class – (Model Specifications)	1-10
460V Class – (Model Specifications)	1-11
460V Class – (Model Specifications)	1-12
Specifications Applicable to All ACN Series Models	1-13
Receiving and Inspection	1-15
Drive Package Contents.	1-15
Model Number Explanation	1-16
Nameplate Information.	1-16
CHAPTER 2: INSTALLATION AND WIRING.	2-1
Drive Models by Frame Size	2-3

Installation	2-3
Basic Configuration Diagram	2-3
Installation Considerations	2-4
Minimum Clearances and Air Flow	2-4
Dimensions	2-5
Mounting the Drive	2-6
Removing Front Cover	2-8
Cable Wiring	2-9
Floating Ground System	2-10
Cable Selection	2-11
Ground Cable and Power Cable Specifications	2-11
Control (signal) Cable Specifications	2-12
Ground Connection	2-12
Power Terminal Wiring	2-13
0.5 – 1 HP (3-phase)	2-13
2.0 – 3.0 HP (3-phase)	2-13
5 HP (3-phase)	2-14
7.5 – 30 HP (3-phase)	2-14
Main Circuit Wiring Diagram (all frames)	2-15
Power Terminal Labels and Descriptions	2-15
Terminals for Connecting DC Reactor, External Brake Resistor, and DC Circuit	2-15
Wiring Guidelines	2-16
Motor Operation Precautions	2-16
Single Phase Input Utility Wiring and Operation	2-17
Power (HP), Input Current and Output Current	2-18
Input Frequency and Voltage Tolerance	2-18
Protection	2-18
Control Terminal Wiring	2-19
Control Board Switches	2-19
Connector	2-19
Input Terminal Labels and Descriptions	2-21
Output/Communication Terminal Labels and Descriptions	2-22
Pre-insulated Crimp Terminal Connectors (Bootlace Ferrule)	2-23
PNP/NPN Mode Wiring and Selection	2-24
PNP Mode (Source)	2-24
NPN Mode (Sink)	2-25
Run Command Wiring	2-25
Digital Output Wiring	2-26
Analog Wiring	2-26
AO Wiring	2-28
System Wiring Diagram	2-28
Re-assembling the Cover	2-28
Post-Installation Checklist	2-29
Test Run	2-30
Verifying the Motor Rotation	2-31
CHAPTER 3: KEYPAD OPERATION AND QUICK START	3-1
Learning to Perform Basic Operations	3-2
About the Keypad	3-2
Learning to Use the Keypad	3-5
Actual Application Examples	3-10

Monitoring the Operation 3-17

CHAPTER 4: AC DRIVE PARAMETERS. 4-1

AC Drive Parameters 4-3

 Bit Selection 4-3

 Parameter Table Format Explanation. 4-3

 Operation Parameter Group 4-5

 DRIVE Parameter Group (dr, DRV) 4-7

 BASIC Parameter group (bA, BAS) 4-12

 ADVANCED Parameter group (Ad, ADV). 4-17

 CONTROL Parameter Group (Cn, CON) 4-21

 INPUT Parameter Group (In, IN) 4-27

 OUTPUT Parameter Group (OU, OUT) 4-32

 COMMUNICATION Parameter Group (Cm, COM) 4-35

 APPLICATION Parameter Group (AP , APP) 4-40

 Extension IO Parameter Group (AO , APO) 4-43

 PROTECTION Parameter Group (Pr, PRT). 4-46

 2nd MOTOR Parameter Group (m2, M2). 4-50

 USER SEQUENCE Parameter Group (US, USS). 4-52

 USER SEQUENCE FUNCTION Parameter Group (UF , USF) 4-55

 Trip Mode (TRP Last-x) 4-60

 Config Mode (CNF) 4-61

IronHorse® ACN Drive Operation and Parameter Details 4-64

 Chart Key 4-64

Learning Basic Features 4-65

 Setting Frequency Reference 4-67

 Frequency Hold by Analog Input. 4-75

 Changing the Displayed Units (Hz↔Rpm) 4-76

 Setting Multi-step Frequency. 4-76

 Command Source Configuration. 4-78

 Local/Remote Mode Switching 4-81

 Forward or Reverse Run Prevention 4-83

 Power-on Run 4-84

 Reset and Restart 4-85

 Setting Acceleration and Deceleration Times 4-86

 Acc/Dec Pattern Configuration 4-90

 Stopping the Acc/Dec Operation. 4-91

 V/F (Voltage/Frequency) Control. 4-92

 Torque Boost 4-95

 Output Voltage Setting 4-96

 Start Mode Setting 4-96

 Stop Mode Setting. 4-97

 Frequency Limit 4-100

 2nd Operation Mode Setting. 4-102

 Multi-function Input Terminal Control. 4-103

 P2P Setting. 4-104

 Multi-keypad Setting 4-105

 User Sequence Setting 4-106

 Fire Mode Operation 4-121

 Improvement of output voltage drop 4-122

Learning Advanced Features 4-123

 Operating with Auxiliary References 4-124

Jog operation	4-127
Up-down Operation.	4-130
3-Wire Operation	4-132
Safe Operation Mode	4-133
Dwell Operation	4-134
Slip Compensation Operation	4-136
PID Control.	4-137
Auto Tuning	4-144
Sensorless Vector Control for Induction Motors	4-146
Sensorless Vector Control for PM (Permanent-Magnet) Synchronous Motors.	4-152
Kinetic Energy Buffering Operation	4-159
Torque Control.	4-161
Energy Saving Operation	4-165
Speed Search Operation	4-166
Auto Restart Settings	4-169
Operational Noise Settings (carrier frequency settings)	4-170
2nd Motor Operation	4-171
Supply Power Transition.	4-172
Cooling Fan Control	4-173
Input Power Frequency and Voltage Settings	4-174
Read, Write, and Save Parameters	4-174
Parameter Initialization (Reset to Defaults)	4-174
Parameter View Lock	4-175
Parameter Lock	4-176
Changed Parameter Display	4-177
User Group.	4-177
Easy Start On.	4-178
Config(CNF) Mode.	4-179
Multi-function IO Timer Settings.	4-180
Brake Control.	4-181
Multi-Function Output On/Off Control	4-182
Press Regeneration Prevention.	4-182
Analog Output.	4-183
Digital Output	4-187
Keypad Language Settings	4-191
Operation State Monitor	4-192
Operation Time Monitor	4-194
Learning Protection Features.	4-195
Motor Protection	4-195
Drive and Sequence Protection.	4-201
Dynamic Braking.	4-204
Under load Fault Trip and Warning.	4-206
Fault/Warning List	4-210
CHAPTER 5: SERIAL COMMUNICATIONS	5-1
Serial RS-485 Communication Features	5-2
Communication Standards	5-2
Common Third-Party Modbus RTU Masters.	5-2
AutomationDirect PLCs as Modbus Master	5-3
RS-232C to RS-485 Conversion.	5-4
Communication Protocol	5-12
Drive Expansion Common Area Parameter	5-15

Drive Parameter Modbus Communication Addresses	5-24
CHAPTER 6: MAINTENANCE AND TROUBLESHOOTING	6-1
Operations Lockout	6-2
Maintenance and Inspections	6-3
Monthly Inspection	6-3
Annual Inspection	6-3
Recharge Capacitors (for drives not in service)	6-3
Recommended Inspection Schedules	6-4
Storage and Disposal	6-7
Troubleshooting	6-8
Trips and Warnings	6-8
Fault Trips.	6-8
APPENDIX A: ACCESSORIES	A-1
Fuses/Circuit Breakers.	A-2
High Performance EMI Input Filters	A-3
EMI Filter Installation	A-3
Recommended Motor Cable Length.	A-5
Line Reactors / Voltage Time Filters	A-6
Line Reactor	A-6
Load Reactor/Voltage Time Filter.	A-6
DC Reactor	A-7
Line/Load Reactors and Output Filters Selection Charts	A-8
Line Reactor Applications and Wiring Connections.	A-8
Recommended Cable Length.	A-11
Dynamic Braking	A-12
Braking Units.	A-12
Choosing and Installing a Braking Resistor	A-13
ACN-232C IronHorse ACN 232 USB to RJ45 Port Cable	A-14
ACN-LCD Remote LCD Keypad.	A-15
About the Keypad	A-15
Menu Items	A-18
Navigating Modes.	A-19
Navigating Modes and Parameters	A-22
Navigating through Codes (Function Items)	A-25
Setting Parameters	A-28
Monitoring Operating Status	A-30
Monitoring Faults	A-33
Initializing Parameters.	A-36
Parameter Lock (LCD)	A-37
ACN-3MRC LCD Keypad Mount Kit and Cable	A-38
ACN-LCDKM Remote LCD Keypad NEMA4X Mounting Kit and Cable	A-39
Installation Procedure	A-39
APPENDIX B: OPTIONAL I/O CARD	B-1
Basic Information	B-2
Characteristics	B-2
Components	B-2
Specifications	B-3
Input and Output Specification.	B-3
Installation	B-4
Installation of ACN I/O Card	B-4

Control Terminal Wiring	B-6
Signal (Control) Cable Specifications	B-8
Parameter Configuration	B-10
Basic Features	B-10
Basic Function	B-10
Setting Frequency Reference	B-10
Analog Output	B-17
Digital Output	B-19
Setting Multi-step Frequency	B-23
Multi-step Acc/Dec Time Configuration	B-25
Stopping the Acc/Dec Operation	B-26
Multi-function Input Terminal Control	B-27
APPENDIX C: ETHERNET MODULE ACN-ETH	C-1
Ethernet/Modbus Card Quick Start	C-3
Hardware	C-3
Parameters	C-4
Introduction	C-5
ACN-ETH Module	C-5
Components	C-5
Ethernet Communication Module Features	C-6
Common Features	C-6
Layout of Ethernet Communication Module	C-6
Installation	C-7
Terminal Block of Ethernet communication Specifications	C-9
Network Cable Specification	C-10
Protocol Selection	C-10
LED information	C-11
LED display feature	C-11
Ethernet Line LED (EtherNet/IP and Modbus TCP are same)	C-11
Modbus TCP LED & Troubleshooting	C-11
EtherNet/IP LED & Troubleshooting	C-12
Keypad Parameter of Ethernet Communication	C-13
FBus S/W Ver (CM.06)	C-13
FBus Led (CM.09)	C-13
IP Address, Subnet Mask, Gateway (CM.10~21) Setting	C-14
Ethernet Speed (CM.22)	C-14
CIP Input Instance (CM.29)	C-15
CIP Output Instance(CM.49)	C-16
Number of Output Parameters (CM.30)	C-16
Parameter Status (CM.31~CM.38)	C-17
Number of Input Parameters (CM.50)	C-17
Parameter Control (CM.51~CM.58)	C-17
Comm Update (CM.94)	C-17
Modbus TCP	C-18
Modbus TCP Frame Structure	C-18
Function Code Description	C-18
Read Holding Register	C-18
Read Input Register	C-18
Write Single Register	C-19
Write Multiple Register	C-19

Except Frame C-20
Exception Frame Structure C-20
Exception Code Type C-20
EtherNet/IP C-21
 Basic Protocol Configuration C-21
 Implicit Message C-22
 Explicit Message C-27
 Supported Object C-28
Lost Command C-33
 Drive Keypad Parameter C-33
APPENDIX D: SAFE TORQUE OFF D-1
 Introduction D-2
 Introduction D-2
 Terminal Configuration D-2
 Safe Torque Off Terminal Function Description D-2
 Operation Conditions Description D-2
 Wiring Diagrams D-3
 Internal Sto Circuit D-3
 Operating Sequence Description D-3
 Normal Operation Status D-3
 Safe Function Failure Rate D-4
 Safety Requirements Specification D-4
 Installation Considerations D-4
 Safe Function Performance D-4

