



IronHorse ACM Series Introduction



IronHorse ACM AC Drives							
Motor Rating	HP	1/8	1/4	1/2	1.0	2.0	3.0
	kW	0.4	0.8	1.5	2.2	4.0	5.5
120V Single-Phase Input/ 230V Three-Phase Output			✓	✓	✓		
230V Single-Phase Input/ 230V Three-Phase Output		✓	✓	✓	✓	✓	✓

Overview

Ironhorse ACM sensorless vector control AC drives provide all the features needed for a variety of applications in a compact and durable package. The drives include many of the same standard features as the Ironhorse ACG series of drives, including dual relay outputs, PID control, and RS-485 Modbus communication, but is designed for use with 1-phase 120V or 230V input power. The drive supports up to two (2) independent IM motor parameter sets. Ironhorse ACM AC drives offer several different control modes: V/Hz, Slip compensation, and simple sensorless vector. Ironhorse ACM drives provide either voltage or current analog input for drive control, one analog output, five digital inputs, and two relay outputs. All of the analog and digital I/O can be configured for a wide variety of input or output functions. An RJ45 port is available for remote mounted keypad or ModBus RTU communication.

Features

- Offering from 1/8 to 3 hp
- 120 VAC: single-phase up to 1 hp
- 230 VAC: single-phase up to 3 hp
- Heavy Load (Constant Torque) rated
- Flexible carrier frequency to 15 khz
- Output frequency to 400 Hz
- Built-in RJ45 port with Modbus RTU for fast and easy programming.
- Free downloadable software for drive configuration
- Local/Remote control mode selection or digital/comm input with Hand/Off/Auto control
- PCB Conformal Coating
- Meets UL 61800-5-1 standards
- 100 kA Short Circuit Current Rating
- Analog I/O – configurable current/voltage input and 1 output
- 2-Motor Control
- Built-in Dynamic Braking on Frame C models
- PID Controller – including sleep and wake
- Built-in Potentiometer
- Password protection
- DIN rail mounting built in
- Zero stack installation.
- Able to operate up to 50°C ambient temperature
- 24-month warranty
- CE, UL, cUL

Accessories

- AC line/load reactors
- dV/dT output filters
- EMI filters
- Braking resistors
- Fuses
- Remote Keypad Mount Kit
- VFD Suite drive configuration software

Typical Applications

Suitable for most applications including:

- Conveyors
- Shop tools
- Mixer
- Crane and Hoist
- Press
- Auger
- Centrifuge
- Waste Water Rake Drive
- X-Y Positioning
- Vibratory Tables
- Synchronous Machine



IronHorse ACM Series Selection

Selecting the Proper Drive Rating

Selecting the Proper Drive Rating															
Determine Motor Voltage and Full-Load Amperage (FLA)															
Motor voltage and FLA are located on the nameplate of the motor. <i>NOTE: FLA of motors that have been rewound may be higher than stated.</i>															
Determine Motor Overload Requirements															
Many applications experience temporary overload conditions due to starting requirements or impact loading. Most AC drives are designed to operate at 150% overload for 60 seconds. If the application requires an overload greater than 150% or longer than 60 seconds, the AC drive must be oversized. <i>NOTE: Applications that require replacement of existing motor starters with AC drives may require up to 600% overload.</i>															
Installation Altitude															
AC drives rely on air flow for cooling. ACM drives are designed to operate at 100% capacity at altitudes up to 1000 meters. As the altitude increases, the air becomes less dense. This drop in air density decreases the cooling properties of the air, therefore, the AC drive must be oversized to compensate for the decrease in cooling. <i>NOTE: For use above 1000m, the AC drive must be derated as described below.</i>															
Derate Output Current Based on Altitude Above 1000 Meters															
<ul style="list-style-type: none"> • If the AC drive is installed at an altitude of 0–1000m, follow normal operation restrictions. • From 1000 to 4000m, the rated input voltage and rated output current of the drive must be derated by 1% for every 100m. 															
<p>Derating for Altitude</p> <table border="1" style="margin: 10px auto;"> <caption>Data for Derating for Altitude</caption> <thead> <tr> <th>Altitude (m)</th> <th>Current Rated Ratio (%)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>100</td> </tr> <tr> <td>1000</td> <td>100</td> </tr> <tr> <td>2000</td> <td>90</td> </tr> <tr> <td>3000</td> <td>80</td> </tr> <tr> <td>4000</td> <td>70</td> </tr> <tr> <td>5000</td> <td>0</td> </tr> </tbody> </table>		Altitude (m)	Current Rated Ratio (%)	0	100	1000	100	2000	90	3000	80	4000	70	5000	0
Altitude (m)	Current Rated Ratio (%)														
0	100														
1000	100														
2000	90														
3000	80														
4000	70														
5000	0														



IronHorse ACM Series Selection

Selecting the Proper Drive Rating

Derate Output Current Based on Carrier Frequency (if necessary)

Carrier Frequency Effects

AC Drives rectify the incoming 50 Hz or 60 Hz line power resulting in DC power. The DC power is then pulse-width modulated and supplied to the motor by the drive's power electronics. IGBTs invert the DC power, simulating a sine wave at the desired frequency (that's what allows variable speed in AC induction motors). The speed at which the IGBTs are turned ON and OFF is called Carrier Frequency. In ACM drives, the Carrier Frequency can range from 2 kHz to 15 kHz. Though Carrier Frequency can be adjusted, there are trade-offs between high Carrier Frequencies and low Carrier Frequencies.

Benefits of Higher Carrier Frequencies:

- Better efficiency (lower harmonic losses) in the motor
- Lower audible noise

Benefits of Lower Carrier Frequencies:

- Better efficiency in the drive
- Lower EMI (electrical noise)
- Reduced reflective wave peak voltage

As a general rule, the Carrier Frequency should be set as low as possible without creating unacceptable audible noise in the motor. Smaller systems can have higher Carrier Frequencies, but larger drives (>20 or 30 hp) should not have Carrier Frequencies set higher than 6 kHz. Heavy duty applications typically run around 1–4 kHz (230 VAC- FRAME A) and 1–6 kHz (120 VAC – all models, 230 VAC – FRAME B/C).

Derating Tables

120 VAC (Frame B/C)		230 VAC (Frame A)		230 VAC (Frame B/C)	
Carrier Frequency (kHz)	Constant Rated Current (%)	Carrier Frequency (kHz)	Constant Rated Current (%)	Carrier Frequency (kHz)	Constant Rated Current (%)
1–6	100	1–4	100	1–6	100
8	88	8	88	8	88
12	77	12	77	12	77
15	72	15	72	15	72

Frame A

Frame B/C



IronHorse ACM Series Selection Specifications

ACM Drive Specifications

ACM 120 VAC Class Specifications					
Part Number		<i>ACM-10P2</i>	<i>ACM-10P5</i>	<i>ACM-11P0</i>	
Price		\$149.00	\$166.00	\$180.00	
Drawing Link		PDF	PDF	PDF	
Frame Size		B	B	C	
Applied Motor	Max Motor Output	hp	0.25	0.5	1.0
		kW	0.2	0.4	0.75
Output Rating	Rated Capacity (kVA)		0.6	0.95	1.9
	Rated Current (A)		1.4	2.4	4.2
	Output Frequency		0–400 Hz		
	Output Voltage		3-phase 200–240 VAC		
Input Rating	Input Voltage		1-phase 100–120 VAC (-15% to +10%)		
	Input Frequency		50–60 Hz (±5%)		
	Rated Current (A)		3.7	7.4	13.9
Weight (lb [kg])		2.2 [1]	2.2 [1]	3 [1.36]	
Cooling Method		Forced fan			

- All specifications are for Heavy Load duty (Constant Torque).
- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 120V series drives is based on a 110V supply voltage.
- The rated output current is limited based on the carrier frequency set at Cn.4.
- The output voltage becomes 15–17% lower during no-load operations to protect the drive from the impact of the motor closing and opening.
- For single phase power input, an input line reactor is recommended. See accessories for the specific line reactor for each drive model.



ACM-10P5



ACM-11P0



IronHorse ACM Series Selection Specifications

ACM Drive Specifications, *continued*

ACM 230 VAC Class Specifications								
Part Number		<u>ACM-20P1</u>	<u>ACM-20P2</u>	<u>ACM-20P5</u>	<u>ACM-21P0</u>	<u>ACM-22P0</u>	<u>ACM-23P0</u>	
Price		\$125.00	\$132.00	\$146.00	\$165.00	\$197.00	\$218.00	
Drawing Link		PDF	PDF	PDF	PDF	PDF	PDF	
Frame Size		A	A	B	B	C	C	
Applied Motor	Max Motor Output	hp	0.125	0.25	0.5	1.0	2.0	3.0
		kW	0.1	0.2	0.4	0.75	1.5	2.2
Output Rating	Rated Capacity (kVA)		0.3	0.6	0.95	1.9	3.0	4.5
	Rated Current (A)		0.8	1.4	2.4	4.2	7.5	11.0
	Output Frequency		0-400 Hz					
	Output Voltage		3-phase 200-240 VAC					
Input Rating	Input Voltage		200-240 VAC (-15% to +10%)					
	Input Frequency	1-phase	50-60 Hz (±5%)					
		3-phase	60 Hz (±5%)					
	Rated Current (A)		1.0	1.8	3.7	7.1	13.6	18.7
Weight (lb [kg])		1.46 [0.66]	1.46 [0.66]	2.2 [1.0]	2.2 [1.0]	3.2 [1.45]	3.2 [1.45]	
Cooling Method		Natural cooling			Forced fan			

- All specifications are for Heavy Load duty (Constant Torque).
- The standard motor capacity is based on a standard 4-pole motor.
- The standard used for 230V series drives is based on a 220V supply voltage.
- The rated output current is limited based on the carrier frequency set at Cn.4.
- The output voltage becomes 15~17% lower during no-load operations to protect the drive from the impact of the motor closing and opening.
- For single phase power input, an input line reactor is recommended. See accessories for the specific line reactor for each drive model.



ACM-20P1



ACM-20P5



ACM-22P0



IronHorse ACM Series General Specifications

ACM General Specifications

IronHorse ACM Series General Specifications (All Models)																
Control Characteristics	Control Method	V/F control, Slip Compensation, Simple Sensorless Vector														
	Frequency Settings Power Resolution	Digital command: 0.01 Hz; Analog command: 0.06 Hz (60 Hz standard)														
	Frequency Accuracy	1% of maximum output frequency														
	V/F Pattern	Linear, square reduction, user V/F														
	Overload Capacity	Heavy Load rated current: 150% for 1 minute														
	Torque Boost	Manual torque boost, automatic torque boost														
Operation Characteristics	Operation Type	Select keypad, terminal strip, or communication operation														
	Frequency Setting Signal	Analog type: 0–10V, 4–20 mA, keypad, built-in potentiometer dial														
	Main Functions	<table border="0"> <tr> <td>Anti-forward and reverse direction rotation</td> <td>Dwell operation</td> </tr> <tr> <td>Frequency jump</td> <td>Slip compensation</td> </tr> <tr> <td>Frequency limit</td> <td>PID control</td> </tr> <tr> <td>DC braking</td> <td>Energy saving operation</td> </tr> <tr> <td>Jog operation</td> <td>Speed search</td> </tr> <tr> <td>Up-down operation</td> <td>Automatic restart</td> </tr> <tr> <td>3-wire operation</td> <td></td> </tr> </table>	Anti-forward and reverse direction rotation	Dwell operation	Frequency jump	Slip compensation	Frequency limit	PID control	DC braking	Energy saving operation	Jog operation	Speed search	Up-down operation	Automatic restart	3-wire operation	
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Inputs	Multi-function Terminal (5) P1–P5	<p>Select PNP (Source) or NPN (Sink) mode. Functions can be set according to In.65–In.69 and parameter settings.</p> <table border="0"> <tr> <td> <ul style="list-style-type: none"> • Forward direction operation • Reset • Emergency stop • Multi-step speed frequency-high/med/low • DC braking during stop • Frequency increase • 3-wire • Select acc/dec/stop </td> <td> <ul style="list-style-type: none"> • Reverse direction operation • External trip • Jog operation • Multi-step acc/dec-high/med/low • Second motor selection • Frequency reduction • Fix analog command frequency • Transition from PID to general operation </td> </tr> </table>	<ul style="list-style-type: none"> • Forward direction operation • Reset • Emergency stop • Multi-step speed frequency-high/med/low • DC braking during stop • Frequency increase • 3-wire • Select acc/dec/stop 	<ul style="list-style-type: none"> • Reverse direction operation • External trip • Jog operation • Multi-step acc/dec-high/med/low • Second motor selection • Frequency reduction • Fix analog command frequency • Transition from PID to general operation 												
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Analog Input (2)	0–10V, 4–20 mA, Speed or PID control															
Outputs	Multi-function Relay Terminal (2)	Fault output and drive operation status output Less than (N.O., N.C.) 250 VAC, 1A Less than 30 VDC 1A														
	Analog Output (1)	0–10 VDC: Select frequency, output current, output voltage, DC terminal voltage and others														
Protection Function Characteristics	Trip	<table border="0"> <tr> <td>Motor over heat trip</td> <td>Inverter over heat</td> </tr> <tr> <td>Motor overload trip</td> <td>Over voltage trip</td> </tr> <tr> <td>Output open-phase trip</td> <td>Ground trip</td> </tr> <tr> <td>External signal trip</td> <td>COM trip</td> </tr> <tr> <td>Inverter overload trip</td> <td>Fan trip</td> </tr> <tr> <td>Command loss trip</td> <td>Low voltage trip</td> </tr> <tr> <td>Over current trip</td> <td>Command loss trip</td> </tr> </table>	Motor over heat trip	Inverter over heat	Motor overload trip	Over voltage trip	Output open-phase trip	Ground trip	External signal trip	COM trip	Inverter overload trip	Fan trip	Command loss trip	Low voltage trip	Over current trip	Command loss trip
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Inverter overload trip	Fan trip															
Command loss trip	Low voltage trip															
Over current trip	Command loss trip															
Alarm	Drive overload alarm															
Instantaneous Blackout	Less than 15 ms: continue operation (must be within the rated input voltage and rated output range) More than 15 ms: auto restart operation															
IP Rating	IP20															
Agency Approvals	UL, CE															



IronHorse ACM Series General Specifications

ACM Environmental Specifications

Environmental Conditions for IronHorse ACM Series AC Drives	
Installation Location	Mount the drive on a wall or inside a panel. Not suitable for use in direct sunlight.
Cooling	Natural cooling structure (0.125–0.25 HP) Forced fan cooling structure (0.5–3.0 HP)
Operating Ambient Temperature	Heavy Load (HD): -10 to +50 °C (14 to 122 °F)
Storage Temperature*	-20 to +65 °C (-4 to +149 °F)
Relative Humidity	Less than 95% (to avoid condensation)
Air Pressure	70 to 106 kPa
Pollution Level	Pollution level 2 environment: prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants.
Altitude	No higher than 3,280ft (1000m). From 1000 to 4000m, the rated input voltage and rated output current of the drive must be derated by 1% for every 100m.
Vibration	Less than 9.8 m/sec ² (1G)
Installation Orientation	Max allowed offset angle = 0 degrees. (Vertical orientation only). Do not install the drive on the floor or mount it sideways against a wall. The drive MUST be installed vertically, on a wall or inside a panel, with its rear flat on the mounting surface.

* The ambient temperature is the temperature measured at a point 2in (5cm) from the surface of the drive.

ACM Watt Loss and Efficiency

IronHorse ACM Watt Loss and Efficiency							
Model Number	Voltage	Rated Power (hp [kW])	Efficiency (%)	Total Losses (W)	Internal Losses (W)	External (Heat) Losses (W)	Heat Losses (Kcal)
ACM-10P2	120 VAC	1/4 [0.2]	93.81	12	8	5	4
ACM-10P5		1/2 [0.4]	94.29	23	13	10	8
ACM-11P0		1 [0.75]	94.23	43	13	30	26
ACM-20P1	230 VAC	1/8 [0.1]	93.00	7	5	2	1
ACM-20P2		1/4 [0.2]	94.00	12	8	4	3
ACM-20P5		1/2 [0.4]	94.70	21	13	8	7
ACM-21P0		1 [0.75]	95.05	40	13	27	23
ACM-22P0		2 [1.5]	95.10	74	14	59	51
ACM-23P0		3 [2.2]	95.15	107	14	92	79

This watt loss and efficiency data were measured under the following test conditions:

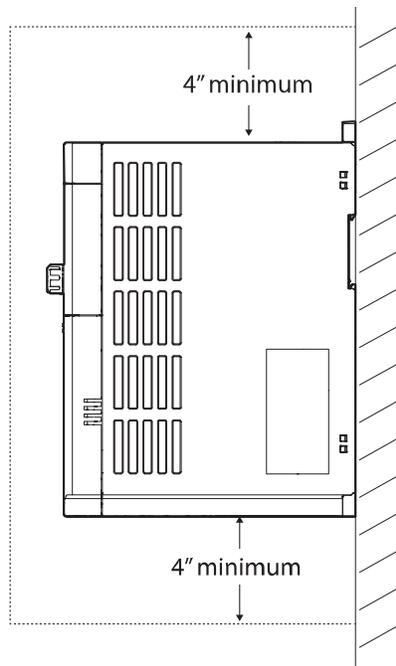
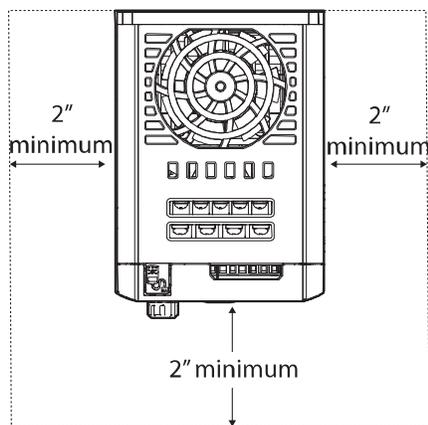
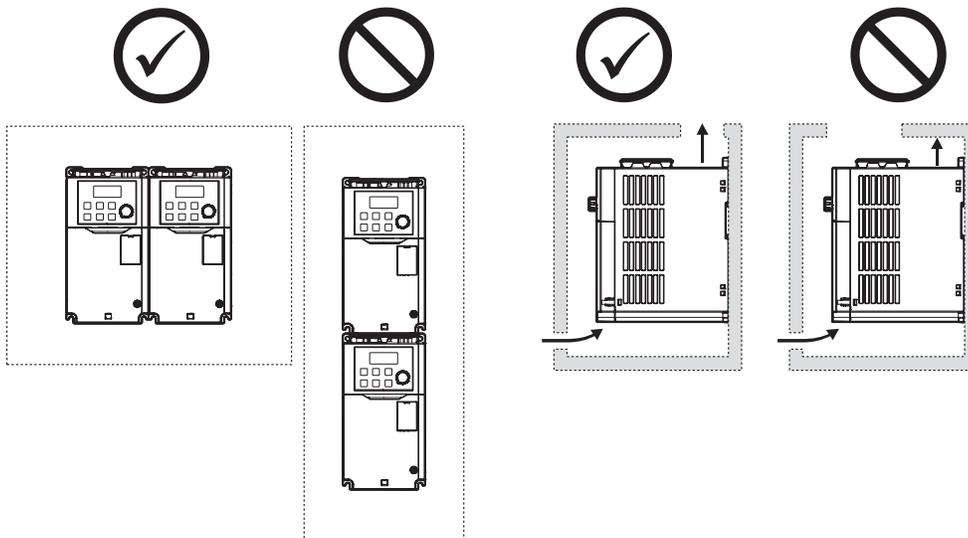
- Operation at 60Hz and room temperature
- 100% load
- Carrier Frequency (Default value)



IronHorse ACM Series Mounting Clearances

ACM Mounting Clearances

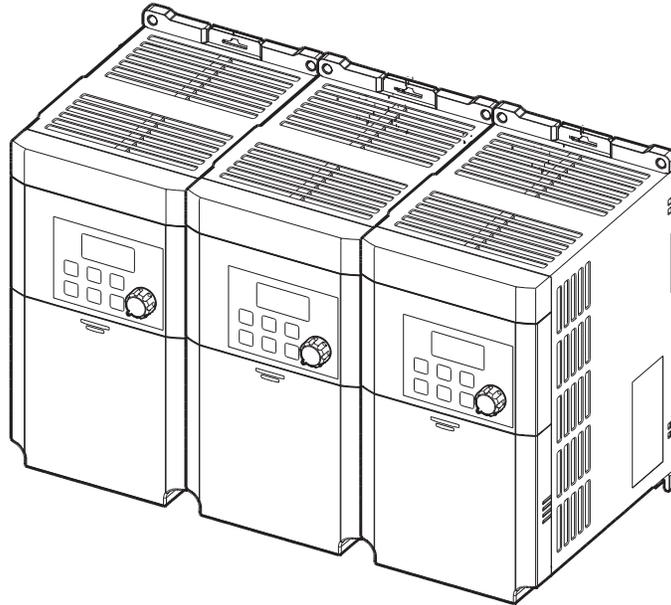
Ensure sufficient air circulation is provided around the drive when it is installed. If the drive is to be installed inside a panel, enclosure, or cabinet rack, carefully consider the position of the drive's cooling fan and the ventilation louver. Cooling fans must be positioned to efficiently transfer the heat generated by the operation of the drive.



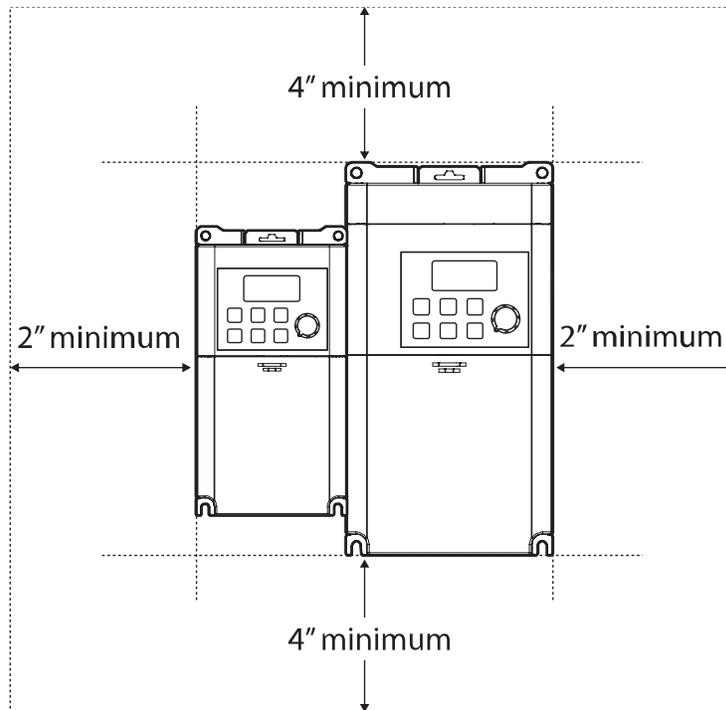


IronHorse ACM Series Mounting Clearances

If you are installing multiple drives in one location, arrange them side-by-side like in the example below.



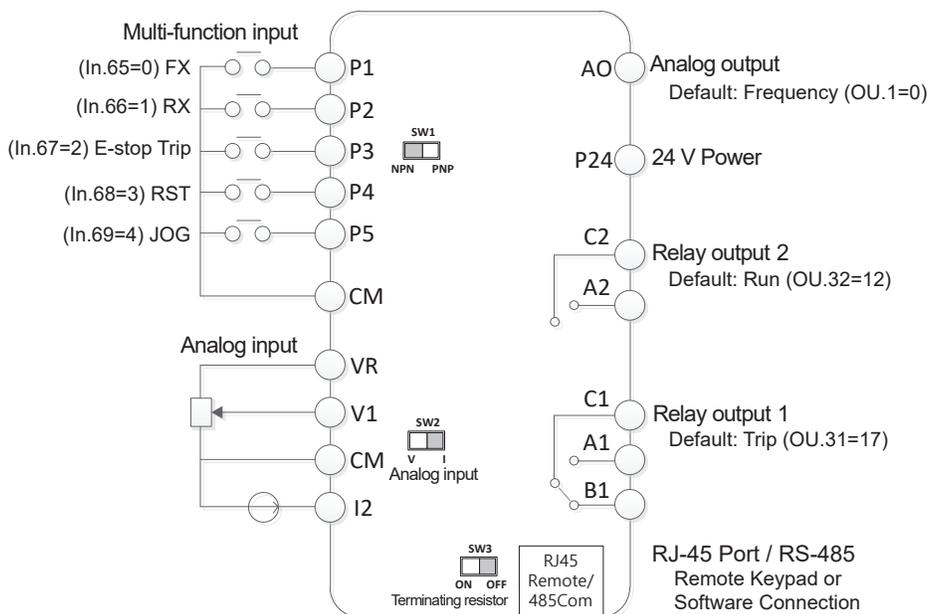
If you are installing multiple drives of different ratings, provide sufficient clearance to meet the clearance specifications of the larger drive.





IronHorse ACM Series Input Terminals

ACM System I/O



Control Terminal Labels and Descriptions			
Function	Label	Name	Description
Multi-function Digital Input Terminal Configuration	P1-P5	Multi-function Input 1-5	Configurable for multi-function input terminals. Factory default terminals and setup are as follows: <ul style="list-style-type: none"> • P1: FX (Forward Run) • P2: RX (Reverse Run) • P3: EST (Emergency Stop trip) • P4: RST (Reset) • P5: JOG
	CM	Common Sequence	Common terminal for all inputs and outputs.
Analog Input Configuration	VR	Potentiometer frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input. <ul style="list-style-type: none"> • Maximum Voltage Output: 12V • Maximum Current Output: 100 mA • Potentiometer: 1-5 kΩ
	V1	Voltage input for control reference	Used to setup or modify a frequency reference via analog voltage input terminal. <ul style="list-style-type: none"> • Unipolar: 0-10V (12V Max.)
	I2	Voltage/current input for control reference	Used to setup or modify a frequency reference via the I2 terminal. Switch between voltage (V2) and current (I2) modes using a control board switch (SW2). <ul style="list-style-type: none"> V Mode: Unipolar: 0-10V (12V Max.) I Mode: Input current : 4-20 mA
Analog Outputs	AO	Voltage output	Used to send inverter output information to external devices: output frequency, output current, output voltage, or a DC voltage. <ul style="list-style-type: none"> • Output voltage: 0-10V • Maximum output voltage/current: 10V / 10 mA • Factory default output: Frequency
Digital Relay Outputs	24	Internal 24V power source	Maximum output current: 50mA
	A1/C1/B1	Fault signal output 1	Sends out alarm signals when the inverter's safety features are activated (250 VAC <1A, 30 VDC < 1A). <ul style="list-style-type: none"> • Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection) • Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection)
	A2/C2	Fault signal output 2	Sends out alarm signals when the inverter's safety features are activated (250 VAC <1A, 30 VDC < 1A). <ul style="list-style-type: none"> • Fault condition: A2 and C2 contacts are connected • Normal operation: A2 and C2 contacts are open connection
Communications	RJ45 Port	RS-485 signals	Remote keypad, ModBus RTU, or software connection

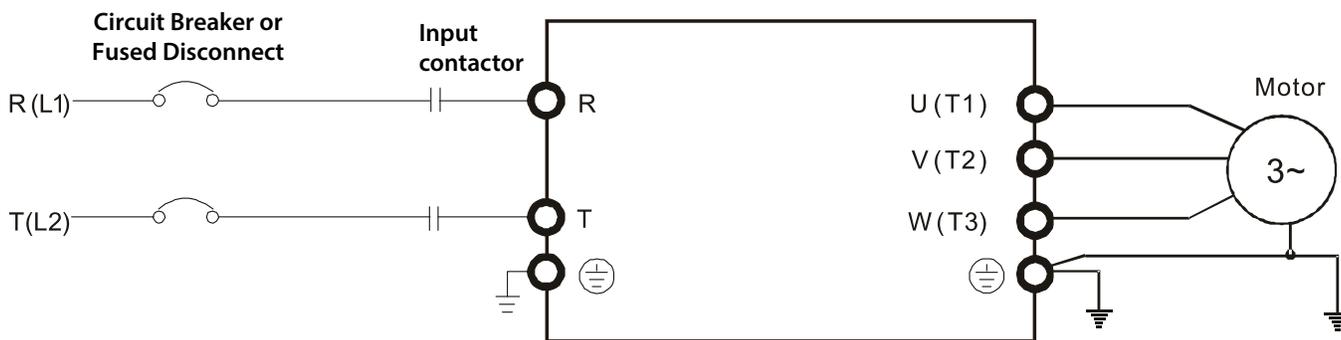


IronHorse ACM Series Basic Wiring

Main Circuit Wiring Diagram

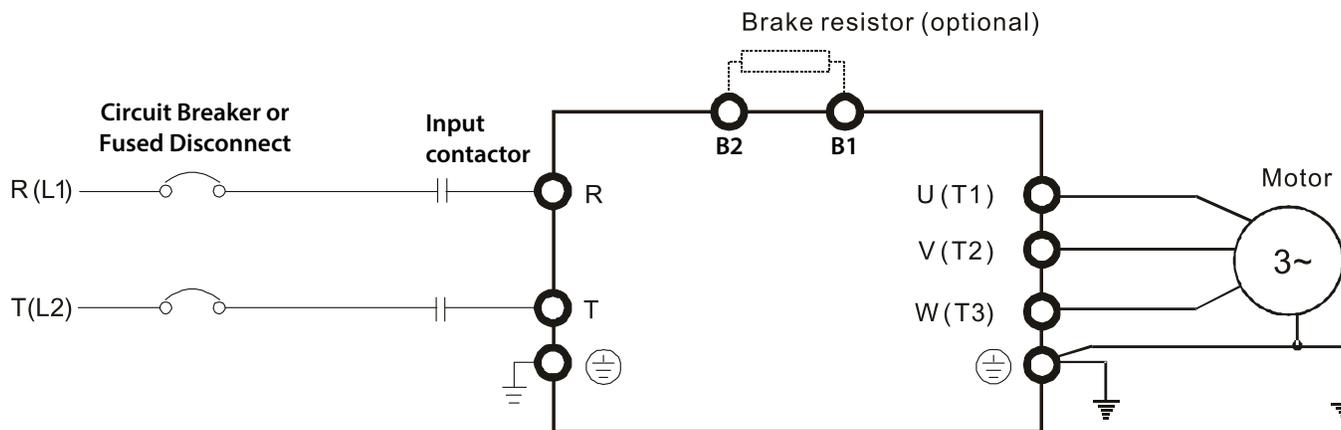
Frame A and B:

- 120V: 0.25 to 0.5 hp
- 230V: 0.125 to 1.0 hp



Frame C:

- 120V: 1.0 hp
- 230V: 2.0 to 3.0 hp



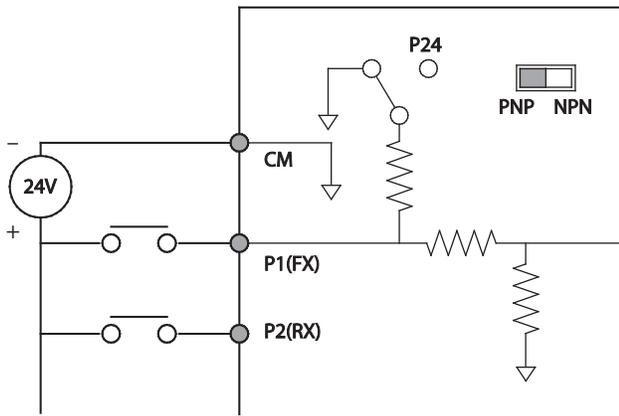
Power Terminal Labels and Descriptions		
Function	Name	Description
R(L1) / T(L2)	AC power input terminal	Mains supply AC power connections.
B1/B2 (for Frame C 120V 1 hp and 230V 2–3 hp only)	Brake resistor terminals	Brake resistor wiring connection.
U/V/W	Motor output terminals	3-phase AC motor wiring connections



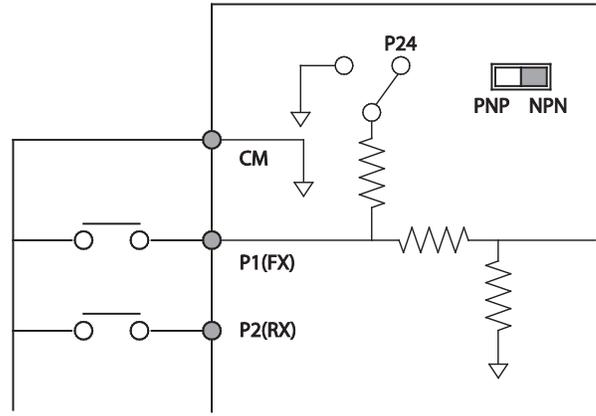
IronHorse ACM Series Basic Wiring

Control Circuit Wiring Diagram: Digital Inputs

Select PNP using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source. If you are using an external 24V source, build a circuit that connects the external source (-) and the CM terminal.



PNP Mode (Source)



NPN Mode (Sink)

2 and 3 Wire Control

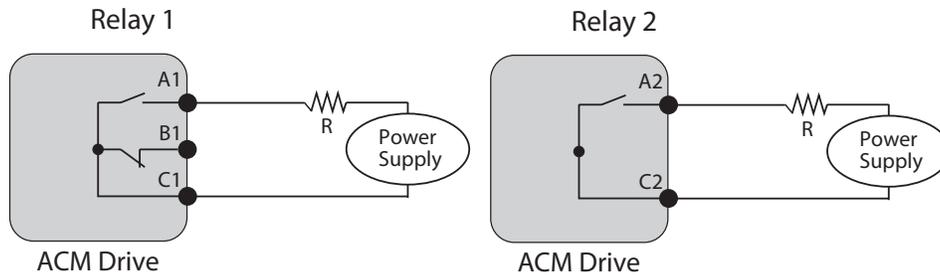
2-Wire Control	
	<p>2-wire control consists of maintained run signals. This can be accomplished via toggle switches, relays, jumpers, etc. Default parameters support this operation.</p> <p>P1=Forward Run (Fx) P2=Reverse Run (Rx) CM=Common</p>
3-Wire Control	
	<p>3-Wire control consists of momentary push buttons to run and stop the VFD. The Forward and Reverse buttons are Normally Open while the Stop button is Normally Closed. Set parameter In.69=17 if using P5 (like below) for the Stop button.</p> <p>P1 = Forward Run (Fx) P2 = Reverse Run (Rx) P5 = Stop (3-Wire) CM = Common Frequency Reference Wiring</p>



IronHorse ACM Series Basic Wiring

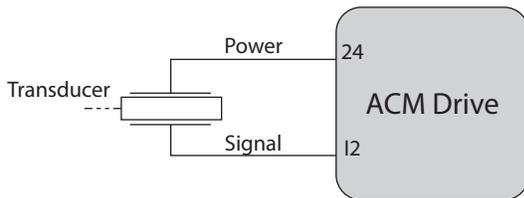
Digital Output Wiring

NOTE: Ensure device current does not exceed 1A.



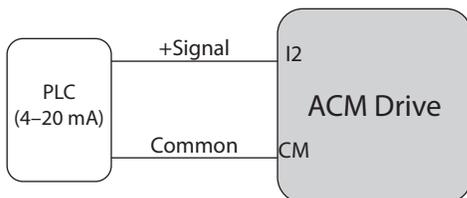
4–20 mA Analog Input Wiring

Transducer (4–20 mA): Transducers are typically 4–20 mA devices which require a 24 VDC power source. For 2-wire transducers connect to the 24 VDC and 4–20 mA input terminals listed below. Connect the positive lead of the device to the 24V terminal and the signal lead to the analog input terminal (I2).



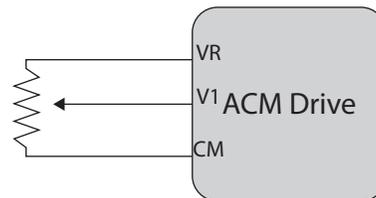
NOTE: Verify that SW2 dip switch on the terminal board to 'II' (down) for 4–20 mA signal.

PLC (4–20 mA): The wiring for connecting a PLC's 4–20 mA output to the analog input of a VFD differs slightly from the transducer wiring discussed above. The positive (signal) lead is wired to the corresponding analog input while the negative (common) lead is wired to the drives common. Reference the figure below.

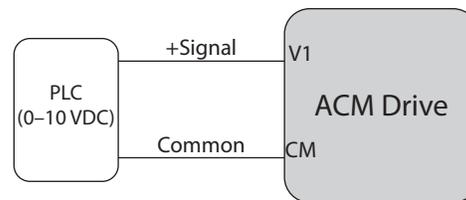


0–10 VDC Analog Input Wiring

Speed POT/Rheostat (0–10 VDC): Speed potentiometers have three wires which must be connected to properly vary a 0–10 VDC signal. The required terminal connections will vary slightly depending on the drive series. Reference the figure below. The wiper of the speed POT should always be connected to the analog input.

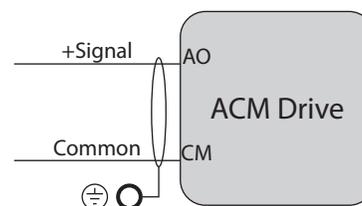


PLC (0–10 VDC): The wiring for connecting a PLC's 0–10 VDC output to the analog input of a VFD differs slightly from the speed POT wiring discussed above. The positive (signal) lead is wired to the corresponding analog input while the negative (common) lead is wired to the drives common. Reference the figure below.



AO Wiring

Wire the drive analog out as follows:





IronHorse ACM Series Accessories

Accessories Available for ACM Drives

ACM Drives Available Software and Accessories	
<i>Accessory</i>	<i>Reference</i>
Remote Keypad: <u>ACM-KPD</u>	Remote Keypad on page tIHA-18
Fuses/Circuit Breakers	Fuses/Circuit Breakers on page tIHA-20
EMI Filters	High Performance EMI Input Filters on page tIHA-21
Braking Resistors	Braking Resistors on page tIHA-23
Line Reactors/Voltage Time Filters	Line Reactors/Voltage Time Filters on page tIHA-22
VFD Suite	VFD Suite on page tIHA-48



IronHorse ACM Series Accessories

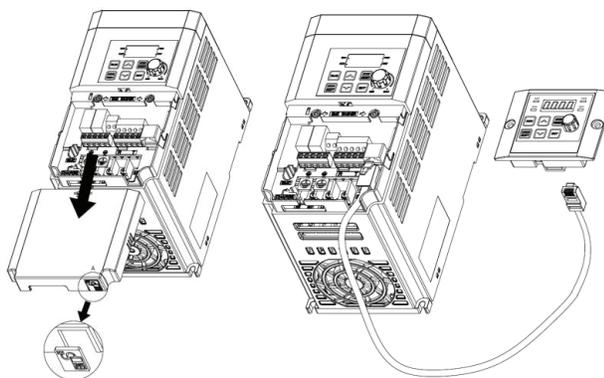
Remote Keypad

The ACM-KPD keypad allows for remote mounting of the standard keypad functionality for the ACM series drives. The keypad can be mounted on an external panel or enclosure and connected to the drive by standard ethernet patch cable.

ACM Remote Keypad			
Part Number	Price	Description	Drawing Links
ACM-KPD	\$49.00	IronHorse ACM series remote keypad, for use with IronHorse ACM series AC drives. (1) 9.8ft/3m Ethernet patch cable included.	PDF



ACM-KPD





IronHorse ACM Series Accessories

Fuses/Circuit Breakers

Protection devices are essential to prevent damage to the ACM drive and application equipment. Please use the fuse specification chart below to select fuses that are applicable to each ACM drive. Only use UL-certified 600V fuses which comply with your local regulations.

Drive	Drive Voltage	HP (HD)	Fuse Amps (Class H or RK5)	Suggested ADC Class RK5 Fuses	Circuit Breaker	
					Size (A)	Model*
ACM-10P2	100-120 VAC	0.25	15	ECSR15	15	GCB100S-2FF15LL
ACM-10P5		0.5	20	ECSR20	15	GCB100S-2FF15LL
ACM-11P0		1.0	30	ECSR30	20	GCB100S-2FF20LL
ACM-20P1	200-240 VAC	0.125	5	ECSR5	15	GCB100S-2FF15LL
ACM-20P2		0.25	5	ECSR5	15	GCB100S-2FF15LL
ACM-20P5		0.5	10	ECSR10	15	GCB100S-2FF15LL
ACM-21P0		1.0	10	ECSR10	15	GCB100S-2FF15LL
ACM-22P0		2.0	15	ECSR15	15	GCB100S-2FF15LL
ACM-23P0		3.0	20	ECSR20	20	GCB100S-2FF20LL

* Gladiator molded case circuit breaker available at [AutomationDirect.com](#)



CAUTION: ONLY USE 600V CLASS H OR RK5, UL LISTED INPUT FUSES AND UL LISTED CIRCUIT BREAKERS. SEE THE TABLE ABOVE FOR THE CURRENT RATINGS FOR FUSES AND CIRCUIT BREAKERS.

MAXIMUM ALLOWED PROSPECTIVE SHORT-CIRCUIT CURRENT AT THE INPUT POWER CONNECTION IS DEFINED IN IEC 60439-1 AS 100 kA. DEPENDING ON THE SELECTED MCCB, THE ACM SERIES IS SUITABLE FOR USE IN CIRCUITS CAPABLE OF DELIVERING A MAXIMUM OF 100 kA RMS SYMMETRICAL AMPERES AT THE DRIVE'S MAXIMUM RATED VOLTAGE.

GLADIATOR MOLDED CASE CIRCUIT BREAKERS WILL PROVIDE THESE SHORT-CIRCUIT CURRENT RATINGS:

- 120 VAC DRIVES: 65 kA AT 60 HZ. 50 kA AT 50 HZ
- 230 VAC DRIVES: 65 kA AT 60HZ. 50 kA AT 50 HZ



IronHorse ACM Series Accessories

High Performance EMI Input Filters

The optional accessories below are available for use with the ACM drive. Selection of these accessories is application specific and may improve drive performance. Additional information regarding filter installation and operation is available in the AutomationDirect white paper, "[Applied EMI/RFI Techniques](#)."

<i>Drive</i>	<i>Drive Voltage</i>	<i>HP (HL)</i>	<i>Roxburgh Filters Chassis Type 1ph *1</i>	<i>Roxburgh Max Performance Filters *2</i>
ACM-10P2	100–120 VAC	0.25	RES90F10	MIF10
ACM-10P5		0.5	RES90F16	MIF16
ACM-11P0		1	RES90S30	MIF23
ACM-20P1	200–240 VAC	0.125	RES90F06	MIF06
ACM-20P2		0.25	RES90F06	MIF06
ACM-20P5		0.5	RES90F10	MIF10
ACM-21P0		1.0	RES90F16	MIF16
ACM-22P0		2.0	RES90S20	MIF23
ACM-23P0		3.0	RES90S30	MIF330B

*1 -EMI rating for motor cable length: C2 to 75ft, C1 to 30ft

*2 -EMI rating for motor cable length: C2 to 150Ft, C1 to 75ft



IronHorse ACM Series Accessories

Line Reactors/Voltage Time Filters

Installing an AC Line Reactor on the input side of an AC motor drive can increase line impedance, improve the power factor, reduce input current, increase system capacity, and reduce interference generated from the motor drive.

Installing a load reactor or voltage time filter on the drive's output side can increase the high-frequency impedance to reduce the dV/dT and terminal voltage to protect the motor. Use output filters if the motor cable length exceeds 100ft or any applications where reduced reflected waves is needed.

ACM Line/Load Reactors & AC Output Filters							
Drive	Voltage	HP	Input (Amps)	Output FLA 3ph (Amps)	AC Input Line Reactor	AC Output Load Reactor	AC dVdT Output Filter *
ACM-10P2	100-120 VAC	0.25	3.7	1.4	LR2-10P2-1PH-A	LR2-20P2	VTF-46-DE
ACM-10P5		0.5	7.4	2.4	LR2-10P5-1PH-A	LR2-20P5	VTF-246-CFG
ACM-11P0		1	13.9	4.2	LR2-11P5-1PH	LR2-21P0	VTF-24-FH
ACM-20P1	200-240 VAC	0.125	1.0	0.8	LR2-20P2-1PH	LR2-20P2	VTF-46-DE
ACM-20P2		0.25	1.8	1.4	LR2-20P2-1PH	LR2-20P2	VTF-46-DE
ACM-20P5		0.5	3.7	2.4	LR2-20P5-1PH	LR2-20P5	VTF-246-CFG
ACM-21P0		1.0	7.1	4.2	LR2-21P5	LR2-21P0	VTF-24-FH
ACM-22P0		2.0	13.6	7.5	LR2-22P0-1PH	LR2-22P0	VTF-246-HKL
ACM-23P0		3.0	18.7	11.0	LR-27P5	LR-25P0	VTF-24-JL

* NEMA 1 filter versions are available. Use the same part number with suffix -N1.



IronHorse ACM Series Accessories

Braking Resistors

Dynamic braking absorbs the motor regeneration energy when the motor is decelerated faster than it would if it was allowed to coast to a stop. The regeneration energy is dissipated by braking resistors. Frame C drives have the braking function built in. The recommended open type or NEMA 1 type brake resistors available at AutomationDirect for each drive model are listed in the table below.

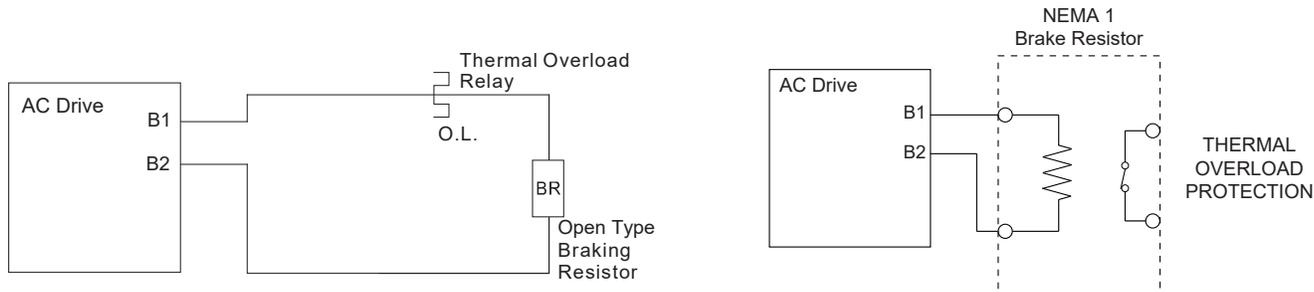
Brake Resistors											
Voltage	Drive	Drive Power (HP)	Drive Braking Capacity-Max Torque			150% Braking Torque @ 5% Duty Cycle					
			Minimum Resistor	Max Total Brake Current (A)	Peak Power (kW)	Open Type Resistors			NEMA1 Resistors with Thermal Switch		
						ADC Part Number	Qty	Total Brake Current (A)	ADC Part Number	Qty	Total Brake Current (A)
120 VAC	ACM-11P0	1.0	120.0	3	0.15	GS-BR-080W200	1	1.9	BR-N1-240W150	1	2.6
	ACM-22P0	2.0	60.0	6	0.3	GS-BR-200W091	1	4.2	BR-N1-280W50	1	7.8
230 VAC	ACM-23P0	3.0	50.0	7	0.4	GS-BR-300W070	1	5.4	BR-N1-280W50	1	7.8

Note: Where noted in resistor quantity, S = series, P = parallel

Brake Wiring

Refer to the diagrams below for examples on how to wire each possible configuration.

Drive + 1 Resistor or NEMA1 Resistor:





IronHorse ACx Series Accessories

VFD Suite Software

VFD Suite is the configuration software for the Automation Direct Ironhorse AC family of variable frequency drives, featuring the ACM and ACG IP20 series and the ACN Nema4X series. It is designed to allow connection of a personal computer to the drives and perform a variety of functions:

- Create new drive configurations
- Upload/Download drive configurations
- Edit/Compare drive configurations
- Utilize Parameter Wizard for easy configuration
- Archive/Store multiple drive configurations on your PC
- Trend drive operation parameters
- Tune the drive PID loop
- View real time key operating parameters
- Start/Stop drive and switch directions, provided drive is set up for remote operation
- View drive faults
- Program Function blocks for simple control applications (ACN series only, 18 steps maximum)

VFD Suite includes a PDF help file for explanation of the software and features. VFD Suite can be downloaded for free from Automationdirect.com.



System Requirements

Category	Requirement
Windows	Windows 8/10/11
Processor	1 GHz or higher
RAM	1 GB (32-bit) or 2 GB (64-bit)
HDD	16 GB (32-bit) or 20 GB (64-bit)
Graphics	Graphic card supporting MS DirectX 9

VFD Suite Components

Ironhorse ACM, ACG, and ACN Drives VFD Suite PLC Programming Software			
Part Number	Price	Description	Drive Compatibility
<u>ACN-VFDS</u>	\$9.25	IronHorse Windows configuration and programming software, USB or free download. For use with IronHorse ACG and ACN series drives. Requires PC serial port, USB-RS232-1 or USB-485M serial adapters.	ACN ACG ACM
<u>ACN-232C</u>	\$86.00	IronHorse programming/communication cable, 3.2ft/1m cable length, RS-232 (RJ45 8P8C) to USB A. For use with IronHorse ACN series drives.	ACN
<u>USB-485M</u>	\$70.00	AutomationDirect PC adapter, USB A to RS-485 (RJ45/RJ12). For use with GS series AC drives, Toshiba AS3 series AC drives, SureServo servo drives, SOLO and ProSense process controllers, CLICK PLCs and P3-550 PLC.	ACN ACG ACM
<u>ZL-RTB-RJ45</u>	\$41.00	ZIPLink feedthrough communication module, 10-position terminal block to RJ45 8P8C female, DIN rail mount.	ACM

* VFDSuite can be downloaded for free or purchased on USB from AutomationDirect.com (search for ACN-VFDS).

** ACM drives require both USB-485M and ZL-RTB-RJ45 to connect to drive through VFDSuite software.