CHAPTER 5

REFERENCE

In This Chapter...

Using IronHorse Motors with AC Drives

IronHorse general purpose motors can be controlled by across-the-line starters such as contactors and manual motor starters. Under certain circumstances, it can be more desirable to control a three-phase IronHorse motor with an AC drive.

Single phase AC motors cannot be controlled by typical AC drives

The advantages of using an AC drive include:

- Lower inrush current at motor startup.
- Ability to change motor speed at any time.
- Greater efficiency in some applications. Fan and Pump applications can use an AC drive to provide motor flow control by varying the motor speed.
- Solid state power delivery meaning minimum maintenance.

There are a few considerations to take into account when an AC drive is chosen for motor control. Fan cooled motors are designed to provide sufficient insulation cooling when the motor is running at the rated speed. The cooling ability of the fan is reduced when motors run at lower speeds. Therefore, there are limitations on how slowly general purpose motors can be continuously run without prematurely causing insulation failure.

- Constant torque (CT) applications – 2:1 (1/2 of the rated speed) – The CT minimum continuous speed for an IronHorse general purpose motor is half of its rated speed, as shown in the motor Performance Data tables. (Constant torque loads require the same amount of torque from the motor regardless of speed; e.g., conveyors, cranes, machine tools.)
- Variable Torque (VT) applications – 5:1 (1/5 of the rated speed) – The VT minimum continuous speed for an IronHorse general purpose motor is one fifth of its rated speed, as shown in the motor Performance Data tables. (Variable torque loads require less torque at lower speeds, resulting in less heat generated by the motor; e.g., fans, centrifugal pumps.)

The insulation of IronHorse motors in both of the above applications can withstand voltage stress per NEMA Part 30 having a value of:

- Base Voltage Rating $\leq$ 600V
- Vpk = 1kV
- Rise Time = 2µs

AutomationDirect offers a line of AC Drives that are suitable for operating IronHorse motors per the above specs and NEMA part 30.

Voltage Spike Considerations for AC Drive Control

All AC drives can cause voltage spikes between the drive and the motor. Long cable lengths can increase these spikes. Therefore, there are maximum cable lengths that can be run between the drive and the motor. Line (load) reactors can also be installed near the drive output to reduce the voltage spikes.

- 230V & 460V without reactor – 125 ft maximum cable length between the drive and motor.
- 230V & 460V with reactor – 250 ft maximum cable length between the drive and motor.

To avoid overheating, the AC Drive carrier frequency must be set at or below 6kHz.

Double Punched Motors

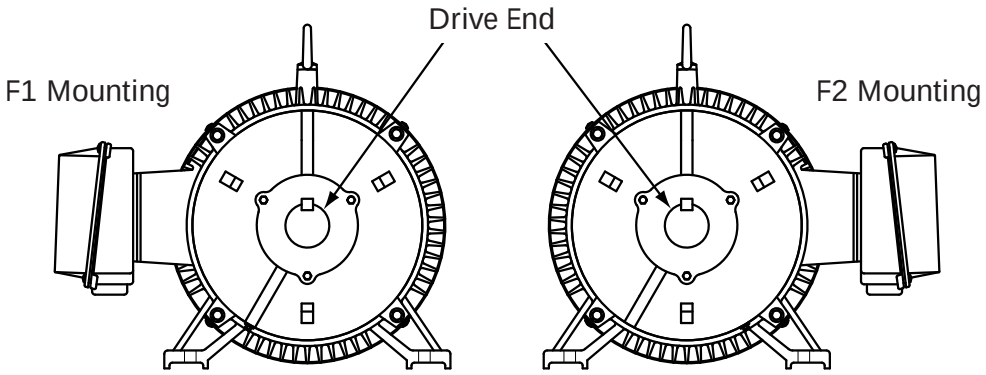
Several IronHorse motor models have mounting feet that are double punched so that larger frame motors can be mounted using the same dimensions of different size frame motors. This can be helpful when replacing a motor with a different frame size. See Chapter 2: Mounting and Initial Startup for complete motor dimensions.

Motor Mounting Bolt Sizes		
Frame Size *	**Double Punched**	**Punched for Additional Frame Size**
56	Yes	143T
143T	No	
145T	Yes	143T
182T	No	
184T	Yes	182T
213T	No	
215T	Yes	213T
254T	No	
256T	Yes	254T
284T	No	
286T	Yes	284T
324T	No	
326T	Yes	324T
364T	No	
365T	Yes	364T
405T	Yes	404T
444T	No	
445T	Yes	444T
445/7T	Yes	445T
449T	No	
**** TC-frame motors have the same mounting foot punching as the comparable T-frame motors.***		

F1 and F2 Mounting

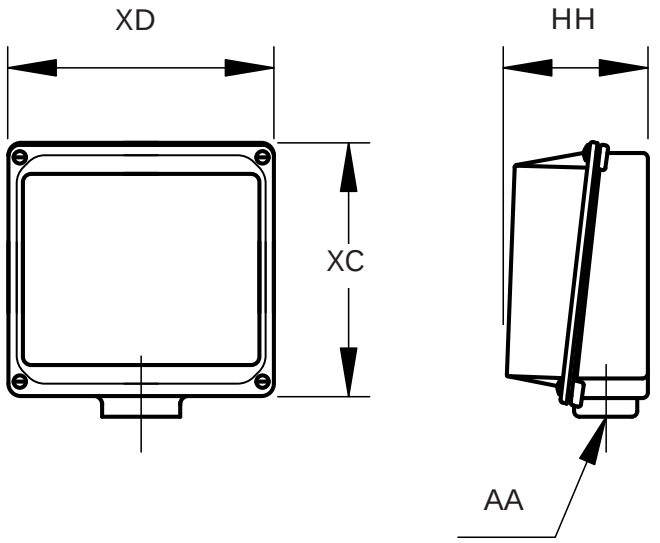
F1 and F2 mounting refers to the location of the junction box on an AC motor. Several models of IronHorse motors can be converted from F1 to F2 mounting.

F1 to F2 Mounting Convertibility	
Frame Size *	**Ability to be Converted**
56	No (F1 only)
143T	Yes (F1, convertible to F2)
145T	
182T	
184T	
213T	
215T	
254T	
256T	
284T	No (F1 only)
286T	
324T	
326T	
364T	
365T	
405T	
444T	Yes (F1, convertible to F2)
445T	
445/7T	
449T	No (F1 only)
**** TC-frame motors have the same convertibility as the comparable T-frame motors.***	



To minimize the potential of damage to any internal component, use caution when pulling the rotor from the frame when converting an IronHorse motor from F1 to F2 mounting. Authorized EASA service centers are equipped with the necessary equipment to quickly and inexpensively convert motor mounting. Visit the EASA website at www.easa.com to find the nearest authorized service center.

Junction Box Dimensions



Junction Box Dimensions				
Frame Size *	**XD Width**	**XC Height**	**HH Depth**	**AA Conduit Hole (NPT)**
56	3.23”	3.7”	1.55”	1/2”
143T	4.1”	4.5”	2.3”	3/4”
145T				
182T	4.6”	5.0”	2.6”	1”
184T				
213T				
215T				
254T	6.3”	7.2”	3.3”	1-1/2”
256T				
284T				
286T				
324T	9”	10.6”	5.3”	2”
326T				
364T				
365T				
405T	9.8”	11.7”	7.1”	3”
444T	11.3”			3” (2 openings)
445T				
445/7T				
449T				

**** TC-frame motors have the same junction boxes as the comparable T-frame motors.***

Minimum Sheave Diameters

The table below illustrates the minimum practical V-belt sheave diameter that can be used with each frame size IronHorse motor.

Minimum Sheave Diameters		
Frame Size (1)	V-Belt Sheave (2)	
	Conventional A, B, C, D and E (3)	Narrow 3V, 5V and 8V (4)
	Minimum Pitch Diameter	Minimum Outside Diameter
143T	2.2”	2.2”
145T	2.4”	2.4”
182T		
184T	3.0”	3.0”
213T		
215T	3.8”	3.8”
254T	4.4”	4.4”
256T	4.6”	
284T	5.0”	
286T	5.4”	5.2”
324T	6.0”	6.0”
326T	6.8”	6.8”
364T	7.4”	7.4”
365T	9.0”	8.6”
405T	10.0”	
444T	11.0”	9.5”
445T	N/A	10.5”
449T		13.2”

Notes:

1) TC-frame motors have the same minimum sheave diameters as the comparable T-frame motors.

2) Sheave dimensions are based on the following:
a) Motor nameplate horsepower and speed.
b) Belt service factor of 1.6 with belts tightened to the belt manufacturers recommendations.
c) Speed reduction of 5:1.
d) Mounting of sheave on motor according to sheave manufacturers instructions.
e) Center-to-center distance between sheaves approximately equal to the diameter of the larger sheave.
f) Calculations covered by the standards listed in notes 2 & 3 below.

3) As covered by IP-20; Specifications for Drives Using Classical V-Belts and Sheaves. Go to www.mpta.org and www.rma.org for details.

4) As covered by IP-22; Specifications for Drives Using Narrow V-Belts and Sheaves. Go to www.mpta.org and www.rma.org for details.

Decibel Levels

The decibel (sound) level of an IronHorse motor should be measured after initial startup, after 30 days, and after six months of use. Decibel levels should remain fairly consistent and can be an indication of misalignment and premature bearing wear. If the measured decibel level for your IronHorse model exceeds the value listed below by more than 10%, contact AutomationDirect or a local motor service technician found at www.easa.com.

Average T-frame Decibel Levels		
Frame Size *	**HP**	**Noise Level: Lw dB(A)**
143T	1	64.0
145T	1-1/2	68.0
	2	68.8
182T	3	74.0
184T	5	73.0
213T	7-1/2	78.4
215T	10	74.3
254T	15	74.6
256T	20	74.0
284T	25	75.0
286T	30	76.1
324T	40	76.4
326T	50	77.0
364T	60	77.1
365T	75	78.0
405T	100	78.1
444T	125	78.3
445T	150	79.4
445/7T	200	79.4
449T	250	81.0
	300	81.4
**** TC-frame motors have the same sound ratings as the comparable T-frame motors.***		

Shipping Crate Dimensions

Nominal Shipping Crate Dimensions		
Frame Size *	**HP**	**Width x Depth x Height (in)**
56C	1/3	15 x 11 x 10
	1/2	
	3/4	
	1	
	1-1/2	17 x 11 x 10
	2	
143T	1	14 x 11 x 17
145T	1-1/2	
145T	2	
182T	3	16 x 14 x 20
184T	5	
213T	7-1/2	18 x 16 x 25
215T	10	
254T	15	31 x 23 x 22
256T	20	
284T	25	33 x 24 x 24
286T	30	
324T	40	36 x 26 x 25
326T	50	
364T	60	39 x 28 x 27
365T	75	
405T	100	44 x 32 x 30
444T	125	47 x 33 x 32
445T	150	
445/7T	200	
449T	250	63 x 33 x 37
	300	
**** TC-frame motors ship in the same crates as the comparable T-frame motors.***		
Shipping weights are listed in the Motor Specifications tables in "Chapter 1: Getting Started."		