ZX900 Electrical Specifications

Electrical specifications for the ZX900 series drive's input and output power are provided in this section.

Input Power

Voltage (Nominal)	240VAC (1-phase or 3-phase)
Voltage (Range)	205-252 VAC (1 or 3-phase)
Frequency (Range)	47-66 Hz
Current (Max. cont.)	30A (rms) 3-phase
Power (Max. cont.)	12.4 KVA
Fuses	40A slow blow—User accessible
Isolation transformer	Not required

The actual input power and current is a function of the operating point of the motor (speed and torque) and the duty cycle. You can de-rate the fuse and the isolation transformer by scaling the above numbers by your actual requirements. The data above reflects the servo motor and drive operating at rated speed and at rated torque at 100% duty.

Output Power

Voltage	405 VDC (maximum)
Frequency	0 - 400Hz fundamental (7 kHz PWM)
Current	40A continuois per phase sinusoidal (28.28 Arms) 80A per phase peak (56.56 Arms)
Regen/power dump	Optional accessory

Motor/Drive Configuration

The ZX900's hardware is pre-configured to control ZX900 series motors. The ZX900 series drives only ZX900 series motors, the ZX800 series drives only Z800 motors, and ZX600 series drives only ZX600 motors. *Be sure that your drive type matches your motor type (Z600, Z800, or Z900).* If you have questions about the ZX Series motor/drive configuration, contact your local Automation Technology Center (ATC) or distributor.

Technical Data ZX900 Series

	Units	ZX-910	ZX-920	ZX-930	ZX-940
Continuous Stall Torque (*±10%)	oz-in lb-in lb-ft Nm	2407 150 12.5 17.0	4263 266 22.2 30.1	5990 374 31.2 42.3	9021 564 47.0 63.7
Peak Torque (*±10%)	oz-in lb-in lb-ft Nm	5205 325 27 37	8525 533 44 60	11980 749 62 85	18041 1128 94 127
Rated Torque (*±10%)	oz-in lb-in lb-ft Nm	1939 121 10.1 13.7	3341 209 17.4 23.6	4830 302 25.2 34.1	7480 467 39.0 52.8
Rated Power	hp kWatts	9.6 7.2	10.4 7.8	11.0 8.2	11.1 8.3
Rated Speed	rpm rps	5000 83.3	3150 52.5	2300 38.3	1500 25.0
Rated Current (line)	A (rms)	27.2	27.7	28.3	28.3
Peak Current (3.3 seconds max)	A (rms)	56.6	56.6	56.6	56.6
Max. Cont. AC input Current (3 phase 240VAC)	A (rms)	30	30	30	30
Rotor Inertia	oz-in^2 (mass) oz-in-sec^2 kg-m^2 x 1E-6	50.79 0.132 92.9	111.21 0.288 2034	166.21 0.431 3040	459.48 1.190 8404
Motor Weight	lbs kg(f)	32 15	57 26	65 29	112 51
Shipping Weight	lbs kg(f)	89 40	114 52	122 55	169 77

ZX900 Indexer/Drive Performance Specifications

Positional Repeatability

Repeatability: ±0.088 degrees, unloaded

Positional Accuracy

Resolver Accuracy: ±7 arc minutes

Resolver-to-Digital Converter Accuracy: ±8 arc minutes *(For finer accuracies, contact Compumotor—800-358-9070.)*

Motor/Drive Compatibility

Different motors can take different amounts of current and require different tuning parameters for typical loads. The **CMTR** (Configure Motor Type) command sets up a drive for a particular motor. By issuing **CMTR**, motor current levels and default parameters are recalled from memory. Do not exceed the current level specified for the motor, excessive current levels will damage the motor.

The following information is provided in case you must modify the motor/drive configuration. This command sequence will set up a drive for a particular motor size and perform the commutation (refer to the ***ZX Indexer/Drive Software Reference Guide*** for more on these commands).

> ***WARNING***
>
> This commutation procedure causes violent motor motion. All loads should be removed from the motor shaft before you begin this procedure.

Command	Description
> 1OFF	Turns drive off
> 1CMTRxxx	Sets drive for the motor; xxx =910, 920, 930, or 940
> 1ON	Enables the drive

Motor Brakes

These brakes are mounted directly behind the motor and come completely assembled from the factory. When ordering the brake option, please specify the motor type.

Brake Characteristics	Z910	Z920/930	Z940	Units
Supply voltage	24	24	24	VDC
Supply current	0.93	1.27	*	A
Static braking torque	1152	6720	*	oz-in

**Same as Z920/930 Characteristics*

Z900 Motor Brake Characteristics

Motor Data

The following pages provide data on each of the four motor frame sizes of ZX900 series systems (ZX910, ZX920, ZX930, ZX940). The data reflecting motor torque does not assume operation from a ZX900 drive. The torque specifications reflect the motor's capabilities. In most cases, the motor windings match the drive's output power with an additional safety margin.

	Motor Size	**Z910**	Value	Units	Tolerance
1	Constant (s):	Torque	88.32	oz-in/A rms	± 10%
2		Voltage (Sinusoidal)	26.7	V rms/Krpm	± 10%
3		Electrical Time	24	milliseconds	nominal
4		Mechanical Time	0.672	milliseconds	nominal
5		Thermal	43	minutes	nominal
6	Torque (s):	Continuous, Stall	2544	oz-in	min. [1]
7		Continuous, Stall	2400	oz-in	min. [2]
8		Continuous, Rated	1939	oz-in	min. [2]
9		Peak, Max w/o Saturation	6835	oz-in	min. [1]
10		Static Friction	40.7	oz-in	max
11		Ripple (of Rated Torque)	4.5	percent	max [3]
12	Speed:	Rated	5000	rpm	reference
13		Maximum	5000	rpm	reference
14	Frequency:	Rated	166.6	Hz	max.
15	Current:	Rated	27.2	A rms	max. [1]
16		Peak	81.4	A rms	nominal
17	Voltage:	Rated	230	V rms	reference
18		Max	250	V rms	maximum
19	Output Power:	Rated	7.2 (9.6)	kWatts (hp)	min. [1]
20	Inductance:	Terminal (line-line)	4.8	mH	± 30%
21	DC Resistance	Terminal (line-line)	0.2	Ohms	± 10% [1]
22	Acceleration at Rated Torque		51971	rads/sec^2	Theoretical
23	Rotor Inertia		929	kgm^2 * 1E-6	nominal
24	Damping		1.728	oz-in / krpm	nominal
25	Weight		32	lbs.	max.
26	Winding Temperature		170 [4]	°C (Celsius)	max.
27	Winding Temperature Rise (Above Ambient) [1]		145	°C (Celsius)	reference
28	Insulation Class		H	—	reference
29	Thermostat TRIP Temperature		135	°C (Celsius)	± 5°C
30	Thermostat RESET Temperature		135	°C (Celsius)	± 10°C
31	Dielectric Strength, (Winding-to-Frame)		1750	VAC	min.
32	Winding Capacitance to Frame		0.00205	µF	max.
33	IP Classification		65 (Shaft [8])	rated	standard
34	Shaft:	Radial-Play (front to back)	2E-5/7E-6	in/lb	reference
35		Material [3]	EC#30	—	reference
36		Magnet Type	NbFeB	—	—
37		Loading [4] 1000 rpm	160	lbs.	max.[7]
		2000 rpm	127.1	lbs.	max.[7]
		3000 rpm	110.9	lbs.	max.[7]
		4000 rpm	100.8	lbs.	max.[7]
		5000 rpm	93.3	lbs.	max.[7]
38	Bearing Class, Internal/External		1/Class 3	ABEC/AFBMA	reference
39	Bearing Grease		SRI#2	Manufacturer	reference
40	Shaft Seal Pressure		0.21 (3)	kg/cm^2 (psi)	max.
41	Basic Motor Design		3 phase *wye* connected 2 (P/2)		
42	Stator Phase Sequence		A-B-C (CW viewed from front face plate)		
43	Resolver Type/Accuracy		oz-in/A rms ±7 arc min.		
44	Resolver Manufacturer/Model #		Facso #21-BRCX-334-J39		
45	Standard Resolver Cable Part Number		71-011776-xx		
46	Standard Motor Cable Part Number		71-011776-xx		
47	Options:	Brake—24VDC (1A)—1152 oz-in Holding Torque			
		IP67 Classification			
		Incremental Encoder			
		Tachometer			
		No Keyway			

[1] 25 °C ambient
[2] 40 °C ambient
[3] Measured at 60 rpm (1 rps) in velocity mode
[4] Rated for 20,000 hours or 40,000 hours @ 155°C
[5] Rotor steel is rated af fatigue proof
[6] Loads centered 1 inch from mounting flange
[7] Loads may be radial and axial such that the sum of the radial and two times the axial does not exceed this figure.
[8] The motor shaft is IP30 rated.

	Motor Size	**Z920**	Value	Units	Tolerance
1	Constant (s):	Torque	154.2	oz-in/A rms	± 10%
2		Voltage (Sinusoidal)	46.6	V rms/Krpm	± 10%
3		Electrical Time	26.9	milliseconds	nominal
4		Mechanical Time	0.6	milliseconds	nominal
5		Thermal	46	minutes	nominal
6	Torque (s):	Continuous, Stall	4518	oz-in	min. [1]
7		Continuous, Stall	4262	oz-in	min. [2]
8		Continuous, Rated	3341	oz-in	min. [2]
9		Peak, Max w/o Saturation	12422	oz-in	min. [1]
10		Static Friction	65	oz-in	max
11		Ripple (of Rated Torque)	4.5	percent	max [3]
12	Speed:	Rated	3150	rpm	reference
13		Maximum	3150	rpm	reference
14	Frequency:	Rated	157.5	Hz	max.
15	Current:	Rated	27.7	A rms	max. [1]
16		Peak	84.8	A rms	nominal
17	Voltage:	Rated	230	V rms	reference
18		Max	250	V rms	maximum
19	Output Power:	Rated	7.7 (10.4)	kWatts (hp)	min. [1]
20	Inductance:	Terminal (line-line)	6.3	mH	± 30%
21	DC Resistance	Terminal (line-line)	0.234	Ohms	± 10% [1]
22	Acceleration at Rated Torque		43133	rads/sec^2	Theoretical
23	Rotor Inertia		2034	kgm^2 * 1E-6	nominal
24	Damping		15.36	oz-in / krpm	nominal
25	Weight		51	lbs.	max.
26	Winding Temperature		170 [4]	°C (Celsius)	max.
27	Winding Temperature Rise (Above Ambient) [1]		145	°C (Celsius)	reference
28	Insulation Class		H	—	reference
29	Thermostat TRIP Temperature		170	°C (Celsius)	± 5°C
30	Thermostat RESET Temperature		135	°C (Celsius)	± 10°C
31	Dielectric Strength, (Winding-to-Frame)		1750	VAC	min.
32	Winding Capacitance to Frame		0.00034	µF	max.
33	IP Classification		65 (Shaft [8])	rated	standard
34	Shaft:	Radial-Play (front to back)	2E-5/7E-6	in/lb	reference
35		Material [3]	RC#30	—	reference
36		Magnet Type	NbFeB	—	—
37		Loading [4] 1000 rpm	255.6	lbs.	max.[7]
		2000 rpm	202.9	lbs.	max.[7]
		3000 rpm	177.2	lbs.	max.[7]
		4000 rpm	N/A	lbs.	max.[7]
		5000 rpm	N/A	lbs.	max.[7]
38	Bearing Class, Internal/External		1/Class 3	ABEC/AFBMA	reference
39	Bearing Grease		SRI#2	Manufacturer	reference
40	Shaft Seal Pressure		0.21 (3)	kg/cm^2 (psi)	max.
41	Basic Motor Design		3 phase *wye* connected 3 (P/2)		
42	Stator Phase Sequence		A-B-C (viewed from front face plate)		
43	Resolver Type/Accuracy		Single-Speed; Rotor-Excited;±7 arc min.		
44	Resolver Manufacturer/Model #		Facso #21-BRCX-335-J39		
45	Standard Resolver Cable Part Number		71-011777-xx		
46	Standard Motor Cable Part Number		71-011777-xx		
47	Options:	Brake—24VDC (1.27A)—6720 oz-in Holding Torque			
		IP67 Classification			
		Incremental Encoder			
		Tachometer			
		No Keyway			

[1] 25 °C ambient
[2] 40 °C ambient
[3] Measured at 60 rpm (1 rps) in velocity mode
[4] Rated for 20,000 hours or 40,000 hours @ 155°C
[5] Rotor steel is rated af fatigue proof
[6] Loads centered 1 inch from mounting flange
[7] Loads may be radial and axial such that the sum of the radial and two times the axial does not exceed this figure.
[8] The motor shaft is IP30 rated.

	Motor Size	**Z930**	Value	Units	Tolerance
1	Constant (s):	Torque	212	oz-in/A rms	± 10%
2		Voltage ()	64	V rms/Krpm	± 10%
3		Electrical Time	31.1	milliseconds	nominal
4		Mechanical Time	0.53	milliseconds	nominal
5		Thermal	50	minutes	nominal
6	Torque (s):	Continuous, Stall	6513	oz-in	min. [1]
7		Continuous, Stall	6144	oz-in	min. [2]
8		Continuous, Rated	4954	oz-in	min. [1]
9		Peak, Max w/o Saturation	17357	oz-in	min. [1]
10		Static Friction	133.2	oz-in	max.
11		Ripple (of Rated Torque)	4.5	percent	max.
12	Speed:	Rated	2300	rpm	reference
13		Maximum	2300	rpm	reference
14	Frequency	Rated	115	Hz	max.
15	Current:	Rated	29	A rms	max. [1]
16		Peak	86.2	A rms	nominal
17	Voltage:	Rated	230	V rms	reference
18		Max	250	V rms	maximum
19	Output Power:	Rated	8.4 (11.3)	kWatts (hp)	min. [1]
20	Inductance:	Terminal (line-line)	8.1	mH	± 10%
21	D.C. Resistance	Terminal (line-line)	0.26	Ohms	± 10% [1]
22	Acceleration at Rated Torque		40357	rads/sec^2	Theoretical
23	Rotor Inertia		3040	kgm^2 * 1E-6	nominal
24	Damping		2.88	oz-in/krpm	nominal
25	Weight		65	lbs.	max.
26	Winding Temperature		170 [4]	°C (Celsius)	max.
27	Winding Temperature Rise (Above Ambient) [1]		145	°C (Celsius)	reference
28	Insulation Class		H	—	reference
29	Thermostat TRIP Temperature		170	°C (Celsius)	± 5 °C
30	Thermostat RESET Temperature		135	°C (Celsius)	± 10 °C
31	Dielectric Strength, (Winding-to-Frame)		1750	VAC	min.
32	Winding Capacitance to Frame		0.0038	µF	max.
33	IP Classification		65 (Shaft [8])	rated	standard
34	Shaft:	Radial-Play (front to back)	2E-5/7E-6	in/lb	reference
35		Material [3]	RC#30	—	reference
36		Magnet Type	NbFeB	—	—
37		Loading [4] 1000 rpm	263	lbs.	max.
		2000 rpm	208.8	lbs.	max.
		3000 rpm	N/A	lbs.	max.
		4000 rpm	N/A	lbs.	max.
		5000 rpm	N/A	percent	max.
38	Bearing Class, Internal/External		1/Class 3	ABEC/AFBMA	reference
39	Bearing Grease		SRI#2	Manufacturer	reference
40	Shaft Seal Pressure		0.21 (3)	kg/cm^2 (psi)	max.
41	Basic Motor Design		3 phase *wye* connected 2 (P/2)		
42	Stator Phase Sequence		A-B-C (CW viewed from front face plate)		
43	Resolver Type/Accuracy		Single-Speed; Rotor-Excited; ± 7 arc min.		
44	Resolver Manufacturer/Model #		Fasco #21-BRCX-335-J39		
45	Standard Resolver Cable Part Number		71-011777-01		
46	Standard Motor Cable Part Number		71-012979-01		
47	Options:	Brake—24VDC (1.27A)—6720 oz-in Holding Torque			
		IP67 Classification			
		Incremental Encoder			
		Tachometer			
		No Keyway			

[1] 25 °C ambient
[2] 40 °C ambient
[3] Measured at 60 rpm (1 rps) in velocity mode
[4] Rated for 20,000 hours or 40,000 hours @ 155°C
[5] Rotor steel is rated af fatigue proof
[6] Loads centered 1 inch from mounting flange
[7] Loads may be radial and axial such that the sum of the radial and two times the axial does not exceed this figure.
[8] The motor shaft is IP30 rated.

	Motor Size	**Z940**	Value	Units	Tolerance
1	Constant (s):	Torque	319	oz-in/A rms	± 10%
2		Voltage ()	96.3	V rms/Krpm	± 10%
3		Electrical Time	56.5	milliseconds	nominal
4		Mechanical Time	0.57	milliseconds	nominal
5		Thermal	56	minutes	nominal
6	Torque (s):	Continuous, Stall	12007	oz-in	min. [1]
7		Continuous, Stall	11328	oz-in	min. [2]
8		Continuous, Rated	9388	oz-in	min. [2]
9		Peak, Max w/o Saturation	32870	oz-in	min. [1]
10		Static Friction	128.6	oz-in	max.
11		Ripple (of Rated Torque)	4.5	percent	max.[3]
12	Speed:	Rated	1500	rpm	reference
13		Maximum	1500	rpm	reference
14	Frequency	Rated	75	Hz	max.
15	Current:	Rated	35.5	A rms	max. [1]
16		Peak	108.5	A rms	nominal
17	Voltage:	Rated	230	V rms	reference
18		Max	250	V rms	maximum
19	Output Power:	Rated	10.4 (14.0)	kWatts (hp)	min. [1]
20	Inductance:	Terminal (line-line)	13	mH	± 10%
21	D.C. Resistance	Terminal (line-line)	0.23	Ohms	± 10% [1]
22	Acceleration at Rated Torque		27613	rads/sec^2	Theoretical
23	Rotor Inertia		8400	kgm^2 * 1E-6	nominal
24	Damping		15.36	oz-in / krpm	nominal
25	Weight		112	lbs.	max.
26	Winding Temperature		170 [4]	°C (Celsius)	max.
27	Winding Temperature Rise (Above Ambient) [1]		145	°C (Celsius)	reference
28	Insulation Class		H	—	reference
29	Thermostat TRIP Temperature		170	°C (Celsius)	± 5 °C
30	Thermostat RESET Temperature		135	°C (Celsius)	± 10 °C
31	Dielectric Strength, (Winding-to-Frame)		1750	VAC	min.
32	Winding Capacitance to Frame		0.0082	µF	max.
33	IP Classification		65 (Shaft [8])	rated	standard
34	Shaft:	Radial-Play (front to back)	1E-5/4E-6	in/lb	reference
35		Material [3]	RC#3	—	reference
36		Magnet Type	NbFeB	—	—
37		Loading [4] 1000 rpm	365.9	lbs.	max.
		2000 rpm	N/A	lbs.	max.
		3000 rpm	N/A	lbs.	max.
		4000 rpm	N/A	lbs.	max.
		5000 rpm	N/A	lbs.	max.
38	Bearing Class, Internal/External		1/Class 3	ABEC/AFBMA	reference
39	Bearing Grease		SRI#2	Manufacturer	reference
40	Shaft Seal Pressure		0.21 (3)	kg/cm^2 (psi)	max.
41	Basic Motor Design		3 phase *wye* connected 3 (P/2)		
42	Stator Phase Sequence		A-B-C (CW viewed from front face plate)		
43	Resolver Type/Accuracy		Single-Speed; Rotor-Excited; ± 7 arc min.		
44	Resolver Manufacturer/Model #		Faxco #21-BRCX-335-J39		
45	Standard Resolver Cable Part Number		71-011777-01		
46	Standard Motor Cable Part Number		71-012979-01		
47	Options:	Brake—24VDC (1.27A)—6816 oz-in Holding Torque			
		IP65 Classification			
		Incremental Encoder			
		Tachometer			
		No Keyway			

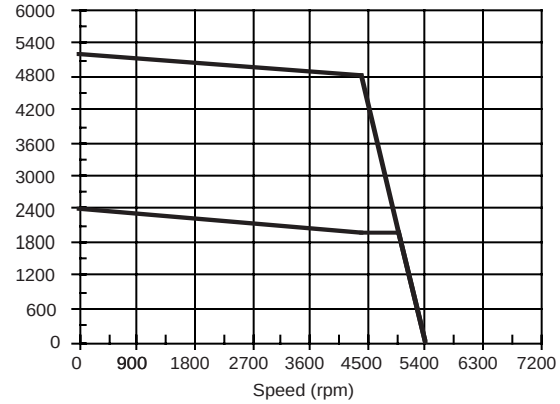
[1] 25 °C ambient
[2] 40 °C ambient
[3] Measured at 60 rpm (1 rps) in velocity mode
[4] Rated for 20,000 hours or 40,000 hours @ 155°C
[5] Rotor steel is rated af fatigue proof
[6] Loads centered 1 inch from mounting flange
[7] Loads may be radial and axial such that the sum of the radial and two times the axial does not exceed this figure.
[8] The motor shaft is IP30 rated.

Z820 Motor Specifications

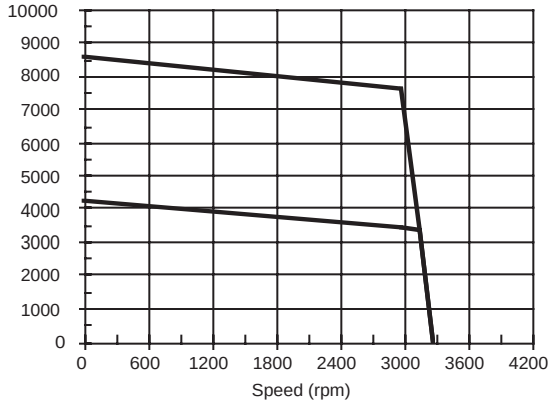
Speed/Torque Curves

The following speed/torque curves represent the available shaft torque at different operating speeds. Operation at 240VAC is shown for each motor size. Actual motor torque may vary ±10% due to motor manufacturing variances.

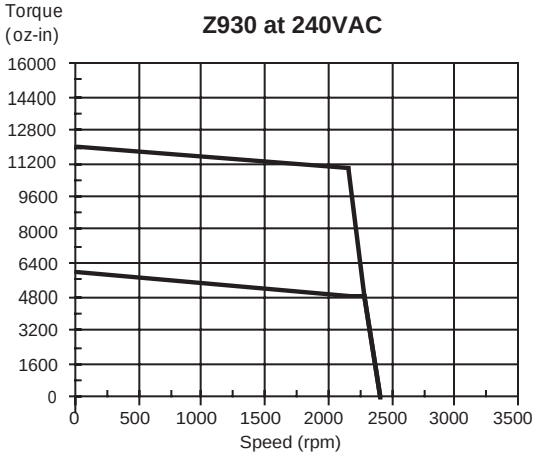
Z910 at 240VAC



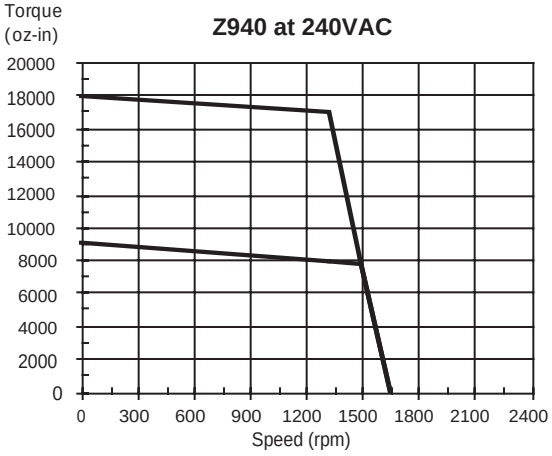
Z920 at 240VAC



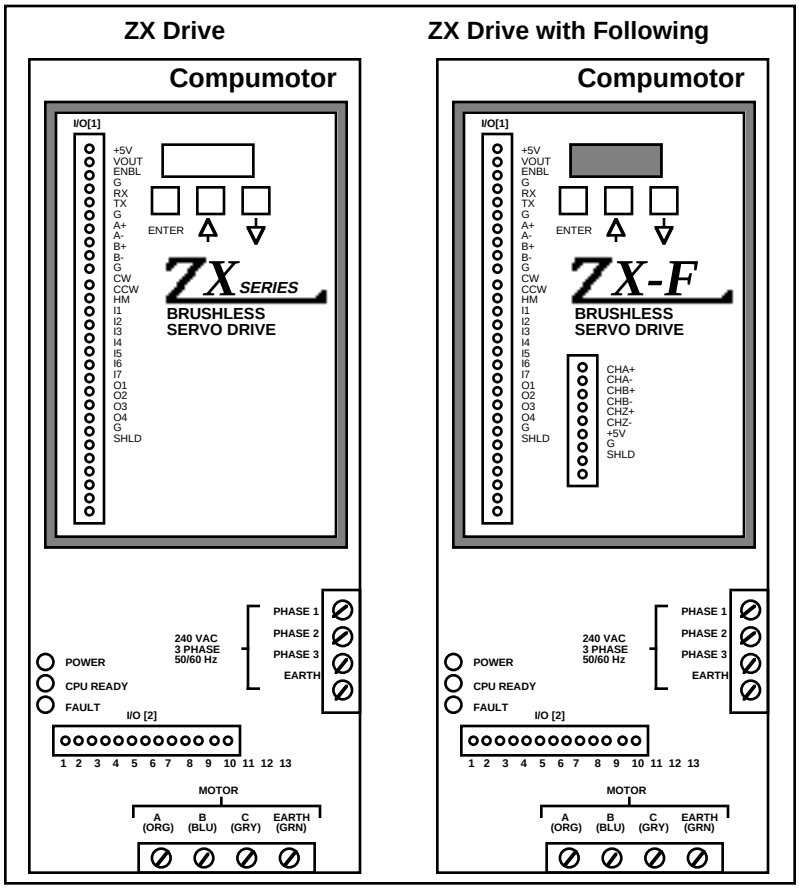
Z930 at 240VAC



Z940 at 240VAC



This section defines the inputs and ouputs that are on the ZX's front panel. Refer to the figure below for the location of the inputs and outputs described in this section.



ZX & ZXF Front Panels

Pin #	Function	Color
1	Shield	—
2	Stator 1	Red
3	Stator 2	Black
4	Stator 3	Green
5	Stator 4	Blue
6	Rotor 1	Brown
7	Rotor 2	White
8	Motor Temp (+)	Yellow
9	Motor Temp (-)	Orange

Resolver Cable Pin-Out

Motor Connector Pin	Color
A	Orange
B	Blue
C	Grey
D	Green

Motor Cable Pin-Out

Programmable Inputs

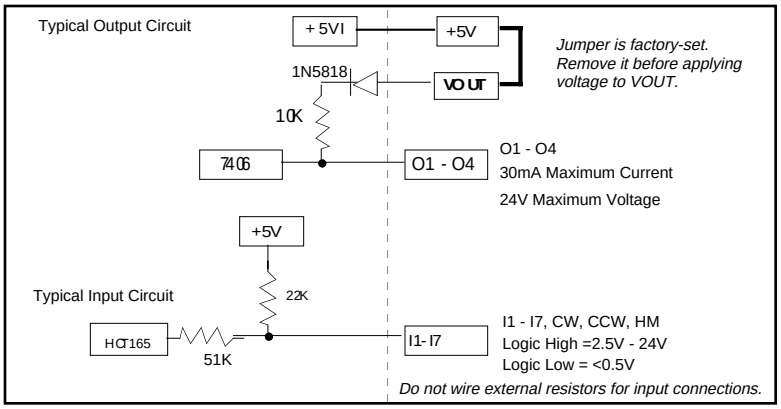
There are 7 inputs, one I/O ground, and one earth ground pin associated with **PROG INPUTS**. The first three inputs are **CCW**, **CW**, and **HM**. These inputs are electronically identical tooinputs **I1** - **I17**. The primary difference between these inputs is that **CCW**, **CW**, and **HM** are dedicated inputs, while **I1**-**I17** have programmable input functions. These

inputs have an internal isolated 5V supply. The figure below represents a typical input circuit. *Input Voltage: 0 - 24VDC (Current limiting resistor not needed).*

Programmable Outputs

The ZX has four programmable outputs that are jumpered at the factory and pulled up to 5VDC through an internal 10K resistor. With the VOUT input, you can pull these outputs up to 24VDC and sink up to 30 mA (max).

Helpful Hint: Output: 5 - 25V and can sink up to 30 mA

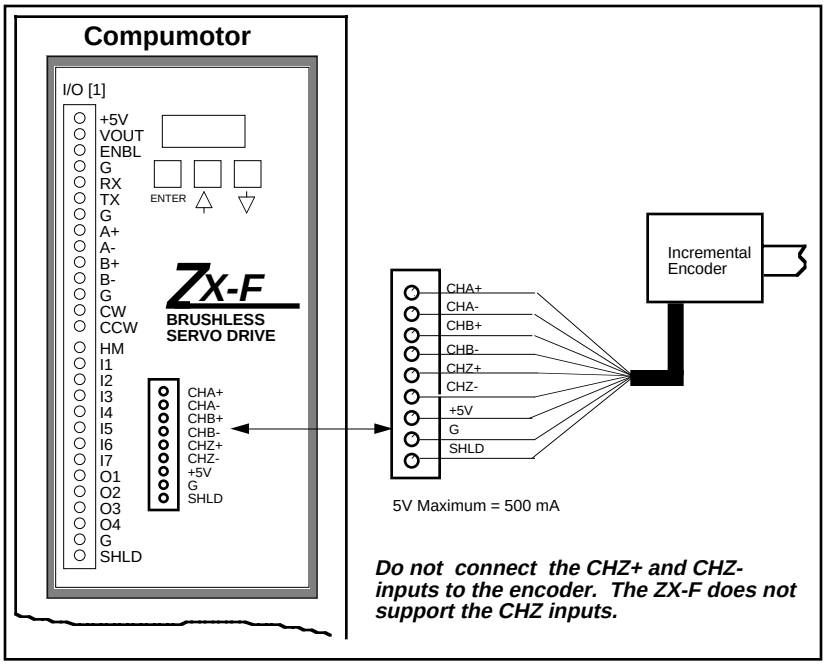


Typical Model Input & Output Circuit

INC Encoder

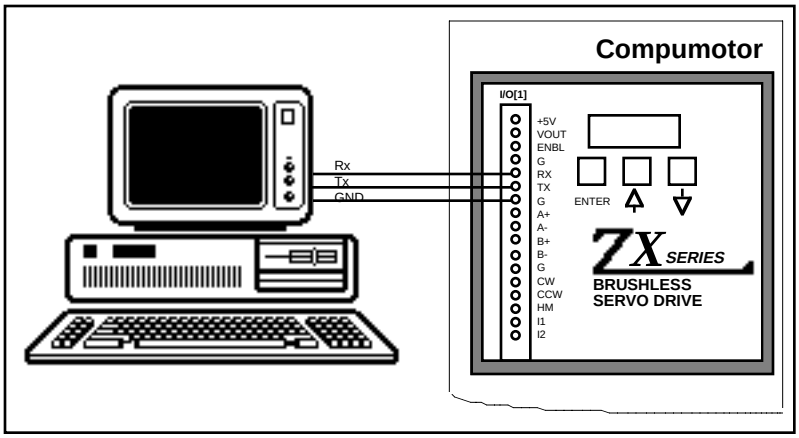
The ZXF's Incremental encoder connector is a 13-pin phoenix connector. The incremental encoder interface accepts two-phase quadrature incremental encoders with differential or single-ended outputs (+5V TTL-compatible). The ZX provides the 5VDC at 500 mA supply for the encoder. The maximum frequency per channel is 800Khz.

Helpful Hint: The ZXF does not use the Z Channel



Incremenal Encoder Connector Description

You can communicate with the ZX via a computer or terminal through RS-232C inputs. You must wire the Tx (Transmit), Rx (Receive), and GND (Logic Ground) inputs as shown in the figure below. The ZX accepts standard EIA RS-232C signals from +15VDC to -15VDC. You can change the baud rate, but the other parameters are fixed. You must configure your computer or terminal to the proper setting.



ZX RS-232C Interface

Factory Default Settings

This section contains the default settings for various ZX/ZXF functions. Your product will be shipped to you with these default settings.

RS-232C Communications

- ❑ Baud Rates: 9600 (default setting), 4800, 2400, 1200, 600, 300
- ❑ Data Bits: 8
- ❑ Parity: None
- ❑ Stop Bits: 1
- ❑ Full Duplex

ZX Device Address

The default address setting is **01**. Refer to *Chapter ② Getting Started* for steps on displaying and modifying the address setting via pushbuttons.

Hardware Interfaces

- ❑ Front panel pushbuttons are enabled
- ❑ Sequence and Ratio Select are disabled
- ❑ RS-232C is enabled
- ❑ Inputs active low and configured as triggers, with dedicated home, CW, and CCW limits
- ❑ Outputs active low, configured as programmable outputs

Limits

- ❑ Hardware limits enabled
- ❑ Software limits disabled

Motion Parameters

- ❑ Acceleration = 10 rps^2
- ❑ Deceleration = 10 rps^2
- ❑ Velocity = 1 rps
- ❑ Motor Resolution = 5,000
- ❑ Distance = 25,000
- ❑ Encoder Resoultion = 4,000

- Use the DR command to display the present configuration of the ZX