

# Shaft Mounted Clutches & Brakes



# Warner Electric

Founded in 1927, Warner Electric has grown to become a global leader in the development of innovative electromagnetic clutch & brake solutions. Warner Electric engineers utilize the latest materials and manufacturing technologies to design long life, easy-to-use clutches and brakes that provide improved accuracy and repeatability. Warner Electric offers the broadest selection of industrial clutches, brakes, controls and web tension systems available from a single manufacturer.

Reliable Warner Electric components are used in a wide range of markets including material handling, packaging machinery, food & beverage, elevator & escalator, turf & garden, agriculture, off-highway, forklift, crane and motion control. Applications include conveyors, lift trucks, wrapping machines, servo motors, capping equipment, combines, balers, baggage handling systems, military vehicles, hoists and lawn mowers.


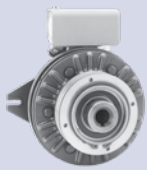

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# Shaft Mounted Clutches & Brakes

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# Packaged Performance Products

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## Electromagnetic Clutches and Brakes

### Packaged Products Benefits

Warner Electric Packaged Products come pre-assembled, ready to install right out of the box.

Warner Electric Packaged Products consist of a single part number in most cases. One part number to inventory, one part number to track in your engineering system.

All Warner Electric packaged products incorporate our Autogap™ mechanism that automatically adjusts for wear. This eliminates the need for maintenance, but more importantly, it ensures the same engagement time cycle after cycle after cycle through the whole life of the unit ensuring consistent product manufacturing processes.

Warner Electric Packaged designs are available for:

- C-face mount applications
- Parallel shaft applications
- Base mount applications

### The Basics

The electric clutch and brake has been called the best thing that ever happened to the electric motor. It's simple, electric clutches and brakes do all the work, while permitting motors to run smoothly and continuously at their most efficient speed by connecting/disconnecting the motor and the load. Fast starts and stops, easy control interface, remote pushbutton operation and smooth acceleration and deceleration are outstanding user benefits.

### Reliable Performance

- High cycle rates
- Smooth soft starts
- Cushioned stops
- Accurate positioning
- Indexing
- Jogging
- Reversing
- Speed changing



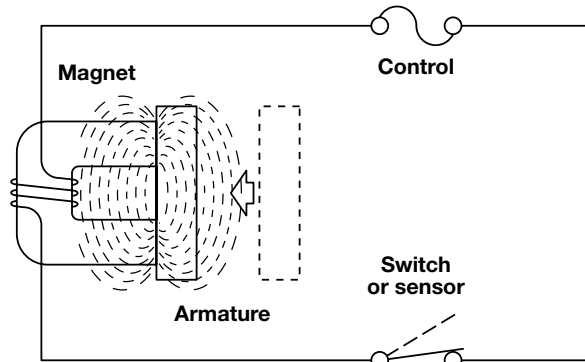


# Packaged Performance Products

## Electromagnetic Clutches and Brakes

### Principle of Operation

A key feature of Warner Electric brakes and clutches is the method of actuation. Like an electromagnet, they have two basic parts. A magnetic field is generated as soon as the current flows through the magnet coil. This draws the armature into direct contact with the magnet. The strength of the magnetic field is directly proportional to the amount of current applied. Full range torque control from 0 to 100% is as simple as turning the knob on a light dimmer.



### Fast and Accurate

The benefits of electric actuation combined with the use of small, low inertia components is fast response, high cycle rates, and increased accuracy. While other devices are often sluggish and slow to respond, electric brakes and clutches respond instantly, resulting in higher productivity and better consistency.

### Easy to Select

Most of the time, all you need to know is motor horsepower and the speed at the brake or clutch location. Warner Electric takes care of the rest. The performance you require is built in, and with the broad range of products to choose from, you won't have to compromise with a clutch or brake that's a little too big or a little too small.

### Maintenance Free

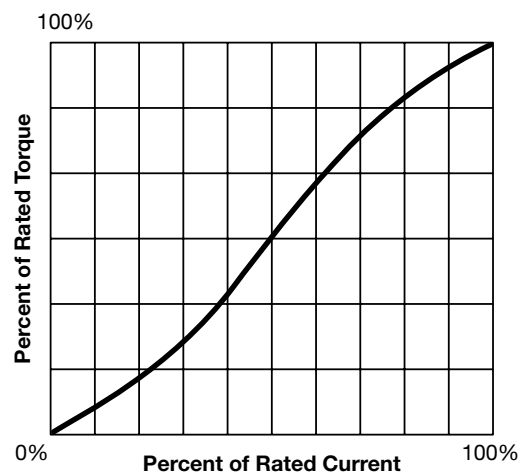
Warner Electric brakes and clutches are clean and quiet. They require no maintenance. They never need lubrication, and they're completely self adjusting for wear. No complicated air system or messy hydraulics. Warner Electric brakes and clutches are outstandingly trouble free.

### Controllable

Electric brakes and clutches are incredibly easy to control. The shift from positive, instantaneous engagement to soft, cushioned starts and stops is as simple as turning a knob.



### Torque/Current Curve



# Packaged Performance Products



## NEMA C-face Clutches, Brakes and Clutch Brake Combinations P-8586-WE

### Electro Module

#### Individual Clutch and Brake Modules



#### EM Series

##### Modular Components that are Easily Combined

- 5 sizes
- 16 clutch and brake modules
- 16 to 95 lb. ft. torque range

Individual modules may be used in combination to form clutches, brakes or clutch/brake packages.

Electro Modules can be bolted directly to NEMA C-face motors or reducers, or base mounted for stand alone operation.

See P-8586-WE for Service Parts

### UniModule®

#### One Piece Preassembled Clutches and Clutch/Brakes



#### UM Series

##### C-face or Base Mounted Units

- 5 sizes
- 20 combinations
- 16 to 95 lb. ft. torque range

UniModule clutches and clutch/brake packages offer the ultimate in installation convenience.

Can be motor or reducer mounted, or used as a separate drive unit powered from a prime mover.

See P-8586-WE for Service Parts

#### UM Smooth-Start

##### Soft Engage Designs

- 5 sizes
- 10-57 lb.ft. torque range

Smooth-Start designs allow for a soft engage clutch and brake without sacrificing unit life.

#### UM-C Series

##### High Performance Version for High Cycle Rate Applications

- 3 sizes
- 6 combinations
- 16 to 95 lb. ft torque range

The UM-C units are UniModules with ceramic faced components, specifically designed for long life, high energy, and high cycle rate applications.

### Enclosed UniModule®

#### Preassembled Units Offer Clean, Quiet Operation



#### EUM Series

##### Totally Enclosed Clutch and Brake Packages

- 5 sizes
- 3 combinations
- 16 to 95 lb. ft. torque range

Totally enclosed, rugged enclosure keeps wear particles in and contaminants out. Finned for rapid heat dissipation and long life.

See P-8586-WE for Service Parts

#### EUM-W Series

##### Washdown Version

- 5 sizes
- 8 combinations
- 16 to 95 lb. ft. torque range

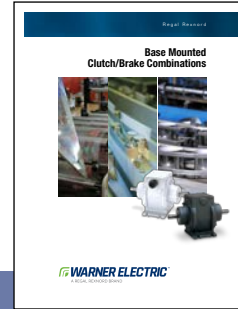
The washdown version of the EUM uses stainless steel shafting, USDA approved coating, corrosion resistant fasteners and special seals.

See P-8586-WE for Service Parts

# Packaged Performance Products



## Shaft Mounted Clutches & Brakes P-8587-WE



## Base Mounted Clutch/Brake Combinations P-8588-WE

### Electro Clutches Electro Brakes

#### Shaft Mounted Units



#### EC Series Clutches

##### Pre-Packaged Convenience

- ☐ 6 sizes
- ☐ 16 to 465 lb. ft. torque range

All the features of an electric clutch in a convenient, pre-packaged assembly. Mounts on any through shaft or extended motor shaft. Easy-to-assemble with standard sheaves, pulleys, gears and sprockets. Packaged design. No assembly required. Long life. No maintenance.

See P-8587-WE for Service Parts

#### EB Series Brakes

##### Torque Arm Mounting

- ☐ 6 sizes
- ☐ 16 to 465 lb. ft. torque range

Torque arm feature makes Electro Brakes easy to mount on any motor or through shaft. Packaged design. No assembly required. Long life. No maintenance.

See P-8587-WE for Service Parts

### Advanced Technology Clutches and Brakes

#### Extra Rugged Design



#### ATC Series Clutches ATB Series Brakes

#### Replaceable Friction Faces

- ☐ 3 sizes
- ☐ 25 to 115 lb. ft. torque range

Rugged, heavy duty units designed for extra long life and efficient operation. Cast components for durability. Finned armatures for high heat dissipation.

Friction faces are designed to allow for replacement without replacing valuable, non-wear components. Provides superior wear life with reduced engagement noise.

See P-8587-WE for Service Parts

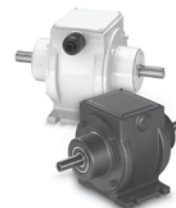
#### SFP Series Clutches

- ☐ Pre-assembled SF – No assembly required
- ☐ Ball bearing mounted field and armature
- ☐ 70 inch pound and 270 inch pound sizes
- ☐ Bore sizes from 3/8" to 1/2" and 1/2" to 1"

SFP clutches provide the simplicity and cost efficiency of the Basic SF design, but with a ball bearing mounted armature hub.

### Electro Pack Clutch/Brakes

#### Foot Mounted Units



#### EP Series

##### Totally Enclosed Units

- ☐ 8 sizes
- ☐ 15 lb. to 1350 lb. ft. torque range

Electro Packs are rugged, pre-assembled clutch and brake combinations in enclosed, foot mounted housings.

See P-8588-WE for Service Parts

#### EP-C Series

##### High Performance Version

- ☐ 2 sizes
- ☐ 15 and 70 lb. in. torque

Ceramic faced wear components provide long life for high cycle rate use. Consistent torque and cycle repeatability with Smooth-Start/stop control.

#### EP-W Series

##### Washdown Design

- ☐ 2 sizes
- ☐ 70 and 270 lb. in. static torque ranges
- ☐ USDA approved coating
- ☐ Stainless steel shaft and hardware
- ☐ Available in 24 or 90 volt DC

# Packaged Performance Products



## Electrically Released Spring-Set Brakes & Unibrake AC Motor Brakes P-8589-WE

### Spring-Set Brakes

For Power-Off Static Holding and Emergency Stopping Applications

**WARNING** For general use in horizontal shaft applications only. For possible vertical applications, contact technical support.



#### ERS Series

Static Engaged

- 5 sizes
- 1.5 to 100 lb. ft. holding torque

Designed for static holding. ERS models feature multiple coil springs that force armature and friction faces together to generate braking torque when power is off. The Electromagnet counters the spring force to disengage the brake when power is applied.

Although this brake should be engaged only when the shaft is at rest, it can occasionally act as a dynamic braking device to stop a rotating load in an emergency situation.

#### Spring Set Brake Module

- 7 to 100 lb. ft. holding torque
- NEMA C-face version of the ERS Series



#### ERD Series

Dynamic Braking

- 8 sizes
- 4 to 221 lb. ft. holding torque

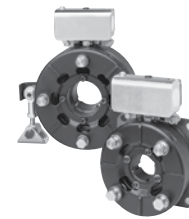
ERD units are electrically released, static and dynamic engaged, spring-set brakes for power-off load holding applications. These spring-set brakes automatically stop and hold a load in the event of a power failure or other emergency stop situations. Fully dynamic friction material allows for repeated braking cycles from full motor speed with no torque fade. An optional manual release allows the brake to be released by hand.

#### Unibrake Series AC Motor Brakes

- Spring Set/Solenoid Released
- Direct acting/manual release standard 3 families
- 3, 6, 10 and 15 lb. ft. capacity
- Steel or cast iron covers
- Rear mount or double C-face designs

### Permanent Magnet Brakes

For Power-Off Dynamic Stopping and Cycling Applications



#### FB Series

Shaft Mounted, Dynamic Braking

- 3 models
- 10.5 to 56 lb. ft. static torque

Permanent magnet brakes are designed to dynamically stop and hold a moving load and also for high cycle rate stopping. Electric power to the coil nullifies the attraction of the permanent magnet, releasing the brake.

FB models are pre-assembled and feature a torque arm for convenient shaft mounting.

See P-8590-WE for Service Parts.

#### ER Series

Flange Mounted, Dynamic Braking

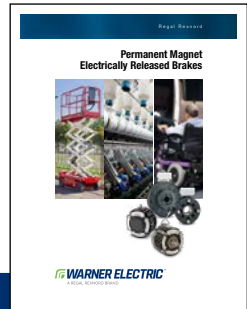
- 5 models
- 10.5 to 400 lb. ft. static torque

The ER style brake offers a bulk head flange mounting system, the highest torque rating offered by Warner Electric in the power released series, high cycle rate capability, and excellent life. They require some assembly.

See P-8590-WE for Service Parts.



## Permanent Magnet Electrically Released Brakes P-8590-WE



### Electro Module

#### C-face Brake Modules



#### EM-FBC Clutch/Brakes

##### Individual Module Components

- ❑ 3 sizes
- ❑ 10.5 to 56 lb. ft. torque range

Used in combination with an Electro Module motor or input clutch module for clutch/brake applications. Electrical power applied to the brake coil nullifies the permanent magnets' force and the brake releases. No springs to limit cycle rates.

#### EM-FBB

##### Brake Modules

- ❑ 5 sizes
- ❑ 10.5 to 56 lb. ft. torque range

Use for brake alone applications. Mounts between a C-face motor and reducer. Recommended for dynamic cycling operations only.

#### EM-MBFB

##### Motor Brakes

- ❑ 4 sizes
- ❑ 56C to 215C frame motors

Mounts to the back of a double shafted C-face motor. Never needs adjustment or lubrication.

### UniModule

#### C-face Brake Modules



#### UM-FBC Clutch/Brakes

##### One Piece Packages

- ❑ 4 sizes
- ❑ 7 combinations
- ❑ 10.5 to 56 lb. ft. static brake torque

UniModule pre-assembled clutch and electrically released brake packages are available in both C-face and base mounted versions.

Unique design employs powerful permanent magnets for maximum torque when power is removed from the brake coil. A small amount of electrical power applied to the brake coil nullifies the permanent magnets and the brake releases. No springs to limit cycle rates. Never any adjustment. No lubrication. These brakes are recommended for dynamic cycling operations only.

### Enclosed UniModule

#### C-face Brake Modules



#### EUM-FBB Brake Modules

##### Totally Enclosed

- ❑ 4 sizes
- ❑ 6 to 32 lb. ft. static torque

Totally enclosed UniModule electrically released brake packages keep contaminants out and wear particles in for clean, quiet operation. Assembly, alignment, and preburnishing have been done at the factory. Use for brake alone applications, mountings between a motor and a gear reducer. Select the torque required for the application. Higher torque brakes stop loads faster. Lower torque models provide softer stopping to prevent boxes on conveyors from tipping or skidding.

#### EUM-MBFB

##### Motor Brakes

- ❑ 4 sizes
- ❑ 56C to 215C frame motors

UniModule motor brakes are used for dynamic stopping and holding of loads when power is removed from the motor. Typical applications include conveyors, process equipment, and lifting devices. Mounts to a double shafted C-face motor.



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# **Electro Clutches and Brakes**

## **Advanced Technology Clutches and Brakes**

### **Packaged Stationary Field Clutches**



**A**

# EC / EB Series Electro Clutches and Brakes

## Shaft Mounted Clutches and Brakes

### Shaft Mounted Clutches

#### EC Series

All the features of an electric clutch in a convenient, preassembled package. Mounts on any through shaft or double shafted motor. Easy-to-assemble with standard sheaves, pulleys, gears and sprockets.

Available in a wide range of bore sizes. Shaft extension makes pulley or sprocket installation easy.

### Shaft Mounted Brakes

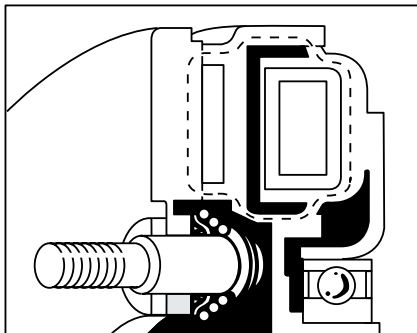
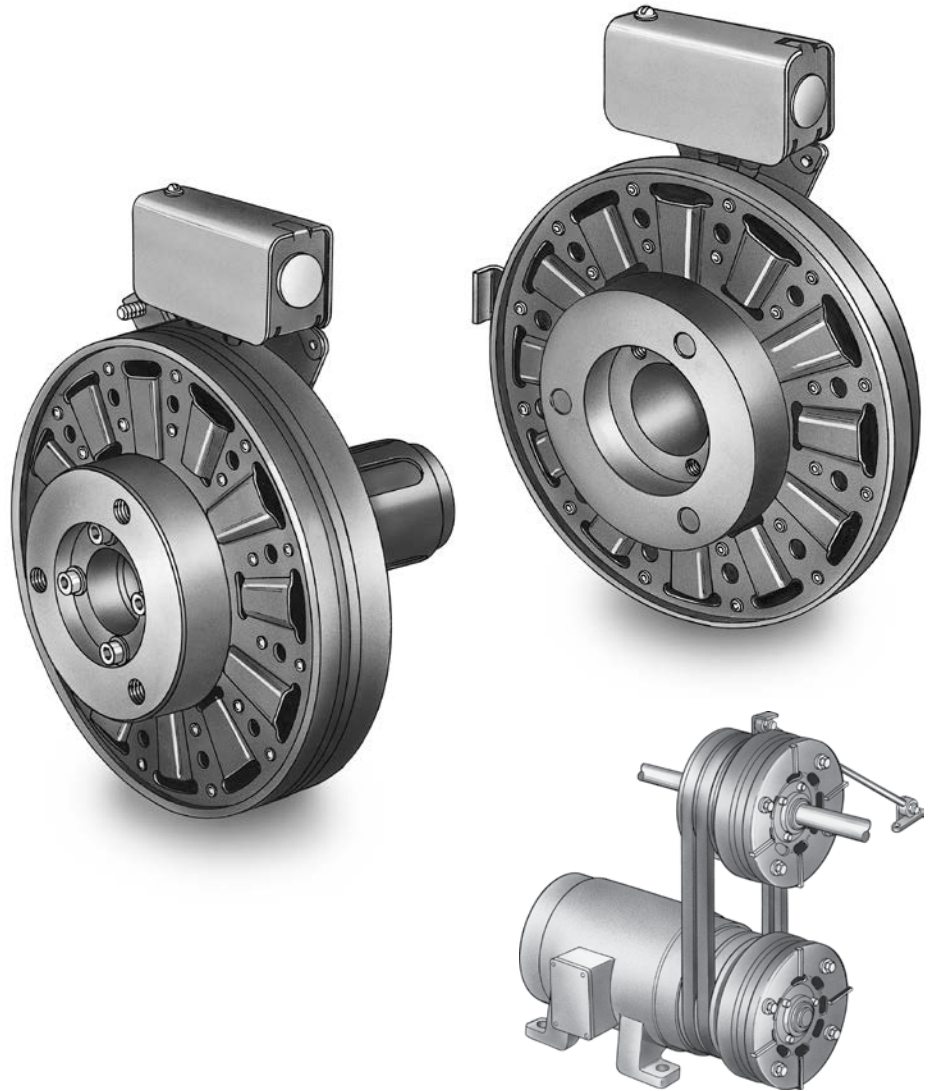
#### EB Series

Electro Brakes mount directly on a motor or through shaft for basic braking functions.

Torque arm feature makes Electro Brakes easy to install on any through shaft or double shaft motor.

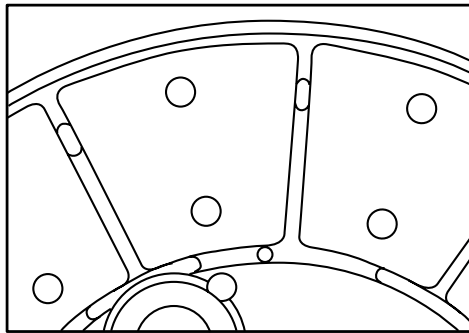
Segmented and fluted armature disc provides maximum cooling of friction surfaces.

- Six sizes of clutches and brakes
- 16 lb. ft. to 465 lb. ft. torque range
- Preassembled. Factory aligned.
- Mounting flexibility
- Simple to install



#### Brushless Design

Warner Electric designed electromagnetic circuit eliminates brushes.



#### Heat Dissipation

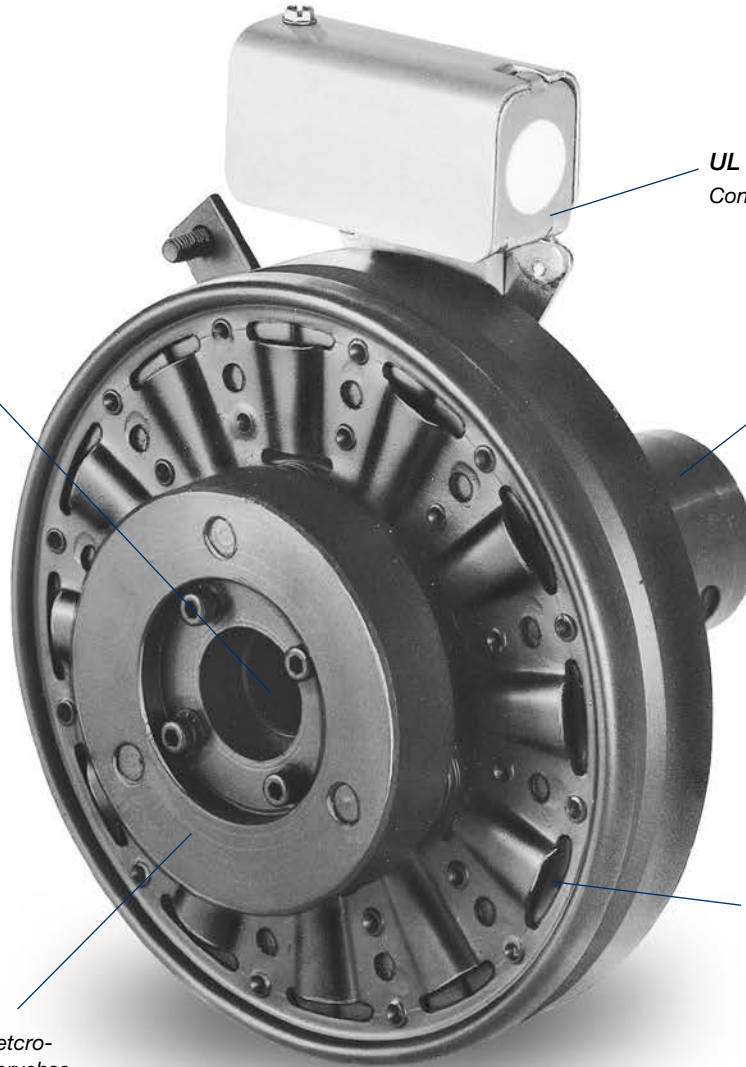
Specially designed segmented armature disc is segmented and fluted to provide maximum cooling of friction surfaces. Automatically adjusts for wear.

Motor mounted Electro Clutch used in combination with an Electro Brake on a through shaft installation.



# EC Series Electro Clutch

## Shaft Mounted Clutches



### UL listed

Conduit box meets industry standards.

### Simple installation

Easy-to-install a pulley, sprocket, sheave or gear on the Electro Clutch shaft extension.

### Long life – no maintenance

Specially designed armature disc is segmented and fluted to provide maximum cooling of friction surfaces. Automatically adjusts to wear.

### Mounting flexibility

Standard Electro Clutches are offered in a wide variety of bore sizes.

### No brushes to wear out

Warner Electric designed electro-magnetic circuit eliminates brushes.

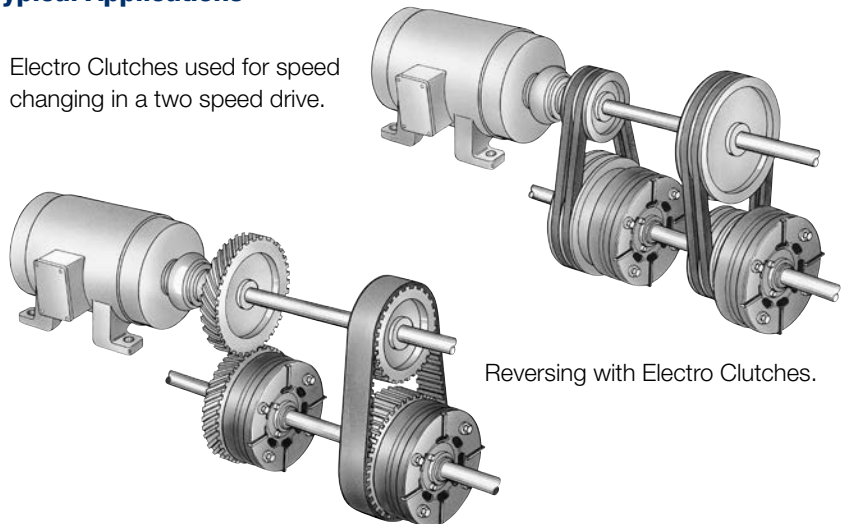
## Packaged Performance

The engineering is built-in. Warner Electric Packaged Performance products are factory aligned and pre-assembled. They have been designed to mate easily with industry standard motors, reducers and other power transmission components. "Bolt-it-down and wire-it-up". . . they're ready to go.

- Hubs mate to standard sheaves, sprockets, gears and pulleys
- Wide torque range from 16 to 465 lb. ft.
- Handle 1 to 20 HP at 1800 RPM

## Typical Applications

Electro Clutches used for speed changing in a two speed drive.



Reversing with Electro Clutches.

# EC Series Electro Clutch

## Selection/Ordering Information

### Selection Procedure

1. Determine the motor horsepower and r.p.m. at the clutch location.
2. Use the Horsepower vs. Shaft Speed chart to determine the right size Electro Clutch.
3. When ordering, specify bore size and voltage.
4. To get maximum performance from your Electro Clutch, use a Warner Electric Control. See the Controls Section starting on page CTL-1.

**Note:**  
Electro Clutches require extended length motor shafts for motor mounting.

### Horsepower vs. Shaft Speed

HP	SHAFT SPEED AT CLUTCH (IN RPM)																				
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1500	1800	2000	2400	3000	3600	4000	4500	5000
1/50																					
1/20																					
1/12																					
1/8																					
1/6																					
1/4																					
1/2																					
3/4																					
1																					
1-1/2																					
2																					
3																					
5																					
7-1/2																					
10																					
15																					
20																					

\*For applications with speeds below 100RPM, please contact Warner Electric Application Support.

### Specifications

Electro Clutch Size	Static Torque lb. ft.	Max. RPM	Voltage DC	Total Wt. lbs.
EC-375	16	5000	6, 24 or 90	4
EC-475	30	4500	6, 24 or 90	8
EC-650	95	3600	6, 24 or 90	18
EC-825	125	3600	6, 24 or 90	28
EC-1000	240	2000	6, 24 or 90	41
EC-1225	465	2000	6, 24 or 90	85

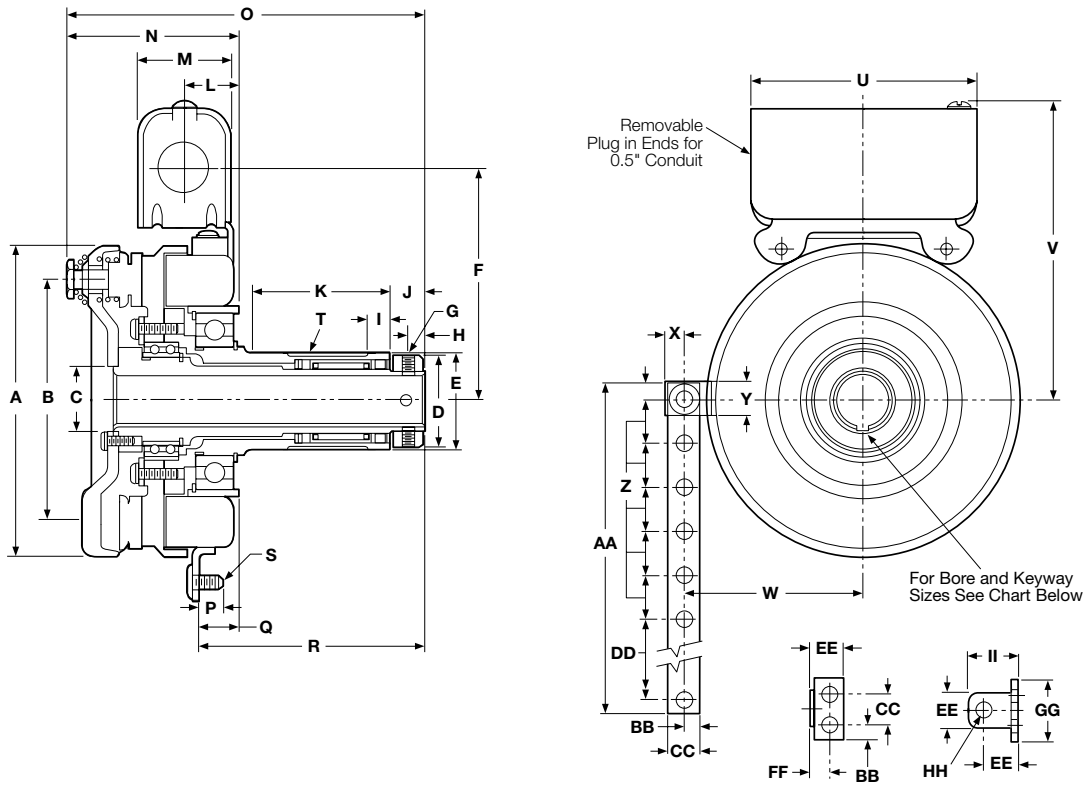
### Part Numbers

Model Size	Bore Size	Voltage DC	Part No.
EC-375	1/2"	6	5180-271-006
		24	5180-271-004
		90	5180-271-009
EC-475	5/8"	6	5180-271-002
		24	5180-271-008
		90	5180-271-005
EC-475	5/8"	6	5181-271-033
		24	5181-271-037
	3/4"	6	5181-271-032
		24	5181-271-038
	7/8"	6	5181-271-031
		24	5181-271-039
EC-650	1"	6	5281-271-004
		24	5281-271-018
	1-1/8"	6	5281-271-002
		24	5281-271-019
	1-1/4"	6	5281-271-009
		24	5281-271-020
EC-825	1-1/4"	90	5281-271-008
		6	5281-271-003
		24	5281-271-016
EC-825	1-1/8"	90	5281-271-006
		6	5282-271-002
		24	5282-271-008
EC-825	1-1/4"	90	5282-271-011
		6	5282-271-003
		24	5282-271-009
EC-1000	1-1/4"	90	5282-271-012
		6	5282-271-004
		24	5282-271-010
EC-1000	1-3/8"	90	5282-271-013
		6	5283-271-002
		24	5283-271-010
EC-1000	1-3/8"	90	5283-271-003
		6	5283-271-012
		24	5283-271-013
EC-1000	1-5/8"	6	5283-271-004
		24	5283-271-011
		90	5283-271-005
EC-1225	1-5/8"	6	5284-271-008
		24	5284-271-013
		90	5284-271-010
EC-1225	1-7/8"	6	5284-271-002
		24	5284-271-014
		90	5284-271-003
EC-1225	2-1/8"	6	5284-271-004
		24	5284-271-015
		90	5284-271-005

Note: Metric bores available in some sizes, consult factory.

# EC Series Electro Clutch

## EC-375, EC-475, EC-650



### Bore Sizes and Keyways

Size	Bore Dia.	Keyway
375	.625	*3/16 x 1/16
	.500	1/8 x 1/16
475	.750	3/16 x 3/32
	.875	*3/16 x 1/16
	.625	3/16 x 3/32
650	1.125	*1/4 x 1/8
	1.375	*5/16 x 3/32
	1.000	1/4 x 1/8
	1.250	1/4 x 1/8

\*Key Furnished

### Dimensions

All dimensions are nominal, unless otherwise noted.

Size	A Max.	B Dia.	C Min.	D Dia.	E Dia.	F	G	H	I	J	K Max.	L	M
375	4.078	3.125	.7505	1.313	1.375 1.374	3.344	10-24 UNC-3A x 5/15	.188	.375	.344	2.047	.781	1.547
475	5.172	4.000	1.0625	1.563	1.625 1.624	3.922	1/4-20 UNC-3A x 7/16	.281	.375	.578	2.359	.875	1.547
650	6.578	5.125	1.625	2.375	2.5000 2.4985	4.625	1/4-20 UNC-3A x 1/2	.281	.188	.563	3.047	.953	1.547

Size	N Max.	O Max.	P	Q Max.	R Min.	S	T	U	V Max.	W	X
375	2.484	4.984	.438	.609	3.000	1/4-20 UNC-2A	5/16 x 3/32	3.750	4.438	2.438	.313
475	3.219	6.266	.422	.658	3.641	1/4-20 UNC-2A	3/8 x 3/32	3.750	4.984	2.984	.313
650	3.547	7.141	.422	.722	4.359	1/4-20 UNC-2A	5/8 x 3/32	3.750	5.750	3.750	.313

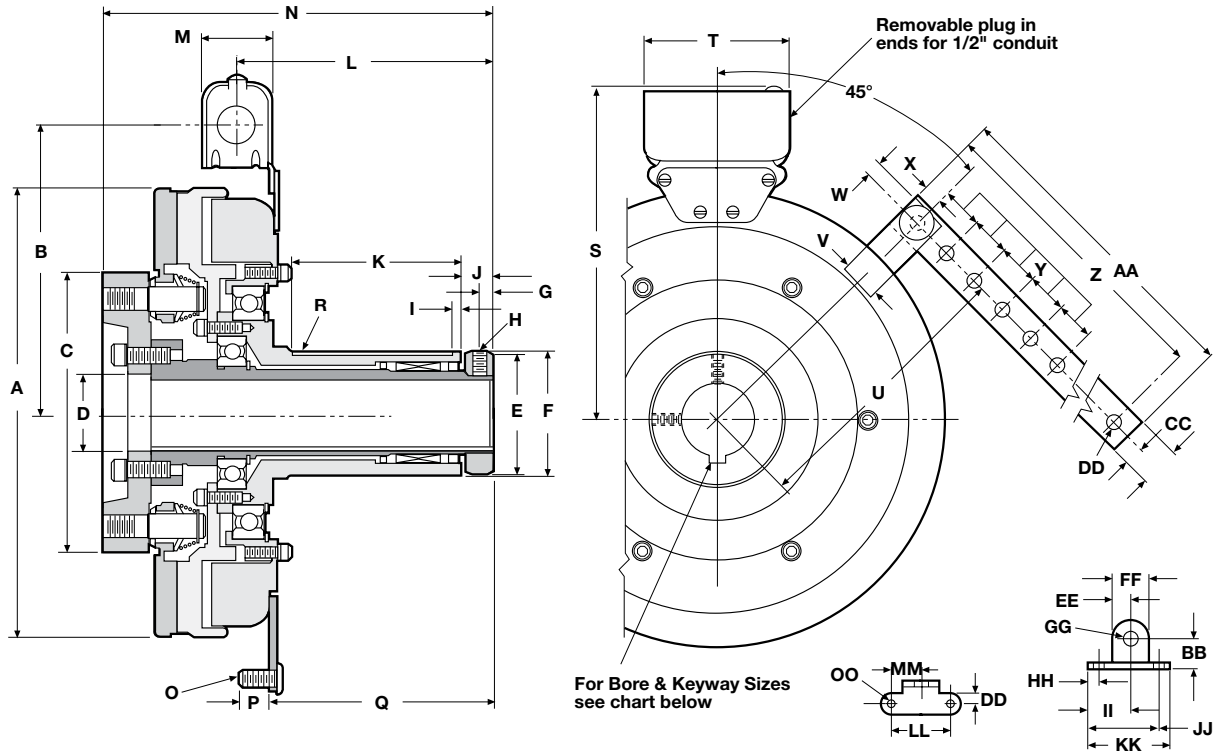
Size	Y	Z	AA	BB	CC	DD	EE Dia.	FF	GG	HH Dia.	II
375	.563	.750	5.000	.250	.500	.750	.563	.313	1.000	.270 .260	.828
475	.578	.750	5.000	.250	.500	.750	.563	.313	1.000	.270 .260	.828
650	.563	.750	10.000	.250	.500	5.750	.563	.313	1.000	.270 .260	.828

### Specifications

Size	Average Wt.-lbs.				Inertia-WR <sup>2</sup> (lb.ft. <sup>2</sup> )			
	Arm. & Carrier.	Rotor	Outer Sleeve	Inner Sleeve	Arm. & Carrier	Rotor	Outer Sleeve	Inner Sleeve
EC-375	.60	.55	.49	.60	.010	.018	.001	.001
EC-475	1.13	1.12	.78	1.22	.072	.033	.006	.002
EC-650	2.3	2.5	1.6	2.37	.106	.202	.010	.013

# EC Series Electro Clutch

## EC-825



### Dimensions

All dimensions are nominal, unless otherwise noted.

Size	A Max.	B Dia.	C	D Min.	E Dia.	F Dia.	G	H	I	J
825	8.656	5.656	4.625	1.437	2.375	<u>2.5000</u> 2.4985	.281	1/4-20 UNC -3A x 3/8	.188	.563

Size	K Max.	L	M	N Max.	O	P	Q Max.	R*	S	T
825	3.047	5.219	1.547	8.000	5/16-18 UNC-2A	1.547	4.468	5/8 x 3/32	6.813	3.750

Size	U	V	W	X	Y	Z	AA	BB	CC	DD Dia.
825	5.063	.875	—	.375	.750	16.625	17	.750	.375	.330 .321

Size	EE	FF	GG Dia.	HH	II	JJ	KK	LL	MM	NN	OO
825	.438	.875	.313	.250	1.000	1.750	2.000	1.500	.750	.250	.270 .260

\* Key supplied

### Specifications

Model Size	Voltage DC	Inertia-WR <sup>2</sup> (lb. ft <sup>2</sup> )			Average Weight-lbs.		
		Armature, Hub & Inner Sleeve	Rotor & Outer Sleeve	Total Weight lbs.	Armature, Hub & Inner Sleeve	Rotor & Outer Sleeve	
EC-825	6	.35	.87	28	6.0	18.5	
	24	.35	.87	28	6.0	18.5	
	90	.35	.87	28	6.0	18.5	

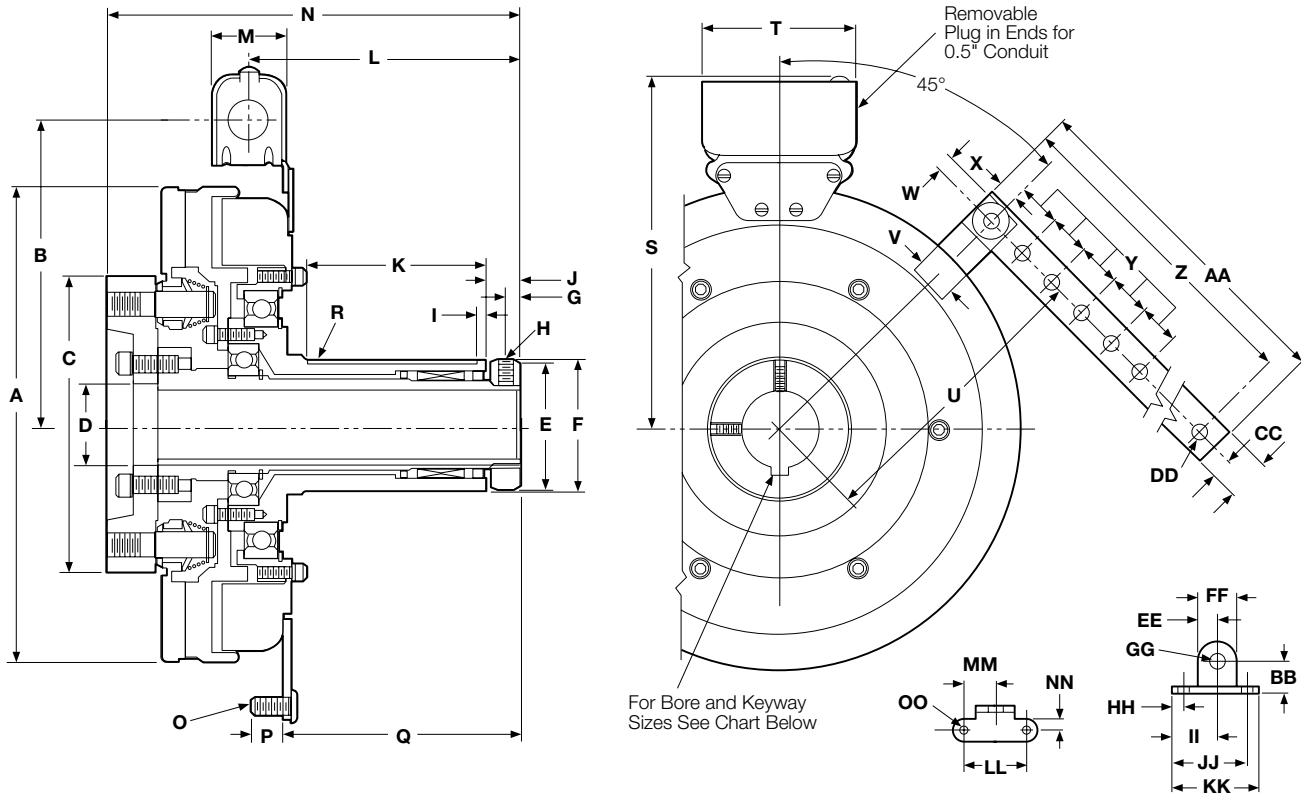
### Bore Sizes and Keyways

Size	Bore Dia.	Keyway
825	1.125	1/4 x 1/8
	1.250	1/4 x 1/8
	1.375	5/16 x 3/32



# EC Series Electro Clutch

## EC-1000, EC-1225



### Specifications

Model Size	Voltage DC	Static Torque (lb. ft.)	Max. Speed RPM	Inertia-WR <sup>2</sup> (lb. ft <sup>2</sup> )			Inner Sleeve	Total Weight lbs.
				Arm. & Hub	Rotor	Outer Sleeve		
EC-1000	6	240 lb. ft.	2000	.720	.894	.129	.036	41
	24	240 lb. ft.	2000	.720	.894	.129	.036	41
	90	240 lb. ft.	2000	.720	.894	.129	.036	41
EC-1225	6	465 lb. ft.	2000	1.8	2.4	.129	.061	85
	24	465 lb. ft.	2000	1.8	2.4	.129	.061	85
	90	465 lb. ft.	2000	1.8	2.4	.129	.061	85

# EC Series Electro Clutch

## EC-1000, EC-1225

### Dimensions

All dimensions are nominal, unless otherwise noted.

Size	A Max.	B Dia.	C	D Min.	E Dia.	F Dia.	G	H	I	J	K Max.	L	M
1000	10.328	6.531	6.344	1.750	2.875	2.9375 2.9365	.344	5/16-18 UNC -3A x 3/8	.188	.750	3.969	6.000	1.547
1225	12.672	7.531	6.969	2.234	3.625	3.750 3.749	.406	5/81-16 UNC -3A x 3/4	.375	.859	5.219	7.781	1.547

Size	N Max.	O	P	Q Max.	R*	S	T	U	V	W	X	Y
1000	9.031	5/16-18 UNC-2A	1.547	5.281	3/4 x 1/8	7.688	3.750	6.125	.875	.344	.375	.750
1225	11.016	5/16-18 UNC-2A	1.547	7.047	7/8 x 1/8	8.688	3.750	7.000	.875	.344	.375	.750

Size	Z	AA	BB	CC	DD Dia.	EE	FF	GG Dia.	HH	II	JJ	KK	LL	MM	NN	OO
1000	16.625	17	.750	.375	.330 .321	.438	.875	.313	.250	1.000	1.750	2.000	1.500	.750	.250	.270 .260
1225	16.625	17	.750	.375	.330 .321	.438	.875	.313	.250	1.000	1.750	2.000	1.500	.750	.250	.270 .260

\* Key supplied

### Bore Sizes and Keyway

Size	Bore Dia.	Keyway
1000	1.375	*5/16 x 5/32
	1.500	*3/8 x 11/64
	1.625	*3/8 x 1/8
1225	1.625	*3/8 x 5/32
	1.875	*1/2 x 1/4
	2.125	*1/2 x 3/16

\*Key Furnished

# EB Series Electro Brake

## Shaft Mounted Brakes for Power-On Applications

Pre-engineered, pre-packaged brakes mount on motor or thru shafts. They have been designed to mate easily with industry standard motors, reducers and other power transmission components. Bolt-it-down and wire-it-up . . . they're ready to go.

- Wide torque range from 16 to 465 lb. ft.
- Handle 1 to 75 HP at 1800 RPM
- Adjustable torque arm

**UL Listed**

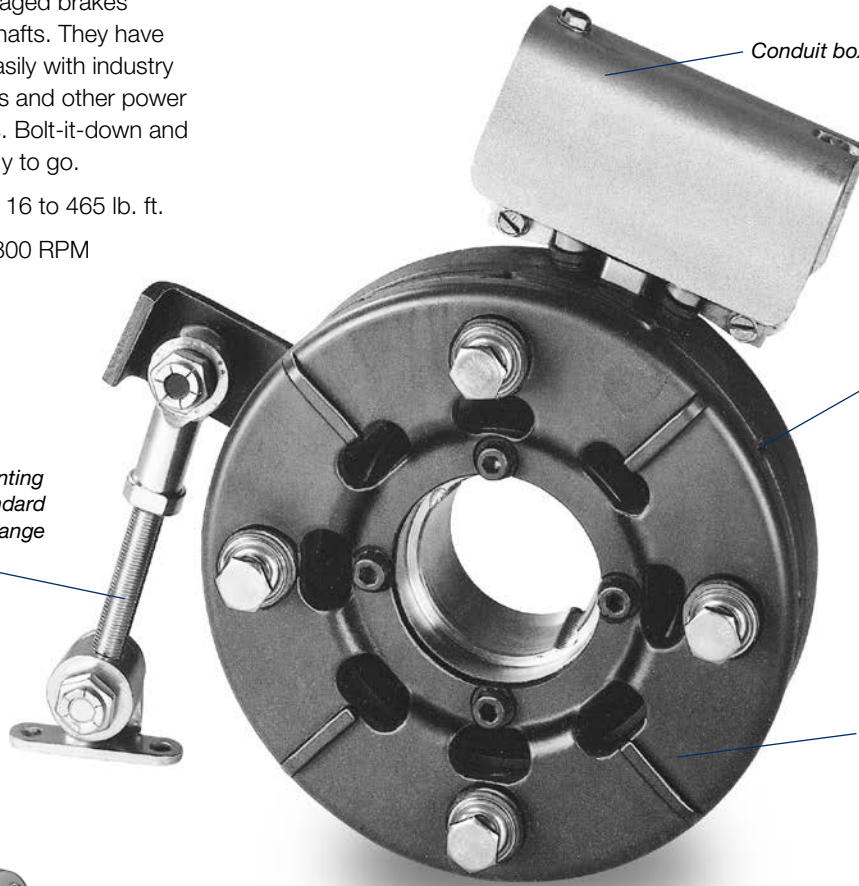
Conduit box meets industry standards.

**Long Life, No Maintenance**

Automatically adjusts for wear. Designed for maximum heat dissipation. No lubrication necessary.

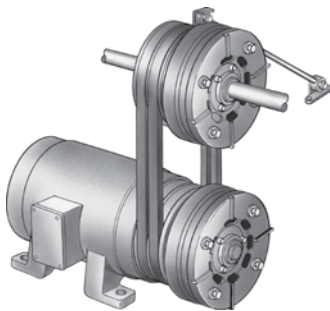
### Mounting Flexibility

Torque arm allows mounting anywhere on shaft. Standard bushings cover a wide range of shaft sizes.



**Packaged Design**  
No assembly required. Insert bushing for proper shaft size, slide on shaft and bolt down torque arm.

### Typical Application



An Electro Brake mounted on a through shaft.

### Selection Procedure

1. Determine the motor horsepower and RPM at the brake location.
2. Use the Horsepower vs. Shaft Speed chart to determine the right size Electro Brake.
3. When ordering, specify bore size and voltage.
4. To get maximum performance from your Electro Brake, use a Warner Electric Control. See the Controls Section.

### Horsepower vs. Shaft Speed

HP	SHAFT SPEED AT BRAKE (IN RPM)																				
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1500	1800	2000	2400	3000	3600	4000	4500	5000
1/12																					
1/8																					
1/6																					
1/4																					
1/3																					
1/2																					
3/4																					
1																					
1-1/2																					
2																					
3																					
5																					
7-1/2																					
10																					
15																					
20																					
25																					
30																					
40																					
50																					
60																					
75																					

\*For applications with speeds below 100RPM, please contact Warner Electric Application Support.

# EB Series Electro Brake

## EB-375, EB-475, EB-650

### Part Numbers

For Electro Brakes specifying a bushing, they need to be ordered separately. Please find specific bushing part numbers on pages B-2 and B-3 corresponding to the type of bushing indicated below and the required bore size.

Model Size	Bore Size	Voltage DC	Part No.
EB-375	1/2"	6	5380-170-005
		24	5380-170-006
		90	5380-170-004
	5/8"	6	5380-170-003
		24	5380-170-007
		90	5380-170-002
	3/4"	6	5370-170-013
		24	5370-170-014
		90	5370-170-012
EB-475	1/2" to 1" Dodge 1008	6	5381-170-003
		24	5381-170-004
		90	5381-170-002
EB-650	1/2" to 1-3/8" Dodge 1310	6	5382-170-003
		24	5382-170-005
		90	5382-170-002
EB-825	1/2" to 1-1/2" Browning H	6	5383-170-002
		24	5383-170-004
		90	5383-170-005
EB-1000	1/2" to 1-5/8" Dodge 1615	6	5384-170-003
		24	5384-170-005
		90	5384-170-002
EB-1225	1/2" to 2-12" Dodge 2517	6	5385-170-003
		24	5385-170-005
		90	5385-170-002

Note: EB-375 also available in some metric bores.  
EB-475-1225 use bushings which are available in metric bores.

### Bore Sizes and Keyway

Size	Bore Dia.	Keyway
375	.501/.500	1/8 x 1/16
	.626/.625	3/16 x 3/32
	.751/.750	3/16 X 3/32
475 Through 1225	See bushing information on pages B-2 and B-3	

### For Service Parts:

See pages SP-8 to SP-13.

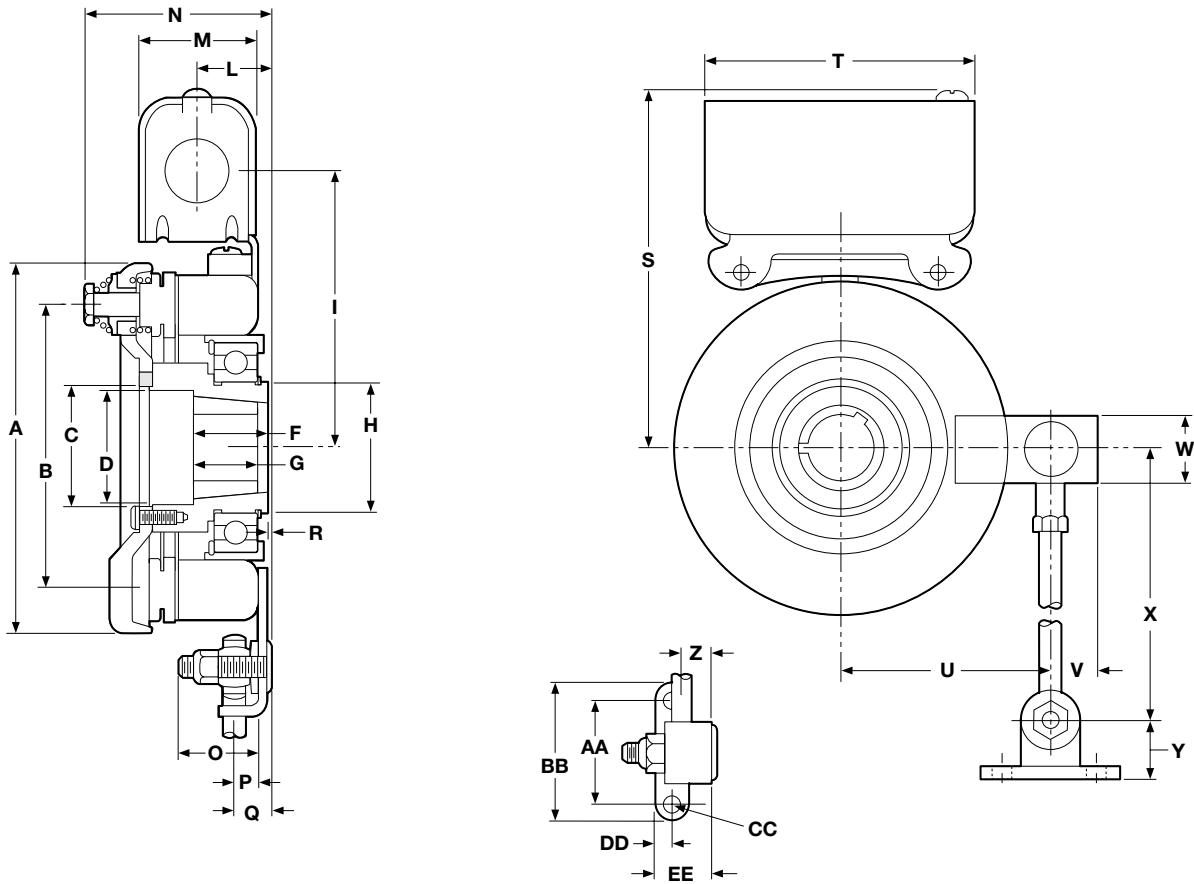
### For Motor Mounting:

See page A-14 for adapter requirements.



# EB Series Electro Brake

## EB-375, EB-475, EB-650



### Dimensions

All dimensions are nominal, unless otherwise noted.

Size	A Max.	B Dia.	C Min.	D Dia.	E	F	G	H Dia.	I	J	K	L	M	N Max.	O
375	4.078	3.125	.7505	-	.031	1.656	-	1.375	3.344	10-32 UNF -3A x 1/4	.188	1.047	1.547	2.438	.844
475	5.172	4.000	1.663	1.594	-	1.000	1.000	1.781	3.875	-	-	.986	1.547	2.922	1.094
650	6.578	5.125	2.343	2.281	-	1.313	1.000	2.563	4.656	-	-	.986	1.547	3.109	1.031

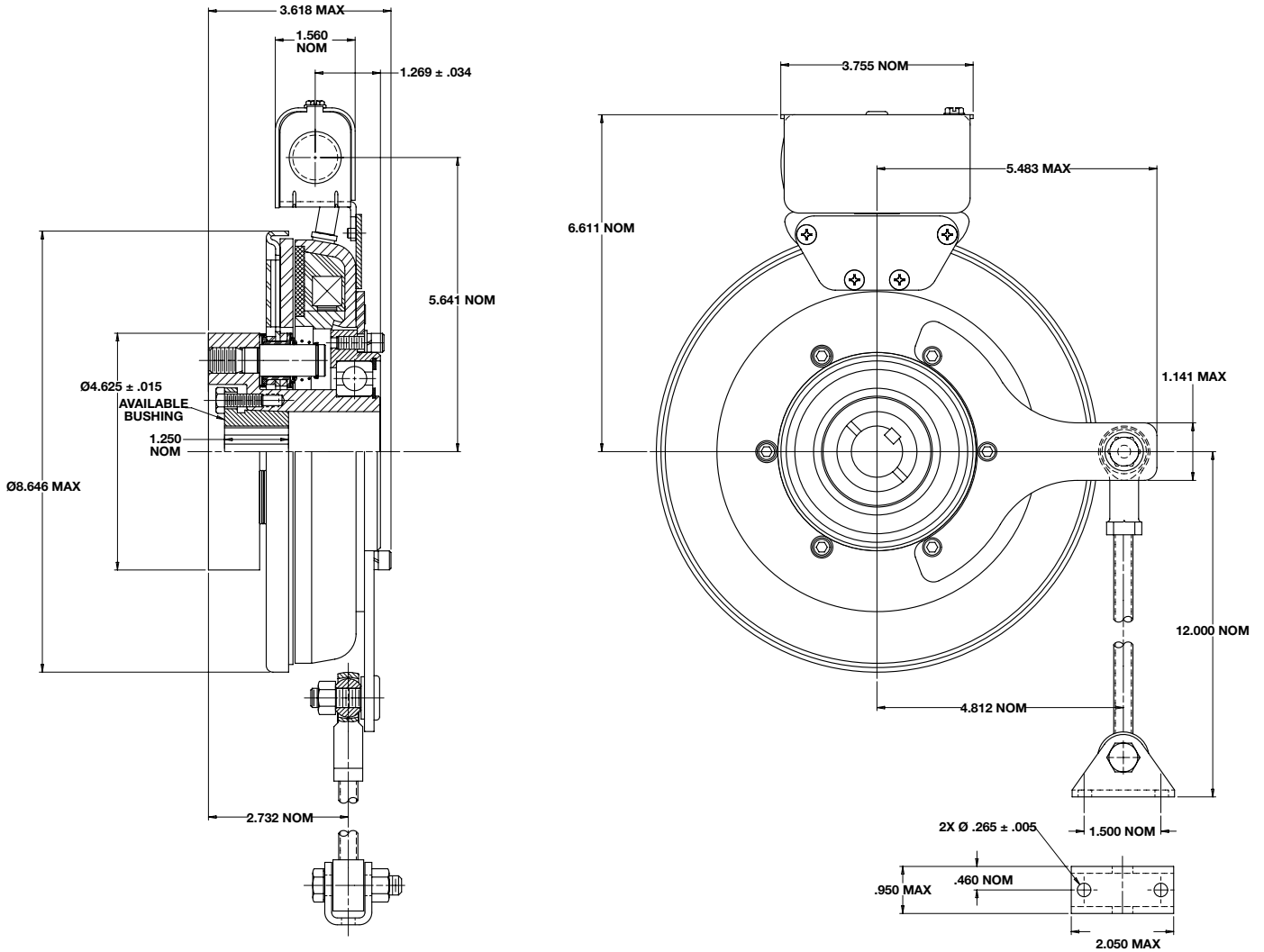
Size	P	Q	R	S Max.	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE
375	.281	.625	.094 Min.	4.453	3.750	2.453	.666	1.000	8.000	.635	.359	1.500	2.000	.270 .260	.250	.781
475	.313	.531	.125 Max.	4.984	3.750	3.093	.697	1.000	10.000	.635	.391	1.500	2.000	.270 .260	.250	.781
650	.344	.641	.203 Max.	5.766	3.750	4.063	.843	1.125	11.000	.635	.438	1.500	2.000	.270 .260	.250	.781

### Specifications

Model Size	Voltage DC	Static Torque (lb. ft.)	Max. Speed RPM	Inertia-WR <sup>2</sup> (lb. ft <sup>2</sup> )		Total Weight lbs.
				Arm. & Carrier	Hub	
EB-375	6, 24, 90	16	5000	.010	.001	4
EB-475	6, 24, 90	30	4500	.072	.006	7
EB-650	6, 24, 90	95	3600	.106	.010	11.3

# EB Series Electro Brake

## EB-825

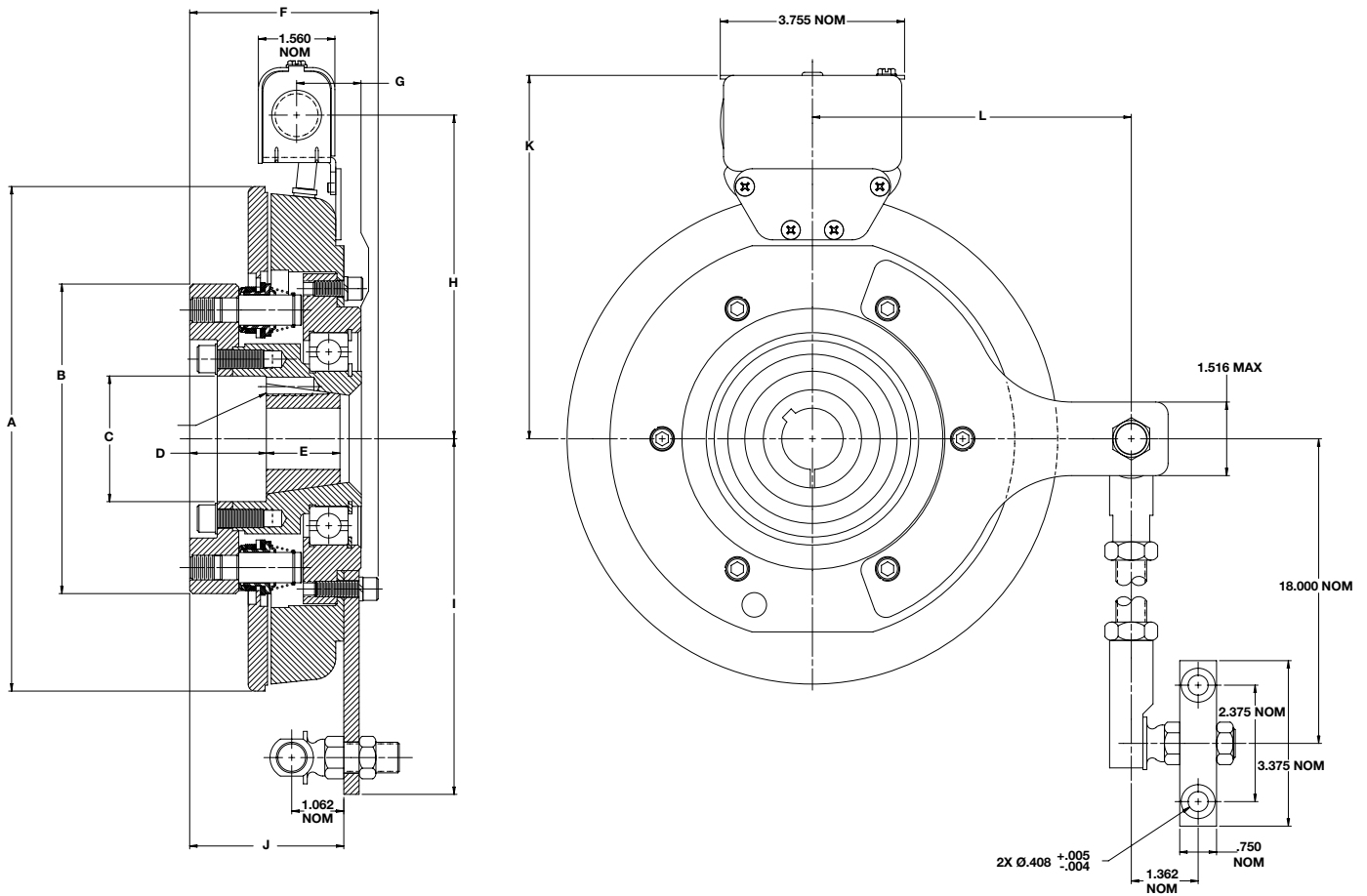


### Specifications

Model Size	Voltage DC	Static Torque lb. ft.	Max. Speed RPM	Inertia-WR <sup>2</sup> (lb. ft <sup>2</sup> ) Arm. & Hub	Total Weight lbs.
EB-825	6, 24, 90	125	3600	.459	20

# EB Series Electro Brake

## EB-1000, EB-1225



For thru-shaft mounting, specify bore size. Order bushing separately.  
 For motor mounting, order adapter separate (see page A-14).

### Dimensions

All dimensions are nominal, unless otherwise noted.

Size	A Max.	B Max.	C Min.	D	E	F Max.	G	H	I	J	K	L
1000	10.318	6.328	2.558	1.563	1.500	3.891	1.308	6.515	7.265	3.141	7.411	6.500
1225	12.703	6.953	3.390	.875	1.750	4.082	1.176	7.620	8.000	3.322	8.481	7.250

### Specifications

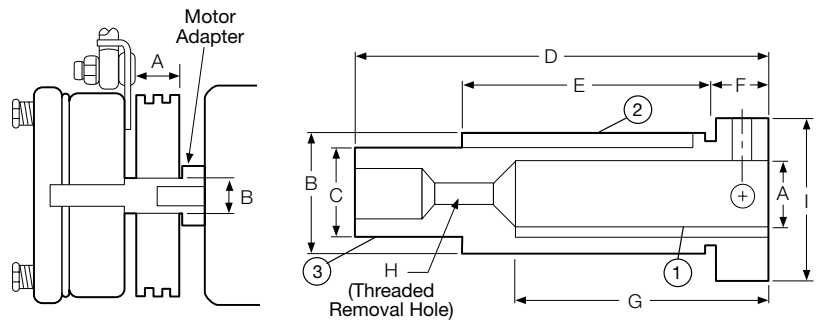
Model Size	Voltage DC	Static Torque (lb. ft.)	Max. Speed RPM	Inertia-WR <sup>2</sup> (lb. ft <sup>2</sup> )		Total Weight lbs.
				Arm. & Carrier	Hub	
EB-1000	6, 24, 90	240	2000	.720	.129	35.5
EB-1225	6, 24, 90	465	2000	1.8	.129	52.5

# EB Series Electro Brake

## Shaft Adapters

### Optional Motor Shaft Adapter

Ten motor shaft adapters are available as an option for mounting Electro-Brakes on single shaft extension motors. For double shaft extension motors the adapter can be eliminated. A standard sheave, pulley, or sprocket, with either a tapered bushing or straight bore, can be installed on the shaft adapter. The Electro Brake is mounted on the end of the shaft adapter and the complete assembly fits onto the motor shaft and is secured with setscrews. Fitting the belts or chain and attaching the torque arm completes the installation.



### Dimensions

All dimensions are nominal, unless otherwise noted.

Model	A	Kwy.	Key Part No. ①	B	Kwy.	Key Part No. ②	C	Kwy.	Key Part No. ③	Dodge Bushing Size	D	E	F	G	H	I
EB-375	5/8	3/16x 3/32	*	7/8	3/16x 3/32	590-0016	5/8	3/16x 3/32	590-0043	None	4.391 4.359	2	.391 .359	2	1/4-20 UNC	1.125
EB-375	7/8	3/16x 3/32	*	1-1/4	1/4x 1/8	590-0022	5/8	3/16x 3/32	590-0043	None	4.578 4.742	2-1/4	.516 .484	2-1/4		1.500
EB-475	1-1/8	1/4x 1/8	*	1-5/8	3/8x 3/16	590-0041	1	1/4x 1/8	**	#1008 1"	4.516 4.484	2-3/4	.641 .609	2-3/4	1/2-13 UNC	1.750
EB-650	1-3/8	5/16x 5/32	*	2	1/2x 1/4	590-0042	1-3/8	5/16x 5/32	590-0044	#1310 1-3/8"	5.547 5.515	3-3/8	.641 .609	3-3/8	1/2-13 UNC	2.125
EB-650	1-5/8	3/8x 3/16	*	2-1/4	1/2x 1/4	590-0042	1-3/8	5/16x 5/32	590-0044	#1310 1-3/8"	6.172 6.140	4	.641 .609	4		2.375
EB-1000	1-5/8	3/8x 3/16	*	2-15/16	3/4x 7/16	590-0052	1-5/8	3/8x 7/32	**	#1615 1-5/8"	8.297 8.265	5-1/4		5	3/4-10 UNC	2.937
EB-1000	1-7/8	1/2x 7/32	*	2-15/16	3/4x 7/16	590-0052	1-5/8	3/8x 7/32	**	#1615 1-5/8"						2.937
EB-1000	2-1/8	1/2x 1/8	590-0062	2-15/16	3/4x 5/16	590-0069	1-5/8	3/8x 7/32	**	#1615 1-5/8"						2.937
EB-1225	2-1/8	1/2x 7/32	*	3-3/4	7/8x 7/16	590-0049	2-1/8	1/2x 9/32	590-0048	#2517 2-1/8"	10.672 10.640	7-1/4		6-7/8	7/8-9 UNC	3.750
EB-1225	2-3/8	5/8x 9/32	*	3-3/4	7/8x 7/16	590-0049	2-1/8	1/2x 9/32	590-0048	#2517 2-1/8"						3.750

\*Standard Square Key Furnished with Motor.

\*\*Special Key Furnished with Bushing.

Note: For adapter part numbers, see Service Parts beginning on page SP-8.

# ATC / ATB Series AT Clutches and Brakes

## Rugged, Durable, Heavy Duty Clutches and Brakes

Warner Electric's AT clutches and brakes are rugged and durable.

The ATC and ATB incorporate a molded friction material/pole assembly and replaceable armature faces with a rugged, durable clutch and brake assembly. Uniquely designed for ease of application and low maintenance.

Besides providing the ultimate in long life and durability, the AT units are easily repairable. Mounting a standard sheave, pulley or sprocket to the clutch is a snap.

The AT Clutches and Brakes feature a replaceable friction face. The results are long life, efficient operation, and minimal down time. Service kits of pre-selected parts enhance unit life.

ATC's and ATB's are completely assembled at the factory and have been specifically designed to match the torque ratings of standard motors, reducers, and other power transmission components. Easy-to-select and easy-to-install.

AT Clutches and Brakes are ideally suited for extremely rugged, heavy duty application demands.

### Advanced Technology Design Advantages

- Replaceable friction face
- Steel wear surface and cast iron hub/armature carrier
- Non-asbestos, split molded friction disc.
- Autogap™ provides automatic wear take-up for consistent engagement.
- Cast iron components—finned, cast iron armature carriers
- Special coil design for high temperature operation.
- Sealed heavy duty bearings
- Rugged spline drive operation
- Easy to install
- Maintenance free



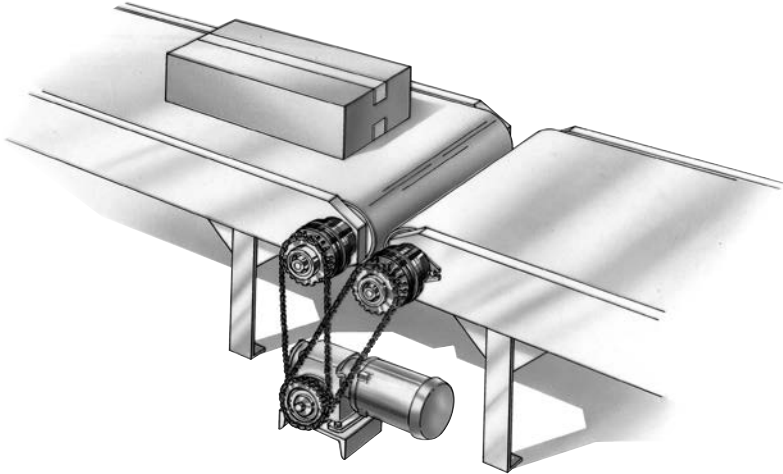
### Options and Accessories

Warner Electric offers accessories and repair kits for AT clutches and brakes, including:

- Clutch field restraining straps
- Brake torque arms
- Conduit boxes
- Clutch pulleys
- Service kits

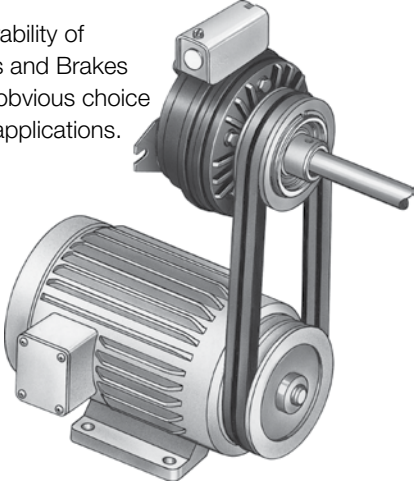
# ATC / ATB Series AT Clutches and Brakes

## Applications/Mounting Configurations

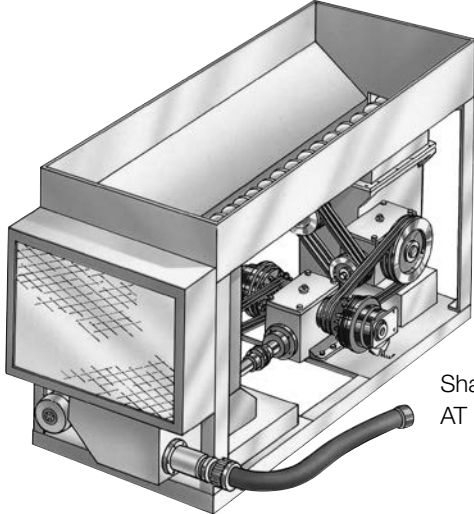
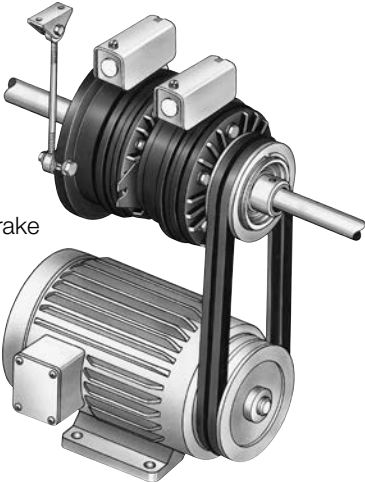


Two AT Clutches, easily mounted on conveyor headshafts, allow conveyor sections to be separately powered from a single drive.

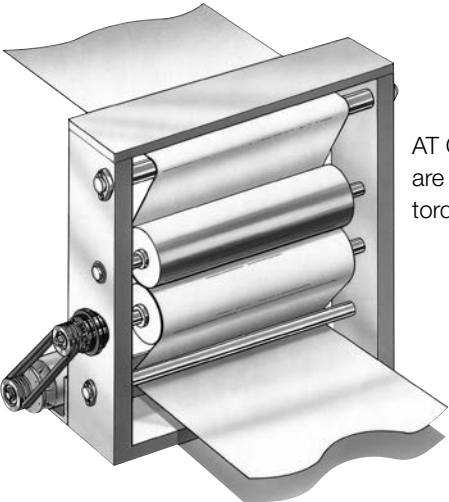
The rugged durability of the AT Clutches and Brakes make them an obvious choice for heavy duty applications.



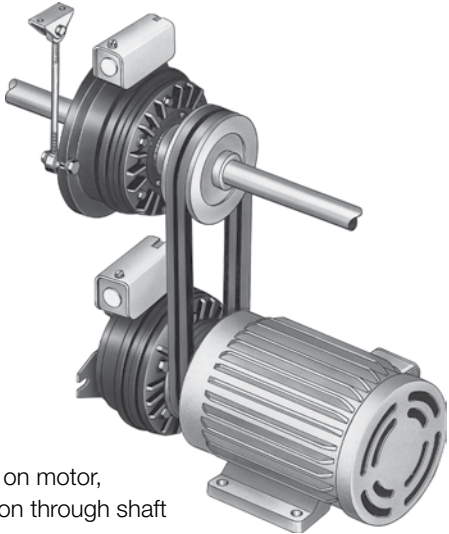
AT Clutch and AT Brake on through shaft



Shaft mounted AT Clutch



AT Clutches and Brakes are excellent for controlled torque applications.



AT Clutch on motor, AT Brake on through shaft

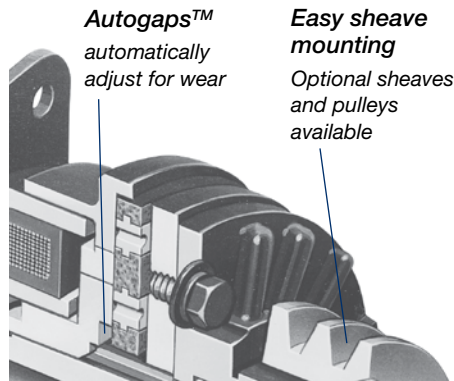


# ATC / ATB Series AT Clutches and Brakes

## Performance Advantages

### Principle of Operation

Ease of control is one of the most outstanding features of Warner Electric brakes and clutches. In operation, a magnetic field is generated as soon as current flows through the magnet coil. The magnetic poles are molded into a replaceable disc with the friction material. The electromagnetic force from the field or magnet passes through the poles to attract the armature, clamping the two together tightly. Strength of the magnetic field is directly proportional to the amount of current applied. The full torque range is completely controllable from 0 to 100% simply by turning the knob on the appropriate Warner Electric control.

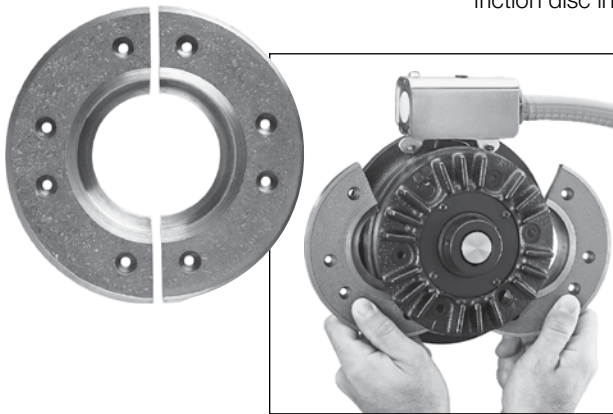


### Replaceable Friction Discs

The AT Electric Clutches and Brakes feature a patented replaceable friction face incorporating a unique combination of electromagnetic poles and friction material in a simple component. Easily visible friction disc indicates when replacement

is necessary—providing a helpful maintenance guide. The results are long life, efficient operation, and minimal down time. Rebuild kits of pre-selected parts enhance unit life.

The split friction disc and armature are replaceable without unit disassembly in less than 5 minutes in most applications.



### Autogap™ Alignment

Provides for automatic adjustment of the air gap between the wearing friction surfaces. Engagement times are consistent to maintain stopping and starting accuracy for the entire life of the unit.

### Technical Considerations

Most normal duty applications will usually require a selection based only on horsepower and speed at the clutch or brake location as indicated on pages A-18, A-19 and A-23. However, to insure the best possible overall performance and the most cost effective unit size selection, additional factors should be considered.

The main criteria are:

1. Horsepower
2. RPM
3. System inertia at the clutch or brake
4. Cycle rate and start/stop time
5. Static torque requirement, if any.

For instance, the HP and RPM sizing derived from the selection chart on page A-19, may be different than the size required by the system inertia and cycle rate. In that case, the proper size is the larger size unit. Additional application information makes a very accurate and exacting unit size selection possible. To achieve this, system inertia and required cycle rate must be known.

### Cycle Rate

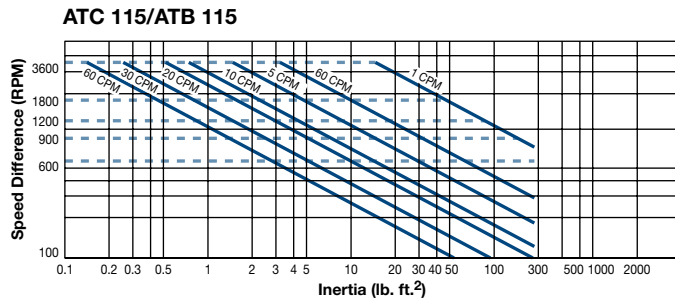
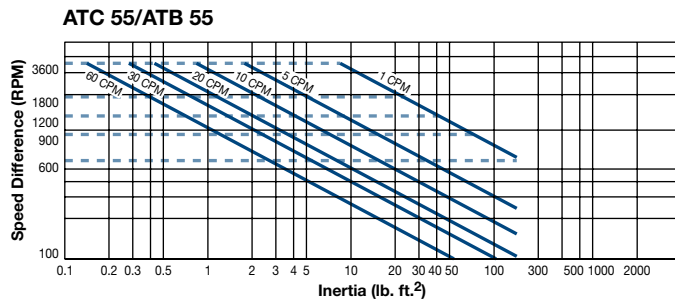
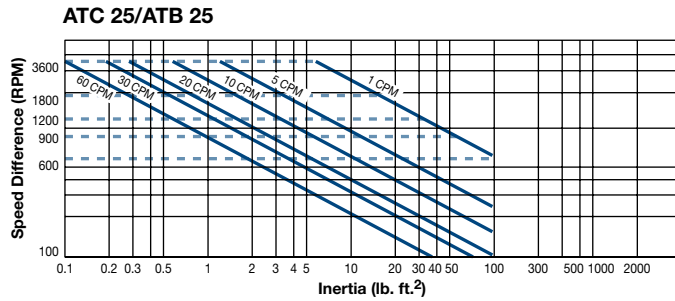
Cycle rate capability is often an important selection criteria. Cycle rate is usually defined as the number of times the clutch and/or brake is switched on and off in a minute or Cycles per Minute (CPM). In order to determine the correct size unit, both required cycle rate and reflected inertia must be known. The inertia of the AT clutch/brake components has been factored into the charts, so these need not be considered. To determine size from the charts:

1. Estimate the size clutch or brake.
2. Read the chart for that size. The intersection of the reflected inertia (lb. ft.<sup>2</sup>) and speed difference (RPM) lines will indicate the maximum cycle rate for that size unit.
3. Compare cycle rates. If the cycle rate required falls within the units capability, proceed to step 4 below. If the required cycle rate is above the size selected, go to the next larger AT unit.
4. Verify selection. Compare the size selected in 2 and 3 above to the Horsepower/Speed simple selection made on page A-19. If the size selected is not the same, choose the larger selected by the two methods.

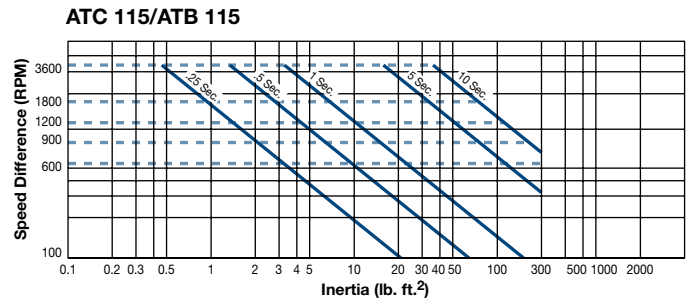
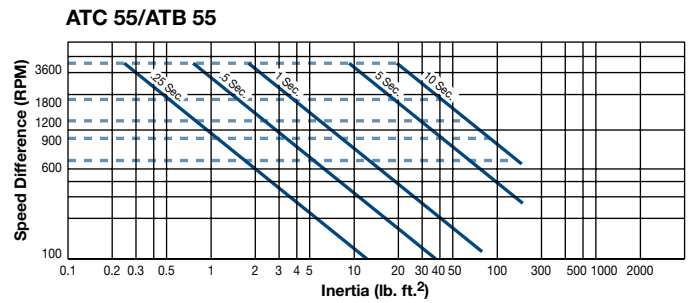
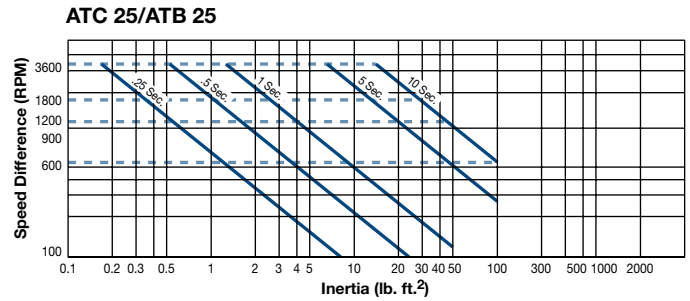
# ATC / ATB Series AT Clutches and Brakes

## Performance Curves

### Cycle Rate Capability



### Stop/Start Time Capability



### Start/Stop Times

In some applications, accelerating and/or decelerating the load within a specific time is a critical factor. In these start/stop time charts, AT unit inertias have already been factored in, so only reflected inertia need be considered. Selection for start/stop times can be made as follows:

1. Estimate the size clutch or brake required.
2. Read the chart for that size. Cross reference the speed difference (RPM) with the reflected inertia (lb. ft.²) to find the maximum start/stop capability for that size unit.
3. Compare start/stop times. If the start/stop time is equal to or less than that required for that application, the correct size unit has been selected. If shorter start/stop times are required, repeat the procedure on the chart for the next larger size unit.
4. Verify the selection. Compare the unit size chosen in steps 1, 2, and 3 to the unit size chosen by the simple Horsepower/Speed method on page A-19. If the sizes selected are not identical, choose the larger selected by the two methods.

# ATC Series AT Clutch

## Rugged and Durable Operation

### Autogaps™

automatically adjust for wear.

### Rugged spline drive

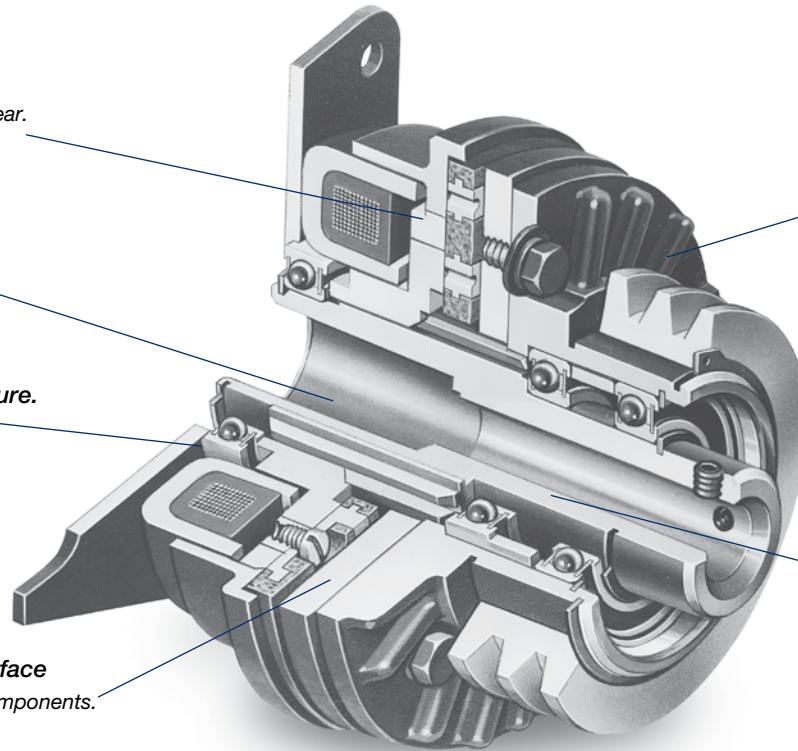
for maximum durability.

### Sealed, high temperature.

UL recognized.

### Rugged steel wear surface

and precision cast iron components.



### Easy sheave mounting.

Optional sheaves and pulleys available from Warner Electric.

### Sealed heavy duty bearings

with high temperature lubricant.

## Mounting Flexibility

The ATC clutch design represents the best combination of features to allow mounting of the widest range of pulleys, sheaves or sprockets with keys and snap rings or bolts for maximum durability. The pulleys or sheaves selected as standard

offerings to support the line are matched to the torque capability of each clutch. The torques and wear lives have been designed to match industry-standard motors and reducers by shaft size and bore size.

## Selection

### 1. Determine Model Size

Determine the motor horsepower and shaft speed (in R.P.M.) at the clutch location.

The correct size unit is shown at the intersection of HP and shaft speed.

### 2. Determine Bore Size

Select bore size and determine part number for correct size clutch from parts lists starting on page A-20.

### 3. Select Options

Refer to the Standard Sheaves and Pulley chart to choose an optional Warner Electric standard pulley or obtain information for fitting other pulley or sprocket.

### 4. Select Control

A simple, built-in AC to DC control is optional for 90 volt AT Clutches.

Complete control information is found in the Controls Section starting on page CTL-1.

## Horsepower vs. Shaft Speed

HP	SHAFT SPEED (IN RPM)																	
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1500	1800	2000	2400	3000	3600
1/4																		
1/2																		
3/4																		
1										AT-25								
1-1/2																		
2																		
3																		
5										AT-55								
7-1/2										AT-115								
10																		
15																		
20																		
25																		
30																		
35																		

\*For applications with speeds below 100RPM, please contact Warner Electric Application Support.

## Selection/Ordering Information

### Optional Equipment

#### Standard Sheaves and Pulleys

Sheave Pulley Type	Clutch or Brake Size	No. Grooves No. Teeth	Part Number	Pitch Diameter	Width	Dimensions O.D.
Timing Belt	25	26H100	689-0256	4.138"	1.312"	4.244"
	55	30H100	689-0278	4.755"	1.312"	4.881"
	115	40H150	689-0257	6.366"	1.812"	6.472"
"A" Section	25	1G3.60	689-0267	3.600"	.750"	3.850"
	55	2G4.80	689-0308	4.800"	1.445"	5.050"
	115	3G6.00	689-0271	6.000"	2.000"	6.250"
"3V" Section	25	1G3.65	689-0259	3.600"	.695"	3.650"
	55	2G4.12	689-0315	4.070"	1.094"	4.120"
	115	3G5.30	689-0263	5.250"	1.515"	5.300"
"B" Section	115	2G6.00	689-0275	6.000"	1.750"	6.350"

#### Other Sheaves, Pulleys and Sprockets

The unique AT Clutch design permits the installation of any customer provided sheave, pulley or sprocket that can be bored out and key seated to the Bore-to-Size dimensions shown on page A-22.

#### Sprockets

The AT clutch design permits installation of customer supplied sprockets. Minimum size sprocket requirements found in the chart below can be bored out and drilled to the dimensions in that chart.

#### Minimum Size Sprockets for Pilot Mount

Chain Size	Clutch Size		
	25	55	115
25	54T	—	—
35	35T	40T	—
41/40	28T	30T	40T
50	22T	24T	30T
60	—	20T	24T
80	—	—	20T
100	—	—	—
120	—	—	—
Bore size	2.500/2.502/ (63.500/63.551)	3.000/3.002/ (76.200/76.251)	4.00/4.002/ (101.600/101.651)
Bolt Circle	3.000/(76.200)	3.500/(88.900)	4.750/(120.650)
No. Holes and Sizes	(3) .281/[(3) 7.144]	(4) .281/[(4) 7.144]	(4) .344/[(4) 8.731]

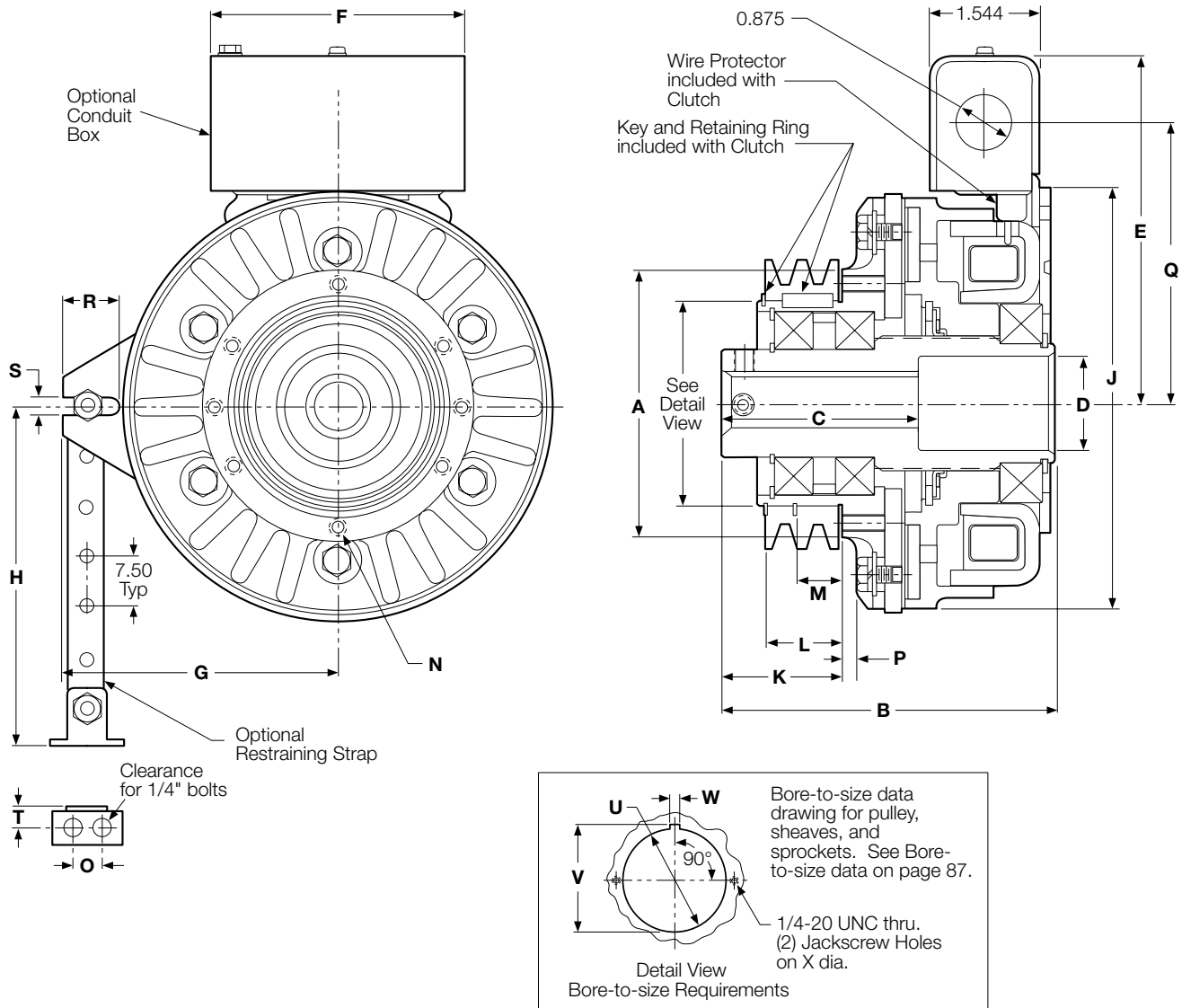
Note: Spacer may be required to avoid chain interference with clutch.

#### Part Numbers

Model Size	Bore Size	Voltage DC	Part No.
ATC-25	1/2"	6	5161-271-002
		24	5161-271-010
		90	5161-271-003
	5/8"	6	5161-271-004
		24	5161-271-011
		90	5161-271-005
	3/4"	6	5161-271-006
		24	5161-271-012
		90	5161-271-007
	ATC-55	7/8"	6
24			5161-271-013
90			5161-271-009
3/4"		6	5162-271-002
		24	5162-271-010
		90	5162-271-003
7/8"		6	5162-271-004
		24	5162-271-011
		90	5162-271-005
1"	6	5162-271-006	
	24	5162-271-012	
	90	5162-271-007	
ATC-115	1-1/8"	6	5162-271-008
		24	5162-271-013
		90	5162-271-009
	1-1/8"	6	5163-271-002
		24	5163-271-010
		90	5163-271-003
	1-1/4"	6	5163-271-004
		24	5163-271-011
		90	5163-271-005
1-3/8"	6	5163-271-006	
	24	5163-271-012	
	90	5163-271-007	
1-1/2"	6	5163-271-008	
	24	5163-271-013	
	90	5163-271-009	

# ATC Series AT Clutch

## ATC-25, ATC-55, ATC-115



### Specifications

Model Size	Voltage DC	Unit	Inertia* -WR <sup>2</sup> (lb.ft. <sup>2</sup> )	Max. RPM	Weight (lbs.)	Static Torque (lb.ft.)	Dynamic Torque @ 1800 RPM
25	6	Clutch	.048	3600	8	25	12 lb. ft.
	24		.048	3600	8	25	12 lb. ft.
	90		.048	3600	8	25	12 lb. ft.
55	6	Clutch	.173	3600	18	55	20 lb. ft.
	24		.173	3600	18	55	20 lb. ft.
	90		.173	3600	18	55	20 lb. ft.
115	6	Clutch	.483	3600	28	115	30 lb. ft.
	24		.483	3600	28	115	30 lb. ft.
	90		.483	3600	28	115	30 lb. ft.

# ATC Series AT Clutch

## ATC-25, ATC-55, ATC115

### Dimensions

All dimensions are nominal, unless otherwise noted.

Model	A Max. Dia.	B Max.	C Nom.	D Nom Dia.	E Max.	F Max.	G Max.	H Max.	J Max. Dia.	K Max.	L Nom.	M Max.	T Nom.
25	3.60 (91.44)	4.39 (111.51)	2.375 (60.33)	1.080 (27.43)	4.748 (120.60)	3.767 (95.68)	3.282 (83.36)	5.11 (129.79)	4.822 (122.49)	1.68 (42.67)	1.003/.991 (25.48/25.17)	.715/.703 (18.16/17.86)	.375 (9.53)
55	3.95 (100.33)	4.935 (125.35)	2.925 (74.30)	1.40 (35.56)	5.182 (131.62)	3.767 (95.682)	4.032 (102.412)	5.11 (129.792)	6.275 (159.39)	1.817 (46.152)	1.113/1.101 (28.27/27.97)	-	.375 (9.53)
115	5.254 (133.452)	5.977 (151.822)	3.102 (78.792)	1.86 (47.242)	6.089 (154.662)	3.767 (95.682)	4.246 (107.852)	10.11 (256.792)	7.906 (200.812)	2.467 (62.662)	1.539/1.523 (39.09/38.68)	-	.375 (9.53)

Model	No. of Holes	N Thread Size	Max. Depth	Bolt Circle	O Nom.	P Nom.	Q Nom.	R Min.	S Min.
25	3	1/4-20	.500	3.00	.500 (12.7)	.036 (0.91)	3.586 (91.10)	.752 (19.08)	.279 (7.09)
55	4	1/4-20	.635	3.50	.500 (12.7)	.081 (2.06)	4.156 (105.56)	.722 (18.34)	.265 (6.73)
115	4	5/16-18	.830	4.75	.500 (12.7)	.237 (6.02)	4.927 (125.15)	.504 (12.80)	.265 (6.73)

### Bore to Size Data

Model	U Bore Dia.	V Keyway Height	W Keyway Width	X Bolt Circle
25	2.502/2.500 (63.55/63.50)	2.601/2.591 (66.06/65.81)	.1905/.1855 (4.84/4.79)	3.00 (76.20)
55	3.002/3.000 (76.25/76.20)	3.099/3.089 (78.71/78.46)	.1905/.1885 (4.84/4.79)	3.50 (88.90)
115	4.002/4.000 (101.65/101.60)	4.127/4.117 (104.83/104.57)	.378/.376 (9.60/9.55)	4.50 (114.30)

### Bore Size and Keyways

Size	Unit Bore		Key
	(in.)	(mm)	
ATC-25	.5025	12.76	1/8 Sq.
	.5005	12.71	
	.6275	15.94	3/16 Sq.
	.6255	15.89	
ATC-25	.7525	19.11	3/16 Sq.
ATC-55	.7505	19.06	
ATC-25	.8775	22.29	3/16 Sq.
ATC-55	.8755	22.24	
ATC-55	1.0025	25.46	1/4 Sq.
ATC-55	1.0005	25.41	
ATC-55	1.1275	28.64	1/4 Sq.
ATC-115	1.1255	28.59	
ATC-115	1.2525	31.81	1/4 Sq.
	1.2505	31.76	
	1.3775	34.99	5/16 Sq.
	1.3755	34.94	
	1.5025	38.16	3/8 Sq.
1.5005	38.11		



## Replaceable Armature Faces Assure Minimum Downtime

Rugged, two piece replaceable steel wear surface and precision cast iron components. Superior wear life, torque capacity and magnetic characteristics.

Two piece molded friction disc replaceable without disassembly of unit in most applications. Long life, low noise.

Sealed heavy duty bearing with high temperature lubricant maintain tight concentricities and running efficiency.

Sealed, high temperature coil with tough teflon lead wires for easy power hookup. UL recognized.

Rugged spline drive

Autogaps™ automatically adjust for wear. Consistent engagement times and repeatability for the life of the unit.

Shaft mounted with torque arm restraint.

ATB Brakes are completely assembled at the factory and have been specifically designed to match the torque ratings of standard motors, reducers, and other power transmission components. They feature a replaceable friction face, which has been designed to provide superior wear life with reduced engagement noise level wear and consistent torque capacity. Wear surfaces can, in many cases, be replaced without removing the unit from the shaft.

### Selection

#### 1. Determine Model Size

Determine the motor horsepower and shaft speed (in RPM) at the brake location.

The correct size unit is shown at the intersection of HP and shaft speed in the chart below.

#### 2. Determine Bore Size

Select bore size and determine part number for correct size brake from parts lists starting on this page.

#### 3. Select Options

Refer to the Standard Sheaves and Pulley chart to choose an optional Warner Electric standard pulley or obtain information for fitting other pulleys or sprockets.

#### 4. Select Control

A simple, built-in AC to DC control is optional for 90 volt AT Brakes.

Complete control information is found in the Controls Section starting on page CTL-1. Selection is by required function.

### Ordering Information

#### Part Numbers

Model Size	Bore Size	Voltage DC	Part No.
ATB-25	1/2"	6	5191-170-002
		24	5191-170-010
		90	5191-170-003
	5/8"	6	5191-170-004
		24	5191-170-011
		90	5191-170-005
	3/4"	6	5191-170-006
		24	5191-170-012
		90	5191-170-007
7/8"	6	5191-170-008	
	24	5191-170-013	
	90	5191-170-009	
ATB-55	3/4"	6	5192-170-002
		24	5192-170-010
		90	5192-170-003
	7/8"	6	5192-170-004
		24	5192-170-011
		90	5192-170-005
	1"	6	5192-170-006
		24	5192-170-012
		90	5192-170-007
1-1/8"	6	5192-170-008	
	24	5192-170-013	
	90	5192-170-009	
ATB-115	1-1/8"	6	5193-170-002
		24	5193-170-010
		90	5193-170-003
	1-1/4"	6	5193-170-004
		24	5193-170-011
		90	5193-170-005
	1-3/8"	6	5193-170-006
		24	5193-170-012
		90	5193-170-007
1-1/2"	6	5193-170-008	
	24	5193-170-013	
	90	5193-170-009	

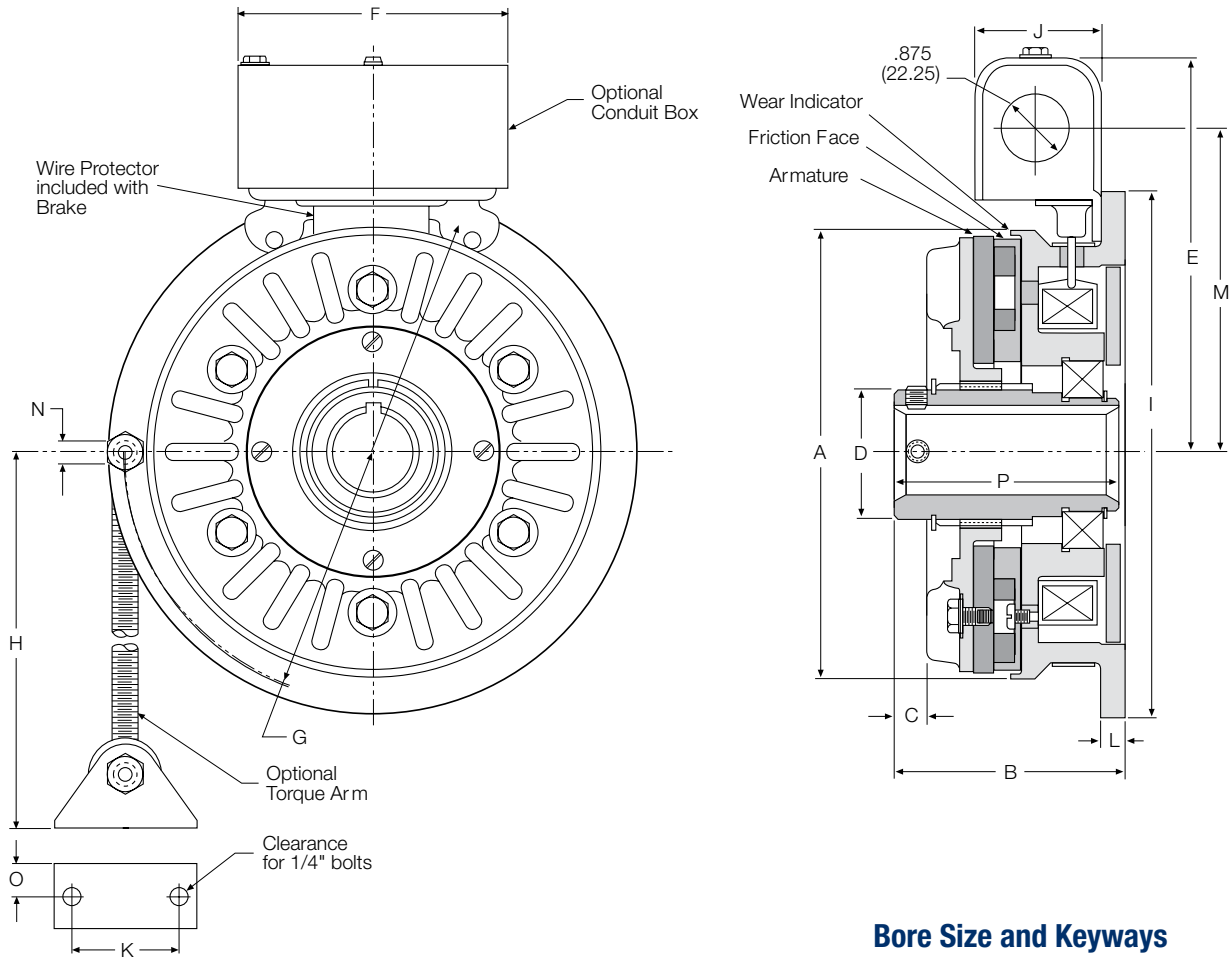
### Horsepower vs. Shaft Speed

HP	SHAFT SPEED (IN RPM)																	
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1500	1800	2000	2400	3000	3600
1/4																		
1/2																		
3/4																		
1											AT-25							
1-1/2																		
2																		
3																		
5											AT-55							
7-1/2																		
10											AT-115							
15																		
20																		
25																		
30																		
35																		

\*For applications with speeds below 100RPM, please contact Warner Electric Application Support.

# ATB Series AT Brake

## ATB-25, ATB-55, ATB-115



### Dimensions

All dimensions are nominal, unless otherwise noted.

Model	A Max. Dia.	B Max.	C Min. Dia.	D Max.	E Nom.	F Max.	G Nom.	H Max.
25	4.822 (122.48)	2.843 (72.21)	.354 (8.99)	1.345 (34.16)	4.748 (120.60)	3.767 (95.68)	2.406 (61.11)	9.03 (229.36)
55	6.271 (159.28)	3.224 (91.89)	.281 (7.14)	1.756 (44.83)	5.37 (136.40)	3.767 (95.68)	3.00 (76.20)	11.19 (284.23)
115	7.906 (200.81)	4.115 (104.52)	.687 (17.45)	2.150 (54.61)	6.278 (159.46)	3.767 (95.68)	3.781 (96.04)	11.19 (284.23)

Model	I Max. Dia.	J Nom.	K Min. Nom.	L Max.	M Nom.	N Min.	O Nom.	P Max.
25	5.760 (146.30)	1.544 (39.22)	1.500 (38.10)	.195 (4.95)	3.586 (91.08)	.280 (7.11)	.312 (7.92)	2.765 (70.23)
55	7.375 (187.33)	1.544 (39.22)	1.50 (38.10)	.491 (12.47)	4.208 (106.88)	.375 (9.53)	.375 (9.53)	3.105 (78.87)
115	9.00 (228.60)	1.544 (39.22)	1.50 (38.10)	.463 (11.76)	5.116 (129.95)	.375 (9.53)	.375 (9.53)	3.955 (100.46)

### Bore Size and Keyways

Size	Unit Bore		Key
	(in.)	(mm)	
ATB-25	.5025	12.76	1/8 Sq.
	.5005	12.71	
	.6275	15.94	3/16 Sq.
ATB-25	.6255	15.89	3/16 Sq.
	.7525	19.11	
ATB-55	.7505	19.06	3/16 Sq.
ATB-25	.8775	22.29	3/16 Sq.
	.8755	22.24	
ATB-55	1.0025	25.46	1/4 Sq.
	1.0005	25.41	
ATB-55	1.1275	28.64	1/4 Sq.
	1.1255	28.59	
ATB-115	1.2525	31.81	1/4 Sq.
	1.2505	31.76	
	1.3775	34.99	
	1.3755	34.94	5/16 Sq.
	1.5025	38.16	3/8 Sq.
1.5005	38.11		

### Specifications

Model Size	Voltage DC	Static Torque lb. ft.	Max. RPM	Weight lbs.	Inertia-WR <sup>2</sup> lb.-ft. <sup>2</sup>	Dynamic Torque @ 1800 RPM
25	6, 24 or 90	25	3600	7	.038	12 lb. ft.
55	6, 24 or 90	55	3600	15	.126	20 lb. ft.
115	6, 24 or 90	115	3600	24	.383	30 lb. ft.

# Shaft Mounted Clutches

Warner Electric's packaged stationary field clutches are factory assembled and burnished to deliver the maximum rated torque immediately. In addition, a packaged product assures that all engineering factors regarding the proper alignment of components to one another have been established at the factory. This allows the unit to be 'slid on the shaft' after being shipped to you. The proper alignment of components is critical to achieving maximum torque and assuring long life.

## Features

- No assembly required
- Anti-backlash armatures standard
- Ball bearing mounted field and armature hub
- Four sizes available
  - Size 180 – 15 in. lbs.
  - Size 250 – 70 in. lbs.
  - Size 325 – 125 in. lbs.
  - Size 400 – 270 in. lbs.

## No brushes to wear out

Besides saving valuable assembly and run-in time, the SFP clutches incorporate an original Warner Electric concept. The concept of the stationary field eliminates the need for brushes. Brushes can be a high maintenance item in an electromagnetic clutch because of the mechanical friction seen at the collector ring. There is no mechanical friction with the stationary field design. In sum, all of the best possible features wrapped up into one compact package - **Warner Electric's SFP.**

## Applications

- Packaging equipment
- Film readers
- Conveyors
- Medical equipment
- Sorting/feeding equipment

## Functions

- Controlled, soft starts
- Speed variation
- High cycling



# Shaft Mounted Clutches

## Specifications

Model	Static Torque	Max.RPM
SFP-180	15 in.lb.	5000
SFP-250	70 in.lb.	7500
SFP-325	125 in.lb.	5000
SFP-400	270 in.lb.	5000

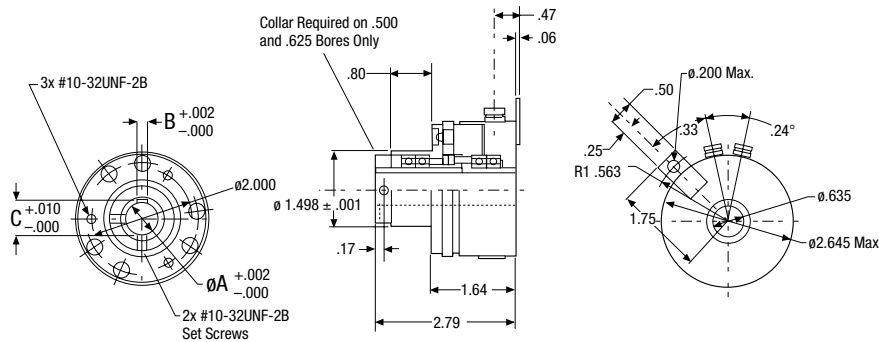
HP	SHAFT SPEED AT CLUTCH (IN RPM)																				
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1500	1800	2000	2400	3000	3600	4000	4600	5000
1/50																					
1/20																					
1/12														180							
1/8																					
1/6																					
1/4					325				250												
1/3																					
1/2																					
3/4																					
1																					
1-1/2																					
2																				400	
3																					

## How to Order

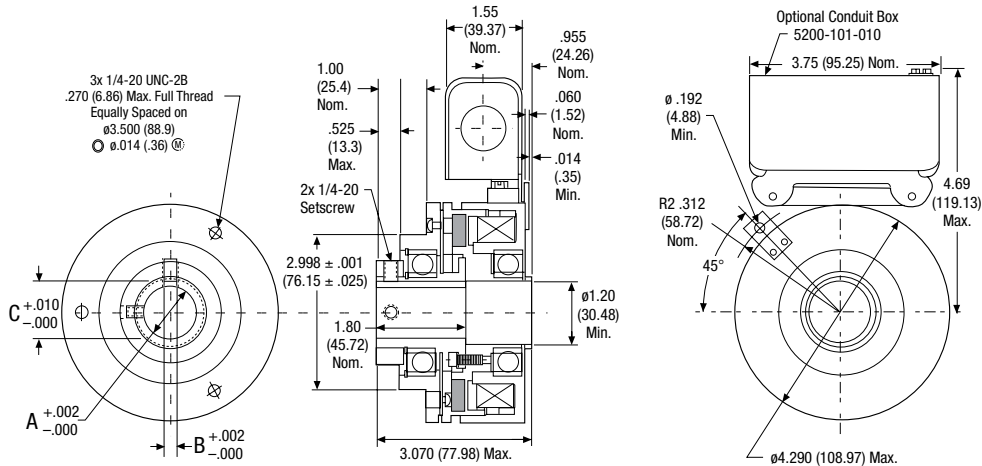
1. Select the proper size from the chart (right).
2. Select the bore size and voltage.
3. Find the corresponding part number from the table below.
4. Select a Warner Electric Control if appropriate.

\*For applications with speeds below 100RPM, please contact Warner Electric Application Support.

## SFP-250



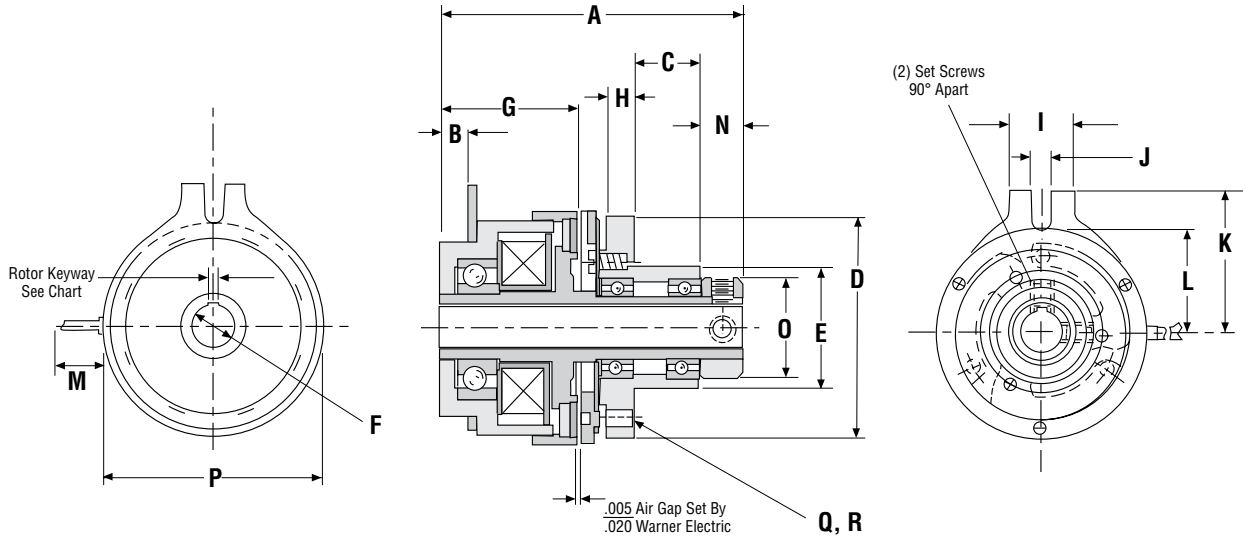
## SFP-400



## Tolerances

Model No.	A Bore	Keyway			Part Number		
		B	C		6V	24V	90V
SFP-250	.375"	.0948	.421		5103-271-002	5103-271-006	5103-271-010
	.438"	.126	.479		5103-271-003	5103-271-007	5103-271-011
	.500"	.126	.560		5103-271-004	5103-271-008	5103-271-012
	.6255	.1885	.678		5103-271-005	5103-271-009	5103-271-013
SFP-400	.5005"	.125	.560		5104-271-006	5104-271-016	5104-271-021
	.6255"	.1875	.709		5104-271-007	5104-271-017	5104-271-022
	.7505"	.1875	.837		5104-271-008	5104-271-018	5104-271-023
	.8755"	.1875	.964		5104-271-009	5104-271-019	5104-271-024
	1.0005"	.1875	1.090		5104-271-010	5104-271-020	5104-271-025

**Pre-Assembled SF Clutch For Parallel Shafts  
Model 180**



**Dimensions**

Model No.	A Max.	B Max.	C Nom.	D Max.	E ± .001 Nom.	F Nom.	G Nom.	H Nom.	I Max.	J Min.	K Nom.	L Nom.	M ± .500 Nom.	N Nom.	O Nom.	P Max.	Rotor Keyway			
																	Bore	Nominal Keyway	Q B.C.	R SIZE
180	2.515	.304	.500	1.755	.9985	5/16	1.290	.193	.505	.184	1.325	.975	12.00	.315	.875	1.620	N.A.	SET SCREWS ONLY	1.437 3-Holes	8-32 UNC-2B
						1/4														
						3/8														

**Mechanical**

Model No.	Static Torque lb. - in	Inertia lb. - in. <sup>2</sup>		Wt. oz.
		Rotor	Arm & Hub	
180	15	.052	.095	26

**Electrical**

Model No.	90 VDC		24 VDC	
	Amps	Ohms	Amps	Ohms
180	.066	1369	.289	83.1

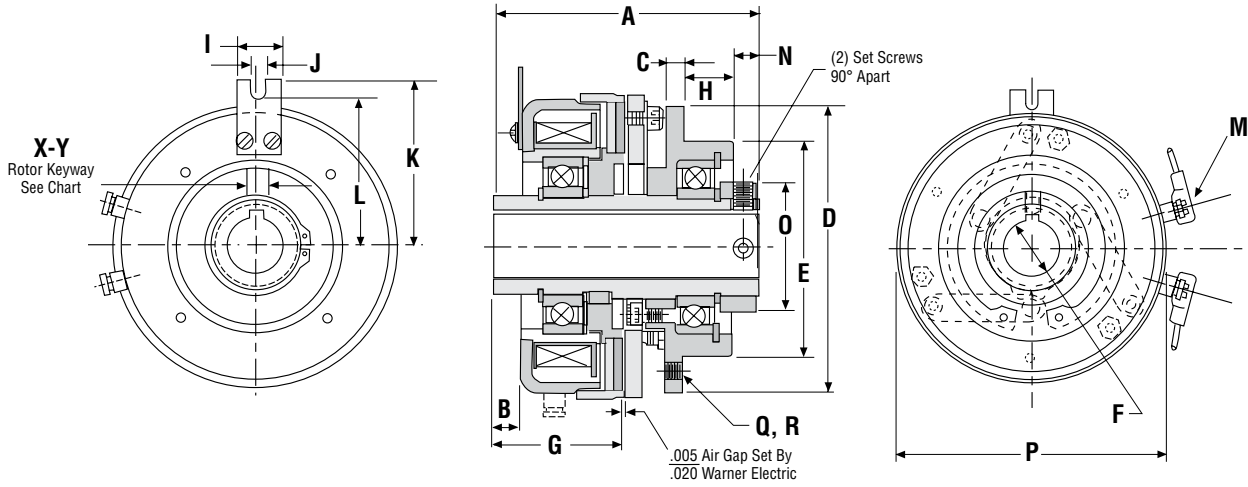
**Part Numbers**

Model Size	Bore Size	Voltage DC	Part No.
180	1/4"	24	SFP180-14-24
	5/16"	24	SFP180-516-24
	3/8"	24	SFP180-38-24
	1/4"	90	SFP180-14-90
	5/16"	90	SFP180-516-90
	3/8"	90	SFP180-38-90

**Customer shall maintain:**

A loose-fitting pin through the anti-rotation tab to prevent preloading the bearings.

**Pre-Assembled SF Clutch For Parallel Shafts  
Model 325**



**Dimensions**

Model No.	A Max.	B Max.	C Nom.	D Max.	E ± .001	F Nom.	G Nom.	H Nom.	I Max.	J Min.	K Nom.	L Nom.	Rotor Keyway								
													M ± .500	N Nom.	O Nom.	P Max	Nominal Keyway		Q B.C.	R SIZE	
													X*	Y*							
325	2.961	.140	.395	2.883	1.498	1/2	1.360	.500	.442	.170	2.050	1.740	Screw Terminals	.408	1.187	3.300	1/2	.125 - .128	.560 - .56	1.790 3-Holes	6-32 UNC-2B

**Mechanical**

Model No.	Static Torque lb. - in	Inertia lb. - in. <sup>2</sup>		Wt. oz.
		Rotor	Arm & Hub	
325	125	.560	.990	54

**Electrical**

Model No.	90 VDC		24 VDC	
	Amps	Ohms	Amps	Ohms
325	.091	988	.378	65.3

Lead wire is UL recognized style 1213, 1015 or 1430, 22 gage. Insulation is .0509 O.D. on 110 units; .0649 or .0959 O.D. on all other units.

**Part Numbers**

Model Size	Bore Size	Voltage DC	Part No.
325	1/2"	24	SFP325-12-24
	1/2"	90	SFP325-12-90

**Customer shall maintain:**

A loose-fitting pin through the anti-rotation tab to prevent preloading the bearings.



### Packaged Performance Products Service Parts for Shaft Mounted Units

#### Electro Clutches and Brakes

EC Series Shaft Mounted Clutches . . . . .	SP-2
EB Series Shaft Mounted Brakes . . . . .	SP-8

#### Advanced Technology Clutches and Brakes

ATC Series Clutches . . . . .	SP-14
ATB Series Brakes . . . . .	SP-16

#### Packaged Stationary Field Clutches

SFP Clutches . . . . .	NA
------------------------	----

When replacing components in clutches and brakes several guidelines are appropriate. In all cases, when replacing worn friction surfaces both the components need to be replaced. In many cases, the splined hubs should be inspected and replaced if worn.



### Common Replacement Practices:

#### EC clutches

- Replace clutch rotor and armature

#### EB brakes

- Replace magnet and armature

#### ATC clutches

- Replace clutch rotor facing and armature facing
- Inspect splined hub

#### ATB brakes

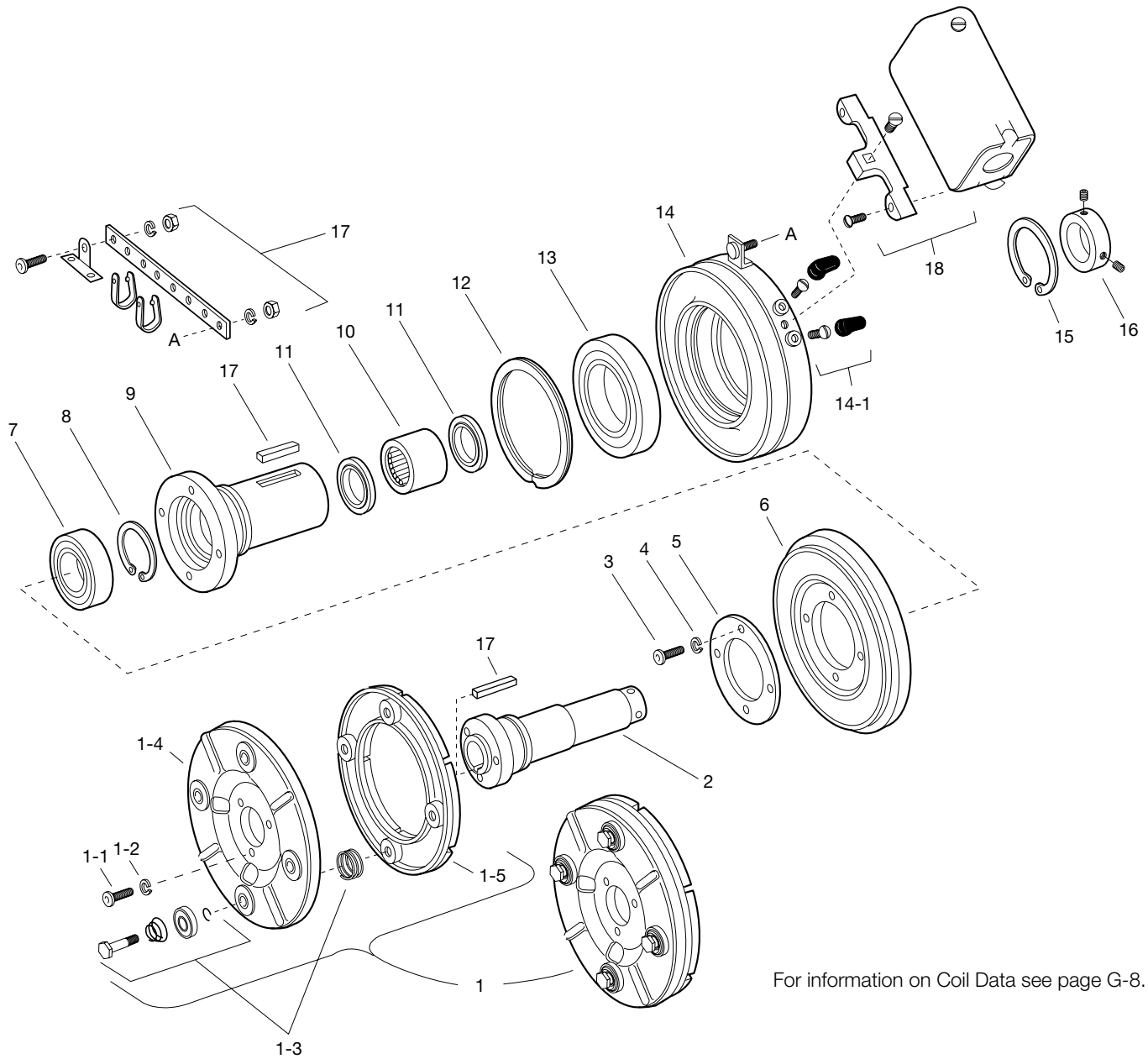
- Replace magnet facing and armature facing
- Inspect splined hub

#### A note on burnishing:

When new friction surfaces are installed it will be necessary to burnish the unit prior to returning to full production rates. Burnishing is the act of wearing in the friction faces to ensure full engagement and therefore full torque. Burnishing is achieved by simply cycling the unit under less than full load (machine empty, if possible). Most units will achieve full torque in less than 100 cycles. Refer to the service manual for more details.

# EC Series Electro Clutch

## EC-375, EC-475, EC-650



For information on Coil Data see page G-8.

### Electrical and Mechanical Data

Model Size	Voltage DC	Static Torque (lb. ft.)	Max. Speed RPM	Armature & Carrier	Inertia-WR <sup>2</sup> (lb. ft <sup>2</sup> )			Weight lbs.
					Rotor	Outer Sleeve	Total Inner Sleeve	
EC-375	6	16 lb. ft.	5000	.010	.018	.001	.001	4
	24	16 lb. ft.	5000	.010	.018	.001	.001	4
	90	16 lb. ft.	5000	.010	.018	.001	.001	4
EC-475	6	30 lb. ft.	4500	.072	.033	.006	.002	8
	24	30 lb. ft.	4500	.072	.033	.006	.002	8
	90	30 lb. ft.	4500	.072	.033	.006	.002	8
EC-650	6	95 lb. ft.	3600	.106	.202	.010	.013	18
	24	95 lb. ft.	3600	.106	.202	.010	.013	18
	90	95 lb. ft.	3600	.106	.202	.010	.013	18

### Service Parts

# EC Series Electro Clutch

## EC-375, EC-475, EC-650

### Component Parts

Item	Description	EC-375		EC-475		EC-650	
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.
1	Armature & Carrier Assembly	5380-101-006	1	5181-101-003	1	5281-101-003	1
	1-1 Capscrew	797-1214	3	797-1214	3	797-0086	3
	1-2 Lockwasher	950-0102	3	950-0102	3	950-0102	3
	1-3 Autogap Accessory	5180-101-011	3	5181-101-010	4	5181-101-010	4
	1-4 Carrier	5380-295-002	1	5181-295-002	1	5281-295-002	1
	1-5 Armature	5180-111-002	1	5181-111-002	1	5281-111-002	1
	Inner Sleeve		1		1		1
	1/2" Bore	803-0054					
	5/8" Bore	803-0055		803-1007			
	3/4" Bore			803-1005			
2	7/8" Bore			803-1006			
	1" Bore					803-0047	
	1-1/8" Bore					803-0049	
	1-1/4" Bore					803-0048	
	1-3/8" Bore					803-0050	
3	Screw	797-1050	6	797-1039	4	797-0083	4
4	Lockwasher	950-0105	6	950-0102	4	950-0103	4
5	Retainer Plate	748-0391	1	748-0393	1	748-0389	1
6	Rotor	5180-751-001	1	5181-751-003	1	5281-751-001	1
7	Ball Bearing	166-0149	1	166-2016	2	166-0110	1
8	Retainer ring	748-0017	1	748-0023	2	748-0002	1
9	Outer Sleeve	5180-104-001	1	803-1003	1	5281-104-001	1
10	Sleeve Bearing	166-0177	1	166-0179	1	166-0178	1
11	Oil Seal	795-0027	2	795-0028	2	795-0026	2
12	Retainer Ring	748-0101	1	748-0102	1	748-0104	1
13	Ball Bearing	166-0150	1	166-0110	1	166-0104	1
	Field		1		1		1
14	6 volt	5180-451-002		5181-451-002		5281-451-002	
	24 volt	5180-451-004		5181-451-004		5281-451-004	
	90 volt	5180-451-005		5181-451-005		5281-451-005	
	14-1 Terminal Accessory	5103-101-002	1	5103-101-002	1	5311-101-001	1
15	Retainer Ring	748-0018	1	748-0002	1	748-0004	1
16	Set Collar	266-0011	1	266-0012	1	266-0010	1
	Accessory, W/Keys		1		1		1
17	1/2" Bore	5180-101-001					
	5/8" Bore	5180-101-001		5181-101-001			
	3/4" Bore			5181-101-001			
	7/8" Bore			5181-101-002			
	1" Bore					5281-101-001	
	1-1/8" Bore					5281-101-001	
	1-1/4" Bore					5281-101-001	
	1-3/8" Bore					5281-101-002	
18	Conduit Box	5200-101-010	1	5200-101-010	1	5200-101-010	1

Refer to service manual P-273-5-WE.

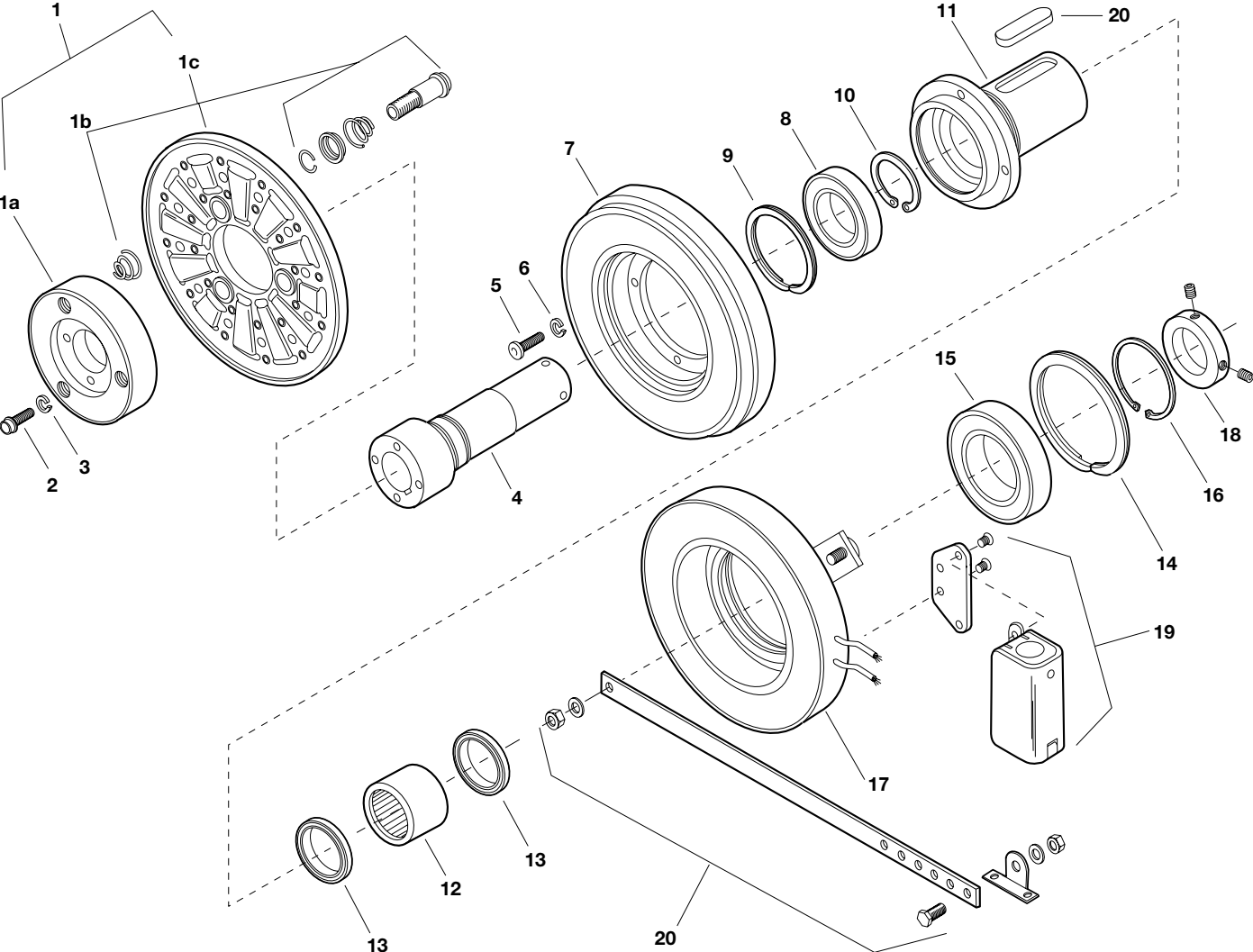
These units meet the standards of UL 508 and are listed under guide card #NMTR2, file #59164.



### Service Parts

# EC Series Electro Clutch

## EC-825



### Service Parts

### Component Parts

EC-825			
Item	Description	Part No.	Qty.
<b>1</b>	Armature Assembly	5282-111-002	1
	1a Hub	540-1298	1
	1b Autogap Accessory	5201-101-068	3
	1c Armature	5282-111-001	1
<b>2</b>	Capscrew	797-0081	4
<b>3</b>	Lockwasher	950-0103	4
<b>4</b>	Inner Sleeve		1
	1-1/8" Bore	803-0069	
	1-1/4" Bore	803-0070	
	1-3/8" Bore	803-0071	
<b>5</b>	Capscrew	797-0086	4
<b>6</b>	Lockwasher	950-0103	4
<b>7</b>	Rotor Assembly	5282-751-001	1
<b>8</b>	Ball Bearing	166-0110	1
<b>9</b>	Retainer Ring	748-0102	1
<b>10</b>	Retainer Ring	748-0002	1
<b>11</b>	Rotor Adapter	5282-105-002	1

EC-825			
Item	Description	Part No.	Qty.
<b>12</b>	Roller Bearing	166-0178	1
<b>13</b>	Oil Seal	795-0026	2
<b>14</b>	Retainer Ring	748-0104	1
<b>15</b>	Ball Bearing	166-0104	1
<b>16</b>	Retainer Ring	748-0004	1
	Field		1
	6 volt	5282-451-002	
<b>17</b>	24 volt	5282-451-004	
	90 volt	5282-451-005	
<b>18</b>	Set Collar	266-0010	1
<b>19</b>	Conduit Box	5200-101-012	1
<b>20</b>	Mounting Accessory with Keys	5282-101-001	1

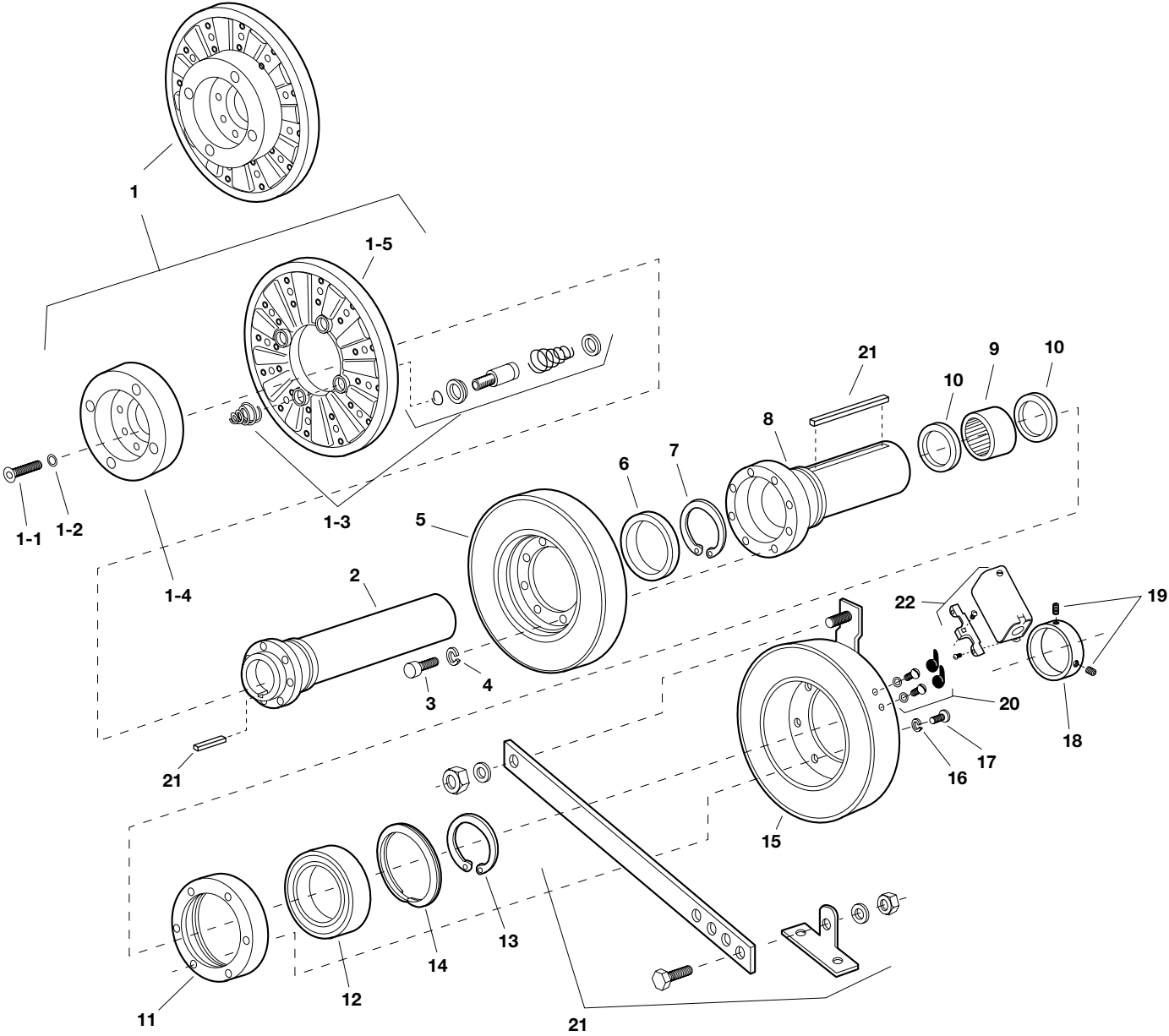
Refer to Service Manual P-0210-WE.

These units when used with the correct Warner Electric conduit box, meets the standards of UL508 and are listed under guide care #NMTR, file #59164.



# EC Series Electro Clutch

EC-1000, EC-1225



## Service Parts



# EC Series Electro Clutch

## EC-1000, EC-1225

### Component Parts

Item	Description	EC-1000		EC-1225	
		Part No.	Qty.	Part No.	Qty.
1	Armature & Carrier Assembly	5283-111-001	1	5284-111-001	1
	1-1 Capscrew	797-1163	6	797-1163	8
	1-2 Lockwasher	950-0111	6	950-0111	8
	1-3 Autogap Accessory	5201-101-008	3	5201-101-008	4
	1-4 Hub	540-1338	1	540-1340	1
	1-5 Armature	5302-111-013	1	5385-111-003	1
2	Inner Sleeve		1		1
	3/8" Bore	803-0027			
	1-1/2" Bore	803-0166			
	1-5/8" Bore	803-0028			
	1-5/8" Bore			803-0078	
	1-7/8" Bore			803-0030	
3	2-1/8" Bore			803-0031	
	Capscrew	797-0083	8	797-0416	8
4	Lockwasher	950-0103	8	950-0106	8
5	Rotor Assembly	5283-101-002	1	5284-101-006	1
6	Ball Bearing	166-0168	1	166-0170	1
7	Retainer Ring	748-0067	1	748-0503	1
8	Outer Sleeve	803-0025	1	803-0032	1
9	Roller Bearing	166-0180	1	166-0181	1
10	Oil Seal	795-0029	2	795-0033	2
11	Adapter Ring	748-0480	1	748-0466	1
12	Ball Bearing	166-0163	1	166-0163	1
13	Retainer Ring	748-0502	1	748-0502	1
14	Retainer Ring	748-0114	1	748-0114	1
15	Field		1		1
	6 volt	5283-451-002		5284-451-002	
	24 volt	5283-451-010		5284-451-010	
	90 volt	5283-451-003		5284-451-003	
16	Lockwasher	950-0355	6	950-0359	6
17	Capscrew	797-0083	6	797-0416	6
18	Set Collar	266-0015	1	266-0016	1
19	Set Screw	797-0468	2	797-0130	2
20	Terminal Accessory	5311-101-001	1	5311-101-001	1
21	Mounting Accessory with Keys		1		1
	1-3/8" Bore	5283-101-005			
	1-1/2" Bore	5283-101-009			
	1-5/8" Bore	5283-101-006		5284-101-007	
	1-7/8" Bore			5284-101-001	
22	2-1/8" Bore			5284-101-002	
	Conduit Box	5200-101-011	1	5200-101-011	1

Refer to service manual P-0210-WE.

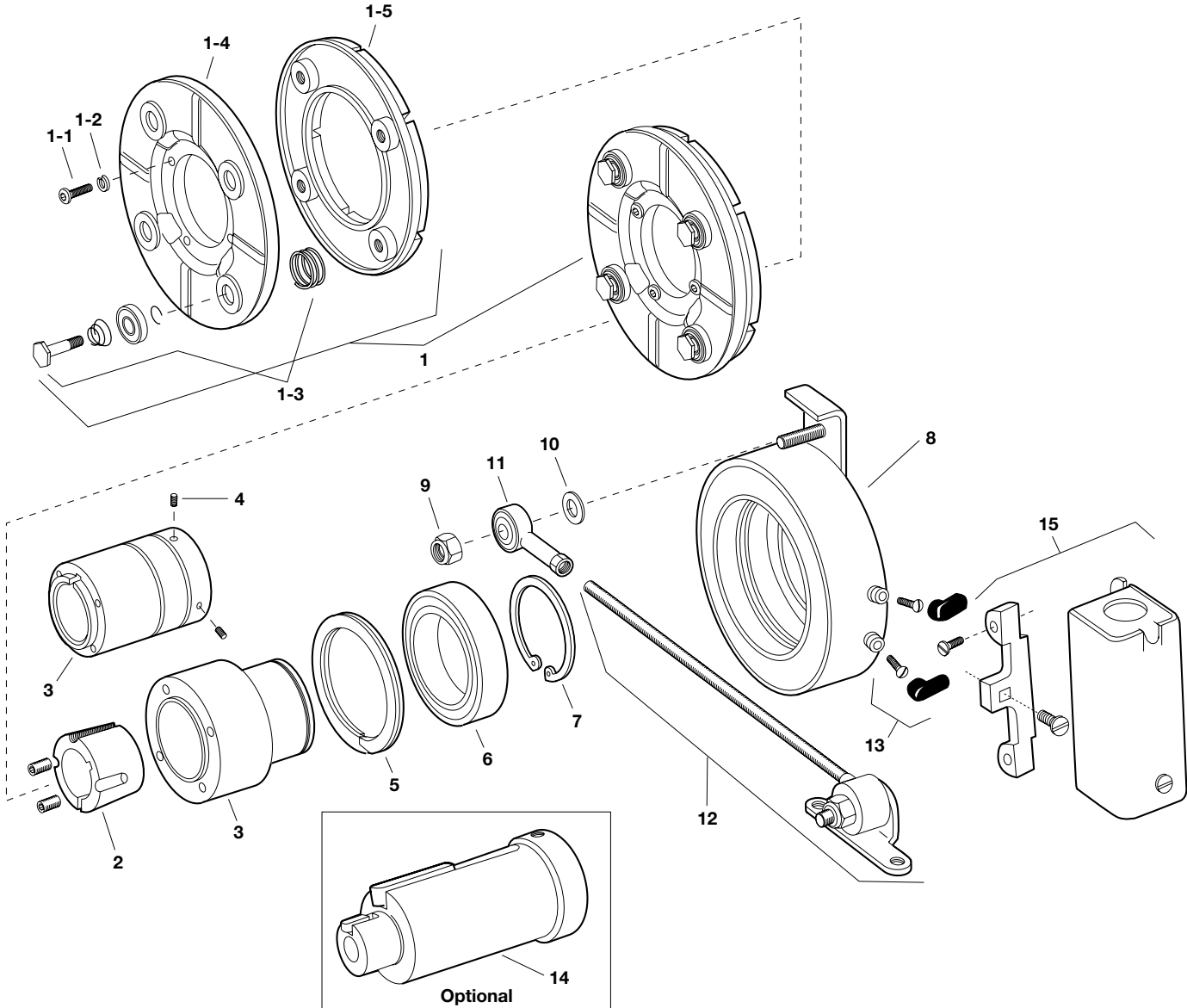
These units when used with the correct Warner Electric conduit box, meets the standards of UL508 and are listed under guide care #NMTR, file #59164.



### Service Parts

# EB Series Electro Brake

## EB-375, EB-475, EB-650



### Service Parts

# EB Series Electro Brake

## EB-375, EB-475, EB-650

### Component Parts

Item	Description	EB-375		EB-475		EB-650	
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.
1	Armature & Carrier Assembly	5380-101-006	1	5381-101-004	1	5382-101-005	1
	1-1 Capscrew	797-1214	3	797-1214	4	797-0086	4
	1-2 Lockwasher	950-0102	3	950-0102	4	950-0103	4
	1-3 Autogap Accessory	5180-101-011	3	5181-101-010	4	5181-101-010	4
	1-4 Carrier	5380-295-002	1	5381-295-003	1	5382-295-002	1
	1-5 Armature	5180-111-002	1	5181-111-002	1	5281-111-002	1
2	*Bushing			180-0410-180-0418 1/2" to 1" bore	1	180-0421-180-0435 1/2" to 1-3/8" bore	1
	Hub		1	540-0524	1	540-0523	1
3	1/2" Bore	540-0520					
	5/8" Bore	540-0519					
4	Set Screw		2				
	1/2" Bore	797-0368					
	5/8" Bore	797-0366					
5	Retainer Ring	748-0101	1	748-0102	1	748-0104	1
6	Ball Bearing	166-0150	1	166-0110	1	166-0104	1
7	Retainer Ring	748-0018	1	748-0002	1	748-0004	1
8	Magnet		1		1		1
	6 volt	5380-631-003		5381-631-003		5382-631-003	
	24 volt	5380-631-004		5381-631-004		5382-631-005	
	90 volt	5380-631-002		5381-631-002		5382-631-002	
9	Locknut	661-0050	1	661-0051	1	661-0004	1
10	Washer	950-0029	1	950-0026	1	950-0030	1
11	Rod End Bearing	166-0186	1	166-0187	1	166-0188	1
12	Torque Arm Rod Assembly	5380-112-001	1	5381-112-001	1	5382-112-001	1
13	Terminal Accessory	5311-101-001	1	5311-101-001	1	5311-101-001	1
	Adapter (optional)		1		1		1
	5/8" Motor Shaft	5380-101-005					
	7/8" Motor Shaft	5380-101-004					
	1-1/8" Motor Shaft			5381-101-003			
	1-3/8" Motor Shaft					5382-101-003	
14	1-5/8" Motor Shaft					5382-101-002	
	Conduit Box	5200-101-010	1	5200-101-010	1	5200-101-010	1

\*See page B-2 for specific part numbers.

Refer to Service Manual P-211-WE.

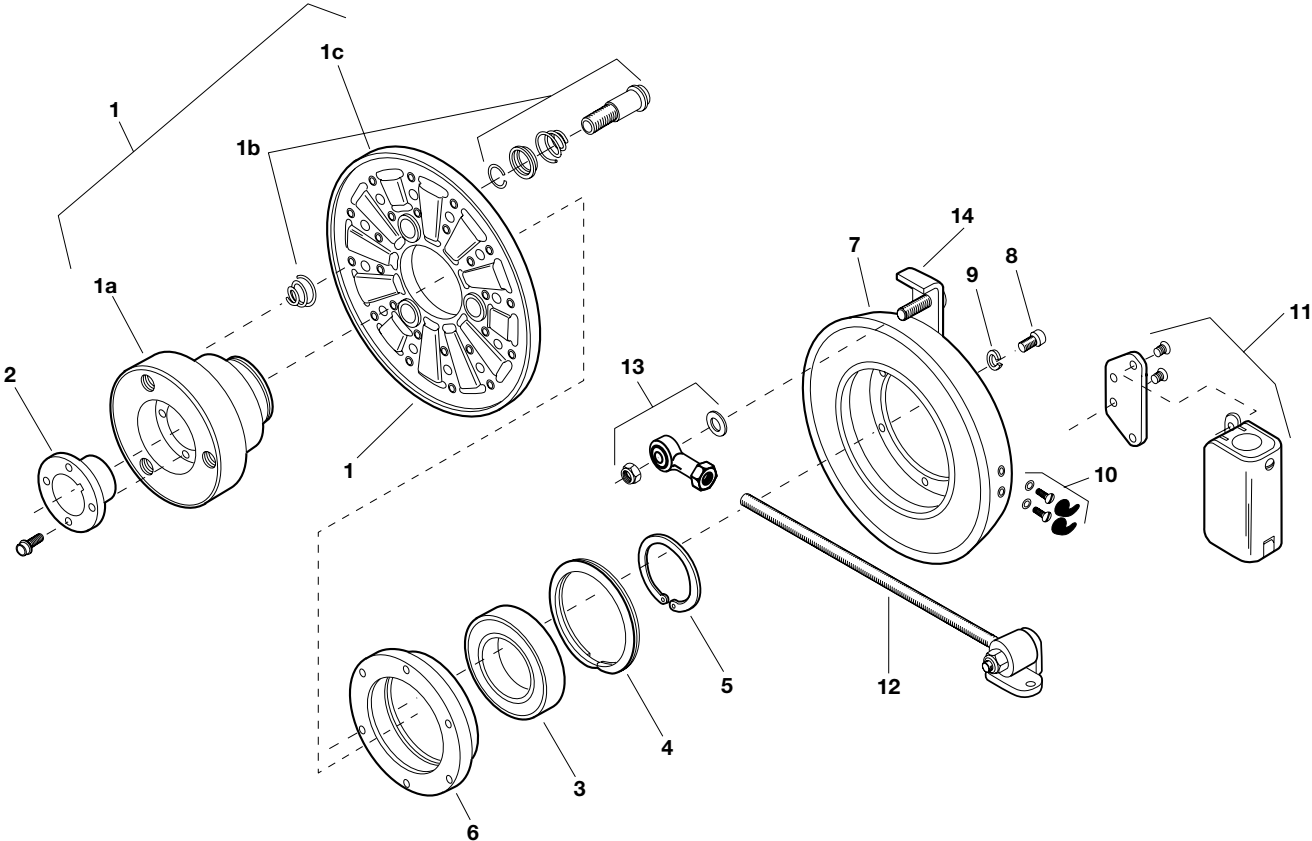
These units when used with the correct Warner Electric conduit box, meets the standards of UL508 and are listed under guide care #NMTR, file #59164.



### Service Parts

# EB Series Electro Brake

## EB-825



### Service Parts

### Component Parts

EB-825			
Item	Description	Part No.	Qty.
1	Armature Assembly	5383-111-001	1
	1a Hub	540-1299	1
	1b Autogap Assembly	5201-101-008	3
	1c Armature	5282-111-001	1
2	*Bushing	180-0002 to 180-0018	
		1/2" to 1-1/2" Bore	1
3	Ball Bearing	166-0168	1
4	Retainer Ring	748-0120	1
5	Retainer Ring	748-0584	1
6	Adapter Ring	748-0631	1

EB-825			
Item	Description	Part No.	Qty.
7	Magnet Assembly		1
	6 volt	5383-631-006	
	24 volt	5383-631-007	
	90 volt	5383-631-008	
8	Capscrew	797-0079	6
9	Lockwasher	950-0372	6
10	Terminal Accessory	5311-101-001	1
11	Conduit Box	5200-101-011	1
12	Torque Arm Rod Assembly	5382-112-001	1
13	Rod End Assembly	5382-101-007	1
14	Torque Arm Kit (bolt-on)	5383-101-001	1

\*See page B-2 for specific part numbers.

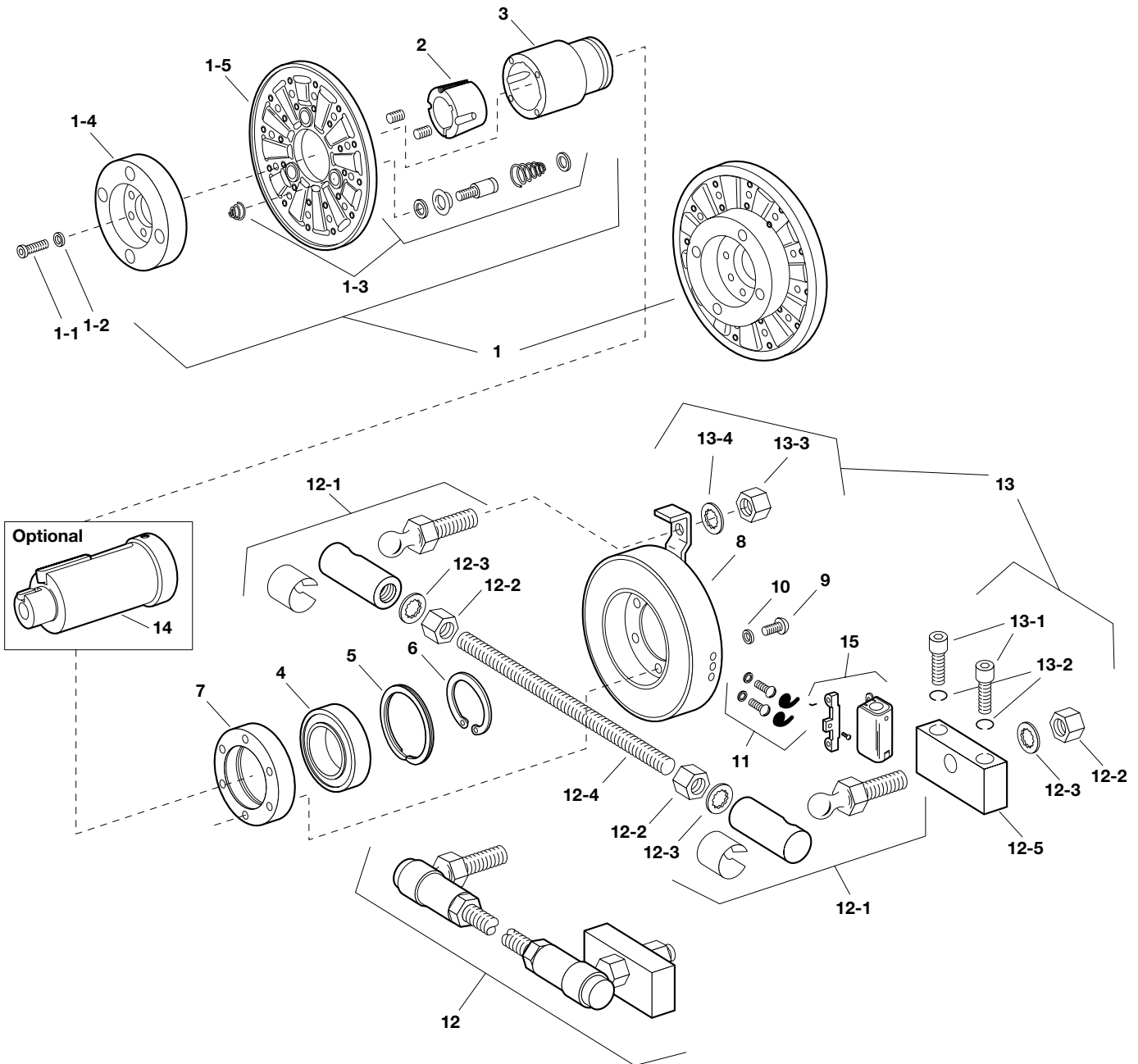
Refer to Service Manual P-211-WE.

These units when used with the correct Warner Electric conduit box, meets the standards of UL508 and are listed under guide care #NMTR, file #59164.



# EB Series Electro Brake

## EB-1000, EB-1225



### Service Parts

# EB Series Electro Brake

**EB-1000, EB-1225**

## Component Parts

Item	Description	EC-1000		EC-1225	
		Part No.	Qty.	Part No.	Qty.
1	Armature & Carrier Assembly	5384-111-003	1	5385-111-004	1
	1-1 Capscrew	797-1163	6	797-1163	8
	1-2 Lockwasher	950-0111	6	950-0111	8
	1-3 Autogap Accessory	5201-101-008	3	5201-101-008	4
	1-4 Hub	540-1339	1	540-1341	1
	1-5 Armature	5302-111-013	1	5385-111-003	1
2	*Bushing	180-0131-180-0149	1	180-0185-180-0217	1
		1/2" to 1-5/8" bore		1/2" to 2-1/2" bore	
3	Hub	540-0579	1	540-0578	1
4	Ball Bearing	166-0164	1	166-0163	1
5	Retainer Ring	748-0116	1	748-0114	1
6	Retainer Ring	748-0501	1	748-0074	1
7	Adapter Ring	748-0467	1	748-0465	1
8	Magnet Assembly		1		1
	6 volt	5384-631-010		5385-631-010	
	24 volt	5384-631-011		5385-631-011	
	90 volt	5384-631-012		5385-631-012	
9	Capscrew	797-0416	6	797-0416	6
10	Lockwasher	950-0106	6	950-0106	6
11	Terminal Accessory	5311-101-001	1	5311-101-001	1
12	Torque Arm Rod Assembly	5385-757-001	1	5385-757-001	1
	12-1 Ball Joint	585-0001	2	585-0001	2
	12-2 Jam Nut	661-0012	3	661-0012	3
	12-3 Lockwasher	950-0114	3	950-0114	3
	12-4 Threaded Rod	756-0030	1	756-0030	1
	12-5 Bracket	174-0073	1	174-0073	1
13	Torque Arm Mounting Accessory	5385-101-001	1	5385-101-001	1
	13-1 Capscrew	797-0293	2	797-0293	2
	13-2 Lockwasher	950-0354	2	950-0354	2
	13-3 Jam Nut	661-0012	1	661-0012	1
	13-4 Lockwasher	950-0114	1	950-0114	1
14	Adapter (optional)		1		1
	1-5/8" Motor Shaft	5384-101-008			
	1-7/8" Motor Shaft	5384-101-007			
	2-1/8" Motor Shaft	5384-101-010		5385-101-008	
	2-3/8" Motor Shaft			5385-101-007	
15	Conduit Box	5200-101-011	1	5200-101-011	1

\*See page B-2 for specific part numbers.

Refer to Service Manual P-211-WE.

These units when used with the correct Warner Electric conduit box, meets the standards of UL508 and are listed under guide care #NMTR, file #59164.

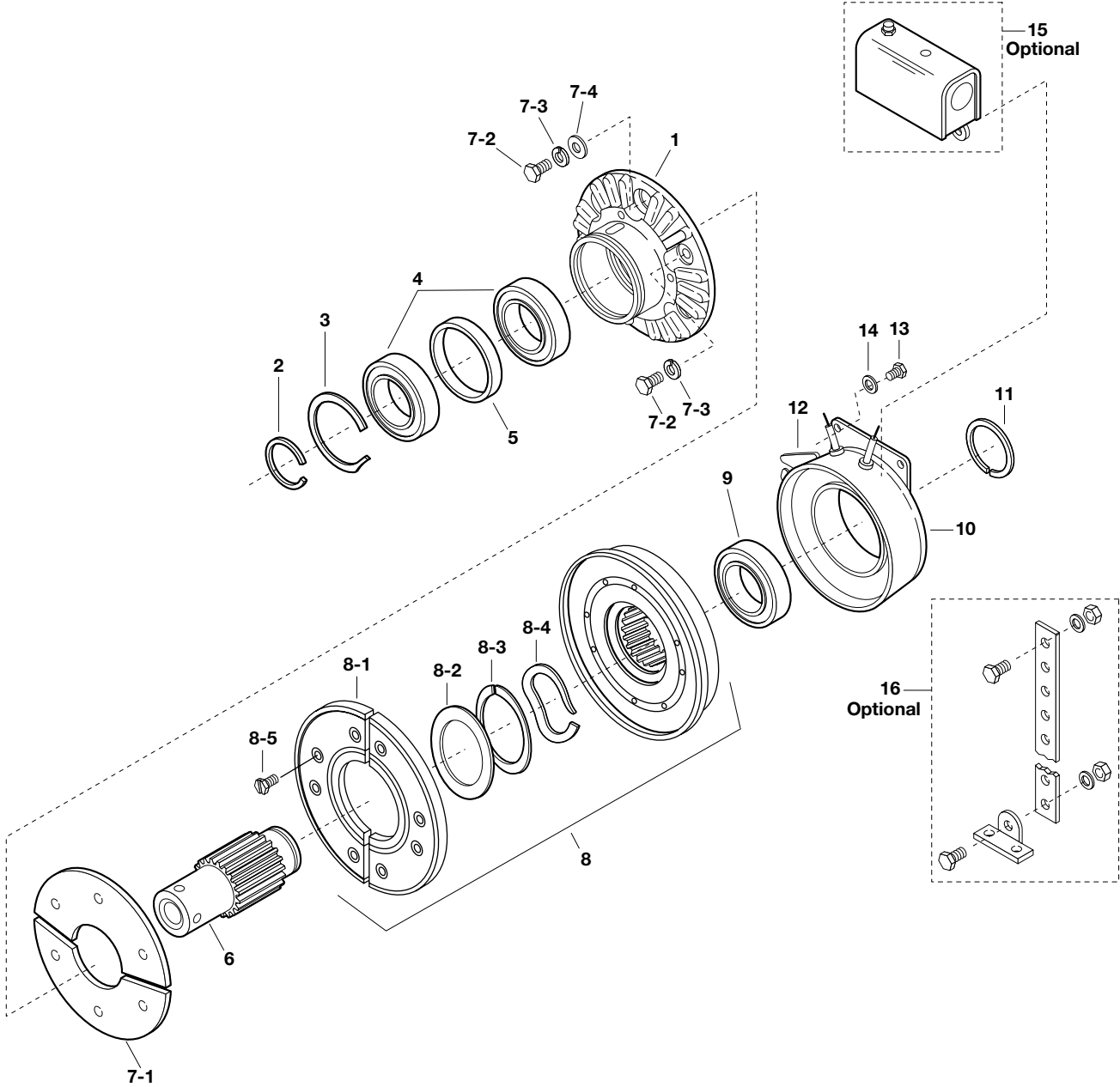


## Service Parts



# ATC Series AT Clutch

ATC-25, ATC-55, ATC-115



## Service Parts

# ATC Series AT Clutch

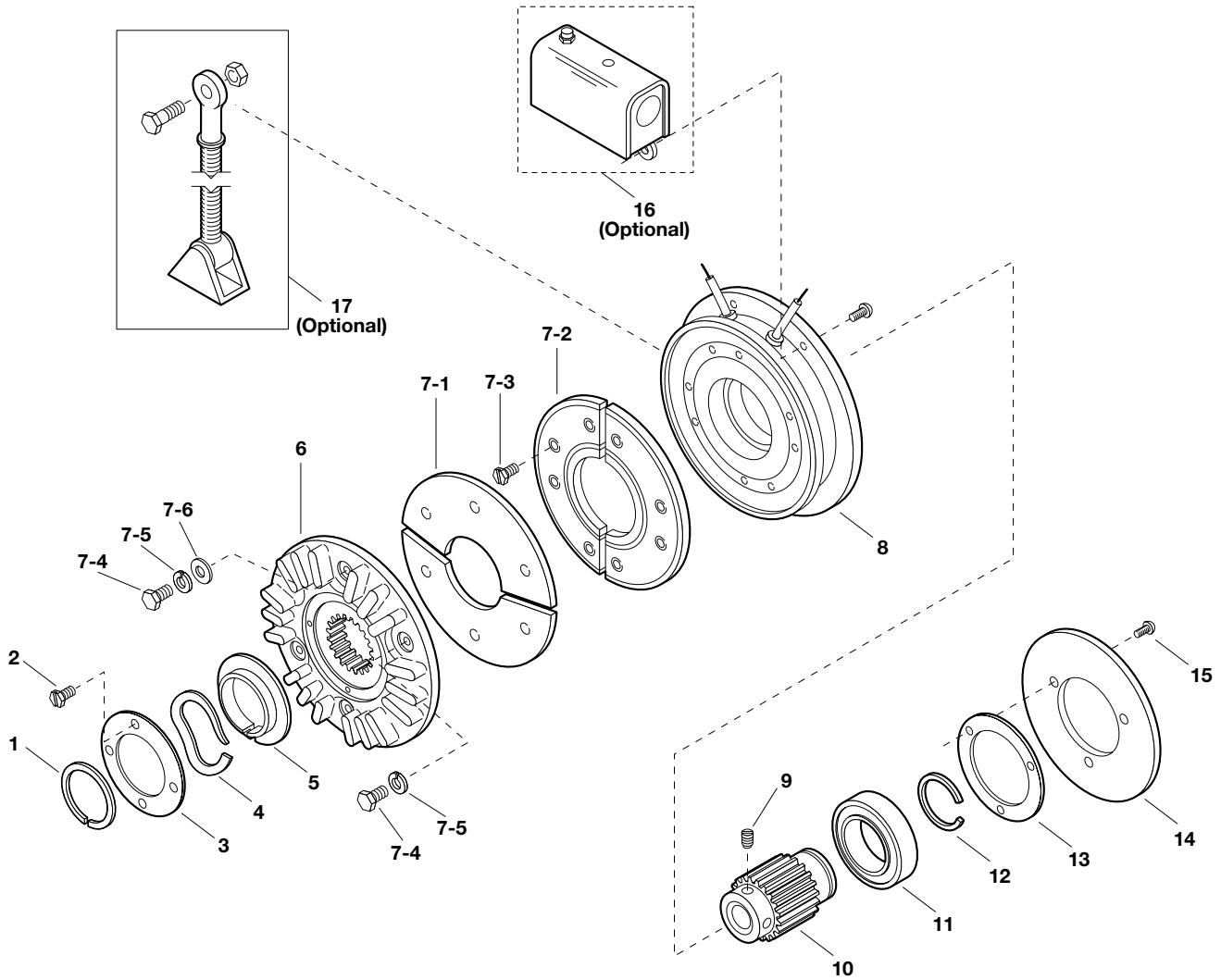
## ATC-25, ATC-55, ATC-115

### Component Parts

Item	Description	ATC-25		ATC-55		ATC-115	
		Part No.	Qty.	Part No.	Qty.		
1	Armature Hub	540-0907	1	540-0852	1	540-0863	1
2	Retaining Ring	748-0732	1	748-0726	1	748-0737	1
3	Retaining Ring	748-0731	1	748-0728	1	748-0736	1
4	Bearing	166-0278	2	166-0277	2	166-0279	2
5	Spacer	807-0119	1	807-1061	1	807-1063	1
6	Splined Hub		1		1		1
	1/2" Bore	540-0910					
	5/8" Bore	540-0911					
	3/4" Bore	540-0912		540-1501			
	7/8" Bore	540-0913		540-1502			
	1" Bore			540-1503			
	1-1/8" Bore			540-1504		540-0857	
	1-1/4" Bore					540-0858	
	1-3/8" Bore					540-0859	
	1-1/2" Bore					540-0860	
*7-1	Armature	110-0220	1	110-0218	1	110-0223	1
*7-2	Screw	797-1519	4	797-1462	6	797-1463	6
*7-3	Lockwasher	950-0436	4	950-0355	6	950-0355	6
*7-4	Flatwasher			950-0023	2	950-0023	2
*8	Rotor	5161-751-001	1	5162-751-001	1	5163-751-001	1
8-1	Facing Assembly	5161-445-003	1	5162-445-003	1	5163-445-003	1
8-2	Retainer Plate					686-0108	1
8-3	Detent Ring	748-2031	1	748-2038	1	748-2020	1
8-4	Wave Spring	808-0404	1	808-0401	1	808-0384	2
8-5	Machine Screw	797-1389	8	797-1389	8	797-1389	8
*9	Bearing	166-0283	1	166-0284	1	166-0279	1
10	Field Assembly		1		1		1
	6 volts DC	5161-451-002		5162-451-002		5163-451-002	
	90 volts DC	5161-451-003		5162-451-003		5163-451-003	
	24 volts DC	5161-451-004		5162-451-004		5163-451-004	
*11	Retainer Ring	748-0018	1	748-0727	1	748-0737	1
12	Adapter					104-0300	2
13	Screw					797-1396	4
14	Lockwasher					950-0102	4
<b>Optional Accessory Items</b>							
15	Conduit box 100-1	5162-101-002	1	5162-101-002	1	5162-101-002	1
16	Restraining Arm Assembly	5162-101-004	1	5162-101-004	1	5163-101-004	1
<b>Kit Items</b>							
	* Clutch Rebuild Kit	5161-101-011	1	5162-101-011	1	5163-101-011	1
(includes items 7-1, 7-2, 7-3, 7-4, 8, 9, 11)							
Note: In some versions of this product, item 8 consists of a one (1) piece rotor.							
	Friction Face Replacement Kit	5161-101-007		5162-101-007		5163-101-007	
For Clutches with Replaceable Friction Face Only							
<b>Mounting Accessory Kits (not shown)</b>							
1	1/2" Bore - 3/4" Bore	5161-101-001					
1-1	Ring Retainer Ext.	748-0734	1				
1-2	Wire Retainer	742-0027	1				
1-3	Key	590-0104	1				
1-4	Setscrew	797-1393	2				
1	7/8" Bore	5161-101-002					
1-1	Ring Retainer Ext.	748-0734	1				
1-2	Wire Retainer	742-0027	1				
1-3	Key	590-0104	1				
1-4	Collar and Setscrew	266-0031	1				
1	3/4" Bore - 1" Bore			5162-101-001			
1-1	Ring Retainer Ext.			748-0725	1		
1-2	Wire Retainer			742-0026	1		
1-3	Key			590-0103	1		
1-4	Setscrew			797-1386	2		
1	1-1/8" Bore			5162-101-010			
1-1	Ring Retainer Ext.			748-0725	1		
1-2	Wire Retainer			742-0026	1		
1-3	Key			590-0103	1		
1-4	Setscrew			797-1077	2		
1-5	Collar			266-0032	1		
1	All bore sizes					5163-101-001	
1-1	Ring Retainer Ext.					748-0738	1
1-2	Wire Retainer					742-0026	1
1-3	Key					590-0105	1
1-4	Setscrew					797-1395	2

# ATB Series AT Brake

## ATB-25, ATB-55, ATB-115



### Electrical and Mechanical Data

Model Size	Voltage DC	Unit	Resistance (Ohms)	Current (Amps)	Watts	Coil Build Up (MMS)	Coil Decay (MMS)	Inertia*–WR <sup>2</sup> (lb.ft.2)	Max. RPM	Weight lbs.
25	6	Brake	1.37	4.38	26.3	145	9	.048	3600	8
	24		20.2	1.19	28.6	145	9	.048	3600	8
	90		290	.31	27.9	145	9	.048	3600	8
55	6	Brake	1.21	4.96	29.8	210	35	.173	3600	18
	24		19.6	1.22	29.3	210	35	.173	3600	18
	90		230	.39	35.2	210	35	.173	3600	18
115	6	Brake	1.02	5.91	35.4	150	45	.483	3600	28
	24		16.5	1.46	35	150	45	.483	3600	28
	90		182	.50	44.6	150	45	.483	3600	28

### Service Parts

# ATB Series AT Brake

## ATB-25, ATB-55, ATB-115

### Component Parts

Item	Description	ATB-25		ATB-55		ATB-115		
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.	
†1	Retainer	748-0018	1	748-0727	1	748-0737	1	
†2	Screw	797-0321	3	797-0321	4	797-0321	4	
3	Plate	686-0166	1	686-0162	1	686-0171	1	
†4	Wave Spring	808-0404	1	808-0401	1	808-0384	2	
†5	Detent Ring	748-2031	1	748-2038	1	748-2020	1	
6	Armature Hub	540-0908	1	540-0851	1	540-0864	1	
*†7-1	Armature	110-0220	1	110-0218	1	110-0223	1	
*†7-2	Facing Assembly	5161-445-003	1	5162-445-003	1	5163-445-003	1	
*†7-3	Screw	797-1389	6	797-1389	8	797-1389	8	
*†7-4	Screw	797-1519	4	797-1462	6	797-1463	6	
*†7-5	Lockwasher	950-0436	4	950-0355	4	950-0355	6	
*†7-6	Flatwasher			950-0023	2	950-0023	2	
	Magnet Assembly		1		1		1	
8	6 volts DC	5191-631-002		5192-631-002		5193-631-002		
	24 volts DC	5191-631-004		5192-631-004		5193-631-004		
	90 volts DC	5191-631-003		5192-631-003		5193-631-003		
†9	Setscrew	797-1393	2	797-1386	2	797-1395	2	
	Splined Hub		1		1		1	
10	1/2" Bore	540-0901						
	5/8" Bore	540-0902						
	3/4" Bore	540-0903		540-1512				
	7/8" Bore	540-0904		540-1513				
	1" Bore			540-1514				
	1-1/8" Bore			540-1515		540-0866		
	1-1/4" Bore					540-0867		
	1-3/8" Bore					540-0868		
1-1/2" Bore					540-0869			
†11	Ball Bearing	166-0283	1	166-0277	1	166-0279	1	
†12	Retainer Ring	748-0018	1	748-0726	1	748-0737	1	
13	Shim	801-1035	1	801-1034	1	801-1036	1	
14	Backplate	686-0167	1	686-0163	1	686-0172	1	
†15	Screw	797-1392	4	797-0437	3	797-0447	3	
	<b>Optional Accessory Items</b>							
16	Conduit box	5162-101-002	1	5162-101-002	1	5162-101-002	1	
17	Torque Arm	5191-101-001	1	5192-101-001	1	5193-101-001	1	
	<b>Kit Items</b>							
*18	Friction Face Replacement Kit (includes items 7-1, 7-2, 7-3, 7-4, 7-5, 7-6)	5161-101-007	1	5162-101-007	1	5163-101-007	1	
†19	Brake Rebuild Kit (includes items, 1, 2, 4, 5, 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 9, 11, 12, 15)	5191-101-006	1	5192-101-006	1	5193-101-006	1	

Refer to Service Manual P-0218-WE.

### Service Parts









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# General Engineering Data



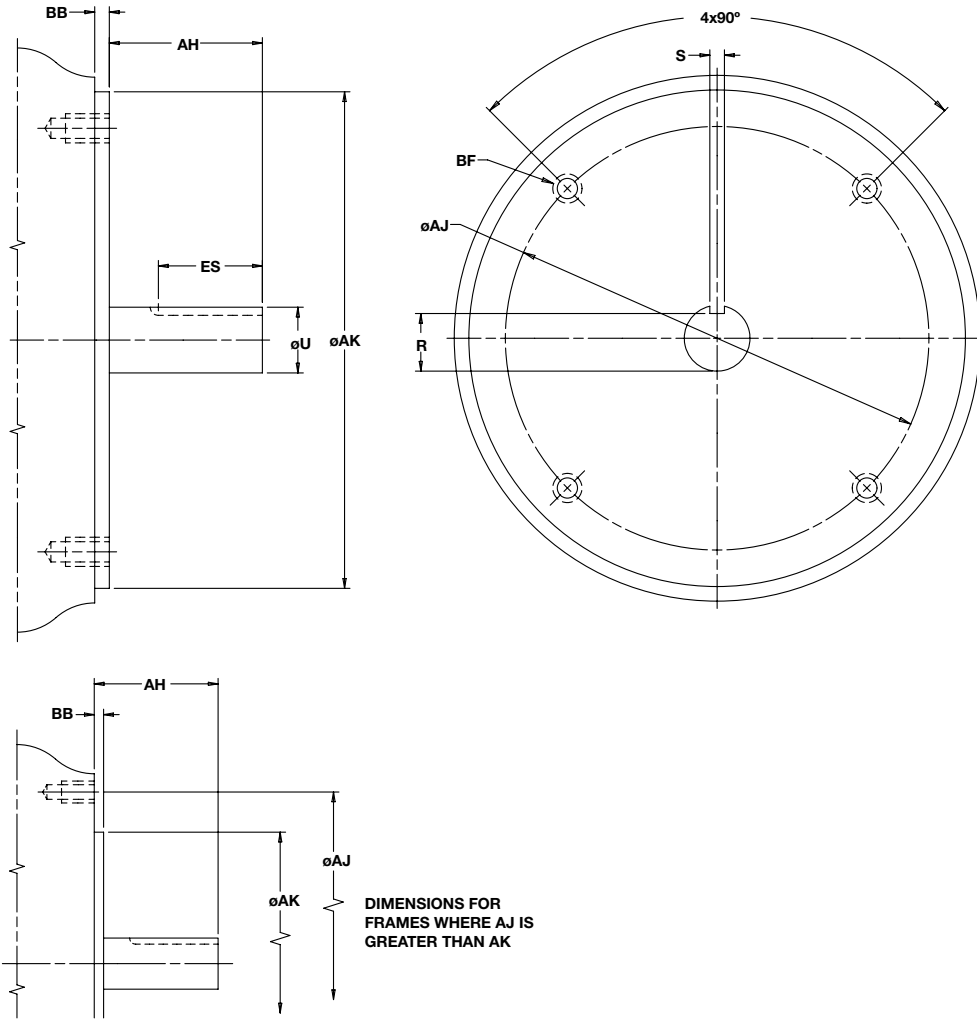
**G**

# Mechanical Data Application Engineering

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- Ordering Information / Standard NEMA Frame Dimensions.....** G-3
- Mechanical Data / Dynamic Torque .....** G-4
- Mechanical Data / Rotational Speed.....** G-6
- Mechanical Data / Clutch Field Restraining Devices.....** G-7
- Electrical Data / Coil Ratings .....** G-8
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- Electrical Data / Coil Suppression & Clutch/Brake Overlap .....** G-12
- Electrical Data / Overexcitation .....** G-13

# Standard NEMA Frame Dimensions Ordering Information



## Specifications

Module Size	NEMA Frame Size	AH	AJ	AK	BB	BF	ES	R	S	U
50	56C/48Y	2.06	5.875	4.500	.16 MAX	3/8-16 UNC	1.41 MIN	0.517	0.188	0.625
100	56C/48Y	2.06	5.875	4.500	.16 MAX	3/8-16 UNC	1.41 MIN	0.517	0.188	0.625
180	143TC/145TC	2.12	5.875	4.500	.16 MAX	3/8-16 UNC	1.41 MIN	0.771	0.188	0.875
210	182TC/184TC	2.62	7.250	8.500	.25 MIN	1/2-13 UNC	1.78 MIN	0.986	0.250	1.125
215	213TC/215TC	3.12	7.250	8.500	.25 MIN	1/2-13 UNC	2.41 MIN	1.201	0.312	1.375

Note: Warner Electric Modules are designed to comply with standard NEMA frame dimensions for mounting. Reference to each particular frame size is given in the individual selection tables for each type of Warner Electric module.

# Mechanical Data Dynamic Torque

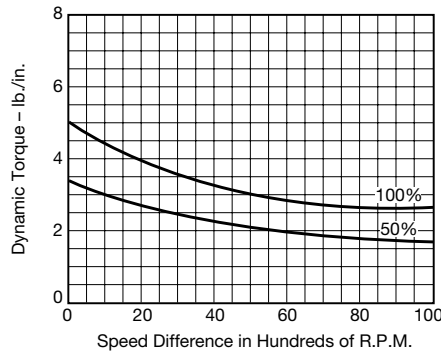
## NOTES:

Speed difference means the difference in speed between one friction face and the other at the moment of engagement. The intersection of the top curve and the speed difference is the maximum torque produced by the unit. When both friction faces are engaged and rotating at the same speed, the unit is said to be locked-in and produces the maximum static torque (zero speed difference).

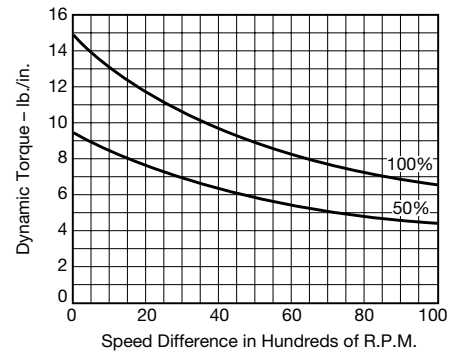
The % lines indicate the percentage of full voltage being used. Example: If 90 volt unit runs at 45 volts, use the 50% line.

Average Torque = Dynamic Torque at  $1/2$  operating speed. Example: If operating speed is 1800, use dynamic torque at 900.

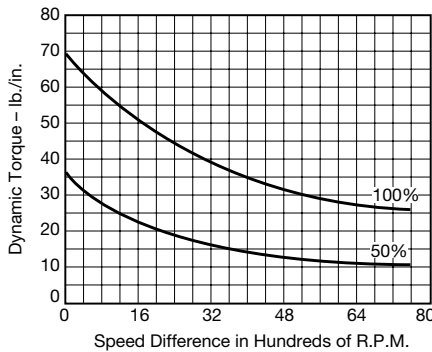
**Size 120** Maximum Speed 10,000 rpm  
Static Torque 5 lb./in.



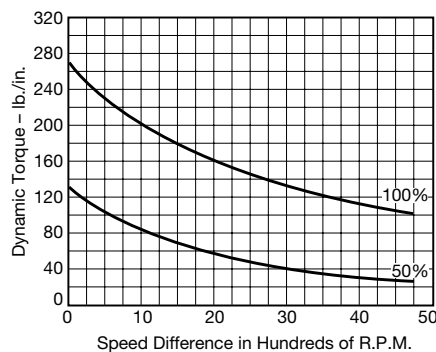
**Size 170** Maximum Speed 10,000 rpm  
Static Torque 15 lb./in.



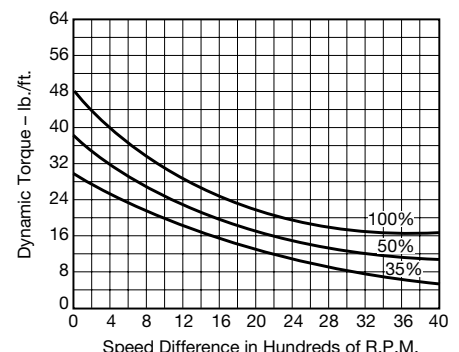
**Size 250** Maximum Speed 7,500 rpm  
Static Torque 70 lb./in.



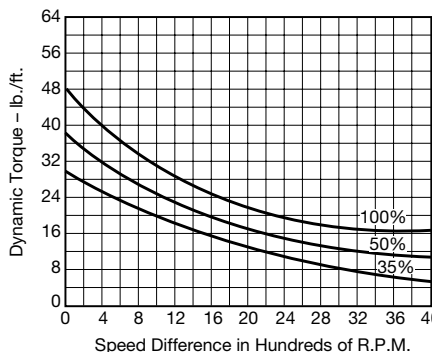
**Size 400** Maximum Speed 4,500 rpm  
Static Torque 270 lb./in.



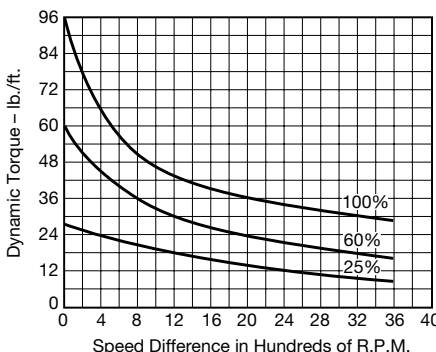
**Size 500-SF** Maximum Speed 4,000 rpm  
Static Torque 50 lb./ft.



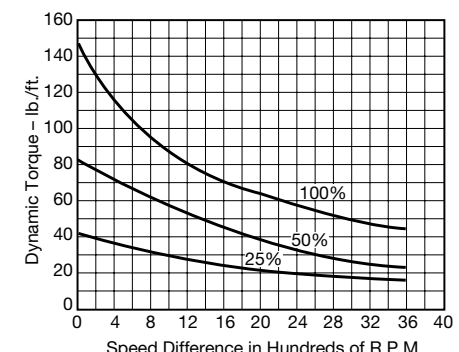
**Size 500-SF** Maximum Speed 4,000 rpm  
Static Torque 50 lb./ft.



**Size 650** Maximum Speed 3,600 rpm  
Static Torque 95 lb./ft.



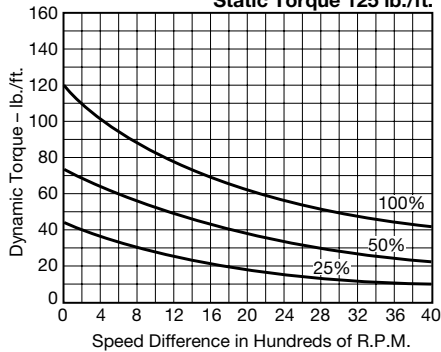
**Size 825-SF** Maximum Speed 3,600 rpm  
Brg. Mtd. Static Torque 150 lb./ft.



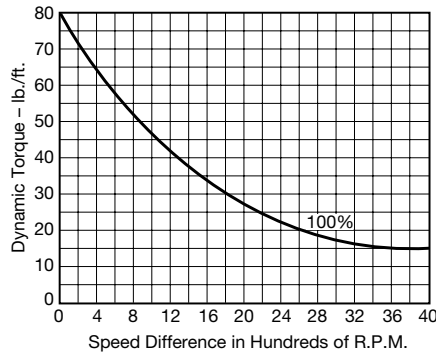
NOTE: Torque values are in inch lbs. for size 400 and smaller, and in ft.lbs. for size 500 and larger.

# Mechanical Data Dynamic Torque

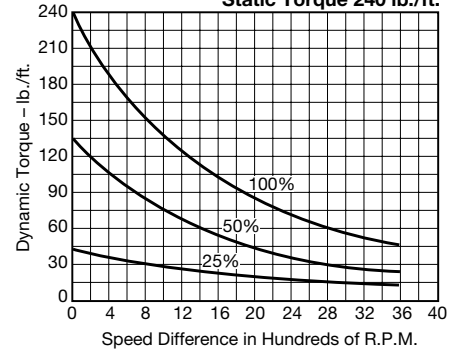
**Size 825** Maximum Speed 4,000 rpm  
Electro-Pack 3,600 rpm  
Static Torque 125 lb./ft.



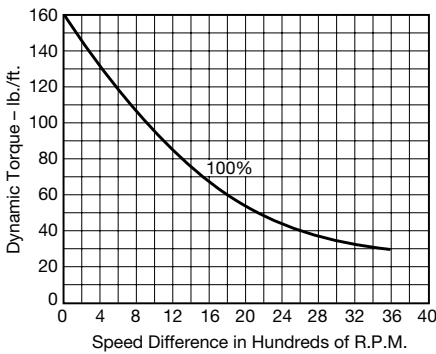
**Size 825-MB** Maximum Speed 4,000 rpm  
Static Torque 80 lb./ft.



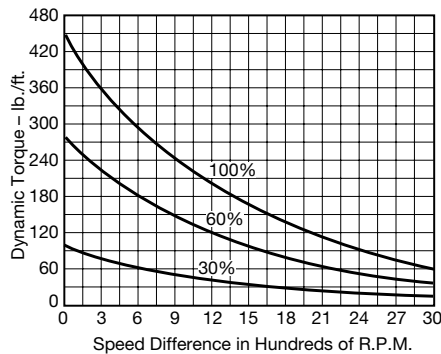
**Size 1000** Maximum Speed 3,600 rpm  
Electro-Pack 3,000 rpm  
Static Torque 240 lb./ft.



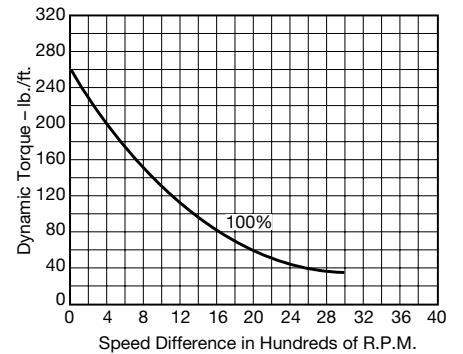
**Size 1000-MB** Maximum Speed 3,600 rpm  
Static Torque 160 lb./ft.



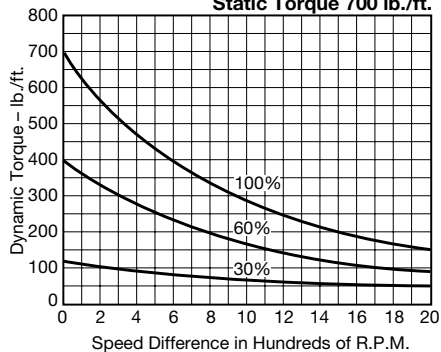
**Size 1225** Maximum Speed 3,000 rpm  
Static Torque 465 lb./ft.



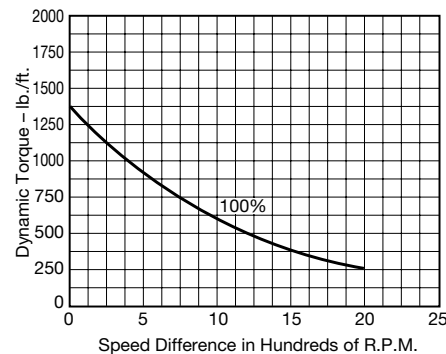
**Size 1225-MB** Maximum Speed 3,000 rpm  
Static Torque 260 lb./ft.



**Size 1525** Maximum Speed 2,000 rpm  
Electro-Pack 1,800 rpm  
Static Torque 700 lb./ft.



**Size 1525-Hi Torque** Maximum Speed 2,000 rpm  
Static Torque 1,350 lb./ft.



## Rotational Speed

Rotational speed of a clutch or brake is an important consideration when selecting a unit for a particular application. Numerous factors must be considered, such as the maximum rated speed of the clutch/brake unit, the dynamic torque required, the heat dissipation needed, the effect of speed on wear rate, and torque stability at very low speeds. Each of these issues are separate, and sometimes interrelated, but always important in selecting the right product for an application.

## Maximum RPM Rating

The most important rotational speed consideration is the maximum rated RPM capability of a unit. DO NOT exceed this rating. Exceeding the maximum RPM of a unit may cause personal injury and/or machine damage. Maximum rated speeds are based on the structural integrity of the rotating components and associated shaft and bearing capabilities. If the RPM rating is exceeded, structural failure may occur, or the unit may experience premature bearing failure and/or premature friction material wear out.

## Dynamic Torque

When determining the correct size clutch/brake for an application, dynamic torque at the highest slip speed is often the determining factor. As you can see by reviewing the dynamic torque curves for different units as shown starting on page G-4, dynamic clutch/brake torque usually decreases with higher speeds. As slip RPM increases, the coefficient of friction of a unit decreases, causing a decrease in dynamic torque availability. Be careful to consider this when selecting the appropriate unit size needed.

## Heat Dissipation

Heat dissipation is inversely related to dynamic torque. As RPM increases, the heat dissipation ability of a unit increases. When an armature is rotating, the heat dissipation rate is proportional to the aerodynamic fan effect of the rotating armature. The faster the armature rotates, the greater the heat dissipation. This is illustrated with a typical catalog curve as shown in Figure 1. It's interesting to note that, at zero RPM, the unit still has some heat dissipation capability. This is due to convection and radiation, but is usually not an important consideration.

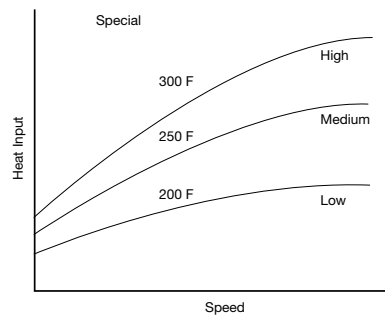


Figure 1: Typical Heat Dissipation Characteristics

## Wear Rate

The wear rate of friction surfaces is dependent on the clamping pressure of the mating surfaces as well as the surface velocity between the wearing surfaces. Many variables are involved in predicting wear life, of which RPM is probably the most influential. Typically, the wear rate will increase directly with the rubbing velocity distance. Another way of stating this is the higher the relative engagement speeds of two rotating parts, the longer they are allowed to slip against each other and the faster the wear rate.

## Low Speed Operation

The effect of low speed usage should also be considered in applications. Performance of clutch/brake units at less than 100 RPM may be very different than at higher RPM. This is due to "burnish" characteristics of friction surfaces.

## Wear In

"Burnish" is the wear in, or mating of two surfaces. When new, these surfaces have manufacturing features which include roughness and waviness. When these surfaces come into initial contact, only the high spots actually meet. See Figure 2. This results in only a small surface area in contact, while the non-contact surface area is "air." The result is low torque. As the mating surfaces continue to engage and slip against each other, the high spots are worn down and more surface area is in contact, thus increasing torque capability. This wear in period, or burnish, typically occurs in the first few hundred cycles of a clutch/brake's life. Faster slip speeds and higher loads mean fewer cycles needed to complete the burnish process. For applications where the speed is less than 100 RPM, the required application torque

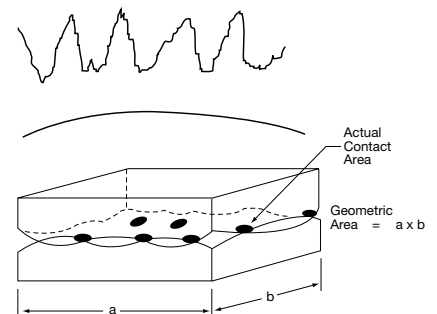


Figure 2: Unburnished Contact Areas

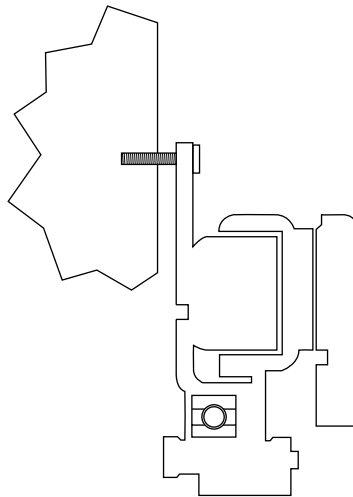
should be doubled to compensate for the low speed "burnish" that the unit experiences. A low speed burnish will require many cycles before full torque and stability are achieved. For example, if an application is determined to need 20 ft.lbs. of static torque, an SF-400 clutch could be selected. But, if the application is only 100 RPM or less, then an SF-500 unit should be the choice to compensate for the low RPM usage, as indicated on the selection chart found on page G-4.

Careful consideration of rotating speeds will help the selection process of an application. Follow these guidelines and the proper clutch/brake selected will provide troublefree operation.

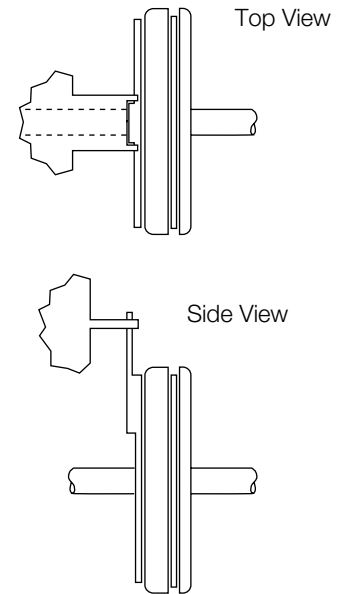
# Mechanical Data Clutch Field Restraining Devices

Many Warner Electric clutch assemblies have a bearing mounted stationary field. By design the bearing maintains its proper position between the field and rotor making it easy for the customer to mount the field-rotor assembly. However, the bearing has a slight drag which tends to make the field rotate if not restrained. And, since the field has lead wires attached, it must be restrained to prevent rotation and pulling of these wires. To counteract this rotational force, the field has a "torque tab" to which the customer must attach an appropriate anti-rotational restraint.

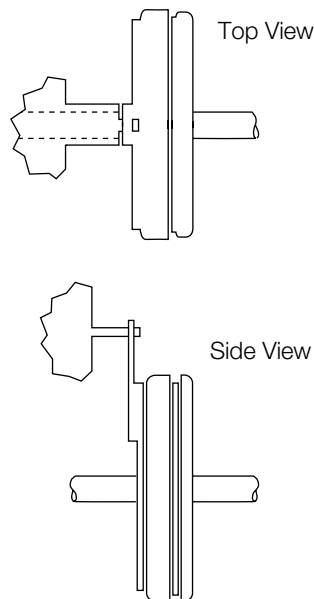
A few hints regarding proper torque tab restraints are in order. First and foremost, it is important to recognize that the force to be overcome is very small and the tab should not be restrained in any manner which will preload the bearing. For example, if the clutch is mounted with the back of the field adjacent to a rigid machine member the customer should not attach a capscrew tightly between the tab and the machine member. This may pull the tab back against the rigid member as shown in Figure 1 and preload the bearing. The recommended methods are illustrated in Figures 2, 3, and 4. The method selected is primarily a matter of customer preference or convenience.



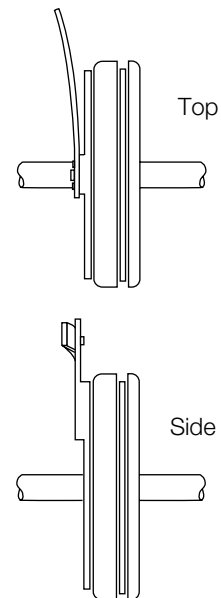
**Figure 1:**  
Rigid member



**Figure 2:**  
Rigid Member with Slot  
Straddling Tab  
(Preferred)



**Figure 3:**  
Pin in Hole  
Loosely  
(Preferred)



**Figure 4:**  
Flexible Strap  
(Preferred)



# Electrical Data Coil Ratings

EC/EB-375	EC			EB		
	90	24	6	90	24	6
Voltage – DC	90	24	6	90	24	6
Resistance @ 20° C – Ohms	453.5	29.3	2.10	446.8	29.3	1.96
Current – Amperes	.198	.82	2.85	.201	.82	3.07
Watts	17	20	17	18	20	18
Coil Build-up – milliseconds	62	60	59	50	60	52
Coil Decay – milliseconds	13	14	15	8	14	10

EC/EB-1000	EC			EB		
	90	24	6	90	24	6
Voltage – DC	90	24	6	90	24	6
Resistance @ 20° C – Ohms	248.7	19.7	1.23	248.7	19.7	1.23
Current – Amperes	.36	1.22	4.87	.36	1.22	4.87
Watts	33	29	29	33	29	29
Coil Build-up – milliseconds	250	235	220	235	220	205
Coil Decay – milliseconds	70	75	80	70	75	80

EC/EB-475	EC			EB		
	90	24	6	90	24	6
Voltage – DC	90	24	6	90	24	6
Resistance @ 20° C – Ohms	368.9	37.8	2.32	443.1	28.8	2.05
Current – Amperes	.244	.64	2.58	.203	.88	2.93
Watts	22	15	16	18	21	18
Coil Build-up – milliseconds	92	91	90	80	75	70
Coil Decay – milliseconds	18	17	16	8	9	9

EC/EB-1225	EC			EB		
	90	24	6	90	24	6
Voltage – DC	90	24	6	90	24	6
Resistance @ 20° C – Ohms	207.3	15.1	1.04	261.7	22.3	1.33
Current – Amperes	.43	1.59	5.79	.34	1.08	4.5
Watts	39	38	35	31	26	27
Coil Build-up – milliseconds	500	490	480	460	445	435
Coil Decay – milliseconds	220	230	240	190	160	140

EC/EB-650	EC			EB		
	90	24	6	90	24	6
Voltage – DC	90	24	6	90	24	6
Resistance @ 20° C – Ohms	225	17.7	1.16	257.2	18.3	1.24
Current – Amperes	.4	1.36	5.19	.35	1.3	4.84
Watts	36	33	31	32	31	29
Coil Build-up – milliseconds	120	115	110	112	108	105
Coil Decay – milliseconds	20	20	20	12	13	14

ATC, ATTC, ATB, ATTB-25	ATC			ATB		
	6	24	90	6	24	90
Voltage – DC	6	24	90	6	24	90
Resistance @ 20° C – Ohms	1.37	20.2	290	1.37	20.2	290
Current – Amperes	4.38	1.19	.31	4.38	1.19	.31
Watts	26.3	28.6	27.9	26.3	28.6	27.9
Coil Build-up – milliseconds	145	145	145	145	145	145
Coil Decay – milliseconds	8	8	8	9	9	9

FB/ER-375, 475, 650	FB-375		FB-475		FB-650	
	90	24	90	24	90	24
Voltage – DC	90	24	90	24	90	24
Resistance @ 20° C – Ohms	446	29	310	22	235	16
Current – Amperes	.201	.822	.300	1.09	.380	1.426
Watts	18	19	27	26	34	34
Coil Build-up – milliseconds	40	40	80	80	90	90
Coil Decay – milliseconds	5	10	8	10	10	10

ATC, ATTC, ATB, ATTB-55	ATC			ATB		
	6	24	90	6	24	90
Voltage – DC	6	24	90	6	24	90
Resistance @ 20° C – Ohms	1.21	19.6	230	1.21	19.6	230
Current – Amperes	4.96	1.22	.39	4.96	1.22	.39
Watts	29.8	29.3	35.2	29.8	29.3	35.2
Coil Build-up – milliseconds	200	200	200	210	210	210
Coil Decay – milliseconds	20	20	20	35	35	35

ER-825, 1225	ER-825		ER-1225	
	90	24	35-75	
Voltage – DC	90	24	35-75	
Resistance @ 20° C – Ohms	305	21.5	235	
Current – Amperes	.29	1.1	.383	
Watts	26	27	35	
Coil Build-up – milliseconds	400	–	700	
Coil Decay – milliseconds	20	–	20	

ATC, ATTC, ATB, ATTB-115	ATC			ATB		
	6	24	90	6	24	90
Voltage – DC	6	24	90	6	24	90
Resistance @ 20° C – Ohms	1.02	16.5	182	1.02	16.5	182
Current – Amperes	5.91	1.46	.50	5.91	1.46	.50
Watts	35.4	35	44.6	35.4	35	44.6
Coil Build-up – milliseconds	145	145	145	150	150	150
Coil Decay – milliseconds	40	40	40	45	45	45

EC/EB-825	EC			EB		
	90	24	6	90	24	6
Voltage – DC	90	24	6	90	24	6
Resistance @ 20° C – Ohms	221	20.9	1.098	223.3	20.4	1.27
Current – Amperes	.407	1.15	5.464	.4	1.18	4.74
Watts	37	28	33	36	28	28
Coil Build-up – milliseconds	225	200	180	170	170	170
Coil Decay – milliseconds	130	122	115	80	75	70

# Electrical Data Coil Ratings

UM/EM/UMFB/EMFB	Clutch	UM/EM Brake	Clutch	UM/EM Brake	Clutch	UM/EM Brake	UMFB/EMFB Brake	UMFB/EMFB Brake	
Voltage – DC	90	90	24	24	6	6	24	90	
Resistance (ohms)	EM-50	452	429	31.8	28.8	1.9	1.9	28.8	429
	EM-100	392	392	26.7	26.7	1.8	1.8	21.7	308
	EM-180	392	392	26.7	26.7	1.8	1.8	21.7	308
	EM-210/215	248	248	17.9	17.9	1.22	1.22	13.3	205
Amperes	EM-50	.20	.21	.76	.83	3.2	3.2	.83	.21
	EM-100	.23	.23	.90	.90	3.3	3.3	1.1	.29
	EM-180	.23	.23	.90	.90	3.3	3.3	1.1	.29
	EM-210/215	.36	.36	1.3	1.3	4.9	4.9	1.8	.38
Watts	EM-50	18	19	19	20	20	20	20	19
	EM-100	21	21	22	22	20	20	27	27
	EM-180	21	21	22	22	20	20	27	27
	EM-210/215	33	33	32	32	30	30	43	34
Build-up (millisecond)	EM-50	52	53	52	53	52	53	40	40
	EM-100	72	75	72	75	72	70	80	80
	EM-180	72	75	72	75	72	70	80	80
	EM-210/215	120	100	120	100	110	100	90	90
Decay (millisecond)	EM-50	6	5	6	5	6	5	5	5
	EM-100	12	10	12	10	12	10	8	8
	EM-180	12	10	12	10	12	10	8	8
	EM-210/215	20	10	20	10	20	10	10	10

# Electrical Data Coil Ratings

Unit Size	SF/PB 120			SF/PB 170			SF/PB 250		
Voltage – DC	6	24	90	6	24	90	6	24	90
Resistance @ 20°C – Ohms	6.32	104	1386	6.96	111.2	1506	5	76.4	1079
Current – Amperes	.949	.230	.065	.861	.215	.060	1.2	.314	.084
Watts	5.69	5.52	5.85	5.85	5.16	5.37	7.2	7.5	7.51
Coil Build-up – milliseconds	12	12	11	17	17	16	48	48	44
Coil Decay – milliseconds	8	8	7	8	7	6	15	15	13

Unit Size	SF/PB 400			SF-500			PB & PC 500			SF-650		
Voltage – DC	6	24	90	6	24	90	6	24	90	6	24	90
Resistance @ 20°C – Ohms	4.88	73	1087	1.076	14.9	206.1	1.36	23.8	251.1	1.16	17.7	225
Current – Amperes	1.23	.322	.083	5.58	1.61	.44	4.4	1.01	.36	5.19	1.36	.4
Watts	7.39	7.96	7.45	34	39	39	26	24	32	31	33	36
Coil Build-up – milliseconds	154	154	154	82	85	90	84	87	93	110	115	120
Coil Decay – milliseconds	62	60	55	40	40	40	38	35	30	50	50	50

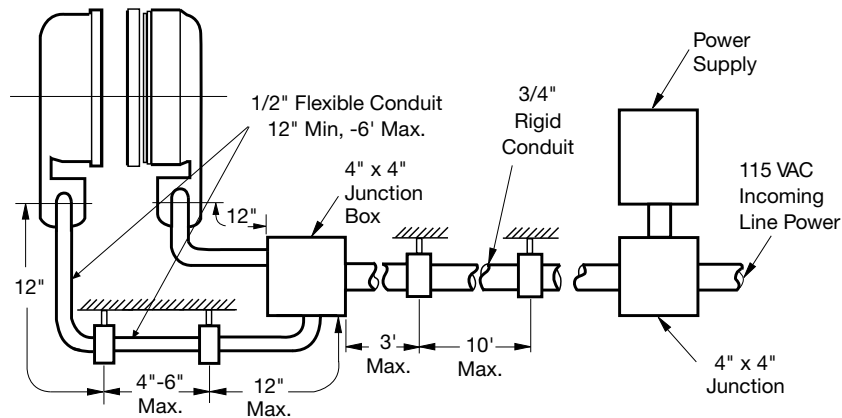
Unit Size	PB-650			SF-825			SF-825 Brg			PB & PC 825			SF-1000			PB & PC 1000		
Voltage – DC	6	24	90	6	24	90	6	24	90	6	24	90	6	24	90	6	24	90
Resistance @ 20°C – Ohms	1.24	18.3	257.2	1.23	20.9	267.0	1.098	14.6	221	1.27	20.4	223.3	1.07	14.4	214.4	1.23	19.7	248.7
Current – Amperes	4.84	1.31	.35	4.9	1.15	.34	5.464	1.65	.407	4.74	1.18	.4	5.61	1.67	.42	4.87	1.22	.36
Watts	29	31	32	29	28	30	33	40	37	28	28	36	34	40	38	29	29	33
Coil Build-up – milliseconds	100	105	110	222	200	245	180	200	225	170	170	170	256	275	283	205	220	235
Coil Decay – milliseconds	50	50	50	105	120	100	115	120	130	70	75	80	123	105	90	70	75	80

Unit Size	SF-1225			PB & PC 1225			SF-1525			PB & PC 1525			SF-1525 H.T.		
Voltage – DC	6	24	90	6	24	90	6	24	90	6	24	90	6	24	90
Resistance @ 20°C – Ohms	1.21	19.5	268.3	1.33	22.3	261.7	1.11	15.5	239.1	1.45	19.8	258.4	.55	7.63	113.4
Current – Amperes	4.97	1.23	.34	4.5	1.08	.34	5.41	1.55	.38	4.13	1.21	.35	10.83	3.14	.794
Watts	30	30	30	27	26	31	32	37	34	25	29	31	65	75	72
Coil Build-up – milliseconds	475	490	510	300	320	350	505	535	575	470	490	512	480		560
Coil Decay – milliseconds	240	230	220	190	190	190	230	237	215	200	170	140	210		160

NOTES: Build-up time equals current to approximately 90% of steady state value and flux to 90%. Decay time equals current to approximately 10% of steady state value and flux to 10%. Approximately because current leads or lags flux by a small amount.

# Electrical Data Installation Procedure



## Recommended Electrical Installation Procedure for Warner Electric Clutches and Brakes

Warner Electric clutches and brakes conform to UL (Underwriters Laboratories) requirements. All packaged products come with conduit boxes or are enclosed in housings with provision for electrical conduit connection. All sizes 400 and larger SF clutch fields and brake magnets accept UL conforming conduit boxes available from Warner Electric.

The National Electrical Code (NEC) requires that conductors subject to physical damage be adequately protected. When electrical conduit is used, a minimum of 12" of 1/2" flexible conduit is to be used between each brake and/or clutch and its box. This construction will prevent improper bearing loading in bearing mounted units and ease field and magnet assembly and disassembly.

Refer to the information below for proper installation practices and wire sizes.

Notwithstanding the above recommendations, all electrical installations should conform to NEC and/or other governing electrical codes.

## Recommended wire size versus maximum distance

Wire Size	Fractional Horsepower Sizes 170-400			Integral Horsepower Sizes 500-1525		
	Distance (feet)			Distance (feet)		
AWG	6 Volt	24 Volt	90 Volt	6 Volt	24 Volt	90 Volt
18	20	280	1000	4	65	700
16	30	430		6	95	
14	50	720		10	160	
12	75	720		10	160	
10	125			25	400	
8	200			40		

General construction wire type MTW or THW recommended.  
 #6 terminal screws (size 400 and smaller) are to be torqued to 15 in.lb.  
 #8 terminal screws (size 500 and larger) are to be torqued to 20 in.lb.

# Electrical Data Coil Suppression & Clutch/Brake Overlap

Users of electric clutch and brake systems are sometimes concerned that a clutch and brake will oppose each other or “overlap” during switching, i.e., when the clutch is switched off and the brake is switched on, or vice versa. This concern relates primarily to dual armature type clutch/brakes similar to the Warner Electric Electro Module product line, as compared to shuttle armature clutch/brakes.

In use, Warner Electric clutches and brakes are not subject to overlap when Zener diode coil suppression techniques are applied to the clutch/brake control. All Warner Electric clutch/brake controls use Zener diode suppression to eliminate any overlap situations.

The charts below graphically display current decay of the clutch and current rise of the brake with Zener diode and with straight diode suppression. In Chart 1, which shows brake and clutch operation with Zener diode suppression, the “Overlap Area” below the intersection of the brake and clutch current lines shows potential for the devices to fight one another. But this

intersection occurs at an extremely low current level and the armature Autogap® springs keep the friction surfaces of the brake armature and magnet separate at such low currents. Even though there is the appearance of a minor clutch/brake overlap in this instance, the brake armature has not yet contacted the brake magnet. Chart 2 shows a much larger overlap area since straight diode suppression is used in this circuit. Clutch current has not decayed fully as the brake is engaged and the load is brought to zero speed.

Clutch and brake coils are inductors. Inductance is the electrical equivalent to mechanical inertia and an energized coil dissipates its energy when turned “off.” Upon removal of power, voltage across an inductor reverses and current continues to flow in the same direction until the energy is fully dissipated. Without suppression in the control circuit, an arc can result from this potentially very large reverse voltage which can damage the electrical switching contacts.

Consequently, Zener diode suppression circuitry, by limiting the reverse voltage to

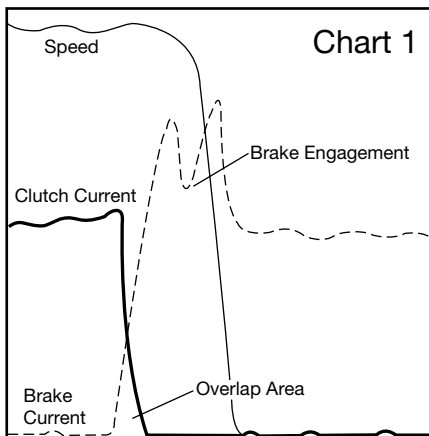
a sufficiently high but safe level, has two major benefits:

- Hastens coil decay
- Protects the switching contacts

The schematics below show circuits with no suppression and both straight diode and Zener diode suppression.

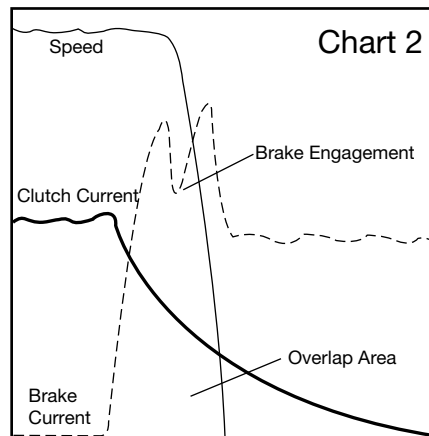
The rapid coil decay of Zener diode suppression lets users enjoy the major advantages which dual armatures have over single, “shuttle” armatures. These include:

- Better heat dissipation – greater area to give off heat and more “off” time.
- Longer life – two armatures absorb wear.
- Armature Autogap® self adjusting for the life of the unit
- Enhanced repeatability and controllability with the use of a light preload spring to keep the armatures in light contact with their mating surfaces, eliminating armature movement time and reducing noise and spline wear. Warner Electric utilizes this preload spring in some packaged clutch/brake models including ceramic EPs and Unimodules and Smooth Start Unimodules.



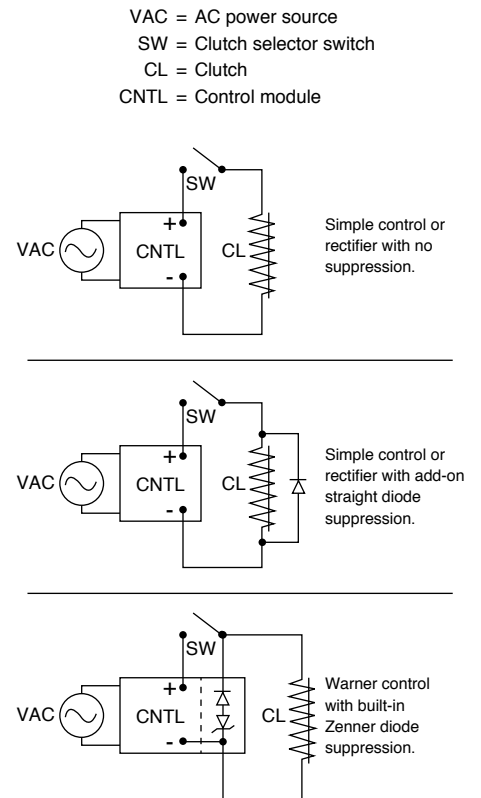
## Brake Engagement with Zener Diode Suppression

Clutch current decay and brake current rise overlap, but the brake armature is not engaged until well past the overlap point. Note that the “blip” in the brake current trace coincides with the sharp decline in the “speed” trace, indicating brake armature engagement at that point.



## Brake Engagement with Straight Diode Suppression

Clutch current decay is much slower than with Zener diode suppression as shown in Chart 1, greatly increasing the overlap area. The current level in the clutch coil is much higher at the point of brake engagement than with Zener diode suppression.



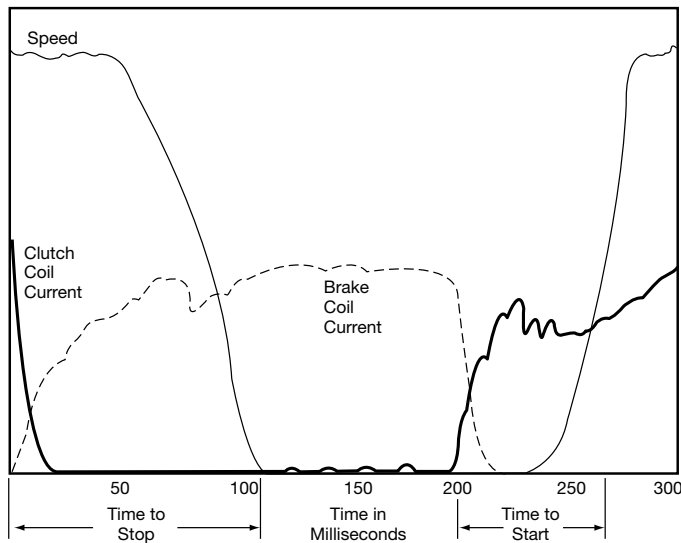
Overexcitation is a technique which makes a clutch or brake engage faster and have greatly improved starting and stopping accuracy. It involves applying over voltage to the clutch or brake coil to reduce current build up time, thereby reducing the magnetizing time.

The graphs below show current rise and shaft speed for an identical system using a Warner Electric EP-400 clutch/brake both with and without overexcitation. The effect of overexcitation is to reduce the time needed to achieve full current and thereby reduce the time required to achieve full speed with a clutch or zero speed with a brake. In the example below, "time to start" is approximate-

ly 70 ms without overexcitation. This is reduced to 30 ms when overexcitation is applied. This time is comparable to the coil buildup times stated on page G-10. The "time to stop" has been similarly reduced; the nominally excited system requires about 110 ms to stop the load, while this is accomplished in only 50 ms with overexcitation.

Overexcitation does not increase torque. Rather, the reduction in start-stop times comes from reduced coil current build up times (or "time to current"). For many common industrial applications, the reduction in "time to speed" and "time to stop" is one half when using overexcitation.

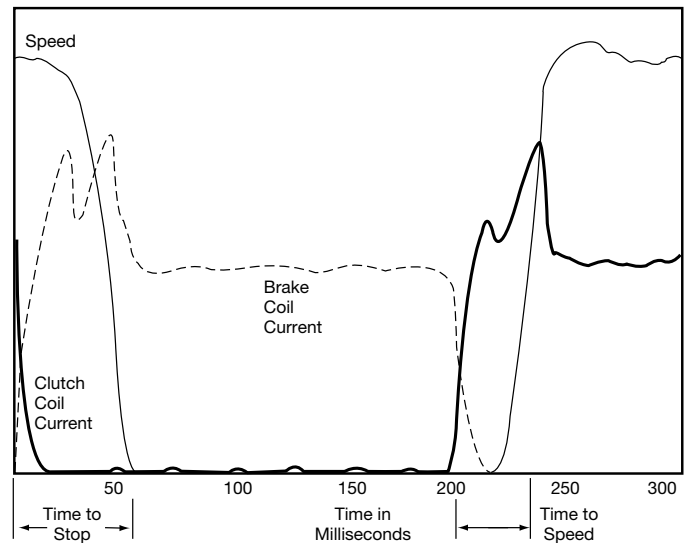
The use of overexcitation on a clutch/brake system does not increase system wear. In fact, the clutch/brake wear rate may be reduced because slippage and energy dissipation is marginally reduced in the clutch/brake. Compliance in the drivetrain may absorb some of the start/stop inertia or wear may be observed in other drivetrain components. Whenever overexcitation is used, adequate coil suppression must be employed. Please refer to "Coil Suppression and Clutch/Brake Overlap" on page G-12.



**Chart 1**

## Without Overexcitation

Current/speed trace of EP400 clutch/brake being run through a single stop/start cycle. Note that 110 milliseconds is required to stop from the time the clutch coil is de-energized and the brake coil is energized. At the 200 milliseconds point on the graph the clutch coil is energized and the load is at speed 70 milliseconds later. Note that the coil current is still increasing after the load is at full speed.



**Chart 2**

## With Overexcitation

Current/speed trace of EP400 clutch/brake being run through a single stop/start cycle. With overexcitation, both brake and clutch coil currents build much faster with concurrent reductions in both stop and start times, when compared with Chart 1.





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# Bushing Part Numbers



**B**

# Bushing Part Numbers

## Browning® Bushing

Shaft Size	Keyway Size	Bushing Number	
		Warner Electric	Browning
1/2	1/8 x 1/16	180-0002	
9/16	1/8 x 1/16	180-0003	
5/8	3/16 x 3/32	180-0004	
11/16	3/16 x 3/32	180-0005	
3/4	3/16 x 3/32	180-0006	
13/16	3/16 x 3/32	180-0007	
7/8	3/16 x 3/32	180-0008	
15/16	1/4 x 1/8	180-0009	
1	1/4 x 1/8	180-0010	
1 1/16	1/4 x 1/8	180-0011	
1 1/8	1/4 x 1/8	180-0012	
1 3/16	1/4 x 1/8	180-0013	
1 1/4	1/4 x 1/8	180-0014	
1 5/16	5/16 x 5/32	180-0015	
1 3/8	5/16 x 5/32	180-0016	
1 7/16	3/8 x 3/16	180-0017	
1 1/2	3/8 x 3/16	180-0018	
3/4	3/16 x 3/32	180-0026	
13/16	3/16 x 3/32	180-0027	
7/8	3/16 x 3/32	180-0028	
15/16	1/4 x 1/8	180-0029	
1	1/4 x 1/8	180-0030	
1 1/16	1/4 x 1/8	180-0031	
1 1/8	1/4 x 1/8	180-0032	
1 3/16	1/4 x 1/8	180-0033	
1 1/4	1/4 x 1/8	180-0034	
1 5/16	5/16 x 5/32	180-0035	
1 3/8	5/16 x 5/32	180-0036	
1 7/16	3/8 x 3/16	180-0037	
1 1/2	3/8 x 3/16	180-0038	
1 9/16	3/8 x 3/16	180-0039	
1 5/8	3/8 x 3/16	180-0040	
1 11/16	3/8 x 3/16	180-0041	
1 3/4	3/8 x 3/16	180-0042	
1 13/16	1/2 x 1/4	180-0043	
1 7/8	1/2 x 1/4	180-0044	
1 15/16	1/2 x 1/4	180-0045	
2	1/2 x 1/4	180-0046	
2 1/16	1/2 x 1/4	180-0047	
2 1/8	1/2 x 1/4	180-0048	
2 3/16	1/2 x 1/4	180-0049	
2 1/4	1/2 x 1/4	180-0050	
2 5/16	5/8 x 5/16	180-0051	
2 3/8	5/8 x 5/16	180-0052	
2 7/16	5/8 x 5/16	180-0053	
2 1/2	5/8 x 5/16	180-0054	
2 9/16	5/8 x 5/16	180-0055	
2 5/8	5/8 x 5/16	180-0056	
2 11/16	5/8 x 5/16	180-0057	

(Browning® is registered to Emerson Electric Co.)

## Dodge Bushing

Shaft Size	Keyway Size	Bushing Number	
		Warner Electric	Dodge
1/2	1/8 x 1/16	180-0101	
9/16	1/8 x 1/16	180-0102	
5/8	3/16 x 3/32	180-0103	
11/16	3/16 x 3/32	180-0104	
3/4	3/16 x 3/32	180-0105	
13/16	3/16 x 3/32	180-0106	
7/8	3/16 x 3/32	180-0107	1210
15/16	1/4 x 1/8	180-0108	
1	1/4 x 1/8	180-0109	
1 1/16	1/4 x 1/8	180-0110	
1 1/8	1/4 x 1/8	180-0111	
1 3/16	1/4 x 1/8	180-0112	
1 1/4	1/4 x 1/8	180-0113	
1/2	1/8 x 1/16	180-0116	
9/16	1/8 x 1/16	180-0117	
5/8	3/16 x 3/32	180-0118	
11/16	3/16 x 3/32	180-0119	
3/4	3/16 x 3/32	180-0120	
13/16	3/16 x 3/32	180-0121	
7/8	3/16 x 3/32	180-0122	1215
15/16	1/4 x 1/8	180-0123	
1	1/4 x 1/8	180-0124	
1 1/16	1/4 x 1/8	180-0125	
1 1/8	1/4 x 1/8	180-0126	
1 3/16	1/4 x 1/8	180-0127	
1 1/4	1/4 x 1/8	180-0128	
1/2	1/8 x 1/16	180-0131	
9/16	1/8 x 1/16	180-0132	
5/8	3/16 x 3/32	180-0133	
11/16	3/16 x 3/32	180-0134	
3/4	3/16 x 3/32	180-0135	
13/16	3/16 x 3/32	180-0136	
7/8	3/16 x 3/32	180-0137	
15/16	1/4 x 1/8	180-0138	
1	1/4 x 1/8	180-0139	
1 1/16	1/4 x 1/8	180-0140	1615
1 1/8	1/4 x 1/8	180-0141	
1 3/16	1/4 x 1/8	180-0142	
1 1/4	1/4 x 1/8	180-0143	
1 5/16	5/16 x 5/32	180-0144	
1 3/8	5/16 x 5/32	180-0145	
1 7/16	3/8 x 3/16	180-0146	
1 1/2	3/8 x 3/16	180-0147	
1 9/16	3/8 x 3/16	180-0148	
1 5/8	3/8 x 3/16	180-0149	
1/2	1/8 x 1/16	180-0155	
9/16	1/8 x 1/16	180-0156	
5/8	3/16 x 3/32	180-0157	
11/16	3/16 x 3/32	180-0158	
3/4	3/16 x 3/32	180-0159	
13/16	3/16 x 3/32	180-0160	
7/8	3/16 x 3/32	180-0161	2012
15/16	1/4 x 1/8	180-0162	
1	1/4 x 1/8	180-0163	
1 1/16	1/4 x 1/8	180-0164	
1 1/8	1/4 x 1/8	180-0165	
1 3/16	1/4 x 1/8	180-0166	
1 1/4	1/4 x 1/8	180-0167	

# Bushing Part Numbers

## Dodge Bushing

Bushing Number				Bushing Number				Bushing Number			
Shaft Size	Keyway Size	Warner Electric	Dodge	Shaft Size	Keyway Size	Warner Electric	Dodge	Shaft Size	Keyway Size	Warner Electric	Dodge
15/16	5/16 x 5/32	180-0168		11 1/16	3/8 x 3/16	180-0235		1/2	1/8 x 1/16	180-0326	
13/8	5/16 x 5/32	180-0169		13/4	3/8 x 3/16	180-0236		9/16	1/8 x 1/16	180-0327	
17/16	3/8 x 3/16	180-0170		113/16	1/2 x 1/4	180-0237		5/8	3/16 x 3/32	180-0328	
11/2	3/8 x 3/16	180-0171		17/8	1/2 x 1/4	180-0238		11/16	3/16 x 3/32	180-0329	
19/16	3/8 x 3/16	180-0172		115/16	1/2 x 1/4	180-0239		3/4	3/16 x 3/32	180-0330	
15/8	3/8 x 3/16	180-0173		2	1/2 x 1/4	180-0240		13/16	3/16 x 3/32	180-0331	
111/16	3/8 x 3/16	180-0174	2012	21/16	1/2 x 1/4	180-0241		7/8	3/16 x 3/32	180-0332	
13/4	3/8 x 3/16	180-0175		21/8	1/2 x 1/4	180-0242		15/16	1/4 x 1/8	180-0333	
113/16	1/2 x 1/4	180-0176		23/16	1/2 x 1/4	180-0243		1	1/4 x 1/8	180-0334	
17/8	1/2 x 1/4	180-0177		21/4	1/2 x 1/4	180-0244		11/16	1/4 x 1/8	180-0335	1610
115/16	1/2 x 1/4	180-0178		25/16	5/8 x 5/16	180-0245		11/8	1/4 x 1/8	180-0336	
2	1/2 x 1/4	180-0179		23/8	5/8 x 5/16	180-0246	3020	13/16	1/4 x 1/8	180-0337	
1/2	1/8 x 1/16	180-0185		27/16	5/8 x 5/16	180-0247		11/4	1/4 x 1/8	180-0338	
9/16	1/8 x 1/16	180-0186		21/2	5/8 x 5/16	180-0248		15/16	5/16 x 5/32	180-0339	
5/8	3/16 x 3/32	180-0187		29/16	5/8 x 5/16	180-0249		13/8	5/16 x 5/32	180-0340	
11/16	3/16 x 3/32	180-0188		25/8	5/8 x 5/16	180-0250		17/16	3/8 x 3/16	180-0341	
3/4	3/16 x 3/32	180-0189		211/16	5/8 x 5/16	180-0251		11/2	3/8 x 3/16	180-0342	
13/16	3/16 x 3/32	180-0190		23/4	5/8 x 5/16	180-0252		19/16	3/8 x 3/16	180-0343	
7/8	3/16 x 3/32	180-0191		213/16	3/4 x 3/8	180-0253		15/8	3/8 x 3/16	180-0344	
15/16	1/4 x 1/8	180-0192		27/8	3/4 x 3/8	180-0254		1/2	1/8 x 1/16	180-0410	
1	1/4 x 1/8	180-0193		215/16	3/4 x 3/8	180-0255		9/16	1/8 x 1/16	180-0411	
11/16	1/4 x 1/8	180-0194		3	3/4 x 3/8	180-0256		5/8	3/16 x 3/32	180-0412	
11/8	1/4 x 1/8	180-0195		15/16	1/4 x 1/8	180-0262		11/16	3/16 x 3/32	180-0413	
13/16	1/4 x 1/8	180-0196		1	1/4 x 1/8	180-0263		3/4	3/16 x 3/32	180-0414	1008
11/4	1/4 x 1/8	180-0197		11/16	1/4 x 1/8	180-0264		3/16	3/16 x 3/32	180-0415	
15/16	5/16 x 5/32	180-0198		11/8	1/4 x 1/8	180-0265		7/8	3/16 x 3/32	180-0416	
13/8	5/16 x 5/32	180-0199		13/16	1/4 x 1/8	180-0266		15/16	1/4 x 1/8	180-0417	
17/16	3/8 x 3/16	180-0200		11/4	1/4 x 1/8	180-0267		1	1/4 x 1/8	180-0418	
11/2	3/8 x 3/16	180-0201	2517	15/16	5/16 x 5/32	180-0268		1/2	1/8 x 1/16	180-0421	
19/16	3/8 x 3/16	180-0202		13/8	5/16 x 5/32	180-0269		9/16	1/8 x 1/16	180-0422	
15/8	3/8 x 3/16	180-0203		17/16	3/8 x 3/16	180-0270		5/8	3/16 x 3/32	180-0423	
111/16	3/8 x 3/16	180-0204		11/2	3/8 x 3/16	180-0271		11/16	3/16 x 3/32	180-0424	
13/4	3/8 x 3/16	180-0205		19/16	3/8 x 3/16	180-0272		3/4	3/16 x 3/32	180-0425	
113/16	1/2 x 1/4	180-0206		15/8	3/8 x 3/16	180-0273		13/16	3/16 x 3/32	180-0426	
17/8	1/2 x 1/4	180-0207		111/16	3/8 x 3/16	180-0274		7/8	3/16 x 3/32	180-0427	
115/16	1/2 x 1/4	180-0208		13/4	3/8 x 3/16	180-0275		15/16	1/4 x 1/16	180-0428	1310
2	1/2 x 1/4	180-0209		113/16	1/2 x 1/4	180-0276		1	1/4 x 1/8	180-0429	
21/16	1/2 x 1/4	180-0210		17/8	1/2 x 1/4	180-0277		11/16	1/4 x 1/8	180-0430	
21/8	1/2 x 1/4	180-0211		115/16	1/2 x 1/4	180-0278		11/8	1/4 x 1/8	180-0431	
23/16	1/2 x 1/4	180-0212		2	1/2 x 1/4	180-0279	3030	13/16	1/4 x 1/8	180-0432	
21/4	1/2 x 1/4	180-0213		21/16	1/2 x 1/4	180-0280		11/4	1/4 x 1/8	180-0433	
25/16	5/8 x 5/16	180-0214		21/8	1/2 x 1/4	180-0281		15/16	5/16 x 5/32	180-0434	
23/8	5/8 x 5/16	180-0215		23/16	1/2 x 1/4	180-0282		13/8	5/16 x 5/32	180-0435	
27/16	5/8 x 5/16	180-0216		21/4	1/2 x 1/4	180-0283					
21/2	5/8 x 5/16	180-0217		215/16	5/8 x 5/16	180-0284					
15/16	1/4 x 1/8	180-0223		23/8	5/8 x 5/16	180-0285					
1	1/4 x 1/8	180-0224		27/16	5/8 x 5/16	180-0286					
11/16	1/4 x 1/8	180-0225		21/2	5/8 x 5/16	180-0287					
11/8	1/4 x 1/8	180-0226		29/16	5/8 x 5/16	180-0288					
13/16	1/4 x 1/8	180-0227		25/8	5/8 x 5/16	180-0289					
11/4	1/4 x 1/8	180-0228	3020	211/16	5/8 x 5/16	180-0290					
15/16	5/16 x 5/32	180-0229		23/4	5/8 x 5/16	180-0291					
13/8	5/16 x 5/32	180-0230		213/16	3/4 x 3/8	180-0292					
17/16	3/8 x 3/16	180-0231		27/8	3/4 x 3/8	180-0293					
11/2	3/8 x 3/16	180-0232		215/16	3/4 x 3/8	180-0294					
19/16	3/8 x 3/16	180-0233		3	3/4 x 3/8	180-0295					
15/8	3/8 x 3/16	180-0234									







Warner Electric's electronic controls are designed to provide simple setup and maximum performance when used with electric clutches and brakes. Our controls offer a range of functions from on-off to torque control to over-excitation.

### Selection

Many parameters beyond function can impact control selection. Warner Electric produces a variety of control options to suit numerous application requirements. Control selection parameters include:

- Mounting Location – Panel or conduit box mounting
- Switching – Relay switching of A.C. or D.C. lines or solid state switching
- Output Voltage – Controls are available for 6, 24 and 90 VDC clutch/brake coils
- Input Voltage – Controls with input power transformers are available for connection to high voltage mains.

If your application requires something special, please call us. We will be happy to provide solutions.

### Clutch and Brake Controls . . . . . CTL-2

#### On-Off Controls

CBC-100 . . . . .	CTL-4
CBC-150 . . . . .	CTL-4
CBC-160 . . . . .	CTL-5
CBC-801 . . . . .	CTL-6
CBC-802 . . . . .	CTL-7

#### Adjustable Torque Controls

MCS-103-1 . . . . .	CTL-8
MCS-805-1 . . . . .	CTL-9
MCS-805-2 . . . . .	CTL-9
CBC-300 . . . . .	CTL-10
CBC-500 . . . . .	CTL-12
CBC-550 . . . . .	CTL-14
CBC-1825R . . . . .	CTL-16

#### Overexcitation Controls

CBC-700 . . . . .	CTL-18
CBC-750 . . . . .	CTL-20

#### Appendix . . . . . CTL-22

#### Questions & Answers . . . . . CTL-23

#### Ordering Information . . . . . CTL-24



# Clutch and Brake Controls

## Functions

### On-Off (Basic start-stop)

Many applications are controlled by energizing the clutches and brakes with their rated D.C. voltages. Warner Electric controls are available with various mounting, input voltage and switching options.

### Adjustable Torque

#### (Soft start-stop)

The torque transmitted by a clutch or brake is proportional to the coil current. Warner Electric offers several products that provide torque control for smooth and repeatable starts and stops.

### Adjustable Accel-Decel

#### (Soft start-stop with full torque)

Warner Electric offers a control that allows for adjustment of the acceleration and deceleration time ramps to achieve a repeatable soft start or stop while still allowing for full torque.

### Overexcitation

#### (Rapid cycling)

The clutch/brake speed of response can be increased for improved accuracy and performance through overexcitation, which is the application of a short high voltage pulse to provide nearly instantaneous torque.

Control Type

On-Off  
Conduit Box  
Mount



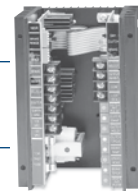
On-Off  
Octal Socket  
Mount



Adjustable  
Torque



Adjustable Accel-Decel



Overexcitation





# Clutch and Brake Controls

Model Number	No. of Channels	Torque Control Channels	A.C. Input Voltages	D.C. Output Voltages	Over-Excitation	Customer Supplied Switching Options	Description	Page Number
CBC-100-1	1	No	120	90	No	Relay A.C.	Single channel control to mount inside standard conduit box	CTL-4
CBC-100-2	1	No	220/240					
CBC-150-1	2	No	120	90	No	Relay A.C.	Dual channel control for clutch/brake to mount inside module conduit box	CTL-4
CBC-150-2	2	No	220/240					
CBC-160-1	1	1	120	90	No	Relay A.C.	Single channel control with torque adjust for module electrically released brakes	CTL-5
CBC-160-2			220/240					
CBC-801-1	2	No	120	90	No	Relay D.C.	Dual channel control for 2 clutches and/or brakes	CTL-6
CBC-801-2	2		220/240					
CBC-802	2	No	120	90	No	Transistor or Relay D.C.	Dual channel control with transistor switching	CTL-7
MCS-103-1	2	1	120	90	No	Relay D.C.	Dual channel control with torque adjust for one channel	CTL-8
MCS-805-1	1	1	120/240	35-75	No	Relay D.C.	Single adjustable channel control for use with ER-1225 brake.	CTL-9
MCS-805-2								
CBC-300	2	2	120	90	No	Transistor or Relay D.C.	Dual channel adjustable current control	CTL-10 to CTL-11
CBC-300-1								
CBC-500-90	2	2	120	90	No	Transistor or Relay D.C.	Dual channel control for two clutches and/or brakes with two torque adjust channels; Emergency stop input	CTL-12 to CTL-15
CBC-500-24	2	2	24-30	24	No			
CBC-550-90	2	2	120/220/240/380/480	90	No			
CBC-550-24	2	2	120/220/240/380/480	24	No			
CBC-1825-R	2	2	120	90	No	Transistor or Relay D.C.	Dual channel adjustable time ramp with short circuit protection	CTL-16 to CTL-17
CBC-700-90	2	No	120	90	Yes	Transistor or Relay D.C.	Dual channel compact overexcitation control for 24 or 90 volt clutches and brakes	CTL-18 to CTL-19
CBC-700-24	2		24-28	24				
CBC-750-6	2	2	120/220/240	6	Yes	Transistor, Relay D.C. or Triac A.C.	Dual channel full function overexcitation control; provides input/output logic, torque adjustable current and remote inputs	CTL-20 to CTL-21

# CBC-100/CBC-150 On-Off Controls

## Integral/Conduit Box Mounted Controls

The CBC-100 and CBC-150 series are UL listed, conduit box mounted controls for 90 volt clutches and brakes. Models are available for either 120 VAC or 220/240 VAC input.



### CBC-100 series Single unit capacity

The CBC-100 mounts inside a standard Warner Electric conduit box and includes rectification and suppression circuits.

- US
- Compact
- Single channel
- Mounts inside conduit box



### CBC-150 series Dual channel capacity

The CBC-150 replaces the cover on the standard module conduit box (part no. 5370-101-042). Provides rectification and suppression for two devices. Green LED indicates power to clutch. Red LED indicates power to brake.

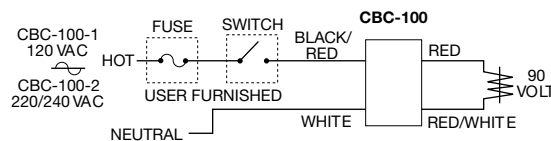
- US
- Dual channel
- Replaces the cover on the module conduit box

## Specifications

	CBC-100-1	CBC-100-2	CBC-150-1	CBC-150-2
Part No.	6003-448-101	6003-448-103	6004-448-001	6004-448-002
Input	120 VAC 50/60 Hz	220/240 VAC 50/60 Hz	120 VAC 50/60 Hz	220/240 VAC 50/60 Hz
Output	90 VDC full wave rectified .8 Amp max.	90 VDC half wave .8 Amp	90 VDC full wave rectified Dual .8 Amp	90 VDC half wave Dual .8 Amp
Ambient Temperatures	-20° to 113°F (-29° to 45°C)			
Switching	External to control, accomplished on A.C. line using relay or triac.			
	SPST	SPST	SPDT	SPDT
Solid State (maximum leakage current <2 mA)	140 VAC, 1 Amp min.	280 VAC, 1 Amp min.	140 VAC, 2 Amp min.	280 VAC, 2 Amp min.
Electro-mechanical	120 VAC, 1 Amp min.	240 VAC, 1 Amp min.	120 VAC, 1 Amp min.	240 VAC, 1 Amp min.

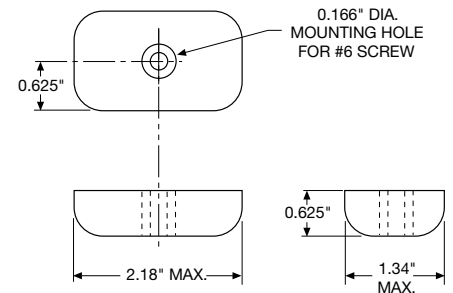
## Connection diagrams

### CBC-100-1, -2

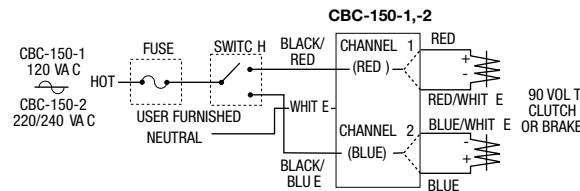


## Dimensions

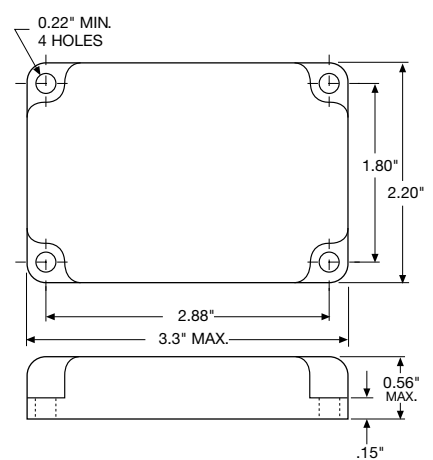
### CBC-100-1, -2



### CBC-150-1, -2



### CBC-150-1, -2



All dimensions nominal unless otherwise specified.

## Integral/Electrically Released Motor Brake Controls

### CBC-160

The CBC-160 series clutch/brake controls provide a single 90 VDC adjustable output for use with any clutch/brake unit. The adjustable output will provide consistent and repeatable release for Warner Electric's 90 VDC permanent magnet electrically released brakes. The CBC-160 mounts as the cover on the standard module conduit box (part number: 5370-101-042).



#### CBC-160-1

The 160-1 accommodates 120 volts A.C. motors.

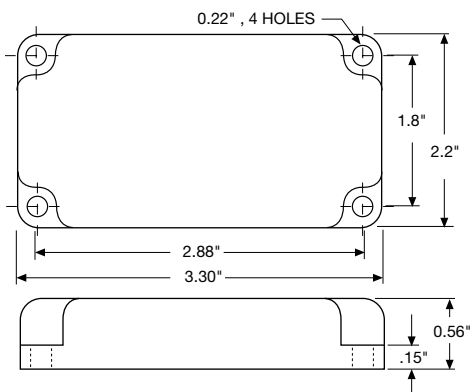
- cULus
- Adjustable 30-100 VDC
- LED indicator
- 120 volt A.C. input

#### CBC-160-2

The power to the 160-2 control can come from either a 230 volt or 460 volt A.C. motor. Customer-provided switching is accomplished through the motor starter on the A.C. input. This allows convenient retrofit of spring-set style motor brakes and inexpensive installation of new applications.

- cULus
- Adjustable 30-100 VDC
- Power from motor
- Easy retrofit
- 230/460 motors

### Dimensions

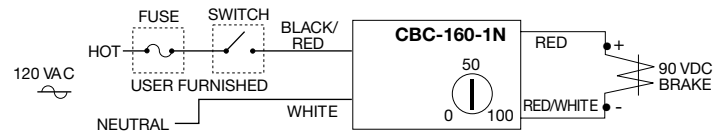


All dimensions nominal unless otherwise specified.

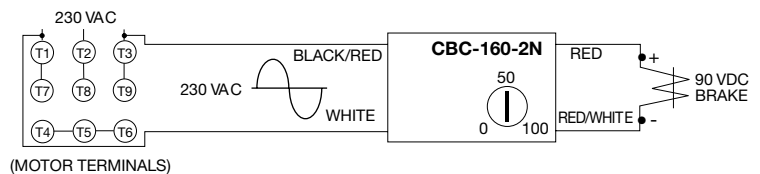
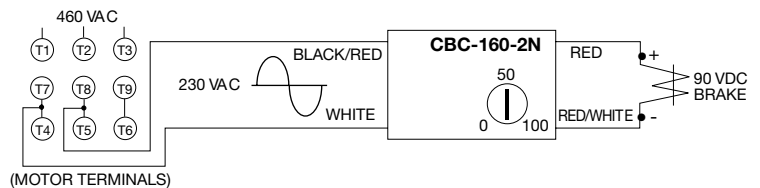
### Specifications

	CBC-160-1	CBC-160-2
Part No.	6013-448-001	6013-448-002
Input	120 VAC, 50/60 Hz	220/240 VAC, 60 Hz, 1 Phase, 100 VA max.
Status Indicator	Red LED indicates power to the brake	—
Output	Single Channel, 30-100 VDC half-wave rectified nominal, 0.8 Amps maximum	
Ambient Temperatures	0° to 122°F (-18° to 50°C)	
Switching	Accomplished through motor starter or on A.C. line using relay or triac	

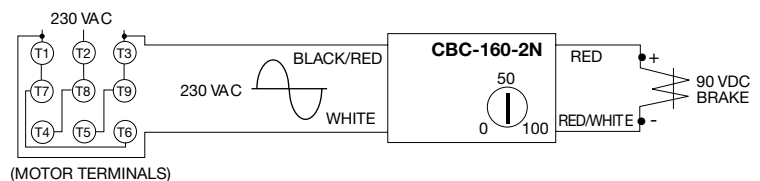
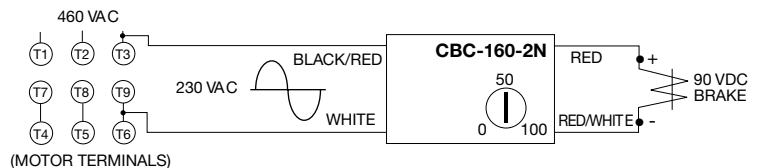
### Connection Diagrams



### WYE Connected Motor



### DELTA Connected Motor



# CBC-801 On-Off Controls

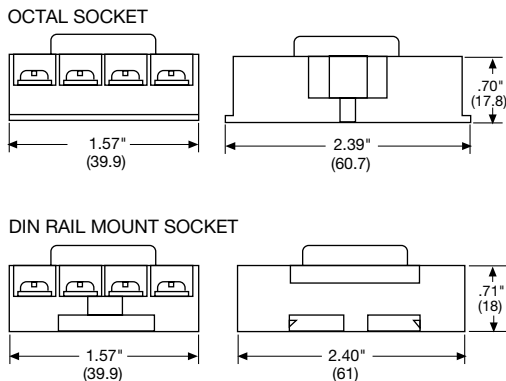
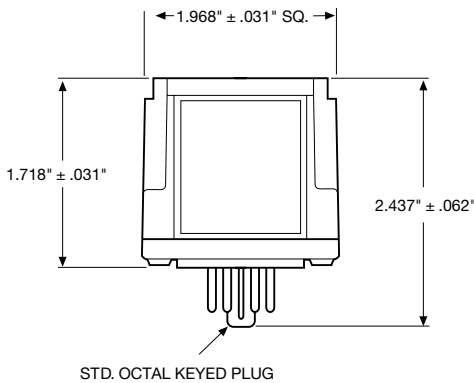
## Plug-in Octal Socket Power Supplies

The CBC-801 is a basic on-off power supply that provides full voltage to a 90 volt clutch or brake and is activated by an external switch. This type of power supply is sufficient for many clutch/brake applications.

### CBC-801 series Multi-unit capacity

The CBC-801 is a plug-in power supply which is used with an octal socket. The wiring connections are made at the socket. The CBC-801 will operate two units separately—or simultaneously. Octal socket is purchased separately.

### Dimensions



All dimensions nominal unless otherwise specified.

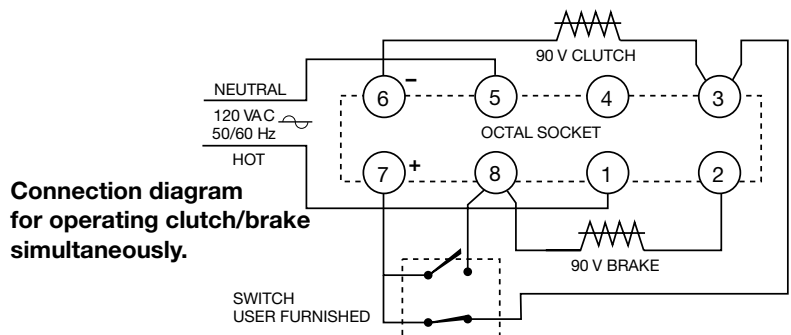
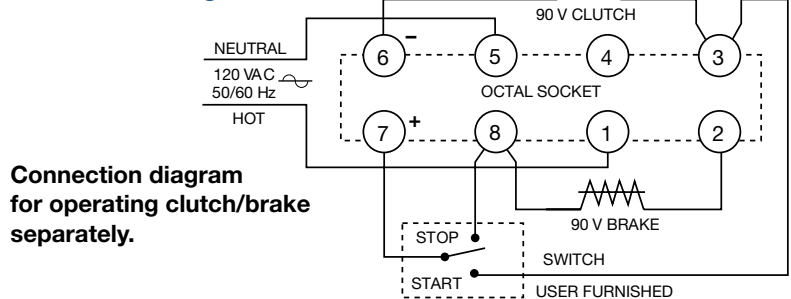
- cULus
- For basic on-off operation
- Wiring connections made at octal socket
- Arc suppression circuitry extends switch life
- Fused for overload protection
- LED output indicators
- DIN rail mountable



### Specifications

	CBC-801-1	CBC-801-2
Part No.	6001-448-004	6001-448-006
Input Voltage	120 VAC, 50/60 Hz	220/240 VAC, 50/60 Hz
Output	90 VDC, 1.25 A max.	
Circuit Protection	Fused 1.6 Amp, 250 V fast-blo	
Ambient Temperature	-23° to 116°F (-31° to 47°C)	
Max. Cycle Rate	Limited by the clutch or brake, variable with application	
Switching	Single pole, double throw Minimum contact rating: 10 Amp, 28 VDC resistive or 10 Amp, 120 VAC inductive	
Status Indicator	Red LED indicates brake is energized, Green LED indicates clutch is energized	
Mounting	Two versions of octal socket are available: 6001-101-001 foot mount 6001-101-002 DIN rail mount	

### Connection Diagrams



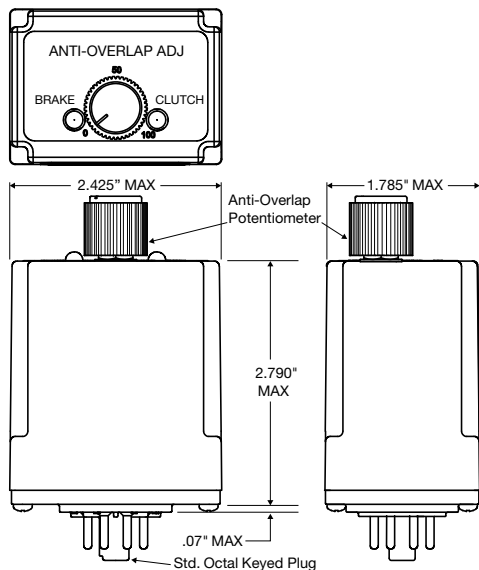


### CBC-802 PLC compatible

The CBC-802 is a power supply with solid state circuits for load switching. A brake and clutch may be operated separately — or, two brakes or two clutches, one unit on at a time. The CBC-802 mounts on an octal socket (purchased separately), and the wiring connections are made at the socket terminals. Octal socket sold separately, refer to mounting specifications for part number.

- Plug-in power supply with solid state switching circuits—increases switch service life
- Adjustable time delay for controlling clutch/brake overlap
- Internally fused for overload protection
- DIN rail mountable
- LED output indicators

### Dimensions

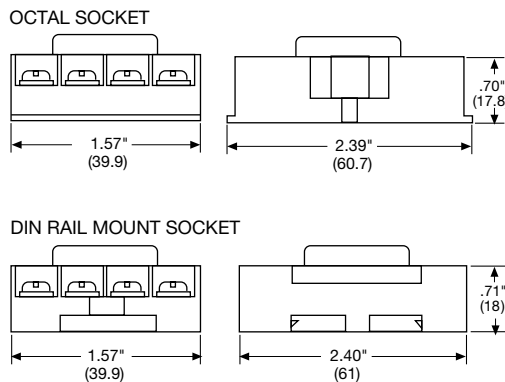
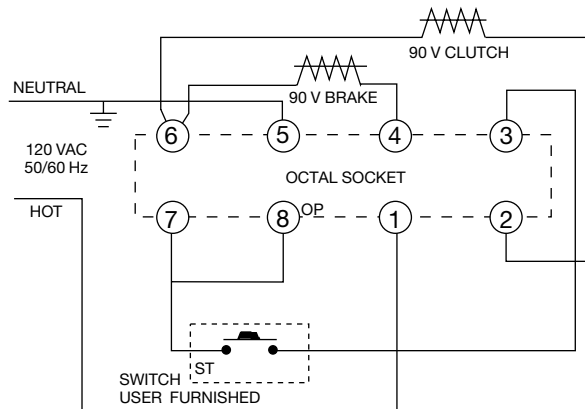


All dimensions nominal unless otherwise specified.

### Specifications

CBC-802	
Part No.	6002-448-002
Input	120 VAC, 50/60 Hz
Output	90 VDC, 0.5 A max.
Status Indicator	Red LED indicates brake energized. Green LED indicates clutch energized.
Circuit Protection	Fused 0.5 Amps, 250 V
Ambient Temperature	-20° to 113°F (-29° to 45°C)
Leakage Current	500 uA max. for solid state switches
Max. Cycle Rate	Limited by the clutch or brake, variable with application
Switching	Momentary contact, maintained contact, or solid state open collector logic Minimum contact rating 20 VDC resistive, 0.01 Amps Minimum input pulse—1 millisecond
Adjustments	Externally adjusted potentiometer sets overlap between clutch and brake from 0 to 130 MS.
Mounting:	Two versions of octal socket are available: 6001-101-001 foot mount 6001-101-002 DIN rail mount


### Connection Diagram



# MCS-103-1 Adjustable Torque Controls

## Adjustable Torque Control

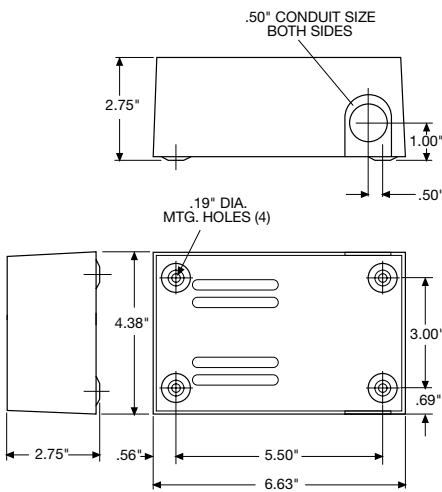
The MCS-103-1 is an enclosed control complete with a cover and mounting provisions. A brake and clutch may be operated separately with this control – or up to four units, two at a time. The external wiring is connected to the terminal strip located behind the cover.

-  Can be used with electrically released brakes

- Torque control for one 90 VDC clutch or brake
- Operates up to four units, two on at a time
- Easy-to-install. Compact. 120 VAC input
- Convenient terminal strip behind an easy-to-remove cover



## Dimensions

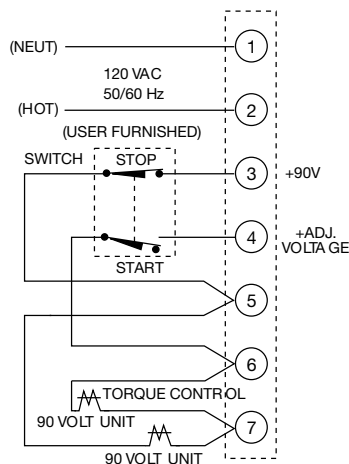


All dimensions nominal unless otherwise specified.

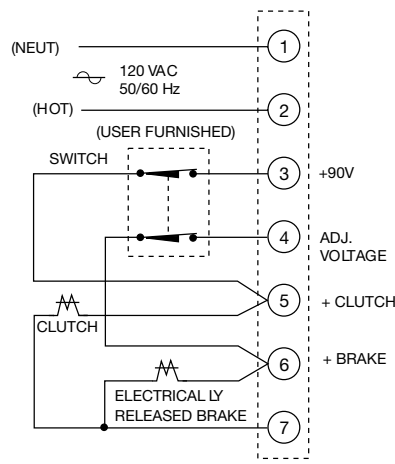
## Specifications

MCS-103-1	
Part No.	6010-448-002
Input	120 VAC, 50/60 Hz
Output	1.25 Amp 90 V full wave rectified for one unit and adjustable from 0-90 volts full wave rectified for second unit
Circuit Protection	Fused 1.5 Amp, 250 V
Ambient Temperature	-20° to 113°F (-29° to 45°C)
Maximum Cycle Rate	Limited by the clutch or brake and will vary with application.
Mounting	Mounting centers 5-1/2" wide, 3" high. Knockouts for 1/2" conduit
External Switches (User furnished)	Double pole, double throw maintained contact. Minimum contact rating: 10 Amp, 28 VDC resistive or 10 Amp, 120 VAC inductive. Contact ratings given will operate all Warner Electric brake and clutch units. However, switches with ratings less than those given may be used with fractional horsepower units provided the rating is equal to or greater than the coil current.

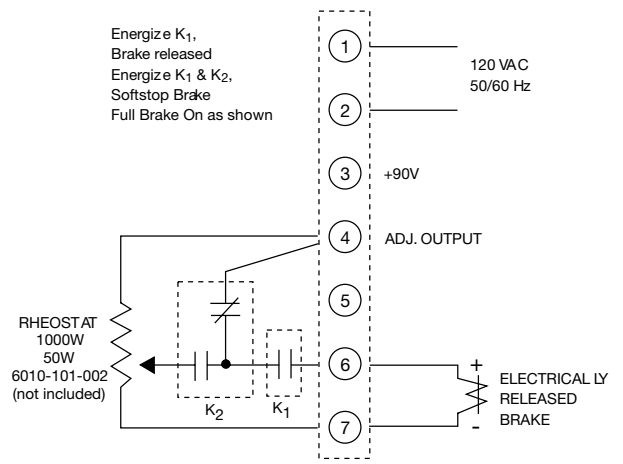
## Connection Diagrams



Normal Clutch/Brake Operation  
(One unit on at a time)



Clutch/Electrically Released  
Brake Operation  
(Both units on at a time)



Soft Stop for  
Electrically Released Brake

# MCS-805-1/MCS-805-2 Power Supply

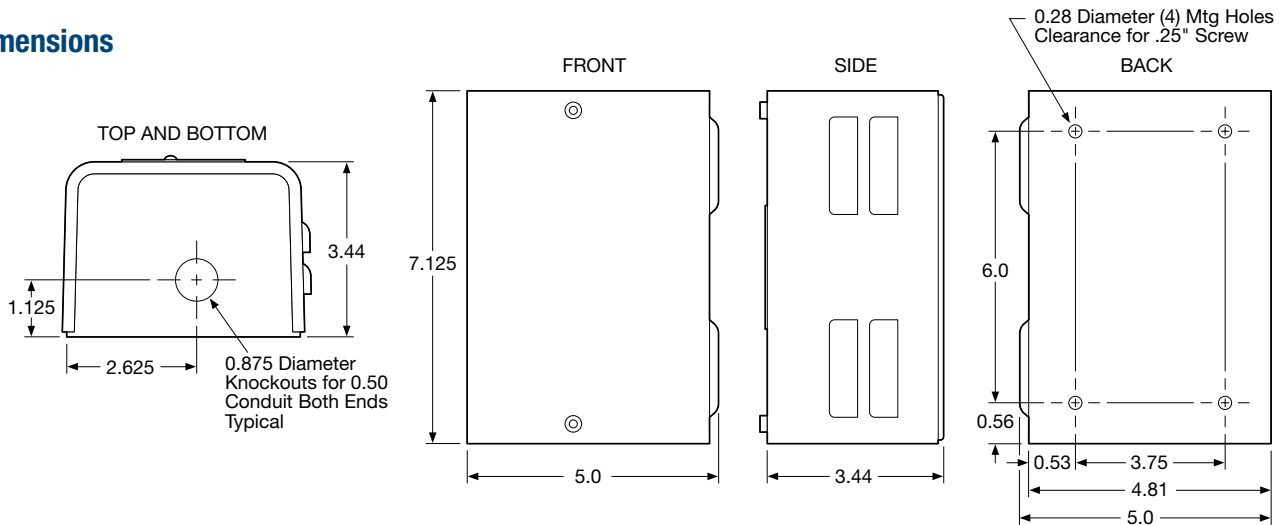
The DC voltage required to release the Warner Electric ER-1225 Brake is supplied by the MCS-805-1 or MCS-805-2 Power Supply. The correct brake release voltage—approximately 35-75 volts DC—is set by adjusting the power supply at the time of brake installation. Temperature compensating circuits provide proper operation over the entire operating range of 0°F to 150°F. Switching may be provided on either the AC or DC side of the power supply. The MCS-805-1 may be mounted on its back panel or on 1/2" conduit. The MCS-805-2 has a torque adjustment capability for soft stop applications. The MCS-805-2 requires two switching circuits when used for those applications requiring soft engagement.



## Specifications

	MCS-805-1	MCS-805-2
Part No.	6090-448-006	6090-448-007
Input	115/230 VAC, 50/60 Hz ±10%	115/230 VAC, 50/60 Hz ±10%
Output	0.4 Amp, 35/75 VDC	0.4 Amp, 35/75 VDC
Ambient Temperature	-20° to 150°F (-29° to 65°C)	-20° to 150°F (-29° to 65°C)
Maximum Cycle Rate	Limited by the clutch or brake and will vary with application. Consult factory for specifics.	
External Switches (User furnished)	For DC switching: single pole, single throw. Minimum contact rating 1 amp, 120 volts DC resistive. For AC switching: single pole, single throw. Minimum contact rating 1 amp, 120 volts AC.	
Circuit Protection	.75 Amp 250V Slow Blow 3 AG	

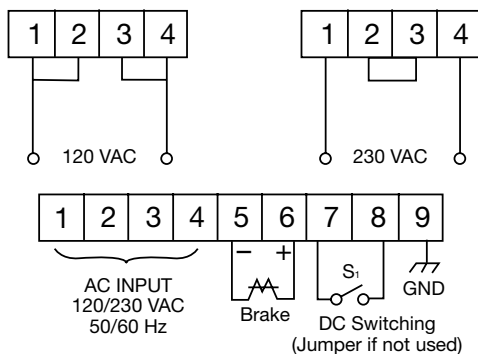
## Dimensions



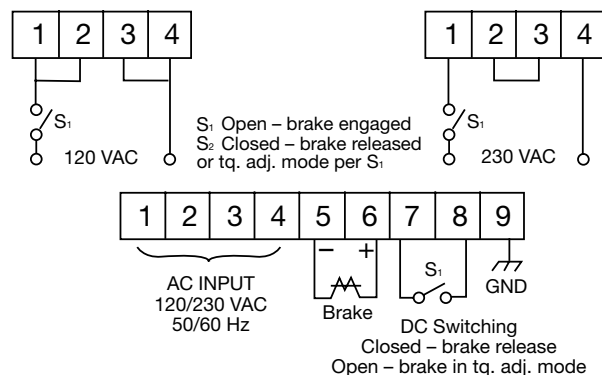
## Connection Diagrams

Connect the MCS-805-1 or MCS-805-2 Power Supply per the following diagram and instructions:

**MCS 805-1**



**MCS 805-2**




For AC switching, switch may be in series with input supply. For DC switching, use terminals 7 and 8 as shown. DO NOT put switch in series with load on terminals 5 and 6.



# CBC-300 Adjustable Torque Controls

The CBC-300 Series Controls provide dual torque controls when connected to any of Warner Electric's 90 volt clutches and brakes.

-  US
- Current monitored output maintains consistent torque regardless of variation in coil temperature.
- Switch selection tunes control to exactly match current requirements and operating characteristics of each clutch or brake.
- Individual torque adjust allows preset maximum torque tailored to application requirements.
- Short circuit protection, line to line.
- Torque limiting protects machine components from damage.
- Can be used with electrically released brakes.
- Internally Fuse Protected



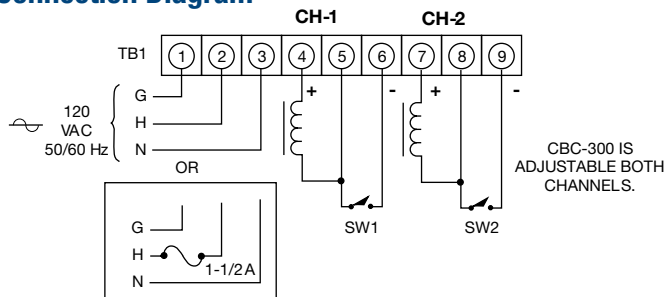
## CBC-300 Series Dual channel/Dual channel torque adjust

The CBC-300 has two adjustable current channels.

## Specifications

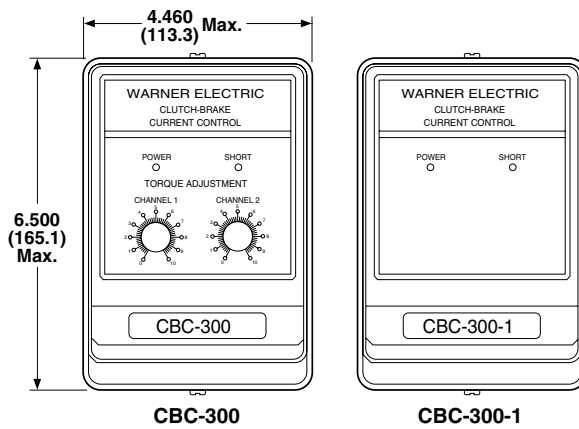
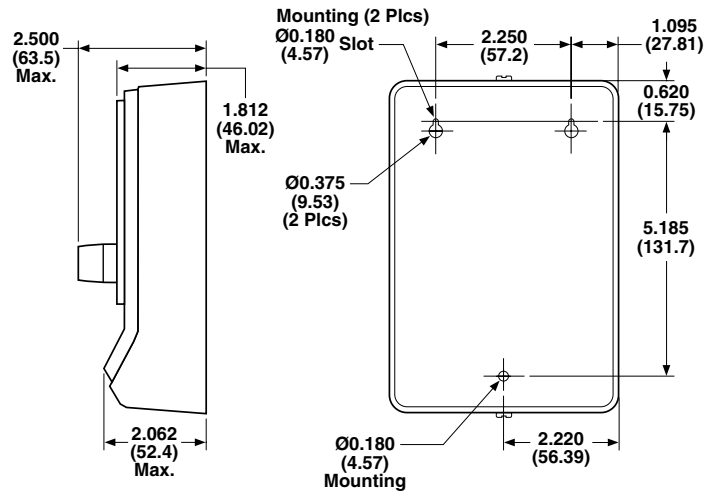
CBC-300													
Part No.	6021-448-009												
Input Power	120 VAC +10% -15%, 50/60 Hz, single phase, 215 VA max.												
Output	Pulse-width modulated full wave rectified D.C. Constant current, switch selectable ranges, 0-90 volt												
Ambient Temperature	+32°F to +113°F (0°C to 45°C) with plastic cover installed +32°F to +150°F (0°C to 66°C) with plastic cover removed												
Circuit Protection	Internal line to line short circuit protection Optional customer supplied fusing on A.C. line, 1.5 Amps, 250 VAC. Fast-acting fuse internal 300 (recommended 300-1)												
Current Adjust (via front panel potentiometers)	Dual adjustable channels												
Status indicators	"POWER"—green LED indicates A.C. power is applied to the control. "SHORT"—red LED indicates a short circuit condition exists on one or both outputs.												
Internal Adjustments	Set DIP switches SW1 and SW2 to suit the current draw of the connected clutch/brake coil: <table border="1"> <thead> <tr> <th>Switch Range</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td>Max Current Draw (mA)</td> <td>60</td> <td>175</td> <td>245</td> <td>305</td> <td>533</td> </tr> </tbody> </table>	Switch Range	1	2	3	4	5	Max Current Draw (mA)	60	175	245	305	533
Switch Range	1	2	3	4	5								
Max Current Draw (mA)	60	175	245	305	533								
External Switching	Mechanical or electromechanical—customer supplied: 1 Amp, 125 V minimum rating Solid-state, NPN isolated transistor—customer supplied: 2 Amp, J250 V minimum rating. Maximum off state leakage current <1 mA												

## Connection Diagram





# CBC-300 Adjustable Torque Controls



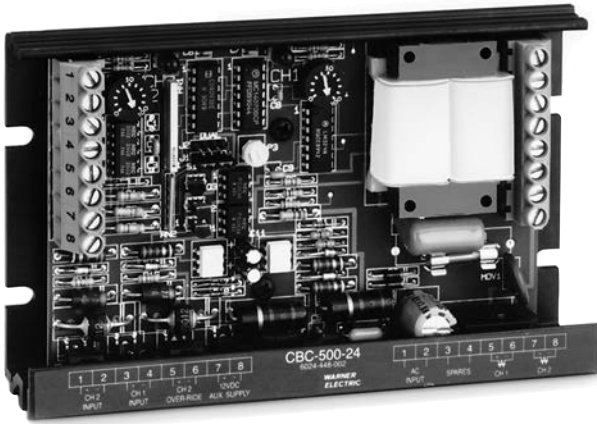
Pots for remote current adjustment: 6011-101-001 single turn  
6011-101-002 ten turn

## Selection Guide

	CBC 300	CBC 300-1
NEMA 1 Enclosure	6021-448-009	6021-448-002
	Both channels adjustable	Both channels adjustable
	Adjustable by knobs on unit	Adjustable by remote pots
	Max. output at 100%	Max. output at 100%

# CBC-500 Adjustable Torque Controls

## Panel Mounted



## Specifications

	CBC-500-90	CBC-500-24
Part No.	6024-448-003	6024-448-002
Input Voltage	120 VAC	24-30 VAC or VDC
Output Voltage	0-90 VDC	0-24 VDC
Output Current	1 Amp/Channel 2 Amps Total	5 Amps/Channel 5 Amps Total
Auxiliary Supply	12 VDC 250 mA	12 VDC 250 mA
Circuit Protection	Fused 2.5 Amp, 250 V Fast-blo	Fused 6.3 Amp, 250 V Fast-blo
Ambient Temperature	+32° to 122°F (0° to 50°C)	
Status Indicators	Red LED indicates channel is energized.	
Adjustments	Two potentiometers for voltage adjustment of channel 1 and channel 2 output from 0 to full rated voltage. Frequency adjustment from 60 to 400 Hz to reduce clutch/brake "Hum" associated with machine frequencies. Jumper for single or dual operation. See Appendix for explanation.	
Inputs:	3 Optically coupled, 10-30 VDC, 3-9 mA for Channel 1, Channel 2 and Channel 2 override (applies full voltage to channel 1 output)	

## CBC-500 series Dual torque adjustable power supplies

The CBC-500 series is a dual channel adjustable voltage control with optically isolated input switching for 24 and 90 volt electric clutches and brakes. These controls can be set up to energize the two outputs alternately (single) or simultaneously (dual). Refer to the Appendix for additional setup and switching information.

- Dual adjustable channels
- Optically isolated input switching
- Single or dual channel operation
- Auxiliary 12V supply
- Can be used with electrically released brakes

## Enclosure (Optional)

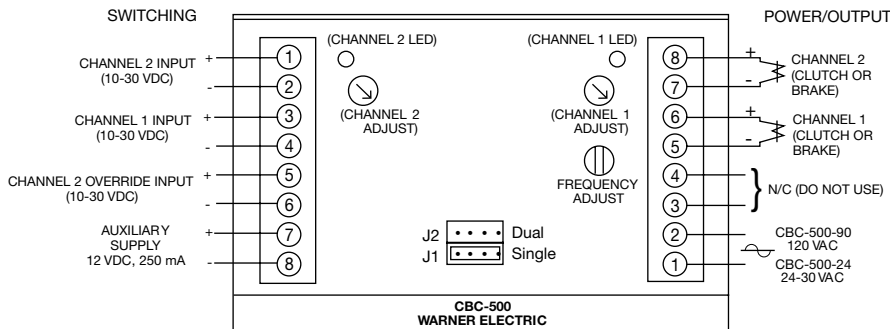


- Lift off hinge
- Quick-release latches
- Conforms to NEMA Type 13
- European Standard IEC 529, IP65

# CBC-500 Adjustable Torque Controls

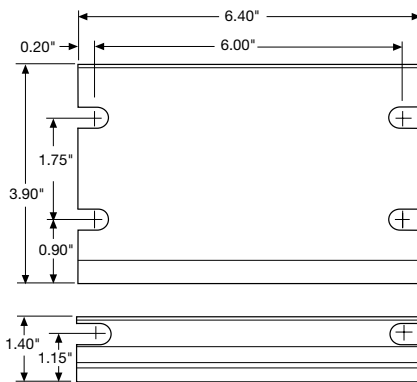
Panel Mounted

## Connection Diagram



All dimensions nominal unless otherwise specified.

## Dimensions



Part No. 6042-101-004

Size 8"H x 6"W x 4"D  
(203.2 x 152.4 x 101.6 mm)

# CBC-550 Adjustable Torque Controls

## Panel Mounted

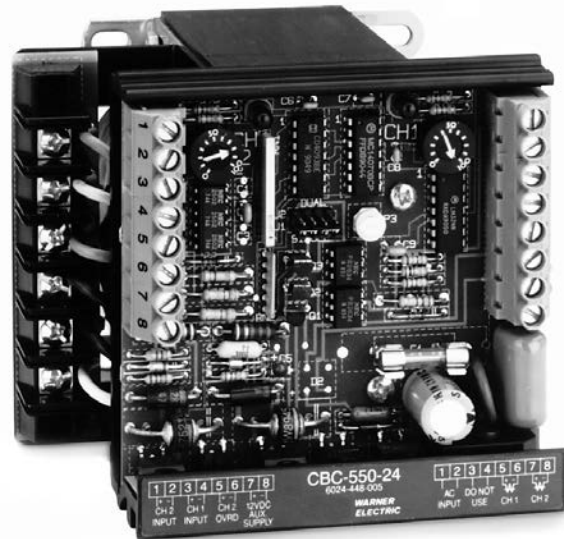
### CBC-550 series

#### Dual adjustable with power transformer

The CBC-550 series is a dual channel adjustable voltage control with optically coupled switching for 24 and 90 volt electric clutches and brakes. These controls can be set up to energize the two outputs alter-nately (single) or simultaneously (dual). Refer to the Appendix for additional setup and switching information.

The CBC-550 series has a power transformer which will operate with a 120, 220, 240, 380, or 480 VAC input.

- Dual adjustable channels
- Optically isolated input switching
- Single or dual channel operation
- Can be used with electrically released brakes



## Specifications

	CBC-550-90	CBC-550-24
Part No.	6024-448-006	6024-448-005
Input Voltage	120/220/240/380/480 VAC	
Output Voltage	0-90 VDC	0-24 VDC
Output Current	1 Amp/Channel 1.2 Amps Total	4 Amps/Channel 4 Amps Total
Auxiliary Supply	12 VDC 250 mA	12 VDC 250 mA
Circuit Protection	Fused 1.5 Amp, 250 V fast-blo	Fused 5 Amp, 250 V fast-blo
Ambient Temperature	+32° to 122°F (0° to 50°C)	
Status Indicators	Red LED indicates channel is energized.	
Adjustments	Two potentiometers for voltage adjustment of channel 1 and channel 2 output from 0 to full rated voltage. Frequency adjustment from 60 to 400 Hz to reduce clutch/brake "Hum" associated with machine frequencies. Jumper for single or dual operation. See Appendix for explanation.	
Inputs	3 Optically coupled, 10-30 VDC, 3-9 mA for Channel 1, Channel 2 and Channel 2 override (applies full voltage to channel 1 output)	

## Enclosure (Optional)



- Lift off hinge
- Quick-release latches
- Conforms to NEMA Type 13
- European Standard IEC 529, IP65

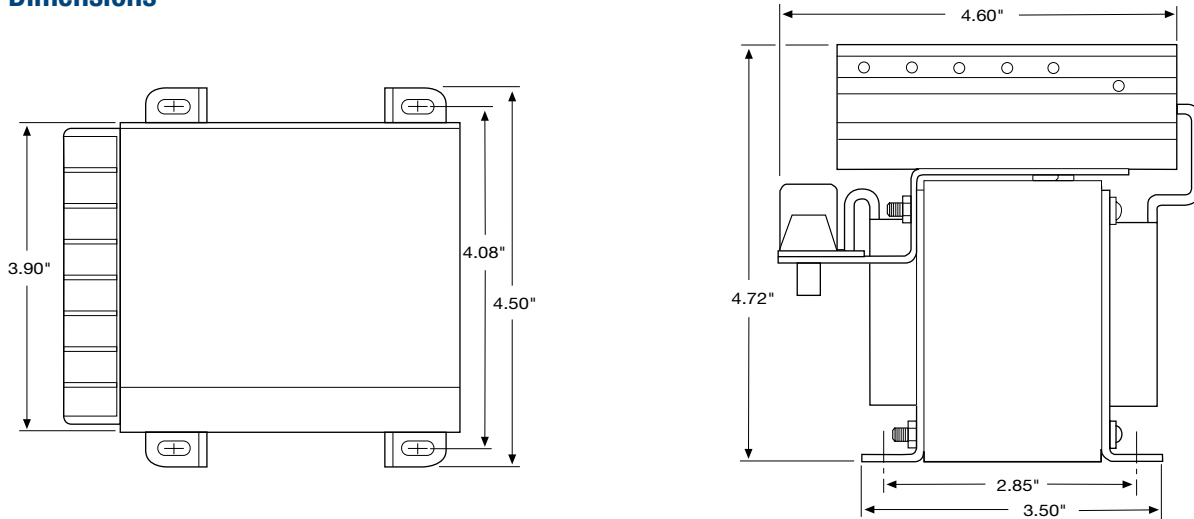
Part No. 6006-101-007

Size 6"H x 6"W x 6"D  
(152.4 x 152.4 x 152.4 mm)

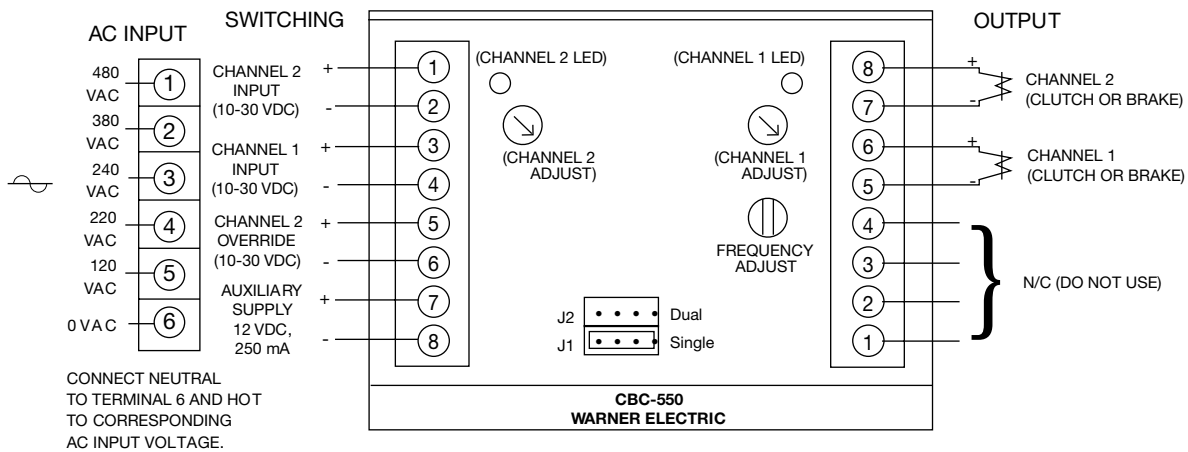
# CBC-550 Adjustable Torque Controls

Panel Mounted

## Dimensions



## Connection Diagram



All dimensions nominal unless otherwise specified.

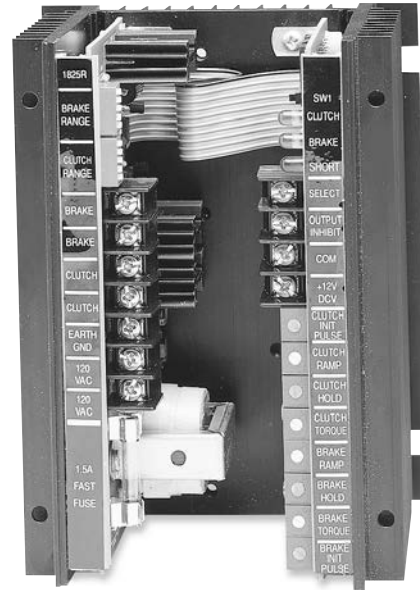
# CBC-1825R Adjustable Torque Controls

## Panel Mounted

### CBC-1825R series

The CBC-1825R is designed to provide consistent and repeatable acceleration and deceleration when used with Warner Electric 90 VDC clutches and brakes. Current to each channel is introduced along an adjustable time ramp and monitored continuously. Adjustments include initial pull-in pulse, hold level, maximum torque, and ramp time. LEDs are provided on the circuit board to indicate power is applied to the clutch or brake unit.

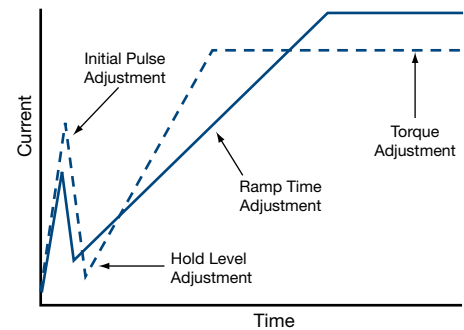
**Note:** It is recommended that the auto-gap springs be removed from the clutch and brake for successful accel-decel application.



### Specifications

CBC-1825R	
Part No.	1825-448-001
Input Voltage	120 VAC, 50/60 Hz, 100 VA maximum
Output Current	Current driven PWM, compatible with 90 VDC clutch/brake (switch selectable current output)
Auxiliary Supply	12 VDC 250 mA
Circuit Protection	Input Fused 1.5 Amp, 250 V fast-blo clutch and brake outputs are short circuit protected
Status Indicators	Clutch and brake LEDs indicate output is energized Short circuit LED indicates a fault
Ambient Temperature	0° to 122°F (-18° to 50°C)
Switching	Contact rating: 15 mA @ 15 V, open collector NPN 2mA maximum allowable leakage current and 2 V maximum saturation voltage

### Set-up

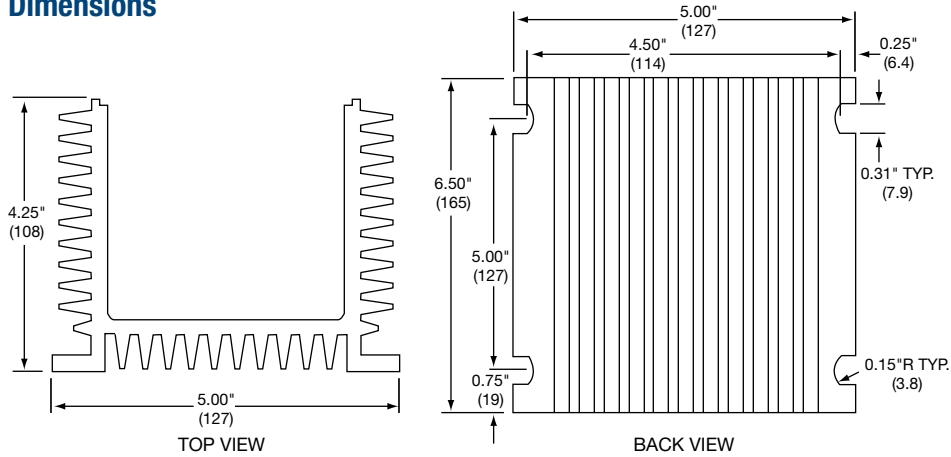


All dimensions nominal unless otherwise specified.

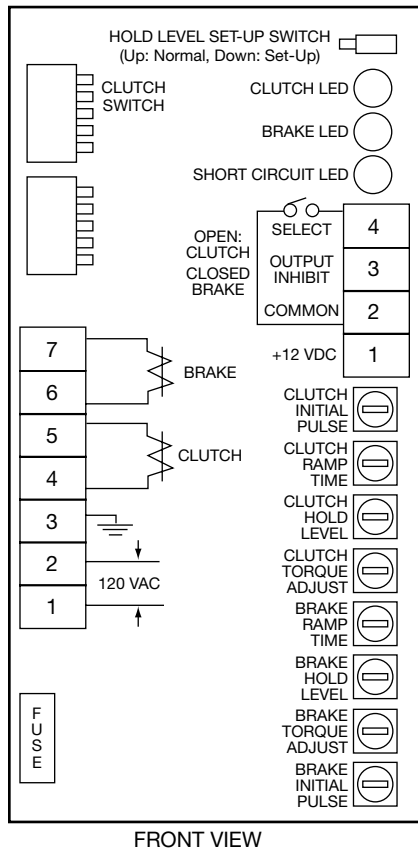
# CBC-1825R Adjustable Torque Controls

Panel Mounted

## Dimensions



## Connection Diagram



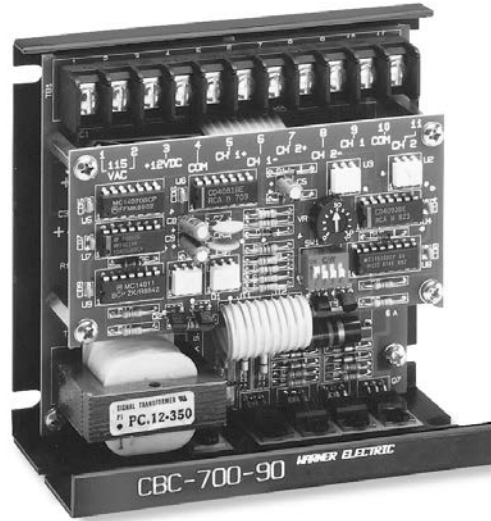
# CBC-700 Overexcitation Controls

## General Purpose OEX Control

### CBC-700 Series

Simple, compact, high performance OEX control for either 90 or 24 VDC clutches and brakes. OEX spike duration and anti-overlap times delay are adjustable. Two optically isolated inputs.

- High performance
- Switch selectable OEX duration
- Force decay suppression with adjustable anti-overlap time delay
- Compact, flexible mounting
- Models for 24 or 90 volt clutches and brakes
- Cycle rate limited by clutch/brake



### Specifications

	CBC-700-90	CBC-700-24
Part No.	6042-448-003	6042-448-002
Input	120 VAC, 50/60 Hz	24-28 VAC, 50/60 Hz
Output Voltages		
Steady State	90 VDC	24 VDC
Overexcitation	340 VDC	105 VDC
Output Current (Per channel alternately)	.5 Amps	3.5 Amps
OEX Pulse Duration	Adjustable through logic board dip switches (see service manual)	
Inputs	Two-optically isolated (10-30 VDC)	
Ambient Temperature Range	0°F to 140°F (-18°C to +60°C)	
Maximum Off State Leakage	<2 mA (inputs)	
Circuit Protection	1.6A Fast Act (5 x 20 mm)	5A Slo-Blo (5 x 20 mm)
Auxiliary Supply	12 VDC, 250 mA maximum	

### Enclosure (Optional)



- Lift off hinge
- Quick-release latches
- Conforms to NEMA Type 13
- European Standard IEC 529, IP65

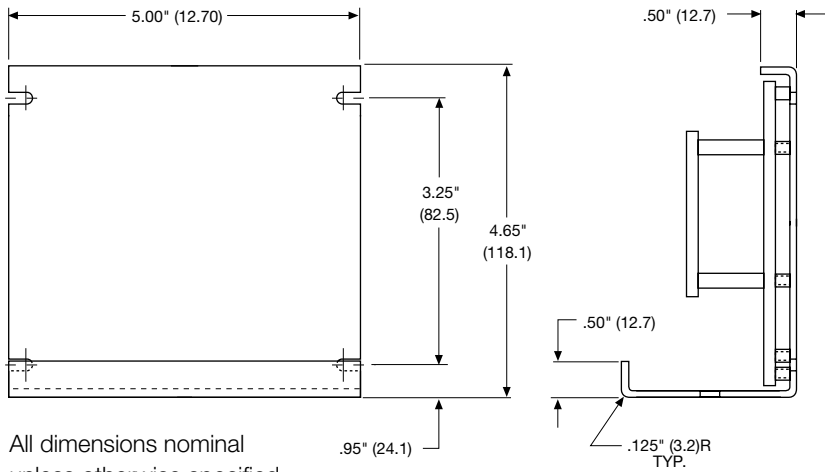
Part No.	6042-101-004
Size	8"H x 6"W x 4"D (203.2 x 152.4 x 101.6 mm)



# CBC-700 Overexcitation Controls

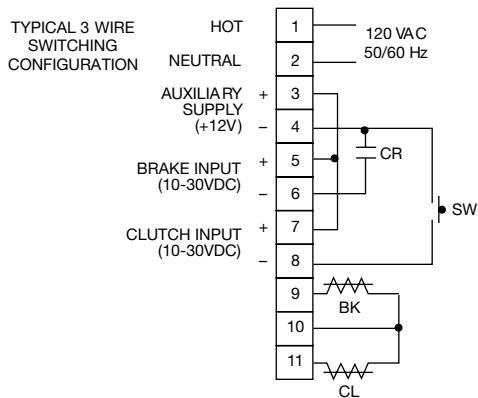
## General Purpose OEX Control

### Dimensions



All dimensions nominal unless otherwise specified.

### Connection Diagram



**NOTE:** CR, SW user furnished switch options for use with control.  
 CR normally open relay contact  
 SW normally open push button switch

# CBC-750 Overexcitation Control

## Rapid Acceleration/Deceleration

### CBC-750 Dual channel, current based OEX with switching logic

Warner Electric's CBC-750 Constant Current Overexcitation Clutch/Brake Control is a solid-state electronic control designed to increase the cycle rate capabilities and accuracies of electromagnetic clutches and brakes. The control accomplish this by sending a momentary high voltage overexcitation spike to the clutch and/or brake magnetic coil to build a high density magnetic flux field almost instantaneously. By using overexcitation, the response time is reduced as dramatically as performance is increased. For example, the current build up time of a 5 inch, 6 volt magnet is reduced from 84 milliseconds to 2 milliseconds.

The CBC-750 user selects either 120, 220 or 240 VAC operation at the time of installation, and is available for 6 volt clutches and brakes.

LED indicators on the faceplate of each control tell the user the status of input signals, output activation and any auxiliary inputs. A reset switch resets the output should a short be detected. Remote torque adjust potentiometer inputs are also provided. Appropriate current range for each size clutch or brake is selected by a dip switch. Constant current for each level is assured by the control's design.

- Maintains torque at preset levels regardless of temperature variations
- Automatically controls OEX pulse duration for optimum response without overheating coils
- Automatically prevents clutch and brake "overlap"
- Configurable as an analog follower control through remote top input
- Integral switching logic through auxiliary, inhibit and override inputs



Shown with optional cover, part number 6041-101-004

- High performance OEX control
- Constant current output capability
- Available for 6 volt clutches and brakes
- Outputs short circuit protected.
- AC/DC optically isolated inputs
- Transformer isolation Remote torque potentiometer capability
- Input/Output inhibit functions
- Switch selectable OEX function
- Automatic CH1/CH2 anti-overlap feature
- Heavy duty suppression circuits
- Selectable output current ranges
- Remote status indicators inputs and outputs

## Specifications

CBC-750-6	
Part No.	6041-448-001
Input Power	120/220/240 VAC, $\pm 10\%$ , 50/60 Hz, 350 VA (switch selectable)
Control Inputs	Opto-isolated 10-30 VDC @ 10-35 mA nominal sinking or sourcing, or 24 VAC (50/60Hz) @ 22 mA nominal, or 120 VAC (50/60 Hz) @ 20 mA nominal
Clutch/brake Output	
Steady State Output	
Current controlled	.910 to 4.34 A max.
Current Rise Time	Dependent on clutch/brake size
Current Fall Time	Depending on clutch/brake size
Overexcitation Voltage	75 VDC nom.
Overexcitation Time	Automatic adjustment by control feedback
Anti-overlap Time	Automatic adjustment by control feedback
Power Supply Output	12 VDC, $\pm 0.6$ VDC, 250 mA max.
Auxiliary Indicator	Opto-isolated NPN transistors
Outputs	24 VDC maximum, 20 mA max., reverse polarity protected
Circuit Protection	Internal short circuit protection on each output channel.
Fusing	
AC Input Line	2 Amp, 250 V Slo-Blo
OEX Supply	10 Amp, 32 V Slo-Blo

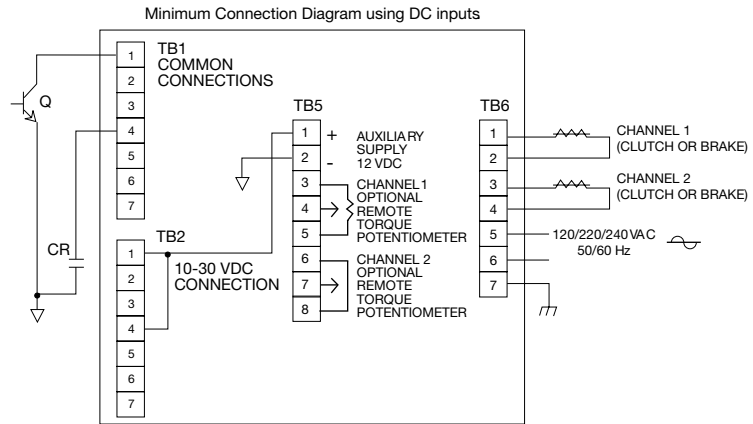
# CBC-750 Overexcitation Controls

## Rapid Acceleration/Deceleration

Seven optically isolated inputs accept 10-30V A.C./D.C. (TB2) or 120 VAC (TB3), configured through set-up switches

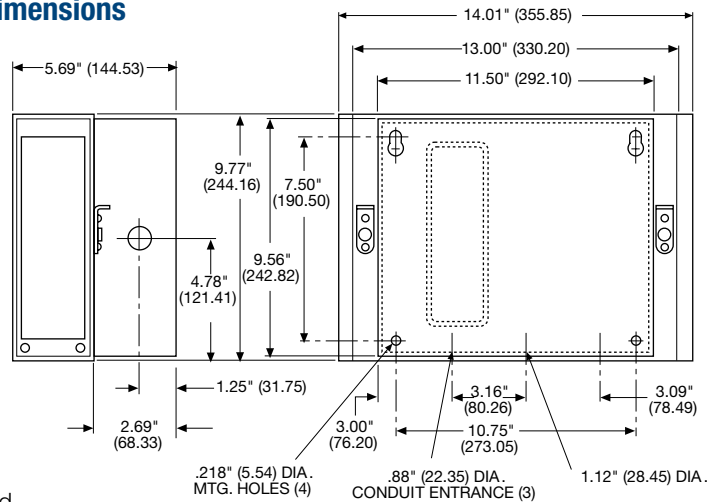
1. Channel 2 Input
2. Channel 2 Input Inhibit (disregards channel 2 input signal)
3. Auxiliary Input
4. Channel 1 Input
5. Channel 1 Input Inhibit (disregards channel 1 input signal)
6. Output Inhibit (deactivates both output channels)
7. Channel 2 Override (applies full voltage to channel 1 output)

### Connection Diagram



**NOTE:** Q, CR user furnished switch options for use with control.  
 Q NPN transistor  
 CR normally open relay contact

### Dimensions



All dimensions nominal unless otherwise specified.

### Setup Switches

SW1: AC Voltage selection switch on terminal board inside control unit

### Max. Current Output

(SW7 & SW8 settings)

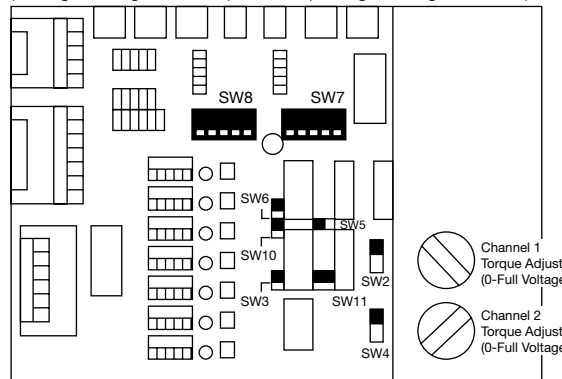
Nominal Voltage	1	2	3	4	5
6	0.910	2.35	3.183	3.760	4.340

#### SW8

Channel 2 current range selector (settings in diagram below)

#### SW7

Channel 1 current range selector (settings in diagram below)



All switches are in the down (v) position from factory

#### SW6

Channel 2 OEX enable (v) disable (v)

#### SW5

Channel 1 OEX enable (v) / disable (v)

#### SW2

Channel 1 local (v) or remote (v) torque adjust

#### SW10

Channel 1 input invert (v) (v)

#### SW4

Channel 2 local (v) or remote (v) torque adjust

#### SW3

Level/pulse selector level (v) pulse (v)

#### SW11

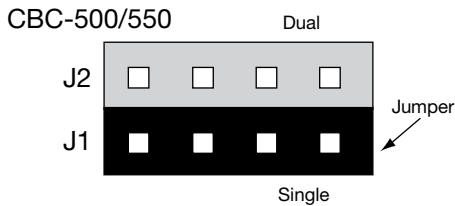
Auxiliary input selector Channel 1 (v) Channel 2 (v)

# Appendix

## CBC-500/550 Single vs. Dual Operation

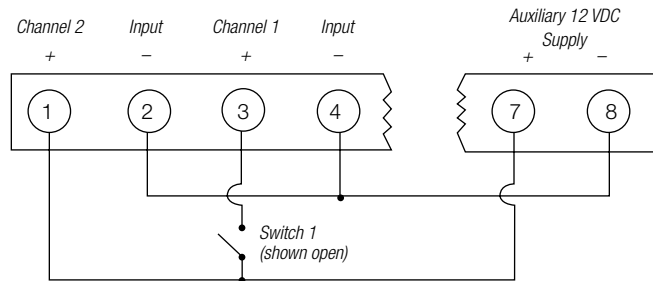
The CBC-500/550 series controls allow operation in either a single or dual mode. The mode of operation is determined via the position of a jumper on the main control board.

The controls are shipped with the jumper in the J1 or single mode position. A variety of output logic can be accomplished via the single/dual jumper position and whether the control is wired to one input switching device (2-wire mode) or two input switching devices (3-wire mode). The following diagrams show how each channel (output) of the control can be either alternately or simultaneously energized.



### 2-wire Switching Option

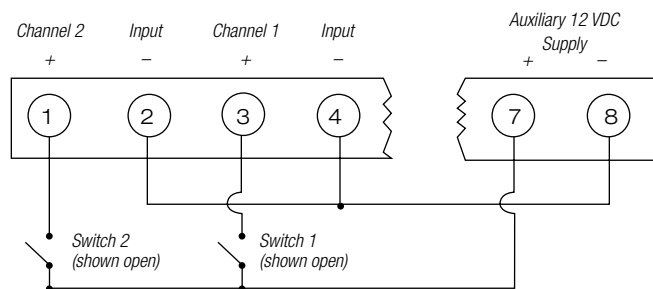
#### Control's switching terminal block



Jumper Mode	Switch 1	Channel 1	Channel 2
J1-Single	Open	Off	Powered
	Closed	Powered	Off
J2-Dual	Open	Powered	Powered
	Closed	Off	Off

### 3-wire Switching Option

#### Control's switching terminal block



Jumper Mode	Switch 1	Switch 2	Channel 1	Channel 2
J1-Single	Closed	Open	Latched On	Off
	Open	Closed	Off	Latched On
J2-Dual	Closed	Open	Off	Off
	Open	Closed	Latched On	Latched On

## 1. What transformers can be used with controls requiring 24-30 VAC input?

Manufacturer	Part Number	Primary	Secondary
Abbott	6B 12-160	115 VAC	24V @ 6 amps
Quality	6-K-119VBR	115/230 VAC	24V @ 8 amps
Signal	24-6	115 VAC	24V @ 6 amps
Signal	DP24-6	115/230 VAC	24V @ 6 amps
Triad	F-260-U	115 VAC	24V @ 6 amps

## 2. What is the difference between a MCS-801 and a CBC-801-1 or between a MCS-103 and a MCS-103-1?

There is no performance difference between the MCS-103 and MCS-103-1. There is no performance difference between the MCS-801 and CBC-801-1. The CBC-801-1 is roughly 1/4" shorter than the MCS-801. The units wire and work exactly the same.

## 3. Which power supplies can be used with the SF 1525HT and SFC 1525HT (used in the EP-1525HT) coil?

90V:

The SF and SFC 1525 High Torque 90V clutch coils require .794 amps of current to produce full rated torque. The following power supplies and controls will provide the needed power.

CBC-100	.8 amps	MCS-103-1	1.25 amps
CBC-150	.8 amps	CBC-500	1 amp
CBC-801	1.25 amps	CBC-550	1 amp

24V:

The SF and SFC 1525 High Torque 24V clutch coils require 3.14 amps of current to produce full rated torque.

Any of our 24V controls (CBC-500, CBC-550, CBC-700) will provide this current.

## 4. Can I use a CBC-160 with a variable frequency drive and AC motor?

No. As the voltage to the drive is varied, the output to the electrically released brake would also vary. This would cause the brake to re-engage when it should be released.

## 5. Which power supplies offer a 12 VDC power source that could be used to power auxiliary switch inputs such as inductive or photoelectric sensors?

CBC-500, CBC-550, CBC-700, CBC-750

## 6. We plan to use a PLC in the application. Does that impact our choice of control or power supply?

The CBC-801s and MCS-103-1 are not very PLC friendly. Both require a 10 amp relay for switching which is not very common for PLCs. Alternatives would be CBC-150 or CBC-500/550 respectively which are more 'PLC-Friendly'.

## 7. Which of the controls would allow for the independent operation of two clutches or two brakes?

Four controls allow for completely independent operation of two clutches or brakes. That is, that a clutch and brake can both be on at once, both off at once, or one on and one off. These controls are:

CBC-801-1 and CBC-801-2, MCS-103-1, CBC-300

The CBC-500/550 allows for operation of both channels on at once, both channels off at once or cycling between channel one and two. However, in the both-on/both-off mode, you cannot also do independent single channel operation.

## 8. Our PLC can provide 24 or 90 volts output. Why do we need a separate power supply at all?

There are two reasons to use a Warner Electric control or power supply with clutches and brakes. First, the electric coil within clutches and brakes can create a significant back EMF spike when turned off. This can damage PLC circuits (some PLCs include a diode for protection). All Warner Electric controls and power supplies include a suppression network to protect upstream electrical components from the back EMF spike. Second, this same suppression network will speed the collapse of the magnetic field within a clutch or brake. Without the suppression circuit, a clutch and brake will often overlap each other in performance with resulting poor machine performance.

## 9. Which controls can be used with electrically released brakes?

The CBC-160-1 and CBC-160-2 are designed specifically to use with the conduit box of EM and EUM electrically released brake designs. The CBC-160-1 and CBC-160-2 can also be used with ER and FB brake designs.

The MCS-103-1, CBC-300 and CBC-500/550 can all be used with ER, FB as well as UM-FBC, EM and EUM-FBB and EM and EUM-MBFB designs.

The MCS 805-1 and MCS 805-2 are for use only with the ER 1225 brakes. The ERS series brakes can be used with the CBC-100 or CBC-801 power supplies.

# Ordering Information

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Model	Part Number	Page
CBC-100-1 .....	6003-448-101 .....	CTL-4
CBC-100-2 .....	6003-448-103 .....	CTL-4
MCS-103-1 .....	6010-448-002 .....	CTL-8
CBC-150-1 .....	6004-448-001 .....	CTL-4
CBC-150-2 .....	6004-448-002 .....	CTL-4
CBC-160-1 .....	6013-448-001 .....	CTL-5
CBC-160-2 .....	6013-448-002 .....	CTL-5
CBC-300 .....	6021-448-009 .....	CTL-10, CTL-11
CBC-300-1 .....	6021-448-002 .....	CTL-11
CBC-500-24 .....	6024-448-002 .....	CTL-12
CBC-500-90 .....	6024-448-003 .....	CTL-12
CBC-550-24 .....	6024-448-005 .....	CTL-14
CBC-550-90 .....	6024-448-006 .....	CTL-14
CBC-1825R .....	1825-448-001 .....	CTL-16
CBC-700-24 .....	6042-448-002 .....	CTL-18
CBC-700-90 .....	6042-448-003 .....	CTL-18
CBC-750-6 .....	6041-448-001 .....	CTL-20
CBC-801-1 .....	6001-448-004 .....	CTL-6
CBC-801-2 .....	6001-448-006 .....	CTL-6
Octal Socket, Foot Mount .....	6001-101-001 .....	CTL-6, CTL-7
Octal Socket, DIN Rail Mount .....	6001-101-002 .....	CTL-6, CTL-7
CBC-802 .....	6002-448-002 .....	CTL-7
Optional Enclosure: CBC-500, CBC-700 .....	6042-101-004 .....	CTL-12, CTL-18
Optional Enclosure: CBC-550 .....	6006-101-007 .....	CTL-14
MCS-805-1 .....	6090-448-006 .....	CTL-9
MCS-805-2 .....	6090-448-007 .....	CTL-9

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# Part Numbers Ordering Information

**PN**

# Part Numbers Ordering Information

## Shaft Mounted Units

### Electro Clutches - EC

Description	Model	Part No.	Voltage	Pg. No.
EC-375	EC-375-1/2	5180-271-006	6	A-4
		5180-271-004	24	
		5180-271-009	90	
	EC-375-5/8	5180-271-002	6	
		5180-271-008	24	
EC-475	EC-475-5/8	5181-271-033	6	A-4
		5181-271-037	24	
		5181-271-036	90	
	EC-475-3/4	5181-271-032	6	
		5181-271-038	24	
EC-650	EC-650-1	5181-271-034	90	A-4
		5181-271-031	6	
		5181-271-039	24	
	EC-650-1-1/8	5181-271-035	90	
		5181-271-032	6	
EC-825	EC-825-1-1/8	5281-271-004	6	A-4
		5281-271-018	24	
		5281-271-007	90	
	EC-825-1-1/4	5281-271-002	6	
		5281-271-019	24	
EC-1000	EC-1000-1-3/8	5281-271-005	90	A-4
		5281-271-009	6	
		5281-271-020	24	
	EC-1000-1-1/2	5281-271-008	90	
		5281-271-003	6	
EC-1225	EC-1225-1-5/8	5281-271-016	24	A-4
		5281-271-006	90	
		5282-271-002	6	
	EC-1225-1-7/8	5282-271-008	24	
		5282-271-011	90	
EC-1225-2-1/8	EC-1225-2-1/8	5282-271-003	6	A-4
		5282-271-009	24	
		5282-271-012	90	
	EC-1225-2-1/4	5282-271-004	6	
		5282-271-010	24	
EC-1225-2-1/8	EC-1225-2-1/8	5282-271-013	90	A-4
		5283-271-002	6	
		5283-271-010	24	
	EC-1225-2-1/4	5283-271-003	90	
		5283-271-013	90	

### Electro Brakes - EB

Description	Model	Part No.	Voltage	Pg. No.
EB-375	EB-375-1/2	5380-170-005	6	A-10
		5380-170-006	24	
		5380-170-004	90	
	EB-375-5/8	5380-170-003	6	
		5380-170-007	24	
EB-475	EB-475	5380-170-002	90	A-10
		5381-170-003	6	
		5381-170-004	24	
	EB-650	5381-170-002	90	
		5382-170-003	6	
EB-825	EB-825	5382-170-005	24	A-10
		5382-170-002	90	
		5383-170-002	6	
	EB-1000	5383-170-004	24	
		5383-170-005	90	
EB-1225	EB-1225	5384-170-003	6	A-10
		5384-170-005	24	
		5384-170-002	90	
	EB-1225	5385-170-003	6	
		5385-170-005	24	
EB-1225	EB-1225	5385-170-002	90	

### Adapters for Electro Brakes

Description	Part No.	Pg. No.
375-3/8	5380-101-005	A-14
375-7/8	5380-101-004	A-14
475-1-1/8	5381-101-003	A-14
650-1-3/8	5382-101-003	A-14
650-1-5/8	5382-101-002	A-14
1000-1-5/8	5384-101-008	A-14
1000-1-7/8	5384-101-007	A-14
1000-2-1/8	5384-101-010	A-14
1225-2-1/8	5385-101-008	A-14
1225-2-3/8	5383-101-007	A-14

### Bushings for Electro Brakes

Description	Model	Part No.
1008	Specify Bore Size 180-0410 to 180-0418	B-3
1310	Specify Bore Size 180-0421 to 180-0435	B-3
H-1, H-2	Specify Bore Size 180-0002 to 180-0018	B-2
1615	Specify Bore Size 180-0131 to 180-0149	B-2
2517	Specify Bore Size 180-0185 to 180-0217	B-3



# Part Numbers Ordering Information

## Shaft Mounted Units

### AT Clutches - ATC

Description	Model	Part No.	Voltage	Pg. No.
<b>ATC-25</b>	ATC-25-1/2	5161-271-002	6	A-20
		5161-271-010	24	
		5161-271-003	90	
	ATC-25-5/8	5161-271-004	6	A-20
		5161-271-011	24	
		5161-271-005	90	
	ATC-25-3/4	5161-271-006	6	A-20
		5161-271-012	24	
		5161-271-007	90	
ATC-25-7/8	5161-271-008	6	A-20	
	5161-271-013	24		
	5161-271-009	90		
<b>ATC-55</b>	ATC-55-3/4	5162-271-002	6	A-20
		5162-271-010	24	
		5162-271-003	90	
	ATC-55-7/8	5162-271-004	6	A-20
		5162-271-011	24	
		5162-271-005	90	
	ATC-55-1	5162-271-006	6	A-20
		5162-271-012	24	
		5162-271-007	90	
ATC-55-1-1/8	5162-271-008	6	A-20	
	5162-271-013	24		
	5162-271-009	90		
<b>ATC-115</b>	ATC-115-1-1/8	5163-271-002	6	A-20
		5163-271-010	24	
		5163-271-003	90	
	ATC-115-1-1/4	5163-271-004	6	A-20
		5163-271-011	24	
		5163-271-005	90	
	ATC-115-1-3/8	5163-271-006	6	A-20
		5163-271-012	24	
		5163-271-007	90	
ATC-115-1-1/2	5163-271-008	6	A-20	
	5163-271-013	24		
	5163-271-009	90		

### AT Brakes - ATB

Description	Model	Part No.	Voltage	Pg. No.
<b>ATB-25</b>	ATB-25-1/2	5191-170-002	6	A-23
		5191-170-010	24	
		5191-170-003	90	
	ATB-25-5/8	5191-170-004	6	A-23
		5191-170-011	24	
		5191-170-005	90	
	ATB-25-3/4	5191-170-006	6	A-23
		5191-170-012	24	
		5191-170-007	90	
ATB-25-7/8	5191-170-008	6	A-23	
	5191-170-013	24		
	5191-170-009	90		
<b>ATB-55</b>	ATB-55-3/4	5192-170-002	6	A-23
		5192-170-010	24	
		5192-170-003	90	
	ATB-55-7/8	5192-170-004	6	A-23
		5192-170-011	24	
		5192-170-005	90	
	ATB-55-1	5192-170-006	6	A-23
		5192-170-012	24	
		5192-170-007	90	
ATB-55-1-1/8	5192-170-008	6	A-23	
	5192-170-013	24		
	5192-170-009	90		
<b>ATB-115</b>	ATB-115-1-1/8	5193-170-002	6	A-23
		5193-170-010	24	
		5193-170-003	90	
	ATB-115-1-1/4	5193-170-004	6	A-23
		5193-170-011	24	
		5193-170-005	90	
	ATB-115-1-3/8	5193-170-006	6	A-23
		5193-170-012	24	
		5193-170-007	90	
ATB-115-1-1/2	5193-170-008	6	A-23	
	5193-170-013	24		
	5193-170-009	90		

### Stationary Field Clutches - SFP

Description	Model	Part No.	Voltage	Pg. No.
<b>SFP-180</b>	SFP-180-1/4	SFP180-14-24	24	A-27
	SFP-180-5/16	SFP180-516-24	24	
	SFP-180-3/8	SFP180-38-24	24	
	SFP-180-1/4	SFP180-14-90	90	
	SFP-180-5/16	SFP180-516-90	90	
	SFP-180-3/8	SFP180-38-90	90	
<b>SFP-250</b>	SFP-250-3/8	5103-271-002	6	A-26
		5103-271-006	24	
		5103-271-010	90	
	SFP-250-7/16	5103-271-003	6	A-26
		5103-271-007	24	
		5103-271-011	90	
	SFP-250-1/2	5103-271-004	6	A-26
		5103-271-008	24	
		5103-271-012	90	
SFP-250-5/8	5103-271-005	6	A-26	
	5103-271-009	24		
	5103-271-013	90		
<b>SFP-325</b>	SFP-325-1/2	SFP325-12-24	24	A-28
		SFP325-12-90	90	

Description	Model	Part No.	Voltage	Pg. No.
<b>SFP-400</b>	SFP-400-1/2	5104-271-006	6	A-26
		5104-271-016	24	
		5104-271-021	90	
	SFP-400-5/8	5104-271-007	6	A-26
		5104-271-017	24	
		5104-271-022	90	
	SFP-400-3/4	5104-271-008	6	A-26
		5104-271-018	24	
		5104-271-023	90	
SFP-400-7/8	5104-271-009	6	A-26	
	5104-271-019	24		
	5104-271-024	90		
SFP-400-1	5104-271-010	6	A-26	
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