

# Electrically Released Brakes FB-375, 475, 650

P-237  
819-0289

Installation Instructions



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**⚠ WARNING** Failure to follow these instructions may result in product damage, equipment damage, and serious or fatal injury to personnel.

This service manual tells how to install, adjust, and maintain your Warner Electric brake. It also contains information for part replacements when needed.

Warner Electrically-Released Brakes are high performance, high torque units. To obtain the required performance and life, the brake must be installed exactly in accordance with the instructions of this service manual. Failure to do so can result in unit breakdown or destruction and possible injury or damage to persons and property. After carefully reading these instructions, no assembly or installation difficulties should be encountered.

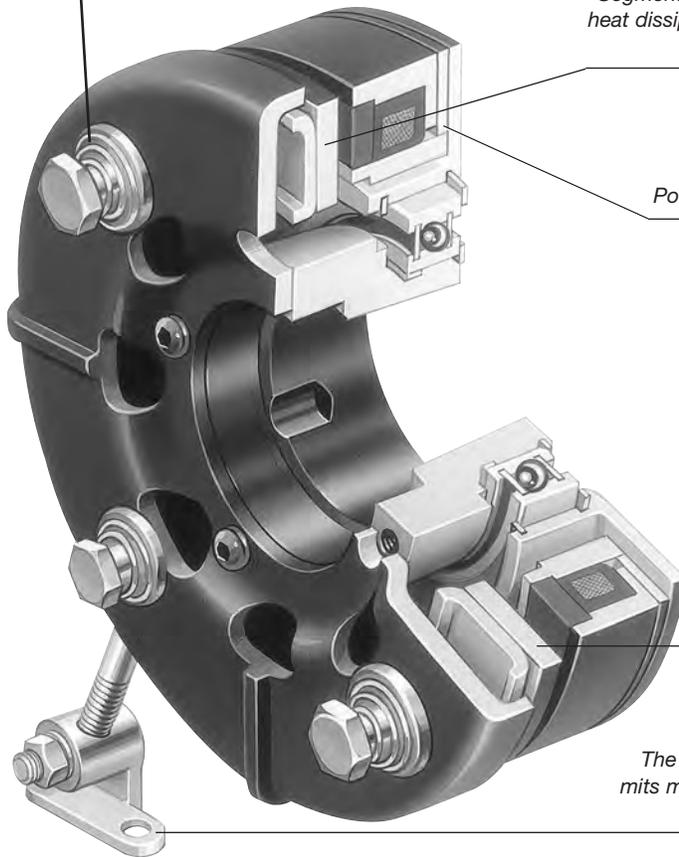
The Warner Electric warranty does not apply to any unit which is not installed, used, operated and maintained in accordance with Warner Electric's instructions.

## Introduction

Warner Electric Electrically Released Brakes function on the same principle of “response to magnetic attraction” that operates other Warner Electric brakes and clutches. Braking torque in these brakes depends on ceramic permanent magnets which have a high resistance to demagnetization. With the power off, the unit

produces full braking torque. The brake is released by generating an electromagnetic field which opposes the field produced by the permanent magnets. An adjustable voltage or current control should be used to achieve best release.

**Autogap®**  
*Automatic wear adjust*



**Long Life – High Cycle Rates**  
*Segmented armature provides high heat dissipation and long service life. Capable of rapid cycling.*

**High Torque**  
*Powerful permanent magnets.*

**Electrically Released**  
*Brake automatically engages when power is turned off– releases when power is applied.*

**Mounting Flexibility**  
*The FB torque arm feature permits mounting on any shaft. Wide range of shaft sizes.*

## Installation Instructions Sizes FB-375 Through FB-650



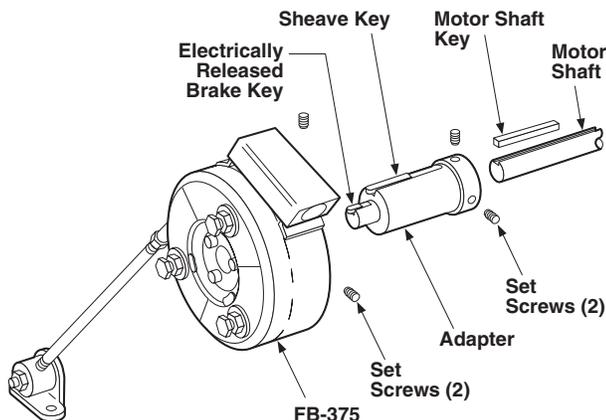
### Installing the Brake

**Note:** Failure to set autogap using the procedures in this manual may cause overheating and premature failure.

#### Step 1:

The first installation step applies only to the optional motor adapter (See Figure 1). For installation on a double shaft extension motor or through shaft, proceed to Step 2A for the FB-375 or Step 2B for the FB-475 or FB-650.

All parts must be clean and free from burrs or chips before assembly. Insert the motor shaft key in the motor shaft. Tighten the motor adapter set screws. Insert the sheave or sprocket key into the motor adapter keyway. Install the sheave or sprocket on the motor adapter either with a tapered bushing or straight bore. Install the belts or chain. To assemble the brake on the motor adapter proceed to Step 2A for the FB-



**Figure 1**  
FB-375 with Motor Adapter

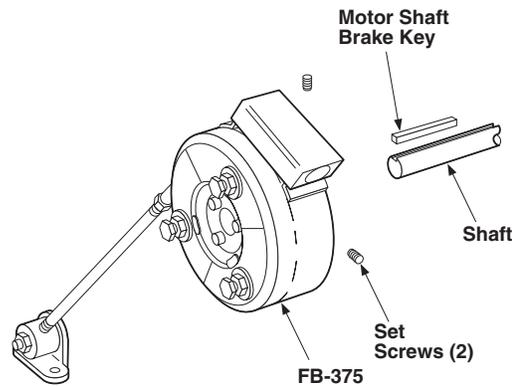
375 or Step 2B for the FB-475 or FB-650.

#### Step 2A:

Check to insure that all parts are clean and free from burrs and chips. Insert the key in the shaft extension keyway. Slide the brake assembly into position on the shaft extension (See Figure 1 or 2). Tighten the set screws. Go to Step 3.

#### Step 2B:

Check to insure that all parts are clean and free from burrs or chips. Insert the key into the shaft keyway. Place the bushing into the hub and match half holes to make complete holes. Each hole will be threaded on one side only. Place the screws loosely into the holes which are threaded on the hub side. Slip the assembly onto the shaft and locate it in the desired position (See Figure 3).



**Figure 2**  
FB-375 without Motor Adapter

Tighten the screws alternately and evenly until all are pulled up very lightly. Tap against the large end of the bushing with a plastic hammer to avoid damaging the bushing. The screws can then be tightened again, using the following torque specifications:

FB-475	55 in. lb.
FB-650	175 in. lb.

Repeat this alternate tapping and retightening until the specified wrench torque no longer turns the screws.

To disassemble, remove both screws and reinsert one screw in the vacant hole (threads on bushing). Tighten this screw until the bushing is loosened in the hub. If the bushing does not loosen, tap on the hub. Go to Step 3.

### Installing The Torque Arm

#### Step 3:

The maximum length threaded rod is furnished for normal mounting. (Consult the factory for recommendations on a longer arm.) The threaded rod can be cut to any desired length. One rod end must be secured to the tab on the Electrically Released Brake and the other end must be secured to a solid base. Although the torque arm may be mounted in either direction, the position of the tab and arm is important. Recommended position relative to shaft rotation is shown in Figure 4. On reversing applications where the rod is in compression every other cycle, the rod must be relatively short, or a special heavier rod may be necessary.

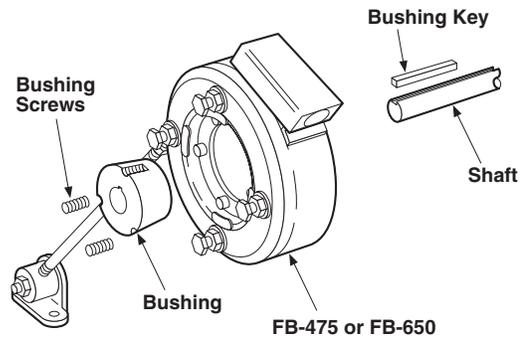
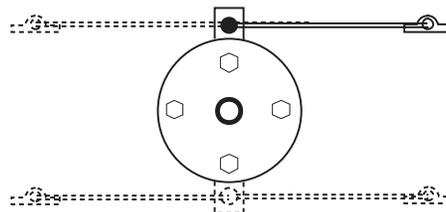
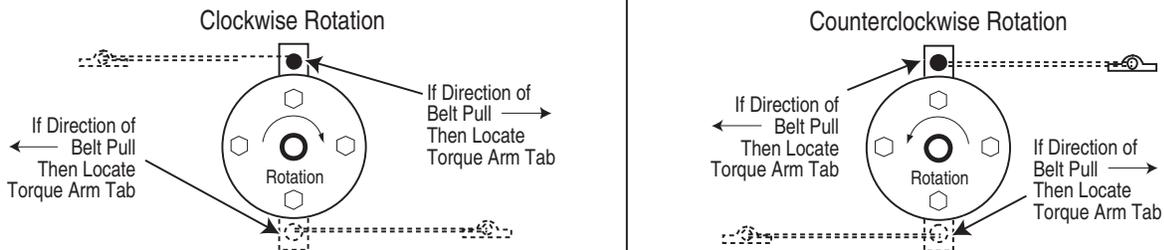


Figure 3

**CAUTION** Do not connect rigid conduit directly to the conduit box. A minimum of 12" of flexible liquid tight conduit or other suitable flexible wiring with appropriate fittings is required. Flexible wiring is required to prevent side loading of bearing on bearing mounted clutches and possible deformation or breakage of the conduit box or clutch/brake components during assembly.



Torque Arm May Be Mounted in Any Direction



ELECTRICALLY RELEASED BRAKE VIEWED FROM ARMATURE SIDE

Figure 4

## Power Supplies for Electrically Released Brakes. Electrical Connections and Adjustments.

### Step 4:

Connect the brake to an adjustable voltage/current control following the instructions for that control. Warner Electric's controls are suitable for these brakes.

**Note:** FB brakes are polarity sensitive. The positive terminal of the brake must be connected to the positive terminal of the control and vice versa.

**Note:** For failsafe or Electrically released brake units (FBB, MBFB, FBC, ER or FB) see instruction on proper electrical setup procedure.

## Instructions for setting the optimum release voltage of permanent magnet applied/electrically released brakes

In a permanent magnet applied/electrically released brake, the attractive force between the brake surface is created by permanent magnets. The brake is electrically released by applying DC power to the electro-magnetic coil in the brake that opposes the permanent magnets.

Electrically released brakes are polarity sensitive: the positive lead of the power supply must be connected to the positive lead of the brake, and the negative lead of the power supply must be connected to the negative lead of the brake. The power supply applied to the brake must also be adjustable so that the optimum release voltage for each individual brake can be determined and set.

The following procedure describes how to set the adjustable power supply to the optimum release point of the brake. A volt-meter is required to perform the procedure.

1. With the power off, connect the positive lead of the power supply to the positive lead of the brake and the negative lead of the power

supply to the negative lead of the brake.

2. Connect a volt-meter to measure the voltage applied across the brake.
3. Adjust the power supply to its lowest possible output, then energize the supply to apply power to the brake.
4. Starting from the low point, slowly increase the applied voltage until the brake armature disengages from the magnet. Note and record the applied voltage at this point.
5. Continue to slowly increase the applied voltage until the armature re-engages the magnet. If the maximum voltage available from the supply does not cause the armature to re-engage, the armature should be manually assisted into engagement.
6. With the armature re-engaged, slowly reduce the applied voltage until the armature disengages from the magnet. Note and record the applied voltage at this point.
7. The optimum release point for the brake is half-way between the two recorded voltage readings. Adjust the supply to this optimum release voltage.

## Autogap Adjustment

### Step 5:

Turn the power on to electrically release the brake. The armature should spring back approximately 1/32-inch as shown. If the armature fails to disengage, turn the control knob on the brake control CCW to 0 and then CW until the armature releases. You've now reached the minimum release voltage. The knob can be turned further CW to find the most favorable release point.

**If the armature does not spring back**, follow the autogap adjustment procedure as follows (refer to Figure 6):

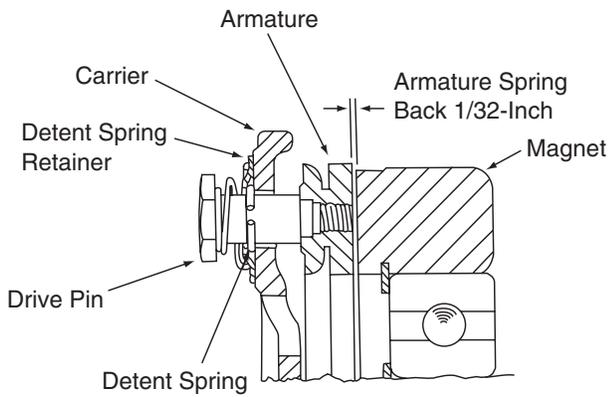


Figure 6

**CAUTION** Keep fingers clear of area between the magnet and the armature because the armature will be pulled sharply toward the magnet if the release voltage is altered for any reason.

1. With the brake power on, pull gently on the O.D. of the armature to separate it from the magnet by a 1/32-inch or greater airgap. **Do not pry. This could damage the components.**
2. Slide the detent spring retainer on each drive pin until it bottoms against the carrier.  
  
If armature cannot be moved, check voltage and polarity. (See Operating Instructions "Fails to Release" on page 8.)
3. Push against the drive pins to push the armature into contact with the magnet.
4. Release the drive pins and the armature will spring back approximately 1/32-inch. The armature gap will now be provided by the autogap mechanism.

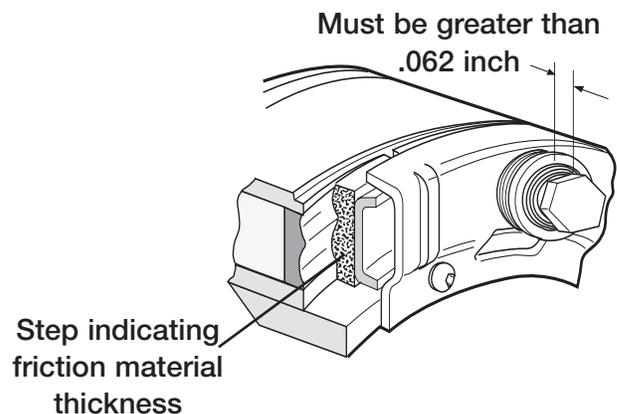
## Operating Instructions

A worn out Electrically Released Brake can lose its ability to produce torque. Consequently, it is imperative that the brake be inspected frequently for wear and to insure that it engages and disengages properly. The frequency of inspections is dictated by usage; a brake used in a high cycle rate and/or heavy load application must be inspected more often than one used less severely. Experience will determine proper inspection intervals.

The end of normal service will occur when the armature wears through the friction material and into the coil, causing an open circuit and failure to release when voltage is applied. Brake wear is determined by two checks. The first determines whether the brake is about to lose torque; the second ensures that the armature has not worn through the friction material, endangering the coil. If either of these checks indicates excessive wear, the unit should be replaced.

### Check No. 1

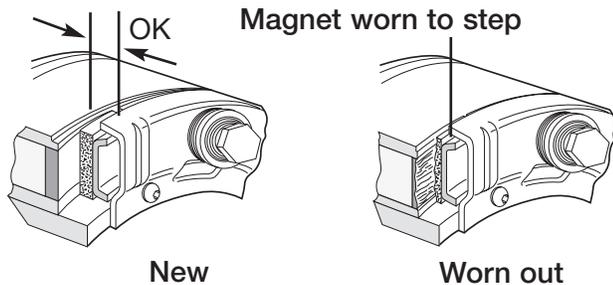
Examine the three autogap release springs to assure that none of them are approaching total compression. If any one of them is approaching total compression or if the distance from the underside of the drive pin head to the top of the detent cup washer is less than .062 inch, the brake should be replaced.



Check No. 1

## Check No. 2

A step is machined on the O.D. of the brake magnet where the armature and magnet meet. This step is equal to the friction material thickness. When this step is completely covered by the armature with the brake engaged, the brake is worn out and should be replaced.



## Check No. 2

After completing an inspection with the machine turned off, cycle it several times. If the Electrically Released Brake stopping time has more than doubled since the original set-up, this also indicates the brake is worn out and should be replaced.

**Foreign Materials:** If units are used on machinery where fine, abrasive dust, chips or grit are dispelled into the atmosphere, a protective screen over the unit may be necessary. **Where units are used near gear boxes or transmissions requiring frequent lubrication's, means should be provided to protect the friction surfaces from oil and great to prevent serious loss of torque by reducing the coefficient of friction and swelling the friction material.** Oil and grease accidentally reaching the friction surfaces may be removed by wiping with a rag dampened with a suitable cleaner, which leaves no residue. In performing this operation, do not drench the friction material. If the friction material has been saturated with oil or grease, no amount of cleaning will be completely effective. Once such a unit has been placed back in service, heat will cause the oil to be boiled to the surface resulting in further torque loss.

The drive pins should be kept free of foreign materials to ensure proper function of the brake.

**Fails to Release:** If the Electrically Released Brake does not release completely, make the following checks:

1. Check that the electrical connections (polarity) between the brake coil and the power supply are correct for the power supply being used (refer to Step 4, page 6).
2. Connect a DC voltmeter across the brake terminals. (Do not disconnect the leads to the terminals.) The voltmeter should indicate a voltage in the range of 75 to 110 volts.
3. The above checks are normally sufficient. Further checks may be made by checking the brake coil resistance.
  - a. Turn off the power to the brake.
  - b. Disconnect one lead from the coil to make sure the circuit is open.
  - c. Connect an ohmmeter across the brake terminals. The resistance should be as shown:

Brake Size	24V Coil Resistance	90V Coil Resistance
	at 20°C (±10%)	at 20°C (±10%)
FB-375	29	447
FB-475	22	310
FB-650	16	235

A very high or infinite resistance reading would indicate an open coil. A very low resistance would indicate a shorted coil. In either case, the unit should be replaced.

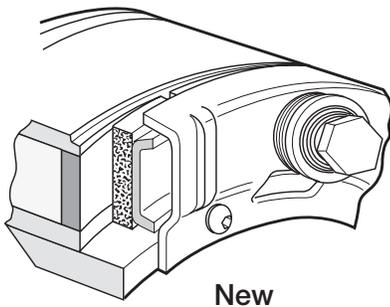
**Wear Pattern:** Wear grooves appear on the friction surfaces. This is a normal wear condition, and does not impair functioning of the unit. Never machine the friction surfaces to remove grooves or score marks resulting from normal wear.

There are two main wear parts, magnet and armature. When either is worn out, the complete brake must be replaced.

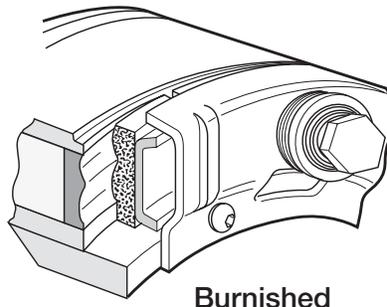
**Heat:** Excessive heat and high operating temperatures are causes of rapid wear. Air should be allowed to circulate around the unit as efficiently as possible, especially if the application requires fast, repetitive cycle operation.

If the above checks indicate that the proper voltage and current is being supplied to the coil, mechanical parts should be checked to assure that they are in good operating condition and properly installed.

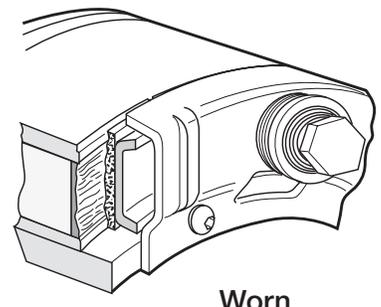
### Wear Pattern



New

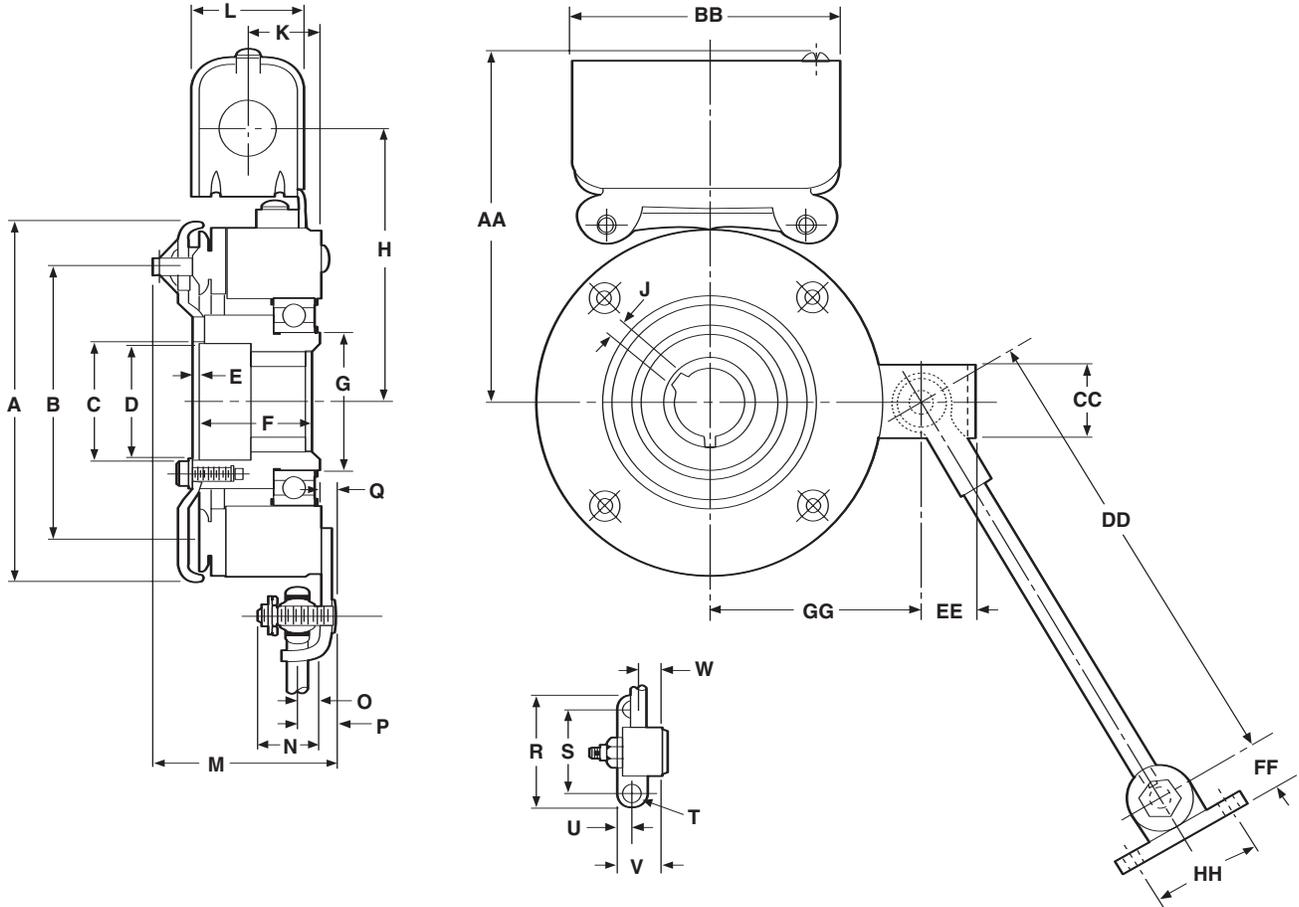


Burnished



Worn

**FB-375, FB-475, FB-650**



**Bore Data** (Key furnished)

Size	Bore Dia.	Keyway
FB-375	.626/.625	3/16 x 3/32
	.501/.500	1/8 x 1/16
FB-475 Dodge #1008	.500 - .562	1/8 x 1/16
	.625 - .875	3/16 x 3/32
	.937 - 1.000	1/4 x 1/8
FB-650 Dodge #1310	.500 - .562	1/8 x 1/16
	.625 - .875	3/16 x 3/32
	.937 - 1.250	1/4 x 1/8
	1.312 - 1.375	5/16 x 5/32



**Note:** FB-375 has a straight bore. Bushing not required.  
 Bushings also available in metric bores.

All dimensions are nominal, unless otherwise noted

Size	A Max.	B Dia	C Min.	D Dia.	E Min.	F	G Dia.	H	J	K	L	M Max.	N	O	P
375	4.078	3.125	.7505	—	.031	1.906	1.375	3.359	.187	1.281	1.546	2.750	.860	.281	.531
475	5.171	4.000	1.663	1.593	—	1.875	1.781	3.875	—	1.218	1.546	3.330	1.093	.312	.531
650	6.578	5.125	2.343	2.281	—	2.250	2.562	4.800	—	1.550	1.546	3.718	1.065	.343	.640

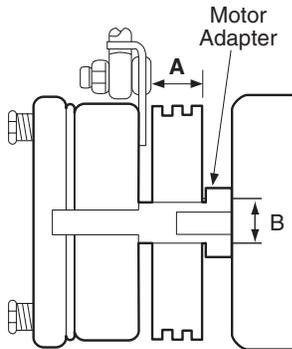
Size	Q Max.	R	S Dia.	T	U	V	W	AA Max.	BB	CC	DD	EE	FF	GG	HH
375	—	2.000	1.500	.270	.250 .260	.781	.359	4.468	3.750	1.000	8.000	.666	.781	2.582	1.500
475	.281	2.000	1.500	.270	.250 .260	.781	.390	4.984	3.750	1.000	10.000	.696	.687	3.093	1.500
650	.359	2.000	1.500	.270	.250 .260	.781	.437	5.843	3.750	1.125	11.000	.843	.843	4.062	1.500

## FB-375, FB-475, FB-650

### Electrically

Released Brake Size	Static Torque	Max. Speed	Total Weight
FB-375	10.5 lb. ft.	5000	4.5 lbs.
FB-475	21 lb. ft.	4500	6.3 lbs.
FB-650	56 lb. ft.	3600	13.2 lbs.

### Motor Adapter Bore Sizes

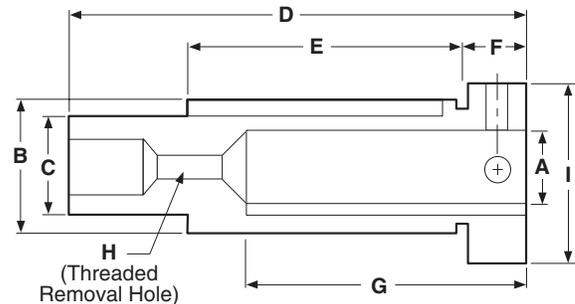


Model Size	Motor Shaft Size	A Usable Length	B Dia.	When using an adapter order the following Adapter Dodge Bushing	
375	.625	2.000	.875	5380-101-005	*None
	.875	2.250	1.250	5380-101-004	*None
475	1.125	2.750	1.625	5381-101-003	#1008 1"
	1.375	3.000	2.000	5382-101-003	#1310 1.375"
650	1.625	3.625	2.250	5382-101-002	#1310 1.375"

\*Order FB-375 with 5/8" bore.

### FB Shaft Adapter

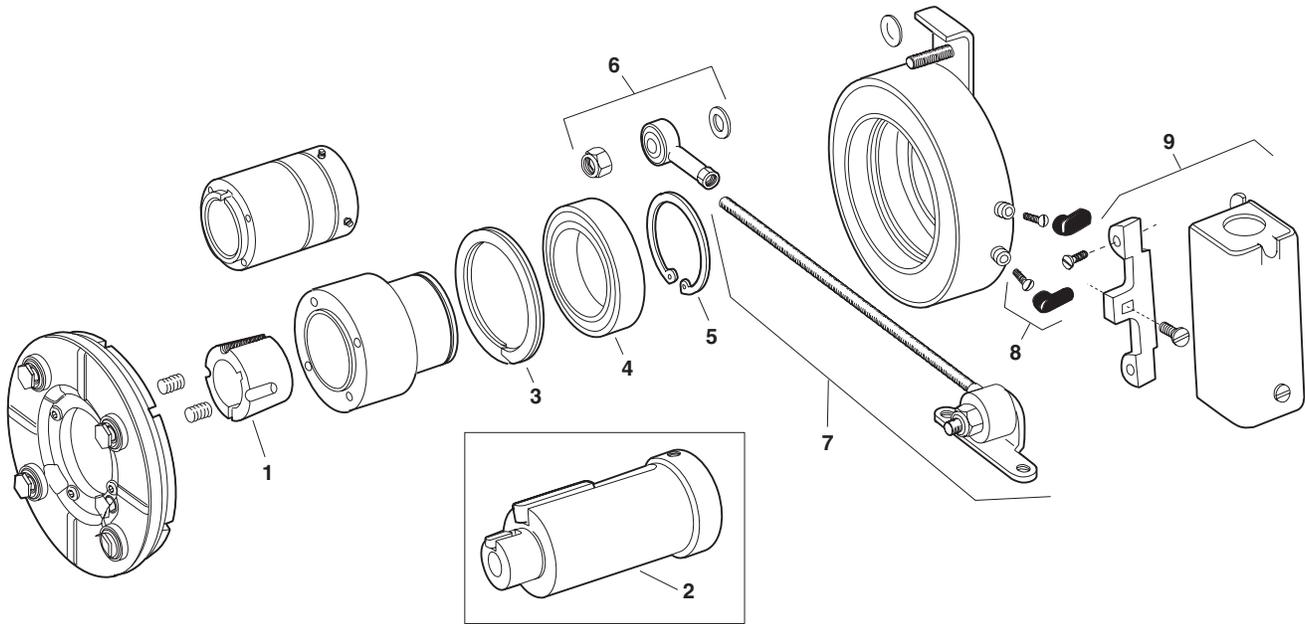
Shown below are dimensions and specifications for the optional shaft adapter available for mounting FB Series brakes on a motor. A standard sheave, pulley, or sprocket, with either a tapered bushing or straight bore, can be installed on the shaft adapter. The brake is mounted on the end of the shaft adapter and the complete assembly fits onto the motor shaft, secured with setscrews. Fitting the belts or chain and torque arm completes the installation.



Model	A	Kwy.	B	Kwy.	Key Part No.	C	Kwy.	Key Part No.	Dodge Bushing Size	D	E	F	G	H	I
FB-375	5/8	3/16 x 3/32	7/8	3/16 x 3/32	590-0016	5/8	3/16 x 3/32	590-0043	None	4.391 4.359	2	.391 .359	2	1/4-20 UNC	1.125
FB-375	7/8	3/16 x 3/32	1-1/4	1/4 x 1/8	590-0022	5/8	3/16 x 3/32	590-0043	None	4.578 4.742	2-1/4	.516 .484	2-1/4	1/4-20 UNC	1.500
FB-475	1-1/8	1/4 x 1/8	1-5/8	3/8 x 3/16	590-0041	1	1/4 x 1/8	—	#1008 1"	4.516 4.484	2-3/4	.641 .609	2-3/4	1/2-13 UNC	1.750
FB-650	1-3/8	5/16 x 5/32	2	1/2 x 1/4	590-0042	1-3/8	5/16 x 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
FB-650	1-5/8	3/8 x 3/16	2-1/4	1/2 x 1/4	590-0042	1-3/8	5/16 x 5/32	590-0044	#1310 1-3/8"	6.172 6.140	4	.641 .609	4	1/2-13 UNC	2.375

All dimensions are nominal unless otherwise noted.

## FB-375, FB-475, FB-650



### How to order

1. For thru-shaft mounting, specify bore size.  
For FB-475 and FB-650 order bushing separately. FB-375 does not require a bushing.
2. For motor mounting order adapter separately—Item 10. Specify the following bore size for the Electrically Released Brake. This is the

bore size required for mounting the Electrically Released Brake on the end of the motor adapter.

FB-375	5/8" bore
FB-475	1-1/8" bore
FB-650	1-3/8" bore

Item	Description	FB-375		FB-475		FB-650	
		Part Number	Qty	Part Number	Qty	Part Number	Qty
<b>Optional Parts</b>							
1	*Bushing	N/A		180-0410 1/2" bore to 180-0418 1" bore	1	180-0421 1/2" bore to 180-0435 1-3/8" bore	1
2	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	
	1-5/8" motor shaft					5382-101-002	
<b>Service Parts</b>							
3	Retainer ring	748-0101	1	748-0102	1	748-0104	1
4	Ball bearing	166-0150	1	166-0110	1	166-0104	1
5	Retainer ring	748-0018	1	748-0002	1	748-0004	1
6	Torque arm mount assembly	5380-101-007	1	5381-101-006	1	5382-101-007	1
7	Torque arm rod assembly	5380-112-001	1	5381-112-001	1	5382-112-001	1
8	Terminal accessory	5311-101-001	1	5311-101-001	1	5311-101-001	1
9	Conduit Box	5200-101-010	1	5200-101-010	1	5200-101-010	1

\*See page 13 for specific part numbers.

These units, when used with the correct Warner Electric conduit box, meet the standards of UL508 and are listed under guide card #NMTR2, file #59164 and are CSA certified under file #LR11543.

Magnet and armature are not field replaceable.

## Bushing Part Numbers

	Shaft Size	Part No.
Dodge 1008	1/2	180-0410
	9/16	180-0411
	5/8	180-0412
	11/16	180-0413
	3/4	180-0414
	13/16	180-0415
	7/8	180-0416
	15/16	180-0417
	1	180-0418
Dodge 1310	1/2	180-0421
	9/16	180-0422
	5/8	180-0423
	11/16	180-0424
	3/4	180-0425
	13/16	180-0426
	7/8	180-0427
	15/16	180-0428
	1	180-0429
	1-1/16	180-0430
	1-1/8	180-0431
	1-3/16	180-0432
	1-1/4	180-0433
	1-5/16	180-0434
	1-3/8	180-0435

## Warranty

Warner Electric LLC warrants that it will repair or replace (whichever it deems advisable) any product manufactured and sold by it which proves to be defective in material or workmanship within a period of one (1) year from the date of original purchase for consumer, commercial or industrial use.

This warranty extends only to the original purchaser and is not transferable or assignable without Warner Electric LLC's prior consent.

Warranty service can be obtained in the U.S.A. by returning any defective product, transportation charges prepaid, to the appropriate Warner Electric LLC factory. Additional warranty information may be obtained by writing the Customer Satisfaction Department, Warner Electric LLC, 449 Gardner Street, South Beloit, Illinois 61080, or by calling 815-389-3771.

A purchase receipt or other proof of original purchase will be required before warranty service is rendered. If found defective under the terms of this warranty, repair or replacement will be made, without charge, together with a refund for transportation costs. If found not to be defective, you will be notified and, with your consent, the item will be repaired or replaced and returned to you at your expense.

This warranty covers normal use and does not cover damage or defect which results from alteration, accident, neglect, or improper installation, operation, or maintenance.

Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

Warner Electric LLC's obligation under this warranty is limited to the repair or replacement of the defective product and in no event shall Warner Electric LLC be liable for consequential, indirect, or incidental damages of any kind incurred by reason of the manufacture, sale or use of any defective product. Warner Electric LLC neither assumes nor authorizes any other person to give any other warranty or to assume any other obligation or liability on its behalf.

WITH RESPECT TO CONSUMER USE OF THE PRODUCT, ANY IMPLIED WARRANTIES WHICH THE CONSUMER MAY HAVE ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL CONSUMER PURCHASE. WITH RESPECT TO COMMERCIAL AND INDUSTRIAL USES OF THE PRODUCT, THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

### Changes in Dimensions and Specifications

All dimensions and specifications shown in Warner Electric catalogs are subject to change without notice. Weights do not include weight of boxing for shipment. Certified prints will be furnished without charge on request to Warner Electric.



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