

Residential, TG-2000 and Commercial MagStop® Clutch/Brake

Installation & Operation Instructions

P-1177-WE
819-0457



This Manual covers Magstop Product Families as outlined below:

Series	Reference Name	Torque Range
5217 Series	RMS	60 & 80 ft-lb.
5218 Series	CMS	175 & 200 ft-lb.
5219 Series	TG 2000	105 & 125 ft-lb.
5228 Series	CMS 250	225 & 250 ft-lb.

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This guide applies to Warner Electric MagStop® clutches and clutch/brakes used on power equipment.

Residential, TG-2000, and Commercial MagStops are available in a range of torque capacities. The MagStop® name comes from the permanent magnet brake (magnetic stopping) rather than conventional spring activated mechanical brakes. In addition to these general procedures, any applicable OEM general and safety procedures must also be followed.

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

MagStop® Bearing Mounted Electric Clutch and Clutch/Brake Assemblies and Operation

Components: (See Figure 1 on page 4.)

1. Rotor Assembly

Generally, the input of the clutch. Includes a keyed hub which mates with the keyway in the crank shaft. The rotor transmits the torque from the crankshaft (driving shaft) to the armature assembly (output).

2. Armature Assembly

Generally, the output of the clutch. Consists of a disk, springs and pulley (or output flange). With power applied the armature transmits torque from the rotor to the driven load. Power from the armature disk is transmitted to the pulley or flange by means of the leaf springs.

3. Field Assembly

The clutch “power” source contains the coil which generates magnetic attractive force.

4. Brake Poles

The two permanent magnets and plates fixed to the field shell provide the brake torque when the clutch is disengaged. Brake poles are not present if the assembly is a clutch only.

5. D-drive Spacer

A hub that is inserted into either armature or field bearing (see Figure 2). The head has flats that can be held with a wrench to prevent rotation of the crankshaft when tightening the mounting bolt (see Figure 5). This hub also takes the place of the standard retaining washer.

6. Anti-rotation Slot

Anti-rotation Slot (used with OEM’s anti-rotation device) prevents MagStop from rotation with crankshaft. If the field is bolted rigidly or if its axial movement is restricted the bearing in the field assembly will be improperly loaded and may fail. Use OEM supplied anti-rotation.

Optional Washer

A single .250 inch (6.35 mm) minimum thick steel washer must be used between the clutch and the crank shaft retaining bolt if the D-drive spacer is not used.

⚠ WARNING A washer less than .250 inch (6.35 mm) thick will deform and allow the clamping load to be lost, resulting in damage to the clutch and/or the crankshaft and possible personal injury due to clutch separating from the shaft. Multiple thinner washers are not acceptable.

MagStop® Components

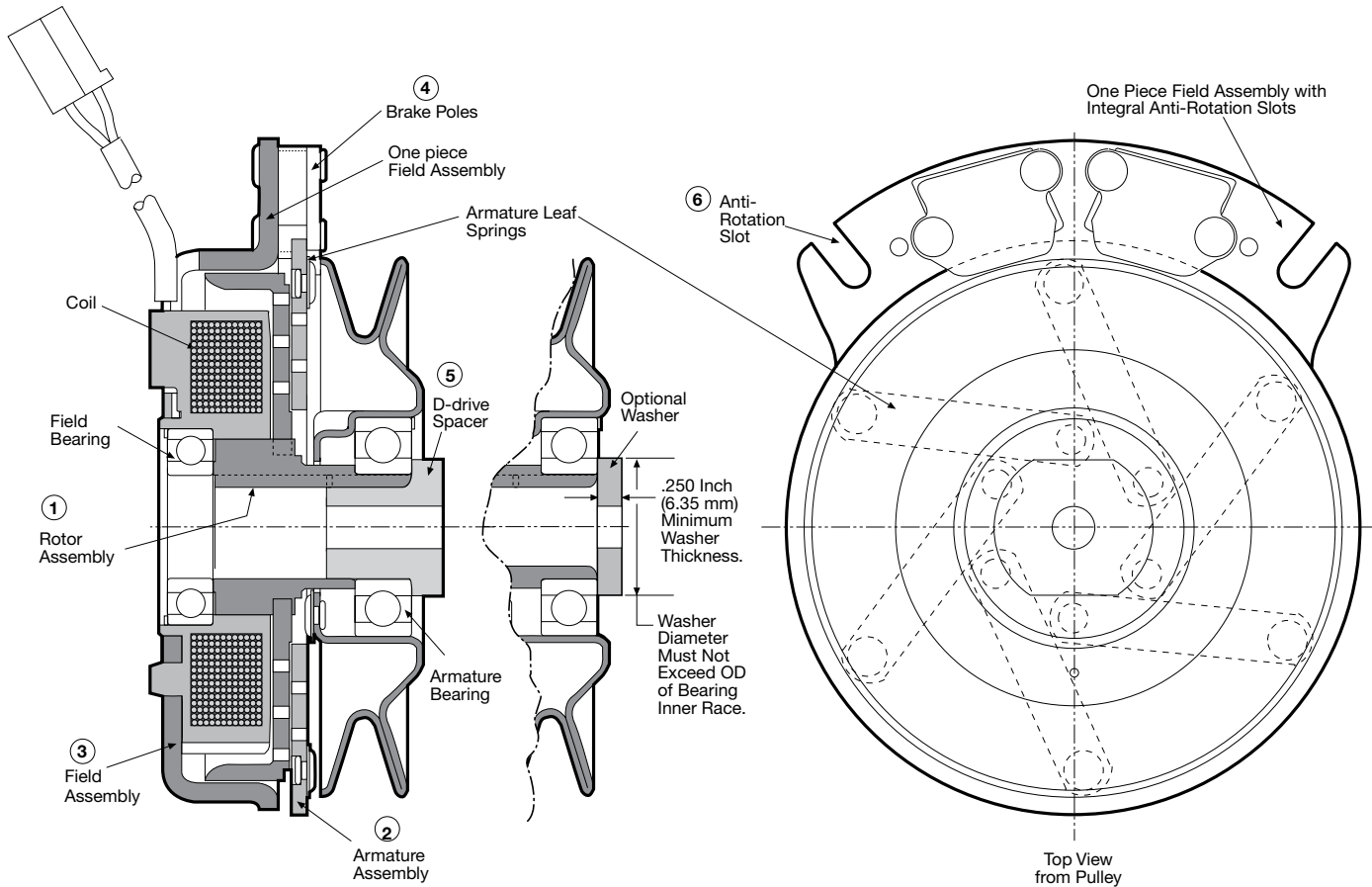


Figure 1

D-drive Spacer Removal/Installation

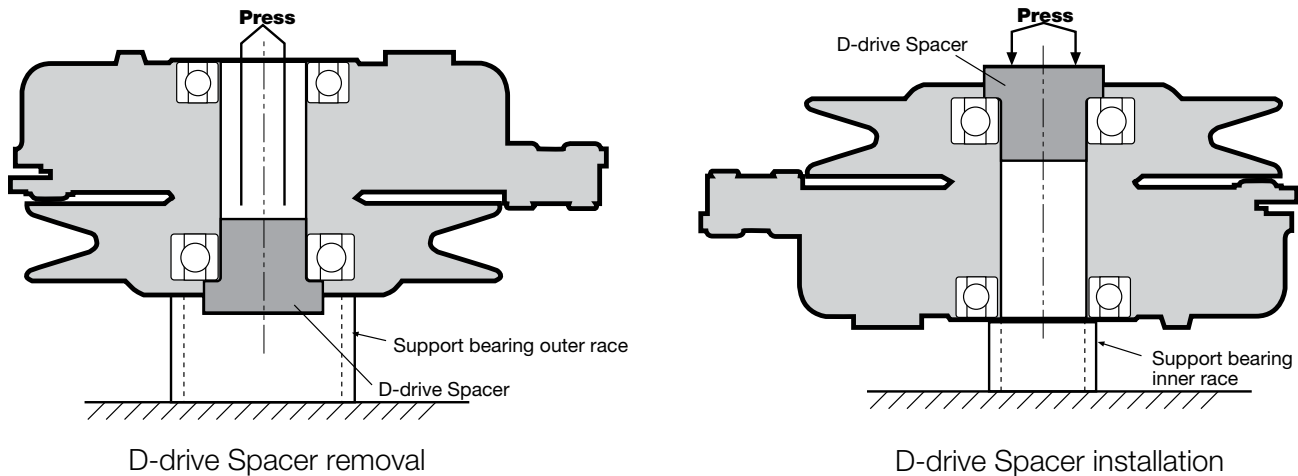


Figure 2

D-drive spacer may be installed on either end of clutch by OEM.

CAUTION D-drive spacer must be removed or installed using an arbor press or equivalent. On installation, opposite bearing INNER race must be supported or bearing damage may occur. On removal, adjacent bearing OUTER race must be supported or bearing damage may occur.

REQUIREMENTS

for a Successful Clutch Application/Installation

Critical Requirements

The two most important requirements for a successful clutch application or installation are:

1. Anti-rotation device must allow both axial and radial free-play!

Failure to allow this free-play will result in field bearing failure. The greater the restriction the faster the bearing will fail!

2. Mounting bolt torque to be minimum of:

- 3/8 -24 UNF use Grade 8 bolt torqued to 45-49 lb.-ft.
(Grade 5 bolt is unacceptable)
- 7/16-20 UNF Grade 5 or 8 bolt torqued to 55-60 lb.-ft.
(Grade 5 or 8 bolt is acceptable)
- M 10 X 1.50 Class 10.9 torqued to 55-65 N-m

Note: All recommended values are for dry (unlubricated) plated bolts, please consult fastener manufacturer if any type of locking element (thread lock compound, patch etc.) is to be used. Please defer to OEM manual for torque specifications.

Failure to properly torque bolt can allow the clutch to separate from shaft causing product damage, equipment damage and personnel injury.

Mounting

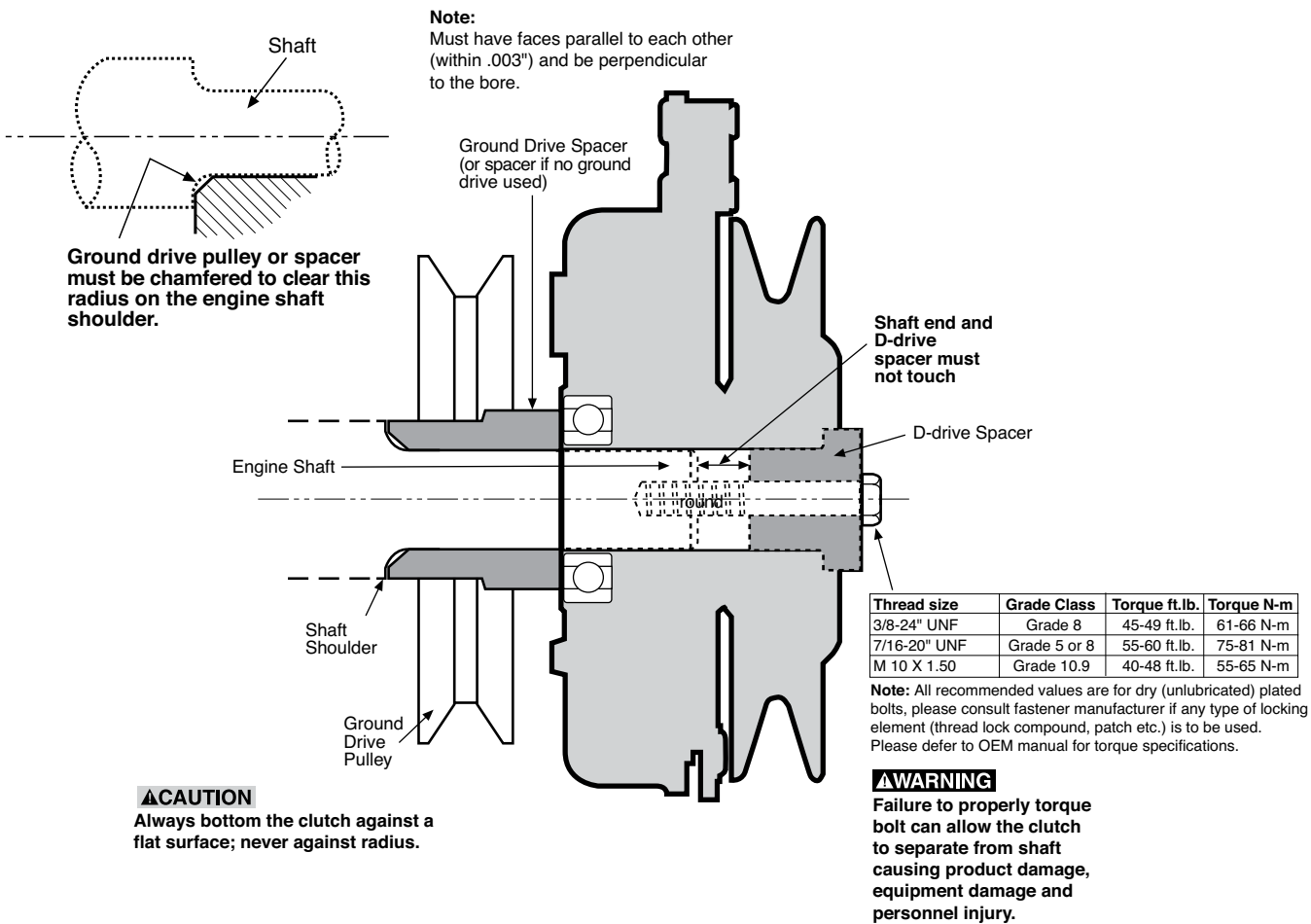


Figure 3
Typical Engine Installation with Ground Drive Pulley

Anti-Rotation

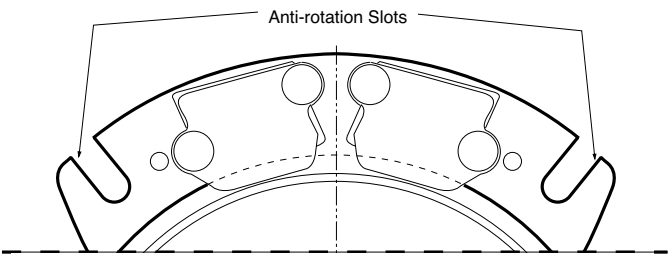
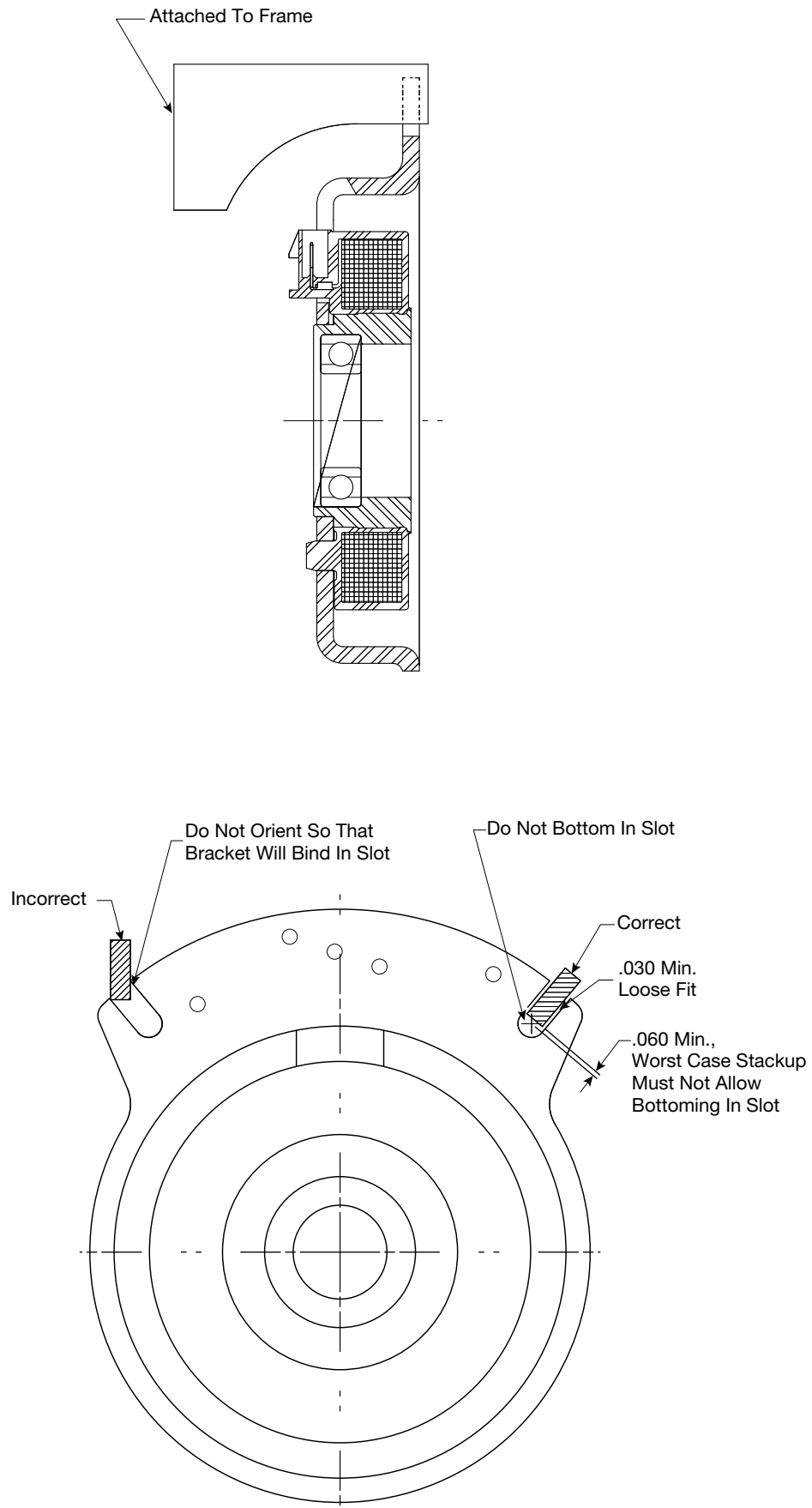


Figure 4

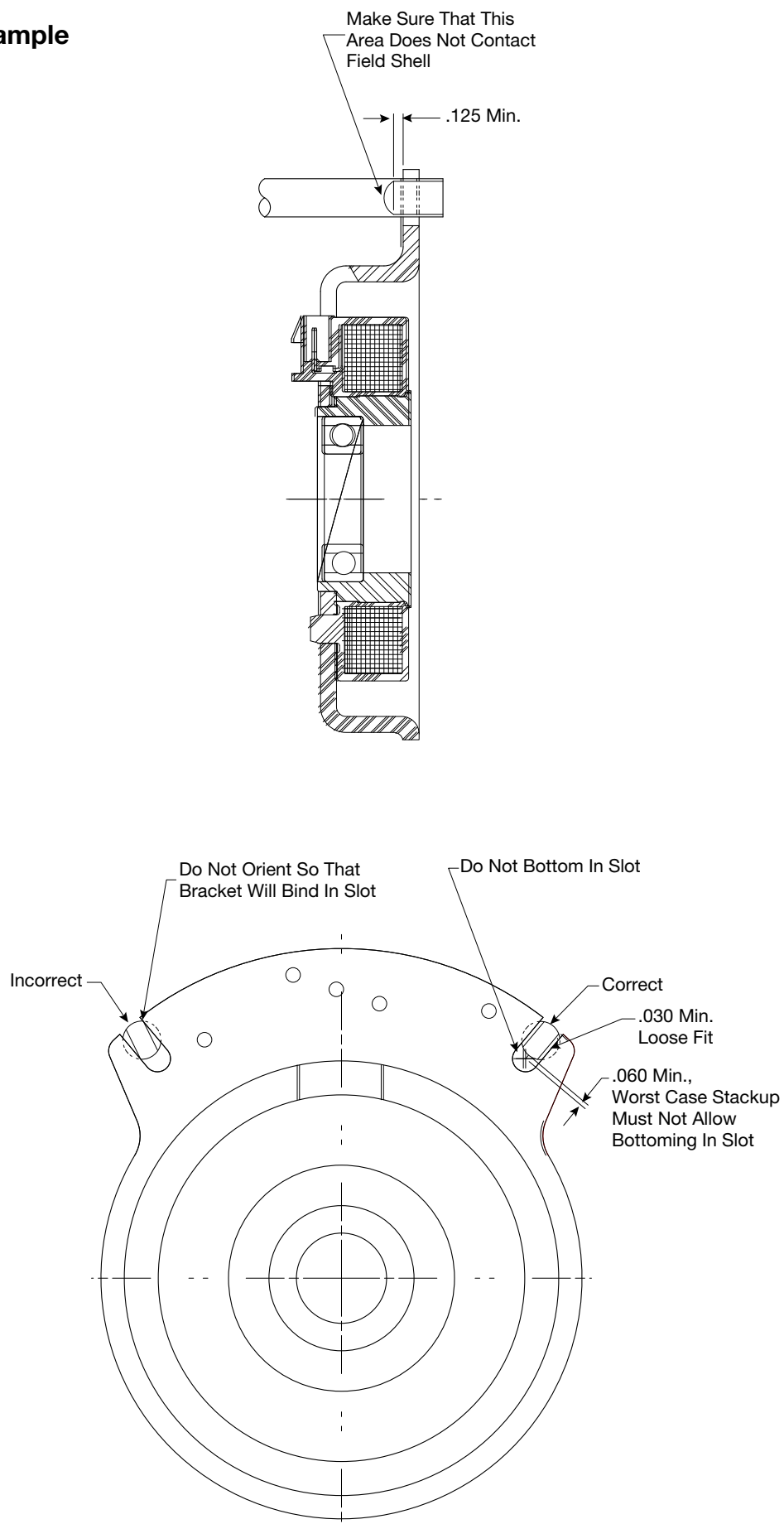
See Anti-Rotation Examples on pages 8-13

CAUTION If the field is bolted rigidly or if its axial movement is restricted, the bearing in the field assembly will be improperly loaded and may fail. Use only factory installed anti-rotation device.

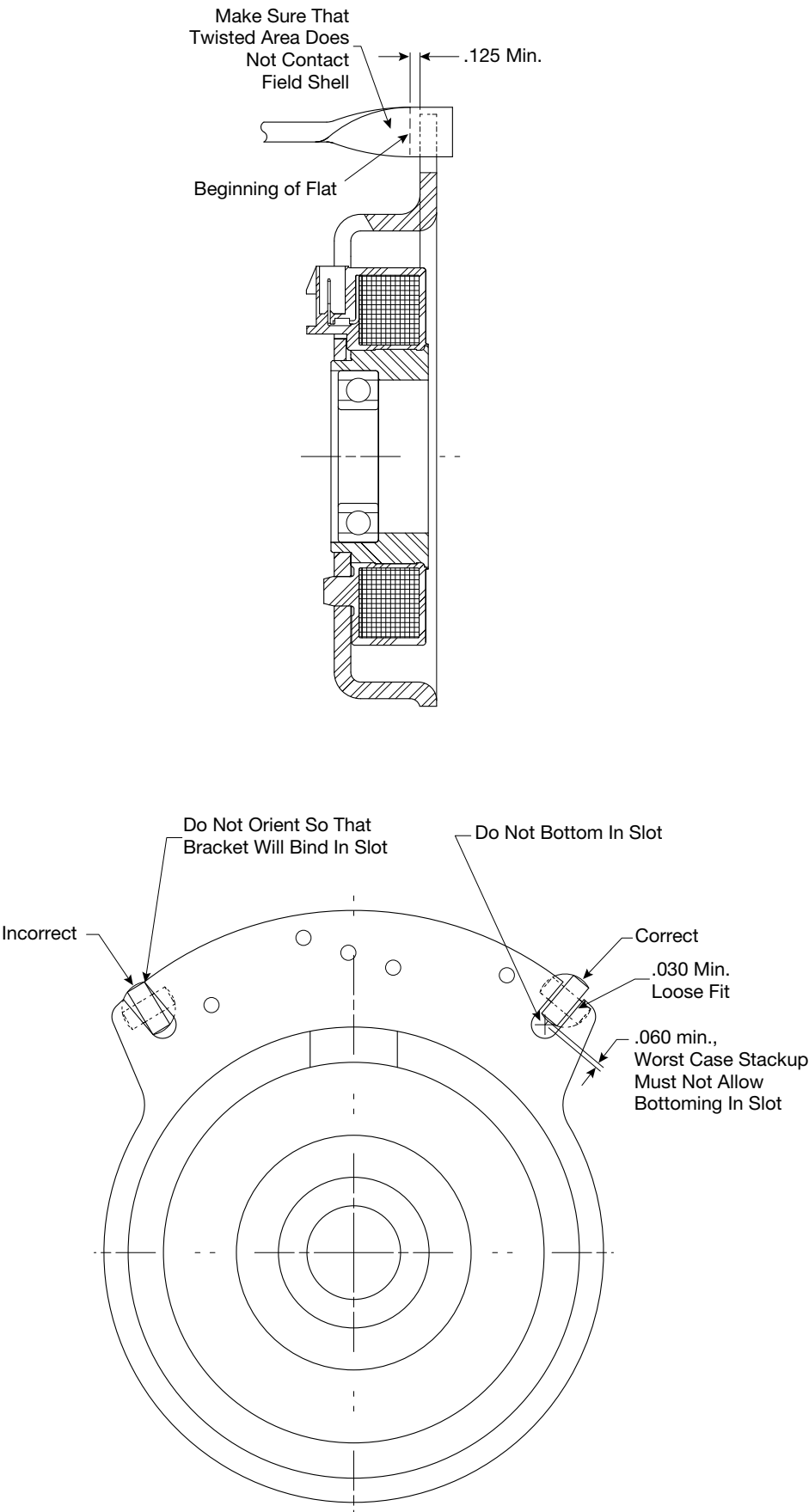
Anti-Rotation Example



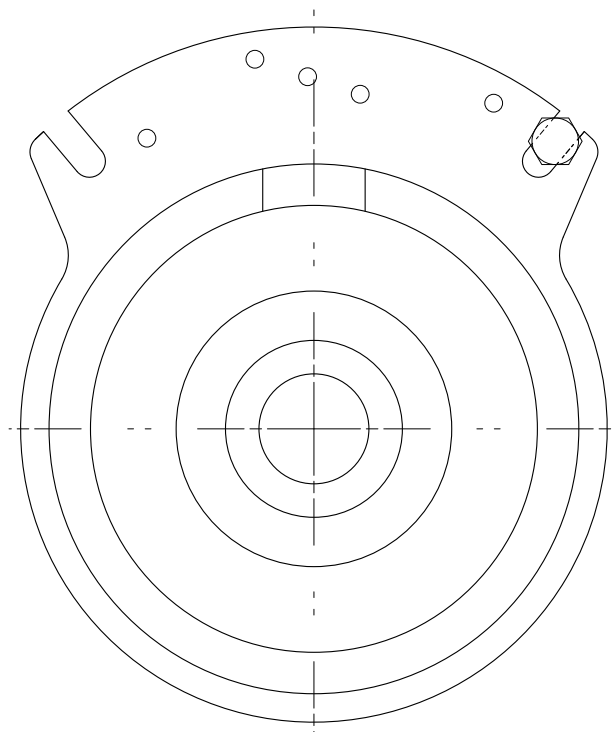
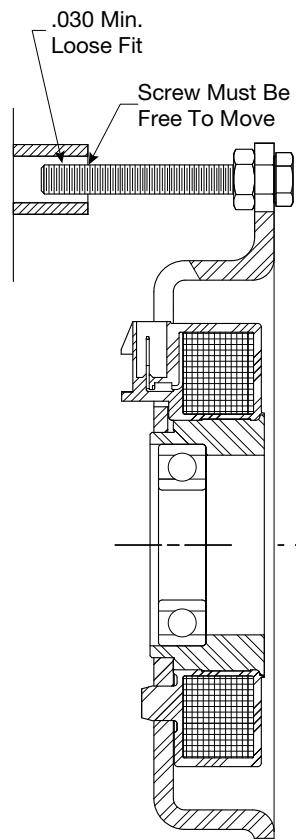
Anti-Rotation Example



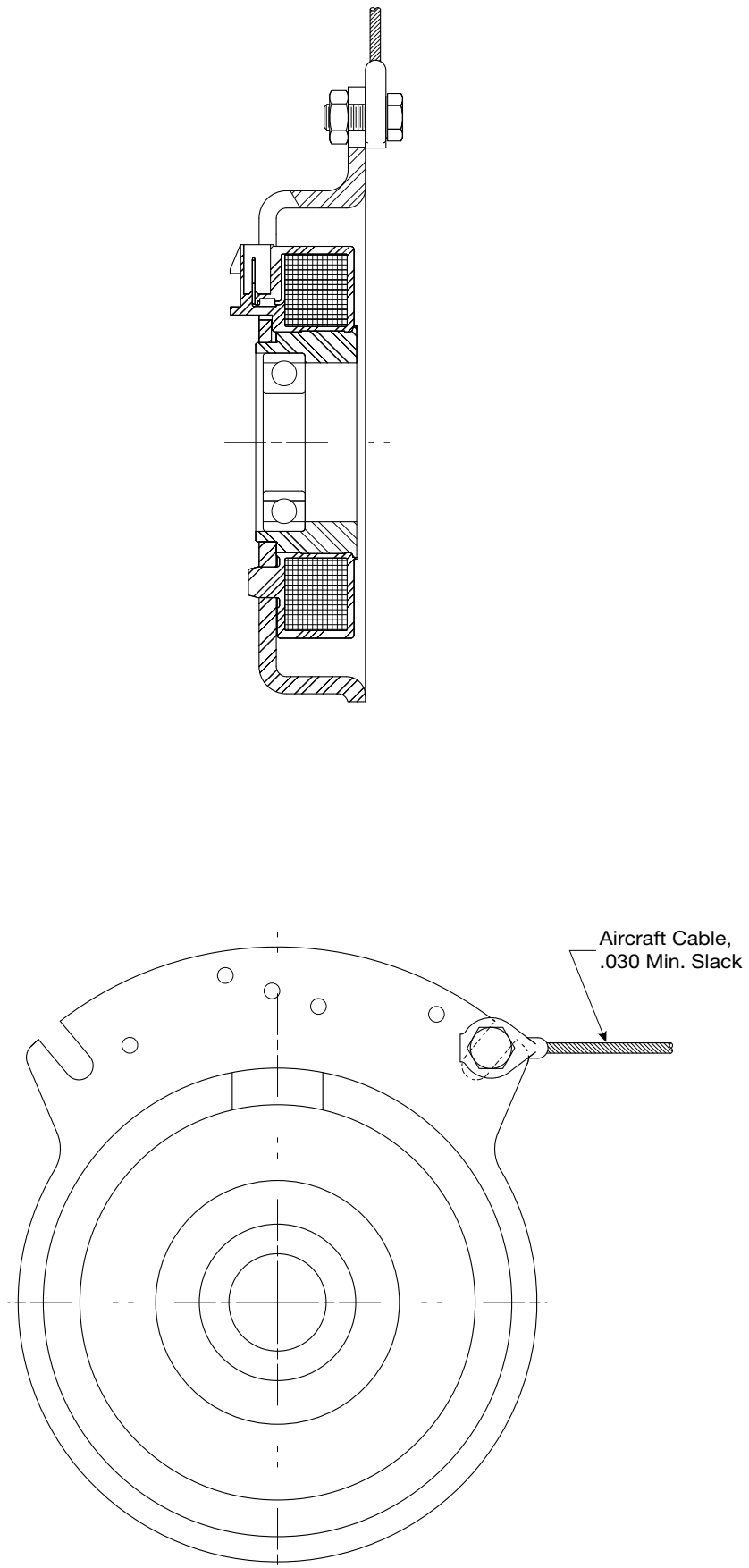
Anti-Rotation Example



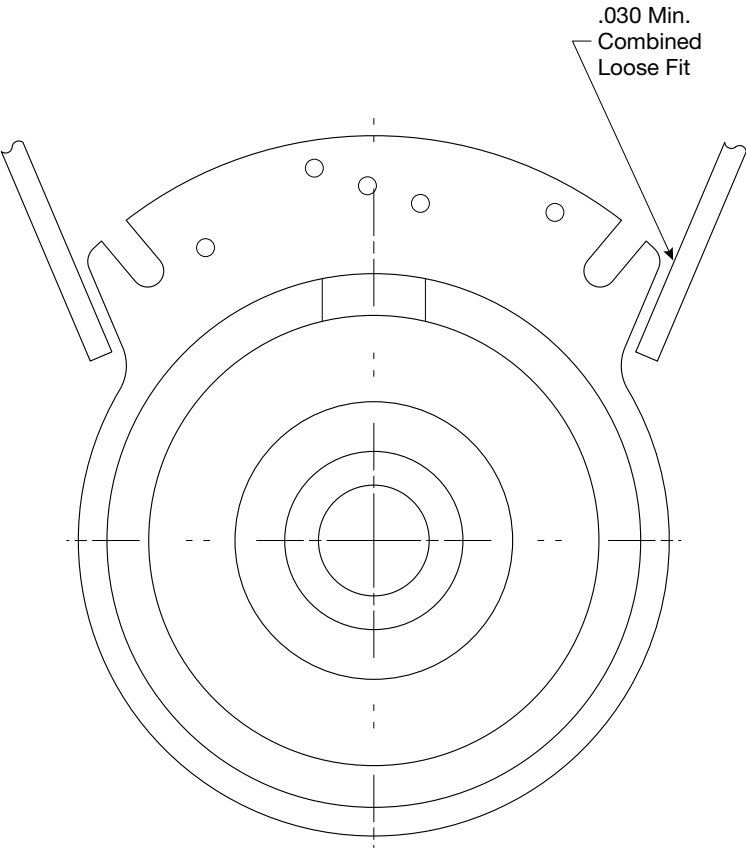
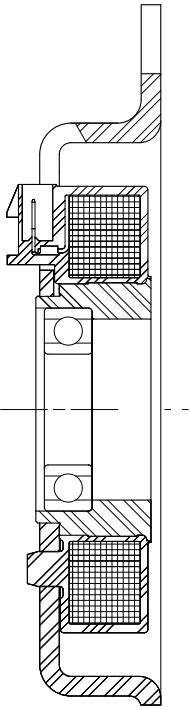
Anti-Rotation Example



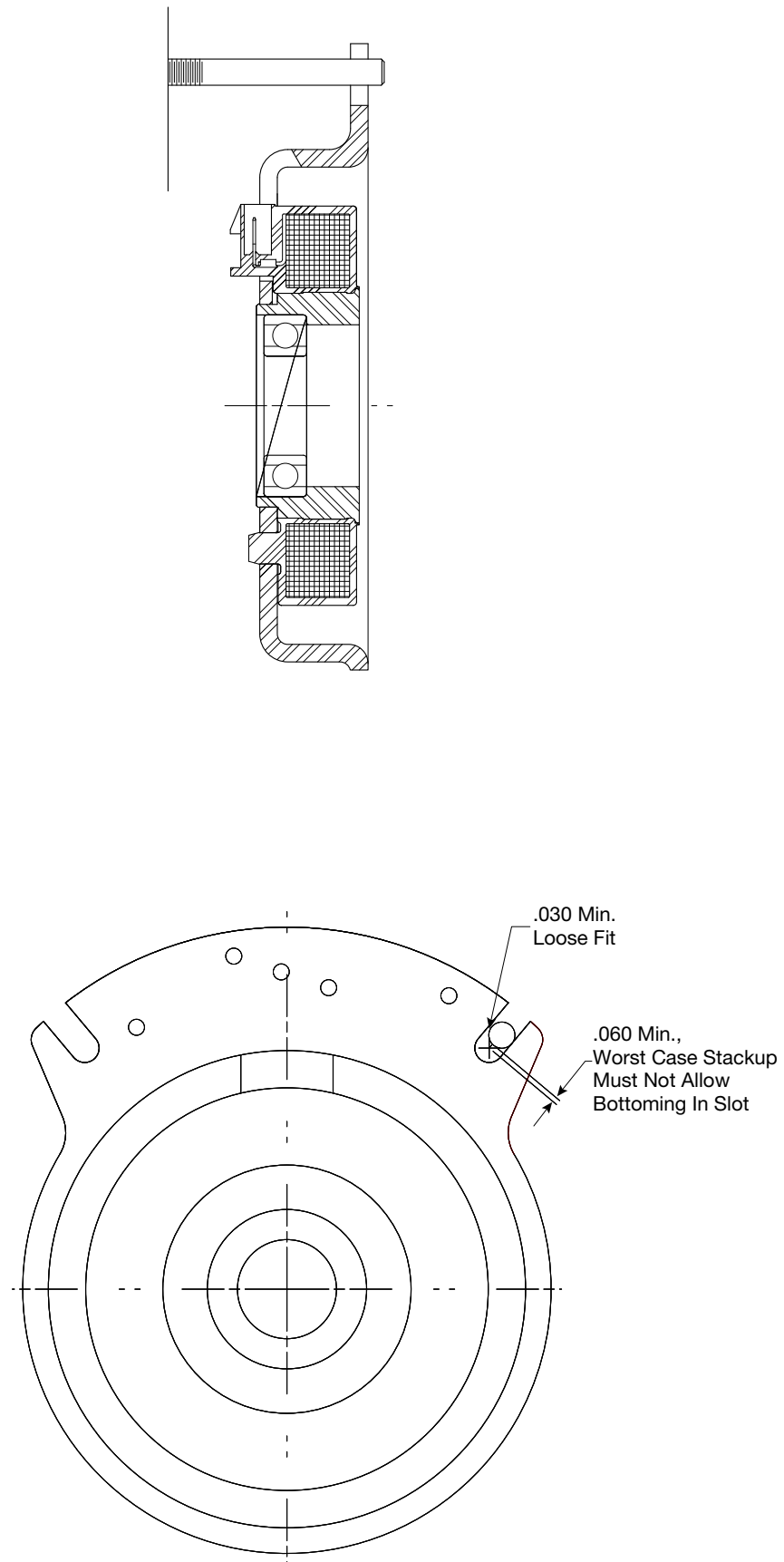
Anti-Rotation Example



Anti-Rotation Example



Anti-Rotation Example



Troubleshooting Checklist

A. Symptom: Clutch will not engage

Problem	Possible Causes	Solution
Blown fuse	<ul style="list-style-type: none"> • Low coil resistance • Defective battery • Faulty charging system • Bad wiring or connections, PTO switch 	<ul style="list-style-type: none"> • Replace with new MagStop unit • Replace • Repair or replace • Repair or replace
Low voltage supply (Less than 12 VDC at clutch)	<ul style="list-style-type: none"> • Defective battery • Faulty charging system • Bad wiring or connectors, PTO switch 	<ul style="list-style-type: none"> • Replace • Repair or replace • Repair or replace
Incorrect coil resistance (see Step 1, page 17)	<ul style="list-style-type: none"> • Damaged coil 	<ul style="list-style-type: none"> • Replace with new MagStop unit
Inadequate current supply	<ul style="list-style-type: none"> • Broken clutch lead wire • Faulty electrical system 	<ul style="list-style-type: none"> • Repair • Measure clutch coil resistance and supply voltage at the clutch. If both are correct, electrical system is faulty. Repair or replace.
Rotor/armature airgap too large (greater than .125 inch/3.18mm)	<ul style="list-style-type: none"> • Rotor/armature wear; end of usable life 	<ul style="list-style-type: none"> • Replace with new MagStop unit

B. Symptom: Brake will not engage

Problem	Possible Causes	Solution
Armature/brake poles wore out	<ul style="list-style-type: none"> • End of usable life 	<ul style="list-style-type: none"> • Replace with new MagStop unit
Contaminated friction surfaces	<ul style="list-style-type: none"> • Engine oil leak on brake 	<ul style="list-style-type: none"> • Repair leak • Replace with new MagStop unit

C. Symptom: Clutch slip

Problem	Possible Causes	Solution
Low voltage supply (less than 12 VDC at clutch)	<ul style="list-style-type: none"> • Defective battery • Faulty charging system • Bad wiring or connectors, PTO switch 	<ul style="list-style-type: none"> • Replace • Repair or replace • Repair
Inadequate current supply	<ul style="list-style-type: none"> • Broken clutch lead wire • Faulty electrical system 	<ul style="list-style-type: none"> • Repair • Measure clutch coil resistance and supply voltage at the clutch. If both are correct, electrical system is faulty. Repair or replace.
Overloaded clutch	<ul style="list-style-type: none"> • Clogged deck, back spindle, etc. 	<ul style="list-style-type: none"> • Remove excess grass • Replace spindle
Contaminated friction surfaces	<ul style="list-style-type: none"> • Engine oil leak on clutch 	<ul style="list-style-type: none"> • Repair leak • Replace with new MagStop unit

Troubleshooting Checklist (Continued)

D. Symptom: Noisy clutch/Vibration

Problem	Possible Causes	Solution
Failed bearing	<ul style="list-style-type: none">• Loose mounting (bolt not torqued properly)• Field assembly movement restricted	<ul style="list-style-type: none">• Replace (see Mounting Figure 3, page 6)• Confirm proper Anti-rotation (see Anti-rotation, Figure 4, page 6)
Adapter plate rattles against anti-rotation pin	<ul style="list-style-type: none">• Some noise is normal	<ul style="list-style-type: none">• If noise is excessive, repair or replace anti-rotation device. (Follow OEM's Specifications. See Anti-rotation, Figure 4, page 6).
Clutch loose on shaft	<ul style="list-style-type: none">• Loose mounting (bolt not torqued properly)• Mounting bolt too long and bottoms in engine shaft before clamping clutch• Mounting washer too thin and deforms when bolt is tightened.• Shaft bottoms on D-drive	<ul style="list-style-type: none">• Tighten mounting bolt to specification. See Mounting, Figure 3. page 6.• Use correct length bolt (see Mounting page 6, Figure 3)• See Figure 1 and Warning on page 4.• Use proper spacer (see Mounting page 6)
Clutch not mounted square	<ul style="list-style-type: none">• Ground Drive Spacer mounting shoulder not squared. See Mounting Figure 3.• Clutch integral key hitting end of keyway in engine shaft• Incorrect or no chamfer on ground drive spacer.	<ul style="list-style-type: none">• Replace• Space clutch away from radius in shaft keyway.• Increase chamfer on ground drive spacer. See Caution, Figure 3, page 6.
Broken Spring	<ul style="list-style-type: none">• Loose mounting	<ul style="list-style-type: none">• Replace clutch

⚠ WARNING A clutch with broken rivets or springs may separate from the shaft and cause personal injury.

Burnishing Procedure when installing a new MagStop® Clutch/Brake

Burnishing of new clutch/brake will be required. This procedure will be performed with the load attached (mower deck, snowblower, pump etc.)

Note: Do NOT add additional load (e.g. cutting grass).

1. Move throttle lever to half speed position.
Allow engine to warm 60 seconds.
2. Engage PTO and run mower for 5 seconds.
3. Disengage PTO and wait 15 seconds for clutch to cool.

4. Repeat this cycle 3 times
5. Move throttle lever to full speed position.
6. Repeat engagements in steps 2 and 3 a total of 7 more times.

Note: To maximize deck drive train life, always engage clutch at half throttle in normal operation.

Electrical Evaluation

Step 1. How to Measure Clutch Coil resistance (See Figure 5)

1. Turn engine and PTO switch off.
2. Disconnect clutch at clutch connector.
3. Select meter setting for ohm reading.
4. Connect meter leads to clutch.
5. Check meter reading and refer to the chart below for correct clutch resistance reading.
(values are @ 68°F.)

If reading falls in acceptable range proceed to step 2, if not replace the clutch.

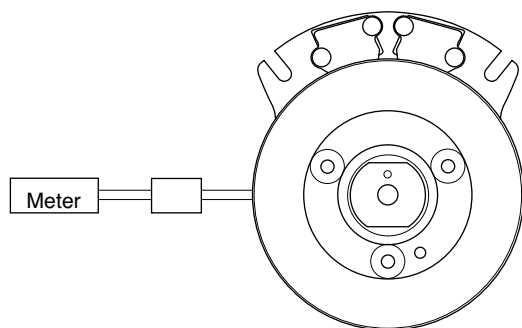


Figure 5
Resistance Measurement

Table 1

Model	Torque Rating		Resistance at 68-70° F (ohms)
	(ft-lb.) Nom.	NM Nom.	
MS - 60	60 ft-lb.	81 NM	6.59 - 7.28
MS - 80 AL	80 ft-lb.	108 NM	2.86 - 3.17
MS - 80 CU	80 ft-lb.	108 NM	3.36 - 3.71
TG - 105	105ft-lb.	142 NM	2.89 - 3.20
TG - 125	125 ft-lb.	169 NM	2.65 - 2.92
CMS - 175	175 ft-lb.	237 NM	2.34 - 2.59
CMS - 200	200 ft-lb.	271 NM	1.74 - 1.93
CMS - 225	225 ft-lb.	305 NM	1.66 - 1.83
CMS - 250	250 ft-lb.	339 NM	1.71 - 1.89

Note: If bench tested with 12 volts applied, armature may not pull away from brakepoles. Rotational motion is required to engage clutch.

Step 2. Measure the supply voltage at the clutch (See Figure 6)

1. Turn engine off.
2. Connect meter leads at the clutch connector.
3. Select meter setting for voltage reading.
4. Make sure wires will not become entangled in rotating components of clutch.
5. Start engine and engage PTO switch.
6. Measure voltage across the leads at the connectors.
7. Voltage should be 12-14 volts DC. If clutch still fails to operate, replace clutch.
8. If voltage is not within 12-14 volt range consult OEM's service manual.

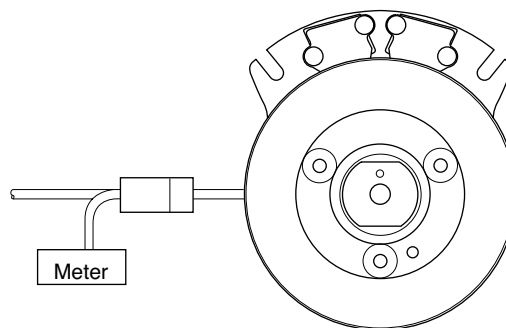


Figure 6
Voltage Measurement

Re-gap Adjustment Procedure

When to remove shim:

When clutch has worn to the extent that the existing air-gap is too large to allow for complete clutch engagement (clutch may engage easily when cold but has problems engaging when hot), brake shim can be removed to restore air gap and allow the clutch to continue to function.

(With engine off, key removed and clutch disengaged)

Component Identification Reference

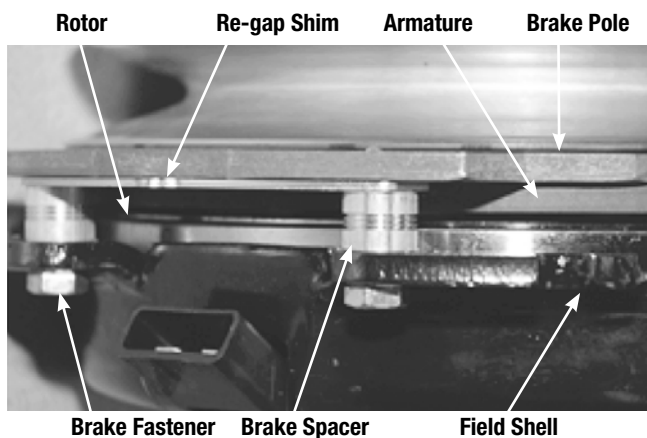


Figure 1

Procedure:

Consult the operator's manual for all related procedures & safety practices.

Using a pneumatic line, blow out any debris from under the brake pole and around the aluminum spacers (Figure 2).

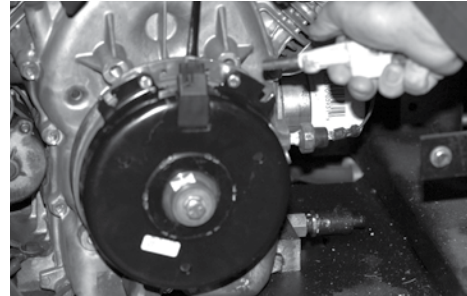
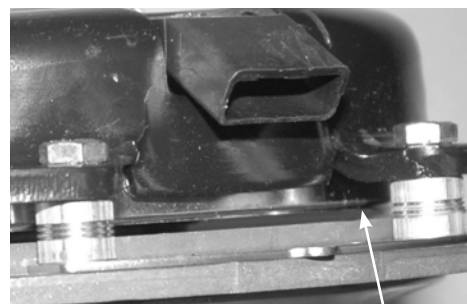


Figure 2

Check the air gap between rotor & armature with feeler gage. If the gap is less than 0.70", then follow the trouble shooting procedure outlined on pages 14, 15 and 16 of this installation trouble shooting guide. If the air gap is over 0.70", proceed with procedure outline below (Figure 3).



Be certain that the gap between the rotor and armature face is greater than .070 prior to shim removal.

Figure 3

Re-gap Adjustment Procedure (Continued)

1. Loosen both brake mounting bolts $\frac{1}{2}$ to 1 full turn as shown below (Figure 4).

Note: Do not remove brake pole from field shell/armature – brake pole tracks match with clutch off and brake on and need to continue to match after shim is removed to ensure proper brake torque.



Figure 4

2. Using needle nose pliers, or by hand, take hold of the tab and remove shim (Figure 5).



Figure 5

3. Using a pneumatic line, blow out any debris from under the brake pole and around the aluminum spacers (Figure 2).
4. Re-torque each bolt (M6 X 1) to 10 ft-lbs +/- .5 ft-lbs.

5. Confirm that a minimum air gap of .015 is present between rotor and armature face at both ends of the brake pole using a feeler gage as shown (Figure 6).



Figure 6



Figure 7

6. If no gap is present, or one smaller than .015, **the clutch must be replaced** (Figure 7).
7. If adequate gap is present, start engine and cycle clutch 10 consecutive times. Refer to burnish procedure on page 15.

Re-gap Adjustment Procedure (Continued)

8. PERFORM SAFETY CHECK:

- a. Be sure to observe deck from position on mower seat to be certain deck is not engaged with PTO switch “off” or clutch de-energized, with engine running

If clutch was removed from the tractor be sure to torque the mounting bolt to the specified torque value:

Thread Size	Grade Class	Torque lb-ft	Torque N-M
3/8-24” UNF	Grade 8	45-49 ft.lb..	61-66 N-m
7/16-20” UNF	Grade 5 or 8	55-60 ft.lb.	75-81 N-m
M 10 X 1.50	Grade 10.9	40-48 ft.lb.	55-65 N-m

Note: All values are for dry (unlubricated) plate bolts, please consult fastener manufacturer if any type of locking elements (thread lock compound, patch etc.) is to be used.

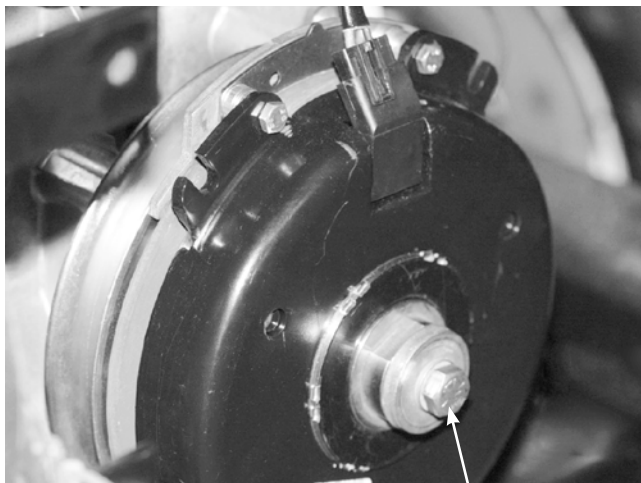


Figure 8 Mounting Bolt

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.

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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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