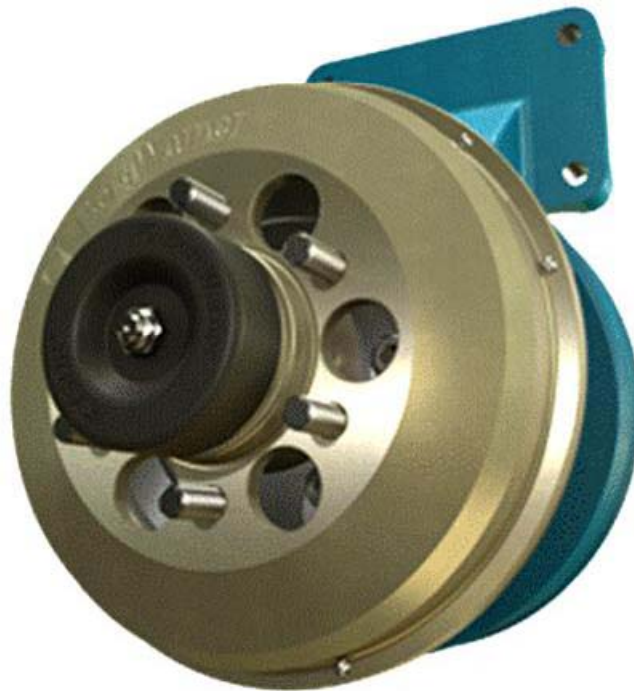




## On/Off Fan Drive Diagnostic and Warranty Guide

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Revision 20120402A



## On/Off Fan Drive Diagnostic and Warranty Guide

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## On/Off Fan Drive Diagnostic and Warranty Guide

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### **Additional Support**

This guide is intended to assist in troubleshooting the BorgWarner On/Off fan drive, and to identify fan drive failure modes that are warrantable through BorgWarner.

**For general service of the BorgWarner On/Off fan drive, including maintenance, disassembly, and repair, please refer to the BorgWarner On/Off Fan Drive Installation and Service Guide, which is available at:**

<http://www.borgwarner.com/en/Thermal/products/Literature/Kysor%20-%20Kysor%20Series%20Service%20Guide.pdf>

Additional information, including product overview, sales literature, and other service literature is available at:

<http://www.borgwarner.com/en/Thermal/products/Pages/Kysor-On-Off-Fan-Drives.aspx>

For all other questions, Technical Support is available from 8:00am to 5:00pm (Eastern), Monday through Friday, at 1-800-927-7811.

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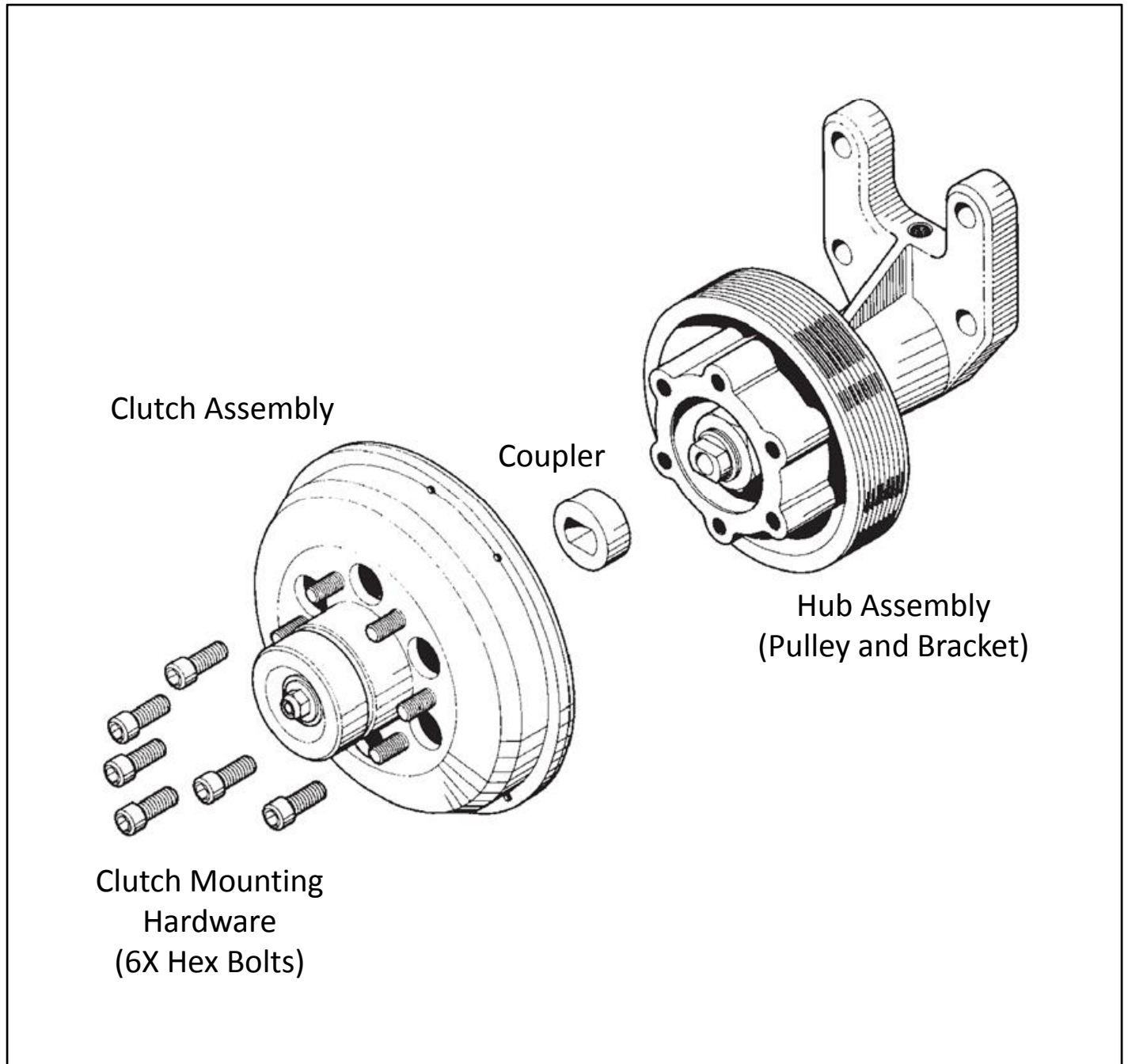
### **Recommended Practices**

For best performance from the BorgWarner On/Off fan drive, follow these recommended practices:

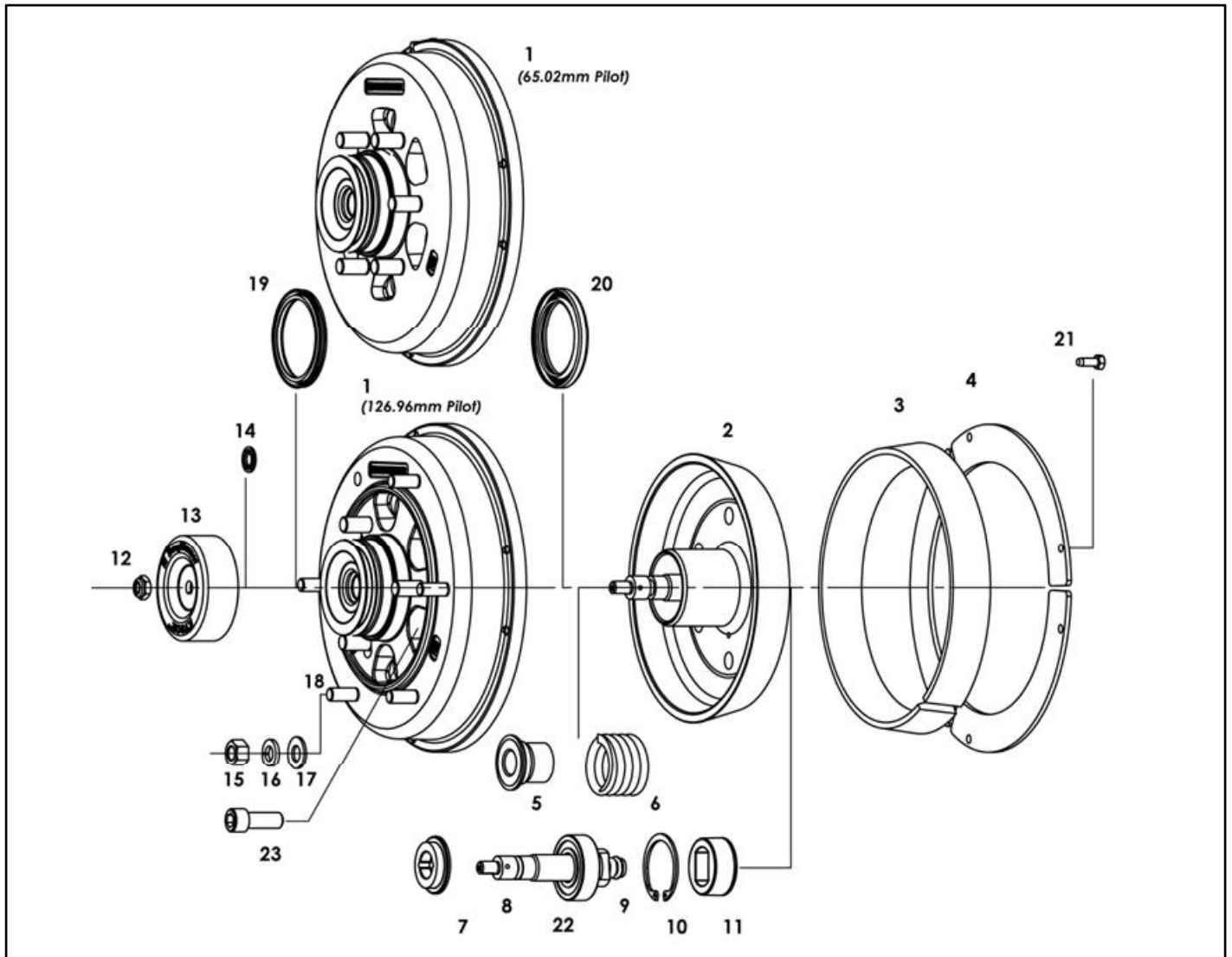
*Manually engage the clutch prior to the use of any PTO, and maintain clutch engagement for the duration of PTO usage.*

*Do not engage the clutch during an engine over-speed condition.*

## Components of the Fan Drive

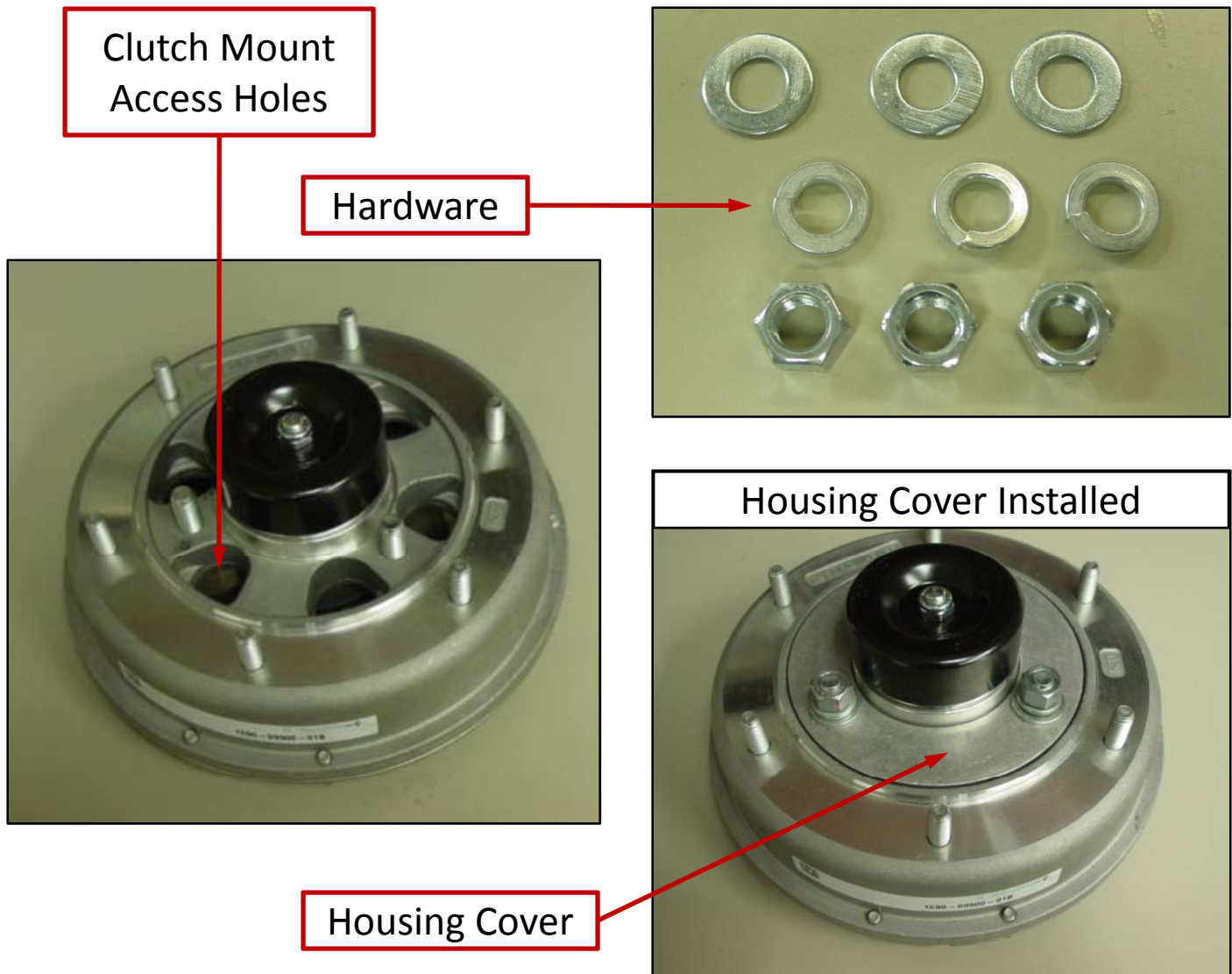


### Components of the Clutch Assembly



(1) Clutch Housing; (2) Clutch Shaft; (3) Liner; (4) Retainer Plate; (5) Spring End-Cap; (6) Spring; (7) Spring Carrier; (8) Front O-Ring; (9) O-Ring at Base of Piston Rod; (10) Snap Ring; (11) Coupler; (12) 5/16" Locknut; (13) Cylinder; (14) Seal-Washer; (15) Fan Mounting Nut; (16) Fan Lock-Washer; (17) Fan Flat-Washer; (18) Fan Stud; (19) U-Cup Seal; (20) Grease Seal; (21) Retainer Plate Fastener; (22) Piston Rod and Rear Bearing Assembly; (23) Clutch Mounting Hardware

### Housing Cover (Only On 1090-09900-01xx)



Part number 1090-09900-01xx has a 5-inch diameter fan pilot and uses a housing cover to protect the inside of the clutch assembly from foreign debris. The housing cover may be removed to gain access to the clutch mounting hardware by removing 3 nuts, 3 lock-washers, and 3 flat-washers (see images above). Retain the housing cover and associated hardware as these components are not sold separately. When reinstalling the housing cover, torque each nut to 37 Nm (28 lbf-ft).



## On/Off Fan Drive Diagnostic and Warranty Guide

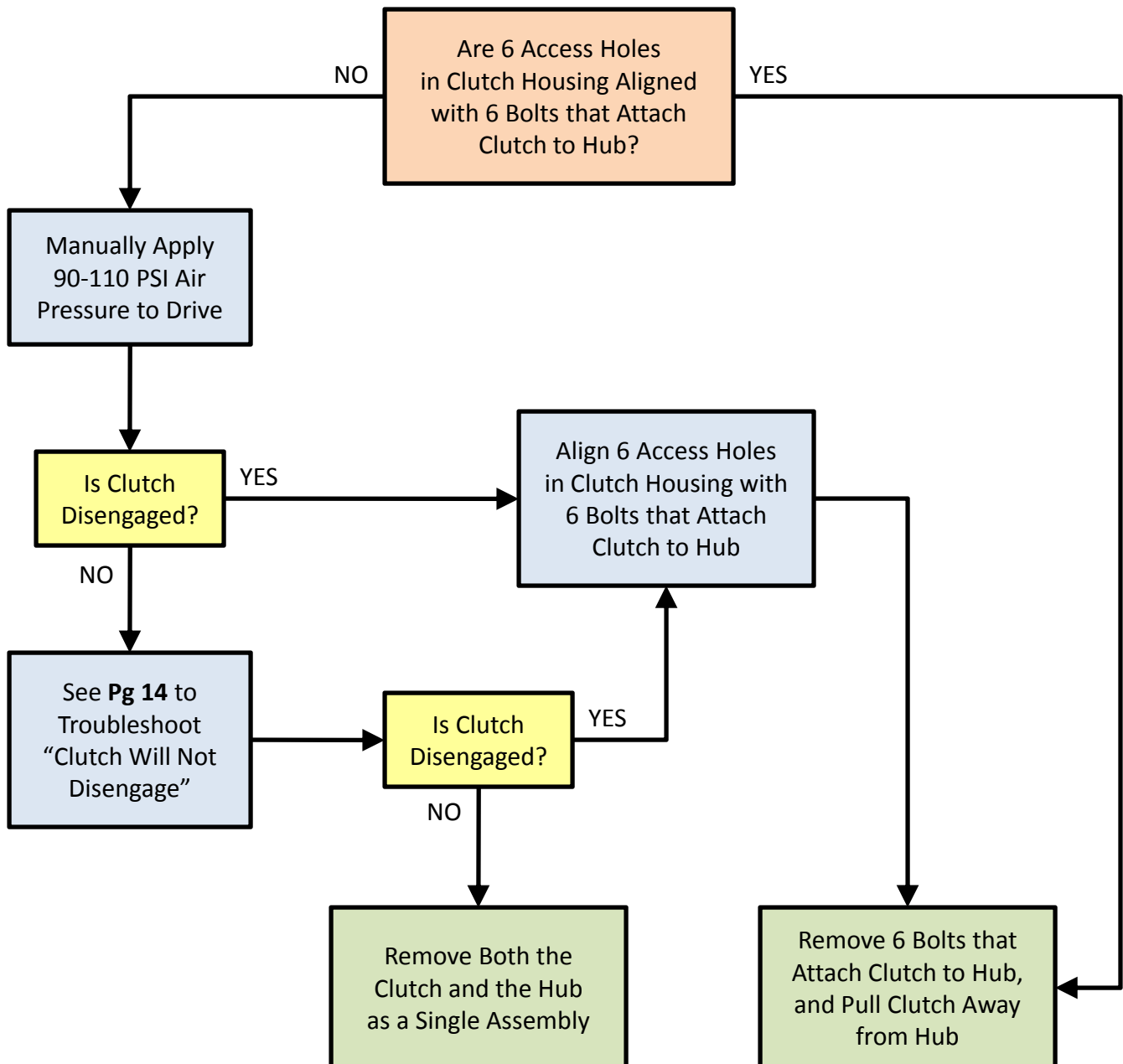
### Clutch Kit Part Numbers

Kit Type	K30 Steel 1090-09600-0xx			K30 Aluminum 1090-09900-0xx or 1090-09800-0xx		
	Part Number	Description	Qty	Part Number	Description	Qty
Service Kit	1033-09339-01	Liner	1	1033-40595-02	Liner	1
		Coupler	1		Coupler	1
		5/16" Locknut	1		5/16" Locknut	1
		Seal-Washer	1		Seal-Washer	1
		U-Cup Seal	1		U-Cup Seal	1
		Grease Seal	1		Grease Seal	1
		Retainer Plate Fastener	6		Retainer Plate Fastener	6
		O-Ring at Base of Piston Rod	1		O-Ring at Base of Piston Rod	1
		Cylinder	1		Cylinder	1
		Clutch Mounting Bolt	6		Clutch Mounting Bolt	6
		Grease Packet	1		Grease Packet	1
		Front O-Ring	1		Front O-Ring	1
Liner Kit	1033-09340-01	Liner	1	1033-40595-01	Liner	1
		Retainer Plate Fastener	6		Retainer Plate Fastener	6
Seal Kit	1033-08233-01	O-Ring at Base of Piston Rod	1	1033-40595-03	O-Ring at Base of Piston Rod	1
		Cylinder	1		Cylinder	1
		U-Cup Seal	1		U-Cup Seal	1
		Seal-Washer	1		Seal-Washer	1
		5/16" Locknut	1		5/16" Locknut	1
		Coupler	1		Coupler	1
		Grease Packet	1		Grease Packet	1
		Front O-Ring	1		Front O-Ring	1

**Caution: K30 Steel Clutch components should never be interchanged with K30 Aluminum Clutch components. Interchanging these components may cause the clutch to fail.**

## Removal of the Clutch Assembly

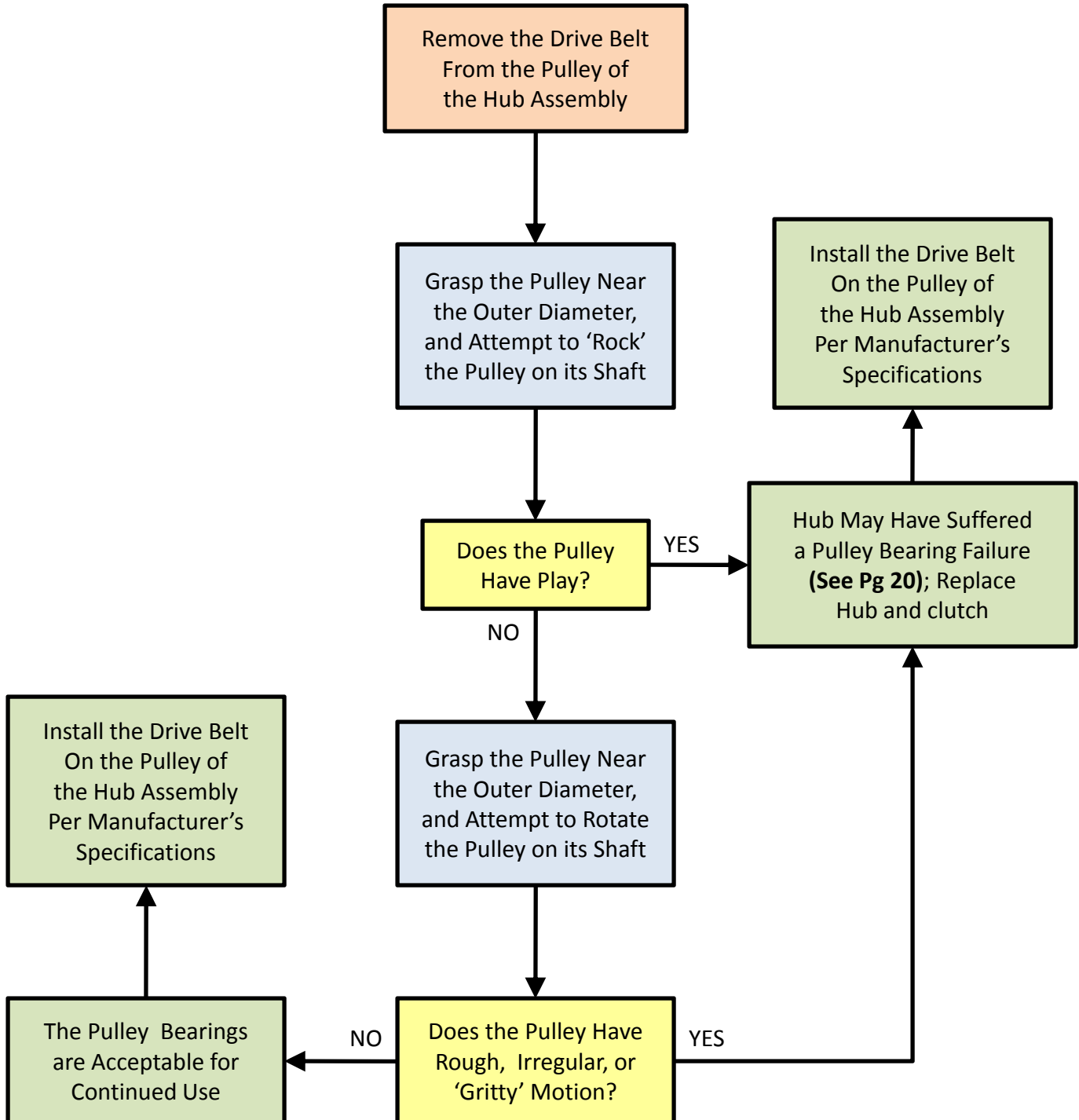
Troubleshooting the fan drive should begin with the clutch assembly still installed on the vehicle. However, at some point during the troubleshooting process, it may become necessary to remove the clutch assembly. Below is a procedure for removing the clutch assembly from the hub assembly:



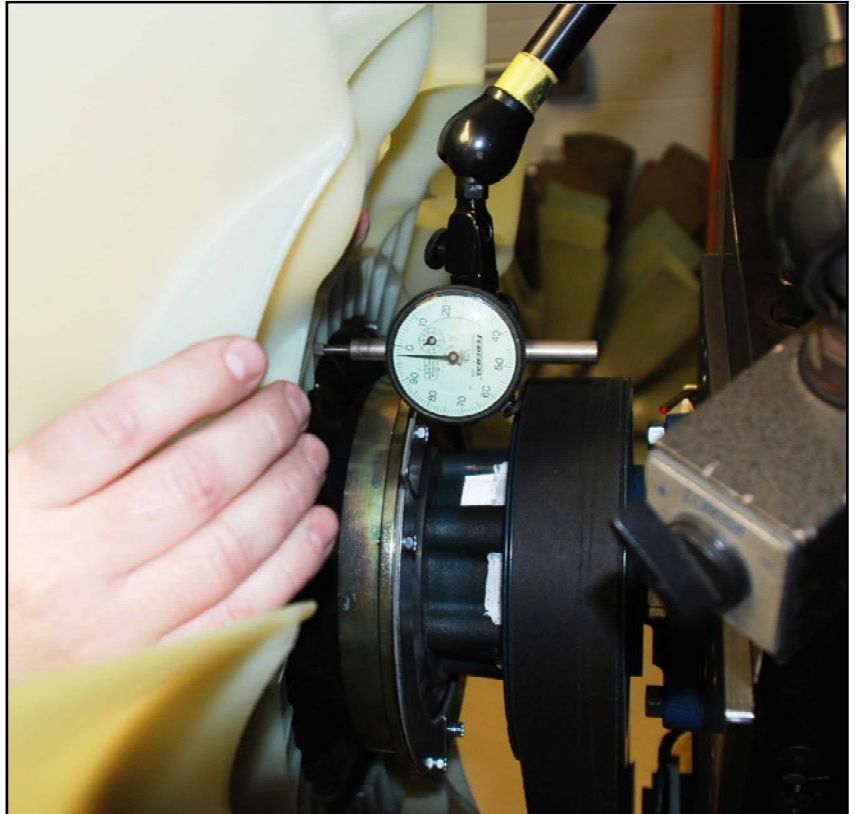


## Inspecting the Hub Assembly for Play

The hub assembly may be inspected for play, with or without the clutch installed. For best results, use the following procedure:



## Inspecting the Clutch Assembly for Play



Supply 90-110 PSI air pressure to the fan drive to disengage the clutch. Setup a dial indicator on a flat rear surface of the fan, very close to the outer rim of the clutch (see the image to the upper left).

Grasp the fan as close to the position of the dial indicator as possible (see the image to the upper right). Gently move the fan forward and rearward (do not force), and record the total indicator reading.

If the total indicator reading exceeds 0.050" (1.27mm) then the clutch should be replaced. If the total indicator reading is less than or equal to 0.050" (1.27mm) then the amount of clutch play is acceptable.

## Checking the Remaining Liner Life



Liner Life Remaining



Liner Replacement Necessary

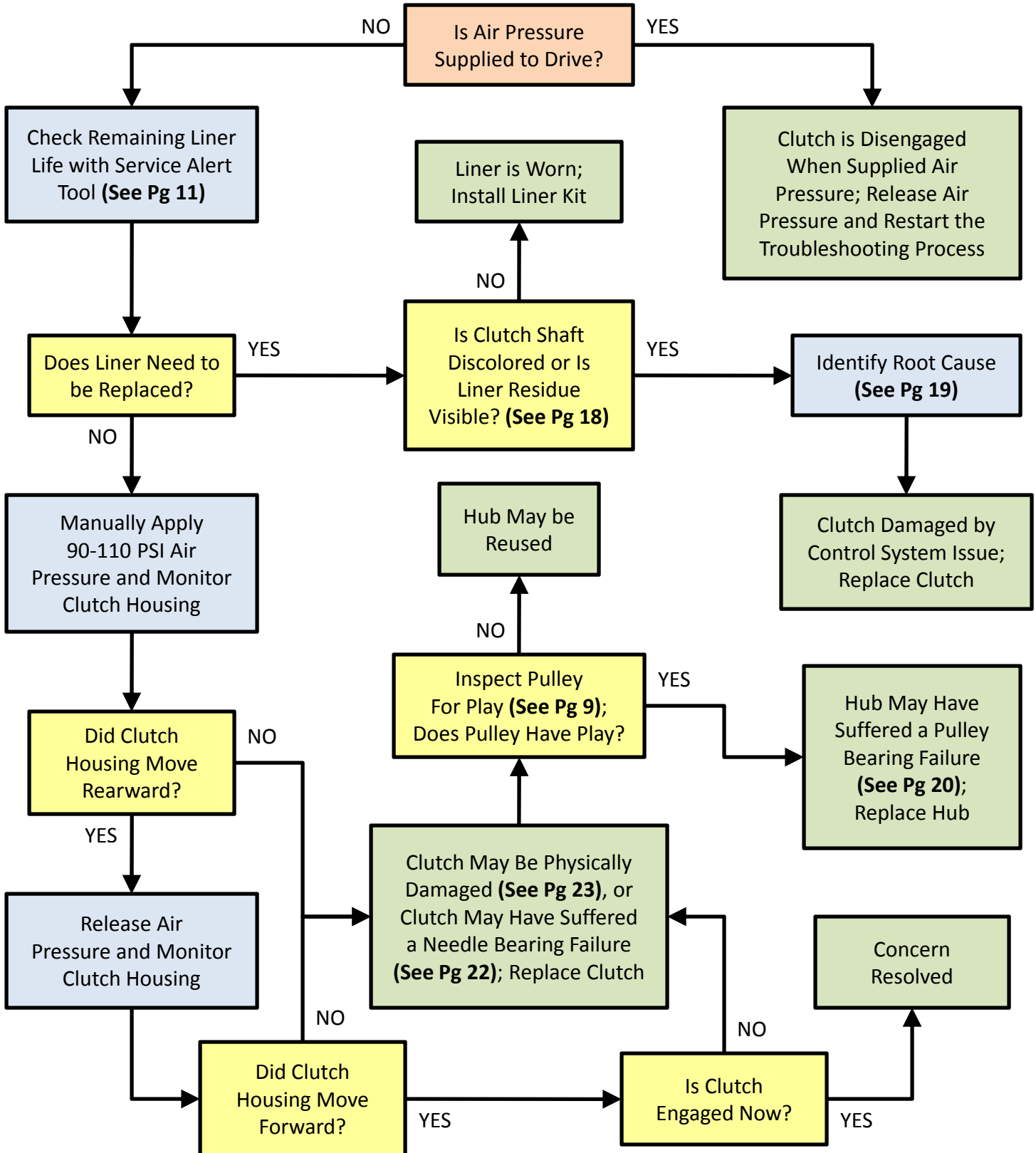
Remaining liner life may be checked by using the Service Alert Tool. This tool is available for no cost at [www.borgwarner.com/thermallit](http://www.borgwarner.com/thermallit).

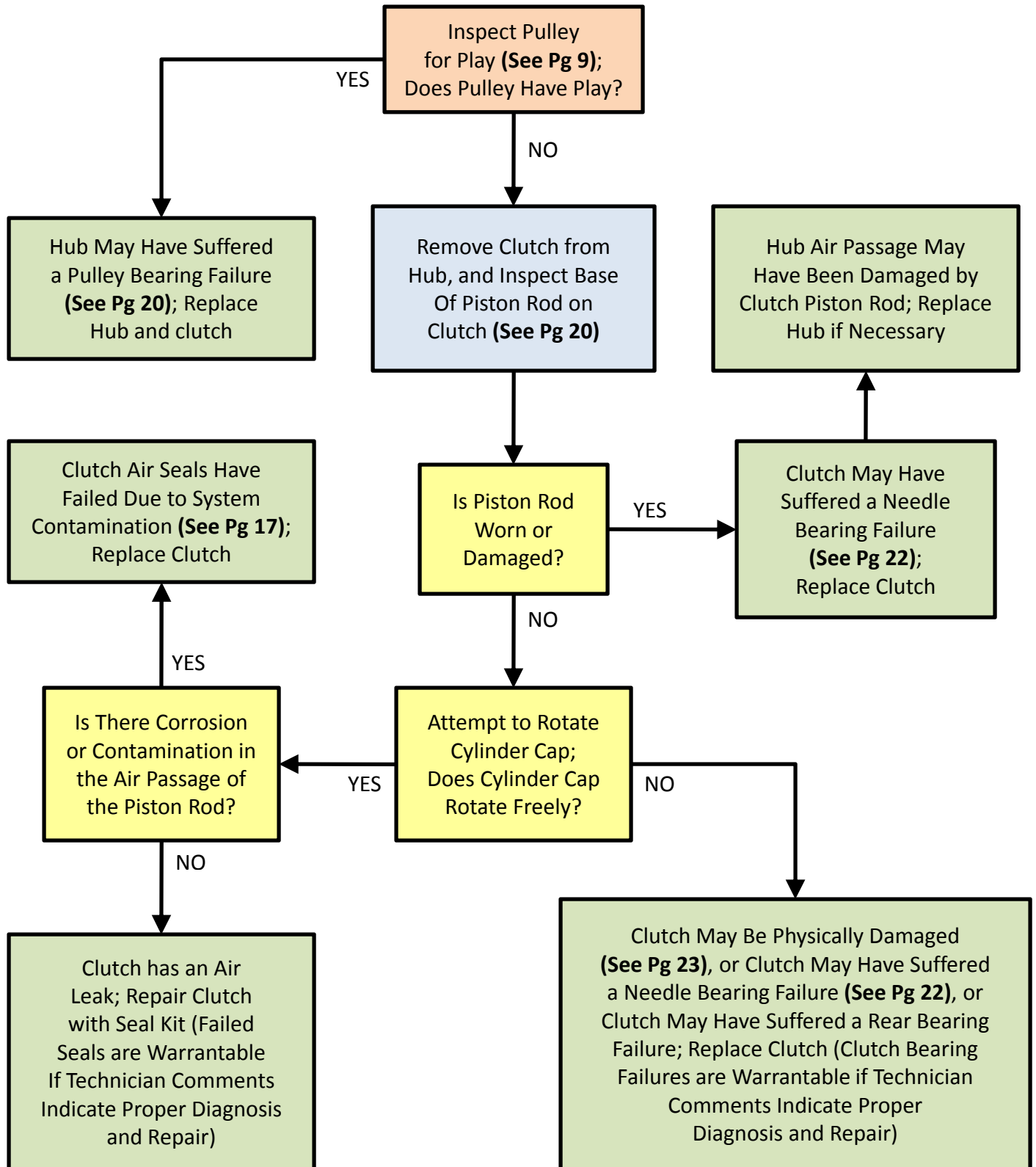
Start with the clutch engaged (no air pressure to the drive). Place the Service Alert Tool flush against the rear face of the clutch shaft as shown in the images above (this may be done with the clutch installed on the vehicle).

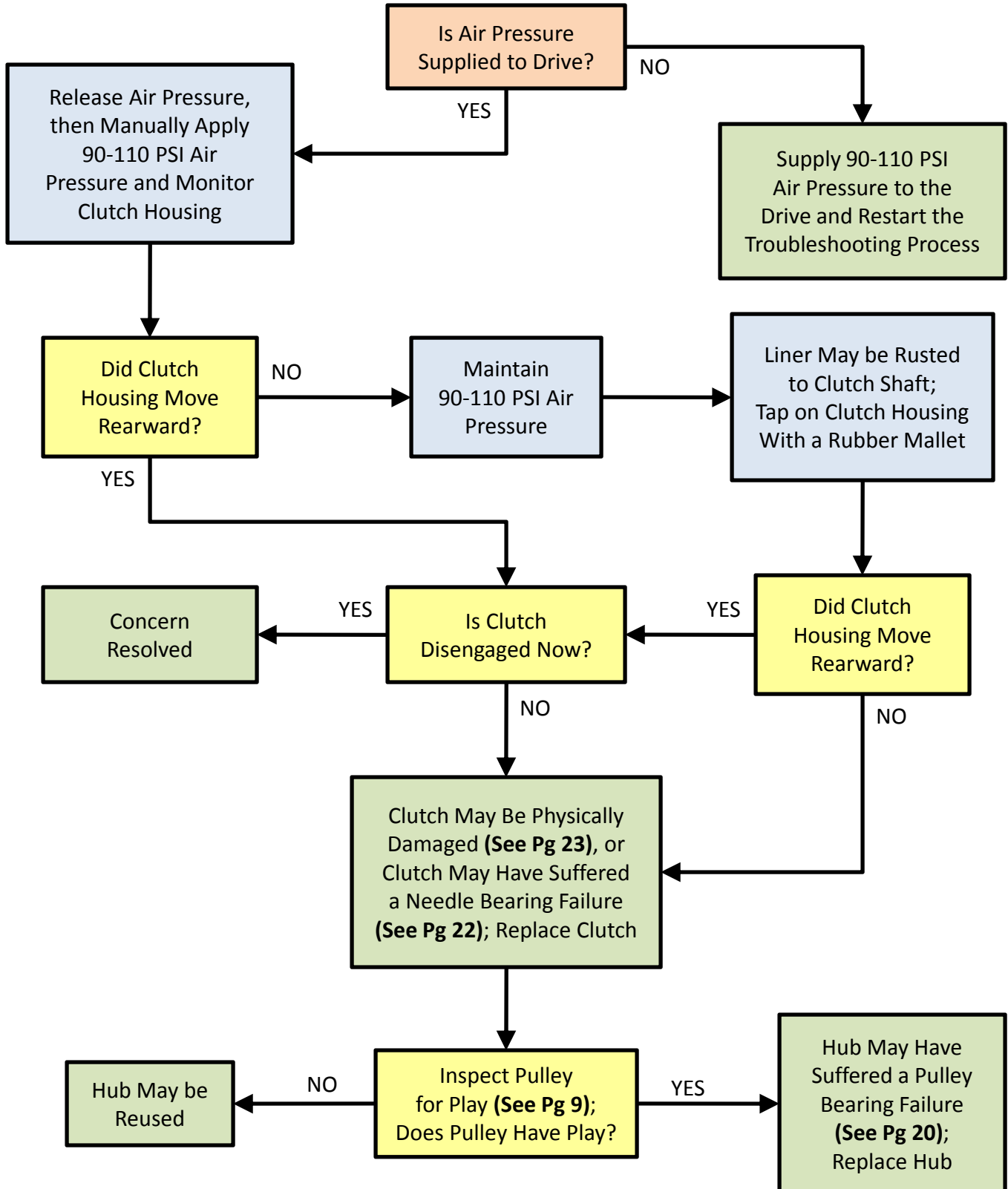
If the Service Alert Tool sits below the surface of the retainer plate (as shown in the image on the left) then the liner has life remaining. If the Service Alert Tool sits above the surface of the retainer plate (as shown in the image on the right) then the liner should be replaced as soon as possible. See Pg 18 to determine whether a control system issue is responsible for rapid liner wear.

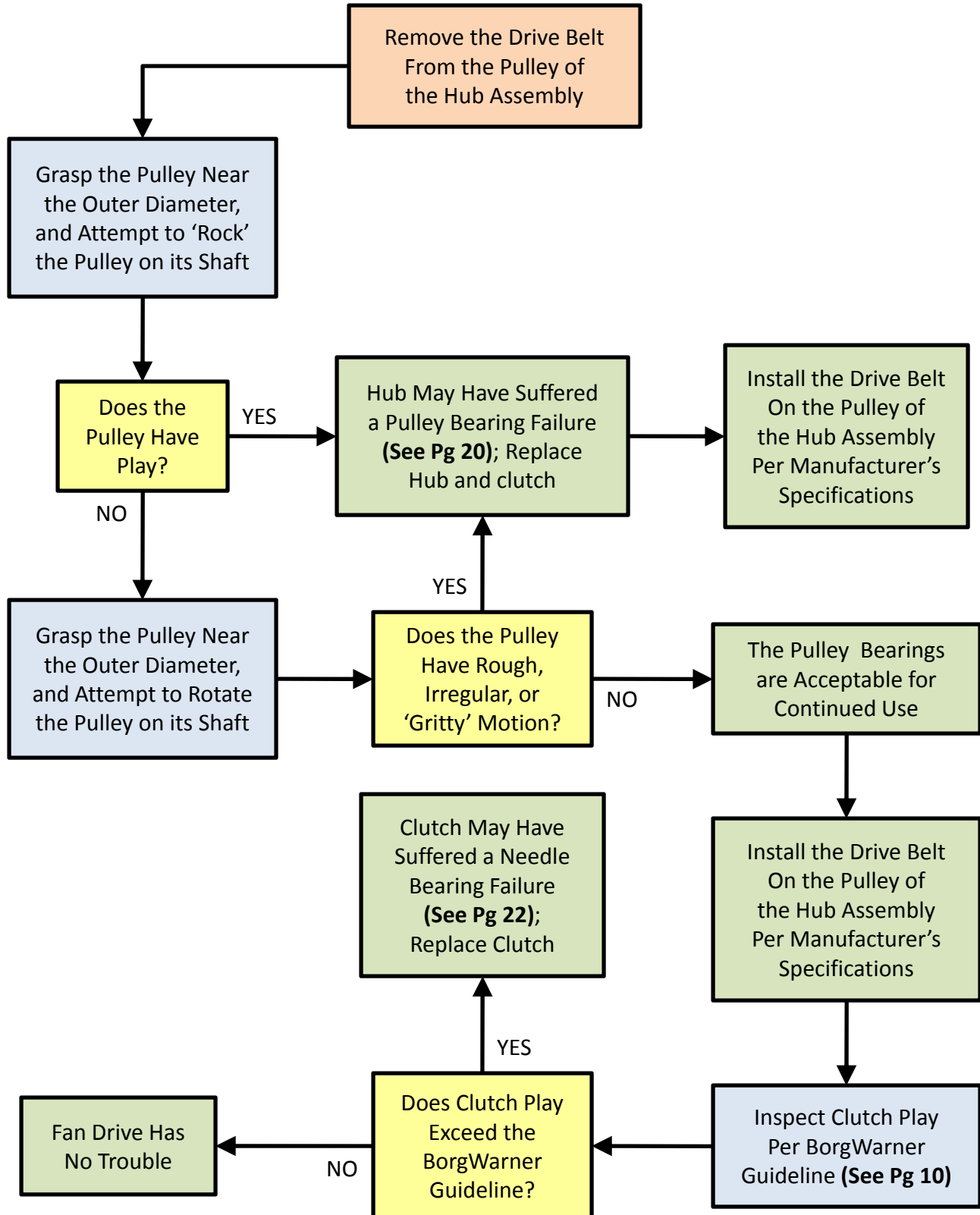
*Note: the Service Alert Tool has a thickness of 0.062" – if the Service Alert Tool is not available, then the liner should be replaced when the clutch shaft's rear face is less than 0.062" forward of the retainer plate's rear face.*

### Troubleshoot: Clutch Will Not Engage



**Troubleshoot: Fan Drive Has An Air Leak**


**Troubleshoot: Clutch Will Not Disengage (If Air Leak, See Pg 13)**


**Troubleshoot: Fan Drive Has Play**


## Clutch Failure Modes and Warranty Coverage

Note: The troubleshooting guides should be used to determine the root cause of a clutch failure before referring to this section (see “Troubleshoot” in the Index on Pg 2).

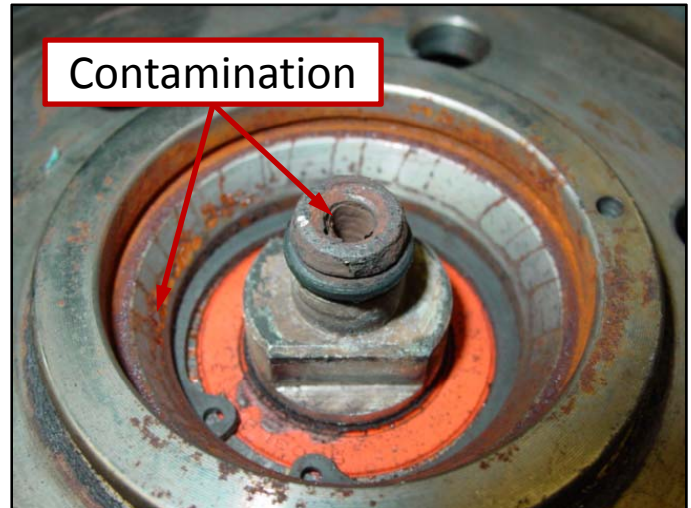
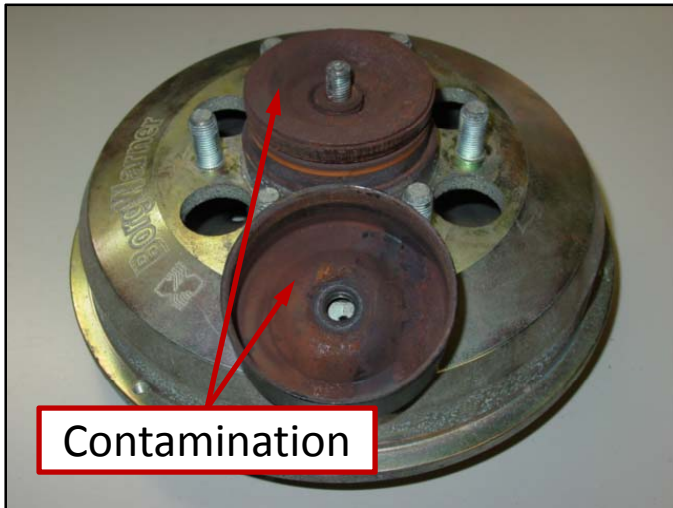
The following pages illustrate the possible failure modes of the clutch assembly. **Disassembly of the clutch is not necessary to diagnose the failure mode.**

### Failure Mode:

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Control System Issue . . . . .	Page 18
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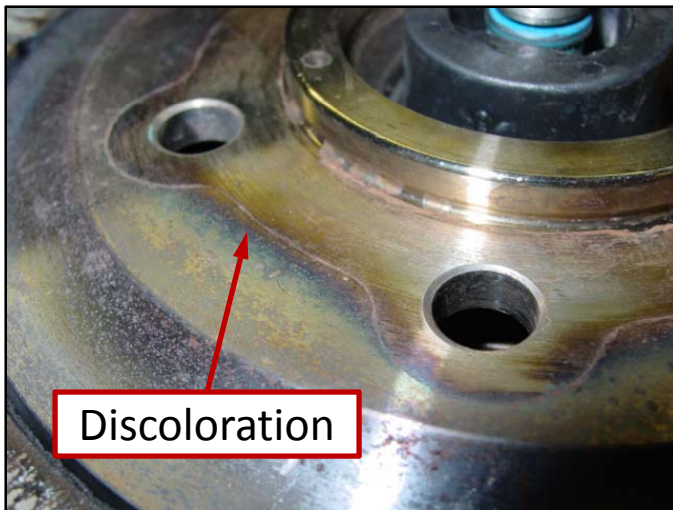
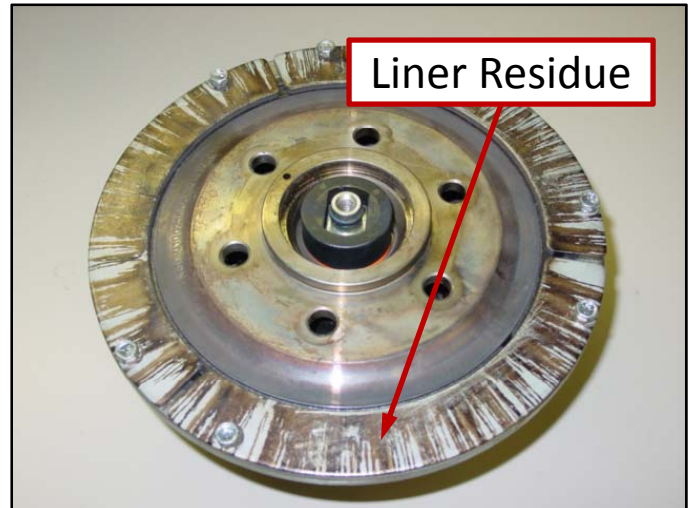
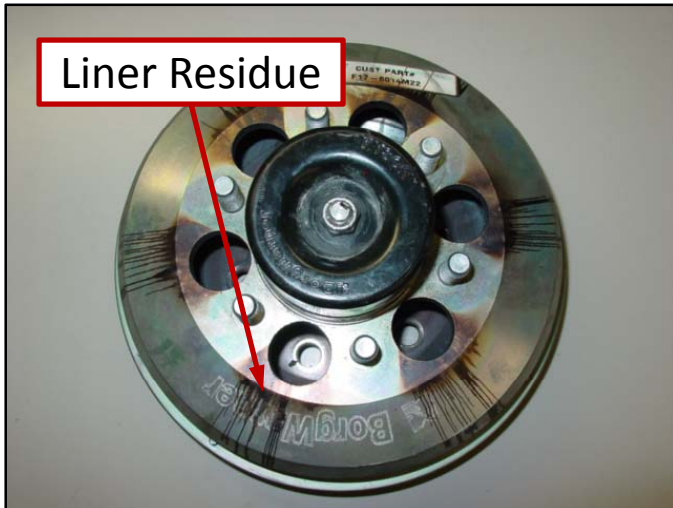


### Air System Contamination



Disassembly of the clutch is not required - images are provided for reference only. Contamination in the air system may cause air seal leaks, operation troubles, or clutch failure. **Any failure due to air system contamination is not warrantable through BorgWarner.**

### Control System Issue



A control system issue (potential root causes identified on Pg 19) may cause the clutch to overheat and ultimately fail. Evidence of an overheated clutch includes liner residue on the forward and/or rear face of the clutch, discoloration of the rear face of the clutch, an extremely worn liner, or even a melted coupler. **Any failure due to a control system issue is not warrantable through BorgWarner – check with the OEM for possible warranty coverage.**

## Control System Issue (Root Causes)

**Any failure due to a control system issue is not warrantable through BorgWarner – check with the OEM for possible warranty coverage.** Control system issues, which may cause the clutch to overheat, include any of the following root causes:

Incomplete clutch disengagement (liner still in contact) due to a source air pressure holding below 90 PSI. Verify that air pressure at the hub fitting is 90-110 PSI when the clutch is disengaged.

Slow clutch disengagement due to a low air flow rate caused by a contaminated air solenoid, pinched air line, air leak, or weak air pump. Verify that air pressure at the hub fitting increases almost instantaneously from 0 PSI to at least 90 PSI (in less than 1 second).

Slow clutch engagement due to plugged air vent (air pressure must be released quickly to engage clutch with minimal slippage). Verify that air pressure at the hub fitting decreases almost instantaneously from more than 90 PSI down to 0 PSI (in less than 1 second).

Slow clutch disengagement or incomplete clutch disengagement due to insufficient air pressure or insufficient air flow rate ultimately caused by vehicle electrical issues. Verify that air pressure at the hub fitting increases almost instantaneously from 0 PSI to at least 90 PSI (in less than 1 second).

Frequent clutch (and fan) engagements lasting less than 30 seconds (clutch over-cycling) due to the lack of a fan “on-time” timer within the engine or vehicle control module.

Clutch slippage caused by partial or full restriction of the fan motion, such as a physical obstruction.

## Evidence of Pulley Bearing Failure



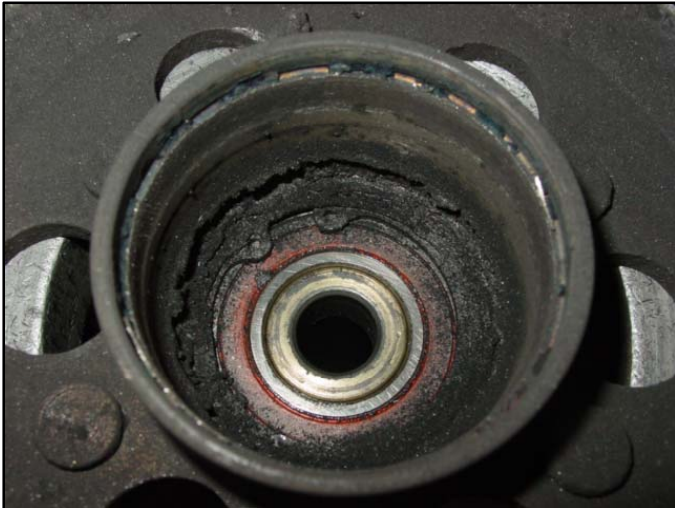
Damage to the base of the piston rod or o-ring may be caused by a pulley bearing failure. A rounded-out or melted coupler may also be caused by a pulley bearing failure. Inspect for play or rough motion in the pulley bearings (See Pg 9). **If a clutch is damaged by a hub failure, and the hub is still under warranty, then both the clutch and hub must be returned to BorgWarner for warranty consideration.**

## Improper Installation



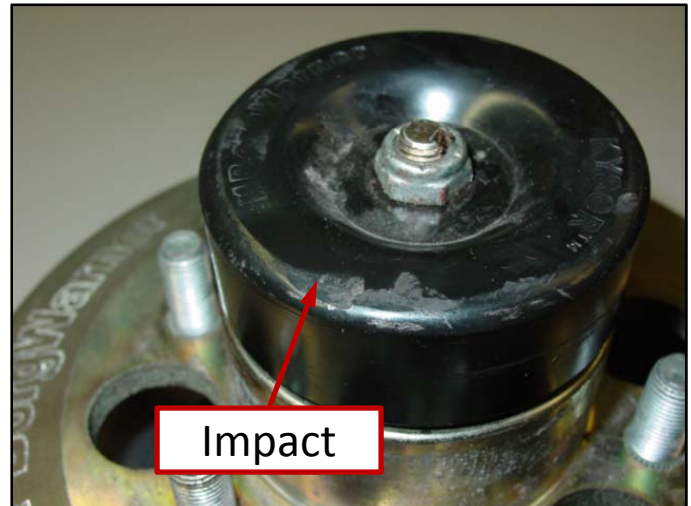
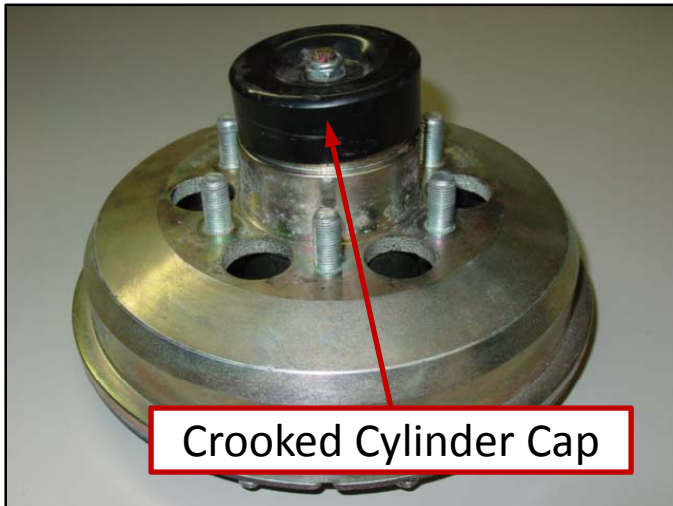
Any extra bolts left loose inside the clutch housing will cause internal damage during clutch operation. Any of the 6 clutch mounting bolts that are not torqued to 45 lbf-ft (61 Nm) may become loose inside the clutch housing and cause internal damage. Bolts that are properly torqued will leave a witness mark in the clutch shaft. **A failure due to improper installation is not warrantable through BorgWarner, unless the failure occurred on an original equipment factory installation.**

## Needle Bearing Failure



Disassembly of the clutch is not required - images are provided for reference only. Needle bearing failures are rare, but can occur. **If a needle bearing fails due to a hub failure (see Pg 20), and the hub is still under warranty, then both the clutch and hub must be returned for warranty consideration.** If a needle bearing fails without a hub failure, then the clutch alone may be returned for warranty consideration. A needle bearing failure due to a defect in material or workmanship is warrantable through BorgWarner.

## Physical Damage



An impact to the cylinder cap may bend the piston rod (which carries the cylinder cap) and produce an air seal leak. The bent piston rod may even prevent the clutch from engaging or disengaging. An impact to the clutch housing, especially near a fastener hole, may fracture the housing and cause a fastener to become loose or lost. **A failure due to physical damage of any kind is not warrantable through BorgWarner.**