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MANUAL REVISION TRANSMITTAL
Manual 171 (61-10-71)
-1, -4, -6 SERIES STEEL
"A" HUB PROPELLER
OVERHAUL MANUAL
REVISION 9 dated March 2024

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NOTE 1: Record the removal of a Temporary Revision on the Record of Temporary Revisions pages in this manual.

NOTE 2: When the manual revision has been inserted in the manual, record the information required on the Record of Revisions pages in this manual.

NOTE 3: Pages distributed in this revision may include pages from previous revisions if they are on the opposite side of revised pages. This is done as a convenience to those users who wish to print a two-sided copy of the new revision.

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Manual No. 171
61-10-71
Revision 9
March 2024

-1, -4, -6 SERIES STEEL "A" HUB PROPELLER OVERHAUL MANUAL

Two Blade	Three Blade
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HC-A2VK-1	PHC-A3VF-4D
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HC-A2VL-6F	HC-A3V20-1B
HC-A2V20-1A	HC-A3V20-1D
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HC-A2MVK-1	PHC-A3MVF-4D
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HC-A2MVL-6F	HC-A3MV20-1B
HC-A2MV20-1A	HC-A3MV20-1D
HA-A2MV20-1B	HC-A3MV20-1E
HC-A2MV20-4A1	HC-A3MV20-1F

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REVISION 9 HIGHLIGHTS

Revision 9, dated March 2024, incorporates the following:

Front matter (Cover, Revision Highlights, etc.), has been revised to match this revision.

Minor language/format changes and renumbering, if applicable are marked with a revision bar, but are not listed below.

- TESTING AND FAULT ISOLATION
  - Revised the section, "Lightning Strike on Hub or Blade"
- REPAIR
  - Revised the section, "Blade Shank Conversion"
- ASSEMBLY
  - Revised the section, "Oil Transfer Unit Assembly"
- FITS AND CLEARANCES
  - Revised the section, "Torque Values"
  - Revised Figure 8-2, "Blade Play"
  - Revised the section, "Blade Tolerances"

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REVISION 9 HIGHLIGHTS

1. Introduction

A. General

(1) This is a list of current revisions that have been issued against this manual. Please compare it to the RECORD OF REVISIONS page to make sure that all revisions have been added to the manual.

B. Components

(1) Revision No. indicates the revisions incorporated in this manual.

(2) Issue Date is the date of the revision.

(3) Comments indicates the level of the revision.

(a) New Issue is a new manual distribution. The manual is distributed in its entirety. All the revision dates are the same and no change bars are used.

(b) Reissue is a revision to an existing manual that includes major content and/or major format changes. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.

(c) Major Revision is a revision to an existing manual that includes major content or minor format changes over a large portion of the manual. The manual is distributed in its entirety. All the revision dates are the same, but change bars are used to indicate the changes incorporated in the latest revision of the manual.

(d) Minor Revision is a revision to an existing manual that includes minor content changes to the manual. Only the revised pages of the manual are distributed. Each page retains the date and the change bars associated with the last revision to that page.

Revision No.	Issue Date	Comments
Original	Jul/07	New Issue
Revision 1	Dec/09	Minor Revision
Revision 2	Mar/13	Major Revision
Revision 3	Nov/19	Reissue
Revision 4	Dec/20	Minor Revision
Revision 5	Feb/22	Minor Revision
Revision 6	Jun/22	Minor Revision
Revision 7	Oct/22	Minor Revision
Revision 8	Apr/23	Major Revision
Revision 9	Mar/24	Minor Revision

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RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 8 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
8	Apr/23	Apr/23	HPI
9	Mar/24	Mar/24	HP

Revision Number	Issue Date	Date Inserted	Inserted By

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RECORD OF TEMPORARY REVISIONS

Update this page to show all temporary revisions inserted into this manual.
Revision 8 includes all prior temporary revisions, up to and including TR-004.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By
TR-004	10A-12	Feb/23	Feb/23	HPI	Apr/23	HPI

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SERVICE DOCUMENT LIST

CAUTION 1: DO NOT USE OBSOLETE OR OUTDATED INFORMATION. PERFORM ALL INSPECTIONS OR WORK IN ACCORDANCE WITH THE MOST RECENT REVISION OF THE SERVICE DOCUMENT. INFORMATION CONTAINED IN A SERVICE DOCUMENT MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. FAILURE TO COMPLY WITH INFORMATION CONTAINED IN A SERVICE DOCUMENT OR THE USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

CAUTION 2: THE INFORMATION FOR THE DOCUMENTS LISTED INDICATES THE REVISION LEVEL AND DATE AT THE TIME THAT THE DOCUMENT WAS INITIALLY INCORPORATED INTO THIS MANUAL. INFORMATION CONTAINED IN A SERVICE DOCUMENT MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. REFER TO THE APPLICABLE SERVICE DOCUMENT INDEX FOR THE MOST RECENT REVISION LEVEL OF THE SERVICE DOCUMENT.

Service Document Number	Incorporation Rev./Date
Service Bulletins:	
HC-SB-61-324	Rev. 1 Aug/07

Service Document Number	Incorporation Rev./Date
Service Letters:	
HC-SL-61-351	Rev. 3 Nov/19
HC-SL-61-367	Rev. 4, Dec/20

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date

Service Document Number	Incorporation Rev./Date

AIRWORTHINESS LIMITATIONS

1. Airworthiness Limitations

   A. Life Limits

      (1) Certain component parts, as well as the entire propeller, may have specific life limits established by the FAA. Such limits require replacement of items after a specific number of hours of use.

      (2) For airworthiness limitations information, refer to Hartzell Propeller Inc. Owner's Manual 168 (61-00-68) and Manual 174 (61-00-74).

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INTRODUCTION - CONTENTS

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1. General (Rev.1)

A. Statement of Purpose

(1) This manual has been reviewed and accepted by the FAA. Additionally, this manual contains data that has been approved in a manner acceptable to the FAA administrator.

(2) This manual provides maintenance and overhaul procedures for use in propeller repair stations by personnel that are trained and experienced with Hartzell Propeller Inc. products.

(a) This manual does not provide complete information for an inexperienced technician to attempt propeller overhaul without supervision.

(3) This manual is intended to be the primary source of maintenance and overhaul information for the applicable Hartzell propeller/component models.

(a) Propeller models addressed in this manual may be Type Certificated by the FAA, or may be experimental. Experimental parts must not be installed on a Type Certificated propeller. Always use the current illustrated parts list for the assembly of any propeller. Always refer to the aircraft Type Certificate (TC) or Supplemental Type Certificate (STC) to determine installation eligibility of any propeller. If installation eligibility is not identifiable, an additional installation approval, such as FAA form 337 field approval or Supplemental Type Certificate may be required. If in doubt, contact Hartzell Propeller Inc. Product Support.

(b) Information published in Service Bulletins, Service Letters, Service Advisories, and Service Instructions may supersede information published in this manual. The reader must consult active Service Bulletins, Service Letters, Service Advisories, and Service Instructions for information that may have not yet been incorporated into the latest revision of this manual.

(4) This manual makes reference to other Hartzell Propeller Inc. manuals that provide important details for procedures such as anodizing, penetrant inspection, and overhaul procedures for hub units.

(5) Where possible, this manual is written in the format specified by ATA iSpec 2200.

B. Item References

(1) Item references throughout the text in this manual refer to item numbers in the Illustrated Parts List chapter of this manual. The item numbers appear in parentheses directly following the part name. Only the item base number will appear in the text of the manual. Item base numbers and the alpha variants of the base numbers will appear in the illustrated parts list. There are two reasons for the use of alpha variants:

(a) A part may be superseded, replaced, or obsoleted by another part. For example, the pitch change block unit (105733) that is item 320 was superseded by the pitch change block unit (105733-1) that is item 320A.

(b) An Illustrated Parts List may contain multiple configurations. Effectivity codes are used to distinguish different part numbers within the same list. For example, one configuration may use a piston (B-2419) that is item 80, yet another configuration uses a piston (104256) that is item 80A. Effectivity codes are very important in the determination of parts in a given configuration.

2. Reference Publications

A. Hartzell Propeller Inc. Publications

(1) Information published in Service Bulletins, Service Letters, Service Advisories, and Service Instructions may supersede information published in this manual. The reader must consult active Service Bulletins, Service Letters, Service Advisories, and Service Instructions for information that may have not yet been incorporated into the latest revision of this manual.

(2) In addition to this manual, one or more of the following publications are required for information regarding specific recommendations and procedures to maintain propeller assemblies that are included in this manual.

Manual No. (ATA No.)	Available at www.hartzellprop.com	Hartzell Propeller Inc. Manual Title
n/a	Yes	Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories
Manual 127 (61-16-27)	Yes	Metal Spinner Assembly Maintenance Manual
Manual 133C (61-13-33)		Aluminum Blade Overhaul Manual
Manual 159 (61-02-59)	Yes	Application Guide
Manual 165A (61-00-65)	Yes	Illustrated Tool and Equipment Manual
Manual 168 (61-00-68)		Propeller Owner's Manual and Logbook for Steel “A” Hub Reciprocating Propeller Models with Aluminum Blades
Manual 174 (61-00-74)		Propeller Owner's Manual and Logbook for Steel Hub Reciprocating Propeller Models HC-A2(MV,V,X)20-4A1 with Aluminum Blades
Manual 180 (30-61-80)	Yes	Propeller Ice Protection System Manual
Manual 202A (61-01-02)	Vol. 7, Yes, Vol. 11, Yes	Standard Practices Manual, Volumes 1 through 11

B. Vendor Publications

None

3. Personnel Requirements (Rev. 1)

   A. Service and Maintenance Procedures in this Manual

      (1) Personnel performing the service and maintenance procedures in this manual are expected to have the required equipment/tooling, training, and certifications (when required by the applicable Aviation Authority) to accomplish the work in a safe and airworthy manner.

      (2) Compliance to the applicable regulatory requirements established by the Federal Aviation Administration (FAA) or international equivalent is mandatory for anyone performing or accepting responsibility for the inspection and/or repair of any Hartzell Propeller Inc. product.

         (a) Maintenance records must be kept in accordance with the requirements established by the Federal Aviation Administration (FAA) or international equivalent.

         (b) Refer to Federal Aviation Regulation (FAR) Part 43 for additional information about general aviation maintenance requirements.

4. Special Tooling and Consumable Materials (Rev. 1)

   A. Special Tooling

      (1) Special tooling may be required for procedures in this manual. For further tooling information, refer to Hartzell Propeller Inc. Illustrated Tool and Equipment Manual 165A (61-00-65).

         (a) Tooling reference numbers appear with the prefix “TE” directly following the tool name to which they apply. For example, a template that is reference number 133 will appear as: template TE133.

   B. Consumable Materials

      (1) Consumable materials are referenced in certain sections throughout this manual. Specific approved materials are listed in the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

         (a) Consumable material reference numbers appear with the prefix “CM” directly following the material to which they apply. For example, an adhesive that is reference number 16 will appear as: adhesive CM16. Only the material(s) specified can be used.

5. Safe Handling of Paints and Chemicals (Rev. 1)

A. Instructions for Use

(1) Always use caution when handling or being exposed to paints and/or chemicals during propeller overhaul and/or maintenance procedures.

(2) Before using paint or chemicals, always read the manufacturer's label on the container(s) and follow specified instructions and procedures for storage, preparation, mixing, and/or application.

(3) Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about the physical properties, health, and physical hazards of any chemical.

6. Calendar Limits and Long Term Storage (Rev. 2)

A. Calendar Limits

(1) The effects of exposure to the environment over a period of time create a need for propeller overhaul regardless of flight time.

(2) A calendar limit between overhauls is specified in Hartzell Propeller Inc. Service Letter HC-SL-61-61Y.

(3) Experience has shown that special care, such as keeping an aircraft in a hangar, is not sufficient to permit extension of the calendar limit.

(4) The start date for the calendar limit is when the propeller is first installed on an engine.

(5) The calendar limit is not interrupted by subsequent removal and/or storage.

(6) The start date for the calendar limit must not be confused with the warranty start date, that is with certain exceptions, the date of installation by the first retail customer.

B. Long Term Storage

(1) Propellers that have been in storage have additional inspection requirements before installation. Refer to the Packaging and Storage chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

7. Component Life and Overhaul (Rev. 2)

WARNING: CERTAIN PROPELLER COMPONENTS USED IN NON-AVIATION APPLICATIONS ARE MARKED WITH DIFFERENT PART NUMBERS TO DISTINGUISH THEM FROM COMPONENTS USED IN AVIATION APPLICATIONS. DO NOT ALTER THE PART NUMBERS SHOWN ON PARTS DESIGNATED FOR NON-AVIATION APPLICATIONS OR OTHERWISE APPLY THOSE PARTS FOR USE ON AVIATION APPLICATIONS.

A. Component Life

(1) Component life is expressed in terms of hours of service (Time Since New, TSN) and in terms of hours of service since overhaul (Time Since Overhaul, TSO).

NOTE: TSN/TSO is considered as the time accumulated between rotation and landing, i.e., flight time.

(2) Time Since New (TSN) and Time Since Overhaul (TSO) records for the propeller hub and blades must be maintained in the propeller logbook.

(3) Both TSN and TSO are necessary for defining the life of the component. Certain components or in some cases an entire propeller, may be "life limited", which means that they must be replaced after a specified period of use (TSN).

(a) It is a regulatory requirement that a record of the Time Since New (TSN) be maintained for all life limited parts.

(b) Refer to the Airworthiness Limitations chapter in the applicable Hartzell Propeller Inc. Owner's Manual for a list of life limited components.

(4) When a component or assembly undergoes an overhaul, the TSO is returned to zero hours.

(a) Time Since New (TSN) can never be returned to zero.

(b) Repair without overhaul does not affect TSO or TSN.

(5) Blades and hubs are sometimes replaced while in service or at overhaul.

(a) Maintaining separate TSN and TSO histories for a replacement hub or blade is required.

(b) Hub replacement

1 If the hub is replaced, the replacement hub serial number must be recorded (the entry signed and dated) in the propeller logbook.

2 The propeller will be identified with the serial number of the replacement hub.

NOTE: Propeller assembly serial numbers are impression stamped on the hub. For stamping information, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

3 The TSN and TSO of the replacement hub must be recorded and maintained in the propeller logbook.

4 If tracking any component(s) other than the hub/blades, maintain these TSN/TSO records separately in the propeller logbook.

NOTE: Hub replacement does not affect the TSN/TSO of any other propeller components.

B. Overhaul

(1) Overhaul is the periodic disassembly, cleaning, inspecting, repairing as necessary, reassembling, and testing in accordance with approved standards and technical data approved by Hartzell Propeller Inc.

(2) The overhaul interval is based on hours of service, i.e., flight time, or on calendar time.

(a) Overhaul intervals are specified in Hartzell Propeller Inc. Service Letter HC-SL-61-61Y.

(b) At such specified periods, the propeller hub assembly and the blade assemblies must be completely disassembled and inspected for cracks, wear, corrosion, and other unusual or abnormal conditions.

(3) Overhaul must be completed in accordance with the latest revision of the applicable component maintenance manual and other publications applicable to, or referenced in, the component maintenance manual.

(a) Parts that are not replaced at overhaul must be inspected in accordance with the check criteria in the applicable Hartzell Propeller Inc. component maintenance manual.

(b) Parts that must be replaced at overhaul are identified by a "Y" in the O/H column of the Illustrated Parts List in the applicable Hartzell Propeller Inc. component maintenance manual.

(4) The information in this manual revision supersedes data in all previously published revisions of this manual.

8. Damage/Repair Types (Rev. 1)

A. Airworthy/Unairworthy Damage

(1) Airworthy damage is a specific condition to a propeller component that is within the airworthy damage limits specified in the applicable Hartzell Propeller Inc. component maintenance manual.

(a) Airworthy damage does not affect the safety or flight characteristics of the propeller and conforms to its type design.

(b) Airworthy damage does not require repair before further flight, but should be repaired as soon as posible to prevent degradation of the damage.

(2) Unairworthy damage is a specific condition to a propeller component that exceeds the airworthy damage limits specified in the applicable Hartzell Propeller Inc. component maintenance manual.

(a) Unairworthy damage can affect the safety or flight characteristics of the propeller and does not conform to its type design.

(b) Unairworthy damage must be repaired before the propeller is returned to service.

B. Minor/Major Repair

(1) Minor Repair

(a) Minor repair is that which may be done safely in the field by a certified aircraft mechanic.

1 For serviceable limits and repair criteria for Hartzell propeller components, refer to the applicable Hartzell Propeller Inc. component maintenance manual.

(2) Major Repair

(a) Major repair cannot be done by elementary operations.

(b) Major repair work must be accepted by an individual that is certified by the Federal Aviation Administration (FAA) or international equivalent.

1 Hartzell recommends that individuals performing major repairs also have a Factory Training Certificate from Hartzell Propeller Inc.

2 The repair station must meet facility, tooling, and personnel requirements and is required to participate in Hartzell Propeller Inc. Sample Programs as defined in the Approved Facilities chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

9. Propeller Critical Parts (Rev. 1)

A. Propeller Critical Parts

(1) Procedures in this manual may involve Propeller Critical Parts (PCP).

(a) These procedures have been substantiated based on Engineering analysis that expects this product will be operated and maintained using the procedures and inspections provided in the Instructions for Continued Airworthiness (ICA) for this product.

(b) Refer to the Illustrated Parts List chapter in the applicable Hartzell Propeller Inc. maintenance manual to identify the Propeller Critical Parts.

(2) Numerous propeller system parts can produce a propeller Major or Hazardous effect, even though those parts may not be considered as Propeller Critical Parts.

(a) The operating and maintenance procedures and inspections provided in the ICA for this product are, therefore, expected to be accomplished for all propeller system parts.

10. Warranty Service (Rev. 1)

A. Warranty Claims

(1) If you believe you have a warranty claim, contact the Hartzell Propeller Inc. Product Support Department to request a *Warranty Application* form. Complete this form and return it to Hartzell Product Support for evaluation **before proceeding with repair or inspection work**. Upon receipt of this form, the Hartzell Product Support Department will provide instructions on how to proceed.

(a) For Hartzell Propeller Inc. Product Support Department contact information, refer to the “Contact Information” section in this chapter.

11. Hartzell Propeller Inc. Contact Information (Rev. 2)

A. Product Support Department

(1) Contact the Product Support Department of Hartzell Propeller Inc. about any maintenance problems or to request information not included in this publication.

NOTE: When calling from outside the United States, dial (001) before dialing the telephone numbers below.

(a) Hartzell Propeller Inc. Product Support may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379 or at (800) 942-7767, toll free from the United States and Canada.

(b) Hartzell Propeller Inc. Product Support can also be reached by fax at (937) 778-4215, and by e-mail at techsupport@hartzellprop.com.

(c) After business hours, you may leave a message on our 24 hour product support line at (937) 778-4376 or at (800) 942-7767, toll free from the United States and Canada.

1 A technical representative will contact you during normal business hours.

2 Urgent AOG support is also available 24 hours per day, seven days per week via this message service.

(d) Additional information is available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

B. Technical Publications Department

(1) For Hartzell Propeller Inc. service literature and revisions, contact:

Hartzell Propeller Inc.
Attn: Technical Publications Department
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A

Telephone: 937.778.4200
Fax: 937.778.4215
E-mail: manuals@hartzellprop.com

C. Recommended Facilities

(1) Hartzell Propeller Inc. recommends using Hartzell-approved distributors and repair facilities for the purchase, repair, and overhaul of Hartzell propeller assemblies or components.

(2) Information about the Hartzell Propeller Inc. worldwide network of aftermarket distributors and approved repair facilities is available on the Hartzell website at www.hartzellprop.com.

12. Definitions (Rev. 4)

A basic understanding of the following terms will assist in maintaining and operating Hartzell Propeller Inc. propeller systems.

Term	Definition
Annealed	Softening of material due to overexposure to heat
Aviation Certified	Intended for FAA or international equivalent type certificated aircraft applications. A TC and PC number must be stamped on the hub, and a PC number must be stamped on blades.
Aviation Experimental	Intended for aircraft/propeller applications not certified by the FAA or international equivalent. Products marked with an “X” at or near the end of the model number or part number are not certified by the FAA or international equivalent and are not intended to use on certificated aircraft.
Beta Operation	A mode of pitch control that is directed by the pilot rather than by the propeller governor
Beta Range	Blade angles between low pitch and maximum reverse blade angle
Beta System	Parts and/or equipment related to operation (manual control) of propeller blade angle between low pitch blade angle and full reverse blade angle
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation
Blade Centerline	An imaginary reference line through the length of a blade around which the blade rotates
Blade Station	Refers to a location on an individual blade for blade inspection purposes. It is a measurement from the blade “zero” station to a location on a blade, used to apply blade specification data in blade overhaul manuals Note: Do not confuse *blade station* with *reference blade radius*; they may not originate at the same location.
Blemish	An imperfection with visible attributes, but having no impact on safety or utility
Brinelling	A depression caused by failure of the material in compression

Term	Definition
Bulge	An outward curve or bend
Camber	The surface of the blade that is directed toward the front of the aircraft. It is the low pressure, or suction, side of the blade. The camber side is convex in shape over the entire length of the blade.
Chord	A straight line distance between the leading and trailing edges of an airfoil
Chordwise	A direction that is generally from the leading edge to the trailing edge of an airfoil
Co-bonded	The act of bonding a composite laminate and simultaneously curing it to some other prepared surface
Composite Material	Kevlar®, carbon, or fiberglass fibers bound together with, or encapsulated within an epoxy resin
Compression Rolling	A process that provides improved strength and resistance to fatigue
Constant Force	A force that is always present in some degree when the propeller is operating
Constant Speed	A propeller system that employs a governing device to maintain a selected engine RPM
Corrosion (Aluminum)	The chemical or electrochemical attack by an acid or alkaline that reacts with the protective oxide layer and results in damage of the base aluminum. Part failure can occur from corrosion due to loss of structural aluminum converted to corrosion product, pitting, a rough etched surface finish, and other strength reduction damage caused by corrosion.
Corrosion (Steel)	Typically, an electrochemical process that requires the simultaneous presence of iron (component of steel), moisture and oxygen. The iron is the reducing agent (gives up electrons) while the oxygen is the oxidizing agent (gains electrons). Iron or an iron alloy such as steel is oxidized in the presence of moisture and oxygen to produce rust. Corrosion is accelerated in the presence of salty water or acid rain. Part failure can occur from corrosion due to loss of structural steel converted to corrosion product, pitting, a rough etched surface finish and other strength reduction damage caused by corrosion.

Term	Definition
Corrosion Product (Aluminum)	A white or dull gray powdery material that has an increased volume appearance (compared to non-corroded aluminum). Corrosion product is not to be confused with damage left in the base aluminum such as pits, worm holes, and etched surface finish.
Corrosion Product (Steel)	When iron or an iron alloy such as steel corrode, a corrosion product known as rust is formed. Rust is an iron oxide which is reddish in appearance and occupies approximately six times the volume of the original material. Rust is flakey and crumbly and has no structural integrity. Rust is permeable to air and water, therefore the interior metallic iron (steel) beneath a rust layer continues to corrode. Corrosion product is not to be confused with damage left in the base steel such as pits and etched surface finish.
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Debond	Separation of two materials that were originally bonded together in a separate operation
Defect	An imperfection that affects safety or utility
Delamination	Internal separation of the layers of composite material
Dent	The permanent deflection of the cross section that is visible on both sides with no visible change in cross sectional thickness
Depression	Surface area where the material has been compressed but not removed
Distortion	Alteration of the original shape or size of a component
Edge Alignment	Distance from the blade centerline to the leading edge of the blade
Erosion	Gradual wearing away or deterioration due to action of the elements
Exposure	Leaving material open to action of the elements

Term	Definition
Face	The surface of the blade that is directed toward the rear of the aircraft. The face side is the high pressure, or thrusting, side of the blade. The blade airfoil sections are normally cambered or curved such that the face side of the blade may be flat or even concave in the midblade and tip region.
Face Alignment	Distance from the blade centerline to the highest point on the face side perpendicular to the chord line
Feathering	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Fraying	A raveling or shredding of material
Fretting	Damage that develops when relative motion of small displacement takes place between contacting parts, wearing away the surface
Galling	To fret or wear away by friction
Gouge	Surface area where material has been removed
Hazardous Propeller Effect	The hazardous propeller effects are defined in Title 14 CFR section 35.15(g)(1)
Horizontal Balance	Balance between the blade tip and the center of the hub
Impact Damage	Damage that occurs when the propeller blade or hub assembly strikes, or is struck by, an object while in flight or on the ground
Inboard	Toward the butt of the blade
Intergranular Corrosion	Corrosion that attacks along the grain boundaries of metal alloys
Jog	A term used to describe movement up/down, left/right, or on/off in short incremental motions
Laminate	To unite composite material by using a bonding material, usually with pressure and heat
Lengthwise	A direction that is generally parallel to the pitch axis
Loose Material	Material that is no longer fixed or fully attached
Low Pitch	The lowest blade angle attainable by the governor for constant speed operation

Term	Definition
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2)
Minor Deformation	Deformed material not associated with a crack or missing material
Monocoque	A type of construction in which the outer skin carries all or a major part of the load
Nick	Removal of paint and possibly a small amount of material
Non-Aviation Certified	Intended for non-aircraft application, such as Hovercraft or Wing in Ground Effect (WIG) applications. These products are certificated by an authority other than FAA. The hub and blades will be stamped with an identification that is different from, but comparable to TC and PC.
Non-Aviation Experimental	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground effect (WIG) applications. Products marked with an “X” at or near the end of the model number or part number are not certified by any authority and are not intended for use on certificated craft.
Onspeed	Condition in which the RPM selected by the pilot through the propeller control/condition lever and the actual engine (propeller) RPM are equal
Open Circuit	Connection of high or infinite resistance between points in a circuit which are normally lower
Outboard	Toward the tip of the blade
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain airworthiness
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control/condition lever
Pitch	Same as “Blade Angle”
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear

Term	Definition
Pitting (Linear)	The configuration of the majority of pits forming a pattern in the shape of a line
Porosity	An aggregation of microvoids. See “voids”.
Propeller Critical Parts	A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by Title 14 CFR section 35.15
Reference Blade Radius	Refers to the propeller reference blade radius in an assembled propeller, e.g., 30-inch radius. A measurement from the propeller hub centerline to a point on a blade, used for blade angle measurement in an assembled propeller. An adhesive stripe (blade angle reference tape CM160) is usually located at the reference blade radius location. Note: Do not confuse *reference blade radius* with *blade station*; they may not originate at the same point.
Reversing	The capability of rotating blades to a position to generate reverse thrust to slow the aircraft or back up
Scratch	Same as “Nick”
Short Circuit	Connection of low resistance between points on a circuit between which the resistance is normally much greater
Shot Peening	Process where steel shot is impinged on a surface to create compressive surface stress, that provides improved strength and resistance to fatigue
Single Acting	Hydraulically actuated propeller that utilizes a single oil supply for pitch control
Split	Delamination of blade extending to the blade surface, normally found near the trailing edge or tip
Station Line	See "Blade Station"
Synchronizing	Adjusting the RPM of all the propellers of a multi-engine aircraft to the same RPM
Synchrophasing	A form of propeller sychronization in which not only the RPM of the engines (propellers) are held constant, but also the position of the propellers in relation to each other

Term	Definition
Ticking	A series of parallel marks or scratches running circumferentially around the diameter of the blade
Track	In an assembled propeller, a measurement of the location of the blade tip with respect to the plane of rotation, used to verify face alignment and to compare blade tip location with respect to the locations of the other blades in the assembly
Trailing Edge	The aft edge of an airfoil over which the air passes last
Trimline	Factory terminology referring to where the part was trimmed to length
Underspeed	The condition in which the actual engine (propeller) RPM is lower than the RPM selected by the pilot through the propeller control/condition lever
Unidirectional Material	A composite material in which the fiber are substantially oriented in the same direction
Variable Force	A force that may be applied or removed during propeller operation
Vertical Balance	Balance between the leading and trailing edges of a two-blade propeller with the blades positioned vertically
Voids	Air or gas that has been trapped and cured into a laminate
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power
Woven Fabric	A material constructed by interlacing fiber to form a fabric pattern
Wrinkle (aluminum blade)	A wavy appearance caused by high and low material displacement
Wrinkle (composite blade)	Overlap or fold within the material

13. Abbreviations (Rev. 2)

Abbreviation	Term
AD	Airworthiness Directives
AMM	Aircraft Maintenance Manual
AOG	Aircraft on Ground
AR	As Required
ATA	Air Transport Association
CSU	Constant Speed Unit
FAA	Federal Aviation Administration
FH	Flight Hour
FM	Flight Manual
FMS	Flight Manual Supplement
Ft-Lb	Foot-Pound
HMI	Human Machine Interface
ICA	Instructions for Continued Airworthiness
ID	Inside Diameter
In-Lb	Inch-Pound
IPL	Illustrated Parts List
IPS	Inches Per Second
kPa	Kilopascals
Lb(s)	Pound(s)
Max.	Maximum
Min.	Minimum
MIL-X-XXX	Military Specification
MPI	Major Periodic Inspection (Overhaul)
MS	Military Standard
MSDS	Material Safety Data Sheet

Abbreviation	Term
N	Newtons
N/A	Not Applicable
NAS	National Aerospace Standards
NASM	National Aerospace Standards, Military
NDT	Nondestructive Testing
NIST	National Institute of Standards and Technology
N•m	Newton-Meters
OD	Outside Diameter
OPT	Optional
PC	Production Certificate
PCP	Propeller Critical Part
PLC	Programmable Logic Controller
PMB	Plastic Media Blasting (Cleaning)
POH	Pilot's Operating Handbook
PSI	Pounds per Square Inch
RF	Reference
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
STC	Supplemental Type Certificate
TBO	Time Between Overhaul
TC	Type Certificate
TSI	Time Since Inspection
TSN	Time Since New
TSO	Time Since Overhaul
UID	Unique Identification
WIG	Wing-In-Ground-Effect

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DESCRIPTION AND OPERATION - CONTENTS

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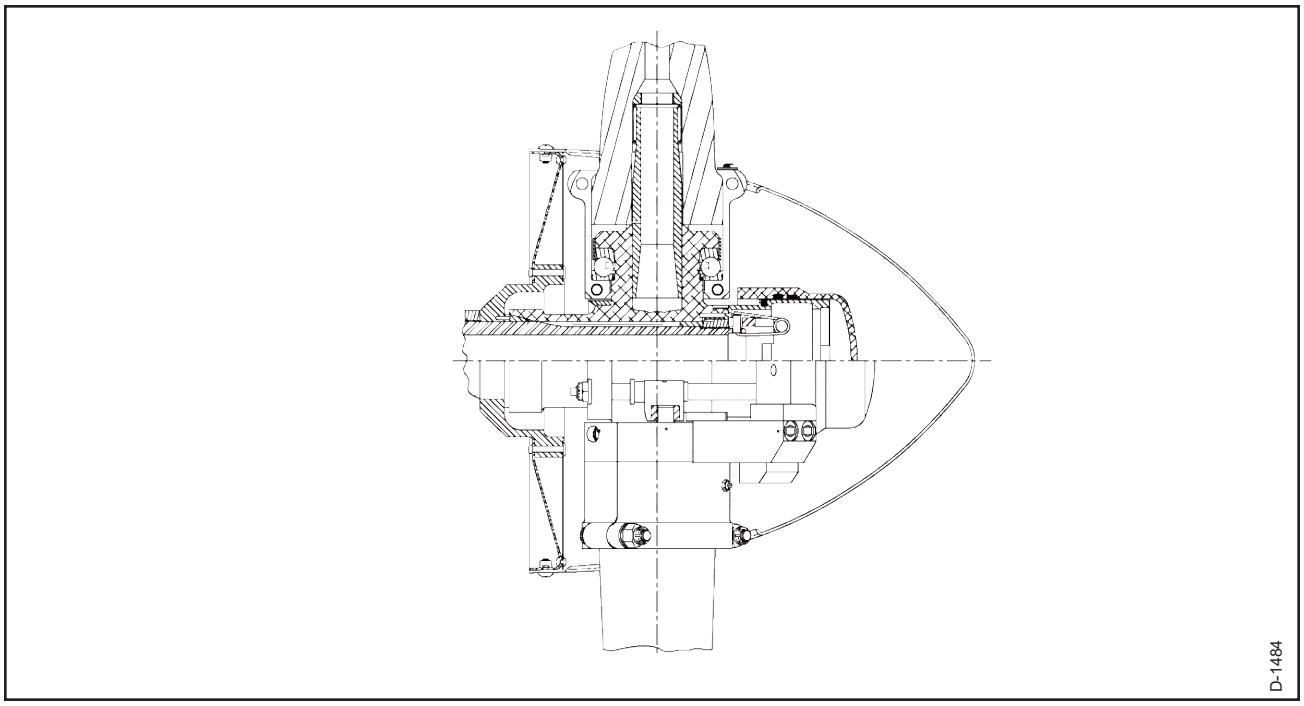
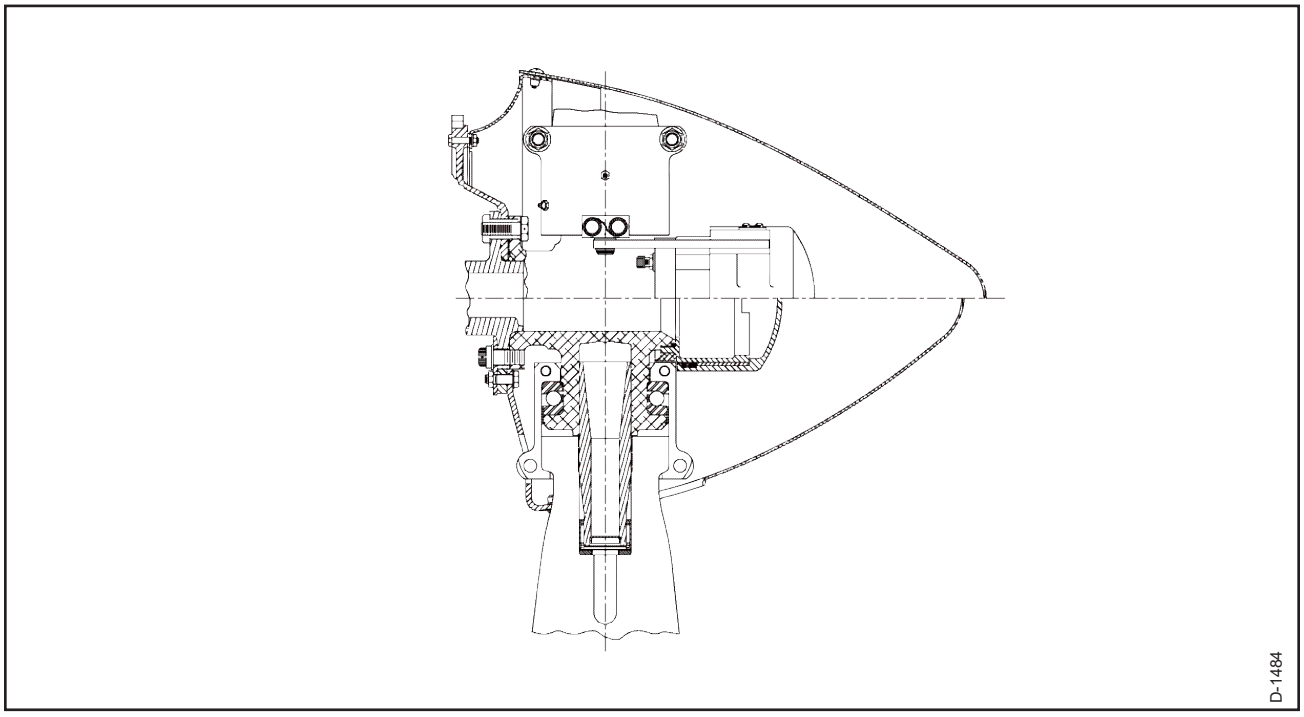


Constant Speed Counterweighted, Non-Feathering Propeller
Figure 1



Constant Speed Non-Counterweighted, Non-Feathering Propeller
Figure 2

1. General (Rev. 1)

   A. Propeller/Blade Model Designation

      (1) Hartzell Propeller Inc. uses a model number designation system to identify specific propeller and blade assemblies. The propeller model number and blade model number are separated by a slash (/).

         (a) Example: *propeller model number / blade model number*.

      (2) The propeller model number is impression stamped on the propeller hub.

         (a) For additional information about the propeller model number designation system, refer to the applicable Hartzell Propeller Inc. owner's manual.

      (3) The blade model number is impression stamped on the butt end of the blade, and also identified by a label on the cylinder.

         (a) For additional information about the model number designation system for composite blades, refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

         (b) For additional information about the model number designation system for aluminum blades, refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

2. Operation

   A. Constant Speed, Non-feathering with Counterweights

      (1) The -1 steel hub models included in this manual are constant speed, non-feathering, counterweighted propellers.

      (2) Constant speed, non-feathering assemblies with counterweights use oil pressure to decrease blade angle, and centrifugal force on counterweights to increase blade angle.

      (3) RPM is controlled by the governor's on-speed setting. When engine speed drops below this setting, the force of the speeder spring overcomes the governor flyweights. The flyweights tilt in and lower the pilot valve. This allows governor oil to actuate the piston. Piston movement decreases blade angle and allows the engine to return to the on-speed setting.

      (4) When engine speed exceeds the RPM of the governor's on-speed setting, the force of the governor flyweights overcome the speeder spring. The governor flyweights tilt out and raise the pilot valve. The pilot valve opens the propeller oil drain. Centrifugal force on the counterweights pushes oil out of the propeller. This increases blade angle and allows the engine to return to the on-speed setting.

B. Constant Speed, Non-feathering without Counterweights

(1) The -4 and -6 steel hub models included in this manual are constant speed, non-feathering, non-counterweighted propellers.

(2) Constant speed non-feathering assemblies without counterweights use oil pressure to increase the blade angle. The centrifugal twisting moment of the blades decreases the blade angle.

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TESTING AND FAULT ISOLATION - CONTENTS

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1. Troubleshooting Guide (Rev. 1)

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

The purpose of this chapter is to help isolate probable causes and suggest remedies for common propeller service problems. In all cases, the remedy for a problem should follow the procedures detailed in the applicable section of this manual.

	Problem	Probable Cause	Remedy
A.	Propeller actuates slowly or fails to actuate	Air is trapped in the piston unit (30) or in the engine shaft.	Before each flight, cycle the propeller three times to purge trapped air from the propeller.
		Lack of split race (920, 930) lubrication.	Add approved grease to blade clamp lubrication fittings in accordance with the Propeller Lubrication chapter of Hartzell Propeller Inc. Standard Practices 202A (61-01-02).
		Insufficient clearance between various moving parts in the pitch change mechanism.	Examine moving parts individually for interference and establish the correct clearances in accordance with this manual. Isolate the friction in each blade by disconnecting the link arm (280) from the piston unit (30) and rotating each blade individually before disassembling the propeller.
		Excessive friction in the piston unit (30) due to the plastic bushing (50) scraping against the wall of cylinder (320).	Inspect the inside diameter of the plastic bushing. Refer to the Check chapter of this manual.
			Inspect the plastic bushing (50). Refer to the Check chapter of this manual. If necessary, follow the replacement procedure in the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
			Inspect the outside diameter of the cylinder (320). Refer to the Check chapter of this manual. Replace the cylinder if necessary.
			For cylinder (320) repair and rechroming procedures, refer to the Hard Chromium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
		Bearing balls (990) in the split race (920, 930) are unusually rough, corroded, or chipped.	Replace the split race assembly in accordance with the Assembly chapter of this manual.
		The wire ring retainer (900) is wedged under the inboard split race (920).	Replace the wire ring retainer in accordance with the Assembly chapter of this manual.

	Problem	Probable Cause	Remedy
A.	Propeller actuates slowly or fails to actuate, continued.	The pilot tube (370) has slipped out slightly and is rubbing hard against the end of the cavity in the blade.	Inspect each pilot tube for wear and to ensure that the pilot tube extends the correct distance from the hub arm. Inspect in accordance with the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices 202A (61-01-02).
		Oil passages are blocked.	Inspect the hydraulic system to ensure that the oil passages are clear.
		Excessive friction in moving parts.	Refer to Symptom A, "Propeller Actuates Slowly or Fails to Actuate".
B.	Surging RPM or Torque	Air is trapped in the piston unit (30) or in the engine shaft.	The engine should have provisions for permitting trapped air to escape from the system during one-half of the pitch cycle. Before each flight, cycle the propeller three times to purge trapped air from the propeller.
		Excessive friction in moving parts.	Refer to Symptom A, "Propeller Actuates Slowly or Fails to Actuate".
C.	Oil leakage	Defective propeller mounting O-ring.	Replace the O-ring in accordance with the Assembly chapter of this manual.
		Piston dust seal (90) is displaced.	Replace the piston dust seal in accordance with the Assembly chapter of this manual.
		Defective O-ring (100) seal between the piston unit (30) and the cylinder (320).	Replace the O-ring in accordance with the Assembly chapter of this manual. Replace the cylinder if the surface of the cylinder is scratched or gouged in the area where the O-ring slides.
		Faulty O-ring (530) on the pitch change rod (730).	Replace the O-ring in accordance with the Assembly chapter of this manual.
		Defective O-ring (330) seal between the hub (360) and the cylinder (320).	Replace the O-ring in accordance with the Assembly chapter of this manual.

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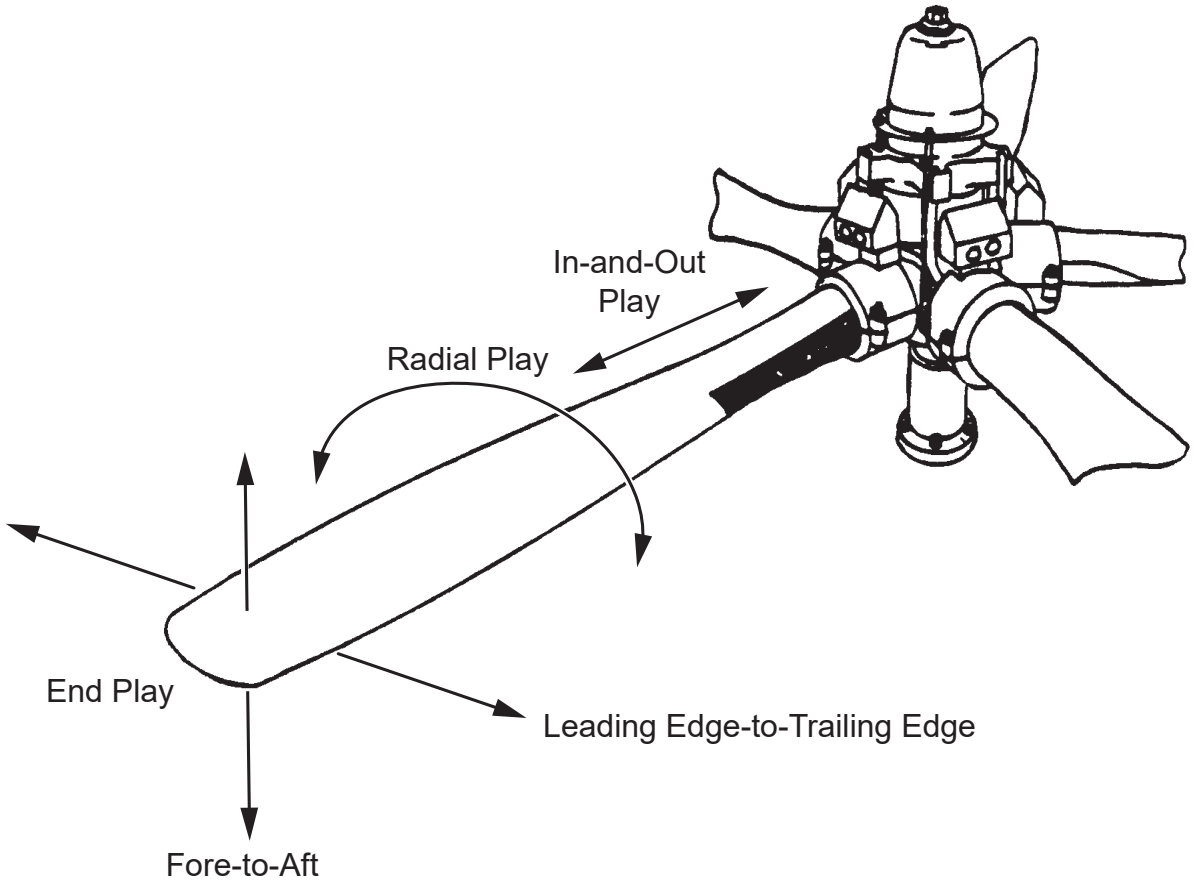
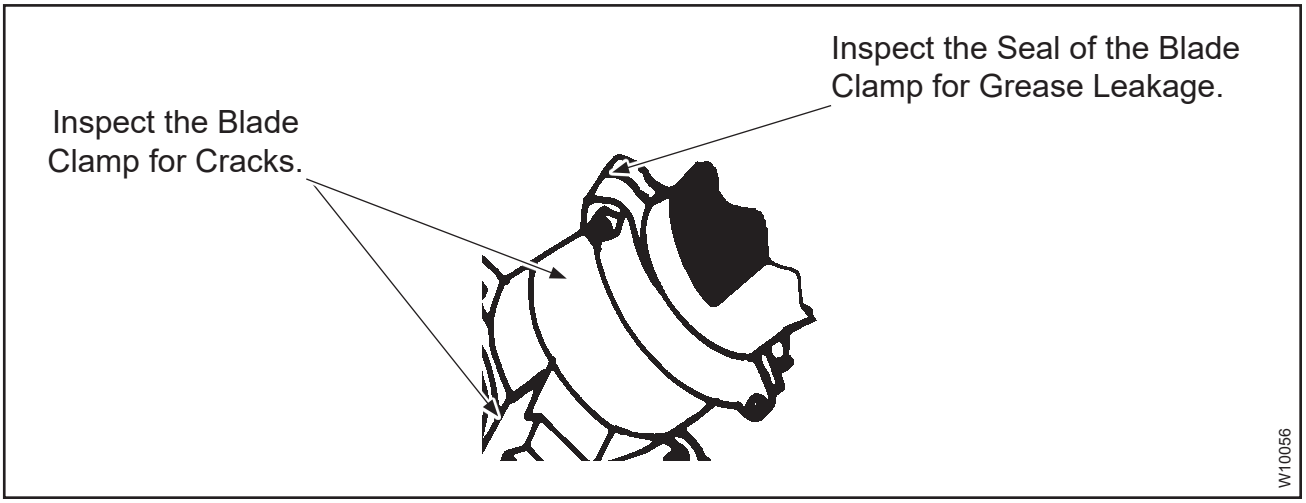


Checking Blade Play
Figure 1-1

	Problem	Probable Cause	Remedy
D.	Grease leakage NOTE: The blade clamp/ split race is the only source for grease leakage.	Damaged lubrication fitting cap (1380).	Replace the lubrication fitting cap.
		Loose lubrication fitting (1390).	Secure the lubrication fitting in accordance with the Assembly chapter of this manual.
		Defective lubrication fitting (1390).	Replace defective lubrication fittings.
		Grease leaks past the clamp gasket(s) (1300).	Loosen the blade clamp bolts and replace the clamp gasket(s), silicone sealant CM93, and gasket compound CM46.
		Grease is leaking from between the blade and the blade clamp (1340).	Remove and clean the blade and the blade clamp. Add approved gasket compound CM46 in the radius of the blade. Reassemble the blade and the blade clamp in accordance with the Assembly chapter of this manual.
		No silicone sealant CM93 on the blade clamp (1340) radius of the split race-to-blade clamp interface.	Remove the blade and the blade clamp. Add approved sealant CM93 in the radius of the blade clamp. Reassemble the blade and the blade clamp in accordance with the Assembly chapter of this manual.
E.	End Play, Leading Edge-to-Trailing Edge Refer to Figure 1-1.	Pilot tube (370) is worn or split race is worn.	Refer to the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual for blade play limits. Inspect the pilot tube (370) and split race for wear or damage, and replace as necessary.
F.	End Play, Fore-to-Aft Refer to Figure 1-1.	Pilot tube (370) is worn.	Refer to the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual for blade play limits.
G.	In-and-Out play Refer to Figure 1-1.	Build-up of wear or repair tolerances.	Refer to the section, "Blade Tolerances" in the Fits and Clearances chapter of this manual for blade play limits. With grease and split races (920, 930) in the blade clamps (1340), in-and-out play in the blades is **not** permitted.
H	Radial Play Refer to Figure 1-1.	Link arm (280) screw hole is worn.	Check the link arm in accordance with the Check chapter of this manual. Replace the link arm if the link arm screw hole is greater than serviceable limits.

	Problem	Probable Cause	Remedy
I.	Blades are not Tracking	Ground strike damage.	Refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33). Refer to the Special Inspections chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
		Pilot tube(s) (370) is bent.	Refer to the Steel Hub Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
		Blade face(s) is out of alignment.	Refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33).
J.	Blade Slippage in the Blade Clamp (1340)	There is not enough clamping action.	Increase clamping action as necessary. Make sure the clamp fasteners are torqued in accordance to the Torque table in the Fits and Clearance chapter of this manual. Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).



Abnormal Vibration
Figure 1-2

	Problem	Probable Cause	Remedy
K.	Excessive Propeller Vibration. Refer to Figure 1-2.	Mass imbalance.	Balance the propeller in accordance with the Static and Dynamic Balance chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
		The link arm (280) hole is worn.	Inspect the link arm in accordance with the Check chapter of this manual. Replace the link arm if the link arm hole is greater than serviceable limits.
		Bent, cracked, or damaged blade.	For aluminum blade overhaul procedures, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33) and the Special Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).
		Blade aerodynamic imbalance due to excessive differences in blade-to-blade angles.	Perform blade-to-blade angle checks at the setup blade radius, at a blade radius six inches outboard of the setup blade radius, and at a blade radius six inches inboard of the setup blade radius. If a blade is consistently high or low at all three locations, rotate the blade in the blade clamp (1340) to minimize blade angle variance, and recheck the blade-to-blade angles.
		The link arm (280) is disconnected from the piston unit (30).	Inspect the threaded holes in the piston unit (30), safety screws (470), and the link pin unit (300) for damage. Repair damaged threads in accordance with the Standard Repairs chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02). Replace damaged components, and install the link arm in accordance with the Assembly chapter of this manual.

2. Lightning Strike on Hub or Blade (Rev. 2)

A. Before Further Flight

(1) In the event of a propeller lightning strike, an inspection is required before further flight.

(a) A lightning strike on the propeller usually leaves arcing damage on the hub or blade, as evidence of where it entered or left the propeller.

(b) Refer to the Special Inspections chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02) for lightning strike inspection criteria.

AUTOMATIC TEST REQUIREMENTS (NOT APPLICABLE) (Rev. 1)

NOTE: In accordance with ATA iSpec 2200 specification this space is reserved for automatic test requirements. Such requirements are not applicable to the Hartzell Propeller Inc. propellers included in this manual.

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DISASSEMBLY - CONTENTS

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WARNING: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

1. Important Information (Rev. 3)
   A. Removing the Propeller
      (1) Remove the propeller from the aircraft in accordance with the applicable Hartzell Propeller Inc. owner's manual.
   B. Record Serial Numbers/Blade Location Before Disassembly
      (1) Make a record of the serial number and model number of the hub, blades, and any other serial-numbered parts and compare with the data in the propeller logbook.
         (a) For the location of the serial number on the hub, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

      CAUTION 1: DO NOT ETCH, SCRIBE, PUNCH MARK, OR SIMILARLY IDENTIFY PARTS IN ANY MANNER THAT MAY BE HARMFUL TO THE STRENGTH OR FUNCTION OF THE PROPELLER.

      CAUTION 2: GRAPHITE ("LEAD") PENCIL MARKS WILL CAUSE CORROSION. ALL MARKS MADE ON PARTS MUST BE MADE WITH A CRAYON OR SOFT, NON-GRAPHITE PENCIL SUCH AS CM162.

      (2) Before disassembly, use a crayon or soft, non-graphite pencil such as CM162 to number the blades counterclockwise from the propeller serial number impression stamped on the propeller hub unit.
         (a) Make a record of each blade serial number and the hub socket/arm from which it was removed.
   C. Ice Protection System (if applicable)
      (1) If the propeller is equipped with an ice protection system supplied by Hartzell, refer to Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80) for technical information about the applicable ice protection system.
      (2) If the propeller is equipped with an ice protection system not supplied by Hartzell Propeller Inc., refer to the applicable TC or STC holder’s Instructions for Continued Airworthiness (ICA) for technical information about the applicable ice protection system..

WARNING: THE USE OF BLADE PADDLES TO MOVE BLADES CAN RESULT IN THE OVERLOAD AND DAMAGE OF THE BLADE PITCH CHANGE MECHANISM. THIS DAMAGE IS NOT REPAIRABLE AND CAN RESULT IN SEPARATION BETWEEN THE BLADE AND THE PITCH CHANGE MECHANISM, CAUSING LOSS OF PITCH CONTROL DURING FLIGHT.

CAUTION 1: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

CAUTION 2: USE COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN TO ACTUATE THE PROPELLERS.

CAUTION 3: DO NOT USE MORE THAN 175 PSI (12.06 BARS) OF PRESSURE WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 4: USE SUFFICIENT PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

2. Propeller Disassembly

A. Disassembly of Flanged-Hub Models: -1 and -6 Series

(1) Piston Disassembly

CAUTION: DO NOT APPLY PRESSURE TO THE PROPELLER WHEN REMOVING THE PISTON RETENTION NUTS.

(a) Remove and discard each set screw (130) from each fork (140).

(b) Remove and discard each nut (180) and washer (190) from the pitch change guide rod (70).

(c) Remove each fork (140), guide rod sleeve (110), and pitch stop spacer (120) from the pitch change guide rod (70).

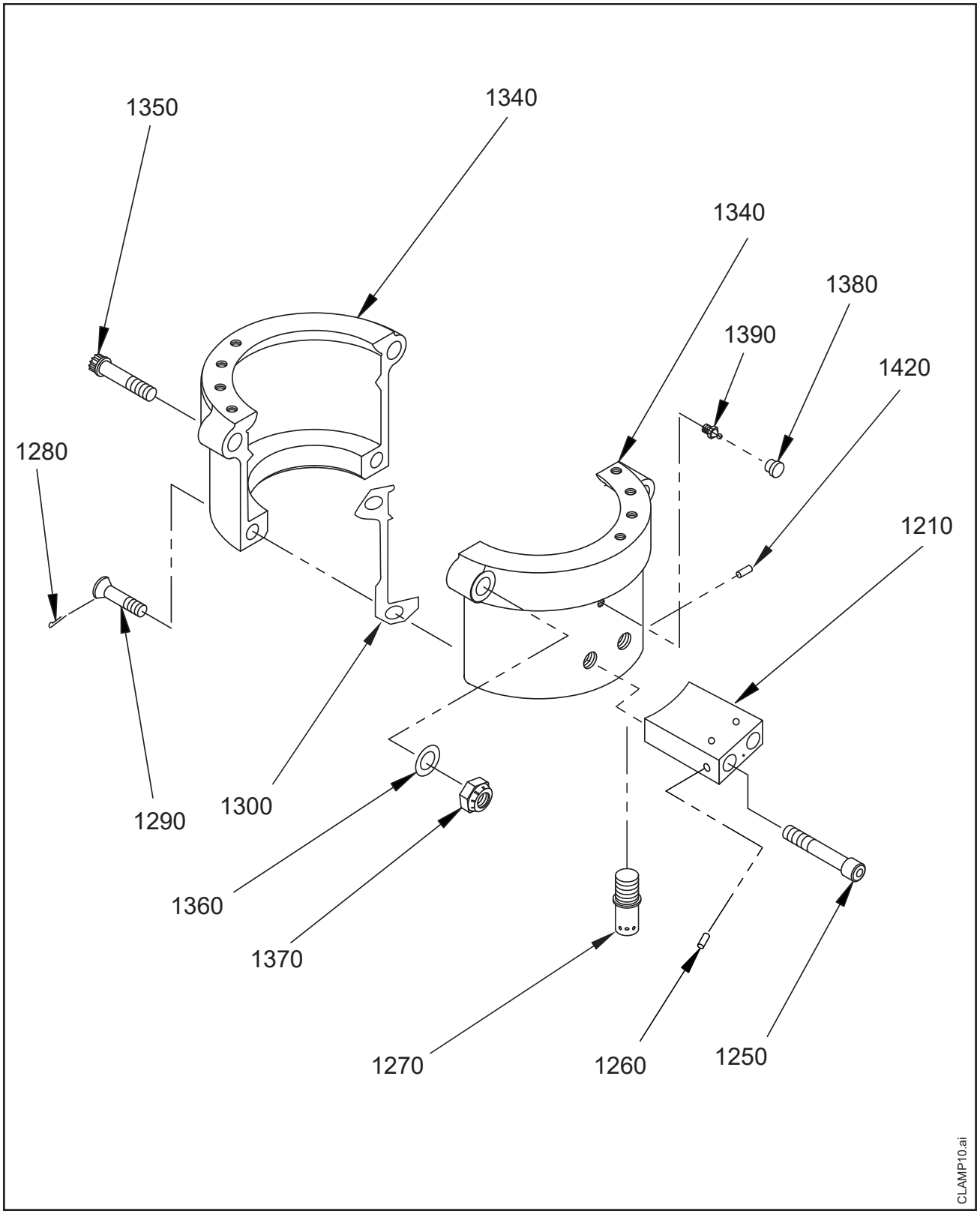
(d) Remove the piston (30) and discard the O-ring (100) from the inside diameter of the piston unit.

(2) Cylinder Removal

(a) Use a bar of appropriate size to fit into the slot in the top of the cylinder (320) to serve as a wrench to slowly unscrew the cylinder from the hub unit (360).

NOTE: There may be some "drag" caused by the O-ring (330).

(b) Remove and discard the O-ring (330).



Clamp Assembly
Figure 3-1

(3) Clamp Disassembly

(a) Remove each balance weight (480) and screw (470). Discard the screws.

(b) Use a round bottom metal stamp or electric pencil to identify the clamp serial number on each corresponding counterweight, if applicable.

(c) Remove and discard each outboard blade clamp bolt (1350), washer (1360), and nut (1370). Refer to Figure 3-1.

(d) Remove and discard the cotter pin (1280) or safety wire securing the inboard blade clamp screw (1290).

(e) Remove and discard the inboard blade clamp screw (1290).

(f) Remove each blade clamp half (1340) from the hub arm.

(g) Remove and discard the pitch change block (170).

(h) Remove and discard each clamp gasket (1300).

(i) Remove and discard each lubrication fitting (1390) and each lubrication fitting cap (1380).

(j) Remove and discard all counterweight slug mounting bolts if applicable. Remove the counterweight slugs.

(k) For information concerning counterweight removal and blade clamp overhaul, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(l) Remove each blade assembly from the hub unit (360).

(4) Blade Mounting Parts Disassembly

(a) Refer to the section, "Common Disassembly Procedures - All Hub Models" in this chapter.

(5) Hub Unit Disassembly

(a) Remove and discard each socket head cap screw (1050) from the guide collar unit (1030) located between the blade arms and hub flange.

(b) Using a punch, drive the dowel pin (1060) away from the guide collar.

(c) Remove the guide collar unit (1030) from the hub unit (360).

(d) Remove the dowel pin (1060).

(e) For hub inspection and overhaul instructions, refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

B. Disassembly of Flanged-Hub Models: -4 Series

(1) Piston Disassembly

(a) Put the propeller assembly on the rotatable fixture of a propeller assembly table.

CAUTION: DO NOT APPLY PRESSURE TO THE PROPELLER WHEN REMOVING THE PISTON (30).

(b) Remove and discard each link pin screw (470) from the piston (30).

(c) Remove and discard each link pin unit (300) from the piston (30).

(d) Remove each link arm (280) from the piston (30).

(e) Remove and discard each socket head cap screw (150), thin nut (180), and washer (190), from the end of each pitch change guide rod (70) as applicable.

(f) Slide the piston (30) off the cylinder (320).

(g) Remove and discard the piston dust seal (90) from the inside diameter of the piston (30).

(h) Remove and discard the O-ring (100) from the inside diameter of the piston (30).

(2) Bulkhead Removal

(a) Remove the bulkhead mounting hardware.

(b) Remove each balance weight from the bulkhead.

(3) Cylinder Removal

(a) Remove and discard each socket head cap screw (1050) from the guide collar unit (1030), if applicable.

(b) Use a bar of appropriate size to fit into the slot in the top of the cylinder (320) and serve as a wrench to slowly unscrew the cylinder from the hub unit (360).

NOTE: There may be some "drag" caused by the O-ring (330).

(c) Remove the guide collar unit (1030), from the cylinder (320), if applicable.

(d) Remove and discard the O-ring (330).

(4) Clamp Disassembly

(a) Remove each balance weight (480) and screw (470).

1 Discard the screws.

(b) Use a round bottom metal stamp or electric pencil to identify the clamp serial number on each corresponding counterweight.

(c) Remove and discard each outboard blade clamp bolt (1350), washer (1360), and lock nut (1370). Refer to Figure 3-1.

(d) Remove and discard the cotter pin (1280) or the safety wire securing the inboard blade clamp screw (1290).

(e) Remove and discard each inboard blade clamp screw (1290).

(f) Remove each blade clamp half (1340) from the hub arm.

(g) Remove and discard each clamp gasket (1300).

(h) Remove and discard each lubrication fitting (1390) and each lubrication fitting cap (1380).

(i) Remove and discard all counterweight slug mounting bolts, if applicable.

(j) Remove the counterweight slugs.

(k) For information concerning counterweight removal and blade clamp overhaul, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(l) Remove each blade assembly from the hub unit (360).

(5) Blade Mounting Parts Disassembly

(a) Refer to the section, "Common Disassembly Procedures - All Hub Models" in this chapter.

(6) Hub Unit Disassembly

(a) For hub inspection and overhaul instructions, refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

C. Disassembly of Splined-Hub, Models: -1 Series [Except HA-A2(MV,V)20-1B]

(1) Piston Disassembly

CAUTION: DO NOT APPLY PRESSURE TO THE PROPELLER WHEN REMOVING THE PISTON RETENTION NUTS.

(a) Remove and discard each set screw (130) from each fork (140).

(b) Remove each nut (180) and washer (190) from the pitch change guide rod (70).

(c) Remove each fork (140), guide rod sleeve (110), and pitch stop spacer (120) from the pitch change guide rod (70).

(d) Remove the piston (30) and discard the O-ring (100) and piston dust seal (90) from the inside diameter of the piston.

(2) Cylinder Removal

(a) Use a bar of appropriate size to fit into the slot in the top of the cylinder (320) and serve as a wrench to slowly unscrew the cylinder from the hub unit (360).

NOTE: There may be some "drag" caused by the O-ring (330).

(b) Remove and discard the cylinder O-ring (330).

(3) Clamp Disassembly

(a) Remove each balance weight (480) and screw (470). Discard the screws.

(b) Use a round bottom metal stamp or electric pencil to identify the clamp serial number on each corresponding counterweight.

(c) Remove and discard each outboard blade clamp bolt (1350), washer (1360), and nut (1370). Refer to Figure 3-1.

(d) Remove and discard the cotter pin (1280) or safety wire securing the inboard blade clamp screw (1290).

(e) Remove and discard the inboard blade clamp screw (1290).

(f) Remove each blade clamp half (1340) from the hub arm.

(g) Remove and discard each clamp gasket (1300) and the pitch change block (170).

(h) Remove and discard each lubrication fitting (1390) and each lubrication fitting cap (1380).

(i) Remove and discard all counterweight slug mounting bolts if applicable. Remove the counterweight slugs.

(j) For information concerning counterweight removal and blade clamp overhaul, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(k) Remove each blade assembly from the hub unit (360).

(4) Blade Mounting Parts Disassembly

(a) Refer to the section, "Common Disassembly Procedures - All Hub Models" in this chapter.

(5) Hub Unit Disassembly

(a) Remove and discard each socket head cap screw (1050) from the guide collar unit (1030) located between the blade arms and hub flange.

(b) Remove the guide collar unit (1030) from the hub unit (360).

(c) For hub inspection and overhaul instructions, refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

D. Disassembly of Splined-Hub Models: HA-A2(MV,V)20-1B

(1) Disassembling Pitch Adjustment Assembly

(a) Remove the pitch change rod (730) from the pitch adjustment assembly (690).

(b) Remove and discard the lock nut (740) from the sleeve nut (750).

(c) Loosen and remove the set screw (770).

(d) Remove and discard the sleeve nut (750) from the retainer cup (760).

(2) Clamp Disassembly

(a) Remove each balance weight (480) and screw (470).

1 Discard the screws.

(b) Use a round bottom metal stamp or electric pencil to identify the clamp serial number on each corresponding counterweight.

(c) Remove and discard each outboard blade clamp bolt (1350), washer (1360), and nut (1370). Refer to Figure 3-1.

(d) Remove and discard the cotter pin (1280) or safety wire securing the inboard blade clamp screw (1290).

(e) Remove each blade clamp half (1340) from the hub arm.

(f) Remove each cotter pin (1280) from the linkscrew (1270).

1 Discard the cotter pin (1280).

(g) Remove each link arm (280).

(h) Remove and discard each linkscrew sleeve (290).

(i) Remove and discard each clamp gasket (1300).

(j) Remove and discard each lubrication fitting (1390) and each lubrication fitting cap (1380).

(k) Remove and discard all set screws (1250).

(l) For information concerning blade clamp overhaul, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(m) Remove each blade assembly from the hub unit (360).

(3) Blade Mounting Parts Disassembly

(a) Refer to the section, "Common Disassembly Procedures - All Hub Models" in this chapter.

(4) Cylinder Removal

(a) Use a bar of appropriate size to fit into the slot in the top of the cylinder (320) and serve as a wrench to slowly unscrew the cylinder from the hub unit (360).

NOTE: There may be some "drag" caused by the O-ring (330).

(b) Remove and discard the O-ring (330).

(5) Hub Unit Disassembly

(a) For hub inspection and overhaul instructions, refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

E. Disassembly of Splined-Hub Models: HC-A2(MV,V)20-4A1

(1) Piston Disassembly

(a) Remove and discard the piston dust seal (90) from the inside diameter of the piston (30).

(b) Remove and discard the O-ring (100) from the inside diameter of the piston (30).

(2) Cylinder Removal

(a) Put the propeller assembly on the rotatable fixture of a propeller assembly table.

(b) Use a bar of appropriate size to fit into the slot in the top of the cylinder (320) to serve as a wrench. Slowly unscrew the cylinder from the hub unit (360).

(c) Remove and discard the O-ring (330).

(d) Remove the shaft nut (550) and puller ring (540).

(e) Remove the seal housing (490) and puller ring (540).

(f) Remove and discard the O-ring (210).

(3) Guide Collar and Bulkhead Removal

(a) Remove the bulkhead mounting hardware. Lower the bulkhead to the assembly table.

(b) If applicable, use a round bottom stamp and mark the guide collar to indicate blade sequence.

(c) Remove and discard the guide collar unit hex head bolts (1050).

(d) Remove the guide collar unit (1030) from the base of the hub (360).

(4) Clamp Disassembly

(a) Use a round bottom metal stamp or electric pencil to identify the clamp serial number on each corresponding counterweight.

(b) Remove and discard each outboard blade clamp bolt (1350), washer (1360), and lock nut (1370). Refer to Figure 3-1.

(c) Remove and discard the cotter pin (1280) or the safety wire securing the inboard blade clamp screw (1290).

(d) Remove and discard the inboard blade clamp screw (1290).

(e) Remove each blade clamp half (1340) from the hub arm.

(f) Remove each cotter pin (1280) from the linkscrew (1270).

1 Discard the cotter pin.

(g) Remove and discard each linkscrew (1270) and linkscrew sleeve (290).

(h) Remove and discard each clamp gasket (1300).

(i) Remove and discard each lubrication fitting (1390) and each lubrication fitting cap (1380).

(j) Remove and discard all counterweight slug mounting bolts if applicable.

(k) Remove the counterweight slugs.

(l) For information concerning counterweight removal and blade clamp overhaul, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(m) Remove each blade assembly from the hub unit (360).

(5) Blade Mounting Parts Disassembly

(a) Refer to the section, "Common Disassembly Procedures - All Hub Models" in this chapter.

(6) Hub Unit Disassembly

(a) For hub inspection and overhaul instructions, refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(7) Oil Transfer Unit Disassembly

NOTE: The rear mounting cone (3030) and the spring pin (3040) were removed when the propeller was removed from the engine.

(a) Remove and discard the cone gasket (3050).

CAUTION: WHEN REMOVING THE BACKUP RING (3010) AND THE RING LIP SEAL (3020), DO NOT DAMAGE THE OIL TRANSFER HOUSING (4050).

(b) Remove and discard the backup ring (3010) and the ring lip seal (3020).

(c) Remove the aluminum elbow (5010) from the oil transfer housing (4050).

(d) Remove and discard the internal retaining ring (5000) that holds the oil transfer tube (4090) in place.

(e) Remove the oil transfer tube (4090) from the oil transfer housing (4050).

(f) Remove the aluminum pipe plug (4020) from the oil transfer housing (4050).

(g) Remove the compression spring (4030) from the oil transfer housing (4050).

(h) Remove the oil transfer locator button (4040) from the oil transfer housing (4050).

(i) Remove and discard the hydraulic gasket (5020) from the rear mounting cone (430).

(j) Remove the oil slinger (3060) from the oil transfer housing (4050).

(k) Remove the oil transfer ring (3080) and oil seal rings (3070, 3090) from the oil transfer collar (4000).

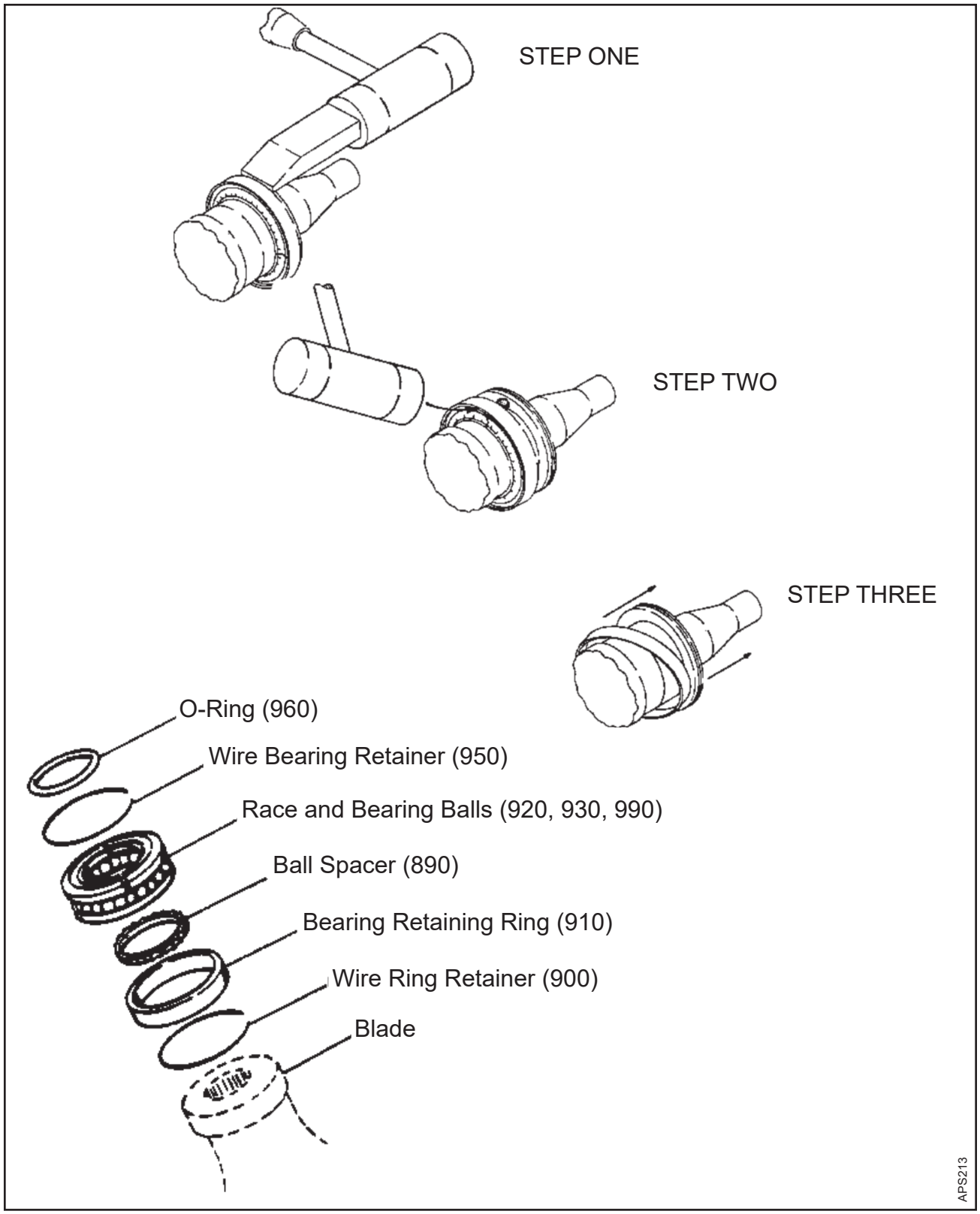
CAUTION: DO NOT STRETCH OR BEND THE SEAL RINGS (3070, 3090)WHILE REMOVING THEM FROM THE OIL TRANSFER RING (3080) GROOVE. THE SEAL RINGS ARE VERY BRITTLE AND WILL BREAK EASILY.

(l) Remove the seal rings (3070, 3090) from the oil transfer ring (3080).

(m) Remove the oil transfer collar (4000) from the oil transfer housing (4050).

(n) Remove and discard the O-ring (4010) from the oil transfer collar (4000).

(o) Remove and discard the O-ring (4010) from the oil transfer housing (4050).



Removing The Bearing Retention Ring
Figure 3-2

3. Common Disassembly Procedures - All Hub Models

   A. Blade Mounting Parts Disassembly

      CAUTION: SPLIT RACES (920, 930) ARE IN MATCHED SETS (TWO SPLIT BEARINGS IN EACH SET). DO NOT MIX RACE SETS.

      (1) Beginning with blade position number one, remove the wire ring retainer (900) from its groove in the inboard split race (920).

      (2) Remove each half of the inboard split race (920).

      (3) Remove and discard the ball spacer (890) and bearing balls (990).

      (4) Remove and discard the blade O-ring (960).

      (5) Use a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (910) to drive the bearing retaining ring inboard over the shoulder of the hub arm. Refer to Figure 3-2, Step One.

      (6) Remove and discard the wire bearing retainer (950).

      (7) Turn the halves of the outboard split race (930) so the split is at the top. Refer to Figure 3-2, Step Two.

      (8) At the split, place a bearing ball (990) between the outboard split race (930) and the inboard shoulder of the hub arm.

      (9) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (910) to dislodge the outboard split race (930) from the bearing retaining ring.

      (10) Remove each half of the split race (930) as they become separated from the bearing retaining ring (910).

      (11) Tilt the bearing retaining ring (910) approximately 45 degrees and remove the bearing retaining ring by sliding it outboard over the shoulder of the hub arm. Refer to Figure 3-2, Step Three.

      (12) Repeat steps (1) through (11) for each remaining blade.

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CLEANING - CONTENTS

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1. Cleaning Procedures (Rev. 5)

A. General Cleaning

(1) Refer to the Cleaning chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

B. Cleaning Steel Parts for Magnetic Particle Inspection

(1) Refer to the Magnetic Particle Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

C. Cleaning Steel Parts for Cadmium Replating Procedures

(1) Refer to the Cadmium Replating chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

D. Cleaning Aluminum Parts for Penetrant Inspection

(1) Refer to the Penetrant Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

E. Cleaning Titanium Parts for Penetrant Inspection

(1) Refer to the Penetrant Inspection chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

F. Cleaning Aluminum Parts for Chromic Acid Anodizing Procedures

(1) Refer to the Chromic Acid Anodizing chapter of Hartzell Propeller Standard Practices Manual 202A (61-01-02).

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CHECK - CONTENTS

CHECK - CONTENTS, CONTINUED

LIST OF FIGURES

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1. Inspection Interval Requirements (Rev. 1)

   A. General

      (1) For information about life limited components and mandatory inspections, refer to the Airworthiness Limitations chapter of the applicable Hartzell Propeller Inc. owner's manual.

      (2) For overhaul periods of Hartzell Propeller Inc. propellers, refer to Hartzell Propeller Inc. Service Letter HC-SL-61-61Y.

2. Dimensional Inspection (Rev. 1)

   A. Diameter Measurements

      (1) When measuring the diameter of a part with a two point measuring instrument, take at least two measurements, unless specified differently.

         (a) Obtaining a measurement outside the specified tolerance at any point of measurement is cause for retirement of the part when a minimum of two measurements are taken.

         (b) Alternately, take eight evenly spaced measurements, unless specified differently.

            1 Obtaining a measurement outside the specified tolerance on three or more measurements is cause for retirement of the part when eight measurements are taken (two of eight measurements may be out of specified tolerance).

            2 This alternate method may not be used to accept a diameter that has obvious damage beyond repairable (serviceable) limits.

      (2) When measuring the diameter of a part with a three point measuring instrument, take one measurement. A measurement outside the specified tolerance is cause for retirement of the part.

   B. Decimal Places

      (1) Inspect the part features to the number of decimal places specified. If three decimal places are specified, inspect the part to three decimal places only.

3. Inspection Criteria/Procedures (Rev. 2)

A. Propeller Components (Except for those listed separately in this section)

(1) Refer to Table 5-1, "Component Inspection Criteria" in this chapter.

B. Hubs

(1) Aluminum hubs: Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Steel hubs: Refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

C. Blades

(1) Aluminum blades: Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

(2) Composite blades: Refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

D. Blade Clamps

(1) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

E. Ice Protection Systems

(1) For ice protection systems supplied by Hartzell, refer to Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(2) For ice protection systems not supplied by Hartzell, refer to the applicable TC or STC holder’s Instructions for Continued Airworthiness (ICA).

F. Spinner Assemblies

(1) Metal Spinners: Refer to Hartzell Propeller Inc. Metal Spinner Maintenance Manual 127 (61-16-27).

(2) Composite Spinners: Refer to Hartzell Propeller Inc. Composite Spinner Maintenance Manual 148 (61-16-48)

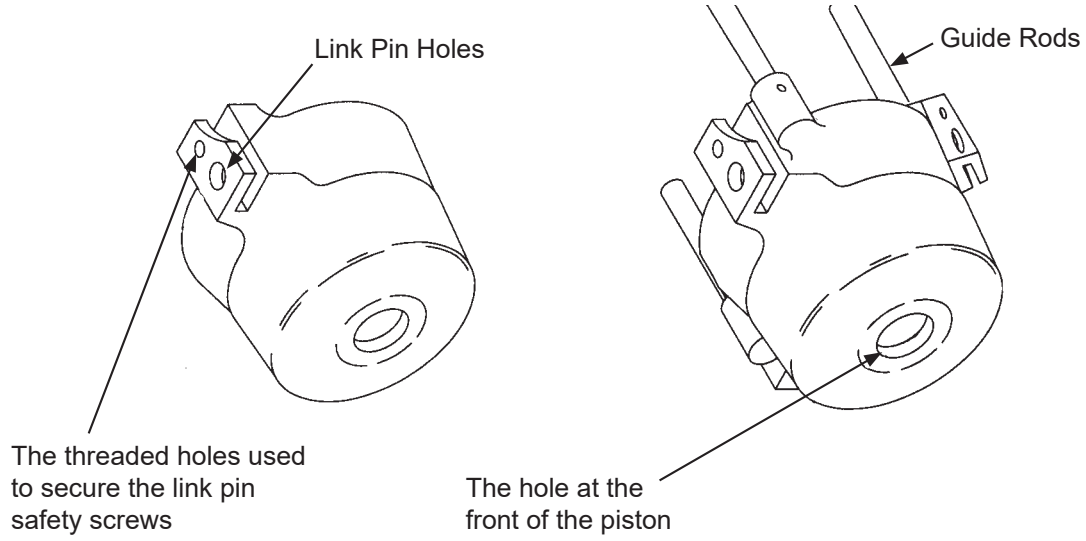
G. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

(1) Refer to the Special Inspections chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

4. Propeller Component Checks

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

Refer to Table 5-1, "Component Inspection Criteria" in this chapter.



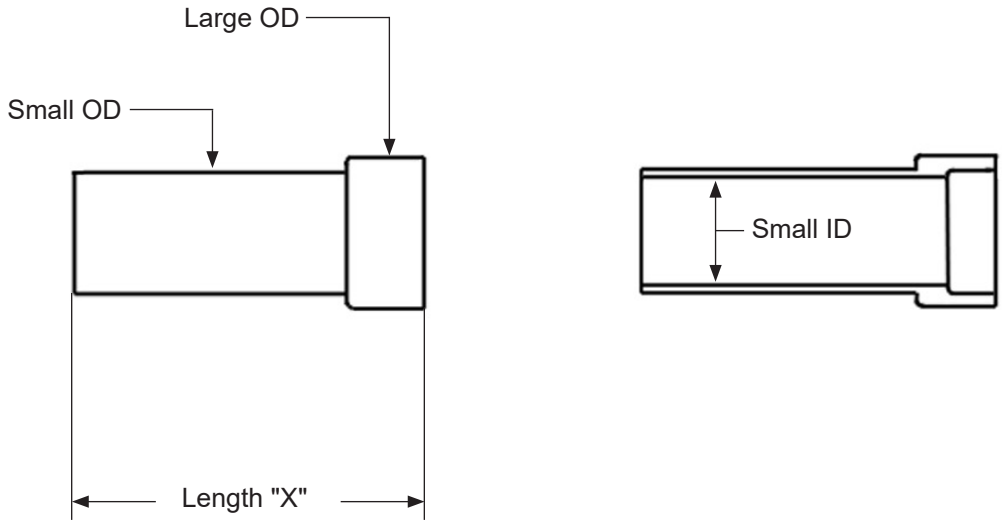
Piston Inspection
Figure 5-1

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
A. Piston Unit (30) Refer to Figure 5-1.		
(1) Visually examine the threaded holes that are used to secure the link pin safety screws.	Adequate threads must be present to hold the safety screw in place. Three full threads are required.	Make sure the correct safety screw is installed. A short screw used with short threads can result in the link pin disconnecting from the piston. Repair a damaged threaded hole in accordance the Standard Repairs chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(2) Penetrant inspect the piston unit in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	Indications are not permitted.	If there is an indication, replace the piston.
(3) Visually examine the hole at the front of the piston unit for wear or damage caused by inserting or removing the piston unit from the pitch change guide rod.	There are no dimensional limits. Wear or damage must not interfere with the ability of the O-ring to seal.	If there is wear that interferes with the ability of the O-ring to seal, replace the piston unit.
(4) Measure the plastic bushing (50) for wear.	The maximum wear limit for the A-862 plastic bushing ID is 3.784 inches (96.12 mm). The maximum wear limit for the A-862-2 plastic bushing ID is 4.284 inches (108.81 mm).	If the plastic bushing ID is greater than the permitted serviceable limits, replace the plastic bushing in accordance with the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
A. Piston Unit (30), continued Refer to Figure 5-1.		
(5) If installed, visually examine the pitch change guide rods (70) for damage.	Scratches are permitted. Damage from set screw (130) is permitted. Wear through the chrome plating is not permitted. A gouge is not permitted.	If there is damage to the pitch change guide rods that is greater than the permitted serviceable limits, replace the pitch change guide rod(s) in accordance with the Standard Repairs chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(6) Apply hand pressure perpendicular to the pitch change guide rod (70) centerline to make sure that each pitch change guide rod is secure in the piston unit.	The pitch change guide rod must be secure in the piston. Movement is not permitted.	If the pitch change guide rod is not secure in the piston unit, replace the pitch change guide rod(s) in accordance with the Standard Repairs chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(7) Measure the link pin unit (300) holes.	The maximum permitted diameter is 0.377 inch (9.58 mm).	If the diameter of the link pin unit hole is greater than the permitted serviceable limits, replace the piston.



Part Number	Length "X" Minimum
A-827-1	1.432
A-827-2	1.635
A-827-6	3.255

TPI-JM-000106

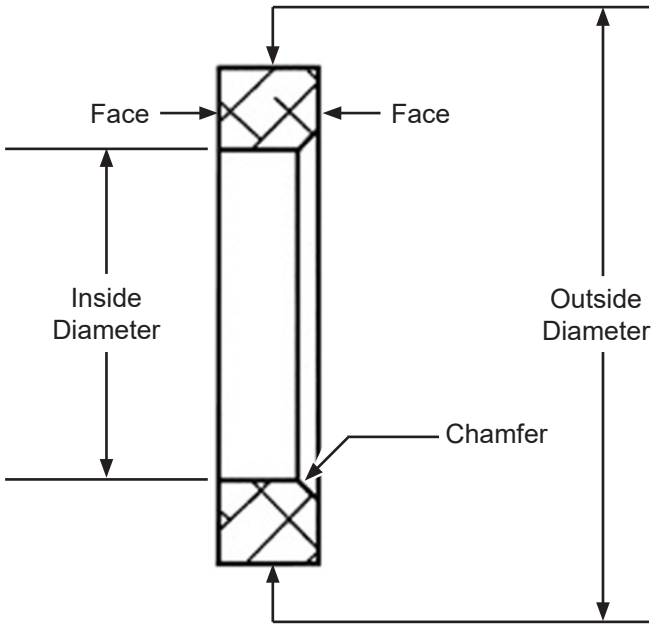
Guide Rod Sleeve
Figure 5-2

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
B. Guide Rod Sleeve (110) Refer to Figure 5-2.		
(1) Visually inspect the guide rod sleeve for corrosion and pitting.	No corrosion is permitted. Maximum permitted depth of pitting is 0.003 inch (0.08 mm). Pitting is not permitted on the small OD Total area of pitting and damage must be less than 10% of the small or large ID and less than 10% of the large OD	Remove corrosion using an abrasive pad CM47, or equivalent. If corrosion or pitting is greater than the permitted serviceable limits or corrective action limits, replace the guide rod sleeve.
(2) Visually inspect the guide rod sleeve for damage.	Maximum permitted depth of damage is 0.003 inch (0.08 mm). Damage is not permitted on the small OD Pushed-up material relative to the surrounding undamaged material is not permitted. Total area of pitting and damage must be less than 10% of the small or large ID and less than 10% of the large OD	If damage or material push-up is greater than the permitted serviceable limits, replace the guide rod sleeve.
(3) Visually inspect the small and large OD for wear through the chrome plate coverage.	Base material is not permitted to show through the chrome plate coverage.	If base material is greater than the permitted serviceable limit, replace the guide rod sleeve.
(4) Dimensionally inspect the diameter of the guide rod sleeve small OD	The small OD diameter is not permitted to be smaller than 0.4980 inch (12.650 mm) or larger than 0.5015 inch (12.738 mm)	If the small OD is greater than the permitted serviceable limits, replace the guide rod sleeve.
(5) Visually inspect the guide rod sleeve small ID for wear.	If wear is present, dimensionally inspect the ID A 0.4390 inch (11.150 mm) diameter plug gage should not pass through the part or enter more than .250 inch (6.35 mm) from either end.	If the ID is greater than the permitted serviceable limits, replace the guide rod sleeve.

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
(6) Visually inspect the guide rod sleeve length "X" for wear or damage that may shorten length "X".	Wear or damage on either end that may shorten rod sleeve length "X" is permitted on only 10% of either end. Maximum local depth of wear or damage is .010 inch (0.25 mm). The minimum length "X" for different guide rod sleeves (not including local damage) is listed in Figure 5-2.	If the guide rod sleeve length "X" is less than the permitted serviceable limits, replace the guide rod sleeve.
(7) Magnetic particle inspect the guide rod sleeve in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02). Cadmium plate does not need to be removed.	No cracks are permitted.	If cracks are greater than the permitted serviceable limits, replace the guide rod sleeve.



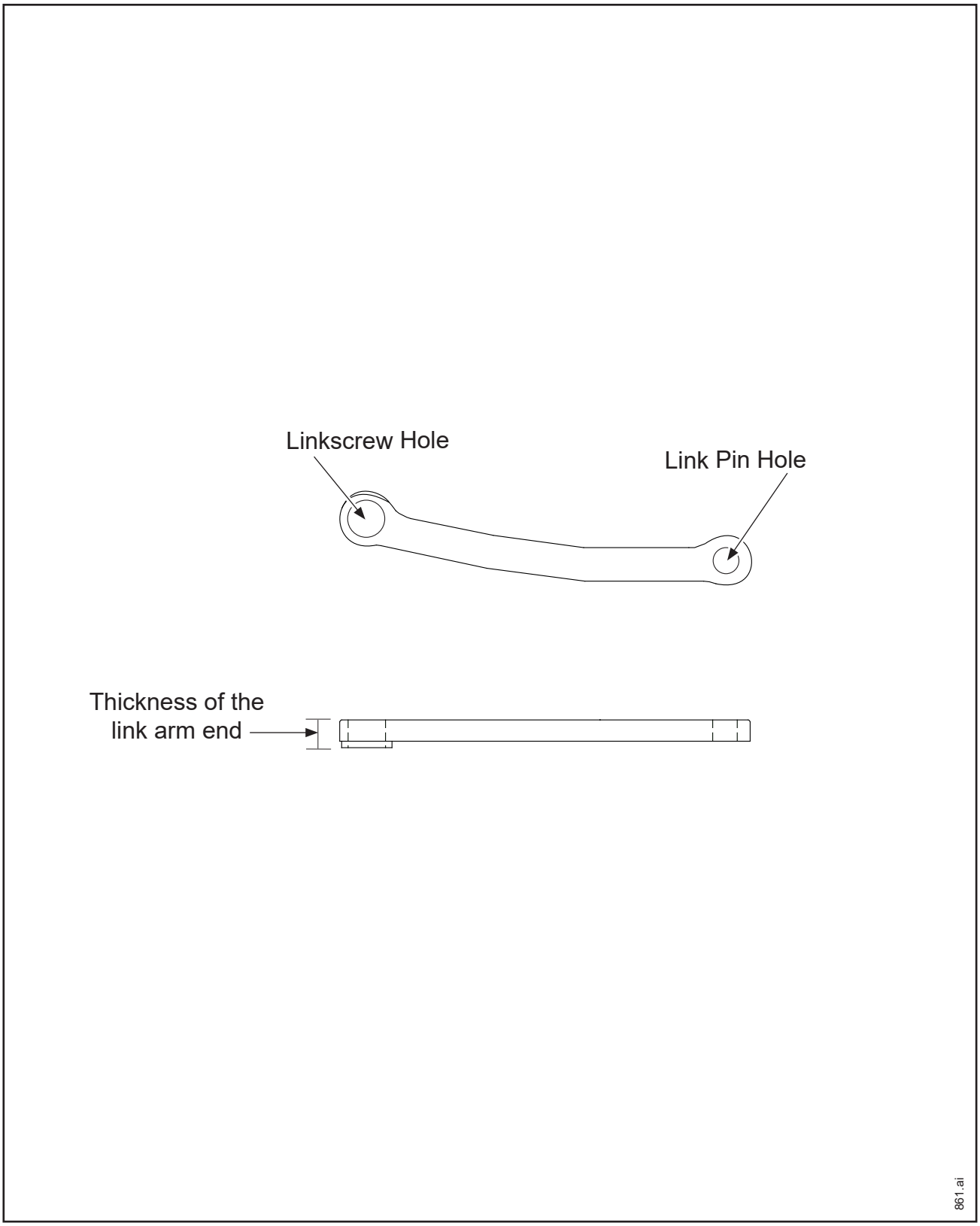
Pitch Stop Spacer Surfaces
Figure 5-3

Component Inspection Criteria

Inspect		Serviceable Limits	Corrective Action
C.	Pitch Stop Spacer (120) Refer to Figure 5-3.		
(1)	Visually examine the pitch stop spacer for corrosion product and pitting.	Corrosion is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits. On all surfaces the maximum permitted depth of pitting is 0.004 inch (0.10 mm). Total damage (which includes pitting) on each surface not to exceed 10% of that surface. Surfaces are inside diameter, outside diameter, chamfer and two faces.	Remove corrosion product using glass bead cleaning or by local polishing to a maximum depth of .005 inch (0.12 mm). Refer to the Cleaning chapter of Standard Practices Manual 202A (61-01-02). Pitting may be removed by local polishing to a maximum depth of .005 inch (0.12 mm). Repair and damage not to exceed 20% of the subject surface. If the corrosion cannot be removed within corrective action repair limits or if pitting is greater than the serviceable limits, replace the pitch stop spacer.
(2)	Visually examine the pitch stop spacer for wear, scratches, gouges or other damage.	Wear, scratches, gouges or other damage are permitted to a maximum depth of .004 inch (0.10 mm). Total damage not to exceed 10% of that surface. Surfaces are inside diameter, outside diameter, chamfer and two faces.	Wear, scratches, gouges or other damage may be removed by local polishing to a maximum depth of .005 inch (0.12 mm). Repair and damage not to exceed 20% of the subject surface. If the damage is more than the permitted serviceable limits or the corrective action repair limits replace the pitch stop spacer.
(3)	Visually examine the pitch stop spacer for cracks in white light.	If a crack is suspected then penetrant inspect the pitch stop spacer in accordance with the Penetrant Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02). A crack is not permitted.	Replace the pitch stop spacer if the serviceable limit is exceeded.
(4)	Dimensionally inspect the inside diameter of the pitch stop spacer with a pin gage if wear or damage is present.	The maximum permitted outside diameter is 0.509 inch (12.92 mm).	If wear damage exceeds the maximum permitted serviceable limit replace the pitch stop spacer.

Component Inspection Criteria

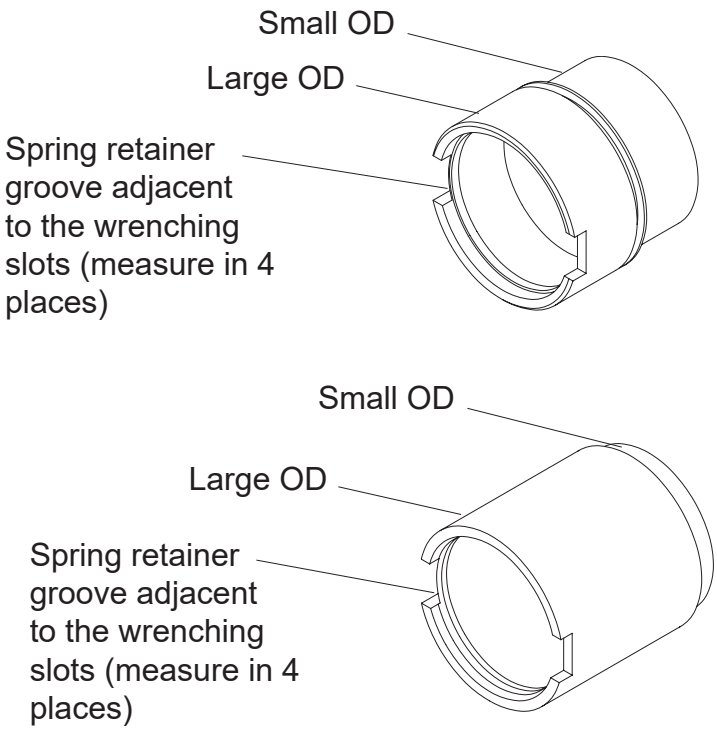
Inspect	Serviceable Limits	Corrective Action
D. Fork (140) For A-921-1 **ONLY**		
(1) Visually inspect all surfaces ,except the three faces of the fork slot, for pitting, scratches, or damage.	The maximum permitted depth of pitting or damage 0.003 inch (0.076 mm).	If pitting is greater than the serviceable limits, replace the fork.
(2) Visually inspect all fork surfaces for corrosion.	Corrosion is not permitted.	Remove light corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If light corrosion cannot be removed using glass bead cleaning, replace the fork.
(3) Visually inspect the set screw threaded hole.	One thread total accumulated damage is permitted. Damage must not interfere with installation of the set screw.	If thread damage exceeds the serviceable limits, replace the fork.
(4) Visually inspect the three faces of the fork slot for pitting and wear.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm). The maximum permitted wear depth is 0.006 inch (0.15 mm).	If pitting or wear are greater than the serviceable limits, replace the fork.
(5) Magnetic particle inspect the fork in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	Relevant indications are not permitted.	If a relevant indication cannot be removed within the permitted limits, replace the fork.



Link Arm Inspection
Figure 5-4

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
E. Link Arm (280) Refer to Figure 5-4.		
(1) Visually examine the link arm for indications of twisting or distortion.	Indications of twisting or distortion are not permitted. Flatness should be less than 0.015 inch (0.38 mm).	If there is wear, replace the link arm.
(2) Visually examine the link pin unit (300) hole and the link screw hole of each link arm.	A link pin unit hole or link screw hole must not be worn in an oblong shape.	If the link pin unit hole or the link screw hole is oblong in shape, replace the link arm.
(3) Measure the ID of the link pin unit (300) hole and the link screw hole of each link arm.	The maximum permitted ID of the link pin unit hole is 0.3785 inch (9.614 mm). The maximum permitted ID of the link screw hole is 0.5645 inch (14.338 mm).	If the link pin unit hole ID or link screw hole ID is greater than the permitted serviceable limits, replace the link arm.
(4) Measure the thickness of the link arm end adjacent to the link screw hole.	The minimum permitted thickness of the link arm is 0.400 inch (10.16 mm).	If the thickness is less than permitted, replace the link arm.
(5) Magnetic particle inspect each link arm in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A crack is not permitted.	If there is a crack, replace the link arm.
(6) Visually examine the link arm for wear to the cadmium plating.	A few random scratches and cadmium missing from corners are permitted; otherwise, cadmium plate must completely cover the link arm.	Replate and bake the link arm in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Cylinder Inspection
Figure 5-5

Part Number	Minimum Large OD	Minimum Small OD
B-854	3.773 inch (95.84 mm)	3.496 inch (88.80 mm)
B-806	3.773 inch (95.84 mm)	3.430 inch (87.13 mm)
B-806-1	3.773 inch (95.84 mm)	3.430 inch (87.13 mm)
B-1882	4.273 inch (108.54 mm)	3.596 inch (91.34 mm)

Cylinder Inspection Limits
Table 5-1

Component Inspection Criteria

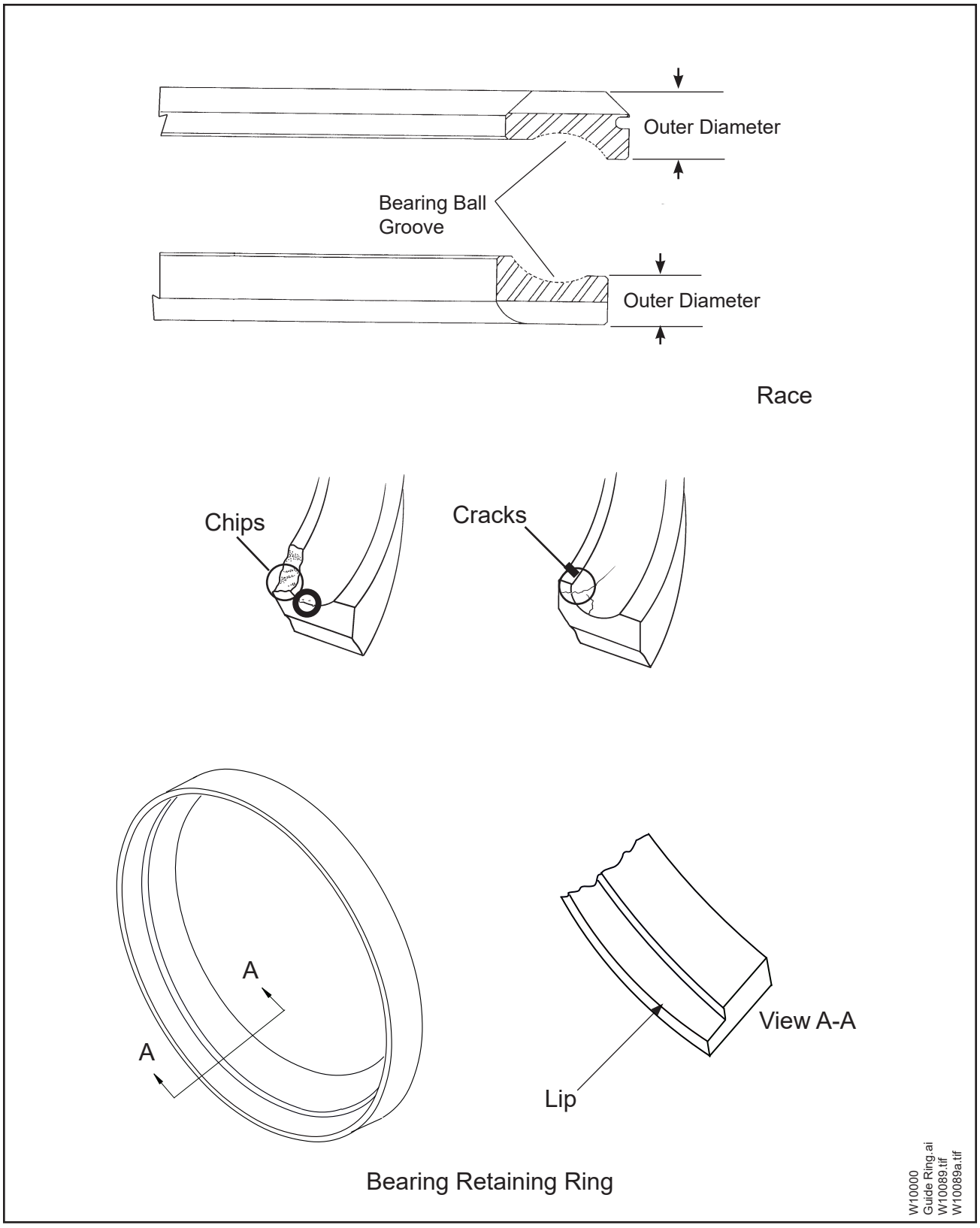
Inspect	Serviceable Limits	Corrective Action
F. Cylinder (320) Refer to Figure 5-5.		
(1) Visually examine the front spring retainer groove, adjacent to the wrenching slots for displaced material.	Displaced material must not interfere with installation of the split retainer ring.	Remove displaced material with a file.
(4) Visually examine all threaded surface on the cylinder.	One damaged thread is permitted.	If the damage is greater than the permitted serviceable limits, replace the cylinder.
(2) Visually examine the cylinder for chrome plate coverage.	Flaking of the chrome finish is not permitted. Minor wear that is within the permitted serviceable limits and random, light scratches that are not greater than the chrome depth and do not interfere with the seal of the O-ring are permitted. Otherwise, complete chrome coverage is required.	If the wear or damage is greater than the permitted serviceable limits, repair or replace the cylinder. For cylinder repair and rechroming procedures, refer to the Hard Chromium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(3) Visually examine the normal operating area of the cylinder for scratches, wear, or gouges.	The maximum permitted depth of a scratch, wear, or gouge is 0.001 inch (0.025 mm).	For cylinder repair and rechroming procedures, refer to the Hard Chromium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(6) Measure the large OD and the small OD of the cylinder.	The minimum permitted large OD is 4.998 inches (126.95 mm). The minimum permitted small OD is 4.721 inches (119.92 mm).	If the large OD or small OD of the cylinder is smaller than the permitted serviceable limits, repair or replace the cylinder. For cylinder repair and rechroming procedures, refer to the Hard Chromium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(5) Magnetic particle inspect the cylinder at each overhaul in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the cylinder.

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
G. Balance Weight (480)		
(1) Visually examine the balance weight for pitting, wear, or damage	The maximum permitted depth of pitting, wear, or damage is 0.003 inch (0.07 mm).	Polish to a maximum depth of 0.005 inch (0.12 mm). If depth of pitting, wear, or damage is deeper than the permitted serviceable limits after rework, replace the balance weight.
(2) Visually examine the balance weight for corrosion product.	Corrosion product is not permitted.	Remove corrosion using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(3) Visually examine for cadmium plating coverage.	Except for a few scratches and corners with cadmium plating missing, complete coverage is required.	If the coverage is less than the permitted serviceable limits, replate the balance weight in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
H. Hub Puller Ring (540)		
(1) Visually examine the for indications of corrosion and pitting.	Corrosion is not permitted. Maximum permitted depth of pitting is 0.003 inch (0.076 mm).	Remove corrosion in accordance with the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If pitting is greater than the serviceable limits, replace the hub puller ring.
(2) Visually examine for cadmium plate coverage.	A maximum of 10 percent of visible base metal is permitted.	Replate and bake the hub puller ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
I. Spline Shaft Nut (550)		
(1) Visually examine the spline shaft nut for indications of corrosion product.	Corrosion product is not permitted.	Remove corrosion product using glass bead cleaning in accordance with the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If corrosion product cannot be removed, replace the spline shaft nut.
(2) Visually examine the surfaces of the spline shaft nut, excluding threads, for pitting.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm). Pitting must not interfere with the engine shaft threads.	If pitting is greater than the permitted serviceable limits, replace the spline shaft nut.
(3) Visually examine the threads on the spline shaft nut for pitting.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm). Pitting must not interfere with the engine shaft threads.	If pitting is greater than the permitted serviceable limits, replace the spline shaft nut.
(4) Visually examine the threads on the spline shaft nut for damage.	1/2 of one thread total accumulated damage is permitted. Damage must not interfere with engine shaft threads.	If damage is greater than the permitted serviceable limits, replace the spline shaft nut.
(5) Visually examine the spline shaft nut for cadmium plate coverage.	A few random scratches are permitted; otherwise, cadmium plate must completely cover the spline shaft nut.	If the cadmium plate coverage is less than the permitted serviceable limits, replate and bake the spline shaft nut in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(6) Magnetic particle inspect the spline shaft nut in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the spline shaft nut.



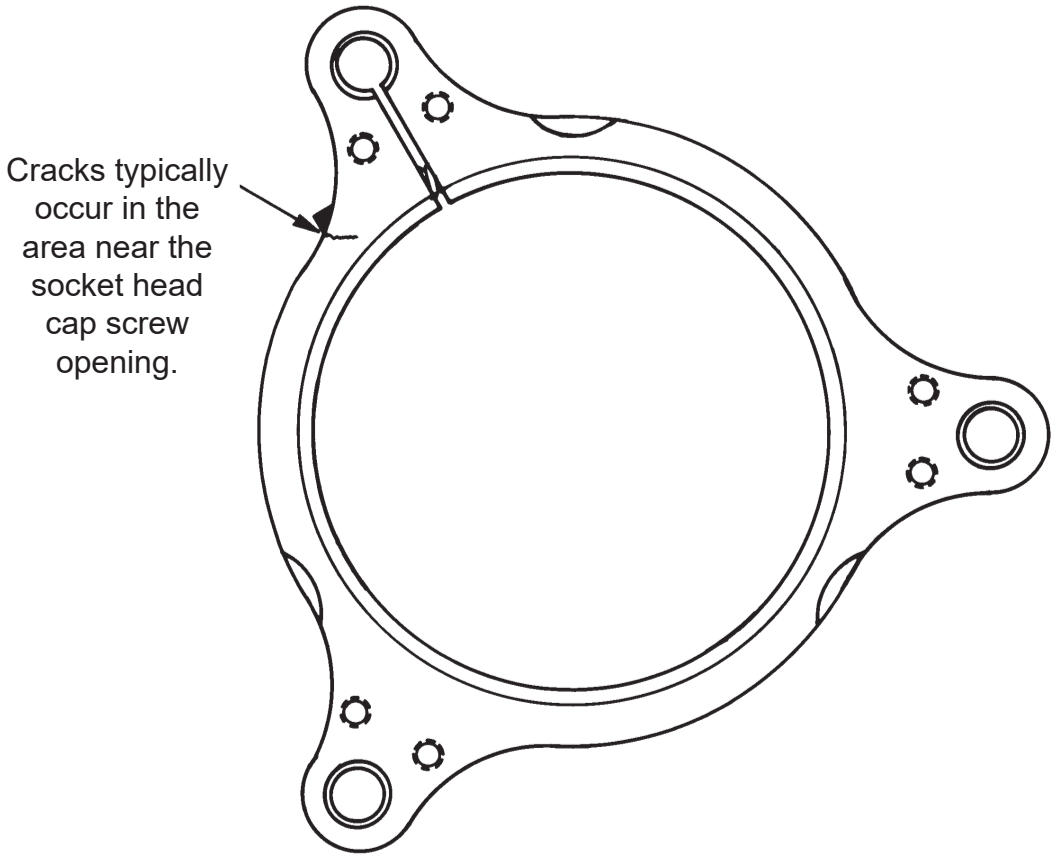
Race and Bearing Retaining Ring Inspection
Figure 5-6

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
J. Bearing Retaining Ring (910) Refer to Figure 5-6.		
(1) Visually examine the bearing retaining ring for corrosion product.	Corrosion product is not permitted. Remove corrosion product in accordance with the corrective action limits.	Remove corrosion product by using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If corrosion product cannot be removed, replace the bearing retaining ring.
(2) Visually examine the bearing retaining ring for pitting.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm). Pitting must not interfere with the ability of the bearing retaining ring to fit tight to the blade and the bearing race.	If the pitting is greater than the permitted serviceable limits, replace the bearing retaining ring.
(3) Visually examine the bearing retaining ring for wear, damage, or fretting.	The bearing retaining ring must fit tightly to the blade and the bearing race when installed over the blade and bearing race.	If wear, damage, or fretting is greater than the permitted serviceable limits, replace the bearing retaining ring.
(4) Visually examine the bearing retaining ring retention lip for damage.	Displaced material must not interfere with the wire ring retainer in the hub arm or rise above the normal OD of the bearing retaining ring. Sufficient lip must remain to ensure wire ring retainer in the hub arm groove when installed.	Displaced material may be removed with a file or a rotary grinder. Polish displaced material to a smooth finish with an abrasive pad CM47 or equivalent.
(5) Verify an interference fit with the hub blade arm.	The bearing retaining ring must fit tight on the hub blade arm. A loose fit is not permitted.	If the bearing retaining ring is loose, replace the bearing retaining ring.
(6) Visually examine the entire bearing retaining ring for cadmium plate coverage.	A few random scratches and corners with cadmium coating missing is permitted; otherwise, complete coverage is required.	If cadmium plating is less than the serviceable limits, replate the bearing retaining ring in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(7) Perform a magnetic particle inspection of the bearing retaining ring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Cadmium plating removal is not required.	A crack is not permitted.	If there is a crack, replace the bearing retaining ring.

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
K. Race (920, 930) Refer to Figure 5-6.		
(1) Visually examine the race's bearing ball groove for wear.	If the race's bearing ball (990) groove shows wear, measure it. The maximum permitted depth of damage is 0.005 inch (0.12 mm)	If the depth of damage is greater than the permitted serviceable limits, replace the race.
(2) Visually examine the races for corrosion and pitting.	Corrosion is not permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	Light corrosion may be removed with an abrasive pad CM47 or equivalent. If corrosion cannot be removed, or if pitting is greater than 0.005 inch (0.12 mm), replace the race.
(3) Visually examine the split surfaces of each race for chipping or cracks.	A chip or a crack is not permitted.	If there is a chip or a crack, replace the race.
(4) Visually examine the outer diameter of all races for fretting damage.	Fretting damage is permitted on the outer diameter of the races. Damage must not affect the tight fit with the bearing retaining ring. The bearing retaining ring must fit tightly.	Clean the damaged area with an abrasive pad CM47, or equivalent to minimize fretting damage. If the bearing retaining ring does not fit tightly, replace the race.
(5) Magnetic particle inspect in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Propeller Inc. Practices Manual 202A (61-01-02).	A crack is not permitted.	If there is a crack, replace the race.

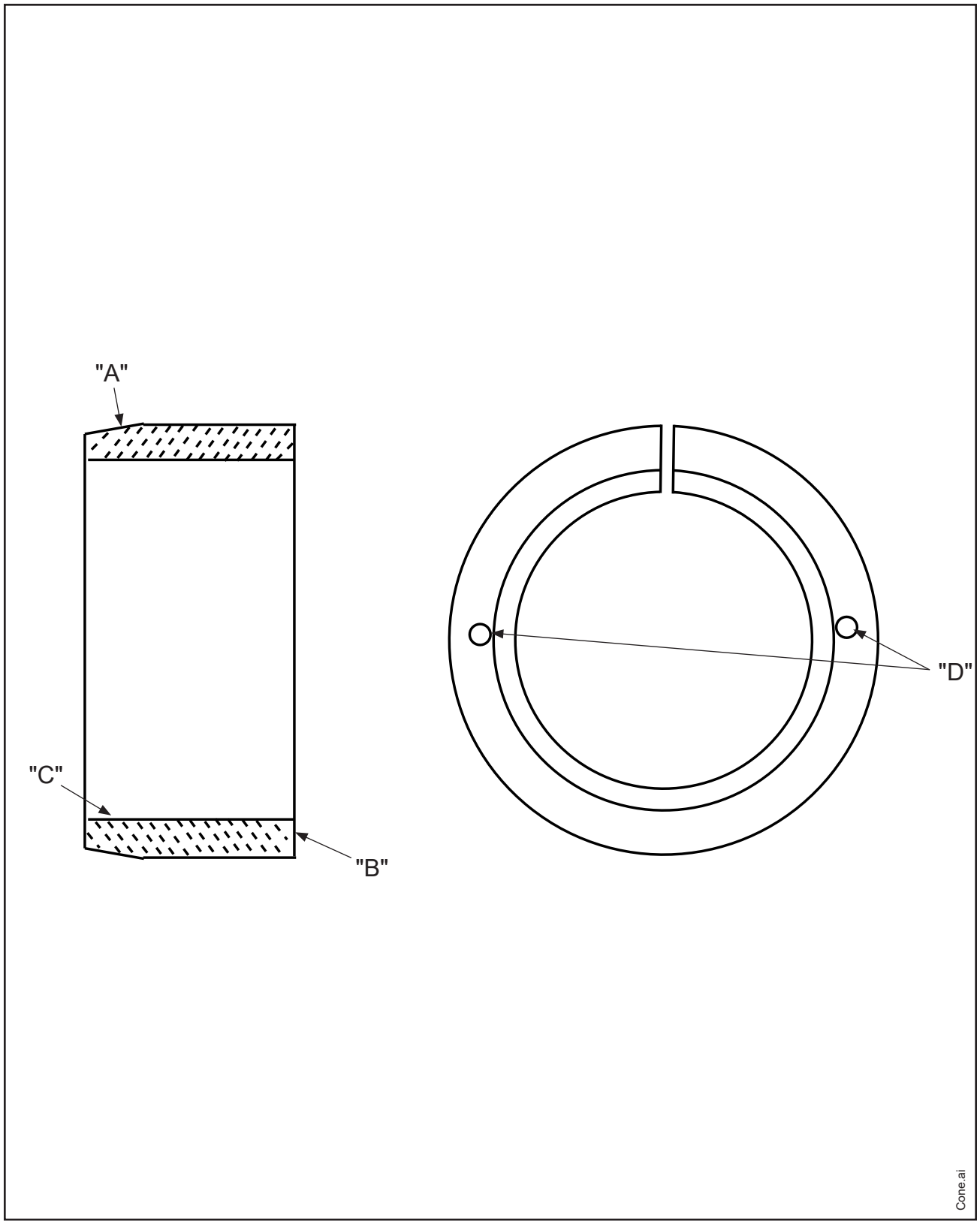


Guide Collar Part Number	Maximum Permitted Plastic Bushing ID	
	Inches	Millimeters
834-3RA	0.513	13.03
834-10	0.509	12.93
834-9	0.509	12.93
834-7B	0.513	13.03

Guide Collar Inspection
Figure 5-7

Component Inspection Criteria

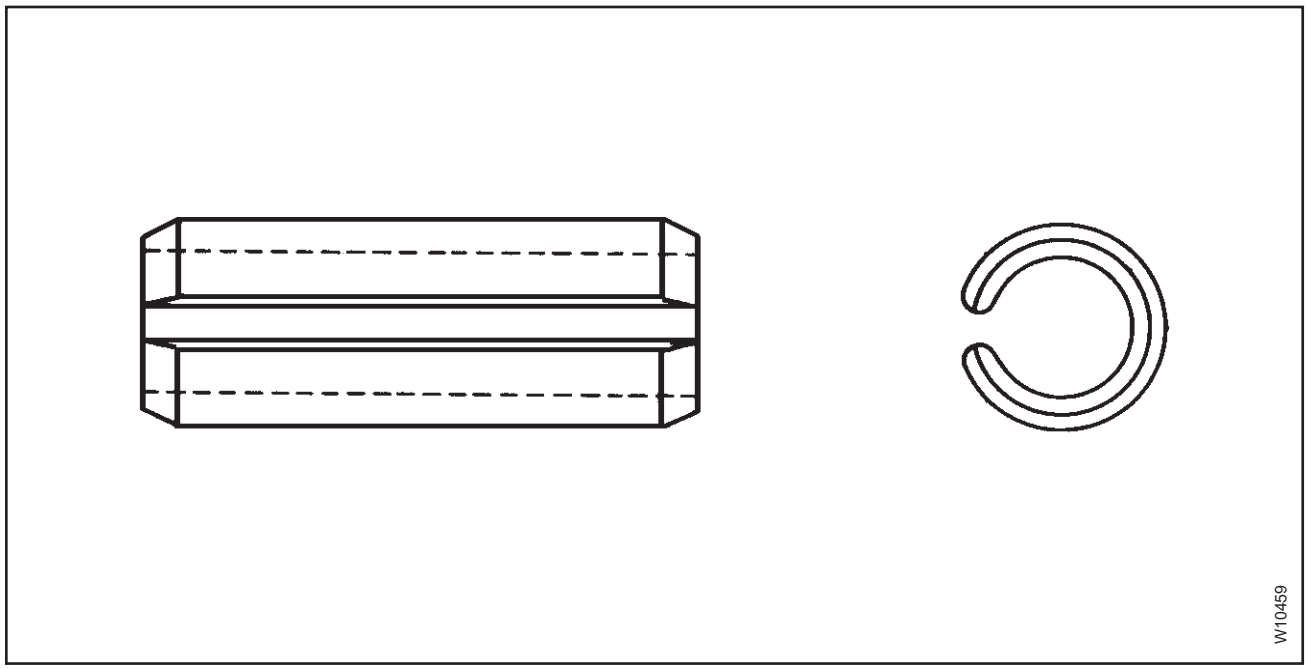
Inspect	Serviceable Limits	Corrective Action
L. Guide Collar (1030) Refer to Figure 5-7.		
(1) Visually examine the guide collar for nicks, gouges, or other damage.	The maximum depth of damage may not be greater than 0.020 inch (0.51 mm).	Polish the damaged area, if less than 0.020 inch (0.51 mm), with an abrasive pad CM47, or equivalent. Chemical conversion coat the reworked area in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If damage is greater than 0.020 inch (0.51 mm), replace the guide collar.
(2) Penetrant inspect in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Removal of Anodize coating is not required.	A crack is not permitted.	If there is a crack, replace the guide collar.
M. Plastic Bushing (1040)		
(1) Measure the ID of the plastic bushings.	Ovality may not be greater than 0.008 inch (0.20 mm). The maximum permitted ID of a plastic bushing is shown in Figure 5-7.	A plastic bushing that has an ID greater than the permitted serviceable limits, must be removed and replaced. Refer to Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



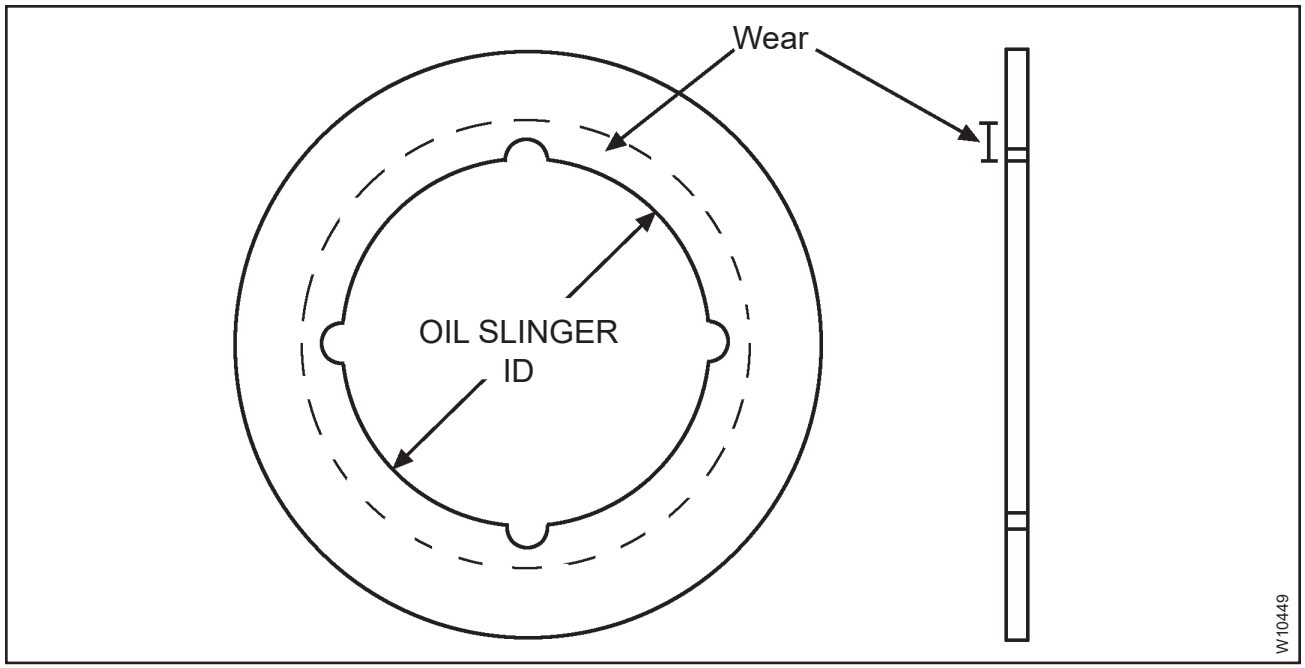
Rear Mounting Cone Inspection
Figure 5-8

Component Inspection Criteria

Inspect		Serviceable Limits	Corrective Action
N.	20 Spline Rear Mounting Cone (3030) Refer to Figure 5-8.		
	(1) Visually examine the OD surface "A" and surface "B" for damage and surface finish.	Surface finish must be 63 micro finish or smoother. Except for very light scratches, damage is not permitted.	If the damage is greater than the permitted serviceable limits, replace the rear mounting cone.
	(2) Visually examine the ID surface "C" for damage.	Except for light scratches, damage is not permitted.	If the damage is greater than the permitted serviceable limits, replace the rear mounting cone.
	(3) If present, visually examine pin holes "D" for elongated hole or raised material surrounding the hole.	Raised material surrounding the hole is not permitted.	Remove raised material from the area surrounding a pin hole by polishing with an abrasive pad CM47, or equivalent. The surface finish must be equal to undamaged surface area adjacent to the repaired area.
		An elongated hole is not permitted.	If there is an elongated hole, replace the rear mounting cone.
	(4) For A-50-3/A-50-5 rear mounting cones: Visually examine for broken pins remaining in the holes.	A broken pin in either hole is not permitted.	If there is a broken pin in either hole, replace the rear mounting cone.



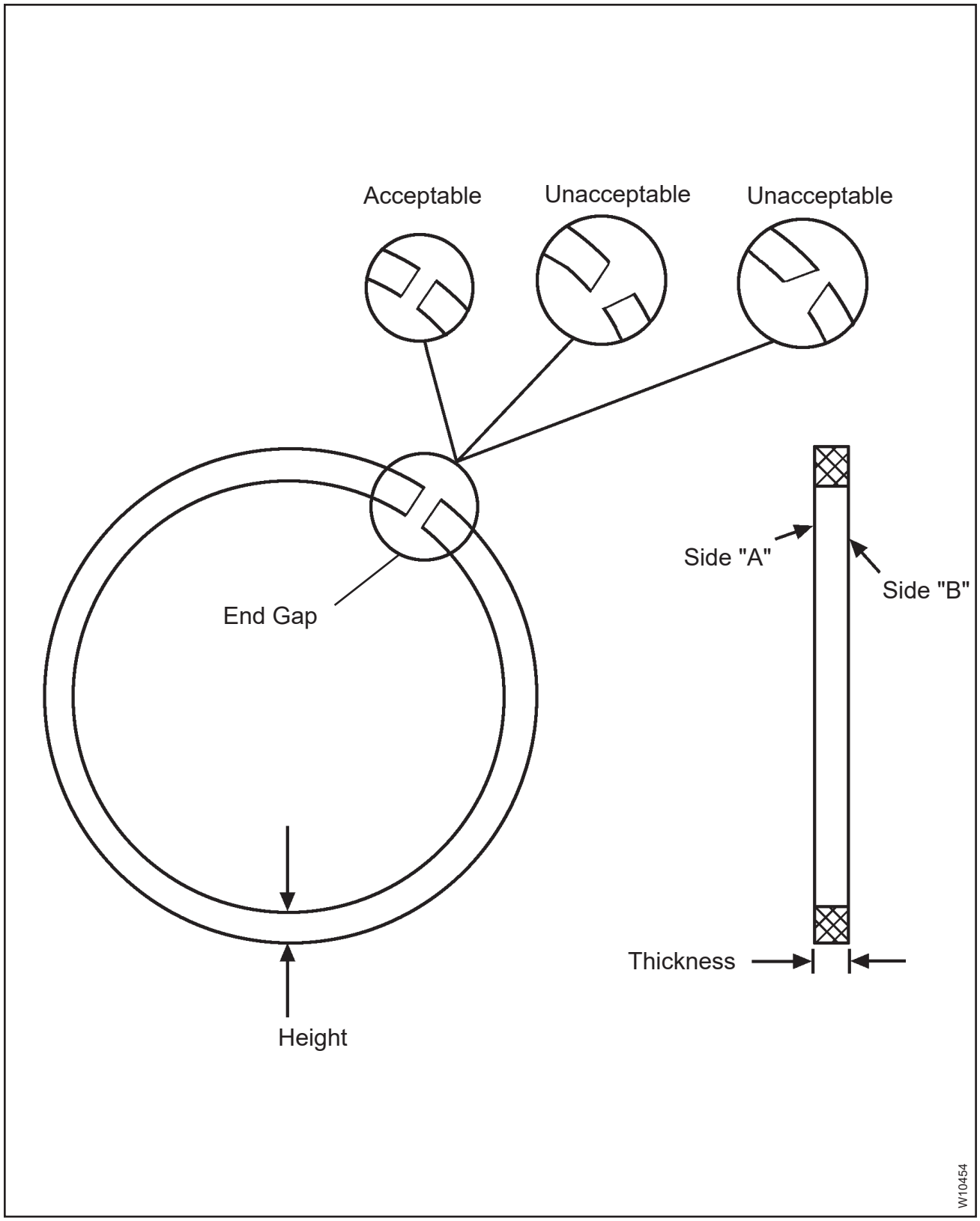
Spring Pin
Figure 5-9



Oil Slinger
Figure 5-10

Component Inspection Criteria

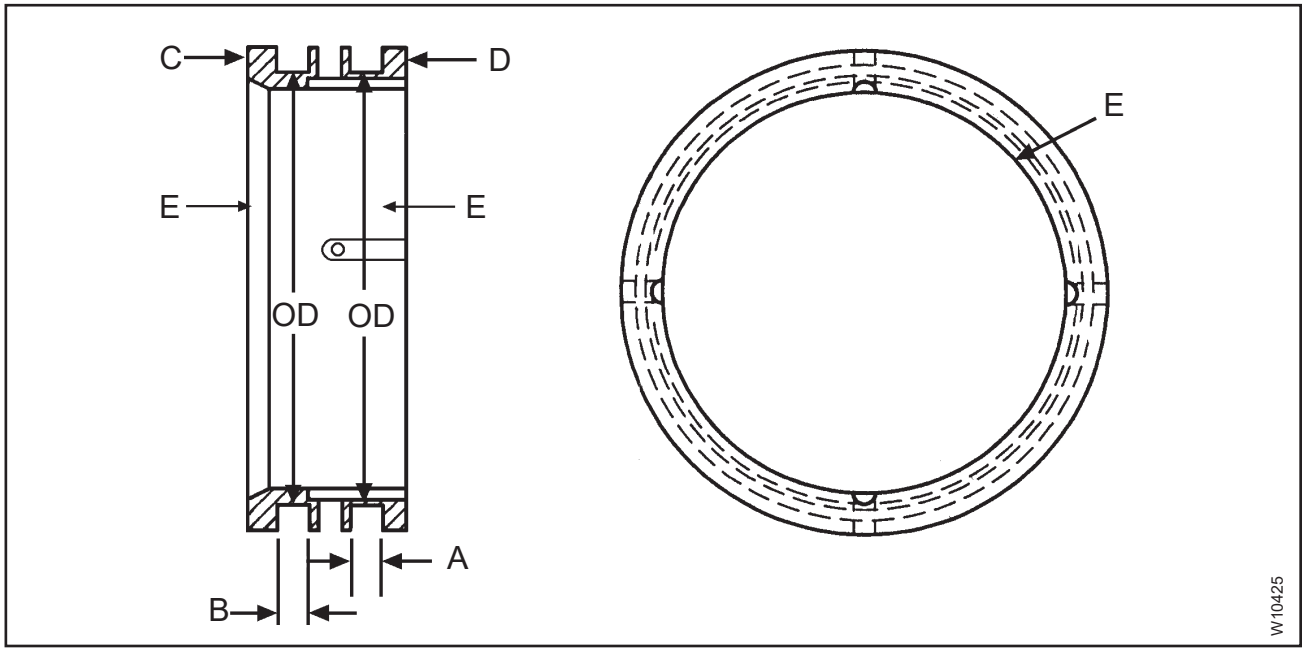
Inspect	Serviceable Limits	Corrective Action
O. Spring Pin (3040) Refer to Figure 5-9.		
(1) Visually examine the spring pin for straightness.	The spring pin must be straight.	If the spring pin is is not straight, replace the spring pin.
(2) Visually examine the spring pin for damage.	Damage is not permitted.	If there is damage, replace the spring pin.
P. Oil Slinger (3060) Refer to Figure 5-10.		
(1) Visually examine the oil slinger ring for corrosion.	Corrosion is not permitted.	If there is corrosion, replace the oil slinger.
(2) Visually examine the oil slinger ring for gouges, pitting, scratches, or other damage.	Gouges, pitting, and other damage is not permitted. Random light scratches no deeper than 0.003 inch (0.07 mm) are permitted.	If the damage is greater than the permitted serviceable limits, replace the oil slinger.
(3) Visually examine the oil slinger ring for bends and warps.	Bends and warps are not permitted.	If there are bends and warps, replace the oil slinger.
(4) Visually examine the oil slinger ring for wear.	If wear caused by the slip ring or rear cone is present, then dimensionally inspect depth of wear. The maximum permitted depth of material loss on either side is 0.003 inch (0.07 mm).	If there is wear, replace the oil slinger.
(5) Measure the ID of the oil slinger.	The maximum permitted ID is 2.383 inches (60.52 mm).	If the ID is greater than the permitted serviceable limit, replace the oil slinger.



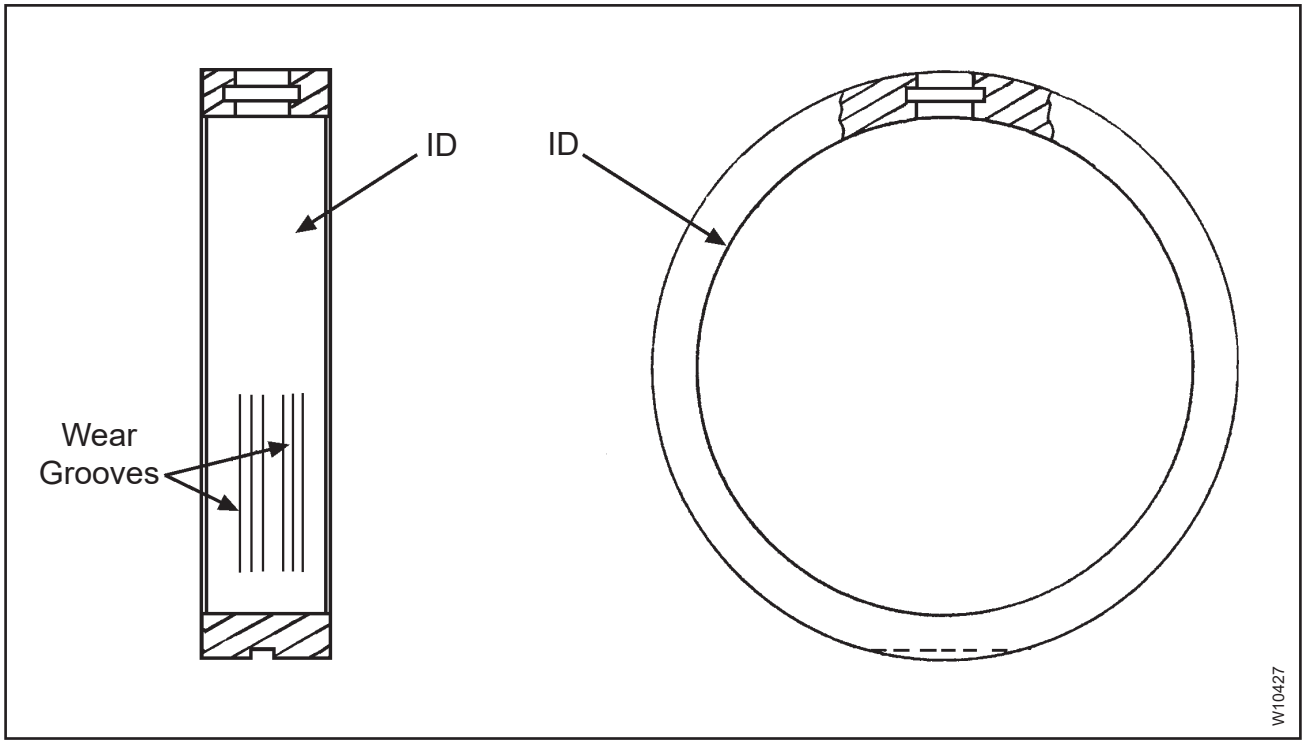
Seal Rings
Figure 5-11

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
Q. Seal Rings (3070,3090) Refer to Figure 5-11.		
(1) Visually examine the end gap.	The end gap must be uniform across the entire end surfaces. A wedge shape opening is not permitted.	If the end gap is not uniform, replace the seal ring.
(2) Visually examine sides "A" and "B" for wear.	A dark gray surface indicates no wear. If either surface is shiny, then measure the thickness from side "A" to "B". The minimum permitted thickness is 0.0915 inch (2.324 mm).	If the sides are less than the serviceable limits, replace the seal ring.
(3) Measure the height of the cross section from the ID to the OD.	The minimum permitted height is 0.122 inch (3.10 mm).	If the height is less than the serviceable limits, replace the seal ring.



Oil Transfer Ring
Figure 5-12



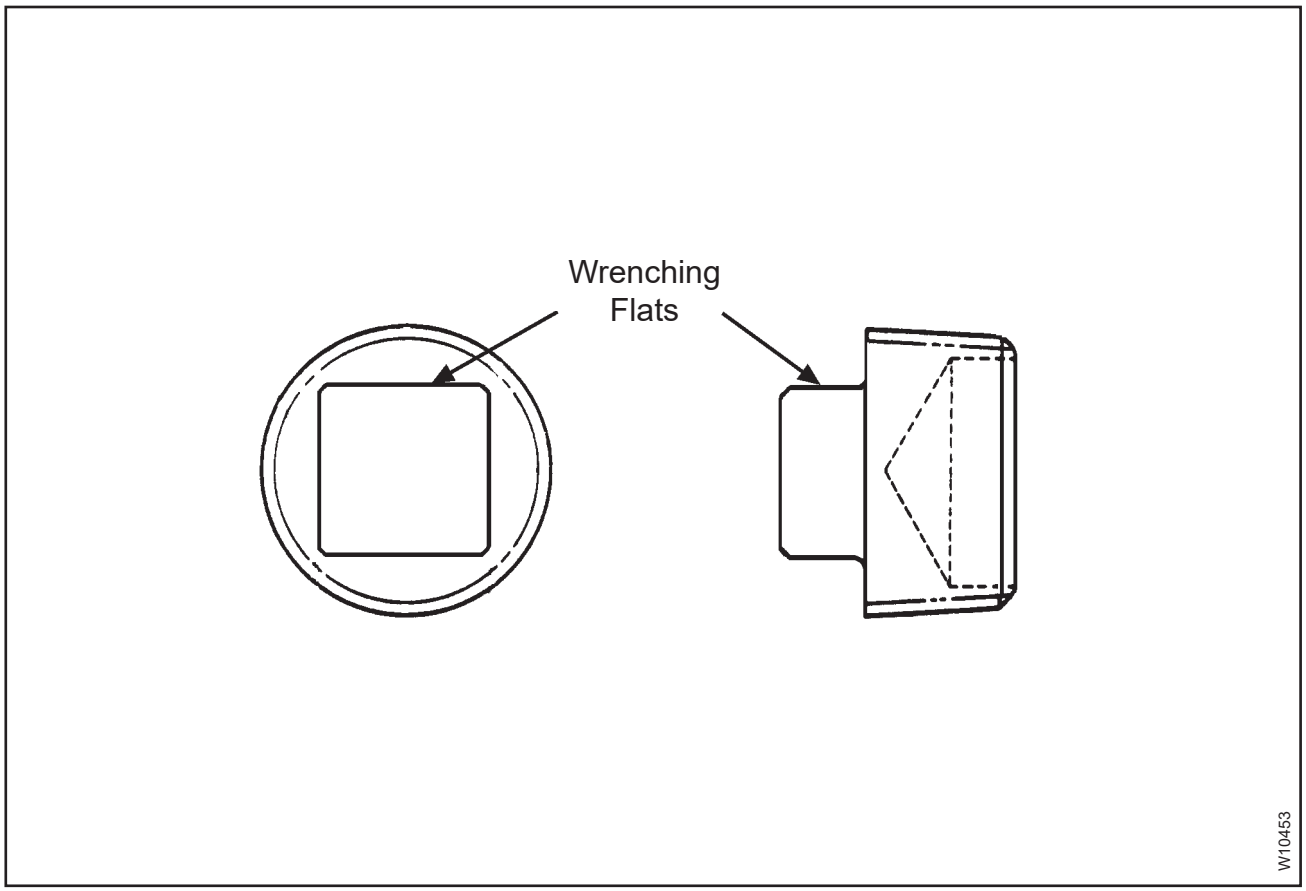
Oil Transfer Collar
Figure 5-13

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
R. Oil Transfer Ring (3080) Refer to Figure 5-12.		
(1) Visually examine the oil transfer ring to determine if it is steel or bronze.	If the oil transfer ring is bronze, continue with inspection procedures. If the oil transfer ring is steel, the oil transfer unit assembly must be replaced.	If the oil transfer ring is steel, replace the oil transfer unit assembly with the current configuration.
(2) Measure the width of grooves "A" and "B".	The maximum permitted groove width is 0.198 inch (5.03 mm). The minimum permitted groove width is 0.193 inch (4.90 mm).	If the groove width is less than or greater than the permitted serviceable limits, replace the oil transfer ring.
(3) Measure the OD of grooves "A" and "B".	The minimum permitted OD is 2.565 inches (65.15 mm).	If the OD is less than the permitted serviceable limits, replace the oil transfer ring.
(4) Visually examine surfaces "C" and "D" for damage.	Except for light scratches, damage is not permitted. Surfaces must be smooth.	If the damage is greater than the permitted serviceable limits, replace the oil transfer ring.
(5) Visually examine the ID surface "E" for damage.	The surface must be generally smooth with no burrs adjacent to the four half round channels. Except for light scratches, damage is not permitted.	Remove burrs with a file and crocus cloth; otherwise, replace the oil transfer ring if the damage is greater than the permitted serviceable limits.
S. Oil Transfer Collar (4000) Refer to Figure 5-13.		
(1) Visually examine the ID for wear grooves caused by the seal rings (3070).	Visible wear is not permitted.	If there is visible wear, replace the oil transfer collar.

Component Inspection Criteria

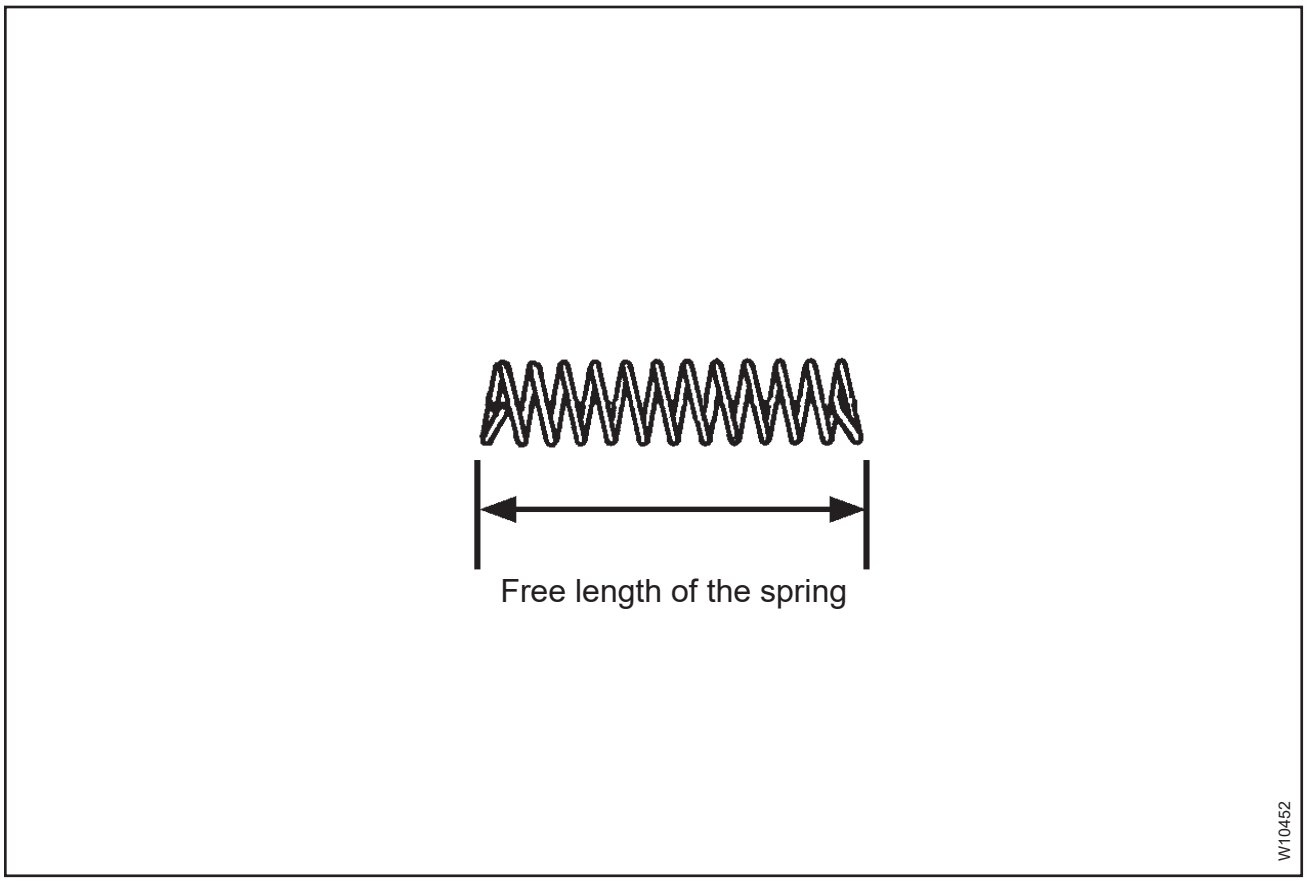
Inspect	Serviceable Limits	Corrective Action
T. Aluminum Pipe Plug (4020) Refer to Figure 5-14.		
(1) Visually examine the threads for damage.	1/2 thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the aluminum pipe plug.
(2) Visually examine the aluminum pipe plug for corrosion.	Corrosion is not permitted.	If there is corrosion, replace the aluminum pipe plug.
(3) Visually examine the wrenching flats for damage.	Sufficient flat surface must remain on two opposing flats to permit torque to be applied by an open-end wrench.	If the damage is greater than the permitted serviceable limits, replace the aluminum pipe plug.



Aluminum Pipe Plug
Figure 5-14

Component Inspection Criteria

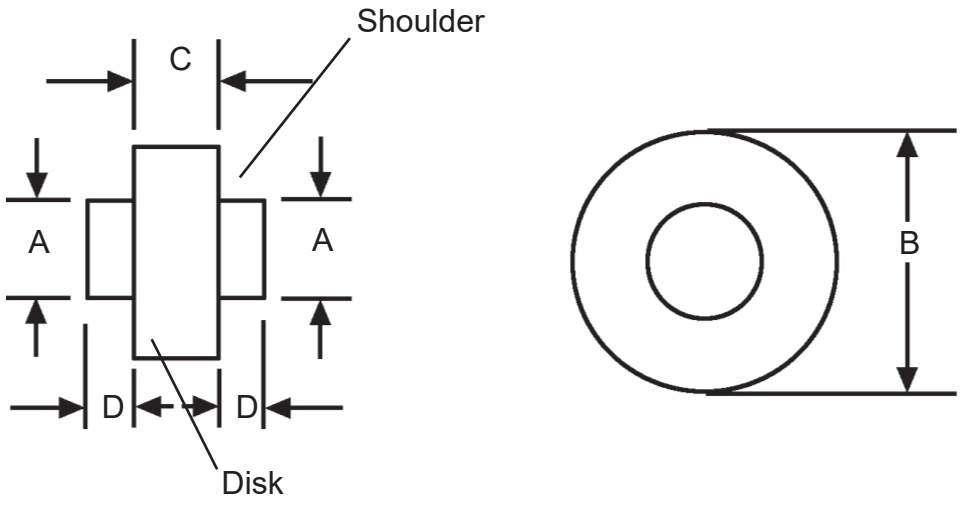
Inspect	Serviceable Limits	Corrective Action
U. Compression Spring (4030) Refer to Figure 5-15.		
(1) Measure the free length of the compression spring.	The minimum permitted free length is 0.875 inch (22.22 mm).	Stretch the compression spring by pulling on the ends. The maximum permitted free length is 1.125 inches (28.57 mm).
(2) Count the coils to verify the correct spring.	Spring must have 10 to 11 coils total.	If the compression spring is not correct, replace the compression spring.
(3) Visually examine for damage.	The maximum permitted depth of damage is 0.003 inch (0.07 mm).	If the damage is greater than the permitted serviceable limits, replace the compression spring.



Compression Spring
Figure 5-15

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
V. Oil Transfer Locator Button (4040) Refer to Figure 5-16.		
(1) Visually examine for corrosion.	Corrosion is not permitted.	Remove light corrosion with glass bead cleaning, otherwise replace the oil transfer locator button.
(2) Visually examine for damage.	Scratches, pitting, or random indentations are permitted to a depth of 0.005 inch (0.12 mm).	If the damage is greater than the permitted serviceable limits, replace the oil transfer locator button.
(3) Visually examine for wear.	Wear to disk thickness, disk diameter, shoulder height, or shoulder width must not be less than the limits listed in Figure 5-14.	If the wear is less than the permitted serviceable limits, replace the oil transfer locator button.

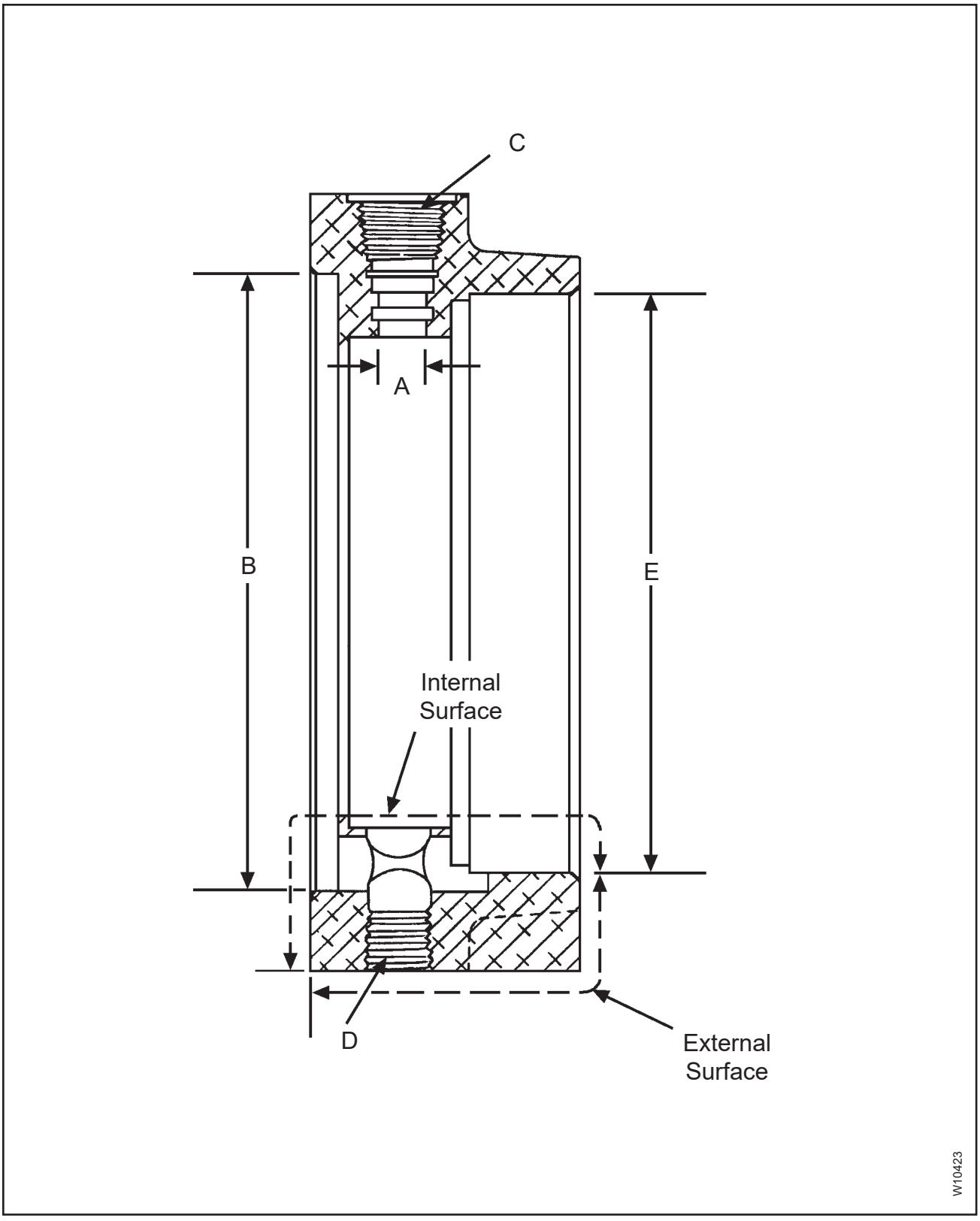


Feature	Description	Dimension
A	Shoulder Width	0.100 inch (2.54 mm) minimum
B	Disk Diameter	0.429 inch (10.90 mm) minimum
C	Disk Thickness	0.040 inch (1.02 mm) minimum
D	Shoulder Height	0.040 inch (1.02 mm) minimum

Oil Transfer Locator Button
Figure 5-16

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
W. Bolt (4060)		
(1) Visually examine each bolt.	Corrosion, scoring, thread damage, or any other damage that would negatively affect the function or serviceability is not permitted.	If the damage is greater than the permitted serviceable limits, replace the bolt.
(2) Magnetic particle inspect each bolt in accordance with the Magnetic Particle Inspection chapter in the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). NOTE: It is not necessary to strip the bolt before magnetic particle inspection.	Relevant indications are not permitted.	If there are relevant indications, replace the bolt.
(3) Visually examine the cadmium plate coverage on the bolt.	Cadmium plate must completely cover the bolt.	Replate the bolt in accordance with the Cadmium Replating chapter in the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
X. Washer (4070)		
(1) Visually examine the washer for corrosion, wear, or damage.	The maximum permitted depth of damage is 0.005 inch (0.12 mm). Sufficient flat surface must remain to support the bolt head.	If the damage is greater than the permitted serviceable limits, replace the washer.
(2) Visually examine the cadmium plating coverage on the washer.	Except for a few abraded corners and light scratches, cadmium plating must completely cover the washer.	Replate the washer in accordance with the Cadmium Replating chapter in the Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



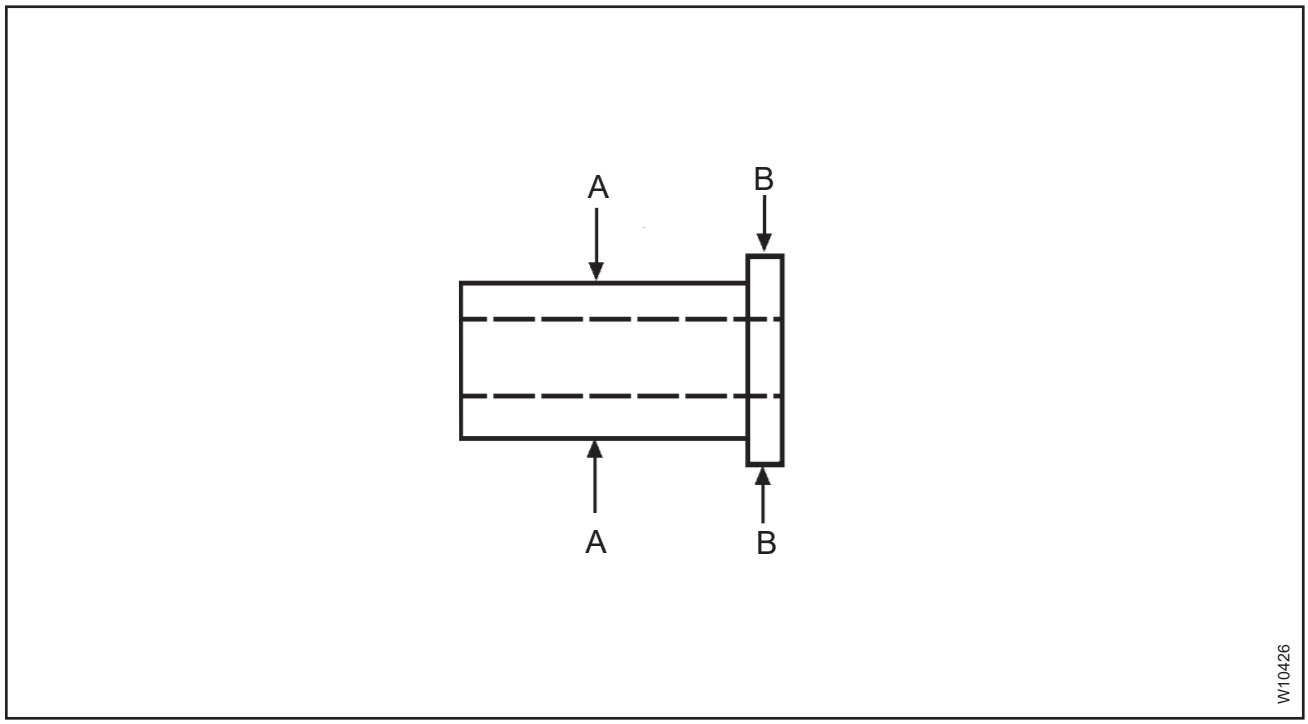
Oil Transfer Housing
Figure 5-17

Component Inspection Criteria

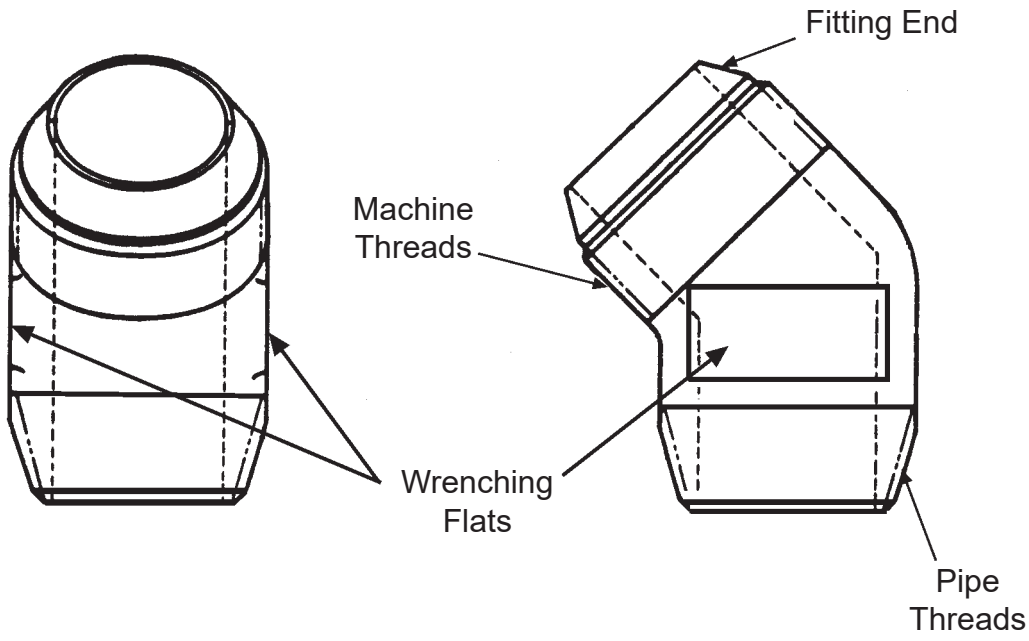
Inspect	Serviceable Limits	Corrective Action
Y. Oil Transfer Housing (4050) Refer to Figure 5-17.		
(1) Measure the bore "A".	The maximum permitted diameter is 0.335 inch (8.51 mm).	If the diameter is greater than the permitted serviceable limits, replace the oil transfer housing.
(2) Measure the ID of the shoulder "B".	The maximum permitted diameter is 4.256 inches (108.10 mm).	If the diameter is greater than the permitted serviceable limits, replace the oil transfer housing.
(3) Visually examine the threaded holes "C" and "D" for thread damage.	1/2 of one thread total accumulated damage is permitted per threaded hole.	If the damage is greater than the permitted serviceable limits, replace the oil transfer housing.
(4) Visually examine the bore "E".	Verify that the lip seal ring (3020) and backup ring (3010) will fit tight in bore "E".	If the lip seal ring (3020) and back up ring (3010) do not fit tight in bore "E", replace the oil transfer housing.
(5) Visually examine for corrosion.	Corrosion is not permitted.	Remove light corrosion with glass bead cleaning. If corrosion cannot be removed, replace the oil transfer housing.
(6) Visually examine the external surfaces for damage.	The maximum permitted depth of damage is 0.040 inch (1.01 mm). Damage must not interfere with the function of the oil transfer unit.	If the damage is greater than the permitted serviceable limits, replace the oil transfer housing.
(7) Visually examine the internal surfaces for damage.	The maximum permitted depth of damage is 0.010 inch (0.25 mm). Pushed up material beyond surrounding surfaces is not permitted. Damage must not interfere with the function of the oil transfer unit.	Remove pushed up material by polishing with an abrasive pad CM47, or equivalent. If the damage is greater than the permitted serviceable limits, replace the oil transfer housing.

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
Z. Oil Transfer Tube (4090) Refer to Figure 5-18.		
(1) Visually examine the OD "A" for wear.	Visible wear is not permitted.	If the wear is greater than the permitted serviceable limits, replace the oil transfer tube.
(2) Measure the OD "B" for wear.	The minimum permitted OD is 0.421 inch (10.69 mm).	If the wear is less than the permitted serviceable limits, replace the oil transfer tube.
(3) Visually examine for corrosion or pitting.	Corrosion or pitting is not permitted.	If corrosion or pitting is greater than the permitted serviceable limits, replace the oil transfer tube.



Oil Transfer Tube
Figure 5-18



Aluminum Elbow
Figure 5-19

Component Inspection Criteria

Inspect	Serviceable Limits	Corrective Action
AA. Aluminum Elbow (5010) Refer to Figure 5-19.		
(1) Visually examine the aluminum elbow for corrosion.	Corrosion is not permitted.	If there is corrosion, replace the aluminum elbow.
(2) Visually examine the machine threads for damage.	1/2 thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the aluminum elbow.
(3) Visually examine the pipe threads for damage.	1/2 thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the aluminum elbow.
(4) Visually examine the fitting end surface for scratches or surface damage.	Surface must be smooth. Scratches or surface damage is not permitted.	If the damage is greater than the permitted serviceable limits, replace the aluminum elbow.
(5) Visually examine the wrenching flats for damage.	Sufficient flat surface must remain to permit torque to be applied with an open-end wrench.	If the damage is greater than the permitted serviceable limits, replace the aluminum elbow.
(6) Visually examine the for cracks.	A crack is not permitted.	If there is a crack, replace the aluminum elbow.

REPAIR - CONTENTS

LIST OF FIGURES

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WARNING: DO NOT ATTEMPT IN THE FIELD ANY REPAIR, REPLACEMENT, REPLATING, RE-ANODIZING OR RE-SHOT PEENING PROCEDURE NOT SPECIFICALLY AUTHORIZED BY HARTZELL PROPELLER INC. OR NOT SPECIFICALLY REFERRED TO IN HARTZELL Propeller Inc. MANUALS. CONTACT THE FACTORY FOR GUIDANCE ABOUT THE AIRWORTHINESS OF ANY PART WITH UNUSUAL WEAR OR DAMAGE.

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

1. General Repair Requirements (Rev. 2)

A. Shot Peening

CAUTION: THE PEENING MARKS ON CERTAIN PROPELLER PARTS ARE NOT TOOL MARKS AND SHOULD NOT BE REMOVED.

(1) Certain surfaces of propeller assembly parts have been shot peened at Hartzell Propeller Inc. to improve fatigue strength.

(2) Shot peened surfaces may require re-shot peening because of rust, corrosion, fretting, or nicks. For shot peening procedures, refer to Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

WARNING: FAILURE TO CORRECTLY SHOT PEEN APPLICABLE PROPELLER PARTS MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. A QUALITY SHOT PEENING PROCESS IS CRITICAL FOR FLIGHT SAFETY. SHOT PEENING OF PROPELLER PARTS REQUIRES SPECIAL TECHNIQUES, TRAINING, MATERIALS, AND EQUIPMENT.

(a) Only repair stations that are properly certified by Hartzell Propeller Inc. should shot peen Hartzell propeller parts.

1 For certification requirements, refer to the Approved Facilities chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

2 For a list of repair stations that are certified by Hartzell Propeller Inc. to perform shot peening on Hartzell propeller parts:

a Go to the Sample Program Approvals page on the Hartzell Propeller Inc. website at www.hartzellprop.com

b Contact Hartzell Propeller Inc. Product Support

(1) Refer to the section, "Contact Information" in the Introduction chapter of this manual.

B. Aluminum and Steel Parts

(1) Remove scratches, nicks, burrs, and other minor damage using a fine emery cloth or an abrasive pad, such as CM47.

(a) Blend the polished area in with the surrounding area.

(b) Use extreme care to completely remove the damage while removing as little material as possible.

(2) After any repair, inspect the part in accordance with the applicable inspection criteria to be sure it is within the permitted limits.

2. Repair/Modification Procedures (Rev. 1)

A. Propeller Components (Except for those listed separately in this section)

(1) For repair and modification procedures of propeller components (except for those listed separately in this section), refer to the applicable section in this chapter.

B. Hubs

(1) Aluminum Hubs: Refer to the Aluminum Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Steel Hubs: Refer to the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

C. Blades

(1) Aluminum Blades: Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

(2) Composite Blades: Refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

D. Blade Clamps (For steel hub propellers only)

(1) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

E. Spinner Assemblies

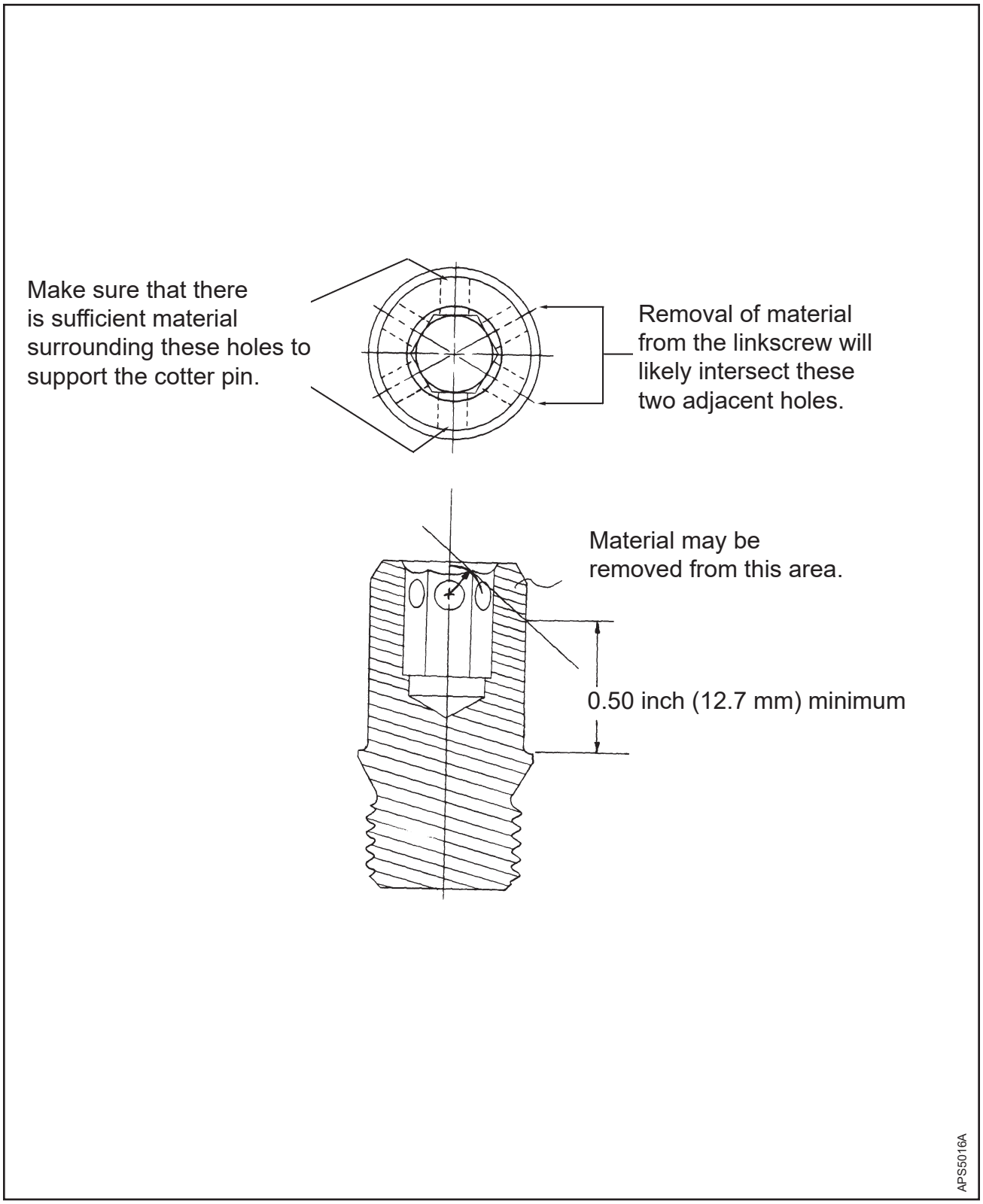
(1) Metal Spinners: Refer to Hartzell Propeller Inc. Metal Spinner Maintenance Manual 127 (61-16-27).

(2) Composite Spinners: Refer to Hartzell Propeller Inc. Composite Spinner Maintenance Manual 148 (61-16-48).

F. Ice Protection Systems

(1) For ice protection systems supplied by Hartzell, refer to Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(2) For ice protection systems not supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).



Linkscrew Repair Limits for Hub Clearance on HC-A3V( )-( ) Propellers
Figure 6-1

3. Component Repair

A. Repair of A-304 Linkscrew on HC-A3V( )-( ) Propeller Assemblies

(1) When adjusting the pitch range of some propeller assemblies, the linkscrew may contact the hub. When this happens, full blade angle range cannot be achieved. This condition can be eliminated by grinding the linkscrew to remove material and allow clearance.

(a) Remove only enough material from the linkscrew to permit clearance with the hub. Refer to Figure 6-1.

NOTE: Removal of material from the linkscrew will likely intersect the two adjacent holes on that side of the linkscrew.

(b) Make sure there is enough material surrounding the remaining unaffected holes in the linkscrew to support the safety cotter pin.

(c) To prevent corrosion, apply Polane paint to the area where material was removed.

4. Blade Shank Conversion

A. Conversion from V-shank to MV-shank

(1) V-shank models, which have double-shoulder configuration, have additional repetitive inspections required by Airworthiness Directive 97-18-02.

(2) MV-shank models, which have a single-shoulder configuration, are not affected by the Airworthiness Directive.

(3) A V-shank blade can be converted to an MV-shank to avoid the inspections required by the Airworthiness Directive. After conversion, the propeller model number changes to reflect the conversion. For example, HC-A2V20-1/V8433N becomes HC-A2MV20-1/MV8433N.

(4) Airworthiness Directive 97-18-02 does not apply to ( )HC-A( )MV( )-( ) propellers. These propellers are equipped with an MV-shank retention system.

(5) For additional information about blade shank conversion, refer to Hartzell Propeller Aluminum Blade Overhaul Manual 133C (61-13-33) and applicable Hartzell Propeller Service Documents.

ASSEMBLY - CONTENTS

ASSEMBLY - CONTENTS, CONTINUED

ASSEMBLY - CONTENTS, CONTINUED

LIST OF FIGURES

WARNING 1: ANY PART IDENTIFIED IN THIS MANUAL AS AN EXPERIMENTAL OR NON-AVIATION PART MUST NOT BE USED IN AN FAA OR INTERNATIONAL EQUIVALENT TYPE CERTIFICATED PROPELLER. A PART IDENTIFIED AS EXPERIMENTAL OR NON-AVIATION DOES NOT HAVE FAA OR INTERNATIONAL EQUIVALENT APPROVAL EVEN THOUGH IT MAY STILL SHOW AN AVIATION TC OR PC NUMBER STAMP. USE ONLY THE APPROVED ILLUSTRATED PARTS LIST PROVIDED IN THE APPLICABLE OVERHAUL MANUAL OR ADDITIONAL PARTS APPROVED BY AN FAA ACCEPTED DOCUMENT FOR ASSEMBLY OF A PROPELLER. THE OPERATOR ASSUMES ALL RISK ASSOCIATED WITH THE USE OF EXPERIMENTAL PARTS. USE OF EXPERIMENTAL PARTS ON AN AIRCRAFT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

WARNING 2: ADHESIVES AND SOLVENTS ARE FLAMMABLE AND TOXIC TO THE SKIN, EYES, AND RESPIRATORY TRACT. SKIN AND EYE PROTECTION ARE REQUIRED. AVOID PROLONGED CONTACT AND BREATHING OF VAPORS. USE SOLVENT RESISTANT GLOVES TO MINIMIZE SKIN CONTACT AND WEAR SAFETY GLASSES FOR EYE PROTECTION. USE IN A WELL VENTILATED AREA AWAY FROM SPARKS AND FLAME. READ AND OBSERVE ALL WARNING LABELS.

CAUTION 1: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

CAUTION 2: THE USE OF BLADE PADDLES TO MOVE BLADES CAN RESULT IN THE OVERLOAD AND DAMAGE OF THE BLADE PITCH CHANGE MECHANISM. THIS DAMAGE IS NOT REPAIRABLE AND CAN RESULT IN SEPARATION BETWEEN THE BLADE AND THE PITCH CHANGE MECHANISM, CAUSING LOSS OF PITCH CONTROL DURING FLIGHT.

1. General (Rev. 5)

   A. Important Information

      (1) Read all assembly instructions before beginning the assembly procedures.

      (2) Protect all unassembled components from damage.

      (3) Use applicable torque values. Refer to the Torque Values table in the Fits and Clearances chapter of this manual.

      (4) Unless specified differently, safety wire in accordance with NASM33540 using 0.032 inch (0.81 mm) safety wire.

      (5) For information about additional weight slugs that may be required to be attached to the counterweight arms of certain clamp models, refer to the Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

CAUTION: BEFORE ASSEMBLING THE PROPELLER, DETERMINE IF AN ICE PROTECTION SYSTEM IS REQUIRED.

B. Ice Protection Systems

(1) If installing an ice protection system supplied by Hartzell, refer to Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(2) If installing an ice protection system not supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

C. O-rings

(1) Unless specified differently, lubricate all O-rings with lubricant CM12 before installing them in the propeller assembly.

(2) Hartzell Propeller Inc. recommends that the lot number and cure date for each O-ring be recorded with all work orders when an O-ring is installed in any propeller assembly.

D. Blade Bore Plug/Bearing Installation

(1) For aluminum blades, refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

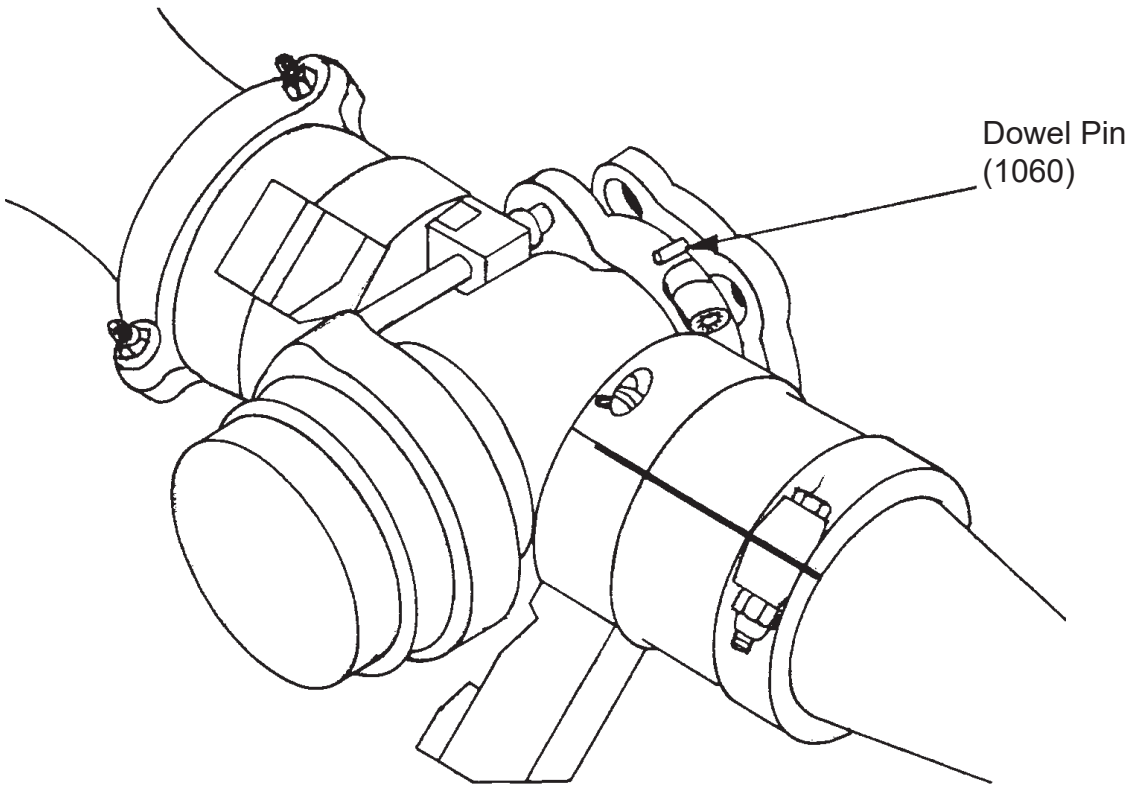
(2) For composite blades, refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

E. Blade Angle Information

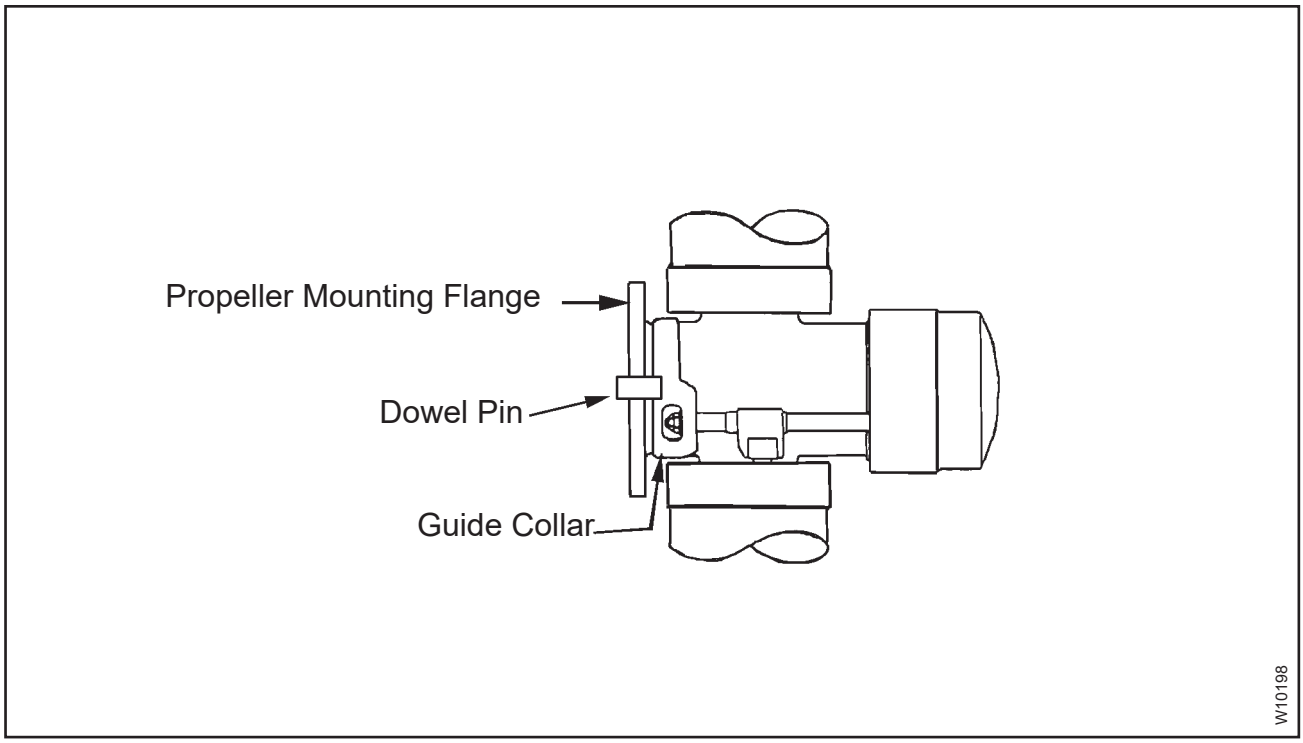
(1) For specific blade angle information, refer to the Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

F. Blade Clamp Assembly

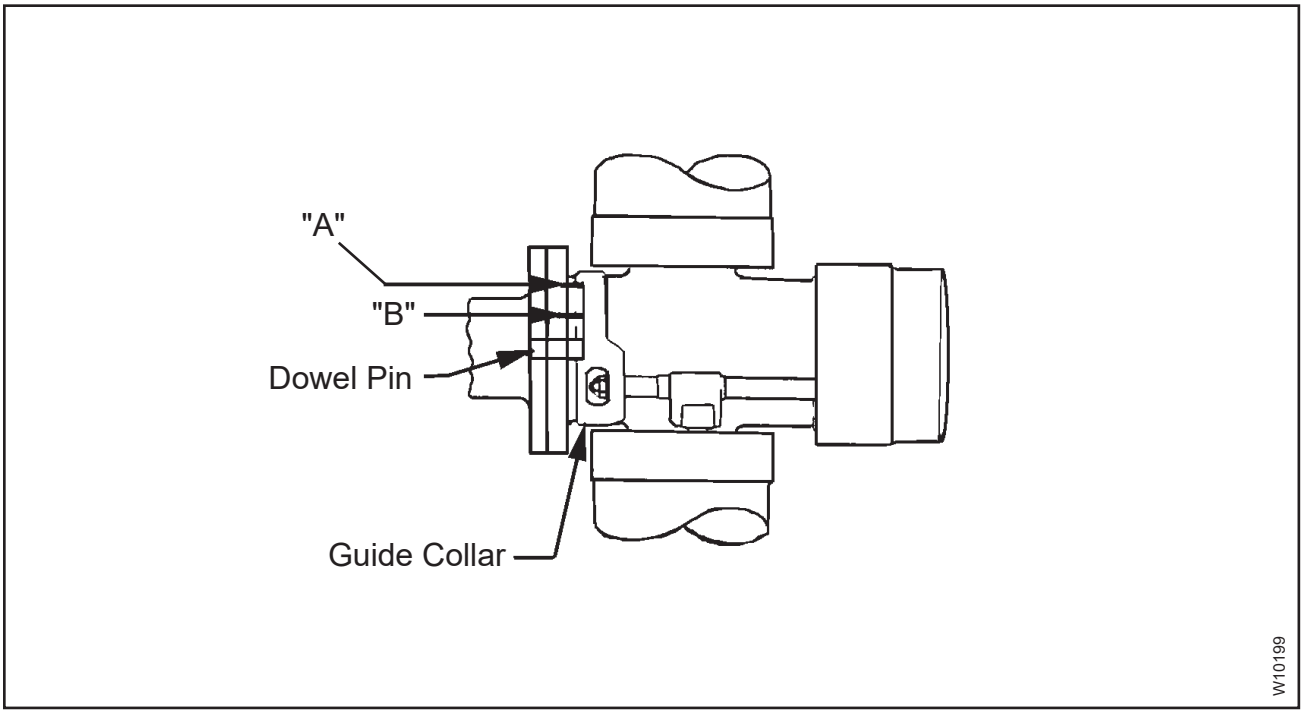
(1) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Inserting The Dowel Pin
Figure 7-1



Pin Drive-Fit (K or L Flange)
Figure 7-2



"A" and "B" Positions
Figure 7-3

CAUTION 1: ACTUATION OF PROPELLERS MUST BE ACCOMPLISHED USING COMPRESSED AIR THAT HAS BEEN FILTERED FOR MOISTURE, OR NITROGEN.

CAUTION 2: DO NOT EXCEED A PRESSURE OF 125 PSI (8.62 BARS) WHEN ACTUATING PROPELLERS COVERED IN THIS CHAPTER.

CAUTION 3: USE SUFFICIENT PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST THE POSITIVE STOP.

2. Assembly of Flanged-Hub Models: -1 and -6 Series

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

A. Hub Unit Assembly

(1) Follow the hub assembly procedure in the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

B. Guide Collar Unit Installation

NOTE: The dowel pin (1060) used for aligning the propeller on the engine flange is also used to stake the guide collar unit (1030). The pin for the BHC-A2VF-1 and BHC-A2MVF-1 is steel. In all other models the pin is aluminum.

(1) Secure the hub unit (360) on the rotatable fixture of a propeller assembly table.

(2) Insert the socket head cap screw (1050) into the guide collar unit (1030). Before tightening the screw, line up the notch in the guide collar unit (1030) with the dowel pin hole in the hub (360).

(3) Insert the dowel pin (1060) into the hub (360) flange from the rear until it enters the notch machined in the guide collar unit (1030). Refer to Figure 7-1. The dowel pin should extend 0.050 inch (12.7 mm) beyond the hub flange.

(4) If the guide collar unit does not have a notch, a notch must be added after the propeller is assembled. A dowel pin notch insertion procedure is found later in this chapter.

(5) Snug the socket head cap screws (1050). The socket head cap screws will be torqued later in propeller assembly.

(6) For models HC-A2VF-1 and HC-A2MVF-1 **ONLY**, install a dowel pin (670) in "A" location of the mounting flange. Refer to Figure 7-3.

(7) For models BHC-A2VF-1 and BHC-A2MVF-1 **ONLY**, install dowel pins (670) in "B" location of the mounting flange. Refer to Figure 7-3.

C. Blade Mounting Parts Assembly

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

D. Clamp Assembly

(1) For clamp assembly (1200) procedures, refer to the Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) For information concerning the correct counterweight slugs and installation hardware, refer to Hartzell Propeller Inc. Propeller Application Guide, Manual 159 (61-02-59).

E. Blade and Clamp Installation

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

F. Cylinder Installation

(1) Clean the threads on the hub unit (360) and cylinder (320).

CAUTION: DO NOT APPLY SEALANT TO THE THREADS OF THE CYLINDER (320). HYDRAULIC SEALANT ADHESIVE IN THE CYLINDER CAN CONTAMINATE THE AIRCRAFT ENGINE OIL.

(2) Apply a bead of hydraulic sealant adhesive CM134 in the groove of the hub unit (360) where the cylinder O-ring (330) fits. Install the O-ring into the cylinder chamfer.

(3) Hand tighten the cylinder (320) onto the hub unit (360).

(4) Using a bar of appropriate size to fit the slot in the top of the cylinder, tighten the cylinder (320) against the hub unit (360).

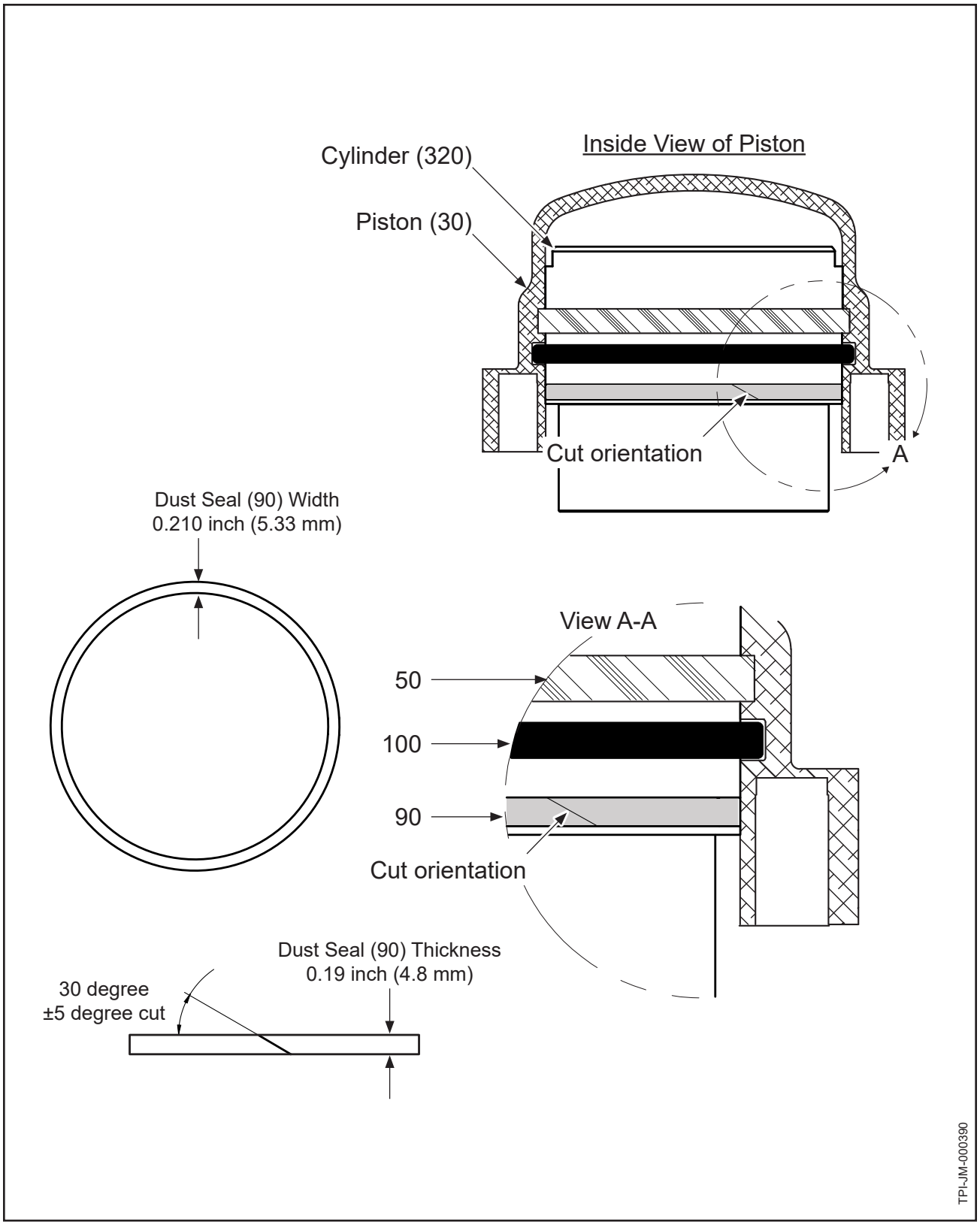
NOTE: Early drag and tightness is caused by the O-ring (330), which acts as a seal and safety.

(5) Tighten the cylinder (320) flush with the hub shoulder. Refer to the Torque Values table in the Fits and Clearance chapter of this manual.

(6) Inspect the slot in the top of the cylinder (320) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(7) Remove any sharp edges in the wrench slot on top of the cylinder (320).

(8) Inspect the inside of the cylinder (320) to make sure the O-ring (330) has not been forced out of place during the cylinder (320) installation procedure.



Piston Dust Seal Orientation
Figure 7-4

G. Piston Installation

NOTE: Refer to Figure 7-4 for the installation and orientation of components installed in the piston (30) and dust seal length.

(1) Using lubricant CM12, lubricate the piston O-ring (100).

(2) Carefully install the piston O-ring (100) in the groove provided for it in the piston (30).

CAUTION: MAKE SURE THAT THE FELT PISTON DUST SEAL (1530) IS FUZZ-FREE.

(3) Cut the piston dust seal material (90) to length on a 30 degree diagonal so there is an overlap at the parting line with a smooth, fuzz-free surface.

(a) If the piston dust seal (90) has fuzz or long strands that could interfere with the operation of the O-ring, replace the piston dust seal.

(4) Soak the piston dust seal (90) in aviation grade engine oil until it is completely saturated.

(a) Squeeze the excess oil from the piston dust seal (90).

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP OF THE FELT PISTON DUST SEAL (90) REMAINS VISIBLE AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON (30).

(5) Install the thinnest section of the piston dust seal (90) onto the cylinder OD groove.

(6) Install a pitch change block (170) on each linkscrew (1270).

(7) Install each fork (140) on each pitch change block (170) with the thick portion of the fork (140) positioned towards the rear of the hub unit (360).

(8) Slide the guide rod sleeve (110) into the plastic bushing (1040). The shoulder of the sleeve should be on the side of the guide collar unit (1030) that faces away from the propeller assembly bench.

(9) Slide the piston (30) over the cylinder (320), and the pitch change guide rods (70) through the forks (140), guide rod sleeves (110), and guide collar unit (1030).

(a) Rotate the guide collar unit (1030) slightly to align components and make sure there is no resistance when the piston actuates.

(10) Tighten each guide collar unit screw (1050), and safety each screw with safety wire CM131 or equivalent.

(11) Install a washer (190) and lock nut (180) on the end of each pitch change guide rod (70). Torque the lock nut in accordance with Torque Values table in the Fits and Clearance chapter of this manual.

(12) Align the fork (140) with the pitch change block (170) and tighten the set screw (130). Torque the set screw in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

H. Establishing Reference Blade Radius

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

I. Setting Blade Angle

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

J. Visual Detection of Blade Slippage in Clamp

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" section of this chapter.

K. Optional Sealant CM93 Application

Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

L. Checking Blade Track

(1) With the propeller secured on a rotatable fixture, check the height of the tip at the center point of the highest blade. Use a scale with at least 0.032 inch (0.79 mm) divisions and adjustable pointer.

CAUTION: BLADE HEIGHT AT THE TIPS SHOULD NOT VARY MORE THAN ±0.06 INCH (1.5 MM).

(2) Rotate the propeller and measure the variation of each blade.

M. Label Replacement

(1) For label replacement instructions, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

3. Assembly of Flanged-Hub Models: -4 Series

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

A. Hub Unit Assembly

(1) Follow the hub assembly procedure in the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

B. Blade Mounting Parts Assembly

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

C. Clamp Assembly

(1) For clamp assembly (1200) procedures, refer to the Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) For information concerning the correct counterweight slugs and installation hardware, refer to Hartzell Propeller Inc. Propeller Application Guide, Manual 159 (61-02-59).

D. Blade and Clamp Installation

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

E. Cylinder and Guide Collar Unit Installation

(1) Clean the threads on the hub unit (360) and cylinder (320).

CAUTION: MAKE SURE THAT THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (1030) IS FACING THE CYLINDER (320) SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR UNIT MUST FACE THE HUB UNIT (360).

(2) Install the socket head cap screw (1350) into the guide collar unit (1030).

(3) Place the guide collar unit (1030) onto the small diameter shoulder of the cylinder (320). Do not tighten the guide collar unit, but permit it to rotate freely on the cylinder.

CAUTION: DO NOT APPLY SEALANT TO THE THREADS OF THE CYLINDER (320). HYDRAULIC SEALANT ADHESIVE IN THE CYLINDER MAY CONTAMINATE THE AIRCRAFT ENGINE OIL.

(4) Apply a bead of hydraulic sealant adhesive CM134 in the groove of the hub unit (360), where the cylinder O-ring (330) will fit.

(5) Lubricate the cylinder O-ring (330) with lubricant CM12 and install it in the groove in the cylinder (320).

(6) With the guide collar unit (1030) resting on the cylinder shoulder, hand tighten the cylinder (320) onto the hub unit (360).

(7) Using a bar of appropriate size to fit the slot in the top of the cylinder (320), tighten the cylinder against the hub unit (360).

(8) Tighten the cylinder (320) flush with the hub shoulder.

NOTE: Early drag and tightness is caused by the O-ring (330), which acts as seal and safety.

(9) Torque the cylinder (320) in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

(10) Inspect the slot in the top of the cylinder (320) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(11) Remove any sharp edges in the slot on top of the cylinder (320).

(12) Inspect the inside of the cylinder (320) to make sure the O-ring (330) has not been forced out of place during the cylinder installation procedure.

F. Piston Installation

NOTE: Refer to Figure 7-4 for the installation and orientation of components installed in the piston (30) and dust seal length.

(1) Using lubricant CM12, lubricate the O-ring (530) and install it in the groove below the threads on the pitch change rod.

(2) Using lubricant CM12, lubricate the piston O-ring (100).

(3) Carefully install the piston O-ring (100) in the groove provided for it in the piston (30).

CAUTION: MAKE SURE THAT THE FELT PISTON DUST SEAL (1530) IS FUZZ-FREE.

(4) Cut the piston dust seal material (90) to length on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(a) If the piston dust seal (90) has fuzz or long strands that could interfere with the operation of the O-ring, replace the piston dust seal.

(5) Soak the piston dust seal (90) in aviation grade engine oil until it is completely saturated.

(a) Squeeze the excess oil from the piston dust seal (90).

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP OF THE FELT PISTON DUST SEAL (90) REMAINS VISIBLE AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON (30).

(6) Install the thinnest section of the piston dust seal (90) onto the cylinder OD groove.

(7) Slide the piston (30) into place over the cylinder (320).

(8) Align the piston guide rods (70) with the holes in the guide collar unit (1030).

(9) Install the socket head cap screw (150), nut (180), and washer (190) on the end of each piston guide rod (70).

(10) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm.

(11) Install the free end of each link arm (280) in the piston (30) slot.

(12) Install each link pin unit (300).

CAUTION: MAKE SURE THE PROPER SAFETY SCREW (310) IS INSTALLED AND THAT ADEQUATE THREADS ARE AVAILABLE IN THE PISTON (30) TO HOLD THE SCREW IN PLACE. AT LEAST THREE THREAD LENGTHS ARE SUFFICIENT. DO NOT BIND THE LINK ARM (280).

(13) Actuate the propeller assembly by hand to make sure the piston (30) moves freely.

(14) Seat the guide collar unit (1030) firmly against the cylinder (320). Make sure the piston guide rods (70) travel freely throughout the guide collar unit.

(15) If the piston guide rods (70) do not move freely, shift the guide collar unit radially to provide the correct alignment.

(16) Tighten the socket head cap screw (1050) in the guide collar unit (1030). Torque the socket head cap screw in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

G. Establishing Reference Blade Radius

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

H. Setting Blade Angle

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

I. Visual Detection of Blade Slippage in Clamp

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" section of this chapter.

J. Optional Sealant CM93 Application

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

K. Checking Blade Track

(1) With the propeller secured on a rotatable fixture, check the height of the tip at the center point of the highest blade. Use a scale with at least 0.032 inch (0.79 mm) divisions and adjustable pointer.

CAUTION: BLADE HEIGHT AT THE TIPS SHOULD NOT VARY MORE THAN ±0.06 INCH (1.5 MM).

(2) Rotate the propeller and measure the variation of each blade.

L. Label Replacement

(1) For label replacement instructions, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

4. Assembly of Splined-Hub Models: -1 Series [Except HA-A2(V,MV)20-1B]

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

A. Hub Unit Assembly

(1) Follow the hub assembly procedure in the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Secure the hub unit (360) on a splined shaft rotatable fixture of a propeller assembly table.

(3) Thread the hub nut (550) and the hub puller ring (540) onto the rotatable fixture to secure the hub unit.

B. Guide Collar Unit Installation

CAUTION: THE GUIDE COLLAR UNIT (1030) MUST BE INSTALLED SO THAT THE SPOT FACES FOR PUSH ROD LOCKING NUT AND WASHER ARE AT THE REAR OF THE HUB UNIT (360).

(1) Position the guide collar unit (1030) halves around the center shaft of the hub unit between the blade arms and propeller assembly table.

(2) Insert two socket head cap screws (1050) into the guide collar unit (1030).

(3) Position the guide collar unit (1030) up against the shoulder on the hub unit (360) near the blade arms and tighten the screws (1050).

NOTE: The guide collar unit (1030) will need to be repositioned later to align with the pitch change guide rods (70).

C. Blade Mounting Parts Assembly

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

D. Clamp Assembly

(1) For clamp assembly (1200) procedures, refer to the Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

E. Blade and Clamp Installation

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

F. Cylinder Installation

(1) Clean the threads on the hub unit (360) and cylinder (320).

CAUTION: DO NOT APPLY SEALANT TO THE THREADS OF THE CYLINDER (320). HYDRAULIC SEALANT ADHESIVE IN THE CYLINDER MAY CONTAMINATE THE AIRCRAFT ENGINE OIL.

(2) Apply a bead of hydraulic sealant adhesive CM134 in the groove of the hub unit (360) where the cylinder O-ring (330) fits. Install the O-ring into the cylinder chamfer.

(3) Hand tighten the cylinder (320) onto the hub unit (360).

(4) Using a bar of appropriate size to fit the slot in the top of the cylinder (320), tighten the cylinder against the hub unit (360).

(5) Tighten the cylinder (320) flush with the hub shoulder.

NOTE: Early drag and tightness is caused by the O-ring (330), which acts as seal and safety.

(6) Torque the cylinder in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

(7) Inspect the slot in the top of the cylinder (320) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(8) Remove any sharp edges in the wrench slot on top of the cylinder (320).

(9) Inspect the inside of the cylinder (320) to make sure the O-ring (330) has not been forced out of place during the cylinder installation procedure.

G. Piston Installation

NOTE: Refer to Figure 7-4 for the installation and orientation of components installed in the piston (30) and dust seal length.

(1) Using lubricant CM12, lubricate the piston O-ring (100).

(2) Carefully install the piston O-ring (100) in the groove provided for it in the piston (30).

CAUTION: MAKE SURE THAT THE FELT PISTON DUST SEAL (1530) IS FUZZ-FREE.

(3) Cut the piston dust seal material (90) to length on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(a) If the piston dust seal (90) has fuzz or long strands that could interfere with the operation of the O-ring, replace the piston dust seal.

(4) Soak the piston dust seal (90) in aviation grade engine oil until it is completely saturated.

(a) Squeeze the excess oil from the piston dust seal (90).

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP OF THE FELT PISTON DUST SEAL (90) REMAINS VISIBLE AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON (30).

(5) Install the thinnest section of the piston dust seal (90) onto the cylinder OD groove.

(6) Slide the high pitch stop spacer (120) onto each guide rod sleeve (110), against the shoulder of the sleeve.

CAUTION: THE SHOULDER OF THE GUIDE ROD SLEEVE (110) AND HIGH PITCH STOP SPACER (120) SHOULD BE ON THE SIDE OF THE GUIDE COLLAR UNIT (1030) FACING AWAY FROM THE PROPELLER ASSEMBLY BENCH.

(7) Slide the guide rod sleeve (110) through the holes in the guide collar unit (1030).

(8) Install the pitch change block (170) on each linkscrew (1270).

(9) Install each fork (140) on each pitch change block (170), with the thick portion of the fork (140) on the side facing the propeller assembly bench.

(10) Slide the piston (30) over the cylinder (320) and the pitch change guide rods (70) through the forks (140), guide rod sleeves (110), pitch stop spacers (120), and guide collar unit (1030).

NOTE: The guide collar unit (1030) may need to be repositioned to align with the pitch change guide rods (70).

(11) Tighten the guide collar unit fasteners (1030). Torque the fasteners in accordance with the Fits and Clearance chapter of this manual.

(12) Safety each guide collar unit fastener (1030) with safety wire CM131 or equivalent.

(13) Install the washer (190) and lock nut (180) on the end of each pitch change guide rod (70).

(14) Torque the nut in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

(15) Align the fork (140) with the pitch change block (170).

(16) Tighten the fork set screw (130). Torque the set screw in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

(17) If the guide collar unit (1030) does not have a dowel pin (1070) notch:

(a) For K-flange and L-flange:

1 Position the guide collar unit (1030) to make sure there is free movement of the pitch change guide rods (70).

2 Spot face the edge of the guide collar unit (1030) approximately 0.125 inch (3.17 mm) deep to receive the dowel pin (1070).

(b) For F-flange:

1 Install four spinner lugs.

2 Position the guide collar unit (1030) so it is properly located to receive the pitch change guide rods (70).

3 Spot face the edge of the guide collar unit (1030) approximately 0.125 inch (3.17 mm) deep to receive the dowel pin (1070).

NOTE: There are pins in two areas on the collar to keep the guide collar unit (1030) from rotating.

H. Establishing Reference Blade Radius

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

I. Setting Blade Angle

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

J. Visual Detection of Blade Slippage in Clamp

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" section of this chapter.

K. Optional Sealant CM93 Application

Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

L. Checking Blade Track

(1) With the propeller secured on a rotatable fixture, check the height of the tip at the center point of the highest blade. Use a scale with at least 0.032 inch (0.79 mm) divisions and adjustable pointer.

CAUTION: BLADE HEIGHT AT THE TIPS SHOULD NOT VARY MORE THAN ±0.06 INCH (1.5 MM).

(2) Rotate the propeller and measure the variation of each blade.

M. Label Replacement

(1) For label replacement instructions, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

5. Assembly of Splined Hub Models: HA-A2(V,MV)20-1B

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

A. Hub Unit Assembly

(1) Follow the hub assembly procedure in the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Secure the hub on the splined shaft of a rotatable fixture of a propeller assembly table.

(3) Thread the hub nut (550) and the hub puller ring (540) onto the rotatable fixture to secure the hub unit.

B. Blade Mounting Parts Assembly

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" in this chapter.

C. Clamp Assembly

(1) For clamp assembly (1200) procedures, refer to the Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) For information concerning the correct counterweight slugs and installation hardware, refer to Hartzell Propeller Inc. Propeller Application Guide Manual 159 (61-02-59).

D. Blade and Clamp Installation

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

E. Cylinder Installation

(1) Clean the threads on the hub (360) and cylinder (320).

CAUTION: DO NOT APPLY SEALANT TO THE THREADS OF THE CYLINDER (320). HYDRAULIC SEALANT ADHESIVE IN THE CYLINDER MAY CONTAMINATE THE AIRCRAFT ENGINE OIL.

(2) Apply a bead of hydraulic sealant adhesive CM134 in the groove of the hub unit (360) where the cylinder O-ring (330) fits. Install the O-ring into the cylinder chamfer, facing the hub unit.

(3) Hand tighten the cylinder (320) onto the hub unit (360).

(4) Use a bar of appropriate size to fit the slot in the top of the cylinder (320), and torque the cylinder against the hub unit (360).

(5) Tighten the cylinder (320) flush with the hub shoulder. Refer to the Torque Values table in the Fits and Clearance chapter of this manual.

NOTE: Early drag and tightness is caused by the O-ring (330), which acts as seal and safety.

(6) Inspect the slot in the top of the cylinder (360) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(7) Remove any sharp edges in the slot on top of the cylinder (360).

(8) Inspect the inside of the cylinder (360) to make sure the O-ring (330) has not been forced out of place during the cylinder installation procedure.

F. Pitch Adjustment Unit Assembly

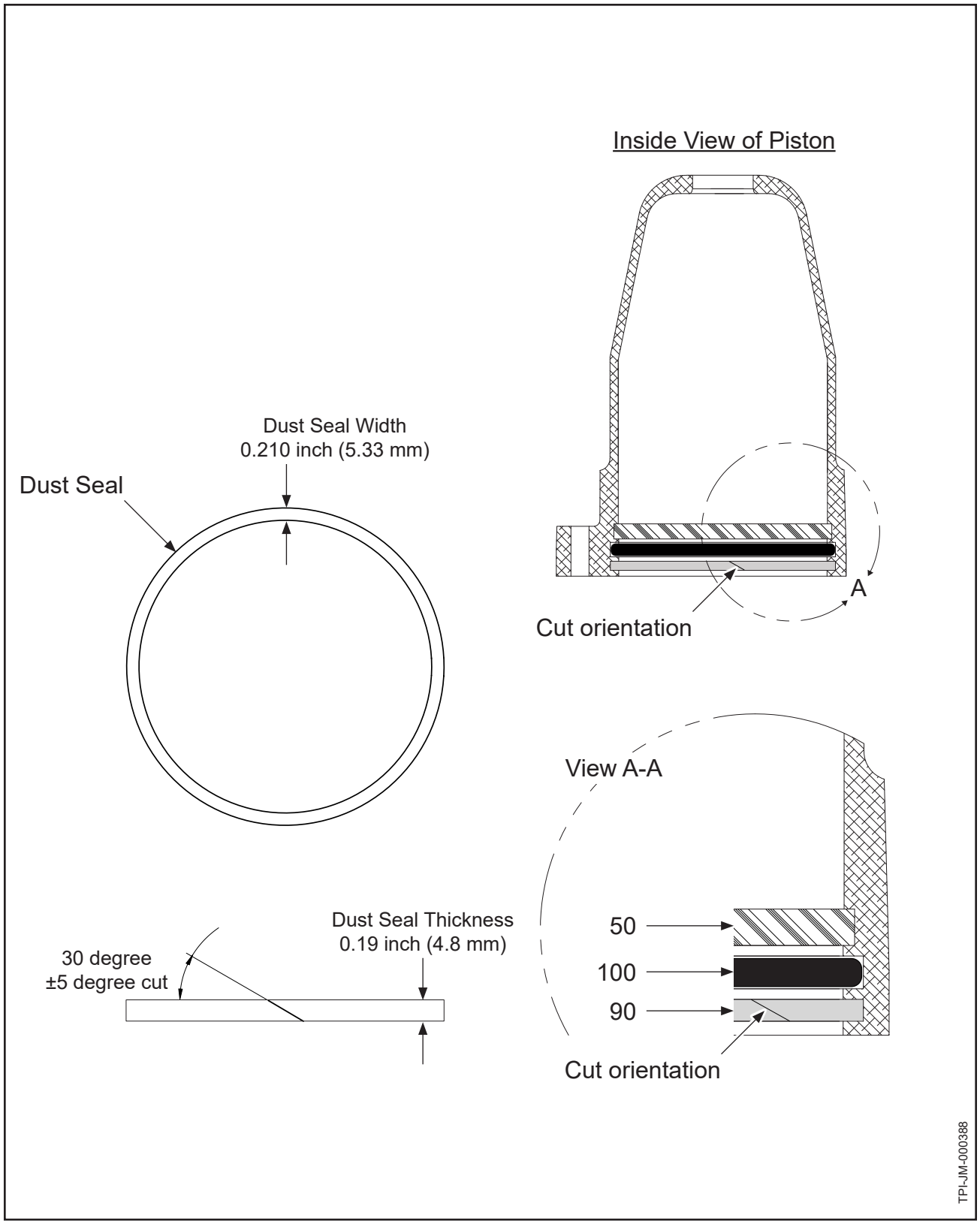
(1) Insert the sleeve nut (750) into the retainer cup (760) through the inside bore.

(2) Thread the socket head set screw (770) into the retainer cup (760) and lock the sleeve nut (750) fully against the retainer cup shoulder.

(3) Thread the lock nut (740) onto the sleeve nut (750) and tighten the nut against the retainer cup.

(4) Torque the lock nut in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

(5) Thread the pitch change rod (730) into the pitch adjustment assembly (690), with the threaded end facing toward the piston (30) to be installed later.



Piston Dust Seal Orientation
Figure 7-5

G. Pitch Adjustment Unit Installation

(1) Insert the shoulder of the pitch adjustment assembly (690) approximately 0.25 inch (6.4 mm) into the cylinder (320), and insert the split keeper (560) into the groove in the cylinder.

(2) Place the keyed retaining ring (520) over the pitch adjustment assembly (690) shoulder and the split keeper (560). Make sure that the pitch adjustment assembly is tight against the split keeper to keep them from sliding out of the groove in the cylinder (320).

(3) Insert the screws (510) through the plate and tighten them into the pitch adjustment assembly (690) shoulder.

NOTE: The screws (510) will be safetied after the propeller is installed on the engine.

H. Piston Installation

NOTE: Refer to Figure 7-5 for the installation and orientation of components installed in the piston (30) and dust seal length.

(1) Using lubricant CM12, lubricate the piston O-ring (100).

(2) Carefully install the piston O-ring (100) in the groove provided for it in the piston (30).

CAUTION: MAKE SURE THAT THE FELT PISTON DUST SEAL (1530) IS FUZZ-FREE.

(3) Cut the piston dust seal material (90) to length on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(a) If the piston dust seal (90) has fuzz or long strands that could interfere with the operation of the O-ring, replace the piston dust seal.

(4) Soak the piston dust seal (90) in aviation grade engine oil until it is completely saturated.

(a) Squeeze the excess oil from the piston dust seal (90).

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP OF THE FELT PISTON DUST SEAL (90) REMAINS VISIBLE AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON (30).

(5) Install the thinnest section of the piston dust seal (90) in the remaining piston OD groove.

(6) Install the O-ring (530) on the pitch change rod (730).

(7) Slide the piston unit (30) onto the cylinder (320) and slide the pitch change rod (730) through the hole in the piston.

(8) Install the lock nut (500) onto the pitch change rod (730). Do not torque the lock nut.

(9) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (280).

(10) Attach the link arms (280) in the piston (30) slots with link pin unit (300) and safety screw (310).

NOTE: The link pin unit (300) and safety screw (310) will be safetied when the propeller is installed on the engine.

I. Establishing Reference Blade Radius

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

J. Setting Blade Angle

(1) Rotate the pitch change rod (730) completely into the pitch adjustment assembly (690), and then back out about one inch (25.4 mm).

(2) Tighten the lock nut (740) on the pitch change rod (730) against the piston (30). Torque the lock nut in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

CAUTION 1: REFER TO THE APPLICABLE TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATA SHEET, OR HARTZELL PROPELLER INC. PROPELLER APPLICATION GUIDE, MANUAL 159 (61-02-59), FOR THE REQUIRED BLADE ANGLES.

CAUTION 2: THE BLADE ANGLE OF ALL BLADES MUST BE WITHIN 0.2 DEGREE OF EACH OTHER.

(3) Use a hand-held or bench-top protractor at the reference blade radius specified in the Hartzell Propeller Inc. Propeller Application Guide Manual 159 (61-02-59), to adjust the angle of the blades. Refer to Figure 7-9.

(4) Rotate the blades to the desired pitch within the blade clamps (1340).

(5) Tighten the lock nuts (1370) on the outer clamp bolts (1350) in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

K. Visual Detection of Blade Slippage in Clamp

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" section of this chapter.

L. Optional Sealant CM93 Application

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

M. Checking Blade Track

(1) With the propeller secured on a rotatable fixture, check the height of the tip at the center point of the highest blade. Use a scale with at least 0.032 inch (0.79 mm) divisions and adjustable pointer.

CAUTION: BLADE HEIGHT AT THE TIPS SHOULD NOT VARY MORE THAN ±0.06 INCH (1.5 MM).

(2) Rotate the propeller and measure the variation of each blade.

N. Label Replacement

(1) For label replacement instructions, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

6. Assembly of Splined-Hub Models: HC-A2(V,MV)20-4A1

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

A. Hub Unit Assembly

(1) Follow the hub assembly procedure in the Steel Hub Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) Place the guide collar unit (1030) around the rotatable fixture on the propeller assembly bench for later attachment. Make sure the large center bore chamfer is facing up, away from the assembly bench.

(3) Install the 20 spline rear mounting cone (3030) on the rotatable fixture of a propeller assembly table.

(4) Use special tool TE146 or equivalent, to tighten the hub nut.

B. Blade Mounting Parts Assembly

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

C. Guide Collar Unit Installation

(1) Insert two hex head bolts (1050) into the guide collar unit (1030) for clamping.

(2) Position it against the small radius shoulder on the hub unit (360), next to the blade arms.

(3) Position the holes in the guide collar unit (1030) appropriately to receive the pitch change guide rods (70).

(4) Tighten the guide collar bolts (1350) enough to hold the guide collar unit (1030) in place.

D. Clamp Assembly

(1) For clamp assembly (1200) procedures, refer to the Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(2) For information concerning the correct counterweight slugs and installation hardware, refer to Hartzell Propeller Inc. Propeller Application Guide Manual 159 (61-02-59).

E. Blade and Clamp Installation

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

F. Cylinder Installation

(1) Clean the threads on the hub unit (360) and cylinder (320).

CAUTION: DO NOT APPLY SEALANT TO THE THREADS OF THE CYLINDER (320). HYDRAULIC SEALANT ADHESIVE IN THE CYLINDER MAY CONTAMINATE THE AIRCRAFT ENGINE OIL.

(2) Apply a bead of hydraulic sealant adhesive CM134 in the groove of the hub unit (360) where the cylinder O-ring (330) will fit. Install the O-ring into the cylinder chamfer.

(3) Turn the cylinder onto the hub unit (360).

(4) Use a bar of appropriate size to fit the slot provided for it in the top of the cylinder, and torque the cylinder (320) against the hub unit (360). Refer to the Torque Values table in the Fits and Clearance chapter of this manual.

(5) Tighten the cylinder (320) flush with the shoulder on the hub unit (360).

NOTE: Early drag and tightness is caused by the O-ring, which acts as seal and safety.

(6) Inspect the slot in the top of the cylinder (320) to make sure the square-bar wrench used for torquing did not raise any sharp edges or damage the threads.

(7) Remove any sharp edges in the wrench slot on top of the cylinder (320).

(8) Inspect the inside of the cylinder (320) to make sure the O-ring has not been forced out of place during the cylinder installation procedure.

(9) Lubricate the O-rings (210, 530) and install them on the seal housing (490).

(10) Install the seal housing (490) on to the shaft nut (550) and seat it so it is below the holes in the propeller nut.

(11) Insert cotter pin (495) from the outboard side of the shaft nut (550) to hold the seal housing (490) in place.

G. Piston Installation

NOTE: Refer to Figure 7-4 for the installation and orientation of components installed in the piston (30) and dust seal length.

(1) Using lubricant CM12, lubricate the piston O-ring (100).

(2) Carefully install the piston O-ring (100) in the groove provided for it in the piston (30).

CAUTION: MAKE SURE THAT THE FELT PISTON DUST SEAL (1530) IS FUZZ-FREE.

(3) Cut the piston dust seal material (90) to length on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(a) If the piston dust seal (90) has fuzz or long strands that could interfere with the operation of the O-ring, replace the piston dust seal.

(4) Soak the piston dust seal (90) in aviation grade engine oil until it is completely saturated.

(a) Squeeze the excess oil from the piston dust seal (90).

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP OF THE FELT PISTON DUST SEAL (90) REMAINS VISIBLE AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON (30).

(5) Install the thinnest section of the piston dust seal (90) onto the cylinder OD groove.

(6) Install the pitch change block (170) on each linkscrew (1270).

(7) Install each fork (140) on each pitch change block (170) with the thick portion of the fork facing down.

(8) Slide the high pitch stop spacer (120) onto each guide rod sleeve (110), against the shoulder of sleeve.

(9) Slide the guide rod sleeve (110) with the high pitch stop spacer (120) into the guide collar unit (1030) holes. The shoulder of the guide rod sleeve and pitch stop spacer must be on the side of the guide collar unit facing away from the propeller assembly bench.

(10) Slide the piston (30) over the cylinder (320) and the pitch change guide rods (70) through the forks (140), guide rod sleeves (110), pitch stop spacers (120), and guide collar unit (1030).

NOTE: Some rotation of the guide collar unit (1030) may be necessary to achieve proper alignment with the fork (140) and linkscrew (1270).

(11) Tighten the guide collar fasteners (1050). Torque the fasteners (1050) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(12) Safety each hex head bolt (1050) with safety wire CM131.

(13) Install the washer (190) and lock nut (180) on the end of each pitch change guide rod (70) and tighten.

(14) Align the fork (140) with the pitch change block (170) and torque the set screw (130) in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

H. Establishing Reference Blade Radius

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

I. Setting Blade Angle

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

J. Visual Detection of Blade Slippage in Clamp

(1) Refer to the section, "Common Assembly Procedures - All Hub Models" section of this chapter.

K. Optional Sealant CM93 Application

Refer to the section, "Common Assembly Procedures - All Hub Models" of this chapter.

L. Checking Blade Track

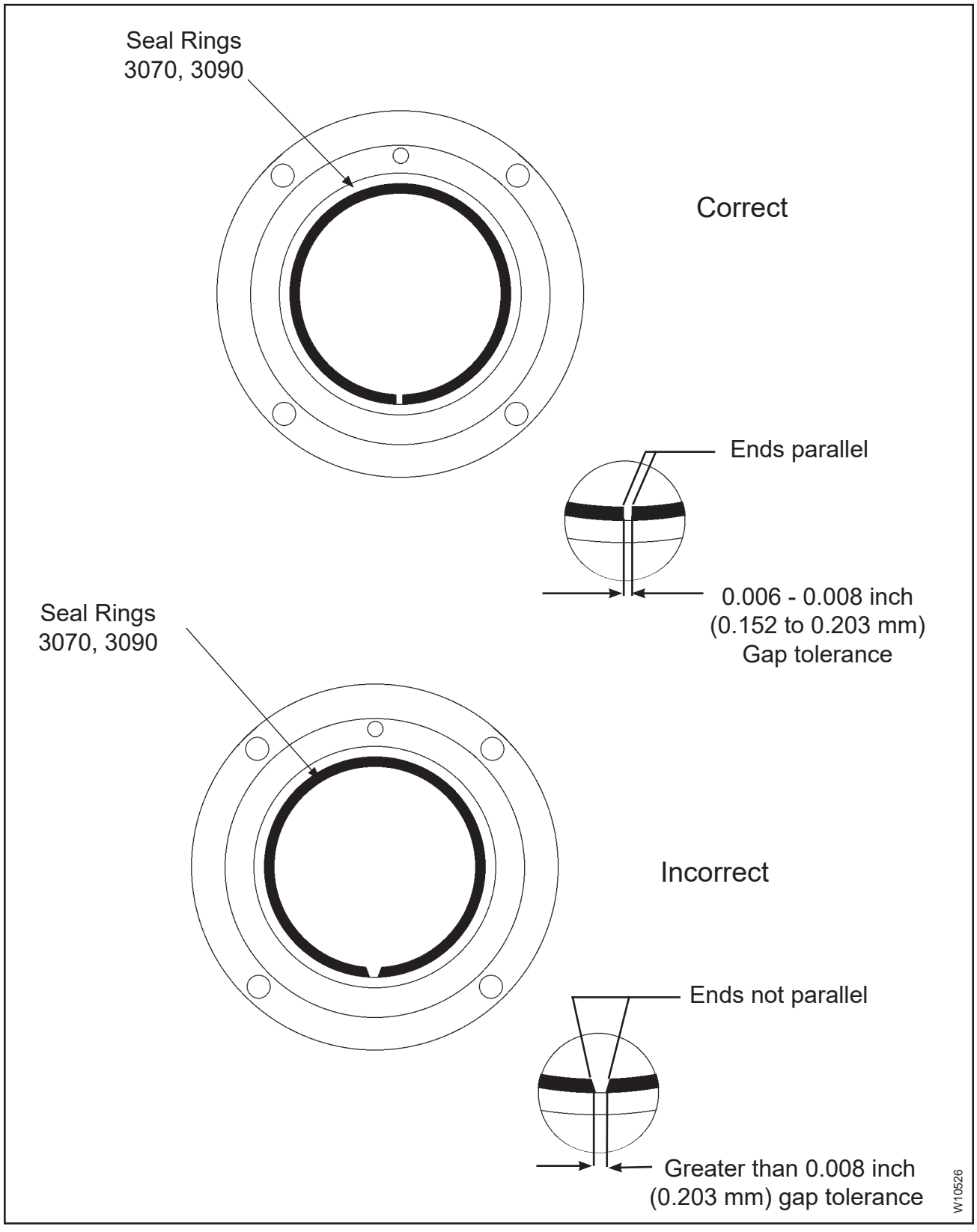
(1) With the propeller secured on a rotatable fixture, check the height of the tip at the center point of the highest blade. Use a scale with at least 0.032 inch (0.79 mm) divisions and adjustable pointer.

CAUTION: BLADE HEIGHT AT THE TIPS SHOULD NOT VARY MORE THAN ±0.06 INCH (1.5 MM).

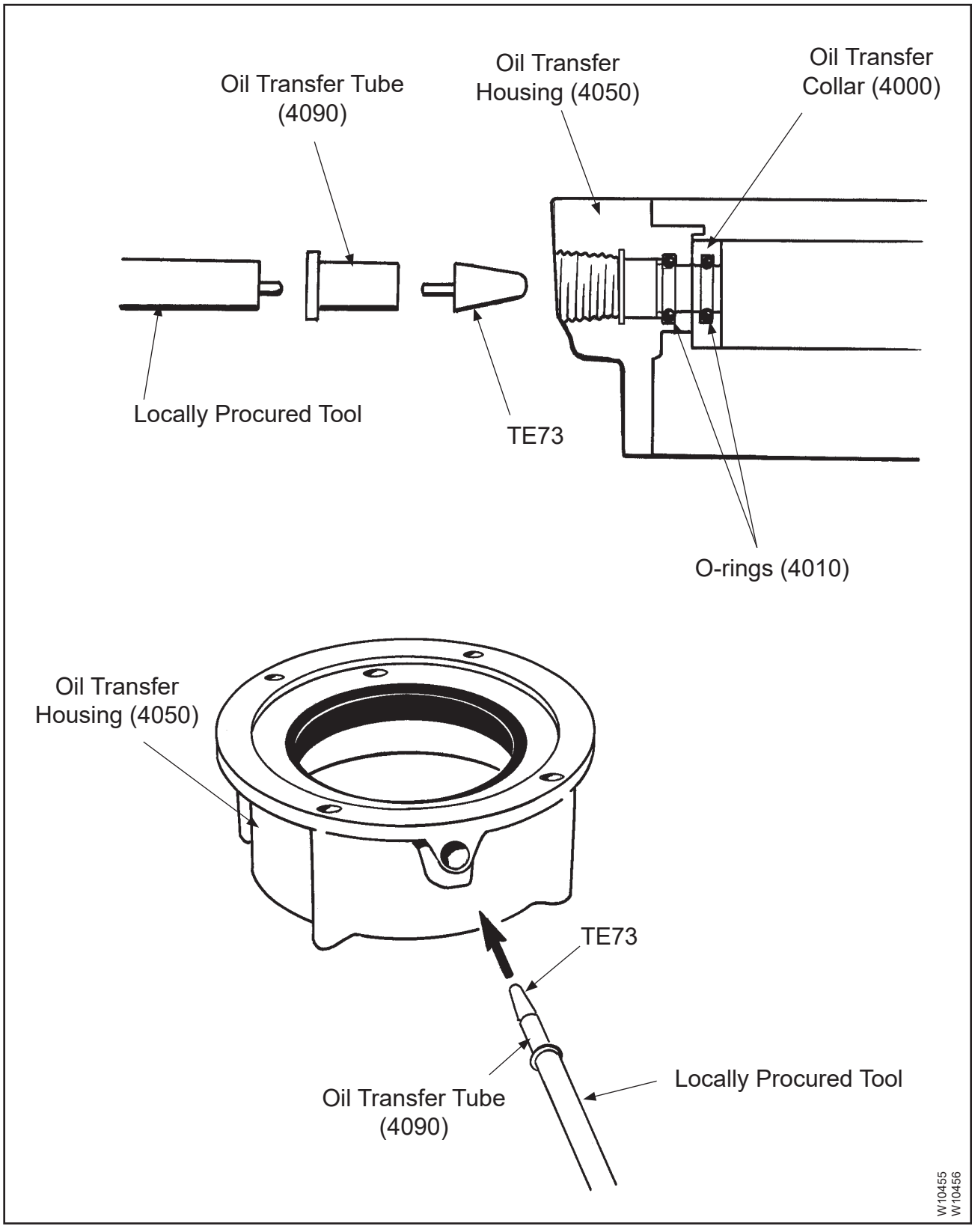
(2) Rotate the propeller and measure the variation of each blade.

M. Label Replacement

(1) For label replacement instructions, refer to the Parts Identification and Marking chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).



Checking End Gap on the Seal Rings
Figure 7-6



Installing the Oil Transfer Tube Using the Installation Tools
Figure 7-7

N. Oil Transfer Unit Assembly

(1) Inspect the end-gap of the seal rings (3070, 3090). Refer to Figure 7-6.

(a) Press a seal ring into the oil transfer collar (4000). Position the seal ring (3070, 3090) in the oil transfer collar so the seal ring is just inside the oil transfer collar.

(b) Examine the seal ring end gap. Ring ends must be parallel, as shown in Figure 7-6. If the ring ends are not parallel, file as necessary to attain a uniform gap.

(c) Measure the end gap of the seal ring (3070, 3090). The ring end gap must be 0.006 to 0.008 inch (0.152 to 0.203 mm).

(d) If the end gap is less than 0.006 inch (0.152 mm), file the ring ends as necessary to attain the required gap. If the end gap exceeds 0.008 inch (0.203 mm), replace the seal ring.

(e) Repeat these steps for the remaining seal rings.

(2) Install an O-ring (4010) into O-ring groove in the hole in the oil transfer collar (4000).

(3) Install the oil transfer collar (4000) into the oil transfer housing (4050), aligning the oil transfer collar hole and installed O-ring with the oil supply hole in the oil transfer housing.

(4) Install the oil transfer tube (4090) into the oil transfer housing (4050) and oil transfer collar (4000). Refer to Figure 7-7.

(a) Insert a locally procured installation tool into the shoulder-side of the oil transfer tube (4090).

(b) Insert the O-ring pilot installation tool TE73 on the opposite end of the oil transfer tube (4090).

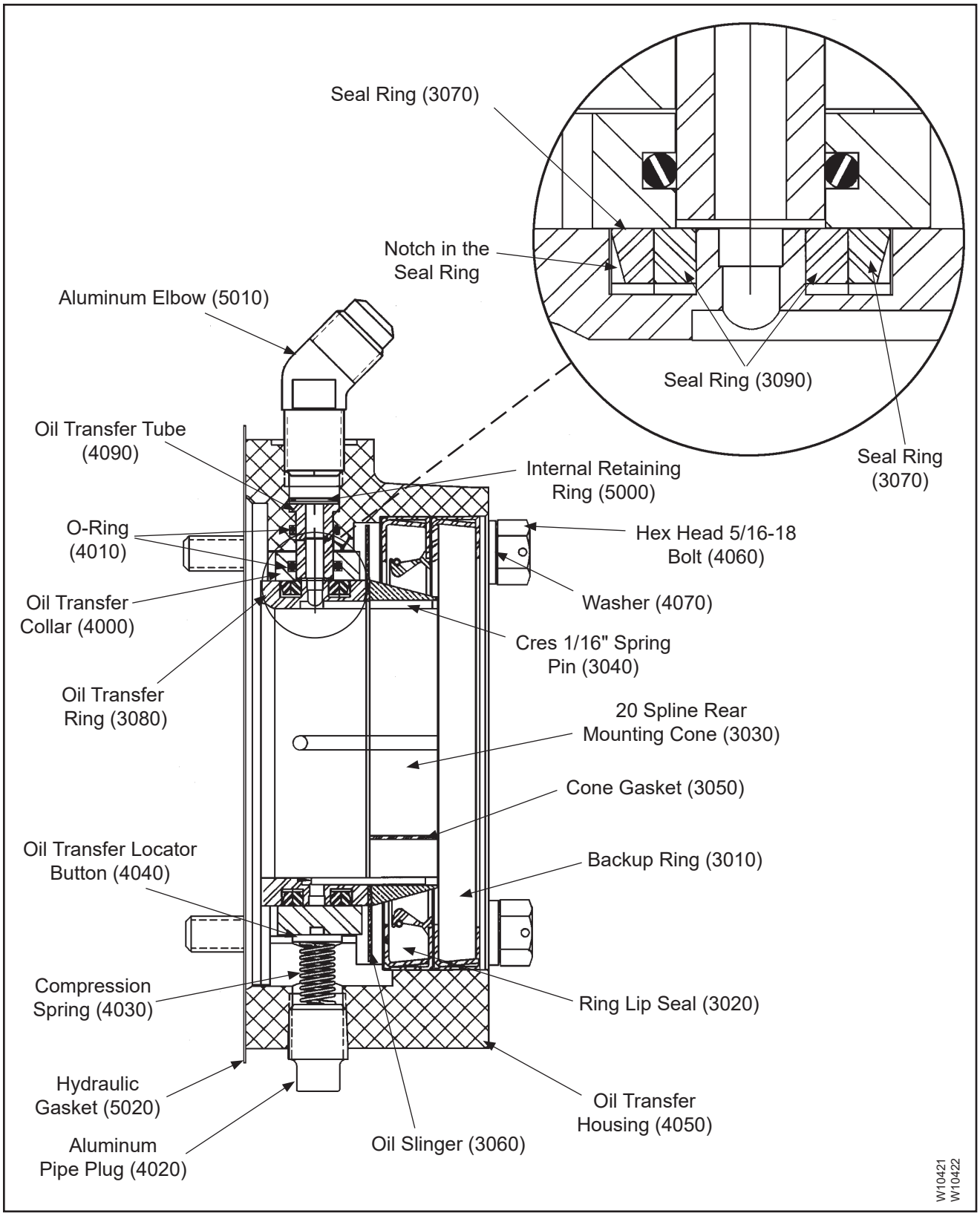
(c) Insert the oil transfer tube (4090) through the oil supply hole of the oil transfer housing (4050) until the shoulder of the oil transfer tube contacts with the shoulder of the oil supply hole of the oil transfer housing.

(d) Using a snap ring tool, install the internal retaining ring (5000) into the groove provided in the oil supply hole of the oil transfer housing (4050).

(e) Remove TE73 from the oil transfer tube (4090) from the ID of the oil transfer collar (4000).

(5) Insert the oil transfer locator button (4040) in place through the aluminum pipe plug (4020) hole of the oil transfer housing (4050) and into the groove of the oil transfer collar (4000).

NOTE: There is a manufactured groove on the OD of the oil transfer collar (4000) for installation of the oil transfer locator button (4040). Refer to Figure 5-10 in the Check chapter of this manual.



A-224-4 Oil Transfer Unit
Figure 7-8

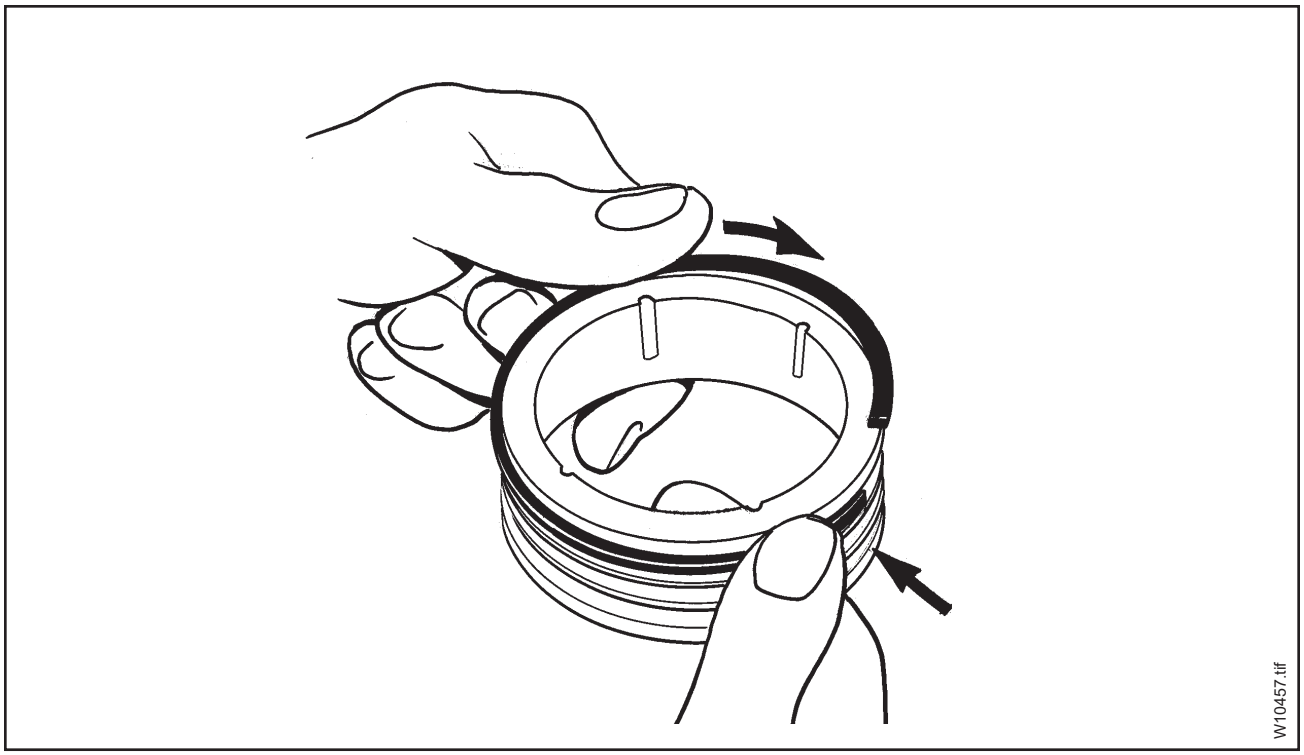
(6) Place the compression spring (4030) in the aluminum pipe plug (4020) hole in the oil transfer housing (4050) on the oil transfer locator button (4040).

(7) Apply thread-locking compound CM21 to the threads of the aluminum pipe plug (4020).

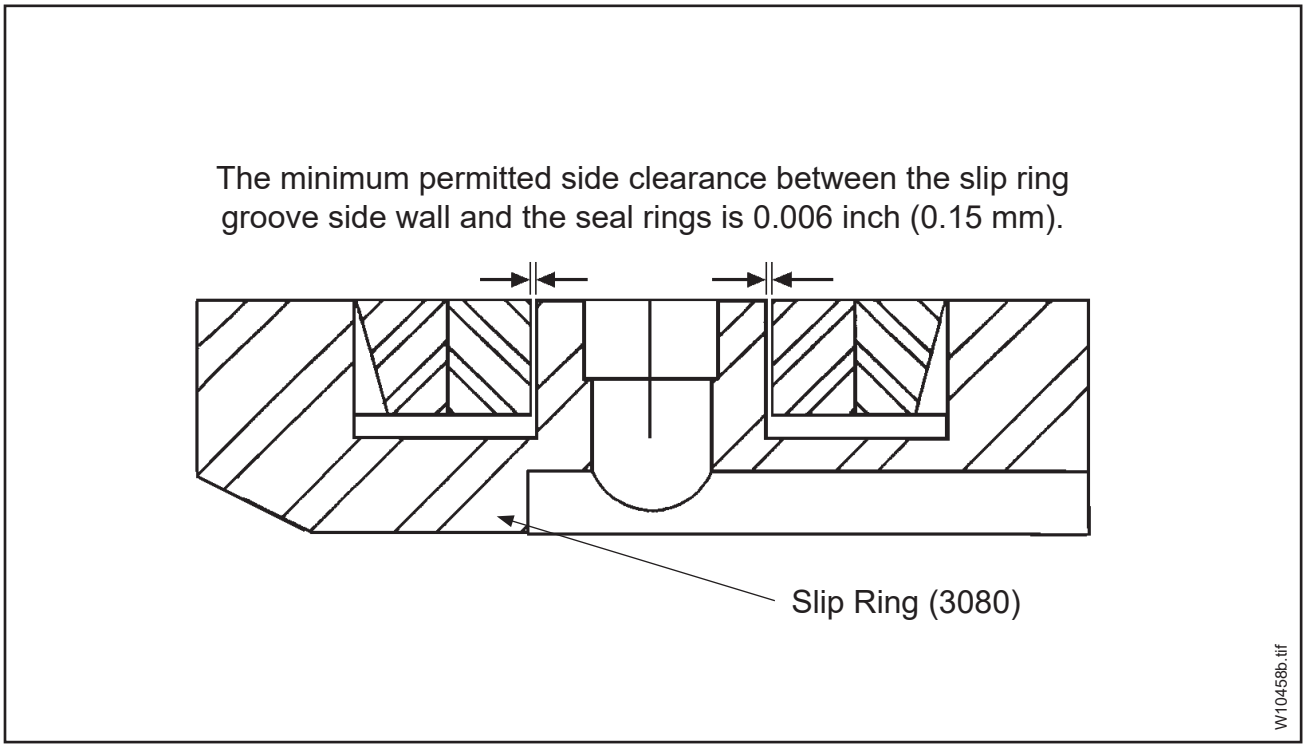
CAUTION: WHEN INSTALLING THE ALUMINUM PIPE PLUG (4020), MAKE SURE THAT THE OIL TRANSFER LOCATOR BUTTON (4040) REMAINS ENGAGED IN THE OIL TRANSFER COLLAR (4000) GROOVE AND THE COMPRESSION SPRING (4030) REMAINS CENTERED ON THE SHOULDER OF THE OIL TRANSFER LOCATOR BUTTON (4040).

(8) Install the aluminum pipe plug (4020) into the oil transfer housing (4050). The compression spring (4030) will be compressed by the aluminum pipe plug (4020) when the aluminum pipe plug is installed in the oil transfer housing (4050).

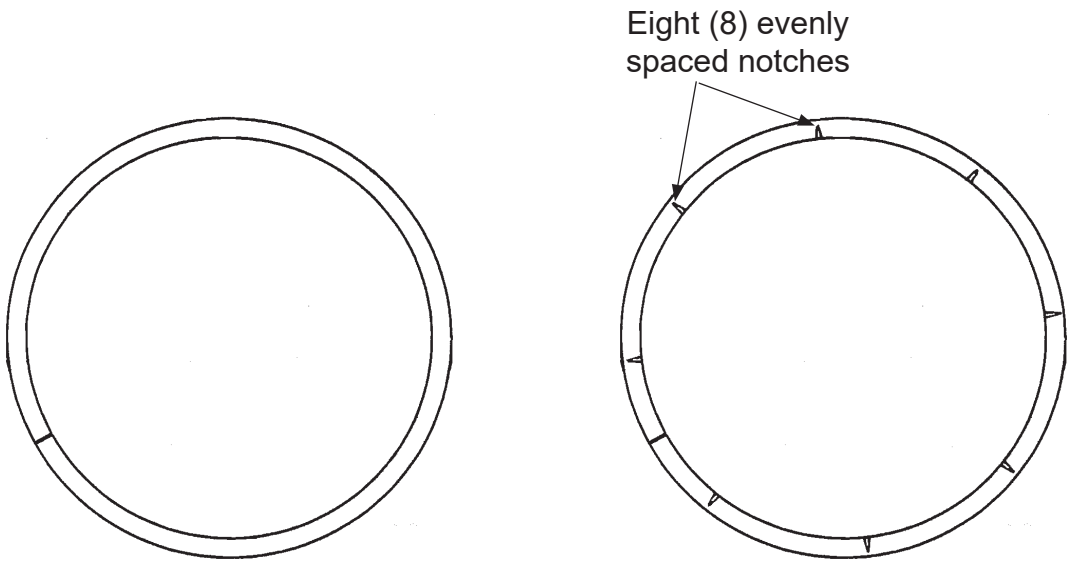
(9) Install an O-ring (4010) into the O-ring groove in the oil supply hole in the oil transfer housing (4050). Refer to Figure 7-8.



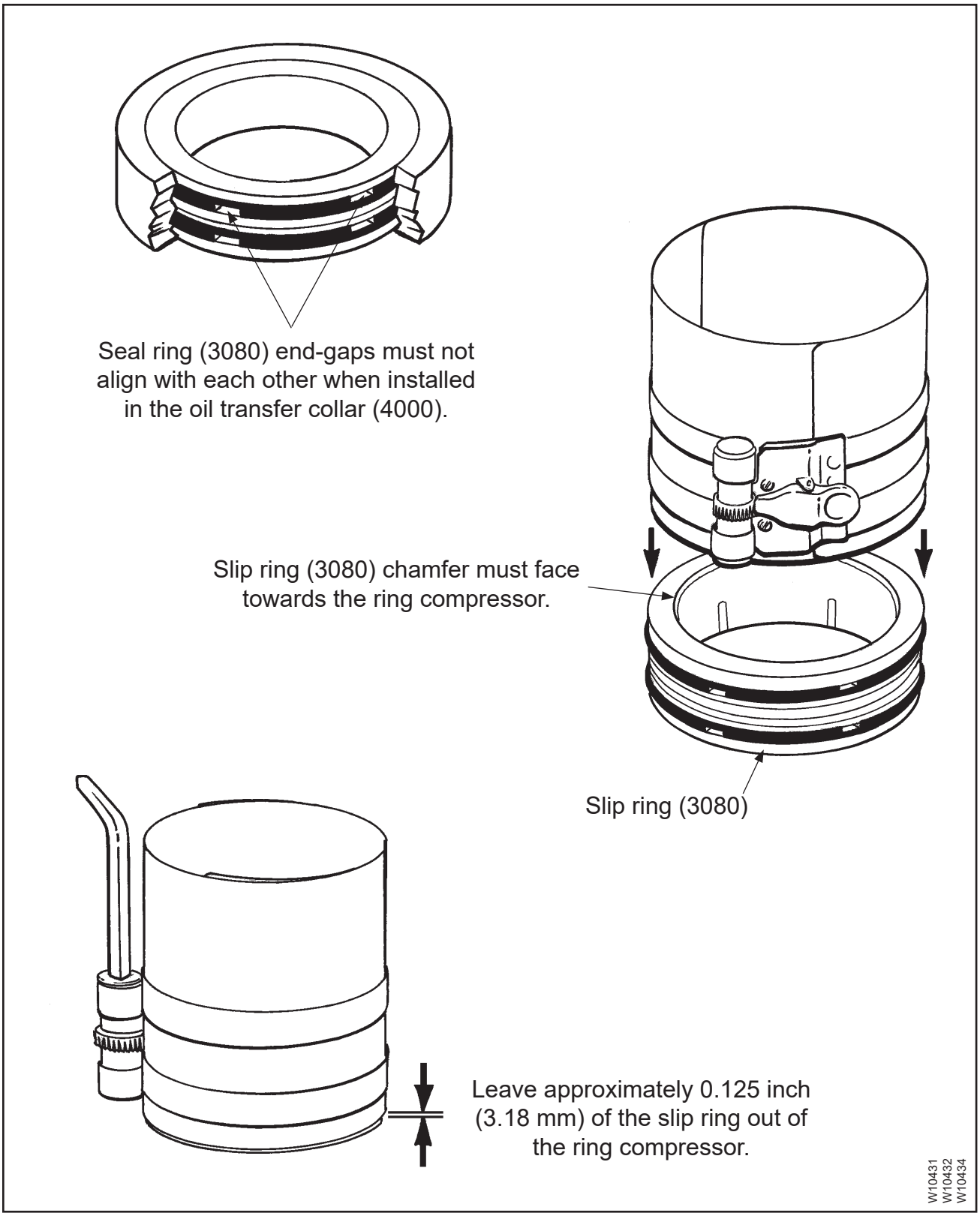
Installing the Seal Rings into the Slip Ring
Figure 7-9



Clearance Between the Slip Ring Groove Side and the Seal Ring
Figure 7-10



A-221-( ) Seal Ring Characteristics
Figure 7-11



Installing the Ring Compressor on the Slip Ring and Seal Rings
Figure 7-12

CAUTION 1: DO NOT STRETCH OR BEND THE SEAL RINGS WHILE INSTALLING IT INTO THE OIL TRANSFER RING (3080) GROOVE. THE SEAL RINGS ARE VERY BRITTLE AND WILL BREAK EASILY.

CAUTION 2: THE SEAL RING (3070, 3090) POSITION AND ORIENTATION IS IMPORTANT TO PROPER OPERATIONAL LUBRICATION AND LONG WEAR LIFE. REFER TO FIGURE 7-11 FOR SEAL RING IDENTIFICATION.

(10) Install a seal ring (3090) in each of the two grooves of the oil transfer ring (3080).

(a) Slide one end of the seal ring (3090) into the slip ring groove and slowly push the remainder of the seal ring into the slip ring groove. Refer to Figure 7-9.

(11) Install a seal ring (3070) in the outboard position of the grooves of the oil transfer ring (3080). Refer to Figure 7-9.

(a) Position the notches in the seal rings to face away from the center of the slip ring.

(b) Slide one end of the seal ring (3090) into the slip ring groove and slowly push the remainder of the seal ring into the slip ring groove. Refer to Figure 7-9.

(12) Measure the remaining side clearance between the oil transfer ring (3080) groove side wall and the seal ring (3090). The clearance must be 0.006 to 0.008 inch (0.152 to 0.203 mm). Refer to Figure 7-10.

CAUTION: ALIGNMENT OF ADJACENT SEAL RING END-GAPS COULD ADVERSELY AFFECT THE PROPELLER CONTROL AND OPERATION.

(13) Position the end-gaps of the adjacent seal rings (3070, 3090) to make sure that they do not align. Refer to Figure 7-12.

CAUTION: THE ID CHAMFER OF THE OIL TRANSFER RING (3080) MUST FACE TOWARDS THE ENGINE WHEN THE OIL TRANSFER UNIT IS INSTALLED ON THE ENGINE.

(14) Position the oil transfer ring (3080) with the ID chamfer facing the ring compressor.

(15) Using a ring compressor, compress the seal rings (3070, 3090) in place. Refer to Figure 7-12.

(16) Apply engine oil to the ID of the oil transfer collar (4000).

CAUTION: PRESSING THE SLIP RING TOO DEEP WILL PERMIT THE SEAL RINGS TO COME OUT OF THE SLIP RING AND WILL CAUSE DAMAGE TO THE UNIT WHEN INSTALLED.

(17) Install the oil transfer ring (3080) and the seal rings (3070, 3090) into the oil transfer collar (4000). Refer to Figure 7-12.

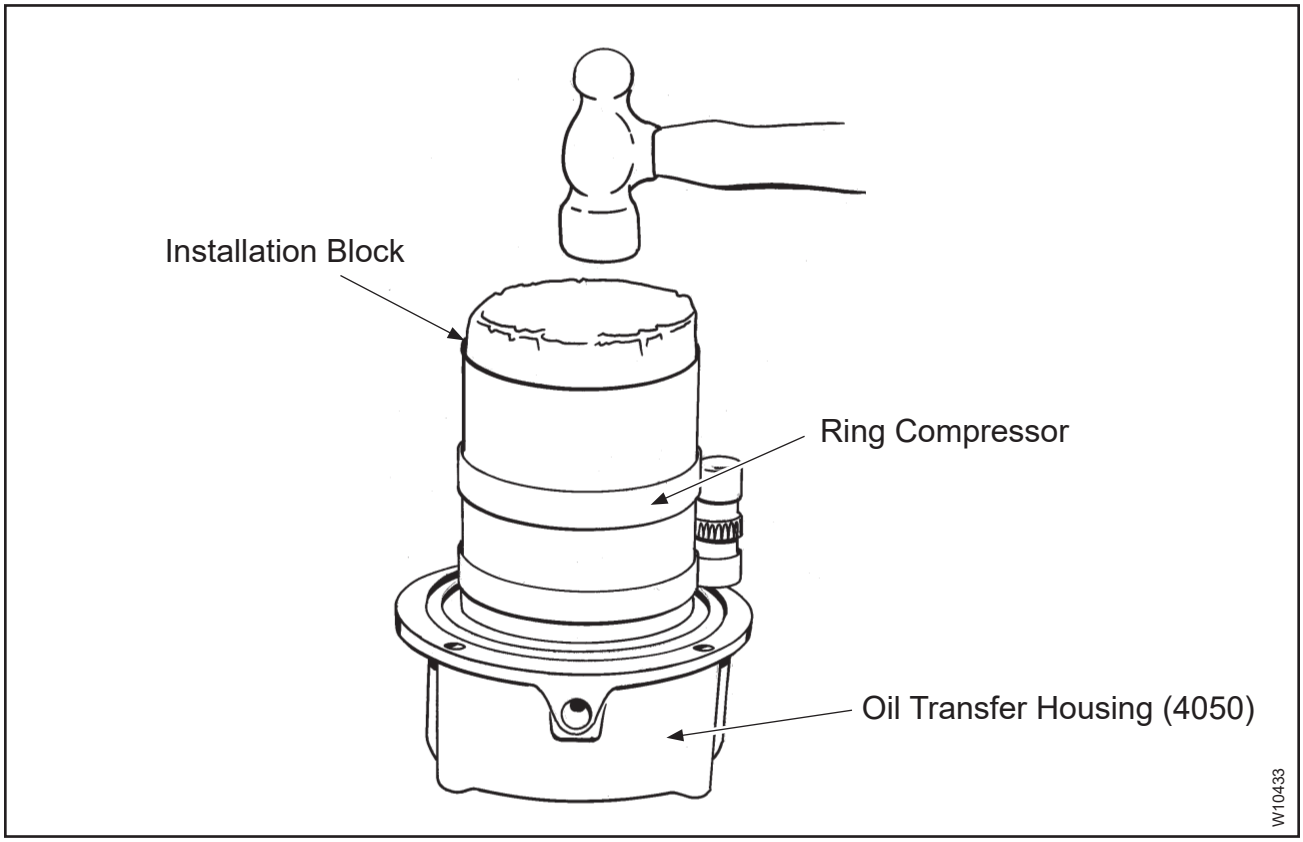
(18) Clean the OD surface of the ring lip seal (3020) and the backup ring (3010) with solvent CM23.

(19) Install the oil slinger (3060) into the oil transfer housing (4050) so it is seated against the oil transfer collar (4000).

(20) Apply sealant CM46 to the OD surface of the ring lip seal (3020) and the backup ring (3010).

(21) Press the ring lip seal (3020) into the propeller-side of the oil transfer housing (4050) until it contacts the shoulder. Refer to Figure 7-12 for the correct position of the ring lip seal.

(22) Press the backup ring (3010) into the propeller-side of the oil transfer housing (4050) until it rests on the ring lip seal (3020). Refer to Figure 7-13.



Installing the Slip Ring and Seal Rings into the Oil Transfer Collar
Figure 7-13

CAUTION: MAKE SURE THE HOLE IN THE OIL TRANSFER COLLAR (4000) ALIGNS WITH THE HOLE IN THE OIL TRANSFER HOUSING (4050).

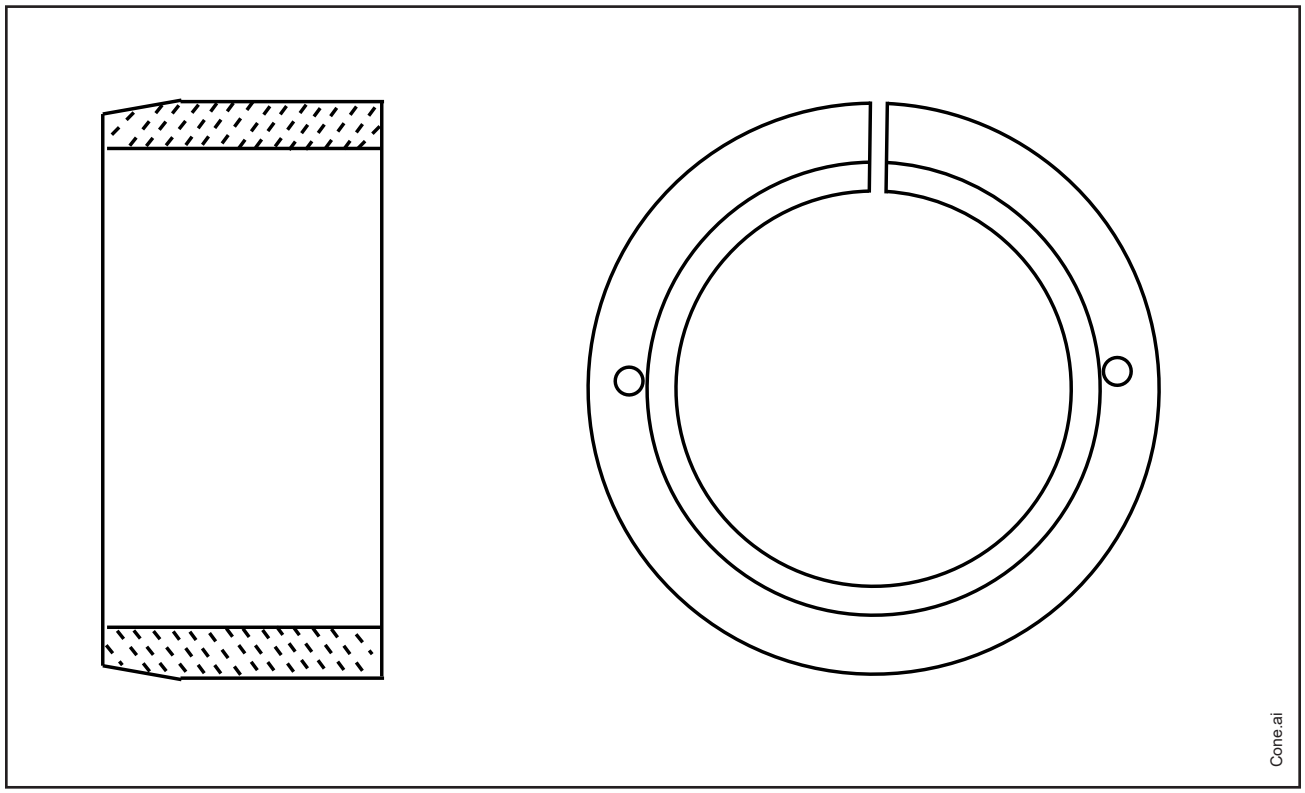
(23) For a 20 spline rear mounting cone (3030) with the saw cut between two half round channels, refer to Figure 7-14.

(a) Using adhesive CM10 or CM71, install the cone gasket (3050) in the slot of the 20 spline rear mounting cone (3030).

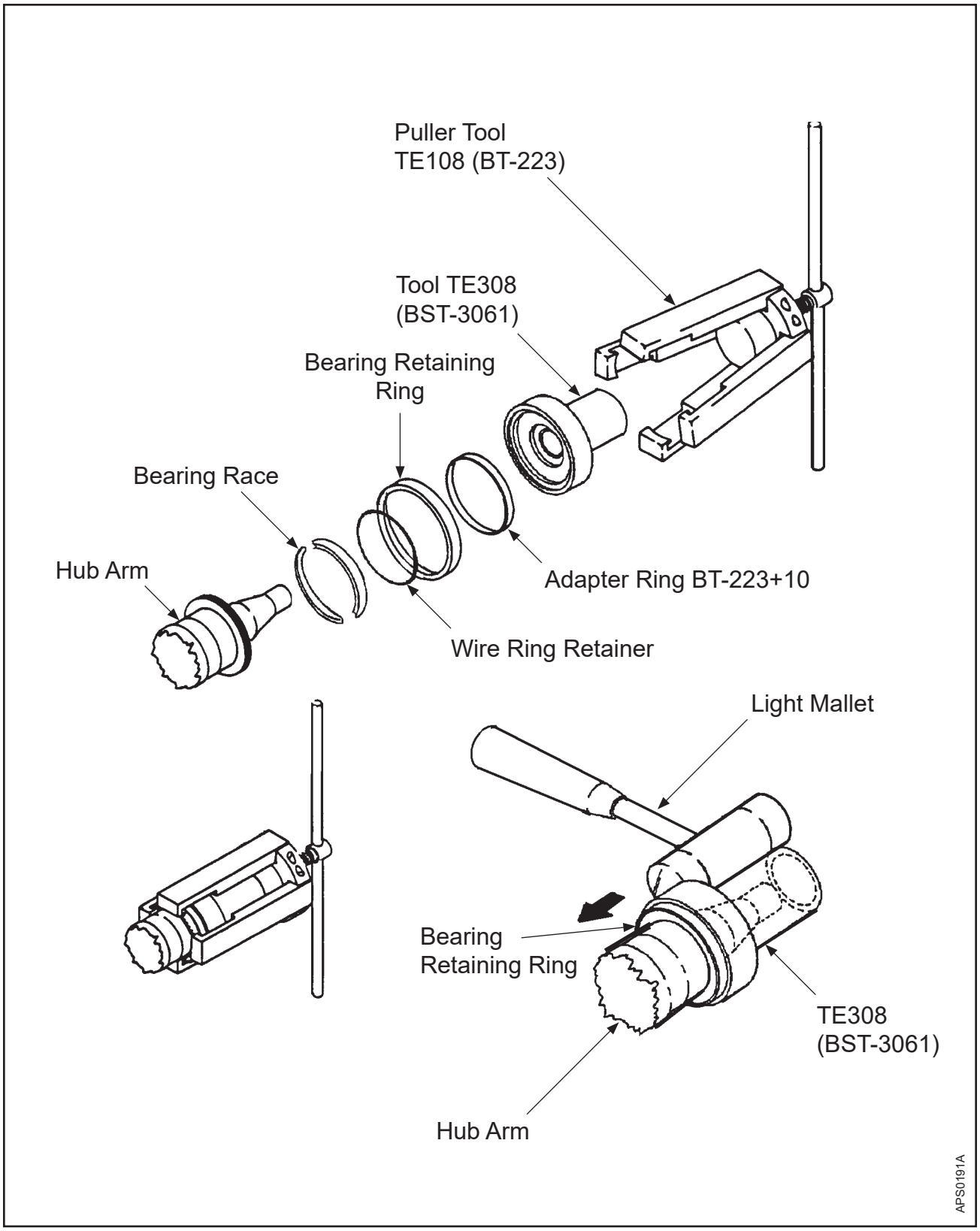
NOTE: The adhesive is used to hold the cone gasket (3050) in place in the 20 spline rear mounting cone (430) during the installation on the engine.

(24) Place the 20 spline rear mounting cone (3030) and cone gasket (3050), cres 1/16" spring pin (3040), aluminum elbow (5010), hydraulic gasket (5020), installation bolts and washers into a bag to ship with the oil transfer unit.

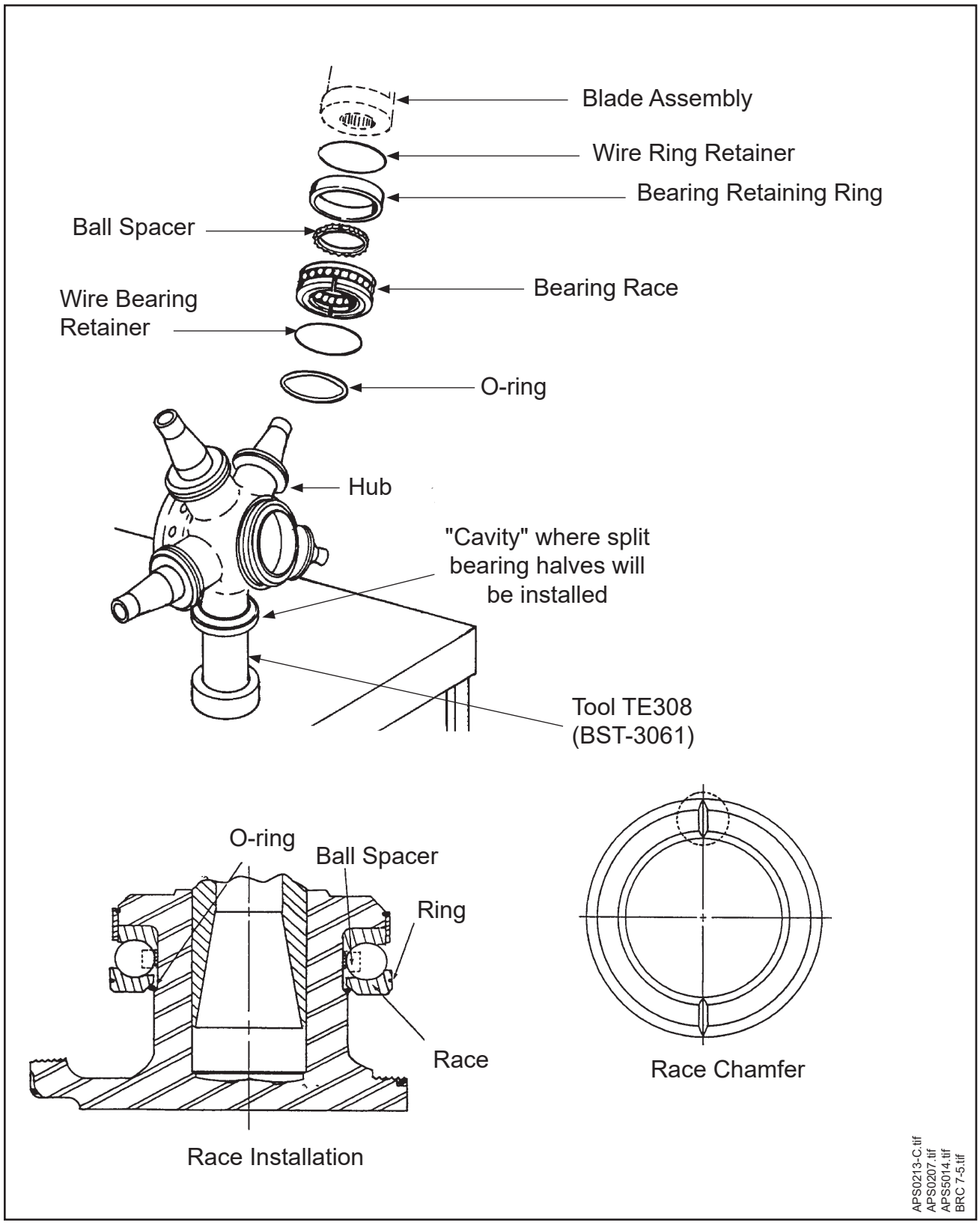
NOTE: The 20 spline rear mounting cone (3030) and cone gasket (3050), cres 1/16" spring pin (3040), aluminum elbow (5010), hydraulic gasket (5020), installation bolts and washers are not installed until the oil transfer unit assembly is installed on the engine.



20 Spline Rear Mounting Cone
Figure 7-14



Hub Arm Build-Up
Figure 7-15



Blade and Flange Mounting Parts
Figure 7-16

7. Common Assembly Procedures - All Hub Models

A. Blade Mounting Parts Assembly

(1) Secure the hub unit (360) to the rotatable fixture of a propeller assembly table.

CAUTION: MAKE SURE THE INTERNAL RECESS OF THE BEARING RETAINING RING (910) FACES OUTBOARD WHEN IT IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (360).

(2) Use a light mallet and special tool TE308, or equivalent, to drive a bearing retaining ring (910) onto one blade arm flange of the hub unit (360). Refer to Figure 7-15.

(3) Drive the bearing retaining ring (910) far enough onto the blade arm flange that the ring forms a narrow channel on the inboard surface of the blade arm flange.

(4) Using approved lubricant CM12, lightly grease the inboard surface of each blade arm flange.

CAUTION 1: THE BREAK-LINE FOR THE OUTBOARD BEARING RACE (930) SHOULD BE PERPENDICULAR TO THE TABLE TOP.

CAUTION 2: THE OUTBOARD BEARING RACE (930) HALVES MUST BE A MATCHED SET.

(5) Place the matched halves of an outboard bearing race (930) in position over one hub arm.

(6) Using a combination of tools TE308 and TE108-2 or equivalent, press the bearing retaining ring (910) far enough onto the outboard bearing race (930) to permit insertion of the wire bearing retainer (950) into the groove in the blade arm flange. Refer to Figure 7-16.

(7) Install the wire bearing retainer (950).

(8) Using tools TE308 and TE108-2, or equivalent, pull the bearing retaining ring (910) outboard far enough to permit it to cover the wire bearing retainer (950). The wire bearing retainer must be fully enclosed in the bearing retaining ring to make sure it is not pinched. Refer to Figure 7-15.

(9) Lubricate the blade O-ring (960) with approved lubricant CM12 and slide it over the blade arm flange of the hub unit (360) to a location inboard of the split bearing. Leave it there for use later in the reassembly.

(10) Repeat steps (1) through (9) of this procedure for each remaining hub arm.

(11) Remove the hub unit (360) from the rotatable fixture on the assembly table and use special tool TE308, or equivalent to hold the hub unit vertical. Refer to Figure 7-16.

CAUTION 1: THE HUB ARM FITTED WITH THE OUTBOARD BEARING RACE (930) MUST FACE DOWN SO THAT THE HUB FLANGE AND BEARING RETAINING RING (910) FORMS A CAVITY THAT WILL HOLD THE BEARING BALLS (990).

CAUTION 2: ANY GAP BETWEEN THE BEARING RACE (920, 930) HALVES CAN BE NO GREATER THAN 0.001 INCH (0.025 MM).

CAUTION 3: ALL BEARING BALLS (990) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL PROPELLER INC. ARE OF THE SAME GAUGE.

(12) Install the ball spacer (890) and the required number of bearing balls (990) onto the outboard bearing race (930), taking care not to scratch the races.

(13) Apply a slight amount of sealant CM93 to the chamfered edges of the inboard bearing race (920).

(a) Remove any excess sealant that comes out into the bearing area when the inboard bearing race (920) halves are joined.

CAUTION: THE OPENING OF THE WIRE RING RETAINER (900) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (920).

(14) Place the inboard bearing race (920) halves around one blade arm of the hub unit and install the wire ring retainer (900) to hold the race halves in place.

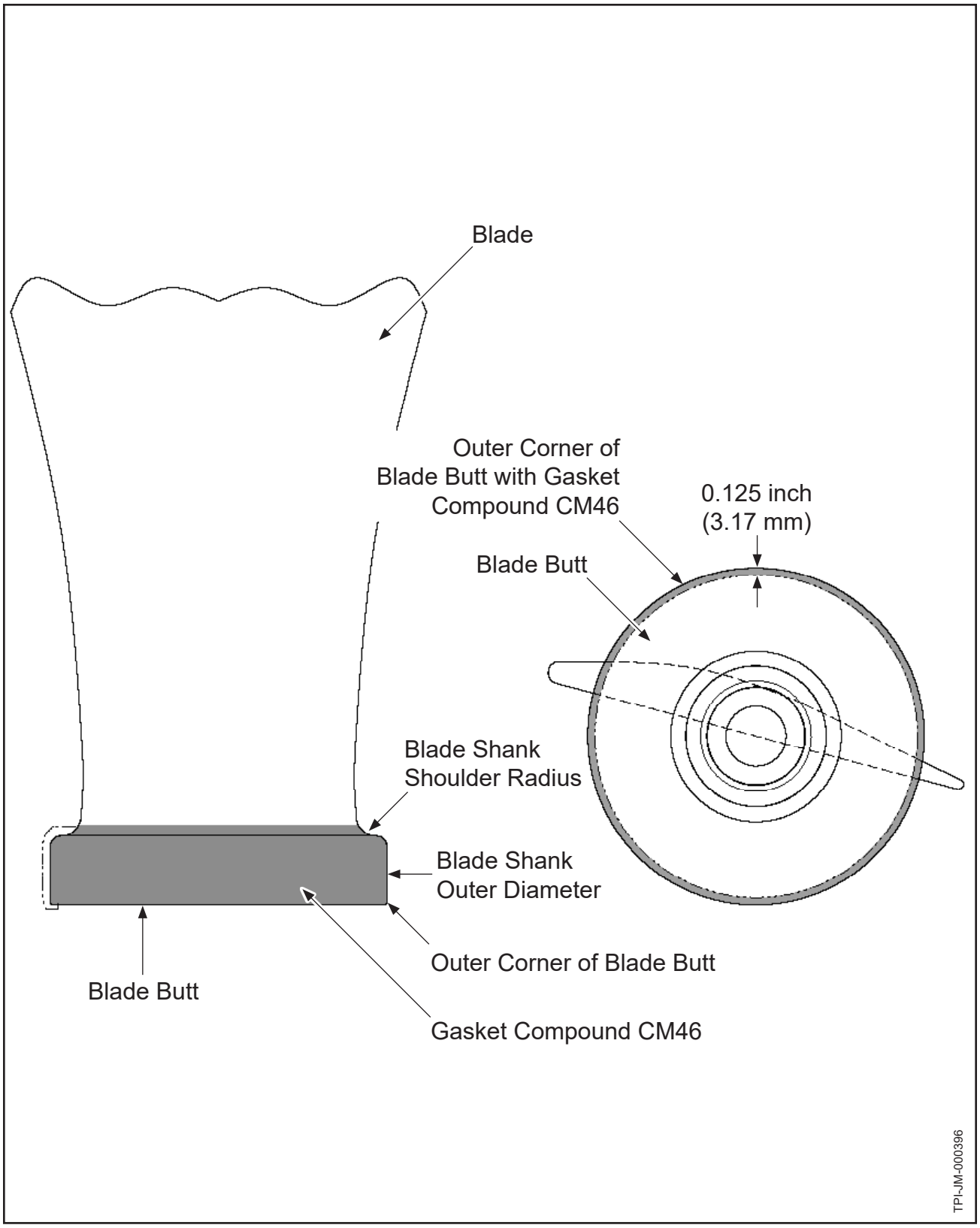
CAUTION: EXCESSIVE USE OF SEALANT MAY CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (1340) AND INBOARD BEARING RACE (920).

(15) Apply a small bead of sealant CM93 to the inboard bearing race (920) at the break point to evenly fill the void in the chamfered area of the inboard bearing race.

(16) Slide the blade O-ring (960) against the inboard bearing race (920).

(17) Wrap wide masking tape around the outside diameter of the bearing assembly to hold the parts in place.

(18) Repeat steps (11) through (17) of this procedure for each remaining blade arm.



Gasket Compound CM46 Application
Figure 7-17

B. Blade and Clamp Installation

CAUTION: IF POSSIBLE, EACH BLADE MUST BE REINSTALLED ON THE HUB ARM FROM WHICH IT WAS REMOVED AT DISASSEMBLY.

(1) With the hub assembly in the horizontal position, follow the "Measuring the Blade Track" procedure in this chapter.

(2) Stand blade number one in vertical position (shank up, tip down) and fill the pilot tube cavity with CM12 grease to the top of the bottom (inboard) bearing race level.

WARNING: AIR TRAPPED IN THE GREASE CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) After making sure no air is trapped in the grease, press the blade onto its matching hub pilot tube (370). Push the blade toward the center of the hub unit (360) until the butt of the blade shank makes contact with the face of the blade arm.

NOTE: A slight amount of grease will come out around the pilot tube if the blade has been lubricated correctly.

(4) Repeat steps (1) and (2) of this procedure for each remaining blade.

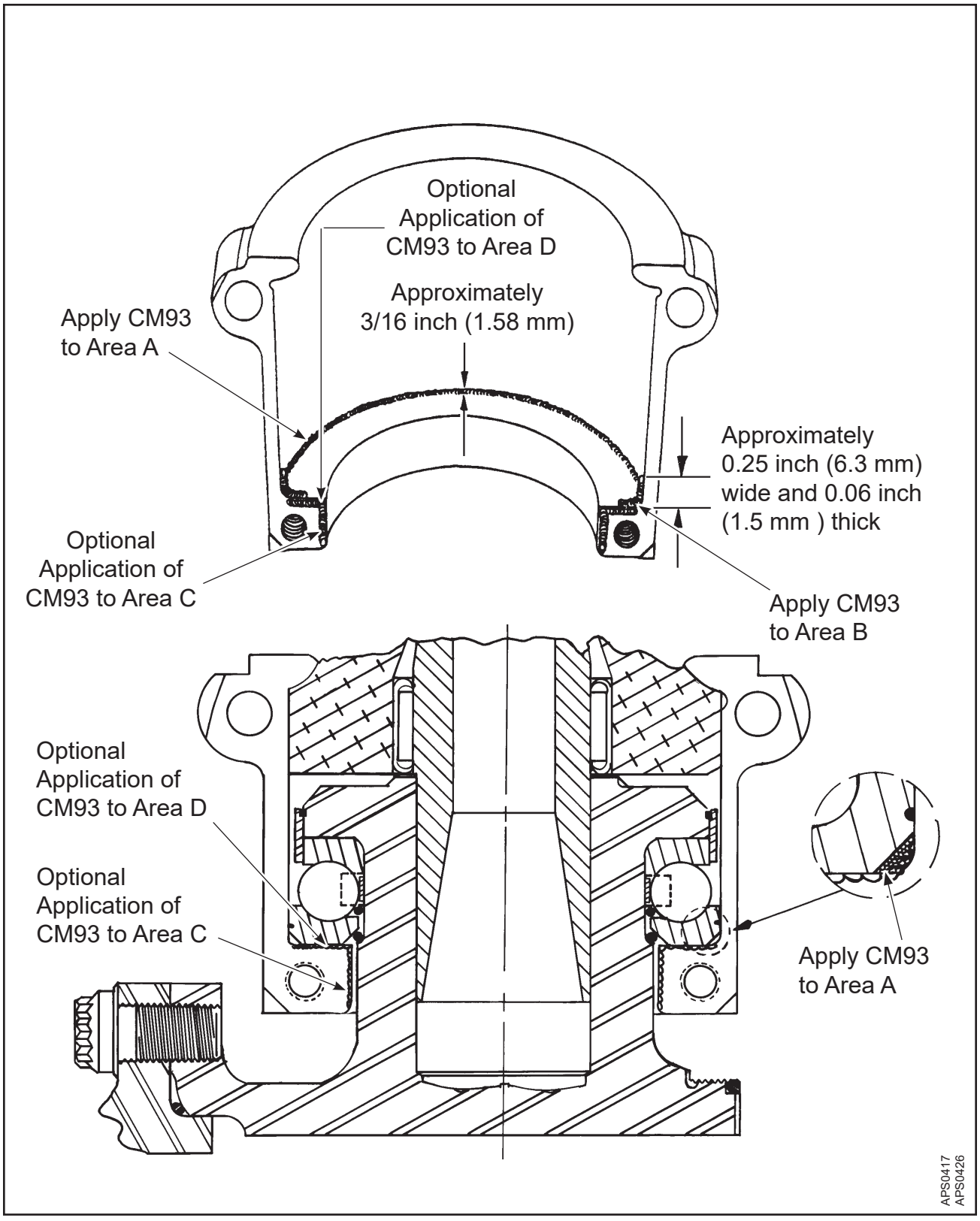
CAUTION: BE SURE TO USE HARDENING GASKET COMPOUND CM46 ON THE SHOULDER RADIUS OF THE BLADE SHANK, THE OUTER DIAMETER OF THE BLADE SHANK, AND THE OUTER CORNER OF THE BLADE BUTT. REFER TO FIGURE 7-17.

(5) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket compound CM46 on the shoulder radius of the blade shank (in the area where it will contact the blade clamp), the outer diameter of the blade shank, and approximately 0.125 inch (3.17 mm) on the outer corner of the blade butt. Refer to Figure 7-17.

NOTE 1: Before installing a clamp, ensure that the shoulder radius of the blade shank, the outer diameter of the blade shank, and the outside corner of the blade butt are completely covered by a smooth even layer of gasket compound CM46. Refer to Figure 7-17.

NOTE 2: Do not apply gasket compound CM46 if blades will be removed to facilitate shipment of the propeller.

(6) Remove the masking tape used to temporarily hold the inboard bearing race (920) together.



Sealant CM93 Application
Figure 7-18

CAUTION: THE PARTING LINE OF THE BLADE CLAMP (1340) HALVES MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (920).

(6) Seal the blade clamp (1340) using the following steps:

CAUTION: SEALANT MUST NOT EXTEND ONTO THE BLADE CLAMP (1340) PARTING SURFACE. REMOVE SEALANT IF IT EXTENDS ONTO THE PARTING SURFACE.

(a) Put a small bead of sealant CM93 on the inboard bearing race (920) radius (Area A and Area B) to fill the void from the beveled edge of the bearing outside diameter. Refer to Figure 7-18.

(7) Optionally, put a small bead of sealant CM93 on a portion of the mating surfaces (Area C and Area D) on both blade clamp (1340) halves. Refer to Figure 7-18.

NOTE: The application of sealant CM93 to the blade clamp (1340) mating surfaces is an optional procedure. Application of CM93 to the blade clamp (1340) mating surfaces may cause the clamp gasket (1300) to slip out of place.

(8) Place the counterweighted blade clamp (1340) half on the blade and bearing assembly. Join the corresponding lower blade clamp half, enclosing the bearing assembly.

CAUTION: A 0.06 INCH (1.59 MM) MAXIMUM OF CLAMP GASKET (1300) MATERIAL SHOULD BE EVENLY EXPOSED THROUGH THE PARTING LINE OF THE CLAMP ASSEMBLY. THE CLAMP GASKET MAY REQUIRE TRIMMING TO PROVIDE METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

(9) Place a clamp gasket (1300) between the parting surface of each blade clamp (1340).

(10) Insert each outboard clamp bolt (1350).

NOTE: Do not torque the outboard clamp bolts (1350) at this stage of the assembly.

(11) Install the washers (1360) and lock nuts (1370). Hand-tighten the lock nuts.

(12) Insert each inboard clamp screw (1290).

CAUTION 1: DO NOT EXCEED RECOMMENDED TORQUE ON THE INBOARD CLAMP SCREWS (1290). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCES CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (1290) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(13) Tighten the clamp screws (1290) in 10 ft-lb increments (10, 20, etc.) alternating between screws at each increment. Torque the clamp screws in accordance with the Torque Values table in the Fits and Clearance chapter of this manual.

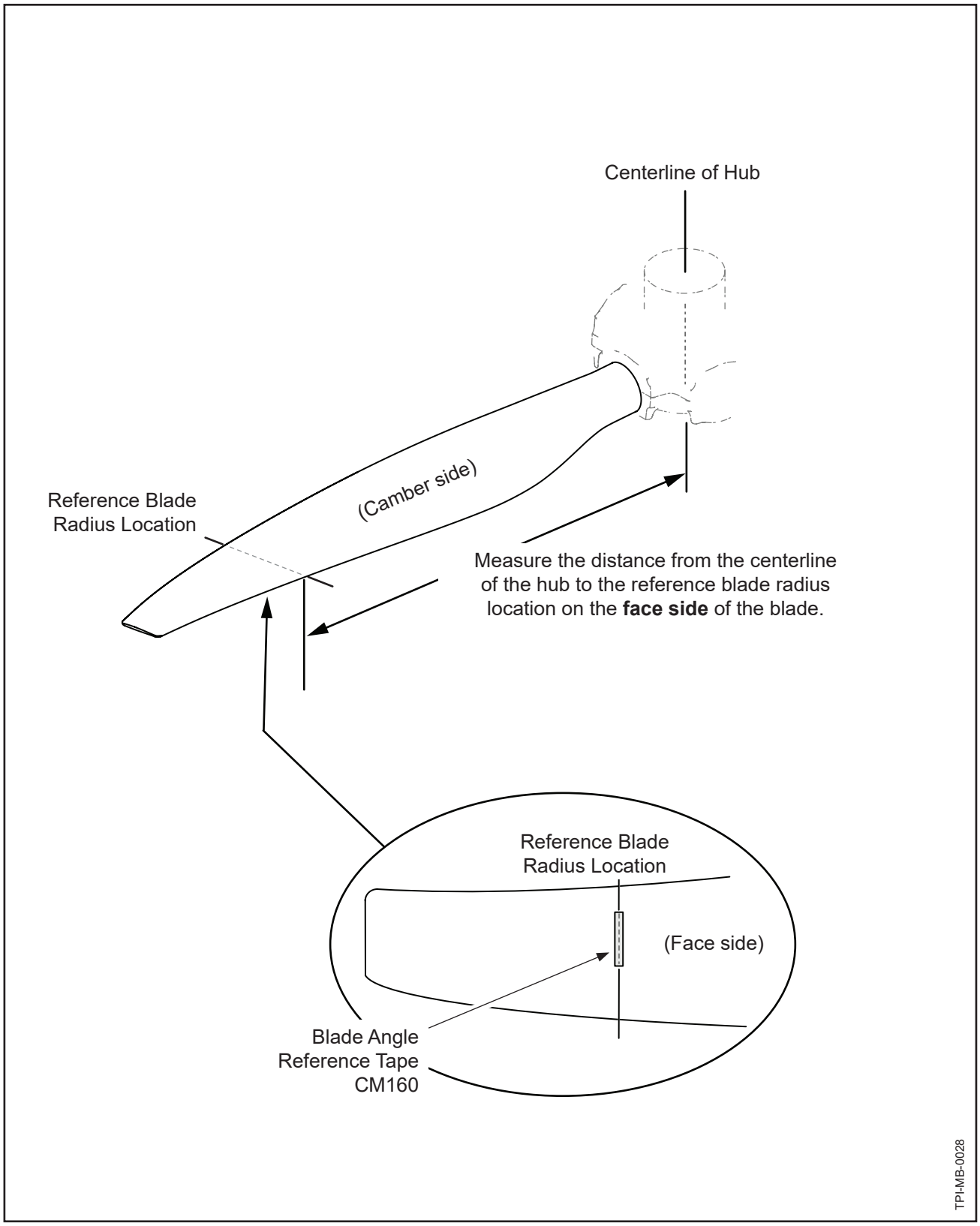
CAUTION: DO NOT CONTACT THE BLADE CLAMP (1340) WHILE DRILLING THE INBOARD CLAMP SCREWS (1290).

(14) With a #42 size bit, drill the head of each inboard clamp screw (1290).

CAUTION: IF AN INSTALLED COTTER PIN (1280) CAUSES INTERFERENCE, THREE LOOPS OF SAFETY WIRE CM131 MAY BE USED AS AN ALTERNATIVE TO SAFETY THE INBOARD CLAMP SCREW (1290).

(15) Safety each inboard clamp screw (1290) with a cotter pin (1280) so that the cotter pin contacts the blade clamp (1340) half and prevents the screw from backing out of the blade clamp.

(16) Repeat steps (4) through (15) of this procedure for each remaining blade.



Blade Angle Reference Tape
Figure 7-19

C. Blade Angle Reference Tape Application (Optional) (Rev. 2)

CAUTION: DO NOT CONFUSE REFERENCE BLADE RADIUS WITH BLADE STATION. REFERENCE BLADE RADIUS AND BLADE STATION OF THE SAME NUMBER MAY NOT ALWAYS INDICATE THE SAME LOCATION ON THE BLADE.

(1) Reference blade radius is measured from the center of the propeller hub to a predetermined reference location on the blade for blade angle measurement.

(2) Blade stations are used during the repair or overhaul process of a blade to define a blade span location for dimensional measurement.

(3) Establish a reference blade radius location

(a) Refer to the Aircraft Type Certificate Data sheet or the Hartzell Propeller Inc. Application Guide, Manual 159 (61-02-59), for the reference blade radius location specified for the applicable aircraft installation.

(b) Beginning with blade one, measure from the center of the propeller hub to the reference blade radius location specified. Refer to Figure 7-19.

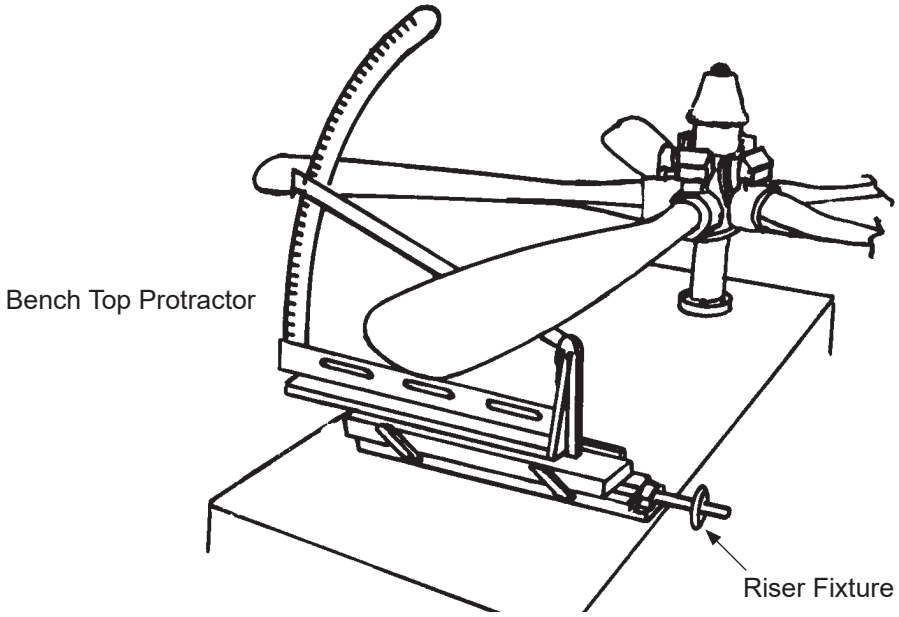
(c) Apply a piece of reference tape CM160 to the face side of the blade at the reference blade radius location, perpendicular to the blade centerline as shown in Figure 7-19.

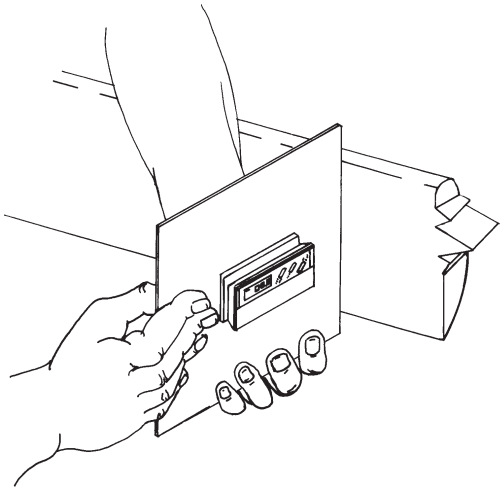
1 Put the reference tape CM160 on the blade so that the reference blade radius location runs through the centerline of the tape.

(d) Repeat steps (3)(b) and (3)(c) for the remaining blades in the hub assembly.

(e) Put a pattern cut-out over each piece of reference tape CM160.

(f) Spray each piece of reference tape CM160 with clear lacquer CM129 to prevent peeling.





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Setting the Blade Angle
Figure 7-20

D. Setting Blade Angle

CAUTION: REFER TO THE APPLICABLE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATA SHEET OR HARTZELL PROPELLER INC. PROPELLER APPLICATION GUIDE 159 (61-02-59) FOR THE REQUIRED BLADE ANGLES.

(1) Apply pressure to the piston unit (30) through the rotatable fixture on the propeller assembly table to move the propeller to low pitch position.

(2) Using a hand-held or bench-top protractor at the reference blade radius specified in the Hartzell Propeller Inc. Propeller Application Guide 159 (61-02-59), measure the angle of the blades. Refer to Figure 7-20.

CAUTION: BLADE ANGLES MUST BE WITHIN 0.2 DEGREE OF EACH OTHER AT LOW PITCH.

(3) Rotate the blades to low pitch position in the clamp assembly (1200).

(4) Tighten each nut (1370) on the outer clamp bolt (1350). Torque the nuts in accordance with the Torque Values table in the Fits and Clearances chapter of this manual.

(5) Check the blade angle of all blades and verify that maximum blade angle variance is within 0.02 degree.

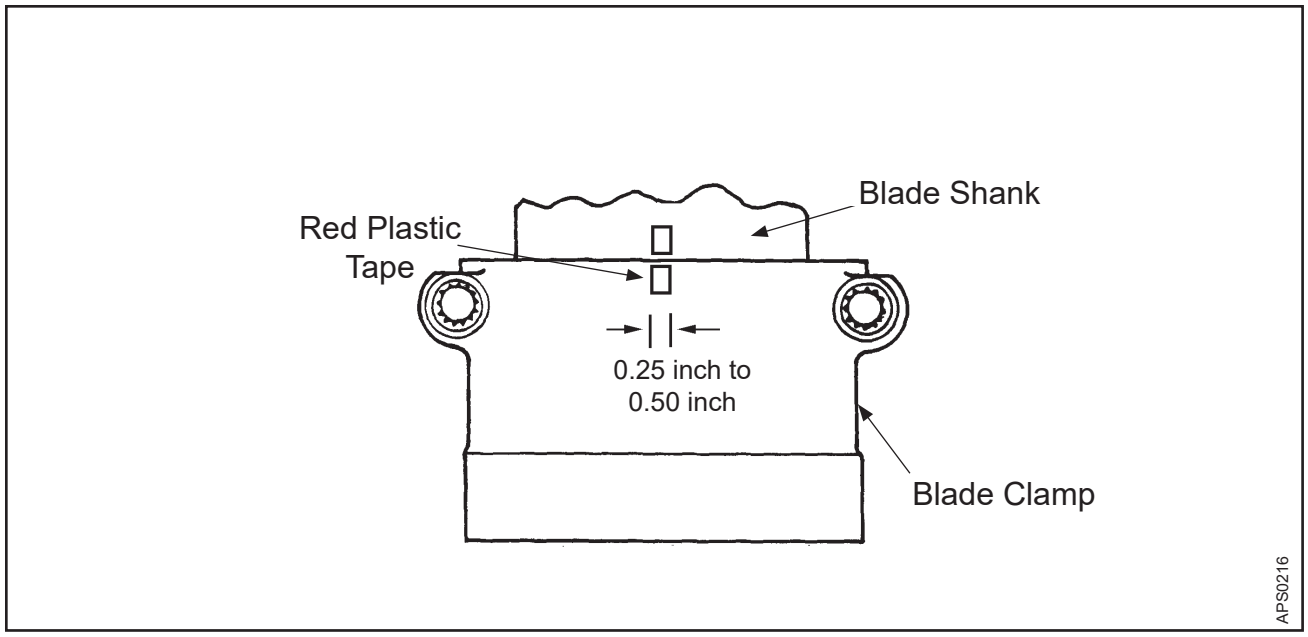
(a) If the variance is not within 0.02 degree, reset the blades in the clamp assembly (1200).

(6) Repeat steps (1) through (5)(a), of this procedure, until correct low pitch blade angle and acceptable difference between the blade angles is achieved.

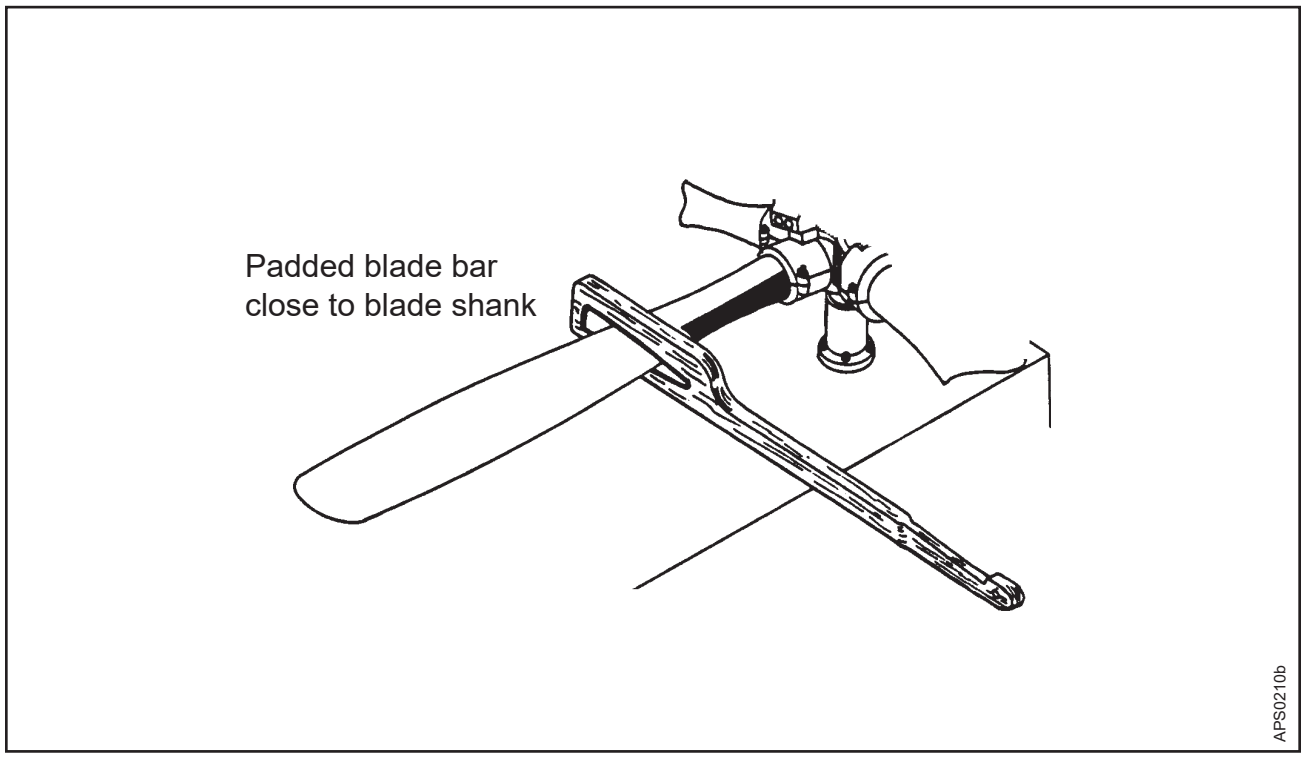
(7) Actuate the propeller to high pitch. The washers should be resting against the guide collar unit (1030).

(8) Check the blades angles to make sure that high pitch can be reached.

(9) Release the pressure and hand rotate the blades to low pitch.



Providing for Visual Detection of Blade Slippage in Clamp
Figure 7-21



Using Padded Blade Bar to Check for Blade Slippage in Clamp
Figure 7-22

E. Visual Detection of Blade Slippage in Clamp

(1) With the propeller still secured on the rotatable fixture of the assembly table, use the following procedure to detect slippage between the blade shank and the blade clamp.

CAUTION: DO NOT USE A PUNCH OR SCRIBE A LINE ON THE BLADE SHANK. THIS COULD START A CRACK IN THE BLADE.

(a) When each blade is properly set, place a strip of red plastic tape down the base and across the clamp of blade number one as shown in Figure 7-21.

(b) Carefully slit the tape along the line where the blade and the blade clamp (1340) meet.

CAUTION: WHEN TORQUING A BLADE ASSEMBLY, DO NOT PLACE THE PADDED BLADE BAR ON THE DE-ICE BOOT. PLACE THE BAR IN THE THICKEST AREA OF THE BLADE, OUTBOARD OF THE DE-ICE BOOT.

(c) Use a padded blade bar, as shown in Figure 7-22, to apply torque to each blade assembly. Torque each assembly in accordance with the Torque Values table in the Fits and Clearances chapter of this manual. Torque each blade toward low pitch.

(d) Recheck blade angles in accordance with the instructions in this chapter.

(e) If blade slippage occurs, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(f) After confirming there is no slippage, spray all pieces of tape with polyurethane spray CM129 to provide a clear protective coating.

(g) Repeat this procedure for each remaining blade.

F. Optional Application of Sealant CM93

(1) The application of sealant CM93 to the blade/blade clamp interface is an optional procedure that may provide additional protection against corrosion of the blade retention components.

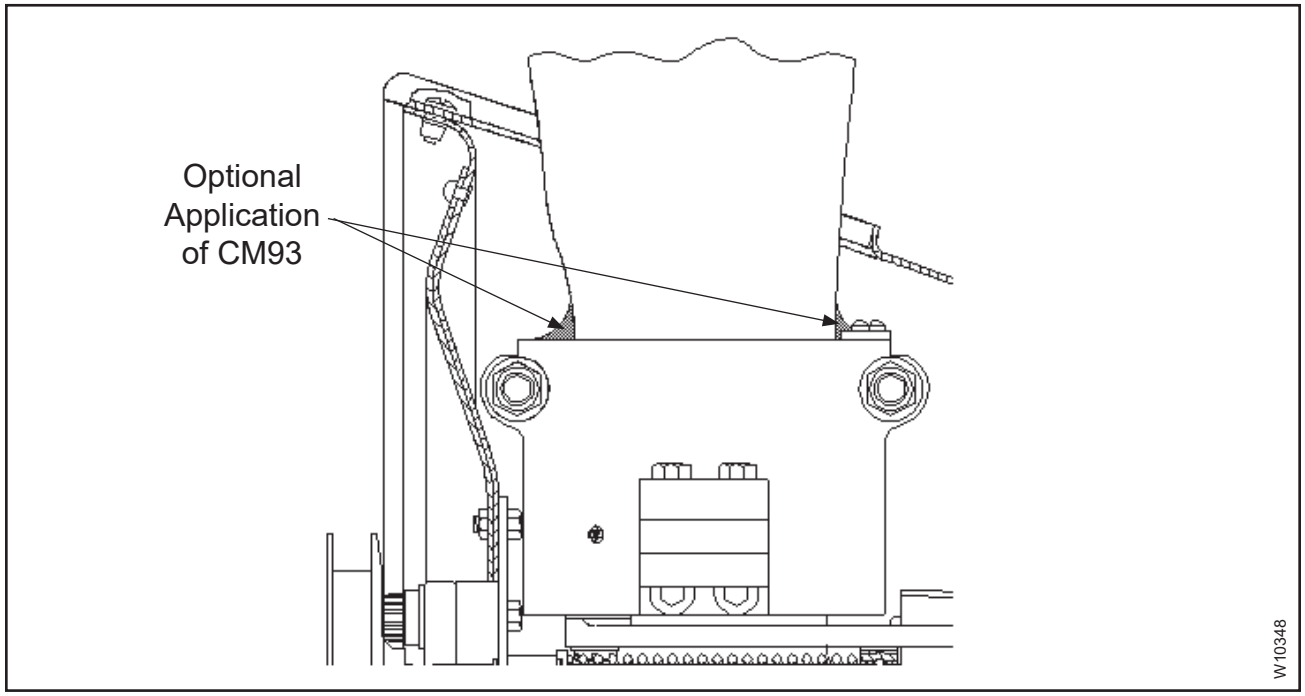
CAUTION 1: TO AVOID PERMANENT DAMAGE TO THE BLADE RETENTION COMPONENTS CAUSED BY TRAPPED CHEMICALS, THIS PROCEDURE MUST ONLY BE PERFORMED DURING REASSEMBLY AFTER CLEANING OF THE PROPELLER BLADE RETENTION COMPONENTS.

CAUTION 2: TO MAKE SURE OF PROPER ADHESION OF SEALANT CM93, BLADE AND BLADE CLAMP SURFACES MUST BE FREE OF GREASE AND DIRT.

CAUTION 3: DO NOT PERMIT THE CM93 TO EXTEND ONTO THE SURFACE OF THE CLAMP WHERE BALANCE WEIGHTS AND DE-ICE HARDWARE ARE INSTALLED.

(2) After performing the check for blade slippage in the clamp, fill the external void at the blade/blade clamp interface with a 0.25 inch (6.35 mm) maximum bead of sealant CM93, around the entire circumference of the blade. Refer to Figure 7-23.

(3) Permit the sealant to cure for a minimum of two hours before returning the propeller to service.



Optional Application of Sealant CM93
Figure 7-23

FITS AND CLEARANCES - CONTENTS

LIST OF FIGURES

LIST OF TABLES

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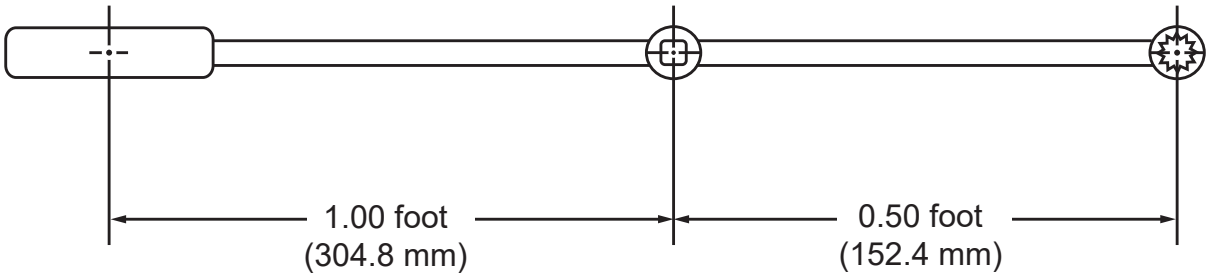


$$\frac{\text{(actual torque required) x (torque wrench length)}}{\text{(torque wrench length) + (length of adaptor)}} = \text{torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m) x 1 ft (304.8 mm)}}{\text{1 ft (304.8 mm) + 0.50 ft (152.4 mm)}} = \text{66.7 Ft-Lb (90 N•m)} < \text{reading on torque wrench with 6-inch (152.4 mm) adapter for actual torque of 100 Ft-Lb (136 N•m)}$$

The correction shown is for an adapter that is aligned with the centerline of the torque wrench. If the adapter is angled 90 degrees relative to the torque wrench centerline, the torque wrench reading and actual torque applied will be equal.

APS0212B

Determining Torque Value of a Standard Torque Wrench with Adapter
Figure 8-1

1. Torque Values (Rev. 3)

A. Important Information

(1) The structural integrity of joints in the propeller that are held together with threaded fasteners is dependent upon proper torque application.

(a) Vibration can cause an incorrectly tightened fastener to fail in a matter of minutes.

(b) Correct tension in a fastener depends on a variety of known load factors and can influence fastener service life.

(c) Correct tension is achieved by application of measured torque.

(2) Use accurate wrenches and professional procedures to make sure of correct tensioning.

(3) For the torque values to use when assembling a Hartzell propeller, refer to Table 8-1, "Torque Values" in this chapter.

(4) When an adapter is used with a torque wrench, use the equation in Figure 8-1 to determine the correct torque value.

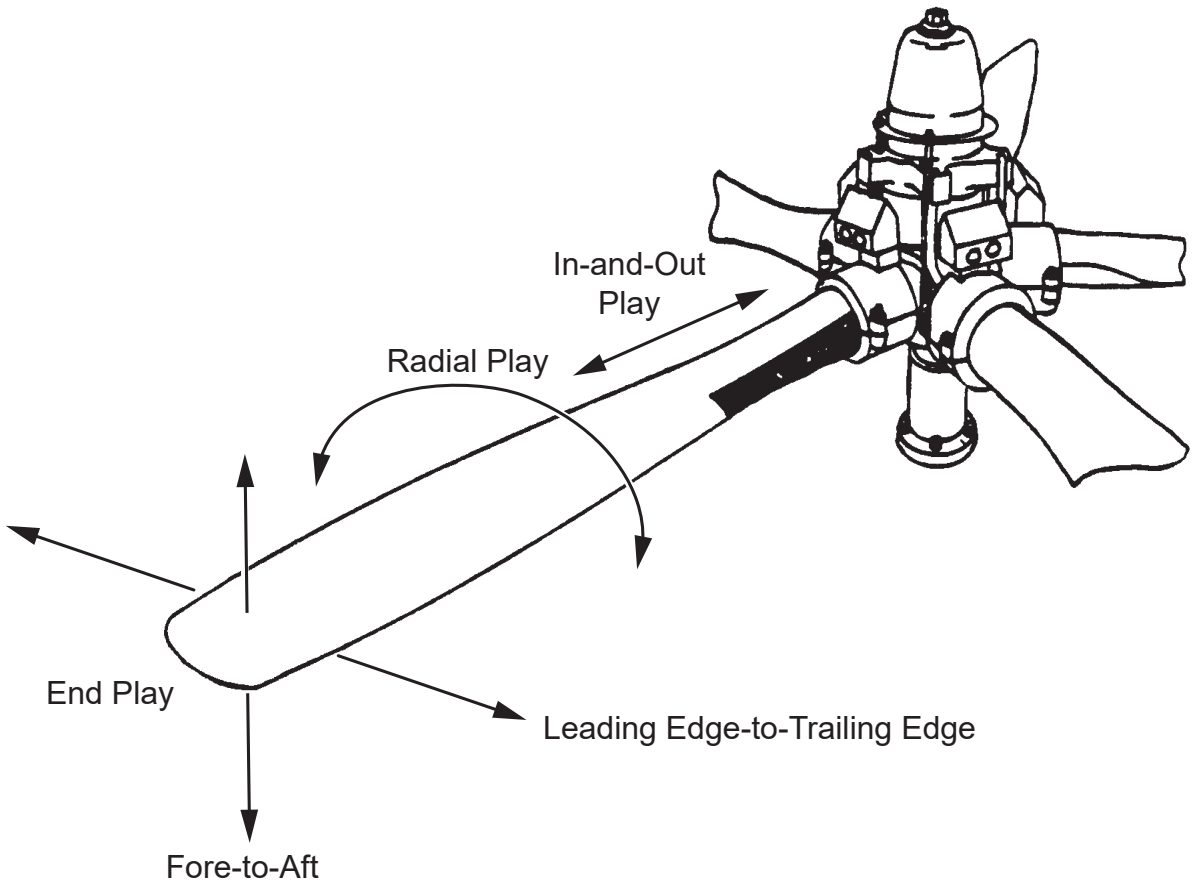
CAUTION 1: TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS, UNLESS SPECIFIED IN TABLE 8-1.

CAUTION 2: FOR TORQUE READING WHEN USING A TORQUE WRENCH ADAPTER, REFER TO FIGURE 8-1.

NOTE: Torque tolerance is ±10 percent unless otherwise noted.

Item Number	Part Number	Description/Location	Torque Ft-Lb	Torque In-Lb	Torque N·m
180	A-848-( )	Nut, Flex Lock / Piston Guide Rod	17-20	204-240	23-37
320	B-806-( )	Cylinder	125-150	1500-1800	169-203
320	B-854-( )	Cylinder	125-150	1500-1800	169-203
320	B-1882-( )	Cylinder	125-150	1500-1800	169-203
500	A-880-( )	Nut, Flexlock / Piston	120	1440	162
620	A-2051	Bolt / Spinner Support Plate	15	180	20
740	A-880-1	Nut, Flexlock / Nut Sleeve HA-A2(V,MV)20-1B only	70	840	94
1050	A-2038-( )	Cap Screw / Guide Collar	Tighten Until Secure		
1050	B-3386-14H	Bolt / Guide Collar	15-19	180-228	20-25
1290	A-321	Screw / Blade Clamp	40	480	54
1350	A-2017	Bolt / Blade Clamp	35	420	47
1370	A-2043-1	Nut, Self Locking / Blade Clamp	35	420	47
Aluminum blade mounted in blade clamp			167	2004	226

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances (Rev. 5)

A. Blade Play

(1) Limits for blade play are specified below. Refer to Figure 8-2.

(a) End Play:

Leading Edge-to-Trailing Edge	±0.625 inch (1.58 mm) 0.125 inch (3.17 mm) total
Fore-to-Aft (face-to-camber)	±0.625 inch (1.58 mm) 0.125 inch (3.17 mm) total

(b) In-and-Out Play — 0.032 inch (0.81 mm)

(c) Radial Play (pitch change) — ±0.5 degree (Total: 1 degree) measured at reference station

(2) Blades should be tight in the propeller; however, play that is within the allowable limits is acceptable if the blade returns to its original position when released.

(a) If blade play is greater than the allowable limits, or if the blade(s) do not return to their original position when released, there may be internal wear or damage that should be referred to a certified propeller repair station with the appropriate rating.

B. Blade Track

(1) Aluminum Blades	±0.0625 inch (1.58 mm) Total: 0.125 inch (3.17 mm)

C. Blade Pitch Tolerance

(1) Blade pitch setting tolerance between blades at low pitch	0.2 degree

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SPECIAL TOOLS, FIXTURES, AND EQUIPMENT - CONTENTS

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1. Tooling and Facility Requirements (Rev. 1)

   A. Standard Tooling

      (1) Propeller repair stations certified by the FAA or international equivalent to overhaul Hartzell Propeller Inc. propellers are expected to possess precision fixtures, tools, and blade tables for blade inspection and repair.

         (a) Except as specifically required in this manual, locally fabricated tooling is acceptable for most repair and inspection operations.

   B. Special Tooling

      (1) Special tooling may be required for procedures in this manual. For further tooling information, refer to Hartzell Propeller Inc. Illustrated Tool and Equipment Manual 165A (61-00-65).

         (a) Tooling reference numbers appear with the prefix “TE” directly following the tool name to which they apply. For example, a template that is reference number 133 will appear as: template TE133.

         (b) It is the responsibility of the repair station or the technician performing the repair or servicing to use these special tools as required.

   C. Facilities

      (1) Grinding, plating, and painting of propeller components have the potential for health and safety hazards beyond that of other areas of a typical workshop.

         (a) Areas where grinding, plating, and painting are performed should comply with governmental regulations for occupational safety and health, industry standards, and environmental regulations.

      (2) Workshop areas need to be segregated to prevent contamination.

         (a) Separate areas should be designated for cleaning, inspection, painting, plating, and assembly.

         (b) Propeller balancing must be performed in a draft-free area.

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ILLUSTRATED PARTS LIST - CONTENTS

PROPELLER PARTS LIST AND FIGURES

SUB-ASSEMBLY PARTS LISTS AND FIGURES

Clamp Assemblies

Oil Transfer Unit Assemblies

Pitch Adjustment Assemblies

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1. Introduction (Rev. 1)

WARNING: ANY PART IDENTIFIED AS AN EXPERIMENTAL OR NON-AVIATION PART MUST NOT BE USED IN AN FAA OR INTERNATIONAL EQUIVALENT TYPE CERTIFICATED PROPELLER. A PART IDENTIFIED AS EXPERIMENTAL OR NON-AVIATION DOES NOT HAVE FAA OR INTERNATIONAL EQUIVALENT APPROVAL EVEN THOUGH IT MAY STILL SHOW AN AVIATION TC OR PC NUMBER STAMP. USE ONLY THE APPROVED ILLUSTRATED PARTS LIST PROVIDED IN THE APPLICABLE OVERHAUL MANUAL OR ADDITIONAL PARTS APPROVED BY AN FAA ACCEPTED DOCUMENT FOR ASSEMBLY OF A PROPELLER. THE OPERATOR ASSUMES ALL RISK ASSOCIATED WITH THE USE OF EXPERIMENTAL PARTS. USE OF EXPERIMENTAL PARTS ON AN AIRCRAFT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE.

A. General

CAUTION: INSTRUCTIONS AND PROCEDURES IN THIS CHAPTER MAY INVOLVE PROPELLER CRITICAL PARTS. REFER TO THE INTRODUCTION CHAPTER OF THIS MANUAL FOR INFORMATION ABOUT PROPELLER CRITICAL PARTS. REFER TO THE ILLUSTRATED PARTS LIST IN THIS MANUAL FOR IDENTIFICATION OF PROPELLER CRITICAL PARTS.

(1) This chapter includes the parts lists and applicable illustrations for the propeller model in the manual.

CAUTION: ILLUSTRATIONS IN THE ILLUSTRATED PARTS LIST ARE TO BE USED FOR IDENTIFYING PARTS AND SHOULD NOT BE USED AS A MAINTENANCE REFERENCE FOR ASSEMBLY.

(a) The illustrations in this chapter use some general views of parts that may not exactly depict every propeller part configuration.

B. Counterweights/Slugs/Mounting Hardware

(1) Counterweights, counterweight slugs, and the applicable mounting hardware are application specific. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

C. Spinner Assemblies/Mounting Hardware

(1) Spinner assemblies and the applicable mounting hardware are application specific. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

D. Ice Protection System Components

(1) Ice protection systems are application specific. Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

(a) For components of ice protection systems supplied by Hartzell, refer to Hartzell Propeller Inc. Ice Protection System Manual 180 (30-61-80).

(b) For components of ice protection systems not supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

2. Description of Columns (Rev. 2)

A. Fig./Item Number

(1) Figure Number refers to the illustration where items appear. Item Numbers refer to the specific part callout in the applicable illustration.

(a) Items Numbers that are listed but not shown in the illustration are identified by a dash to the left of the item number. (example: "-800")

(b) Alpha variants will be used to add additional items. There are two reasons for the use of alpha variants:

1 A part may have an alternate, or may be superseded, replaced, or obsoleted by another part.

a For example, the self-locking nut (A-2043) that is item 20 was superseded by the self-locking nut (A-2043-1) that is item 20A.

2 An Illustrated Parts List may contain multiple configurations. Effectivity codes are used to distinguish different part numbers within the same list.

a For example, one propeller configuration may use a mounting bolt (B-3339-1) that is item 30, yet another propeller configuration uses a mounting bolt (B-3347) that is item 30A. Effectivity codes are very important in the determination of parts in a given configuration.

B. Part Number

(1) The Part Number is the Hartzell Propeller Inc. identification number for the part.

(2) Use the Hartzell Propeller Inc. part number when ordering the part from Hartzell or a Hartzell-approved distributor.

C. Description

(1) This column provides the Hartzell Propeller Inc. description of the part.

(2) Bullets and indentations are used to indicate parts that are components of a sub-assembly.

(a) For example, a Fork Assembly that is part of a HC-C2YR-1 propeller assembly will have one bullet (•) before the description. This indicates that the Fork Assembly is part of the propeller assembly.

1 A Fork Bumper that is part of the Fork Assembly will appear directly below the Fork Assembly with two bullets (• •) before the description. This indicates that the Fork Bumper is part of the Fork Assembly - that is part of the Propeller Assembly.

a Example: HC-C2YR-1
• Fork Assembly
• • Fork Bumper

(3) If the description in this column includes a "PCP:" prefix, the part is classified as a Propeller Critical Part.

(4) If applicable, information regarding part alternatives, supersedures, replacements, or obsolescence will appear in the Description column.

(a) Refer to the section, "Description of Terms" in this chapter for definitions and requirements for part "alternates", "supersedures", etc.

(b) When part alternatives, supersedures, replacements, etc. are listed, the service document number related to the change may be included for reference.

(5) If applicable, vendor CAGE codes will be listed in the Description column.

D. Effectivity Code (EFF CODE)

(1) This column is used when additional information about a part is required.

(a) Effectivity codes can be used to identify parts that are only used on a particular model, or to direct the user to additional information in the "Effectivity" box at the bottom of the page.

(b) Whenever an effectivity code is present, refer to the "Effectivity" box at the bottom of the page for the applicable information.

(2) Parts common to all assembly models on the page show no effectivity code.

E. Units Per Assembly (UPA)

(1) Designates the total quantity of an item required for the next higher assembly or subassembly.

F. Overhaul (O/H)

(1) Designates the parts to be replaced at overhaul. A “Y” identifies the parts that must be replaced at overhaul.

NOTE: An overhaul kit may not contain all the parts identified with a "Y" for a particular model propeller. An example of parts that may not be included in the overhaul kit is spinner mounting parts.

G. Propeller Critical Part (PCP)

(1) This column identifies the Propeller Critical Parts (PCP) that are contained in each propeller model.

(a) Refer to the Introduction chapter of this manual for the definition of Propeller Critical Parts (PCP).

3. Description of Terms (Rev. 1)

A. Alternate

(1) Alternate parts are identified by the term "ALTERNATE" in the Description column. Alternate items are considered airworthy for continued flight and existing stock of parts may be used for maintenance and/or repair. The new or alternate part number may be used interchangeably when ordering/stocking new parts.

B. Supersedure

(1) Part changes are identified by the terms “SUPERSEDES ITEM _____” or “SUPERSEDED BY ITEM _____” in the Description column. Superseded items are considered airworthy for continued flight and existing stock of superseded parts may be used for maintenance and/or repair. Once the superseding part has been incorporated/installed into an assembly, the original superseded part may no longer be used. Superseded parts may no longer be available, and the new part number must be used when ordering/stocking new parts.

C. Replacement

(1) Part changes identified by the terms "REPLACES ITEM _____” or “REPLACED BY ITEM _____” in the Description column are considered airworthy for continued flight, but must be replaced with a part with the new part number at overhaul. Existing stock of replaced parts may not be used for maintenance and/or repair of effected assemblies. Replaced parts may no longer be available, and the new part number must be used when ordering/stocking new parts.

D. Obsolete

(1) Obsolete parts are identified by "OBS” in the Units Per Assembly (UPA) column. Obsolete items are considered unairworthy for continued flight.

4. Vendor Supplied Hardware (Rev. 1)

A. Important Information

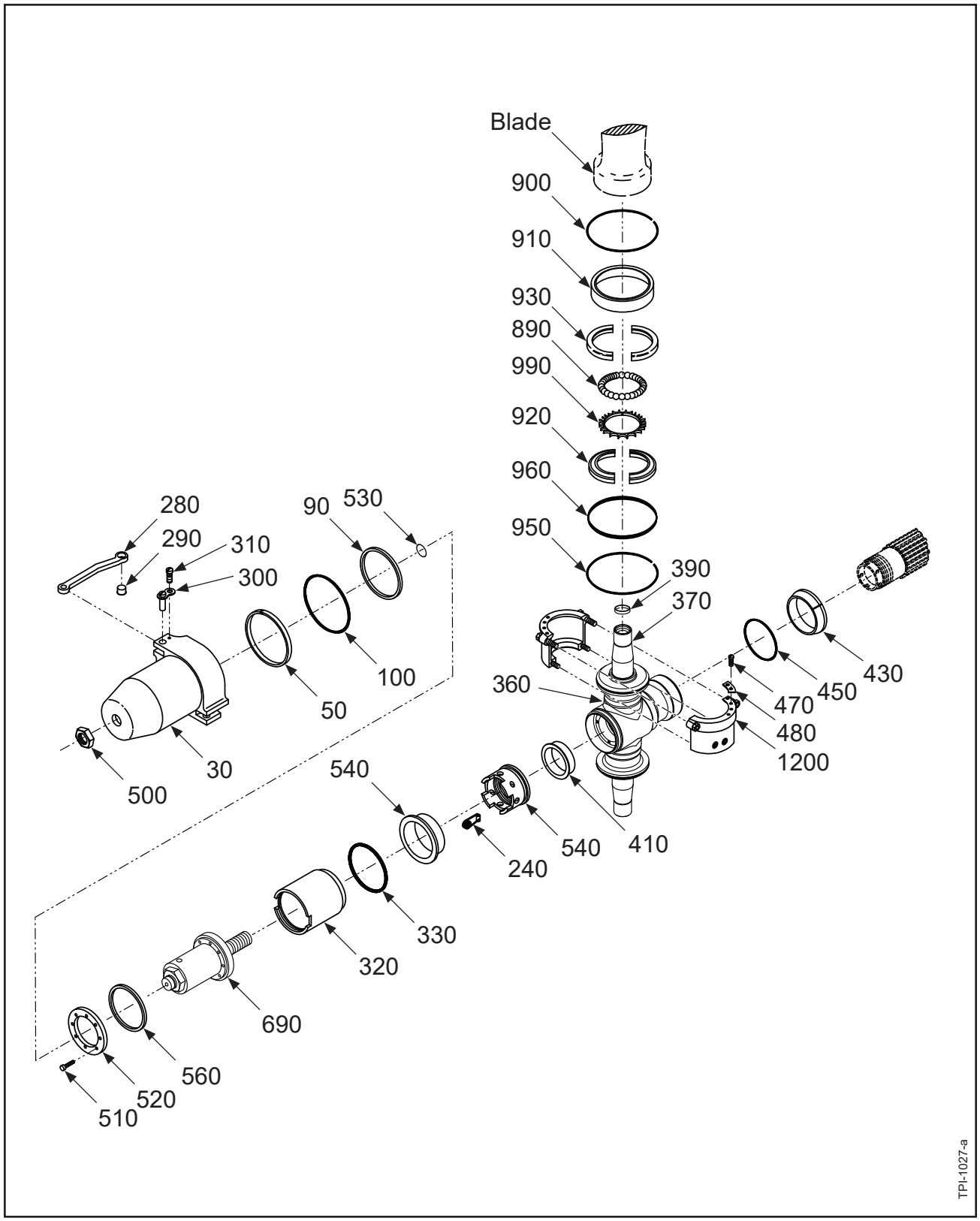
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS or vendor part number. To provide internal controls and procurement flexibility, Hartzell Propeller Inc. has made engineering changes to provide all O-rings, fasteners, and hardware with a Hartzell Propeller Inc. part number. Parts shipments from Hartzell Propeller Inc. will specify only the Hartzell Propeller Inc. part numbers.

(2) Some O-rings, fasteners, and hardware manufactured in accordance with established industry specifications (certain AN, MS, NAS items) are acceptable for use in Hartzell Propeller Inc. products without additional standards imposed by Hartzell Propeller Inc.; however, Hartzell Propeller Inc. does impose restrictions on certain AN, MS, and NAS vendor parts, which must be procured directly from Hartzell Propeller Inc.

(a) For a listing of part number interchangeability, refer to the Vendor Cross Reference chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(b) Where permitted, both the Hartzell Propeller Inc. part number item and AN, MS, NAS, and other specified vendor numbers items can be used interchangeably.

(c) The Hartzell Propeller Inc. part number must be used when ordering these parts from Hartzell Propeller Inc.



HA-A2(MV,V)20-1B: Propeller Parts
Figure 10-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER ASSEMBLY**				
30	C-7033	• PISTON UNIT		1		
30A	C-2961-1	• PISTON UNIT, ALTERNATE FOR ITEM 30		1		
50	A-862	• • BUSHING, PLASTIC		1		
90	B-1843	• SEAL, DUST, PISTON		1	Y	
100	C-3317-343-1	• O-RING		1	Y	
240	A-847	• SAFETY PIN, SHAFT NUT		1		
280	B-1901	• LINK ARM		2		
290	A-944	• SLEEVE, LINKSCREW		2	Y	
-295	A-6119	• BUSHING, LINK ARM (OPTIONAL)		2	Y	
300	A-1464	• LINK PIN UNIT		2	Y	
310	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		2	Y	
320	B-854	• CYLINDER		1		
330	C-3317-235	• O-RING		1	Y	
360	840-94	• PCP: HUB UNIT		1		PCP
370	A-1496	• • PILOT TUBE, REPLACED BY ITEM 370A		2		
370A	C-7080	• • PILOT TUBE, REPLACES ITEM 370		2		
390	B-7070-17	• • PLUG, CUPPED, STEEL		2	Y	
410	A-155	• • HUB BUSHING, SHAFT		1		
430	A-50-1	• CONE, MOUNTING, REAR, 20 SPLINE		1		
450	C-3317-229	• O-RING		1	Y	
470	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		A/R	Y	
480	A-48	• BALANCE WEIGHT		A/R		
-495	B-3838-3-3	• COTTER PIN		2	Y	
500	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
510	B-3840-10	• SCREW, 10-32, FILLISTER HEAD		4	Y	
520	A-1945	• RING, RETAINING, KEYED		1		
530	C-3317-020	• O-RING		1	Y	
540	A-870	• RING, PULLER, HUB		1		
550	A-63B	• PCP: NUT, SHAFT, 20 SPLINE		1		PCP
560	A-859	• KEEPER, SPLIT		1		
690	B-1944	• PITCH ADJUSTMENT ASSEMBLY (REFER TO "B-1944 PITCH ADJUSTMENT ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
890	A-311	• BALL SPACER		2	Y	
900	A-974	• RETAINER, RING, WIRE		2	Y	
910	A-972	• RING, RETAINING, BEARING		2		
920	A-971-A	• RACE		2		
930	A-971-B	• RACE		2		
950	A-2027	• RETAINER, BEARING, WIRE		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

HA-A2(MV,V)20-1B

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER ASSEMBLY**				
960	C-3317-230	• O-RING		2	Y	
960A	C-3317-228	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
960B	C-3317-229	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
990	B-6144-2	• BALL, BEARING, 9/16" DIA		34	Y	
1200	838-106	• PCP: CLAMP ASSEMBLY (REFER TO "838-106 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V	2		PCP
	838-1106	• PCP: CLAMP ASSEMBLY (REFER TO "838-1106 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV	2		PCP
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9040		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE ARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
V	HA-A2V20-1B		
MV	HA-A2MV20-1B		

- ITEM NOT ILLUSTRATED

HA-A2(MV,V)20-1B

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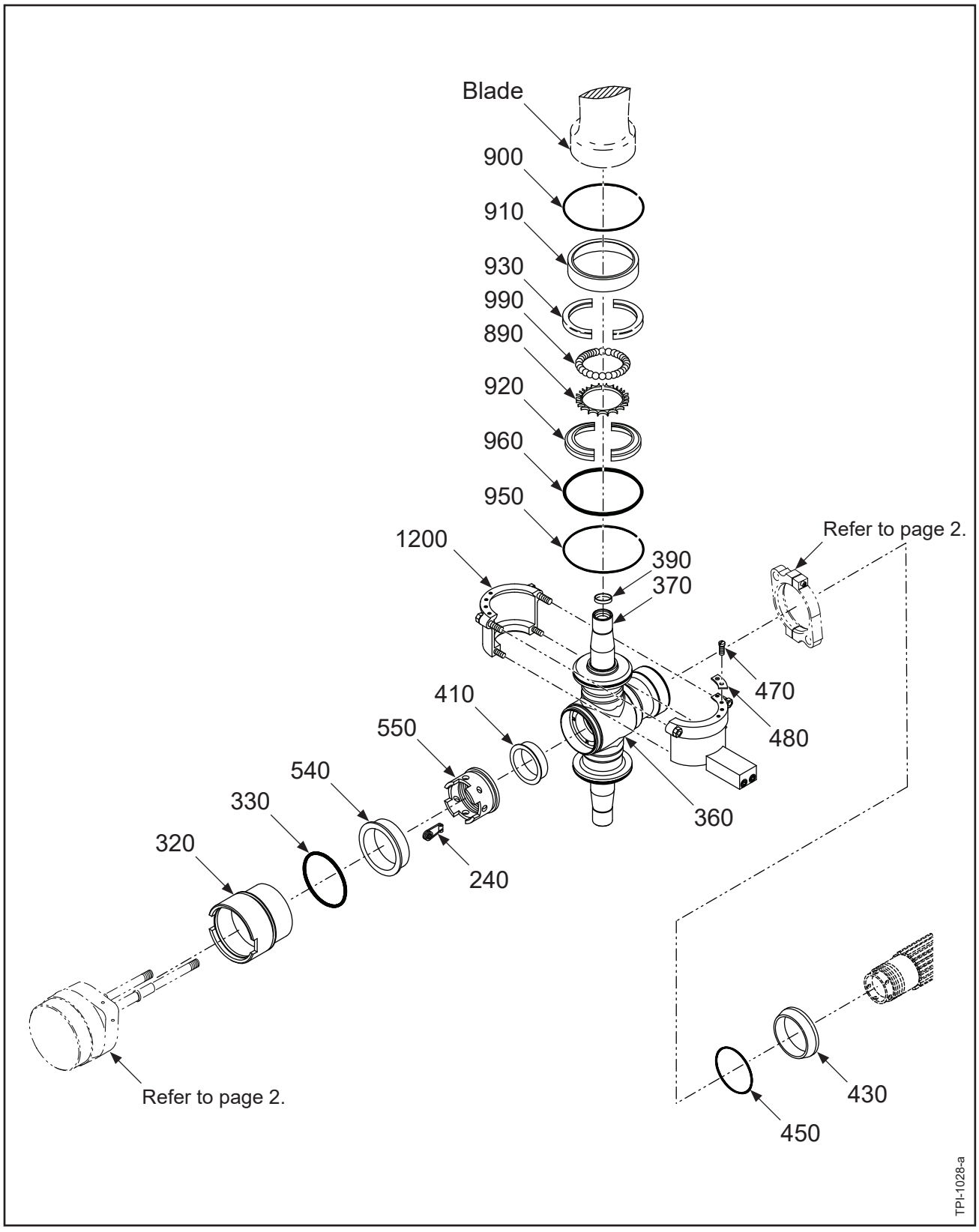
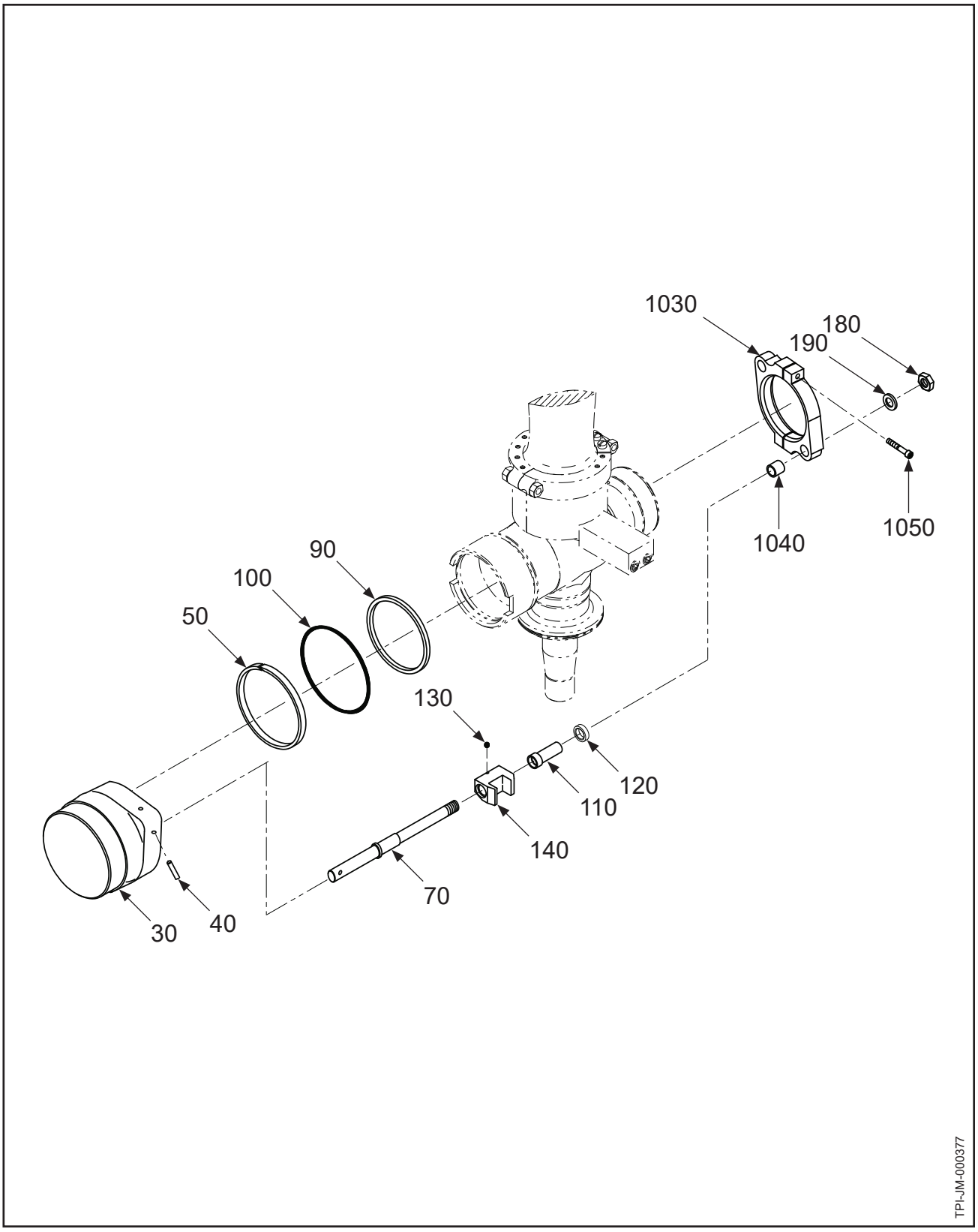


HC-A2(MV,V)20-1A: Propeller Parts
Figure 10-2, page 1 of 2



HC-A2(MV,V)20-1A: Propeller Parts
Figure 10-2, page 2 of 2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-2		**PROPELLER ASSEMBLY**				
30	B-966-3	• PISTON UNIT		1		
40	A-114-F	• • DOWEL PIN		2		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-826-3	• • ROD, GUIDE, PITCH CHANGE		2		
90	B-1843	• SEAL, DUST, PISTON		1	Y	
100	C-3317-343-1	• O-RING		1	Y	
110	A-827-2	• SLEEVE, ROD, GUIDE		2		
120	A-970-4	• SPACER, STOP, PITCH		2		
140	A-921-1	• FORK UNIT			2	
130	A-2039	• • SCREW, SET, 10-32		2	Y	
-170	A-95-A	• BLOCK, PITCH CHANGE		2	Y	
180	A-848-2	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
190	A-965	• WASHER, 7/16, CRES		2	Y	
240	A-847	• SAFETY PIN, SHAFT NUT		1	Y	
320	B-806-1	• CYLINDER		1		
330	C-3317-235	• O-RING		1	Y	
360	840-94	• PCP: HUB UNIT, HC-A2_20-		1		PCP
370	A-1496	• • PILOT TUBE - REPLACED BY ITEM 370A		2		
370A	C-7080	• • PILOT TUBE - REPLACES ITEM 370		2		
390	B-7070-17	• • PLUG, CUPPED, STEEL		2	Y	
410	A-155	• • HUB BUSHING, SHAFT		1		
430	A-50-3	• CONE, MOUNTING, REAR, 20 SPLINE		1		
450	C-3317-229	• O-RING		1	Y	
470	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		A/R	Y	
480	A-48	• BALANCE WEIGHT		A/R		
540	A-870	• RING, PULLER, HUB		1		
550	A-63B	• PCP: NUT, SHAFT, 20 SPLINE		1		PCP
890	A-311	• BALL SPACER		2	Y	
900	A-974	• RETAINER, RING, WIRE		2	Y	
910	A-972	• RING, RETAINING, BEARING		2		
920	A-971-A	• RACE		2		
930	A-971-B	• RACE		2		
950	A-2027	• RETAINER, BEARING, WIRE		2	Y	
960	C-3317-230	• O-RING		2	Y	
960A	C-3317-228	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
960B	C-3317-229	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
990	B-6144-2	• BALL, BEARING, 9/16" DIA		34	Y	
1030	834-3RA	• GUIDE COLLAR UNIT		1		
1040	A-116-F1	• • BUSHING, PLASTIC		2		
1050	A-2038-12	• • SCREW, 1/4-28, CAP		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

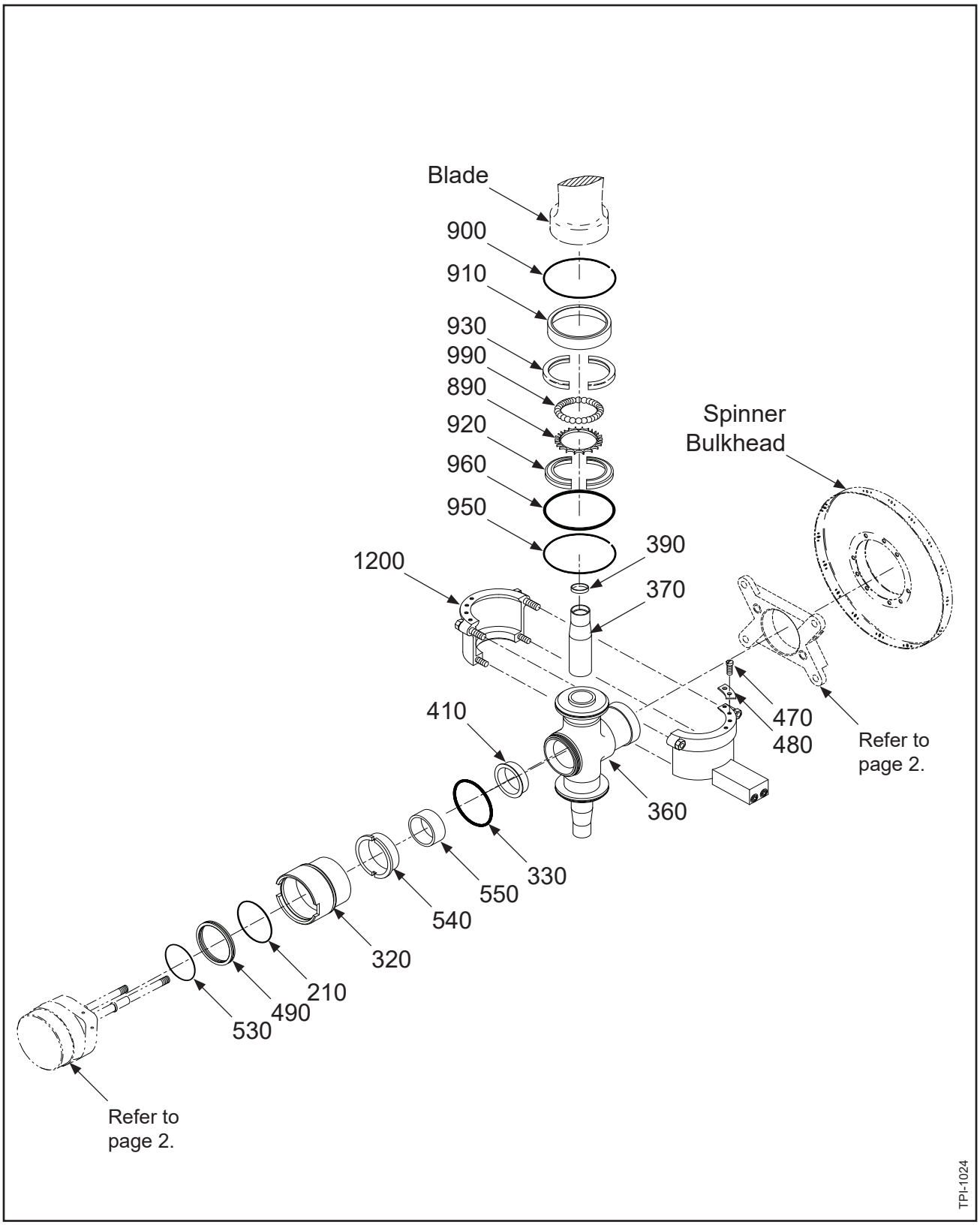
- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-2		**PROPELLER ASSEMBLY**				
1200	838-25	• PCP: CLAMP ASSEMBLY (REFER TO "838-25 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V	2		PCP
	838-1025	• PCP: CLAMP ASSEMBLY (REFER TO "838-1025 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV	2		PCP
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9040		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE ARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

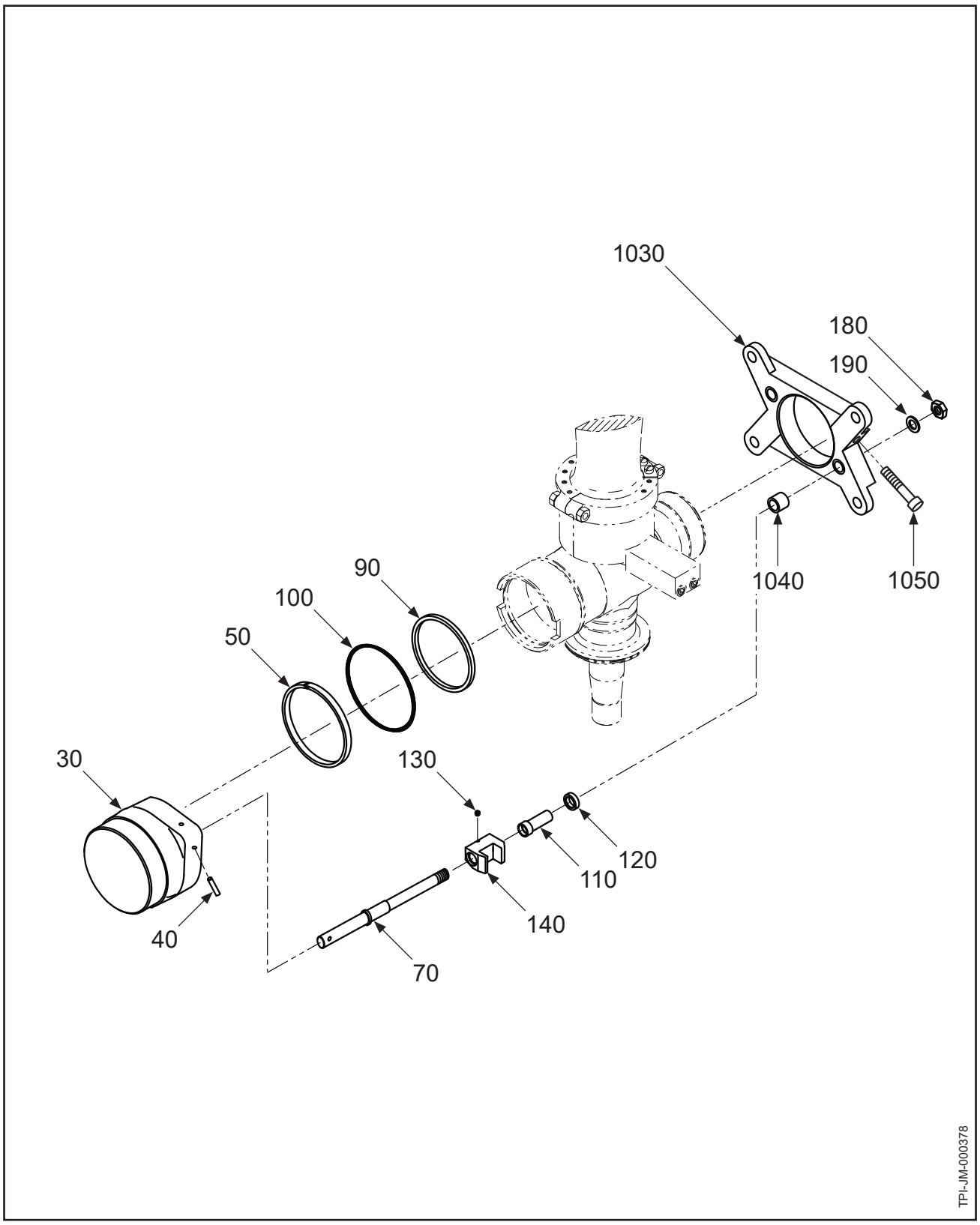
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
V	HC-A2V20-1A		
MV	HC-A2MV20-1A		

- ITEM NOT ILLUSTRATED

HC-A2(MV,V)20-1A



HC-A2(MV,V)20-4A1: Propeller Parts
Figure 10-3, page 1 of 2



HC-A2(MV,V)20-4A1: Propeller Parts
Figure 10-3, page 2 of 2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER ASSEMBLY**				
30	B-966-3	• PISTON UNIT		1		
40	A-114-F	• • DOWEL PIN		2		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-826-3	• • ROD, GUIDE, PITCH CHANGE		2		
90	B-1843	• SEAL, DUST, PISTON		1	Y	
100	C-3317-343-1	• O-RING		1	Y	
110	A-827-2	• SLEEVE, ROD, GUIDE		2		
120	A-970-( )	• SPACER, STOP, PITCH		2		
140	A-921-1	• FORK UNIT		2		
130	A-2039	• • SCREW, SET, 10-32		2	Y	
-170	A-95-A	• BLOCK, PITCH CHANGE		2	Y	
180	A-848-2	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
190	A-965	• WASHER, 7/16, CRES		2	Y	
210	C-3317-231	• O-RING		1	Y	
320	B-806-1	• CYLINDER		1		
330	C-3317-235	• O-RING		1	Y	
360	840-121	• PCP: HUB UNIT, HC-A2_20-4A1		1		PCP
370	A-1496	• • PILOT TUBE, REPLACED BY ITEM 370A		2		
370A	C-7080	• • PILOT TUBE, REPLACES ITEM 370		2		
390	B-7070-17	• • PLUG, CUPPED, STEEL		2	Y	
410	A-218	• • HUB BUSHING, SHAFT		1		
-420	A-249	• • SLEEVE, PROPELLER SHAFT		1	Y	
470	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		A/R	Y	
480	A-48	• BALANCE WEIGHT		A/R		
490	A-2054	• HOUSING, SEAL		1		
-495	B-3838-3-3	• COTTER PIN		1	Y	
530	C-3317-232	• O-RING		1	Y	
540	A-219	• RING, PULLER		1		
550	A-2053	• PCP: NUT, SHAFT, 20 SPLINE		1		PCP
890	A-311	• BALL SPACER		2	Y	
900	A-974	• RETAINER, RING, WIRE		2	Y	
910	A-972	• RING, RETAINING, BEARING		2		
920	A-971-A	• RACE		2		
930	A-971-B	• RACE		2		
950	A-2027	• RETAINER, BEARING, WIRE		2	Y	
960	C-3317-230	• O-RING		2	Y	
960A	C-3317-228	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
960B	C-3317-229	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
990	B-6144-2	• BALL, BEARING, 9/16" DIA		34	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

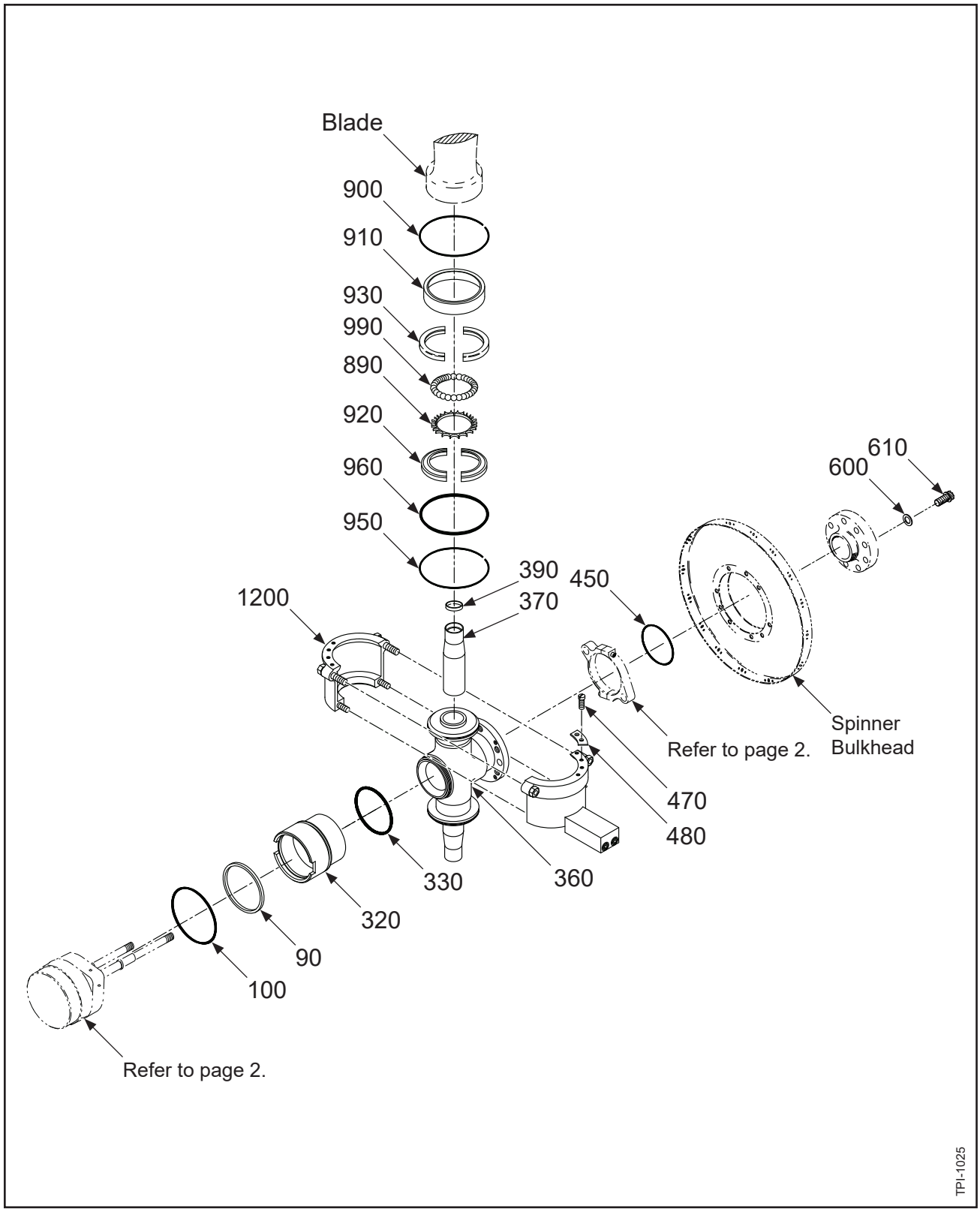
- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER ASSEMBLY**				
1030	834-10	• GUIDE COLLAR UNIT		1		
1040	A-116-F1	• • BUSHING, PLASTIC		2		
1050	B-3386-14H	• • BOLT, 3/8-24, HEX HEAD		2	Y	
1200	838-2	• PCP: CLAMP ASSEMBLY (REFER TO "838-2 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V	2		PCP
	838-1002	• PCP: CLAMP ASSEMBLY (REFER TO "838-1002 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV	2		PCP
3000	A-224-4	• OIL TRANSFER UNIT ASSEMBLY (REFER TO "A-224-4 OIL TRANSFER UNIT ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV	1		
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9040		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE ARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

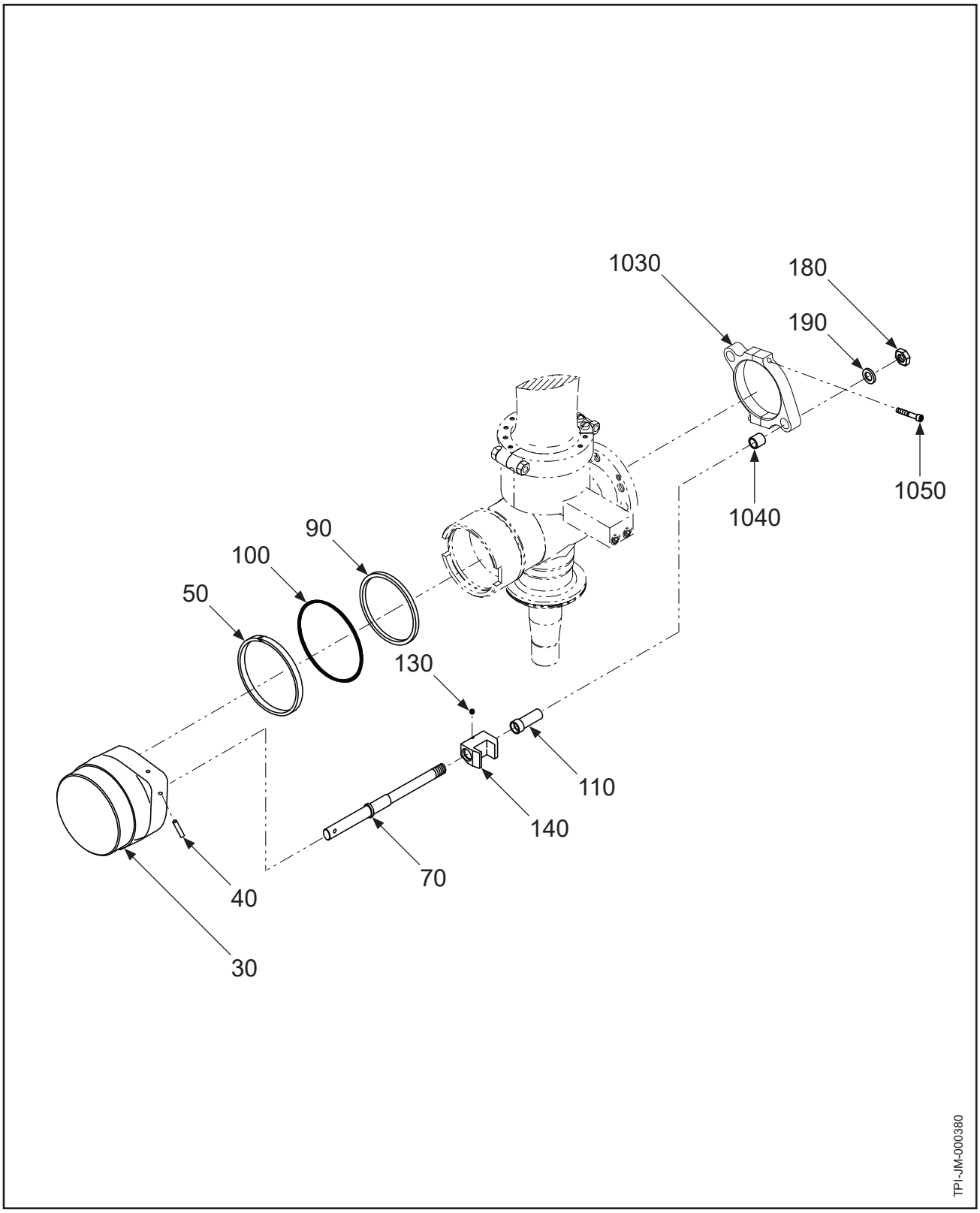
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
MV	HC-A2MV20-4A1		
V	HCA2V20-4A1		

- ITEM NOT ILLUSTRATED

HC-A2(MV,V)20-4A1



(B)HC-A2(MV,V)(F,K,L)-(1,6)(A,F): Propeller Parts
Figure 10-4, page 1 of 2



(B)HC-A2(MV,V)(F,K,L)-(1,6)(A,F): Propeller Parts
Figure 10-4, page 2 of 2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-4		**PROPELLER ASSEMBLY**				
30	B-966-1	• PISTON UNIT	BF1A, F1A	1		
	B-966-8	• PISTON UNIT	K1, L1, L6	1		
40	A-114-F	• • DOWEL PIN		2		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-826-1	• • ROD, GUIDE, PITCH CHANGE	BF1A, F1A	2		
	A-826-8	• • ROD, GUIDE, PITCH CHANGE	K1, L1, L6	2		
90	B-1843	• SEAL, DUST, PISTON		1	Y	
100	C-3317-343-1	• O-RING		1	Y	
110	A-827-1	• SLEEVE, ROD, GUIDE		2		
140	A-921-1	• FORK UNIT			2	
130	A-2039	• • SCREW, SET, 10-32		2	Y	
-170	A-95-A	• BLOCK, PITCH CHANGE	L1, L6	2	Y	
180	A-848-2	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
190	A-965	• WASHER, 7/16, CRES		2	Y	
320	B-806	• CYLINDER		1		
330	C-3317-235	• O-RING		1	Y	
360	840-122	• PCP: HUB UNIT	BF1A	1		PCP
	840-130	• PCP: HUB UNIT	F1A	1		PCP
	840-131	• PCP: HUB UNIT	L1, L6	1		PCP
	840-132	• PCP: HUB UNIT	K1	1		PCP
370	A-1496	• • PILOT TUBE, REPLACED BY ITEM 370A		2		
370A	C-7080	• • PILOT TUBE, REPLACES ITEM 370		2		
390	B-7070-17	• • PLUG, CUPPED, STEEL		2	Y	
1030	834-9	• • GUIDE COLLAR UNIT		1		
1040	A-116-A1	• • • BUSHING, PLASTIC		2		
1050	A-2038-10	• • • SCREW, 1/4-28, CAP		2	Y	
-1060	B-6138-8-12	• • DOWEL PIN	F1A	2	Y	
	A-957	• • PIN, 1/2", ALUMINUM	BF1A	2	Y	
	A-1332-2	• • PIN, 3/8", ALUMINUM	K1, L1, L6	2	Y	
450	C-3317-228	• O-RING	BF1A, F1A	1	Y	
	C-3317-329	• O-RING	K1, L1, L6	1	Y	
470	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		A/R	Y	
480	A-48	• BALANCE WEIGHT		A/R		
540	A-870	• RING, PULLER, HUB		1		
600	A-1381	• WASHER, 1/2" CRES	BF1A, F1A	6	Y	
610	A-1328-1	• BOLT, MOUNTING, 1/2-20,12 POINT	BF1A, F1A	6	Y	
	A-1333-3	• BOLT, MOUNTING, 1/2-20, HEX HEAD	K1	2	Y	
	B-322	• BOLT, 7/16-20, HEX HEAD	L1, L6	2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
BF1A	BHC-A2(MV,V)F-1A		
F1A	HC-A2 (MV, V)F-1A		
K1	HC-A2 (MV, V)K-1		
L1	HC-A2 (MV, V)L-1		
L6	HC-A2 (MV, V)L-6F		

- ITEM NOT ILLUSTRATED

(B)HC-A2(MV,V)(F,K,L)-(1,6)(A,F)

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-4		**PROPELLER ASSEMBLY**				
-620	A-2051-1	• BOLT, 5/16-24, HEX HEAD	BF1A, F1A	4	Y	
	A-1333-3	• BOLT, MOUNTING, 1/2-20, HEX HEAD (UNDER GUIDE COLLAR CAP SCREWS)	K1	4	Y	
	A-1333-6	• BOLT, MOUNTING, 1/2-20, HEX HEAD (UNDER PISTON RODS)	K1	2	Y	
	B-322	• BOLT, 7/16-20, HEX HEAD (ON HUB SPIDER UNIT)	L1, L6	4	Y	
-620A	A-2051	• BOLT, 5/16-24, HEX HEAD, ALTERNATE FOR ITEM 620	BF1A, F1A	4	Y	
-635	A-846-1	• PLATE, MOUNTING, SPINNER	BF1A, F1A	4		
-640	B-6138-8-8	• DOWEL PIN	F1A	2	Y	
-650	B-1322	• SHIM, MOUNTING, "K" FLANGE	K1	1	Y	
	B-933-1	• SHIM, MOUNTING, PROPELLER	L1, L6	1	Y	
890	A-311	• BALL SPACER		2	Y	
900	A-974	• RETAINER, RING, WIRE		2	Y	
910	A-972	• RING, RETAINING, BEARING		2		
920	A-971-A	• RACE		2		
930	A-971-B	• RACE		2		
950	A-2027	• RETAINER, BEARING, WIRE		2	Y	
960	C-3317-230	• O-RING		2	Y	
960A	C-3317-228	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
960B	C-3317-229	• O-RING, ALTERNATE FOR ITEM 960		2	Y	
990	B-6144-2	• BALL, BEARING, 9/16" DIA		36	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
BF1A	BHC-A2(MV,V)F-1A		
F1A	HC-A2(MV,V)F-1A		
K1	HC-A2(MV,V)K-1		
L1	HC-A2(MV,V)L-1		
L6	HC-A2(MV,V)L-6F		

- ITEM NOT ILLUSTRATED

(B)HC-A2(MV,V)(F,K,L)-(1,6)(A,F)

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-4		**PROPELLER ASSEMBLY**				
1200	838-2	• PCP: CLAMP ASSEMBLY (REFER TO "838-2 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V-BF1A, V-F1A, V-K1	2		PCP
	838-20	• PCP: CLAMP ASSEMBLY (REFER TO "838-20 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V-L1	2		PCP
	838-24	• PCP: CLAMP ASSEMBLY (REFER TO "838-24 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V-L6	2		PCP
	838-1002	• PCP: CLAMP ASSEMBLY (REFER TO "838-1002 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV-BF1A, MV-F1A, MV-K1	2		PCP
	838-1020	• PCP: CLAMP ASSEMBLY (REFER TO "838-1020 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV-L1	2		PCP
	838-1024	• PCP: CLAMP ASSEMBLY (REFER TO "838-1024 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV-L6	2		PCP
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9040		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE ARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
MV-BF1A	BHC-A2MVF-1A	V-BF1A	BHC-A2VF-1A
MV-F1A	HC-A2MVF-1A	V-F1A	HC-A2VF-1A
MV-K1	HC-A2MVK-1	V-K1	HC-A2VK-1
MV-L1	HC-A2MVL-1	V-L1	HC-A2VL-1
MV-L6	HC-A2MVL-6F	V-L6	HC-A2VL-6F

- ITEM NOT ILLUSTRATED

(B)HC-A2(MV,V)(F,K,L)-(1,6)(A,F)

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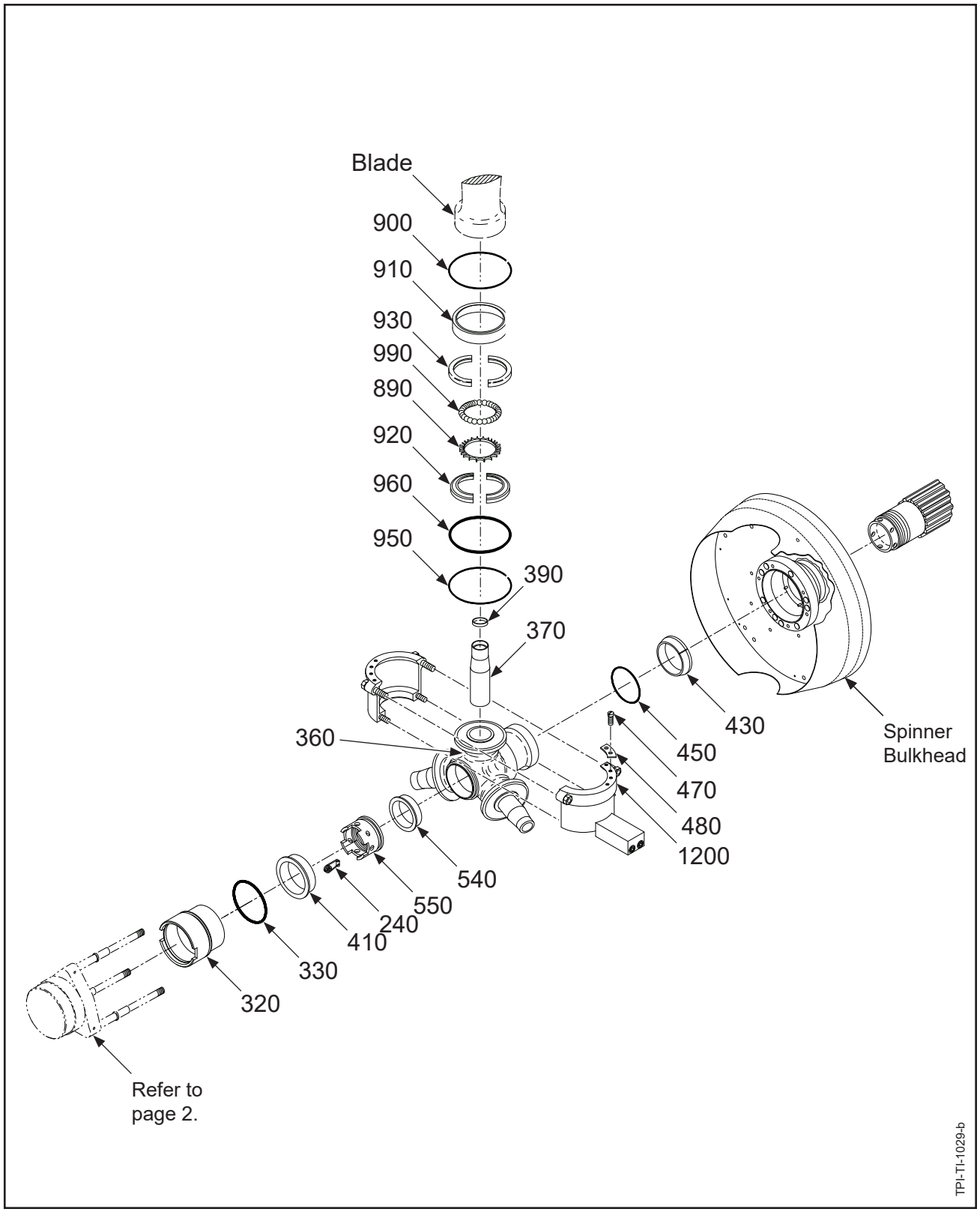
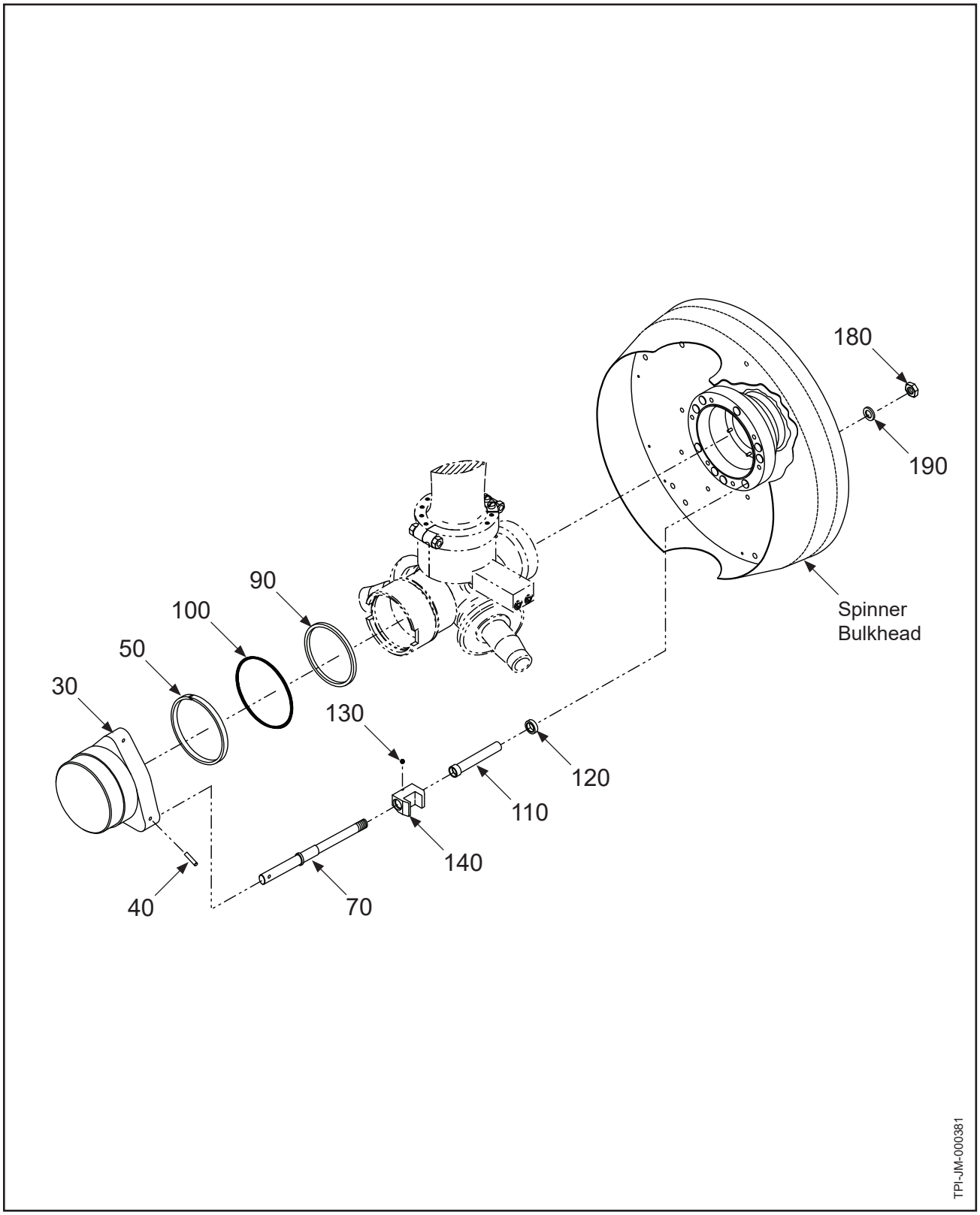


HC-A3(MV,V)20-1(B,D,E,F): Propeller Parts
Figure 10-5, page 1 of 2



HC-A3(MV,V)20-1(B,D,E,F): Propeller Parts
Figure 10-5, page 2 of 2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER ASSEMBLY**				
30	B-1421-5	• PISTON UNIT		1		
40	A-114-G	• • DOWEL PIN		3		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-826-5	• • ROD, GUIDE, PITCH CHANGE		3		
90	B-1843	• SEAL, DUST, PISTON		1	Y	
100	C-3317-343-1	• O-RING		1	Y	
110	A-827-6	• SLEEVE, ROD, GUIDE		3		
120	A-970-( )	• SPACER, STOP, PITCH		3		
140	A-1926	• FORK		3		
130	A-2039	• • SCREW, SET, 10-32		3	Y	
-170	A-95-A	• BLOCK, PITCH CHANGE		3	Y	
180	A-848-2	• NUT, 7/16-20, HEX, SELF-LOCKING		3	Y	
190	A-965	• WASHER, 7/16, CRES		3	Y	
240	A-847	• SAFETY PIN, SHAFT NUT		1		
320	B-806-1	• CYLINDER		1		
330	C-3317-235	• O-RING		1	Y	
360	840-85	• PCP: HUB UNIT, HC-(A,D)3_20-		1		PCP
370	A-1496	• • PILOT TUBE, REPLACED BY ITEM 370A		3		
370A	C-7080	• • PILOT TUBE, REPLACES ITEM 370A		3		
390	B-7070-17	• • PLUG, CUPPED, STEEL (USED WITH ITEM 370A)		3	Y	
410	A-155	• • HUB BUSHING, SHAFT		1		
430	A-50-3	• CONE, MOUNTING, REAR, 20 SPLINE	1B	1		
	A-50-5	• CONE, MOUNTING, REAR, 20 SPLINE	1D, 1E, 1F	1		
450	C-3317-229	• O-RING		1	Y	
470	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		A/R	Y	
480	A-48	• BALANCE WEIGHT		A/R		
540	A-870	• RING, PULLER, HUB		1		
550	A-63B	• PCP: NUT, SHAFT, 20 SPLINE		1		PCP
890	A-311	• BALL SPACER		3	Y	
900	A-974	• RETAINER, RING, WIRE		3	Y	
910	A-972	• RING, RETAINING, BEARING		3		
920	A-971-A	• RACE		3		
930	A-971-B	• RACE		3		
950	A-2027	• RETAINER, BEARING, WIRE		3	Y	
960	C-3317-230	• O-RING		3	Y	
960A	C-3317-228	• O-RING, ALTERNATE FOR ITEM 960		3	Y	
960B	C-3317-229	• O-RING, ALTERNATE FOR ITEM 960		3	Y	
990	B-6144-2	• BALL, BEARING, 9/16" DIA		51	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
1B	HC-A3(MV,V)20-1B		
1D	HC-A3(MV,V)20-1D		
1E	HC-A3(MV,V)20-1E		
1F	HC-A3(MV,V)20-1F		

- ITEM NOT ILLUSTRATED

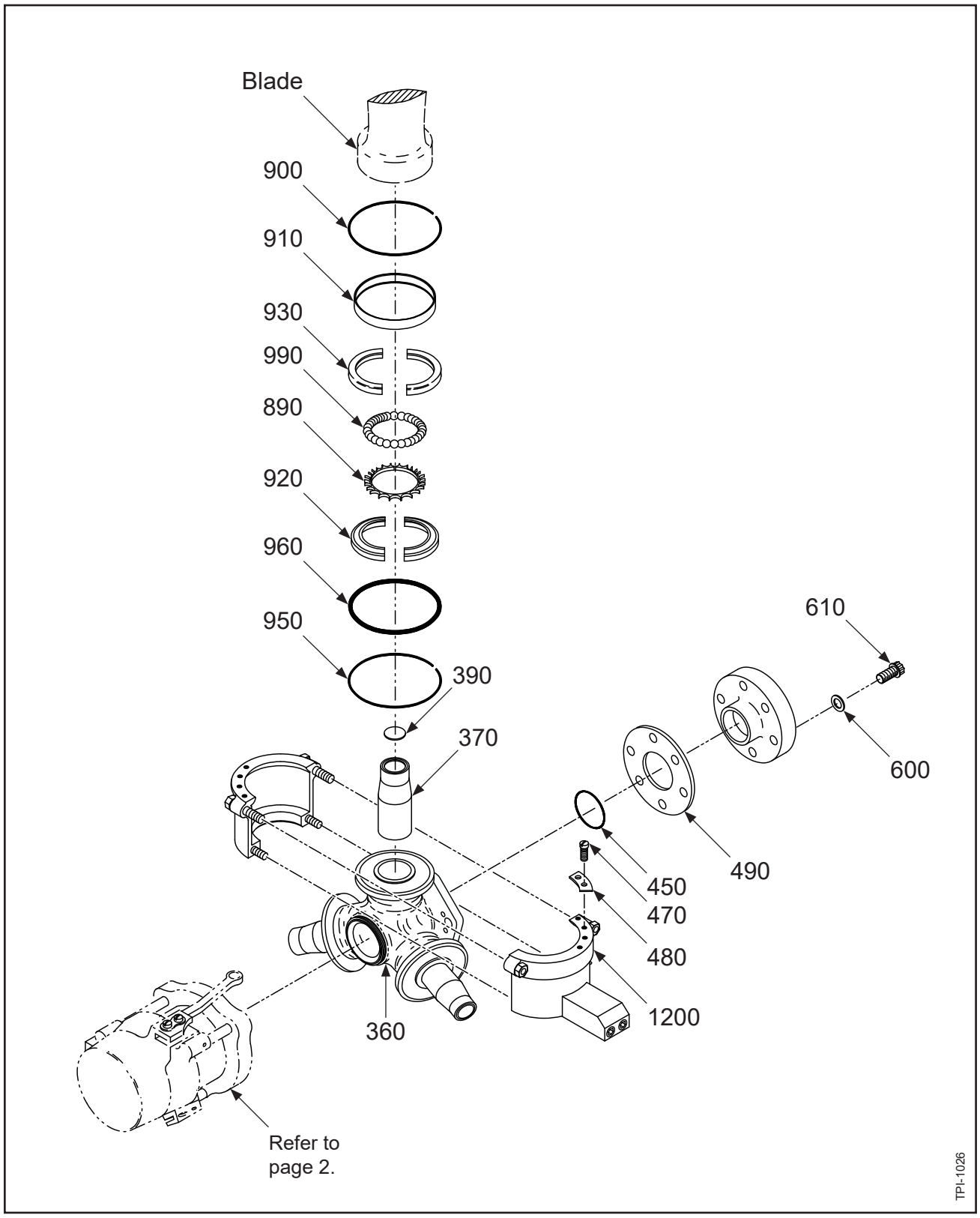
HC-A3(MV,V)20-1(B,D,E,F)

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER ASSEMBLY**				
1200	838-25	• PCP: CLAMP ASSEMBLY (REFER TO "838-25 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V-1B, V-1D	3		PCP
	838-25R	• PCP: CLAMP ASSEMBLY (REFER TO "838-25R CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V-1E, V-1F	3		PCP
	838-1025	• PCP: CLAMP ASSEMBLY (REFER TO "838-1025 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV-1B, MV-1D	3		PCP
	838-1025R	• PCP: CLAMP ASSEMBLY (REFER TO "838-1025R CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV-1E, MV-1 F	3		PCP
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9040		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE ARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

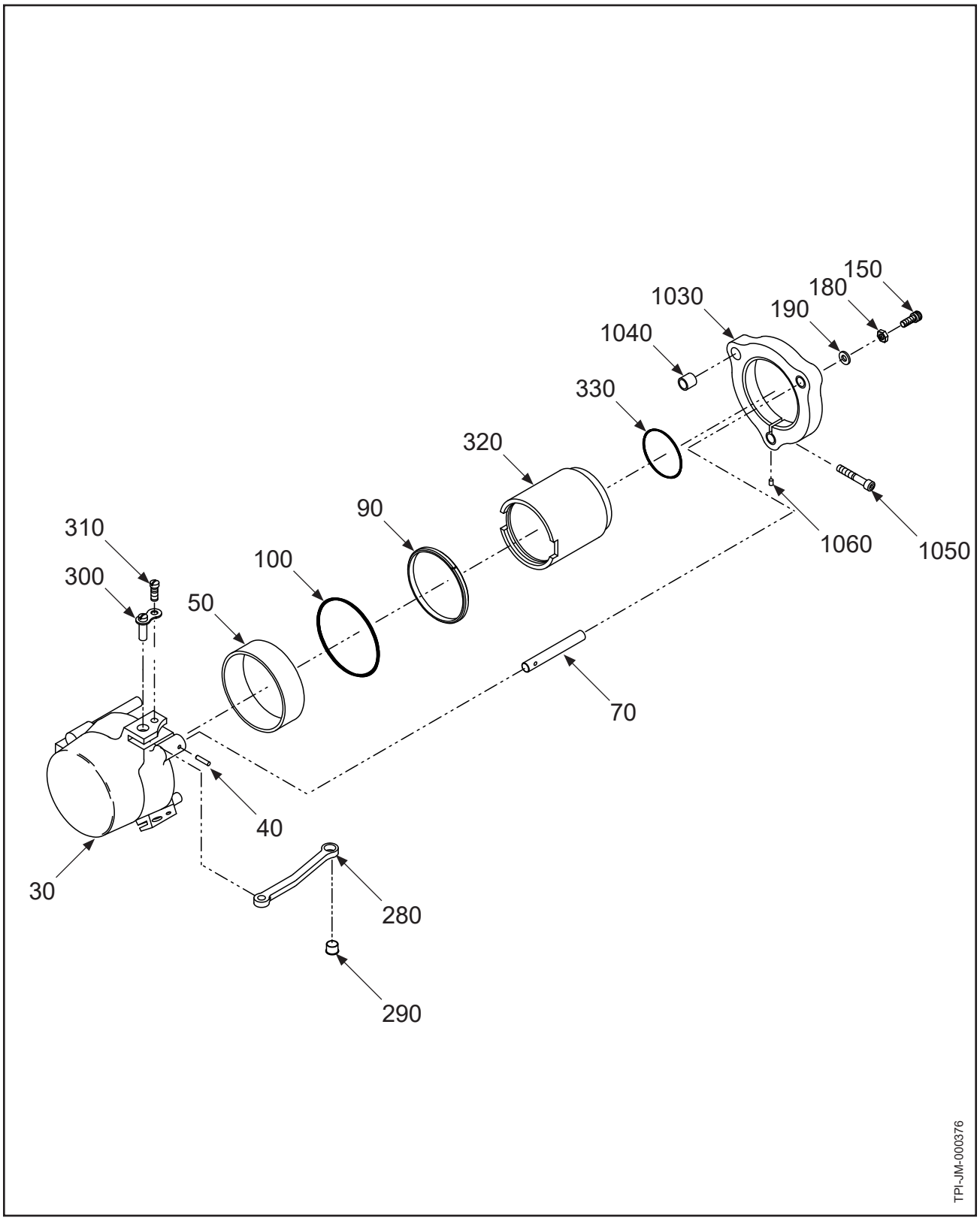
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
MV-1B	HC-A3MV20-1B	V-1B	HC-A3V20-1B
MV-1D	HC-A3MV20-1D	V-1D	HC-A3V20-1D
MV-1E	HC-A3MV20-1E	V-1E	HC-A3V20-1E
MV-1F	HC-A3MV20-1F	V-1F	HC-A3V20-1F

- ITEM NOT ILLUSTRATED

HC-A3(MV,V)20-1(B,D,E,F)



(E,P)HC-A3(MV,V)(F,K)-4(D): Propeller Parts
Figure 10-6, page 1 of 2



(E,P)HC-A3(MV,V)(F,K)-4(D): Propeller Parts
Figure 10-6, page 2 of 2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-6		**PROPELLER ASSEMBLY**				
30	C-1881-1	• PISTON UNIT		1		
40	A-114-7	• • DOWEL PIN		3		
50	A-862-2	• • BUSHING, PLASTIC		1		
70	A-817-4	• • ROD, GUIDE, PISTON		3		
90	B-1843	• SEAL, DUST, PISTON		1	Y	
100	C-3317-347-1	• O-RING		1	Y	
150	A-2037	• SCREW, 5/16, CAP		1	Y	
180	B-3368	• NUT, 5/16-24, HEX, THIN		3	Y	
190	A-1444	• WASHER, 5/16"		3	Y	
280	A-861-3L	• LINK ARM		3	Y	
290	A-944	• SLEEVE, LINKSCREW		3	Y	
-295	A-6119	• BUSHING, LINK ARM - OPTIONAL		2	Y	
300	A-1464	• LINK PIN UNIT		3	Y	
310	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
320	B-1882	• CYLINDER		1		
330	C-3317-235	• O-RING		1	Y	
360	840-77	• PCP: HUB UNIT	K	1		PCP
	840-83	• PCP: HUB UNIT	P	1		PCP
	840-102	• PCP: HUB UNIT	E	1		PCP
370	A-1496	• • PILOT TUBE, REPLACED BY ITEM 370A		3		
370A	C-7080	• • PILOT TUBE, REPLACES ITEM 370		3		
390	B-7070-17	• • PLUG, CUPPED, STEEL (USED WITH ITEM 370A)		3	Y	
450	C-3317-329	• O-RING	K	1	Y	
	C-3317-228	• O-RING	E, P	1	Y	
470	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		A/R	Y	
480	A-48	• BALANCE WEIGHT		A/R		
490	B-1344	• PLATE, MOUNTING, SPINNER	P	1		
600	A-1381	• WASHER, 1/2" CRES	E, P	6	Y	
610	A-1333-3	• BOLT, MOUNTING, 1/2-20, HEX HEAD	K	6	Y	
	A-1328-2	• BOLT, MOUNTING, 1/2-20,12 POINT	E, P	6	Y	
-650	B-1322	• SHIM, MOUNTING, "K" FLANGE	K	1	Y	
-670	B-6138-8-8	• DOWEL PIN	E, P	2	Y	
890	A-311	• BALL SPACER		3	Y	
900	A-974	• RETAINER, RING, WIRE		3	Y	
910	A-972	• RING, RETAINING, BEARING		3		
920	A-971-A	• RACE		3		
930	A-971-B	• RACE		3		
950	A-2027	• RETAINER, BEARING, WIRE		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
E	EHC-A3(MV,V)F-4		
P	PHC-A3(MV,V)F-4(D)		
K	HC-A3(MV,V)K-4		

- ITEM NOT ILLUSTRATED

(E,P)HC-A3(MV,V)(F,K)-4(D)

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-6		**PROPELLER ASSEMBLY**				
960	C-3317-230	• O-RING		3	Y	
960A	C-3317-228	• O-RING, ALTERNATE FOR ITEM 960		3	Y	
960B	C-3317-229	• O-RING, ALTERNATE FOR ITEM 960		3	Y	
990	B-6144-2	• BALL, BEARING, 9/16" DIA		51	Y	
1030	834-7B	• GUIDE COLLAR UNIT		1		
1040	A-116-D1	• • BUSHING, PLASTIC		3		
1050	A-2038-14	• • SCREW, 1/4-28, CAP		1	Y	
1060	A-114-2	• • DOWEL PIN		1		
1200	838-58	• PCP: CLAMP ASSEMBLY (REFER TO "838-58 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	V	3		PCP
	838-1058	• PCP: CLAMP ASSEMBLY (REFER TO "838-1058 CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	MV	3		PCP
		COUNTERWEIGHTS/MOUNTING BOLTS				
-9030		• COUNTERWEIGHT APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				PCP
		• COUNTERWEIGHT MOUNTING BOLTS REFER TO THE APPLICABLE HARTZELL PROPELLER BLADE OVERHAUL MANUAL: MANUAL 135F (61-13-35) - COMPOSITE BLADES MANUAL 133C (61-13-33) - ALUMINUM BLADES				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9040		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE ARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION				
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
V	(E,P)HC-A3V(F,K)-4(D)		
MV	(E,P)HC-A3MV(F,K)-4(D)		

- ITEM NOT ILLUSTRATED

(E,P)HC-A3(MV,V)(F,K)-4(D)

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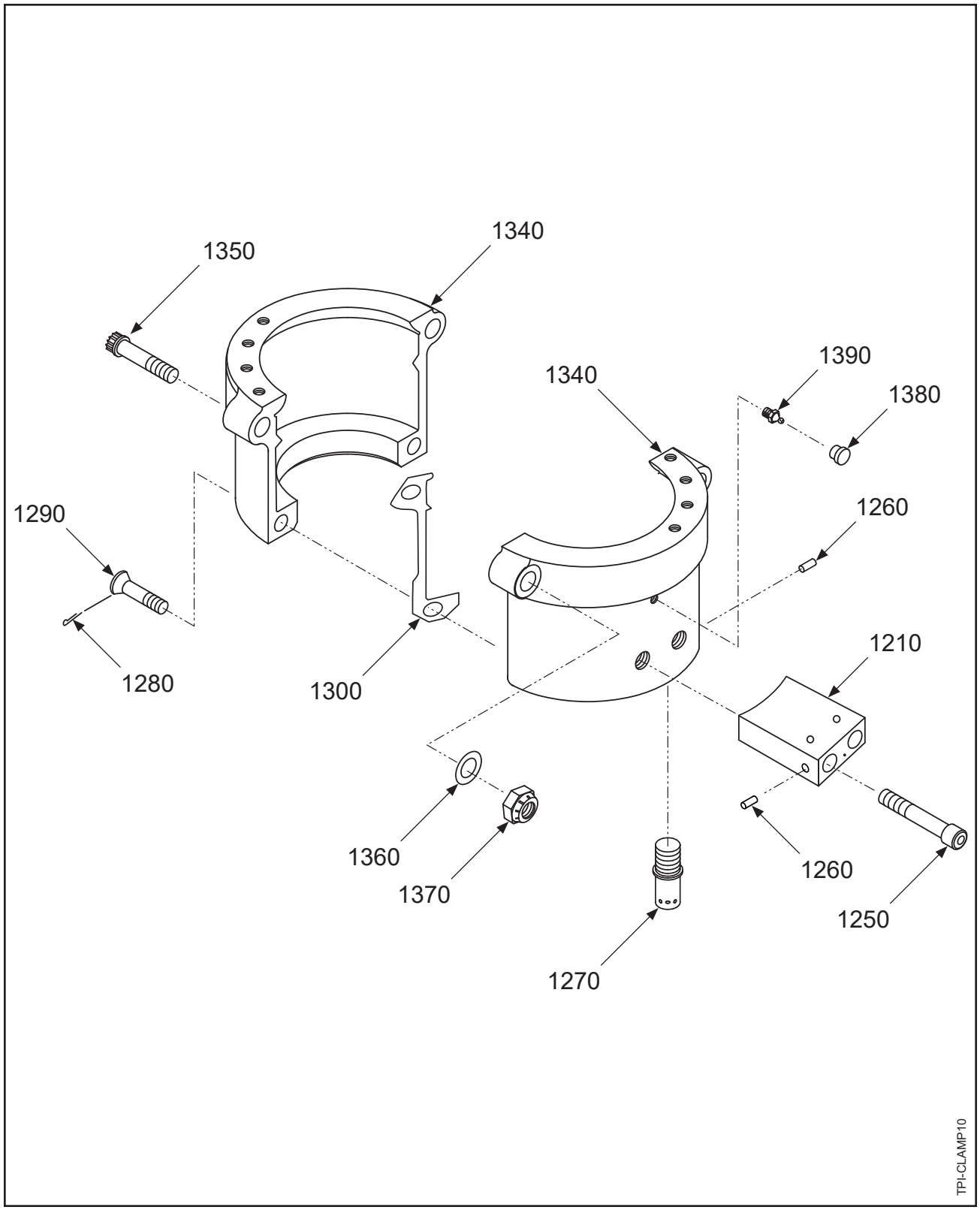
SUB-ASSEMBLY
PARTS LISTS and FIGURES



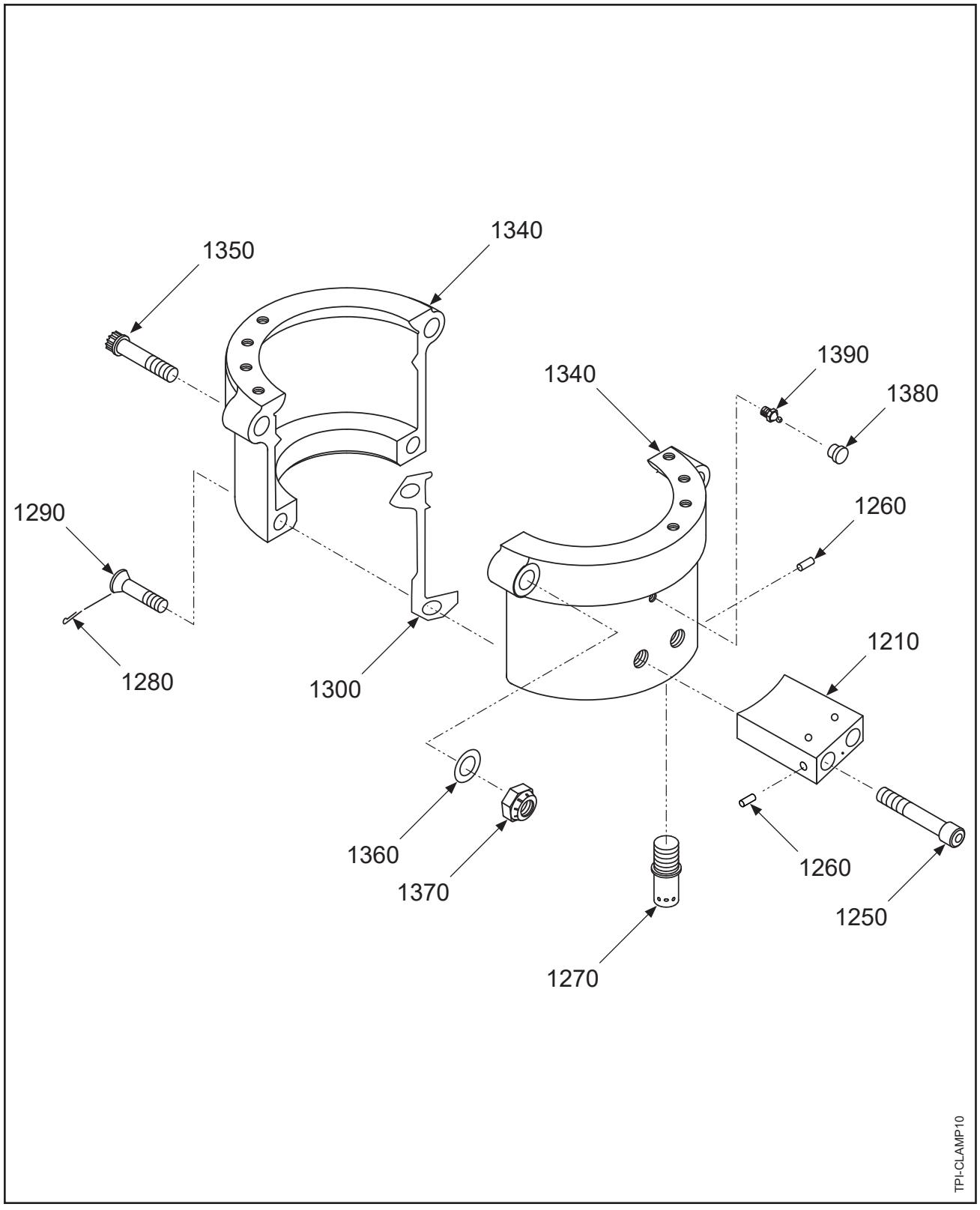
838-2: Clamp Assembly
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**838-2 CLAMP ASSEMBLY**				
1210	B-891-1	• PCP: COUNTERWEIGHT UNIT		1		PCP
1250	A-2036-30	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-30	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• SPRING PIN, 3/32", CRES		3	Y	
1270	A-295	• LINKSCREW, 1/2-20		1	Y	
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-47-1	• GASKET, CLAMP		2	Y	
1340	C-3-1A	• PCP: BLADE CLAMP		1		PCP
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
1390	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-2: Clamp Assembly



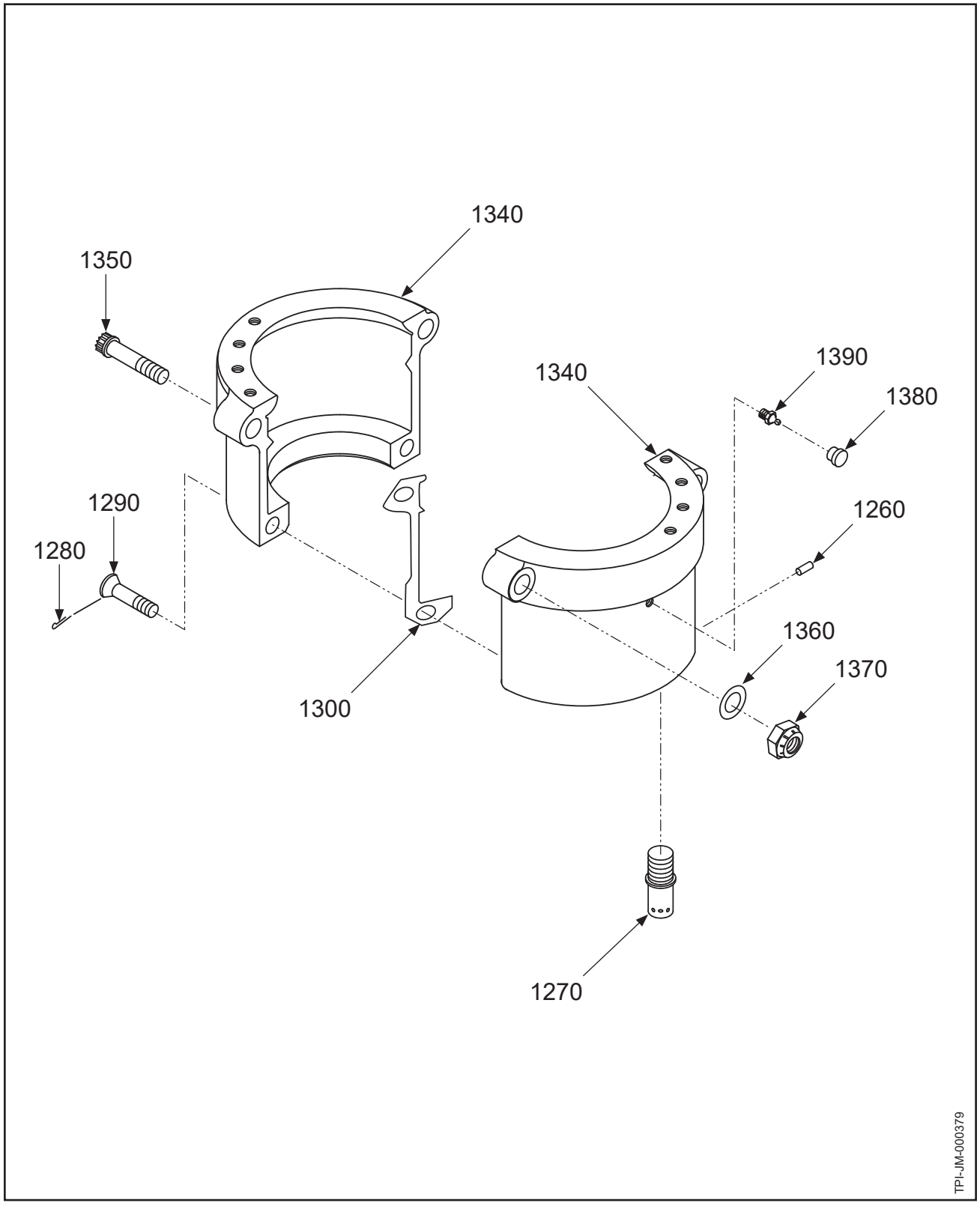
838-20: Clamp Assembly
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**838-20 CLAMP ASSEMBLY**				
1210	B-271-2	• PCP: COUNTERWEIGHT		1		PCP
1250	A-2036-30	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-30	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• SPRING PIN, 3/32", CRES		3	Y	
1270	A-295	• LINKSCREW, 1/2-20		1	Y	
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-47-1	• GASKET, CLAMP		2	Y	
1340	C-3-1A	• PCP: BLADE CLAMP		1		PCP
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
1390	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-20: Clamp Assembly



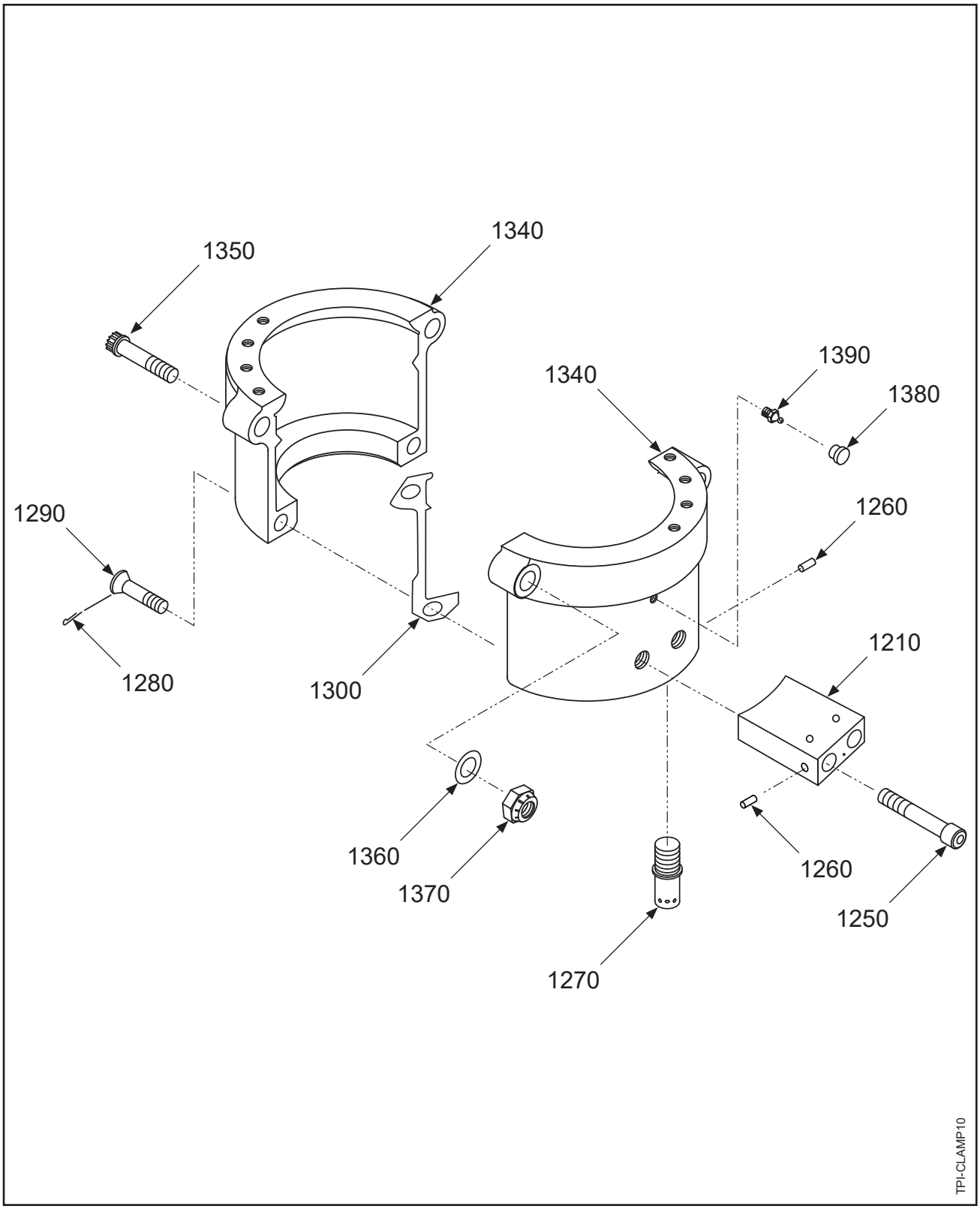
838-24: Clamp Assembly
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**838-24 CLAMP ASSEMBLY**				
1260	A-285	• SPRING PIN, 3/32", CRES		1	Y	
1270	A-295	• LINKSCREW, 1/2-20		1	Y	
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-47-1	• GASKET, CLAMP		2	Y	
1340	C-3-1B	• PCP: BLADE CLAMP		1		PCP
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
1390	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-24: Clamp Assembly



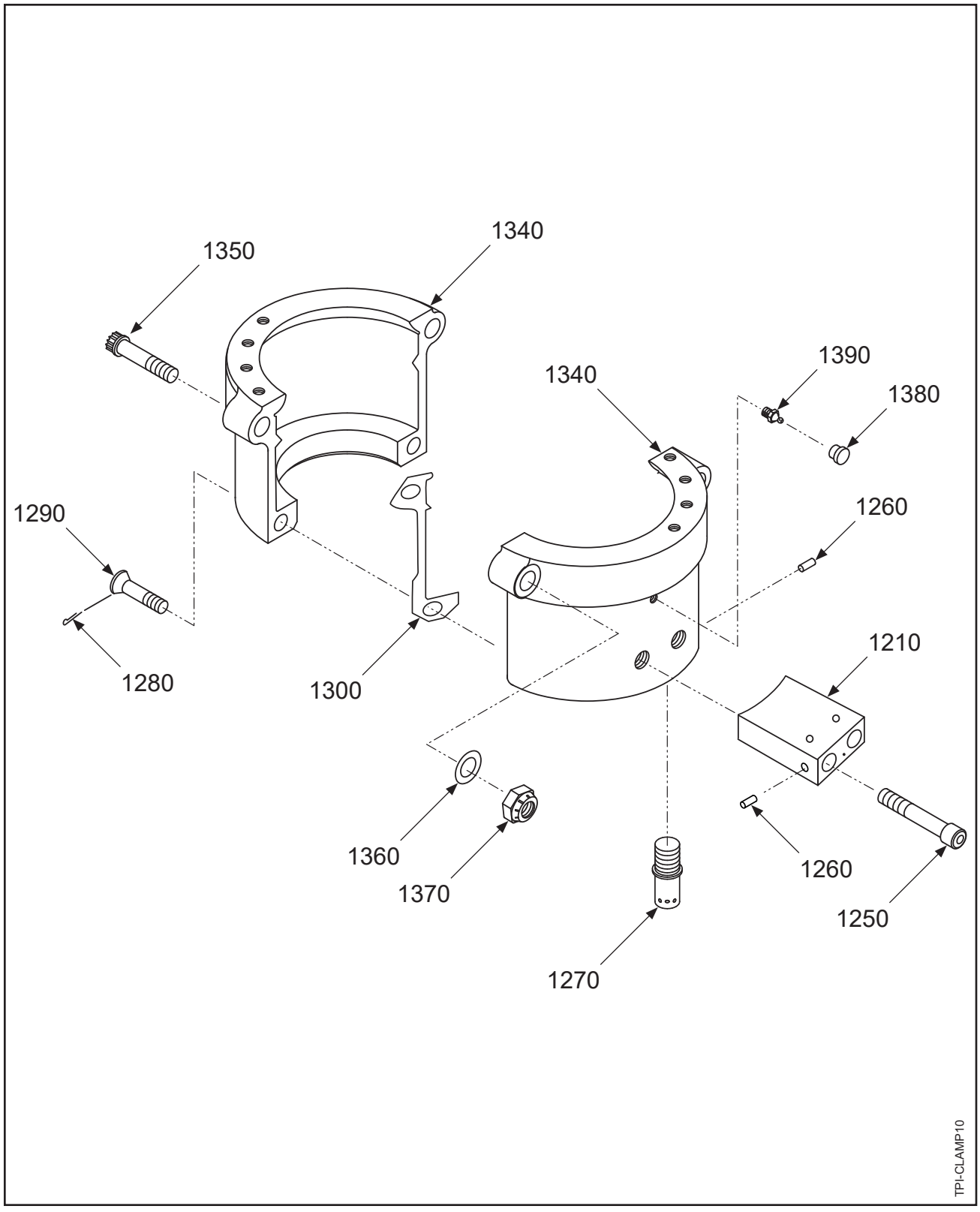
838-25: Clamp Assembly
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**838-25 CLAMP ASSEMBLY**				
1210A	833-24	• PCP: COUNTERWEIGHT UNIT		1		PCP
1250	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• SPRING PIN, 3/32", CRES		3	Y	
1270	A-304	• LINKSCREW, 1/2-20		1	Y	
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-47-1	• GASKET, CLAMP		2	Y	
1340	C-3-1A	• PCP: BLADE CLAMP		1		PCP
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
1390	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-25: Clamp Assembly



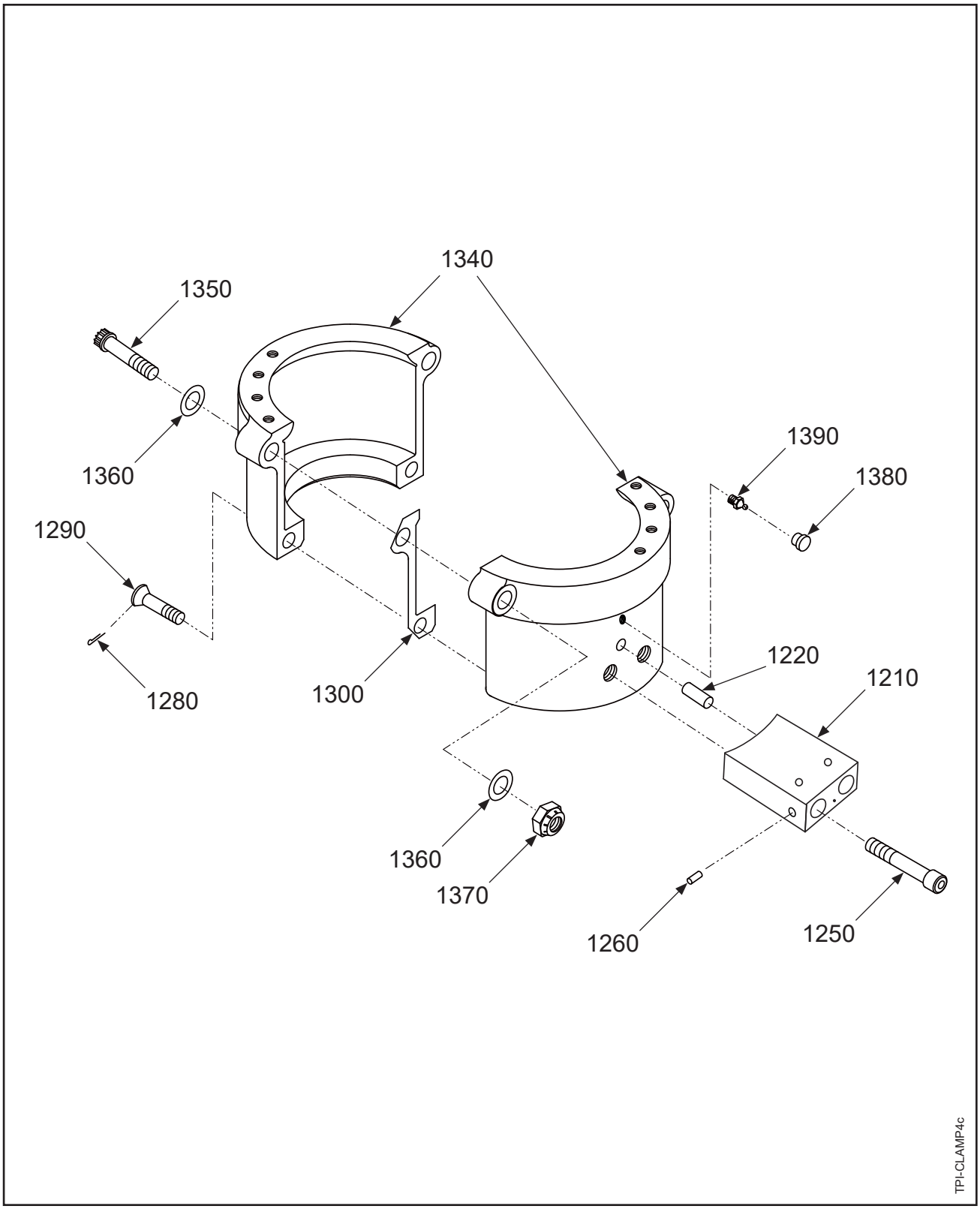
838-25R: Clamp Assembly
Figure 10A-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-5		**838-25R CLAMP ASSEMBLY**				
1210A	833-24R	• PCP: COUNTERWEIGHT UNIT		1		PCP
1250	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• SPRING PIN, 3/32", CRES		3	Y	
1270	A-304	• LINKSCREW, 1/2-20		1	Y	
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-47-1	• GASKET, CLAMP		2	Y	
1340	C-3-1A	• PCP: BLADE CLAMP		1		PCP
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
1390	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-25R: Clamp Assembly



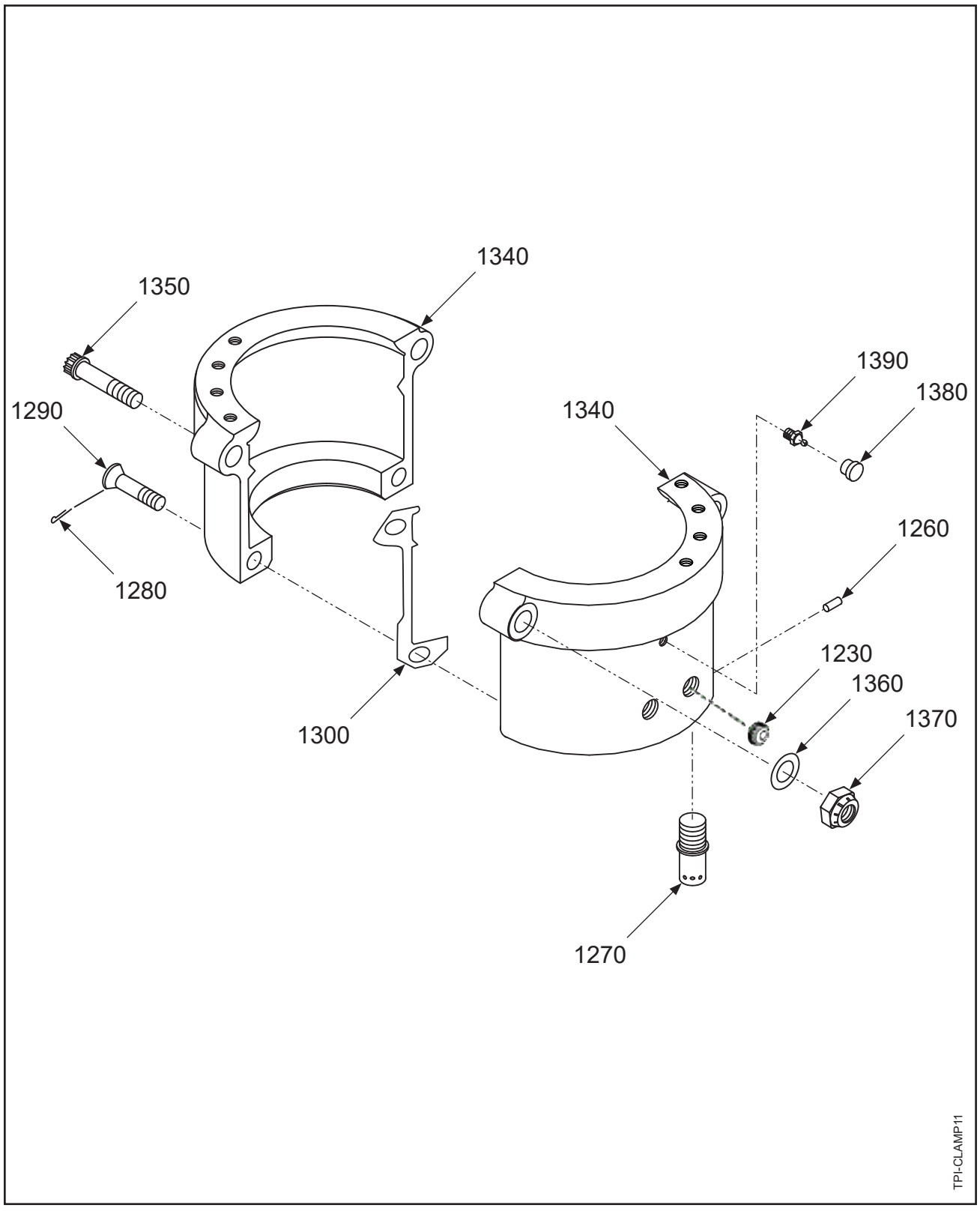
838-58: Clamp Assembly
Figure 10A-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-6		**838-58 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60º HEAD		2	Y	
1300	A-47-1	• CLAMP GASKET		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		4	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-58	• PCP: CLAMP UNIT		1		PCP
1210	B-1480	• • LINK PIN UNIT		1		
1220	A-65	• • DOWEL PIN, 1/4, REPLACED BY ITEM 1220A		OBS	Y	
1220A	101375	• • PLUG, PULL, REPLACES ITEM 1220, POST HC-SB-61-285		1	Y	
1250	A-2036-22	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-22	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• • SPRING PIN, 3/32", CRES		2	Y	
1340	C-3-1E	• • PCP: BLADE CLAMP		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-58: Clamp Assembly



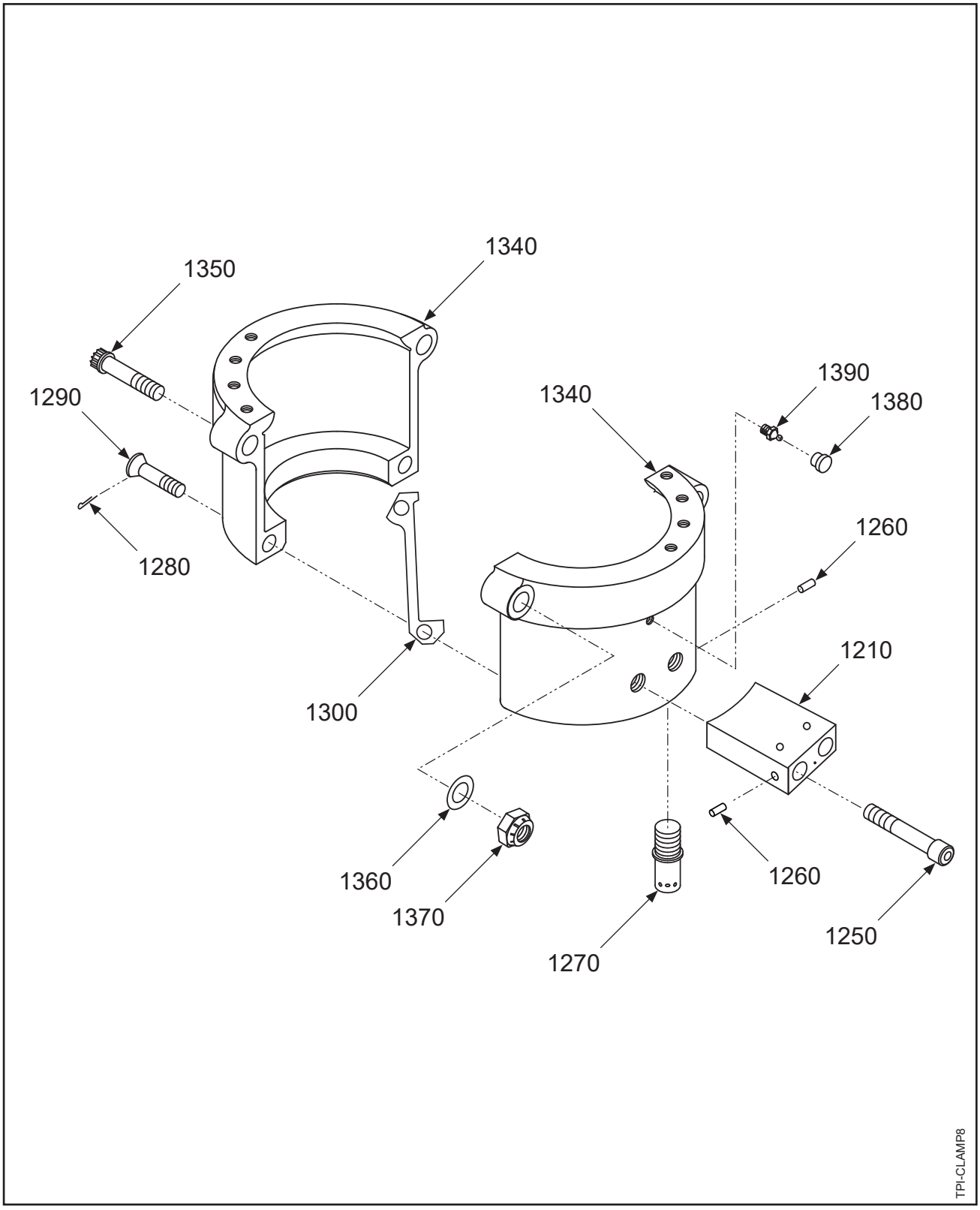
838-106: Clamp Assembly
Figure 10A-7

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-7		**838-106 CLAMP ASSEMBLY**				
1230	A-2309	• SCREW, SET, 7/16-20		2		
1230A	B-6723-12C	• SOCKET SET SCREW, ALTERNATE FOR ITEM 1230		2	Y	
1260	A-285	• SPRING PIN, 3/32", CRES		1	Y	
1270	A-304	• LINKSCREW, 1/2-20		1	Y	
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-47-1	• GASKET, CLAMP		2	Y	
1340	C-3-5A	• PCP: BLADE CLAMP		1		PCP
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
1390	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-106: Clamp Assembly



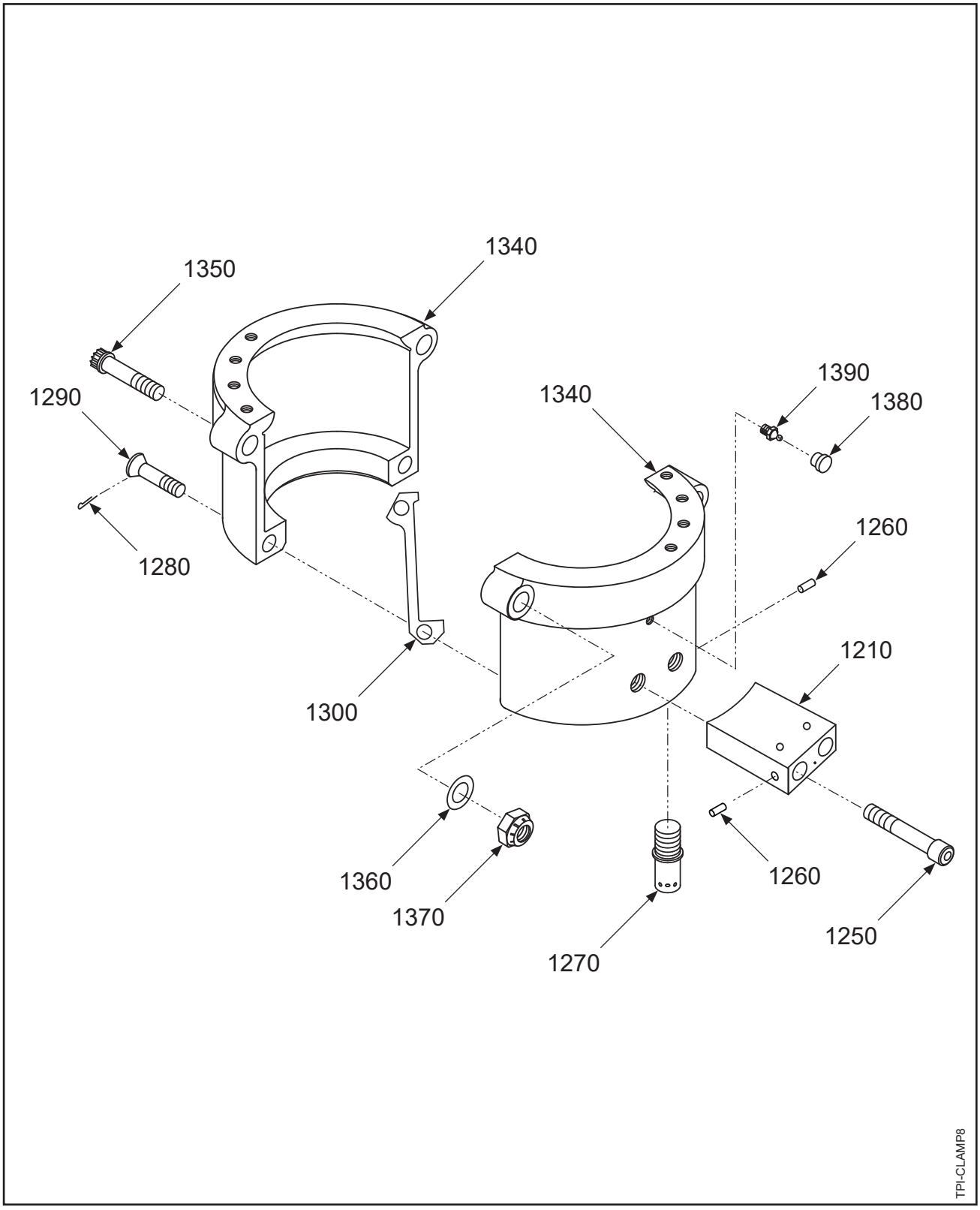
838-1002: Clamp Assembly
Figure 10A-8

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-8		**838-1002 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1002	• PCP: CLAMP UNIT		1		PCP
1210	B-891-1	• • PCP: COUNTERWEIGHT UNIT		1		PCP
1250	A-2036-30	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-30	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• • SPRING PIN, 3/32", CRES		3	Y	
1270	A-295	• • LINKSCREW, 1/2-20		1	Y	
1340	D-6831-1A	• • PCP: CLAMP, BLADE, "MV" SHANK		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1002: Clamp Assembly



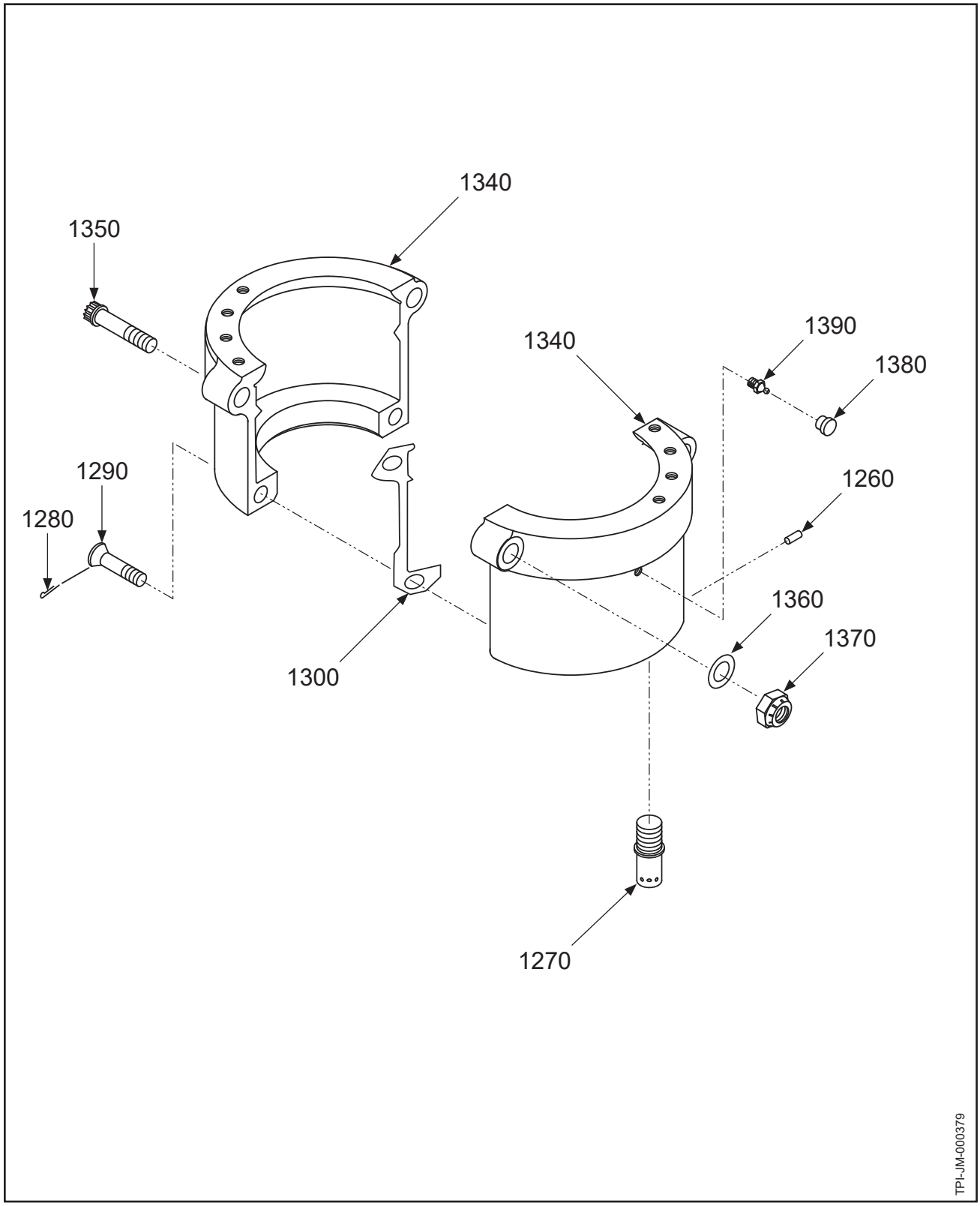
838-1020: Clamp Assembly
Figure 10A-9

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-9		**838-1020 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1020	• PCP: CLAMP UNIT		1		PCP
1210	B-271-2	• • PCP: COUNTERWEIGHT		1		PCP
1250	A-2036-30	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-30	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• • SPRING PIN, 3/32", CRES		3	Y	
1270	A-295	• • LINKSCREW, 1/2-20		1	Y	
1340	D-6831-1A	• • PCP: BLADE CLAMP		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1020: Clamp Assembly



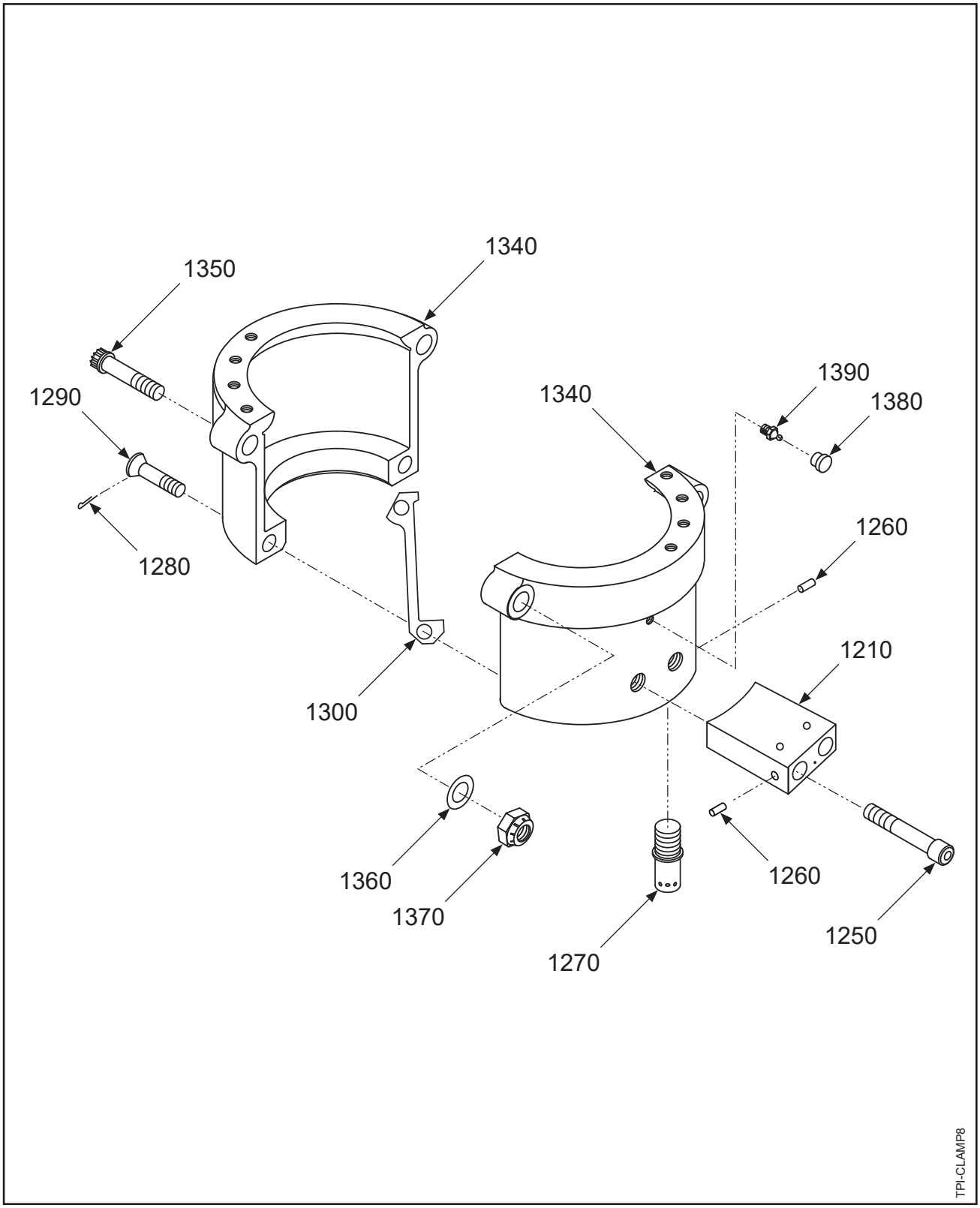
838-1024: Clamp Assembly
Figure 10A-10

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-10		**838-1024 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1024	• PCP: CLAMP UNIT		1		PCP
1260	A-285	• • SPRING PIN, 3/32", CRES		1	Y	
1270	A-295	• • LINKSCREW, 1/2-20		1	Y	
1340	D-6831-1B	• • PCP: BLADE CLAMP		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1024: Clamp Assembly



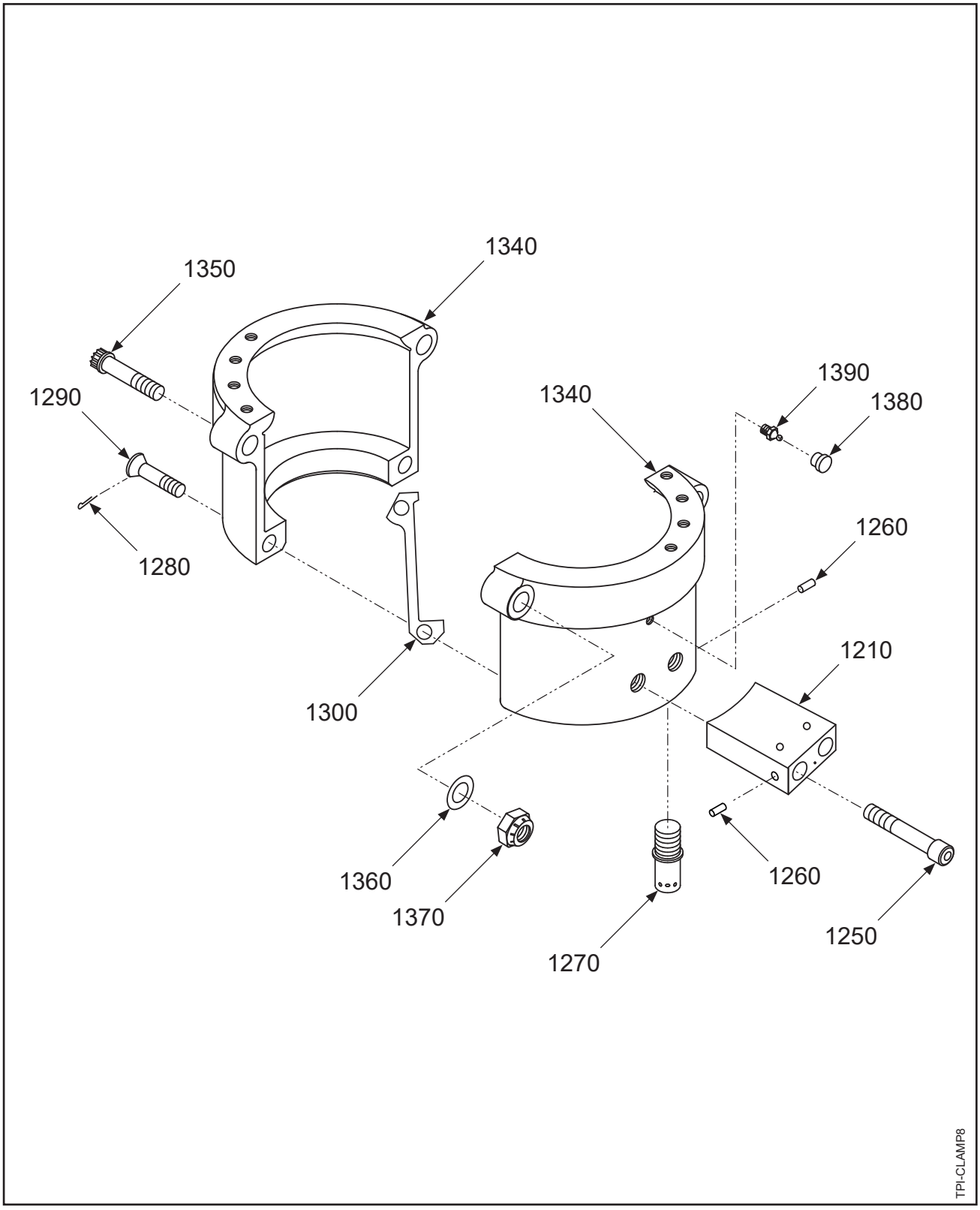
838-1025: Clamp Assembly
Figure 10A-11

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-11		**838-1025 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1025	• PCP: CLAMP UNIT		1		PCP
1210	833-24	• • PCP: COUNTERWEIGHT UNIT		1		PCP
1250	A-2036-32	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-32	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• • SPRING PIN, 3/32", CRES		3	Y	
1270	A-295	• • LINKSCREW, 1/2-20		1	Y	
1340	D-6831-1A	• • PCP: CLAMP, BLADE, "MV" SHANK		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1025: Clamp Assembly



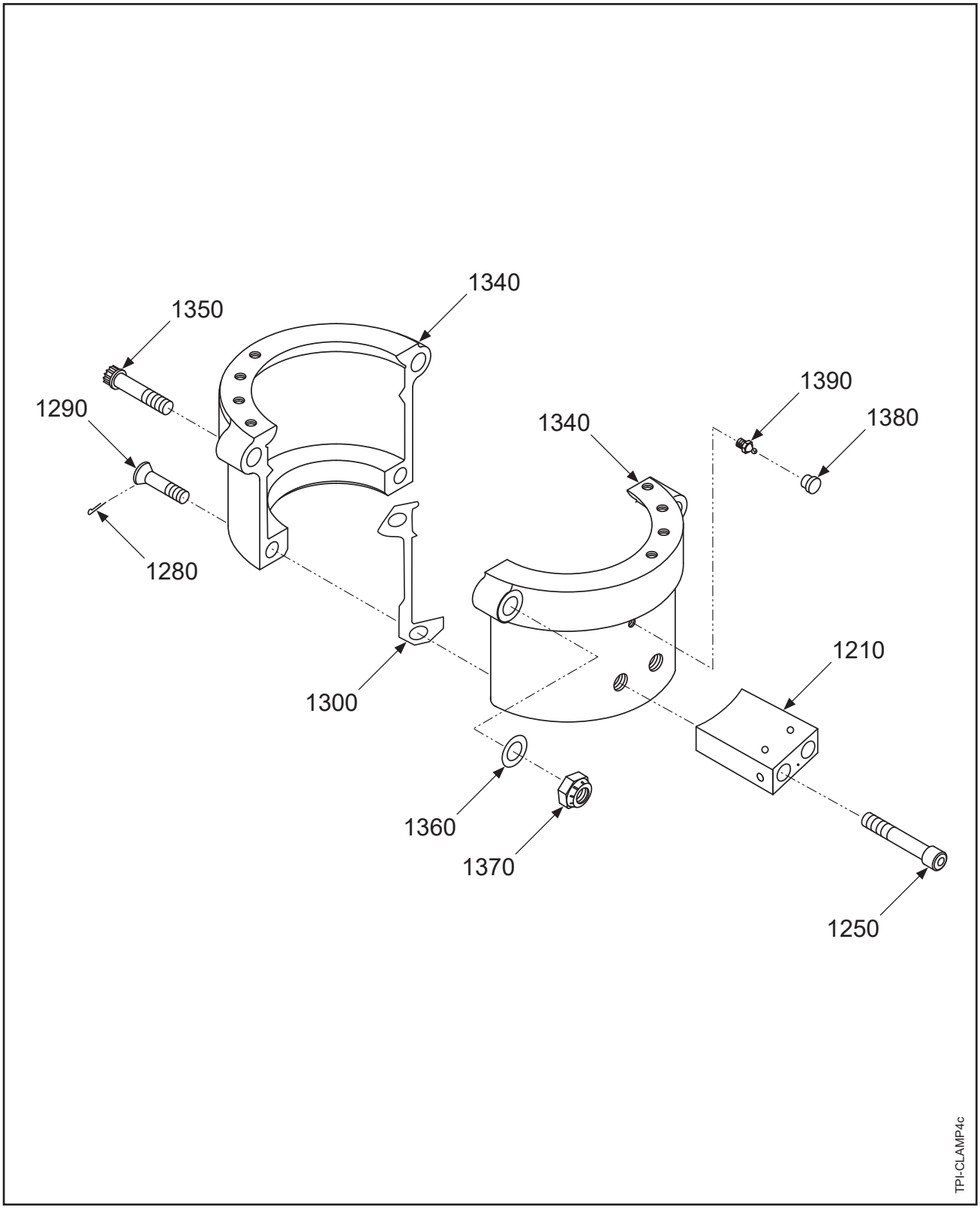
838-1025R: Clamp Assembly
Figure 10A-12

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-12		**838-1025R CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1025R	• PCP: CLAMP UNIT		1		PCP
1210	833-24R	• • PCP: COUNTERWEIGHT UNIT		1		PCP
1250	A-2036-32	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-32	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1260	A-285	• • SPRING PIN, 3/32", CRES		3	Y	
1270	A-295	• • LINKSCREW, 1/2-20		1	Y	
1340	D-6831-1A	• • PCP: CLAMP, BLADE, "MV" SHANK		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1025R: Clamp Assembly



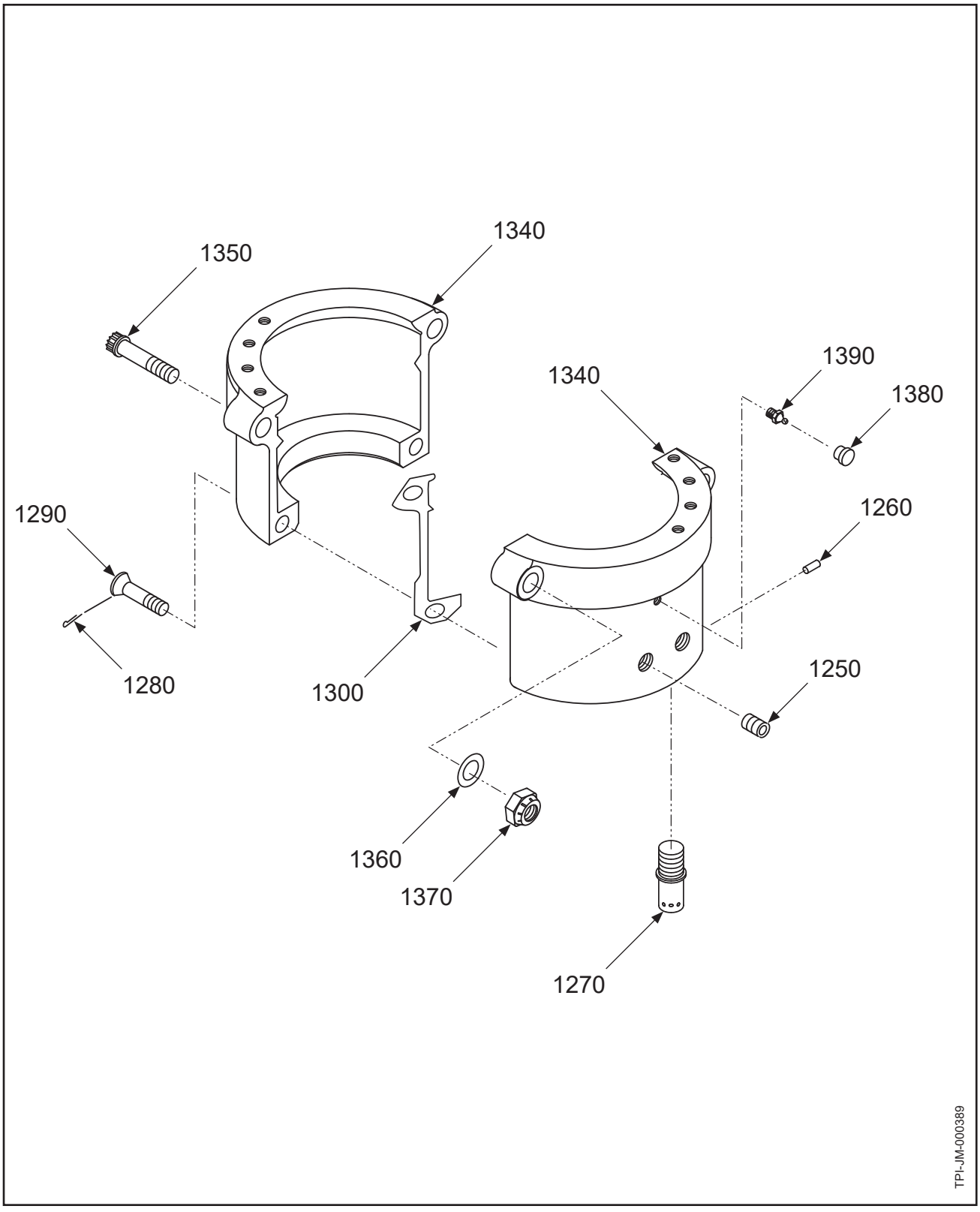
838-1058: Clamp Assembly
Figure 10A-13

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-13		**838-1058 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60º HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1058	• PCP: CLAMP UNIT		1		PCP
1210	B-1480	• • LINK PIN UNIT		1		
1250	A-2036-22	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 1250A		2	Y	
1250A	107995-22	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 1250		2	Y	
1340	D-6831-1EA	• • PCP: CLAMP, BLADE, "MV" SHANK		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1058: Clamp Assembly



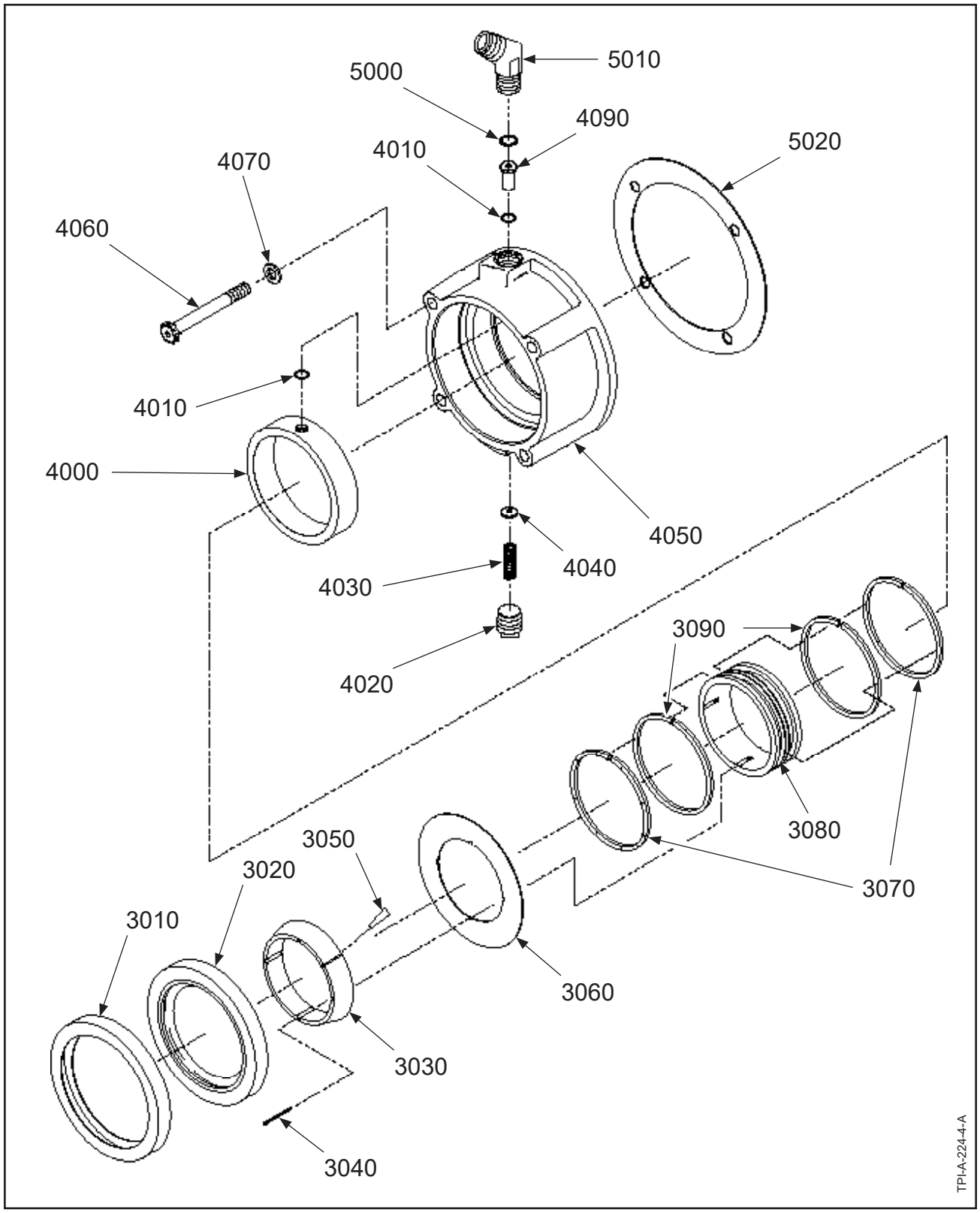
838-1106: Clamp Assembly
Figure 10A-14

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-14		**838-1106 CLAMP ASSEMBLY**				
1280	B-3838-3-2	• COTTER PIN		2	Y	
1290	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
1300	A-6871-1	• GASKET, CLAMP		2	Y	
1350	A-2017	• BOLT, 3/8-24, 12 POINT		2	Y	
1360	A-2031	• WASHER, 3/8"		2	Y	
1370	A-2043-1	• NUT, 3/8-24, HEX, SELF-LOCKING		2	Y	
1380	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
-1500	D-7838-1106	• PCP: CLAMP UNIT		1		PCP
1250	A-2309	• • SCREW, SET, 7/16-20 (USE WITH THREADLOCKER CM116)		2		
1260	A-285	• • SPRING PIN, 3/32", CRES		1	Y	
1270	A-304	• • LINKSCREW, 1/2-20		1	Y	
1340	D-6831-5A	• • PCP: CLAMP, BLADE, "MV" SHANK		1		PCP
1390	B-6588-1	• • FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-1106: Clamp Assembly



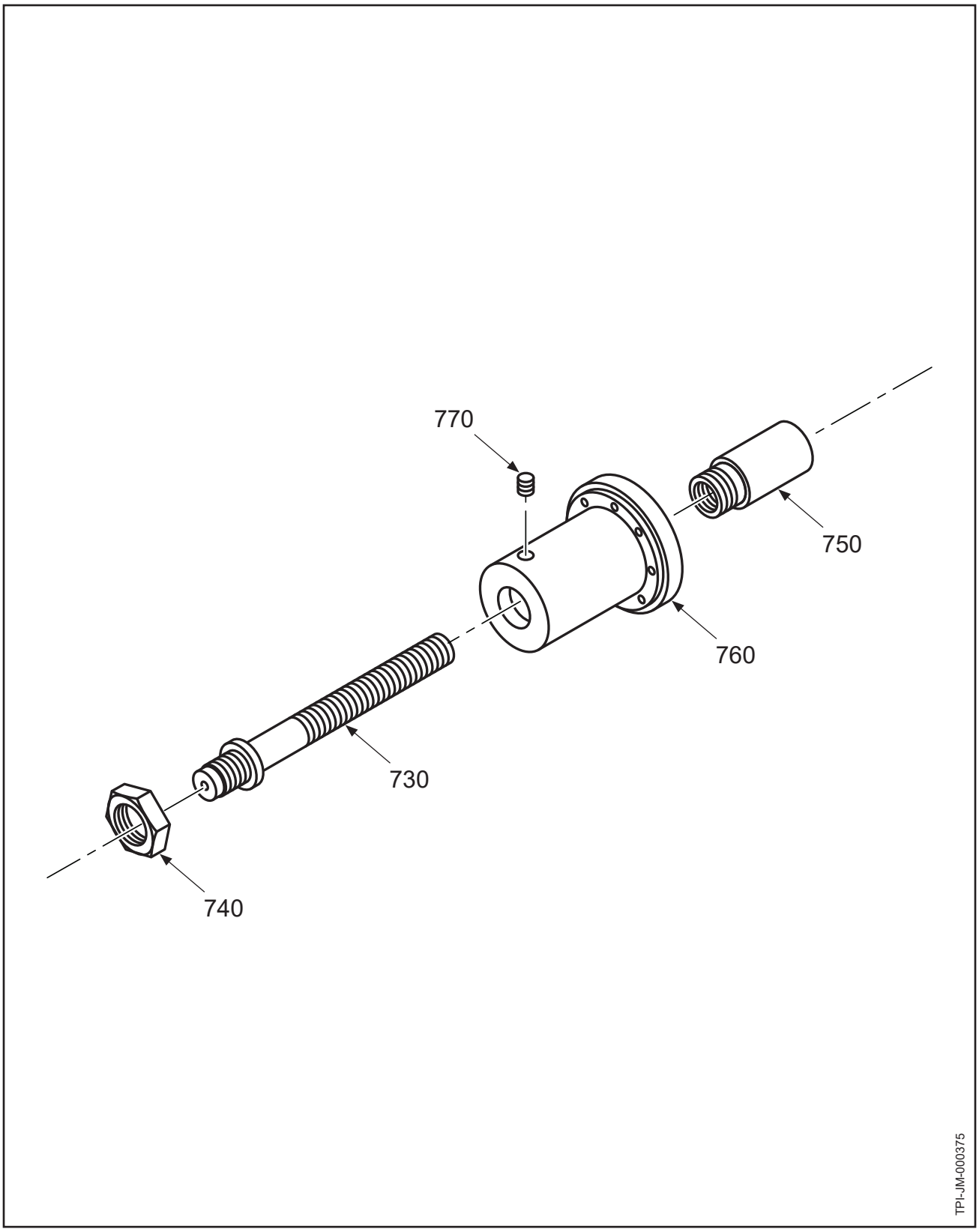
A-224-4: Oil Transfer Unit Assembly
Figure 10A-15

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-15		**A-224-4 OIL TRANSFER UNIT ASSEMBLY**				
3010	B-7288	• RING, BACKUP		1	Y	
3020	B-6674	• SEAL, LIP, RING		1	Y	
3030	A-4254	• CONE, MOUNTING, REAR, 20 SPLINE		1		
3040	B-6580-1000	• SPRING PIN, 1/6", CRES		1		
3050	A-4255	• GASKET, CONE		1	Y	
3060	A-228	• SLINGER, OIL		1		
3070	A-221-1	• RING, SEAL		2		
3080	B-241-1	• RING, OIL TRANSFER		1		
3090	A-221	• RING, SEAL		2		
4000	A-216-3	• COLLAR, OIL TRANSFER		1		
4010	C-3317-011	• O-RING		2	Y	
4020	B-6651-2	• PLUG, PIPE, ALUMINUM		1		
4030	A-884-3	• SPRING, COMPRESSION		1		
4040	A-242	• BUTTON, LOCATOR, OIL TRANSFER		1		
4050	B-214-1	• HOUSING, OIL TRANSFER		1		
4060	B-3805	• BOLT, 5/16-18, HEX HEAD		4		
4070	B-3851-0563	• WASHER		4	Y	
4090	A-217-2	• TUBE, OIL TRANSFER		1	Y	
5000	B-6629-43PP	• RING, RETAINING, INTERNAL		1		
5010	B-6718-6	• ELBOW, ALUMINUM		1		
5020	A-135	• GASKET, HYDRAULIC		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

A-224-4: Oil Transfer Unit Assembly



B-1944: Pitch Adjustment Assembly
Figure 10A-16

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-16		**B-1944 PITCH ADJUSTMENT ASSEMBLY**				
730	B-1942	• ROD, PITCH CHANGE		1		
740	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
750	A-1941	• NUT, SLEEVE		1		
760	B-364	• RETAINER CUP		1		
770	B-6670-A8	• SCREW, SET, 3/8-24		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1944: Pitch Adjustment Assembly

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