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MANUAL REVISION TRANSMITTAL

MANUAL 177 (61-10-77)
-1, -2, -4 Series Steel "B" Hub
Propeller Overhaul Manual

REVISION 4 dated July 2023

Remove Pages:	Insert Pages:
Entire Manual	**Entire Manual**

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

This page may be discarded after proper filing of the revision.

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Manual No. 177
61-10-77
Revision 4
July 2023

-1, -2, -4 SERIES STEEL "B" HUB PROPELLER OVERHAUL MANUAL

Three Blade	Four Blade
HC-B3Z20-1 HA-B3( )30-1B HC-B3( )30-1( ) HC-B3( )F-2( ) HC-B3WN-2L HC-B3( )20-2( ) HC-B3( )30-2B( ) HC-B3( )30-2E( ) HC-B3WF-4 HC-B3( )20-4 HC-B3( )30-4 HC-B3R30-4A,-4B	HC-B4TN-1

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REVISION 4 HIGHLIGHTS

Revision 4, dated July 2023, incorporates the following:

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

Updated the Hartzell Propeller Inc. logo on the cover and revised the header on all pages.

Revised the titles of Hartzell Propeller Inc. Aluminum Blade Maintenance Manual 133C and Hartzell Propeller Inc. Composite Propeller Blade Maintenance Manual 135F to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C and Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F where applicable

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

- FITS AND CLEARANCES
  - Revised the section, "Torque Values"
  - Revised Figure 8-2, "Blade Play"
  - Revised the section, "Blade Tolerances"
  - Removed Table 8-2, "Blade Tolerances"

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REVISION 4 HIGHLIGHTS

1. Introduction

A. General

(1) This is a list of current revisions that have been issued against this manual. Please compare 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 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	Jun/07	New Issue
Revision 1	Mar/20	Major Revision
Revision 2	Aug/21	Minor Revision
Revision 3	Nov/22	Minor Revision
Revision 4	Jul/23	Major Revision

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RECORD OF REVISIONS

This is a record of revisions inserted into this manual.
Revision 4 includes all prior revisions.

Revision Number	Issue Date	Date Inserted	Inserted By
4	Jul/23	Jul/23	HPI

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RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 1 includes all prior temporary revisions, up to and including TR-001.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

RECORD OF TEMPORARY REVISIONS

Update this page to show all Temporary Revisions inserted into this manual.
Revision 1 includes all prior temporary revisions, up to and including TR-001.

Temporary Revision No.	Section/ Page	Issue Date	Date Inserted	Inserted By	Date Removed	Removed By

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:	
SB 137A	Jun/07
HC-SB-61-069	Jun/07
HC-SB-61-374	Mar/20

Service Document Number	Incorporation Rev./Date
Service Instructions:	
SI 182B	Jun/07
SI 169	Jun/07

SERVICE DOCUMENT LIST

Service Document Number	Incorporation Rev./Date
Service Letters:	
SL 39	Jun/07
SL-93	Jun/07
SL 159	Jun/07
HC-SL-61-167	Jun/07
HC-SL-61-177	Jun/07
HC-SL-61-184	Jun/07
HC-SL-61-188	Jun/07
HC-SL-61-211	Jun/07
HC-SL-61-217	Jun/07
HC-SL-61-229	Jun/07
HC-SL-61-238	Jun/07
HC-SL-61-291	Mar/20
HC-SL-61-351	Mar/20
HC-SL-61-367	Rev. 2 Aug/21

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 167 (61-00-67).

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LIST OF EFFECTIVE PAGES

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Record of Temporary Revisions	1 and 2	Rev. 4	Jul/23
Service Document List	1 and 2	Rev. 4	Jul/23
Airworthiness Limitations	1 and 2	Rev. 4	Jul/23
List of Effective Pages	1 and 2	Rev. 4	Jul/23
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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. <u>Reference Publications</u>

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 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 167 (61-00-67)	Yes	Propeller Owner's Manual and Logbook for "B" Steel Hub Reciprocating Propellers
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. <u>Personnel Requirements</u> (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. <u>Special Tooling and Consumable Materials</u> (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 paint or 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 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 possible 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 corrodes, 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
Ticking	A series of parallel marks or scratches running circumferentially around the diameter of the blade

Term	Definition
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 fibers 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 epositioned 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
N	Newtons

Abbreviation	Term
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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1. General (Rev. 2)

   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, Counterweighted, Non-feathering Propeller Models HC-B3( )20-1, HC-B3( )30-1( ), and HC-B4( )N-1( ).

(1) Constant speed, counterweighted, non-feathering propellers are usually installed on single engine aircraft.

(2) Propeller blade angle change is operated by a hydraulic piston/cylinder combination installed on the forward end of the propeller hub. The linear motion of the hydraulic piston is transmitted to each blade through either a link arm system, or a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is held on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle with the blade under centrifugal load.

(3) Propeller forces consisting of mechanical spring action (HC-B3[ ]30-1[ ] models only), blade counterweight twisting moment and centrifugal and aerodynamic twisting moment of the blades in different combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher blade angle. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade angle opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and maintain a constant engine RPM.

(4) A counterweight is a weight that is attached to each blade clamp. Centrifugal force acts against the counterweight to cause the blade to rotate to a higher blade pitch. Governor-supplied oil is necessary to decrease blade pitch in counterweighted propellers. If the oil supply is lost, the counterweighted propeller will go to high pitch, or low RPM.

(5) A governor is an engine speed-sensing device that keeps a constant engine/propeller RPM by changing blade angle and varying load on the engine.

(6) The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses engine oil and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

(7) Oil pressure from the engine-driven governor is supplied to the propeller installed hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder reduces blade angle to increase engine RPM. Decreasing the oil volume increases blade angle to decrease engine RPM. By changing the blade angle, the governor keeps engine RPM constant (within limits), independent of the throttle setting.

(8) On some models that have a spring (HC-B3[ ]30-1E[ ]), it is undesirable to permit the propeller to go to high pitch when the engine is stopped after landing To prevent the propeller from going to high pitch during normal engine shut down, the propeller has spring energized latches (start locks). If the propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latch weights to compress the springs. When the propeller drops below 800 RPM, the springs overcome the centrifugal force acting on the latch weights and move the latches to engage the start locks, preventing blade angle movement to a higher blade angle.

B. Constant Speed, Non-counterweighted, Non-feathering Propeller Models HC-B3( )20-4( ),HC-B3( )30-4( ), and HC-B3( )F-4( ).

(1) Constant speed, non-counterweighted, non-feathering propellers are usually installed on single engine aircraft.

(2) Propeller blade angle change is operated by a hydraulic piston/cylinder combination installed on the forward end of the propeller hub. The linear motion of the hydraulic piston is transmitted to each blade through either a link arm system, or a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is held on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle with the blade under centrifugal load.

(3) Propeller forces consisting of centrifugal and aerodynamic twisting moment of the blades in different combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a lower blade angle. A variable hydraulic force (oil under pressure from the engine driven governor) toward a higher blade angle opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and keep a constant engine RPM.

(4) A spring may be installed in some models. If a spring is installed, its force helps rotation of blade pitch to a higher blade angle. Propeller models HC-B3R30-4A and -4B use spring force to lower blade angle. All other -4 type propeller models covered in this manual use spring force to increase blade angle.

(5) A non-counterweighted propeller needs governor supplied oil to increase blade angle. If the oil supply is lost, the non-counterweighted propeller will go to low pitch, or high RPM.

(6) A governor is an engine speed-sensing device that keeps a constant engine/propeller RPM by changing blade angle and varying load on the engine.

(7) The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses engine oil and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or drain of oil from the propeller, resulting in a change of blade pitch to maintain constant engine speed.

(8) Oil pressure from the engine-driven governor is supplied to the propeller-installed hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder increases blade angle to decrease engine RPM. Decreasing the oil volume decreases blade angle to increase engine RPM. By changing the blade angle, the governor keeps constant engine RPM (within limits), independent of the throttle setting.

C. Constant Speed and Feathering Propeller Models HC-B3( )20-2( ), HC-B3( )30-2( ), HC-B3( )F-2, and HC-B3( )N-2( ).

(1) A constant speed and feathering propeller is usually installed on a twin engine aircraft. It is counterweighted, and is controlled by an engine speed-sensing device (governor) to keep a constant engine/propeller RPM by changing blade angle and varying load on the engine.

(2) Propeller blade angle change is operated by a hydraulic piston/cylinder combination installed on the forward end of the propeller hub. The linear motion of the hydraulic piston is transmitted to each blade through either a link arm system, or a sliding rod and fork system, connected to a blade clamp that rotates with the blade. Each blade is held on the propeller hub by a blade clamp and thrust bearing. The thrust bearing permits the blade to change angle.

(3) Propeller forces consisting of mechanical spring action, blade counterweight twisting moment, and centrifugal and aerodynamic twisting moment of the blades in different combinations are constantly present while the propeller is operating. The summation of these forces causes the propeller to rotate to a higher pitch. A variable hydraulic force (oil under pressure from the engine driven governor) toward a lower blade pitch opposes the summation of these forces. Oil is metered by the governor to oppose these constant forces and keep a constant engine RPM.

(4) The counterweight is a weight that is attached to each blade clamp. Centrifugal force acts against the counterweight to cause the blade to rotate to a higher blade pitch. Governor-supplied oil is necessary to decrease blade pitch in counterweighted propellers. If the oil supply is lost, the counterweighted propeller will go to high pitch, or low RPM.

(5) A governor is an engine speed-sensing device that keeps a constant engine/propeller RPM by changing blade angle and varying load on the engine.

(6) The governor uses an internal pump that is driven by an accessory drive from the engine. This pump uses engine oil and increases the engine oil pressure for supply to the propeller. Engine speed sensing hardware within the governor controls the supply of oil to, or the drain of oil from the propeller, resulting in a change of blade pitch to keep constant engine speed.

(7) Oil pressure from the engine-driven governor is supplied to the propeller installed hydraulic cylinder through the engine shaft and propeller hub. Increasing the oil volume within the hydraulic cylinder reduces blade angle to increase engine RPM. Decreasing the oil volume will increase blade angle to decrease engine RPM. By changing the blade angle, the governor keeps constant engine RPM (within limits), independent of the throttle setting.

(8) If oil supply is lost during flight, the propeller will feather. Feathering occurs because the spring and blade clamp installed counterweight forces are no longer opposed by hydraulic oil pressure and are free to increase blade pitch to the feathering (high pitch) stop.

(9) Normal in-flight feathering of these propellers is accomplished when the pilot retards the propeller pitch control past the feather detent. This permits oil to drain from the propeller and return to the engine sump. Engine shutdown is normally accomplished during the feathering process.

(10) Normal in-flight unfeathering is accomplished when the pilot positions the propeller pitch control into normal flight (governing) range and restarts the engine. As engine speed increases, oil is supplied by the governor to the propeller, and the blade angle decreases.

(11) It is undesirable to feather the propeller when the engine is stopped after landing. To prevent feathering during normal engine shut down, the propeller has spring energized latches (start locks). If the propeller rotation is approximately 800 RPM or above, the latches are disengaged by centrifugal force acting on the latch weights to compress the springs. When the propeller drops below 800 RPM, the springs overcome the centrifugal force acting on the latch weights and move the latches to engage the start locks, preventing blade angle movement to feather.

D. Ground Adjustable Pitch Propeller Models HA-B3( )30-1( ).

(1) Ground adjustable pitch propellers are usually installed on single engine aircraft equipped with an engine that does not support governing capability nor is able to supply oil through a hollow shaft to the propeller.

(2) Ground adjustable pitch propellers may be set to a desired blade pitch by manually adjusting the propeller when the aircraft is static on the ground. This permits an optimal blade pitch to be selected for different flight conditions, such as climb or cruise. A propeller adjusted for climb will not fly very fast (unless engine RPM's are excessively high). A propeller adjusted for cruise will need more runway for takeoff and will climb more slowly (engine RPM will be less than optimum).

(3) Ground adjustable propellers do not need a governor or any oil supply, since they do not change blade pitch in flight.

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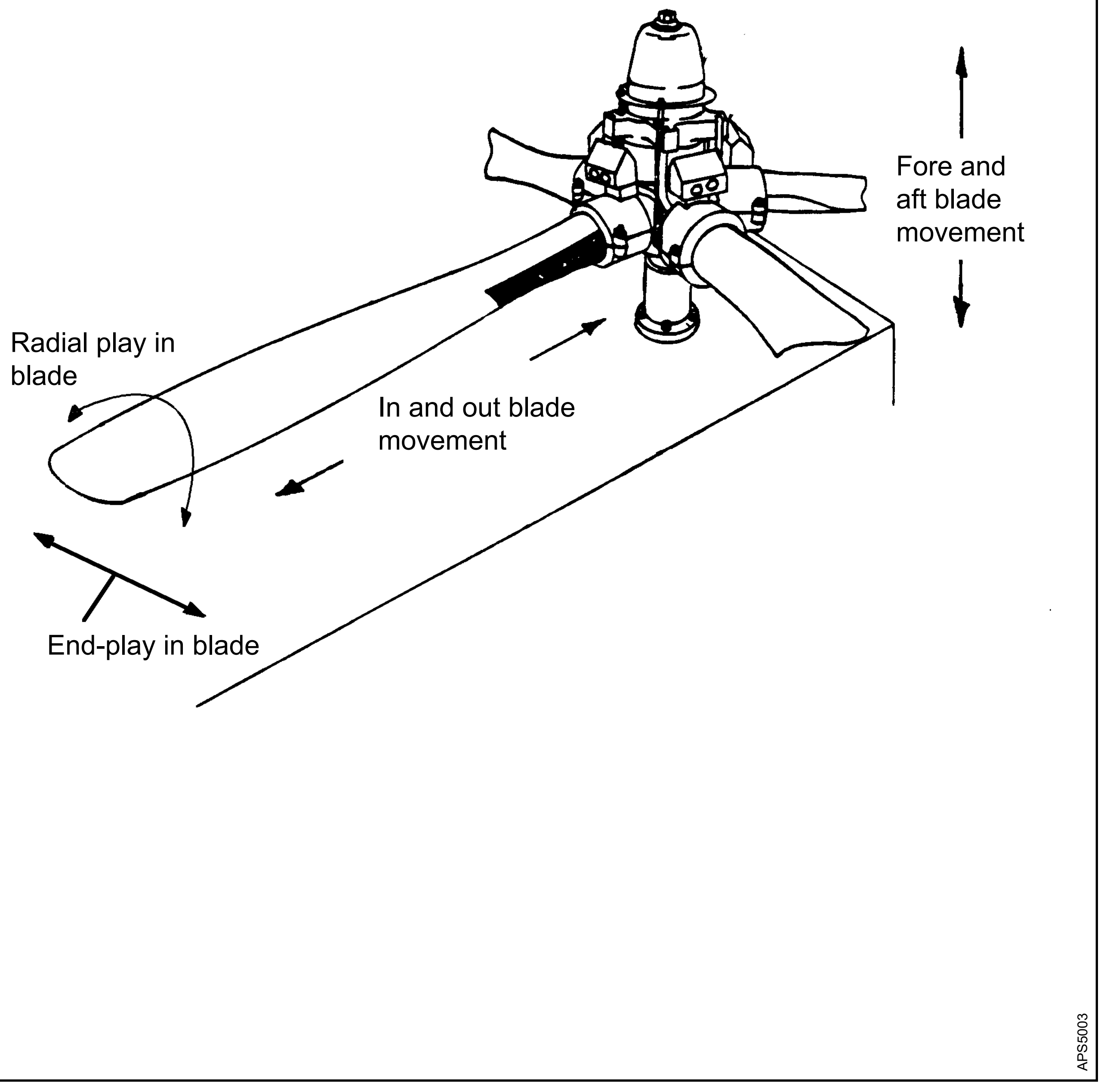
1. Troubleshooting Guide

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 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.

	Symptom	Probable Cause	Remedy
A.	Propeller Actuates Slowly or Fails to Actuate	Air is trapped in the propeller piston or in the engine shaft.	Before each flight, cycle the propeller three times to purge trapped air from the propeller.
		Lack of blade bearing lubrication.	Add approved grease to blade clamp lubrication fittings in accordance with the Propeller Lubrication chapter of Hartzell 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 from the piston and rotating each blade individually before disassembling the propeller.
		Excessive friction in the piston because of the phenolic bushing scraping against wall of the cylinder.	Inspect the inside diameter of the phenolic bushing. Refer to the Check chapter of this manual.
			Inspect the roundness of the bushing. Refer to the Check chapter of this manual. If necessary, follow the replacement procedure in the Special Adhesive and Bonding Procedures chapter of Hartzell Standard Practices Manual 202A (61-01-02).
			Inspect the outside diameter of the cylinder. Refer to the Check chapter of this manual. Replace the cylinder if necessary.
			For cylinder repair and rechroming procedures, see the Hard Chromium Replating chapter of Hartzell Standard Practices Manual 202A (61-01-02).
		Bearing balls in the split bearing are unusually rough, corroded, or chipped.	Replace the split bearing assembly in accordance with the Assembly chapter of this manual.
		The wire retention ring is wedged under the inboard race of the blade bearing.	Replace the wire retention ring in accordance with the Assembly chapter of this manual.
		The pilot tube 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 make sure that the pilot tube extends the correct distance from the hub arm in accordance with Steel Hub Overhaul chapter of Hartzell Standard Practices 202A (61-01-02).

	Symptom	Probable Cause	Remedy
A.	Propeller Actuates Slowly or Fails to Actuate -continued	The feathering spring is weak or broken.	Replace the feathering spring in accordance with the Assembly chapter of this manual.
		Oil passages are blocked.	Inspect the hydraulic system to make sure that the oil passages are clear.
B.	Failure to Feather	Excessive friction between moving parts.	Refer to Symptom A, "Propeller Actuates Slowly or Fails to Actuate".
		The feathering spring is weak or broken.	Replace the feathering spring in accordance with the Assembly chapter of this manual.
C.	Surging RPM or Torque	Air is trapped in the propeller piston or in the engine shaft.	The engine should have provision 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 between moving parts.	Refer to Symptom A, "Propeller Actuates Slowly or Fails to Actuate".
D.	Oil Leakage	Defective propeller mounting O-ring.	Replace the O-ring in accordance with the Assembly chapter of this manual.
		Felt seal is displaced.	Replace the felt seal in accordance with the Assembly chapter of this manual.
		Defective O-ring seal between the hub and cylinder.	Replace the O-ring in accordance with the Assembly chapter of this manual.
			Replace the cylinder if the surface is scratched or gouged in the area where the O-ring slides.
		Faulty O-ring on pitch change rod.	Replace the O-ring in accordance with the Assembly chapter of this manual.
		Defective O-ring seal between the hub and cylinder.	Replace the O-ring in accordance with the Assembly chapter of this manual.

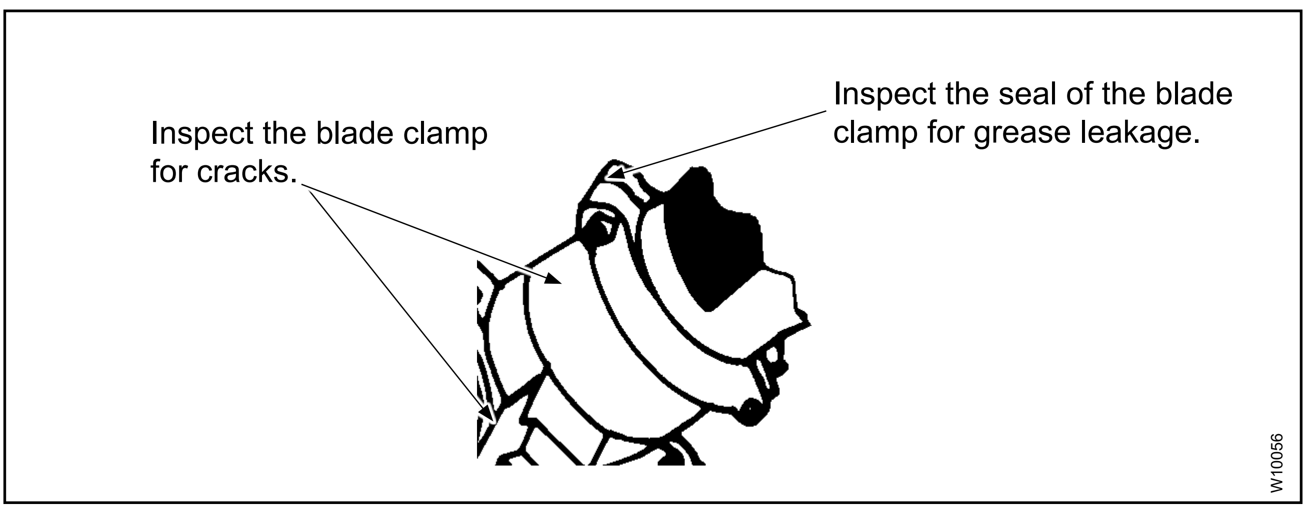


Checking Blade Movement
Figure 1-1

	Symptom	Probable Cause	Remedy
E.	Grease Leakage	Damaged lubrication fitting cap.	Replace the lubrication fitting cap.
	NOTE: The clamp/split-bearing is the only source for grease leakage.	Loose lubrication fitting.	Tighten the fitting in accordance with the Assembly chapter of this manual.
		Defective lubrication fitting.	Replace defective lubrication fitting.
		Grease leaks past blade clamp seal gaskets.	Loosen the blade clamp bolts and replace the gaskets, sealant, and gasket compound.
		Grease leaks from between the blade and clamp.	Remove the blade and the clamp. Add approved gasket compound CM46 in radius of blade. Reassemble the blade and clamp in accordance with the Assembly chapter of this manual.
		No silicone sealant CM93 on clamp radius of bearing-to-clamp interface.	Remove the blade and the clamp. Add sealant CM93 in radius of clamp. Reassemble the blade and the clamp in accordance with the Assembly chapter of this manual.
F.	End-Play Movement in Blade. Refer to Figure 1-1.	Buildup of wear or repair tolerances.	Total 0.100 inch (2.54 mm) end-play is permitted. Refer to the Check chapter of this manual.
G.	In-and-Out Movement in Blade. Refer to Figure 1-1.	Buildup of wear or repair tolerances.	Without grease or split-bearings in the blade clamps, maximum permitted in-and-out movement is 0.100 inch (2.54 mm). With grease and split-bearings in the blade clamps, there must be no in-and-out movement in the blades. Refer to the Check chapter of this manual.
H.	Fore-and-Aft Movement in Blade Refer to Figure 1-1.	Buildup of allowable wear or repair tolerances.	A total of 0.100 inch (2.54 mm) fore-and-aft movement is permitted. Refer to the Check chapter of this manual. Refer to Hartzell Aluminum Blade Overhaul Manual 133C (61-13-33).

Symptom	Probable Cause	Remedy
I. Blades not Tracking	Ground strike damage.	Refer to the Special Inspections chapter of Hartzell Standard Practices Manual 202A (61-01-02).
	Hub pilot tube(s) distorted.	Refer to the Steel Hub Overhaul chapter of Hartzell Standard Practices Manual 202A (61-01-02).
	Blade face(s) out of alignment.	Refer to Hartzell Aluminum Blade Overhaul Manual 133C (61-13-33).
J. Radial Play in the Blade	Wear in link arm screw hole.	Check the link arm in accordance with the Check chapter of this manual. Replace the link arm if it is beyond serviceable limits.
		Remove the blade and clamp in accordance with the Disassembly chapter in this manual. Clean the blade and clamp thoroughly. Reinstall the blade and clamp in accordance with the Assembly chapter of this manual. Use caution to avoid excessive sealant.
K. Blade Slippage in the Blade Clamp	There is not enough clamping action.	Increase clamping action as necessary. Refer to the Blade Clamp Overhaul chapter of Hartzell Standard Practices Manual 202A (61-01-02).
L. Excessive Propeller Vibration Refer to Figure 1-2.	Blade slipped in clamp.	Inspect blade-to-blade angles and reset as required.
	Mass imbalance.	Balance the propeller in accordance with the Static and Dynamic Balance chapter of Hartzell Standard Practices Manual 202A (61-01-02).
	The link arm hole is worn.	Inspect the link arm in accordance to the Check chapter of this manual and replace as necessary.
	Bent, cracked, or damaged blade.	Refer to Hartzell Manual 133C (61-13-33) for aluminum blade overhaul procedures and the Special inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02).

	Symptom	Probable Cause	Remedy
L.	Excessive Propeller Vibration -continued.	Blade aerodynamic imbalance because of 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 clamp to minimize blade angle variance, and recheck the blade-to-blade angles.
		Blade slipped in the clamp.	Inspect blade-to-blade angles. Refer to the aircraft type certificate data sheet, or Hartzell Application Guide Manual 159 (61-02-59) for required blade angles.
		Cracked or damaged hub.	Replace the hub.



Abnormal Vibration
Figure 1-2

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 Inc. 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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1. Important Information (Rev. 3)

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.

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.

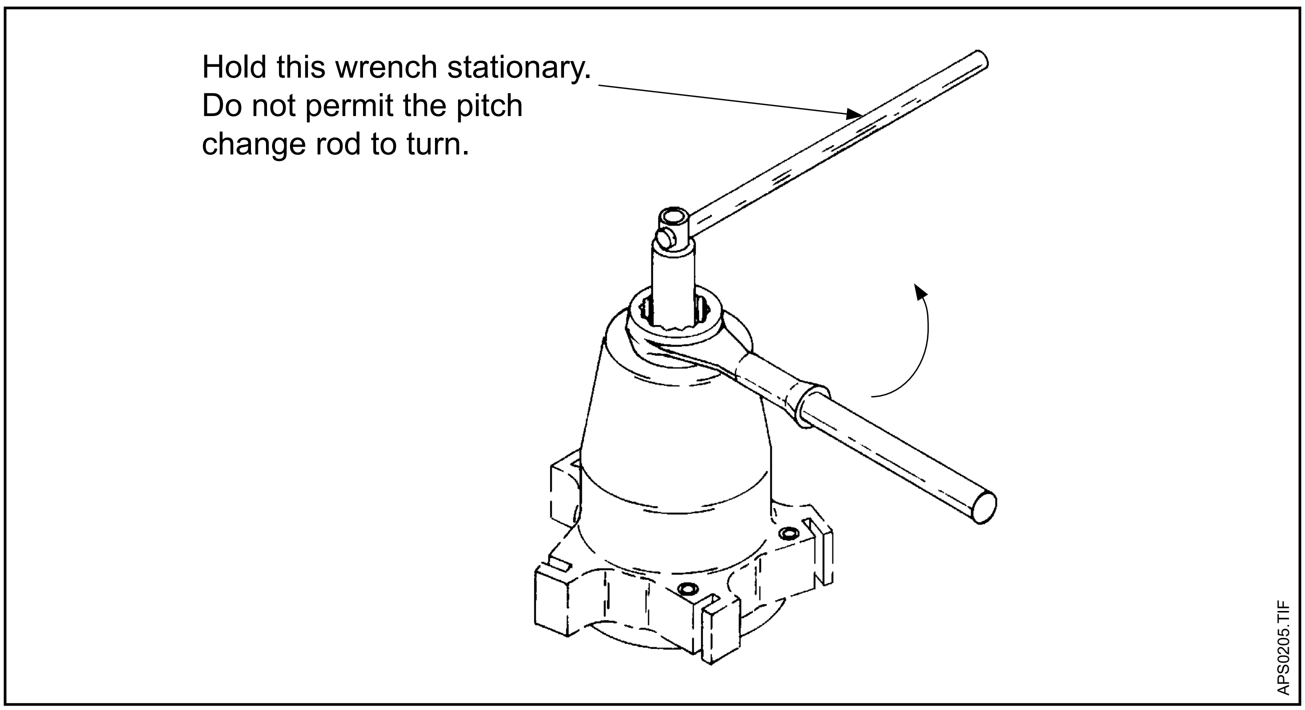
(2) If the propeller is equipped with an ice protection system not supplied by Hartzell Propeller Inc., refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA) for technical information about the applicable ice protection system.

2. Disassembly of Flanged-Hub Propeller Model HC-B4TN-1

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.



Removing Self Locking Hex Nut
Figure 3-1

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

A. Piston Removal

(1) Install the propeller assembly on the rotatable fixture of a propeller assembly table TE129, or equivalent.

CAUTION: DO NOT PERMIT THE PITCH CHANGE ROD (1410) TO TURN WHEN REMOVING THE NUT (10).

(2) Using a 1-13/16 inch wrench and a 1 inch socket wrench, remove and discard the self-locking hex nut (10) from the end of the pitch change rod (1410). Refer to Figure 3-1.

(3) Turn the blades by hand from high pitch to the lowest pitch possible.

(4) Remove and discard the safety wire from the link pin safety screws (110).

(5) Remove and discard the safety screws from each link pin unit (120).

(6) Remove and discard each link pin unit (120).

(7) Disengage each link arm (130) from the piston slot.

(8) Remove the piston unit (30) from the cylinder (300).

(9) Remove and discard the piston O-ring (930).

(10) Remove and discard the pitch change rod O-ring (240).

(11) Remove and discard the felt dust seal (270) from the outside diameter groove in the piston (30).

B. Feathering Spring Disassembly

WARNING: USE CAUTION WHEN REMOVING THE SPRING ASSEMBLY FROM THE PROPELLER. THE SPRING ASSEMBLY IS PRELOADED TO APPROXIMATELY 400 POUNDS (174 KG) FORCE.

(1) Make a record of the distance between the feathering stop screws (280) and the spring retainer cup (1440).

(2) Remove and discard the safety wire from the spring retainer cup (1440).

(3) Remove and discard the safety wire from the feathering stop screws (280).

(4) Remove and discard the feathering stop screws (280).

(5) Using spanner wrench TE148 or equivalent, remove the spring retainer cup (1440).

CAUTION: DO NOT FORCE THE FEATHERING COMPRESSION SPRING (1540) TO RELEASE THE SPLIT KEEPER (1590) IN THE CYLINDER. FORCING THE SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY.

(6) Remove the spring assembly (1400) from the cylinder (300).

(7) Using the bench-top fixture TE59 or equivalent, compress the feathering compression spring (1540) for disassembly. Refer to Figure 3-2.

(8) Remove and discard the split keeper (1590).

(9) Permit the spring assembly to extend to its unloaded length, and remove it from bench-top fixture TE159.

(10) Disassemble the remaining spring assembly component parts.

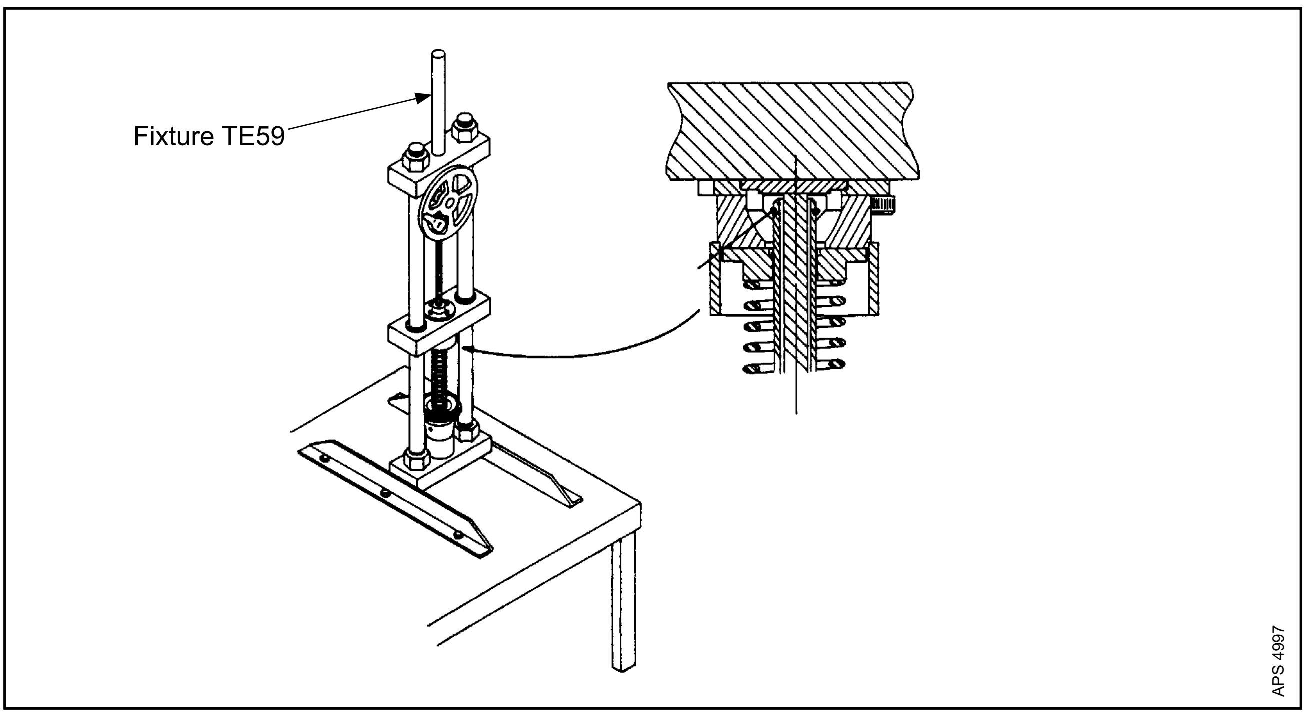
C. Cylinder Removal

CAUTION: UNSCREW THE CYLINDER (300) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(1) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(2) Remove the cylinder (300).

(3) Remove and discard the cylinder O-ring (260).



Placing Spring Assembly in Special Fixture TE59
Figure 3-2

D. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Use a round bottom stamp or electric pencil to identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard balance weight safety wire and fillister head screws (640).

(3) Remove all balance weights (650).

(4) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

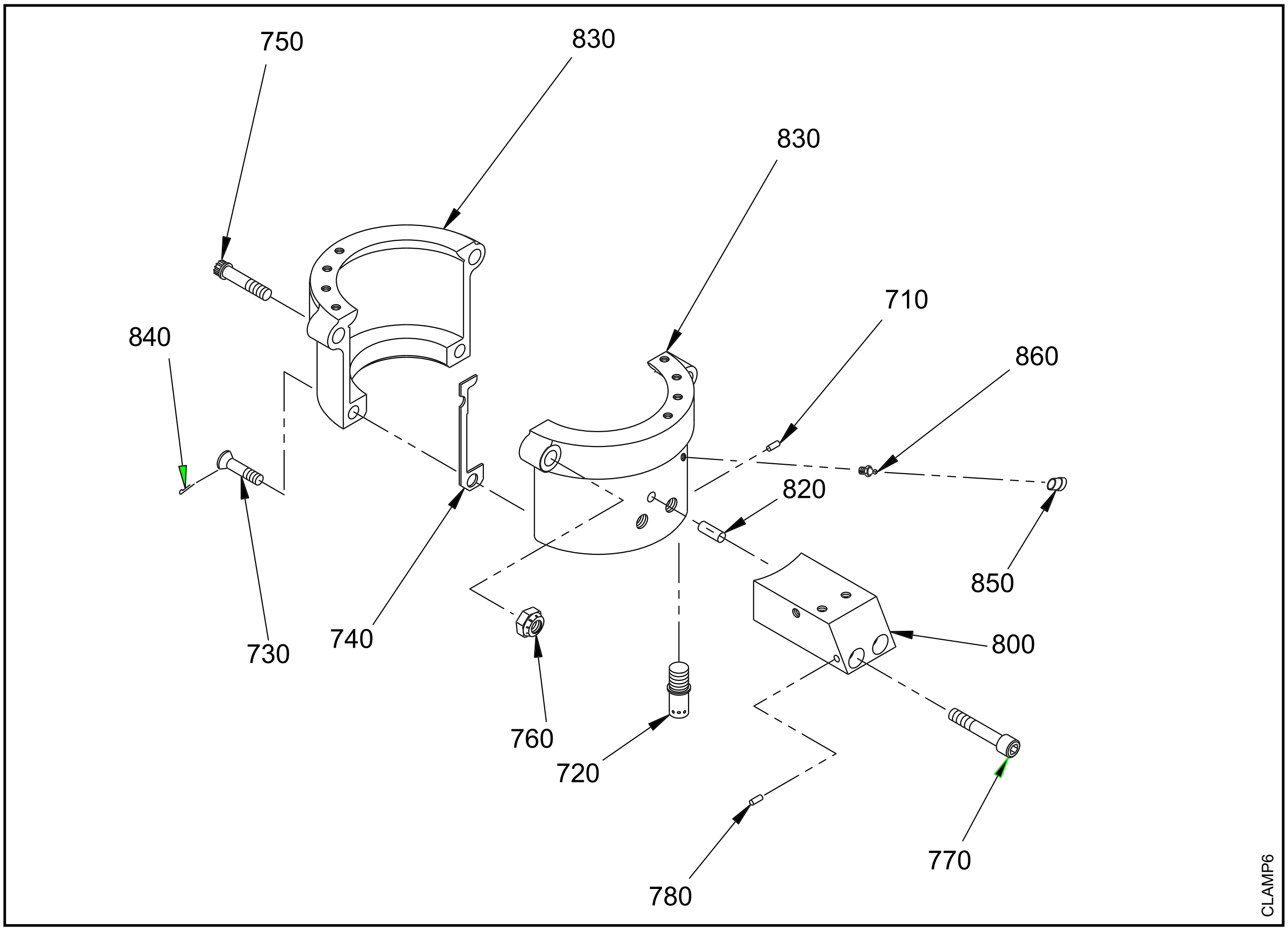
(5) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(6) Remove all blade clamp-halves (830) from the hub arms.

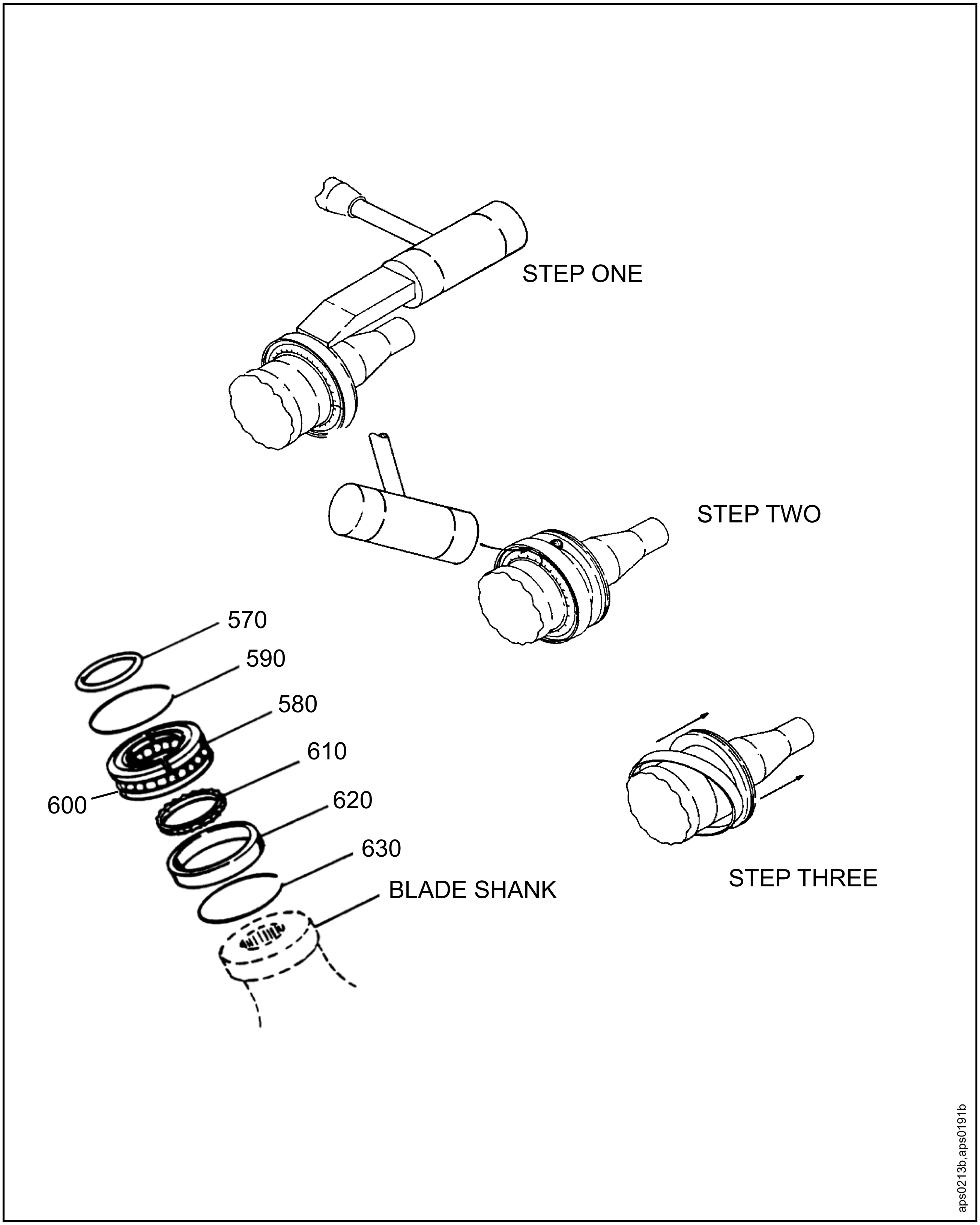
(7) Remove and discard each clamp gasket (740).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the linkscrews (720), staking pins (710), and link arm bushings (660).



Clamp Assembly
Figure 3-3



Removing Bearing Retention Ring
Figure 3-4

(10) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

CAUTION 1: IF POSSIBLE, EACH BLADE ASSEMBLY SHOULD BE REINSTALLED ON THE HUB ARM FROM WHICH IT WAS REMOVED. RECORD EACH BLADE SERIAL NUMBER AND ITS MATCHING HUB ARM AND CLAMP.

CAUTION 2: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(11) Remove each blade assembly from its hub pilot tube.

(12) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

E. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Use a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620) to move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

F. Hub Unit Disassembly

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

3. Disassembly of Splined-Hub Propeller Model HC-B3Z20-1

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Cylinder Removal

CAUTION: UNSCREW THE CYLINDER (300) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(1) Install the propeller assembly on the rotatable fixture of the propeller assembly table TE129, or equivalent.

(2) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(3) Remove the cylinder (300).

(4) Remove and discard the cylinder O-ring (260).

B. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Use a round bottom stamp or electric pencil and identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

CAUTION 1: IF POSSIBLE, EACH BLADE ASSEMBLY SHOULD BE REINSTALLED ON THE HUB ARM FROM WHICH IT WAS REMOVED. RECORD EACH BLADE SERIAL NUMBER AND ITS MATCHING HUB ARM AND CLAMP.

CAUTION 2: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(9) Remove each blade assembly from its hub pilot tube.

(10) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

C. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the hub arm O-ring (570).

(6) Using a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620), move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

D. Hub Unit Disassembly

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

E. Piston Disassembly

NOTE: When the propeller was removed from the aircraft, the piston was removed.

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the cylinder (300).

4. Disassembly of Splined-Hub Propeller Models HA-B3( )30-1B

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Cylinder Removal

CAUTION: UNSCREW THE CYLINDER (300) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(1) Install the propeller assembly on the rotatable fixture of the propeller assembly table TE129, or equivalent.

(2) Loosen the socket head cap screw (350) in the guide collar (320).

(3) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(4) Remove the cylinder (300).

(5) Remove the guide collar unit (320) from the cylinder (300).

(6) Remove and discard the cylinder O-ring (260).

B. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the linkscrews (720), staking pins (710), and link arm bushings (660).

(10) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

NOTE: If possible, each blade assembly should be reinstalled on the hub arm from which it was removed. Record each blade serial number and its matching hub arm and clamp.

CAUTION: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(11) Remove each blade assembly from its hub pilot tube.

(12) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

C. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Use a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620) to move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

D. Hub Unit Disassembly

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

E. Piston Disassembly

NOTE: When the propeller was removed from the aircraft, the piston was removed.

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

5. Disassembly of Splined-Hub Propeller Models HC-B3( )30-1E( ), -2E( )

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Feathering Spring Disassembly

WARNING: USE CAUTION WHEN REMOVING THE SPRING ASSEMBLY FROM THE PROPELLER. THE SPRING ASSEMBLY IS PRELOADED TO APPROXIMATELY 400 POUNDS (174 KG) FORCE.

NOTE: When the propeller was removed from the aircraft, the spring assembly was removed.

(1) Make a record of the measurement between the feathering stop screws and the spring retainer cup (1440).

(2) Remove and discard the safety wire from the spring retainer cup (1440) and feathering stop screws (280).

(3) Remove and discard the feathering stop screws (280).

(4) Using spanner wrench TE148 or equivalent, remove the spring retainer cup (1440).

CAUTION: DO NOT FORCE THE FEATHERING COMPRESSION SPRING (1540) TO RELEASE THE SPLIT KEEPER (1590) IN THE CYLINDER. FORCING THE SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY.

(5) Remove the spring assembly (1400) from the cylinder (300).

(6) Using the bench-top fixture TE59 or equivalent, compress the feathering compression spring (1540) for disassembly. Refer to Figure 3-2.

(7) Remove and discard the split keeper (1590).

(8) Permit the spring assembly extend to its unloaded length, and remove it from special fixture TE159.

(9) Disassemble the remaining spring assembly component parts.

B. Cylinder Removal

CAUTION: UNSCREW THE CYLINDER (610) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(1) Install the propeller on the rotatable fixture of a propeller assembly table TE129, or equivalent.

(2) Loosen the socket head cap screw (350) in the guide collar (320).

(3) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(4) Remove the cylinder (300).

(5) Remove and discard the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

(6) Remove the guide collar unit (320).

(7) Remove and discard the cylinder O-ring (260).

(8) Remove the shaft nut (360).

(9) Remove and discard the O-ring (540) from the bushing (560).

C. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the linkscrews (720), staking pins (710), and link arm bushings (660).

(10) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

CAUTION 1: IF POSSIBLE, EACH BLADE ASSEMBLY SHOULD BE REINSTALLED ON THE HUB ARM FROM WHICH IT WAS REMOVED. RECORD EACH BLADE SERIAL NUMBER AND ITS MATCHING HUB ARM AND CLAMP.

CAUTION 2: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(11) Remove each blade assembly from its hub pilot tube.

(12) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

D. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Use a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620) to move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove the bearing guide ring (630) that was covered by the bearing retaining ring (620). Discard the bearing wire ring if it is sprung.

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

E. Start Lock Disassembly

WARNING: THE SPRING IS COMPRESSED AND WILL BE RELEASED WHEN THE COTTER PIN IS REMOVED FROM THE START LOCK BRACKET.

(1) Remove and discard the cotter pin (1800) from each start lock bracket (1710).

(2) Remove and discard the washer (1810) from each bracket.

(3) Remove and discard the compression spring (1730) from each bracket.

(4) Remove the start lock pin (1720) from each bracket.

F. Hub Unit Disassembly

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

G. Piston Disassembly

NOTE: When the propeller was removed from the aircraft, the piston was removed.

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

6. Disassembly of Flanged-Hub Propeller Models HC-B3( )F-2( )

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Start Lock and Piston Removal

WARNING: BE SURE THE PROPELLER IS IN FEATHER POSITION BEFORE BEGINNING DISASSEMBLY PROCEDURES.

(1) Install the propeller assembly on the rotatable fixture of a propeller assembly table TE129, or equivalent.

(2) If the propeller is not in feather position, perform the following steps:

CAUTION: DO NOT PUT THE BLADE PADDLES IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLES IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(a) Using one blade paddle per blade, turn the blades all at the same time to a slightly lower pitch to disengage the start lock plates (1740) from the start lock assemblies (1700).

(b) Retract the start lock pins (1720).

(3) If the propeller is equipped with a de-ice system, follow the instructions in the appropriate manufacturer's manual for removal of the slip ring and other de-ice system components.

(4) Remove and discard nuts (1785), washers (1790), and bolts (1780) that attach the spinner bulkhead to the start lock assemblies (1700).

(5) Remove the spinner bulkhead.

(6) Remove and discard bolts (1770) and washers (1760) that attach the start locks (1700) to the hub.

(7) Remove the start locks.

(8) Remove and discard the self-locking hex nut (10).

(9) Remove and discard the safety wire from the link pin safety screws (110).

(10) Remove and discard the safety screws from each link pin unit (120).

(11) Remove and discard each link pin unit (120).

(12) The piston (30) and guide collar (320) should have matching index numbers (1, 2, and 3) impression-stamped. If they are not marked, impression stamp each component.

(13) Mark each component to make sure it can be reassembled in its original location.

(14) Disengage each link arm (130) from the piston slot.

(15) Remove and discard the socket head cap screw (200), jam nut (220), and washer (210) from each pitch change guide rod (70).

(16) Remove the piston unit (30) from the cylinder (300).

(17) Remove and discard the felt dust seal (270) from the outside diameter groove in the cylinder.

(18) Remove and discard the O-ring (930) from the inside diameter of the piston.

B. Feathering Spring Disassembly

WARNING: USE CAUTION WHEN REMOVING THE SPRING ASSEMBLY FROM THE PROPELLER. THE SPRING ASSEMBLY IS PRELOADED TO APPROXIMATELY 400 POUNDS (174 KG) FORCE.

(1) Remove and discard the safety wire and feathering stop screws (280) from the feathering stop (290).

(2) Remove the feathering stops (290).

(3) Remove the front spring retainer split rings (250) by pushing the spring assembly into the cylinder approximately 0.25 inch (6.35 mm), permitting the split rings to fall out of the groove in the cylinder.

(4) Remove the spring assembly (1400) from the cylinder (300).

(5) Using the bench-top fixture TE59 or equivalent, compress the feathering compression spring (1400) for disassembly. Refer to Figure 3-2.

(6) Remove and discard the split keeper (1590).

(7) Permit the spring assembly to extend to its unloaded length, and remove it from special fixture TE159.

(8) Disassemble the remaining spring assembly component parts.

C. Cylinder Removal

(1) Loosen the socket head cap screw (350) in the guide collar (320).

(2) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

CAUTION: UNSCREW THE CYLINDER (610) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(3) Using a square-bar of appropriate size to fit into the slot in the top of the cylinder (300) and serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(4) Remove the cylinder (300).

(5) Remove and discard the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

(6) Remove the guide collar unit (320).

(7) Remove and discard the cylinder O-ring (260).

D. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the linkscrews (720), staking pins (710), and link arm bushings (310).

(10) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

NOTE: If possible, each blade assembly should be reinstalled on the hub arm from which it was removed. Record each blade serial number and its matching hub arm and clamp.

CAUTION: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(11) Remove each blade assembly from its hub pilot tube.

(12) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

E. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Use a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620) to move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

F. Start Lock Disassembly

WARNING: THE SPRING IS COMPRESSED AND WILL BE RELEASED WHEN THE COTTER PIN IS REMOVED FROM THE START LOCK BRACKET.

(1) Remove and discard the cotter pin (1800) from each start lock bracket (1710).

(2) Remove and discard the lock washer (1810) from each bracket.

(3) Remove and discard the compression spring (1730) from each bracket.

(4) Remove the start lock pin (1720) from each bracket.

G. Hub Unit Disassembly

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

H. Piston Disassembly

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

7. Disassembly of Flanged-Hub Propeller Model HC-B3WN-2L

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Start Lock and Piston Removal

CAUTION: BE SURE THE PROPELLER IS IN FEATHER POSITION BEFORE BEGINNING DISASSEMBLY PROCEDURES.

(1) Install the propeller on the rotatable fixture of a propeller assembly table TE129, or equivalent.

(2) If the propeller is not in feather position, perform the following steps:

CAUTION: DO NOT PUT THE BLADE PADDLES IN THE AREA OF THE DE-ICE BOOT WHEN APPLYING TORQUE TO A BLADE ASSEMBLY. PUT THE BLADE PADDLES IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(a) Using one blade paddle per blade, turn the blades all at the same time to a slightly lower pitch to disengage the start lock plates (1740) from the start lock assemblies (1700).

(b) Retract the start lock pins (1720).

(3) If the propeller is equipped with a de-ice system, follow the instructions in the appropriate manufacturer's manual for removal of the slip ring and other de-ice system components.

(4) Remove and discard nuts (1785), washers (1790), and bolts (1780) that secure each start lock assembly (1700).

(5) Remove the spinner bulkhead.

(6) Remove the start lock assemblies (1700).

(7) Remove and discard the self-locking hex nut (10).

(8) Remove and discard the safety wire from the link pin safety screws (110).

(9) Remove and discard the safety screws (110) from each link pin unit (120).

(10) Remove and discard each link pin unit (120).

(11) The piston (30) and guide collar (320) should have matching index numbers (1, 2, and 3) impression-stamped or marked with a felt-tipped pen. If they are not marked, number them with a felt-tipped pen.

(12) Make a mark on each component to make sure it can be reassembled in its original location.

(13) Disengage the link arms (130) from the piston slots.

(14) Remove and discard the socket head cap screw (200), jam nut (220), and washer (210) from each piston guide rod (70).

(15) Remove the piston unit (30) from the cylinder (300).

(16) Remove and discard the felt dust seal (270) from the outside diameter groove in the piston.

(17) Remove and discard the O-ring (930) from the inside diameter of the piston (30).

B. Feathering Spring Disassembly

WARNING: USE CAUTION WHEN REMOVING THE SPRING ASSEMBLY FROM THE PROPELLER. THE SPRING ASSEMBLY IS PRELOADED TO APPROXIMATELY 400 POUNDS (174 KG) FORCE.

NOTE: When the propeller was removed from the aircraft, the spring assembly was removed.

(1) Make a record of the measurement between the feathering stop screws and the spring retainer cup (1440).

(2) Remove and discard the safety wire from the spring retainer cup (1440).

(3) Remove and discard the feathering stop screws (280).

(4) Using a spanner wrench TE148 or equivalent, remove the spring retainer cup (1440).

CAUTION: DO NOT FORCE THE FEATHERING COMPRESSION SPRING (1540) TO RELEASE THE SPLIT KEEPER (1590) IN THE CYLINDER. FORCING THE SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY.

(5) Remove the spring assembly (1400) from the cylinder (300).

(6) Using the bench-top fixture TE59 or equivalent, compress the feathering compression spring (1540) for disassembly. Refer to Figure 3-2.

(7) Remove and discard the split keeper (1590).

(8) Permit the spring assembly to extend to its unloaded length, and remove it from special fixture TE159.

(9) Disassemble the remaining spring assembly component parts.

C. Cylinder Removal

CAUTION: UNSCREW THE CYLINDER (610) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(1) Install the propeller assembly on the rotatable fixture of the propeller assembly table TE129, or equivalent.

(2) Loosen the socket head cap screw (350) in the guide collar (320).

(3) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(4) Remove the cylinder (300).

(5) Remove and discard the self-locking socket head cap screw (320) in the side of the guide collar unit (620).

(6) Remove the guide collar unit (320) from the cylinder (300).

(7) Remove and discard the cylinder O-ring (260).

D. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the linkscrews (720), linkscrew sleeves (310), staking pins (710), and link arm bushings (660).

(10) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

NOTE: If possible, each blade assembly should be reinstalled on the hub arm from which it was removed. Record each blade serial number, and its matching hub arm and clamp.

CAUTION: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(11) Remove each blade assembly from its hub pilot tube.

(12) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

E. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

CAUTION: BLADE RETENTION BEARINGS ARE IN MATCHED SETS (TWO RACES PER SET). DO NOT MIX BEARING SET COMPONENTS.

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Use a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620) to move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

F. Start Lock Disassembly

WARNING: THE SPRING IS COMPRESSED AND WILL BE RELEASED WHEN THE COTTER PIN IS REMOVED FROM THE START LOCK BRACKET.

(1) Remove and discard the cotter pin (1800) from each start lock bracket (1710).

(2) Remove and discard the washer (1810) from each bracket.

(3) Remove and discard the compression spring (1730) from each bracket.

(4) Remove the start lock pin (1720) from each bracket.

G. Hub Unit Disassembly

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

H. Piston Disassembly

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

8. Disassembly of Splined-Hub Propeller Models HC-B3( )20-2( ) and HC-B3( )30-2B( )

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Feathering Spring Disassembly

NOTE: The feathering spring (1400) and piston (30) were removed when the propeller was removed from the aircraft.

(1) Make a record of the measurement between the feathering stop screws and the spring retainer cup (1440).

(2) Remove and discard the feathering stop screws (280).

CAUTION: DO NOT FORCE THE FEATHERING COMPRESSION SPRING (1540) TO RELEASE THE SPLIT KEEPER (1590) IN THE CYLINDER. FORCING THE SPRING MAY CAUSE THE RELEASE OF THE SPLIT RING RETAINERS IN THE SPRING ASSEMBLY.

(3) Using the bench-top fixture TE59 or equivalent, compress the feathering compression spring (1540) for disassembly. Refer to Figure 3-2.

(4) Remove and discard the split keeper (1590).

(5) Permit the spring assembly to extend to its unloaded length, and remove it from special fixture TE159.

(6) Disassemble the remaining spring assembly component parts.

(7) Using a press or by hand, remove the rod guide bushing (1600) from the spring retainer cup (1440).

(a) Using MEK CM106 or acetone CM173, remove any residue.

B. Cylinder Removal

(1) Install the propeller assembly on the rotatable fixture of a propeller assembly table TE129, or equivalent.

(2) Loosen the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

CAUTION: UNSCREW THE CYLINDER (300) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(3) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(4) Remove the cylinder (300).

(5) Remove and discard the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

(6) Remove the guide collar unit (320).

(7) Remove and discard the cylinder O-ring (260).

(8) Remove the shaft nut (360).

(9) Remove and discard the felt dust seal (270) from the piston (30).

C. Blade Clamp Disassembly
Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard the clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the linkscrews (720), linkscrew sleeve (310), staking pins (710), and link arm bushings (660).

(10) Remove and discard each hex head bolt (1750) from the start lock plate (1740).

(11) Remove the start lock plate (1740) from each clamp.

(12) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

NOTE: If possible, each blade assembly should be reinstalled on the hub arm from which it was removed. Record each blade serial number and its matching hub arm and clamp.

CAUTION: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(13) Remove each blade assembly from its hub pilot tube.

(14) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

D. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

CAUTION: BLADE RETENTION BEARINGS ARE IN MATCHED SETS (TWO RACES PER SET). DO NOT MIX BEARING SET COMPONENTS.

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the ball spacer (610).

(4) Remove and discard the bearing balls (600).

(5) Remove and discard the blade O-ring (570).

(6) Using a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620), move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

E. Start Lock Disassembly

WARNING: THE SPRING IS COMPRESSED AND WILL BE RELEASED WHEN THE COTTER PIN IS REMOVED FROM THE START LOCK BRACKET.

(1) Remove and discard the cotter pin (1800) from each start lock bracket (1710).

(2) Remove and discard the washer (1810) from each bracket.

(3) Remove and discard the compression spring (1730) from each bracket.

(4) Remove the start lock pin (1720) from each bracket.

9. Disassembly of Flanged-Hub Propeller Model HC-B3WF-4

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Piston Removal

(1) Install the propeller assembly on the rotatable fixture of a propeller assembly table TE129, or equivalent.

(2) Rotate the blades by hand to move the piston unit (30) forward.

(3) Remove and discard the safety screw (110) and link pin unit (120) at each link arm (130) location.

(4) Disengage the link arms (130) from the piston unit (30).

(5) Remove and discard the socket head cap screw (200), check nut (220), and washer (210) from the end of each pitch change guide rod.

(6) Remove the piston unit (30) from the cylinder (300).

(7) Remove and discard the felt dust seal (270) from the inside diameter of the piston (30).

(8) Remove and discard the O-ring (270) from the inside diameter of the piston (30).

B. Cylinder Removal

(1) Loosen the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

CAUTION: UNSCREW THE CYLINDER (300) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(2) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(3) Remove the cylinder (300).

(4) Remove and discard the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

(5) Remove the guide collar unit (320).

(6) Remove and discard the cylinder O-ring (260).

C. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew, and disengage the link arms (130) from the linkscrews.

(9) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

NOTE: If possible, each blade assembly should be reinstalled on the hub arm from which it was removed. Record each blade serial number and its matching hub arm and clamp.

CAUTION: USE CARE NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(10) Remove each blade assembly from its hub pilot tube.

(11) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

D. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

CAUTION: BLADE RETENTION BEARINGS ARE IN MATCHED SETS (TWO RACES PER SET). DO NOT MIX BEARING SET COMPONENTS.

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Using a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620), move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the wire bearing retainer (630).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

E. Hub Unit Disassembly

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

F. Piston Disassembly

NOTE: When the propeller was removed from the aircraft, the piston was removed.

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

10. Disassembly of Splined-Hub Propeller Models HC-B3( )20-4 and HC-B3( )30-4

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Cylinder Removal

(1) Install the propeller assembly on the rotatable fixture of a propeller assembly table TE129, or equivalent.

(2) Loosen the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

CAUTION: UNSCREW THE CYLINDER (610) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(3) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(4) Remove the cylinder (300).

(5) Remove and discard the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

(6) Remove the guide collar unit (320).

(7) Remove and discard the cylinder O-ring (260).

B. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

CAUTION 1: IF POSSIBLE, EACH BLADE ASSEMBLY SHOULD BE REINSTALLED ON THE HUB ARM FROM WHICH IT WAS REMOVED. RECORD EACH BLADE SERIAL NUMBER AND ITS MATCHING HUB ARM AND CLAMP.

CAUTION 2: BE CAREFUL NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(10) Remove each blade assembly from its hub pilot tube.

(11) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

C. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

CAUTION: BLADE RETENTION BEARINGS ARE IN MATCHED SETS (TWO RACES PER SET). DO NOT MIX BEARING SET COMPONENTS.

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Using a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620), move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove the bearing guide ring (630) that was covered by the bearing retaining ring (620). Discard the bearing wire ring if it is sprung.

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

D. Hub Unit Disassembly

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

E. Piston Disassembly

NOTE: When the propeller was removed from the aircraft, the piston was removed.

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

11. Disassembly of Splined-Hub Propeller Models HC-B3R30-4A, -4B

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 ENOUGH PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

A. Feathering Spring Disassembly

NOTE: When the propeller was removed from the aircraft, the spring assembly was removed.

(1) Using the bench-top fixture TE59 or equivalent, compress the feathering compression spring (1400) for disassembly. Refer to Figure 3-2.

(2) Remove and discard the split keeper (1590).

(3) Permit the spring assembly to extend to its unloaded length, and remove it from special fixture TE159.

(4) Disassemble the remaining spring assembly component parts.

B. Cylinder Removal

(1) Loosen the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

CAUTION: UNSCREW THE CYLINDER (300) SLOWLY AND CAREFULLY TO AVOID DAMAGING THE THREADS.

(2) Using a 1.00 inch (25.4 mm) square bar to fit the slot supplied for it in the top of the cylinder (300) to serve as a wrench, slowly unscrew the cylinder from the hub unit (500).

(3) Remove the cylinder (300).

(4) Remove and discard the self-locking socket head cap screw (350) in the side of the guide collar unit (320).

(5) Remove the guide collar unit (320).

(6) Remove and discard the cylinder O-ring (260).

C. Blade Clamp Disassembly

Refer to Figure 3-3.

(1) Using a round bottom stamp or electric pencil, identify the clamp serial number on each corresponding counterweight (800).

(2) Remove and discard all outboard clamp bolts (750) and self-locking nuts (760).

(3) Remove and discard all inboard clamp socket screws (730) and cotter pins (840).

(4) Remove all blade clamp-halves (830) from the hub arms.

(5) Remove and discard each clamp gasket (740).

(6) Remove and discard balance weight fillister head screws (640).

(7) Remove all balance weights (650).

(8) Remove and discard the cotter pin (670) from each linkscrew (720), and disengage the link arms (130) from the linkscrews.

(9) Remove and discard the link arm bushings (660).

(10) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) for blade clamp overhaul instructions.

NOTE: If possible, each blade assembly should be reinstalled on the hub arm from which it was removed. Record each blade serial number and its matching hub arm and clamp.

CAUTION: USE CARE NOT TO DAMAGE THE BLADES WHEN THEY ARE REMOVED AND STORED.

(11) Remove each blade assembly from its hub pilot tube.

(12) Refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33) for additional aluminum blade disassembly and overhaul instructions.

D. Blade Mounting Parts Disassembly

(1) Remove and discard the wire bearing retainer (590) from its groove in the inboard race of the blade retention bearing (580).

CAUTION: BLADE RETENTION BEARINGS ARE IN MATCHED SETS (TWO RACES PER SET). DO NOT MIX BEARING SET COMPONENTS.

(2) Remove the two halves of the inboard blade retention bearing (580).

(3) Remove and discard the bearing balls (600).

(4) Remove and discard the ball spacer (610).

(5) Remove and discard the blade O-ring (570).

(6) Using a mallet and soft punch at several places on the outboard edge of the bearing retaining ring (620), move the ring inboard over the shoulder of the hub arm. Refer to Figure 3-4, Step One.

(7) Remove and discard the bearing wire ring (630) that was covered by the bearing retaining ring (620).

(8) Turn the halves of the inboard blade retention bearing (580) so the split is at the top. Refer to Figure 3-4, Step Two.

(9) At the split, put one of the bearing balls (600) between the outboard blade retention bearing (580) and inboard shoulder of the hub arm.

(10) Using a soft mallet, lightly tap the inboard top edge of the bearing retaining ring (620) to loosen the split outboard race (580) from the bearing retaining ring.

(11) Remove the halves of the race (580) as they come apart from the bearing retention ring (620).

(12) Tilt the bearing retaining ring (620) inboard approximately 45 degrees and remove the ring by moving it outboard over the shoulder of the hub arm. Refer to Figure 3-4, Step Three.

E. Hub Unit Disassembly

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

F. Piston Disassembly

NOTE: When the propeller was removed from the aircraft, the piston was removed.

(1) Remove and discard the O-ring (930) from the piston (30).

(2) Remove and discard the felt dust seal (270) from the piston (30).

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1. Cleaning Procedures (Rev. 4)

   A. General Cleaning

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

   D. Cleaning Aluminum Parts for Penetrant Inspection

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

   E. Cleaning Titanium Parts for Penetrant Inspection

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

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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. 3)

   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) 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).

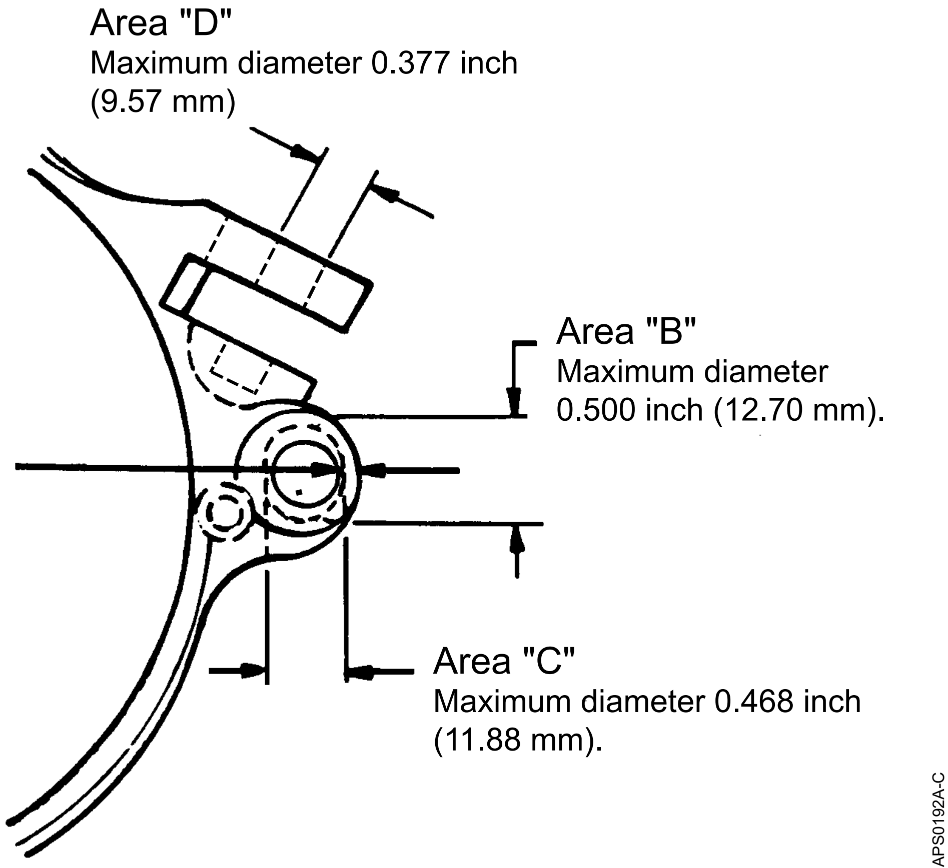
G. Special Inspections (Lightning Strike, Foreign Object Strike, etc.)

(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.



Part No.	Maximum ID	
	Inches	Millimeters
A-862	3.784	96.11
A-862-1	4.286	108.86
A-862-2	4.286	108.86
A-862-7	4.634	117.70

Piston Bushing Wear Limits

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Piston Inspection
Figure 5-1

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
A. Piston (Item 30) Refer to Figure 5-1.		
(1) Visually examine the threads of the link pin safety screw holes in the piston.	At least three thread lengths must be present in the piston link pin screw hole to hold the safety screw in position.	If the threads are less than the permitted serviceable limits, repair the threads in the link pin safety screw holes in accordance with the Standard Repairs chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(2) Visually examine the hole at the front of the piston for damage caused by inserting or removing the pitch change rod.	Damage must not interfere with the sealing ability of the O-ring.	If damage does not permit the O-ring to seal, replace the piston.
(3) Measure the link pin piston holes.	The maximum permitted diameter is 0.377 inch (9.58 mm).	If the diameter is greater than the permitted serviceable limits, replace the piston.
(4) Visually examine the piston bushing for wear. If wear is present, measure the bushing.	For the maximum permitted serviceable limits, refer to Figure 5-1.	If the piston bushing ID is greater than the permitted serviceable limits, replace the piston bushing in accordance with the Special Adhesive and Bonding chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(5) Visually examine the piston ID for wear in the metal surface. If wear is present, measure the piston bushing.	For the maximum permitted serviceable limits, refer to Figure 5-1.	Replace the piston bushing in accordance with the Special Adhesive and Bonding chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(6) If applicable, apply hand pressure to the guide rod (70) centerline to make sure that each rod is tight in the piston.	The rod must be tight in the piston. Movement is not permitted.	If the rod is not tight in the piston, replace the guide rod in accordance with the Standard Repairs chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

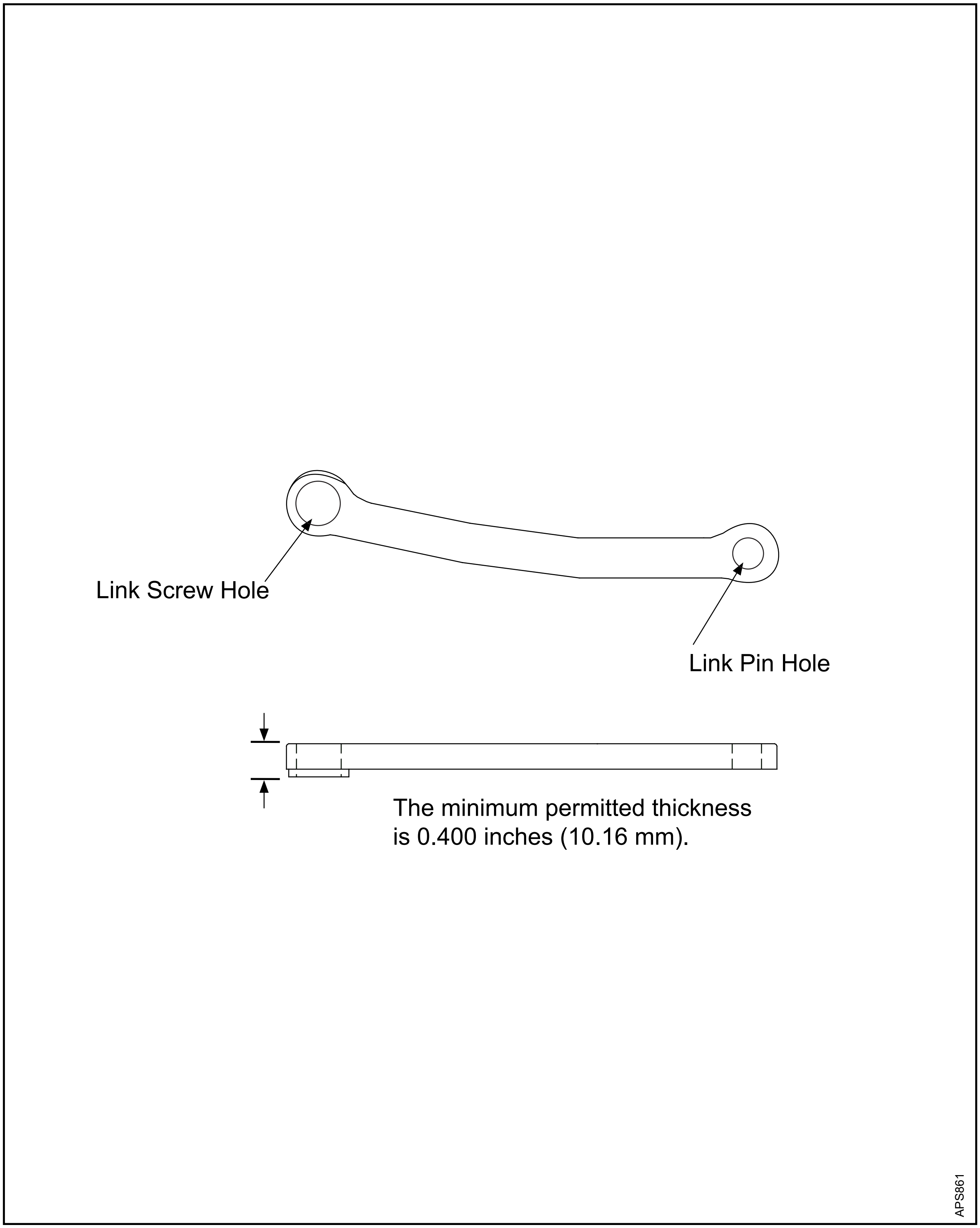
Inspect	Serviceable Limits	Corrective Action
A. Piston (Item 30) Continued Refer to Figure 5-1.		
(7) If applicable, visually examine guide rods (70) for wear, gouges, or damage.	Wear or damage through the chrome plating is not permitted. Gouges are not permitted.	If the guide rod has wear, gouges, or damage greater than the permitted serviceable limits, replace the guide rod in accordance with the Standard Repairs chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(8) Visually examine the outside surfaces of the piston assembly for corrosion, pitting, scratches or damage.	Corrosion is not permitted. The maximum permitted depth of pitting is 0.005 inch (0.12 mm) deep and 0.0625 inch (1.587 mm) diameter.	If pitting is greater than the serviceable limits, repair the outside surfaces of the piston assembly to a minimum diameter of the pitting depth x 10. The maximum depth of repair for pitting is 0.008 inch (0.20 mm).
	The maximum permitted depth of scratching and damage is 0.004 inch (0.10 mm). Pushed up material is not permitted. The area limit of pitting, scratching, and damage is 0.5 inch (12.7 mm) linearly around the circumference of the piston. Refer to Figure 5-1.	Remove any pushed-up material by using an abrasive pad CM47 or equivalent. If the corrosion, pitting, scratches or damage is greater than the serviceable limits or corrective action, replace the piston. Refer to Figure 5-1.
	Pitting, scratches, or damage are not permitted to interfere with link pin attachment.	Repair is not permitted in the link pin attaching area. If pitting, scratches, or damage are outside the serviceable limits the piston must be replaced.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
A. Piston (Item 30) Continued Refer to Figure 5-1.		
(9) Visually examine the felt seal groove side walls for pitting or damage.	The maximum permitted depth of pitting or damage is 0.003 inch (0.07 mm). The maximum permitted diameter of an individual pit is 0.06 inch (1.5 mm). Pin-point penetrant indications from corrosion pitting are permitted.	Using an abrasive pad CM47 or equivalent, polish to remove pitting or damage to a maximum depth of 0.006 inch (0.15 mm). If the pitting or damage is greater than the permitted serviceable limits or corrective action limits, replace the piston.
(10) Visually examine the O-ring groove side walls for pitting or damage.	A smooth surface finish is required. Pitting or damage is not permitted.	Using an abrasive pad CM47 or equivalent, polish to remove pitting or damage to a maximum depth of 0.006 inch (0.15 mm). If the pitting or damage is greater than the permitted serviceable limits or corrective action limits, replace the piston.
(11) Visually examine the felt seal groove ID for pitting or damage.	The maximum permitted depth of pitting or damage is 0.005 inch (0.12 mm). The maximum permitted diameter of an individual pit is 0.060 inch (1.50 mm). Pin-point penetrant indications from corrosion pitting are permitted.	Using an abrasive pad CM47 or equivalent, polish to remove pitting or damage to a maximum depth of 0.010 inch (0.25 mm). Localized repairs of pitting or damage are permitted up to a maximum depth of 0.015 inch (3.81 mm). A maximum of three localized repair sites are permitted. The maximum length of a localized repair site is 0.25 inch (6.3 mm). Each localized repair site may be the entire width of the felt seal groove. If the pitting or damage is greater than the permitted serviceable limits or corrective action limits, replace the piston.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
A. Piston (Item 30) Continued Refer to Figure 5-1.		
(12) Penetrant inspect the piston in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). CAUTION: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted.	If there is a relevant indication, replace the piston.



Link Arm
Figure 5-2

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
B. Link Arm (Item 130) Refer to Figure 5-2.		
(1) Visually examine each link arm for indications of twisting or distortion.	Distortion is not permitted. The link arm must be flat from one hole to another within 0.015 inch (0.38 mm).	If the twisting or distortion is greater than the serviceable limits, replace the link arm.
(2) Measure the ID of the link pin hole and linkscrew hole of each link arm.	A maximum ID of 0.3785 inch (9.614 mm) is permitted for the link pin hole. A maximum ID of 0.5645 inch (14.338 mm) is permitted for the linkscrew hole.	If either diameter is greater than the permitted serviceable limits, replace the link arm.
(3) Measure the thickness of the end of the link arm, surrounding the link screw hole.	The minimum thickness limit for the end of the link arm is 0.400 inch (10.16 mm). Refer to Figure 5-1A.	If the thickness does not meet the serviceable limits, replace the link arm.
(4) Visually examine each link arm for scratches or wear to the cadmium plating.	A few random scratches are permitted, otherwise, complete cadmium plate coverage is required.	If wear or scratches are greater than the permitted serviceable limits, replate and bake the link arm in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(5) Magnetic particle inspect the link arms 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 link arm.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. Fork (Item 160)		
(1) Visually examine 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 permitted serviceable limits, replace the fork.
(2) Visually examine all surfaces except the three faces of the fork slot for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 fork.
(3) Visually examine the threaded hole for set screw.	One thread total accumulated damage is permitted. Damage must not interfere with set screw installation.	If thread damage is greater than the serviceable limits, replace the fork.
(4) Visually examine 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 permitted serviceable limits, replace the fork.
(5) Visually examine the three faces of the fork slot for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 fork.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
C. Fork (Item 160) Continued		
(6) Magnetic particle inspect the fork in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the fork.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
D. Pitch Stop Spacer (Item 170)		
(1) Visually examine the pitch stop spacer for pitting, wear, and damage.	The maximum permitted depth of pitting, wear, or damage 0.005 inch (0.12 mm). Surface area of pitting, wear, or damage coverage must not interfere with the ability of the pitch stop spacer to equally support the circumference of the rod sleeve when at high pitch.	If pitting, wear, or damage is greater than the serviceable limits, replace the pitch stop spacer.
(2) Visually examine the pitch stop spacer for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 pitch stop spacer.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
E.	Split Keeper (Item 250)		
	(1) Visually examine the split keeper for pitting, and damage.	The maximum permitted depth of pitting, wear, or damage is 0.002 inch (0.050 mm).	If pitting, wear, or damage is greater than the serviceable limits, replace the split keeper.
	(2) Visually examine the split keeper for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 split keeper.
	(3) Visually examine the split keeper for cadmium plate coverage.	A few random scratches are permitted; otherwise, cadmium plate must completely cover the split keeper.	If cadmium plate coverage is less than the permitted serviceable limits, replate the split keeper in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

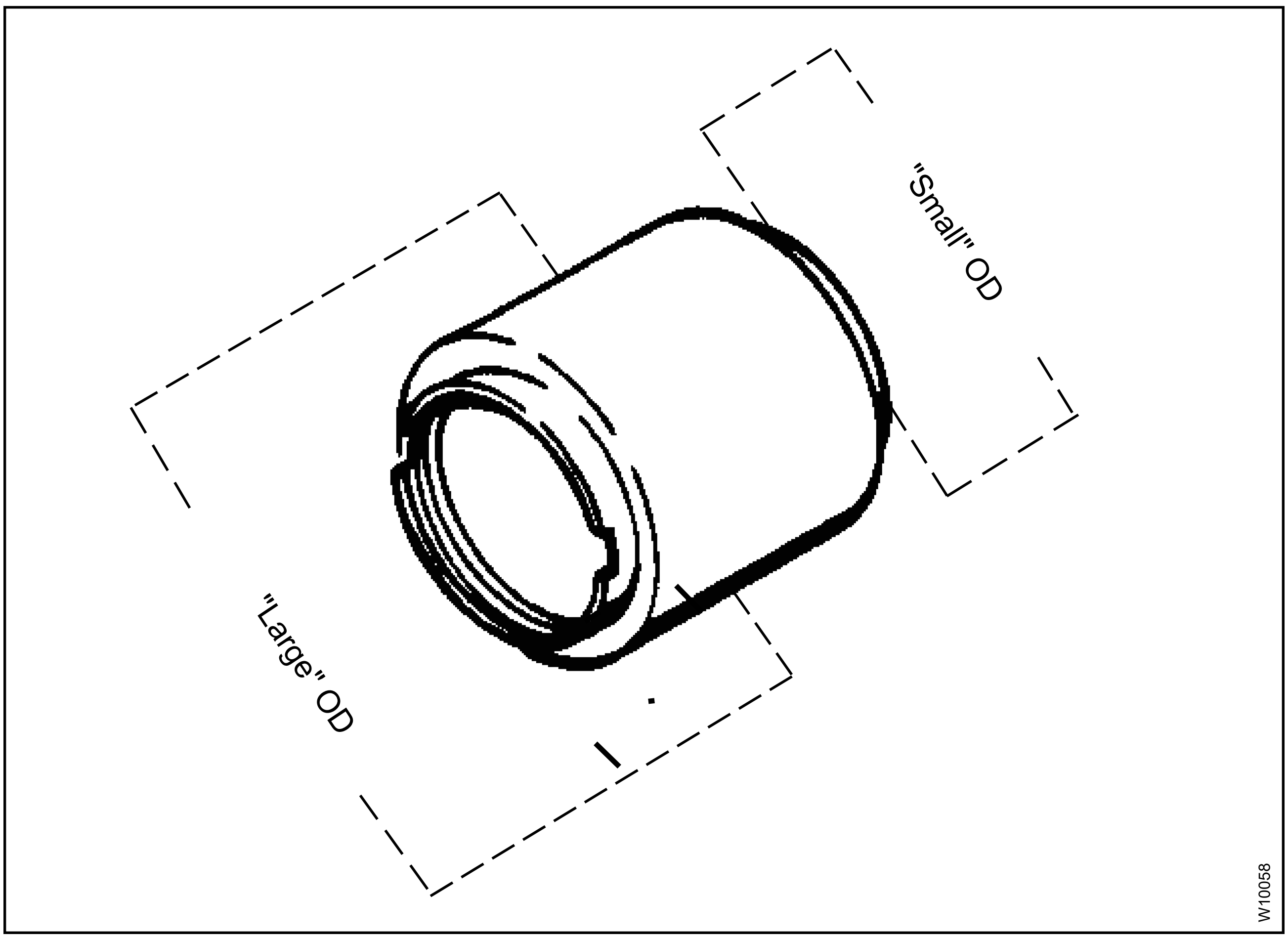
Inspect	Serviceable Limits	Corrective Action
F. <u>Front Plate</u> (Item 255)		
(1) Visually examine the front plate for pitting, wear, and damage.	The maximum permitted depth of wear, pitting, or damage is 0.005 inch (0.12 mm).	Replace the front plate if pitting, wear, or damage is greater than the serviceable limits.
(2) Visually examine the front plate for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 front plate.
(3) Visually examine the front plate for cadmium plate coverage.	A few random scratches are permitted; otherwise, cadmium plate must completely cover the front plate.	If the cadmium plate coverage is less than the permitted serviceable limits, replate the front plate in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
G.	Pitch Stop Spacer (Item 290)		
(1)	Visually examine the pitch stop spacer for pitting.	The maximum permitted depth of pitting, wear, or damage is 0.002 inch (0.050 mm).	If pitting is greater than the serviceable limits, replace the pitch stop spacer.
(2)	Visually examine the pitch stop spacer for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 pitch stop spacer.
(3)	Visually examine the pitch stop spacer for cadmium plate coverage.	A few random scratches are permitted; otherwise, cadmium plate must completely cover the pitch stop spacer.	If cadmium plate coverage is less than the permitted serviceable limits, replate the pitch stop spacer in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Baking the pitch stop spacer after cadmium plating is not required.
(4)	Magnetic particle inspect the pitch stop spacer in accordance with the Magnetic Particle Inspection chapter of Hartzell Standard Practices Manual 202A (61-01-02).	A relevant indication is not permitted.	If there is a relevant indication, replace the pitch stop spacer.

PART NUMBER	MINIMUM LARGE OD	MINIMUM SMALL OD
B-806-1	3.773 INCHES (95.84 MM)	3.432 INCHES (87.18 MM)
B-854	3.773 INCHES (95.84 MM)	3.496 INCHES (88.80 MM)
B-854-2	3.773 INCHES (95.84 MM)	3.496 INCHES (88.80 MM)
B-1803-1	4.273 INCHES (108.54 MM)	3.596 INCHES (91.34 MM)
B-1803-2	4.273 INCHES (108.54 MM)	3.596 INCHES (91.34 MM)
B-1882	4.273 INCHES (108.54 MM)	3.596 INCHES (91.34 MM)
B-1882-2	4.273 INCHES (108.54 MM)	3.596 INCHES (91.34 MM)
B-3406	4.623 INCHES (117.43 MM)	4.346 INCHES (110.39 MM)

Cylinder Dimensional Limits
Table 5-2



Cylinder Large and Small OD
Figure 5-3

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
H.	Cylinder (Item 300) Refer to Figure 5-3.		
(1)	Visually examine all threaded surfaces 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. Scratches, wear, or gouges deeper than 0.001 inch (0.025 mm) are not permitted.	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).	If the scratches, wear, or gouges are deeper 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).
(4)	Measure the large OD and the small OD of the cylinder.	Refer to Table 5-2 for the minimum permitted serviceable limits.	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).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
H. Cylinder, (Item 300) continued Refer to Figure 5-3.		
(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). NOTE: It is not necessary to remove chrome plating from the cylinder before magnetic particle inspection.	A relevant indication is not permitted.	If there is a relevant indication, replace the cylinder.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
I. <u>Guide Collar</u> (Item 320)		
(1) Visually examine the guide collar for nicks, gouges, or other damage.	Nicks, gouges, or other damage are not permitted.	If the depth of the nick, gouge, or damage is less than 0.020 inch (0.51 mm), using an abrasive pad CM47 or equivalent, polish the damaged area and apply chemical conversion coating in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the depth of the damage is greater than 0.020 inch (0.51 mm), replace the guide collar.
(2) Penetrant inspect the guide collar in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). <u>CAUTION</u>: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted.	If there is a relevant indication, replace the guide collar.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
J. Guide Collar Bushing (Item 330)		
(1) Measure the ID of each guide collar bushing.	The maximum permitted ID of the guide collar bushing is 0.515 inch (13.08 mm).	If the guide collar bushing ID is greater than the permitted serviceable limits, replace the guide collar bushing. Refer to the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
	Oval shaped wear greater than 0.008 inch (0.20 mm) is not permitted.	If the guide collar bushing ID is worn to an oval shape greater than the permitted serviceable limits, replace the guide collar bushing. Refer to the Special Adhesive and Bonding Procedures chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
K. Shaft Nut (Item 360)		
(1) Visually examine the shaft nut for indications corrosion product.	Corrosion product is not permitted.	Remove corrosion product 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 shaft nut.
(2) Visually examine the surfaces of the 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 shaft nut.
(3) Visually examine the threads on the 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 shaft nut.
(4) Visually examine the threads on the 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 shaft nut.
(5) Visually examine the shaft nut for cadmium plate coverage.	A few random scratches are permitted; otherwise, cadmium plate must completely cover the shaft nut.	If the cadmium plate coverage is less than the permitted serviceable limits, replate and bake the shaft nut in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

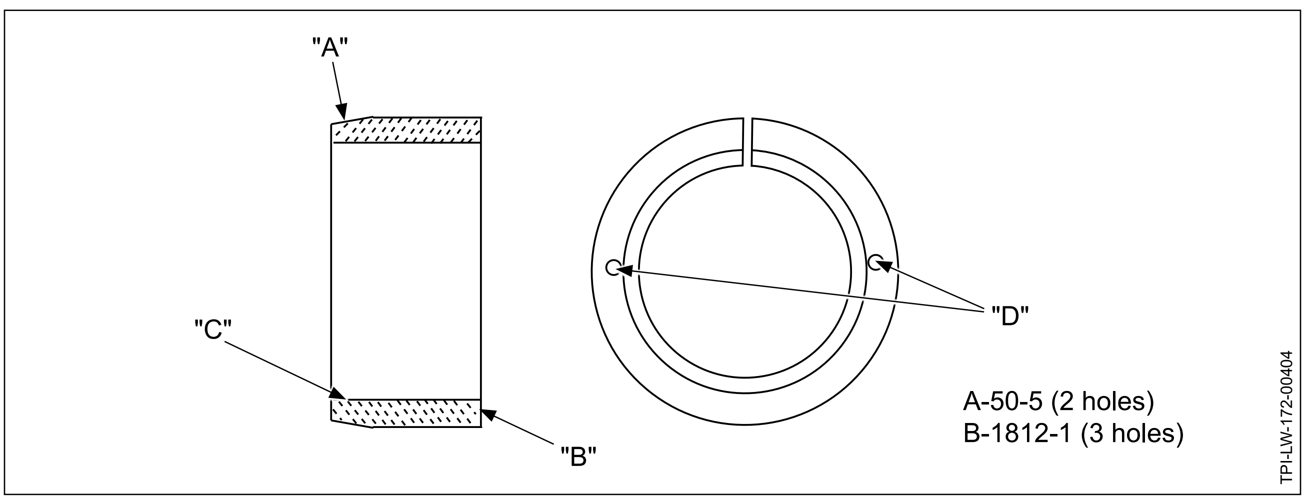
Inspect	Serviceable Limits	Corrective Action
K. Shaft Nut (Item 360) continued		
(6) Magnetic particle inspect the shaft nut in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). It is not necessary to remove cadmium plating before magnetic particle inspection.	A relevant indication is not permitted.	If there is a relevant indication, replace the shaft nut.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
L.	Hub Puller Ring (Item 370)		
(1)	Visually examine the hub puller ring for corrosion product.	Corrosion product is not permitted.	Remove corrosion product to a maximum depth of 0.003 inch (0.076 mm) using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If corrosion product is greater than a depth of 0.003 inch (0.076 mm), replace the hub puller ring.
(2)	Visually examine the hub puller ring for pitting.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm).	If pitting is greater than the permitted serviceable limits, replace the hub puller ring.
(3)	Visually examine the hub puller ring for cadmium plate coverage.	A few random scratches are permitted; otherwise, cadmium plate must completely cover the puller ring.	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).
(4)	Magnetic particle inspect the hub puller ring 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 hub puller ring.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
M. Rear Mounting Cone (Item 420) Refer to Figure 5-4.		
(1) Visually examine the OD taper surface "A" and surface "B" of the rear mounting cone for damage and surface finish.	The surface finish must be 63 micro finish or smoother. Except for very light scratches, damage is not permitted.	Remove light corrosion product 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 or damage is greater 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) Visually examine pin holes "D" for damage, deformed material, and broken pins remaining in the holes.	A broken pin in any hole is not permitted. An elongated hole is not permitted. Deformed material around the hole that is pushed above the surface is not permitted.	If there is damage, deformed material, or broken pins remaining in the holes, replace the rear mounting cone.



Rear Mounting Cone
Figure 5-4

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
N. <u>30 Spline Shaft Spacer</u> (Item 430)		
(1) Visually examine the 30 spline shaft spacer for pitting, wear, and damage.	The maximum permitted depth of pitting, wear, or damage 0.005 inch (0.12 mm). Surface area wear or damage coverage must not interfere with the ability of the 30 spline shaft spacer to equally support the rear cone around the entire circumference of the 30 spline shaft spacer.	If the depth of the pitting, wear, or damage is less than 0.005 inch (0.12 mm), using an abrasive pad CM47 or equivalent, polish the damaged area and apply chemical conversion coating in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the depth of the damage is greater than 0.020 inch (0.51 mm), replace the 30 spline shaft spacer.
(2) Visually examine the 30 spline shaft spacer for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 30 spline shaft spacer.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
O.	Spinner Mounting Plate (Item 490)		
(1)	Visually examine the spinner mounting plate for corrosion product and pitting.	Corrosion product is not permitted.	If the depth of corrosion product is 0.005 inch (0.12 mm) or less, remove the corrosion product and replate in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the depth of corrosion product is greater than 0.005 inch (0.12 mm), replace the spinner mounting plate.
(2)	Visually examine the spinner mounting plate for scratches.	The maximum permitted depth for a scratch is 0.005 inch (0.12 mm).	If the depth of a scratch is 0.005 inch (0.12 mm) or less, replate the spinner mounting plate in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).
(3)	Measure the thickness of each one piece spinner mounting plate.	The spinner mounting plate must be 0.1192 inch to 0.1196 inch (3.027 mm to 3.037 mm) thick before cadmium plating, and 0.120 to 0.121 inch (3.04 to 3.07 mm) thick after cadmium plating.	If the thickness does not meet the serviceable limits, replace the spinner mounting plate.
(4)	Magnetic particle inspect the spinner mounting plate 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 spinner mounting plate.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
P. Bulkhead Spacer (Item 495)		
(1) Visually examine the bulkhead spacer for pitting, wear, and damage.	The maximum permitted depth of pitting is 0.010 inch (0.25 mm). The maximum permitted depth of wear or foreign object damage is 0.030 inch (0.76 mm).	If pitting, wear, or damage is greater than the serviceable permitted limits, replace the bulkhead spacer. Using an abrasive pad CM47 or equivalent, polish pushed up material to blend with the surrounding original surface
(2) Visually examine the bulkhead spacer for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 bulkhead spacer.
(3) Visually examine the bulkhead spacer for anodize coverage.	Surface area of pitting, wear, or damage coverage must not interfere with the ability of the bulkhead spacer to equally support the spinner bulkhead around the entire circumference of the bulkhead. Except for a few scratches and corners, the mounting plate must have complete anodize coverage.	Reanodize the bulkhead spacer in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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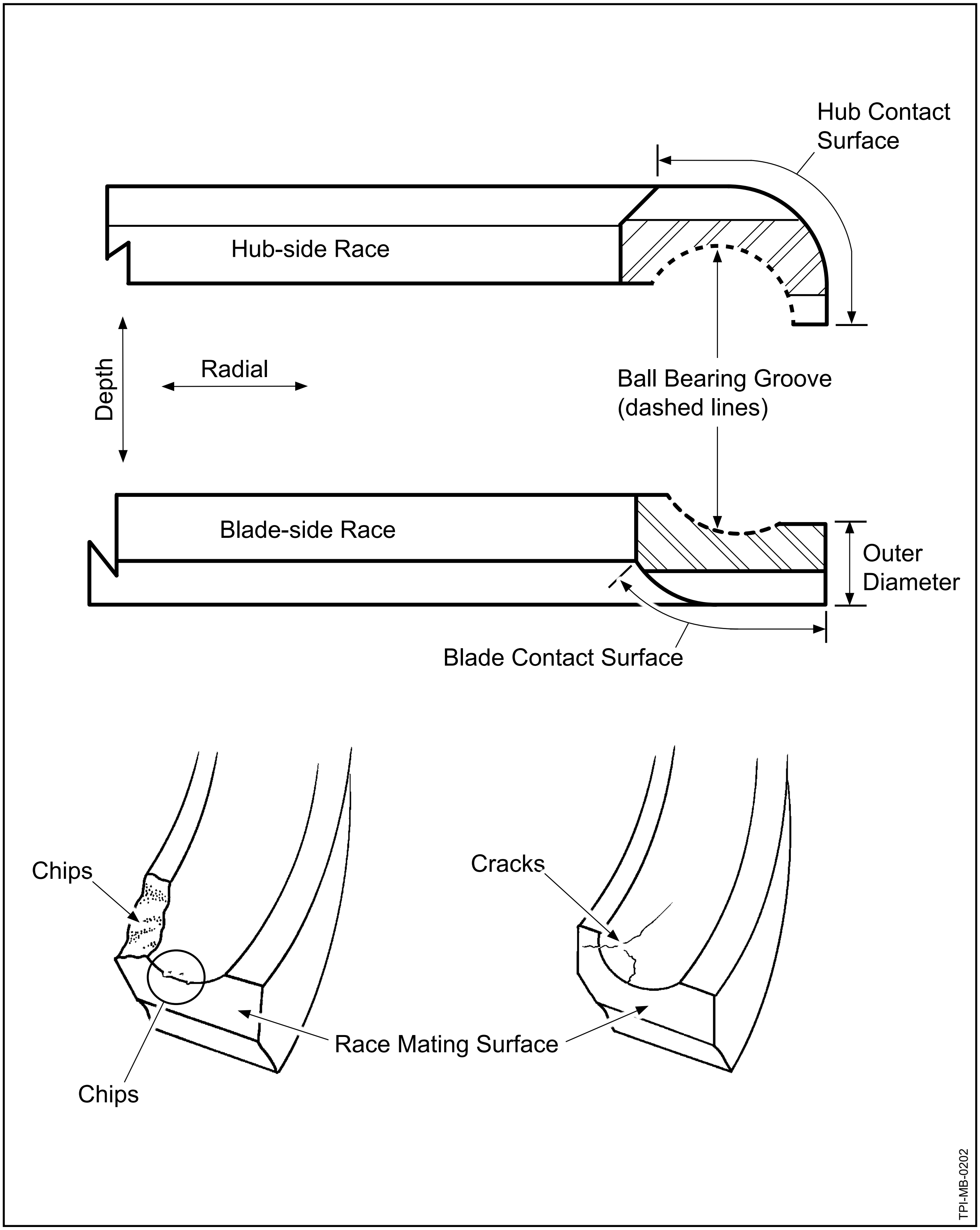

Race
Figure 5-5

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. Race (Item 581, 582) Refer to Figure 5-5.		
(1) Visually examine the ball bearing groove in each race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the race.
(2) Visually examine the ball bearing groove in each race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.003 inch (0.076 mm) in the ball bearing groove. The maximum permitted diameter of a pit is 0.032 inch (0.81 mm). The maximum permitted total area of pitting in the ball bearing groove on a complete race is 0.12 square inch (77.4 square mm) (two races for each bearing set). Pitting must not interfere with bearing ball movement or support.	If the pitting is greater than the permitted serviceable limits, replace the race.
	If the ball bearing groove has wear, measure the wear. The maximum permitted depth of wear is 0.005 inch (0.12 mm).	If the wear is greater than the permitted serviceable limits, replace the race.
	Fretting damage is not permitted.	If there is fretting damage, replace the race.
	For damage other than pitting or fretting, the maximum permitted depth of damage is 0.003 inch (0.076 mm) and must not interfere with bearing ball movement or support.	If damage is greater than the permitted serviceable limits, replace the race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. Race (Item 581, 582), continued Refer to Figure 5-5.		
(3) Except for the ball bearing groove, visually examine all other surfaces of each race for corrosion product.	Corrosion product is not permitted. If there is corrosion product, remove it in accordance with the corrective action repair limits.	Remove corrosion product using glass bead cleaning. For glass bead cleaning refer to the Cleaning chapter of Hartzell Propeller Inc.Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the race.
(4) Except for the ball bearing groove, visually examine all other surfaces of each race for pitting, wear, fretting, and damage.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm). The maximum permitted diameter of a pit is 0.062 inch (1.57 mm). The maximum permitted total area of pitting on all surfaces except the ball bearing groove of a complete race is 0.25 square inch (161.2 square mm) (two races for each bearing set).	If the pitting is greater than the permitted serviceable limits, replace the race.
	Fretting damage is permitted on the outer diameter of the races that interface with the bearing retaining ring (620). Fretting must not loosen the tight fit with the bearing retaining ring.	Clean the fretted area thoroughly using an abrasive pad CM47 or equivalent to decrease fretting damage to a minimum. If the fit of the bearing retaining ring (620) to the race is not tight, replace the race.
	Wear is not permitted.	If there is wear, replace the race.
	For damage other than pitting, the maximum permitted depth of damage is 0.005 inch (0.12 mm) and must not interfere with the mating surfaces.	If the damage is greater than the permitted serviceable limits, replace the race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Q. Race (Item 581, 582), continued Refer to Figure 5-5.		
(5) Visually examine the race for chips or cracks that are adjacent to the mating surfaces of the race.	Chips or cracks that are adjacent to the mating surfaces of the race are not permitted.	If there are chips or cracks adjacent to the mating surfaces of the race, replace the race.
(6) Magnetic particle inspect each race 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 race.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
R. Bearing Retaining Ring (Item 620)		
(1) Magnetic particle inspect and replate the bearing retaining ring in accordance with the Magnetic Particle Inspection and Cadmium Replating chapters 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 bearing retaining ring.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
S. Balance Weight (Item 650)		
(1) Visually examine the balance weight for corrosion product.	Corrosion product is not permitted. Remove corrosion product in accordance with the corrective action instructions.	Remove corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If the corrosion product cannot be removed, replace the balance weight.
(2) 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).	Using an abrasive pad CM47 or equivalent, polish to a maximum depth of 0.005 inch (0.12 mm). If the depth of pitting, wear, or damage is greater than the permitted serviceable limits or the corrective action limits, replace the balance weight.
(3) For a steel (silver color) balance weight: 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).

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Component Inspection Criteria
Table 5-1

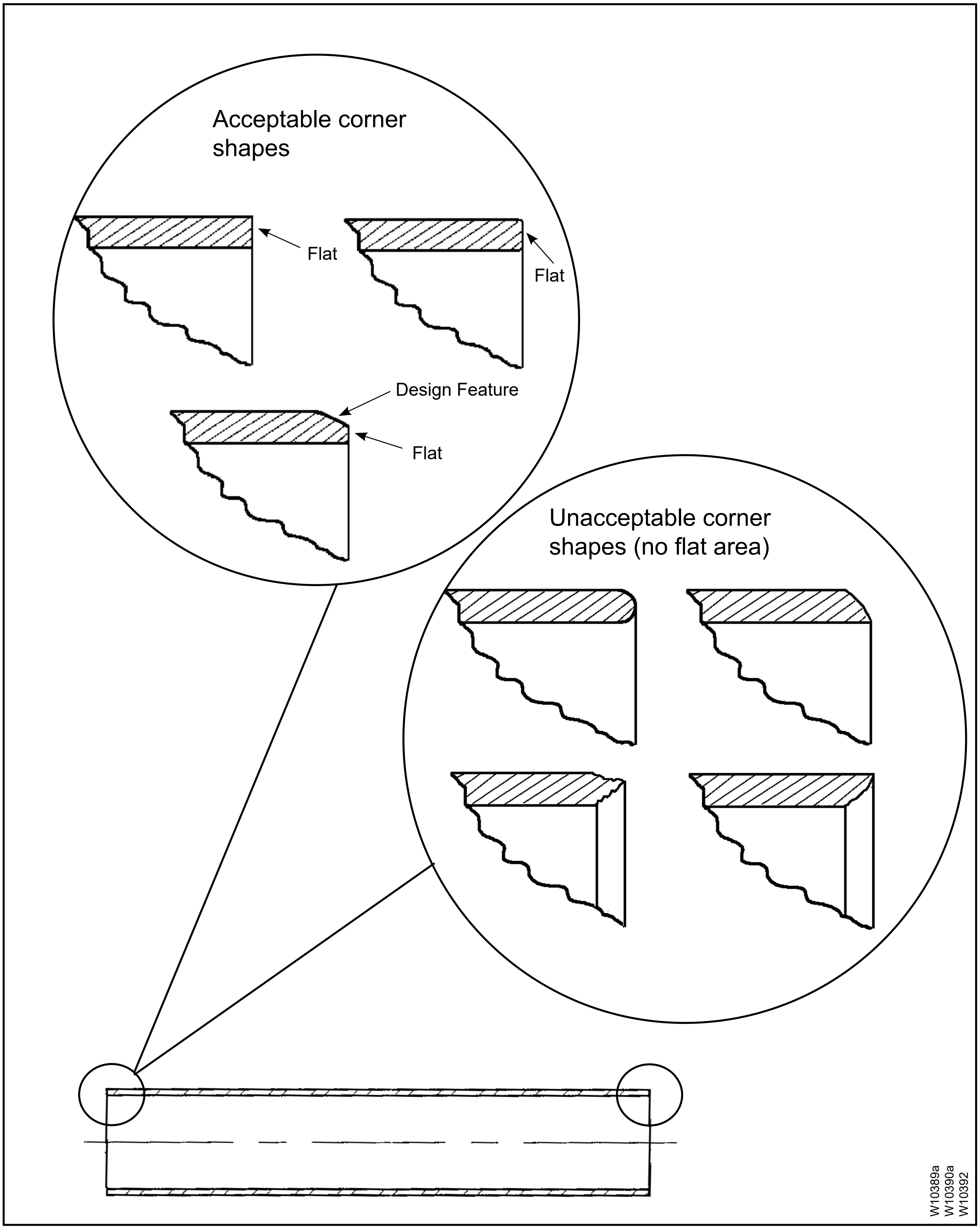
Inspect		Serviceable Limits	Corrective Action
T.	Pitch Change Rod (Item 1410)		
(1)	Visually examine the threaded areas of the pitch change rod for damage.	1/4 of one thread total accumulated damage is permitted on pitch change rods that engage pistons. One thread of total accumulated damage is permitted on 3/4 -16UNF-1A threads on the B-1942 pitch change rod. (Used in ground adjustable propellers).	If thread damage is greater than the permitted serviceable limits, replace the pitch change rod.
(2)	Measure the OD of the pitch change rod.	The minimum permitted OD of D-5862, B-868( )-( ), and B-3332 pitch change rods is 0.731 inch (18.57 mm). The minimum permitted OD of a B-855A pitch change rod is 0.981 inch (24.92 mm).	If the OD is less than the permitted serviceable limits, replace the pitch change rod.
(3)	Visually examine the pitch change rod for cadmium plate coverage.	Except for minor wear on corners and random light scratches, complete cadmium plate coverage is required.	Replate and bake applicable surfaces of the pitch change rod in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-10-02).
(4)	Magnetic particle inspect each pitch change rod 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 pitch change rod.

Component Inspection Criteria
Table 5-1

	Inspect	Serviceable Limits	Corrective Action
U.	Flanged Spring Retainer p/n A-856, A-871 (Item 1420)		
(1)	Visually examine the flanged spring retainer for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 flanged spring retainer.
(2)	Visually examine the flanged spring retainer for wear, pitting, nicks, gouges, or damage.	The maximum permitted depth of wear, pitting, nicks, gouges, or damage. 0.005 inch (0.12 mm).	If the wear, pitting, nicks, gouges, or damage is greater than the permitted serviceable limits, replace the flanged spring retainer.
(3)	Visually examine the 10-32 UNF-3B threaded holes for damage.	The maximum permitted depth of corrosion product is 0.003 inch (0.076 mm).	Remove light corrosion product using glass bead cleaning. Refer to the Cleaning chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). If corrosion product is greater than the permitted serviceable limits replace the flanged spring retainer.
		1/2 of one thread total accumulated damage is permitted in each threaded hole.	If thread damage is greater than the permitted serviceable limits, replace the flanged spring retainer.
(4)	Measure the ID of the pitch change rod hole.	The maximum permitted ID for a pitch change rod hole in an A-856 flanged spring retainer is 0.991 inch (25.17 mm). The maximum permitted ID for a pitch change rod hole in an A-871 flanged spring retainer is 0.741 inch (18.82 mm).	If the pitch change rod hole ID is greater than the permitted serviceable limits, replace the flanged spring retainer.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
U. Flanged Spring Retainer p/n A-856, A-871, continued (Item 1420)		
(5) Penetrant inspect the flanged spring retainer in accordance with the Penetrant 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 flanged spring retainer.



Spring Spacer Tube and Spring Sleeve Corner Inspection
Figure 5-6

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
V.	Spring Spacer Tube (Item 1430) Refer to Figure 5-6.		
	(1) Visually examine the spacer tube for indications of wear and pitting.	The maximum permitted depth of wear or pitting permitted is 0.005 inch (0.12 mm).	If wear or pitting is greater than the permitted serviceable limits, replace the spring spacer tube.
	(2) Visually examine the spring spacer tube for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 spring spacer tube.
	(3) Visually examine the shape of the corner of the spring spacer tube between the ID and the OD.	The corners on both ends of the spring spacer tube must have a flat surface and acceptable corner shapes as described in Figure 5-5.	If the corner shapes do not meet the permitted serviceable limits, replace the spring spacer tube.
	(4) Visually examine for chemical conversion coating on the A-3042A-( ) spring spacer tube. NOTE: There is no chemical conversion coating on the A-860-3 stop sleeve.	Except for the edges and a few minor scratches, chemical conversion coating must completely cover the outside of the spring spacer tube.	If damage is greater than the permitted serviceable limits, chemical conversion coat the spring spacer tube in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). .

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
W.	Spring Retainer Cup p/n B-666, A-1827-1, C-2858 (Item 1440)		
(1)	Visually examine the spring retainer cup for damage to the OD threads if applicable.	1/4 of one thread total accumulated damage (excluding drill damage to the first three threads) is permitted. No additional thread damage is permitted.	If thread damage is greater than the permitted serviceable limits, replace the spring retainer cup.
(2)	Visually examine the 10-32UNF-3B threaded holes for damage.	1/2 of one thread total accumulated damage per threaded hole is permitted.	If thread damage is greater than the permitted serviceable limits, replace the spring retainer cup.
(3)	Visually examine the spring retainer cup for damage to the safety wire hole area, if applicable.	Safety wire holes may be "pulled out" of the spring retainer cup. This damage is permitted if a new safety wire hole can be established. No other damage is permitted.	If damage is greater than the permitted serviceable limits, replace the spring retainer cup.
(4)	Measure the pitch change rod hole (ID) of the spring retainer cup or flanged spring retainer.	The maximum permitted ID of a pitch change rod hole is 0.741 inch (18.82 mm).	If the ID is greater than the permitted serviceable limits, replace the spring retainer cup.
(5)	Penetrant inspect the spring retainer flange in accordance with the Penetrant 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 spring retainer cup.
(6)	Visually examine a C-2858 spring retainer for anodize coverage.	Except for edges and a few minor scratches, anodize must completely cover the surface of the spring retainer cup.	If damage is greater than the permitted serviceable limits, reanodize the spring cup in accordance with the Chromic Acid Anodize chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
X.	<u>Spring Retainer Cup p/n B-1364</u> (Item 1440)		
(1)	Visually examine the spring retainer cup for pitting, nicks, and damage.	The maximum permitted depth of pitting, nicks, or damage is 0.005 inch (0.12 mm).	If damage is greater than the permitted serviceable limit, replace the spring retainer cup.
(2)	Visually examine the spring retainer cup for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 spring retainer cup.
(3)	Visually examine the threaded holes for damage.	1/2 of one thread total accumulated damage per threaded hole is permitted.	If damage is greater than the permitted serviceable limit, replace the spring retainer cup.
(4)	Visually examine the threaded holes for damage.	One thread total accumulated damage per threaded hole is permitted.	If damage is greater than the permitted serviceable limit, replace the spring retainer cup.
(5)	Measure the ID for supporting the rod guide bushing (1600).	The maximum permitted ID is 1.004 inches (25.50 mm).	If the ID is greater than the permitted serviceable limit, replace the spring retainer cup.
(6)	Penetrant inspect the spring retainer cup in accordance with the Penetrant 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 spring retainer cup.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Y. Spring Spacer (Item 1470) Refer to Figure 5-6.		
(1) Visually examine the spring spacer for pitting.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	If pitting is greater than the permitted serviceable limit, replace the spring spacer.
(2) Visually examine the spring spacer for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 spring spacer.
(3) Visually examine the shape of the corner of the spring spacer tube between the ID and the OD.	The corners on both ends of the spacer must be flat, as defined in Figure 5-6.	If damage is greater than the permitted serviceable limit, replace the spring spacer.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
Z. Spacer (Item 1500)		
(1) Visually examine the spacer for indications of wear and pitting.	The maximum permitted depth of wear or pitting is 0.005 inch (0.12 mm).	If wear or pitting is greater than the permitted serviceable limit, replace the spacer.
(2) Visually examine the spacer for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 spacer.
(3) Visually examine opposite ends of the spacer for flatness.	Ends of the spacer must be sufficiently flat to support a hydraulic load without damaging adjacent parts.	If damage is greater than the permitted serviceable limit, replace the spacer.
AA. Ball Thrust Bearing (Item 1530)		
(1) Examine the ball thrust bearing for smooth operation.	The bearing must rotate smoothly.	If the thrust bearing does not meet the permitted serviceable limits, replace the ball thrust bearing.
(2) Examine the ball thrust bearing races for pitting or wear.	The maximum permitted depth of damage is 0.002 inch (0.05 mm).	If the damage is greater than the permitted serviceable limits, replace the ball thrust bearing.
(3) Visually examine each bearing ball (encased in the ball thrust bearing) for corrosion product and pitting.	Corrosion product and pitting are not permitted.	If there is corrosion product or pitting, replace the ball thrust bearing.

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
AB.	Feathering Compression Spring (Items 1540, 1550, 1560)		
(1)	Visually examine each feathering compression spring for pitting.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	If pitting is greater than the permitted serviceable limit, replace the feathering compression spring.
(2)	Visually examine the feathering compression spring for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 feathering compression spring.
(3)	Magnetic particle inspect each feathering compression spring in accordance with the Magnetic Particle Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).	Cracks, laps, or seams are not permitted.	If damage is greater than the permitted serviceable limit, replace the feathering compression spring.
AC.	Spacer Sleeve (Item 1570)		
(1)	Visually examine the spacer sleeve for indications of wear.	Maximum depth of wear or pitting permitted is 0.010 inch (0.25 mm).	If the wear or pitting is greater than the permitted serviceable limits, replace the spacer sleeve.
(2)	Visually examine the shape of the corner of the spacer sleeve between the ID and the OD.	The corners on both ends of the spring sleeve must be flat, as defined in Figure 5-5.	If the flatness does not meet the permitted serviceable limits, replace the spacer sleeve.

Component Inspection Criteria
Table 5-1

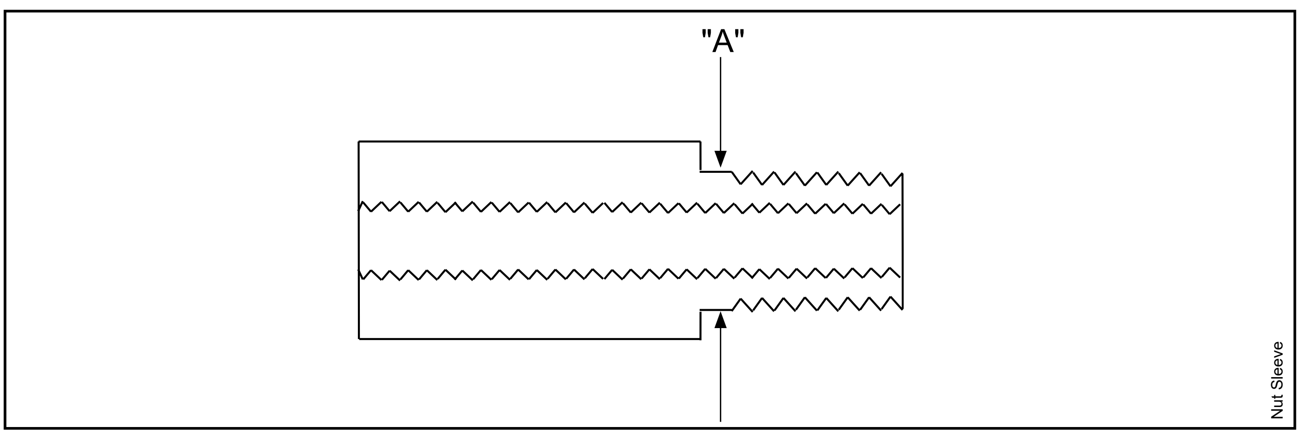
Inspect	Serviceable Limits	Corrective Action
AD. Rear Spring Retainer (Item 1580)		
(1) Visually examine the rear spring retainer for indications of pitting.	The maximum permitted depth of pitting permitted is 0.005 inch (0.12 mm).	If pitting is greater than the permitted serviceable limits, replace the rear spring retainer.
(2) Visually examine the rear spring retainer for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 rear spring retainer.
(3) Visually examine the rear spring retainer for damage caused by the feathering spring.	The maximum permitted depth of damage permitted is 0.005 inch (0.12 mm).	If damage is greater than the permitted serviceable limits, replace the rear spring retainer.
(4) Inspect the OD surface that contacts the engine shaft or hub bore for wear.	The minimum OD must be held in accordance with Table 5-3 below.	If pitting is less than the permitted serviceable limit, replace the rear spring retainer.

Rear Retainer	Minimum OD	
	Inches	Millimeters
A-857	2.227	56.56
A-866	1.236	31.39
A-866-3	1.475	37.46
A-1427	1.833	46.55
A-1829	2.464	62.58
A-3646	2.237	56.82
A-4008-1	3.116	79.14

Rear Spring Retainer Inspection Limits
Table 5-3

Component Inspection Criteria
Table 5-1

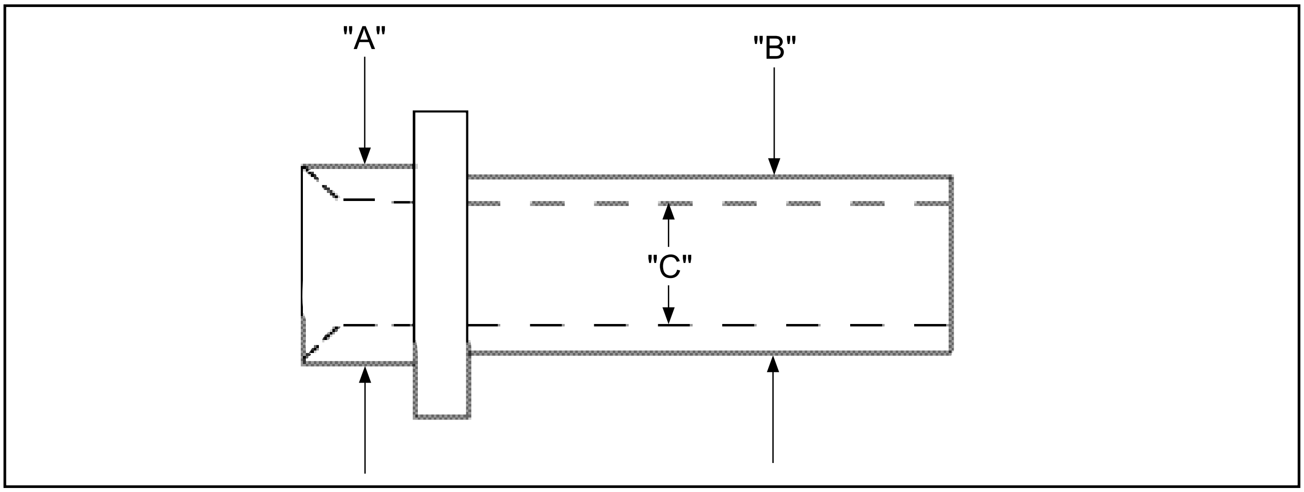
Inspect	Serviceable Limits	Corrective Action
AE. Nut Sleeve (Item 1585) Refer to Figure 5-7.		
(1) Visually examine the external threads for damage.	1/2 of one thread total accumulated damage is permitted.	If the damage is greater than the permitted serviceable limits, replace the nut sleeve.
(2) Visually examine the internal threads for damage.	1/2 of one thread total accumulated damage is permitted in each threaded hole.	If the damage is greater than the permitted serviceable limits, replace the nut sleeve.
(3) Visually examine the nut sleeve for pitting.	The maximum permitted depth of pitting is 0.010 inch (0.25 mm).	If the pitting is greater than the permitted serviceable limits, replace the nut sleeve.
(4) Visually examine the nut sleeve for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 nut sleeve.
(5) Visually examine the unthreaded areas for damage.	The maximum permitted depth of damage is 0.025 inch (0.63 mm).	If the damage is greater than the permitted serviceable limits, replace the nut sleeve.
(6) Measure the nut sleeve OD "A".	The minimum permitted OD is 0.996 inch (25.30 mm).	If the OD does not meet the permitted serviceable limits, replace the nut sleeve.



Nut Sleeve Inspection
Figure 5-7

Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
AF.	Rod Guide Bushing (Item 1600) Refer to Figure 5-8.		
(1)	Visually examine the rod guide bushing for pitting, nicks, and damage.	The maximum permitted depth of pitting, nicks, or damage is 0.005 inch (0.12 mm).	If the damage is greater than the permitted serviceable limits, replace the rod guide bushing.
(2)	Visually examine the rod guide bushing for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 rod guide bushing.
(3)	Measure the rod guide bushing OD "A".	The minimum permitted OD is 0.997 inch (25.33 mm).	If the OD is less than the permitted serviceable limits, replace the rod guide bushing.
(4)	Measure the rod guide bushing OD "B".	The minimum permitted OD is 0.849 inch (21.57 mm).	If the OD is less than the permitted serviceable limits, replace the rod guide bushing.
(5)	Measure the rod guide bushing ID "C".	The maximum permitted ID is 0.741 inch (18.82 mm).	If the ID is less than the permitted serviceable limits, replace the rod guide bushing.



Rod Guide Bushing Dimensions
Figure 5-8

Component Inspection Criteria
Table 5-1

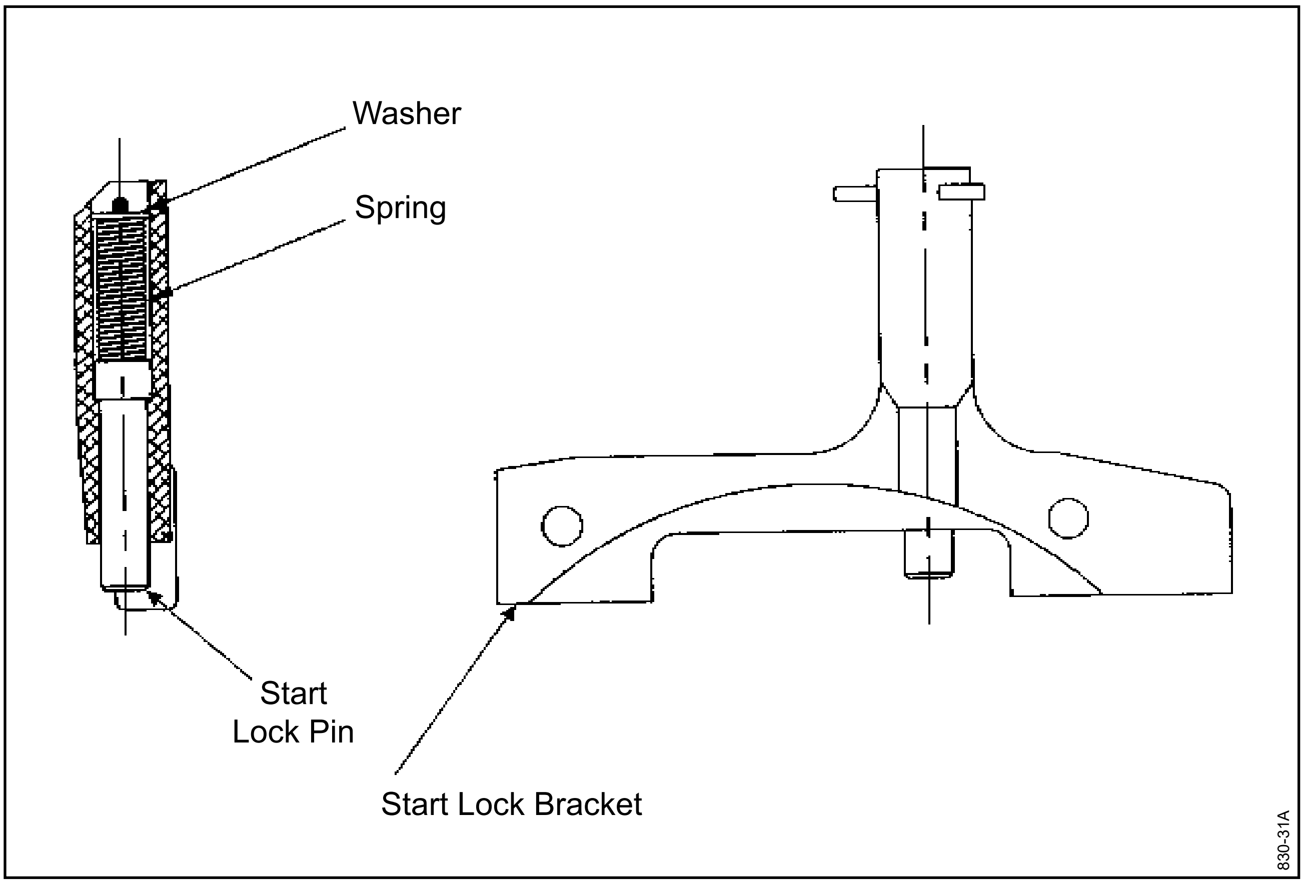
Inspect		Serviceable Limits	Corrective Action
AG.	Spring Retainer Cup p/n B-1943 (Item 1610)		
(1)	Visually examine the spring cup retainer cup for pitting, nicks, and damage.	The maximum permitted depth of pitting, nicks, or damage is 0.005 inch (0.12 mm).	If damage is greater than the permitted serviceable limit, replace the spring retainer cup.
(2)	Visually examine the spring retainer cup for indications of corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 spring retainer cup.
(3)	Visually examine the threaded holes for damage.	1/2 of one thread total accumulated damage per threaded hole is permitted.	If damage is greater than the permitted serviceable limit, replace the spring retainer cup.
(4)	Visually examine the threaded holes for damage.	One thread total accumulated damage per threaded hole is permitted.	If damage is greater than the permitted serviceable limit, replace the spring retainer cup.
(5)	Measure the ID for supporting the sleeve nut (1585).	The maximum permitted ID is 1.006 inches (25.55 mm).	If the ID is greater than the permitted serviceable limit, replace the spring retainer cup.
(6)	Penetrant inspect the spring retainer cup in accordance with the Penetrant 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 spring retainer cup.

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AH. Split Keeper Retaining Ring (Item 1635)		
(1) Visually examine the outer plate for pitting, wear, and damage.	The maximum permitted depth of wear, pitting or damage permitted is 0.005 inch (0.12 mm).	If wear, pitting, or damage is greater than the permitted serviceable limits, replace the outer plate.
(2) Visually examine the outer plate for corrosion product.	Corrosion product is not permitted.	Remove light corrosion product 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 outer plate.
(3) Visually examine the outer plate for cadmium plate coverage.	A few random scratches are permitted. Otherwise, cadmium plate must completely cover the plate.	If damage is greater than the permitted serviceable limits, replate the outer plate in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AI. Start Lock Bracket (Item 1700) Refer to Figure 5-9.		
(1) Visually examine the start lock bracket for corrosion product.	Corrosion product is not permitted.	Remove corrosion product 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 start lock bracket.



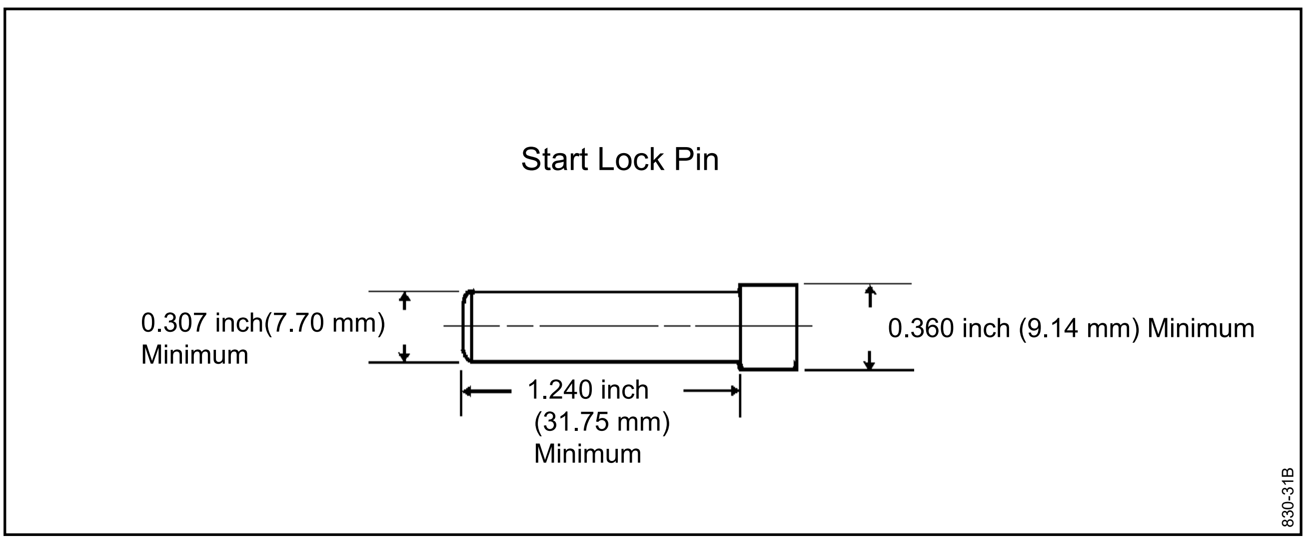
Start Lock Unit
Figure 5-9

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AI. <u>Start Lock Bracket</u> (Item 1700), continued Refer to Figure 5-8.		
(2) Visually examine the start lock bracket for damage.	Damage or raised material is not permitted.	Using an abrasive pad CM47 or equivalent, polish the damaged area and chemical conversion coat in accordance with the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). Repairs up to 0.005 inch (0.12 mm) deep are permitted. If the damage cannot be repaired, replace the start lock bracket.
(3) Penetrant inspect the start lock bracket in accordance with the Penetrant Inspection chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02). <u>CAUTION</u>: DO NOT REMOVE THE ANODIZE COATING BEFORE PENETRANT INSPECTION.	A relevant indication is not permitted.	If there is a relevant indication, replace the start lock bracket.

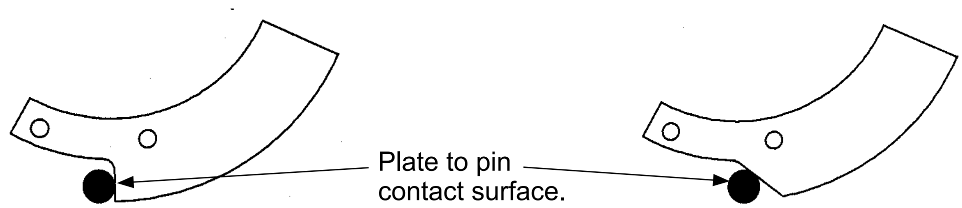
Component Inspection Criteria
Table 5-1

Inspect		Serviceable Limits	Corrective Action
AJ.	Start Lock Pin (Item 1720) Refer to Figure 5-10.		
(1)	Visually examine the start lock pin for corrosion product.	Corrosion product is not permitted.	Remove corrosion product 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 start lock pin.
(2)	Measure the start lock pin.	For the minimum permitted dimensional limits, refer to Figure 5-9.	If a dimension is less than the permitted serviceable limits, replace the start lock pin.
(3)	Visually examine the start lock pin for damage.	Damage or raised material is not permitted.	Using an abrasive pad CM47 or equivalent, remove all damage. Repairs up to 0.005 inch (0.12 mm) deep are permitted. If damage cannot be removed, replace the start lock pin.



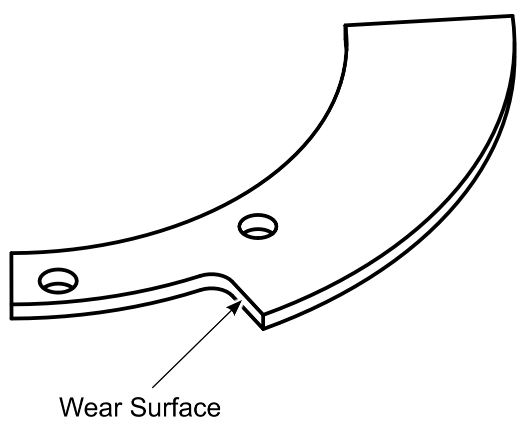
Start Lock Pin
Figure 5-10

Filing start lock plates is permitted to achieve high pitch. If filing is performed, the notched area must contact the pin squarely. If the start lock plate has been modified and does not permit square contact, the start lock plate must be replaced.



This contact area of this start lock plate has been modified to allow the start lock pin to squarely contact the start lock plate.

This is an example of a modified start lock plate that is unacceptable. The start lock plate does not squarely contact the start lock plate. The start lock plate must be replaced.



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Start Lock Plate
Figure 5-11

Component Inspection Criteria
Table 5-1

Inspect	Serviceable Limits	Corrective Action
AK. Start Lock Plate (Item 1740) Refer to Figure 5-11.		
(1) Visually examine the start lock plate for 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 within the permitted serviceable limits, replace the start lock plate.
(2) Visually examine the start lock plate for pitting.	The maximum permitted depth of pitting is 0.005 inch (0.12 mm).	If pitting is greater than the permitted serviceable limit, replace the start lock plate.
(3) Visually examine the start lock plate for scratches.	The maximum permitted scratch depth is 0.005 inch (0.12 mm).	If the depth of a scratch is greater than the permitted serviceable limit, replace the start lock plate.
(4) Visually examine for wear on the surface that contacts the start lock pin.	The maximum permitted wear depth is 0.020 inch (0.50 mm).	If the start lock angle can still be obtained, remove wear depth by filing the notched area; otherwise, replace the start lock plate. Refer to the Figure 5-11.
(5) Visually examine the start lock plate for cadmium plate coverage.	A few random scratches are permitted. Otherwise, cadmium plate must completely cover the start lock plate.	Replate and bake the start lock plate in accordance with the Cadmium Replating chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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WARNING 1: 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 HARTZELL PROPELLER INC. FOR GUIDANCE ABOUT THE AIRWORTHINESS OF ANY PART WITH UNUSUAL WEAR OR 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: 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) Some 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 the Shot Peening chapter of 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 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. 3)

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) 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. Spinner Assemblies

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

(2) Composite Spinners: Refer to the following 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 <u>not</u> supplied by Hartzell, refer to the applicable TC or STC holder's Instructions for Continued Airworthiness (ICA).

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1. General (Rev. 6)

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.

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 Table 8-1, "Torque Values", 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).

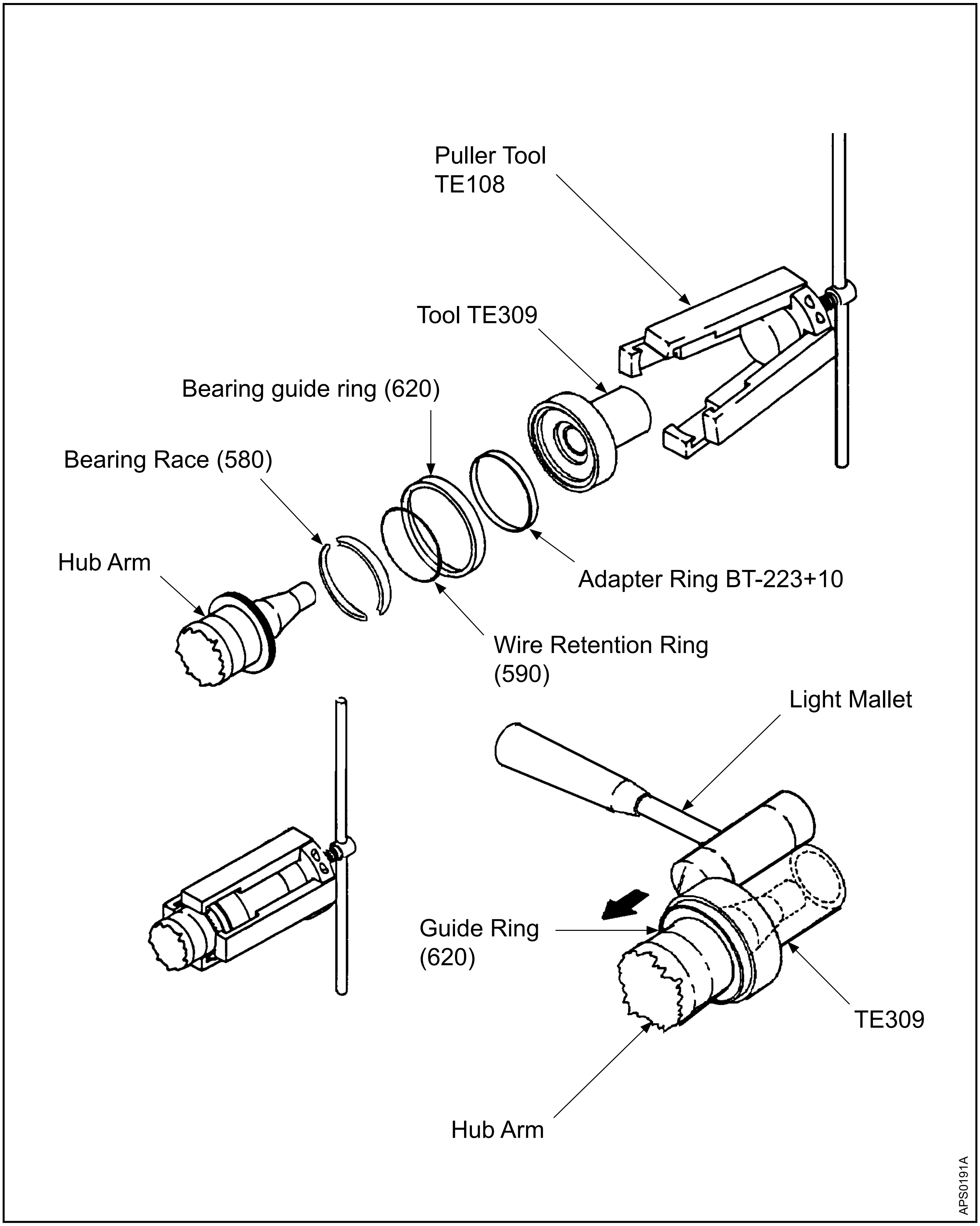
(2) For composite blades, refer to Hartzell Propeller Inc. Composite Blade Overhaul Manual 135F (61-13-35).

E. Blade Angle Information

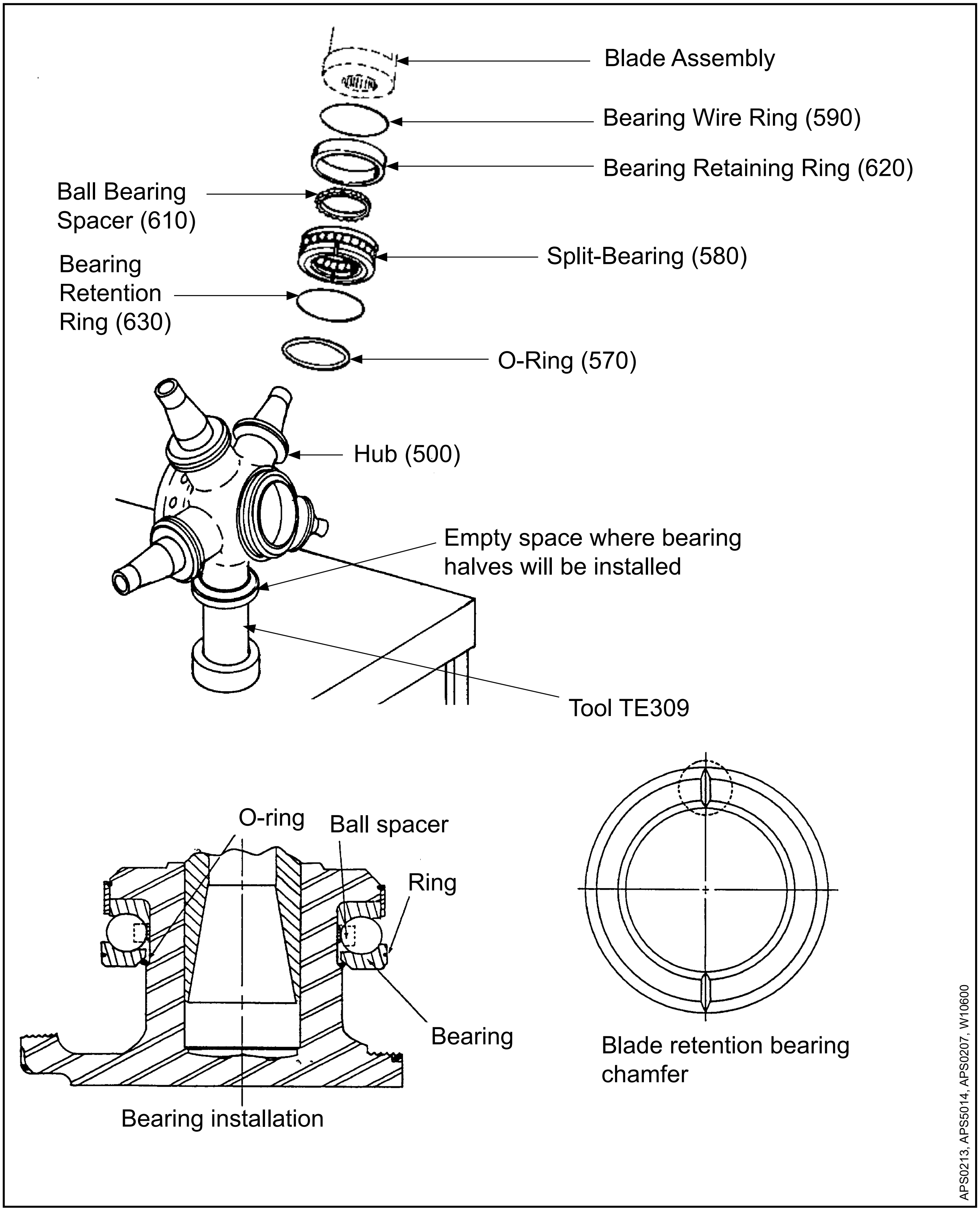
(1) For specific blade angle information, refer to the Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

F. Blade Clamp Assembly

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



Hub Arm Build-Up
Figure 7-1



Blade and Flange Mounting Parts
Figure 7-2

2. Assembly of Flanged-Hub Propeller Model HC-B4TN-1

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

NOTE: Item numbers in the following text refer to the figures in the Illustrated Parts List chapter of this manual, unless otherwise noted.

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table.

(2) Tighten the mounting bolts (440) until snug.

(3) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(4) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

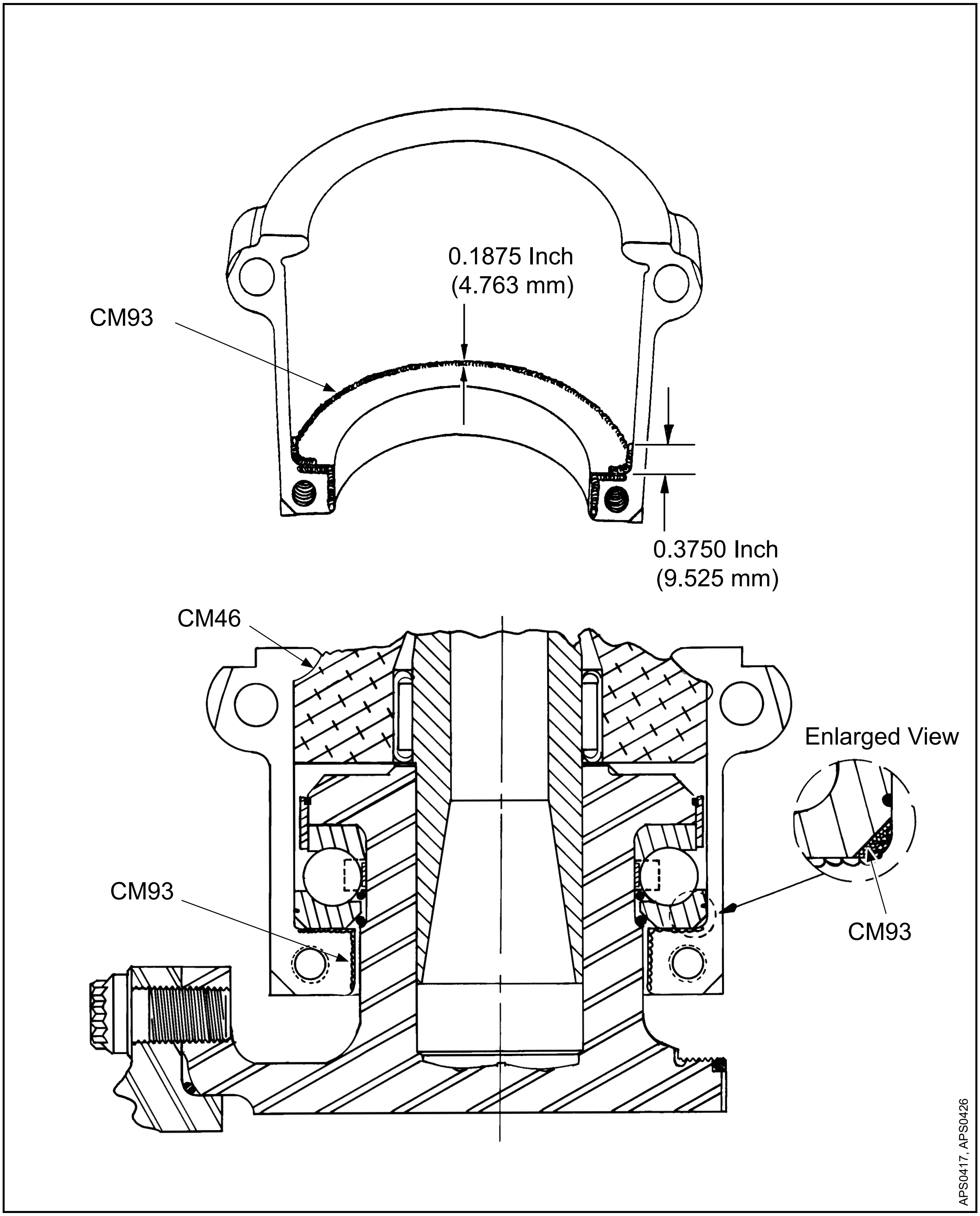
NOTE: Drive the bearing guide ring (620) far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.



CM93 Sealant Application
Figure 7-3

CAUTION: THE WIRE RETENTION RING (590) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Use a combination of special tools TE309 and TE108, or equivalents, to press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (630) to seat in the wire retention groove in the bearing guide ring. Refer to Figure 7-1.

(12) Make sure the wire retention ring (630) is fully enclosed.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical. Refer to Figure 7-2.

NOTE: The arm of the hub unit (500) being fitted with bearing races (580) must be facing down, so that the hub flange and bearing guide ring (620) form an empty space that will hold the bearing races.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Refer to Figure 7-3.

(16) Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (630) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (590).

(17) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(18) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race. Refer to Figure 7-3.

(19) Move the O-ring (570) outboard against the inboard bearing race (580).

(20) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(21) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

CAUTION: A LINK ARM (130) CANNOT BE INSTALLED ON THE BLADE CLAMP-HALF (830) AFTER THE BLADE CLAMP (700) IS INSTALLED ON THE HUB UNIT (500).

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the clamp-half (830).

(c) Install the link arm (130) on the link screw (720). The raised shoulder on the link arm must face outboard, toward the clamp-half (830).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to secure the link arm (130).

NOTE: The lubrication fittings (850) are not installed on the clamp-halves (830) at this stage of assembly.

(f) Repeat the assembly procedure for the remaining clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (500) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

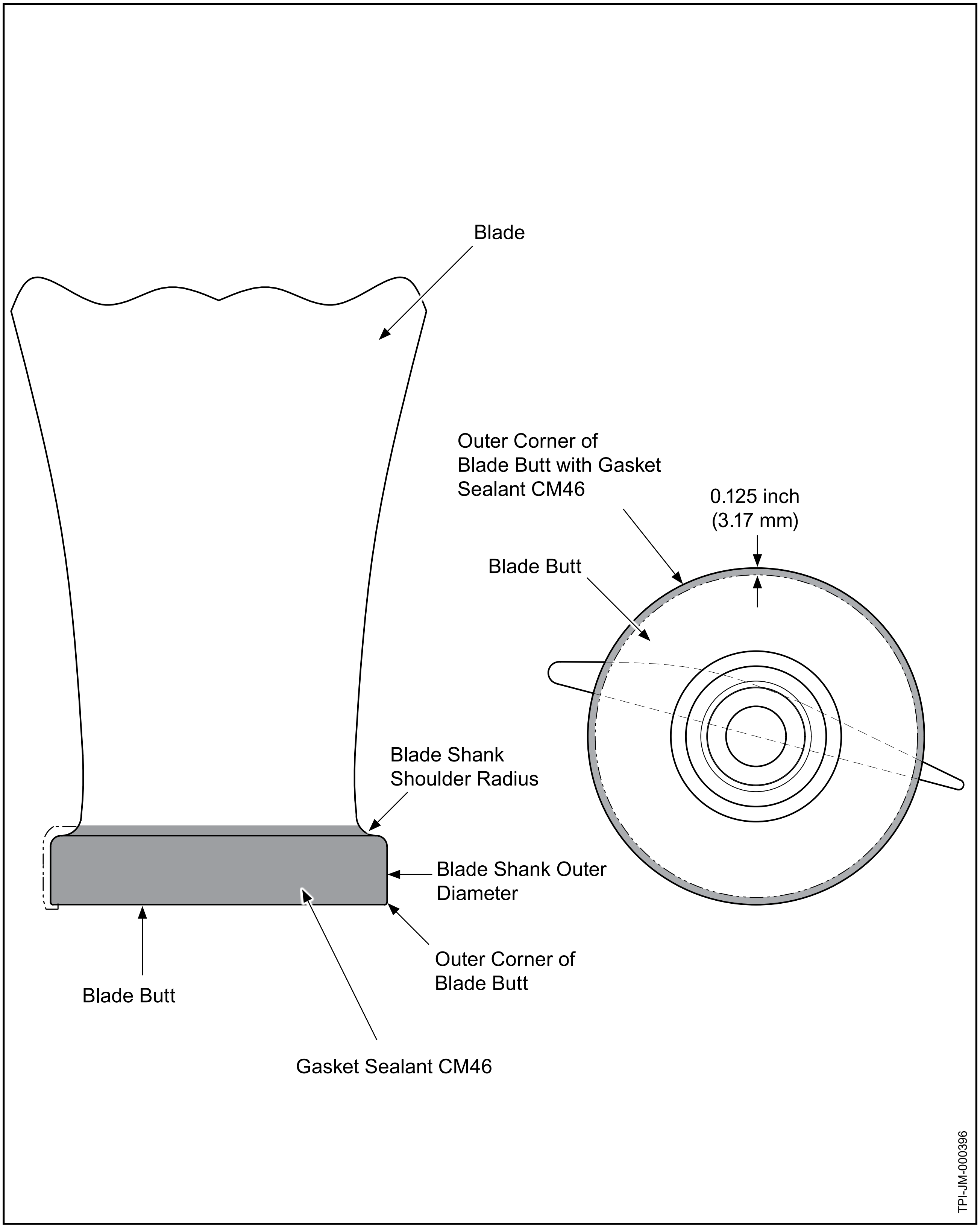
CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.



Gasket Sealant CM46 Application
Figure 7-4

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

(7) Remove the masking tape used to temporarily hold the blade split-bearing together

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(8) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(9) Attach the corresponding lower clamp half, enclosing the bearing assembly.

(10) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(11) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(12) Install the self locking nuts (760). Hand-tighten the self locking nuts.

(13) Insert the inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(14) Torque the inboard clamp screws (730) in 10 Ft-Lb increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(15) Using a #42 size bit, drill the head of each inboard clamp screw (730).

(16) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

NOTE: If an installed cotter pin (840) causes interference, three loops of safety wire CM131 may be used to safety the inboard clamp screw (730).

(17) Repeat this procedure for the remaining blades and clamps.

D. Cylinder Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(2) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(3) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(4) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(5) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(6) Examine the slot in the top of the cylinder (300) 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 (300).

(8) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of put during cylinder installation.

E. Feathering Spring Assembly

(1) Use special fixture TE59 to compress the feathering spring assembly (1400).

(2) Install the spacer (1500) and optional high stop spacer (1480) as necessary on the pitch change rod (1410).

(3) Install the spring retainer cup (1440) on the pitch change rod (1410).

(4) Install the thrust bearing (1530) on the pitch change rod (1410).

(5) Add the spring spacers (1480) as needed.

NOTE: The exact number of spacers (1480) needed is not known until the counterweight angle is set (later assembly procedure); however, the number of spacers needed will usually be the same as the number of spacers removed during propeller disassembly.

(6) Install the spacer tube (1430) on the pitch change rod (1410).

(7) Install the feathering spring (1540) over the spacer tube (1430).

(8) Install the rear spring retainer (1580) on the feathering spring (1540).

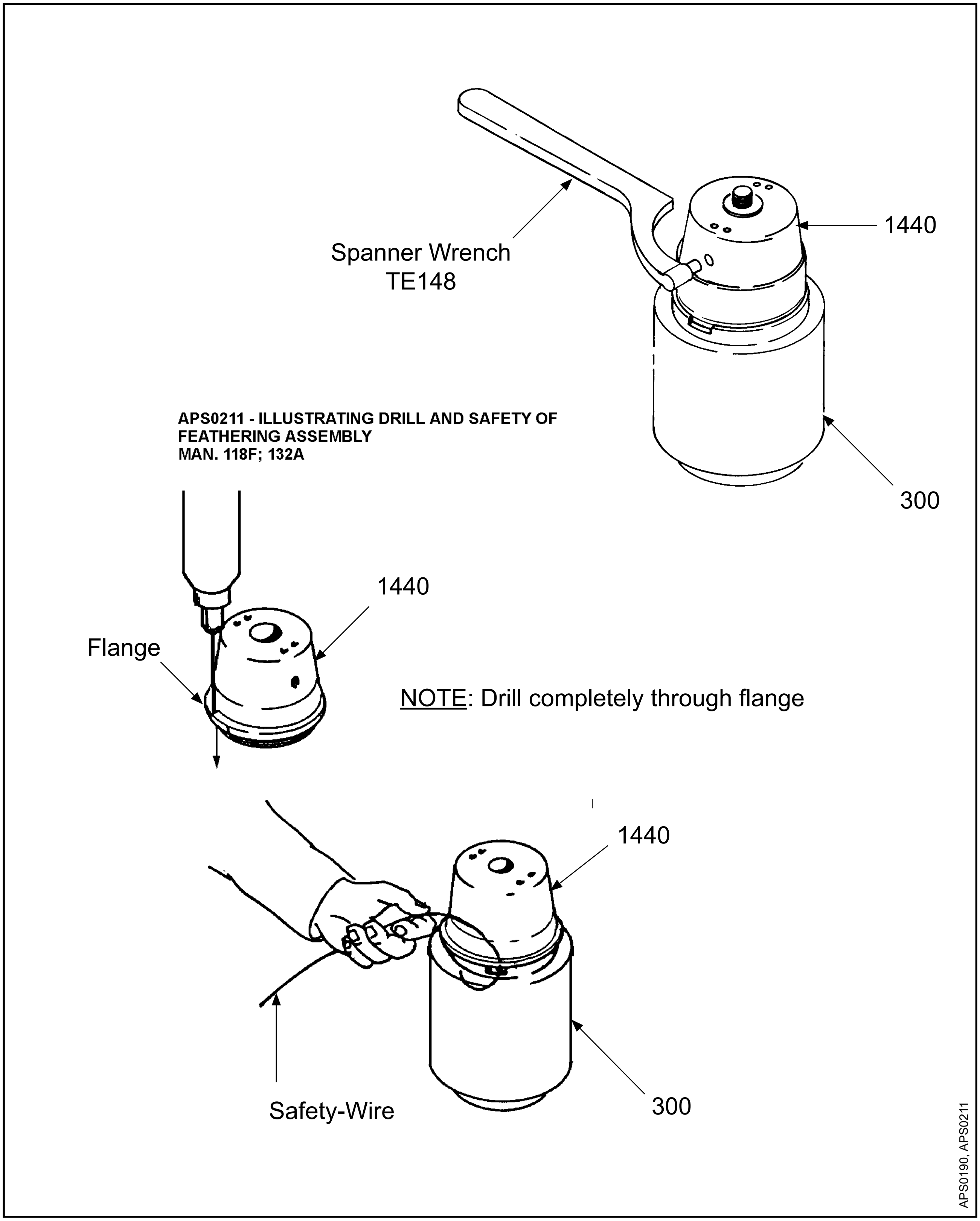
WARNING: USE EXTREME CAUTION. WHEN COMPRESSED, THE FEATHERING SPRING ASSEMBLY (1400) IS LOADED TO APPROXIMATELY 400 POUNDS (182 KG) FORCE.

(9) Compress the feathering spring assembly (1400) enough to install the split keeper (1590) that holds the feathering spring retainer (1580) in compression on the pitch change rod (1410).

NOTE: Applying oil or grease to each half of the split keeper (1590) will keep it in position until the feathering spring retainer (1580) is decompressed.

CAUTION: MAKE SURE THE SPLIT KEEPER (1590) DOES NOT COME OUT OF THE GROOVE IN THE PITCH CHANGE ROD (1410) DURING DECOMPRESSION OF THE FEATHERING SPRING RETAINER (1580).

(10) Carefully decompress (unload) the feathering spring assembly (1400).



Feathering Spring Assembly
Figure 7-5

F. Feathering Spring Assembly Installation

(1) Apply anti-seize compound CM118 to the threads of the spring retainer cup (1440).

(2) Install the feathering spring assembly (1400) in the cylinder (300).

(3) Using a spanner wrench TE148, install the feathering spring assembly (400) in the cylinder (300).

(4) Tighten the feathering spring assembly (1400) until the attachment is snug.

(5) Using a #42 size (0.0935 inch [2.375 mm]) drill bit, drill through the flange of the spring retainer cup (1440) at the wrench slot in the cylinder (300). Drill in and down at an angle that goes out the other side of the flange. Refer to Figure 7-5.

(6) Install 0.032-inch (0.81 mm) minimum diameter stainless steel wire CM131 through the drilled hole.

(a) Use three loops of wire to safety the feathering spring assembly (1400).

(b) Tuck the "pigtail" into the slotted area.

G. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12 and carefully install it in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there is an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

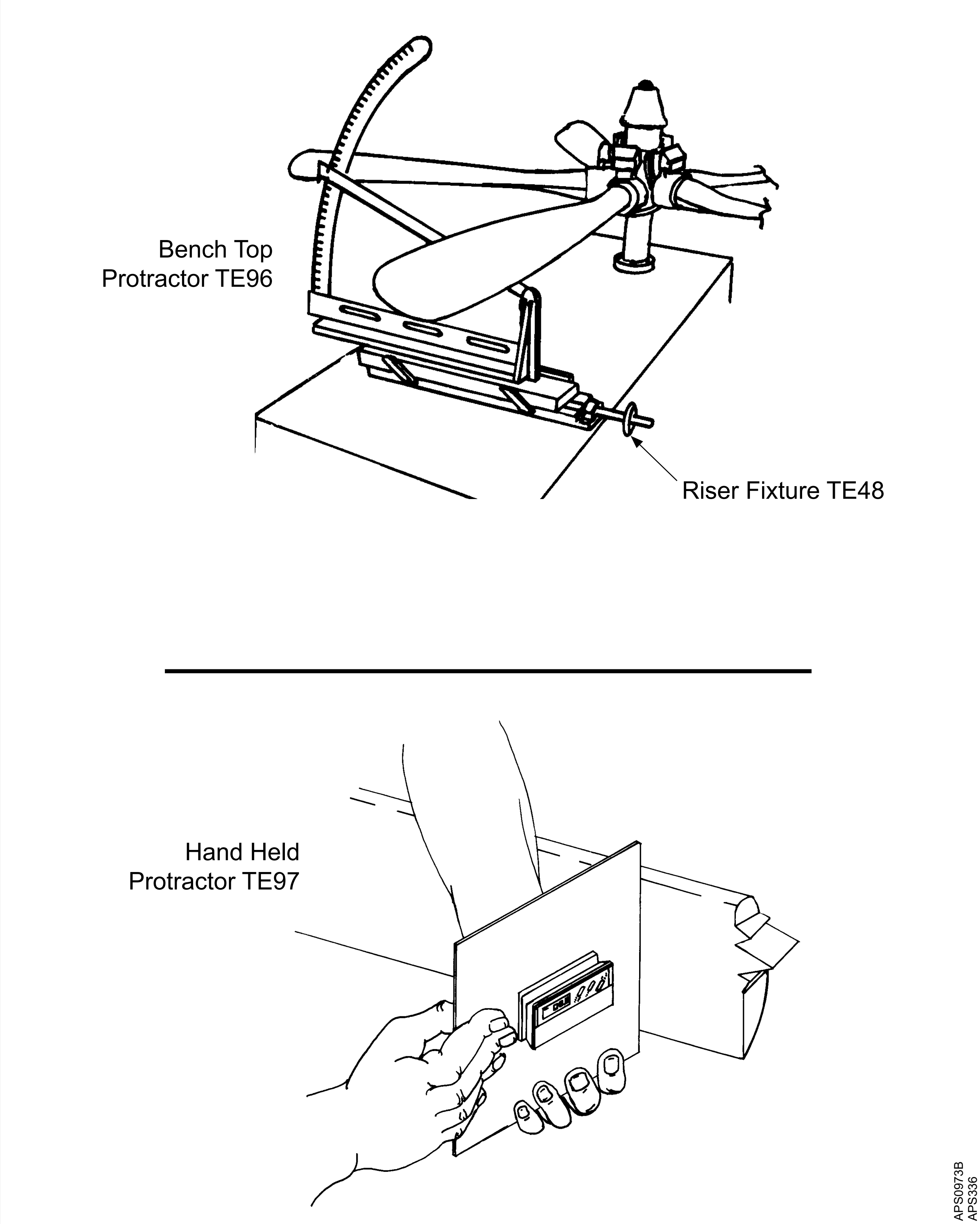
(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) in position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120).



Setting the Blade Angle
Figure 7-6

CAUTION 1: MAKE SURE THAT THE CORRECT SAFETY SCREWS (110) ARE INSTALLED AND THAT AT LEAST THREE THREAD LENGTHS ARE AVAILABLE IN THE PISTON UNIT (30) TO HOLD THE SCREWS (110) IN POSITION.

CAUTION 2: MAKE SURE THE LINK ARM (130) MOVES FREELY.

(9) Install the safety screws (110) in each link pin unit (120).

(10) Move the piston unit (30) into high pitch position (back against the hub assembly) so that the threaded end of the pitch change rod (1410) passes through the end of the piston unit (30).

(11) Install the self-locking hex nut (10) on the end of the pitch change rod (1410).

(12) Using a wrench on the nut (10) and a socket on the pitch change rod (1410), torque the nut in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

H. Setting Blade Angle

NOTE: At this step of assembly, the outboard clamp bolts (750) have not been tightened.

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

(1) Apply pressure to the piston unit (30) through the rotatable fixture on the propeller assembly table.

(2) Move the piston unit (30) to the lowest pitch position.

(3) Use a bench-top protractor TE96 at the 30-inch (762 mm) reference blade radius location, as shown in Figure 7-6, to adjust the angle of the blades.

NOTE: Refer to the Aircraft Type Certificate Data Sheet, Supplemental Type Certificate Date Sheet, or Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59) for information about required blade angles, tolerances, and radius references.

(4) Turn the blades to low pitch position in the blade clamps (700).

(5) Torque the nuts (760) on the outer clamp bolts (750) in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: THE ANGLE OF ALL BLADES MUST BE WITHIN 0.2 DEGREE OF EACH OTHER AT LOW PITCH OR FLOATING PITCH.

(6) Measure the angle of each blade and make sure that the maximum blade angle difference between blades is 0.2 degree. If it is not, then reset the blades in the blade clamps (700).

(7) Make sure that high pitch can be accomplished.

(8) If high pitch cannot be accomplished, add or remove a washer (1480) as needed.

NOTE: One washer will change blade angle by approximately 0.7 degree.

I. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

3. Assembly of Splined-Hub Propeller Model HC-B3Z20-1

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-2. Tighten the shaft nut (360) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

NOTE: Drive the bearing guide ring (620) far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(4) Repeat the bearing guide ring (620) installation procedure on the remaining blade arm flanges of the hub unit (500).

(5) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(6) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(7) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (630) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(8) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(9) Install the wire retention ring (630).

(10) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (630) to seat in the wire retention groove in the bearing guide ring.

(11) Make sure the wire retention ring (630) is fully enclosed.

(12) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

NOTE: The arm of the hub unit (500) being fitted with bearing races (580) must be facing down, so that the hub flange and bearing retaining ring (620) form an empty space that will hold the bearing races.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(13) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(14) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may have been moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (590) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (590).

(15) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (630) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(16) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(17) Move the O-ring (570) outboard against the inboard bearing race (580).

(18) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(19) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Blade and Clamp Installation

(1) With the hub assembly (500) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly. Attach the corresponding lower clamp half, enclosing the bearing assembly.

(10) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(11) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(12) Install the self locking nuts (760). Hand-tighten the self locking nuts.

(13) Insert the inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(14) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

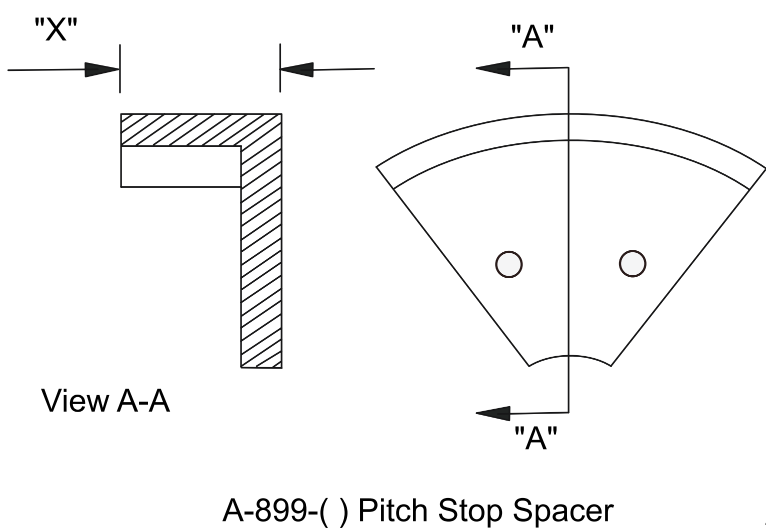
(15) Using a #42 size bit, drill the head of each inboard clamp screw (730).

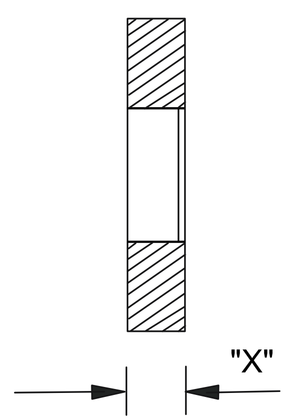
(16) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

NOTE: If an installed cotter pin (840) causes interference, three loops of safety wire CM131 may be used to safety the inboard clamp screw (730).

A-899 ( ) Pitch Stop Spacer	
Part No.	"x" +/- 0.010 inch (0.25 mm)
A-899	0.250 inch (6.35 mm)
A-899-1	0.265 inch (6.73 mm)
A-899-2	0.280 inch (7.11 mm)
A-899-3	0.295 inch (7.49 mm)
A-899-4	0.310 inch (7.87 mm)
A-899-5	0.325 inch (8.25 mm)
A-899-6	0.340 inch (8.63 mm)
A-899-7	0.355 inch (9.01 mm)
A-899-8	0.370 inch (9.39 mm)
A-899-9	0.385 inch (9.77 mm)
A-899-10	0.400 inch (10.16 mm)
A-899-11	0.415 inch (10.54 mm)
A-899-12	0.430 inch (10.92 mm)
A-899-13	0.445 inch (11.30 mm)
A-899-14	0.460 inch (11.68 mm)
A-899-15	0.475 inch (12.06 mm)
A-899-16	0.490 inch (12.44 mm)
A-899-17	0.505 inch (12.82 mm)
A-899-18	0.520 inch (13.20 mm)
A-899-19	0.535 inch (13.58 mm)
A-899-20	0.550 inch (13.97 mm)

A-970-( ) Pitch Stop Spacer	
Part No.	"x" +/- 0.010 inch (0.25 mm)
A-970	0.250 inch (6.35 mm)
A-970-1	0.280 inch (7.11 mm)
A-970-2	0.310 inch (7.87 mm)
A-970-3	0.340 inch (8.63 mm)
A-970-4	0.370 inch (9.39 mm)
A-970-5	0.400 inch 10.16 mm)
A-970-6	0.430 inch (10.92 mm)
A-970-7	0.460 inch (11.68 mm)
A-970-8	0.490 inch (12.44 mm)
A-970-9	0.520 inch (13.20 mm)
A-970-10	0.550 inch (13.97 mm)





A-899-( ) and A-970-( ) Pitch Stop Spacers
Figure 7-7

C. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12, and carefully install the O-ring in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE CYLINDER (300).

(4) Install the piston dust seal (270) in the groove supplied for it in the cylinder (300).

(5) Match the index numbers (1, 2, and 3) on the pitch change forks (160) and outside of the piston unit (30) with the index numbers on the counterweights (800).

(6) Install the rod sleeve (165) and pitch stop spacer (170) in the bulkhead. Refer to Figure 7-7.

(7) Pitch change blocks (190) will require fitting to the pitch change fork (160).

(a) Remove material from the forward (thin) side of the pitch change block (190) as required for fit to the pitch change fork (160).

(b) Radius the side of the pitch change block (190) for hub clearance.

(c) Radius the inside corners of the pitch change block (190) to match the inside radius of the pitch change fork (160).

(8) Install the pitch change block (190) on each clamp link screw (720). Turn each block so that the thick side will be in the bottom of the fork.

(9) Oil the surface of the cylinder (300).

(10) Engage the pitch change forks (160) on the pitch change blocks (190).

(11) Install the piston guide rods through the pitch change fork (160) and through the sleeves (165) in the bulkhead.

(12) Install the washer (210) and jam nut (220) on the end of each guide rod (70). Tighten the jam nut.

(13) Align the fork (160) square (or slightly toward the hub) with the clamp.

(14) Torque the jam nut (220) against the guide rod (70) in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

NOTE: The set screws (180) located in the each pitch change fork (160) are not tightened during propeller assembly. Secure the set screw during propeller installation, immediately after the jam nut (220) is torqued.

D. Setting Blade Angle

CAUTION 1: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 2: USE SUFFICIENT AIR PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

(1) Apply pressure to the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on Blade One at the reference blade radius. Refer to Figure 7-6.

(3) The low pitch angle of all blades must be within a blade-to-blade tolerance of 0.2 degree from the maximum to the minimum blade angle at low pitch.

(4) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(5) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

 (a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

 (b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(6) Repeat this procedure for each of the other blades.

(7) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

 NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(8) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

(9) If the high pitch blade angle is incorrect, remove piston and change the high stop spacer size as needed, to achieve the correct high pitch blade angle.

NOTE 1: As the high stop spacer length increases, the high pitch blade angle decreases.

NOTE 2: The height at the tip of each blade can vary within 0.125 inch (3.17 mm).

(10) Examine end-play movement on each blade tip. Refer to Figure 1-1 in the Testing and Fault Isolation chapter, and the Blade Tolerance Table in the Fits and Clearances chapter of this manual for acceptable limits.

(11) Examine fore-and-aft movement on each blade tip. Refer to Figure 1-1 in the Testing and Fault Isolation chapter, and the Blade Tolerance Table in the Fits and Clearances chapter of this manual for acceptable limits.

(12) Examine radial play on each blade. Refer to Figure 1-1 in the Testing and Fault Isolation chapter, and the Blade Tolerance Table in the Fits and Clearances chapter of this manual for acceptable limits.

(13) Examine blade pitch settings. Refer to the Type Certificate Data Sheet, Supplemental Type Certificate Data Sheet, or Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59), for the applicable blade pitch settings, associated tolerance, and the reference blade radius specified for measurement.

E. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

F Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

G. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

H. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

I. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

4. Assembly of Splined-Hub Propeller Model HA-B3( )30-1B

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-1. Tighten the shaft nut (360) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (590) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (630) is fully enclosed.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

NOTE: The arm of the hub unit (500) being fitted with bearing races (580) must be facing down, so that the hub flange and bearing retaining ring (620) form an empty space that will hold the bearing races.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (590) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

CAUTION: THE RAISED SHOULDER ON THE LINK ARM (130) MUST FACE OUTBOARD, TOWARD THE BLADE CLAMP (700).

(c) Install the link arm (130) on the link screw (720).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to keep it in position.

NOTE: The lubrication fittings (850) are not installed on the blade clamp (700) at this time.

(f) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) For instructions regarding aluminum blade bearing installation, balancing, and all other overhaul or repair procedures, refer to Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: IF POSSIBLE, EACH BLADE SHOULD BE REINSTALLED ON THE HUB ARM FROM WHICH IT WAS REMOVED AT DISASSEMBLY.

(2) As specified in the "Disassembly Procedure", each blade should be identified with a number to make sure of correct assembly.

(3) Measure blade track

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and check the height at the tip of each blade using a gauge and adjustable pointer as shown in Figure 7-11.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

(4) Put blade one in vertical position (base up, tip down) and fill the pilot tube (530) cavity with CM12 grease to the top of the bottom blade needle bearing.

CAUTION: AIR TRAPPED IN THE GREASE CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(5) After making sure no air is trapped in the grease, press the blade on its matching hub pilot tube (530).

NOTE: A slight amount of grease will be squeezed out around the pilot tube (530) if the blade has been lubricated correctly.

(6) In consecutive order, repeat the lubrication and reinstallation procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(7) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

(8) Remove the masking tape used to temporarily hold the bearing race (580) together.

CAUTION 1: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580)

CAUTION 2: DO NOT APPLY GASKET COMPOUND CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(9) Apply a small bead of sealant CM93 to both blade clamp-halves (830) on a portion of the mating surface in the inboard bearing radius, as shown in Figure 7-3.

(a) On the blade clamp-half (830) mating surfaces, the sealant supplements the sealing of the inboard end of the blade clamp gaskets (740).

(b) Between the blade clamp (700) and inboard bearing race (580), use the sealant to fill the void from the beveled edge of the bearing race outside diameter.

(10) Install the matching blade clamp-half (830) to which the counterweight is attached. Install the other blade clamp-half.

(11) Put a new gasket (740) between each of the blade clamp-half (830) parting surfaces.

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE INBOARD CLAMP LUGS MEET.

(12) Apply anti-seize lubricant CM118 to the threaded portion of the outboard clamp bolts (750).

NOTE: Do not torque the outboard clamp bolts (750) at this time.

(13) Insert the outboard clamp bolts (750) and fasten them with self-locking nuts (760). Hand-tighten.

NOTE: This step helps align the blade clamp gasket (740), but the clamp bolts (750) should not be torqued at this time.

CAUTION: INBOARD CLAMP SOCKET SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(14) Insert inboard clamp socket screws (730).

CAUTION: DO NOT EXCEED THE RECOMMENDED TORQUE ON INBOARD CLAMP SOCKET SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCES CHAPTER OF THIS MANUAL.

(15) Using a 5/16-inch Allen wrench, torque the clamp socket screws (730) in 10 Ft-Lb (14 N•m) increments (10, 20, etc.), alternating between screws at each increment.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 (0.094 inch [2.37 mm]) size bit, drill the head of each inboard clamp socket screw (730).

CAUTION: DO NOT SAFETY OR DRILL THE CLAMP SOCKET SCREWS (730) IF BLADES WILL BE REMOVED TO FACILITATE SHIPMENT OF THE PROPELLER.

(17) Safety each clamp socket screw (730) with a cotter pin (840) in such a way that the cotter pin touches the blade clamp-half (830) and prevents any tendency for the screw to back out of the blade clamp.

NOTE: Three wraps of CM131 0.032 inch (0.81 mm) minimum diameter stainless steel wire may be used as an alternative to safety the clamp socket screw (730) if the cotter pin (840) causes clearance problems.

(18) Repeat the blade clamp (700) reinstallation procedure for each remaining blade.

(19) Install weight slugs on the clamp counterweight arms, if applicable. For weight slug information, refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59).

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300). Do not tighten the cap screw (350). Permit the guide collar unit to rotate freely on the cylinder.

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(5) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(6) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(7) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(8) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(9) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(10) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Pitch Adjustment Assembly

(1) Install the sleeve nut (1585) into the spring retainer cup (1610), through the inside bore.

(2) Install the socket set screw (1630) into the spring retainer cup (1610), and lock the sleeve nut (1585) fully against the shoulder of the spring retainer cup.

(3) Install the self-locking hex nut (1620) on the sleeve nut (1585).

(4) Torque the self-locking hex nut (1620) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(5) Install the pitch change rod (1410) into the pitch adjustment assembly (1200) with the threaded end facing toward the piston unit (30).

NOTE: The piston will be installed later.

F. Pitch Adjustment Assembly Installation

(1) Install the shoulder of the pitch adjustment assembly (1200) approximately 0.25 inch (6.35 mm) into the cylinder (300).

(2) Install the split rings (250) into the groove in the cylinder (300).

(3) Install the plate (255) over the shoulder of the pitch adjustment assembly (1200) and split rings (250).

NOTE: Make sure the pitch adjustment assembly (1200) is tight against the split rings (250) to keep them from sliding out of the groove in the cylinder (300).

(4) Install the plate screws (280) through the plate (255) and tighten the plate into the shoulder of the pitch adjustment assembly (1200).

NOTE: The plate screws (280) will be safety wired together after the propeller is installed on the engine.

G. Piston Assembly Installation

(1) Lubricate the O-ring (240) with lubricant CM12 and install it on the pitch change rod (1410) in the groove supplied for it.

(2) Lubricate the piston O-ring (930) with lubricant CM12, and carefully install the O-ring in the groove supplied for it in the piston unit (30).

(3) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(4) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(5) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30)

(6) Install the piston unit (30) into position over the cylinder (300).

(7) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(8) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(9) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(10) Push the link pin units (120) flush with the piston unit (30).

(11) Put the guide collar unit (320) solidly against the cylinder (300) at the correct radial location to assist in aligning the piston unit (30).

NOTE: If necessary, shift the guide collar unit (320) radially to supply the necessary clearance between the piston unit (30) and the guide rods (70).

CAUTION: FOR ASSEMBLY PURPOSES ONLY, USE A NON-LOCKING NUT ON THE END OF THE PITCH CHANGE ROD IN PLACE OF THE SELF-LOCKING HEX NUT (10). THE NON-LOCKING NUT MUST BE REPLACED WITH A SELF-LOCKING HEX NUT AFTER ANGLES ARE CHECKED.

(12) Install a non-locking setup nut on the end of the pitch change rod (1410).

CAUTION: DO NOT REMOVE THE GUIDE ROD (70) FROM THE PISTON UNIT (30) DURING OVERHAUL, UNLESS IT IS DAMAGED OR UNLESS SOME OTHER CONDITION REQUIRES ITS REMOVAL.

(13) Using a 1-13/16 inch wrench TE144-1 or equivalent on the non-locking setup nut, and a one-inch (25.4 mm) socket on the pitch change rod (1410), tighten the nut into position.

(14) When the correct alignment is reached, use an Allen wrench with torquing adapter to Torque the socket head cap screw in accordance with the Torque Values Table, found in the Fits and Clearances chapter of this manual.

(15) Install the socket head cap screw (200), washer (210) and check nut (220) on the end of each piston guide rod (70).

H. Setting Blade Angle

(1) Install the pitch change rod (1410) completely into the pitch adjustment assembly (1400), and then back it out approximately one inch (25.4 mm).

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on Blade One at the reference blade radius.

(3) The low pitch angle of all blades must be within a blade-to-blade tolerance of 0.2 degree from the maximum to the minimum blade angle at low pitch.

(4) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(5) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

(b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(6) Repeat this procedure for each blade.

(7) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

I. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

5. Assembly of Splined-Hub Propeller Models HC-B3( )30-1E( ), -2E( )

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table. Tighten the shaft nut (360) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure for each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (590) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (630) is fully enclosed.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

NOTE: The arm of the hub unit (500) being fitted with bearing races (580) must be facing down, so that the hub flange and bearing retaining ring (620) form an empty space that will hold the bearing races.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (630) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

NOTE: A link arm (130) cannot be installed on the blade clamp half (830) after the blade clamp (700) is installed on the hub unit (500).

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

(c) Install the link arm (130) on the link screw (720).

NOTE: The raised shoulder on the link arm (130) must face outboard, toward the blade clamp (700).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

(e) Open the cotter pin (670) to secure it in position.

NOTE 1: The link arm (130) must move freely on the link screw (720).

NOTE 2: Do not install the lubrication fittings (850) on the blade clamp (700) at this stage of assembly.

(f) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175 mm) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half (830), enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760). Hand-tighten the self locking nuts.

CAUTION: THE HEAD OF THE CLAMP SCREW (730) REQUIRES REMOVAL OF MATERIAL FOR CLEARANCE BETWEEN THE START LOCK BRACKET (910) AND CLAMP SCREW. DO NOT DAMAGE THE BLADE CLAMP (830) WHEN REMOVING MATERIAL FROM THE CLAMP SCREW. PAINT THE AREA OF THE CLAMP SCREW WHERE MATERIAL WAS REMOVED.

(14) Insert inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(15) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 size bit, drill the head of each inboard clamp screw (730).

CAUTION: IF AN INSTALLED COTTER PIN (840) CAUSES INTERFERENCE, THREE LOOPS OF SAFETY WIRE CM131 MAY BE USED TO SAFETY THE INBOARD CLAMP SCREW (730).

(17) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

CAUTION 1: THERE MUST BE CLEARANCE BETWEEN THE OD OF THE START LOCK PLATE (1740) AND THE SPINNER MOUNTING PLATE OR BULKHEAD. THERE MUST ALSO BE CLEARANCE BETWEEN THE START LOCK BRACKET (910) AND THE HEAD OF THE INBOARD CLAMP SCREW (730).

(18) Attach a start lock plate (1740) on the inboard side of each lower clamp half (830) with fasteners (1750), as applicable.

(19) Safety the start lock plate fasteners (1750) with safety wire CM131.

(20) Repeat this procedure for the remaining blades and clamps.

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

CAUTION: DO NOT TIGHTEN THE CAP SCREW (350). PERMIT THE GUIDE COLLAR UNIT TO ROTATE FREELY ON THE CYLINDER.

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300).

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits.

(5) Install the O-ring into the cylinder (300) chamfer.

(6) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(7) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(8) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(9) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(10) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(11) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Feathering Spring Assembly

NOTE: Special fixture TE59 is necessary for compression of the feathering spring assembly (1400).

(1) Propeller models HC-B3( )30-1E( ) only: Install the spring spacer (1470) on the pitch change rod (1410).

(2) Install the spring retainer cup (1440) on the pitch change rod (1410).

(3) Install the spring spacer sleeve (1570).

(4) Install the compression feathering springs (1540, 1550, 1560) over the spring spacer sleeve (1570).

(5) Install the rear spring retainer (1580) on the feathering springs (1540, 1550, 1560).

WARNING: WHEN COMPRESSED, THE FEATHERING SPRING ASSEMBLY (1400) IS LOADED TO APPROXIMATELY 400 POUNDS (182 KG) FORCE. MAKE SURE OF THE SAFETY OF EVERYONE IN THE AREA DURING ASSEMBLY PROCEDURES.

(6) Compress the feathering spring assembly (1400) enough to install the split keeper (1590) that holds the feathering spring in compression on the pitch change rod (1410).

(7) Apply oil or grease to each half of the split keeper (1590) to hold it in position until the feathering spring is decompressed.

CAUTION: MAKE SURE THE SPLIT RETAINER DOES NOT COME OUT OF THE GROOVE IN THE PITCH CHANGE ROD DURING DECOMPRESSION OF THE FEATHERING SPRING.

(8) Carefully decompress (unload) the feathering spring assembly (1400).

F. Feathering Spring Assembly Installation

(1) Apply anti-seize compound CM118 to the threads of the spring retainer cup (1440).

(2) Install the feathering spring assembly (1400) into the cylinder (300).

(3) Using a spanner wrench TE148, install the feathering spring assembly (1400) into the cylinder (300).

(4) Tighten the feathering spring assembly (1400) until the attachment is satisfactory.

(5) Using a #42 size (0.0935 inch [2.375 mm]) drill bit, drill through the flange of the spring retainer cup (1440) at the wrench slot in the cylinder (300). Drill in and down at an angle that goes out the other side of the flange. Refer to Figure 7-5.

NOTE: The feather spring assembly (1400) will be safety wired after the propeller is installed on the aircraft.

(6) Install four feathering stop screws (280), if applicable, in the spring retainer cup (1440).

(7) Adjust the height of the feathering stop screws (280) using one of the following methods:

(a) Set the height of the feathering stop screws (280) to match the recorded measurements of the previous screws that were discarded at disassembly.

(b) If the height of the previous feathering stop screws (280) was not measured and recorded at disassembly, turn the feathering stop screws all the way in; then, back them out to an even height of approximately three threads.

NOTE: For propeller models HC-B3( )30-2E( ) only, the feathering stop screws may need to be adjusted later to get the correct feathering angle.

(8) Using 0.032-inch (0.81 mm) minimum diameter stainless steel wire CM131, safety the feathering stop screws (280).

CAUTION: MAKE SURE ALL BITS OF METAL FROM DRILLING AND SAFETY WIRE ARE REMOVED. ENGINE OIL ENTERS THIS AREA OF THE PROPELLER ASSEMBLY.

(9) Lubricate the pitch change rod O-ring (240) with lubricant CM12 and install the O-ring in the groove supplied for it.

G. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12, and carefully install the O-ring in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) into position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(9) Push the link pin units (120) flush with the piston unit (30).

CAUTION 1: MAKE SURE THAT THE CORRECT SAFETY SCREWS (110) ARE INSTALLED AND THAT AT LEAST THREE THREAD LENGTHS ARE AVAILABLE IN THE PISTON UNIT (30) TO HOLD THE SCREWS (110) IN POSITION.

CAUTION 2: MAKE SURE THE LINK ARM (130) MOVES FREELY.

(10) Install the safety screws (110) in each link pin unit (120).

CAUTION: IF NECESSARY, SHIFT THE GUIDE COLLAR UNIT (320) RADIALLY TO SUPPLY THE CORRECT ALIGNMENT BETWEEN THE PISTON UNIT (30) AND THE GUIDE RODS (70).

(11) Make sure the guide collar unit (320) is set solidly against the cylinder (300) at the correct radial location.

(12) When the correct alignment is reached, tighten the socket head cap screw (350) in the guide collar unit (320). Torque the socket head cap screw in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

(13) Move the piston unit (30) into full feathered/high pitch position (back against the hub unit), so that the threaded end of the pitch change rod (1410) passes through the end of the piston.

(14) Install the self-locking hex nut (10) on the end of the pitch change rod (1410).

(15) Using a wrench on the self-locking hex nut (10) and a socket on the pitch change rod (1410), torque the nut in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

(16) Install the socket head cap screw (200), washer (210) and check nut (220) on the end of each piston guide rod (70).

H. Start Lock Assembly and Installation

CAUTION 1: THE PROPELLER MUST ACTUATE WITHOUT INTERFERENCE FROM THE START LOCK PLATE (1740).

CAUTION 2: THE START LOCK PLATE (1740) MUST TOUCH AT LEAST ONE HALF OF THE DIAMETER OF THE START LOCK PIN (1720) WHEN THE START LOCK UNIT (1700) IS ENGAGED.

(1) Insert the start lock pin (1720) into the start lock bracket (1710).

(2) Insert the spring (1730) into the start lock bracket (1710) against the pin (1720).

(3) Compress the spring (1730).

(4) Install the washer (1810) on top of the spring.

(5) Insert the cotter pin (1800) into the start lock bracket (1710) to keep the washer (1810), spring (1730), and start lock pin (1720) in the start lock bracket.

(6) Spread the cotter pin (1800) to keep the assembly in place.

(7) Attach the start lock units (1700) to the spinner bulkhead.

(8) Examine for clearance between each clamp assembly (700) and start lock assembly (1700).

(9) To relieve interference, local polishing on the start lock bracket (1710), not exceeding 0.020 inch (0.51 mm) is permitted. Remove all polish marks from the repaired surface and apply chemical conversion coating as specified in the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(10) Retract the start lock pins (1720) for assembly, and hold them in position with a wire inserted in the hole in the start lock bracket (1710).

I. Setting Blade Angle

CAUTION 1: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 2: USE SUFFICIENT AIR PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

(1) Apply pressure to the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on Blade One at the reference blade radius. Refer to Figure 7-6.

(3) The low pitch angle of all blades must be within a blade-to-blade tolerance of 0.2 degree from the maximum to the minimum blade angle at low pitch.

(4) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(5) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(a) While torquing the outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

(b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(6) Repeat this procedure for each of the other blades.

(7) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(8) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

J. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

N. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

6. Assembly of Flanged-Hub Propeller Models HC-B3( )F-2( )

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-1. Tighten the mounting bolts (440).

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (630) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (630) is fully enclosed.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

NOTE: The arm of the hub unit (500) being fitted with bearing races (580) must be facing down, so that the hub flange and bearing retaining ring (620) form an empty space that will hold the bearing races.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (590) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

NOTE: A link arm (130) cannot be installed on the blade clamp half (830) after the blade clamp (700) is installed on the hub unit (500).

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

CAUTION: THE RAISED SHOULDER ON THE LINK ARM (130) MUST FACE OUTBOARD, TOWARD THE BLADE CLAMP (700).

(c) Install the link arm (130) on the link screw (720).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to keep it in position.

NOTE: The lubrication fittings (850) are not installed on the blade clamp (700) at this time.

(f) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half (830), enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760). Hand-tighten the self locking nuts.

(14) Insert inboard clamp screws (730).

(15) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 size bit, drill the head of each inboard clamp screw (840).

(17) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

NOTE: If an installed cotter pin (840) causes interference, three loops of safety wire CM131 may be used to safety the inboard clamp screw (730).

CAUTION: THERE MUST BE CLEARANCE BETWEEN THE OD OF THE START LOCK PLATE (1740) AND THE SPINNER MOUNTING PLATE OR BULKHEAD. THERE MUST ALSO BE CLEARANCE BETWEEN THE START LOCK BRACKET (910) AND THE HEAD OF THE INBOARD CLAMP SCREW (730).

(18) Attach a start lock plate (1740) on the inboard side of each lower clamp half (830) with fasteners (1750), as applicable.

(19) Safety the start lock plate fasteners (1750) with safety wire CM131.

(20) Repeat this procedure for the remaining blades and clamps.

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300). Do not tighten the cap screw (350). Permit the guide collar unit to rotate freely on the cylinder.

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(5) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(6) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(7) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(8) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(9) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(10) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Feathering Spring Assembly

NOTE: Special fixture TE59 is necessary for compression of the feathering spring assembly (1400).

(1) Install the spring retainer flange (1420) on the pitch change rod (1410).

(2) Install the spring spacer sleeve (1430).

(3) Install the feathering springs (1540, 1560) over the spring spacer sleeve (1430).

(4) Install the rear spring rear spring retainer (1580) on the feathering springs (1540, 1560).

WARNING: WHEN COMPRESSED, THE FEATHERING SPRING ASSEMBLY (1400) IS LOADED TO APPROXIMATELY 400 POUNDS (182 KG) FORCE. MAKE SURE OF THE SAFETY OF EVERYONE IN THE AREA DURING ASSEMBLY PROCEDURES.

(5) Compress the feathering spring assembly (1400) enough to install the split rear retainer (1590) that holds the feathering spring in compression on the pitch change rod.

NOTE: Apply oil or grease to each half of the split keeper (1590) to hold it in position until the feathering spring is decompressed.

CAUTION: MAKE SURE THE SPLIT RETAINER DOES NOT COME OUT OF THE GROOVE IN THE PITCH CHANGE ROD DURING DECOMPRESSION OF THE FEATHERING SPRING.

(6) Carefully decompress (unload) the feathering spring assembly (1400).

F. Feathering Spring Assembly Installation

(1) Install the shoulder of the flanged spring retainer (1420) approximately 0.25 inch (6.35 mm) into the cylinder (300), and install the front spring retainer split rings (250) into the groove in the cylinder.

(2) Install the flanged spring retainer (1420) against the front spring retainer split rings (250) to hold it in position.

(3) Install the pitch stop spacer (290) ("L" cross section) using two screws (110) for each plate. Refer to Figure 7-7.

NOTE 1: The height of the pitch stop spacers (290) will determine the propeller feathering blade angle. A higher pitch stop spacer will result in a lower feather blade angle and a lower pitch stop spacer will result in a higher feather blade angle.

NOTE 2: Reuse the pitch stop spacer (290) that were removed during disassembly. They should have the correct feathering stop plate height.

(4) Safety the pitch stop spacer screws (290).

G. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12 and carefully install it in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there is an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) into position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(9) Push the link pin units (120) flush with the piston unit (30).

(10) Put the guide collar unit (320) solidly against the cylinder (300) at the correct radial location to assist in aligning the piston unit (30).

NOTE: If necessary, shift the guide collar unit (320) radially to supply the necessary clearance between the piston unit (30) and the guide rods (70).

CAUTION: FOR ASSEMBLY PURPOSES ONLY, USE A NON-LOCKING NUT ON THE END OF THE PITCH CHANGE ROD IN PLACE OF THE SELF-LOCKING HEX NUT (10). THE NON-LOCKING NUT MUST BE REPLACED WITH A SELF-LOCKING HEX NUT AFTER FEATHER ANGLES ARE CHECKED.

(11) Install a non-locking setup nut on the end of the pitch change rod (1410).

(12) Use a 1-13/16 inch wrench TE144-1, or equivalent, on the non-locking setup nut, and a one-inch (25.4 mm) socket on the pitch change rod (1410) to tighten the nut into position.

(13) Install the safety screws (110) in each link pin unit (120).

(14) Make sure the guide collar unit (320) is set solidly against the cylinder (300) at the correct radial location.

NOTE: If it is necessary, shift the guide collar unit (320) radially to supply the correct alignment between the piston unit (30) and the guide rods (70).

(15) When the correct alignment is reached, use an Allen wrench with torquing adapter to tighten the socket head cap screw (350) in the guide collar unit (320).Torque the socket head cap screw in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

H. Start Lock Assembly and Installation

CAUTION 1: THE PROPELLER MUST ACTUATE WITHOUT INTERFERENCE FROM THE START LOCK PLATE (1740).

CAUTION 2: THE START LOCK PLATE (1740) MUST TOUCH AT LEAST ONE HALF OF THE DIAMETER OF THE START LOCK PIN (1720) WHEN THE START LOCK UNIT (1700) IS ENGAGED.

(1) Insert the start lock pin (1720) into the start lock bracket (1710).

(2) Insert the spring (1730) into the start lock bracket (1710) against the pin (1720).

(3) Compress the spring (1730). Install the washer (1810) on top of the spring.

(4) Insert the cotter pin (1800) into the start lock bracket (1710) to keep the washer (1810), spring (1730), and start lock pin (1720) in the start lock bracket.

(5) Spread the cotter pin (1800) to keep the assembly in place.

(6) Attach the start lock units (1700) to the hub unit flange.

(7) Examine for clearance between each clamp assembly (700) and start lock assembly (1700).

(8) To relieve interference, local polishing on the start lock bracket (1710), not exceeding 0.020 inch (0.51 mm) is permitted. Remove all polish marks from the repaired surface and apply chemical conversion coating as specified in the Chromic Acid Anodizing chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(9) Retract the start lock pins (1720) for assembly, and hold them in position with a wire inserted in the hole in the start lock bracket (1710).

I. Setting Blade Angle

CAUTION 1: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 2: USE SUFFICIENT AIR PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

(1) Apply pressure to the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on blade one at the reference blade radius. Refer to Figure 7-6.

(3) The low pitch angle of all blades must be within a blade-to-blade tolerance of 0.2 degree from the maximum to the minimum blade angle at low pitch.

(4) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(5) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

(b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(6) Repeat this procedure for each blade.

(7) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(8) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

(9) If the feather angle is incorrect, remove piston and change the high stop spacer size as needed, to achieve the correct feather angle.

J. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

N. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

7. Assembly of Flanged-Hub Propeller Model HC-B3WN-2L

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub (500) on the rotatable fixture of the assembly table and tighten the mounting bolts (440).

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (590) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (590).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (630) is fully enclosed.

CAUTION: THE ARM OF THE HUB UNIT (500) BEING FITTED WITH BEARING RACES (580) MUST BE FACING DOWN, SO THAT THE HUB FLANGE AND BEARING RETAINING RING (620) FORM AN EMPTY SPACE THAT WILL HOLD THE BEARING RACES.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (630) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

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

(2) Refer to Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59), as applicable, for information on counterweight slugs.

(3) After each blade clamp (700) is assembled, perform the following steps:

CAUTION: A LINK ARM (130) CANNOT BE INSTALLED ON THE BLADE CLAMP-HALF (830) AFTER THE CLAMP IS INSTALLED ON THE HUB UNIT (500).

(a) Install the link screw sleeve (310) in the large hole of the link arm (130).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

CAUTION: THE RAISED SHOULDER ON THE LINK ARM (130) MUST FACE OUTBOARD, TOWARD THE BLADE CLAMP (700).

(c) Install the link arm (130) on the link screw (720).

(d) Push the sleeve cotter pin (670) through the hole in the end of the link screw (720).

(e) Open the cotter pin (670) to secure the link arm (130).

NOTE: The link arm (130) should move freely on the link screw (720).

CAUTION: DO NOT INSTALL THE LUBRICATION FITTINGS (860) ON THE BLADE CLAMP (700) AT THIS STEP OF ASSEMBLY.

(f) Repeat the assembly procedures for the other blade clamps (830) and counterweights (800).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half, enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760).

(14) Hand-tighten the self locking nuts (760).

(15) Insert inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(16) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(17) Using a #42 size bit, drill the head of each inboard clamp screw (730).

CAUTION: IF AN INSTALLED COTTER PIN (840) CAUSES INTERFERENCE, THREE LOOPS OF SAFETY WIRE CM131 MAY BE USED TO SAFETY THE INBOARD CLAMP SCREW (730).

(18) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

CAUTION: THERE MUST BE CLEARANCE BETWEEN THE OD OF THE START LOCK PLATE (1740) AND THE SPINNER MOUNTING PLATE OR BULKHEAD. THERE MUST ALSO BE CLEARANCE BETWEEN THE START LOCK BRACKET (910) AND THE HEAD OF THE INBOARD CLAMP SCREW (730). WASHERS MAY BE INSTALLED BETWEEN THE START LOCK PLATE AND CLAMP ASSEMBLY (700) TO REPOSITION THE START LOCK PLATE AND IMPROVE INTERFACE WITH THE START LOCK.

(19) Attach a start lock plate (1740) on the inboard side of each lower clamp half (830) with fasteners (1750), as applicable.

(20) Safety the start lock plate fasteners (1750) with safety wire CM131.

(21) Repeat this procedure for the remaining blades and clamps.

D. Cylinder Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(2) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (520) fits. Install the O-ring into the cylinder (300) chamfer.

(3) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(4) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(5) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(6) Examine the slot in the top of the cylinder (300) 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 (300).

(8) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Feathering Spring Assembly

(1) Use special fixture TE59 for compression of the feathering spring assembly (1400).

(2) Install the spring retainer cup (1440) on the pitch change rod (1410).

(3) Install the thrust bearing (1450) on the pitch change rod (1410).

(4) Add the spring spacers (1480) as needed.

NOTE: The exact number of spacers (1480) needed is not known until the counterweight angle is set (later assembly procedure); however, the number of spacers needed will usually be the same as the number of spacers removed during propeller disassembly.

(5) Install the spacer tube (1430) on the pitch change rod (1410).

(6) Install the feathering spring (1540) over the spacer tube (1430).

(7) Install the rear retainer (1580) on the feathering spring (1540).

WARNING: USE EXTREME CAUTION. WHEN COMPRESSED, THE SPRING ASSEMBLY (1400) IS LOADED TO APPROXIMATELY 400 POUNDS (182 KG) FORCE.

(8) Compress the spring assembly (1400) enough to install the split rear keeper (1590) that holds the feathering spring in compression on the pitch change rod (1410).

(9) Apply oil or grease to each half of the rear split keeper (1590) to keep it in position until the feathering spring (1540) is decompressed.

CAUTION: MAKE SURE THE SPLIT KEEPER (1590) DOES NOT COME OUT OF THE GROOVE IN THE PITCH CHANGE ROD (1410) DURING DECOMPRESSION OF THE FEATHERING SPRING (1540).

(10) Carefully decompress (unload) the spring assembly (1400).

F. Feathering Spring Assembly Installation

(1) Apply anti-seize compound CM118 to the threads of the spring retainer cup (1440).

(2) Install the feathering spring assembly (1400) into the cylinder (300).

(3) Using a spanner wrench TE148, install the spring assembly (1400) in the cylinder (300).

(4) Tighten the feathering spring assembly (1400) until secure.

(5) Using a #42 size (0.0935 inch [2.375 mm]) drill bit, drill through the flange of the spring retainer cup (1440) at the wrench slot in the cylinder (300). Drill in and down at an angle that goes out the other side of the flange. Refer to Figure 7-5.

(6) Install 0.032-inch (0.81 mm) minimum diameter stainless steel wire CM131 through the drilled hole.

(a) Use three loops of wire to safety the spring assembly (1400).

(b) Tuck the "pigtail" into the slotted area.

(7) Install four feathering stop screws (280) in the spring retainer cup (1440).

(8) Adjust the height of the feathering stop screws (280) using one of the following methods:

(a) Set the height of the feathering stop screws (280) to match the recorded measurements of the previous screws that were discarded at disassembly.

(b) If the height of the previous feathering stop screws (280) was not measured and recorded at disassembly, turn the feathering stop screws all the way in; then, back them out to an even height of approximately three threads.

NOTE: The feathering stop screws (280) may have to be adjusted later to get the correct feather angle.

(9) Safety the feathering stop screws (280) with 0.032-inch (0.81 mm) minimum diameter stainless steel wire CM131.

CAUTION: ENGINE OIL ENTERS THIS AREA OF THE ASSEMBLY. MAKE SURE ALL BITS OF METAL FROM DRILLING AND SAFETY WIRE ARE REMOVED.

(10) Lubricate the pitch change rod O-ring (240) with lubricant CM12.

(11) Install the O-ring (240) in the groove supplied for it.

G. Piston Assembly Installation

(1) Using lubricant CM12, lubricate the piston O-ring (930).

(2) Carefully install the piston O-ring (930) in the groove supplied for it in the piston unit (30).

(3) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there is an overlap at the parting line with a smooth, fuzz-free surface.

(4) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(5) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(6) Move the piston unit (30) into position over the cylinder (300).

(7) Align the piston guide rods (70) with the holes supplied for them in the guide collar unit (320).

(8) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(9) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(10) Install each link pin unit (120).

CAUTION 1: MAKE SURE THAT THE CORRECT SAFETY SCREWS (110) ARE INSTALLED AND THAT AT LEAST THREE THREAD LENGTHS ARE AVAILABLE IN THE PISTON UNIT (30) TO HOLD THE SCREWS (110) IN POSITION.

CAUTION 2: MAKE SURE THAT THE LINK ARM (130) MOVES FREELY.

(11) Install the safety screws (110) in each link pin unit (120).

(12) Make sure the guide collar unit (320) is set solidly against the cylinder (300) at the correct radial location.

(a) If it is necessary, shift the guide collar unit (320) radially to align the piston unit (30) and the piston guide rods (70).

(13) When the correct alignment is reached, using an Allen wrench with a torquing adapter, tighten the socket head cap screw (350) in the guide collar unit (320). Torque the socket head cap screw in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(14) Move the piston unit (30) into full feathered/high pitch position (back against the hub assembly) so that the threaded end of the pitch change rod (1410) passes through the end of the piston unit.

(15) Install the self-locking hex nut (10) on the end of the pitch change rod (1410).

(16) Using a wrench on the nut (10) and a socket on the pitch change rod (1410), torque the nut. Torque the nut in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(17) Install the socket head cap screw (200), washer (210), and check hex jam nut (220) on the end of each piston guide rod (70).

H. Setting Blade Angle

CAUTION 1: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 2: USE SUFFICIENT AIR PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

(1) Apply pressure to the piston unit (30) through the rotatable fixture on the propeller assembly table.

(2) Move the piston unit (30) to the lowest pitch position.

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(3) Using a bench-top protractor TE96 at the 30-inch (762 mm) reference blade radius location, as shown in Figure 7-6, adjust the angle of the blades.

(4) Turn the blades to low pitch position in the blade clamps (830).

NOTE: When the lock nut (220) and washer (210) on the end of each guide rod (70) are against the guide collar unit (320), the pitch change mechanism is at low pitch.

(5) Tighten the nuts (760) on the outer clamp bolts (750). Torque the bolts in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: THE ANGLE OF ALL BLADES MUST BE WITHIN 0.2 DEGREE OF EACH OTHER AT LOW PITCH OR FLOATING PITCH.

(6) Measure the angle of each blade and make sure that the maximum blade angle difference between blades is 0.2 degree. If it is not, then reset the blades in the blade clamps (830).

(7) Perform a check to make sure that high pitch can be reached.

I. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

8. Assembly of Splined-Hub Propeller Models HC-B3( )20-2( ) and HC-B3( )30-2B( )

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-1. Tighten the shaft nut (360) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on the on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (630) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (630) is fully enclosed.

CAUTION: THE ARM OF THE HUB UNIT (500) BEING FITTED WITH BEARING RACES (580) MUST BE FACING DOWN, SO THAT THE HUB FLANGE AND BEARING RETAINING RING (620) FORM AN EMPTY SPACE THAT WILL HOLD THE BEARING RACES.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (590) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

CAUTION: A LINK ARM (130) CANNOT BE INSTALLED ON THE BLADE CLAMP-HALF (830) AFTER THE BLADE CLAMP (700) IS INSTALLED ON THE HUB UNIT (500).

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

(c) Install the link arm (130) on the link screw (720).

NOTE: The raised shoulder on the link arm (130) must face outboard, toward the blade clamp (700).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to secure the link arm (130).

(f) Do not install the lubrication fittings (850) on the blade clamp (700) at this stage of assembly.

(g) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half, enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760). Hand-tighten the self locking nuts.

(14) Insert inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(15) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 size bit, drill the head of each inboard clamp screw (730).

CAUTION: IF AN INSTALLED COTTER PIN (840) CAUSES INTERFERENCE, THREE LOOPS OF SAFETY WIRE CM131 MAY BE USED TO SAFETY THE INBOARD CLAMP SCREW (730).

(17) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

CAUTION: THERE MUST BE CLEARANCE BETWEEN THE OD OF THE START LOCK PLATE (1740) AND THE SPINNER MOUNTING PLATE OR BULKHEAD. THERE MUST ALSO BE CLEARANCE BETWEEN THE START LOCK BRACKET (910) AND THE HEAD OF THE INBOARD CLAMP SCREW (730). WASHERS MAY BE INSTALLED BETWEEN THE START LOCK PLATE AND CLAMP ASSEMBLY (700) TO REPOSITION THE START LOCK PLATE AND IMPROVE INTERFACE WITH THE START LOCK.

(18) Attach a start lock plate (1740) on the inboard side of each lower clamp half (830) with fasteners (1750), as applicable.

(19) Safety the start lock plate fasteners (1750) with safety wire CM131.

(20) Repeat this procedure for the remaining blades and clamps.

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300). Do not tighten the cap screw (350). Permit the guide collar unit to rotate freely on the cylinder.

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(5) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(6) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(7) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(8) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(9) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(10) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Feathering Spring Assembly

NOTE: Special fixture TE59 is necessary for compression of the feathering spring assembly (1400).

(1) Install the spring retainer cup (1440) on the pitch change rod (1410) with the small area facing the threaded end of the pitch change rod.

(2) Install the rod guide bushing (1600) on the pitch change rod (1410).

(3) Install the feathering compression spring (1540) over the rod guide bushing (1600).

(4) Install the rear spring retainer (1580) and split keeper (1590), using special fixture TE59 to compress the feathering compression spring (1540), permitting installation of the split keeper into the groove of the pitch change rod (1410).

WARNING: USE EXTREME CAUTION. WHEN COMPRESSED, THE FEATHERING SPRING ASSEMBLY (1400) IS LOADED TO APPROXIMATELY 400 POUNDS (182 KG) FORCE.

(5) Compress the feathering spring assembly (1400) enough to install the rear split keeper (1590) that holds the spring in compression on the pitch change rod (1410).

(6) Apply oil or grease to each half of the rear split keeper (1590) to keep it in position until the feathering compression spring (1540) is decompressed.

CAUTION: MAKE SURE THE SPLIT KEEPER (1590) DOES NOT COME OUT OF THE GROOVE IN THE PITCH CHANGE ROD (1410) DURING DECOMPRESSION OF THE FEATHERING COMPRESSION SPRING (1540).

(7) Carefully decompress (unload) the feathering spring assembly (1400).

F. Feathering Spring Assembly Installation

(1) Install the shoulder of the spring retainer cup (1440) approximately 0.25 inch (6.35 mm) into the cylinder (300), and install the split keeper (1625) into the groove in the cylinder.

(2) Install the spring retainer cup (1440) against the split keeper (1590) to hold it in position.

(3) Install the split keeper retaining ring (1635) using four screws (1645).

NOTE: The split keeper retaining ring screws (1645) are safety wired when installed on the aircraft.

(4) Install two feathering stop screws (280) in the spring retainer cup (1440).

(5) Adjust the height of the feathering stop screws (280) using one of the following methods:

(a) Set the height of the feathering stop screws (280) to match the recorded measurements of the previous screws that were discarded at disassembly.

(b) If the height of the previous feathering stop screws (280) was not measured and recorded at disassembly, turn the feathering stop screws all the way in; then, back them out to an even height of approximately three threads.

NOTE: The feathering stop screws (280) may have to be adjusted later to get the correct feather angle.

(6) Safety the feathering stop screws (280) with 0.032-inch (0.81 mm) with minimum diameter stainless steel wire CM131.

G. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12 and carefully install it in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there is an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THAT THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) into position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(9) Push the link pin units (120) flush with the piston unit (30).

(10) Put the guide collar unit (320) solidly against the cylinder (300) at the correct radial location to assist in aligning the piston unit (30).

NOTE: If necessary, shift the guide collar unit (320) radially to supply the necessary clearance between the piston unit (30) and the guide rods (70).

CAUTION: FOR ASSEMBLY PURPOSES ONLY, USE A NON-LOCKING NUT ON THE END OF THE PITCH CHANGE ROD IN PLACE OF THE SELF-LOCKING HEX NUT (10). THE NON-LOCKING NUT MUST BE REPLACED WITH A SELF-LOCKING HEX NUT AFTER FEATHER ANGLES ARE CHECKED.

(11) When the correct alignment is reached, use an Allen wrench with torquing adapter to tighten the socket head cap screw (350) in the guide collar unit (320). Torque the socket head cap screw in accordance with Torque Values Table in the Fits and Clearances chapter of this manual.

(12) Move the piston unit (30) into high pitch position (back against the hub assembly) so that the threaded end of the pitch change rod (1410) passes through the end of the piston unit (30).

(13) Use a 1-13/16 inch wrench TE144-1, or equivalent, on the non-locking setup nut, and a one-inch (25.4 mm) socket on the pitch change rod (1410) to tighten the nut into position.

(14) Install the socket head cap screw (200), washer (210) and check nut (220) on the end of each piston guide rod (70).

H. Setting Blade Angle

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

(1) Apply pressure to the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION 1: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

CAUTION 2: THE LOW PITCH ANGLE OF ALL BLADES MUST BE WITHIN A BLADE-TO-BLADE TOLERANCE OF 0.2 DEGREE FROM THE MAXIMUM TO THE MINIMUM BLADE ANGLE AT LOW PITCH.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on blade one at the reference blade radius. Refer to Figure 7-6.

(3) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(4) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

   (a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

   (b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(5) Repeat this procedure for each of the other blades.

(6) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(7) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

I. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

9. Assembly of Flanged-Hub Propeller Model HC-B3WF-4

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-1. Tighten the mounting bolts (440) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on the on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (630) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (630) is fully enclosed.

CAUTION: THE ARM OF THE HUB UNIT (500) BEING FITTED WITH BEARING RACES (580) MUST BE FACING DOWN, SO THAT THE HUB FLANGE AND BEARING RETAINING RING (620) FORM AN EMPTY SPACE THAT WILL HOLD THE BEARING RACES.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309 to hold the hub unit vertical as shown in Figure 7-2.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (590) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

CAUTION: THE RAISED SHOULDER ON THE LINK ARM (130) MUST FACE OUTBOARD, TOWARD THE BLADE CLAMP (700).

(c) Install the link arm (130) on the link screw (720).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to secure the link arm (130).

CAUTION: DO NOT INSTALL THE LUBRICATION FITTINGS (850) ON THE BLADE CLAMP (700) AT THIS STAGE OF ASSEMBLY.

(f) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half, enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760). Hand-tighten the self locking nuts.

(14) Insert inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(15) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 size bit, drill the head of each inboard clamp screw (730).

CAUTION: IF AN INSTALLED COTTER PIN (840) CAUSES INTERFERENCE, THREE LOOPS OF SAFETY WIRE CM131 MAY BE USED TO SAFETY THE INBOARD CLAMP SCREW (730).

(17) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300). Do not tighten the cap screw (350). Permit the guide collar unit to rotate freely on the cylinder.

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(5) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(6) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(7) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(8) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(9) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(10) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12, and carefully install the O-ring in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) into position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(9) Push the link pin units (120) flush with the piston unit (30).

CAUTION: IF NECESSARY, SHIFT THE GUIDE COLLAR UNIT (320) RADIALLY TO SUPPLY THE NECESSARY CLEARANCE BETWEEN THE PISTON UNIT (30) AND THE GUIDE RODS (70).

(10) Put the guide collar unit (320) solidly against the cylinder (300) at the correct radial location to assist in aligning the piston unit (30).

(11) Install the socket head cap screw (200), washer (210) and check nut (220) on the end of each piston guide rod (70).

F. Setting Blade Angle

CAUTION 1: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 2: USE SUFFICIENT AIR PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

(1) Apply pressure to the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION 1: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

CAUTION 2: THE LOW PITCH ANGLE OF ALL BLADES MUST BE WITHIN A BLADE-TO-BLADE TOLERANCE OF 0.2 DEGREE FROM THE MAXIMUM TO THE MINIMUM BLADE ANGLE AT LOW PITCH.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on blade one at the reference blade radius. Refer to Figure 7-6.

(3) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(4) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

(b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(5) Repeat this procedure for each of the other blades.

(6) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(7) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

G. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

H. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

I. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

10. Assembly of Splined-Hub Propeller Models HC-B3( )20-4 and HC-B3( )30-4

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-1. Tighten the shaft nut (360) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease CM12 to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (630) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (590) is fully enclosed.

CAUTION: THE ARM OF THE HUB UNIT (500) BEING FITTED WITH BEARING RACES (580) MUST BE FACING DOWN, SO THAT THE HUB FLANGE AND BEARING RETAINING RING (620) FORM AN EMPTY SPACE THAT WILL HOLD THE BEARING RACES.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (590) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) Refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02) For blade clamp (700) overhaul instructions.

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

(3) After each blade clamp (700) is assembled, perform the following steps:

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half.

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

CAUTION: THE RAISED SHOULDER ON THE LINK ARM (130) MUST FACE OUTBOARD, TOWARD THE BLADE CLAMP (700).

(c) Install the link arm (130) on the link screw (720).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to secure it in position.

(f) Do not install the lubrication fittings (850) on the blade clamp (700) at this stage of assembly.

(g) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half, enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded portion of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760). Hand-tighten the self locking nuts.

(14) Insert inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(15) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 size bit, drill the head of each inboard clamp screw (730).

(17) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

NOTE: If an installed cotter pin (840) causes interference, three loops of safety wire CM131 may be used to safety the inboard clamp screw (730).

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300). Do not tighten the cap screw (350). Permit the guide collar unit to rotate freely on the cylinder.

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(5) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(6) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(7) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(8) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(9) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(10) Examine the inside of the cylinder (300) to make sure the O-ring (520) has not been moved out of position during cylinder installation.

E. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12, and carefully install the O-ring in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) into position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(9) Push the link pin units (120) flush with the piston unit (30).

CAUTION 1: MAKE SURE THAT THE CORRECT SAFETY SCREWS (110) ARE INSTALLED AND THAT AT LEAST THREE THREAD LENGTHS ARE AVAILABLE IN THE PISTON UNIT (30) TO HOLD THE SCREWS (110) IN POSITION.

CAUTION 2: MAKE SURE THE LINK ARM (130) MOVES FREELY.

(10) Install the safety screws (110) in each link pin unit (120).

(11) Put the guide collar unit (320) solidly against the cylinder (300) at the correct radial location to assist in aligning the piston unit (30).

NOTE: If necessary, shift the guide collar unit (320) radially to supply the necessary clearance between the piston unit (30) and the guide rods (70).

(12) Install the socket head cap screw (200), washer (210) and check nut (220) on the end of each piston guide rod (70).

F. Setting Blade Angle

CAUTION 1: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

CAUTION 2: USE SUFFICIENT AIR PRESSURE TO MAKE SURE THAT THE PROPELLER ACTUATES AGAINST EACH POSITIVE STOP.

(1) Remove pressure from the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on blade one at the reference blade radius. Refer to Figure 7-6.

(3) The low pitch angle of all blades must be within a blade-to-blade tolerance of 0.2 degree from the maximum to the minimum blade angle at low pitch.

(4) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(5) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

   (a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

   (b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(6) Repeat this procedure for each of the other blades.

(7) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

   NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(8) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

G. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

H. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

I. Sealant CM93 Application

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.

11. Assembly of Splined-Hub Propeller Models HC-B3R30-4A, -4B

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

CAUTION 2: DO NOT EXCEED 175 PSI (12.06 BARS) +10 PSI (0.68 BARS) WHEN ACTUATING PROPELLERS INCLUDED IN THIS MANUAL.

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

A. Bearing Installation

(1) Install the hub unit (500) on the rotatable fixture of the assembly table as shown in Figure 7-1. Tighten the shaft nut (360) until snug.

CAUTION: THE INTERNAL RECESS OF THE BEARING GUIDE RING (620) MUST FACE OUTBOARD WHEN THE BEARING GUIDE RING IS SLIPPED OVER THE BLADE ARM FLANGE OF THE HUB UNIT (500).

(2) Apply a thin layer of grease to an O-ring (570), and stretch it over the hub blade arm so that it rests inboard near the center of the hub.

(3) Using a light mallet and special tool TE309 or equivalent, drive a bearing guide ring (620) on one blade arm flange of the hub unit (500). Refer to Figure 7-1.

(4) Drive the bearing guide (620) ring far enough on the arm flange so that the ring forms a narrow channel on the inboard surface of the flange.

(5) Repeat the bearing guide ring (620) installation procedure on each remaining hub (500) arm.

(6) Lightly grease the inboard surface of each blade arm flange with approved lubricant CM12.

(7) Put the matched halves of an outboard bearing race (580) in position over one hub arm.

(8) Examine the bearing-to-hub-arm fit. The bearing should rest firmly against the seating area on the hub arm, with no "rocking" action apparent.

CAUTION: THE WIRE RETENTION RING (630) MUST BE FULLY ENCLOSED TO MAKE SURE IT IS NOT PINCHED.

(9) Using a combination of special tools TE309 and TE108, or equivalents, press the bearing guide ring (620) far enough on the bearing race (580) to permit insertion of the wire retention ring (630) into the groove in the blade arm flange. Refer to Figure 7-1.

(10) Install the wire retention ring (630).

(11) Using a combination of special tools TE309 and TE108 or equivalents, with special spacer A-972 or equivalent, as shown in Figure 7-1, pull the bearing guide ring (620) outboard far enough to permit the wire retention ring (590) to seat in the wire retention groove in the bearing guide ring.

(12) Make sure the wire retention ring (590) is fully enclosed.

CAUTION: THE ARM OF THE HUB UNIT (500) BEING FITTED WITH BEARING RACES (580) MUST BE FACING DOWN, SO THAT THE HUB FLANGE AND BEARING RETAINING RING (620) FORM AN EMPTY SPACE THAT WILL HOLD THE BEARING RACES.

(13) Remove the hub unit (500) from the rotatable fixture on the assembly table and use special tool TE309, or equivalent, to hold the hub unit vertical as shown in Figure 7-2.

CAUTION 1: THE BREAK LINE OF THE BEARING RACES (580) MUST BE AT A 90 DEGREE ANGLE TO THE BREAK LINE OF THE BLADE CLAMP-HALVES (830).

CAUTION 2: DO NOT SCRATCH THE BEARING RACES (580) DURING INSTALLATION.

CAUTION 3: ALL BEARING BALLS (600) INSTALLED IN A SINGLE BEARING RACE (580) MUST BE OF THE SAME GAUGE. BEARING BALLS SUPPLIED BY HARTZELL ARE OF THE SAME GAUGE.

(14) Install the ball spacer (610) and bearing balls (600) on the outboard bearing race (580).

(15) Apply a small amount of sealant CM93 to the broken edges of the inboard bearing race (580). Remove any sealant that may be moved out into the bearing race when the bearing halves are put together.

CAUTION: THE OPENING OF THE WIRE RETENTION RING (630) MUST BE AT A 90 DEGREE ANGLE TO THE PARTING LINE OF THE INBOARD BEARING RACE (580).

(16) Put the inboard halves of the bearing race (580) around one blade arm of the hub unit (500), and install the wire retention ring (590) to hold the halves in position.

CAUTION: THE USE OF TOO MUCH SEALANT COULD CAUSE UNEVEN SEATING BETWEEN THE BLADE CLAMP (700) AND BEARING RACE (580).

(17) Apply a small bead of sealant CM93 to the inboard bearing race (580) at the chamfer (break point) to evenly fill the void in the chamfered area of the race.

(18) Move the O-ring (570) outboard against the inboard bearing race (580).

(19) Wind wide masking tape around the OD of the bearing assembly to hold the parts in position.

(20) Repeat the assembly procedure for the remaining blade arms on the hub unit (500).

B. Clamp and Link Arm Assembly

(1) For blade clamp (700) overhaul instructions, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

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

(3) After each blade clamp (700) is assembled, perform the following steps:

CAUTION: A LINK ARM (130) CANNOT BE INSTALLED ON THE BLADE CLAMP-HALF (830) AFTER THE BLADE CLAMP (700) IS INSTALLED ON THE HUB UNIT (500).

(a) Install the link screw sleeve (310) in the large hole of the link arm (130) in the side that does not face the clamp-half (830).

(b) Install the link arm bushing (660) between the link arm (130) and the blade clamp (700).

CAUTION: THE RAISED SHOULDER ON THE LINK ARM (130) MUST FACE OUTBOARD, TOWARD THE BLADE CLAMP (700).

(c) Install the link arm (130) on the link screw (720).

(d) Push the link screw cotter pin (670) through the hole in the end of the link screw (720).

CAUTION: THE LINK ARM (130) MUST MOVE FREELY ON THE LINK SCREW (720).

(e) Open the cotter pin (670) to secure it in position.

CAUTION: DO NOT INSTALL THE LUBRICATION FITTINGS (850) ON THE BLADE CLAMP (700) AT THIS STAGE OF ASSEMBLY.

(f) Repeat the assembly procedure for the remaining blade clamp-halves (830) and link arms (130).

C. Blade and Clamp Installation

(1) With the hub assembly (700) mounted on the rotatable fixture of the assembly table, follow the procedure for Measuring blade track found in this chapter.

(2) Measure blade track.

CAUTION: BLADE HEIGHTS AT THE TIP MUST NOT VARY MORE THAN 0.125 INCH (3.18 MM).

(a) Turn the propeller on the rotatable fixture, and measure the height at the tip of each blade using a gauge and adjustable pointer.

(b) If all blades do not track:

1 Make sure that there is no debris between the rotatable fixture flange and the propeller hub flange.

2 Remove a blade or blades not in tolerance with the majority and reinspect for blade face alignment in accordance with Hartzell Propeller Inc. Aluminum Blade Overhaul Manual 133C (61-13-33).

CAUTION: AIR TRAPPED IN THE LUBRICANT CAN AFFECT PROPELLER BALANCE AFTER RUN-UP.

(3) Stand blade number one in vertical position (base up, tip down) and fill the blade bore with lubricant CM12 to the top of the outboard needle bearing.

(4) Install the blade on the pilot tube (530), pushing the blade toward the center of the hub until the butt of the blade shank touches with the face of the blade arm.

NOTE: A slight amount of lubricant will come out around the pilot tube if the blade has been lubricated correctly.

(5) Repeat this procedure for the remaining blades.

CAUTION: BE SURE TO USE HARDENING GASKET SEALANT 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 7-4.

(6) Using an acid brush or finger, optionally wearing non-powdered latex gloves, apply a smooth even layer of gasket sealant CM46 on the shoulder radius of the blade shank (in the area where it will touch 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 7-4.

NOTE 1: Before installing the clamp assembly (700), make sure 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 sealant CM46. Refer to Figure 7-4.

NOTE 2: Do not apply gasket sealant CM46 if blades will be removed to make shipping the propeller easier.

CAUTION: DO NOT APPLY SEALANT CM93 IF THE PROPELLER WILL BE DISASSEMBLED FOR SHIPMENT.

(7) Apply a bead of sealant CM93 approximately 0.125 inch (3.175) wide and 0.06 inch (1.52 mm) thick to both clamp halves (830) on the mating surfaces and in the inboard bearing radius as shown in Figure 7-3.

(8) Remove the masking tape used to temporarily hold the bearing assembly together.

CAUTION: THE PARTING LINES OF THE CLAMP HALVES (830) MUST BE AT A RIGHT ANGLE TO THE PARTING LINE OF THE INBOARD SPLIT BEARING (580).

(9) Put the counterweighted clamp half (830) on the blade and bearing assembly.

(10) Attach the corresponding lower clamp half, enclosing the bearing assembly.

(11) Put a clamp gasket (740) between the parting surfaces of the clamp assembly (700).

CAUTION 1: A 0.06-INCH (1.5 MM) MAXIMUM OF GASKET MATERIAL MUST BE EVENLY EXPOSED THROUGH THE PARTING LINE ON EACH SIDE OF THE CLAMP ASSEMBLY (700). TRIM THE GASKET (740) AS NECESSARY TO SUPPLY METAL-TO-METAL CONTACT WHERE THE CLAMP LUGS MEET.

CAUTION 2: DO NOT TORQUE THE OUTBOARD CLAMP BOLTS (750) AT THIS STEP OF ASSEMBLY.

(12) Apply anti-seize lubricant CM118 to the threaded part of the outboard clamp bolt (750), and install the outboard clamp bolts.

NOTE: This step helps align the clamp gasket (740).

(13) Install self locking nuts (760). Hand-tighten the self locking nuts.

(14) Insert inboard clamp screws (730).

CAUTION 1: DO NOT EXCEED THE RECOMMENDED TORQUE FOR INBOARD CLAMP SCREWS (730). REFER TO THE TORQUE VALUES TABLE IN THE FITS AND CLEARANCE CHAPTER OF THIS MANUAL.

CAUTION 2: INBOARD CLAMP SCREWS (730) MUST BE TORQUED IN THE SEQUENCE SPECIFIED.

(15) Torque the inboard clamp screws (730) in 10 Ft-Lb (13 N•m) increments (20 Ft-Lb [27 N•m], 30 Ft-Lb [40 N•m], etc.) alternating between the inboard clamp screws at each increment. Torque the inboard clamp screws in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

CAUTION: DO NOT CONTACT THE CLAMP ASSEMBLY (700) WITH THE DRILL BIT WHEN DRILLING THE INBOARD CLAMP SCREWS (730).

(16) Using a #42 size bit, drill the head of each inboard clamp screw (730).

(17) Safety each inboard clamp screw (730) with a cotter pin (840) so that the cotter pin touches the clamp half (830) and prevents the inboard clamp screw from backing out of the clamp assembly (700).

NOTE: If an installed cotter pin (840) causes interference, three loops of safety wire CM131 may be used to safety the inboard clamp screw (730).

(18) Repeat this procedure for the remaining blades and clamps.

D. Cylinder and Guide Collar Installation

(1) Clean the threads on the hub unit (500) and cylinder (300).

CAUTION: THE CHAMFERED SIDE OF THE GUIDE COLLAR UNIT (320) MUST SEAT AGAINST THE CYLINDER SHOULDER. TO PERMIT PROPER HUB CLEARANCE, THE LARGER INSIDE DIAMETER OF THE GUIDE COLLAR MUST FACE THE HUB UNIT (500).

(2) Install the cap screw (350) into the guide collar unit (320).

(3) Install the guide collar unit (320) on the smaller diameter shoulder of the cylinder (300). Do not tighten the cap screw (350). Permit the guide collar unit to rotate freely on the cylinder.

CAUTION: DO NOT APPLY HYDRAULIC SEALANT CM134 TO THE THREADS OF THE CYLINDER (300).

(4) Apply a bead of hydraulic sealant CM134 in the groove of the hub unit (500) where the cylinder O-ring (260) fits. Install the O-ring into the cylinder (300) chamfer.

(5) Hand-tighten the cylinder (300) and the guide collar unit (320) if applicable, on the hub unit (500).

(6) Using a bar of appropriate size to fit the slot in the top of the cylinder (300), tighten the cylinder flush against the hub unit (500).

NOTE: Initial drag and tightness is caused by the O-ring (260), which acts as a seal and safety.

(7) Torque the cylinder (300) against the shoulder of the hub unit (500). Refer to the Torque Values Table in the Fits and Clearances chapter of this manual.

(8) Examine the slot in the top of the cylinder (300) to make sure the bar wrench used for torquing did not raise any sharp edges or damage the threads.

(9) Remove any sharp edges in the wrench slot on top of the cylinder (300).

(10) Examine the inside of the cylinder (300) to make sure the O-ring (260) has not been moved out of position during cylinder installation.

E. Feathering Spring Assembly

NOTE: Special fixture TE59 is necessary for compression of the feathering spring assembly (1400).

(1) Install the spacer (1470) on the pitch change rod (1410).

(2) Install the spring retainer cup (1440) on the pitch change rod (1410).

(3) Install the spring spacer sleeve (1570).

(4) Install the feathering springs (1540, 1550, 1560).

(5) Install the rear spring retainer (1580) on the feathering springs (1540, 1550, 1560).

WARNING: WHEN COMPRESSED, THE FEATHERING SPRING ASSEMBLY IS LOADED TO APPROXIMATELY 400 POUNDS (182 KG) FORCE. MAKE SURE OF THE SAFETY OF EVERYONE IN THE AREA DURING ASSEMBLY PROCEDURES.

(6) Compress the spring assembly enough to install the split keeper (1590) that holds the feathering spring in compression on the pitch change rod (1410).

NOTE: Apply oil or grease to each half of the split keeper (1590) to hold it in position until the feathering spring is decompressed.

(7) Carefully decompress (unload) the feathering spring assembly.

F. Feathering Spring Assembly Installation

(1) Apply anti-seize compound CM118 to the threads of the spring retainer cup (1440).

(2) Install the feathering spring assembly (1400) into the cylinder (300).

(3) Use a spanner wrench TE148 to install the feathering spring assembly (1400) into the cylinder (300).

(4) Tighten the feathering spring assembly (1400) until secure.

(5) Using a #42 size (0.0935 inch [2.375 mm]) drill bit, drill through the flange of the spring retainer cup (1440) at the wrench slot in the cylinder (300). Drill in and down at an angle that goes out the other side of the flange. Refer to Figure 7-5.

(6) Install 0.032-inch (0.81 mm) minimum diameter stainless steel wire CM131 through the drilled hole.

(a) Use three loops of wire to safety the spring assembly.

(b) Tuck the "pigtail" into the slotted area.

G. Piston Assembly Installation

(1) Lubricate the piston O-ring (930) with lubricant CM12, and carefully install the O-ring in the groove supplied for it in the piston unit (30).

(2) Cut the necessary length of piston dust seal (270) on a 30 degree diagonal so there will be an overlap at the parting line with a smooth, fuzz-free surface.

(3) Soak the piston dust seal (270) in aviation grade reciprocating engine oil.

CAUTION: MAKE SURE THE DIAGONAL OVERLAP REMAINS ON THE TOP OF THE PISTON DUST SEAL (270) AND DOES NOT ROTATE TO ITS SIDE AS IT IS INSTALLED IN THE GROOVE OF THE PISTON UNIT (30).

(4) Install the piston dust seal (270) in the groove supplied for it in the piston unit (30).

(5) Install the piston unit (30) into position over the cylinder (300).

(6) Apply a thin layer of anti-seize compound CM118 in the hole of the free end of each link arm (130).

(7) Install the free end of each link arm (130) in the slot supplied for it in the piston unit (30).

(8) Install each link pin unit (120) through the large hole in each piston unit (30), and through the hole in each link arm (130).

(9) Push the link pin units (120) flush with the piston unit (30).

CAUTION 1: MAKE SURE THAT THE CORRECT SAFETY SCREWS (110) ARE INSTALLED AND THAT AT LEAST THREE THREAD LENGTHS ARE AVAILABLE IN THE PISTON UNIT (30) TO HOLD THE SCREWS (110) IN POSITION.

CAUTION 2: MAKE SURE THE LINK ARM (130) MOVES FREELY.

(10) Install the safety screws (110) in each link pin unit (120).

(11) Put the guide collar unit (320) solidly against the cylinder (300) at the correct radial location to assist in aligning the piston unit (30).

NOTE: If necessary, shift the guide collar unit (320) radially to supply the necessary clearance between the piston unit (30) and the guide rods (70).

CAUTION: FOR ASSEMBLY PURPOSES ONLY, USE A NON-LOCKING NUT ON THE END OF THE PITCH CHANGE ROD IN PLACE OF THE SELF-LOCKING HEX NUT (10). THE NON-LOCKING NUT MUST BE REPLACED WITH A SELF-LOCKING HEX NUT AFTER ANGLES ARE CHECKED.

(12) Install a non-locking setup nut on the end of the pitch change rod (1410).

(13) Use a 1-13/16 inch wrench TE144-1, or equivalent, on the non-locking setup nut, and a one-inch (25.4 mm) socket on the pitch change rod (1410) to tighten the nut into position.

(14) Install the socket head cap screw (200), washer (210) and check nut (220) on the end of each piston guide rod (70).

H. Setting Blade Angle

(1) Remove pressure from the propeller assembly through the rotatable fixture on the assembly table to move the propeller to low pitch position.

CAUTION: REFER TO THE AIRCRAFT TYPE CERTIFICATE DATA SHEET, SUPPLEMENTAL TYPE CERTIFICATE DATE SHEET, OR HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR INFORMATION ABOUT REQUIRED BLADE ANGLES, TOLERANCES, AND RADIUS REFERENCES.

(2) Using a hand held protractor TE97 or bench-top protractor TE96 and special riser fixture TE48 or equivalent, measure the low pitch angle on blade one at the reference blade radius. Refer to Figure 7-6.

(3) The low pitch angle of all blades must be within a blade-to-blade tolerance of 0.2 degree from the maximum to the minimum blade angle at low pitch.

(4) Rotate the blade in the clamp (700) to get the correct low pitch blade angle.

(5) Using clamp nut wrench TE142 or equivalent, hold the self-locking nut (760) and a standard 12-point socket torque the outboard clamp bolts (750) in accordance with the Torque Values Table in the Fits and Clearances chapter of this manual.

(a) While torquing outboard clamp bolts (750), make sure the gasket (740) position is maintained to supply an adequate grease seal.

(b) Make sure a nearly equal gap between the two clamp-halves (830) is maintained after final torque is applied.

(6) Repeat this procedure for each of the other blades.

(7) Measure the blade-to-blade low pitch angle difference at the reference blade radius, and readjust the blade low pitch angles if they are not within tolerance.

NOTE: A blade-to-blade tolerance is applicable when setting the low pitch blade angle. This will supply the best opportunity to meet all blade angle tolerance requirements.

(8) Make sure the low pitch blade angle setting and high pitch blade angle setting are correct by cycling the propeller from low pitch to high pitch, and back to low pitch.

I. Blade Angle Reference Tape Application (Optional)

(1) Refer to the section, "Finishing Procedures" in this chapter.

J. Examine for Blade Slippage in Clamp

(1) Refer to the section, "Finishing Procedures" in this chapter.

K. Sealant CM93 Application

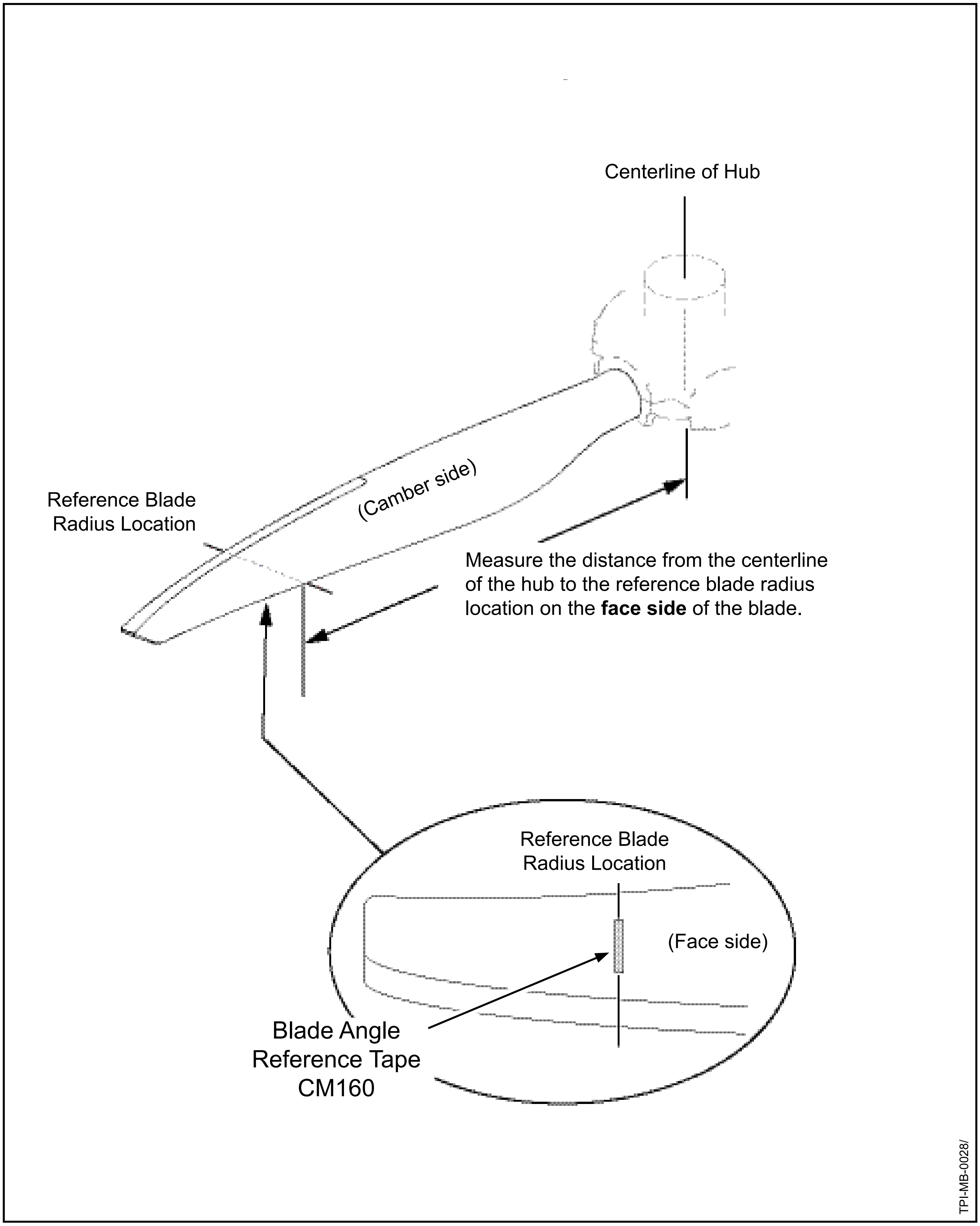
(1) Refer to the section, "Finishing Procedures" in this chapter.

L. Label Replacement

(1) Refer to the section, "Finishing Procedures" in this chapter.

M. Inspecting the Reassembled Propeller

(1) Refer to the section, "Finishing Procedures" in this chapter.



Blade Angle Reference Tape
Figure 7-8

12. Finishing Procedures

A. 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 SHOW 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 7-8.

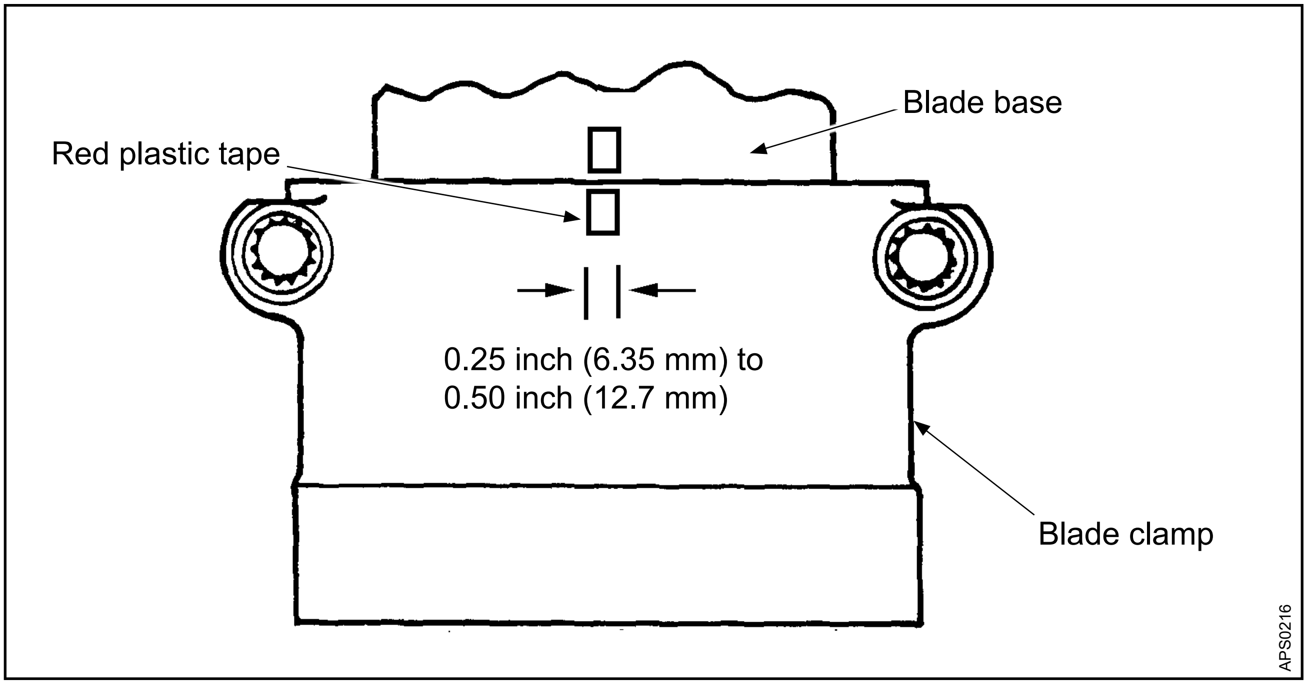
(c) Apply a piece of reference tape CM160 to the face side of the blade at the reference blade radius location, perpendicular to the blade centerline as shown in Figure 7-8.

1 Put the reference tape CM160 on the blade so that the reference blade radius location runs through the centerline of the tape.

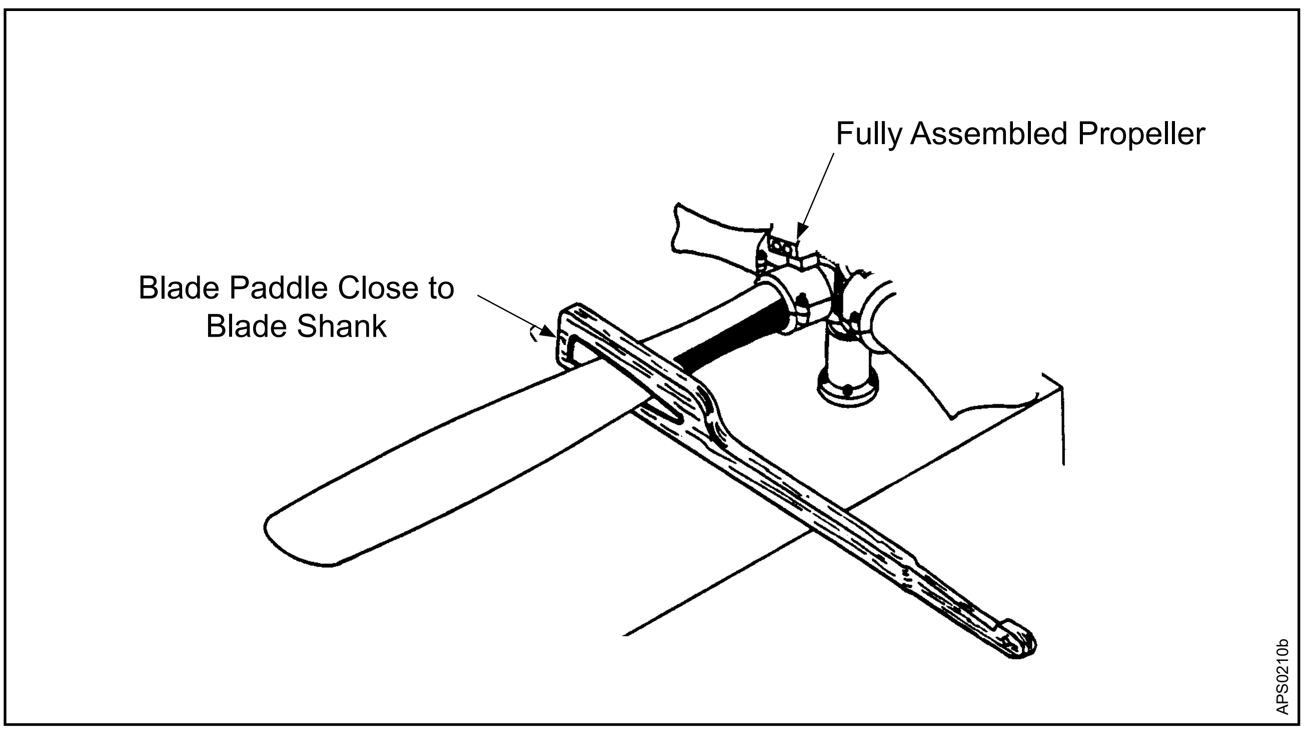
(d) Repeat (3)(b) and (3)(c) for the remaining blades in the hub assembly.

(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.



Providing for Visual Detection of Blade Slippage in Blade Clamp
Figure 7-9



Using Blade Paddle to Examine for Blade Slippage in Blade Clamp
Figure 7-10

B. Examine for Blade Slippage in Clamp

(1) With the propeller still installed on the rotatable fixture of the assembly table, continue as follows to supply visual detection of slippage between the blade base and the blade clamp (700).

CAUTION: DO NOT USE A PUNCH OR SCRIBE A LINE ON THE BLADE BASE. THIS COULD START A CRACK IN THE BLADE.

(2) When the correct pitch is set in each blade, apply a strip of red plastic tape down the base and across the clamp (700) of blade number one as shown in Figure 7-9.

(3) Carefully cut the tape along the line where the blade and blade clamp (700) meet.

(4) Spray the pieces of tape with polyurethane CM129 to supply a clear protective coating.

(5) Repeat this procedure on the other blade assemblies.

NOTE: Misalignment of the halves of tape on a blade assembly shows slippage between the blade and blade clamp (700). Follow the repair procedure found in the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

CAUTION: DO NOT PUT THE BLADE PADDLE IN THE AREA OF THE DE-ICE BOOT WHEN TORQUING A BLADE ASSEMBLY. PUT THE BLADE PADDLE IN THE THICKEST AREA OF THE BLADE, JUST OUTBOARD OF THE DE-ICE BOOT. USE ONE BLADE PADDLE PER BLADE.

(6) Using one blade paddle per blade, torque each blade assembly toward reverse. Refer to the Blade Torque Values Table in the Fits and Clearances chapter of this manual. Refer to Figure 7-10.

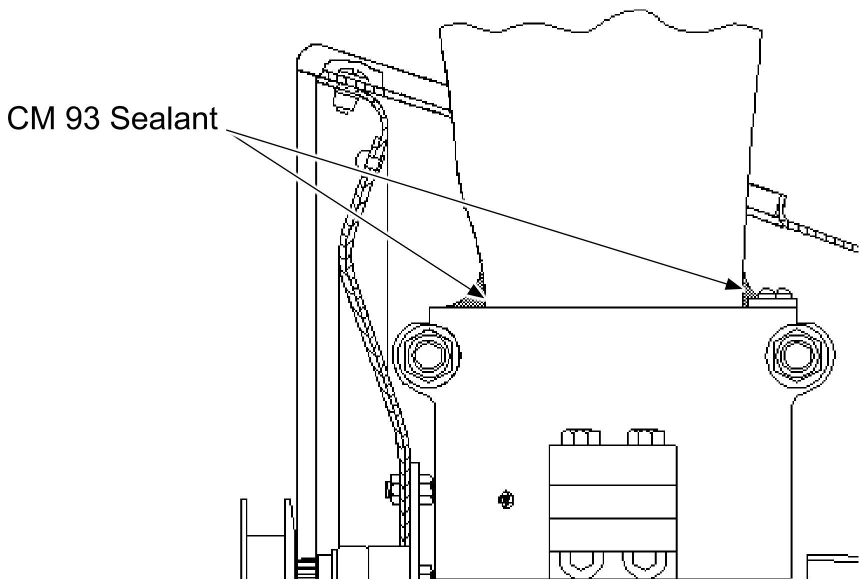
(7) If it is necessary to correct blade slippage, refer to the Blade Clamp Overhaul chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(8) Static balance the propeller in accordance with the Static and Dynamic Balance chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(9) Add grease to the blade clamp assemblies (700) in accordance the Propeller Lubrication chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

(10) Tighten the lubrication fitting (860) in each blade clamp (700) until snug.

(11) Install a lubrication fitting cap (850) on each lubrication fitting (860).



Sealant CM93 Application
Figure 7-11

C. Sealant CM93 Application

(1) The application of sealant CM93 to the blade/blade clamp interface is an optional procedure that may supply additional protection against corrosion of the blade retention components.

(2) Do not apply sealant CM93 to the blade/blade clamp interface if the blades will be removed to facilitate shipment of the propeller.

CAUTION 1: TO PREVENT PERMANENT DAMAGE TO THE BLADE RETENTION COMPONENTS CAUSED BY TRAPPED CHEMICALS, THIS PROCEDURE MUST ONLY BE PERFORMED FOLLOWING THE ASSEMBLY OF A PROPELLER AFTER OVERHAUL OR AFTER ANY OTHER PROCEDURE THAT INCLUDES DISASSEMBLY AND CLEANING OF THE PROPELLER BLADE RETENTION COMPONENTS.

CAUTION 2: FOR CORRECT ADHESION OF SEALANT CM93, BLADE AND BLADE CLAMP (830) SURFACES MUST BE FREE OF GREASE AND DIRT.

CAUTION 3: DO NOT PERMIT THE SEALANT CM93 TO EXTEND TO THE SURFACE OF THE BLADE CLAMP (830), WHERE BALANCE WEIGHTS (650) AND DE-ICE HARDWARE ARE INSTALLED.

(3) After doing the check for blade slippage in the blade clamp (830), 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, as shown in Figure 7-11.

(4) Permit the sealant to cure for a minimum of two hours before returning the propeller to service.

D. Label Replacement

(1) For information of labels, refer to the Parts Identification and Marking chapter and the Paint and Finish chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-01-02).

ASSEMBLY INSPECTION CHECK-OFF RECORD
Reversing and Feathering Propeller

MODEL - HCB ( ) ( ) ( ) - ( )		Assembly No.	
Customer		Factory No.	
Order No. New		Repair	
HUB Ser. No. Ass'y No. - 840 ( )		FINAL ASSEMBLY	
		Pitch L. P. at ( ) Sta.	
		F. A. ____ R. P. ____ S. P. ____	
		Track	Ct. Wt. Angle in Reverse Position
		Blade Angle Set By: Insp. By:	
		BALANCE	
BLADES		Greased By:	
Ser. No. & &		Slugs Per Blade (1) (2) (3) Total	
Design No.		Bal. By: Insp. By:	
Grease In Pilot Tube Hole		SHIPPING INSPECTION	
CLAMPS 838 - ( )		8-A2047 Bolts	Reverse Block A3044
Ser. No. & &		1-909-8 "O" Ring	General Appearance
Ct. Wt. Slugs		A2048-2 Washers	Link Screws Safetied
Clamp Bolts Torqued at 60-65 Ft. Lbs. (7/16-20)		B3001-2 Low Stop Collar	Red Index Tape Installed
A282 Clamp Bolts Torqued at 40 Ft. Lbs.		A3074	A3049 Ring Installed
Blades Torqued at 165 Ft. Lbs., Composites 200 Ft. Lbs.		Low Stop Collar has ____ Total Runout in Reverse Position Ser. No.	
PISTON Ser. No. Ass'y No.		Low Stop Collar has ____ Total Runout in Feather Position	
Cyl. No.		Hub and Cyl. Clean	
"O" Ring & Dust Seal In Place		Spring Safetied	
Guide Collar 834 ( )		Bulkhead Ser. No. -	Insp. Date
SPRING ASS'Y No. 831 - ( )		De-Icing Platter Runout	F.A.A. Designee
NOTE: For Turbo-Prop Applications: Use "O" Ring of PRP Compound 1487 or 8307 which are in contact with Engine Lubricant			
For Repairs Only: Complies with all Hartzell Service Bulletins through A.D. ____		& Bulletins No. ___	

Low Stop Collar set at ____________ Signed ____________

Functional Test 0 to 200 lbs.

**This propeller has been repaired in accordance with FAR Part 43 or in accordance with manufacturer's approved data on file with the Federal Aviation Ag. ncy, and is classed as a minor repair. This sheet should be attached to your log book in lieu of a log book entry in compliance with requirements of FAR Part 43.

InspSheet

An Example of an Inspection Check-Off Form
Figure 7-12

E. Inspecting the Reassembled Propeller

(1) Use an assembly inspection check-off form as a checklist for a final inspection of the reassembled propeller. Refer to Figure 7-12.

(2) Make sure that propeller balance was completed.

(3) Perform a blade track check. Refer to Figure 7-13.

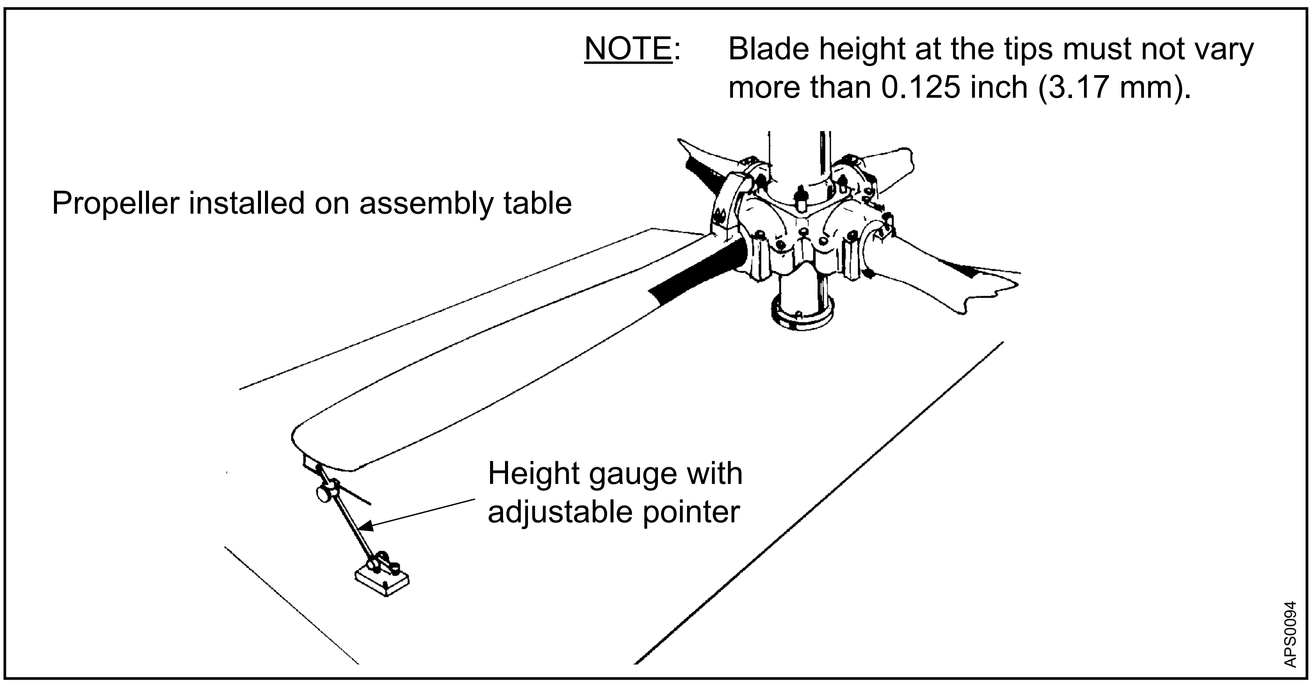
NOTE: The height at the tip of each blade can vary within 0.125 inch (3.17 mm).

(4) Examine end-play movement on each blade tip. Refer to Figure 1-1 in the Testing and Fault Isolation chapter, and the Blade Tolerance Table in the Fits and Clearances chapter of this manual for acceptable limits.

(5) Examine fore-and-aft movement on each blade tip. Refer to Figure 1-1 in the Testing and Fault Isolation chapter, and the Blade Tolerance Table in the Fits and Clearances chapter of this manual for acceptable limits.

(6) Examine radial play on each blade. Refer to Figure 1-1 in the Testing and Fault Isolation chapter, and the Blade Tolerance Table in the Fits and Clearances chapter of this manual for acceptable limits.

(7) Examine blade pitch settings. Refer to the Type Certificate Data Sheet, Supplemental Type Certificate Data Sheet, or Hartzell Propeller Inc. Application Guide Manual 159 (61-02-59), for the applicable blade pitch settings, associated tolerance, and the reference blade radius specified for measurement.



Measuring Blade Track
Figure 7-13

FITS AND CLEARANCES - CONTENTS

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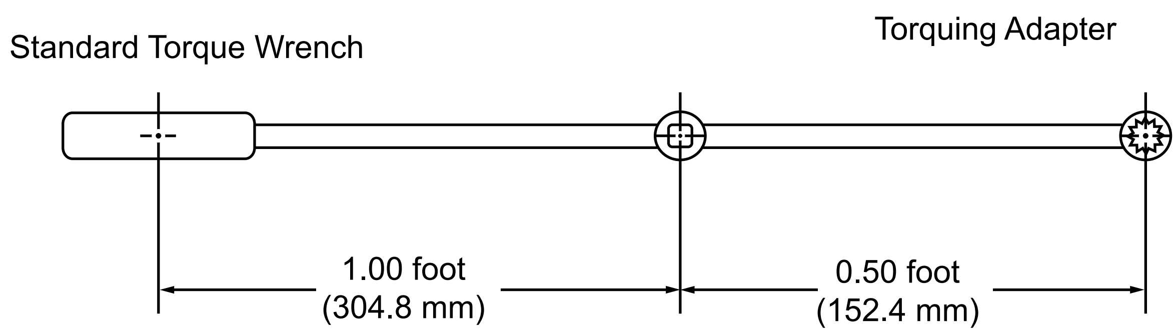


$$\frac{\text{(actual torque required)} \times \text{(torque wrench length)}}{\text{(torque wrench length)} + \text{(length of adapter)}} = \text{torque wrench reading to achieve required actual torque}$$

EXAMPLE:

$$\frac{\text{100 Ft-Lb (136 N•m)} \times \text{1 ft (304.8 mm)}}{\text{1 ft (304.8 mm)} + \text{0.50 ft (152.4 mm)}} = \text{66.7 Ft-Lb (90.4 N•m)}$$

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.

APS212

Calculating Torque When Using a Torque Wrench Adapter
Figure 8-1

1. Torque Values (Rev. 2)

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 Inc. 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.

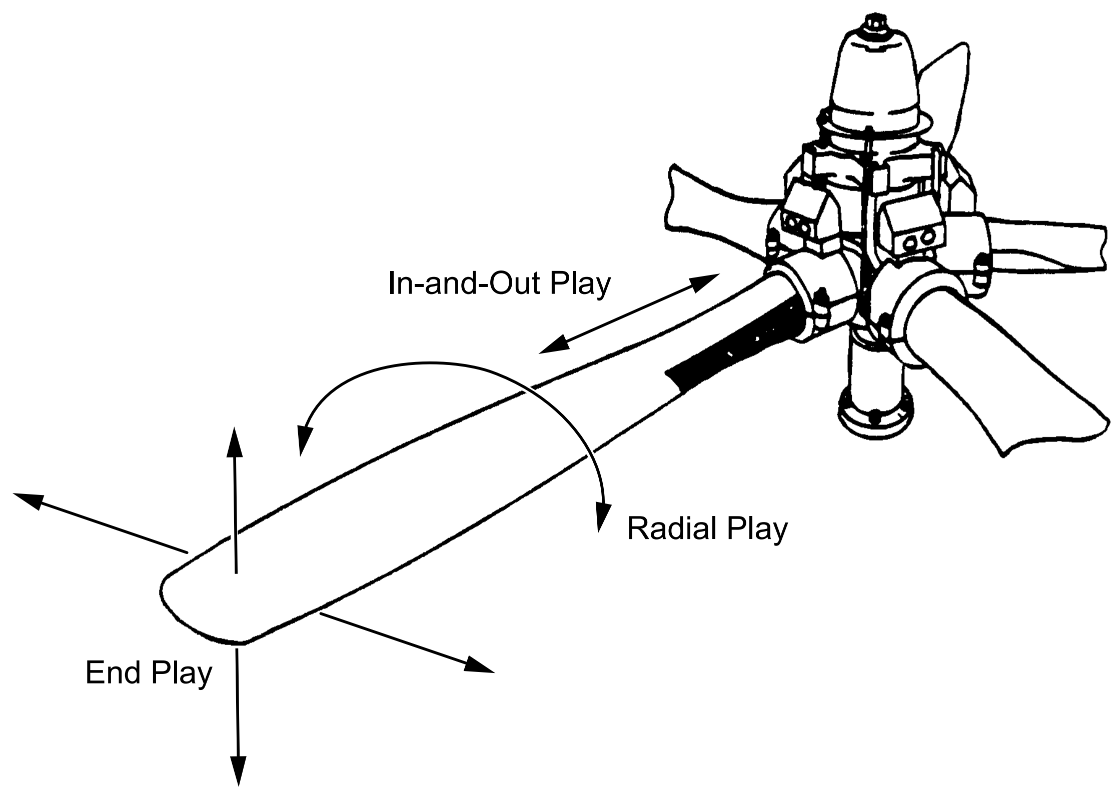
CAUTION 1: TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS, UNLESS SPECIFIED IN TABLE 8-1.

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
10	A-880-( )	Nut, Hex, Self-Locking, Thin	120	1440	162
180	A-2039	Screw, Set, 10-32	----	24-36	2.7-4.1
220	B-3368	Nut, 5/16-24, Hex, Thin/Guide Rod	----	120	13.7
300	B-806-( )	Cylinder	125-150	1500-1800	169-203
	B-854-( )	Cylinder	125-150	1500-1800	169-203
	B-1803-( )	PCP: Cylinder	125-150	1500-1800	169-203
	B-1882-( )	Cylinder	125-150	1500-1800	169-203
	B-3406	Cylinder	125-150	1500-1800	169-203
350	A-2038-( )	Screw, 1/4-28, Cap/Guide Collar	Tighten until secure		
730	A-321	Screw, 3/8-24 Double 60° Head/ Clamp	40	480	54
750	A-1372	Bolt, 7/16-20, 12 Point/Clamp Bolt, Outer	60-65 wet	720-780 wet	82-88 wet
	A-1379	Bolt, 7/16-20, 12 Point/Clamp Bolt, Outer	60-65 wet	720-780 wet	82-88 wet
1620	A-880-1	Nut, Hex, Self-Locking, Thin	70	840	94-96
1750	A-2016	Bolt, 10-32, Hex Head/Start Lock Plate	----	48-72	5.5-8.2
1770	B-3384-( )	Bolt, 1/4-28, Hex Head/Bulkhead	----	96-120	10.9-13.6
	A-2051-( )	Bolt, 5/16-24, Hex Head	15	180	20
Aluminum Blade Mounted in Clamp			167	2004	226

Torque Values
Table 8-1



Blade Play
Figure 8-2

2. Blade Tolerances (Rev. 4)

A. Blade Play

(1) Limits for blade play are specified below. Refer to Figure 8-2.

(a) End Play:

Leading Edge to Trailing Edge	0.25 inch (6.3 mm) total
Fore-and-Aft (face to camber)	0.25 inch (6.3 mm) total

(b) In-and-Out Play — 0.032 inch (0.81 mm)

(c) Radial Play (pitch change) — ±0.5 degree (1 degree total) 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) Blade Track — 0.25 inch (6.3 mm) total

C. Blade Pitch Tolerance

(1) Blade pitch setting tolerance between blades at low pitch — 0.2 degree

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   B. Special Tooling 9-3
   C. Facilities 9-3

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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 can create 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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HC-B3R30-4(A,B), HC-B3(R,W)30-4, and HC-B3WF-4 Propeller
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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 models included in this manual.

CAUTION: THE ILLUSTRATIONS IN THIS CHAPTER ARE PROVIDED FOR PART IDENTIFICATION AND LOCATION REFERENCE ONLY. THEY SHOULD NOT BE USED 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. 1)

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) Item 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-asssembly.

(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

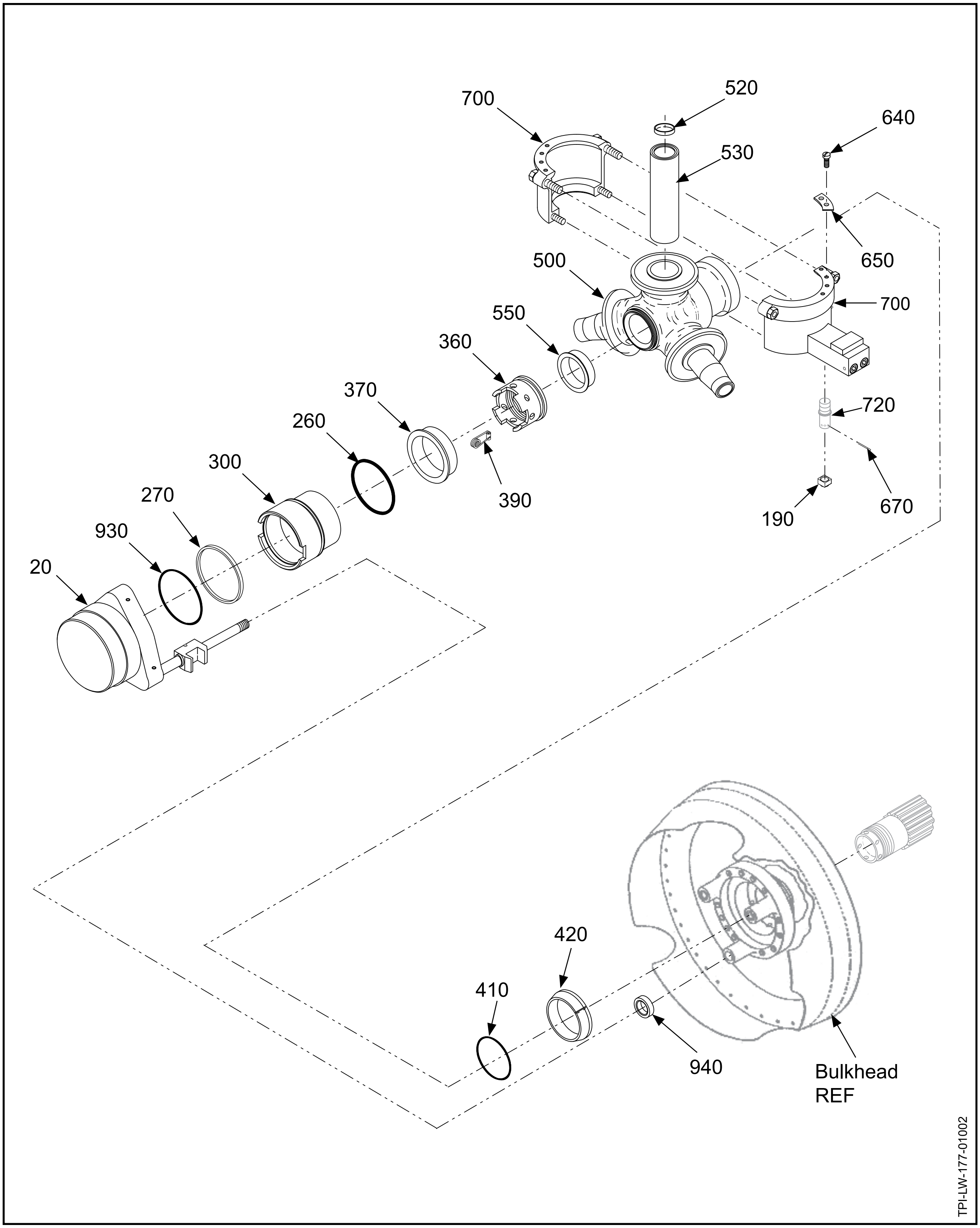
(1) Many O-rings, fasteners, and other vendor supplied hardware listed in Hartzell Propeller Inc. manuals have previously been specified with AN, MS, NAS, or vendor part number. To provide internal controls and procurement flexibility, Hartzell part numbers have been assigned to all O-rings, fasteners, and hardware. Part shipments from Hartzell Propeller Inc. will specify only the Hartzell 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.

(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 part number item and AN, MS, NAS, and other specified vendor number items can be used interchangeably.

(c) The Hartzell part number must be used when ordering these parts from Hartzell Propeller Inc.



HC-B3Z20-1: Propeller Parts
Figure 10-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-B3Z20-1**		RF		
10A-13						
20	B-1378	• PISTON ASSEMBLY (REFER TO "B-1378 PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
190	A-95-A	• BLOCK, PITCH CHANGE		3	Y	
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
-270	B-1843	• SEAL, DUST, PISTON		1	Y	
300	B-806-1	• CYLINDER		1		
360	A-63-B	• NUT, SHAFT, 20 SPLINE (USE WITH ITEM 370)		1		
360A	B-2063	• PCP: NUT, SHAFT, 20 SPLINE ALTERNATE FOR ITEM 360		1		PCP
370	A-870	• PULLER RING (USE WITH ITEM 360)		1		
390	A-847	• SAFETY PIN, HUB LOCK		1	Y	
410	C-3317-229	• O-RING, REAR CONE		1	Y	
420	A-50-5	• REAR CONE		1		
500	840-55	• PCP: HUB UNIT		1		PCP
520	B-7070-25	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530) SUPERSEDED BY ITEM 520A		3	Y	
520A	B-7070-22	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530A) SUPERSEDES ITEM 520		3	Y	
530	D-7469-( )	• • PILOT TUBE - SUPERSEDED BY ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS)		3		
530A	100320	• • PILOT TUBE - SUPERSEDES ITEM 530 (DO NOT MIX PILOT TUBES ON HUB UNITS.)		3		
550	A-155	• • HUB BUSHING, SHAFT		1		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		4	Y	
700	838-42	• PCP: CLAMP ASSEMBLY (REFER TO "838-42: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		PCP
700A	838-90	• CLAMP ASSEMBLY, ALTERNATE FOR ITEM 700 (REFER TO "838-90: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
720	A-295	• • LINKSCREW, 1/2-20		1	Y	
930	C-3317-343-1	• O-RING (PISTON)		1	Y	
940	A-116-D1	• BUSHING		3		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-1		**PROPELLER PARTS - HC-B3Z20-1- CONTINUED**				
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

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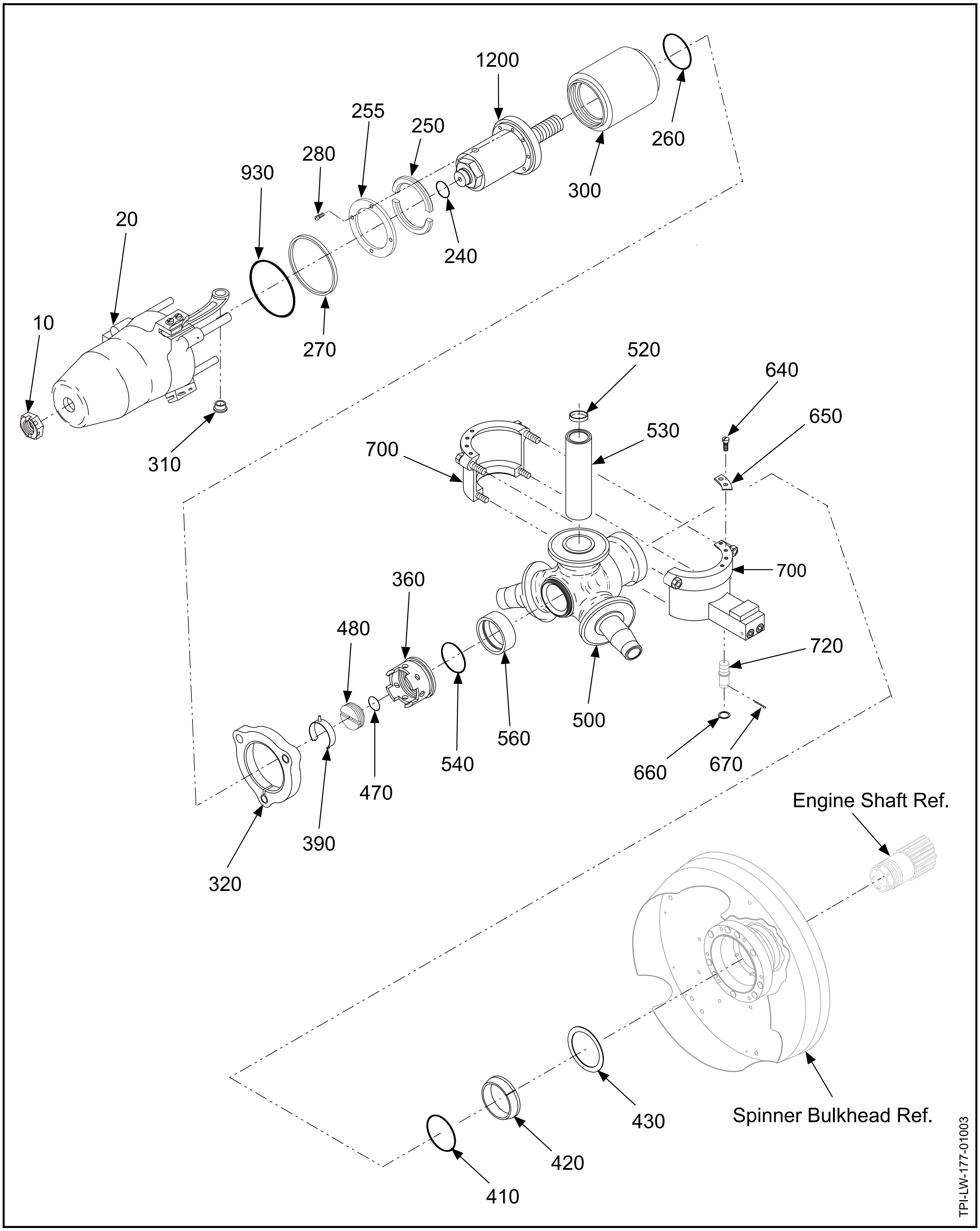

HA-B3(P,Z)30-1B: Propeller Parts
Figure 10-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-2		**PROPELLER PARTS - HA-B3(P,Z)30-1B**		RF		
10	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
20	B-1368-1	• PISTON ASSEMBLY (REFER TO "B-1368-1 PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
250	A-859	• KEEPER, SPLIT		1		
255	A-1945	• PLATE, FRONT		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	A-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-10	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-854	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-6	• GUIDE COLLAR UNIT (REFER TO "834-6 GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	B-1894	• PCP: NUT, SHAFT, 30 SPLINE		1		PCP
390	A-1848	• LOCK, NUT, SHAFT, 30 SPLINE-UNIT		1		
410	C-3317-231	• O-RING, REAR CONE		1	Y	
420	A-1812-1	• CONE, MOUNTING, REAR, 30 SPLINE (SPINNER)	-PW, -ZW	1		
	A-1856	• CONE, MOUNTING, REAR, 30 SPLINE (NO SPINNER)	-PN, -ZN	1		
430	A-1855	• SPACER, SHAFT, 30 SPLINE	-PW, ZW	1		
470	C-3317-210-1	• O-RING, (ENGINE SHAFT) (USE WITH ITEM 480 ONLY)		1	Y	
480	A-1857	• SHAFT PLUG (USE WITH ITEM 470)		1		
480A	A-1857-1	• SHAFT PLUG, ALTERNATE FOR ITEM 480		1		
500	840-34	• PCP: HUB UNIT		1		PCP
520	B-7070-25	• • PLUG, CUPPED, STEEL (USED ONLY WITH ITEM 530A)		3	Y	
520A	B-7070-22	• • PLUG, CUPPED, STEEL - SUPERSEDES ITEM 520 (USED WITH ITEM 530A)		3	Y	
530	A-1308	• • PILOT TUBE - SUPERSEDED BY ITEM 530A		3		
530A	D-7469-( )	• • PILOT TUBE - SUPERSEDES ITEM 530 (USED WITH ITEM 520) (DO NOT MIX PILOT TUBES ON HUB UNITS.)		3		
530B	100320	• • PILOT TUBE - SUPERSEDES ITEM 530A (USED WITH ITEM 520A) (DO NOT MIX PILOT TUBES ON HUB UNITS.)		3		
560	A-1817	• • BUSHING, HUB		1		
540	C-3317-141	• O-RING (PILOT TUBE)		1	Y	
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-PW	HA-B3P30-1B (WITH SPINNER)	-ZW	HA-B3Z30-1B (WITH SPINNER)
-PN	HA-B3P30-1B (NO SPINNER)	-ZN	HA-B3Z30-1B (NO SPINNER)

- ITEM NOT ILLUSTRATED

HA-B3(P,Z)30-1B

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-2		**PROPELLER PARTS - HA-B3(P,Z)30-1B- CONTINUED**				
650	A-1305	• BALANCE WEIGHT		AR		
660	A-6119	• BUSHING, LINK ARM		3	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-73	• PCP: CLAMP ASSEMBLY (REFER TO "838-73: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-PW, -PN	3		PCP
	838-50	• CLAMP ASSEMBLY (REFER TO "838-50: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-ZW, -ZN			
720	A-304	• LINKSCREW, 1/2-20		3	Y	
930	C-3317-343-1	• O-RING (PISTON)		1	Y	
-1200	B-1944	• PITCH ADJUSTMENT ASSEMBLY (REFER TO "B-1944 PITCH ADJUSTMENT ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-PW	HA-B3P30-1B (WITH SPINNER)	-ZW	HA-B3Z30-1B (WITH SPINNER)
-PN	HA-B3P30-1B (NO SPINNER)	-ZN	HA-B3Z30-1B (NO SPINNER)

- ITEM NOT ILLUSTRATED

HA-B3(P,Z)30-1B

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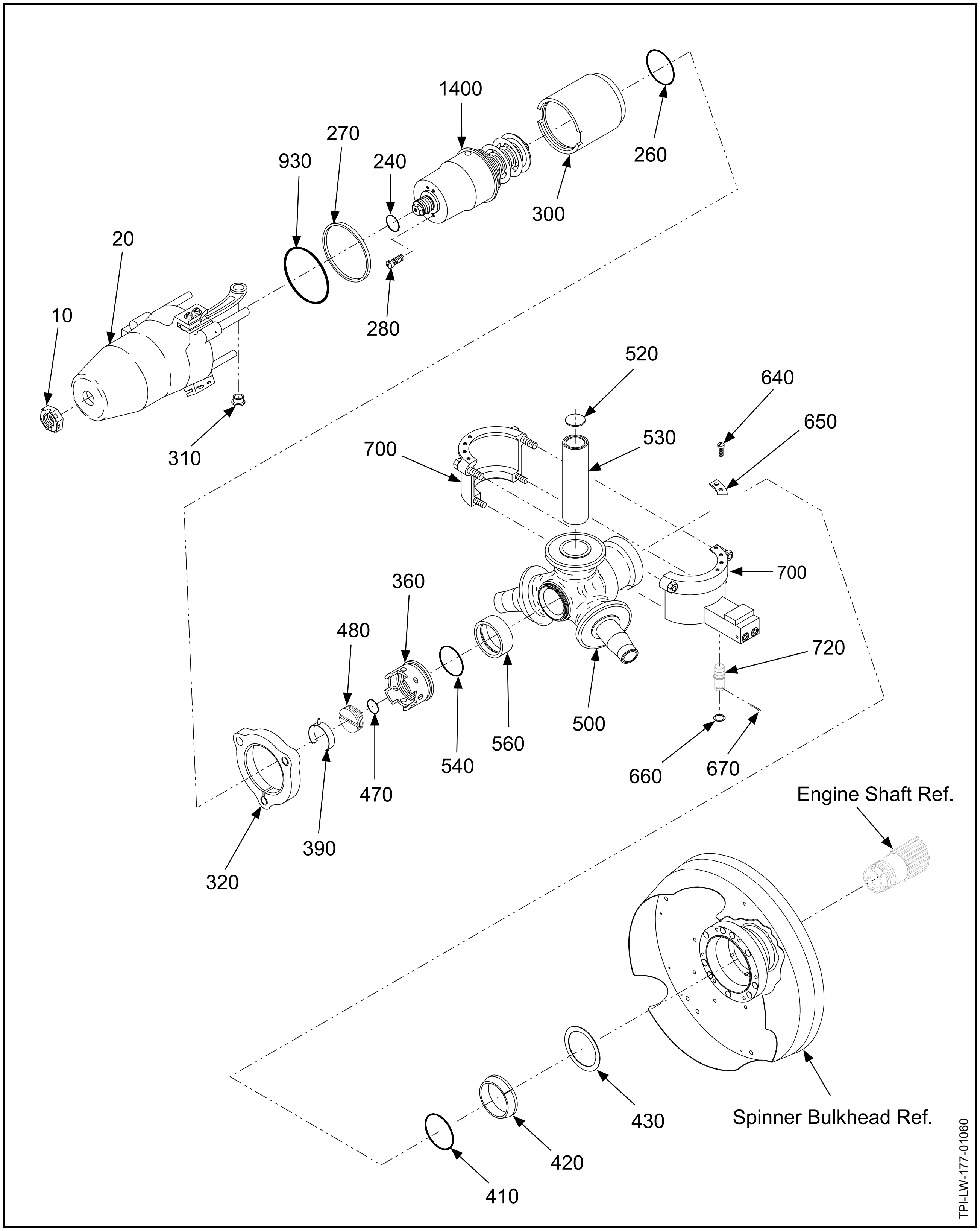


HC-B3(P,R,W,Z)30-1E(A,B): Propeller Parts
Figure 10-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER PARTS - HC-B3(P,R,W,Z)30-1E(A,B)**		RF		
10	A-880-1	• NUT, HEX,SELF-LOCKING, THIN		1	Y	
20	B-1368-3	• PISTON ASSEMBLY (REFER TO "B-1368-3: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-1803-1	• PCP: CYLINDER		1		PCP
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7A	• GUIDE COLLAR UNIT (REFER TO "834-7A GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	B-1894	• PCP: NUT, SHAFT, 30 SPLINE		1		PCP
390	A-1848	• LOCK, NUT, SHAFT, 30 SPLINE-UNIT		1	Y	
410	C-3317-231	• O-RING (REAR CONE)		1	Y	
420	A-1812-1	• CONE, MOUNTING, REAR, 30 SPLINE		1		
430	A-1855	• SPACER, SHAFT, 30 SPLINE		AR		
470	C-3317-210	• O-RING		1		
480	A-1834-( )	• PLUG		1		
500	840-34	• PCP: HUB UNIT	-PA, -PB, -ZA,- ZB	1		PCP
	840-74	• PCP: HUB UNIT	-RA,- WA -RB, -WB	1		PCP
520	B-3897-1	• • PLUG, EXPANSION - SUPERSEDED BY ITEM 520A	-RA, -WA -RB, -WB	3	Y	
520A	B-7070-25	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530A) SUPERSEDED BY ITEM 520B	-RA, -WA -RB, -WB	3	Y	
520B	B-7070-22	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530B) SUPERSEDES ITEM 520A	-RA, -WA -RB, -WB	3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-PA	HC-B3P30-1EA	-WB	HC-B3W30-1EB
-PB	HC-B3P30-1EB	-ZA	HC-B3Z30-1EA
-RA	HC-B3R30-1EA	-ZB	HC-B3Z30-1EB
-WA	HC-B3W30-1EA		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		PROPELLER PARTS - HC-B3(P,R,W,Z)30-1E(A,B)- CONTINUED				
530	A-1884-A	• • PILOT TUBE	-W2B, -RA, -WA -RB, -WB	3		
	A-1308	• • PILOT TUBE - SUPERSEDED BY ITEM 530A DO NOT MIX PILOT TUBES ON HUB UNITS.	-PA,- PB -ZA, -ZB	3		
530A	D-7469-( )	• • PILOT TUBE (USED WITH ITEM 520A) SUPERSEDED BY ITEM 530B (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-PA,- PB -ZA, -ZB	3		
530B	100320	• • PILOT TUBE - SUPERSEDES ITEM 530A (USED WITH ITEM 520B) (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-PA,- PB -ZA, -ZB	3		
560	A-1817	• • BUSHING, HUB		1	Y	
540	C-3317-141	• O-RING (FRONT BUSHING)		1	Y	
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
660	A-6119	• BUSHING, LINK ARM - OPTIONAL		3	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-17	• PCP: CLAMP ASSEMBLY (REFER TO "838-17: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-WB, -ZB	3		PCP
	838-28	• PCP: CLAMP ASSEMBLY (REFER TO "838-28: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-WA, -ZA	3		PCP
	838-72	• PCP: CLAMP ASSEMBLY (REFER TO "838-72: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-RA, -PA	3		PCP
	838-74	• PCP: CLAMP ASSEMBLY (REFER TO "838-74: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-PB	3		PCP
720	A-304	• • LINKSCREW, 1/2-20		3	Y	
930	C-3317-347-1	• O-RING (PISTON)		1	Y	
1400	831-87B	• FEATHERING SPRING ASSEMBLY (REFER TO "831-87B: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
-1700	830-14	• START LOCK ASSEMBLY (BULKHEAD MOUNTED) (REFER TO "830-14: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		

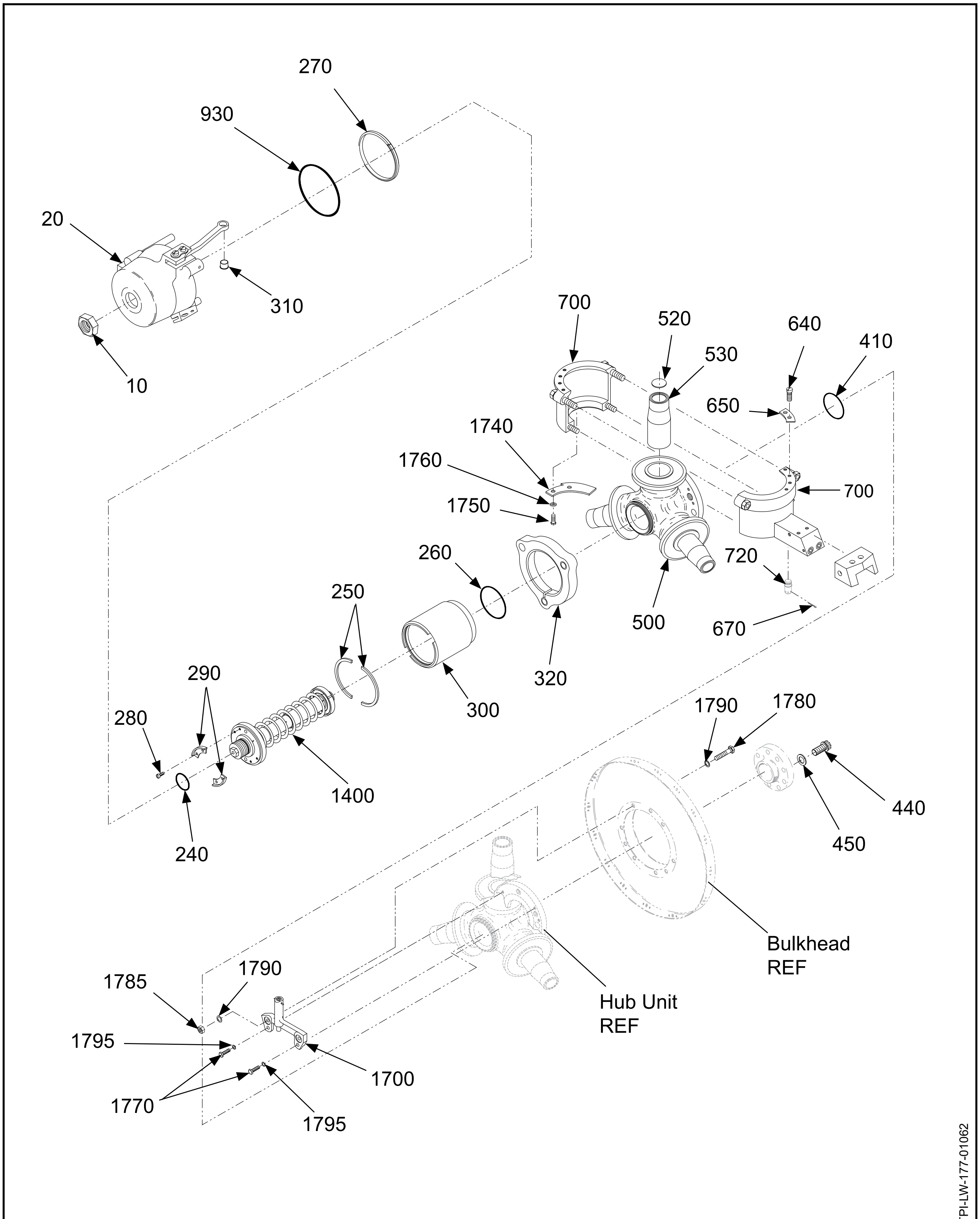
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-PA	HC-B3P30-1EA	-WB	HC-B3W30-1EB
-PB	HC-B3P30-1EB	-W2B	HC-B3W30-1EB
-RA	HC-B3R30-1EA	-ZA	HC-B3Z30-1EA
-RB	HC-B3R30-1EB	-ZB	HC-B3Z30-1EB
-WA	HC-B3W30-1EA		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-3		**PROPELLER PARTS - HC-B3(P,R,W,Z)30-1E(A,B)- CONTINUED**				
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-B3WF-2: Propeller Parts
Figure 10-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-4		**PROPELLER PARTS - HC-B3WF-2**		RF		
10	A-880-2	• NUT,HEX,SELF-LOCKING,THIN		1	Y	
20	832-17	• PISTON ASSEMBLY (REFER TO "832-17: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-024	• O-RING (FRONT)		1	Y	
250	A-859	• KEEPER, SPLIT		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		4	Y	
290	A-899-( )	• SPACER, STOP, PITCH		2		
300	B-854	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-1	• GUIDE COLLAR UNIT (REFER TO "834-1 GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
410	C-3317-228	• O-RING (SHAFT)		1	Y	
440	A-1328-1	• BOLT, MOUNTING, 1/2-20, 12 POINT		6	Y	
450	A-1381	• WASHER, FLAT		6	Y	
500	840-115	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION		3	Y	
530	A-1884-( )A	• • PILOT TUBE		3		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-81	• CLAMP ASSEMBLY (REFER TO "838-81: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
720	A-304	• • LINKSCREW, 1/2-20		3	Y	
930	C-3317-343-1	• O-RING (PISTON)		1	Y	
1400	831-4	• FEATHERING SPRING ASSEMBLY (REFER TO "831-4: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
1700	830-31	• START LOCK ASSEMBLY (REFER TO "830-31: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-881-4	• PLATE, START LOCK		3		
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1750A	A-2016-2	• BOLT, 10-32, HEX HEAD, ALTERNATE FOR ITEM 1750		6	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-4		**PROPELLER PARTS - HC-B3WF-2 - CONTINUED**				
1760	B-3851-0363	• WASHER, FLAT (USE WITH ITEM 1750A)		6	Y	
1770	B-3384-3H	• BOLT, 1/4-28, HEX HEAD		6	Y	
1780	B-3384-18	• BOLT, 1/4-28, HEX HEAD		6	Y	
1785	B-3808-4	• NUT, HEX, SELF-LOCKING		6	Y	
1790	B-3851-0463	• WASHER		6	Y	
1795	A-1864	• WASHER, 1/4 INCH, FIBER (AUTO HIGH STOP BRACKET MOUNTING)		6	Y	
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

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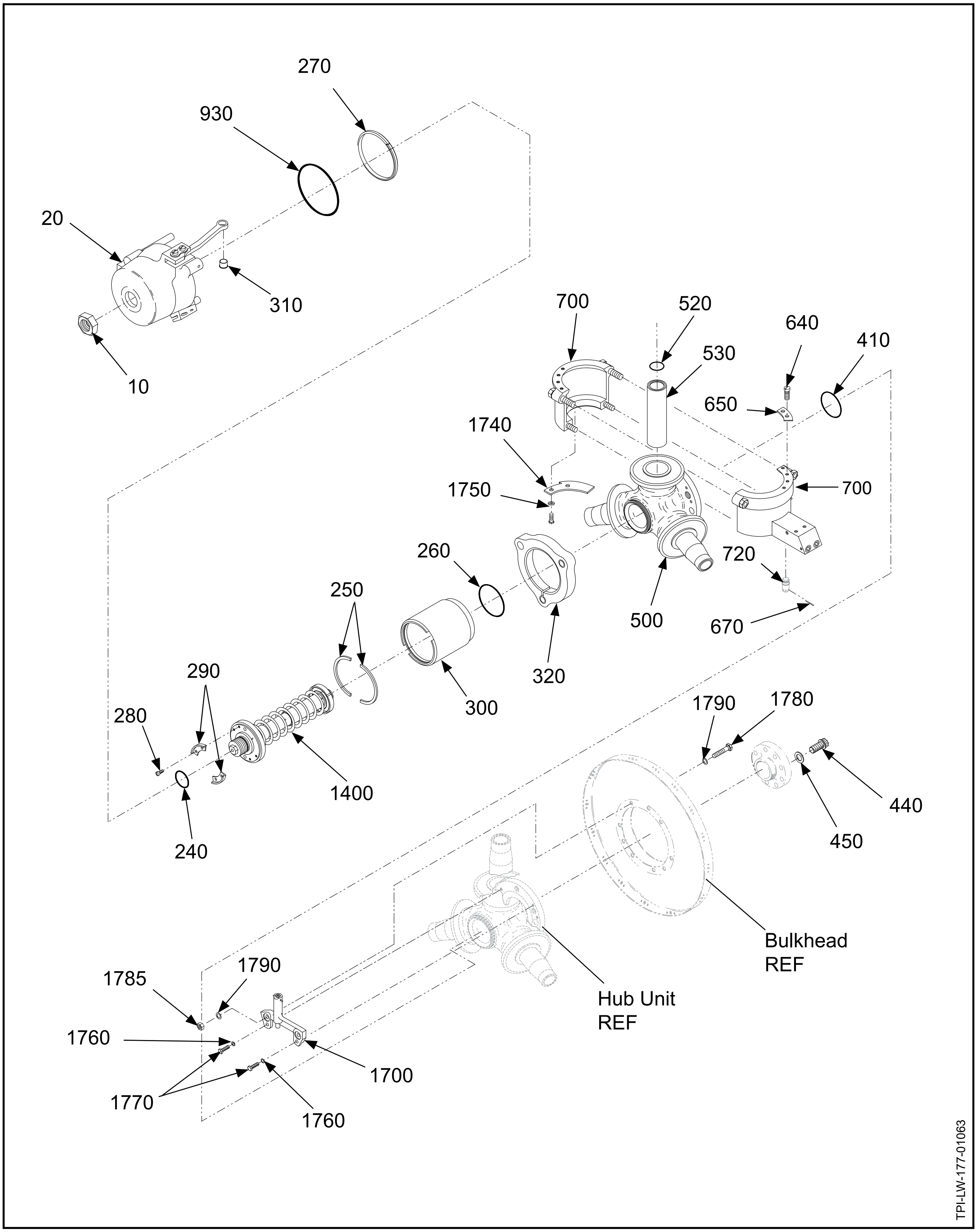

HC-B3ZF-2A, -2B: Propeller Parts
Figure 10-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER PARTS - HC-B3ZF-2A, -2B**		RF		
10	A-880-2	• NUT, HEX, SELF-LOCKING, THIN	-2A	1	Y	
	A-880-1	• NUT, HEX, SELF-LOCKING, THIN	-2B	1	Y	
20	832-17	• PISTON ASSEMBLY (REFER TO "832-17: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2A	1		
	832-14	• PISTON ASSEMBLY (REFER TO "832-14: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2B	1		
240	C-3317-024	• O-RING (FRONT)	-2A	1	Y	
	C-3317-020	• O-RING (FRONT)	-2B	1	Y	
250	A-859	• KEEPER, SPLIT		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		4	Y	
290	A-899-( )	• SPACER, STOP, PITCH		2		
300	B-854	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-1	• GUIDE COLLAR UNIT (REFER TO "834-1 GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
410	C-3317-228	• O-RING (SHAFT)		1	Y	
440	A-1328-1	• BOLT, MOUNTING, 1/2-20, 12 POINT		6	Y	
450	A-1381	• WASHER, FLAT		6	Y	
500	840-57	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION - SUPERSEDED BY ITEM 520A (USED WITH ITEM 530)		3	Y	
520A	B-7070-25	• • PLUG, CUPPED, STEEL - SUPERSEDED BY ITEM 520B (USED WITH ITEM 530A)		3	Y	
520B	B-7070-22	• • PLUG, CUPPED, STEEL - SUPERSEDES ITEM 520A (USED WITH ITEM 530B)		3	Y	
530	A-1308	• • PILOT TUBE - SUPERSEDED BY ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS.)		3		
530A	D-7469-( )	• • PILOT TUBE - SUPERSEDES ITEM 530 SUPERSEDED BY ITEM 530B (DO NOT MIX PILOT TUBES ON HUB UNITS)		3		
530B	100320	• • PILOT TUBE - SUPERSEDES ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS.)		3		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-2A	HC-B3ZF-2A		
-2B	HC-B3ZF-2B		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-5		**PROPELLER PARTS - HC-B3ZF-2A, -2B - CONTINUED**				
930	C-3317-343-1	• O-RING (PISTON)		1	Y	
700	838-17	• PCP: CLAMP ASSEMBLY (REFER TO "838-17: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		PCP
720	A-304	• • LINKSCREW, 1/2-20		3	Y	
1400	831-4	• FEATHERING SPRING ASSEMBLY (REFER TO "831-4: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2A	1		
	831-8	• FEATHERING SPRING ASSEMBLY (REFER TO "831-8: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-2B	1		
1700	830-15	• START LOCK ASSEMBLY (REFER TO "830-15: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-881-1	• PLATE, START LOCK		3		
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1750A	A-2016-2	• BOLT, 10-32, HEX HEAD, ALTERNATE FOR ITEM 1750		6	Y	
1760	B-3851-0363	• WASHER, FLAT (USE WITH A-2016-2 HEX HEAD BOLTS)		6	Y	
1770	A-3384-3H	• HEX HEAD BOLT		6	Y	
1780	B-3384-20	• BOLT, 1/4-28, HEX HEAD		6	Y	
1785	B-3808-4	• NUT, HEX, SELF-LOCKING		6	Y	
1790	B-3851-0463	• WASHER		6	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-2A	HC-B3ZF-2A		
-2B	HC-B3ZF-2B		

- ITEM NOT ILLUSTRATED

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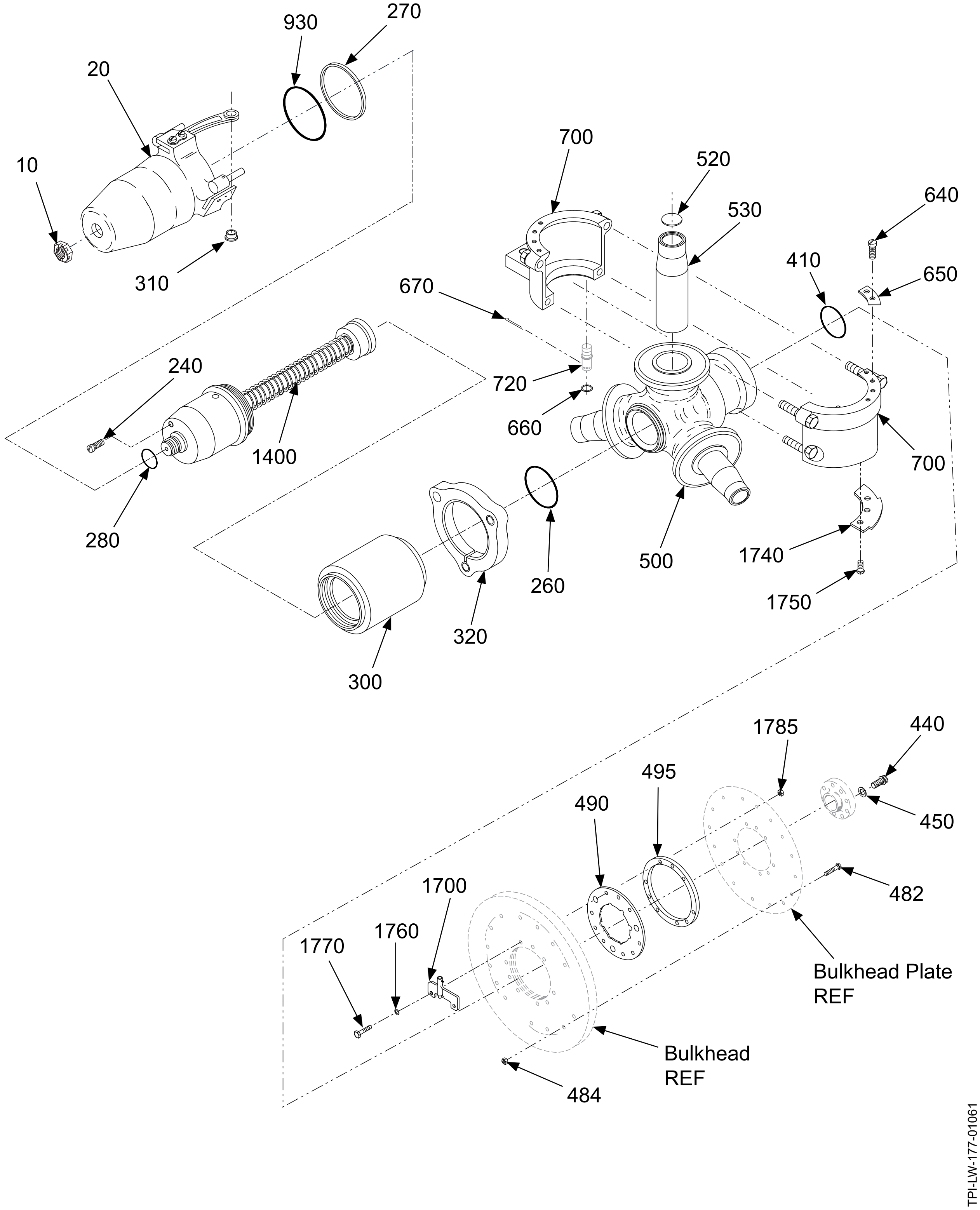

HC-B3WN-2L: Propeller Parts
Figure 10-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-6		**PROPELLER PARTS - HC-B3WN-2L**		RF		
10	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1		
20	B-1368-13L	• PISTON ASSEMBLY (REFER TO "B-1368-13L: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING (FRONT)		1	Y	
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-1803-2	• PCP: CYLINDER		1		PCP
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7A	• GUIDE COLLAR UNIT (REFER TO "834-7A GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
410	C-3317-230	• O-RING (SHAFT)		1	Y	
440	B-3339	• BOLT, MOUNTING, 9/16-18, 12 POINT		8	Y	
450	A-2048-2	• WASHER, FLAT		8	Y	
482	B-3383-4	• BOLT, HEX HEAD, 10-32		12	Y	
484	B-3808-3	• NUT, HEX, SELF-LOCKING		12	Y	
490	B-3029-1	• SPINNER MOUNTING PLATE		1		
495	B-3068	• SPACER, BULKHEAD		1		
500	840-92	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION		3	Y	
530	A-1884-A	• • PILOT TUBE		3		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
660	A-6119	• BUSHING, LINK ARM		3	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-57	• PCP: CLAMP ASSEMBLY (REFER TO "838-57: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		PCP
720	A-304	• • LINKSCREW, 1/2-20		3	Y	
930	C-3317-347-2	• O-RING (PISTON)		1	Y	
1400	831-57	• FEATHERING SPRING ASSEMBLY (REFER TO "831-57: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
1700	830-22	• START LOCK ASSEMBLY (REFER TO "830-22: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-3086	• PLATE, START LOCK		3		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-6		**PROPELLER PARTS - HC-B3WN-2L - CONTINUED**				
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1750A	A-2016-2	• BOLT, 10-32, HEX HEAD, ALTERNATE FOR ITEM 1750		6	Y	
1760	B-3851-0363	• WASHER, FLAT (USE WITH ITEM 1750A)		6	Y	
1770	A-2051	• BOLT, 5/16-24, HEX HEAD		6	Y	
1770A	A-2051-1	• BOLT, 5/16-24, HEX HEAD ALTERNATE FOR ITEM 1770, POST HC-SL-61-351		6	Y	
1785	B-3808-4	• NUT, HEX, SELF-LOCKING		6	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

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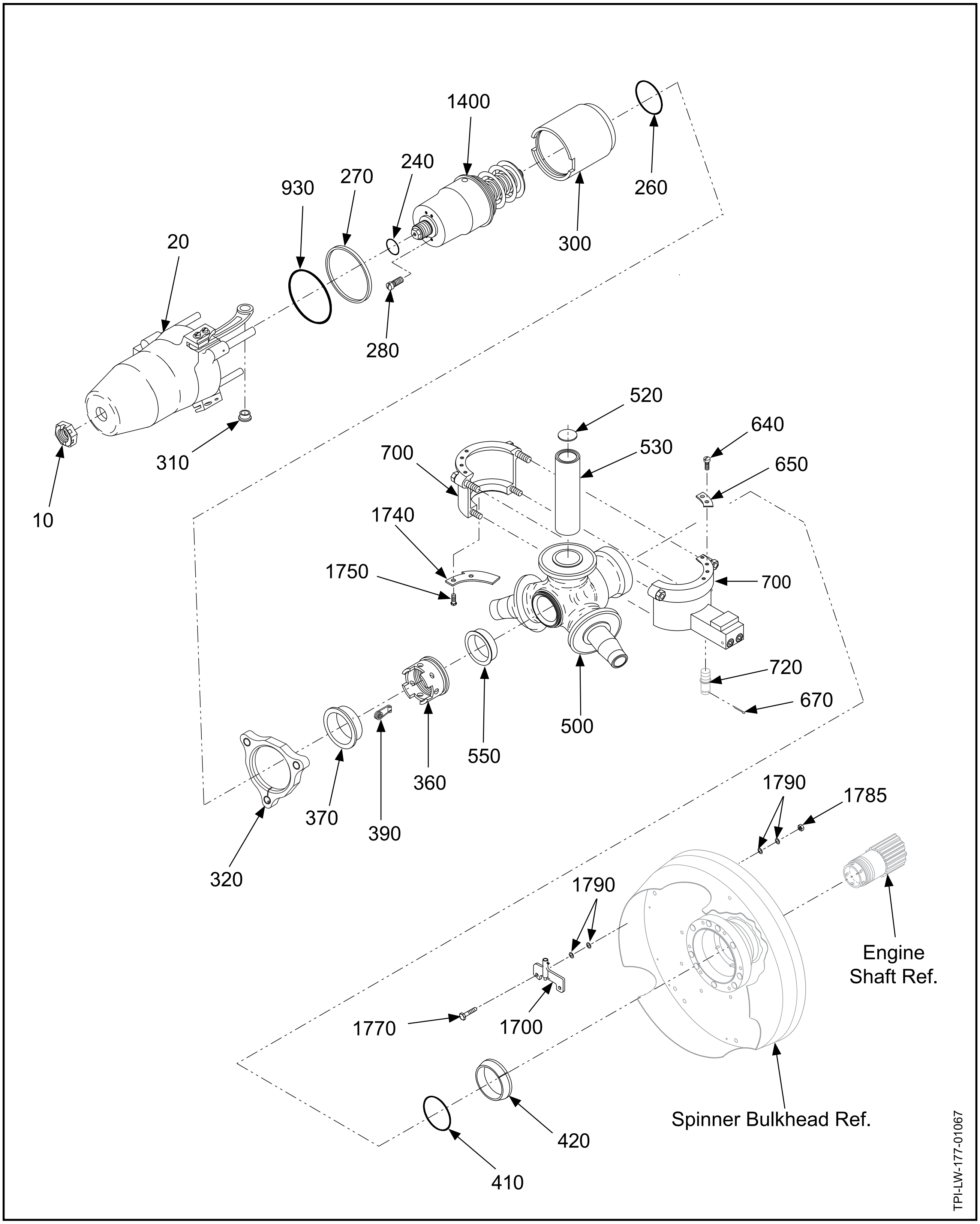

HC-B3R20-2B: Propeller Parts
Figure 10-7

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-7		**PROPELLER PARTS - HC-B3(R)20-2B**		RF		
10	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
20	B-1368	• PISTON ASSEMBLY (REFER TO "B-1368: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-8	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-854	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-1	• GUIDE COLLAR UNIT (REFER TO "834-1 GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1	Y	
360	A-63-B	• NUT, SHAFT, 20 SPLINE		1		
360A	B-2063	• PCP: SHAFT NUT, 20 SPLINE, ALTERNATE FOR ITEM 360		1		PCP
370	A-870	• PULLER RING (USE WITH ITEM 360 HUB NUT ONLY)		1		
390	A-847	• SAFETY PIN, PROP, SHAFT		1		
410	C-3317-229	• O-RING, REAR CONE		1	Y	
420	A-50-5	• CONE, REAR		1		
500	840-84	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION		3	Y	
530	A-1884-A	• • PILOT TUBE		3		
550	A-155	• • HUB BUSHING, SHAFT		1		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-74	• PCP: CLAMP ASSEMBLY (REFER TO "838-74: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		PCP
720	A-304	• • LINKSCREW, 1/2-20		3	Y	
930	C-3317-343-1	• O-RING (PISTON)		1	Y	
1400	831-81	• FEATHERING SPRING ASSEMBLY (REFER TO "831-81: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
1700	830-5	• START LOCK ASSEMBLY (REFER TO "830-5: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-881	• PLATE, START LOCK		3		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-7		**PROPELLER PARTS - HC-B3(R)20-2B - CONTINUED**				
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1750A	A-2016-2	• BOLT, 10-32, HEX HEAD, ALTERNATE FOR 1750		6	Y	
-1760	B-3851-0363	• WASHER, FLAT (USE WITH ITEM 1750A)		6	Y	
1770	A-3384-3H	• BOLT, 1/4-28, HEX HEAD		6	Y	
1785	B-3808-4	• NUT, HEX, SELF-LOCKING		6	Y	
1790	B-3851-0463	• WASHER		6	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

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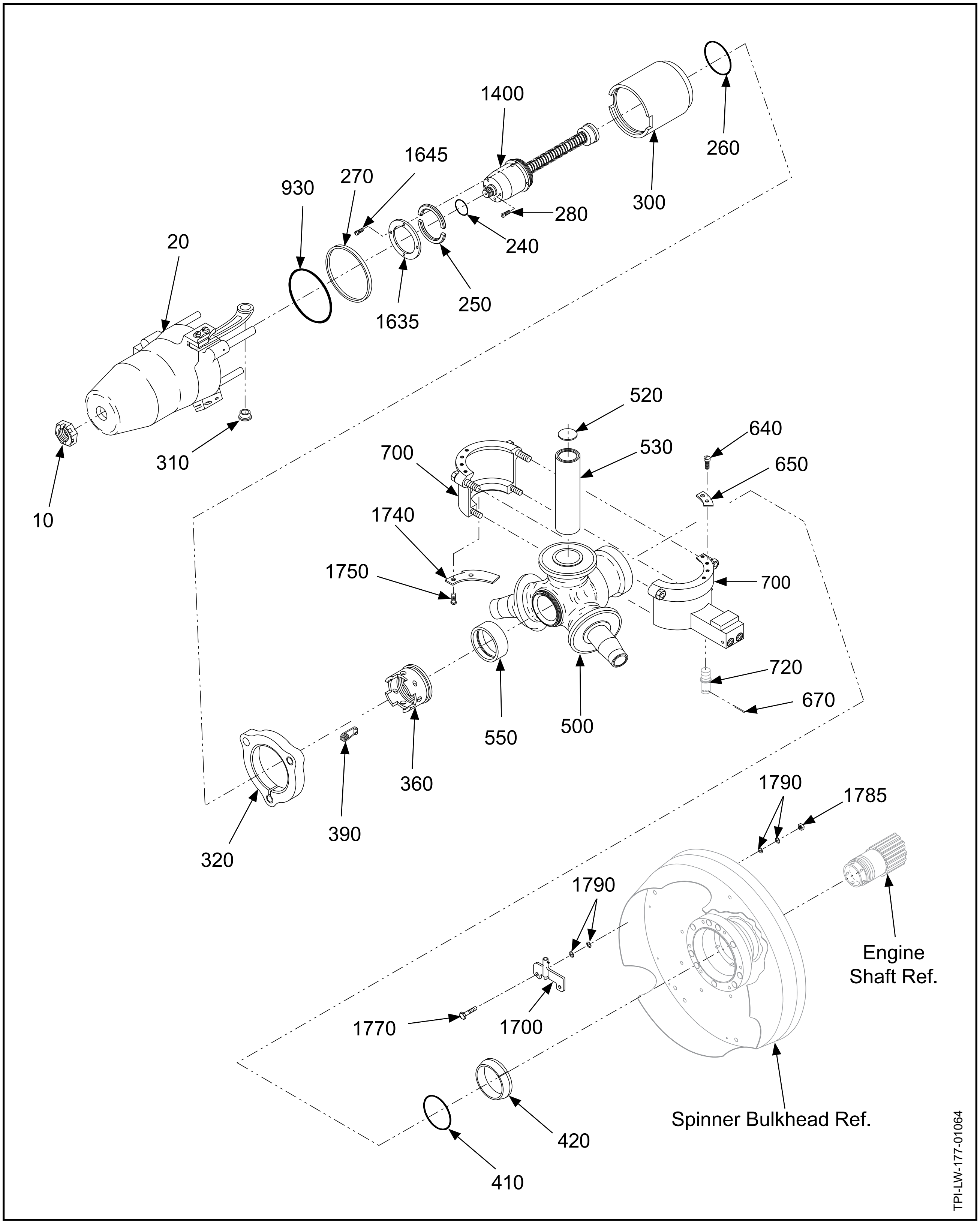


HC-B3(W,Z)20-2(A,B): Propeller Parts
Figure 10-8

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-8		**PROPELLER PARTS - HC-B3(W,Z)20-2(A,B)**		RF		
10	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1		
20	B-1368	• PISTON ASSEMBLY (REFER TO "B-1368: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
250	A-859	• KEEPER, SPLIT, FRONT		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-12	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-854	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-1	• GUIDE COLLAR UNIT (REFER TO "834-1 GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	A-63-B	• NUT, SHAFT, 20 SPLINE		1		
360A	B-2063	• PCP: NUT, SHAFT, 20 SPLINE, ALTERNATE FOR ITEM 360		1 1		PCP
-370	A-870	• PULLER RING (USE WITH ITEM 360 HUB NUT ONLY)				
390	A-847	• SAFETY PIN, PROP, SHAFT		1	Y	
410	C-3317-229	• O-RING, REAR CONE		1	Y	
420	A-50-5	• CONE, REAR		1		
500	840-55	• PCP: HUB UNIT	-Z2A,-Z2B	1		PCP
	840-84	• PCP: HUB UNIT	-W2A,-W2B	1		PCP
520	B-7070-25	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530A)		3	Y	
	B-7070-22	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530B)		3	Y	
530	A-1884-A	• • PILOT TUBE	-W2A,-W2B	3		
	A-1308	• • PILOT TUBE - SUPERSEDED BY ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-Z2A,-Z2B	3		
530A	D-7469	• • PILOT TUBE - SUPERSEDED BY ITEM 530B (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-Z2A,-Z2B	3		
530B	100320	• • PILOT TUBE - SUPERSEDES ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-Z2A,-Z2B	3		
550	A-155	• • HUB BUSHING, SHAFT		1		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-W2A	HC-B3W20-2A	-Z2A	HC-B3Z20-2A
-W2B	HC-B3W20-2B	-Z2B	HC-B3Z20-2B

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-8		**PROPELLER PARTS - HC-B3(W,Z)20-2(A,B) - CONTINUED**				
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
670A	B-3838-3-2	• COTTER PIN (LINKSCREW) ALTERNATE FOR ITEM 670		3	Y	
700	838-16	• PCP: CLAMP ASSEMBLY (REFER TO "838-16: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W2B,-Z2B	3		PC
	838-17E	• PCP: CLAMP ASSEMBLY (REFER TO "838-17E: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W2A,-Z2A	3		PCP
720	A-304	• • LINKSCREW, 1/2-20		3	Y	
930	C-3317-343-1	• O-RING (PISTON)		1	Y	
1400	831-81	• FEATHERING SPRING ASSEMBLY (REFER TO "831-81: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W2B,-Z2B	1		
	831-86	• FEATHERING SPRING ASSEMBLY (REFER TO "831-86: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W2A,-Z2A	1		
1635	A-1369-1	• RING, RETAINING, KEEPER, SPLIT		1		
1645	B-3840-8	• SCREW, 10-32, FILLISTER HEAD		4	Y	
1700	830-5	• START LOCK ASSEMBLY (REFER TO "830-5: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-881	• PLATE, START LOCK		3		
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1750A	A-2016-2	• BOLT, 10-32, HEX HEAD, ALTERNATE FOR 1750		6	Y	
1760	B-3851-0432	• WASHER, FLAT (USE WITH ITEM 1750A)		6	Y	
1770	A-3384-3H	• HEX HEAD BOLT		6	Y	
1785	B-3808-4	• NUT, HEX, SELF-LOCKING		6	Y	
1790	B-3851-0463	• WASHER		6	Y	

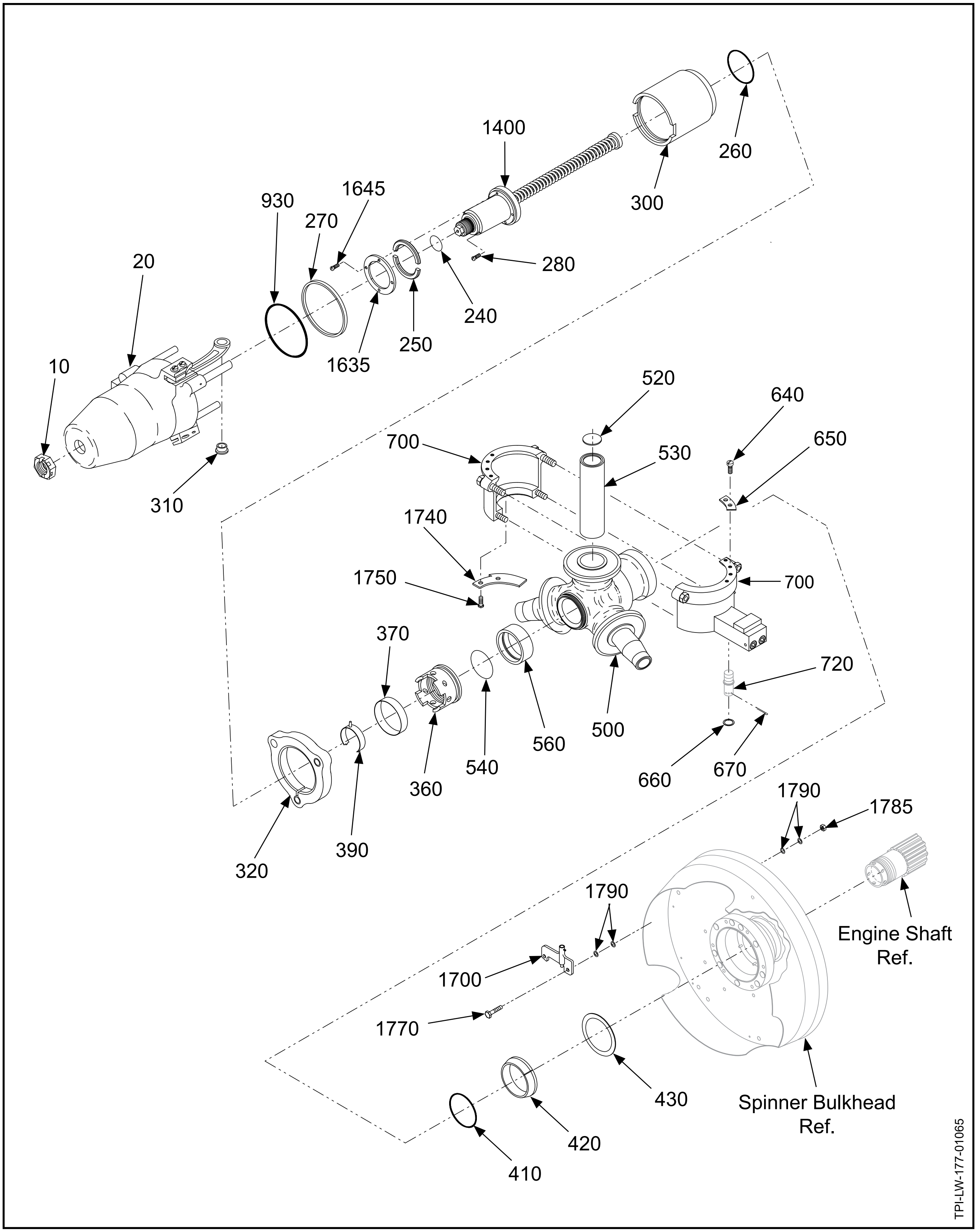
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-W2A	HC-B3W20-2A	-Z2A	HC-B3Z20-2A
-W2B	HC-B3W20-2B	-Z2B	HC-B3Z20-2B

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-8		**PROPELLER PARTS - HC-B3(W,Z)20-2(A,B) - CONTINUED**				
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-B3W30-2B(S), HC-B3Z30-2B(L): Propeller Parts
Figure 10-9

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-9		**PROPELLER PARTS - HC-B3W30-2B(S) AND HC-B3Z30-2B(L)**		RF		
10	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
20	B-1368-1	• PISTON ASSEMBLY (REFER TO "B-1368-1: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W2B, -W2BS, -Z2B	1 1		
	B-1368-1L	• PISTON ASSEMBLY (REFER TO "B-1368: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-Z2BL	1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
250	A-859	• KEEPER, SPLIT, FRONT		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-8	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-854	• CYLINDER	-W2B, -Z2B -Z2BL	1		
	B-854-2	• CYLINDER	-W2BS	1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-6	• GUIDE COLLAR UNIT (REFER TO "834-6 GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	B-1814	• NUT, SHAFT, 30 SPLINE		1		
360A	B-1894	• PCP: NUT, SHAFT, 30 SPLINE ALTERNATE FOR ITEM 360		1		PCP
370	A-1813	• PULLER RING (USE WITH ITEM 360)		1		
390	A-1848	• LOCK, NUT, SHAFT, 30 SPLINE-UNIT		1	Y	
390A	A-847	• SAFETY PIN, PROP SHAFT - ALTERNATE FOR ITEM 390		1	Y	
410	C-3317-231	• O-RING, REAR CONE		1	Y	
420	A-1812-1	• CONE, MOUNTING, REAR, 30 SPLINE		1		
430	A-1855	• SPACER, SHAFT, 30 SPLINE		AR		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-W2B	HC-B3W30-2B	-Z2B	HC-B3Z30-2B
-W2BS	HC-B3W30-2BS	-Z2BL	HC-B3Z30-2BL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-9		**PROPELLER PARTS - HC-B3W30-2B(S) AND HC-B3Z30-2B(L) - CONTINUED**				
500	840-34	• PCP: HUB UNIT	-Z2B -Z2BL	1		PCP
	840-74	• PCP: HUB UNIT	-W2B	1		PCP
	840-113	• PCP: HUB UNIT -	W2BS	1		PCP
520	B-3897-1	• • PLUG, EXPANSION (USED WITH ITEM 530C)	-W2B, -W2BS	3	Y	
520A	B-7070-25	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530A)	-Z2B -Z2BL	3	Y	
520B	B-7070-22	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530B) SUPERSEDES ITEM 520A	-Z2B -Z2BL	3	Y	
530	A-1884-A	• • PILOT TUBE	-W2B, -W2BS	3		
	A-1308	• • PILOT TUBE - SUPERSEDED BY ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-Z2B -Z2BL	3		
530A	D-7469-( )	• • PILOT TUBE - SUPERSEDED BY ITEM 530B (USED WITH ITEM 520A) (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-Z2B -Z2BL	3		
530B	100320	• • PILOT TUBE - SUPERSEDES ITEM 530A (USED WITH ITEM 520B) (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-Z2B -Z2BL	3		
560	A-1817	• • BUSHING, HUB		1		
540	C-3317-141	• O-RING, SHAFT (BUSHING)		1	Y	
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
660	A-6119	• BUSHING, LINK ARM (OPTIONAL)		3	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-17	• PCP: CLAMP ASSEMBLY - REFER TO FIGURE 10-33 (REFER TO "838-17: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W2B -W2BS -Z2B	3		PCP
	838-57	• PCP: CLAMP ASSEMBLY (REFER TO "838-57: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-Z2BL	3		PCP
720	A-304	• •LINKSCREW, 1/2-20		3	Y	
930	C-3317-343-1	• O-RING (PISTON)		1	Y	

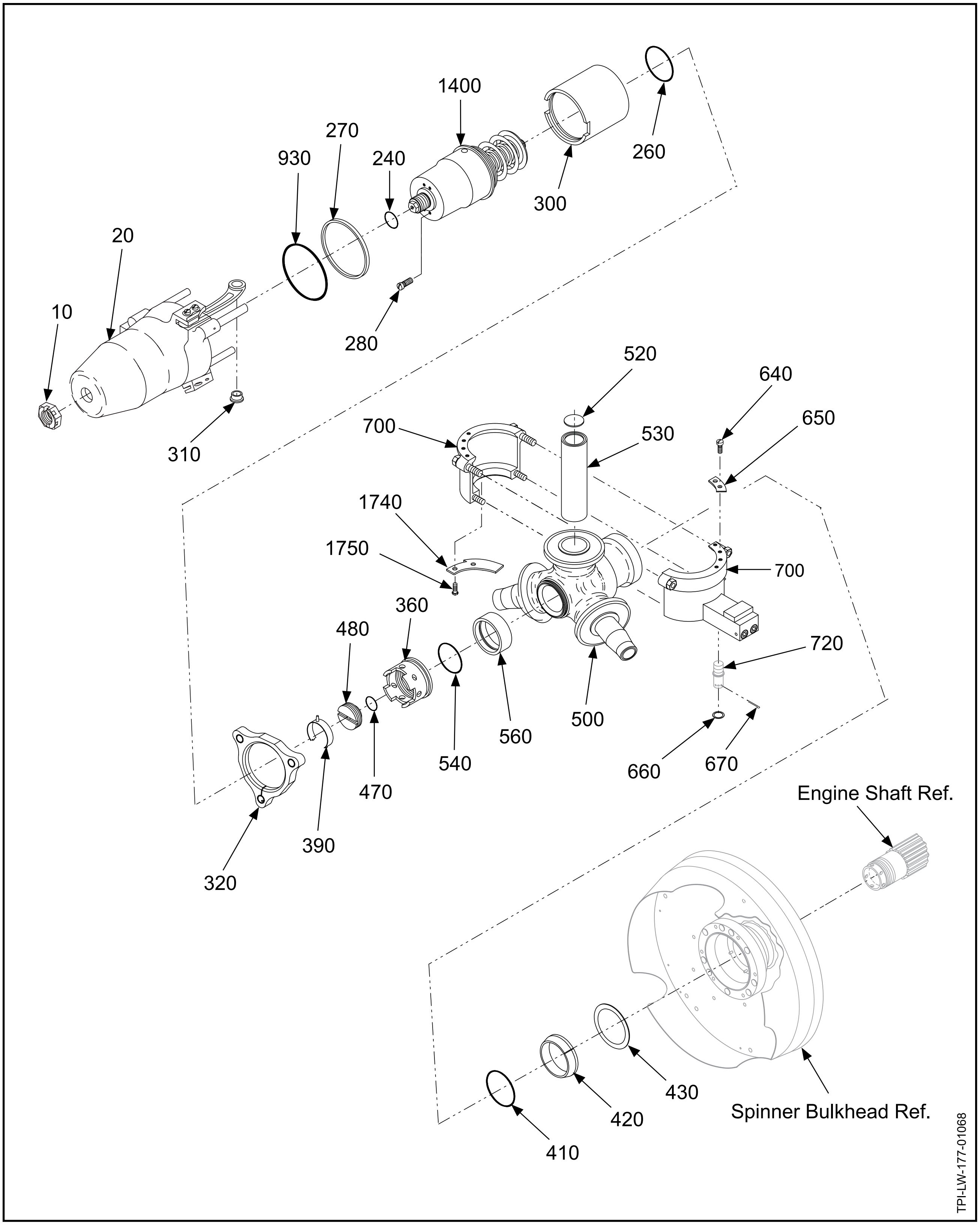
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-W2B	HC-B3W30-2B	-Z2B	HC-B3Z30-2B
-W2BS	HC-B3W30-2BS	-Z2BL	HC-B3Z30-2BL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-9		**PROPELLER PARTS - HC-B3W30-2B(S) AND HC-B3Z30-2B(L) - CONTINUED**				
1400	831-88	• FEATHERING SPRING ASSEMBLY (REFER TO "831-88: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
1635	A-1369-1	• RING, RETAINING, KEEPER, SPLIT		1		
1645	B-3840-8	• SCREW, 10-32, FILLISTER HEAD		4	Y	
1700	830-8	• START LOCK ASSEMBLY (REFER TO "830-8: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-881	• STOP PLATE- START LOCK		3		
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1770	B-3384-23	• BOLT, 1/4-28, HEX HEAD		6	Y	
1785	B-3808-4	• NUT, HEX, SELF-LOCKING		6	Y	
1790	B-3851-0463	• WASHER		24	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-B3(P,R,W,Z)30-2E(A,B): Propeller Parts
Figure 10-10

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-10		**PROPELLER PARTS - HC-B3(P,R,W,Z)30-2E(A,B)**		RF		
10	A-880-1	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
20	B-1368-3	• PISTON ASSEMBLY (REFER TO "B-1368-3: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
280	B-3840-8	• SCREW, 10-32, FILLISTER HEAD		4	Y	
300	B-1803-1	• PCP: CYLINDER		1		PCP
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7A	• GUIDE COLLAR UNIT (REFER TO "834-7A GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	B-1894	• PCP: NUT, SHAFT, 30 SPLINE		1		PCP
390	A-1848	• LOCK, NUT, SHAFT, 30 SPLINE-UNIT		1	Y	
410	C-3317-231	• O-RING (REAR CONE)		1	Y	
420	A-1812-1	• CONE, MOUNTING, REAR, 30 SPLINE		1		
430	A-1855	• SPACER, SHAFT, 30 SPLINE		AR		
470	C-3317-210-1	• O-RING		1		
480	A-1834-( )	• PLUG		1		
500	840-34	• PCP: HUB UNIT	-PA, -PB, -ZA, -ZB	1		PCP
	840-74	• PCP: HUB UNIT	-RA, -WA -RB, -WB	1		PCP
520	B-3897-1	• • PLUG, EXPANSION	-RA, -WA -RB, -WB	3	Y	
530	A-1884-A	• • PILOT TUBE	-RA, -WA -RB, -WB	3		
530A	A-1308	• • PILOT TUBE, SUPERSEDED BY ITEM 530B	-PA, -PB, -ZA, -ZB	3		
530B	100320	• • PILOT TUBE, SUPERSEDES ITEM 530A	-PA, -PB, -ZA, -ZB	3		
560	A-1817	• • BUSHING, HUB		1		
540	C-3317-141	• O-RING (PILOT TUBE)		1	Y	
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-PA	HC-B3P30-2EA	-WB	HC-B3W30-2EB
-PB	HC-B3P30-2EB	-ZA	HC-B3Z30-2EA
-RA	HC-B3R30-2EA	-ZB	HC-B3Z30-2EB
-WA	HC-B3W30-2EA		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-10		**PROPELLER PARTS - HC-B3(P,R,W,Z)30-2E(A,B) - CONTINUED**				
660	A-6119	• BUSHING, LINK ARM (OPTIONAL)		3	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-17	• PCP: CLAMP ASSEMBLY (REFER TO "838-17: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-WB, -ZB	3		PCP
	838-28	• PCP: CLAMP ASSEMBLY (REFER TO "838-28: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-WA, -ZA	3		PCP
	838-72	• PCP: CLAMP ASSEMBLY (REFER TO "838-72: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-RA, -PA	3		PCP
	838-74	• PCP: CLAMP ASSEMBLY (REFER TO "838-74: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-PB	3		PCP
720	A-304	• •LINKSCREW, 1/2-20		3	Y	
930	C-3317-347-1	• O-RING (PISTON)		1	Y	
1400	831-87	• FEATHERING SPRING ASSEMBLY (REFER TO "831-87: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
-1700	830-14	• START LOCK ASSEMBLY (BULKHEAD MOUNTED) (REFER TO "830-14: START LOCK ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		
1740	A-881	• STOP PLATE- START LOCK		3		
1750	A-2016	• BOLT, 10-32, HEX HEAD		6	Y	
1750A	A-2016-2	• BOLT, 10-32, HEX HEAD, ALTERNATE FOR ITEM 1750		6	Y	
-1760	B-3851-0363	• WASHER, FLAT (USE WITH ITEM 1750A)		6	Y	

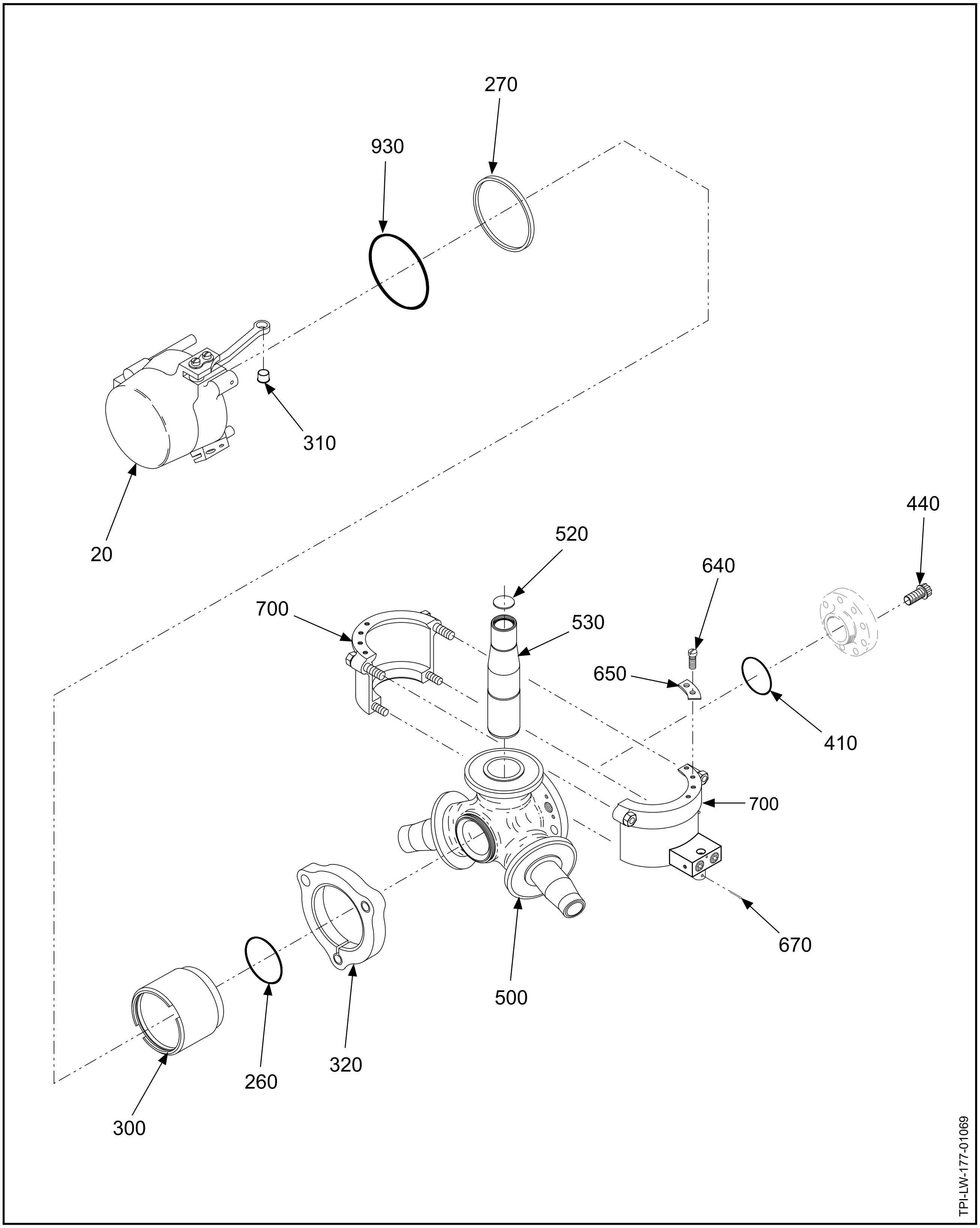
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-PA	HC-B3P30-2EA	-WB	HC-B3W30-2EB
-PB	HC-B3P30-2EB	-ZA	HC-B3Z30-2EA
-RA	HC-B3R30-2EA	-ZB	HC-B3Z30-2EB
-WA	HC-B3W30-2EA		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-10		**PROPELLER PARTS - HC-B3(P,R,W,Z)30-2E(A,B) - CONTINUED**				
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

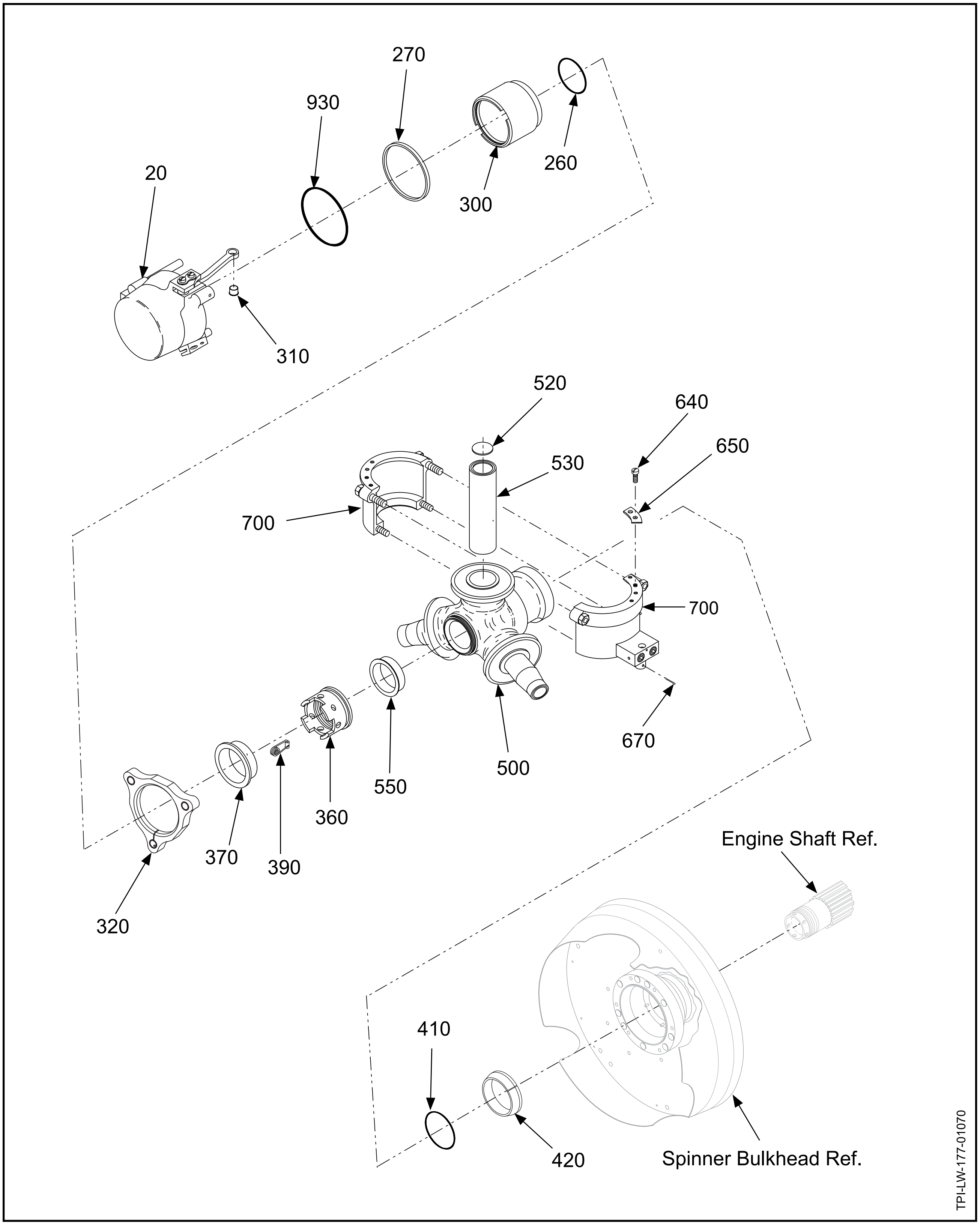


HC-B3WF-4: Propeller Parts
Figure 10-11

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-11		**PROPELLER PARTS - HC-B3WF-4**		RF		
20	832-36	• PISTON ASSEMBLY (REFER TO "832-36: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	A-1843	• SEAL, DUST, PISTON		1	Y	
300	B-1882-2	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7B	• GUIDE COLLAR UNIT (REFER TO "834-7B GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
410	C-3317-228	• SHAFT O-RING		1	Y	
440	A-1328-2	• BOLT, MOUNTING, 1/2-20, 12 POINT		6	Y	
500	840-115	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION		3	Y	
530	A-1884-A	• • PILOT TUBE		3		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-79	• PCP: CLAMP ASSEMBLY (REFER TO "838-79: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		PCP
930	C-3317-347-1	• O-RING (PISTON)		1	Y	
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-B3(P,R,W)20-4: Propeller Parts
Figure 10-12

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-12		**PROPELLER PARTS - HC-B3(W,R,P)20-4**		RF		
20	832-33	• PISTON ASSEMBLY (REFER TO "832-33: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
300	B-1882	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7B	• GUIDE COLLAR UNIT (REFER TO "834-7B GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	A-63B	• PCP: PROP SHAFT NUT, 20 SPLINE		1		PCP
370	A-870	• RING, PULLER, HUB		1		
390	A-847	• SAFETY PIN, SHAFT NUT		1	Y	
410	C-3317-229	• O-RING, (REAR CONE)		1	Y	
420	A-50-5	• CONE, MOUNTING, REAR, 20 SPLINE		1		
420A	A-50-1	• CONE, MOUNTING, REAR, 20 SPLINE, ALTERNATE FOR ITEM 420 WHEN NOT USING A SPINNER		1		
500	840-84	• PCP: HUB UNIT HC-B3_20-	-R4, -W4	1		PCP
	840-55	• PCP: HUB UNIT HC-B3_20-	-P4	1		PCP
520	B-3897-1	• • PLUG, EXPANSION (USED WITH ITEM 530) SUPERSEDED BY ITEM 520A	-R4, -W4	3	Y	
520A	B-7070-25	• • PLUG, CUPPED, STEEL (USED WITH 530A) SUPERSEDED BY ITEM 520B	-R4, -W4	3	Y	
520B	B-7070-22	• • PLUG, CUPPED, STEEL (USED WITH ITEM 530B) SUPERSEDES ITEM 520A	-P4	3	Y	
530	A-1884-A	• • PILOT TUBE - (USED WITH ITEM 520) SUPERSEDED BY ITEM 530A	-R4, -W4	3		
530A	D-7469-( )	• • PILOT TUBE - (USED WITH ITEM 520A) SUPERSEDED BY ITEM 530B	-R4, -W4	3		
530B	100320	• • PILOT TUBE - SUPERSEDES ITEM 530A (DO NOT MIX PILOT TUBES ON HUB UNITS.)	-P4	3		
530C	A-1308	• • PILOT TUBE - SUPERSEDED BY ITEM 530A	-P4	3		
550	A-155	• • HUB BUSHING, SHAFT		3		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-P4	HC-B3P20-4		
-R4	HC-B3R20-4		
-W4	HC-B3W20-4		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-12		**PROPELLER PARTS - HC-B3(W,R,P)20-4 - CONTINUED**				
700	838-84	• PCP: CLAMP ASSEMBLY (REFER TO "838-84: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-P4, -R4	3		PCP
	838-79	• PCP: CLAMP ASSEMBLY (REFER TO "838-79: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W4	3		PCP
930	C-3317-347-1	• O-RING (PISTON)		1	Y	
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-P4	HC-B3P20-4		
-R4	HC-B3R20-4		
-W4	HC-B3W20-4		

- ITEM NOT ILLUSTRATED

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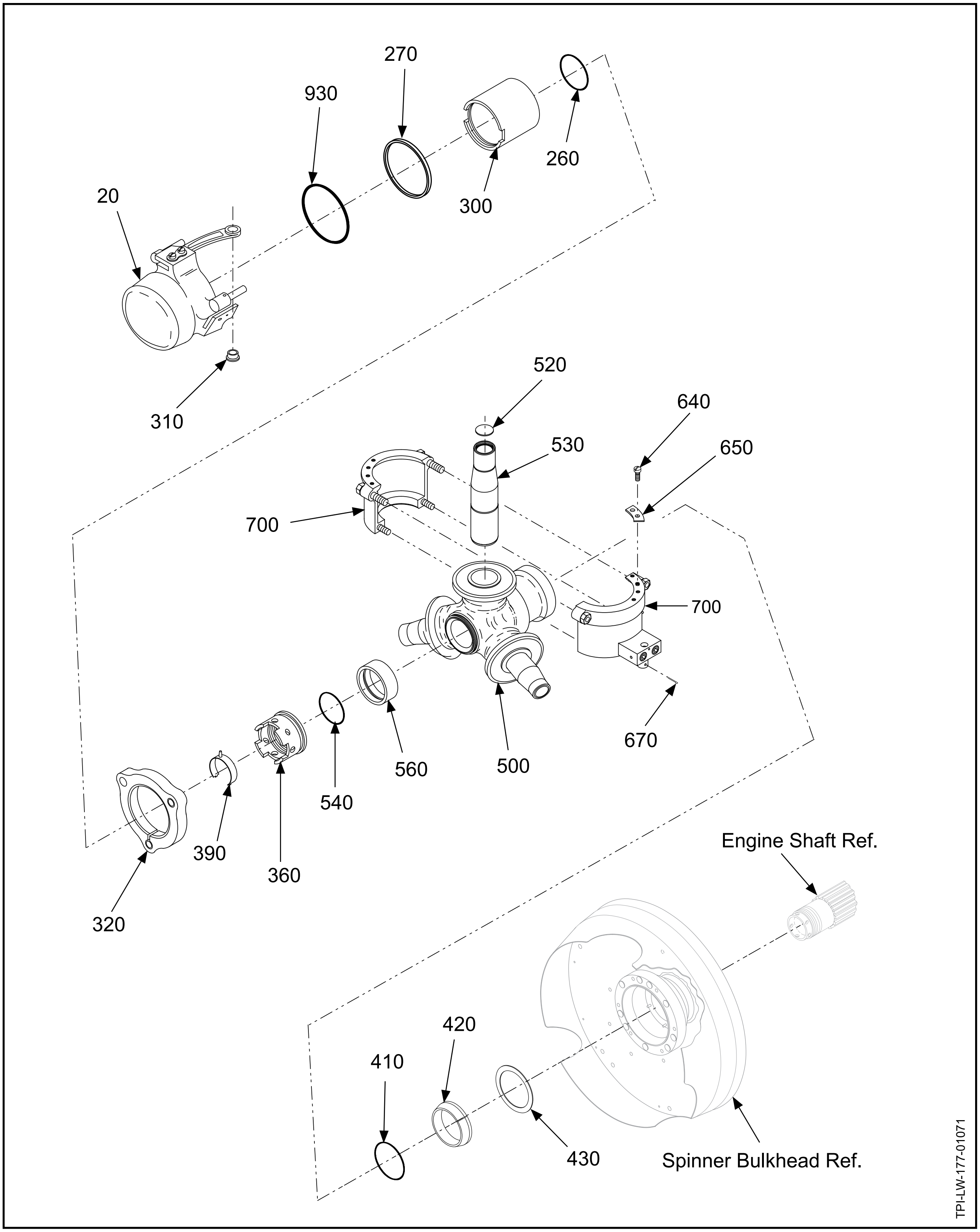

HC-B3(R,W)30-4: Propeller Parts
Figure 10-13

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-13		**PROPELLER PARTS - HC-B3(R,W)30-4**		RF		
20	832-33	• PISTON ASSEMBLY (REFER TO "832-33: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
300	B-1882	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7C	• GUIDE COLLAR UNIT (REFER TO "834-7C GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	B-1894	• PCP: NUT, SHAFT, 30 SPLINE		1		PCP
390	A-1848	• LOCK, NUT, SHAFT, 30 SPLINE-UNIT		1	Y	
410	C-3317-231	• O-RING, REAR CONE		1	Y	
420	A-1812-1	• CONE, MOUNTING, REAR, 30 SPLINE		1		
420A	A-1856	• CONE, MOUNTING, REAR, 30 SPLINE, ALTERNATE FOR ITEM 420 WHEN NOT USING A SPINNER		1		
430	A-1855	• SPACER, SHAFT, 30 SPLINE		AR		
500	840-74	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION		3	Y	
530	A-1884-A	• • PILOT TUBE		3		
560	A-1817	• • BUSHING, HUB		3		
540	C-3317-141	• O-RING, SHAFT (BUSHING)		1	Y	
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-91	• PCP: CLAMP ASSEMBLY (REFER TO "838-91: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-R4	3		PCP
	838-66	• PCP: CLAMP ASSEMBLY (REFER TO "838-66: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-W4	3		PCP
930	C-3317-347-1	• O-RING (PISTON)		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-R4	HC-B3R30-4		
-W4	HC-B3W30-4		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-13		**PROPELLER PARTS - HC-B3(R,W)30-4 - CONTINUED**				
10A-1		**BLADE RETENTION PARTS** (REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

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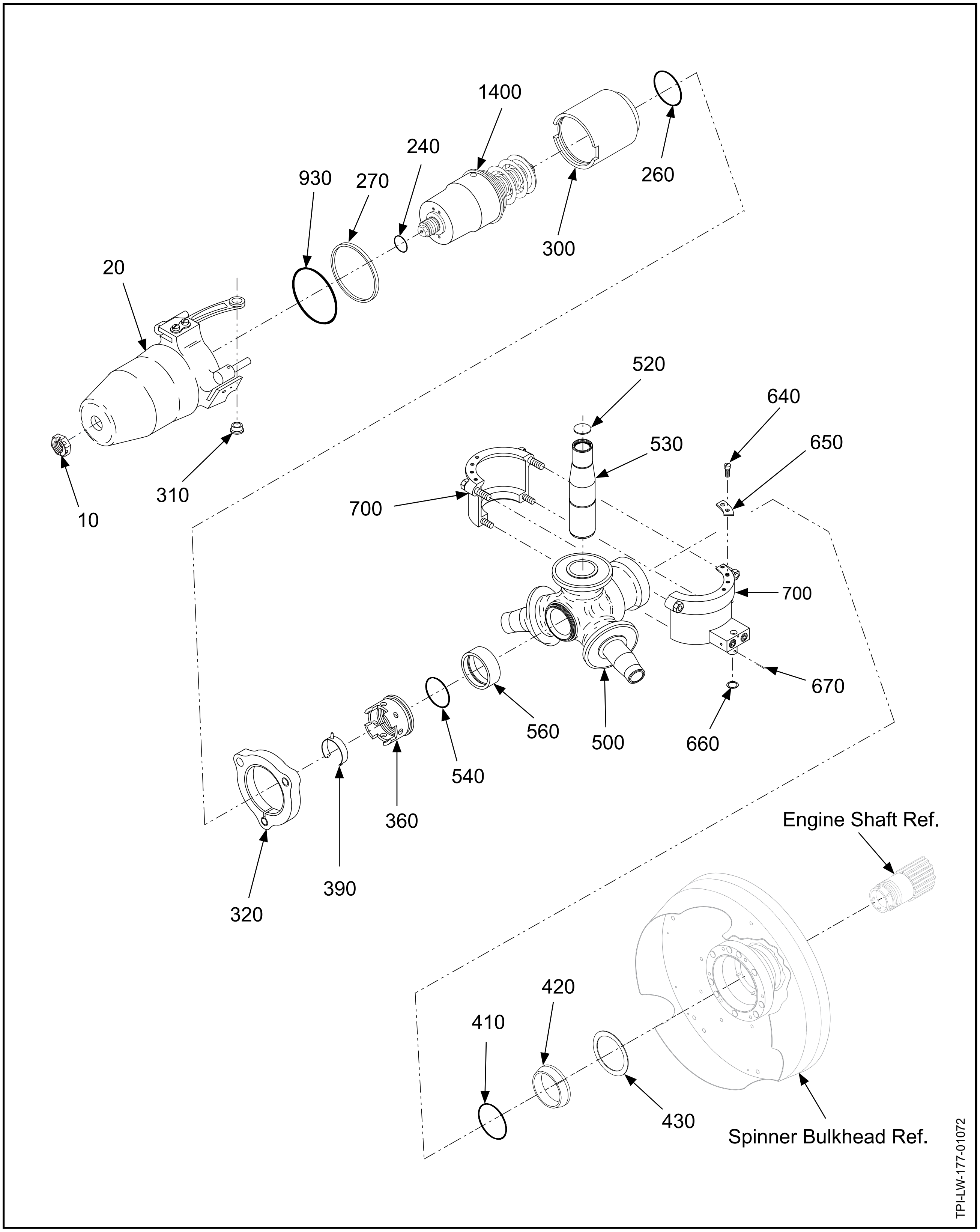


HC-B3R30-4(A,B): Propeller Parts
Figure 10-14

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-14		**PROPELLER PARTS - HC-B3R30-4(A,B)**		RF		
10	A-880-1	• NUT,HEX,SELF-LOCKING,THIN		1	Y	
20	B-1368-3L	• PISTON ASSEMBLY (REFER TO "B-1368-3L: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-4A	1		
	B-1368-13L	• PISTON ASSEMBLY (REFER TO "B-1368-13L: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)	-4B	1		
240	C-3317-020	• O-RING, ROD (FRONT)		1	Y	
260	C-3317-235	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
300	B-1803-1	• PCP: CYLINDER		1		PCP
310	A-944	• SLEEVE, LINKSCREW		3	Y	
320	834-7A	• GUIDE COLLAR UNIT (REFER TO "834-7A GUIDE COLLAR UNIT" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
360	B-1894	• PCP: NUT, SHAFT, 30 SPLINE		1		PCP
390	A-1848	• LOCK, NUT, SHAFT, 30 SPLINE-UNIT		1	Y	
410	C-3317-231	• O-RING, REAR CONE		1	Y	
420	A-1812-1	• CONE, MOUNTING, REAR, 30 SPLINE		1		
420A	A-1856	• CONE, MOUNTING, REAR, 30 SPLINE, ALTERNATE FOR ITEM 420 WHEN NOT USING SPINNER		1		
430	A-1855	• SPACER, SHAFT, 30 SPLINE		AR		
500	840-74	• PCP: HUB UNIT, HC-B3_30-		1		PCP
520	B-3897-1	• • PLUG, EXPANSION (USED WITH ITEM 530A)		3	Y	
530	A-1884	• • PILOT TUBE - SUPERSEDED BY ITEM 530A		3		
530A	A-1884-A	• • PILOT TUBE - SUPERSEDES ITEM 530 (USED WITH ITEM 520)		3		
540	C-3317-141	• • O-RING, SHAFT (BUSHING)		1	Y	
560	A-1817	• • BUSHING, HUB		1		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
660	A-6119	• BUSHING, LINK ARM		3	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		3	Y	
700	838-100	• PCP: CLAMP ASSEMBLY (REFER TO "838-100: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		3		PCP
930	C-3317-347-1	• O-RING (PISTON)		1	Y	

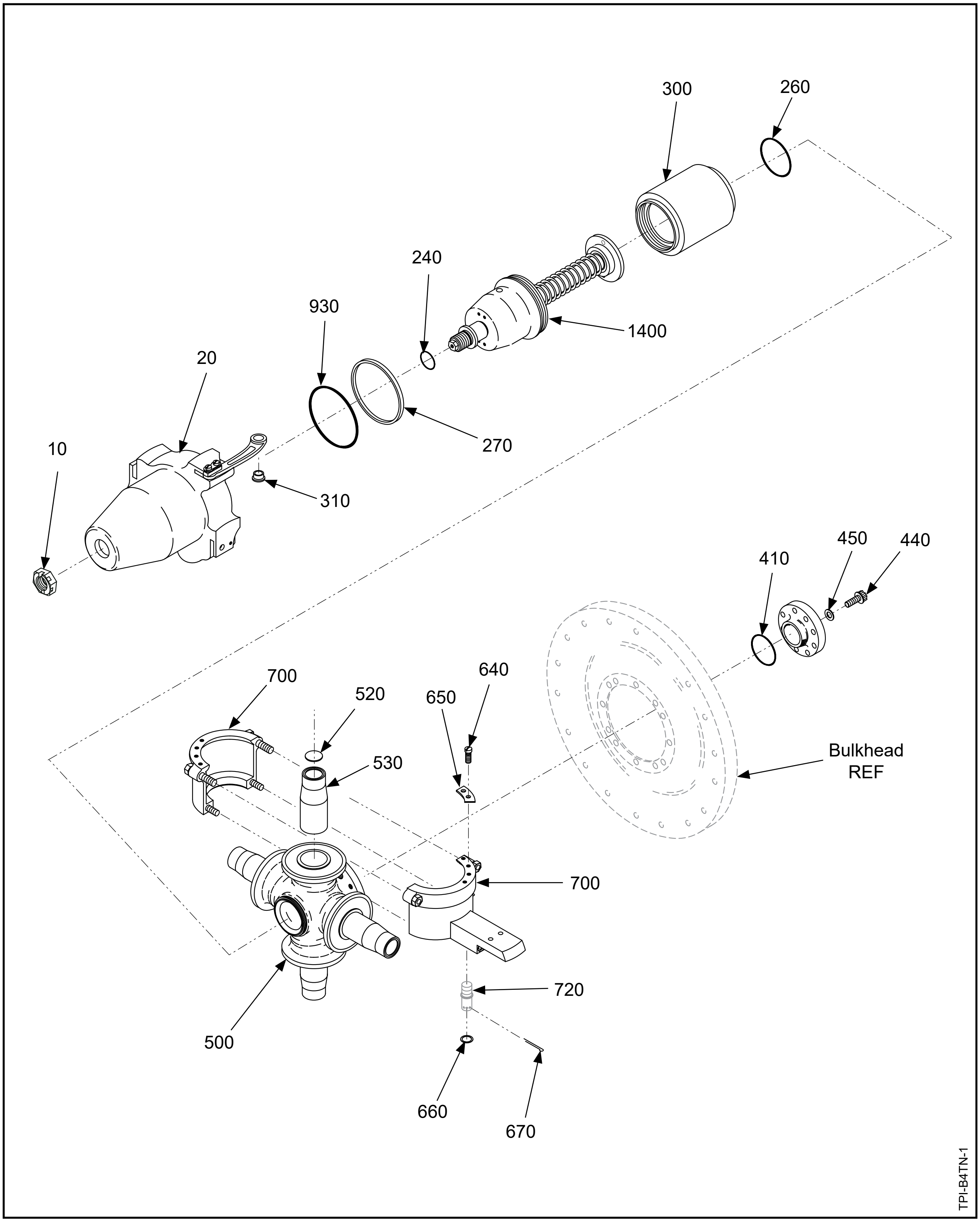
EFFECTIVITY	MODEL	EFFECTIVITY	MODEL
-4A	HC-B3R30-4A		
-4B	HC-B3R30-4B		

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-14		**PROPELLER PARTS - HC-B3R30-4(A,B) - CONTINUED**				
1400	831-56	• FEATHERING SPRING ASSEMBLY - SUPERSEDED BY ITEM 1400A (REFER TO "831-56: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
1400A	831-90	• FEATHERING SPRING ASSEMBLY - SUPERSEDES ITEM 1400 (REFER TO "831-90: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED



HC-B4TN-1: Propeller Parts
Figure 10-15

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-15		**PROPELLER PARTS - HC-B4TN-1**		**RF**		
10	A-880-2	• NUT, HEX, SELF-LOCKING, THIN		1	Y	
20	832-30	• PISTON ASSEMBLY (REFER TO "832-30: PISTON ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		
240	C-3317-020	• O-RING (PILOT TUBE)		1	Y	
260	C-3317-240	• O-RING (CYLINDER)		1	Y	
270	B-1843	• SEAL, DUST, PISTON		1	Y	
300	B-3406	• CYLINDER		1		
310	A-944	• SLEEVE, LINKSCREW		4	Y	
410	C-3317-230	• O-RING (HUB)		1	Y	
440	B-3339	• BOLT, MOUNTING, 9/16-18, 12 POINT		8	Y	
450	A-2048-2	• WASHER, MOUNTING, 9/16 “ CSK		8	Y	
500	840-139	• PCP: HUB UNIT		1		PCP
520	B-3897-1	• • PLUG, EXPANSION		4	Y	
530	A-1891( )A	• • PILOT TUBE		4		
530A	A-1891	• • PILOT TUBE, ALTERNATE FOR ITEM 530		4		
640	B-3840-( )	• SCREW, 10-32, FILLISTER HEAD		AR	Y	
650	A-1305	• BALANCE WEIGHT		AR		
660	A-6119	• BUSHING, LINK ARM		4	Y	
670	B-3838-3-3	• COTTER PIN (LINKSCREW)		4	Y	
930	C-3317-426-2	• O-RING (PISTON)		1	Y	
700	838-67	• PCP: CLAMP ASSEMBLY (REFER TO "838-67: PCP: CLAMP ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		4		PCP
720	A-304	• • LINKSCREW, 1/2-20		1	Y	
1400	831-80	• FEATHERING SPRING ASSEMBLY (REFER TO "831-80: FEATHERING SPRING ASSEMBLY" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10-15		**PROPELLER PARTS - HC-B4TN-1- CONTINUED**				
10A-1		**BLADE RETENTION PARTS**				
		(REFER TO "BLADE RETENTION PARTS" IN THIS CHAPTER FOR EXPLODED VIEW/PARTS LIST)				
		COUNTERWEIGHT SLUGS/MOUNTING HARDWARE				
-9050		• COUNTERWEIGHT SLUGS AND SLUG MTG. HARDWARE APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) FOR PART NUMBER AND PROPELLER CRITICAL PART (PCP) IDENTIFICATION			Y	
		SPINNER PARTS				
		APPLICATION SPECIFIC REFER TO HARTZELL PROPELLER INC. APPLICATION GUIDE MANUAL 159 (61-02-59) AND THE APPLICABLE HARTZELL PROPELLER INC. SPINNER MAINTENANCE MANUAL: MANUAL 127 (61-16-27) - METAL SPINNER ASSEMBLIES MANUAL 148 (61-16-48) - COMPOSITE SPINNER ASSEMBLIES				

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

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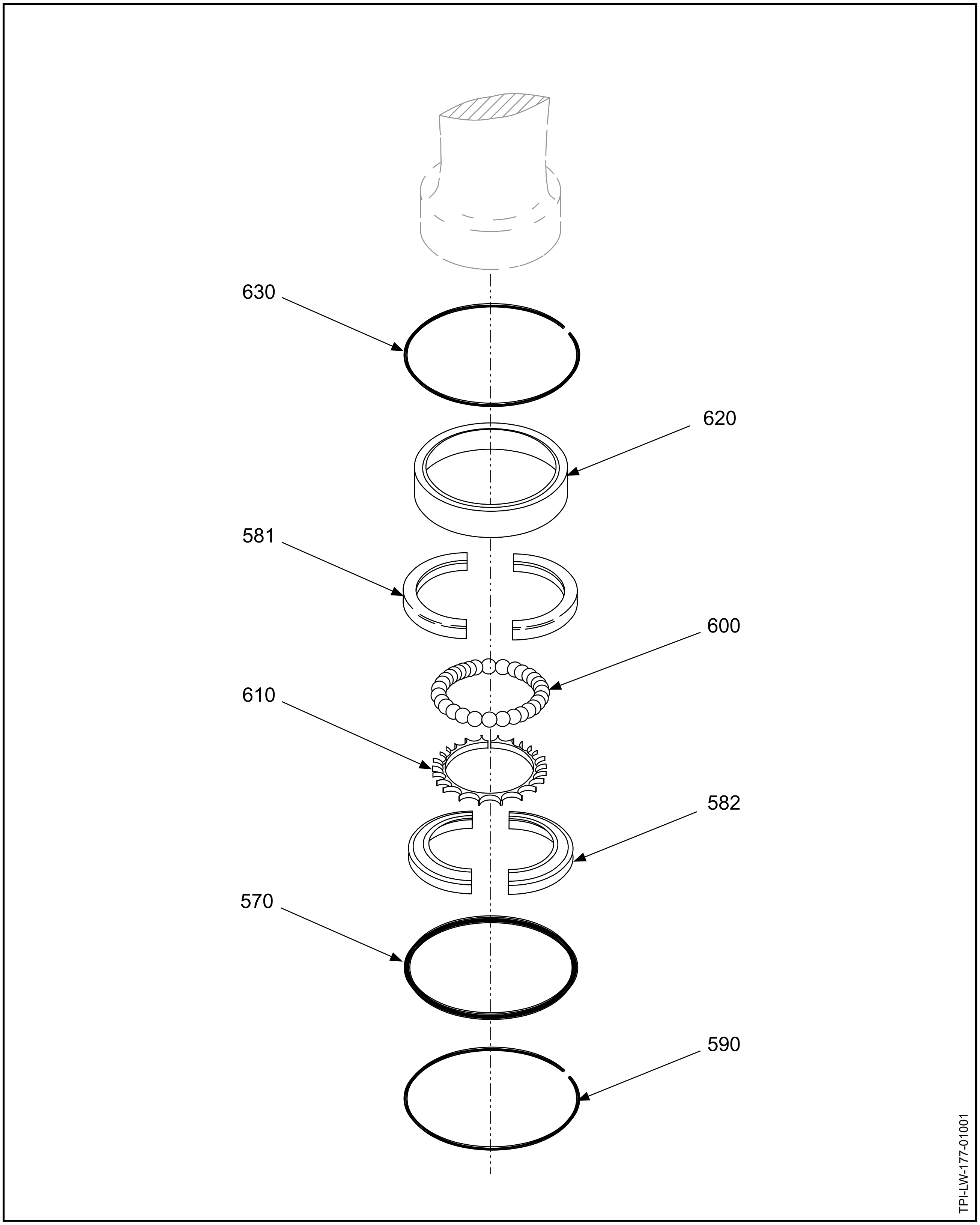
SUB-ASSEMBLY
PARTS LISTS and FIGURES



Blade Retention Parts
Figure 10A-1

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS**				
		FOR HC-B3WF-2, HC-B3ZF-2A, AND HC-B3ZF-2B PROPELLERS **All quantities (UPA) in this parts list are per blade assembly.**				
570	C-3317-229	O-RING (BLADE)		1	Y	
-580	A-1851	BEARING, RETENTION, BLADE		1		
581	A-1851-A	• RACE, HUB SIDE		1		
582	A-1851-B	• RACE, BLADE SIDE		1		
590	A-1877	• RETAINER, BEARING, WIRE		1	Y	
600	B-6144-2	• BALL, BEARING, 9/16" DIA.		19	Y	
	B-6144-2-450	• BALL, BEARING, 9/16" DIA. (450 PIECE BOX)		RF		
610	B-3742	BALL SPACER		1	Y	
620	A-1852	RING, RETAINING, BEARING		1		
630	A-1854	RETAINER, RING, WIRE		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

Blade Retention Parts

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS**				
		FOR HA-B3(P,Z)30-1B, HC-B3(R)20-2B, HC-B3(W,Z)20-2(A,B), AND HC-B4TN-1 PROPELLERS **All quantities (UPA) in this parts list are per blade assembly.**				
570	C-3317-232	O-RING (BLADE)		1	Y	
-580	A-1851	BEARING, RETENTION, BLADE		1		
581	A-1851-A	• RACE, HUB SIDE		1		
582	A-1851-B	• RACE, BLADE SIDE		1		
590	A-1877	• RETAINER, BEARING, WIRE		1	Y	
600	B-6144-2	• BALL, BEARING, 9/16" DIA.		19	Y	
	B-6144-2-450	• BALL, BEARING, 9/16" DIA. (450 PIECE BOX)		RF		
610	B-3742	BALL SPACER		1	Y	
620	A-1852	RING, RETAINING, BEARING		1		
630	A-1854	RETAINER, RING, WIRE		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

Blade Retention Parts

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS**				
		FOR HC-B3Z20-1, HC-B3(P,R,W)20-4, HC-B3(P,R,W,Z)30-1E(A,B), HC-B3(P,R,W,Z)30-2E(A,B), HC-B3W30-2B(S), HC-B3Z30-2B(L), HC-B3R30-4(A,B), HC-B3(R,W)30-4, AND HC-B3WF-4 PROPELLERS				
		All quantities (UPA) in this parts list are per blade assembly.				
570	C-3317-232	O-RING (BLADE)		1	Y	
	C-3317-231	O-RING (BLADE), ALTERNATE IF ITEM 570 CAUSES FRICTION		1	Y	
	C-3317-230	O-RING (BLADE), ALTERNATE IF ITEM 570 CAUSES FRICTION		1	Y	
-580	A-1851	BEARING, RETENTION, BLADE		1		
581	A-1851-A	• RACE, HUB SIDE		1		
582	A-1851-B	• RACE, BLADE SIDE		1		
590	A-1877	• RETAINER, BEARING, WIRE		1	Y	
600	B-6144-2	• BALL, BEARING, 9/16" DIA.		19	Y	
	B-6144-2-450	• BALL, BEARING, 9/16" DIA. (450 PIECE BOX)		RF		
610	B-3742	BALL SPACER		1	Y	
620	A-1852	RING, RETAINING, BEARING		1		
630	A-1854	RETAINER, RING, WIRE		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

Blade Retention Parts

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-1		**BLADE RETENTION PARTS**				
		FOR HC-B3WN-2L PROPELLERS **All quantities (UPA) in this parts list are per blade assembly.**				
570	C-3317-232	O-RING (BLADE)		1	Y	
	C-3317-231	O-RING (BLADE), ALTERNATE IF ITEM 570 CAUSES FRICTION		1	Y	
	C-3317-230	O-RING (BLADE), ALTERNATE IF ITEM 570 CAUSES FRICTION		1	Y	
-580	A-1851-T	BEARING, RETENTION, BLADE		1		
581	A-1851-TA	• RACE, HUB SIDE		1		
582	A-1851-TB	• RACE, BLADE SIDE		1		
590	A-1877	• RETAINER, BEARING, WIRE		1	Y	
600	B-6144-2	• BALL, BEARING, 9/16" DIA.		19	Y	
	B-6144-2-450	• BALL, BEARING, 9/16" DIA. (450 PIECE BOX)		RF		
610	B-3742	BALL SPACER		1	Y	
620	A-1852	RING, RETAINING, BEARING		1		
630	A-1854	RETAINER, RING, WIRE		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

Blade Retention Parts

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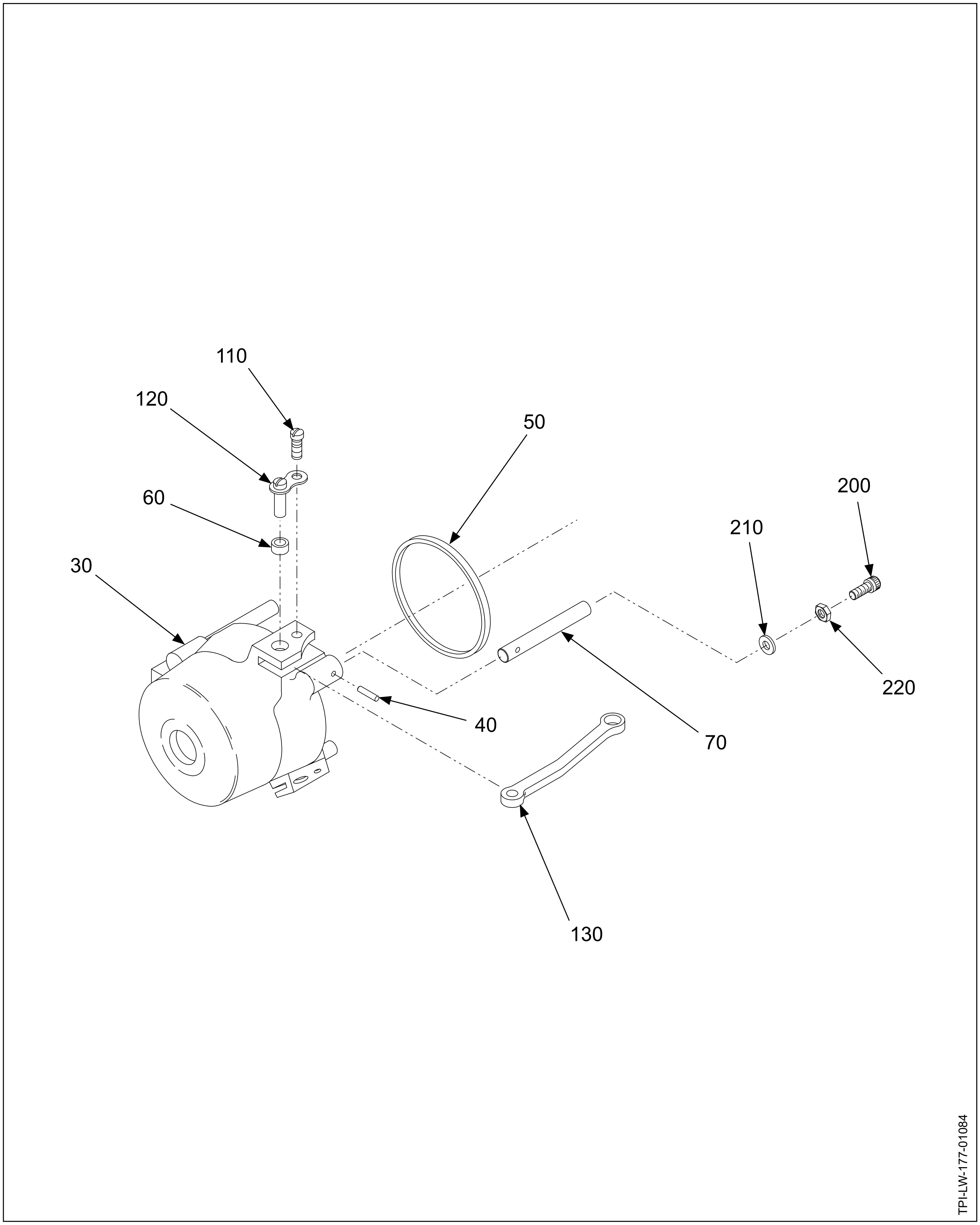


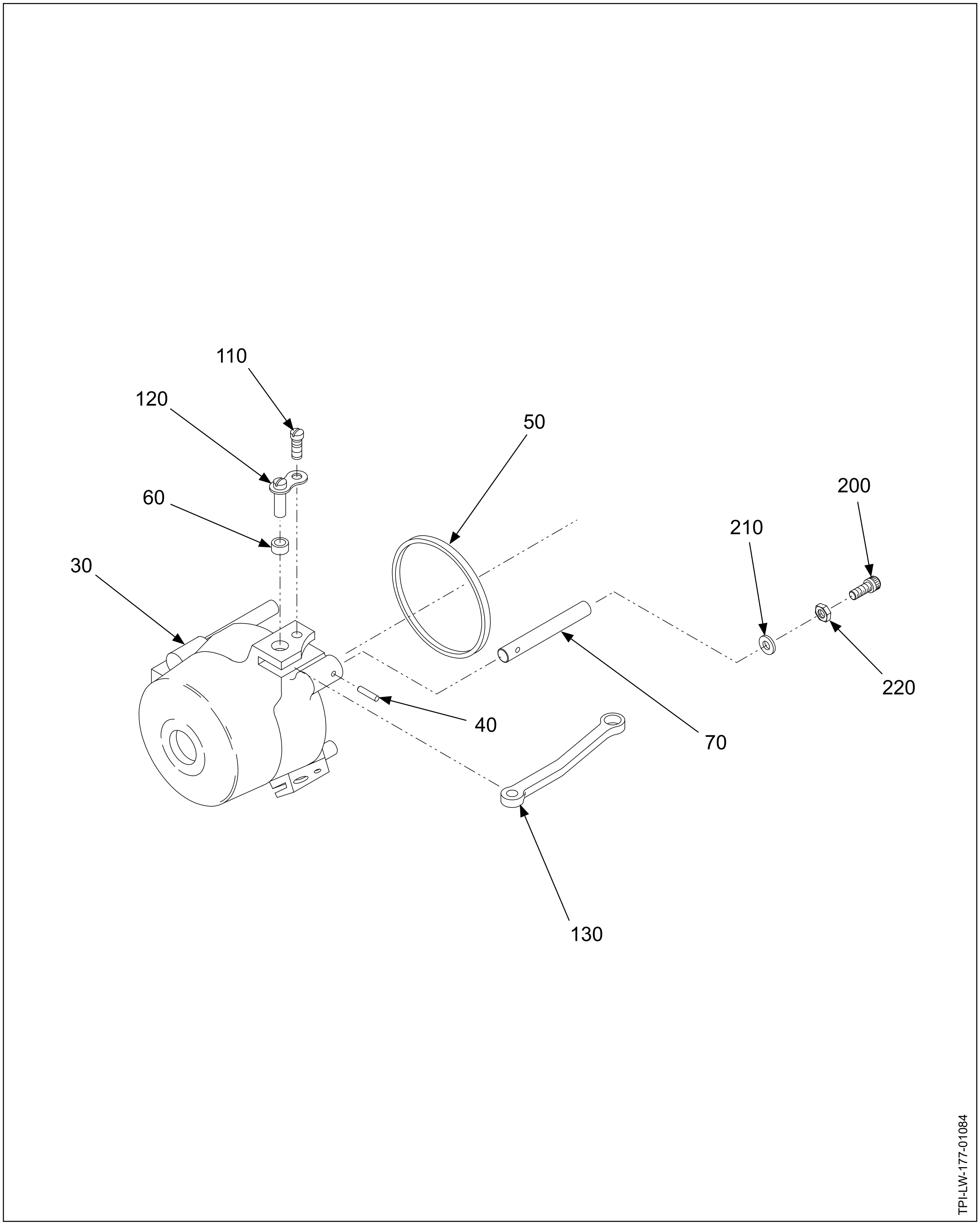
832-14 Piston Assembly
Figure 10A-2

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-2		**832-14: PISTON ASSEMBLY**		**RF**		
-20	832-14	PISTON ASSEMBLY		1		
30	C-1401-3	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN SUPERSEDED BY ITEM 40A		3		
40A	A-114-E	• • DOWEL PIN SUPERSEDES ITEM 40		3		
50	A-862	• • BUSHING, PLASTIC		1		
60	A-946	• • BRONZE BUSHING		A/R		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
-121	A-979	• • LINK		1		
-122	A-872-1	• • PIN, LINK		1		
-123	B-3840-8	• • SCREW, 10-32, FILLISTER HEAD		1	Y	
130	A-861-3	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

832-14: Piston Assembly



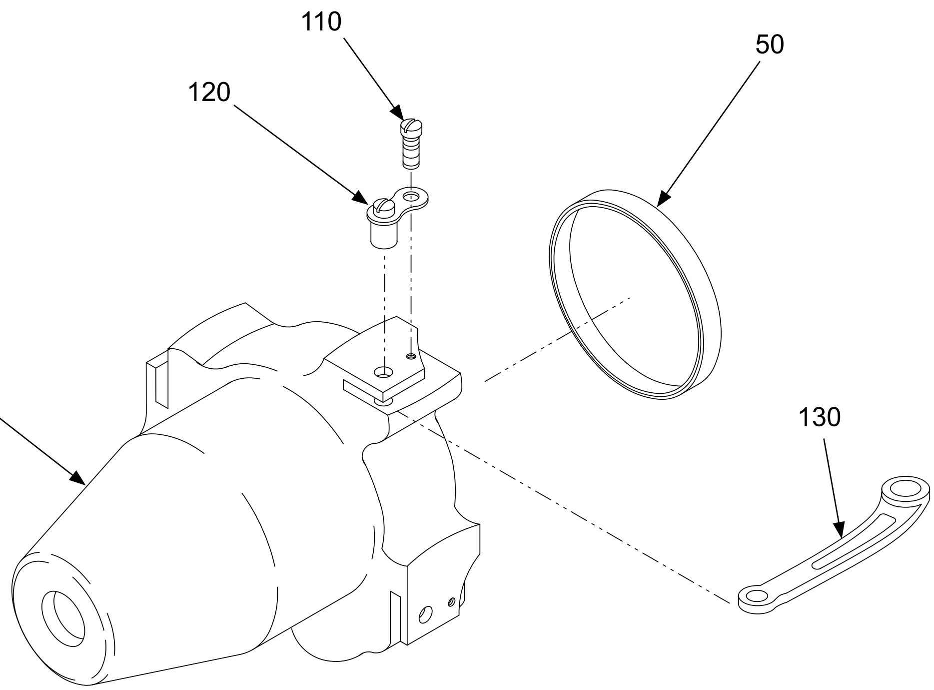
832-17 Piston Assembly
Figure 10A-3

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-3		**832-17: PISTON ASSEMBLY PARTS**		**RF**		
-20	832-17	PISTON ASSEMBLY		1		
30	C-1401-2	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN SUPERSEDED BY ITEM 40A		3		
40A	A-114-E	• • DOWEL PIN SUPERSEDES ITEM 40		3		
50	A-862	• • BUSHING, PLASTIC		1		
60	A-946	• • BRONZE BUSHING		A/R		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
-121	A-979	• • LINK		1		
-122	A-872-1	• • PIN, LINK		1		
-123	B-3840-8	• • SCREW, 10-32, FILLISTER HEAD		1	Y	
130	A-861-3	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

832-17: Piston Assembly



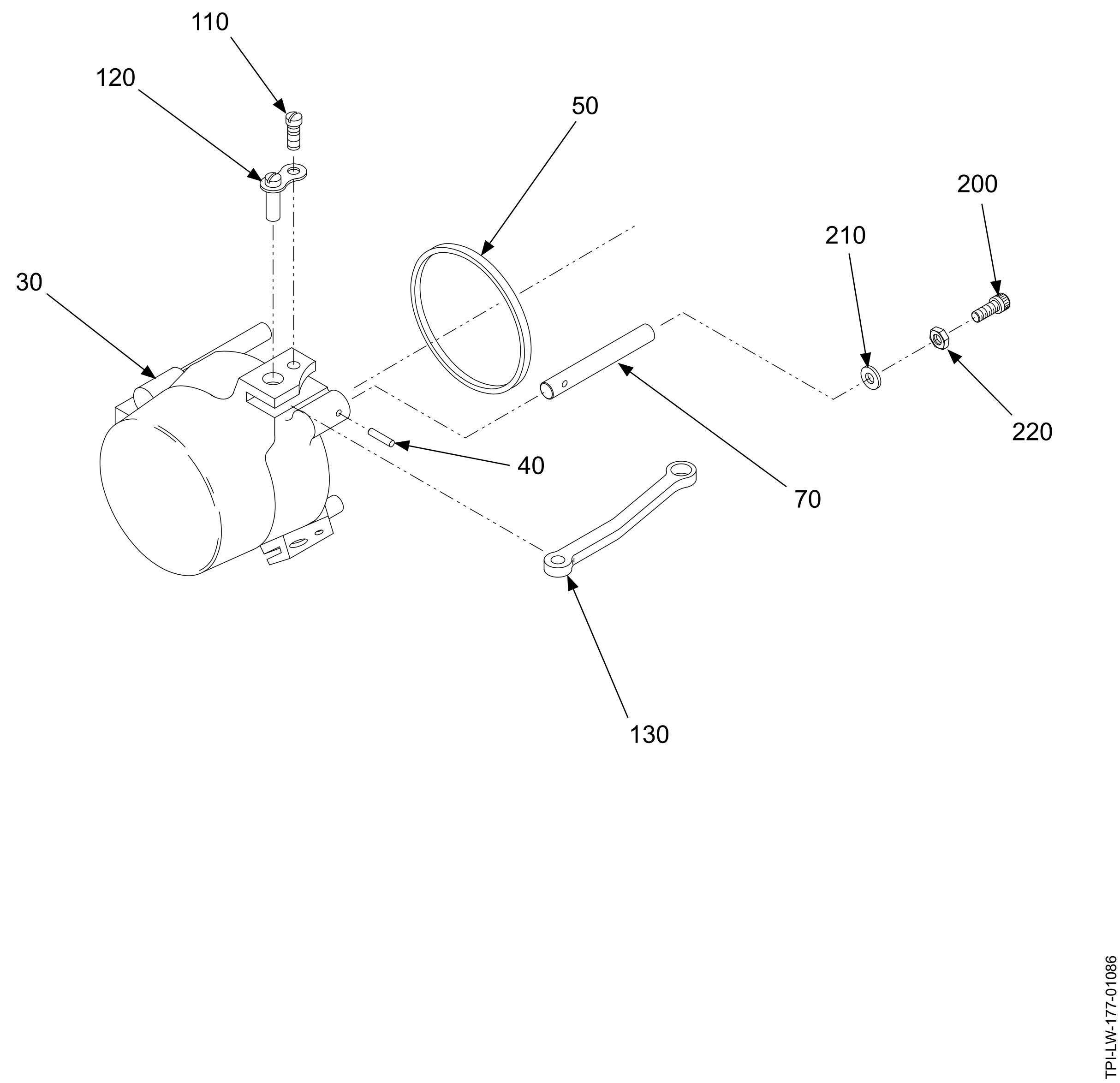
832-30 Piston Assembly
Figure 10A-4

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-4		**832-30: PISTON ASSEMBLY PARTS**		**RF**		
-20	832-30	PISTON ASSEMBLY		1		
30	C-2303-3	• PISTON UNIT		1		
50	A-862-7	• • BUSHING, PLASTIC		1		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		4	Y	
120	A-1464	• LINK PIN UNIT		4	Y	
-121	A-979	• • LINK		1		
-122	A-872-1	• • PIN, LINK		1		
-123	B-3840-8	• • SCREW, 10-32, FILLISTER HEAD		1	Y	
130	B-4016	• LINK ARM		4		
130A	B-1901	• LINK ARM, ALTERNATE FOR ITEM 130		4		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

832-30: Piston Assembly



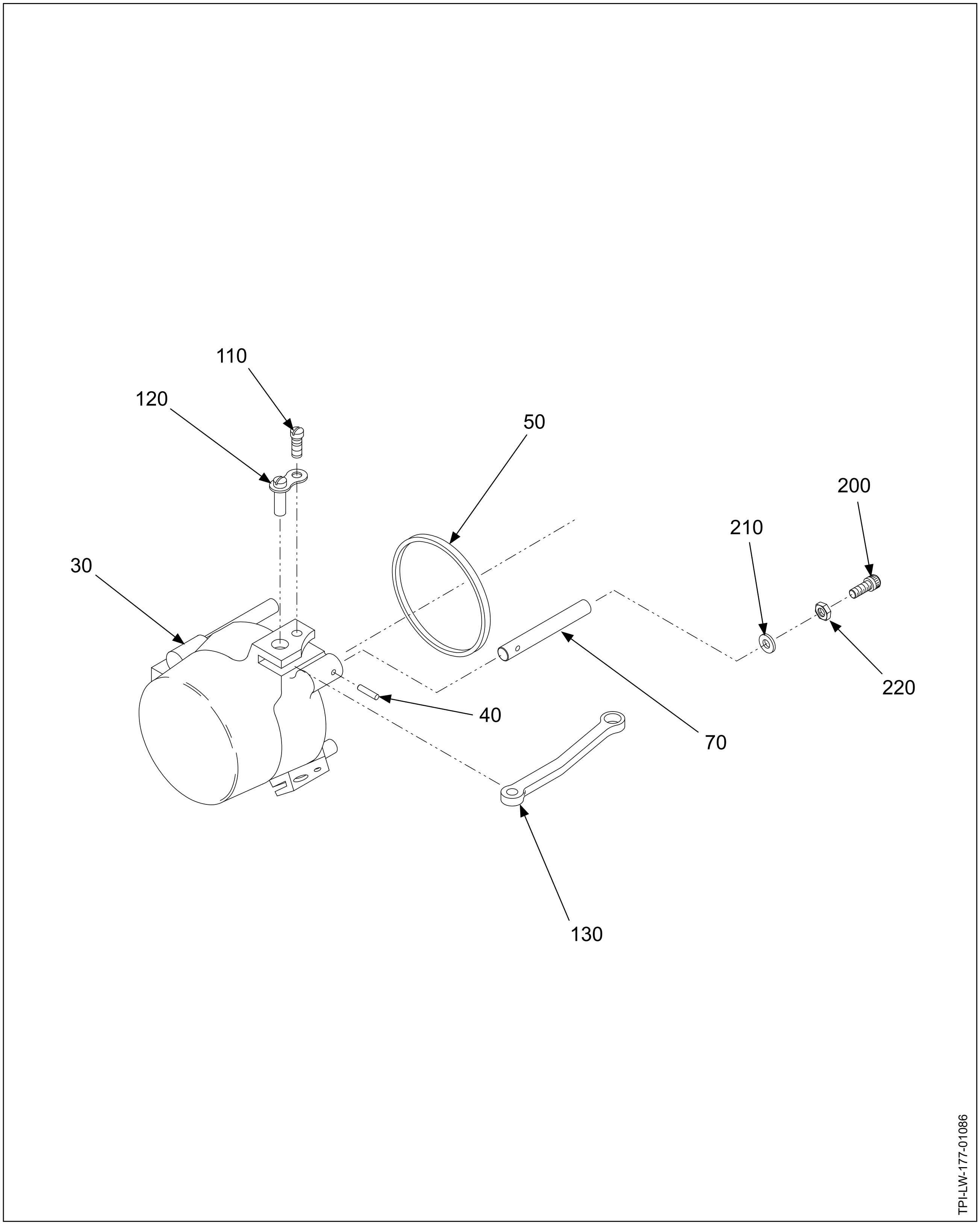
832-33 Piston Assembly
Figure 10A-5

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-5		**832-33: PISTON ASSEMBLY PARTS**		**RF**		
-20	832-33	PISTON ASSEMBLY		1		
30	C-1881-1	• PISTON UNIT		1		
40	A-114-7	• • DOWEL PIN		3		
50	A-862-2	• • BUSHING, PLASTIC		3		
70	A-817-4	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
-121	A-979	• • LINK		1		
-122	A-872-1	• • PIN, LINK		1		
-123	B-3840-8	• • SCREW, 10-32, FILLISTER HEAD		1	Y	
130	A-861-3L	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

832-33: Piston Assembly



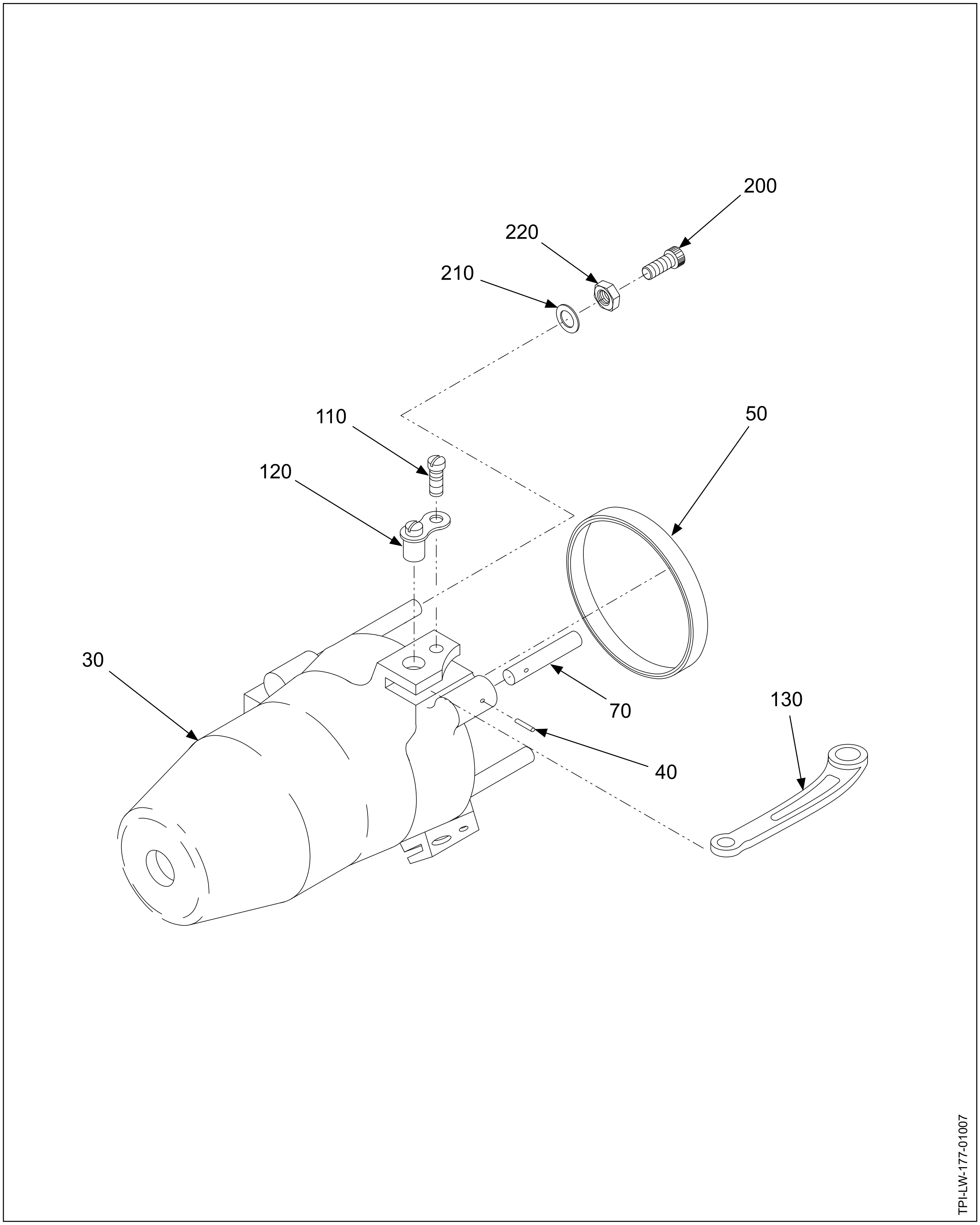
832-36 Piston Assembly
Figure 10A-6

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-6		**832-36: PISTON ASSEMBLY PARTS**		**RF**		
-20	832-36	PISTON ASSEMBLY		1		
30	C-1881-2	• PISTON UNIT		1		
-40	A-114-7	• • DOWEL PIN		3		
50	A-862-2	• • BUSHING, PLASTIC		1		
70	A-817-6	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
-121	A-979	• • LINK		1		
-122	A-872-1	• • PIN, LINK		1		
-123	B-3840-8	• • SCREW, 10-32, FILLISTER HEAD		1	Y	
130	A-861-3L	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH (PISTON GUIDE ROD)		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

832-36: Piston Assembly



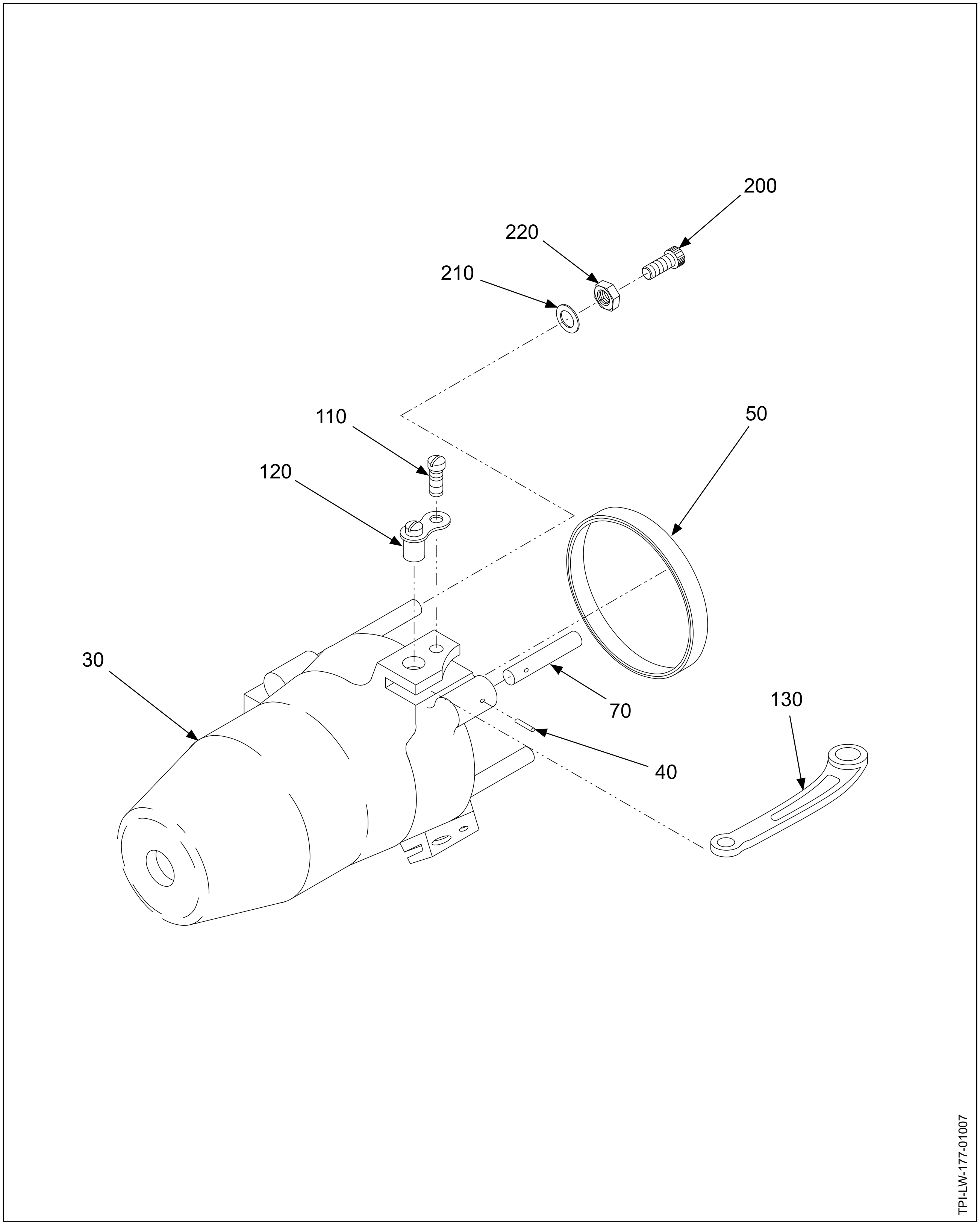
B-1368 Piston Assembly
Figure 10A-7

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-7		**B-1368: PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1368	PISTON ASSEMBLY		1		
30	C-1451	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN, SUPERSEDED BY ITEM 40A		3		
40A	B-6582-0875	• • SPRING PIN, 3/16", CRES, SUPERSEDES ITEM 40		3	Y	
50	A-862	• • BUSHING, PLASTIC		1		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
130	A-861-3	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1368: Piston Assembly



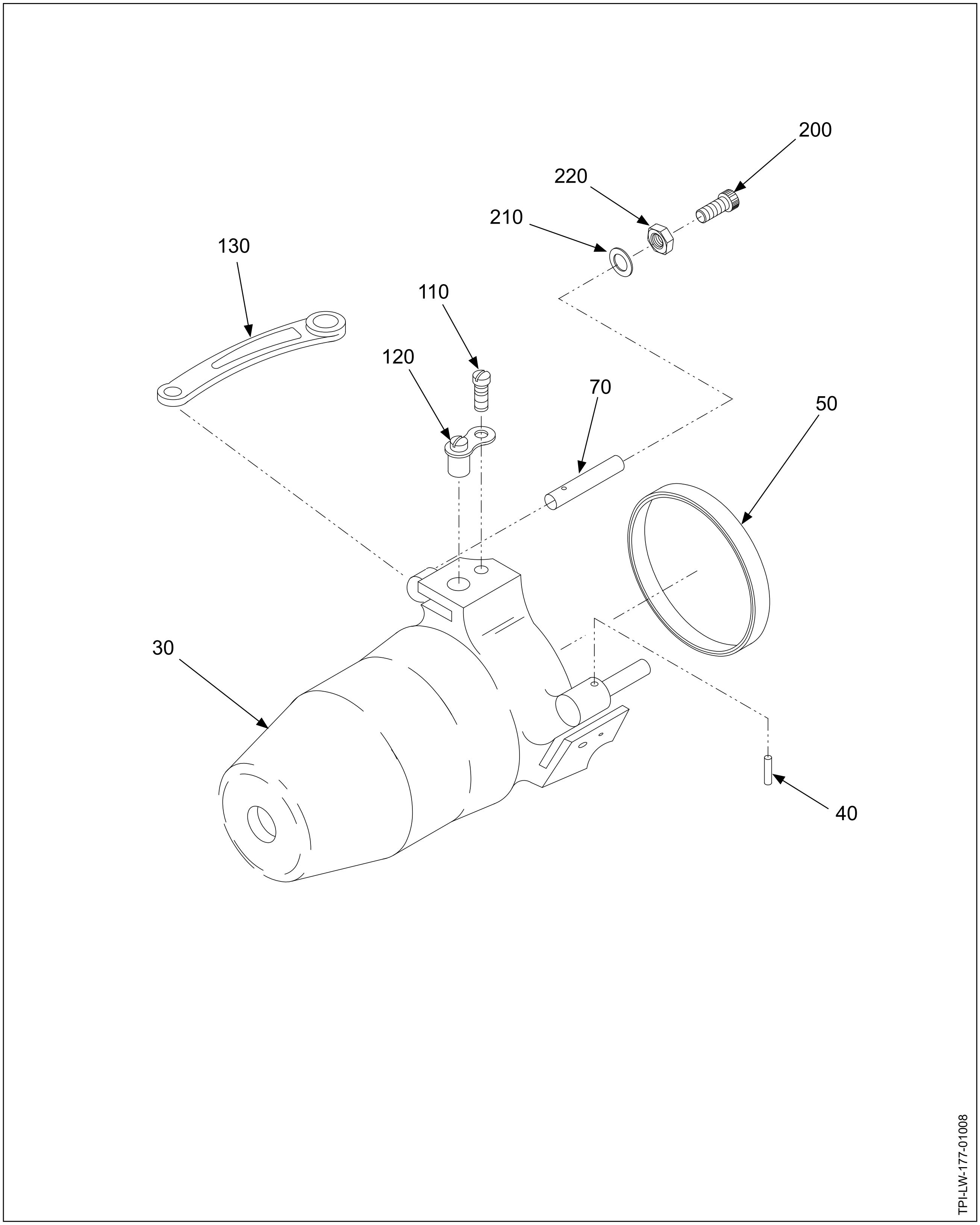
B-1368-1 Piston Assembly
Figure 10A-8

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-8		**B-1368-1: PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1368-1	PISTON ASSEMBLY		1		
30	C-1816	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN		3		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
130	A-861-3	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1368-1 Piston Assembly



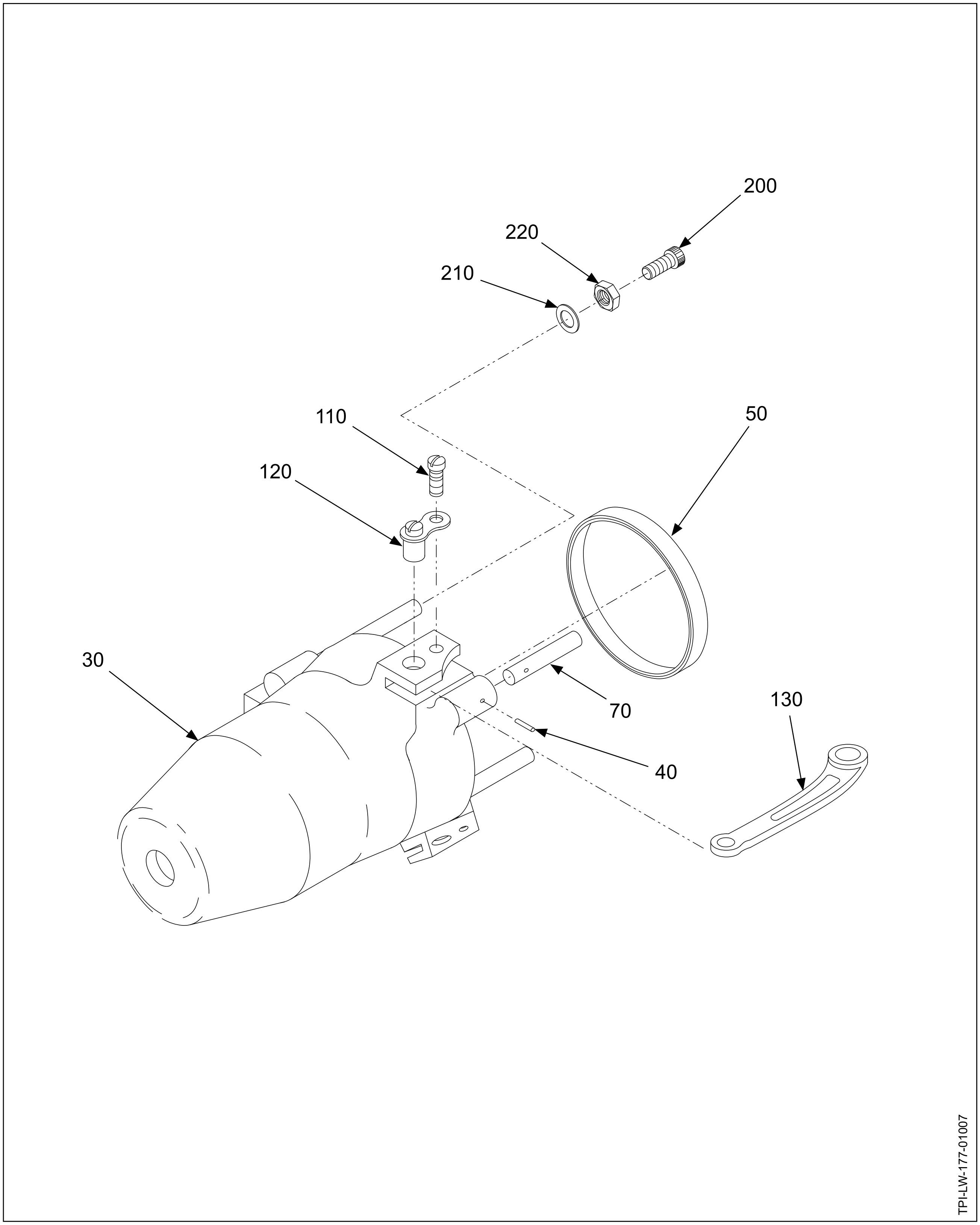
B-1368-1L Piston Assembly
Figure 10A-9

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-9		**B-1368-1L PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1368-1L	PISTON ASSEMBLY		1		
30	C-1816L	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN		3		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
110A	B-3840-5	• SCREW, 10-32, FILLISTER HEAD ALTERNATE FOR ITEM 110		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
130	A-861-1L	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1368-1L Piston Assembly



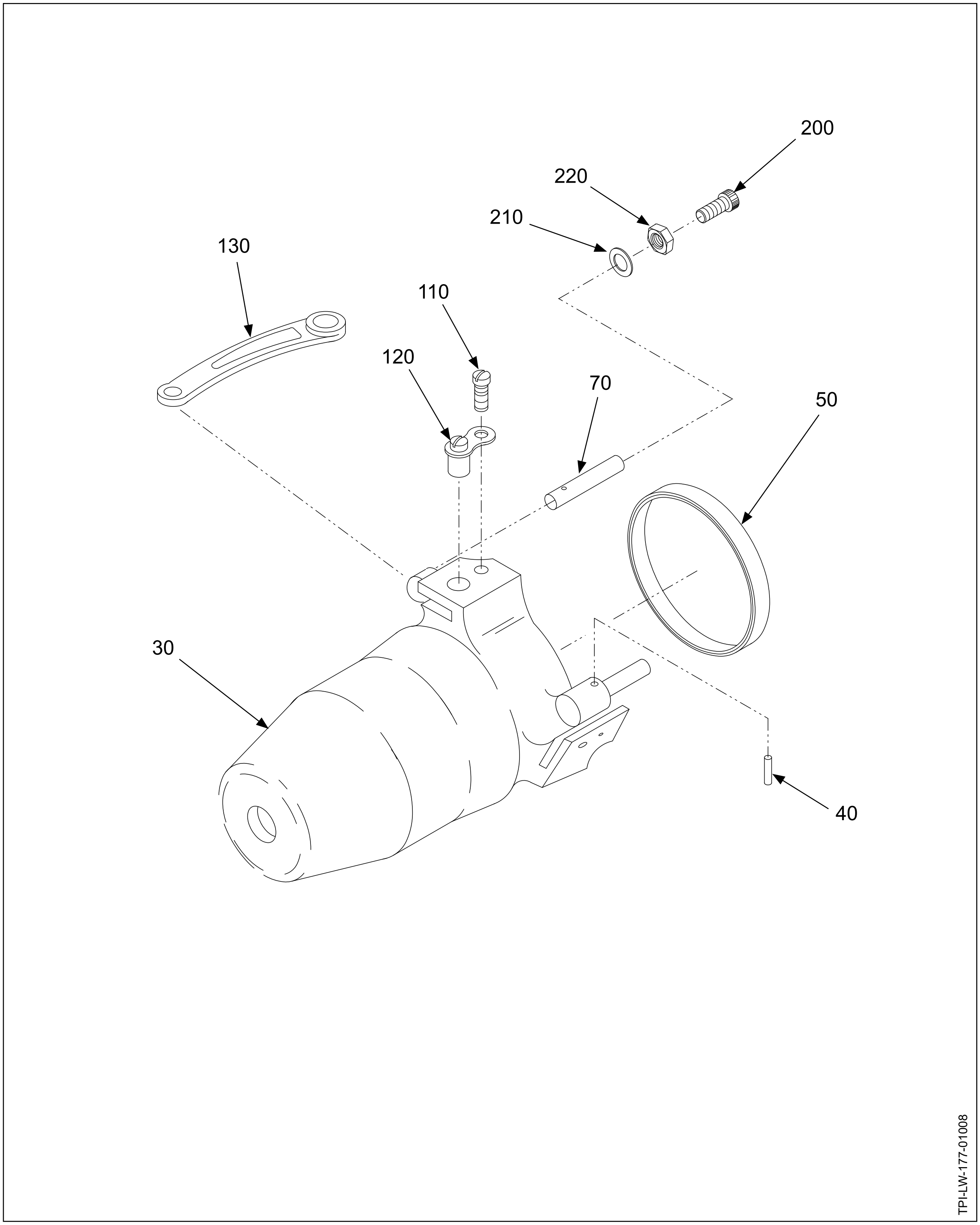
B-1368-3 Piston Assembly
Figure 10A-10

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-10		**B-1368-3: PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1368-3	PISTON ASSEMBLY		1		
30	C-1802	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN		3		
50	A-862-1	• • BUSHING, PLASTIC		1		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
110A	B-3840-5	• SCREW, 10-32, FILLISTER HEAD ALTERNATE FOR ITEM 110		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
130	A-861-3	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1368-3: Piston Assembly



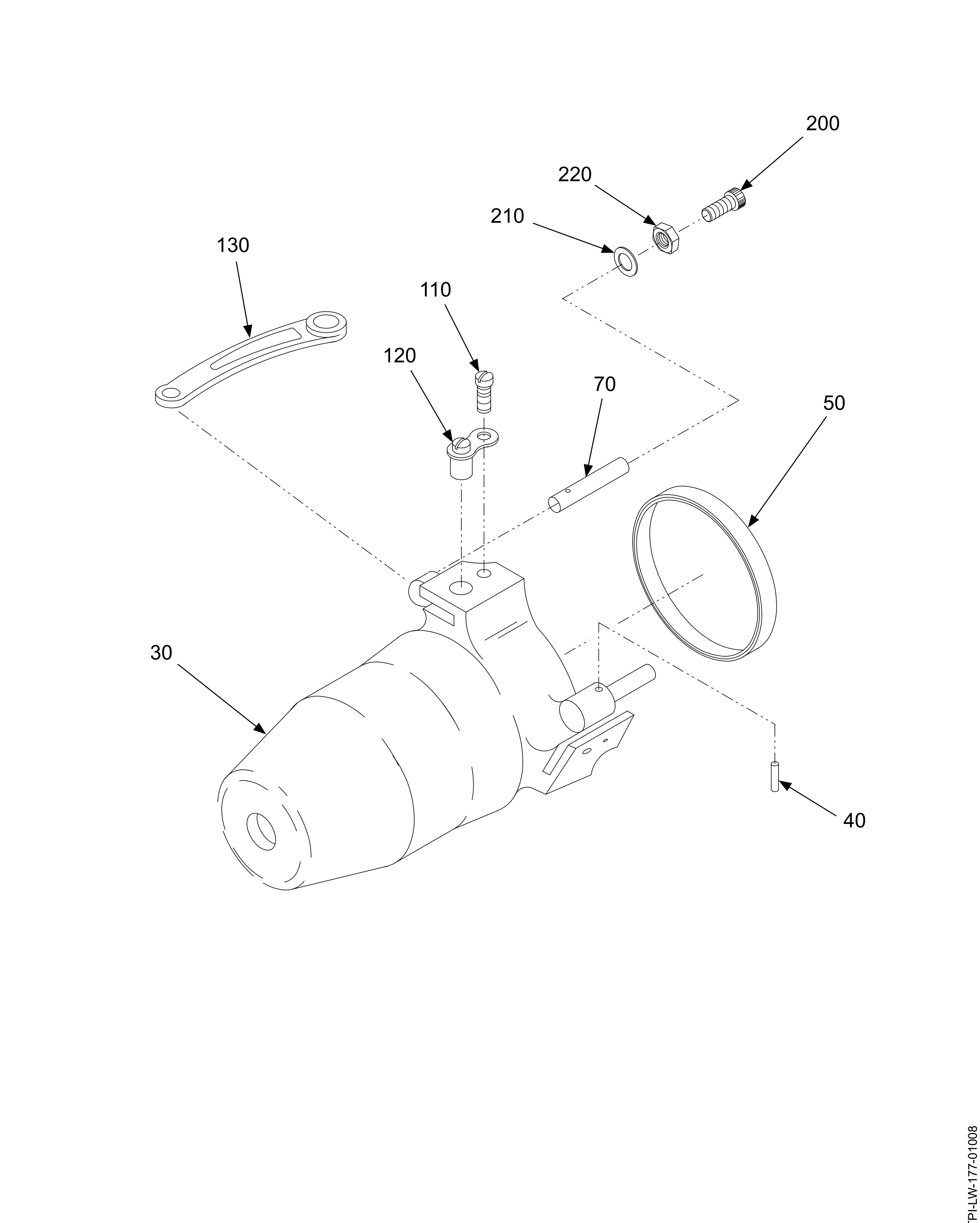
B-1368-3L Piston Assembly
Figure 10A-11

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-11		**B-1368-3L PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1368-3L	PISTON ASSEMBLY		1		
30	C-1802-L	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN		3		
50	A-862-1	• • BUSHING, PLASTIC		1		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
130	A-861-3L	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1368-3L Piston Assembly



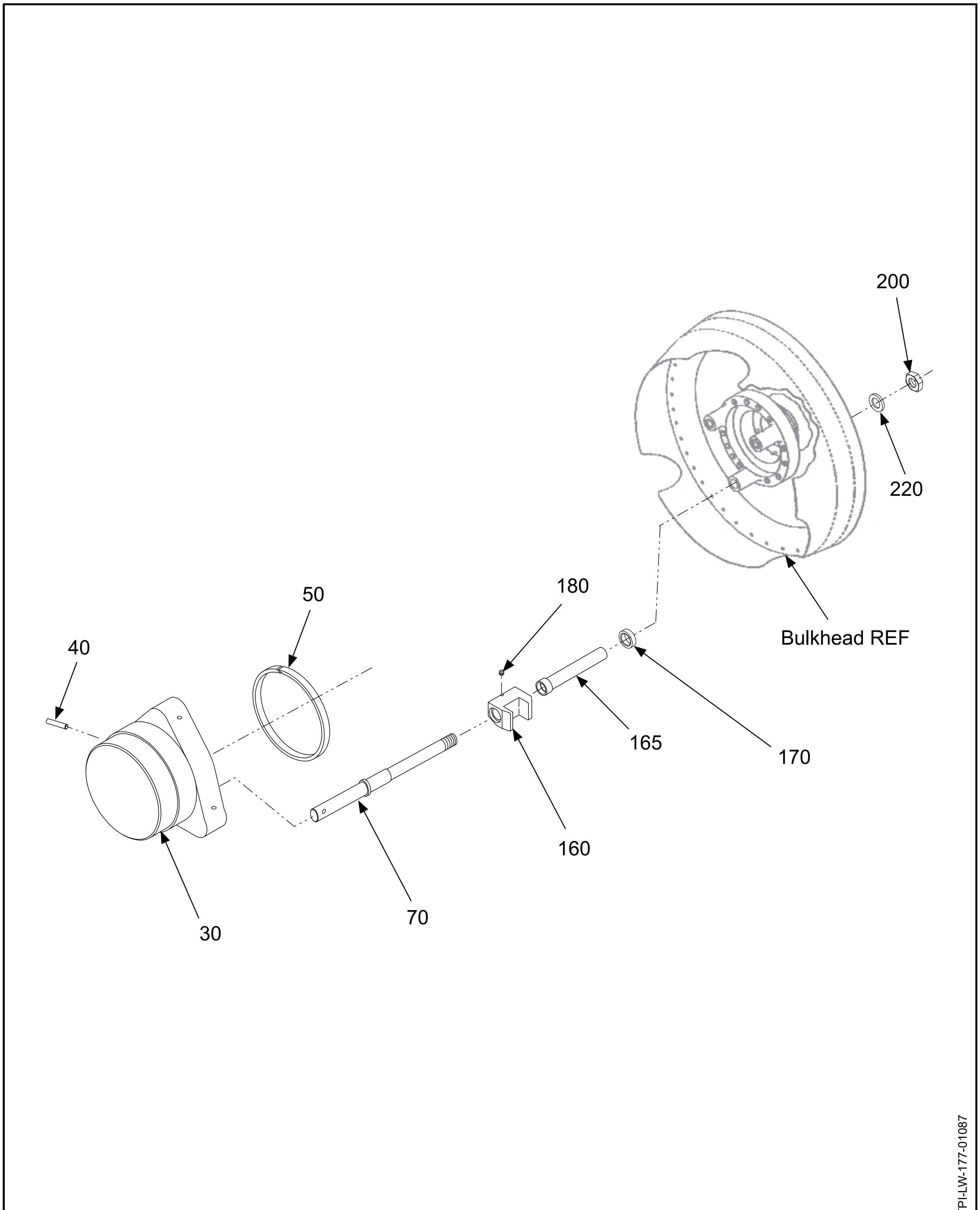
B-1368-13L Piston Assembly
Figure 10A-12

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-12		**B-1368-13L: PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1368-13L	PISTON ASSEMBLY		1		
30	C-1863L	• PISTON UNIT		1		
40	A-114-B	• • DOWEL PIN		3		
50	A-862-1	• • BUSHING, PLASTIC		1		
70	A-817-2	• • ROD, GUIDE, PISTON		3		
110	B-3840-6	• SCREW, 10-32, FILLISTER HEAD		3	Y	
120	A-1464	• LINK PIN UNIT		3	Y	
130	A-861-3L	• LINK ARM		3		
200	A-2037	• SCREW, 5/16-24, CAP (GUIDE ROD)		3	Y	
210	A-1444	• WASHER, 5/16 INCH, PISTON GUIDE ROD		3	Y	
220	B-3368	• NUT, 5/16-24, HEX, THIN (GUIDE ROD)		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1368-13L: Piston Assembly



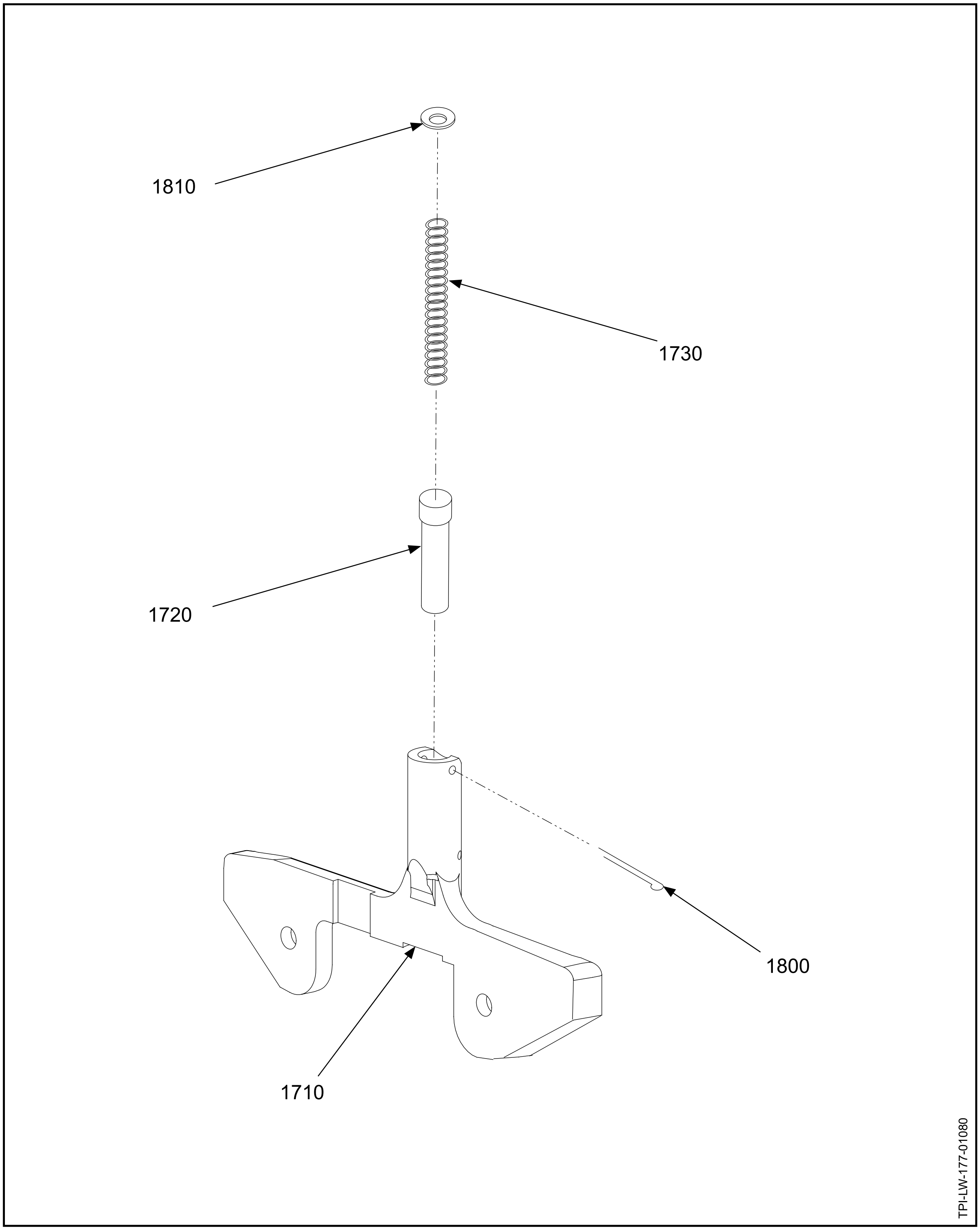
B-1378 Piston Assembly
Figure 10A-13

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-13		**B-1378: PISTON ASSEMBLY PARTS**		**RF**		
-20	B-1378	PISTON ASSEMBLY				
30	B-1421-5	• PISTON UNIT		1		
40	A-114-G	• • DOWEL PIN (ROD)		3		
50	A-862	• • BUSHING, PLASTIC		1		
70	A-826-5	• • ROD, GUIDE, PITCH CHANGE		3		
160	A-921-1	• FORK UNIT		3		
180	A-2039	• • SCREW, SET, 10-32		3	Y	
165	A-827-3	• SLEEVE, ROD, GUIDE		3		
170	A-970-( )	• SPACER, STOP, PITCH		3		
210	A-965	• WASHER, 7/16" CRES.		3	Y	
220	A-848-2	• NUT, 7/16-20, HEX, SELF-LOCKING		3	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

B-1378: Piston Assembly



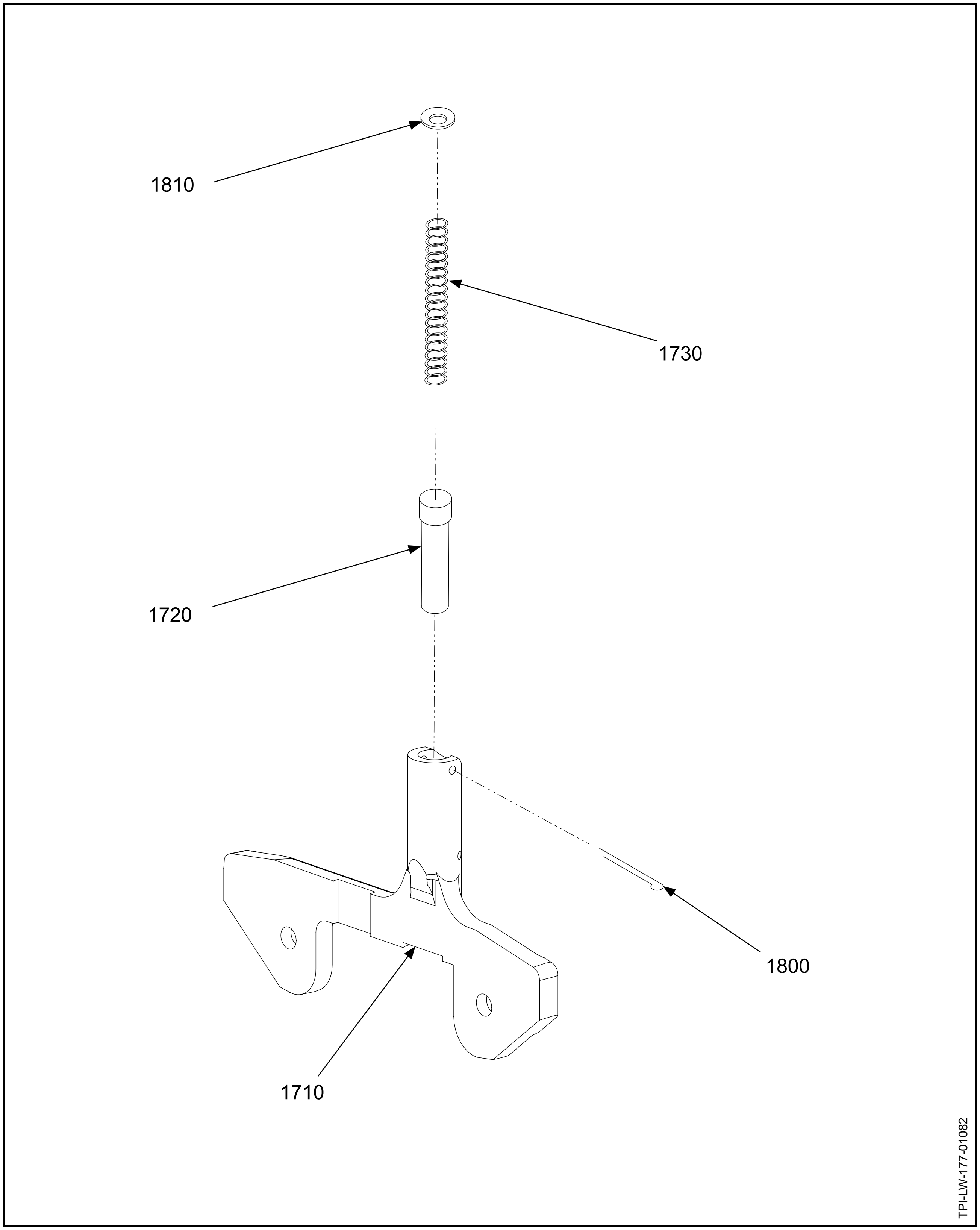
830-5 Start Lock Assembly
Figure 10A-14

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-14		**830-5: START LOCK ASSEMBLY PARTS**				
-1700	830-5	START LOCK ASSEMBLY		1		
1710	B-1353-5	• BRACKET, START LOCK		1		
1720	A-883	• PIN, START LOCK		1		
1730	A-884	• SPRING, COMPRESSION		1	Y	
1800	B-3838-3-3	• COTTER PIN		1	Y	
1810	B3851-N832	• WASHER		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

830-5: Start Lock Assembly



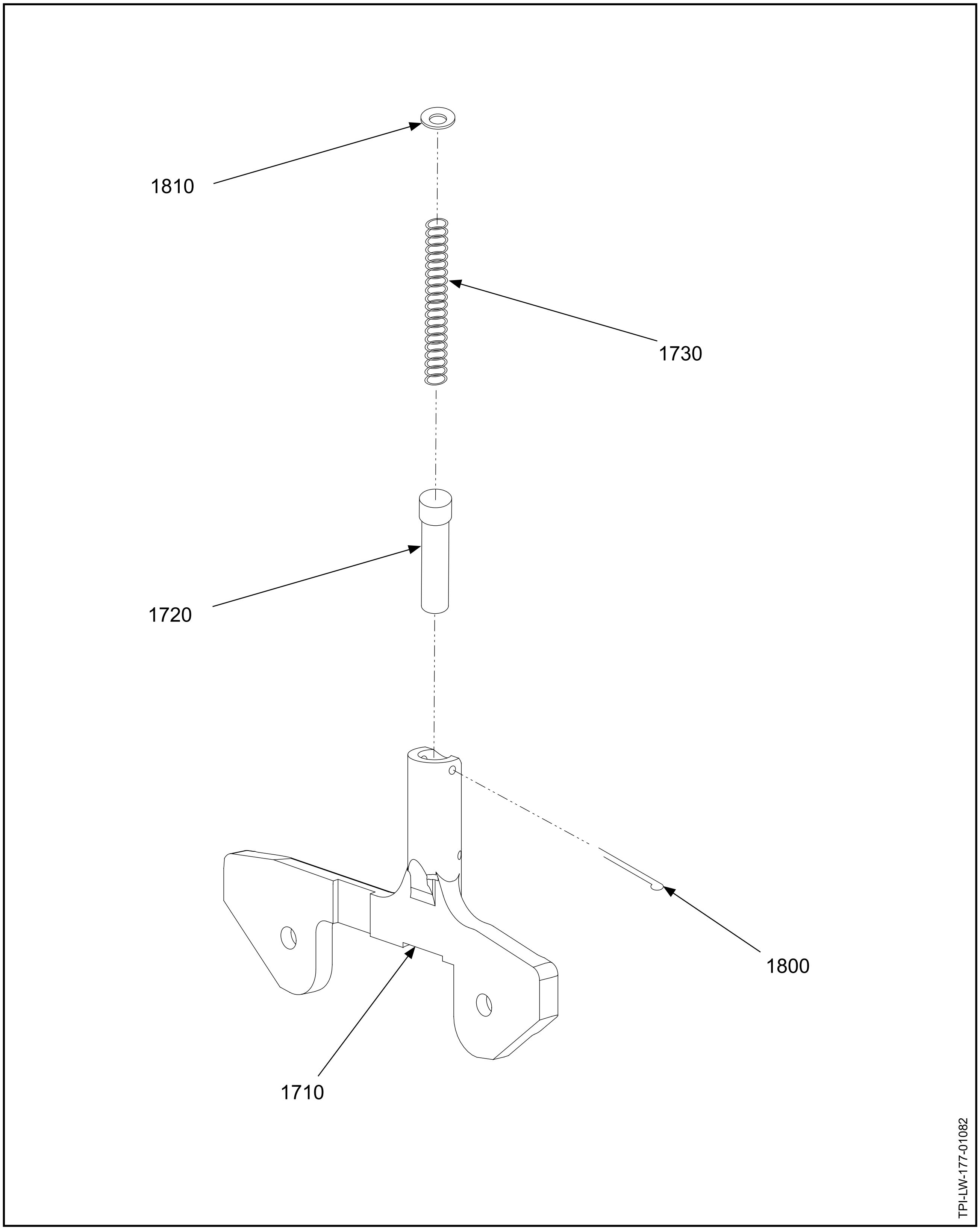
830-8 Start Lock Assembly
Figure 10A-15

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-15		**830-8: START LOCK ASSEMBLY PARTS**				
-1700	830-8	START LOCK ASSEMBLY		RF		
1710	B-1353	• BRACKET, START LOCK		1		
1720	A-883	• PIN, START LOCK		1		
1730	A-884	• SPRING, COMPRESSION		1	Y	
1800	B-3838-3-3	• COTTER PIN		1	Y	
1810	B-3851-N832	• WASHER		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

830-8: Start Lock Assembly



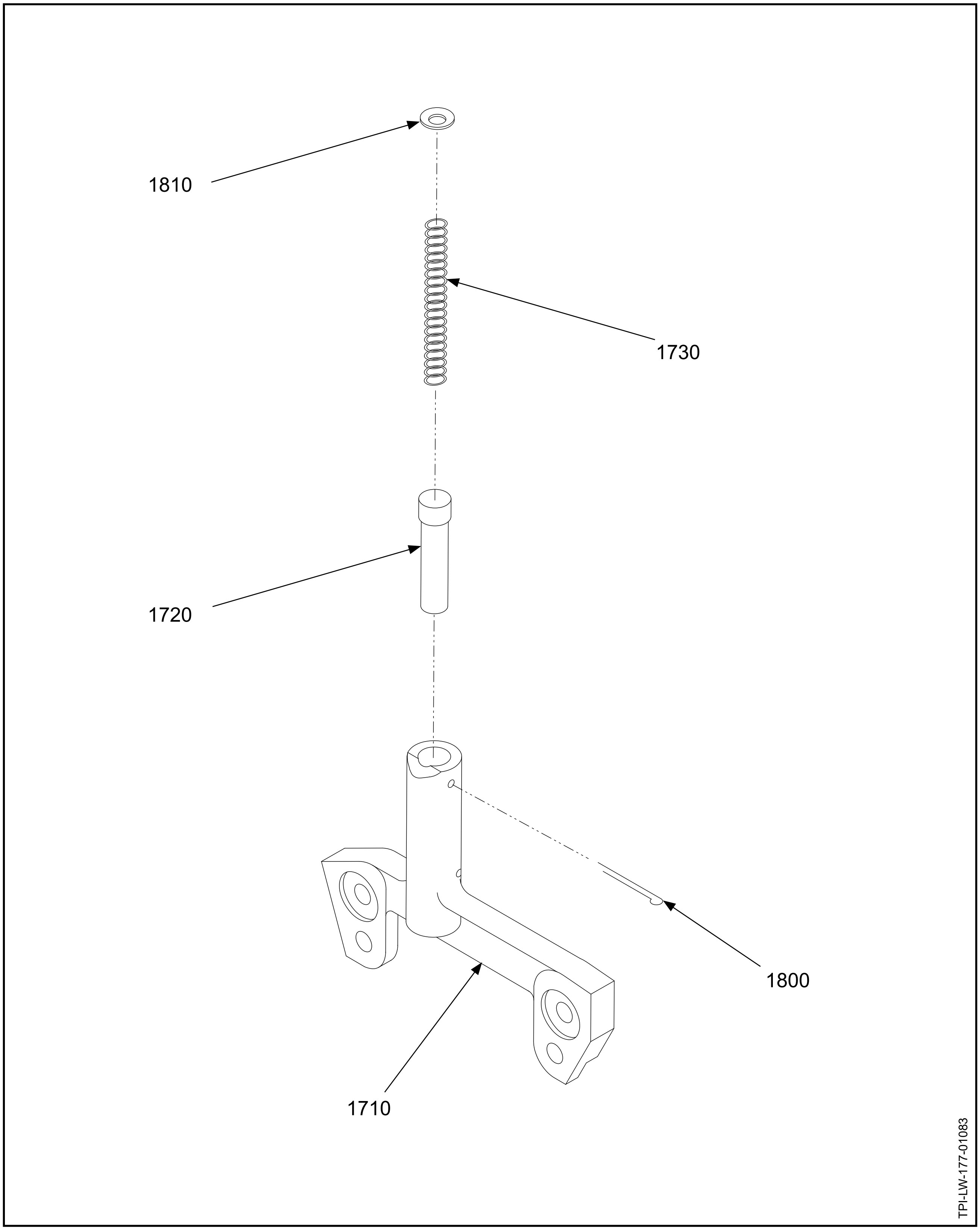
830-14 Start Lock Assembly
Figure 10A-16

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-16		**830-14: START LOCK ASSEMBLY PARTS**				
-1700	830-14	START LOCK ASSEMBLY (BULKHEAD MOUNTED)		RF		
1710	B-1353-1	• BRACKET, START LOCK		1		
1720	A-883	• PIN, START LOCK		1		
1730	A-884	• SPRING, COMPRESSION		1	Y	
1800	B-3838-3-3	• COTTER PIN		1	Y	
1810	B-3851-N832	• WASHER		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

830-14: Start Lock Assembly



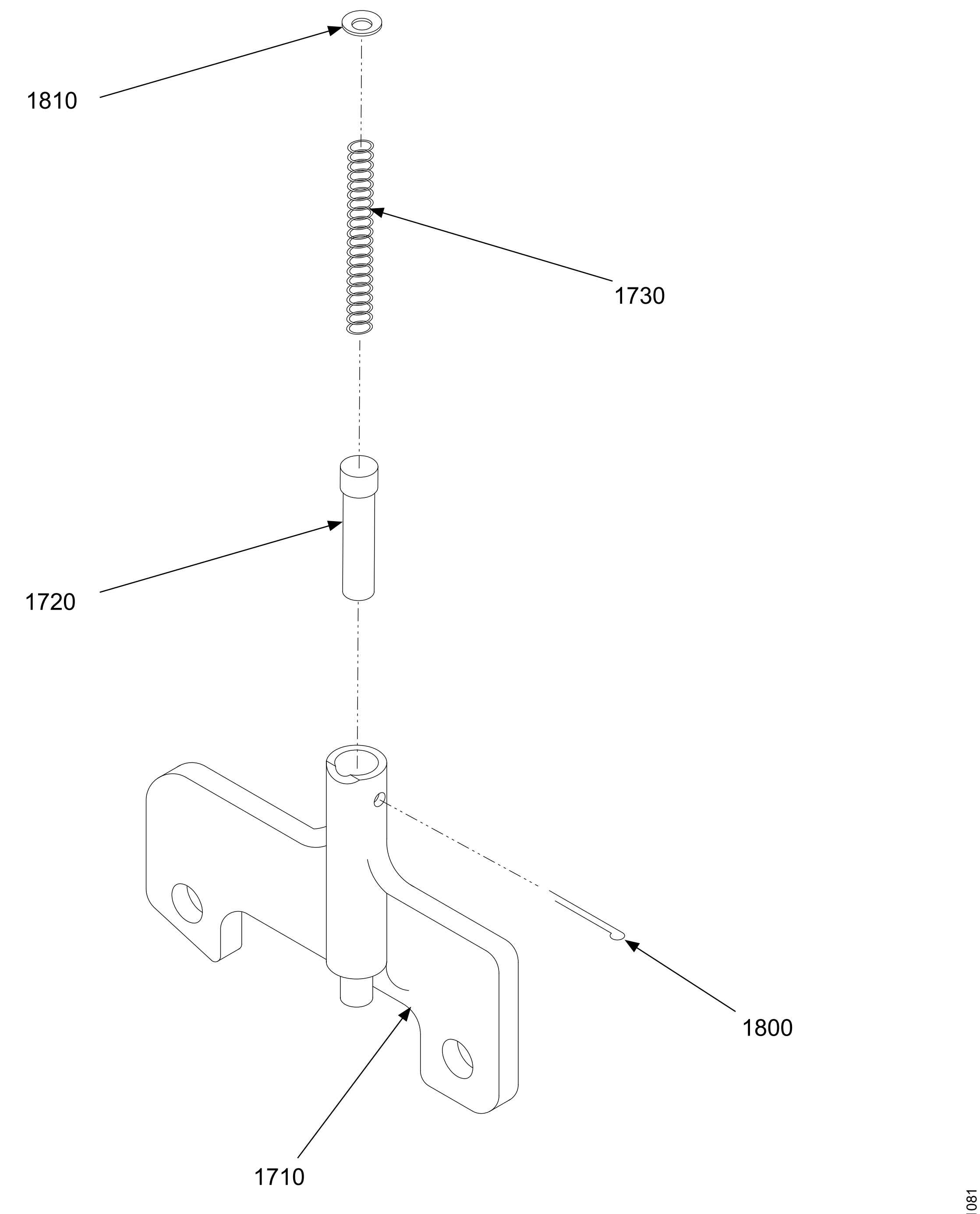
830-15 Start Lock Assembly
Figure 10A-17

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-17		**830-15: START LOCK ASSEMBLY PARTS**				
-1700	830-15	START LOCK ASSEMBLY		3		
1710	B-882-4B	• BRACKET, START LOCK		1		
1720	A-883	• PIN, START LOCK		1		
1730	A-884	• SPRING, COMPRESSION		1	Y	
1800	B-3838-3-3	• COTTER PIN		1	Y	
1810	B-3864-39	• WASHER		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

830-15: Start Lock Assembly



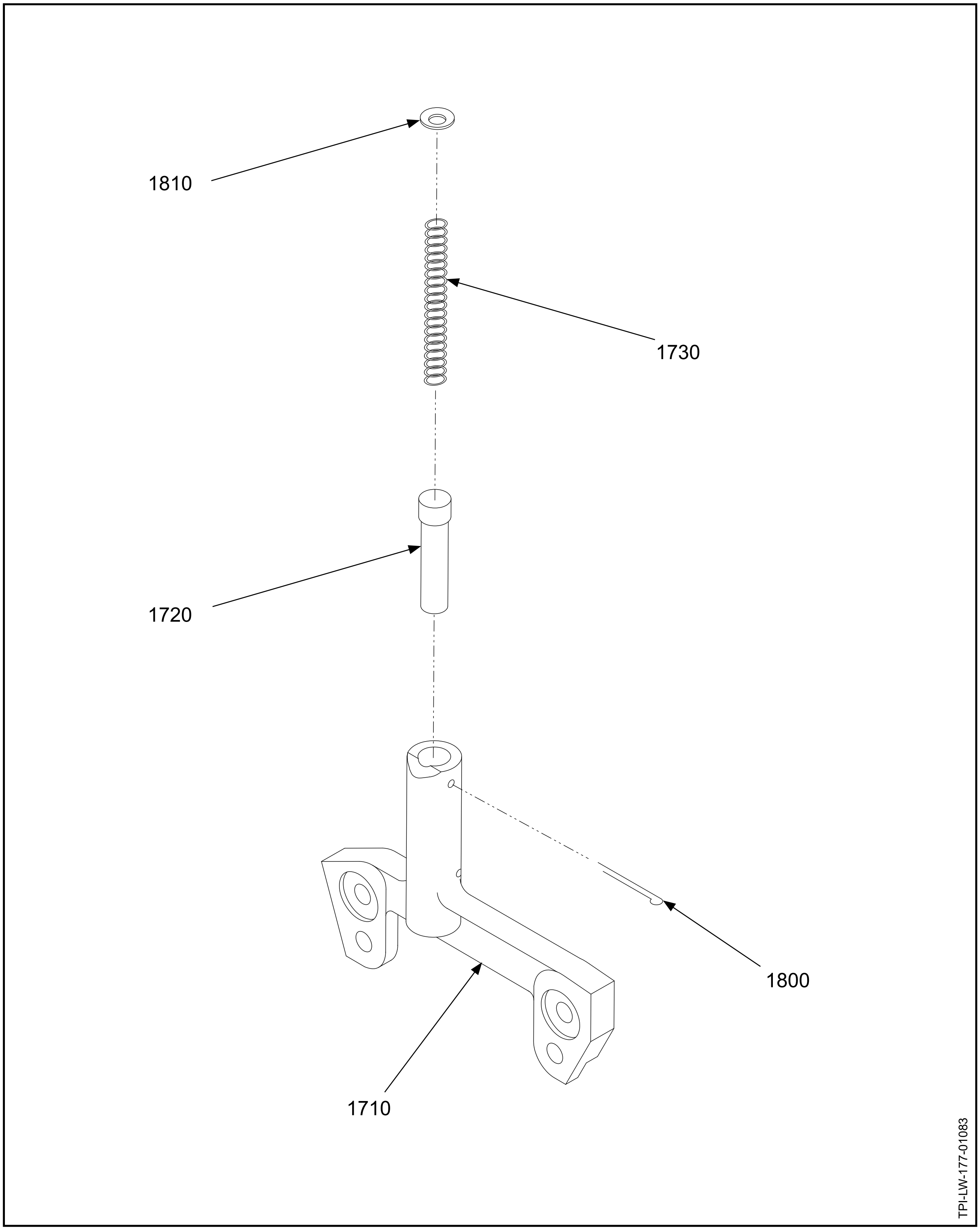
830-22 Start Lock Assembly
Figure 10A-18

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-18		**830-22: START LOCK ASSEMBLY PARTS**				
-1700	830-22	START LOCK ASSEMBLY		1		
1710	B-3085	• BRACKET, START LOCK		1		
1720	A-883	• PIN, START LOCK		1		
1730	A-884	• SPRING, COMPRESSION		1	Y	
1800	B-3838-3-3	• COTTER PIN		1	Y	
1810	B-3851-N832	• WASHER		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

830-22: Start Lock Assembly



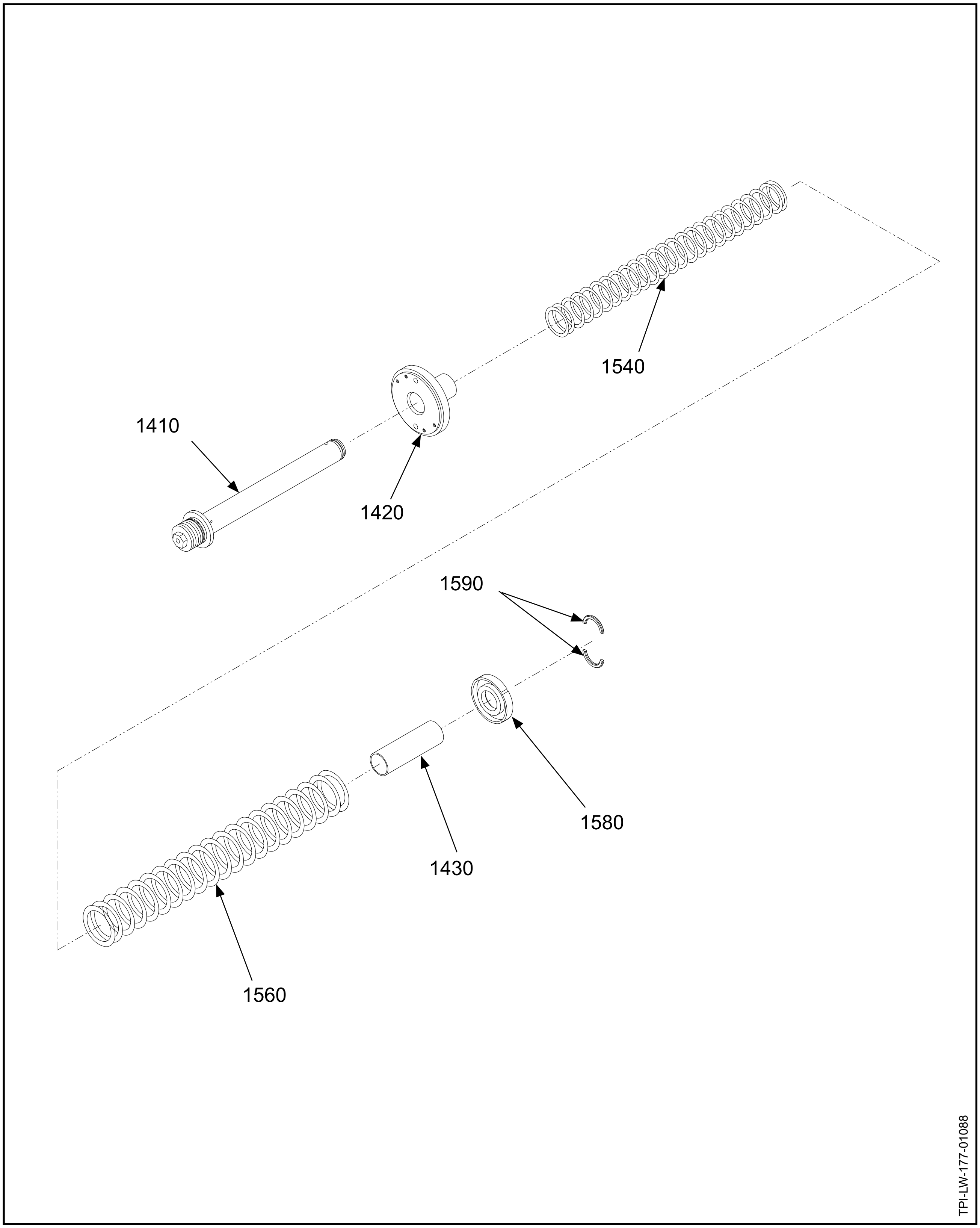
830-31 Start Lock Assembly
Figure 10A-19

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-19		**830-31: START LOCK ASSEMBLY PARTS**				
-1700	830-31	START LOCK ASSEMBLY		3		
1710	B-882-4D	• BRACKET, START LOCK		1		
1720	A-883	• PIN, START LOCK		1		
1730	A-884	• SPRING, COMPRESSION		1	Y	
1800	B-3838-3-3	• COTTER PIN		1	Y	
1810	B-3864-39	• WASHER, SUPERSEDED BY ITEM 1810A		1	Y	
1810A	B-3851-N832	• WASHER, SUPERSEDES ITEM 1810		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

830-31: Start Lock Assembly



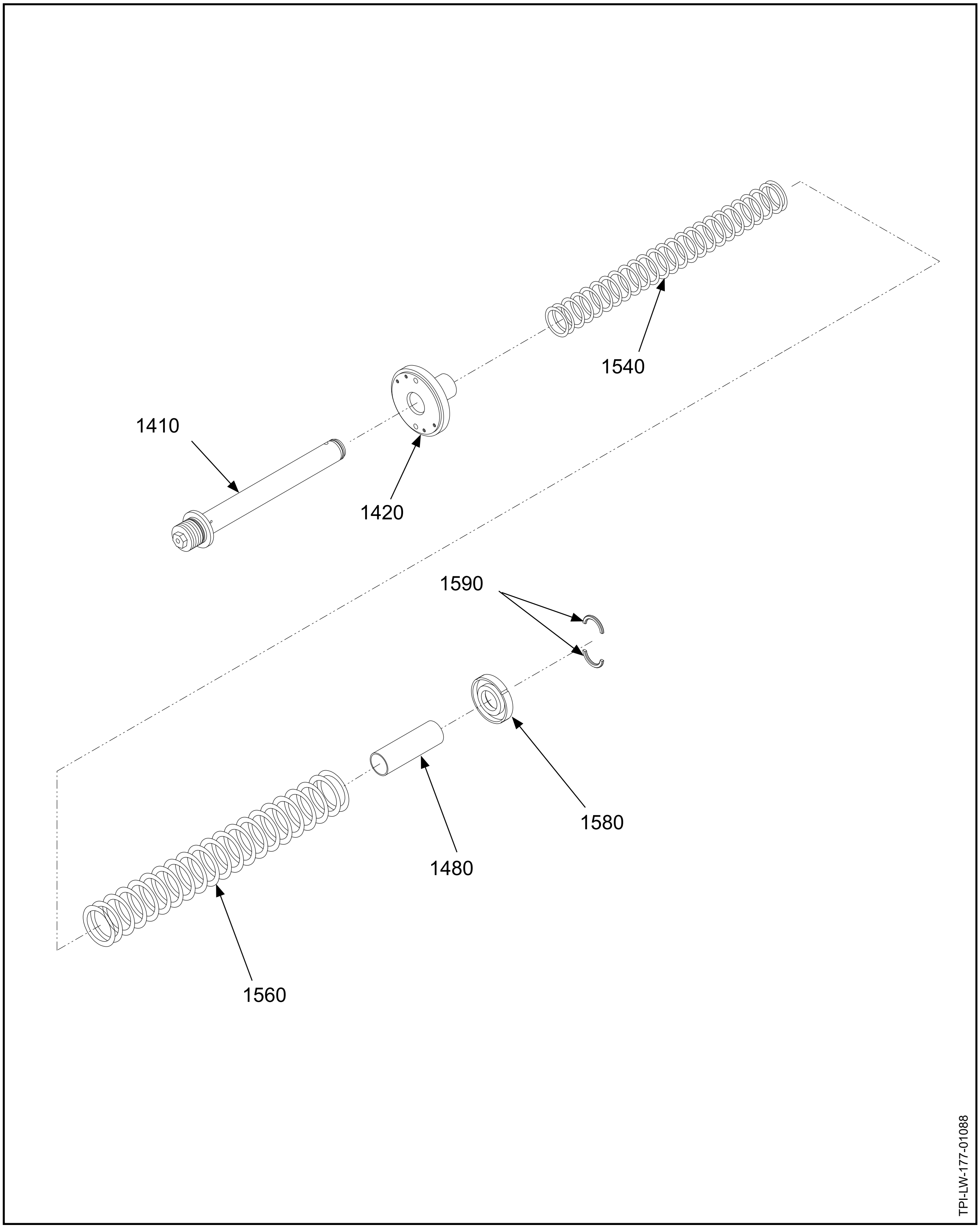
831-4 Feathering Spring Assembly
Figure 10A-20

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-20		**831-4: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-4	FEATHERING SPRING ASSEMBLY		1		
1410	B-855A	• ROD, PITCH CHANGE		1		
1420	A-856	• SPRING RETAINER, FLANGED		1		
1430	A-860-3	• SLEEVE, STOP		1		
1540	B-853	• PCP: SPRING, COMPRESSION, FEATHERING (INNER)		1		PCP
1560	B-953	• SPRING, COMPRESSION, FEATHERING (OUTER)		1		
1580	A-857	• SPRING RETAINER, REAR		1		
1590	A-858	• KEEPER, SPLIT		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-4: Feathering Spring Assembly



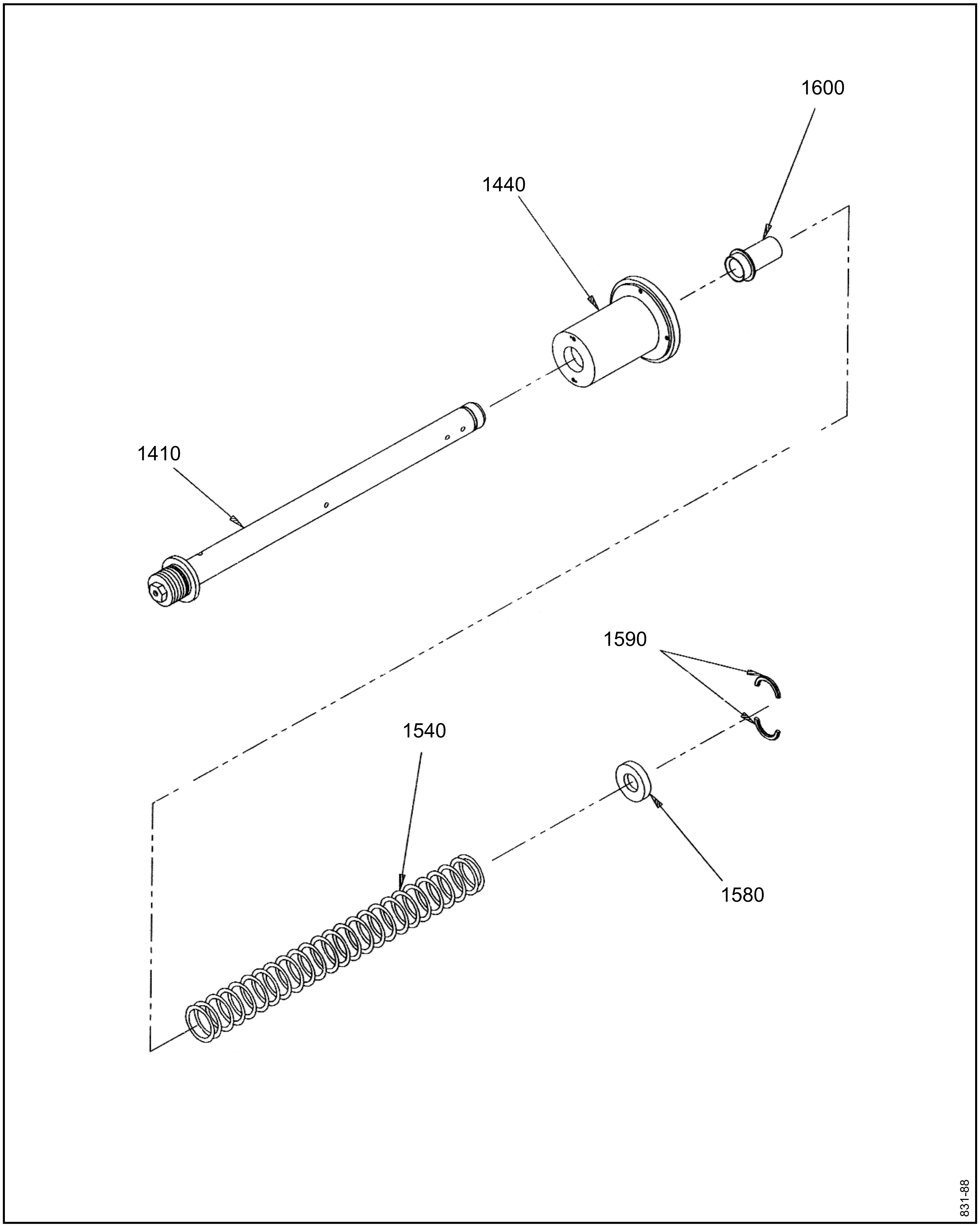
831-8 Feathering Spring Assembly
Figure 10A-21

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-21		**831-8: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-8	FEATHERING SPRING ASSEMBLY		1		
1410	B-868AS	• PCP: ROD, PITCH CHANGE		1		PCP
1420	A-871	• SPRING RETAINER, FLANGED		1		
1480	A-1955	• SPACER, SPRING		1	Y	
1540	B-1428	• SPRING, FEATHERING (INNER)		1		
1560	B-1363-1	• PCP: SPRING, COMPRESSION, FEATHERING (OUTER)		1		PCP
1580	A-1427	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-8: Feathering Spring Assembly



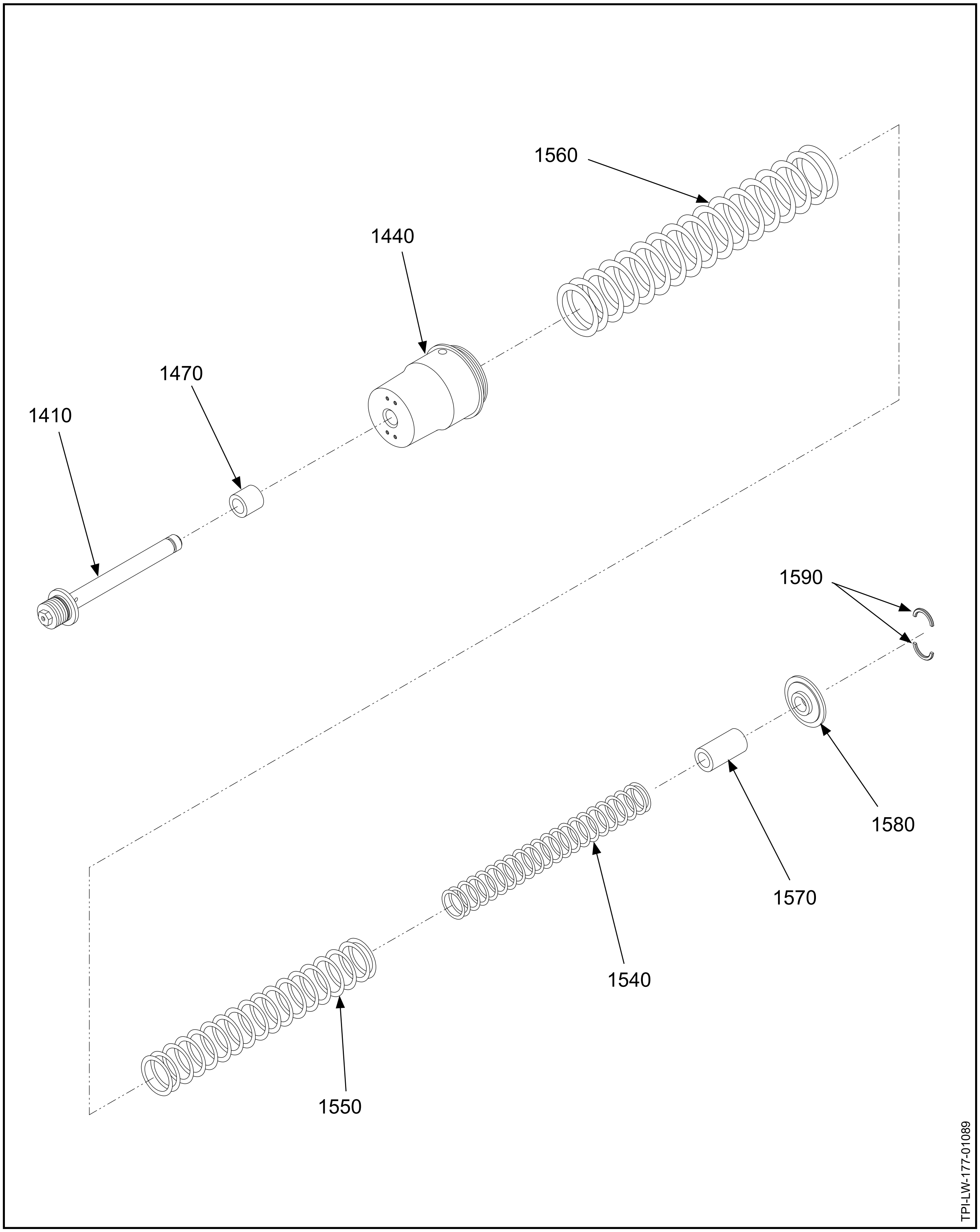
831-17 Feathering Spring Assembly
Figure 10A-22

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-22		**831-17: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-17	FEATHERING SPRING ASSEMBLY		1		
1410	B-868AS-4	• ROD, PITCH CHANGE		1		
1440	B-1364	• SPRING RETAINER CUP		1		
1540	B-1363-2	• PCP: SPRING, COMP, FEATHERING		1		PCP
1580	A-866-3	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP
1600	A-1365	• BUSHING, GUIDE, ROD		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-17: Feathering Spring Assembly



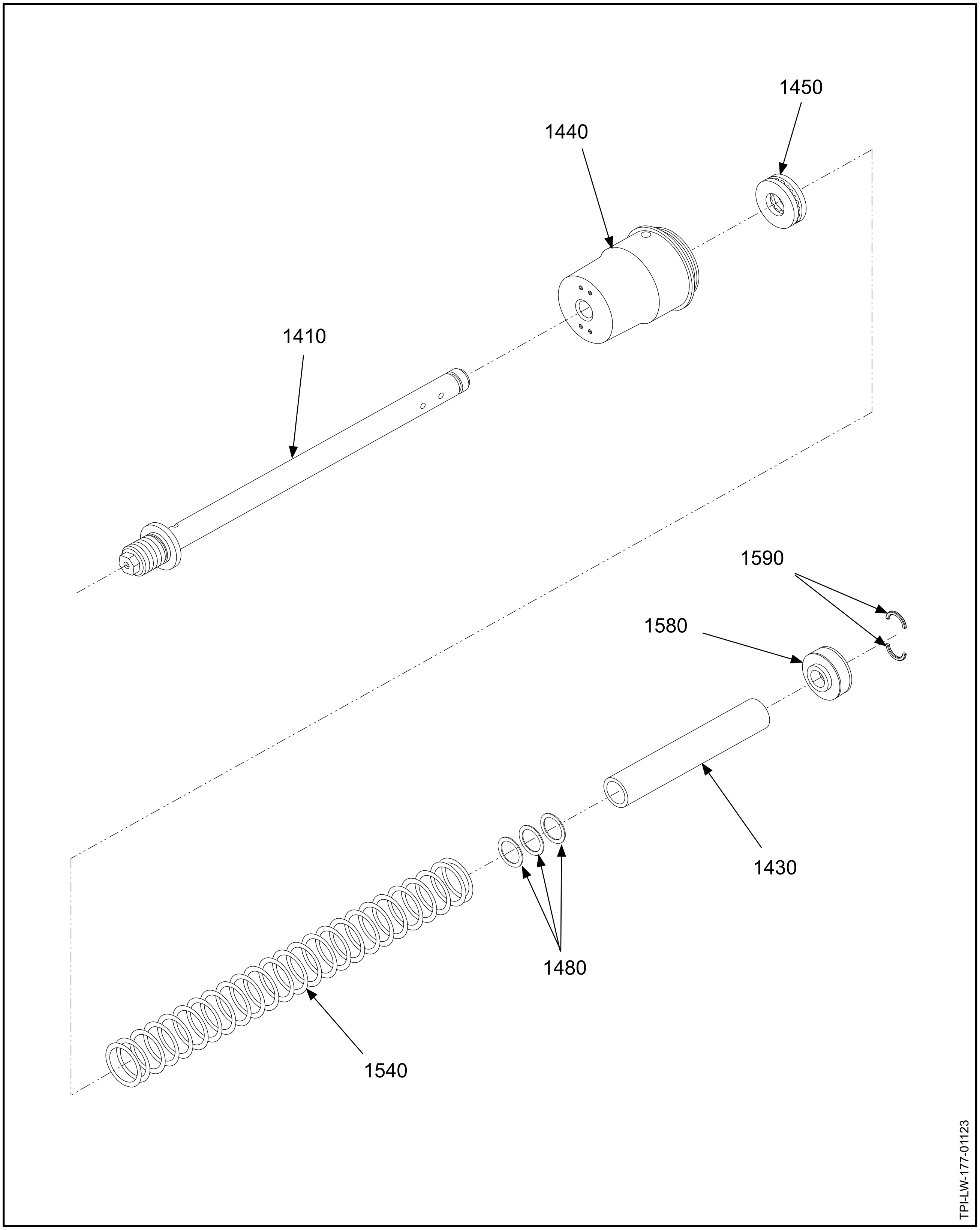
831-56 Feathering Spring Assembly
Figure 10A-23

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-23		**831-56: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-56	FEATHERING SPRING ASSEMBLY SUPERSEDED BY ITEM 1400A		1		
1410	B-868AS-2	• PCP: ROD, PITCH CHANGE		1		PCP
1440	B-666	• PCP: SPRING RETAINER CUP		1		PCP
1470	A-3042A-6	• TUBE, SPACER, SPRING		1		
1540	B-1824	• PCP: SPRING, COMP, FEATHERING (INNER)		1		PCP
1550	B-1825	• PCP: SPRING, COMP, FEATHERING (CENTER)		1		PCP
1560	B-1826	• PCP: SPRING, COMP, FEATHERING (OUTER)		1		PCP
1570	A-1849	• PCP: SLEEVE, SPACER		1	Y	PCP
1580	A-1829	• PCP: SPRING RETAINER, REAR		1		PCP
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-56: Feathering Spring Assembly



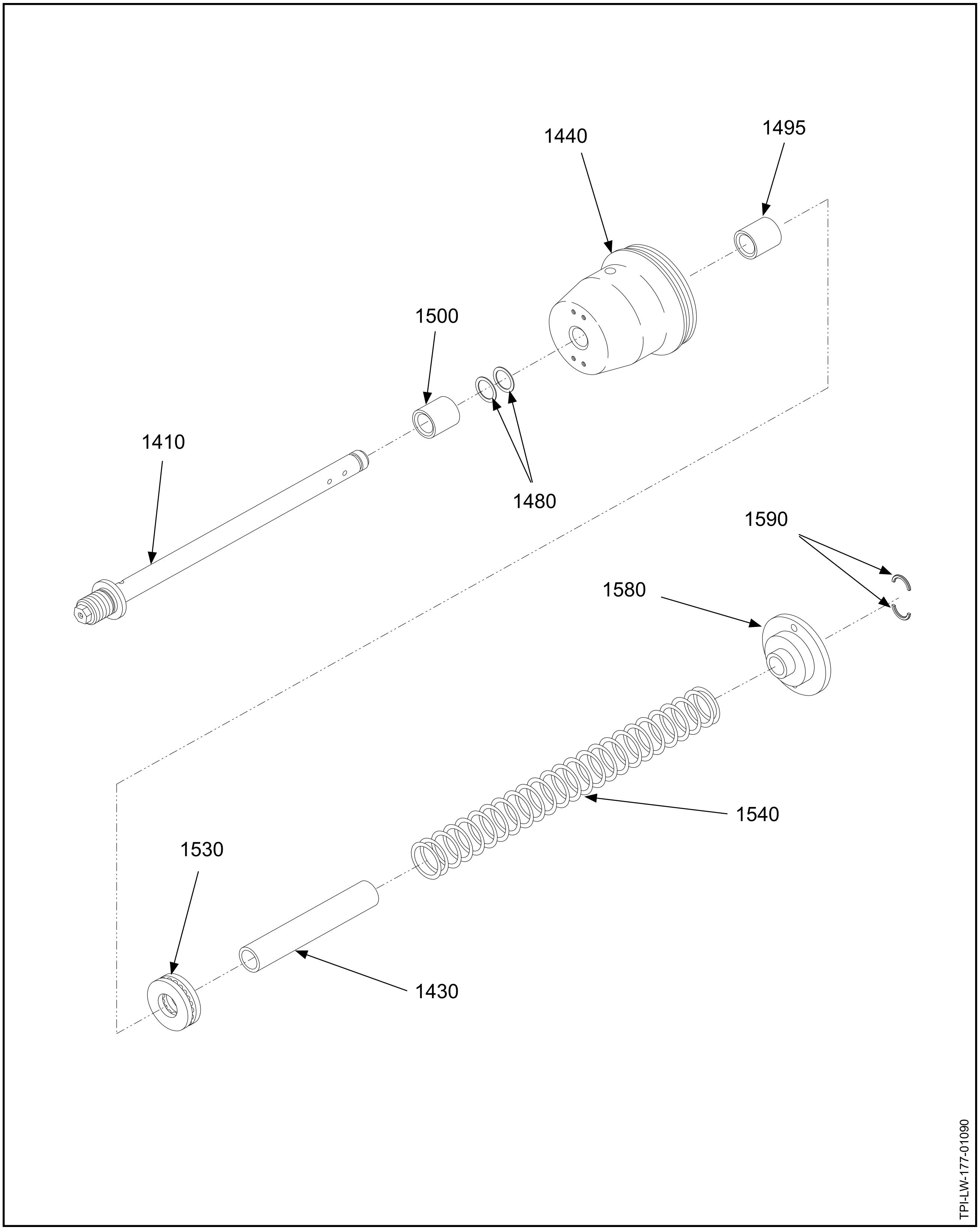
831-57 Feathering Spring Assembly
Figure 10A-24

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-24		**831-57: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-57	FEATHERING SPRING ASSEMBLY		1		
1410	B-3332	• PCP: ROD, PITCH CHANGE		1		PCP
1430	A-3042A-4	• TUBE, SPACER, SPRING		1		
1440	A-1827-1	• PCP: SPRING RETAINER CUP		1		PCP
1450	A-3497	• BEARING, THRUST, BALL		1		
1480	A-3087	• PCP: SPACER, SPRING		AR	Y	PCP
1540	A-3498	• PCP: SPRING, COMPRESSION, FEATHERING		1		PCP
1580	A-3646	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-57: Feathering Spring Assembly



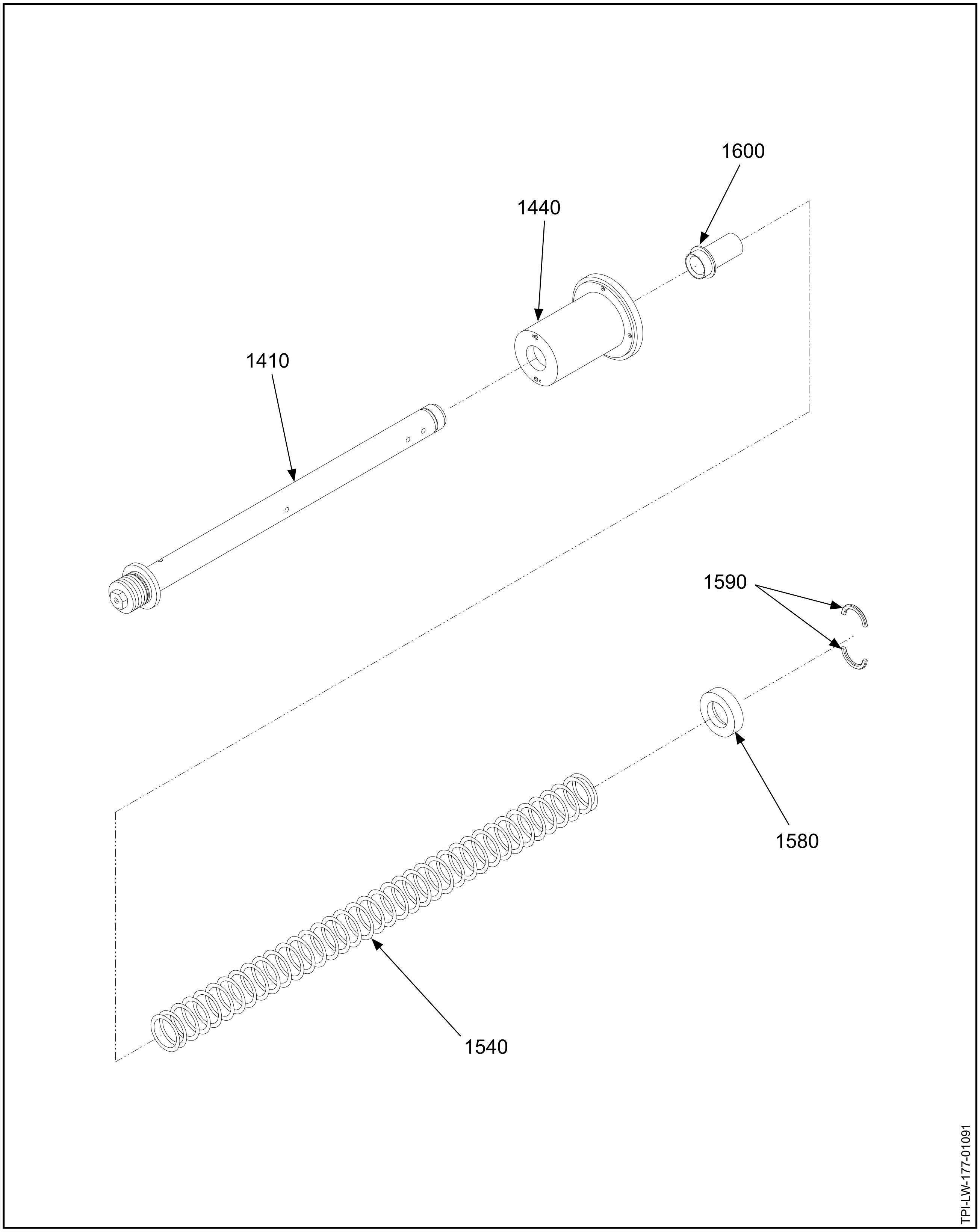
831-80 Spring Assembly
Figure 10A-25

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-25		**831-80: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-80	SPRING ASSEMBLY		RF		
1410	D-5862	• PCP: ROD, PITCH CHANGE		1		PCP
1430	A-3042A-4	• TUBE, SPACER, SPRING		1		
1440	C-2858	• SPRING RETAINER CUP		1		
1480	A-3087	• PCP: SPACER, SPRING (OPTIONAL)		AR	Y	PCP
1495	A-3042A-3	• TUBE, SPACER, SPRING		1		
1500	B-5841	• SPACER		1		
1530	A-3497	• BEARING, THRUST, BALL		1		
1540	A-3496	• PCP: SPRING, COMPRESSION, FEATHERING REPLACED BY ITEM 1540A		1		PCP
1540A	102877	• PCP: SPRING, COMPRESSION, FEATHERING REPLACES ITEM 1540		1		PCP
1580	A-4008-1	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-80: Feathering Spring Assembly



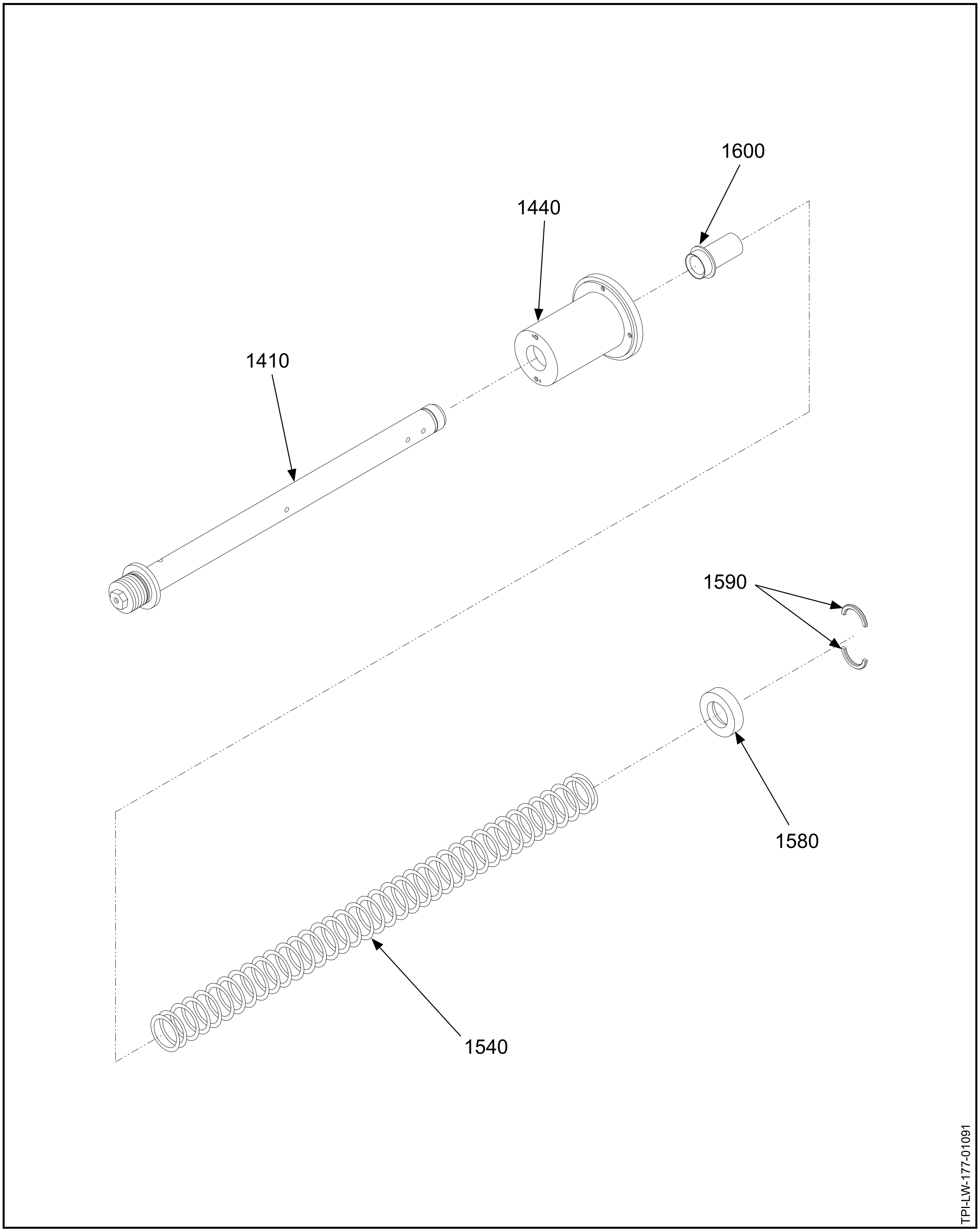
831-81 Feathering Spring Assembly
Figure 10A-26

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-26		**831-81: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-81	FEATHERING SPRING ASSEMBLY		RF		
1410	D-5862-2	• PCP: ROD, PITCH CHANGE		1		PCP
1440	B-1364	• SPRING RETAINER CUP		1		
1540	B-1363-1	• PCP: SPRING, COMPRESSION, FEATHERING		1		PCP
1580	A-866	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP
1600	A-1365	• BUSHING, GUIDE, ROD		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-81: Feathering Spring Assembly



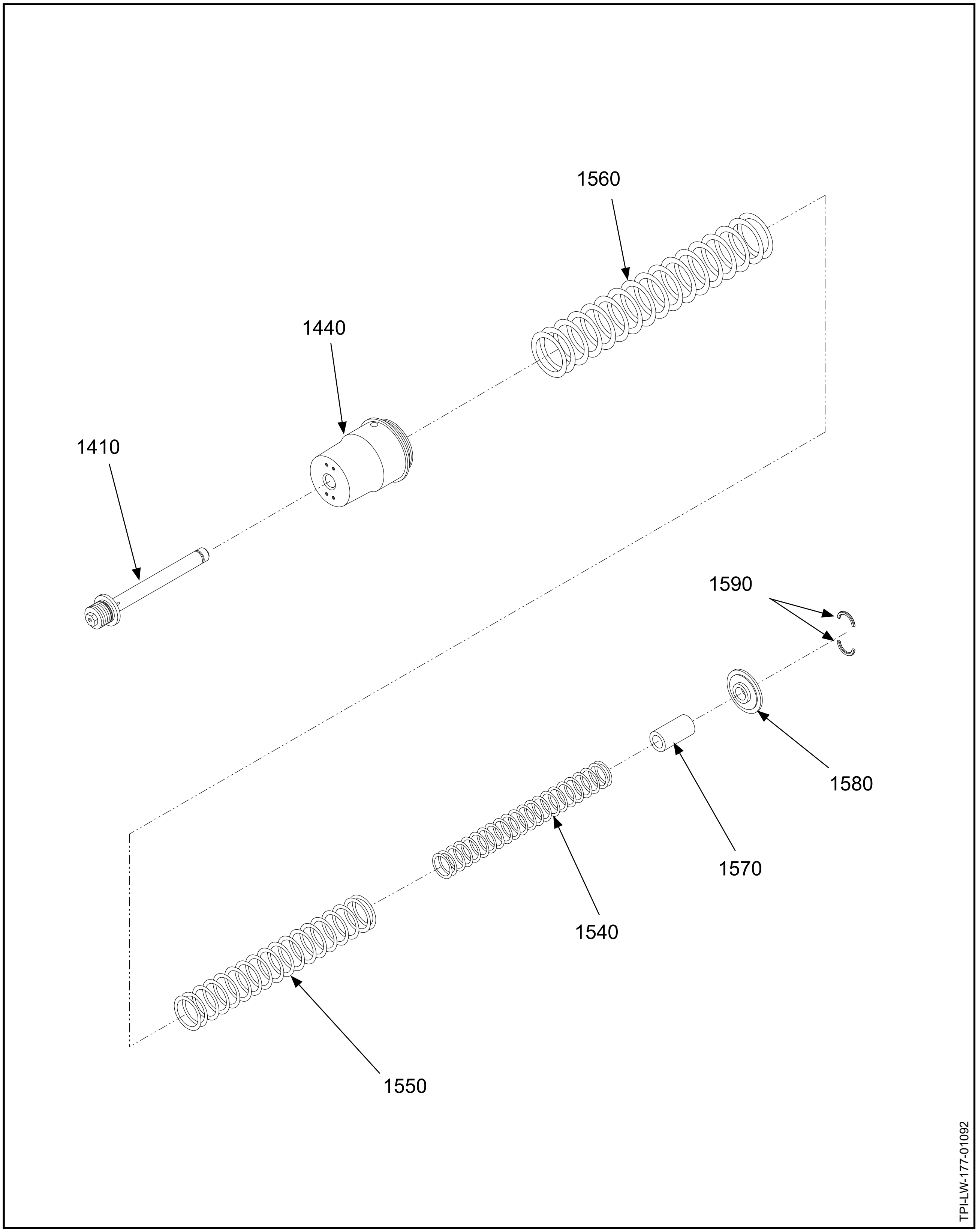
831-86 Feathering Spring Assembly
Figure 10A-27

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-27		**831-86: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-86	FEATHERING SPRING ASSEMBLY		RF		
1410	D-5862-2	• PCP: ROD, PITCH CHANGE		1		PCP
1440	B-1364	• SPRING RETAINER CUP		1		
1540	B-1363	• PCP: SPRING, COMPRESSION, FEATHERING		1		PCP
1580	A-866	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP
1600	A-1365	• BUSHING, GUIDE, ROD		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-86: Feathering Spring Assembly



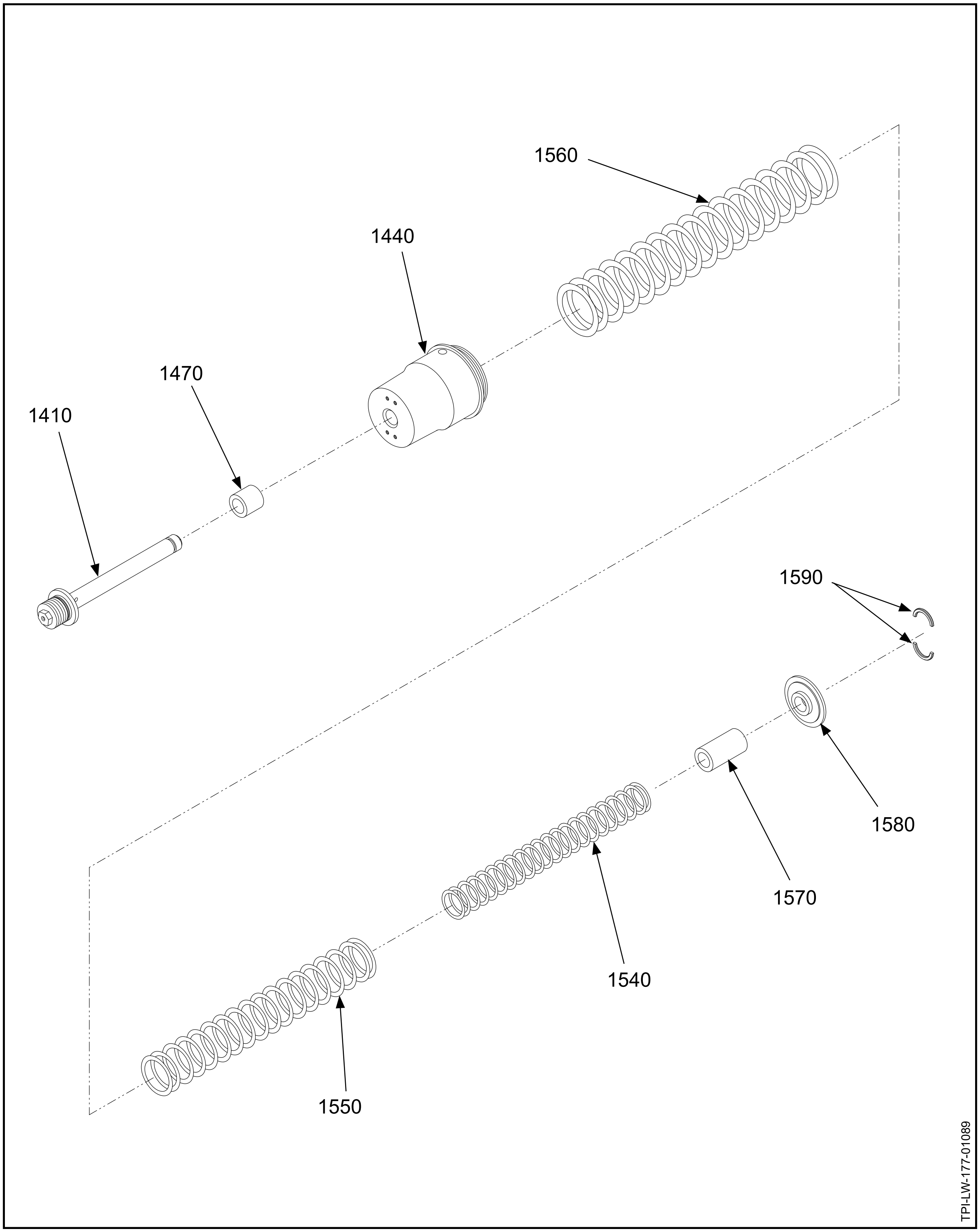
831-87 Feathering Spring Assembly
Figure 10A-28

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-28		**831-87: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-87	FEATHERING SPRING ASSEMBLY		RF		
1410	D-5862-2	• PCP: ROD, PITCH CHANGE		1		PCP
1440	B-666	• PCP: SPRING RETAINER CUP		1		PCP
1540	B-1824	• PCP: SPRING, COMPRESSION, FEATHERING (INNER)		1		PCP
1550	B-1825	• PCP: SPRING, COMPRESSION, FEATHERING (CENTER)		1		PCP
1560	B-1826	• PCP: SPRING, COMPRESSION, FEATHERING (OUTER)		1		PCP
1570	A-1849	• PCP: SLEEVE, SPACER		1	Y	PCP
1580	A-1829	• PCP: SPRING RETAINER, REAR		1		PCP
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-87: Feathering Spring Assembly



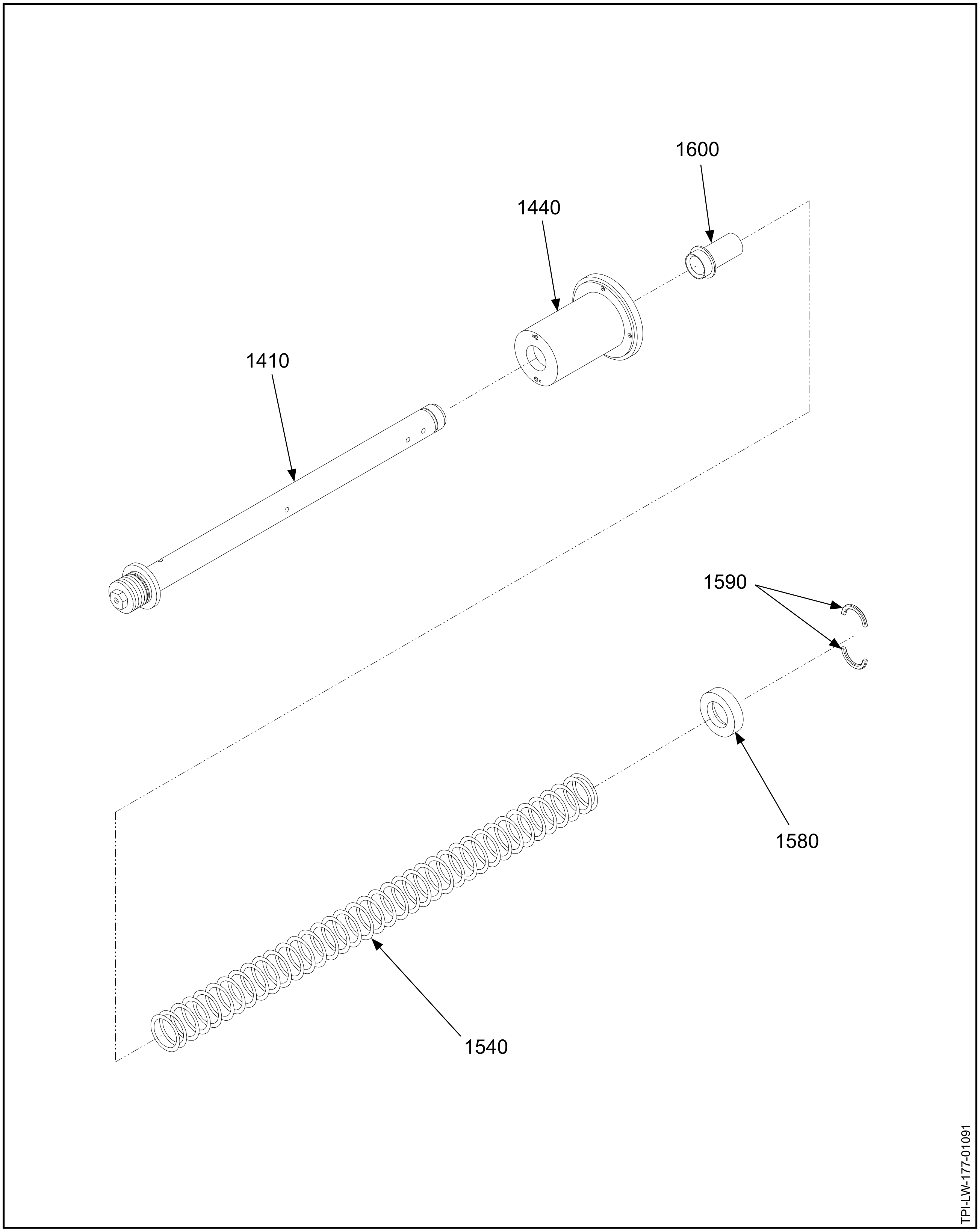
831-87B Feathering Spring Assembly
Figure 10A-29

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-29		**831-87B: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-87B	FEATHERING SPRING ASSEMBLY		RF		
1410	D-5862-2	• PCP: ROD, PITCH CHANGE		1		PCP
1470	A-1869	• SPACER, SPRING		1		
1440	B-666	• PCP: SPRING RETAINER CUP		1		PCP
1540	B-1824	• PCP: SPRING, COMP, FEATHERING (INNER)		1		PCP
1550	B-1825	• PCP: SPRING, COMP, FEATHERING (CENTER)		1		PCP
1560	B-1826	• PCP: SPRING, COMP, FEATHERING (OUTER)		1		PCP
1570	A-1849	• PCP: SLEEVE, SPACER		1	Y	PCP
1580	A-1829	• PCP: SPRING RETAINER, REAR		1		PCP
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-87B: Feathering Spring Assembly



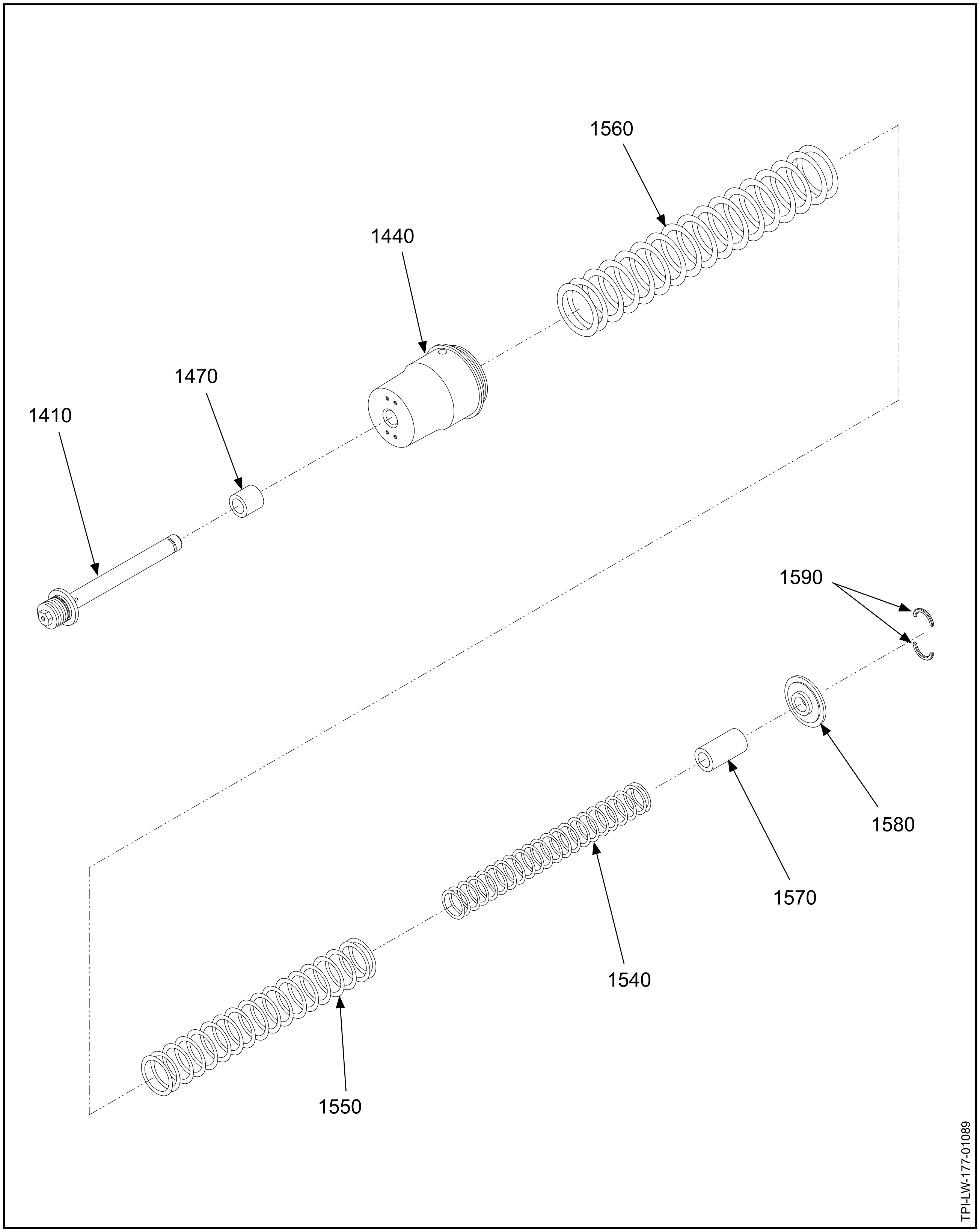
831-88 Feathering Spring Assembly
Figure 10A-30

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-30		**831-88: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-88	FEATHERING SPRING ASSEMBLY		1		
1410	D-5862-4	• PCP: ROD, PITCH CHANGE		1		PCP
1440	B-1364	• SPRING RETAINER CUP		1		
1540	B-1363-2	• PCP: SPRING, COMP, FEATHERING		1		PCP
1580	A-866-3	• SPRING RETAINER, REAR		1		
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP
1600	A-1365	• BUSHING, GUIDE, ROD		1		

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-88: Feathering Spring Assembly



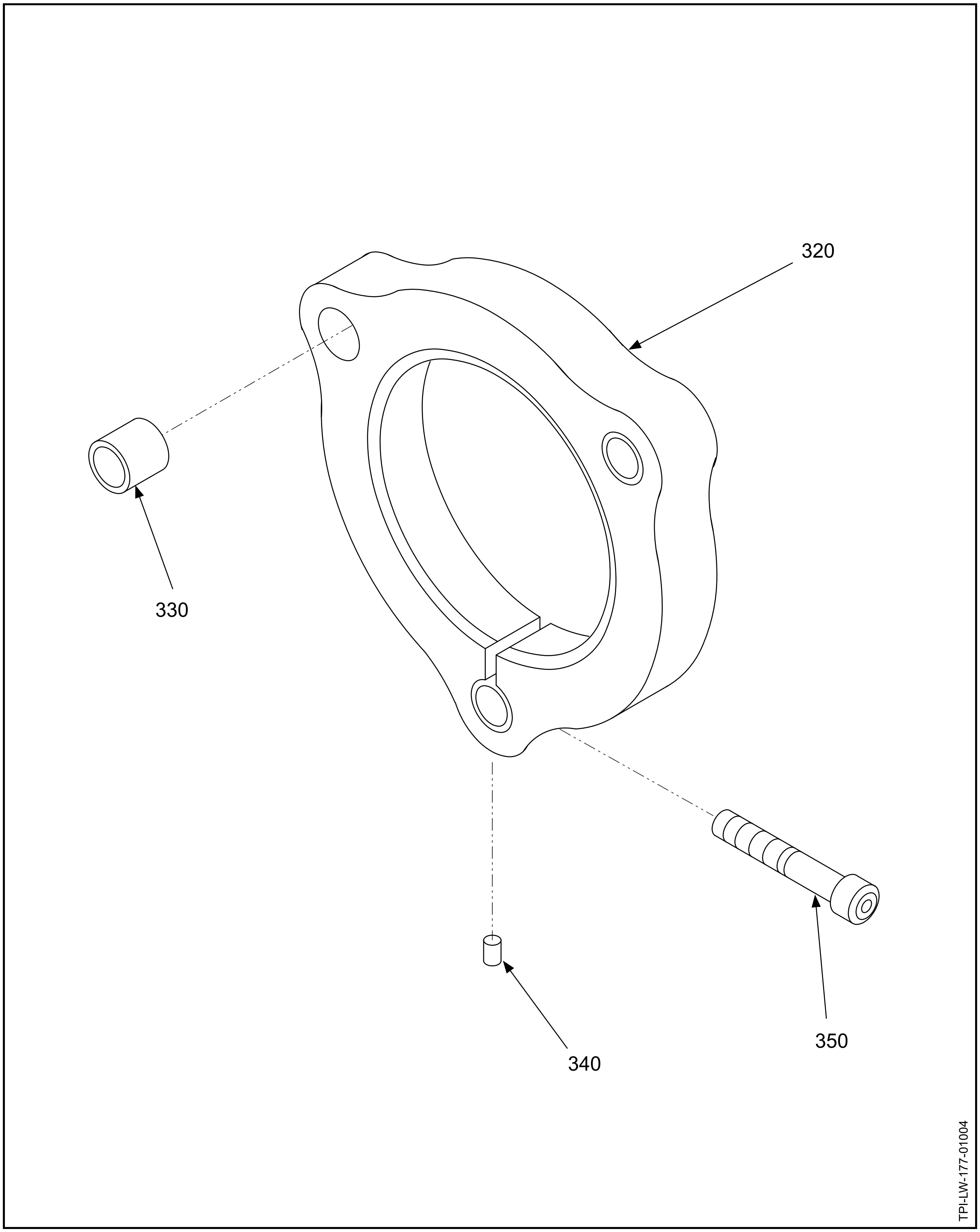
831-90 Feathering Spring Assembly
Figure 10A-31

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-31		**831-90: FEATHERING SPRING ASSEMBLY PARTS**				
-1400	831-90	FEATHERING SPRING ASSEMBLY		1		
1410	D-5862-2	• PCP: ROD, PITCH CHANGE		1		PCP
1440	B-666	• PCP: SPRING RETAINER CUP		1		PCP
1470	A-2420-39	• COLLAR, STOP		1		
1540	B-1824	• PCP: SPRING, COMP, FEATHERING (INNER)		1		PCP
1550	B-1825	• PCP: SPRING, COMP, FEATHERING (CENTER)		1		PCP
1560	B-1826	• PCP: SPRING, COMP, FEATHERING (OUTER)		1		PCP
1570	A-1849	• PCP: SLEEVE, SPACER		1	Y	PCP
1580	A-1829	• PCP: SPRING RETAINER, REAR		1		PCP
1590	A-867	• PCP: KEEPER, SPLIT		1	Y	PCP

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

831-90: Feathering Spring Assembly



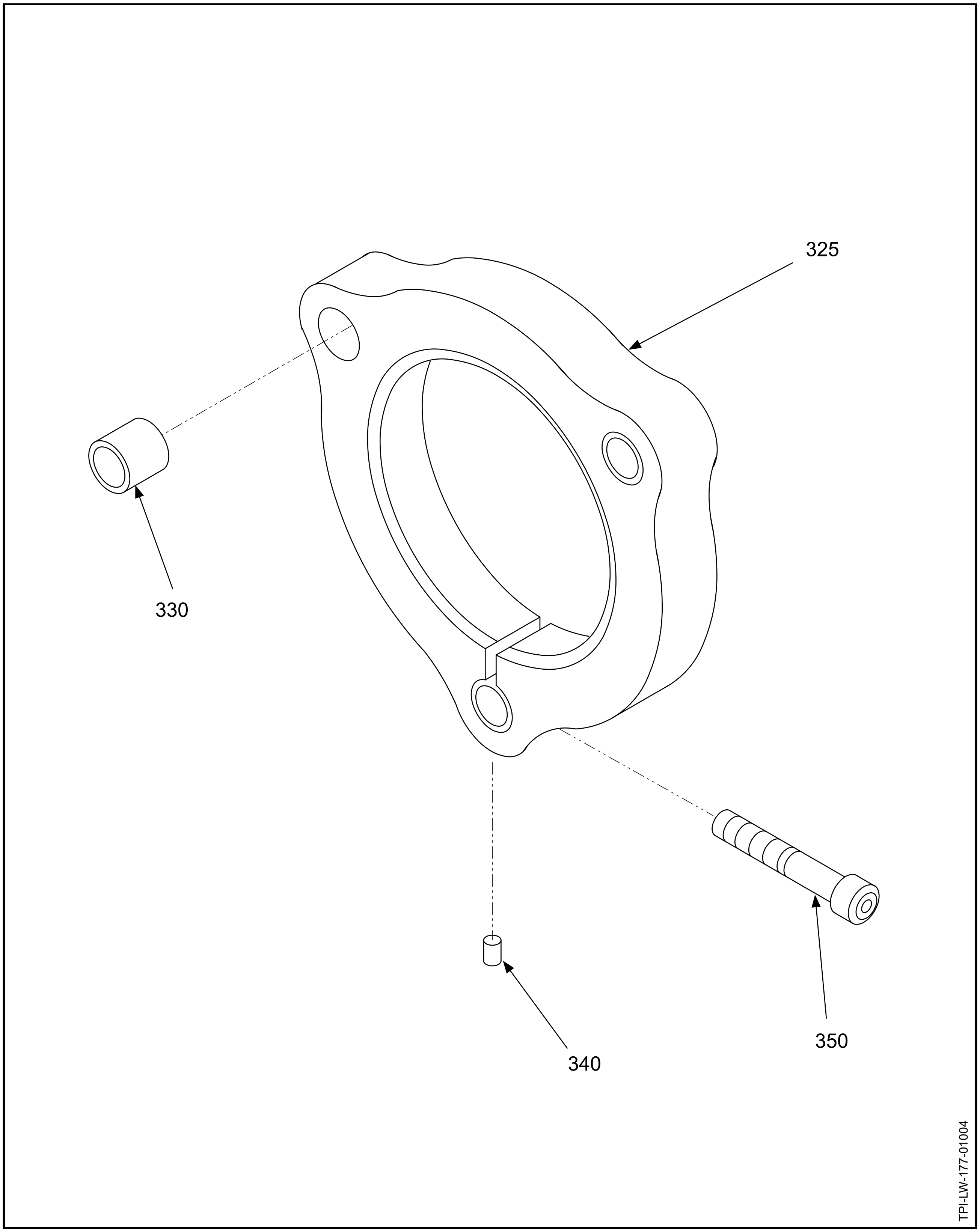
834-1: Guide Collar Unit
Figure 10A-32

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-32		**834-1: GUIDE COLLAR UNIT PARTS**				
-320	834-1	GUIDE COLLAR UNIT		1		
330	A-116-D-1	• PLASTIC BUSHING		3		
340	A-114-C	• DOWEL PIN		1		
350	A-2038-12	• SCREW, 1/4-28, CAP		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

834-1: Guide Collar Unit



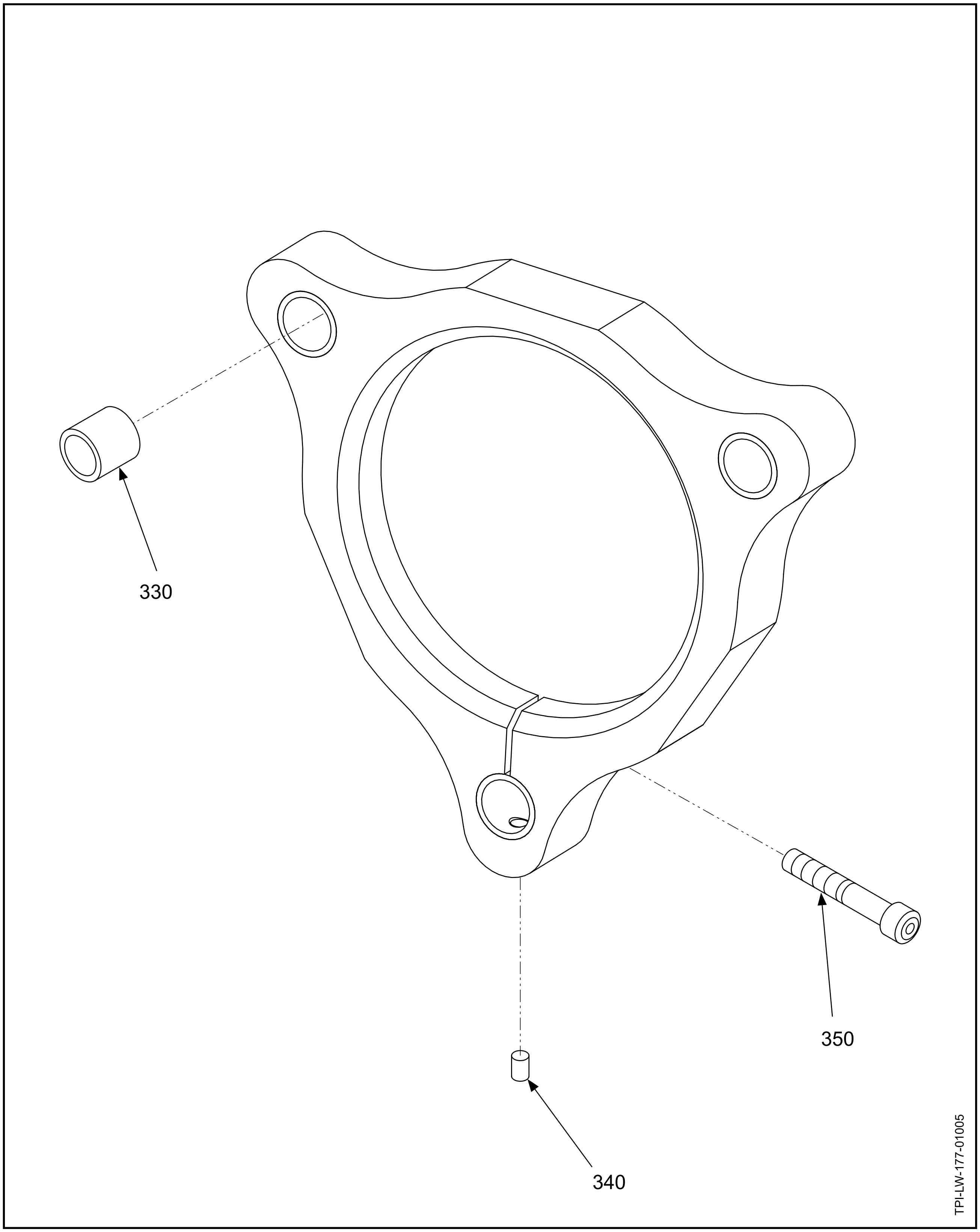
834-6: Guide Collar Unit
Figure 10A-33

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-33		**834-6: GUIDE COLLAR UNIT PARTS**				
-320	834-6	GUIDE COLLAR UNIT		1		
325	B-1836-4	• GUIDE COLLAR		1		
330	A-116-D1	• GUIDE COLLAR BUSHING		3		
340	A-114-1	• DOWEL PIN (GUIDE COLLAR)		1		
350	A-2038-14	• SCREW, 1/4-28, CAP		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

834-6: Guide Collar Unit



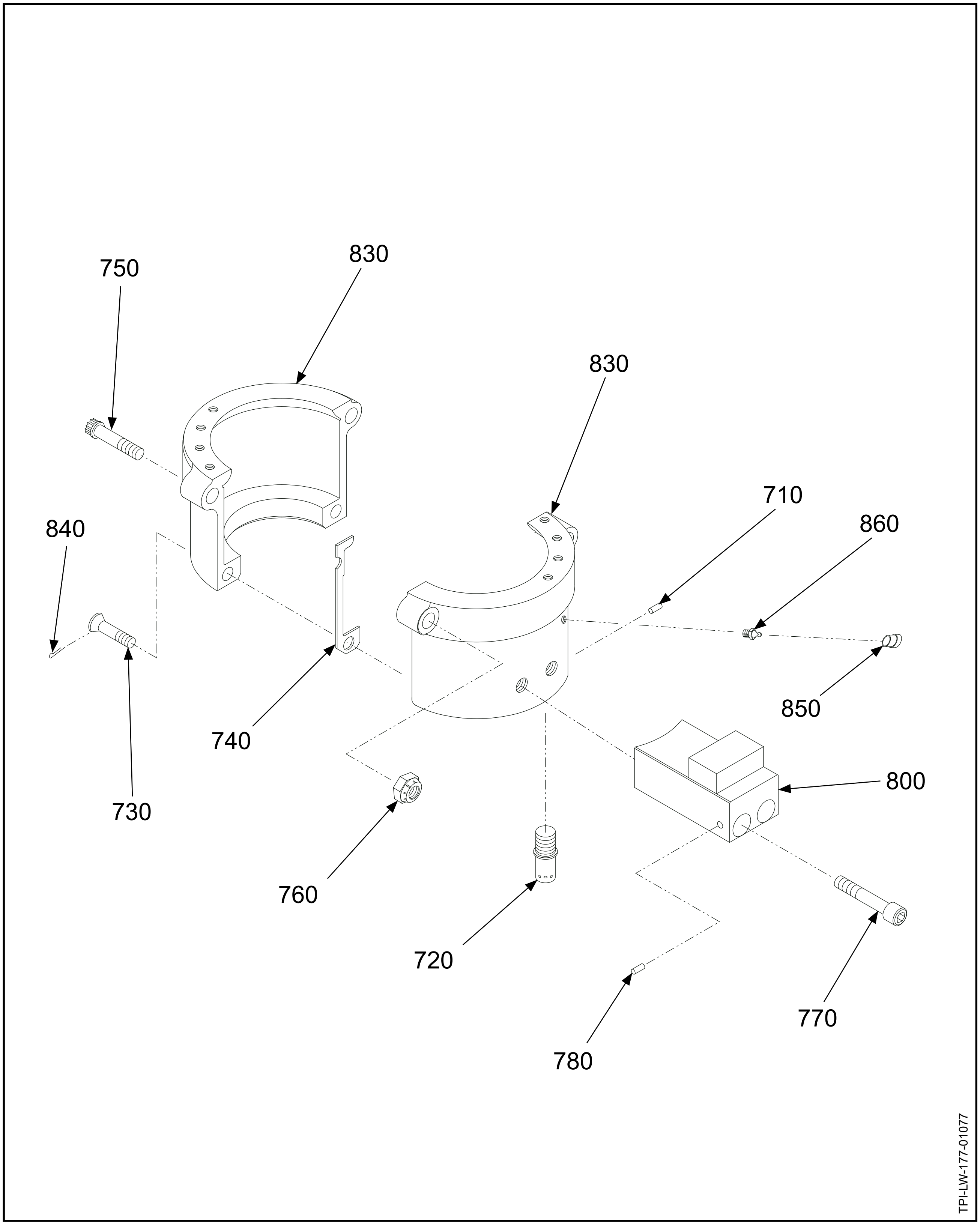
834-7(A,B,C): Guide Collar Unit
Figure 10A-34

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-34		**834-7(A,B,C): GUIDE COLLAR UNIT PARTS**				
-320	834-7(A,B,C)	GUIDE COLLAR UNIT		1		
330	A-116-D1	• PLASTIC BUSHING		3		
340	A-114-2	• DOWEL PIN		1		
350	A-2038-14	• SCREW, 1/4-28, CAP		1	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

834-7(A,B,C): Guide Collar Unit



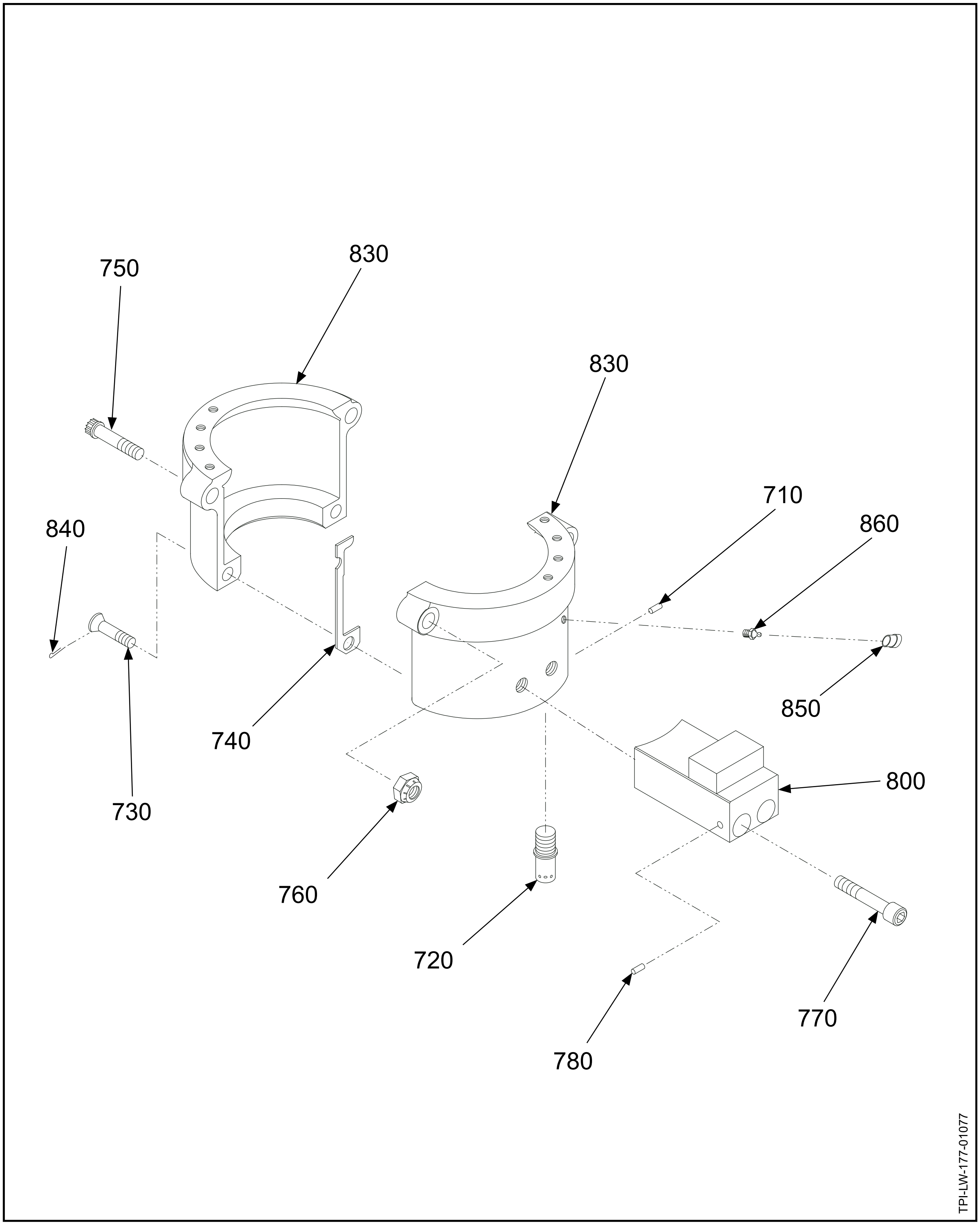
838-16 Clamp Assembly
Figure 10A-35

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-35		**838-16: CLAMP ASSEMBLY PARTS**				
-700	838-16	PCP: CLAMP ASSEMBLY		1		PCP
710	A-285	• SPRING PIN, 3/32" CRES.		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-30	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-30	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	833-16	• COUNTERWEIGHT UNIT		1		
-820	A-65	• DELETED				
830	C-1301S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-16: Clamp Assembly



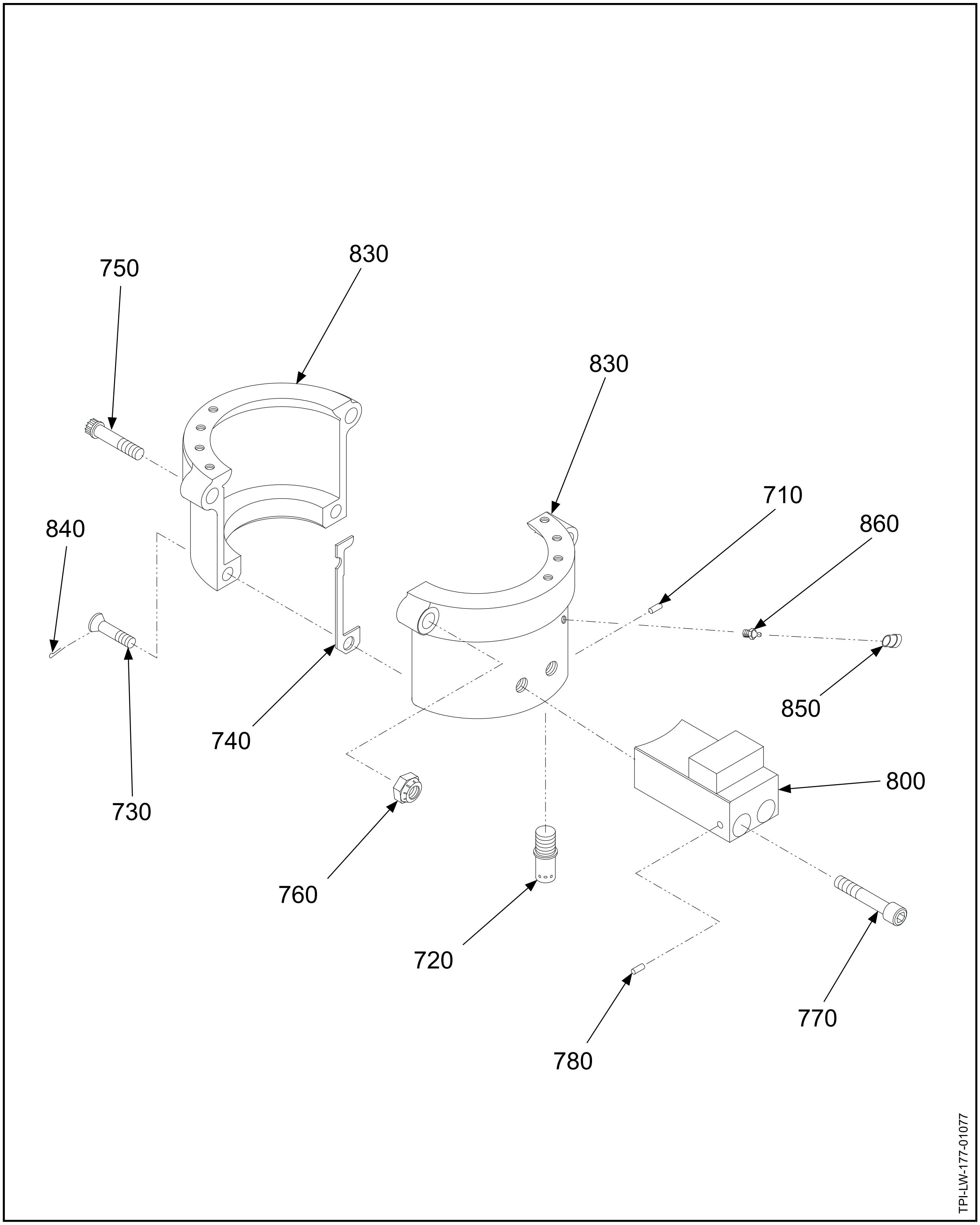
838-17 Clamp Assembly
Figure 10A-36

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-36		**838-17: CLAMP ASSEMBLY PARTS**				
-700	838-17	PCP: CLAMP ASSEMBLY		1		PCP
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	833-16	• PCP: COUNTERWEIGHT UNIT		1		
-820	A-65	• DELETED				
830	C-1301S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-17: Clamp Assembly



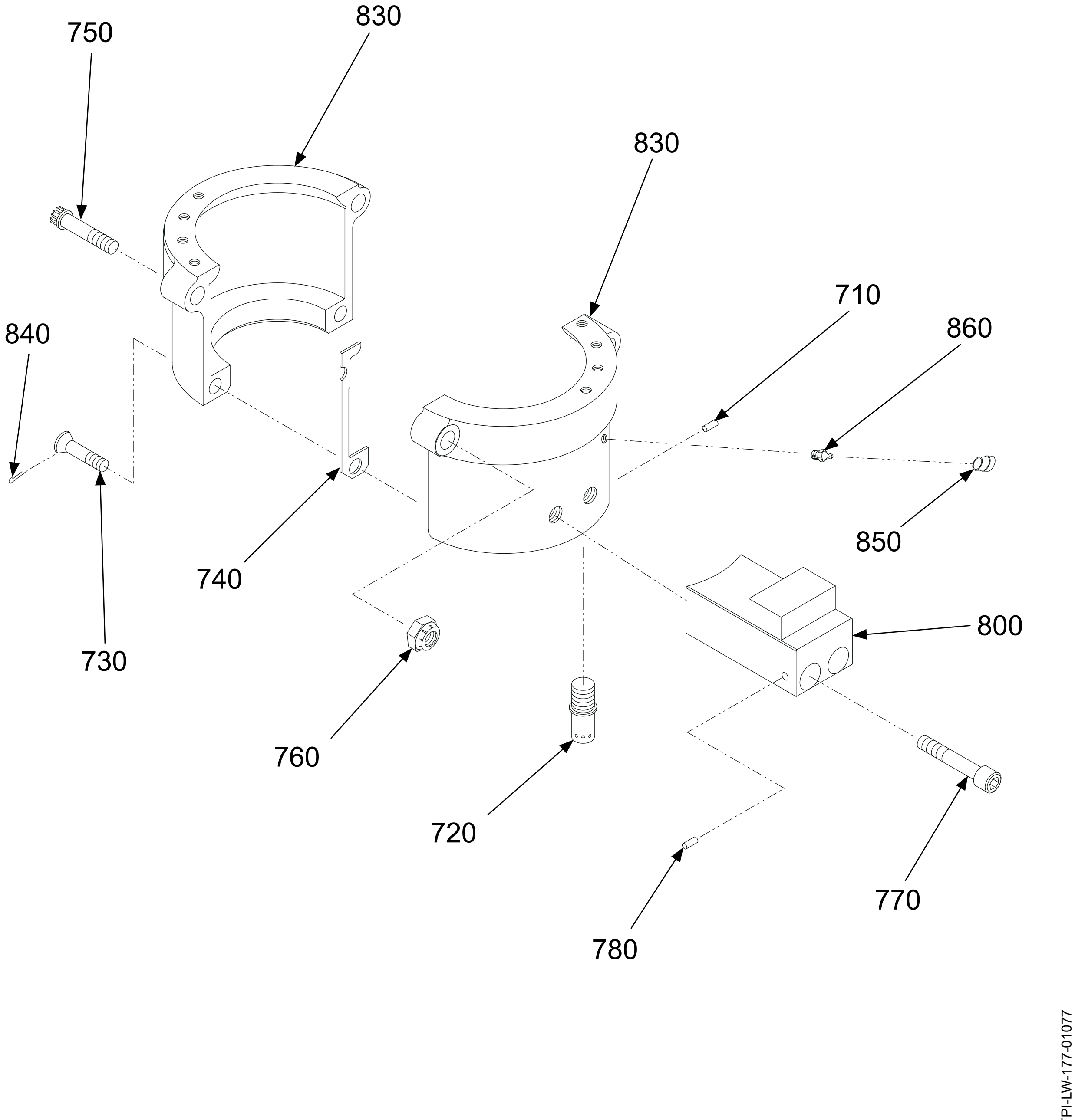
838-17E Clamp Assembly
Figure 10A-37

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-37		**838-17E: CLAMP ASSEMBLY PARTS**				
-700	838-17E	PCP: CLAMP ASSEMBLY		1		PCP
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-17E	• PCP: CLAMP UNIT		1		PCP
710	A-285	• • SPRING PIN, 3/32" CRES.		1	Y	
720	A-304	• • LINKSCREW, 1/2-20		1	Y	
770	A-2036-32	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• • SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• • COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
860	B-6588-1	• • FITTING LUBRICATION		2	Y	
800	833-16E	• • PCP: COUNTERWEIGHT UNIT		1		PCP
830	C-1301S	• • PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
-820	A-65	• DELETED				
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-17E: Clamp Assembly



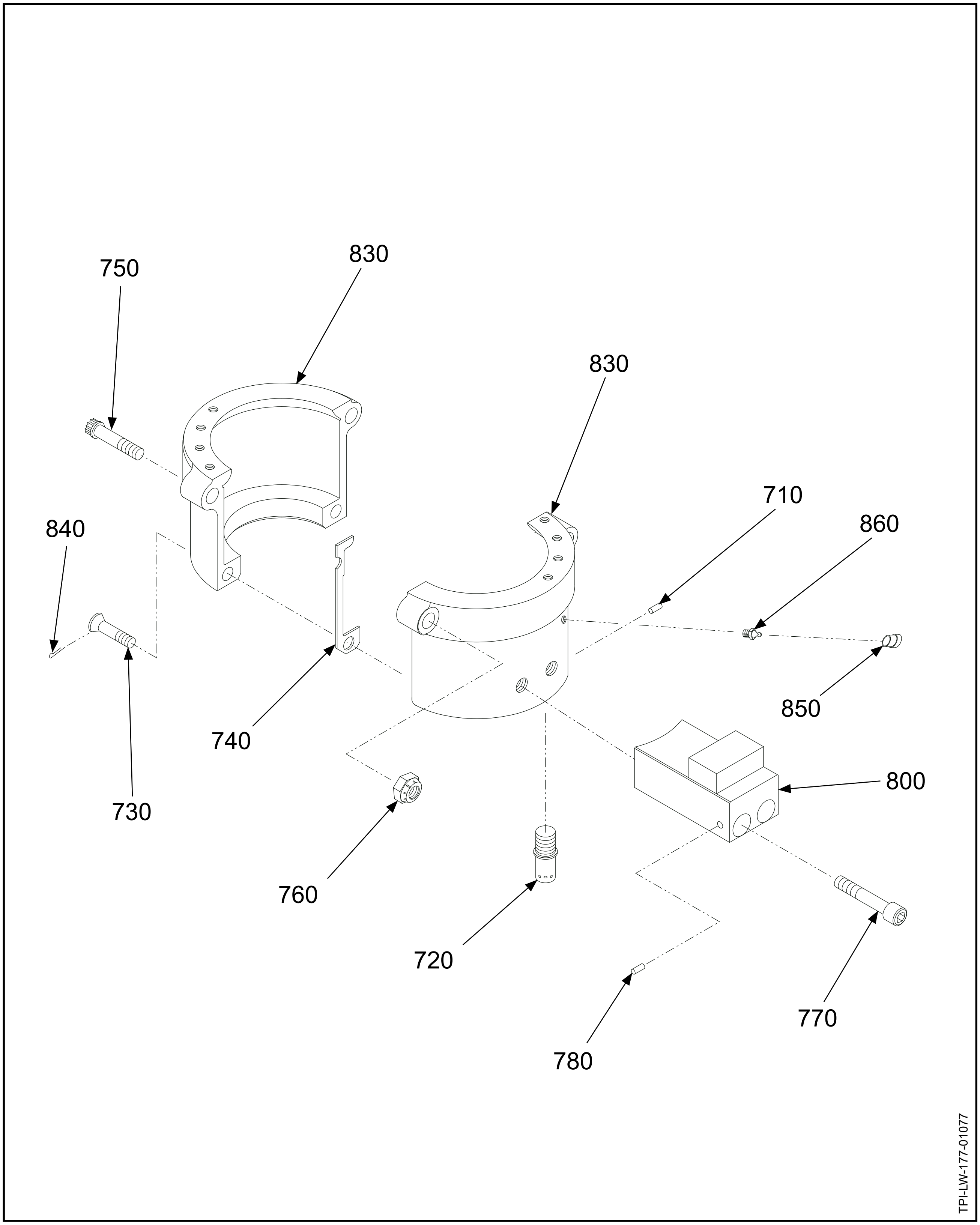
838-28 Clamp Assembly
Figure 10A-38

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-38		**838-28: CLAMP ASSEMBLY PARTS**				
-700	838-28	PCP: CLAMP ASSEMBLY		3		PCP
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
800	833-14	• PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• DELETED				
830	C-1301S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-28: Clamp Assembly



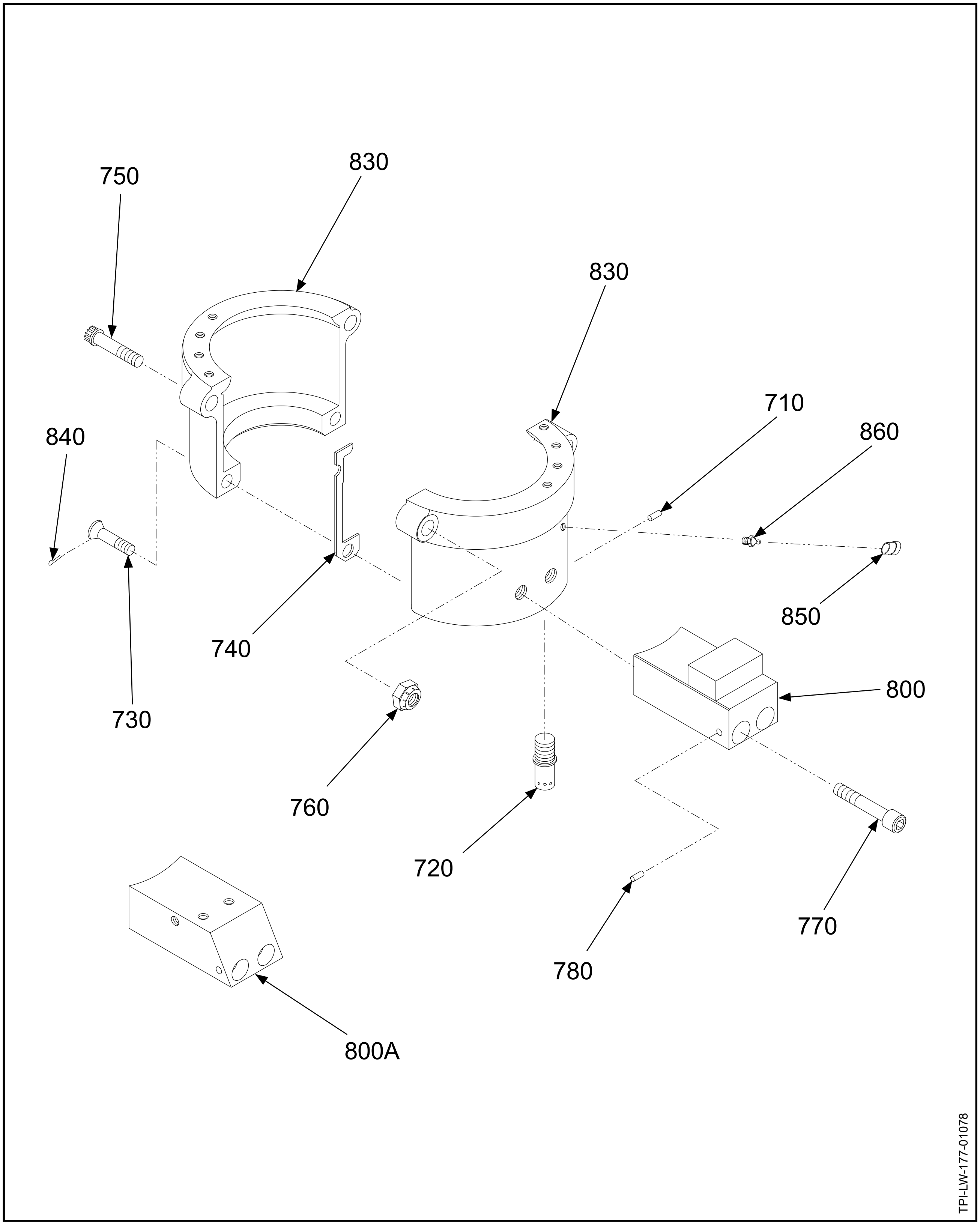
838-42 Clamp Assembly
Figure 10A-39

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-39		**838-42: CLAMP ASSEMBLY PARTS**				
-700	838-42	PCP: CLAMP ASSEMBLY		3		PCP
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-42	• PCP: CLAMP UNIT		1		PCP
770	A-2036-32	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• • SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
710	A-285	• • SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-295	• • LINKSCREW		1	Y	
860	B-6588-1	• • FITTING, LUBRICATION		2	Y	
800	833-16R	• • PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• DELETED				
830	C-1301-1S	• • PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
830A	C-1301-9S	• • PCP: CLAMP, BLADE, T,W,Z SHANK, ALTERNATE FOR ITEM 830		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-42: Clamp Assembly



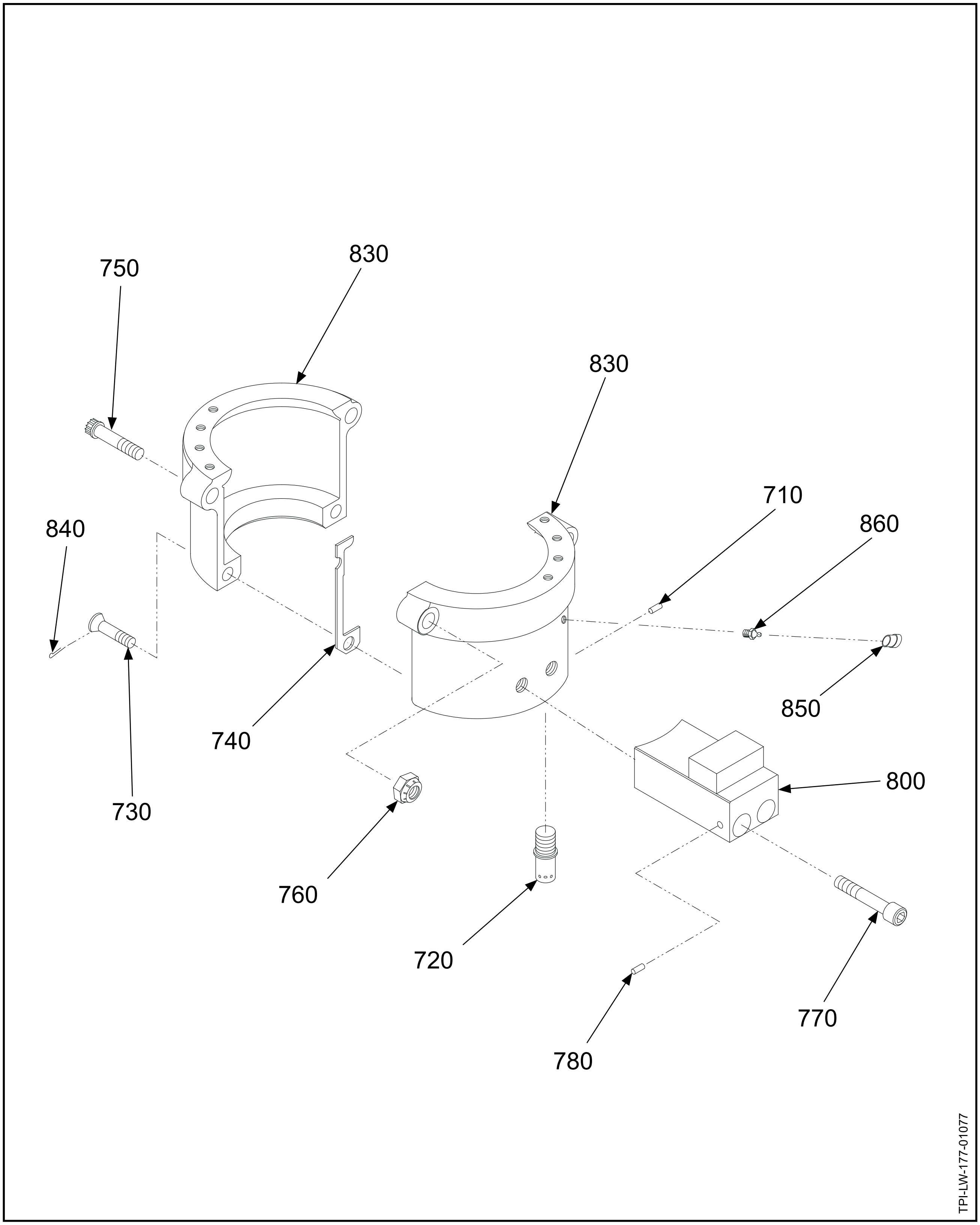
838-50 Clamp Assembly
Figure 10A-40

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-40		**838-50: CLAMP ASSEMBLY PARTS**				
-700	838-50	CLAMP ASSEMBLY		3		
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-30	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-30	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	B-1311	• COUNTERWEIGHT UNIT		1		
-820	A-65	• DELETED				
830	C-1301	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-50: Clamp Assembly



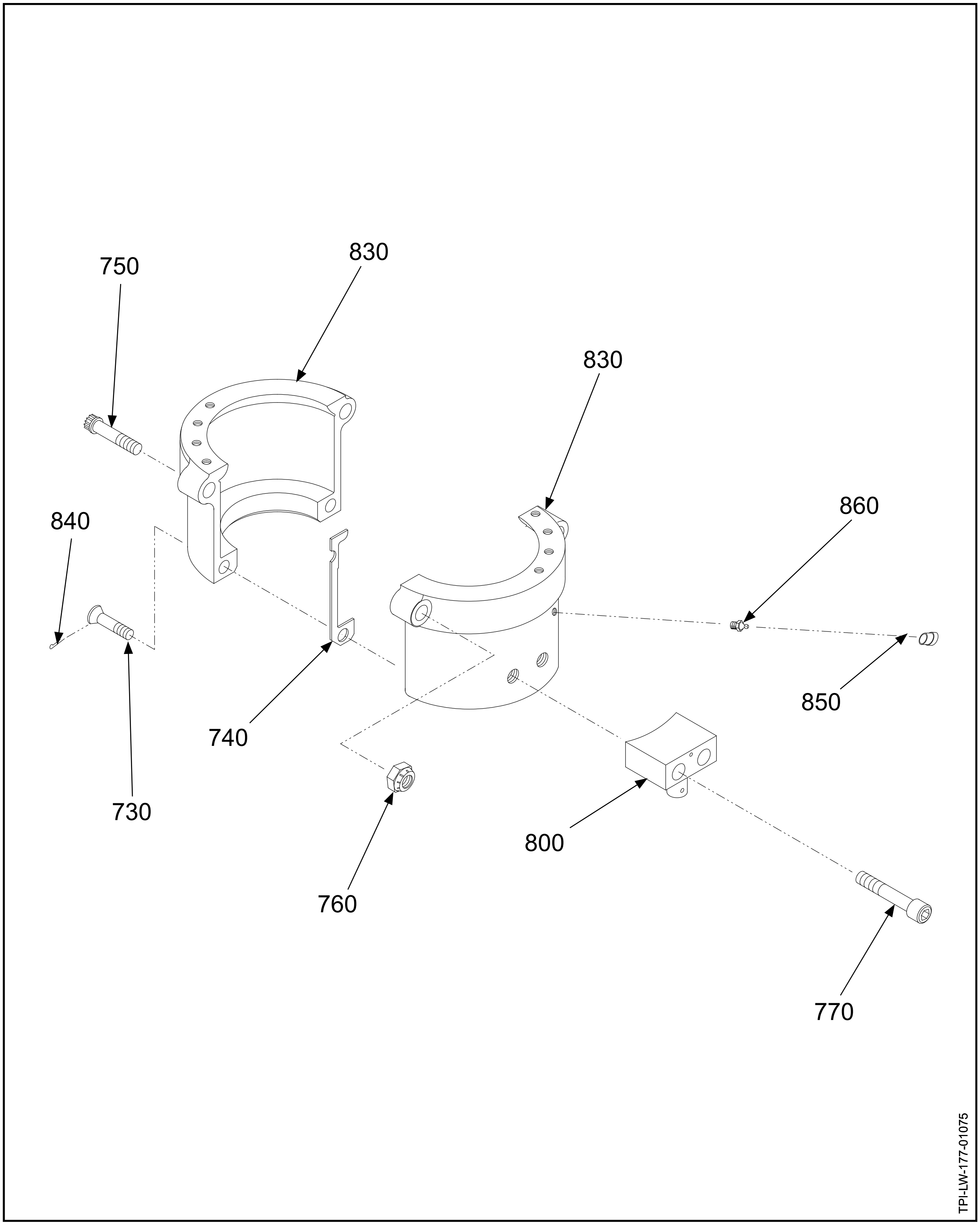
838-57 Clamp Assembly
Figure 10A-41

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-41		**838-57: CLAMP ASSEMBLY PARTS**				
-700	838-57	PCP: CLAMP ASSEMBLY		3		PCP
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	833-16E	• PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• DELETED				
830	C-1301-3S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-3	• PIN, COTTER (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-57: Clamp Assembly



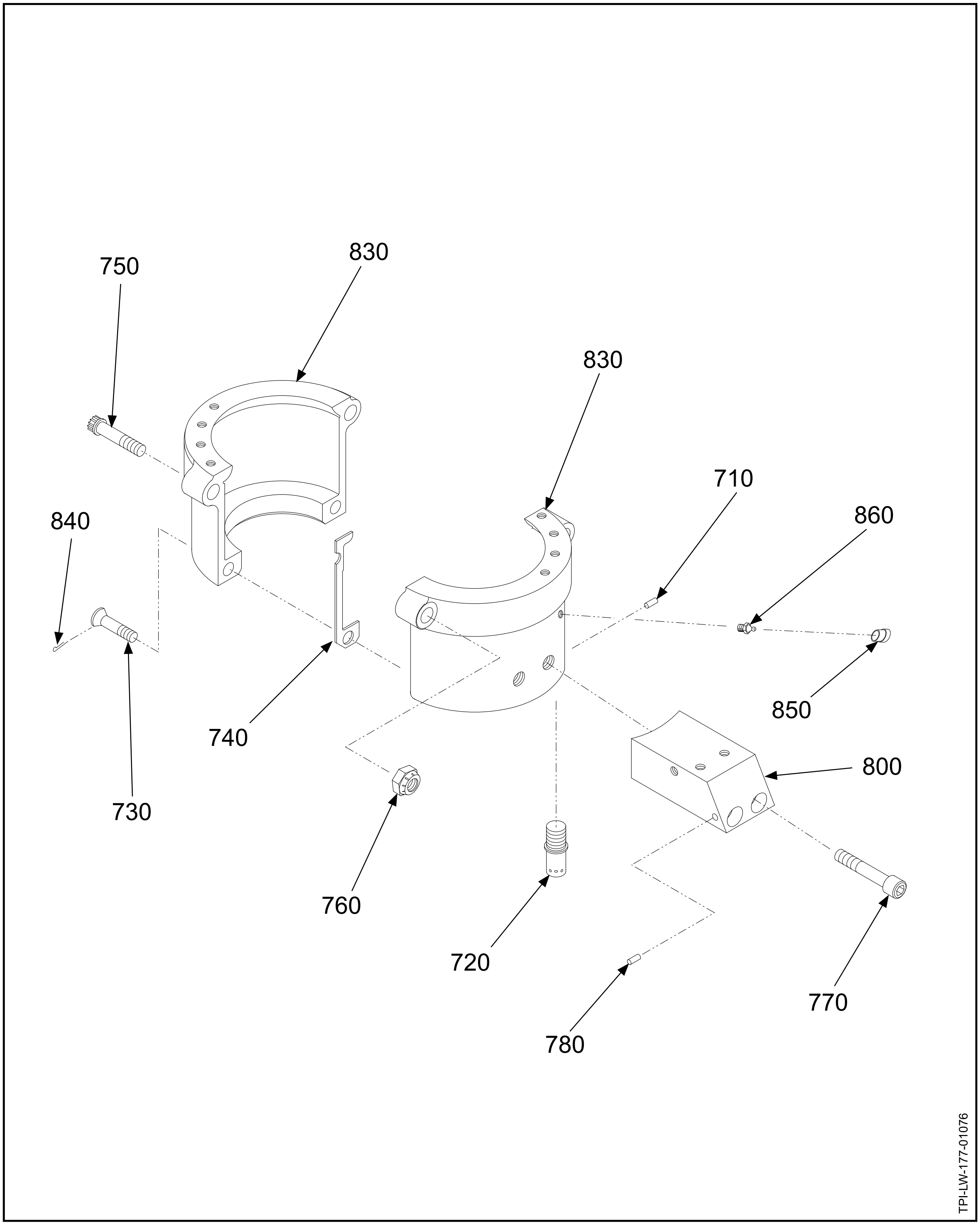
838-66 Clamp Assembly
Figure 10A-42

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-42		**838-66: CLAMP ASSEMBLY PARTS**				
-700	838-66	PCP: CLAMP ASSEMBLY		3		PCP
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-22	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-22	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
800	B-3309	• LINK PIN UNIT		1		
-810	101560	• • PIN, LINK		1		
-820	B-3842-0750	• • SPRING PIN, 3/32", CRES		1	Y	
830	C-1301-8S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-66: Clamp Assembly



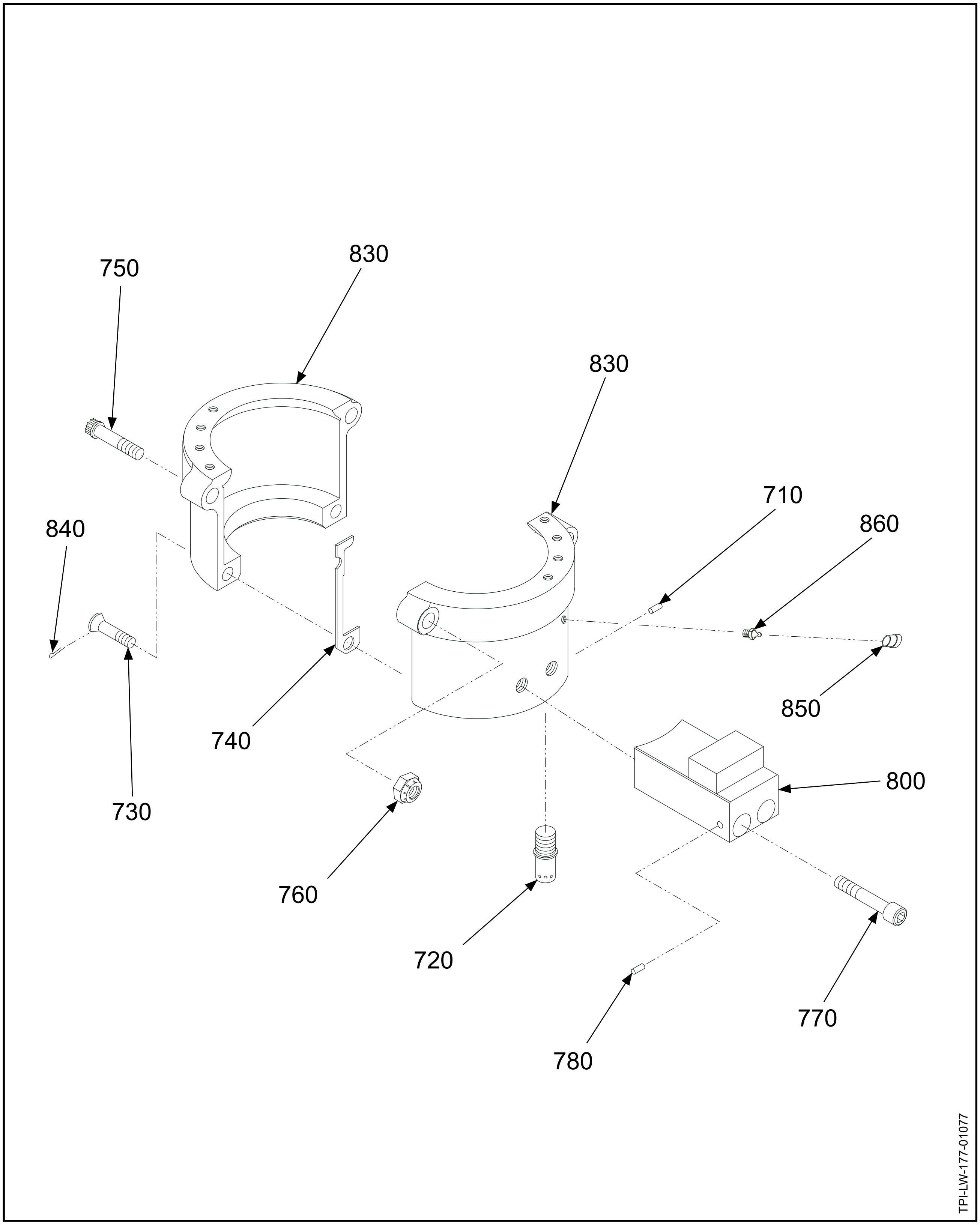
838-67 Clamp Assembly
Figure 10A-43

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-43		**838-67: CLAMP ASSEMBLY PARTS**				
-700	838-67	PCP: CLAMP ASSEMBLY		4		PCP
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1372	• BOLT, 7/16-20, 12 POINT		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-67	• PCP: CLAMP UNIT		1		PCP
720	A-304	• • LINKSCREW, 1/2-20		1	Y	
770	A-2036-22	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-22	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• • SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
800	B-3007	• • PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• • DELETED				
830	C-1301-9S	• • PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
860	B-6588-1	• • FITTING, LUBRICATION		2	Y	
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-67: Clamp Assembly



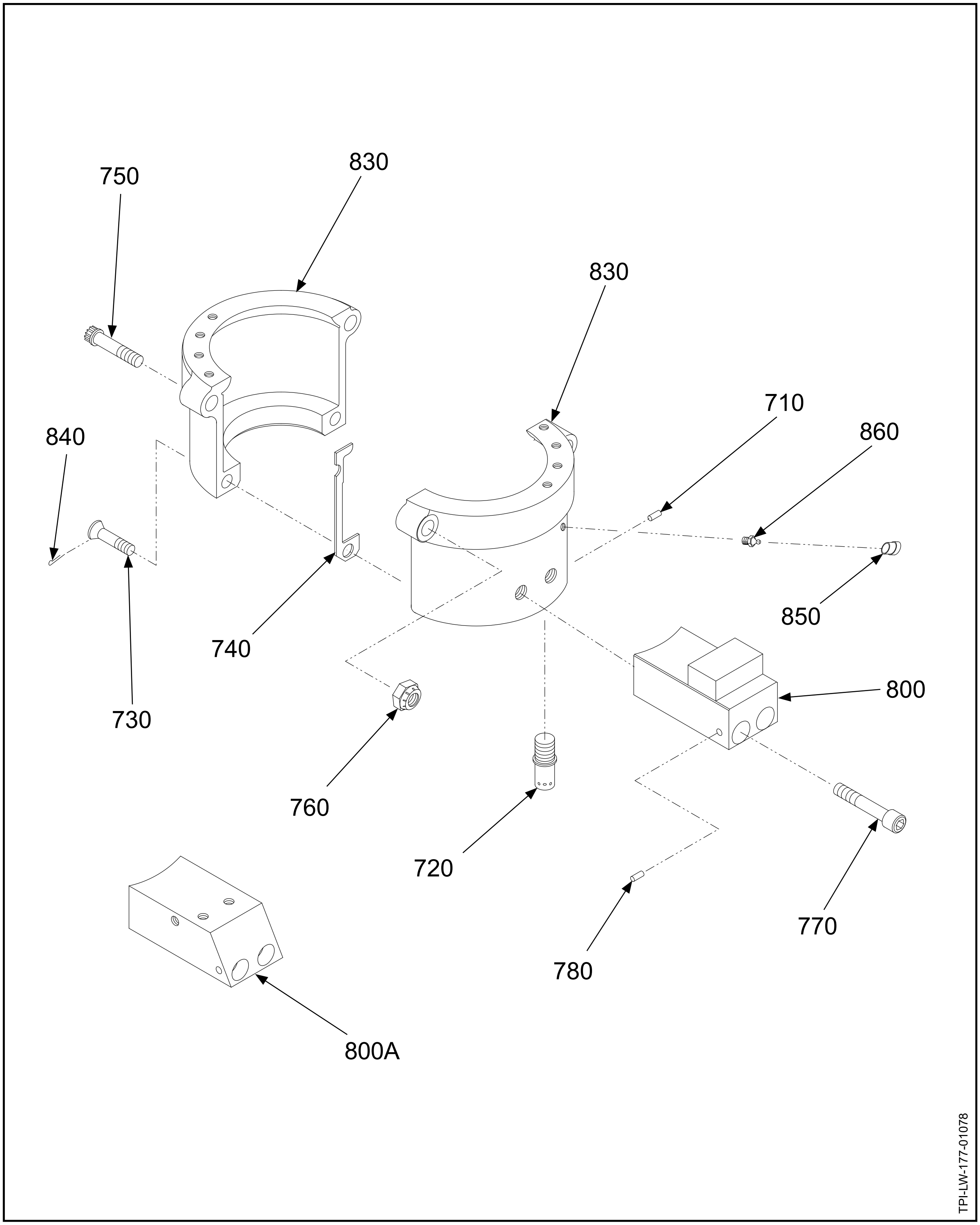
838-72 Clamp Assembly
Figure 10A-44

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-44		**838-72: CLAMP ASSEMBLY PARTS**				
-700	838-72	PCP: CLAMP ASSEMBLY		3		PCP
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306-1	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-72	• PCP: CLAMP UNIT		1		PCP
710	A-285	• • SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• • LINKSCREW, 1/2-20		1	Y	
770	A-2036-32	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• • SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
800	833-14	• • PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• • DELETED				
830	C-1977P	• • PCP: CLAMP, BLADE, M,P,R SHANK		1		PCP
860	B-6588-1	• • FITTING, LUBRICATION		2	Y	
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-72: Clamp Assembly



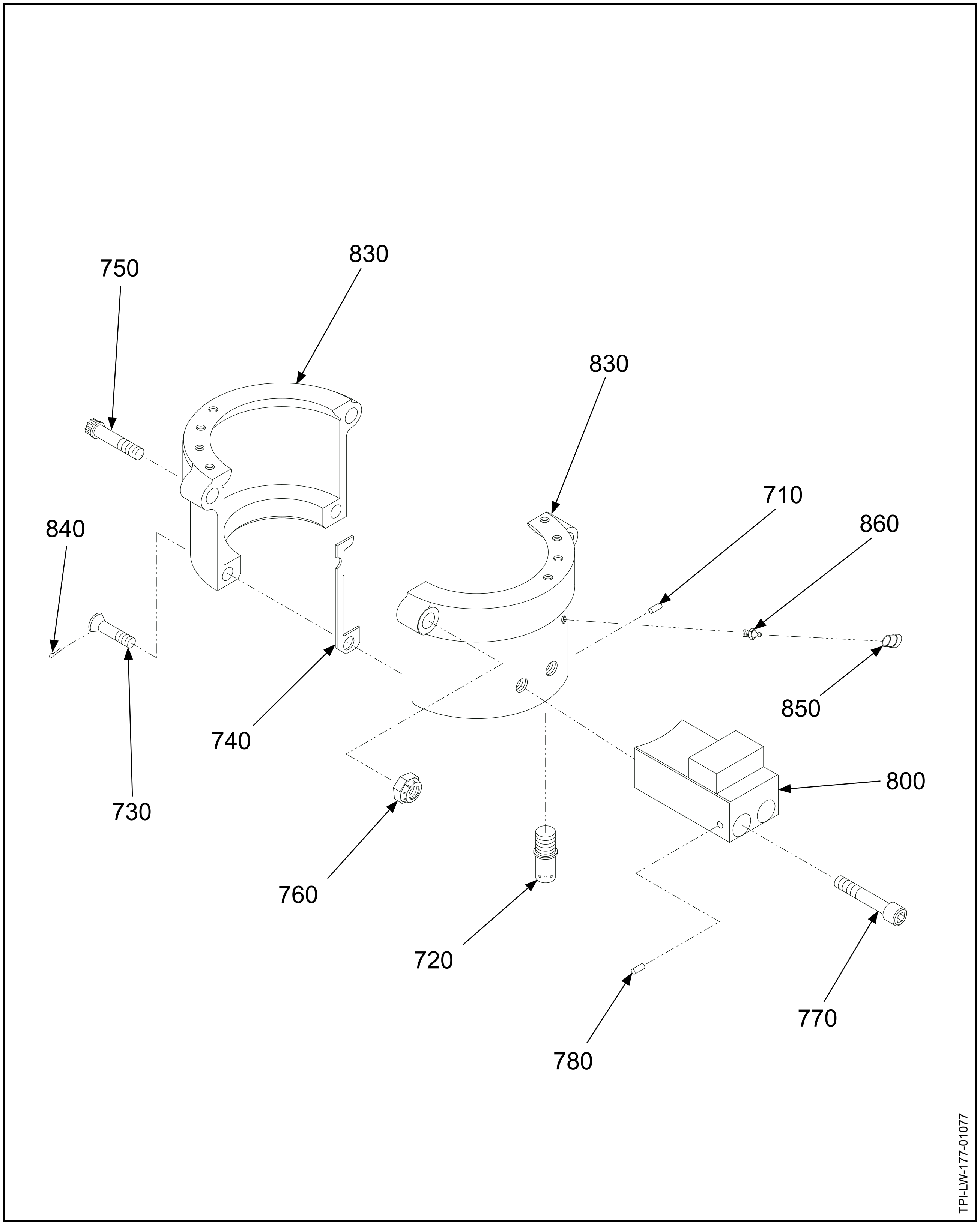
838-73 Clamp Assembly
Figure 10A-45

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-45		**838-73: CLAMP ASSEMBLY PARTS**				
-700	838-73	CLAMP ASSEMBLY		3		
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306-1	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-30	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-30	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	B-1311	• COUNTERWEIGHT UNIT		1		
-820	A-65	• DELETED				
830	C-1977P	• PCP: CLAMP, BLADE, M,P,R SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-73: Clamp Assembly



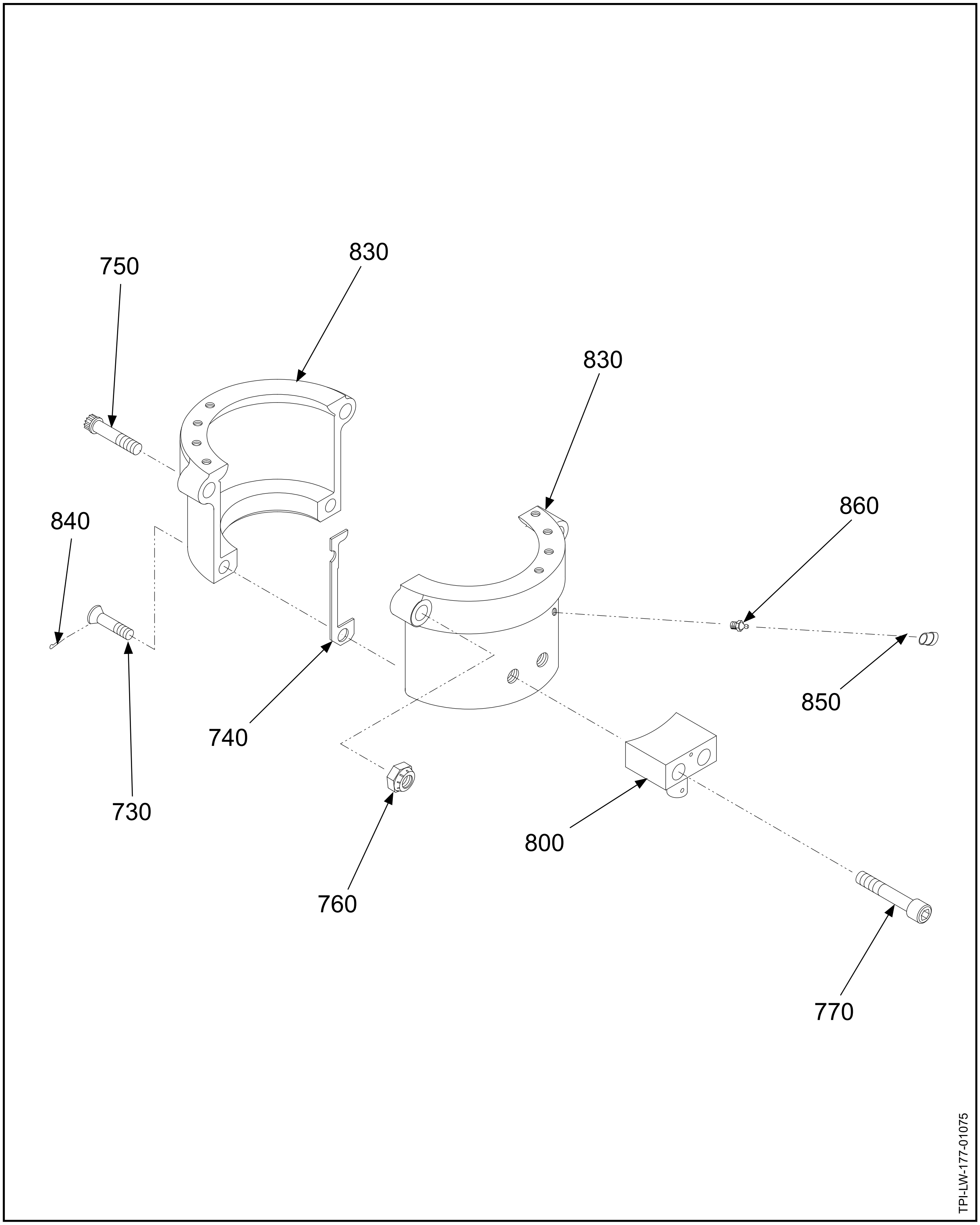
838-74 Clamp Assembly
Figure 10A-46

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-46		**838-74: CLAMP ASSEMBLY PARTS**				
-700	838-74	PCP: CLAMP ASSEMBLY		3		PCP
710	A-285	• SPRING PIN, 3/32" CRES.		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306-1	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	833-16	• PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• DELETED				
830	C-1977P	• PCP: CLAMP, BLADE, M,P,R SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-74: Clamp Assembly



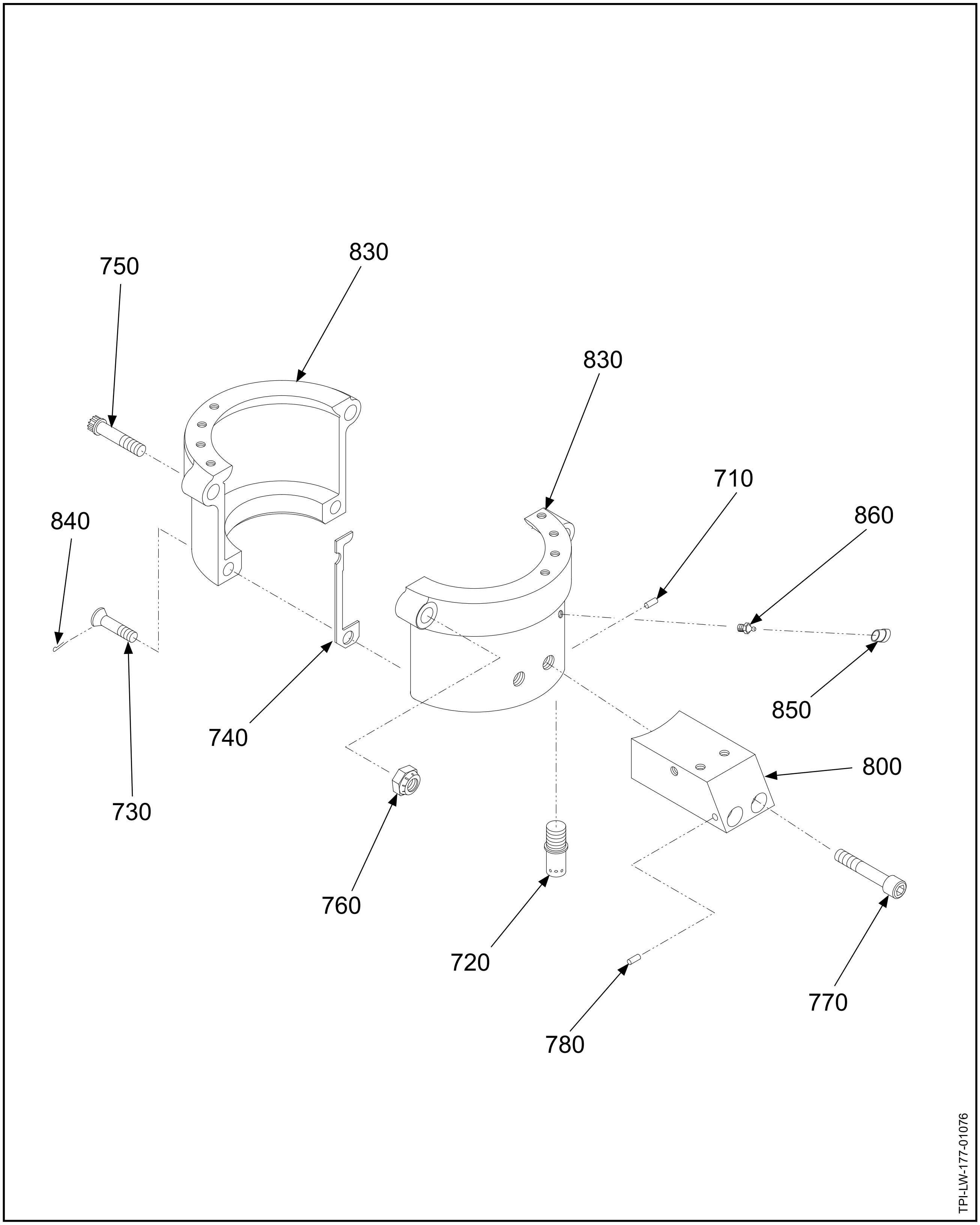
838-79 Clamp Assembly
Figure 10A-47

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-47		**838-79: CLAMP ASSEMBLY PARTS**				
-700	838-79	PCP: CLAMP ASSEMBLY		3		PCP
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-79	• PCP: CLAMP UNIT		1		PCP
770	A-2036-16	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-16	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
800	B-3309-1	• • LINK PIN UNIT		1		
-810	101562	• • • PIN, LINK		1		
-820	B-3842-0750	• • • SPRING PIN, 3/32", CRES		1	Y	
830	C-1301-8S	• • PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
860	B-6588-1	• • FITTING, LUBRICATION		2	Y	
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-79: Clamp Assembly



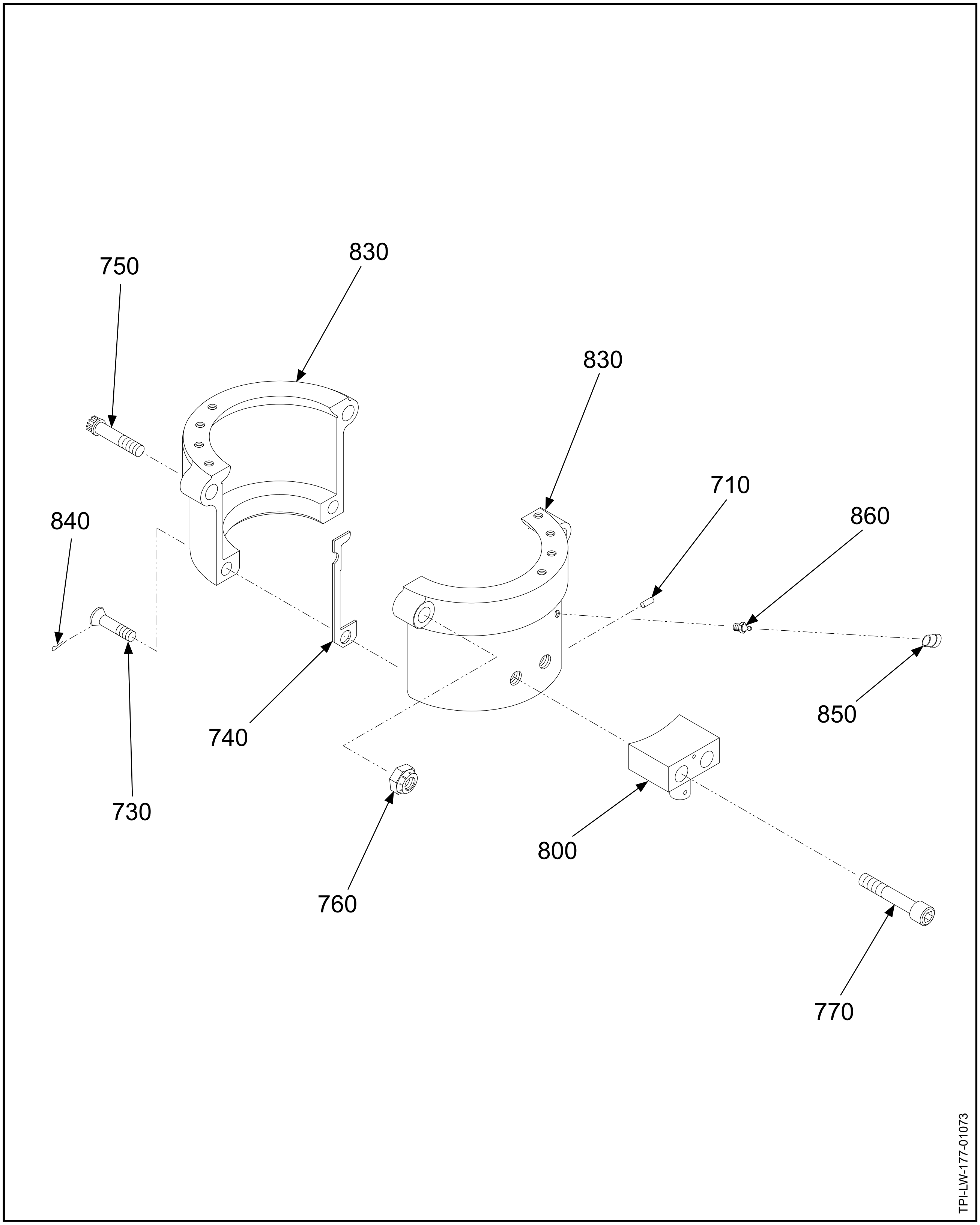
838-81 Clamp Assembly
Figure 10A-48

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-48		**838-81: CLAMP ASSEMBLY PARTS**				
-700	838-81	CLAMP ASSEMBLY		3		
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-304	• LINKSCREW, 1/2-20		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-30	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-30	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	833-11	• COUNTERWEIGHT UNIT		1		
-820	A-65	• DELETED				
830	C-1301S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-81: Clamp Assembly



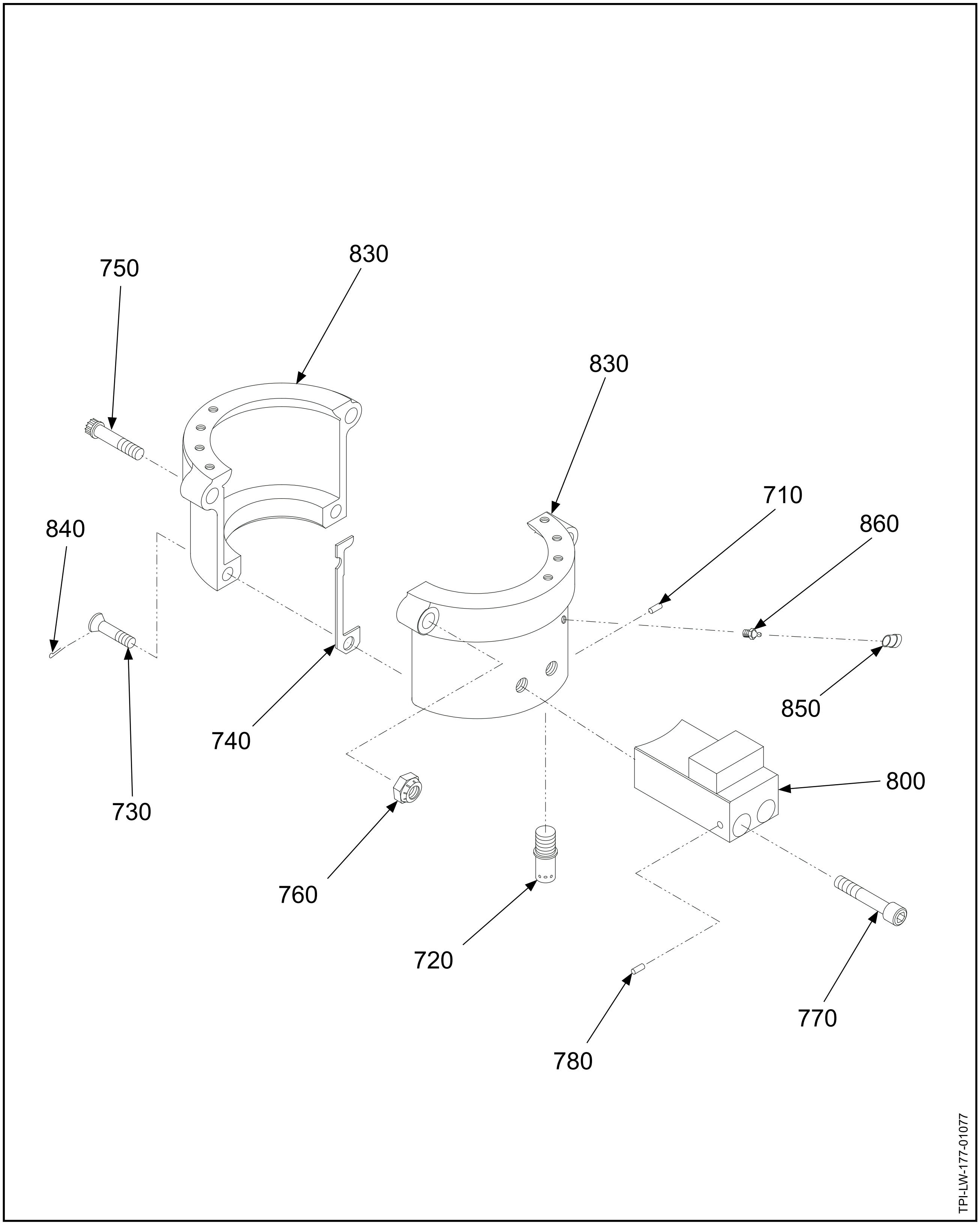
838-84 Clamp Assembly
Figure 10A-49

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-49		**838-84: CLAMP ASSEMBLY PARTS**				
-700	838-84	PCP: CLAMP ASSEMBLY		3		PCP
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW) SUPERSEDED BY ITEM 710A		2	Y	
710A	B-3838-3-2	• COTTER PIN (LINKSCREW) SUPERSEDES ITEM 710		2	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306-1	• GASKET, CLAMP		2	Y	
750	A-1372	• BOLT, 7/16-20, 12 POINT		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-16	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-16	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
800	B-3309-3	• LINK PIN UNIT		1		
-810	101565	• • PIN, LINK		1		
-820	B-3842-0750	• • SPRING PIN, 3/32", CRES		1	Y	
830	C-1977(P)	• PCP: CLAMP, BLADE, M,P,R SHANK		1		PCP
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-84: Clamp Assembly



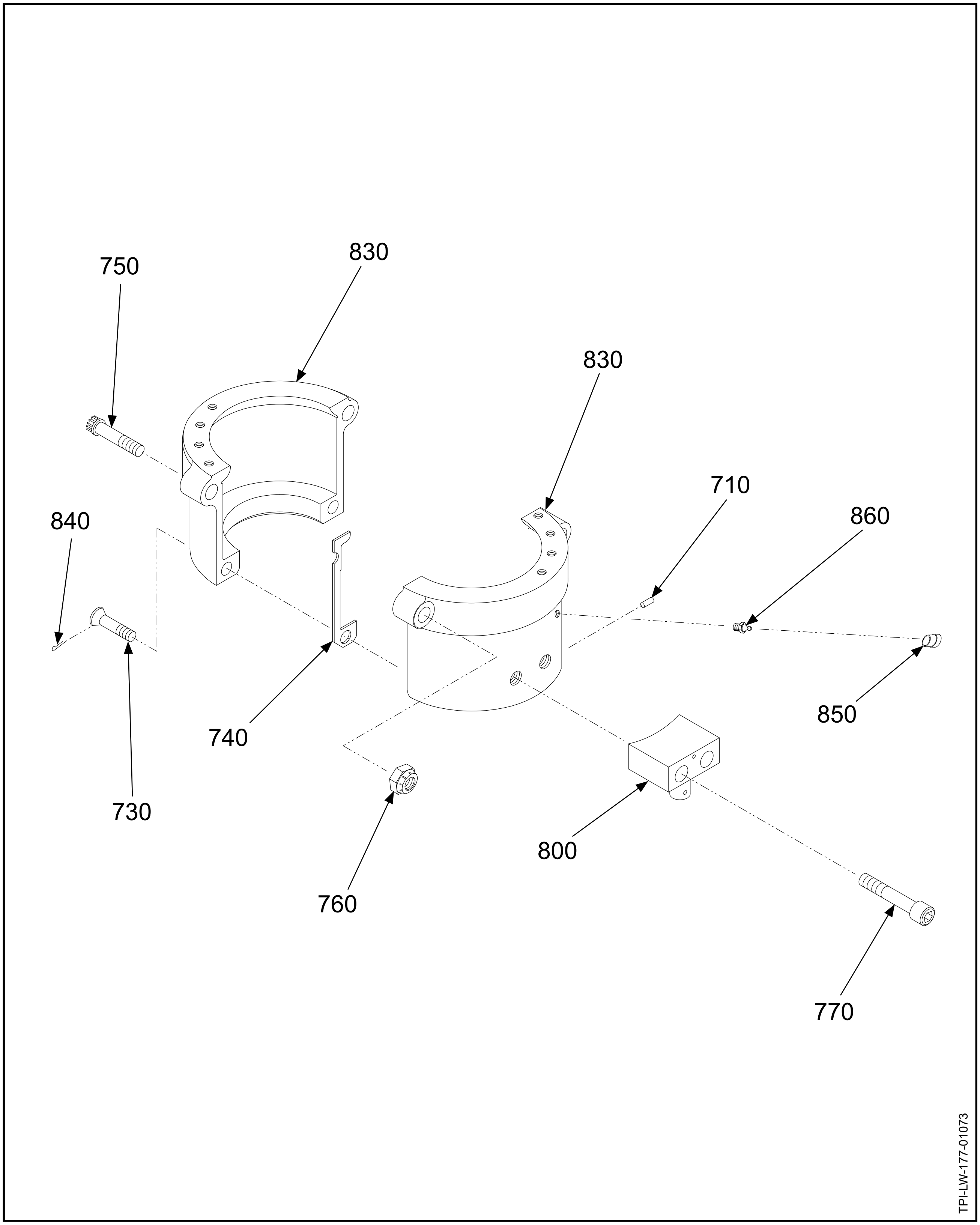
838-90 Clamp Assembly
Figure 10A-50

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-50		**838-90: CLAMP ASSEMBLY PARTS**				
-700	838-90	CLAMP ASSEMBLY		3		
710	A-285	• SPRING PIN, 3/32" CRES. (LINKSCREW)		1	Y	
720	A-295	• LINKSCREW		1	Y	
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
770	A-2036-32	• SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (COUNTERWEIGHT)		2	Y	
770A	107995-32	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (COUNTERWEIGHT)		2	Y	
780	A-285	• SPRING PIN, 3/32" CRES. (COUNTERWEIGHT SCREW)		2	Y	
780A	B-3838-3-2	• COTTER PIN (COUNTERWEIGHT SCREW), ALTERNATE FOR ITEM 780		2	Y	
800	833-16R	• PCP: COUNTERWEIGHT UNIT		1		PCP
-820	A-65	• DELETED				
830	C-1301-9S	• PCP: CLAMP, BLADE, T,W,Z SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	
860	B-6588-1	• FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-90: Clamp Assembly



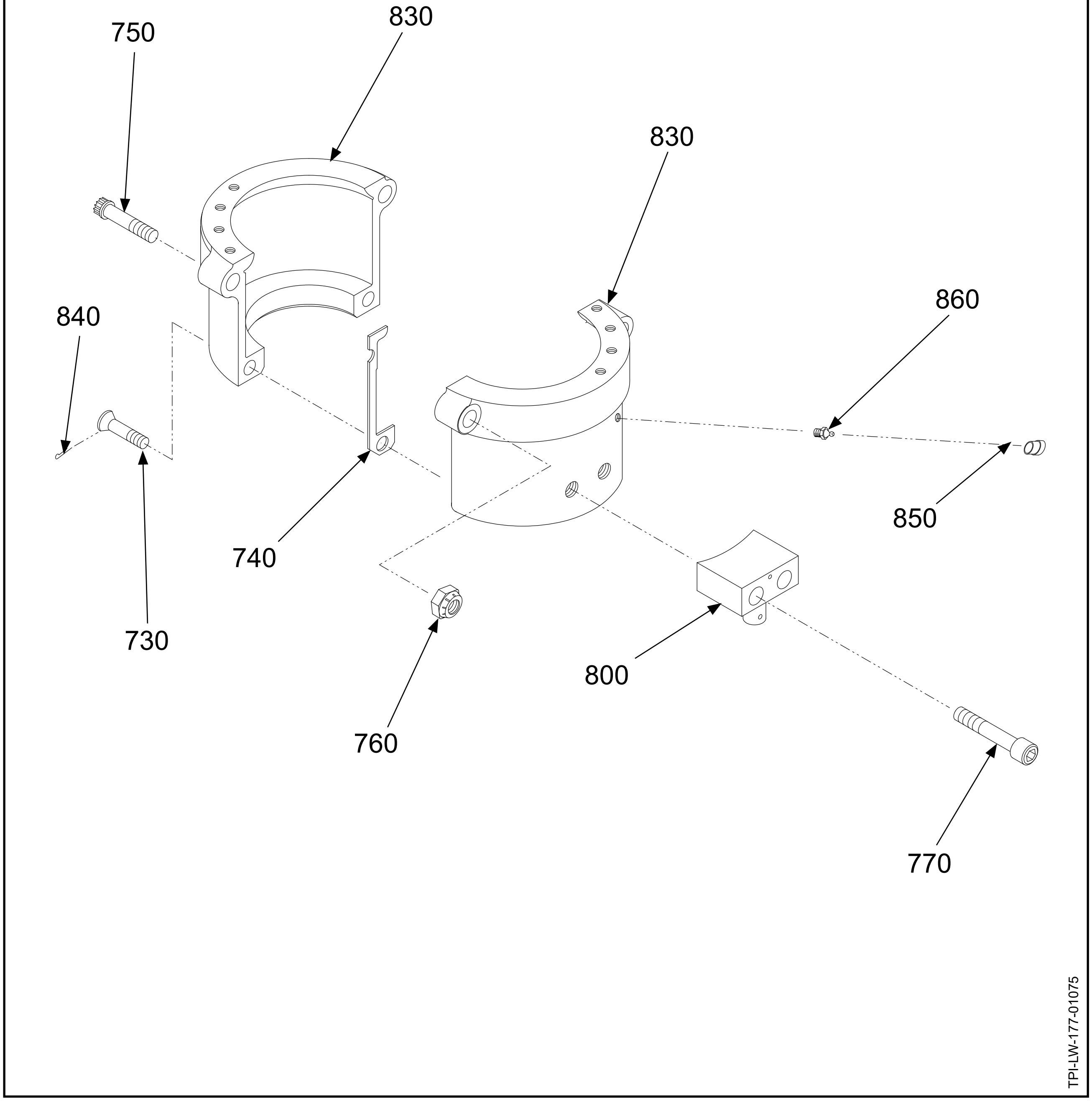
838-91 Clamp Assemblies
Figure 10A-51

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-51		**838-91: CLAMP ASSEMBLY PARTS**				
-700	838-91	PCP: CLAMP ASSEMBLY		3		PCP
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306-1	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-91	• PCP: CLAMP UNIT		1		PCP
710	A-285	• • SPRING PIN, 3/32" CRES.		1	Y	
770	A-2036-22	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (LINK PIN UNIT)		2	Y	
770A	107995-22	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (LINK PIN UNIT)		2	Y	
800	B-3309	• • LINK PIN UNIT		1		
-810	101560	• • • PIN, LINK		1		
-820	B-3842-0750	• • • SPRING PIN, 3/32", CRES		1	Y	
860	B-6588-1	• • FITTING, LUBRICATION		2	Y	
830	C-1977P	• PCP: CLAMP, BLADE, M,P,R SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-91: Clamp Assembly



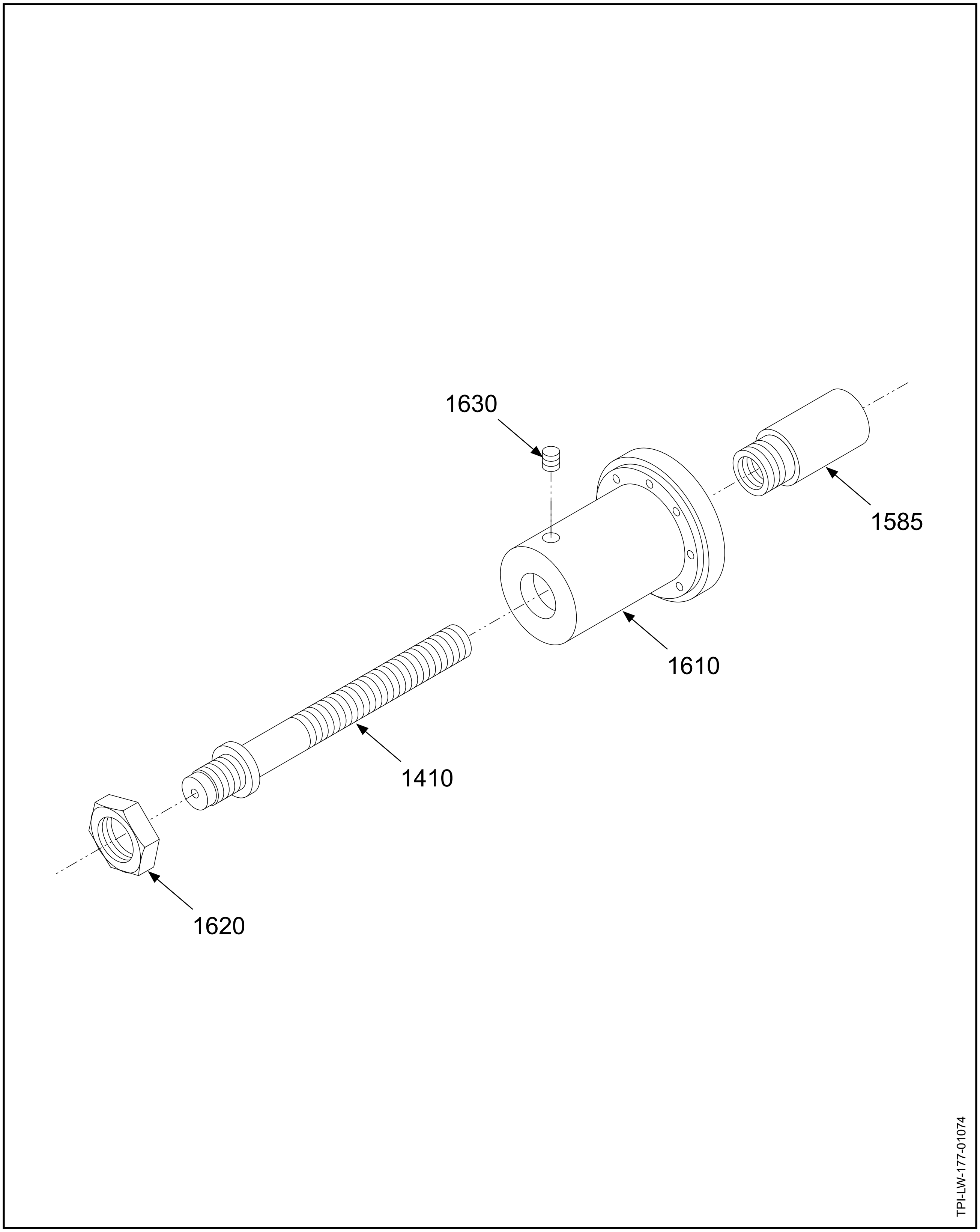
838-100 Clamp Assembly
Figure 10A-52

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-52		**838-100: CLAMP ASSEMBLY PARTS**				
-700	838-100	PCP: CLAMP ASSEMBLY		3		PCP
730	A-321	• SCREW, 3/8-24 DOUBLE 60° HEAD		2	Y	
740	A-1306-1	• GASKET, CLAMP		2	Y	
750	A-1379	• BOLT, 7/16-20, 12 POINT, REPLACED BY ITEM 750A		2	Y	
750A	A-1372	• BOLT, 7/16-20, 12 POINT, REPLACES ITEM 750		2	Y	
760	A-1373	• NUT, 7/16-20, HEX, SELF-LOCKING		2	Y	
-765	D-7838-100	• PCP: CLAMP UNIT		1		PCP
770	A-2036-22	• • SCREW, 7/16-20, CAP, MODIFIED, REPLACED BY ITEM 770A (LINK PIN UNIT)		2	Y	
770A	107995-22	• • BOLT, 7/16-20, 12 POINT, REPLACES ITEM 770 (LINK PIN UNIT)		2	Y	
800	B-3309-3	• • LINK PIN UNIT		1		
-810	101565	• • • PIN, LINK		1		
-820	B-3842-0750	• • • SPRING PIN, 3/32", CRES		1	Y	
860	B-6588-1	• • FITTING, LUBRICATION		2	Y	
830	C-1977P	• • PCP: CLAMP, BLADE, M,P,R SHANK		1		PCP
840	B-3838-3-2	• COTTER PIN (CLAMP SCREW)		2	Y	
850	B-6544	• CAP, FITTING, LUBRICATION		2	Y	

EFFECTIVITY	MODEL	EFFECTIVITY	MODEL

- ITEM NOT ILLUSTRATED

838-100: Clamp Assembly



B-1944 Pitch Adjustment Assembly
Figure 10A-53

FIG./ITEM NUMBER	PART NUMBER	DESCRIPTION	EFF CODE	UPA	O/H	PCP
10A-53		**B-1944: PITCH ADJUSTMENT ASSEMBLY PARTS**				
-1200	B-1944	PITCH ADJUSTMENT ASSEMBLY		1		
1410	B-1942	• ROD, PITCH CHANGE		1		
1585	A-1941	• NUT, SLEEVE		1		
1610	B-1943	• SPRING RETAINER CUP, REPLACED BY ITEM 1610A		1		
1610A	B-364	• RETAINER CUP, REPLACES ITEM 1610		1		
1620	A-880-1	• NUT, HEX, SELF-LOCKING, THIN (RETAINER)		1	Y	
1630	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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