SERVICE TABLE OF LIMITS
AND
TORQUE VALUE
RECOMMENDATIONS

NOTICE

The basic Table of Limits, SSP-1776 has been completely revised and reissued herewith as SSP-1776-5. It is made up of the following four parts, each part contains five sections.

PART I	DIRECT DRIVE ENGINES (Including VO and IVO-360)
PART II	INTEGRAL ACCESSORY DRIVE ENGINES
PART III	GEARED ENGINES
PART IV	VERTICAL ENGINES (Excluding VO and IVO-360)

SECTION I	500 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT
SECTION II	600 SERIES	CYLINDERS
SECTION III	700 SERIES	GEAR TRAIN
SECTION IV	800 SERIES	BACKLASH (GEAR TRAIN)
SECTION V	900 SERIES	TORQUE AND SPRINGS

This publication supersedes and replaces the previous publication SSP-1776-4. To make sure that SSP-1776-5 will receive the attention of maintenance personnel, a complete set of pages for the book is sent to all registered owners of Overhaul Manuals. These recipients should remove all previous Table of Limits material from the Overhaul Manual and discard.

* - Indicates cut-off date for data retrieved prior to publication.

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INTRODUCTION

SERVICE TABLE OF LIMITS

This Table of Limits is provided to serve as a guide to all service and maintenance personnel engaged in the repair and overhaul of Lycoming Aircraft Engines. Much of the material herein contained is subject to revision; therefore, if any doubt exists regarding a specific limit or the incorporation of limits shown, an inquiry should be addressed to the Lycoming factory for clarification.

DEFINITIONS

Ref. (1st column)	The numbers in the first column headed "Ref." are shown as a reference number to locate the area described in the "Nomenclature" column. This number will be found in a diagram at the end of each section indicating a typical section where the limit is applicable.
Chart (2nd column)	The letter in this column is used as a symbol to designate engine models to which the specific limits are applicable. A list of the letter and the engines to which it refers is shown on the following page.
Nomenclature (3rd column)	This is a brief description of the parts or fits specified in the adjacent columns and indicated in the diagram at end of each section.
Dimensions (4th and 5th columns)	The dimensions shown in column 4 are the minimum and maximum dimensions for the part as manufactured. The dimensions shown in column 5 indicate the limit that must not be exceeded. Unless it can be restored to serviceable size, any part that exceeds this dimension must not be rebuilt into an engine.
Clearance (6th and 7th columns)	Like the dimensions shown in the 4th and 5th columns, the clearance represents the fit between the two mating surfaces as controlled during manufacture and as a limit for permissible wear. Clearances may sometimes be found to disagree with limits for mating parts; for example, maximum diameter of cylinder minus minimum diameter of piston exceeds limit for piston and barrel clearance. In such instances, the specified maximum clearance must not be exceeded.

In some instances, where a parts revision has caused a dimensional or tolerance change, the superseded dimensional data has been deleted from the list; provided compliance with the change is mandatory.

This manual contains torque values specifications for various type of hardware used on Lycoming Engines.

The importance of correct torque application cannot be overemphasized. Under-torque can cause premature wear of nuts and bolts, as well as the parts they secure. Over-torque can cause wear or premature failure of a bolt or nut from overstress on threaded areas

REQUIRED PRACTICES

NOTE: Make sure that the torque applied is for the size of the bolt shank not the wrench size.

NOTE: Do not exceed the maximum torque plus the friction drag. If the hole and nut castellation do not align, change washer or nut and try again. Exceeding the maximum recommended torque is not recommended.

- Calibrate the torque wrench at least once a year, or immediately after it has been abused or dropped, to ensure continued accuracy.
- Be sure the bolt and nut threads are clean and dry, unless otherwise specified by the manufacturer.
- Apply a smooth even pull when applying torque pressure. If chattering or a jerking motion occurs during the final torque, back off the nut and retorque.
- When installing a castle nut, start alignment with the cotter pin hole at the minimum recommended torque plus friction drag torque.

If special adapters are used which will change the effective length of the torque wrench, the final torque indication or wrench setting must be adjusted accordingly. Identify the correct torque wrench indication or setting with the adapter installed. Refer to AC 43.13-1B for details.

Drag Torque

VARIABLE AFFECTING TORQUE. Several variables must be taken into consideration when determining the amount of torque to apply to a given fastener. Standard torque charts are developed for dry, un-plated conditions. Surface variables to be taken into account for each specific application include thread roughness, lubrication, hardening, scale, paint, and plating.

Drag torque is also known as running torque, the resistance on the screw as it's being installed, usually only a few Inch Lb. Drag torque is the natural friction between a fastener and its nut, nut plate, etc.

NOTE: When specific torque values are included in a technical manual for a specific item, those values shall be used. This means that friction drag torque was already included for known conditions.

- Run the nut down to near contact with the washer or bearing surface and check the friction drag torque required to turn the nut.
- Add the friction drag torque to the desired torque. This is referred to as "final torque," which should register on the indicator or setting for a snap-over type torque wrench.
- Final torque = friction drag torque + desired torque.

Letters of the alphabet and numbers are used as symbols throughout the Table of Limits to represent specific interpretations and to designate engine models. Letters in parenthesis refer to dimensional characteristics; letters without parentheses indicate engine models. They are listed below with the separate definitions.

(A)	These fits are either shrink fits controlled by machining, fits that may readily be adjusted, or fits where wear does not normally occur. In each case, the fit must be held to manufacturing tolerance.
(B)	Side clearance of wedge type rings must be measured with face of ring flush with piston.
(D)	These dimensions shown are measured at the bottom of the piston skirt at right angles to the piston pin.
(E)	Permissible wear on crankshaft (rod and main bearing journals) to be minus .0015 on diameter.
(L)	Loose fit; wherein a definite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or interference fit.
(WD)	Wide Deck Crankcase.

The illustrations shown are typical of the referenced limit or fit described in the Table and in no instance are these illustrations intended to represent a specific part or engine model unless specified. Also, the terms used to designate cylinder, piston and ring materials such as "nitride, chrome, half-wedge" are more fully explained in the latest revision of Service Instruction No. 1037.

SERVICE TABLE OF LIMITS
PART I – DIRECT DRIVE ENGINES

CHART	MODELS	CHART	MODELS
A	O-235-C, -E, -H	S7	HIO-360-D
A1	O-235-F, -G, -J,-K, -L, -M, -N, -P	S8	HIO-360-B
B	O-290	S9	HIO-360-C
B1	O-290-D2	S10	HIO-360-A (S/N with suffix A)
BD	O-320-H (76 Series)	S11	HIO-390-A
G	O, IO, LIO, AEIO-320		IO-, AEIO-390-A
G1	O, IO-320 With Gov. at Front		IO-390-C, -D
	(O-320-E1F, -E1J, -D1F & IO-320-D1B)	S12	HIO-360-F1AD
G2	AIO-320	S13	HIO-360-A (S/N without suffix A)
J	O-340	S14	HIO-360-E
BE	O, LO-360-E (76 Series)	D	O-435-A
Y	VO, IVO-360	T	O, IO, LIO, AEIO, TIO, LTO-540
S	O, IO, LIO, HIO, LHIO, TO, TIO, AEIO-360	T1	O-540-G, -H &IO-540-N, -R
S1	TO-360	T2	(Large Mains – Parallel Valve)
S2	AIO-360		IO-540-A, -B, -E, -G, -P (Angle Valve)
S3	TIO-360	T3	IO-540-K, -M, -S; TIO, LTIO-540-A, -F,
S4	O-360-A With Gov. at Front		-J, -N, -R (Large Mains – Angle Valve)
	(O-360-A1H, -A1LD)		IO, AEIO-580-B1A
S5	IO, LIO-360-A, -C (Angle Valve)		TEO-540
S6	IO, LIO-360-A, -C With Gov. at Front	T4	TIO-540-C, -E, -G, -H
	(IO, LIO-360-C1E6 & IO-360-A1D6)	AF	IO-720

NOTE: In “Chart” column, a number appearing after a letter indicates an exception to the basic model.
For example, A1 (O-235-F. –G, -J, -K, -L, -M, -N –P) is an exception to the basic model A (O-235-C, -E, -H)

When referencing any section in this Table of Limits for a dimension or clearance, if the there is no specific A1 row for a particular reference number, the A limits also apply to the A1 engine models.

SECTION I	500 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT
SECTION II	600 SERIES	CYLINDERS
SECTION III	700 SERIES	GEAR TRAIN
SECTION IV	800 SERIES	BACKLASH (GEAR TRAIN)
SECTION V	900 SERIES	TORQUE AND SPRINGS

(A)	These fits are either shrink fits controlled by machining, fits that may readily be adjusted, or fits where wear does not normally occur. In each case, the fit must be held to manufacturing tolerance.
(B)	Side clearance on piston rings must be measured with face of ring flush with piston.
(D)	The dimensions shown are measured at the bottom of the piston skirt at right angles to the piston pin.
(E)	Permissible wear of the crankshaft (rod and main bearing journals) to be minus 0.0015 on the diameter.
(L)	Loose fit; wherein a definite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or interference fit.
(WD)	Wide Deck Crankcase.

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TECHNICAL PUBLICATION
REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
SSP-1776-5-PT1	Service Table of Limits	SSP-1776	October 28, 2013

PREVIOUS REVISIONS

March 2014
1-1

July 2014
1-10

February 2016
Title Page, 1-1, 1-2, 1-3, 1-8, 1-9, 1-10, 1-11, 1-12

- Added S11 designation to Chart for IO-, AEIO-390-A engine models
- Revised tappet information for Reference number 511 and 512
- Updated piston and cylinder barrel information for:
  - IO, AEIO-390-A
  - TIO-540-C, -E, -G, -H; IO
  - AEIO-580-B1A

September 2016
Title Page, 1-8, 1-30

- Added engine model IO-390-C to Chart
- Added engine model IO-390-C to Piston Application Table
- Added S11 designation to Reference #823, backlash clearance for front governor engines

April 2018
Title Page, 1-1, 1-3, 1-7, 1-8, 1-9, 1-10, 1-11, 1-34, 1-35, 1-36, 1-37

- Added HIO-360-F1AD, HIO-390-A, and TEO-540 to Chart
- Added S12 designation for HIO-360-F1AD to tables where applicable
- Revised Ref. number 512 (Tappet Plunger Assembly and Body) for clarity
- Revised Piston Application Table to list only piston part numbers
- Added NOTE to refer to the latest revision of Service Instruction No. SI-1037 for engine model and piston part number applicability
- Deleted obsolete part numbers and Notes associated with those part numbers in Piston Application Table
- Deleted NOTES that reference S.I. 1243 in Piston Application Table
- Updated Lycoming P/N and Vendor P/N for one of the V-band couplings for Ref. number 921.
- Added Ref. number 933 to Section V table and figure for torque value for brass union nut on stainless steel injector fuel line (Both Ends)
- Deleted obsolete part numbers for Ref. numbers 950 and 951

CURRENT REVISION*

April 2020
Title Page, 1-1, 1-7, 1-8, 1-9, 1-10, 1-11, 1-34, 1-36

- Added Serial Number identification for Chart number S10 - HIO-360-A
- Added new engine model listing for IO-390-D to Chart reference number S11
- Added new Chart reference number S13 for HIO-360-A engines without S/N suffix A
- Deleted HIO-360-E from Chart reference S9
- Added new Chart reference number S14 for HIO-360-E
- Added new reference numbers S13 and S14 as applicable in Sections I, II, and V
- Revised burnishing instructions for connecting rod bushing in reference number 600
- Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607

* Revisions are indicated with a vertical bar to the left of the revised item.

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SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	A	All Main Bearings and Crankshaft			.0025L .0055L	.0060L
	B-D-G-J-S-T-Y-BD-BE-AF	Main Bearings and Crankshaft (Thin Wall Bearing - .09 Wall Approx.)			.0015L .0045L	.0060L
	B-G-J-S-T-Y-AF	Main Bearings and Crankshaft (Thick Wall Bearing - .16 Wall Approx.)			.0011L .0041L	.0050L
	A	Diameter of Main Bearing Journal on Crankshaft	2.3735 2.375	(E)		
	B-D-G-J-S-T-Y-BD-BE	Diameter of Main Bearing Journal on Crankshaft (2-3/8 in. Main)	2.3745 2.376	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Main Bearing Journal on Crankshaft (2-5/8 in. Main)	2.6245 2.626	(E)		
	S8-S10-S13	Diameter of Front Main Bearing Journal on Crankshaft (2-3/8 in. Main)	2.3750 2.3760	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Front Main Bearing Journal on Crankshaft (2-5/8 in. Main)	2.6245 2.6255	(E)		
500	A-B-B1-D-G*-BD-BE	Crankcase Bearing Bore Diameter (All) (Thin Wall Bearing) (2-3/8 in. Main)	2.566 2.567	2.5685		
	G**-J-S-T-Y	Crankcase Bearing Bore Diameter (All Except Front) (Thick Wall Bearing) (2-3/8 in. Main)	2.6865 2.6875	2.6890		
	T1-T3-AF	Crankcase Bearing Bore Diameter (Front Only) (Thin Wall Bearing) (2-5/8 in. Main)	2.816 2.817	2.8185		
	T1-T3-AF	Crankcase Bearing Bore Diameter (All Except Front) (Thick Wall Bearing) (2-5/8 in. Main)	2.9365 2.9375	2.9390		
	S1-S12-T-AF	Crankcase Bearing Bore Diameter (All) (Thin Wall Bearing) (2-5/8 in. Main)	2.816 2.817	2.8185		
	G**-J-S-T-Y *O-320-A, -E Narrow Deck, **O-320-A, -E Wide Deck	Crankcase Bearing Bore Diameter (Front Only) (Thin Wall Bearing) (2-3/8 in. Main)	2.566 2.567	2.5685		
501	ALL	Connecting Rod Bearing and Crankshaft			.0008L .0038L	.0050L
	A-B-D-G-J-S-T-Y-BD	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	2.1235 2.125	(E)		
	S-T-AF	Diameter of Connecting Rod Journal on Crankshaft (2-1/4 in.)	2.2485 2.250	(E)		
	A-B-D-G-J-S-T-Y-BD-BE	Connecting Rod Bearing Bore Diameter (2-1/8 in.) (Measured At Axis 30^{O} on Each Side)	2.2870 2.2875			

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
501	S-T-AF	Connecting Rod Bearing Bore Diameter (2-1/4 in.) (Measured At Axis 30^{O} on Each Side)	2.4205 2.4210			
502	ALL	Connecting Rod - Side Clearance			.004L .010L	.016L
503	ALL	Connecting Rod - Alignment			.010 in 10 Inches	
504	ALL	Connecting Rod – Twist			.012 in 10 Inches	
505		Crankshaft Run-Out at Center Main Bearing				
	4 CYLINDER	Mounted on No. 1 and 4 Journals Max. Run-Out No. 2 Journal			.002	.002
		Mounted on No. 1 and 4 Journals Max. Run-Out No. 3 Journal			.005	.0075
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
	6 CYLINDER	Mounted on No. 2 and 5 Journals Max. Run-Out No. 1 Journal			.002	.002
		Mounted on No. 2 and 5 Journals Max. Run-Out No. 3 Journal			.005	.0075
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
		Mounted on No. 3 and 5 Journals Max. Run-Out No. 4 Journal			.003	.0045
	8 CYLINDER	Mounted on No. 2 and 6 Journals Max. Run-Out No. 1 Journal			.002	.002
		Mounted on No. 2 and 4 Journals Max. Run-out No. 3 Journal			.003	.0045
		Mounted on No. 3 and 5 Journals Max. Run-Out No. 4 Journal			.003	.0045
		Mounted on No. 4 and 6 Journals Max. Run-Out No. 5 Journal			.003	.0045
		Mounted on No. 2 and 6 Journals Max. Run-Out No. 3, 4 and 5 Journals			.005	.0075
506	ALL	Crankshaft and Crankcase Front End Clearance			.009L .016L	.026L
507	ALL	Clearance – Front Face of Crankshaft Oil Slinger to Front Face of Recess in Crankcase (Crankshaft Against Thrust Face)			.002 .007L	(A)

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

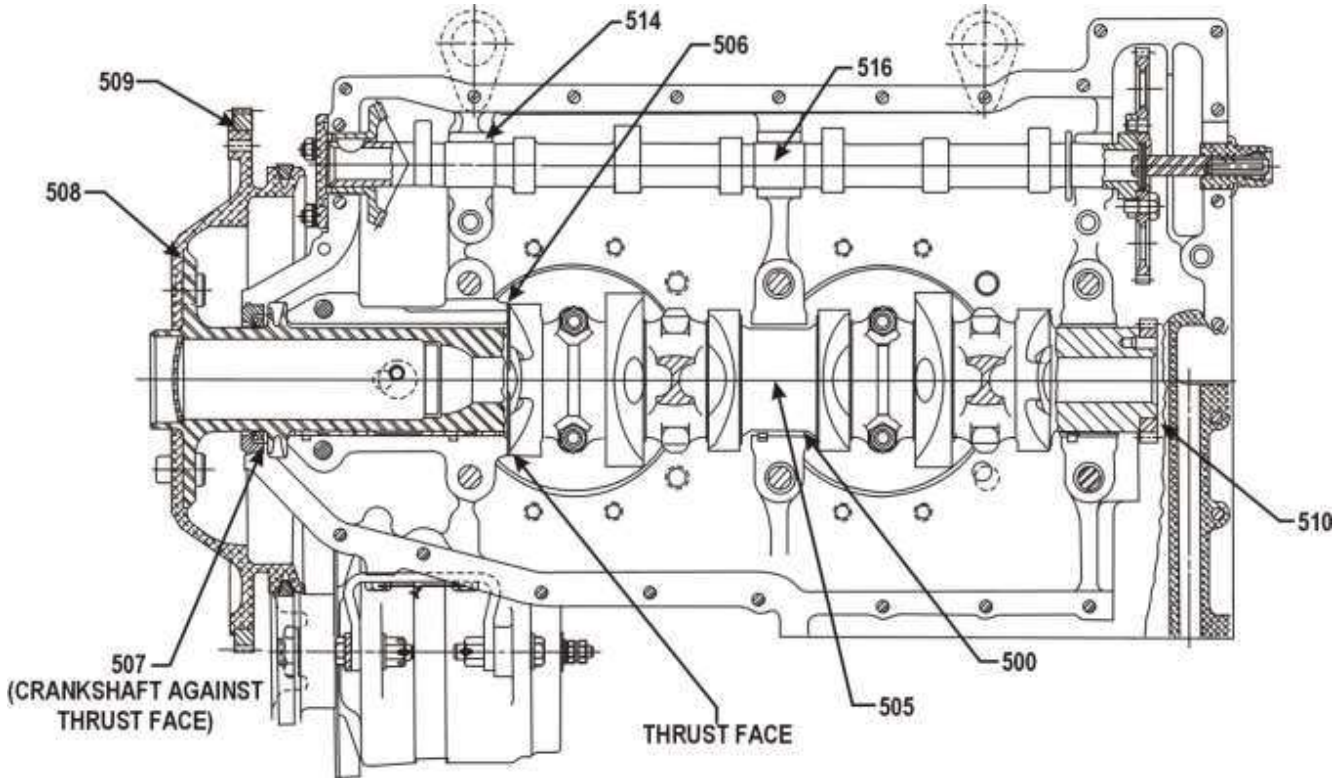
Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
508	ALL	Crankshaft – Prop. Flange Run-Out			.002	.005
509	ALL	Starter Ring Gear and Support			.014T .022T	(A)
510	A-B-D-G-J-S-T-Y-AF-BD-BE	Crankshaft Timing Gear and Crankshaft			.0005T .0010L	(A)
511	A-B-D-G-J-S-T-Y-AF	Tappet Body and Crankcase			.0010L .0033L	.004L
	BD-BE	Tappet Body and Crankcase			.0010L .0030L	.004L
	A-B (Solid Tappets)	O.D. of Tappet	.6232 .6240	.6229		
	B1-D-G-J-S-T-Y-AF (Flat Tappets)	O.D. of Tappet	.7169 .7177	.7166		
	B1-D-G-J-S-T-Y-AF (Roller Tappets)	O.D. of Tappet	.8420 .8428	.8417		
	BD-BE	O.D. of Tappet	.8740 .8745	.8737		
	A-B (Solid Tappets)	I.D. Tappet Bore in Crankcase	.6250 .6263	.6266		
	B1-D-G-J-S-T-Y (Flat Tappets)	I.D. Tappet Bore in Crankcase	.7187 .7200	.7203		
	B1-D-G-J-S-T-Y-AF (Roller Tappets)	I.D. Tappet Bore in Crankcase	.8437 .8445	.8448		
	BD-BE	I.D. Tappet Bore in Crankcase (Small Bore Tappet)	.8755 .8773	.8776		
	BD-BE	I.D. Tappet Bore in Crankcase (Large Bore Tappet)	.9545 .9555			
512	All Models Using Roller Tappets	Tappet Plunger Assembly and Body – (Roller Tappets)			.0010L .0047L	.0067L
	All Models Using Straight Body Tappets	Tappet Plunger Assembly and Body – (Straight Body Tappets)			.0010L .0047L	.0067L
	All Models Using Hyperbolic Tappets	Tappet Plunger Assembly and Body – (Hyperbolic Tappets)			.0010L .0067L	.0087L
513	ALL	Tappet Socket and Body (Hyperbolic Flat and Roller Tappets)			.002L .007L	.009L
514	ALL	Camshaft and Crankcase			.002L .004L	.006L
515	ALL	Camshaft – End Clearance			.002L .009L	.015L
516	ALL	Camshaft Run-Out at Center Bearing Journal			.000 .001	.006
517	All Models Using Counterweights	Counterweight Bushing and Crankshaft			.0013T .0026T	(A)
518	All Models Using Counterweights	Counterweight Roller – End Clearance			.007L .025L	.038L
519	All Models Using Counterweights	Counterweight and Crankshaft – Side Clearance*			.003L .013L	.017L
	*Measure below roller next to flat.					

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
520	All Models Using Counterweights	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	All Models Using Counterweights	I.D. of Counterweight Bushing	.7485 .7505	.7512		
522	All (AS APPLICABLE)	O.D. of Counterweight Roller (See latest revision of Service Instruction No. 1012)				
523	D	Thrust Bearing and Propeller Shaft			.0000 .0012L	.002L
524	D	Thrust Bearing and Thrust Bearing Cap Clamp Fit (Shim to this Fit)			.003T .005T	(A)
525	D	Thrust Bearing Tilt		.027 Tilt		
526	D	Crankshaft Run-Out – Rear Cone Location				.003
527	D	Crankshaft Run-Out – Front Cone Location				.007
528	D	Thrust Bearing and Thrust Bearing Cage			.0016L .0034L	.0045L

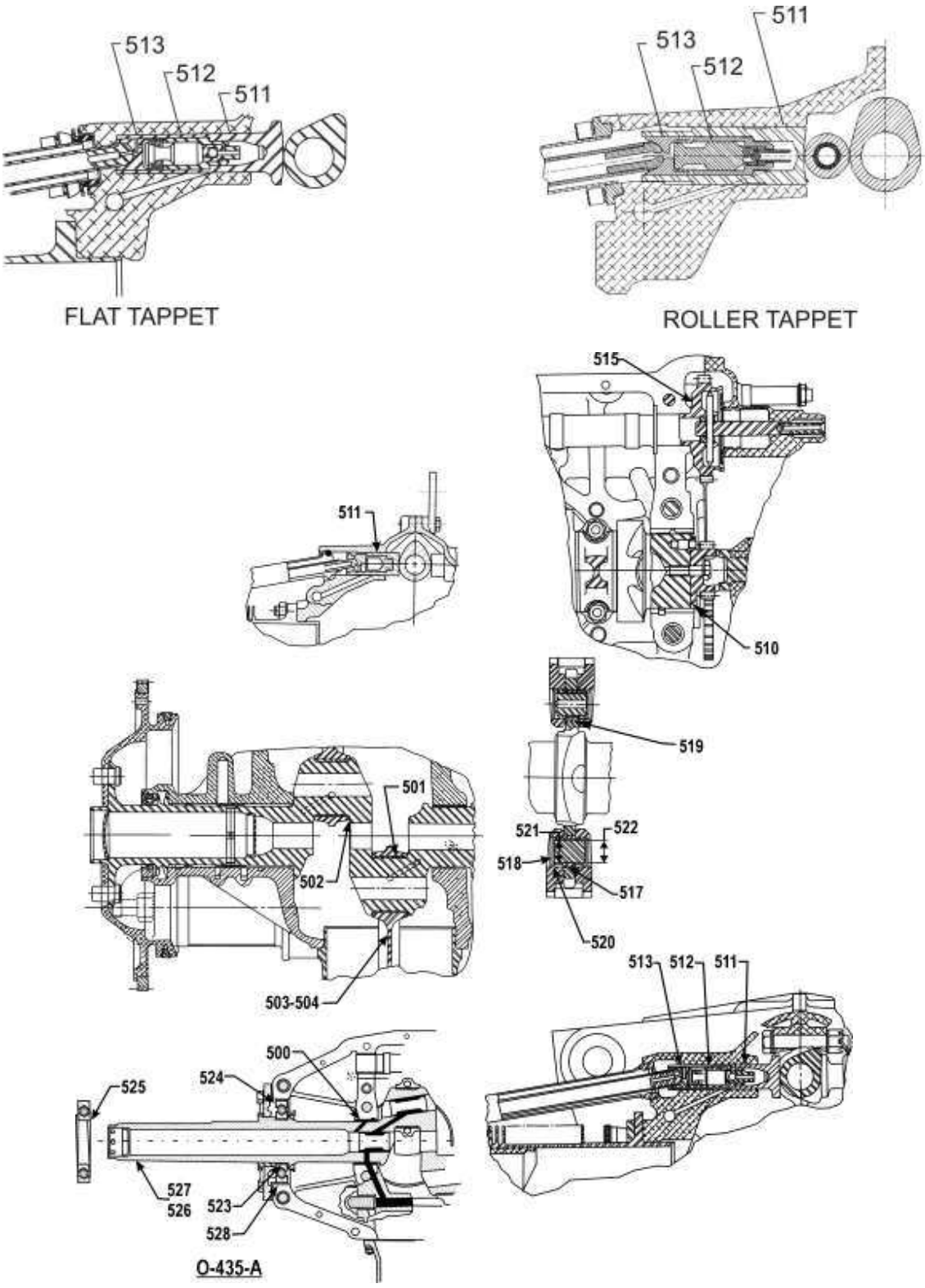


Longitudinal Section Thru Engines

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



Crankcase, Crankshaft, Camshaft and Related Parts

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
600	ALL	Connecting Rod and Connecting Rod Bushing	Bushing P/N LW-13923 to be burnished in place Bushing P/N 01K28983 is **not** burnished in place			
	ALL	Finished I.D. of Connecting Rod Bushing	1.1254 1.1262			
601	A-B-D-G-J-BD	Length Between Connecting Rod Bearing Centers	6.4985 6.5015			
	S-T-Y-AF-BE	Length Between Connecting Rod Bearing Centers	6.7485 6.7515			
602	ALL	Connecting Rod Bushing and Piston Pin			.0008L .0021L	.0025L
603	ALL	Piston Pin and Piston			.0003L .0014L	.0018L
	ALL	Diameter of Piston Pin Hole in Piston	1.1249 1.1254			
	ALL	Diameter of Piston Pin	1.1241 1.1246			
604	A-G-J-S-T-AF-BD-BE	Piston and Piston Pin Plug			.0002L .0010L	.002L
	A-G-J-S-T-AF-BD-BE	*Diameter of Piston Pin Plug	1.1242 1.1247			
605	B-D-G-J-S-T-Y-AF	Piston Pin and Piston Pin Plug (Optional)			.0005L .0025L	.005L
	G-J-S-T-Y-AF	*Diameter of Piston Pin Plug	.5655 .5665			
	B-D	Diameter of Piston Pin Plug (Thin Wall Pin)	.8405 .8415			
	*See latest edition of Service Instruction No. SI-1267.					
606	A-B	Piston Ring and Piston – Side Clearance (Top Ring Comp.) (Plain) Full Wedge			.000 .004L	.006L (B)
	B-D	Piston Ring and Piston – Side Clearance (Top Ring Comp.) (Chrome) Full Wedge			.0025L .0065L	.008L (B)
	G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side Clearance (Top Ring Comp.) Half Wedge			.0025L .0055L	.008L (B)
606	B	Piston Ring and Piston – Side Clearance (2nd Ring Comp.) (Chrome) Full Wedge			.0025L .0065L	.008L (B)
	A-B-D-G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side Clearance (2nd Ring Comp.) Full or Half Wedge			.000 .004L	.006L (B)
	J	Piston Ring and Piston – Side Clearance (3rd Ring Comp.) Half Wedge			.000 .004L	.006L (B)
606	ALL	Piston Ring and Piston – Side Clearance (Oil Regulating)			.002L .004L	.006L (B)
	A	Piston Ring and Piston – Side Clearance (Bottom)			.003L .0055L	.007L(B)

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
607	ALL	Piston Ring Gap (Compression) Plain and Chrome Cylinders (Straight Barrels)			.020 .030	.047
	ALL	Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels)			.045 .065	.067
	ALL	Piston Ring Gap (Oil)			.015 .040	.047
	A-T2	Piston Ring Gap (Oil Scraper) (All Barrels)			.015 .030	.047
	For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075. For All Other Barrels – Ring gap is measured at top limit of ring travel.					

	Piston Specifications				
		Min. Piston Dia.			
608 608 609 610	Piston Number	Top	Bottom	Cylinder Barrel Maximum Diameter	Max. Clearance Piston Skirt & Cyl.
	14B23917	4.3470	4.3555	4.3795	.021L
	14B23918*	4.3290	4.3605	4.3805	.018L
	14B23919	4.3470	4.3555	4.3795	.021L
	14C28324	4.8395	4.8590	4.8805	.018L
	14D21953-S	5.0790	5.1090	5.1305	.018L
	14D23907	5.0790	5.1090	5.1305	.018L
	14D23908*	5.0790	5.1090	5.1305	.018
	14D23909*	5.0790	5.1090	5.1305	.018
	14D23910*	5.0790	5.1090	5.1305	.018
	14D23912*	5.0790	5.1090	5.1305	.018
	14D23913	5.0790	5.1090	5.1305	.018L
	14D23914*	5.0790	5.1090	5.1305	.018L
	14D23915	5.0790	5.1090	5.1305	.018L
	14D23916	5.0790	5.1090	5.1305	.018L
	14D28056	5.0790	5.1090	5.1305	.018L
	14E23911*	5.2720	5.3020	5.3235	.018L
	70396†	4.8290	4.8620	4.8805	.018L
	75984-S	4.8395	4.8590	4.8805	.018L
	LW-10208-S	5.0790	5.1090	5.1305	.018L

NOTES:

Refer to the latest revision of Service Instruction No. SI-1037 for a listing of engine models and piston part numbers applicable for each engine model.

To find the average diameter of cylinder in an area 4" above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Add both diameters; this sum, divided by 2, represents the average diameter of the cylinder.

* - High Compression.

† - Piston no longer available from Lycoming Engines.

Maximum taper and out-of-round for cylinder in service is .0045 inch.

To find the average out-of-round, measure diameter of cylinder in an area 4" above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Difference between diameters must not exceed .0045 inch.

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
611	A	Exhaust Valve Seat and Cylinder Head			.0065T .010T	(A)
	B-D-G-J-S-T-Y-BD-BE	Exhaust Valve Seat and Cylinder Head			.0045T .008T	(A)
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	Exhaust Valve Seat and Cylinder Head			.0075T .011T	(A)
	A	O.D. Exhaust Seat	2.0025 2.004			
	B-D-G-J-S-T-Y-BD-BE	O.D. Exhaust Seat	1.7395 1.741			
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	O.D. Exhaust Seat	1.9355 1.937			
	A	I.D. Exhaust Seat Hole in Cylinder Head	1.994 1.996			
	B-D-G-J-S-T-Y-BD-BE	I.D. Exhaust Seat Hole in Cylinder Head	1.733 1.735			
611	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	Exhaust Seat Hole in Cylinder Head	1.926 1.928			
612	A	Intake Valve Seat and Cylinder Head			.0070T .0105T	(A)
	B-D-G-J-S-T-Y-AF-BD-BE	Intake Valve Seat and Cylinder Head			.0066T .010T	(A)
	A	O.D. Intake Seat	2.0965 2.0975			
	A1-B-D	O.D. Intake Seat	1.9265 1.928			
	B1-C-J-S-T-Y-BD-BE	O.D. Intake Seat	2.0815 2.083			
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	O.D. Intake Seat	2.2885 2.290			
	A	I.D. Intake Seat Hole in Cylinder Head	2.087 2.089			
	A1-B-D	I.D. Intake Seat Hole in Cylinder Head	1.918 1.920			
	B1-G-J-S-T-Y-BD-BE	I.D. Intake Seat Hole in Cylinder Head	2.073 2.076			
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	I.D. Intake Seat Hole in Cylinder Head	2.280 2.282			
613	ALL	Exhaust Valve Guide in Cylinder Head			.001T .0025T	(A)
613	A-B-D-J	O.D. Exhaust Valve Guide	.5933 .5938			
	Y	O.D. Exhaust Valve Guide	.6267 .6272			
	G-J-S-T-AF-BD-BE	O.D. Exhaust Valve Guide	.6633 .6638			
	S1	O.D. Exhaust Valve Guide	.6953 .6958			

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II –CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
613	A-B-D-G-J	I.D. Exhaust Valve Guide Hole in Cylinder Head	.5913 .5923			
	Y	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6247 .6257			
	G-J-S-T-AF-BD	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6613 .6623			
	S1	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6933 .6943			
614	ALL	Intake Valve Guide and Cylinder Head			.0010T .0025T	
	ALL	O.D. Intake Valve Guide	.5933 .5938			
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	.5913 .5923			
615	A-B-D	Exhaust Valve Stem and Valve Guide			.0020L .0038L	(A)
	A1-G-J-S-T-BD-BE	Exhaust Valve Stem and Valve Guide (Parallel Valve Heads)			.0040L .0060L	(A)
	Y	Exhaust Valve Stem and Valve Guide			.0035L .0053L	(A)
	S1-S2-S3-S5-S6-S11-S12-T2-T3-AF	Exhaust Valve Stem and Valve Guide (Angle Valve Heads)			.0037L .0050L	(A)
	S7-S9-S10-S13-S14	Exhaust Valve Stem and Valve Guide (Angle Valve Heads - Helicopter)			.0035L .0055L	(A)
	A-B-D	O.D. Exhaust Valve Stem	.4012 .4020			
	A1	O.D. Exhaust Valve Stem	.4320 .4333			
	G-J-Y	O.D. Exhaust Valve Stem	.4332 .4340			
	G-J-S-T-BD-BE	O.D. Exhaust Valve Stem (Parallel Valve Heads)	.4932 .4945	.4915		
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	O.D. Exhaust Valve Stem (Angle Valve Heads)	.4955 .4965	.4937 Service allowable limits of .4937 or .4915 is applicable only to inconel or nimonic valves		
	A-B-D	Finished I.D. Exhaust Valve Guide	.4040 .4050			
	A1-G-J	Finished I.D. Exhaust Valve Guide	.4370 .4380			
	Y	Finished I.D. Exhaust Valve Guide	.4375 .4385			

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
615	G-J-S-T-BD-BE	Finished I.D. Exhaust Valve Guide (Parallel Valve Heads)	.4985 .4995			
	S1-S2-S3-S5-S6-S11-S12-S13-S14-T2-T3-AF	Finished I.D. Exhaust Valve Guide (Angle Valve Heads)	.4995 .5005			
	S7-S9-S10	Finished I.D. Exhaust Valve Guide (Angle Valve Heads – Helicopter)	.5000 .5010			
	½ inch diameter exhaust valves may have exhaust valve guides that are .003 in. over the maximum inside diameter limit, anytime up to 300 hours of service. After 300 hours of service, inside diameter of exhaust valve guide may increase .001 in. during each 100 hours of operation up to the recommended overhaul time for the engine, or not to exceed .015 inch over the basic I.D. See latest edition of Service Instruction No. 1009 for recommended overhaul time.					
616	ALL	Intake Valve Stem and Valve Guide			.0010L .0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022 .4030	.4010		
616	ALL	Finished I.D. Intake Valve Guide	.4040 .4050			
617	ALL	Intake and Exhaust Valve and Valve Cap Clearance (Rotator Type Small Dia. Head)			.000 .004L	006L
618	A-B	Solid Tappet Clearance (After Engine in Run)			.006 .012	
	A	Dry Tappet Clearance (Steel Push Rods)			.002 .008	
	D-G-J-S-T-Y-AF-BD-BE	Dry Tappet Clearance			.028 .080	
619	A	Valve Rocker Shaft and Cylinder Head (No Bushing)			.0001L .0013L	.0025L
619	B-D-J-S-T-Y	Valve Rocker Shaft and Valve Rocker Bushing (Parallel Valve Heads)			.0001L .0013L	.0025L
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	Valve Rocker Shaft and Valve Rocker Bushing (Angle Valve Heads)			.0001L .0013L	.0025L
619	A	Finished I.D. of Valve Rocker Shaft Bores in Cylinder Head (No Bushings)	.6246 .6261	.6270		
619	B-D-G-J-S-T-Y	Finished I.D. of Valve Rocker Shaft (Bushing) in Cylinder Head (Parallel Valve Heads)	.6246 .6261	.6270		
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	Finished I.D. of Valve Rocker Shaft (Bushing) in Cylinder Head (Angle Valve Heads)	.6246 .6261	.6270		
620	ALL	Valve Rocker Shaft and Valve Rocker Bushing			.0007L .0017L	.004L
	ALL	Finished I.D. of Rocker Arm Bushing	.6252 .6263	.6270		
	ALL	O.D. of Valve Rocker Shaft	.6241 .6245	.6231		

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

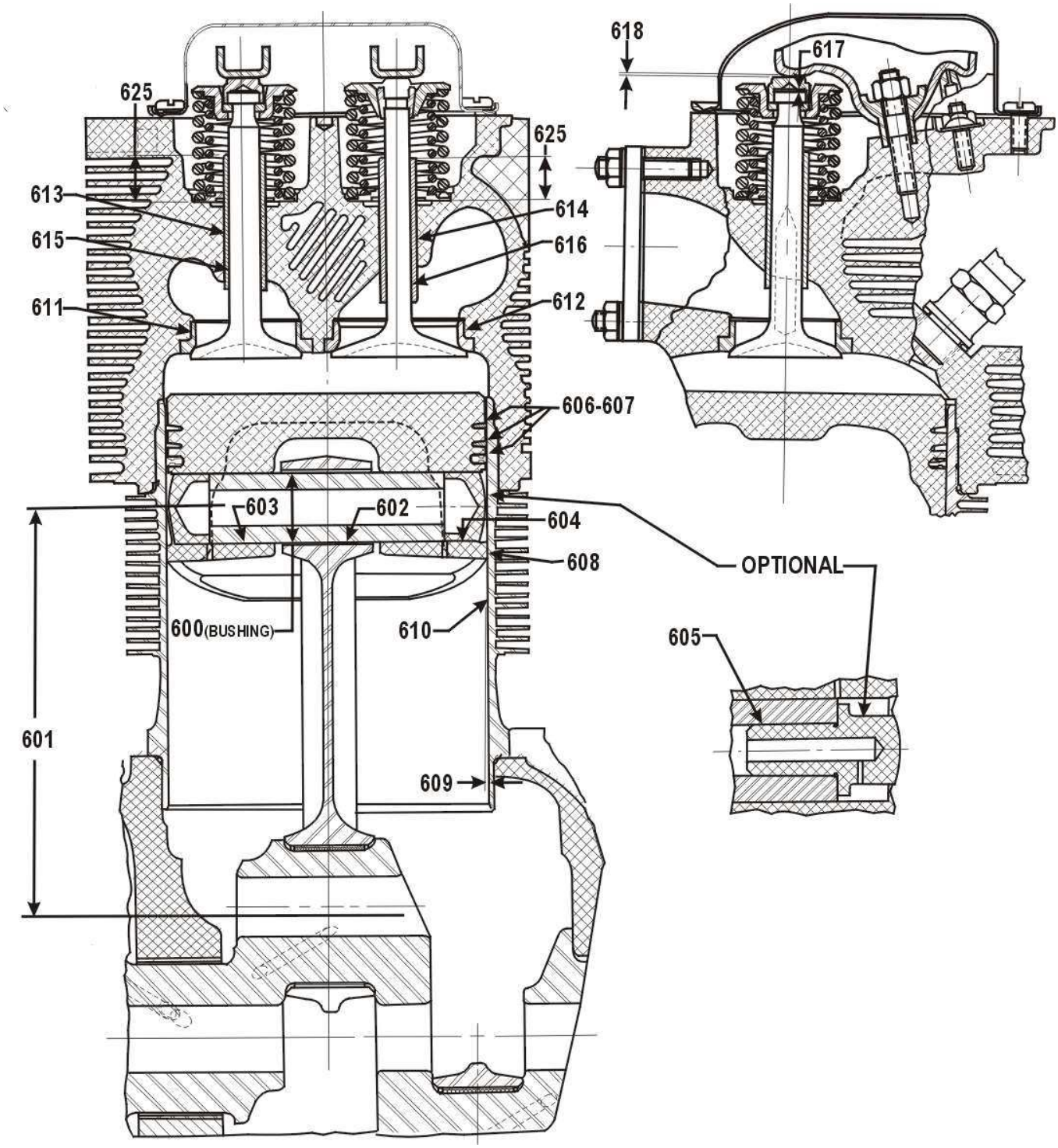
SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
621	ALL	Valve Rocker Bushing and Valve Rocker	Bushing Must Be Burnished In Place			
622	ALL	Valve Rocker Shaft Bushing and Cylinder Head			.0022T .0038T	(A)
	ALL	Valve Rocker Shaft Bushing Hole in Cylinder Head	.7380 .7388			
623	A-B-D-G-J-S-T-Y	Valve Rocker and Cylinder Head - Side Clearance (Parallel Valve Heads)			.005L .013L	.016L
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	Valve Rocker and Cylinder Head – Side Clearance (Angle Valve Heads)			.002L .020L	.024L
624	A-B-J	Push Rod and Ball End			.0005T .0025T	(A)
625	A	Intake and Exhaust Valve Guide Height	.705 .725			
	ALL	Intake Valve Guide Height (Parallel Valve Heads)	.705 .725			
	ALL EXCEPT O-235	Exhaust Valve Guide height (Parallel Valve Heads)	.765 .785			
	ALL	Intake and Exhaust Valve Guide height (Angle Valve Heads)	.914 .954			
		MEASURE VALVE GUIDE HEIGHT FROM THE VALVE SPRING SEAT COUNTERBORE IN THE CYLINDER HEAD TO THE TOP OF VALVE GUIDE.				

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS

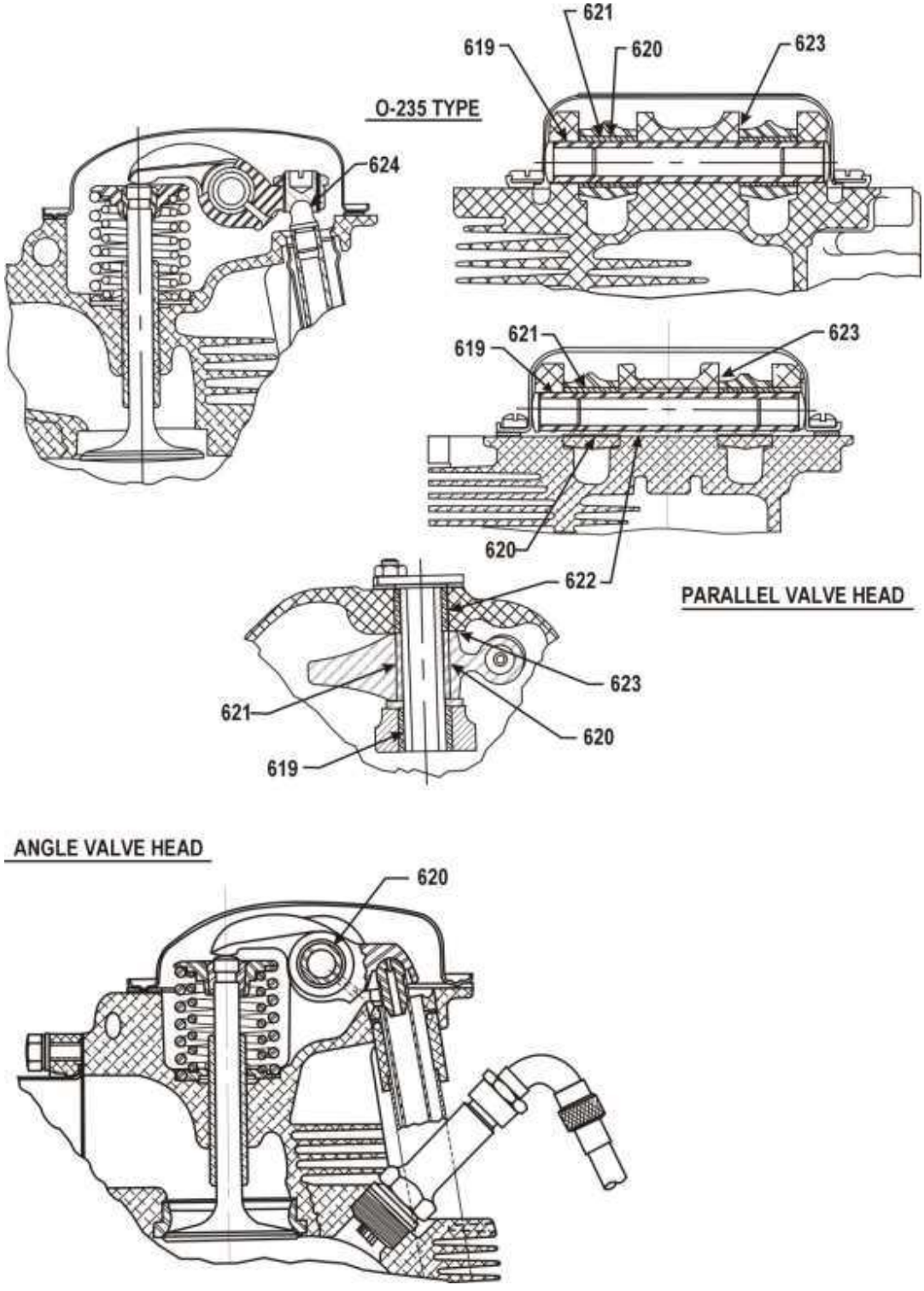


Cylinder, Piston and Valve Components

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS



Cylinder, Piston and Valve Components

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PUMP						
700	ALL	Oil Pump Drive Shaft and Oil Pump Body or Cover			.0010L .0025L	.004L
701	A-B-D-G-J-S-T-AF	Oil Pump Drive Shaft and Accessory Housing			.0015L .0030L	.006L
	Y	Oil Pump Drive Shaft and Accessory Case			.0015L .0030L	.006L
	BD-BE	Oil Pump Drive Shaft and Crankcase			.0010L .0025L	.004L
702	S-T-AF (DUAL MAGNETO)	Oil Pump Drive Shaft – End Clearance			.015L .050L	.065L
	BD-BE	Oil Pump Drive Shaft – End Clearance			.017L .037L	.047L
703	A-B-D-G-J-S-T-Y-AF	Oil Pump Impellers – Diameter Clearance			.002L .006L	.008L
	BD-BE	Oil Pump Impellers – Diameter Clearance			.0035L .0075L	.009L
704	ALL (EXCEPT BD-BE)	Oil Pump Impellers – Side Clearance			.002L .0045L	.005L
	BD-BE	Oil Pump Impellers – Side Clearance			.003L .005L	.006L
	AS APPLICABLE	Width of Oil Pump Impellers	.622 .624	.621		
	AS APPLICABLE	Width of Oil Pump Impellers	.747 .749	.746		
	AS APPLICABLE	Width of Oil Pump Impellers	.995 .997	.994		
	BD-BE	Width of Oil Pump Impellers	.622 .623	.620		
705	S-T-AF (DUAL MAGNETO)	Oil Pump Impeller and Idler Shaft			.0010L .0025L	.004L
	A-B-D-G-J-S-T-Y-AF	Oil Pump Impeller and Idler Shaft (Alum. and Sinterbond)			.001T .003T	(A)
	BD-BE	Oil Pump Impeller and Idler Shaft			.002T .004T	(A)
706	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and Oil Pump Body			.0005L .0020L	.003L
	BD-BE	Oil Pump Idler Shaft and Oil Pump Body			.0010L .0025L	.003L
	S-T-AF (DUAL MAGNETO)	Oil Pump Idler Shaft and Oil Pump Body			.0000 .0015T	(A)
707	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and Accessory Housing			.0010L .0025L	.0035L
	BD-BE	Oil Pump Idler Shaft and Crankcase			.0010L .0025L	.0035L
708	G2-S2	Scavenge Pump Drive Shaft and Adapter			.0010L .0025L	.004L
709	G2-S2	Scavenge Pump – End Clearance			.000 .045L	.060L

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
SCAVENGE PUMP						
710	G2-S2	Scavenge Pump Impellers – Diameter Clearance			.007L .011L	.014L
711	G2-S2	Scavenge Pump Impellers – Side Clearance			.003L .005L	.006L
	G2-S2	Width of Impellers	1.496 1.498	1.495		
712	G2-S2	Scavenge Pump Impellers and Idler Shaft			.0010L .0025L	.004L
713	G2-S2	Scavenge Pump Body and Idler Shaft			.0000 .0015T	(A)
714	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump Drive and Adapter			.0010L .0025L	.004L
715	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump Shaft and Adapter			.0010L .0020L	.0035L
716	S-T4-AF (WIDE DECK)	Gerotor Pump – Rotor – Side Clearance			.0015L .003L	.004L
717	S-T4-AF (WIDE DECK)	Gerotor Pump Housing and Adapter			.0005L .0020L	(A)
718	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump – End Clearance			.0055L .0365L	.0415L
	T4 (DUAL MAGNETO)	Turbocharger Scavenge Pump – End Clearance			.0105L .0395L	.0445L
FUEL PUMP						
719	A-B-D-G-J-S-T	AC Fuel Pump Plunger and Accessory Housing			.0015L .003L	.005L
720	J-S-T-AF	Crankshaft Idler Gear and Crankshaft Idler Gear Shaft			.001L .003L	.005L
721	S-T-AF (DUAL MAGNETO)	Crankshaft Idler Gear Shaft and Accessory Housing			.0020L .0035L	.0065L
	S-T-AF (DUAL MAGNETO)	Crankshaft Idler Gear Shaft and Crankcase			.0020L .0035L	.0065L
722	S-T-AF	AN Fuel Pump Idler Gear and Shaft			.001L .003L	.005L
723	S-T-AF (DUAL MAGNETO)	AN Fuel Pump Idler Shaft and Accessory Housing and Crankcase			.0020L .0035L	.0065L
	S-T-AF (DUAL MAGNETO)	AN Fuel Pump Idler Shaft and Crankcase			.0020L .0035L	.0065L
724	A-B	Crankshaft Idler Gear – End Clearance			.003L .043L	.058L
	G-J-S-Y	Crankshaft Idler Gear – End Clearance			.005L .040L	.055L
	T-AF	Crankshaft Idler Gear – End Clearance			.007L .037L	.052L
	S (DUAL MAGNETO)	Crankshaft Idler Gear – End Clearance			.020L .030L	.040L
	T-AF (DUAL MAGNETO)	Crankshaft Idler Gear – End Clearance			.015L .038L	.046L

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
FUEL PUMP (CONT.)						
725	S	AN Fuel Pump Idler Gear – End Clearance			.010L .045L	.055L
	T-AF	AN Fuel Pump Idler Gear – End Clearance			.002L .018L	.024L
	S-T-AF (DUAL MAGNETO)	AN Fuel Pump Idler Gear – End Clearance			.015L .038L	.045L
726	S-T-Y-AF	AN Fuel Pump Drive Shaft Gear and Adapter			.0010L .0025L	.004L
727	S	AN Fuel Pump Drive Shaft Gear – End Clearance			.035L .069L	.079L
	T-AF	AN Fuel Pump Drive Shaft Gear – End Clearance			.044L .081L	.091L
	T-AF (DUAL MAGNETO)	AN Fuel Pump Drive Shaft Gear – End Clearance			.035L .073L	.083L
	Y	AN Fuel Pump Drive Shaft Gear – End Clearance			.000L .067L	.075L
GOVERNOR & HYDRAULIC PUMP						
728	T-AF (NARROW DECK)	Front Governor Drive Idler Shaft (Both Ends) and Crankcase			.0010L .0025L	.004L
729	G1-G2-S2-S4-S6-T-AF (WIDE DECK)	Front Governor Idler Gear and Shaft			.0010L .0025L	.004L
730	BD-BE	Front Governor Drive Gear and Crankcase			.0010L .0025L	.004L
	BD-BE	Front Governor Drive Gear and Camshaft			.0005L .0025L	.004L
731	G1-G2-S-T-AF	Front Governor Gear and Crankcase			.0010L .0025L	.004L
	BD	Front Governor Gear and Crankcase			.0010L .0030L	.004L
732	G1-G2-S-T-AF	Front Governor Gear – End Clearance			.008L .016L	.021L
	BD-BE	Front Governor Gear – End Clearance			.0045L .0165L	.021L
733	G-J-S	Rear Governor Gear and Adapter			.0010L .0025L	.005L
	G-S (DUAL MAGNETO)	Rear Governor Gear and Accessory Housing			.0010L .0025L	.005L
734	G-J-S	Rear Governor Gear – End Clearance			.002L .024L	.034L
	G-S (DUAL MAGNETO)	Rear Governor Gear – End Clearance			.002L .037L	.044L
735	T-AF	Hydraulic Pump Gear and Adapter			.0010L .0025L	.004L
	T-AF (DUAL MAGNETO)	Hydraulic Pump Gear and Accessory Housing			.0010L .0025L	.004L
736	T-AF	Hydraulic Pump Gear – End Clearance			.010L .066L	.076L
	T-AF (DUAL MAGNETO)	Hydraulic Pump Gear – End Clearance			.007L .032L	.039L

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
VACUUM & TACHOMETER						
737	A-B-G-J-S-T-Y-AF	Vacuum Pump Gear and Adapter			.0010L .0030L	.0045L
737	S-T-AF (DUAL MAGNETO)	Vacuum Pump Gear and Accessory Housing			.0010L .0025L	.004L
737	D	Vacuum Pump Gear and Accessory Housing			.0010L .0025L	.006L
738	A-B-G-J-S-T-AF	Vacuum Pump Gear – End Clearance			.010L .057L	.075L
	D	Vacuum Pump Gear – End Clearance			.003L .020L	.030L
	Y	Vacuum Pump Gear – End Clearance			.000 .067L	.075L
	S (DUAL MAGNETO)	Vacuum Pump Gear – End Clearance			.012L .044L	.055L
	T-AF (DUAL MAGNETO)	Vacuum Pump Gear – End Clearance			.017L .039L	.050L
739	A-B-Y	Tachometer Drive Shaft and Adapter			.0015L .0035L	.006L
	BD-BE	Tachometer Drive Shaft and Adapter			.0010L .0050L	.0065L
739	D-G-J-S-T-AF	Tachometer Drive Shaft and Accessory Housing			.0015L .0035L	.006L
740	G-J-S (DUAL DRIVE)	Vacuum Pump Gear and Adapter			.0010L .0025L	.004L
741	G-J-S (DUAL DRIVE)	Vacuum Pump Gear – End Clearance			.000 .017L	.027L
742	G-J-S (DUAL DRIVE)	Idler Gear and Shaft			.0010L .0030L	.005L
743	G-J-S (DUAL DRIVE)	Idler Gear – End Clearance			.021L .041L	.060L
744	G-J-S (DUAL DRIVE)	Propeller Governor Gear and Adapter			.0013L .0028L	.005L
	G-J-S (DUAL DRIVE)	Hydraulic Pump Gear and Adapter			.0013L .0028L	.005L
745	G-J-S (DUAL DRIVE)	Propeller Governor or Hydraulic Pump – End Clearance			.000 .054L	.074L
MAGNETO, GENERATOR, STARTER						
746	T	Magneto Bearing and Gear			.0005T .0001L	.0005L
746	D	Magneto Bearing and Gear			.0008T .0001L	.0005L
747	T	Magneto Bearing and Crankcase			.0002T .0007L	(A)
747	D	Magneto Drive Bearing and Adapter			.0006T .0008T	(A)
748	S7	Magneto Bearing and Gear			.0001T .0010T	(A)

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

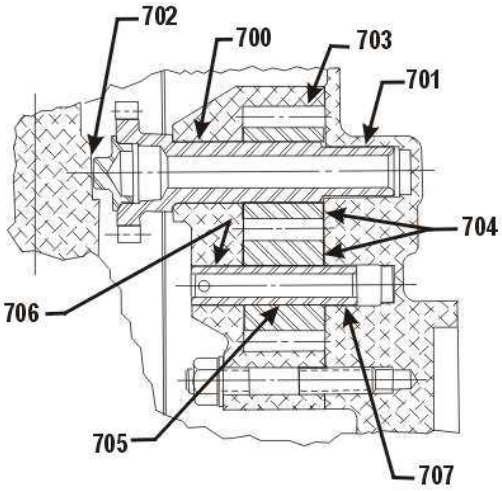
SECTION III – GEAR TRAIN –

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
MAGNETO, GENERATOR, STARTER (CONT.)						
749	S7	Magneto Bearing and Adapter			.000 .0012L	.0015L
750	S-T-AF (DUAL MAGNETO)	Magneto Drive Gear and Crankcase			.0010L .0025L	.003L
751	S-T-AF (DUAL MAGNETO)	Magneto Drive Gear – End Clearance			.005L .073L	.083L
752	AF	Magneto Drive Gear and Shaft			.001L .003L	.005L
753	BD-BE	Magneto Drive Gear and Crankcase Bushing			.001L .003L	.005L
754	Y	Magneto Shaft Gear and Magneto Case			.001L .003L	.005L
755	Y	Magneto Shaft Gear and Support Assembly			.001L .003L	.005L
756	Y	Magneto Shaft Gear and Accessory Drive Shaft Gear – End Play			.0075L .0125L	.015L
757	Y	Accessory Drive Shaft Gear and Support Assembly			.001L .003L	.005L
758	S	Magneto Gear and Bushing (S4LN-21 and S4LN-1227)			.0005L .0020L	.0035L
	T	Magneto Gear and Bushing (S6LN-21 & S6LN-1227)			.0015L .0035L	.0055L
	T-AF (DUAL MAGNETO)	Magneto Gear and Bushing			.0015L .0035L	.0055L
7095	BD-BE	Bushing – Magneto Drive and Crankcase			.0025T .0045T	(A)
759	D	Generator Gear Bushing and Generator Gear			.0020T .0035T	(A)
760	D	Generator Gear Bushing and Generator Drive Coupling Adapter			.001L .0028L	.005L
761	D	Bendix Drive Gear Bushing and Crankcase			.0005T .0025T	(A)
762	D	Bendix Drive Gear and Bendix Drive Gear Bushing			.0010L .0025L	.005L
763	D	Bendix Drive Shaft and Bendix Drive Housing			.003L .005L	.010L
764	D	Bendix Drive Shaft – End Clearance			.000 .0059L	.080L

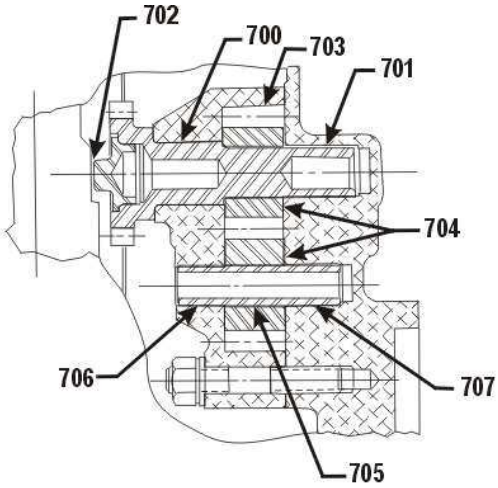
SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

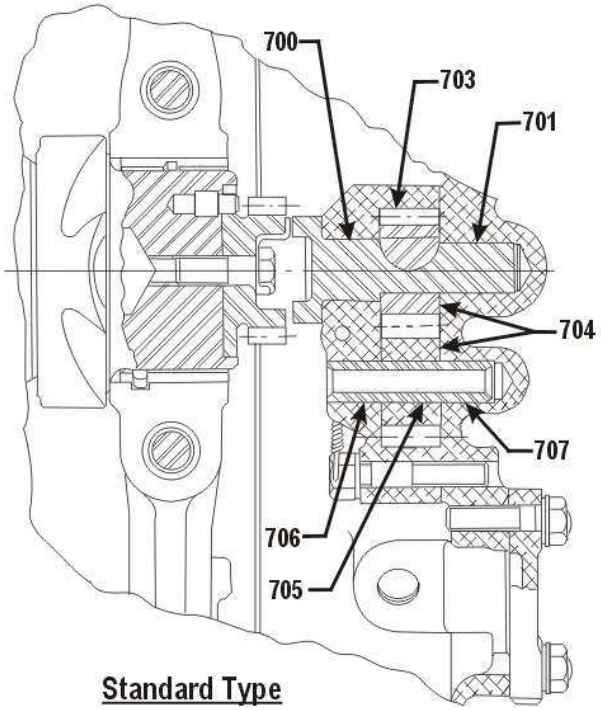
SECTION III – GEAR TRAIN



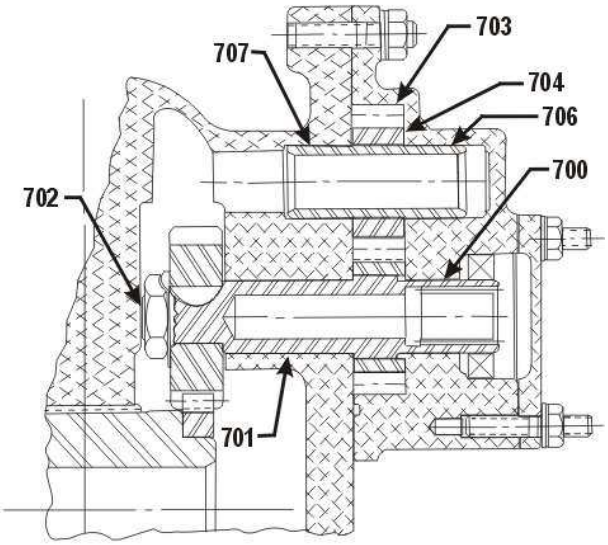
6 CYL-DUAL MAG



4 CYL-DUAL MAG



Standard Type



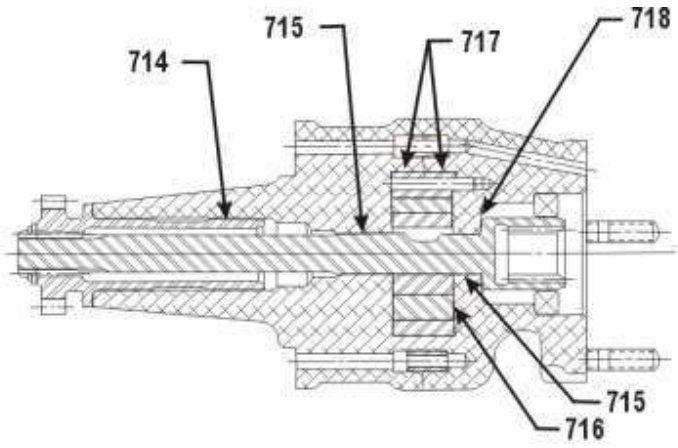
O-320-H,O,LO-360-E

Oil Pumps

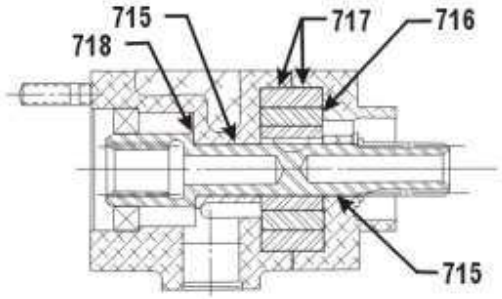
SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

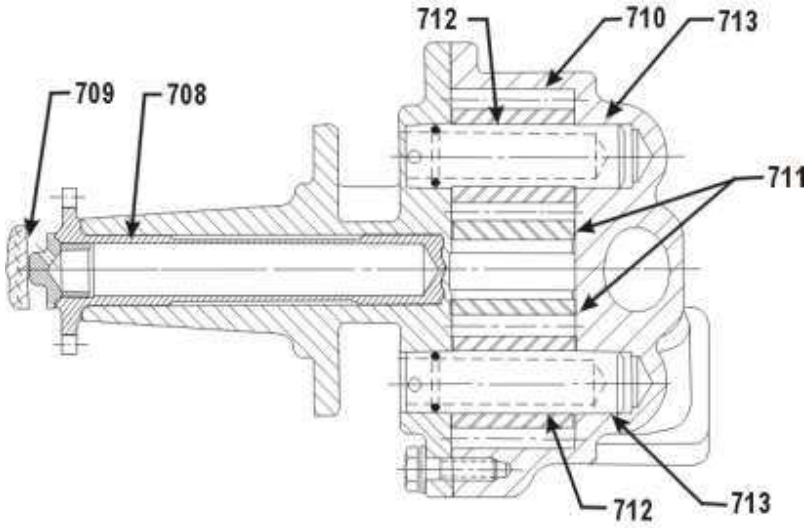
SECTION III – GEAR TRAIN



TURBO SCAVENGE PUMP & HYD PUMP (TIO-540-C)
TURBO SCAVENGE PUMP & GOV. (TIO-360)



DUAL MAG TURBO SCAVENGE PUMP & HYD. PUMP



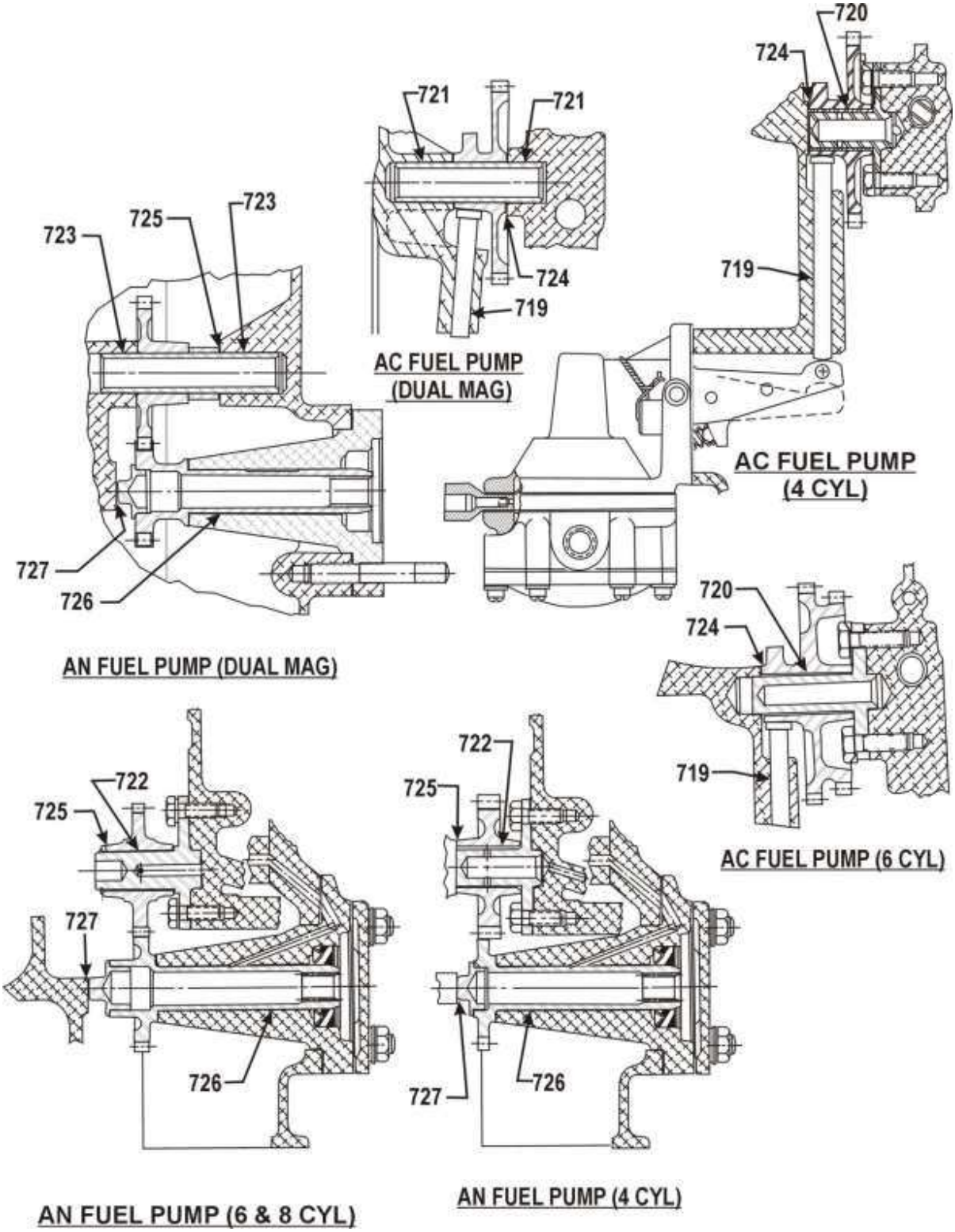
SCAVENGE PUMP AIO 320 & AIO-360

Scavenge Pumps

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

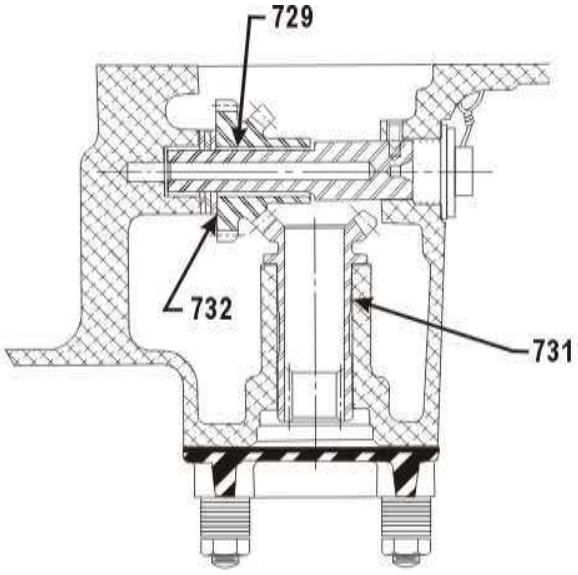


Fuel Pumps

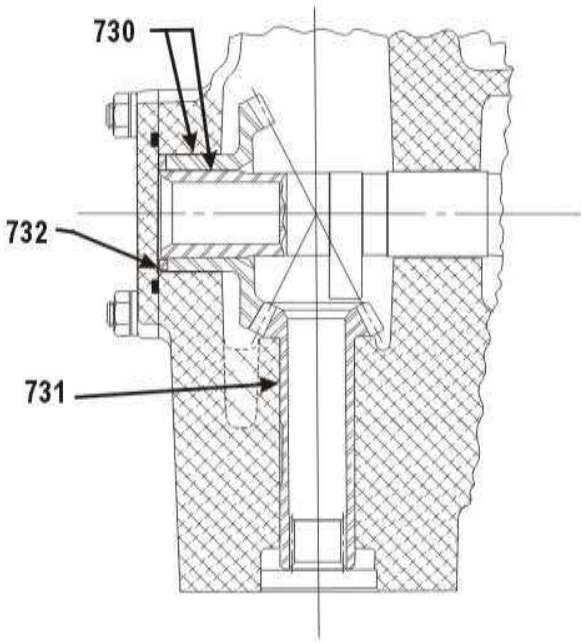
SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

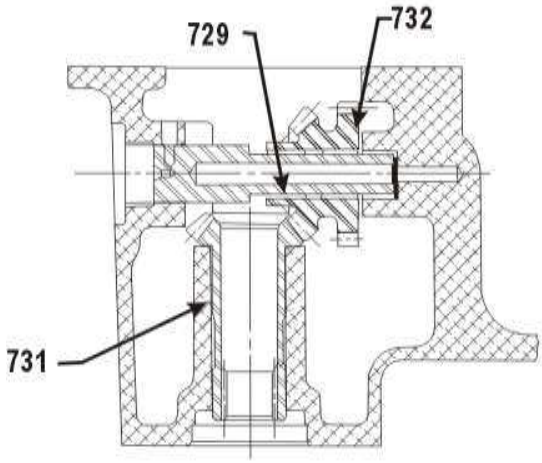
SECTION III – GEAR TRAIN



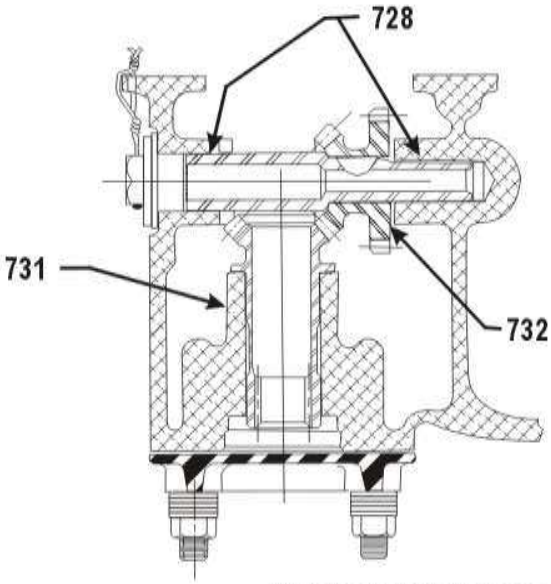
4 & 8 (WIDE DECK)



O-320-H O,LO-360-E



6 CYL. (WIDE DECK) (2200 LB)



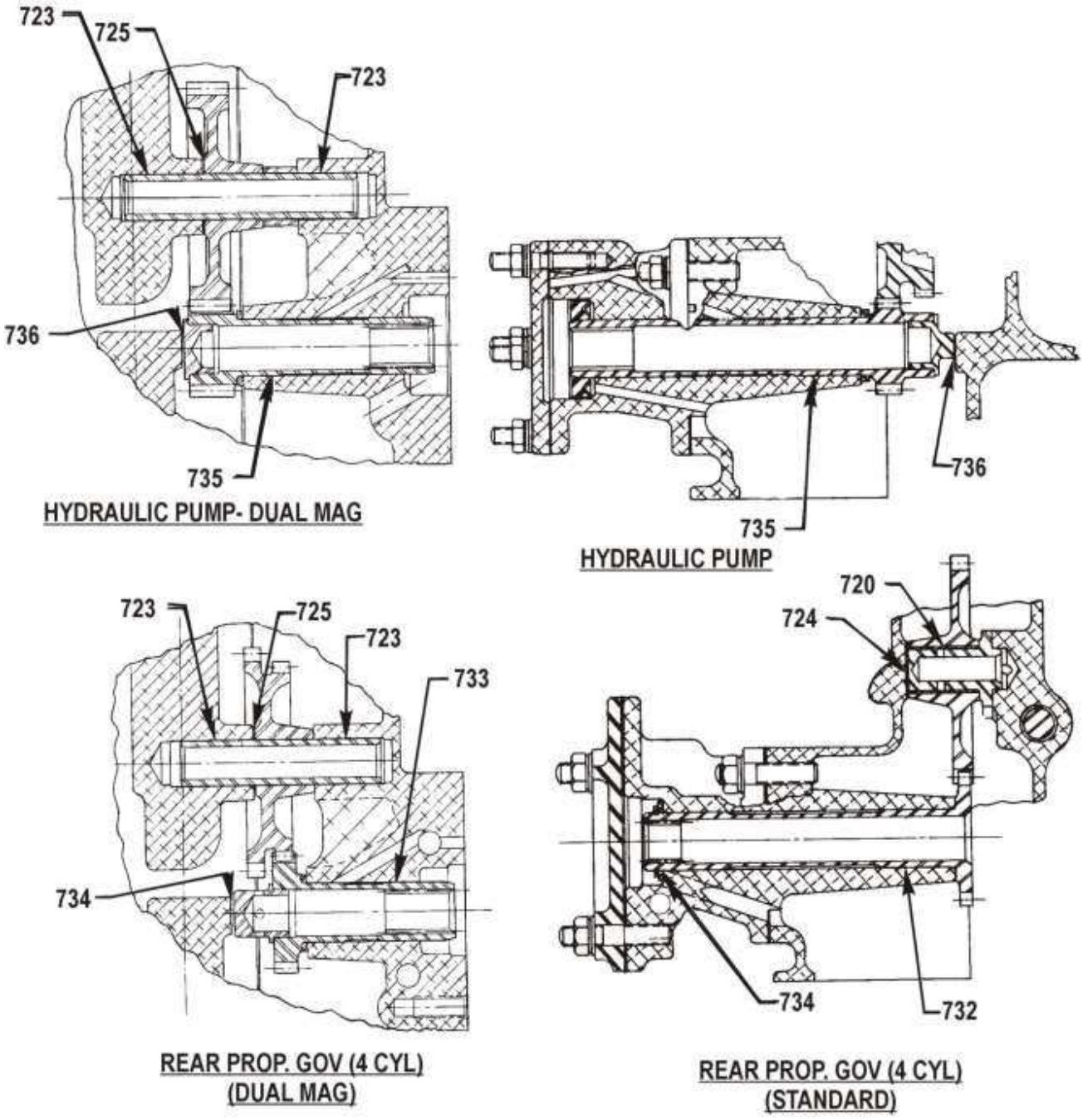
NARROW DECK (6 & 8 CYL.)

Front Governor

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

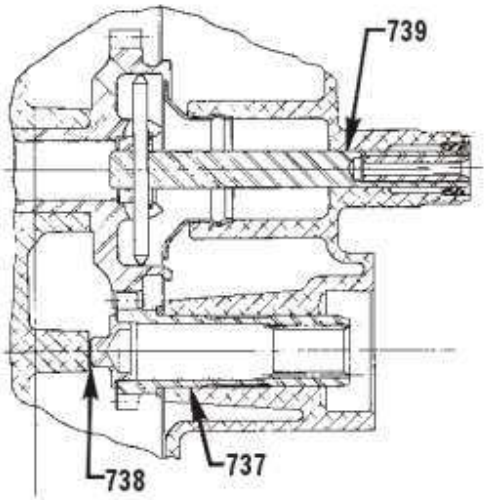


Rear Governor and Hydraulic Pumps

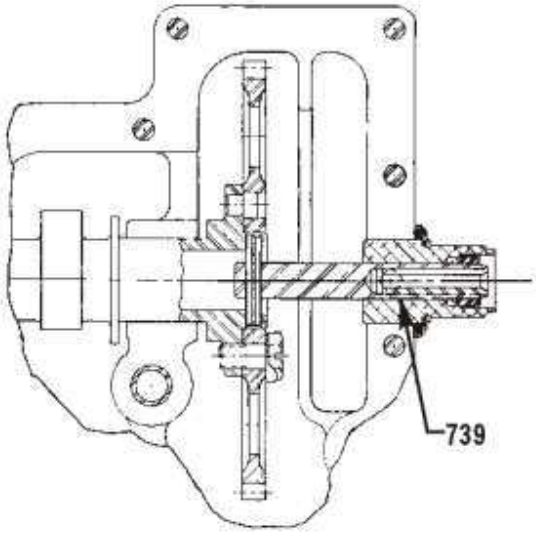
SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

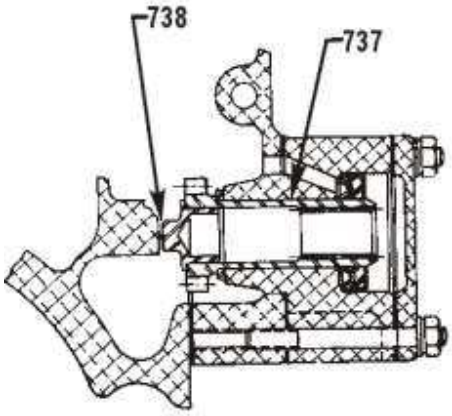
SECTION III – GEAR TRAIN



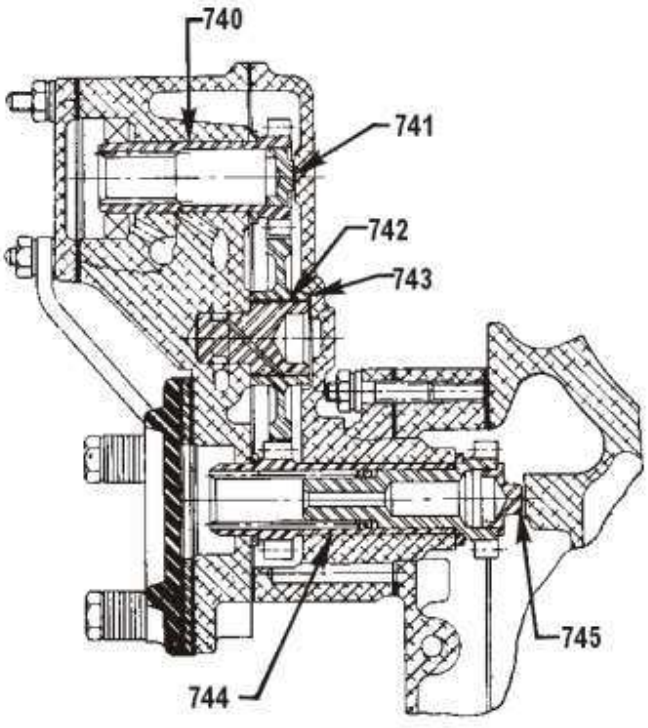
VACUUM PUMP & TACHOMETER



TACHOMETER DRIVE



VACUUM PUMP



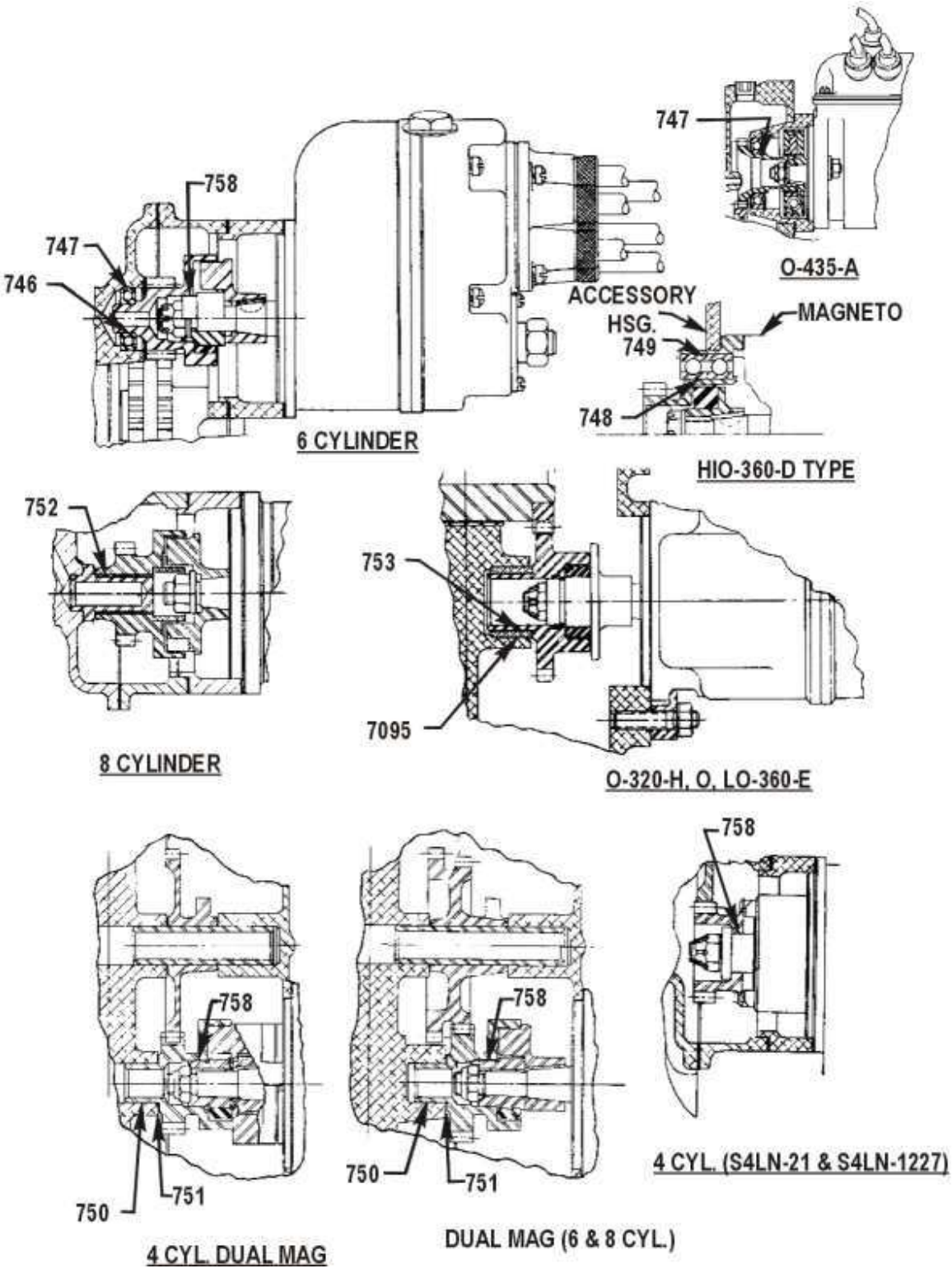
DUAL DRIVE (VACUUM PUMP & PROP GOV.)
OR (VACUUM PUMP & HYD. PUMP)

Tachometer Drives, Vacuum and Hydraulic Pump Drives

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

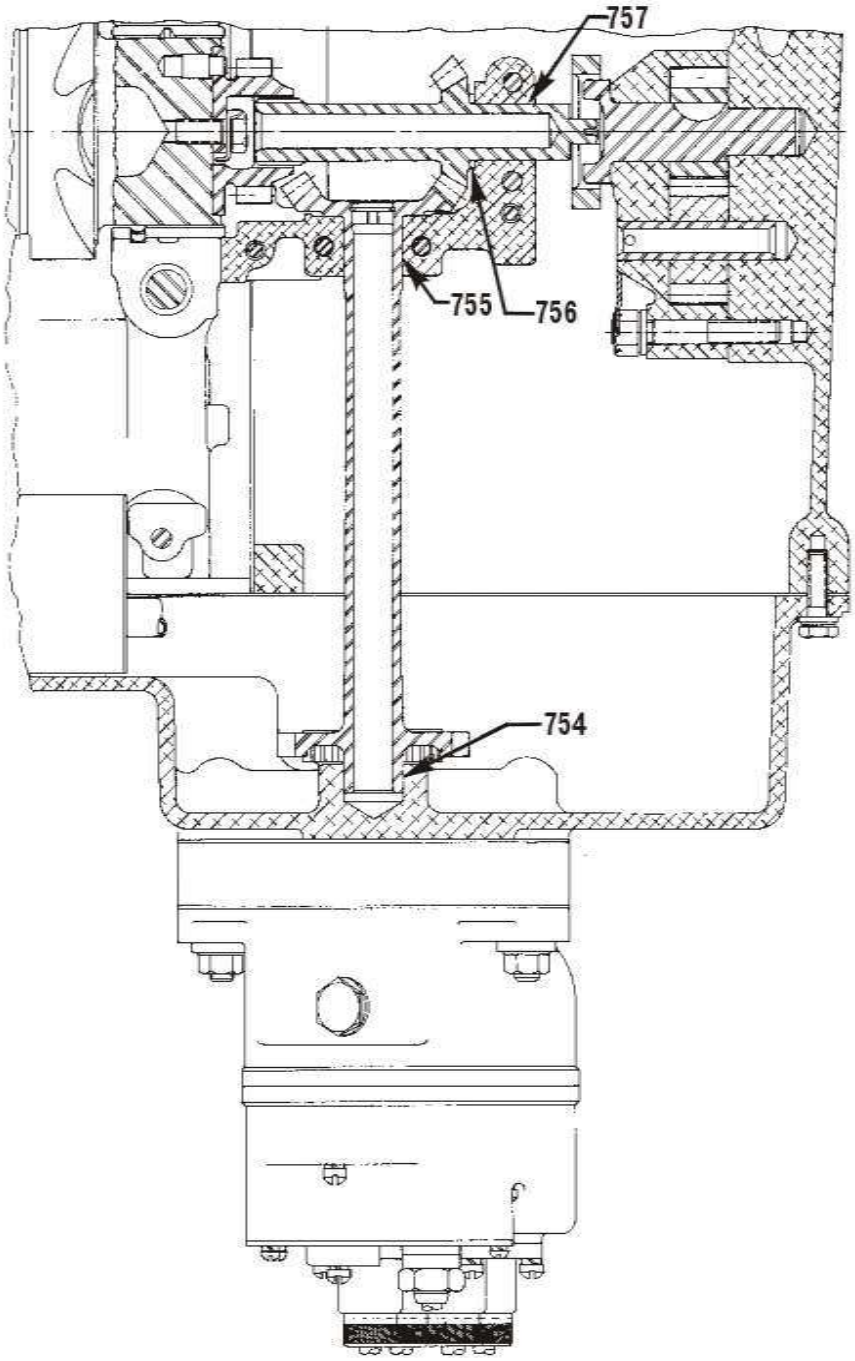


Accessory Drives: Magnetos Generator and Starters

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN



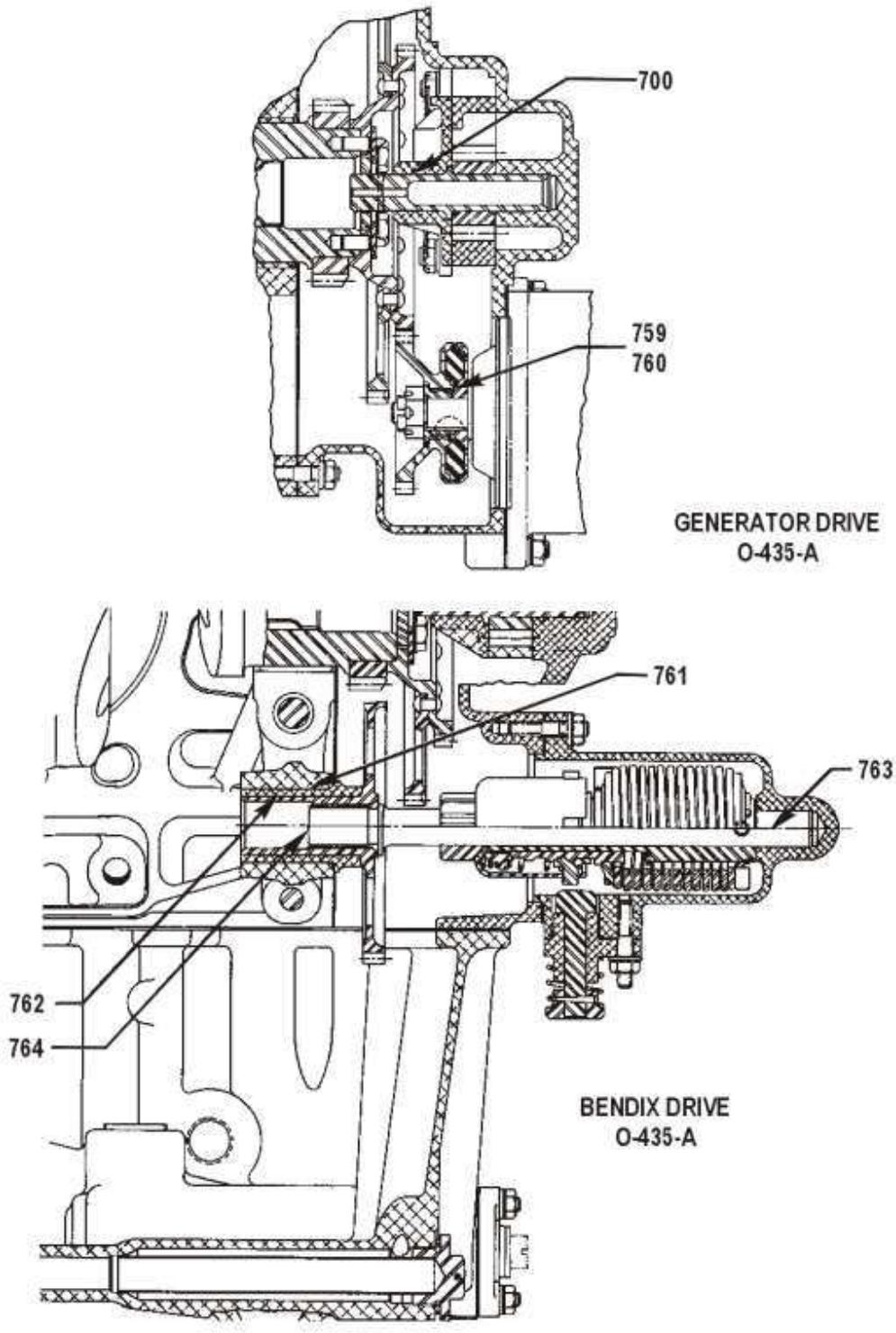
VO, IVO-360

Accessory Drives: Magnetos

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN



Generator and Bendix Drive

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
800	A-B-G-J-S-T-Y-AF	Camshaft and Vacuum Pump – Backlash			.004 .015	.020
801	BD-BE	Camshaft and Vacuum and Oil Pump Drive – Backlash			.006 .014	.020
802	Y	Camshaft and Fuel Pump – Backlash			.004 .015	.020
803	A-B-G-J-S-T-Y-AF	Camshaft and Crankshaft Idler – Backlash			.004 .015	.020
804	A-B-G-J-S-T-Y-AF	Crankshaft and Crankshaft Idler – Backlash			.004 .015	.020
805	A-B-G-J-S-T-AF	Magneto Drive and Crankshaft Idler – Backlash			.004 .015	.020
806	BD-BE	Magneto Drive and Crankshaft Gear – Backlash			.006 .014	.020
807	BD-BE	Crankshaft Gear and Vacuum and Oil Pump Drive – Backlash			.006 .014	.020
808	A-B-D-G-J-S-T-Y-AF	Oil Pump Impellers – Backlash			.008 .015	.020
	BD-BE	Oil Pump Impellers – Backlash			.008 .012	.020
809	S-T-AF (DUAL MAGNETO)	Oil Pump Drive and Crankshaft Idler – Backlash			.004 .015	.020
810	Y	Magneto and Magneto Shaft Gear – Backlash			.004 .015	.020
811	Y	Accessory Drive Shaft Gear and Magneto Driven Shaft Gear – Backlash			.003 .005	.012
812	Y	Crankshaft Gear and Accessory Drive Shaft Gear – Spline Backlash			.002 .005	.015
813	G-J-S (DUAL DRIVE)	Camshaft and Propeller Governor or Hydraulic Pump – Backlash			.004 .015	.020
814	G-J-S (DUAL DRIVE)	Governor or Hydraulic Pump Drive and Drive Gear – Spline Backlash			.0013 .0073	.010
815	G-J-S (DUAL DRIVE)	Governor or Hydraulic Pump and Idler – Backlash			.004 .015	.020
816	G-J-S (DUAL DRIVE)	Vacuum Pump and Idler – Backlash			.004 .015	.020
817	S-T-AF	AN Fuel Pump Idler and Crankshaft Idler – Backlash			.004 .015	.020
818	S-T-AF	AN Fuel Pump Idler and Fuel Pump Drive – Backlash			.004 .015	.020
819	S-T-AF (DUAL MAGNETO)	Crankshaft Gear and AN Fuel Pump Idler – Backlash			.004 .015	.020
820	T-AF	Hydraulic Pump and Crankshaft Idler – Backlash			.004 .015	.020

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

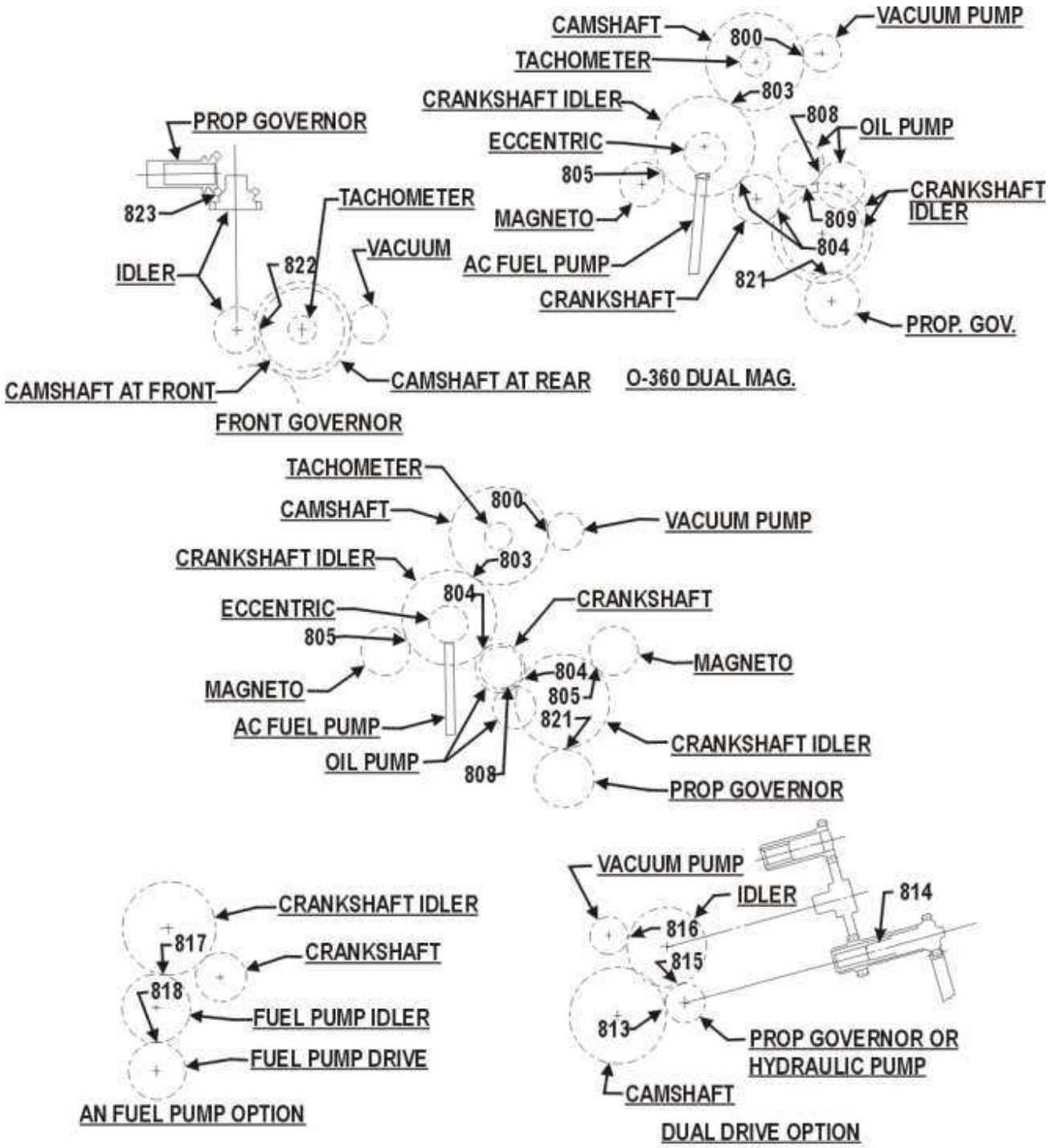
SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
821	G-J-S	Propeller Governor Drive and Crankshaft Idler – Backlash (Rear Governor)			.004 .015	.020
822	G1-G2-S2-S4-S6-T-AF	Propeller Governor Idler and Camshaft – Backlash (Front Governor)			.004 .015	.020
823	G1-G2-S2-S4-S6-S11-T-AF	Propeller Governor Drive and Idler – Backlash (Bevel Gears) (Front Governor)			.004 .008	.015
824	BD-BE	Propeller Governor Drive and Camshaft – Backlash (Bevel Gears) (Front Governor)			.003 .011	.015
825	D	Crankshaft Timing Gear and Camshaft Gear – Backlash			.004 .015	.020
826	D	Camshaft Gear and Generator Gear – Backlash			.004 .015	.020
827	D	Crankshaft Gear and Generator Gear – Backlash			.004 .015	.020
828	D	Magneto Coupling Spline – Backlash			.001 .005	.0075
829	D	Vacuum Pump Gear and Vacuum Pump Drive Gear – Backlash			.004 .015	.020
830	D	Starter Drive and Bendix Drive Gear – Backlash			.004 .015	.020
831	D	Bendix Drive Shaft Spline and Bendix Drive Gear Spline – Backlash			.001 .006	.015
832	S	Injector Pump Idler Gear and Injector Pump Drive Shaft Gear – Backlash			.004 .015	.020

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION IV – BACKLASH

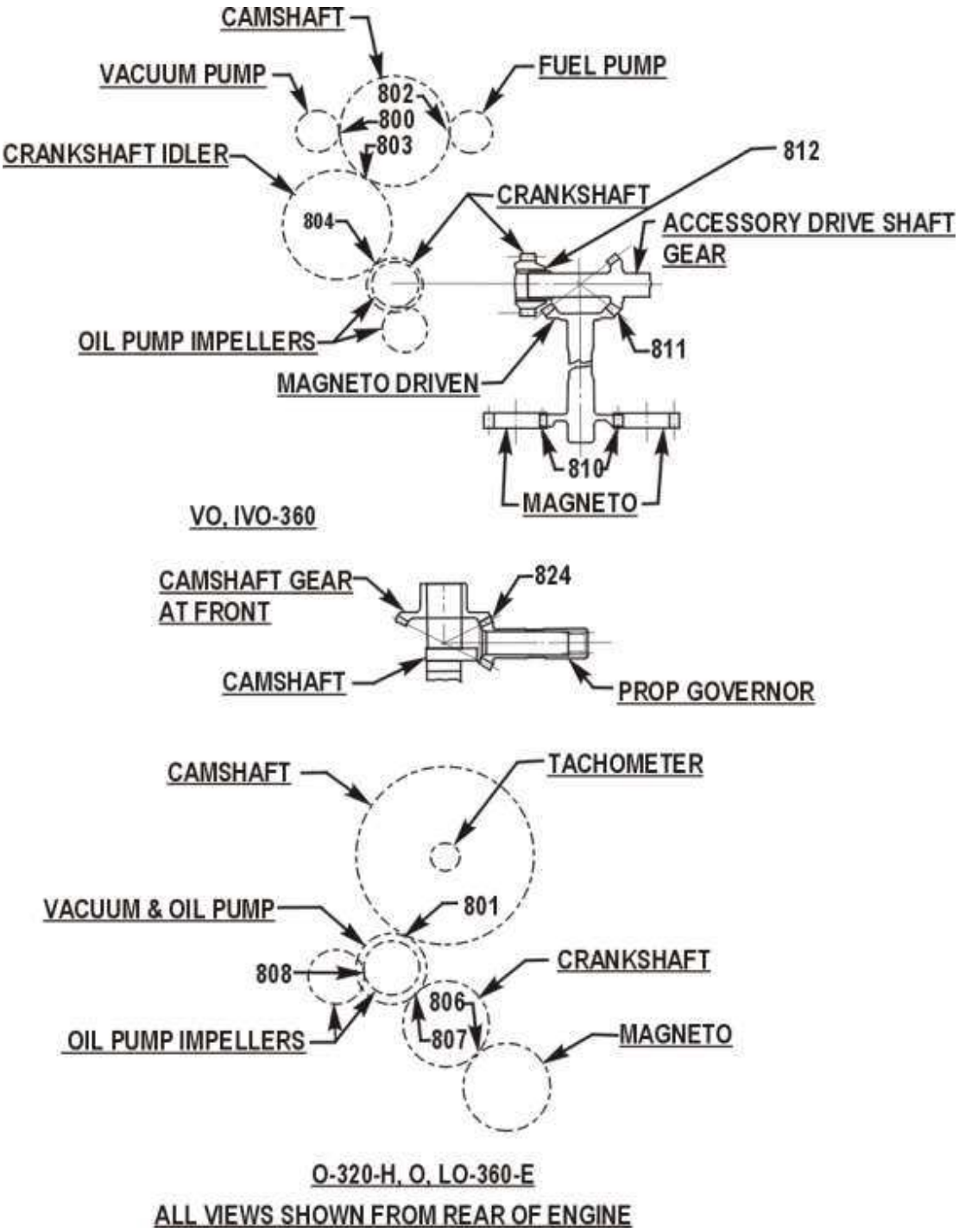


Backlash (Accessory Drives)

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION IV – BACKLASH

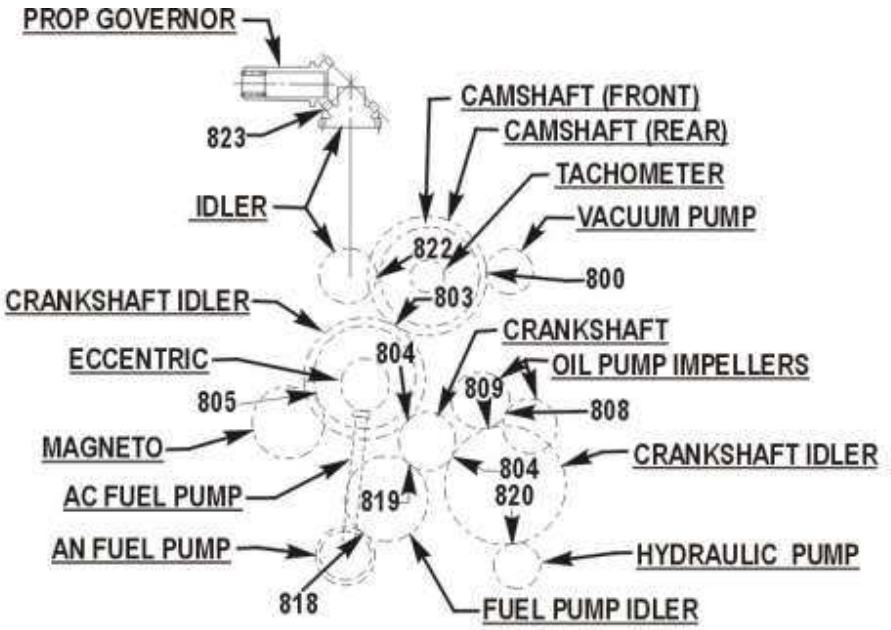


Backlash (Accessory Drives)

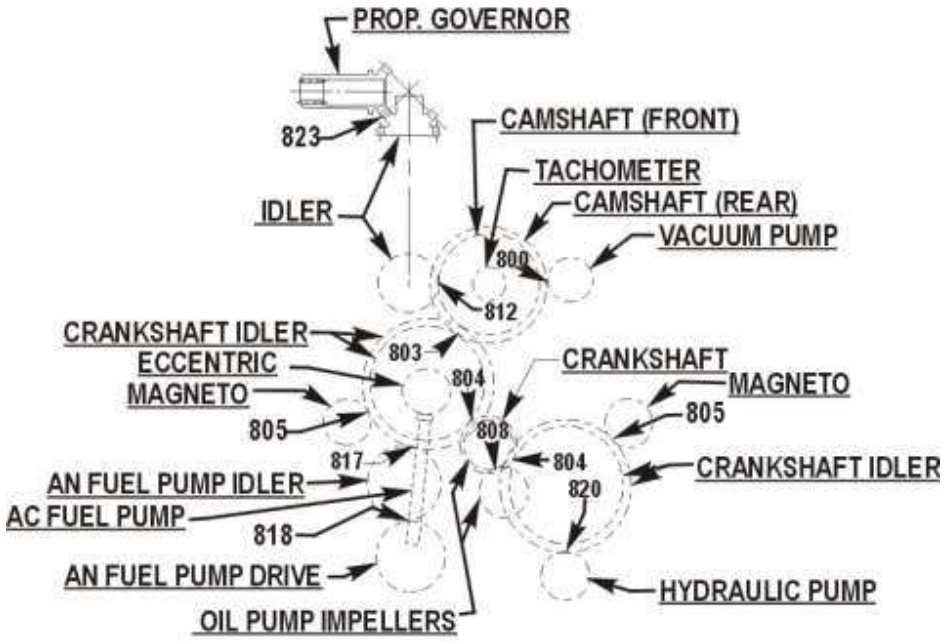
SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION IV – BACKLASH



O-540 & IO-720 DUAL MAG



O-540 & IO-720

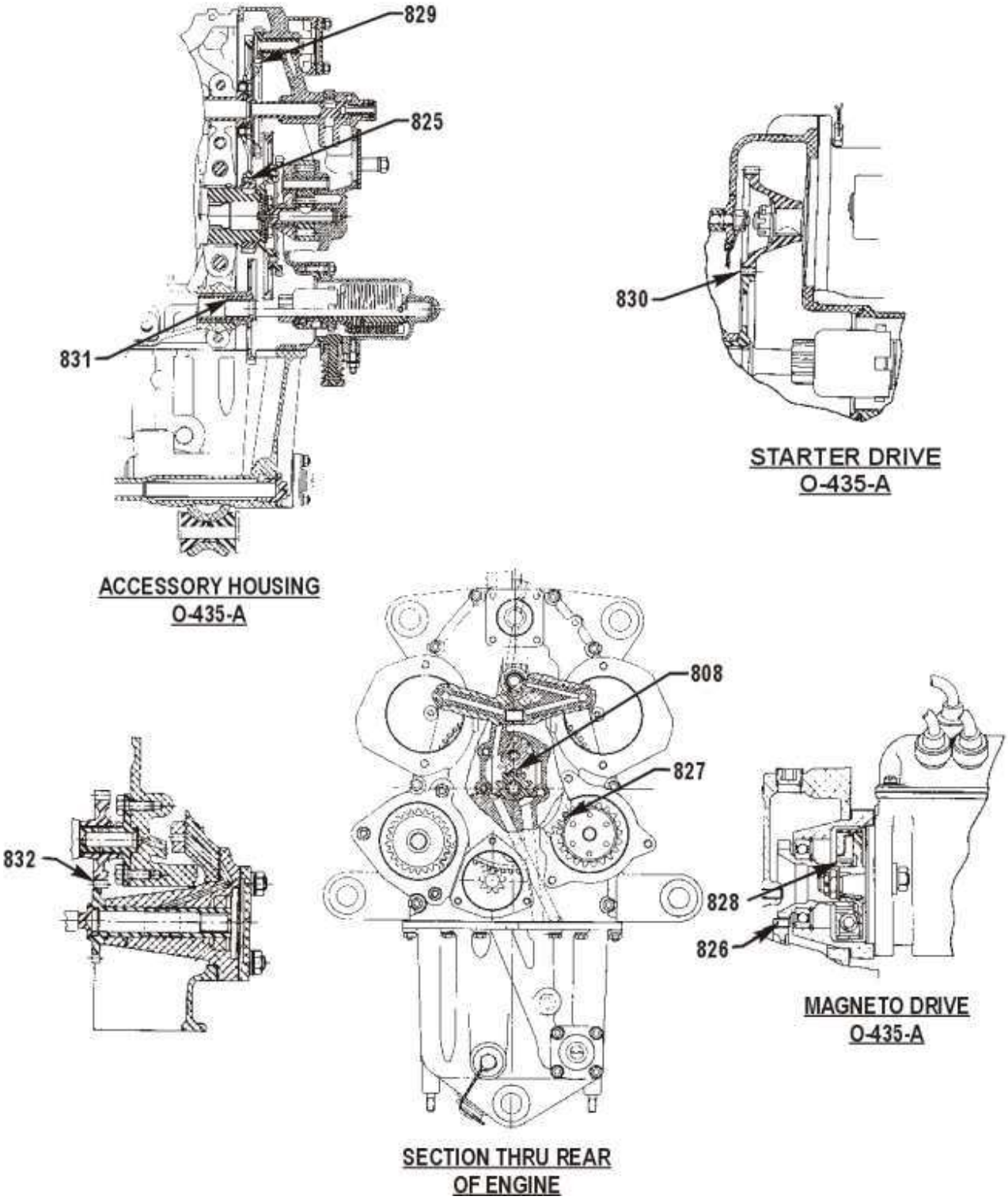
ALL VIEWS SHOWN FROM REAR OF ENGINE

Backlash (Accessory Drives)

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION IV – BACKLASH



Backlash (Accessory Drives)

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	Chart	Thread Size	Nomenclature	Torque Limits
900	A-B-D-G-S-T-Y-BD-BE	3/8-24	Connecting Rod Nuts	480 in.-lbs
	J	3/8-24	Connecting Rod Nuts	360 in.-lbs
	S1-S3-S5-S6-S7-S9-S11-S12-S14-T3-AF	3/8-24	Connecting Rod Bolts – Tighten to this Length	2-255 – 2.256
901	BD-BE	9/16-18	Oil Pump Shaft Nut	660 in.-lbs
902	BD-BE	5/16-24	Rocker Stud Nut	150 in.-lbs.
903	ALL (AS APPLICABLE) (EXCEPT S7)	3/8-24	Magneto Nut (To attach drive member to magneto) – Bendix – Sintered Bushing – Gray	120-150 in.-lbs.
	ALL (AS APPLICABLE)	3/8-24	Magneto Nut (To attach drive member to magneto) – Bendix – Steel Bushing	170-300 in.-lbs.
	A-G-S	3/8-24	Magneto Nut (To attach drive member to magneto) – Slick	120-300 in.-lbs.
	S7	1/2-20	Magneto Nut (To attach drive member to magneto)	170-300 in.-lbs.
904	ALL	10-32	Magneto Plate Screws (To attach ignition cable outlet plate to magneto)	15 in.-lbs.
905	ALL (using a silicone gasket)	1/4-20	Rocker Box Screws	35 in.-lbs.
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 in.-lbs.
906	ALL	5/16-18	Exhaust Port Studs	40 in.-lbs. min.
907	ALL	18MM	Spark Plugs	420 in.-lbs.
908	ALL	1/8-27 NPT	Fuel Pump Vent Fitting (Approximately two turns beyond finger tight)	96 in.-lbs.
909	ALL	5/8-32	Alternator Pulley Nut	450 in.-lbs.
910	ALL	1/4-28	Alternator Output Terminal Nut	85 in.-lbs.
911	ALL	10-32	Alternator Auxiliary Terminal Nut	30 in.-lbs.
912	ALL	5/16-24	Starter Terminal Nut	24 in.-lbs.
913	ALL (AS APPLICABLE)	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 in.-lbs.
914	Y-S-T-AF	1/8-27 NPT	Injector Nozzle in Cylinder Head	60 in.-lbs.
915	ALL (AS APPLICABLE)	3/4-16	Oil Filter Bolt (AC Can and Element Type)	300 in.-lbs
	ALL (AS APPLICABLE)	13/16-16	Oil Filter (Throw-Away Type)	240 in.-lbs.
	ALL (AS APPLICABLE)	3/4-16	Converter Stud	720 in.-lbs..)
916	ALL (AS APPLICABLE)	3/4-18 NPT	Carburetor Drain Plug	144 in.-lbs.
917	ALL (AS APPLICABLE)	1.00-14	Oil Cooler Bypass Valve	300 in.-lbs.

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS (CONT.)

New Ref.	Chart	Thread Size	Nomenclature	Torque Limits
918	ALL (AS APPLICABLE)	1-1/4-12	Oil Pressure Relief Valve	300 in.-lbs.
919	ALL	1/4 Hex Head and Below	Hose Clamps (Worm Type)	20 in.-lbs.
		5/16 Hex. Head and Above	Hose Clamps (Worm Type) (Metal to metal: example: heat shield to exhaust pipe)	45 in.-lbs.
		5/16 Hex. Head and Above	Hose Clamps (Worm Type)	30 – 35 in.-lbs.
920	ALL		Cylinder Head Drain Back Hose Clamps	10 in.-lbs.

921	S-T	Exhaust V-Band Coupling Torque Data			
	Coupling Size Tube OD	Lycoming Part Number	Vendor Part Number	T-Bolt Split Type Locknut Torque In.-Lbs.	1/4 In. Drilled Hex Nut With Safety Wire Torque In.-Lbs.
	1.75 in.	LW-12093-4	MVT69183-175	65	75
	2.00 in.	LW-12093-5	MVT69183-200	85	75
	2.25 in.	LW-12093-6	MVT69183-225	85	75
	2.25 in.	LW-12125-3	MVT69197-225	85	
	3.69 in.	LW-13464	U4204-55-369M	70	
	3.69 in.	LW-15768	NH1004420-10	70	

922	ALL	Turbocharger V-Band Torque Data		
	Turbocharger Model No.	V-Clamp Part No.	V-Clamp Diameter	Torque In.-Lbs.
	TO-473*	400500-600	6.00 in.	40 – 80
	TEO659*	400500-685	6.85 in.	40 – 50
	THO8A60*	400500-775	7.75 in.	40 – 60
	THO8A69*	400500-775	7.75 in.	40 – 60
	301E10-2**	TC-6-15	6.50 in.	15 – 20
	* - AiResearch turbocharger. ** - Rajay turbocharger. See latest revision of Service Instruction No. 1238 for assembly procedure.			

927	Chart	Thread Size	Nomenclature	Torque Limits
	ALL DUAL MAG. MODELS	1/2-20	Crankshaft Gear Bolt	660 in.-lbs.
	BD	1/4	Crankshaft Gear Bolts	96 – 120 in.-lbs.
928	ALL	3/8-16	Cylinder Hold Down Studs (Crankcase Driving Torque)	100 in.-lbs.
		7/16-14	Cylinder Hold Down Studs (Crankcase Driving Torque)	200 in.-lbs.
		1/2-13	Cylinder Hold Down Studs (Crankcase Driving Torque)	250 in.-lbs.
929	A-B-D-BD-BE-J-G-Y-S-T-AF	3/8	Cylinder Hold Down Nuts	300 in.-lbs.
	A1	7/16	Cylinder Hold Down Nuts	420 in.-lbs.
	B-D-BD-BE-J-G-Y-S-T-AF	1/2	Cylinder Hold Down Nuts	600 in.-lbs.
	Cylinder Hold Down and Crankcase Parting Flange Nuts' Tightening Procedures – See latest revision of Service Instruction No. 1029			

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS (CONT.)

Ref.	Chart	Thread Size	Nomenclature	Torque Limits
930	ALL	3/8	Allen Head Screw (Diaphragm Fuel Pump)	225-250 in.-lbs.
931	A	9/16	Locking Nut (Valve Adjusting Screw)	450 in.-lbs.
932	ALL	5/16-18	Exhaust Transitions – Studs (Driving Torque)	100 in.-lbs.
	ALL	3/8-16	Exhaust Transitions – Studs (Driving Torque)	200 in.-lbs.
933	ALL	5/16-32	Brass union nut on stainless steel injector fuel line (Both Ends)	25-50 in.-lbs.*

* It is also permissible to tighten the fuel line union nut finger tight, then continue tightening the nut with a wrench an additional 30 to 60 degrees (1/2 to 1 flat of the nut.) Torque in excess of 50 in.-lbs. can result in damage to the parts.

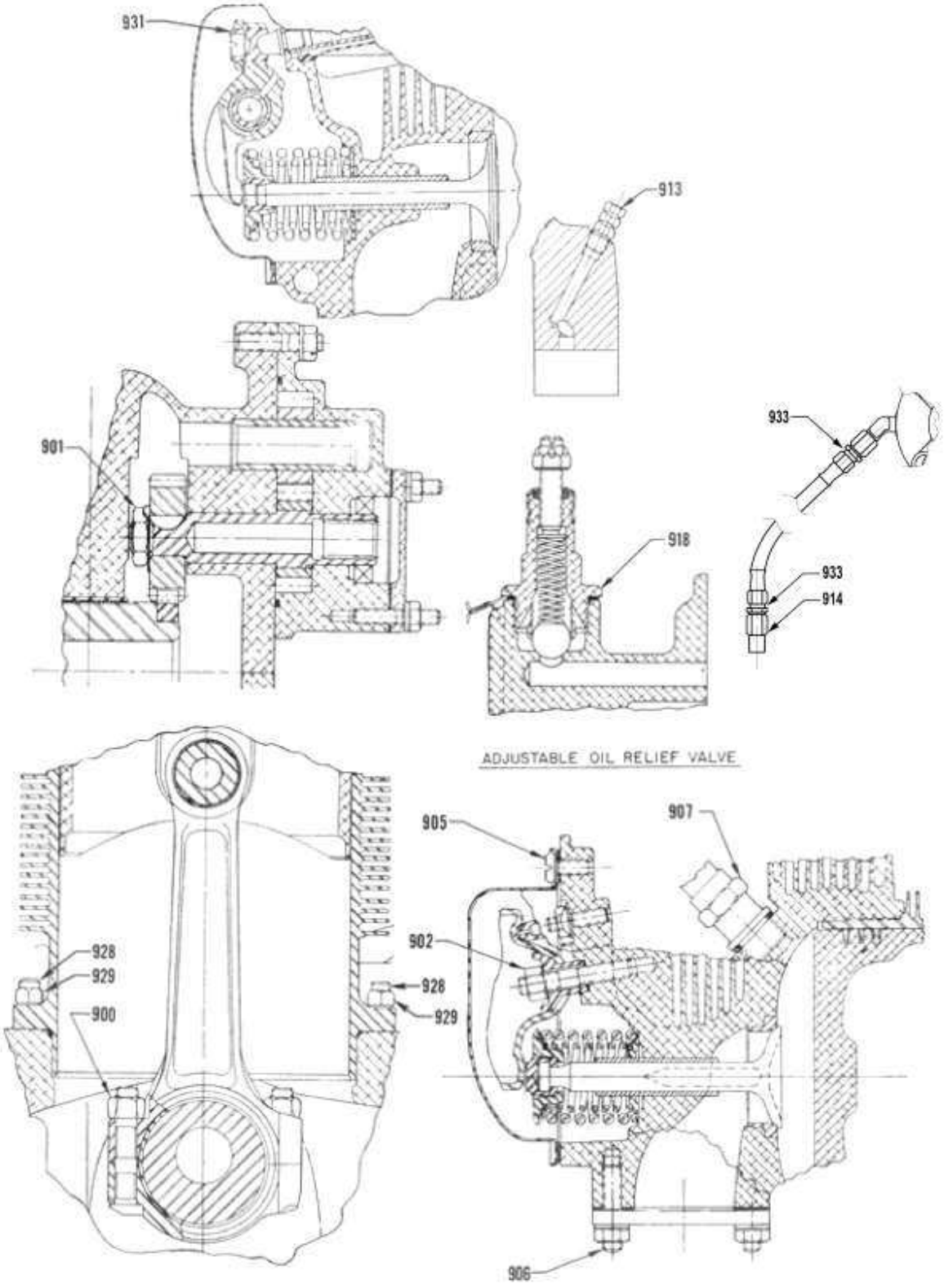
SECTION V – SPRINGS

Ref.	Chart	Nomenclature	Lycoming Part No.	Wire Dia.	Length at Comp. Length	COMP. LOAD		
						Mfr. Min.	Mfr. Min.	Service Max.
950	A-B-D-G-J-S-T-Y-BD-BE	Outer Valve Springs (Parallel)	LW-11800	.177	1.30 in.	112 lb.	122 lb.	109 lb. min.
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3	Outer Valve Springs (Angle)	LW-11796	.182	1.43 in.	116 lb.	124 lb.	113 lb. min.
951	A-B-D-G-J-S-T-Y-BD-BE	Auxiliary Valve Spring (Parallel)	LW-11795	.135	1.17 in.	61 lb.	67 lb.	58 lb. min.
	S1-S2-S3-S5-S6-S7-S9-S10-S11-S12-S13-S14-T2-T3-AF	Auxiliary Valve Spring (Angle)	LW-11797	.142	1.33 in.	75 lb.	83 lb.	72 lb. min.
952	ALL (AS APPLICABLE)	Oil Pressure Relief Valve Spring						
	Lycoming Part Numbers	Identification: Dye	Identification: Free Length					
	61084	None	2.18	.054	1.30 in.	8.5 lb.	9.5 lb.	8.3 lb. min.
	LW-18085	Purple/White	1.93	.067	1.44 in.	14.50 lb.	15.23 lb.	13.8 lb. min.
	68668	Purple	2.04	.054	1.30 in.	7.1 lb.	7.8 lb.	6.9 lb. min.
	77467	Yellow	1.90	.054	1.30 in.	6.4 lb.	7.1 lb.	6.2 lb. min.
	LW-11713	White	2.12	.059	1.44 in.	10.79 lb.	11.92 lb.	10.5 lb. min.
953	A-B-G-J-S-T-Y-AF	Oil Cooler Bypass Spring		.0465	1.94 in.	6.50 lb.	7.25 lb.	6.41 lb. min.
954	BD-BE	Oil Filter Bypass Spring		.047	1.00 in.	3.05 lb.	3.55 lb.	3.0 lb. min.
955	D	Magneto Coupling Spring		.091	.603 in.	20 lb.	22 lb.	19 lb. min.

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

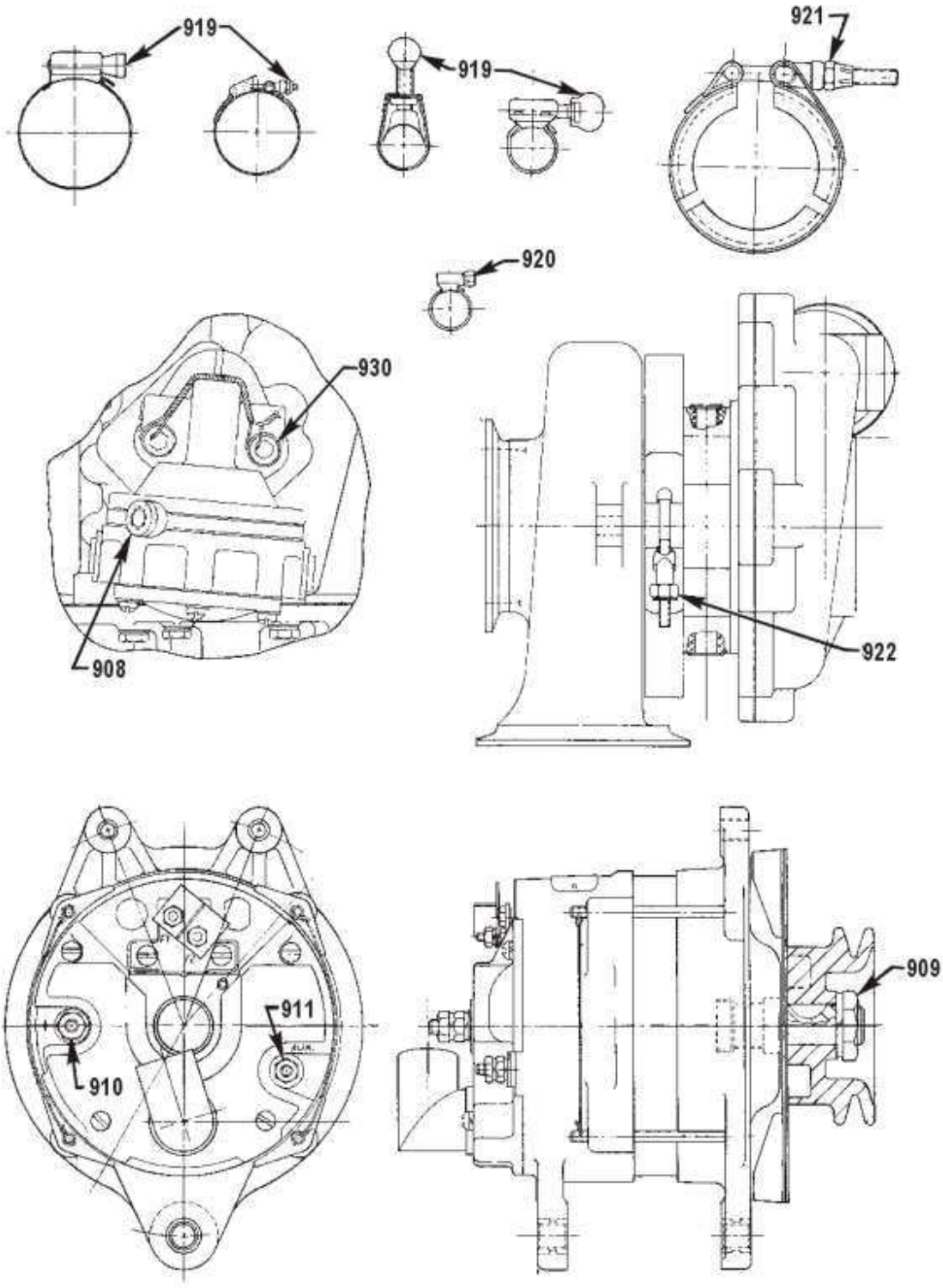
SECTION V SPECIAL TORQUE REQUIREMENTS



SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

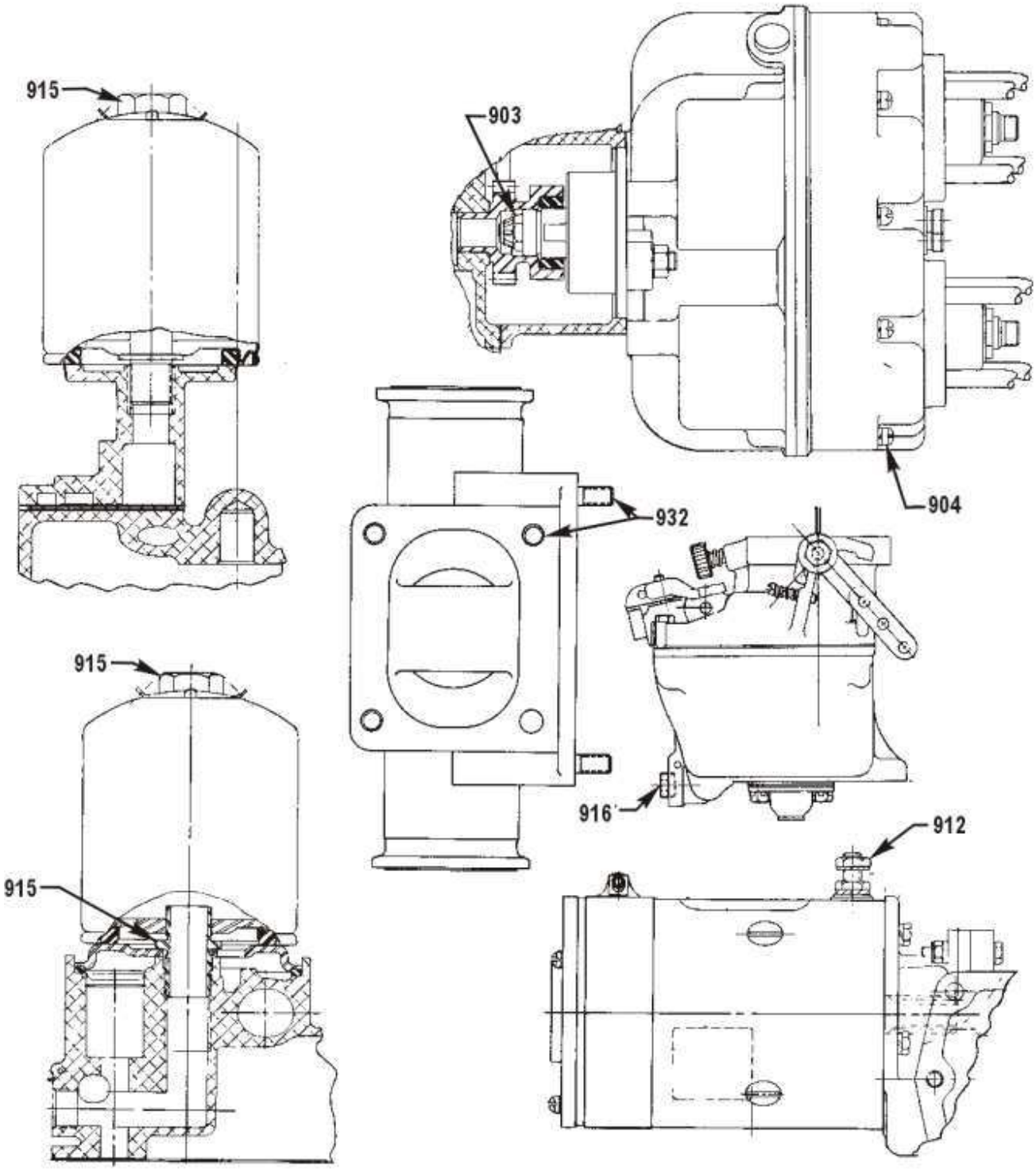


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

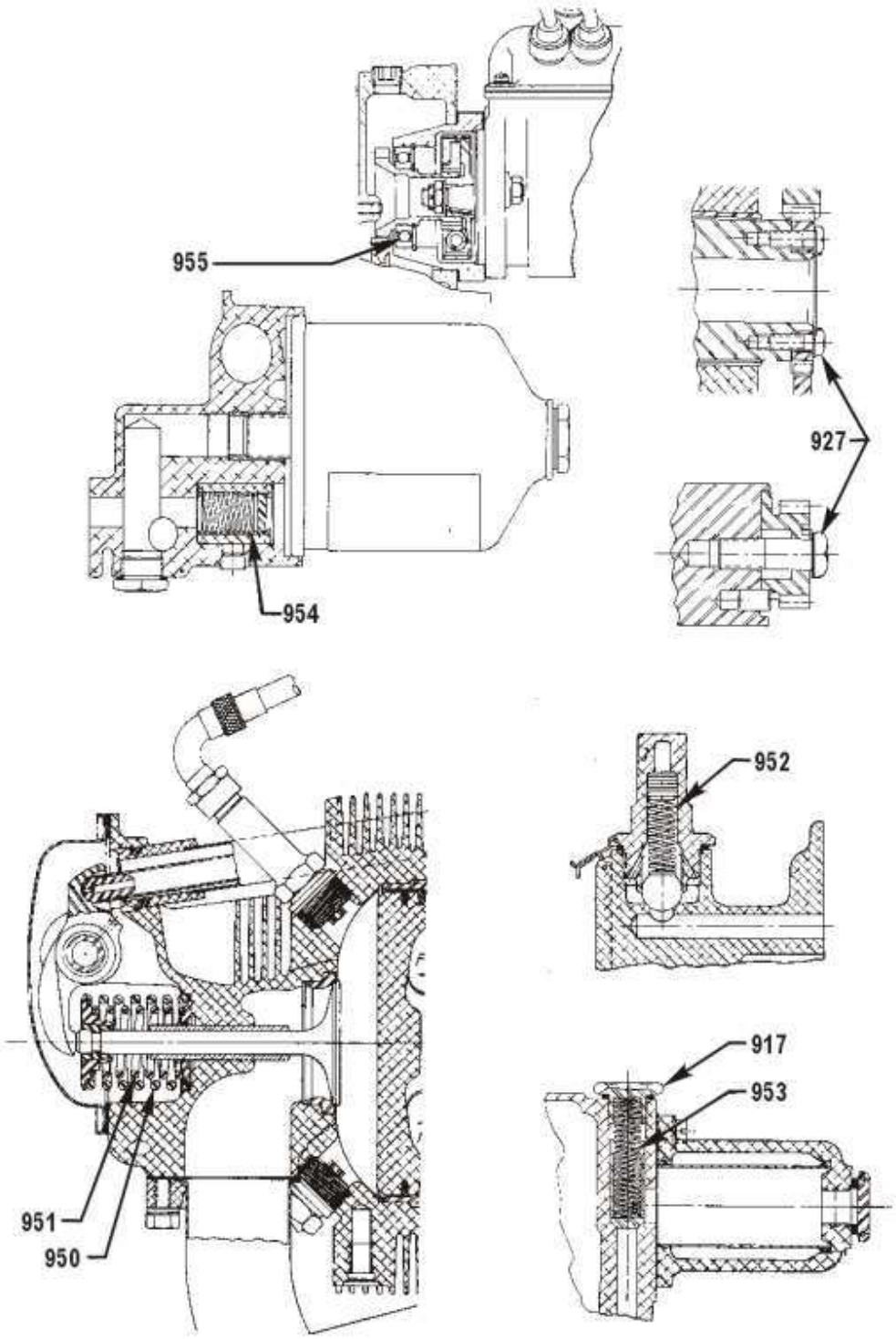


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



Engine Springs and Hardware

SERVICE TABLE OF LIMITS

STANDARD TORQUE
UNLESS OTHERWISE LISTED

Torque limits for propeller attaching bolts to be supplied by propeller aircraft manufacturer.

NOTE: Refer to Table VIII for torque value conversions (In. Lb. or Ft. Lb. to Nm).

TABLE I
BOLTS, SCREW AND NUTS

Thread	Torque		Thread	Torque	
	In. Lb.	Ft. Lb.		In. Lb.	Ft. Lb.
8	20 to 22	-----	7/16	600 to 660	50 to 55
10	49 to 54	-----	1/2	900 to 984	75 to 82
1/4	96 to 106	-----	9/16	1320 to 1452	110 to 121
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297
THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE					

TABLE II
PIPE PLUGS

Thread	Torque
	In.-Lbs.
1/16-27 NPT	40 to 44
1/8-27 NPT	40 to 44
1/4-18 NPT	85 to 94
3/8-18 NPT	110 to 121
1/2-14 NPT	160 to 176
3/4-14 NPT	230 to 252
1-11-1/2 NPT	315 to 347

TABLE III
CRUSH TYPE GASKETS

Thread Pitch on Part to be Tightened	ANGLE OF TURN	
Threads Per Inch	Aluminum	Copper
8	135°	67°
10	135°	67°
12	180°	90°
14	180°	90°
16	270°	135°
18	270°	135°
20	270°	135°
24	360°	180°
28	360°	180°

NOTE: Install all crush type gaskets except the self centering type, with the unbroken surface against the flange of the plug or part being tightened against the seal. Turn the part until the sealing surfaces are in contact and then tighten to the angle of turn listed for the appropriate thread size.
NOTE: Lubricate Threads Unless Otherwise Specified.

TABLE IV
FLEXIBLE TUBE CONNECTIONS
(SEALASTIC OR EQUIVALENT FITTINGS)

Tube Size	Thread	Torque In.-Lbs.	
		Aluminum Alloy	Steel
(-3) 3/16	3/8 - 24	30 to 50	70 to 80
(-4) 1/4	7/16 - 20	40 to 65	90 to 100
(-5) 5/16	1/2 - 20	60 to 80	135 to 150
(-6) 3/8	9/16-18	75 to 125	270 to 300
(-8) 1/2	3/4-16	150 to 250	450 to 500
(-10) 5/8	7/8 - 14	200 to 350	650 to 700

TABLE V
STUDS MIN. DRIVING TORQUE

Threads	Torque In.-Lbs.
1/4-20	15
5/16-18	25
3/8-16	50

TABLE VI
JAM NUT OR STRAIGHT THREAD O-RING BOSS

Tube Size	Thread	Torque Ft. Lbs.
-03	3/8 – 24	8 – 9
-04	7/16 – 20	13 – 15
-05	1/2 – 20	14 – 15
-06	9/16 – 18	23 – 24
-08	3/4 – 16	40 – 43
-10	7/8 – 14	43 – 48
-12	1-1/16 – 12	68 – 75
-14	1-3/16 – 12	83 – 90
-16	1-5/16 – 12	112 – 123
-20	1-5/8 – 12	146 – 161
-24	1-7/8 – 12	154 – 170
-32	2-1/2 – 12	218 – 240

SERVICE TABLE OF LIMITS

STANDARD TORQUE (CONT.)
UNLESS OTHERWISE LISTED

TABLE VII

METAL TUBE FITTINGS

Dash Nos. Ref.	Tubing OD inches	Wrench torque for tightening AN-818 Nut (pound inches)						Minimum bend radii measured to tubing centerline. Dimension in inches	
		Aluminum-alloy tubing		Steel tubing		Aluminum-alloy tubing (Flare MS33583) for use on oxygen lines only			
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Alum. Alloy	Steel
-2	1/8	20	30	75	85	--	--	3/8	--
-3	3/16	25	35	95	105	--	--	7/16	21/32
-4	1/4	50	65	135	150	--	--	9/16	7/8
-5	5/16	70	90	170	200	100	125	3/4	1-1/8
-6	3/8	110	130	270	300	200	250	15/16	1-5/16
-8	1/2	230	260	450	500	300	400	1-1/4	1-3/4
-10	5/8	330	360	650	700	--	--	1-1/2	2-3/16
-12	3/4	460	500	900	1000	--	--	1-3/4	2-5/8
-16	1	500	700	1200	1400	--	--	3	3-1/2
-20	1-1/4	800	900	1520	1680	--	--	3-3/4	4-3/8
-24	1-1/2	800	900	1900	2100	--	--	5	5-1/4
-28	1-3/4	--	--	--	--	--	--	--	--
-32	2	1800	2000	2660	2940	--	--	8	7

TABLE VIII

TORQUE CONVERSIONS

In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm
5	0.42	0.56	100	8.33	11.30	1000	83.33	113.00
10	0.83	1.13	200	16.67	22.60	2000	166.70	226.00
20	1.67	2.26	300	25.00	53.90	3000	250.00	339.00
30	2.50	3.39	400	33.33	45.19	4000	333.30	451.90
40	3.33	4.52	500	41.67	56.49	5000	416.70	564.90
50	4.17	5.65	600	50.00	67.79	6000	500.00	677.90

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

CHART	MODELS
AQ	TIO-541
AZ	TIGO-541

SECTION I	500 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT
SECTION II	600 SERIES	CYLINDERS
SECTION III	700 SERIES	GEAR TRAIN
SECTION IV	800 SERIES	BACKLASH (GEAR TRAIN)
SECTION V	900 SERIES	TORQUE AND SPRINGS

(A)	These fits are either shrink fits controlled by machining, fits that may readily be adjusted, or fits where wear does not normally occur. In each case, the fit must be held to manufacturing tolerance.
(B)	Side clearance on piston rings must be measured with face of ring flush with piston.
(D)	The dimensions shown are measured at the bottom of the piston skirt at right angles to the piston pin.
(E)	Permissible wear of the crankshaft (rod and main bearing journals) to be minus 0.0015 on the diameter.
(L)	Loose fit; wherein a definite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or interference fit.
(WD)	Wide Deck Crankcase.

* - Indicates cut-off date for data retrieved prior to publication.

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TECHNICAL PUBLICATION
REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
SSP-1776-5-PT2	**Service Table of Limits**	**SSP-1776**	**October 28, 2013**

PREVIOUS REVISIONS	CURRENT REVISION*
April 2018 2-8, 2-23, 2-24, 2-25, 2-26, 2-27, 2-28, 2-29 • Deleted NOTES that reference S.I. 1243 in Piston Application Table • Added pages and figures for all 900 Series reference numbers in Section V	**April 2020** 2-7 • Revised burnishing instructions for connecting rod bushing in reference number 600 • Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607 * Revisions are indicated with a vertical bar to the left of the revised item.

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SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	AQ	Main Bearings and Crankshaft (Except Front)			.0011L .0041L	.0050L
	AZ	Main Bearings and Crankshaft			.0011L .0041L	.0050L
	AQ	Front Main Bearings and Crankshaft			.0021L .0046L	.0050L
	AQ-AZ	Diameter of Main Bearing Journal on Crankshaft (2-5/8 Main)	2.6245 2.626	(E)		
	AQ	Diameter of Front Main Bearing Journal on Crankshaft (2-5/8 Main)	2.6240 2.6250	(E)		
	AQ-AZ	Crankcase Bearing Bore Diameter	2.9365 2.9375	2.9390		
501	AQ-AZ	Connecting Rod Bearing and Crankshaft			.0008L .0038L	.0050L
	AZ	Diameter of Connecting Rod Journal on Crankshaft (2-1/8)	2.1235 2.125	(E)		
	AQ	Diameter of Connecting Rod Journal on Crankshaft (2-1/4)	2.2485 2.250	(E)		
	AZ	Connecting Rod Bearing Bore Diameter (2-1/8) (Measure at Axis 30° on each side)	2.2870 2.2875			
	AQ	Connecting Rod Bearing Bore Diameter (2-1/4) (Measure at Axis 30° on each side)	2.4205 2.4210			
502	AQ-AZ	Connecting Rod – Side Clearance			.004L .010L	.016L
503	AQ-AZ	Connecting Rod – Alignment			.010 in 10 Inches	
504	AQ-AZ	Connecting Rod – Twist			.012 in 10 Inches	
505		Crankshaft Run-Out at Center Main Bearings				
	AZ	Mounted on No. 1 and 4 Journals Max. Run-Out No. 2 and 3 Journals			.005	.0075
		Mounted on No. 1 and 3 Journals Max. Run-Out No. 2 Journal			.003	.0045
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
	AQ	Mounted on No. 2 and 5 Journals Max. Run-Out No. 1 Journal			.002	.002
		Mounted on No. 2 and 5 Journals Max. Run-Out No. 3 Journal			.005	.0075
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

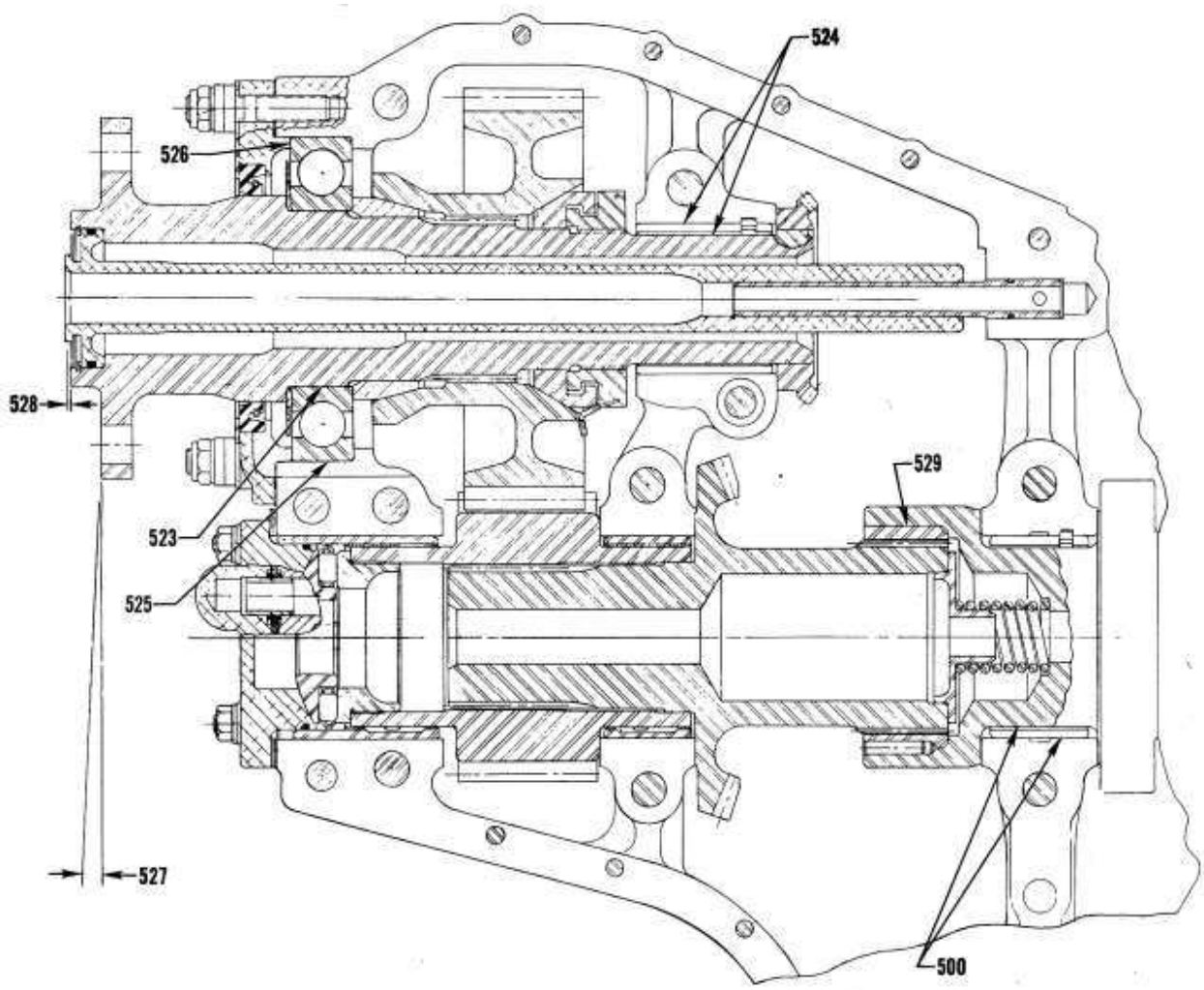
Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
506	AQ (CONT.)	Mounted on No. 3 and 5 Journals Max. Run-Out No. 4 Journal			.003	.0045
	AQ-AZ	Crankshaft and Crankcase – Front End Clearance			.005L .016L	.026L
507	AQ	Clearance – Front Face of Crankshaft Oil Slinger to Front Face of Recess in Crankcase (Crankshaft Against Thrust Face)			.002 .007	(A)
508	AQ-AZ	Crankshaft Propeller Flange Run-Out				.005
509	AQ	Starter Ring Gear and Support			.014T .022T	(A)
510	AQ-AZ	Crankshaft Timing Gear and Crankshaft			.002L .0005L	(A)
511	AQ-AZ	Tappet Body and Crankcase			.0010L .0030L	.004L
	AQ-AZ	O.D. of Tappet	.9990 .9995	.9987		
	AQ-AZ	I.D. Tappet Bore in Crankcase	1.0005 1.0018	1.0021		
514	AQ-AZ	Camshaft and Crankcase			.002L .004L	.006L
515	AQ-AZ	Camshaft – End Clearance			.002L .004L	.015L
516	AQ-AZ	Camshaft Run-Out at Center Bearing Journal			.000 .001	.006
517	AQ-AZ	Counterweight Bushing and Crankshaft			.0013T .0026T	(A)
518	AQ-AZ	Counterweight Roller – End Clearance			.003L .025L	.038L
519	AQ-AZ	Counterweight and Crankshaft – Side Clearance (Measure Below Roller Next to Flat)			.003L .013L	.017L
520	AQ-AZ	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	AQ-AZ	I.D. Counterweight Bushing	.7485 .7505	.7512		
	AZ	I.D. Counterweight Bushing (2nd order)	1.030 1.032	1.0327		
522	AQ-AZ	O.D. of Counterweight Roller (See latest revision of Service Instruction No. 1012)				
523	AZ	Thrust Bearing and Propeller Shaft			.0001L .0012L	.002L
524	AZ	Propeller Shaft and Rear Bearing			.0015L .0030L	.0040L

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
524	AZ	Propeller Shaft Bearing Bore Diameter	2.1865 2.1875	2.1885		
525	AZ	Thrust Bearing and Crankcase			.0006L .0010T	(A)
526	AZ	Thrust Bearing and Thrust Bearing Cap Clamp Fit (Shim to this Fit)			.003T .005T	(A)
527	AZ	Thrust Bearing Tilt at 4 Foot	.027 Tilt			
528	AZ	Thrust Bearing End Play			.006 .008	.010
529	AZ	Crankshaft and Crankshaft Front Bearing			.0002T .0015T	(A)

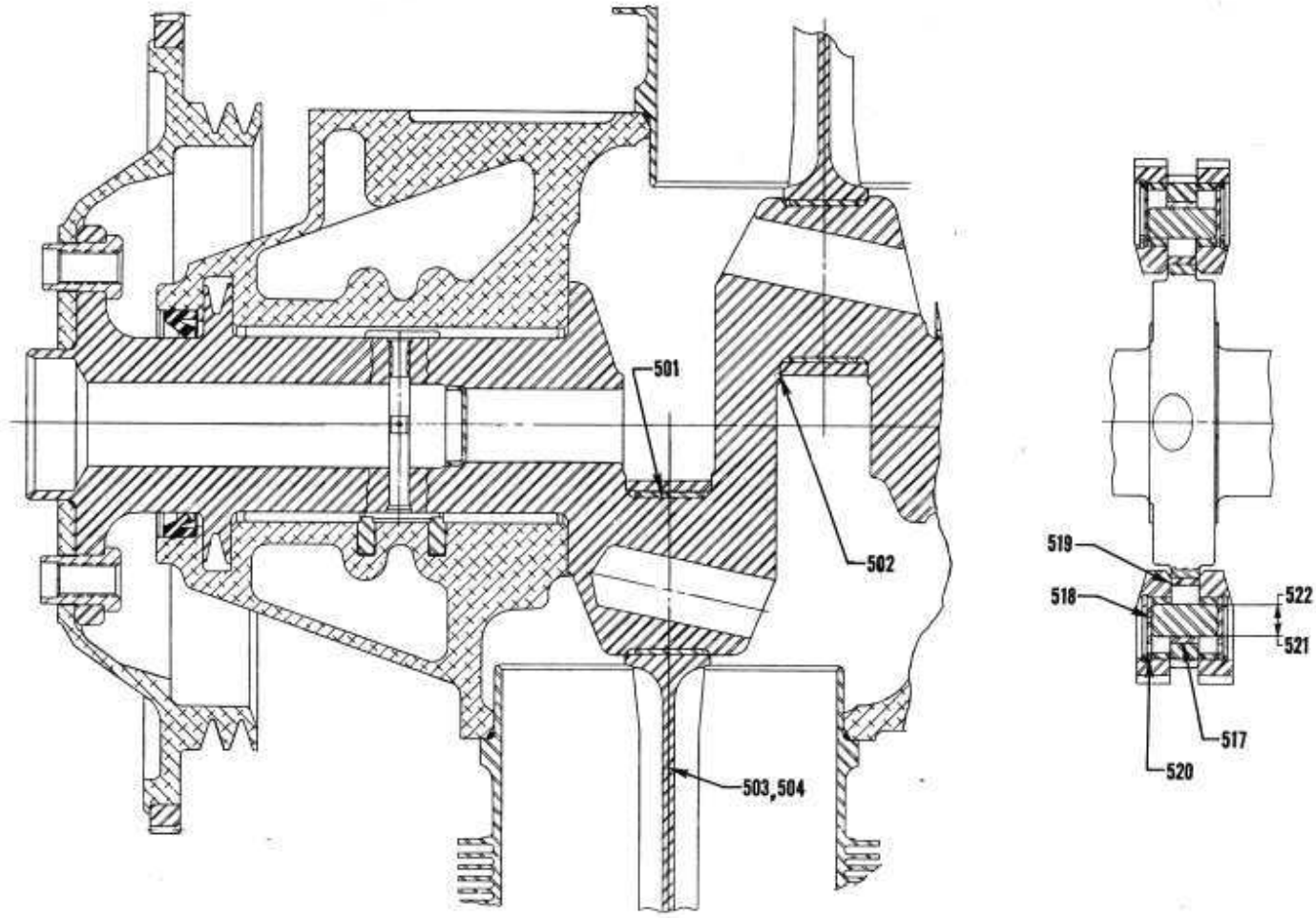


Section Thru Prop. Shaft, Crankshaft and Front Bearings

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

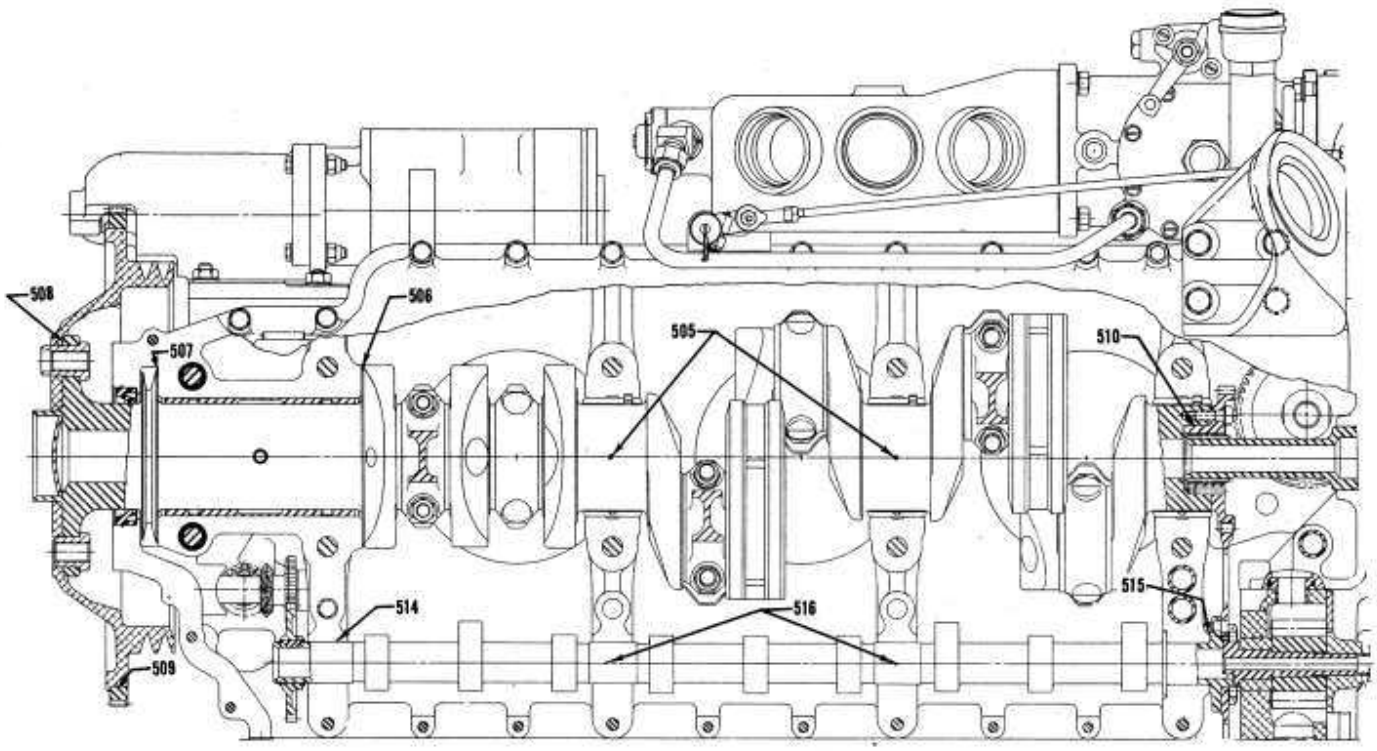


Connecting Rod, Counterweights and Related Parts

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

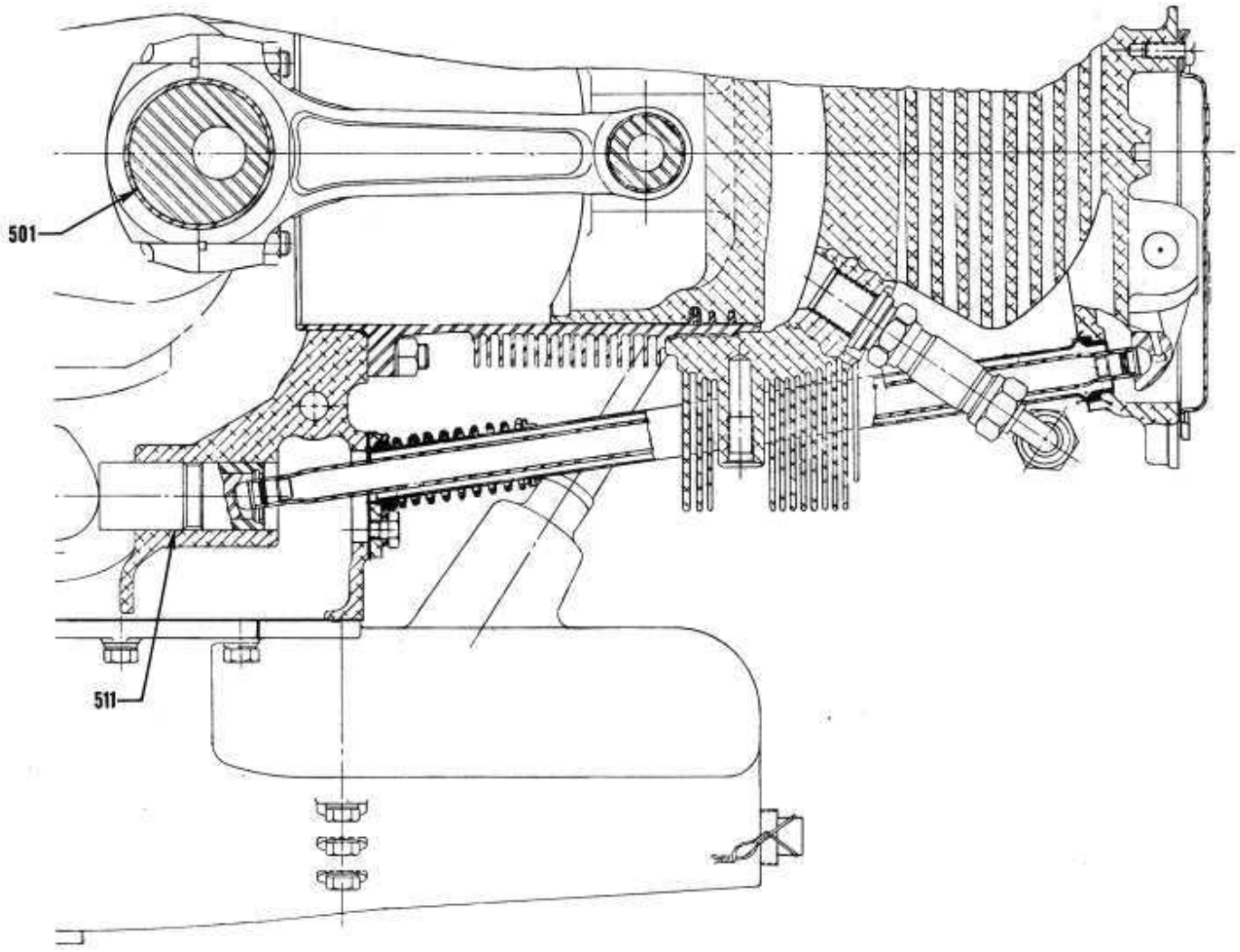


Longitudinal Section Thru Engine

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



Connecting Rod Bearing, Tappet Body and Crankcase

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
600	AQ-AZ	Connecting Rod and Connecting Rod Bushing	Bushing P/N LW-13923 to be burnished in place Bushing P/N 01K28983 is **not** burnished in place			
	AQ-AZ	Finished I.D. of Connecting Rod Bushing	1.1254 1.1262			
601	AQ-AZ	Length Between Connecting Rod Bearing Centers	6.7485 6.7515			
602	AQ-AZ	Connecting Rod Bushing and Piston Pin			.0008L .0021L	.0025L
603	AQ-AZ	Piston Pin and Piston			.0003L .0014L	.0018L
	AQ-AZ	Diameter of Piston Pin Hole in Piston	1.1249 1.1254			
	AQ-AZ	Diameter of Piston Pin	1.1241 1.1246			
604	AQ-AZ	Piston and Piston Pin Plug			.0002L .0010L	.002L
	AQ-AZ	*Diameter of Piston Pin Plug	1.1242 1.1247			
605	AQ-AZ	Piston Pin and Piston Pin Plug – Nitrided and Chrome Cylinders			.0005L .0025L	.005L
	AQ-AZ	*Diameter of Piston Pin Plug	.5655 .5665			
	* See latest revision of Service Instruction No. 1267.					
606	AQ-AZ	Piston Ring and Piston – Side Clearance (Top Ring Comp.)			.0025L .0055L	.008L (B)
	AQ-AZ	Piston Ring and Piston – Side Clearance (2nd Ring Comp.)			.000L .004L	.006L (B)
	AQ-AZ	Piston Ring and Piston - Side Clearance (Oil Regulating)			.002L .004L	.006L (B)
607	AQ-AZ	Piston Ring Gap (Compression) Chrome Cylinders (Straight Barrels)			.020 .030	.047
	AQ-AZ	Piston Ring Gap (Compression) Nitrided and Chrome Cylinders (Choke Barrels)			.045 .065	.067
	AQ-AZ	Piston Ring Gap (Oil Regulating) (All Barrels)			.015 .040	.047
	For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075. For All Other Barrels – Ring gap is measured at top limit of ring travel.					

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.

	Engine and Piston Application		Min. Piston Diameter			Cylinder Barrel		
	Engine Chart Code Letter	Piston Number	Top	Bottom	Type of Piston	Type of Surface	Maximum Diameter	Max. Clearance Piston Skirt & Cyl.
608 608 609 610	AQ-AZ	76966, LW-10545	5.0790	5.1090	Forged-Cam	N-C	5.1305	.018L

NOTES:

To find the average diameter of cylinder in an area 4" above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Add both diameters; this sum, divided by 2, represents the average diameter of the cylinder.

*=High Compression.

Cylinder Barrel: N=nitride hardened, C=chrome plated.

Maximum taper and out-of-round permitted for cylinder in service is .0045 inch.

To find the average out-of-round, measure diameter of cylinder in an area 4" above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Difference between diameters must not exceed .0045 inch.

Piston diameter at top is measured at top ring land (between top and second compression ring grooves) at right angle to piston pin hole; diameter at bottom of piston is measured at the bottom of the piston skirt at right angles to the piston pin.

Ref.	*Chart*	*Nomenclature*	*Dimensions* Mfr. Min. & Max.	*Dimensions* Service Max.	*Clearances* Mfr. Min. & Max.	*Clearances* Service Max.
611	AQ-AZ	Exhaust Valve Seat and Cylinder Head			.0075T .011T	**(A)**
	AQ-AZ	O.D. Exhaust Seat	1.9355 1.937			
	AQ-AZ	I.D. Exhaust Seat Hole in Cylinder Head	1.926 1.928			
612	AQ-AZ	Intake Valve Seat Hole in Cylinder Head			.0065T .010T	**(A)**
	AQ-AZ	O.D. Intake Seat	2.2885 2.290			
	AQ-AZ	I.D. Intake Seat Hole in Cylinder Head	2.280 2.282			
613	AQ-AZ	Exhaust Valve Guide and Cylinder Head			.0011T .0030T	**(A)**
	AQ-AZ	O.D. Exhaust Valve Guide	.6954 .6963			
	AQ-AZ	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6933 .6943			

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

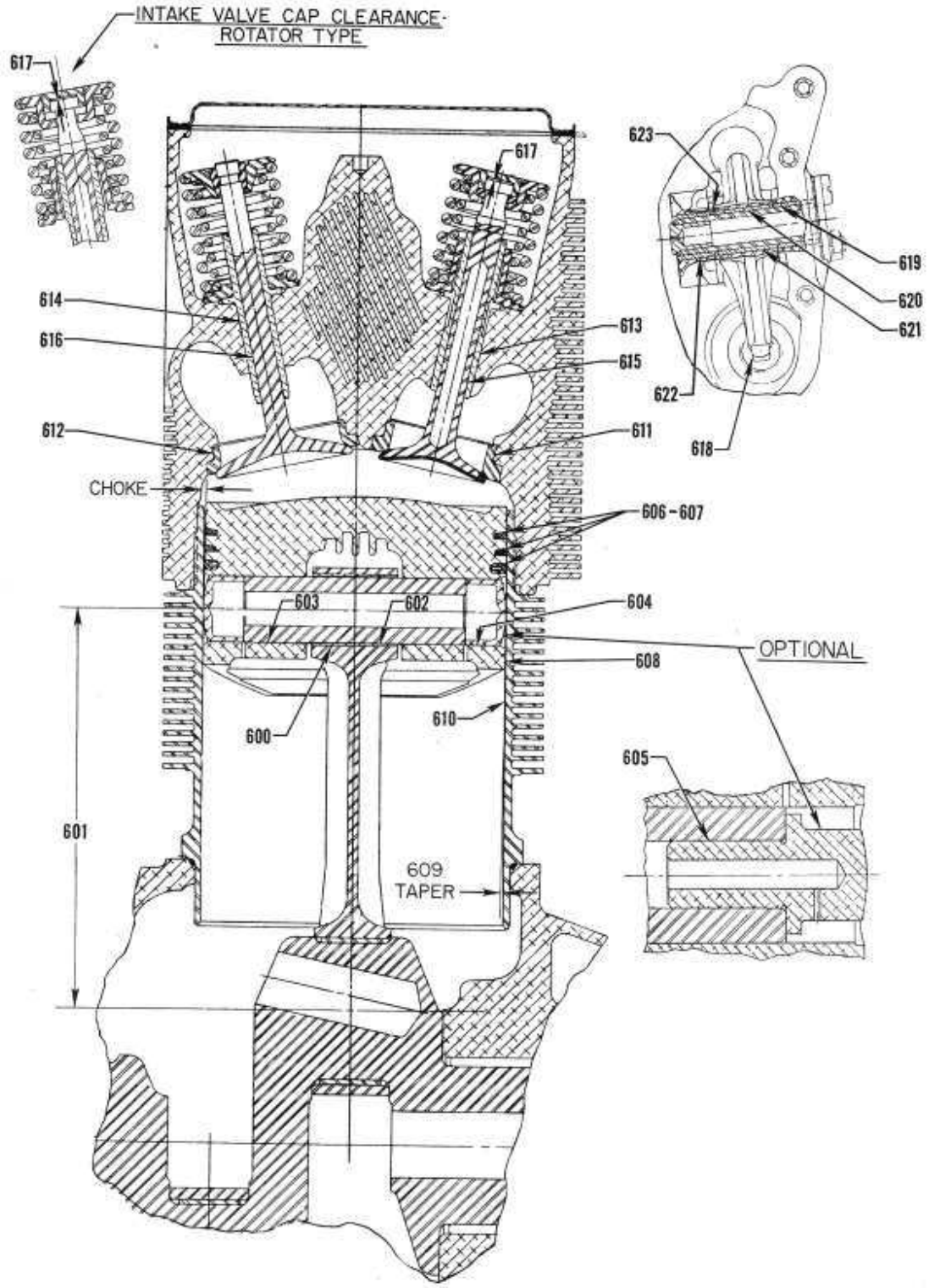
SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
614	AQ-AZ	Intake Valve Guide and Cylinder Head			.0010T .0025T	
	AQ-AZ	O.D. Intake Valve Guide	.5933 .5938			
	AQ-AZ	I.D. Intake Valve Guide Hole in Cylinder Head	.5913 .5923			
615	AQ-AZ	Exhaust Valve Stem and Valve Guide			.0037L .0050L	(A)
	AQ-AZ	O.D. Exhaust Valve Stem	.4955 .4965	.4937		
	AQ-AZ	Finished I.D. Exhaust Valve Guide	.4995 .5005			
	1/2 inch diameter exhaust valves may have exhaust valve guides that are .003 in. over the maximum inside diameter limit, anytime up to 300 hours of service. After 300 hours of service, inside diameter of exhaust valve guide may increase .001 in. during each 100 hours of operation up to the recommended overhaul time for the engine, or not to exceed .015 inch over the basic I.D. See latest revision of Service Instruction No. 1009 for recommended overhaul time.					
616	AQ-AZ	Intake Valve Stem and Valve Guide			.0010L .0028L	.006L
	AQ-AZ	O.D. Intake Valve Stem	.4022 .4030	.4010		
	AQ-AZ	Finished I.D. Intake Valve Guide	.4040 .4050			
617	AQ-AZ	Intake and Exhaust Valve and Valve Cap – Clearance (Rotator Type with Small Diameter Head)			.000 .004L	.005L
618	AQ-AZ	Dry Tappet Clearance			.040 .105	
619	AQ-AZ	Valve Rocker Shaft and Valve Rocker Bushing			.0001L .0013L	.0025L
	AQ-AZ	Finished I.D. of Valve Rocker Shaft (Bushing) in Cylinder Head	.6246 .6261	.6270		
620	AQ-AZ	Valve Rocker Shaft and Valve Rocker Bushing			.0007L .0017L	.004L
	AQ-AZ	Finished I.D. of Rocker Arm Bushing	.6252 .6263	.6270		
	AQ-AZ	O.D. Valve Rocker Shaft	.6241 .6245	.6231		
621	AQ-AZ	Valve Rocker Bushing and Valve Rocker	Bushing Must Be Burnished in Place			
622	AQ-AZ	Valve Rocker Shaft Bushing and Cylinder Head			.0022T .0038T	(A)
	AQ-AZ	Valve Rocker Shaft Bushing Hole in Cylinder Head	.7380 .7388			
623	AQ-AZ	Valve Rocker and Cylinder Head – Side Clearance			.002L .020L	.024L

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS



Cylinder, Piston and Valve Components

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PUMP						
700	AQ-AZ	Oil Pump Drive Shaft and Oil Pump Body			.0010L .0030L	.004L
701	AQ-AZ	Oil Pump Drive Shaft and Oil Pump Cover			.0035L .0050L	.0065L
703	AQ-AZ	Oil Pump Impellers – Diameter Clearance			.002L .005L	.008L
704	AQ-AZ	Oil Pump Impellers – Side Clearance			.002L .0045L	.005L
		Width of Oil Pump Impellers	1.372 1.374	1.371		
705	AQ-AZ	Oil Pump Driven Impellers and Idler Shaft			.0005L .002L	.004L
FUEL PUMP						
722	AQ-AZ	Fuel Pump Idler Gear and Shaft			.001L .003L	.005L
725	AQ-AZ	Fuel Pump Idler Gear – End Clearance			.002L .028L	.038L
726	AQ-AZ	Fuel Pump Drive Shaft Gear and Crankcase			.0010L .0025L	.004L
727	AQ-AZ	Fuel Pump Drive Shaft Gear – End Clearance			.0015L .0385L	.0485L
GOVERNOR & TACHOMETER						
728	AQ	Front Governor Drive Idler Shaft (Both Ends) and Crankcase			.0010L .0025L	.004L
731	AQ-AZ	Governor Driven Gear and Crankcase			.0010L .0025L	.004L
732	AQ-AZ	Propeller Governor Drive Gear – End Clearance			.008L .016L	.021L
739	AZ	Tachometer Drive Shaft and Adapter			.0015L .0035L	.006L
VACUUM PUMP & HYDRAULIC PUMP						
759	AQ-AZ	Vacuum and Hydraulic Pump Drive Shaft Gear and Crankcase			.0010L .0025L	.006L
760	AQ-AZ	Vacuum and Hydraulic Pump Drive Shaft Gear – End Clearance			.018L .028L	.035L
MAGNETO						
761	AQ-AZ	Magneto Coupling and Crankcase			.0010L .0030L	.004L
762	AQ-AZ	Magneto Drive Shaft Gear and Crankcase			.0010L .0030L	.004L

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

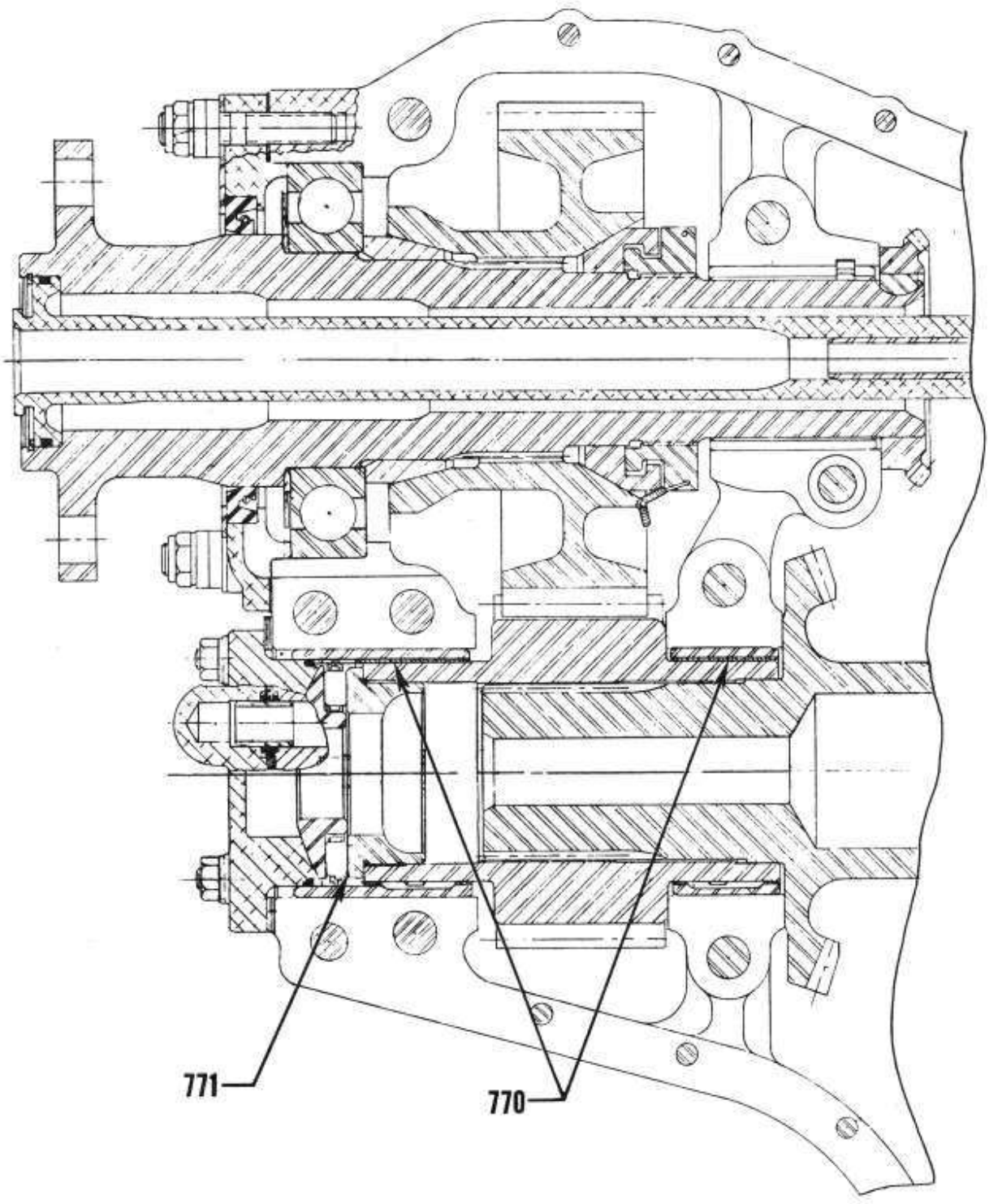
SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
ACCESSORY DRIVE, COMPRESSOR, BREATHER, PROPELLER SHAFT, ALTERNATOR, & STARTER						
763	AQ-AZ	Accessory Drive Gear Intermediate and Crankcase (2 Places)			.0010L .0030L	.005L
764	AQ-AZ	Accessory Drive Gear – End Clearance			.016L .018L	.020L
765	AQ-AZ	Accessory Drive Gear and Crankcase			.0010L .0030L	.005L
766	AQ-AZ	Compressor Drive Shaft and Compressor Drive Adapter			.0010L .0030L	.005L
767	AQ-AZ	Compressor Drive Shaft – End Clearance			.0005 .0295	.040
768	AQ-AZ	Breather Slinger Gear and Shaft			.0021L .0035L	.005L
769	AQ-AZ	Breather Slinger Gear – End Clearance			.008 .017	.025
770	AZ	Propeller Shaft Drive Gear and Bearings			.0025L .0050L	.0060L
771	AZ	Propeller Shaft Drive Gear – End Play			.005 .015	.022
772	AZ	Propeller Shaft and Rear Bearing			.0015L .0030L	.0040L
773	AZ	Alternator Driven Gear and Adapter Bushing			.0025L .0045L	.0065L
774	AZ	Starter Drive and Alternator Drive Gear – End Play			.004 .008	.011
775	AZ	Starter Driven Gear and Adapter Bushing			.0015L .0030L	.005L
776	AZ	Starter Drive Shaft (Slip Coupling) and Crankcase			.0015L .0040L	.007L
777	AZ	Starter Idler Gear and Idler Gear Bearing			.0005L .0020L	.005L

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN

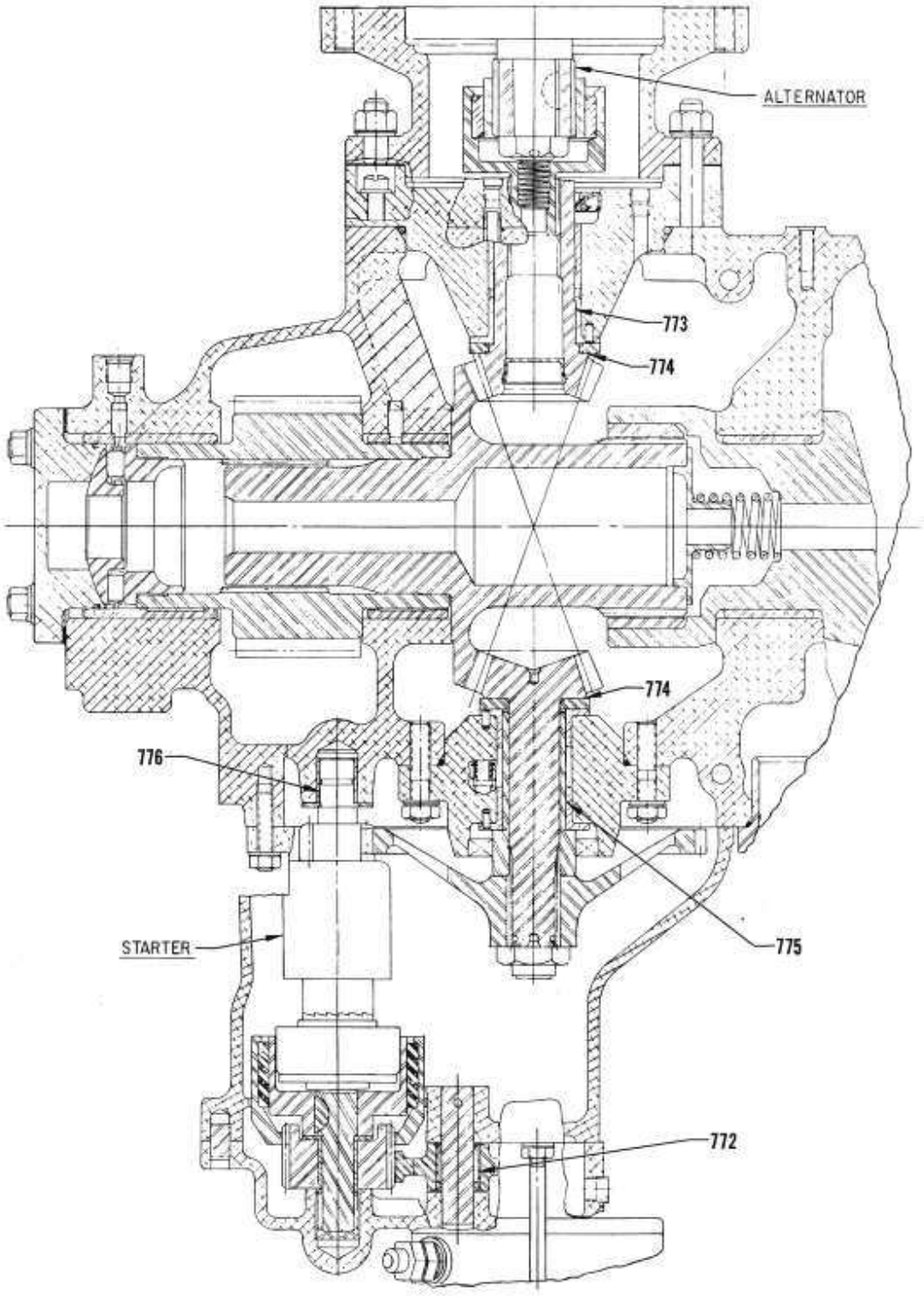


Propeller Shaft Drive Gear

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN

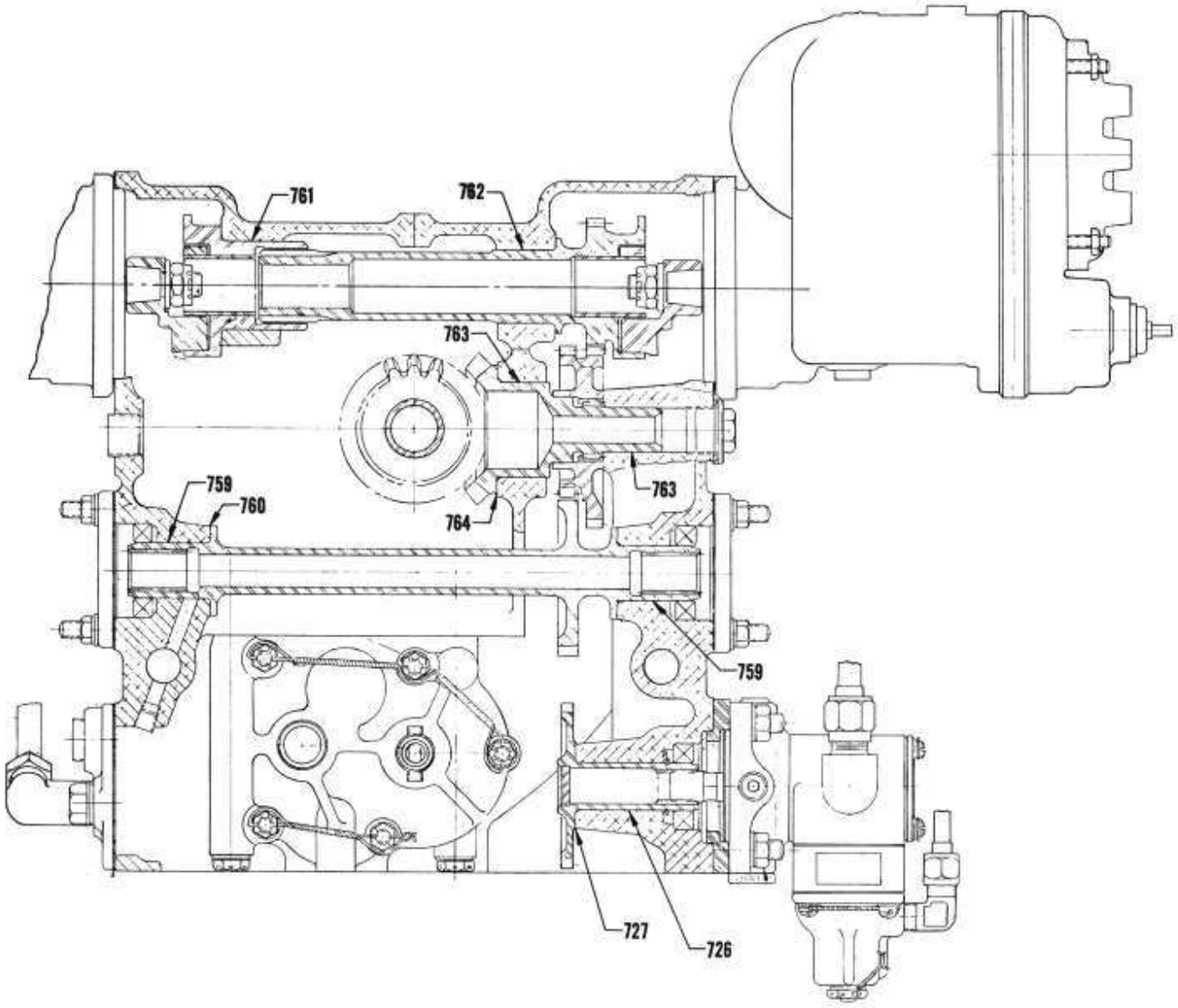


Alternator, Starter and Propeller Shaft

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN

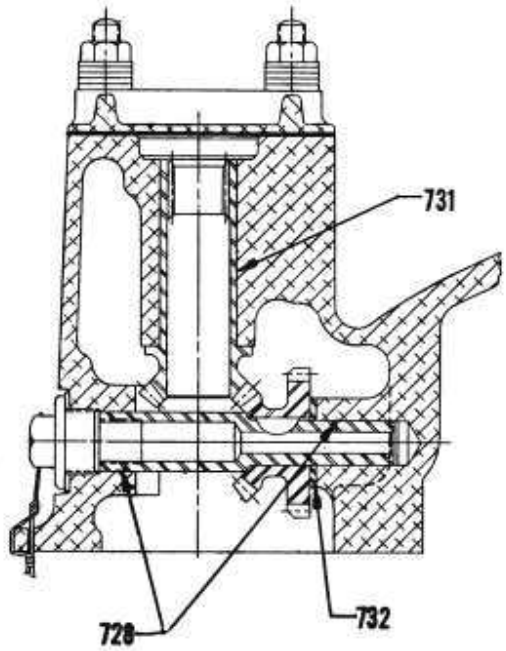


Fuel Pump, Magneto, Vacuum and Hydraulic Pump

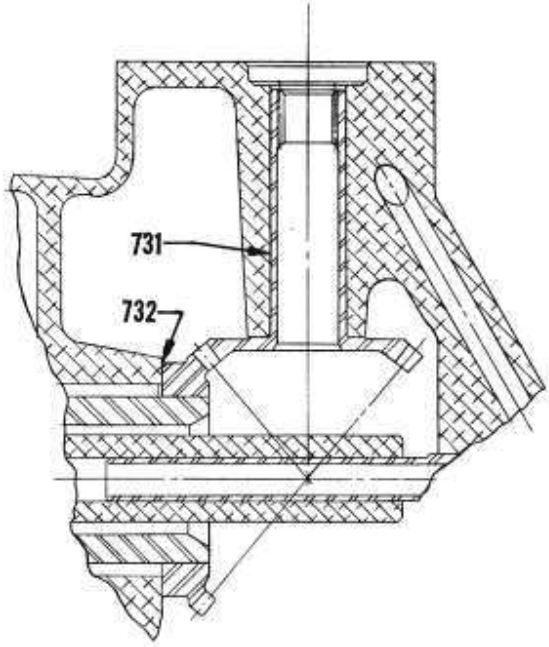
SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN



TIGO-541
PROP. GOVERNOR



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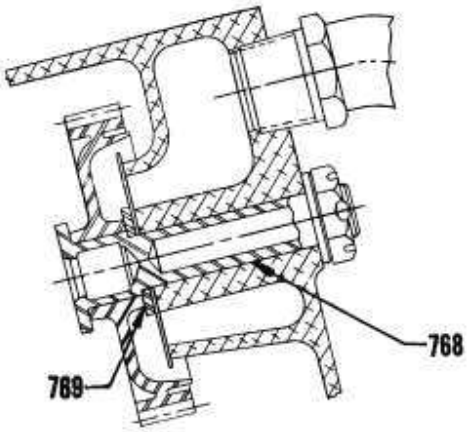
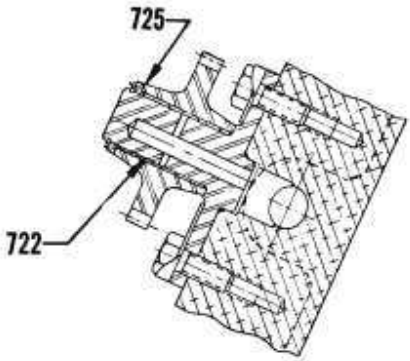


BREATHER GEAR
TIO-541 ONLY



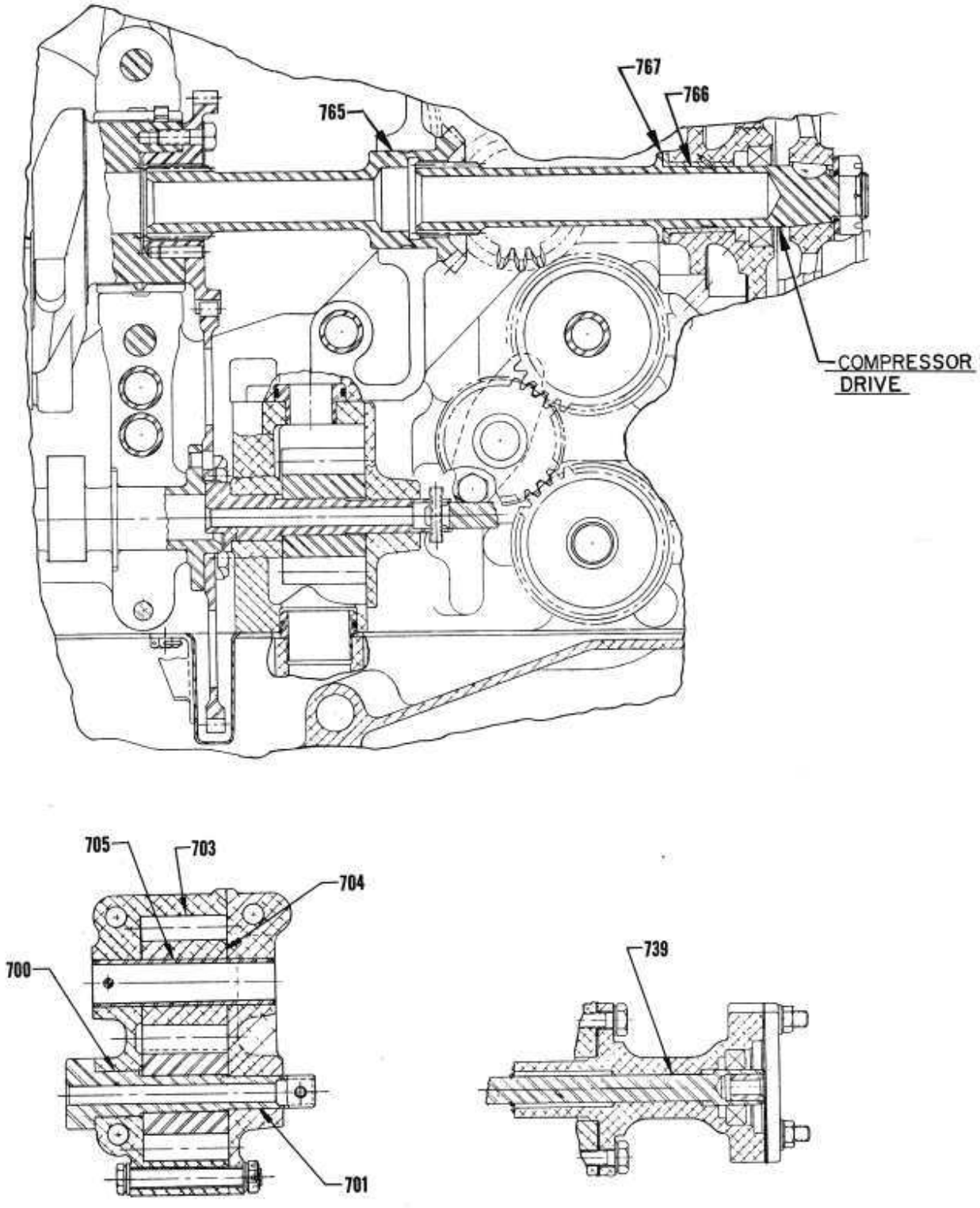
FUEL PUMP IDLER GEAR

Governor, Fuel Pump and Breather Gear

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN



Oil Pump, Tachometer and Compressor

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION IV – BACKLASH

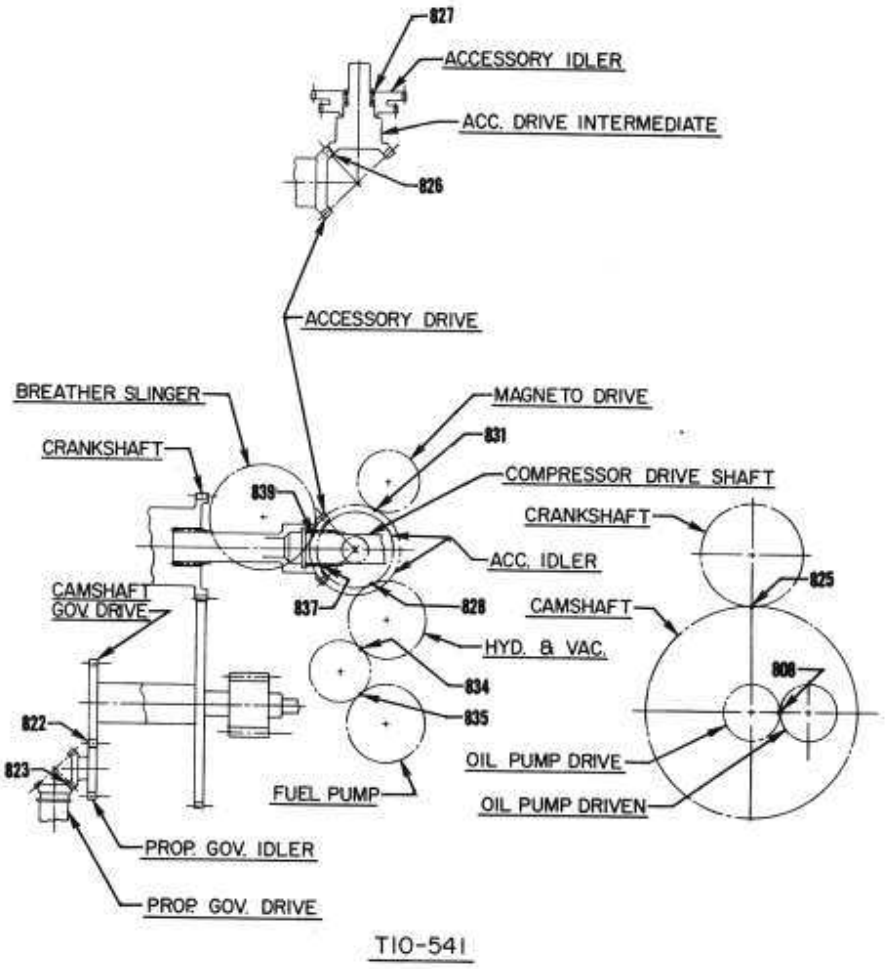
Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
808	AQ-AZ	Oil Pump Impellers – Backlash			.008 .013	.020
822	AQ	Propeller Governor Idler and Camshaft – Backlash			.005 .015	.020
823	AQ-AZ	Propeller Governor Drive and Idler – Backlash			.004 .008	.015
825	AQ-AZ	Crankshaft Timing Gear and Camshaft – Backlash			.005 .015	.020
826	AQ-AZ	Accessory Drive and Accessory Drive Intermediate			.004L .006L	.010L
827	AQ-AZ	Accessory Drive Gear Intermediate and Idler – Spline Backlash			.002 .005	.007
828	AQ-AZ	Accessory Idler and Vacuum and Hydraulic Pump Gear – Backlash			.004 .011	.016
829	AZ	Propeller Shaft – Reduction Gear Total Backlash at 4 Foot Radius			.38 .75	.90
830	AZ	Starter (Bendix – Slip Coupling) and Starter Drive Gear – Backlash			.016 .031	.045
831	AQ-AZ	Accessory Idler and Magneto Drive Shaftgear – Backlash			.005 .015	.020
832	AZ	Starter Drive Gear and Starter and Alternator Drive Shaft Gear – Backlash			.004 .008	.015
833	AZ	Alternator Drive Gear and Starter and Alternator Drive Shaftgear – Backlash			.003 .008	.012
834	AQ-AZ	Fuel Pump Idler Gear and Vacuum and Hydraulic Pump Drive Gear – Backlash			.002 .015	.020
835	AQ-AZ	Fuel Pump Idler Gear and Fuel Pump Drive – Backlash			.0006 .0160	.021
836	AQ-AZ	Magneto Drive Shaft Gear and Magneto Coupling – Spline Backlash			.0010 .0045	.0075
837	AQ-AZ	Accessory Drive Gear and Compressor Drive Shaft – Spline Backlash			.0040 .0076	.014
838	AQ-AZ	Crankshaft Gear and Accessory Drive Shaftgear – Spline Backlash			.0040 .0076	.014
839	AQ	Breather Slinger Gear and Accessory Idler – Backlash			.005 .015	.020
840	AZ	Front Crankshaft Spline Bushing and Alternator and Starter Shaft Gear – Spline Backlash			.001 .005	.006

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	*Service* Max.	Mfr. Min. & Max.	Service Max.
841	AZ	Propeller Shaft Drive Gear and Alternator and Starter Shaft Gear – Spline Backlash			.001 .004	.006
842	AZ	Propeller Shaft Drive Gear and Driven Gear – Backlash			.008 .014	.016
843	AZ	Starter Slip Coupling Gear and Starter Idler – Backlash			.0002 .0045	.0075
844	AZ	Bendix Starter Motor Shaft Gear and Idler – Backlash			.0002 .0045	.0075
845	AZ	Propeller Shaft Spline and Propeller Shaft Driven Gear – Spline Backlash			.008 .011	.015
		(When Measured at O.D. of Propeller Gear)			.020 .028	.036

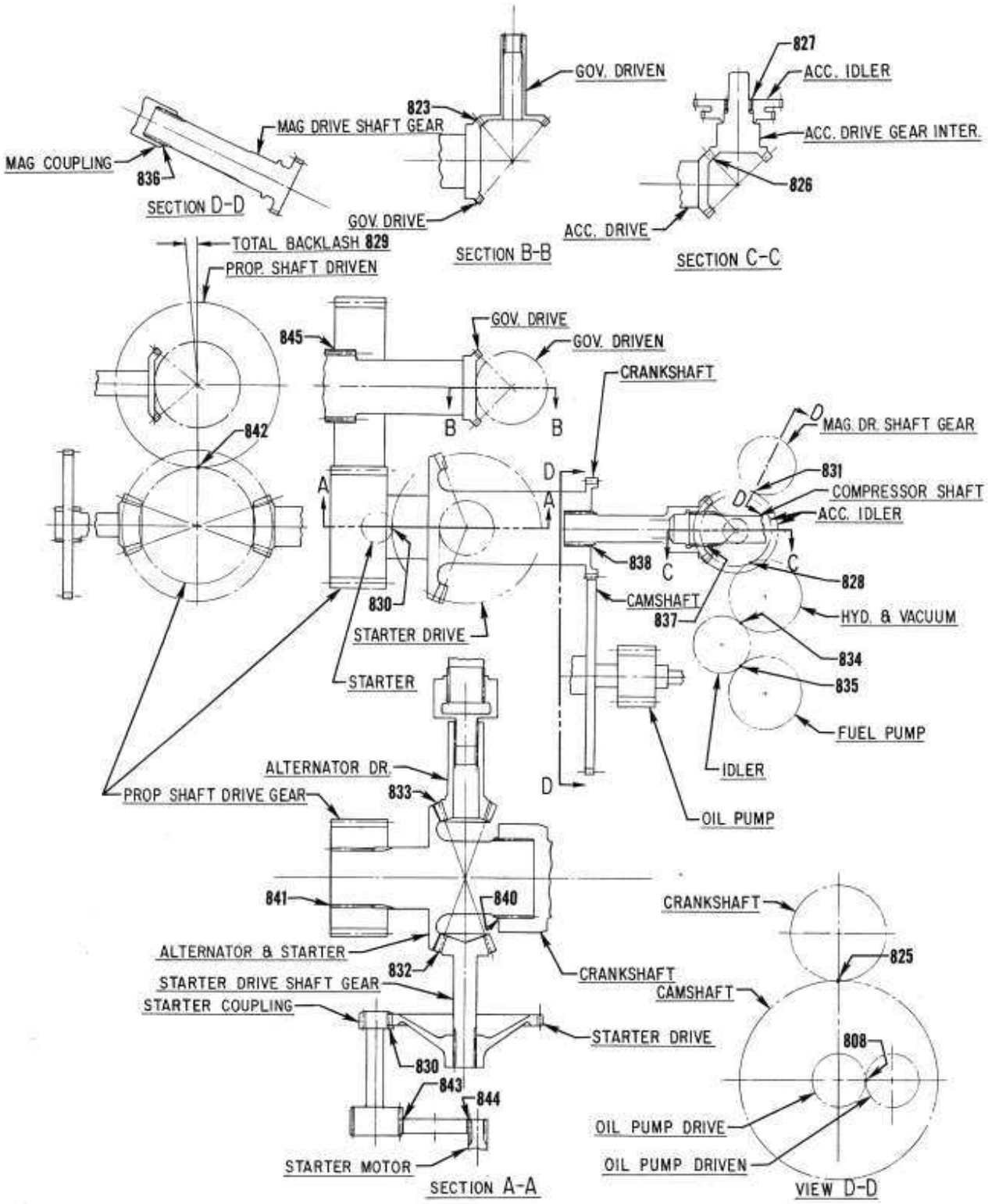


Accessory Drives

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION IV – BACKLASH



Accessory Drives

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	*Chart*	*Thread Size*	*Nomenclature*	Torque Limits
900	AQ-AZ	3/8-24	Connecting Rod Nuts – Tighten to Length	2.255-2.256
903	AQ-AZ	3/8-24	Magneto – Nut (To attach drive member to magneto)	300 in. lbs.
904	AQ-AZ	10-32	Magneto – Plate Screws	15 in. lbs.
905	AQ-AZ (using a silicone gasket)	1/4-20	Rocker Box Screws	35 in.-lbs.
	AQ-AZ (using a cork gasket)	1/4-20	Rocker Box Screws	50 in. lbs.
907	AQ-AZ	18MM	Spark Plugs	420 in. lbs.
909	AQ		Alternator Pulley Nut	450 in. lbs.
	AZ		Alternator Quill Shaft Nut	474 in. lbs.
910	AQ-AZ	1/4-28	Alternator Output Terminal Nut	85 in. lbs.
911	AQ-AZ	10-32	Alternator Auxiliary Nut	30 in. lbs.
912	AQ-AZ	5/16-24	Starter Terminal Nut	2 in. lbs.
913	AQ-AZ	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 in. lbs.
915	AQ-AZ	3/4-16	Oil Filter Bolt (AC Can and Element Type)	300 in. lbs.
	AQ-AZ	13/16-16	Oil Filter (Throw away type)	240 in. lbs.
	AQ-AZ	3/4-16	Converter Stud	720 in. lbs.
917	AQ-AZ	1.00-14	Oil Cooler Bypass Valve	300 in. lbs.
918	AQ-AZ	1-1/4-12	Oil Pressure Relief Valve	300 in. lbs.
919	AQ-AZ		Hose Clamps	45 in. lbs.
921	AQ-AZ	Exhaust V-Band Coupling Torque Data		
	Coupling Size Tube OD / Lycoming Part No.	Vendor Part No.	T-Bolt Split Type Locknut Torque In. Lbs.	1/4 In. Drilled Hex Nut with Safety Wire Torque In. Lbs.
	2.00 in. / LW-12093-5	MVT69183-200	85	75
	2.25 in. / LW-12093-6	MVT-69183-225	85	75
	2.25 in. / LW-12125-3	MVT-69197-225	85	
922	AZ	Turbocharger V-Band Torque Data		
	Turbocharger Model No.	V-Clamp Part No.	V-Clamp Diameter	Torque In. Lbs.
	T18A21*	400500-925	9.25 in.	40-60
	* - AiResearch turbocharger. See latest revision of Service Instruction No. 1238 for assembly procedure.			
923	AZ	2-1/16-12	Propeller Shaft Lock Nut	1000 ft. lbs.
924	AQ-AZ	7/16-20	Fuel Injector Nozzles (In Induction Housing)	210 in. lbs.
925	AQ-AZ	3/4-16	Compressor Drive Pulley Nut	240 in. lbs.
926	AZ	5/8-18	Starter Drive Shaft Gear Nut	900 in. lbs.
927	AQ-AZ	1/4	Bolts – Crankshaft Gear	96-120 in. lbs.
928	AQ-AZ	3/8-16	Cylinder Hold Down Studs (Crankcase Driving Torque)	100 in. lbs.
		1/2-13	Cylinder Hold Down Studs (Crankcase Driving Torque)	250 in. lbs.
929	AQ-AZ	3/8	Cylinder Hold Down Nuts	300 in. lbs.
		1/2	Cylinder Hold Down Nuts	600 in. lbs.
	Cylinder Hold Down Nut Tightening Procedure – See latest revision of Service Instruction No. 1029.			
932	AQ-AZ	5/16-18	Exhaust Transitions – Studs (Driving Torque)	100 in. lbs.
		3/8-16	Exhaust Transitions – Studs (Driving Torque)	200 in. lbs.

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

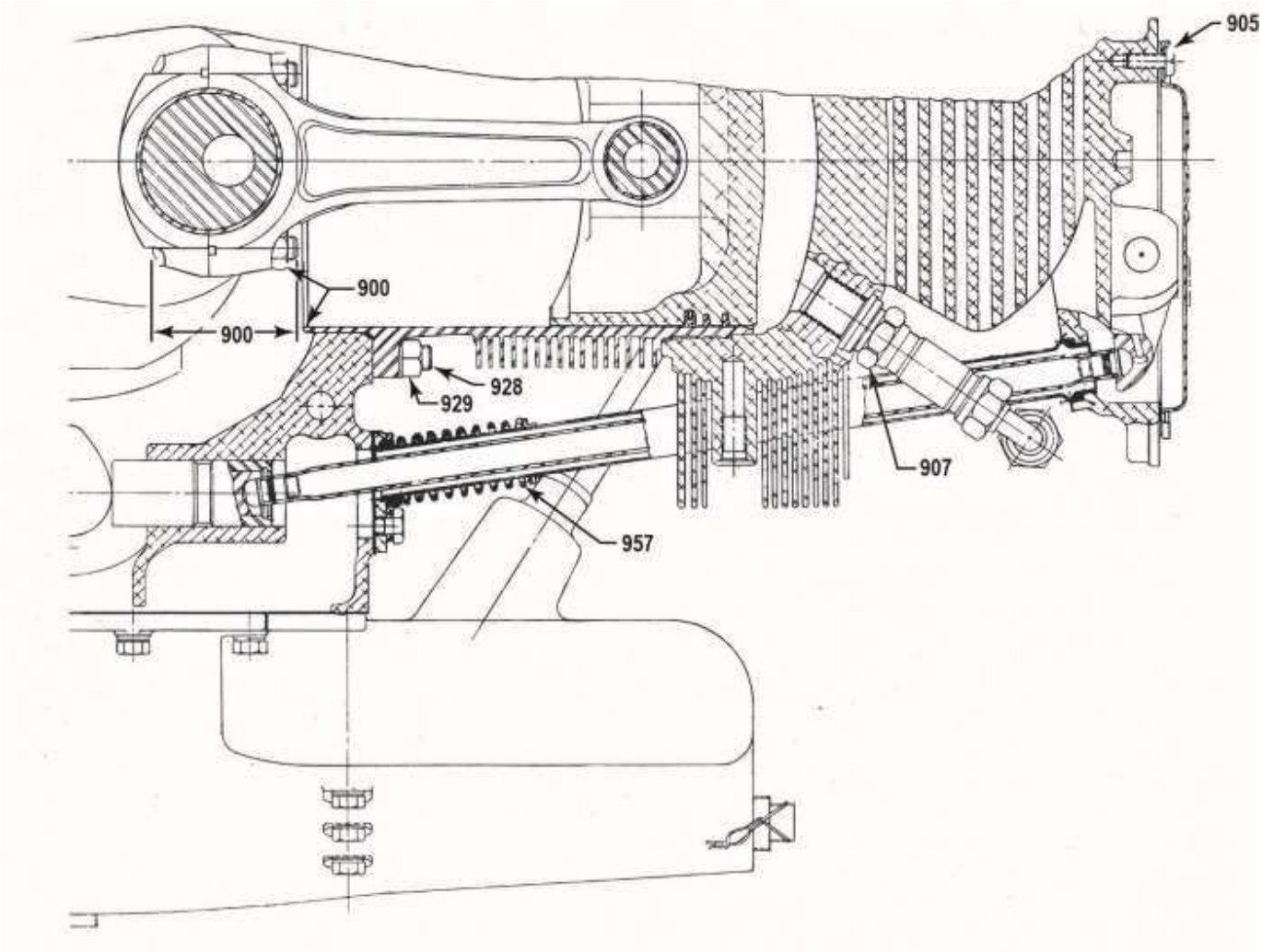
SECTION V – SPRINGS

Ref.	Chart	Nomenclature	Lyc. Part No.	Wire Dia.	Length at Comp. Length	COMP. LOAD		
						Mfr. Min.	Mfr. Max.	Service Max.
950	AQ-AZ	Outer Valve Spring	LW-11798 76351	.192 .177	1.610 in. 1.610 in.	136 lb. 136 lb.	144 lb. 144 lb.	133 lb. min.
951	AQ-AZ	Auxiliary Valve Spring	LW-11799 76352	.148 .142	1.48 in. 1.48 in.	86 lb. 86 lb.	94 lb. 94 lb.	83 lb. min.
952	AQ-AZ	Oil Pressure Relief Valve Spring						
		Lycoming Part Numbers	Identification: Dye	Identification: Free Length				
		68668	Purple	2.04	.054	1.30 in.	7.1 lb.	7.8 lb.
		LW-11713	White	2.12	.059	1.44 in.	10.79 lb.	11.92 lb.
		LW-11138	None	2.64	.051	1.44 in.	8.55 lb.	9.45 lb.
955	AQ-AZ	Fuel Drain Check Valve Spring			.047	.75 in.	5.50 lb.	6.50 lb.
956	AQ-AZ	Oil Filter Relief Valve Spring			.054	1.93 in.	3.05 lb.	3.55 lb.
957	AZ	Shroud Tube Spring			.105	2.09 in.	14 lb.	16 lb.
958	AQ-AZ	Pressurizing Valve Spring			.032	.455-.485	.65 lb.	.75 lb.
959	AZ	Spring Between Crankshaft and Starter and Alternator Drive Gear			.13	1.40 in.	48 lb.	52 lb.
960	AZ	Alternator Drive Coupling Spring			.047	.83 in.	10 lb.	11 lb.

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

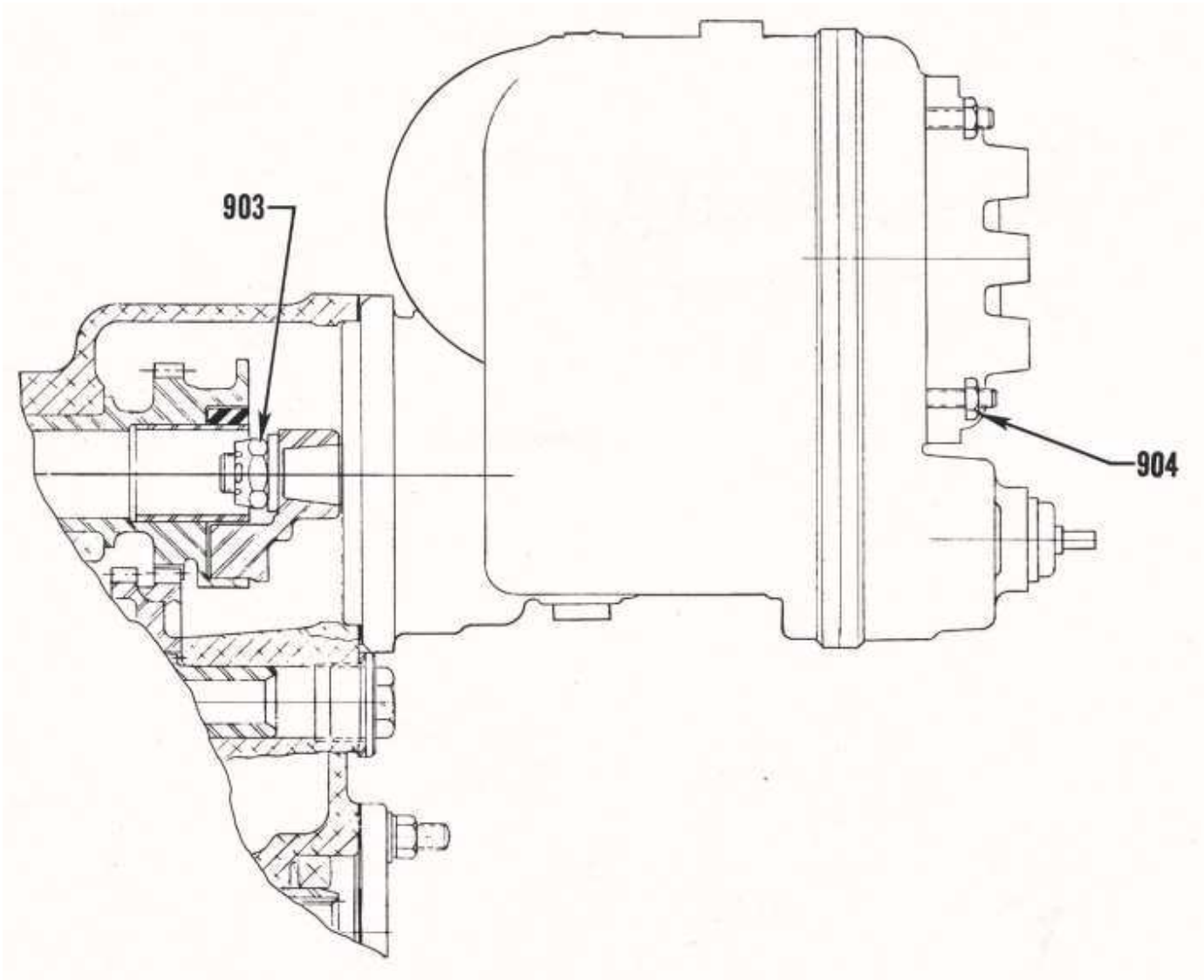


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

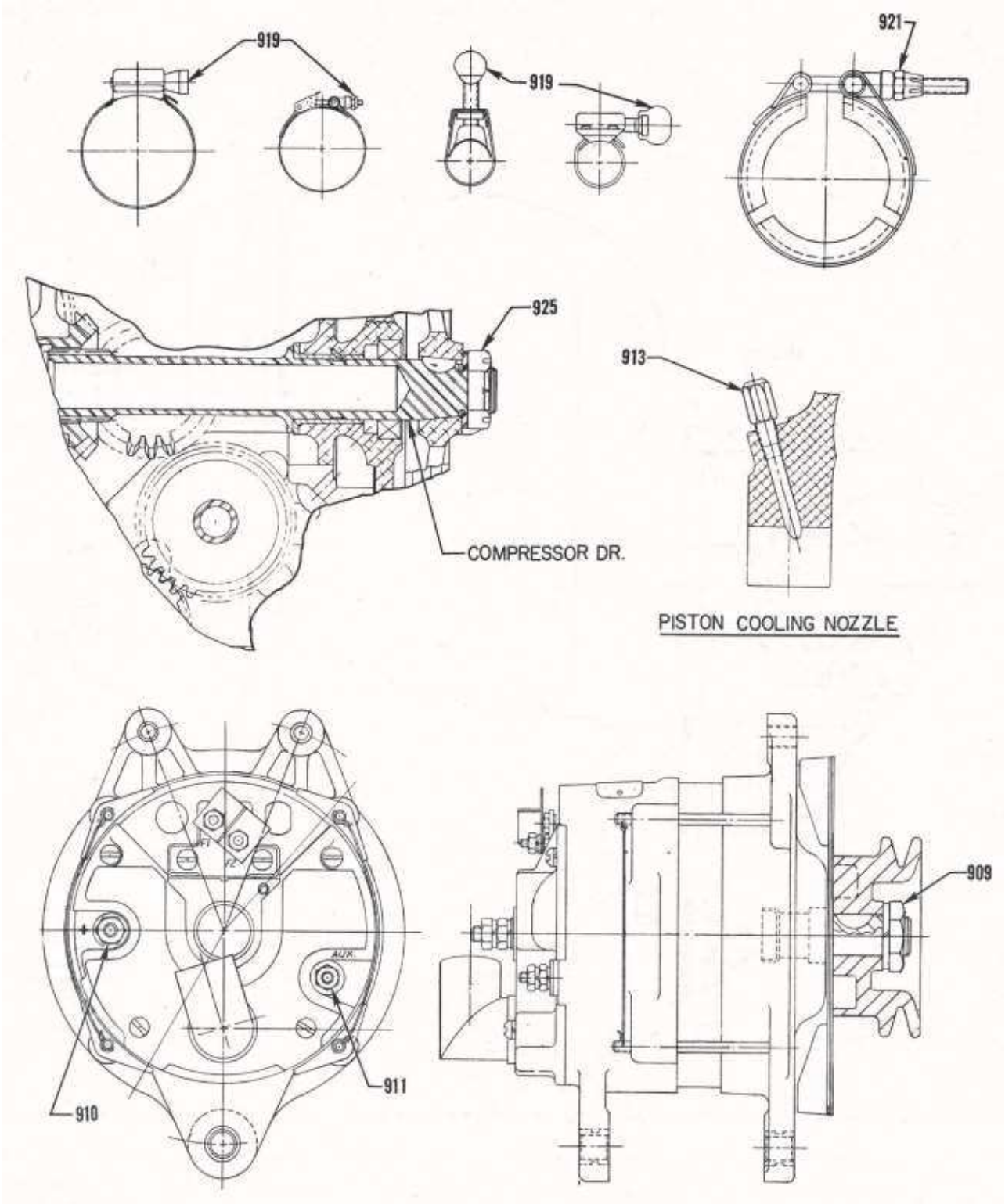


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

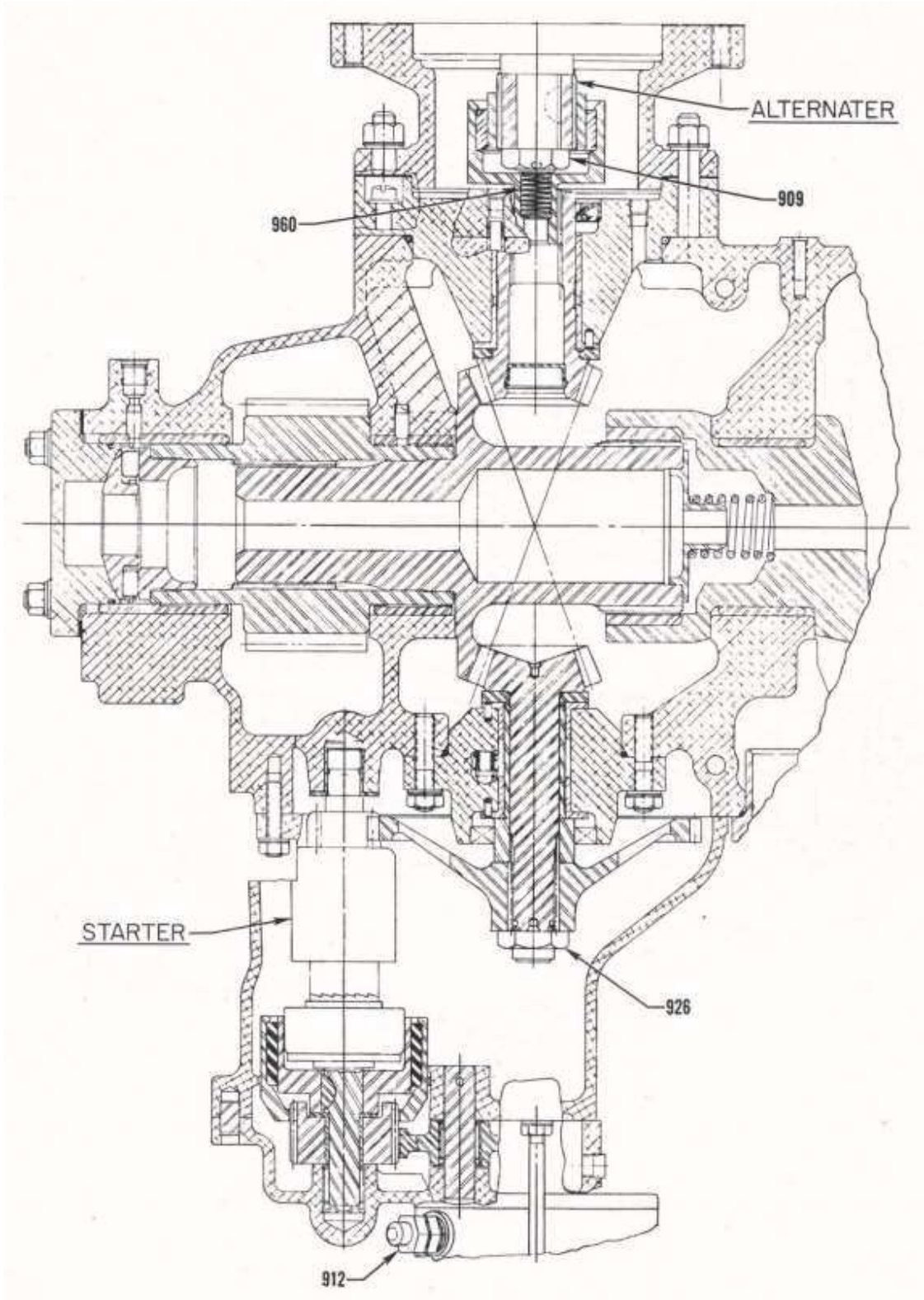


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

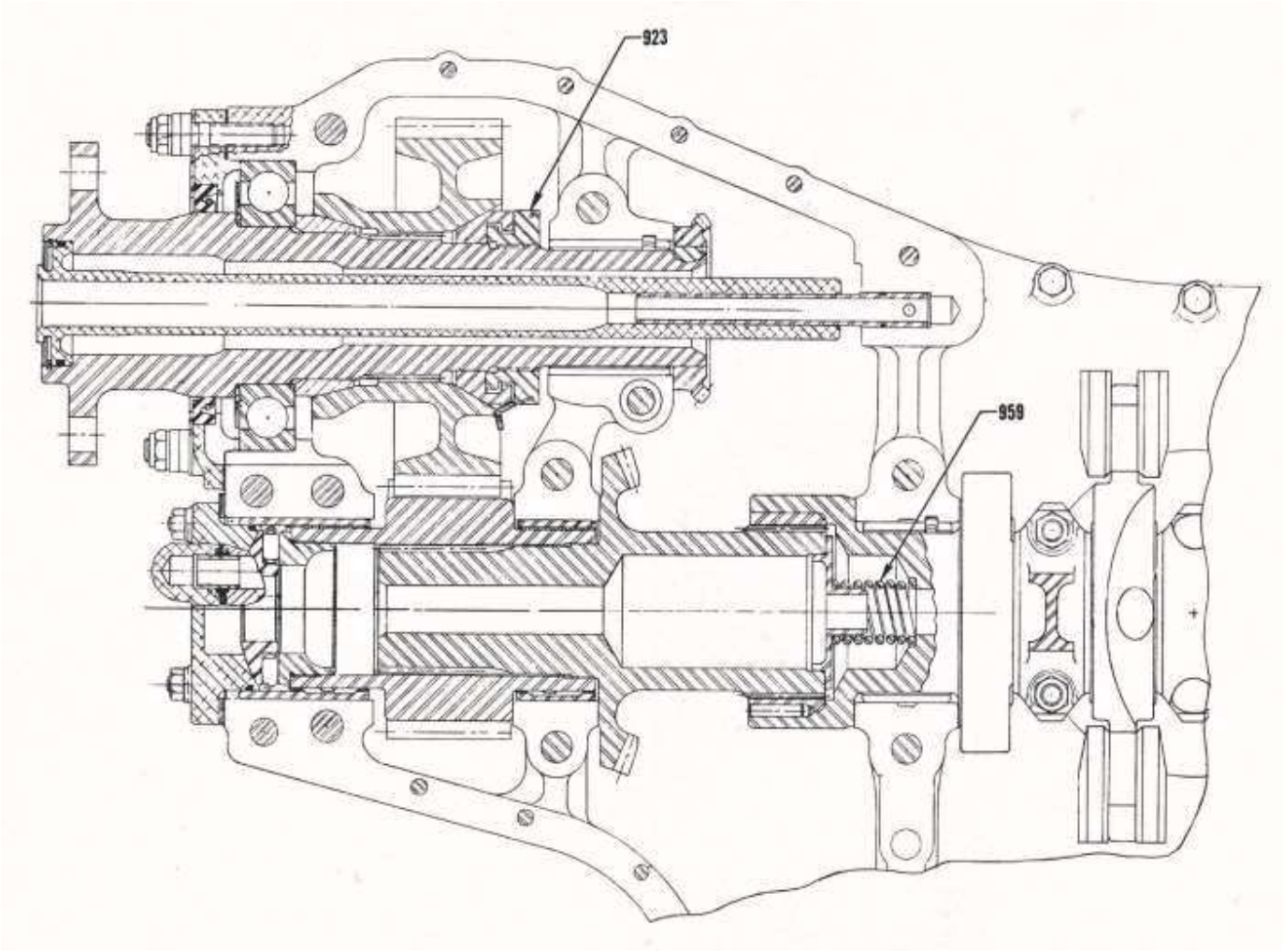


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

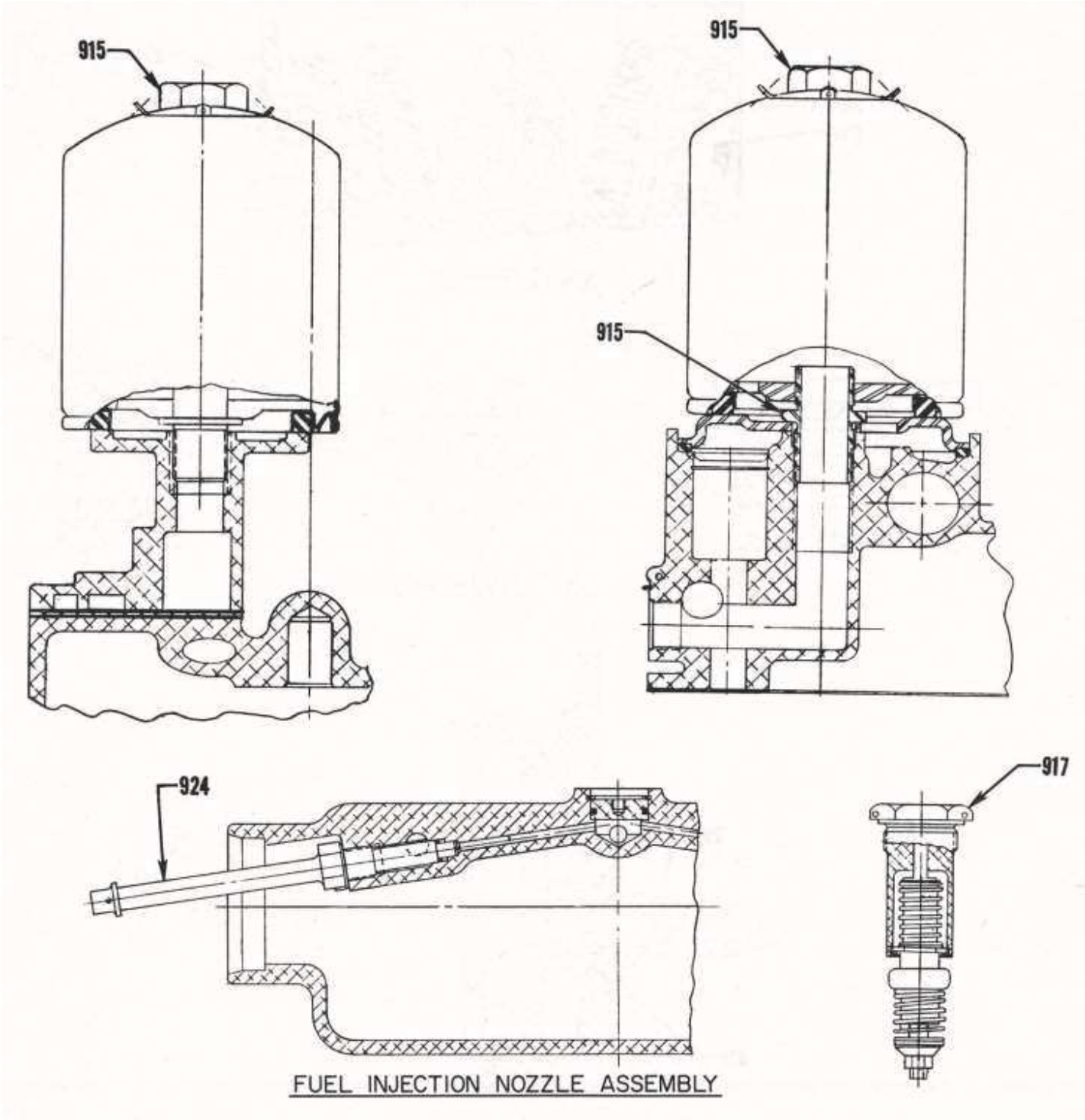


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

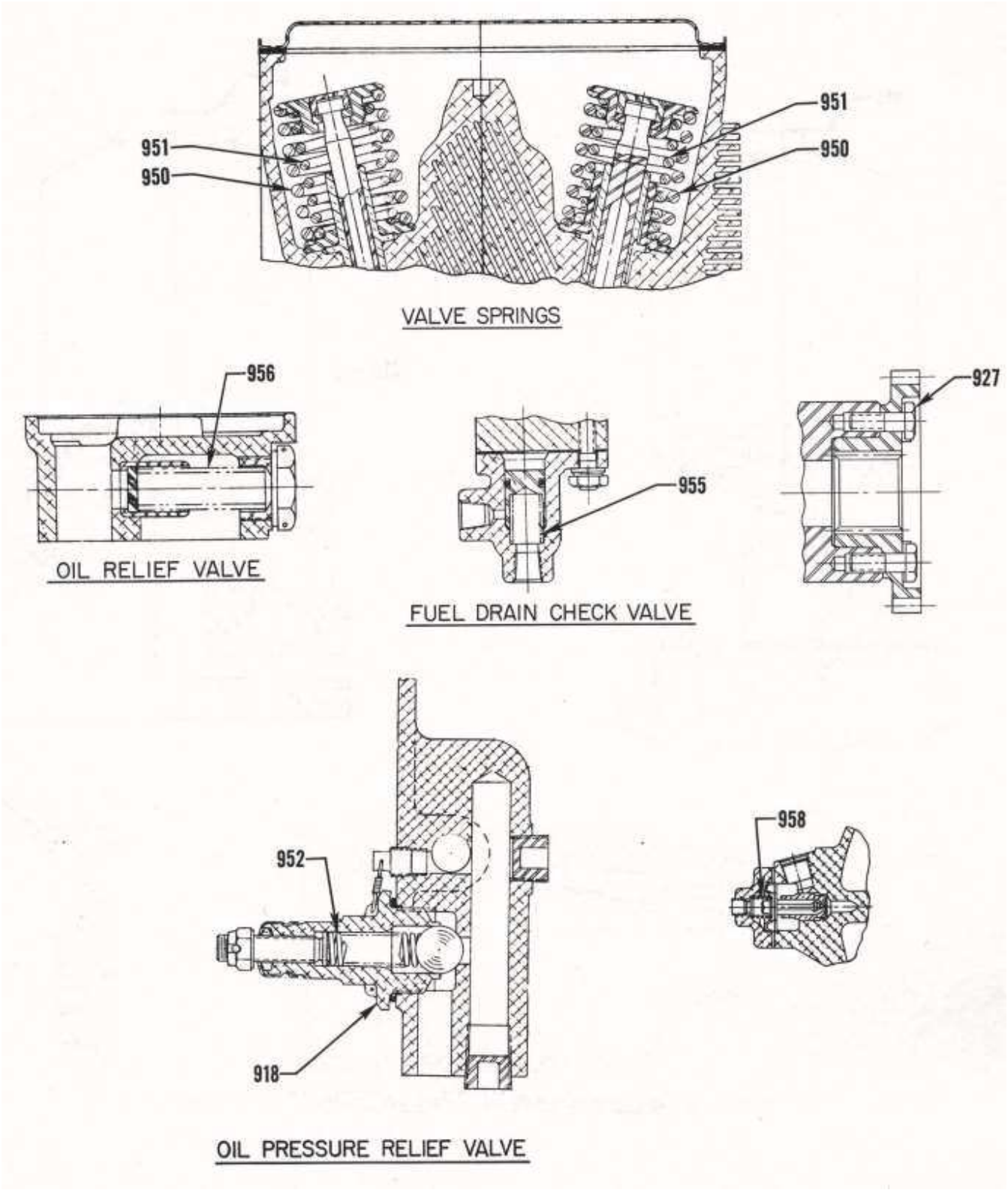


Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

STANDARD TORQUE

UNLESS OTHERWISE LISTED

Torque limits for propeller attaching bolts to be supplied by propeller aircraft manufacturer.

NOTE: Refer to Table VIII for torque value conversions (In. Lb. or Ft. Lb. to Nm).

TABLE I

BOLTS, SCREW AND NUTS

Thread	Torque		Thread	Torque	
	In. Lb.	Ft. Lb.		In. Lb.	Ft. Lb.
8	20 to 22	-----	7/16	600 to 660	50 to 55
10	49 to 54	-----	1/2	900 to 984	75 to 82
1/4	96 to 106	-----	9/16	1320 to 1452	110 to 121
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297
THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE					

TABLE II

PIPE PLUGS

Thread	Torque
	In. Lbs.
1/16-27 NPT	40 to 44
1/8-27 NPT	40 to 44
1/4-18 NPT	85 to 94
3/8-18 NPT	110 to 121
1/2-14 NPT	160 to 176
3/4-14 NPT	230 to 252
1-11-1/2 NPT	315 to 347

TABLE III

CRUSH TYPE GASKETS

Thread Pitch on Part to be Tightened	ANGLE OF TURN	
Threads Per Inch	Aluminum	Copper
8	135°	67°
10	135°	67°
12	180°	90°
14	180°	90°
16	270°	135°
18	270°	135°
20	270°	135°
24	360°	180°
28	360°	180°

NOTE: Install all crush type gaskets except the self centering type, with the unbroken surface against the flange of the plug or part being tightened against the seal. Turn the part until the sealing surfaces are in contact and then tighten to the angle of turn listed for the appropriate thread size.
NOTE: Lubricate Threads Unless Otherwise Specified.

TABLE IV

FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)

Tube Size	Thread	Torque In. Lbs.	
		Aluminum Alloy	Steel
(-3) 3/16	3/8 - 24	30 to 50	70 to 80
(-4) 1/4	7/16 - 20	40 to 65	90 to 100
(-5) 5/16	1/2 - 20	60 to 80	135 to 150
(-6) 3/8	9/16-18	75 to 125	270 to 300
(-8) 1/2	3/4-16	150 to 250	450 to 500
(-10) 5/8	7/8 - 14	200 to 350	650 to 700

TABLE V

STUDS MIN. DRIVING TORQUE

Threads	Torque In. Lbs.
1/4-20	15
5/16-18	25
3/8-16	50

TABLE VI

JAM NUT OR STRAIGHT THREAD O-RING BOSS

Tube Size	Thread	Torque Ft. Lbs.
-03	3/8 – 24	8 – 9
-04	7/16 – 20	13 – 15
-05	1/2 – 20	14 – 15
-06	9/16 – 18	23 – 24
-08	3/4 – 16	40 – 43
-10	7/8 – 14	43 – 48
-12	1-1/16 – 12	68 – 75
-14	1-3/16 – 12	83 – 90
-16	1-5/16 – 12	112 – 123
-20	1-5/8 – 12	146 – 161
-24	1-7/8 – 12	154 – 170
-32	2-1/2 – 12	218 – 240

SERVICE TABLE OF LIMITS

STANDARD TORQUE (CONT.)
UNLESS OTHERWISE LISTED

TABLE VII

METAL TUBE FITTINGS

Dash Nos. Ref.	Tubing OD inches	Wrench torque for tightening AN-818 Nut (pound inches)						Minimum bend radii measured to tubing centerline. Dimension in inches	
		Aluminum-alloy tubing		Steel tubing		Aluminum-alloy tubing (Flare MS33583) for use on oxygen lines only			
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Alum. Alloy	Steel
-2	1/8	20	30	75	85	--	--	3/8	--
-3	3/16	25	35	95	105	--	--	7/16	21/32
-4	1/4	50	65	135	150	--	--	9/16	7/8
-5	5/16	70	90	170	200	100	125	3/4	1-1/8
-6	3/8	110	130	270	300	200	250	15/16	1-5/16
-8	1/2	230	260	450	500	300	400	1-1/4	1-3/4
-10	5/8	330	360	650	700	--	--	1-1/2	2-3/16
-12	3/4	460	500	900	1000	--	--	1-3/4	2-5/8
-16	1	500	700	1200	1400	--	--	3	3-1/2
-20	1-1/4	800	900	1520	1680	--	--	3-3/4	4-3/8
-24	1-1/2	800	900	1900	2100	--	--	5	5-1/4
-28	1-3/4	--	--	--	--	--	--	--	--
-32	2	1800	2000	2660	2940	--	--	8	7

TABLE VIII

TORQUE CONVERSIONS

In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm
5	0.42	0.56	100	8.33	11.30	1000	83.33	113.00
10	0.83	1.13	200	16.67	22.60	2000	166.70	226.00
20	1.67	2.26	300	25.00	53.90	3000	250.00	339.00
30	2.50	3.39	400	33.33	45.19	4000	333.30	451.90
40	3.33	4.52	500	41.67	56.49	5000	416.70	564.90
50	4.17	5.65	600	50.00	67.79	6000	500.00	677.90

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

CHART	MODELS
E	GO-435 ALL
E1	GO-435-C2B2, -C2B2-6
H	GO-480, IGO-480 ALL
H1	GO-480-B
H2	GO-480-F1A6, -F2A6, -F4A6, -G2D6, -G2F6
H3	GO-480-G1H6, -G1D6
H4	GO-480-D1A (Crosswise Accessory Housing)
H5	GO-480-G1B6 (Crosswise Accessory Housing)
P	GSO-480, IGSO-480
P1	IGSO-480
AB	IGSO-540
AC	IGO-540

NOTE

In "Chart" column, a number appearing after a letter shows exception to basic model.

SECTION I	500 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT
SECTION II	600 SERIES	CYLINDERS
SECTION III	700 & 7000 SERIES	GEAR TRAIN
SECTION IV	800 SEREIS	BACKLASH (GEAR TRAIN)
SECTION V	900 SERIES	TORQUE & SPRINGS

(A) These fits are either shrunk fits controlled by machining, fits that may readily be adjusted, or fits where wear does not normally occur. In each case, the fit must be held to manufacturing tolerance.

(B) Side clearance on piston rings must be measured with face of ring flush with piston.

(C) Replacements to correct these items must be made to give uniform backlash within 0.001 between the stationary gear and pinions, and within 0.001 between the pinions and the ring gear.

(D) These dimensions shown are measured at bottom of piston skirt at right angles to piston pin.

(E) Permissible wear of the crankshaft (rod and main bearing journals) to be minus 0.0015 on the diameter.

(L) Loose fit; wherein a definite clearance is mentioned between the mating surfaces.

(T) Tight fit; shrink or interference fit.

* - Indicates cut-off date for data retrieved prior to publication.

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TECHNICAL PUBLICATION
REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
SSP-1776-5-PT3	**Service Table of Limits**	**SSP-1776**	**October 28, 2013**

PREVIOUS REVISIONS	CURRENT REVISION*
April 2018 3-9, 3-47, 3-53 • Deleted NOTES that reference S.I. 1243 in Piston Application Table • Added Ref. number 930 to Section V table and figure for torque value for brass union nut on stainless steel injector fuel lines and primer lines (Both Ends)	**April 2020** 3-8 • Revised burnishing instructions for connecting rod bushing in reference number 600 • Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607 * Revisions are indicated with a vertical bar to the left of the revised item.

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SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	E-H1-H2-H4	All Main Bearings and Crankshaft			.0015L .0045L	.0060L
	H3-H5-P-AB-AC	Main Bearings and Crankshaft (Except Front)			.0011L .0041L	.0050L
	H3-H5-P-AB-AC	Front Main Bearings and Crankshaft			.0011L .0041L	.0050L
	E-H-P	Diameter of Main Bearing Journal on Crankshaft	2.3745 2.376	(E)		
	E-H1-H2-H4	Crankcase Bearing Bore Diameters (All)	2.566 2.567	2.5685		
	H3-H5-P-AB-AC	Crankcase Bearing Bore Diameters (All)	2.6865 2.6875	2.6890		
501	ALL	Connecting Rod Bearings and Crankshaft			.0008L .0038L	.0050L
	ALL	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	2.1235 2.125	(E)		
	ALL	Connecting Rod Bearing Bore Diameter (Measured at axis 30° on each side)	2.2870 2.2875			
502	ALL	Connecting Rod Side Clearance			.004L .010L	.016L
503	ALL	Connecting Rod Alignment			.010 in 10 Inches	
504	ALL	Connecting Rod Twist			.012 in 10 Inches	
505	ALL	Crankshaft Run-Out at Center Main Bearings				
		Mounted on No. 1 and 4 Journals Max. Run-Out No. 2 and 3 Journals			.005	.0075
		Mounted on No. 1 and 3 Journals Max. Run-Out No. 2 Journal			.003	.0045
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
506	ALL	Crankshaft and Crankcase Front End Clearance			.006L .015L	.025L
510	E-H1-H2-H3	Crankshaft Timing Gear and Crankshaft			.0015L .0005T	(A)
	H4-H5-P-AB-AC	Crankshaft Timing Gear and Crankshaft			.0000 .0015T	(A)
511	ALL	Tappet Body and Crankcase			.0010L .0033L	.004L
	ALL	O.D. of Tappet	.7169 .7177	.7166		
	ALL	I.D. Tappet Bore in Crankcase	.7187 .7200	.7203		

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
512	ALL	Tappet Plunger Assembly and Body (Hyperbolic)			.0010L .0067L	.0087L
513	ALL	Tappet Socket and Body (Hyperbolic)			.002L .007L	.009L
514	ALL	Camshaft and Crankcase			.002L .004L	.006L
515	ALL	Camshaft – End Clearance			.002L .009L	.015L
516	ALL	Camshaft Run-Out at Center Bearing Journal			.000 .001	.006
517	ALL	Counterweight Bushing and Crankshaft			.0013T .0026T	(A)
518	ALL	Counterweight Roller – End Clearance			.007L .025L	.038L
519	ALL	Counterweight and Crankshaft – Side Clearance*			.003L .013L	.017L
	* - Measure below roller next to flat.					
520	ALL	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	ALL	I.D. of Counterweight Bushing	.7485 .7505	.7512		
522	ALL	O.D. of Counterweight Roller (P/N 69433) (See latest revision of Service Instruction No. 1012)	.5045 .5050			
	AC	O.D. of Counterweight Roller (P/N 73287) (See latest revision of Service Instruction No. 1012)	.5189 .5194			
	ALL	O.D. of Counterweight Roller (P/N 70416) (See latest revision of Service Instruction No. 1012)	.6945 .6950			
523	ALL	Thrust Bearing and Propeller Shaft			.0000 .0012L	.002L
526	ALL	Thrust Bearing and Thrust Bearing Cap Clamp Fit (Shim to this fit)			.003T .005T	(A)
527	ALL	Thrust Bearing Tilt			.027 Tilt	
528	ALL	Thrust Bearing – End Play			.006 .008	.010
530	ALL	Propeller Shaft Run-Out (Rear Cone Location)				.003
531	ALL	Propeller Shaft Run-Out (Front Cone Location) (Propeller Shaft Installed)				.007
532	E-H1-H2-H3	Starter Jaw and Crankshaft			.0005L .0040L	(A)
533	ALL	Thrust Bearing and Reduction Gear Housing			.0006L .0024L	.0035L

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

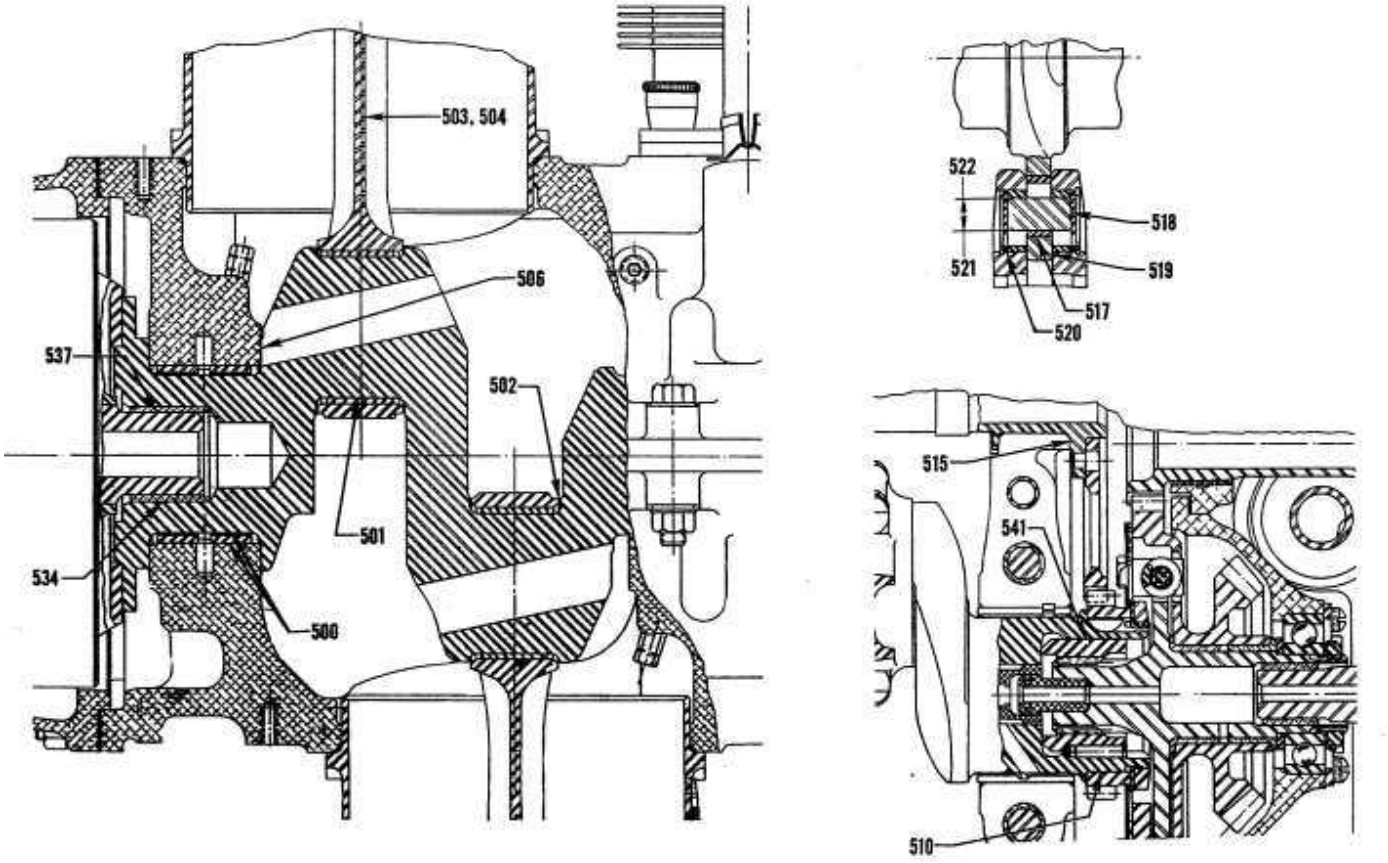
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
534	ALL	Crankshaft and Crankcase Front Bushing			.0010T .0025T	(A)
535	ALL	Pinion – End Clearance			.011 .016	.030
536	ALL	Pinion Shaft and Cage (See latest revision of Service Instruction No. 1236)			.0001T .0005T	
	ALL	Pinion Shaft and Cage (See latest revision of Service Instruction No. 1114)			Select for Hand Push Fit (C) .002	
537	ALL	Propeller Shaft and Crankshaft Bushing			.0020L .0035L	.005L
	ALL	I.D. Propeller Shaft Bushing in Crankshaft	1.251 1.2525	1.253		
			This Diameter must be concentric with Front Main Bearing within .003 in. TIR.			
538	ALL	Stationary Gear and Plate – End Clearance			.000 .004	.007
539	ALL	Ring Gear and Drive Plate – End Clearance			.000 .004	.007
540	P-AB-AC	Reduction Gear Governor and Magneto Housing and Reduction Gear Housing Sleeve			.004T .006T	(A)
541	H4-H5-P-AB-AC	Rear Crankshaft Spline Bushing and Crankshaft			.0002T .0015T	(A)

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

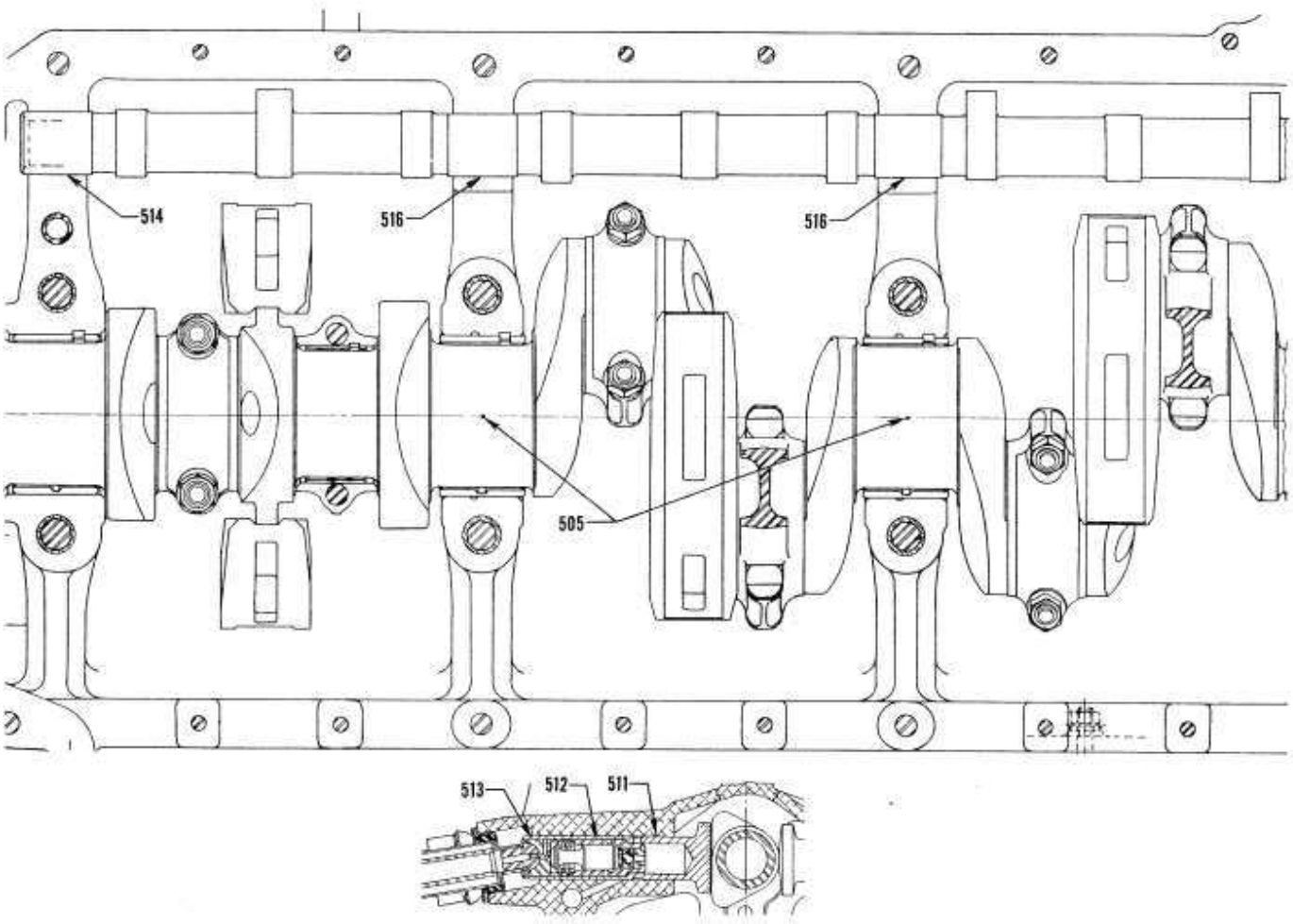


Crankcase, Crankshaft, Bearings, Camshaft, Tappets and Counterweights

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

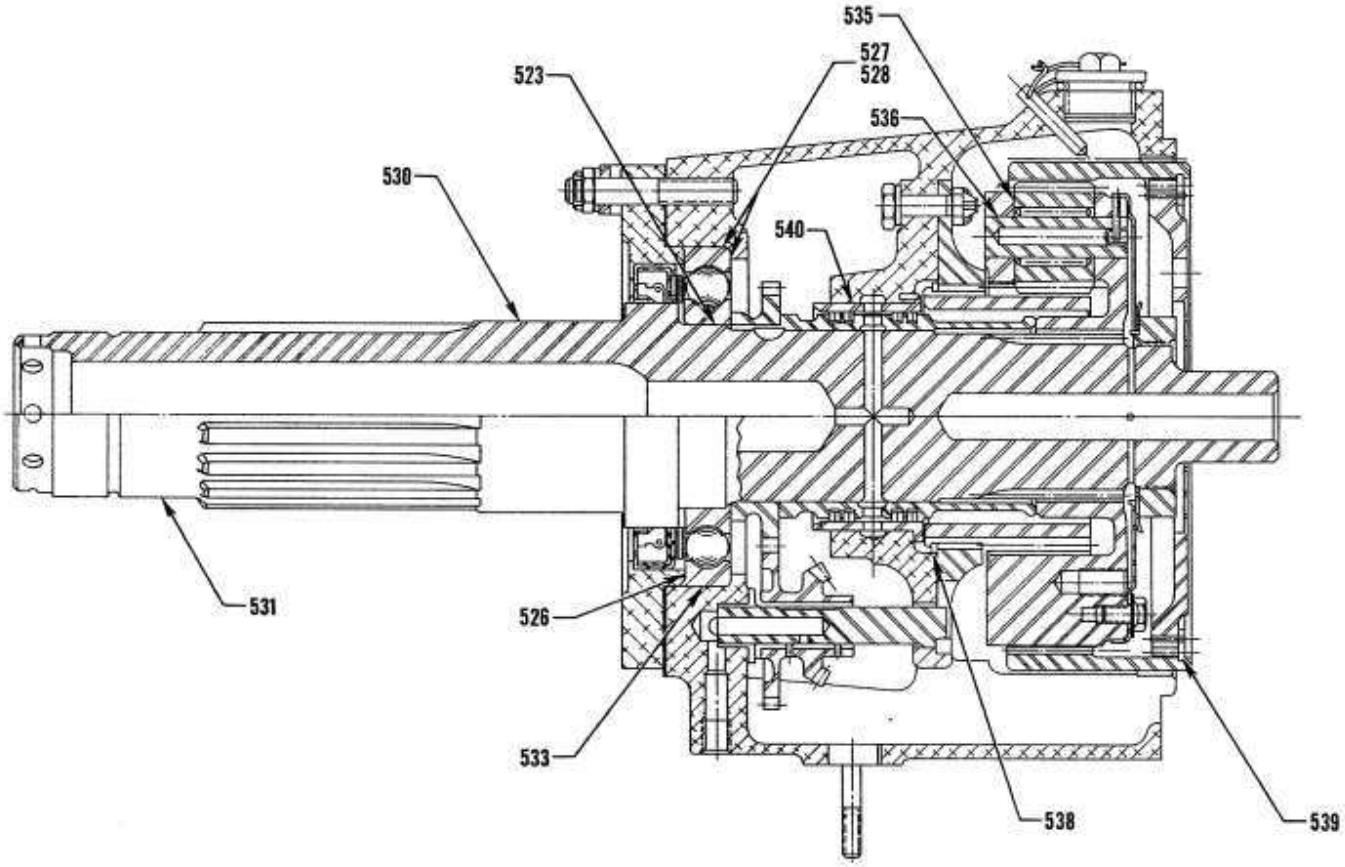


Longitudinal Section Thru Engine, Camshaft, Tappet Body and Crankshaft

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

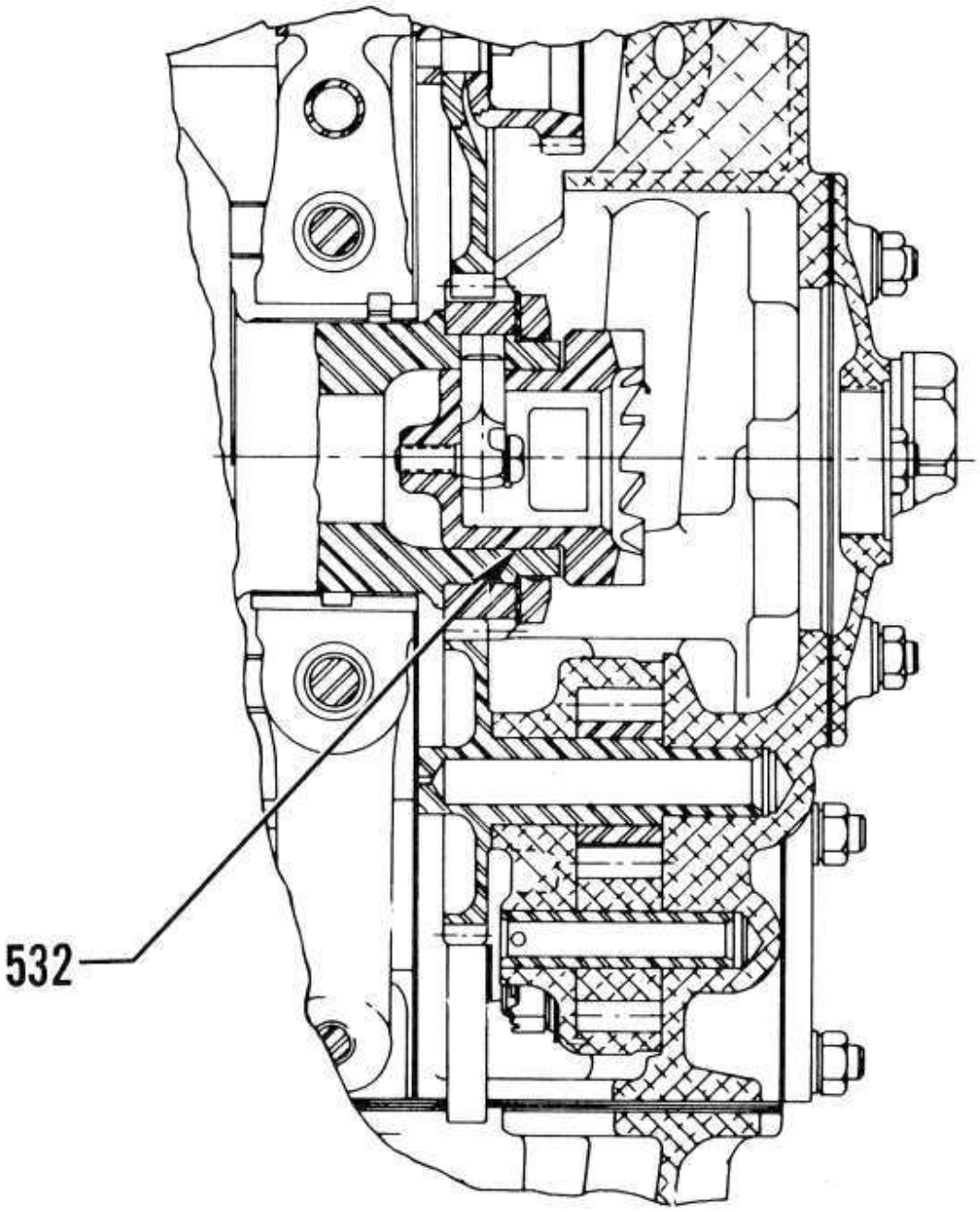


Reduction Gear and Related Parts

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



Starter Jaw and Crankshaft

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
600	ALL	Connecting Rod and Connecting Rod Bushing	Bushing P/N LW-13923 to be burnished in place Bushing P/N 01K28983 is **not** burnished in place			
		Finished I.D. of Connecting Rod Bushing	1.1254 1.1262			
601	E-H-P	Length Between Connecting Rod Bearing Centers	6.4985 6.5015			
	AB-AC	Length Between Connecting Rod Bearing Centers	6.4785 6.7515			
602	ALL	Connecting Rod Bushing and Piston Pin			.0008L .0021L	.0025L
603	ALL	Piston Pin and Piston			.0003L .0014L	.0018L
	ALL	Diameter of Piston Pin Hole in Piston	1.1249 1.1254			
	ALL	Diameter of Piston Pin	1.1241 1.1246			
604	H-P-AB-AC	Piston and Piston Pin Plug			.0002L .0010L	.002L
	H-P-AB-AC	*Diameter of Piston Pin Plug	1.1242 1.1247			
605	ALL	Piston Pin and Piston Pin Plug (Optional)			.0005L .0025L	.005L
	H-P-AB-AC	*Diameter of Piston Pin Plug	.5655 .5665			
	E	Diameter of Piston Pin Plug (Thin Wall Pin)	.8405 .8415			
	*See latest revision of Service Instruction No. 1267.					
606	ALL	Piston Ring and Piston – Side Clearance (Top Ring Comp.) Half Wedge			.0025L .0055L	.008L (B)
	ALL	Piston Ring and Piston – Side Clearance (2nd Ring Comp.) Full or Half Wedge			.000 .004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (3rd Ring Comp.) Half Wedge			.000 .004L	.006L (B)
	ALL	Piston Ring and Piston – Side Clearance (Oil Regulating)			.002L .004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (Oil Scraper)			.003L .0055L	.007L (B)
607	ALL	Piston Ring Gap (Comp.) Plain and Chrome Cylinders (Straight Barrels)			.020 .030	.047
	ALL	Piston Ring Gap (Comp.) Nitrided and Chrome Cylinders (Choke Barrels)			.045 .065	.067
	ALL	Piston Ring Gap (Oil Regulating) (All Barrels)			.015 .040	.047

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
607	ALL (AS APPLICABLE)	Piston Ring Gap (Oil Scraper) (All Barrels)			.015 / .030	.047
	For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075. For All Other Barrels – Ring gap is measured at top limit of ring travel.					

	Engine and Piston Application		Min. Piston Diameter			Cylinder Barrel		Max. Clearance Piston Skirt & Cyl.
	Engine Chart Code Letter	Piston Number	Top	Bottom	Type of Piston	Type of Surface	Maximum Diameter	
608 608 609 610	E	67266, 71553	4.8395	4.8540	Forged-Round	P	4.8805	.018L
	E	73620, 73628	4.8395	4.8540	Forged-Round	N	4.8805	.018L
	E	67266, 71553, 73620, 73628, 73932	4.8395	4.8540	Forged-Round	C	4.8805	.0225L
	E	75984	4.8395	4.8590	Forged-Cam	C-N	4.8805	.018L
	H-P	69236	5.0905	5.1040	Forged-Cam	P-C	5.1305	.0225L
	H-P	71545, 71608*	5.0905	5.1025	Forged-Round	C	5.1305	.024L
	H-P-AB-AC	71940, 72249*, 72578, 73947*, 73976	5.0905	5.1040	Forged-Round	C	5.1305	.0225L
	H-AC	71940, 72249*, 73947*, 73976	5.0905	5.1040	Forged-Round	N	5.1305	.023L
	H-P-AB	74242, 75617*	5.0790	5.1090	Forged-Cam	C	5.1305	.018L
	H-P-AB-AC	74242, 76258*	5.0790	5.1090	Forged-Cam	N	5.1305	.018L
	AC	75617*, 76258*	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L
	H-P-AB-AC	73264*, 75961, 76966, 78203*, 78762, LW-10207*, LW-10208, LW-10545	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L

NOTES:

To find the average diameter of cylinder in an area 4" above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Add both diameters; this sum, divided by 2, represents the average diameter of the cylinder.

*=High Compression.

Cylinder Barrel: N=nitride hardened, C=chrome plated.

Maximum taper and out-of-round permitted for cylinder in service is .0045 inch.

To find the average out-of-round, measure diameter of cylinder in an area 4" above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Difference between diameters must not exceed .0045 inch.

Piston diameter at top is measured at top ring land (between top and second compression ring grooves) at right angle to piston pin hole; diameter at bottom of piston is measured at the bottom of the piston skirt at right angles to the piston pin.

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
611	ALL	Exhaust Valve Seat and Cylinder Head			.0075T .011T	(A)
	ALL	O.D. Exhaust Seat	1.9355 1.937			
	ALL	I.D. Exhaust Seat Hole in Cylinder Head	1.926 1.928			
612	ALL	Intake Valve Seat and Cylinder Head			.0065T .010T	(A)
	E-H-P	O.D. Intake Seat	2.1675 2.169			
	AB-AC	O.D. Intake Seat	2.2885 2.290			
	E-H-P	I.D. Intake Seat Hole in Cylinder Head	2.159 2.161			
	AB-AC	I.D. Intake Seat Hole in Cylinder Head	2.280 2.282			
613	ALL	Exhaust Valve Guide and Cylinder Head			.001T .0025T	(A)
	ALL	O.D. Exhaust Valve Guide	.6633 .6638			
	ALL	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6613 .6623			
614	ALL	Intake Valve Guide and Cylinder Head			.001T .0025T	(A)
	ALL	O.D. Intake Valve Guide	.5933 .5938			
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	.5913 .5923			
615	ALL	Exhaust Valve Stem and Valve Guide			.0037L .0050L	
	ALL	O.D. Exhaust Valve Stem	.4957 .4965	.4937		
			Service allowable limits of .4937 is applicable only to inconel or nimonic valves.			
	ALL	Finished I.D. Exhaust Valve Guide	.4995 .5005			
	½ inch diameter exhaust valves may have exhaust valve guides that are .003 inch over the maximum inside diameter limit, anytime up to 300 hours of service. After 300 hours of service, inside diameter of exhaust valve guide may increase .001 inch during each 100 hours of operation up to the recommended overhaul time for the engine, or not to exceed .015 inch over the basic I.D. See latest revision of Service Instruction No. 1009 for recommended overhaul time.					
616	ALL	Intake Valve Stem and Valve Guide			.0010L .0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022 .4030	.4010		
	ALL	Finished I.D. Intake Valve Guide	.4040 .4050			

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

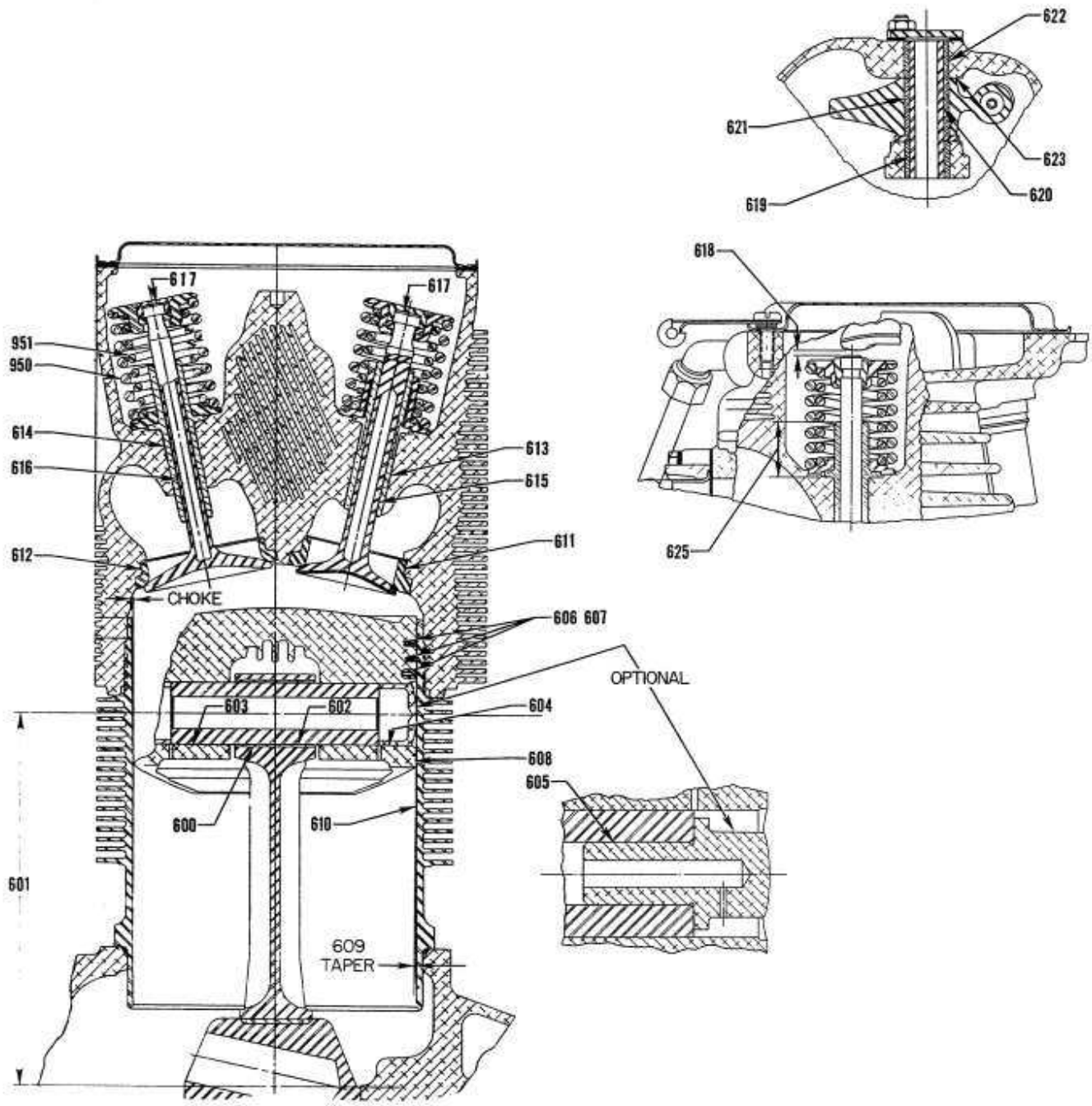
SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
617	ALL	Valve and Valve Cap Clearance			.000 .004L	.005L
618	ALL	Dry Tappet Clearance			.028 .080	
619	ALL	Valve Rocker Shaft and Valve Rocker Bushing			.0001L .0013L	.0025L
	ALL	Finished I.D. of Valve Rocker Shaft (Bushing) in Cylinder Head	.6246 .6261	.6270		
620	ALL	Valve Rocker Shaft and Valve Rocker Bushing			.0007L .0017L	.004L
	ALL	O.D. Valve Rocker Shaft	.6241 .6245	.6231		
	ALL	Finished I.D. of Rocker Arm Bushing	.6252 .6263	.6270		
621	ALL	Valve Rocker Bushing and Valve Rocker	Bushing Must Be Burnished In Place			
622	ALL	Valve Rocker Shaft Bushing and Cylinder Head			.0022T .0038T	(A)
	ALL	Valve Rocker Shaft Bushing and Hole in Cylinder Head	.7380 .7388			
623	ALL	Valve Rocker and Cylinder Head – Side Clearance			.002L .020L	.024L
625	ALL	Intake and Exhaust Valve Guide Height	.914 .954			
		MEASURE VALVE GUIDE HEIGHT FROM THE VALVE SPRING SEAT COUNTERBORE IN THE CYLINDER HEAD TO THE TOP OF VALVE GUIDE.				

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION II – CYLINDERS



Cylinder, Piston, Connecting Rod and Valve Components

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PUMP & SCAVENGE PUMP						
700	E-H1-H2-H3	Oil Pump Drive Gear and Oil Pump Body			.0010L .0025L	.004L
701	E-H1-H2-H3	Oil Pump Drive Gear and Accessory Housing			.0015L .0030L	.006L
702	E-H1-H2-H3	Oil Pump Drive Gear – End Clearance			.008L .042L	.060L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Gear – End Clearance			.007L .030L	.045L
703	E-H1-H2-H3	Oil Pump Impeller – Diameter Clearance			.002L .005L	.008L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Impellers – Diameter Clearance			.007L .011L	.014L
704	E-H1-H2-H3	Oil Pump Impeller – Side Clearance			.002L .0045L	.005L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Impellers – Side Clearance			.003L .0055L	.006L
	E-H1-H2-H3	Width of Oil Pump Impellers	.747 .749	.746		
	H4-H5-P-AB-AC	Width of Oil Pump Impellers	.995 .997	.994		
	H4-H5-P-AB-AC	Width of Oil Scavenge Pump Impellers	1.496 1.498	1.495		
705	E-H1-H2-H3	Oil Pump Driven Impellers and Idler Shaft			.0010L .0025L	.004L
	H4-H5-P-AB-AC	Oil Pump and Oil Scavenge Pump Driven Impellers and Idler Shaft			.0010L .0025L	.004L
706	E-H1-H2-H3	Oil Pump Idler Shaft and Oil Pump Body			.0000 .0025T	(A)
	H4-H5-P-AB-AC	Oil Pump Idler Shaft and Oil Pump Body			.0000 .0015T	(A)
707	E-H1-H2-H3	Oil Pump Idler Shaft and Accessory Housing			.0005L .0025L	.0035L
713	H4-H5-P-AB-AC	Oil Pump Idler Shaft and Scavenge Pump Body			.0000 .0015T	(A)
777	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Scavenge Pump Body			.001T .003T	(A)
778	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pump Body			.001T .003T	(A)
779	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pressure and Scavenge Pump Gear			.0015L .0035L	.005L
780	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pump Shaft			.0015L .0035L	.005L

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
FUEL PUMP						
727	E-H1-H2-H3	Fuel Pump Drive Gear – End Clearance			.016L .045L	.065L
781	E-H1-H2-H3	Fuel Pump Drive Gear and Accessory Housing			.0010L .0030L	.005L
782	H4-H5-P-AB-AC	Fuel Pump Drive Gear Bushing and Accessory Housing			.001T .004T	(A)
783	H4-H5-P	Fuel Pump Drive Shaft Gear – End Clearance			.006L .064L	.074L
784	H4-H5-P	Fuel Pump Drive Shaft Gear and Bushing			.001L .004L	.006L
785	P1	Injector Drive Gear and Accessory Housing Cover Bushing			.0036L .0048L	.006L
786	P1	Injector Drive Gear – End Clearance			.002L .020L	.030L
787	P1	Injector Idler Gear and Magneto Idler Ball Bearing			.0005T .0004L	(A)
788	P1	Injector Idler Shaft and Magneto Idler Ball Bearing			.0001T .0005L	(A)
789	AB	Injector Drive Shaftgear and Accessory Housing Bushing			.001L .003L	.005L
790	AC	Fuel Pump Drive Shaftgear and Accessory Housing Bushing			.001L .003L	.005L
791	AB	Injector Drive Shaftgear – End Clearance			.006 .036	.048
792	AC	Fuel Pump Drive Shaftgear – End Clearance			.006 .036	.048
VACUUM PUMP & TACHOMETER						
737	E-H1-H2-H3	Vacuum Pump Gear and Accessory Housing			.0010L .0025L	.006L
738	E-H1-H2-H3	Vacuum Pump Gear – End Clearance			.016L .045L	.065L
	Reference No. 739 to follow Reference No. 7000.					
793	H4-H5-P	Vacuum Pump Shaftgear Bushing and Accessory Housing Cover			.0015T .0035T	(A)
794	H4-H5-P	Vacuum Pump Shaftgear Bushing (At Cover) and Vacuum Pump Shaftgear			.002L .004L	.006L
795	H4-H5-P	Vacuum Pump Shaftgear Bushing and Accessory Housing			.0015T .0035T	(A)
796	H4-H5-P	Vacuum Pump Shaftgear Bushing (At Accessory Housing) and Vacuum Pump Shaftgear			.0020L .0045L	.006L
797	H4-H5-P	Vacuum Pump Shaftgear – End Clearance			.008 .030	.050
798	AB-AC	Vacuum Pump Drive Gear and Vacuum Pump Spline Coupling – End Clearance			.008 .045	.065

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

PART III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
VACUUM PUMP & TACHOMETER (CONT.)						
799	AB-AC	Vacuum Pump Drive Gear Bushing and Accessory Housing			.001T .003T	(A)
7000	AB-AC	Vacuum Pump Drive Gear Bushing and Vacuum Pump Drive Gear			.002L .004L	.006L
739	E-H1-H2-H3	Tachometer Drive Gear and Accessory Housing			.0010L .0025L	.006L
7001	E-H1-H2-H3	Tachometer Drive Gear – End Clearance			.000 .030L	.040L
7002	E-H1	Tachometer Driven Gear and Adapter			.0015L .0035L	.005L
7003	E-H1	Tachometer Cover and Adapter			.001T .003T	(A)
7004	E-H1	Tachometer Gear – End Clearance			.001L .040L	.060L
7005	H1-H2-H3	Electric Tachometer Idler Gear – End Clearance			.005L .052L	.065L
7006	H1-H2-H3	Electric Tachometer Driven Gear – End Clearance			.005L .027L	.047L
7006	H4-H5-P-AB-AC	Electric Tachometer Driven Gear – End Clearance			.007L .025L	.047L
7007	H1-H2-H3	Electric Tachometer Idler Gear Shaft and Idler Gear Bushing			.001L .0025L	.004L
7008	H1-H2-H3	Electric Tachometer Driven Gear and Adapter			.0015L .0035L	.006L
7009	AB-AC	Tachometer Drive Idler Gear Bushing and Tachometer Drive Idler Gear	Bushing To Be Burnished In Place			
7010	AB-AC	Tachometer Drive Idler Gear Bushing and Tachometer Drive Idler Shaft			.001L .003L	.004L
7011	AB-AC	Tachometer Drive Idler Gear – End Clearance			.005L .014L	.024L
7012	H1-H5-P-AB-AC	Electric Tachometer Driven Gear and Accessory Housing Cover			.001L .003L	.004L
GOVERNOR						
7013	ALL	Governor Drive Idler Gear Bushing and Governor Drive Idler Shaft			.000L .002L	.004L
7014	ALL	Governor Driven Gear and Governor Drive Adapter Bushing			.001L .003L	.004L
7015	ALL	Reduction Gear Governor and Magneto Housing and Magneto and Governor Drive Bushing			.002T .004T	(A)
7016	ALL	Governor Drive Idler Gear and Governor Drive Idler Gear Bushing			.001T .003T	(A)
7017	ALL	Governor Adapter and Governor Drive Adapter Bushing			.001T .003T	(A)

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
MAGNETO, GENERATOR, & STARTER						
7018	AB-AC	Magneto Drive Idler Gear and Magneto Drive Idler Bushing			.001T .003T	(A)
7019	AB-AC	Magneto Drive Idler Shaft and Magneto Drive Idler Bushings			.001L .003L	.005L
7020	AB-AC	Reduction Gear Housing Magneto Drive Bushings and Magneto Drive Idler Shaft			.000 .002L	.004L
7021	AB-AC	Magneto Drive Adapter and Magneto Adapter Bushings			.001T .003T	(A)
7022	AB-AC	Magneto Drive Gear and Magneto Adapter Bushings			.001L .003L	.005L
7023	E-H1-H2-H3	Magneto Drive Bushing and Magneto Gear			.001T .0005L	.001L
7024	E-H1-H2-H3	Magneto Drive Bearing and Support			.0001T .0007L	(A)
7025	H4-H5-P	Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub	Bushing Must Be Burnished In Place			
7026	H4-H5-P	Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Shaft			.001L .003L	.004L
7027	H4-H5-P	Magneto Drive Idler Gear Hub – End Clearance			.005L .014L	.024L
7028	H4-H5-P	Magneto Drive Shaft and Accessory Housing Cover Bushing			.0020L .0045L	.006L
7029	H4-H5-P	Magneto Drive Shaft and Accessory Housing Bushing			.0025L .0045L	.006L
7030	H4-H5-P	Magneto Drive Shaft Sleeve and Magneto Drive Shaft			.001T .004T	(A)
7031	H4-H5-P	Magneto Drive Shaft Sleeve and Magneto Drive Coupling			.001T .004T	(A)
7032	H4-H5-P	Magneto Drive Shaft Gear – End Clearance			.002L .020L	.030L
7033	E-H1-H2-H3	Generator Driven Gear Bushing and Accessory Housing			.001T .003T	(A)
7034	E-H1-H2-H3	Generator Driven Gear and Bushing			.002L .004L	.006L
7035	E-H1-H2-H3	Generator Driven Gear – End Clearance			.005L .049L	.060L
7036	H1	Generator Drive Idler Gear and Bushing (Hi-Speed)	Bushing Must Be Burnished In Place			
7037	H1	Finished I.D. of Idler Gear Bushing	1.000 1.001	1.002		
7038	H1	Generator Drive Countershaft and Bushing			.0015L .0035L	.005L
7039	H1	Generator Drive Idler Gear – End Clearance			.004L .010L	.020L

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
MAGNETO, GENERATOR, STARTER (CONT.)						
7040	E1-H1-H3	Angle Generator Drive – Generator Driven Gear Bushing and Generator Housing			.001T .003T	(A)
7041	E1-H1-H3	Angle Generator Drive – Generator Driven Gear and Bushing			.002L .004L	.006L
7042	E1-H1-H3	Angle Generator Drive – Generator Housing and Generator Drive Gear			.001L .003L	.004L
7043	H4-H5-P-AB-AC	Generator Drive Gear Bushing and Accessory Housing Cover			.0015T .0035T	(A)
7044	H4-H5-P-AB-AC	Generator Drive Gear Bushing (At Cover) and Generator Drive Gear			.002L .004L	.006L
7045	H4-H5-P-AB-AC	Generator Drive Gear Bushing and Accessory Housing			.002T .004T	(A)
7046	H4-H5-P-AB-AC	Generator Drive Gear Bushing (At Accessory Housing) and Generator Drive Gear			.0025L .0045L	.006L
7047	H4-H5-P-AB-AC	Generator Drive Gear – End Clearance			.010 .038	.050
7048	H4-H5-P-AB-AC	Starter Drive Gear Bushings and Adapter			.002T .004T	(A)
7049	H4-H5-P-AB-AC	Starter Drive Gear Bushings and Starter Drive Gear			.002L .004L	.006L
7050	H4-H5-P-AB-AC	Starter Drive Adapter and Accessory Housing Cover			.0005L .0025L	(A)
7051	E1-H1-H2-H3	Oil Relief Plunger and Oil Relief Valve Plug			.0015L .0035L	.005L
	H4-H5-P-AB-AC	Oil Relief Valve Plunger and Sleeve			.001L .003L	.005L
ACCESSORY DRIVE						
7053	H4-H5-AC	Accessory Idler Gear Bearing and Accessory Drive Gear			.0001L .0007T	(A)
	P	Accessory Drive Gear Bearing and Accessory Drive Shaft			.0001L .0007T	(A)
	AB	Accessory Idler Gear Bearing and Supercharger and Accessory Drive Gear			.0001L .0007T	(A)
7054	P-AB	Supercharger and Accessory Drive Gear and Bushing			.001T .003T	(A)
7055	H1-H5-P-AB-AC	Accessory Idler Gear Bearing and Accessory Drive Shaft Adapter			.0005T .0005L	(A)
7056	P-AB	Supercharger and Accessory Drive Gear Bushing and Accessory Drive Shaft			.0005L .0017L	.004L

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

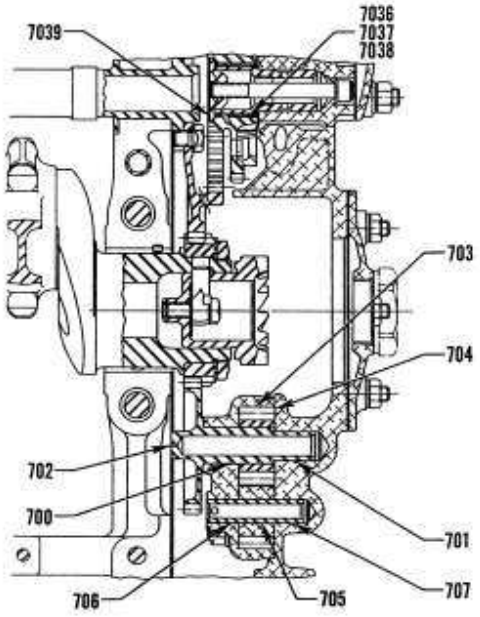
Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
ACCESSORY DRIVE (CONT.)						
7056	P-AB	Finished I.D. of Supercharger and Accessory Drive Gear Bushing	1.3295 1.3305	1.3312		
7057	P-AB	Supercharger and Accessory Drive Gear – End Clearance			.004L .012L	.017L
7058	P	Accessory Drive Shaft and Bushing			.001T .003T	(A)
	P	Finished I.D. of Accessory Drive Shaft Bushing	.750 .7515	.752		
7059	P-AB	Supercharger Drive Shaftgear and Accessory Drive Shaft Bushing			.002L .004L	.006L
7060	P-AB	Supercharger Drive Shaftgear and Supercharger Shaft Bearing			.0038L .0050L	.008L
7061	P-AB	Supercharger Drive Shaftgear – End Clearance (Use 1 Spacer if Necessary to Maintain Fit)			.011L .020L	.020L
7062	P-AB	Impeller and Supercharger Air Inlet Adapter – Clearance			.040L .070L	
7063	P	Intermediate Supercharger Drive Shaftgear and Bushing			.0040L .0055L	.0075L
7064	P-AB	Accessory Housing and Intermediate Supercharger Drive Shaftgear Bushing			.001T .003T	(A)
7065	P-AB	Intermediate Supercharger Drive Gear and Bushing			.002L .004L	.006L
7066	P	Intermediate Supercharger Drive Gear – End Clearance			.011L .026L	.030L
	AB	Intermediate Supercharger Drive Gear – End Clearance			.009L .020L	.024L
7067	AB	Accessory Housing Adapter and Bearing			.0006L .0006T	.0016L
7068	AB	Supercharger and Accessory Drive Gear Support and Bearing			.0002T .0013T	(A)
7069	AB	Supercharger and Accessory Drive Gear Support and Bushing			.001T .003T	(A)
7070	P-AB	Supercharger Shaft Bearing and Supercharger Housing			.0005L .002L	(A)
7071	AB	Supercharger and Accessory Drive Gear and Accessory Drive Shaft – End Clearance			.001L .015L	.020L
7072	AB-AC	Oil Pressure and Scavenge Pump Idler Gear Bushing and Fuel Injector or Fuel Pump Drive Shaftgear (As Applicable)			.001L .003L	.005L
7073	AB-AC	Oil Pressure and Scavenge Pump Idler Gear and Bushing			.001T .003T	(A)

SERVICE TABLE OF LIMITS

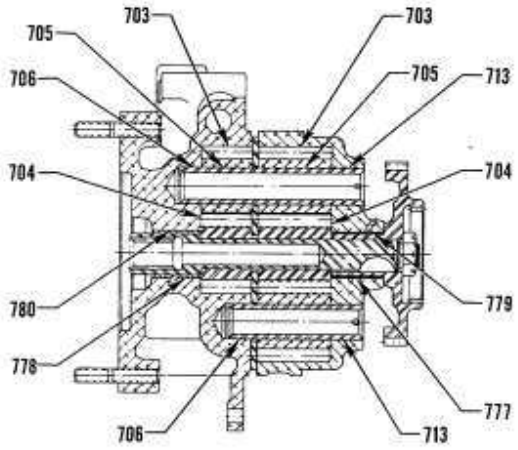
PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
ACCESSORY DRIVE (CONT.)						
7074	P1	Throttle Shaft and Supercharger Air Inlet Housing Bushing			.001L .003L	.005L
7074	AB	Throttle Shaft and Supercharger Air Inlet Housing Bushing			.0005L .0025L	.005L
7075	H2-H3	Propeller Flange Two Locator Holes	.5000 .5005	.5008		



REAR MOUNTED ACCESSORY HSG.



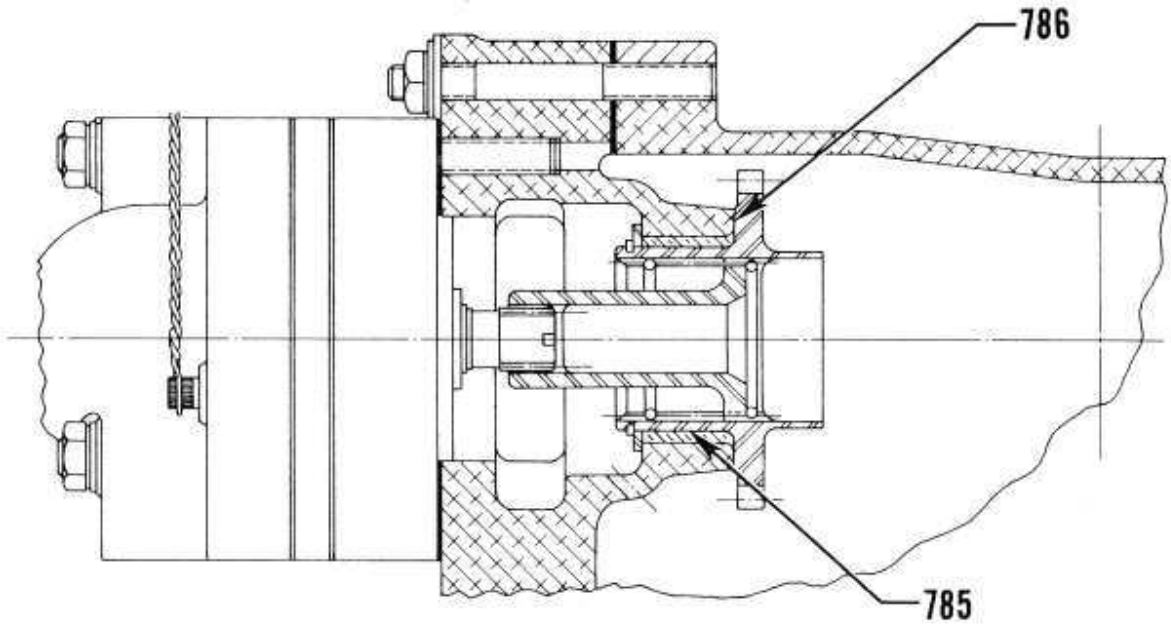
CROSSWISE ACCESSORY HSG.

Oil Pumps

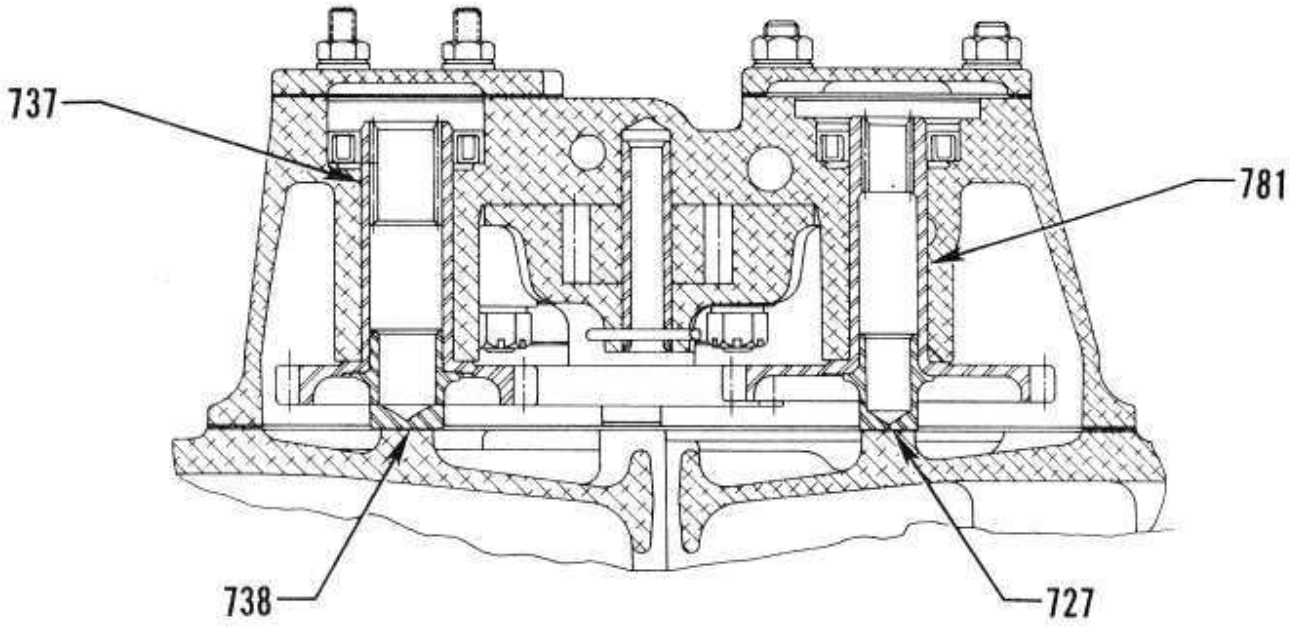
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



Simmonds Injector

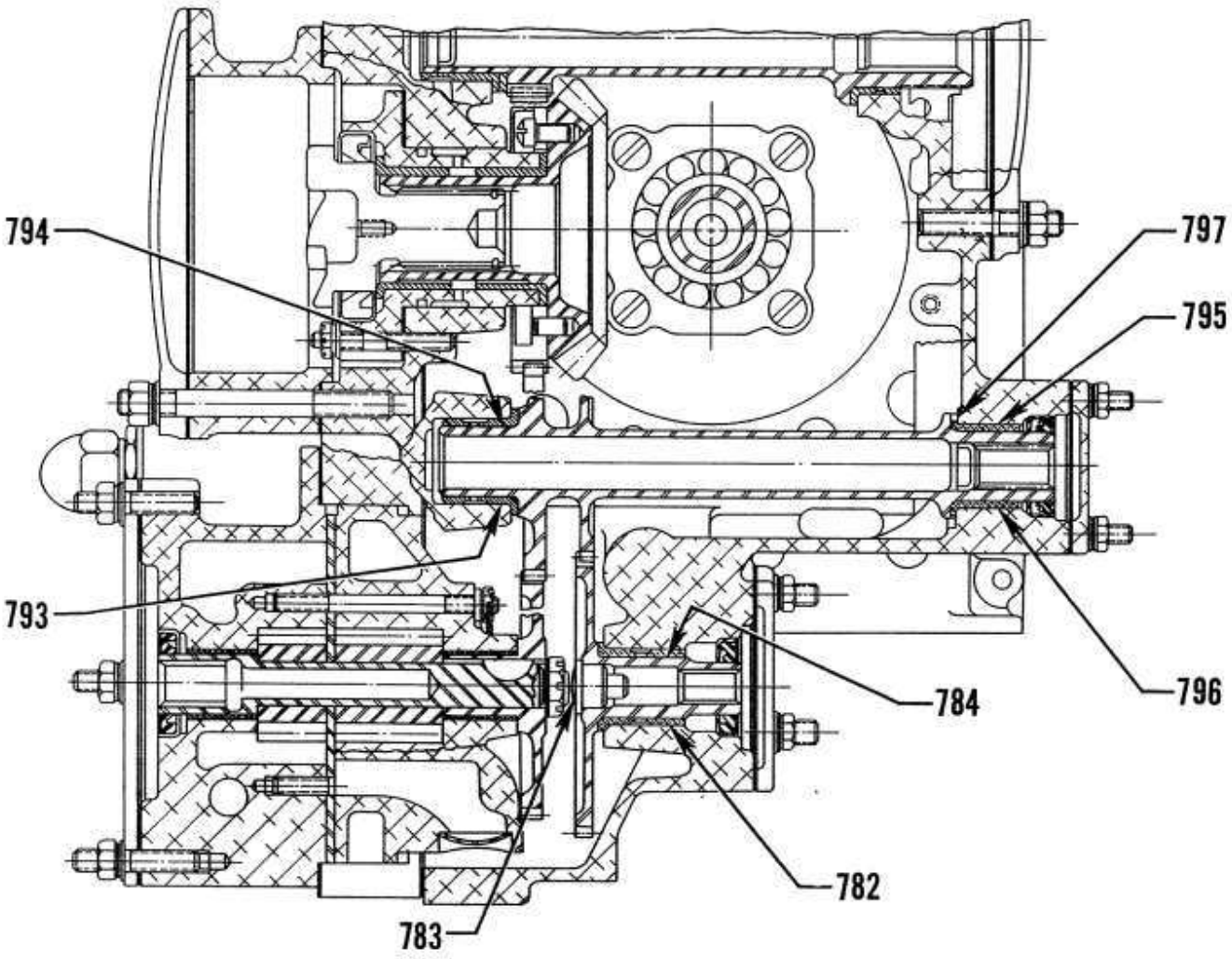


Vacuum and Fuel Pump Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

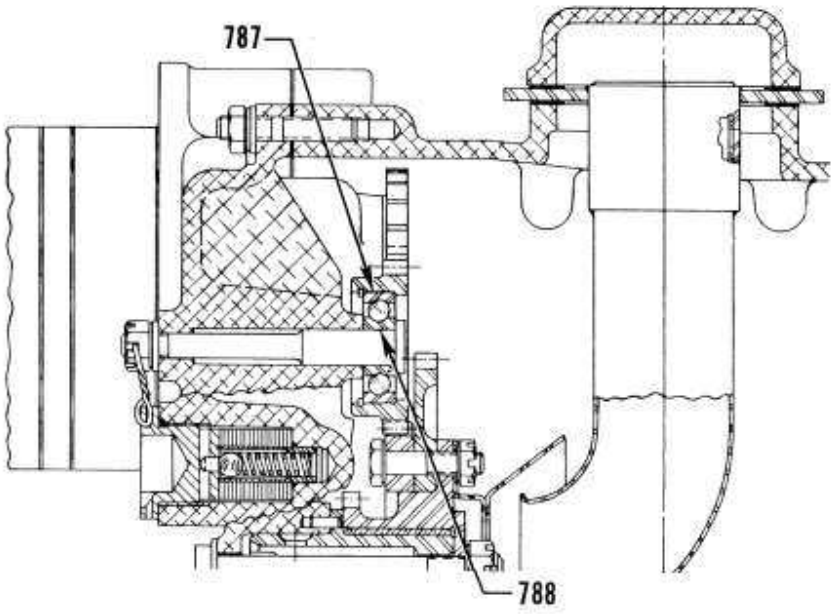


Vacuum and Fuel Pump Drives

SERVICE TABLE OF LIMITS

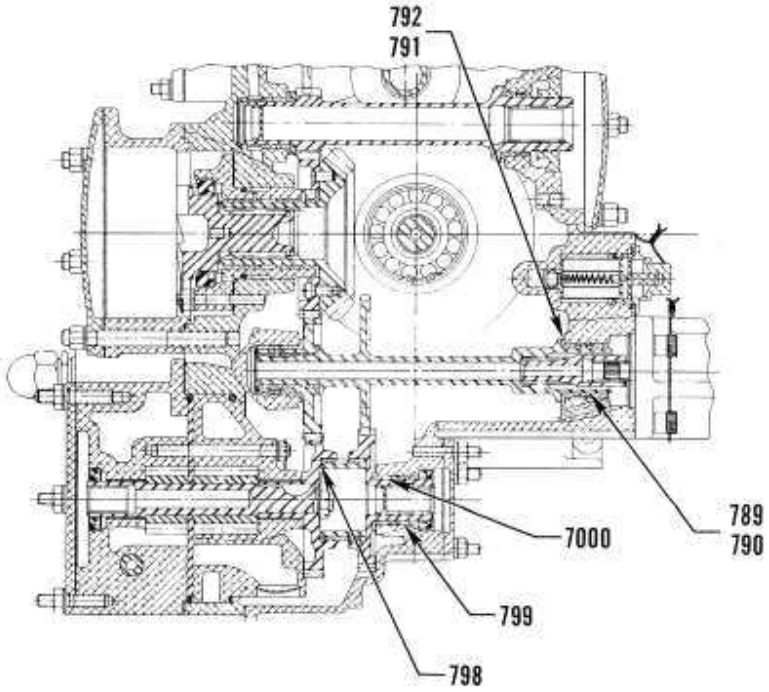
PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



IGSO-480

Fuel Injector and Magneto Idler Bearing



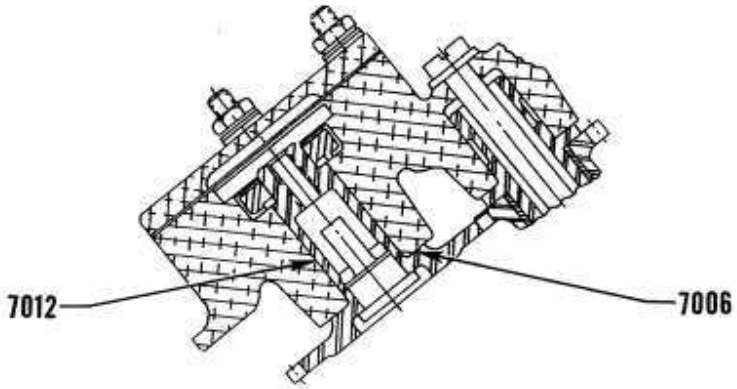
IGO, IGSO-540

Fuel Injector and/or Fuel Pump, Vacuum Pump Drives

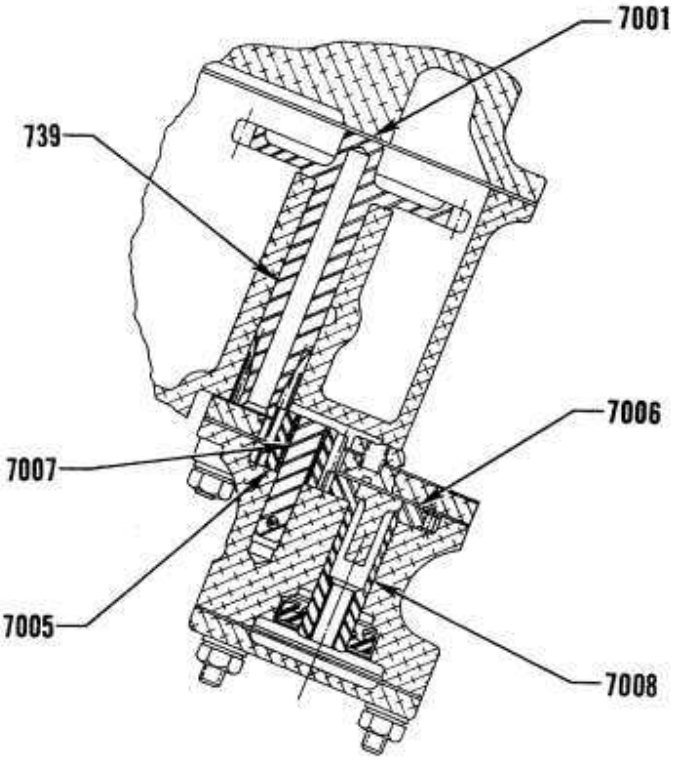
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

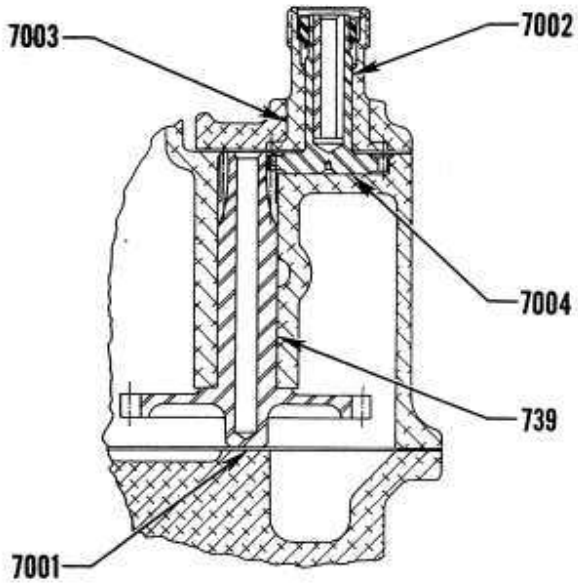
SECTION III – GEAR TRAIN



GO-480-D, GSO, IGSO-480 & IGO, IGSO-540



GO-480-B,F & GID6



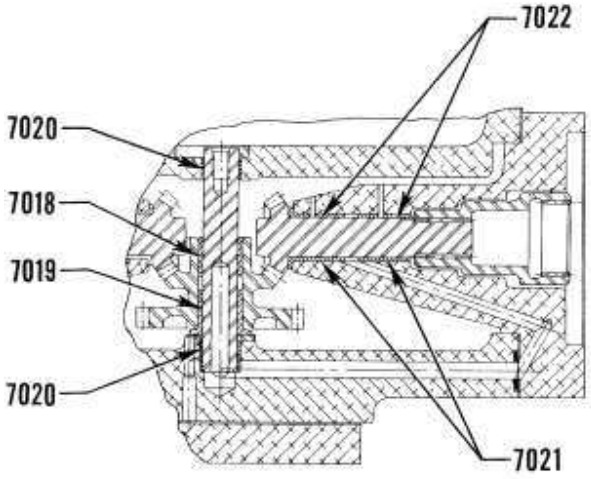
GO-435-C & GO-480-B

Tachometer Drives

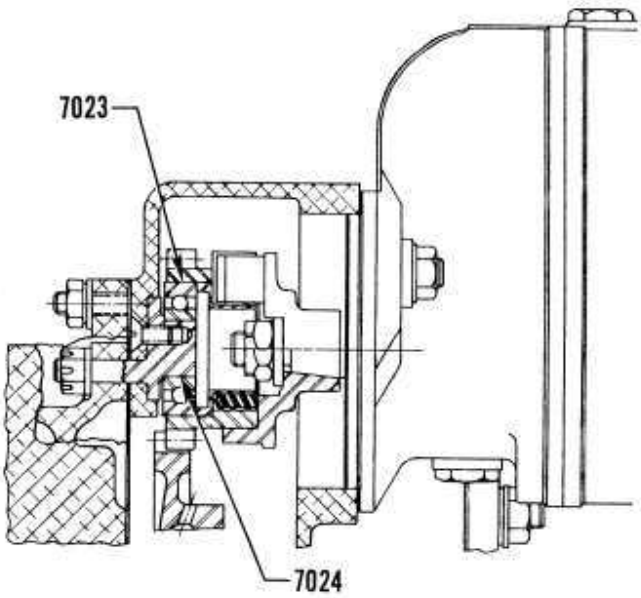
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

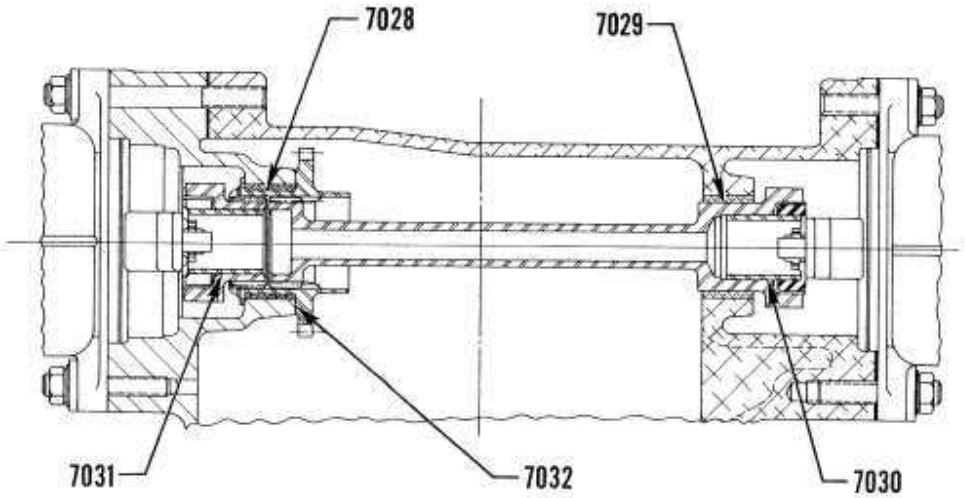
SECTION III – GEAR TRAIN



IGO, IGSO-540



GO-435 & GO-480-B



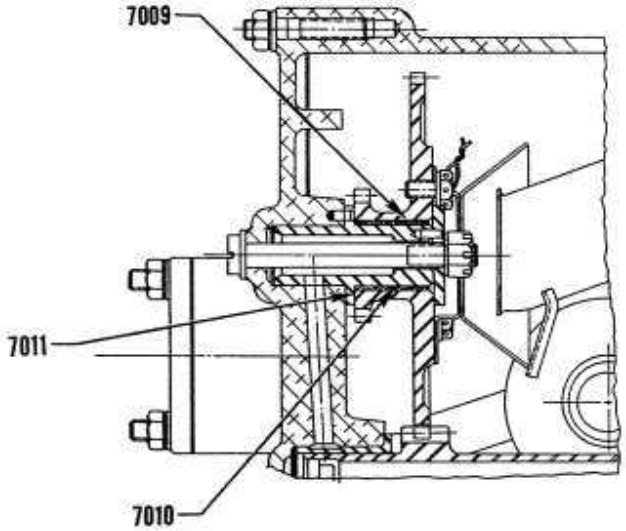
GO-480-D, GSO, IGSO-480

Magneto Drives

SERVICE TABLE OF LIMITS

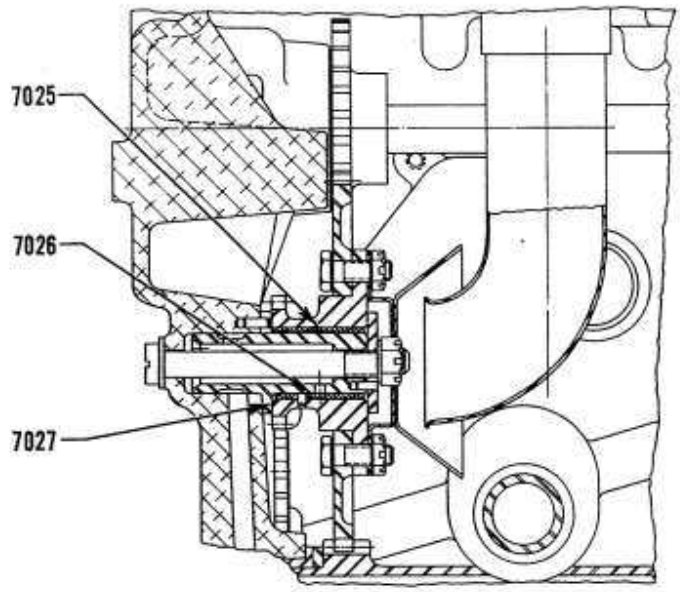
PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



IGO, IGSO-540-A & B

Tachometer Drives



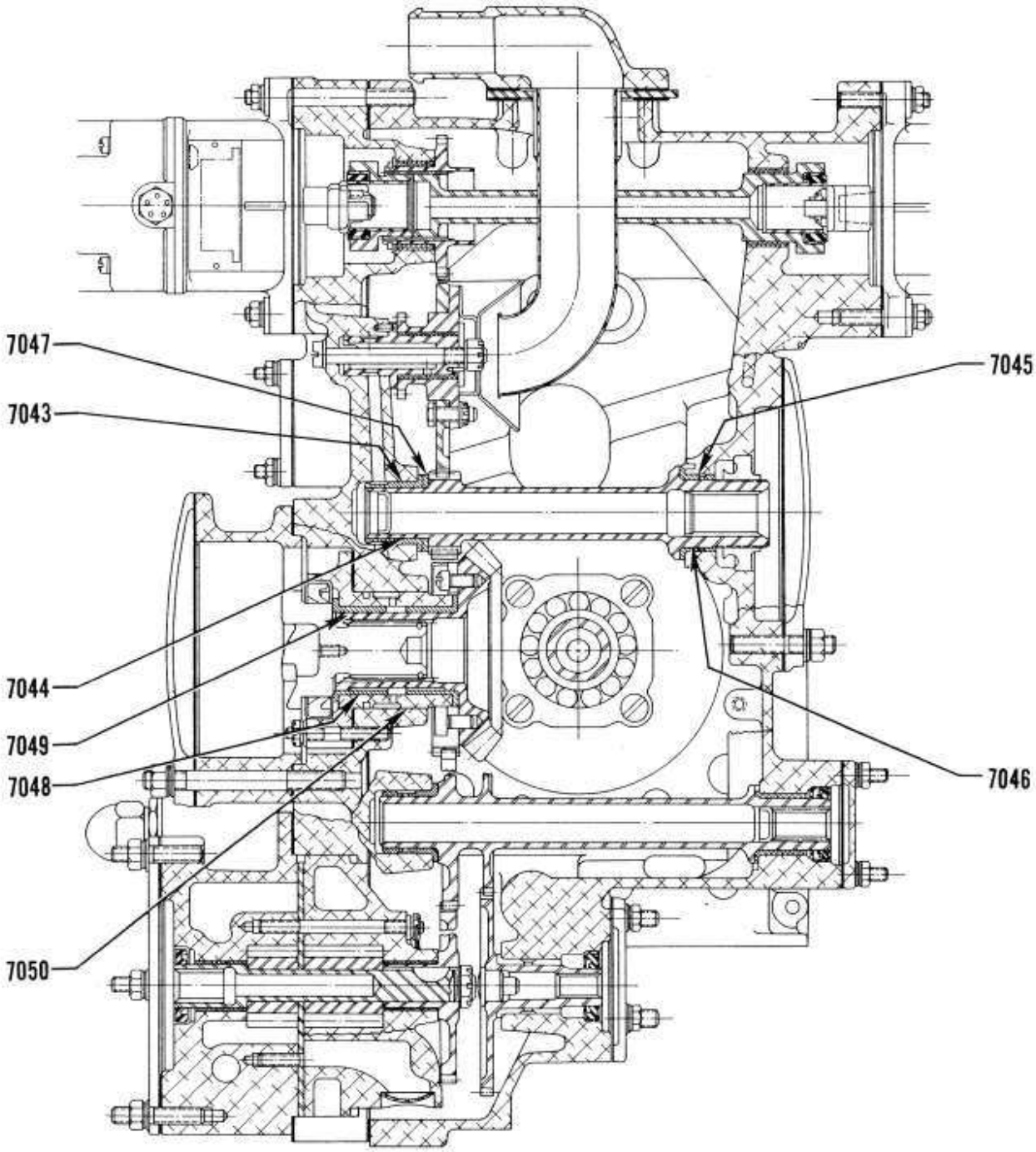
GO-480-B, GIB6, GSO, IGSO-480

Magneto and Tachometer Idler Gear

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



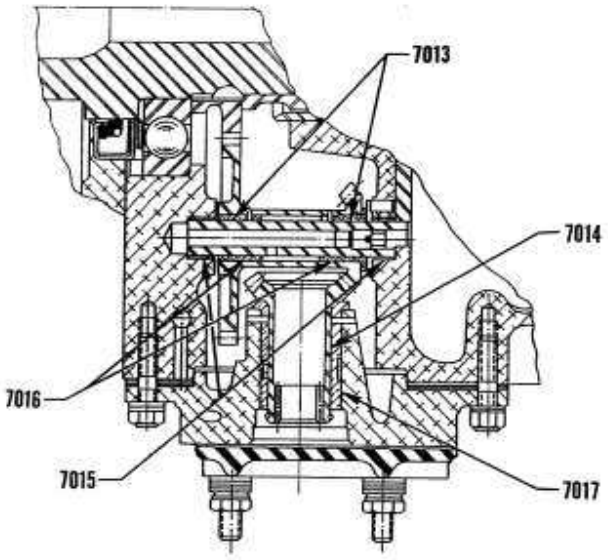
GO-480-B, GSO, IGSO-480 & IGO, IGSO-540

Generator and Starter Drives

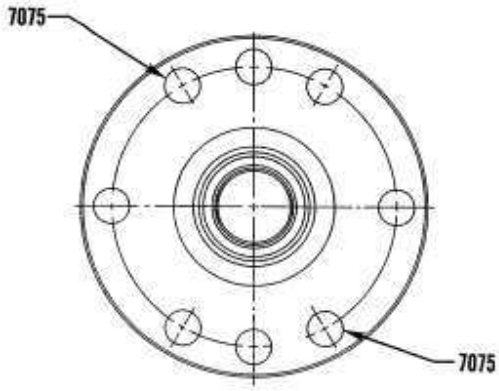
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

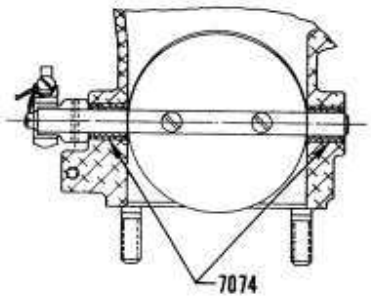
SECTION III – GEAR TRAIN



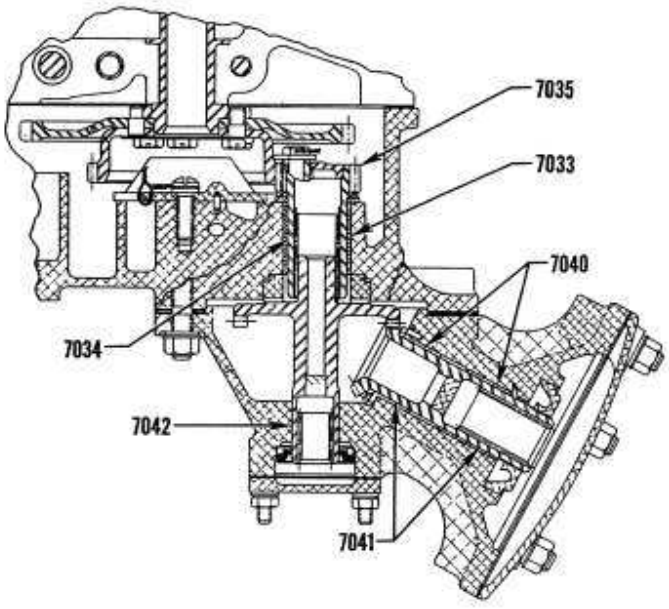
GOVERNOR DRIVE



GO-480-F, GID6
PROP FLANGE



IGSO-480, 540
THROTTLE LEVER



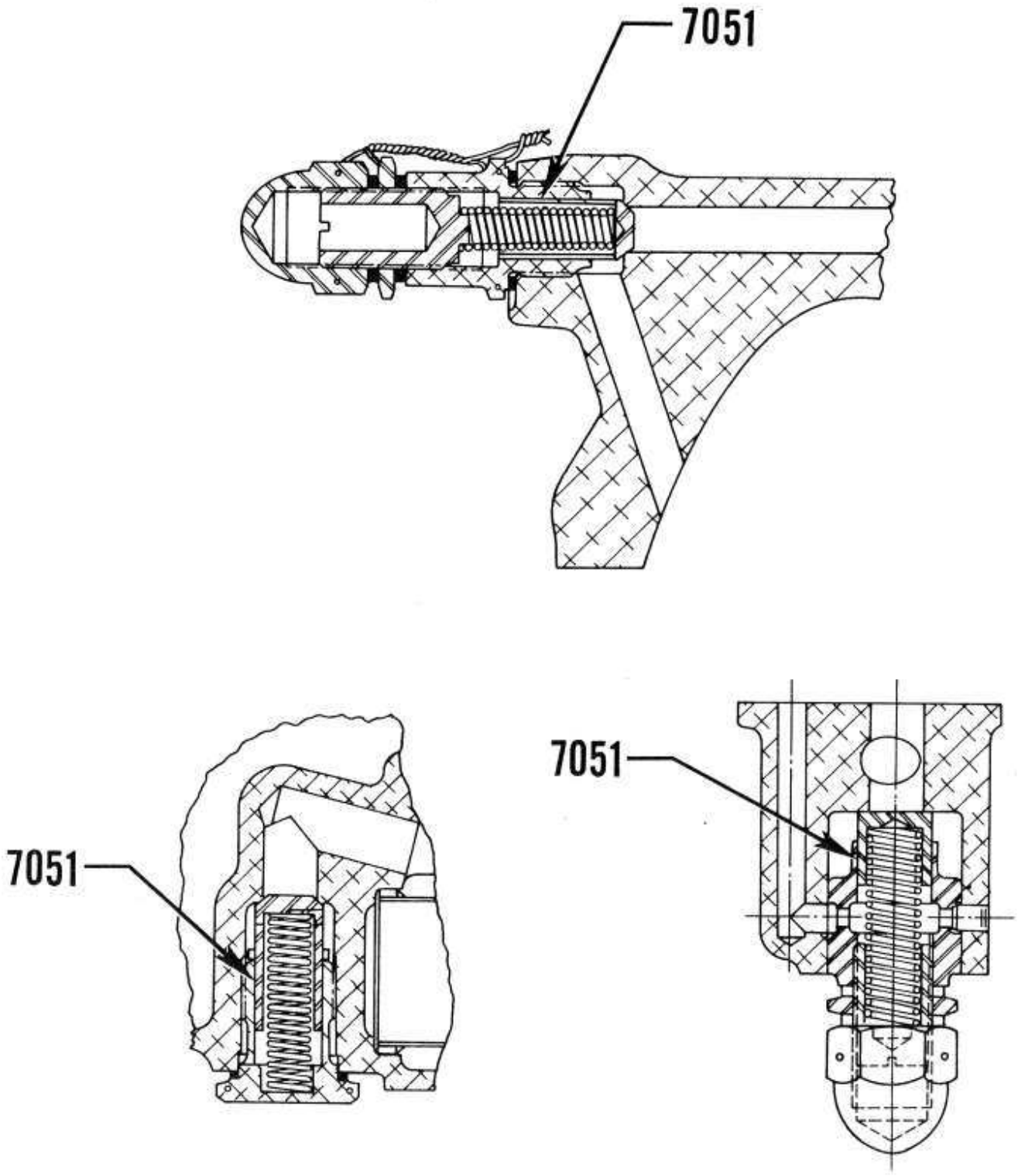
GO-435, GO-480-B, GID6
DUAL GENERATOR & VACUUM PUMP DRIVE

Governor Drive, Prop. Flange, Throttle Lever,
Dual Generator and Vacuum Pump Drive

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

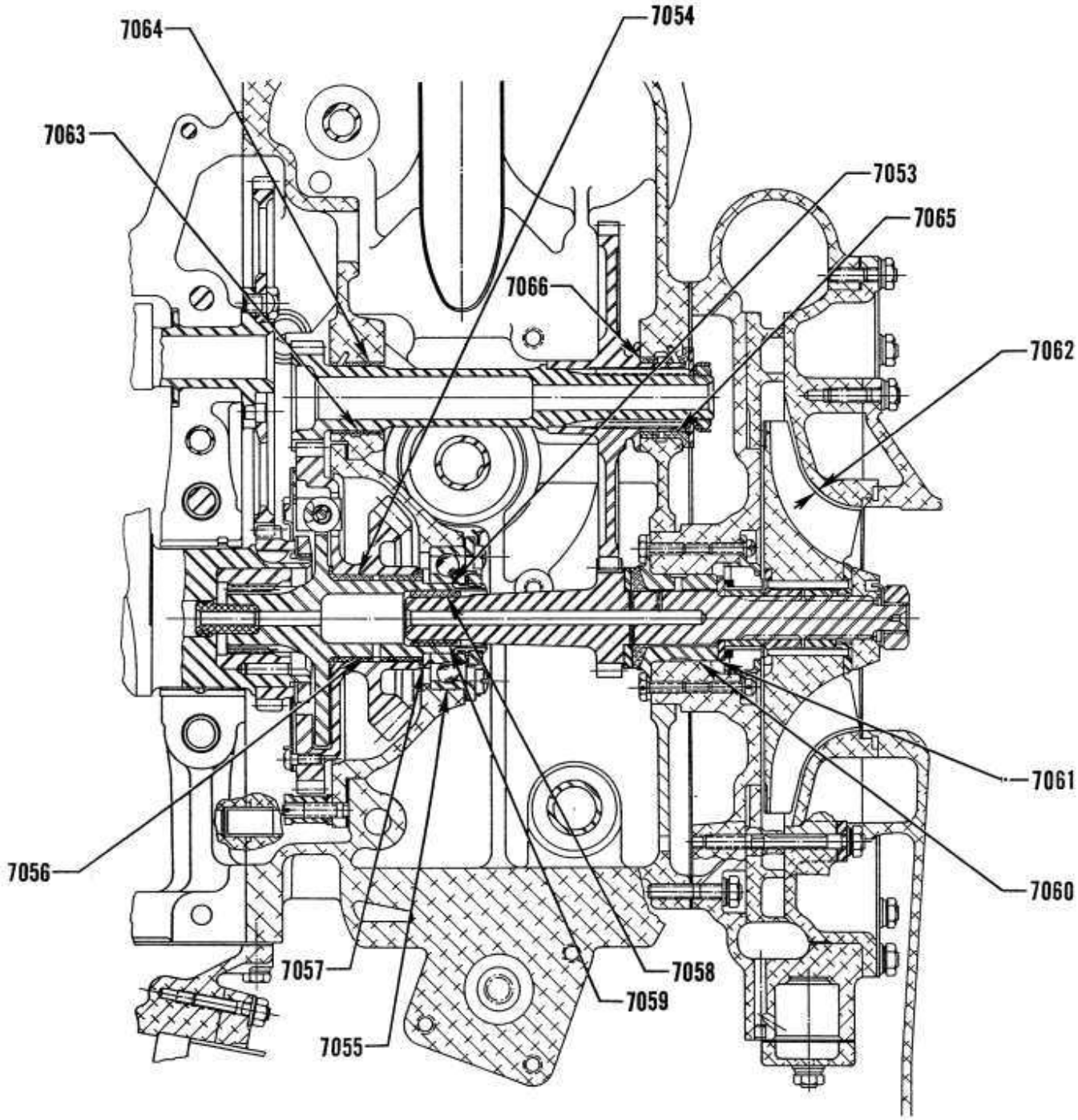


Oil Relief Valves

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

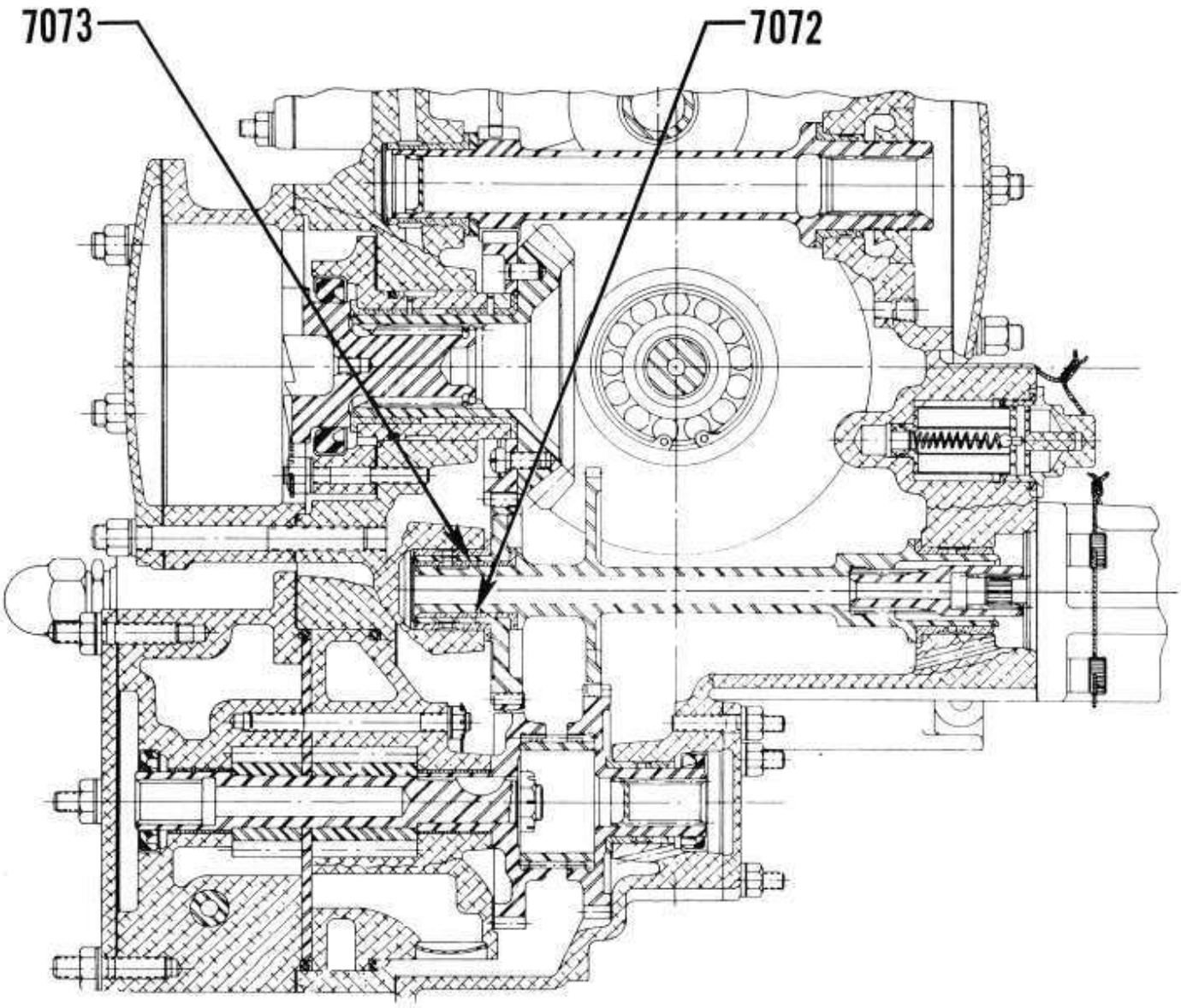


Supercharger and Components

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

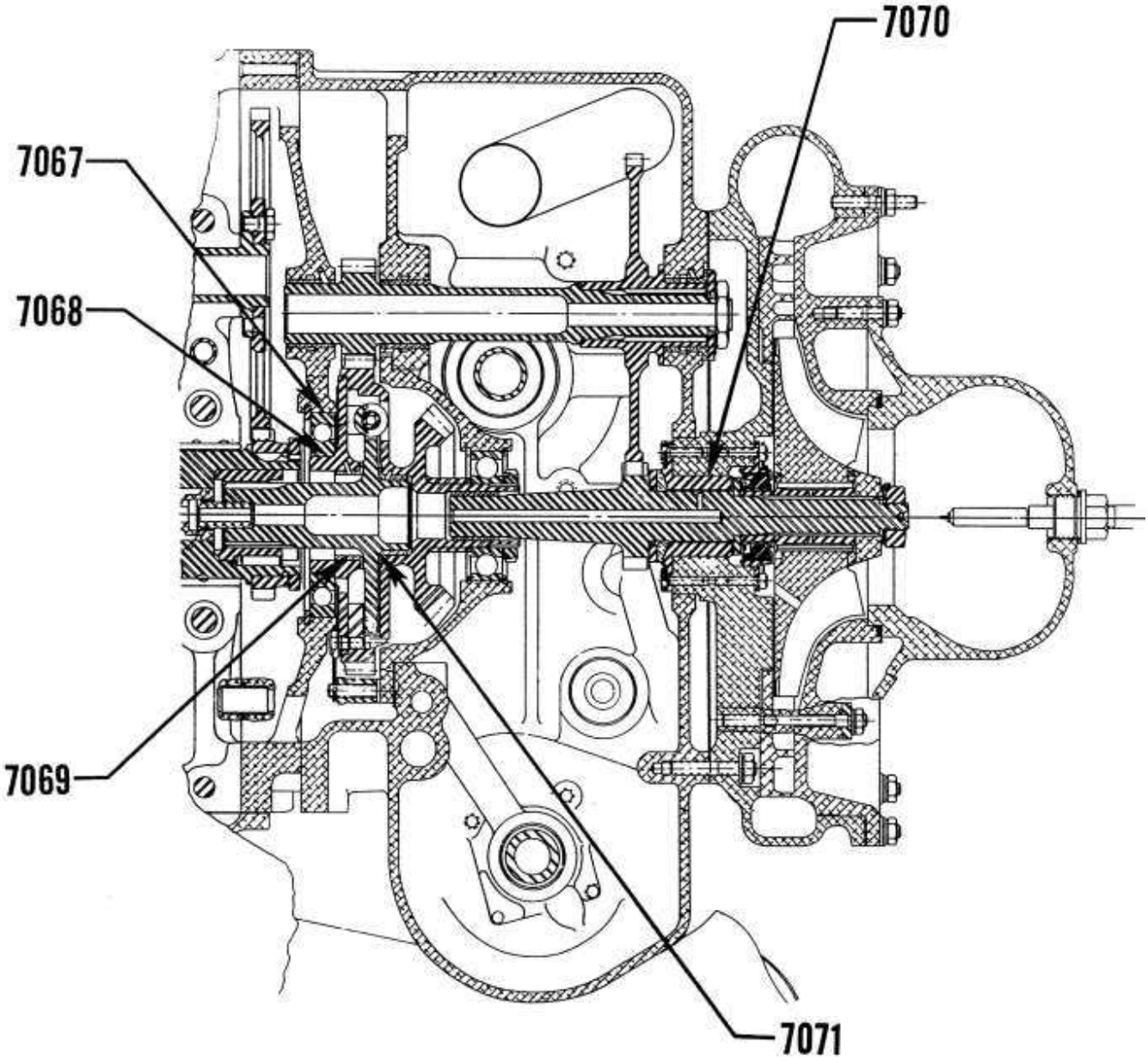


Oil Scavenge Pump and Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



Supercharger Housing

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
807	E-H1-H2-H3	Oil Pump Drive Gear and Crankshaft Timing Gear			.004 .015	.020
808	E-H1-H2-H3	Oil Pump Impellers			.008 .015	.020
	E-H1-H2-H3	Oil Pump and Scavenge Pump Impellers			.008 .015	.020
825	ALL	Crankshaft Timing Gear and Camshaft Gear			.004 .015	.020
829	ALL	Propeller Shaft – Reduction Gear – Total Backlash (At 4 ft. Radius)				.50
846	E-H1-H2-H3	Camshaft Gear and Magneto Gear			.004 .015	.020
847	E-H1-H2-H3	Tachometer Drive Gear and Crankshaft Timing Gear			.004 .015	.020
848	E-H1	Tachometer Driven Gear and Tachometer Drive Gear			.004 .015	.020
849	ALL	Stationary Gear and Stationary Gear Drive Plate			.002 .005	.010
850	ALL	Ring Gear and Ring Gear Drive Plate			.001 .004	.010
851	E-H2-H3	Generator Drive Gear and Generator Driven Gear			.004 .015	.020
852	E-H1-H2-H3	Oil Pump Drive Gear and Accessory (Fuel Pump) Drive Gear			.004 .015	.020
853	E-H1-H2-H3	Oil Pump Drive Gear and Vacuum Pump Drive Gear			.004 .015	.020
854	ALL	Pinion Gear and Stationary Gear			.004 .0077	.012 (C)
855	ALL	Pinion Gear and Ring Gear			.003 .0065	.012 (C)
856	ALL	Governor and Magneto Drive Gear and Governor Drive Idler Gear			.004 .015	.020
857	AB-AC	Governor and Magneto Drive Gear and Magneto Drive Idler Gear			.004 .015	.020
858	ALL	Governor Drive Idler Gear (Bevel Gear End) and Governor Driven Gear			.004 .008	.015
859	H1	Camshaft Gear and Generator Drive Idler Gear			.004 .015	.020
860	H1	Generator Drive Idler Gear and Generator Driven Gear			.004 .015	.020
861	E1-H1-H2-H3	Electric Tachometer Idler Gear and Driven Gear			.004 .015	.020
862	E1-H1-H2-H3	Electric Tachometer Idler Gear and Tachometer Drive Gear			.004 .015	.020

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
863	E1-H1	Angle Generator Drive Gear and Generator Driven Gear			.002 .004	.010
864	E1-H1	Angle Generator Drive Gear and Generator Drive Gear Spline			.003 .007	.009
865	P1	Generator Drive Gear and Magneto Drive Idler Gear			.004 .015	.020
	H4-H5-P-AB-AC	Generator Drive Gear and Tachometer Drive Idler Gear			.004 .015	.020
866	P1	Electric Tachometer Drive Gear (Magneto Idler Hub) and Tachometer Driven Gear			.004 .015	.020
	H4-H5-P-AB-AC	Tachometer Drive Idler Gear and Tachometer Driven Gear			.004 .015	.020
867	H4-H5-P	Tachometer Drive Idler Gear and Magneto Drive Shaftgear			.004 .015	.020
868	H4-H5-P	Magneto Drive Shaft (Spline) and Magneto Drive Shaftgear (Spline)			.001 .015	.008
869	H4-H5-P	Magneto Drive Shaftgear (Spline) and Magneto Drive Coupling (Spline)			.001 .005	.008
870	H4-H5-AC	Rear Crankshaft (Spline Bushing) and Accessory Drive Gear (Spline)			.002 .0073	.018
	P-AB	Rear Crankshaft (Spline Bushing) and Accessory Drive Shaft (Spline)			.002 .0073	.018
871	H4-H5-AC	Accessory Idler Gear and Starter Drive Gear			.004 .008	.015
871	P-AB	Supercharger and Accessory Drive Gear and Starter and Accessory Drive Gear			.004 .008	.015
872	H4-H5-P-AB-AC	Accessory Drive Gear and Generator Drive Gear			.004 .015	.020
873	H4-H5-P	Accessory Drive Gear and Vacuum Pump Shaftgear			.004 .015	.020
874	H4-H5-P	Vacuum Pump Shaftgear and Oil Pressure and Scavenge Pump Gear			.004 .015	.020
875	E	Scavenge Pump Driven Gear and Accessory Drive Gear			.004 .015	.020
876	E	Scavenge Pump Impellers			.008 .015	.020
877	P-AB	Supercharger and Accessory Drive Gear and Intermediate Supercharger Drive Shaftgear			.006 .015	.020
878	P-AB	Supercharger Drive Shaftgear and Intermediate Supercharger Drive Gear			.006 .015	.020

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

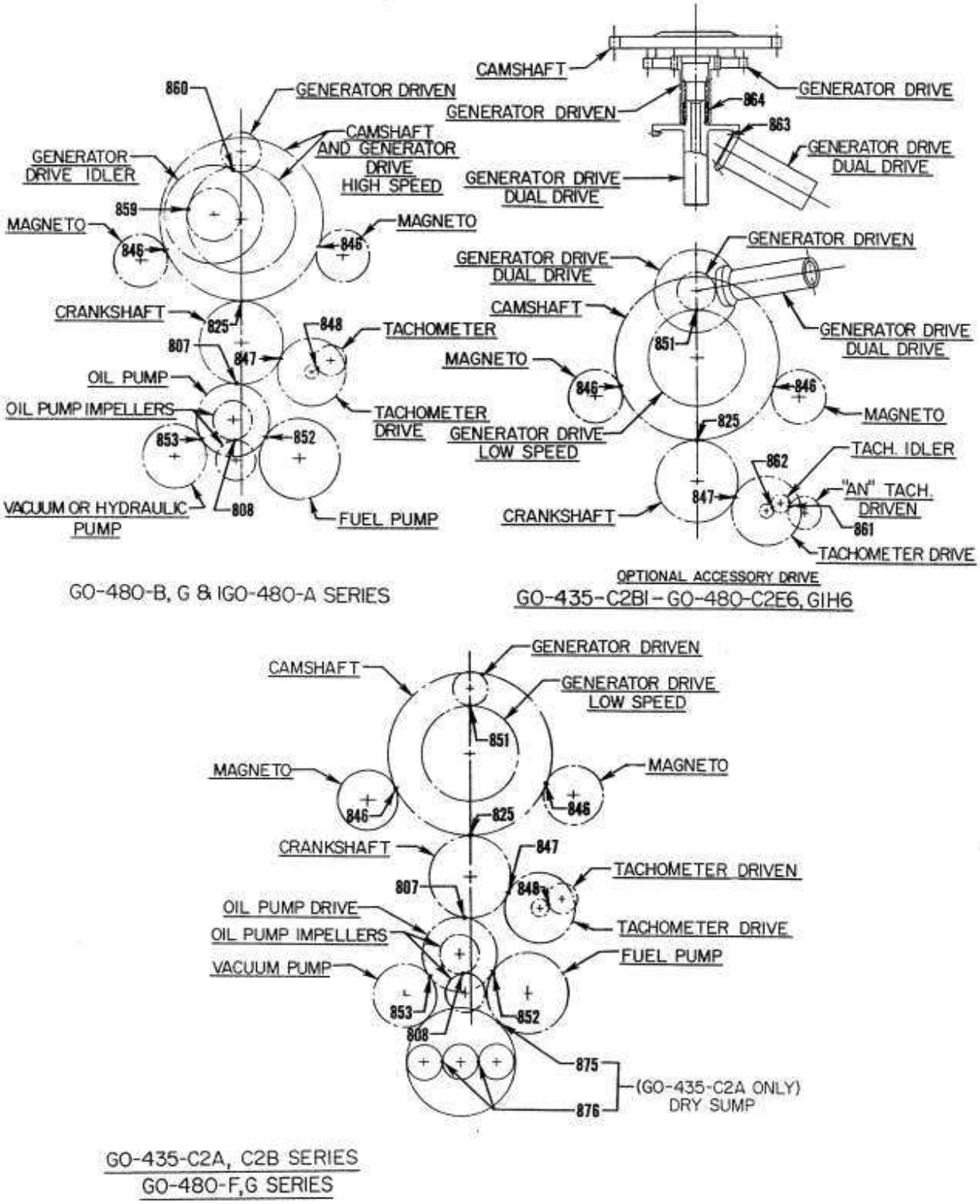
SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
879	P-AB	Intermediate Supercharger Drive Shaftgear (Spline) and Intermediate Supercharger Drive Gear (Spline)			.000 .002	.005
880	P1	Fuel Injector Idler Gear and Magneto Drive Shaftgear			.004 .015	.020
881	P1	Fuel Injector Drive Idler Gear and Fuel Injector Idler Gear			.004 .015	.020
882	P1	Injector Drive Shaft (Spline) and Fuel Injector Pump (Spline)			.0005 .0056	.008
883	P1	Magneto Drive Shaftgear (Spline) and Fuel Injector Drive Shaft (Spline)			.002 .006	.008
884	AB-AC	Magneto Drive Idler Gear (Bevel End) and Magneto Driven Gear			.004 .008	.015
885	AB-AC	Magneto Driven Gear (Spline) and Magneto Drive Coupling (Spline)			.001 .004	.007
886	AB-AC	Magneto Drive Coupling (Spline) and Magneto Coupling (Spline)			.001 .004	.007
887	H4-H5-P-AB-AC	Starter Jaw (Spline) and Starter Drive Gear (Spline)			.002 .005	.010
888	AB-AC	Accessory and Starter Drive and Oil Pressure and Scavenge Pump Idler Gear			.004 .015	.020
889	AB-AC	Oil Pressure and Scavenge Pump Idler and Oil Pressure and Scavenge Pump Gear			.004 .015	.020
890	AB	Fuel Injector Drive Shaftgear (Spline) and Fuel Injector Drive Coupling (Spline)			.003 .007	.012
891	AB	Fuel Injector Drive Coupling (Spline) and Fuel Injector Pump (Spline)			.002 .005	.010
892	AB-AC	Oil Pressure and Scavenge Pump Gear (Spline) and Vacuum Pump Coupling (Spline)			.003 .0065	.010
893	AB-AC	Vacuum Pump Drive Gear (Spline) and Vacuum Pump Coupling (Spline)			.003 .0065	.010
894	AB	Vacuum Pump Drive Gear and Fuel Injector Drive Shaftgear			.004 .015	.020
895	H4-H5-P-AC	Vacuum Pump Shaftgear and Fuel Pump Drive Shaftgear			.004 .015	.020

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV- BACKLASH

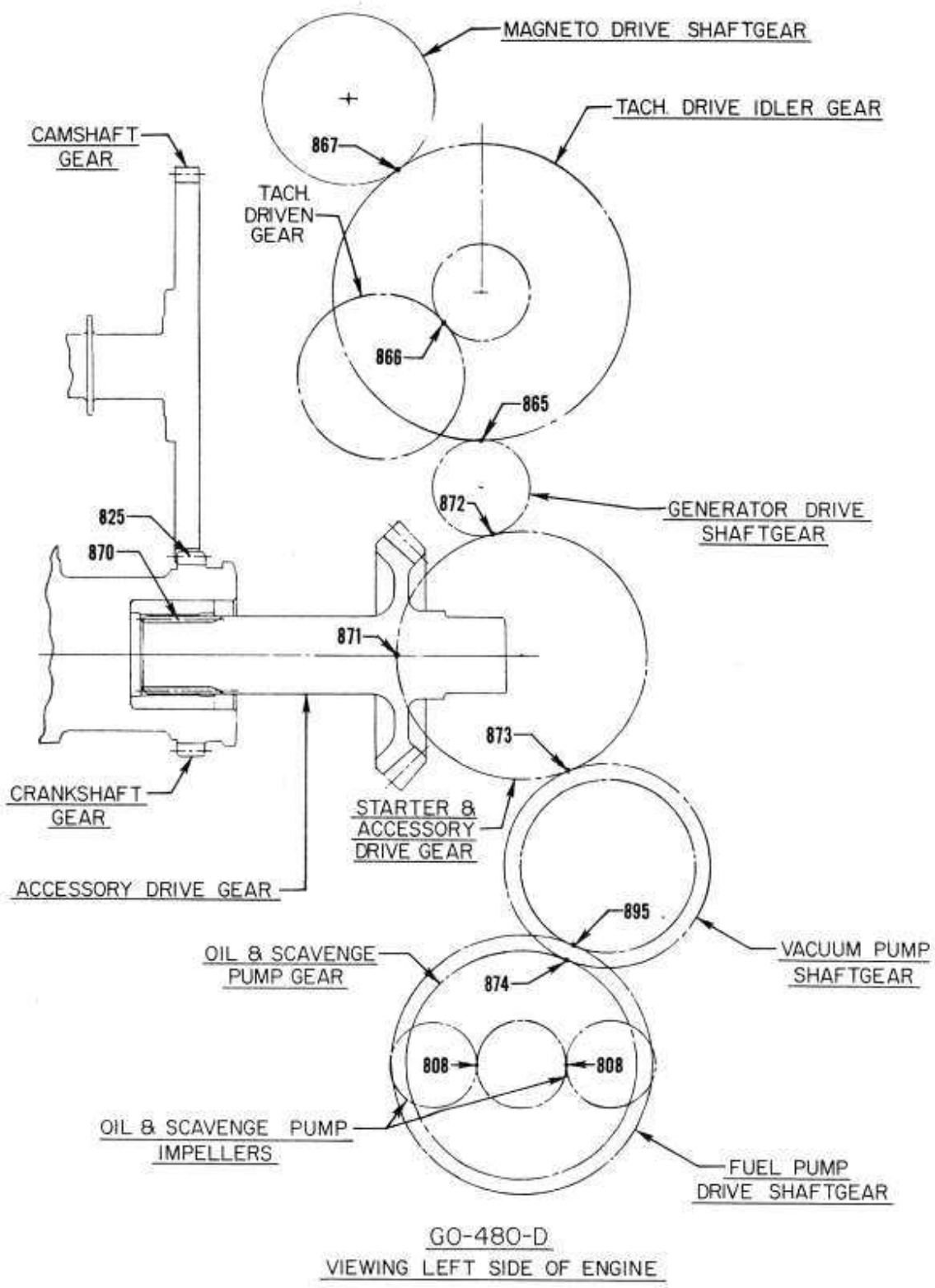


Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

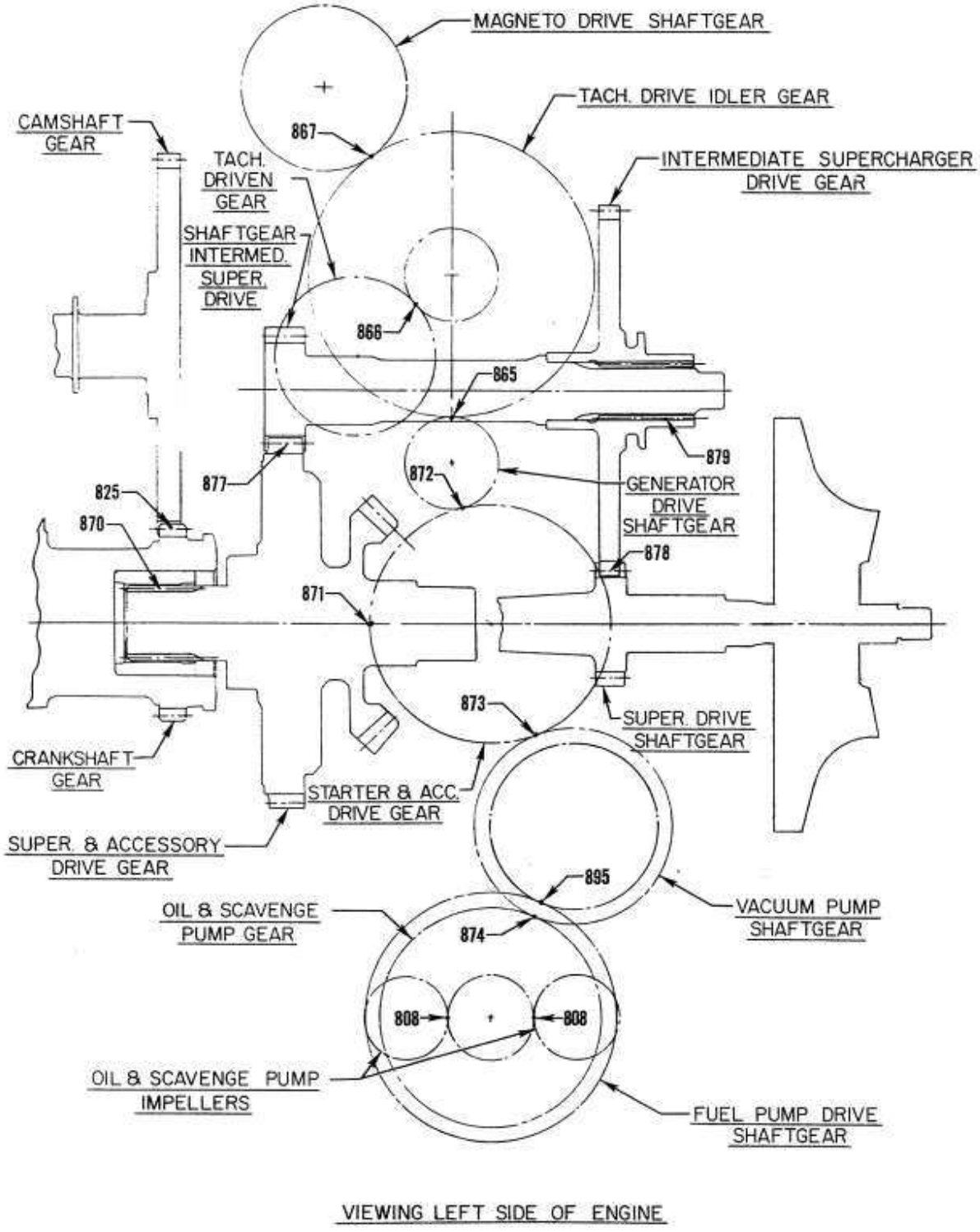


Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

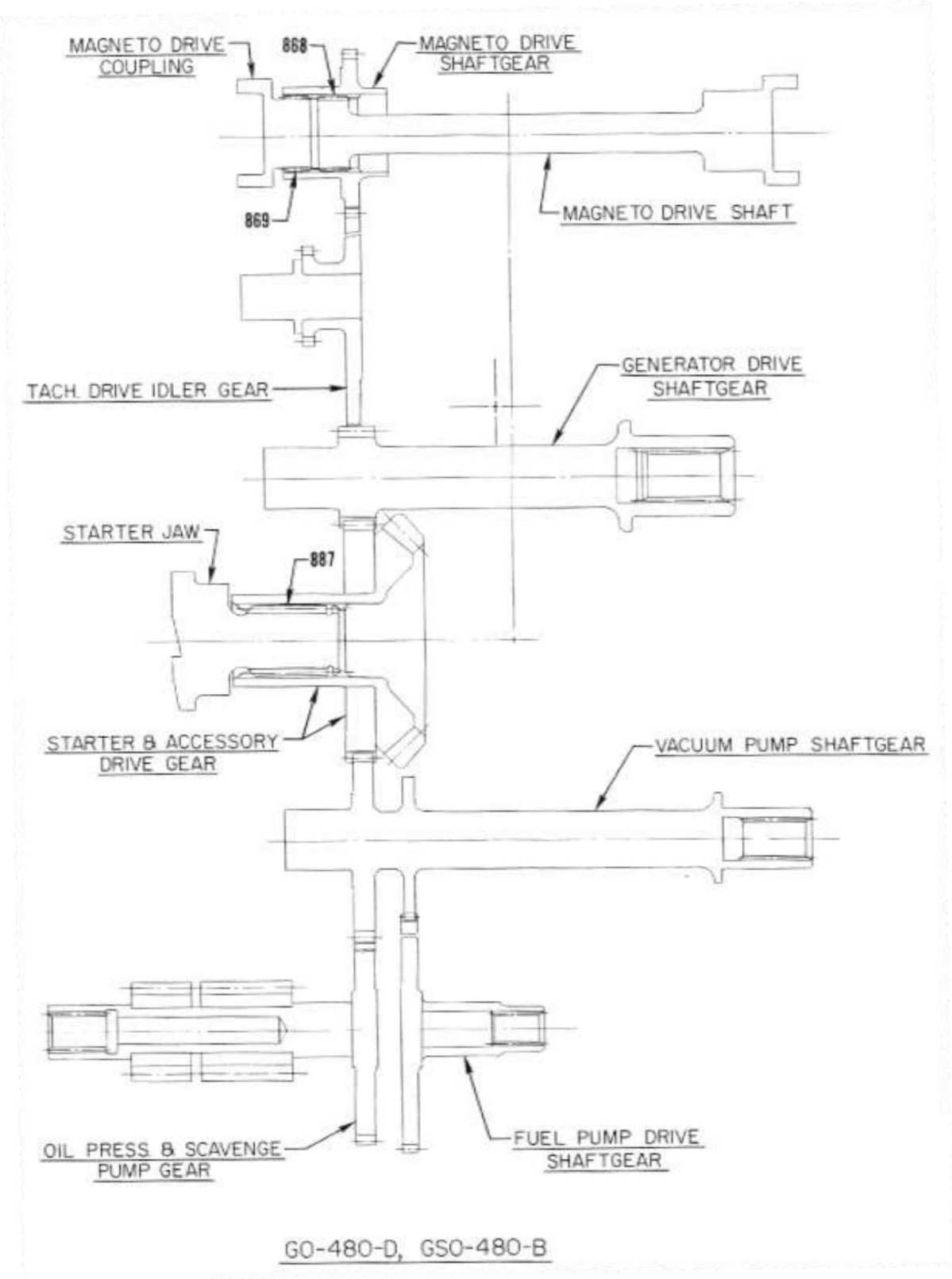


Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

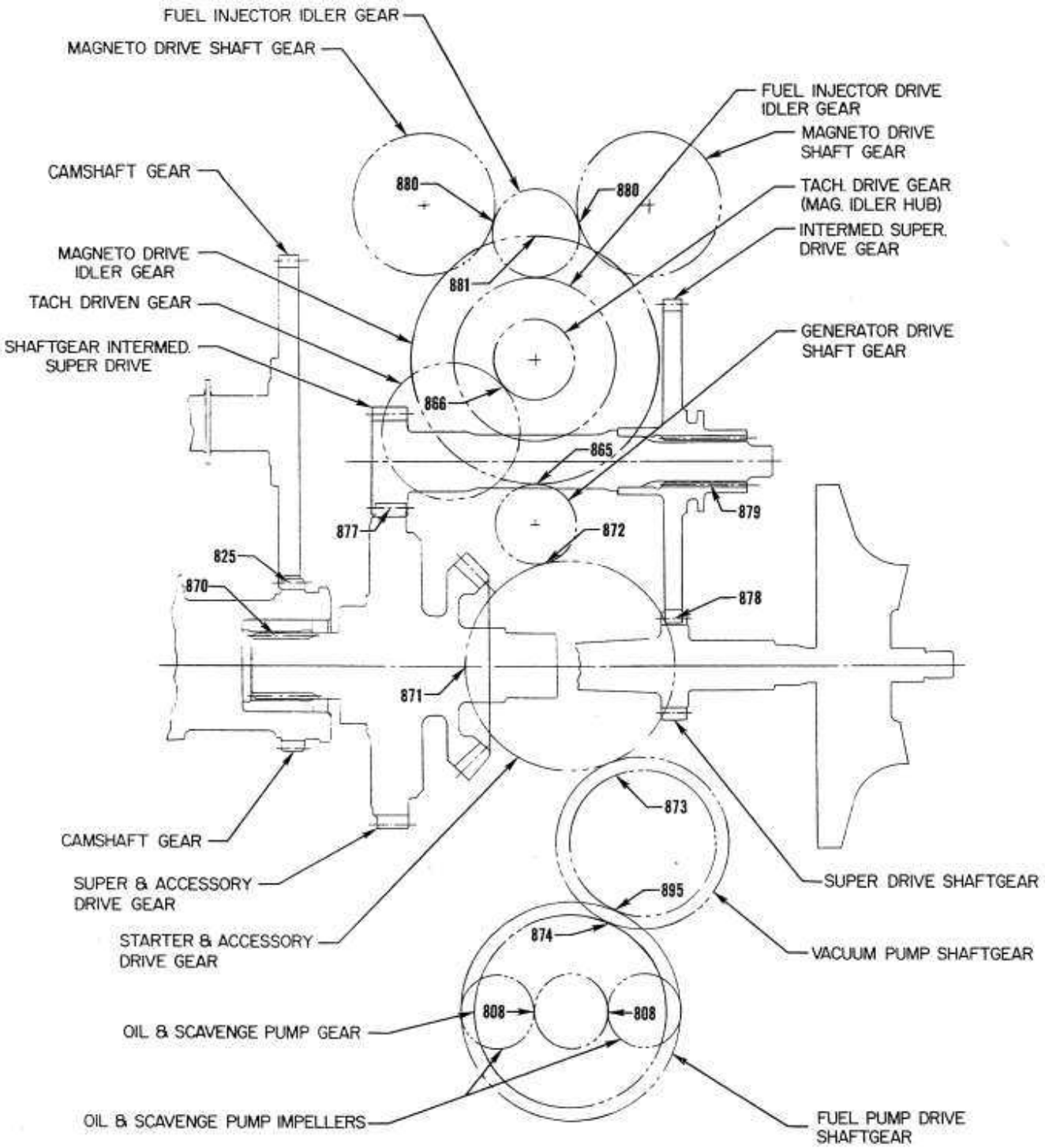


Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH



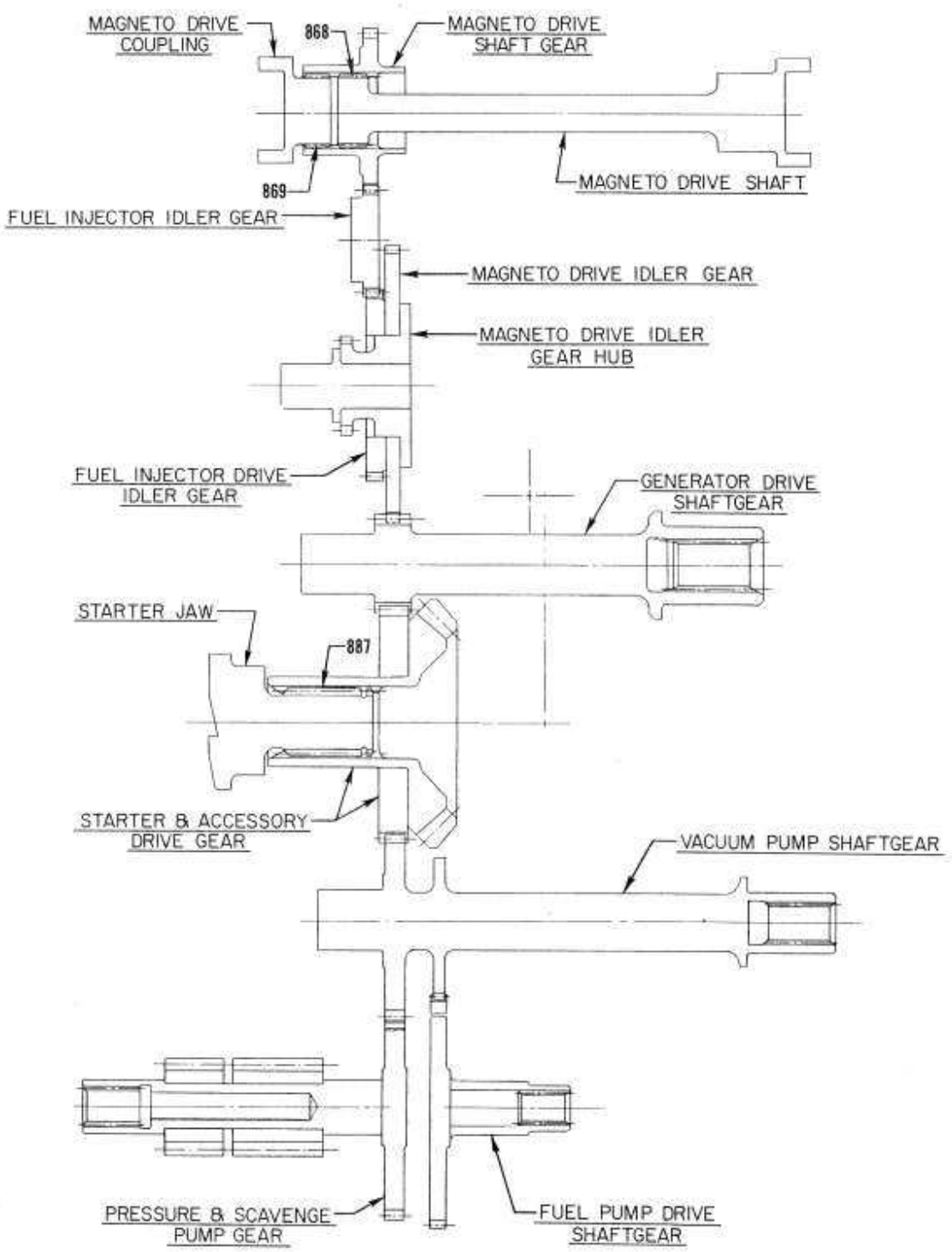
IGSO-480-A
VIEWING LEFT SIDE OF ENGINE

Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

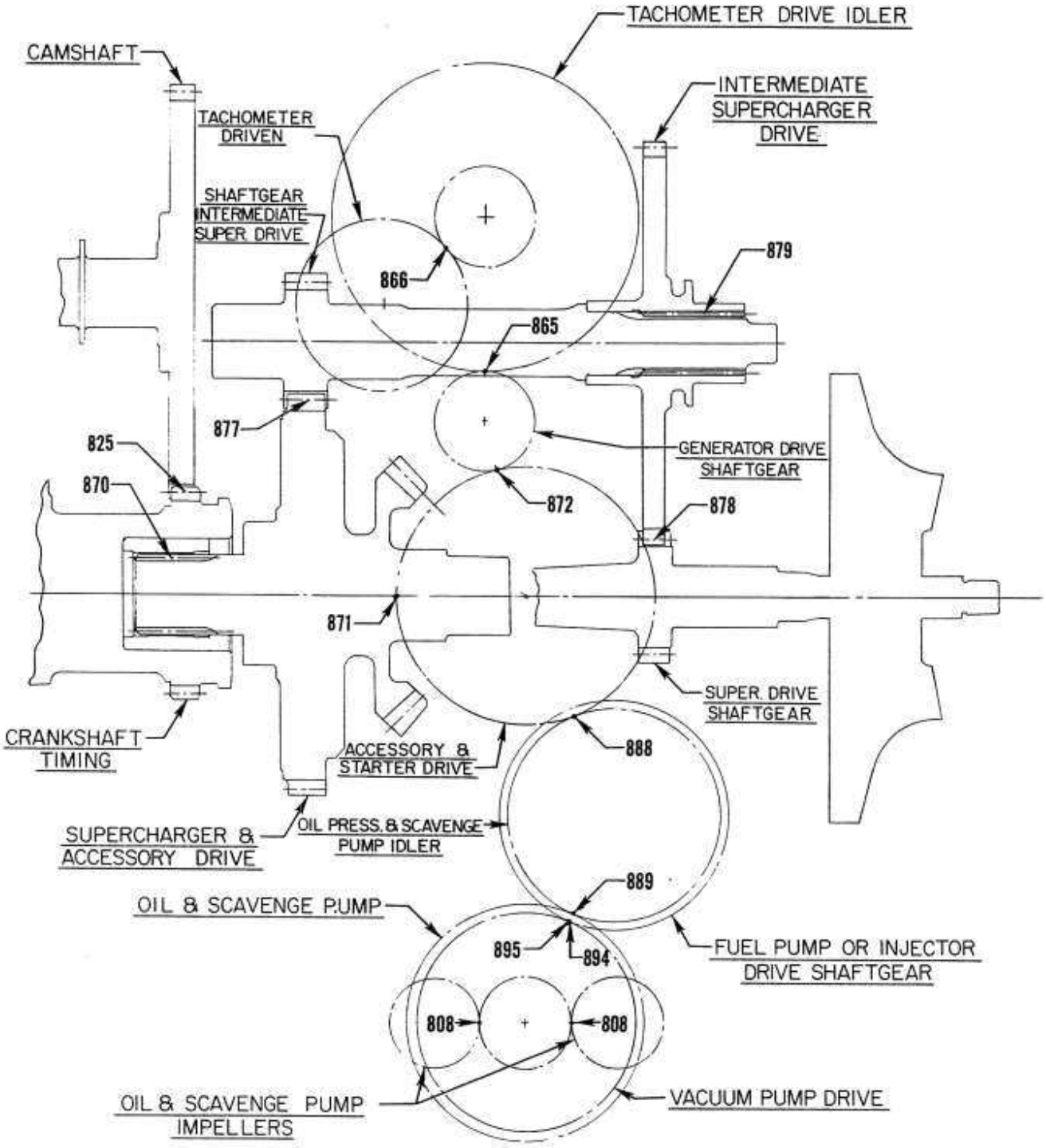


Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH



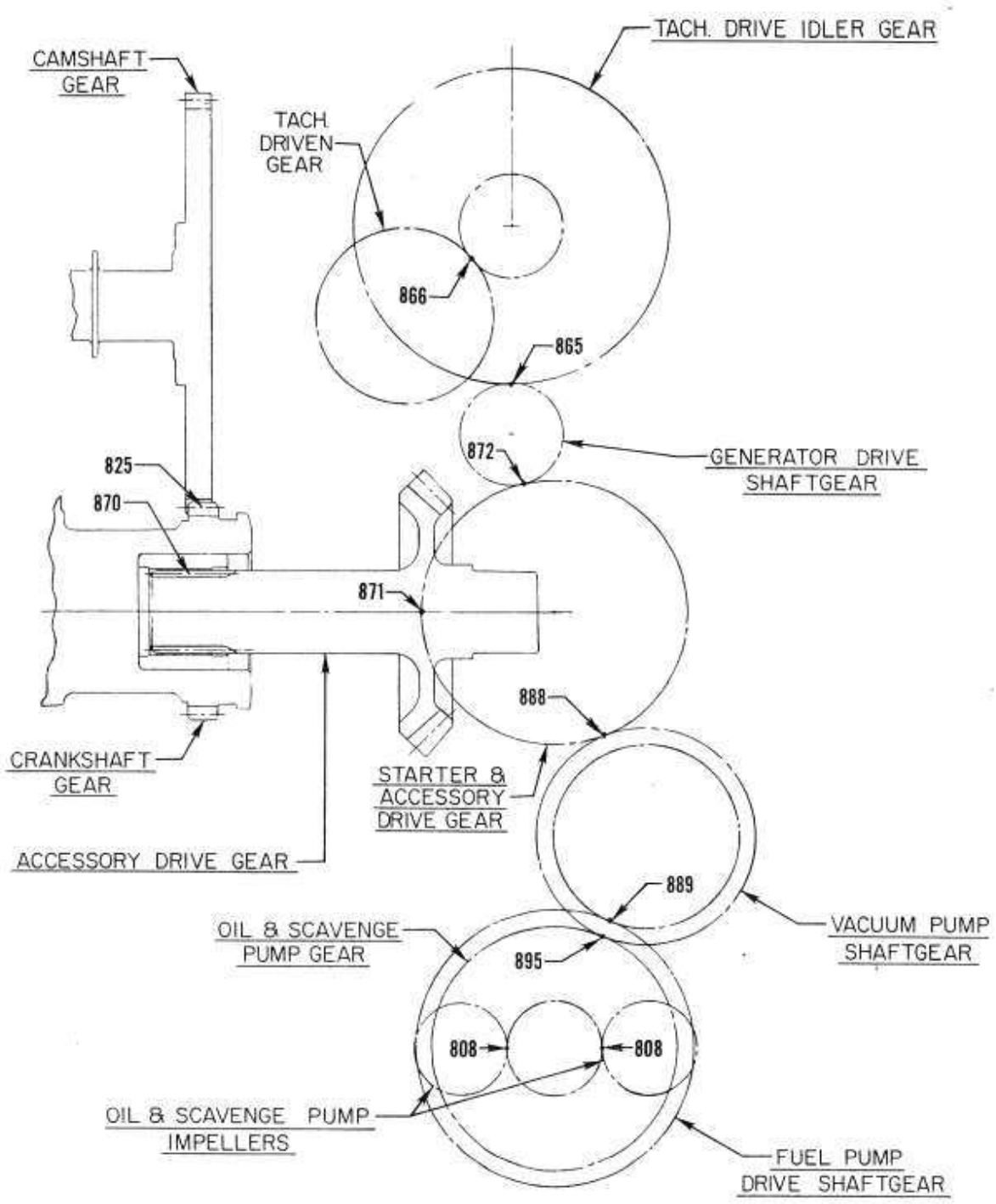
IGSO-540
VIEWING LEFT SIDE OF ENGINE

Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH



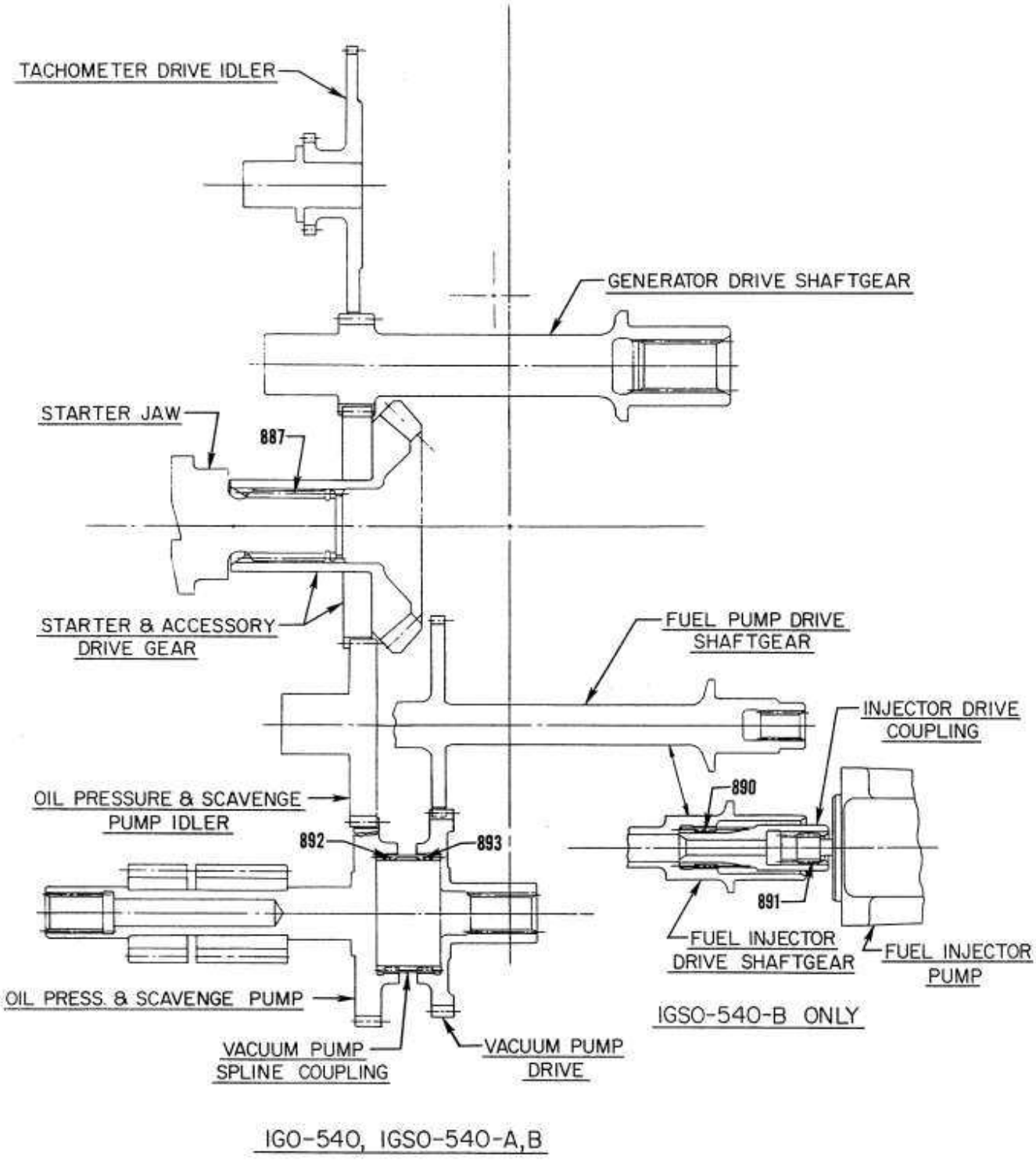
IGO-540
VIEWING LEFT SIDE OF ENGINE

Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH

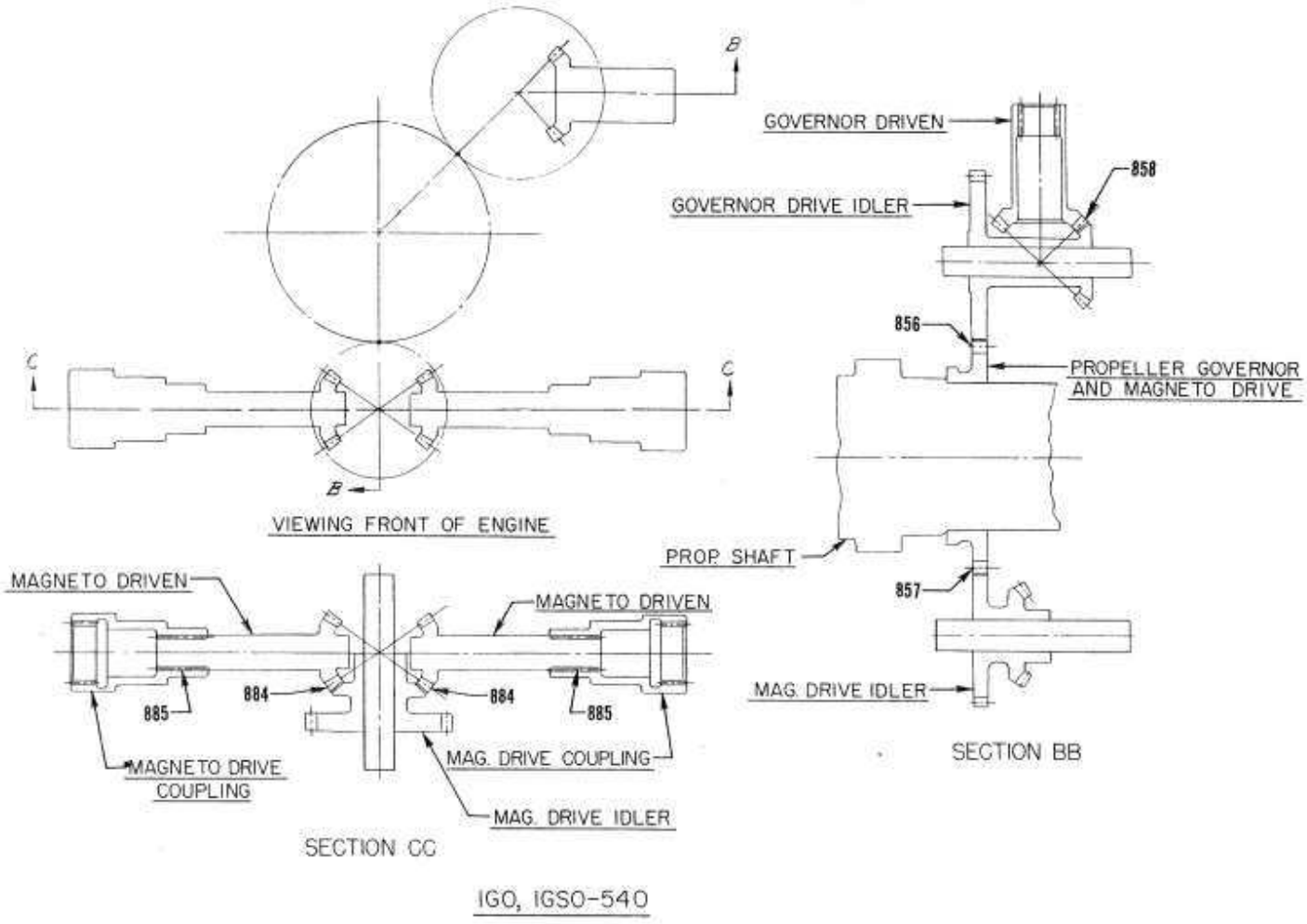


Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

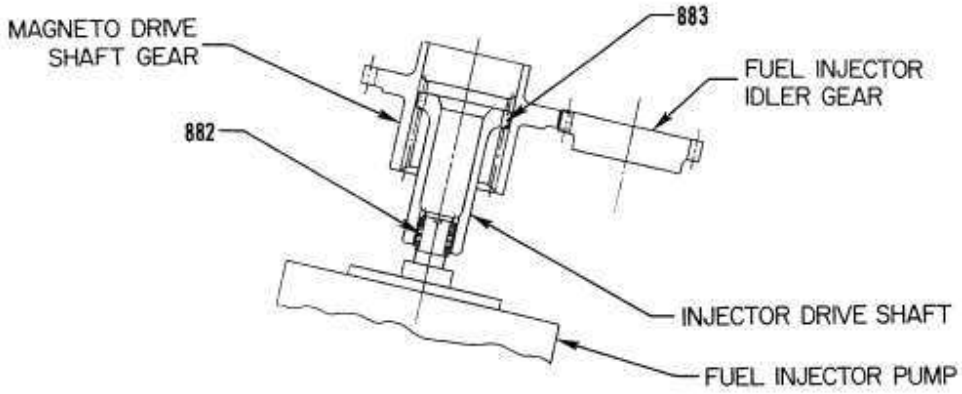
SECTION IV – BACKLASH



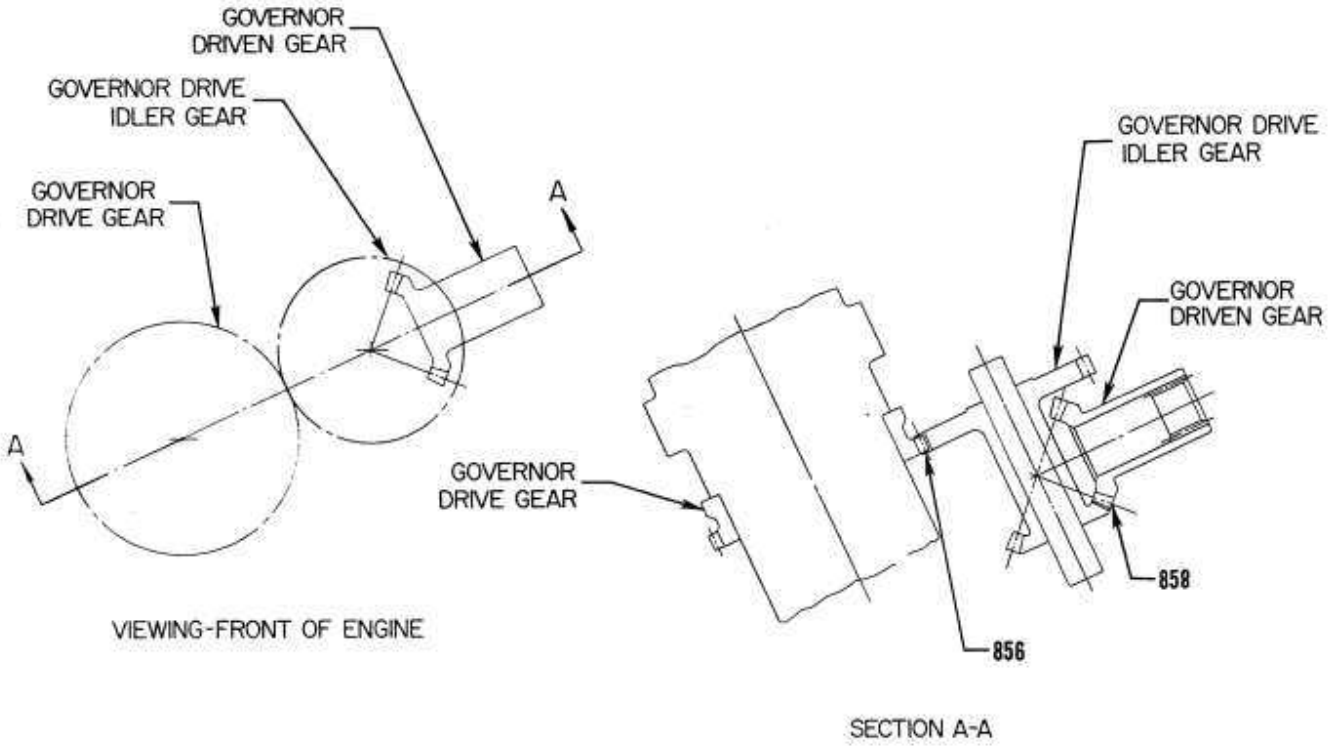
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH



IGSO-480-B



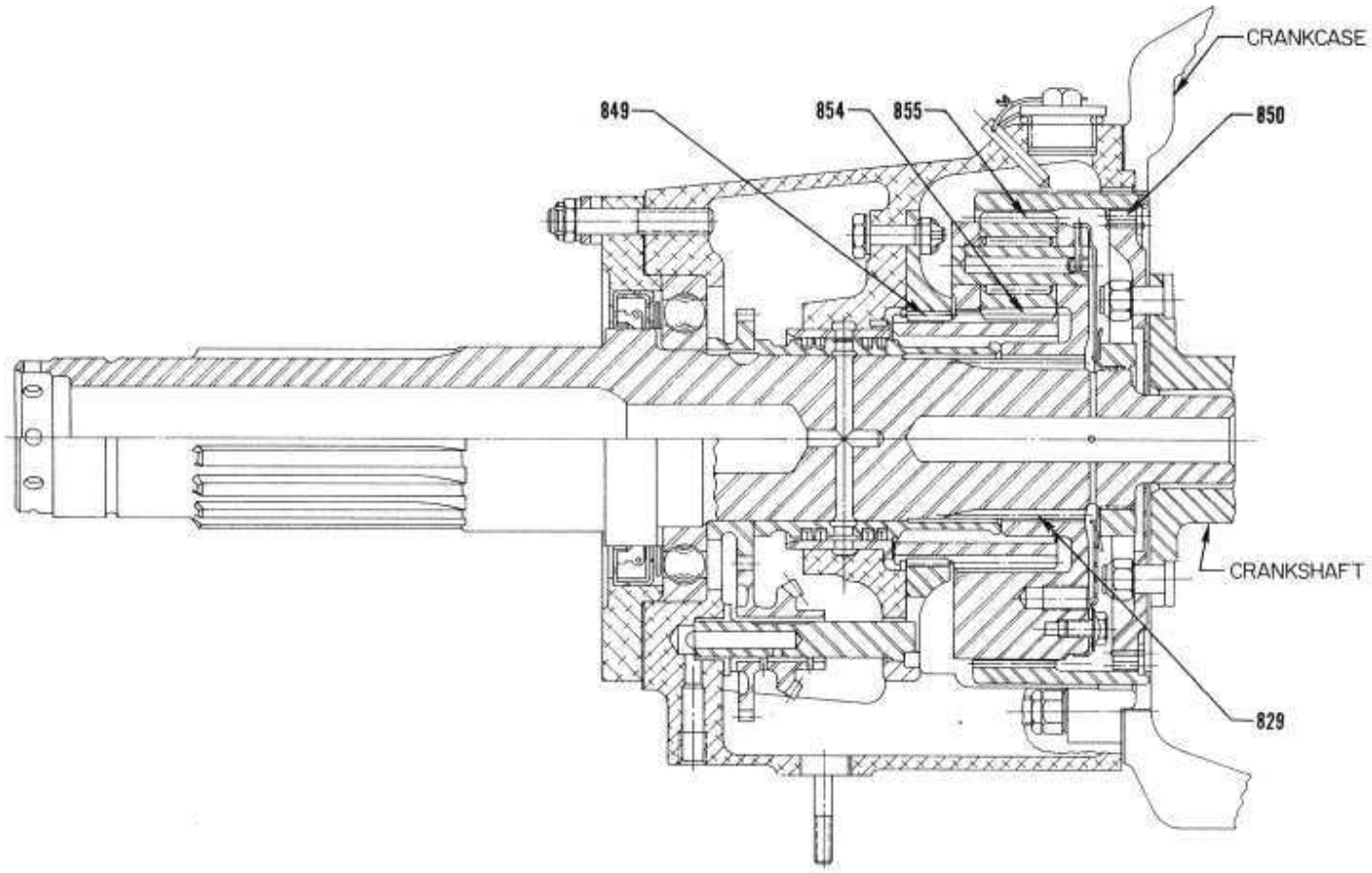
GO-435, GO, GSO & IGSO-480-A

Accessory Drives

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION IV – BACKLASH



SECTION THRU REDUCTION GEAR

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	*Chart*	*Thread Size*	*Nomenclature*	*Torque Limits*
900	E-H-P	3/8-24	Connecting Rod Nuts	480 in. lbs.
	AB-AC	3/8-24	Connecting Rod Bolts – Tighten to Length	2.255-2.256
901	H4-H5-P-AB-AC	1/2-20	Oil Pump Shaft Nut	360-480 in. lbs.
903	E-H	3/8-24	Magneto Nut (To attach drive member to magneto) – Steel Bushing	300 in. lbs.
904	H-P1	10-32	Screw Plate Nuts (To attach ignition cable outlet plate to magneto)	15 in. lbs.
905	ALL (using a silicone gasket)	1/4-20	Rocker Box Screws	35 in.-lbs.
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 in.-lbs.
906	ALL	5/16-18	Exhaust Port Studs (Driving Torque)	40 in. lbs. min.
	ALL	5/16-18	Nut to Attach Exhaust Stacks to Cylinder Head	160-180 in. lbs.
907	ALL	18MM	Spark Plugs	420 in. lbs.
909	ALL	5/8-32	Alternator Pulley Nut	450 in. lbs.
	ALL	5/8-32	Alternator Nut (Quill Shaft)	474 in. lbs.
910	AC	1/4-28	Alternator Output Terminal Nut	85 in. lbs.
911	AC	10-32	Alternator Auxiliary Terminal Nut	30 in. lbs.
913	H3-H5-P-AB-AC	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 in. lbs.
914	AC	1/8-27 NPT	Injector Nozzle in Cylinder Head	60 in. lbs.
919	ALL	1/4 Hex Head and Below	Hose Clamps (Worm Type)	45 in. lbs.
	ALL	5/16 Hex Head and Above	Hose Clamps (Worm Type)	45 in. lbs.
919-1	ALL		"T" Bolt Hose Clamps – Initial Torque . . . . . Retorque After Engine Test. . . .	35 in. lbs. 25 in. lbs.
920	ALL		Cylinder Head Drain Back Hose Clamp	10 in. lbs.
928	ALL	3/8-16	Cylinder Hold Down Studs (Crankcase Driving Torque)	100 in. lbs.
	ALL	1/2-13	Cylinder Hold Down Studs (Crankcase Driving Torque)	250 in. lbs.
929	ALL	3/8	Cylinder Hold Down Nuts	300 in. lbs.
	ALL	1/2	Cylinder Hold Down Nuts	600 in. lbs.
930	ALL	5/16-32	Brass union nut on stainless steel injector/primer fuel line (Both Ends)	25-50 in.-lbs.*
* It is also permissible to tighten the fuel line union nut finger tight, then continue tightening the nut with a wrench an additional 30 to 60 degrees (1/2 to 1 flat of the nut.) Torque in excess of 50 in.-lbs. can result in damage to the parts.				
	Cylinder Hold Down and Crankcase Parting Flange Nuts' Tightening Procedures – See latest revision of Service Instruction No. 1029.			
931	ALL	2.000-16	Pinion Cage Retaining Nut	400 ft. lbs.
932	E-H1-H4-H5-P-AB-AC		Propeller Retaining Nut	450-500 ft. lbs.
933	H4-H5-P-AB-AC		Accessory Drive Shaft Nut	75-125 ft. lbs.
934	H4-H5-P-AB-AC		Crankshaft Gear Retaining Nut	150 ft. lbs.

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	*Chart*	*Thread Size*	*Nomenclature*	*Torque Limits*
936	P-AB		Supercharger – Intermediate Drive Shaft Nut	75 ft. lbs.
937	P-AB		Supercharger – Impeller Locknut	(600 in. lbs. Plus Torque Req'd. to Reach Next Locking Slot)
938	H4-H5-P-AB-AC	1/4-28	Thin Slotted Nut	(38 in. lbs. Plus Torque Req'd. to Reach Next Locking Slot)
940	ALL		Ring Gear Assembly – Attaching Nuts	360 in. lbs.
941	ALL		Reduction Gear Assembly – Attaching Nuts	300 in. lbs.
942	E1-H1	1/4-18 NPT	Carburetor Drain Plug	120-144 in. lbs.
	E-H-P	1/8-27 NPT	Carburetor Drain Plug	50-60 in. lbs.
943	P	10-32	Screws (To Attach Accessory Drive Coupling Plate)	25-30 in. lbs.

SECTION V – SPRINGS

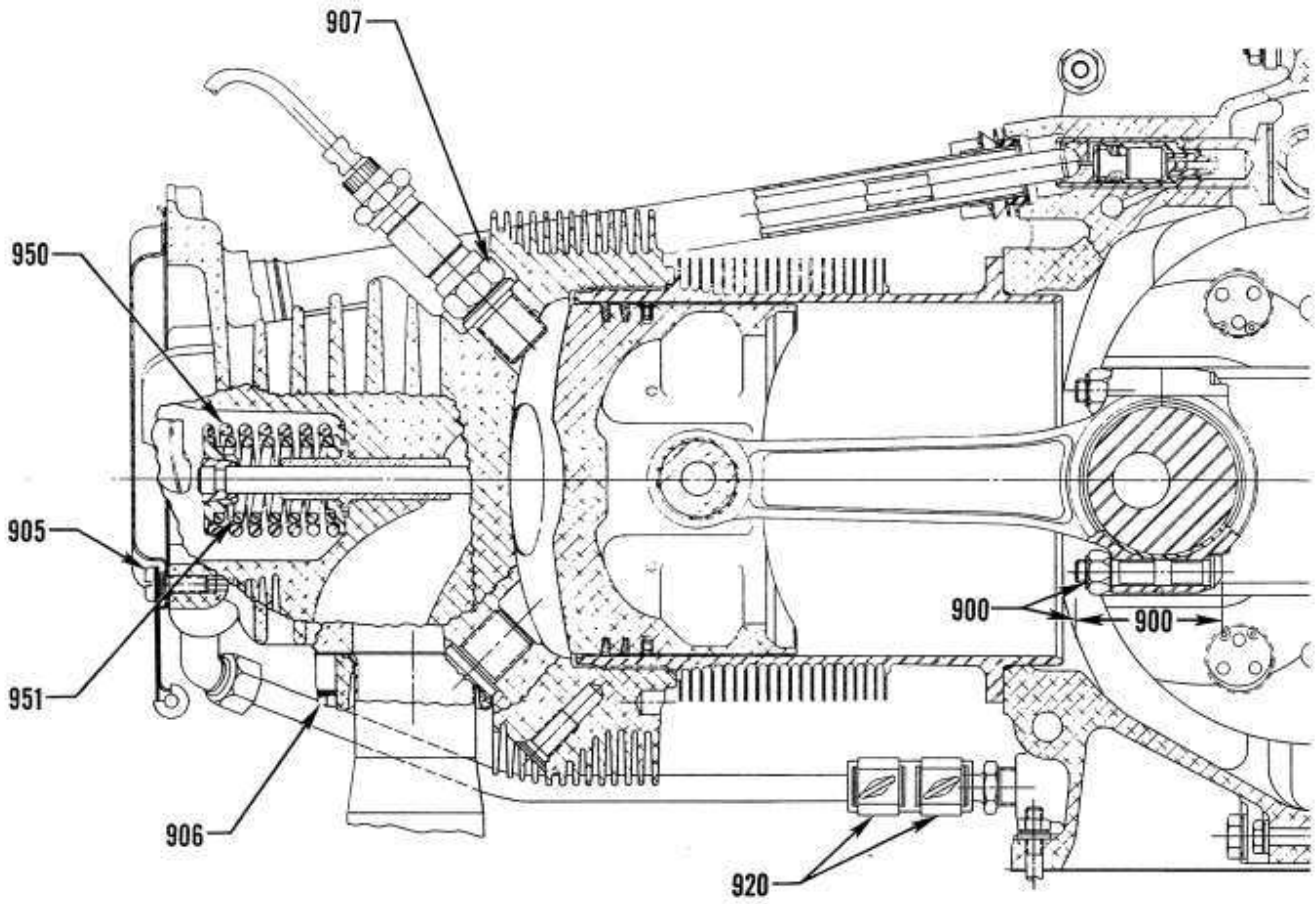
Ref.	Chart	Nomenclature	**Lyc. Part No.**	Wire **Dia.**	**Length at Comp. Length**	**COMP. LOAD** **Mfr. Min.**	**Mfr. Max.**	Service **Max.**
950	ALL	Outer Valve Springs (Angle)	68326	.177	1.46 in.	103 lb.	111 lb.	100 lb. min.
	ALL	Outer Valve Springs (Angle)	LW-11796	.182	1.43 in.	114 lb.	124 lb.	111 lb. min.
951	ALL	Auxiliary Valve Springs (Angle)	68328 LW-11797	.142	1.33 in.	75 lb. 73 lb.	83 lb.	72 lb. min.
952	H4-H5-P-AB-AC	Check Valve Springs						
		Lycoming Part Numbers	Free Length					
		654-B	--------	.031	1.03 in.	.74 lb.	.94 lb.	.69 lb. min.
		73761	2.065	.041	1.03 in.	3.15 lb.	3.35 lb.	3.10 lb. min.

Ref.	Chart	Nomenclature	Identification		Wire **Dia.**	**Length at Comp. Length**	**COMP. LOAD** **Mfr. Min.**	**Mfr. Max.**	Service **Max.**
953		Oil Pressure Relief Valve Spring							
		Lycoming Part Numbers	Dye	Free Length					
	H4-H5-P-AB-AC	68542	None	2.38	.067	1.66 in.	15 lb.	17 lb.	14 lb. min.
	H4-H5-P-AB-AC	LW-14029	White	2.28	.072	1.66 in.	20 lb.	22 lb.	17 lb. min.
	E1-H1-H2-H3	60476	None	2.38	.047	1.44 in.	7.15 lb.	7.65 lb.	7.00 lb. min.
	E1-H1-H2-H3	66920	None	2.54	.047	1.44 in.	8.35 lb.	8.85 lb.	8.20 lb. min.
	E1-H1-H2-H3	74596	None	2.96	.047	1.44 in.	11.65 lb.	12.15 lb.	11.50 lb. min.
954		Supercharger Drive Coupling Spring							
		Lycoming Part Numbers	Free Length						
	P	68830	1.25		.148	1.10 in.	168 lb.	184 lb.	165 lb. min.
	P	LW-12303	1.28		.148	1.13 in.	168 lb.	184 lb.	165 lb. min.
	AB	72774	1.23		.177	1.10 in.	249 lb.	275 lb.	244 lb. min.
	AB	LW-12301	1.26		.177	1.13 in.	255 lb.	270 lb.	250 lb. min.

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

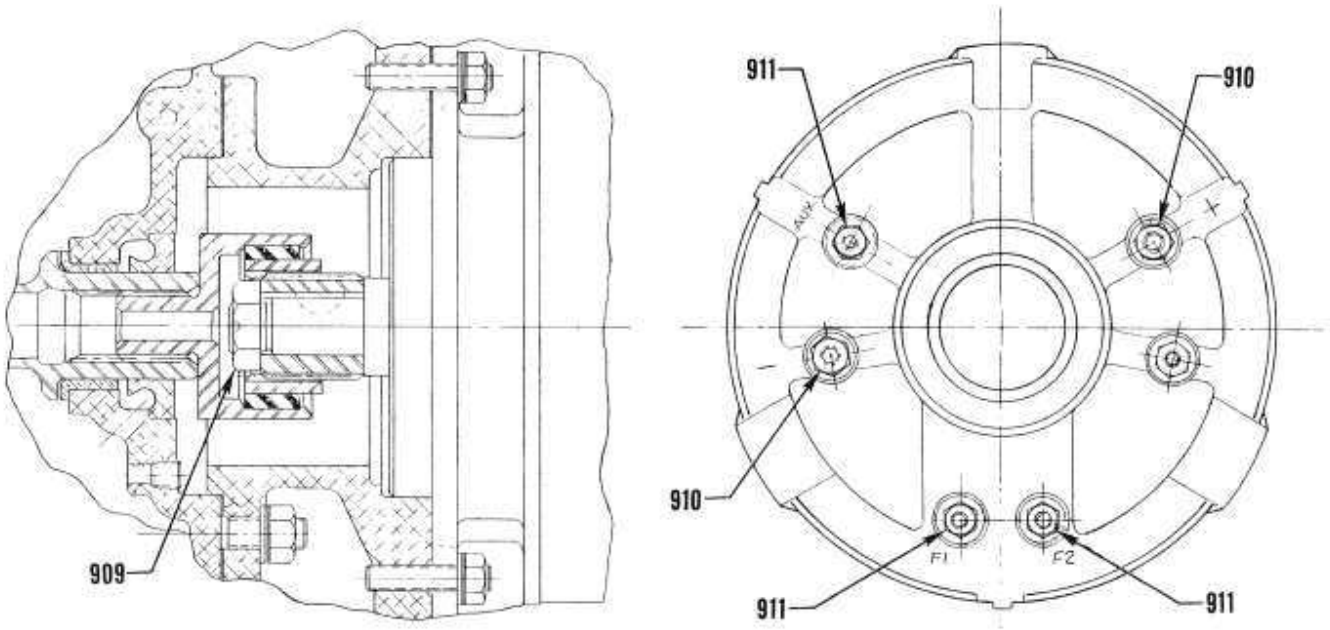
SECTION V – SPECIAL TORQUE REQUIREMENTS



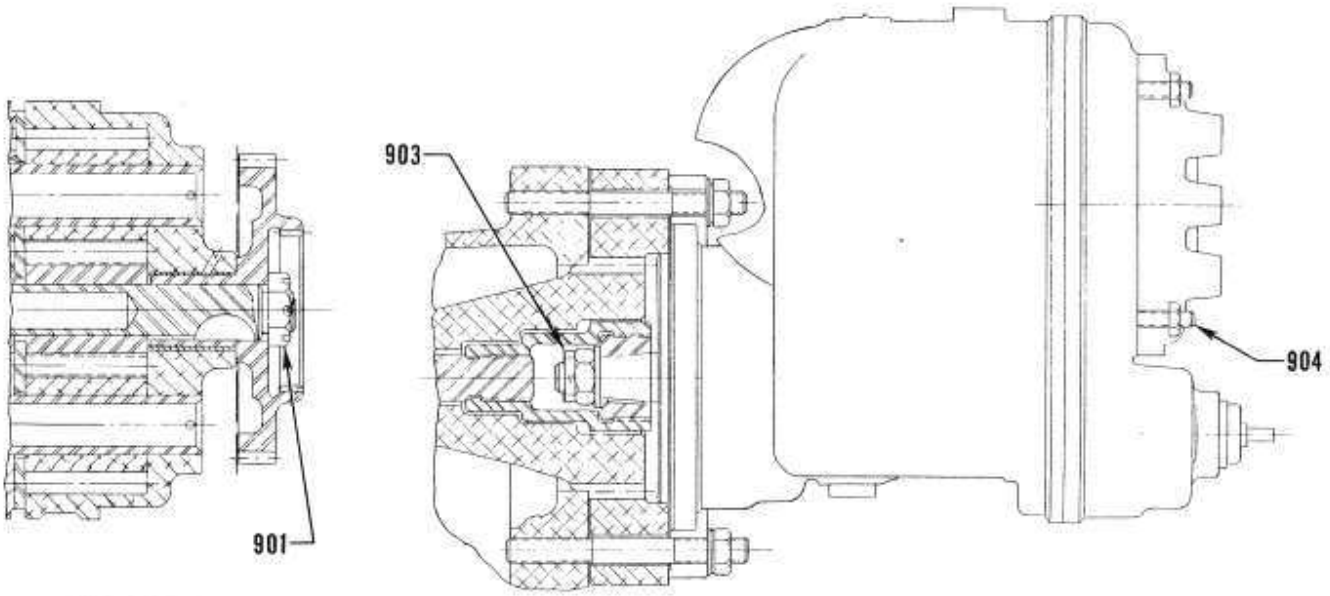
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



ALTERNATOR & ALTERNATOR DRIVE



OIL PUMP

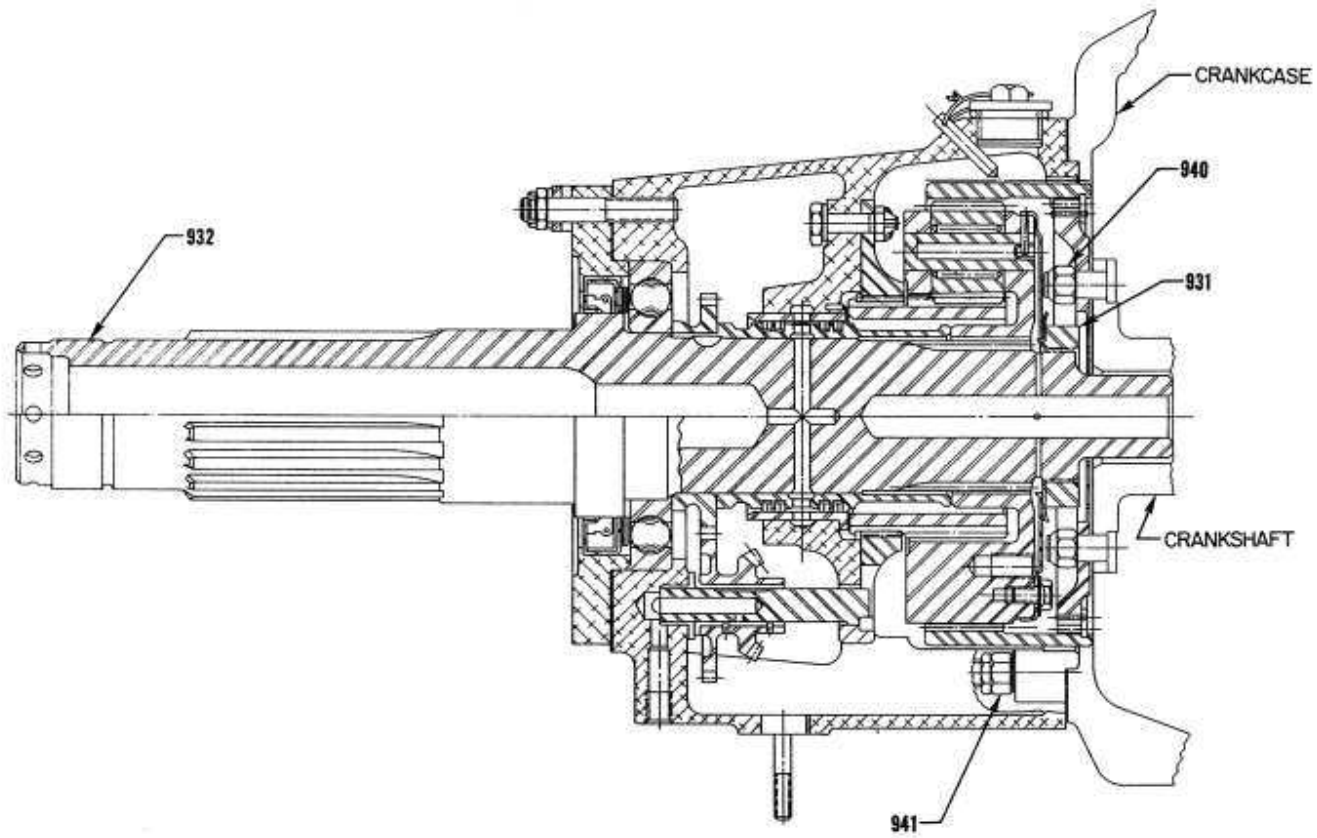
MAGNETO

Engine Accessories and Hardware

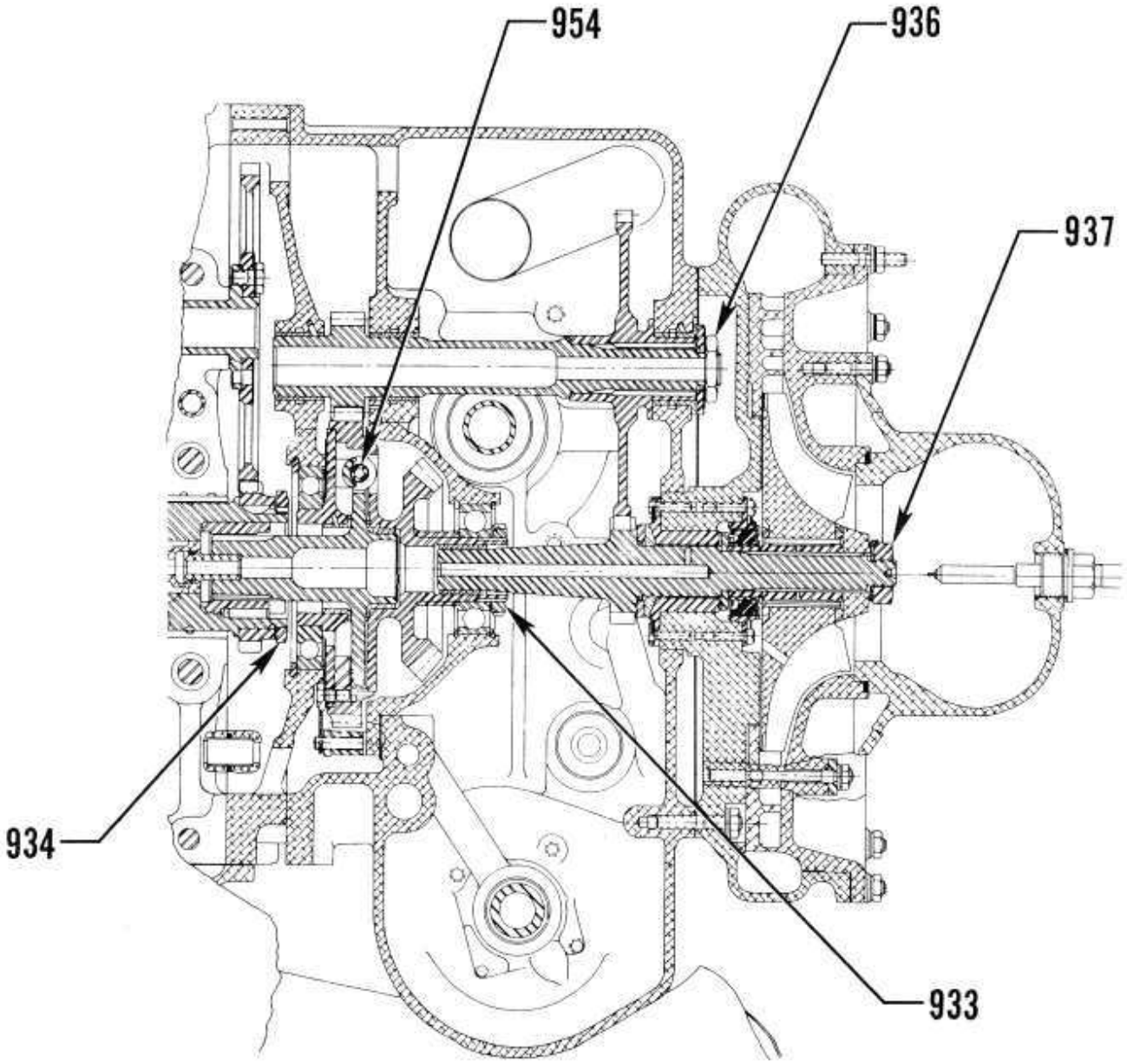
SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



SECTION THRU REDUCTION GEAR

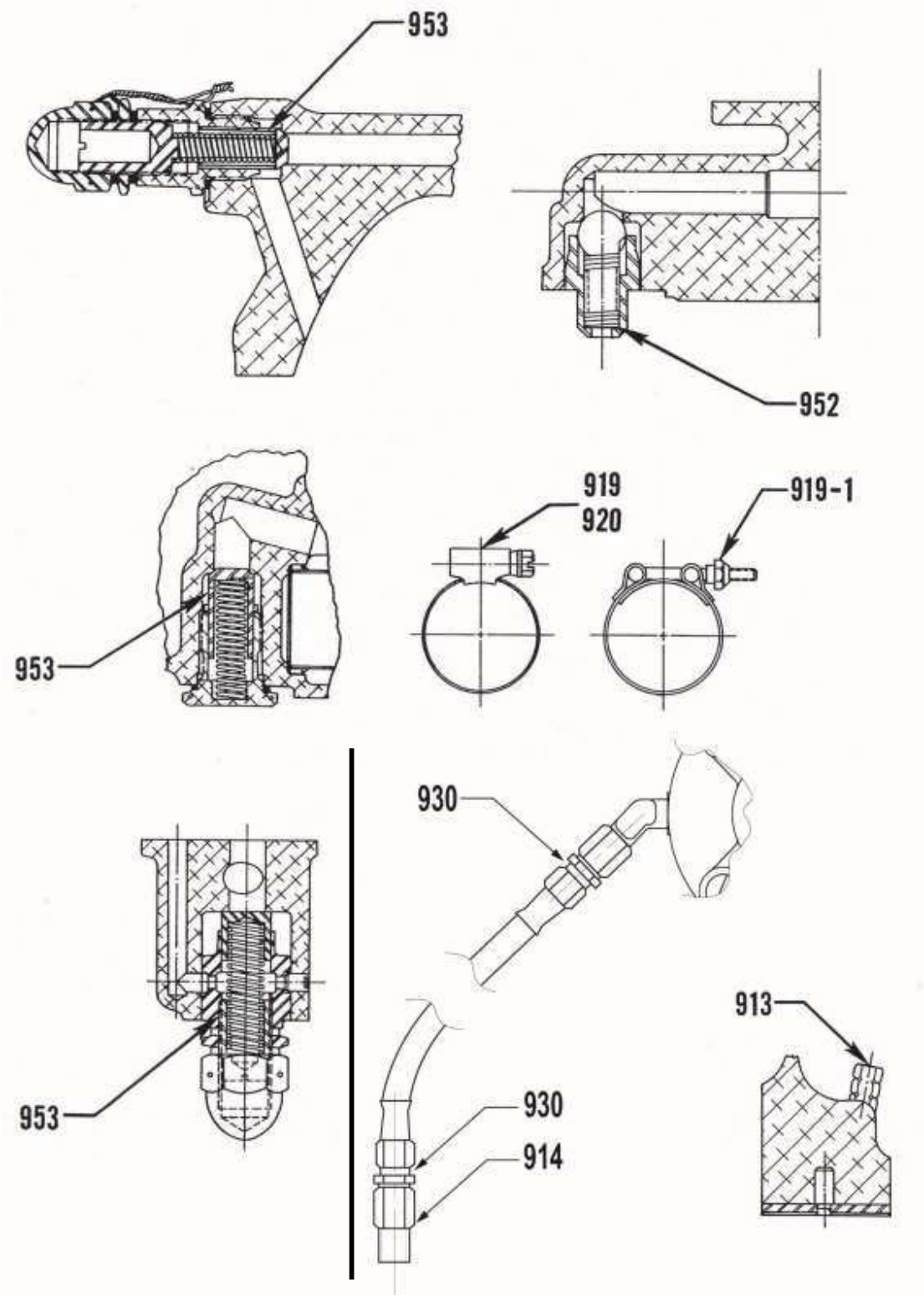


SECTION THRU ACCESSORY HSG. & SUPERCHARGER

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



Engine Springs and Hardware

SERVICE TABLE OF LIMITS

PART III – GEARED ENGINES

STANDARD TORQUE

UNLESS OTHERWISE LISTED

Torque limits for propeller attaching bolts to be supplied by propeller aircraft manufacturer.

NOTE: Refer to Table VIII for torque value conversions (In. Lb. or Ft. Lb. to Nm).

TABLE I

BOLTS, SCREW AND NUTS

Thread	Torque		Thread	Torque	
	In. Lb.	Ft. Lb.		In. Lb.	Ft. Lb.
8	20 to 22	-----	7/16	600 to 660	50 to 55
10	49 to 54	-----	1/2	900 to 984	75 to 82
1/4	96 to 106	-----	9/16	1320 to 1452	110 to 121
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297
THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE					

TABLE II

PIPE PLUGS

Thread	Torque
	In. Lbs.
1/16-27 NPT	40 to 44
1/8-27 NPT	40 to 44
1/4-18 NPT	85 to 94
3/8-18 NPT	110 to 121
1/2-14 NPT	160 to 176
3/4-14 NPT	230 to 252
1-11-1/2 NPT	315 to 347

TABLE III

CRUSH TYPE GASKETS

Thread Pitch on Part to be Tightened	ANGLE OF TURN	
Threads Per Inch	Aluminum	Copper
8	135°	67°
10	135°	67°
12	180°	90°
14	180°	90°
16	270°	135°
18	270°	135°
20	270°	135°
24	360°	180°
28	360°	180°

NOTE: Install all crush type gaskets except the self-centering type, with the unbroken surface against the flange of the plug or part being tightened against the seal. Turn the part until the sealing surfaces are in contact and then tighten to the angle of turn listed for the appropriate thread size.

NOTE: Lubricate Threads Unless Otherwise Specified.

TABLE IV

FLEXIBLE TUBE CONNECTIONS
(SEALASTIC OR EQUIVALENT FITTINGS)

Tube Size	Thread	Torque In. Lbs.	
		Aluminum Alloy	Steel
(-3) 3/16	3/8 - 24	30 to 50	70 to 80
(-4) 1/4	7/16 - 20	40 to 65	90 to 100
(-5) 5/16	1/2 - 20	60 to 80	135 to 150
(-6) 3/8	9/16-18	75 to 125	270 to 300
(-8) 1/2	3/4-16	150 to 250	450 to 500
(-10) 5/8	7/8 - 14	200 to 350	650 to 700

TABLE V

STUDS MIN. DRIVING TORQUE

Threads	Torque In. Lbs.
1/4-20	15
5/16-18	25
3/8-16	50

TABLE VI

JAM NUT OR STRAIGHT THREAD O-RING BOSS

Tube Size	Thread	Torque Ft. Lbs.
-03	3/8 – 24	8 – 9
-04	7/16 – 20	13 – 15
-05	1/2 – 20	14 – 15
-06	9/16 – 18	23 – 24
-08	3/4 – 16	40 – 43
-10	7/8 – 14	43 – 48
-12	1-1/16 – 12	68 – 75
-14	1-3/16 – 12	83 – 90
-16	1-5/16 – 12	112 – 123
-20	1-5/8 – 12	146 – 161
-24	1-7/8 – 12	154 – 170
-32	2-1/2 – 12	218 – 240

SERVICE TABLE OF LIMITS

STANDARD TORQUE (CONT.)
UNLESS OTHERWISE LISTED

TABLE VII

METAL TUBE FITTINGS

Dash Nos. Ref.	Tubing OD inches	Wrench torque for tightening AN-818 Nut (pound inches)						Minimum bend radii measured to tubing centerline. Dimension in inches	
		Aluminum-alloy tubing		Steel tubing		Aluminum-alloy tubing (Flare MS33583) for use on oxygen lines only			
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Alum. Alloy	Steel
-2	1/8	20	30	75	85	--	--	3/8	--
-3	3/16	25	35	95	105	--	--	7/16	21/32
-4	1/4	50	65	135	150	--	--	9/16	7/8
-5	5/16	70	90	170	200	100	125	3/4	1-1/8
-6	3/8	110	130	270	300	200	250	15/16	1-5/16
-8	1/2	230	260	450	500	300	400	1-1/4	1-3/4
-10	5/8	330	360	650	700	--	--	1-1/2	2-3/16
-12	3/4	460	500	900	1000	--	--	1-3/4	2-5/8
-16	1	500	700	1200	1400	--	--	3	3-1/2
-20	1-1/4	800	900	1520	1680	--	--	3-3/4	4-3/8
-24	1-1/2	800	900	1900	2100	--	--	5	5-1/4
-28	1-3/4	--	--	--	--	--	--	--	--
-32	2	1800	2000	2660	2940	--	--	8	7

TABLE VIII

TORQUE CONVERSIONS

In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm
5	0.42	0.56	100	8.33	11.30	1000	83.33	113.00
10	0.83	1.13	200	16.67	22.60	2000	166.70	226.00
20	1.67	2.26	300	25.00	53.90	3000	250.00	339.00
30	2.50	3.39	400	33.33	45.19	4000	333.30	451.90
40	3.33	4.52	500	41.67	56.49	5000	416.70	564.90
50	4.17	5.65	600	50.00	67.79	6000	500.00	677.90

SERVICE TABLE OF LIMITS

PART IV – VERTICAL DRIVE ENGINES EXCLUDING VO AND IVO-360

CHART	MODELS
L	VO, TVO-435 (ALL)
L1	VO-435-B, TVO-435-F
L2	TVO-435-A
V	VO, IVO, TVO, TIVO-540
V1	TVO, TIVO-540

NOTE

In "Chart" column, a number appearing after a letter shows exceptions to the basic model.

SECTION I	500 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT
SECTION II	600 SERIES	CYLINDERS
SECTION III	700 & 7000 SERIES	GEAR TRAIN
SECTION IV	800 & 8000 SERIES	BACKLASH (GEAR TRAIN)
SECTION V	900 SERIES	TORQUE AND SPRINGS

(A) These fits are either shrink fits controlled by machining, fits that may readily be adjusted, or fits where wear does not normally occur, in each case the fit must be held to the manufacturing tolerance.

(B) Side clearance on piston rings must be measured with face of ring flush with piston.

(D) These dimensions shown are measured at bottom of piston skirt at right angles to piston pin.

(E) Permissible wear of the crankshaft (rod and main bearing journals) to be minus 0.0015 on the diameter.

(L) Loose fit; wherein a definite clearance is mentioned between the mating surfaces.

(T) Tight fit; shrink or interference fit.

* - Indicates cut-off date for data retrieved prior to publication.

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TECHNICAL PUBLICATION
REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
SSP-1776-5-PT4	**Service Table of Limits**	**SSP-1776**	**October 28, 2013**

PREVIOUS REVISIONS	CURRENT REVISION*
April 2018 4-6, 4-35, 4-39 • Deleted NOTES that reference S.I. 1243 in Piston Application Table • Added Ref. number 930 to Section V table and figure for torque value for brass union nut on stainless steel injector fuel lines and primer lines (Both Ends)	**April 2020** 4-5, 4-6 • Revised burnishing instructions for connecting rod bushing in reference number 600 • Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607 * Revisions are indicated with a vertical bar to the left of the revised item.

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SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	L	All Main Bearings and Crankshaft			.0015L .0045L	.0060L
	L1-V	Main Bearings and Crankshaft (Except Front)			.0011L .0041L	.0050L
	V	Front Main Bearing and Crankshaft			.0011L .0041L	.0050L
	L1	Front Main Bearing and Crankshaft			.0015L .0045L	.0050L
	ALL	Diameter of Main Bearing Journal on Crankshaft	2.3745 2.376	(E)		
	L	Crankcase Bearing Bore Diameter (All)	2.566 2.567	2.5685		
	V	Crankcase Bearing Bore Diameter (All)	2.6865 2.6875	2.6890		
501	ALL	Connecting Rod Bearing and Crankshaft			.0008L .0038L	.0050L
	ALL	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	2.1235 2.125	(E)		
	ALL	Connecting Rod Bearing Bore Diameter (2-1/8 in.) (Measured at Axis 30° on Each Side)	2.2870 2.2875			
502	ALL	Connecting Rod – Side Clearance			.004L .010L	.016L
503	ALL	Connecting Rod – Alignment			.010 in 10 Inches	
504	ALL	Connecting Rod – Twist			.012 in 12 Inches	
505	ALL	Crankshaft Run-Out at Center Main Bearings				
		Mounted on No. 1 and 4 Journals Max. Run-Out No. 2 and 3 Journals			.005	.0075
		Mounted on No. 1 and 3 Journals Max. Run-Out No. 2 Journal			.003	.0045
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
506	ALL	Crankshaft and Crankcase Front End Clearance			.006L .015L	.025L
508	ALL	Crankshaft Propeller Flange Run-Out			.002	.005
510	ALL	Crankshaft Timing Gear and Crankshaft			.0000 .0015T	(A)
511	ALL	Tappet Body and Crankcase			.0010L .0033L	.004L
	ALL	O.D. of Tappet	.7169 .7177	.7166		
	ALL	I.D. Tappet Bore in Crankcase	.7187 .7200	.7203		

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

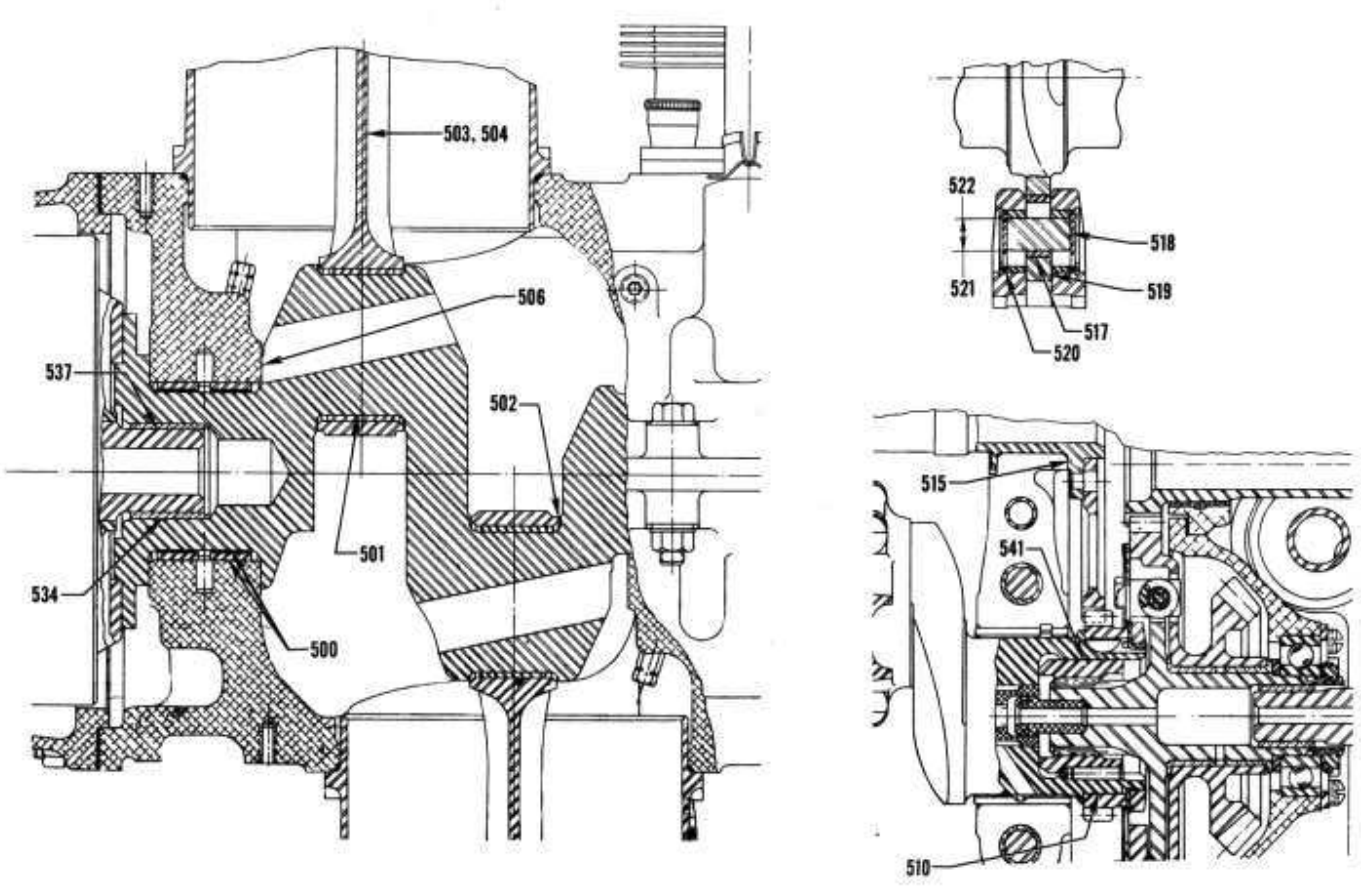
SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
512	ALL	Tappet Plunger Assembly and Body – Hyperbolic			.0010L .0067L	.0087L
513	ALL	Tappet Socket and Body (Hyperbolic)			.002L .007L	.009L
514	ALL	Camshaft and Crankcase			.002L .004L	.006L
515	ALL	Camshaft – End Clearance			.002L .009L	.015L
516	ALL	Camshaft Run-Out at Center Bearing Journal			.000 .001	.006
517	V	Counterweight Bushing and Crankshaft			.0013T .0026T	(A)
518	V	Counterweight Roller – End Clearance			.007L .025L	.038L
519	V	Counterweight and Crankshaft Side Clearance*			.003L .013L	.017L
520	V	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	V	I.D. of Counterweight Bushing	.7485 .7505	.7512		
522	V	O.D. of Counterweight Roller (P/N 73338) (See latest revision of Service Instruction No. 1012)	.5255 .5260			
541	ALL	Rear Crankshaft Spline Bushing and Crankshaft			.0002T .0015T	(A)
	* - Measure below roller next to flat.					

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

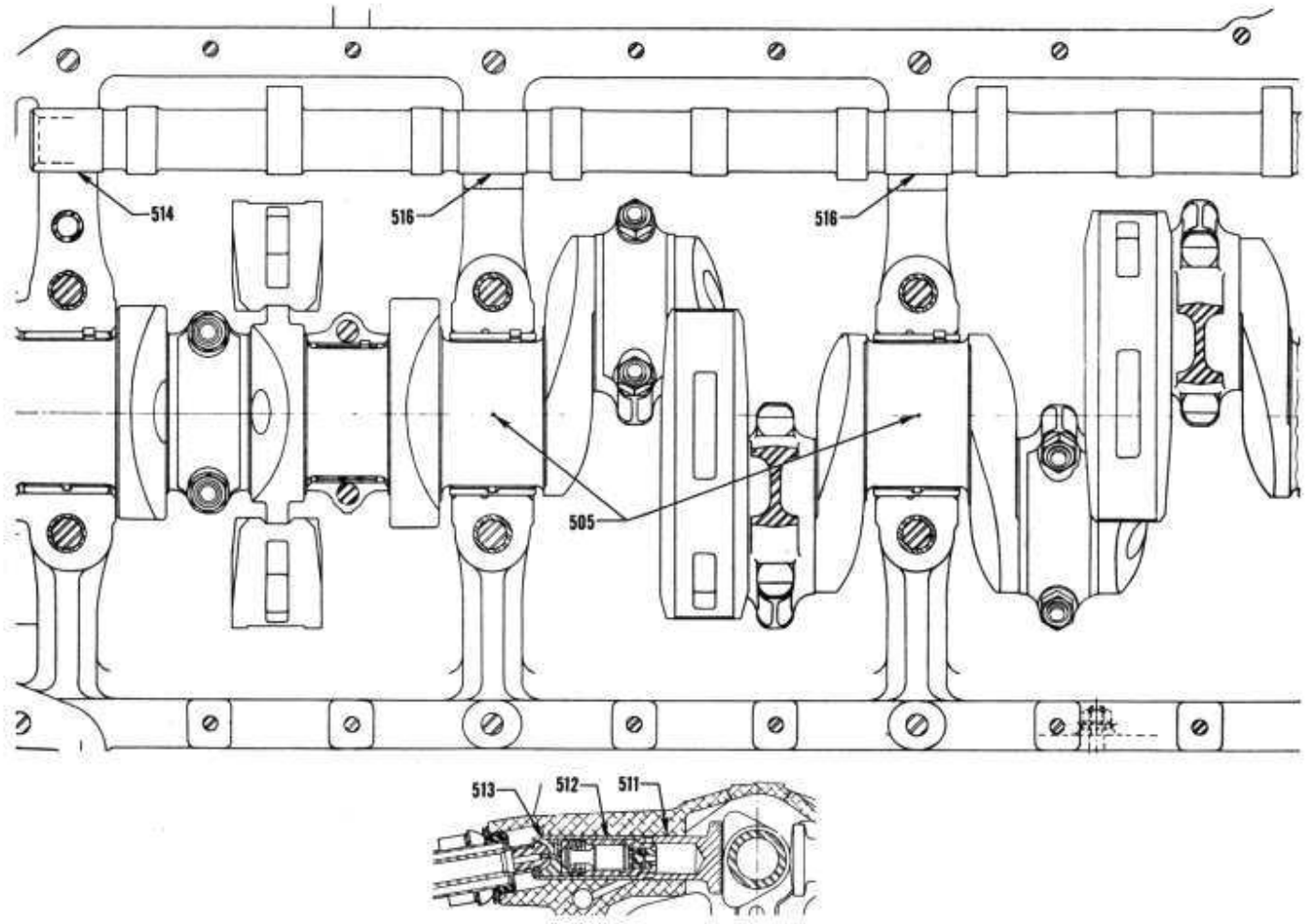


Crankcase, Crankshaft, Bearings, Camshaft and Counterweights

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



Longitudinal Section Thru Engine, Camshaft, Tappet Body and Crankshaft

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
600	ALL	Connecting Rod and Connecting Rod Bushing	Bushing P/N LW-13923 to be burnished in place Bushing P/N 01K28983 is **not** burnished in place			
	ALL	Finished I.D. of Connecting Rod Bushing	1.1254 1.1262			
601	L	Length Between Connecting Rod Bearing Centers	6.4985 6.5015			
	V	Length Between Connecting Rod Bearing Centers	6.7485 6.7515			
602	ALL	Connecting Rod Bushing and Piston Pin			.0008L .0021L	.0025L
603	ALL	Piston Pin and Piston			.0003L .0014L	.0018L
	ALL	Diameter of Piston Pin Hole in Piston	1.1249 1.1254			
	ALL	Diameter of Piston Pin	1.1241 1.1246			
604	V	Piston and Piston Pin Plug			.0002L .0010L	.002L
	V	Diameter of Piston Pin Plug*	1.1242 1.1247			
605	ALL	Piston Pin and Piston Pin Plug (Nitrided and Chrome Cylinders)			.0005L .0025L	.005L
	V	Diameter of Piston Pin Plug*	.5655 .5665			
	L	Diameter of Piston Pin Plug**	.7605 .7615			
	L	Diameter of Piston Pin Plug** (Thin Wall Pin)	.8405 .8415			
	*See latest revision of Service Instruction No. 1267. **See latest revision of Service Bulletin No. 316					
606	ALL	Piston Ring and Piston – Side Clearance (Top Ring Comp.) Half Wedge			.0025L .0055L	.008L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (2nd Ring Comp.) Full or Half Wedge			.000 .004L	.006L (B)
	ALL	Piston Ring and Piston – Side Clearance (Oil Regulating)			.002L .004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (Oil Scraper)			.003L .0055L	.007L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (3rd Ring Comp.) Half Wedge			.000 .004L	.006L (B)
607	ALL	Piston Ring Gap (Compression) Chrome Cylinders (Straight Barrels)			.020 .030	.047
	ALL	Piston Ring Gap (Compression) Nitrided and Chrome Cylinders (Choke Barrels)			.045 .065	.067

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
607	ALL	Piston Ring Gap (Oil Regulating) (All Barrels)			.015 .040	.047
	ALL (AS APPLICABLE)	Piston Ring Gap (Oil Scraper) (All Barrels)			.015 .030	.047
	For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075. For All Other Barrels – Ring gap is measured at top limit of ring travel.					

	Engine and Piston Application		Min. Piston Diameter		Cylinder Barrel			
	Engine Chart Code Letter	Piston Number	Top	Bottom	Type of Piston	Type of Surface	Maximum Diameter	Max. Clearance Piston Skirt & Cyl.
608 608 609 610	L	67266, 71553, 73620	4.8395	4.8540	Forged-Round	C	4.8805	.0225L
		73932	4.8395	4.8540	Forged-Round	N	4.8805	.0225L
		75984	4.8395	4.8590	Forged-Cam	C	4.8805	.018L
		75984, 76172*	4.8395	4.8590	Forged-Cam	N	4.8805	.018L
	V	71940, 72249, 72578, 73947*, 73976	5.0905	5.1040	Forged-Round	C	5.1305	.0225L
		71940, 72249, 73947, 73976	5.0905	5.1040	Forged-Round	N	5.1305	.023L
		74242, 75617	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L
		78203, 78762, LW-10207*, LW-10208	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L

NOTES:

To find the average diameter of cylinder in an area 4” above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Add both diameters; this sum, divided by 2, represents the average diameter of the cylinder.

*=High Compression.

Cylinder Barrel: N=nitride hardened, C=chrome plated.

Maximum taper and out-of-round permitted for cylinder in service is .0045 inch.

To find the average out-of-round, measure diameter of cylinder in an area 4” above bottom of barrel: First, measure diameter at right angles from plane in which valves are located. Second, measure diameter through the plane in which valves are located. Difference between diameters must not exceed .0045 inch.

Piston diameter at top is measured at top ring land (between top and second compression ring grooves) at right angle to piston pin hole; diameter at bottom of piston is measured at the bottom of the piston skirt at right angles to the piston pin.

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
611	L	Exhaust Valve Seat and Cylinder Head (Flat Seat)			.0065T .010T	(A)
	ALL	Exhaust Valve Seat and Cylinder Head (Allison Seat)			.0075T .011T	(A)
	ALL	O.D. Exhaust Seat (Allison Seat)	1.9355 1.937			
	L	O.D. Exhaust Seat (Flat Seat)	2.0965 2.098			
	ALL	I.D. Exhaust Seat Hole in Cylinder Head (Allison Seat)	1.926 1.928			
	L	I.D. Exhaust Seat Hole in Cylinder Head (Flat Seat)	2.088 2.090			
612	ALL	Intake Valve Seat and Cylinder Head			.0065T .010T	(A)
	L	O.D. Intake Seat (Allison Seat)	2.1675 2.169			
	L	O.D. Intake Seat (Flat Seat)	2.3145 2.316			
	V	O.D. Intake Seat	2.2885 2.290			
	L	I.D. Intake Seat Hole in Cylinder Head (Allison Seat)	2.159 2.161			
	L	I.D. Intake Seat Hole in Cylinder Head (Flat Seat)	2.306 2.308			
	V	I.D. Intake Seat Hole in Cylinder Head	2.280 2.282			
613	ALL	Exhaust Valve Guide and Cylinder Head			.001T .0025T	(A)
	ALL	O.D. Exhaust Valve Guide (1/2 in. Exhaust Valve)	.6633 .6638			
	L	O.D. Exhaust Valve Guide (7/16 in. Exhaust Valve)	.5933 .5938			
	ALL	I.D. Exhaust Valve Guide Hole in Cylinder Head (1/2 in. Exhaust Valve)	.6613 .6623			
	L	I.D. Exhaust Valve Guide Hole in Cylinder Head (7/16 in. Exhaust Valve)	.5913 .5923			
614	ALL	Intake Valve Guide and Cylinder Head			.001T .0025T	(A)
	ALL	O.D. Intake Valve Guide	.5933 .5938			
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	.5913 .5923			
615	ALL	Exhaust Valve Stem and Valve Guide			.0035L .0053L	(A)

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

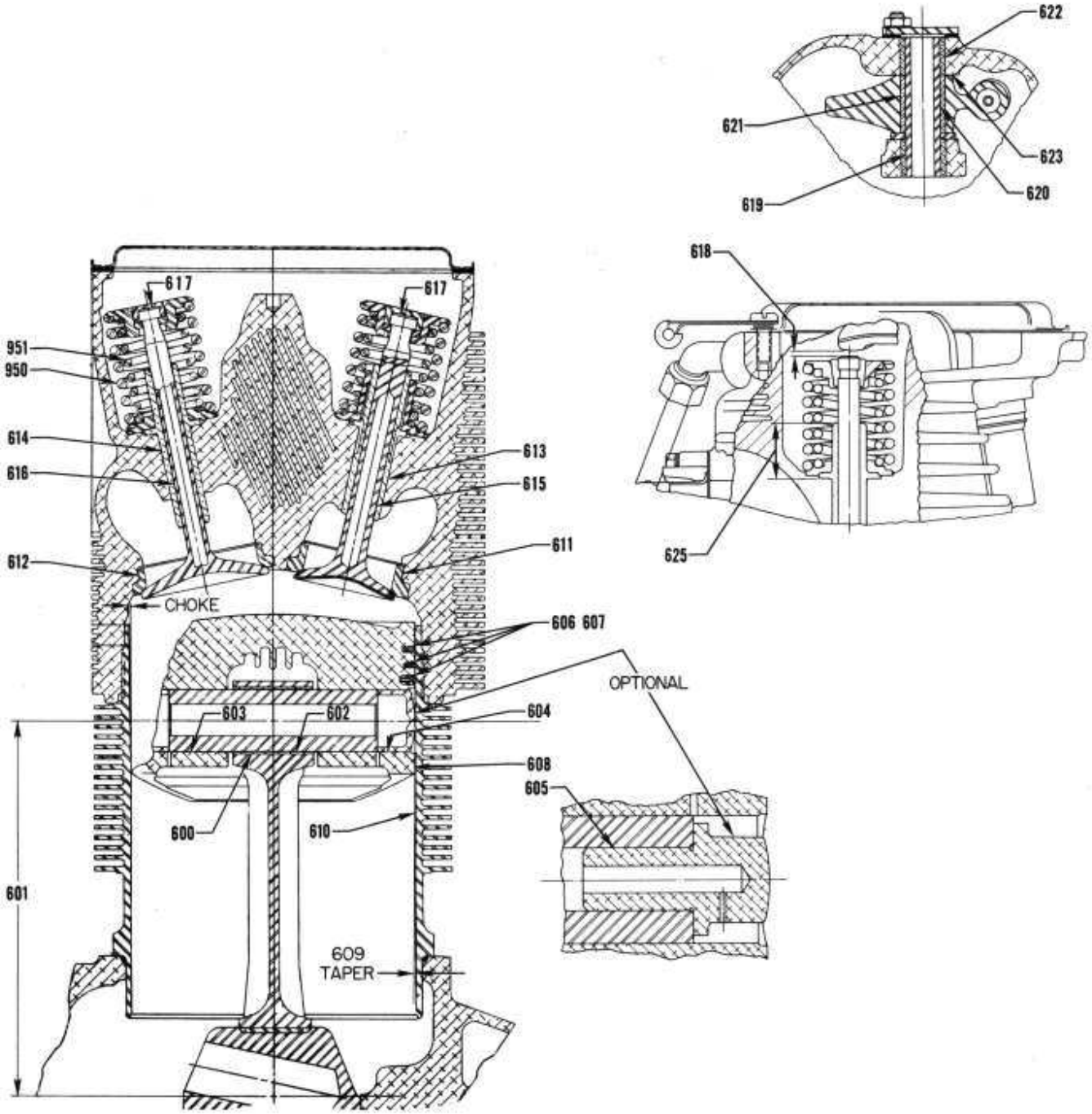
SECTION II – CYLINDERS

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
615	ALL	O.D. Exhaust Valve Stem	.4957 .4965	.4937		
			Service allowable limits of .4937 is applicable only to inconel or nimonic valves.			
	L	O.D. Exhaust Valve Stem (7/16 in. Exhaust Valve)	.4332 .4340			
	ALL	Finished I.D. Exhaust Valve Guide (1/2 in. Exhaust Valve)	.5000 .5010			
	L	Finished I.D. Exhaust Valve Guide (7/16 in. Exhaust Valve)	.4360 .4370			
	½ inch diameter exhaust valves may have exhaust valve guides that are .003 in. over the maximum inside diameter limit, anytime up to 300 hours of service. After 300 hours of service, inside diameter of exhaust valve guide may increase .001 in. during each 100 hours of operation up to the recommended overhaul time for the engine, or not to exceed .015 inch over the basic I.D. See latest revision of Service Instruction No. 1009 for recommended overhaul time.					
616	ALL	Intake Valve Stem and Valve Guide			.0010L .0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022 .4030	.4010		
	ALL	Finished I.D. Intake Valve Guide	.4040 .4050			
617	ALL	Valve and Valve Cap Clearance			.000 .004L	.005L
618	ALL	Dry Tappet Clearance			.028 .080	
619	ALL	Valve Rocker Shaft and Valve Rocker Bushing			.0001L .0013L	.0025L
	ALL	Finished I.D. of Valve Rocker Shaft Bushing in Cylinder Head	.6246 .6261	.6270		
620	ALL	Valve Rocker Shaft and Valve Rocker Bushings			.0007L .0017L	.004L
	ALL	O.D. Valve Rocker Shaft	.6241 .6245	.6231		
	ALL	Finished I.D. of Rocker Arm Bushing	.6252 .6263	.6270		
621	ALL	Valve Rocker Bushing and Valve Rocker	Bushing Must Be Burnished In Place			
622	ALL	Valve Rocker Shaft Bushing and Cylinder Head			.0022T .0038T	(A)
	ALL	Valve Rocker Shaft Bushing Hole in Cylinder Head	.7380 .7388			
623	ALL	Valve Rocker and Cylinder Head – Side Clearance			.002L .020L	.024L
625	ALL	Intake and Exhaust Valve Guide Height	.914 .954			
		MEASURE THE VALVE GUIDE HEIGHT FROM THE VALVE SPRING SEAT COUNTERBORE IN THE CYLINDER HEAD TO THE TOP OF VALVE GUIDE.				

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION II – CYLINDERS



Cylinder, Piston, Connecting Rod and Valve Components

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PUMP						
702	L-V	Oil Pump and Scavenge Pump Gear – End Clearance			.007L .030L	.045L
	L1	Oil Pump Drive Gear – End Clearance			.010L .035L	.060L
703	L-V	Oil Pump and Scavenge Pump Impellers – Dia. Clearance			.007L .011L	.014L
	L1	Oil Pump Impellers – Dia. Clearance			.007L .011L	.014L
704	L-V	Oil Pump and Scavenge Pump Impellers – Side Clearance			.003L .0055L	.006L
	L1	Oil Pump Impellers – Side Clearance			.003L .0055L	.006L
	ALL	Width of Oil Pump Impellers	.995 .997	.994		
	ALL	Width of Oil Scavenge Pump Impellers	1.496 1.498	1.495		
705	L-V	Oil Pump and Oil Scavenge Pump Driven Impeller and Idler Shaft			.001L .0025L	.004L
	L1	Oil Pump Driven Impeller and Idler Shaft			.0010L .0025L	.004L
706	ALL	Oil Pump Idler Shaft and Oil Pump Body			.0000 .0015T	(A)
	L1	Oil Pump Idler Shaft and Oil Pump Cover			.0000 .0015T	(A)
713	L-V	Oil Pump Idler Shaft and Scavenge Pump Body			.0000 .0015T	(A)
777	L-V	Oil Pump Drive Shaft Bushing and Scavenge Pump Body			.001T .003T	(A)
	L1	Oil Pump Drive Shaft Bushing and Oil Pump Body			.001T .003T	(A)
778	ALL	Oil Pump Drive Shaft Bushing and Oil Pump Body			.001T .003T	(A)
	L1	Oil Pump Drive Shaft Bushing and Oil Pump Cover			.001T .003T	(A)
779	L-V	Oil Pump Drive Bushing and Oil Scavenge Pump Gear			.0015L .0035L	.005L
	L1	Oil Pump Drive Gear and Oil Pump Cover			.0015L .0035L	.005L
780	ALL	Oil Pump Drive Shaft Bushing and Oil Pump Shaft			.0015L .0035L	.005L
7051	ALL	Oil Relief Valve Plunger and Sleeve			.001L .003L	.005L
7076	L1	Oil Pump Drive Gear Bushing and Accessory Housing			.002T .004T	(A)
7077	L1	Oil Pump Drive Gear and Accessory Housing Bushing			.0015L .0035L	.005L

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
FUEL PUMP						
782	L-V	Fuel Pump Drive Shaftgear Bushing and Accessory Housing			.001T .004T	(A)
783	L-V	Fuel Pump Drive Shaftgear – End Clearance			.006 .064	.074
784	L-V	Fuel Pump Drive Shaftgear and Bushing			.001L .004L	.006L
VACUUM PUMP						
793	L-V	Vacuum Pump Shaftgear Bushing and Accessory Housing Cover			.0015T .0035T	(A)
794	L-V	Vacuum Pump Shaftgear Bushing (At Cover) and Vacuum Pump Shaftgear			.002L .004L	.006L
795	L-V	Vacuum Pump Shaftgear Bushing and Accessory Housing			.0015T .0035T	(A)
	L1	Vacuum Pump Shaftgear Bushing and Accessory Housing			.0025T .0045T	(A)
796	ALL	Vacuum Pump Shaftgear Bushing (At Accessory Housing) and Vacuum Pump Shaftgear			.002L .0045L	.006L
797	L-V	Vacuum Pump Shaftgear – End Clearance			.008 .030	.050
799	L1	Vacuum Pump Drive Gear Bushing and Accessory Housing			.002T .004T	(A)
7000	L1	Vacuum Pump Drive Gear Bushing and Vacuum Pump Drive Gear			.0025L .0045L	.006L
7078	L1	Vacuum Pump Drive Gear and Cover			.0013L .0033L	.005L
7079	L1	Vacuum Pump Drive Gear – End Clearance			.010 .032	.037
TACHOMETER						
7002	L1	Tachometer Driven Gear and Adapter			.001L .003L	.0045L
7006	L-V	Electric Tachometer Driven Gear – End Clearance			.007 .025	.047
7012	L-V	Electric Tachometer Driven Gear and Accessory Housing Cover			.001L .003L	.004L
7088	L1	Tachometer Adapter and Accessory Housing			.0005L .0025L	.0035L
MAGNETO						
7025	L-V	Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub	Bushing Must Be Burnished In Place			
7026	L-V	Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Shaft			.001L .003L	.004L

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
MAGNETO (CONT.)						
7027	L-V	Magneto Drive Idler Gear Hub – End Clearance			.005 .014	.024
7028	L-V	Magneto Drive Shaft and Accessory Housing Cover			.002L .0045L	.006L
7029	L-V	Magneto Drive Shaft and Accessory Housing			.0025L .0045L	.006L
7030	ALL	Magneto Drive Shaft Sleeve and Magneto Drive Shaft			.001T .004T	(A)
7031	ALL	Magneto Drive Shaft Sleeve and Magneto Drive Coupling			.001T .004T	(A)
7032	L-V	Magneto Drive Shaftgear – End Clearance			.002 .020	.030
7039	L1	Magneto Drive Idler Gear – End Clearance			.002 .030	.040
7080	L1	Magneto Drive Idler Gear Bushing and Magneto Drive Idler Shaft			.001L .003L	.004L
7081	L1	Magneto Drive Idler Gear and Magneto Drive Idler Gear Bushing			.0005T .0025T	(A)
7082	L1	Magneto Drive Gear Bushing and Accessory Housing			.002T .004T	(A)
7083	L1	Magneto Drive Coupling and Accessory Housing Bushing			.001L .003L	.004L
7084	L1	Magneto Drive Gear and Accessory Housing Bushing			.001L .003L	.004L
GENERATOR						
7043	L-V	Generator Drive Gear Bushing and Accessory Housing Cover			.0015T .0035T	(A)
7044	L-V	Generator Drive Gear Bushing (At Cover) and Generator Drive Gear			.002L .004L	.006L
7045	L-V	Generator Drive Gear Bushing and Accessory Housing			.002T .004T	(A)
7046	L-V	Generator Drive Gear Bushing (At Accessory Housing) and Generator Drive Gear			.0025L .0045L	.006L
7047	L-V	Generator Drive Gear – End Clearance			.010 .038	.050
STARTER						
7048	L-V	Starter Drive Gear Bushing and Adapter			.002T .004T	(A)
	L1	Starter Drive Spacer Bushing and Adapter			.002T .004T	(A)
7049	L-V	Starter Drive Gear Bushings and Starter Drive Gear			.002L .004L	.006L
	L1	Starter Drive Spacer and Starter Drive Adapter Bushing			.0015L .003L	.004L

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

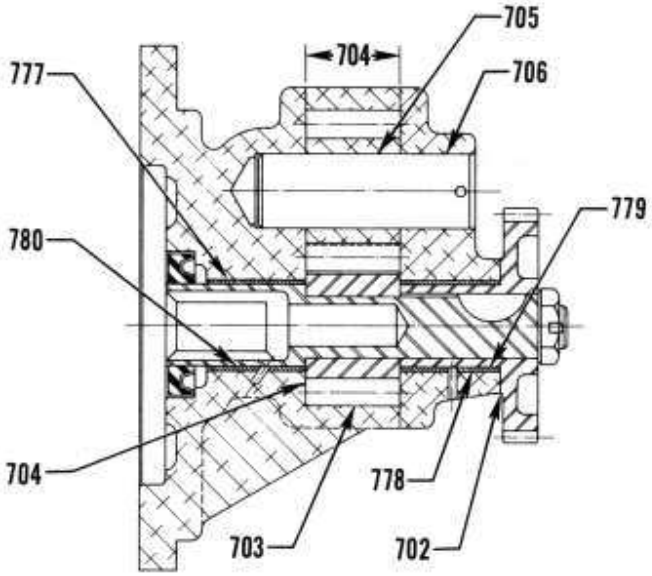
SECTION III – GEAR TRAIN

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
STARTER (CONT.)						
7050	L-V	Starter Drive Adapter and Accessory Housing Cover			.0005L .0025L	(A)
7089	L1	Starter Drive Gear – End Clearance			.007 .011	.015
7090	L1	Bendix Drive Shaft (Slip Coupling) and Accessory Housing Bushing			.0015L .0045L	.005L
ACCESSORY DRIVE						
7053	L-V	Accessory Idler Gear Bearing and Accessory Drive Gear			.0001L .0007T	(A)
7054	V	Accessory Drive Gear and Bushing			.001T .003T	(A)
7055	L-V	Accessory Idler Gear Bearing and Accessory Drive Shaft Adapter			.0005T .0005L	(A)
7056	V	Accessory Drive Gear Bushing and Accessory Drive Shaft			.0005L .0017L	.004L
7057	V	Accessory Drive Gear – End Clearance			.004 .012	.017
7086	L1	Accessory Drive Shaftgear Bushing and Accessory Housing			.002T .004T	(A)
7087	L1	Accessory Drive Shaftgear and Accessory Housing Bushing			.002L .004L	.006L
7091	L1	Dual Accessory Idler Gear and Idler Shaft			.001L .003L	.0045L
7092	L1	Dual Accessory Idler Gear – End Clearance			.009 .018	.023L
7093	L1	Dual Accessory Drive Gear – End Clearance			.005 .062	.077
7094	L1	Dual Accessory Drive Gear and Adapter			.0013L .0028L	.0034L

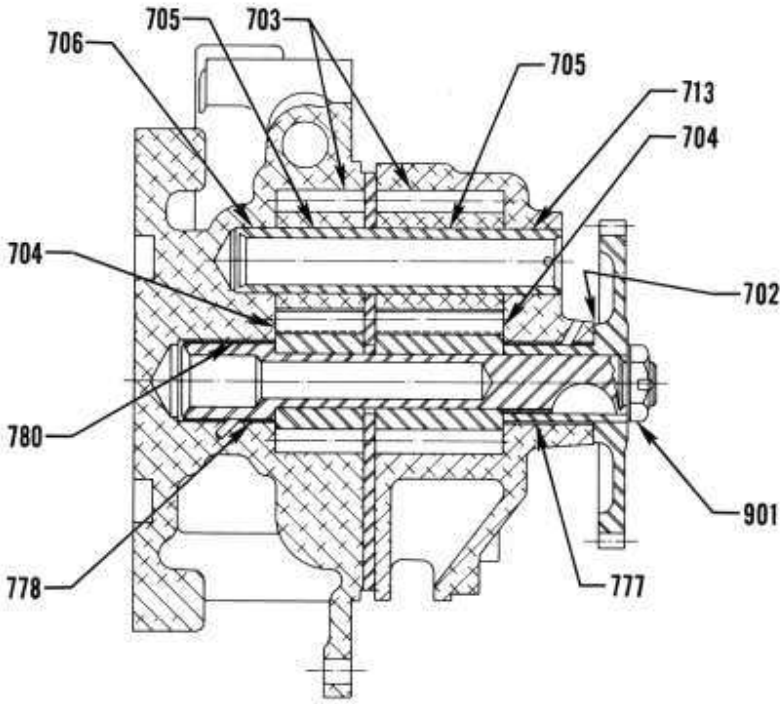
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO-435-B & TVO-435-F
OIL PUMP & HYD. PUMP DR.



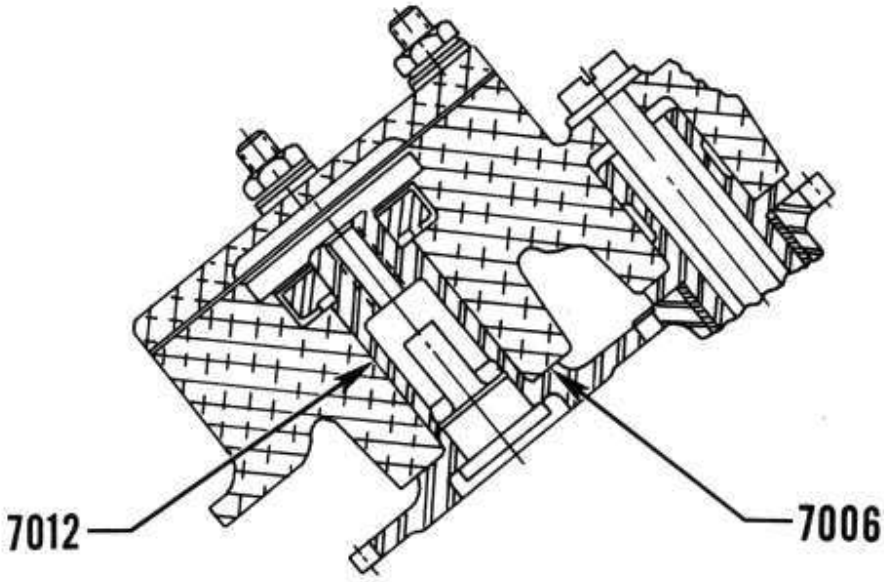
CROSSWISE ACC. HSG.

Oil Pumps

SERVICE TABLE OF LIMITS

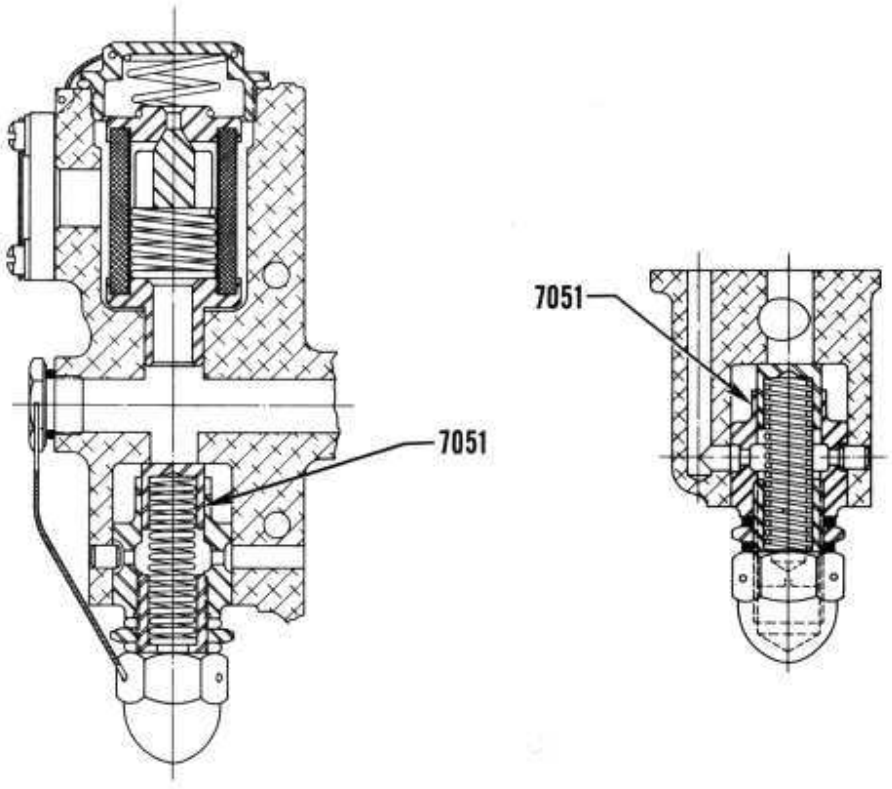
PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO, TVO-435-A & VO, TVO-540

Tachometer Drive

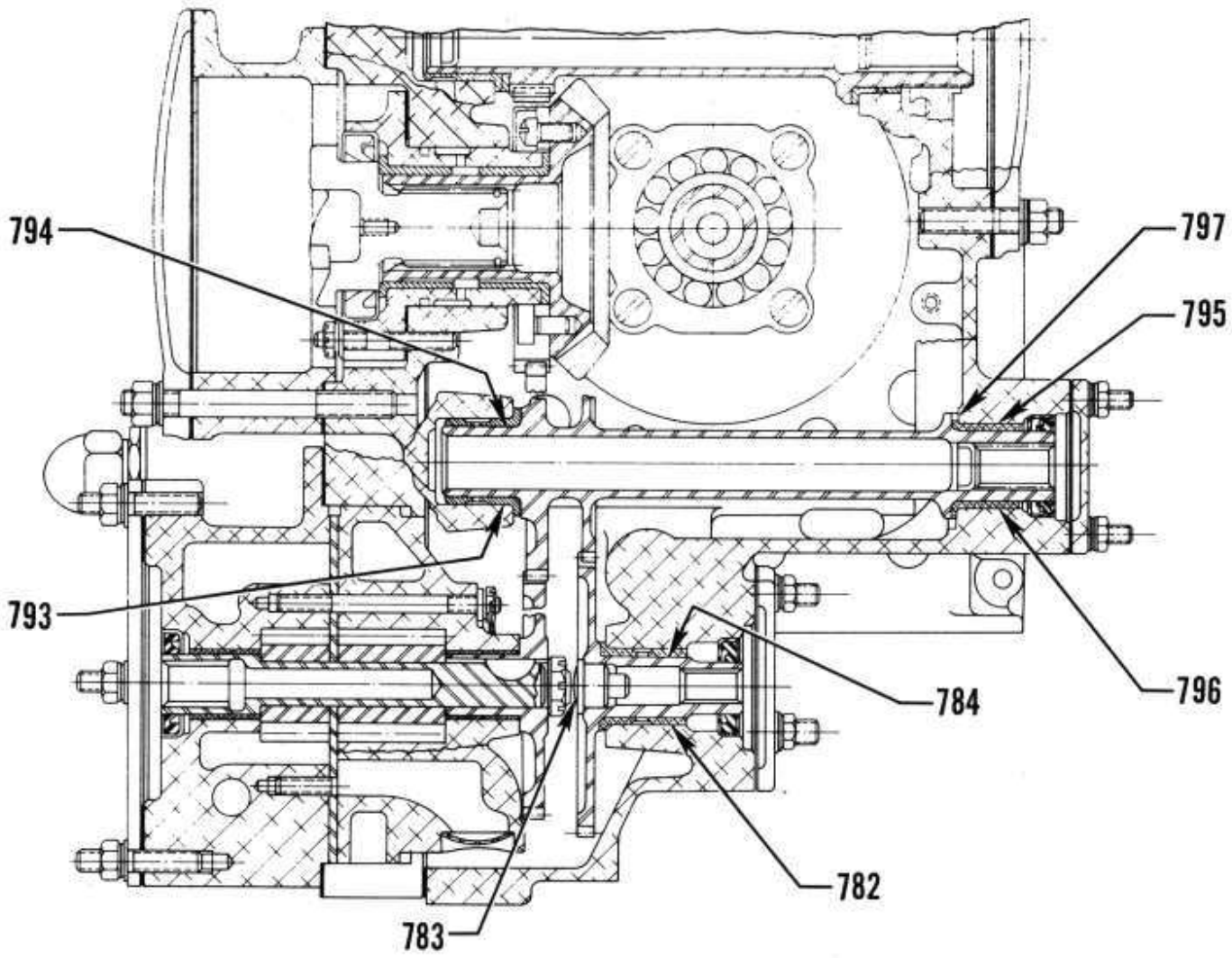


Oil Relief Valves

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN

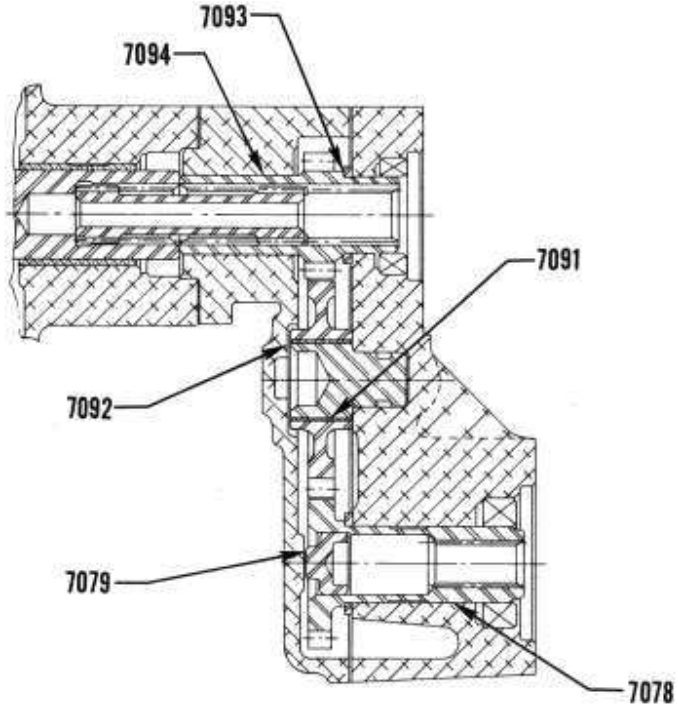


Vacuum and Fuel Pump Drives

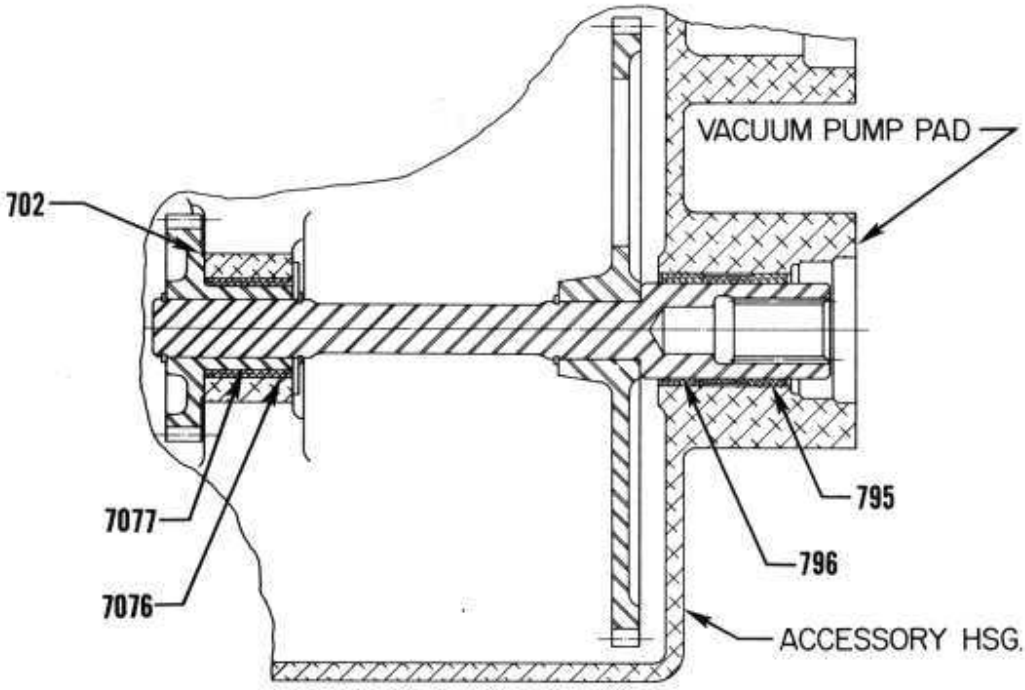
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



TVO-435-F
Vacuum Pump and Fuel Pump Dual Drive

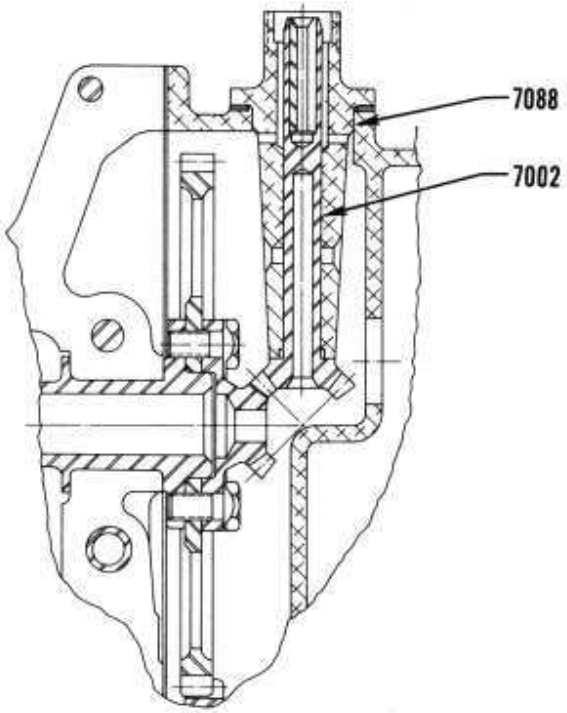


VO-435-BIA & TVO-435-F
Vacuum Pump Drive

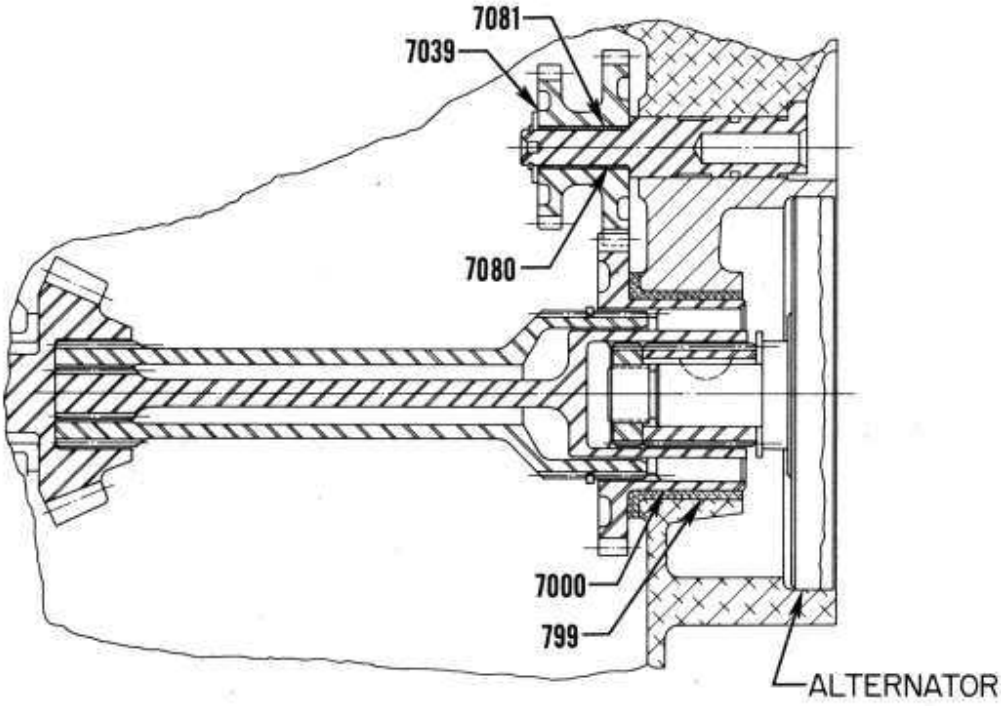
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO-435-B & TVO-435-F
Tachometer Drive

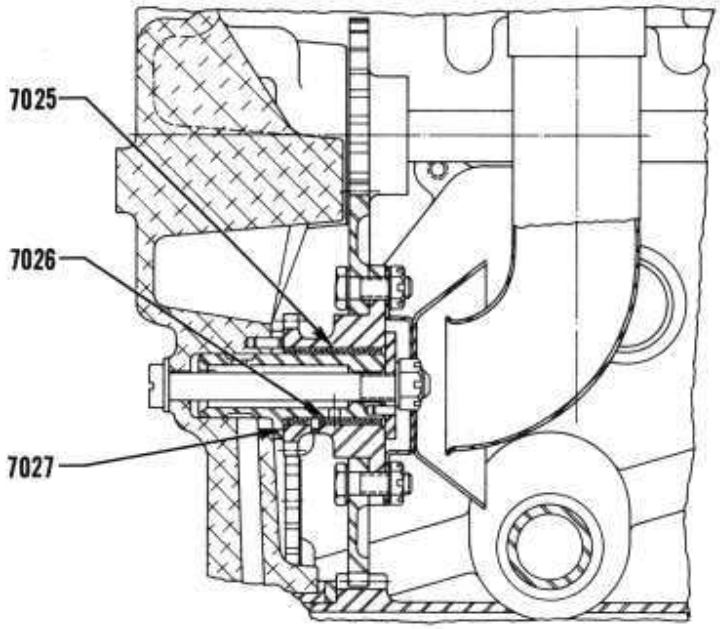


VO-435-B & TVO-435-F
Vacuum, Magneto and Alternator Drive

SERVICE TABLE OF LIMITS

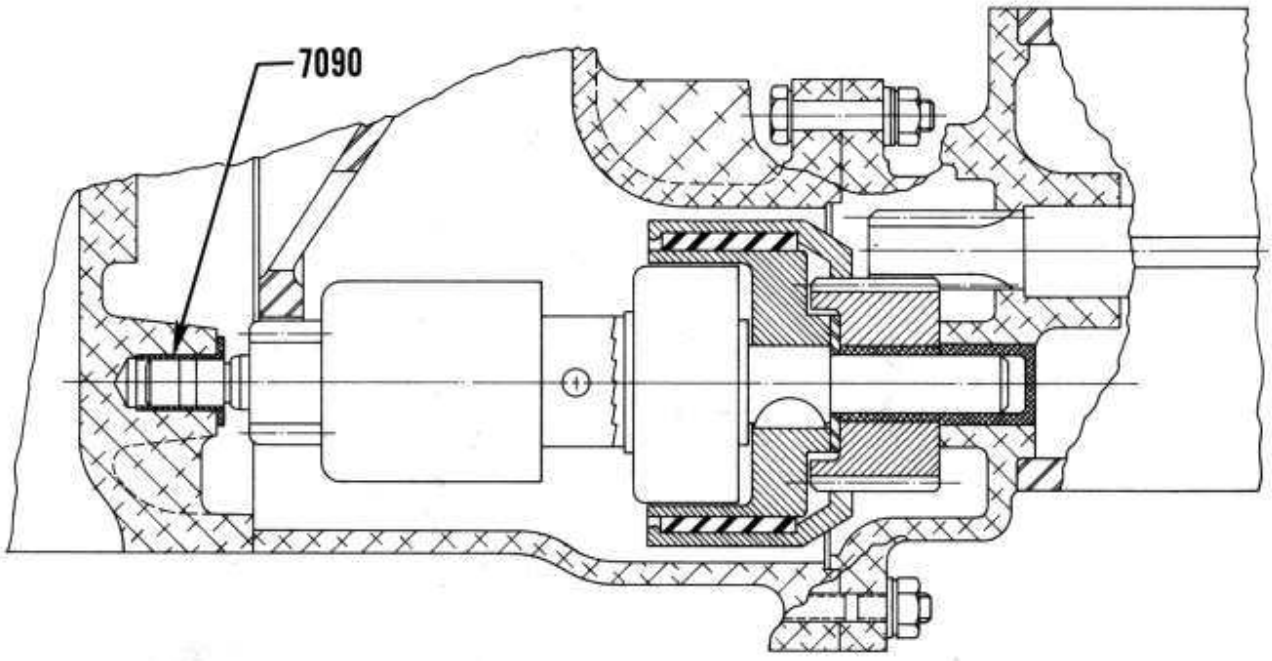
PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO, TVO-435-A & VO, TVO-540

Magneto and Tachometer Idler Gear



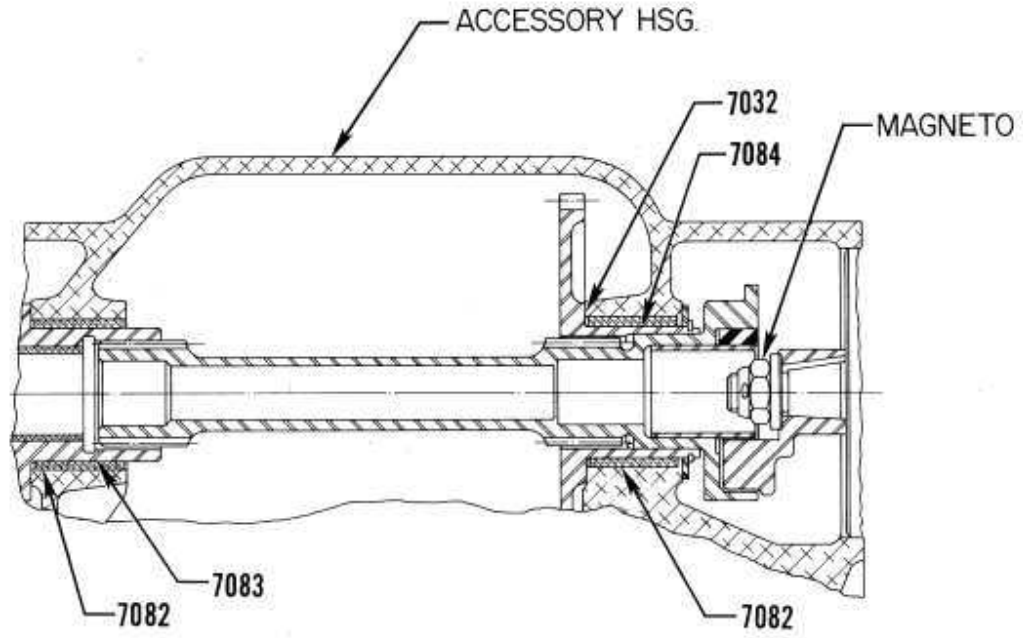
VO-435-B & TVO-435-F

Bendix Drive

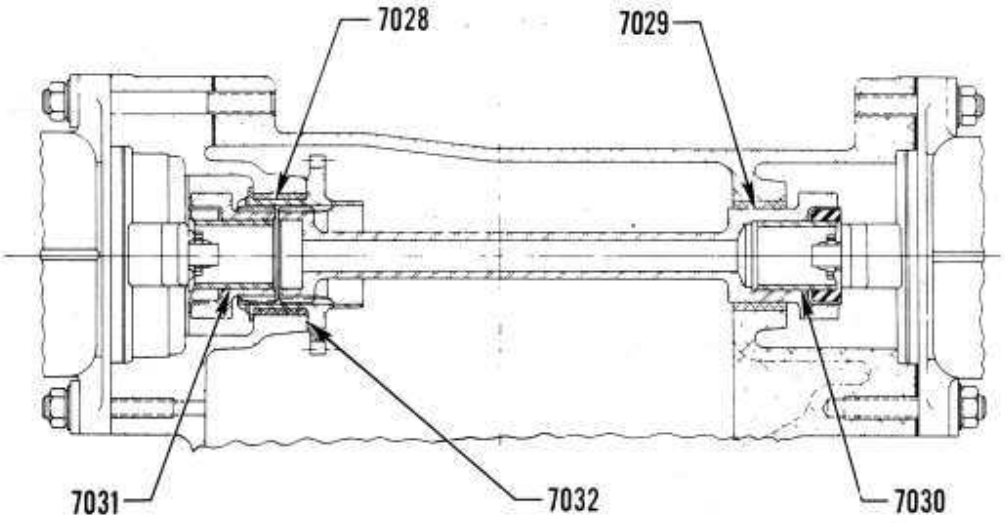
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO-435-BIA



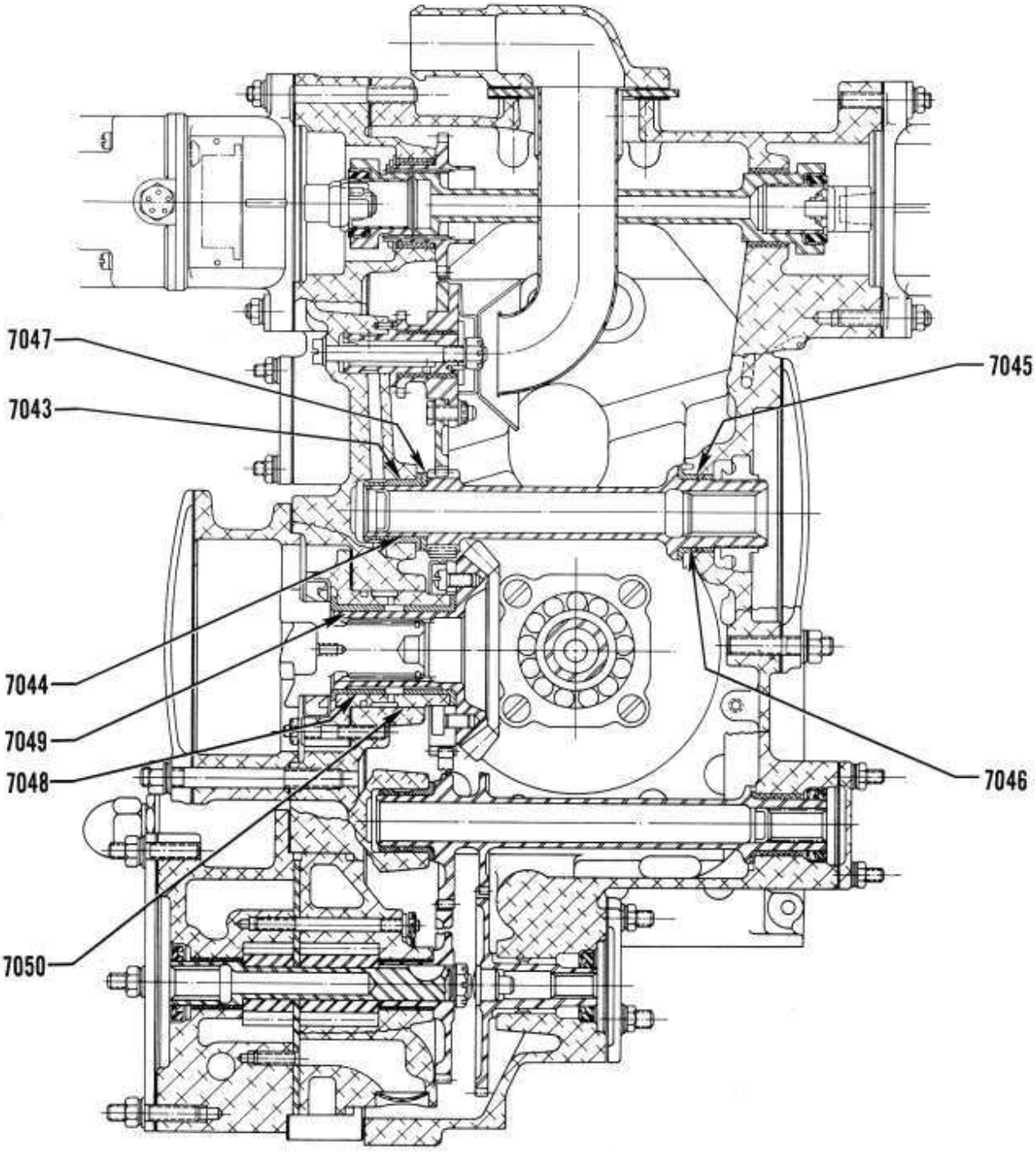
VO, TVO-435-A & VO, TVO-540

Magneto Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



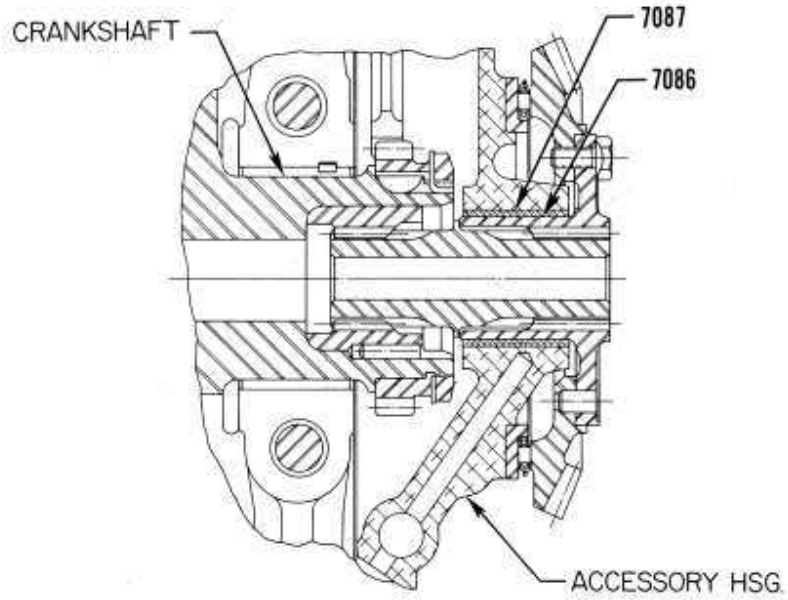
VO, TVO-435-A & VO, TVO-540

Generator and Starter Drives

SERVICE TABLE OF LIMITS

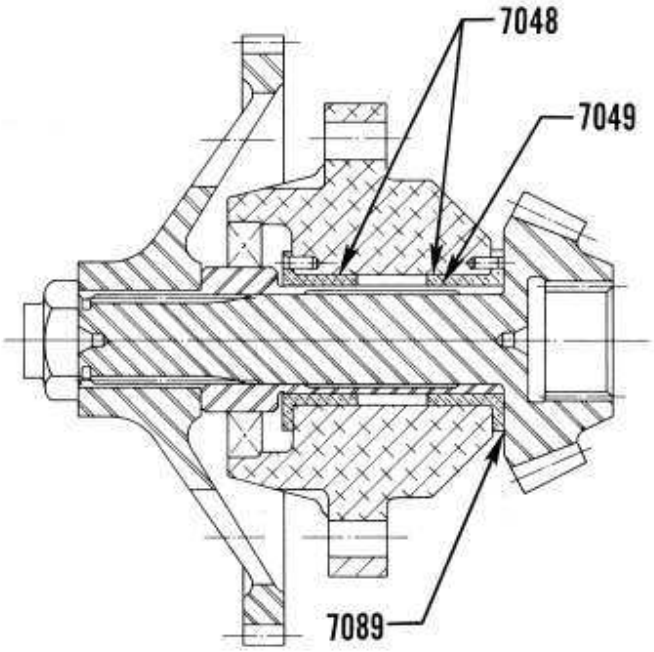
PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO-435-BIA

Accessory Drive Gear



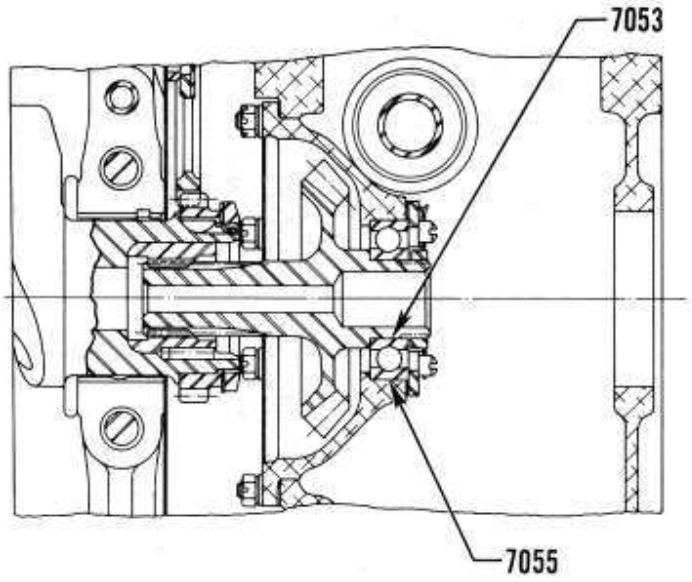
VO-435-BIA

Starter Drive

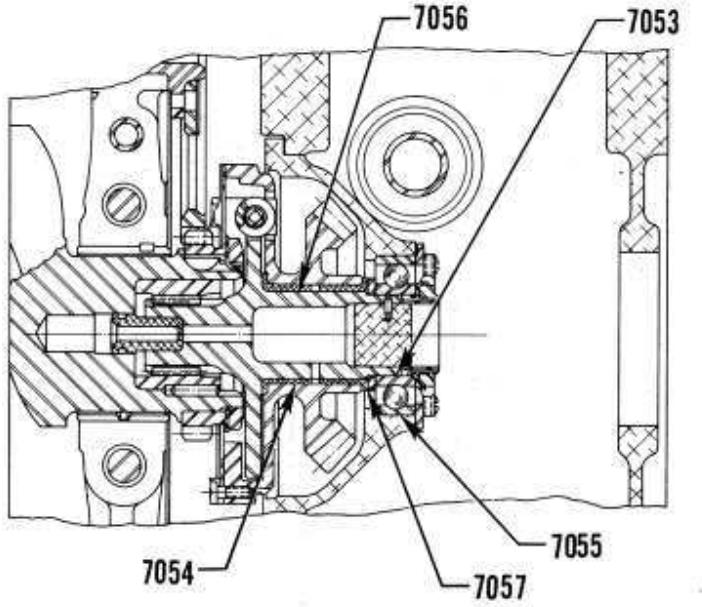
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION III – GEAR TRAIN



VO, TVO-435-A & VO, TVO-540



VO-540

Accessory Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
808	L1	Oil Pump Impellers			.005 .015	.020
	L-V	Oil Pump and Scavenge Pump Impellers			.008 .015	.020
825	ALL	Crankshaft Timing Gear and Camshaft Gear			.004 .015	.020
866	L-V	Electric Tachometer Drive Gear (Magneto Idler Hub) and Tachometer Driven Gear			.004 .015	.020
867	L-V	Generator Drive Gear and Magneto Drive Idler Gear			.004 .015	.020
868	L-V	Magneto Drive Shaft (Spline) and Magneto Drive Shaftgear (Spline)			.001 .005	.008
869	L-V	Magneto Drive Shaftgear (Spline) and Magneto Drive Coupling (Spline)			.001 .005	.008
	L1	Magneto Drive Shaft (Spline) and Magneto Drive Coupling (Spline)			.001 .0045	.0075
870	L-V1	Rear Crankshaft Spline Bushing and Accessory Gear (Spline)			.002 .0073	.018
	L1	Rear Crankshaft Spline Bushing and Accessory Drive Quill Shaft (Spline)			.004 .0073	.018
	V	Rear Crankshaft Spline Bushing and Accessory Drive Shaft (Spline)			.002 .0073	.018
871	L-V	Accessory Drive Gear and Starter Drive Gear			.004 .008	.015
	L1	Accessory Drive Gear and Starter Drive Gear			.002 .016	.022
	L1	Starter Drive Shaftgear and Starter Drive Gear (Spline)			.000 .002	.004
872	L-V	Accessory Drive Gear and Generator Drive Gear			.004 .015	.020
	L1	Alternator Drive Shaft (Spline) and Vacuum and Magneto Drive Shaft (Spline)			.001 .004	.006
	L1	Alternator Drive Shaft (Spline) and Alternator (Spline)			.001 .005	.007
873	L-V	Accessory Drive Gear and Vacuum Pump Shaftgear			.004 .015	.020
874	L-V	Vacuum Pump Shaftgear and Oil Pressure Scavenge Pump Gear			.004 .015	.020
884	L1	Magneto Drive Idler Gear and Magneto Driven Gear			.006 .014	.020
	L1	Magneto Drive Gear and Magneto Idler Drive Gear			.006 .014	.020

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

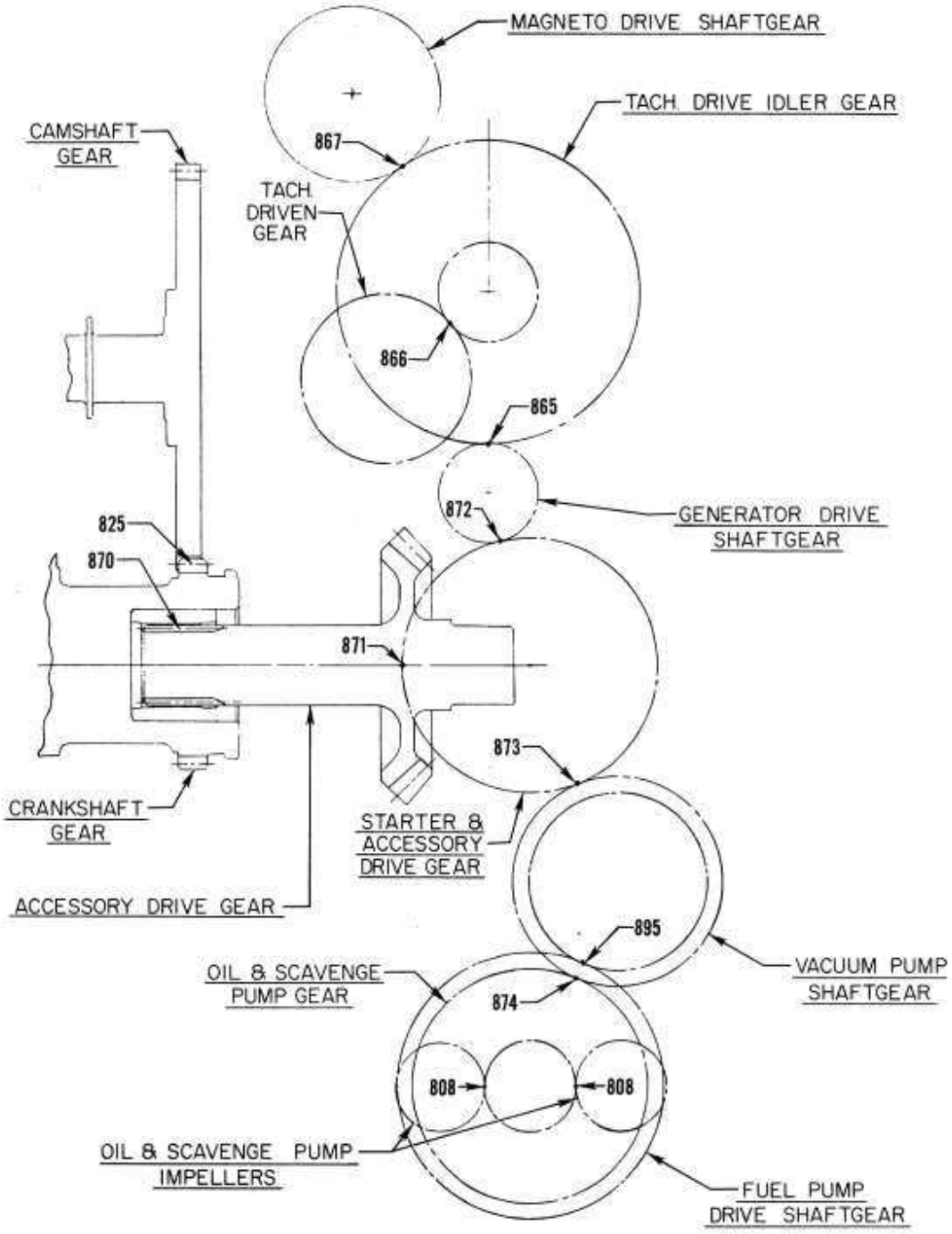
SECTION IV – BACKLASH

Ref.	Chart	Nomenclature	Dimensions		Clearances	
			Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
895	L-V	Vacuum Pump Shaftgear and Fuel Pump Drive Shaftgear			.004 .010	.015
896	L1	Oil Pump Drive Gear and Tachometer Drive Shaftgear			.006 .014	.020
897	L1	Tachometer Drive Gear and Tachometer Drive Shaftgear			.002 .006	.010
898	L1	Magneto Gear (Spline) and Magneto Drive Shaft (Spline)			.001 .0045	.0075
899	L1	Starter Drive Shaftgear (Spline) and Vacuum, Magneto Shaft (Spline)			.001 .004	.007
8001	L1	Accessory Drive Quill Shaft (Spline) and Accessory Drive Gear (Spline)			.004 .0073	.011
8002	L1	Vacuum Pump Drive Gear (Spline) and Shaft Vacuum Pump Magneto Drive (Spline)			.001 .004	.007
8003	L1	Vacuum, Oil Pump Drive Shaftgear and Vacuum Pump Drive Gear			.005 .015	.020
8004	L1	Dual Accessory Drive Gear and Idler			.004 .015	.020
8005	L1	Starter Drive Gear and Bendix Drive (Slip Coupling) Gear			.016 .026	.031
8006	L1	Dual Accessory Idler Gear and Vacuum Pump Drive Gear			.004 .015	.020

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



VO, TVO-435-A & VO, TVO-540

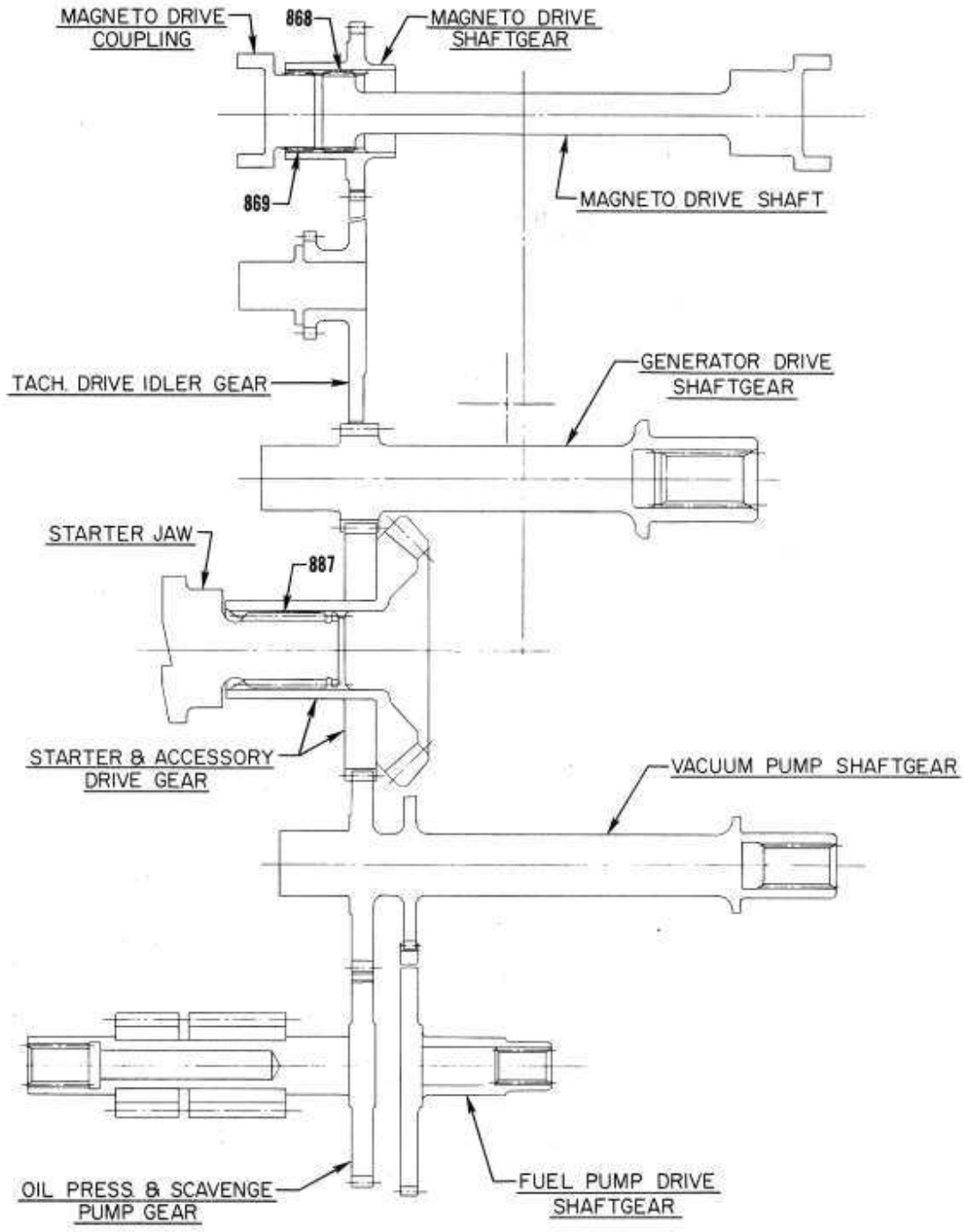
VIEWING LEFT SIDE OF ENGINE

Accessory Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



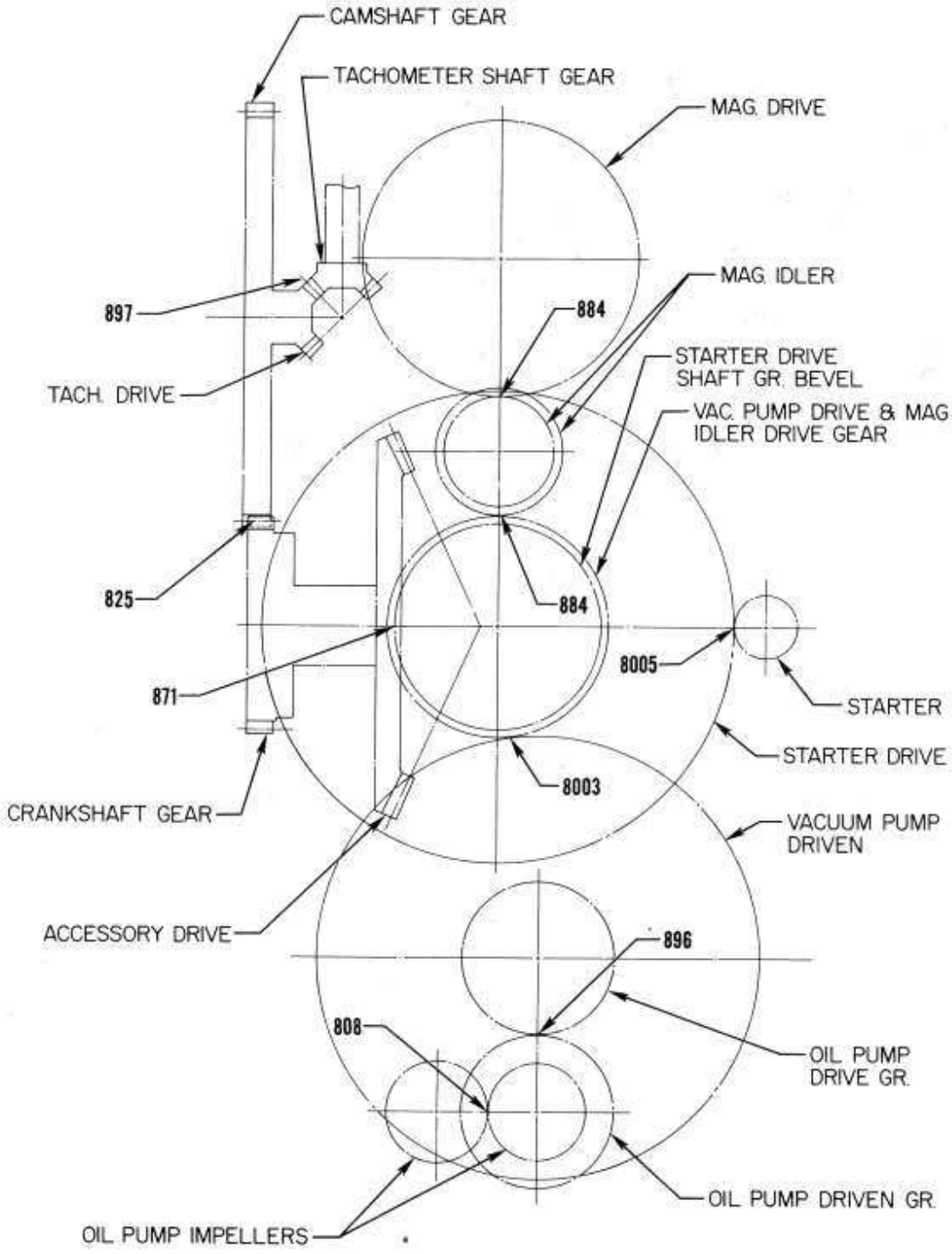
VO-TVO-435-A & VO, TVO-540
REAR OF ENGINE

Accessory Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



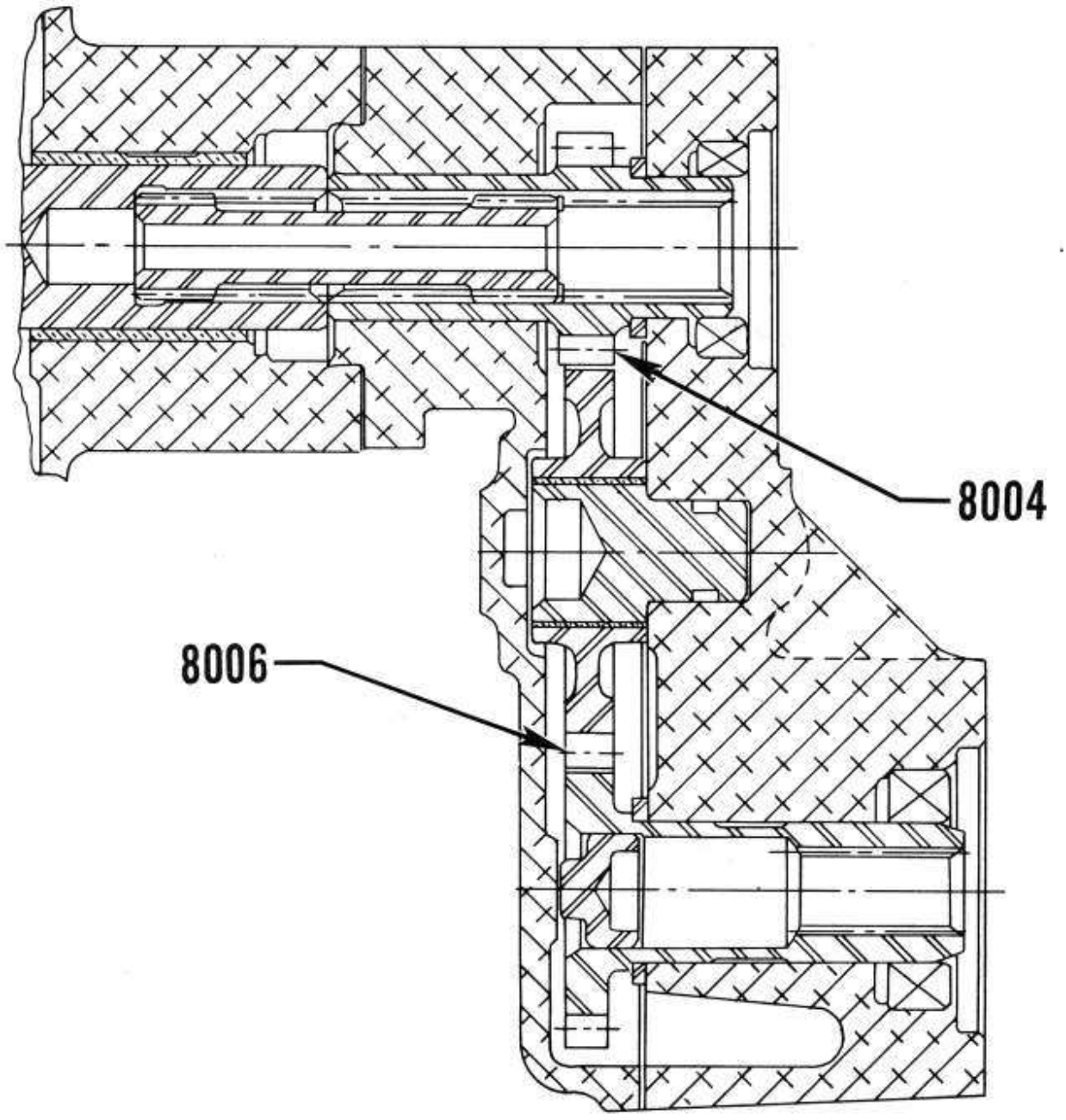
VO-435-BIA
LEFT SIDE OF ENGINE

Accessory Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH

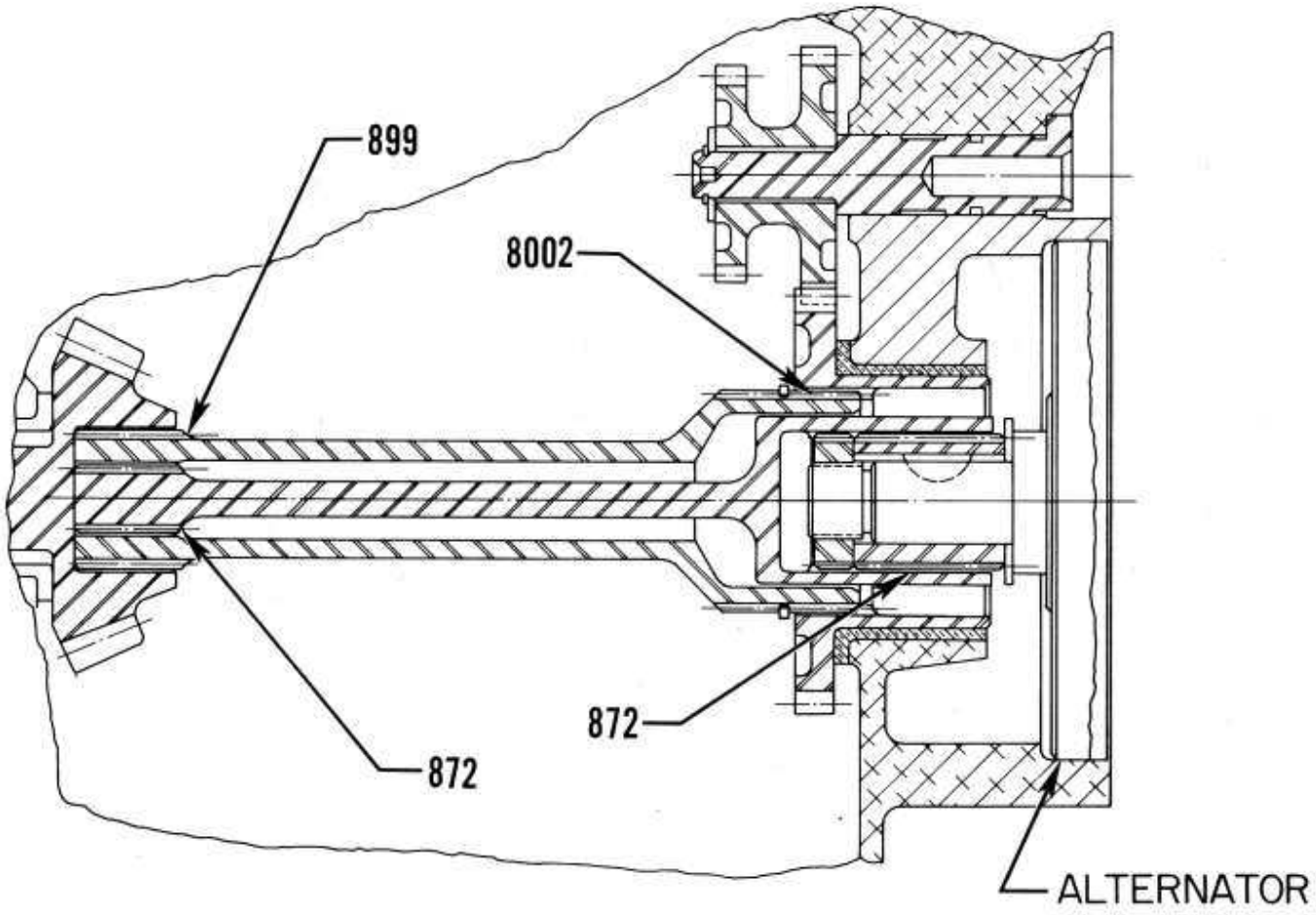


Vacuum Pump and Fuel Pump Dual Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



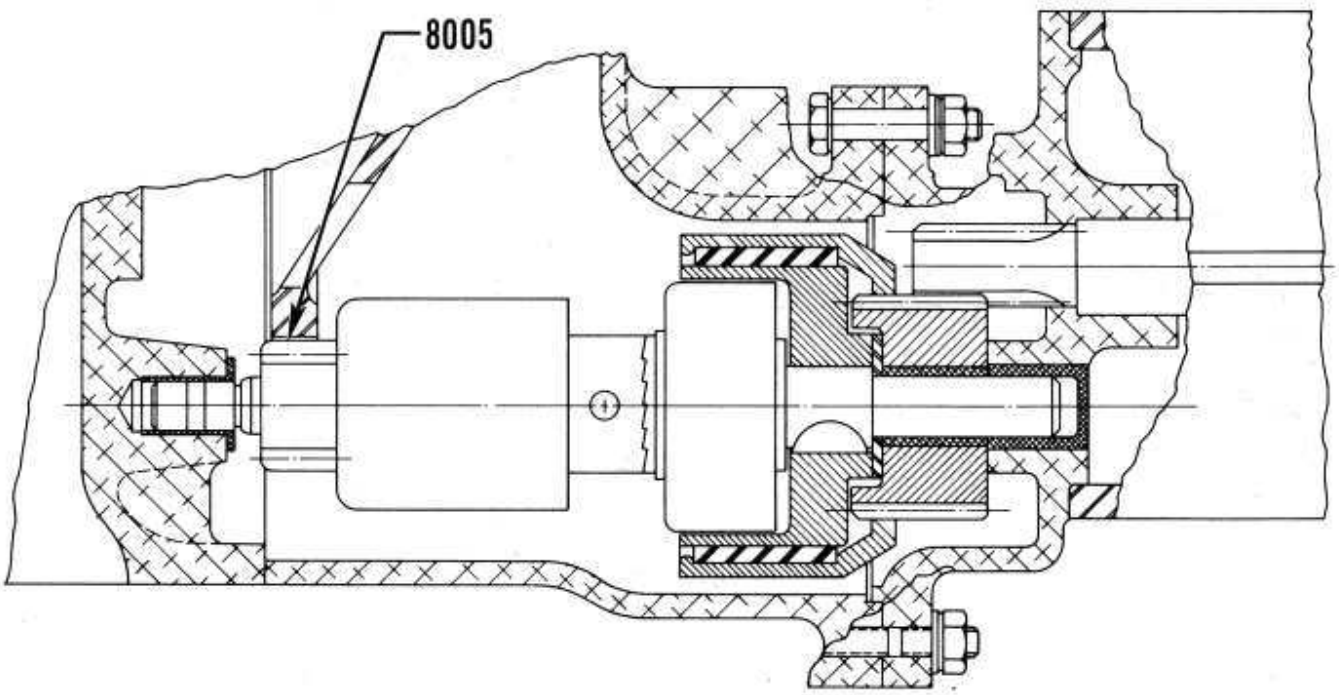
VO-435-B & TVO-435-F

Vacuum, Magneto and Alternator Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



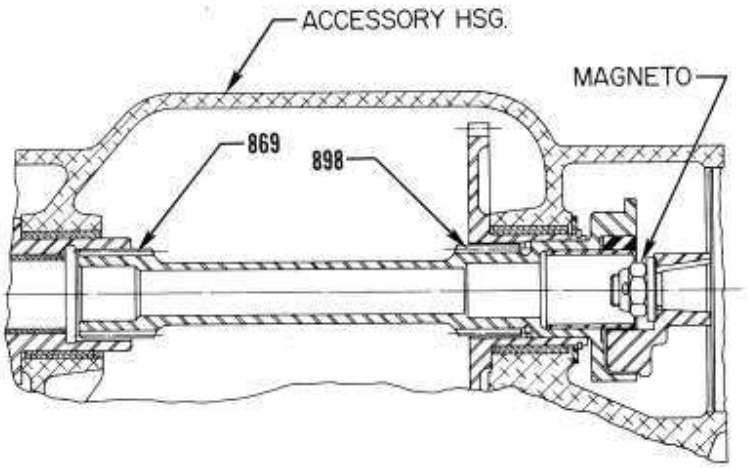
VO-435-B & TVO-435-F

Bendix Drive

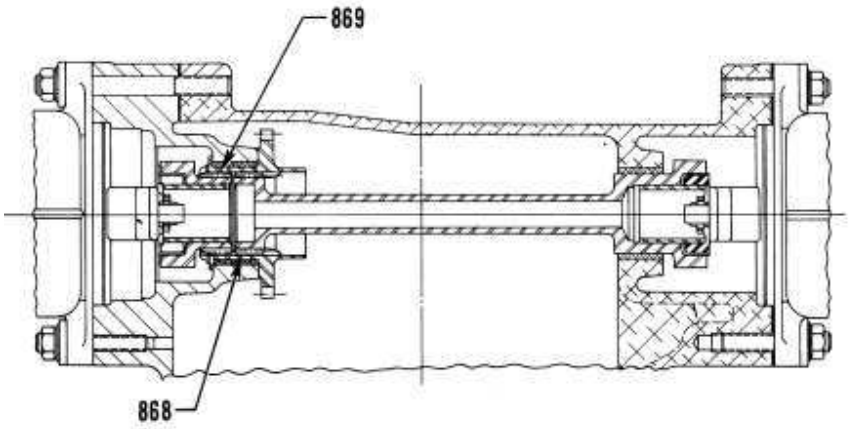
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



VO-435-BIA



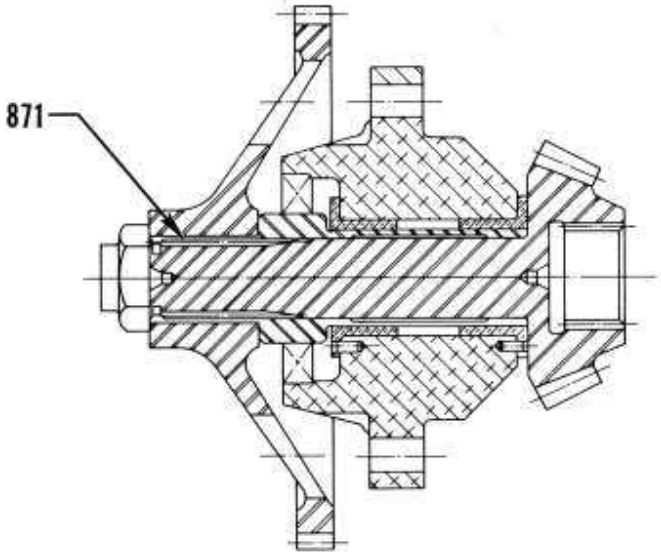
VO, TVO-435-A & VO, TVO-540

Magneto Drives

SERVICE TABLE OF LIMITS

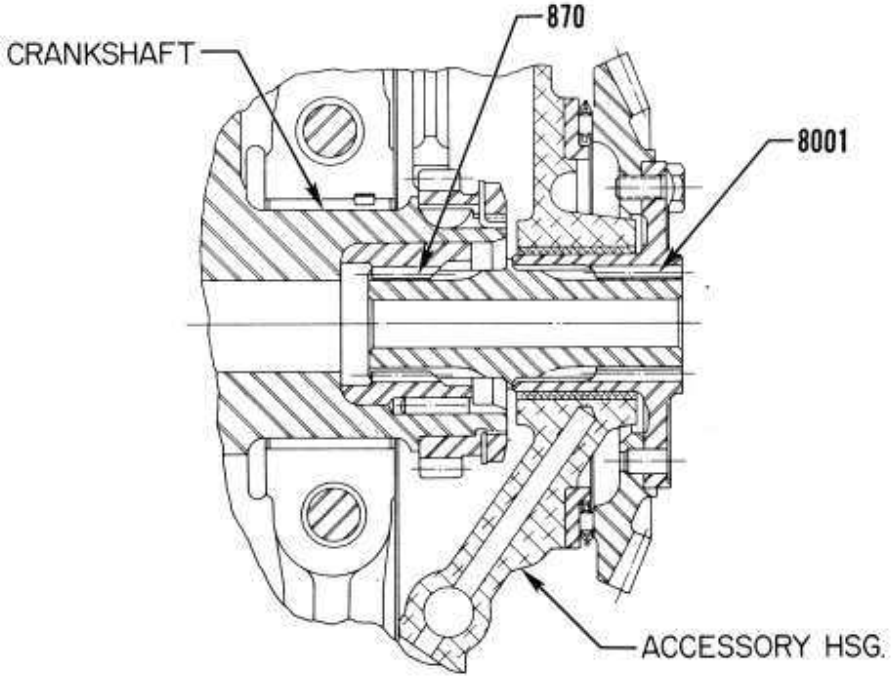
PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



VO-435-BIA

Starter Drives



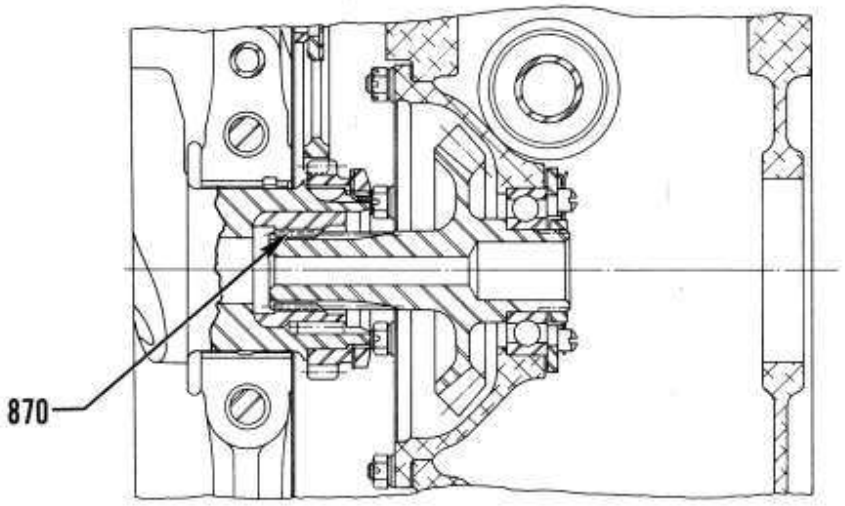
VO-435-BIA

Accessory Drive Gear

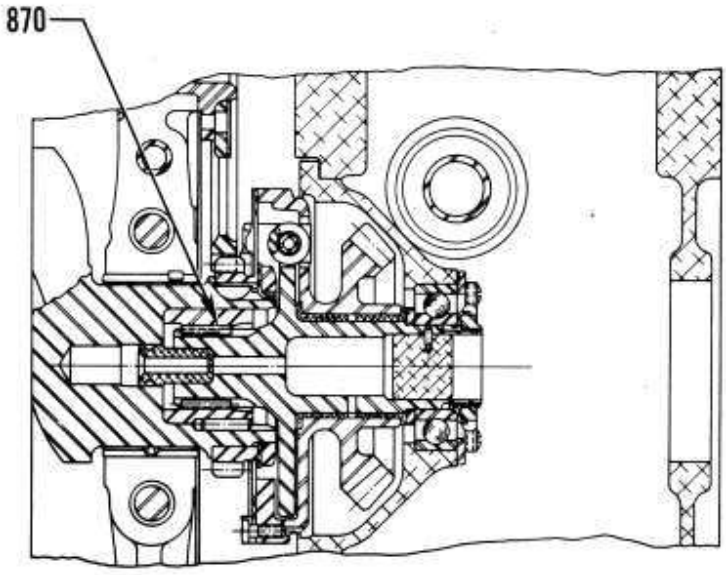
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION IV – BACKLASH



VO, TVO-435-A & TVO-540



VO-540

Accessory Drives

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	*Chart*	*Thread Size*	*Nomenclature*	Torque Limits
900	L	3/8-24	Connecting Rod Nuts	480 in. lbs.
	V	3/8-24	Connecting Rod Bolt and Nut – Tighten to This Length	2.255-2.256
901	ALL	1/2-20	Oil Pump Shaft Nut	360-480 in. lbs.
903	ALL	3/8-24	Magneto Nut (To attach drive member to magneto) – Steel Bushing	300 in. lbs.
904	ALL	10-32	Screw Plate Nuts (To attach ignition cable outlet plate to magneto)	15 in. lbs.
905	ALL (using a silicone gasket)	1/4-20	Rocker Box Screws	35 in.-lbs.
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 in.-lbs.
906	ALL	5/16-18	Exhaust Port Studs (Driving Torque)	40 in. lbs. min.
	ALL	5/16-18	Nuts to Attach Exhaust Stacks to Cylinder Head	160-180 in. lbs.
907	ALL	18MM	Spark Plugs	420 in. lbs.
909	L-V	5/8-32	Alternator Pulley Nut	450 in. lbs.
	L1	5/8-32	Alternator Nut (Quill Shaft)	474 in. lbs.
910	L1	1/4-28	Alternator Output Terminal Nut	85 in. lbs.
911	L1	10-32	Alternator Auxiliary Terminal Nut	30 in. lbs.
913	L1-L2-V	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 in. lbs.
914	V-V1	1/8-27 NPT	Injector Nozzle in Cylinder Head	60 in. lbs.
919	ALL	1/4 Hex Head and Below	Hose Clamps (Worm Type)	20 in. lbs.
	ALL	5/16 Hex Head and Above	Hose Clamps (Worm Type)	45 in. lbs.
919-1	ALL		"T" Bolt Hose Clamps Initial Torque . . . . . . Retorque After Run-In	 35 in. lbs. 25 in. lbs.
920	ALL		Cylinder Head Drain Back Hose Clamp	10 in. lbs.
921	L2-V1		Exhaust Clamp – Coupling – V-Band (See latest revision of Service Instruction No. 1238)	
928	ALL	3/8-16	Cylinder Hold Down Studs (Crankcase Driving Torque)	100 in. lbs.
	ALL	1/2-13	Cylinder Hold Down Studs (Crankcase Driving Torque)	250 in. lbs.
929	ALL	3/8-16	Cylinder Hold Down Nuts	300 in. lbs.
	ALL	1/2-13	Cylinder Hold Down Nuts	600 in. lbs.
930	ALL	5/16-32	Brass union nut on stainless steel injector/primer fuel line (Both Ends)	25-50 in.-lbs.*
* It is also permissible to tighten the fuel line union nut finger tight, then continue tightening the nut with a wrench an additional 30 to 60 degrees (1/2 to 1 flat of the nut.) Torque in excess of 50 in.-lbs. can result in damage to the parts.				
	Cylinder Hold Down and Crankcase Parting Flange Nuts' Tightening Procedures – See latest revision of Service Instruction No. 1029.			
933	L-V		Accessory Drive Shaft Nut	75-125 ft. lbs.
934	ALL		Crankshaft Gear Retaining Nut	150 ft. lbs.

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	*Chart*	*Thread Size*	*Nomenclature*	*Torque Limits*
938	ALL	1/4-28	Thin Slotted Nut (38 in. lbs. plus torque required to reach next locking slot)	38 in. lbs.
942	ALL	1/8-27 NPT	Carburetor Drain Plug	50-60 in. lbs.
943	V	10-32	Screws (To attach necessary drive coupling plate)	25-30 in. lbs.
944	V		Carburetor Throttle Lever Screw	20-28 in. lbs.
945	L1		Accessory Drive Shaft and Accessory Drive Gear Attaching Screw	100-120 in. lbs.

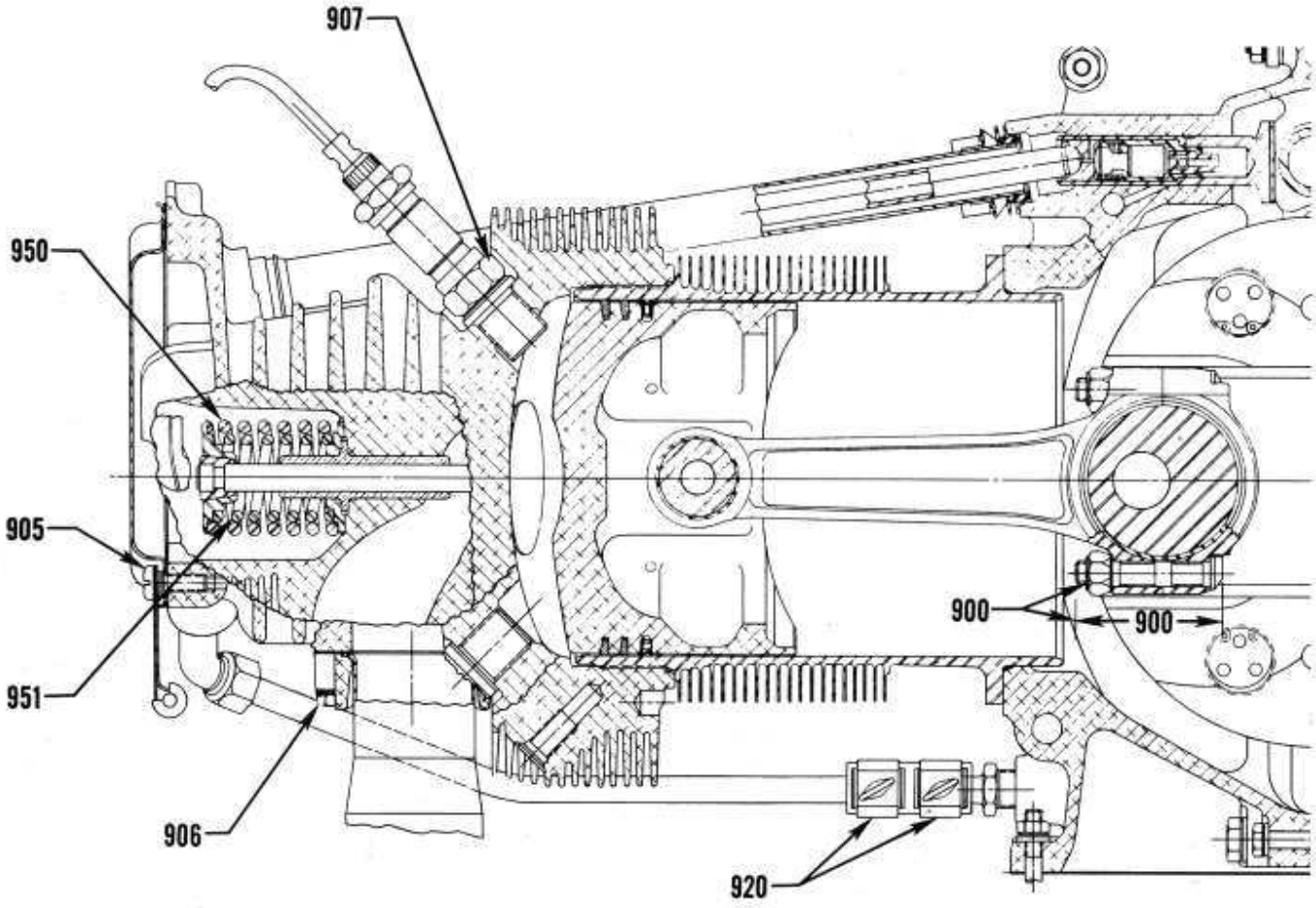
SECTION V – SPRINGS

Ref.	Chart	Nomenclature	**Lyc. Part No.**	Wire **Dia.**	**Length at Comp. Length**	**COMP. LOAD**		
						Mfr. Min.	**Mfr. Max.**	Service **Max.**
950	ALL	Outer Valve Springs (Angle)	68326	.177	1.46 in.	103 lb.	111 lb.	100 lb. min.
	ALL	Outer Valve Springs (Angle)	LW-11796	.182	1.43 in.	114 lb.	124 lb.	111 lb. min.
951	ALL	Auxiliary Valve Springs (Angle)	68328 LW-11797	.142	1.33 in.	75 lb. 73 lb.	83 lb.	70 lb. min.
952	L-V	Check Valve Springs						
		Lycoming Part Numbers	Free Length					
		654-B	--------	.031	1.03 in.	.74 lb.	.94 lb.	.69 lb. min.
		73761	2.065	.041	1.03 in.	3.15 lb.	3.35 lb.	3.10 lb. min.
953		Oil Pressure Relief Valve Spring						
		Lycoming Part Numbers	Identification: Dye	Identification: Free Length				
	L-V	68542	None	2.38	.067	1.66 in.	15 lb.	17 lb.	14 lb. min.
	L-V	LW-14029	White	2.28	.072	1.66 in.	20 lb.	22 lb.	17 lb. min.
954		Accessory Drive Coupling Spring						
		Lycoming Part Numbers	Free Length					
	V – AS APPLICABLE	74616	1.25	.092	1.10 in.	23 lb.	26 lb.	20 lb.

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION V – SPECIAL TORQUE AND SPRINGS

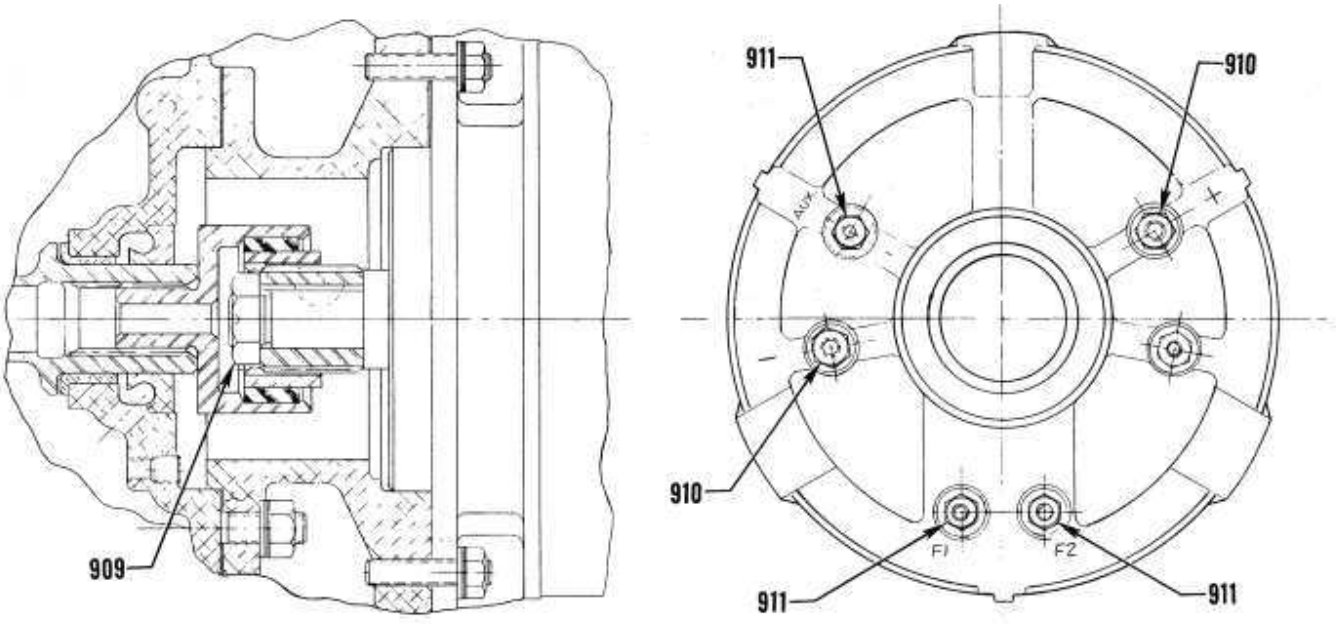


Engine Accessories and Hardware

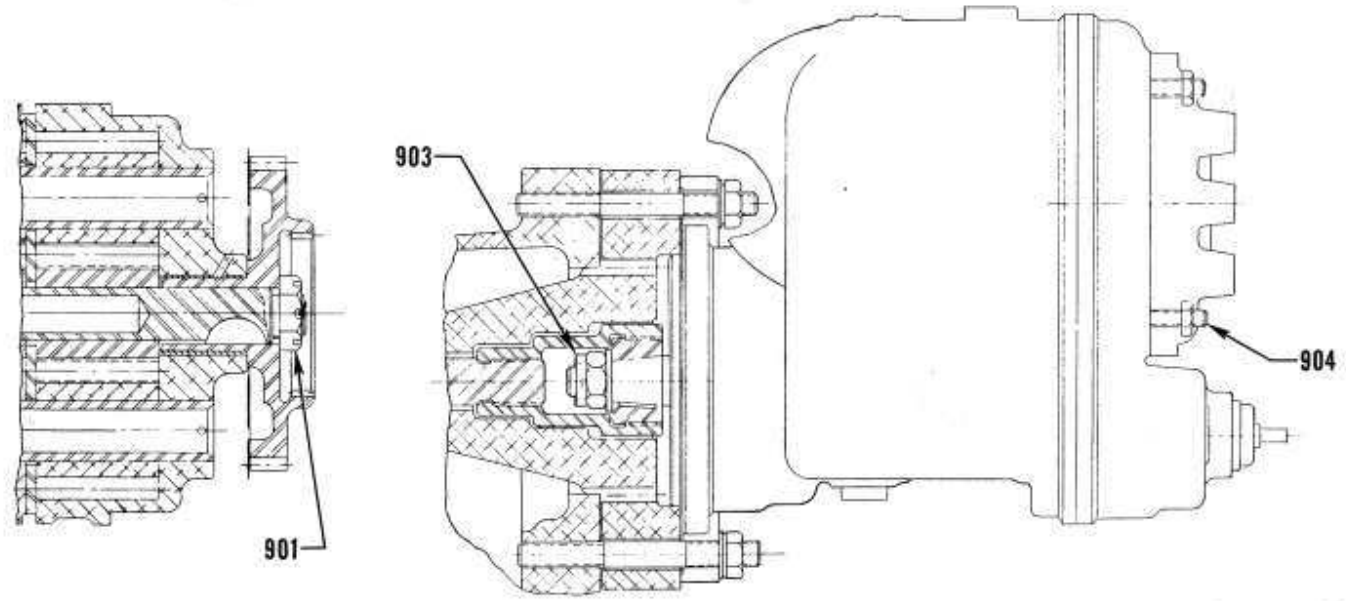
SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION V – SPECIAL TORQUE AND SPRINGS



ALTERNATOR & ALTERNATOR DRIVE



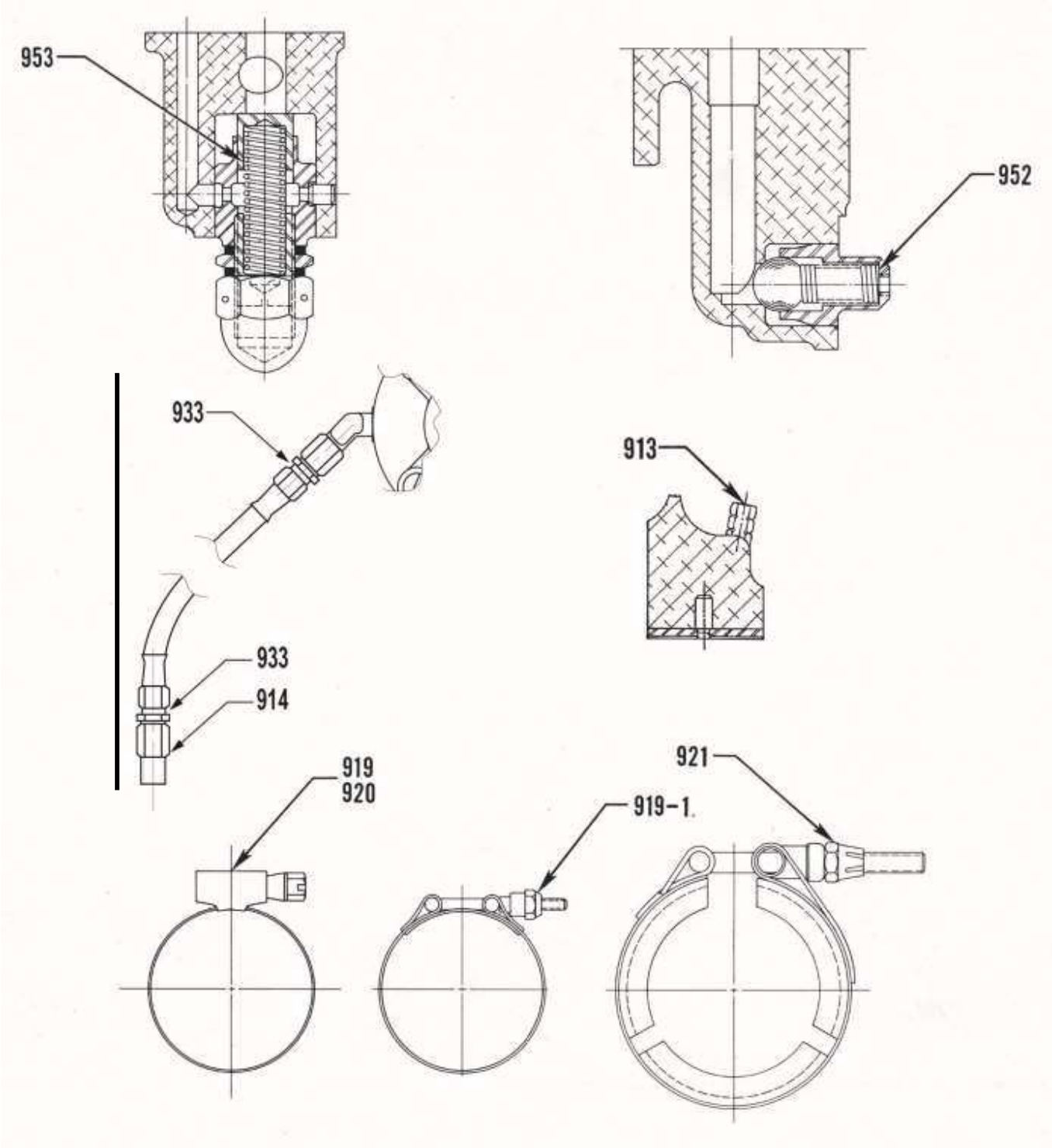
OIL PUMP

MAGNETO

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

SECTION V – SPECIAL TORQUE AND SPRINGS



Engine Accessories and Hardware

SERVICE TABLE OF LIMITS

PART IV – VERTICAL ENGINES

STANDARD TORQUE

UNLESS OTHERWISE LISTED

Torque limits for propeller attaching bolts to be supplied by propeller aircraft manufacturer.

NOTE: Refer to Table VIII for torque value conversions (In. Lb. or Ft. Lb. to Nm).

TABLE I

BOLTS, SCREW AND NUTS

Thread	Torque		Thread	Torque	
	In. Lb.	Ft. Lb.		In. Lb.	Ft. Lb.
8	20 to 22	-----	7/16	600 to 660	50 to 55
10	49 to 54	-----	1/2	900 to 984	75 to 82
1/4	96 to 106	-----	9/16	1320 to 1452	110 to 121
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297
THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE					

TABLE II

PIPE PLUGS

Thread	Torque
	In. Lbs.
1/16-27 NPT	40 to 44
1/8-27 NPT	40 to 44
1/4-18 NPT	85 to 94
3/8-18 NPT	110 to 121
1/2-14 NPT	160 to 176
3/4-14 NPT	230 to 252
1-11-1/2 NPT	315 to 347

TABLE III

CRUSH TYPE GASKETS

Thread Pitch on Part to be Tightened	ANGLE OF TURN	
Threads Per Inch	Aluminum	Copper
8	135°	67°
10	135°	67°
12	180°	90°
14	180°	90°
16	270°	135°
18	270°	135°
20	270°	135°
24	360°	180°
28	360°	180°

NOTE: Install all crush type gaskets except the self centering type, with the unbroken surface against the flange of the plug or part being tightened against the seal. Turn the part until the sealing surfaces are in contact and then tighten to the angle of turn listed for the appropriate thread size.
NOTE: Lubricate Threads Unless Otherwise Specified.

TABLE IV

FLEXIBLE TUBE CONNECTIONS
(SEALASTIC OR EQUIVALENT FITTINGS)

Tube Size	Thread	Torque In. Lbs.	
		Aluminum Alloy	Steel
(-3) 3/16	3/8 - 24	30 to 50	70 to 80
(-4) 1/4	7/16 - 20	40 to 65	90 to 100
(-5) 5/16	1/2 - 20	60 to 80	135 to 150
(-6) 3/8	9/16-18	75 to 125	270 to 300
(-8) 1/2	3/4-16	150 to 250	450 to 500
(-10) 5/8	7/8 - 14	200 to 350	650 to 700

TABLE V

STUDS MIN. DRIVING TORQUE

Threads	Torque In. Lbs.
1/4-20	15
5/16-18	25
3/8-16	50

TABLE VI

JAM NUT OR STRAIGHT THREAD O-RING BOSS

Tube Size	Thread	Torque Ft. Lbs.
-03	3/8 – 24	8 – 9
-04	7/16 – 20	13 – 15
-05	1/2 – 20	14 – 15
-06	9/16 – 18	23 – 24
-08	3/4 – 16	40 – 43
-10	7/8 – 14	43 – 48
-12	1-1/16 – 12	68 – 75
-14	1-3/16 – 12	83 – 90
-16	1-5/16 – 12	112 – 123
-20	1-5/8 – 12	146 – 161
-24	1-7/8 – 12	154 – 170
-32	2-1/2 – 12	218 – 240

SERVICE TABLE OF LIMITS
PART IV – VERTICAL ENGINES

STANDARD TORQUE (CONT.)
UNLESS OTHERWISE LISTED

TABLE VII

METAL TUBE FITTINGS

Dash Nos. Ref.	Tubing OD inches	Wrench torque for tightening AN-818 Nut (pound inches)						Minimum bend radii measured to tubing centerline. Dimension in inches	
		Aluminum-alloy tubing		Steel tubing		Aluminum-alloy tubing (Flare MS33583) for use on oxygen lines only			
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Alum. Alloy	Steel
-2	1/8	20	30	75	85	--	--	3/8	--
-3	3/16	25	35	95	105	--	--	7/16	21/32
-4	1/4	50	65	135	150	--	--	9/16	7/8
-5	5/16	70	90	170	200	100	125	3/4	1-1/8
-6	3/8	110	130	270	300	200	250	15/16	1-5/16
-8	1/2	230	260	450	500	300	400	1-1/4	1-3/4
-10	5/8	330	360	650	700	--	--	1-1/2	2-3/16
-12	3/4	460	500	900	1000	--	--	1-3/4	2-5/8
-16	1	500	700	1200	1400	--	--	3	3-1/2
-20	1-1/4	800	900	1520	1680	--	--	3-3/4	4-3/8
-24	1-1/2	800	900	1900	2100	--	--	5	5-1/4
-28	1-3/4	--	--	--	--	--	--	--	--
-32	2	1800	2000	2660	2940	--	--	8	7

TABLE VIII

TORQUE CONVERSIONS

In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm	In. Lb.	Ft. Lb.	Nm
5	0.42	0.56	100	8.33	11.30	1000	83.33	113.00
10	0.83	1.13	200	16.67	22.60	2000	166.70	226.00
20	1.67	2.26	300	25.00	53.90	3000	250.00	339.00
30	2.50	3.39	400	33.33	45.19	4000	333.30	451.90
40	3.33	4.52	500	41.67	56.49	5000	416.70	564.90
50	4.17	5.65	600	50.00	67.79	6000	500.00	677.90