

# 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 IDIRECT DRIVE ENGINES (Including VO and IVO-360)PART IIINTEGRAL ACCESSORY DRIVE ENGINESPART IIIGEARED ENGINESPART IVVERTICAL 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. (1 <sup>st</sup> 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 (2 <sup>nd</sup> 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 (3 <sup>rd</sup> 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 (4 <sup>th</sup> and 5 <sup>th</sup> 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 (6 <sup>th</sup> and 7 <sup>th</sup> columns)	Like the dimensions shown in the 4 <sup>th</sup> and 5 <sup>th</sup> 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
А	О-235-С, -Е, -Н	S7	HIO-360-D
A1	O-235-F, -G, -J,-K, -L, -M, -N, -P	S8	НІО-360-В
В	O-290	S9	НЮ-360-С
B1	O-290-D2	S10	HIO-360-A (S/N with suffix A)
BD	O-320-H (76 Series)	S11	НЮ-390-А
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	НІО-360-Е
BE	O, LO-360-E (76 Series)	D	O-435-A
Y	VO, IVO-360	Т	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
<b>S</b> 1	TO-360	T2	(Large Mains – Parallel Valve)
S2	AIO-360		IO-540-A, -B, -E, -G, -P (Angle Valve)
<b>S</b> 3	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	ТІО-540-С, -Е, -G, -Н
	(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.

ERIES ERIES ERIES ERIES ERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT CYLINDERS GEAR TRAIN BACKLASH (GEAR TRAIN) TORQUE AND SPRINGS
	shrink fits controlled by machining, fits that may readily be wear does not normally occur. In each case, the fit must be held rance.
Side clearance on pist	on rings must be measured with face of ring flush with piston.
The dimensions shown the piston pin.	n are measured at the bottom of the piston skirt at right angles to
Permissible wear of th on the diameter.	e crankshaft (rod and main bearing journals) to be minus 0.0015
Loose fit; wherein a d	efinite clearance is mentioned between the mating surfaces.
Tight fit; shrink or int	erference fit.
Wide Deck Crankcase	2.
	ERIES ERIES ERIES ERIES These fits are either adjusted, or fits where to manufacturing toler Side clearance on pist The dimensions show the piston pin. Permissible wear of th on the diameter. Loose fit; wherein a d Tight fit; shrink or int

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# TECHNICAL PUBLICATION REVISION

SSP-1776-5-PT1     Service Table of Limits       PREVIOUS REVISIONS	SSP-1776	0 4 1 00 0012
DREVIOUS DEVISIONS	551 1.10	October 28, 2013
	CURRENT	REVISION*
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:       0         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 Diston 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 numbers applicability         Deleted NOTES that reference S.I. 1243 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.	<ul> <li>Apri Title Page, 1-1, 1-7, 1-8,</li> <li>Added Serial Number ide S10 - HIO-360-A</li> <li>Added new engine model reference number S11</li> <li>Added new Chart referen engines without S/N suffi</li> <li>Deleted HIO-360-E from</li> <li>Added new Chart referen</li> <li>Added new reference nur in Sections I, II, and V</li> <li>Revised burnishing instru- bushing in reference num</li> <li>Revised the Mfr. Min. &amp; Gap (Compression) Nitrid and Piston Ring Gap (Oil</li> <li>* Revisions are indicated with revised item.</li> </ul>	<b>1 2020</b> 1-9, 1-10, 1-11, 1-34, 1-36 entification for Chart number listing for IO-390-D to Chart ce number S13 for HIO-360-A x A Chart reference S9 ce number S14 for HIO-360-E nbers S13 and S14 as applicable actions for connecting rod ber 600 Max. Clearance for Piston Ring ded Cylinders (Choke Barrels) ) in reference number 607

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#### **PART I – DIRECT DRIVE ENGINES**

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	A	All Main Bearings and Crankshaft	Max.	IVIAX.	<u>.0025L</u> .0055L	.0060L
	B-D-G-J-S-T-Y-BD-BE-AF	Main Bearings and Crankshaft (Thin Wall Bearing09 Wall Approx.)			<u>.0015L</u> .0045L	.0060L
	B-G-J-S-T-Y-AF	Main Bearings and Crankshaft (Thick Wall Bearing16 Wall Approx.)			<u>.0011L</u> .0041L	.0050L
	A	Diameter of Main Bearing Journal on Crankshaft	<u>2.3735</u> 2.375	(E)		
	B-D-G-J-S-T-Y-BD-BE	Diameter of Main Bearing Journal on Crankshaft (2-3/8 in. Main)	<u>2.3745</u> 2.376	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Main Bearing Journal on Crankshaft (2-5/8 in. Main)	<u>2.6245</u> 2.626	(E)		
	S8-S10-S13	Diameter of Front Main Bearing Journal on Crankshaft (2-3/8 in. Main)	$\frac{2.3750}{2.3760}$	(E)		
	\$1-\$11-\$12-T1-T3-AF	Diameter of Front Main Bearing Journal on Crankshaft (2-5/8 in. Main)	<u>2.6245</u> 2.6255	(E)		
500	A-B-B1-D-G*-BD-BE	Crankcase Bearing Bore Diameter (All) (Thin Wall Bearing) (2-3/8 in. Main)	<u>2.566</u> 2.567	2.5685		
	G**-J-S-T-Y	Crankcase Bearing Bore Diameter (All Except Front) (Thick Wall Bearing) (2-3/8 in. Main)	<u>2.6865</u> 2.6875	2.6890		
	T1-T3-AF	Crankcase Bearing Bore Diameter (Front Only) (Thin Wall Bearing) (2-5/8 in. Main)	<u>2.816</u> 2.817	2.8185		
	T1-T3-AF	Crankcase Bearing Bore Diameter (All Except Front) (Thick Wall Bearing) (2-5/8 in. Main)	<u>2.9365</u> 2.9375	2.9390		
	S1-S12-T-AF	Crankcase Bearing Bore Diameter (All) (Thin Wall Bearing) (2-5/8 in. Main)	<u>2.816</u> 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)	<u>2.566</u> 2.567	2.5685		
501	ALL	Connecting Rod Bearing and Crankshaft			<u>.0008L</u> .0038L	.0050L
	A-B-D-G-J-S-T-Y-BD	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	<u>2.1235</u> 2.125	(E)		
	S-T-AF	Diameter of Connecting Rod Journal on Crankshaft (2-1/4 in.)	<u>2.2485</u> 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 <sup>o</sup> on Each Side)	<u>2.2870</u> 2.2875			

#### **PART I – DIRECT DRIVE ENGINES**

SECTION I - CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clearances	
Ref.	Chart	Nomenclature	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 <sup>o</sup> on Each Side)	$\frac{2.4205}{2.4210}$			
502	ALL	Connecting Rod - Side Clearance			<u>.004L</u> .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				
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.005	.0075
		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			<u>.009L</u> .016L	.026L
507	ALL	Clearance – Front Face of Crankshaft Oil Slinger to Front Face of Recess in Crankcase (Crankshaft Against Thrust Face)			<u>.002</u> .007L	(A)

#### **PART I – DIRECT DRIVE ENGINES**

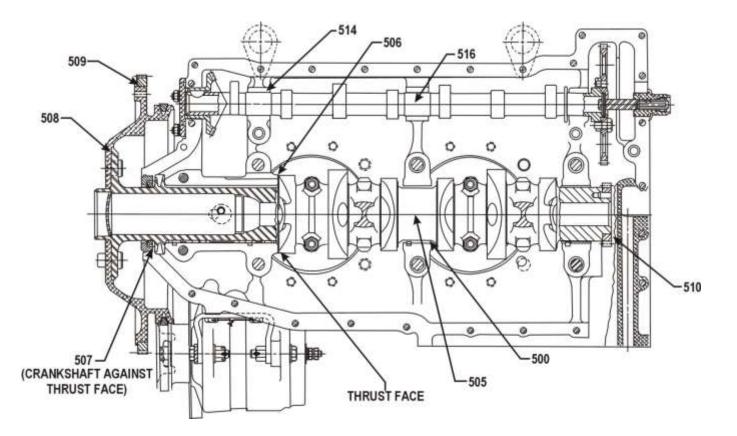
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dimensions		Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	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			.0005T	
		Crankshaft			.0010L	(A)
	A-B-D-G-J-S-T-Y-AF	Tappet Body and Crankcase			.0010L	
					.0033L	.004L
511	BD-BE	Tappet Body and Crankcase			.0010L	
					.0030L	.004L
	A-B	O.D. of Tappet	.6232	(220)		
	(Solid Tappets)		.6240	.6229		
	B1-D-G-J-S-T-Y-AF	O.D. of Tappet	.7169			
	(Flat Tappets)		.7177	.7166		
	B1-D-G-J-S-T-Y-AF	O.D. of Tappet	.8420			
	(Roller Tappets)		.8428	.8417		
	BD-BE	O.D. of Tappet	.8740			
			.8745	.8737		
	A-B	I.D. Tappet Bore in Crankcase	.6250			
	(Solid Tappets)		.6263	.6266		
	B1-D-G-J-S-T-Y	I.D. Tappet Bore in Crankcase	.7187			
	(Flat Tappets)		.7200	.7203		
	B1-D-G-J-S-T-Y-AF	I.D. Tappet Bore in Crankcase	.8437			
	(Roller Tappets)		.8445	.8448		
	BD-BE	I.D. Tappet Bore in Crankcase	.8755			
		(Small Bore Tappet)	.8773	.8776		
	BD-BE	I.D. Tappet Bore in Crankcase	.9545			
		(Large Bore Tappet)	.9555			
512	All Models Using Roller	Tappet Plunger Assembly and			.0010L	.0067L
	Tappets	Body – (Roller Tappets)			.0047L	.000712
	All Models Using Straight Body	Tappet Plunger Assembly and			.0010L	.0067L
	Tappets	Body – (Straight Body Tappets)			.0047L	.00071
	All Models Using Hyperbolic	Tappet Plunger Assembly and			.0010L	.0087L
	Tappets	Body – (Hyperbolic Tappets)			.0067L	.00071
513	ALL	Tappet Socket and Body			.002L	
		(Hyperbolic Flat and Roller			.007L	.009L
		Tappets)				
514	ALL	Camshaft and Crankcase			.002L	
					.004L	.006L
515	ALL	Camshaft – End Clearance			.002L	
					.009L	.015L
516	ALL	Camshaft Run-Out at Center			.000	
		Bearing Journal	-		.001	.006
517	All Models Using	Counterweight Bushing and			.0013T	
	Counterweights	Crankshaft			.0026T	(A)
518	All Models Using	Counterweight Roller – End			.007L	0.007
	Counterweights	Clearance	-		.025L	.038L
519	All Models Using	Counterweight and Crankshaft –			.003L	0177
	Counterweights	Side Clearance*			.013L	.017L
	*Measure below roller next to flat					

#### **PART I – DIRECT DRIVE ENGINES**

#### SECTION I - CRANKCASE, CRANKSHAFT, CAMSHAFT

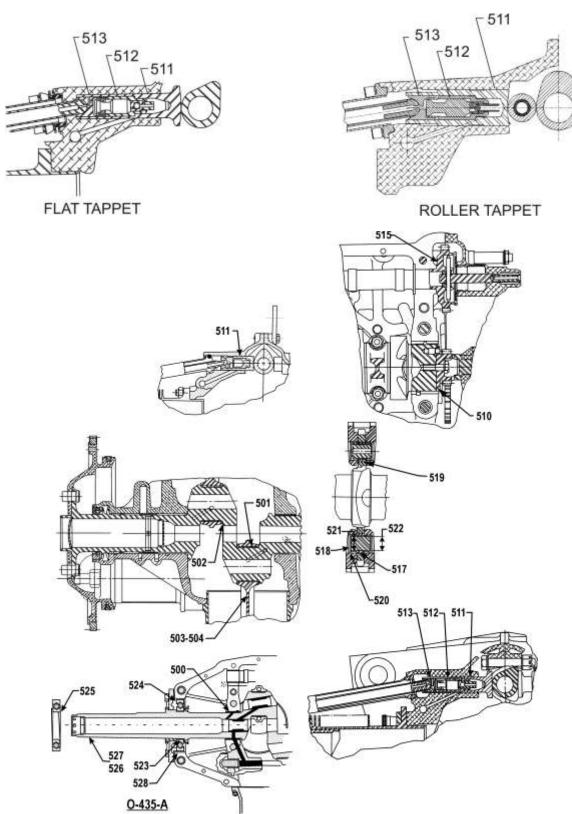
			Dimensions		Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
520	All Models Using Counterweights	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	All Models Using Counterweights	I.D. of Counterweight Bushing	<u>.7485</u> .7505	.7512		
522	All (AS APPLICABLE)	O.D. of Counterweight Roller (See latest revision of Service Instruction No. 1012)				
523	D	Thrust Bearing and Propeller Shaft			<u>.0000</u> .0012L	.002L
524	D	Thrust Bearing and Thrust Bearing Cap Clamp Fit (Shim to this Fit)			<u>.003T</u> .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			<u>.0016L</u> .0034L	.0045L



Longitudinal Section Thru Engines

#### **PART I – DIRECT DRIVE ENGINES**

#### SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT





## **PART I – DIRECT DRIVE ENGINES**

#### SECTION II – CYLINDERS

			Dimens	sions	Cleara	ances
			Mfr. Min.		Mfr. Min.	
			& Max.	Service	& Max.	Service
Ref.	Chart	Nomenclature		Max.		Max.
600	ALL	Connecting Rod and Connecting	Bushing P/N	LW-13923	to be burnish	ed in place
		Rod Bushing	Bushing P/N	01K28983	is <u>not</u> burnish	ed in place
	ALL	Finished I.D. of Connecting Rod	1.1254			
		Bushing	1.1262			
601	A-B-D-G-J-BD	Length Between Connecting	<u>6.4985</u>			
		Rod Bearing Centers	6.5015			
	S-T-Y-AF-BE	Length Between Connecting	6.7485			
		Rod Bearing Centers	6.7515			
602	ALL	Connecting Rod Bushing and			<u>.0008L</u>	
		Piston Pin			.0021L	.0025L
603	ALL	Piston Pin and Piston			<u>.0003L</u>	
					.0014L	.0018L
	ALL	Diameter of Piston Pin Hole in	<u>1.1249</u>			
		Piston	1.1254			
	ALL	Diameter of Piston Pin	<u>1.1241</u>			
			1.1246			
604	A-G-J-S-T-AF-BD-BE	Piston and Piston Pin Plug			<u>.0002L</u>	
					.0010L	.002L
	A-G-J-S-T-AF-BD-BE	*Diameter of Piston Pin Plug	<u>1.1242</u>			
			1.1247			
605	B-D-G-J-S-T-Y-AF	Piston Pin and Piston Pin Plug			<u>.0005L</u>	
		(Optional)			.0025L	.005L
	G-J-S-T-Y-AF	*Diameter of Piston Pin Plug	.5655			
			.5665			
	B-D	Diameter of Piston Pin Plug	<u>.8405</u>			
		(Thin Wall Pin)	.8415			
	*See latest edition of Service Inst				•	
606	A-B	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			<u>.000</u>	
		(Plain) Full Wedge			.004L	.006L (B)
	B-D	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			<u>.0025L</u>	
		(Chrome) Full Wedge			.0065L	.008L (B)
	G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			<u>.0025L</u>	
		Half Wedge			.0055L	.008L (B)
606	В	Piston Ring and Piston – Side				
		Clearance (2 <sup>nd</sup> Ring Comp.)			<u>.0025L</u>	
		(Chrome) Full Wedge			.0065L	.008L (B)
	A-B-D-G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side			000	
		Clearance (2 <sup>nd</sup> Ring Comp.) Full			<u>.000</u>	
	T	or Half Wedge			.004L	.006L (B)
	J	Piston Ring and Piston – Side			.000	
		Clearance (3 <sup>rd</sup> Ring Comp.) Half			.004L	
(0.1		Wedge				.006L (B)
606	ALL	Piston Ring and Piston – Side			<u>.002L</u>	
		Clearance (Oil Regulating)			.004L	.006L (B)
	А	Piston Ring and Piston – Side			<u>.003L</u>	0071 (D)
		Clearance (Bottom)			.0055L	.007L(B)

#### **PART I – DIRECT DRIVE ENGINES**

#### SECTION II - CYLINDERS

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

	Min. Piston Dia. Cylinder Barrel			Max. Clearance
Piston Number	Тор	Bottom	Maximum Diameter	Piston Skirt & Cy
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

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.

<sup>†</sup> - 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.

## PART I – DIRECT DRIVE ENGINES

#### SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
611	A	Exhaust Valve Seat and Cylinder Head			<u>.0065T</u> .010T	(A)
	B-D-G-J-S-T-Y-BD-BE	Exhaust Valve Seat and Cylinder Head			<u>.0045T</u> .008T	(A)
	S1-S2-S3-S5-S6-S7-S9-S10- S11-S12-S13-S14-T2-T3-AF	Exhaust Valve Seat and Cylinder Head			<u>.0075T</u> .011T	(A)
	A	O.D. Exhaust Seat	$\frac{2.0025}{2.004}$			(/
	B-D-G-J-S-T-Y-BD-BE	O.D. Exhaust Seat	<u>1.7395</u> 1.741			
	S1-S2-S3-S5-S6-S7-S9-S10- S11-S12-S13-S14-T2-T3-AF	O.D. Exhaust Seat	<u>1.9355</u> 1.937			
	A	I.D. Exhaust Seat Hole in Cylinder Head	<u>1.994</u> 1.996			
	B-D-G-J-S-T-Y-BD-BE	I.D. Exhaust Seat Hole in Cylinder Head	<u>1.733</u> 1.735			
611	S1-S2-S3-S5-S6-S7-S9-S10- S11-S12-S13-S14-T2-T3-AF	Exhaust Seat Hole in Cylinder Head	<u>1.926</u> 1.928			
612	A	Intake Valve Seat and Cylinder Head			<u>.0070T</u> .0105T	(A)
	B-D-G-J-S-T-Y-AF-BD-BE	Intake Valve Seat and Cylinder Head			<u>.0066T</u> .010T	(A)
	А	O.D. Intake Seat	$\frac{2.0965}{2.0975}$			
	A1-B-D	O.D. Intake Seat	<u>1.9265</u> 1.928			
	B1-C-J-S-T-Y-BD-BE	O.D. Intake Seat	$\frac{2.0815}{2.083}$			
	S1-S2-S3-S5-S6-S7-S9-S10- S11-S12-S13-S14-T2-T3-AF	O.D. Intake Seat	$\frac{2.2885}{2.290}$			
	A	I.D. Intake Seat Hole in Cylinder Head	$\frac{2.087}{2.089}$			
	A1-B-D	I.D. Intake Seat Hole in Cylinder Head	<u>1.918</u> 1.920			
	B1-G-J-S-T-Y-BD-BE	I.D. Intake Seat Hole in Cylinder Head	<u>2.073</u> 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	<u>2.280</u> 2.282			
613	ALL	Exhaust Valve Guide in Cylinder Head	3.202		<u>.001T</u> .0025T	(A)
613	A-B-D-J	O.D. Exhaust Valve Guide	<u>.5933</u> .5938			
	Y	O.D. Exhaust Valve Guide	<u>.6267</u> .6272			
	G-J-S-T-AF-BD-BE	O.D. Exhaust Valve Guide	<u>.6633</u> .6638			
	S1	O.D. Exhaust Valve Guide	<u>.6953</u> .6958			

## **PART I – DIRECT DRIVE ENGINES**

#### SECTION II –CYLINDERS

			Dime	ensions	Clea	rances
Ref.	Chart	Nomenclature	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			
	Al	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		
	\$1-\$2-\$3-\$5-\$6-\$7-\$9-\$10- \$11-\$12-\$13-\$14-T2-T3-AF	O.D. Exhaust Valve Stem (Angle Valve Heads)	.4955 .4965	.4937		
			of .4937	llowable limi or .4915 is e only to inco ic 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			

## PART I – DIRECT DRIVE ENGINES

#### SECTION II - CYLINDERS

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
615	G-J-S-T-BD-BE	Finished I.D. Exhaust Valve	.4985			
		Guide (Parallel Valve Heads)	.4995			
	S1-S2-S3-S5-S6-S11-S12-S13-	Finished I.D. Exhaust Valve	.4995			
	S14-T2-T3-AF	Guide (Angle Valve Heads)	.5005			
	S7-S9-S10	Finished I.D. Exhaust Valve				
		Guide (Angle Valve Heads –	<u>.5000</u>			
		Helicopter)	.5010			
	<sup>1</sup> / <sub>2</sub> inch diameter exhaust valves m	ay have exhaust valve guides that are	.003 in. over	the maximum	n inside diar	neter limit,
		e. After 300 hours of service, inside di				
		ation up to the recommended overhaul				
		on of Service Instruction No. 1009 for				
616	ALL	Intake Valve Stem and Valve			.0010L	
		Guide			.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			.000	
		Type Small Dia. Head)			.004L	006L
618	A-B	Solid Tappet Clearance			.006	
010		(After Engine in Run)			.012	
	А	Dry Tappet Clearance (Steel Push			.002	
		Rods)			.008	
	D-G-J-S-T-Y-AF-BD-BE	Dry Tappet Clearance			.028	
		Dry rupper clearance			.080	
619	А	Valve Rocker Shaft and Cylinder			.0001L	
017		Head (No Bushing)			.0013L	.0025L
619	B-D-J-S-T-Y	Valve Rocker Shaft and Valve				
017		Rocker Bushing (Parallel Valve			<u>.0001L</u>	00057
		Heads)			.0013L	.0025L
	S1-S2-S3-S5-S6-S7-S9-S10-	Valve Rocker Shaft and Valve			00017	
	S11-S12-S13-S14-T2-T3-AF	Rocker Bushing (Angle Valve			<u>.0001L</u>	
		Heads)			.0013L	.0025L
619	А	Finished I.D. of Valve Rocker				
017	1	Shaft Bores in Cylinder Head	.6246			
		(No Bushings)	.6261	.6270		
619	B-D-G-J-S-T-Y	Finished I.D. of Valve Rocker	10201			
017		Shaft (Bushing) in Cylinder Head	.6246			
		(Parallel Valve Heads)	.6261	.6270		
	S1-S2-S3-S5-S6-S7-S9-S10-	Finished I.D. of Valve Rocker				
	S11-S12-S13-S14-T2-T3-AF	Shaft (Bushing) in Cylinder Head	.6246			
		(Angle Valve Heads)	.6261	.6270		
620	ALL	Valve Rocker Shaft and Valve			.0007L	
020		Rocker Bushing			.0017L	.004L
	ALL	Finished I.D. of Rocker Arm	.6252			.0011
		Bushing	.6263	.6270		
				.0270		
	ALL	O.D. of Valve Rocker Shaft	.6241			

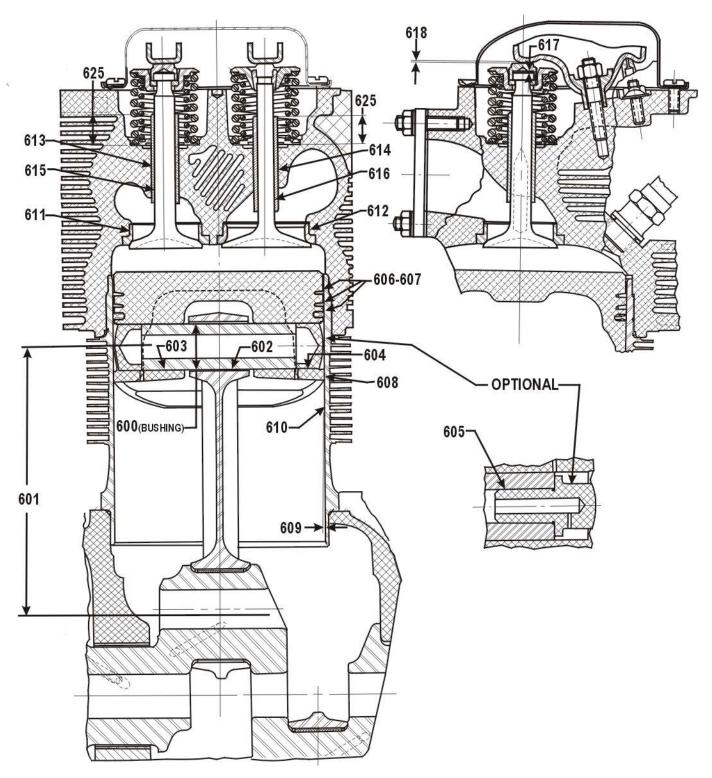
## **PART I – DIRECT DRIVE ENGINES**

#### SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	<b>a</b> .
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.
621	ALL	Valve Rocker Bushing and	Bushing M			
		Valve Rocker	Burnished	In Place		
622	ALL	Valve Rocker Shaft Bushing			<u>.0022T</u>	
		and Cylinder Head			.0038T	(A)
	ALL	Valve Rocker Shaft Bushing	<u>.7380</u>			
(22		Hole in Cylinder Head	.7388			
623	A-B-D-G-J-S-T-Y	Valve Rocker and Cylinder Head - Side Clearance			.005L	
		(Parallel Valve Heads)			.013L	.016L
	S1-S2-S3-S5-S6-S7-S9-S10-	Valve Rocker and Cylinder				.010L
	S11-S12-S13-S14-T2-T3-AF	Head – Side Clearance			<u>.002L</u>	
		(Angle Valve Heads)			.020L	.024L
624	A-B-J	Push Rod and Ball End			<u>.0005T</u>	
					.0025T	(A)
625	Α	Intake and Exhaust Valve	<u>.705</u>			
		Guide Height	.725			
	ALL	Intake Valve Guide Height	<u>.705</u> .725			
	ALL EXCEPT O-235	(Parallel Valve Heads) Exhaust Valve Guide height	.725			
	ALL EXCEPT 0-233	(Parallel Valve Heads)	.785			
	ALL	Intake and Exhaust Valve Guide	<u>.914</u>			
		height (Angle Valve Heads)	.954			
		MEASURE VALVE GUIDE HI FROM THE VALVE SPRING S COUNTERBORE IN THE CYL HEAD TO THE TOP OF VALV GUIDE.	SEAT LINDER			

### **PART I – DIRECT DRIVE ENGINES**

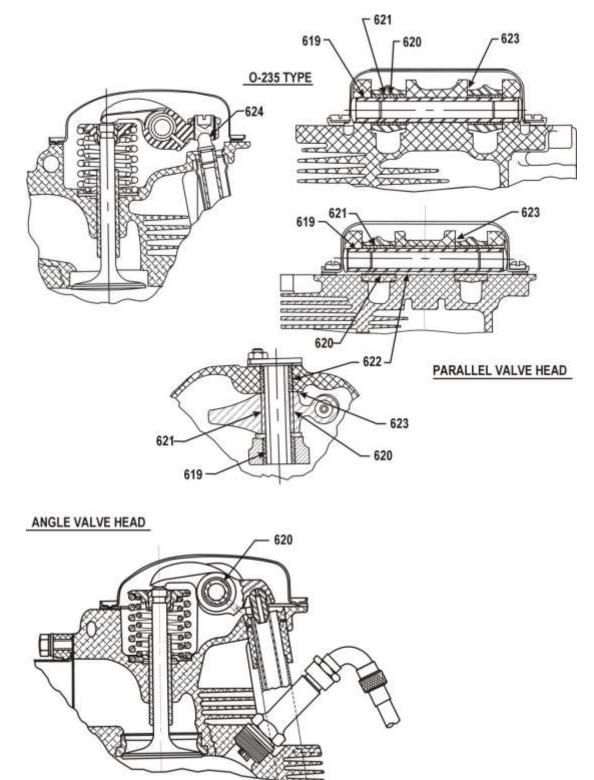
SECTION II - CYLINDERS



Cylinder, Piston and Valve Components

## PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS



Cylinder, Piston and Valve Components

## **PART I – DIRECT DRIVE ENGINES**

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PL			IVIUA	171uA	IVIUA	101uA
700	ALL	Oil Pump Drive Shaft and Oil			.0010L	
700	ALL	Pump Body or Cover			.0025L	.004L
701	A-B-D-G-J-S-T-AF	Oil Pump Drive Shaft and			.0015L	.004L
/01	A-D-D-0-j-5-1-AI	Accessory Housing			.0030L	.006L
	Y	Oil Pump Drive Shaft and			.0015L	.0001
	-	Accessory Case			.0030L	.006L
	BD-BE	Oil Pump Drive Shaft and			.0010L	
		Crankcase			.0025L	.004L
702	S-T-AF (DUAL MAGNETO)	Oil Pump Drive Shaft – End			<u>.015L</u>	
		Clearance			.050L	.065L
	BD-BE	Oil Pump Drive Shaft – End			<u>.017L</u>	
		Clearance			.037L	.047L
703	A-B-D-G-J-S-T-Y-AF	Oil Pump Impellers – Diameter			<u>.002L</u>	
		Clearance			.006L	.008L
	BD-BE	Oil Pump Impellers – Diameter			<u>.0035L</u>	0001
704	ALL (EXCEPT DD DE)	Clearance Oil Pump Impellers – Side			.0075L .002L	.009L
704	ALL (EXCEPT BD-BE)	Clearance			.002L .0045L	.005L
	BD-BE	Oil Pump Impellers – Side			.0043L	.003L
	DD-DL	Clearance			.005L	.006L
	AS APPLICABLE	Width of Oil Pump Impellers	.622		.00512	.0001
		······································	.624	.621		
	AS APPLICABLE	Width of Oil Pump Impellers	.747			
			.749	.746		
	AS APPLICABLE	Width of Oil Pump Impellers	<u>.995</u>			
			.997	.994		
	BD-BE	Width of Oil Pump Impellers	<u>.622</u>			
705			.623	.620	00101	
705	S-T-AF	Oil Pump Impeller and Idler Shaft			<u>.0010L</u> .0025L	.004L
	(DUAL MAGNETO) A-B-D-G-J-S-T-Y-AF	Oil Pump Impeller and Idler Shaft			.0023L	.004L
	A-D-D-O-J-S-1-1-AI	(Alum. and Sinterbond)			.003T	(A)
	BD-BE	Oil Pump Impeller and Idler Shaft			.003T	(11)
		on rump imperer and faler phare			.004T	(A)
706	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and Oil			.0005L	
		Pump Body			.0020L	.003L
	BD-BE	Oil Pump Idler Shaft and Oil			<u>.0010L</u>	
		Pump Body			.0025L	.003L
	S-T-AF (DUAL MAGNETO)	Oil Pump Idler Shaft and Oil			<u>.0000</u>	
		Pump Body			.0015T	(A)
707	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and			<u>.0010L</u>	000
		Accessory Housing			.0025L	.0035L
	BD-BE	Oil Pump Idler Shaft and			<u>.0010L</u>	00251
708	G2-S2	Crankcase Scavenge Pump Drive Shaft and			.0025L	.0035L
108	02-32	Adapter			<u>.0010L</u> .0025L	.004L
				1		1 .004L
709	G2-S2	Scavenge Pump – End Clearance			.000	

## **PART I – DIRECT DRIVE ENGINES**

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. &	Service Max.
	ENGE PUMP	Tomenciature	Max.	Iviax.	Max.	Max.
		Secure as Dump Impellers			0071	
710	G2-S2	Scavenge Pump Impellers – Diameter Clearance			<u>.007L</u> .011L	.014L
711	G2-S2	Scavenge Pump Impellers – Side			<u>.003L</u>	.014L
/11	62.62	Clearance			.005L	.006L
	G2-S2	Width of Impellers	1.496		10002	10002
		1	1.498	1.495		
712	G2-S2	Scavenge Pump Impellers and			<u>.0010L</u>	
		Idler Shaft			.0025L	.004L
713	G2-S2	Scavenge Pump Body and Idler Shaft			<u>.0000</u> .0015T	(A)
714	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump			.0010L	
	``´´´´	Drive and Adapter			.0025L	.004L
715	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump			<u>.0010L</u>	
		Shaft and Adapter			.0020L	.0035L
716	S-T4-AF (WIDE DECK)	Gerotor Pump – Rotor – Side			<u>.0015L</u>	0.0.47
717	S-T4-AF (WIDE DECK)	Clearance			.003L	.004L
717	S-14-AF (WIDE DECK)	Gerotor Pump Housing and Adapter			<u>.0005L</u> .0020L	(A)
718	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump –			.0020L	(A)
/10	5 IT III (WIDE DECK)	End Clearance			.0365L	.0415L
	T4 (DUAL MAGNETO)	Turbocharger Scavenge Pump –			.0105L	
		End Clearance			.0395L	.0445L
FUEL	PUMP					
719	A-B-D-G-J-S-T	AC Fuel Pump Plunger and			<u>.0015L</u>	
		Accessory Housing			.003L	.005L
720	J-S-T-AF	Crankshaft Idler Gear and			<u>.001L</u>	
701		Crankshaft Idler Gear Shaft			.003L	.005L
721	S-T-AF	Crankshaft Idler Gear Shaft and			<u>.0020L</u> .0035L	.0065L
	(DUAL MAGNETO) S-T-AF	Accessory Housing Crankshaft Idler Gear Shaft and			.0033L .0020L	.0003L
	(DUAL MAGNETO)	Crankcase			.0035L	.0065L
722	S-T-AF	AN Fuel Pump Idler Gear and			<u>.001L</u>	100002
		Shaft			.003L	.005L
723	S-T-AF	AN Fuel Pump Idler Shaft and			<u>.0020L</u>	
	(DUAL MAGNETO)	Accessory Housing and Crankcase			.0035L	.0065L
	S-T-AF	AN Fuel Pump Idler Shaft and			<u>.0020L</u>	00.551
704	(DUAL MAGNETO)	Crankcase			.0035L	.0065L
724	A-B	Crankshaft Idler Gear – End Clearance			<u>.003L</u> .043L	.058L
	G-J-S-Y	Crankshaft Idler Gear – End			.045L	
		Clearance			.040L	.055L
	T-AF	Crankshaft Idler Gear – End			<u>.007L</u>	
		Clearance			.037L	.052L
	S (DUAL MAGNETO)	Crankshaft Idler Gear – End			<u>.020L</u>	0.401
	T-AF (DUAL MAGNETO)	Clearance Crankshaft Idler Gear – End			.030L	.040L
	1-AF (DUAL MAGNETO)	Clearance			<u>.015L</u> .038L	.046L
L	1	Citarante	1	1	.030L	.0-TUL

## **PART I – DIRECT DRIVE ENGINES**

			Dimensions		Clearances	
	Chart		Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.		Nomenclature	Max.	Max.	Max.	Max.
FUEL .	PUMP (CONT.)					
725	S	AN Fuel Pump Idler Gear – End			.010L	
		Clearance			.045L	.055L
	T-AF	AN Fuel Pump Idler Gear – End			<u>.002L</u>	
		Clearance			.018L	.024L
	S-T-AF	AN Fuel Pump Idler Gear – End			<u>.015L</u>	
	(DUAL MAGNETO)	Clearance			.038L	.045L
726	S-T-Y-AF	AN Fuel Pump Drive Shaft Gear			<u>.0010L</u>	
		and Adapter		-	.0025L	.004L
727	S	AN Fuel Pump Drive Shaft Gear –			<u>.035L</u>	
		End Clearance			.069L	.079L
	T-AF	AN Fuel Pump Drive Shaft Gear –			<u>.044L</u>	
		End Clearance			.081L	.091L
	T-AF	AN Fuel Pump Drive Shaft Gear –			<u>.035L</u>	0021
	(DUAL MAGNETO) Y	End Clearance			.073L	.083L
	Y	AN Fuel Pump Drive Shaft Gear –			<u>.000L</u>	0751
		End Clearance			.067L	.075L
	RNOR & HYDRAULIC PUMP	_			I	
728	T-AF	Front Governor Drive Idler Shaft			<u>.0010L</u>	
	(NARROW DECK)	(Both Ends) and Crankcase			.0025L	.004L
729	G1-G2-S2-S4-S6-T-AF	Front Governor Idler Gear and			<u>.0010L</u>	0.0.47
720	(WIDE DECK)	Shaft			.0025L	.004L
730	BD-BE	Front Governor Drive Gear and			<u>.0010L</u>	00.41
		Crankcase			.0025L	.004L
	BD-BE	Front Governor Drive Gear and			<u>.0005L</u>	0041
731	G1-G2-S-T-AF	Camshaft Front Governor Gear and			.0025L	.004L
/51	01-02-5-1-AF	Crankcase			<u>.0010L</u> .0025L	.004L
	BD	Front Governor Gear and			.0010L	.00+L
		Crankcase			.0030L	.004L
732	G1-G2-S-T-AF	Front Governor Gear – End			.008L	.0012
,32		Clearance			.016L	.021L
	BD-BE	Front Governor Gear – End			.0045L	
		Clearance			.0165L	.021L
733	G-J-S	Rear Governor Gear and Adapter			.0010L	
		-			.0025L	.005L
	G-S	Rear Governor Gear and			<u>.0010L</u>	
	(DUAL MAGNETO)	Accessory Housing			.0025L	.005L
734	G-J-S	Rear Governor Gear – End			<u>.002L</u>	
		Clearance			.024L	.034L
	G-S	Rear Governor Gear – End			<u>.002L</u>	
	(DUAL MAGNETO)	Clearance			.037L	.044L
735	T-AF	Hydraulic Pump Gear and Adapter			<u>.0010L</u>	
					.0025L	.004L
	T-AF (DUAL MAGNETO)	Hydraulic Pump Gear and			<u>.0010L</u>	0.0.17
		Accessory Housing			.0025L	.004L
				1		
736	T-AF	Hydraulic Pump Gear – End			<u>.010L</u>	0.7.5
736	T-AF T-AF (DUAL MAGNETO)	Hydraulic Pump Gear – End Clearance Hydraulic Pump Gear – End			<u>.010L</u> .066L .007L	.076L

## **PART I – DIRECT DRIVE ENGINES**

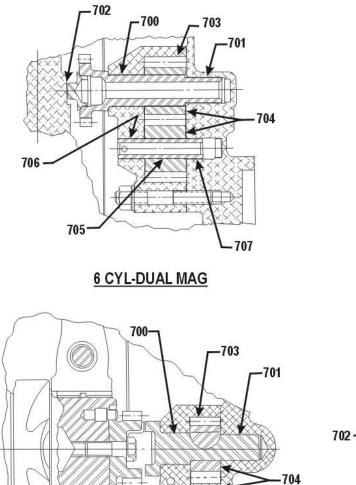
			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
VACU	UM & TACHOMETER					
737	A-B-G-J-S-T-Y-AF	Vacuum Pump Gear and Adapter			.0010L	
, , ,		, account only cour and thoup of			.0030L	.0045L
737	S-T-AF	Vacuum Pump Gear and			.0010L	
	(DUAL MAGNETO)	Accessory Housing			.0025L	.004L
737	D	Vacuum Pump Gear and			.0010L	
		Accessory Housing			.0025L	.006L
738	A-B-G-J-S-T-AF	Vacuum Pump Gear – End			<u>.010L</u>	
		Clearance			.057L	.075L
	D	Vacuum Pump Gear – End			<u>.003L</u>	
		Clearance			.020L	.030L
	Y	Vacuum Pump Gear – End			<u>.000</u>	
		Clearance		ļ	.067L	.075L
	S	Vacuum Pump Gear – End			<u>.012L</u>	
	(DUAL MAGNETO)	Clearance			.044L	.055L
	T-AF	Vacuum Pump Gear – End			<u>.017L</u>	
	(DUAL MAGNETO)	Clearance			.039L	.050L
739	A-B-Y	Tachometer Drive Shaft and			<u>.0015L</u>	00.01
		Adapter Tachometer Drive Shaft and			.0035L	.006L
	BD-BE				<u>.0010L</u>	00651
720	D-G-J-S-T-AF	Adapter Tachometer Drive Shaft and			.0050L	.0065L
739	D-G-J-S-1-AF				<u>.0015L</u> .0035L	.006L
740	G-J-S	Accessory Housing Vacuum Pump Gear and Adapter			.0033L	.000L
740	(DUAL DRIVE)	Vacuum Fump Gear and Adapter			.0025L	.004L
741	G-J-S	Vacuum Pump Gear – End			<u>.000</u>	.004L
, 11	(DUAL DRIVE)	Clearance			.017L	.027L
742	G-J-S	Idler Gear and Shaft			.0010L	10272
	(DUAL DRIVE)				.0030L	.005L
743	G-J-S	Idler Gear – End Clearance			.021L	
	(DUAL DRIVE)				.041L	.060L
744	G-J-S	Propeller Governor Gear and			<u>.0013L</u>	
	(DUAL DRIVE)	Adapter			.0028L	.005L
	G-J-S	Hydraulic Pump Gear and Adapter			<u>.0013L</u>	
	(DUAL DRIVE)				.0028L	.005L
745	G-J-S	Propeller Governor or Hydraulic			<u>.000</u>	
	(DUAL DRIVE)	Pump – End Clearance			.054L	.074L
MAGN	ETO, GENERATOR, STARTER	2				
746	Т	Magneto Bearing and Gear			.0005T	
					.0001L	.0005L
746	D	Magneto Bearing and Gear			<u>.0008T</u>	
					.0001L	.0005L
747	Т	Magneto Bearing and Crankcase			<u>.0002T</u>	
					.0007L	(A)
747	D	Magneto Drive Bearing and			<u>.0006T</u>	
		Adapter			.0008T	(A)
748	S7	Magneto Bearing and Gear			<u>.0001T</u>	
					.0010T	(A)

## **PART I – DIRECT DRIVE ENGINES**

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
Ref.	Chart	Nomenclature	Min. &	Service	Min. &	Service
			Max.	Max.	Max.	Max.
	ETO, GENERATOR, STARTER				1	1
749	S7	Magneto Bearing and Adapter			<u>.000</u> .0012L	.0015L
750	S-T-AF (DUAL MAGNETO)	Magneto Drive Gear and Crankcase			<u>.0010L</u> .0025L	.003L
751	S-T-AF (DUAL MAGNETO)	Magneto Drive Gear – End Clearance			<u>.005L</u> .073L	.083L
752	AF	Magneto Drive Gear and Shaft			<u>.001L</u> .003L	.005L
753	BD-BE	Magneto Drive Gear and Crankcase Bushing			<u>.003E</u> .001L .003L	.005L
754	Y	Magneto Shaft Gear and Magneto Case			<u>.001L</u> .003L	.005L
755	Y	Magneto Shaft Gear and Support Assembly			<u>.001L</u> .003L	.005L
756	Y	Magneto Shaft Gear and Accessory Drive Shaft Gear – End Play			<u>.0075L</u> .0125L	.015L
757	Y	Accessory Drive Shaft Gear and Support Assembly			<u>.001L</u> .003L	.005L
758	S	Magneto Gear and Bushing (S4LN-21 and S4LN-1227)			<u>.0005L</u> .0020L	.0035L
	Т	Magneto Gear and Bushing (S6LN-21 & S6LN-1227)			<u>.0015L</u> .0035L	.0055L
	T-AF (DUAL MAGNETO)	Magneto Gear and Bushing			<u>.0015L</u> .0035L	.0055L
7095	BD-BE	Bushing – Magneto Drive and Crankcase			<u>.0025T</u> .0045T	(A)
759	D	Generator Gear Bushing and Generator Gear			<u>.0020T</u> .0035T	(A)
760	D	Generator Gear Bushing and Generator Drive Coupling Adapter			<u>.001L</u> .0028L	.005L
761	D	Bendix Drive Gear Bushing and Crankcase			<u>.0005T</u> .0025T	(A)
762	D	Bendix Drive Gear and Bendix Drive Gear Bushing			<u>.0010L</u> .0025L	.005L
763	D	Bendix Drive Shaft and Bendix Drive Housing			<u>.003L</u> .005L	.010L
764	D	Bendix Drive Shaft – End Clearance			<u>.000</u> .0059L	.080L

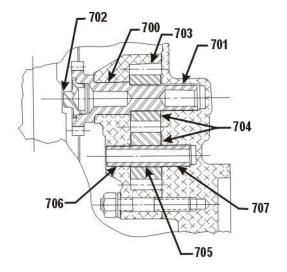
## **PART I – DIRECT DRIVE ENGINES**

#### SECTION III – GEAR TRAIN

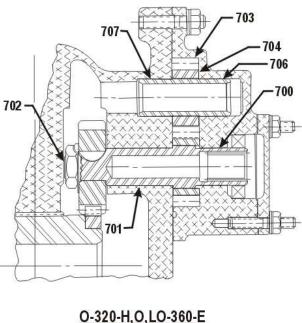


706-705

Standard Type



4 CYL-DUAL MAG

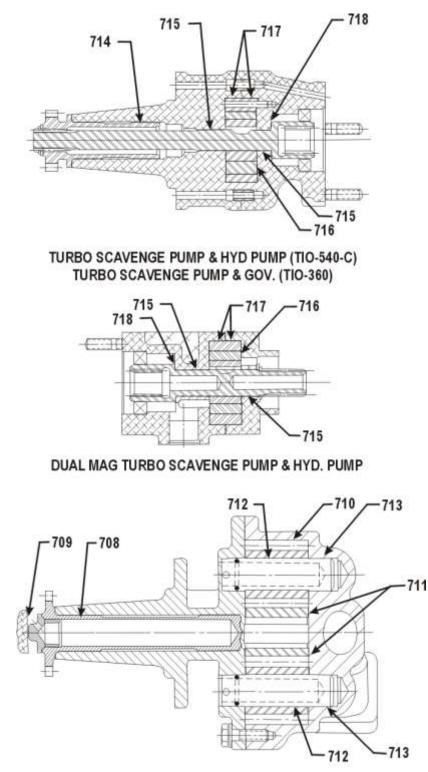


Oil Pumps

707

#### **PART I – DIRECT DRIVE ENGINES**

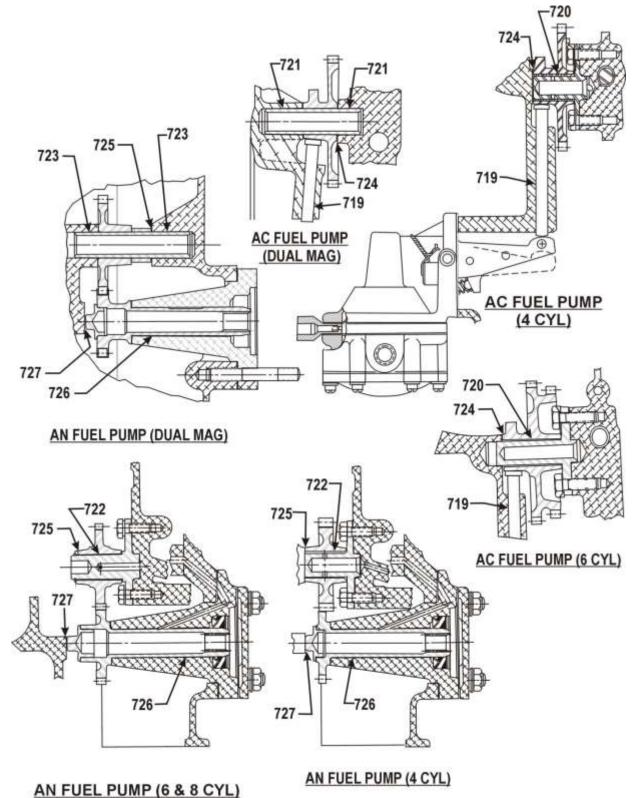
SECTION III - GEAR TRAIN



SCAVENGE PUMP AIO 320 & AIO-360

Scavenge Pumps

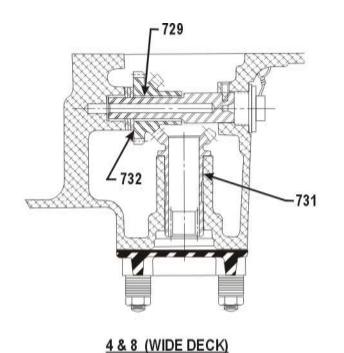
**PART I – DIRECT DRIVE ENGINES** 

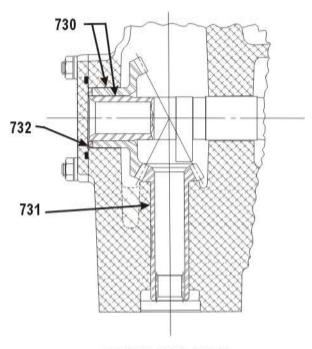


Fuel Pumps

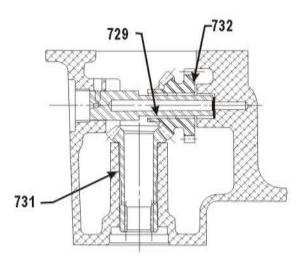
#### **PART I – DIRECT DRIVE ENGINES**

#### SECTION III – GEAR TRAIN





0-320-H O,LO-360-E

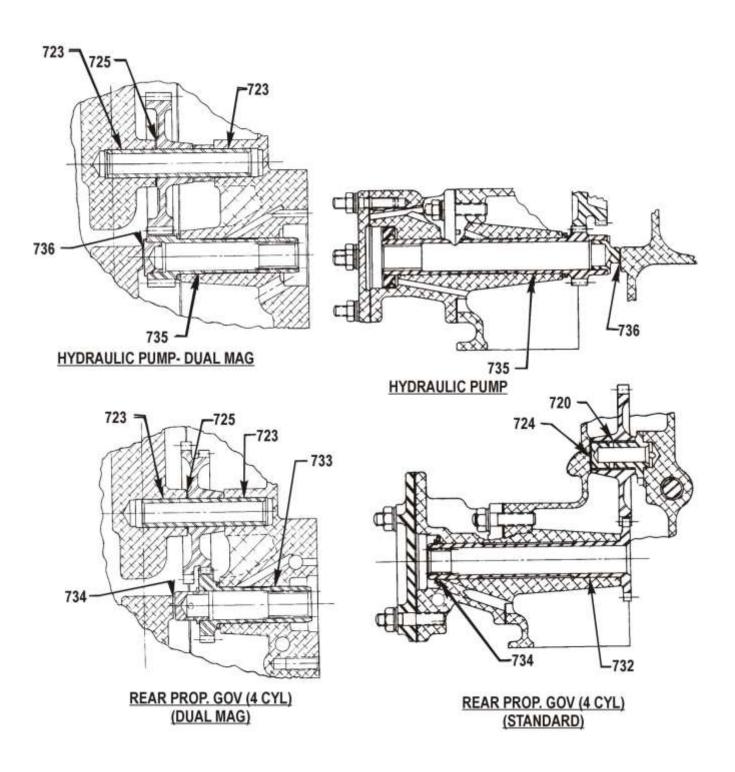


# 

6 CYL. (WIDE DECK) (2200 LB)



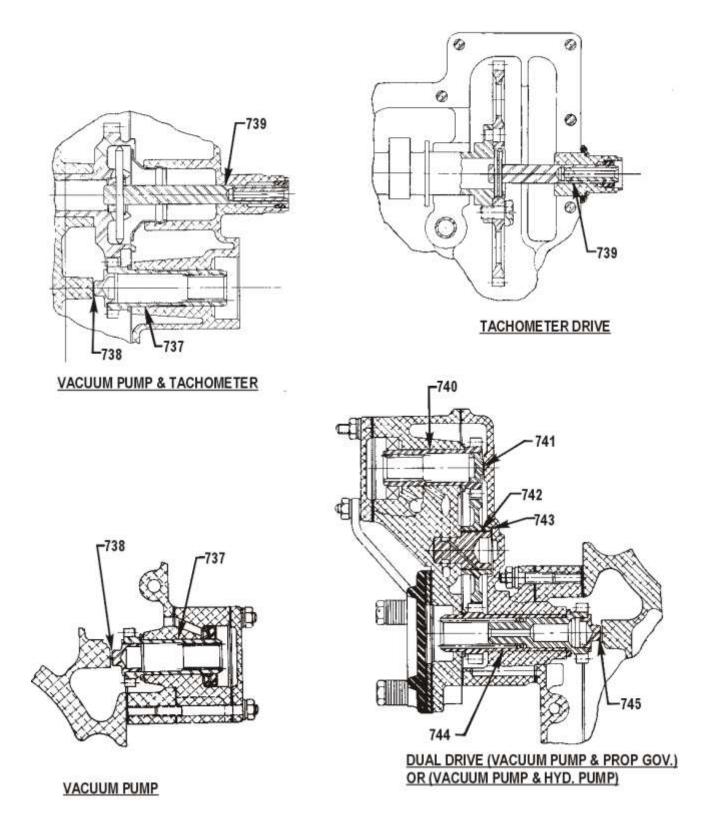
#### **PART I – DIRECT DRIVE ENGINES**



Rear Governor and Hydraulic Pumps

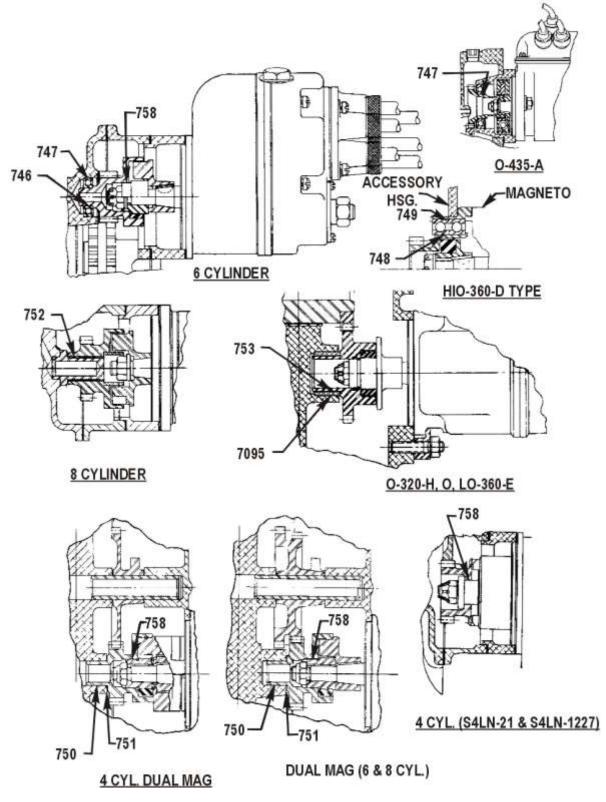
#### **PART I – DIRECT DRIVE ENGINES**

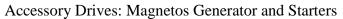
#### SECTION III – GEAR TRAIN



Tachometer Drives, Vacuum and Hydraulic Pump Drives

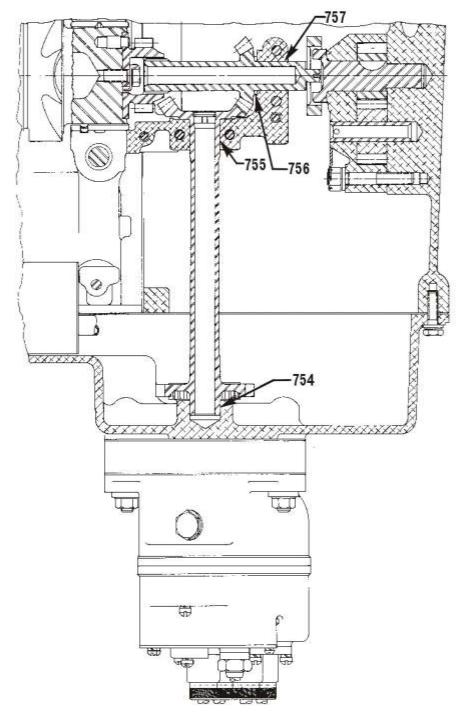
**PART I – DIRECT DRIVE ENGINES** 





## **PART I – DIRECT DRIVE ENGINES**

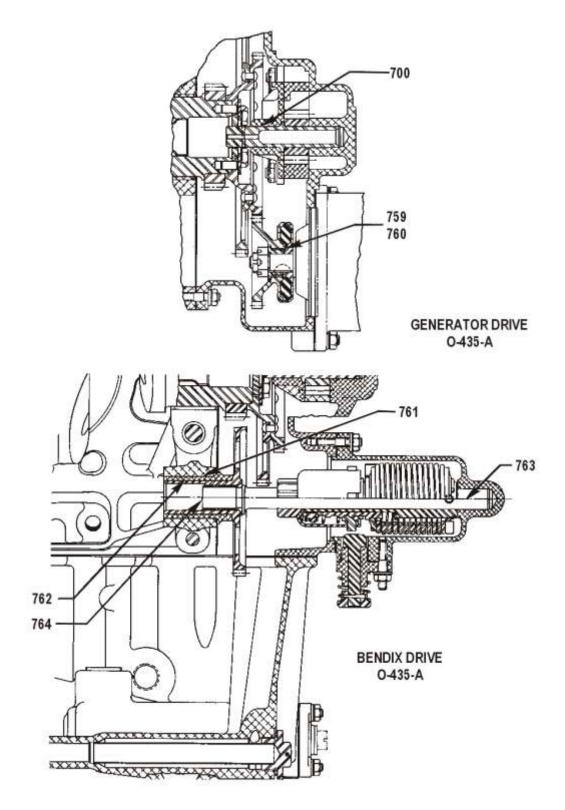
SECTION III – GEAR TRAIN



VO, IVO-360

Accessory Drives: Magnetos

#### **PART I – DIRECT DRIVE ENGINES**



Generator and Bendix Drive

## **PART I – DIRECT DRIVE ENGINES**

SECTION IV – BACKLASH

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

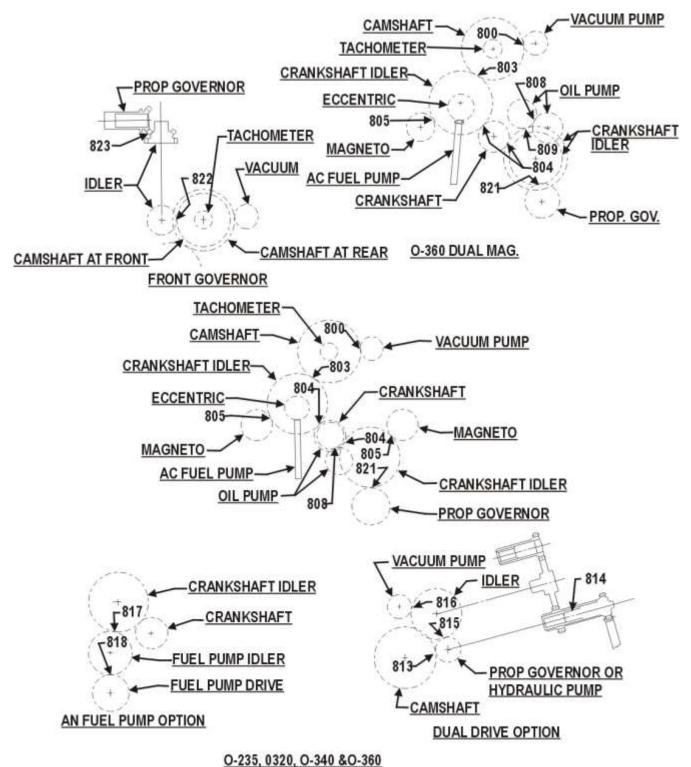
## **PART I – DIRECT DRIVE ENGINES**

#### SECTION IV – BACKLASH

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

#### PART I – DIRECT DRIVE ENGINES

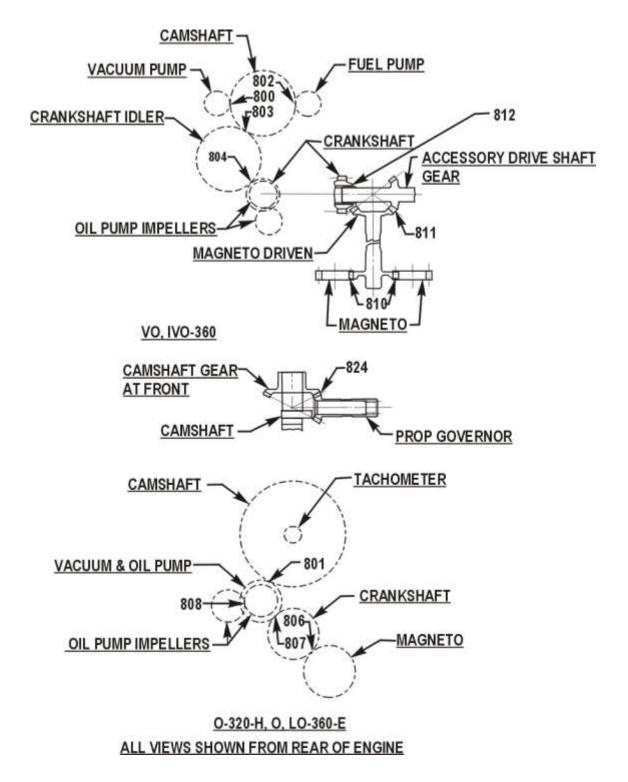
SECTION IV – BACKLASH



ALL VIEWS SHOWN FROM REAR OF ENGINE

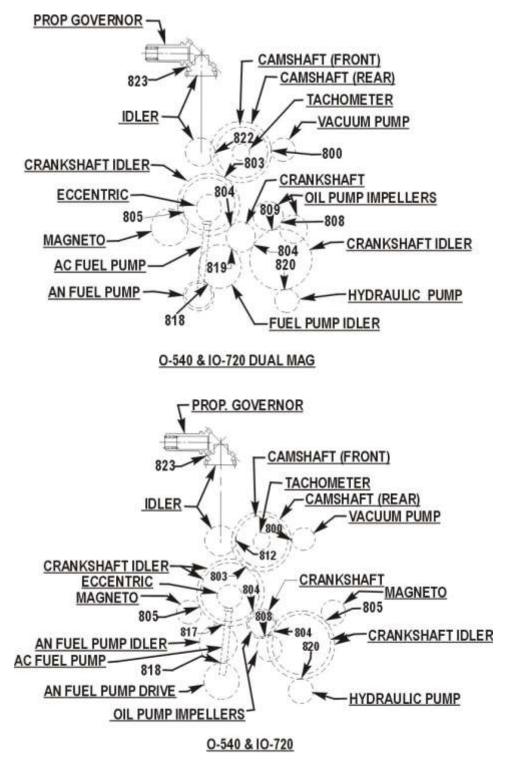
**PART I – DIRECT DRIVE ENGINES** 

SECTION IV - BACKLASH



#### PART I – DIRECT DRIVE ENGINES

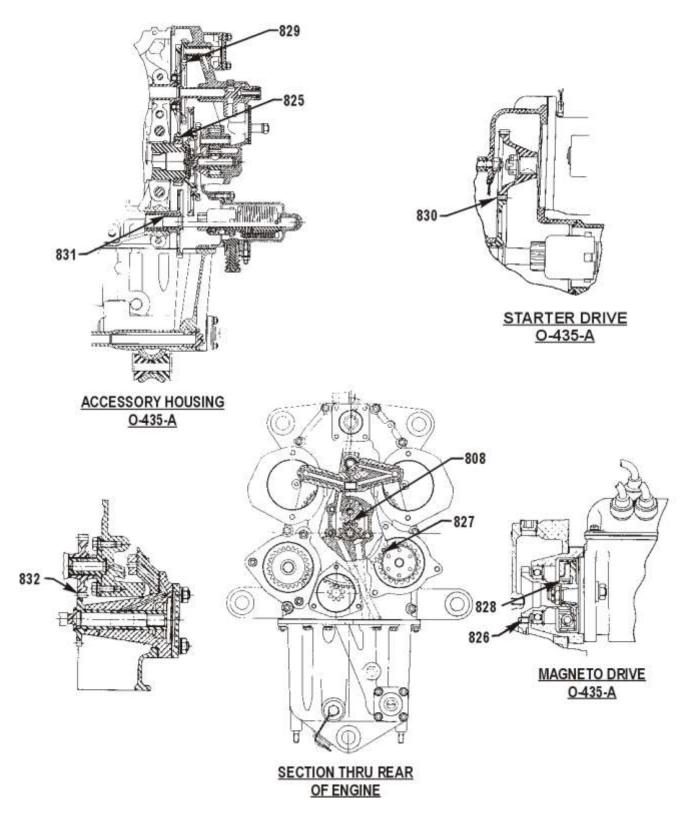
SECTION IV - BACKLASH



#### ALL VIEWS SHOWN FROM REAR OF ENGINE

### **PART I – DIRECT DRIVE ENGINES**

SECTION IV – BACKLASH



## **PART I – DIRECT DRIVE ENGINES**

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

## **PART I – DIRECT DRIVE ENGINES**

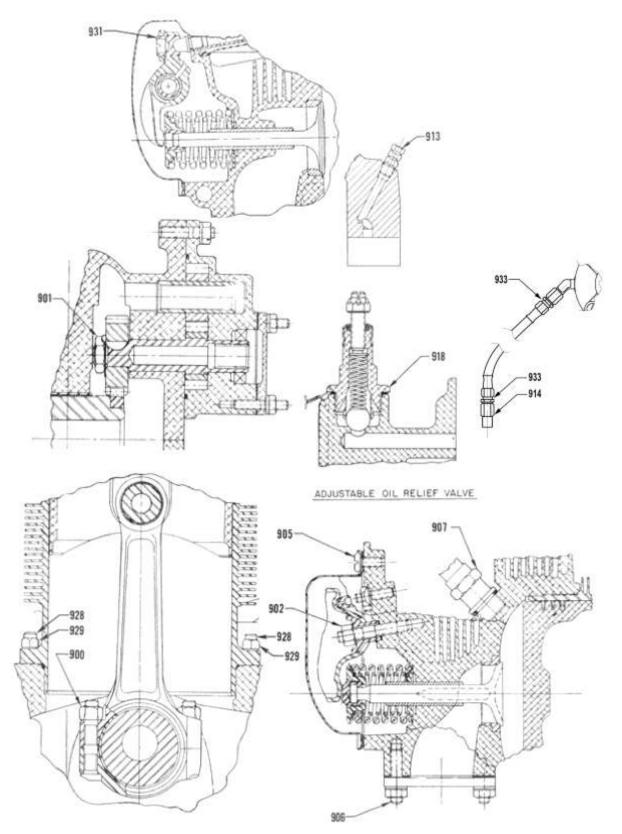
#### SECTION V - SPECIAL TORQUE REQUIREMENTS (CONT.)

New Ref.	Chart	Thr	ead Size	:		No	omenclature		Torque Limits	
918	ALL (AS APPLICABLE)	1-1/4-1	2		Oil Pressure	Rel	ief Valve		300 inlbs.	
919	ALL	1/4 Hex Below	Head a	nd	Hose Clamps (Worm Type)				20 inlbs.	
		5/16 He	5/16 Hex. Head and Above		/16 Hex. Head Hose Clamps (Worm Type) (Metal to			45 inlbs.		
		5/16 He and Ab	ex. Head ove		Hose Clamps	s (W	/orm Type)		30 – 35 inlbs.	
920	ALL				Cylinder Hea	ad D	Drain Back Hose C	lamp	s 10 inlbs.	
	S-T				Exhaust V-	-Baı	nd Coupling Torqu	ie Da	ta	
921	Coupling Size Tube OD	Lycomin Numb			Vendor Part Number		T-Bolt Split Type Locknut Torque InLbs.	1/4	In. Drilled Hex Nut Witl fety Wire Torque InLbs	
	1.75 in.	LW-120	93-4	М	VT69183-175		65		75	
	2.00 in.	LW-120			VT69183-200		85		75	
	2.25 in.	LW-120			VT69183-225		85		75	
	2.25 in.	LW-121					85			
	3.69 in.	LW-121				U4204-55-369M 70				
	3.69 in.				04204-55-509M         70           NH1004420-10         70					
922	ALL	LW-13	LW-15768 NH1004420-10 70 Turbocharger V-Band Torque Data							
922		r 1 1 N T	M	11		-				
	Turbocharger M			-	p Part No.		V-Clamp Diameter 6.00 in.		Torque InLbs.	
	TO-473			00500-600					40 - 80	
	TEO659			00500-685		6.85 in.		40-50		
	THO8A6		40050				7.75 in. 7.75 in.		40-60	
	THO8A6		400500-775						40-60	
	301E10-2			TC-	6-15		6.50 in.		15 - 20	
	* - AiResearch t ** - Rajay turboc	harger.		: N	La 1229 fam a					
	See latest revision Chart		ead Size		1258 101 as		omenclature		Torque Limits	
	ALL DUAL	1111		,		Nomenciature				
927	MAG. MODELS	1	/2-20		Crankshaft C	Jear	Bolt		660 inlbs.	
	BD		1/4		Crankshaft Gear Bolts		96 – 120 inlbs.			
		3	8/8-16		Cylinder Hold Down Studs (Crankcase Driving Torque)		100 inlbs.			
928	ALL	7,	/16-14		Cylinder Hol (Crankcase I	Driv	ing Torque)		200 inlbs.	
		1	(/2.13		Cylinder Hol (Crankcase I				250 inlbs.	
	A-B-D-BD-BE-J- G-Y-S-T-AF		3/8			ld D	own Nuts		300 inlbs.	
929	A1		7/16		Cylinder Hol	ld D	own Nuts		420 inlbs.	
	B-D-BD-BE-J-G Y-S-T-AF	-	1/2	Cylinder Hold Down Nuts		600 inlbs.				

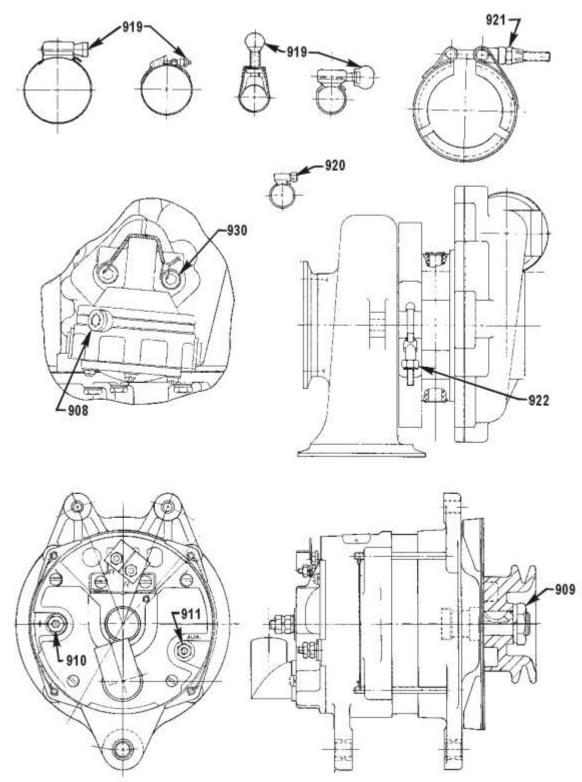
## **PART I – DIRECT DRIVE ENGINES**

Ref.	Chart	Thread Size	Nomenclature				Torque Li	nits
930	ALL	3/8	Allen Head Screw (Diaphragm Fuel Pump)				225-250 in.	-lbs.
931	A	9/16	Locking Nut (Valve Adjusting Screw)				450 inlb	os.
932	ALL	5/16-18	Exhaust Trans Torque)	itions – St	uds (Driving		100 inlb	os.
	ALL	3/8-16	Exhaust Trans Torque)	itions – St	uds (Driving		200 inlb	os.
933	ALL	5/16-32	Brass union nu injector fuel lin				25-50 inll	08.*
		ten the fuel line union at of the nut.) Torque i		nlbs. can	result in dama			n additional
					Length		COMP. LO	DAD
Ref.	Chart	Nomenclature	Lycoming Part No.	Wire Dia.	at Comp. Length	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						1
		Identifica	tion					
	Lycoming Part Numbers	Dye	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.		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.

## **PART I – DIRECT DRIVE ENGINES**

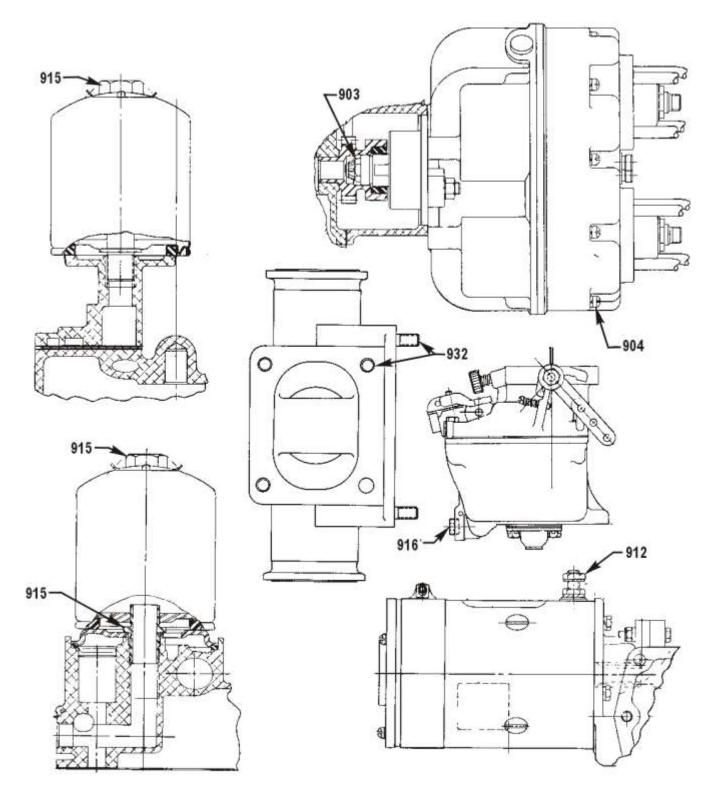


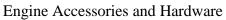
PART I – DIRECT DRIVE ENGINES



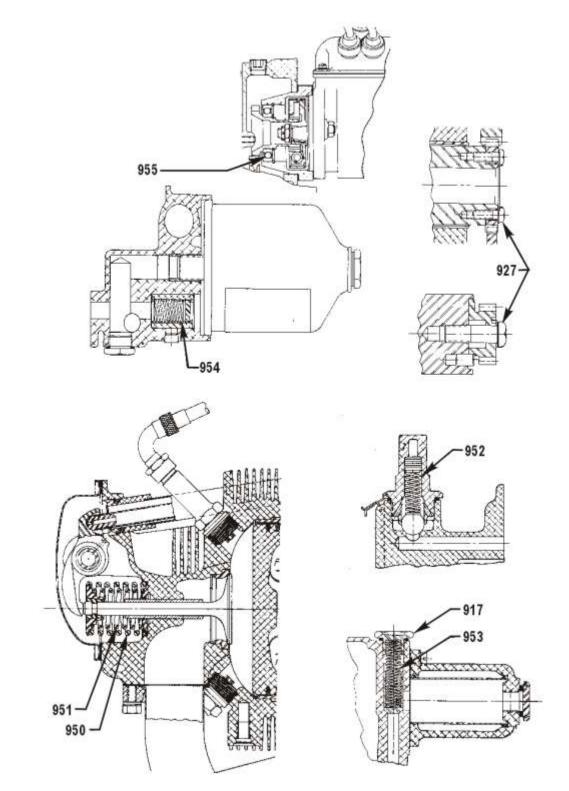
Engine Accessories and Hardware

## PART I – DIRECT DRIVE ENGINES





## PART I – DIRECT DRIVE ENGINES



Engine Springs and Hardware

#### 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).

		TAE	TABLE II				
	B	OLTS, SCRE	W AND N	IUTS		PIPE F	PLUGS
Thread	Tor	que	Thread	Torq	ue	Thread	Torque
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Thread	InLbs.
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44
10	49 to 54		1/2	900 to 984 75 to 82		1/8-27 NPT	40 to 44
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121
3/8	360 to 396	30 to 33	270 to 297	1/2-14 NPT	160 to 176		
тц			3/4-14 NPT	230 to 252			
1П	IIN NUTS (1/2	2 DIA. OF BU	1-11-1/2 NPT	315 to 347			

TABLE III	TABLE IV								
CRUSH TYPE GAS	CRUSH TYPE GASKETS					FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)			
Thread Pitch on Part to be Tightened	ANGLE OF	F TURN	Tube	Thread	Torque InLbs.				
Threads Per Inch	Aluminum	Copper	Size		Aluminum Alloy	Steel			
8	135°	67°	(-3) 3/16	3/8 - 24	30 to 50	70 to 80			
10	135°	67°	(-4) 1/4	7/16 - 20	40 to 65	90 to 100			
12	180°	90°	(-5) 5/16	1/2 - 20	60 to 80	135 to 150			
14	180°	90°	(-6) 3/8	9/16-18	75 to 125	270 to 300			
16	270°	135°	(-8) 1/2	3/4-16	150 to 250	450 to 500			
18	270°	135°	(-10) 5/8	7/8 - 14	200 to 350	650 to 700			
20	270°	135°							
24	360°	180°		Т	ABLE V				
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	E			
NOTE: Install all crush type gas	skets except	the self	Thr	eads	Torque In	Lbs.			
centering type, with the unbroken sur	1/4	-20	15						
of the plug or part being tightened ag	5/1	5/16-18 25							
part until the sealing surfaces are in c	3/8-16 50								
to the angle of turn listed for the appr									
NOTE: Lubricate Threads Unless Ot	herwise Speci	fied.							

	TABLE VI							
JAM	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						

#### STANDARD TORQUE (CONT.) UNLESS OTHERWISE LISTED

	TABLE VII									
	METAL TUBE FITTINGS									
	Wrench torque for tightening AN-818 Nut (pound inches)									
Dash Nos. Ref.	Tubing OD inches	Aluminum-	alloy tubing				alloy tubing (583) for use lines only	measured centerline. D inc	imension in	
		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	

## **PART II – INTEGRAL ACCESSORY DRIVE ENGINES**

CHART	MODELS
AQ	TIO-541
AZ	TIGO-541

SECTION I SECTION II SECTION III SECTION IV SECTION V	500 SERIES 600 SERIES 700 SERIES 800 SERIES 900 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT CYLINDERS GEAR TRAIN BACKLASH (GEAR TRAIN) TORQUE AND SPRINGS
(A)		ither shrink fits controlled by machining, fits that may readily be where wear does not normally occur. In each case, the fit must be held g tolerance.
(B)	Side clearance o	n piston rings must be measured with face of ring flush with piston.
(D)	The dimensions the piston pin.	shown are measured at the bottom of the piston skirt at right angles to
(E)	Permissible wear on the diameter.	r of the crankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; where	in a definite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink	or interference fit.
(WD)	Wide Deck Cran	kcase.

SSP-1776-5-PT2

April 13, 2020\*

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

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# TECHNICAL PUBLICATION REVISION

<b>REVISION NO.</b>	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE			
SSP-1776-5-PT2	Service Table of Limits	SSP-1776	October 28, 2013			
PREVIOU	S REVISIONS	CURRENT REVISION*				
Ар	ril 2018	April 2020				
2-8, 2-23, 2-24, 2-2.	5, 2-26, 2-27, 2-28, 2-29	2	-7			
• Deleted NOTES that refe Application Table		<ul> <li>Revised burnishing instru bushing in reference numl</li> <li>Revised the Mfr. Min. &amp; 1</li> </ul>	ctions for connecting rod ber 600 Max. Clearance for Piston Ring led Cylinders (Choke Barrels) ) in reference number 607			

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## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
500	AQ	Main Bearings and Crankshaft			<u>.0011L</u>	
	_	(Except Front)			.0041L	.0050L
	AZ	Main Bearings and Crankshaft			.0011L	
					.0041L	.0050L
	AQ	Front Main Bearings and			<u>.0021L</u>	
		Crankshaft			.0046L	.0050L
	AQ-AZ	Diameter of Main Bearing				
		Journal on Crankshaft (2-5/8	<u>2.6245</u>			
		Main)	2.626	(E)		
	AQ	Diameter of Front Main Bearing				
		Journal on Crankshaft (2-5/8	<u>2.6240</u>			
		Main)	2.6250	(E)		
	AQ-AZ	Crankcase Bearing Bore	<u>2.9365</u>			
		Diameter	2.9375	2.9390		
501	AQ-AZ	Connecting Rod Bearing and			<u>.0008L</u>	
		Crankshaft			.0038L	.0050L
	AZ	Diameter of Connecting Rod	<u>2.1235</u>			
		Journal on Crankshaft (2-1/8)	2.125	(E)		
	AQ	Diameter of Connecting Rod	<u>2.2485</u>			
		Journal on Crankshaft (2-1/4)	2.250	(E)		
	AZ	Connecting Rod Bearing Bore				
		Diameter (2-1/8) (Measure at	<u>2.2870</u>			
		Axis 30° on each side)	2.2875			
	AQ	Connecting Rod Bearing Bore				
		Diameter (2-1/4) (Measure at	<u>2.4205</u>			
		Axis 30° on each side)	2.4210			
502	AQ-AZ	Connecting Rod – Side			<u>.004L</u>	
		Clearance			.010L	.016L
503	AQ-AZ	Connecting Rod – Alignment				10 Inches
504	AQ-AZ	Connecting Rod – Twist			.012 in 1	10 Inches
505		Crankshaft Run-Out at Center				
		Main Bearings				
	AZ	Mounted on No. 1 and 4				
		Journals Max. Run-Out No. 2			005	0075
		and 3 Journals			.005	.0075
		Mounted on No. 1 and 3 Journals Max. Run-Out No. 2				
					002	0045
		Journal Mounted on No. 2 and 4			.003	.0045
		Journals Max. Run-Out No. 3				
		Journal			.003	.0045
	AQ	Mounted on No. 2 and 5			.005	.0043
		Journals Max. Run-Out No. 1				
		Journal			.002	.002
		Mounted on No. 2 and 5		<u> </u>	.002	.002
		Journals Max. Run-Out No. 3				
		Journal			.005	.0075
		Mounted on No. 2 and 4		1	.005	.0013
		Journals Max. Run-Out No. 3				
		Journal			.003	.0045
	1	Journal	1		.005	.0075

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

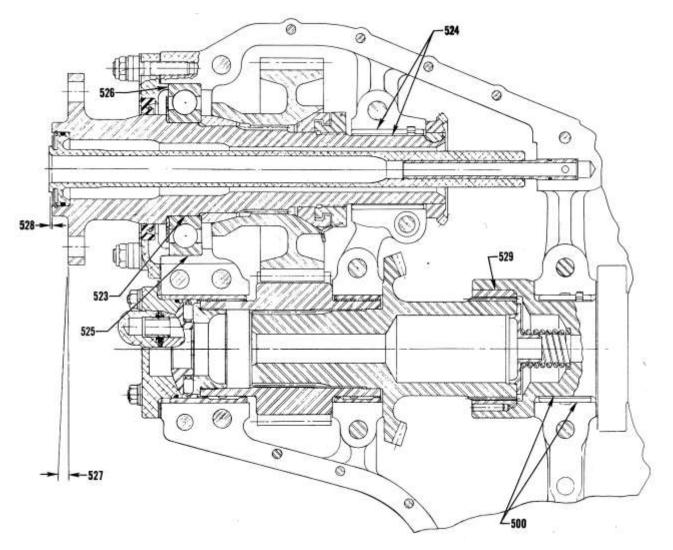
#### SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clearances	
Ref.	Chart	Nomenclature	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			0.02	0045
		Journal			.003	.0045
	AQ-AZ	Crankshaft and Crankcase – Front End Clearance			<u>.005L</u> .016L	.026L
507	AQ	Clearance – Front Face of			.010L	.020L
507		Crankshaft Oil Slinger to Front Face of Recess in Crankcase (Crankshaft Against Thrust			.002	
		Face)			.007	(A)
508	AQ-AZ	Crankshaft Propeller Flange Run-Out				.005
509	AQ	Starter Ring Gear and Support			<u>.014T</u> .022T	(A)
510	AQ-AZ	Crankshaft Timing Gear and Crankshaft			<u>.002L</u> .0005L	(A)
511	AQ-AZ	Tappet Body and Crankcase			<u>.0010L</u> .0030L	.004L
	AQ-AZ	O.D. of Tappet	<u>.9990</u> .9995	.9987	.00501	100112
	AQ-AZ	I.D. Tappet Bore in Crankcase	<u>1.0005</u> 1.0018	1.0021		
514	AQ-AZ	Camshaft and Crankcase	110010		<u>.002L</u> .004L	.006L
515	AQ-AZ	Camshaft – End Clearance			<u>.002L</u> .004L	.015L
516	AQ-AZ	Camshaft Run-Out at Center Bearing Journal			<u>.000</u> .001	.006
517	AQ-AZ	Counterweight Bushing and Crankshaft			<u>.0013T</u> .0026T	(A)
518	AQ-AZ	Counterweight Roller – End Clearance			<u>.003L</u> .025L	.038L
519	AQ-AZ	Counterweight and Crankshaft – Side Clearance (Measure Below Roller Next to Flat)			<u>.003L</u> .013L	.017L
520	AQ-AZ	Counterweight Bore and Washer O.D.			<u>.0002L</u> .0030L	(A)
521	AQ-AZ	I.D. Counterweight Bushing	<u>.7485</u> .7505	.7512		
	AZ	I.D. Counterweight Bushing (2 <sup>nd</sup> order)	<u>1.030</u> 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			<u>.0001L</u> .0012L	.002L
524	AZ	Propeller Shaft and Rear Bearing			<u>.0015L</u> .0030L	.0040L

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

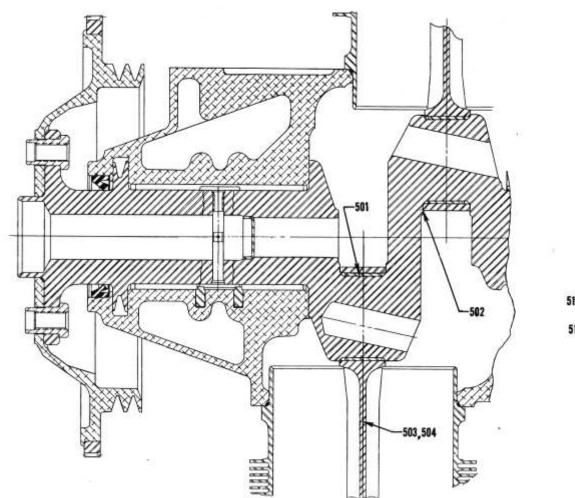
			Dimensions		Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
524	AZ	Propeller Shaft Bearing Bore	<u>2.1865</u>			
		Diameter	2.1875	2.1885		
525	AZ	Thrust Bearing and Crankcase			<u>.0006L</u>	
					.0010T	(A)
526	AZ	Thrust Bearing and Thrust				
		Bearing Cap Clamp Fit (Shim to			<u>.003T</u>	
		this Fit)			.005T	(A)
527	AZ	Thrust Bearing Tilt at 4 Foot		.027	' Tilt	
528	AZ	Thrust Bearing End Play			<u>.006</u>	
					.008	.010
529	AZ	Crankshaft and Crankshaft Front			<u>.0002T</u>	
		Bearing			.0015T	(A)

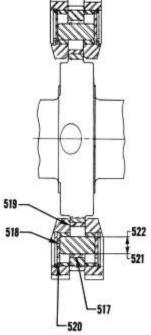


Section Thru Prop. Shaft, Crankshaft and Front Bearings

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION I - CRANKCASE, CRANKSHAFT, CAMSHAFT

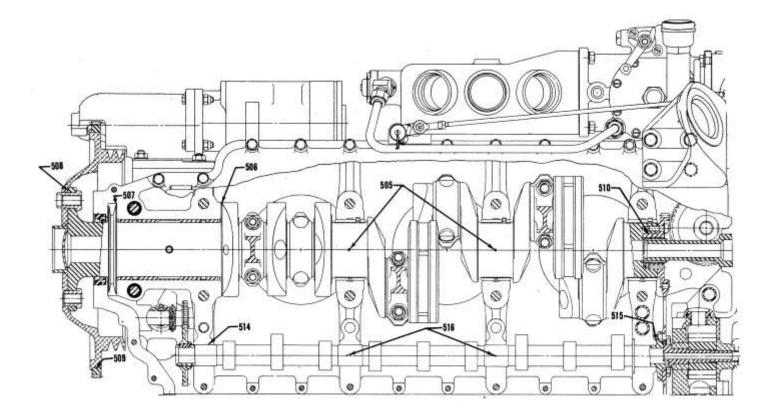




**Connecting Rod, Counterweights and Related Parts** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

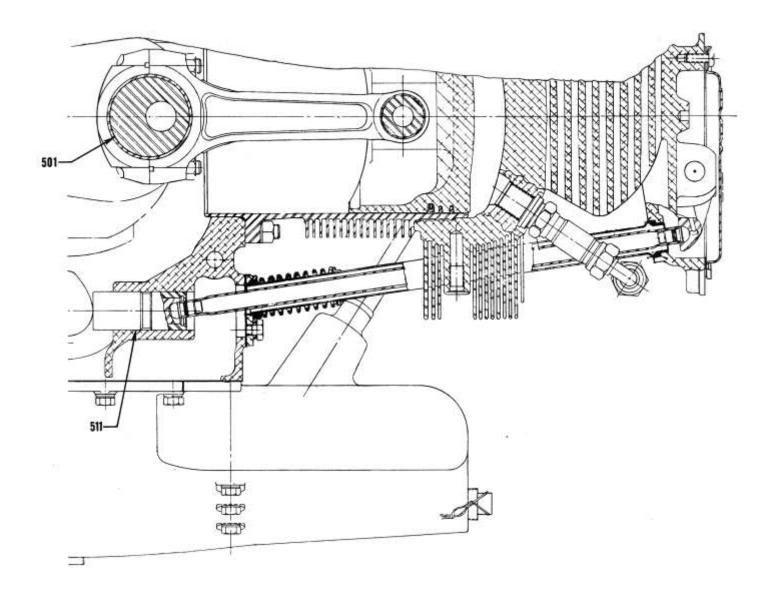
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



Longitudinal Section Thru Engine

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



**Connecting Rod Bearing, Tappet Body and Crankcase** 

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### **SECTION II – CYLINDERS**

				Dimensions		Clearances	
			Mfr. Min.		Mfr.		
<b>D</b> 4			& Max.	Service	Min. &	Service	
Ref.	Chart	Nomenclature		Max.	Max.	Max.	
600	AQ-AZ	Connecting Rod and Connecting			to be burnis		
		Rod Bushing		<u> 01K28983</u>	is not burnis	shed in place	
	AQ-AZ	Finished I.D. of Connecting Rod Bushing	$\frac{1.1254}{1.1262}$				
601	AQ-AZ	Length Between Connecting Rod	6.7485				
		Bearing Centers	6.7515				
602	AQ-AZ	Connecting Rod Bushing and			<u>.0008L</u>		
		Piston Pin			.0021L	.0025L	
603	AQ-AZ	Piston Pin and Piston			<u>.0003L</u> .0014L	.0018L	
	AQ-AZ	Diameter of Piston Pin Hole in	1.1249		.0014L	.0010L	
		Piston	1.1254				
	AQ-AZ	Diameter of Piston Pin	<u>1.1241</u>			1	
			1.1246				
604	AQ-AZ	Piston and Piston Pin Plug			<u>.0002L</u>		
					.0010L	.002L	
	AQ-AZ	*Diameter of Piston Pin Plug	$\frac{1.1242}{1.1247}$				
605	AQ-AZ	Piston Pin and Piston Pin Plug –	1.1247		.0005L		
		Nitrided and Chrome Cylinders			.0025L	.005L	
	AQ-AZ	*Diameter of Piston Pin Plug	.5655				
			.5665				
	* See latest revision of Se	rvice Instruction No. 1267.					
606	AQ-AZ	Piston Ring and Piston – Side			.0025L		
		Clearance (Top Ring Comp.)			.0055L	.008L (B)	
	AQ-AZ	Piston Ring and Piston – Side			<u>.000L</u>		
		Clearance (2 <sup>nd</sup> Ring Comp.)			.004L	.006L (B)	
	AQ-AZ	Piston Ring and Piston - Side			<u>.002L</u>		
		Clearance (Oil Regulating)			.004L	.006L (B)	
607	AQ-AZ	Piston Ring Gap (Compression)			0.20		
		Chrome Cylinders (Straight Barrels)			<u>.020</u> .030	047	
	AO AZ	Piston Ring Gap (Compression)			.030	.047	
	AQ-AZ	Nitrided and Chrome Cylinders			.045		
		(Choke Barrels)			.065	.067	
	AQ-AZ	Piston Ring Gap (Oil Regulating)			<u>.015</u>	,	
	(	(All Barrels)			.040	.047	
			1			1	

For All Other Barrels – Ring gap is measured at top limit of ring travel.

# **PART II – INTEGRAL ACCESSORY DRIVE ENGINES**

#### SECTION II – CYLINDERS

						Dim	Dimensions		Clearances	
Daf						Mfr. Min. &	Servi		Mfr. Min. &	Service
Ref.		Chart		enclature		Max.	May		Max.	Max.
	Engine and Engine Chart Code Letter	1 Piston Application Piston Number	Min. Pistor Top		Type of 1	Piston	Cylind Type of Surface	N	arrel Iaximum Diameter	Max. Clearance Piston Skirt & Cyl.
608 608 609 610	AQ-AZ	76966, LW-10545	5.0790	5.1090 H	Forged-	Cam N	[-C		5.1305	.018L
				NOTES:						
	from plane in	verage diameter of cy which valves are loc s; this sum, divided b pression.	ated. Second, 1	measure diame	ter thro	ough the p	lane in wl			
	Cylinder Barr	el: N=nitride hardene	d, C=chrome p	blated.						
	Maximum taper and out-of-round permitted for cylinder in service is .0045 inch.									
	To find the av diameter at rig	verage out-of-round, ght angles from plane	e in which valv	res are located.	Secon	d, measur				
	To find the av diameter at rig valves are loc Piston diameter	verage out-of-round,	e in which valv een diameters at top ring land	res are located. must not excee l (between top	Seconed .004 and se	id, measure 5 inch. cond comp n of the pi	e diameter pression ri ston skirt	r thro ng g	ough the pla rooves) at ri ight angles t	ne in which ght angle to o the piston
	To find the av diameter at rig valves are loc Piston diamete piston pin hol	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land	res are located. must not excee l (between top	Seconed .004 and se	d, measur 5 inch. cond comp n of the pi <i>Dimensio</i>	e diameter pression ri ston skirt	r thro ng g	ough the pla rooves) at ri ight angles t <i>Clearance</i>	ne in which ght angle to o the piston
Ref.	To find the av diameter at rig valves are loc Piston diamete piston pin hol	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land	res are located. must not excee d (between top neasured at the	Seconed .004 and se	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. &	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	ough the pla rooves) at ri ight angles t <i>Clearance</i> <b>Mfr.</b> <b>Min. &amp;</b>	ne in which ght angle to o the piston s Service
<b>Ref.</b> 611	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin.	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land n of piston is n <i>Nomenclature</i> Exhaust Valvo	res are located. must not excee d (between top neasured at the	Secon ed .004 and sec bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> <b>Mfr.</b>	e diameter pression ri ston skirt	ng g at ri	rooves) at ri ight angles t <i>Clearance</i> <b>Mfr.</b> <b>Min. &amp;</b> <b>Max.</b> <u>.0075T</u>	ne in which ght angle to o the piston s Service Max.
	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i>	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valveen diameters at top ring land n of piston is n	res are located. must not excee I (between top heasured at the e e Seat and Cyli	Secon ed .004 and sec bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. & Max. <u>1.9355</u>	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	ough the pla rooves) at ri ight angles t <i>Clearance</i> <b>Mfr.</b> <b>Min. &amp;</b> <b>Max.</b>	ne in which ght angle to o the piston s Service
	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i> AQ-AZ	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land n of piston is n <u>Nomenclature</u> Exhaust Valvo Head	res are located. must not excee d (between top neasured at the e e Seat and Cyli Seat Seat Hole in	Secon ed .004 and sec bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. & Max.	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	rooves) at ri ight angles t <i>Clearance</i> <b>Mfr.</b> <b>Min. &amp;</b> <b>Max.</b> <u>.0075T</u>	ne in which ght angle to o the piston s Service Max.
	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i> AQ-AZ AQ-AZ	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land of piston is n <i>Nomenclature</i> Exhaust Valve Head O.D. Exhaust I.D. Exhaust S	res are located. must not excee d (between top neasured at the e Seat and Cylic Seat Seat Hole in d Seat Hole in	Secon ed .004 and sec bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. & Max. <u>1.9355</u> <u>1.937</u> <u>1.926</u>	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	rooves) at ri ight angles t <i>Clearance</i> <b>Mfr.</b> <b>Min. &amp;</b> <b>Max.</b> <u>.0075T</u>	ne in which ght angle to o the piston s Service Max.
611	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i> AQ-AZ AQ-AZ AQ-AZ	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land n of piston is m <u>Nomenclature</u> Exhaust Valve Head O.D. Exhaust I.D. Exhaust S Cylinder Heac Intake Valve S	res are located. must not excee I (between top heasured at the e Seat and Cyli Seat Seat Hole in d Seat Hole in d	Secon ed .004 and sec bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. & Max. <u>1.9355</u> <u>1.937</u> <u>1.926</u>	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	ough the pla rooves) at ri ight angles t Clearance Mfr. Min. & Max. .0075T .011T	ne in which ght angle to o the piston s Service Max. (A)
611	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i> AQ-AZ AQ-AZ AQ-AZ AQ-AZ	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land of piston is n Nomenclature Exhaust Valve Head O.D. Exhaust I.D. Exhaust Cylinder Head O.D. Intake S	res are located. must not excee I (between top heasured at the e Seat and Cyli Seat Seat Hole in d Seat Hole in d	Secon ed .004 and se bottor	d, measur 5 inch. cond comp n of the pi Dimension Mfr. Min. & Max. <u>1.9355</u> <u>1.937</u> <u>1.926</u> 1.928 <u>2.2885</u>	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	ough the pla rooves) at ri ight angles t Clearance Mfr. Min. & Max. .0075T .011T	ne in which ght angle to o the piston s Service Max. (A)
611	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i> AQ-AZ AQ-AZ AQ-AZ AQ-AZ AQ-AZ	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land of piston is n Nomenclature Exhaust Valve Head O.D. Exhaust I.D. Exhaust Cylinder Head O.D. Intake Se I.D. Intake Se	res are located. must not excee d (between top heasured at the easured at the seat and Cylic Seat Seat Hole in d Seat Hole in d eat eat eat Hole in Cylic e Guide and	Secon ed .004 and se bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. & <u>Max.</u> <u>1.9355</u> <u>1.937</u> <u>1.926</u> <u>1.928</u> <u>2.2885</u> <u>2.290</u> <u>2.280</u>	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	ough the pla rooves) at ri ight angles t Clearance Mfr. Min. & Max. .0075T .011T	ne in which ght angle to o the piston s Service Max. (A)
611	To find the av diameter at rig valves are loc Piston diamete piston pin hol pin. <i>Chart</i> AQ-AZ AQ-AZ AQ-AZ AQ-AZ AQ-AZ AQ-AZ	verage out-of-round, ght angles from plane ated. Difference betw er at top is measured	e in which valv een diameters at top ring land of piston is m <i>Nomenclature</i> Exhaust Valve Head O.D. Exhaust I.D. Exhaust S Cylinder Head O.D. Intake Se Head Exhaust Valve	res are located. must not excee d (between top heasured at the easured at the seat and Cylic Seat Seat Hole in d Seat Hole in d eat eat eat Hole in Cylic e Guide and d	Secon ed .004 and se bottor	d, measur 5 inch. cond comp n of the pi <u>Dimensio</u> Mfr. Min. & <u>Max.</u> <u>1.9355</u> <u>1.937</u> <u>1.926</u> <u>1.928</u> <u>2.2885</u> <u>2.290</u> <u>2.280</u>	e diameter pression ri ston skirt <u>ns</u> Servi	ng g at ri	ough the pla rooves) at ri ight angles t Clearance Mfr. Min. & Max. .0075T .011T .011T	ne in which ght angle to o the piston s Service Max. (A) (A)

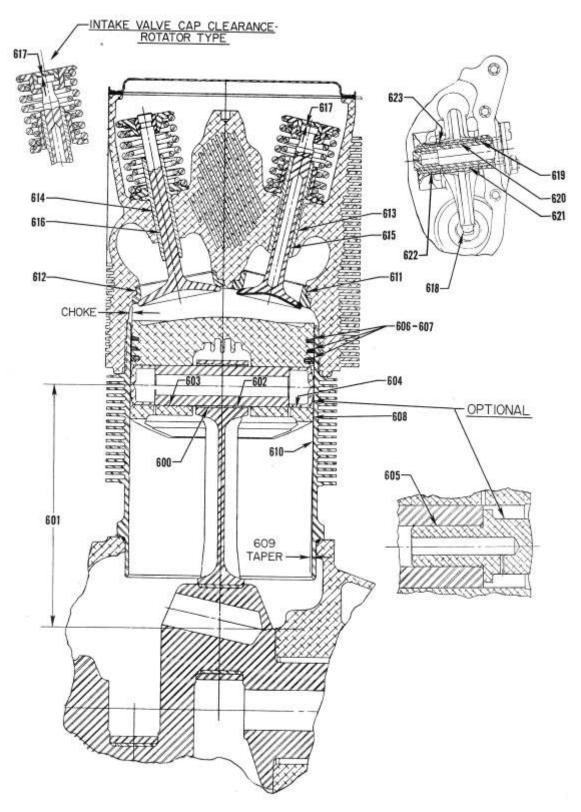
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION II – CYLINDERS

			Dimensions		Clearances	
			Mfr. Min. &	Service	Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
614	AQ-AZ	Intake Valve Guide and Cylinder Head			<u>.0010T</u> .0025T	
	AQ-AZ	O.D. Intake Valve Guide	<u>.5933</u> .5938			
	AQ-AZ	I.D. Intake Valve Guide Hole in Cylinder Head	<u>.5913</u> .5923			
615	AQ-AZ	Exhaust Valve Stem and Valve Guide			<u>.0037L</u> .0050L	(A)
	AQ-AZ	O.D. Exhaust Valve Stem	<u>.4955</u> .4965	.4937		
	AQ-AZ	Finished I.D. Exhaust Valve Guide	<u>.4995</u> .5005			
616	.001 in. during each 100 hours	f service. After 300 hours of service, ins of operation up to the recommended ov est revision of Service Instruction No. 1 Intake Valve Stem and Valve	verhaul time	for the engir	ne, or not to e	
	AQ-AZ	Guide O.D. Intake Valve Stem	4022		.0028L	.006L
	AQ-AZ	O.D. Intake varve Stem	<u>.4022</u> .4030	.4010		
	AQ-AZ	Finished I.D. Intake Valve Guide	<u>.4040</u> .4050			
617	AQ-AZ	Intake and Exhaust Valve and Valve Cap – Clearance (Rotator Type with Small Diameter Head)			<u>.000</u> .004L	.005L
618	AQ-AZ	Dry Tappet Clearance			<u>.040</u> .105	10002
619	AQ-AZ	Valve Rocker Shaft and Valve Rocker Bushing			<u>.0001L</u> .0013L	.0025L
	AQ-AZ	Finished I.D. of Valve Rocker Shaft (Bushing) in Cylinder Head	<u>.6246</u> .6261	.6270		
620	AQ-AZ	Valve Rocker Shaft and Valve Rocker Bushing			<u>.0007L</u> .0017L	.004L
	AQ-AZ	Finished I.D. of Rocker Arm Bushing	<u>.6252</u> .6263	.6270		
	AQ-AZ	O.D. Valve Rocker Shaft	<u>.6241</u> .6245	.6231		
621	AQ-AZ	Valve Rocker Bushing and Valve Rocker	Bushing Must Be Burnished in Place			Place
622	AQ-AZ	Valve Rocker Shaft Bushing and Cylinder Head			<u>.0022T</u> .0038T	(A)
	AQ-AZ	Valve Rocker Shaft Bushing Hole in Cylinder Head	<u>.7380</u> .7388			
623	AQ-AZ	Valve Rocker and Cylinder Head – Side Clearance			<u>.002L</u> .020L	.024L

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS



Cylinder, Piston and Valve Components

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION III – GEAR TRAIN

			Dimensions		Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
OIL P	UMP					
700	AQ-AZ	Oil Pump Drive Shaft and Oil			.0010L	
		Pump Body			.0030L	.004L
701	AQ-AZ	Oil Pump Drive Shaft and Oil			<u>.0035L</u>	
		Pump Cover			.0050L	.0065L
703	AQ-AZ	Oil Pump Impellers – Diameter			<u>.002L</u>	
		Clearance			.005L	.008L
704	AQ-AZ	Oil Pump Impellers – Side			<u>.002L</u>	0.0 51
		Clearance	1.070		.0045L	.005L
		Width of Oil Pump Impellers	<u>1.372</u>	1 271		
705	40.47	Oil Pump Driven Impellers and	1.374	1.371	00051	
703	AQ-AZ	Idler Shaft			<u>.0005L</u> .002L	.004L
FIIFI	PUMP	Idioi Shart			.002L	.004L
		Fred Down Idley Coop and Shoft			0011	
722	AQ-AZ	Fuel Pump Idler Gear and Shaft			<u>.001L</u> .003L	.005L
725	AQ-AZ	Fuel Pump Idler Gear – End			.003L	.003L
125	AQ-AL	Clearance			.028L	.038L
726	AQ-AZ	Fuel Pump Drive Shaft Gear and			.020L	.0301
/20		Crankcase			.0025L	.004L
727	AQ-AZ	Fuel Pump Drive Shaft Gear –			.0015L	
		End Clearance			.0385L	.0485L
GOVE	CRNOR & TACHOMETER	·				•
728	AQ	Front Governor Drive Idler Shaft			.0010L	
		(Both Ends) and Crankcase			.0025L	.004L
731	AQ-AZ	Governor Driven Gear and			.0010L	
		Crankcase			.0025L	.004L
732	AQ-AZ	Propeller Governor Drive Gear –			<u>.008L</u>	
		End Clearance			.016L	.021L
739	AZ	Tachometer Drive Shaft and			<u>.0015L</u>	
		Adapter			.0035L	.006L
VACU	UM PUMP & HYDRAULI	C PUMP	1	1	1	1
759	AQ-AZ	Vacuum and Hydraulic Pump			<u>.0010L</u>	
		Drive Shaft Gear and Crankcase			.0025L	.006L
760	AQ-AZ	Vacuum and Hydraulic Pump				
		Drive Shaft Gear – End			<u>.018L</u>	
14.00		Clearance			.028L	.035L
MAGN						
761	AQ-AZ	Magneto Coupling and			<u>.0010L</u>	0.5.17
		Crankcase			.0030L	.004L
762	AQ-AZ	Magneto Drive Shaft Gear and			<u>.0010L</u>	0.0.47
		Crankcase			.0030L	.004L

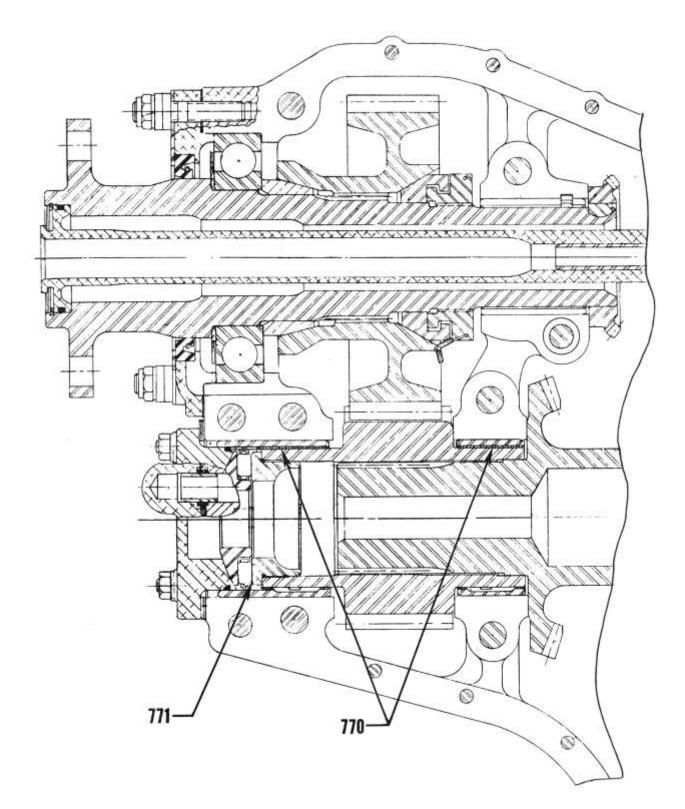
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION III – GEAR TRAIN

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

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

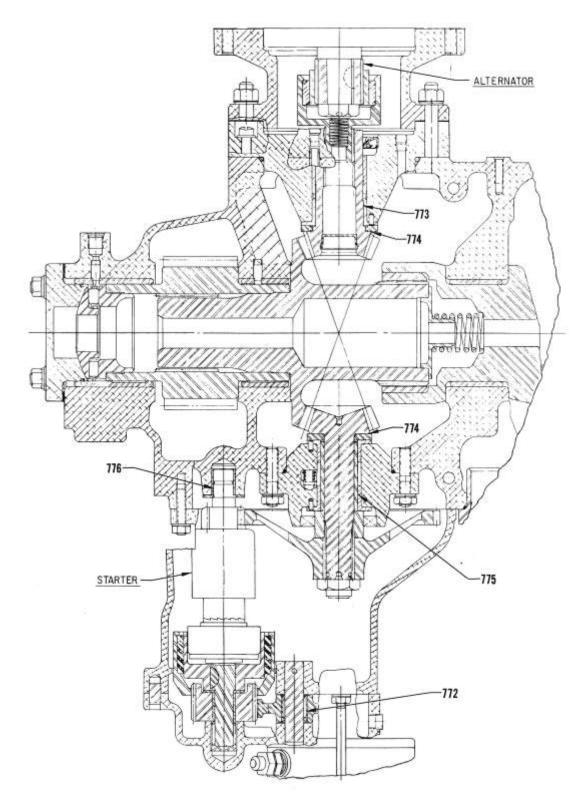
SECTION III – GEAR TRAIN



#### **Propeller Shaft Drive Gear**

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

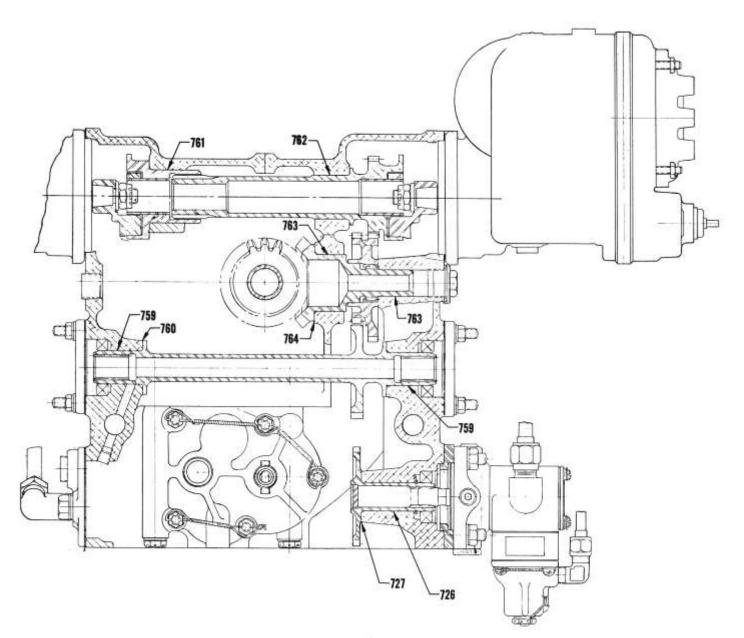
SECTION III – GEAR TRAIN



Alternator, Starter and Propeller Shaft

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

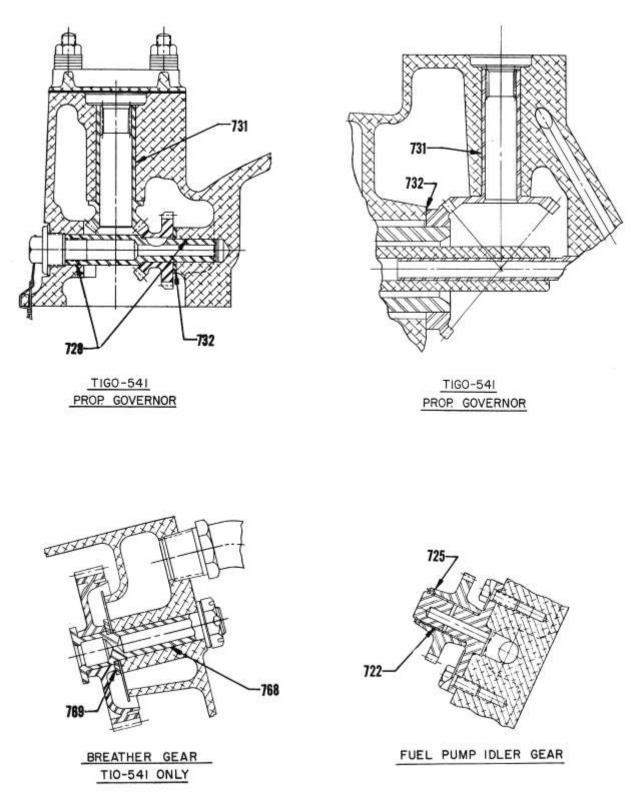
SECTION III – GEAR TRAIN



## Fuel Pump, Magneto, Vacuum and Hydraulic Pump

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

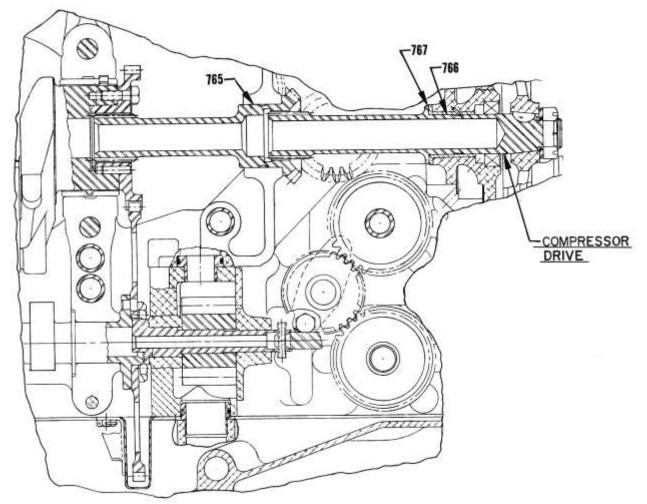
SECTION III – GEAR TRAIN

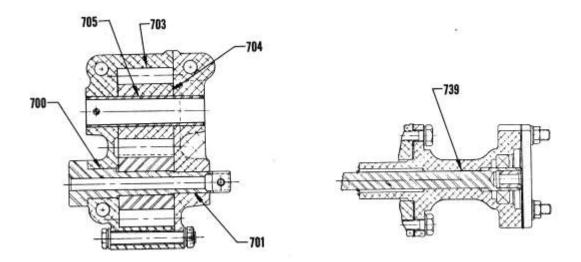


#### **Governor, Fuel Pump and Breather Gear**

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III - GEAR TRAIN





**Oil Pump, Tachometer and Compressor** 

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

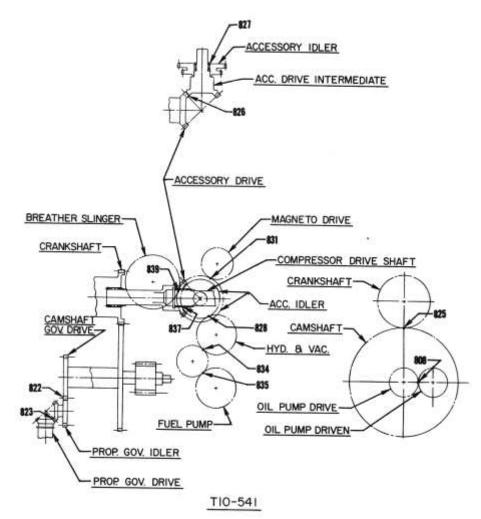
#### SECTION IV – BACKLASH

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

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION IV – BACKLASH

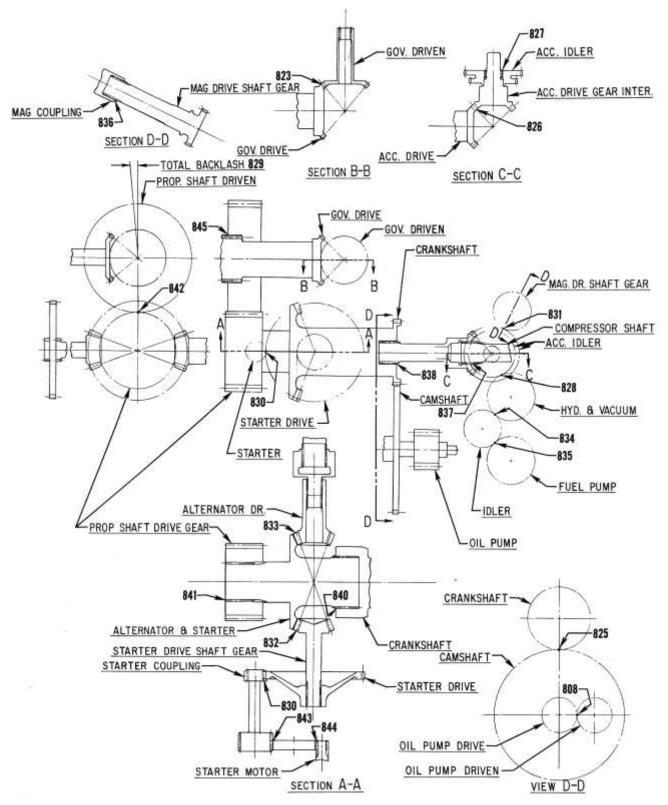
			Dimensions		Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
841	AZ	Propeller Shaft Drive Gear and Alternator and Starter Shaft Gear – Spline Backlash			<u>.001</u> .004	.006
842	AZ	Propeller Shaft Drive Gear and Driven Gear – Backlash			<u>.008</u> .014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



**Accessory Drives** 

PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION IV - BACKLASH



**Accessory Drives** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

### SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	Chart		Thread Size	Nomen	clature	Torque Limits
900	AQ-AZ		3/8-24	Connec	ting Rod Nuts – Tighten	
				to Leng		2.255-2.256
903	AQ-AZ		3/8-24		to – Nut (To attach drive	
					r to magneto)	300 in. lbs.
904	AQ-AZ		10-32		to – Plate Screws	15 in. lbs.
905	AQ-AZ (using a	silicone gasket)	1/4-20		Box Screws	35 inlbs.
	AQ-AZ (using a		1/4-20	Rocker	Box Screws	50 in. lbs.
907	AQ-AZ		18MM	Spark F	lugs	420 in. lbs.
909	AQ				tor Pulley Nut	450 in. lbs.
	AZ				tor Quill Shaft Nut	474 in. lbs.
910	AQ-AZ		1/4-28	Alterna	tor Output Terminal Nut	85 in. lbs.
911	AQ-AZ		10-32		tor Auxiliary Nut	30 in. lbs.
912	AQ-AZ		5/16-24		Terminal Nut	2 in. lbs.
913	AQ-AZ		1/16-27 NPT	Piston (	Cooling Nozzle in	
	-			Crankc	ase	100 in. lbs.
915	AQ-AZ		3/4-16	Oil Filt	er Bolt (AC Can and	
				Elemen		300 in. lbs.
	AQ-AZ		13/16-16		er (Throw away type)	240 in. lbs.
	AQ-AZ		3/4-16	Conver	ter Stud	720 in. lbs.
917	AQ-AZ		1.00-14	Oil Coo	oler Bypass Valve	300 in. lbs.
918	AQ-AZ		1-1/4-12	Oil Pre	ssure Relief Valve	300 in. lbs.
919	AQ-AZ			Hose Clamps		45 in. lbs.
921	AQ-AZ		Exhaust V-Band	d Couplin	g Torque Data	·
					T-Bolt Split Type	1/4 In. Drilled Hex Nut
	Coupling Size	Lycoming Part			Locknut Torque In.	with Safety Wire
	Tube OD	No.	Vendor Part	t No.	Lbs.	Torque In. Lbs.
	2.00 in.	LW-12093-5	MVT69183	-200	85	75
	2.25 in.	LW-12093-6	MVT-69183	3-225	85	75
	2.25 in.	LW-12125-3	MVT-69197	-225	85	
922	AZ		Turbocharger V	-Band To	rque Data	
	Turbocharge	er Model No.	V-Clamp Par	rt No.	V-Clamp Diameter	Torque In. Lbs.
	T184	A21*	400500-9	25	9.25 in.	40-60
	* - AiResearch t	urbocharger.				
	See latest revisio	on of Service Instr	<u>uction No. 1238</u> f	<u>or assem</u> t	oly procedure.	
923	AZ		2-1/16-12	Propell	er Shaft Lock Nut	1000 ft. lbs.
924	AQ-AZ		7/16-20	Fuel In	jector Nozzles (In	
					on Housing)	210 in. lbs.
925	AQ-AZ		3/4-16	Compre	essor Drive Pulley Nut	240 in. lbs.
926	AZ		5/8-18		Drive Shaft Gear Nut	900 in. lbs.
927	AQ-AZ		1/4		Crankshaft Gear	96-120 in. lbs.
928	AQ-AZ		3/8-16	~	er Hold Down Studs	
					case Driving Torque)	100 in. lbs.
			1/2-13		er Hold Down Studs (Cr	
					e Driving Torque)	250 in. lbs.
929	AQ-AZ		3/8		er Hold Down Nuts	300 in. lbs.
			1/2		er Hold Down Nuts	600 in. lbs.
		own Nut Tighteni	Ŭ		evision of Service Instructi	on No. 1029.
932	AQ-AZ		5/16-18		t Transitions – Studs	
					g Torque)	100 in. lbs.
			3/8-16		t Transitions – Studs	
				(Drivin	g Torque)	200 in. lbs.

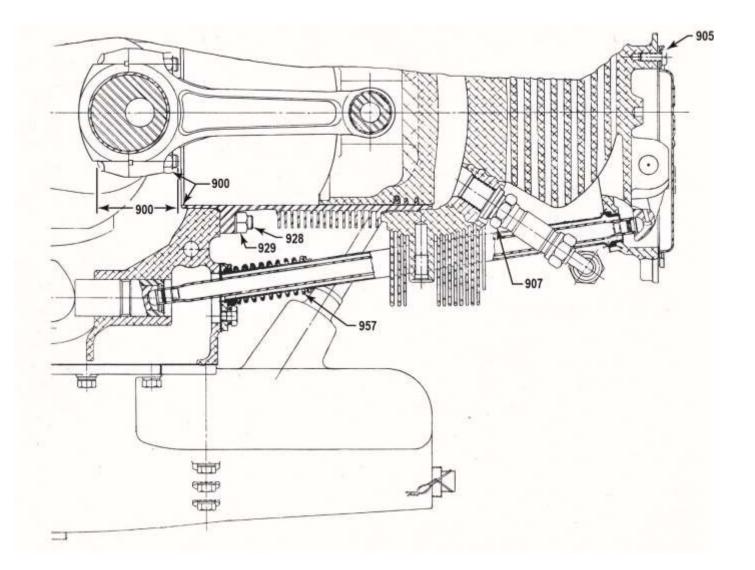
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPRINGS

							C	OMP. LOA	D
Ref.	Chart	Nomenc	lature	Lyc. Part No.	Wire Dia.	Length at Comp. Length	Mfr. Min.	Mfr. Max.	Service Max.
950	AQ-AZ	Outer Valve S	pring	LW-11798	.192	1.610 in.	136 lb.	144 lb.	133 lb.
	-			76351	.177	1.610 in.	136 lb.	144 lb.	min.
951	AQ-AZ	Auxiliary Valv	ve Spring	LW-11799	.148	1.48 in.	86 lb.	94 lb.	83 lb.
				76352	.142	1.48 in.	86 lb.	94 lb.	min.
952	AQ-AZ	Oil Pressure R	elief						
		Valve Spring							
		Lycoming	Ident	ification					
		Part		Free					
		Numbers	Dye	Length				-	-
									7.1 lb.
		68668	Purple	2.04	.054	1.30 in.	7.1 lb.	7.8 lb.	min.
									10.5 lb.
		LW-11713	White	2.12	.059	1.44 in.	10.79 lb.	11.92 lb.	min.
									8.3 lb.
		LW-11138	None	2.64	.051	1.44 in.	8.55 lb.	9.45 lb.	min.
955	AQ-AZ	Fuel Drain Che	eck Valve S	pring					5.35 lb.
					.047	.75 in.	5.50 lb.	6.50 lb.	min.
956	AQ-AZ	Oil Filter Relie	ef Valve Sp	ring					3.00 lb.
					.054	1.93 in.	3.05 lb.	3.55 lb.	min.
957	AZ	Shroud Tube S	Spring						13 lb.
0.50					.105	2.09 in.	14 lb.	16 lb.	min.
958	AQ-AZ	Pressurizing V	Pressurizing Valve Spring						.63 lb.
0.50					.032	.455485	.65 lb.	.75 lb.	min.
959	AZ	Spring Between Cranksha							46 lb.
0.60		Starter and Alt			.13	1.40 in.	48 lb.	52 lb.	min.
960	AZ	Alternator Driv	ve Coupling	g Spring					9 lb.
					.047	.83 in.	10 lb.	11 lb.	min.

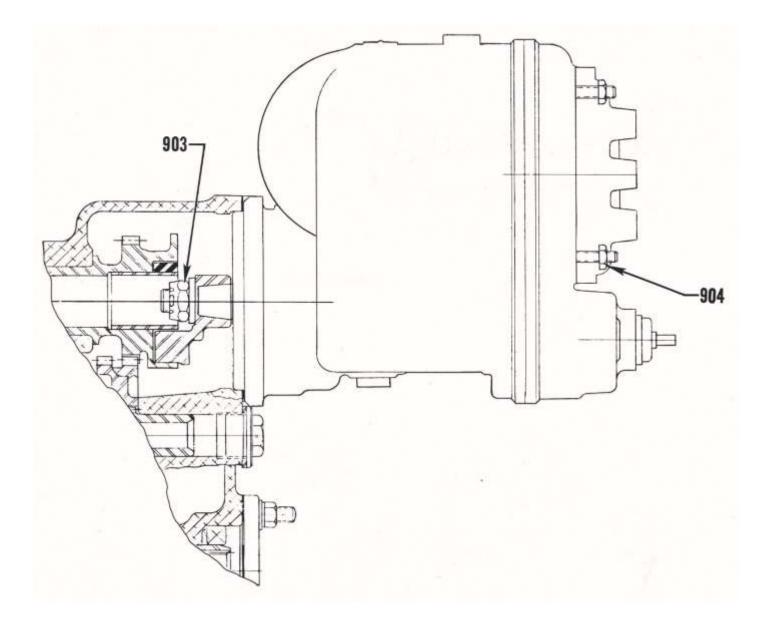
### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



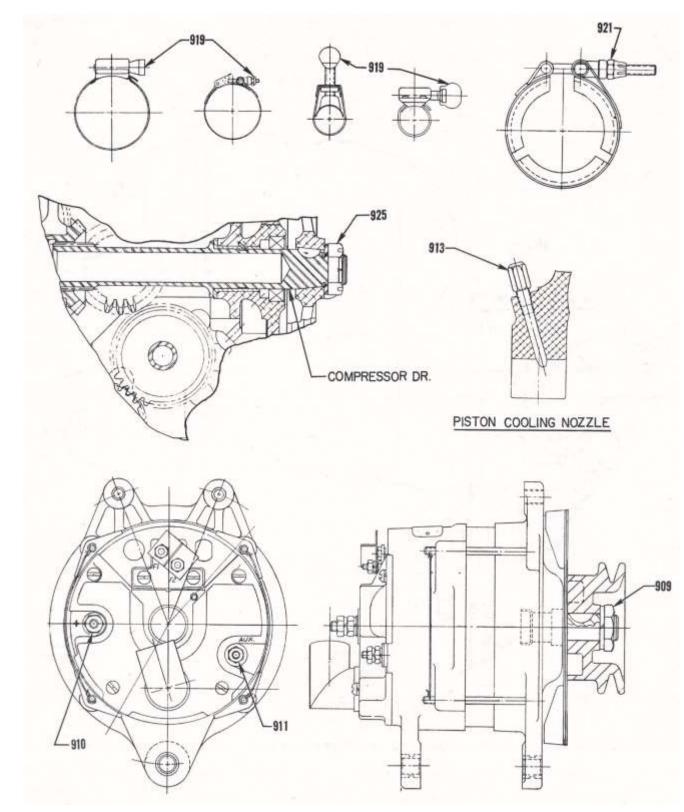
### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



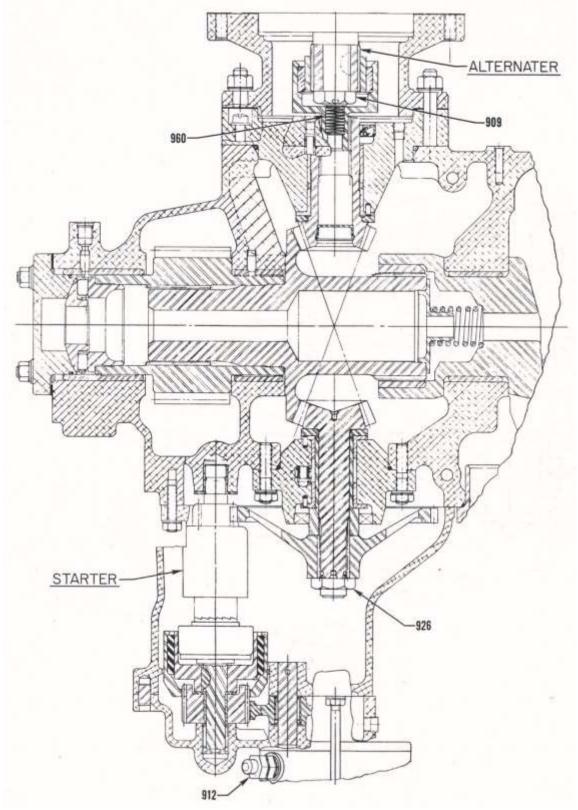
### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

### SECTION V – SPECIAL TORQUE REQUIREMENTS



### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

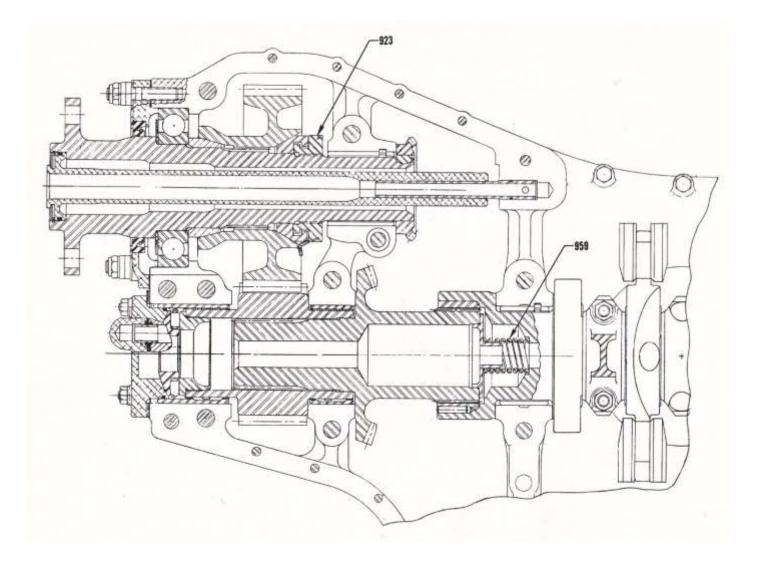
### SECTION V – SPECIAL TORQUE REQUIREMENTS



**Engine Accessories and Hardware** 

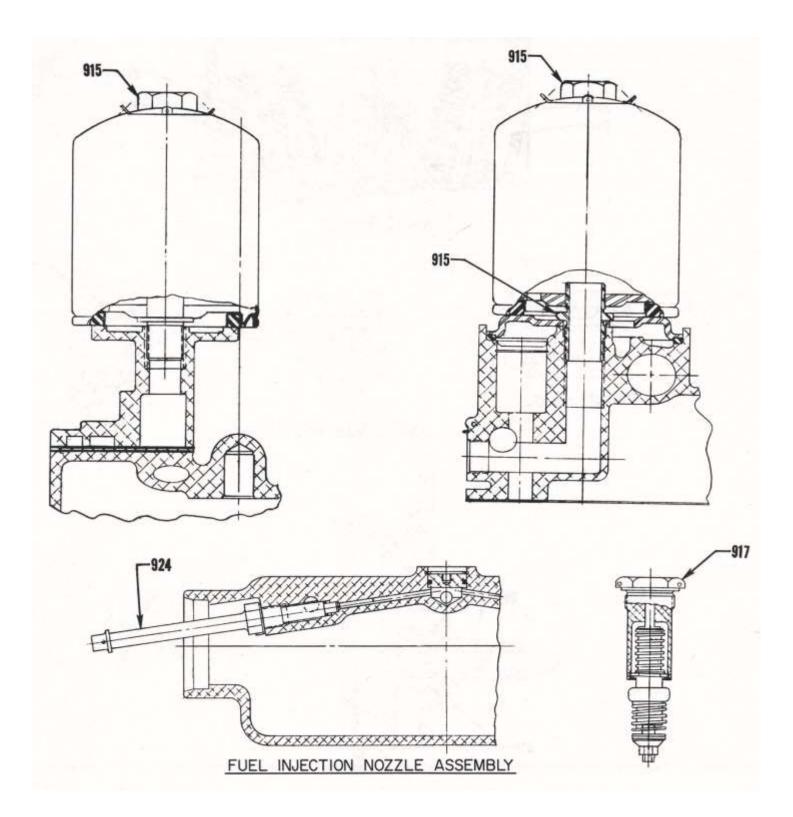
### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



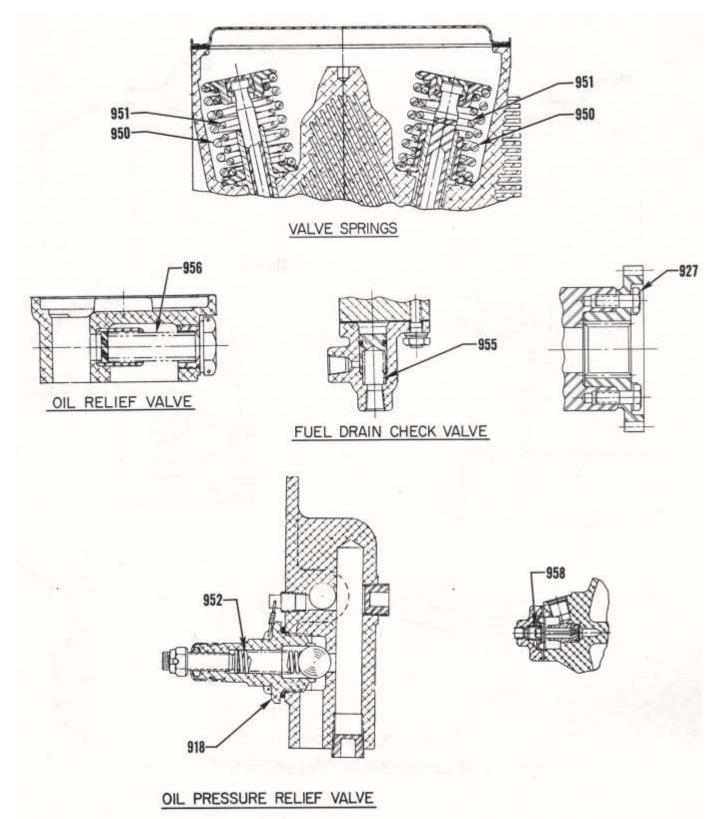
### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

### SECTION V – SPECIAL TORQUE REQUIREMENTS



### PART II - INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION V – SPECIAL TORQUE REQUIREMENTS



### 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).

		TAE	BLE I			TAB	LE II
	B	OLTS, SCRE		PIPE PLUGS			
Thread	Tor	que	Thread	Torque		Thread	Torque
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Thread	In. Lbs.
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121
3/8	3/8 360 to 396 30 to 33 3/4 3240 to 3564 270 to 297				270 to 297	1/2-14 NPT	160 to 176
тц	IN NUTS (1/2		3/4-14 NPT	230 to 252			
10	$\lim \operatorname{NO1S}(1/2$	2 DIA. OF BU	JL1) = 1/2	LISTED TORU	UE	1-11-1/2 NPT	315 to 347

TABLE III			TABLE IV			
CRUSH TYPE GAS	KETS		FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)			
Thread Pitch on Part to be Tightened	ANGLE OF TURN		Tube	Thread	Torque In. Lbs.	
Threads Per Inch	Aluminum	Copper	Size		Aluminum Alloy	Steel
8	135°	67°	(-3) 3/16	3/8 - 24	30 to 50	70 to 80
10	135°	67°	(-4) 1/4	7/16 - 20	40 to 65	90 to 100
12	180°	90°	(-5) 5/16	1/2 - 20	60 to 80	135 to 150
14	180°	90°	(-6) 3/8	9/16-18	75 to 125	270 to 300
16	270°	135°	(-8) 1/2	3/4-16	150 to 250	450 to 500
18	270°	135°	(-10) 5/8	7/8 - 14	200 to 350	650 to 700
20	270°	135°				
24	360°	180°		Т	ABLE V	
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	Е
NOTE: Install all crush type gas	skets except	the self	Thr	eads	Torque In.	Lbs.
centering type, with the unbroken sur	centering type, with the unbroken surface against the flange					
of the plug or part being tightened ag	5/1	1/4-20         15           5/16-18         25				
part until the sealing surfaces are in c	3/8-16 50					
to the angle of turn listed for the appr						
NOTE: Lubricate Threads Unless Ot	herwise Speci	fied.				

	TABLE VI							
JAN	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						

### STANDARD TORQUE (CONT.) UNLESS OTHERWISE LISTED

	TABLE VII										
	METAL TUBE FITTINGS										
	Wrench torque for tightening AN-818 Nut (pound inches)										
Dash Nos. Ref.	Tubing OD inches	Aluminum-	alloy tubing			eel tubingAluminum-alloy tubing(Flare MS33583) for use on oxygen lines only		measured to tubing centerline. Dimension in inches			
		Minimum	Maximum	Minimum	Minimum Maximum		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		

# **PART III – GEARED ENGINES**

CHART	MODELS
Е	GO-435 ALL
E1	GO-435-C2B2, -C2B2-6
Н	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)
Р	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 SECTION II SECTION III SECTION IV SECTION V	500 SERIES 600 SERIES 700 & 7000 SERIES 800 SEREIS 900 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT CYLINDERS GEAR TRAIN BACKLASH (GEAR TRAIN) TORQUE & SPRINGS
(A)		ink fits controlled by machining, fits that may readily be ar does not normally occur. In each case, the fit must be held e.
(B)	Side clearance on piston r	ings must be measured with face of ring flush with piston.
(C)		these items must be made to give uniform backlash within ary gear and pinions, and within 0.001 between the pinions
(D)	These dimensions shown piston pin.	are measured at bottom of piston skirt at right angles to
(E)	Permissible wear of the croom the diameter.	ankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherein a defin	ite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or interfe	rence fit.

#### SSP-1776-5-PT3

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

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# TECHNICAL PUBLICATION REVISION

	PUBLICATION	<b>PUBLICATION NO.</b>	<b>PUBLICATION DATE</b>
SSP-1776-5-PT3	Service Table of Limits	SSP-1776	October 28, 2013
PREVIOUS RE	EVISIONS	CURRENT	REVISION*
April 20	018	April	2020
3-9, 3-47, 3	3-53	3-	-8
<ul> <li>Deleted NOTES that reference Application Table</li> <li>Added Ref. number 930 to Sec torque value for brass union nu fuel lines and primer lines (Bot</li> </ul>	ction V table and figure for ut on stainless steel injector		ber 600 Max. Clearance for Piston Ring ed Cylinders (Choke Barrels) in reference number 607

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### PART III – GEARED ENGINES

#### SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	E-H1-H2-H4	All Main Bearings and Crankshaft			<u>.0015L</u> .0045L	.0060L
	Н3-Н5-Р-АВ-АС	Main Bearings and Crankshaft (Except Front)			<u>.0011L</u> .0041L	.0050L
	Н3-Н5-Р-АВ-АС	Front Main Bearings and Crankshaft			<u>.0011L</u> .0041L	.0050L
	E-H-P	Diameter of Main Bearing Journal on Crankshaft	<u>2.3745</u> 2.376	(E)		
	E-H1-H2-H4	Crankcase Bearing Bore Diameters (All)	<u>2.566</u> 2.567	2.5685		
	Н3-Н5-Р-АВ-АС	Crankcase Bearing Bore Diameters (All)	$\frac{2.6865}{2.6875}$	2.6890		
501	ALL	Connecting Rod Bearings and Crankshaft			<u>.0008L</u> .0038L	.0050L
	ALL	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	<u>2.1235</u> 2.125	(E)		
	ALL	Connecting Rod Bearing Bore Diameter (Measured at axis 30° on each side)	$\frac{2.2870}{2.2875}$			
502	ALL	Connecting Rod Side Clearance			<u>.004L</u> .010L	.016L
503	ALL	Connecting Rod Alignment			.010 in 1	0 Inches
504	ALL	Connecting Rod Twist			.012 in 1	0 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			<u>.006L</u> .015L	.025L
510	Е-Н1-Н2-Н3	Crankshaft Timing Gear and Crankshaft			<u>.0015L</u> .0005T	(A)
	Н4-Н5-Р-АВ-АС	Crankshaft Timing Gear and Crankshaft			<u>.0000</u> .0015T	(A)
511	ALL	Tappet Body and Crankcase			<u>.0010L</u> .0033L	.004L
	ALL	O.D. of Tappet	<u>.7169</u> .7177	.7166		
	ALL	I.D. Tappet Bore in Crankcase	<u>.7187</u> .7200	.7203		

### PART III – GEARED ENGINES

#### SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
512	ALL	Tappet Plunger Assembly and			<u>.0010L</u>	
		Body (Hyperbolic)			.0067L	.0087L
513	ALL	Tappet Socket and Body			<u>.002L</u>	
		(Hyperbolic)			.007L	.009L
514	ALL	Camshaft and Crankcase			<u>.002L</u>	
					.004L	.006L
515	ALL	Camshaft – End Clearance			<u>.002L</u>	
					.009L	.015L
516	ALL	Camshaft Run-Out at Center			<u>.000</u>	
		Bearing Journal			.001	.006
517	ALL	Counterweight Bushing and			<u>.0013T</u>	
		Crankshaft			.0026T	(A)
518	ALL	Counterweight Roller – End			<u>.007L</u>	
		Clearance			.025L	.038L
519	ALL	Counterweight and Crankshaft –			<u>.003L</u>	0.1.57
		Side Clearance*			.013L	.017L
	* - Measure below roller next		1	1	r	1
520	ALL	Counterweight Bore and Washer			<u>.0002L</u>	
		O.D.			.0030L	(A)
521	ALL	I.D. of Counterweight Bushing	<u>.7485</u>			
			.7505	.7512		
522	ALL	O.D. of Counterweight Roller				
		(P/N 69433) (See latest revision	<u>.5045</u>			
		of Service Instruction No. 1012)	.5050			
	AC	O.D. of Counterweight Roller	<b>51</b> 00			
		(P/N 73287) (See latest revision	<u>.5189</u>			
		of Service Instruction No. 1012)	.5194			
	ALL	O.D. of Counterweight Roller	6045			
		(P/N 70416) (See latest revision of Service Instruction No. 1012)	<u>.6945</u> .6950			
523	ALL	Thrust Bearing and Propeller	.0930		.0000	
525	ALL	Shaft			.0012L	.002L
526	ALL	Thrust Bearing and Thrust			.0012L	.002L
520		Bearing Cap Clamp Fit (Shim to			.003T	
		this fit)			.005T	(A)
527	ALL	Thrust Bearing Tilt			.027 Tilt	(1-)
528	ALL	Thrust Bearing – End Play			<u>.006</u>	
520		Thrust Dearing – End Flay			.000	.010
530	ALL	Propeller Shaft Run-Out (Rear			.000	.010
550		Cone Location)				.003
531	ALL	Propeller Shaft Run-Out (Front				.005
221		Cone Location) (Propeller Shaft				
		Installed)				.007
532	Е-Н1-Н2-Н3	Starter Jaw and Crankshaft			.0005L	
					.0040L	(A)
533	ALL	Thrust Bearing and Reduction			.0006L	× -/
		Gear Housing			.0024L	.0035L

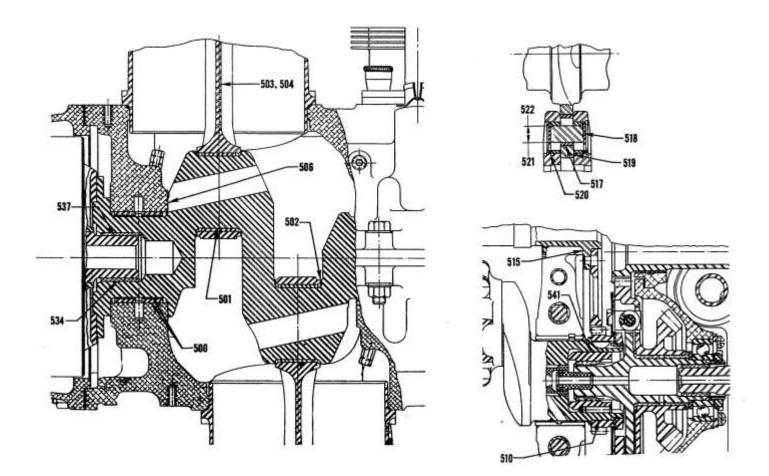
### PART III – GEARED ENGINES

### SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
534	ALL	Crankshaft and Crankcase Front Bushing			<u>.0010T</u> .0025T	(A)
535	ALL	Pinion – End Clearance			<u>.011</u> .016	.030
536	ALL	Pinion Shaft and Cage (See latest revision of Service Instruction No. 1236)			<u>.0001T</u> .0005T	
	ALL	Pinion Shaft and Cage (See latest revision of Service Instruction No. 1114)			Select for H Fit (C) .002	
537	ALL	Propeller Shaft and Crankshaft Bushing			<u>.0020L</u> .0035L	.005L
	ALL	I.D. Propeller Shaft Bushing in Crankshaft	<u>1.251</u> 1.2525	1.253		
				eter must be ng within .0	e concentric 03 in. TIR.	with Front
538	ALL	Stationary Gear and Plate – End Clearance			<u>.000</u> .004	.007
539	ALL	Ring Gear and Drive Plate – End Clearance			<u>.000</u> .004	.007
540	P-AB-AC	Reduction Gear Governor and Magneto Housing and Reduction Gear Housing Sleeve			<u>.004T</u> .006T	(A)
541	H4-H5-P-AB-AC	Rear Crankshaft Spline Bushing and Crankshaft			<u>.0002T</u> .0015T	(A)

### PART III – GEARED ENGINES

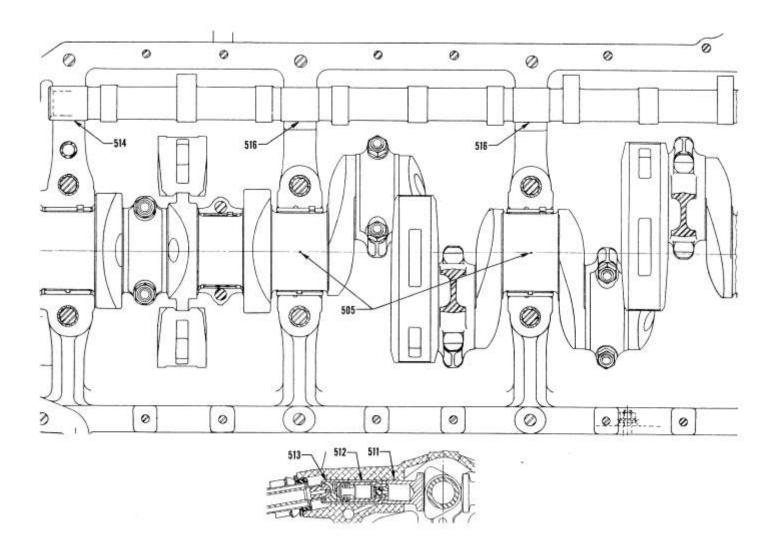
### SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



Crankcase, Crankshaft, Bearings, Camshaft, Tappets and Counterweights

### PART III – GEARED ENGINES

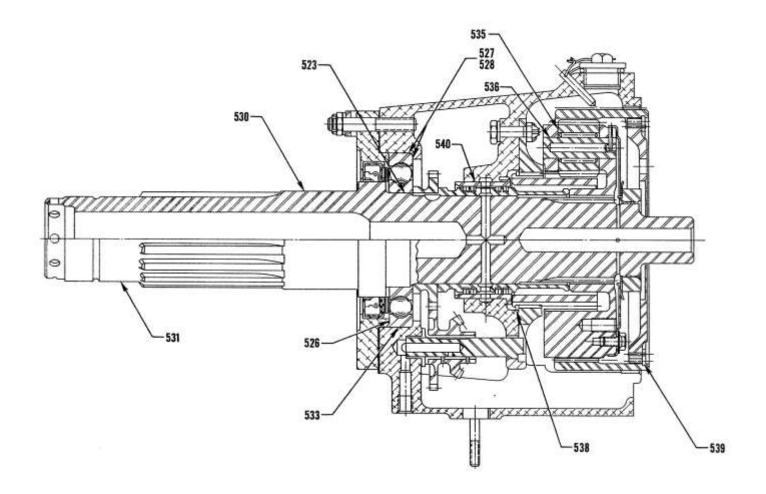
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



Longitudinal Section Thru Engine, Camshaft, Tappet Body and Crankshaft

### PART III – GEARED ENGINES

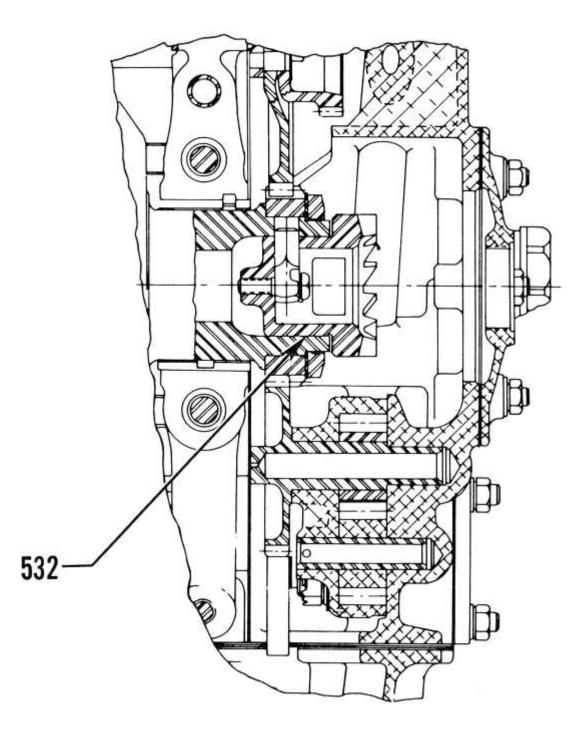
#### SECTION I - CRANKCASE, CRANKSHAFT, CAMSHAFT



**Reduction Gear and Related Parts** 

### PART III – GEARED ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



Starter Jaw and Crankshaft

### PART III - GEARED ENGINES

			Dimen	sions	Clear	rances
			Mfr. Min.		Mfr.	
Ref.	Chart	Nomenclature	& Max.	Service Max.	Min. & Max.	Service Max.
600	ALL	Connecting Rod and	Bushing P/N	LW-13923 t	o be burnish	ed in place
		Connecting Rod Bushing	Bushing P/N	01K28983 is	s <u>not</u> burnish	ed in place
		Finished I.D. of Connecting	<u>1.1254</u>			
		Rod Bushing	1.1262			
601	E-H-P	Length Between Connecting	<u>6.4985</u>			
		Rod Bearing Centers	6.5015			
	AB-AC	Length Between Connecting	<u>6.4785</u>			
		Rod Bearing Centers	6.7515		00007	
602	ALL	Connecting Rod Bushing and			<u>.0008L</u>	00251
(02		Piston Pin			.0021L	.0025L
603	ALL	Piston Pin and Piston			<u>.0003L</u>	00101
	ALL	Diameter of Piston Pin Hole in	1 1240		.0014L	.0018L
	ALL	Piston	$\frac{1.1249}{1.1254}$			
	ALL	Diameter of Piston Pin	<u>1.1234</u> <u>1.1241</u>			
	ALL	Diameter of Fiston Fin	$\frac{1.1241}{1.1246}$			
604	H-P-AB-AC	Piston and Piston Pin Plug	1.1240		.0002L	
004	in i nu ne	r istoir and r istoir r in r iug			.0010L	.002L
	H-P-AB-AC	*Diameter of Piston Pin Plug	1.1242		.00101	.0021
		Diameter of Fiston Fin Fing	1.1247			
605	ALL	Piston Pin and Piston Pin Plug			.0005L	
		(Optional)			.0025L	.005L
	H-P-AB-AC	*Diameter of Piston Pin Plug	<u>.5655</u> .5665			
	Е	Diameter of Piston Pin Plug	.8405			
		(Thin Wall Pin)	.8415			
	*See latest revision of Service	Instruction No. 1267.				
606	ALL	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			<u>.0025L</u>	
		Half Wedge			.0055L	.008L (B)
	ALL	Piston Ring and Piston – Side				
		Clearance (2 <sup>nd</sup> Ring Comp.)			<u>.000</u>	
		Full or Half Wedge			.004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side				
		Clearance (3 <sup>rd</sup> Ring Comp.)			<u>.000</u>	
		Half Wedge			.004L	.006L (B)
	ALL	Piston Ring and Piston – Side			<u>.002L</u>	
		Clearance (Oil Regulating)			.004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side			<u>.003L</u>	007L (D)
607	ALL	Clearance (Oil Scraper)			.0055L	.007L (B)
007	ALL	Piston Ring Gap (Comp.) Plain and Chrome Cylinders (Straight			<u>.020</u>	
		Barrels)			.030	.047
	ALL	Piston Ring Gap (Comp.)			.050	.077
		Nitrided and Chrome Cylinders			.045	
		(Choke Barrels)			.065	.067
	ALL	Piston Ring Gap (Oil			<u>.015</u>	
		Regulating) (All Barrels)			.040	.047

### PART III – GEARED ENGINES

						D	imensions	Cle	Clearances		
Ref.	Chart		Nomenclature		Mfr Min. May	& Servi		Service Max.			
607	ALL (AS AP	PLICABLE)	Piston Ring ( (All Barrels)	Gap (Oil Scr	aper)			<u>.015</u> .030	.047		
	.0075.	arrels – Ring gap is m Barrels – Ring gap is	easured within			-	gap at top of				
	Engine an	d Piston Application	Min. Piston Diameter			Cyline	ler Barrel	Max.			
	Engine Chart Code Letter	Piston Number	Тор	Bottom	Type of	Piston	Type of Surface	Maximum Diameter	Clearance Piston Skirt & Cyl.		
608	Е	67266, 71553	4.8395	4.8540	Forged	-Round	Р	4.8805	.018L		
608	Е	73620, 73628	4.8395	4.8540	Forged		N	4.8805	.018L		
609	Ē	67266, 71553, 73620,									
610		73628, 73932	4.8395	4.8540	Forged	-Round	С	4.8805	.0225L		
	Е	75984	4.8395	4.8590	Forged		C-N	4.8805	.018L		
	H-P	69236	5.0905	5.1040	Forged		P-C	5.1305	.0225L		
	H-P	71545, 71608*	5.0905	5.1025	Forged		C	5.1305	.024L		
	H-P-AB-AC	71940, 72249*, 72578, 73947*,									
	H-AC	73976	5.0905	5.1040	Forged	-Kouna	С	5.1305	.0225L		
	H-AC	71940, 72249*,	5 0005	5 1040	Erred	D J	N	5 1205	0221		
	U.D. AD	73947*, 73976	5.0905	5.1040	Forged		N C	5.1305	.023L		
	H-P-AB	74242, 75617*	5.0790	5.1090	Forged			5.1305	.018L		
	H-P-AB-AC	74242, 76258*	5.0790	5.1090	Forged		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 Bar	Cylinder Barrel: N=nitride hardened, C=chrome plated.									
	Maximum tap	Maximum taper and out-of-round permitted for cylinder in service is .0045 inch.									
	diameter at ri	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.									
		ter at top is measured le; diameter at bottom									

### **PART III – GEARED ENGINES**

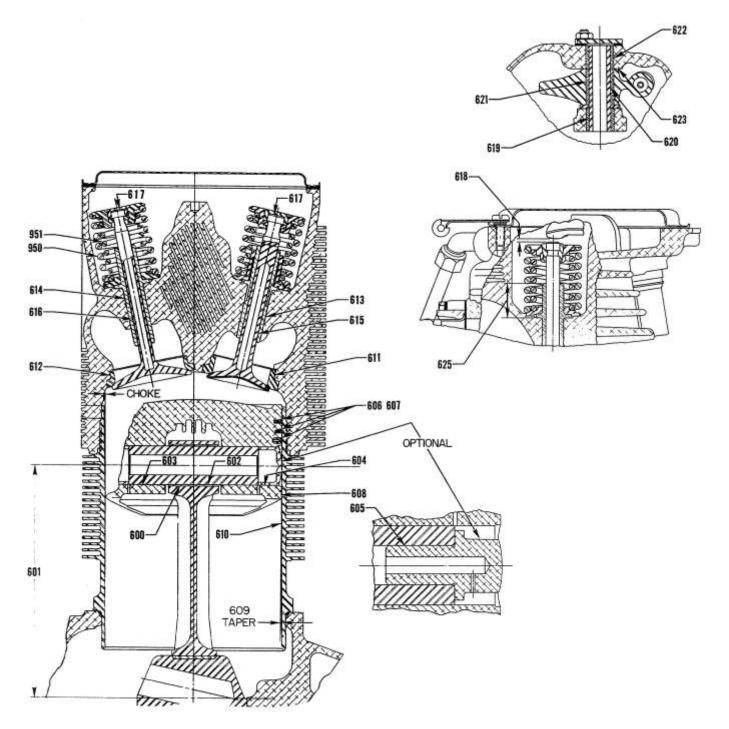
			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
611	ALL	Exhaust Valve Seat and Cylinder			<u>.0075T</u>	
		Head			.011T	(A)
	ALL	O.D. Exhaust Seat	<u>1.9355</u>			
			1.937			
	ALL	I.D. Exhaust Seat Hole in	<u>1.926</u>			
(10		Cylinder Head	1.928		00657	
612	ALL	Intake Valve Seat and Cylinder			<u>.0065T</u>	$(\mathbf{A})$
	E-H-P	Head O.D. Intake Seat	2 1675		.010T	(A)
	E-n-r	O.D. Intake Seat	$\frac{2.1675}{2.169}$			
	AB-AC	O.D. Intake Seat	<u>2.105</u>			
		0.D. make beat	2.290			
	E-H-P	I.D. Intake Seat Hole in Cylinder	2.159			
		Head	2.161			
	AB-AC	I.D. Intake Seat Hole in Cylinder	2.280			
		Head	2.282			
613	ALL	Exhaust Valve Guide and			<u>.001T</u>	
		Cylinder Head			.0025T	(A)
	ALL	O.D. Exhaust Valve Guide	<u>.6633</u>			
		I.D. Exhaust Valve Guide Hole	.6638			
	ALL	in Cylinder Head	<u>.6613</u> .6623			
614	ALL	Intake Valve Guide and Cylinder	.0023		<u>.001T</u>	
014	ALL	Head			.0025T	(A)
	ALL	O.D. Intake Valve Guide	.5933		100201	(**)
			.5938			
	ALL	I.D. Intake Valve Guide Hole in	.5913			
		Cylinder Head	.5923			
615	ALL	Exhaust Valve Stem and Valve			<u>.0037L</u>	
		Guide			.0050L	
	ALL	O.D. Exhaust Valve Stem	<u>.4957</u>	1007		
			.4965	.4937	6 4007 :	
				owable limits		
			nimonic va	•	inconel or	
	ALL	Finished I.D. Exhaust Valve	.4995			
	ALL	Guide	.5005			
	<sup>1</sup> / <sub>2</sub> inch diameter exhaust valves r	nay have exhaust valve guides that a		over the m	aximum insid	le diameter
		ervice. After 300 hours of service, in				
		f operation up to the recommended of				
		revision of Service Instruction No. 1				
616	ALL	Intake Valve Stem and Valve			<u>.0010L</u>	
		Guide			.0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022			
			.4030	.4010		
	ALL	Finished I.D. Intake Valve	<u>.4040</u>			
		Guide	.4050			

## PART III – GEARED ENGINES

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
617	ALL	Valve and Valve Cap Clearance			<u>.000</u>	
					.004L	.005L
618	ALL	Dry Tappet Clearance			<u>.028</u>	
					.080	
619	ALL	Valve Rocker Shaft and Valve			<u>.0001L</u>	
		Rocker Bushing			.0013L	.0025L
	ALL	Finished I.D. of Valve Rocker				
		Shaft (Bushing) in Cylinder	<u>.6246</u>			
<b>(3</b> )		Head	.6261	.6270	00051	
620	ALL	Valve Rocker Shaft and Valve			<u>.0007L</u>	00.47
		Rocker Bushing	(2.11		.0017L	.004L
	ALL	O.D. Valve Rocker Shaft	<u>.6241</u>	(221		
			.6245	.6231		
	ALL	Finished I.D. of Rocker Arm	<u>.6252</u>	(270		
621	ALL	Bushing Valve Rocker Bushing and	.6263	.6270		
021	ALL	Valve Rocker	Duching M	ust Do Durn	ished In Dieg	
622	ALL	Valve Rocker Shaft Bushing and	Busining M		ished In Place	
022	ALL	Cylinder Head			.00221 .0038T	(A)
	ALL	Valve Rocker Shaft Bushing and	.7380		.00301	(11)
		Hole in Cylinder Head	.7388			
623	ALL	Valve Rocker and Cylinder			.002L	
020		Head – Side Clearance			.020L	.024L
625	ALL	Intake and Exhaust Valve Guide	.914		-	
		Height	.954			
		MEASURE VALVE GUIDE	HEIGHT			
		FROM THE VALVE SPRIN				
		COUNTERBORE IN THE C				
		HEAD TO THE TOP OF VALVE				

### PART III – GEARED ENGINES

SECTION II – CYLINDERS



Cylinder, Piston, Connecting Rod and Valve Components

## PART III – GEARED ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PU	UMP & SCAVENGE PUMP					
700	Е-Н1-Н2-Н3	Oil Pump Drive Gear and Oil Pump Body			<u>.0010L</u> .0025L	.004L
701	Е-Н1-Н2-Н3	Oil Pump Drive Gear and Accessory Housing			<u>.0015L</u> .0030L	.006L
702	Е-Н1-Н2-Н3	Oil Pump Drive Gear – End Clearance			<u>.008L</u> .042L	.060L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Gear – End Clearance			<u>.007L</u> .030L	.045L
703	Е-Н1-Н2-Н3	Oil Pump Impeller – Diameter Clearance			<u>.002L</u> .005L	.008L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Impellers – Diameter Clearance			<u>.007L</u> .011L	.014L
704	Е-Н1-Н2-Н3	Oil Pump Impeller – Side Clearance			<u>.002L</u> .0045L	.005L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Impellers – Side Clearance			<u>.003L</u> .0055L	.006L
	Е-Н1-Н2-Н3	Width of Oil Pump Impellers	<u>.747</u> .749	.746		
	Н4-Н5-Р-АВ-АС	Width of Oil Pump Impellers	<u>.995</u> .997	.994		
	Н4-Н5-Р-АВ-АС	Width of Oil Scavenge Pump Impellers	<u>1.496</u> 1.498	1.495		
705	Е-Н1-Н2-Н3	Oil Pump Driven Impellers and Idler Shaft			<u>.0010L</u> .0025L	.004L
	H4-H5-P-AB-AC	Oil Pump and Oil Scavenge Pump Driven Impellers and Idler Shaft			<u>.0010L</u> .0025L	.004L
706	Е-Н1-Н2-Н3	Oil Pump Idler Shaft and Oil Pump Body			<u>.0000</u> .0025T	(A)
	H4-H5-P-AB-AC	Oil Pump Idler Shaft and Oil Pump Body			<u>.0000</u> .0015T	(A)
707	Е-Н1-Н2-Н3	Oil Pump Idler Shaft and Accessory Housing			<u>.0005L</u> .0025L	.0035L
713	Н4-Н5-Р-АВ-АС	Oil Pump Idler Shaft and Scavenge Pump Body			<u>.0000</u> .0015T	(A)
777	Н4-Н5-Р-АВ-АС	Oil Pump Drive Shaft Bushing and Scavenge Pump Body			<u>.001T</u> .003T	(A)
778	Н4-Н5-Р-АВ-АС	Oil Pump Drive Shaft Bushing and Oil Pump Body			<u>.001T</u> .003T	(A)
779	Н4-Н5-Р-АВ-АС	Oil Pump Drive Shaft Bushing and Oil Pressure and Scavenge Pump Gear			<u>.0015L</u> .0035L	.005L
780	Н4-Н5-Р-АВ-АС	Oil Pump Drive Shaft Bushing and Oil Pump Shaft			<u>.0015L</u> .0035L	.005L

## PART III – GEARED ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
FUEL.	PUMP					
727	E-H1-H2-H3	Fuel Pump Drive Gear – End			<u>.016L</u>	
		Clearance			.045L	.065L
781	E-H1-H2-H3	Fuel Pump Drive Gear and			<u>.0010L</u>	
		Accessory Housing			.0030L	.005L
782	H4-H5-P-AB-AC	Fuel Pump Drive Gear Bushing			<u>.001T</u>	
		and Accessory Housing			.004T	(A)
783	H4-H5-P	Fuel Pump Drive Shaft Gear –			<u>.006L</u>	
		End Clearance			.064L	.074L
784	H4-H5-P	Fuel Pump Drive Shaft Gear and			<u>.001L</u>	
		Bushing			.004L	.006L
785	P1	Injector Drive Gear and				
		Accessory Housing Cover			<u>.0036L</u>	
		Bushing			.0048L	.006L
786	P1	Injector Drive Gear – End			<u>.002L</u>	0.001
		Clearance			.020L	.030L
787	P1	Injector Idler Gear and Magneto			<u>.0005T</u>	( • >
700	D1	Idler Ball Bearing			.0004L	(A)
788	P1	Injector Idler Shaft and Magneto			<u>.0001T</u>	
700	AD	Idler Ball Bearing			.0005L	(A)
789	AB	Injector Drive Shaftgear and			<u>.001L</u>	0051
700		Accessory Housing Bushing			.003L	.005L
790	AC	Fuel Pump Drive Shaftgear and			<u>.001L</u>	0051
701	AB	Accessory Housing Bushing			.003L	.005L
791	АВ	Injector Drive Shaftgear – End Clearance			<u>.006</u> .036	.048
792	AC	Fuel Pump Drive Shaftgear –		-		.040
192	AC	End Clearance			<u>.006</u> .036	.048
VACU	UM PUMP & TACHOMETE				.030	.040
	·			I		
737	Е-Н1-Н2-Н3	Vacuum Pump Gear and			<u>.0010L</u>	00.0
720		Accessory Housing			.0025L	.006L
738	Е-Н1-Н2-Н3	Vacuum Pump Gear – End			<u>.016L</u>	0.651
	D. G N. 720 4. G. H.	Clearance			.045L	.065L
702	Reference No. 739 to follow			1	00167	
793	H4-H5-P	Vacuum Pump Shaftgear Bushing			<u>.0015T</u>	(A)
704	H4-H5-P	and Accessory Housing Cover			.0035T	(A)
794	П4-П3-Р	Vacuum Pump Shaftgear Bushing (At Cover) and Vacuum			.002L	
		Pump Shaftgear			.002L .004L	.006L
795	H4-H5-P	Vacuum Pump Shaftgear				.000L
195	117-11,)-1	Bushing and Accessory Housing			<u>.0015T</u> .0035T	(A)
796	H4-H5-P	Vacuum Pump Shaftgear			.00551	(Л)
190	117-11,7-1	Bushing (At Accessory Housing)			.0020L	
		and Vacuum Pump Shaftgear			.0045L	.006L
	H4-H5-P	Vacuum Pump Shaftgear – End			<u>.0043L</u>	.000L
797		vacuum i ump shangeai – Ellu				
797		Clearance			030	050
		Clearance Vacuum Pump Drive Gear and			.030	.050
797 798	AB-AC	Clearance Vacuum Pump Drive Gear and Vacuum Pump Spline Coupling			.030 .008	.050

## PART III – GEARED ENGINES

PART III – GEAR TRAIN

				ensions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
VACU	UM PUMP & TACHOMETER	(CONT.)				
799	AB-AC	Vacuum Pump Drive Gear			<u>.001T</u>	
		Bushing and Accessory Housing			.003T	(A)
7000	AB-AC	Vacuum Pump Drive Gear				
		Bushing and Vacuum Pump			<u>.002L</u>	
		Drive Gear			.004L	.006L
739	E-H1-H2-H3	Tachometer Drive Gear and			<u>.0010L</u>	
		Accessory Housing			.0025L	.006L
7001	E-H1-H2-H3	Tachometer Drive Gear – End			<u>.000</u>	
		Clearance			.030L	.040L
7002	E-H1	Tachometer Driven Gear and			<u>.0015L</u>	
		Adapter			.0035L	.005L
7003	E-H1	Tachometer Cover and Adapter			<u>.001T</u>	
					.003T	(A)
7004	E-H1	Tachometer Gear – End			<u>.001L</u>	0.001
7005		Clearance			.040L	.060L
7005	Н1-Н2-Н3	Electric Tachometer Idler Gear –			<u>.005L</u>	0.651
7006		End Clearance			.052L	.065L
7006	Н1-Н2-Н3	Electric Tachometer Driven			<u>.005L</u> .027L	0471
7006		Gear – End Clearance Electric Tachometer Driven				.047L
7006	H4-H5-P-AB-AC	Gear – End Clearance			<u>.007L</u> .025L	.047L
7007	Н1-Н2-Н3	Electric Tachometer Idler Gear			.023L .001L	.047L
/00/	111-112-115	Shaft and Idler Gear Bushing			.0025L	.004L
7008	Н1-Н2-Н3	Electric Tachometer Driven			.0015L	.004L
7000	111-112-115	Gear and Adapter			.0035L	.006L
7009	AB-AC	Tachometer Drive Idler Gear			.0035L	.0001
1002		Bushing and Tachometer Drive	Bushing To Be Burnished In Place			
		Idler Gear	2 doning 1	0 20 20 10		
7010	AB-AC	Tachometer Drive Idler Gear				
		Bushing and Tachometer Drive			<u>.001L</u>	
		Idler Shaft			.003L	.004L
7011	AB-AC	Tachometer Drive Idler Gear –			.005L	
		End Clearance			.014L	.024L
7012	H1-H5-P-AB-AC	Electric Tachometer Driven Gear			<u>.001L</u>	
		and Accessory Housing Cover			.003L	.004L
GOVE	RNOR					
7013	ALL	Governor Drive Idler Gear				
		Bushing and Governor Drive			.000L	
		Idler Shaft			.002L	.004L
7014	ALL	Governor Driven Gear and			<u>.001L</u>	
		Governor Drive Adapter Bushing			.003L	.004L
7015	ALL	Reduction Gear Governor and				
		Magneto Housing and Magneto			<u>.002T</u>	
		and Governor Drive Bushing			.004T	(A)
7016	ALL	Governor Drive Idler Gear and				
		Governor Drive Idler Gear			<u>.001T</u>	
		Bushing			.003T	(A)
7017	ALL	Governor Adapter and Governor			<u>.001T</u>	( • )
		Drive Adapter Bushing			.003T	(A)

## PART III – GEARED ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
MAGN	ETO, GENERATOR, & STARTER			-		
7018	AB-AC	Magneto Drive Idler Gear and			.001T	
		Magneto Drive Idler Bushing			.003T	(A)
7019	AB-AC	Magneto Drive Idler Shaft and			<u>.001L</u>	(/
, 017		Magneto Drive Idler Bushings			.003L	.005L
7020	AB-AC	Reduction Gear Housing				
		Magneto Drive Bushings and			.000	
		Magneto Drive Idler Shaft			.002L	.004L
7021	AB-AC	Magneto Drive Adapter and			.001T	
		Magneto Adapter Bushings			.003T	(A)
7022	AB-AC	Magneto Drive Gear and			.001L	
		Magneto Adapter Bushings			.003L	.005L
7023	E-H1-H2-H3	Magneto Drive Bushing and			.001T	
1020		Magneto Gear			.0005L	.001L
7024	E-H1-H2-H3	Magneto Drive Bearing and			.0001T	
/021		Support			.0007L	(A)
7025	H4-H5-P	Magneto Drive Idler Gear Hub			.0007L	(11)
1025		Bushing and Magneto Drive	Bush	ing Must Be	Burnished In	Place
		Idler Gear Hub	Dusin	ing must be	Durmöned m	Thee
7026	H4-H5-P	Magneto Drive Idler Gear Hub				
7020		Bushing and Magneto Drive			.001L	
		Idler Shaft			.003L	.004L
7027	H4-H5-P	Magneto Drive Idler Gear Hub –			.005L	.00112
1021		End Clearance			.014L	.024L
7028	H4-H5-P	Magneto Drive Shaft and			.0112	.0212
7020		Accessory Housing Cover			.0020L	
		Bushing			.0045L	.006L
7029	H4-H5-P	Magneto Drive Shaft and			.0025L	
1022		Accessory Housing Bushing			.0045L	.006L
7030	H4-H5-P	Magneto Drive Shaft Sleeve and			.001T	
1020		Magneto Drive Shaft			.004T	(A)
7031	H4-H5-P	Magneto Drive Shaft Sleeve and			.001T	()
1001		Magneto Drive Coupling			.004T	(A)
7032	H4-H5-P	Magneto Drive Shaft Gear – End		1	.002L	()
		Clearance			.020L	.030L
7033	E-H1-H2-H3	Generator Driven Gear Bushing		<u> </u>	.020E	
		and Accessory Housing			.003T	(A)
7034	E-H1-H2-H3	Generator Driven Gear and			.0031	(**)
,		Bushing			.004L	.006L
7035	E-H1-H2-H3	Generator Driven Gear – End			.001L	
		Clearance			.049L	.060L
7036	H1	Generator Drive Idler Gear and		1		
,000		Bushing (Hi-Speed)	Bushing Must Be Burnished In Place			Place
7037	H1	Finished I.D. of Idler Gear	<u>1.000</u>			- 1400
1051		Bushing	$\frac{1.000}{1.001}$	1.002		
7038	H1	Generator Drive Countershaft	1.001	1.002	.0015L	
1050	111	and Bushing			.0035L	.005L
				1	.00555	.005L
7039	H1	Generator Drive Idler Gear –			<u>.004L</u>	

## PART III – GEARED ENGINES

#### SECTION III - GEAR TRAIN

			Dime	ensions	Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
MAGN	ETO, GENERATOR, STARTE	ER (CONT.)				
7040	E1-H1-H3	Angle Generator Drive –				
		Generator Driven Gear Bushing and Generator Housing			<u>.001T</u> .003T	(A)
7041	E1-H1-H3	Angle Generator Drive – Generator Driven Gear and Bushing			<u>.002L</u> .004L	.006L
7042	Е1-Н1-Н3	Angle Generator Drive – Generator Housing and Generator Drive Gear			<u>.001L</u> .003L	.004L
7043	Н4-Н5-Р-АВ-АС	Generator Drive Gear Bushing and Accessory Housing Cover			<u>.0015T</u> .0035T	(A)
7044	Н4-Н5-Р-АВ-АС	Generator Drive Gear Bushing (At Cover) and Generator Drive Gear			<u>.002L</u> .004L	.006L
7045	Н4-Н5-Р-АВ-АС	Generator Drive Gear Bushing and Accessory Housing			<u>.002T</u> .004T	(A)
7046	H4-H5-P-AB-AC	Generator Drive Gear Bushing (At Accessory Housing) and Generator Drive Gear			<u>.0025L</u> .0045L	.006L
7047	Н4-Н5-Р-АВ-АС	Generator Drive Gear – End Clearance			<u>.010</u> .038	.050
7048	Н4-Н5-Р-АВ-АС	Starter Drive Gear Bushings and Adapter			<u>.002T</u> .004T	(A)
7049	H4-H5-P-AB-AC	Starter Drive Gear Bushings and Starter Drive Gear			<u>.002L</u> .004L	.006L
7050	H4-H5-P-AB-AC	Starter Drive Adapter and Accessory Housing Cover			<u>.0005L</u> .0025L	(A)
7051	E1-H1-H2-H3	Oil Relief Plunger and Oil Relief Valve Plug			<u>.0015L</u> .0035L	.005L
	H4-H5-P-AB-AC	Oil Relief Valve Plunger and Sleeve			<u>.001L</u> .003L	.005L
ACCES	SSORY DRIVE					
7053	Н4-Н5-АС	Accessory Idler Gear Bearing and Accessory Drive Gear			<u>.0001L</u> .0007T	(A)
	Р	Accessory Drive Gear Bearing and Accessory Drive Shaft			<u>.0001L</u> .0007T	(A)
	AB	Accessory Idler Gear Bearing and Supercharger and Accessory Drive Gear			<u>.0001L</u> .0007T	(A)
7054	P-AB	Supercharger and Accessory Drive Gear and Bushing			<u>.001T</u> .003T	(A)
7055	Н1-Н5-Р-АВ-АС	Accessory Idler Gear Bearing and Accessory Drive Shaft Adapter			<u>.0005T</u> .0005L	(A)
7056	P-AB	Supercharger and Accessory Drive Gear Bushing and Accessory Drive Shaft			<u>.0005L</u> 0017I	0041

.0017L

.004L

Accessory Drive Shaft

## PART III – GEARED ENGINES

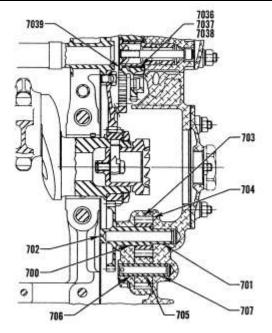
#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
ACCES	SSORY DRIVE (CONT.)					
7056	P-AB	Finished I.D. of Supercharger				
1020		and Accessory Drive Gear	1.3295			
		Bushing	1.3305	1.3312		
7057	P-AB	Supercharger and Accessory			<u>.004L</u>	
		Drive Gear – End Clearance			.012L	.017L
7058	Р	Accessory Drive Shaft and			<u>.001T</u>	
		Bushing			.003T	(A)
	Р	Finished I.D. of Accessory Drive	<u>.750</u>			
		Shaft Bushing	.7515	.752		
7059	P-AB	Supercharger Drive Shaftgear				
		and Accessory Drive Shaft			<u>.002L</u>	
		Bushing			.004L	.006L
7060	P-AB	Supercharger Drive Shaftgear			<u>.0038L</u>	
		and Supercharger Shaft Bearing		-	.0050L	.008L
7061	P-AB	Supercharger Drive Shaftgear –				
		End Clearance (Use 1 Spacer if			<u>.011L</u>	
		Necessary to Maintain Fit)			.020L	.020L
7062	P-AB	Impeller and Supercharger Air			<u>.040L</u>	
	-	Inlet Adapter – Clearance			.070L	
7063	Р	Intermediate Supercharger Drive			<u>.0040L</u>	0.07.51
		Shaftgear and Bushing			.0055L	.0075L
7064	P-AB	Accessory Housing and			0015	
		Intermediate Supercharger Drive			<u>.001T</u>	
7065	D 4 D	Shaftgear Bushing			.003T	(A)
7065	P-AB	Intermediate Supercharger Drive			<u>.002L</u>	0061
7066	Р	Gear and Bushing			.004L	.006L
7066	P	Intermediate Supercharger Drive Gear – End Clearance			<u>.011L</u> .026L	.030L
	AB	Intermediate Supercharger Drive			.020L .009L	.030L
	AD	Gear – End Clearance			.020L	.024L
7067	AB	Accessory Housing Adapter and			.020L	.024L
/00/	AD	Bearing			.0006T	.0016L
7068	AB	Supercharger and Accessory			.0000T	.0010L
/000		Drive Gear Support and Bearing			.0013T	(A)
7069	AB	Supercharger and Accessory			<u>.001T</u>	()
1007		Drive Gear Support and Bushing			.003T	(A)
7070	P-AB	Supercharger Shaft Bearing and			.0005L	
		Supercharger Housing			.002L	(A)
7071	AB	Supercharger and Accessory				. ,
		Drive Gear and Accessory Drive			<u>.001L</u>	
		Shaft – End Clearance			.015L	.020L
7072	AB-AC	Oil Pressure and Scavenge Pump				
		Idler Gear Bushing and Fuel				
		Injector or Fuel Pump Drive			<u>.001L</u>	
		Shaftgear (As Applicable)			.003L	.005L
7073	AB-AC	Oil Pressure and Scavenge Pump			<u>.001T</u>	
		Idler Gear and Bushing			.003T	(A)

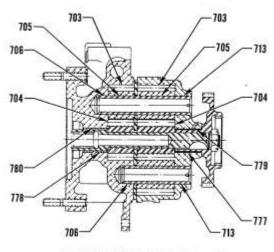
### **PART III – GEARED ENGINES**

SECTION III - GEAR TRAIN

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



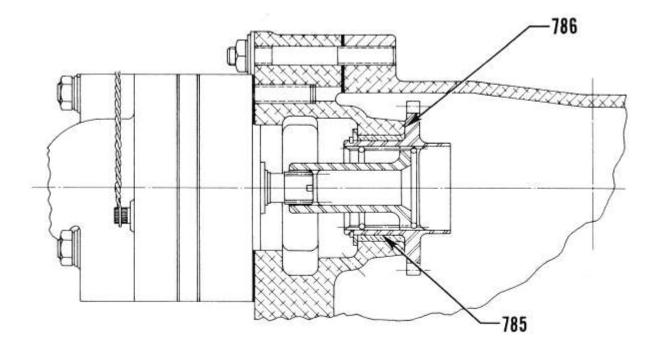
REAR MOUNTED ACCESSORY HSG.



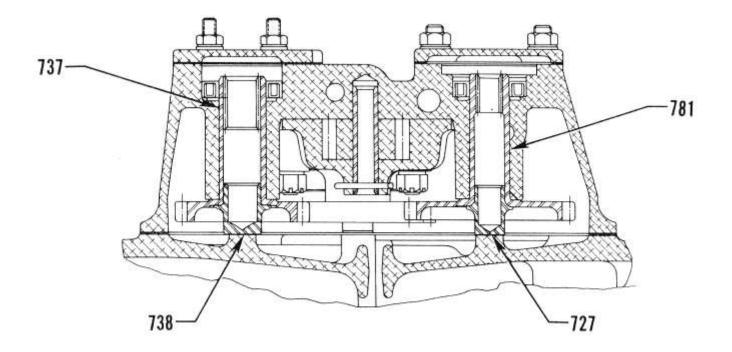
CROSSWISE ACCESSORY HSG.

**Oil Pumps** 

**PART III – GEARED ENGINES** 

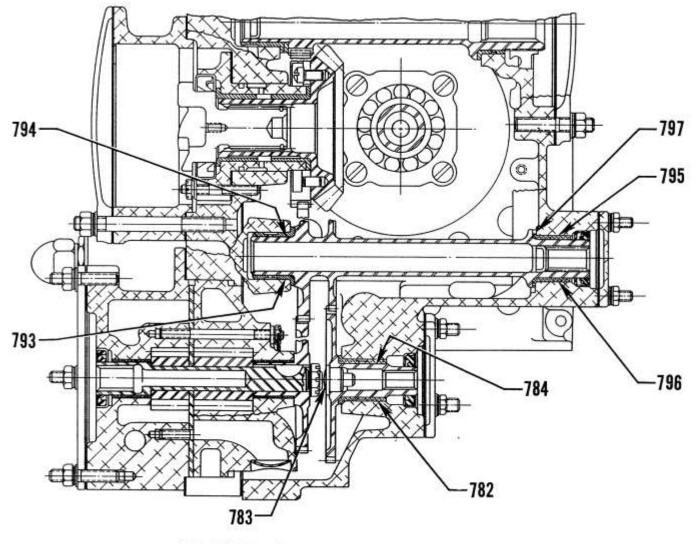


Simmonds Injector



Vacuum and Fuel Pump Drives

### PART III - GEARED ENGINES

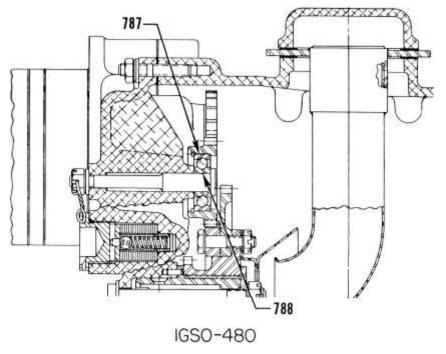




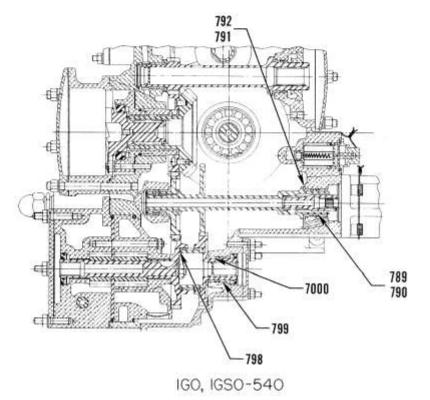
Vacuum and Fuel Pump Drives

### PART III - GEARED ENGINES

#### SECTION III – GEAR TRAIN



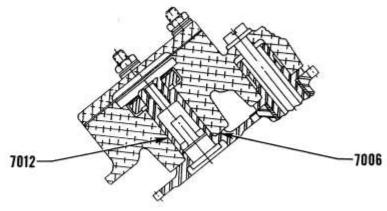




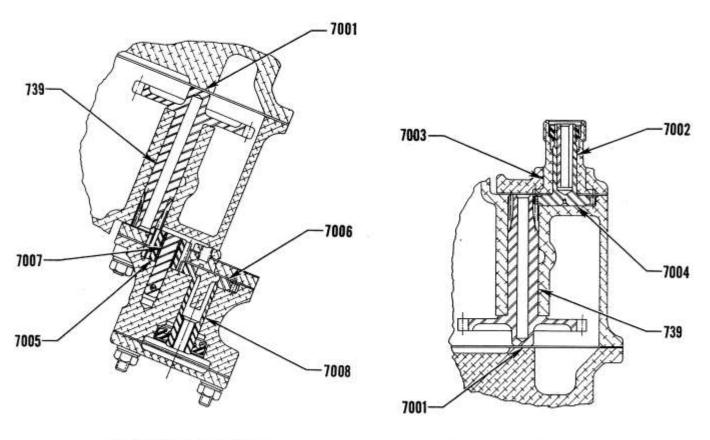
Fuel Injector and/or Fuel Pump, Vacuum Pump Drives

PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



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



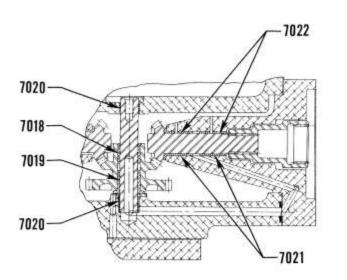
GO-480-B, F & GID6

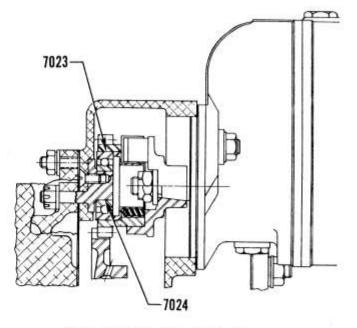
GO-435-C & GO-480-B

**Tachometer Drives** 

### **PART III – GEARED ENGINES**

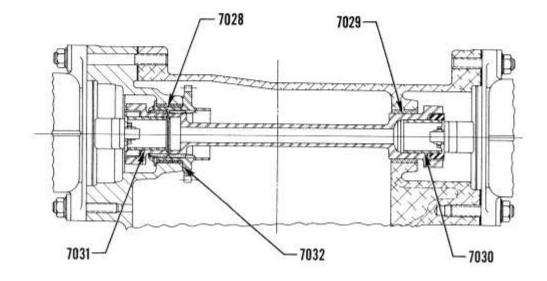
SECTION III – GEAR TRAIN





IGO, IGSO-540

GO-435 & GO-480-B

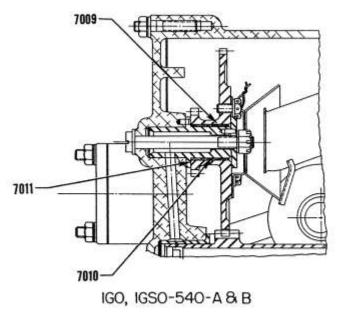


GO-480-D, GSO, IGSO-480

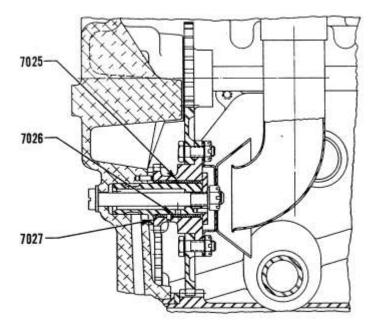
**Magneto Drives** 

### PART III - GEARED ENGINES

SECTION III – GEAR TRAIN



**Tachometer Drives** 

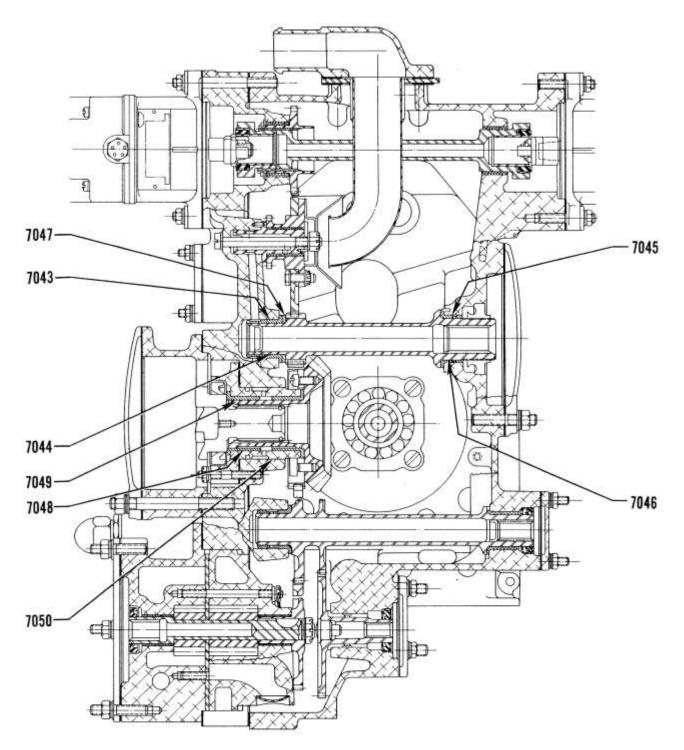


GO-480-B, GIB6, GSO, IGSO-480

### **Magneto and Tachometer Idler Gear**

### PART III - GEARED ENGINES

SECTION III – GEAR TRAIN

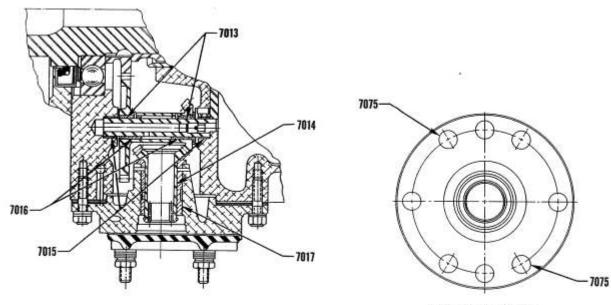


GO-480-B, GSO, IGSO-480 & IGO, IGSO-540

### **Generator and Starter Drives**

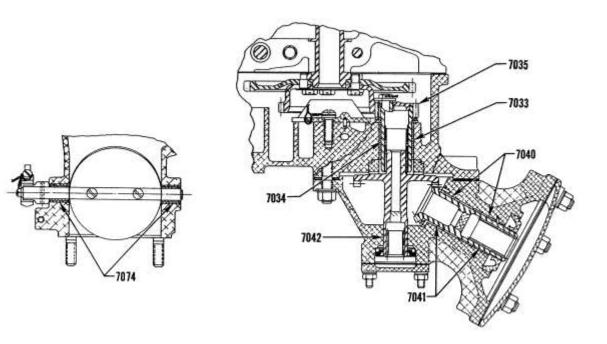
### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



GOVERNOR DRIVE

GO-480-F, GID6 PROP FLANGE



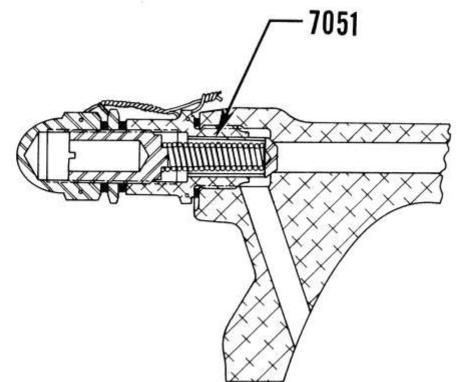
IGSO-480, 540 THROTTLE LEVER

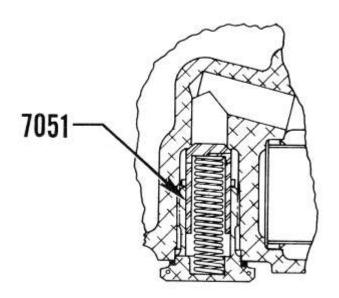
GO-435, GO-480-B, GID6 DUAL GENERATOR & VACUUM PUMP DRIVE

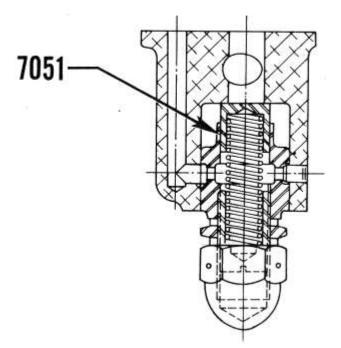
Governor Drive, Prop. Flange, Throttle Lever, Dual Generator and Vacuum Pump Drive

### PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

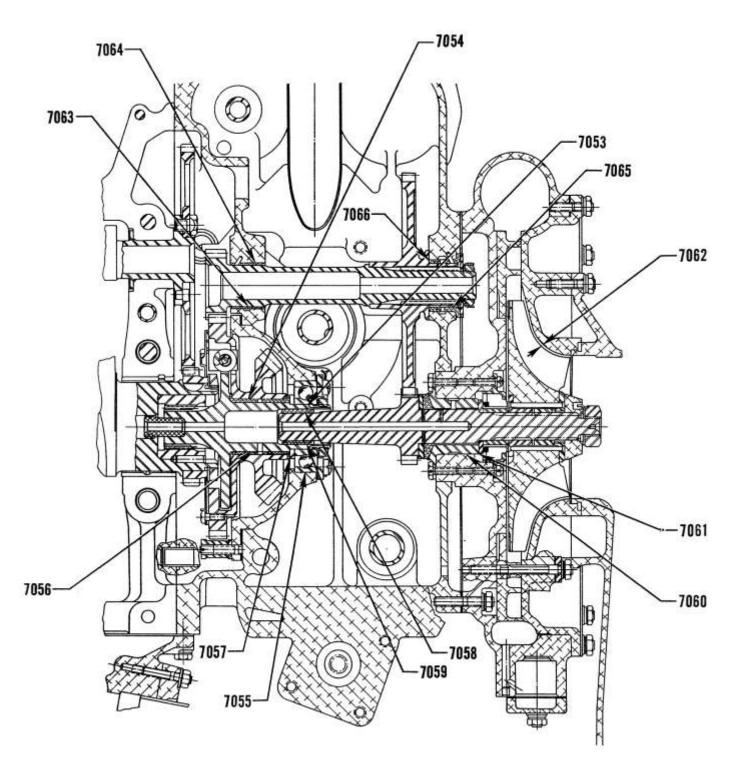






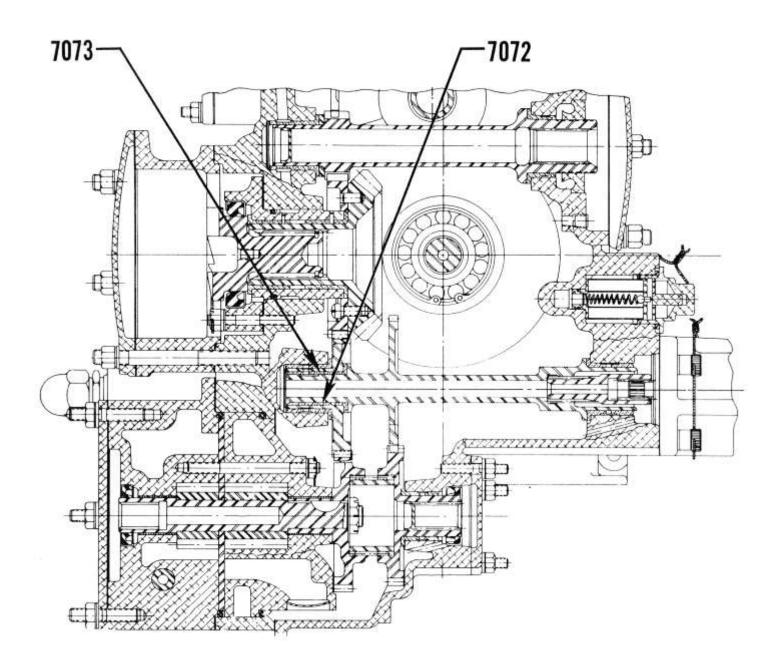
### **Oil Relief Valves**

PART III – GEARED ENGINES



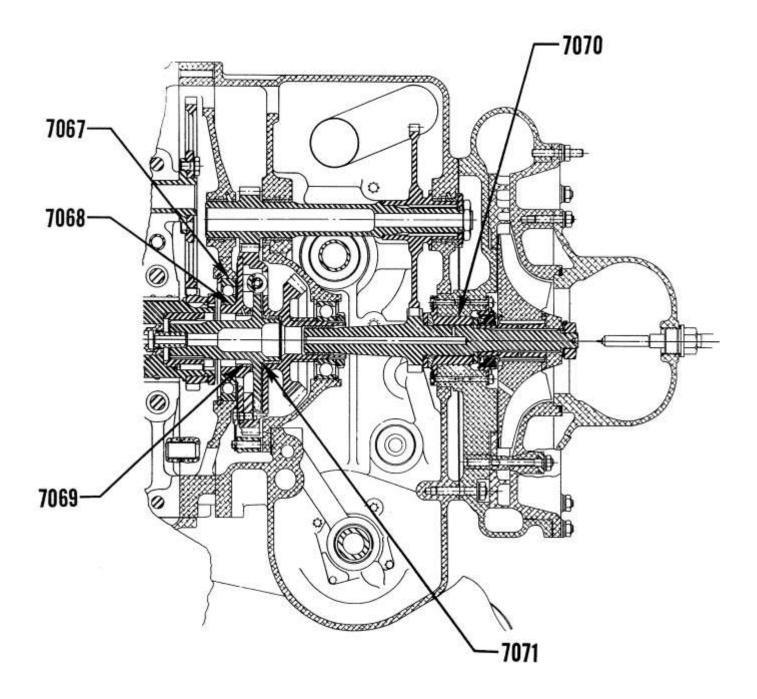
### **Supercharger and Components**

### PART III – GEARED ENGINES



**Oil Scavenge Pump and Drives** 

PART III - GEARED ENGINES



**Supercharger Housing** 

### PART III – GEARED ENGINES

			Dime	nsions	Clearances		
			Mfr.		Mfr.		
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.	
807	Е-Н1-Н2-Н3	Oil Pump Drive Gear and Crankshaft Timing Gear			<u>.004</u> .015	.020	
808	Е-Н1-Н2-Н3	Oil Pump Impellers			<u>.008</u> .015	.020	
	Е-Н1-Н2-Н3	Oil Pump and Scavenge Pump Impellers			<u>.008</u> .015	.020	
825	ALL	Crankshaft Timing Gear and Camshaft Gear			<u>.004</u> .015	.020	
829	ALL	Propeller Shaft – Reduction Gear – Total Backlash (At 4 ft. Radius)			.010	.50	
846	Е-Н1-Н2-Н3	Camshaft Gear and Magneto Gear			<u>.004</u> .015	.020	
847	Е-Н1-Н2-Н3	Tachometer Drive Gear and Crankshaft Timing Gear			<u>.004</u> .015	.020	
848	E-H1	Tachometer Driven Gear and Tachometer Drive Gear			<u>.004</u> .015	.020	
849	ALL	Stationary Gear and Stationary Gear Drive Plate			<u>.002</u> .005	.010	
850	ALL	Ring Gear and Ring Gear Drive Plate			<u>.001</u> .004	.010	
851	Е-Н2-Н3	Generator Drive Gear and Generator Driven Gear			<u>.004</u> .015	.020	
852	Е-Н1-Н2-Н3	Oil Pump Drive Gear and Accessory (Fuel Pump) Drive Gear			<u>.004</u> .015	.020	
853	Е-Н1-Н2-Н3	Oil Pump Drive Gear and Vacuum Pump Drive Gear			<u>.004</u> .015	.020	
854	ALL	Pinion Gear and Stationary Gear			<u>.004</u> .0077	.012 (C)	
855	ALL	Pinion Gear and Ring Gear			<u>.003</u> .0065	.012 (C)	
856	ALL	Governor and Magneto Drive Gear and Governor Drive Idler Gear			<u>.004</u> .015	.020	
857	AB-AC	Governor and Magneto Drive Gear and Magneto Drive Idler Gear			<u>.004</u> .015	.020	
858	ALL	Governor Drive Idler Gear (Bevel Gear End) and Governor Driven Gear			<u>.004</u> .008	.015	
859	H1	Camshaft Gear and Generator Drive Idler Gear			<u>.004</u> .015	.020	
860	H1	Generator Drive Idler Gear and Generator Driven Gear			<u>.004</u> .015	.020	
861	Е1-Н1-Н2-Н3	Electric Tachometer Idler Gear and Driven Gear			<u>.004</u> .015	.020	
862	Е1-Н1-Н2-Н3	Electric Tachometer Idler Gear and Tachometer Drive Gear			<u>.004</u> .015	.020	

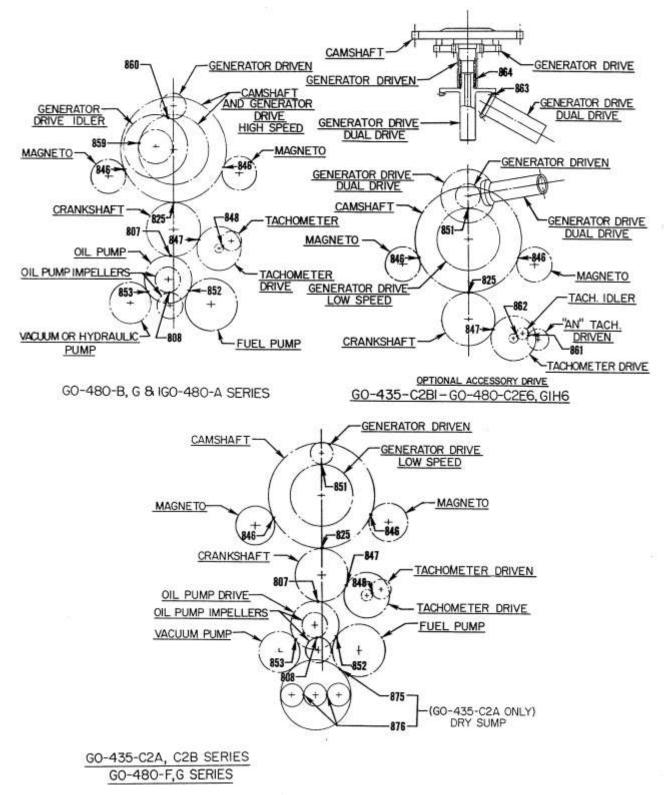
### PART III – GEARED ENGINES

			Dime	nsions	Clearances		
			Mfr.		Mfr.		
			Min. &	Service	Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
863	E1-H1	Angle Generator Drive Gear and			.002		
		Generator Driven Gear			.004	.010	
864	E1-H1	Angle Generator Drive Gear and			<u>.003</u>		
		Generator Drive Gear Spline			.007	.009	
865	P1	Generator Drive Gear and			<u>.004</u>		
		Magneto Drive Idler Gear			.015	.020	
	H4-H5-P-AB-AC	Generator Drive Gear and			<u>.004</u>		
		Tachometer Drive Idler Gear			.015	.020	
866	P1	Electric Tachometer Drive Gear					
		(Magneto Idler Hub) and			<u>.004</u>		
		Tachometer Driven Gear			.015	.020	
	H4-H5-P-AB-AC	Tachometer Drive Idler Gear			<u>.004</u>		
0.67		and Tachometer Driven Gear			.015	.020	
867	H4-H5-P	Tachometer Drive Idler Gear			<u>.004</u>	020	
0.60		and Magneto Drive Shaftgear			.015	.020	
868	H4-H5-P	Magneto Drive Shaft (Spline)			001		
		and Magneto Drive Shaftgear			<u>.001</u> .015	009	
960		(Spline)			.015	.008	
869	H4-H5-P	Magneto Drive Shaftgear			001		
		(Spline) and Magneto Drive			<u>.001</u> .005	009	
870	H4-H5-AC	Coupling (Spline)			.005	.008	
870	Н4-Н5-АС	Rear Crankshaft (Spline Bushing) and Accessory Drive			002		
		Gear (Spline)			<u>.002</u> .0073	.018	
	P-AB	Rear Crankshaft (Spline			.0073	.018	
	1-AD	Bushing) and Accessory Drive			.002		
		Shaft (Spline)			.0073	.018	
871	H4-H5-AC	Accessory Idler Gear and Starter			<u>.004</u>	.010	
071		Drive Gear			.008	.015	
871	P-AB	Supercharger and Accessory					
		Drive Gear and Starter and			.004		
		Accessory Drive Gear			.008	.015	
872	H4-H5-P-AB-AC	Accessory Drive Gear and			.004		
		Generator Drive Gear			.015	.020	
873	Н4-Н5-Р	Accessory Drive Gear and			.004		
		Vacuum Pump Shaftgear			.015	.020	
874	H4-H5-P	Vacuum Pump Shaftgear and Oil					
		Pressure and Scavenge Pump			<u>.004</u>		
		Gear			.015	.020	
875	Е	Scavenge Pump Driven Gear			<u>.004</u>		
		and Accessory Drive Gear			.015	.020	
876	E	Scavenge Pump Impellers			<u>.008</u> .015	.020	
877	P-AB	Supercharger and Accessory					
0.1		Drive Gear and Intermediate			.006		
		Supercharger Drive Shaftgear			.015	.020	
878	P-AB	Supercharger Drive Shaftgear	1				
2.0		and Intermediate Supercharger			.006		
	1	Drive Gear			.015	.020	

### **PART III – GEARED ENGINES**

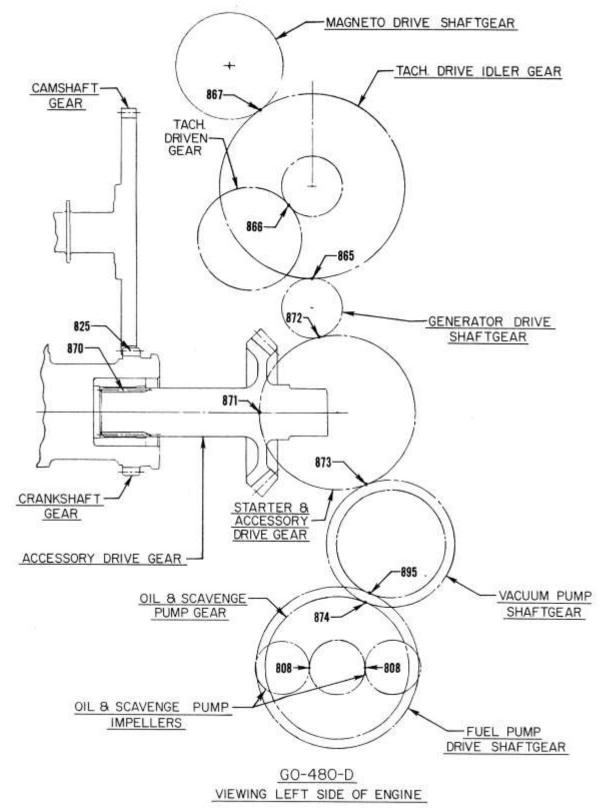
			Dime	nsions	Clearances		
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.	
879	P-AB	Intermediate Supercharger Drive Shaftgear (Spline) and					
		Intermediate Supercharger Drive Gear (Spline)			<u>.000</u> .002	.005	
880	P1	Fuel Injector Idler Gear and Magneto Drive Shaftgear			<u>.004</u> .015	.020	
881	P1	Fuel Injector Drive Idler Gear and Fuel Injector Idler Gear			<u>.004</u> .015	.020	
882	P1	Injector Drive Shaft (Spline) and Fuel Injector Pump (Spline)			<u>.0005</u> .0056	.008	
883	P1	Magneto Drive Shaftgear (Spline) and Fuel Injector Drive Shaft (Spline)			<u>.002</u> .006	.008	
884	AB-AC	Magneto Drive Idler Gear (Bevel End) and Magneto Driven Gear			<u>.004</u> .008	.015	
885	AB-AC	Magneto Driven Gear (Spline) and Magneto Drive Coupling (Spline)			<u>.001</u> .004	.007	
886	AB-AC	Magneto Drive Coupling (Spline) and Magneto Coupling (Spline)			<u>.001</u> .004	.007	
887	Н4-Н5-Р-АВ-АС	Starter Jaw (Spline) and Starter Drive Gear (Spline)			<u>.002</u> .005	.010	
888	AB-AC	Accessory and Starter Drive and Oil Pressure and Scavenge Pump Idler Gear			<u>.004</u> .015	.020	
889	AB-AC	Oil Pressure and Scavenge Pump Idler and Oil Pressure and Scavenge Pump Gear			<u>.004</u> .015	.020	
890	AB	Fuel Injector Drive Shaftgear (Spline) and Fuel Injector Drive Coupling (Spline)			<u>.003</u> .007	.012	
891	AB	Fuel Injector Drive Coupling (Spline) and Fuel Injector Pump (Spline)			<u>.002</u> .005	.010	
892	AB-AC	Oil Pressure and Scavenge Pump Gear (Spline) and Vacuum Pump Coupling (Spline)			<u>.003</u> .0065	.010	
893	AB-AC	Vacuum Pump Drive Gear (Spline) and Vacuum Pump Coupling (Spline)			<u>.003</u> .0065	.010	
894	AB	Vacuum Pump Drive Gear and Fuel Injector Drive Shaftgear			<u>.004</u> .015	.020	
895	Н4-Н5-Р-АС	Vacuum Pump Shaftgear and Fuel Pump Drive Shaftgear			<u>.004</u> .015	.020	

**PART III – GEARED ENGINES** 



**Accessory Drives** 

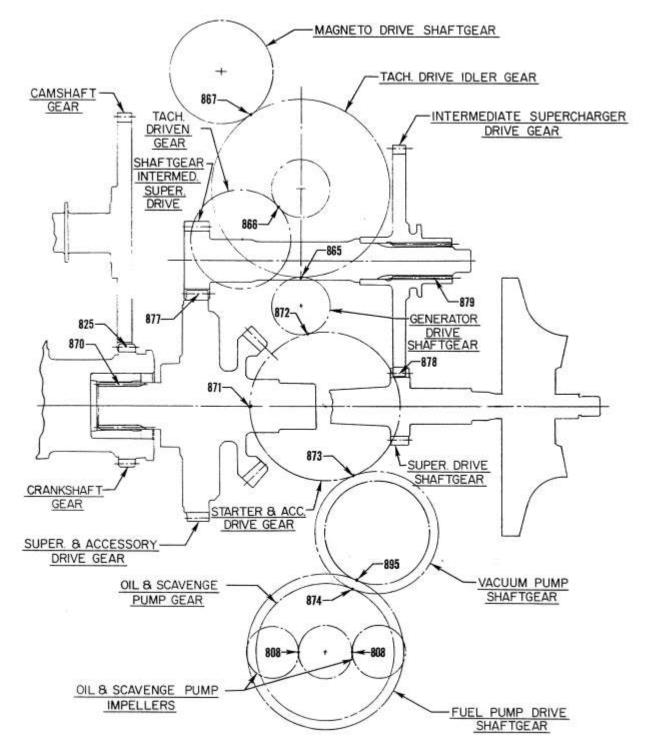
#### **PART III – GEARED ENGINES**



**Accessory Drives** 

#### **PART III – GEARED ENGINES**

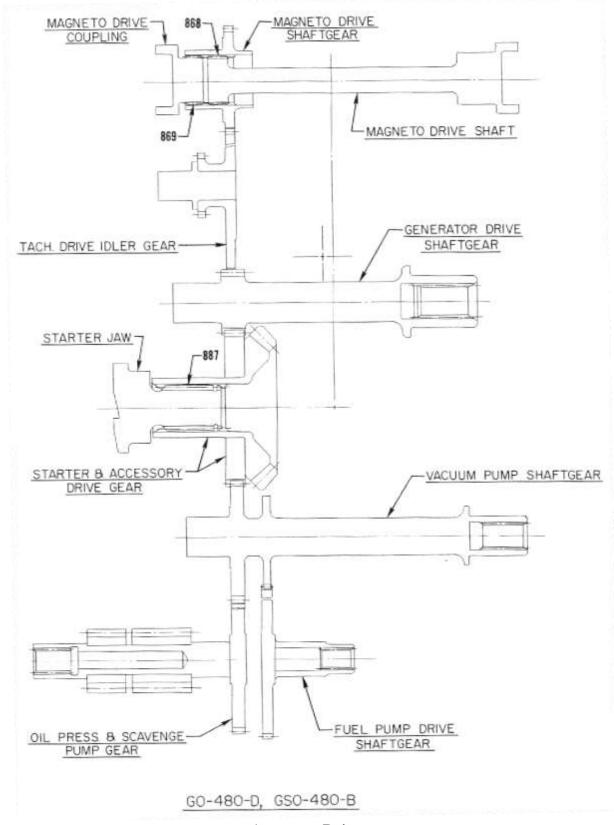
SECTION IV – BACKLASH



VIEWING LEFT SIDE OF ENGINE

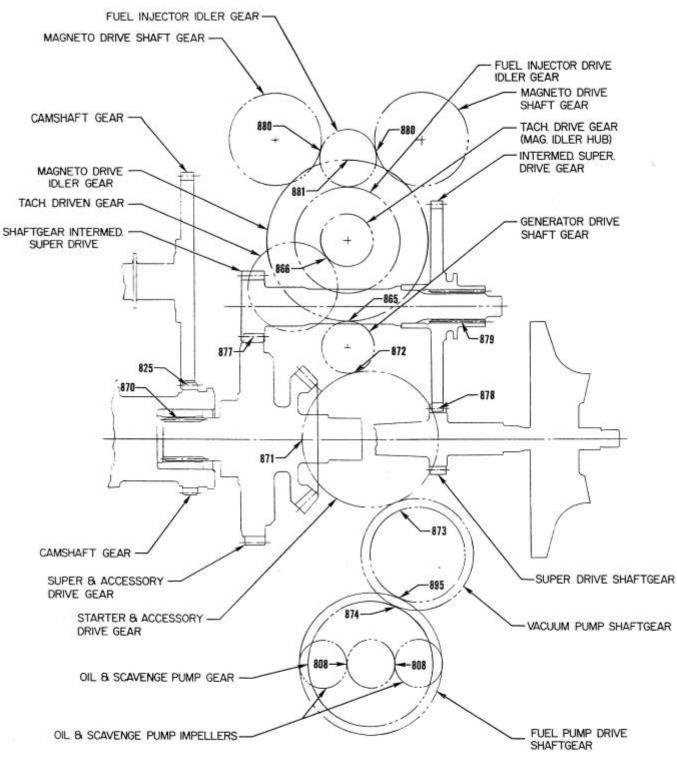
### **PART III – GEARED ENGINES**

#### $SECTION \, IV-BACKLASH$



#### **PART III – GEARED ENGINES**

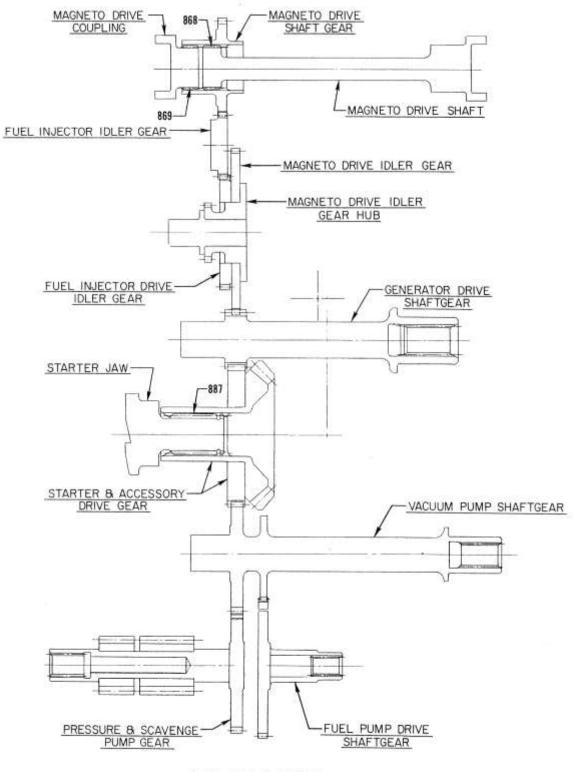
SECTION IV - BACKLASH



IGSO-480-A VIEWING LEFT SIDE OF ENGINE

#### **PART III – GEARED ENGINES**

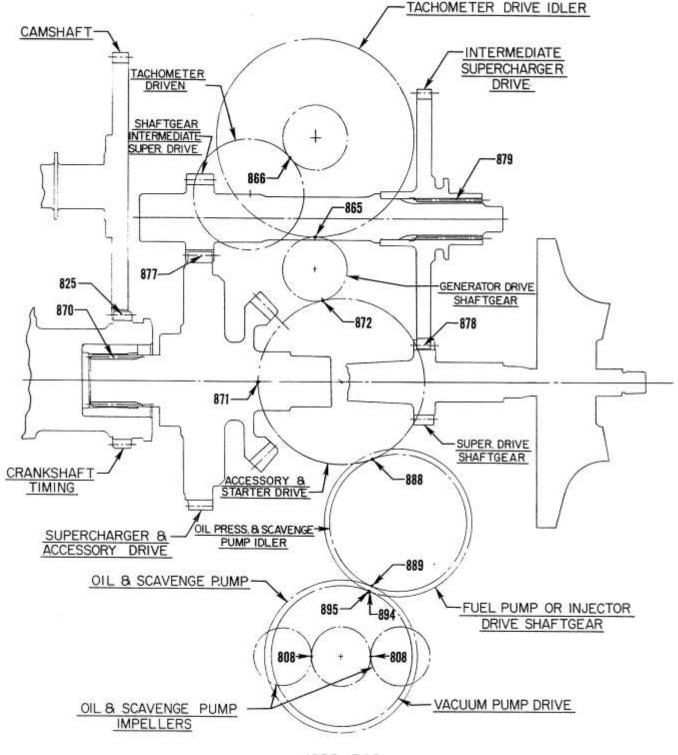
#### SECTION IV – BACKLASH



IGSO-480-A SERIES

**PART III – GEARED ENGINES** 

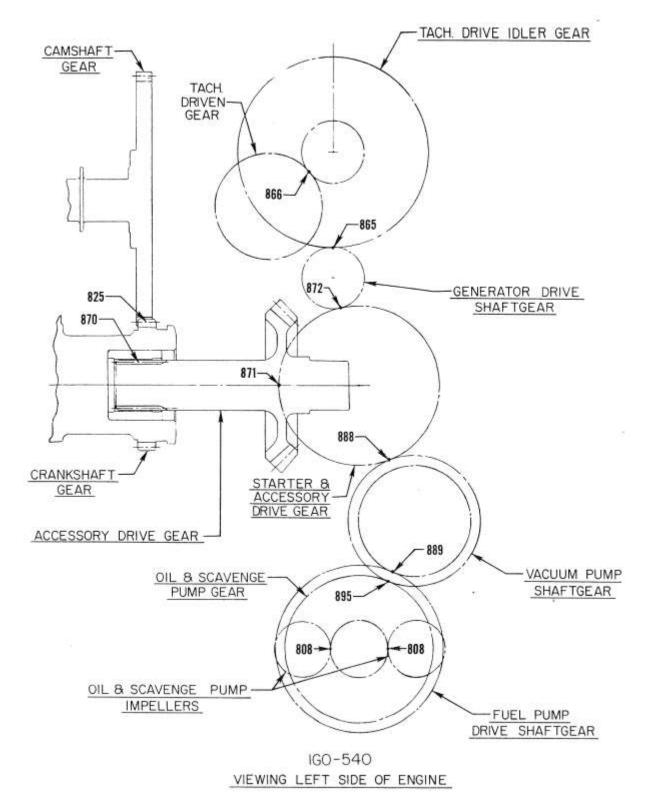
SECTION IV – BACKLASH



IGSO-540 VIEWING LEFT SIDE OF ENGINE

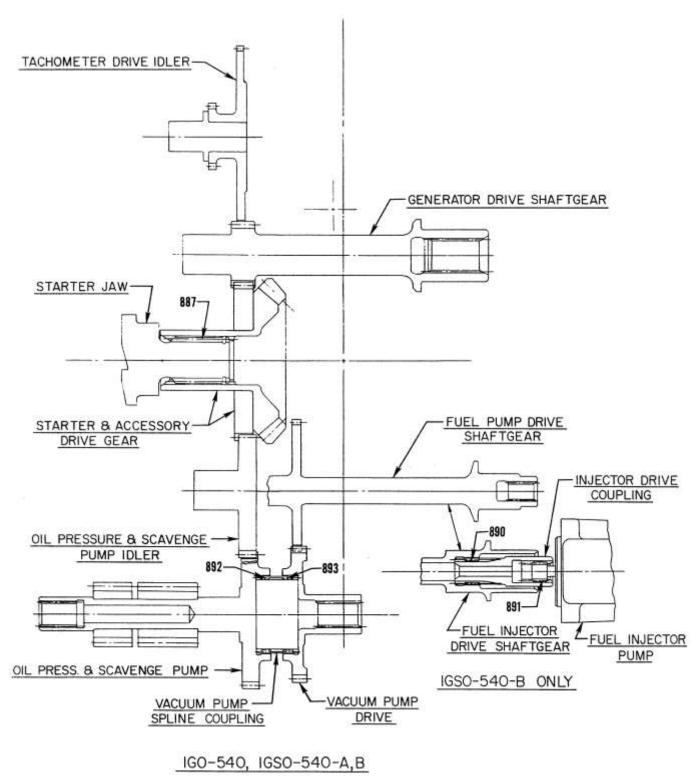
#### **PART III – GEARED ENGINES**

SECTION IV – BACKLASH

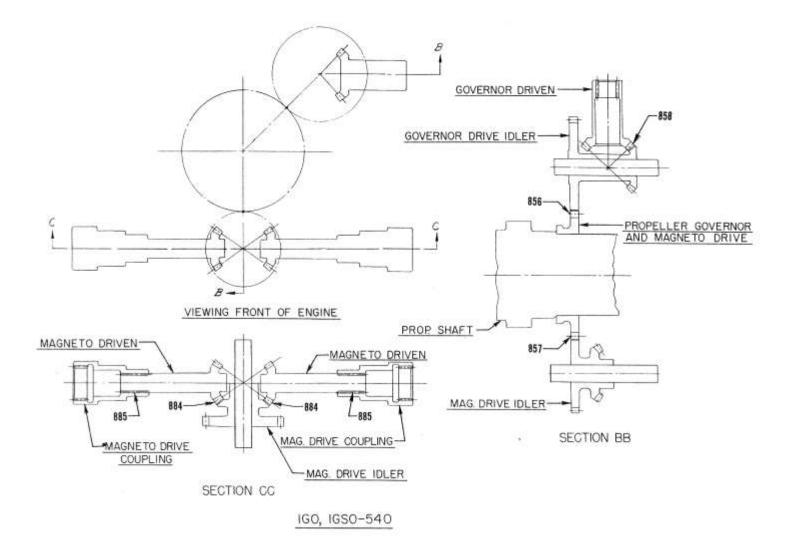


### **PART III – GEARED ENGINES**

SECTION IV – BACKLASH

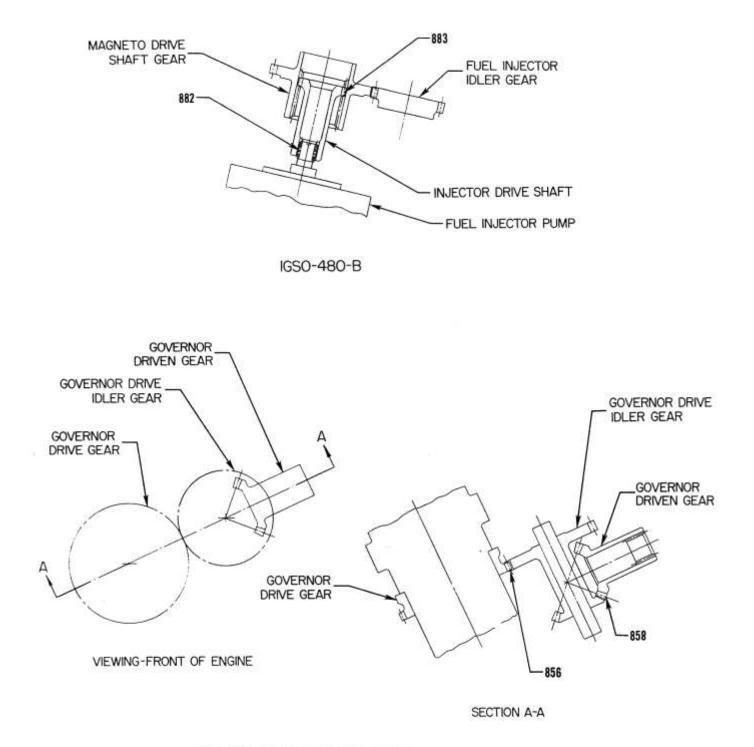


### **PART III – GEARED ENGINES**



**PART III – GEARED ENGINES** 

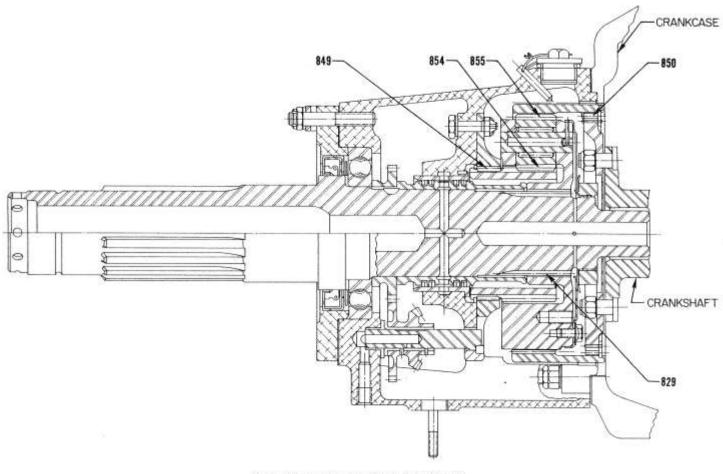
SECTION IV - BACKLASH



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

### PART III – GEARED ENGINES

SECTION IV – BACKLASH



SECTION THRU REDUCTION GEAR

### 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 inlbs.
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 inlbs.
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	
			C C	100 in. lbs.
914	AC	1/8-27 NPT	Injector Nozzle in Cylinder Head	
				60 in. lbs.
919	ALL	1/4 Hex Head	Hose Clamps (Worm Type)	
		and Below		45 in. lbs.
	ALL	5/16 Hex Head	Hose Clamps (Worm Type)	
		and Above		45 in. lbs.
919-1	ALL		"T" Bolt Hose Clamps –	
			Initial Torque	35 in. lbs.
			Retorque After Engine Test	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	25-50 inlbs.*
			injector/primer fuel line (Both Ends)	20 00 m. 105.
			r tight, then continue tightening the nut v in excess of 50 inlbs. can result in dam	
auditt	-			
		case Parting Flange	Nuts' Tightening Procedures – See late	st revision of Service
0.01	Instruction No. 1029.	0.000.15		100.0.1
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.

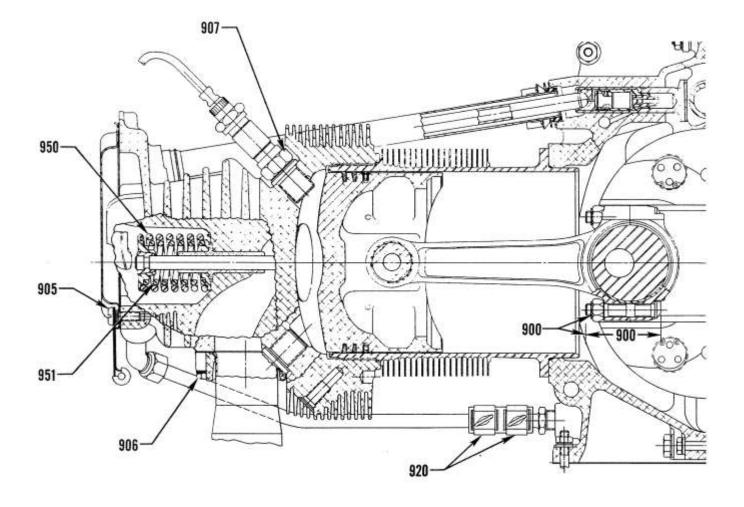
### PART III – GEARED ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	Chart	~ ~	Thread	l Size	Nomer	iclature				Tor	que Lin	nits			
936	P-AB		1	512,0		Supercharger – Intermediate			Torque Limits						
						Shaft Nut							75 ft. lbs.		
937	P-AB				Superc	charger – Impeller Locknut		(600 in. lbs. Plus Torque		s Torque					
											'd. to F		Next		
			-								king Sl				
938	H4-H5-P-AB-AC		1/4-28		Thin S	lotted Nu	ıt						Torque		
											i'd. to F king Sl		Next		
940	ALL				Ring (	Gear Asse	mhly			Loc	king Si	01)			
940	ALL					ing Nuts							360 in. lbs.		
941	ALL					tion Gear		mbly –							
						ing Nuts		2				3	300 in. lbs.		
942	E1-H1		1/4-18		Carbu	etor Drai	in Plug	5				120-1	44 in. lbs.		
	E-H-P		1/8-27	NPT		etor Drai						50-	-60 in. lbs.		
943	Р		10-32			s (To Atta			У						
						Coupling		)				25	-30 in. lbs.		
			S	ECTIO	NV -	SPRIN	GS								
							Ler	ngth		C	OMP.	LOA	D		
					.yc.	Wire		omp.	M		Mf		Service		
Ref.	Chart	Nomeno		Par	rt No.	Dia.	Ler	ngth	M	in.	Ma	х.	Max.		
950	ALL	Outer Valve	Springs			1.55			100				100 lb.		
		(Angle)	a :	6832	26	.177	1.4	6 in.	103	b lb.	111	lb.	min.		
	ALL	Outer Valve	Springs	T W	11706	.182	1.4	2 :	114	11.	124	11.	111 lb.		
951	ALL	(Angle) Auxiliary Va	1100	6832	11796	.182	1.4	3 in.		lb. lb.	124	10.	min. 72 lb.		
951	ALL	Springs (Ang			11797	.142	1.3	3 in.	73			b.	72 ib. min.		
952	H4-H5-P-AB-AC	Check Valve		2	,		110		,,,	0010.					
		Lycomir		F	Free										
		Numł	bers	Le	ength						_				
		654	B			.031	1.0	3 in.	74	lb.	.94	lh	.69 lb.		
			-D			.031	1.0	5 m.	./+	10.	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	10.	min.		
		737	61	2	.065	.041	1.0	03 in 3 15		.03 in. 3.15		5 lb	3.35	lh	3.10 lb.
					.002	.011	1.0	<i>c</i> m.	0.11	, 10.	5.55	10.	min.		
953		Oil Pressu													
		Valve S		<u> </u>											
		Lycoming Part	Identi	fication Free	_										
		Numbers	Dye	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			10. 1b.		22 lb.		17 lb. min.		
	E1-H1-H2-H3	60476	None	2.38	.047	1.44		7.15			65 lb.		00 lb. min.		
	E1-H1-H2-H3	66920	None	2.54	.047	1.44 in. 8.35 lb				85 lb.		20 lb. min.			
	E1-H1-H2-H3	74596	None	2.96	.047	1.44 in. 11.65 lb.			15 lb.		50 lb. min.				
954		Supercharger						_							
		Spring													
		Lycoming													
		Part		T 1	1										
	D	Numbers		Length	140	1 10	T	1701	1.	104	11.	17	5 11		
	P P	68830 LW-12303		.25 .28	.148	1.10 1.13		168 l			lb. lb.		5 lb. min. 5 lb. min.		
	AB	72774		.28 .23	.148	1.13		2491			5 lb.		4 lb. min.		
	AB	LW-12301		.25	.177	1.10		2491			) lb.		4 10. min. 0 lb. min.		
L		12.01	1 1	.20	,	1.15		2551		270	, 10.	25	5 10. mm.		

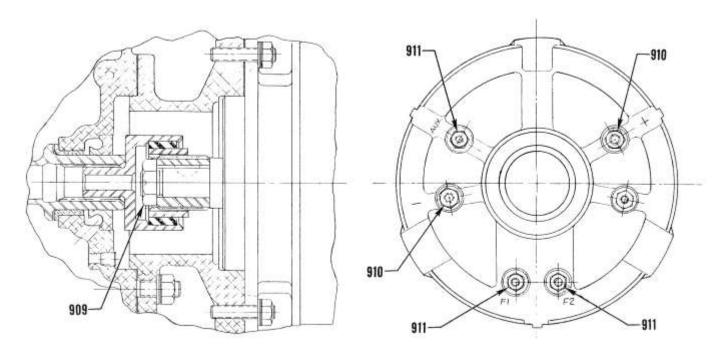
### PART III - GEARED ENGINES

#### SECTION V – SPECIAL TORQUE REQUIREMENTS

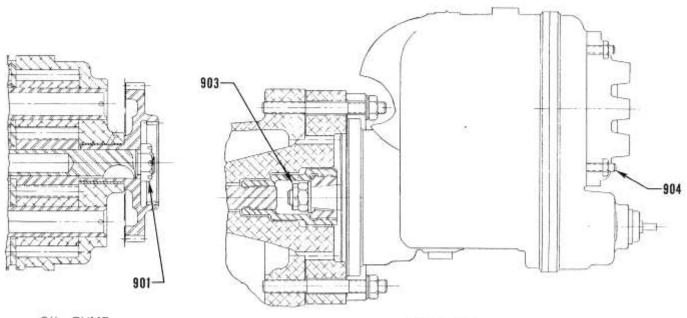


### PART III – GEARED ENGINES

#### SECTION V – SPECIAL TORQUE REQUIREMENTS



ALTERNATOR & ALTERNATOR DRIVE

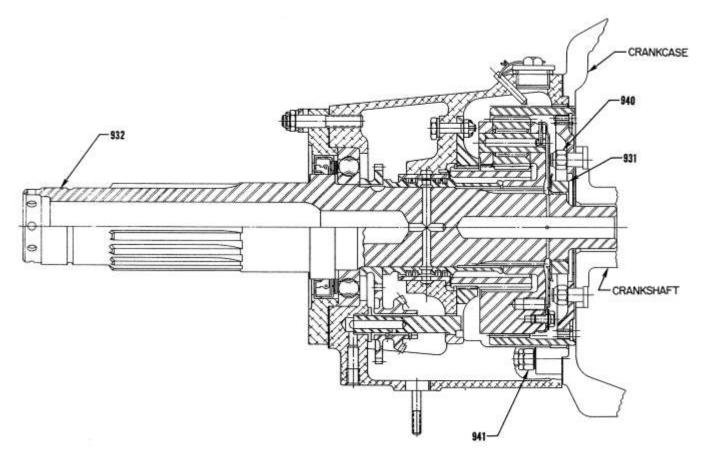


OIL PUMP

MAGNETO

### PART III – GEARED ENGINES

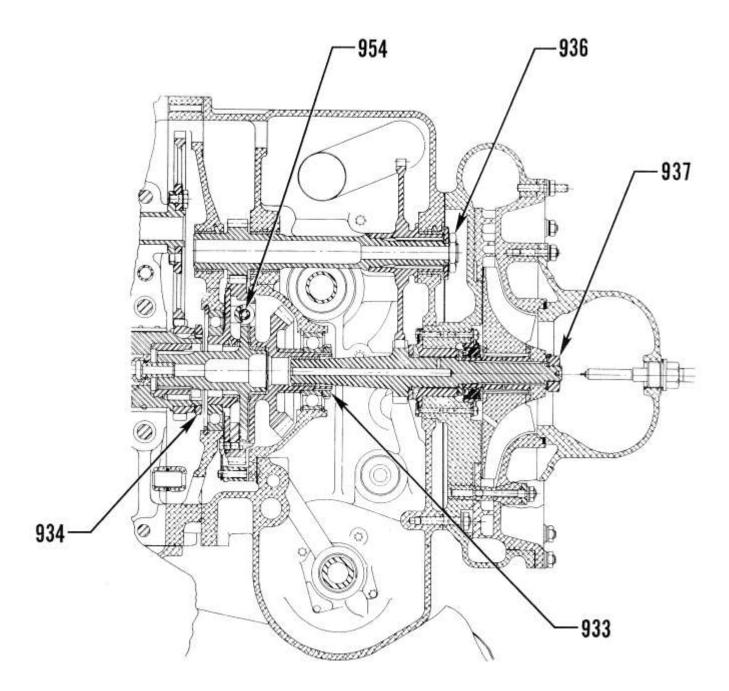
SECTION V – SPECIAL TORQUE REQUIREMENTS



SECTION THRU REDUCTION GEAR

### **PART III – GEARED ENGINES**

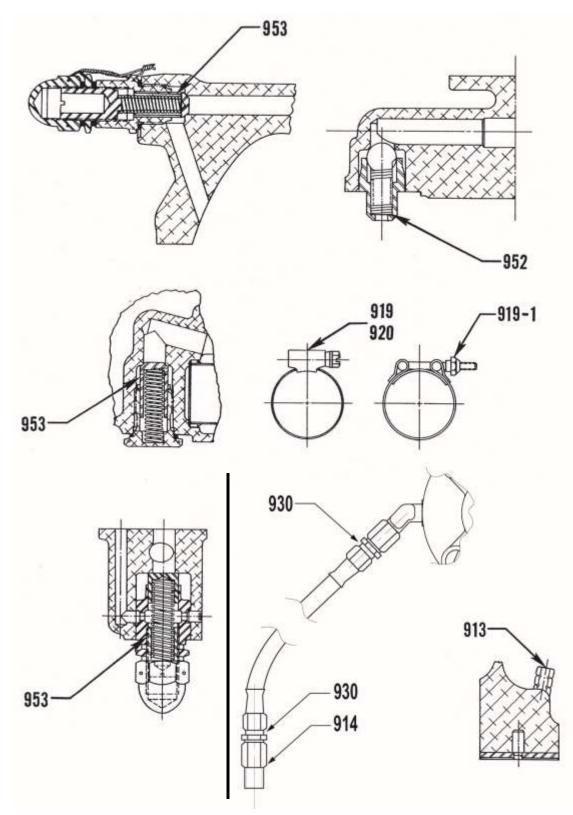
#### SECTION V – SPECIAL TORQUE REQUIREMENTS



# SECTION THRU ACCESSORY HSG. & SUPERCHARGER

### 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).

		TAE	TABLE II				
	В	OLTS, SCRE	PIPE PLUGS				
Thread	Tor	Torque		Torque		Thread	Torque
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Thread	In. Lbs.
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297	1/2-14 NPT	160 to 176
тц							230 to 252
10	THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE						315 to 347

TABLE III	TABLE IV						
CRUSH TYPE GAS	FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)						
Thread Pitch on Part to be Tightened	ANGLE OF TURN		Tube	Thread	Torque In. Lbs.		
Threads Per Inch	Aluminum	Copper	Size		Aluminum Alloy	Steel	
8	135°	67°	(-3) 3/16	3/8 - 24	30 to 50	70 to 80	
10	135°	67°	(-4) 1/4	7/16 - 20	40 to 65	90 to 100	
12	180°	90°	(-5) 5/16	1/2 - 20	60 to 80	135 to 150	
14	180°	90°	(-6) 3/8	9/16-18	75 to 125	270 to 300	
16	270°	135°	(-8) 1/2	3/4-16	150 to 250	450 to 500	
18	270°	135°	(-10) 5/8	7/8 - 14	200 to 350	650 to 700	
20	270°	135°					
24	360°	180°		Т	ABLE V		
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	Е	
NOTE: Install all amush tuna and	leate execut	the celf	Thr	Threads Torque In. Lbs.			
NOTE: Install all crush type gas			1/4	-20	15		
	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				25		
					50		
to the angle of turn listed for the appr							

NOTE: Lubricate Threads Unless Otherwise Specified.

	TABLE VI									
JAM	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								

#### STANDARD TORQUE (CONT.) UNLESS OTHERWISE LISTED

				TABI	LE VII				
				METAL TUP	BE FITTINGS				
			Wrench torque	e for tightening	g AN-818 Nut	(pound inches)		Minimum	
Dash Nos. Ref.	Tubing OD inches	Aluminum-	alloy tubing	Steel	tubing	(Flare MS33	alloy tubing (583) for use (lines only)	measured centerline. D incl	imension in
		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		

## 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 SECTION II SECTION III SECTION IV SECTION V	500 SERIES 600 SERIES 700 & 7000 SERIES 800 & 8000 SERIES 900 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT CYLINDERS GEAR TRAIN BACKLASH (GEAR TRAIN) TORQUE AND SPRINGS
(A)		ink fits controlled by machining, fits that may readily be ear does not normally occur, in each case the fit must be held rance.
(B)	Side clearance on piston	rings must be measured with face of ring flush with piston.
(D)	These dimensions shown piston pin.	n are measured at bottom of piston skirt at right angles to
(E)	Permissible wear of the crown on the diameter.	rankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherein a defir	nite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or interfe	erence fit.

SSP-1776-5-PT4

April 13, 2020\*

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

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# TECHNICAL PUBLICATION REVISION

<b>REVISION NO.</b>	PUBLICATION	PUBLICATION NO.	<b>PUBLICATION DATE</b>
SSP-1776-5-PT4	Service Table of Limits	SSP-1776	October 28, 2013
PREVIOU	S REVISIONS	CURRENT	REVISION*
Ap	ril 2018	April	2020
4-6, 4	4-35, 4-39	4-5,	4-6
	o Section V table and figure for on nut on stainless steel injector		ber 600 Max. Clearance for Piston Ring ed Cylinders (Choke Barrels) in reference number 607

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### **PART IV – VERTICAL ENGINES**

#### SECTION I - CRANKCASE, CRANKSHAFT AND CAMSHAFT

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
500	L	All Main Bearings and			<u>.0015L</u>	
		Crankshaft			.0045L	.0060L
	L1-V	Main Bearings and Crankshaft			<u>.0011L</u>	
		(Except Front)			.0041L	.0050L
	V	Front Main Bearing and			<u>.0011L</u>	00501
	Y 1	Crankshaft			.0041L	.0050L
	L1	Front Main Bearing and Crankshaft			<u>.0015L</u> .0045L	.0050L
	ALL	Diameter of Main Bearing	2.3745		.0043L	.0030L
	ALL	Journal on Crankshaft	$\frac{2.3743}{2.376}$	(E)		
	L	Crankcase Bearing Bore	<u>2.566</u>			
		Diameter (All)	$\frac{2.560}{2.567}$	2.5685		
	V	Crankcase Bearing Bore	2.6865	2.0000		
		Diameter (All)	2.6875	2.6890		
501	ALL	Connecting Rod Bearing and			.0008L	
		Crankshaft			.0038L	.0050L
	ALL	Diameter of Connecting Rod	2.1235			
		Journal on Crankshaft (2-1/8 in.)	2.125	(E)		
	ALL	Connecting Rod Bearing Bore				
		Diameter (2-1/8 in.) (Measured	<u>2.2870</u>			
		at Axis 30° on Each Side)	2.2875			
502	ALL	Connecting Rod – Side			<u>.004L</u>	
		Clearance			.010L	.016L
503	ALL	Connecting Rod – Alignment				0 Inches
504	ALL	Connecting Rod – Twist			.012 in 1	2 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			1005	10072
		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			<u>.006L</u>	
		End Clearance			.015L	.025L
508	ALL	Crankshaft Propeller Flange			0.0.5	0.07
<b>510</b>		Run-Out			.002	.005
510	ALL	Crankshaft Timing Gear and			<u>.0000</u>	
511		Crankshaft			.0015T	(A)
511	ALL	Tappet Body and Crankcase			<u>.0010L</u> .0033L	.004L
	ALL	O.D. of Tappet	.7169			
			.7177	.7166		
	ALL	I.D. Tappet Bore in Crankcase	<u>.7187</u>			
			.7200	.7203		

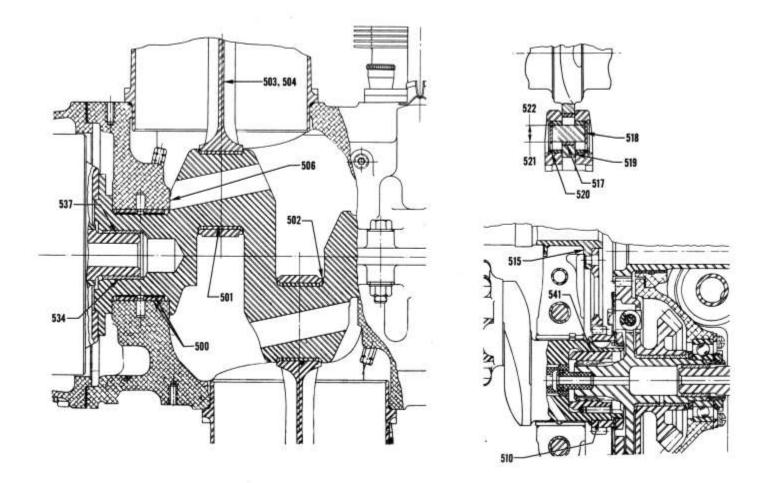
### **PART IV – VERTICAL ENGINES**

#### SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

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

### **PART IV – VERTICAL ENGINES**

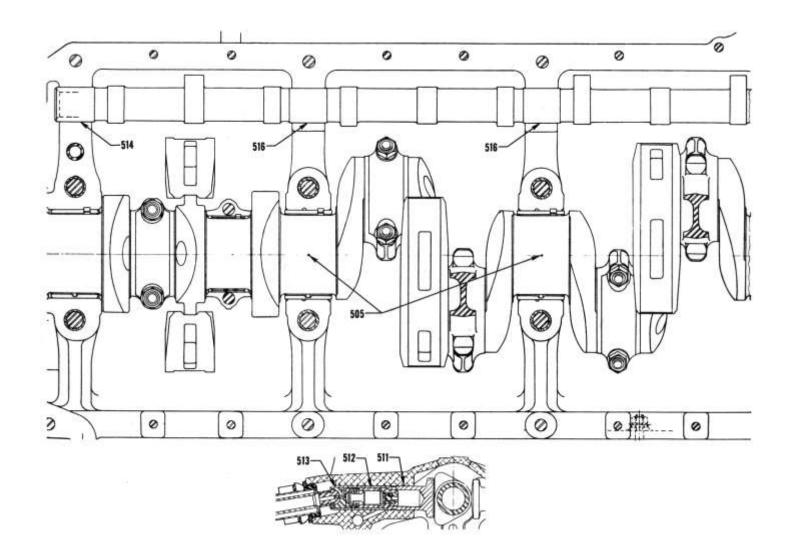
#### SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



Crankcase, Crankshaft, Bearings, Camshaft and Counterweights

### PART IV - VERTICAL ENGINES

#### SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



Longitudinal Section Thru Engine, Camshaft, Tappet Body and Crankshaft

### PART IV - VERTICAL ENGINES

			Dimer	sions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
600	ALL	Connecting Rod and Connecting	Bushing P/N Bushing P/N			
	ALL	Rod Bushing Finished I.D. of Connecting Rod	<u>1.1254</u>	01K20905 18	<u>not</u> burnishe	
601	L	Bushing           Length Between Connecting Rod           During Contemp	1.1262 6.4985 6.5015			
	V	Bearing Centers Length Between Connecting Rod	<u>6.7485</u> 6.7515			
602	ALL	Bearing Centers Connecting Rod Bushing and Piston Pin	0./515		<u>.0008L</u> .0021L	.0025L
603	ALL	Piston Pin and Piston			<u>.0003L</u> .0014L	.0018L
	ALL	Diameter of Piston Pin Hole in Piston	$\frac{1.1249}{1.1254}$			
	ALL	Diameter of Piston Pin	<u>1.1241</u> 1.1246			
604	V	Piston and Piston Pin Plug			<u>.0002L</u> .0010L	.002L
	V	Diameter of Piston Pin Plug*	$\frac{1.1242}{1.1247}$			
605	ALL	Piston Pin and Piston Pin Plug (Nitrided and Chrome Cylinders)			<u>.0005L</u> .0025L	.005L
	V	Diameter of Piston Pin Plug*	<u>.5655</u> .5665			
	L	Diameter of Piston Pin Plug**	<u>.7605</u> .7615			
	L	Diameter of Piston Pin Plug** (Thin Wall Pin)	<u>.8405</u> .8415			
	*See latest revision of Serv **See latest revision of Serv					
606	ALL	Piston Ring and Piston – Side Clearance (Top Ring Comp.) Half Wedge			<u>.0025L</u> .0055L	.008L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (2 <sup>nd</sup> Ring Comp.) Full or Half Wedge			<u>.000</u> .004L	.006L (B)
	ALL	Piston Ring and Piston – Side Clearance (Oil Regulating)			<u>.002L</u> .004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (Oil Scraper)			<u>.003L</u> .0055L	.007L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (3 <sup>rd</sup> Ring Comp.) Half Wedge			<u>.000</u> .004L	.006L (B)
607	ALL	Piston Ring Gap (Compression) Chrome Cylinders (Straight Barrels)			<u>.020</u> .030	.047
	ALL	Piston Ring Gap (Compression) Nitrided and Chrome Cylinders (Choke Barrels)			<u>.045</u> .065	.067

### **PART IV – VERTICAL ENGINES**

						D	imensions		Cle	arances
Df			N			Mfr Min.	& Servi		Mfr. Min. &	Service
Ref.		Chart		nenclature		Max	. Max	κ.	Max.	Max.
607	ALL		Piston Ring C						<u>.015</u>	0.17
			Regulating) (		\ \				.040	.047
	ALL (AS AP	PLICABLE)	Piston Ring ( (All Barrels)	Jap (OII Sera	aper)				<u>.015</u> .030	.047
	.0075.	arrels – Ring gap is m	easured within			-	gap at top of	f trav		
	For All Other	Barrels – Ring gap is	s measured at t	op limit of r	ing travel		Calind	D	1	
	Engine ar	nd Piston Application	Min. Pisto	on Diameter			Cylind	er Bai	rrel	
	Engine Chart Code Letter	Piston Number	Тор	Bottom	Type o	f Piston	Type of Surface		/laximum Diameter	Max. Clearance Piston Skirt & Cyl.
608		67266, 71553, 73620	4.8395	4.8540	Forged		С		4.8805	.0225L
608	L	73932	4.8395	4.8540	Forged		N		4.8805	.0225L
609		75984	4.8395	4.8590	Forged		С		4.8805	.018L
610		75984, 76172*	4.8395	4.8590	Forged	-Cam	N		4.8805	.018L
	V	71940, 72249, 72578, 73947*, 73976 71940, 72249, 73947,	5.0905	5.1040	Forged	-Round	С		5.1305	.0225L
		73976	5.0905	5.1040	Forged	-Round	Ν		5.1305	.023L
		74242, 75617	5.0790	5.1090	Forged		C-N		5.1305	.018L
		78203, 78762, LW-10207*, LW-10208	5.0790	5.1090	Forged		C-N		5.1305	.018L
				NOTE	ES:					
	from plane in	verage diameter of cy a which valves are loc rs; this sum, divided b pression.	ated. Second,	measure dia	meter thr	ough the	e plane in wl			
	Cylinder Bar	rel: N=nitride hardene	ed, C=chrome	plated.						
	Maximum tap	per and out-of-round p	permitted for c	ylinder in se	rvice is .(	0045 inc	h.			
To find the average out-of-round, measure diameter of cylinder in an area 4" above bottom of bar diameter at right angles from plane in which valves are located. Second, measure diameter through valves are located. Difference between diameters must not exceed .0045 inch.										
		ter at top is measured le; diameter at botton								

### **PART IV – VERTICAL ENGINES**

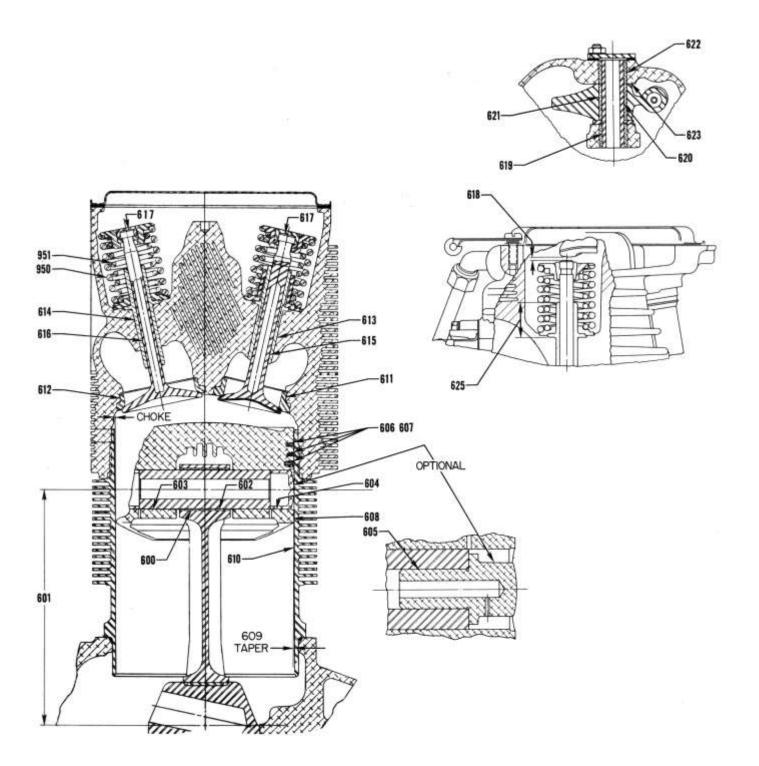
			Dime	nsions	Clearances		
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.	
611	L	Exhaust Valve Seat and Cylinder			<u>.0065T</u>		
		Head (Flat Seat)			.010T	(A)	
	ALL	Exhaust Valve Seat and Cylinder			<u>.0075T</u>		
	ALL	Head (Allison Seat)	1.0255		.011T	(A)	
	ALL	O.D. Exhaust Seat (Allison Seat)	<u>1.9355</u> 1.937				
	L	O.D. Exhaust Seat (Flat Seat)	2.0965				
	_		2.098				
	ALL	I.D. Exhaust Seat Hole in	1.926				
		Cylinder Head (Allison Seat)	1.928				
	L	I.D. Exhaust Seat Hole in	2.088				
		Cylinder Head (Flat Seat)	2.090				
612	ALL	Intake Valve Seat and Cylinder			<u>.0065T</u>		
		Head			.010T	(A)	
	L	O.D. Intake Seat (Allison Seat)	$\frac{2.1675}{2.160}$				
	T	OD Intoles Seat (Elet Seat)	2.169				
	L	O.D. Intake Seat (Flat Seat)	$\frac{2.3145}{2.316}$				
	V	O.D. Intake Seat	<u>2.2885</u>				
	, •	O.D. Intake Seat	2.290				
	L	I.D. Intake Seat Hole in Cylinder	2.159				
		Head (Allison Seat)	2.161				
	L	I.D. Intake Seat Hole in Cylinder	2.306				
		Head (Flat Seat)	2.308				
	V	I.D. Intake Seat Hole in Cylinder	2.280				
		Head	2.282				
613	ALL	Exhaust Valve Guide and			<u>.001T</u>		
	ALL	Cylinder Head	((22		.0025T	(A)	
	ALL	O.D. Exhaust Valve Guide (1/2 in. Exhaust Valve)	<u>.6633</u> .6638				
	L	O.D. Exhaust Valve) O.D. Exhaust Valve Guide (7/16	.5933				
	L	in. Exhaust Valve)	.5938				
	ALL	I.D. Exhaust Valve Guide Hole					
		in Cylinder Head (1/2 in.	.6613				
		Exhaust Valve)	.6623				
	L	I.D. Exhaust Valve Guide Hole					
		in Cylinder Head (7/16 in.	<u>.5913</u>				
		Exhaust Valve)	.5923				
614	ALL	Intake Valve Guide and Cylinder Head			<u>.001T</u> .0025T	(A)	
	ALL	O.D. Intake Valve Guide	.5933			(- <b>-</b> )	
			.5938				
	ALL	I.D. Intake Valve Guide Hole in	.5913				
		Cylinder Head	.5923				
615	ALL	Exhaust Valve Stem and Valve			<u>.0035L</u>		
		Guide			.0053L	(A)	

### PART IV - VERTICAL ENGINES

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
615	ALL	O.D. Exhaust Valve Stem	.4957			
010			.4965	.4937		
				owable limits	of 4937 is	
				only to i		
			nimonic va			
	L	O.D. Exhaust Valve Stem (7/16	.4332			
		in. Exhaust Valve)	.4340			
	ALL	Finished I.D. Exhaust Valve	.5000			
		Guide (1/2 in. Exhaust Valve)	.5010			
	L	Finished I.D. Exhaust Valve	.4360			
	2	Guide (7/16 in. Exhaust Valve)	.4370			
	<sup>1</sup> / <sub>2</sub> inch diameter exhaust valves ma	ay have exhaust valve guides that are		r the maximu	ım inside dia	meter limit
		After 300 hours of service, inside d				
		ation up to the recommended overha				
		ion of Service Instruction No. 1009				inen
616	ALL	Intake Valve Stem and Valve			.0010L	
010		Guide			.0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022			10002
			.4030	.4010		
	ALL	Finished I.D. Intake Valve	.4040			
		Guide	.4050			
617	ALL	Valve and Valve Cap Clearance			.000	
		1			.004L	.005L
618	ALL	Dry Tappet Clearance			.028	
		• • • •			.080	
619	ALL	Valve Rocker Shaft and Valve			.0001L	
		Rocker Bushing			.0013L	.0025L
	ALL	Finished I.D. of Valve Rocker	.6246			
		Shaft Bushing in Cylinder Head	.6261	.6270		
620	ALL	Valve Rocker Shaft and Valve			<u>.0007L</u>	
		Rocker Bushings			.0017L	.004L
	ALL	O.D. Valve Rocker Shaft	.6241			
			.6245	.6231		
	ALL	Finished I.D. of Rocker Arm	<u>.6252</u>			
		Bushing	.6263	.6270		
621	ALL	Valve Rocker Bushing and				
		Valve Rocker	Bushi	ng Must Be		Place
622	ALL	Valve Rocker Shaft Bushing and			<u>.0022T</u>	
		Cylinder Head			.0038T	(A)
	ALL	Valve Rocker Shaft Bushing	<u>.7380</u>			
		Hole in Cylinder Head	.7388			
623	ALL	Valve Rocker and Cylinder			<u>.002L</u>	
		Head – Side Clearance			.020L	.024L
625	ALL	Intake and Exhaust Valve Guide	<u>.914</u>			
		Height	.954			
		MEASURE THE VALVE GUID				
		FROM THE VALVE SPRIN				
		COUNTERBORE IN THE C				
		HEAD TO THE TOP OF VALVE	GUIDE.			

**PART IV – VERTICAL ENGINES** 

SECTION II – CYLINDERS



### Cylinder, Piston, Connecting Rod and Valve Components

### PART IV – VERTICAL ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
Def	Chart	Nomenalotana	Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
OIL PU					1	
702	L-V	Oil Pump and Scavenge Pump			<u>.007L</u>	
		Gear – End Clearance			.030L	.045L
	L1	Oil Pump Drive Gear – End			<u>.010L</u>	
		Clearance			.035L	.060L
703	L-V	Oil Pump and Scavenge Pump			<u>.007L</u>	
		Impellers – Dia. Clearance			.011L	.014L
	L1	Oil Pump Impellers – Dia.			<u>.007L</u>	
		Clearance			.011L	.014L
704	L-V	Oil Pump and Scavenge Pump			<u>.003L</u>	0.0.47
		Impellers – Side Clearance			.0055L	.006L
	L1	Oil Pump Impellers – Side			<u>.003L</u>	
		Clearance		ļ	.0055L	.006L
	ALL	Width of Oil Pump Impellers	<u>.995</u>			
			.997	.994		
	ALL	Width of Oil Scavenge Pump	<u>1.496</u>			
		Impellers	1.498	1.495		
705	L-V	Oil Pump and Oil Scavenge				
		Pump Driven Impeller and Idler			<u>.001L</u>	
		Shaft			.0025L	.004L
	L1	Oil Pump Driven Impeller and			<u>.0010L</u>	
		Idler Shaft			.0025L	.004L
706	ALL	Oil Pump Idler Shaft and Oil			<u>.0000</u>	
		Pump Body			.0015T	(A)
	L1	Oil Pump Idler Shaft and Oil			<u>.0000</u>	
		Pump Cover			.0015T	(A)
713	L-V	Oil Pump Idler Shaft and			<u>.0000</u>	
		Scavenge Pump Body			.0015T	(A)
777	L-V	Oil Pump Drive Shaft Bushing			<u>.001T</u>	
		and Scavenge Pump Body			.003T	(A)
	L1	Oil Pump Drive Shaft Bushing			<u>.001T</u>	
		and Oil Pump Body			.003T	(A)
778	ALL	Oil Pump Drive Shaft Bushing			<u>.001T</u>	
		and Oil Pump Body			.003T	(A)
	L1	Oil Pump Drive Shaft Bushing			<u>.001T</u>	
		and Oil Pump Cover			.003T	(A)
779	L-V	Oil Pump Drive Bushing and Oil			<u>.0015L</u>	0.057
		Scavenge Pump Gear			.0035L	.005L
	L1	Oil Pump Drive Gear and Oil			<u>.0015L</u>	0.0
<b>7</b> 00		Pump Cover			.0035L	.005L
780	ALL	Oil Pump Drive Shaft Bushing			<u>.0015L</u>	0.0
		and Oil Pump Shaft			.0035L	.005L
7051	ALL	Oil Relief Valve Plunger and		1	<u>.001L</u>	0.0.77
		Sleeve			.003L	.005L
7076	L1	Oil Pump Drive Gear Bushing			<u>.002T</u>	
		and Accessory Housing		ļ	.004T	(A)
7077	L1	Oil Pump Drive Gear and			<u>.0015L</u>	
		Accessory Housing Bushing			.0035L	.005L

### **PART IV – VERTICAL ENGINES**

#### SECTION III - GEAR TRAIN

				nsions		ances
Ref.	Chart	Nomenclature	Mfr. Min. & Mor	Service	Mfr. Min. &	Service
		Nomenciature	Max.	Max.	Max.	Max.
	PUMP				0015	
782	L-V	Fuel Pump Drive Shaftgear			<u>.001T</u>	
702	L-V	Bushing and Accessory Housing			.004T	(A)
783	L-V	Fuel Pump Drive Shaftgear – End Clearance			<u>.006</u> .064	074
784	L-V	Fuel Pump Drive Shaftgear and			.004 .001L	.074
/04	L-v	Bushing			.001L .004L	.006L
VACU	UM PUMP	Dushing			.004L	.000L
	L-V	V D Cl C				
793	L-V	Vacuum Pump Shaftgear Bushing and Accessory Housing			001 <b>5</b> T	
		Cover			<u>.0015T</u> .0035T	(A)
794	L-V	Vacuum Pump Shaftgear			.00331	(Л)
774		Bushing (At Cover) and Vacuum			.002L	
		Pump Shaftgear			.004L	.006L
795	L-V	Vacuum Pump Shaftgear			.0015T	
		Bushing and Accessory Housing			.0035T	(A)
	L1	Vacuum Pump Shaftgear			.0025T	
		Bushing and Accessory Housing			.0045T	(A)
796	ALL	Vacuum Pump Shaftgear				
		Bushing (At Accessory Housing)			<u>.002L</u>	
		and Vacuum Pump Shaftgear			.0045L	.006L
797	L-V	Vacuum Pump Shaftgear – End			<u>.008</u>	
		Clearance			.030	.050
799	L1	Vacuum Pump Drive Gear			<u>.002T</u>	
7000	L1	Bushing and Accessory Housing			.004T	(A)
7000		Vacuum Pump Drive Gear Bushing and Vacuum Pump			.0025L	
		Drive Gear			.0045L	.006L
7078	L1	Vacuum Pump Drive Gear and			.0043L	.000L
1010		Cover			.0033L	.005L
7079	L1	Vacuum Pump Drive Gear – End			.010	
		Clearance			.032	.037
TACH	OMETER	· · ·				
7002	L1	Tachometer Driven Gear and			.001L	
7002		Adapter			.003L	.0045L
7006	L-V	Electric Tachometer Driven			.007	
		Gear – End Clearance			.025	.047
7012	L-V	Electric Tachometer Driven				
		Gear and Accessory Housing			<u>.001L</u>	
		Cover			.003L	.004L
7088	L1	Tachometer Adapter and			<u>.0005L</u>	
		Accessory Housing			.0025L	.0035L
MAGN	IETO					
7025	L-V	Magneto Drive Idler Gear Hub				
		Bushing and Magneto Drive	Bush	ing Must Be	Burnished In	Place
		Idler Gear Hub			•	
7026	L-V	Magneto Drive Idler Gear Hub				
		Bushing and Magneto Drive			<u>.001L</u>	
		Idler Shaft			.003L	.004L

### **PART IV – VERTICAL ENGINES**

#### SECTION III – GEAR TRAIN

			Dime	ensions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
MAGN	ETO (CONT.)					
7027	L-V	Magneto Drive Idler Gear Hub –			.005	
		End Clearance			.014	.024
7028	L-V	Magneto Drive Shaft and			<u>.002L</u>	
		Accessory Housing Cover			.0045L	.006L
7029	L-V	Magneto Drive Shaft and			.0025L	
		Accessory Housing			.0045L	.006L
7030	ALL	Magneto Drive Shaft Sleeve and			<u>.001T</u>	
		Magneto Drive Shaft			.004T	(A)
7031	ALL	Magneto Drive Shaft Sleeve and			<u>.001T</u>	
		Magneto Drive Coupling			.004T	(A)
7032	L-V	Magneto Drive Shaftgear – End			.002	
		Clearance			.020	.030
7039	L1	Magneto Drive Idler Gear – End			.002	
		Clearance			.030	.040
7080	L1	Magneto Drive Idler Gear				
		Bushing and Magneto Drive			<u>.001L</u>	
		Idler Shaft			.003L	.004L
7081	L1	Magneto Drive Idler Gear and				
		Magneto Drive Idler Gear			<u>.0005T</u>	
		Bushing			.0025T	(A)
7082	L1	Magneto Drive Gear Bushing			<u>.002T</u>	
		and Accessory Housing			.004T	(A)
7083	L1	Magneto Drive Coupling and			<u>.001L</u>	
		Accessory Housing Bushing			.003L	.004L
7084	L1	Magneto Drive Gear and			<u>.001L</u>	
		Accessory Housing Bushing			.003L	.004L
GENEI	RATOR					
7043	L-V	Generator Drive Gear Bushing			.0015T	
		and Accessory Housing Cover			.0035T	(A)
7044	L-V	Generator Drive Gear Bushing				, í
		(At Cover) and Generator Drive			<u>.002L</u>	
		Gear			.004L	.006L
7045	L-V	Generator Drive Gear Bushing			.002T	
		and Accessory Housing			.004T	(A)
7046	L-V	Generator Drive Gear Bushing				
		(At Accessory Housing) and			<u>.0025L</u>	
		Generator Drive Gear			.0045L	.006L
7047	L-V	Generator Drive Gear – End			.010	
		Clearance			.038	.050
START	ER	·				•
7048	L-V	Starter Drive Gear Bushing and			<u>.002T</u>	
/040		Adapter			.004T	(A)
	L1	Starter Drive Spacer Bushing			<u>.0041</u>	
		and Adapter			<u>.0021</u> .004T	(A)
7049	L-V	Starter Drive Gear Bushings and			.0041 .002L	(A)
1049	μ- γ	Starter Drive Gear Bushings and Starter Drive Gear			.002L .004L	.006L
	L1	Starter Drive Gear Starter Drive Spacer and Starter			.004L .0015L	.000L
		Drive Adapter Bushing			.0013L .003L	.004L
		Drive Adapter Dushing		1	.003L	.004L

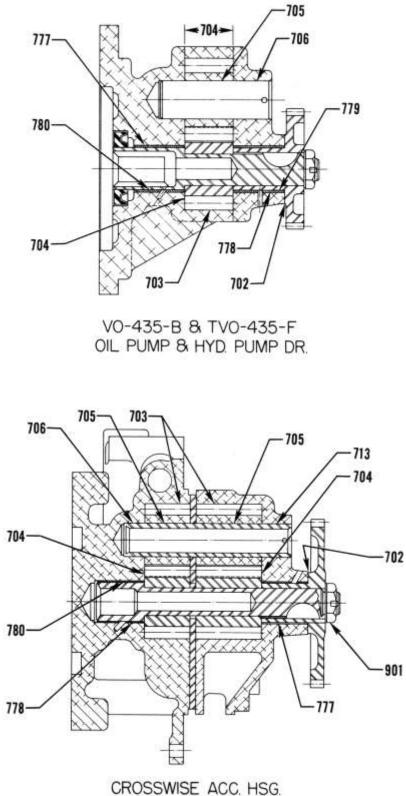
### **PART IV – VERTICAL ENGINES**

#### SECTION III – GEAR TRAIN

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

### PART IV - VERTICAL ENGINES

SECTION III – GEAR TRAIN

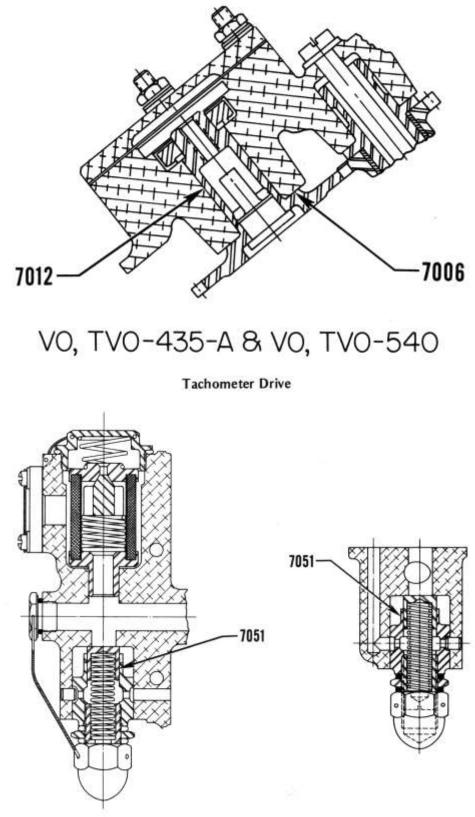


1033WISE AUG. 1130

**Oil Pumps** 

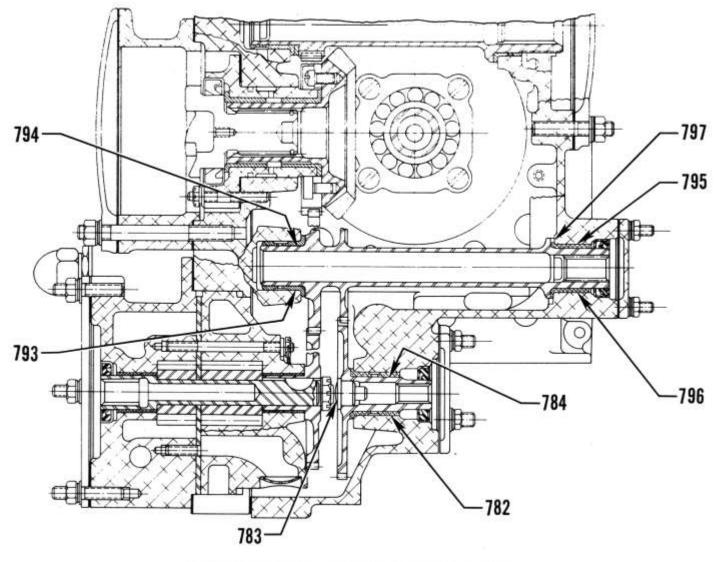
**PART IV – VERTICAL ENGINES** 

SECTION III – GEAR TRAIN



**Oil Relief Valves** 

### **PART IV – VERTICAL ENGINES**

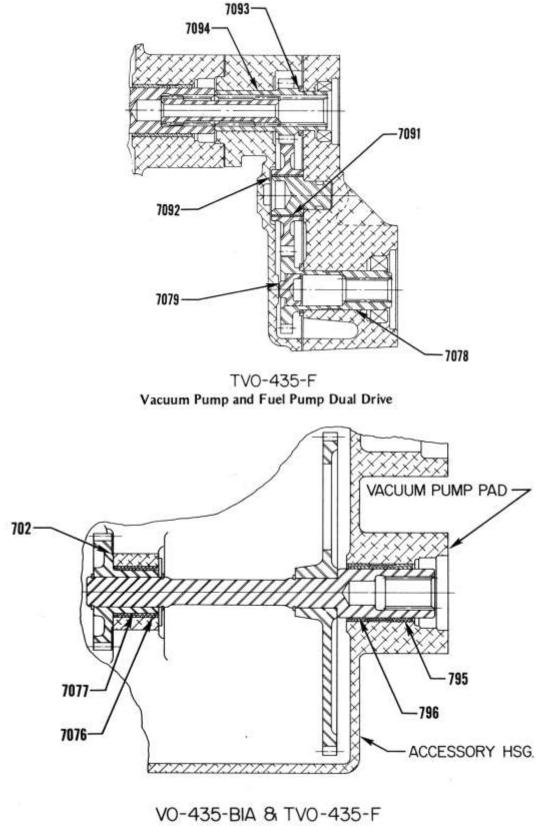


CROSSWISE ACCESSORY HSG.

Vacuum and Fuel Pump Drives

### **PART IV – VERTICAL ENGINES**

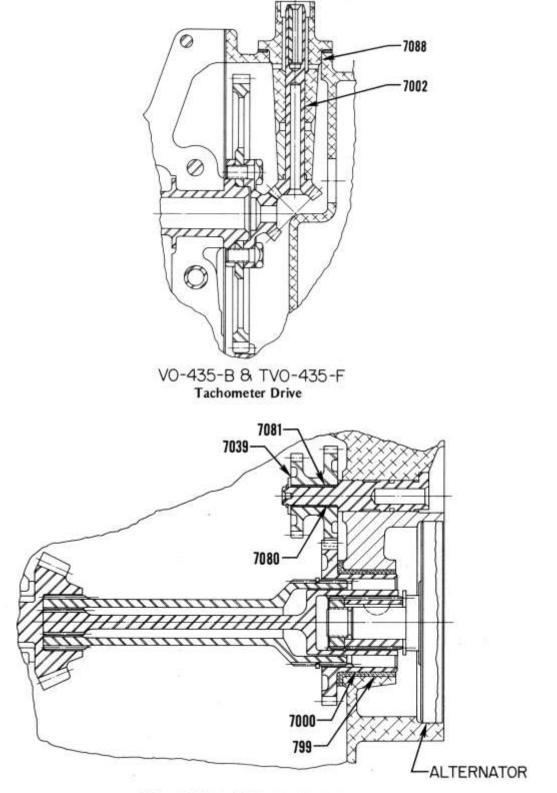
SECTION III – GEAR TRAIN



**Vacuum Pump Drive** 

### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN

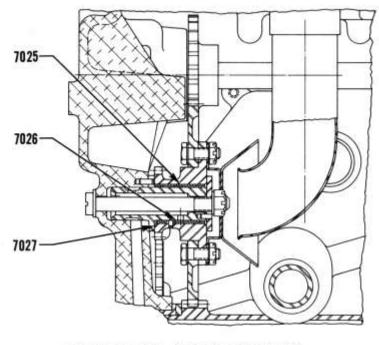


VO-435-B & TVO-435-F

Vacuum, Magneto and Alternator Drive

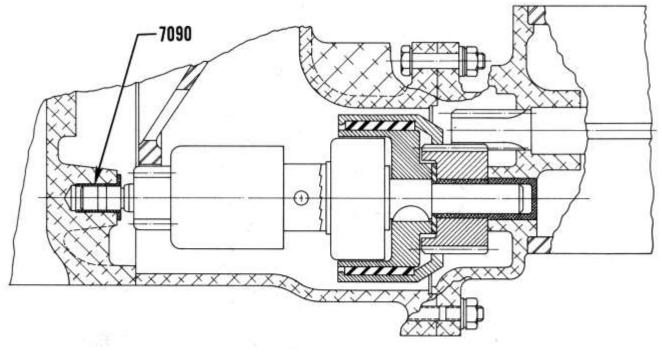
### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



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

Magneto and Tachometer Idler Gear

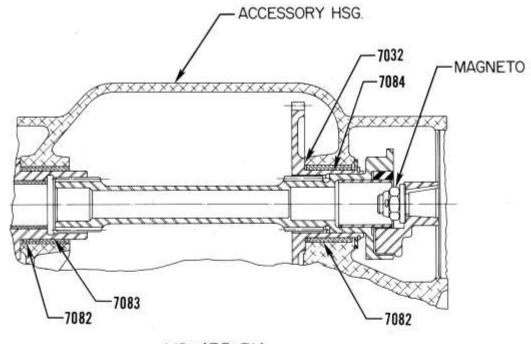


VO-435-B & TVO-435-F

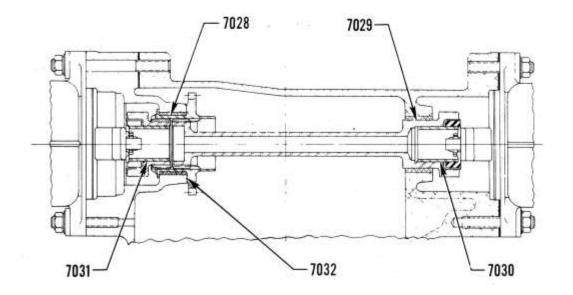
**Bendix Drive** 

### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



VO-435-BIA

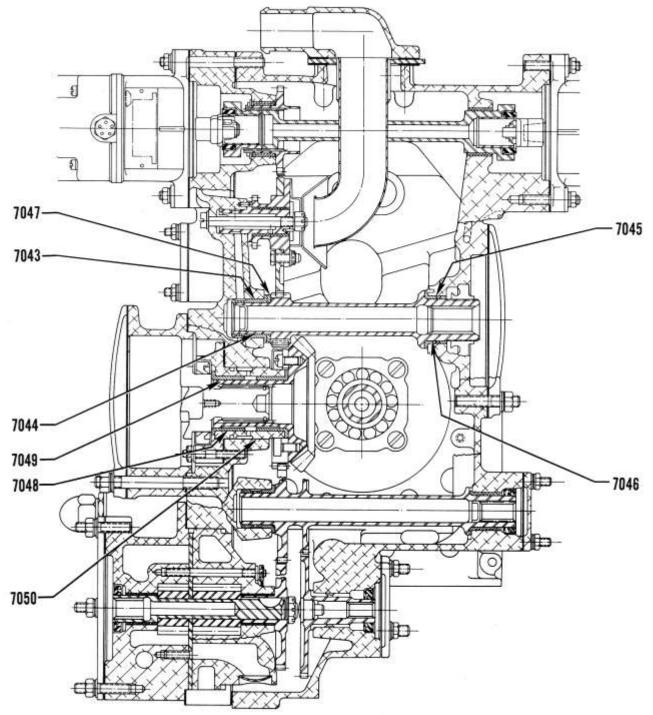


VO, TVO-435-A & VO, TVO-540

### **Magneto Drives**

**PART IV – VERTICAL ENGINES** 

SECTION III – GEAR TRAIN

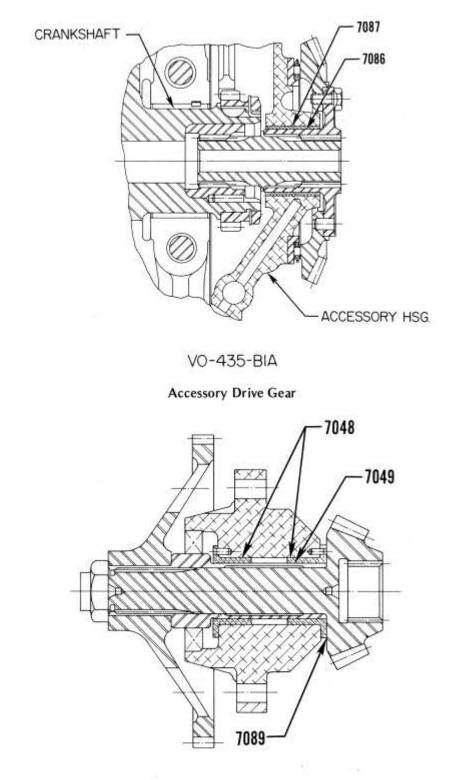


VO, TVO-435-A & VO, TVO-540

**Generator and Starter Drives** 

### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN

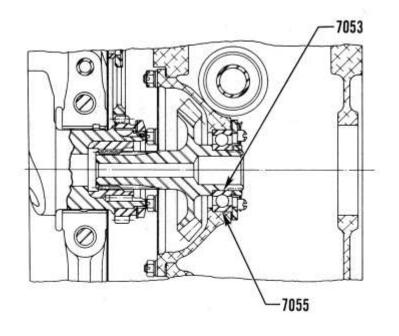


VO-435-BIA

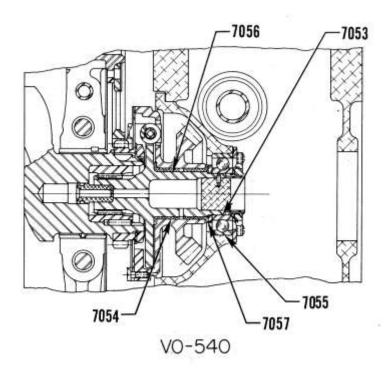
#### Starter Drive

**PART IV – VERTICAL ENGINES** 

SECTION III – GEAR TRAIN



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



Accessory Drives

### **PART IV – VERTICAL ENGINES**

#### SECTION IV – BACKLASH

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

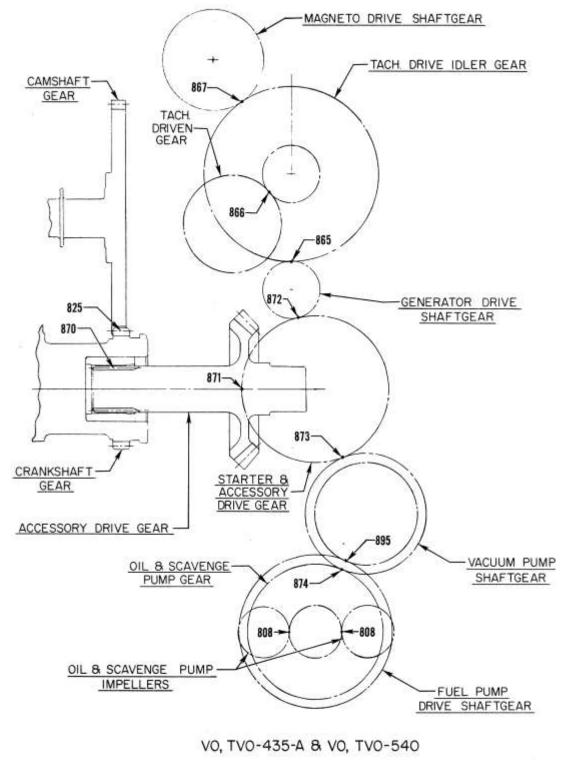
### **PART IV – VERTICAL ENGINES**

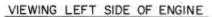
#### SECTION IV – BACKLASH

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

#### **PART IV – VERTICAL ENGINES**

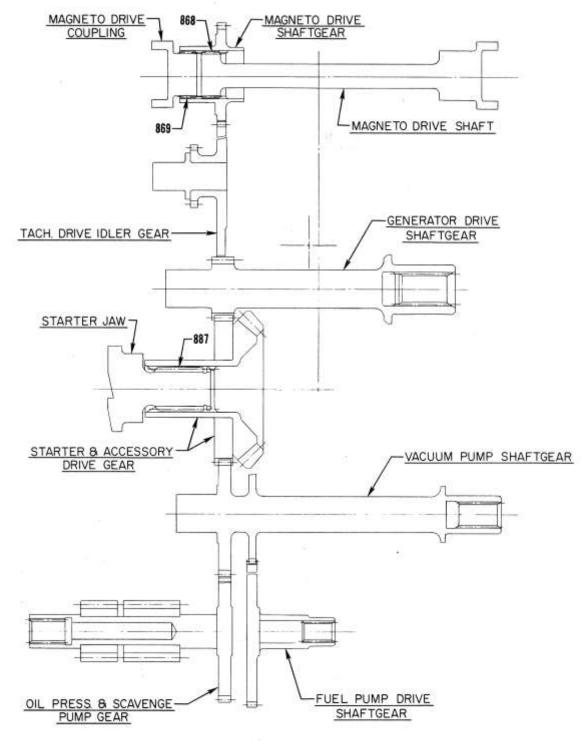
SECTION IV – BACKLASH





**PART IV – VERTICAL ENGINES** 

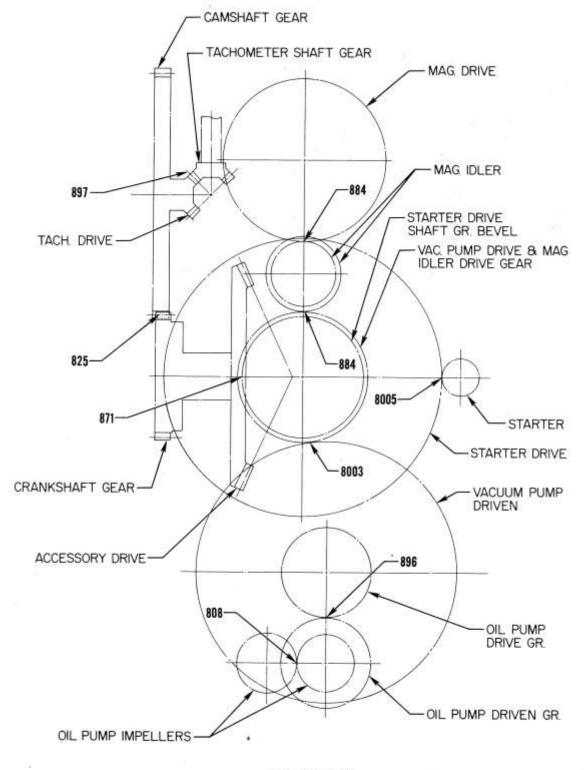
#### SECTION IV – BACKLASH



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

#### **PART IV – VERTICAL ENGINES**

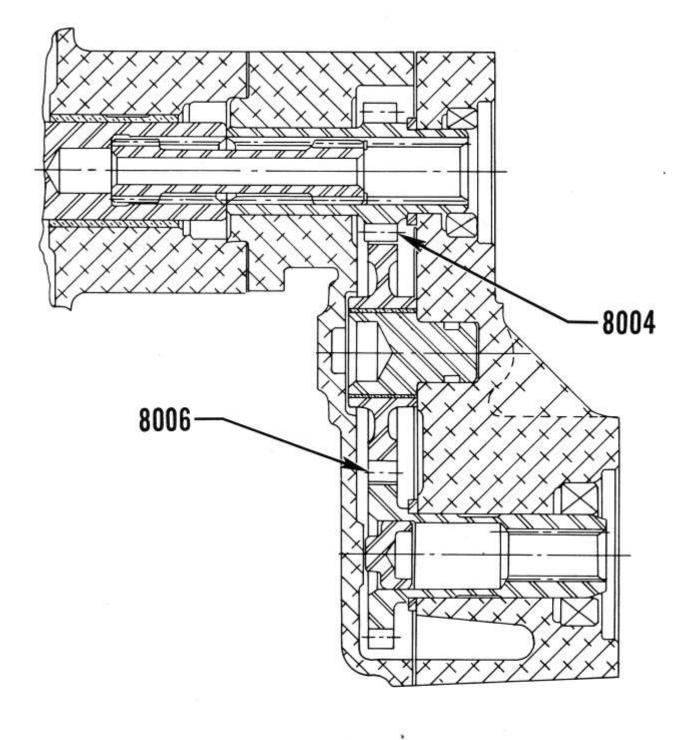
SECTION IV – BACKLASH



VO-435-BIA LEFT SIDE OF ENGINE

**PART IV – VERTICAL ENGINES** 

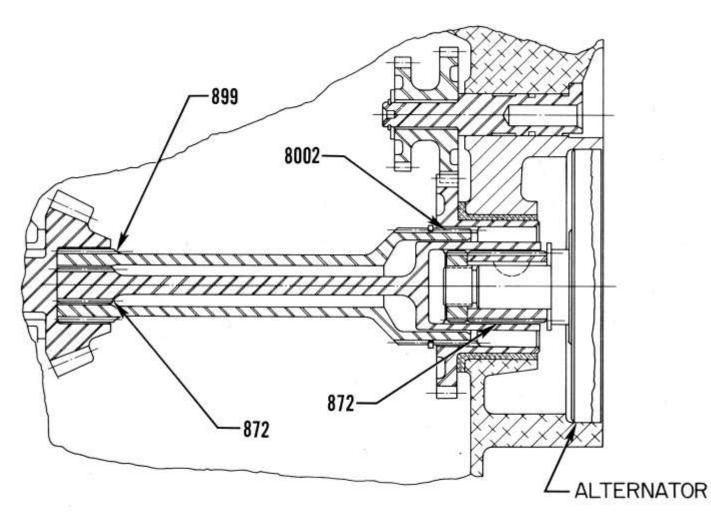
SECTION IV – BACKLASH



TVO-435-F

#### Vacuum Pump and Fuel Pump Dual Drives

### **PART IV – VERTICAL ENGINES**

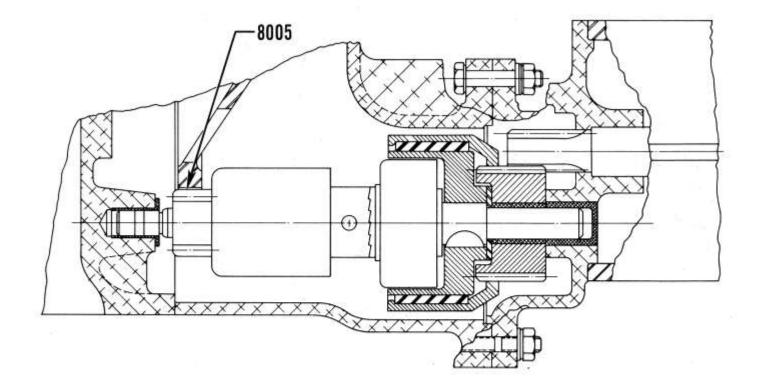


# VO-435-B & TVO-435-F

Vacuum, Magneto and Alternator Drives

### **PART IV – VERTICAL ENGINES**

SECTION IV – BACKLASH

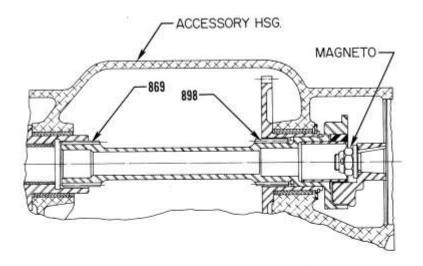


# VO-435-B & TVO-435-F

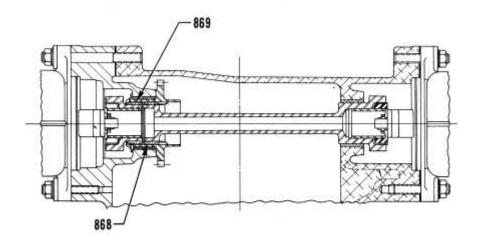
**Bendix Drive** 

### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH



VO-435-BIA

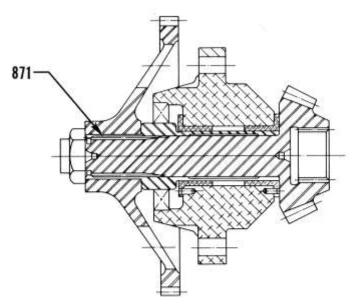


VO, TVO-435-A & VO, TVO-540

**Magneto Drives** 

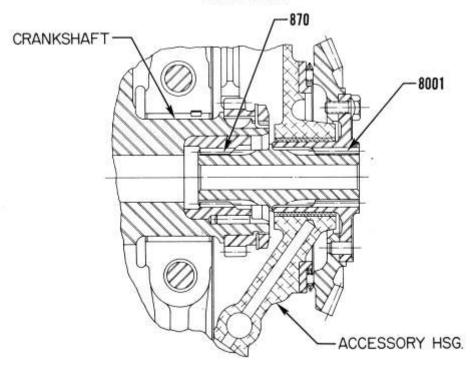
**PART IV – VERTICAL ENGINES** 

SECTION IV – BACKLASH



VO-435-BIA

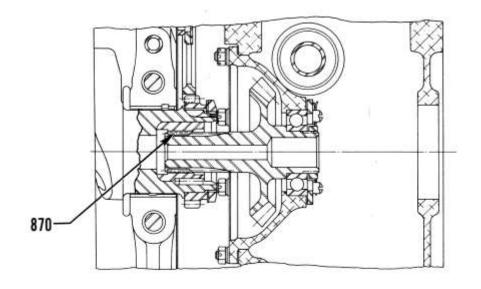
Starter Drives



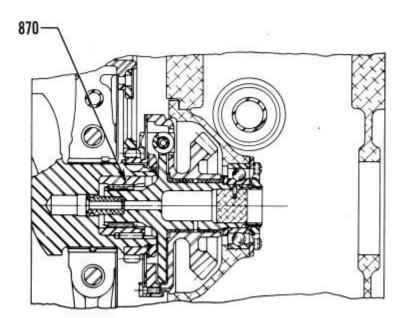
VO-435-BIA Accessory Drive Gear

### **PART IV – VERTICAL ENGINES**

SECTION IV – BACKLASH



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



V0-540

### **PART IV – VERTICAL ENGINES**

#### SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	Chart	Thread Size	Nomenclature	<b>Torque Limits</b>
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 inlbs
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 inlbs
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 1 11
				100 in. lbs
914	V-V1	1/8-27 NPT	Injector Nozzle in Cylinder Head	<b>CO</b> : 11
010				60 in. lbs
919	ALL	1/4 Hex Head	Hose Clamps (Worm Type)	20 in the
		and Below 5/16 Hex Head	Hang Classes (Warm Tama)	20 in. lbs
	ALL	and Above	Hose Clamps (Worm Type)	45 in. lbs
919-1	ALL		"T" Bolt Hose Clamps	45 111. 108
919-1	ALL		Initial Torque	35 in. lbs
			Retorque After Run-In	25 in. lbs
920	ALL		Cylinder Head Drain Back Hose	25 111. 105
120	ALL		Clamp	10 in. lbs
921	L2-V1		Exhaust Clamp – Coupling – V-Band	10 11. 105
121			(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 inlbs.*
* It is a	lso permissible to tighten the fuel	line union nut finge	r tight, then continue tightening the nut w	ith a wrench an
			in excess of 50 inlbs. can result in dama	
			Nuts' Tightening Procedures – See lates	
	Instruction No. 1029.	cuse i artilig i lallge	Trais Tightening Trocedures – See fales	
933	L-V		Accessory Drive Shaft Nut	75-125 ft. lbs
100	ALL		Crankshaft Gear Retaining Nut	150 ft. lbs

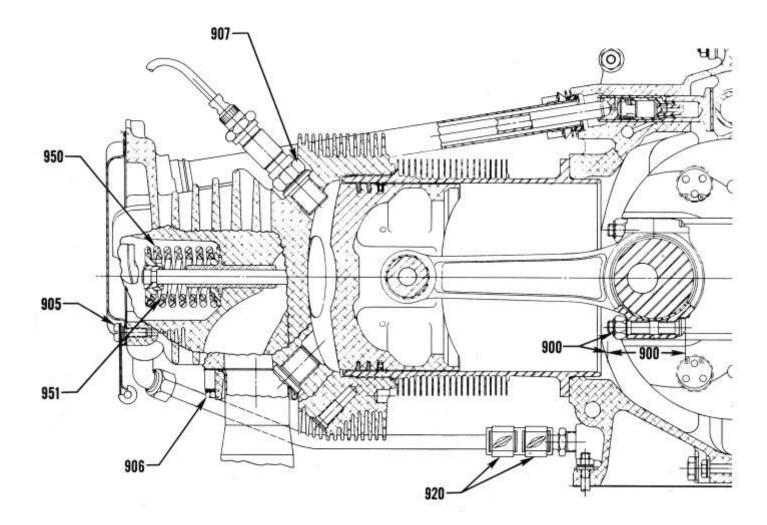
### **PART IV – VERTICAL ENGINES**

#### SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	Chart	Th	read Size		Nomenc	lature					Ta	orque	e Limits
938	ALL	1/4	-28			otted Nut l to reach		-		-			38 in. lbs.
942	ALL	1/8	3-27 NPT		Carburetor Drain Plug						50-60 in. lbs.		
943	V		-32		Screws plate)	(To attac	h nece			couplir	ng	25-30 in. lbs.	
944	V					tor Throt						20	-28 in. lbs.
945	L1		Drive G	ory Drive lear Attac	ching S		cess	ory		100-	120 in. lbs.		
			5	SECTIO	DN V –	<u>SPRIN</u>	GS			С	OMP.	LOA	D
Ref.	Chart	Nomen	Lyc. Part No.Length Wire Dia.Length Mfr. Length			Mf Ma		Service Max.					
950	ALL	Outer Valve (Angle)	Springs	683	326	.177	1.4	6 in.	10	3 lb.	111	lb.	100 lb. min.
	ALL		Outer Valve Springs (Angle)		7-11796	.182	1.4	3 in.	11	4 lb.	124		111 lb. min.
951	ALL		Auxiliary Valve Springs (Angle)		328 7-11797	.142	1.3	3 in.		5 lb. 3 lb.	83 1	b.	70 lb. min.
952	L-V	Check Valve Lycomin Numl	ng Part		Free ength								
		654	654-B		.03		1.0	3 in.	.74	4 lb.	.94	lb.	.69 lb. min.
		737	73761		2.065	.065 .041 1.03 in.		3 in.	3.1	5 lb.	3.35	lb.	3.10 lb. min.
953		Oil Pressu Valve S				-							
		Lycoming Part Numbers	Identi Dye	fication Free Lengtl	n								
	L-V	68542	None	2.38	.067	1.66	in.	15	lb.	1	17 lb.		14 lb. min.
	L-V	LW-14029	White	2.28	.072	1.66	in.	20	lb.	2	22 lb.		17 lb. min.
954		Accessory D	rive Coup	oling Spi	ring								
		Lycoming Part Numbers											
	V – AS APPLICABLE	74616	1.25	i	.092	1.10	in.	23 lt	<b>)</b> .	26	lb.		20 lb.

### **PART IV – VERTICAL ENGINES**

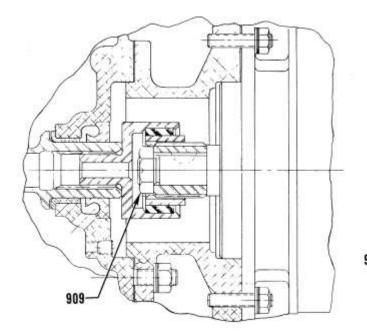
SECTION V – SPECIAL TORQUE AND SPRINGS

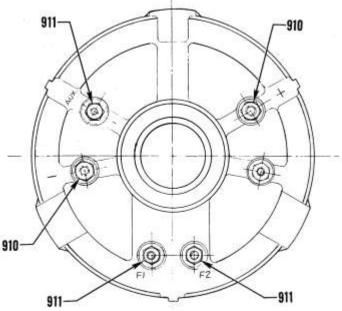


### **Engine Accessories and Hardware**

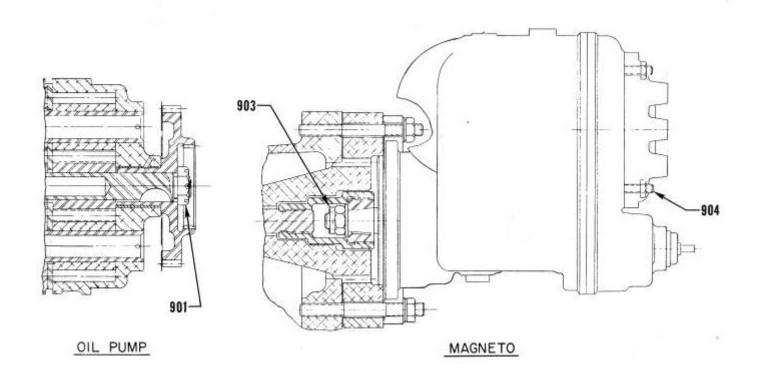
### **PART IV – VERTICAL ENGINES**

#### SECTION V - SPECIAL TORQUE AND SPRINGS





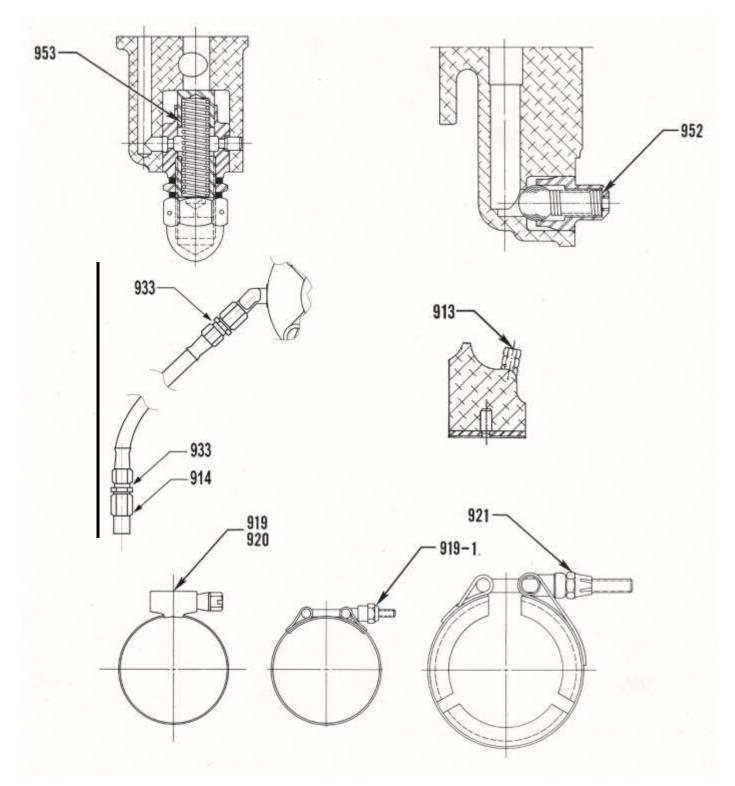




### **Engine Accessories and Hardware**

### **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).

		TAE	SLE I			TABLE II		
	B	OLTS, SCRE	W AND N	IUTS		PIPE F	PLUGS	
Thread	Tor	que	Thread	Torq	ue	Thread	Torque	
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Thread	In. Lbs.	
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44	
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44	
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94	
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121	
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297	1/2-14 NPT	160 to 176	
тц			<u>лт)</u> 1/2	LISTED TORQ	I IE	3/4-14 NPT	230 to 252	
10	$\lim \operatorname{NO1S}(1/2$	2 DIA. OF BU	JL1) = 1/2	LISTED TORU	UE	1-11-1/2 NPT	315 to 347	

TABLE III			TABLE IV					
CRUSH TYPE GAS	KETS		FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)					
Thread Pitch on Part to be Tightened	ANGLE OF TURN		Tube	Thread	Torque In. Lbs.			
Threads Per Inch	Aluminum	Copper	Size		Aluminum Alloy	Steel		
8	135°	67°	(-3) 3/16	3/8 - 24	30 to 50	70 to 80		
10	135°	67°	(-4) 1/4	7/16 - 20	40 to 65	90 to 100		
12	12 180° 90°				60 to 80	135 to 150		
14	180° 90°		(-6) 3/8	9/16-18	75 to 125	270 to 300		
16	270°	135°	(-8) 1/2	3/4-16	150 to 250	450 to 500		
18	270°	135°	(-10) 5/8	7/8 - 14	200 to 350	650 to 700		
20	270°	135°						
24	360°	180°		Т	ABLE V			
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	E		
NOTE: Install all crush type gas	skets except	the self	Thr	eads	Torque In.	Lbs.		
centering type, with the unbroken sur			1/4	-20	15			
of the plug or part being tightened ag			5/1	6-18	25			
part until the sealing surfaces are in c			3/8-16 50					
to the angle of turn listed for the appr								
NOTE: Lubricate Threads Unless Ot	herwise Speci	fied.						

	TABLE VI								
JAN	I 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 TUR	BE FITTINGS							
			Wrench torque	e for tightening	g AN-818 Nut (	(pound inches)		Minimum				
Dash Nos. Ref.	Tubing OD inches	Aluminum-alloy tubing     Steel tubing       Minimum     Maximum     Minimum		Steel	tubing	Aluminum- (Flare MS33 on oxygen	(3583) for use	measured to tubing centerline. Dimension in inches				
				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				