

# 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-1776-4. It is made up of the following four parts, each part contains five sections.

PART I DIRECT DRIVE ENGINES (Including VO and IVO-360)

PART II INTEGRAL ACCESSORY DRIVE ENGINES

PART III GEARED ENGINES

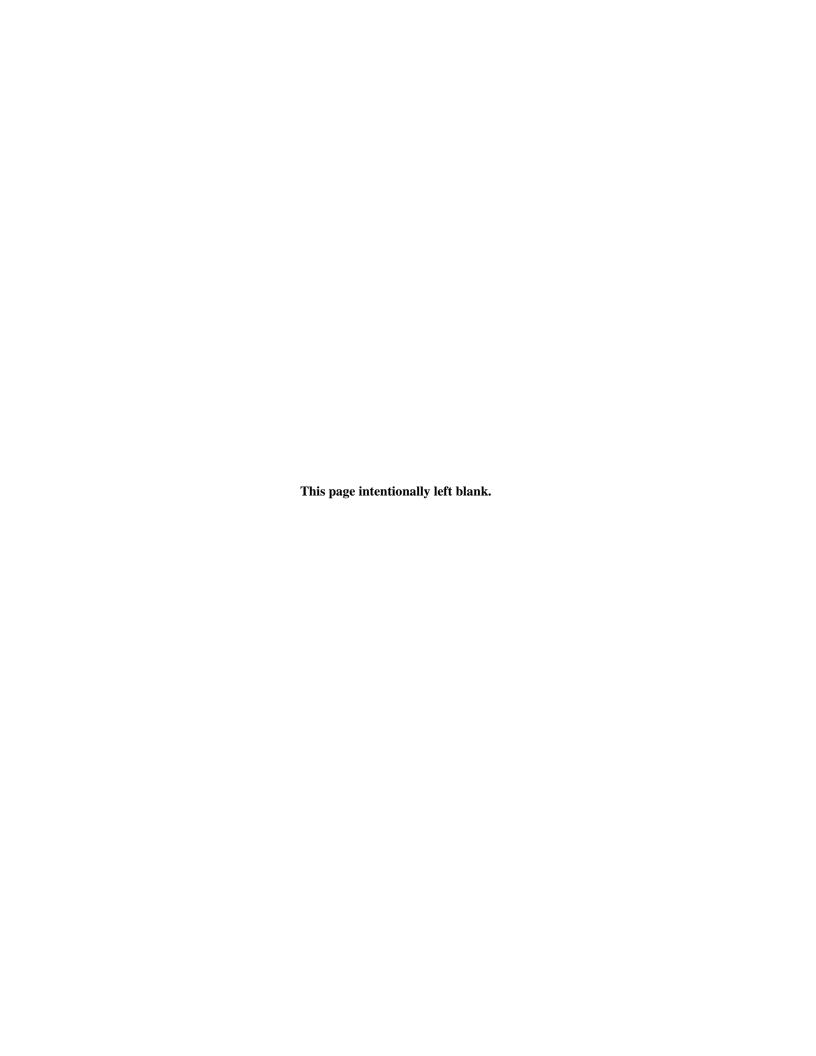
PART IV VERTICAL ENGINES (Excluding VO and IVO-360)

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

This publication supersedes and replaces the previous publication SSP-1776-3. To make sure that SSP-1776-4 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.

SSP-1776-4 April 10, 2018\*

<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.



#### 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.

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#### **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.

*Introduction* ii

## SERVICE TABLE OF LIMITS PART I – DIRECT DRIVE ENGINES

CHART	MODELS	CHART	MODELS
A	O-235-C, -E, -H	S7	HIO-360-D
A1	O-235-F, -G, -J,-K, -L, -M, -N, -P	S8	HIO-360-B
В	O-290	S9	HIO-360-C, -E
B1	O-290-D2	S10	HIO-360-A
BD	O-320-H (76 Series)	S11	HIO-390-A
G	O, IO, LIO, AEIO-320		IO-, AEIO-390-A
G1	O, IO-320 With Gov. at Front		IO-390-C
	(O-320-E1F, -E1J, -D1F & IO-320-D1B)	S12	HIO-360-F1AD
G2	AIO-320	D	O-435-A
J	O-340	T	O, IO, LIO, AEIO, TIO, LTO-540
BE	O, LO-360-E (76 Series)	T1	O-540-G, -H &IO-540-N, -R
Y	VO, IVO-360	T2	(Large Mains – Parallel Valve)
S	O, IO, LIO, HIO, LHIO, TO, TIO, AEIO-360		IO-540-A, -B, -E, -G, -P (Angle Valve)
S1	TO-360	T3	IO-540-K, -M, -S; TIO, LTIO-540-A, -F,
S2	AIO-360		-J, -N, -R (Large Mains – Angle Valve)
S3	TIO-360		IO, AEIO-580-B1A
S4	O-360-A With Gov. at Front		TEO-540
	(O-360-A1H, -A1LD)	T4	TIO-540-C, -E, -G, -H
S5	IO, LIO-360-A, -C (Angle Valve)	AF	IO-720
S6	IO, LIO-360-A, -C With Gov. at Front (IO, LIO-360-C1E6 & IO-360-A1D6)		

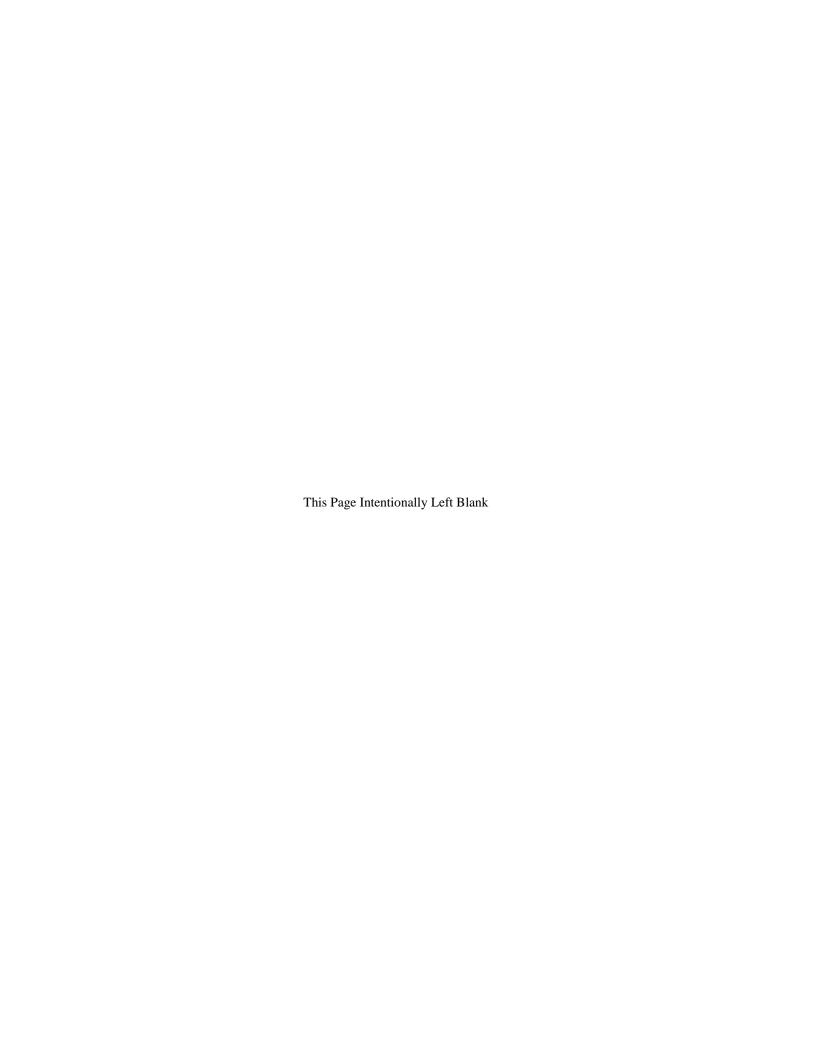
NOTE: In "Chart" column, a number appearing after a letter indicates an exception to the basic model. For example, A1 (O-235-F. –G, -J, -K, -L, -M, -N –P) is an exception to the basic model A (O-235-C, -E, -H)

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

SECTION I SECTION II 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	ıkcase.

SSP-1776-4-PT1 April 10, 2018\*

<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication





# TECHNICAL PUBLICATION REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
SSP-1776-4-PT1	Service Table of Limits	SSP-1776	October 28, 2013
PREVIOUS	REVISIONS	CURRENT	REVISION*
Marc	ch 2014	Apri	1 2018
	1-1		1-3, 1-7, 1-8, 1-9, , 1-35, 1-36, 1-37
Title Page, 1-1, 1-2, 1-3  Added S11 designation to engine models  Revised tappet information 512  Updated piston and cylind  IO, AEIO-390-A  TIO-540-C, -E, -G, -H  AEIO-580-B1A  Septem  Title Pag  Added engine model IO-3	ty, IO  Ther 2016  The, 1-8, 1-30  90-C to Chart  90-C to Piston Application Table  Reference #823, backlash	<ul> <li>Chart</li> <li>Added S12 designation for where applicable</li> <li>Revised Ref. number 512 Body) for clarity</li> <li>Revised Piston Application numbers</li> <li>Added NOTE to refer to the Instruction No. SI-1037 for number applicability</li> <li>Deleted obsolete part numbers in Piston Deleted NOTES that refer Application Table</li> <li>Updated Lycoming P/N and V-band couplings for Reform Added Ref. number 933 to torque value for brass unifuel line (Both Ends)</li> </ul>	(Tappet Plunger Assembly and on Table to list only piston part the latest revision of Service or engine model and piston part abers and Notes associated with on Application Table rence S.I. 1243 in Piston and Vendor P/N for one of the number 921. Section V table and figure for on nut on stainless steel injector abers for Ref. numbers 950 and



## PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
500	A	All Main Bearings and Crankshaft			.0025L	
					.0055L	.0060L
	B-D-G-J-S-T-Y-BD-BE-AF	Main Bearings and Crankshaft				
		(Thin Wall Bearing09 Wall			<u>.0015L</u>	
		Approx.)			.0045L	.0060L
	B-G-J-S-T-Y-AF	Main Bearings and Crankshaft				
		(Thick Wall Bearing16 Wall			<u>.0011L</u>	
		Approx.)			.0041L	.0050L
	A	Diameter of Main Bearing Journal	<u>2.3735</u>			
		on Crankshaft	2.375	(E)		
	B-D-G-J-S-T-Y-BD-BE	Diameter of Main Bearing Journal				
		on Crankshaft	<u>2.3745</u>			
_		(2-3/8 in. Main)	2.376	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Main Bearing Journal				
		on Crankshaft	<u>2.6245</u>			
		(2-5/8 in. Main)	2.626	(E)		
	S8-S10	Diameter of Front Main Bearing				
		Journal on Crankshaft	<u>2.3750</u>			
		(2-3/8 in. Main)	2.3760	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Front Main Bearing				
		Journal on Crankshaft	<u>2.6245</u>			
		(2-5/8 in. Main)	2.6255	(E)		
500	A-B-B1-D-G*-BD-BE	Crankcase Bearing Bore Diameter	2.5.5	2 7 6 0 7		
		(All) (Thin Wall Bearing) (2-3/8	<u>2.566</u>	2.5685		
	Calcula I C TO II	in. Main)	2.567			
	G**-J-S-T-Y	Crankcase Bearing Bore Diameter	2 6065	2 (000		
		(All Except Front) (Thick Wall	2.6865 2.6875	2.6890		
	T1-T3-AF	Bearing) (2-3/8 in. Main)	2.6875			
	11-13-АГ	Crankcase Bearing Bore Diameter (Front Only) (Thin Wall Bearing)	2016	2.8185		
		(2-5/8 in. Main)	2.816 2.817	2.0103		
	T1-T3-AF	Crankcase Bearing Bore Diameter	2.017			
	11-13-АГ	(All Except Front) (Thick Wall	2.9365	2.9390		
		Bearing) (2-5/8 in. Main)	2.9375	2.7370		
	S1-S12-T-AF	Crankcase Bearing Bore Diameter	2.7313			
	51 512 1 M	(All) (Thin Wall Bearing) (2-5/8	2.816	2.8185		
		in. Main)	2.817	2.0103		
	G**-J-S-T-Y	Crankcase Bearing Bore Diameter	2.017			
		(Front Only) (Thin Wall Bearing)	2.566	2.505		
	*O-320-A, -E Narrow Deck,	(2-3/8 in. Main)	$\frac{2.560}{2.567}$	2.5685		
	**O-320-A, -E Wide Deck	, 2, 3,	,			
501	ALL	Connecting Rod Bearing and			.0008L	
		Crankshaft			.0038L	.0050L
	A-B-D-G-J-S-T-Y-BD	Diameter of Connecting Rod	2.1235			
		Journal on Crankshaft (2-1/8 in.)	2.125	(E)		
	S-T-AF	Diameter of Connecting Rod	2.2485	` ´		
		Journal on Crankshaft (2-1/4 in.)	2.250	(E)		
	A-B-D-G-J-S-T-Y-BD-BE	Connecting Rod Bearing Bore				
		Diameter (2-1/8 in.) (Measured At	<u>2.2870</u>			
1		Axis 30° on Each Side)	2.2875			

#### PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
501	S-T-AF	Connecting Rod Bearing Bore	2.4205			
		Diameter (2-1/4 in.) (Measured At	2.4203 2.4210			
		Axis 30° on Each Side)	2.4210			
502	ALL	Connecting Rod - Side Clearance			<u>.004L</u>	
702					.010L	.016L
503	ALL	Connecting Rod - Alignment			.010 in 10	
504	ALL	Connecting Rod – Twist			.012 in 10	Inches
505		Crankshaft Run-Out at Center				
	A CVII INDED	Main Bearing				
	4 CYLINDER	Mounted on No. 1 and 4 Journals			002	002
		Max. Run-Out No. 2 Journal Mounted on No. 1 and 4			.002	.002
		Journals Max. Run-Out No. 3				
		Journal			.005	.0075
		Mounted on No. 2 and 4 Journals			.003	.0073
		Max. Run-Out No. 3 Journal				
		Max. Run-Out No. 3 Journal			.003	.0045
	6 CYLINDER	Mounted on No. 2 and 5 Journals			.003	.0043
	O CTEN VEEK	Max. Run-Out No. 1 Journal				
		Max. Run Out 10. 1 Journal			.002	.002
		Mounted on No. 2 and 5 Journals				
		Max. Run-Out No. 3 Journal				
					.005	.0075
		Mounted on No. 2 and 4 Journals				
		Max. Run-Out No. 3 Journal				
					.003	.0045
		Mounted on No. 3 and 5 Journals				
		Max. Run-Out No. 4 Journal				
					.003	.0045
	8 CYLINDER	Mounted on No. 2 and 6 Journals				
		Max. Run-Out No. 1 Journal				
		M			.002	.002
		Mounted on No. 2 and 4 Journals				
		Max. Run-out No. 3 Journal			002	0045
		Mounted on No. 3 and 5	-	-	.003	.0045
		Journals Max. Run-Out No. 4				
		Journal			.003	.0045
		Mounted on No. 4 and 6 Journals			.003	.00-5
		Max. Run-Out No. 5 Journal				
		1.2mi run Gut 1.0. 2 sounui			.003	.0045
		Mounted on No. 2 and 6 Journals				
		Max. Run-Out No. 3, 4 and 5			.005	.0075
		Journals				
506	ALL	Crankshaft and Crankcase Front			.009L	
500		End Clearance			.016L	.026L
507	ALL	Clearance – Front Face of				
		Crankshaft Oil Slinger to Front				
		Face of Recess in Crankcase			.002	
		(Crankshaft Against Thrust Face)			.007L	(A)

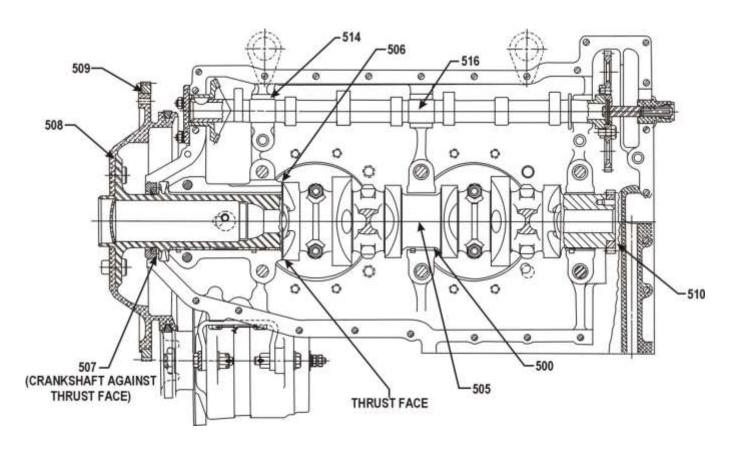
#### PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clear	ances
			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	00.47
511	DD DE	Transact Data and Constant			.0033L	.004L
511	BD-BE	Tappet Body and Crankcase			.0010L .0030L	.004L
	A-B	O.D. of Tappet	.6232		.0030L	.004L
	(Solid Tappets)	O.D. of Tappet	.6232	.6229		
	B1-D-G-J-S-T-Y-AF	O.D. of Tappet	.7169	.0229		
	(Flat Tappets)	O.D. of Tappet	.7177	.7166		
	B1-D-G-J-S-T-Y-AF	O.D. of Tappet	.8420	.7100		
	(Roller Tappets)	O.D. of Tappet	.8428	.8417		
	BD-BE	O.D. of Tappet	.8740	.0117		
		S.B. of Pupper	.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	.0007E
	All Models Using Straight Body	Tappet Plunger Assembly and			.0010L	.0067L
	Tappets	Body – (Straight Body Tappets)			.0047L	.0007E
	All Models Using Hyperbolic	Tappet Plunger Assembly and			.0010L	.0087L
	Tappets	Body – (Hyperbolic Tappets)			.0067L	.00072
513	ALL	Tappet Socket and Body			.002L	
		(Hyperbolic Flat and Roller			.007L	.009L
E 1 4	ATT	Tappets)			0021	
514	ALL	Camshaft and Crankcase			.002L .004L	0061
515	ALL	Camshaft – End Clearance			.004L	.006L
313	ALL	Camsuart – End Clearance			.002L .009L	.015L
516	ALL	Camshaft Run-Out at Center			.009L	.013L
510	ALL	Bearing Journal			.000	.006
517	All Models Using	Counterweight Bushing and			.001 .0013T	.000
211	Counterweights	Crankshaft			.00151 .0026T	(A)
518	All Models Using	Counterweight Roller – End			.00201	(11)
510	Counterweights	Clearance			.025L	.038L
519	All Models Using	Counterweight and Crankshaft –			.003L	
	Counterweights	Side Clearance*			.013L	.017L
	*Measure below roller next to flat					

#### PART I – DIRECT DRIVE ENGINES

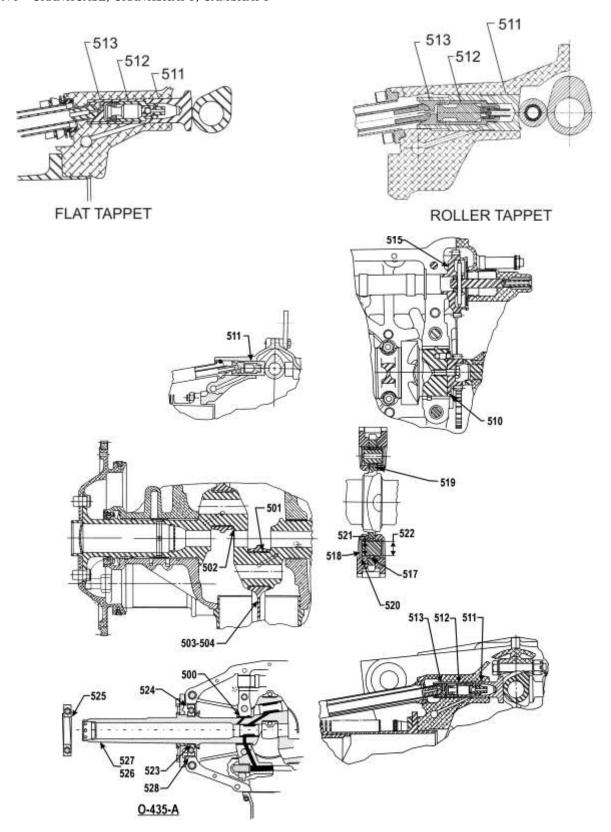
 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 

			Dime	nsions	Clear	ances
- 0	<b></b>		Mfr. Min. &	Service	Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
520	All Models Using	Counterweight Bore and Washer			.0002L	
	Counterweights	O.D.			.0030L	(A)
521	All Models Using	I.D. of Counterweight Bushing	<u>.7485</u>			
	Counterweights		.7505	.7512		
522	All	O.D. of Counterweight Roller (See				
	(AS APPLICABLE)	latest revision of Service				
		Instruction No. 1012)				
523	D	Thrust Bearing and Propeller Shaft			.0000 .0012L	.002L
524	D	Thrust Bearing and Thrust Bearing			.003T	
		Cap Clamp Fit (Shim to this Fit)			.005T	(A)
525	D	Thrust Bearing Tilt		.027	Tilt 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			<u>.0016L</u>	
		Cage			.0034L	.0045L



Longitudinal Section Thru Engines

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



Crankcase, Crankshaft, Camshaft and Related Parts

## PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
600	ALL	Connecting Rod and Connecting Rod Bushing	Bushing to	be Burnishe	d in Place	
	ALL	Finished I.D. of Connecting Rod	1.1254			
		Bushing	1.1262			
601	A-B-D-G-J-BD	Length Between Connecting Rod	<u>6.4985</u>			
		Bearing Centers	6.5015			
	S-T-Y-AF-BE	Length Between Connecting Rod	<u>6.7485</u>			
		Bearing Centers	6.7515		20007	
602	ALL	Connecting Rod Bushing and			.0008L	00251
602	A Y Y	Piston Pin			.0021L	.0025L
603	ALL	Piston Pin and Piston			.0003L	00101
	ALL	Diameter of Dieton Die Hele in	1 1240		.0014L	.0018L
	ALL	Diameter of Piston Pin Hole in Piston	1.1249 1.1254			
	ALL	Diameter of Piston Pin				
	ALL	Diameter of Fiston Fin	1.1241 1.1246			
604	A-G-J-S-T-AF-BD-BE	Piston and Piston Pin Plug	1.1240		.0002L	
001	A G J S I A B B B E	riston and riston rin riag			.0010L	.002L
	A-G-J-S-T-AF-BD-BE	*Diameter of Piston Pin Plug	1.1242		.00102	.0022
			1.1247			
605	B-D-G-J-S-T-Y-AF	Piston Pin and Piston Pin Plug			.0005L	
		(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		1		1	_
606	A-B	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			.000	000 (7)
	P. P.	(Plain) Full Wedge			.004L	.006L (B)
	B-D	Piston Ring and Piston – Side			00051	
		Clearance (Top Ring Comp.)			.0025L .0065L	0081 (B)
	G-J-S-T-Y-AF-BD-BE	(Chrome) Full Wedge Piston Ring and Piston – Side			.0003L	.008L (B)
	G-J-S-1-1-AF-BD-BE	Clearance (Top Ring Comp.)			.0025L	
		Half Wedge			.0023L	.008L (B)
606	В	Piston Ring and Piston – Side			.0033E	.000E (B)
000		Clearance (2 <sup>nd</sup> Ring Comp.)			.0025L	
		(Chrome) Full Wedge			.0065L	.008L (B)
	A-B-D-G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side				
		Clearance (2 <sup>nd</sup> Ring Comp.) Full			.000	
		or Half Wedge			.004L	.006L (B)
	J	Piston Ring and Piston – Side			000	
		Clearance (3 <sup>rd</sup> Ring Comp.) Half			.000 004I	
		Wedge			.004L	.006L (B)
606	ALL	Piston Ring and Piston – Side			<u>.002L</u>	
		Clearance (Oil Regulating)			.004L	.006L (B)
	A	Piston Ring and Piston – Side			.003L	0057
		Clearance (Bottom)			.0055L	.007L(B)

#### PART I – DIRECT DRIVE ENGINES

#### SECTION II - CYLINDERS

			Dimensions		Clearances	
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)			.045 .055	.067
	ALL	Piston Ring Gap (Oil)			.015 .030	.047
	A-T2	Piston Ring Gap (Oil Scraper) (All Barrels)			<u>.015</u> .030	.047

For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075. For All Other Barrels – Ring gap is measured at top limit of ring travel.

		Piston Specifications	s		
)8 Pieter Versel		iston Dia.	Cylinder Barrel	Max. Clearance	
98 Piston Number	Тор	Bottom	Maximum Diameter	Piston Skirt & Cyl	
09 14B23917	4.3470	4.3555	4.3795	.021L	
14B23918*	4.3290	4.3605	4.3805	.018L	
14B23919	4.3470	4.3555	4.3795	.021L	
14C28324	4.8395	4.8590	4.8805	.018L	
14D21953-S	5.0790	5.1090	5.1305	.018L	
14D23907	5.0790	5.1090	5.1305	.018L	
14D23908*	5.0790	5.1090	5.1305	.018	
14D23909*	5.0790	5.1090	5.1305	.018	
14D23910*	5.0790	5.1090	5.1305	.018	
14D23912*	5.0790	5.1090	5.1305	.018	
14D23913	5.0790	5.1090	5.1305	.018L	
14D23914*	5.0790	5.1090	5.1305	.018L	
14D23915	5.0790	5.1090	5.1305	.018L	
14D23916	5.0790	5.1090	5.1305	.018L	
14D28056	5.0790	5.1090	5.1305	.018L	
14E23911*	5.2720	5.3020	5.3235	.018L	
70396†	4.8290	4.8620	4.8805	.018L	
75984-S	4.8395	4.8590	4.8805	.018L	
LW-10208-S	5.0790	5.1090	5.1305	.018L	

#### NOTES:

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

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

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.

<sup>\* -</sup> High Compression.

<sup>† -</sup> Piston no longer available from Lycoming Engines.

## PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
611	A	Exhaust Valve Seat and Cylinder			<u>.0065T</u>	
		Head			.010T	(A)
	B-D-G-J-S-T-Y-BD-BE	Exhaust Valve Seat and Cylinder			<u>.0045T</u>	
		Head			.008T	(A)
_	S1-S2-S3-S5-S6-S7-S9-S10-	Exhaust Valve Seat and Cylinder			<u>.0075T</u>	
	S11-S12-T2-T3-AF	Head			.011T	(A)
	A	O.D. Exhaust Seat	<u>2.0025</u>			
			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-	O.D. Exhaust Seat	<u>1.9355</u>			
			1.937			
	A	I.D. Exhaust Seat Hole in Cylinder	<u>1.994</u>			
		Head	1.996			
	B-D-G-J-S-T-Y-BD-BE	I.D. Exhaust Seat Hole in Cylinder	1.733			
C1.1	01 02 02 05 05 07 02 010	Head	1.735			
611	S1-S2-S3-S5-S6-S7-S9-S10-	Exhaust Seat Hole in Cylinder	1.926			
	S11-S12-T2-T3-AF	Head	1.928		00505	
612	A	Intake Valve Seat and Cylinder			.0070T	(4)
		Head			.0105T	(A)
	B-D-G-J-S-T-Y-AF-BD-BE	Intake Valve Seat and Cylinder			.0066T	(4)
	<u> </u>	Head Section Section 1	2.0065		.010T	(A)
	A	O.D. Intake Seat	2.0965 2.0075			
	A1-B-D	O.D. Inteles Cont	2.0975			
	A1-B-D	O.D. Intake Seat	1.9265			
	B1-C-J-S-T-Y-BD-BE	O.D. Intake Seat	1.928			
	D1-C-J-3-1-1-DD-DE	O.D. Intake Seat	2.0815 2.083			
	S1-S2-S3-S5-S6-S7-S9-S10-	O.D. Intake Seat	2.2885			
		O.D. Intake Seat	2.2863			
	A	I.D. Intake Seat Hole in Cylinder	2.290			
		Head	$\frac{2.087}{2.089}$			
	A1-B-D	I.D. Intake Seat Hole in Cylinder	1.918			
		Head	1.920			
	B1-G-J-S-T-Y-BD-BE	I.D. Intake Seat Hole in Cylinder	2.073			
	2.305110000	Head	2.076			
	S1-S2-S3-S5-S6-S7-S9-S10-	I.D. Intake Seat Hole in Cylinder	2.280			
	S11-S12-T2-T3-AF	Head	$\frac{2.280}{2.282}$			
613	ALL	Exhaust Valve Guide in Cylinder	2.202		.001T	
		Head			.0025T	(A)
613	A-B-D-J	O.D. Exhaust Valve Guide	.5933			\- */
			.5938			
	Y	O.D. Exhaust Valve Guide	.6267			
			.6272			
	G-J-S-T-AF-BD-BE	O.D. Exhaust Valve Guide	.6633			
			.6638			
	S1	O.D. Exhaust Valve Guide	.6953			
			.6958			

## PART I – DIRECT DRIVE ENGINES

		Nomenclature	Dime	ensions	Clearances	
Ref.	Chart		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	Exhaust Valve Stem and Valve Guide (Angle Valve Heads - Helicopter)			.0035L .0055L	(A)
	A-B-D	O.D. Exhaust Valve Stem	.4012 .4020			
	A1	O.D. Exhaust Valve Stem	.4320 .4333			
	G-J-Y	O.D. Exhaust Valve Stem	.4332 .4340			
	G-J-S-T-BD-BE	O.D. Exhaust Valve Stem (Parallel Valve Heads)	.4932 .4945	.4915		
ı	\$1-\$2-\$3-\$5-\$6-\$7-\$9-\$10- \$11-\$12-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			

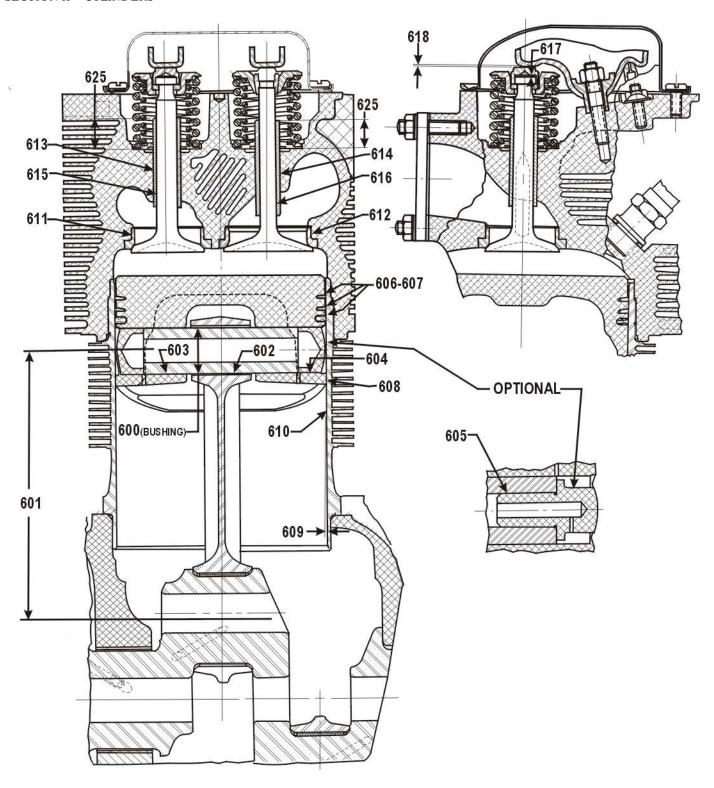
## PART I – DIRECT DRIVE ENGINES

			Dimensions		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-T2-	Finished I.D. Exhaust Valve	.4995			
_	T3-AF	Guide (Angle Valve Heads)	.5005			
	S7-S9-S10	Finished I.D. Exhaust Valve				
		Guide (Angle Valve Heads –	<u>.5000</u>			
		Helicopter)	.5010			
	½ inch diameter exhaust valves m	ay have exhaust valve guides that are	.003 in. over	the maximu	m inside diai	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			
	1.22		.4030	.4010		
616	ALL	Finished I.D. Intake Valve Guide	.4040	.1010		
010	TEE	Timbred 1.2. Intake varve Suite	.4050			
617	ALL	Intake and Exhaust Valve and	1.020			
017	TEE	Valve Cap Clearance (Rotator			.000	
		Type Small Dia. Head)			.004L	006L
618	A-B	Solid Tappet Clearance			.006	0002
010		(After Engine in Run)			.012	
	A	Dry Tappet Clearance (Steel Push			.002	
		Rods)			.008	
	D-G-J-S-T-Y-AF-BD-BE	Dry Tappet Clearance			.028	
		Bry Tupper Clearance			.080	
619	A	Valve Rocker Shaft and Cylinder			.0001L	
01)		Head (No Bushing)			.0013L	.0025L
619	B-D-J-S-T-Y	Valve Rocker Shaft and Valve				.00202
01)		Rocker Bushing (Parallel Valve			.0001L	00057
		Heads)			.0013L	.0025L
	S1-S2-S3-S5-S6-S7-S9-S10-	Valve Rocker Shaft and Valve			00047	
1	S11-S12-T2-T3-AF	Rocker Bushing (Angle Valve			.0001L	00251
•		Heads)			.0013L	.0025L
619	A	Finished I.D. of Valve Rocker				
		Shaft Bores in Cylinder Head	.6246			
		(No Bushings)	.6261	.6270		
619	B-D-G-J-S-T-Y	Finished I.D. of Valve Rocker				
		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				
l I	S11-S12-T2-T3-AF	Shaft (Bushing) in Cylinder Head	.6246			
•		(Angle Valve Heads)	.6261	.6270		
620	ALL	Valve Rocker Shaft and Valve			.0007L	
		Rocker Bushing			.0017L	.004L
	ALL	Finished I.D. of Rocker Arm	.6252			
		Bushing	.6263	.6270		
	ALL	O.D. of Valve Rocker Shaft	.6241			
			.6245	.6231		1

## PART I – DIRECT DRIVE ENGINES

		T	Dime	Dimensions		ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
621	ALL	Valve Rocker Bushing and	Bushing M	ust Be	172421	111111
622	ALL	Valve Rocker Valve Rocker Shaft Bushing and Cylinder Head	Burnished	In Place	.0022T .0038T	(A)
	ALL	Valve Rocker Shaft Bushing Hole in Cylinder Head	<u>.7380</u> .7388			(/
623	A-B-D-G-J-S-T-Y	Valve Rocker and Cylinder Head - Side Clearance (Parallel Valve Heads)			<u>.005L</u> .013L	.016L
ı	\$1-\$2-\$3-\$5-\$6-\$7-\$9-\$10- \$11-\$12-T2-T3-AF	Valve Rocker and Cylinder Head – Side Clearance (Angle Valve Heads)			.002L .020L	.024L
624	A-B-J	Push Rod and Ball End			.0005T .0025T	(A)
625	A	Intake and Exhaust Valve Guide Height	.705 .725			, ,
	ALL	Intake Valve Guide Height (Parallel Valve Heads)	.705 .725			
	ALL EXCEPT O-235	Exhaust Valve Guide height (Parallel Valve Heads)	<u>.765</u> .785			
	ALL	Intake and Exhaust Valve Guide height (Angle Valve Heads)	<u>.914</u> .954			
		MEASURE VALVE GUIDE H FROM THE VALVE SPRING COUNTERBORE IN THE CYI HEAD TO THE TOP OF VALV GUIDE.	SEAT LINDER			

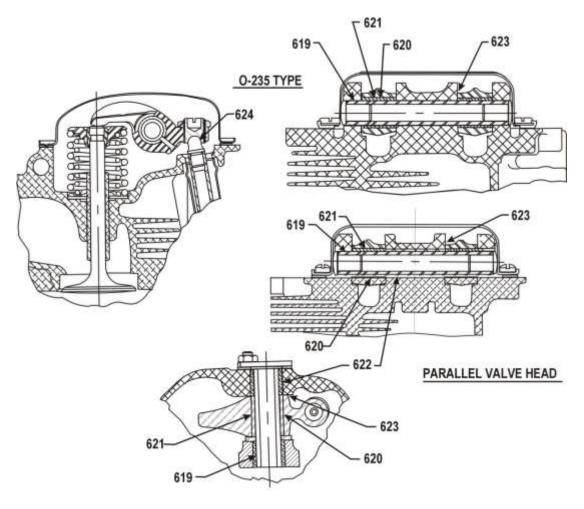
## PART I – DIRECT DRIVE ENGINES

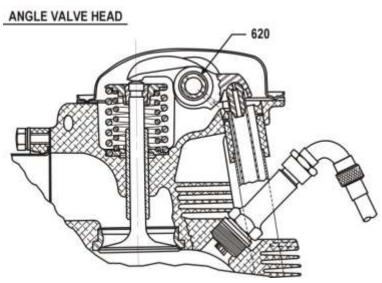


Cylinder, Piston and Valve Components

## PART I – DIRECT DRIVE ENGINES

SECTION II – CYLINDERS





Cylinder, Piston and Valve Components

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## PART I – DIRECT DRIVE ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
Dof	Chart	Nomenclature	Min. &	Service	Min. &	Service
Ref.		Nomenciature	Max.	Max.	Max.	Max.
OIL PU			<u> </u>		00107	<u> </u>
700	ALL	Oil Pump Drive Shaft and Oil			.0010L	0041
701	ADDCIGTAE	Pump Body or Cover Oil Pump Drive Shaft and			.0025L	.004L
701	A-B-D-G-J-S-T-AF	Accessory Housing			.0015L .0030L	.006L
	Y	Oil Pump Drive Shaft and			.0030L	.000L
	1	Accessory Case			.0013L	.006L
	BD-BE	Oil Pump Drive Shaft and			.0010L	.000E
		Crankcase			.0025L	.004L
702	S-T-AF (DUAL MAGNETO)	Oil Pump Drive Shaft – End			.015L	
		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>	2007
704	ALL (ENGERE DE DE)	Clearance			.0075L	.009L
704	ALL (EXCEPT BD-BE)	Oil Pump Impellers – Side			.002L	0051
	BD-BE	Clearance Oil Pump Impellers – Side			.0045L	.005L
	DD-DE	Clearance			.003L .005L	.006L
	AS APPLICABLE	Width of Oil Pump Impellers	.622		.003L	.000L
	AS AT LICABLE	Widdi of On Fump impeners	.624	.621		
	AS APPLICABLE	Width of Oil Pump Impellers	.747	.021		
		r r	.749	.746		
	AS APPLICABLE	Width of Oil Pump Impellers	<u>.995</u>			
			.997	.994		
	BD-BE	Width of Oil Pump Impellers	<u>.622</u>			
			.623	.620		
705	S-T-AF	Oil Pump Impeller and Idler Shaft			<u>.0010L</u>	
	(DUAL MAGNETO)				.0025L	.004L
	A-B-D-G-J-S-T-Y-AF	Oil Pump Impeller and Idler Shaft			.001T	(4)
	DD DE	(Alum. and Sinterbond)			.003T	(A)
	BD-BE	Oil Pump Impeller and Idler Shaft			.002T .004T	(A)
706	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and Oil			.0005L	(11)
,00		Pump Body			.0020L	.003L
	BD-BE	Oil Pump Idler Shaft and Oil			.0010L	.0001
		Pump Body			.0025L	.003L
	S-T-AF (DUAL MAGNETO)	Oil Pump Idler Shaft and Oil			.0000	
	,	Pump Body			.0015T	(A)
707	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and			<u>.0010L</u>	
		Accessory Housing			.0025L	.0035L
	BD-BE	Oil Pump Idler Shaft and			.0010L	
<b>5</b> 00	G0 G0	Crankcase			.0025L	.0035L
708	G2-S2	Scavenge Pump Drive Shaft and			.0010L	0041
700	G2 S2	Adapter End Clearance			.0025L	.004L
709	G2-S2	Scavenge Pump – End Clearance			.000 .045L	.060L
	1		L	L	.043L	.UUUL

## PART I – DIRECT DRIVE ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
- 0	<b>67</b>		Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
SCAVE	ENGE PUMP					
710	G2-S2	Scavenge Pump Impellers –			<u>.007L</u>	
		Diameter Clearance			.011L	.014L
711	G2-S2	Scavenge Pump Impellers – Side Clearance			<u>.003L</u> .005L	.006L
	G2-S2	Width of Impellers	1.496 1.498	1.495		
712	G2-S2	Scavenge Pump Impellers and Idler Shaft			.0010L .0025L	.004L
713	G2-S2	Scavenge Pump Body and Idler Shaft			<u>.0000</u> .0015T	(A)
714	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump Drive and Adapter			.0010L .0025L	.004L
715	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump Shaft and Adapter			.0010L .0020L	.004L
716	S-T4-AF (WIDE DECK)	Gerotor Pump – Rotor – Side			<u>.0015L</u>	
717	S-T4-AF (WIDE DECK)	Clearance Gerotor Pump Housing and			.003L .0005L	.004L
, 1 ,	STITE (WIBE BEER)	Adapter			.0020L	(A)
718	S-T4-AF (WIDE DECK)	Turbocharger Scavenge Pump – End Clearance			.0055L	04151
	T4 (DUAL MAGNETO)	Turbocharger Scavenge Pump –			.0365L .0105L	.0415L
	14 (DONE WINGINETO)	End Clearance			.0395L	.0445L
FUEL .	PUMP			•	•	
719	A-B-D-G-J-S-T	AC Fuel Pump Plunger and			.0015L	
		Accessory Housing			.003L	.005L
720	J-S-T-AF	Crankshaft Idler Gear and Crankshaft Idler Gear Shaft			<u>.001L</u> .003L	.005L
721	S-T-AF	Crankshaft Idler Gear Shaft and			<u>.0020L</u>	
	(DUAL MAGNETO)	Accessory Housing			.0035L	.0065L
	S-T-AF	Crankshaft Idler Gear Shaft and			.0020L	00.651
722	(DUAL MAGNETO) S-T-AF	Crankcase  AN Fuel Pump Idler Gear and			.0035L .001L	.0065L
722	5-1-AF	Shaft			.001L	.005L
723	S-T-AF	AN Fuel Pump Idler Shaft and			.0020L	.003E
	(DUAL MAGNETO)	Accessory Housing and Crankcase			.0035L	.0065L
	S-T-AF	AN Fuel Pump Idler Shaft and			.0020L	
	(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			<u>.005L</u>	
	T-AF	Clearance Crankshaft Idler Gear – End			.040L	.055L
	1-ΑΓ	Clearance			.007L .037L	.052L
	S (DUAL MAGNETO)	Crankshaft Idler Gear – End			<u>.020L</u>	
	TAR (DIVAL) (1 CYTTC)	Clearance			.030L	.040L
	T-AF (DUAL MAGNETO)	Crankshaft Idler Gear – End Clearance			.015L .038L	.046L
	1	Cicarance		1	.UJOL	.040L

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## PART I – DIRECT DRIVE ENGINES

#### SECTION III – GEAR TRAIN

			Dimensions		Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	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			.002L	
		Clearance			.018L	.024L
	S-T-AF	AN Fuel Pump Idler Gear – End			.015L	
	(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>	
	(DUAL MAGNETO)	End Clearance			.073L	.083L
	Y	AN Fuel Pump Drive Shaft Gear -			<u>.000L</u>	
		End Clearance			.067L	.075L
GOVE	RNOR & HYDRAULIC PUMP					
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>	
	(WIDE DECK)	Shaft			.0025L	.004L
730	BD-BE	Front Governor Drive Gear and			<u>.0010L</u>	
		Crankcase			.0025L	.004L
	BD-BE	Front Governor Drive Gear and			<u>.0005L</u>	
		Camshaft			.0025L	.004L
731	G1-G2-S-T-AF	Front Governor Gear and			<u>.0010L</u>	
	7.7	Crankcase			.0025L	.004L
	BD	Front Governor Gear and			.0010L	00.41
700	G1 G2 G T 4 F	Crankcase			.0030L	.004L
732	G1-G2-S-T-AF	Front Governor Gear – End			.008L	0211
	BD-BE	Clearance Front Governor Gear – End			.016L	.021L
	DD-DE	Clearance			.0045L .0165L	.021L
733	G-J-S	Rear Governor Gear and Adapter			.0010JL	.021L
133	0-1-2	Real Governor Gear and Adapter			.0010L	.005L
	G-S	Rear Governor Gear and			.0010L	.003L
	(DUAL MAGNETO)	Accessory Housing			.0025L	.005L
734	G-J-S	Rear Governor Gear – End			.0023L	.003L
, 54		Clearance			.024L	.034L
	G-S	Rear Governor Gear – End			.002L	
	(DUAL MAGNETO)	Clearance			.037L	.044L
735	T-AF	Hydraulic Pump Gear and Adapter			.0010L	
		T T T			.0025L	.004L
	T-AF (DUAL MAGNETO)	Hydraulic Pump Gear and			<u>.0010L</u>	
		Accessory Housing			.0025L	.004L
736	T-AF	Hydraulic Pump Gear – End			<u>.010L</u>	
		Clearance			.066L	.076L
	T-AF (DUAL MAGNETO)	Hydraulic Pump Gear – End			<u>.007L</u>	
		Clearance			.032L	.039L

## PART I – DIRECT DRIVE ENGINES

#### SECTION III – GEAR TRAIN

			Dimensions		Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
VACUU	UM & TACHOMETER					
737	A-B-G-J-S-T-Y-AF	Vacuum Pump Gear and Adapter			<u>.0010L</u>	
					.0030L	.0045L
737	S-T-AF	Vacuum Pump Gear and			.0010L	00.47
707	(DUAL MAGNETO)	Accessory Housing			.0025L	.004L
737	D	Vacuum Pump Gear and Accessory Housing			.0010L .0025L	0061
738	A-B-G-J-S-T-AF	Vacuum Pump Gear – End			.0023L .010L	.006L
730	A-B-G-J-S-1-AF	Clearance			.057L	.075L
	D	Vacuum Pump Gear – End			.003L	.073L
		Clearance			.020L	.030L
İ	Y	Vacuum Pump Gear – End			.000	
		Clearance			.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			.0015L	00.57
	DD DE	Adapter			.0035L	.006L
	BD-BE	Tachometer Drive Shaft and			.0010L	00651
739	D-G-J-S-T-AF	Adapter Tachometer Drive Shaft and			.0050L .0015L	.0065L
139	D-G-J-S-1-AF	Accessory Housing			.0015L	.006L
740	G-J-S	Vacuum Pump Gear and Adapter			.0010L	.000L
7.10	(DUAL DRIVE)	vacaum ramp Sear and raupter			.0025L	.004L
741	G-J-S	Vacuum Pump Gear – End			.000	
	(DUAL DRIVE)	Clearance			. <del>017</del> L	.027L
742	G-J-S	Idler Gear and Shaft			<u>.0010L</u>	
	(DUAL DRIVE)				.0030L	.005L
743	G-J-S	Idler Gear – End Clearance			<u>.021L</u>	
	(DUAL DRIVE)				.041L	.060L
744	G-J-S	Propeller Governor Gear and			.0013L	0051
	(DUAL DRIVE) G-J-S	Adapter Hydraulic Pump Gear and Adapter			.0028L .0013L	.005L
	(DUAL DRIVE)	Hydraune Fump Gear and Adapter			.0013L	.005L
745	G-J-S	Propeller Governor or Hydraulic			.000	.003L
, 15	(DUAL DRIVE)	Pump – End Clearance			.054L	.074L
MAGN	ETO, GENERATOR, STARTER		ı	ı		
746	T	Magneto Bearing and Gear			.0005T	
, 10		magneto Bouring una Gour			.00031 .0001L	.0005L
746	D	Magneto Bearing and Gear			.0008T	
					.0001L	.0005L
747	Т	Magneto Bearing and Crankcase			<u>.0002T</u>	
					.0007L	(A)
747	D	Magneto Drive Bearing and			<u>.0006T</u>	
<b>-</b>	95	Adapter			.0008T	(A)
748	S7	Magneto Bearing and Gear			.0001T	(4)
					.0010T	(A)

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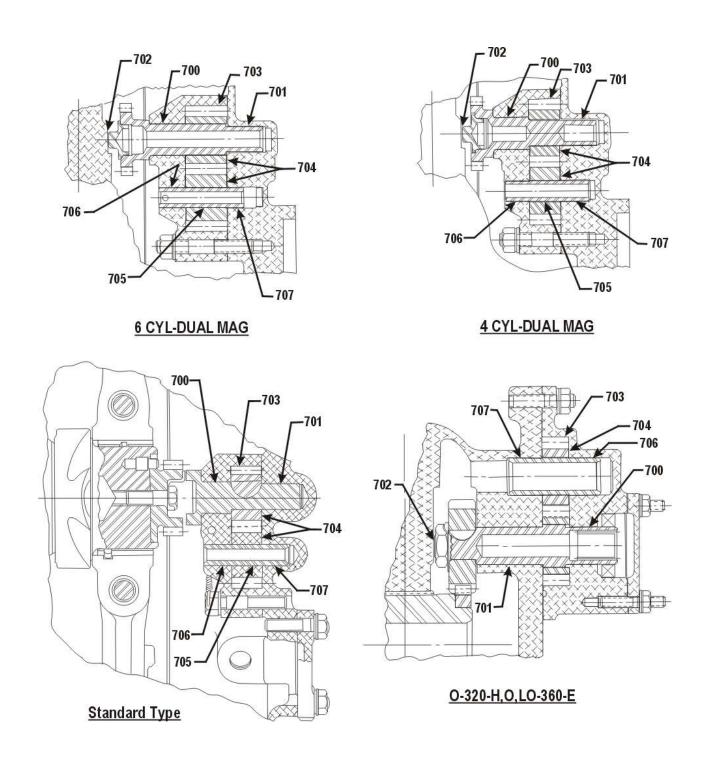
#### PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN –

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
D.C		N 14	Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
	ETO, GENERATOR, STARTER			_		
749	S7	Magneto Bearing and Adapter			<u>.000</u> .0012L	.0015L
750	S-T-AF	Magneto Drive Gear and			.0012L	.0013L
	(DUAL MAGNETO)	Crankcase			.0025L	.003L
751	S-T-AF	Magneto Drive Gear – End			<u>.005L</u>	
	(DUAL MAGNETO)	Clearance			.073L	.083L
752	AF	Magneto Drive Gear and Shaft			<u>.001L</u> .003L	.005L
753	BD-BE	Magneto Drive Gear and			.001L	.0022
		Crankcase Bushing			.003L	.005L
754	Y	Magneto Shaft Gear and Magneto			<u>.001L</u>	
		Case			.003L	.005L
755	Y	Magneto Shaft Gear and Support			<u>.001L</u>	
==-		Assembly			.003L	.005L
756	Y	Magneto Shaft Gear and			00751	
		Accessory Drive Shaft Gear – End Play			.0075L .0125L	.015L
757	Y	Accessory Drive Shaft Gear and			.001L	.013L
,,,,		Support Assembly			.003L	.005L
758	S	Magneto Gear and Bushing			.0005L	
		(S4LN-21 and S4LN-1227)			.0020L	.0035L
	T	Magneto Gear and Bushing			<u>.0015L</u>	
		(S6LN-21 & S6LN-1227)			.0035L	.0055L
	T-AF	Magneto Gear and Bushing			.0015L	00551
7095	(DUAL MAGNETO) BD-BE	Bushing – Magneto Drive			.0035L .0025T	.0055L
7093	BD-BE	and Crankcase			.0025T	(A)
759	D	Generator Gear Bushing and			.0020T	(11)
.0,		Generator Gear			.0035T	(A)
760	D	Generator Gear Bushing and			<u>.001L</u>	
		Generator Drive Coupling Adapter			.0028L	.005L
761	D	Bendix Drive Gear Bushing and			<u>.0005T</u>	
		Crankcase			.0025T	(A)
762	D	Bendix Drive Gear and Bendix			.0010L	0071
762	D	Drive Gear Bushing Bendix Drive Shaft and Bendix			.0025L	.005L
763	D	Drive Housing			.003L .005L	.010L
764	D	Bendix Drive Shaft – End			.003L .000	.010L
/ U <del>1</del>		Clearance			.0059L	.080L
		Cicurunico	l	I	.00371	.000L

## PART I – DIRECT DRIVE ENGINES

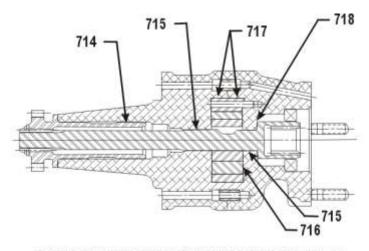
SECTION III – GEAR TRAIN



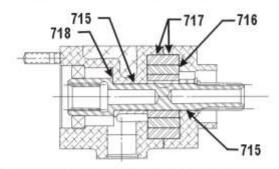
Oil Pumps

#### PART I – DIRECT DRIVE ENGINES

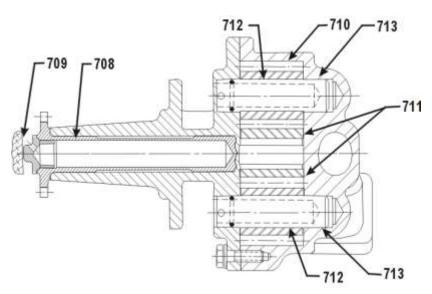
SECTION III – GEAR TRAIN



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



DUAL MAG TURBO SCAVENGE PUMP & HYD. PUMP

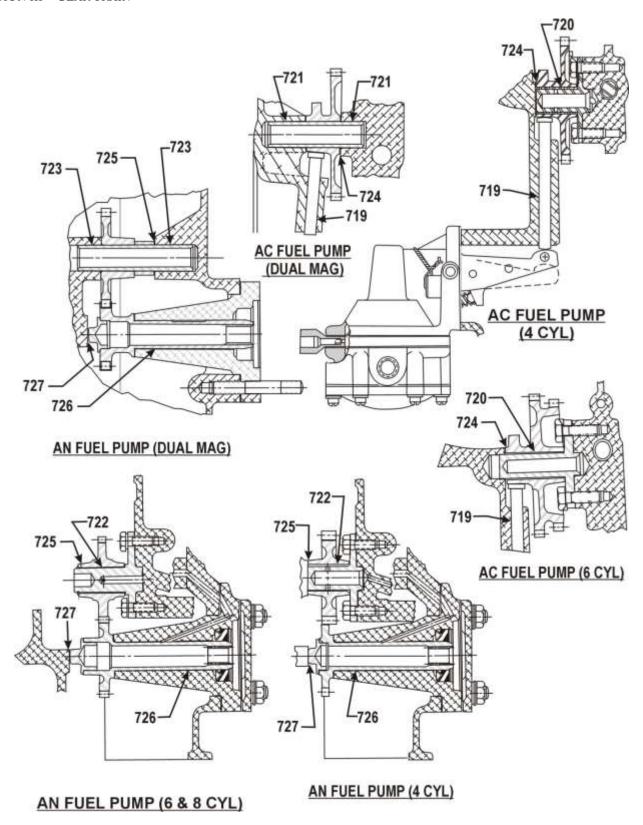


SCAVENGE PUMP AIO 320 & AIO-360

Scavenge Pumps

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

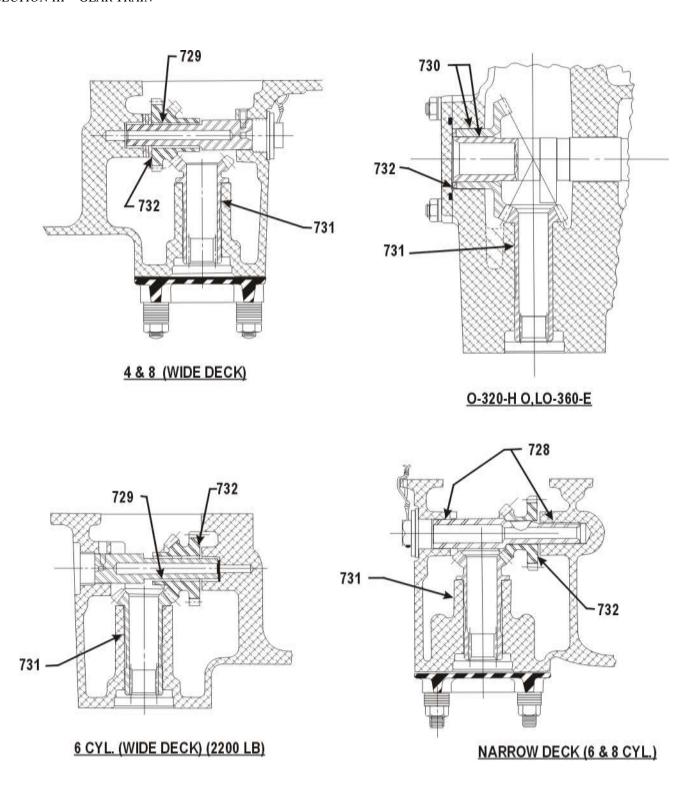
SECTION III – GEAR TRAIN



Fuel Pumps

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

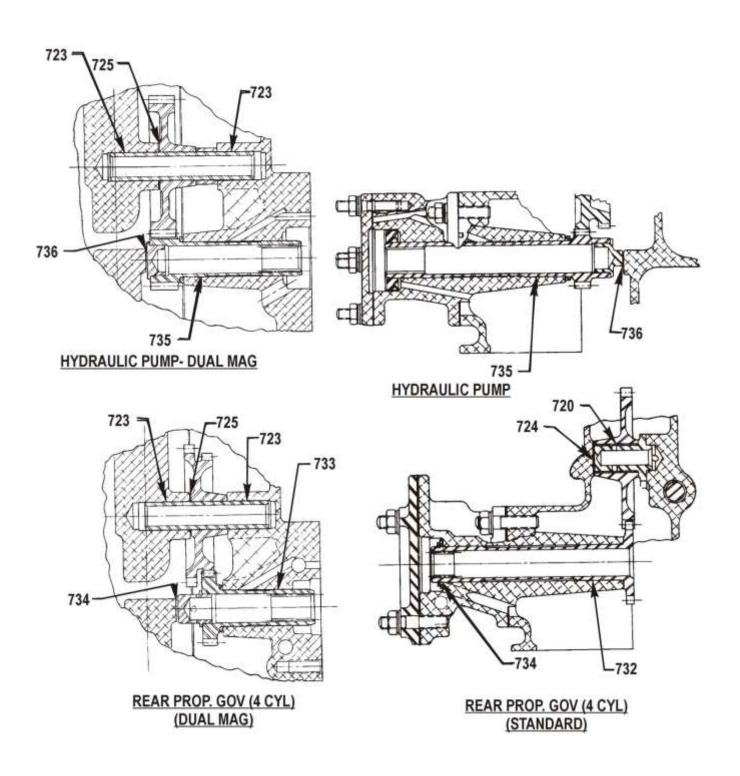
SECTION III – GEAR TRAIN



Front Governor

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

SECTION III – GEAR TRAIN

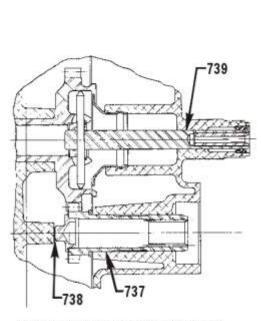


Rear Governor and Hydraulic Pumps

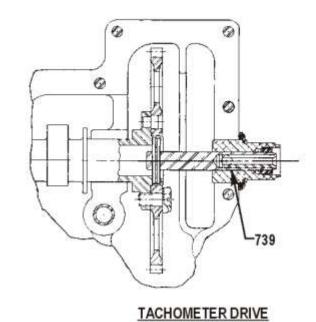
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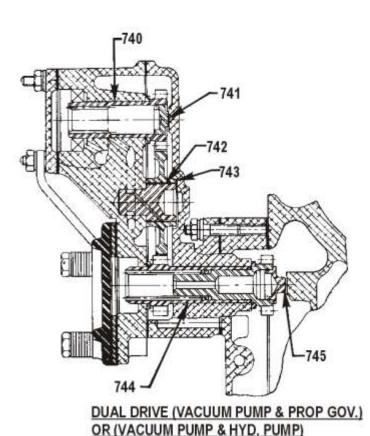
#### **PART I – DIRECT DRIVE ENGINES**

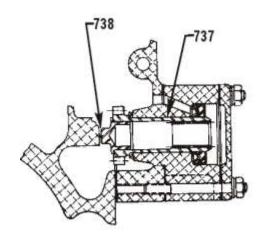
SECTION III – GEAR TRAIN



VACUUM PUMP & TACHOMETER







VACUUM PUMP

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

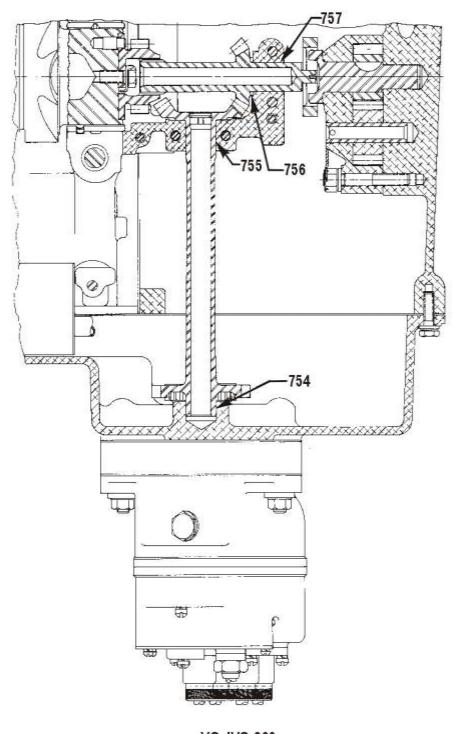
SECTION III – GEAR TRAIN -758 747 O-435-A 746 ACCESSOR MAGNETO HSG 6 CYLINDER HIO-360-D TYPE 752 753 7095 **8 CYLINDER** O-320-H, O, LO-360-E 758 4 CYL. (S4LN-21 & S4LN-1227) 750 DUAL MAG (6 & 8 CYL.) 4 CYL. DUAL MAG

Accessory Drives: Magnetos Generator and Starters

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## PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN

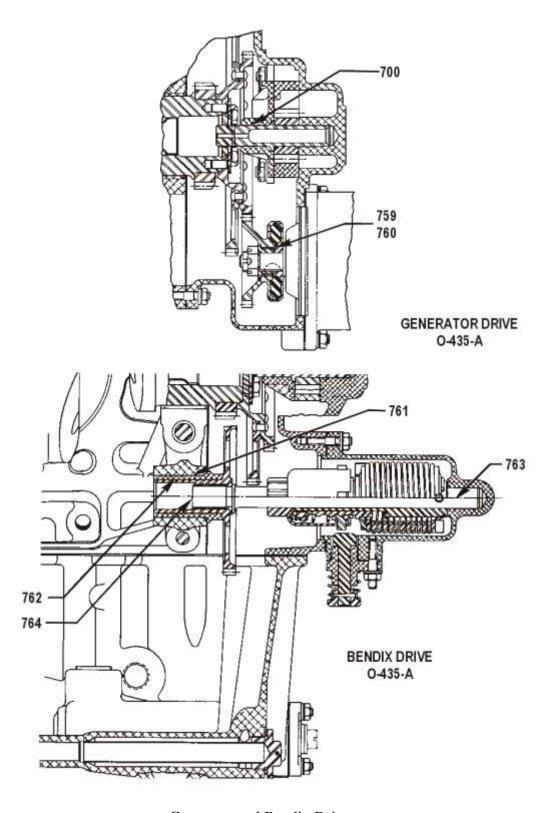


VO, IVO-360

Accessory Drives: Magnetos

#### PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN



Generator and Bendix Drive

## PART I – DIRECT DRIVE ENGINES

#### SECTION IV – BACKLASH

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
D.£	Ch4	NI	Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
800	A-B-G-J-S-T-Y-AF	Camshaft and Vacuum Pump – Backlash			.004 .015	.020
801	BD-BE	Camshaft and Vacuum and Oil			.006	
		Pump Drive – Backlash			.014	.020
802	Y	Camshaft and Fuel Pump –			<u>.004</u>	
		Backlash			.015	.020
803	A-B-G-J-S-T-Y-AF	Camshaft and Crankshaft Idler –			.004	0.20
904	A D C I C T V A F	Backlash			.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			.004	
		Idler – Backlash			.015	.020
806	BD-BE	Magneto Drive and Crankshaft			.006	
		Gear – Backlash			.014	.020
807	BD-BE	Crankshaft Gear and Vacuum and			<u>.006</u>	
		Oil Pump Drive – Backlash			.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			.008	.020
	BD-BL	On I ump impeners – Backlasii			.012	.020
809	S-T-AF	Oil Pump Drive and Crankshaft			.004	
	(DUAL MAGNETO)	Idler – Backlash			.015	.020
810	Y	Magneto and Magneto Shaft Gear			.004	
		– Backlash			.015	.020
811	Y	Accessory Drive Shaft Gear and				
		Magneto Driven Shaft Gear –			<u>.003</u>	0.1.2
012	Y	Backlash			.005	.012
812	Y	Crankshaft Gear and Accessory Drive Shaft Gear – Spline			002	
		Backlash			.002 .005	.015
813	G-J-S	Camshaft and Propeller Governor			.004	.013
010	(DUAL DRIVE)	or Hydraulic Pump – Backlash			.015	.020
814	G-J-S	Governor or Hydraulic Pump				
	(DUAL DRIVE)	Drive and Drive Gear – Spline			.0013	
		Backlash			.0073	.010
815	G-J-S	Governor or Hydraulic Pump and			<u>.004</u>	
	(DUAL DRIVE)	Idler – Backlash			.015	.020
816	G-J-S	Vacuum Pump and Idler –			<u>.004</u>	020
817	(DUAL DRIVE) S-T-AF	Backlash AN Fuel Pump Idler and			.015	.020
01/	9-1-AF	Crankshaft Idler – Backlash			.004 .015	.020
818	S-T-AF	AN Fuel Pump Idler and Fuel			.004	.020
		Pump Drive – Backlash			.015	.020
819	S-T-AF	Crankshaft Gear and AN Fuel			.004	
	(DUAL MAGNETO)	Pump Idler – Backlash			.015	.020
820	T-AF	Hydraulic Pump and Crankshaft			.004	
		Idler – Backlash			.015	.020

## PART I – DIRECT DRIVE ENGINES

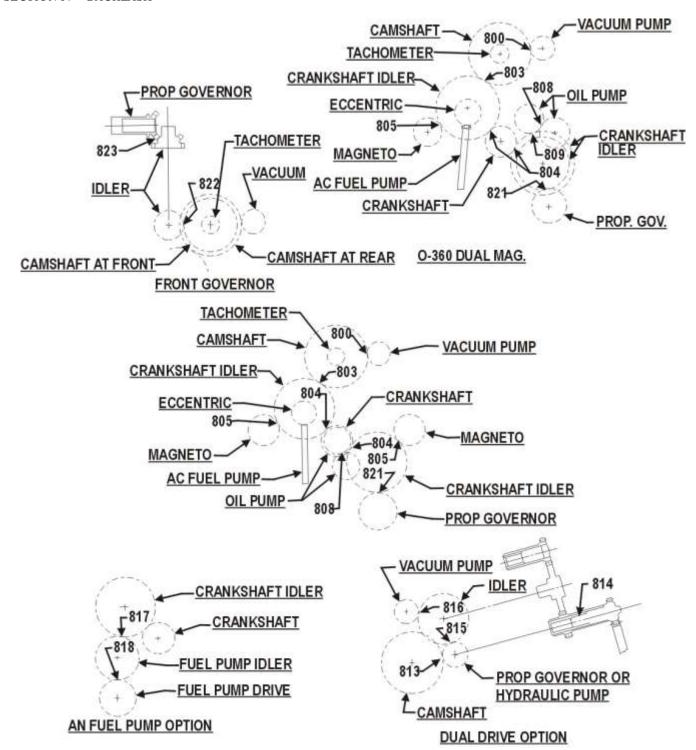
#### SECTION IV – BACKLASH

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

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#### PART I – DIRECT DRIVE ENGINES

SECTION IV - BACKLASH

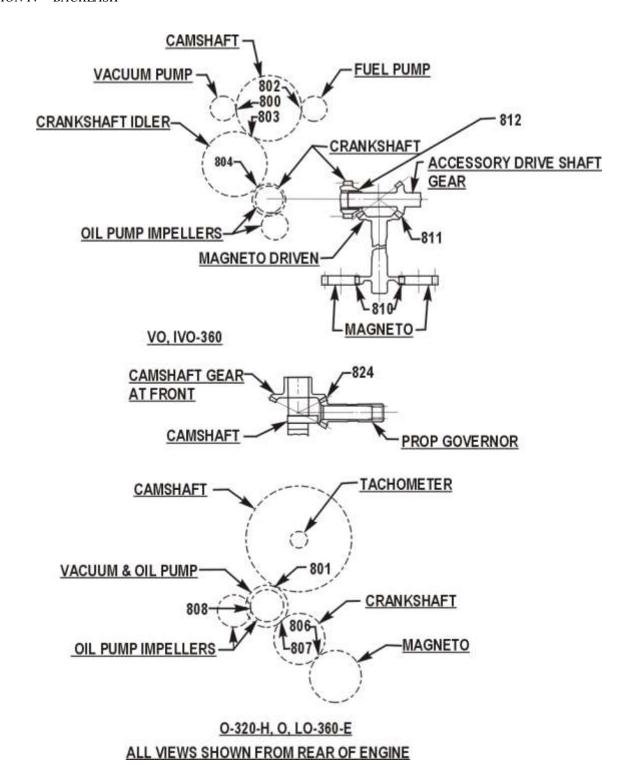


# O-235, 0320, O-340 &O-360 ALL VIEWS SHOWN FROM REAR OF ENGINE

Backlash (Accessory Drives)

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

SECTION IV - BACKLASH

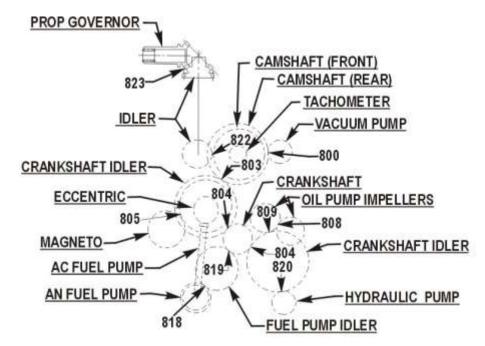


Backlash (Accessory Drives)

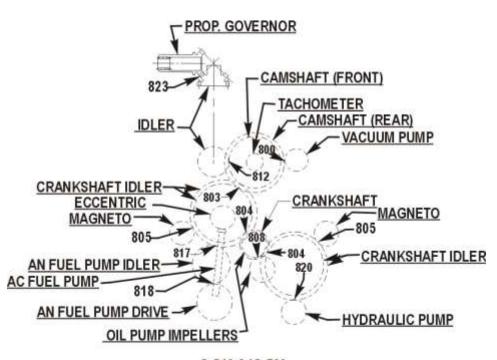
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#### PART I – DIRECT DRIVE ENGINES

SECTION IV - BACKLASH



#### O-540 & IO-720 DUAL MAG



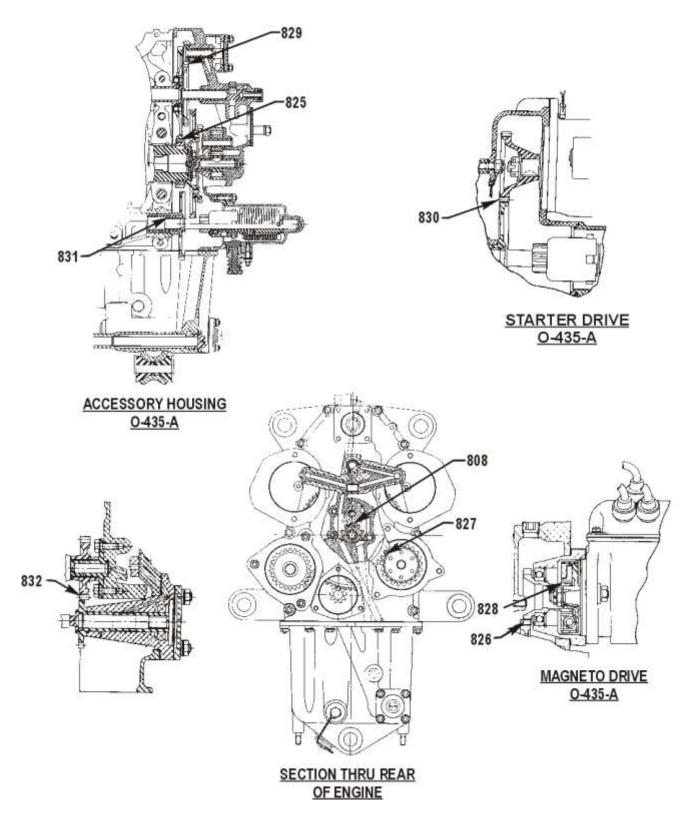
0-540 & 10-720

#### ALL VIEWS SHOWN FROM REAR OF ENGINE

Backlash (Accessory Drives)

#### PART I – DIRECT DRIVE ENGINES

SECTION IV - BACKLASH



Backlash (Accessory Drives)

### PART I – DIRECT DRIVE ENGINES

 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 

Ref.	Chart	Thread Size	Nomenclature	Torque Limits
900	A-B-D-G-S-T-Y-BD-BE	3/8-24	Connecting Rod Nuts	480 inlbs
	J	3/8-24	Connecting Rod Nuts	360 inlbs
I	S1-S3-S5-S6-S7-S9-S11-S12- 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		Nomenclature			Torque Limits	
918	ALL (AS APPLICABLE)	1-1/4-12	2		Oil Pressure R	Relief 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 5/16 Hex. Head and Above			(Worm Type) (Meta e: heat shield to exh		45 inlbs.	
					Hose Clamps	(Worm Type)		30 – 35 inlbs.	
920	ALL				Cylinder Head	l Drain Back Hose C	lamps	10 inlbs.	
	S-T				Exhaust V-I	Band Coupling Torqu	ie Data		
921	Coupling Size Tube OD	Lycomin, Numb		,	Vendor Part Number	T-Bolt Split Type Locknut Torque InLbs.		Drilled Hex Nut With y Wire Torque InLbs.	
	1.75 in.	LW-120	93-4	M	VT69183-175	65		75	
	2.00 in.	LW-120	93-5	M	VT69183-200	85		75	
	2.25 in.	LW-120	93-6	M	VT69183-225	85		75	
	2.25 in.	LW-121	25-3	M	VT69197-225	85			
	3.69 in.	LW-13	464	U4	204-55-369M	70			
1	3.69 in.	LW-15	768		H1004420-10	70			
922	ALL					ger V-Band Torque D	) Data		
	Turbocharger Mo	odel No.	V-C	lamp	Part No.	V-Clamp Diameter		Torque InLbs.	
	TO-473*				00-600 6.00 in.			40 – 80	
	TEO659*				00-685 6.85 in.			40 – 50	
	THO8A60				0-775	7.75 in.	40 - 60		
	THO8A69				0-775	7.75 in.		40 - 60	
	301E10-2*			TC-		6.50 in.		15 – 20	
	* - AiResearch tu ** - Rajay turboch	ırbocharge arger.			1				
	Chart		ead Size	1011 1	No. 1238 for assembly procedure.  Nomenclature			Torque Limits	
927	ALL DUAL MAG. MODELS		/2-20		Crankshaft Ge			660 inlbs.	
	BD		1/4		Crankshaft Ge	ear Bolts		96 – 120 inlbs.	
		3	/8-16		Cylinder Hold (Crankcase Di	Down Studs riving Torque)		100 inlbs.	
928	ALL 7/16-14			Cylinder Hold (Crankcase Dr	l Down Studs riving Torque)		200 inlbs.		
		1	1/2-13		Cylinder Hold Down Studs (Crankcase Driving Torque)		250 inlbs.		
	A-B-D-BD-BE-J- G-Y-S-T-AF		3/8		Cylinder Hold			300 inlbs.	
929	A1		7/16		Cylinder Hold	Down Nuts		420 inlbs.	
	B-D-BD-BE-J-G- Y-S-T-AF		1/2		Cylinder Hold	l Down Nuts		600 inlbs.	
	Cylinder Hold Do Service Instruction			e Par	ting Flange Nu	ts' Tightening Proce	edures -	- See latest revision of	

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

SECTION V – SPECIAL TORQUE REQUIREMENTS (CONT.)

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

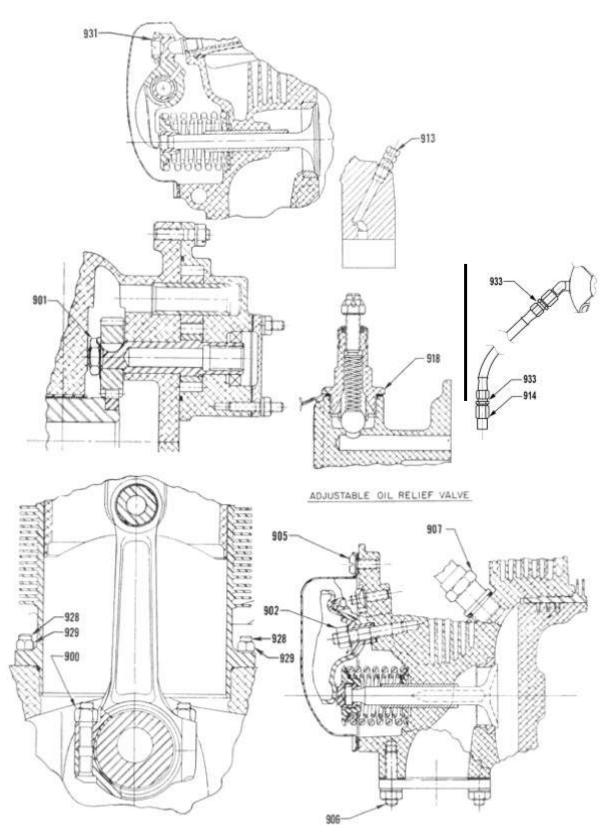
<sup>\*</sup> It is also permissible to tighten the fuel line union nut finger tight, then continue tightening the nut with a wrench an additional 30 to 60 degrees (1/2 to 1 flat of the nut.) Torque in excess of 50 in.-lbs. can result in damage to the parts.

#### SECTION V – SPRINGS

					Length		COMP. LO	AD
Ref.	Chart	Nomenclature	Lycoming Part No.	Wire Dia.	at Comp. Length	Mfr. Min.	Mfr. Min.	Service Max.
950	A-B-D-G-J-S-T- Y-BD-BE	Outer Valve Springs (Parallel)	LW-11800	.177	1.30 in.	112 lb.	122 lb.	109 lb. min.
	\$1-\$2-\$3-\$5-\$6- \$7-\$9-\$10-\$11- \$12-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-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		_				
		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.	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.

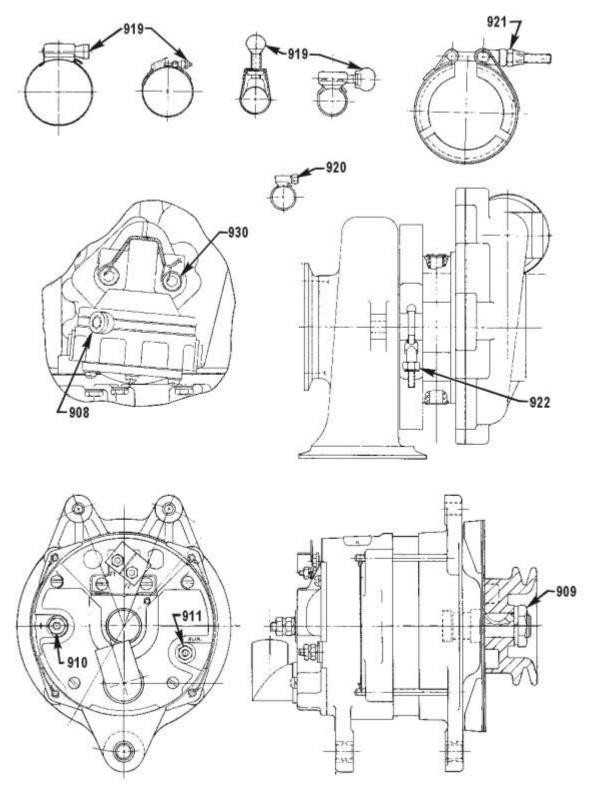
### PART I – DIRECT DRIVE ENGINES

SECTION V SPECIAL TORQUE REQUIREMENTS



### PART I – DIRECT DRIVE ENGINES

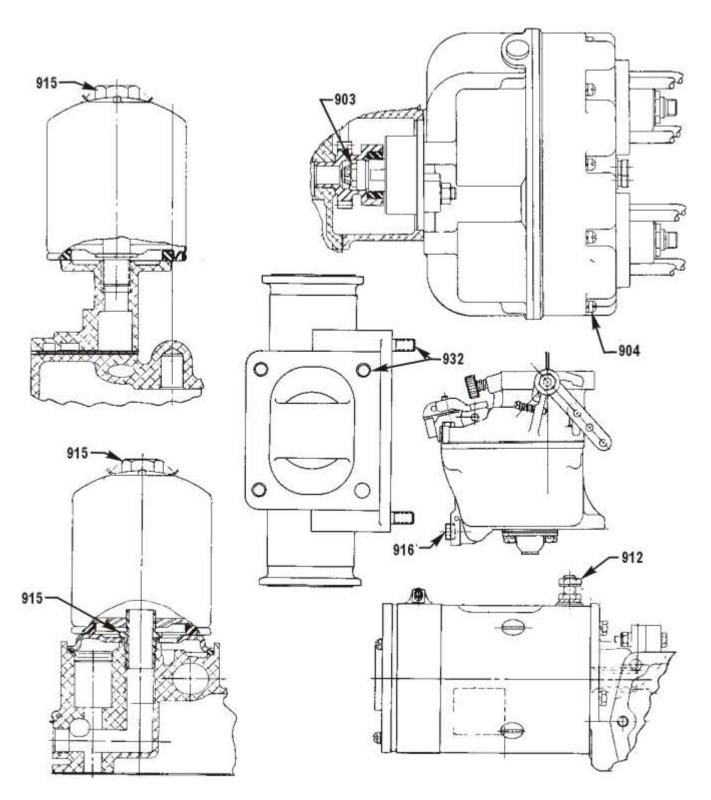
SECTION V – SPECIAL TORQUE REQUIREMENTS



Engine Accessories and Hardware

### PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS

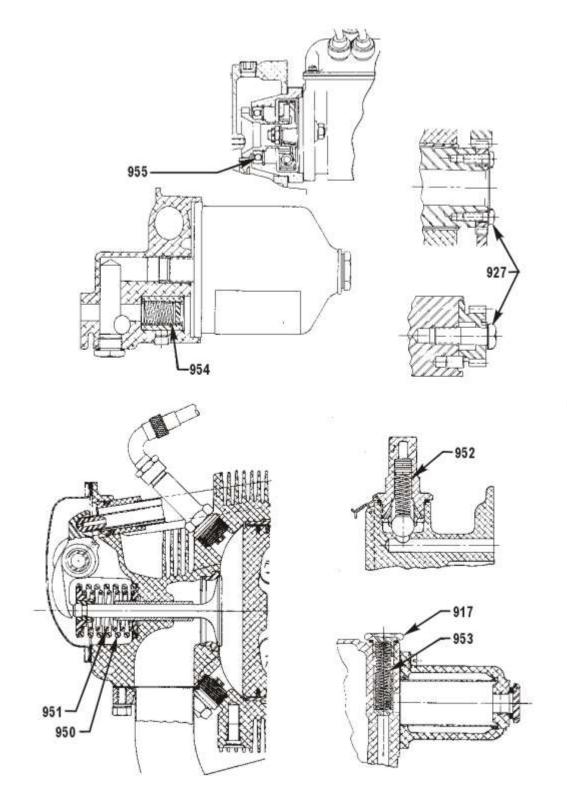


Engine Accessories and Hardware

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### PART I – DIRECT DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



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).

		TAB	TABLE II					
	В	OLTS, SCRE	W AND N	IUTS		PIPE PLUGS		
Throad	Tor	Torque		Torq	ue	Thread	Torque	
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Tillead	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			
ти	IN NUTS (1/2	DIA OF DO	NIE -	3/4-14 NPT	230 to 252			
1.11	IIIN INO 13 (1/2	L DIA. OF BU	UE	1-11-1/2 NPT	315 to 347			

TADLEIII				ADI E IV					
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 OI	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°	270° 135°		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°	TABLE V						
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	E			
NOTE: Install all crush type ga	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	5/10	6-18	25						
part until the sealing surfaces are in c	3/8	G-16	50						
to the angle of turn listed for the app. NOTE: Lubricate Threads Unless Ot									

	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	e for tightening	g AN-818 Nut	(pound inches)		Minimum bend radii	
Dash Nos. Ref.	Tubing OD inches	Aluminum-	alloy tubing Steel to	Steel tubing		alloy tubing 3583) for use lines only	measured to tubing centerline. Dimension in inches		
		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 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)		ther shrink fits controlled by machining, fits that may readily be where wear does not normally occur. In each case, the fit must be held tolerance.
(B)	Side clearance on	piston rings must be measured with face of ring flush with piston.
(D)	The dimensions s the piston pin.	hown are measured at the bottom of the piston skirt at right angles to
(E)	Permissible wear on the diameter.	of the crankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherei	n a definite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink o	or interference fit.
(WD)	Wide Deck Cranl	scase.

SSP-1776-4-PT2 April 10, 2018\*

<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.





# TECHNICAL PUBLICATION REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE		
SSP-1776-4-PT2	Service Table of Limits	SSP-1776	October 28, 2013		
PREVIOUS	REVISIONS	CURRENT	REVISION*		
		Apri	1 2018		
		2-8, 2-23, 2-24, 2-25,	2-26, 2-27, 2-28, 2-29		
		<ul> <li>Deleted NOTES that reference S.I. 1243 in Piston Application Table</li> <li>Added pages and figures for all 900 Series reference numbers in Section V</li> </ul>			
		* Revisions are indicated with a revised item.	a vertical bar to the left of the		



## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clear	ances
			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			<u>.0011L</u>	
					.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>	2 0200		
501	10.17	Diameter	2.9375	2.9390	00001	
501	AQ-AZ	Connecting Rod Bearing and			.0008L	00501
	A.77	Crankshaft	2 1225		.0038L	.0050L
	AZ	Diameter of Connecting Rod	2.1235 2.125	(E)		
	40	Journal on Crankshaft (2-1/8)		(E)		
	AQ	Diameter of Connecting Rod Journal on Crankshaft (2-1/4)	2.2485 2.250	(E)		
	AZ	Connecting Rod Bearing Bore	2.230	(E)		
	AL	Diameter (2-1/8) (Measure at	2.2870			
		Axis 30° on each side)	$\frac{2.2870}{2.2875}$			
	AQ	Connecting Rod Bearing Bore	2.2073			
	110	Diameter (2-1/4) (Measure at	2.4205			
		Axis 30° on each side)	$\frac{2.1209}{2.4210}$			
502	AQ-AZ	Connecting Rod – Side	2.1210		.004L	
002	114.12	Clearance			.010L	.016L
503	AQ-AZ	Connecting Rod – Alignment			.010 in 1	0 Inches
504	AQ-AZ	Connecting Rod – Twist			.012 in 1	0 Inches
505		Crankshaft Run-Out at Center				
		Main Bearings				
	AZ	Mounted on No. 1 and 4				
		Journals Max. Run-Out No. 2				
		and 3 Journals			.005	.0075
		Mounted on No. 1 and 3				
		Journals Max. Run-Out No. 2				
		Journal			.003	.0045
		Mounted on No. 2 and 4				
		Journals Max. Run-Out No. 3				
		Journal			.003	.0045
	AQ	Mounted on No. 2 and 5				
		Journals Max. Run-Out No. 1			000	002
1		Journal No. 2 and 5			.002	.002
1		Mounted on No. 2 and 5				
		Journals Max. Run-Out No. 3			007	0075
		Journal			.005	.0075
		Mounted on No. 2 and 4				
		Journals Max. Run-Out No. 3			003	0045
		Journal	j	I	.003	.0045

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

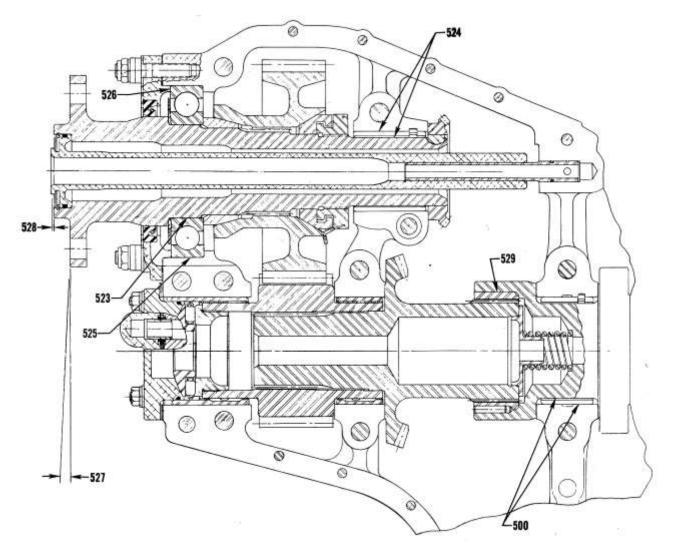
 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 

			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				
	AQ-AZ	Journal  Crankshaft and Crankcase – Front End Clearance			.003 .005L .016L	.0045 .026L
507	AQ	Clearance – Front Face of Crankshaft Oil Slinger to Front Face of Recess in Crankcase (Crankshaft Against Thrust Face)			.010L .002 .007	(A)
508	AQ-AZ	Crankshaft Propeller Flange Run-Out			1007	.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			.0010L .0030L	.004L
	AQ-AZ	O.D. of Tappet	<u>.9990</u> .9995	.9987		
	AQ-AZ	I.D. Tappet Bore in Crankcase	1.0005 1.0018	1.0021		
514	AQ-AZ	Camshaft and Crankcase			<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)			.003L .013L	.017L
520	AQ-AZ	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	AQ-AZ	I.D. Counterweight Bushing	<u>.7485</u> .7505	.7512		
	AZ	I.D. Counterweight Bushing (2 <sup>nd</sup> order)	1.030 1.032	1.0327		
522	AQ-AZ	O.D. of Counterweight Roller (See latest revision of Service Instruction No. 1012)				
523	AZ	Thrust Bearing and Propeller Shaft			<u>.0001L</u> .0012L	.002L
524	AZ	Propeller Shaft and Rear Bearing			.0015L .0030L	.0040L

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

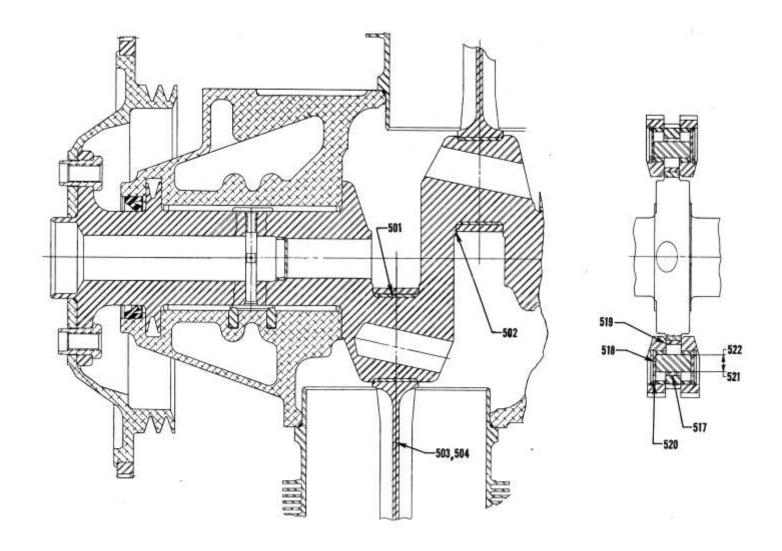
			Dimensions		Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
524	AZ	Propeller Shaft Bearing Bore	2.1865			
		Diameter	2.1875	2.1885		
525	AZ	Thrust Bearing and Crankcase			<u>.0006L</u>	
					.0010T	(A)
526	AZ	Thrust Bearing and Thrust				
		Bearing Cap 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			.006	
					.008	.010
529	AZ	Crankshaft and Crankshaft Front			<u>.0002T</u>	
		Bearing			.0015T	(A)



Section Thru Prop. Shaft, Crankshaft and Front Bearings

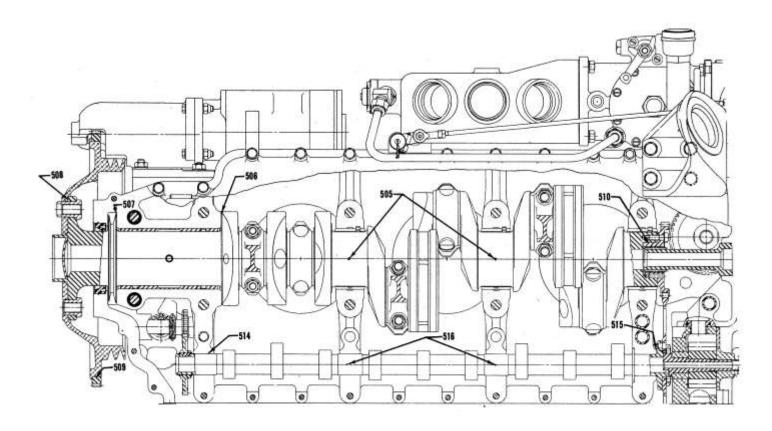
### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 



### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

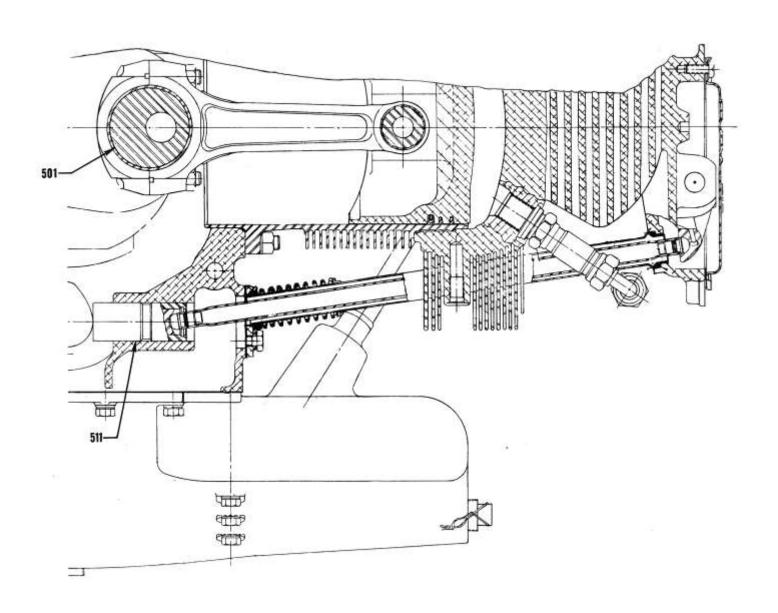
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 



## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### **SECTION II – CYLINDERS**

			Dime	nsions	Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
600	AQ-AZ	Connecting Rod and Connecting Rod Bushing		hing to be Bu		
	AQ-AZ	Finished I.D. of Connecting Rod Bushing	1.1254 1.1262	ling to be bu	imsiled iii r	lace.
601	AQ-AZ	Length Between Connecting Rod Bearing Centers	6.7485 6.7515			
602	AQ-AZ	Connecting Rod Bushing and Piston Pin	0.7313		.0008L .0021L	.0025L
603	AQ-AZ	Piston Pin and Piston			.0003L .0014L	.0018L
	AQ-AZ	Diameter of Piston Pin Hole in Piston	1.1249 1.1254		.00112	.00102
	AQ-AZ	Diameter of Piston Pin	1.1241 1.1246			
604	AQ-AZ	Piston and Piston Pin Plug	111210		.0002L .0010L	.002L
	AQ-AZ	*Diameter of Piston Pin Plug	1.1242 1.1247			
605	AQ-AZ	Piston Pin and Piston Pin Plug – Nitrided and Chrome Cylinders			.0005L .0025L	.005L
	AQ-AZ	*Diameter of Piston Pin Plug	<u>.5655</u> .5665			
	* See latest revision of Service l	Instruction No. 1267.				1
606	AQ-AZ	Piston Ring and Piston – Side Clearance (Top Ring Comp.)			.0025L .0055L	.008L (B)
	AQ-AZ	Piston Ring and Piston – Side Clearance (2 <sup>nd</sup> Ring Comp.)			.000L .004L	.006L (B)
	AQ-AZ	Piston Ring and Piston - Side Clearance (Oil Regulating)			.002L .004L	.006L (B)
607	AQ-AZ	Piston Ring Gap (Compression) Chrome Cylinders (Straight Barrels)			.020 .030	.047
	AQ-AZ	Piston Ring Gap (Compression) Nitrided and Chrome Cylinders (Choke Barrels)			.045 .055	.067
	AQ-AZ	Piston Ring Gap (Oil Regulating) (All Barrels)			.015 .030	.047
	.0075.	s measured within 4 inches from bottom p is measured at top limit of ring travel		at top of trav	•	•

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#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II - CYLINDERS

			D	imensions		Clearances				
Ref.		Chart	Nor	nenclature		Mfr Min. Max	& Servi	ce M	Mfr. lin. & Max.	Service Max.
	Engine and	d Piston Application	Min. Pisto	on Diameter		Cylinder Ba		ler Barrel	nrrel Max.	
	Engine Chart Code Letter	Piston Number	Тор	Bottom	Type of	Piston	Type of Surface	Maxim Diame		Clearance Piston Skirt & Cyl.
608 608 609 610	AQ-AZ	76966, LW-10545	5.0790	5.1090	Forged-	-Cam	N-C	5.130	)5	.018L

#### NOTES:

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

\*=High Compression.

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

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

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

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

			Dimensions	5	Clearances	1
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
611	AQ-AZ	Exhaust Valve Seat and Cylinder			<u>.0075T</u>	
		Head			.011T	<b>(A)</b>
	AQ-AZ	O.D. Exhaust Seat	1.9355			
			1.937			
	AQ-AZ	I.D. Exhaust Seat Hole in	1.926			
		Cylinder Head	1.928			
612	AQ-AZ	Intake Valve Seat Hole in			<u>.0065T</u>	
		Cylinder Head			.010T	<b>(A)</b>
	AQ-AZ	O.D. Intake Seat	2.2885			
			2.290			
	AQ-AZ	I.D. Intake Seat Hole in Cylinder	2.280			
		Head	2.282			
613	AQ-AZ	Exhaust Valve Guide and			.0011T	
		Cylinder Head			.0030T	<b>(A)</b>
	AQ-AZ	O.D. Exhaust Valve Guide	.6954			
	_		.6963			
	AQ-AZ	I.D. Exhaust Valve Guide Hole	.6933			
		in Cylinder Head	.6943			

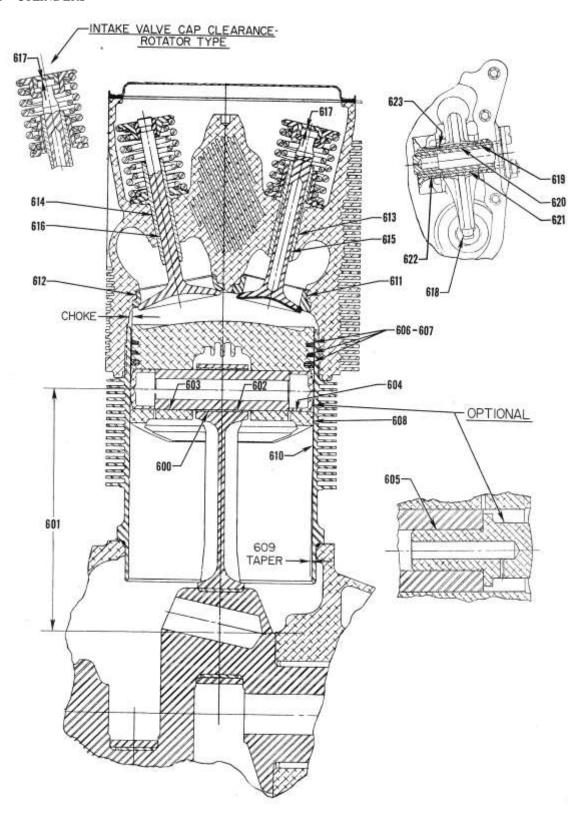
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS

			Dimensions		Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service 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	.5913 .5923			
615	AQ-AZ	Exhaust Valve Stem and Valve Guide	,		.0037L .0050L	(A)
	AQ-AZ	O.D. Exhaust Valve Stem	<u>.4955</u> .4965	.4937	.00302	(11)
	AQ-AZ	Finished I.D. Exhaust Valve Guide	.4995 .5005	.1737		
616	.001 in. during each 100 ho	urs of service. After 300 hours of service, insurs of operation up to the recommended ov latest revision of Service Instruction No. 1  Intake Valve Stem and Valve	erhaul time	for the engir	ne, or not to	
	AQ-AZ	Guide O.D. Intake Valve Stem	.4022		.0028L	.006L
		Finished I.D. Intake Valve	.4030	.4010		
	AQ-AZ	Guide	.4040 .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			.040 .105	
619	AQ-AZ	Valve Rocker Shaft and Valve Rocker Bushing			.0001L .0013L	.0025L
	AQ-AZ	Finished I.D. of Valve Rocker Shaft (Bushing) in Cylinder Head	<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	.6241 .6245	.6231		
621	AQ-AZ	Valve Rocker Bushing and Valve Rocker		ing Must Be	Rurnished in	Place
622	AQ-AZ	Valve Rocker Shaft Bushing and Cylinder Head	Dusii	Ing must be	.0022T .0038T	(A)
	AQ-AZ	Valve Rocker Shaft Bushing Hole in Cylinder Head	<u>.7380</u> .7388		.00301	(11)
623	AQ-AZ	Valve Rocker and Cylinder Head – Side Clearance			.002L .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	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL PU	UMP					
700	AQ-AZ	Oil Pump Drive Shaft and Oil Pump Body			.0010L .0030L	.004L
701	AQ-AZ	Oil Pump Drive Shaft and Oil Pump Cover			.0035L .0050L	.0065L
703	AQ-AZ	Oil Pump Impellers – Diameter Clearance			<u>.002L</u> .005L	.008L
704	AQ-AZ	Oil Pump Impellers – Side Clearance			<u>.002L</u> .0045L	.005L
		Width of Oil Pump Impellers	1.372 1.374	1.371		
705	AQ-AZ	Oil Pump Driven Impellers and Idler Shaft			.0005L .002L	.004L
FUEL	PUMP					
722	AQ-AZ	Fuel Pump Idler Gear and Shaft			<u>.001L</u> .003L	.005L
725	AQ-AZ	Fuel Pump Idler Gear – End Clearance			<u>.002L</u> .028L	.038L
726	AQ-AZ	Fuel Pump Drive Shaft Gear and Crankcase			<u>.0010L</u> .0025L	.004L
727	AQ-AZ	Fuel Pump Drive Shaft Gear – End Clearance			<u>.0015L</u> .0385L	.0485L
GOVE	RNOR & TACHOMETER		•	<u> </u>	•	<u> </u>
728	AQ	Front Governor Drive Idler Shaft (Both Ends) and Crankcase			<u>.0010L</u> .0025L	.004L
731	AQ-AZ	Governor Driven Gear and Crankcase			<u>.0010L</u> .0025L	.004L
732	AQ-AZ	Propeller Governor Drive Gear – End Clearance			<u>.008L</u> .016L	.021L
739	AZ	Tachometer Drive Shaft and Adapter			.0015L .0035L	.006L
VACU	UM PUMP & HYDRAULIC PUMP	-	•	<u> </u>	•	<u> </u>
759	AQ-AZ	Vacuum and Hydraulic Pump Drive Shaft Gear and Crankcase			<u>.0010L</u> .0025L	.006L
760	AQ-AZ	Vacuum and Hydraulic Pump Drive Shaft Gear – End Clearance			.018L .028L	.035L
MAGN	ЕТО					
761	AQ-AZ	Magneto Coupling and Crankcase			.0010L .0030L	.004L
762	AQ-AZ	Magneto Drive Shaft Gear and Crankcase			<u>.0010L</u> .0030L	.004L

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

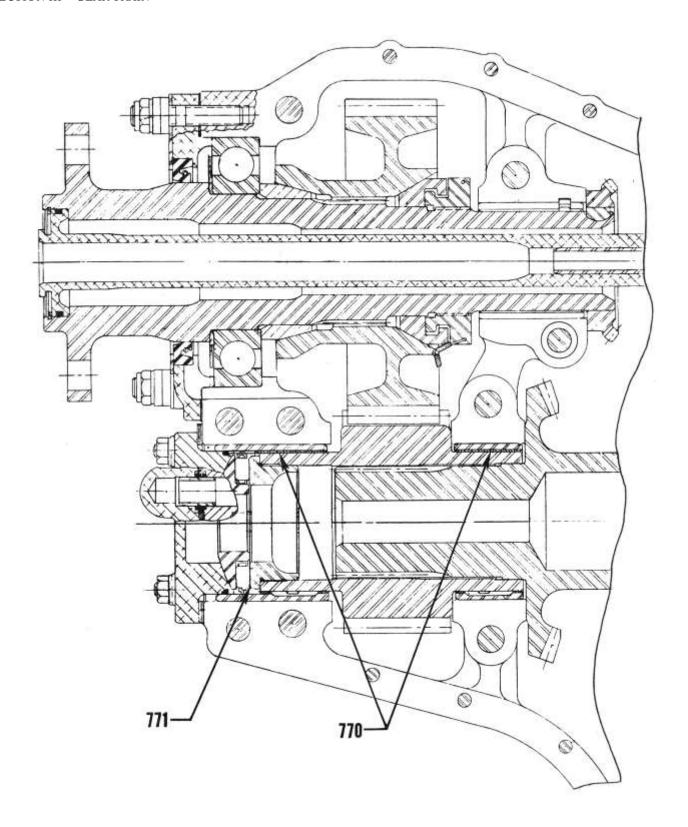
SECTION III – GEAR TRAIN

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

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN

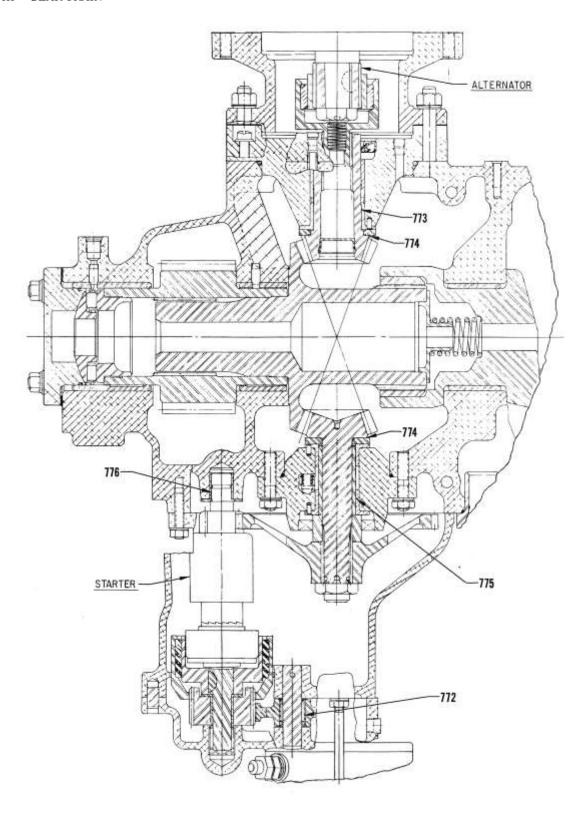


**Propeller Shaft Drive Gear** 

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

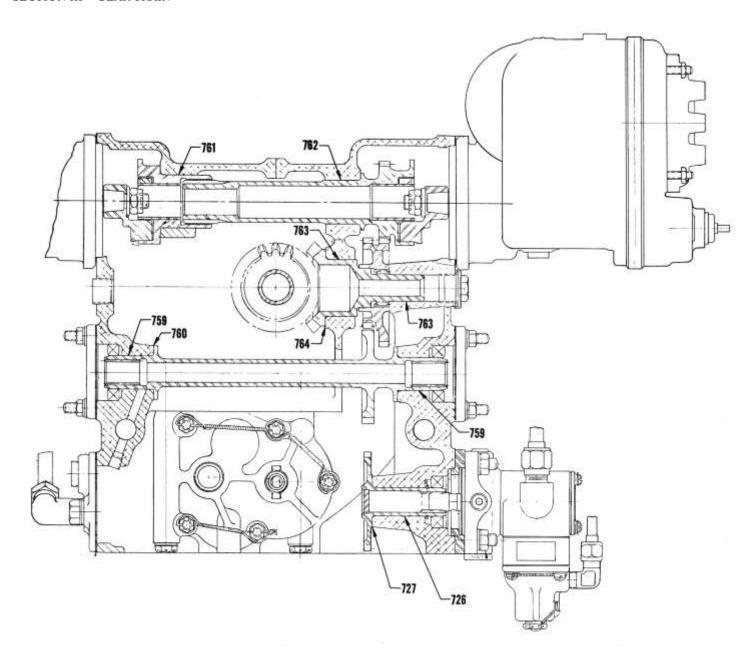
SECTION III – GEAR TRAIN



**Alternator, Starter and Propeller Shaft** 

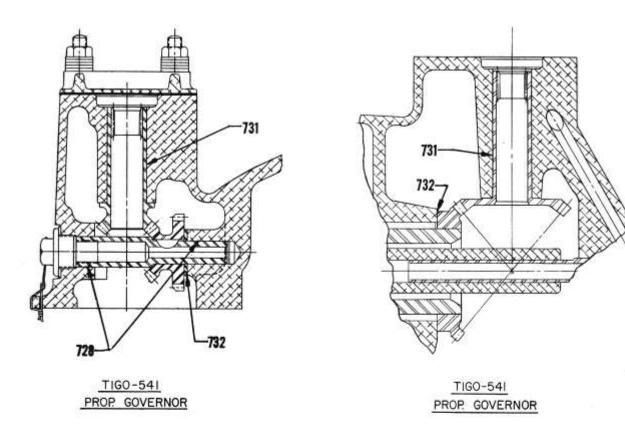
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

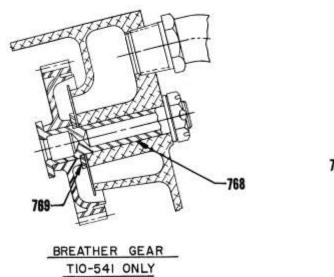
SECTION III – GEAR TRAIN

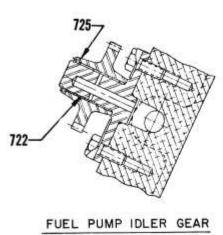


#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN



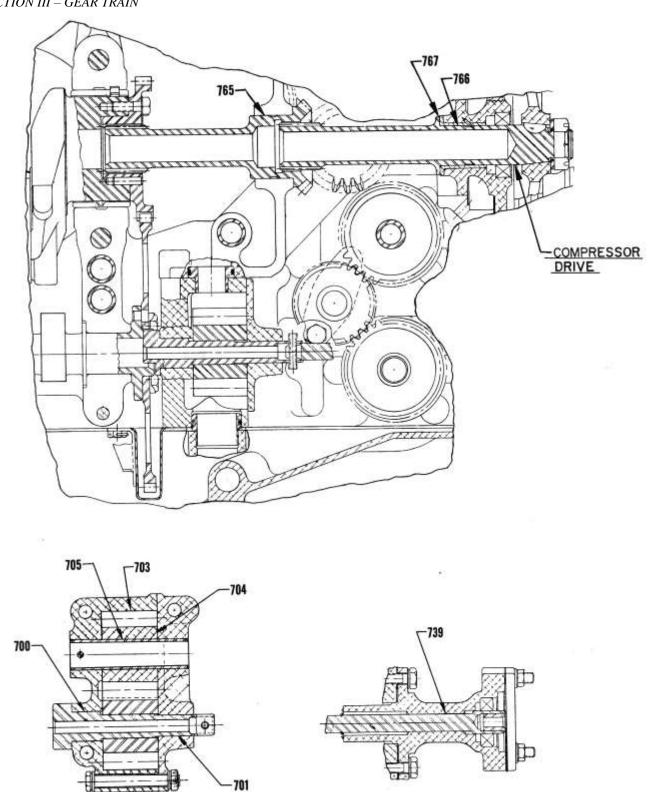




Governor, Fuel Pump and Breather Gear

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN



Oil Pump, Tachometer and Compressor

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

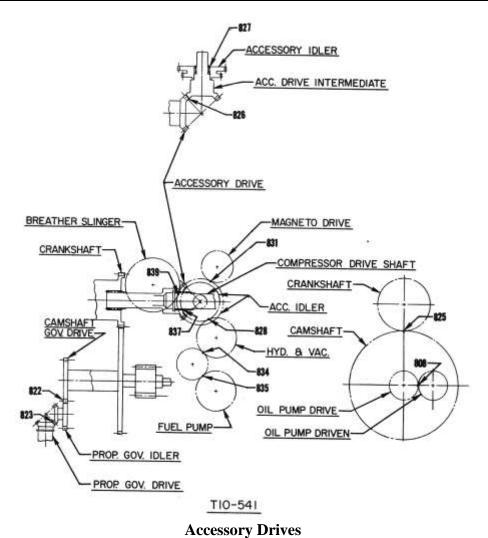
SECTION IV – BACKLASH

		Di			Clear	rances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
808	AQ-AZ	Oil Pump Impellers – Backlash			.008	
	,	1			.013	.020
822	AQ	Propeller Governor Idler and			<u>.005</u>	
		Camshaft – Backlash			.015	.020
823	AQ-AZ	Propeller Governor Drive and			<u>.004</u>	
		Idler – Backlash			.008	.015
825	AQ-AZ	Crankshaft Timing Gear and			<u>.005</u>	
		Camshaft – Backlash			.015	.020
826	AQ-AZ	Accessory Drive and Accessory			<u>.004L</u>	0.1.01
007	10.17	Drive Intermediate			.006L	.010L
827	AQ-AZ	Accessory Drive Gear			002	
		Intermediate and Idler – Spline Backlash			.002 .005	007
929	10.17	Accessory Idler and Vacuum			.003	.007
828	AQ-AZ	and Hydraulic Pump Gear –			.004	
		Backlash			.011	.016
829	AZ	Propeller Shaft – Reduction			.011	.010
02)		Gear Total Backlash at 4 Foot			.38	
		Radius			<u>.38</u> .75	.90
830	AZ	Starter (Bendix – Slip Coupling)				
		and Starter Drive Gear –			<u>.016</u>	
		Backlash			.031	.045
831	AQ-AZ	Accessory Idler and Magneto			<u>.005</u>	
		Drive Shaftgear – Backlash			.015	.020
832	AZ	Starter Drive Gear and Starter				
		and Alternator Drive Shaft Gear			<u>.004</u>	
		- Backlash			.008	.015
833	AZ	Alternator Drive Gear and			002	
		Starter and Alternator Drive			.003	012
834	10.17	Shaftgear – Backlash			.008	.012
034	AQ-AZ	Fuel Pump Idler Gear and Vacuum and Hydraulic Pump			002	
		Drive Gear – Backlash			.002 .015	.020
835	AQ-AZ	Fuel Pump Idler Gear and Fuel			.0006	.020
033	110 112	Pump Drive – Backlash			.0160	.021
836	AQ-AZ	Magneto Drive Shaft Gear and				1.5
		Magneto Coupling – Spline			.0010	
		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>	
0.00	1.0	Backlash			.0076	.014
839	AQ	Breather Slinger Gear and			<u>.005</u>	000
0.40	A.77	Accessory Idler – Backlash			.015	.020
840	AZ	Front Crankshaft Spline Bushing and Alternator and Starter Shaft			001	
					.001 .005	.006
	L	Gear – Spline Backlash	<u> </u>	1	.003	.000

#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

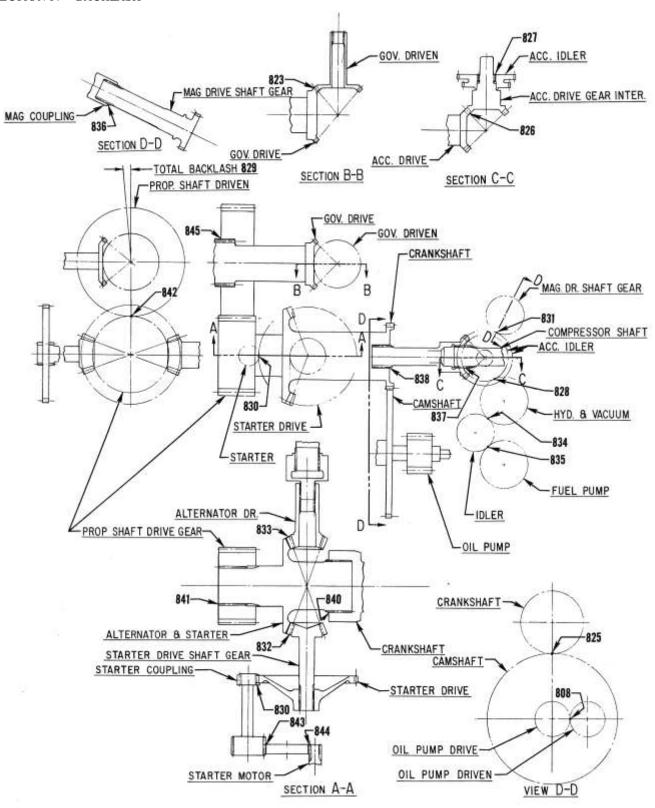
#### SECTION IV - BACKLASH

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



#### 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	Magnet	o – Nut (To attach drive	
				membe	r to magneto)	300 in. lbs.
904	AQ-AZ		10-32	Magnet	o – Plate Screws	15 in. lbs.
905	AQ-AZ (using a	silicone gasket)	1/4-20		Box Screws	35 inlbs.
	AQ-AZ (using a	cork gasket)	1/4-20		Box Screws	50 in. lbs.
907	AQ-AZ		18MM	Spark F		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		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		Cooling Nozzle in	
01.7	10.17		2/1.15	Cranke		100 in. lbs.
915	AQ-AZ		3/4-16		er Bolt (AC Can and	200: 11
	10.47		12/16/16	Elemen		300 in. lbs.
	AQ-AZ		13/16-16		er (Throw away type)	240 in. lbs.
017	AQ-AZ		3/4-16	_	ter Stud	720 in. lbs.
917	AQ-AZ		1.00-14		oler Bypass Valve ssure Relief Valve	300 in. lbs.
918 919	AQ-AZ		1-1/4-12	_		300 in. lbs. 45 in. lbs.
919	AQ-AZ		Exhaust V-Band	Hose C		43 III. 108.
921	AQ-AZ		Exilaust V-Dalie	u Coupini	T-Bolt Split Type	1/4 In. Drilled Hex Nut
	Coupling Size	Lycoming Part			Locknut Torque In.	with Safety Wire
	Tube OD	No.	Vendor Par	t No	Lbs.	Torque In. Lbs.
	2.00 in.	LW-12093-5	MVT69183		85	75
	2.25 in.	LW-12093-6	MVT-69183		85	75
	2.25 in.	LW-12125-3	MVT-69197		85	,,,
922	AZ		Turbocharger V			
	Turbocharge	er Model No.	V-Clamp Par		V-Clamp Diameter	Torque In. Lbs.
		A21*	400500-9		9.25 in.	40-60
	* - AiResearch t	urbocharger.				
	See latest revision	on of Service Instr				
923	AZ		2-1/16-12	Propell	er Shaft Lock Nut	1000 ft. lbs.
924	AQ-AZ		7/16-20	-	jector Nozzles (In	
					on Housing)	210 in. lbs.
925	AQ-AZ		3/4-16		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	100 : #
			1/2 12		case Driving Torque)	100 in. lbs.
			1/2-13		er Hold Down Studs (Cr	050 i 11
020	10.47		2/9		e Driving Torque)	250 in. lbs.
929	AQ-AZ		3/8		er Hold Down Nuts	300 in. lbs.
	Cylinder Hold D	Your Nut Tighton			er Hold Down Nuts evision of Service Instructi	600 in. lbs.
932	AQ-AZ	own mut 11gnteni	5/16-18		evision of Service Instructi t Transitions – Studs	011 INO. 1029.
734	AQ-AZ		3/10-10		g Torque)	100 in. lbs.
			3/8-16		t Transitions – Studs	100 III. 108.
			3/0-10		g Torque)	200 in. lbs.
<u> </u>			1	(DIIVIII	5 1 01que/	200 m. 103.

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

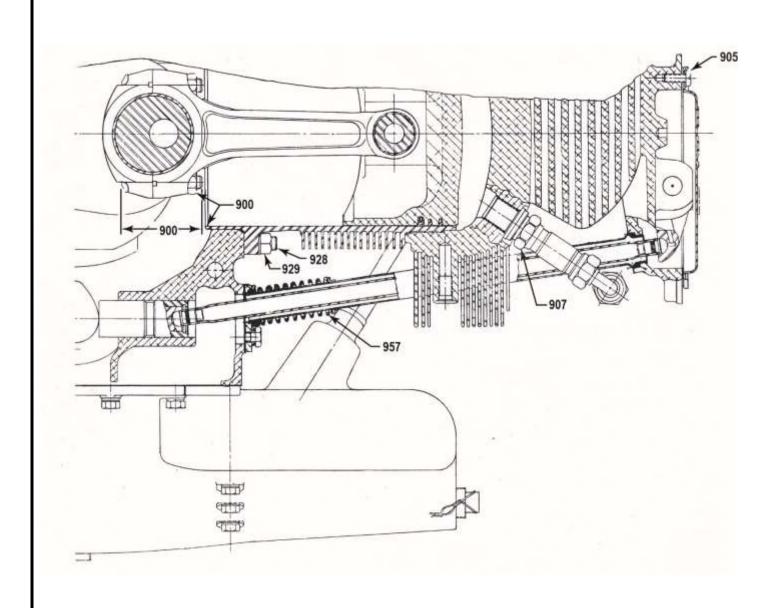
SECTION V – SPRINGS

							C	OMP. LOA	AD .
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	e 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			r	1	,
									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.
		LW-11138	None	2.64	.051	1.44 in.	8.55 lb.	9.45 lb.	8.3 lb. min.
955	AQ-AZ	Fuel Drain Che				27.7.2	0.00	71.00	5.35 lb.
				78	.047	.75 in.	5.50 lb.	6.50 lb.	min.
956	AQ-AZ	Oil Filter Relie	ef Valve Sp	ring					3.00 lb.
			1	C	.054	1.93 in.	3.05 lb.	3.55 lb.	min.
957	AZ	Shroud Tube S	Spring						13 lb.
			1 0		.105	2.09 in.	14 lb.	16 lb.	min.
958	AQ-AZ	Pressurizing V	alve Spring	5					.63 lb.
					.032	.455485	.65 lb.	.75 lb.	min.
959	AZ	Spring Betwee	n Cranksha	ft and					46 lb.
		Starter and Alt	ernator Dri	ve Gear	.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.

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

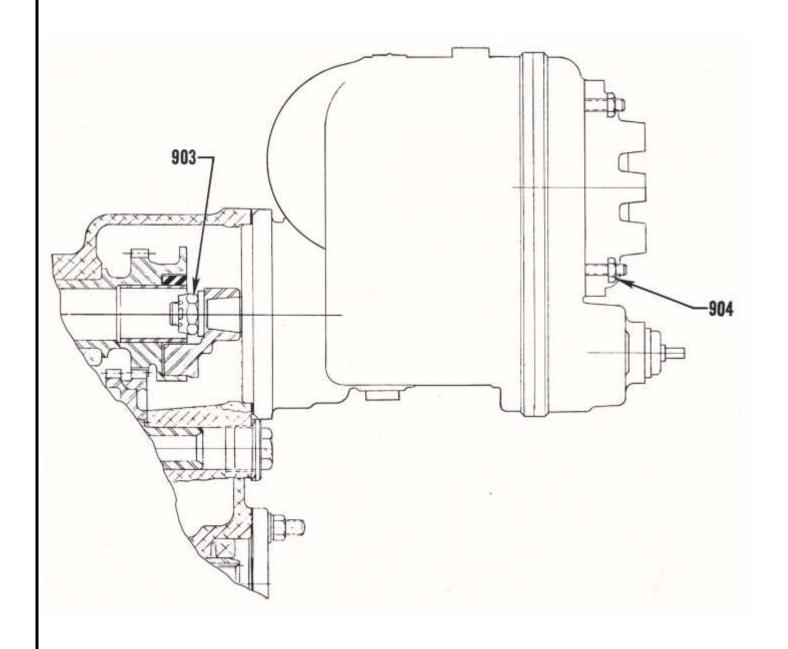
SECTION V – SPECIAL TORQUE REQUIREMENTS



**Engine Accessories and Hardware** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

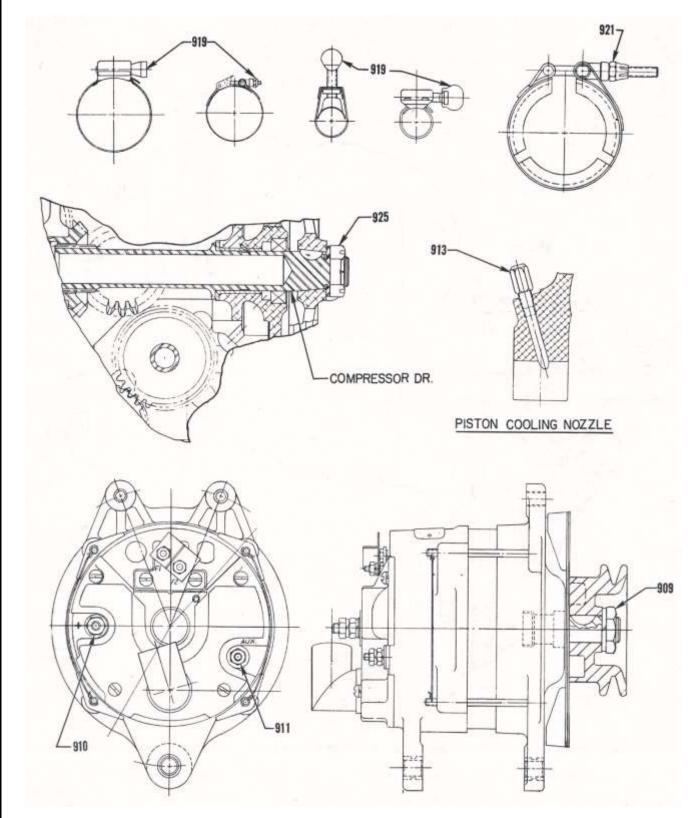
SECTION V – SPECIAL TORQUE REQUIREMENTS



**Engine Accessories and Hardware** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

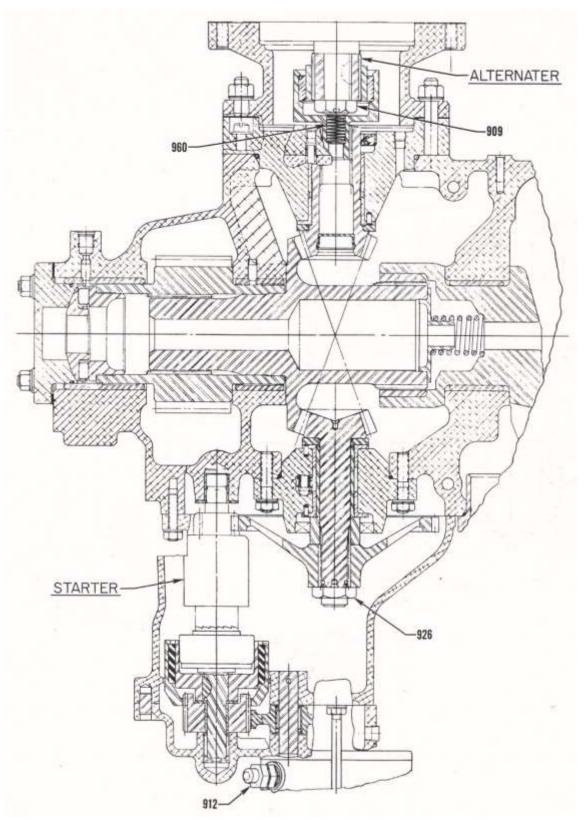
SECTION V – SPECIAL TORQUE REQUIREMENTS



**Engine Accessories and Hardware** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

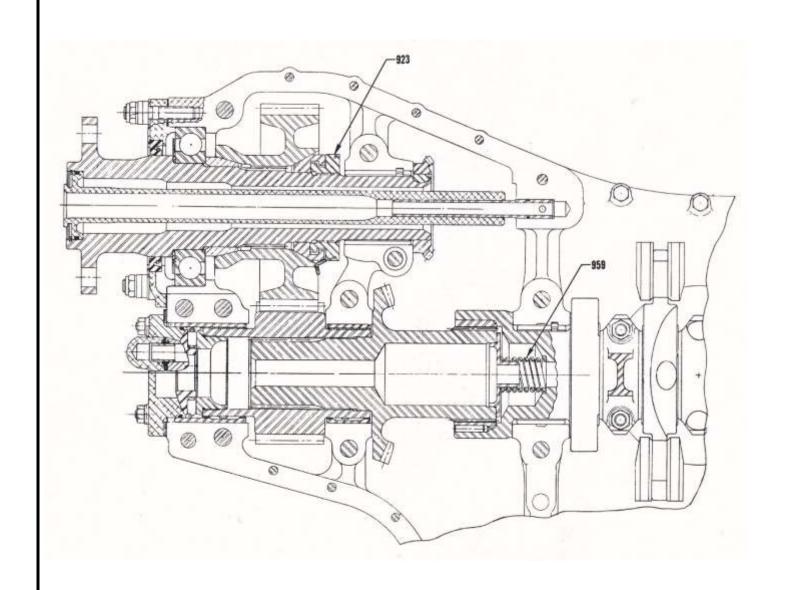
SECTION V – SPECIAL TORQUE REQUIREMENTS



**Engine Accessories and Hardware** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

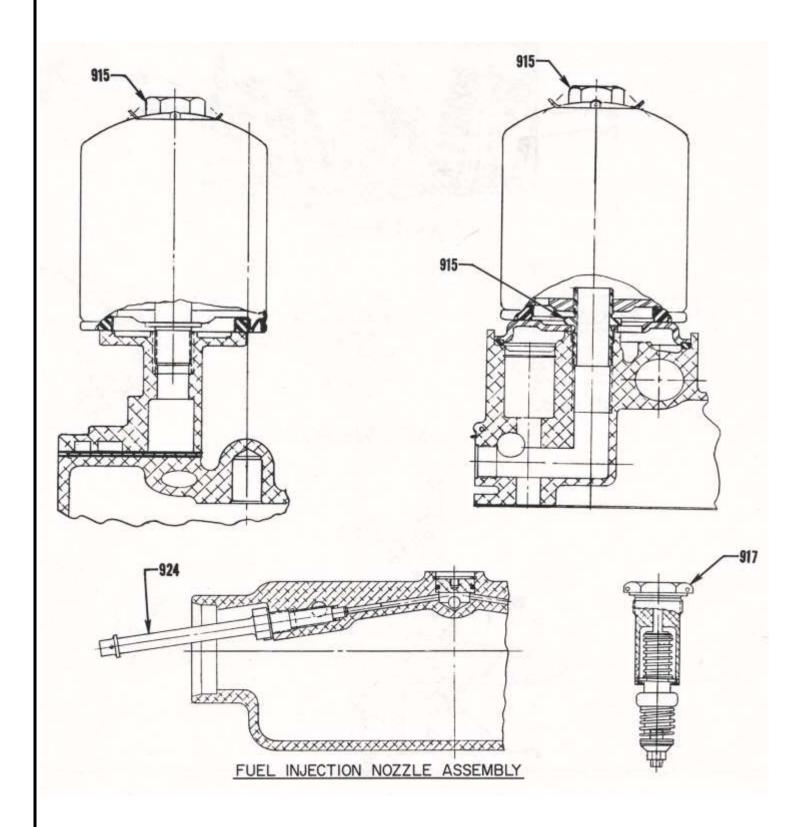
 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 



**Engine Accessories and Hardware** 

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

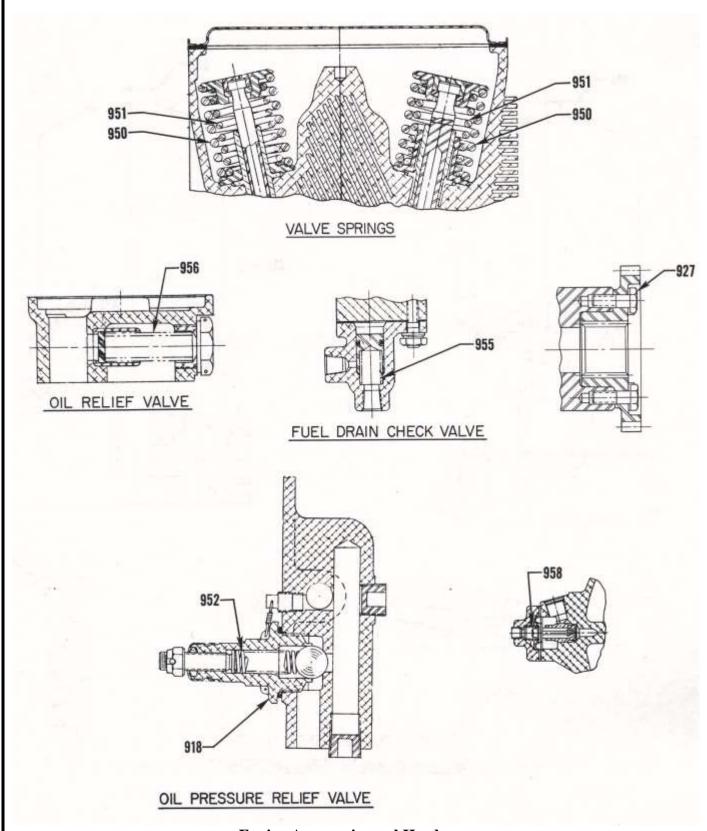
 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 



**Engine Accessories and Hardware** 

#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION V – SPECIAL TORQUE REQUIREMENTS



#### 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).

		TAB	TAB	LE II				
	В	OLTS, SCRE	W AND N	IUTS		PIPE PLUGS		
Thread	Tore	que	Thread	Torq	ue	Thread	Torque	
Tiread	In. Lb.	Ft. Lb.	Tillead	In. Lb. Ft. Lb.		Tillead	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	
THIN MUTS (1/2 DIA OF DOLT) 1/2 LISTED TOPOLIE						3/4-14 NPT	230 to 252	
111	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 OI			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°	TABLE 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	face against tl	he flange	1/4	l-20	15	
of the plug or part being tightened ag	5/10	6-18	25			
part until the sealing surfaces are in co	3/8	3-16	50			
to the angle of turn listed for the appr NOTE: Lubricate Threads Unless Ot						

	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						

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

	TABLE VII									
METAL TUBE FITTINGS										
			Wrench torque	e for tightening	g AN-818 Nut	(pound inches)			Minimum bend radii	
Dash Nos. Ref.	Tubing OD inches	Aluminum-alloy tubing		Steel tubing		Aluminum-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.	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		

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### **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
Н3	GO-480-G1H6, -G1D6
H4	GO-480-D1A (Crosswise Accessory Housing)
H5	GO-480-G1B6 (Crosswise Accessory Housing)
P	GSO-480, IGSO-480
P1	IGSO-480
AB	IGSO-540
AC	IGO-540

#### NOTE

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

CRANKCASE, CRANKSHAFT & CAMSHAFT

500 SERIES

SECTION II	600 SERIES	CYLINDERS
SECTION III	700 & 7000 SERIES	GEAR TRAIN
SECTION IV	800 SEREIS	BACKLASH (GEAR TRAIN)
SECTION V	900 SERIES	TORQUE & SPRINGS
(A)		ner shrunk fits controlled by machining, fits that may readily be nere wear does not normally occur. In each case, the fit must be held olerance.
(B)	Side clearance on p	piston rings must be measured with face of ring flush with piston.
(C)		correct these items must be made to give uniform backlash within stationary gear and pinions, and within 0.001 between the pinions
(D)	These dimensions piston pin.	shown are measured at bottom of piston skirt at right angles to
(E)	Permissible wear o on the diameter.	of the crankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherein	a definite clearance is mentioned between the mating surfaces.

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Tight fit; shrink or interference fit.

SECTION I

(T)

<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.





# TECHNICAL PUBLICATION REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
SSP-1776-4-PT3	Service Table of Limits	SSP-1776	October 28, 2013
PREVIOU	S REVISIONS	CURRENT	REVISION*
		Apri	1 2018
		3-9, 3-	47, 3-53
		torque value for brass uni- fuel lines and primer lines	o Section V table and figure for on nut on stainless steel injector (Both Ends)
		* Revisions are indicated with a revised item.	a vertical bar to the left of the



### **PART III – GEARED 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	E-H1-H2-H4	All Main Bearings and			<u>.0015L</u>	
		Crankshaft			.0045L	.0060L
	H3-H5-P-AB-AC	Main Bearings and Crankshaft			<u>.0011L</u>	
		(Except Front)			.0041L	.0050L
	H3-H5-P-AB-AC	Front Main Bearings and			<u>.0011L</u>	
		Crankshaft			.0041L	.0050L
	E-H-P	Diameter of Main Bearing	<u>2.3745</u>			
		Journal on Crankshaft	2.376	(E)		
	E-H1-H2-H4	Crankcase Bearing Bore	<u>2.566</u>	2.5.05		
	112 115 D AD AG	Diameters (All)	2.567	2.5685		
	H3-H5-P-AB-AC	Crankcase Bearing Bore	<u>2.6865</u>	2 (000		
501	ALL	Diameters (All)	2.6875	2.6890	00001	
501	ALL	Connecting Rod Bearings and Crankshaft			.0008L .0038L	.0050L
	ALL	Diameter of Connecting Rod	2.1235		.0038L	.0030L
	ALL	Journal on Crankshaft (2-1/8 in.)	$\frac{2.1235}{2.125}$	(E)		
	ALL	Connecting Rod Bearing Bore	2.123	(L)		
	TEE	Diameter (Measured at axis 30°	2.2870			
		on each side)	$\frac{2.2875}{2.2875}$			
502	ALL	Connecting Rod Side Clearance	2.2070		.004L	
		8			.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			002	0045
		Journal			.003	.0045
		Mounted on No. 2 and 4				
		Journals Max. Run-Out No. 3 Journal			.003	.0045
506	ALL	Crankshaft and Crankcase Front			.003	.0043
300	ALL	End Clearance			.006L .015L	.025L
510	E-H1-H2-H3	Crankshaft Timing Gear and			.0015L	.0231
310		Crankshaft  Crankshaft			.0005T	(A)
	H4-H5-P-AB-AC	Crankshaft Timing Gear and			.0000	` ′
		Crankshaft			.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		

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### **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			.0010L	
		Body (Hyperbolic)			.0067L	.0087L
513	ALL	Tappet Socket and Body			.002L	
		(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			.000	00.5
517		Bearing Journal			.001	.006
517	ALL	Counterweight Bushing and			.0013T	(4)
£10	ATT	Crankshaft			.0026T	(A)
518	ALL	Counterweight Roller – End Clearance			<u>.007L</u> .025L	.038L
510	ATT					.038L
519	ALL	Counterweight and Crankshaft – Side Clearance*			<u>.003L</u> .013L	.017L
	* - Measure below roller ne:				.013L	.017L
520					00001	
520	ALL	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	ALL	I.D. of Counterweight Bushing	.7485		.0030L	(A)
321	ALL	1.D. of Counterweight Bushing	.7505	.7512		
522	ALL	O.D. of Counterweight Roller	.7303	.7312		
322	ALL	(P/N 69433) (See latest revision	.5045			
		of Service Instruction No. 1012)	.5050			
	AC	O.D. of Counterweight Roller				
		(P/N 73287) (See latest revision	.5189			
		of Service Instruction No. 1012)	.5194			
	ALL	O.D. of Counterweight Roller				
		(P/N 70416) (See latest revision	<u>.6945</u>			
		of Service Instruction No. 1012)	.6950			
523	ALL	Thrust Bearing and Propeller			.0000	
		Shaft			.0012L	.002L
526	ALL	Thrust Bearing and Thrust				
		Bearing Cap Clamp Fit (Shim to			<u>.003T</u>	7.5
		this fit)			.005T	(A)
527	ALL	Thrust Bearing Tilt			.027 Tilt	1
528	ALL	Thrust Bearing – End Play			<u>.006</u>	_
					.008	.010
530	ALL	Propeller Shaft Run-Out (Rear				005
F.C.1	A 7 7	Cone Location)				.003
531	ALL	Propeller Shaft Run-Out (Front				
		Cone Location) (Propeller Shaft				007
532	E-H1-H2-H3	Installed) Starter Jaw and Crankshaft		1	00051	.007
332	Е-П1-П2-П3	Starter Jaw and Cranksnaft			.0005L .0040L	(A)
533	ALL	Thrust Bearing and Reduction			.0040L .0006L	(A)
233	ALL	Gear Housing	1		.0006L .0024L	.0035L

### **PART III – GEARED ENGINES**

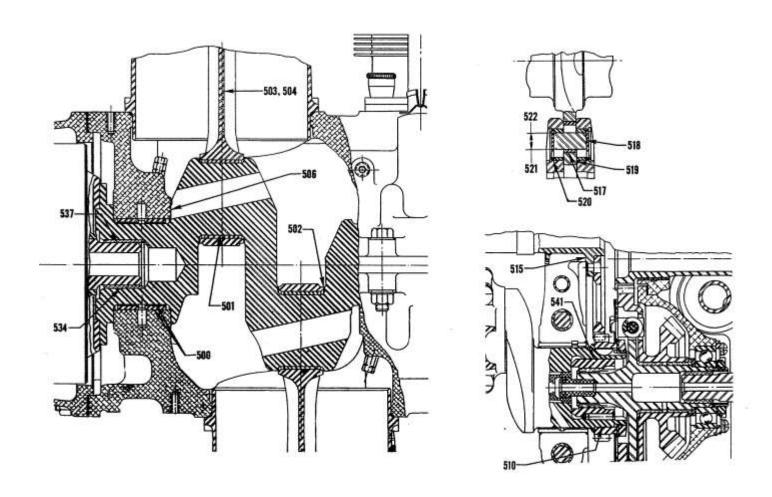
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clear	rances
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)			.0001T .0005T	
	ALL	Pinion Shaft and Cage (See latest revision of Service Instruction No. 1114)			Select for I Fit (C) .002	
537	ALL	Propeller Shaft and Crankshaft Bushing			.0020L .0035L	.005L
	ALL	I.D. Propeller Shaft Bushing in Crankshaft	1.251 1.2525	1.253		
				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)

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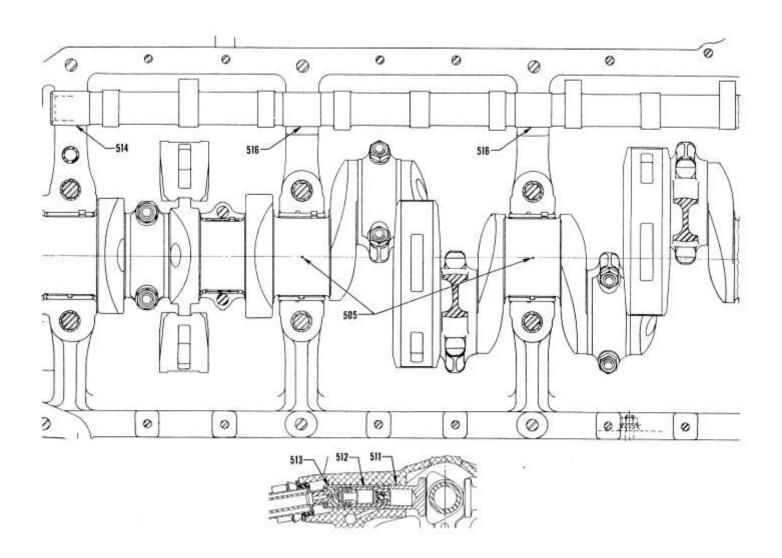
### **PART III – GEARED ENGINES**

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



### **PART III – GEARED ENGINES**

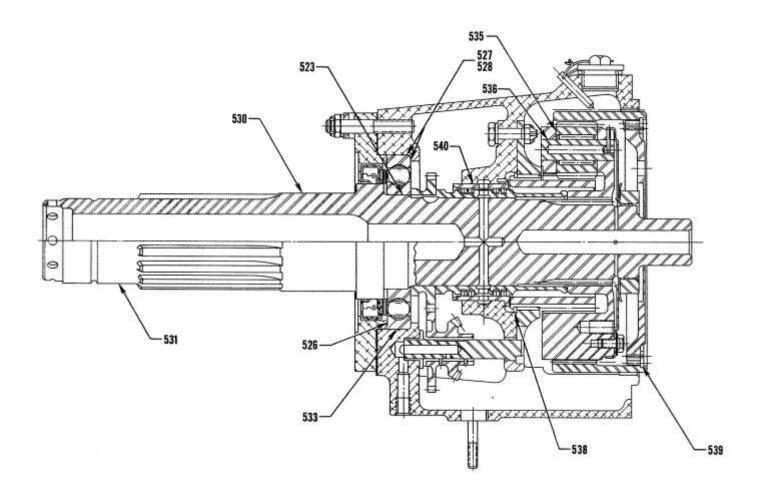
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



3-5

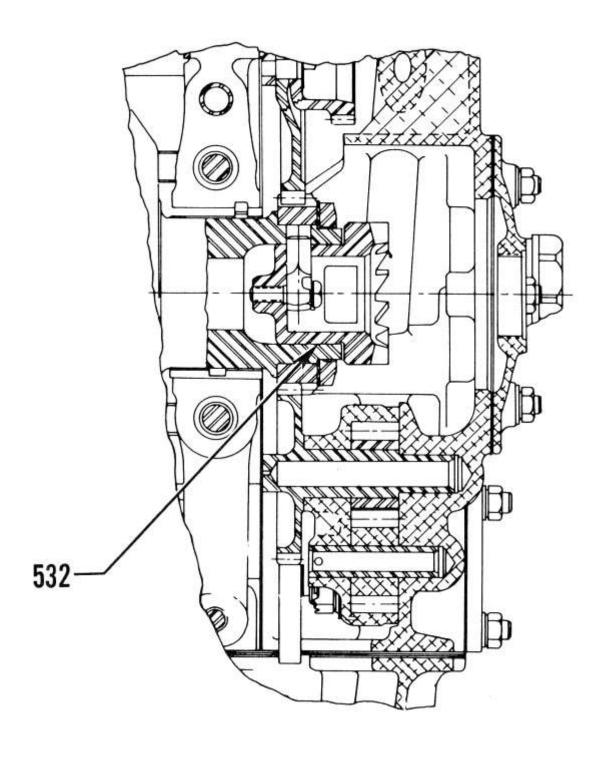
### **PART III – GEARED ENGINES**

 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 



### **PART III – GEARED ENGINES**

SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT



**Starter Jaw and Crankshaft** 

### **PART III – GEARED ENGINES**

#### SECTION II – CYLINDERS

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
600	ALL	Connecting Rod and Connecting	Duo	hina ta ha Di	ranished in T	01000
		Rod Bushing Finished I.D. of Connecting Rod	1.1254	hing to be Bu	irmsnea m r	Tace.
		Bushing	1.1254			
601	E-H-P	Length Between Connecting	6.4985			
		Rod Bearing Centers	6.5015			
	AB-AC	Length Between Connecting Rod Bearing Centers	6.4785 6.7515			
602	ALL	Connecting Rod Bushing and	0.7313		<u>.0008L</u>	
002		Piston Pin			.0021L	.0025L
603	ALL	Piston Pin and Piston			.0003L	
					.0014L	.0018L
	ALL	Diameter of Piston Pin Hole in	1.1249			
		Piston	1.1254			
	ALL	Diameter of Piston Pin	<u>1.1241</u> 1.1246			
604	H-P-AB-AC	Piston and Piston Pin Plug			<u>.0002L</u>	
					.0010L	.002L
	H-P-AB-AC	*Diameter of Piston Pin Plug	1.1242 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			
	E	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.) Full			<u>.000</u>	00(1 (D)
	ALL (AC ADDITION DIE)	or Half Wedge			.004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (3 <sup>rd</sup> Ring Comp.) Half			.000	
		Wedge			.004L	.006L (B)
	ALL	Piston Ring and Piston – Side			.002L	.000L (B)
	THE	Clearance (Oil Regulating)			.004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side			.003L	,
		Clearance (Oil Scraper)			.0055L	.007L (B)
607	ALL	Piston Ring Gap (Comp.) Plain				
		and Chrome Cylinders (Straight			<u>.020</u>	
		Barrels)			.030	.047
	ALL	Piston Ring Gap (Comp.)			0.15	
		Nitrided and Chrome Cylinders			<u>.045</u>	067
	ALL	(Choke Barrels) Piston Ring Gap (Oil			.055	.067
	ALL	Regulating) (All Barrels)			.015 .030	.047

#### PART III - GEARED ENGINES

#### SECTION II - CYLINDERS

			Dimensions		Clearances	
			Mfr.	Carrias	Mfr.	Compies
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.
607	ALL (AS APPLICABLE)	Piston Ring Gap (Oil Scraper)			.015	
		(All Barrels)			.030	.047

For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075.

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

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

#### NOTES:

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

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

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

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

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

<sup>\*=</sup>High Compression.

### **PART III – GEARED ENGINES**

#### SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.
611	ALL	Exhaust Valve Seat and Cylinder Head			<u>.0075T</u> .011T	(A)
	ALL	O.D. Exhaust Seat	1.9355 1.937			
	ALL	I.D. Exhaust Seat Hole in Cylinder Head	1.926 1.928			
612	ALL	Intake Valve Seat and Cylinder Head			.0065T .010T	(A)
	Е-Н-Р	O.D. Intake Seat	2.1675 2.169			. ,
	AB-AC	O.D. Intake Seat	2.2885 2.290			
	Е-Н-Р	I.D. Intake Seat Hole in Cylinder Head	2.159 2.161			
	AB-AC	I.D. Intake Seat Hole in Cylinder Head	2.280 2.282			
613	ALL	Exhaust Valve Guide and Cylinder Head			<u>.001T</u> .0025T	(A)
	ALL	O.D. Exhaust Valve Guide	.6633 .6638			
	ALL	I.D. Exhaust Valve Guide Hole in Cylinder Head	<u>.6613</u> .6623			
614	ALL	Intake Valve Guide and Cylinder Head			.001T .0025T	(A)
	ALL	O.D. Intake Valve Guide	. <u>5933</u> .5938			. ,
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	. <u>5913</u> .5923			
615	ALL	Exhaust Valve Stem and Valve Guide			.0037L .0050L	
	ALL	O.D. Exhaust Valve Stem	<u>.4957</u> .4965	.4937		
			Service all	owable limits	s of .4937 is	
			applicable	only to	inconel or	
			nimonic va	ilves.		
	ALL	Finished I.D. Exhaust Valve Guide	<u>.4995</u> .5005			
	limit, anytime up to 300 hours of s .001 inch during each 100 hours o	nay have exhaust valve guides that a ervice. After 300 hours of service, ins f operation up to the recommended or revision of Service Instruction No. 1	side diameter verhaul time	r of exhaust ver for the engine	valve guide manne, or not to e	ay increase
616	ALL	revision of Service Instruction No. 1  Intake Valve Stem and Valve	101 1600	minenaca ov	<u>.0010L</u>	0061
	ALL	Guide O.D. Intake Valve Stem	.4022 .4030	.4010	.0028L	.006L
	ALL	Finished I.D. Intake Valve Guide	.4040 .4050	.1010		

### **PART III – GEARED ENGINES**

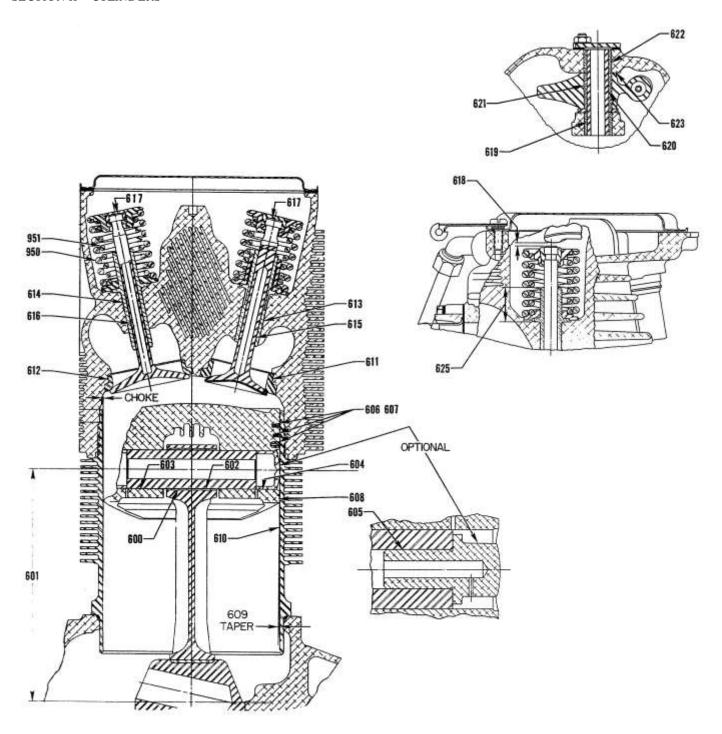
#### SECTION II – CYLINDERS

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

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### **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	E-H1-H2-H3	Oil Pump Drive Gear and Oil Pump Body			<u>.0010L</u> .0025L	.004L
701	E-H1-H2-H3	Oil Pump Drive Gear and Accessory Housing			.0015L .0030L	.006L
702	E-H1-H2-H3	Oil Pump Drive Gear – End Clearance			<u>.008L</u> .042L	.060L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Gear – End Clearance			<u>.007L</u> .030L	.045L
703	E-H1-H2-H3	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	E-H1-H2-H3	Oil Pump Impeller – Side Clearance			<u>.002L</u> .0045L	.005L
	H4-H5-P-AB-AC	Oil Pump and Scavenge Pump Impellers – Side Clearance			.003L .0055L	.006L
	E-H1-H2-H3	Width of Oil Pump Impellers	<u>.747</u> .749	.746		
	H4-H5-P-AB-AC	Width of Oil Pump Impellers	<u>.995</u> .997	.994		
	H4-H5-P-AB-AC	Width of Oil Scavenge Pump Impellers	1.496 1.498	1.495		
705	E-H1-H2-H3	Oil Pump Driven Impellers and Idler Shaft			<u>.0010L</u> .0025L	.004L
	H4-H5-P-AB-AC	Oil Pump and Oil Scavenge Pump Driven Impellers and Idler Shaft			.0010L .0025L	.004L
706	E-H1-H2-H3	Oil Pump Idler Shaft and Oil Pump Body			<u>.0000</u> .0025T	(A)
	H4-H5-P-AB-AC	Oil Pump Idler Shaft and Oil Pump Body			<u>.0000</u> .0015T	(A)
707	E-H1-H2-H3	Oil Pump Idler Shaft and Accessory Housing			<u>.0005L</u> .0025L	.0035L
713	H4-H5-P-AB-AC	Oil Pump Idler Shaft and Scavenge Pump Body			<u>.0000</u> .0015T	(A)
777	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Scavenge Pump Body			.001T .003T	(A)
778	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pump Body			.001T .003T	(A)
779	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pressure and Scavenge Pump Gear			.0015L .0035L	.005L
780	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pump Shaft			.0015L .0035L	.005L

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### **PART III – GEARED ENGINES**

#### SECTION III – GEAR TRAIN

			Dimensions		Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
FUEL	PUMP	•		<u> </u>		
727	E-H1-H2-H3	Fuel Pump Drive Gear – End Clearance			<u>.016L</u> .045L	.065L
781	Е-Н1-Н2-Н3	Fuel Pump Drive Gear and Accessory Housing			.0010L .0030L	.005L
782	H4-H5-P-AB-AC	Fuel Pump Drive Gear Bushing and Accessory Housing			<u>.001T</u> .004T	(A)
783	H4-H5-P	Fuel Pump Drive Shaft Gear – End Clearance			<u>.006L</u> .064L	.074L
784	H4-H5-P	Fuel Pump Drive Shaft Gear and Bushing			<u>.001L</u> .004L	.006L
785	P1	Injector Drive Gear and Accessory Housing Cover Bushing			<u>.0036L</u> .0048L	.006L
786	P1	Injector Drive Gear – End Clearance			<u>.002L</u> .020L	.030L
787	P1	Injector Idler Gear and Magneto Idler Ball Bearing			<u>.0005T</u> .0004L	(A)
788	P1	Injector Idler Shaft and Magneto Idler Ball Bearing			<u>.0001T</u> .0005L	(A)
789	AB	Injector Drive Shaftgear and Accessory Housing Bushing			.001L .003L	.005L
790	AC	Fuel Pump Drive Shaftgear and Accessory Housing Bushing			<u>.001L</u> .003L	.005L
791	AB	Injector Drive Shaftgear – End Clearance			<u>.006</u> .036	.048
792	AC	Fuel Pump Drive Shaftgear – End Clearance			<u>.006</u> .036	.048
VACUU	UM PUMP & TACHOMETER			•		
737	E-H1-H2-H3	Vacuum Pump Gear and Accessory Housing			<u>.0010L</u> .0025L	.006L
738	Е-Н1-Н2-Н3	Vacuum Pump Gear – End Clearance			.016L .045L	.065L
	Reference No. 739 to follow Ref			1	10.02	.0022
793	H4-H5-P	Vacuum Pump Shaftgear Bushing and Accessory Housing Cover			.0015T .0035T	(A)
794	H4-H5-P	Vacuum Pump Shaftgear Bushing (At Cover) and Vacuum Pump Shaftgear			<u>.002L</u> .004L	.006L
795	H4-H5-P	Vacuum Pump Shaftgear Bushing and Accessory Housing			.0015T .0035T	(A)
796	H4-H5-P	Vacuum Pump Shaftgear Bushing (At Accessory Housing) and Vacuum Pump Shaftgear			.0020L .0045L	.006L
797	H4-H5-P	Vacuum Pump Shaftgear – End Clearance			.008 .030	.050
798	AB-AC	Vacuum Pump Drive Gear and Vacuum Pump Spline Coupling – End Clearance			.008 .045	.065

### **PART III – GEARED ENGINES**

#### PART III – GEAR TRAIN

			Dimensions		Clearances	
			Mfr. Min. &	Service	Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
VACIII	UM PUMP & TACHOMETER (COI	NT )	1124124	1124124	1124111	1124124
799	AB-AC	Vacuum Pump Drive Gear			.001T	
177	AD-AC	Bushing and Accessory Housing			.003T	(A)
7000	AB-AC	Vacuum Pump Drive Gear			.0031	(21)
7000		Bushing and Vacuum Pump			.002L	
		Drive Gear			.004L	.006L
739	E-H1-H2-H3	Tachometer Drive Gear and			.0010L	
		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			.001T	(4)
7004	E-H1	Tachometer Gear – End			.003T	(A)
7004	E-HI	Clearance			<u>.001L</u> .040L	.060L
7005	H1-H2-H3	Electric Tachometer Idler Gear –			.040L .005L	.000L
7003	111-112-113	End Clearance			.052L	.065L
7006	H1-H2-H3	Electric Tachometer Driven			.005L	.00312
, , , ,		Gear – End Clearance			.027L	.047L
7006	H4-H5-P-AB-AC	Electric Tachometer Driven			<u>.007L</u>	
		Gear – End Clearance			.025L	.047L
7007	H1-H2-H3	Electric Tachometer Idler Gear			<u>.001L</u>	
		Shaft and Idler Gear Bushing			.0025L	.004L
7008	H1-H2-H3	Electric Tachometer Driven			<u>.0015L</u>	
		Gear and Adapter			.0035L	.006L
7009	AB-AC	Tachometer Drive Idler Gear				
		Bushing and Tachometer Drive	Bushing To	Be Burnish	ed In Place	
7010	AB-AC	Idler Gear Tachometer Drive Idler Gear				
7010	AD-AC	Bushing and Tachometer Drive			<u>.001L</u>	
		Idler Shaft			.001L	.004L
7011	AB-AC	Tachometer Drive Idler Gear –			.005L	.5012
		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			<u>.000L</u>	
		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			0027	
		Magneto Housing and Magneto			.002T	(4)
7016	ATT	and Governor Drive Bushing			.004T	(A)
7016	ALL	Governor Drive Idler Gear and Governor Drive Idler Gear			.001T	
		Bushing			.0011 .003T	(A)
7017	ALL	Governor Adapter and Governor			.0031 .001T	(11)
, 01,		Drive Adapter Bushing			.003T	(A)
<u> </u>	1		1	·		\/

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### **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.
	ETO, GENERATOR, & STARTER		IIIA.	171424	1714A	TVIUA.
7018	AB-AC	Magneto Drive Idler Gear and			.001T	
7010	AD-AC	Magneto Drive Idler Bushing			.0011 .003T	(A)
7019	AB-AC	Magneto Drive Idler Shaft and			.001L	(11)
7017		Magneto Drive Idler Bushings			.003L	.005L
7020	AB-AC	Reduction Gear Housing				
		Magneto Drive Bushings and			.000	
		Magneto Drive Idler Shaft			. <del>002</del> L	.004L
7021	AB-AC	Magneto Drive Adapter and			<u>.001T</u>	
		Magneto Adapter Bushings			.003T	(A)
7022	AB-AC	Magneto Drive Gear and			<u>.001L</u>	
		Magneto Adapter Bushings			.003L	.005L
7023	E-H1-H2-H3	Magneto Drive Bushing and			<u>.001T</u>	
		Magneto Gear			.0005L	.001L
7024	E-H1-H2-H3	Magneto Drive Bearing and			<u>.0001T</u>	
		Support			.0007L	(A)
7025	H4-H5-P	Magneto Drive Idler Gear Hub				
		Bushing and Magneto Drive	Bushi	ng Must Be	Burnished In	Place
		Idler Gear Hub		1		1
7026	H4-H5-P	Magneto Drive Idler Gear Hub				
		Bushing and Magneto Drive			<u>.001L</u>	00.47
		Idler Shaft			.003L	.004L
7027	H4-H5-P	Magneto Drive Idler Gear Hub –			<u>.005L</u>	02.41
7020	114 115 B	End Clearance			.014L	.024L
7028	H4-H5-P	Magneto Drive Shaft and			00201	
		Accessory Housing Cover Bushing			.0020L .0045L	.006L
7029	H4-H5-P	Magneto Drive Shaft and			.0045L	.000L
1029	114-113-1	Accessory Housing Bushing			.0025L	.006L
7030	H4-H5-P	Magneto Drive Shaft Sleeve and			.0043L	.000L
7030	114-113-1	Magneto Drive Shaft  Magneto Drive Shaft			.004T	(A)
7031	H4-H5-P	Magneto Drive Shaft Sleeve and			.001T	(11)
, 001		Magneto Drive Coupling			.004T	(A)
7032	H4-H5-P	Magneto Drive Shaft Gear – End			.002L	(= -/
		Clearance			.020L	.030L
7033	E-H1-H2-H3	Generator Driven Gear Bushing			<u>.001T</u>	
		and Accessory Housing			.003T	(A)
7034	E-H1-H2-H3	Generator Driven Gear and			<u>.002L</u>	, ,
<u> </u>		Bushing			.004L	.006L
7035	E-H1-H2-H3	Generator Driven Gear – End	· · · · · · · · · · · · · · · · · · ·		<u>.005L</u>	
		Clearance			.049L	.060L
7036	H1	Generator Drive Idler Gear and				
ļ		Bushing (Hi-Speed)		ng Must Be	Burnished In	Place
7037	H1	Finished I.D. of Idler Gear	1.000			
		Bushing	1.001	1.002		
7038	H1	Generator Drive Countershaft			<u>.0015L</u>	
<b>#</b> 650		and Bushing			.0035L	.005L
7039	H1	Generator Drive Idler Gear –			.004L	0207
		End Clearance			.010L	.020L

### **PART III – GEARED ENGINES**

#### SECTION III – GEAR TRAIN

			Dimensions		Clearances		
			Mfr. Min. &	Service	Mfr. Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
MAGNETO, GENERATOR, STARTER (CONT.)							
7040	E1-H1-H3	Angle Generator Drive –					
		Generator Driven Gear Bushing			<u>.001T</u>		
		and Generator Housing			.003T	(A)	
7041	E1-H1-H3	Angle Generator Drive –					
		Generator Driven Gear and			<u>.002L</u>	005	
<b>7</b> 0.42	T1 111 112	Bushing			.004L	.006L	
7042	Е1-Н1-Н3	Angle Generator Drive –			0017		
		Generator Housing and			.001L	00.41	
70.10	W. W. D. A. D. A. G.	Generator Drive Gear			.003L	.004L	
7043	H4-H5-P-AB-AC	Generator Drive Gear Bushing			.0015T		
7044	W. W. D. A. D. A. G.	and Accessory Housing Cover			.0035T	(A)	
7044	H4-H5-P-AB-AC	Generator Drive Gear Bushing			0021		
		(At Cover) and Generator Drive			.002L	0061	
7045	H4-H5-P-AB-AC	Gear			.004L	.006L	
7045	H4-H5-P-AB-AC	Generator Drive Gear Bushing			<u>.002T</u> .004T	(4)	
7046	H4-H5-P-AB-AC	and Accessory Housing Generator Drive Gear Bushing			.0041	(A)	
7046	H4-H5-P-AB-AC	(At Accessory Housing) and			.0025L		
		Generator Drive Gear			.0023L	.006L	
7047	H4-H5-P-AB-AC	Generator Drive Gear – End			.010	.000L	
7047	114-115-1 -AB-AC	Clearance			.038	.050	
7048	H4-H5-P-AB-AC	Starter Drive Gear Bushings and			.002T	.030	
7040	114-115-1 -AD-AC	Adapter			.002T	(A)	
7049	H4-H5-P-AB-AC	Starter Drive Gear Bushings and			.002L	(11)	
7047	H4 H3 I AB AC	Starter Drive Gear Bushings and Starter Drive Gear			.004L	.006L	
7050	H4-H5-P-AB-AC	Starter Drive Adapter and			.0005L	10002	
, , , ,		Accessory Housing Cover			.0025L	(A)	
7051	E1-H1-H2-H3	Oil Relief Plunger and Oil Relief			.0015L	(/	
		Valve Plug			.0035L	.005L	
	H4-H5-P-AB-AC	Oil Relief Valve Plunger and			<u>.001L</u>		
		Sleeve			.003L	.005L	
ACCES	SSORY DRIVE					•	
7053	H4-H5-AC	Accessory Idler Gear Bearing			.0001L		
7000		and Accessory Drive Gear			.0007T	(A)	
	P	Accessory Drive Gear Bearing			.0001L	()	
		and Accessory Drive Shaft			.0007T	(A)	
	AB	Accessory Idler Gear Bearing				\ -7	
		and Supercharger and Accessory			.0001L		
		Drive Gear			.0007T	(A)	
7054	P-AB	Supercharger and Accessory			<u>.001T</u>		
		Drive Gear and Bushing			.003T	(A)	
7055	H1-H5-P-AB-AC	Accessory Idler Gear Bearing					
		and Accessory Drive Shaft			<u>.0005T</u>		
		Adapter			.0005L	(A)	
7056	P-AB	Supercharger and Accessory					
		Drive Gear Bushing and			<u>.0005L</u>		
		Accessory Drive Shaft			.0017L	.004L	

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### **PART III – GEARED ENGINES**

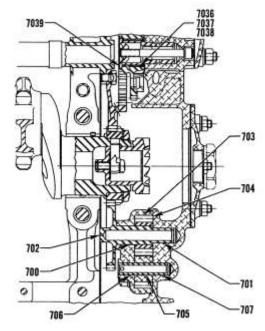
#### SECTION III – GEAR TRAIN

			Dimensions		Clearances			
			Mfr.		Mfr.			
			Min. &	Service	Min. &	Service		
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.		
ACCESSORY DRIVE (CONT.)								
7056	P-AB	Finished I.D. of Supercharger						
		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	P	Accessory Drive Shaft and			<u>.001T</u>			
		Bushing			.003T	(A)		
	P	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	P	Intermediate Supercharger Drive			<u>.0040L</u>			
<b>5</b> 0.64	D 10	Shaftgear and Bushing			.0055L	.0075L		
7064	P-AB	Accessory Housing and			0015			
		Intermediate Supercharger Drive			.001T	(4)		
7065	D A D	Shaftgear Bushing			.003T	(A)		
7065	P-AB	Intermediate Supercharger Drive			.002L	0061		
7066	P	Gear and Bushing Intermediate Supercharger Drive			.004L	.006L		
/000	P	Gear – End Clearance			<u>.011L</u> .026L	0201		
	AB	Intermediate Supercharger Drive			.026L .009L	.030L		
	Ab	Gear – End Clearance			.020L	.024L		
7067	AB	Accessory Housing Adapter and			.0006L	.024L		
7007		Bearing Bearing			.0006T	.0016L		
7068	AB	Supercharger and Accessory			.0002T	.0010L		
7000		Drive Gear Support and Bearing			.0013T	(A)		
7069	AB	Supercharger and Accessory			.001T	\/		
		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)		

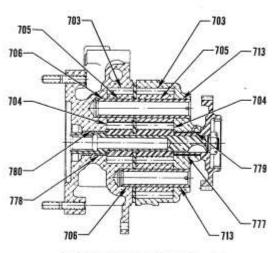
### **PART III – GEARED ENGINES**

#### SECTION III – GEAR TRAIN

			Dimensions		Clearances		
			Mfr.		Mfr.		
			Min. &	Service	Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	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	<u>.5000</u>				
		Holes	.5005	.5008			



REAR MOUNTED ACCESSORY HSG.

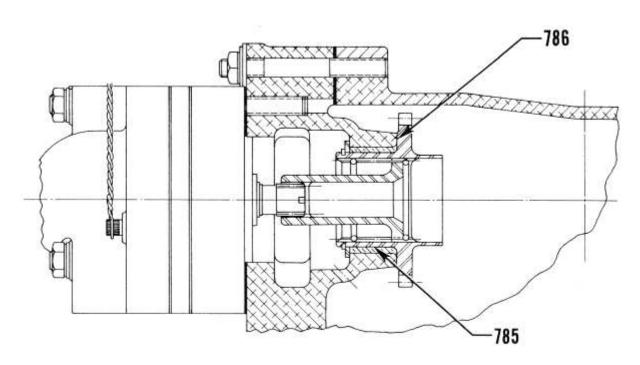


CROSSWISE ACCESSORY HSG.

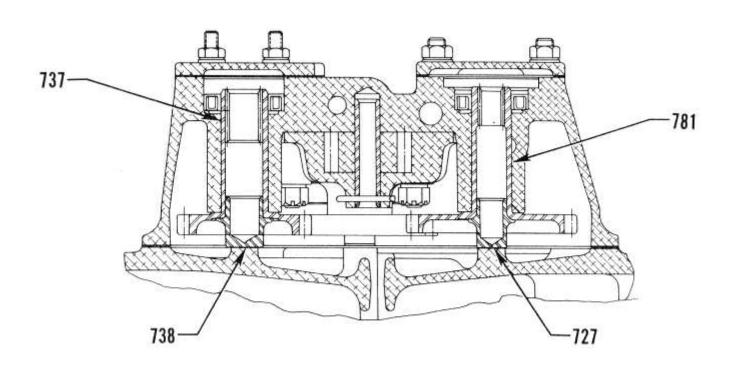
**Oil Pumps** 

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### **PART III – GEARED ENGINES**

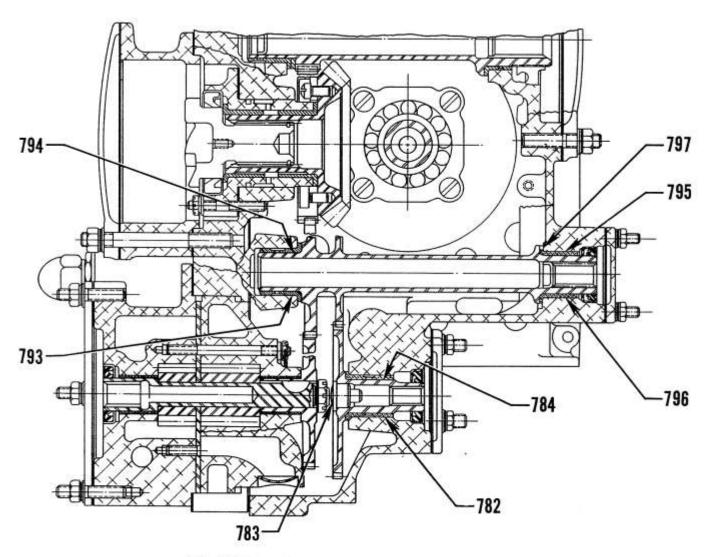


Simmonds Injector



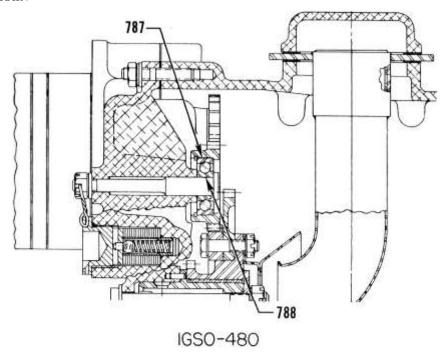
Vacuum and Fuel Pump Drives

### **PART III – GEARED ENGINES**

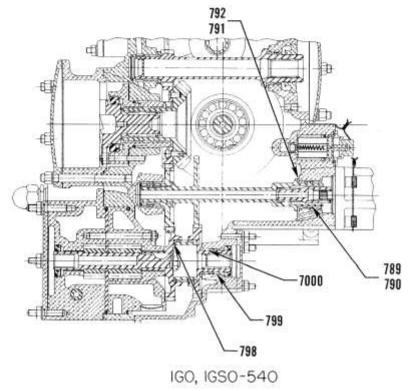


CROSSWISE ACCESSORY HSG.

### **PART III – GEARED ENGINES**

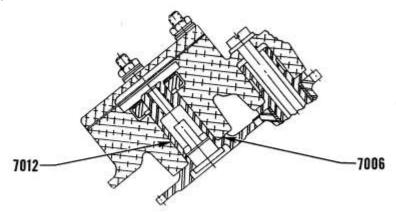


Fuel Injector and Magneto Idler Bearing

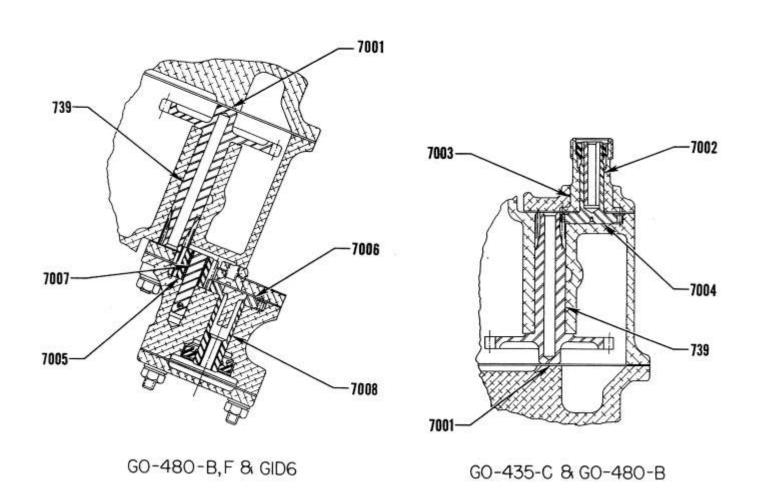


Fuel Injector and/or Fuel Pump, Vacuum Pump Drives

### **PART III – GEARED ENGINES**



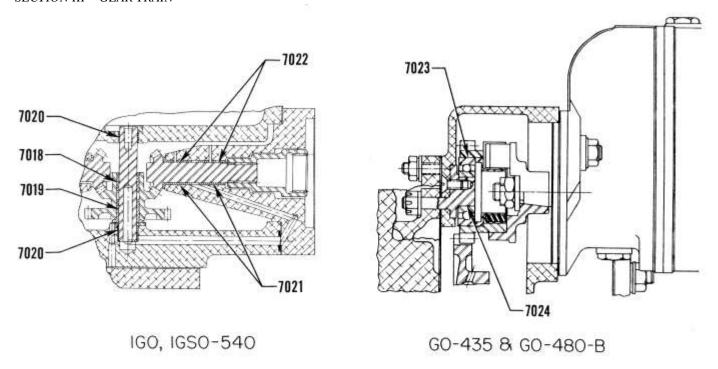
GO-480-D, GSO, IGSO-480 & IGO, IGSO-540

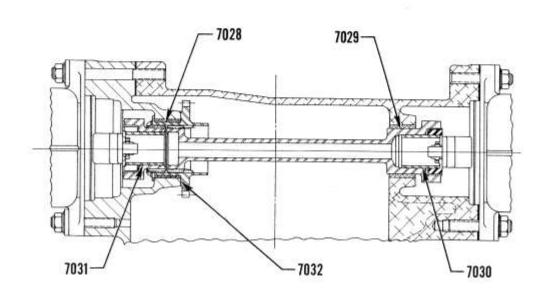


**Tachometer Drives** 

#### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



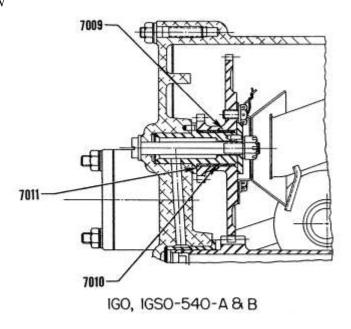


GO-480-D, GSO, IGSO-480

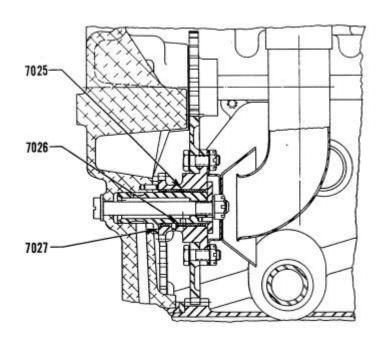
### **Magneto Drives**

### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



#### **Tachometer Drives**

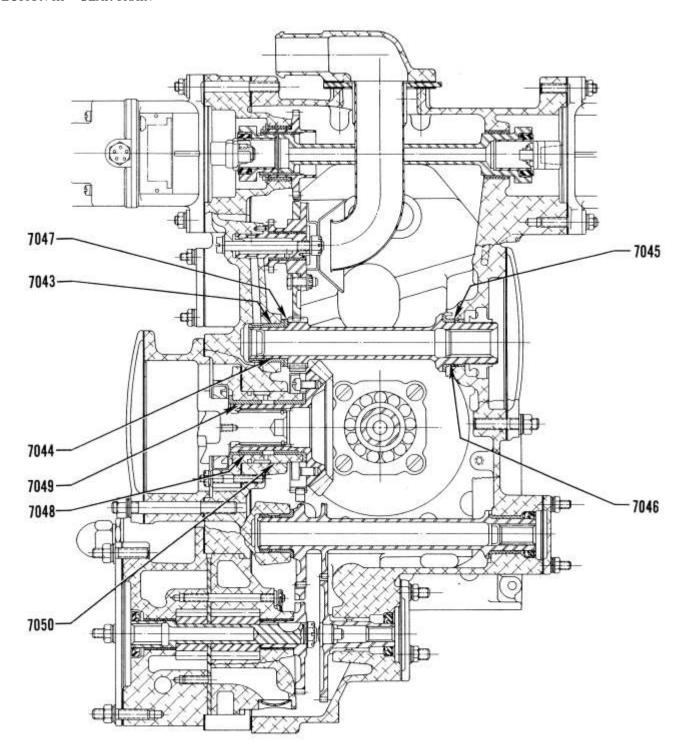


GO-480-B, GIB6, GSO, IGSO-480

Magneto and Tachometer Idler Gear

### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN

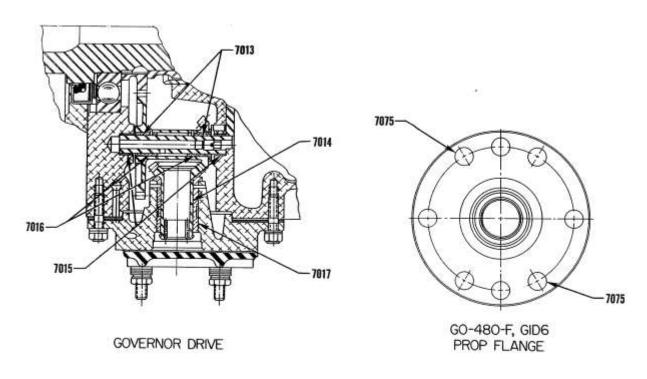


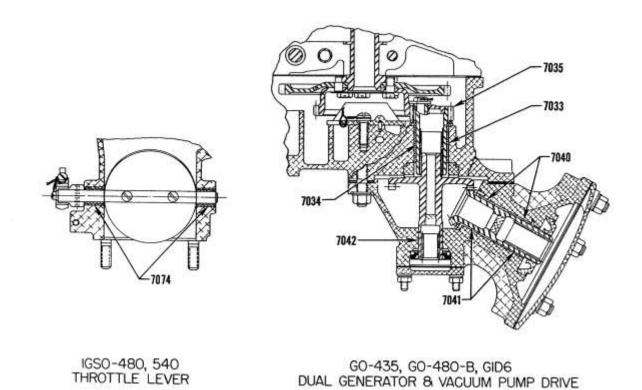
GO-480-B, GSO, IGSO-480 & IGO, IGSO-540

**Generator and Starter Drives** 

#### **PART III – GEARED ENGINES**

#### SECTION III – GEAR TRAIN

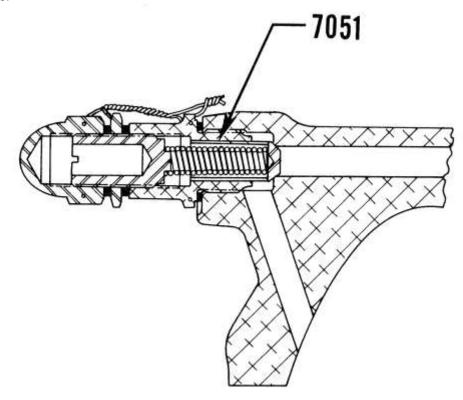


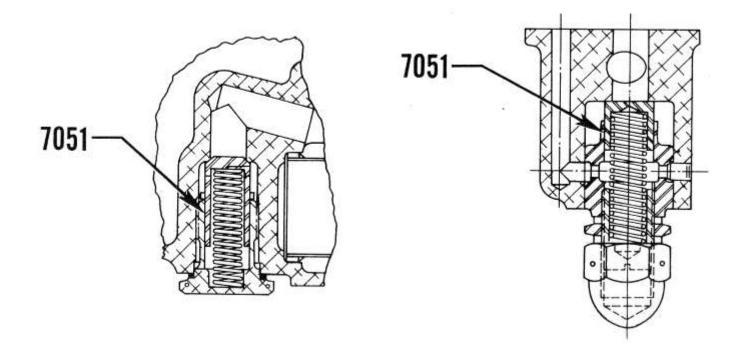


Governor Drive, Prop. Flange, Throttle Lever, Dual Generator and Vacuum Pump Drive

### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN

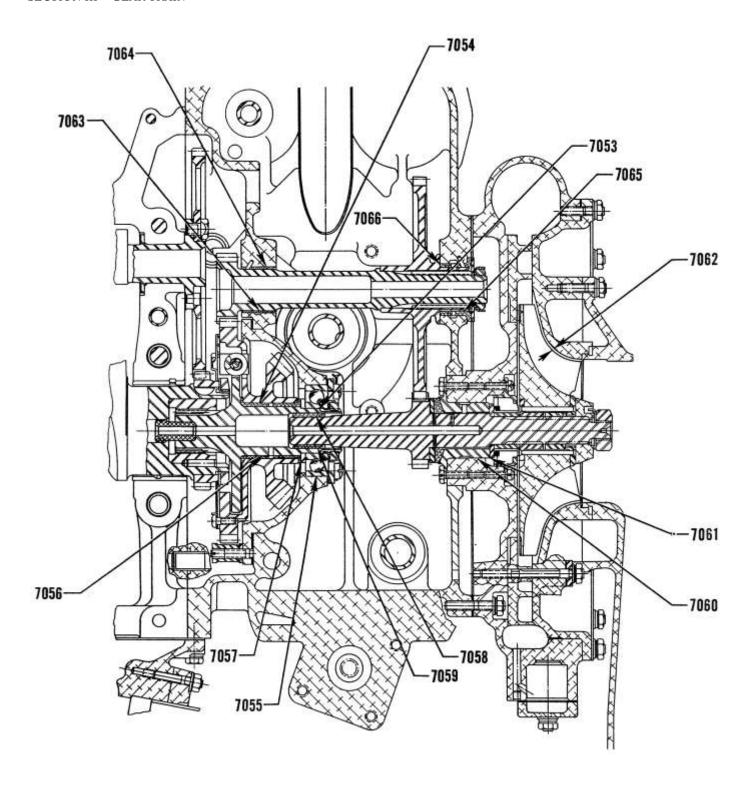




Oil Relief Valves

### **PART III – GEARED ENGINES**

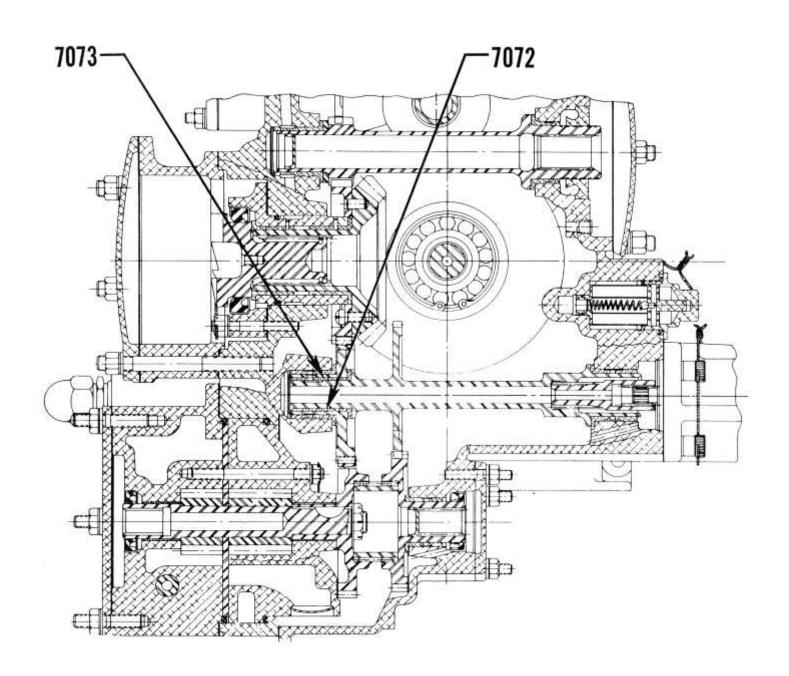
SECTION III – GEAR TRAIN



**Supercharger and Components** 

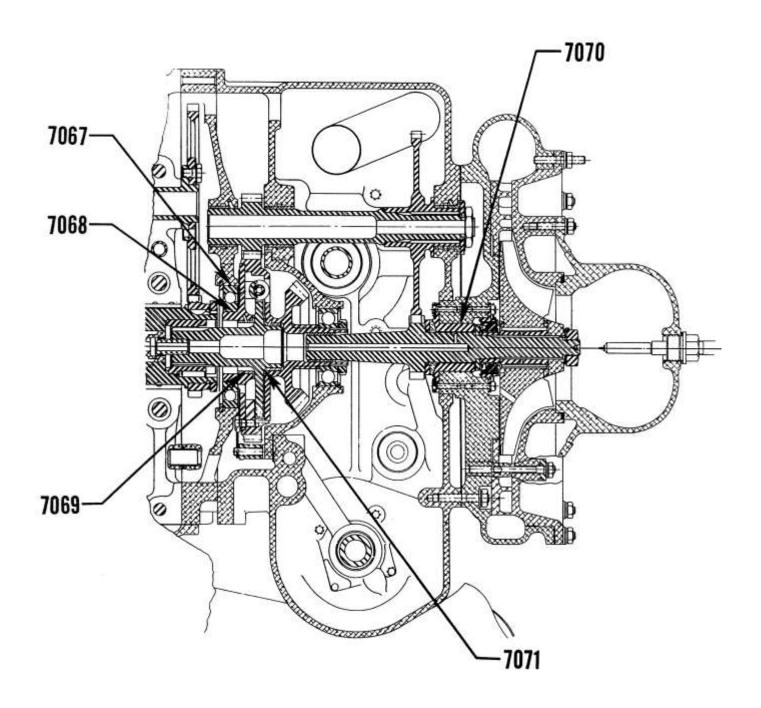
3-29 SSP-1776-4-PT3

## **PART III – GEARED ENGINES**



### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



## **Supercharger Housing**

3-31 SSP-1776-4-PT3

## **PART III – GEARED ENGINES**

#### $SECTION\ IV-BACKLASH$

			Dime	nsions	Clearances		
			Mfr.		Mfr.		
			Min. &	Service	Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
807	E-H1-H2-H3	Oil Pump Drive Gear and			<u>.004</u>		
		Crankshaft Timing Gear			.015	.020	
808	E-H1-H2-H3	Oil Pump Impellers			<u>.008</u>		
					.015	.020	
İ	E-H1-H2-H3	Oil Pump and Scavenge Pump			.008		
		Impellers			.015	.020	
825	ALL	Crankshaft Timing Gear and			<u>.004</u>		
		Camshaft Gear			.015	.020	
829	ALL	Propeller Shaft – Reduction					
		Gear – Total Backlash (At 4 ft.					
		Radius)				.50	
846	E-H1-H2-H3	Camshaft Gear and Magneto			<u>.004</u>		
		Gear			.015	.020	
847	E-H1-H2-H3	Tachometer Drive Gear and			.004	0.20	
0.40	7.77	Crankshaft Timing Gear			.015	.020	
848	E-H1	Tachometer Driven Gear and			.004	020	
0.40	ATT	Tachometer Drive Gear			.015	.020	
849	ALL	Stationary Gear and Stationary			.002 .005	010	
050	ATT	Gear Drive Plate				.010	
850	ALL	Ring Gear and Ring Gear Drive			.001 .004	010	
851	E-H2-H3	Plate Generator Drive Gear and				.010	
851	E-H2-H3	Generator Drive Gear and Generator Driven Gear			.004 .015	020	
852	E-H1-H2-H3	Oil Pump Drive Gear and			.013	.020	
032	E-H1-H2-H3	Accessory (Fuel Pump) Drive			<u>.004</u>	.020	
		Gear			.015	.020	
853	E-H1-H2-H3	Oil Pump Drive Gear and			.004		
055		Vacuum Pump Drive Gear			.015	.020	
854	ALL	Pinion Gear and Stationary Gear			.004	.020	
051		I mion Gear and Stationary Gear			.0077	.012 (C)	
855	ALL	Pinion Gear and Ring Gear			.003	.012 (0)	
000		1 mion com und rung com			.0065	.012 (C)	
856	ALL	Governor and Magneto Drive				(-)	
		Gear and Governor Drive Idler			.004		
		Gear			.015	.020	
857	AB-AC	Governor and Magneto Drive					
		Gear and Magneto Drive Idler			.004		
		Gear			.015	.020	
858	ALL	Governor Drive Idler Gear					
		(Bevel Gear End) and Governor			<u>.004</u>		
		Driven Gear			.008	.015	
859	H1	Camshaft Gear and Generator			<u>.004</u>		
		Drive Idler Gear			.015	.020	
860	H1	Generator Drive Idler Gear and			<u>.004</u>		
		Generator Driven Gear			.015	.020	
861	E1-H1-H2-H3	Electric Tachometer Idler Gear			<u>.004</u>		
		and Driven Gear			.015	.020	
862	E1-H1-H2-H3	Electric Tachometer Idler Gear			<u>.004</u>		
		and Tachometer Drive Gear			.015	.020	

## **PART III – GEARED ENGINES**

#### SECTION IV – BACKLASH

			Dime	nsions	Clear	rances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
863	E1-H1	Angle Generator Drive Gear and			<u>.002</u>	
		Generator Driven Gear			.004	.010
864	E1-H1	Angle Generator Drive Gear and			.003	
		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>	
		and Tachometer Driven Gear			.015	.020
867	H4-H5-P	Tachometer Drive Idler Gear			<u>.004</u>	
		and Magneto Drive Shaftgear			.015	.020
868	H4-H5-P	Magneto Drive Shaft (Spline)				
		and Magneto Drive Shaftgear			.001 .015	
		(Spline)			.015	.008
869	H4-H5-P	Magneto Drive Shaftgear				
		(Spline) and Magneto Drive			<u>.001</u>	
		Coupling (Spline)			.005	.008
870	H4-H5-AC	Rear Crankshaft (Spline				
		Bushing) and Accessory Drive			<u>.002</u>	
		Gear (Spline)			.0073	.018
	P-AB	Rear Crankshaft (Spline				
		Bushing) and Accessory Drive			<u>.002</u>	
		Shaft (Spline)			.0073	.018
871	H4-H5-AC	Accessory Idler Gear and Starter			<u>.004</u>	
		Drive Gear			.008	.015
871	P-AB	Supercharger and Accessory				
		Drive Gear and Starter and			<u>.004</u>	
		Accessory Drive Gear			.008	.015
872	H4-H5-P-AB-AC	Accessory Drive Gear and			<u>.004</u>	
		Generator Drive Gear			.015	.020
873	H4-H5-P	Accessory Drive Gear and			<u>.004</u>	
		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	E	Scavenge Pump Driven Gear			<u>.004</u>	000
6= :		and Accessory Drive Gear			.015	.020
876	E	Scavenge Pump Impellers			.008	020
077	D AD				.015	.020
877	P-AB	Supercharger and Accessory			00.5	
		Drive Gear and Intermediate			<u>.006</u>	020
070	D AD	Supercharger Drive Shaftgear			.015	.020
878	P-AB	Supercharger Drive Shaftgear			007	
		and Intermediate Supercharger			<u>.006</u>	020
		Drive Gear	1		.015	.020

3-33 SSP-1776-4-PT3

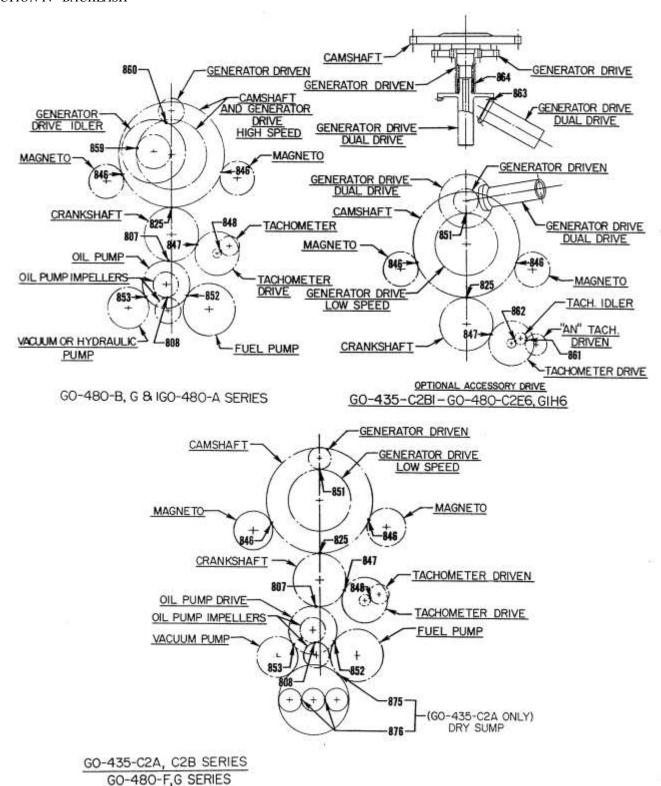
## **PART III – GEARED ENGINES**

#### SECTION IV – BACKLASH

			Dime	ensions	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			<u>.000</u> .002	005	
880	P1	Gear (Spline) Fuel Injector Idler Gear and Magneto Drive Shaftgear			.002 .004 .015	.005	
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)			.0005 .0056	.008	
883	P1	Magneto Drive Shaftgear (Spline) and Fuel Injector Drive Shaft (Spline)	Magneto Drive Shaftgear (Spline) and Fuel Injector Drive		.002 .006	.008	
884	AB-AC	Magneto Drive Idler Gear (Bevel End) and Magneto Driven Gear			.004 .008	.015	
885	AB-AC	Magneto Driven Gear (Spline) and Magneto Drive Coupling (Spline)			<u>.001</u> .004	.007	
886	AB-AC	Magneto Drive Coupling (Spline) and Magneto Coupling (Spline)			<u>.001</u> .004	.007	
887	H4-H5-P-AB-AC	Starter Jaw (Spline) and Starter Drive Gear (Spline)			.002 .005	.010	
888	AB-AC	Accessory and Starter Drive and Oil Pressure and Scavenge Pump Idler Gear			<u>.004</u> .015	.020	
889	AB-AC	Oil Pressure and Scavenge Pump Idler and Oil Pressure and Scavenge Pump Gear			.004 .015	.020	
890	AB	Fuel Injector Drive Shaftgear (Spline) and Fuel Injector Drive Coupling (Spline)			.003 .007	.012	
891	AB	Fuel Injector Drive Coupling (Spline) and Fuel Injector Pump (Spline)			.002 .005	.010	
892	AB-AC	Oil Pressure and Scavenge Pump Gear (Spline) and Vacuum Pump Coupling (Spline)	ressure and Scavenge Pump (Spline) and Vacuum		. <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			.004 .015	.020	
895	H4-H5-P-AC	Vacuum Pump Shaftgear and Fuel Pump Drive Shaftgear			<u>.004</u> .015	.020	

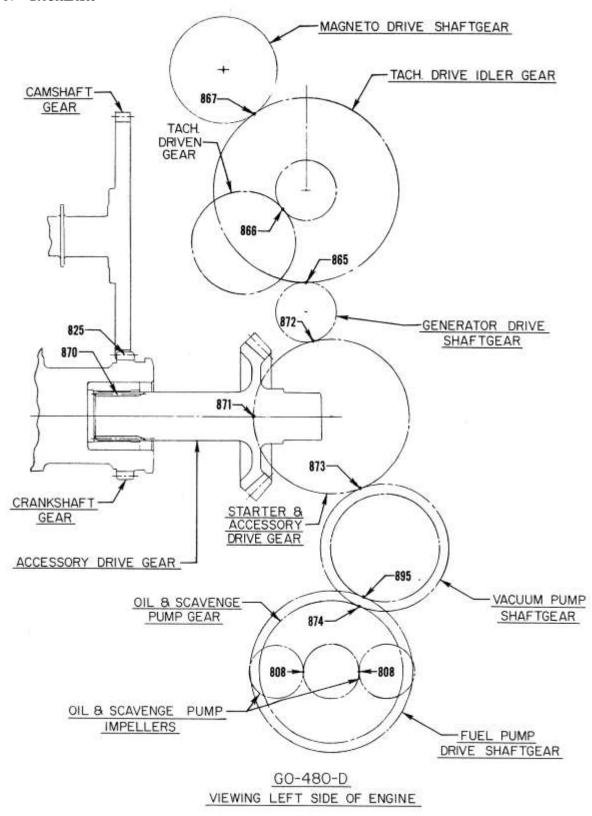
#### PART III - GEARED ENGINES

SECTION IV- BACKLASH



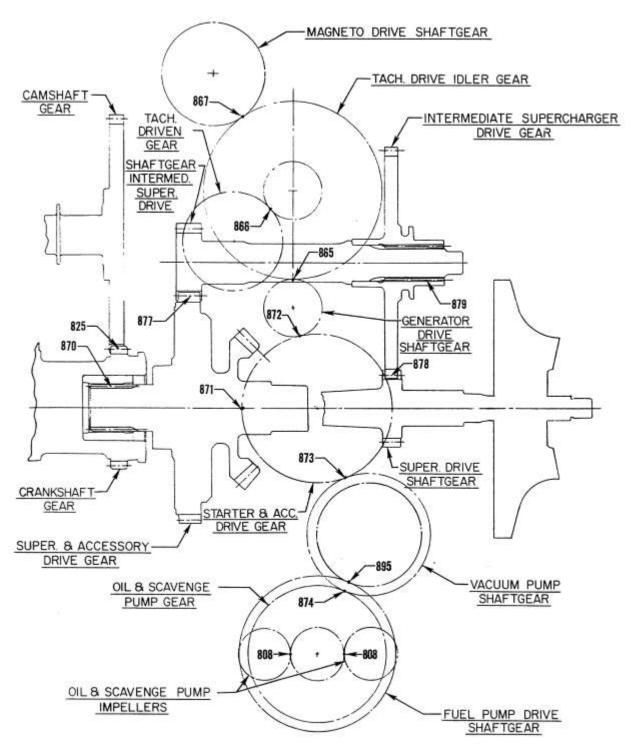
#### **PART III – GEARED ENGINES**

SECTION IV - BACKLASH



#### **PART III – GEARED ENGINES**

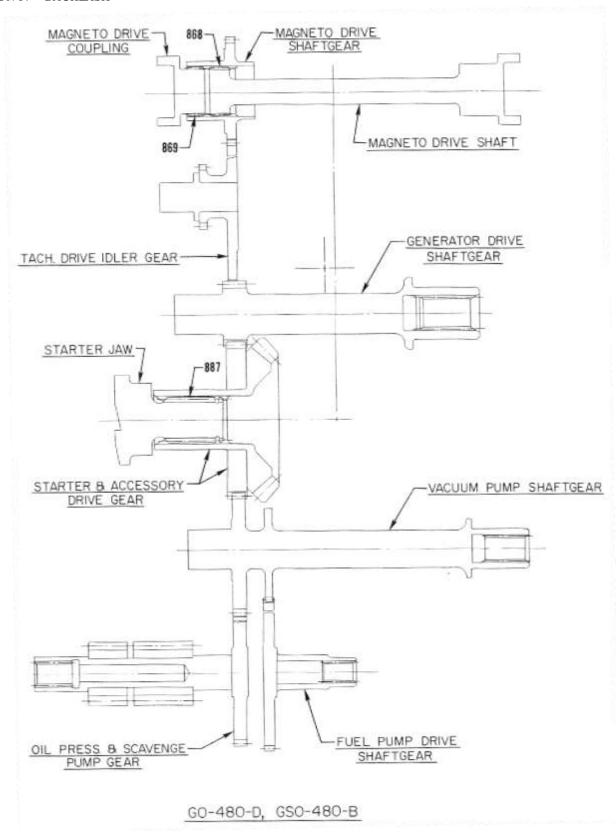
SECTION IV - BACKLASH



VIEWING LEFT SIDE OF ENGINE

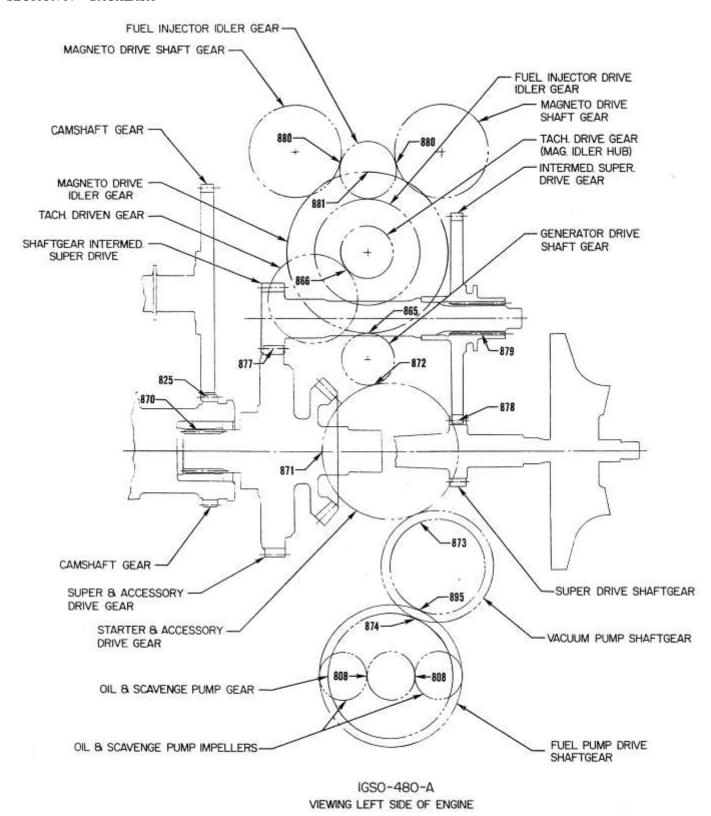
#### **PART III – GEARED ENGINES**

SECTION IV - BACKLASH



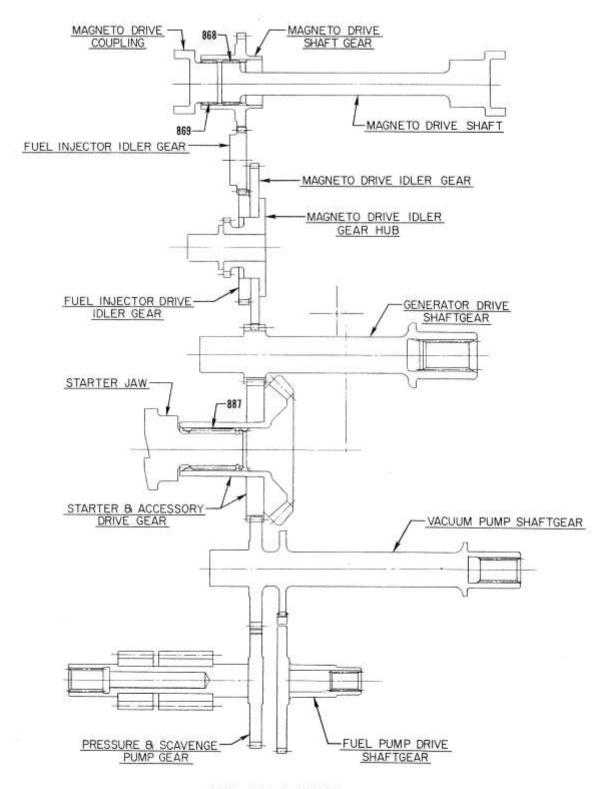
#### **PART III – GEARED ENGINES**

#### SECTION IV - BACKLASH



#### **PART III – GEARED ENGINES**

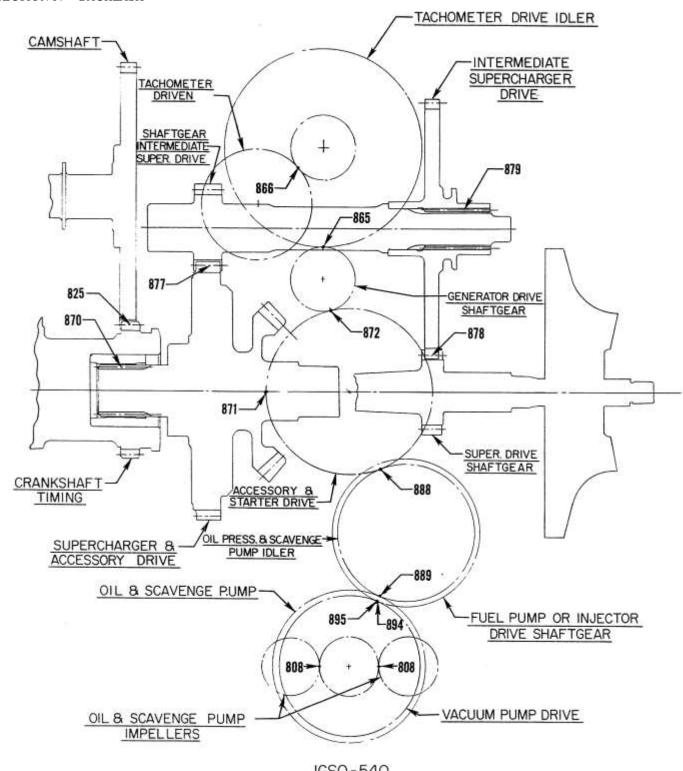
SECTION IV - BACKLASH



IGSO-480-A SERIES

#### **PART III – GEARED ENGINES**

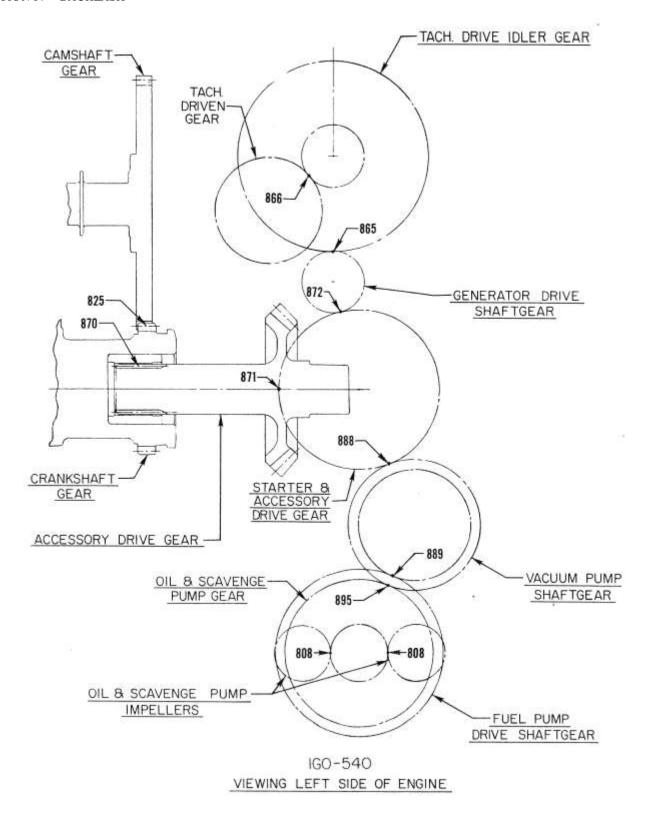
SECTION IV - BACKLASH



IGSO-540 VIEWING LEFT SIDE OF ENGINE

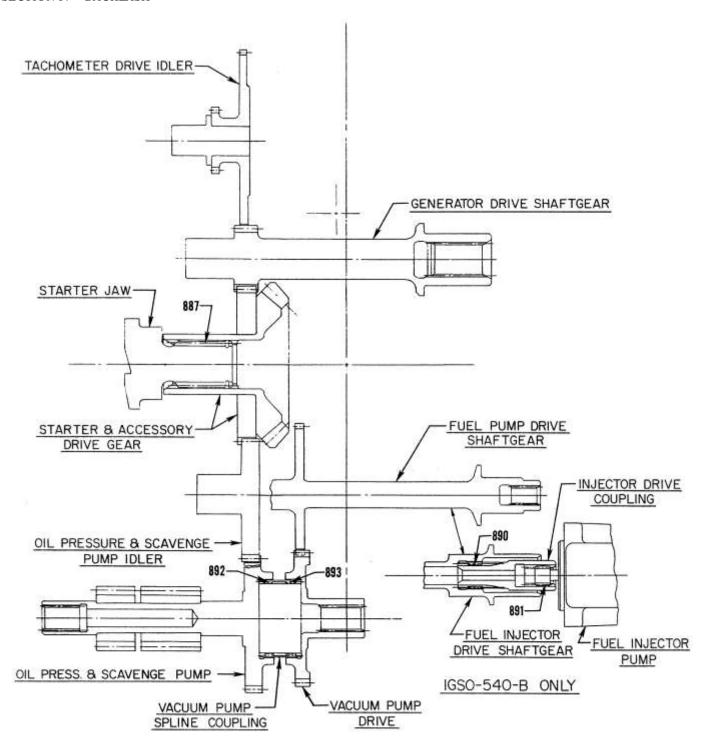
#### **PART III – GEARED ENGINES**

SECTION IV - BACKLASH



#### **PART III – GEARED ENGINES**

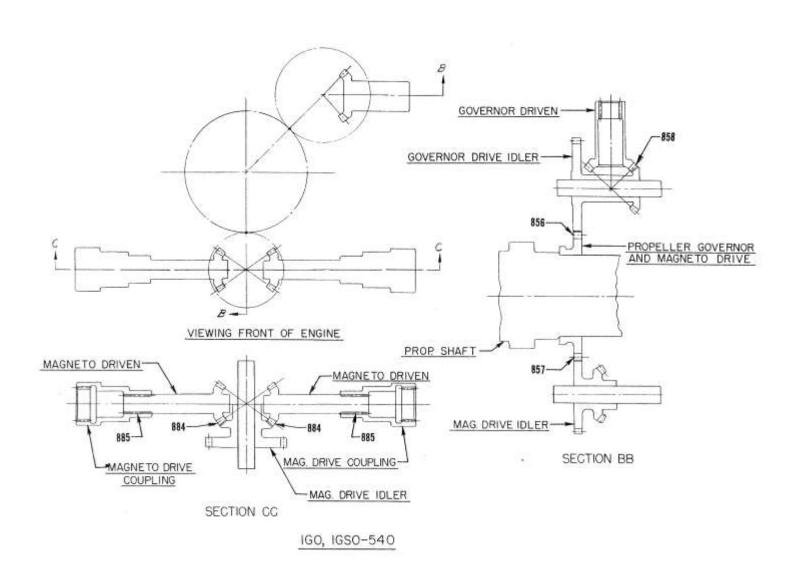
SECTION IV - BACKLASH



IGO-540, IGSO-540-A,B

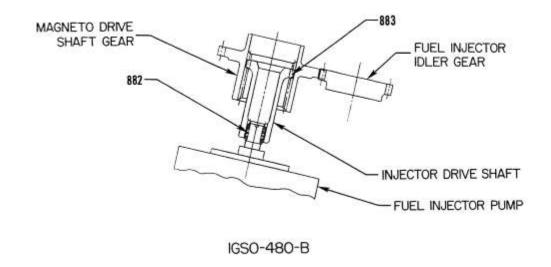
#### **PART III – GEARED ENGINES**

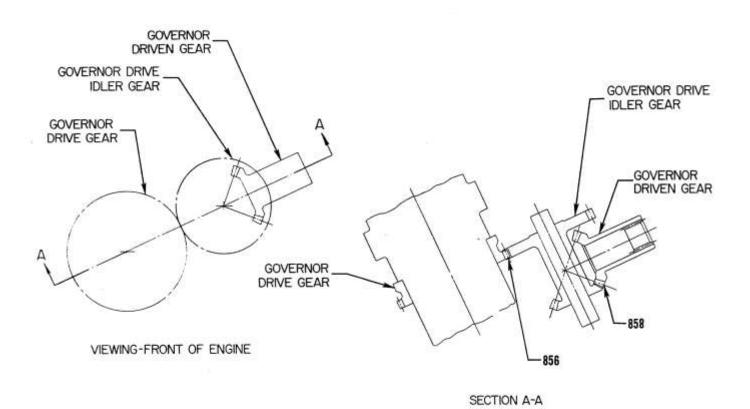
SECTION IV - BACKLASH



#### **PART III – GEARED ENGINES**

SECTION IV - BACKLASH





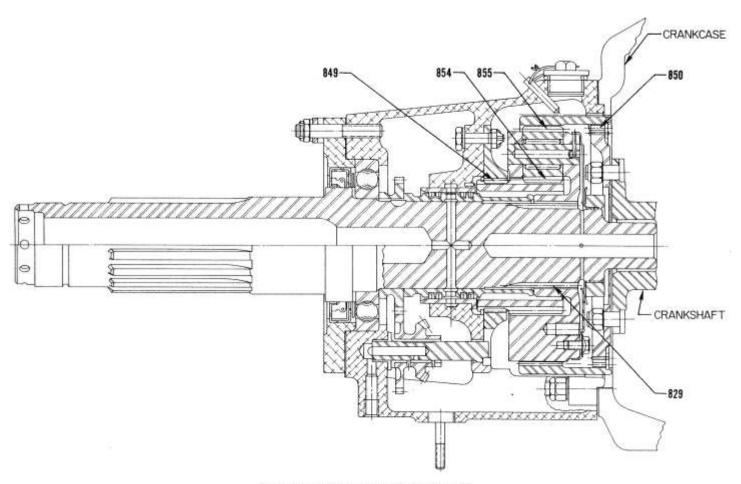
GO-435, GO, GSO & IGSO-480-A

**Accessory Drives** 

3-45

## **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	Е-Н	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)	
00.				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	20: 11
012	112 115 D 1 D 1 G	1/1 < 27 NDT		30 in. lbs.
913	H3-H5-P-AB-AC	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 ' 11
014	AC	1/0.27 NDT	Lair at a No. 1. in C. Parta Hand	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)	00 III. 108.
717	ALL	and Below	Hose Clamps (World Type)	45 in. lbs.
	ALL	5/16 Hex Head	Hose Clamps (Worm Type)	+3 III. 103.
	THE C	and Above	Tiose Clamps (Worm Type)	45 in. lbs.
919-1	ALL	una ricove	"T" Bolt Hose Clamps –	13 111 105
1 1 1			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)	
			r tight, then continue tightening the nut with in excess of 50 inlbs. can result in dam	
additt				
1	Instruction No. 1029.	ase rarting Flange	Nuts' Tightening Procedures – See late	st revision of Service
021		2,000,16	Dinion Cogo Datairing Net	/OO & 11:
931	ALL E III III III D AD AC	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.

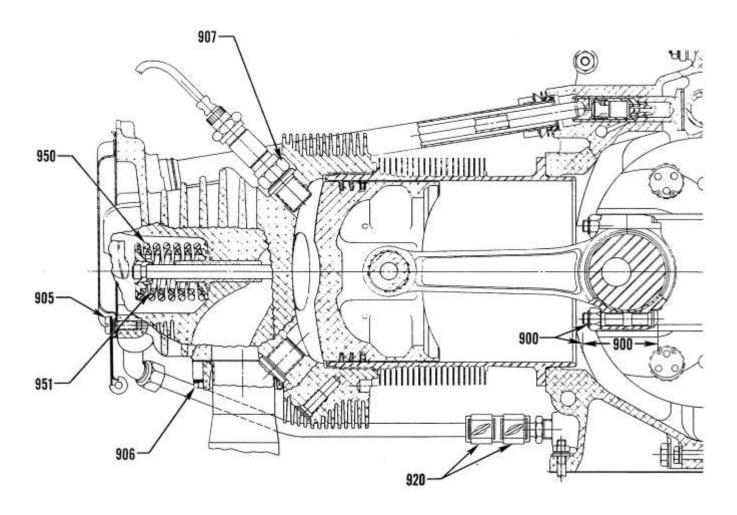
## **PART III – GEARED ENGINES**

 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 

	TO V - SPECIAL TORG	20L KLQUIKL		ı cı	3.7	1 .					7.	•,	
Ref.	Chart P-AB		Thread	Size	Nomenclature		Torque Limits						
936					Supercharger – Intermediate Drive Shaft Nut		75 ft. lbs.						
937	P-AB				Supero	charger –	Impe	ller Loc	knut				s Torque
											'd. to F		Next
938	HA HE D AD AC		1/4-28		Thin C	lotted Nu	1.6			Locking Slot) (38 in. lbs. Plus Torque			
936	H4-H5-P-AB-AC		1/4-20		111111 3	ionea ivi	11				iii. 10s. 'd. to F		
											king Sl		TICAL
940	ALL				Ring C	Gear Asse	mbly	· _					
						ing Nuts						3	360 in. lbs.
941	ALL					tion Gear	Asse	embly –					
0.42	E1 II1		1/4 10	NDT		ing Nuts	Dl						300 in. lbs.
942	E1-H1 E-H-P		1/4-18			retor Drai							44 in. lbs. -60 in. lbs.
943	Р		10-32	INF I		s (To Atta			<b>'</b>			30-	00 111. 108.
)43	1		10 32			Coupling			y			25-	-30 in. lbs.
			S	ECTIO		_ · ·		,					
		1		Lerro				47		C	OMP.	LOA	D
					yc.	Wire		ength Comp.		fr.	Mf		Service
Ref.	Chart	Nomeno	elature		t No.	Dia.		ength		in.	Ma		Max.
950	ALL	Outer Valve		1 442	<b>V</b> 1 (0)	Dia.		g				-	100 lb.
1		(Angle)	opinigo	6832	6	.177	1.4	46 in.	103	3 lb.	111	lb.	min.
	ALL	Outer Valve	Springs										111 lb.
		(Angle)			11796	.182	1.4	43 in.		4 lb. 124		lb.	min.
951	ALL	Auxiliary Va		6832						lb.			72 lb.
0.72	**********	Springs (Ang		LW-	11797	.142	1.3	33 in.	73	lb.	83 1	b.	min.
952	H4-H5-P-AB-AC	Check Valve			,								
		Lycomir Numb			ree ngth								
				LC	ngui								.69 lb.
		654-	В			.031	1.0	03 in.	.74	lb.	.94	lb.	min.
		<b>505</b>	- 4		0.5	0.44		20.	2.1	~ 11	2.25		3.10 lb.
		7370	51	2.	065	.041	1.0	)3 in.	3.15 lb. 3.35 l		lb.	min.	
953		Oil Pressu											
		Valve S		<u> </u>	1								
		Lycoming Part	Identi	fication	4								
		Numbers	Dye	Free									
	H4-H5-P-AB-AC	68542	None	Length 2.38	.067	1.66	in	15	lb.		17 lb.	1	14 lb. min.
	H4-H5-P-AB-AC	LW-14029	White	2.28	.072	1.66			lb.		22 lb.		17 lb. min.
	E1-H1-H2-H3	60476	None	2.38	.047						65 lb.		00 lb. min.
	E1-H1-H2-H3	66920	None	2.54	.047	1.44 in. 7.15 lb. 1.44 in. 8.35 lb.			85 lb.		20 lb. min.		
	E1-H1-H2-H3	74596	None	2.96	.047	1.44		11.65			15 lb.		50 lb. min.
954		Supercharger			1.,,,			-1.50					
		Spring		1 <i>B</i>									
		Lycoming											
		Part											
	D	Numbers		Length	1.40	1.10		1.001	ı <u>ı.</u> T	104	11.	1.0	5 11
	P P	68830 LW-12303		.25 .28	.148	1.10		168 l		184 184			5 lb. min. 5 lb. min.
	AB	72774		.28	.148	1.10		249 1		275			4 lb. min.
	AB	LW-12301		.26	.177	1.13		255 1		270			0 lb. min.
	ı —	1_001							~ -	0			

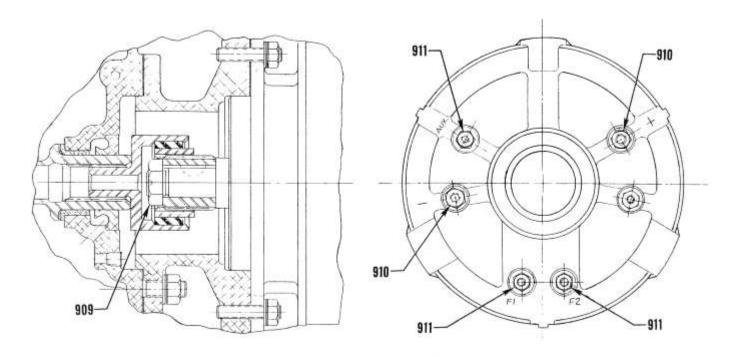
### **PART III – GEARED ENGINES**

SECTION V – SPECIAL TORQUE REQUIREMENTS

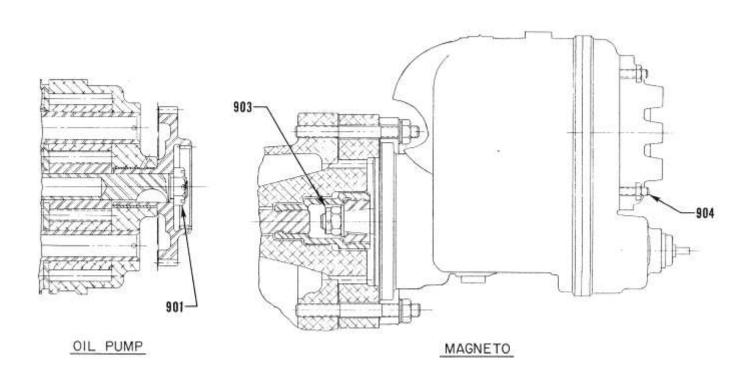


#### **PART III – GEARED ENGINES**

SECTION V – SPECIAL TORQUE REQUIREMENTS



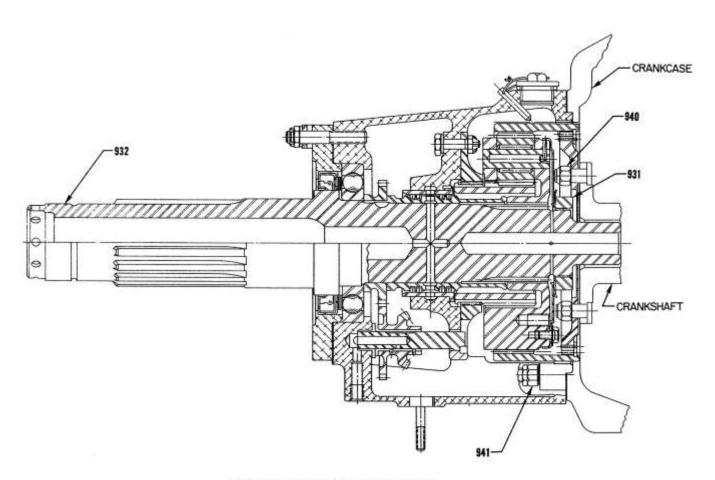
### ALTERNATOR & ALTERNATOR DRIVE



**Engine Accessories and Hardware** 

### **PART III – GEARED ENGINES**

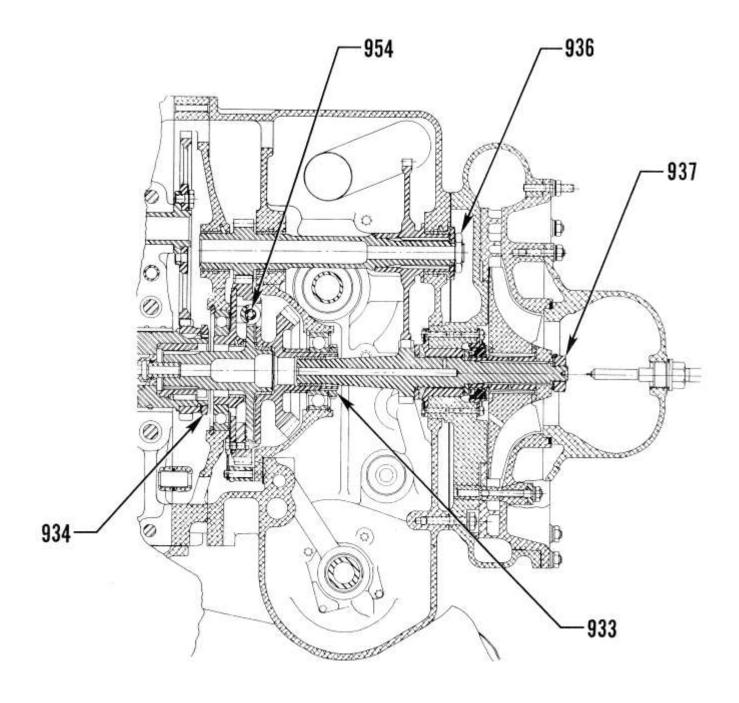
 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 



SECTION THRU REDUCTION GEAR

#### **PART III – GEARED ENGINES**

SECTION V – SPECIAL TORQUE REQUIREMENTS

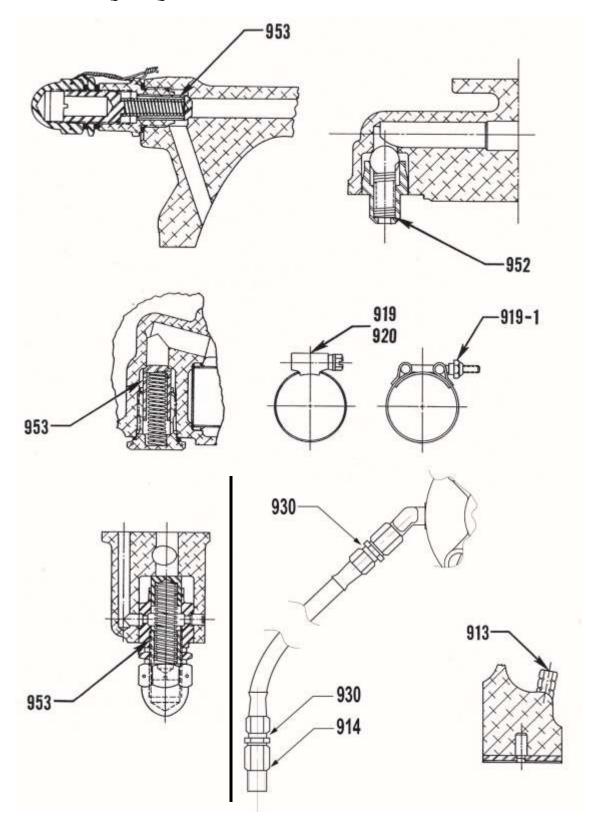


## SECTION THRU ACCESSORY HSG. & SUPERCHARGER

**Engine Accessories and Hardware** 

### **PART III – GEARED ENGINES**

 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 



**Engine Springs and Hardware** 

## 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).

		TAB	TABLE II				
	В	OLTS, SCRE	PIPE PLUGS				
Throad	Torque		Thread	Torq	ue	Thread	Torque
Thread	In. Lb.	Ft. Lb.	Tillead	In. Lb.	Ft. Lb.	Tillead	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
ти	THIN MITS (1/2 DIA OF DOLT) 1/2 LISTED TODOLE						230 to 252
In	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°		T	ABLE V	
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	E
NOTE: Install all amuch true and	Irata avaamt	the colf	Thr	eads	Torque In. Lbs.	
NOTE: Install all crush type gas centering type, with the unbroken sur			1/4	-20	15	
of the plug or part being tightened ag	5/10	6-18	25			
part until the sealing surfaces are in contact and then tighten			3/8-16		50	
to the angle of turn listed for the appr						
NOTE: Lubricate Threads Unless Ot						

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

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

	TABLE VII										
	METAL TUBE FITTINGS										
			Wrench torqu	e for tightening	g AN-818 Nut	(pound inches)		Minimum bend radii			
Dash Nos. Ref.	Tubing OD inches	Aluminum-alloy tubing		(Flare M				Aluminum-alloy tubing (Flare MS33583) for use on oxygen lines only		measured to tubing centerline. Dimension in inches	
		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	

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#### 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 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 contraction 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-1776-4-PT4 April 10, 2018\*

<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.





# TECHNICAL PUBLICATION REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE			
SSP-1776-4-PT4	Service Table of Limits	SSP-1776	October 28, 2013			
PREVIOU	S REVISIONS	CURRENT	REVISION*			
		Apr	il 2018			
		4-6, 4-35, 4-39				
		<ul> <li>Deleted NOTES that reference S.I. 1243 in Piston Application Table</li> <li>Added Ref. number 930 to Section V table and figure torque value for brass union nut on stainless steel in fuel lines and primer lines (Both Ends)</li> </ul>				
		* Revisions are indicated with revised item.	a vertical bar to the left of the			



#### **PART IV – VERTICAL ENGINES**

 $SECTION\ I-CRANKCASE,\ CRANKSHAFT\ AND\ CAMSHAFT$ 

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
	C7		Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
500	L	All Main Bearings and			<u>.0015L</u>	00.40*
	7.1.77	Crankshaft			.0045L	.0060L
	L1-V	Main Bearings and Crankshaft			.0011L	00501
	V	(Except Front)			.0041L	.0050L
	V	Front Main Bearing and Crankshaft			.0011L .0041L	.0050L
	L1	Front Main Bearing and			.0015L	.0030L
	Li	Crankshaft			.0015L	.0050L
	ALL	Diameter of Main Bearing	2.3745		.0043L	.0030L
		Journal on Crankshaft	$\frac{2.3715}{2.376}$	(E)		
	L	Crankcase Bearing Bore	2.566			
		Diameter (All)	2.567	2.5685		
	V	Crankcase Bearing Bore	2.6865			
		Diameter (All)	2.6875	2.6890		
501	ALL	Connecting Rod Bearing and			<u>.0008L</u>	
		Crankshaft			.0038L	.0050L
	ALL	Diameter of Connecting Rod	<u>2.1235</u>			
		Journal on Crankshaft (2-1/8 in.)	2.125	(E)		
	ALL	Connecting Rod Bearing Bore				
		Diameter (2-1/8 in.) (Measured	2.2870			
700		at Axis 30° on Each Side)	2.2875		00.47	
502	ALL	Connecting Rod – Side			.004L	016
502	ALL	Clearance Connecting Rod – Alignment			.010L	.016L 0 Inches
503 504	ALL	Connecting Rod – Ariginnent  Connecting Rod – Twist				2 Inches
505	ALL	Crankshaft Run-Out at Center			.012 III	12 menes
303	ALL	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			.006L	0251
500	ATT	End Clearance			.015L	.025L
508	ALL	Crankshaft Propeller Flange			.002	005
510	ALL	Run-Out Crankshaft Timing Gear and			.002	.005
510	ALL	Crankshaft Crankshaft			.0015T	(A)
511	ALL	Tappet Body and Crankcase			.0010L	(11)
J11		Tuppet Body and Crankease			.0033L	.004L
	ALL	O.D. of Tappet	.7169			
		11	.7177	.7166		
	ALL	<u>.7187</u>				
		I.D. Tappet Bore in Crankcase	.7200	.7203		

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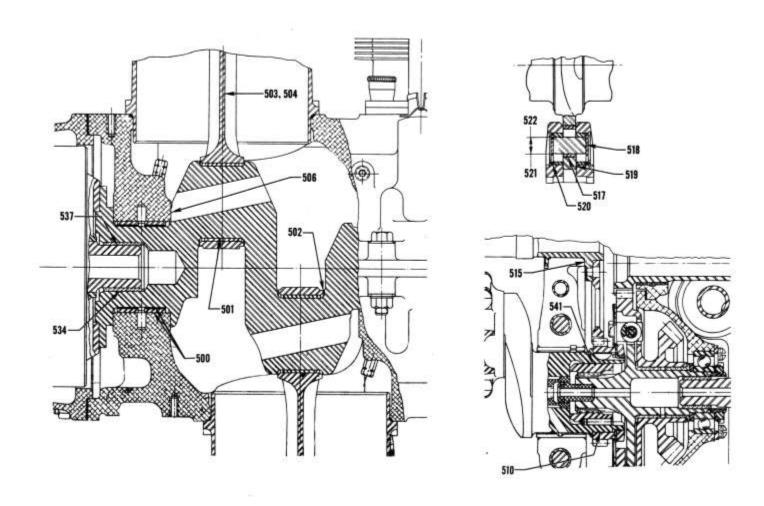
#### **PART IV – VERTICAL ENGINES**

 $SECTION\ I-CRANKCASE,\ CRANKSHAFT\ AND\ CAMSHAFT$ 

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
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			.002L	
					.009L	.015L
516	ALL	Camshaft Run-Out at Center			.000	
		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	<u>.5255</u>			
		of Service Instruction No. 1012)	.5260			
541	ALL	Rear Crankshaft Spline Bushing			<u>.0002T</u>	
		and Crankshaft			.0015T	(A)
	* - Measure below roller next to	flat.		<del></del>	<del></del>	
		<u> </u>				

#### **PART IV – VERTICAL ENGINES**

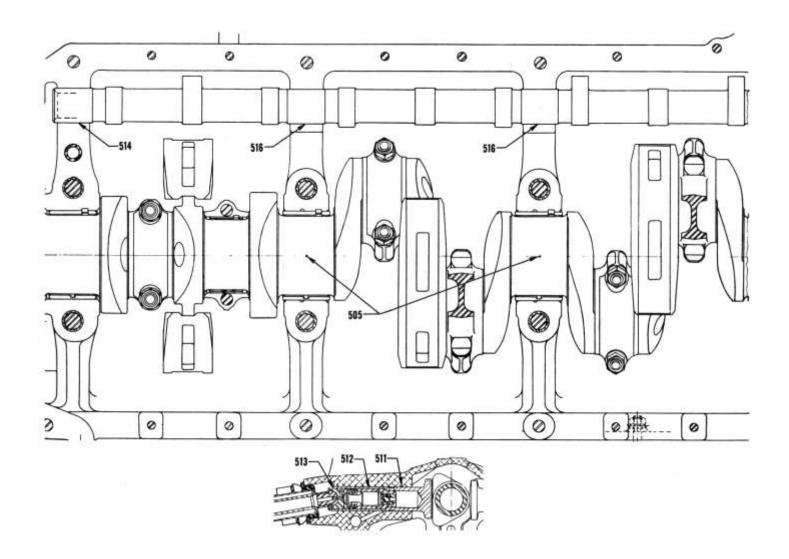
SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



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#### **PART IV – VERTICAL ENGINES**

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



#### **PART IV – VERTICAL ENGINES**

#### SECTION II – CYLINDERS

			Dime	nsions	Clear	rances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
600	ALL	Connecting Rod and Connecting Rod Bushing	Bus	hing to be B	urnished in I	Place
	ALL	Finished I.D. of Connecting Rod Bushing	1.1254 1.1262			
601	L	Length Between Connecting	6.4985			
	V	Rod Bearing Centers Length Between Connecting	6.5015 6.7485			
602	ALL	Rod Bearing Centers Connecting Rod Bushing and	6.7515		.0008L	
603	ALL	Piston Pin Piston Pin and Piston			.0021L .0003L	.0025L
003			1 1240		.0014L	.0018L
	ALL	Diameter of Piston Pin Hole in Piston	1.1249 1.1254			
	ALL	Diameter of Piston Pin	1.1241 1.1246			
604	V	Piston and Piston Pin Plug			.0002L .0010L	.002L
	V	Diameter of Piston Pin Plug*	1.1242 1.1247			
605	ALL	Piston Pin and Piston Pin Plug (Nitrided and Chrome Cylinders)			.0005L .0025L	.005L
	V	Diameter of Piston Pin Plug*	<u>.5655</u> .5665		.00232	.0032
	L	Diameter of Piston Pin Plug**	.7605 .7615			
	L	Diameter of Piston Pin Plug** (Thin Wall Pin)	.8405 .8415			
	*See latest revision of Service **See latest revision of Service	Instruction No. 1267.	.0113			
606	ALL	Piston Ring and Piston – Side				
000	ALL	Clearance (Top Ring Comp.) Half Wedge			.0025L .0055L	.008L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (2 <sup>nd</sup> Ring Comp.) Full			.000	
	ALL	or Half Wedge Piston Ring and Piston – Side			.004L .002L	.006L (B)
	ALL (AS APPLICABLE)	Clearance (Oil Regulating) Piston Ring and Piston – Side			.004L .003L	.006L (B)
	ALL (AS APPLICABLE)	Clearance (Oil Scraper)  Piston Ring and Piston – Side Clearance (3 <sup>rd</sup> Ring Comp.) Half			.0055L	.007L (B)
607	ALL	Wedge Piston Ring Gap (Compression) Chrome Cylinders (Straight			.004L .020	.006L (B)
	ALL	Barrels) Piston Ring Gap (Compression) Nitrided and Chrome Cylinders (Choke Barrels)			.030 .045 .055	.047

#### **PART IV – VERTICAL ENGINES**

#### SECTION II – CYLINDERS

			Dimensions		Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
607	ALL	Piston Ring Gap (Oil			<u>.015</u>	
		Regulating) (All Barrels)			.030	.047
	ALL (AS APPLICABLE)	Piston Ring Gap (Oil Scraper)			.015	
		(All Barrels)			.030	.047

For Choke Barrels – Ring gap is measured within 4 inches from bottom. Ring gap at top of travel must not be less than .0075.

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

	Engine an	ad Piston Application	Min Pisto	on Diameter		Cylinder Barrel				
	Engine Chart Code Letter	Piston Number	Top	Bottom	Type of Piston	Type of Surface	Maximum Diameter	Max. Clearance Piston Skirt & Cyl.		
608	Ŧ	67266, 71553, 73620	4.8395	4.8540	Forged-Round	С	4.8805	.0225L		
608	L	73932	4.8395	4.8540	Forged-Round	N	4.8805	.0225L		
609		75984	4.8395	4.8590	Forged-Cam	С	4.8805	.018L		
610		75984, 76172*	4.8395	4.8590	Forged-Cam	N	4.8805	.018L		
	V	71940, 72249, 72578, 73947*, 73976	5.0905	5.1040	Forged-Round	С	5.1305	.0225L		
		71940, 72249, 73947, 73976	5.0905	5.1040	Forged-Round	N	5.1305	.023L		
		74242, 75617	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L		
		78203, 78762, LW-10207*,	5.0700	5 1000	F 10	G.N.	5 1205	0101		
		LW-10208	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L		

#### NOTES:

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

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

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

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

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

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<sup>\*=</sup>High Compression.

#### **PART IV – VERTICAL ENGINES**

#### SECTION II – CYLINDERS

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

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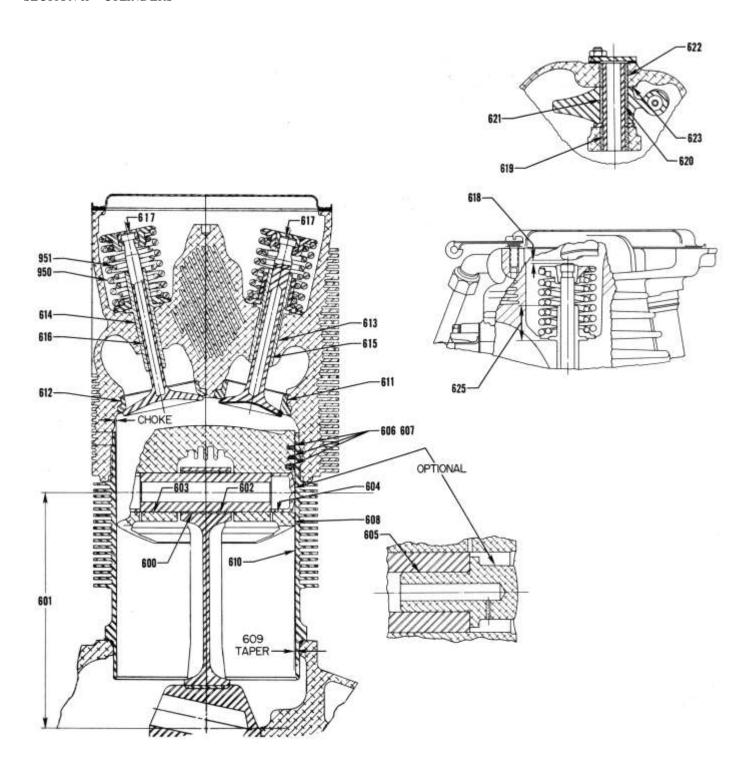
#### **PART IV – VERTICAL ENGINES**

#### SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
615	ALL	O.D. Exhaust Valve Stem	.4957			
			.4965	.4937		
	ţ		Service allo			
			applicable			
			nimonic va		inconer of	
	L O.D. Exhaust Valve Stem (7/16		.4332	1 100.		
		in. Exhaust Valve)	.4340			
	ALL	Finished I.D. Exhaust Valve	.5000			
	ALL	Guide (1/2 in. Exhaust Valve)	.5010			
	L	Finished I.D. Exhaust Valve	.4360			
	L	Guide (7/16 in. Exhaust Valve)	.4300			
	1/1 1 11 11 11			.1		. 1
		ay have exhaust valve guides that are				
		e. After 300 hours of service, inside d				
		ation up to the recommended overha				a .015 inch
	-	ion of Service Instruction No. 1009 to	for recomme	nded overhai		
616	ALL	Intake Valve Stem and Valve			<u>.0010L</u>	
		Guide			.0028L	.006L
	ALL	O.D. Intake Valve Stem	<u>.4022</u>			
			.4030	.4010		
ALL		Finished I.D. Intake Valve	<u>.4040</u>			
		Guide	.4050			
617	ALL	Valve and Valve Cap Clearance			<u>.000</u>	
					.004L	.005L
618	ALL	Dry Tappet Clearance			.028	
					.080	
619	ALL	Valve Rocker Shaft and Valve			<u>.0001L</u>	
		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			.0007L	
		Rocker Bushings			.0017L	.004L
	ALL	O.D. Valve Rocker Shaft	.6241			
			.6245	.6231		
	ALL	Finished I.D. of Rocker Arm	.6252			
		Bushing	.6263	.6270		
621	ALL	Valve Rocker Bushing and			I	
		Valve Rocker	Bushi	ng Must Be	Burnished In	Place
622	ALL	Valve Rocker Shaft Bushing and	2 0511		.0022T	11000
022		Cylinder Head			.0038T	(A)
	ALL	Valve Rocker Shaft Bushing	.7380		100001	(1.2)
		Hole in Cylinder Head	.7388			
623	ALL	Valve Rocker and Cylinder	.,,500		.002L	
023		Head – Side Clearance			.020L	.024L
625	ALL	Intake and Exhaust Valve Guide	.914	1	.UZUL	.024L
043	ALL	Height	.914 .954	1		
					]	
		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

			Dime	nsions	Clearances		
			Mfr.		Mfr.		
			Min. &	Service	Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
OIL PU	UMP						
702	L-V	Oil Pump and Scavenge Pump			.007L		
		Gear – End Clearance			.030L	.045L	
	L1	Oil Pump Drive Gear – End			.010L	10.02	
		Clearance			.035L	.060L	
703	L-V	Oil Pump and Scavenge Pump			.007L		
		Impellers – Dia. Clearance			.011L	.014L	
	L1	Oil Pump Impellers – Dia.			.007L		
		Clearance			.011L	.014L	
704	L-V	Oil Pump and Scavenge Pump			.003L		
		Impellers – Side Clearance			.0055L	.006L	
	L1	Oil Pump Impellers – Side			.003L		
		Clearance			.0055L	.006L	
	ALL	Width of Oil Pump Impellers	.995				
		r r	.997	.994			
	ALL	Width of Oil Scavenge Pump	1.496				
		Impellers	1.498	1.495			
705	L-V	Oil Pump and Oil Scavenge					
		Pump Driven Impeller and Idler			<u>.001L</u>		
		Shaft			. <del>0025</del> L	.004L	
	L1	Oil Pump Driven Impeller and			.0010L		
		Idler Shaft			.0025L	.004L	
706	ALL	Oil Pump Idler Shaft and Oil			.0000		
		Pump Body			.0015T	(A)	
	L1	Oil Pump Idler Shaft and Oil			.0000		
		Pump Cover			.0015T	(A)	
713	L-V	Oil Pump Idler Shaft and			.0000		
		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>		
		Scavenge Pump Gear			.0035L	.005L	
	L1	Oil Pump Drive Gear and Oil			<u>.0015L</u>		
		Pump Cover			.0035L	.005L	
780	ALL	Oil Pump Drive Shaft Bushing			<u>.0015L</u>		
		and Oil Pump Shaft			.0035L	.005L	
7051	ALL	Oil Relief Valve Plunger and			<u>.001L</u>		
		Sleeve			.003L	.005L	
7076	L1	Oil Pump Drive Gear Bushing			<u>.002T</u>		
		and Accessory Housing			.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

			Dimensions		Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
FUEL I	PUMP	•				
782	L-V	Fuel Pump Drive Shaftgear Bushing and Accessory Housing			<u>.001T</u> .004T	(A)
783	L-V	Fuel Pump Drive Shaftgear –			<u>.006</u>	(A)
784	L-V	End Clearance Fuel Pump Drive Shaftgear and			.064 .001L	.074
VACIU	UM PUMP	Bushing			.004L	.006L
		N B GLC				
793	L-V	Vacuum Pump Shaftgear Bushing and Accessory Housing Cover			.0015T .0035T	(A)
794	L-V	Vacuum Pump Shaftgear Bushing (At Cover) and Vacuum Pump Shaftgear			.002L .004L	.006L
795	L-V	Vacuum Pump Shaftgear Bushing and Accessory Housing			.0015T .0035T	(A)
	L1	Vacuum Pump Shaftgear Bushing and Accessory Housing			<u>.0025T</u> .0045T	(A)
796	ALL	Vacuum Pump Shaftgear Bushing (At Accessory Housing) and Vacuum Pump Shaftgear			<u>.002L</u> .0045L	.006L
797	L-V	Vacuum Pump Shaftgear – End Clearance			.008 .030	.050
799	L1	Vacuum Pump Drive Gear Bushing and Accessory Housing			<u>.002T</u> .004T	(A)
7000	L1	Vacuum Pump Drive Gear Bushing and Vacuum Pump Drive Gear			.0025L .0045L	.006L
7078	L1	Vacuum Pump Drive Gear and Cover			.0013L .0033L	.005L
7079	L1	Vacuum Pump Drive Gear – End Clearance			.010 .032	.037
TACHO	OMETER	Crearance	l .	l .	1002	1007
7002	L1	Tachometer Driven Gear and Adapter			<u>.001L</u> .003L	.0045L
7006	L-V	Electric Tachometer Driven Gear – End Clearance			.007 .025	.047
7012	L-V	Electric Tachometer Driven Gear and Accessory Housing Cover			.001L .003L	.004L
7088	L1	Tachometer Adapter and Accessory Housing			.0005L .0025L	.0035L
MAGN	ETO	,	ı	ı		
7025	L-V	Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub	Bushi	Bushing Must Be Burnished In Place		
7026	L-V	Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Shaft			.001L .003L	.004L

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#### **PART IV – VERTICAL ENGINES**

			Dime	nsions	Clear	rances
			Mfr.	g .	Mfr.	g .
Ref.	Chart	Nomenclature	Min. &	Service	Min. &	Service
	ETO (CONT.)	Nomenciature	Max.	Max.	Max.	Max.
	L-V	Magneta Drive Idles Coop Hel			005	
7027	L-V	Magneto Drive Idler Gear Hub – End Clearance			.005 .014	.024
7028	L-V	Magneto Drive Shaft and			.002L	.024
7020	L-V	Accessory Housing Cover			.002 <u>L</u>	.006L
7029	L-V	Magneto Drive Shaft and			.0025L	.0002
		Accessory Housing			.0045L	.006L
7030	ALL	Magneto Drive Shaft Sleeve and			.001T	
		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			<u>.002</u>	
		Clearance			.020	.030
7039	L1	Magneto Drive Idler Gear – End			<u>.002</u>	0.40
7000	T 1	Clearance			.030	.040
7080	L1	Magneto Drive Idler Gear Bushing and Magneto Drive			0011	
		Idler Shaft			.001L .003L	.004L
7081	L1	Magneto Drive Idler Gear and			.003L	.004L
7001		Magneto Drive Idler Gear			.0005T	
		Bushing			.0025T	(A)
7082	L1	Magneto Drive Gear Bushing			.002T	
		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
	RATOR					
7043	L-V	Generator Drive Gear Bushing			<u>.0015T</u>	
		and Accessory Housing Cover			.0035T	(A)
7044	L-V	Generator Drive Gear Bushing				
		(At Cover) and Generator Drive			.002L .004L	0061
7045	L-V	Gear				.006L
7043	L-V	Generator Drive Gear Bushing and Accessory Housing			<u>.002T</u> .004T	(A)
7046	L-V	Generator Drive Gear Bushing			.0041	(A)
7040	L-V	(At Accessory Housing) and			.0025L	
		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			.002T	
		Adapter			.004T	(A)
	L1	Starter Drive Spacer Bushing			<u>.002T</u>	, /
		and Adapter	<u> </u>		.004T	(A)
7049	L-V	Starter Drive Gear Bushings and			<u>.002L</u>	
		Starter Drive Gear			.004L	.006L
	L1	Starter Drive Spacer and Starter			<u>.0015L</u>	
		Drive Adapter Bushing			.003L	.004L

#### **PART IV – VERTICAL ENGINES**

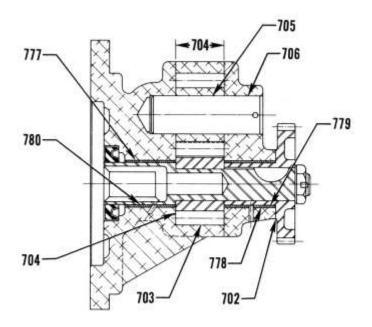
#### SECTION III – GEAR TRAIN

			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			.001T	, ,
		Bushing			.003T	(A)
7055	L-V	Accessory Idler Gear Bearing				, ,
		and Accessory Drive Shaft			.0005T	
		Adapter			.0005L	(A)
7056	V	Accessory Drive Gear Bushing			.0005L	
		and Accessory Drive Shaft			.0017L	.004L
7057	V	Accessory Drive Gear – End			<u>.004</u>	
		Clearance			.012	.017
7086	L1	Accessory Drive Shaftgear			.002T	
		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			.009	
		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

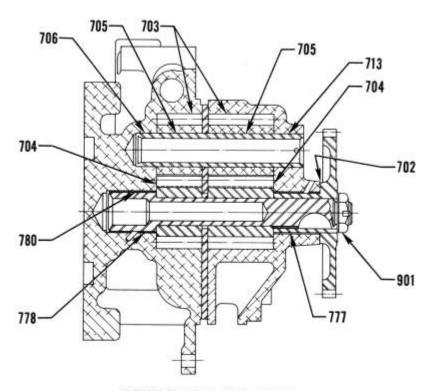
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#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



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

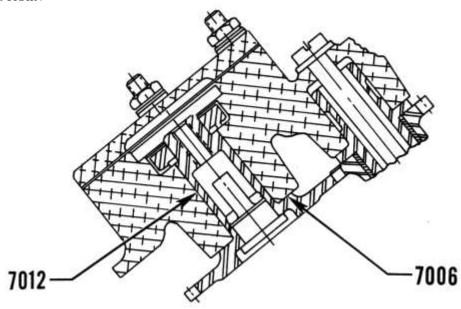


CROSSWISE ACC. HSG.

#### **Oil Pumps**

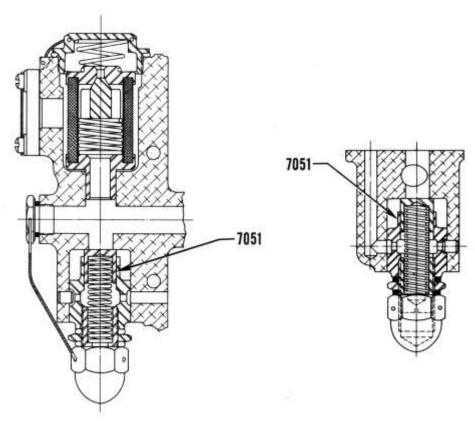
#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



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

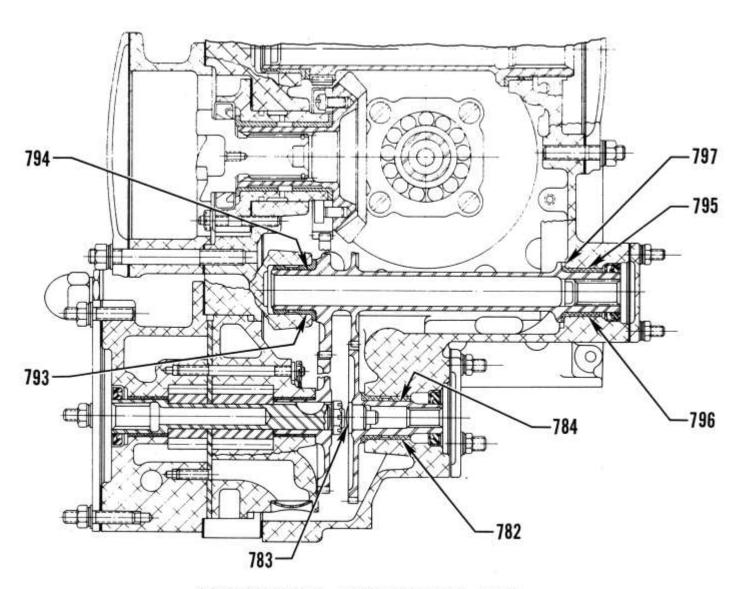
#### Tachometer Drive



Oil Relief Valves

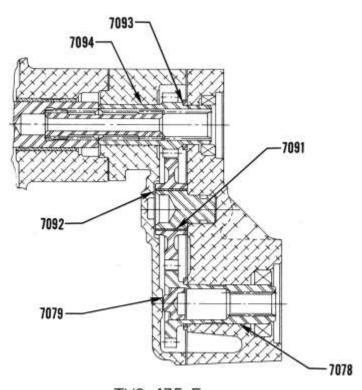
4-15

#### **PART IV – VERTICAL ENGINES**

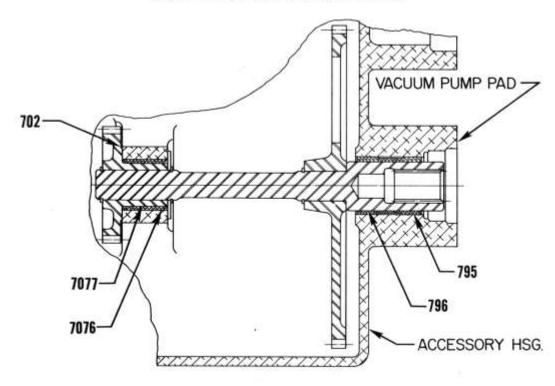


CROSSWISE ACCESSORY HSG.

#### **PART IV – VERTICAL ENGINES**

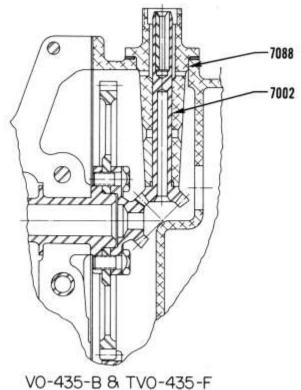


TVO-435-F Vacuum Pump and Fuel Pump Dual Drive

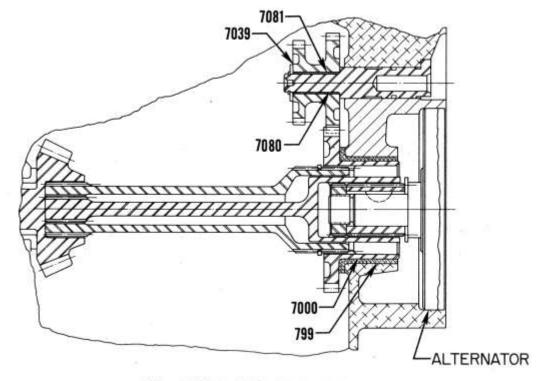


VO-435-BIA & TVO-435-F Vacuum Pump Drive

#### **PART IV – VERTICAL ENGINES**



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

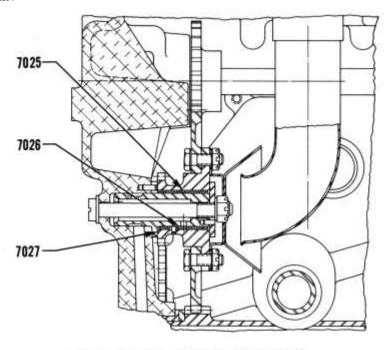


VO-435-B & TVO-435-F

Vacuum, Magneto and Alternator Drive

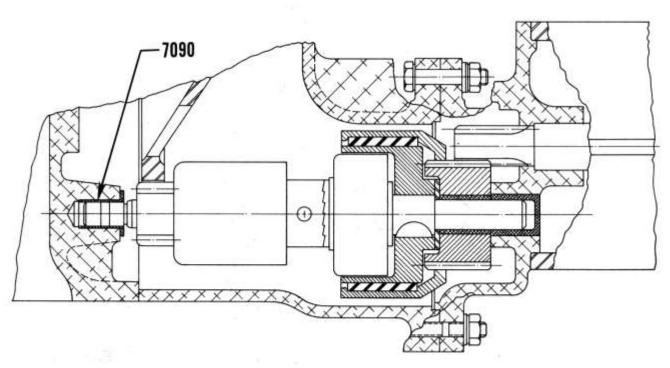
#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



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

Magneto and Tachometer Idler Gear



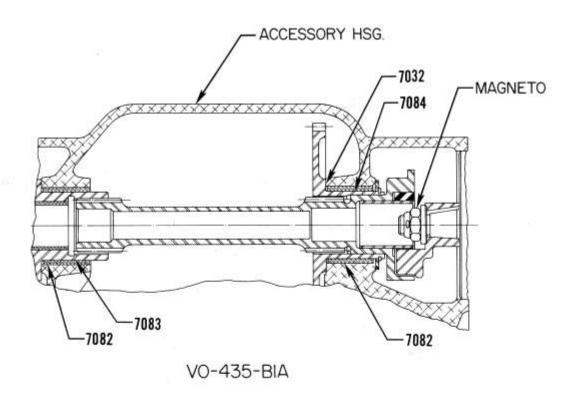
VO-435-B & TVO-435-F

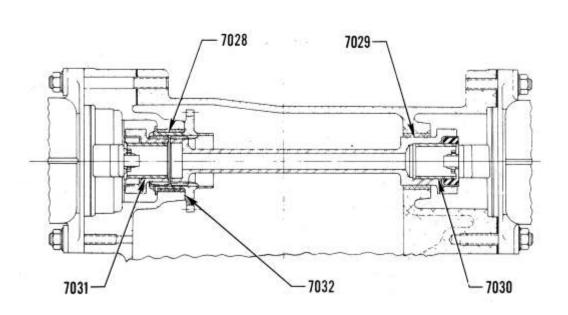
**Bendix Drive** 

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#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



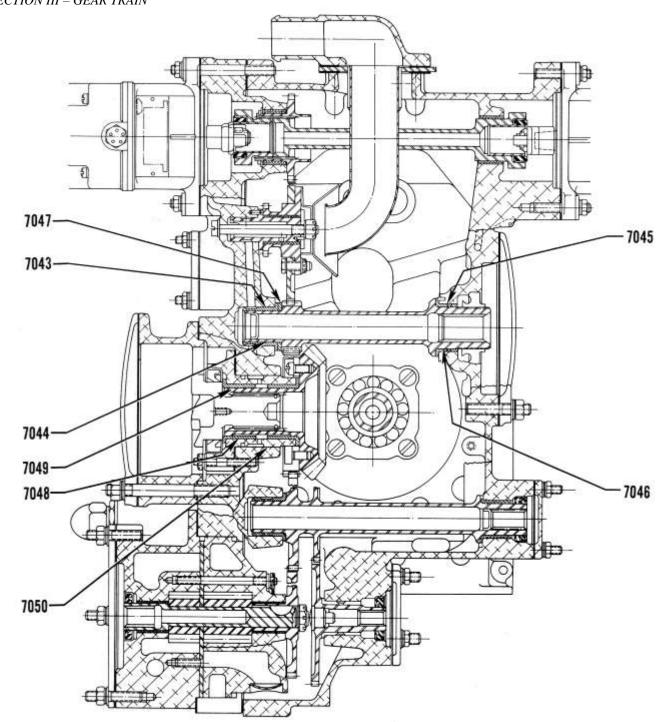


VO, TVO-435-A & VO, TVO-540

**Magneto Drives** 

#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN

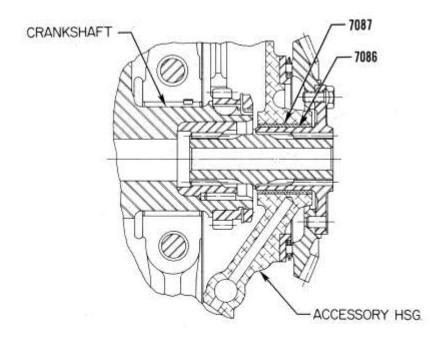


VO, TVO-435-A & VO, TVO-540

**Generator and Starter Drives** 

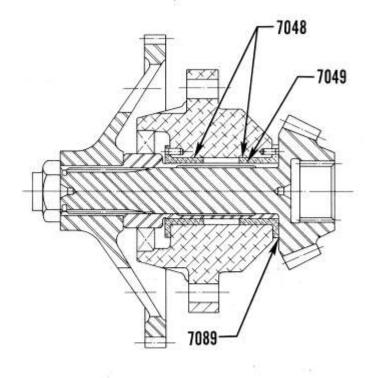
#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



VO-435-BIA

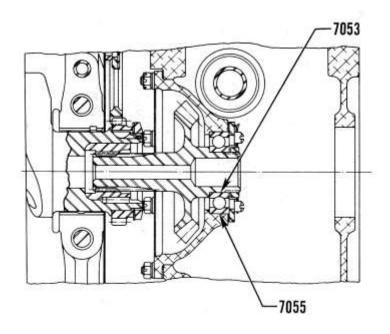
#### Accessory Drive Gear



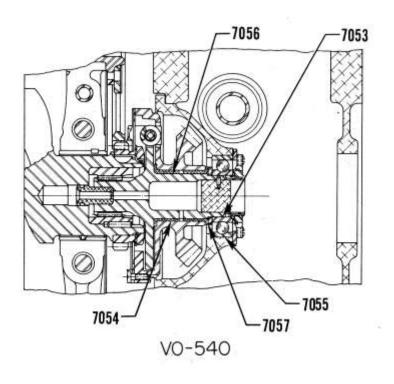
VO-435-BIA

Starter Drive

#### **PART IV – VERTICAL ENGINES**



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



Accessory Drives

### PART IV – VERTICAL ENGINES

#### SECTION IV – BACKLASH

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
808	L1	Oil Pump Impellers			.005	
					.015	.020
	L-V	Oil Pump and Scavenge Pump			.008	
		Impellers			.015	.020
825	ALL	Crankshaft Timing Gear and			<u>.004</u>	
		Camshaft Gear			.015	.020
866	L-V	Electric Tachometer Drive Gear				
		(Magneto Idler Hub) and			<u>.004</u>	0.50
0.45	* **	Tachometer Driven Gear			.015	.020
867	L-V	Generator Drive Gear and			.004	0.20
0.50		Magneto Drive Idler Gear			.015	.020
868	L-V	Magneto Drive Shaft (Spline)			001	
		and Magneto Drive Shaftgear			<u>.001</u>	000
0.60	7 37	(Spline)			.005	.008
869	L-V	Magneto Drive Shaftgear			001	
		(Spline) and Magneto Drive			.001 .005	.008
	L1	Coupling (Spline)  Magneto Drive Shaft (Spline)			.003	.008
	LI	and Magneto Drive Coupling			001	
		(Spline)			.001 .0045	.0075
870	L-V1	Rear Crankshaft Spline Bushing			.002	.0073
670	L-V1	and Accessory Gear (Spline)			.002	.018
	L1	Rear Crankshaft Spline Bushing			.0073	.010
	Li	and Accessory Drive Quill Shaft			.004	
		(Spline)			.0073	.018
	V	Rear Crankshaft Spline Bushing				1020
		and Accessory Drive Shaft			.002	
		(Spline)			.0073	.018
871	L-V	Accessory Drive Gear and			.004	
		Starter Drive Gear			.008	.015
	L1	Accessory Drive Gear and			.002	
		Starter Drive Gear			.016	.022
	L1	Starter Drive Shaftgear and			.000	
		Starter Drive Gear (Spline)			.002	.004
872	L-V	Accessory Drive Gear and			.004	
		Generator Drive Gear			.015	.020
	L1	Alternator Drive Shaft (Spline)				
		and Vacuum and Magneto Drive			<u>.001</u>	
		Shaft (Spline)			.004	.006
	L1	Alternator Drive Shaft (Spline)			.001	0
052		and Alternator (Spline)			.005	.007
873	L-V	Accessory Drive Gear and			.004	020
07.4	1 37	Vacuum Pump Shaftgear			.015	.020
874	L-V	Vacuum Pump Shaftgear and Oil			<u>.004</u>	020
004	T 1	Pressure Scavenge Pump Gear			.015	.020
884	L1	Magneto Drive Idler Gear and			<u>.006</u>	020
	T 1	Magneto Driven Gear			.014	.020
	L1	Magneto Drive Gear and			<u>.006</u>	020
		Magneto Idler Drive Gear	l		.014	.020

#### **PART IV – VERTICAL ENGINES**

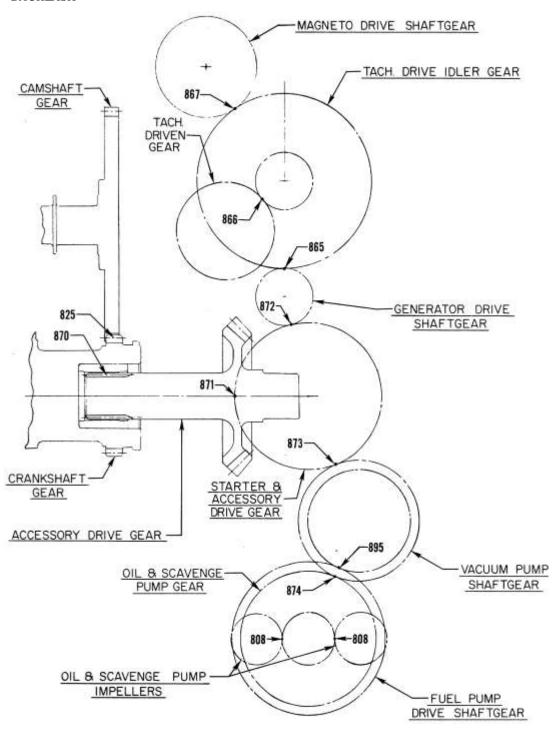
#### SECTION IV - BACKLASH

			Dime	Dimensions		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			.006 .014	.020
897	L1	Tachometer Drive Gear and Tachometer Drive Shaftgear			.002 .006	.010
898	L1	Magneto Gear (Spline) and Magneto Drive Shaft (Spline)			.001 .0045	.0075
899	L1	Starter Drive Shaftgear (Spline) and Vacuum, Magneto Shaft (Spline)			<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			.005 .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

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#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH

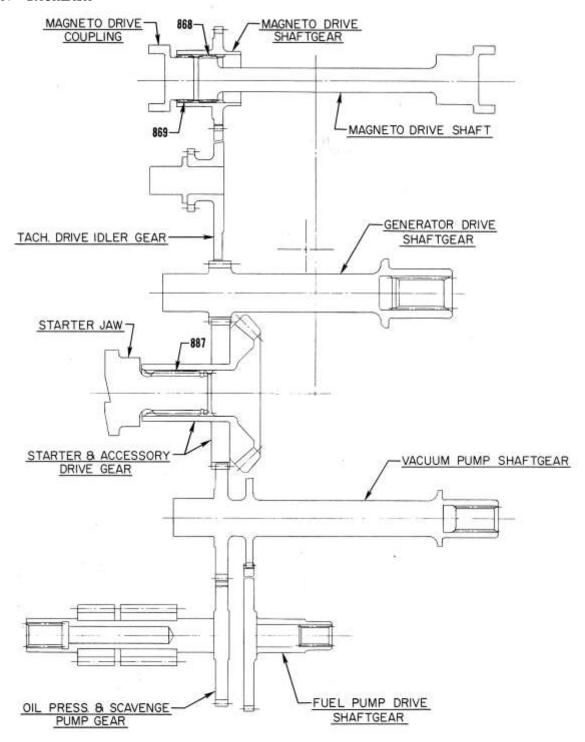


VO, TVO-435-A & VO, TVO-540
VIEWING LEFT SIDE OF ENGINE

Accessory Drives

#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH

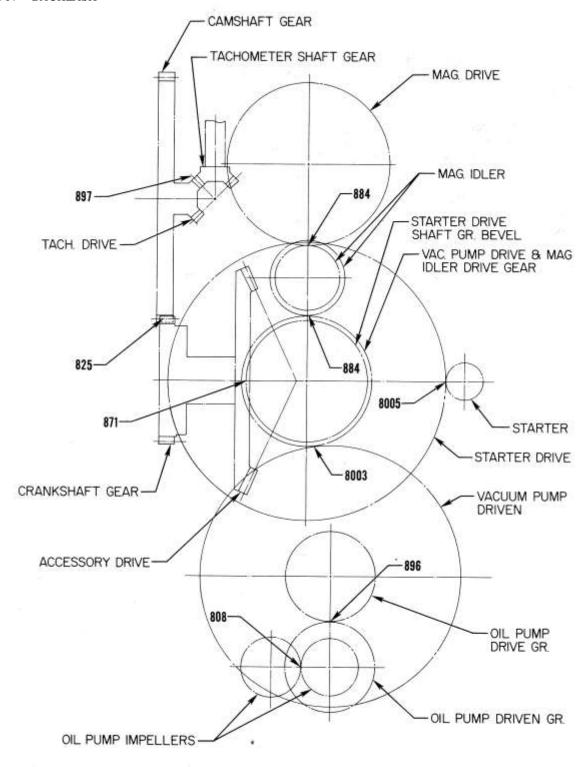


VO-TVO-435-A & VO, TVO-540 REAR OF ENGINE

**Accessory Drives** 

#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH

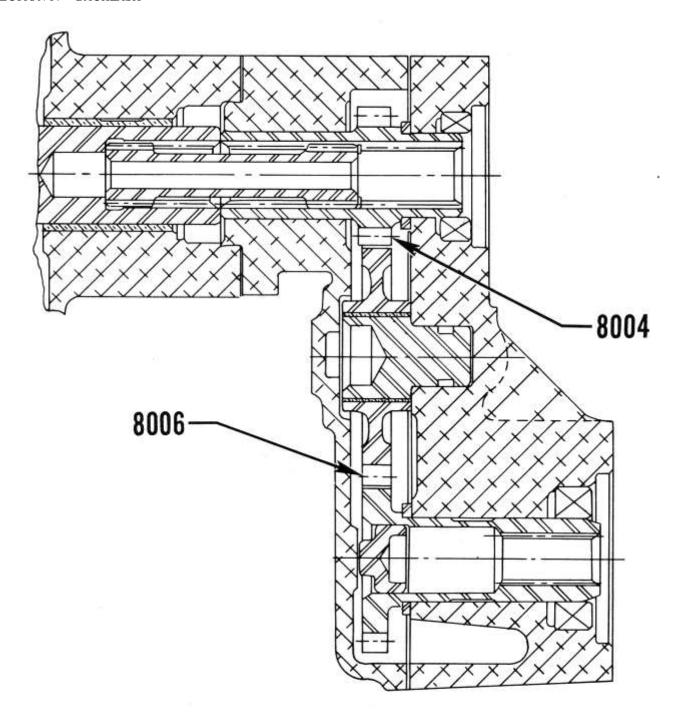


VO-435-BIA LEFT SIDE OF ENGINE

Accessory Drives

#### **PART IV – VERTICAL ENGINES**

SECTION IV – BACKLASH

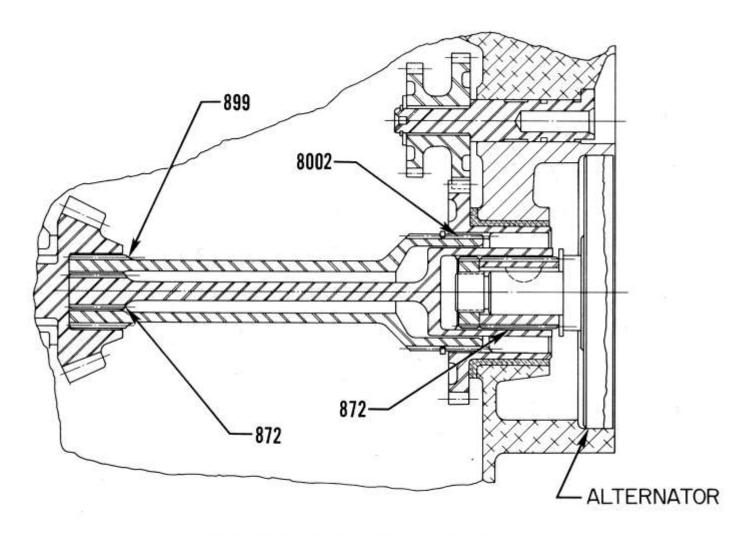


TVO-435-F

**Vacuum Pump and Fuel Pump Dual Drives** 

#### **PART IV – VERTICAL ENGINES**

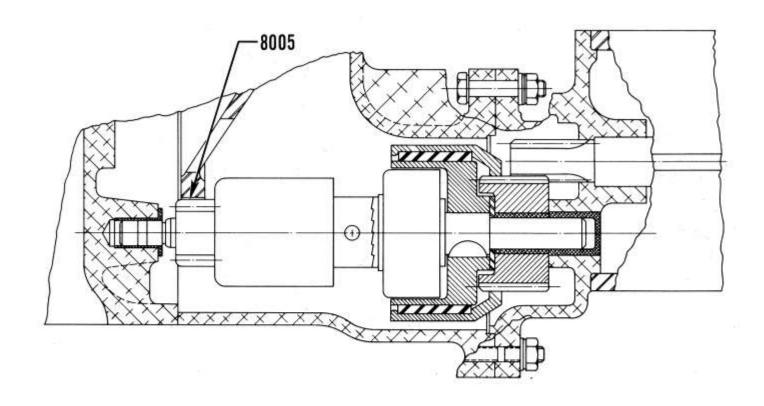
SECTION IV - BACKLASH



VO-435-B & TVO-435-F

#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH



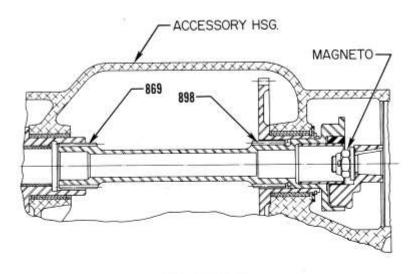
VO-435-B & TVO-435-F

**Bendix Drive** 

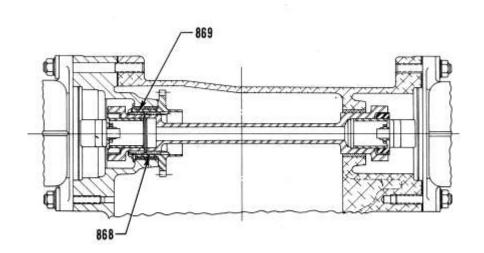
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#### **PART IV – VERTICAL ENGINES**

SECTION IV – BACKLASH



VO-435-BIA

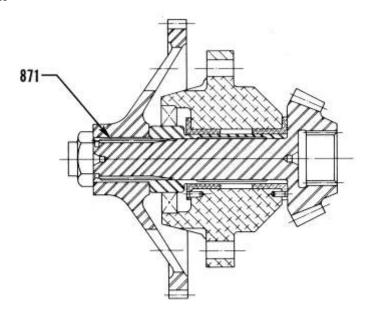


VO, TVO-435-A & VO, TVO-540

**Magneto Drives** 

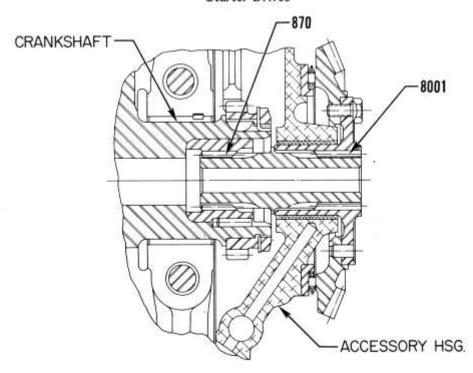
#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH



VO-435-BIA

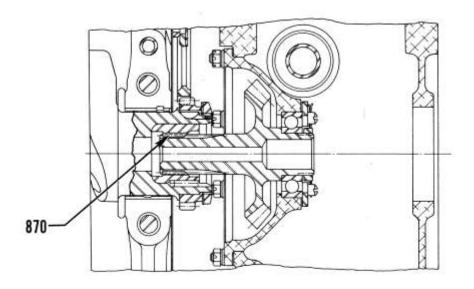
#### Starter Drives



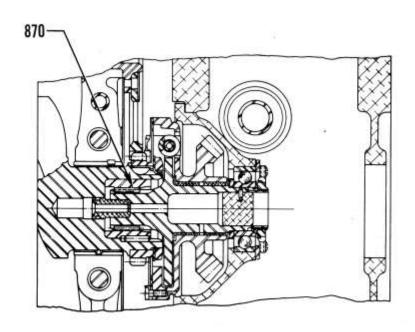
VO-435-BIA Accessory Drive Gear

#### **PART IV – VERTICAL ENGINES**

SECTION IV – BACKLASH



VO, TVO-435-A & TVO-540



VO-540

**Accessory Drives** 

#### **PART IV – VERTICAL ENGINES**

 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 

Ref.	Chart	Thread Size	Nomenclature	Torque Limits
900	L	3/8-24	Connecting Rod Nuts	480 in. lbs.
	V	3/8-24	Connecting Rod Bolt and Nut –	
			Tighten to This Length	2.255-2.256
901	ALL	1/2-20	Oil Pump Shaft Nut	360-480 in. lbs.
903	ALL	3/8-24	Magneto Nut (To attach drive	
			member to magneto) – Steel Bushing	200 : 11
004	ATT	10.22	Complete N. 42 (To attack to a transfer	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)	30 III. 103.
700		0,10 10	Zimust i sit stuus (Zii ing i sique)	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	20.1
012	11121	1 /1 C 27 NDT	Dia Gali Managara	30 in. lbs.
913	L1-L2-V	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 in. lbs.
914	V-V1	1/8-27 NPT	Injector Nozzle in Cylinder Head	100 III. 108.
714	V-V1	1/0-2/111	injector rozzie in Cymider riead	60 in. lbs.
919	ALL	1/4 Hex Head	Hose Clamps (Worm Type)	00 III. 105.
		and Below	Jr.,	20 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.
020			Retorque After Run-In	25 in. lbs.
920	ALL		Cylinder Head Drain Back Hose	10 : 11
921	L2-V1		Clamp Exhaust Clamp – Coupling – V-Band	10 in. lbs.
921	1.2- V 1		(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	25-50 inlbs.*
			injector/primer fuel line (Both Ends)	
			r tight, then continue tightening the nut w	
additi			in excess of 50 inlbs. can result in dam	
		ase Parting Flange	Nuts' Tightening Procedures – See later	st revision of Service
933	Instruction No. 1029.		Accessory Drive Shaft Nut	75-125 ft. lbs.
933	ALL		Crankshaft Gear Retaining Nut	150 ft. lbs.
234	1111	1	Crankonari Ocai Ketaning Nut	150 11. 108.

#### **PART IV – VERTICAL ENGINES**

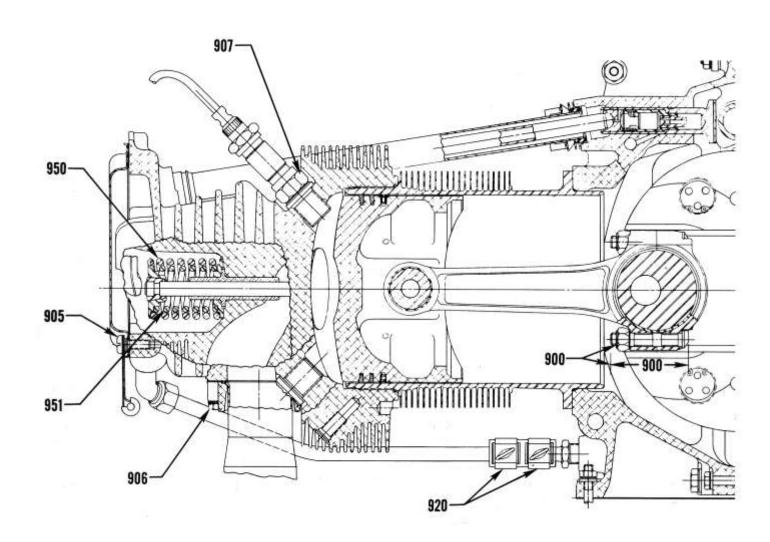
 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 

Ref.	Chart	Thi	read Size		Nomenc	lature				Torqu	e Limits
938	ALL	1/4	-28		Thin Slo	Thin Slotted Nut (38 in. lbs. plus torque					
					required	to reach	next lockir	ig slot)	)		
											38 in. lbs.
942	ALL		1/8-27 NPT			tor Drain					0-60 in. lbs.
943	V	10-	-32			(To attac	h necessary	drive	couplin	_	20 1 11 .
944	V				plate)	ton Thuot	tle Lever S				5-30 in. lbs. 0-28 in. lbs.
944	L1						Shaft and A		OFT	20	<i>J</i> -28 III. 108.
243	LI						thing Screw		or y	100-	-120 in. lbs.
		l	9	FCTIO		SPRIN(				100	120 III. 103.
				T	1 <b>4 V</b> —	JI KIIW	Jb I	1	CC	OMP. LO	A D
							Length			JMII . LO.	AD 
				]	Lyc.	****	at Comp.	.   1	Ifr.	Mfr.	Service
Ref.	G1				rt No.	Wire	Length		Iin.	Max.	Max.
	Chart	Nomeno				Dia.					
950	ALL	Outer Valve	Springs								100 lb.
		(Angle)	~ .	683	26	.177	1.46 in.	10	3 lb.	111 lb.	min.
	ALL		Valve Springs		11706	100	1 42 :	11	4 11.	10411	111 lb.
951	ALL	(Angle) Auxiliary Va	1	683	-11796	.182	1.43 in.		4 lb. 5 lb.	124 lb.	min. 70 lb.
931	ALL	Springs (Ang			28 -11797	.142	1.33 in.		3 lb.	83 lb.	min.
952	L-V	Check Valve		LW	-11///	.172	1.55 III.	1.	710.	05 10.	111111.
752	L	Lycomir		1	Free						
		Numb			ength						
					- 8						.69 lb.
		654-	-B			.031	1.03 in.	.74	4 lb.	.94 lb.	min.
											3.10 lb.
		7370	61	2	2.065		1.03 in.	3.1	5 lb.	3.35 lb.	min.
953		Oil Pressu	re Relief			1	ı	<u> </u>	Į.		
		Valve S	pring								
		Lycoming	Identi	fication							
		Part		Free							
		Numbers	Dye	Length		1		1			
	L-V	68542	None	2.38	.067	1.66		5 lb.		7 lb.	14 lb. min.
	L-V	LW-14029	White	2.28	.072	1.66	in. 2	20 lb.	2	2 lb.	17 lb. min.
954		Accessory Dr	rive Coup	oling Spri	ng						
		Lycoming									
		Part	- ·	.1							
		Numbers	Free Le	ngth							
	V – AS										
	APPLICABLE	74616	1.25		.092	1.10	in. 23	lb.	261	b.	20 lb.

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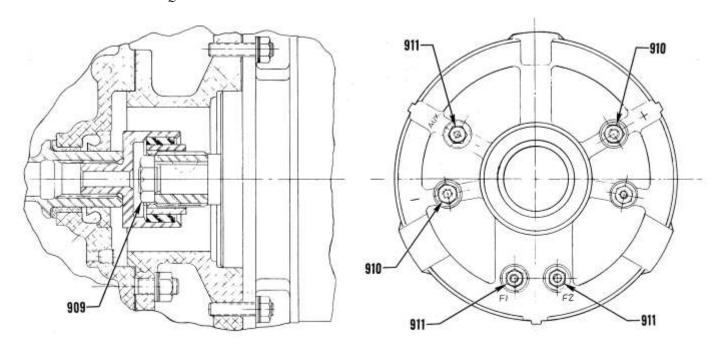
#### **PART IV – VERTICAL ENGINES**

 $SECTION\ V-SPECIAL\ TORQUE\ AND\ SPRINGS$ 

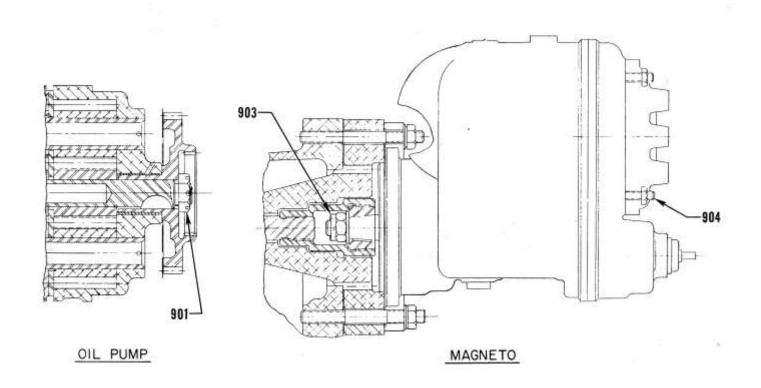


#### **PART IV – VERTICAL ENGINES**

SECTION V – SPECIAL TORQUE AND SPRINGS



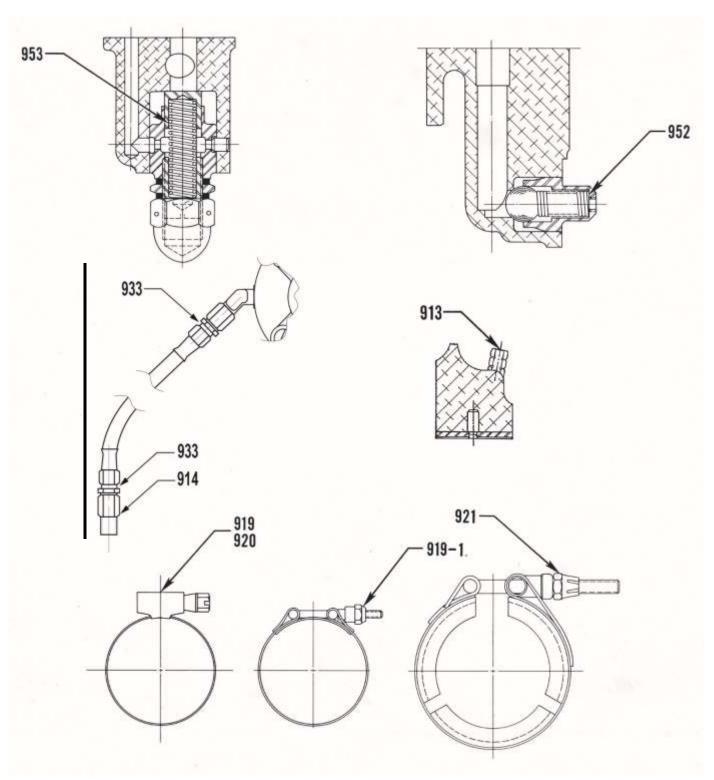
#### ALTERNATOR & ALTERNATOR DRIVE



**Engine Accessories and Hardware** 

#### **PART IV – VERTICAL ENGINES**

SECTION V – SPECIAL TORQUE AND SPRINGS



**Engine Accessories and Hardware** 

#### 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		TABLE II			
	В	OLTS, SCRE	PIPE PLUGS				
Throad	Tor	que	Thread	Torq	ue	Thread	Torque
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	1 nread	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
ти	IN NUTS (1/2	DIA OF DO	3/4-14 NPT	230 to 252			
111	IIIN INO 13 (1/2	L DIA. OF BU	UE	1-11-1/2 NPT	315 to 347		

		1	_						
TABLE III	TABLE III				TABLE IV				
CRUSH TYPE GAS	KETS		FLEXIBLE TUBE CONNECTIONS						
CROSH TITE GAS	CROSH TITE GASKETS				QUIVALENT FITT	ΓINGS)			
Thread Pitch on Part to be	ANGLE OF	TIIDN	TT. 1		Tomava In	I ha			
Tightened	ANGLE OF	FIUKN	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°		T	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. 1	Lbs.			
centering type, with the unbroken sur	face against tl	he flange	1/4	20	15				
	of the plug or part being tightened against the seal. Turn the				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							

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## SERVICE TABLE OF LIMITS PART IV – VERTICAL ENGINES

## STANDARD TORQUE (CONT.) UNLESS OTHERWISE LISTED

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

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