

# SERVICE TABLE OF LIMITS AND TORQUE VALUE RECOMMENDATIONS

### **NOTICE**

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

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

PART II INTEGRAL ACCESSORY DRIVE ENGINES

PART III GEARED ENGINES

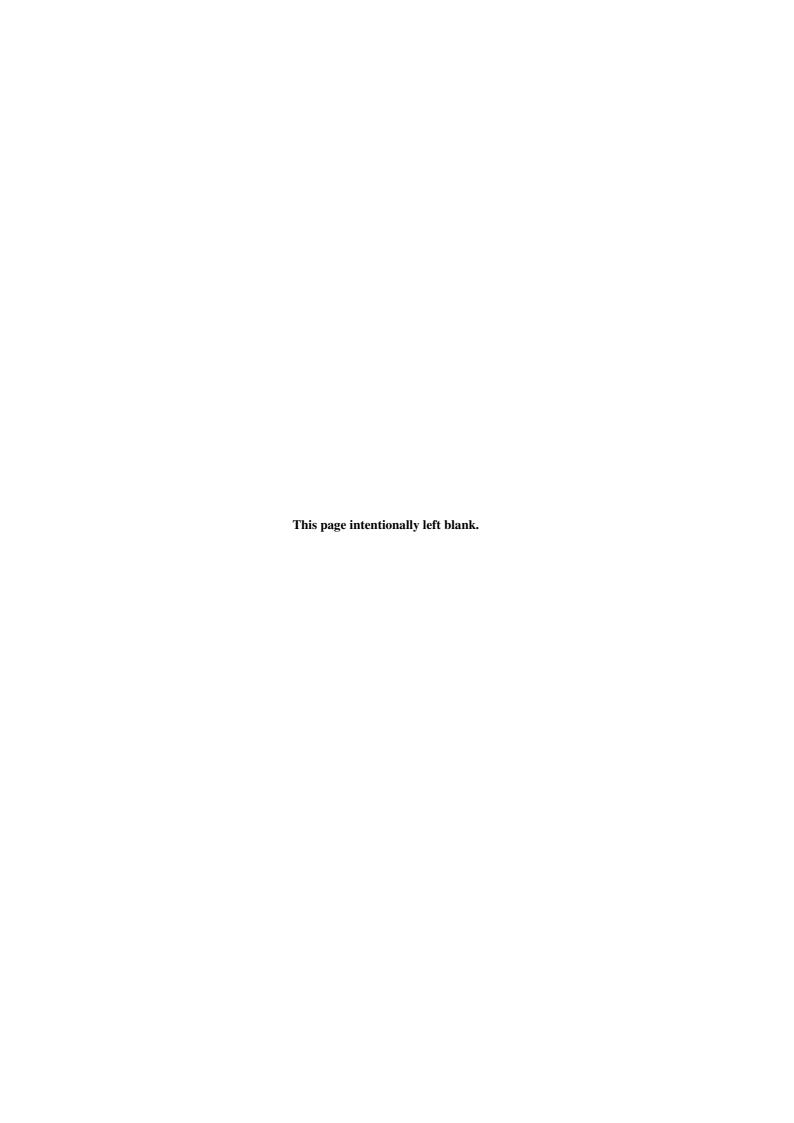
PART IV VERTICAL ENGINES (Excluding VO and IVO-360)

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

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

SSP-1776-5 April 13, 2020\*

<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. (1st column) The numbers in the first column headed "Ref." are shown as a reference number to

locate the area described in the "Nomenclature" column. This number will be found in a diagram at the end of each section indicating a typical section where the limit is

applicable.

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

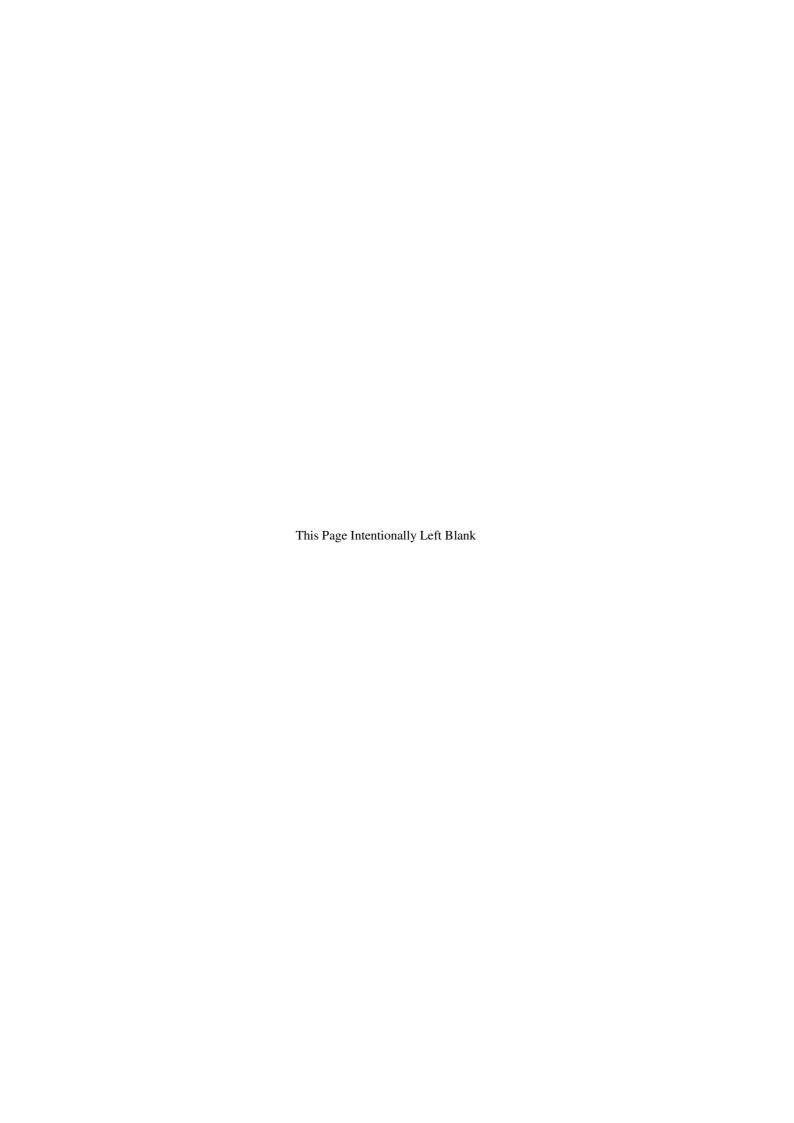
NOTE: In "Chart" column, a number appearing after a letter indicates an exception to the basic model. For example, A1 (O-235-F. -G, -J, -K, -L, -M, -N -P) is an exception to the basic model A (O-235-C, -E, -H)

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

SECTION II SECTION IV SECTION IV	500 SERIES 600 SERIES 700 SERIES 800 SERIES 900 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT CYLINDERS GEAR TRAIN BACKLASH (GEAR TRAIN) TORQUE AND SPRINGS
(A)		shrink fits controlled by machining, fits that may readily be wear does not normally occur. In each case, the fit must be held rance.
(B)	Side clearance on pisto	on rings must be measured with face of ring flush with piston.
(D)	The dimensions show the piston pin.	n are measured at the bottom of the piston skirt at right angles to
(E)	Permissible wear of th on the diameter.	the crankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherein a d	efinite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or into	erference fit.
(WD)	Wide Deck Crankcase	2.

SSP-1776-5-PT1 April 13, 2020\*

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

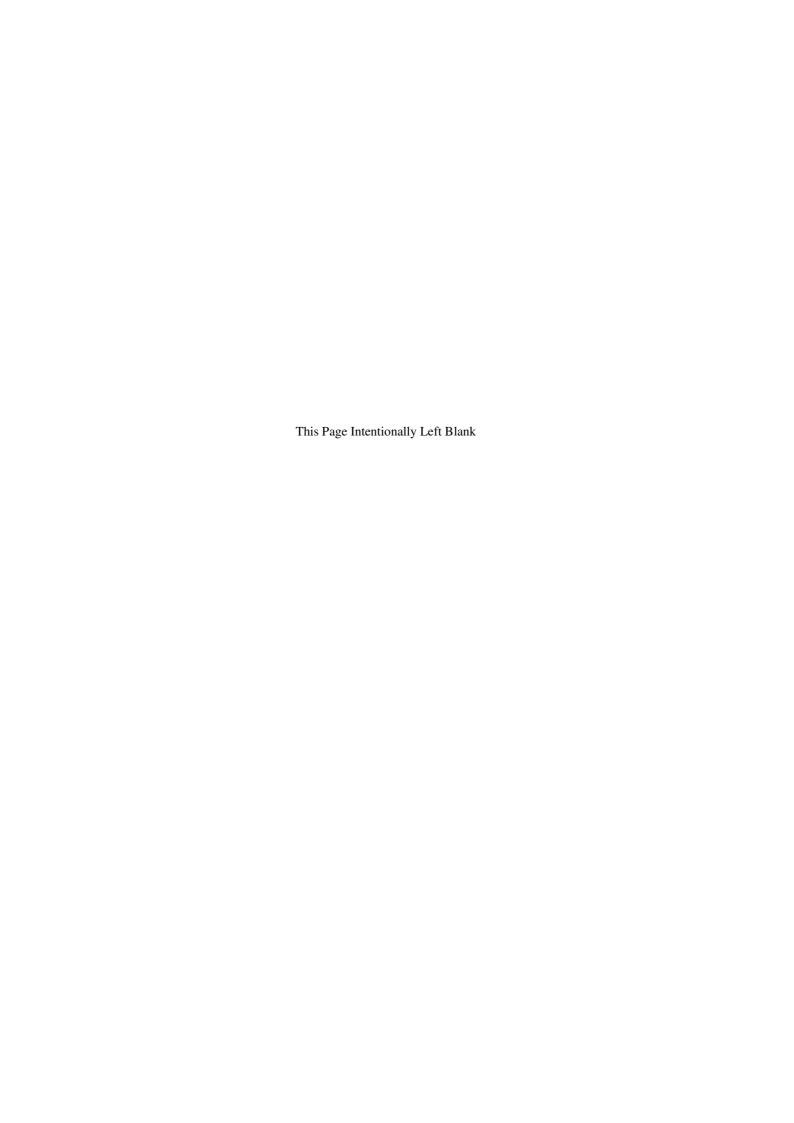




# TECHNICAL PUBLICATION REVISION

RE VISION					
REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE		
SSP-1776-5-PT1	Service Table of Limits	SSP-1776	October 28, 2013		
PREVIOUS	REVISIONS	CURRENT	REVISION*		
Febru 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	; IO  ther 2016  te, 1-8, 1-30  90-C to Chart  90-C to Piston Application Table  Reference #823, backlash	CURRENT REVISION  April 2020  Title Page, 1-1, 1-7, 1-8, 1-9, 1-10, 1-1  • Added Serial Number identification for S10 - HIO-360-A  • Added new engine model listing for IO reference number S11  • Added new Chart reference number S12 engines without S/N suffix A  • Deleted HIO-360-E from Chart reference number S14  • Added new Chart reference number S13 and in Sections I, II, and V  • Revised burnishing instructions for conbushing in reference number 600  • Revised the Mfr. Min. & Max. Clearance Gap (Compression) Nitrided Cylinders and Piston Ring Gap (Oil) in reference			
Apr Title Page, 1-1, 1-10, 1-11, 1-34  Added HIO-360-F1AD, H  Added S12 designation for applicable Revised Ref. number 512 Body) for clarity Revised Piston Application numbers  Added NOTE to refer to the Instruction No. SI-1037 for number applicability Deleted obsolete part numbers in Piston Deleted NOTES that refer Application Table Updated Lycoming P/N are band couplings for Ref. not Added Ref. number 933 to	il 2018 1-3, 1-7, 1-8, 1-9, 4, 1-35, 1-36, 1-37 IO-390-A, and TEO-540 to Chart r HIO-360-F1AD to tables where (Tappet Plunger Assembly and n Table to list only piston part ne latest revision of Service or engine model and piston part bers and Notes associated with on Application Table ence S.I. 1243 in Piston and Vendor P/N for one of the V-				

Deleted obsolete part numbers for Ref. numbers 950 and 951



# PART I – DIRECT DRIVE ENGINES

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

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	A	All Main Bearings and Crankshaft	IVIUA	17142.46	.0025L .0055L	.0060L
	B-D-G-J-S-T-Y-BD-BE-AF	Main Bearings and Crankshaft (Thin Wall Bearing09 Wall Approx.)			.0015L .0045L	.0060L
	B-G-J-S-T-Y-AF	Main Bearings and Crankshaft (Thick Wall Bearing16 Wall Approx.)			.0011L .0041L	.0050L
	A	Diameter of Main Bearing Journal on Crankshaft	2.3735 2.375	(E)		
	B-D-G-J-S-T-Y-BD-BE	Diameter of Main Bearing Journal on Crankshaft (2-3/8 in. Main)	2.3745 2.376	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Main Bearing Journal on Crankshaft (2-5/8 in. Main)	2.6245 2.626	(E)		
	S8-S10-S13	Diameter of Front Main Bearing Journal on Crankshaft (2-3/8 in. Main)	2.3750 2.3760	(E)		
	S1-S11-S12-T1-T3-AF	Diameter of Front Main Bearing Journal on Crankshaft (2-5/8 in. Main)	2.6245 2.6255	(E)		
500	A-B-B1-D-G*-BD-BE	Crankcase Bearing Bore Diameter (All) (Thin Wall Bearing) (2-3/8 in. Main)	2.566 2.567	2.5685		
	G**-J-S-T-Y	Crankcase Bearing Bore Diameter (All Except Front) (Thick Wall Bearing) (2-3/8 in. Main)	2.6865 2.6875	2.6890		
	T1-T3-AF	Crankcase Bearing Bore Diameter (Front Only) (Thin Wall Bearing) (2-5/8 in. Main)	2.816 2.817	2.8185		
	T1-T3-AF	Crankcase Bearing Bore Diameter (All Except Front) (Thick Wall Bearing) (2-5/8 in. Main)	2.9365 2.9375	2.9390		
	S1-S12-T-AF	Crankcase Bearing Bore Diameter (All) (Thin Wall Bearing) (2-5/8 in. Main)	2.816 2.817	2.8185		
	G**-J-S-T-Y  *O-320-A, -E Narrow Deck,  **O-320-A, -E Wide Deck	Crankcase Bearing Bore Diameter (Front Only) (Thin Wall Bearing) (2-3/8 in. Main)	2.566 2.567	2.5685		
501	ALL	Connecting Rod Bearing and Crankshaft			.0008L .0038L	.0050L
	A-B-D-G-J-S-T-Y-BD	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	2.1235 2.125	(E)		
	S-T-AF	Diameter of Connecting Rod Journal on Crankshaft (2-1/4 in.)	2.2485 2.250	(E)		
	A-B-D-G-J-S-T-Y-BD-BE	Connecting Rod Bearing Bore Diameter (2-1/8 in.) (Measured At Axis 30° on Each Side)	2.2870 2.2875	(2)		

# PART I – DIRECT DRIVE ENGINES

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

			Dime	nsions	Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
501	S-T-AF	Connecting Rod Bearing Bore Diameter (2-1/4 in.) (Measured At Axis 30° on Each Side)	2.4205 2.4210			
502	ALL	Connecting Rod - Side Clearance			<u>.004L</u> .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 Main Bearing				
	4 CYLINDER	Mounted on No. 1 and 4 Journals Max. Run-Out No. 2 Journal			.002	.002
		Mounted on No. 1 and 4 Journals Max. Run-Out No. 3 Journal			.005	.0075
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
	6 CYLINDER	Mounted on No. 2 and 5 Journals Max. Run-Out No. 1 Journal			.002	.002
	6 CYLINDER	Mounted on No. 2 and 5 Journals Max. Run-Out No. 3 Journal			.005	.0075
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
		Mounted on No. 3 and 5 Journals Max. Run-Out No. 4 Journal			.003	.0045
	8 CYLINDER	Mounted on No. 2 and 6 Journals Max. Run-Out No. 1 Journal			.002	.002
		Mounted on No. 2 and 4 Journals Max. Run-out No. 3 Journal			.003	.0045
		Mounted on No. 3 and 5 Journals Max. Run-Out No. 4 Journal			.003	.0045
		Mounted on No. 4 and 6 Journals Max. Run-Out No. 5 Journal			.003	.0045
		Mounted on No. 2 and 6 Journals Max. Run-Out No. 3, 4 and 5 Journals			.005	.0075
506	ALL	Crankshaft and Crankcase Front End Clearance			<u>.009L</u> .016L	.026L
507	ALL	Clearance – Front Face of Crankshaft Oil Slinger to Front Face of Recess in Crankcase (Crankshaft Against Thrust Face)			.002 .007L	(A)

# PART I – DIRECT DRIVE ENGINES

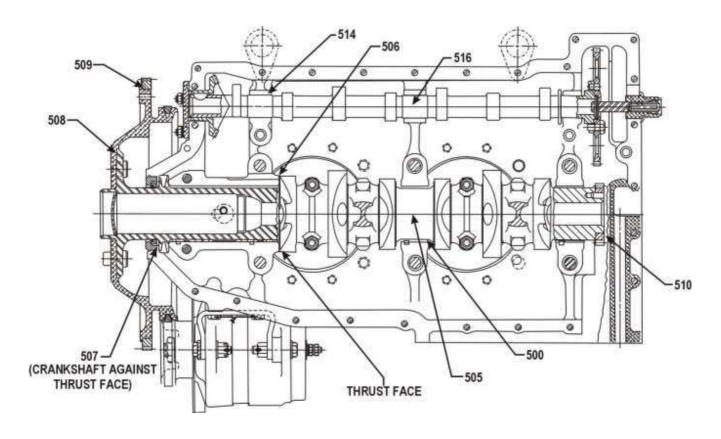
 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
508	ALL	Crankshaft – Prop. Flange				
		Run-Out			.002	.005
509	ALL	Starter Ring Gear and Support			.014T	
					.022T	(A)
510	A-B-D-G-J-S-T-Y-AF-BD-BE	Crankshaft Timing Gear and			.0005T	
		Crankshaft			.0010L	(A)
	A-B-D-G-J-S-T-Y-AF	Tappet Body and Crankcase			.0010L	
					.0033L	.004L
511	BD-BE	Tappet Body and Crankcase			.0010L	
					.0030L	.004L
	A-B	O.D. of Tappet	.6232			
	(Solid Tappets)		.6240	.6229		
	B1-D-G-J-S-T-Y-AF	O.D. of Tappet	.7169			
	(Flat Tappets)		.7177	.7166		
	B1-D-G-J-S-T-Y-AF	O.D. of Tappet	.8420			
	(Roller Tappets)		.8428	.8417		
	BD-BE	O.D. of Tappet	.8740			
			.8745	.8737		
	A-B	I.D. Tappet Bore in Crankcase	.6250			
	(Solid Tappets)		.6263	.6266		
	B1-D-G-J-S-T-Y	I.D. Tappet Bore in Crankcase	.7187			
	(Flat Tappets)		.7200	.7203		
	B1-D-G-J-S-T-Y-AF	I.D. Tappet Bore in Crankcase	.8437			
	(Roller Tappets)		.8445	.8448		
	BD-BE	I.D. Tappet Bore in Crankcase	.8755			
		(Small Bore Tappet)	.8773	.8776		
	BD-BE	I.D. Tappet Bore in Crankcase	.9545			
		(Large Bore Tappet)	.9555			
512	All Models Using Roller	Tappet Plunger Assembly and			.0010L	.0067L
	Tappets	Body – (Roller Tappets)			.0047L	.0007L
	All Models Using Straight Body	Tappet Plunger Assembly and			.0010L	.0067L
	Tappets	Body – (Straight Body Tappets)			.0047L	.0007L
	All Models Using Hyperbolic	Tappet Plunger Assembly and			.0010L	.0087L
	Tappets	Body – (Hyperbolic Tappets)			.0067L	.0087L
513	ALL	Tappet Socket and Body			.002L	
		(Hyperbolic Flat and Roller			.007L	.009L
		Tappets)				
514	ALL	Camshaft and Crankcase			.002L	
					.004L	.006L
515	ALL	Camshaft – End Clearance			.002L	
					.009L	.015L
516	ALL	Camshaft Run-Out at Center			.000	
		Bearing Journal			.001	.006
517	All Models Using	Counterweight Bushing and			.0013T	
	Counterweights	Crankshaft			.0026T	(A)
518	All Models Using	Counterweight Roller – End			.007L	
	Counterweights	Clearance			.025L	.038L
519	All Models Using	Counterweight and Crankshaft –			.003L	
	Counterweights	Side Clearance*	1		.013L	.017L
	*Measure below roller next to flat				<u> </u>	

# PART I – DIRECT DRIVE ENGINES

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

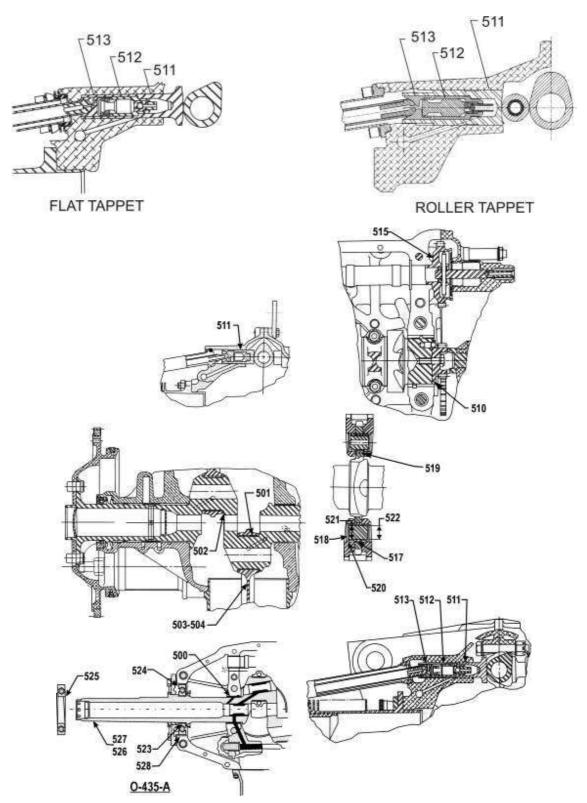
			Dimensions		Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
520	All Models Using Counterweights	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	All Models Using Counterweights	I.D. of Counterweight Bushing	<u>.7485</u> .7505	.7512		
522	All (AS APPLICABLE)	O.D. of Counterweight Roller (See latest revision of Service Instruction No. 1012)				
523	D	Thrust Bearing and Propeller Shaft			<u>.0000</u> .0012L	.002L
524	D	Thrust Bearing and Thrust Bearing Cap Clamp Fit (Shim to this Fit)			.003T .005T	(A)
525	D	Thrust Bearing Tilt		.027	' Tilt	
526	D	Crankshaft Run-Out – Rear Cone Location				.003
527	D	Crankshaft Run-Out – Front Cone Location				.007
528	D	Thrust Bearing and Thrust Bearing Cage			<u>.0016L</u> .0034L	.0045L



Longitudinal Section Thru Engines

### **PART I – DIRECT DRIVE ENGINES**

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



Crankcase, Crankshaft, Camshaft and Related Parts

1-5

# PART I – DIRECT DRIVE ENGINES

			Dimensions		Clearances	
			Mfr. Min.		Mfr. Min.	
D.e	Ch 4	NI	& Max.	Service	& Max.	Service
Ref.	Chart	Nomenclature		Max.	<u> </u>	Max.
600	ALL	Connecting Rod and Connecting			to be burnish	
	ATT	Rod Bushing		01K28983	is <u>not</u> burnish	led in place
	ALL	Finished I.D. of Connecting Rod Bushing	1.1254 1.1262			
601	A-B-D-G-J-BD	Length Between Connecting	6.4985			
001	A-B-D-G-J-BD	Rod Bearing Centers	6.5015			
	S-T-Y-AF-BE	Length Between Connecting	6.7485			
	S I I M BL	Rod Bearing Centers	6.7515			
602	ALL	Connecting Rod Bushing and	0.7515		.0008L	
002	1.02	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	A-G-J-S-T-AF-BD-BE	Piston and Piston Pin Plug			<u>.0002L</u>	
					.0010L	.002L
	A-G-J-S-T-AF-BD-BE	*Diameter of Piston Pin Plug	1.1242			
60.7			1.1247		000.57	
605	B-D-G-J-S-T-Y-AF	Piston Pin and Piston Pin Plug			.0005L	0051
	C I C T V A F	(Optional)	5655		.0025L	.005L
	G-J-S-T-Y-AF	*Diameter of Piston Pin Plug	<u>.5655</u>			
	B-D	Diameter of Distan Din Dlug	.5665			
	B-D	Diameter of Piston Pin Plug (Thin Wall Pin)	<u>.8405</u> .8415			
	*See latest edition of Service Inst		.0413			
606	A-B	Piston Ring and Piston – Side				
000	A B	Clearance (Top Ring Comp.)			.000	
		(Plain) Full Wedge			.004L	.006L (B)
	B-D	Piston Ring and Piston – Side			100.12	10002 (2)
		Clearance (Top Ring Comp.)			.0025L	
		(Chrome) Full Wedge			.0065L	.008L (B)
	G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			<u>.0025L</u>	
		Half Wedge			.0055L	.008L (B)
606	В	Piston Ring and Piston – Side				
		Clearance (2 <sup>nd</sup> Ring Comp.)			<u>.0025L</u>	
		(Chrome) Full Wedge			.0065L	.008L (B)
	A-B-D-G-J-S-T-Y-AF-BD-BE	Piston Ring and Piston – Side			000	
		Clearance (2 <sup>nd</sup> Ring Comp.) Full			<u>.000</u>	00(I (D)
	ī	or Half Wedge			.004L	.006L (B)
	J	Piston Ring and Piston – Side Clearance (3 <sup>rd</sup> Ring Comp.) Half			.000	
		Wedge			.004L	.006L (B)
606	ALL	Piston Ring and Piston – Side			.002L	.UUUL (D)
000	ALL	Clearance (Oil Regulating)			.002L .004L	.006L (B)
	A	Piston Ring and Piston – Side			.003L	.000L (D)
1		Clearance (Bottom)			.0055L	.007L(B)
	I .	Cicuration (Bottom)	I .	1	.00551	.00/L(D)

### 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 .065	.067
	ALL	Piston Ring Gap (Oil)			<u>.015</u> .040	.047
	A-T2	Piston Ring Gap (Oil Scraper) (All Barrels)			.015 .030	.047

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

		Piston Specifications	3	
8 Professional State of State	<u> </u>	Min. Piston Dia.		Max. Clearance
Piston Number	Тор	Bottom	Maximum Diameter	Piston Skirt & Cyl.
14B23917	4.3470	4.3555	4.3795	.021L
14B23918*	4.3290	4.3605	4.3805	.018L
14B23919	4.3470	4.3555	4.3795	.021L
14C28324	4.8395	4.8590	4.8805	.018L
14D21953-S	5.0790	5.1090	5.1305	.018L
14D23907	5.0790	5.1090	5.1305	.018L
14D23908*	5.0790	5.1090	5.1305	.018
14D23909*	5.0790	5.1090	5.1305	.018
14D23910*	5.0790	5.1090	5.1305	.018
14D23912*	5.0790	5.1090	5.1305	.018
14D23913	5.0790	5.1090	5.1305	.018L
14D23914*	5.0790	5.1090	5.1305	.018L
14D23915	5.0790	5.1090	5.1305	.018L
14D23916	5.0790	5.1090	5.1305	.018L
14D28056	5.0790	5.1090	5.1305	.018L
14E23911*	5.2720	5.3020	5.3235	.018L
70396†	4.8290	4.8620	4.8805	.018L
75984-S	4.8395	4.8590	4.8805	.018L
LW-10208-S	5.0790	5.1090	5.1305	.018L

### NOTES:

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

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

- \* High Compression.
- † Piston no longer available from Lycoming Engines.

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

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

# PART I – DIRECT DRIVE ENGINES

			Dimensions		Clearances	
			Mfr.	g .	Mfr.	g .
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.
611	A	Exhaust Valve Seat and Cylinder	wax.	Max.	.0065T	wax.
011	A	Head			.010T	(A)
	B-D-G-J-S-T-Y-BD-BE	Exhaust Valve Seat and Cylinder			.0045T	
		Head			.008T	(A)
	\$1-\$2-\$3-\$5-\$6-\$7-\$9-\$10-	Exhaust Valve Seat and Cylinder			<u>.0075T</u>	
	S11-S12-S13-S14-T2-T3-AF	Head			.011T	(A)
	A	O.D. Exhaust Seat	<u>2.0025</u>			
	B-D-G-J-S-T-Y-BD-BE	O.D. Exhaust Seat	2.004			
	B-D-G-J-S-1-1-BD-BE	O.D. Exhaust Seat	1.7395 1.741			
	S1-S2-S3-S5-S6-S7-S9-S10-	O.D. Exhaust Seat	1.9355			
	S11-S12-S13-S14-T2-T3-AF	G.D. Exhaust Scat	1.937			
	A	I.D. Exhaust Seat Hole in Cylinder	1.994			
		Head	1.996			
	B-D-G-J-S-T-Y-BD-BE	I.D. Exhaust Seat Hole in Cylinder	1.733			
		Head	1.735			
611	S1-S2-S3-S5-S6-S7-S9-S10-	Exhaust Seat Hole in Cylinder	<u>1.926</u>			
	S11-S12-S13-S14-T2-T3-AF	Head	1.928			
612	A	Intake Valve Seat and Cylinder			.0070T	(4)
	B-D-G-J-S-T-Y-AF-BD-BE	Head			.0105T	(A)
	B-D-G-J-S-1-Y-AF-BD-BE	Intake Valve Seat and Cylinder Head			<u>.0066T</u> .010T	(A)
	A	O.D. Intake Seat	2.0965		.0101	(A)
		G.D. Intake Seat	$\frac{2.0905}{2.0975}$			
	A1-B-D	O.D. Intake Seat	1.9265			
			1.928			
	B1-C-J-S-T-Y-BD-BE	O.D. Intake Seat	<u>2.0815</u>			
			2.083			
	S1-S2-S3-S5-S6-S7-S9-S10-	O.D. Intake Seat	<u>2.2885</u>			
	S11-S12-S13-S14-T2-T3-AF		2.290			
	A	I.D. Intake Seat Hole in Cylinder Head	2.087 2.089			
	A1-B-D	I.D. Intake Seat Hole in Cylinder	1.918			
1	AI-D-D	Head	1.918			
	B1-G-J-S-T-Y-BD-BE	I.D. Intake Seat Hole in Cylinder	2.073			
1		Head	2.076			
1	S1-S2-S3-S5-S6-S7-S9-S10-	I.D. Intake Seat Hole in Cylinder	2.280			
	S11-S12-S13-S14-T2-T3-AF	Head	2.282			
613	ALL	Exhaust Valve Guide in Cylinder			<u>.001T</u>	
		Head	<b>7</b> 0.55		.0025T	(A)
613	A-B-D-J	O.D. Exhaust Valve Guide	<u>.5933</u>			
1	Y	O.D. Exhaust Valve Guide	.5938			
1	1	O.D. Exhaust valve Guide	<u>.6267</u> .6272			
	G-J-S-T-AF-BD-BE	O.D. Exhaust Valve Guide	.6633			
1		5.5. Emiliant varie Galac	.6638			
	S1	O.D. Exhaust Valve Guide	.6953			
			.6958	<u> </u>		

# PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
613	A-B-D-G-J	I.D. Exhaust Valve Guide Hole in Cylinder Head	.5913 .5923			
	Y	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6247 .6257			
	G-J-S-T-AF-BD	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6613 .6623			
	S1	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6933 .6943			
614	ALL	Intake Valve Guide and Cylinder Head			.0010T .0025T	
	ALL	O.D. Intake Valve Guide	.5933 .5938			
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	.5913 .5923			
615	A-B-D	Exhaust Valve Stem and Valve Guide			.0020L .0038L	(A)
	A1-G-J-S-T-BD-BE	Exhaust Valve Stem and Valve Guide (Parallel Valve Heads)			.0040L .0060L	(A)
	Y	Exhaust Valve Stem and Valve Guide			.0035L .0053L	(A)
	S1-S2-S3-S5-S6-S11-S12-T2- T3-AF	Exhaust Valve Stem and Valve Guide (Angle Valve Heads)			.0037L .0050L	(A)
	S7-S9-S10-S13-S14	Exhaust Valve Stem and Valve Guide (Angle Valve Heads - Helicopter)			.0035L .0055L	(A)
	A-B-D	O.D. Exhaust Valve Stem	.4012 .4020			
	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		
	\$1-\$2-\$3-\$5-\$6-\$7-\$9-\$10- \$11-\$12-\$13-\$14-T2-T3-AF	O.D. Exhaust Valve Stem (Angle Valve Heads)	.4955 .4965	.4937		
			of .4937	llowable limitor .4915 is e only to inco		
	A-B-D	Finished I.D. Exhaust Valve Guide	.4040 .4050			
	A1-G-J	Finished I.D. Exhaust Valve Guide	.4370			
	Y	Finished I.D. Exhaust Valve Guide	.4375 .4385			

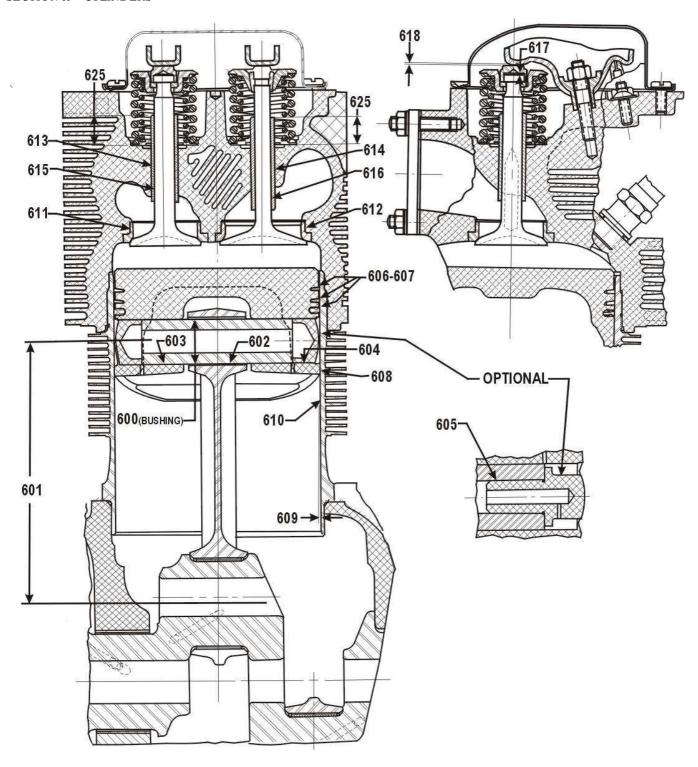
# PART I – DIRECT DRIVE ENGINES

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
615	G-J-S-T-BD-BE	Finished I.D. Exhaust Valve	.4985			
		Guide (Parallel Valve Heads)	.4995			
	S1-S2-S3-S5-S6-S11-S12-S13-	Finished I.D. Exhaust Valve	<u>.4995</u>			
	S14-T2-T3-AF	Guide (Angle Valve Heads)	.5005			
	S7-S9-S10	Finished I.D. Exhaust Valve	5000			
		Guide (Angle Valve Heads –	<u>.5000</u>			
		Helicopter)	.5010			
		nay have exhaust valve guides that are				
	anytime up to 300 hours of servic	e. After 300 hours of service, inside di	ameter of exl	haust valve g	uide may ind	crease .001
	in. during each 100 hours of operations	ation up to the recommended overhaul	time for the	engine, or no	t to exceed.	015 inch
	over the basic I.D. See latest editi	on of Service Instruction No. 1009 for	recommende	ed overhaul t	ime.	
616	ALL	Intake Valve Stem and Valve			<u>.0010L</u>	
		Guide			.0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022			
			.4030	.4010		
616	ALL	Finished I.D. Intake Valve Guide	.4040			
			.4050			
617	ALL	Intake and Exhaust Valve and				
		Valve Cap Clearance (Rotator			.000	
		Type Small Dia. Head)			.004L	006L
618	A-B	Solid Tappet Clearance			.006	
		(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	
		7 11			.080	
619	A	Valve Rocker Shaft and Cylinder			.0001L	
		Head (No Bushing)			.0013L	.0025L
619	B-D-J-S-T-Y	Valve Rocker Shaft and Valve			00011	
		Rocker Bushing (Parallel Valve			.0001L .0013L	00251
		Heads)			.0013L	.0025L
	S1-S2-S3-S5-S6-S7-S9-S10-	Valve Rocker Shaft and Valve			00011	
	S11-S12-S13-S14-T2-T3-AF	Rocker Bushing (Angle Valve			.0001L .0013L	.0025L
		Heads)			.0013L	.0023L
619	A	Finished I.D. of Valve Rocker				
		Shaft Bores in Cylinder Head	<u>.6246</u>			
		(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				
	S11-S12-S13-S14-T2-T3-AF	Shaft (Bushing) in Cylinder Head	<u>.6246</u>			
		(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		

# PART I – DIRECT DRIVE ENGINES

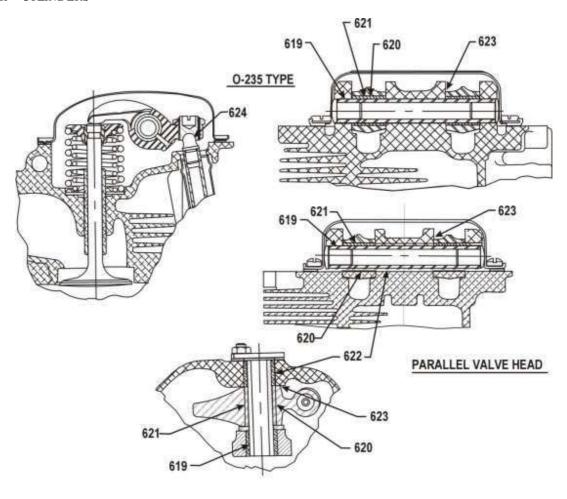
			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
621	ALL	Valve Rocker Bushing and	Bushing M			
		Valve Rocker	Burnished	In Place	,	1
622	ALL	Valve Rocker Shaft Bushing			<u>.0022T</u>	
		and Cylinder Head			.0038T	(A)
	ALL	Valve Rocker Shaft Bushing	<u>.7380</u>			
		Hole in Cylinder Head	.7388			
623	A-B-D-G-J-S-T-Y	Valve Rocker and Cylinder				
		Head - Side Clearance			<u>.005L</u>	
		(Parallel Valve Heads)			.013L	.016L
	\$1-\$2-\$3-\$5-\$6-\$7-\$9-\$10-	Valve Rocker and Cylinder			.002L	
	S11-S12-S13-S14-T2-T3-AF	Head – Side Clearance			.020L	
	. = -	(Angle Valve Heads)				.024L
624	A-B-J	Push Rod and Ball End			<u>.0005T</u>	
					.0025T	(A)
625	A	Intake and Exhaust Valve	<u>.705</u>			
		Guide Height	.725			
	ALL	Intake Valve Guide Height	<u>.705</u>			
	ALL EXCEPT O 225	(Parallel Valve Heads)	.725			
	ALL EXCEPT O-235	Exhaust Valve Guide height	<u>.765</u>			
	ATT	(Parallel Valve Heads)	.785			
	ALL	Intake and Exhaust Valve Guide	<u>.914</u> .954			
		height (Angle Valve Heads)	.934			
		MEASURE VALVE GUIDE HI FROM THE VALVE SPRING S COUNTERBORE IN THE CYL HEAD TO THE TOP OF VALV GUIDE.	SEAT LINDER			

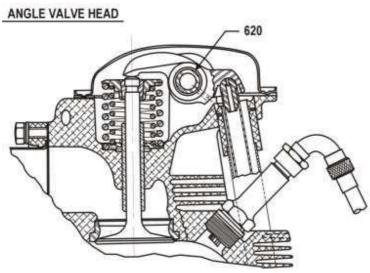
# PART I – DIRECT DRIVE ENGINES



Cylinder, Piston and Valve Components

# PART I – DIRECT DRIVE ENGINES





Cylinder, Piston and Valve Components

# PART I – DIRECT DRIVE ENGINES

			Dimensions		Clearances	
			Mfr. Min. &	Service	Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
OIL PU						_
700	ALL	Oil Pump Drive Shaft and Oil			.0010L	00.47
=0.4	1.55.67.65.15	Pump Body or Cover			.0025L	.004L
701	A-B-D-G-J-S-T-AF	Oil Pump Drive Shaft and Accessory Housing			.0015L .0030L	0061
	Y	Oil Pump Drive Shaft and			.0030L .0015L	.006L
	1	Accessory Case			.0013L	.006L
	BD-BE	Oil Pump Drive Shaft and			.0010L	.0002
		Crankcase			.0025L	.004L
702	S-T-AF (DUAL MAGNETO)	Oil Pump Drive Shaft – End			<u>.015L</u>	
		Clearance			.050L	.065L
	BD-BE	Oil Pump Drive Shaft – End			<u>.017L</u>	
		Clearance			.037L	.047L
703	A-B-D-G-J-S-T-Y-AF	Oil Pump Impellers – Diameter			.002L	0001
	BD-BE	Clearance Oil Pump Impellers – Diameter			.006L .0035L	.008L
	DD-BE	Clearance			.0033L .0075L	.009L
704	ALL (EXCEPT BD-BE)	Oil Pump Impellers – Side			.002L	.007L
,	THE (Effect 1 DD DE)	Clearance			.0045L	.005L
	BD-BE	Oil Pump Impellers – Side			.003L	
		Clearance			.005L	.006L
	AS APPLICABLE	Width of Oil Pump Impellers	<u>.622</u>			
			.624	.621		
	AS APPLICABLE	Width of Oil Pump Impellers	<u>.747</u> .749	.746		
	AS APPLICABLE	Width of Oil Pump Impellers	<u>.995</u> .997	.994		
	BD-BE	Width of Oil Pump Impellers	.622			
			.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)
	BD-BE	(Alum. and Sinterbond)			.003T	(A)
	DD-BE	Oil Pump Impeller and Idler Shaft			<u>.002T</u> .004T	(A)
706	A-B-D-G-J-S-T-Y-AF	Oil Pump Idler Shaft and Oil			.0005L	(11)
700	11 2 2 3 4 5 1 1 11	Pump Body			.0020L	.003L
	BD-BE	Oil Pump Idler Shaft and Oil			.0010L	
		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			.0010L	00251
	BD-BE	Accessory Housing Oil Pump Idler Shaft and		-	.0025L .0010L	.0035L
	םם-סב	Crankcase			.0010L	.0035L
708	G2-S2	Scavenge Pump Drive Shaft and			.0010L	.003311
, 50		Adapter			.0025L	.004L
709	G2-S2	Scavenge Pump – End Clearance			.000	
					.045L	.060L

# PART I – DIRECT DRIVE ENGINES

Ref.   Chart   Nomenclature   Mfr.   Min. & Service   Max.   Ma				Dime	nsions	Clear	ances
Ref.   Chart   Nomenclature   Max.   Max.   Max.   Max.   Max.   SCAVENCE PUMP				Mfr.		Mfr.	
SCAVENGE PUMP				Min. &	Service	Min. &	Service
	Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
Diameter Clearance	SCAVE	ENGE PUMP					
	710	G2-S2	Scavenge Pump Impellers –			<u>.007L</u>	
Clearance						.011L	.014L
G2-S2	711	G2-S2				<u>.003L</u>	
Table						.005L	.006L
Total   G2-S2   Scavenge Pump Impellers and		G2-S2	Width of Impellers				
Idler Shaft				1.498	1.495		
Table   Tabl	712	G2-S2					00.41
Shaft	712	G2 S2					.004L
S-T4-AF (WIDE DECK)	/13	G2-32					(A)
Drive and Adapter   .0025L   .004L   .0010L   .0035L   .004L   .0020L   .0035L   .004L   .0020L   .0035L   .0035L   .004L   .0020L   .0035L   .004SL   .0020L   .0035L   .004SL   .0020L   .0035L   .004SL   .0025L   .002	714	S-T4-AF (WIDE DECK)					(71)
Turbocharger Scavenge Pump	,						.004L
Title	715	S-T4-AF (WIDE DECK)					
Clearance						.0020L	.0035L
T17	716	S-T4-AF (WIDE DECK)					
Adapter							.004L
Turbocharger Scavenge Pump	717	S-T4-AF (WIDE DECK)	1 0				
End Clearance	710						(A)
T4 (DUAL MAGNETO)	/18	S-14-AF (WIDE DECK)					04151
End Clearance   .0395L   .0445L		T4 (DUAL MAGNETO)					.0413L
TUEL PUMP		14 (BOAL MAGNETO)					04451
A-B-D-G-J-S-T	FUEL	PIIMP	End Creatance			.037312	.01131
Accessory Housing   .003L   .005L		1	AC Fuel Pump Plunger and			0015L	
T-20	, 1)						.005L
Crankshaft Idler Gear Shaft   .003L   .005L	720	J-S-T-AF					
DUAL MAGNETO  Accessory Housing   .0035L .0065L			Crankshaft Idler Gear Shaft				.005L
S-T-AF	721	S-T-AF					
DUAL MAGNETO    Crankcase   D035L   D065L							.0065L
T-22   S-T-AF							
Shaft	722						.0065L
T-AF	122	5-1-AF	*				0051
DUAL MAGNETO  Accessory Housing and Crankcase   .0035L   .0065L     S-T-AF	723	S_T_AF	17 11 1				.oosl
S-T-AF	123						.00651
(DUAL MAGNETO)         Crankcase         .0035L         .0065L           724         A-B         Crankshaft Idler Gear – End         .003L         .043L         .058L           G-J-S-Y         Crankshaft Idler Gear – End         .040L         .055L           T-AF         Crankshaft Idler Gear – End         .007L         .007L           Clearance         .037L         .052L           S (DUAL MAGNETO)         Crankshaft Idler Gear – End         .020L         .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End         .015L							.00051
724         A-B         Crankshaft Idler Gear – End Clearance         .003L .058L           G-J-S-Y         Crankshaft Idler Gear – End Clearance         .005L .005L .055L           T-AF         Crankshaft Idler Gear – End Clearance         .007L .052L           S (DUAL MAGNETO)         Crankshaft Idler Gear – End Clearance         .020L .030L .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End .030L .040L							.0065L
Clearance         .043L         .058L           G-J-S-Y         Crankshaft Idler Gear – End         .005L         .005L           Clearance         .040L         .055L           T-AF         Crankshaft Idler Gear – End         .007L         .007L           Clearance         .037L         .052L           S (DUAL MAGNETO)         Crankshaft Idler Gear – End         .020L         .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End         .015L	724						
Clearance         .040L         .055L           T-AF         Crankshaft Idler Gear – End         .007L           Clearance         .037L         .052L           S (DUAL MAGNETO)         Crankshaft Idler Gear – End         .020L           Clearance         .030L         .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End         .015L			Clearance			.043L	.058L
T-AF         Crankshaft Idler Gear – End Clearance         .007L .052L           S (DUAL MAGNETO)         Crankshaft Idler Gear – End Clearance         .020L .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End         .015L		G-J-S-Y					
Clearance         .037L         .052L           S (DUAL MAGNETO)         Crankshaft Idler Gear – End         .020L           Clearance         .030L         .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End         .015L							.055L
S (DUAL MAGNETO)  Crankshaft Idler Gear – End Clearance  T-AF (DUAL MAGNETO)  Crankshaft Idler Gear – End Clearance  Crankshaft Idler Gear – End Clearance  1.030L 0.040L 0.015L		T-AF					0521
Clearance         .030L         .040L           T-AF (DUAL MAGNETO)         Crankshaft Idler Gear – End         .015L		C (DILAI MACNETO)					.052L
T-AF (DUAL MAGNETO) Crankshaft Idler Gear – End <u>.015L</u>		S (DUAL MAGNETO)					0401
		T-AF (DUAL MAGNETO)					.UHUL
Clearance			Clearance			.038L	.046L

# PART I – DIRECT DRIVE ENGINES

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

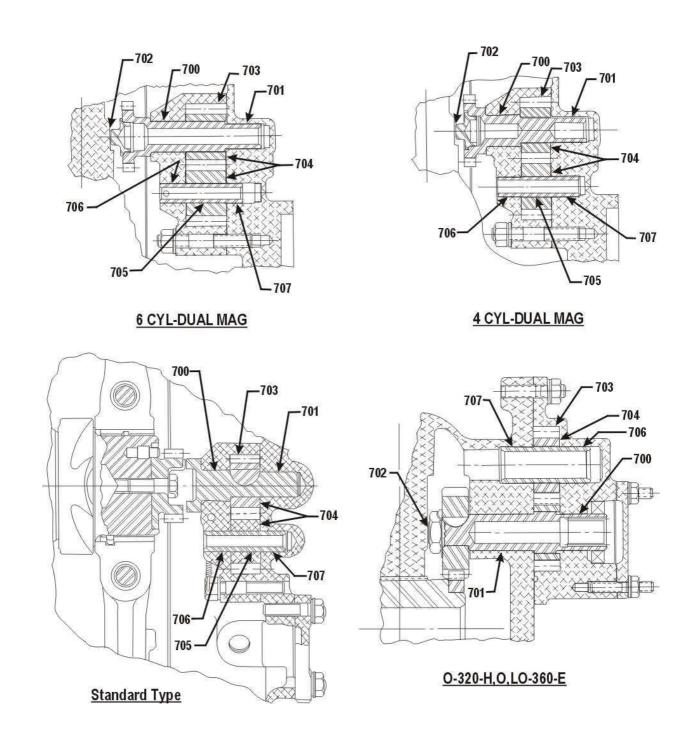
# PART I – DIRECT DRIVE ENGINES

			Dimensions		Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
VACUI	UM & TACHOMETER		TTUA:	IVIUA.	17142.	IVIUA.
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	00.41
737	(DUAL MAGNETO) D	Accessory Housing Vacuum Pump Gear and			.0025L .0010L	.004L
131		Accessory Housing			.0010L	.006L
738	A-B-G-J-S-T-AF	Vacuum Pump Gear – End			.010L	.0002
		Clearance			.057L	.075L
	D	Vacuum Pump Gear – End			<u>.003L</u>	
		Clearance			.020L	.030L
	Y	Vacuum Pump Gear – End Clearance			<u>.000</u> .067L	.075L
	S	Vacuum Pump Gear – End			.007L .012L	.073L
	(DUAL MAGNETO)	Clearance			.044L	.055L
	T-AF	Vacuum Pump Gear – End			.017L	
	(DUAL MAGNETO)	Clearance			.039L	.050L
739	A-B-Y	Tachometer Drive Shaft and			<u>.0015L</u>	
	DD DE	Adapter			.0035L	.006L
	BD-BE	Tachometer Drive Shaft and Adapter			.0010L .0050L	.0065L
739	D-G-J-S-T-AF	Tachometer Drive Shaft and			.0030L	.0003L
137	D-G-J-S-1-AI	Accessory Housing			.0015L	.006L
740	G-J-S	Vacuum Pump Gear and Adapter			.0010L	
	(DUAL DRIVE)	1			.0025L	.004L
741	G-J-S	Vacuum Pump Gear – End			<u>.000</u>	
7.40	(DUAL DRIVE)	Clearance			.017L	.027L
742	G-J-S (DUAL DRIVE)	Idler Gear and Shaft			.0010L .0030L	.005L
743	G-J-S	Idler Gear – End Clearance			.021L	.003L
7 13	(DUAL DRIVE)	Taler Gear End Cicurative			.041L	.060L
744	G-J-S	Propeller Governor Gear and			<u>.0013L</u>	
	(DUAL DRIVE)	Adapter			.0028L	.005L
	G-J-S	Hydraulic Pump Gear and Adapter			.0013L	00.51
745	(DUAL DRIVE) G-J-S	Propeller Governor or Hydraulic			.0028L	.005L
/43	(DUAL DRIVE)	Pump – End Clearance			<u>.000</u> .054L	.074L
MAGN	ETO, GENERATOR, STARTER			1	.0JTL	.U/TL
746	T	Magneto Bearing and Gear			.0005T	
/ 40	1	Magneto Bearing and Gear			.00031 .0001L	.0005L
746	D	Magneto Bearing and Gear			.0008T .0001L	.0005L
747	Т	Magneto Bearing and Crankcase			.0001E .0002T .0007L	(A)
747	D	Magneto Drive Bearing and Adapter			.0007E .0006T .0008T	(A)
748	S7	Magneto Bearing and Gear			.0001T .0010T	(A)

# PART I – DIRECT DRIVE ENGINES

			Dimensions		Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
MAGN	ETO, GENERATOR, STARTER	R (CONT.)				
749	S7	Magneto Bearing and Adapter			.000	
					.0012L	.0015L
750	S-T-AF	Magneto Drive Gear and			<u>.0010L</u>	
	(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			.001L	0051
7.50	PD DE	N Bi G			.003L	.005L
753	BD-BE	Magneto Drive Gear and			.001L	0051
751	Y	Crankcase Bushing			.003L	.005L
754	Y	Magneto Shaft Gear and Magneto Case			<u>.001L</u> .003L	.005L
755	Y	Magneto Shaft Gear and Support			.003L .001L	.003L
133	1	Assembly			.001L	.005L
756	Y	Magneto Shaft Gear and			.003L	.003L
750	1	Accessory Drive Shaft Gear – End			.0075L	
		Play			.0125L	.015L
757	Y	Accessory Drive Shaft Gear and			<u>.001L</u>	
		Support Assembly			.003L	.005L
758	S	Magneto Gear and Bushing			<u>.0005L</u>	
		(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			<u>.0015L</u>	
	(DUAL MAGNETO)				.0035L	.0055L
7095	BD-BE	Bushing – Magneto Drive			.0025T	
7.50		and Crankcase			.0045T	(A)
759	D	Generator Gear Bushing and			.0020T	(4)
760	D	Generator Gear Generator Gear Bushing and			.0035T	(A)
700	D	Generator Drive Coupling Adapter			<u>.001L</u> .0028L	.005L
761	D	Bendix Drive Gear Bushing and			.0028L	.003L
/01		Crankcase			.0005T	(A)
762	D	Bendix Drive Gear and Bendix			.0010L	(11)
702		Drive Gear Bushing			.0025L	.005L
763	D	Bendix Drive Shaft and Bendix			.003L	
. 50		Drive Housing			.005L	.010L
764	D	Bendix Drive Shaft – End			.000	
		Clearance			.0059L	.080L

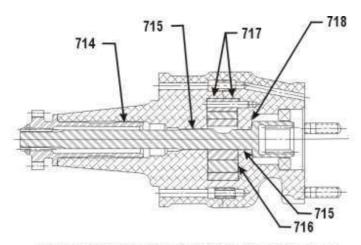
# PART I – DIRECT DRIVE ENGINES



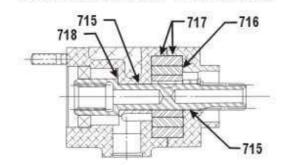
Oil Pumps

# PART I – DIRECT DRIVE ENGINES

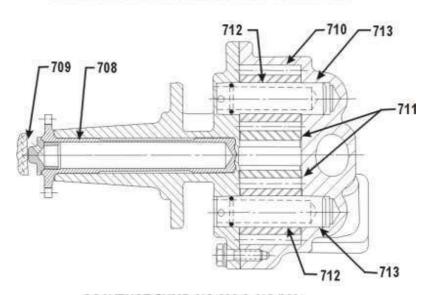
SECTION III – GEAR TRAIN



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



**DUAL MAG TURBO SCAVENGE PUMP & HYD. PUMP** 

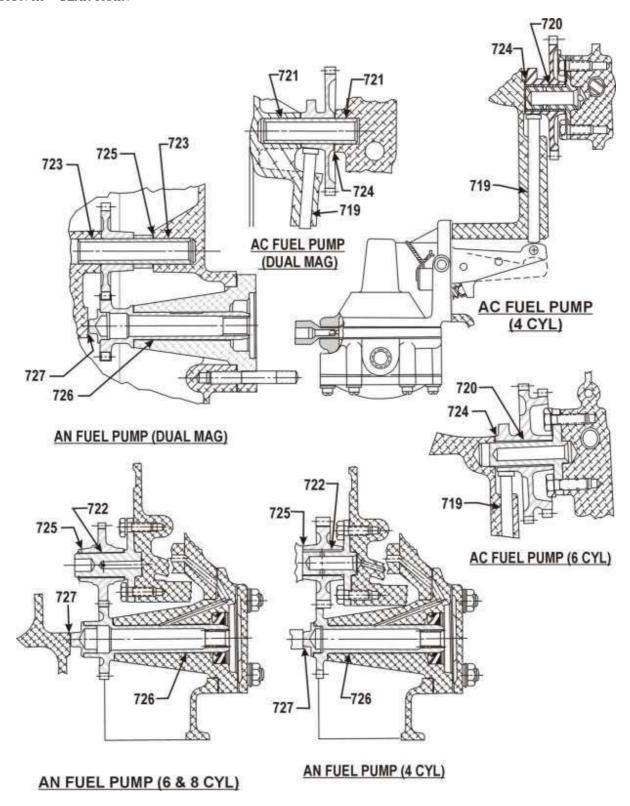


SCAVENGE PUMP AIO 320 & AIO-360

Scavenge Pumps

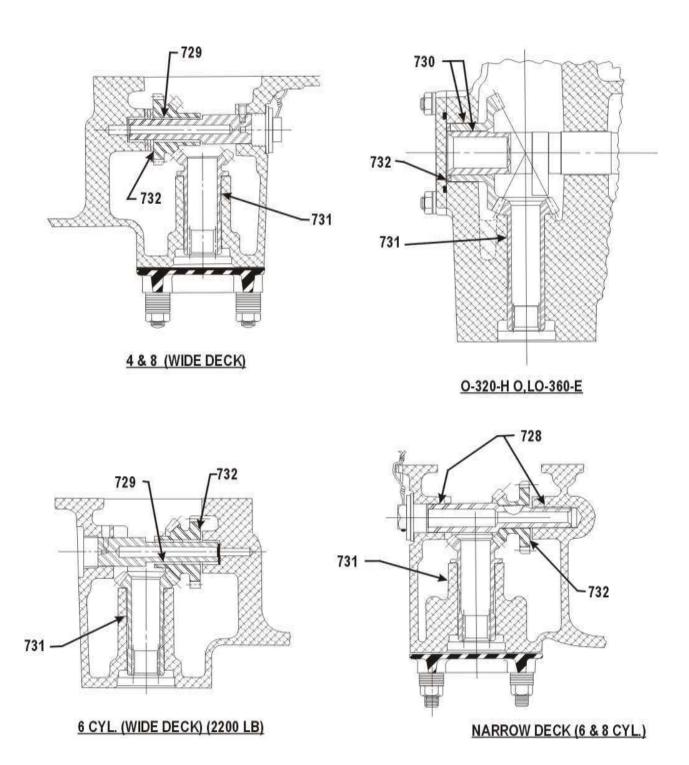
### PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN



Fuel Pumps

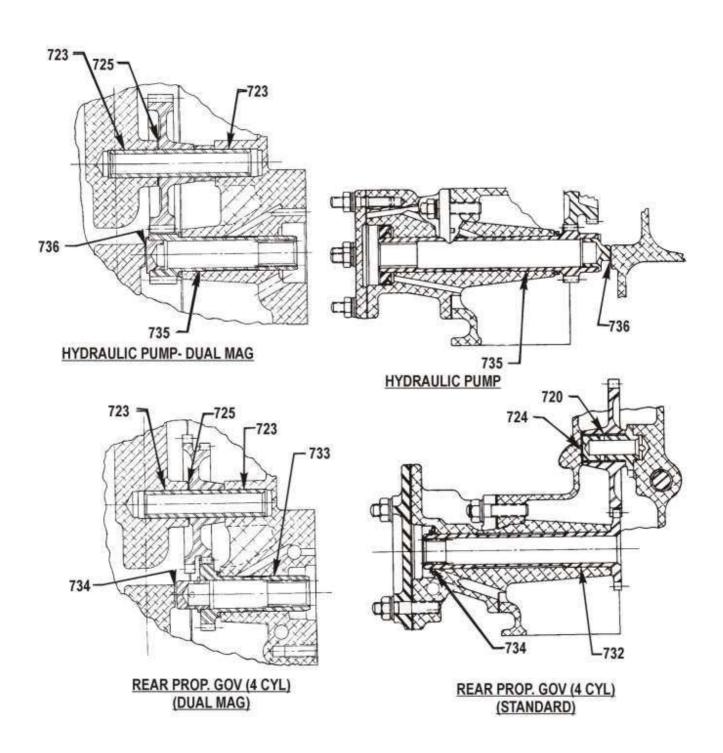
# PART I – DIRECT DRIVE ENGINES



Front Governor

# PART I – DIRECT DRIVE ENGINES

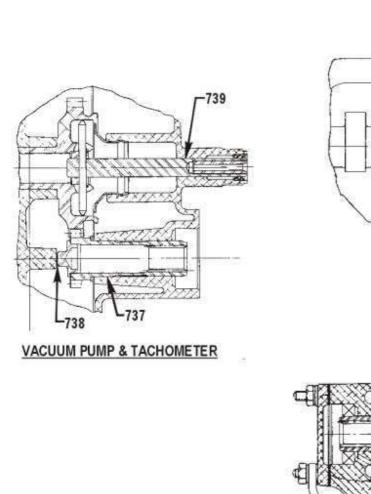
SECTION III – GEAR TRAIN

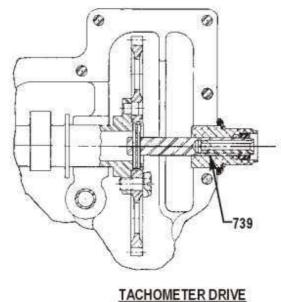


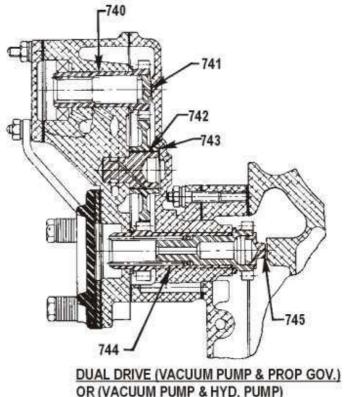
Rear Governor and Hydraulic Pumps

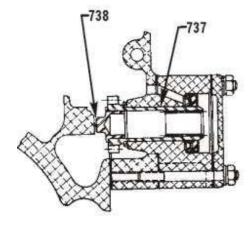
# PART I – DIRECT DRIVE ENGINES

SECTION III – GEAR TRAIN









VACUUM PUMP

Tachometer Drives, Vacuum and Hydraulic Pump Drives

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### PART I – DIRECT DRIVE ENGINES

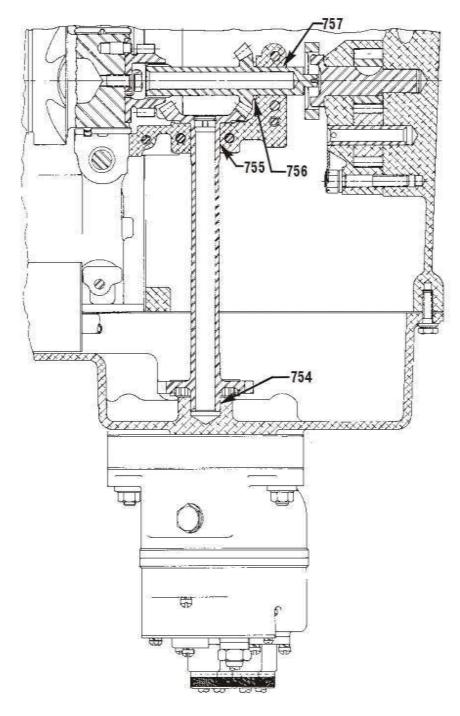
SECTION III – GEAR TRAIN 747 -758 O-435-A 746 -MAGNETO 6 CYLINDER HIO-360-D TYPE 752 753 7095 8 CYLINDER O-320-H, O, LO-360-E 4 CYL. (S4LN-21 & S4LN-1227) 750 -DUAL MAG (6 & 8 CYL.) 4 CYL. DUAL MAG

Accessory Drives: Magnetos Generator and Starters

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# PART I – DIRECT DRIVE ENGINES

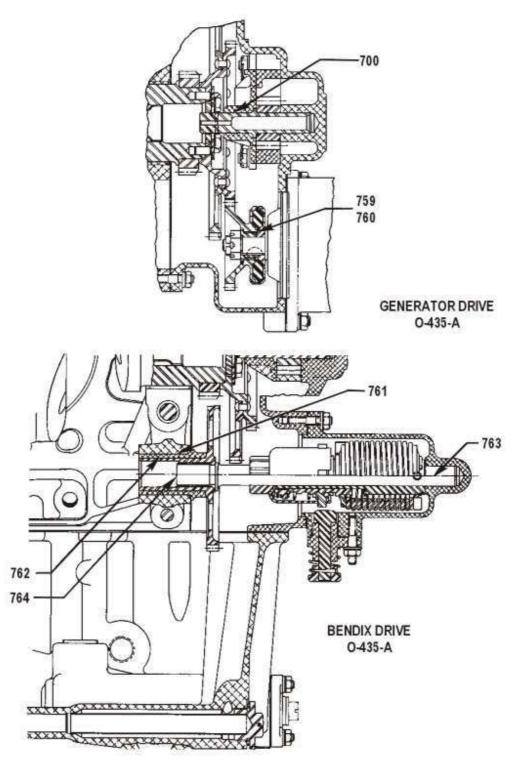
SECTION III – GEAR TRAIN



VO, IVO-360

Accessory Drives: Magnetos

# PART I – DIRECT DRIVE ENGINES



Generator and Bendix Drive

# PART I – DIRECT DRIVE ENGINES

### $SECTION\:IV-BACKLASH$

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

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## PART I – DIRECT DRIVE ENGINES

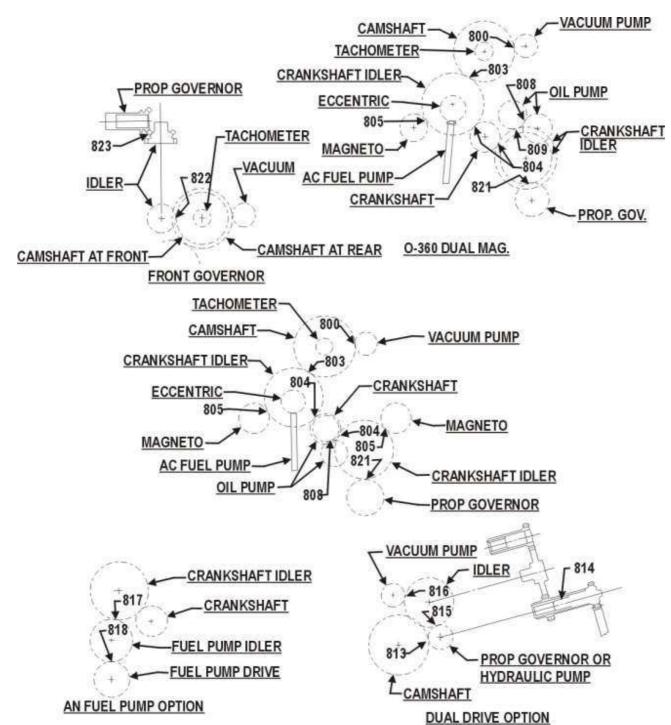
#### $SECTION\ IV-BACKLASH$

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
	an .		Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
821	G-J-S	Propeller Governor Drive and				
		Crankshaft Idler – Backlash			.004 .015	
		(Rear Governor)			.015	.020
822	G1-G2-S2-S4-S6-T-AF	Propeller Governor Idler and			004	
		Camshaft – Backlash			<u>.004</u>	020
022		(Front Governor)			.015	.020
823	G1-G2-S2-S4-S6-S11-T-AF	Propeller Governor Drive and			004	
		Idler – Backlash (Bevel Gears) (Front Governor)			<u>.004</u> .008	.015
824	BD-BE	Propeller Governor Drive and			.008	.013
024	BD-BE	Camshaft – Backlash			003	
		(Bevel Gears) (Front Governor)			.003 .011	.015
825	D	Crankshaft Timing Gear and			.004	.013
023		Camshaft Gear – Backlash			.015	.020
826	D	Camshaft Gear and Generator			.004	1020
		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			<u>.004</u>	0.5.5
		Gear – Backlash			.015	.020
831	D	Bendix Drive Shaft Spline and			001	
		Bendix Drive Gear Spline –			<u>.001</u>	015
922	S	Backlash			.006	.015
832	3	Injector Pump Drive Short Goor			004	
		Injector Pump Drive Shaft Gear – Backlash			.004 .015	.020
		DackidSii			.013	.020

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#### PART I – DIRECT DRIVE ENGINES

SECTION IV - BACKLASH

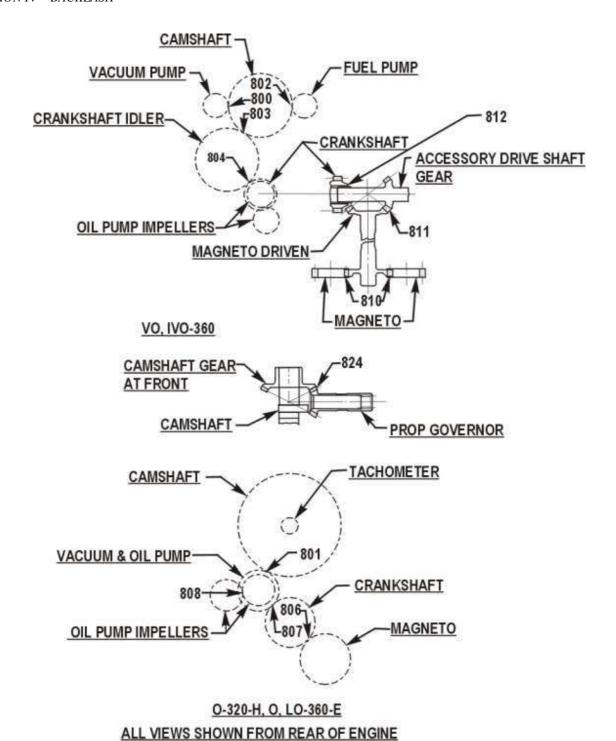


# O-235, 0320, O-340 &O-360 ALL VIEWS SHOWN FROM REAR OF ENGINE

Backlash (Accessory Drives)

#### PART I – DIRECT DRIVE ENGINES

SECTION IV - BACKLASH

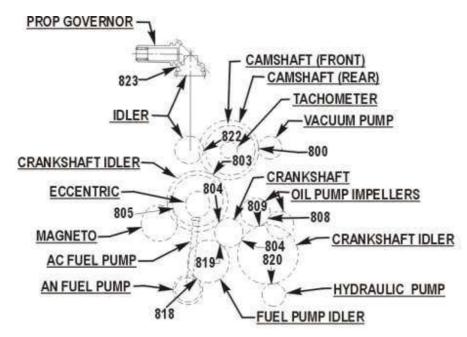


Backlash (Accessory Drives)

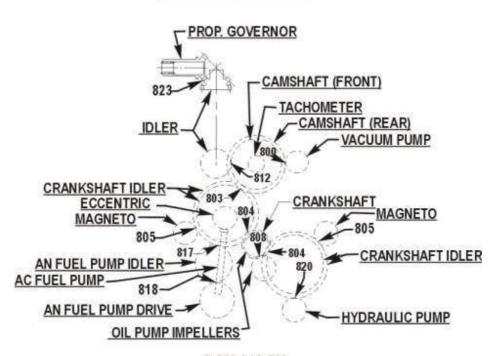
1-31 SSP-1776-5-PT1

#### PART I – DIRECT DRIVE ENGINES

SECTION IV - BACKLASH



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



0-540 & 10-720

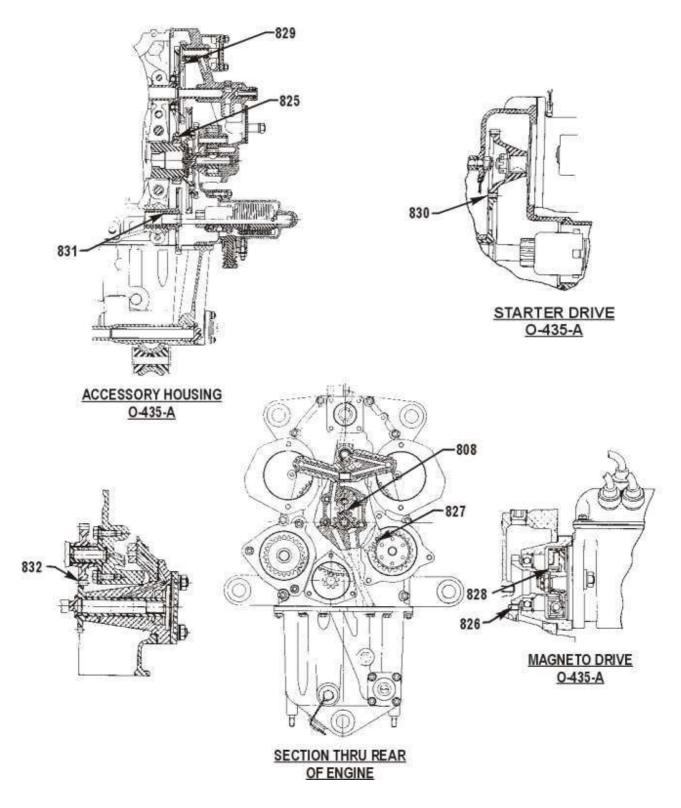
#### ALL VIEWS SHOWN FROM REAR OF ENGINE

Backlash (Accessory Drives)

SSP-1776-5-PT1 1-32

### 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
	\$1-\$3-\$5-\$6-\$7-\$9-\$11-\$12- \$14-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)	1-1/4-1	2		Oil Pressure	Rel	ief Valve		300 inlbs.
919	ALL	1/4 Hex Below	Head a	nd	Hose Clamps (Worm Type)			20 inlbs.	
		5/16 He	5/16 Hex. Head and Above			Hose Clamps (Worm Type) (Metal to metal: example: heat shield to exhaust pine)			45 inlbs.
		5/16 He	ex. Head ove		Hose Clamps	s (V	Vorm Type)		30 – 35 inlbs.
920	ALL				Cylinder Hea	ad I	Drain Back Hose C	lamps	s 10 inlbs.
	S-T				Exhaust V-	-Ba	nd Coupling Torqu	ie Dat	ta
921	Coupling Size Tube OD	Lycomin Numb			Vendor Part Number		T-Bolt Split Type Locknut Torque InLbs.		In. Drilled Hex Nut With ety 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	1204-55-369M	[	70		
	3.69 in.	LW-15	768	N	H1004420-10	70			
922	ALL				Turbochar	rger	· V-Band Torque D	ata	
	Turbocharger M	odel No.	V-C	Clamp	Part No.	V-Clamp Diameter		Torque InLbs.	
	TO-473				0-600 6.00 in.		40 – 80		
	TEO659			400500-685 6.85 in.			40 – 50		
	THO8A6			400500-775 7.75 in.			40 – 60		
	THO8A69				00-775		7.75 in.		40 – 60
	301E10-2	**		TC-	6-15		6.50 in.		15 – 20
	* - AiResearch t ** - Rajay turboc See latest revision	harger.		tion N	Vo. 1238 for as	sen	nbly procedure.	1	
	Chart		ead Size			Nomenclature			Torque Limits
927	ALL DUAL MAG. MODELS	1	/2-20		Crankshaft G	Sear	Bolt		660 inlbs.
	BD		1/4		Crankshaft G				96 – 120 inlbs.
		3	3/8-16		Cylinder Hol (Crankcase D	Driv	ring Torque)		100 inlbs.
928	ALL	7.	/16-14		Cylinder Hol (Crankcase D	Driv	ring Torque)		200 inlbs.
			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 Hol				300 inlbs.
929	A1		7/16		Cylinder Hol	ld D	Down Nuts		420 inlbs.
	B-D-BD-BE-J-G- Y-S-T-AF		1/2		Cylinder Hol				600 inlbs.
	Cylinder Hold D Service Instructio			e Par	ting Flange N	uts	'Tightening Proce	edure	s – 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.*

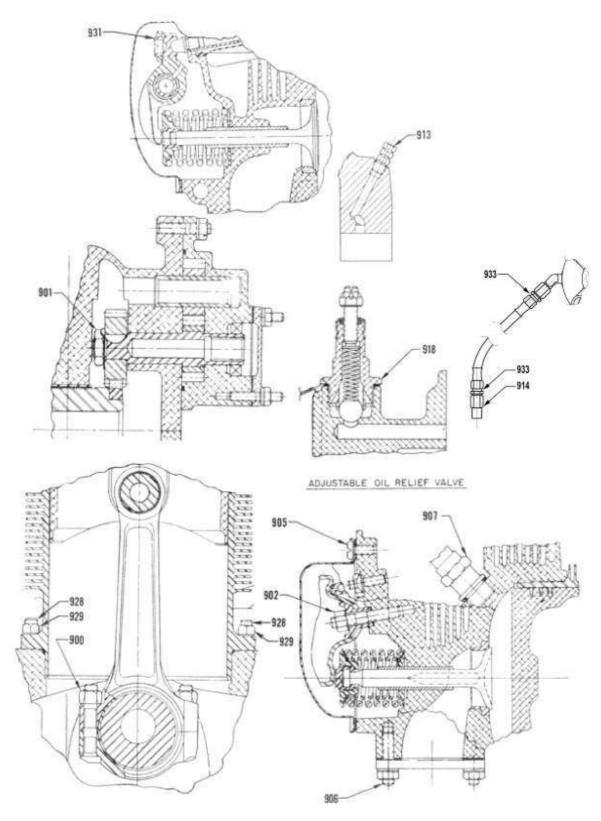
<sup>\*</sup> It is also permissible to tighten the fuel line union nut finger tight, then continue tightening the nut with a wrench an additional 30 to 60 degrees (1/2 to 1 flat of the nut.) Torque in excess of 50 in.-lbs. can result in damage to the parts.

#### 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-\$13-\$14-\$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.
	\$1-\$2-\$3-\$5-\$6- \$7-\$9-\$10-\$11- \$12-\$13-\$14-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.

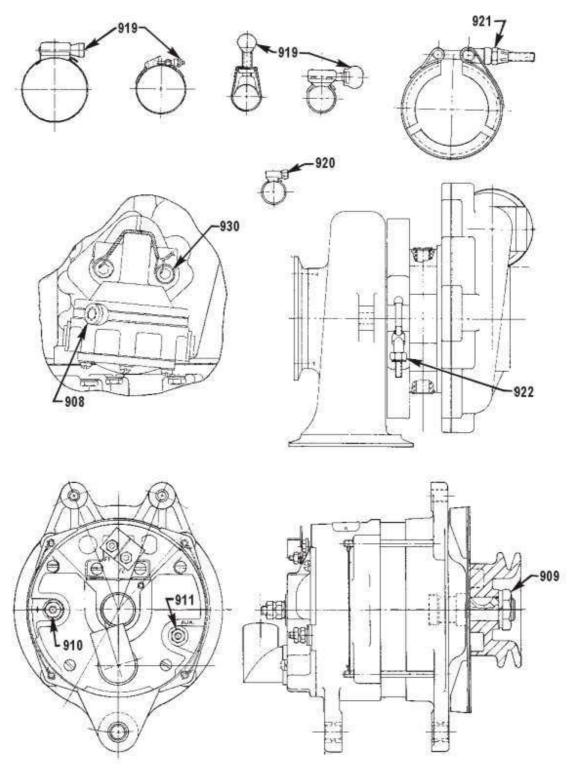
### PART I – DIRECT DRIVE ENGINES

SECTION V SPECIAL TORQUE REQUIREMENTS



## PART I – DIRECT DRIVE ENGINES

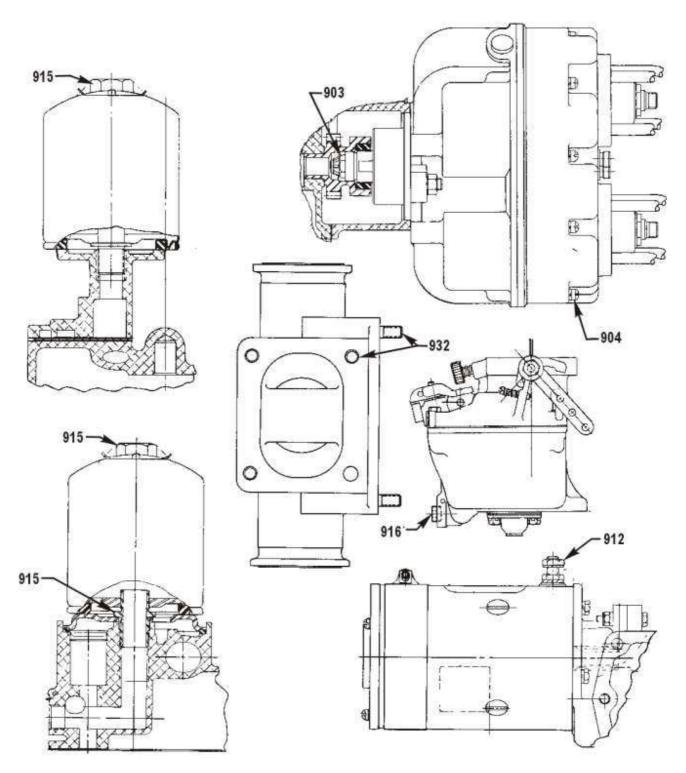
SECTION V – SPECIAL TORQUE REQUIREMENTS



Engine Accessories and Hardware

## PART I – DIRECT DRIVE ENGINES

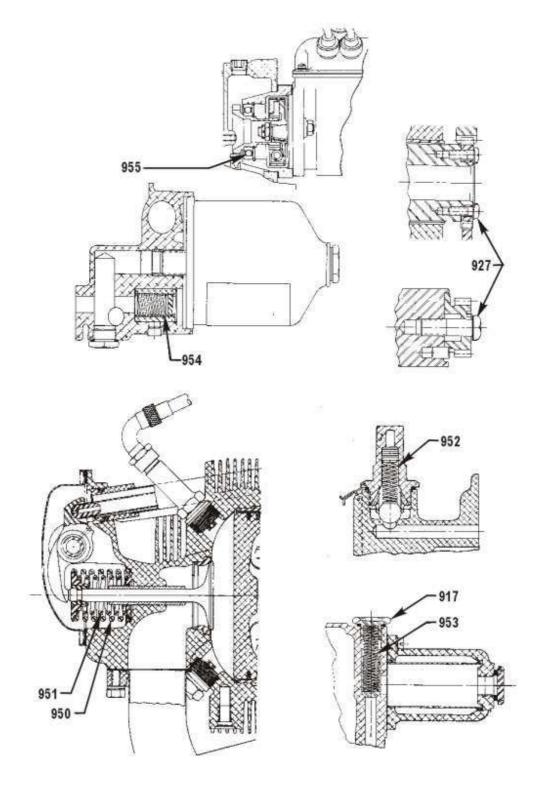
SECTION V – SPECIAL TORQUE REQUIREMENTS



Engine Accessories and Hardware

## 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).

		TAE		TABLE II				
	В	OLTS, SCRE	W AND N	IUTS		PIPE PLUGS		
Thusad	Tore	que	Thusad	Torq	ue	Thusad	Torque	
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Thread	InLbs.	
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44	
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44	
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94	
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121	
3/8	360 to 396	30 to 33	270 to 297	1/2-14 NPT	160 to 176			
ти	IN NUTS (1/2	DIA OF DO	NI TE	3/4-14 NPT	230 to 252			
111	IN NU15 (1/2	Z DIA. OF BU	UE	1-11-1/2 NPT	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	F TURN	Tube	Thread	Torque In	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	Е	
NOTE: Install all crush type gas	skets except	the self	Thr	eads	Torque In	Lbs.	
centering type, with the unbroken sur			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 c	3/8	3-16	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					

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

	TABLE VII								
METAL TUBE FITTINGS									
			Minimum bend radii						
Dash Nos. Ref.	Tubing OD inches	Aluminum-	Wrench torque for tightening n-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	

# PART II – INTEGRAL ACCESSORY DRIVE ENGINES

CHART	MODELS
AQ	TIO-541
AZ	TIGO-541

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 or	n piston rings must be measured with face of ring flush with piston.
(D)	The dimensions the piston pin.	shown are measured at the bottom of the piston skirt at right angles to
(E)	Permissible wear on the diameter.	r of the crankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; where	in a definite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink	or interference fit.
(WD)	Wide Deck Cran	kcase.

SSP-1776-5-PT2 April 13, 2020\*

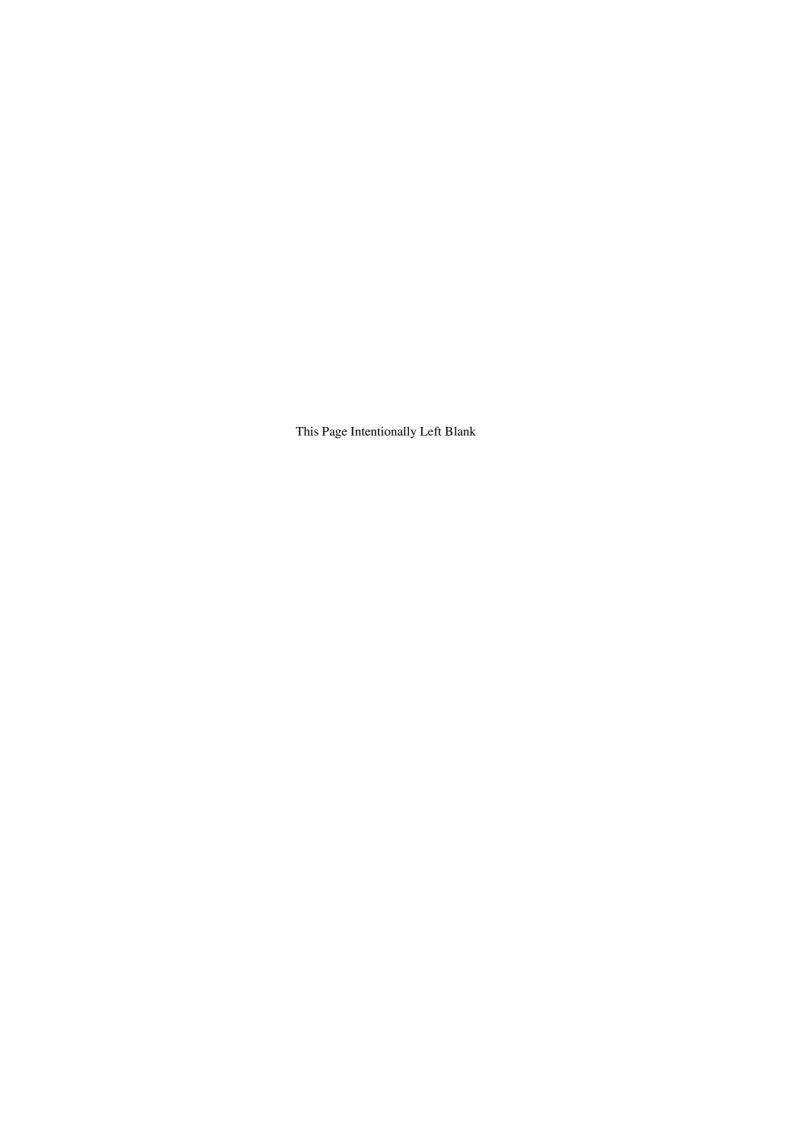
<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.





# TECHNICAL PUBLICATION REVISION

SSP-1776-5-PT2  Service Table of Limits  SSP-1776  October 28, 2013  PREVIOUS REVISIONS  CURRENT REVISION*  April 2018  2-8, 2-23, 2-24, 2-25, 2-26, 2-27, 2-28, 2-29  Deleted NOTES that reference S.I. 1243 in Piston Application Table Added pages and figures for all 900 Series reference numbers in Section V  PREVIOUS REVISIONS  CURRENT REVISION*  April 2020  2-7  Revised burnishing instructions for connecting rod bushing in reference number 600  Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607  *Revisions are indicated with a vertical bar to the left of the revised item.	REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE
April 2018  2-8, 2-23, 2-24, 2-25, 2-26, 2-27, 2-28, 2-29  • Deleted NOTES that reference S.I. 1243 in Piston Application Table • Added pages and figures for all 900 Series reference numbers in Section V  • Revised burnishing instructions for connecting rod bushing in reference number 600 • Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607  * Revisions are indicated with a vertical bar to the left of the	SSP-1776-5-PT2	Service Table of Limits	SSP-1776	October 28, 2013
<ul> <li>2-8, 2-23, 2-24, 2-25, 2-26, 2-27, 2-28, 2-29</li> <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> <li>Revised burnishing instructions for connecting rod bushing in reference number 600</li> <li>Revised the Mfr. Min. &amp; Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607</li> <li>* Revisions are indicated with a vertical bar to the left of the</li> </ul>	PREVIOUS	S REVISIONS	CURRENT	REVISION*
<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> <li>Revised burnishing instructions for connecting rod bushing in reference number 600</li> <li>Revised the Mfr. Min. &amp; Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607</li> </ul>	Ap	ril 2018	Apri	1 2020
Application Table  • Added pages and figures for all 900 Series reference numbers in Section V  • Revised the Mfr. Min. & Max. Clearance for Piston Ring Gap (Compression) Nitrided Cylinders (Choke Barrels) and Piston Ring Gap (Oil) in reference number 607  * Revisions are indicated with a vertical bar to the left of the	2-8, 2-23, 2-24, 2-23	5, 2-26, 2-27, 2-28, 2-29	2	-7
	<ul> <li>Deleted NOTES that reference</li> <li>Application Table</li> <li>Added pages and figures</li> </ul>	rence S.I. 1243 in Piston	<ul> <li>Revised burnishing instrubushing in reference numl</li> <li>Revised the Mfr. Min. &amp; Gap (Compression) Nitricand Piston Ring Gap (Oil)</li> <li>* Revisions are indicated with a second control of the s</li></ul>	ctions for connecting rod ber 600 Max. Clearance for Piston Ring led Cylinders (Choke Barrels) in reference number 607



### 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	2 (210			
		Journal on Crankshaft (2-5/8	<u>2.6240</u>	(E)		
	10.17	Main)	2.6250	(E)		
	AQ-AZ	Crankcase Bearing Bore	2.9365 2.0375	2.0200		
501	AO A7	Diameter Pad Paging and	2.9375	2.9390	00001	
301	AQ-AZ	Connecting Rod Bearing and Crankshaft			.0008L .0038L	.0050L
	AZ	Diameter of Connecting Rod	2.1235		.0036L	.0030L
	AL	Journal on Crankshaft (2-1/8)	$\frac{2.1233}{2.125}$	(E)		
	AQ	Diameter of Connecting Rod	<u>2.123</u> <u>2.2485</u>	(L)		
	110	Journal on Crankshaft (2-1/4)	2.250	(E)		
	AZ	Connecting Rod Bearing Bore	2.230	(2)		
		Diameter (2-1/8) (Measure at	2.2870			
		Axis 30° on each side)	$\frac{2.2875}{2.2875}$			
	AQ	Connecting Rod Bearing Bore				
		Diameter (2-1/4) (Measure at	2.4205			
		Axis 30° on each side)	2.4210			
502	AQ-AZ	Connecting Rod – Side			<u>.004L</u>	
		Clearance			.010L	.016L
503	AQ-AZ	Connecting Rod – Alignment				10 Inches
504	AQ-AZ	Connecting Rod – Twist			.012 in 1	0 Inches
505		Crankshaft Run-Out at Center				
		Main Bearings				
	AZ	Mounted on No. 1 and 4				
		Journals Max. Run-Out No. 2			005	0075
		and 3 Journals			.005	.0075
		Mounted on No. 1 and 3 Journals Max. Run-Out No. 2				
		Journal			.003	.0045
		Mounted on No. 2 and 4			.003	.0043
		Journals Max. Run-Out No. 3				
		Journal			.003	.0045
	AQ	Mounted on No. 2 and 5				
		Journals Max. Run-Out No. 1				
		Journal			.002	.002
		Mounted on No. 2 and 5				
		Journals Max. Run-Out No. 3				
		Journal			.005	.0075
		Mounted on No. 2 and 4				
		Journals Max. Run-Out No. 3				
		Journal			.003	.0045

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## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

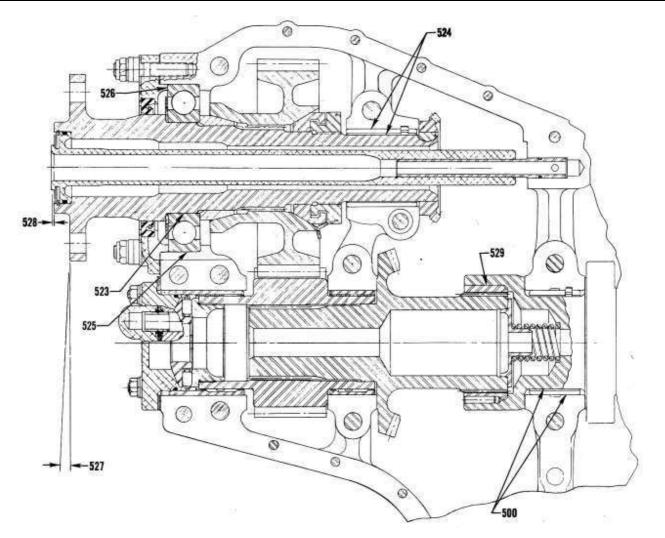
SECTION I – CRANKCASE, CRANKSHAFT, CAMSHAFT

			Dime	nsions	Clearances		
			Mfr.		Mfr.		
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.	
506	AQ (CONT.)	Mounted on No. 3 and 5					
		Journals Max. Run-Out No. 4					
		Journal			.003	.0045	
	AQ-AZ	Crankshaft and Crankcase –			<u>.005L</u>		
		Front End Clearance			.016L	.026L	
507	AQ	Clearance – Front Face of Crankshaft Oil Slinger to Front					
		Face of Recess in Crankcase					
		(Crankshaft Against Thrust			<u>.002</u>		
		Face)			.007	(A)	
508	AQ-AZ	Crankshaft Propeller Flange				00.5	
500	4.0	Run-Out			0.1.475	.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	1.0010	1.0021	.002L .004L	.006L	
515	AQ-AZ	Camshaft – End Clearance			.002L .004L	.015L	
516	AQ-AZ	Camshaft Run-Out at Center			.000		
517	AQ-AZ	Bearing Journal Counterweight Bushing and			.001 .0013T	.006	
317	AQ-AZ	Crankshaft			.00151 .0026T	(A)	
518	AQ-AZ	Counterweight Roller – End			.00201	(A)	
310	110 112	Clearance			.025L	.038L	
519	AQ-AZ	Counterweight and Crankshaft –			.0201		
		Side Clearance (Measure Below			.003L		
		Roller Next to Flat)			.013L	.017L	
520	AQ-AZ	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)	
521	AQ-AZ	I.D. Counterweight Bushing	.7485		.0030L	(11)	
	(	· · · · · · · · · · · · · · · ·	.7505	.7512			
	AZ	I.D. Counterweight Bushing (2 <sup>nd</sup>	1.030				
		order)	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		Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	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			<u>.006</u>	
					.008	.010
529	AZ	Crankshaft and Crankshaft Front			<u>.0002T</u>	
		Bearing			.0015T	(A)

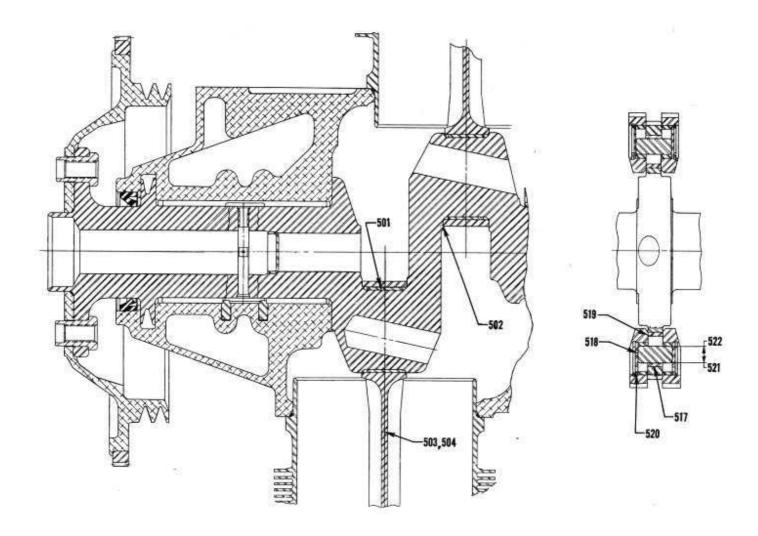


Section Thru Prop. Shaft, Crankshaft and Front Bearings

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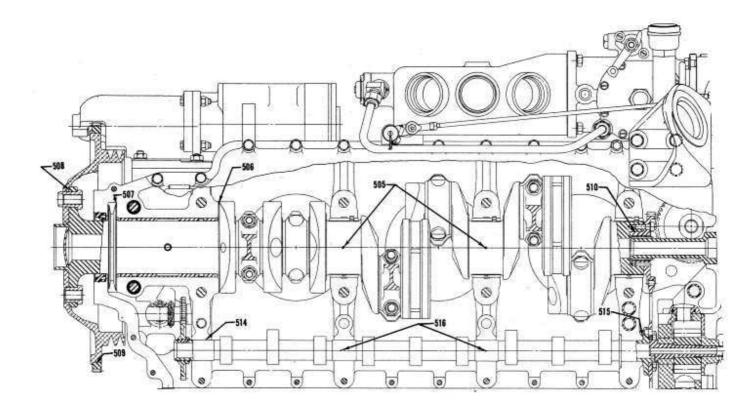
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

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



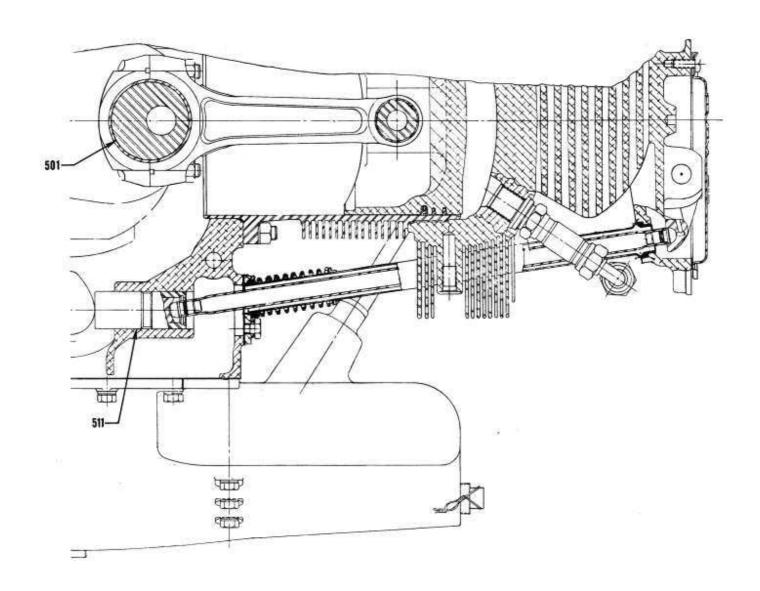
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

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



## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

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



## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

### SECTION II – CYLINDERS

			Dimensions		Clearances	
			Mfr. Min.		Mfr.	
D 0			& Max.	Service	Min. &	Service
Ref.	Chart	Nomenclature		Max.	Max.	Max.
600	AQ-AZ	Connecting Rod and Connecting			to be burnish	
	10.17	Rod Bushing		N 01K28983	is <u>not</u> burnis	hed in place
	AQ-AZ	Finished I.D. of Connecting Rod	1.1254			
601	AQ-AZ	Bushing Length Between Connecting Rod	1.1262			
001	AQ-AZ	Bearing Centers	6.7485 6.7515			
602	AQ-AZ	Connecting Rod Bushing and	0.7313		.0008L	
002	AQ-AZ	Piston Pin			.0021L	.0025L
603	AQ-AZ	Piston Pin and Piston			.0003L	.0023E
005	110 112				.0014L	.0018L
	AQ-AZ	Diameter of Piston Pin Hole in	1.1249			
		Piston	1.1254			
	AQ-AZ	Diameter of Piston Pin	1.1241			
			1.1246			
604	AQ-AZ	Piston and Piston Pin Plug			<u>.0002L</u>	
					.0010L	.002L
	AQ-AZ	*Diameter of Piston Pin Plug	1.1242			
(05	AO A7	D' ( D'   LD' ( D' D)	1.1247		00051	
605	AQ-AZ	Piston Pin and Piston Pin Plug – Nitrided and Chrome Cylinders			.0005L .0025L	.005L
	AQ-AZ	*Diameter of Piston Pin Plug	.5655		.0023L	.003L
	AQ-AZ	Diameter of Fiston Fin Flug	.5665			
			.5005			
	* See latest revision of Sei	rvice Instruction No. 1267.				
606	AQ-AZ	Piston Ring and Piston – Side			.0025L	
		Clearance (Top Ring Comp.)			.0055L	.008L (B)
	AQ-AZ	Piston Ring and Piston – Side			<u>.000L</u>	
		Clearance (2 <sup>nd</sup> Ring Comp.)			.004L	.006L (B)
	AQ-AZ	Piston Ring and Piston - Side			<u>.002L</u>	
		Clearance (Oil Regulating)			.004L	.006L (B)
607	AQ-AZ	Piston Ring Gap (Compression)			020	
		Chrome Cylinders (Straight			.020 .030	047
	AQ-AZ	Barrels) Piston Ring Gap (Compression)			.030	.047
	AQ-AZ	Nitrided and Chrome Cylinders			.045	
		(Choke Barrels)			.065	.067
	AQ-AZ	Piston Ring Gap (Oil Regulating)			.015	.507
		(All Barrels)			.040	.047
	- CI I					I
	_	gap is measured within 4 inches from bott	om. Ring gap	at top of tra	vel must not	be less than
	.0075.					
	For All Other Barrels – Ri					

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION II – CYLINDERS

						Dimensions			Clearances	
Ref.	(	Chart	Noi	nenclature		Mfr Min. Max	& Se	rvice Iax.	Mfr. Min. & Max.	Service Max.
	Engine and	d Piston Application	Min. Pisto	on Diameter			Cylinde		arrel	Max.
	Engine Chart Code Letter	Piston Number	Тор	Bottom	Type of	Piston	Type of Surface		Aaximum Diameter	Clearance Piston Skirt & Cyl.
608	AQ-AZ	76966, LW-10545	5.0790	5.1090	Forged-	-Cam	N-C		5.1305	.018L
608										
609										
610										

#### 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		Clearances	
			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	<u>1.9355</u>			
			1.937			
	AQ-AZ	I.D. Exhaust Seat Hole in	<u>1.926</u>			
		Cylinder Head	1.928			
612	AQ-AZ	Intake Valve Seat Hole in			<u>.0065T</u>	
		Cylinder Head			.010T	(A)
	AQ-AZ	O.D. Intake Seat	<u>2.2885</u>			
			2.290			
	AQ-AZ	I.D. Intake Seat Hole in Cylinder	2.280			
		Head	2.282			
613	AQ-AZ	Exhaust Valve Guide and			<u>.0011T</u>	
		Cylinder Head			.0030T	(A)
	AQ-AZ	O.D. Exhaust Valve Guide	<u>.6954</u>			
			.6963			
	AQ-AZ	I.D. Exhaust Valve Guide Hole	<u>.6933</u>			
		in Cylinder Head	.6943			

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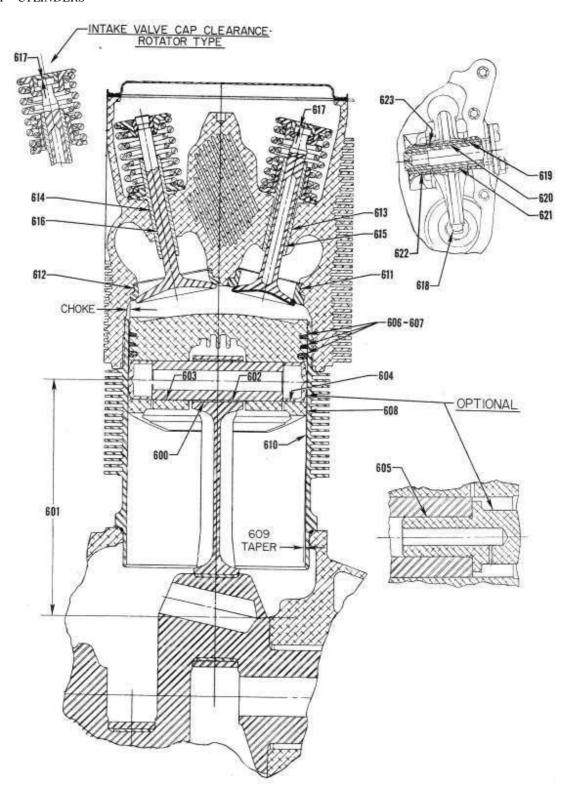
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
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	10,20		.0037L .0050L	(A)
	AQ-AZ	O.D. Exhaust Valve Stem	<u>.4955</u> .4965	.4937	100002	(12)
	AQ-AZ	Finished I.D. Exhaust Valve Guide	.4995 .5005	.1737		
616	.001 in. during each 100 hou	rs of service. After 300 hours of service, insurs of operation up to the recommended ovalatest revision of Service Instruction No. 1  Intake Valve Stem and Valve	verhaul time	for the engin	ne, or not to everhaul time.  0010L	exceed .01
	AQ-AZ	Guide O.D. Intake Valve Stem	.4022	4010	.0028L	.006L
	AQ-AZ	Finished I.D. Intake Valve Guide	.4030 .4040 .4050	.4010		
617	AQ-AZ	Intake and Exhaust Valve and Valve Cap – Clearance (Rotator Type with Small Diameter Head)	.1050		<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			.0007L .0017L	.004L
	AQ-AZ	Finished I.D. of Rocker Arm Bushing	<u>.6252</u> .6263	.6270	100172	100.12
	AQ-AZ	O.D. Valve Rocker Shaft	.6241 .6245	.6231		
621	AQ-AZ	Valve Rocker Bushing and Valve Rocker			Burnished in	Place
021				,	~ william III	- 1400
622	AQ-AZ	Valve Rocker Shaft Bushing and	<u> </u>		<u>.0022T</u>	(A)
	AQ-AZ AQ-AZ		.7380 .7388			(A)

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION II – CYLINDERS



Cylinder, Piston and Valve Components

### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. &	Service	Mfr. Min. &	Service
OIL P		Nomenciature	Max.	Max.	Max.	Max.
	T	Oil Process Delices Charles and Oil			00101	
700	AQ-AZ	Oil Pump Drive Shaft and Oil Pump Body			.0010L .0030L	.004L
701	AQ-AZ	Oil Pump Drive Shaft and Oil			.0035L	.004L
,01	110 112	Pump Cover			.0050L	.0065L
703	AQ-AZ	Oil Pump Impellers – Diameter Clearance			<u>.002L</u> .005L	.008L
704	AQ-AZ	Oil Pump Impellers – Side Clearance			.002L .0045L	.005L
		Width of Oil Pump Impellers	1.372 1.374	1.371	.00102	.0032
705	AQ-AZ	Oil Pump Driven Impellers and Idler Shaft	1.371	1.5/1	.0005L .002L	.004L
FUEL	PUMP	Total Share		<u> </u>	.002L	.004L
722	AQ-AZ	Fuel Pump Idler Gear and Shaft			.001L	
					.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			.0010L .0025L	.004L
727	AQ-AZ	Fuel Pump Drive Shaft Gear – End Clearance			.0025E .0015L .0385L	.0485L
GOVE	TRNOR & TACHOMETER	Zha Giourunee			.0303E	.0403L
728	AQ	Front Governor Drive Idler Shaft (Both Ends) and Crankcase			<u>.0010L</u> .0025L	.004L
731	AQ-AZ	Governor Driven Gear and Crankcase			.0010L .0025L	.004L
732	AQ-AZ	Propeller Governor Drive Gear – End Clearance			.008L .016L	.021L
739	AZ	Tachometer Drive Shaft and Adapter			.0015L .0035L	.006L
VACU	 'UM PUMP & HYDRAULIC F	•			.0033L	.000L
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	NETO					
761	AQ-AZ	Magneto Coupling and Crankcase			<u>.0010L</u> .0030L	.004L
762	AQ-AZ	Magneto Drive Shaft Gear and Crankcase			.0010L .0030L	.004L

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

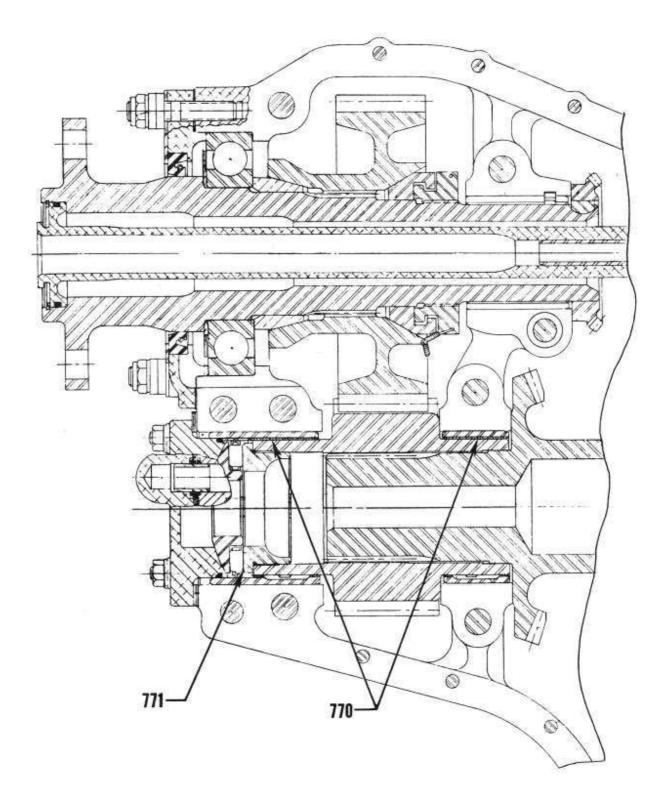
#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
ACCES	SSORY DRIVE, COMPRESSOR, BR	EATHER, PROPELLER SHAFT, AL	TERNATOR,	, & STARTEI	R	
763	AQ-AZ	Accessory Drive Gear				
		Intermediate and Crankcase (2			<u>.0010L</u>	
		Places)			.0030L	.005L
764	AQ-AZ	Accessory Drive Gear – End			<u>.016L</u>	
		Clearance			.018L	.020L
765	AQ-AZ	Accessory Drive Gear and			<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			.0005	
		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

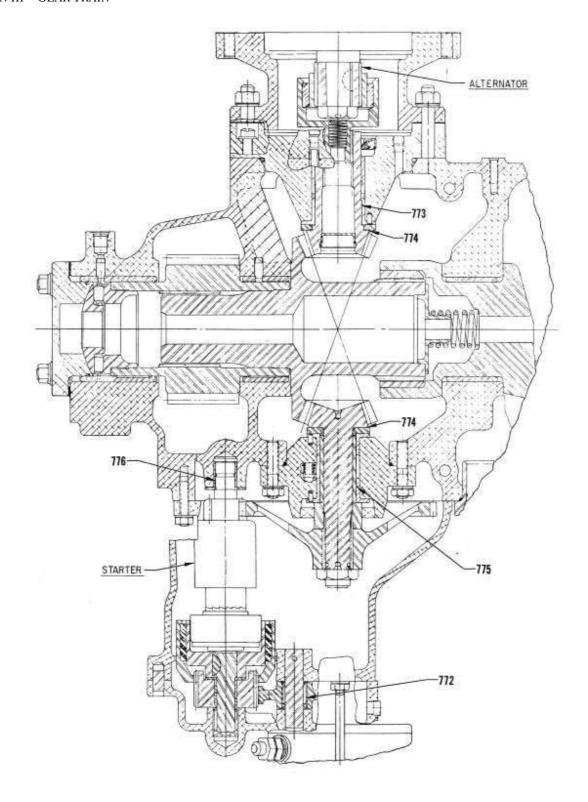


**Propeller Shaft Drive Gear** 

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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

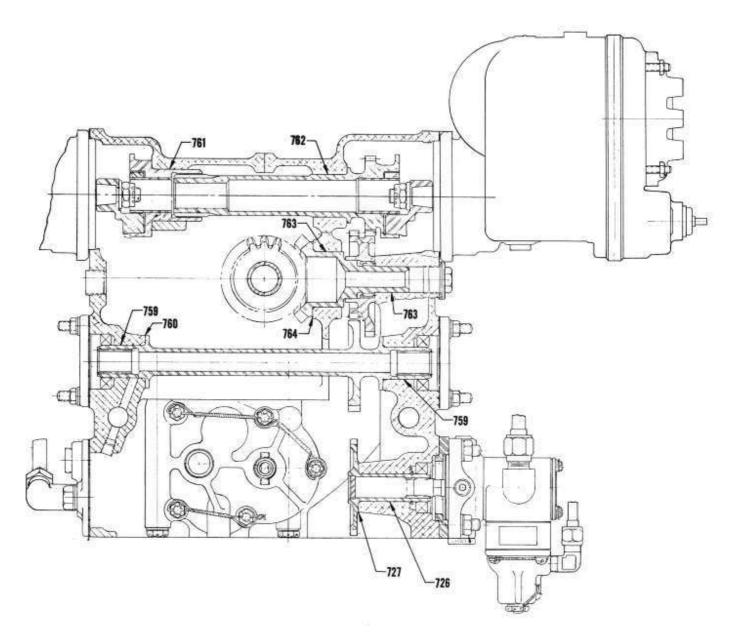
SECTION III – GEAR TRAIN



**Alternator, Starter and Propeller Shaft** 

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

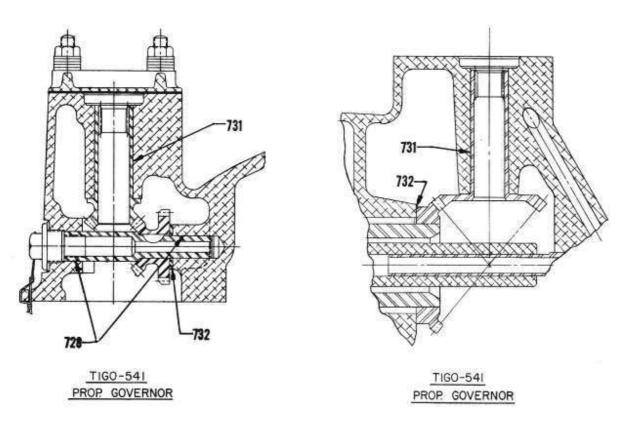
SECTION III – GEAR TRAIN

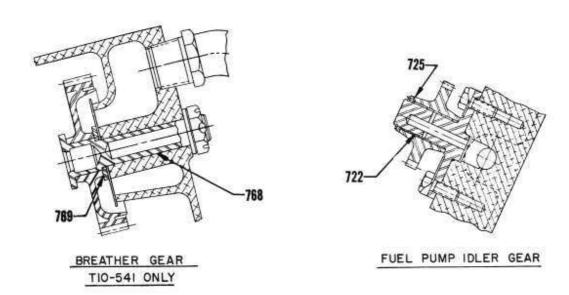


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### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN

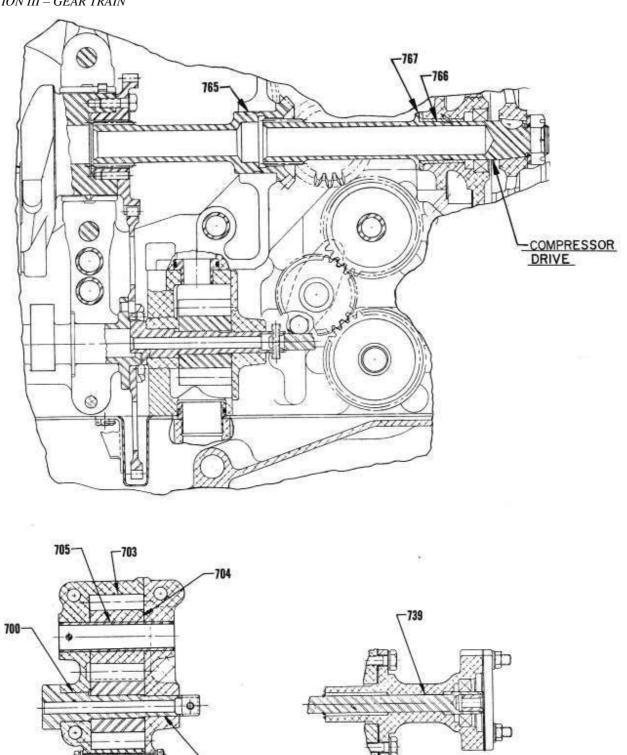




Governor, Fuel Pump and Breather Gear

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

SECTION III – GEAR TRAIN



Oil Pump, Tachometer and Compressor

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## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

 $SECTION\:IV-BACKLASH$ 

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

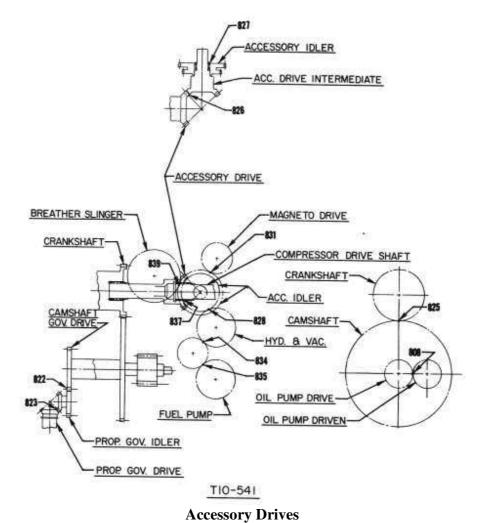
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#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### $SECTION\ IV-BACKLASH$

			Dime	nsions	Clear	ances
			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			<u>.0002</u>	
		and Idler – Backlash			.0045	.0075
845	AZ	Propeller Shaft Spline and				
		Propeller Shaft Driven Gear –			.008	
		Spline Backlash			.011	.015
		(When Measured at O.D. of			.020	
		Propeller Gear)			.028	.036

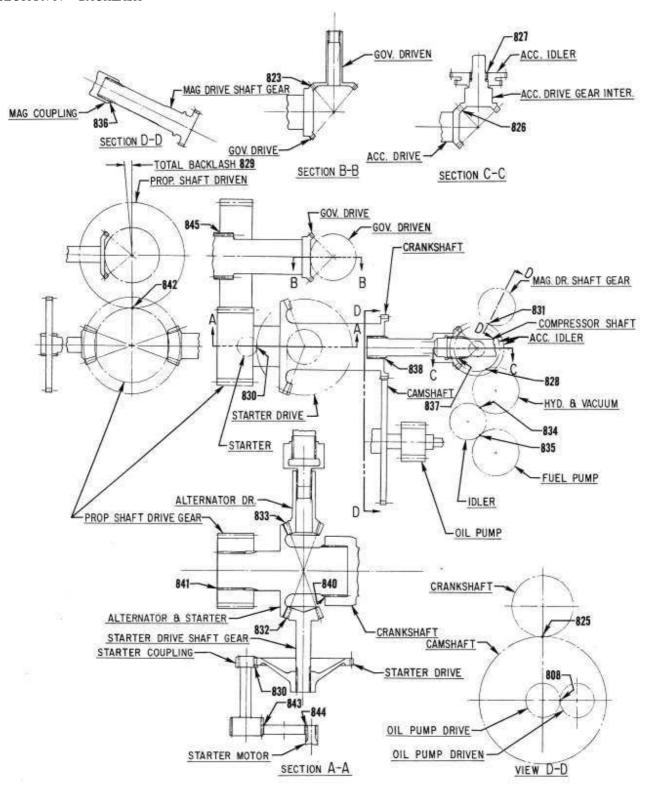


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#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

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		o – Nut (To attach drive	
					r to magneto)	300 in. lbs.
904	AQ-AZ		10-32		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	Rocker	Box Screws	50 in. lbs.
907	AQ-AZ		18MM	Spark F	lugs	420 in. lbs.
909	AQ			Alterna	tor Pulley Nut	450 in. lbs.
	AZ			Alterna	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	Alterna	tor Auxiliary Nut	30 in. lbs.
912	AQ-AZ		5/16-24		Terminal Nut	2 in. lbs.
913	AQ-AZ		1/16-27 NPT	Piston (	Cooling Nozzle in	
<u> </u>				Cranke		100 in. lbs.
915	AQ-AZ		3/4-16		er Bolt (AC Can and	
1				Elemen		300 in. lbs.
	AQ-AZ		13/16-16		er (Throw away type)	240 in. lbs.
01=	AQ-AZ		3/4-16	Conver		720 in. lbs.
917	AQ-AZ		1.00-14		oler Bypass Valve	300 in. lbs.
918	AQ-AZ		1-1/4-12	Oil Pressure Relief Valve Hose Clamps		300 in. lbs.
919	AQ-AZ		E1 (VD			45 in. lbs.
921	AQ-AZ	T	Exhaust V-Band	ı Couplin		1/4 I., D.:11-4 II N
	Counting Sign	I vocamina Dant			T-Bolt Split Type Locknut Torque In.	1/4 In. Drilled Hex Nut with Safety Wire
	Coupling Size Tube OD	Lycoming Part No.	Vendor Part	· 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	15
922	AZ	277 12123 3	Turbocharger V			
		er Model No.	V-Clamp Par		V-Clamp Diameter	Torque In. Lbs.
		A21*	400500-9		9.25 in.	40-60
1	* - AiResearch t			-		1
	See latest revision	on of Service Instr	uction No. 1238 f	or assemb	ly procedure.	
923	AZ		2-1/16-12		er Shaft Lock Nut	1000 ft. lbs.
924	AQ-AZ		7/16-20	Fuel In	ector Nozzles (In	
				Induction	on Housing)	210 in. lbs.
925	AQ-AZ	·	3/4-16	Compre	essor Drive Pulley Nut	240 in. lbs.
926	AZ		5/8-18		Drive Shaft Gear Nut	900 in. lbs.
927	AQ-AZ		1/4		Crankshaft Gear	96-120 in. lbs.
928	AQ-AZ		3/8-16		er Hold Down Studs	
1					case Driving Torque)	100 in. lbs.
			1/2-13		er Hold Down Studs (Cr	220.
020	10.45			_	Driving Torque)	250 in. lbs.
929	AQ-AZ		3/8		r Hold Down Nuts	300 in. lbs.
1	Cylinds - II-11D	Novem Not Ti-l-4	1/2		er Hold Down Nuts	600 in. lbs.
022	•	own mut 11gnteni			evision of Service Instructi	011 NO. 1029.
932	AQ-AZ		5/16-18		t Transitions – Studs g Torque)	100 in the
			3/8-16		g Torque) t Transitions – Studs	100 in. lbs.
			3/0-10		g Torque)	200 in. lbs.
	I		1		5 rorque)	200 III. 108.

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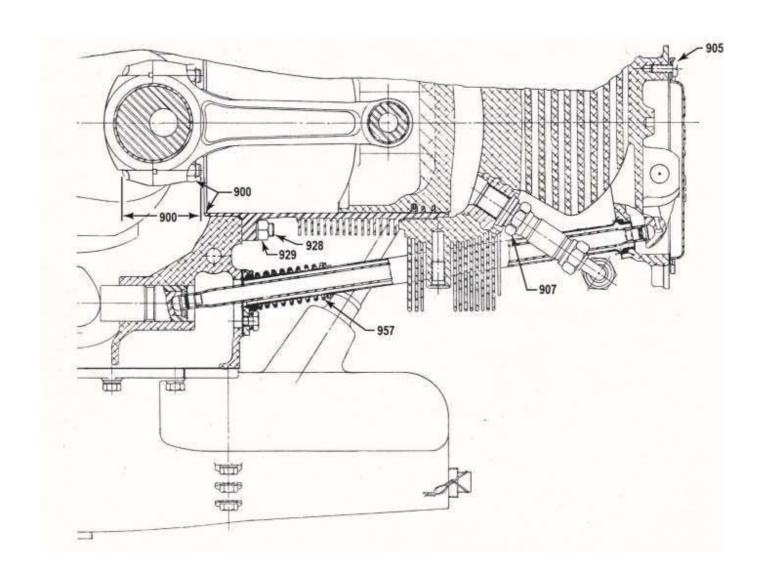
## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

 $SECTION\ V-SPRINGS$ 

							C	OMP. LOA	AD.
Ref.	Chart	Nomencl	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			T	T	
									7.1 lb.
		68668	Purple	2.04	.054	1.30 in.	7.1 lb.	7.8 lb.	min.
									10.5 lb.
		LW-11713	White	2.12	.059	1.44 in.	10.79 lb.	11.92 lb.	min.
									8.3 lb.
055		LW-11138	None	2.64	.051	1.44 in.	8.55 lb.	9.45 lb.	min.
955	AQ-AZ	Fuel Drain Che	eck Valve S	Spring					5.35 lb.
056					.047	.75 in.	5.50 lb.	6.50 lb.	min.
956	AQ-AZ	Oil Filter Relie	ef Valve Sp	ring	0.7.4		20511	2 7 7 11	3.00 lb.
057					.054	1.93 in.	3.05 lb.	3.55 lb.	min.
957	AZ	Shroud Tube S	pring		105	2.00	1 4 11	16.11	13 lb.
958	10.17	D	. 1 . 0 .		.105	2.09 in.	14 lb.	16 lb.	min.
938	AQ-AZ	Pressurizing V	aive Spring	5	022	455 405	(5 1L	75 11-	.63 lb.
959	A 77	Carrier a Dark	C1- 1	£ 1	.032	.455485	.65 lb.	.75 lb.	min.
939	AZ	Spring Betwee			12	1 40 in	40 lb	52 lb	46 lb.
960	A 77	Starter and Alt			.13	1.40 in.	48 lb.	52 lb.	min.
900	AZ	Alternator Driv	ve Coupiing	g spring	.047	92 in	10 lb.	11 lb.	9 lb. min.
					.047	.83 in.	10 10.	11 10.	IIIIII.

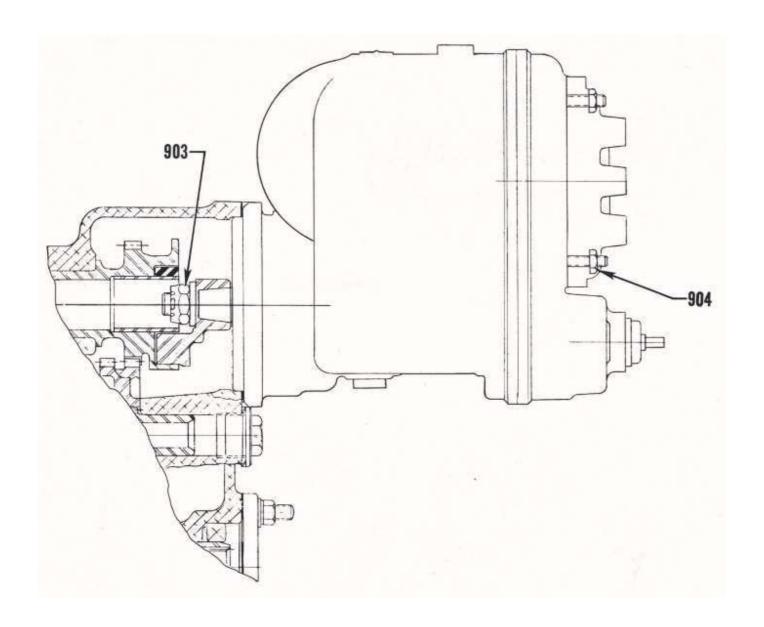
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## PART II – INTEGRAL ACCESSORY DRIVE ENGINES



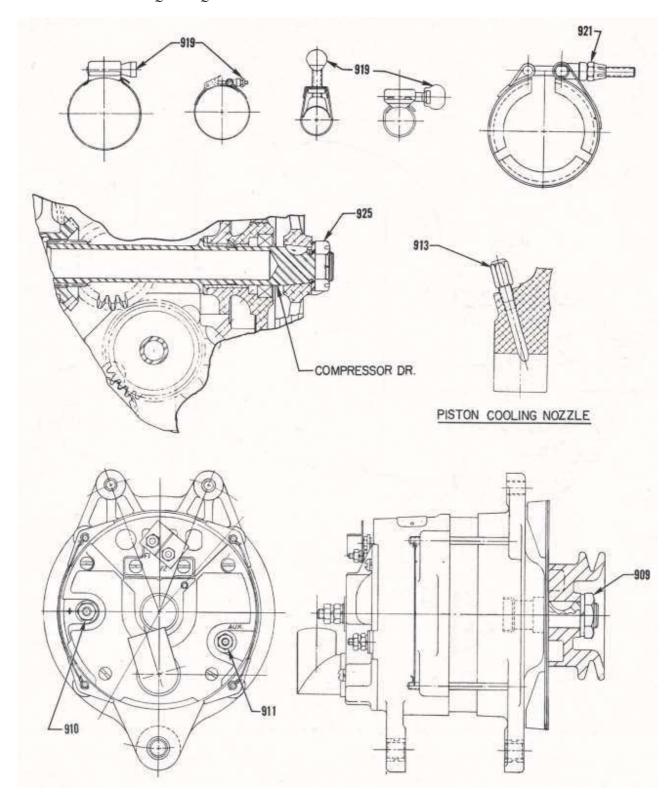
**Engine Accessories and Hardware** 

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES



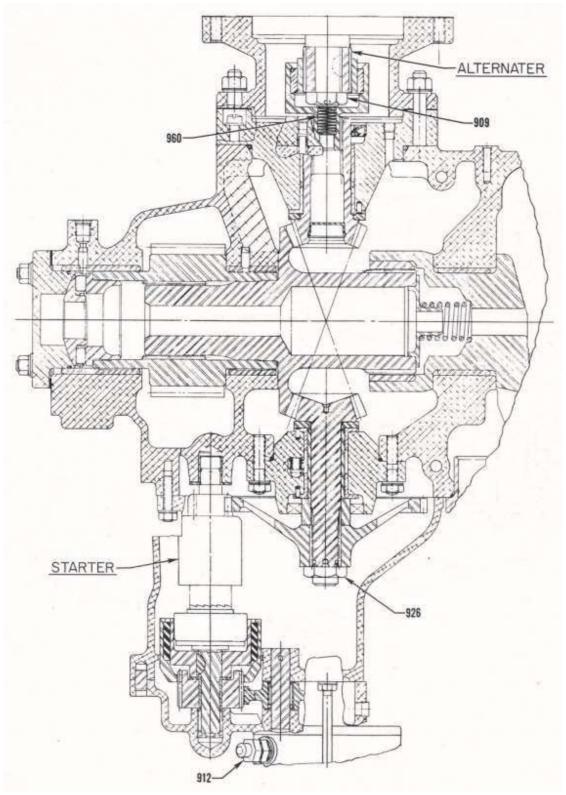
**Engine Accessories and Hardware** 

#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES



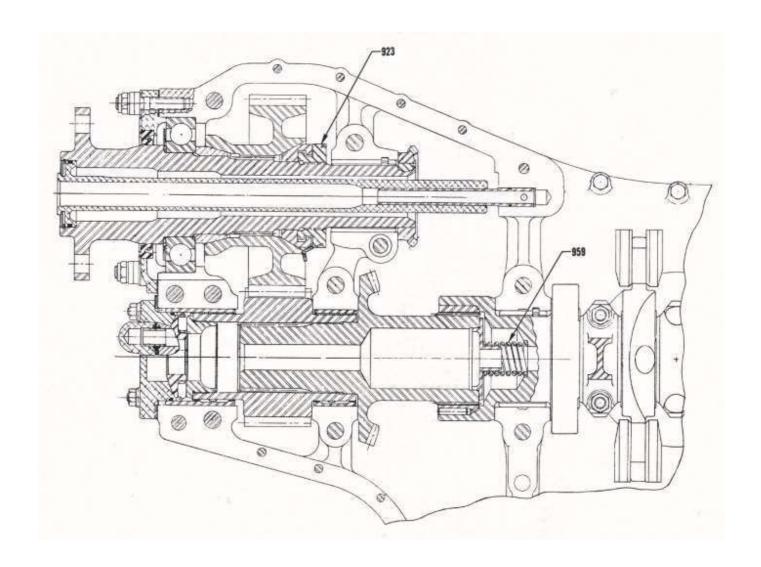
**Engine Accessories and Hardware** 

## PART II – INTEGRAL ACCESSORY DRIVE ENGINES

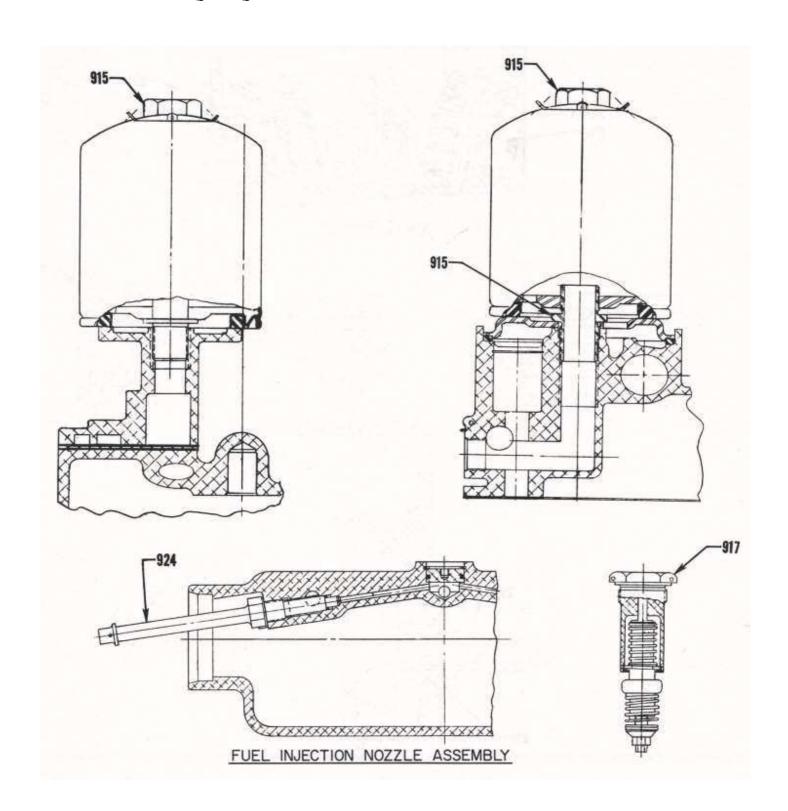


**Engine Accessories and Hardware** 

# PART II – INTEGRAL ACCESSORY DRIVE ENGINES

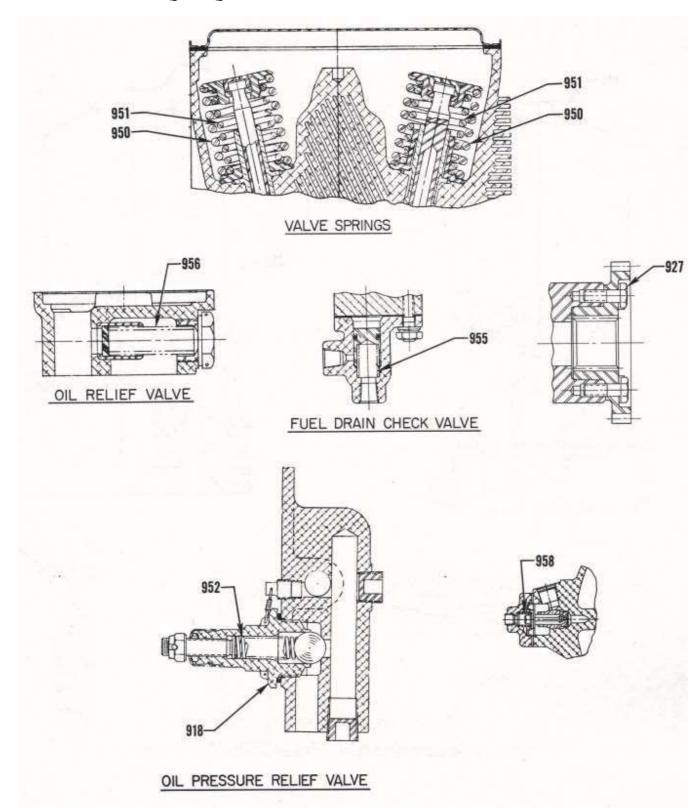


## PART II – INTEGRAL ACCESSORY DRIVE ENGINES



**Engine Accessories and Hardware** 

#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES



**Engine Accessories and Hardware** 

#### PART II – INTEGRAL ACCESSORY DRIVE ENGINES

#### STANDARD TORQUE

#### UNLESS OTHERWISE LISTED

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

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

	TABLE I						LE II
	BOLTS, SCREW AND NUTS						PLUGS
Thusad	Tor	Torque		Torq	ue	Thursd	Torque
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb.	Ft. Lb.	Thread	In. Lbs.
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121
3/8 360 to 396 30 to 33 3/4 3240 to 3564 270 to 297						1/2-14 NPT	160 to 176
TU	THIN MITTE (1/2 DIA OF DOLT) 1/2 LICTED TODOLE						230 to 252
111	THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE						315 to 347

TADIEIII		TADI E IV					
TABLE III	TABLE IV						
CRUSH TYPE GAS	KETS		FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)				
	1		(SEAL.	ASTIC OR E	EQUIVALENT FIT	IINGS)	
Thread Pitch on Part to be	ANGLE OI	FTURN	Tube		Torque In.	Torque In. Lbs.	
Tightened			Size	Thread			
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°	180° 90°		9/16-18	75 to 125	270 to 300	
16	270°	135°	(-8) 1/2	3/4-16	150 to 250	450 to 500	
18	270°	135°	(-10) 5/8	7/8 - 14	200 to 350	650 to 700	
20	270°	135°					
24	360°	180°		Т	ABLE V		
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	Е	
NOTE: Install all crush type gas	skets except	the self	Thr	eads	Torque In.	Lbs.	
centering type, with the unbroken sur	face against th	he flange	1/4	20	15		
of the plug or part being tightened ag	5/10	5-18	25				
part until the sealing surfaces are in c		3/8	-16	50			
to the angle of turn listed for the appr							
NOTE: Lubricate Threads Unless Of	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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#### STANDARD TORQUE (CONT.) UNLESS OTHERWISE LISTED

	TABLE VII									
METAL TUBE FITTINGS										
	Wrench torque for tightening AN-818 Nut (pound inches)									
Dash Nos. Ref.	Tubing OD inches	Aluminum-	alloy tubing	Steel	Steel tubing		alloy tubing 3583) for use lines only	measured centerline. I inc	Dimension in	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Alum. Alloy	Steel	
-2	1/8	20	30	75	85			3/8		
-3	3/16	25	35	95	105			7/16	21/32	
-4	1/4	50	65	135	150			9/16	7/8	
-5	5/16	70	90	170	200	100	125	3/4	1-1/8	
-6	3/8	110	130	270	300	200	250	15/16	1-5/16	
-8	1/2	230	260	450	500	300	400	1-1/4	1-3/4	
-10	5/8	330	360	650	700			1-1/2	2-3/16	
-12	3/4	460	500	900	1000			1-3/4	2-5/8	
-16	1	500	700	1200	1400			3	3-1/2	
-20	1-1/4	800	900	1520	1680			3-3/4	4-3/8	
-24	1-1/2	800	900	1900	2100			5	5-1/4	
-28	1-3/4									
-32	2	1800	2000	2660	2940			8	7	

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

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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.

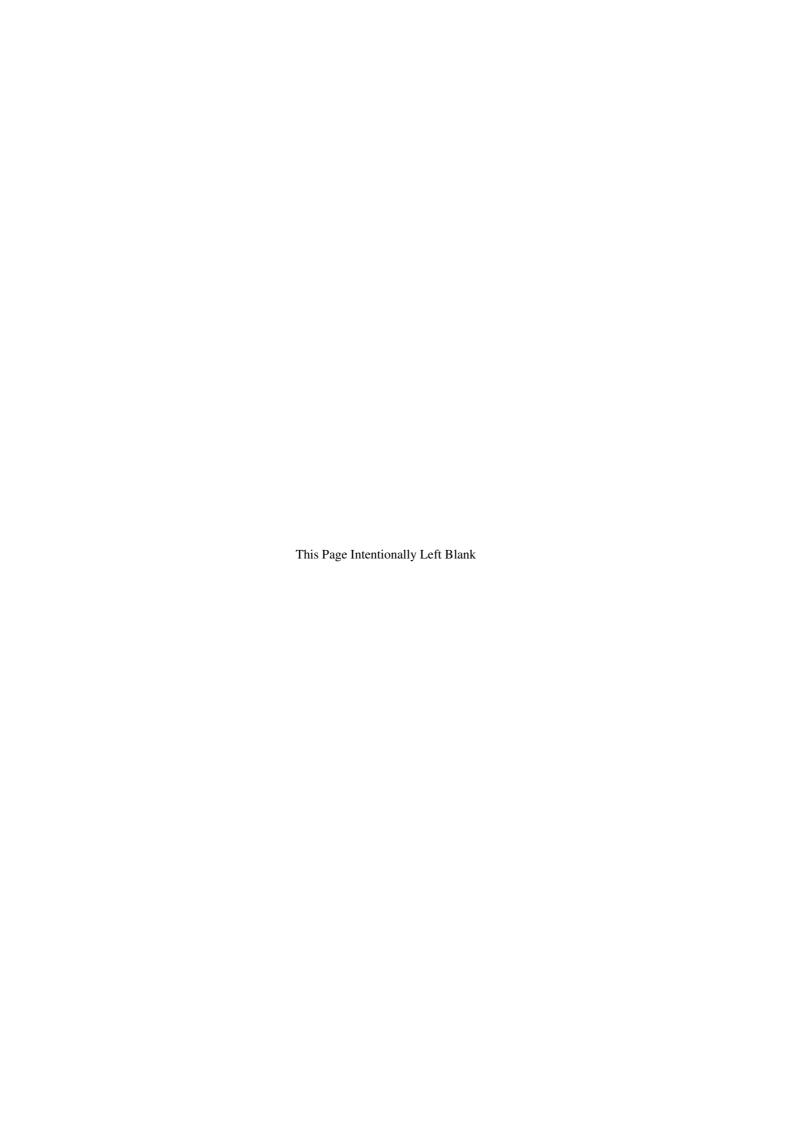
SECTION I SECTION II SECTION IV SECTION V	500 SERIES 600 SERIES 700 & 7000 SERIES 800 SEREIS 900 SERIES	CRANKCASE, CRANKSHAFT & CAMSHAFT CYLINDERS GEAR TRAIN BACKLASH (GEAR TRAIN) TORQUE & SPRINGS
(A)		runk fits controlled by machining, fits that may readily be ear does not normally occur. In each case, the fit must be held ce.
(B)	Side clearance on piston	rings must be measured with face of ring flush with piston.
(C)		these items must be made to give uniform backlash within nary gear and pinions, and within 0.001 between the pinions
(D)	These dimensions show piston pin.	n are measured at bottom of piston skirt at right angles to
(E)	Permissible wear of the con the diameter.	rankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherein a defin	nite clearance is mentioned between the mating surfaces.

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Tight fit; shrink or interference fit.

(T)

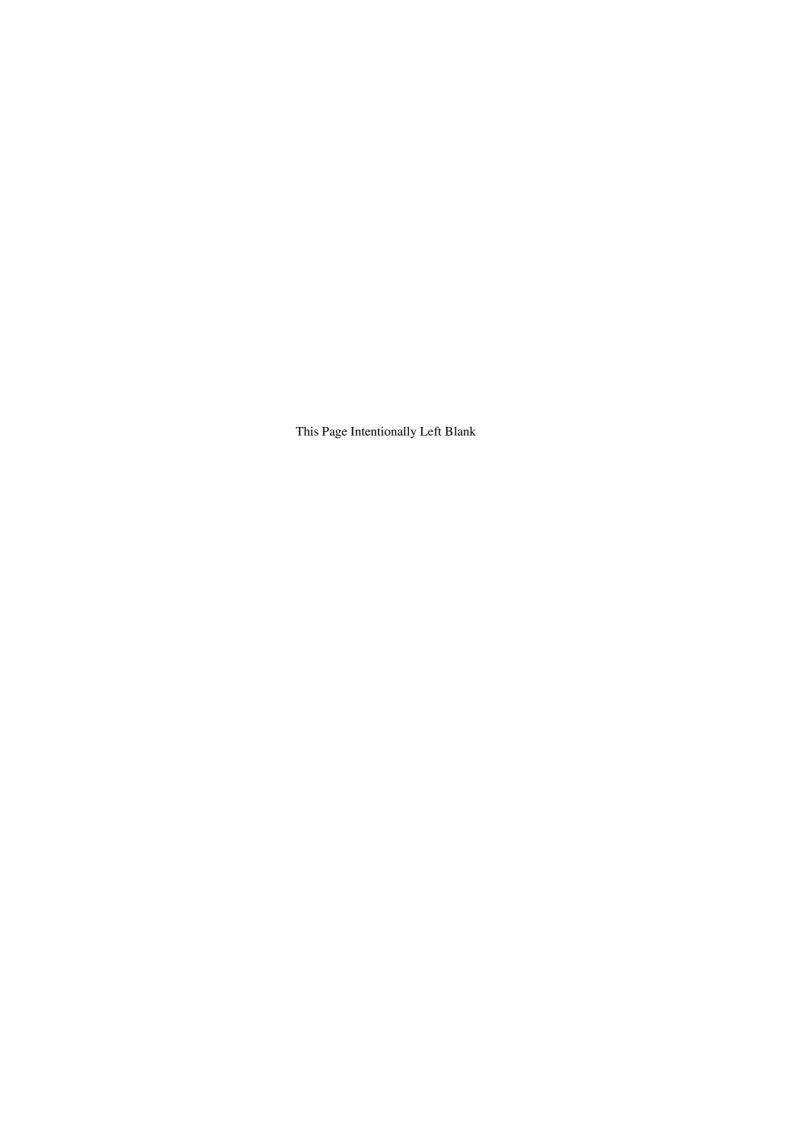
<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.





# TECHNICAL PUBLICATION REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO. PUBLICATION		
SSP-1776-5-PT3	Service Table of Limits	SSP-1776	October 28, 2013	
PREVIOU	S REVISIONS	CURRENT	REVISION*	
Ap	ril 2018	Apri	1 2020	
3-9, 3	3-47, 3-53	3	-8	
	to Section V table and figure for on nut on stainless steel injector		ber 600 Max. Clearance for Piston Ring led Cylinders (Choke Barrels) in reference number 607	



#### **PART III – GEARED ENGINES**

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

			Dime	nsions	Clear	rances
			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>			
		Diameters (All)	2.567	2.5685		
	H3-H5-P-AB-AC	Crankcase Bearing Bore	<u>2.6865</u>	•		
<b>501</b>		Diameters (All)	2.6875	2.6890	00001	
501	ALL	Connecting Rod Bearings and			.0008L	00501
		Crankshaft	2 1225		.0038L	.0050L
	ALL	Diameter of Connecting Rod	<u>2.1235</u>	(E)		
	A 7 7	Journal on Crankshaft (2-1/8 in.)	2.125	(E)		
	ALL	Connecting Rod Bearing Bore	2 2070			
		Diameter (Measured at axis 30°	2.2870 2.2875			
502	ALL	on each side)	2.2875		0041	
502	ALL	Connecting Rod Side Clearance			.004L .010L	.016L
503	ALL	Connecting Rod Alignment			.010 in 1	0 Inches
504	ALL	Connecting Rod Twist			.012 in 1	0 Inches
505	ALL	Crankshaft Run-Out at Center				
		Main Bearings				
		Mounted on No. 1 and 4				
		Journals Max. Run-Out No. 2				
		and 3 Journals			.005	.0075
		Mounted on No. 1 and 3				
		Journals Max. Run-Out No. 2				
		Journal			.003	.0045
		Mounted on No. 2 and 4				
		Journals Max. Run-Out No. 3			002	0045
500	ATT	Journal			.003	.0045
506	ALL	Crankshaft and Crankcase Front End Clearance			<u>.006L</u> .015L	.025L
510	E-H1-H2-H3	Crankshaft Timing Gear and			.015L	.UZJL
310	L-111-114-113	Crankshaft Crankshaft			.0013L .0005T	(A)
	H4-H5-P-AB-AC	Crankshaft Timing Gear and			.0000	(11)
	IIIIIII IIII-AC	Crankshaft Crankshaft			.0000 .0015T	(A)
511	ALL	Tappet Body and Crankcase			.0010L	\11)
	1	Tappet Body and Claimease			.0033L	.004L
	ALL	O.D. of Tappet	<u>.7169</u>			
	_		.7177	.7166		
	A T T	I.D. Tappet Bore in Crankcase	.7187	1		
	ALL	1.D. Tappet Bole III Clalikcase	./10/			

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#### **PART III – GEARED ENGINES**

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

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
Ref.	Chart	Nomenclature	Min. & Max.	Service Max.	Min. & Max.	Service Max.
512	ALL	Tappet Plunger Assembly and			<u>.0010L</u>	
		Body (Hyperbolic)			.0067L	.0087L
513	ALL	Tappet Socket and Body			.002L	0001
£1.4	ATT	(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 .000	.013L
310	, iee	Bearing Journal			.001	.006
517	ALL	Counterweight Bushing and			.0013T	
		Crankshaft			.0026T	(A)
518	ALL	Counterweight Roller – End			<u>.007L</u>	
		Clearance			.025L	.038L
519	ALL	Counterweight and Crankshaft –			<u>.003L</u>	
		Side Clearance*			.013L	.017L
	* - Measure below roller next to f					•
520	ALL	Counterweight Bore and Washer O.D.			.0002L .0030L	(A)
521	ALL	I.D. of Counterweight Bushing	.7485			
			.7505	.7512		
522	ALL	O.D. of Counterweight Roller				
		(P/N 69433) (See latest revision	.5045			
		of Service Instruction No. 1012)	.5050			
	AC	O.D. of Counterweight Roller				
		(P/N 73287) (See latest revision	<u>.5189</u>			
		of Service Instruction No. 1012)	.5194			
	ALL	O.D. of Counterweight Roller	6045			
		(P/N 70416) (See latest revision of Service Instruction No. 1012)	.6945 .6950			
523	ALL	Thrust Bearing and Propeller	.0930		.0000	
323	ALL	Shaft			.0012L	.002L
526	ALL	Thrust Bearing and Thrust			.0012L	.002L
320	TEE	Bearing Cap Clamp Fit (Shim to			<u>.003T</u>	
		this fit)			.005T	(A)
527	ALL	Thrust Bearing Tilt			.027 Tilt	/
528	ALL	Thrust Bearing – End Play			.006	
		<i>g</i>			.008	.010
530	ALL	Propeller Shaft Run-Out (Rear				
		Cone Location)				.003
531	ALL	Propeller Shaft Run-Out (Front				_
		Cone Location) (Propeller Shaft Installed)				.007
532	E-H1-H2-H3	Starter Jaw and Crankshaft			.0005L	.007
332	L 111-112-113	Starter Jaw and Crankshart			.0040L	(A)
533	ALL	Thrust Bearing and Reduction			.0006L	(11)
333		Gear Housing			.0024L	.0035L

## PART III – GEARED ENGINES

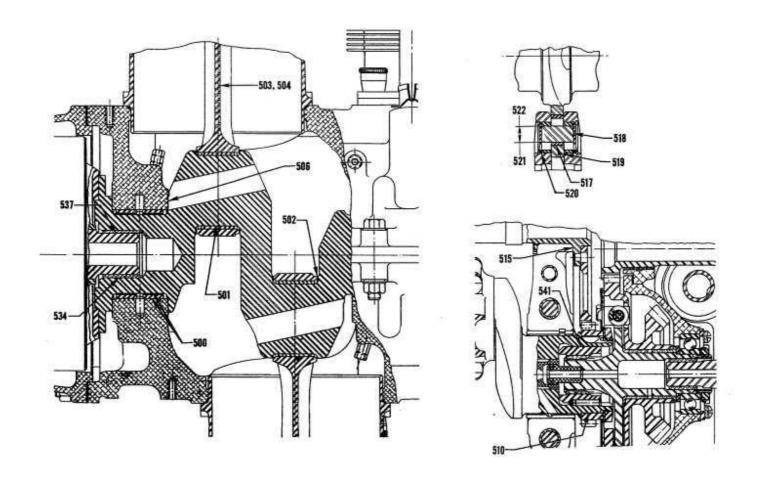
 $SECTION\ I-CRANKCASE,\ CRANKSHAFT,\ CAMSHAFT$ 

			Dime	nsions	Clear	Clearances	
			Mfr. Min. &	Service	Mfr. Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
534	ALL	Crankshaft and Crankcase Front Bushing			.0010T .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 being 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			.0002T .0015T	(A)	

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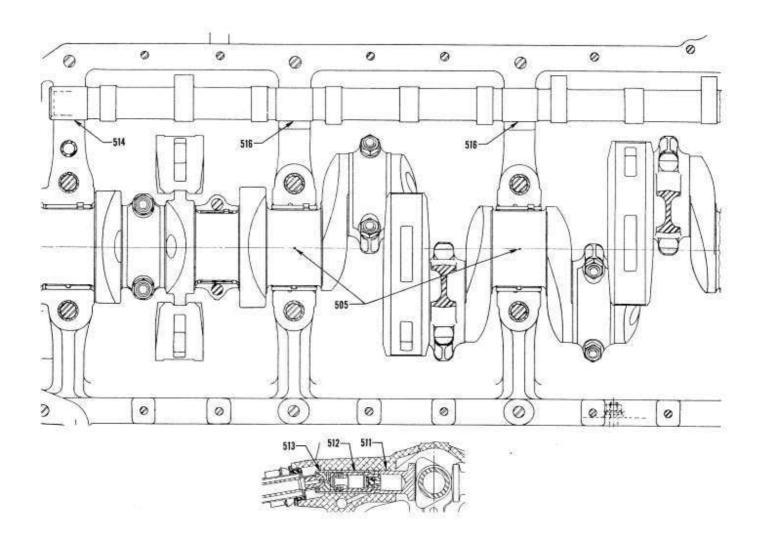
#### **PART III – GEARED ENGINES**

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



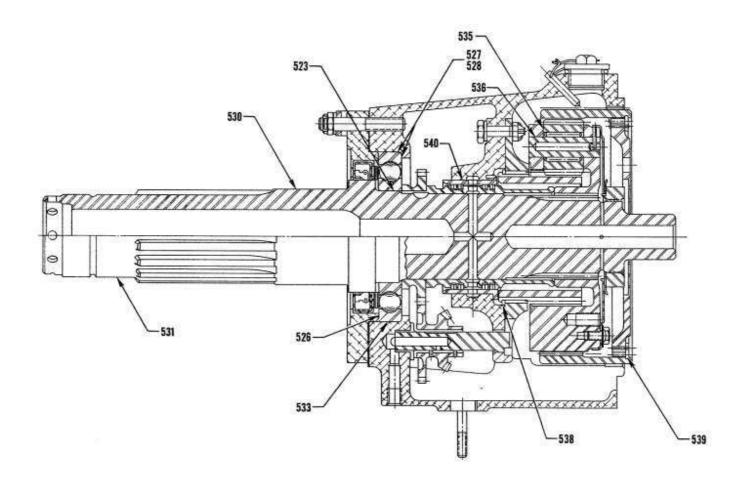
#### **PART III – GEARED ENGINES**

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



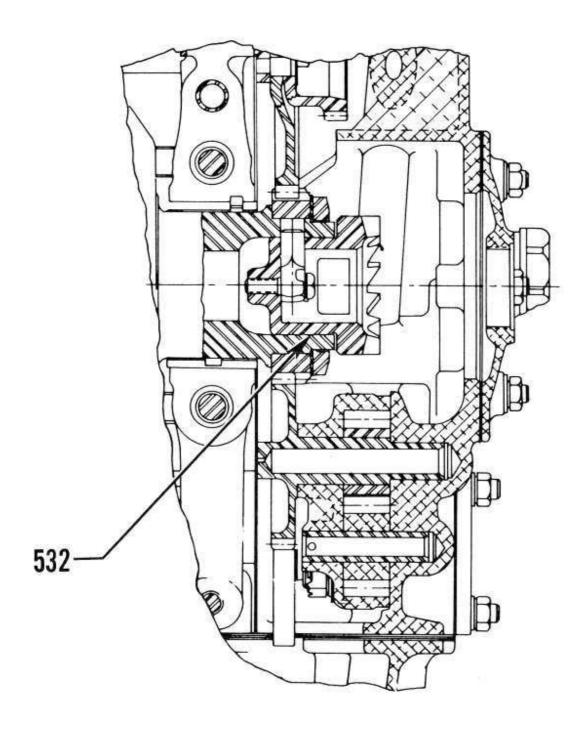
## PART III – GEARED ENGINES

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



#### **PART III – GEARED ENGINES**

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



**Starter Jaw and Crankshaft** 

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## PART III – GEARED ENGINES

#### SECTION II – CYLINDERS

			Dimer	nsions	Clear	ances
			Mfr. Min.		Mfr.	
			& Max.	Service	Min. &	Service
Ref.	Chart	Nomenclature		Max.	Max.	Max.
600	ALL	Connecting Rod and	Bushing P/N			
		Connecting Rod Bushing	Bushing P/N	01K28983 is	s <u>not</u> burnish	ed in place
		Finished I.D. of Connecting	<u>1.1254</u>			
		Rod Bushing	1.1262			
601	E-H-P	Length Between Connecting	6.4985			
	1.D. 1.G	Rod Bearing Centers	6.5015			
	AB-AC	Length Between Connecting	<u>6.4785</u>			
602	ALL	Rod Bearing Centers	6.7515		00001	
602	ALL	Connecting Rod Bushing and Piston Pin			<u>.0008L</u> .0021L	.0025L
603	ALL	Piston Pin and Piston			.0021L .0003L	.0023L
003	ALL	Fiston Fin and Fiston			.0003L .0014L	.0018L
	ALL	Diameter of Piston Pin Hole in	1.1249		.0014L	.0016L
	ALL	Piston	1.1254			
	ALL	Diameter of Piston Pin	1.1241			
		Diameter of Fiston Fin	1.1246			
604	H-P-AB-AC	Piston and Piston Pin Plug	111210		.0002L	
					.0010L	.002L
	H-P-AB-AC	*Diameter of Piston Pin Plug	1.1242			
			$\overline{1.1247}$			
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			T	T	T
606	ALL	Piston Ring and Piston – Side			00051	
		Clearance (Top Ring Comp.)			.0025L	000I (D)
	ALL	Half Wedge Piston Ring and Piston – Side			.0055L	.008L (B)
	ALL	Clearance (2 <sup>nd</sup> Ring Comp.)			000	
		Full or Half Wedge			.000 .004L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side			.004L	.000L (B)
	ALL (AS AIT LICABLE)	Clearance (3 <sup>rd</sup> Ring Comp.)			.000	
		Half Wedge			.004L	.006L (B)
	ALL	Piston Ring and Piston – Side			.002L	.0002 (2)
		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			.020	
		Barrels)			.030	.047
	ALL	Piston Ring Gap (Comp.)			0.15	
		Nitrided and Chrome Cylinders			<u>.045</u>	
		(Choke Barrels)			.065	.067
	ALL	Piston Ring Gap (Oil			<u>.015</u> .040	
		Regulating) (All Barrels)			.040	.047

#### **PART III – GEARED ENGINES**

#### SECTION II – CYLINDERS

			Dime	nsions	Clearances	
			Mfr. Min. & Service		Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	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 and	d Piston Application	Min. Pisto	on Diameter		Cylind	der Barrel	Max.
Engine Chart Code Letter	Piston Number	Тор	Bottom	Type of Piston	Type of Surface	Maximum Diameter	Clearance Piston Skirt & Cyl.
Е	67266, 71553	4.8395	4.8540	Forged-Round	P	4.8805	.018L
E	73620, 73628	4.8395	4.8540	Forged-Round	N	4.8805	.018L
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	C	5 1305	.0225L
H-AC	71940, 72249*, 73947*, 73976	5.0905	5.1040	Forged-Round	N	5.1305	.023L
H-P-AB	74242, 75617*	5.0790	5.1090	Forged-Cam	C	5.1305	.018L
H-P-AB-AC	74242, 76258*	5.0790	5.1090	Forged-Cam	N	5.1305	.018L
AC	75617*, 76258*	5.0790	5.1090	Forged-Cam	C-N	5.1305	.018L
H-P-AB-AC	73264*, 75961, 76966, 78203*, 78762, LW-10207*, LW-10208,	5.0500	7.1000	- I G			.018L
	Engine Chart Code Letter  E E E H-P H-P H-P-AB-AC  H-P-AB H-P-AB-AC AC	Code Letter         Piston Number           E         67266, 71553           E         73620, 73628           E         67266, 71553, 73620, 73628, 73932           E         75984           H-P         69236           H-P         71545, 71608*           H-P-AB-AC         71940, 72249*, 72578, 73947*, 73976           H-AC         71940, 72249*, 73947*, 73976           H-P-AB         74242, 75617*           H-P-AB-AC         74242, 76258*           AC         75617*, 76258*           H-P-AB-AC         73264*, 75961, 76966, 78203*, 78762, LW-10207*, 78762, LW-10207*,	Engine Chart Code Letter         Piston Number         Top           E         67266, 71553         4.8395           E         73620, 73628         4.8395           E         67266, 71553, 73620, 73628, 73932         4.8395           E         75984         4.8395           H-P         69236         5.0905           H-P         71545, 71608*         5.0905           H-P-AB-AC         71940, 72249*, 72578, 73947*, 73976         5.0905           H-AC         71940, 72249*, 73947*, 73976         5.0905           H-P-AB         74242, 75617*         5.0790           H-P-AB-AC         74242, 76258*         5.0790           AC         75617*, 76258*         5.0790           H-P-AB-AC         73264*, 75961, 76966, 78203*, 78762, LW-10207*, LW-10208,         5.0790	Engine Chart Code Letter         Piston Number         Top         Bottom           E         67266, 71553         4.8395         4.8540           E         73620, 73628         4.8395         4.8540           E         67266, 71553, 73620, 73628, 73932         4.8395         4.8540           E         75984         4.8395         4.8590           H-P         69236         5.0905         5.1040           H-P         71545, 71608*         5.0905         5.1025           H-P-AB-AC         71940, 72249*, 72578, 73947*, 73976         5.0905         5.1040           H-AC         71940, 72249*, 73947*, 73976         5.0905         5.1040           H-P-AB         74242, 75617*         5.0790         5.1090           H-P-AB-AC         74242, 76258*         5.0790         5.1090           AC         75617*, 76258*         5.0790         5.1090           H-P-AB-AC         73264*, 75961, 76966, 78203*, 78762, LW-10207*, LW-10208,         5.0790         5.1090	Engine Chart Code Letter         Piston Number         Top         Bottom         Type of Piston           E         67266, 71553         4.8395         4.8540         Forged-Round           E         73620, 73628         4.8395         4.8540         Forged-Round           E         67266, 71553, 73620, 73628, 73932         4.8395         4.8540         Forged-Round           E         75984         4.8395         4.8590         Forged-Cam           H-P         69236         5.0905         5.1040         Forged-Cam           H-P         71545, 71608*         5.0905         5.1025         Forged-Round           H-P-AB-AC         71940, 72249*, 72578, 73947*, 73976         5.0905         5.1040         Forged-Round           H-P-AB         74242, 75617*         5.0790         5.1090         Forged-Round           H-P-AB-AC         74242, 76258*         5.0790         5.1090         Forged-Cam           H-P-AB-AC         73264*, 75961, 76966, 78203*, 78762, LW-10207*, LW-10208,         5.0790         5.1090         Forged-Cam	Engine Chart Code Letter         Piston Number         Top         Bottom         Type of Piston         Type of Surface           E         67266, 71553         4.8395         4.8540         Forged-Round         P           E         73620, 73628         4.8395         4.8540         Forged-Round         N           E         67266, 71553, 73620, 73628, 73932         4.8395         4.8540         Forged-Round         C           E         75984         4.8395         4.8590         Forged-Round         C           H-P         69236         5.0905         5.1040         Forged-Cam         P-C           H-P         71545, 71608*         5.0905         5.1025         Forged-Round         C           H-P-AB-AC         71940, 72249*, 72578, 73947*, 73976         5.0905         5.1040         Forged-Round         C           H-P-AB         74242, 75617*         5.0790         5.1090         Forged-Round         N           H-P-AB-AC         74242, 76258*         5.0790         5.1090         Forged-Cam         C           H-P-AB-AC         73264*, 75961, 76258*         5.0790         5.1090         Forged-Cam         C-N           H-P-AB-AC         73264*, 75961, 76258*         5.0790         5.1090 </td <td>Engine Chart Code Letter         Piston Number         Top         Bottom         Type of Piston         Type of Surface         Maximum Diameter           E         67266, 71553         4.8395         4.8540         Forged-Round         P         4.8805           E         73620, 73628         4.8395         4.8540         Forged-Round         N         4.8805           E         67266, 71553, 73620, 73628, 73932         4.8395         4.8540         Forged-Round         C         4.8805           E         75984         4.8395         4.8590         Forged-Cam         C-N         4.8805           H-P         69236         5.0905         5.1040         Forged-Cam         P-C         5.1305           H-PAB-AC         71940, 72249*, 72578, 73947*, 73947*, 73976         5.0905         5.1040         Forged-Round         C         5.1305           H-P-AB         74242, 75617*         5.0905         5.1040         Forged-Round         N         5.1305           H-P-AB-AC         74242, 76258*         5.0790         5.1090         Forged-Cam         C         5.1305           H-P-AB-AC         75617*, 76258*         5.0790         5.1090         Forged-Cam         C-N         5.1305           AC</td>	Engine Chart Code Letter         Piston Number         Top         Bottom         Type of Piston         Type of Surface         Maximum Diameter           E         67266, 71553         4.8395         4.8540         Forged-Round         P         4.8805           E         73620, 73628         4.8395         4.8540         Forged-Round         N         4.8805           E         67266, 71553, 73620, 73628, 73932         4.8395         4.8540         Forged-Round         C         4.8805           E         75984         4.8395         4.8590         Forged-Cam         C-N         4.8805           H-P         69236         5.0905         5.1040         Forged-Cam         P-C         5.1305           H-PAB-AC         71940, 72249*, 72578, 73947*, 73947*, 73976         5.0905         5.1040         Forged-Round         C         5.1305           H-P-AB         74242, 75617*         5.0905         5.1040         Forged-Round         N         5.1305           H-P-AB-AC         74242, 76258*         5.0790         5.1090         Forged-Cam         C         5.1305           H-P-AB-AC         75617*, 76258*         5.0790         5.1090         Forged-Cam         C-N         5.1305           AC

#### 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.

## PART III – GEARED ENGINES

#### SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
			Mfr. Min. &	Service	Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	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	1,720		<u>.0065T</u> .010T	(A)
	Е-Н-Р	O.D. Intake Seat	2.1675 2.169		.0101	(11)
	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	2,202		<u>.001T</u> .0025T	(A)
	ALL	O.D. Exhaust Valve Guide	<u>.6633</u> .6638		.00231	(11)
	ALL	I.D. Exhaust Valve Guide Hole in Cylinder Head	.6613 .6623			
614	ALL	Intake Valve Guide and Cylinder Head	.0023		<u>.001T</u> .0025T	(A)
	ALL	O.D. Intake Valve Guide	. <u>5933</u> . <u>5938</u>		100201	(1.1)
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	.5913 .5923			
615	ALL	Exhaust Valve Stem and Valve Guide	.5725		.0037L .0050L	
	ALL	O.D. Exhaust Valve Stem	<u>.4957</u> .4965	.4937	.0000E	
				owable limits		
	ALL	Finished I.D. Exhaust Valve Guide	.499 <u>5</u> .5005			
	limit, anytime up to 300 hours of s .001 inch during each 100 hours of	may have exhaust valve guides that a service. After 300 hours of service, inservice of operation up to the recommended of revision of Service Instruction No. 1	are .003 inch side diameter verhaul time	r of exhaust ver for the engine	alve guide m ne, or not to e	ay increase
616	ALL	Intake Valve Stem and Valve	557 101 1000	Innended 0 v	<u>.0010L</u>	0061
	ALL	Guide O.D. Intake Valve Stem	<u>.4022</u> .4030	.4010	.0028L	.006L
	ALL	Finished I.D. Intake Valve Guide	.4040 .4050	.1010		

## PART III – GEARED ENGINES

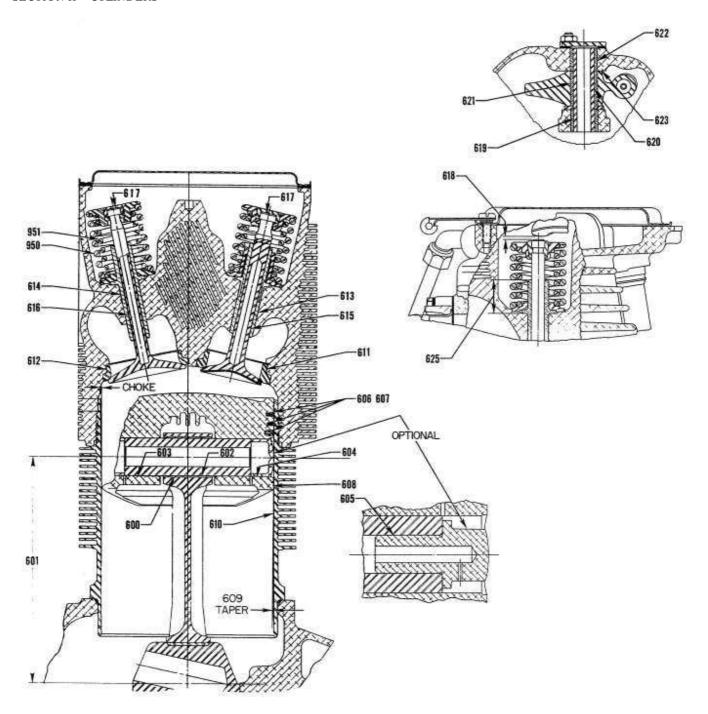
#### SECTION II – CYLINDERS

			Dime	nsions	Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	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			.0001L	
		Rocker Bushing			.0013L	.0025L
	ALL	Finished I.D. of Valve Rocker				
		Shaft (Bushing) in Cylinder	<u>.6246</u>			
		Head	.6261	.6270		
620	ALL	Valve Rocker Shaft and Valve			<u>.0007L</u>	
		Rocker Bushing			.0017L	.004L
	ALL	O.D. Valve Rocker Shaft	<u>.6241</u>			
			.6245	.6231		
	ALL	Finished I.D. of Rocker Arm	<u>.6252</u>			
		Bushing	.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			<u>.0022T</u>	
		Cylinder Head			.0038T	(A)
	ALL	Valve Rocker Shaft Bushing and	<u>.7380</u>			
		Hole in Cylinder Head	.7388			
623	ALL	Valve Rocker and Cylinder			<u>.002L</u>	
		Head – Side Clearance			.020L	.024L
625	ALL	Intake and Exhaust Valve Guide	<u>.914</u>			
		Height	.954			
		MEASURE VALVE GUIDE	HEIGHT			
		FROM THE VALVE SPRIN	NG SEAT			
		COUNTERBORE IN THE C	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

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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.
OIL PU	UMP & SCAVENGE PUMP					
700	Е-Н1-Н2-Н3	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			<u>.003L</u> .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			.0000 .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			.0000 .0015T	(A)
777	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Scavenge Pump Body			.001T .003T	(A)
778	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pump Body			.001T .003T	(A)
779	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pressure and Scavenge Pump Gear			.0015L .0035L	.005L
780	H4-H5-P-AB-AC	Oil Pump Drive Shaft Bushing and Oil Pump Shaft			.0015L .0035L	.005L

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#### **PART III – GEARED ENGINES**

#### SECTION III – GEAR TRAIN

	Mfr. rvice Min. &	
	rvice   Min. &	
Pof Chart Namonalatura 3.5	111111111111111111111111111111111111111	Service
Ref.   Chart   Nomenclature   Max.   M	Iax. Max.	Max.
FUEL PUMP		
727 E-H1-H2-H3 Fuel Pump Drive Gear – End	<u>.016L</u>	
Clearance	.045L	.065L
781 E-H1-H2-H3 Fuel Pump Drive Gear and	<u>.0010L</u>	
Accessory Housing	.0030L	.005L
782 H4-H5-P-AB-AC Fuel Pump Drive Gear Bushing	<u>.001T</u>	
and Accessory Housing	.004T	(A)
783 H4-H5-P Fuel Pump Drive Shaft Gear –	<u>.006L</u>	
End Clearance	.064L	.074L
784 H4-H5-P Fuel Pump Drive Shaft Gear and	<u>.001L</u>	
Bushing	.004L	.006L
785 P1 Injector Drive Gear and		
Accessory Housing Cover	.0036L	
Bushing	.0048L	.006L
786 P1 Injector Drive Gear – End	.002L	
Clearance	.020L	.030L
787 P1 Injector Idler Gear and Magneto	.0005T	
Idler Ball Bearing	.0004L	(A)
788 P1 Injector Idler Shaft and Magneto	.0001T	
Idler Ball Bearing	.0005L	(A)
789 AB Injector Drive Shaftgear and	.001L	
Accessory Housing Bushing	.003L	.005L
790 AC Fuel Pump Drive Shaftgear and	.001L	
Accessory Housing Bushing	.003L	.005L
791 AB Injector Drive Shaftgear – End	.006	
Clearance	.036	.048
792 AC Fuel Pump Drive Shaftgear –	.006	
End Clearance	.036	.048
VACUUM PUMP & TACHOMETER		
737 E-H1-H2-H3 Vacuum Pump Gear and	.0010L	
Accessory Housing	.0025L	.006L
738 E-H1-H2-H3 Vacuum Pump Gear – End	<u>.016L</u>	10002
Clearance	.045L	.065L
Reference No. 739 to follow Reference No. 7000.	1 19 19 -	
793 H4-H5-P Vacuum Pump Shaftgear Bushing	<u>.0015T</u>	
and Accessory Housing Cover	.0035T	(A)
794 H4-H5-P Vacuum Pump Shaftgear		` ′
Bushing (At Cover) and Vacuum	<u>.002L</u>	
Pump Shaftgear	.004L	.006L
795 H4-H5-P Vacuum Pump Shaftgear	<u>.0015T</u>	
Bushing and Accessory Housing	.0035T	(A)
796 H4-H5-P Vacuum Pump Shaftgear		` ′
Bushing (At Accessory Housing)	<u>.0020L</u>	
and Vacuum Pump Shaftgear	.0045L	.006L
797 H4-H5-P Vacuum Pump Shaftgear – End	.008	
Clearance	.030	.050
798 AB-AC Vacuum Pump Drive Gear and		
Vacuum Pump Spline Coupling	.008	
- End Clearance	.045	.065

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## PART III – GEARED ENGINES

#### PART III – GEAR TRAIN

			Dime	nsions	Clearances		
			Mfr.		Mfr.		
			Min. &	Service	Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
VACUU	UM PUMP & TACHOMETER (CO	DNT.)					
799	AB-AC	Vacuum Pump Drive Gear			.001T		
		Bushing and Accessory Housing			.003T	(A)	
7000	AB-AC	Vacuum Pump Drive Gear				` ′	
		Bushing and Vacuum Pump			<u>.002L</u>		
		Drive Gear			.004L	.006L	
739	E-H1-H2-H3	Tachometer Drive Gear and			<u>.0010L</u>		
		Accessory Housing			.0025L	.006L	
7001	E-H1-H2-H3	Tachometer Drive Gear – End			.000		
		Clearance			.030L	.040L	
7002	E-H1	Tachometer Driven Gear and			<u>.0015L</u>		
		Adapter			.0035L	.005L	
7003	E-H1	Tachometer Cover and Adapter			<u>.001T</u>		
					.003T	(A)	
7004	E-H1	Tachometer Gear – End			<u>.001L</u>		
		Clearance			.040L	.060L	
7005	H1-H2-H3	Electric Tachometer Idler Gear –			<u>.005L</u>		
		End Clearance			.052L	.065L	
7006	H1-H2-H3	Electric Tachometer Driven			<u>.005L</u>		
		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			.0015L	0067	
<b>-</b>	15.16	Gear and Adapter		l	.0035L	.006L	
7009	AB-AC	Tachometer Drive Idler Gear	D 1: T	D D '1	I T DI		
		Bushing and Tachometer Drive	Busning 1	o Be Burnish	ed in Place		
7010	AB-AC	Idler Gear Tachometer Drive Idler Gear		Τ	I		
7010	AB-AC				0011		
		Bushing and Tachometer Drive Idler Shaft			.001L .003L	.004L	
7011	AB-AC	Tachometer Drive Idler Gear –			.005L	.004L	
7011	AB-AC	End Clearance			.003L .014L	.024L	
7012	H1-H5-P-AB-AC	Electric Tachometer Driven Gear			.001L	.024E	
7012	III IIS I AB AC	and Accessory Housing Cover			.003L	.004L	
GOVE	RNOR	that recessory mousing cover		ı	.003E	.0012	
7013	ALL	Governor Drive Idler Gear					
7015		Bushing and Governor Drive			.000L		
		Idler Shaft			.002L	.004L	
7014	ALL	Governor Driven Gear and			.001L	.0012	
, 01.		Governor Drive Adapter Bushing			.003L	.004L	
7015	ALL	Reduction Gear Governor and					
-		Magneto Housing and Magneto			<u>.002T</u>		
		and Governor Drive Bushing			.004T	(A)	
7016	ALL	Governor Drive Idler Gear and					
		Governor Drive Idler Gear			<u>.001T</u>		
		Bushing			.003T	(A)	
7017	ALL	Governor Adapter and Governor			<u>.001T</u>		
		Drive Adapter Bushing			.003T	(A)	

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## PART III – GEARED ENGINES

#### SECTION III – GEAR TRAIN

			Dime	nsions	Clearances	
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
MAGN	ETO, GENERATOR, & STARTER					
7018	AB-AC	Magneto Drive Idler Gear and			.001T	
		Magneto Drive Idler Bushing			.003T	(A)
7019	AB-AC	Magneto Drive Idler Shaft and			.001L	
		Magneto Drive Idler Bushings			.003L	.005L
7020	AB-AC	Reduction Gear Housing				
		Magneto Drive Bushings and			.000	
		Magneto Drive Idler Shaft			.002L	.004L
7021	AB-AC	Magneto Drive Adapter and			<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	ing Must Be	Burnished In	Place
		Idler Gear Hub			T	T
7026	H4-H5-P	Magneto Drive Idler Gear Hub				
		Bushing and Magneto Drive			<u>.001L</u>	00.47
7027	111 115 5	Idler Shaft			.003L	.004L
7027	H4-H5-P	Magneto Drive Idler Gear Hub –			<u>.005L</u>	00.47
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	114-115-1	Accessory Housing Bushing			.0025L	.006L
7030	H4-H5-P	Magneto Drive Shaft Sleeve and			.001T	.000L
7030	114 115 1	Magneto Drive Shaft			.004T	(A)
7031	H4-H5-P	Magneto Drive Shaft Sleeve and			.001T	(11)
7051		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			.001T	
		and Accessory Housing			.003T	(A)
7034	E-H1-H2-H3	Generator Driven Gear and			<u>.002L</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				
		Bushing (Hi-Speed)		ing Must Be	Burnished In	Place
7037	H1	Finished I.D. of Idler Gear	<u>1.000</u>			
		Bushing	1.001	1.002		
7038	H1	Generator Drive Countershaft			<u>.0015L</u>	
		and Bushing			.0035L	.005L
7039	H1	Generator Drive Idler Gear –			<u>.004L</u>	
		End Clearance			.010L	.020L

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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.
	VETO, GENERATOR, STARTI		Max.	Max.	max.	wiax.
7040	E1-H1-H3	Angle Generator Drive –				
7040	L1-111-113	Generator Driven Gear Bushing			.001T	
		and Generator Housing			.003T	(A)
7041	E1-H1-H3	Angle Generator Drive –			.0031	(11)
, , , ,		Generator Driven Gear and			.002L	
		Bushing			.004L	.006L
7042	E1-H1-H3	Angle Generator Drive –				
		Generator Housing and			<u>.001L</u>	
		Generator Drive Gear			.003L	.004L
7043	H4-H5-P-AB-AC	Generator Drive Gear Bushing			<u>.0015T</u>	
		and Accessory Housing Cover			.0035T	(A)
7044	H4-H5-P-AB-AC	Generator Drive Gear Bushing			0027	
<b>5</b> 0.15		(At Cover) and Generator Drive			.002L	006
	114 115 D AD AC	Gear			.004L	.006L
7045	H4-H5-P-AB-AC	Generator Drive Gear Bushing			.002T	(4)
7046	H4-H5-P-AB-AC	and Accessory Housing Generator Drive Gear Bushing			.004T	(A)
7040	H4-H3-F-AB-AC	(At Accessory Housing) and			.0025L	
		Generator Drive Gear			.0025L	.006L
7047	H4-H5-P-AB-AC	Generator Drive Gear – End			.010	.000L
		Clearance			.038	.050
7048	H4-H5-P-AB-AC	Starter Drive Gear Bushings and			.002T	
		Adapter			.004T	(A)
7049	H4-H5-P-AB-AC	Starter Drive Gear Bushings and			.002L	
		Starter Drive Gear			.004L	.006L
7050	H4-H5-P-AB-AC	Starter Drive Adapter and			<u>.0005L</u>	
		Accessory Housing Cover			.0025L	(A)
7051	E1-H1-H2-H3	Oil Relief Plunger and Oil Relief			<u>.0015L</u>	
		Valve Plug			.0035L	.005L
	H4-H5-P-AB-AC	Oil Relief Valve Plunger and			<u>.001L</u>	00.57
		Sleeve			.003L	.005L
	SSORY DRIVE					
7053	H4-H5-AC	Accessory Idler Gear Bearing			<u>.0001L</u>	
		and Accessory Drive Gear			.0007T	(A)
	P	Accessory Drive Gear Bearing			.0001L	(1)
		and Accessory Drive Shaft			.0007T	(A)
	AB	Accessory Idler Gear Bearing			00011	
		and Supercharger and Accessory Drive Gear			.0001L .0007T	(4)
7054	P-AB	Supercharger and Accessory			1	(A)
/034	r-AD	Drive Gear and Bushing			.001T .003T	(A)
7055	H1-H5-P-AB-AC	Accessory Idler Gear Bearing			.0031	(A)
	111-113-1 -AD-AC	and Accessory Drive Shaft			.0005T	
		Adapter			.0005L	(A)
7056	P-AB	Supercharger and Accessory			.00031	(21)
	, <del></del>	Drive Gear Bushing and			.0005L	
		Accessory Drive Shaft			.0017L	.004L

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## PART III – GEARED ENGINES

#### SECTION III – GEAR TRAIN

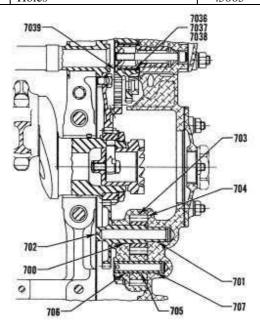
			Dimensions		Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
ACCES	SSORY DRIVE (CONT.)					
7056	P-AB	Finished I.D. of Supercharger				
		and Accessory Drive Gear Bushing	1.3295 1.3305	1.3312		
7057	P-AB	Supercharger and Accessory Drive Gear – End Clearance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

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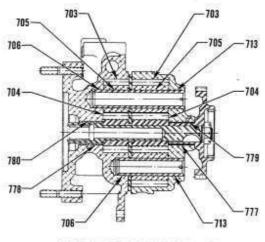
## **PART III – GEARED ENGINES**

#### SECTION III – GEAR TRAIN

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



REAR MOUNTED ACCESSORY HSG.



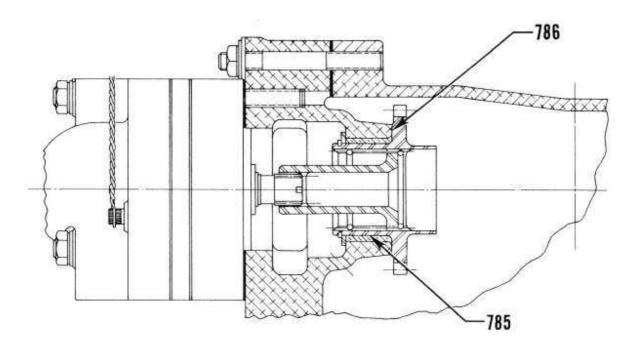
CROSSWISE ACCESSORY HSG.

**Oil Pumps** 

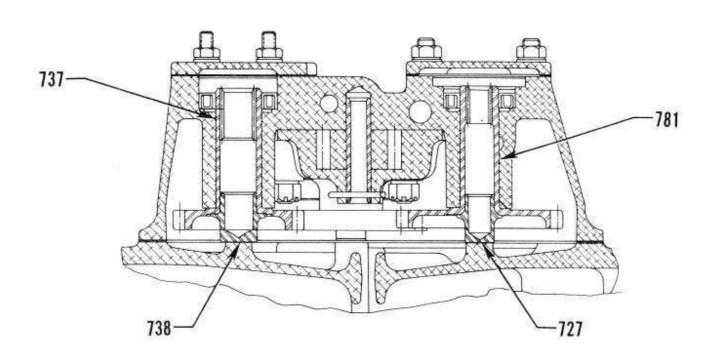
3-19 SSP-1776-5-PT3

## PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



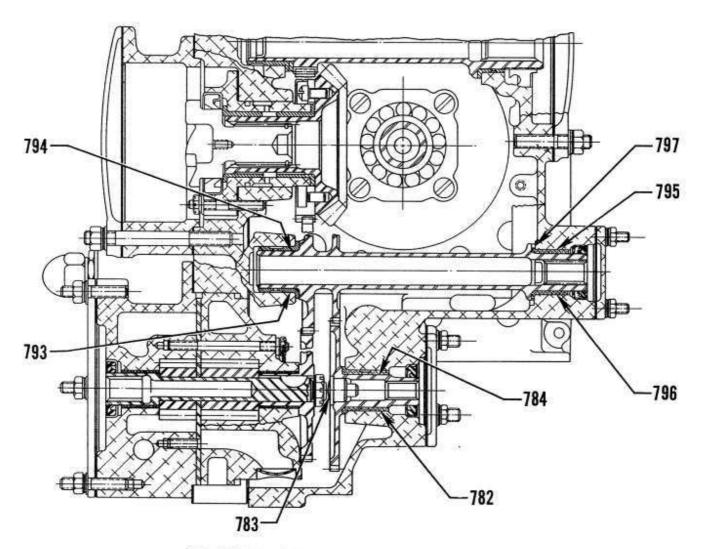
Simmonds Injector



Vacuum and Fuel Pump Drives

## **PART III – GEARED ENGINES**

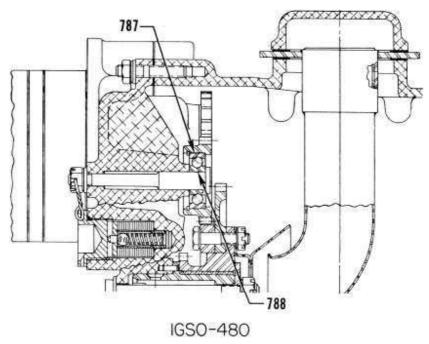
SECTION III – GEAR TRAIN



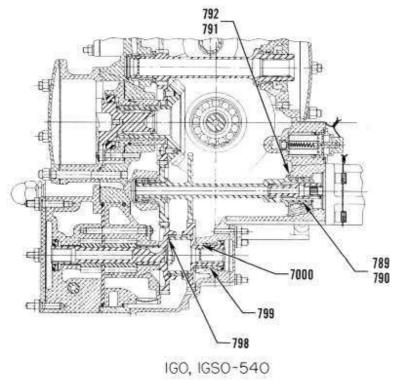
CROSSWISE ACCESSORY HSG.

## PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



Fuel Injector and Magneto Idler Bearing

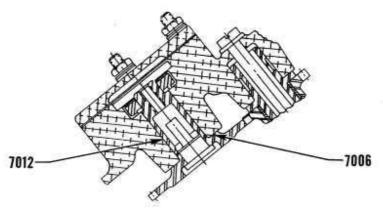


Fuel Injector and/or Fuel Pump, Vacuum Pump Drives

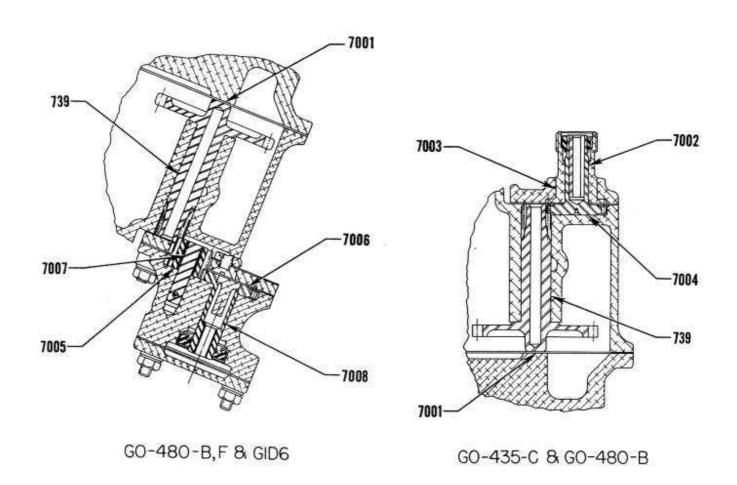
SSP-1776-5-PT3 3-22

## **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



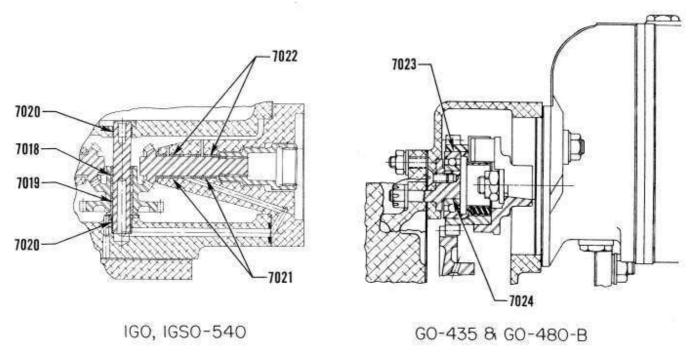
GO-480-D, GSO, IGSO-480 & IGO, IGSO-540

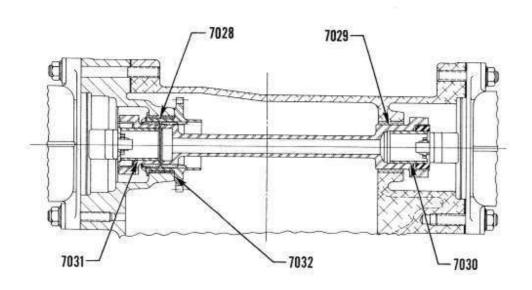


**Tachometer Drives** 

## **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



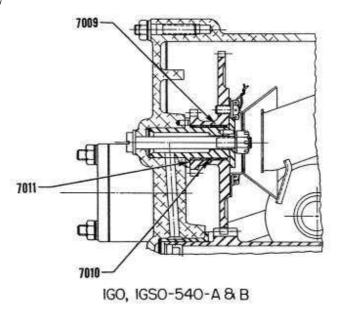


GO-480-D, GSO, IGSO-480

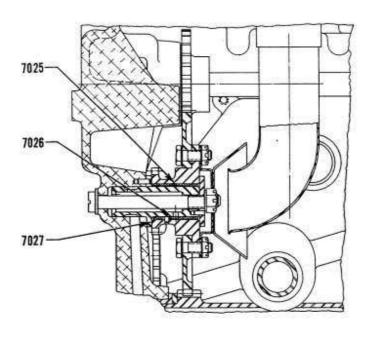
## **Magneto Drives**

## **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN



## **Tachometer Drives**

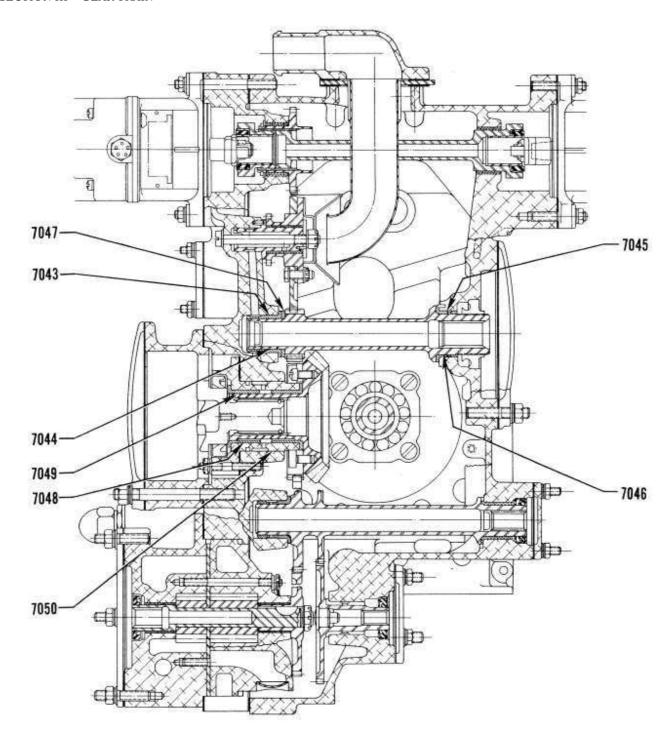


GO-480-B, GIB6, GSO, IGSO-480

**Magneto and Tachometer Idler Gear** 

## **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN

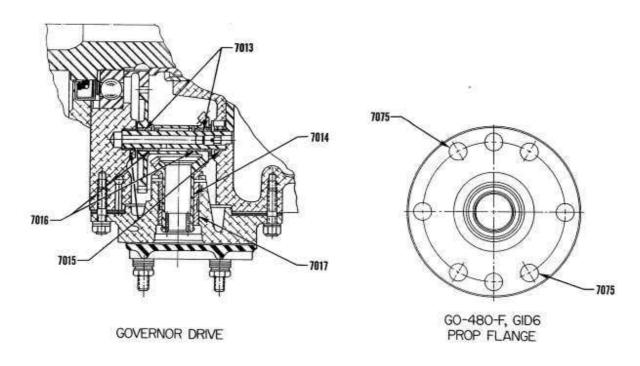


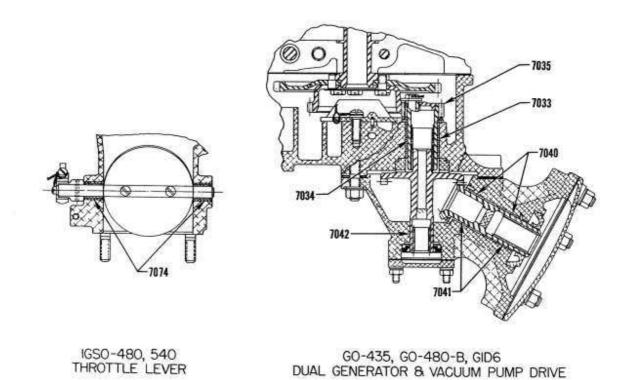
GO-480-B, GSO, IGSO-480 & IGO, IGSO-540

**Generator and Starter Drives** 

#### **PART III – GEARED ENGINES**

SECTION III – GEAR TRAIN

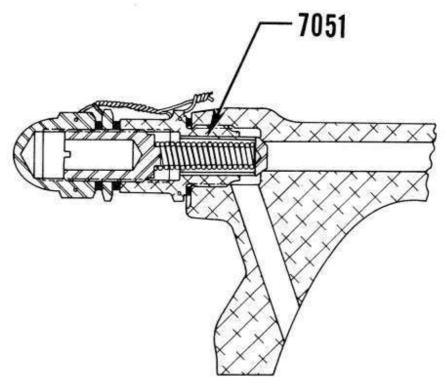


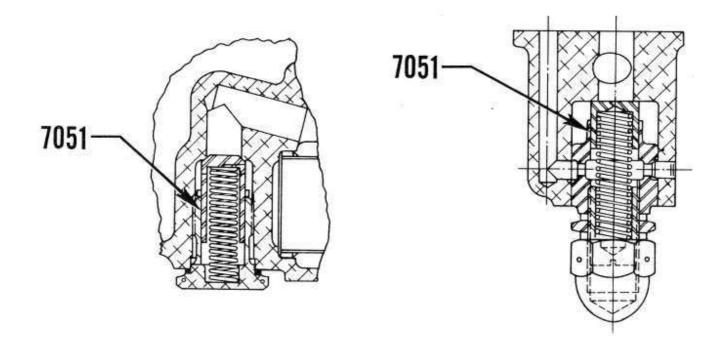


Governor Drive, Prop. Flange, Throttle Lever, Dual Generator and Vacuum Pump Drive

## PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

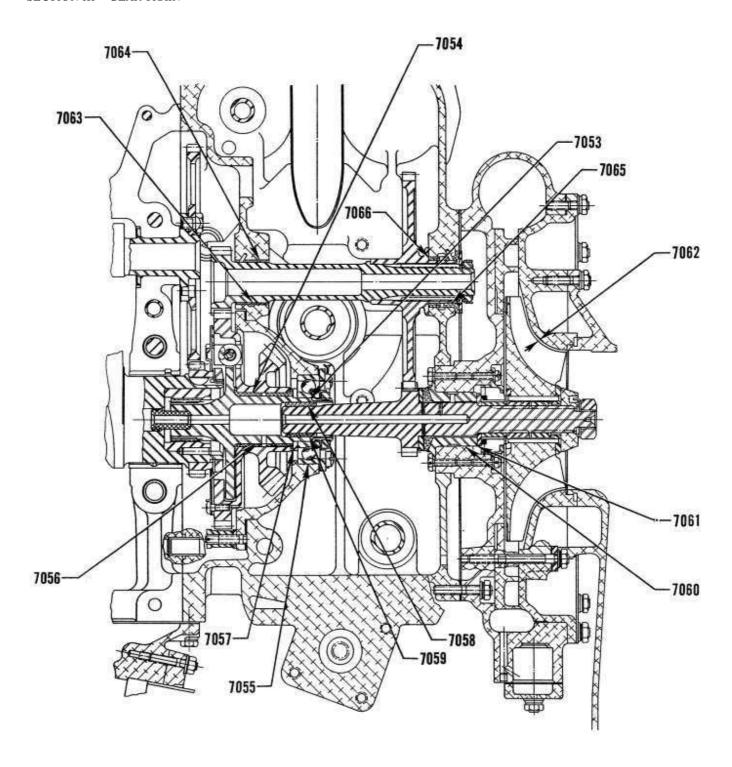




Oil Relief Valves

## PART III – GEARED ENGINES

SECTION III – GEAR TRAIN

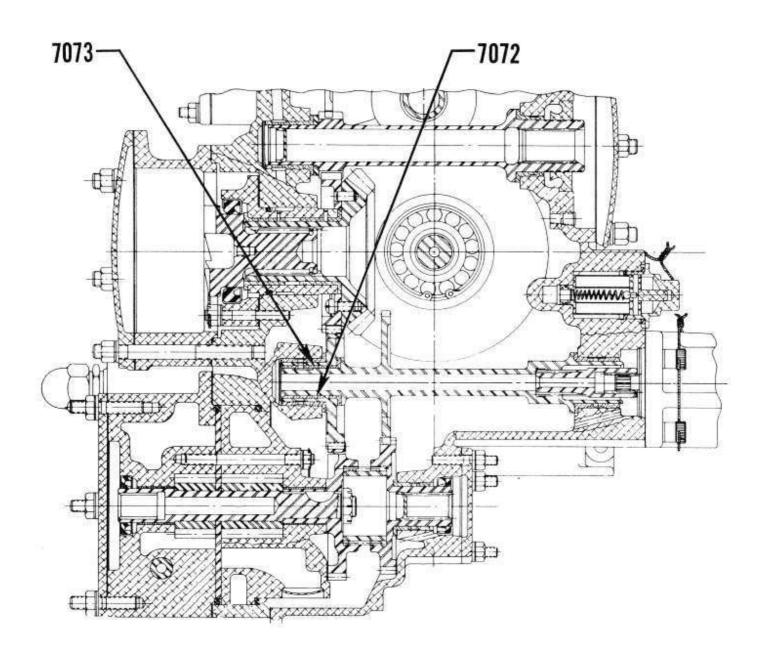


**Supercharger and Components** 

3-29 SSP-1776-5-PT3

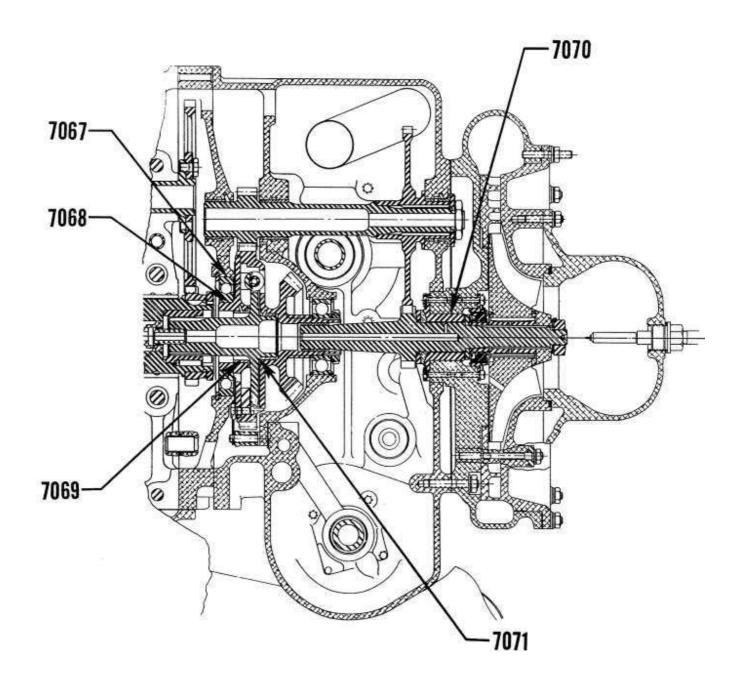
# PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



## PART III – GEARED ENGINES

SECTION III – GEAR TRAIN



**Supercharger Housing** 

## PART III – GEARED ENGINES

#### $SECTION\:IV-BACKLASH$

			Dimensions				
D e		N. L.	Mfr. Min. &	Service	Mfr. Min. &	Service	
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.	
807	E-H1-H2-H3	Oil Pump Drive Gear and Crankshaft Timing Gear			<u>.004</u> .015	.020	
808	Е-Н1-Н2-Н3	Oil Pump Impellers			.008 .015		
	Е-Н1-Н2-Н3	Oil Pump and Scavenge Pump			.008	.020	
		Impellers			.015	.020	
825	ALL	Crankshaft Timing Gear and Camshaft Gear			<u>.004</u> .015	.020	
829	ALL	Propeller Shaft – Reduction Gear – Total Backlash (At 4 ft. Radius)				.50	
846	Е-Н1-Н2-Н3	Camshaft Gear and Magneto Gear			<u>.004</u> .015	.020	
847	E-H1-H2-H3	Tachometer Drive Gear and			.004	.020	
		Crankshaft Timing Gear			.015	.020	
848	E-H1	Tachometer Driven Gear and Tachometer Drive Gear			<u>.004</u> .015	.020	
849	ALL	Stationary Gear and Stationary Gear Drive Plate			.002 .005	.010	
850	ALL	Ring Gear and Ring Gear Drive Plate			.003 .001 .004		
851	E-H2-H3	Generator Drive Gear and			<u>.004</u>	.010	
		Generator Driven Gear			.015	.020	
852	E-H1-H2-H3	Oil Pump Drive Gear and Accessory (Fuel Pump) Drive Gear			<u>.004</u> .015	.020	
853	Е-Н1-Н2-Н3	Oil Pump Drive Gear and Vacuum Pump Drive Gear			.004 .015	.020	
854	ALL	Pinion Gear and Stationary Gear			<u>.004</u>		
855	ALL	Pinion Gear and Ring Gear			.0077 .003	.012 (C)	
					.0065	.012 (C)	
856	ALL	Governor and Magneto Drive Gear and Governor Drive Idler Gear			<u>.004</u> .015	.020	
857	AB-AC	Governor and Magneto Drive Gear and Magneto Drive Idler Gear			<u>.004</u> .015	.020	
858	ALL	Governor Drive Idler Gear (Bevel Gear End) and Governor Driven Gear			.004 .008		
859	H1	Camshaft Gear and Generator			<u>.004</u>	.015	
860	H1	Drive Idler Gear Generator Drive Idler Gear and			.015 .004	.020	
0/1	E1 111 112 112	Generator Driven Gear			.015	.020	
861	E1-H1-H2-H3	Electric Tachometer Idler Gear and Driven Gear			<u>.004</u> .015	.020	
862	E1-H1-H2-H3	Electric Tachometer Idler Gear and Tachometer Drive Gear			<u>.004</u> .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			.002	
		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>	0.00
0.6	771 772 5	and Tachometer Driven Gear			.015	.020
867	H4-H5-P	Tachometer Drive Idler Gear			<u>.004</u>	000
0.60	111 115 B	and Magneto Drive Shaftgear			.015	.020
868	H4-H5-P	Magneto Drive Shaft (Spline)			001	
		and Magneto Drive Shaftgear			<u>.001</u>	000
0.00	114 115 D	(Spline)			.015	.008
869	H4-H5-P	Magneto Drive Shaftgear			001	
		(Spline) and Magneto Drive			.001 .005	.008
870	H4-H5-AC	Coupling (Spline)  Rear Crankshaft (Spline			.003	.008
870	H4-H3-AC	Bushing) and Accessory Drive			.002	
		Gear (Spline)			.002	.018
	P-AB	Rear Crankshaft (Spline			.0073	.010
	1-AD	Bushing) and Accessory Drive			.002	
		Shaft (Spline)			.0073	.018
871	H4-H5-AC	Accessory Idler Gear and Starter			.004	1010
0,1	111 116 116	Drive Gear			.008	.015
871	P-AB	Supercharger and Accessory				
		Drive Gear and Starter and			.004	
		Accessory Drive Gear			.008	.015
872	H4-H5-P-AB-AC	Accessory Drive Gear and			.004	
		Generator Drive Gear			.015	.020
873	H4-H5-P	Accessory Drive Gear and			.004	
		Vacuum Pump Shaftgear			.015	.020
874	H4-H5-P	Vacuum Pump Shaftgear and Oil				
		Pressure and Scavenge Pump			<u>.004</u>	
		Gear			.015	.020
875	E	Scavenge Pump Driven Gear			<u>.004</u>	
		and Accessory Drive Gear			.015	.020
876	E	Scavenge Pump Impellers			.008	0.50
0.55	D + D				.015	.020
877	P-AB	Supercharger and Accessory			001	
		Drive Gear and Intermediate			<u>.006</u>	000
070	D A D	Supercharger Drive Shaftgear			.015	.020
878	P-AB	Supercharger Drive Shaftgear			006	
		and Intermediate Supercharger			<u>.006</u>	020
		Drive Gear	l		.015	.020

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## PART III – GEARED ENGINES

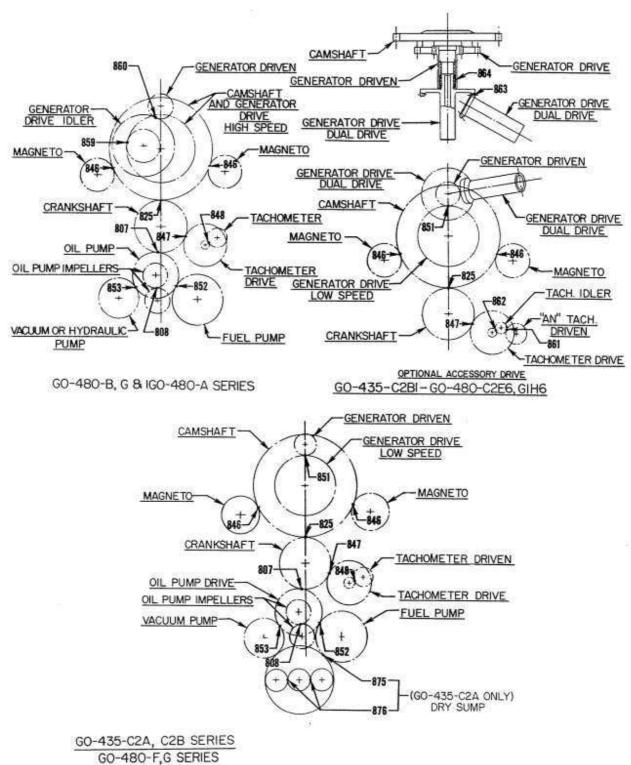
#### $SECTION\:IV-BACKLASH$

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

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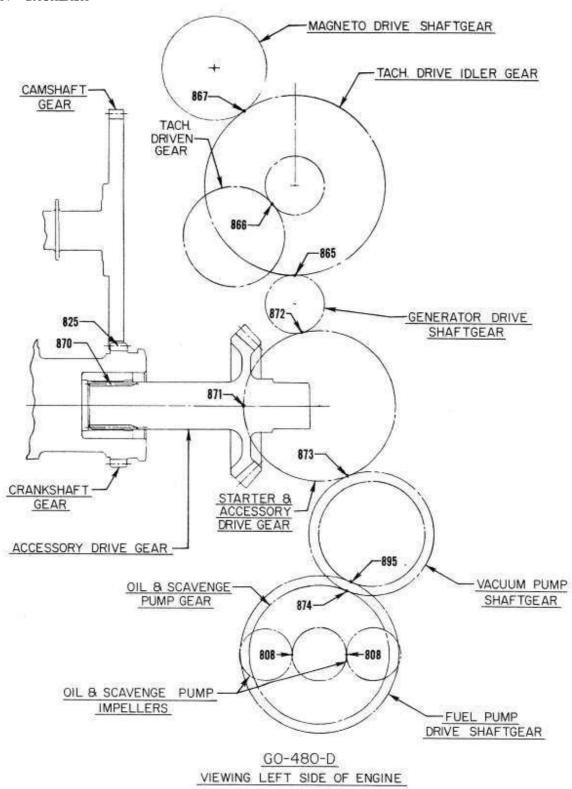
#### **PART III – GEARED ENGINES**

SECTION IV- BACKLASH



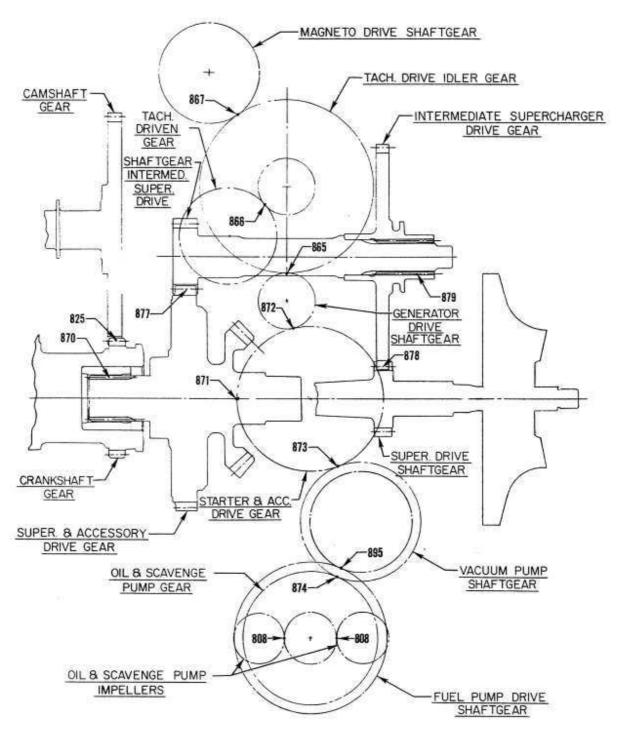
#### **PART III – GEARED ENGINES**

SECTION IV - BACKLASH



#### **PART III – GEARED ENGINES**

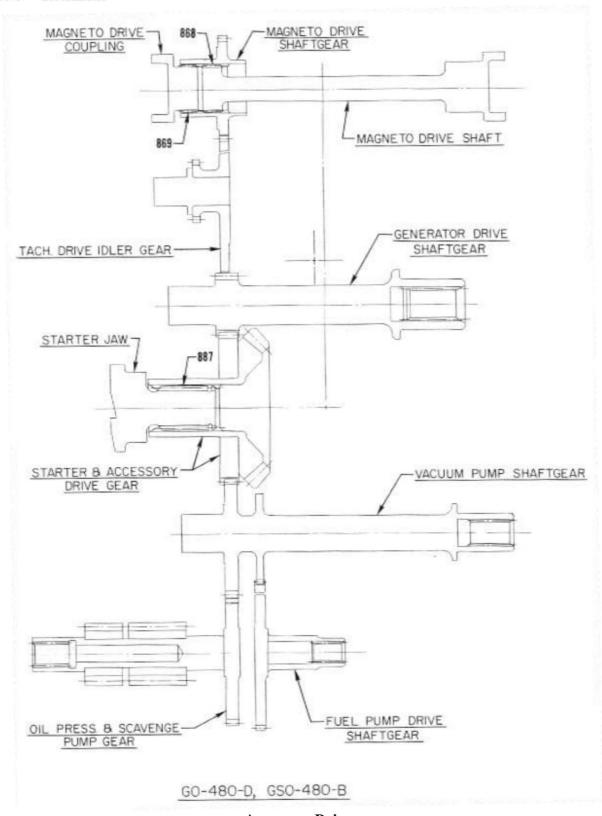
SECTION IV - BACKLASH



VIEWING LEFT SIDE OF ENGINE

#### **PART III – GEARED ENGINES**

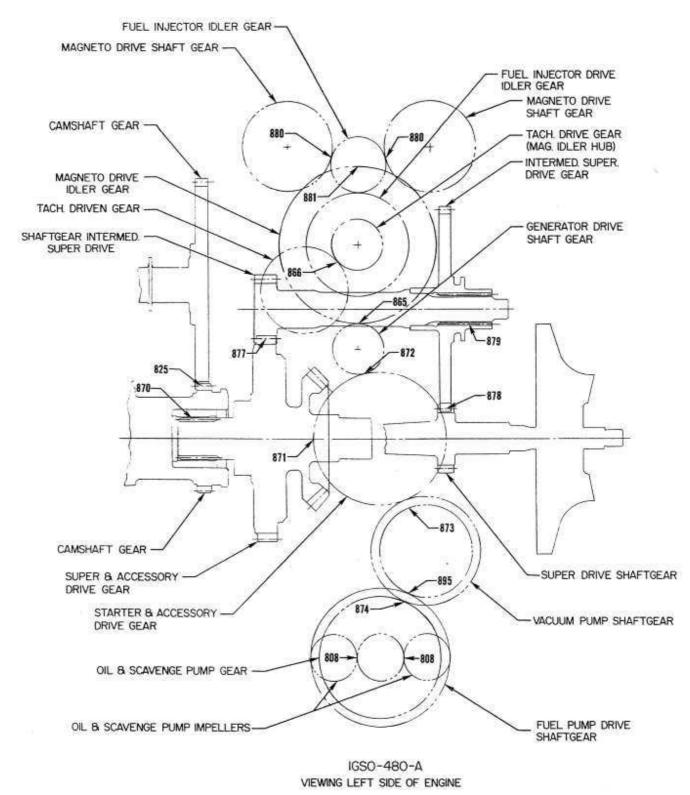
SECTION IV - BACKLASH



**Accessory Drives** 

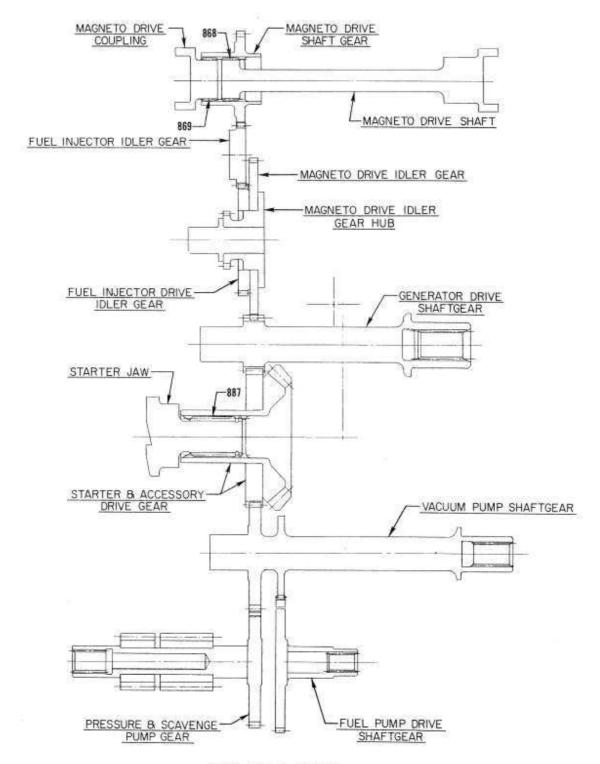
#### **PART III – GEARED ENGINES**

#### SECTION IV - BACKLASH



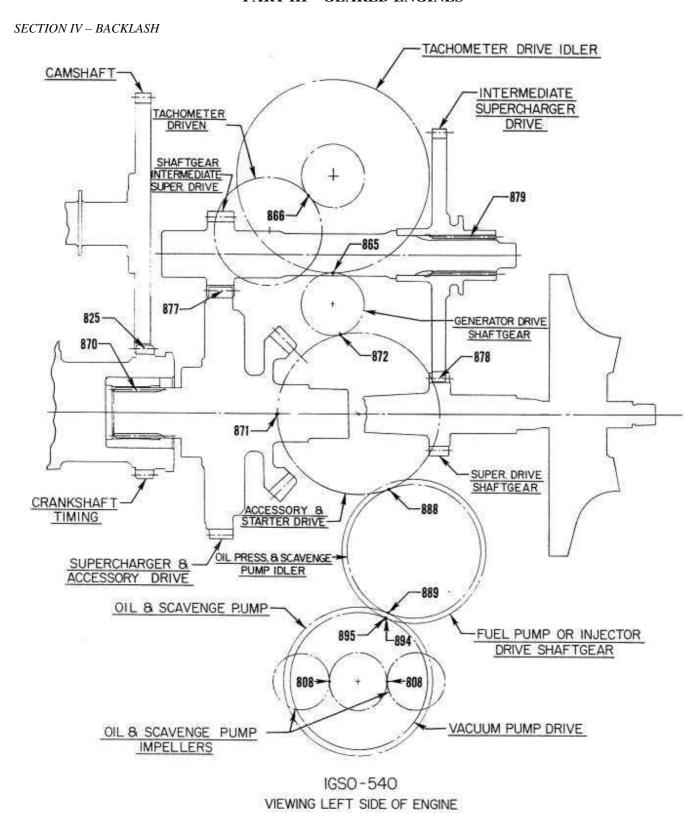
#### **PART III – GEARED ENGINES**

#### $SECTION\:IV-BACKLASH$



IGSO-480-A SERIES

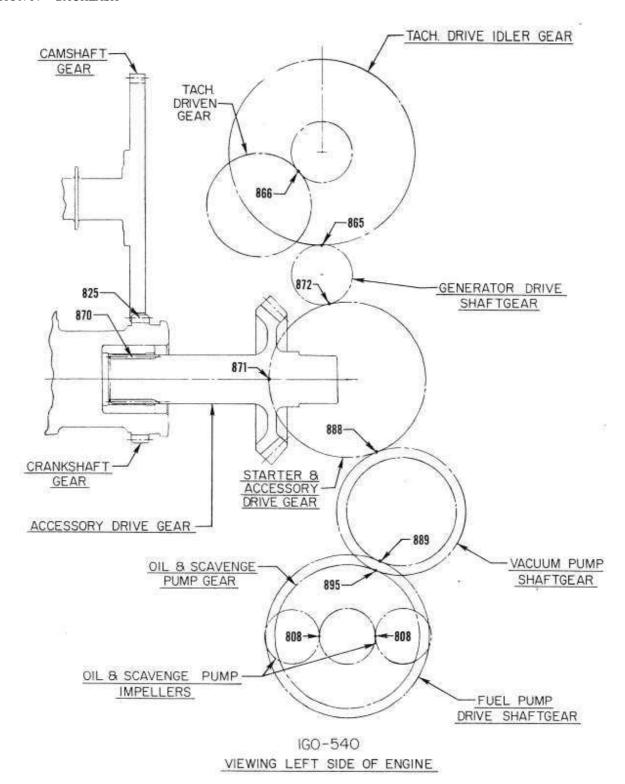
#### **PART III – GEARED ENGINES**



**Accessory Drives** 

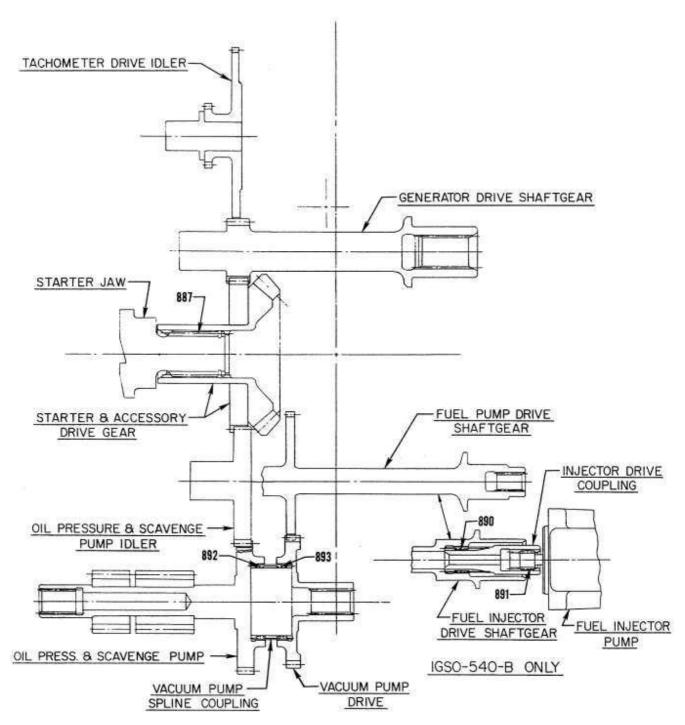
#### **PART III – GEARED ENGINES**

SECTION IV - BACKLASH



#### **PART III – GEARED ENGINES**

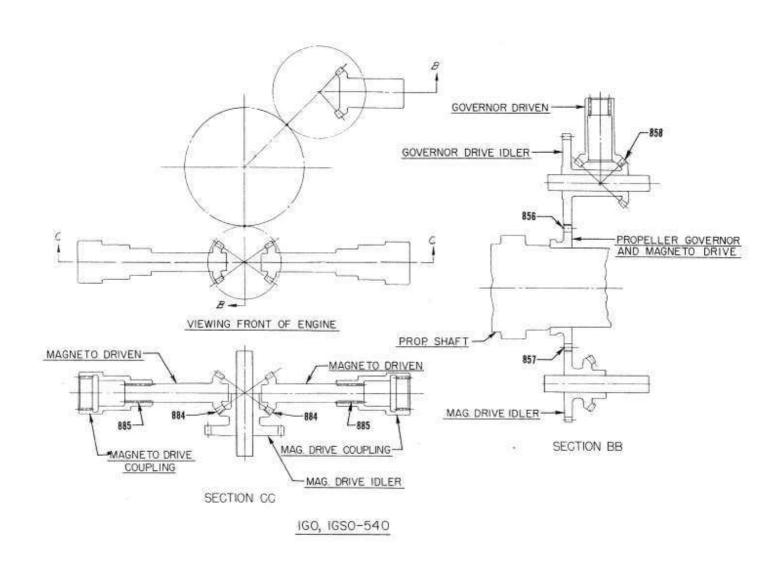
SECTION IV - BACKLASH



IGO-540, IGSO-540-A,B

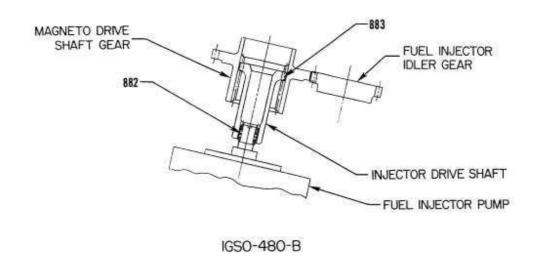
#### **PART III – GEARED ENGINES**

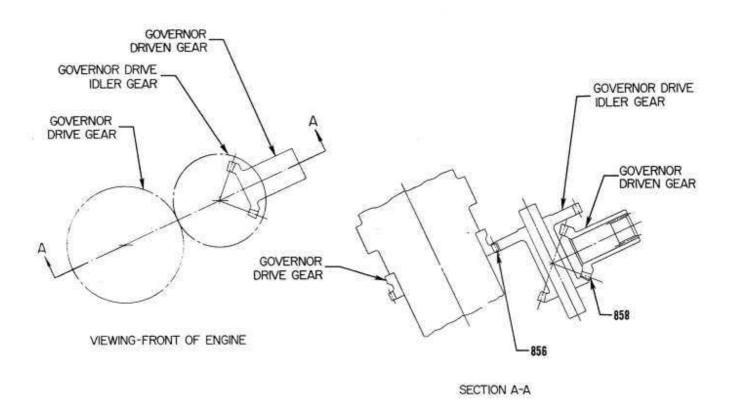
SECTION IV - BACKLASH



#### PART III – GEARED ENGINES

SECTION IV - BACKLASH

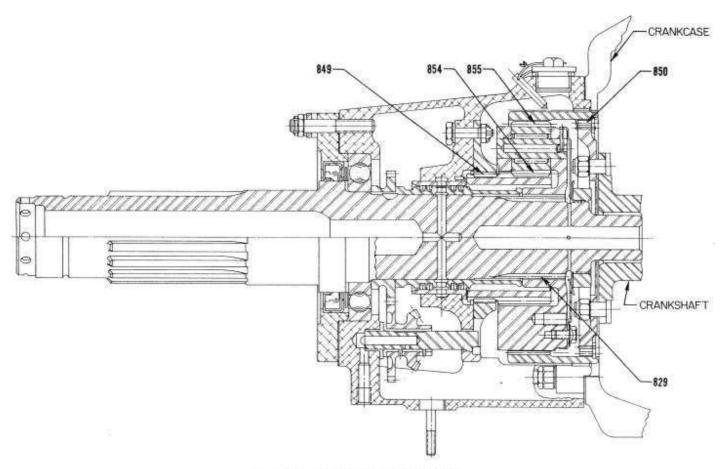




GO-435, GO, GSO & IGSO-480-A

## **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)	15 in. lbs.
905	ALL (using a silicone gasket)	1/4-20	Rocker Box Screws	35 inlbs.
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 inlbs.
906	ALL	5/16-18	Exhaust Port Studs (Driving Torque)	40 in. lbs. min.
	ALL	5/16-18	Nut to Attach Exhaust Stacks to Cylinder Head	160-180 in. lbs.
907	ALL	18MM	Spark Plugs	420 in. lbs.
909	ALL	5/8-32	Alternator Pulley Nut	450 in. lbs.
	ALL	5/8-32	Alternator Nut (Quill Shaft)	474 in. lbs.
910	AC	1/4-28	Alternator Output Terminal Nut	85 in. lbs.
911	AC	10-32	Alternator Auxiliary Terminal Nut	30 in. lbs.
913	H3-H5-P-AB-AC	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	100 in. lbs.
914	AC	1/8-27 NPT	Injector Nozzle in Cylinder Head	60 in. lbs.
919	ALL	1/4 Hex Head and Below	Hose Clamps (Worm Type)	45 in. lbs.
	ALL	5/16 Hex Head and Above	Hose Clamps (Worm Type)	45 in. lbs.
919-1	ALL		"T" Bolt Hose Clamps – Initial Torque	35 in. lbs. 25 in. lbs.
920	ALL		Cylinder Head Drain Back Hose Clamp	10 in. lbs.
928	ALL	3/8-16	Cylinder Hold Down Studs (Crankcase Driving Torque)	100 in. lbs.
	ALL	1/2-13	Cylinder Hold Down Studs (Crankcase Driving Torque)	250 in. lbs.
929	ALL	3/8	Cylinder Hold Down Nuts	300 in. lbs.
	ALL	1/2	Cylinder Hold Down Nuts	600 in. lbs.
930	ALL	5/16-32	Brass union nut on stainless steel injector/primer fuel line (Both Ends)	25-50 inlbs.*
			r tight, then continue tightening the nut v in excess of 50 inlbs. can result in dam	
	Cylinder Hold Down and Cranko Instruction No. 1029.	case Parting Flange	Nuts' Tightening Procedures – See late	est revision of Service
931	ALL	2.000-16	Pinion Cage Retaining Nut	400 ft. lbs.
932	E-H1-H4-H5-P-AB-AC		Propeller Retaining Nut	450-500 ft. lbs.
933	H4-H5-P-AB-AC		Accessory Drive Shaft Nut	75-125 ft. lbs.
934	H4-H5-P-AB-AC		Crankshaft Gear Retaining Nut	150 ft. lbs.

## **PART III – GEARED ENGINES**

SECTION V – SPECIAL TORQUE REQUIREMENTS

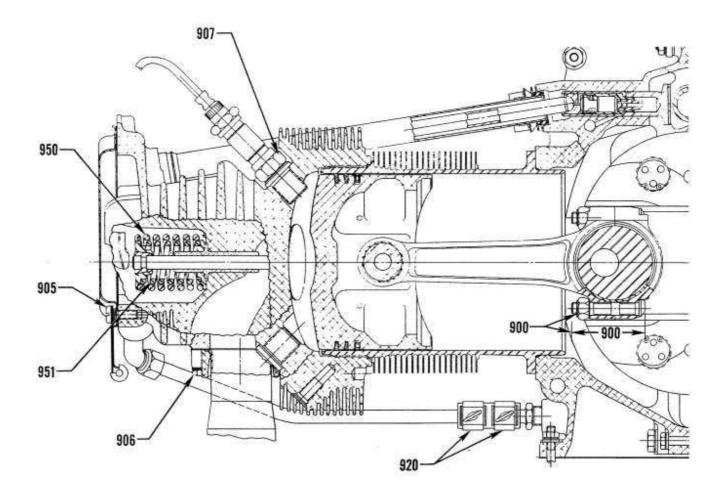
Ref.	Chart		Thread	l Size	Nomer	clature			Tor	aue I in	nite	
936	P-AB	Thi cad St.		BILC	Supercharger – Intermediate			Torque Limits				
)30	1 115				Drive Shaft Nut			75 ft. lbs.				
937	P-AB					harger – Impeller Locknut						
						8	r		Req'd. to Reach Next			
									Locking Slot)			
938	H4-H5-P-AB-AC		1/4-28		Thin S	lotted Nu	ıt		(38 in. lbs. Plus Torque			Torque
										'd. to R		Next
									Locking Slot)			
940	ALL					Gear Asse	mbly –					
0.11						ing Nuts						360 in. lbs.
941	ALL						Assembly	· —	200: "			
942	E1-H1		1/4-18	NDT		ing Nuts etor Drai	in Dlug			1		300 in. lbs. 144 in. lbs.
942	E-H-P		1/8-27			etor Drai						-60 in. lbs.
943	P		10-32	111 1			ach Access	orv			30	-00 III. 108.
743	1		10 32			Coupling		,01 y			25	-30 in. lbs.
			<u> </u>	ECTIO								20 1111 1001
			N.	)LC11O	14 V — 1	JI KII W			C	OMP.	ΙΩΛ	D
						****	Length			T		
Def	Chart	Nomeno	loturo		yc.	Wire	at Comp		Ifr. Iin.	Mfi Ma		Service
Ref.				Pal	rt No.	Dia.	Length	1V.	1111.	IVIA	х.	Max.
950	ALL	Outer Valve (Angle)	Springs	6832	06	.177	1.46 in.	10	3 lb.	111	lh	100 lb. min.
	ALL	Outer Valve	Springs	0032	.0	.1//	1.40 111.	10	3 10.	111	10.	111 lb.
	ALL	(Angle)			11796	.182	1.43 in.	13 in 11		lb. 124		min.
951	ALL	Auxiliary Va			28	.102	1.43 III.		5 lb.	12.10.		72 lb.
731	1122	Springs (Ang						3 lb.			min.	
952	H4-H5-P-AB-AC	Check Valve										
			Lycoming Part Free									
		Numb	-	Le	ength							
		654-	D			.031	1.03 in.	7.	4 lb.	.94 1	h	.69 lb.
		0.54-	ъ			.031	1.05 111.	. / -	+ 10.	.54 1	υ.	min.
		7376	<b>51</b>	2	.065	.041	1.03 in.	2 1	15 lb. 3.35 lb.		1h	3.10 lb.
		7370	J1	۷.	.003	.041	1.03 III.	3.1	5 10.	3.33	10.	min.
953		Oil Pressur										
		Valve S										
		Lycoming	Identi	fication								
		Part		Free								
		Numbers	Dye	Length	0.5-	1	. 1			1		
	H4-H5-P-AB-AC	68542	None	2.38	.067	1.66		15 lb.		17 lb.		14 lb. min.
	H4-H5-P-AB-AC	LW-14029	White	2.28	.072	1.66		20 lb.		22 lb.		
	E1-H1-H2-H3	60476	None	2.38	.047	1.44		15 lb.		65 lb.		00 lb. min.
	E1-H1-H2-H3	66920	None	2.54	.047				85 lb.		20 lb. min.	
	E1-H1-H2-H3	74596	None	2.96	.047	.047 1.44 in. 11.65 lb.		12.	15 lb.	11.	50 lb. min.	
954		Supercharger	Drive C	oupling								
		Spring	1		-							
		Lycoming Part										
		Numbers	Free	Length								
	P	68830		.25	.148	1.10	in 16	8 lb.	18/	1 lb.	16	5 lb. min.
	P	LW-12303		.28	.148	1.13		8 lb.		lb.		5 lb. min.
	AB	72774		.23	.177	1.10		9 lb.		5 lb.		4 lb. min.
	AB	LW-12301		.26	.177	1.13		5 lb.		) lb.		0 lb. min.
<b>L</b>	1				,	1 1.10			2,0			

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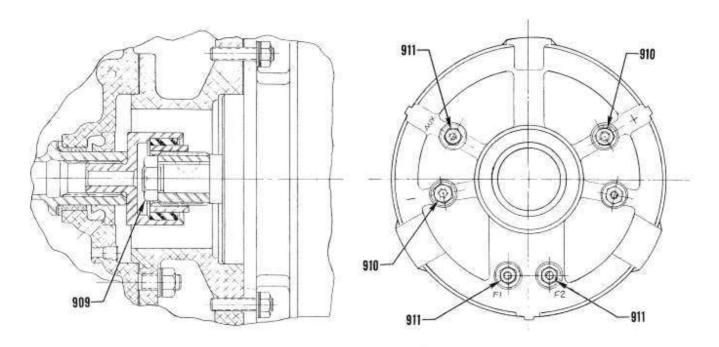
## **PART III – GEARED ENGINES**

 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 

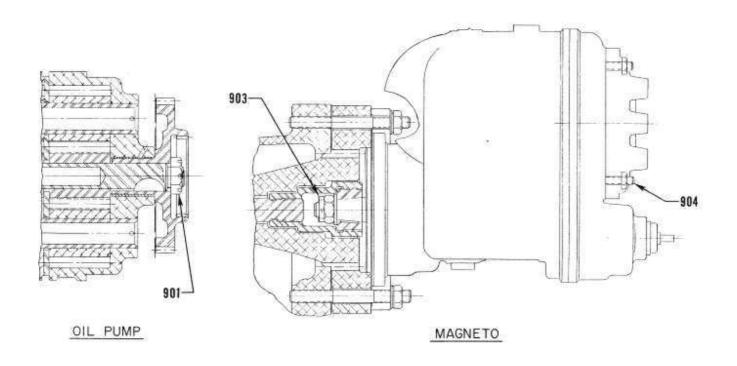


## **PART III – GEARED ENGINES**

 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 



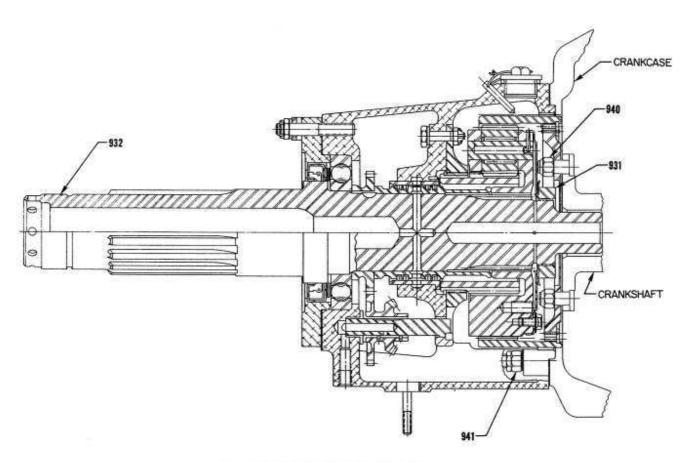
## ALTERNATOR & ALTERNATOR DRIVE



**Engine Accessories and Hardware** 

## **PART III – GEARED ENGINES**

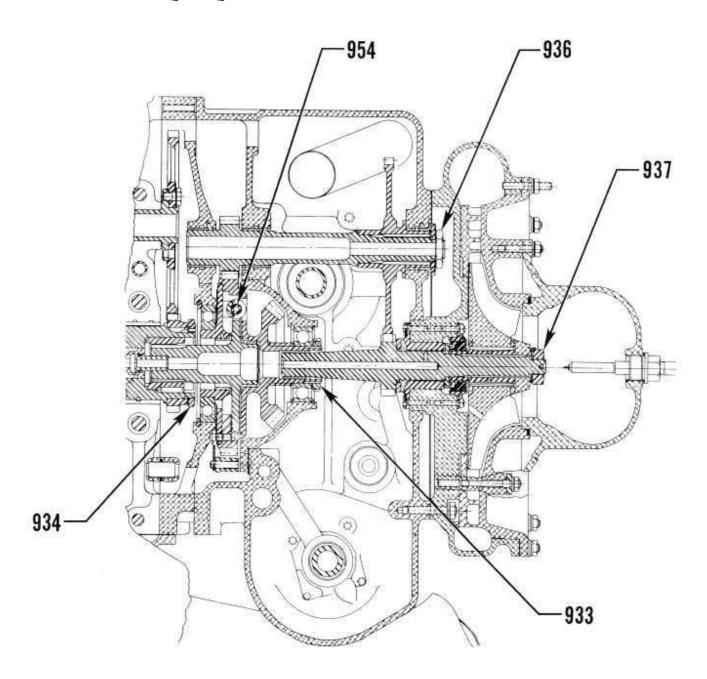
 $SECTION\ V-SPECIAL\ TORQUE\ REQUIREMENTS$ 



SECTION THRU REDUCTION GEAR

#### **PART III – GEARED ENGINES**

SECTION V - SPECIAL TORQUE REQUIREMENTS

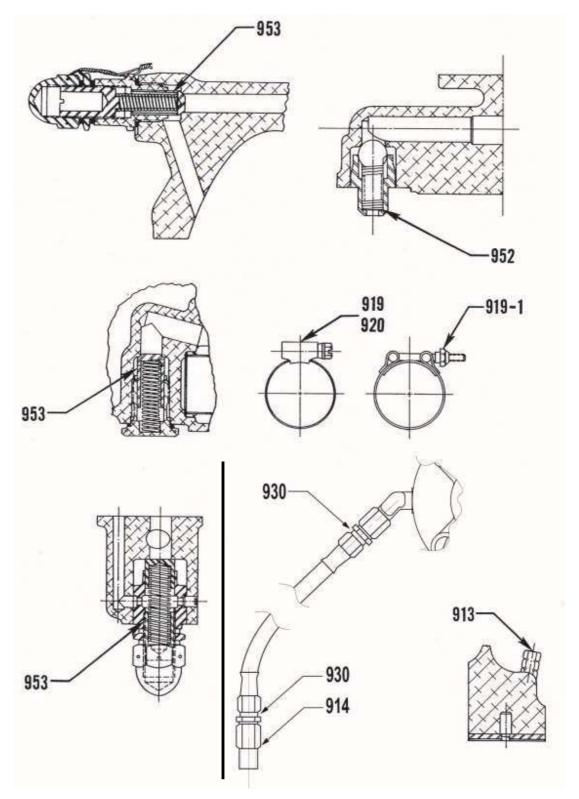


# SECTION THRU ACCESSORY HSG. & SUPERCHARGER

**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					
BOLTS, SCREW AND NUTS						PIPE PLUGS		
Thusad	Torque		Thusad	Torq	ue	Thursd	Torque	
Thread	In. Lb.	Ft. Lb.	Thread	In. Lb. Ft. Lb. Thread		In. Lbs.		
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44	
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44	
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94	
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121	
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297	1/2-14 NPT	160 to 176	
ти	THIN NUTS (1/2 DIA OF DOLT) 1/2 LISTED TOPOLE						230 to 252	
THIN NUTS (1/2 DIA. OF BOLT) – 1/2 LISTED TORQUE						1-11-1/2 NPT	315 to 347	

			The state of the s			
TABLE III	TABLE IV					
CRUSH TYPE GAS	FLEXIBLE TUBE CONNECTIONS (SEALASTIC OR EQUIVALENT FITTINGS)					
Thread Pitch on Part to be Tightened	ANGLE OF TURN		Tube	Thread	Torque In.	Lbs.
Threads Per Inch	Aluminum	Copper	Size		Aluminum Alloy	Steel
8	135°	67°	(-3) 3/16	3/8 - 24	30 to 50	70 to 80
10	135°	67°	(-4) 1/4	7/16 - 20	40 to 65	90 to 100
12	180°	90°	(-5) 5/16	1/2 - 20	60 to 80	135 to 150
14	180°	90°	(-6) 3/8	9/16-18	75 to 125	270 to 300
16	270°	135°	(-8) 1/2	3/4-16	150 to 250	450 to 500
18	270°	135°	(-10) 5/8	7/8 - 14	200 to 350	650 to 700
20	270°	135°				
24	360°	180°		Т	ABLE V	
28	360°	180°	S	TUDS MIN.	DRIVING TORQU	E
NOTE: Install all amuch type and	lrata avaamt	the self	Thr	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	5/16-18		25			
part until the sealing surfaces are in contact and then tighten			3/8-16			
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								
	1	1		METAL TUI	BE FITTINGS			1	
			Wrench torque	e for tightening	g AN-818 Nut	(pound inches)		Minimum bend radii	
Dash Nos. Ref.	Tubing OD inches	Aluminum-	alloy tubing	(Flare MS3		alloy tubing 3583) for use lines only	measured centerline. I inc	Dimension in	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Alum. Alloy	Steel
-2	1/8	20	30	75	85			3/8	
-3	3/16	25	35	95	105			7/16	21/32
-4	1/4	50	65	135	150			9/16	7/8
-5	5/16	70	90	170	200	100	125	3/4	1-1/8
-6	3/8	110	130	270	300	200	250	15/16	1-5/16
-8	1/2	230	260	450	500	300	400	1-1/4	1-3/4
-10	5/8	330	360	650	700			1-1/2	2-3/16
-12	3/4	460	500	900	1000			1-3/4	2-5/8
-16	1	500	700	1200	1400			3	3-1/2
-20	1-1/4	800	900	1520	1680			3-3/4	4-3/8
-24	1-1/2	800	900	1900	2100			5	5-1/4
-28	1-3/4								
-32	2	1800	2000	2660	2940			8	7

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

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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

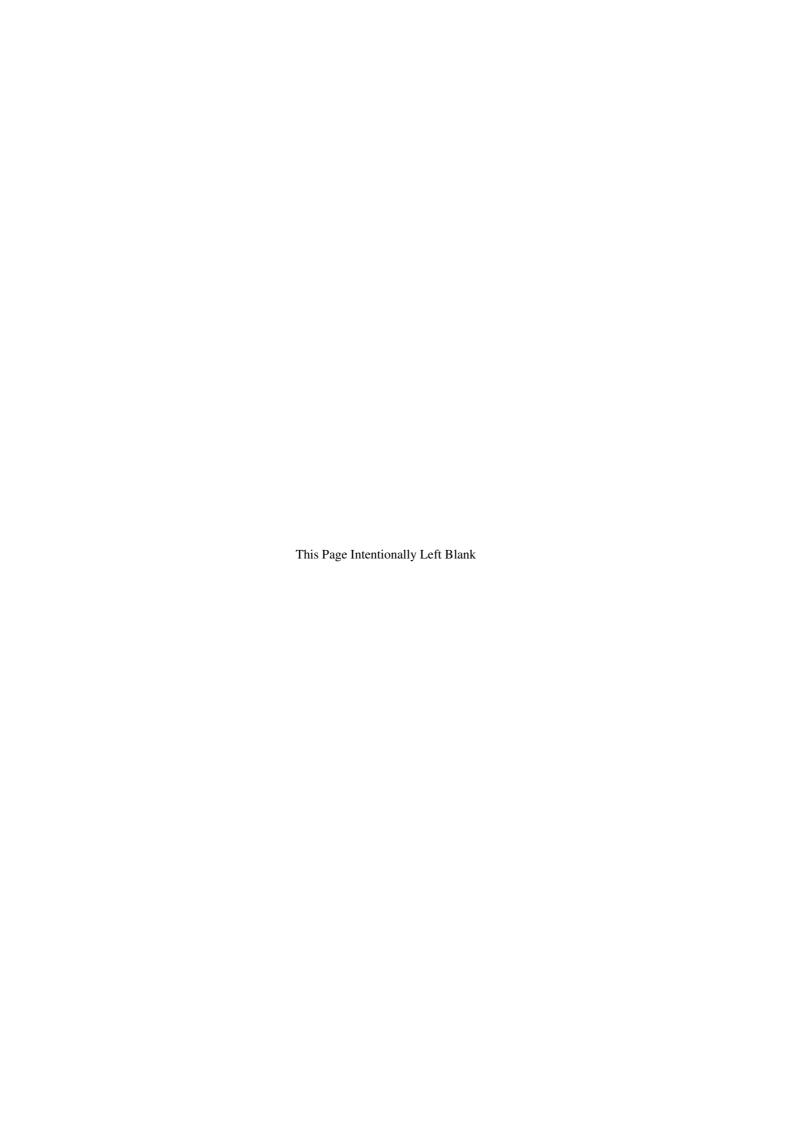
#### NOTE

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

SECTION I SECTION II 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)		shrink fits controlled by machining, fits that may readily be wear does not normally occur, in each case the fit must be held olerance.
(B)	Side clearance on pisto	on rings must be measured with face of ring flush with piston.
(D)	These dimensions sho piston pin.	wn are measured at bottom of piston skirt at right angles to
(E)	Permissible wear of the on the diameter.	e crankshaft (rod and main bearing journals) to be minus 0.0015
(L)	Loose fit; wherein a de	efinite clearance is mentioned between the mating surfaces.
(T)	Tight fit; shrink or inte	rrference fit.

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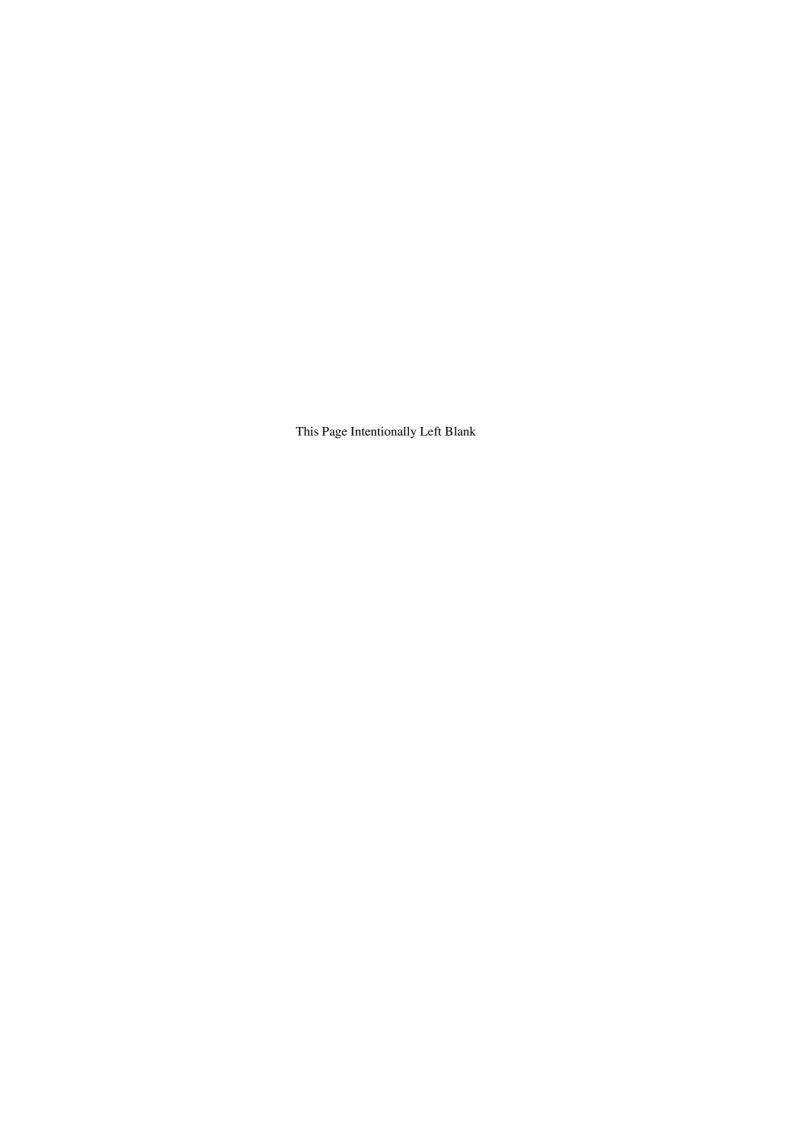
<sup>\* -</sup> Indicates cut-off date for data retrieved prior to publication.





# TECHNICAL PUBLICATION REVISION

REVISION NO.	PUBLICATION	PUBLICATION NO.	PUBLICATION DATE		
SSP-1776-5-PT4	Service Table of Limits	SSP-1776	October 28, 2013		
PREVIOUS	REVISIONS	CURRENT	REVISION*		
Apr	il 2018	April	2020		
4-6, 4	-35, 4-39	4-5, 4-6			
	Section V table and figure for on nut on stainless steel injector	Revised burnishing instruct bushing in reference numbers. Revised the Mfr. Min. & Manage (Compression) Nitridiand Piston Ring Gap (Oil) Revisions are indicated with a revised item.	per 600 Max. Clearance for Piston Ring ed Cylinders (Choke Barrels) in reference number 607		



## **PART IV – VERTICAL ENGINES**

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
500	L	All Main Bearings and			.0015L	00601
	L1-V	Crankshaft Main Bearings and Crankshaft (Except Front)			.0045L .0011L .0041L	.0060L
	V	Front Main Bearing and Crankshaft			.0011L .0041L	.0050L
	L1	Front Main Bearing and Crankshaft			.0015L .0045L	.0050L
	ALL	Diameter of Main Bearing Journal on Crankshaft	2.3745 2.376	(E)		
	L	Crankcase Bearing Bore Diameter (All)	2.566 2.567	2.5685		
	V	Crankcase Bearing Bore Diameter (All)	2.6865 2.6875	2.6890		
501	ALL	Connecting Rod Bearing and Crankshaft			.0008L .0038L	.0050L
	ALL	Diameter of Connecting Rod Journal on Crankshaft (2-1/8 in.)	2.1235 2.125	(E)		
	ALL	Connecting Rod Bearing Bore Diameter (2-1/8 in.) (Measured at Axis 30° on Each Side)	2.2870 2.2875			
502	ALL	Connecting Rod – Side Clearance			<u>.004L</u> .010L	.016L
503	ALL	Connecting Rod – Alignment				0 Inches
504	ALL	Connecting Rod – Twist			.012 in 1	2 Inches
505	ALL	Crankshaft Run-Out at Center Main Bearings Mounted on No. 1 and 4				
		Journals Max. Run-Out No. 2 and 3 Journals Mounted on No. 1 and 3			.005	.0075
		Journals Max. Run-Out No. 2 Journal			.003	.0045
		Mounted on No. 2 and 4 Journals Max. Run-Out No. 3 Journal			.003	.0045
506	ALL	Crankshaft and Crankcase Front End Clearance			.006L .015L	.025L
508	ALL	Crankshaft Propeller Flange Run-Out			.002	.005
510	ALL	Crankshaft Timing Gear and Crankshaft			.0000 .0015T	(A)
511	ALL	Tappet Body and Crankcase			.0010L .0033L	.004L
	ALL	O.D. of Tappet	<u>.7169</u> .7177	.7166		
	ALL	I.D. Tappet Bore in Crankcase	.7187 .7200	.7203		

## **PART IV – VERTICAL ENGINES**

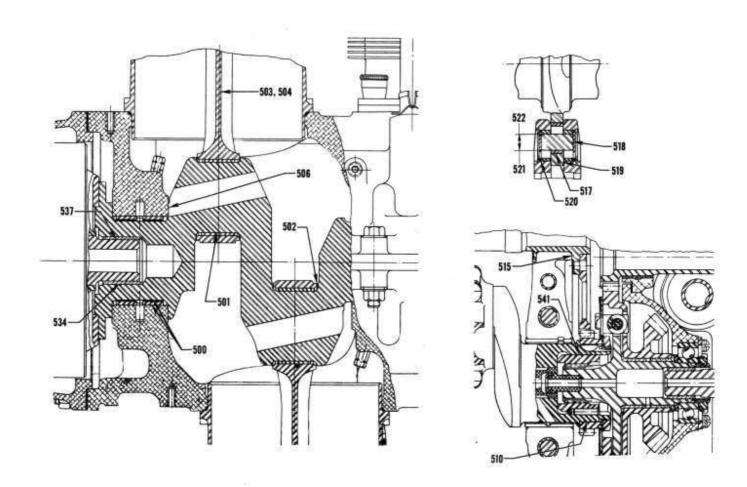
#### $SECTION\,I-CRANKCASE,\,CRANKSHAFT\,AND\,\,CAMSHAFT$

			Dimensions		Clear	ances
			Mfr.		Mfr.	
			Min. &	Service	Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
512	ALL	Tappet Plunger Assembly and			<u>.0010L</u>	
		Body – Hyperbolic			.0067L	.0087L
513	ALL	Tappet Socket and Body			<u>.002L</u>	
		(Hyperbolic)			.007L	.009L
514	ALL	Camshaft and Crankcase			<u>.002L</u>	
					.004L	.006L
515	ALL	Camshaft – End Clearance			<u>.002L</u>	
					.009L	.015L
516	ALL	Camshaft Run-Out at Center			<u>.000</u>	
		Bearing Journal			.001	.006
517	V	Counterweight Bushing and			<u>.0013T</u>	
		Crankshaft			.0026T	(A)
518	V	Counterweight Roller – End			<u>.007L</u>	
		Clearance			.025L	.038L
519	V	Counterweight and Crankshaft			<u>.003L</u>	
		Side Clearance*			.013L	.017L
520	V	Counterweight Bore and Washer			<u>.0002L</u>	
		O.D.			.0030L	(A)
521	V	I.D. of Counterweight Bushing	<u>.7485</u>			
			.7505	.7512		
522	V	O.D. of Counterweight Roller				
		(P/N 73338) (See latest revision	<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.				

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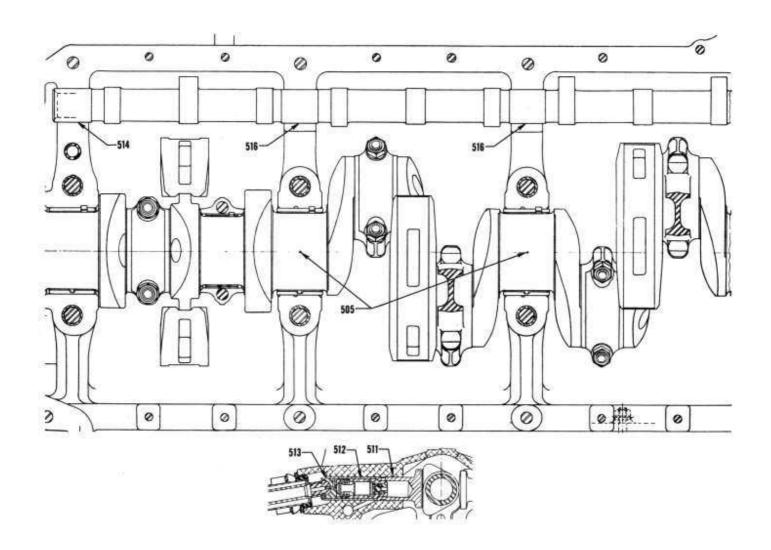
#### **PART IV – VERTICAL ENGINES**

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



## PART IV – VERTICAL ENGINES

SECTION I – CRANKCASE, CRANKSHAFT AND CAMSHAFT



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## **PART IV – VERTICAL ENGINES**

 $SECTION\:II-CYLINDERS$ 

				nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service	Mfr. Min. & Max.	Service
600	ALL	Connecting Rod and Connecting	Ruching D/N	Max.	o be burnishe	Max.
000	ALL	Rod Bushing			s <u>not</u> burnishe	
	ALL	Finished I.D. of Connecting Rod	1.1254			, p
		Bushing	1.1262			
601	L	Length Between Connecting Rod	<u>6.4985</u>			
		Bearing Centers	6.5015			
	V	Length Between Connecting Rod	<u>6.7485</u>			
602	ATT	Bearing Centers	6.7515		00001	
602	ALL	Connecting Rod Bushing and Piston Pin			<u>.0008L</u> .0021L	.0025L
603	ALL	Piston Pin and Piston			.0021L .0003L	.0023L
003	ALL	1 istori i ili and i istori			.0014L	.0018L
	ALL Diameter of Piston Pin Hole in		1.1249		.00112	.0010E
		Piston	1.1254			
	ALL	Diameter of Piston Pin	1.1241			
			1.1246			
604	V	Piston and Piston Pin Plug			<u>.0002L</u>	
					.0010L	.002L
	V	Diameter of Piston Pin Plug*	1.1242			
			1.1247		00057	
605	ALL	Piston Pin and Piston Pin Plug			.0005L	0051
	V	(Nitrided and Chrome Cylinders)  Diameter of Piston Pin Plus*	5655		.0025L	.005L
	V	Diameter of Piston Pin Plug*	<u>.5655</u> .5665			
	L	Diameter of Piston Pin Plug**	.7605			
		Diameter of Fiston Fin Fing	.7615			
	L	Diameter of Piston Pin Plug**	.8405			
		(Thin Wall Pin)	.8415			
	*See latest revision of Serv	ice Instruction No. 1267.				
	**See latest revision of Serv					
606	ALL	Piston Ring and Piston – Side				
		Clearance (Top Ring Comp.)			<u>.0025L</u>	0007 (7)
	ALL (AG ARRIVER DIE)	Half Wedge			.0055L	.008L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side Clearance (2 <sup>nd</sup> Ring Comp.) Full			000	
		or Half Wedge			.000 .004L	.006L (B)
	ALL	Piston Ring and Piston – Side			.002L	.000L (B)
	ALL	Clearance (Oil Regulating)			.002L	.006L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side			.003L	10002 (2)
	(	Clearance (Oil Scraper)			.0055L	.007L (B)
	ALL (AS APPLICABLE)	Piston Ring and Piston – Side				ì
	,	Clearance (3 <sup>rd</sup> Ring Comp.) Half			.000	
		Wedge			.004L	.006L (B)
607	ALL	Piston Ring Gap (Compression)				
		Chrome Cylinders (Straight			.020	0.47
	ATT	Barrels)			.030	.047
	ALL	Piston Ring Gap (Compression) Nitrided and Chrome Cylinders			.045	
		(Choke Barrels)			.065	.067
		(CHOKE Darreis)		l		.007

#### **PART IV – VERTICAL ENGINES**

#### SECTION II - CYLINDERS

			Dimensions Mfr. Min. & Service Max. Max.		Clearances	
Ref.	Chart	Nomenclature			Mfr. Min. & Max.	Service Max.
607	ALL	Piston Ring Gap (Oil			<u>.015</u>	
		Regulating) (All Barrels)			.040	.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	d Piston Application	Min Pista	on Diameter		Cylinder Barrel			
	Engine Chart Code Letter	Piston Number	Тор	Bottom	Type of Piston	Type of Surface	Maximum Diameter	Max. Clearance Piston Skirt & Cyl.	
608	Ţ	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*,							
		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	Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
611	L	Exhaust Valve Seat and Cylinder			<u>.0065T</u>	
	ATT	Head (Flat Seat)			.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	1.926			
		Cylinder Head (Allison Seat)	1.928			
	L	I.D. Exhaust Seat Hole in	2.088			
		Cylinder Head (Flat Seat)	2.090			
612	ALL	Intake Valve Seat and Cylinder			.0065T	
		Head			.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	2.159			
		Head (Allison Seat)	2.161			
	L	I.D. Intake Seat Hole in Cylinder	2.306			
		Head (Flat Seat)	2.308			
	V	I.D. Intake Seat Hole in Cylinder	2.280			
		Head	2.282			
613	ALL	Exhaust Valve Guide and			.001T	
		Cylinder Head			.0025T	(A)
	ALL	O.D. Exhaust Valve Guide (1/2	.6633			
		in. Exhaust Valve)	.6638			
	L	O.D. Exhaust Valve Guide (7/16	.5933			
		in. Exhaust Valve)	.5938			
	ALL	I.D. Exhaust Valve Guide Hole				
		in Cylinder Head (1/2 in.	<u>.6613</u>			
		Exhaust Valve)	.6623			
	L	I.D. Exhaust Valve Guide Hole				
		in Cylinder Head (7/16 in.	.5913			
		Exhaust Valve)	.5923			
614	ALL	Intake Valve Guide and Cylinder Head			<u>.001T</u> .0025T	(A)
	ALL	O.D. Intake Valve Guide	. <u>5933</u>			
	ATT	I.D. Intoles Value Cuide Halaire	.5938			
	ALL	I.D. Intake Valve Guide Hole in Cylinder Head	<u>.5913</u> 5923			
615	ALL	Exhaust Valve Stem and Valve	.5923		.0035L	
013	ALL	Guide Stelli and Valve			.0053L	(A)

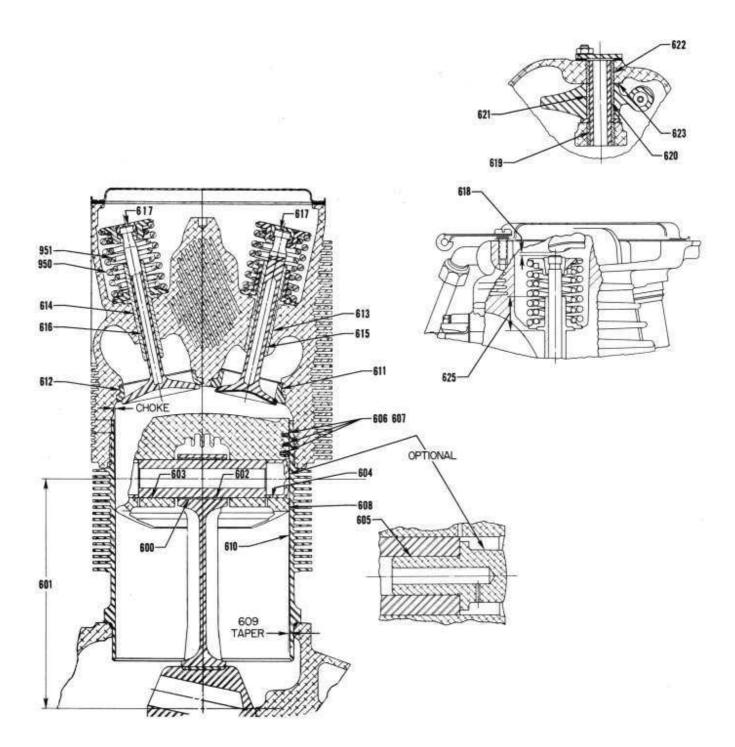
## **PART IV – VERTICAL ENGINES**

#### 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		
			Service allo	owable limits	of .4937 is	
				only to		
			nimonic va			
	L	O.D. Exhaust Valve Stem (7/16	.4332			
		in. Exhaust Valve)	.4340			
	ALL	Finished I.D. Exhaust Valve	.5000			
		Guide (1/2 in. Exhaust Valve)	.5010			
	L	Finished I.D. Exhaust Valve	.4360			
		Guide (7/16 in. Exhaust Valve)	.4370			
	½ inch diameter exhaust valves ma	ay have exhaust valve guides that are		r the maximu	ım inside dia	meter limit.
		e. After 300 hours of service, inside of				
		ation up to the recommended overha				
		ion of Service Instruction No. 1009				
616	ALL	Intake Valve Stem and Valve			.0010L	
		Guide			.0028L	.006L
	ALL	O.D. Intake Valve Stem	.4022			
			.4030	.4010		
	ALL	Finished I.D. Intake Valve	.4040			
		Guide	.4050			
617	ALL	Valve and Valve Cap Clearance			.000	
		1			.004L	.005L
618	ALL	Dry Tappet Clearance			.028	
					.080	
619	ALL	Valve Rocker Shaft and Valve			.0001L	
		Rocker Bushing			.0013L	.0025L
	ALL	Finished I.D. of Valve Rocker	.6246			
		Shaft Bushing in Cylinder Head	.6261	.6270		
620	ALL	Valve Rocker Shaft and Valve			<u>.0007L</u>	
		Rocker Bushings			.0017L	.004L
	ALL	O.D. Valve Rocker Shaft	<u>.6241</u>			
			.6245	.6231		
	ALL	Finished I.D. of Rocker Arm	<u>.6252</u>			
		Bushing	.6263	.6270		
621	ALL	Valve Rocker Bushing and				
		Valve Rocker	Bushi	ng Must Be	Burnished In	Place
622	ALL	Valve Rocker Shaft Bushing and			<u>.0022T</u>	
		Cylinder Head			.0038T	(A)
	ALL	Valve Rocker Shaft Bushing	<u>.7380</u>			
		Hole in Cylinder Head	.7388		0007	
623	ALL	Valve Rocker and Cylinder			.002L	00.47
607	ATT	Head – Side Clearance	014		.020L	.024L
625	ALL	Intake and Exhaust Valve Guide	<u>.914</u>			
		Height	.954			
		MEASURE THE VALVE GUID				
		FROM THE VALVE SPRIN				
		COUNTERBORE IN THE C				
		HEAD TO THE TOP OF VALVE	GUIDE.			

## **PART IV – VERTICAL ENGINES**

SECTION II – CYLINDERS



Cylinder, Piston, Connecting Rod and Valve Components

## **PART IV – VERTICAL ENGINES**

			Dime	nsions	Clearances	
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
OIL Pl	UMP					
702	L-V	Oil Pump and Scavenge Pump			<u>.007L</u>	
		Gear – End Clearance			.030L	.045L
	L1	Oil Pump Drive Gear – End			<u>.010L</u>	
		Clearance			.035L	.060L
703	L-V	Oil Pump and Scavenge Pump			<u>.007L</u>	
		Impellers – Dia. Clearance			.011L	.014L
	L1	Oil Pump Impellers – Dia.			<u>.007L</u>	01.41
704	L-V	Clearance			.011L	.014L
704	L-V	Oil Pump and Scavenge Pump Impellers – Side Clearance			<u>.003L</u> .0055L	.006L
	L1	Oil Pump Impellers – Side			.0033L	.000L
	Li	Clearance			.005L	.006L
	ALL	Width of Oil Pump Impellers	.995		.0033E	.000L
	TIEE	Width of On Fump Imperiors	.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			.0025L	.004L
	L1	Oil Pump Driven Impeller and			<u>.0010L</u>	
<b>-</b> 0.6		Idler Shaft			.0025L	.004L
706	ALL	Oil Pump Idler Shaft and Oil			.0000	(4)
	L1	Pump Body Oil Pump Idler Shaft and Oil			.0015T .0000	(A)
	LI	Pump Cover			.000 <del>0</del>	(A)
713	L-V	Oil Pump Idler Shaft and			.0000	(A)
713		Scavenge Pump Body			.0015T	(A)
777	L-V	Oil Pump Drive Shaft Bushing			.001T	()
		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			.001T	
770	1.37	and Oil Pump Cover			.003T	(A)
779	L-V	Oil Pump Drive Bushing and Oil			.0015L .0035L	0051
	L1	Scavenge Pump Gear Oil Pump Drive Gear and Oil				.005L
	LI	Pump Cover			.0015L .0035L	.005L
780	ALL	Oil Pump Drive Shaft Bushing			.0035L	.003L
, 50		and Oil Pump Shaft			.0015L	.005L
7051	ALL	Oil Relief Valve Plunger and			.001L	
-		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

Ref.   Chart   Nomenclature   Min. & Service   Min. & Service   Max.   Max.   Max.				Dime	nsions	Clear	ances
Fuel Pump Drive Shaftgear	Ref	Chart	Nomenclature	Min. &		Min. &	
Teal Pump Drive Shaftgear   Dott			Tromendadare	was.	Max.	Max.	wax.
Bushing and Accessory Housing		1	Fuel Pump Drive Shaftgear			.001T	
Fuel Pump Drive Shaftgear -   0.06   0.074							(A)
End Clearance	783	L-V					
National Pump   Nating and Accessory Housing   Note   National Pump Shaftgear   Bushing and Accessory Housing   Note   National Pump Shaftgear   Note   National Pump Shaftgear   Note   Note							.074
Vacuum Pump Shaftgear   Bushing and Accessory Housing   Cover   Cove	784	L-V	Fuel Pump Drive Shaftgear and			<u>.001L</u>	
1.   Vacuum Pump Shaftgear Bushing and Accessory Housing Cover   0.0015T   0.0035T   (A)			Bushing			.004L	.006L
Bushing and Accessory Housing   0.015T   (A)	VACU	UM PUMP					
Cover	793	L-V	Vacuum Pump Shaftgear				
Total			Bushing and Accessory Housing			<u>.0015T</u>	
Bushing (At Cover) and Vacuum   0.002L   .006L			Cover			.0035T	(A)
Pump Shaftgear   .004L   .006L   .006L   .006L   .0015T   .0025T   .0045T   .006L	794	L-V	Vacuum Pump Shaftgear				
Total							
Bushing and Accessory Housing							.006L
L1	795	L-V					
Bushing and Accessory Housing							(A)
Nacuum Pump Shaftgear		L1					
Bushing (At Accessory Housing) and Vacuum Pump Shaftgear   .0045L   .006L						.0045T	(A)
And Vacuum Pump Shaftgear   .0045L   .006L	796	ALL					
Vacuum Pump Shaftgear - End Clearance   .008							000
Clearance							.006L
Vacuum Pump Drive Gear Bushing and Accessory Housing	797	L-V					050
Bushing and Accessory Housing   .004T	700	T 1					.050
Vacuum Pump Drive Gear Bushing and Vacuum Pump Drive Gear Bushing and Vacuum Pump Drive Gear Bushing and Vacuum Pump Drive Gear	799	LI	*				(4)
Bushing and Vacuum Pump   .0025L   .0045L   .006L	7000	T 1				.0041	(A)
Drive Gear   .0045L   .006L   .007   .007   .007   .007   .1   .008	7000	LI				00251	
Vacuum Pump Drive Gear and Cover   .0013L .003L   .005L							0061
Cover   .0033L .005L	7078	1.1					.000L
Total	7070		-				0051.
Clearance   .032   .037	7079	L.1					10002
7002         L1         Tachometer Driven Gear and Adapter         .001L .003L .0045L           7006         L-V         Electric Tachometer Driven Gear - End Clearance         .007 .025 .047           7012         L-V         Electric Tachometer Driven Gear and Accessory Housing Cover         .001L .004L           7088         L1         Tachometer Adapter and Accessory Housing         .0005L .003L .004L           7088         L-V         Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub Bushing Adapter	, , ,						.037
7002         L1         Tachometer Driven Gear and Adapter         .001L .003L .0045L           7006         L-V         Electric Tachometer Driven Gear - End Clearance         .007 .025 .047           7012         L-V         Electric Tachometer Driven Gear and Accessory Housing Cover         .001L .004L           7088         L1         Tachometer Adapter and Accessory Housing         .0005L .003L .004L           7088         L-V         Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub Bushing Adapter	TACHO	OMETER					ų.
Adapter		•	Tachometer Driven Gear and			.001L	
Tou	, 002						.0045L
Gear - End Clearance   .025   .047	7006	L-V					
Total			Gear – End Clearance				.047
Cover	7012	L-V					
7088     L1     Tachometer Adapter and Accessory Housing     .0005L .0035L       MAGNETO     .0025L     .0035L       7025     L-V     Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub     Bushing Must Be Burnished In Place Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub Bushing and Magneto Drive			Gear and Accessory Housing			<u>.001L</u>	
Accessory Housing0025L .0035L  MAGNETO  7025 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub  7026 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub			Cover			.003L	.004L
MAGNETO         7025       L-V       Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub       Bushing Must Be Burnished In Place Idler Gear Hub Bushing and Magneto Drive       Bushing Must Be Burnished In Place Idler Gear Hub Bushing and Magneto Drive	7088	L1					
7025 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive Idler Gear Hub  7026 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive  Magneto Drive Idler Gear Hub Bushing and Magneto Drive  .001L			Accessory Housing			.0025L	.0035L
Bushing and Magneto Drive Bushing Must Be Burnished In Place Idler Gear Hub  7026 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive001L	MAGN	VETO					
Bushing and Magneto Drive Bushing Must Be Burnished In Place Idler Gear Hub  7026 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive001L	7025	L-V	Magneto Drive Idler Gear Hub				
Idler Gear Hub  7026 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive001L				Bushi	ng Must Be	Burnished In	Place
7026 L-V Magneto Drive Idler Gear Hub Bushing and Magneto Drive001L					-		
Bushing and Magneto Drive .001L	7026	L-V					
Idler Shaft .003L .004L			Bushing and Magneto Drive				
			Idler Shaft			.003L	.004L

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## **PART IV – VERTICAL ENGINES**

			Dime	nsions	Clear	rances
			Mfr. Min. &	Service	Mfr. Min. &	Service
Ref.	Chart	Nomenclature	Max.	Max.	Max.	Max.
MAGN	ETO (CONT.)		_		_	
7027	L-V	Magneto Drive Idler Gear Hub –			<u>.005</u>	
		End Clearance			.014	.024
7028	L-V	Magneto Drive Shaft and			.002L	0067
7020	T 37	Accessory Housing Cover			.0045L	.006L
7029	L-V	Magneto Drive Shaft and Accessory Housing			.0025L .0045L	.006L
7030	ALL	Magneto Drive Shaft Sleeve and			.0043L	.000L
7030	ALL	Magneto Drive Shaft  Magneto Drive Shaft			.004T	(A)
7031	ALL	Magneto Drive Shaft Sleeve and			.001T	(12)
		Magneto Drive Coupling			.004T	(A)
7032	L-V	Magneto Drive Shaftgear – End			.002	
		Clearance			.020	.030
7039	L1	Magneto Drive Idler Gear – End			<u>.002</u>	
		Clearance			.030	.040
7080	L1	Magneto Drive Idler Gear			0047	
		Bushing and Magneto Drive			.001L	0041
7081	L1	Idler Shaft Magneto Drive Idler Gear and			.003L	.004L
/081	LI	Magneto Drive Idler Gear			.0005T	
		Bushing			.0025T	(A)
7082	L1	Magneto Drive Gear Bushing			.002T	(71)
, 002		and Accessory Housing			.004T	(A)
7083	L1	Magneto Drive Coupling and			.001L	
		Accessory Housing Bushing			.003L	.004L
7084	L1	Magneto Drive Gear and			<u>.001L</u>	
		Accessory Housing Bushing			.003L	.004L
GENE	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	006
7045	1.37	Gear			.004L	.006L
7045	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	TER					
7048	L-V	Starter Drive Gear Bushing and			.002T	
		Adapter			.004T	(A)
	L1	Starter Drive Spacer Bushing			<u>.002T</u>	Ì
		and Adapter			.004T	(A)
7049	L-V	Starter Drive Gear Bushings and			<u>.002L</u>	
		Starter Drive Gear			.004L	.006L
	L1	Starter Drive Spacer and Starter			.0015L	00.47
		Drive Adapter Bushing			.003L	.004L

## **PART IV – VERTICAL ENGINES**

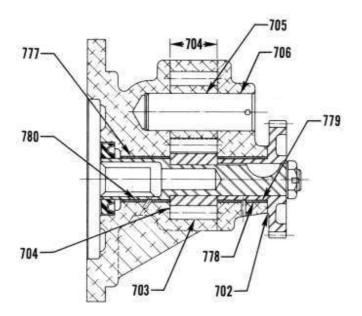
#### SECTION III – GEAR TRAIN

			Dime	nsions	Clear	ances
Ref.	Chart	Nomenclature	Mfr. Min. & Max.	Service Max.	Mfr. Min. & Max.	Service Max.
	ER (CONT.)	1 (omenciature	Max.	wax.	Max.	Max.
7050	L-V	Starter Drive Adapter and			.0005L	
, 000		Accessory Housing Cover			.0025L	(A)
7089	L1	Starter Drive Gear – End			.007	\ /
		Clearance			.011	.015
7090	L1	Bendix Drive Shaft (Slip				
		Coupling) and Accessory			<u>.0015L</u>	
		Housing Bushing			.0045L	.005L
ACCES	SSORY DRIVE					
7053	L-V	Accessory Idler Gear Bearing			.0001L	
		and Accessory Drive Gear			.0007T	(A)
7054	V	Accessory Drive Gear and			<u>.001T</u>	
		Bushing			.003T	(A)
7055	L-V	Accessory Idler Gear Bearing				
		and Accessory Drive Shaft			<u>.0005T</u>	
		Adapter			.0005L	(A)
7056	V	Accessory Drive Gear Bushing			<u>.0005L</u>	00.47
		and Accessory Drive Shaft			.0017L	.004L
7057	V	Accessory Drive Gear – End			.004	017
7086	L1	Clearance			.012	.017
7086	LI	Accessory Drive Shaftgear Bushing and Accessory Housing			<u>.002T</u> .004T	(A)
7087	L1	Accessory Drive Shaftgear and			.0041 .002L	(A)
7087		Accessory Housing Bushing			.002L	.006L
7091	L1	Dual Accessory Idler Gear and			.001L	.000E
7071		Idler Shaft			.003L	.0045L
7092	L1	Dual Accessory Idler Gear – End			.009	,,,,,,,,
		Clearance			.018	.023L
7093	L1	Dual Accessory Drive Gear –			.005	
		End Clearance			.062	.077
7094	L1	Dual Accessory Drive Gear and			<u>.0013L</u>	
		Adapter			.0028L	.0034L

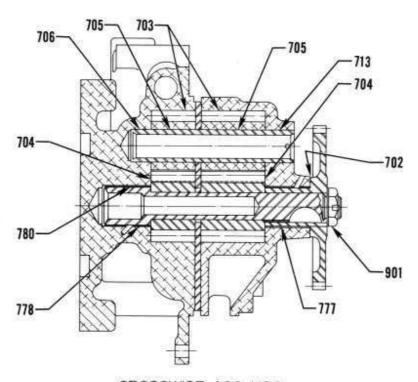
4-13 SSP-1776-5-PT4

#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



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



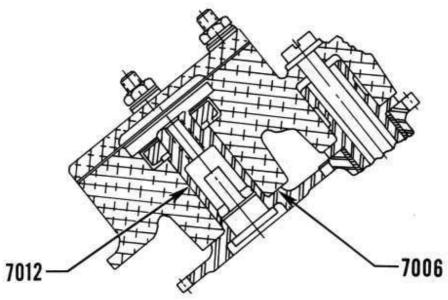
CROSSWISE ACC. HSG.

#### **Oil Pumps**

SSP-1776-5-PT4 4-14

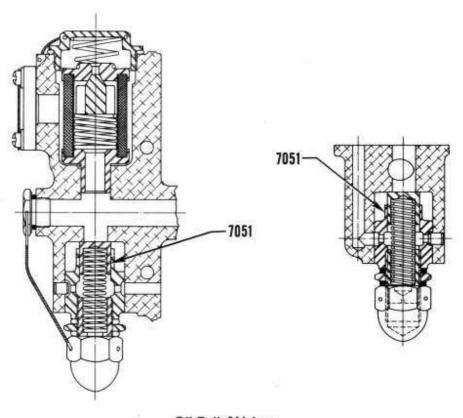
#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



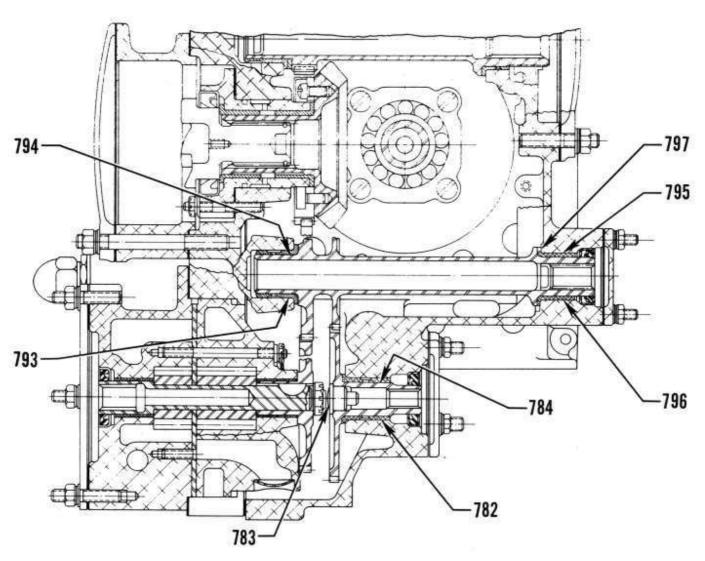
VO, TVO-435-A & VO, TVO-540

#### **Tachometer Drive**



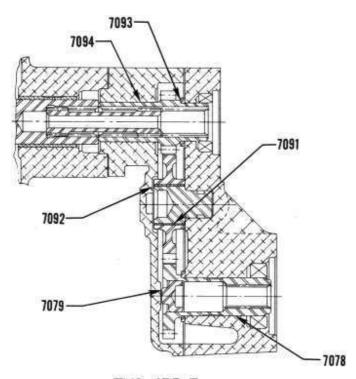
Oil Relief Valves

#### **PART IV – VERTICAL ENGINES**

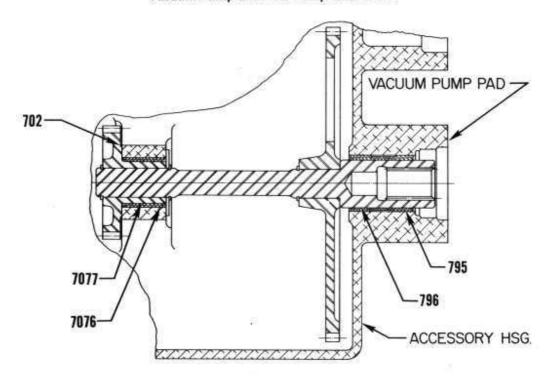


CROSSWISE ACCESSORY HSG.

#### **PART IV – VERTICAL ENGINES**

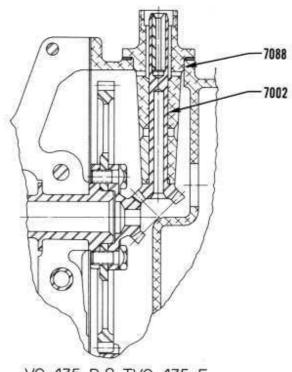


TVO-435-F Vacuum Pump and Fuel Pump Dual Drive

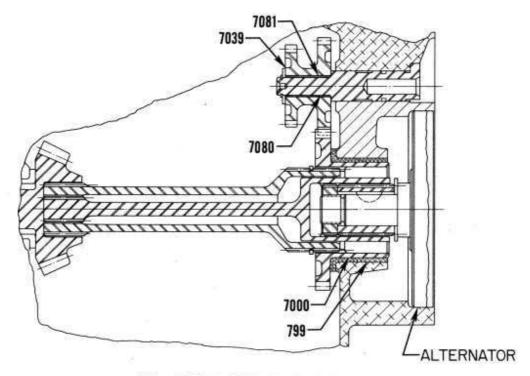


VO-435-BIA & TVO-435-F Vacuum Pump Drive

## **PART IV – VERTICAL ENGINES**



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

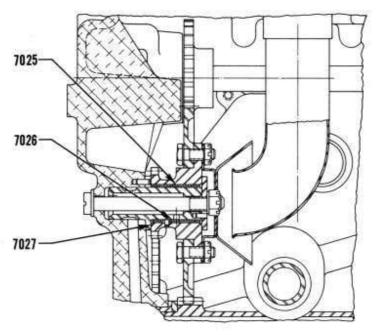


VO-435-B & TVO-435-F

Vacuum, Magneto and Alternator Drive

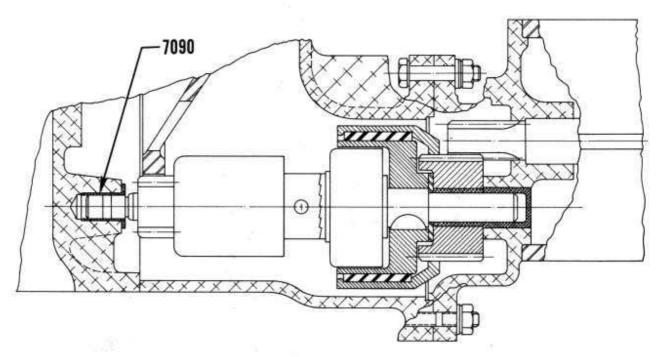
#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



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

Magneto and Tachometer Idler Gear



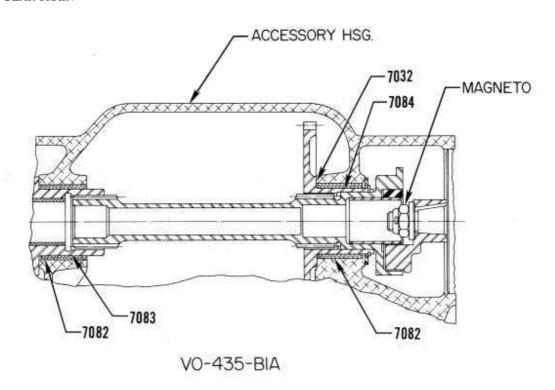
VO-435-B & TVO-435-F

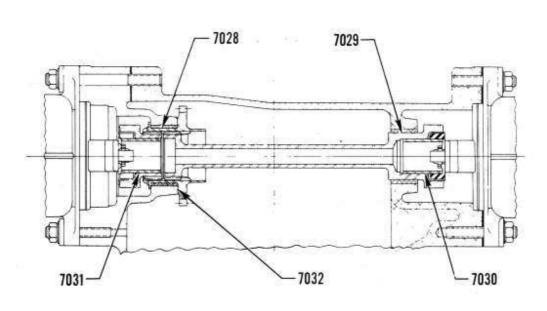
**Bendix Drive** 

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#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



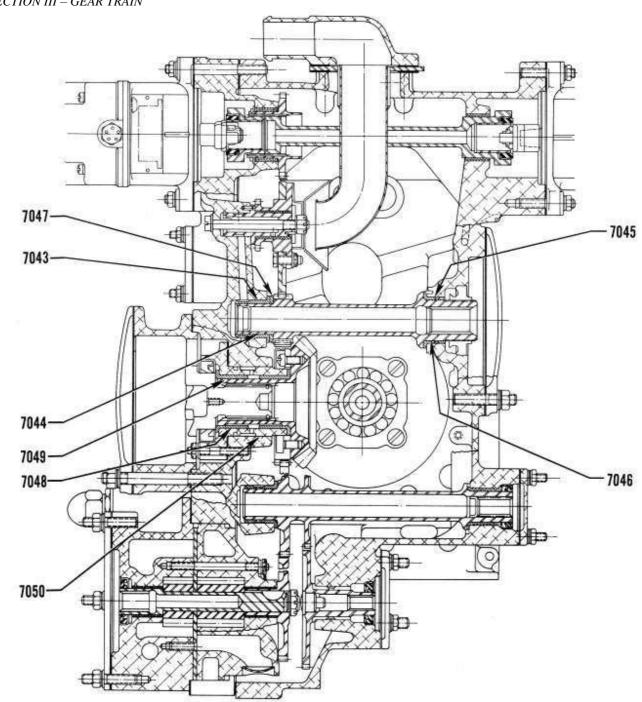


VO, TVO-435-A & VO, TVO-540

**Magneto Drives** 

## **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN

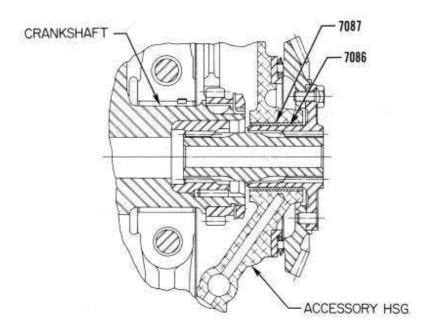


VO, TVO-435-A & VO, TVO-540

**Generator and Starter Drives** 

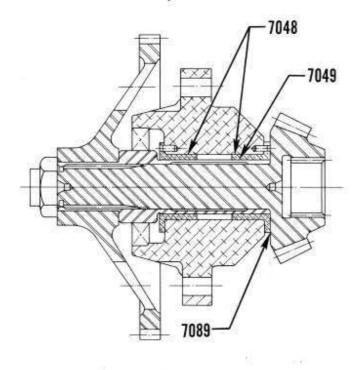
#### **PART IV – VERTICAL ENGINES**

SECTION III – GEAR TRAIN



VO-435-BIA

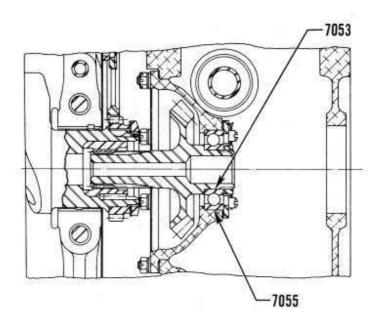
## Accessory Drive Gear



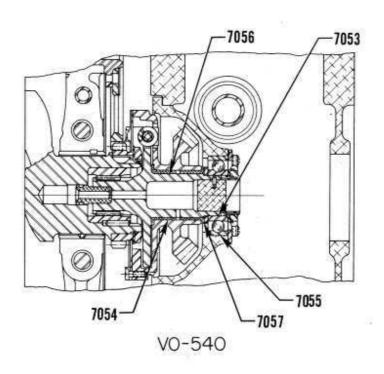
VO-435-BIA

Starter Drive

#### **PART IV – VERTICAL ENGINES**



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



Accessory Drives

## **PART IV – VERTICAL ENGINES**

#### $SECTION\ IV-BACKLASH$

			Dime	nsions	Clear	rances
			Mfr.		Mfr.	
Ref.	Chart	Nomenclature	Min. &	Service	Min. &	Service
			Max.	Max.	Max.	Max.
808	L1	Oil Pump Impellers			<u>.005</u> .015	.020
	L-V	Oil Pump and Scavenge Pump			.008	.020
		Impellers			.015	.020
825	ALL	Crankshaft Timing Gear and			.004	
		Camshaft Gear			.015	.020
866	L-V	Electric Tachometer Drive Gear				
		(Magneto Idler Hub) and			<u>.004</u>	020
0.67	7.37	Tachometer Driven Gear			.015	.020
867	L-V	Generator Drive Gear and			<u>.004</u> .015	020
868	L-V	Magneto Drive Idler Gear  Magneto Drive Shaft (Spline)			.013	.020
000	L-V	and Magneto Drive Shaftgear			.001	
		(Spline)			.005	.008
869	L-V	Magneto Drive Shaftgear			.003	.000
00)		(Spline) and Magneto Drive			.001	
		Coupling (Spline)			.005	.008
	L1	Magneto Drive Shaft (Spline)				
		and Magneto Drive Coupling			<u>.001</u>	
		(Spline)			.0045	.0075
870	L-V1	Rear Crankshaft Spline Bushing			<u>.002</u>	
		and Accessory Gear (Spline)			.0073	.018
	L1	Rear Crankshaft Spline Bushing			004	
		and Accessory Drive Quill Shaft			<u>.004</u>	010
	V	(Spline)			.0073	.018
	V	Rear Crankshaft Spline Bushing and Accessory Drive Shaft			.002	
		(Spline)			.002	.018
871	L-V	Accessory Drive Gear and			.004	.010
0,1		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			<u>.004</u>	
		Generator Drive Gear			.015	.020
	L1	Alternator Drive Shaft (Spline)			004	
		and Vacuum and Magneto Drive			<u>.001</u>	006
	T 1	Shaft (Spline)			.004	.006
	L1	Alternator Drive Shaft (Spline) and Alternator (Spline)			<u>.001</u> .005	.007
873	L-V	Accessory Drive Gear and			.003	.007
013		Vacuum Pump Shaftgear			.015	.020
874	L-V	Vacuum Pump Shaftgear and Oil			.004	.020
٠. ١		Pressure Scavenge Pump Gear			.015	.020
884	L1	Magneto Drive Idler Gear and			.006	
		Magneto Driven Gear			.014	.020
	L1	Magneto Drive Gear and			<u>.006</u>	
		Magneto Idler Drive Gear			.014	.020

## **PART IV – VERTICAL ENGINES**

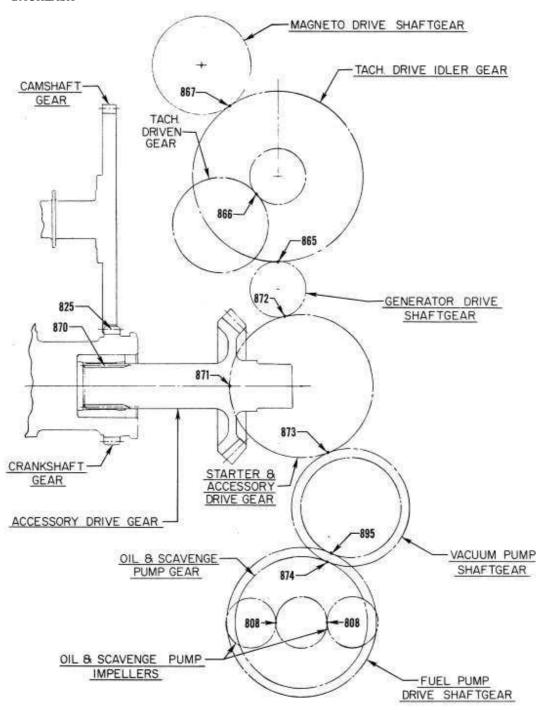
#### $SECTION\:IV-BACKLASH$

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

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## **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH

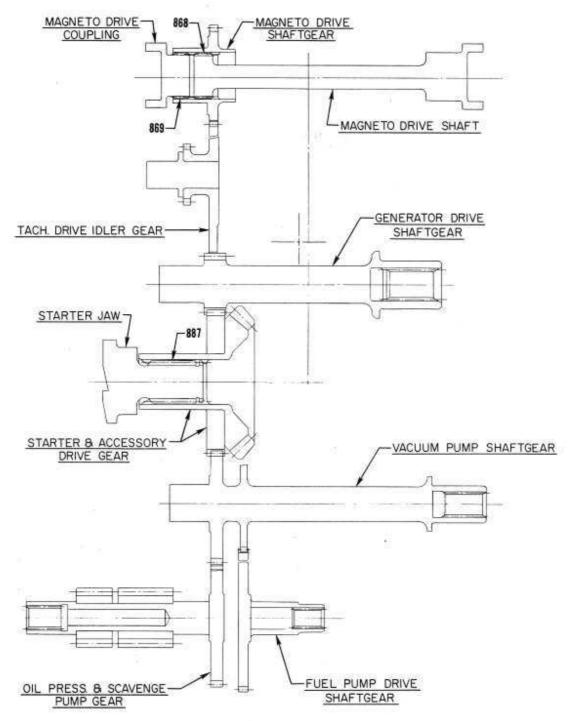


VO, TVO-435-A & VO, TVO-540
VIEWING LEFT SIDE OF ENGINE

**Accessory Drives** 

#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH

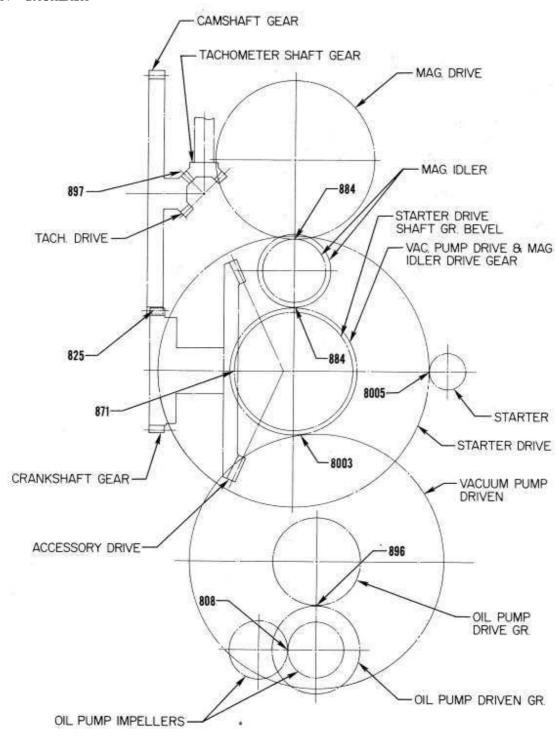


VO-TVO-435-A & VO, TVO-540 REAR OF ENGINE

**Accessory Drives** 

#### **PART IV – VERTICAL ENGINES**

SECTION IV - BACKLASH

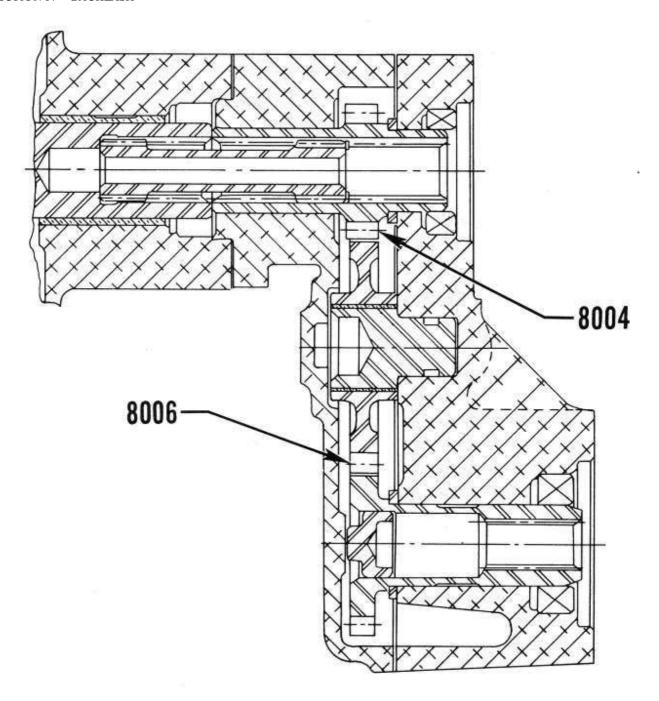


VO-435-BIA LEFT SIDE OF ENGINE

Accessory Drives

#### **PART IV – VERTICAL ENGINES**

 $SECTION\:IV-BACKLASH$ 

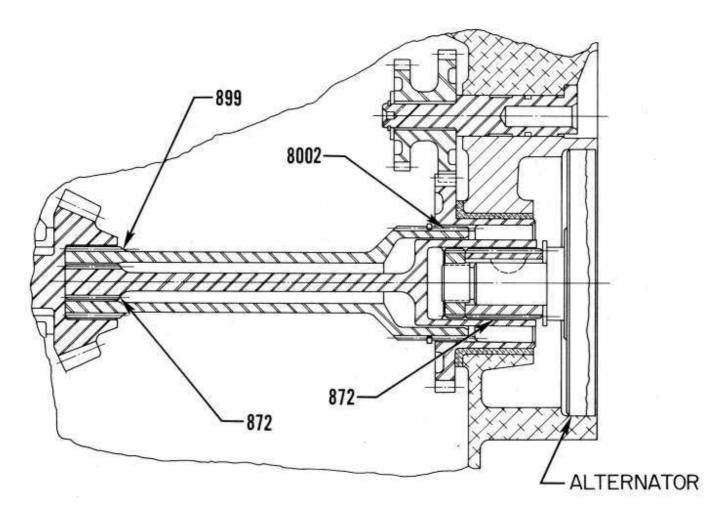


TVO-435-F

**Vacuum Pump and Fuel Pump Dual Drives** 

#### **PART IV – VERTICAL ENGINES**

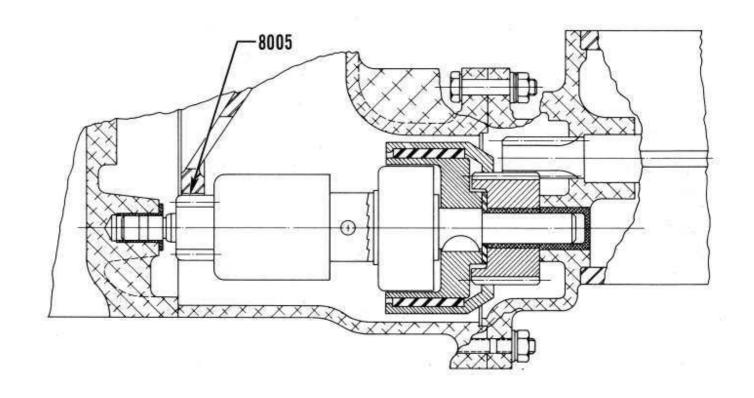
 $SECTION\:IV-BACKLASH$ 



VO-435-B & TVO-435-F

#### **PART IV – VERTICAL ENGINES**

 $SECTION\ IV-BACKLASH$ 

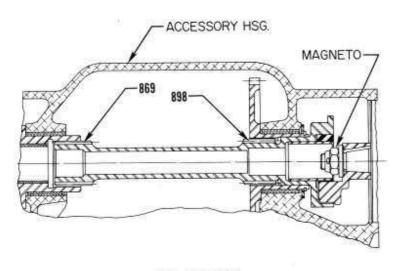


VO-435-B & TVO-435-F

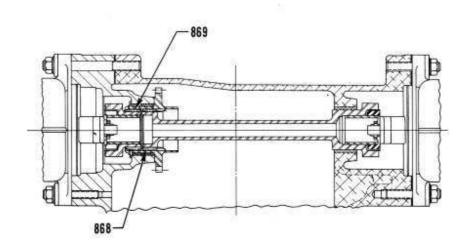
**Bendix Drive** 

#### **PART IV – VERTICAL ENGINES**

#### $SECTION\:IV-BACKLASH$



VO-435-BIA

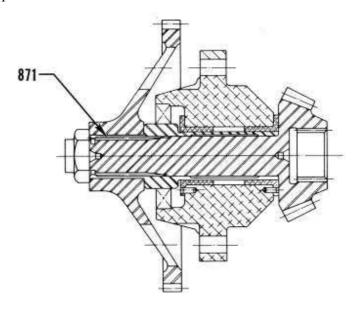


VO, TVO-435-A & VO, TVO-540

**Magneto Drives** 

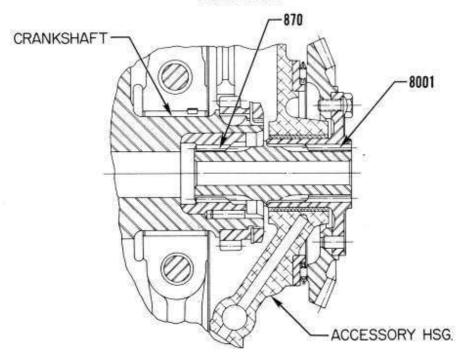
#### **PART IV – VERTICAL ENGINES**

 $SECTION\ IV-BACKLASH$ 



VO-435-BIA

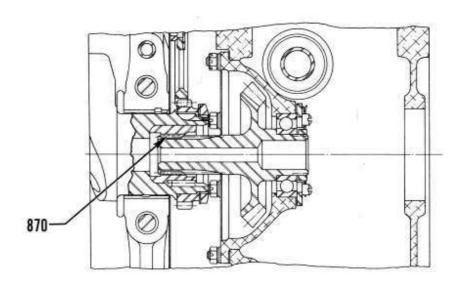
#### Starter Drives



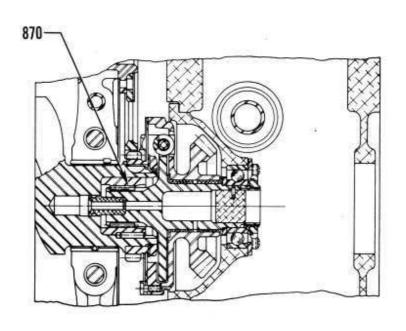
VO-435-BIA Accessory Drive Gear

#### **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	
				300 in. lbs.
904	ALL	10-32	Screw Plate Nuts (To attach ignition	
			cable outlet plate to magneto)	
				15 in. lbs.
905	ALL (using a silicone gasket)	1/4-20	Rocker Box Screws	35 inlbs.
	ALL (using a cork gasket)	1/4-20	Rocker Box Screws	50 inlbs.
906	ALL	5/16-18	Exhaust Port Studs (Driving Torque)	
				40 in. lbs. min.
	ALL	5/16-18	Nuts to Attach Exhaust Stacks to	
			Cylinder Head	160-180 in. lbs.
907	ALL	18MM	Spark Plugs	420 in. lbs.
909	L-V	5/8-32	Alternator Pulley Nut	450 in. lbs.
	L1	5/8-32	Alternator Nut (Quill Shaft)	474 in. lbs.
910	L1	1/4-28	Alternator Output Terminal Nut	85 in. lbs.
911	L1	10-32	Alternator Auxiliary Terminal Nut	
				30 in. lbs.
913	L1-L2-V	1/16-27 NPT	Piston Cooling Nozzle in Crankcase	
				100 in. lbs.
914	V-V1	1/8-27 NPT	Injector Nozzle in Cylinder Head	
				60 in. lbs.
919	ALL	1/4 Hex Head	Hose Clamps (Worm Type)	201 11
		and Below	II. GI (III. T	20 in. lbs.
	ALL	5/16 Hex Head	Hose Clamps (Worm Type)	45 : 11
010 1	ATT	and Above	"T" D. 1/ H	45 in. lbs.
919-1	ALL		"T" Bolt Hose Clamps	25 in 1ha
			Initial Torque	35 in. lbs. 25 in. lbs.
920	ALL		Retorque After Run-In	23 III. 108.
92U	ALL		Clamp	10 in. lbs.
921	L2-V1		Exhaust Clamp – Coupling – V-Band	10 111. 108.
141	122 V 1		(See latest revision of Service	
			Instruction No. 1238)	
928	ALL	3/8-16	Cylinder Hold Down Studs	
/20		3,010	(Crankcase Driving Torque)	100 in. lbs.
	ALL	1/2-13	Cylinder Hold Down Studs	100 III. 100.
			(Crankcase Driving Torque)	250 in. lbs.
929	ALL	3/8-16	Cylinder Hold Down Nuts	300 in. lbs.
	ALL	1/2-13	Cylinder Hold Down Nuts	600 in. lbs.
930	ALL	5/16-32	Brass union nut on stainless steel	
-			injector/primer fuel line (Both Ends)	25-50 inlbs.*
* It is a	also permissible to tighten the fuel	ine union nut finge	r tight, then continue tightening the nut w	ith a wrench an
			in excess of 50 inlbs. can result in dama	
uauit.			Nuts' Tightening Procedures – See lates	
	Instruction No. 1029.	ast railing fiange	ivuis Tightening Frocedures – See lates	or revision of Service
933	L-V		Accessory Drive Shaft Nut	75-125 ft. lbs.
933	ALL		Crankshaft Gear Retaining Nut	150 ft. lbs.
234	ALL	1	Crankshart Ocal Ketallilig Nut	150 11. 108.

#### **PART IV – VERTICAL ENGINES**

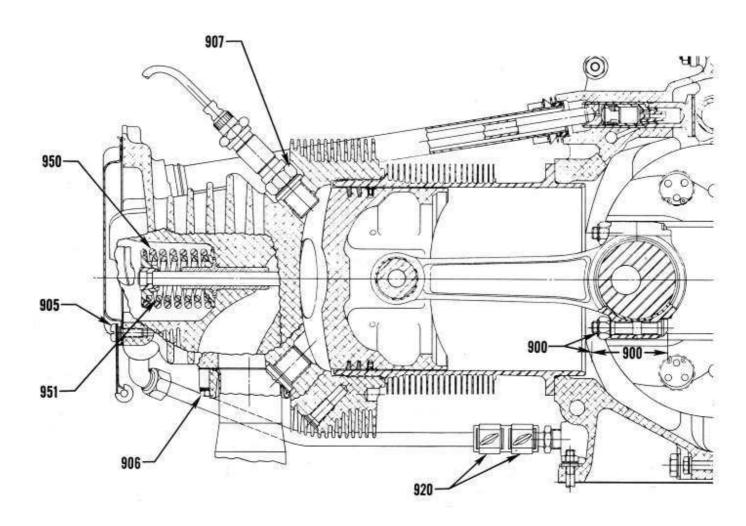
#### SECTION V – SPECIAL TORQUE REQUIREMENTS

Ref.	Chart	Th	read Size		Nomeno	nclature				To	orque	e Limits	
938	ALL	1/4	-28			otted Nut I to reach							38 in. lbs.
942	ALL	1/8	1/8-27 NPT			retor Drain Plug					50-60 in. lbs.		
943	V	10-	-32		Screws plate)	(To attac	h nece			couplir	ng		-30 in. lbs.
944	V					tor Throt						20	-28 in. lbs.
945	L1			E C T I	Drive G	ory Drive ear Attac	ching S		cesso	ory		100-	120 in. lbs.
		-	S	ECTIO	)N V –	SPRIN	GS	1					
Ref.	Chart	Nomeno	omanalatura		Lyc. art No.	Wire Dia.	at C	ngth Comp. ngth		Ifr. Iin.	OMP. Mf Ma	r.	Service Max.
950	ALL	Outer Valve	Springs										100 lb.
		(Angle)		683	26	.177	1.4	6 in.	10	3 lb.	111	lb.	min.
	ALL	Outer Valve (Angle)		LW	′-11796	.182	1.4	3 in.		4 lb.	124	lb.	111 lb. min.
951	ALL	Auxiliary Va Springs (Ang	(le)	683 LW	28 7-11797	.142	1.3	3 in.		5 lb. 3 lb.	83 1	b.	70 lb. min.
952	L-V	Check Valve Lycomir Numl	ng Part		Free ength			ı					
		654-B		_		.031	1.0	3 in.	.74	4 lb.	.94	lb.	.69 lb. min.
		7370	61	2	2.065	.041	1.0	3 in.	3.1	5 lb.	3.35	lb.	3.10 lb. min.
953		Oil Pressu Valve S											
		Lycoming Part Numbers	Identi:	Free Lengtl	1								
	L-V	68542	None	2.38	.067	1.66	in.	15	lb.		17 lb.		14 lb. min.
	L-V	LW-14029	White	2.28			- /	22 lb.		17 lb. min.			
954		Accessory D	rive Coup	oling Spi	ring								
		Lycoming Part Numbers	Free Le	ngth									
	V – AS APPLICABLE	74616	1.25		.092	1.10	in.	23 lb	).	26	lb.		20 lb.

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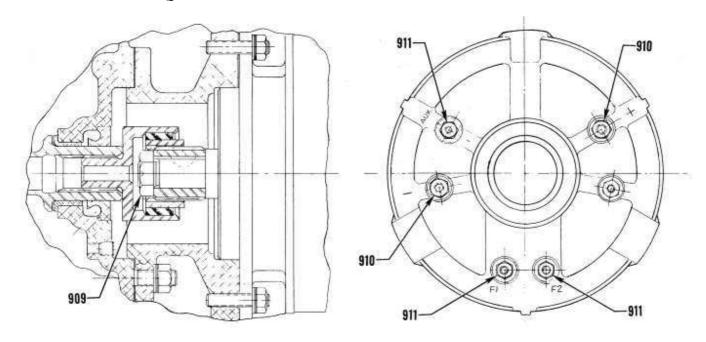
## **PART IV – VERTICAL ENGINES**

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

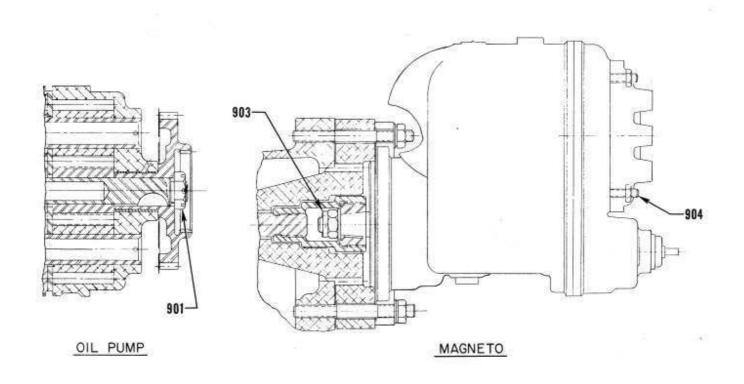


#### **PART IV – VERTICAL ENGINES**

SECTION V – SPECIAL TORQUE AND SPRINGS



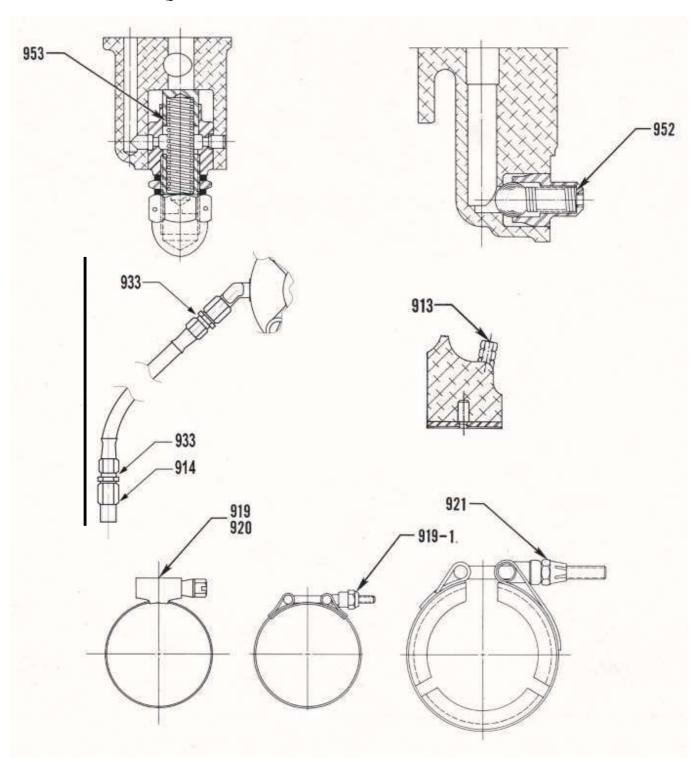
#### ALTERNATOR & ALTERNATOR DRIVE



**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	LE I			TAB	LE II
	В	OLTS, SCRE		PIPE F	PLUGS		
Thusad	Tor	que	Thread	Torq	ue	Thursd	Torque
Thread	In. Lb.	Ft. Lb.	1 nread	In. Lb.	Ft. Lb.	Thread	In. Lbs.
8	20 to 22		7/16	600 to 660	50 to 55	1/16-27 NPT	40 to 44
10	49 to 54		1/2	900 to 984	75 to 82	1/8-27 NPT	40 to 44
1/4	96 to 106		9/16	1320 to 1452	110 to 121	1/4-18 NPT	85 to 94
5/16	204 to 228	17 to 19	5/8	1800 to 1980	150 to 165	3/8-18 NPT	110 to 121
3/8	360 to 396	30 to 33	3/4	3240 to 3564	270 to 297	1/2-14 NPT	160 to 176
TU	IIN NUTS (1/2	DIA OF DO	3/4-14 NPT	230 to 252			
111	III INO 13 (1/2	Z DIA. OF BU	1-11-1/2 NPT	315 to 347			

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