TM 5-3810-289-34 CRANE-SHOVEL, CRAWLER MOUNTED; 12 ½ TON-1970

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

Direct Support And General Support Maintenance Manual CRANE-SHOVEL CRAWLER MOUNTED; 12 ½ -TON, ¾ -CU YD; DIESEL ENGINE DRIVEN (BUCYRUS-ERIE MODEL 22BM) FSN 3810-869-3092

HEADQUARTERS, DEPARTMENT OF THE ARMY
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HEADQUARTERS
DEPARTMENT OF THE ARMY
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DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

CRANE-SHOVEL, CRAWLER MOUNTED; 12 ½ -TON, ¾ CU. YD; DIESEL ENGINE DRIVEN (BUCVRUS-ERIE MODEL 22 BM) FSN 3810-869-3092

***This manual supersedes the direct support, general support and depot maintenance portions of TM 5-3810-289-15, 3 July 1968.**

LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains instructions for use by direct and general support maintenance personnel maintaining the Bucyrus Erie Model 22-BM Crane-Shovel. It provides information on maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

b. Numbers in parentheses following nomenclature callouts on illustrations indicate quantity; numbers preceding callouts indicate preferred sequence.

1-2. Maintenance Forms and Records

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

1-3. Report of Equipment Publication Improvements

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

1-4. Description

Refer to TM 5-3810-289-12 for complete description of the Model 22-BM Crane-Shovel.

1-5. Differences Between Models

This manual covers only the Model 22-BM Crane Shovel. No known unit differences exist for the model covered by this manual.

1-6. Tabulated Data

a. Crane-Shovel.

Manufacturer	Bucyrus-F Erie Co.
Model	22-BM
Type	Crawler mounted
Serial numbers	129566-129742
	129905-130081
	131944--131963
	132052-132151

b. Engine.

Manufacturer	Cummins
Model	JN-6-1
Number of cylinders	4
Type of engine	Diesel
Cycle	4
Unit	Fan to fly wheel
Bore (in.)	4-1/in
Stroke (in.)	5 in.
Displacement (ea .in)	401
Compression ratio	16.3:1
Type drive	Mechanical
Type air intake	Naturally aspirated
Altitude-range (ft)	0-5000 + 107 F.
Rotation	Counter-clockwise
Cooling	Liquid
Fuel	fuel oil
Exhaust valve opens	62 BRC
Exhaust valve closes	44 ATC
Intake valve, opens	44 BTC
Intakes valve closes	40 ABC

(1) Governor.

Make	Cummins
Type	Mechanical variable-speed

(2) Fuel Injector.

Make	Cummins
Model	PT

(3) Fuel pump.

Make	Cummins
Model	G

c. Capacities

(1) Engine.

Crankcase	16 quarts
Oil filter	4 quarts
Fuel tank	50 gallons
Fuel filter	3 quarts
Coolant system	7 gallons

(2) Crane-shovel.

Transmission gear case	3 quarts
Machinery gear case	8 quarts
Propel gear case	2 quarts

CHAPTER 2
DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIRS PARTS, SPECIAL TOOLS, AND EQUIPMENT

2-1. Tools and Equipment
Tools and equipment required to perform direct support and general support maintenance on the Crane-Shovel are listed in table 2-1. References to graphs and illustrations indicating the use of tools and equipment are listed in the table.

2-2. Special Tools and Equipment
Table 2-1 lists special tools and equipment required for direct support and general support maintenance on the crane-shovel.

2-3. Maintenance Repair Parts
Maintenance repair parts are listed and illustrated in TM 5-3810-289-35P.

Table 2-1. Special tools and equipment

Item	FSN or part No.	Paragraph reference	Use
Leakage tester	ST-990	3-13	Check injector cup for leaks.
Liner puller	ST-777 51203645416	3-48	Pull cylinder liners from block.
Camshaft bushing mandrel	ST-783 67342	3-45	Replace camshaft bushing.
Pulley assembly tool	ST-386	3-22	Assemble pulley.
Mandrel	ST430	3-2	Tachometer drive assembly installation.
Puller	ST-709	3-5	Governor weight shaft removal.
Liner bore tool	ST-676 51330728366	3-45	Resurface cylinder liner counterbore.
Adapter plate	ST-679	3-45	Used with cylinder liner counterbore tool.
Mandrel set block	ST491 34609991210	3-29	Replace rocker liner bushings.
Guide spacer	ST-707	3-47	Press in new solid guides in lead.
Belt tension gage	ST-968	3-36	Check belt tension.
Standard puller	ST-647	3-23	Remove accessory drive pulley.
Grinding machine	ST-685 Model-SG	3-46	Grind valve seats.
Seal driver	ST480	3-44	Install crankshaft oil seal.
Regrooving tool	ST483	3-43	Regroove top ring groove on piston.
Hold-down adapter	ST-1010	3-28	Hold-down injector sleeve for repair.
Plug gage	ST-504	3-43	Check piston pin bushing diameter.
Oil assembly tool	ST419 51208968097	3-6	Assemble drive cover on fuel pump.
Packing tool assembly	ST422	3-2	Install O-ring on throttle shaft of fuel pump.
Valve spring compressor	ST448 51209813114	3-28	Remove valves and springs from cylinder head.
Seat cutter pilot	ST-843	3-14	Guide seat cutter in drill press.
Grooving tool	ST-913 49109991499	3-28	Regroove cylinder head.
Holding tool	ST-923	3-28	Hold injector sleeve while testing for cracks.
Cup wrench	ST-934		Remove injector cup.
Guide puller	ST-667 51209813110	3-46	Remove valve cross-head guides.
Grooving tool	ST-597	3-28	Regroove cylinder head
Holding tool	ST-383 51207664758	3-28	Hold injector sleeve while testing for cracks.
Drill ream fixture	ST406	3-34	Ream dowel holes in flywheel housing.
Checking bar	ST409	3-45	(heck bore alignment.
Main bearing bore reamer	ST401 51209991266	3-45	Ream out main bearing bore.

Table 2-1. Continued

Item	FSN or part No.	Paragraph reference	Use
Valve tester	ST-417 49108980645		Check valves and seats for leakage.
Reamer driver	ST-219	3-45	Hard driver to turn main bearing bore reamer.
Valve seat insert kit	ST-257 51803453708	3-46	Hold and drive cutter when removing insert.
Sleeve expander	ST-297 51207664756	3-14	Seal upper portion of injector sleeve.
Ball joint vise	ST-302		Holds fuel pump for disassembly.
Injector seat cutter	ST-379 51207664757	3-14	Cut injector seat to give proper seat and tip protrusion.
Valve guide driver	ST-740	3-31	Install valve guides.
Cutter	ST-S25	3-14	Cut injector sleeve.
Piston ring compressor	ST-755	3-43	Install piston into skirt end of liner.
Chamfering tool	ST-861 49109991498	3-43	Chamfer tapered piston pin bushing bore.
Flange puller	ST-887	3-38	Pull crankshaft hub.
Wrench adapter	ST-669 M 1302A	3-47	Adapts torque wrench to locknuts of valve crossheads.
Spot facing tool	ST-542 51207664754	3-13	Repair inlet and drain connection surfaces of injector body.
Pump mounting plate	ST-546	3-2	Hold fuel pump for disassembly.
Gage block	ST-547 51206907949	3-45	Measure block counterbore depth.
Seal tool assembly	ST-558	3-42	Guides rear cover and seal into position.
Wear gage	ST-560 51209991209	3-43	Check ring groove wear.
Valve facing machine	ST684 Model-VS	3-31	Grind valves.
Lifting fixture	ST-756	3-28	Lift engine for mounting.
Sleeve rolling tool	ST-819 5130777529	3-14	Seal injector sleeve in lower seating area.
Packing tool assembly	ST-835 49109991505	3-2	Install preformed packing on throttle shaft of fuel pump.
Bead cutting tool	ST-839	3-14	Machine bead in sleeve seat area of bead.
Locating mandrel	ST-562	3-13	Measure connecting rod alinement.
Holding fixture	ST-569 51203645417	3-13	Hold fuel injector for repair.
Checking fixture	ST-570 51206907950	3-13	Check inject plunger seating for leaks
Holding fixture	ST-583 49207119307	3-28	Hold cylinder head for disassembly.
Cylinder liner driver	ST-594 51209991206	3-48	Cylinder liner installation.
Ring expander	ST-760 P407-R	3-43	Expands piston ring for installation.
Boring machine	ST-0526 PM 9000D	3-43	Bore out new piston ring for installation
Plate puller	ST-77S8	3-48	Used with cylinder liner puller.
Checking fixture	ST-561 49109777507	3-43	Check rod alinement.
Camshaft bushing driver.	ST-782 51209 39664	3-45	Replace camshaft bushing.
Mandrel and block	ST-605	3-43	Replace piston pin bushing.

Section II. TROUBLESHOOTING

2-4. General

This section provides information for diagnosing and correcting unsatisfactory operation or failure of the crane-shovel and its components.

2-5. Troubleshooting Chart

In chart 2-1, each malfunction listed is followed by probable causes of the trouble. The corrective action required is described opposite the probable cause.

Chart 2-1. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Engine fails to start.	a. Injectors clogged b. Defective fuel pump	a. Replace injector (para 3-13) b. Replace fuel pump (para 3-2)
2. Irregular firing of engine	a. Injectors defective b. Piston rings worn	a. Replace injector (para 3-13) b. Replace piston rings (para 3-43)
3. Engine smokes.	a.. Injector defective b. Piston rings worn	a. Replace injector (para 3-13) b. Replace piston ring (para 3-43)
4. Engine knocks excessively	a. Injectors defective b. Main bearings c. Connecting rod bearings	a. Replace injectors (para 3-13) b. Replace plain hearings (para 3-44) c. Replace connecting rod hearing- (para 3-43)
5. Low or no lubricating oil pressure indication.	a. Loose bearings b. Oil pump gear worn	a. Replace bearings (para 3-37) b. Replace gears (para 3-37)
6. Starter will not crank engine.	Armature burned out.	Replace armature.
7. Alternator not charging.	Alternator inoperative.	Repair or replace alternate (para 3-1)
8. Alternator output low or unsteady.	Open or shorted silicon rectifier.	Replace rectifier (para 3-1)
9. Batteries will not hold charge.	Alternator regulator not operating properly.	Refer to para 3-1.

Section III. GENERAL MAINTENANCE INSTRUCTIONS

2-6. General

This section contains general reference data and instructions for use by direct and general support maintenance as authorized by the maintenance allocation chart. It provides dimensions, tolerances, wear limits, torque data, and miscellaneous information required for maintenance of the crane-shovel.

2-7. Reference Data

a. Table 2-2 provides the following reference data:

(1) Engine dimensions, tolerances, and wear limits.

(2) Crane dimensions, tolerances, and wear limits.

(3) Specific engine torque data.

(4) General engine torque data.

(5) Miscellaneous data.

(6) Shovel dimensions, tolerances, and wear limits.

b. Paragraph 2-8 contains general maintenance instructions for the crane-shovel upper and lower works gears and bearings.

2-8. Maintenance of Gears and Bearings

a. General. Every power transmitting part on the crane-shovel revolving frame that is used in the work cycle is mounted on anti-friction bearings. This includes shafts and parts turning on shafts. Anti-friction bearings maintain concentricity, resulting in longer service life and lower maintenance.

Note. While the following instructions show ball bearings, the same procedure will apply to roller bearings.

b. Bearing Removal.

(1) An arbor press is one of the best demounting tools and should be used wherever it is adaptable. Rest the bearing inner ring or both rings (never the outer ring only) against a pair of flat blocks of the same size and using a firm, stead pressure, force the shaft out.

(2) Keep the shaft straight to avoid drainage from cocking.

(3) Where press is not adaptable, use a puller of a type which can be inserted behind the bearing inner race. Be sure that the jaws are set so that they will not slip over the inner race when pressure is applied. Exert an even pressure and pull straight.

(4) In cases where gears or other removable parts do not allow the puller to contact the bearing directly, use the puller on the parts directly back of the bearing.

(5) The use of a hammer is to be avoided unless other methods cannot be employed. Split sections of pipe or tubing, with welded lugs, can be used for shafts of various sizes. Alternating blows on opposite sides will prevent serious cocking. Be careful that pipe is free of chips that would be shaken into the bearing. In removing a bearing by pounding, care must be observed not to hit or scrape locknut threads on the shaft.

(6) Cover bearings with cloth or paper as soon as they are removed.

Caution: Do not spin bearings before they are clean. If bearings are spun, dirt can cause scratch marks which may later lead to spilling.

c. Bearing Cleaning

(1) Place bearings in a wire basket, so there is plenty of space for-cleaner to reach all parts and

immerse in a solvent. Tank should have a screened false bottom to prevent settings from being stirred up into the bearings. Agitate basket frequently until grease, oil or sludge is thoroughly loosened and can be flushed out.

(2) Bearings that contain especially heavy carbon deposits or hardened grease should be put in a basket by themselves and soaked in a separate container or solvent.

(3) Using a spray gun with air filter and a clean solvent, flush each bearing until all dirt or residue is removed. Turn one of the races slowly while flushing to help dislodge dirt from around balls and separator sockets.

(4) With dry, filtered air, blow solvent out of bearings, being careful not to spin by force of air Since dry bearings rust quickly, lubricate them at once.

(5) Dip bearings in clean light spindle oil. Rotate them a few times and after draining the excess oil place them in a covered container for inspection.

d. Bearing Inspection. Discard bearings which show any of the following:

(1) Rusted balls or raceways. Usually caused by water passing worn or defective seals or by condensation inside housing.

(2) Fractured ring. Forcing a cocked bearing on or off a shaft will do this, as will too heavy a press fit.

(3) Worn, galled or abraded surfaces. Can be caused by too loose a fit, or bearing locked by dirt and turning on shaft or in housing.

(4) Broken or bent shields, seals or separator Usually caused by improper uses of tools during mounting or removal.

(5) Badly discolored balls and races. Usually due to inadequate supply of lubricant. Moderate discoloration of balls and ball track is not a cause of discard.

(6) General feeling of roughness which remains unchanged by thorough cleaning, indicating damage to raceways or balls, such as indenting by dirt or pitting by corrosion.

(7) Catchy or rough feeling at one or more points which repeated flushing will not remove and which may be a spalled or fatigued spot. Thorough flushing is necessary to be sure it is not caused by dirt.

(8) Excessive looseness or end play, indicating lapping by dirt of abrasive in lubricant. If in doubt, check against endplay feel of identical new bearing. Races and balls are dull gray when lapped by dirt.

(9) Any looseness or endplay which can be detected by hand feel is a cause for rejection only in the case of double row angular contact bearings.

e. Bearing Mounting.

(1) An arbor press is the most satisfactory tool for mounting bearings. Used properly, no Slows are struck and there is no danger of loosening shields or seals from this cause.

(2) Place the bearing on two flat blocks of equal size so that they contact the inner ring of the. bearing. Then press shaft straight until the bearing is seated solidly against the shaft shoulder. Be sure that the blocks do not scrape or damage the threads if the shaft is threaded for a bearing locknut.

(3) Use of blocks that contact both rings is also good practice, provided the blocks are flat and the faces parallel.

(4) Where the distance from shaft end to bearing seat is short, a piece of pipe or tubing may be used. The pipe must be clean inside and out and the ends squared.

(5) In cases where a press is not available a piece of tubing may be used with a hammer. A plug in the tubing and a shield outside help to prevent jarring dirt into bearing. The hammer should be applied alternately at opposite points to avoid cocking and particular care should be taken when' the bearing is started.

f. Gear Inspection and Repair.

(1) Clean gear with an approved cleaning solvent being particularly careful to clean out between gear teeth, and dry thoroughly. Inspect gear for cracks or breaks. Inspect key ways in gear hub. Be sure they are clean and open and in good condition. Check gear for warpage and if it is out of true more than the tolerance given in table 2-2 replace the gear. Inspect teeth for wear and if worn in excess of the tolerance given, replace the gear. Check teeth for any broken or nubbed teeth and also for other irregularities.

(2) Repair cracks or other defects in the gear by welding and grinding. If a considerable amount of welding is done on one side of the gear, check before reinstalling.

Table 2-2. Reference Data

Component points of measurement	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
a. Cylinder Block					
Installed Camshaft	1.8745	1.8765			
Bushing Inside Diameter					1.8780
Camshaft Bushing Bore					
In Block No. 2-7	2.0035	2.0045			2.0055
No. I Bore for Thrust Plate	2.1245	2.1255			2.1265
Cylinder Liner Counterbore					
Inside Diameter	4.874	4.876			
Oversize Flange Linen	4.894	4.896			
Cylinder Liner Counterbore					
Depth	0.3092	0.3105			0.4023
Idler Gear Shaft	1.4975	1.4985			1.4995
Cylinder Block Height					
From Main Bearing Bore	15.122	15.124			15.114
From Top of Alinement Bar	13.0600	13.0615			13.0500
Cylinder Liner Counterbore Pt No.43782-A	0.0063	0.0077			
Shims Pt. No. 437824	0.0072	0.0088			
Pt. No. 43782-C	0.0081	0.0099			
Pt. No. 114552	0.018	0.022			
Pt. No. 114523	0.028	0.034			
Pt. No. 124455	0.056	0.068			
Pt. No. 124569	0.093				
Cylinder Liner Protrusion	0.004	0.006			
Liner-to-Block Clearance	Liner may contact block if it does not force liner out of round				
Liner Bore					
Diametrical	0.005	0.009			
Lower Liner Bore:					
Inside Diameter	4.619	4.21			
Main Bearing Bore	4.1240	4.1250			4.1255
Tappet Bore in Block:					
Injector	1.3120	1.3130			1.3145
Valve	1.1870	1.1880			1.1895
Main Bearing Cap Fit In Block	0. 4.002	4.004			0.001
b. Cylinder Liner.					
Cylinder Liner (ID)—Cast Iron	4.1250	4.1260			4.1300
Cylinder Liner Protrusion	0.004	0.006			
c. Idler Gear.					
Idler Gear Bushing (ID)	2.125	2.126			2.127
Gear Hub Bushing (ID.)	1.500	1.501			1.502
Idler Gear Hub	2.1225	2.1235			2.1215
Idler Thrust Washers					
Part Nos.:					
68631 .	0.096	0.106			0.091
68632	0.061	0.063			0.059
68633-1	0.192	0.194			0.190
d. Bearings.					
Standard Bearing Shell Thickness					
Main Bearing	0.1231	0.1236			0.1216
Connecting Rod	0.0722	0.0727			0.0710
Journal Oil Clearance					
Main	0.0018	0.0048			0.0068
Connecting Rod		0.0020	0.0045		0.0080
Crankshaft Thrust Bearings--					
Part No. 150310	0.151	0.153			
Crankshaft End Clearance	004	0.015			0.022
Vibration Dampers:					
Eccentricity and Wobble		0.030			0.030

Table 2-2. Reference Data-Continued

Component points of measurement	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Connecting Rod Dimensions:					
Crank pin Bore	2.7725	2.7730			
Out of Round					0.0015
Piston Pin Bushing	1.5000	1.5005			1.5015
Connecting Rod Twist:					
Without Bushing					0.020
With Bushing					0.010
Connecting Rod Length	9.498	9.500			
Bore Misalinement					0.001
Piston and Piston Rings:					
Piston Ring Gap (new or reconditioned liner)					
Pt. No. 68788	0.013	0.023			
Pt. No. 109410	0.013	0.023			
Pt. No. 144980	0.013	0.023			
Pt. No. 126480	0.013	0.025			
Pt. No. 146140	0.015	0.055			
Standard Piston Skirt Diameter (700 F)					
130360, 130500, 11738, 144840, 149200,					
168430, compression ratio					
16.3:1 Gage Point BC	4.1180	4.1190			4.1150
Piston Pin Bore	1.4988	1.4990			1.5000
Piston Pin Diameter	1.4988	1.4990			1.4978
Pistons and Rings Oversize	0.020	0.030			0.040
e. Camshaft.					
Camshaft Journal Diameter:					
No. 1 Journal only	1.747	1.748			1.746
All Other Journals	1.872	1.873			1.871
Camshaft Lobe Lift					
f. Injection Spec BTC 64°, A r 19°. Valve Overlap 880.					
Exhaust Opens BBC 620. Intake Opens BTC 440°.					
Exhaust Closes ATC 440°. Intake closes ABC 400.					
Valve Lobe Lift 0.251 in.					
Injection Lobe Lift 0.112 in.					
g. Gear Cover.					
Accessory Drive Bushing I.D.:					
139810 Std	1.314	1.319			1.3205
139811 0.010 in	1.304	1.309			1.3105
139812 0.020 in	1.294	1.299			1.3005
h. Cylinder Head.					
Crosshead Guide Dimensions:					
Solid type (OD.)	0.3750	0.3755			0.3740
Head Height	5.000	5.010			4.970
i. Valve Seats and Insert					
Valve Seat Insert Run-Out		0.002			
Oversize Diameter Std. Depth Std. Insert O.D.					
1.4300/11.4305. Cylinder Head I.D. 1.427/1.428.					
Insert Thickness 0.156/0.161.					
I. Valve Crossheads.					
Crosshead Dimensions:					
Solid Stem	0.3708	0.3713			0.370
k. Valves, Guides and Springs.					
Valves Stem Dimensions:					
Four-valve Head	0.3400	0.3410			0.3390
Valve Guide I.D.:					
Four-valve Head	0.3425	0.3432			0.3442
Valve Guide Protrusion:					
Four-valve Head	1.240	1.260			

Table 2-2. Reference Data-Continued

Component points of measurement	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Valve Spring Data					
Free Length is 2.364. Pounds Force Required to Compress 105 Lbs. 50 117 Lbs. No. of Coils 91/2. Wire Diameter 0.148. Length 1.610.					
1. Rocker Levers and Cover.					
Rocker Lever Bushing (I.D.)	1.1245	1.1275			1.1285
Rocker Lever Shaft (O.D.)	1.1230	1.1235			1.1220
m. Push Tubes					
Valve Push Tube:					
Ball End	0.624	0.625			
Socket End (Spherical I.D.)	.0.4995	0.5005			
Injector Push Tube					
Ball End	0.685	0.687			
Socket End (Spherical I.D.)	0.4995	0.5005			
n. Tappets.					
Injector Tappet Assembly:					
Body (O.D.)	1.3100	1.3110			1.3090
Roller (O.D.)	1.1230	1.1250			1.1210
Roller (I.D.)	0.5655	0.5665			0.5675
Roller Pin (O.D.)	0.5620	0.5626			0.5610
Roller, Side Clearance	0.0050	0.0170			0.0220
Roller Concentricity Assembled		0.0005			
Roller Squareness Assembled		0.0010			
Valve Tappet Assembly:					
Body (O.D.)	1.1850	1.1860			1.1840
Roller (O.D.)	1.0610	1.0630			1.0590
Roller (I.D.)	0.5030	0.5040			0.5050
Roller Pin (O.D.)	0.4995	0.5000			0.4985
Roller Side Clearance	0.0080	0.0220			0.0270
Roller Concentricity Assembled		0.0010			
Roller Squareness Assembled .		0.0010			
o. Lubricating Oil Pump.					
Lubricating Oil Pump Dimensions:					
Idler and Drive Shaft Bushing (I.D.)	0.6165	0.6175			0.6185
Idler and Drive Shaft (O.D.)	0.6150	0.6155			0.6140
Idler Gear Bushings (I.D.)	0.9925	0.9935			0.9945
Idler Gear Shaft (O.D.)	0.9900	0.9910			0.9890
Idler and Driven Gear (O.D.)	1.8320	1.8330			1.8310
Gear Pockets (Minor I.D.).	1.8400	1.8420			1.8430
Gear Pocket Depth	1.6230	1.6250			1.8430
Balance Drive Shaft		0.8095			0.8105
Balance Drive Shaft Bushing	0.8145	0.8150			0.8170
Idler Gear Thrust Washer	0.0610	0.0630			
Balance, Drive Gear Thrust Washer	0.600	0.620			
Lube Pump Drive Shaft Bushing	0.6165	0.6175			0.6185
p. Pressure Regulator.					
Pressure Regulator Dimensions:					
Low Pressure (I.D.)	0.621	0.626			0.627
Low Pressure (O.D.)	0.740	0.741			0.739
High Pressure (Large Outside)	0.740	0.741			0.739
High Pressure (Small Outside)	0.615	0.617			0.614
Housing Bore	0.740	0.741			0.739
Spring Load @ 2.055 in	16.4 lb.	18.01 lb.			14.0 lb.