



## MARINE DIESEL ENGINE

MODELS: 4D242; 4D254; 6D363; 6D363TC; 6D380

# OPERATORS MANUAL AND PARTS IDENTIFICATION

### Lehman Power Corporation

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PRICE **15.00**

This manual is divided into sections as follows:

SECTION 1 - Page Nos. 1/up - General data, specifications, installation, adjustments, maintenance, etc. See index below.

SECTION A - Page Nos. A1/up - Parts identification of Ford base engines. See index on page A-1.

SECTION B - Page Nos. B1/up - Parts identification of Lehman marinizing parts. See index page B-1.

In order to provide a simple method of identification, all models included herein have been assigned a "code" letter as follows:

ENGINE CODE	CU/IN	No.CYLS.	YEARS	IDENTIFICATION
E	242	4	2/65-11/69	With cylinder liners
F	363	6	2/65-11/69	With cylinder liners
G	254	4	12/69-up	Less cylinder liners
H	380	6	12/69-up	Less cylinder liners
I	363	6	7/68-up	Turbocharged

### INSTRUCTIONS FOR ORDERING PARTS

Parts listed herein may be ordered through any Lehman Distributor, any Ford Industrial Engine Distributor or directly from the Lehman Power Corporation. Prices will be quoted upon request. In order to prevent errors, please order any required material by exact part number and name of part. Be sure to include engine model, serial number and year of manufacture, if known (see page 7). All orders must be accompanied by a deposit of one-third cost of material unless prior credit has been approved.

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RL BENJAMIN  
360-379-9851

Dear Engine Owner:

Welcome to the growing family of Lehman Power Marine diesel engine users. You'll be happy to know that you have chosen an engine which is heartily endorsed by leading boat builders for its quality, performance, fuel economy and long life. Your engine is simple but highly efficient. Its power, stamina and fuel economy will amaze you — especially if you've previously operated gasoline power.

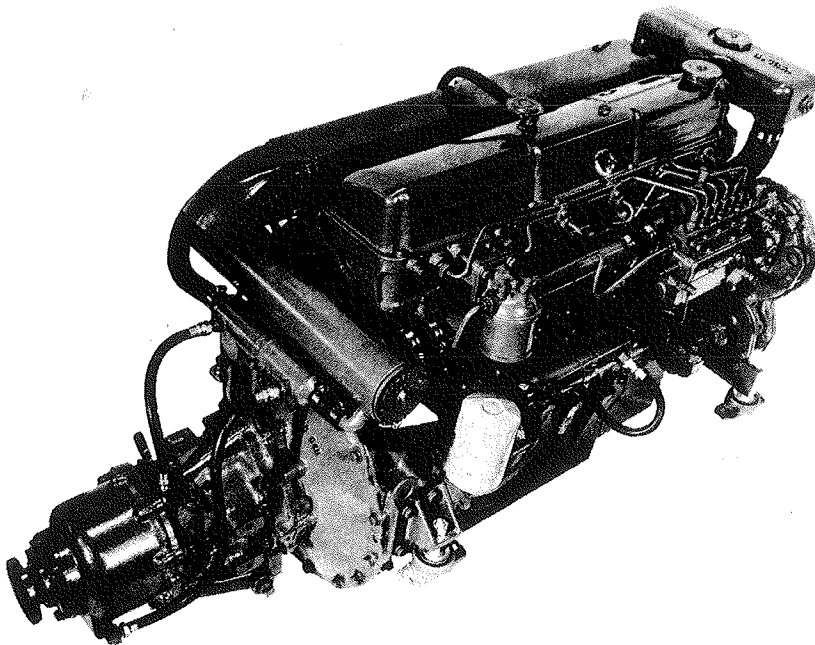
To obtain the best performance and the longest life from any machine, it must be serviced properly and regularly. Filters should be changed, coolant checked, oil changed at specified times, etc. Follow the suggested schedule shown herein — it will add to your boating safety, economy and enjoyment.

Perhaps the most important single recommendation I can make to the new engine owner is "do not tinker"! If the unit is running well — leave it alone! Adjustments and repairs should be performed only by a competent diesel mechanic who has the proper knowledge and tools. Many times we are requested to assist an owner who has attempted his own repairs. Unless you know what you're doing, please "hands off"!

Lehman has a world-wide Service Network of Distributors and Dealers. Get to know your local one through the Lehman Start Up Program and they will be on hand to help you, should you need it.

Finally, always insist on genuine Lehman Parts. There are many examples of good boating days ruined by the use of spurious engine and cooling circuit parts. Always specify Lehman parts. If you have difficulty in obtaining them, please contact Lehman.

With proper care your Lehman Power engine will provide many hours of carefree boating. Thanks for the confidence you have shown in our Company by selecting our equipment. You will not be disappointed.



**'Here's how to operate me...'**

## ENGINE WARRANTY (LIMITED)

*Dear Engine Owner:*

The Lehman Power Corporation is fully aware of the problems which are sometimes encountered in obtaining service for marine powering equipment. We offer the following in an endeavor to provide an understanding of and solve such problems in the quickest and most efficient manner.

It should be recognized that servicing a marine engine cannot be compared to repairs to an automobile engine. In many cases the boat cannot be moved to a repair facility such as towing a car to a garage; breakdowns may occur in remote waters far from competent mechanics and spare parts; the yard or marina at which a disabled boat is berthed may not have qualified mechanics and, of course, marine facilities are far fewer in number than auto repair garages. Facilities and mechanics to service marine engines are usually limited to the immediate area in which boats are moored. The reasonable boat owner cannot expect the same service which may be available to him in case of an emergency auto repair. An impatient boatman may well become frustrated if he attempts to compare available service facilities between the marine and auto industries.

Your Lehman *Econ-O-Power* engine is built using a Ford engine as the "base" unit. Lehman manufactures and provides the "conversion" equipment .... those parts which are needed to adapt the Ford engine to marine use. In many instances, Lehman provides these parts to "engine converters" who assemble them to Ford engines purchased locally. Sometimes Lehman provides only a portion of the complete conversion with the converter supplying the balance of required parts. Lehman may also provide the completed engine which is fitted with the *Econ-O-Power* conversion equipment at the Lehman factory.

But, your base engine is warranted by Ford Motor Company regardless of where or who converted it .... if the conversion is an approved type such as Lehman equipment. Lehman warrants the parts manufactured and supplied by them. Claims for service or parts under warranty should be directed to either your nearest Ford distributor or to the Lehman Power Corporation (or Lehman distributor) depending upon the nature of the complaint. The two applicable warranties and extent of coverage follows.

Be assured we will work with you to the fullest extent in order to service your requirements.

*Lehman Power Corporation*

# FORD MOTOR WARRANTY (LIMITED)

This warranty covers the base engine as provided by Ford - cylinder assembly from rocker arm cover to engine base and from flywheel to front water pump. Starting motor and complete fuel system (including fuel transfer pump, injectors, injection pump, fuel filter, etc.) are included.

Warranty claims should be directed to your nearest Ford Industrial Products Distributor. There are many such distributors throughout the U.S. (Any Ford dealer will advise your nearest contact) and these companies often have dealers in areas which they cannot efficiently service themselves. If in doubt regarding any warranty problem, or if complete satisfaction is not obtained, contact Lehman Power Corporation. The following excerpts are from the standard Ford warranty as applies to marine power applications. But, please note that this summary is not complete and, of course, is subject to change:

"Ford Motor Company warrants that each part of such engine will be free under normal use and service from defects in material and workmanship for a period of one year from the date of delivery to the original retail purchaser. In the event that new Ford base engine assemblies are used in marine power commercial or work boat applications, each part of such engine will be free under normal use and service from defects in material and workmanship for a period of six months from the date of delivery to the original retail purchaser. Ford's obligation is limited to free replacement of, including related labor (other than labor required to remove, replace or gain access to the engine) at a Ford approved location or credit for such parts as shall be returned to Ford with transportation prepaid and as shall be acknowledged by Ford to be defective.

This warranty shall not apply to any Ford engine 1) if it has been subject to misapplication, abuse, misuse, negligence or accident, or 2) if parts not made or supplied by Ford have been used in connection with it if, in the sole judgement of Ford, such use affects its performance, stability, or reliability 3) if it has been altered or repaired outside of a Ford location in a manner which, in the sole judgement of Ford affects its performance, stability or reliability, or 4) if it shows evidence of participation in racing or other competitive activities."


A warranty registration form is provided with your engine. Before placing engine in service, complete all questions and forward all copies, excepting the one marked "owner" to:

Ford Motor Company - Engine & Foundry Division  
Industrial Engine & Turbine Operations  
P.O. Box 1796 Village Plaza  
Dearborn, Michigan 48121

The "Owner" copy should be kept by the engine owner in case it should be required for reference or proof of registration.

To validate the Service Parts Warranty this form must be filled completely by the Vendor/Dealer and distributed as follows:-  
WHITE COPY TO OWNER. BLUE COPY TO SERVICING FORD MOTOR Co.  
YELLOW COPY TO VENDOR/DEALER. PINK COPY TO SELLING FORD MOTOR Co.

### FORD INDUSTRIAL ENGINE REGISTRATION

ENGINE SERIAL No	MODEL/BUILD No	OPTION No	DATE SOLD *
NAME OF OWNER		NAME OF EQUIPMENT VENDOR	
OWNER'S ADDRESS		EQUIPMENT VENDOR'S ADDRESS	
CITY, COUNTY, STATE AND COUNTRY		CITY, COUNTY, STATE AND COUNTRY	
NAME OF ORIGINAL EQUIPMENT MANUFACTURER			
ADDRESS AND COUNTRY			
MFG. No. <b>BOAT</b>	MODEL No. <b>BOAT</b>	SERIAL No. ( <b>BOAT</b> )	
KIND OR TYPE OF EQUIPMENT ENGINE USED ON <b>MARINE</b>			
<input type="checkbox"/> NEW INSTALLATION <input type="checkbox"/> REPLACEMENT		COMPETITIVE ENGINE REPLACED, IF APPLICABLE	
CHECK INDUSTRY APPLICATION OF MANUFACTURER'S EQUIPMENT			
<input type="checkbox"/> AGRICULTURE <input type="checkbox"/> LOGGING	<input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> OIL FIELD	<input checked="" type="checkbox"/> INDUSTRIAL <input checked="" type="checkbox"/> MARINE	<input type="checkbox"/> OTHER
* For Combine Harvesters specify date of first operation			
OWNER MUST KEEP HIS COPY AND PRESENT TO VENDOR/DEALER FOR WARRANTY SERVICE			
IMPORTANT - ALL COPIES MUST BE LEGIBLE			
			

**NAME & ADDRESS OF COMPANY FROM WHICH YOU PURCHASED BOAT OR ENGINE.**

## LEHMAN DIESEL ENGINE WARRANTY (LIMITED)

Complete diesel engines provided by Lehman Power Corporation are fully checked and tested prior to shipment. An occasional defect will become apparent only after the equipment has been placed in service and, in such cases, defective parts will be replaced under the terms of our standard warranty as follows:

"The manufacturer warrants each new assembly or component part manufactured by him to be free from defects in material and workmanship when used by the original purchaser under normal conditions for the purpose and service for which intended.

Under this warranty, such material claimed defective may be returned to the factory not longer than one (1) year after date of purchase. Upon inspection by the manufacturer and verification by him of defects claimed, the manufacturer will at his option repair or replace such material at no charge.

Diesel engines provided by Lehman include a Lehman warranty card which must be completed and mailed prior to or at time of initial engine "start-up" in order to initiate warranty. No claims will be honored unless such registration has been filed.

The manufacturer will not be responsible for time spent, work performed or materials furnished by others without his written authorization."

It is recognized that, in practice, it is often impractical to remove some vital part from the engine and await its delivery to our factory, repair and return to service. Therefor, if a defective part becomes apparent, the user may notify us and a replacement will be forwarded at once. Such replacement part must be paid for at time of delivery. If the part claimed defective is returned to the Lehman Power Corporation within thirty (30) days of receipt of replacement and if defect is confirmed, customer will be issued credit on the purchased part. If found not defective, part will be returned to customer and no credit issued.

A defective Lehman part is our responsibility and we realize that labor charges will be incurred in making required replacement. Lehman will absorb such costs, within the limits shown below, on defective parts removed from engines which have been assembled, tested and provided complete from the Lehman factory for marine installation. Please note that these charges will not be reimbursed on those installations where basic engines or transmissions are provided by others. It is only through assembly and testing and final inspection of the complete engine "package" within our plant that hidden defects may become apparent.

When applicable under above conditions, allowable labor time will be as follows: (Time shown is for removal of defective part, replacement and paint, if required.)

Alternator assembly . . . . .	one half hour
Engine mount (and align engine) . . . .	one hour
Oil cooler (engine or transmission) . . .	one hour
Heat exchanger . . . . .	one hour
Exhaust manifold (4 cyl. model) . . . .	two and one quarter hours
Exhaust manifold (6 cyl. models) . . . .	two and one half hours
Transmission . . . . .	three hours
Expansion tank . . . . .	one half hour

All warranty claims must be accompanied by engine serial number, name of boat manufacturer with model and serial numbers, name and address of owner, date engine placed in service and full history of defect.

### EXCLUSIONS

This warranty shall not apply to:

- a) Failure resulting from improper installation of engine.
- b) Failure resulting from lack of proper maintenance.
- c) Engines used for racing or operated in excess of rated speed.
- d) Cost of removal or reinstallation in a boat.
- e) Engines which may have been operated with improper or contaminated fuel or lubricants.
- f) Engines which are installed in such manner that servicing or parts replacement cannot be normally accomplished.
- g) Any engine which has been altered or adjusted so as to impair its original characteristics.

## MODEL IDENTIFICATION & SERIAL NUMBERS

The model and serial number of your engine is easily located by reference to the following drawing. It will be noted that an identification plate with detailed information is affixed to the flywheel housing (starting May, 1972) at approximately the 2 o'clock position. Serial number is also stamped on a "pad" located at front, right side of engine block (behind water hose). The cubic inch displacement of engine is stamped on similar pad at rear of block, right side.

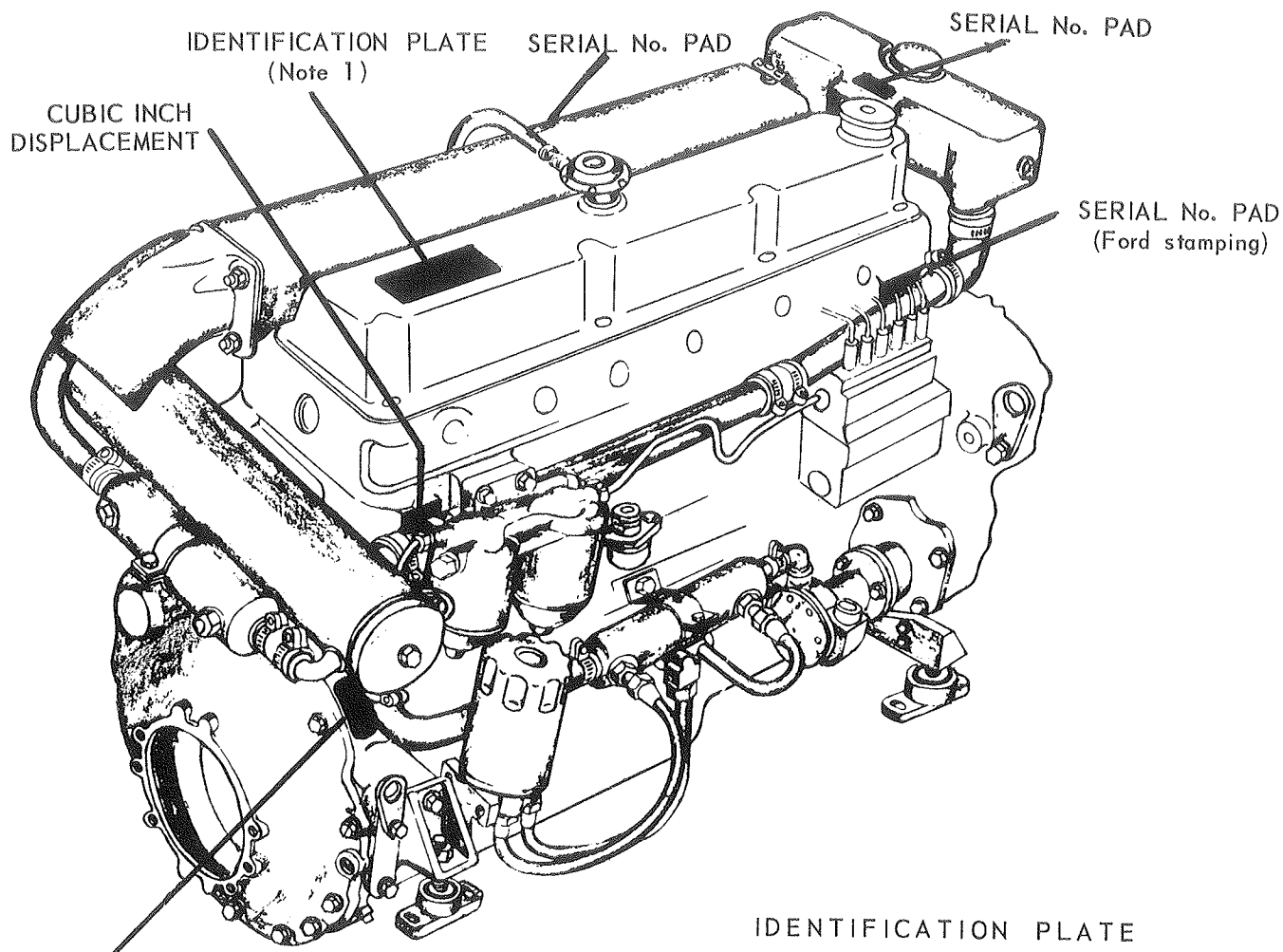


PLATE INDICATES ORIGINAL  
CRANKSHAFT JOURNAL SIZES  
(Note 1)

### IDENTIFICATION PLATE

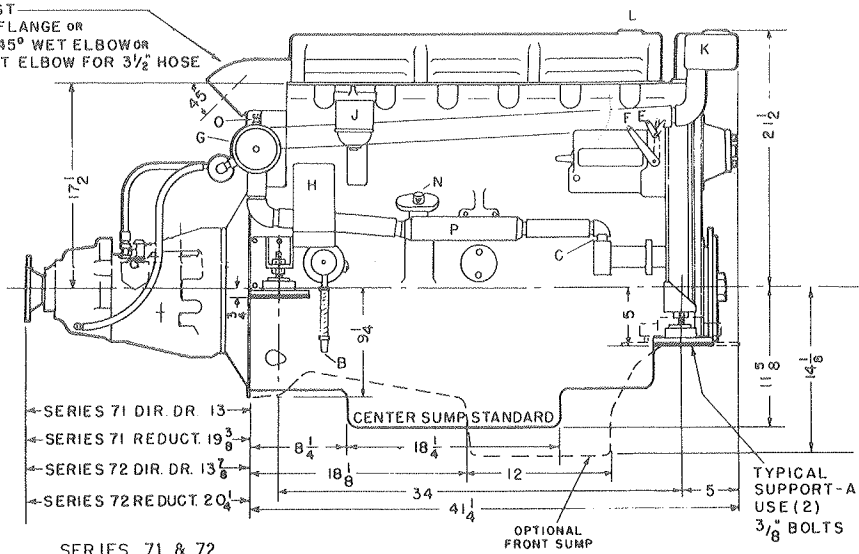
The identification plate affixed to engine rocker arm cover as shown above, provides the following information:

- 1 - Engine model
- 2 - Cubic Inch Displacement
- 3 - (Not Applicable)
- 5 - Complete "build" number coded to indicate factory installed equipment.
- 6 - Injection Pump: A-Governor at Front  
B - Governor at Rear
- 7 - Type of Governor
- 8 - Special Injection Equipment (If provided)
- 9 - General Operating R.P.M.
- 10-Cylinder Head Type
- 11-Engine Block Type
- 12-Special Equipment (If provided)

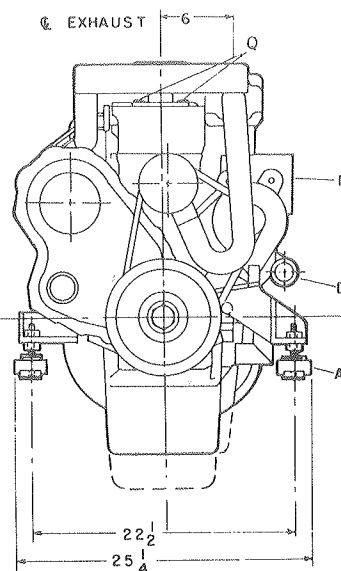
Ford Industrial Power Products										MODEL	
CAPACITY		FUEL SYS.			R.P.M.		H'D		BLOCK		
2	6	7	8	9	10	11					
DATE SER No.				BUILD No.							
3							5				
SPECIAL EQUIPMENT											
12											

Note 1: Prior to mid-1977, identification plate was located on flywheel housing.

EXHAUST  
3" NPT FLANGE OR  
3" NPT 45° WET ELBOW OR  
30° WET ELBOW FOR 3½" HOSE

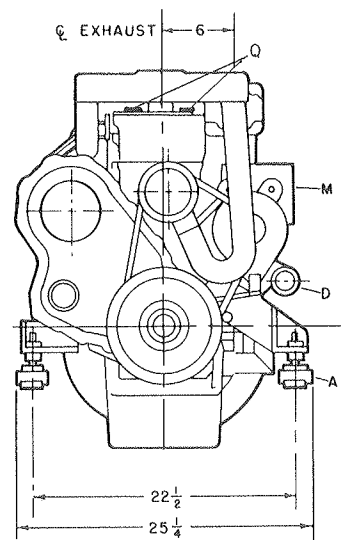
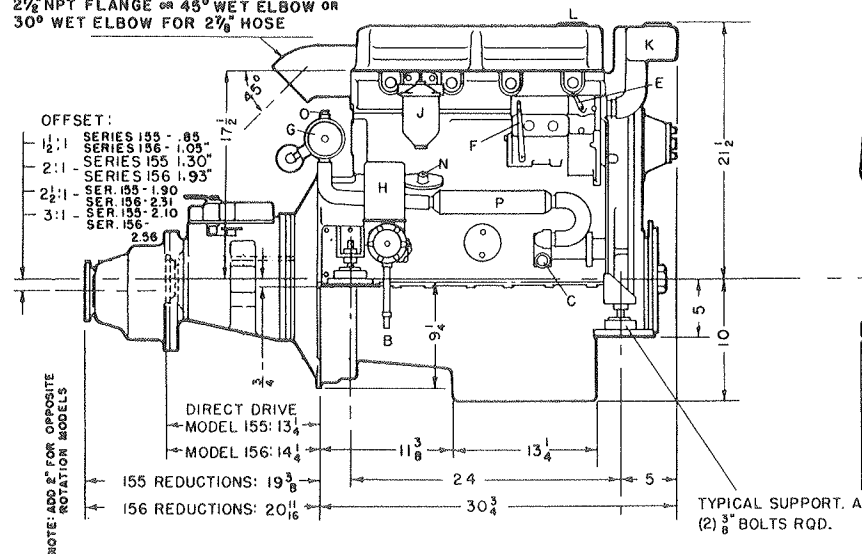


SERIES 71 &amp; 72

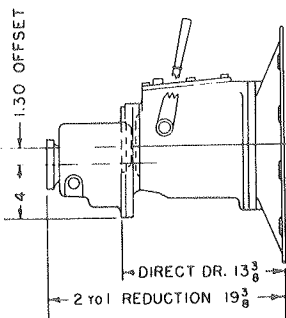


## 6 CYLINDER MODELS

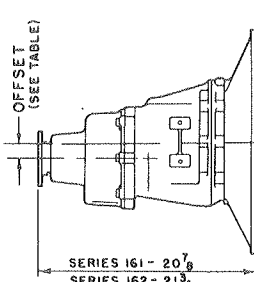
EXHAUST  
2½" NPT FLANGE OR 45° WET ELBOW OR  
30° WET ELBOW FOR 2½" HOSE



## 4 CYLINDER MODELS

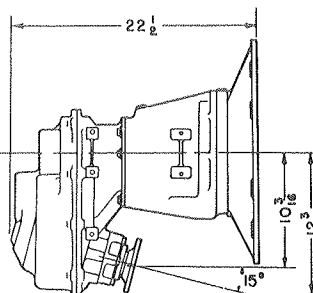


SERIES 144



RATIO	OFFSET
1.58:1	1.15"
2.03:1	1.58"
2.47:1	1.86"
2.93:1	2.07"

SERIES 161 &amp; 162



SERIES 146 &amp; 147

- A - Typical Support (4)
- B - Fuel Inlet 5/16" tube
- C - Raw Water In - 3/4" npt
- D - Starter Solenoid
- E - Engine stop control
- F - Throttle control
- G - Heat Exchanger clean-out
- H - Oil Filter
- J - Fuel Filter
- K - Fresh Water Tank
- L - Oil Fill Cap
- M - Air Filter
- N - Tach. Adaptor, 2:1, CCW
- O - Zinc Pencil
- P - Lube Oil Cooler
- Q - Temp. gage connection

Key to above drawings

## TRANSMISSIONS



## SPECIFICATIONS

G - 254 cu/in. 4 Cyl.

H - 380 cu/in. 6 Cyl.

I - 363 6 Cyl. Turbo.

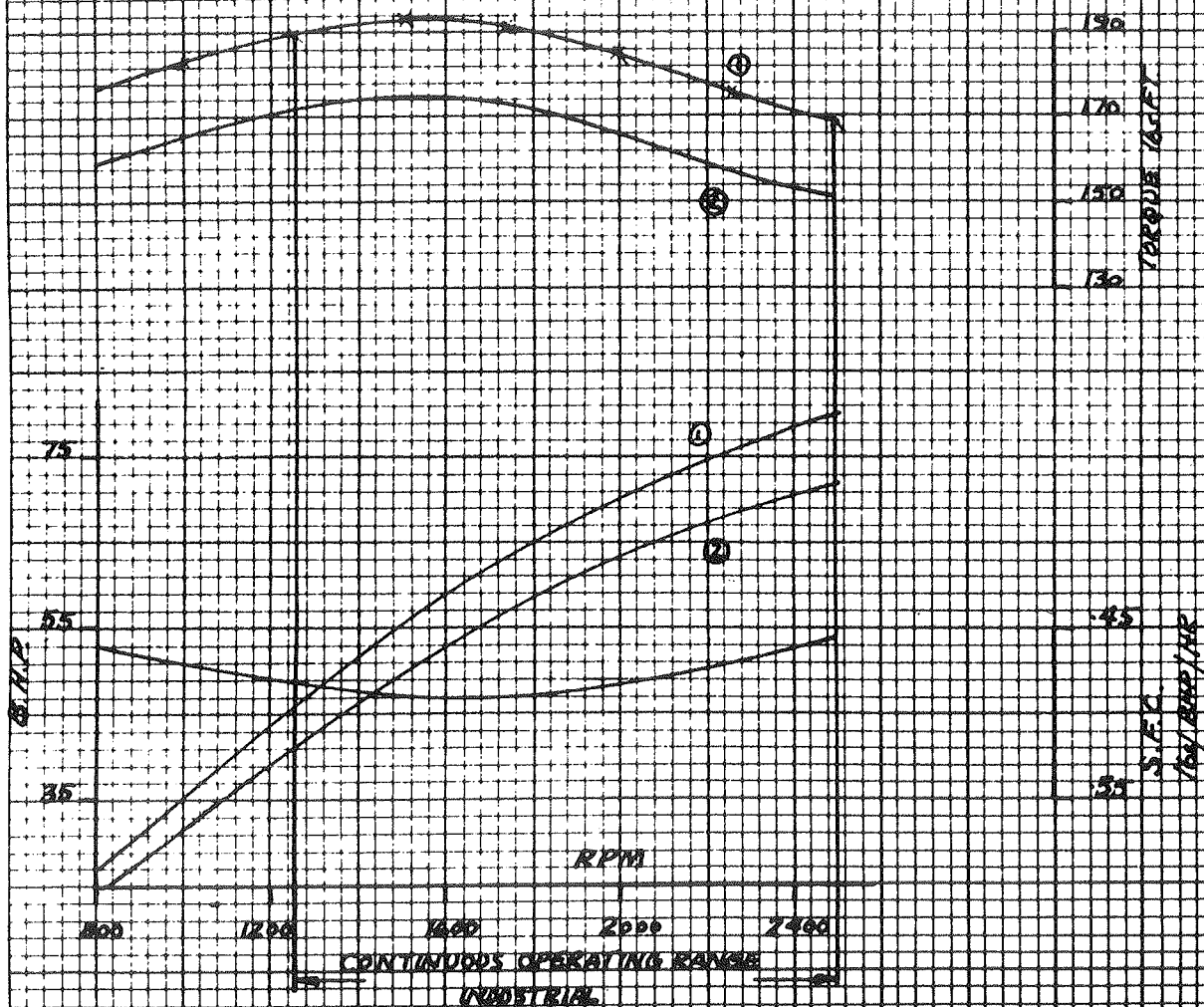
	----- 4 CYCLE, OVERHEAD VALVE, DIRECT INJECTION -----		
TYPE	2712-E	2715-E	2704-ET
MODEL (INDUSTRIAL)	4D254	6D380	6D363T
MODEL (LEHMAN)	4.22 x 4.52"	4.22 x 4.52"	4.125 x 4.52"
BORE x STROKE	254 cu/in. (4150 cc)	380 cu/in. (6220 cc)	363 cu/in. (5950 cc)
CAPACITY	80 at 2500 rpm	120 at 2500 rpm	150 at 2400 rpm
B. H. P. (B. S. Overload)	74.2 at 2500 rpm	114.5 at 2500 rpm	136.5 at 2400 rpm
(Cont. B Din. 6270)	186 ft/lbs at 1600 rpm	280 ft/lbs at 1600 rpm	348 ft/lbs at 1800 rpm
TORQUE (B. S. Overload)	168 ft/lbs at 1600 rpm	252 ft/lbs at 1600 rpm	317 ft/lbs at 1800 rpm
(B. S. Rating)	16 to 1	16 to 1	15.7 to 1
COMPRESSION RATIO	360 lbs. per sq. in. at 215 rpm		
COMPRESSION PRESSURE	1-2-4-3	1-5-3-6-2-4	1-5-3-6-2-4
FIRING ORDER	* 15°	C.C.W. facing flywheel	* 15°
CRANKSHAFT ROTATION	2650 rpm	2650 rpm	2500 rpm
MAX. INSTALLATION ANGLE	2500 rpm	2500 rpm	2400 rpm
GOVERNED SPEED (Max) NO LOAD		600 - 700 rpm	
UNDER LOAD			
IDLING SPEED	2 1/2" NPT	3" NPT	4" I.D. Hose
EXHAUST SIZE	1 1/2 lb/sq.in. (3.0" Mercury)		.491 lb/sq.in. (1.0" Hg)
EXHAUST BACK PRESSURE (Max)	Excess fuel device	Excess fuel device	Glow plug
COLD START	No. 2 Diesel	No. 2 Diesel	No. 2 Diesel
FUEL		Free turn type	
VALVES	Int. .015; Exh. .012"	Int. .015"; Exh. .012"	Int. .018"; Exh. .018"
VALVE CLEARANCE (hot)		Aluminum alloy, tin plated	
PISTONS		Machined in piston crown	
COMBUSTION CHAMBER		3 Compression; 1 Oil control	
PISTON RINGS		Cast iron alloy; Gear driven	
CAMSHAFT		Steel forging	
CRANKSHAFT	5	7	7
MAIN BEARINGS			
LUBE SYSTEM:			
OIL CAPACITY (level, w/filter)	8 qts.	12 qts.	12 qts.
NORMAL OIL PRESSURE	30 lbs/sq. in. at 1600 rpm; 35 lbs/sq. in. at 2000 rpm		
OIL TEMPERATURE (range)	165 - 220°		
LUBRICANT			
Above 90° f			
20 to 90° f			
Below 30° f			
OIL FILTER			
OIL COOLER			
FUEL INJECTION PUMP			
GOVERNOR			
TIMING			
LUBRICANT			
OIL CAPACITY			
INJECTORS			
OPENING PRESSURE			
FUEL LIFT PUMP			
COOLING SYSTEM			
CAPACITY, WATER			
OPERATING TEMP.			
OPTIMUM TEMP.			
CIRCULATION			
ELECTRICAL SYSTEM			
ALTERNATOR			
SUGGESTED BATTERY			
STARTING MOTOR			
VOLTS			
LOCK TORQUE			
RUNNING TORQUE			
HEAT EXCHANGER			
RAW WATER PUMP			
MANIFOLD, EXHAUST			
MANIFOLD, INTAKE			
AIR FILTER ELEMENT			
ENGINE MOUNTINGS			
FUEL LINE			
TACHOMETER ADAPTOR			
FAN BELT TENSION			
WEIGHTS:			
ENGINE (Less transmission)	874 lbs.	1092 lbs.	1120 lbs.
BLOCK ONLY	230 lbs.	340 lbs.	360 lbs.
HEAD with VALVES	82 lbs.	120 lbs.	120 lbs.
FLYWHEEL	87 lbs.	87 lbs.	87 lbs.

\* 15° with standard sump. 18° with front well type sump.

## 4 CYLINDER, 254 Cu./In., LEHMAN MODEL 4D254

*Ford Motor Company, Ltd.*

## OFFICIAL ENGINE PERFORMANCE CURVES

ENGINE MODEL **2712E DIESEL ENGINE**DATE **28-MAY-70**NO. OF CYLS **4**BORE **4.22 INS.**STROKE **4.524 INS.**DISPLACEMENT **254 CU. INS.**COMPRESSION RATIO: **16.0:1**CORRECTED TO **① + ② BS. 649**① **BS OVERLOAD** - MAX BHP **85.0 @ 2800 RPM** - MAX TORQUE **194 Lb.FT @ 1600 RPM**② **BS RATING** - MAX BHP **72.0 @ 2500 RPM** - MAX TORQUE **175 Lb.FT @ 1400 RPM**

## CONDITIONS OF TEST

DEDUCTIONS FOR A 4 BLADE 18" DIA FAN

ENGINE RPM	1500	1800	2000	2500
H P DEDUCTIONS	1.5	2.5	3.5	7.0

ENGINE & TRANSMISSION  
ENGINEERING

APPROVED

DATE

5. June 70

6 CYLINDER, 380 Cu./In., LEHMAN MODEL 6D380

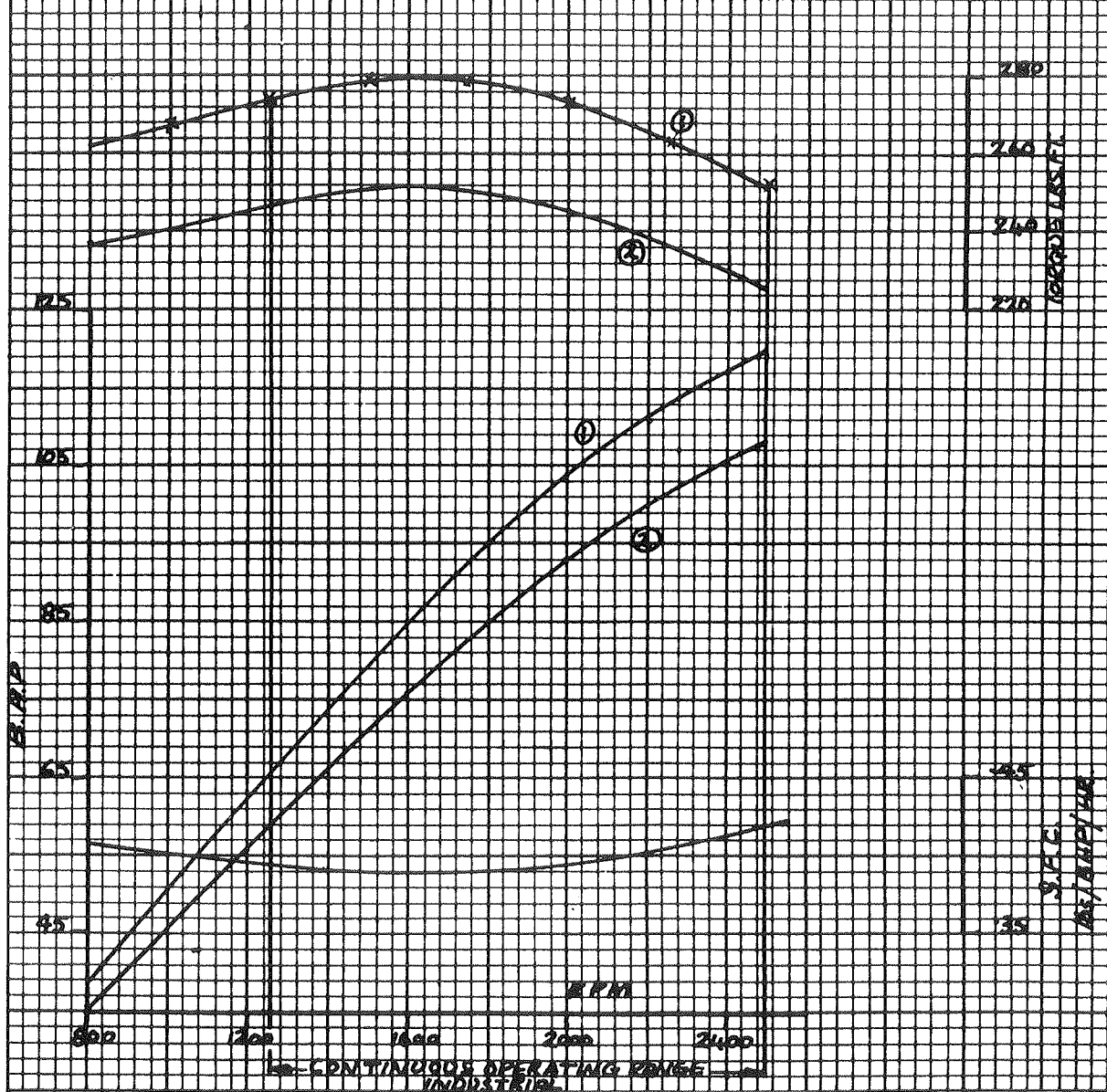
*Ford Motor Company, Ltd.*

OFFICIAL ENGINE PERFORMANCE CURVES

ENGINE MODEL **2715E DIESEL ENGINE** DATE **28-MAY-70**

NO. OF CYLS **6** BORE **4.22 INS.** STROKE **4.524 INS.** DISPLACEMENT **380 CU. IN.**  
COMPRESSION RATIO: **16.0:1**  
CORRECTED TO **① + ② BS.649.**

- ① BS OVERLOAD - MAX BHP 120 @ 2500 RPM - MAX TORQUE 280 LBS. FT @ 1600 RPM
- ② BS RATING - MAX BHP 100 @ 2500 RPM - MAX TORQUE 252 LBS. FT @ 1600 RPM



CONDITIONS OF TEST

DEDUCTIONS FOR A4 BLADE 18" DIA FAN

ENGINE RPM	1500	1800	2000	2500
H P DEDUCTIONS	1.5	2.5	3.5	7.0

ENGINE & TRANSMISSION  
ENGINEERING

APPROVED .....

DATE **5-June-70** .....

## 6 CYLINDER, 363 Cu./In. TURBOCHARGED - LEHMAN MODEL 6D363TC

ENGINE MODEL 2704ET TURBOCHARGED DIESEL MARINE ENGINE

DATE 25-7-69

NO. OF CYLS. 6

BORE 4.1258 ins.

STROKE 4.524 ins.

DISPLACEMENT 362.8 cu. ins.

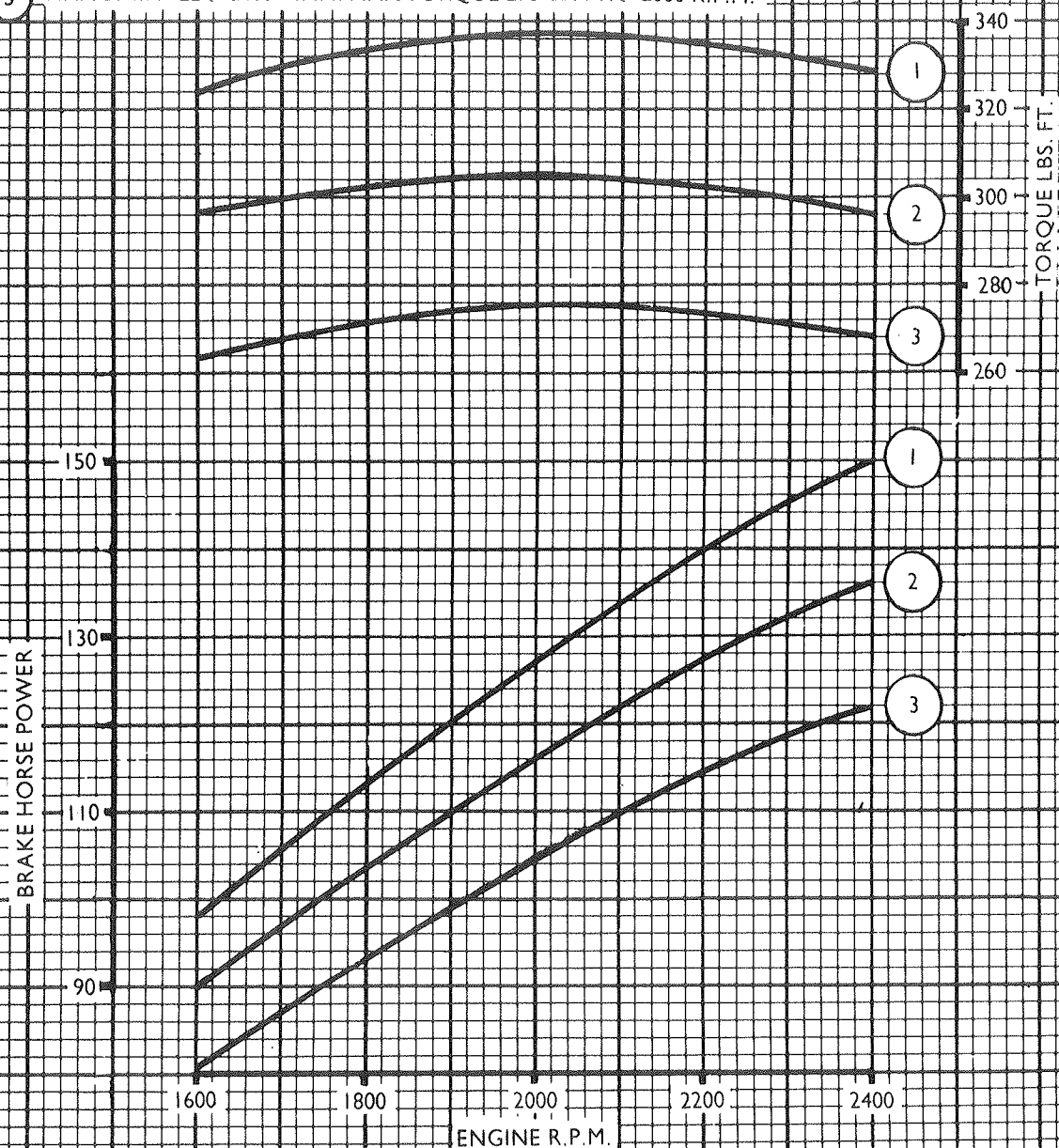
COMPRESSION RATIO: 15.70:1

CORRECTED TO TEMP 60° F PRESSURE 29.5 ins Hg DRY AIR

① MAX B.H.P. 150 @ 2400 R.P.M. MAX. TORQUE 337 LB. FT. @ 2000 R.P.M.

② MAX B.H.P. 135 @ 2400 R.P.M. MAX. TORQUE 305 LB. FT. @ 2000 R.P.M.

③ MAX B.H.P. 122 @ 2400 R.P.M. MAX. TORQUE 276 LB. FT. @ 2000 R.P.M.



CONDITIONS OF TEST Engine with generator, mesh type air filter and exhaust back pressure not exceeding 1 in Hg

① PLEASURE CRAFT - MAX OVERLOAD

② PLEASURE CRAFT - CONTINUOUS OR WORKBOAT OVERLOAD

③ WORKBOATS CONTINUOUS

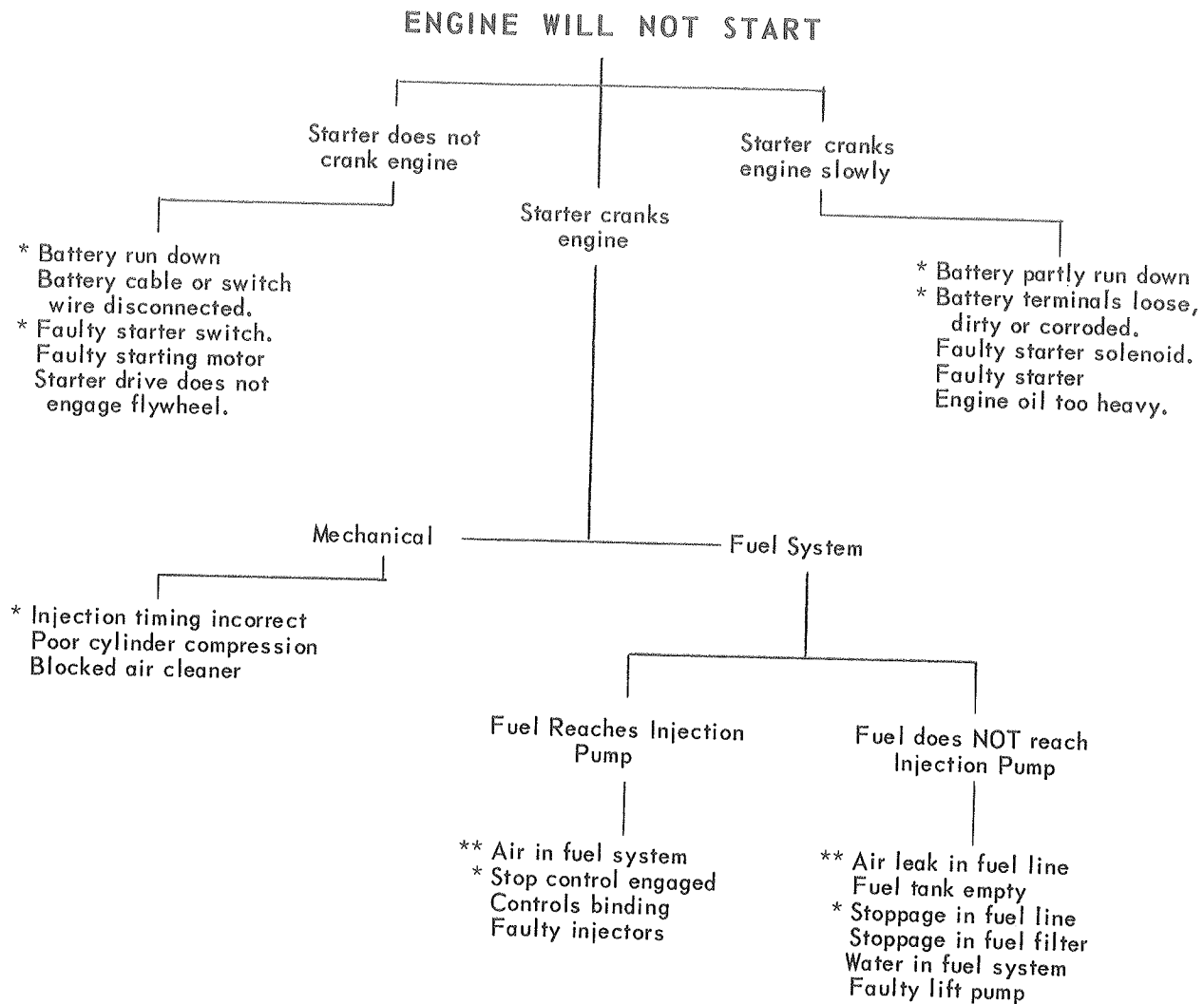
ENGINE ENGINEERING  
INDUSTRIAL PRODUCTS

APPROVED

DATE

17 Oct 1969

\* Particular attention should be directed to the most common trouble-spots marked by asterik -



## ENGINE STARTS

### ENGINE RUNS INTERMITTENTLY

- Idle adjustment too low
- \* Air - Leaking fuel system
- Fuel (lift) pump diaphragm worn
- Fuel tank near empty
- Fuel filter(s) clogged

### ENGINE NOT DELIVERING FULL POWER

- \*\* Air in fuel system
- Engine overheated
- Injection timing incorrect
- Incorrect valve clearances
- Dirty air cleaner(s)
- Stop control partly engaged

### ROUGH IDLING

- \* Air in fuel system
- \* Idle adjustment set too low
- \* Idle damper screw requires adjustment
- Dirty or faulty injectors
- Injector pipes loose, cracked or broken
- Incorrect injection timing

### ENGINE KNOCKS

- \* Air in fuel system
- Oil level (pressure) low
- Incorrect grade fuel oil
- Water - Leaking cylinder head gasket
- Incorrect injection timing
- Faulty injector
- Sticking valve or rocker arm

Continued on following page . . .

## FAULT-FINDING GUIDE (Continued)

### ENGINE OVERHEATS

- \* Insufficient water supply
  - Fresh water not circulating
    - a) Loose or broken vee belt
    - b) Hoses clogged or collapsing while running at high speed.
    - c) Faulty thermostat
- \* d) Air trapped in water system.
- \* e) Clogged heat exchanger
- f) Clogged bleed hole in thermostat
- Sea water flow insufficient
  - \* a) Clogged sea water strainer
  - b) Water intake scoop damaged or lost
  - c) Sea cock closed
  - d) Water pump impeller damaged
  - \* e) Heat exchanger or oil coolers clogged.
- Low crankcase oil level
- Incorrect injection timing

### ENGINE EXHAUST SMOKES

- Fuel, poor grade (black smoke)
- Crankcase overfilled (blue smoke)
- Cold engine temperature (white or lite blue)
- \* Propeller too large (black smoke)
- Max. speed stop screw set too high for load (black smoke)
- Propeller too small (white smoke)
- Excess fuel button stuck
- Incorrect injection timing

### ENGINE MISFIRES

- \* Injector pipe loose, broken or cranked
- Injectors dirty
- \* Air leaking in fuel system
- Sticking valve or rocker arm

## BEFORE OPERATION

Before operating a new engine it should be thoroughly inspected for damage likely to affect its subsequent operation or that may have resulted from shipment or installation in the boat. Controls should be inspected to assure they perform properly and, of course, the operator should be familiar with all controls, instruments and proper engine operation.

The engine should not be started until the operator has read this manual thoroughly and familiarized himself with manner of checking oil level in engine sump, coolant level, oil in injection pump sump, oil in transmission, bleeding of air from fuel system, etc. The chapters on "maintenance" and "running in" should be particularly noted.

Assuming that all engine checks have been performed you are ready to start your engine.

## RUNNING IN

**DO NOT OPERATE YOUR NEW ENGINE AT HIGH SPEEDS IMMEDIATELY FOR EXCESSIVE WEAR OR DAMAGE MAY RESULT.**

Long and dependable service may be expected if proper care is taken during the "break-in" period. The following speed limitations are recommended:

<u>RUNNING TIME</u>	<u>RPM</u>
30 Minutes	Idle (no load)
30 Minutes	800
1 Hour	1000
1 Hour	1200
2 Hours	1400
4 Hours	1500

Total run-in period - 9 hours

After the first 15 hours, complete the maintenance instructions as shown elsewhere in this manual.

### IMPORTANT

Before starting turbo engine, refer to "Lubrication" section for information regarding priming with oil.

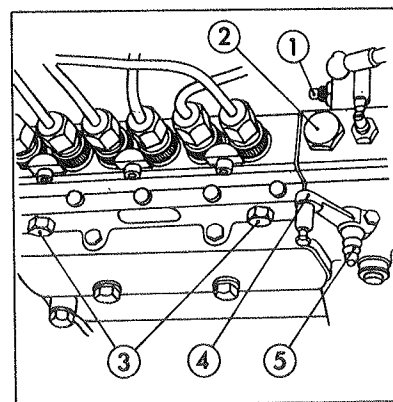


FIG. 2

### INJECTION PUMP

- 1 - Idling speed adj. screw
- 2 - Oil fill plug
- 3 - Air bleed screws
- 4 - Stop control lever
- 5 - Excess fuel (cold weather start) button.

## CONTROLS, STARTING & STOPPING ENGINE

No amount of engineering ingenuity or care in manufacture can substitute for the need of knowledge on the operation and avoidance of mis-use by the operator. It is important to be familiar with all controls so as to know how to properly operate your engine.

Refer to Fig. 2. To stop engine, the stop lever should be moved as far as it will travel towards the front of engine and held until engine is fully stopped. This lever cuts off the supply of fuel to the injection pump. (NOTE: Before shutting down engine it should always be allowed to idle for about two minutes, particularly after extended periods of cruising.)

Engine speed control is the longer lever at side of injection pump (Fig. 3). Moving toward front of engine increases engine speed.

The excess fuel device permits additional fuel to be supplied by the injection pump when starting engine in cold climates. It is situated in front of pump at base of engine stop lever. To operate, move throttle control lever to maximum engine speed position, push the excess fuel button inwards, then return throttle to about mid-point position. The button will spring out automatically when engine starts. Do not attempt to wedge the button in as this will reduce engine power.

To start engine when cold — make certain that transmission is in neutral position and that all boat accessory equipment (bilge pump, extra alternator or generator, hydraulic pump, winch, etc.) is disengaged. Check that engine stop lever is fully towards rear (flywheel end) of engine. Set throttle lever to  $\frac{1}{4}$  open position. (In extreme cold weather, engage the excess fuel device as described above.) Press starting button to operate starter. As soon as engine starts, release starting button and reduce speed control lever to warm-up (idling) speed of 700-800 RPM. If engine fails to start within 5 seconds, release starting button. Try again after allowing sufficient time for all moving parts to stop.

Once engine has started, it should be allowed to reach 170°F before full load is applied.

To restart engine when warm, use same procedure as above except set speed control lever to approximately mid-point of its travel.

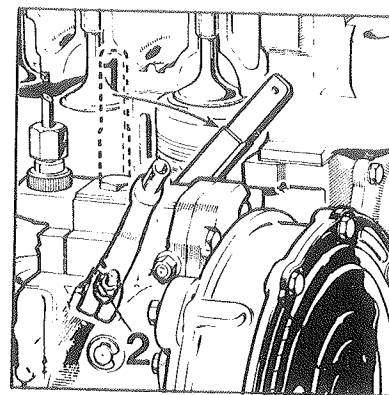


FIG. 3

### INJECTION PUMP DETAIL

- 1 - Throttle control lever (at maximum speed position)
- 2 - Excess fuel (cold weather start) button.

## FUEL SYSTEM

Caution: Your injection pump is a very accurately machined piece of equipment and requires careful handling and adjustment. No repairs other than shown herein should be entrusted to other than a diesel repair facility having the required tools, knowledge and test/calibration equipment.

Caution: Never bend the injector pipes (which connect injection pump to injectors) as this may unbalance the volume of fuel delivered to each cylinder.

Caution: Do not use a galvanized fuel tank as the zinc coating reacts with the fuel oil and forms undesirable compounds which can foul the injection system.

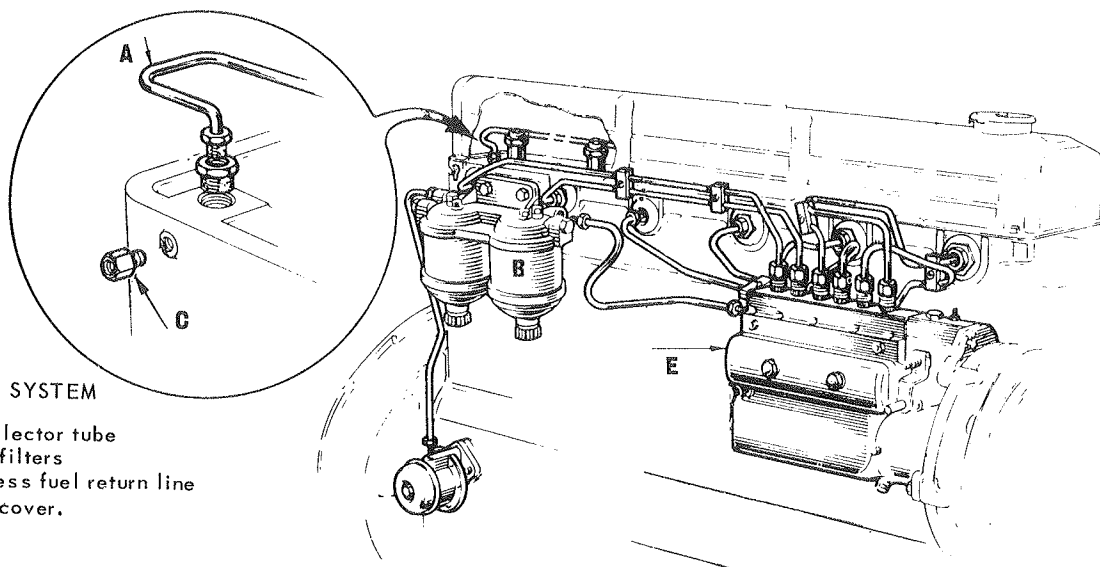


FIG. 4

### ENGINE FUEL SYSTEM

- A - Excess fuel collector tube
- B - Secondary fuel filters
- C - Connector, excess fuel return line
- E - Injection pump cover.

## FUEL SYSTEM (Continued)

The fuel injection equipment is made to very accurate limits and therefore even the smallest particle of dirt entering the system will destroy its efficiency by causing blockage or scoring or premature wear on highly finished parts. A clean fuel system is absolutely essential. Insure scrupulous cleanliness when handling fuel or fuel system components. At all times make certain that water is not allowed to contaminate the fuel oil. Try to make a practice of refueling out of the rain. Use a fine gauze filter funnel and always wipe the fuel tank around the filler cap before and after filling and immediately replace the cap.

An efficient, large size primary fuel filter and water separator (coalescer) is deemed a necessity in order to prevent foreign particles reaching the injection equipment on your engine.

Your engine is equipped with secondary fuel filters which filter out contaminants that may find their way through the primary filter. These filters (see fig. 4, 5 & 5-A) located towards rear of engine block, right side, have elements which should be replaced once each season or at least each 200 hours (whichever comes first) under normal conditions. (When replacing filters, use new gaskets or sealing rings to prevent air leaks.) Following filter replacement, bleed air from fuel system as later described under "bleeding the fuel system". Excess fuel delivered to the injectors by the injection pump is collected by a tube located under the rocker arm cover (see A, Fig. 4) and delivered to fitting C, Fig. 4 located at rear, right side of cylinder head. This fitting should be connected to top of fuel tank by  $\frac{1}{4}$ " (min.) tube or hose (C, Fig. 5) in order to return excess fuel to tank. Make sure to install a short section of flexible tubing in this line to prevent breakage due to engine vibration.

An overflow tube is provided on the sump of some injection pumps to prevent overfilling. Upon first filling or when replenishing oil, a can or other container may be used to catch the overflow oil until level in sump is balanced. If the injection pump does not have an overflow tube, it will have an oil level plug directly below the side cover E, Fig. 4. When adding oil, fill to level of this plug. An injection pump without overflow tube will have a vent containing a gauze filter which should be removed after each 200 hours of operation, washed in solvent such as kerosene, dipped in clean engine oil and replaced. In new installations, injection pump level should be watched carefully. A small amount of oil ejected from the overflow tube is no cause for concern, but indicates that sump may have been overfilled or oil is seeking a new level due to angle of installation. But should oil flow persist or if oil must be added between normal maintenance periods, such fact should be reported at once. Warranty does not cover injection pumps which have been operated without proper lubrication.

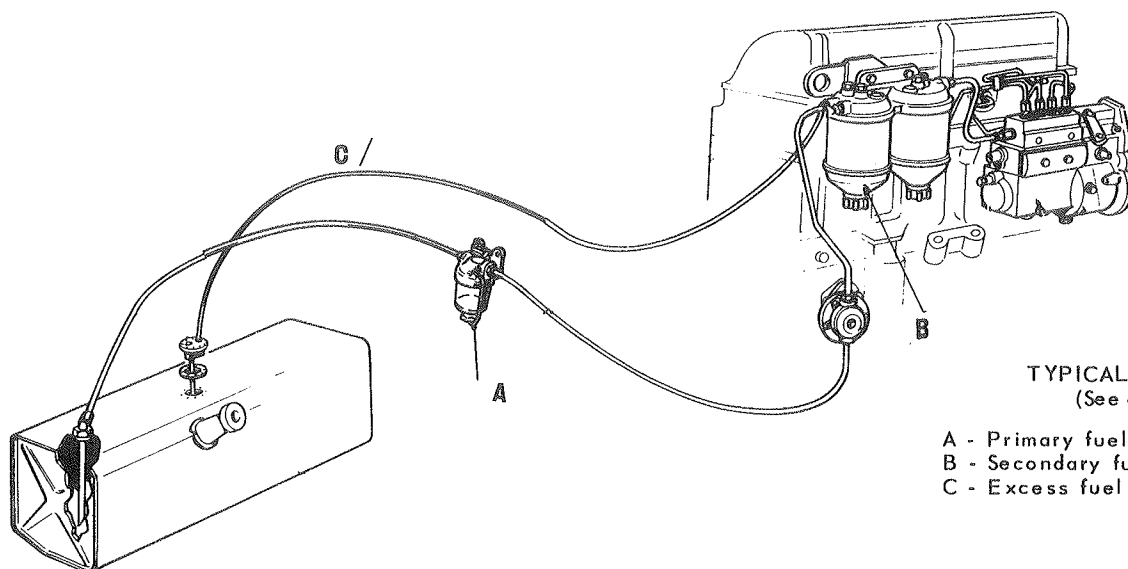


FIG. 5  
TYPICAL FUEL SYSTEM  
(See also Fig. 5-A)

- A - Primary fuel filter & water separator
- B - Secondary fuel filter
- C - Excess fuel return tube



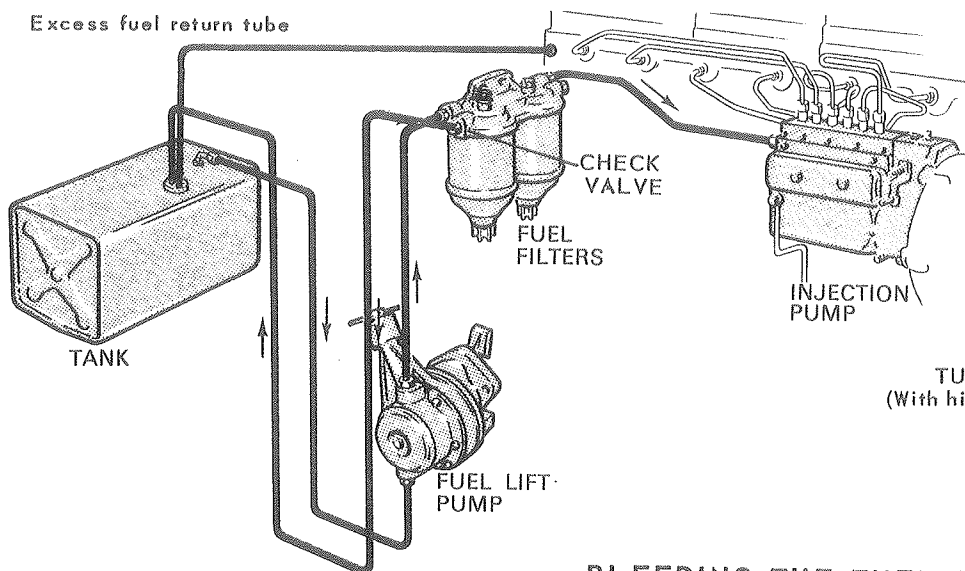


FIG. 5-A  
TURBO FUEL SYSTEM  
(With hi-pressure fuel lift pump)

## BLEEDING THE FUEL SYSTEM

Bleeding air from the fuel system may well be one of the important procedures to be learned by the operator. Air in the injection system may cause erratic engine performance, "missing" on one or more cylinders, reduced power, stop fuel from reaching engine and prevent or cause hard engine starting.

It must be remembered that the lift pump draws fuel from the tank, so any accumulation of air in the fuel system makes all connections, filters, etc. between fuel lift pump and tank suspect. In any new installation one must "bleed" the system of air for, obviously, air will be in the new fuel lines, filters, etc. If the fuel tank should run dry, bleeding will be needed when the boat is refueled. Bleeding will also be required after changing fuel filter elements. (Time and effort may be saved if filter is charged with fuel by removing the bleed plugs on top and slowly pouring fuel into the filter until it overflows.) Occasionally, after an extended run, an engine may slow down, or "miss", or lose RPM's or stop. Although there may be other causes, air in the fuel system should not be overlooked. Many times a tiny leak in a fuel line fitting may allow air to enter the system and accumulate until there is sufficient to cause the above mentioned symptoms.

Upon completing a new installation, best check against air leaks is to block the fuel tank vent and filler cap, disconnect fuel line at tank side of fuel lift pump and induct pressure (approximately 10 lbs. should suffice) into the fuel line. Make certain that fuel line to tank will maintain pressure and inspect all connections for possible leaks.

To bleed system, follow this procedure:

1. Ascertain that there is sufficient fuel in tank, (Note: Low fuel level may result in intake pipe being exposed due to "sloshing" of fuel, thus drawing air into system.
2. Make certain that fuel shut-off valve is turned on.
3. Loosen the bleed screw on the inlet side of the fuel filter (Fig. 6 & 7) about two or three turns.
4. Operate the priming lever at the side of the fuel lift pump (Fig. 8) until a flow of fuel, free of air, is expelled. Then close screw.

Caution: Do not use excess pressure in tightening bleed screws as the castings are soft and threads strip easily. A slight pressure with wrench will seal all plugs tightly.

Note: If the eccentric which operates the fuel lift pump is on maximum lift the pump priming lever will be inoperative. If this occurs, rotate the engine using starter until priming lever can be operated.

5. Loosen bleed screw on outlet side of filter and repeat operation 4.

6. Inspection of injection pump will reveal two additional bleed screws (Fig. 9). First loosen screw nearest to inlet line and repeat operation 4. The same procedure is then used on the last bleed screw.

Caution: Allow engine to operate for at least ten minutes before leaving dockside to ensure all air has been purged from system.

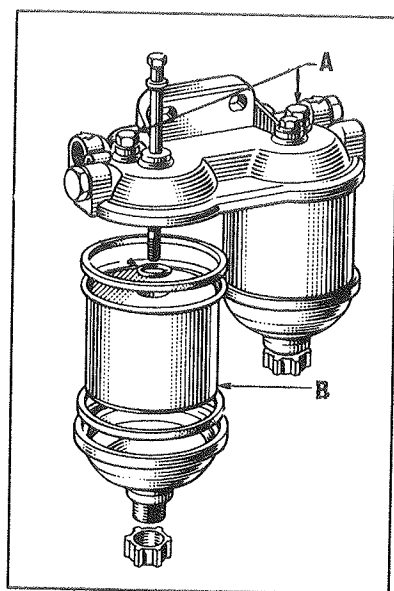


FIG. 6  
FUEL FILTER (DUAL TYPE)  
A - Bleed screws  
B - Replaceable element

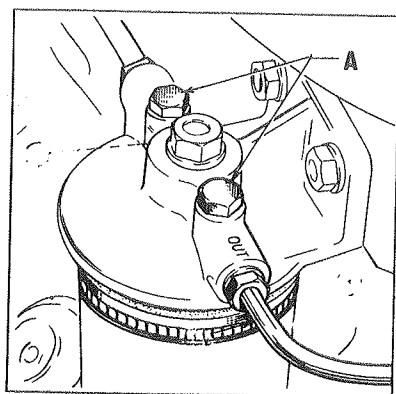


FIG. 7  
FUEL FILTER (SINGLE TYPE)  
A - Bleed screws

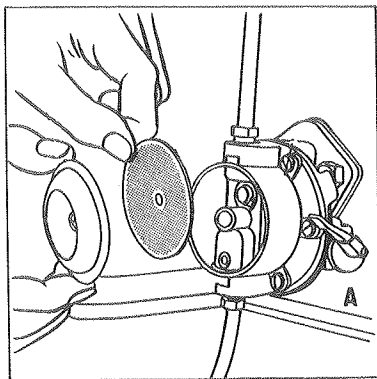


FIG. 8  
FUEL LIFT PUMP  
A - Priming lever

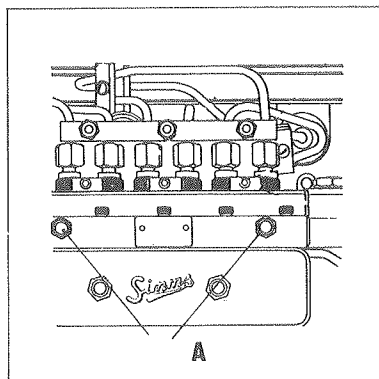


FIG. 9  
INJECTION PUMP (TYPICAL)  
A - Bleed screws

## TIMING THE FUEL INJECTION PUMP

The injection pump delivers an accurately metered quantity of fuel to each cylinder to suit any engine speed and load condition. The pump is a very accurately machined piece of equipment and requires careful handling and maintenance. Repairs other than described in this manual should be entrusted only to a qualified diesel mechanic who is equipped with proper tools, gauges and test and setting equipment.

As indicated in the fault-finding chart, poor engine performance may sometimes be traced to incorrect injection timing. Following is the method to correctly set timing.

1. Position stop control lever to avoid starting engine.
2. Remove the inspection plug which is adjacent to the injection pump (Figure 10) and rotate engine crankshaft until the two semi-circular dimples which can be seen through the timing aperture are in line. (Note: Timing Tool No. C-9077 is available to insure positive location.)
3. It is now necessary to ascertain position of No. 1 piston. Two methods are possible . . . .
  - a. Some models are equipped with a timing scale just forward of crankshaft pulley on port side (See Figure 11). Rotate engine crankshaft until timing mark (a saw cut or scratch mark) on periphery of pulley coincides with the desired mark on scale. See "Specifications".
  - b. For engines not equipped with timing scale, it will be necessary to remove aperture cover on flywheel housing (in lower sector, star-board side) in order to check setting from markings on periphery of flywheel (See Figure 12). In marine use this may be difficult due to engine bed interference. A small mirror may be of assistance.
4. When crankshaft has been rotated to proper position, recheck the two "dimples" as per Paragraph 2. If not aligned, carefully loosen bolts holding injection pump to engine. Slotted holes in pump adaptor plate allows rotating pump to achieve proper alignment. Retighten bolts securely. (Note: If difficulty is experienced in rotating pump, disconnect injector pipes.)

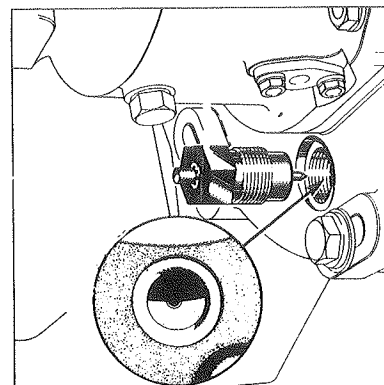


FIG. 10  
INJECTION PUMP TIMING TOOL

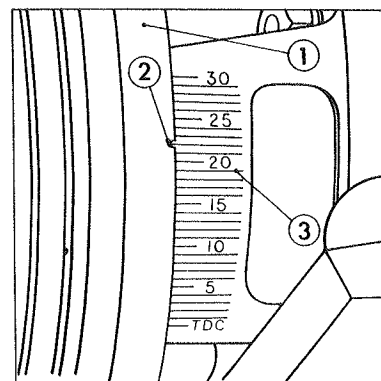


FIG. 11  
ENGINE TIMING MARKS  
1 - Crankshaft pulley  
2 - Timing mark  
3 - Timing scale

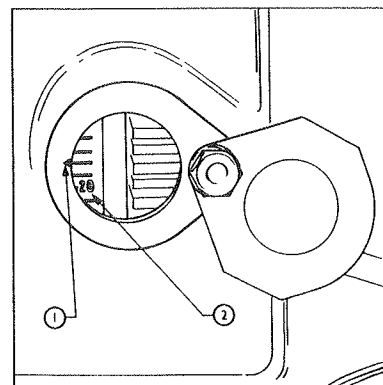


FIG. 12  
TIMING MARKS (FLYWHEEL)  
1 - Timing mark on engine  
flywheel housing.  
2 - Timing scale on flywheel.

Your engine is cooled by the circulation of fresh water (contained in the system) through the water jackets surrounding the cylinders, cylinder head and exhaust manifold. The heated water flows by thermo-syphonic action, assisted by a pump at the front of cylinder block around the tubes of a "heat exchanger" located above the flywheel housing at rear of engine. Raw water from outside the boat flows through the heat exchanger tubes, and the heat from the fresh water is thus transferred to the raw water which is expelled overboard. Examination of Figures 13 and 14 will clarify the water systems. A thermostat located in front of cylinder head, below expansion tank, promotes rapid "warming up" and assists in maintaining constant engine temperature.

The fresh water system is filled through a cap atop the expansion tank at front of engine. Water level should be checked daily and maintained to within one-half inch below top of tank. The air bleed valve at top front end of exhaust manifold should be opened while filling fresh water system in order to allow trapped air to escape. When water appears, close valve tightly.

DO NOT OPEN VALVE WHILE ENGINE IS RUNNING, as this will draw air into system, displacing water and causing overheating of engine.

Most complaints of overheating are due to improper purging of air from the fresh water system. The following is correct method with engine not running:

- A. Open air bleed valve (on top front end of manifold) to allow air to escape.
- B. Remove filler cap from top of expansion tank.
- C. Slowly fill cooling system with water/anti-freeze mixture
- D. Continue filling cooling system until all air or bubbles cease to expel at air bleed valve, and solid stream of water appears.
- E. Close air bleed valve.
- F. Continue filling of cooling system until water level reaches top of expansion tank.
- G. Start engine and run approximately 900 RPM (in neutral) until thermostat opens. Turbulence in water will be noted through filler hole.
- H. Maintain water level to top of tank.
- I. Replace filler cap.

**DO NOT OPEN AIR BLEED VALVE WHILE ENGINE IS RUNNING, AS THIS WILL DRAW AIR INTO SYSTEM AND DISPLACE WATER AND CAUSE OVERHEATING.**

The fresh water system is pressurized by the cap atop expansion tank. When proper pressure is reached, excess water is expelled through the overflow tube under tank. Extreme care should be taken in removing cap while engine is hot. While engine is hot, if there is liquid in tank, the system may be refilled with safety; if not, allow engine to cool before refilling. If an anti-freeze solution is not being used in freezing temperatures, it is essential that the water systems be drained while engine stands idle and refilled before engine is restarted. Check water supply daily. Maintain level to approximately one-half inch below top of tank.

To assist in corrosion control, a zinc pencil is installed in your heat exchanger at top, left side (6 cylinder models); bottom, left side in 4 cylinder models. This zinc pencil is sacrificial . . . that is, the raw water will attack and "eat away" the zinc before attacking metal of the heat exchanger. It is suggested that the plug accommodating this pencil be removed each week while engine is in service in order to inspect zinc. Replace zinc element when required. Failure to install zincs when needed may cause serious damage to exchanger.

It will be noted that your heat exchanger has removable end caps to facilitate cleaning. Removing caps will allow access to end of the tube "bundle". To clean tubes use a 3/16" diameter wood dowel. Do not use a metal rod which may rupture the copper tubings.

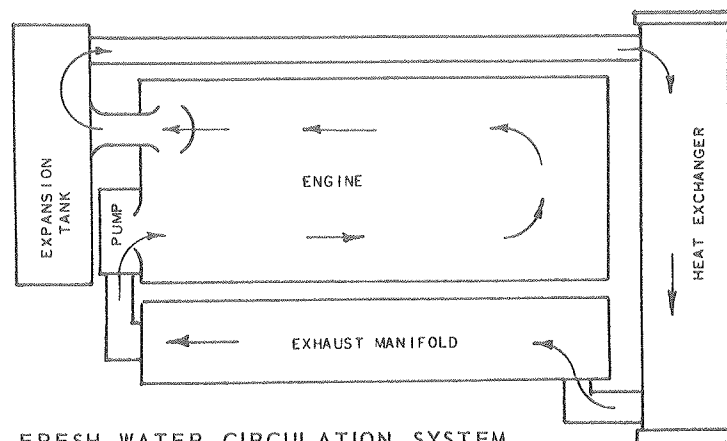


FIG. 13 - FRESH WATER CIRCULATION SYSTEM

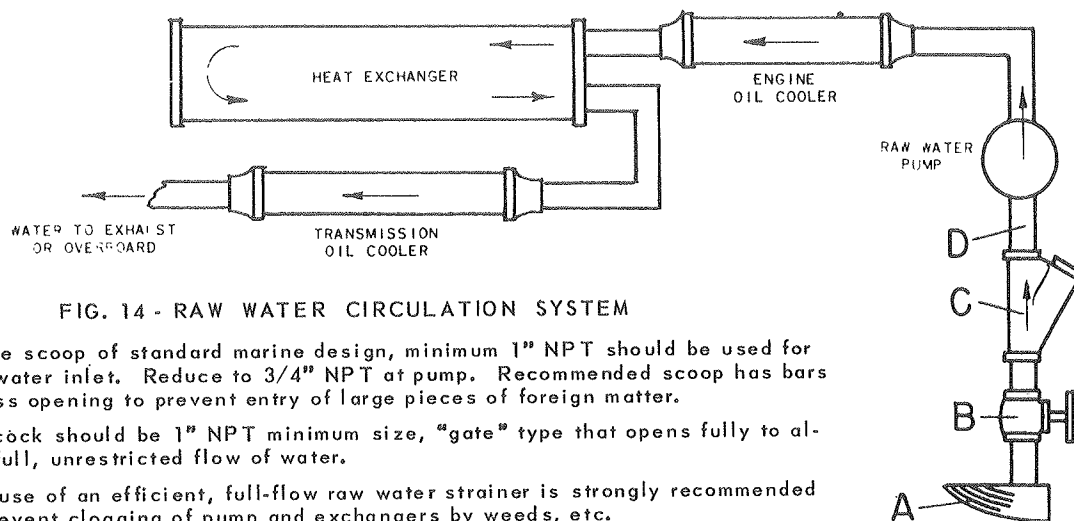


FIG. 14 - RAW WATER CIRCULATION SYSTEM

- A - Intake scoop of standard marine design, minimum 1" NPT should be used for raw water inlet. Reduce to 3/4" NPT at pump. Recommended scoop has bars across opening to prevent entry of large pieces of foreign matter.
- B - Sea-cock should be 1" NPT minimum size, "gate" type that opens fully to allow full, unrestricted flow of water.
- C - The use of an efficient, full-flow raw water strainer is strongly recommended to prevent clogging of pump and exchangers by weeds, etc.
- D - If hose is employed for intake, same should be reinforced type of extra heavy construction to prevent collapse under powerful suction of raw water pump.

In preparation for freezing weather, anti-freeze should be provided in the fresh water system of the engine. Due to the high temperatures at which these engines operate, high boiling point anti-freeze is demanded. Do not attempt to use alcohol or other non-permanent types, and do not use a "sealer" type which tends to build up a coating on exchanger elements, thus interfering with normal heat transfer. Consult the specification section of this manual to determine water capacity of your engine, and add sufficient anti-freeze to bring within limits of expected temperatures.

Inboard type heat exchangers must be drained of raw water when exposed to freezing temperatures. Raw water pump, water inlet piping and intake strainer should likewise be drained when subjected to extreme cold. Drains will be found at following locations:

#### FRESH WATER DRAINS

(Note: While draining, remove filler cap from top of expansion tank).

- 4 Cylinder models:
  - Engine Block - Left side, front (behind alternator)
  - Heat Exchanger - Underneath, right side
  - Exhaust Manifold - Leftside, rear
- 6 Cylinder models:
  - Engine Block - Left side, low (near center)
  - Heat Exchange - Underneath, left side (nearest center of engine)
  - Exhaust Manifold - Left side, rear

#### RAW WATER DRAINS

Water pump: Loosen rear cover  
 Lube oil cooler: Under, rear  
 Transmission oil cooler: under, left side  
 Heat exchanger: Under, left side (Note: 4 cylinder models have combination drain plug & zinc pencil)

(Note: Manual type transmissions (Lehman Series 144 or Paragon G-33 having reduction gearing will also require draining).

In some cases the installation of a "keel cooling" system may be preferred to the standard "heat exchanger" previously discussed. This system employs a series of tubes mounted on the underside of the hull through which the engine cooling water is circulated. Such a system is beneficial when the boat is to operate in muddy or silt-laden areas, however, the cooling element does produce additional hull "drag" which could affect performance in faster boats and creates a potential hazard if tubes fracture or are struck by driftwood, etc.

Piping engine to keel cooler is quite simple. As shown in Fig. 14-A the connection on underside (starboard) of expansion tank delivers hot water from engine to keel cooler. Cooled water from keel cooler returns to engine via connection on aft end of exhaust manifold. The use of 1 $\frac{3}{4}$ " I.D. hose will simplify connections, however hose must be reinforced type to prevent collapsing under suction and care must be exercised when installing to avoid "kinks" or the possibility of chafing.

Installations using a "wet" exhaust will require raw water system as shown in Fig. 14, but omitting heat exchanger.

When dry exhaust is employed, it is possible to eliminate use of the raw water pump. Upon special order, lube and transmission oil coolers of large size may be incorporated in the engine fresh water system. The addition of such coolers is shown in Fig. 14-B.

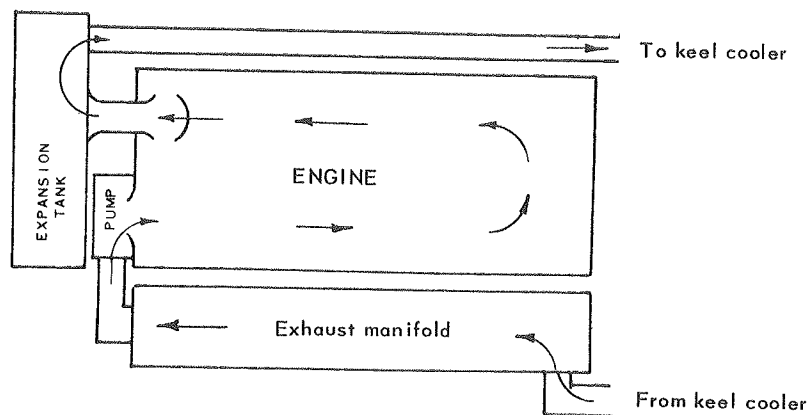


FIG. 14-A FRESH WATER CIRCULATION SYSTEM (Keel Cooler Type)

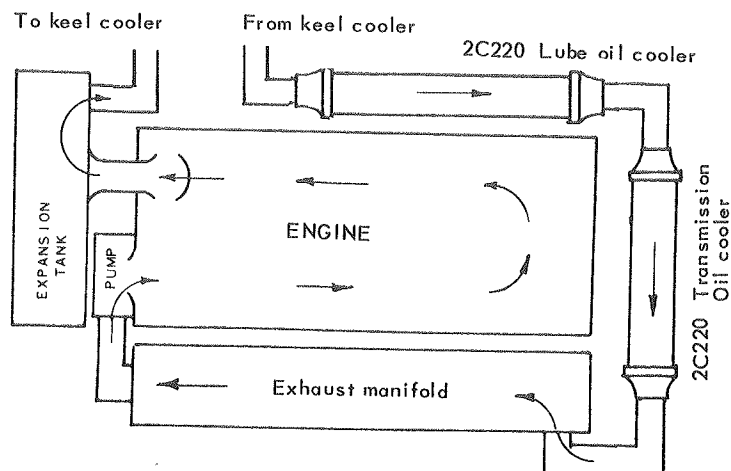


FIG. 14-B WATER CIRCULATION SYSTEM (Keel Cooler Type) WITH LUBE and TRANSMISSION OIL COOLERS IN FRESH WATER FLOW.

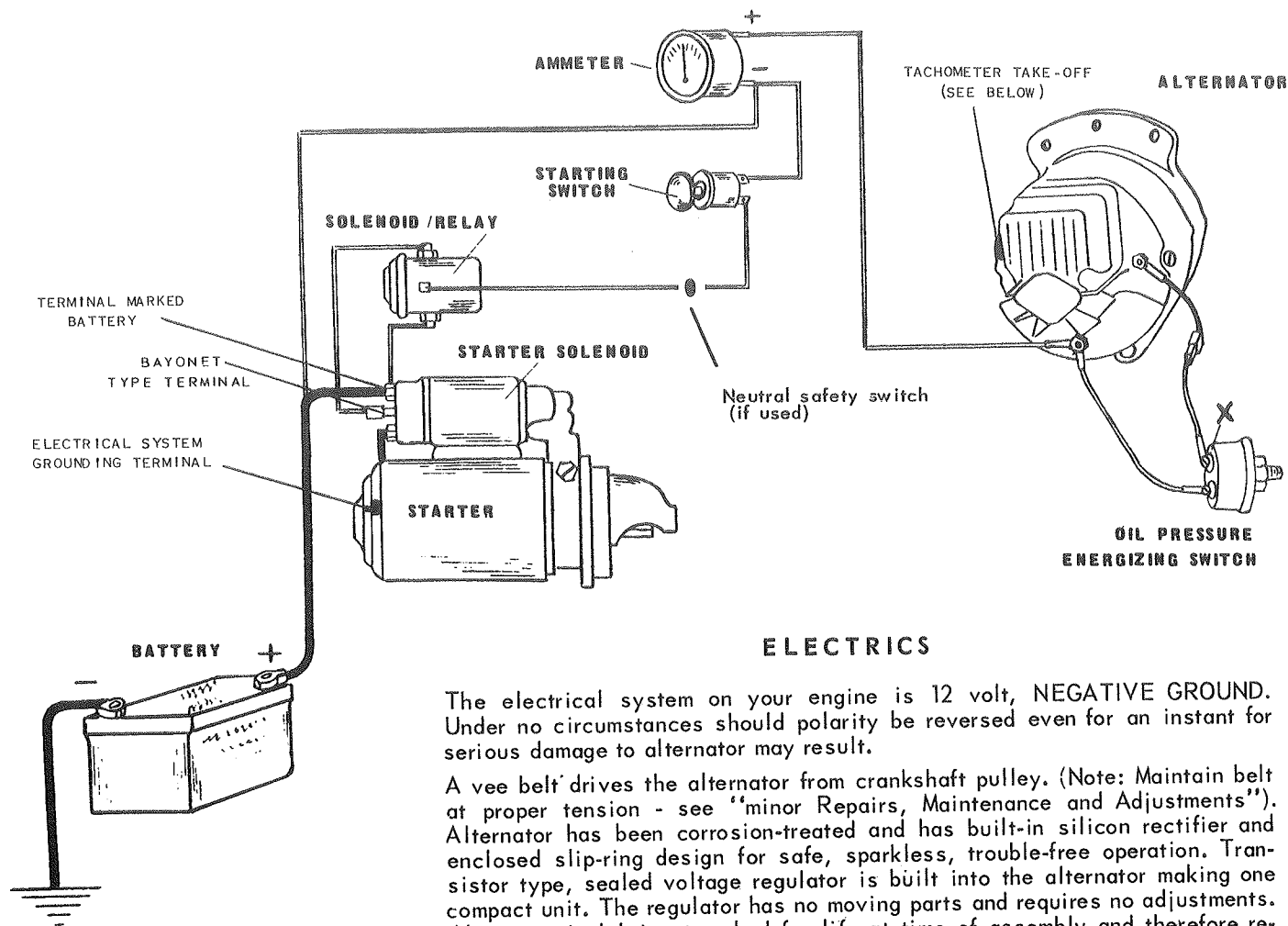


FIG. 15  
WIRING DIAGRAM

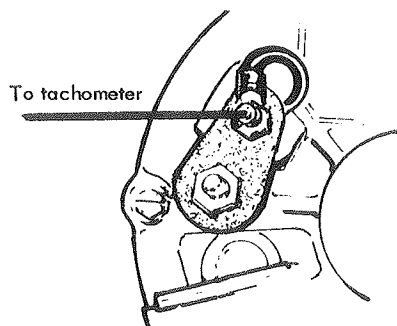


FIG. 16  
Tap at rear of alternator  
for (optional) electrical  
tachometer.

## ELECTRICS

The electrical system on your engine is 12 volt, **NEGATIVE GROUND**. Under no circumstances should polarity be reversed even for an instant for serious damage to alternator may result.

A vee belt drives the alternator from crankshaft pulley. (Note: Maintain belt at proper tension - see "minor Repairs, Maintenance and Adjustments"). Alternator has been corrosion-treated and has built-in silicon rectifier and enclosed slip-ring design for safe, sparkless, trouble-free operation. Transistor type, sealed voltage regulator is built into the alternator making one compact unit. The regulator has no moving parts and requires no adjustments. Alternator is lubricant packed for life at time of assembly and therefore requires no external lubrication. Starting Sept. 1972 alternators (designated model 8MR2018-K) are equipped with a tapping (see fig. 16) for connection to operate a matching electric tachometer (optional).

A special actuating switch located on side of engine block behind alternator automatically energizes the alternator from the battery when engine is started and oil pressure reaches 7 lbs. Battery is disconnected by this switch when the engine is stopped. This switch initiates operation of the alternator system without the need of a separate switch and precludes the possibility of the operator neglecting to turn the charging system on or off. If desired, electrical instruments such as oil gage, temperature gage, etc. may be wired to be automatically energized when engine is started.

The starter motor is located on the left side (rear) of engine and requires no attention beyond maintaining the electric cable connections clean and tight, the commutator clean and brushes renewed when necessary.

The standard solenoid mounted on the starting motor is a heavy-duty type. It must mechanically engage the starter pinion with the ring gear on flywheel; then it must actuate an electric switch to energize the starting motor. As the solenoid is normally energized by a simple push-button located at some distance from the starter, relatively heavy gage wire is required to transmit the needed amperage. Using small gage wire can result in insufficient current reaching the starter solenoid, overheating of wires, insufficient travel of starter pinion and failure of engine to start.

To assure adequate amperage reaching starter solenoid a "piggy-back" solenoid is provided with short, heavy-gage wires connecting the two solenoids. The new solenoid requires comparatively little amperage so smaller gage wiring is required for connection to pushbutton.

The accompanying diagram indicates basic wiring requirements. Make certain that all connections are clean and tight. Locate battery as close as practical to the starter. Gage of battery cables will be dependent upon length, but should be NO. 0 minimum. Use No. 12 gage or heavier wire for balance of system. Electrical gages which require low current draw may be wired to oil pressure energizing switch indicated by "X" on the diagram.

## TACHOMETER ADAPTER

A tachometer "take-off" is provided on the starboard side of your engine near center of engine block. This adapter accommodates a standard marine tachometer cable with 7/8" - 18 adaptor nut. Tip of cable core should be .187" diameter. Cable turns one-half engine speed in counter-clockwise direction.

If mechanical tachometer is not used or if cable is disconnected with engine to be operated for any lengthy period, the take-off should be capped to prevent oil leakage. Suitable cap (or plug to close aperture if take-off assembly is removed) is listed in the parts section of this manual.

It is recommended that a mechanical type tachometer be used only if located relatively close to engine. If cable length exceeds 12 to 14 feet or if many bends are required, an electrical tachometer system should be considered as much less strain is placed upon the take-off assembly. Installations requiring two tachometers should always use electric instruments.

## LUBRICATION SYSTEM

The engine lubricating system is of the forced feed type, the oil being circulated by an oil pump mounted within the crankcase. The pump draws oil from the sump through a metal gauze screen and through an oil gallery on the port (left) side of engine which is tapped for installation of oil pressure gauge, low oil pressure alarm, or other such devices. Constant oil pressure is maintained by means of a relief valve situated in the pump. Oil under pressure passes through the oil filter where it is cleaned prior to being circulated inside the engine. The filter is a full-flow, disposable "spin-on" type of automotive design and easily available through automotive suppliers. It should be replaced at each oil change.

All marine installations should include an oil pressure gauge to register the lube system pressure and such gauge should be frequently checked to insure that system is functioning correctly. Normally the registered pressure should remain constant for a given engine speed. If pressure reading suddenly varies or fluctuates, the reason should be determined at once, otherwise severe damage may occur. As it is difficult to maintain a constant watch on engine gauges, the use of an audible warning system to sound a buzzer in case of low oil pressure (or high engine temperature) is strongly recommended.

The oil sump capacity of various model engine is shown under "Specifications". But note that such capacities are calculated when engine is level. As your engine will probably be installed at an angle, the dipstick provided for measuring oil level in the crankcase must be remarked. (Note that the dipstick on your engine may be installed on either the port or starboard side).

When engine is first installed, provide the proper quantity of oil as indicated under "specifications" section. The oil fill cap is located on top of engine rocker arm cover. After pouring in oil, it will be necessary to wait several minutes before the oil level is checked in order to allow time for oil to flow to sump. Another fill cap which leads directly to sump is located on sump near front of engine. Run engine for several moments, shut down and check level on dipstick (see figure 17). If oil level measurement is different from the "full" mark on dipstick, a new mark should be scratched or filed at the correct level. When measuring oil level in regular usage it is preferable to check after the engine has stopped for a period of time, such as overnight. This allows the oil in the overhead valve system to drain back to the oil sump, permitting a more accurate measurement. Add engine oil of the type and viscosity recommended as follows:

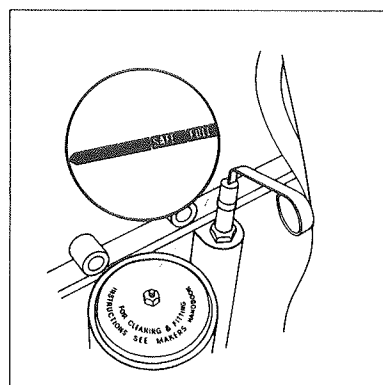


FIG. 17  
ENGINE OIL DIPSTICK

**IMPORTANT**  
LUBE OIL CLEANLINESS IS VITAL  
FOR THE LONG LIFE OF YOUR EN-  
GINE. WHEN CHANGING OR ADDING  
OIL, USE CLEAN RECEPTICLES.

ENGINE OIL RECOMMENDATIONS	
NATURALLY ASPIRATED MODELS:	API CLASSIFICATION CC
TURBOCHARGED MODELS:	API CLASSIFICATION CD or SERIES III
Average Temp. (F)	SAE Viscosity
-10° to 32°	10W
10° to 60°	20W
32° to 90°	30
Over 90°	40

## LUBRICATION SYSTEM (Continued)

**TURBO ENGINES:** API classification CD oils only must be used in turbocharged engines. Use of other oil will result in reduced engine life and will invalidate engine warranty.

Serious damage to turbocharger may result from inadequate lubrication. Upon starting, engine should be allowed to idle (1000 rpm maximum) for 30 seconds or more before applying load. Also allow engine to idle for at least one minute before shut-down to dissipate heat from turbocharger bearings.

Turbocharger must be oil-primed under any one of following conditions:

- After an oil change.
- If oil supply tube to turbocharger has been disconnected.
- If either the engine or turbocharger is newly installed.
- If no oil pressure registers on gage after a "dead crank" (cranking with stop control in operation) for 10 seconds. This test must be performed if engine has not been started for 4 weeks or more.

To oil-prime turbocharger:

- a) Check for sufficient oil in the engine sump but do not top-up at this time.
- b) Disconnect the oil feed tube at the turbocharger end and fill the housing with oil. Reconnect tube.
- c) Using suitable syringe, inject about 4 pints of oil (as used in engine sump) into oil gage connection of engine. Refit oil gage.
- d) Start engine, allowing 1 minute to idle before increasing speed.
- e) Stop engine and check sump oil level. Top-off if needed or drain off any surplus.

Engine oil should be changed after the initial 15 hours of operation and at each 200 hours of operation thereafter. Run the engine until normal operating temperature is reached. Shut down engine and allow oil to return to sump for five to ten minutes. In most installations it will not be possible to drain sump by removing plug which is located at bottom of oil pan, for clearance to bilge of hull will be limited. A low-cost, suction type, hand operated sump pump is required. Remove the dip-stick tube and insert suction hose of pump, working same towards lower portion of sump. (Some operators find it advantageous to use a length of copper tubing to assure reaching low section of sump.) Pump oil into container and dispose of same ashore. Replace vent cap on sump. Refill crankcase to "full" mark on dipstick. Run engine for several minutes, shut down and recheck oil level. If required, add sufficient oil to bring up to full mark.

Lube oil filter element should be replaced at each oil change. The disposable element is simply unscrewed from its base by turning counter-clockwise. Position a one-quart or larger container under filter before removal to catch oil from spilling into bilge. A new element is simply screwed onto the base with medium hand tightness. Under no circumstances should a wrench or excess pressure be used. When next starting engine, check filter for possible leaks or seepage, and tighten only sufficiently to prevent same.

The sump of the Simms fuel injection pump carries a supply of oil to lubricate the intricate mechanism contained within the housing. It is imperative that this unit be properly and regularly serviced. (See fig. 18)

Oil level must be checked when engine is first placed in service, before initial start-up and at intervals as specified in the Maintenance section. Oil should be changed after initial 15 engine hours operation, and at 50-hour intervals thereafter. Drain the sump oil by removing drain plug located on bottom of housing. Replace drain plug and remove filler plug from top of injection pump and oil level plug located at side of housing, above drain plug. Add engine oil (same type and viscosity as used in engine sump) through the filler orifice until oil reaches the level plug opening. Do not overfill as this may cause improper operation and cause excess oil to leak out of injection pump. Replace oil level and filler plugs.

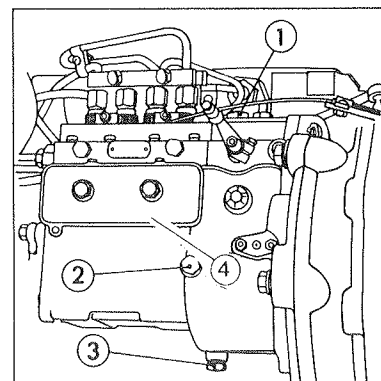


FIG. 18

#### INJECTION PUMP

- 1 - Filling plug
- 2 - Oil level plug
- 3 - Drain plug
- 4 - Side cover



## TRANSMISSION

As there is such a wide variety of transmissions available with Lehman diesels, it is not practical to cover all installations in this manual. However, due to the popularity of Paragon and Warner transmissions, the following information is offered for these models

No attempt is made herein to instruct in the installation of engine in the boat. The prudent boat owner or operator will, before initially starting engine, check engine/shaft alignment, operate clutch control to make certain that lever fully travels to the full ahead or full reverse positions, that neutral position may easily and quickly be found, and, of course, check oil level.

The transmission is a self-contained, sealed unit with independent lubrication system. No external adjustments of any kind are required. A built-in oil pump supplies the required hydraulic pressure to provide effortless shifting and assures an adequate supply of lubricant to all moving parts. An oil cooler is provided in order to maintain proper oil temperature which should not exceed 190°F.

Automatic transmission fluid type A, suffix A is recommended for lubrication. Or, if desired, "Dexron" type fluid may be used. Before starting engine fill transmission to the full mark on the dipstick. Run engine for a minute or two at low speed (in order to fill oil lines, cooler, etc.) then shut off engine and check oil level. Add sufficient oil to bring up to full mark. Transmission oil level should be checked each time the oil level in engine is checked. Change oil every 200 hours of operation or at least once each season under normal conditions; however, number of hours may vary depending upon severity and conditions of service. WARNER drain plug is a large "hex" plug located near bottom right side. To drain, remove plug and pull out strainer. (fig. 19). PARAGON drain plugs are located at bottom of reverse gear housing and reduction gear housing. (fig. 20)

A low-cost "sump pump" provides easy method of changing oil without removal of drain plugs.

PARAGON transmissions are normally provided with offset DOWN (propeller shaft flange BELOW the engine crankshaft). To revolve offset to UP position, disassemble reduction gear case from transmission by removing the 6 or 8 cap screws. Be careful not to damage gasket. You will now be able to remove the 6 or 8 socket-head cap screws which hold the reduction adaptor plate to transmission case. This adaptor can be revolved to desired position. (Note: It may be necessary to tap the adaptor with a mallet or hardwood block in order to break its "set" to the transmission case). Make certain to replace any damaged gaskets. (Note: Paragon transmissions which reverse propeller shaft rotation - Lehman models D155BP and D156BP - cannot have offset revolved to the "up" position).

**WARNING:** Once again we repeat - control cable or other mechanism for shifting transmission must have sufficient "throw" to shift the operating lever fully into both forward or reverse position. Unless shift lever is positively in forward, neutral or reverse, considerable damage may result. Transmission warranty is void if control lever is changed in any manner, or repositioned or if linkage to remote control does not have sufficient travel in both directions.

When ordering parts for your transmission be sure to specify both model and serial numbers as shown on identification tag.

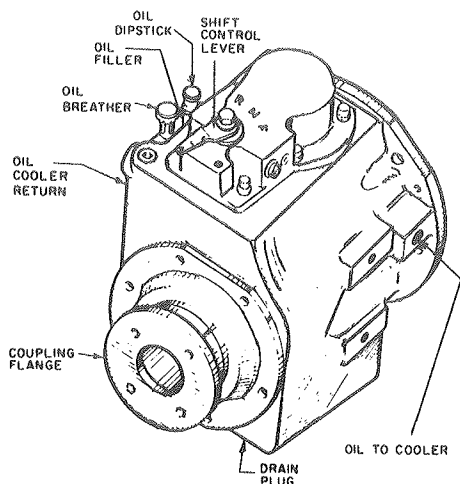


FIG. 20  
PARAGON TRANSMISSION

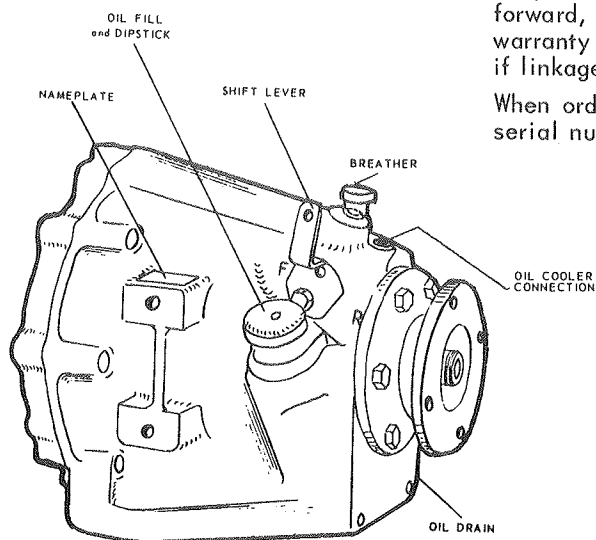


FIG. 19  
WARNER TRANSMISSION

## MAINTENANCE

The importance of correct lubrication, periodic inspection and adjustment cannot be over-emphasised. On it will depend, to a very large extent, the service which your engine will deliver.

The heat exchanger of your engine is protected by a "zinc pencil" which should be inspected and replaced periodically, as required. As the rate of electrolysis varies greatly in different areas, only experience will dictate how often inspections should be made.

For convenience, lubrication and maintenance work has been divided into the following periods:

- (a) After first 15 hours running.
- (b) After every 10 hours running.
- (c) After every 50 hours running.
- (d) After every 200 hours running.
- (e) After every 400 hours running.

### SUMMARY OF REGULAR MAINTENANCE

- |                                      |  |
|--------------------------------------|--|
| After first 15 hours running . . . . | 1. Change Engine Oil   |
|                                      | 2. Tighten cylinder head retaining bolts.  |
|                                      | 3. Adjust valve clearances.  |
|                                      | 4. Check (exchanger) zinc pencil.  |
|                                      | 5. Adjust belt tension.  |
|                                      | 6. Check injection pump oil level.   |
|                                      | 7. Check transmission oil level.   |
|                                      | 8. Check cleanliness of intake air filter.   |
|                                      | 9. Check engine/propeller shaft alignment. (twice annually, minimum).                                      |
|                                      | 10. Adjust idling speed (if required).   |
| Every 10 hours running . . . . .     | 11. Check engine and transmission oil levels.  |
|                                      | 12. Check cooling water level.   |
| Every 50 hours running . . . . .     | 13. Check cleanliness of intake air filter.  |
|                                      | 14. Check (exchanger) zinc pencil.   |
|                                      | 15. Change oil in injection pump.  |
| Every 200 hours running . . . . .    | 16. Adjust belt tension.   |
|                                      | 17. Change engine and transmission oil.  |
|                                      | 18. Change all engine and fuel oil filters.  |
|                                      | 19. Clean fuel lift pump.  |
|                                      | 20. Clean injection pump cover filter.   |
| Every 400 hours running . . . . .    | 21. Remove and service injectors.  |
|                                      | 22. Adjust valve clearances.   |
|                                      | 23. Remove raw water pump and check drive coupling. Place dab of grease on coupling halves when replacing. |
|                                      | 24. Adjust idling speed (if required).   |
|                                      | 25. Check torque of cylinder head bolts (turbo only).  |

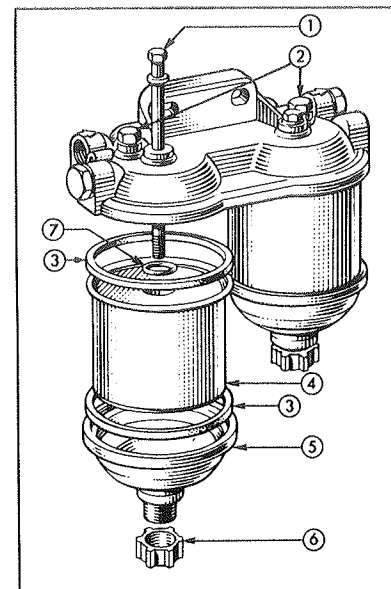


FIG. 21  
FUEL FILTER

- 1 - Securing bolt
- 2 - Bleed screws
- 3 - Sealing rings
- 4 - Filter element
- 5 - Bowl
- 6 - Drain cap
- 7 - Sealing ring

To change fuel filter element: (note- make certain that the filter element(s) you will use is an EXACT replacement for the element you will remove, otherwise, air leaks into the fuel system may result). Unscrew the securing bolts on top of filter housing (see fig. 21) and remove filter bowls and elements. Discard elements and upper and lower sealing rings. Wash out the bowls and clean fuel oil but do not use a cloth for remaining lint may clog the fuel system. Carefully fit new sealing rings to the filter heads and bowls, assemble to the filter heads and replace and tighten securing bolts. It will now be necessary to bleed the fuel system of air as described in separate section. After running engine for a short time, check filters for possible fuel leaks.

NOTE: A NEW GASKET SHOULD BE AVAILABLE BEFORE REMOVING THE ROCKER ARM COVER IN CASE OF DAMAGE TO THE ONE PRESENTLY IN USE.

**TO TIGHTEN CYLINDER HEAD BOLTS:** Start and run engine until normal operating temperature is reached. Stop engine. Remove rocker arm cover from top of engine. Tighten cylinder head bolts in sequence as shown in figures 22 and 23 to a torque of 105 to 110 ft/lbs., engine hot. (130-135 ft/lbs. for turbo models). Check valve clearances before replacing rocker arm cover.

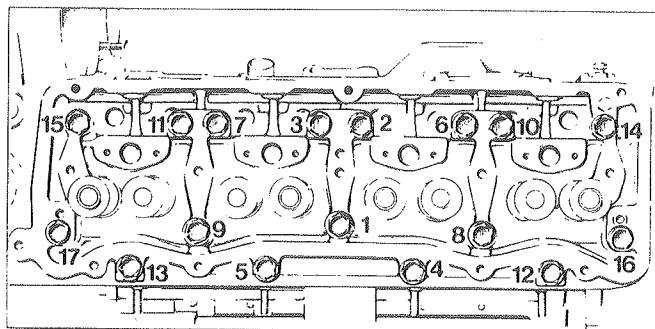


FIG. 22 - BOLT TIGHTENING SEQUENCE (4 Cyl.)

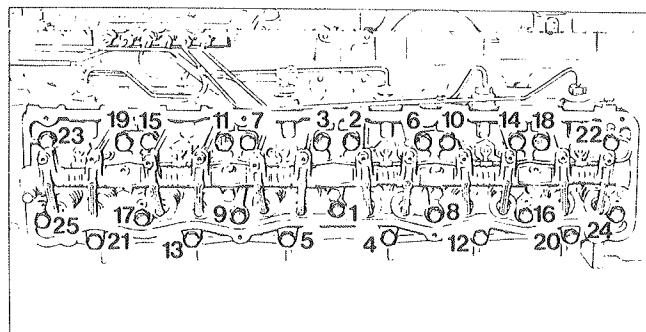


FIG. 23 - BOLT TIGHTENING SEQUENCE (6 CYL.)

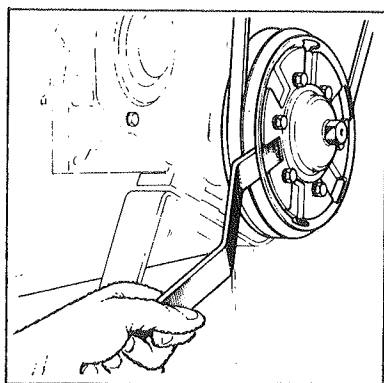


FIG. 24  
ENGINE BARRING PLATE  
(4 Cyl. only)

**TO ADJUST VALVE CLEARANCES:** (Note . . Adjustments should be made while engine is at normal operating temperature). Following removal of rocker arm cover and tightening cylinder head bolts as described above, actuate the engine stop control lever so engine will not start and revolve crankshaft (Note: 4 cylinder models are fitted with a barring plate at crankshaft pulley, figure 24) until numbers 1 and 6 valves (on 4 cylinder) or numbers 1 and 4 (on 6 cylinder) are opened by their respective rocker arms.

Insert the correct thickness feeler gage (as shown in the following table) between the valve stem cap and rocker arm of No. 3 inlet valve (on 4 cylinder) or No. 9 inlet valve (on 6 cylinder) as shown in figure 25. Turn the valve clearance adjusting screw until the feeler blade is lightly caught between the rocker arm and valve stem cap, but so that the blade can still be removed with light resistance.

Select the appropriate feeler blade and repeat the procedure for No. 8 exhaust valve (on 4 cylinder) or No. 12 exhaust valve (on 6 cylinder models).

Rotate the engine and, following the sequence in following table, adjust each of the remaining valves. Replace rocker cover, making certain that gasket is unbroken and correctly positioned. After running engine for a short while, check rocker arm cover gasket for possible oil leaks.

VALVE CLEARANCES (Engine at normal working temperature)

	INLET	EXHAUST
NORMALLY ASPIRATED	.015"	.012"
TURBO-CHARGED	.018"	.018"

ADJUSTMENT SEQUENCE - 4 CYL. MODELS  
(Valves are numbered starting at front of engine)

VALVES OPEN	VALVES TO ADJUST
1 and 6	3 In. and 8 Ex.
2 and 4	5 Ex. and 7 In.
3 and 8	1 Ex. and 6 In.
5 and 7	2 In. and 4 Ex.

ADJUSTMENT SEQUENCE - 6 CYL. MODELS

VALVES OPEN	VALVES TO ADJUST
1 and 4	9 In. and 12 Ex.
8 and 10	3 Ex. and 5 In.
2 and 6	7 Ex. and 11 In.
9 and 12	1 Ex. and 4 In.
3 and 5	8 In. and 10 Ex.
7 and 11	2 In. and 6 Ex.

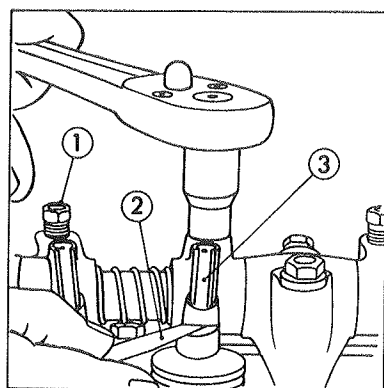


FIG. 25  
ADJUSTING VALVE CLEARANCE  
1- Adjusting screw  
2- Feeler blade  
3- Rocker arm

**TO ADJUST VEE BELT TENSION:** Loosen alternator mounting and adjusting strap bolts as per figure 26. Move alternator to adjust belt tension. Tension is correct when your thumb pressure on belt at a point between alternator and water pump pulleys does not exceed 1/4". Tighten alternator mounting and adjustment strap bolts.

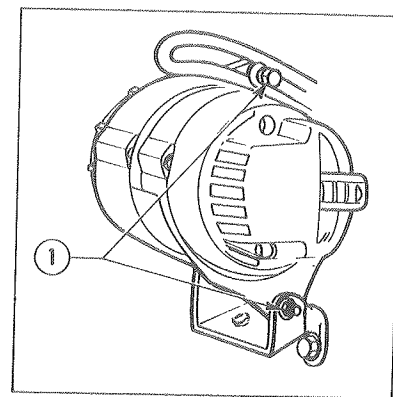


FIG. 26  
BELT ADJUSTMENT  
1 - Adjusting bolts

**INTAKE AIR FILTER:** The air filtering element(s) on your engine is polyurethan foam which traps and holds dust and foreign matter which could be drawn into the engine and cause severe damage. **DO NOT OPERATE ENGINE WITHOUT HAVING FILTER IN PLACE.**

By reason of the efficiency of the filter in trapping contaminants it is difficult to effectively clean the element. It is usually best to replace this low-cost item as occasion demands. Simply slide old element off its retaining screen and carefully stretch a new element into position. If cleaning is desired, wash in a mild detergent mixed in clear, sweet water. **DO NOT** wash in mineral spirits, varsol, gasoline, or any petroleum product.

**TO ADJUST IDLING SPEED:** When properly serviced and after the initial "break-in" period, your engine should idle within a general range of 600 to 700 RPM; when new, idle speed may be somewhat higher.

Engine must be at normal operating temperature when making adjustments. With engine running, loosen the idle screw locknut (figure 27) which is on side of fuel injection pump (between pump and engine block). Adjust the idle speed screw until engine is idling at correct speed and then tighten locknut. Operate the throttle lever to make certain that same returns to same setting.

To adjust for "surging" or erratic idle, carefully adjust the "damper" screw (figure 27) at rear of injection pump. Turn the damper screw in (clockwise) until engine idle speed just starts to increase, then loosen damper screw (turning counter-clockwise) SLIGHTLY. The adjustment at this point is quite critical and should be made by adjusting the screw 1/8 turn at a time, increasing the throttle momentarily between each trial setting until the most favorable adjustment is obtained. Turning the damper screw IN too far will increase the engine idle speed and require resetting the idle stop screw.

Note: If engine is new or cold, it may idle unevenly. Do not increase the idle speed setting to compensate. **ON NO ACCOUNT SHOULD THE MAXIMUM SPEED STOP BE CHANGED.**

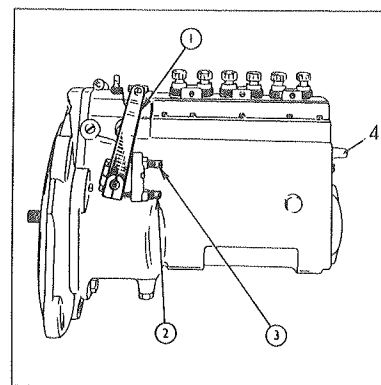


FIG. 27  
INJECTION PUMP

- 1 - Speed control lever
- 2 - Max. speed stop screw
- 3 - Idling stop screw
- 4 - Idle damper screw

**TO REMOVE INJECTORS:** Remove the rocker arm cover from top of engine. Remove the fuel leak-off pipe (fig. 28) by unscrewing the union nut at rear of cylinder head and the bolts connecting leak-off pipe to each injector. Care must be exercised not to bend or damage fuel injector pipes so it is suggested that the union nuts at top of injection pump (fig. 29) be loosened after first removing the injector pipe clamp(s).

Slacken each of the oil seal nuts (fig. 28) on side of cylinder head and by unscrewing the fuel inlet adaptor nuts, remove adaptors from the injectors.

Unscrew the two bolts securing each injector to the cylinder head and carefully remove injectors, making certain that no foreign matter drops into the cavity. A low cost "injector removing tool" will assist in this operation (fig. 30). Remove the copper sealing washer from the injector housing if same is not removed with the injector. New sealing washers should be used when replacing. Note: Special equipment is required for servicing injector, and this should not be attempted by the novice.

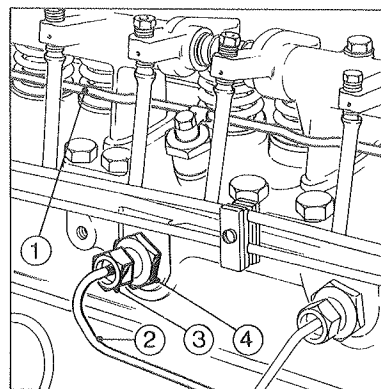


FIG. 28  
INJECTOR PIPES

- 1 - Fuel leak-off pipe
- 2 - Injector pipe
- 3 - Inlet adaptor nut
- 4 - Oil seal nut

**TO CLEAN FUEL LIFT PUMP:** Turn off fuel supply valve. Holding receptacle under pump to prevent spilling of fuel into bilge of boat, loosen the center bolt (fig. 31) and remove cover and pulsator. Clean pump thoroughly and wash cover and pulsator in fuel oil. Replace parts carefully. It will be necessary to bleed fuel system. Check for possible leaks after starting engine.

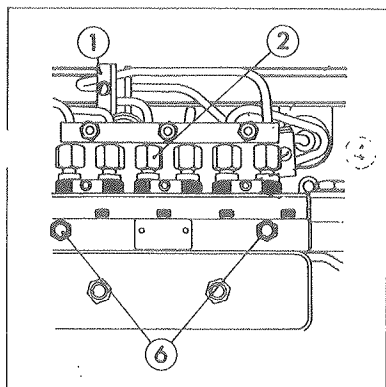


FIG. 29

## INJECTION PUMP

- 1 - Injector pipe clamp
- 2 - Union nut
- 6 - Bleed screws

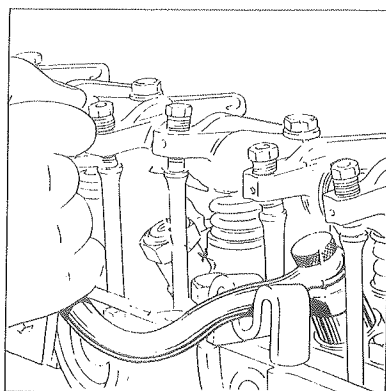


FIG. 30

## INJECTOR REMOVING TOOL

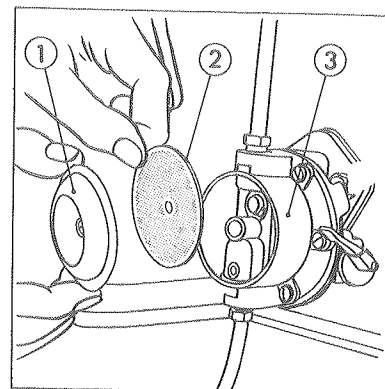


FIG. 31

FUEL LIFT PUMP  
(Except turbo)

- 1 - Cover
- 2 - Diaphragm
- 3 - Pump body

## WINTERIZING

In preparation for freezing temperatures, anti-freeze should be provided in the fresh water system of your engine. Due to the high temperature of operation, a high boiling point anti-freeze is demanded. Do not attempt to use alcohol or other non-permanent types and do not use any liquids containing "sealants". Zerex (produced by DuPont) is highly recommended. Consult the specification chart of your engine to determine its coolant capacity and add sufficient anti-freeze to bring within the limits of expected temperatures.

Inboard type heat exchangers and oil coolers must be drained of raw (sea) water when exposed to freezing temperatures. Drain plugs will be found on bottom of heat exchanger and oil coolers and should be removed until all water has been drained. Raw water pump may be drained by loosening screws holding rear cover in position.

If boat is to remain in water while draining engine, of course, the intake water seacock must be closed prior to draining. Do not neglect to open seacock prior to starting engine.

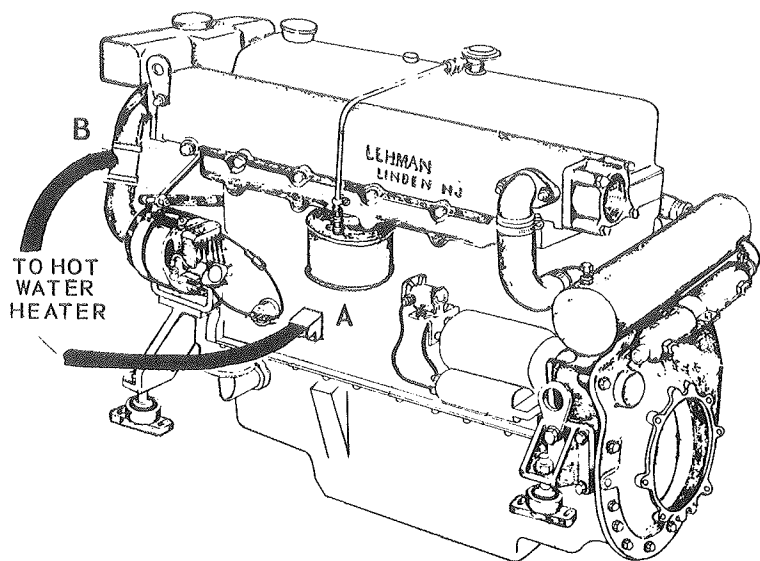
**NOTE: TO DRAIN FRESH WATER, REMOVE WATER FILLER CAP FROM TOP OF EXPANSION TANK ON FRONT OF ENGINE. DRAIN BLOCK BY OPENING PETCOCK ON PORT (LEFT) SIDE OF ENGINE IN CENTER, LOWER SECTION. REMOVE PLUG ON UNDERSIDE OF HEAT EXCHANGER (THE ONE NEAREST CENTER OF EXCHANGER) TO DRAIN WATER FROM EXCHANGER, EXPANSION TANK AND EXHAUST MANIFOLD. REPLACE FILL CAP ON TANK AFTER ALL WATER HAS DRAINED.**

Remove air filter(s) and cover openings in manifold with plastic film held in place with masking tape. Seal off all other openings . . . air vent on top of rocker arm cover, vent on front end of sump and overflow and vent hole on injection pump. Plug exhaust pipe to prevent entrance of moisture.

Make certain that all engine exterior surfaces are clean, dry and free of oil or grease; then spray complete engine with any good rust preventative compound.

Before restarting engine, remove all plastic seals, covers, exhaust plug, etc., and refit air filter(s) in place. Do not neglect to replace all drain plugs, tighten rear cover of raw water pump, and turn on seacock.

## HOT WATER HEATER CONNECTIONS



It is common marine practice to use heat produced by the engine for on-board hot water requirements. A portion of the (fresh water) engine coolant is directed through a "galley hot water heater" which provides the required heat transfer.

Connection to engine (for supplying hot engine coolant to the water heater) is made from engine block drain fitting located at lower, center of block on port side. See "A" in accompanying sketch. A tee fitting will allow this connection, while retaining the convenient drain cock.

Coolant return to engine is made into the formed front water hose leading to the fresh water pump. See "B" in sketch.

Lehman offers a complete "Galley hot water heater connection kit" as optional equipment.

## BOLT TIGHTENING TORQUE LIMITS (ft./lbs.)

Oil Pan Drain Plug . . . . .	30-40	Injector Retaining Bolts . . . . .	12-15
Oil Pump to Cylinder Block . . . . .	12-15	Injector Inlet Adaptor to Injector . . . . .	16-20
Oil Pump Cover Plate . . . . .	12-15	Injector Oil Seal Locknut . . . . .	16-20
Oil Pick-up Tube to Oil Pump . . . . .	12-15	Injector Pipe Nut (pump end) . . . . .	16-20
Oil Pan to Cylinder Block . . . . .	22-24	Injection Pump Bleed Screws . . . . .	3-5
Main Bearing Cap bolts . . . . .	115-120	Leak-off Pipe to Injector Bolt . . . . .	12-15
Connecting Rod bolts . . . . .	85-90	Leak-off Pipe Banjo Connector . . . . .	12-15
Cylinder Head Bolts (engine hot) . . . . .	105-110	Injection Pump Retaining bolts . . . . .	22-27
Cylinder Head Bolts (turbo only) . . . . .	130-145	Injection Pump Fill, Level & Drain	
Crankshaft center bolt . . . . .	240	Plugs . . . . .	3-5
Engine Mounting bolts . . . . .	35-40	Valve rocker Cover Bolts . . . . .	12-18
Rocker Shaft Bracket bolts . . . . .	17-22	Fuel (lift) Pump Center Bolt . . . . .	7-10
Front Housing to Cylinder Block . . . . .	25-30	Fuel Filter Bracket bolts . . . . .	12-15
Camshaft Thrust Plate . . . . .	25-30	Fuel Filter Bleed Screws . . . . .	5-7
Exhaust Manifold Retaining bolts . . . . .	20-25	Fuel (lift) Pump Mounting bolts . . . . .	12-15
Exhaust Manifold Outlet Flange . . . . .	22-27	Alternator Support Bracket bolts . . . . .	12-15
Expansion (water) Tank Nuts . . . . .	12-15	Alternator Adjusting Strap bolt . . . . .	12-15
Flywheel to Crankshaft flange bolts . . . . .	80-90		

Torque limits for various size bolts except as listed above:

1/4" diameter . . . . .	6-9
5/16-18 . . . . .	12-15
5/16-24 . . . . .	15-18
3/8-16 . . . . .	23-28
3/8-24 . . . . .	30-35
7/16-14 . . . . .	45-50
7/16-20 . . . . .	50-60
1/2-13 . . . . .	60-70
1/2-20 . . . . .	70-80
9/16-18 . . . . .	85-95
5/8-18 . . . . .	130-145

# SECTION A

## PARTS IDENTIFICATION - BASE ENGINE

In order to provide a simple method of identification, all models included herein have been assigned a "code" letter as follows:

ENGINE CODE	CU/IN	No.CYLS.	YEARS	IDENTIFICATION
E	242	4	2/65-11/69	With cylinder liners
F	363	6	2/65-11/69	With cylinder liners
G	254	4	12/69-up	Less cylinder liners
H	380	6	12/69-up	Less cylinder liners
I	363	6	7/68-up	Turbocharged

For ease in locating part numbers, turn to the applicable page:

Alternator	-----	see section B
Bearings, main and rod	-----	page A6
Block, engine	-----	A3
Camshaft	-----	A6
Crankshaft	-----	A6
Damper, crankshaft	-----	A13
Filter, fuel	-----	A22-A23
Flywheel	-----	A9
Gasket kit, engine	-----	A3
Head, cylinder	-----	A5
Injection equipment:		
Injectors	-----	A28
Pipes	-----	A20
Pump	-----	A24-A25
Pistons	-----	A6
Pulley, crankshaft	-----	A13
Pump, fuel (lift)	-----	A29
Pump, oil	-----	A12
Pump, water	-----	A31
Starting motor	-----	A33
Sump (oil pan)	-----	A14-A15
Tools	-----	A2
Turbocharger	-----	A35
Valves	-----	A10

By reference to the drawings on the applicable page, select the required part and note the "key" number assigned to it. The key number will be repeated in the first column of a following page. The second column will indicate the engine to which the part applies per the engine code letters shown above. The third column shows the quantity required per engine.

The fourth "code" column indicates the manufacturer of the subject part per the following:

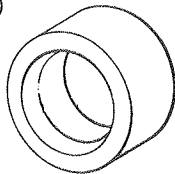
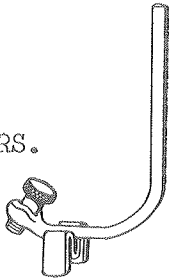
CODE	MANUFACTURER
F	Ford Motor Company
T	Jabsco Pump Company
L	Lehman Power Corporation
P	Paraon Gear Works
S	Simms or CAV (Jos. Lucas Co.)
W	Warner Gear
BY	Motorola, Inc.

SERVICE MANUALS FOR ENGINES AND TRANSMISSIONS ARE LISTED AT END OF SECTION B

WHEN ORDERING PARTS SEE INSTRUCTIONS ON PAGE 2

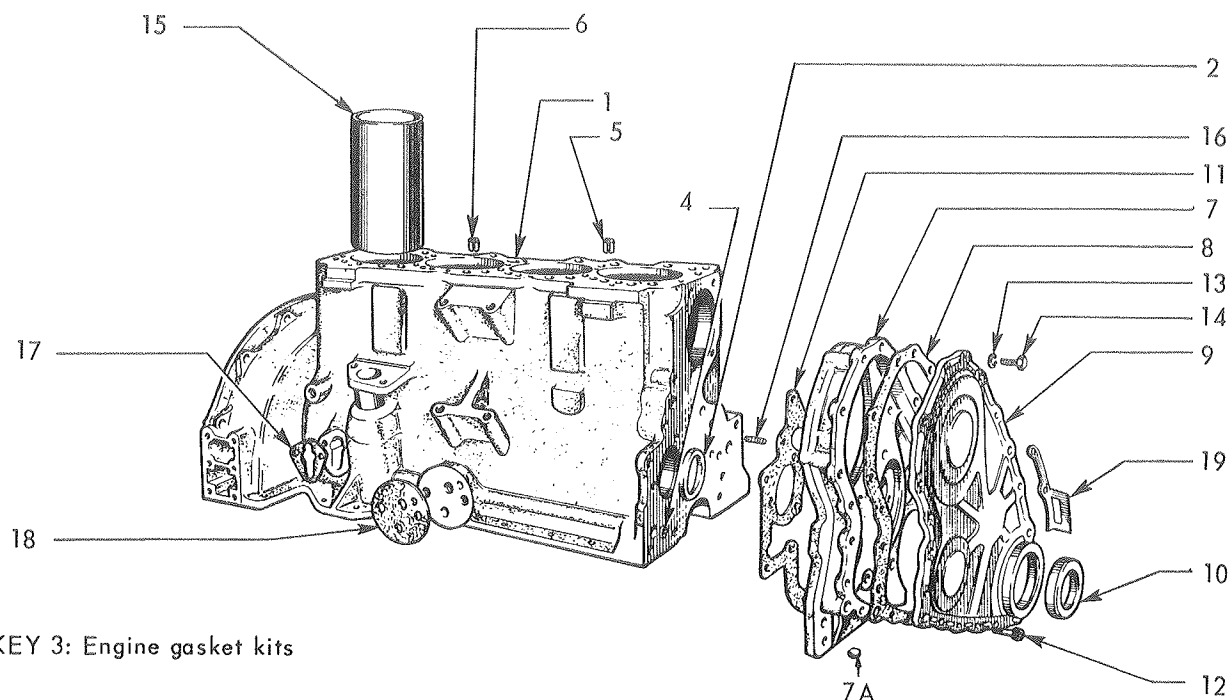
FORD SERVICE TOOLS

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
-	ALL	1	F	1713504	TOOL FOR REMOVING INJECTORS. (SEE PAGE 29)
-	ALL	1	F	8A1	WRENCH FOR FUEL INJECTION PIPE NUTS (TOP OF INJECTION PUMP)
-	ALL	1	F	8A2	SOCKET TOOL - DELIVERY VALVE HOLDER
-	ALL	1	F	8A3	FRONT SEAL (TIMING COVER) CENTRALIZING TOOL
-	ALL	1	F	8A4	TOOL FOR SETTING INJECTION PUMP TIMING. (SEE PAGE 18)





## CYLINDER BLOCK ASSEMBLY



KEY 3: Engine gasket kits

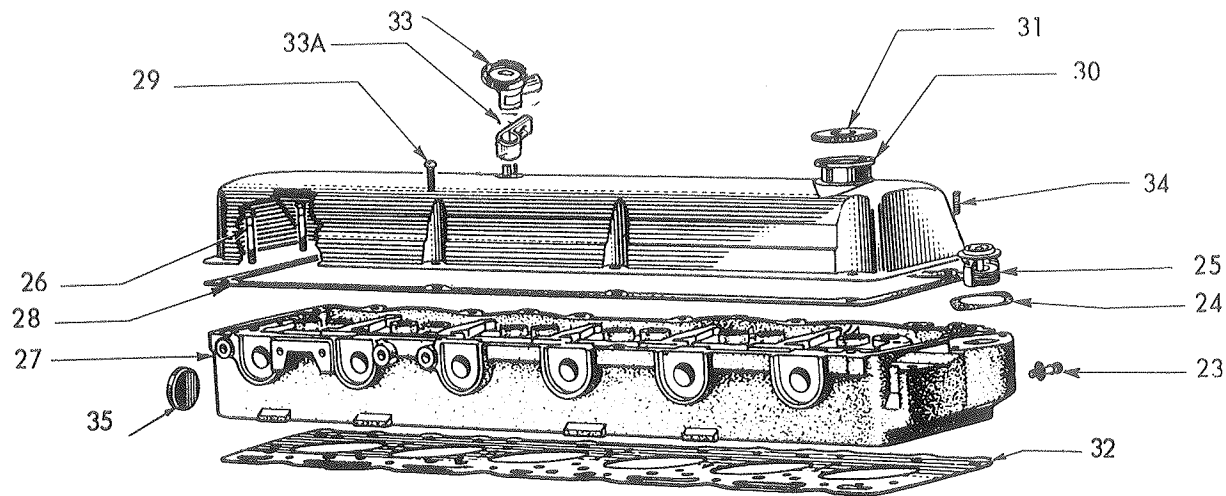
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	NOTES
1	E	1	F	1460397	BLOCK, ENGINE	NOTE 1
1	F	1	F	1460401	BLOCK, ENGINE	NOTE 1
1	G	1	F	1468409	BLOCK, ENGINE	
1	H	1	F	1447612	BLOCK, ENGINE	
1	I	1	F	1527930	BLOCK, ENGINE	
1	E	1	F	1463880	CYL ASS. C/W CRANKSHAFT & PISTONS	
1	F	1	F	1460404	CYL ASS. C/W CRANKSHAFT & PISTONS	NOTE 1
1	G	1	F	1605072	CYL ASS. C/W CRANKSHAFT & PISTONS	
1	H	1	F	6073183	CYL ASS. C/W CRANKSHAFT & PISTONS	
1	I	1	F	1599335	CYL ASS. C/W CRANKSHAFT & PISTONS	
2	ALL	1	F	1788785	SLEEVE, FRONT, STD. (2/65-1/68)	
2	ALL	1	F	1746786	SLEEVE, FRONT, .020" o/s (2/65-1/68)	
2	ALL	1	F	1419959	SLEEVE, FRONT, STD. (1/68-UP)	
2	ALL	1	F	1419960	SLEEVE, FRONT, .020" o/s (1/68-UP)	
3	EG	1	F	1463786	TOP ENGINE O'HAUL GASKET KIT	
	EG	1	F	1428990	SUMP GASKET KIT	
	EG	1	F	1579279	MISCL. GASKET KIT	
	F	1	F	1444135	TOP ENGINE O'HAUL GASKET KIT	
	F	1	F	1428991	SUMP GASKET KIT	
	F	1	F	1579279	MISCL. GASKET KIT	
	H	1	F	1575292	TOP ENGINE O'HAUL GASKET KIT	
	H	1	F	1428991	SUMP GASKET KIT	
	H	1	F	1579279	MISCL. GASKET KIT	
	I	1	F	1575293	TOP ENGINE O'HAUL GASKET KIT	
	I	1	F	1428991	SUMP GASKET KIT	
	I	1	F	1579279	MISCL. GASKET KIT	

NOTE 1: WHEN USING THIS PART, ORDER NEW SUMP TO OIL PUMP TUBE AND 1426698 SEAL.

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	NOTES
4	ALL	1	F	1789547	SEAL, OIL FEED (2/65-3/68)	NOTE 2
4	ALL	1	F	1426698	SEAL, OIL FEED (3/68-UP)	NOTE 2
5	ALL	1	F	116388-ES	DOWEL, .516" DIA.	
6	ALL	1	F	1790651	DOWEL, .392" DIA.	
7	ALL	1	F	6113977	HOUSING, TIMING GEAR	
7A	ALL	1	F	1789541	PLUG, CUP TYPE, 3/8"	
*	ALL	6	L	0E303-C	BOLT, 3/8-16 x 1 1/4	
*	ALL	1	F	1715827	BOLT, 3/8-16 x 7/8	
*	ALL	7	L	0C41	LOCKWASHER, 3/8	
8	ALL	1	F	6059086	GASKET, TIMING GEAR HOUSING	
9	ALL	1	F	1582837	COVER, TIMING GEAR HSG.	
10	ALL	1	F	6062635	SEAL, FRONT OIL	
11	ALL	1	F	1789834	GASKET, HSG. TO BLOCK	
12	ALL	2	F	1789945	BOLT, HSG. TO BRG. CAP	
13	ALL	18	L	0C31	LOCKWASHER, 5/16"	
14	ALL	18	F	1583040	BOLT, 5/16-18 x 1/2	
15	EF	4/6	F	1787897	LINER, CYLINDER	
15	I	6	F	1526012	LINER, CYLINDER, GRADE 1	NOTE 1
15	I	6	F	1526010	LINER, CYLINDER, GRADE 2	NOTE 1
16	ALL	2	F	1401461	STUD, TIMING GEAR HSG.	
17	ALL	1	F	1789436	GASKET, FUEL PUMP	
18	ALL	1	L	2D29	GASKET, OIL TAKE-OFF	
*	ALL	1	F	1703827	PETCOCK, BLOCK DRAIN (SPIGOT TYPE)	
*	ALL	1	L	3J2	PETCOCK, BLOCK DRAIN (TEE HANDLE TYPE)	
*	ALL	2/4	F	1716356	PLUG, EXPANSION, 1.672"	
*	ALL	AR	F	6048527	PLUG, EXPANSION, 2 7/32"	
*	ALL	AR	F	1761991	PLUG, REAR, 2 13/64"	
*	ALL	AR	F	1561836	PLUG, TACH. TAKE-OFF, 1 1/16"	
*	ALL	1	F	1788927	PLUG, OIL GALLERY, .594"	
19		1	F	1702961	TIMING MARKER (NOT USED ON ALL MODELS)	
70	ALL	AR	F	1788928	PLUG, CAM. BORE 2 21/64"	
70	ALL	AR	F	6048528	PLUG, CAM. BORE, 2.203"	

NOTE 1: LINERS AND PISTONS ON TURBO ENGINES ARE MARKED EITHER 1 OR 2 ACCORDING TO CLEARANCE OR FIT BETWEEN BOTTOM SKIRT OF PISTON AND CYLINDER BORE. TOP OF PISTON IS MARKED EITHER 1 OR 2 AND THE BLOCK IS LIKEWISE STAMPED ON PUSH-ROD SIDE OF CYLINDER BLOCK ADJACENT TO THE TOP FACE DURING MANUFACTURE.

NOTE 2: YELLOW IDENTIFICATION MARK ON 1426698 BOTH KEY #4 SEALS INCLUDED IN KEY #3 GASKET KITS.



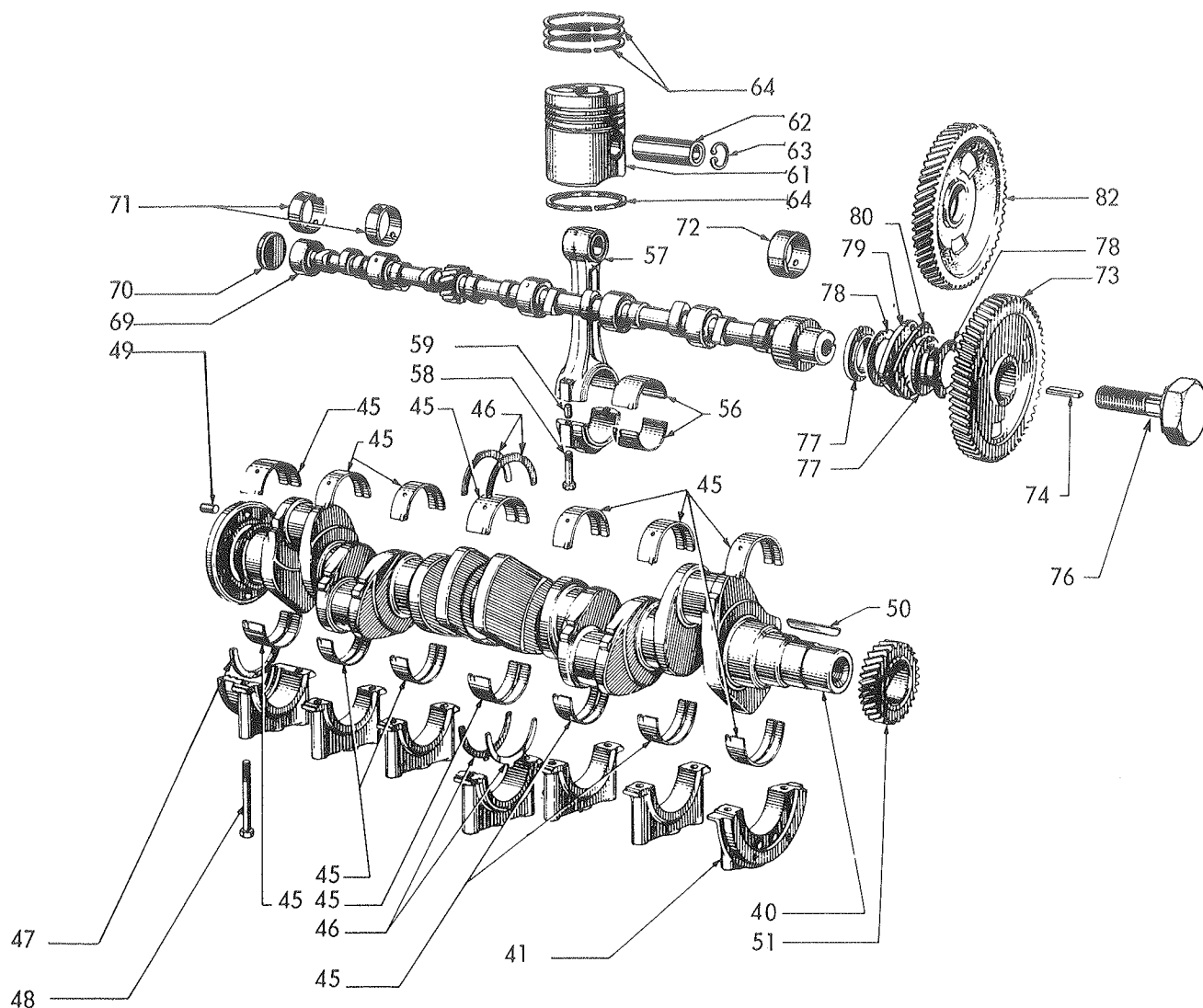
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
23	ALL	4/6	F	6087437	STUD MAINIF. TO HEAD	
24	ALL	1	F	1541317	GASKET, TANK TO CYL. HEAD	
	I	1		6002351	GASKET, THERM. HOUSING	NOTE 2
25	EFGH	1	F	1595156	THERMOSTAT 172°	
25	EFGH	1	F	6071840	THERMOSTAT, 178°	
26	ALL	17/25	F	1415284	BOLT, CYL. HEAD	
26	I	25	F	6071840	BOLT, CYL. HEAD	NOTE 1
27	EG	1	F	6100889	HEAD, CYL.	
27	FH	1	F	1599146	HEAD, CYL.	
27	I	1	F	1599147	HEAD, CYL.	
28	EG	1	F	1762246	GASKET, ROCKER COVER	
28	FHI	1	F	1762293	GASKET, ROCKER COVER	
29	ALL	7/8	F	1568855	SCREW, ROCKER COVER	
30	EG	1	F	6090236	COVER, ROCKER COVER	
30	FHI	1	F	6090237	COVER, ROCKER COVER	
31	ALL	1	F	6071651	CAP, OIL FILL	
32	F	1	F	1564186	GASKET, CYL. HEAD	SEE ALSO KEY 3
32	EG	1	F	1564187	GASKET, CYL. HEAD	SEE ALSO KEY 3
32	HI	1	F	1574857	GASKET, CYL. HEAD	SEE ALSO KEY 3

33	ALL	1	F	1548074	EMISSION VALVE	
33-A	ALL	1	F	1408907	CLAMP, EMISSION VALVE	
34	ALL	2	L	OD10	STUD, TANK MOUNTING	
*	ALL	2	L	OC31	LOCKWASHER, 5/16"	
*	ALL	2	L	OB25	NUT, 5/16-24	
35	ALL	1	F	1716356	PLUG, CYL. HEAD, REAR, 1.672"	

NOTE 1: BOLT WITH INTEGRAL WASHER, NOT INTERCHANGEABLE WITH OTHER TYPE BOLTS.

NOTE 2: MUST BE USED WITH THERMOSTAT HOUSING PART #752

## CRANKSHAFT, CAMSHAFT, PISTONS, RINGS AND BEARINGS



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
40	EG	1	F	6106523	CRANKSHAFT	
40	FH	1	F	1535814	CRANKSHAFT	
40	I	1	F	1512271	CRANKSHAFT	
41	ALL	1	F	1754741	BEARING CAP, FRONT MAIN	
45	EG	1	F	1582109	KIT, MAIN BRG. STD ID; STD OD	NOTE 2
45	EG	1	F	1473045	KIT, MAIN BRG. .010 U/S ID STD OD	NOTE 2
45	EG	1	F	1473046	KIT, MAIN BRG. .020 U/S STD OD	NOTE 2
45	EG	1	F	1473047	KIT, MAIN BRG. .030 U/S ID STD OD	NOTE 2
45	EG	1	F	1473016	KIT, MAIN BRG. .040 U/S ID STD OD	NOTE 2
45	FHI	1	F	1582109	KIT, MAIN BRG. STD ID STD OD	NOTE 2
45	FHI	1	F	1473041	KIT, MAIN BRG. .010 U/S ID STD OD	NOTE 2
45	FHI	1	F	1473042	KIT, MAIN BRG. .020 U/S ID STD OD	NOTE 2
45	FHI	1	F	1473040	KIT, MAIN BRG. .030 U/S ID STD OD	NOTE 2
45	FHI	1	F	1473039	KIT, MAIN BRG. .040 U/S ID STD OD	NOTE 2

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
46	ALL	2	F	1728432	KIT, THRUST WASHER, STD	NOTE 3
46	ALL	2	F	1728433	KIT, THRUST WASHER, .0025 O/S	NOTE 3
46	ALL	2	F	1728434	KIT, THRUST WASHER, .005" O/S	NOTE 3
46	ALL	2	F	1728435	KIT, THRUST WASHER, .0075" O/S	NOTE 3
46	ALL	2	F	1728436	KIT, THRUST WASHER, .010" O/S	NOTE 3
46	ALL	2	F	1728437	KIT, THRUST WASHER, .015" O/S	NOTE 3
46	ALL	2	F	1728438	KIT, THRUST WASHER, .020" O/S	NOTE 3
47	ALL	2	F	6105490	SEAL, CRANKSHAFT OIL	
48	ALL	10/14	F	1788352	BOLT, BRG. CAP	
49	ALL	1	F	1710714	DOWEL, CRANKSHAFT	
50	ALL	1	F	1512311	KEY, CRANKSHAFT GEAR	
51	ALL	1	F	1487748	GEAR, CRANKSHAFT	
56	EFGH	8/12	F	1428375	BEARING, CONN ROD, STD.	
56	EFGH	8/12	F	1428376	BEARING, CONN ID, .010 U/S	
56	EFGH	8/12	F	1428377	BEARING, CONN ID, .020 U/S	
56	EFGH	8/12	F	1428378	BEARING, CONN ID, .030 U/S	
56	EFGH	8/12	F	1428379	BEARING, CONN ID, .040 U/S	
56	I	6	F	1537592	BEARING, CONN. ROD STD UPPER	
56	I	6	F	1537556	BEARING, CONN. ROD .010" UPPER	
56	I	6	F	1537557	BEARING, CONN. ROD .020" UPPER	
56	I	6	F	1428375	BEARING, CONN. ROD STD LOWER	
57	EF	4/6	F	6007061	CONN. ROD ASSY. STD.	
57	GH	4/6	F	6007061	CONN. ROD ASSY. STD	
57	GH	4/6	F	6007062	CONN. ROD ASSY. (.003")	NOTE 4
57	GH	4/6	F	6007063	CONN. ROD ASSY. (.006")	NOTE 4
57	GH	4/6	F	6007064	CONN. ROD ASSY. (.009")	NOTE 4
57	I	6	F	6088942	CONN. ROD ASSY. STD	
57	I	6	F	1542956	CONN. ROD ASSY. (.003")	NOTE 4
58	ALL	8/12	F	1447624	BOLT, CONN. ROD	
59	ALL	8/12	F	1428387	PIN, TENSION	
60	EF	4/6	F	1710453	BUSHING, CONN. ROD	
60	GHI	4/6	F	1497464	BUSHING, CONN. ROD	

NOTE 2 - EACH KIT CONTAINS FULL SET OF MAIN BEARINGS FOR LISTED ENGINE.

NOTE 3 - EACH KIT CONTAINS 2 HALF WASHERS (EACH ENGINE REQUIRES 2 KITS).

NOTE 4 - DIMENSION INDICATES PISTON HEIGHT ABOVE BLOCK SURFACE.

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	NOTES
61	EF	4/6	F	1436363	PISTON, PIN & RINGS STD.	
61	GH	4/6	F	1587878	PISTON, PIN & RINGS, STD.	
61	GH	4/6	F	1587879	PISTON, PIN & RINGS, .015" o/s	NOTE 3
61	GH	4/6	F	1587880	PISTON, PIN & RINGS, .035" o/s	NOTE 3
61	GH	4/6	F	1587881	PISTON, PIN & RINGS, .055" o/s	NOTE 3
61	I	6	F	1523643	PISTON, PIN & RINGS, STD	
62	EF	4/6	F	1516961	PIN, PISTON	
62	GHI	4/6	F	1516960	PIN, PISTON	
63	EF	8/12	F	1710376	RETAINER, PISTON PIN	
63	GHI	8/12	F	1415288	RETAINER, PISTON PIN	
64	EF	2/3	F	1584935	KIT, PISTON RING, STD	NOTE 2
64	EF	2/3	F	1719953	KIT, PISTON RING, .025" o/s	NOTE 2
64	GH	4/6	F	1584931	KIT, PISTON RING, STD	
64	GH	4/6	F	1584932	KIT, PISTON RING, .015" o/s	
64	GH	4/6	F	1584933	KIT, PISTON RING, .035" o/s	
64	GH	4/6	F	1584934	KIT, PISTON RING, .055" o/s	
64	I	3	F	1548729	KIT, PISTON RING, STD. (1/73/UP)	NOTE 2
69	EG	1	F	1587825	CAMSHAFT	NOTE 1
69	FHI	1	F	1487978	CAMSHAFT	
70	ALL	1	F	1788928	PLUG, CAMSHAFT, REAR	
71	ALL	3/5	F	1789333	BRG., CAMSHT, EXCEPT FRONT, STD.	
71	ALL	3/5	F	1789334	BRG., CAMSHT, EXCEPT FRONT, .020" o/s OD	
72	ALL	1	F	1794742	BRG., CAMSHT, FRONT, STD.	
72	ALL	1	F	1794743	BRG., CAMSHT, FRONT, .020 o/s OD	
73	ALL	1	F	1599143	GEAR, CAMSHAFT (COLOR CODE BLUE)	
74	ALL	1	F	1789748	KEY, CAM GEAR	
76	ALL	1	F	1487140	BOLT, CAM GEAR	NOTE 4
77	EF	1	F	N.L.A.	COLLAR, CAMSHT, THRUST (CHAMFERED)	
77	ALL	1	F	1427085	COLLAR, CAMSHT, THRUST (PLAIN)	
78	ALL	2	F	1793898	WASHER, CAMSHT THRUST	
79	ALL	1	F	1701616	PLATE, CAMSHT THRUST	

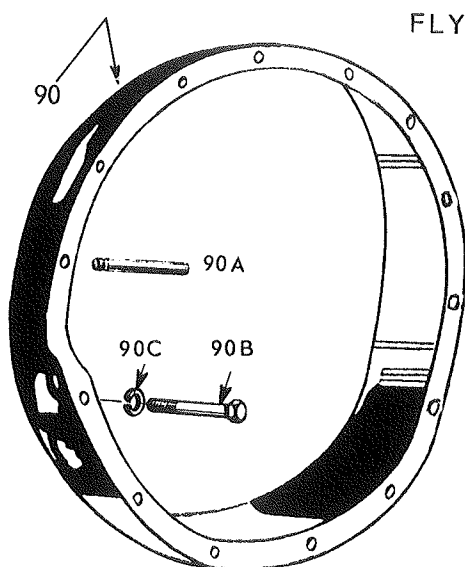
NOTE 1 - WHEN USED IN CYLINDER BLOCK CONTAINING CAMSHAFT LINERS, THE PHOSPHATE COATING MUST BE REMOVED FROM BEARING JOURNALS.

NOTE 2- THESE PISTON RING KITS CONTAIN SUFFICIENCT RINGS FOR TWO PISTONS.

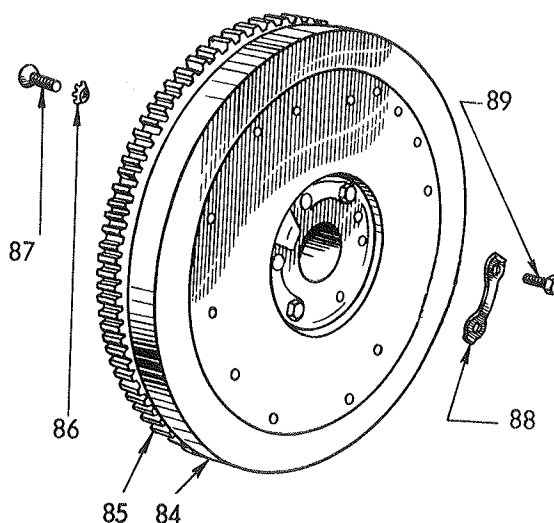
NOTE 3 - REPLACE IN COMPLETE ENGINE SETS. BORE SIZES MAY NOT BE MIXED.

NOTE 4 - FORMERLY SEPARATE BOLT & WASHER

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	NOTES
80	ALL	1	F	1702841	PLATE, LOCKING	
*	ALL	3	L	0E303C	BOLT, CAMSHT. THRUST	
82	ALL	1	F	1568733	GEAR, INJ. PUMP DRIVE	
*	ALL	1	F	1515457	NUT, GEAR TO SHAFT	
*	ALL	1	L	0C61	WASHER	
*	ALL	1	F	3416018	KEY	
82	F	1	F	1703843	GEAR, INJ. PUMP. USE WITH C.A.V. (ROTARY) PUMP ONLY	
*	F	3	F	3414943	BOLT, GEAR TO PUMP HUB	
*	F	3	F	3415320	LOCKWASHER	
*	F	1	F	1788818	PIN	

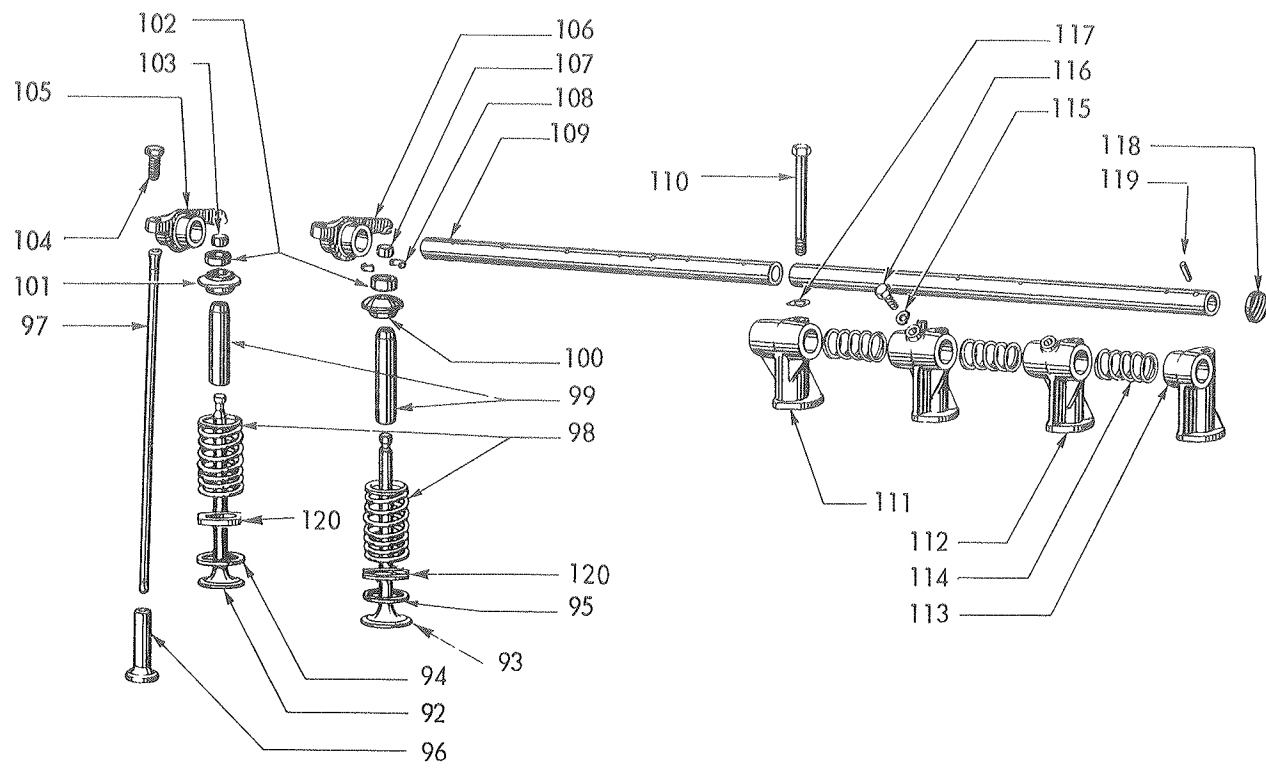


FLYWHEEL ASSEMBLY



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
84	ALL	1	F	1476012	FLYWHEEL ASSY. (INCL. KEY 85)
84	ALL	1	F	1745236	FLYWHEEL ASSY. - SPECIAL 200 LB.
85	ALL	1	F	1710704	RING GEAR, FLYWHEEL
86	ALL	6	F	1606427	LOCKWASHER, RING GEAR
87	ALL	6	F	1758355	SCREW, RING GEAR
88	ALL	3	F	1798064	LOCKPLATE, FLYWHEEL
89	ALL	6	F	1788021	BOLT, FLYWHEEL
90	ALL	1	L	1A373	SPACER, HOUSING (733) (REQ. WITH 200 LB. FLYWHEEL)
90A	ALL	2	L	2K207	DOWEL, SPACER HOUSING
90B	ALL	15	L	0E410	BOLT, 7/16-14 x 4"
90C	ALL	15	L	0C51	LOCKWASHER, 7/16"

VALVE OPERATING MECHANISM



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
92	ALL	4/6	F	1596817	VALVE, EXHAUST	NOTE 3
93	ALL	6	F	1538374	VALVE, INLET	
94	ALL	4/6	F	1710305	INSERT, EXHAUST SEAT, STD.	NOTE 1
94	ALL	4/6	F	1743925	INSERT, EXHAUST SEAT .010" O/S OD	NOTE 1
94	ALL	6	F	1430249	INSERT, EXHAUST SEAT, STD.	NOTE 2
94	ALL	6	F	1430250	INSERT, EXHAUST SEAT,.010" O/S OD	NOTE 2
95	ALL	4/6	F	1788847	INSERT, INTAKE SEAT, STD.	NOTE 1
95	ALL	4/6	F	1788848	INSERT, INTAKE SEAT,.010" O/S OD	NOTE 1
95	ALL	6	F	1430247	INSERT, INTAKE SEAT, STD.	NOTE 2
95	ALL	6	F	1430248	INSERT, INTAKE SEAT,.010" O/S OD	NOTE 2
96	ALL	8/12	F	1403429	TAPPET (STD.)	
97	ALL	8/12	F	1745354	PUSH ROD	
98	ALL	8/12	F	1717773	VALVE SPRING	
99	ALL	8/12	F	1710777	VALVE GUIDE	

NOTE 1: USED THRU ENGINE SERIAL 929496 (JULY 1974)  
NOTE 2: USED FROM ENGINE SERIAL 929497 (AUGUST 1974)  
NOTE 3: VALVE STEM HAS 1/8" CHAMFERED SLOT. USED WITH (KEY 108) 1596819 TAPERED TYPE COLLET. SERVICE STARTED OCTOBER 1974, REPLACING VALVE 1745444 HAVING SQUARE TYPE SLOT IN STEM.

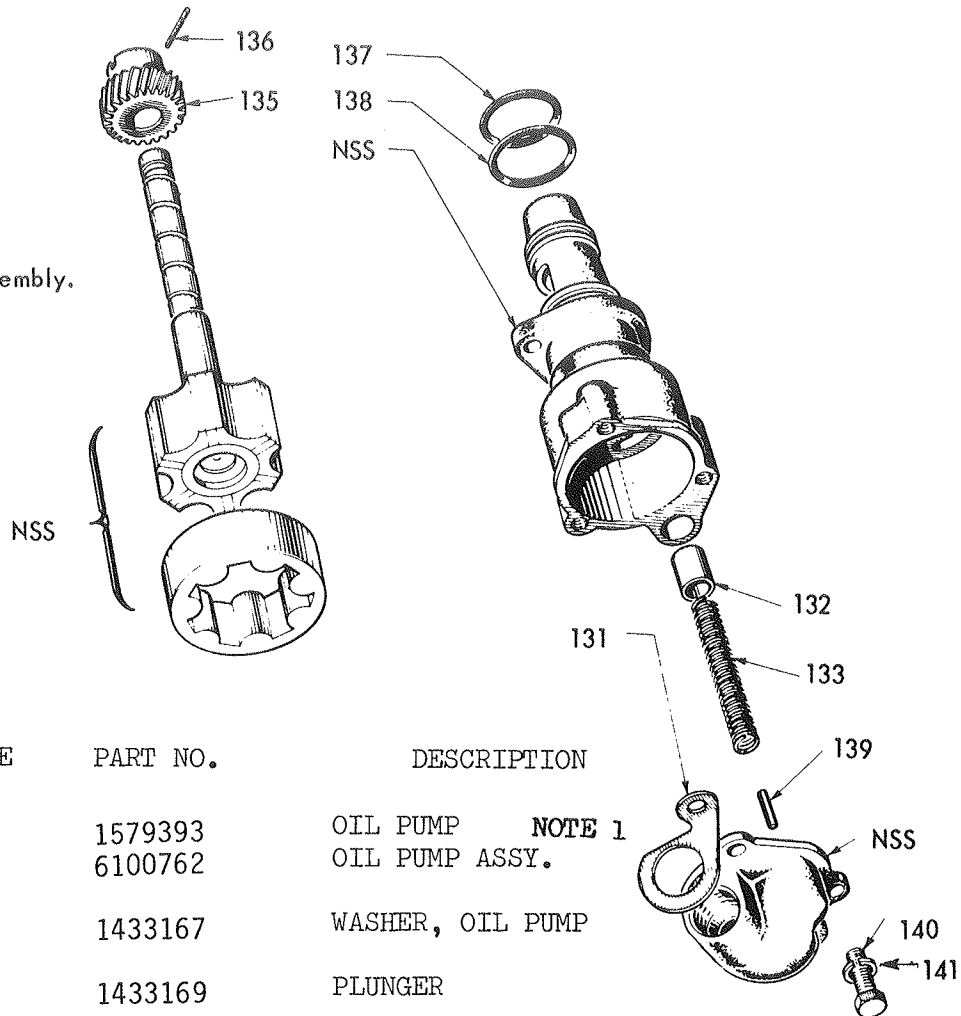


KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
100	ALL	4/6	F	1473015	RETAINER, INLET VALVE SPRING
101	ALL	4/6	F	1473015	RETAINER, EXHAUST VALVE SPRING
102	ALL	8/12	F	1710835	SEAL, VALVE STEM
103	ALL	4/6	F	1789727	CAP, EXHAUST VALVE STEM
104	ALL	8/12	F	1789505	SCREW, ROCKER ARM ADJUST.
105	EF	4/6	F	6084185	ROCKER ARM, L.H.
105	GHI	4/6	F	6093620	ROCKER ARM, L.H.
106	EF	4/6	F	6084186	ROCKER ARM, R.H.
106	GHI	4/6	F	6084186	ROCKER ARM, R.H.
107	ALL	4/6	F	1789727	CAP, INTAKE VALVE STEM
108	ALL	8/12	F	1745444	COLLET, SPRING RETAINER, TAPERED TYPE
109	EG	1	F	1788868	SHAFT, ROCKER ARM
109	FHI	2	F	6085961	SHAFT, ROCKER ARM
110	ALL	5/7	F	1716046	BOLT, ROCKER SUPPORT 3/8-16 x 3 1/2"
111	ALL	1	F	1710727	BRACKET, SHAFT SUPP. CENTER
112	ALL	2/4	F	1710726	BRACKET, SHAFT SUPP. INTERMEDIATE
113	ALL	2	F	1710818	BRACKET, SHAFT SUPP., FRONT & REAR
114	ALL	4/6	F	1745333	SPRING, ROCKER ARM LOCATING
115	ALL	2/4	L	0C21	LOCKWASHER
116	ALL	2/4	F	1602472	BOLT
117	ALL	5/7	L	0C41	LOCKWASHER
118	ALL	2	F	3416839	PLUG, ROCKER SHAFT END
119	ALL	2	F	1745347	PIN, ROCKER SHAFT RETAINING. (USE WHEN RQD ONLY)
120	ALL	8/12	F	1789728	SPACER, VALVE SPRING

NOTE 1: USED THRU OCTOBER 1974 WITH EXHAUST VALVE HAVING SQUARE TYPE SLOT IN STEM.

OIL PUMP ASSEMBLY

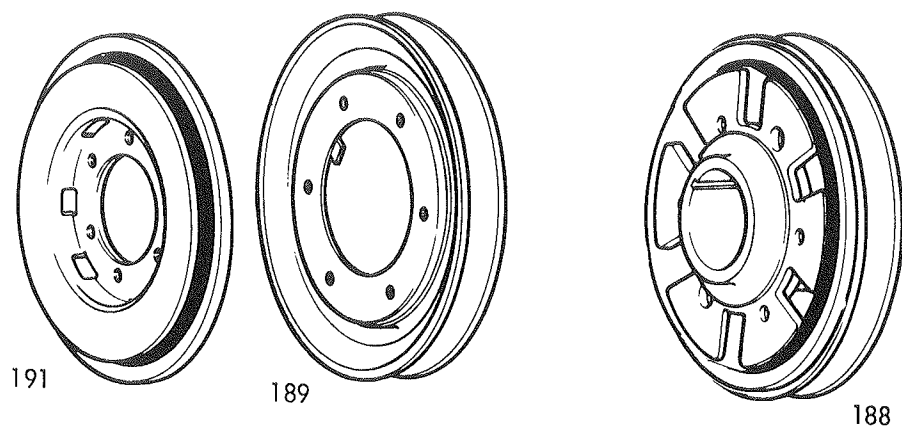
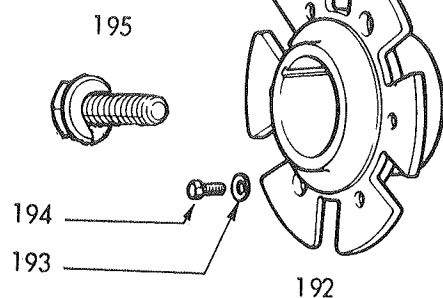
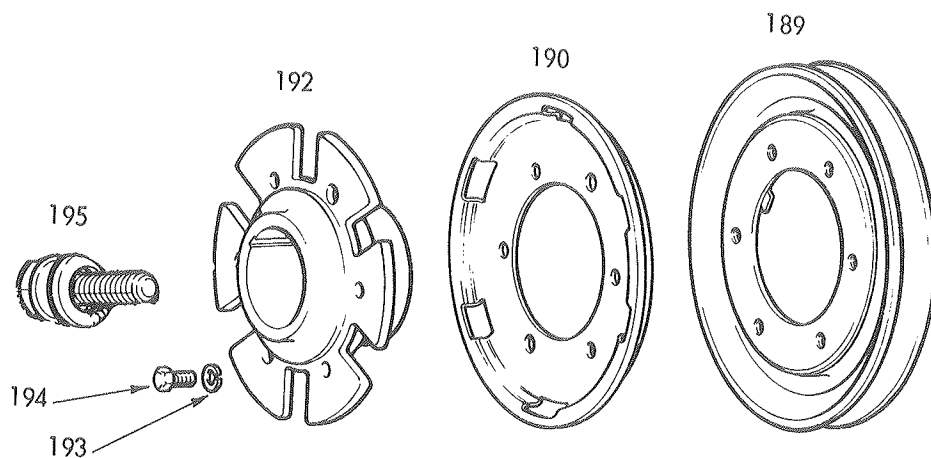
KEY No. 130 - Complete pump assembly.  
NSS - Not supplied separately.



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
130	EG	1	F	1579393	OIL PUMP NOTE 1
130	FHI	1	F	6100762	OIL PUMP ASSY.
131	ALL	1	F	1433167	WASHER, OIL PUMP
132	ALL	1	F	1433169	PLUNGER
133	ALL	1	F	1433168	SPRING
135	ALL	1	F	1793868	GEAR, OIL PUMP
136	ALL	1	F	1720056	PIN, GEAR TO SHAFT
137	AR	1	F	1433203	SEAL, 1 7/16" ID
138	AR	1	F	1433204	SEAL, 1 9/16" ID
139	I	1	F	1433211	PIN, COVER TO BODY
140	ALL	3	L	0E202-C	BOLT, OIL PUMP COVER, 5/16 x 1 USS
141	ALL	3	L	0C31	LOCKWASHER, 5/16"
*	ALL	2	L	0E202-C	BOLT, OIL PUMP TO BLOCK, 5/16 x 1 USS
*	ALL	2	L	0C31	LOCKWASHER FOR ABOVE, 5/16"

NOTE 1: MOTOFIDES AND EATON HOLBOURN PUMPS ARE INTERCHANGEABLE.

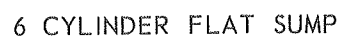
## 4 CYLINDER MODELS

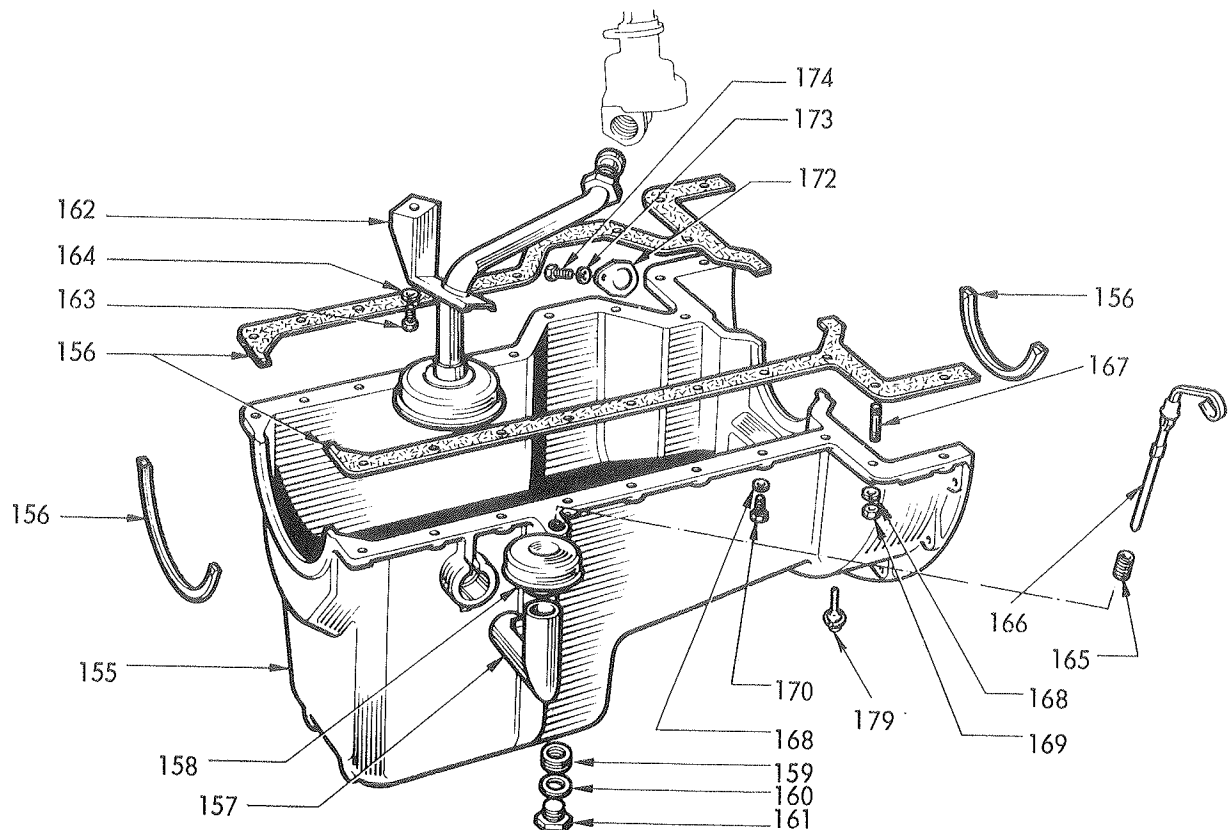
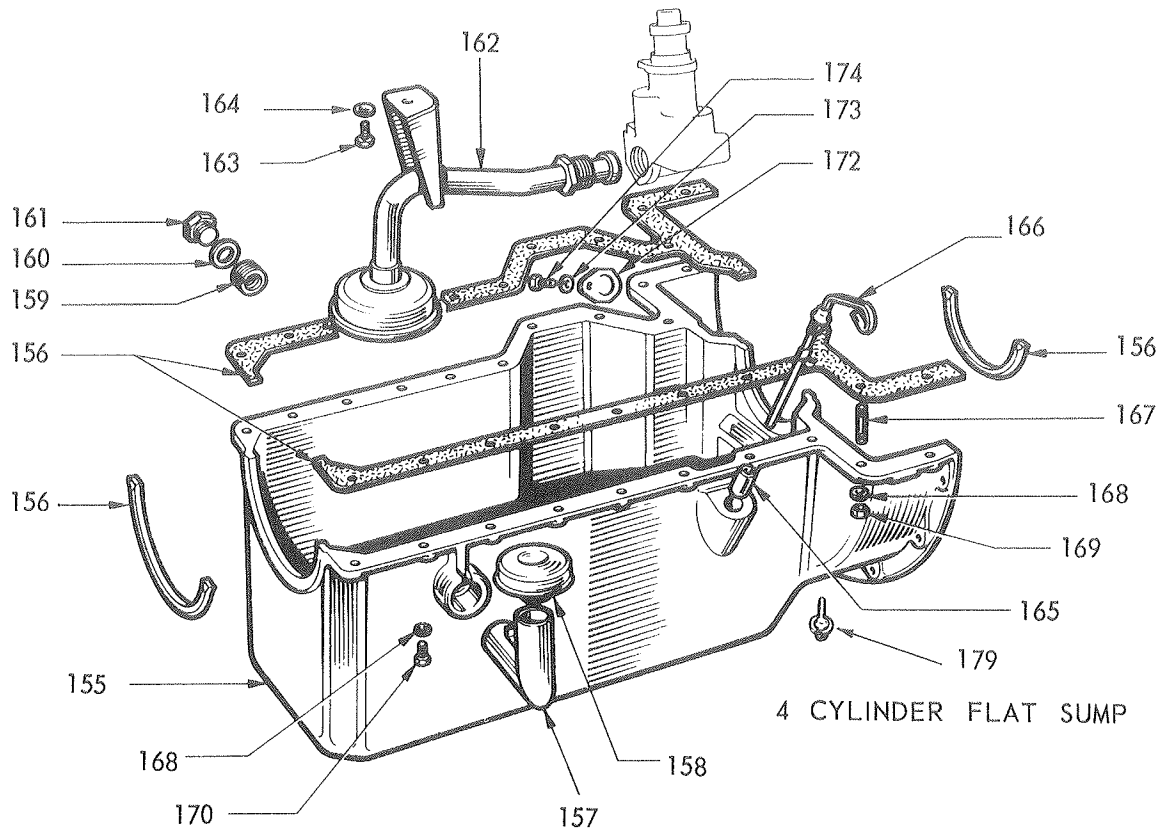


## 6 CYLINDER MODELS

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
188	HI	1	F	6086403	PULLEY/DAMPER ASSY. 7 5/8" DIA. SINGLE SHEAVE	NOTE 1
	HI	1	F	1549849	PULLEY/DAMPER ASSY. 7 5/8" DIA. DUAL SHEAVE	NOTE 1
189	EFGH	1	F	6086402	PULLEY, CRANKSHAFT	
190	EG	1	F	1778344	PLATE, ENGINE BARRING	
*	ALL	2	F	1794303	DOWEL, BARRING PLATE OR DAMPER TO PULLEY HUB	
191	F	1	F	1794021	DAMPER, CRANKSHAFT, 9 3/4" DIA.	
191	H	1	F	1461766	DAMPER, CRANKSHAFT (THRU 1974), 10 5/8" DIA.	
192	EFGH	1	F	1447271	HUB, CRANKSHAFT PULLEY	
193	EFGH	6	L	0C31	LOCKWASHER	
*	EFGH	2	L	0C30	FLAT WASHER, 5/16"	
194	EFGH	6	F	1715834	BOLT, 5/16-24 x 1"	
195	ALL	1	F	6059090	FLANGED BOLT	

NOTE 1: REPLACES KEY 189 THRU 194 STARTING 1974

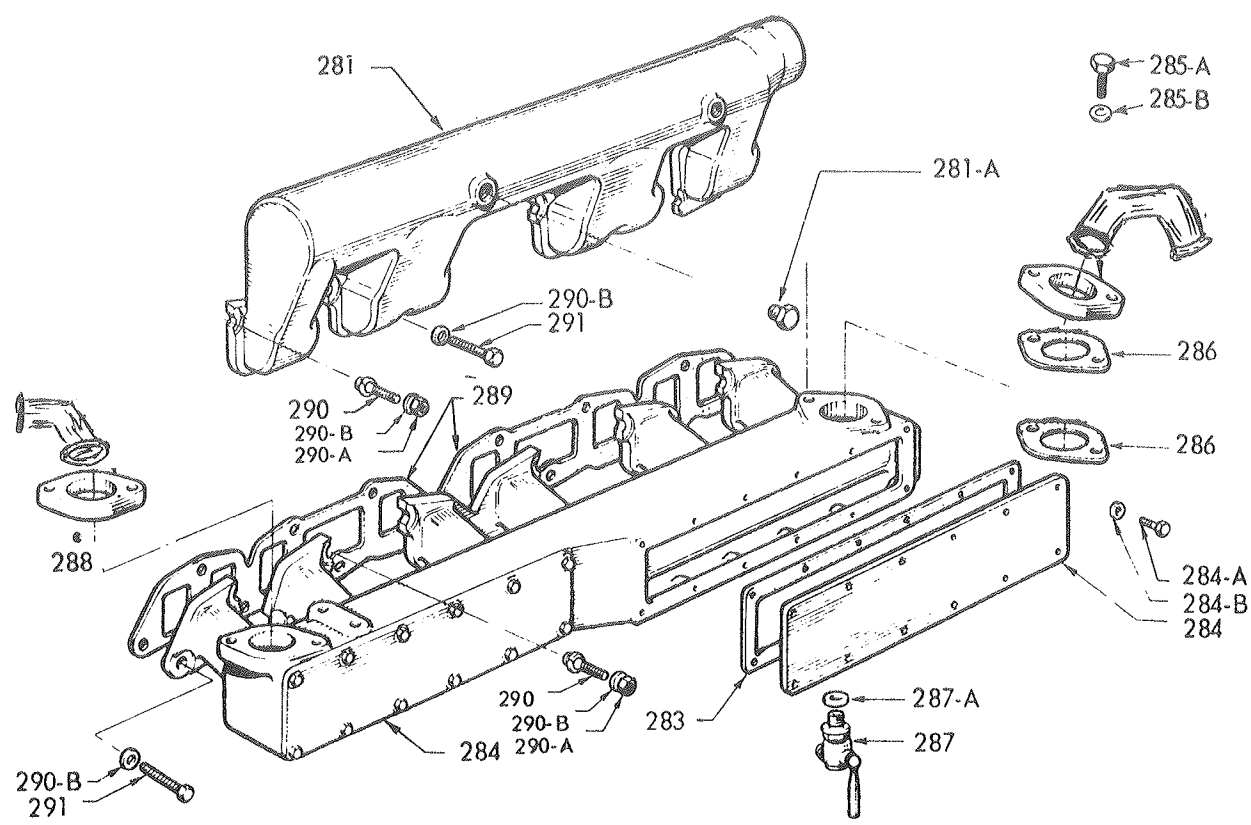




KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
155	EG	1	F	1509694	SUMP, OIL, FLAT TYPE
155	EG	1	F	1789337	SUMP, OIL, FRONT WELL TYPE
155	FH	1	F	1403431	SUMP, OIL, FLAT TYPE
155	FH	1	F	1789337	SUMP, OIL, FRONT WELL TYPE
155	I	1	F	1538997	SUMP, OIL, FLAT TYPE
156	EG	1	F	1428996	KIT, SUMP GASKET
156	FHI	1	F	1428997	KIT, SUMP GASKET
					SEE ALSO KEY #3
					SEE ALSO KEY #3
157	ALL	1	F	1703608	TUBE, CRANKCASE VENT
158	ALL	1	F	1608307	CAP, CRANKCASE VENT
159	ALL	1	F	1708048	INSERT, SUMP DRAIN PLUG
160	ALL	1	F	1710927	GASKET, SUMP DRAIN PLUG
161	ALL	1	F	1704131	PLUG, SUMP DRAIN
162	E	1	F	1797976	TUBE, OIL PICK-UP. USED W/ FRONT WELL SUMP TO ENGINE SERIAL S-647473 (MAR. 1968)
162	EG	1	F	1508085	TUBE, OIL PICK-UP. USED W/FRONT WELL SUMP STARTING ENGINE NO. S-647474.
162	E	1	F	1409810	TUBE, OIL PICK-UP. USED W/FLAT SUMP TO ENGINE SERIAL S-647473 (MAR. 1968)
162	EG	1	F	1508088	TUBE, OIL PICK-UP. USED W/FLAT SUMP STARTING ENGINE SERIAL S-647474
162	FHI	1	F	1508092	TUBE, OIL PICK-UP. USED WITH FLAT SUMP
162	FHI	1	F	1511062	TUBE, OIL PICK-UP. USED WITH FRONT WELL SUMP.
163	ALL	1	F	1583040	BOLT, SUMP TUBE
164	ALL	1	L	OC31	WASHER

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
165	EG	1	F	1788795	TUBE, OIL STICK. 3 5/16" OA LONG
165	FH	1	F	1788874	TUBE, OIL STICK. 2 3/8" OA LONG
165	I	1	F	1415303	TUBE, OIL STICK
166	EG	1	F	1791936	DIP STICK, OIL. USED WITH FLAT SUMP
166	FH	1	F	1403432	DIP STICK, OIL. USED WITH FLAT SUMP
166	EF'GH	1	F	1710937	DIP STICK. OIL. USED WITH FRONT WELL SUMP.
166	I	1	F	1457366	DIP STICK, OIL.
167	ALL	4	F	6115327	STUD, SUMP TO BLOCK
168	ALL	21/29	L	0C41	LOCKWASHER, 3/8"
169	ALL	4	L	0B34	NUT, 3/8 - 24
170	ALL	21/29	L	0E302	BOLT, 3/8 - 16 x 1"
171	FHI	2	F	1720055	PIN, SUMP TO BLOCK
172	ALL	1	L	1A329	COVER, APERTURE
*	ALL	1	L	1C28	GASKET, APERTURE COVER
173	ALL	1	L	0C31	LOCKWASHER, 5/16"
174	ALL	1	L	0E201	BOLT, 5/16-18 x 1"
175	I	1	F	1433169	ADAPTOR, OIL RETURN
176	I	1	F	1521644	PLUG, SUMP
177	ALL	1	F	1703791	PLUG, OIL STICK TAPPING
179	ALL	1	L	0E290	SELF TAP SCREW/WASHER ASSY.

MANIFOLDS - INTAKE & EXHAUST  
TURBO MODELS ONLY - (For other models see section B)



KEY 282 - Complete exhaust manifold ass'y.

KEY	ENGINE	QUAN.	CODE	PART NO.	DESCRIPTION
281	I	1	F	6062098	MANIFOLD, INTAKE
281-A	I	2	F	1472481	PLUG, 7/8-14 HEX.
282	I	1	F	1487987	EXHAUST MANIFOLD ASSY., COMPLETE
283	I	2	F	1458318	GASKET, COVER
284	I	2	F	1487988	COVER, WATER JACKET
284-A	I	24	F	1602472	BOLT, COVER, HEX. HD. 1/4-28 x 3/4
284-B	I	24	L	OC-21	LOCKWASHER, 1/4"
285-A	I	4	L	OE-352	BOLT, HEX. HD., 3/8-24 x 1"
285-B	I	4	L	OC-41	LOCKWASHER, 3/8"



KEY	ENGINE	QUAN.	CODE	PART NO.	DESCRIPTION
286	I	2	F	1458319	GASKET, FLANGE
287	ALL	1	F	1703827	PETCOCK, DRAIN
287-A	I	1	F	1796718	WASHER, COPPER, 1/2" x 3/4" x .064"
288	I	1	F	1A385	ELBOW
289	I	2	F	1418493	GASKET, MANIFOLD TO HEAD
290	ALL	7	F	6087437	STUD
290-A	I	7	L	0B-34	NUT, HEX., 3/8-24
290-B	I	13	F	1415664	WASHER, FLAT, .420" ID x .880" OD
291	I	6	L	0E303-C	BOLT, HEX. HD., 3/8-16 x 1 1/4"
292	I	1	F	1A386	ELBOW



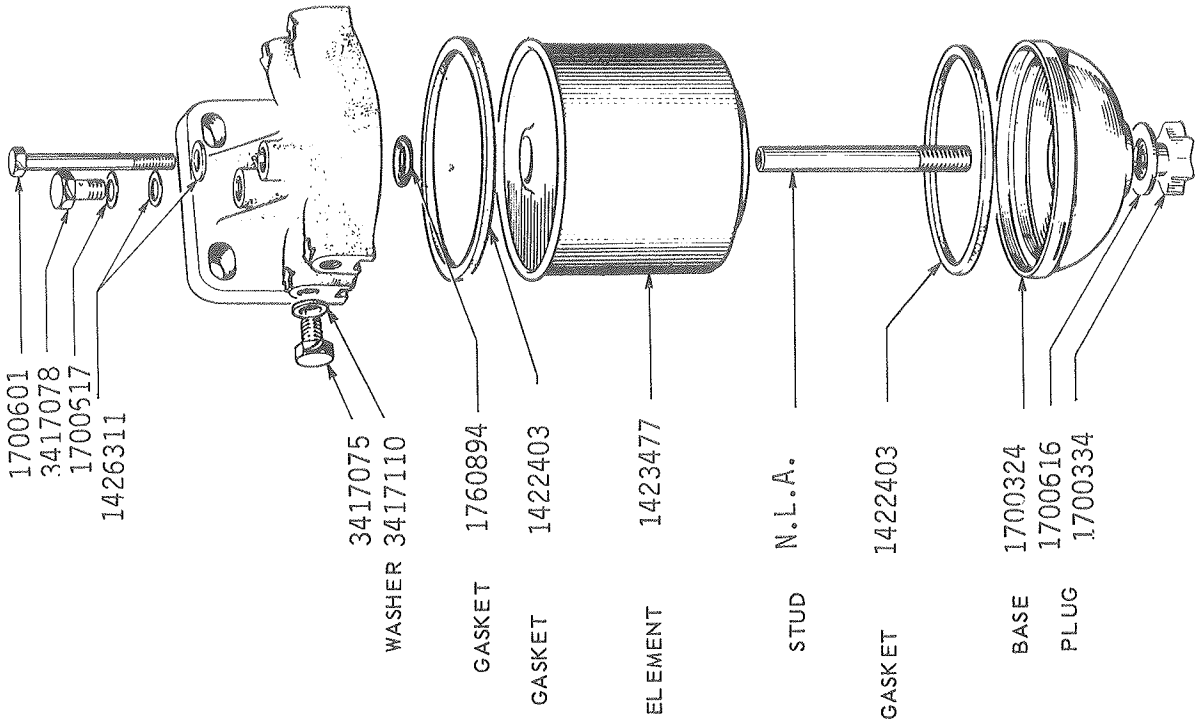
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	A21
202	E	1	F	1487984	FUEL PIPE	
202	G	1	F	9200006	FUEL PIPE, USE WITH SINGLE BOWL FILTER	
202	G	1	F	9200006	FUEL PIPE, USE WITH DUAL BOWL FILTER	
202	F	1	F	1447315	FUEL PIPE, USE WITH SINGLE BOWL FILTER	
202	H	1	F	9200006	FUEL PIPE, USE WITH SINGLE BOWL FILTER	
202	H	1	F	9200006	FUEL PIPE, USE WITH DUAL BOWL FILTER	
202	I	1	F	1487744	FUEL PIPE	
203	EG	1	F	1464561	FUEL PIPE, USE WITH DUAL BOWL FILTER	
203	FHI	1	F	1427611	FUEL PIPE, USE WITH DUAL BOWL FILTER	
203	FHI	1	F	1489009	FUEL PIPE, USE WITH SINGLE BOWL FILTER	
203	F	1	F	1700361	FUEL PIPE, USE WITH C.A.V. INJ. PUMP AND SINGLE BOWL FILTER (FUEL RETURN)	
204	EG	1	F	1407447	LEAK-OFF PIPE, INJ. PUMP (NOTE 1)	
204	FHI	1	F	6097947	LEAK-OFF PIPE, INJ. PUMP (NOTE 1)	
205	ALL	1	F	1461587	CLIP, LEAK-OFF PIPE (NOTE 1)	
206	ALL	1	F	1749944	PLUG	
206	ALL	1	F	1788796	BOLT, LEAK-OFF (NOTE 1)	
207	ALL	1	F	1422409	WASHER	
207	ALL	2	F	1422409	WASHER (NOTE 1)	
209	EG	1	F	1514296	PIPE, INJECTOR LEAK-OFF	
209	FHI	1	F	1514297	PIPE, INJECTOR LEAK-OFF	
210	ALL	1	F	1481753	NUT, COMPRESSION - USE WITH E455036-ES STEEL CONNECTOR	
210	ALL	1	L	3E12	NUT, COMPRESSION - USE WITH 131404-ES BRASS CONNECTOR	
211	ALL	1	F	1514322	CONNECTOR - STEEL	
212	ALL	4/6	F	1791096	SEAL	
213	ALL	1	F	FUEL FILTER	SEE FOLLOWING PAGES	
214	ALL	1	L	3E36	ADAPTOR, LEAK OFF PIPE (NOTE 2)	
215	ALL	1	L	1A233	MOUNTING BRACKET FOR SINGLE BOWL FILTER	
215	ALL	1	F	1427610	MOUNTING BRACKET FOR DUAL BOWL FILTER	
216	ALL	1	F	3C26	HOSE BARB	

NOTE 1: LEAK-OFF PIPE (KEY 204) WITH ATTACHING PARTS AND NON-VENTED COVER (KEY 272) USED TO FEBRUARY 1975 ONLY.

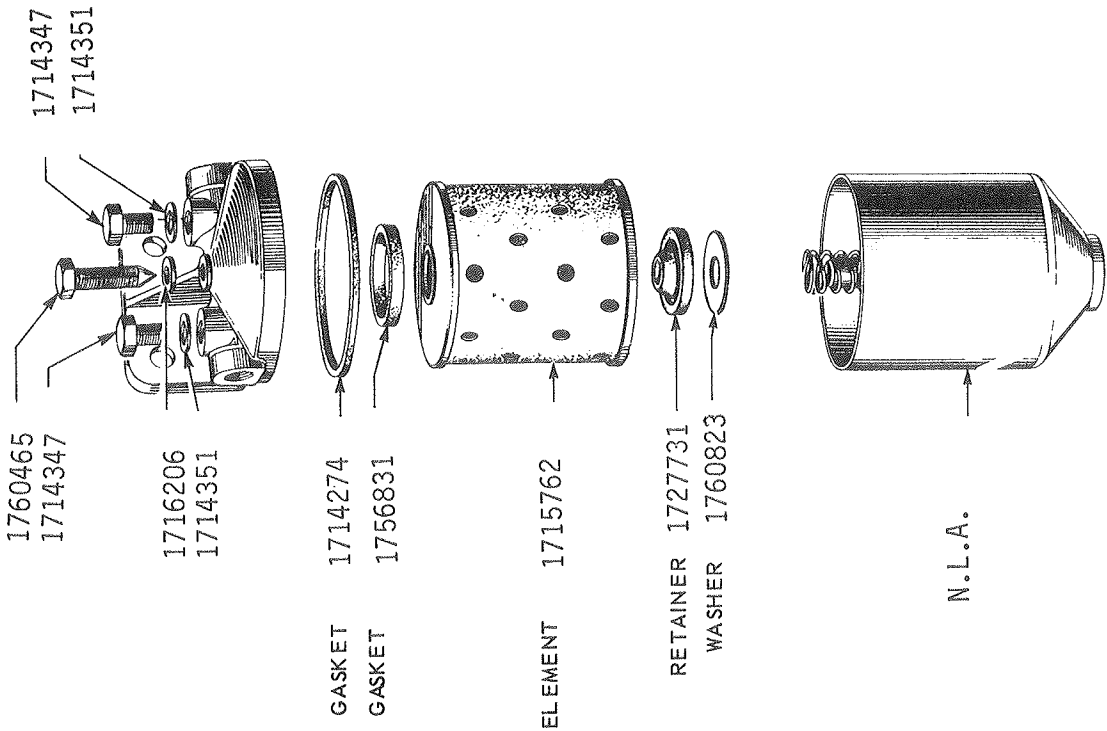
NOTE 2: BANJO FITTING USED TO JUNE 1974 CONSISTS OF:

1	F	1714487	BANJO ADAPTOR, LEAK-OFF
1	F	1715904	BOLT, LEAK-OFF
2	F	1707206	WASHER
1	F	3C26	ADAPTOR

(KEY 213) FUEL FILTERS  
(All part numbers on this page are code F)

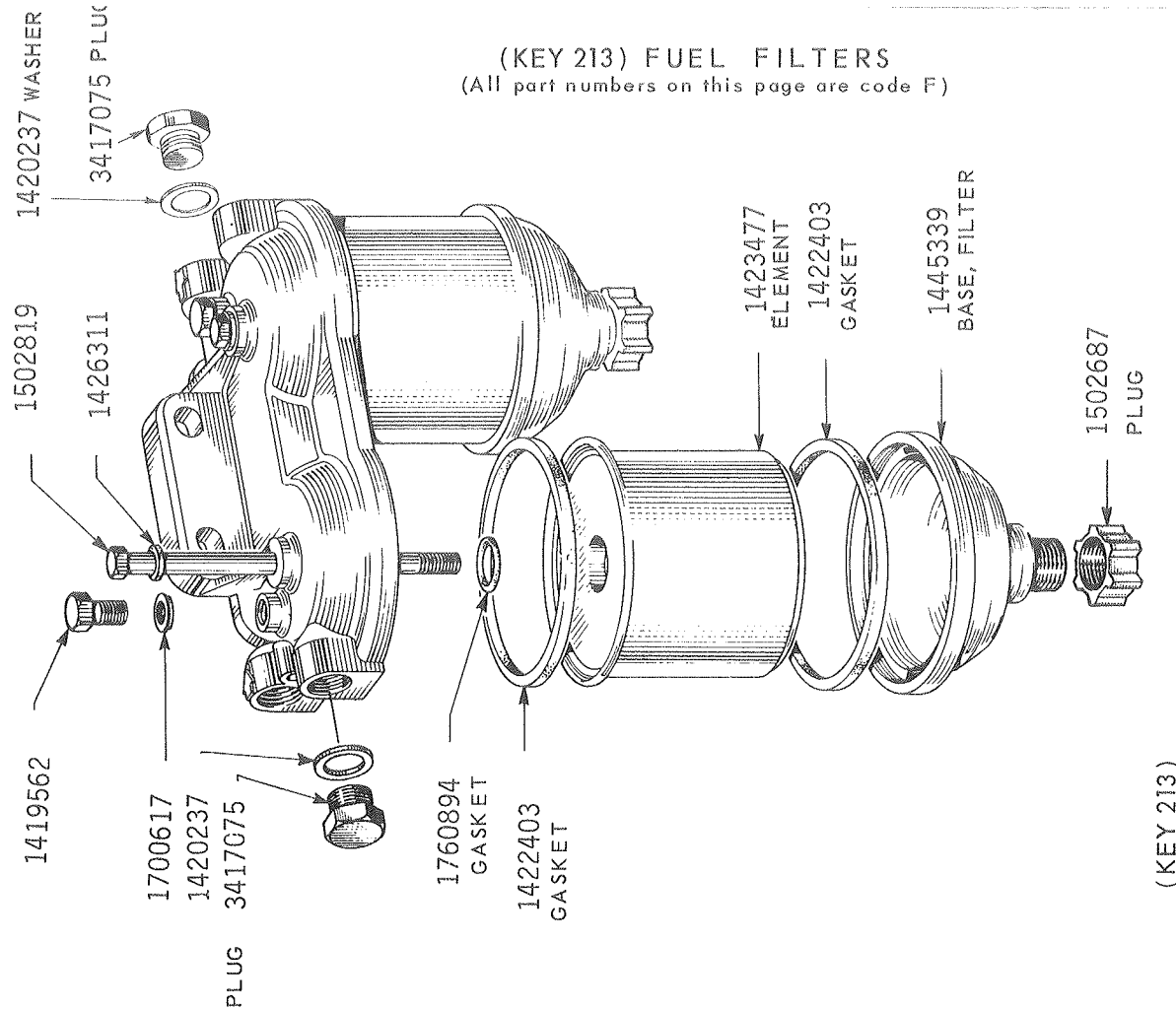


(KEY 213) FUEL FILTER ASSEMBLY FOR "F" ENGINES.  
C.A.V. SINGLE BOWL TYPE - Identification 583  
1789434 Complete filter assembly.  
1423477 Element kit. Includes all items marked £.



(KEY 213) FUEL FILTER ASSEMBLY FOR "E" ENGINES -  
A.C. TYPE - Identification DOA-1  
N.L.A. Complete filter assembly.  
1715762 Element kit. Includes all items marked £.

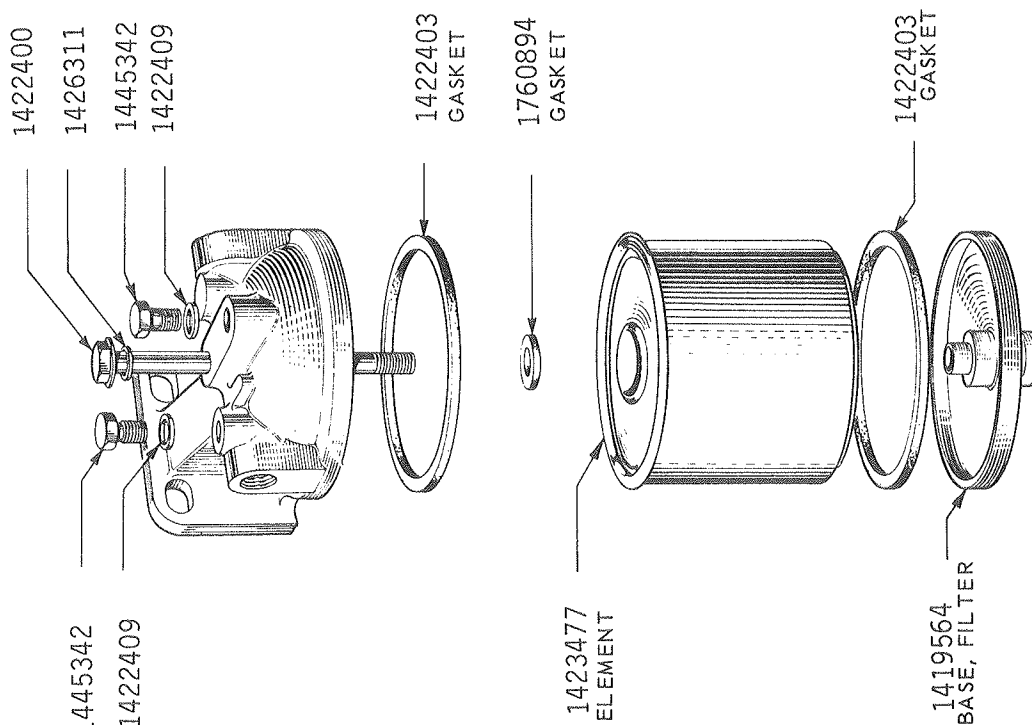
# (KEY 213) FUEL FILTERS (All part numbers on this page are code F)



(KEY 213)

FUEL FILTER ASSEMBLY - USED ON ALL ENGINES.  
SIMMS DOUBLE BOWL TYPE - Identification FH-61, or FH-89

6065057	Complete filter assembly.
1423477	Element kit. Includes all items marked £. (2 required)



(KEY 213)

FUEL FILTER ASSEMBLY FOR E,F,G,H ENGINES  
SIMMS SINGLE BOWL TYPE - Identification FH-60 or FH-73

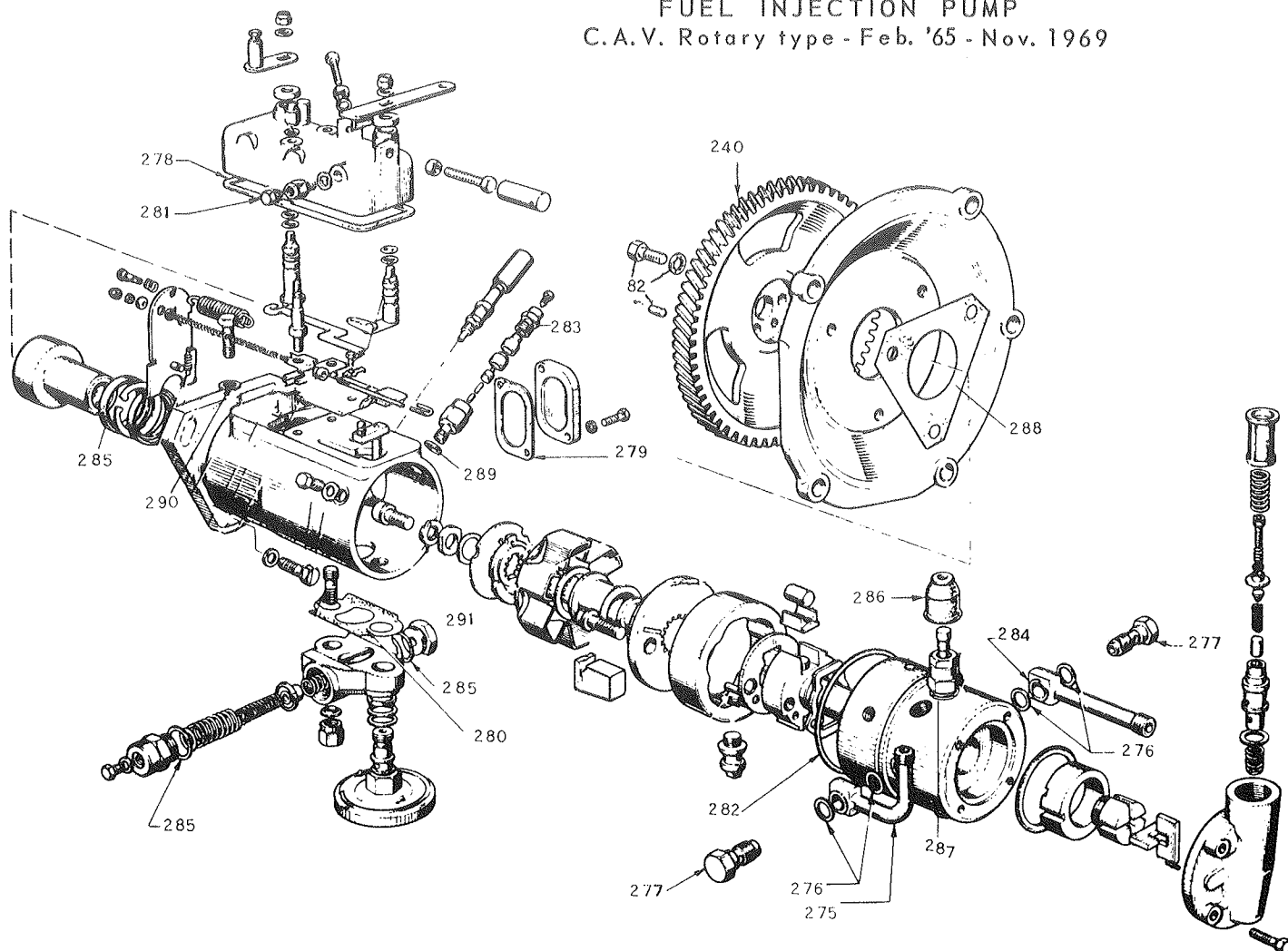
1445341	Complete filter assembly
1423477	Element kit. Includes all items marked £.

\* Use 1419562 on filters identified as FH-60.



# FUEL INJECTION PUMP

C.A.V. Rotary type - Feb. '65 - Nov. 1969



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
220	E	1	F	1762475	INJECTION PUMP (P4741)
220	F	1	F	1435976	INJECTION PUMP (P4742)
220	F	1	F	1400886	INJECTION PUMP, C.A.V.
220	G	1	F	6057111	INJECTION PUMP (P5128)
220	H	1	F	6057118	INJECTION PUMP (P5130)
220	I	1	F	6057107	INJECTION PUMP (P5060)
221	ALL	1	S	9000479	IDLE DAMPER, BOLT-ON TYPE
221	ALL	1	S	1575252	IDLE DAMPER, THREADED TYPE
222	EG	1	F	1762814	GASKET, COVER
222	FHI	1	F	1749944	GASKET, COVER
223	ALL	1	F	1772364	STOP LEVER
224	ALL	1	F	1749884	SHROUD
225	ALL	16/19	F	3415311	LOCKWASHER
226	ALL	2	F	1758598	SCREW
227	ALL	3	F	1584986	SCREW, DRAIN
228	ALL	7	F	1422409	WASHER
229	ALL	1	F	1720733	PLUG, OIL FILL
230	ALL	2	F	1481234	STOP SCREW

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
231	ALL	3	L	OB25	NUT	
232	ALL	1	F	1409565	SHAFT, THROTTLE	
233	ALL	1	F	1772192	LEVER, THROTTLE	
234	ALL	1	F	1767545	GASKET	
235	ALL	1	F	1461587	COVER, GOVERNOR	
236	ALL	1	F	1719874	O RING, INJ. PUMP TO ENGINE	
237	ALL	1	F	1727582	PLUG, TIMING HOLE	
238	ALL	1	F	1766028	GASKET, TIMING HOLE	
239	ALL	1	F	1714566	SHAFT SEAL	
240	ALL	1	F	1568733	GEAR. USE WITH SIMMS INJ. PUMP	
240	ALL	1	F	1703843	GEAR. USE WITH C.A.V. INJ. PUMP	
241	ALL	1	L	OC-61	LOCKWASHER	
242	ALL	1	F	3415236	NUT	
243	ALL	2	F	1749751	SCREW, AIR VENT	
244	ALL	1	F	1772516	SHAFT, EXCESS FUEL	
245	EF	4/6	F	1749521	RETAINER, DELIVERY VALVE	
245	GHI	4/6	F	1476063	RETAINER, DELIVERY VALVE	
246	EF	4/6	F	1749822	WASHER, DELIVERY VALVE	
246	GHI	4/6	F	1476066	WASHER, DELIVERY VALVE	
247	ALL	2/3	F	3G49	CLAMP (WITH THREADED HOLE)	NOTE 1
248	ALL	2/3	F	3G49	CLAMP (WITH PLAIN HOLE)	NOTE 1
249	ALL	10/13	F	1749883	CLAMP SCREW	
250	ALL	4/6	F	1749391	REDUCER, VOLUME	
251	EF	4/6	F	1749391	SPRING, DELIVERY VALVE	
251	GHI	4/6	F	1421441	SPRING, DELIVERY VALVE	
252	ALL	1	F	1769705	ADAPTOR, FUEL INLET	
253	ALL	1	F	1760716	WASHER, ADAPTOR	
255	ALL	2	F	1759726	BOLT, COVER	
256	ALL	1	F	1749756	STOP SCREW	
257	ALL	1	F	1749622	SEAL, EXCESS FUEL SHAFT	
258	ALL	1	F	1762368	WASHER	
259	ALL	4	F	3416159	SEAL, 1/2" O.D.	
260	ALL	1	F	1720057	SEAL, 1/4" O.D.	
261	ALL	4	F	1479277	SCREW	
262	ALL	3	L	OE202	BOLT, 5/16 - 18 x 1"	
263	ALL	3	L	OC31	LOCKWASHER, 5/16"	
264	ALL	2	F	1779874	SEAL, CONTROL SHAFT	
265	ALL	3	F	1720915	CLIP	
266	ALL	3	F	1767558	WASHER, CONTROL SHAFT	
267	ALL	1	F	1788815	WASHER, CONTROL SHAFT	

NOTE 1: USED TO JULY '77

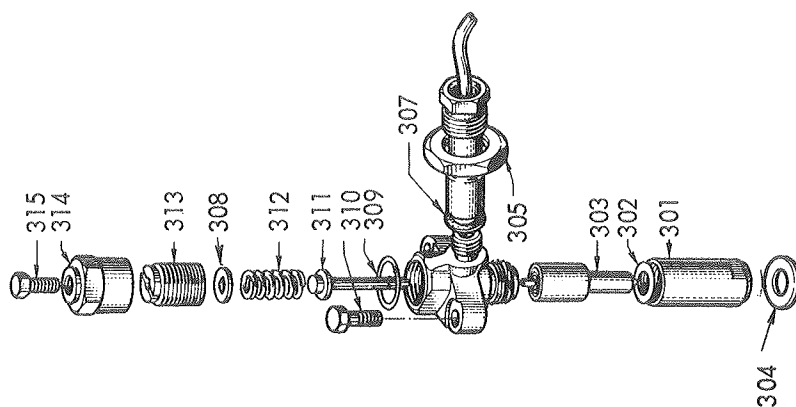


KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	
268	ALL	1	F	1767541	QUADRANT	
269	ALL	1	F	3425152	SCREW, QUADRANT	
270	ALL	1	F	1773618	SEAL, FULCRUM PIN	
271	ALL	1	F	1750078	SPRING	
272	EG	1	F	1762811	COVER	NOTE 1
272	EG	1	F	1546223	COVER, VENTED TYPE	
272	FHI	1	F	1749867	COVER	NOTE 1
272	FHI	1	F	1546222	COVER, VENTED TYPE	
273	GHI	4/6	F	1476072	O RING	
274	ALL	1	F	1772013	SHAFT	
275	F	1	F	1404004	CONNECTION OUTLET, ANGLE TYPE	
276	F	12	F	1700615	WASHER	
277	F	6	F	1412199	BOLT	
278	F	1	F	1700386	GASKET, HOUSING	
279	F	1	F	1706285	GASKET, COVER	
280	F	1	F	1727841	GASKET, HOUSING	
281	F	1	F	1700376	VENT SCREW	
282	F	1	F	1760918	SEAL, BODY	
283	F	1	F	1401625	VALVE, PRESSURIZING	
284	F	5	F	1795283	CONNECTION, OUTLET	
285	F	2	F	1760924	SEAL	
286	F	1	F	1700367	COVER (BOOT)	
287	F	1	F	1703934	WASHER	
288	F	1	F	1702457	GASKET	
289	F	1	F	1703971	WASHER	
290	F	1	F	N.L.A.	WASHER	
291	F	1	F	1795285	PLUG	

NOTE 1: USED WITH KEY 204 LEAK-OFF PIPE. DISCONTINUED FEB. 1975.

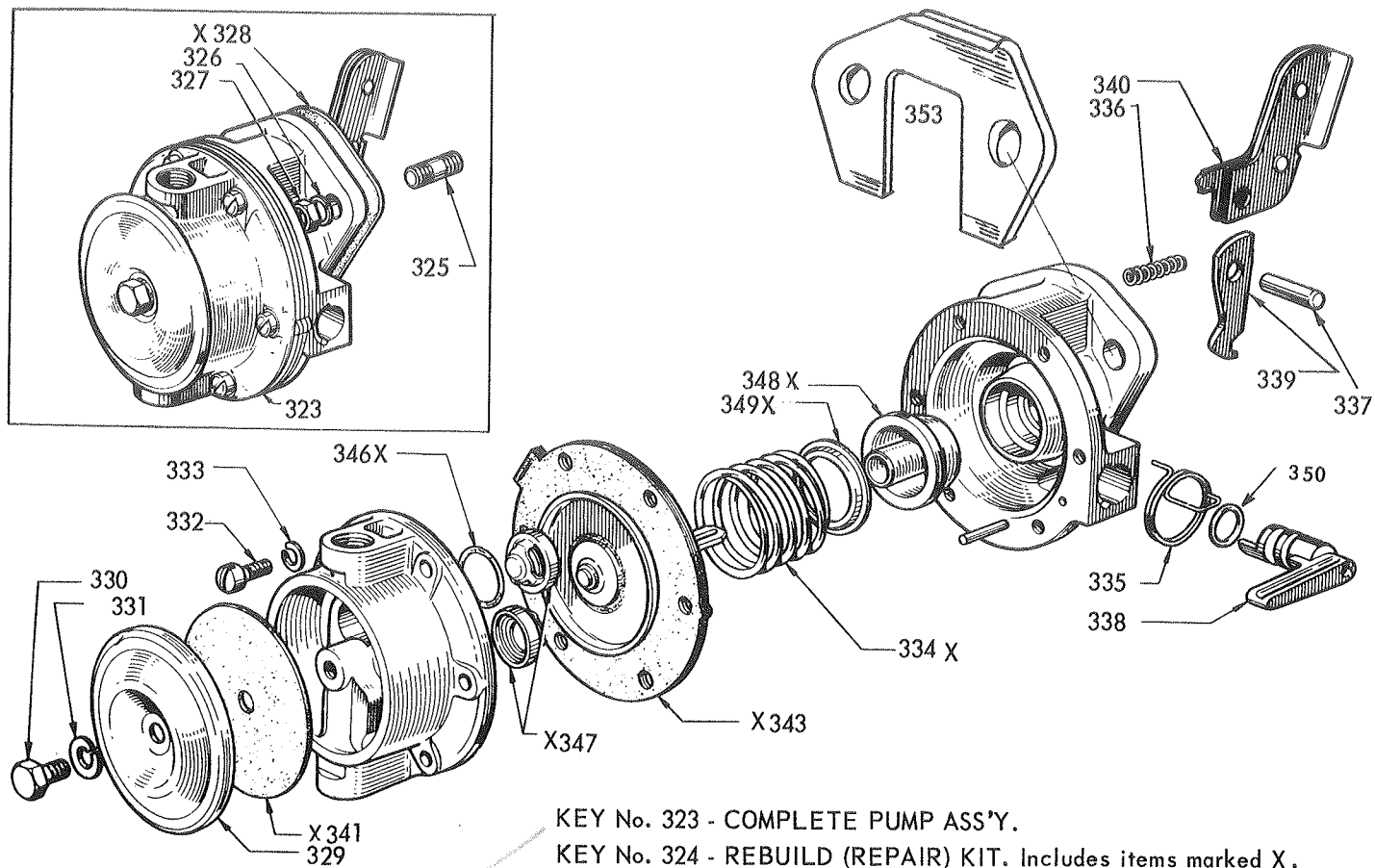
## FUEL INJECTOR

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
300	EFGH	4/6	F	1529252	INJECTOR ASSEMBLY
300	I	6	F	1529253	INJECTOR ASSEMBLY
301	ALL	4/6	F	1700364	KEY 303 NOZZLE
302	ALL	4/6	F	1700362	NUT, INJECTOR NOZZLE
303	EFGH	4/6	F	1540209	SHIM, INJ. NOZZLE
303	I	6	F	1540210	NOZZLE ASSY.
304	ALL	4/6	F	1707224	NOZZLE ASSY.
305	ALL	4/6	F	1791101	WASHER, SEALING
307	ALL	4/6	F	1791102	NUT, OIL SEAL RETAINING
308	ALL	4/6	F	1700351	SEAL
309	ALL	4/6	F	1502840	WASHER
310	ALL	8/12	F	1716286	WASHER, SEALING
311	ALL	6	F	1700361	BOLT 5/16-18 x 1 1/8"
312	ALL	4/6	F	1700354	SPINDLE & CAP ASSY.
313	ALL	4/6	F	1502694	SPRING
314	ALL	4/6	F	1502694	SCREW, SPRING ADJUSTING
315	ALL	4/6	F	1715904	NUT, INJ. SPRING CAP
*	ALL	4/6	F	1713504	BOLT, LEAK-OFF
					TOOL, INJECTOR REMOVING

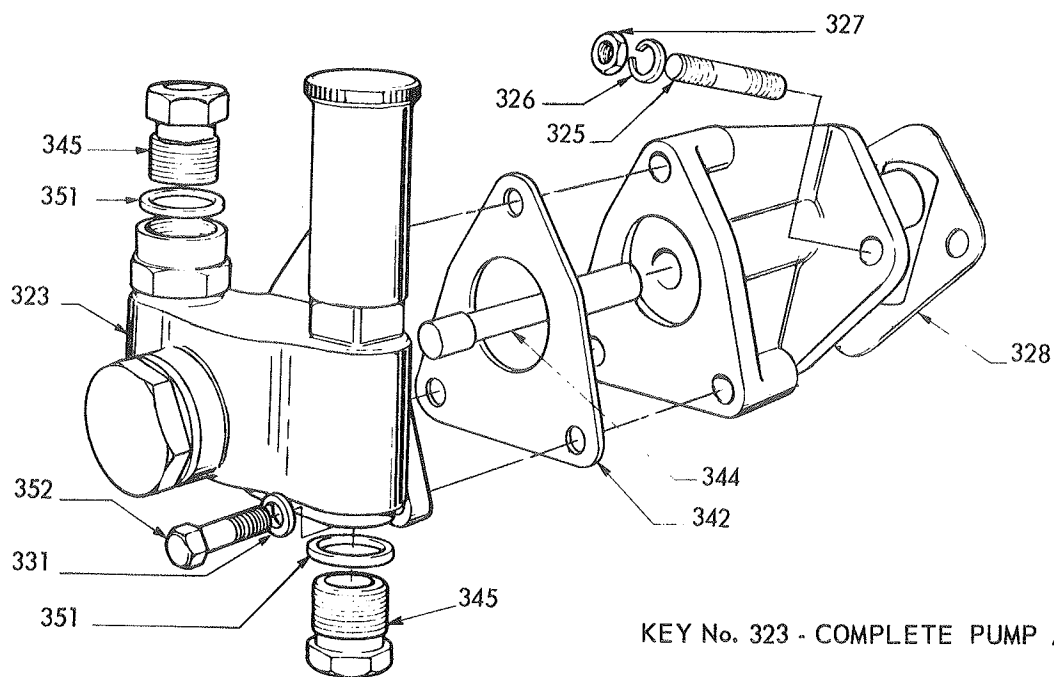


KEY No. 300 - COMPLETE INJECTOR  
 KEY No. 300A - COMPLETE INJECTOR ASSY.  
 LESS NOZZLE.

## FUEL (LIFT) PUMP



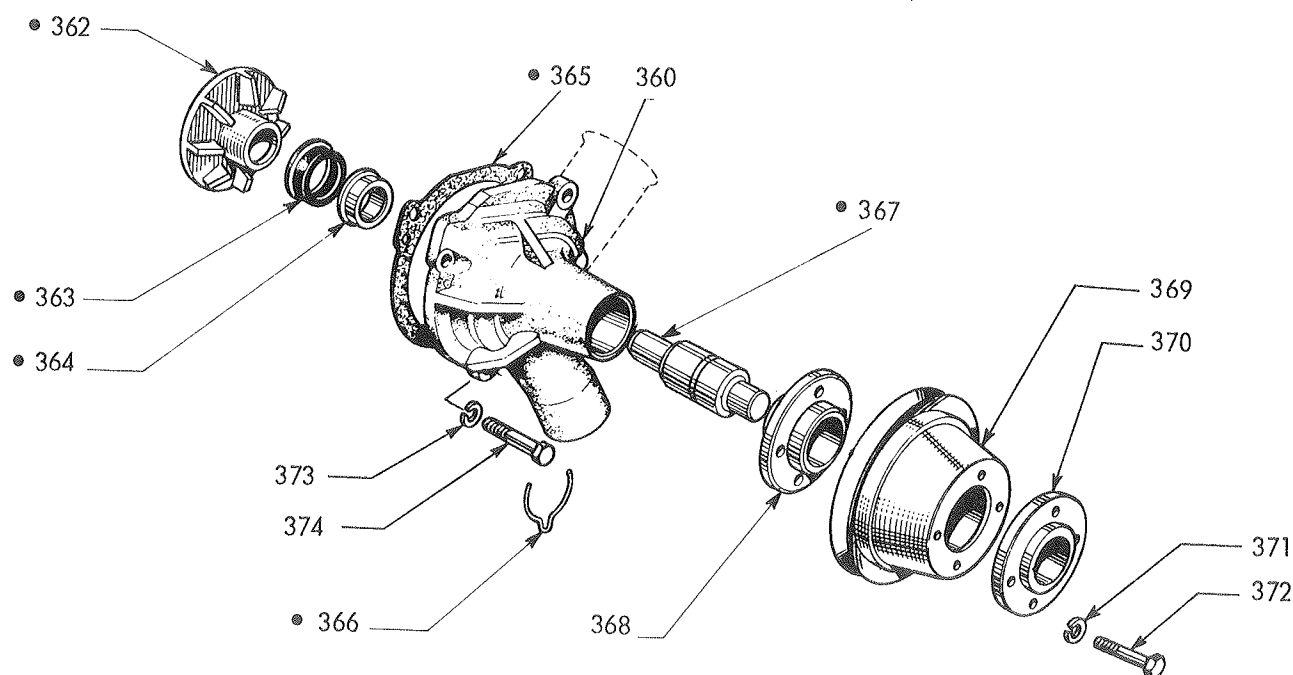
## FUEL LIFT PUMP, TURBO ONLY



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
323	EFGH	1	F	6038718	FUEL PUMP
323	I	1	F	1536780	FUEL PUMP
324	EFGH	1	F	1563606	KIT, DIAPHRAGM & VALVE (FOR CONTENTS SEE PARTS MARKED X ON ILLUSTRATION)
325	ALL	2	L	OD-15	STUD, 5/16-24 x 18 x 1 1/8
326	ALL	2	L	OC-31	LOCKWASHER, 5/16
327	ALL	2	L	OB25	NUT, 5/16-24
327	ALL	2	F	1467349	NUT, 5/16-24 HALF-ROUND TYPE. USED WITH KEY 353 PLATE.
328	ALL	1	F	1789436	GASKET
329	EFGH	1	F	1749047	COVER
330	EFGH	1	F	1757233	BOLT, 1/4-28 x 3/8"
331	ALL	AR	L	OC-21	LOCKWASHER
332	EFGH	6	F	1472222	SCREW
333	EFGH	6	F	1703778	LOCKWASHER
334	EFGH	1	F	6039027	SPRING
335	EFGH	1	F	1405313	SPRING, HAND PRIMER
336	EFGH	1	F	1749182	SPRING, ROCKER ARM
337	EFGH	1	F	1749177	PIN, ROCKER ARM
338	EFGH	1	F	1749193	LEVER, HAND PRIMING
339	EFGH	1	F	1401104	LINK
340	EFGH	1	F	1703732	ROCKER ARM
341	ALL	1	F	1791854	PULSATOR (DIAPHRAGM)
342	I	1	F	1501698	GASKET
343	EFGH	1	F	6039028	DIAPHRAGM
344	I	1	F	6018119	PLUNGER
345	I	2	F	1501527	BUSHING
346	EFGH	1	F	1749061	GASKET

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
347	EFGH	2	F	1706711	VALVE
348	EFGH	1	F	1707225	SEAL
349	EFGH	1	F	1405317	RETAINER
350	EFGH	1	F	1748715	O RING
351	I	2	F	1503882	WASHER
352	I	3	L	0E101	BOLT, 1/4-20 x 5/8
353	GHI	1	F	1459154	PLATE, FUEL PUMP FLANGE

### WATER PUMP (FRESH WATER)



KEY 360 - COMPLETE PUMP ASSY.

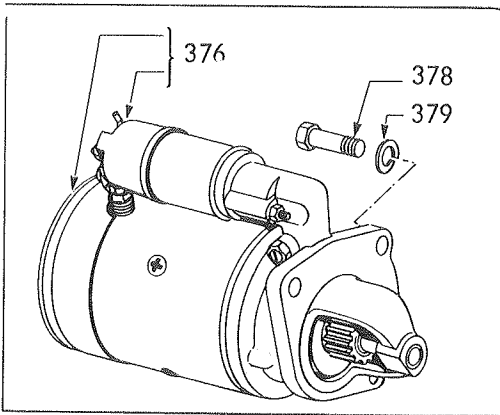
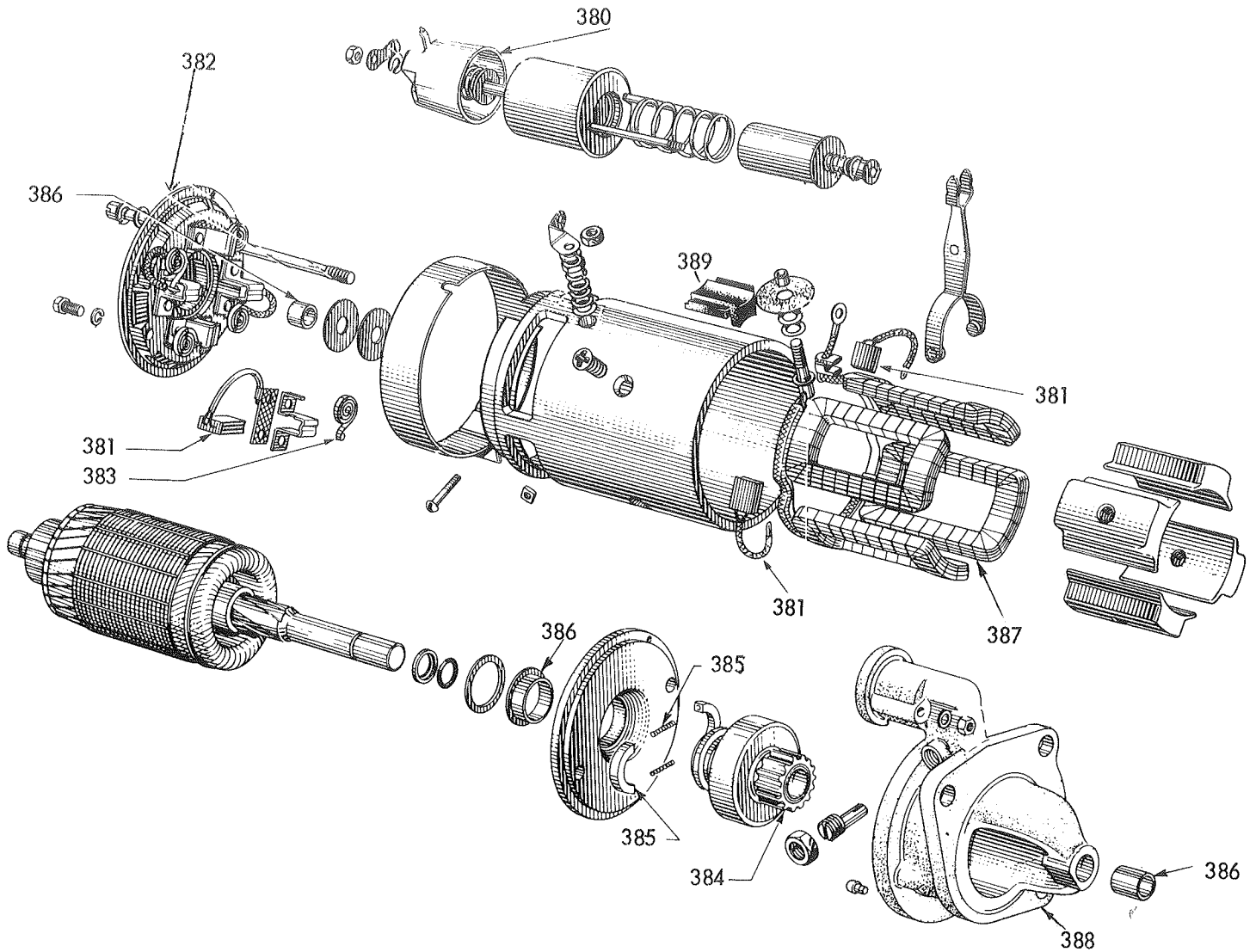
KEY 361 - PUMP OVERHAUL KIT. Includes items marked •.

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
360	EFGH	1	F	5004985	WATER PUMP ASSY.
360	I	1	F	1468672	WATER PUMP ASSY. 2 O'CLOCK TYPE
361	ALL	1	F	1468677	KIT, PUMP REPAIR, INCLUDES ITEMS MARKED ●
362	ALL	1	F	1468675	● IMPELLER
*	GH	1	F	1467293	● SEAT, PUMP IMPELLER
363	ALL	1	F	1467294	● SEAL
364	ALL	1	F	1711755	● SLINGER
365	ALL	1	F	1467070	● GASKET
366	ALL	1	F	1711767	● RETAINER
367	ALL	1	F	1711754	● SHAFT & BEARING ASSY.
368	ALL	1	F	1788367	HUB
369	ALL	1	F	1711744	PULLEY, 4 1/2" O.D.
369	EG	1	F	1422360	PULLEY, 5 1/2" O.D.
370	ALL	1	F	1788282	SPACER (USED TO 7/74)
371	ALL	4	L	0C31	LOCKWASHER, 5/16"
372	ALL	4	F	1715834	BOLT, 5/16-24 x 1"
372	ALL	4	F	1568477	BOLT, 5/16-24 x 1 3/8"
373	ALL	4	L	0C-31	LOCKWASHER, 5/16"
374	ALL	4	L	0E203	BOLT, 5/16-18 x 1 1/4"

NOTE 1

NOTE 1: USED WITH KEY 370 SPACER (TO 7/74).

## STARTING MOTOR

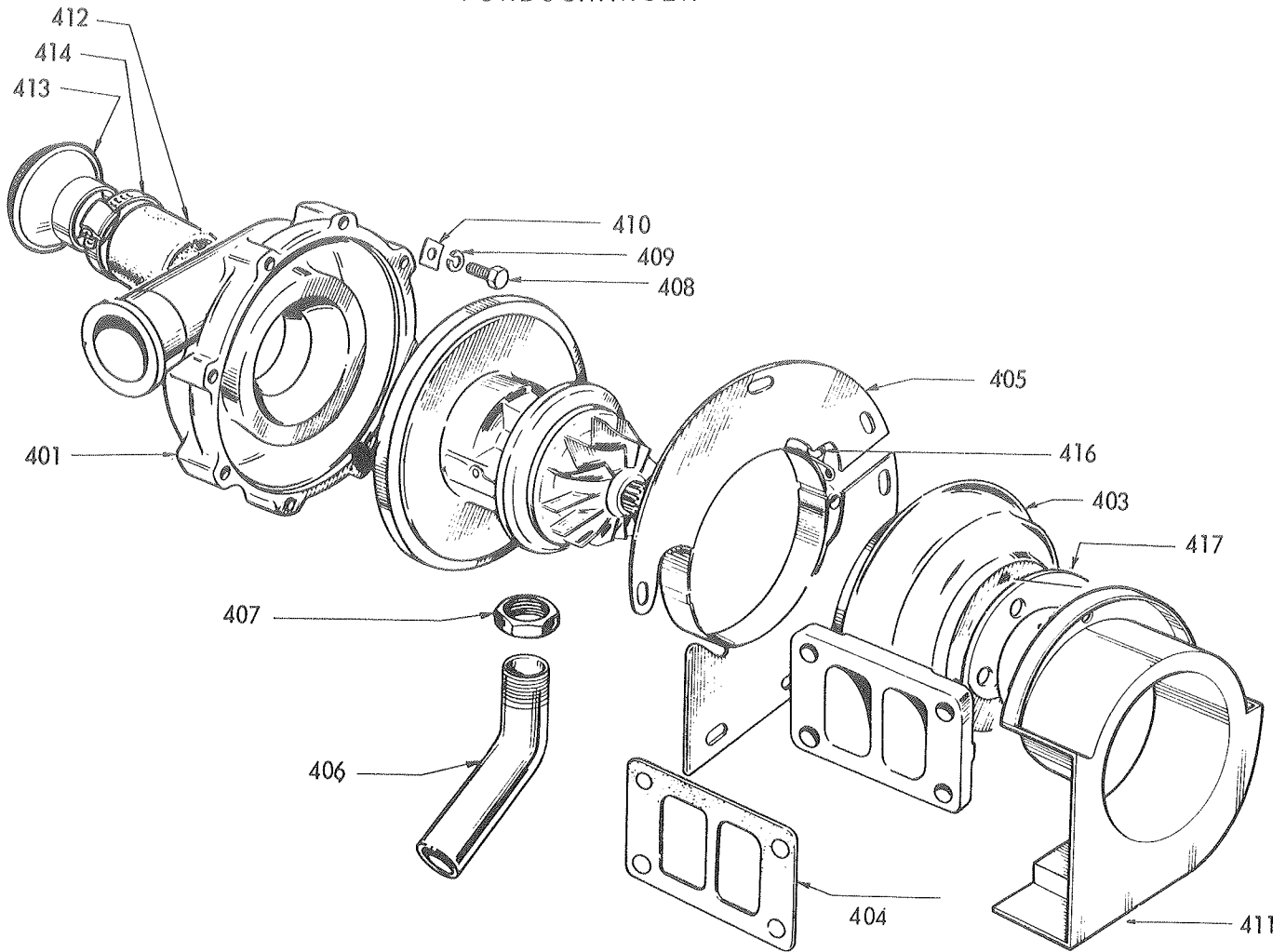


KEY 376 - COMPLETE STARTER, DRIVE and SOLENOID ASSY.  
KEY 377 - COMPLETE SOLENOID ASSY.

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
376	ALL	1	F	1513727	STARTER, DRIVE & SOLENOID
377	ALL	1	F	1460981	SOLENOID ASS'Y.
378	ALL	3	L	0E302	BOLT, 3/8-16 x 1"
379	ALL	3	L	0C41	LOCKWASHER, 3/8"
380	ALL	1	F	1416050	CAP, SOLENOID
381	ALL	1	F	1739175	BRUSH KIT (4 BRUSHES). FOR STARTERS USING BRUSHES 25/32" x 11/32" x 1".
381	ALL	1	F	1712447	BRUSH KIT (4 BRUSHES). FOR STARTERS USING BRUSHES 23/32" x 5/16" x 7/8".
382	ALL	1	F	1739166	END PLATE KIT. INCLUDES ALL ITEMS MARKED X.
383	ALL	4	F	1739191	SPRING, BRUSH
384	ALL	1	F	1527421	STARTER DRIVE ASSY. (12 INTERNAL SPLINES)
384	ALL	1	F	1542237	STARTER DRIVE ASSY. (3 INTERNAL SPLINES)
385	ALL	1	S	1739118	SHOE, BRAKE (PR) AND SPRINGS
386	ALL	1	S	54243853	BUSHING KIT (3)
387	ALL	1	F	1553856	FIELD COILS (SET)
388	ALL	1	F	1527445	HOUSING, STARTER DRIVE
389	ALL	1	F	1739005	SEAL, SOLENOID
*	ALL	1	F	4D7	DECAL (12 VOLT, NEG. GROUND)



## TURBOCHARGER



Complete turbocharger assembly - Key 400

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
400	I	1	F	6092653	TURBOCHARGER ASSY.
401	I	1	F	1468321	CASING, TURBO COMPRESSOR
403	I	1	F	1461717	CASING, TURBINE
404	I	1	F	1420460	GASKET
405	I	1	F	1510462	PLATE, HEAT SHIELD
406	I	1	F	1599466	CONNECTION, OIL DRAIN
407	I	1	F	1457824	LOCKNUT
408	I	8	F	1457824	BOLT
409	I	8	F	1568871	LOCKWASHER
410	I	8	F	1457461	CLAMP, COMPR. CASING

## A36

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
411	I	1	F	458211	CASE, HEAT SHIELD
*	I	7	F	1575224	BOLT, HEAT SHIELD
*	I	7	F	0C21	LOCKWASHER, HEAT SHIELD
412	I	1	F	1456626	HOSE, AIR CLEANER
413	I	1	F	1456620	AIR CLEANER
414	I	2	L	3K5	CLAMP, HOSE
417	I	1	F	1419786	GASKET

# SECTION B

B1

## PARTS IDENTIFICATION - LEHMAN MARINIZING PARTS

In order to provide a simple method of identification, all models included herein have been assigned a "code" letter as follows:

ENGINE CODE	CU/IN	No.CYLS.	YEARS	IDENTIFICATION
E	242	4	2/65-11/69	With cylinder liners
F	363	6	2/65-11/69	With cylinder liners
G	254	4	12/69-up	Less cylinder liners
H	380	6	12/69-up	Less cylinder liners
I	363	6	7/68-up	Turbocharged

For ease in locating parts, refer to pictorial index on following page or to index below.

Air filter - - - - -	page B23
Alarm system - - - - -	B27
Alternator, Motorola 55 AMP - - - - -	B11, B12
Alternator, Motorola 72 AMP - - - - -	B13
Aperature cover - - - - -	B21
Belt, vee - - - - -	B23
Cooler, oil - - - - -	B14
Exchanger, heat - - - - -	B8
Fuel line (flexible) - - - - -	B23
Hoses, water - - - - -	B8, B18, B23
Manifold, 6 cylinder - - - - -	B4
Manifold, 4 cylinder - - - - -	B6
Manuals, instruction, shop, etc. - - - - -	B29
Miscellaneous - - - - -	B23
Mountings, engine - - - - -	B19
Piping, fresh water - - - - -	B8
Piping, raw water - - - - -	B18
Pump drive assembly - - - - -	B17
Pump, water - - - - -	B16
Riser, exhaust - - - - -	B26
Solenoid, starter relay - - - - -	B22
Spare parts kits - - - - -	B28
Stop engine controls - - - - -	B24, B25
Supports, engine - - - - -	B19
Tachometer adaptor - - - - -	B9
Tank, expansion - - - - -	B10
Throttle control brackets - - - - -	B24, B25
Transmission adaption - - - - -	B20
Water heater connection kit - - - - -	B27

By reference to the drawing on the applicable page, select the required part and note the "key" number assigned to it. The key number will be repeated in the listing of parts following the drawing. The second column indicates the engine to which the part applies per the engine code letters shown above. The third column shows the quantity required per engine.

The fourth "code" column indicates the manufacturer of the subject part per the following:

CODE	MANUFACTURER
F	Ford Motor Company
T	Jabsco Pump Company
L	Lehman Power Corporation.
P	Paragon Gear Works
S	Simms (Jos. Lucas Co.)
W	Warner Gear Division
BY	Motorola, Inc.

WHEN ORDERING PARTS SEE INSTRUCTIONS ON PAGE 2

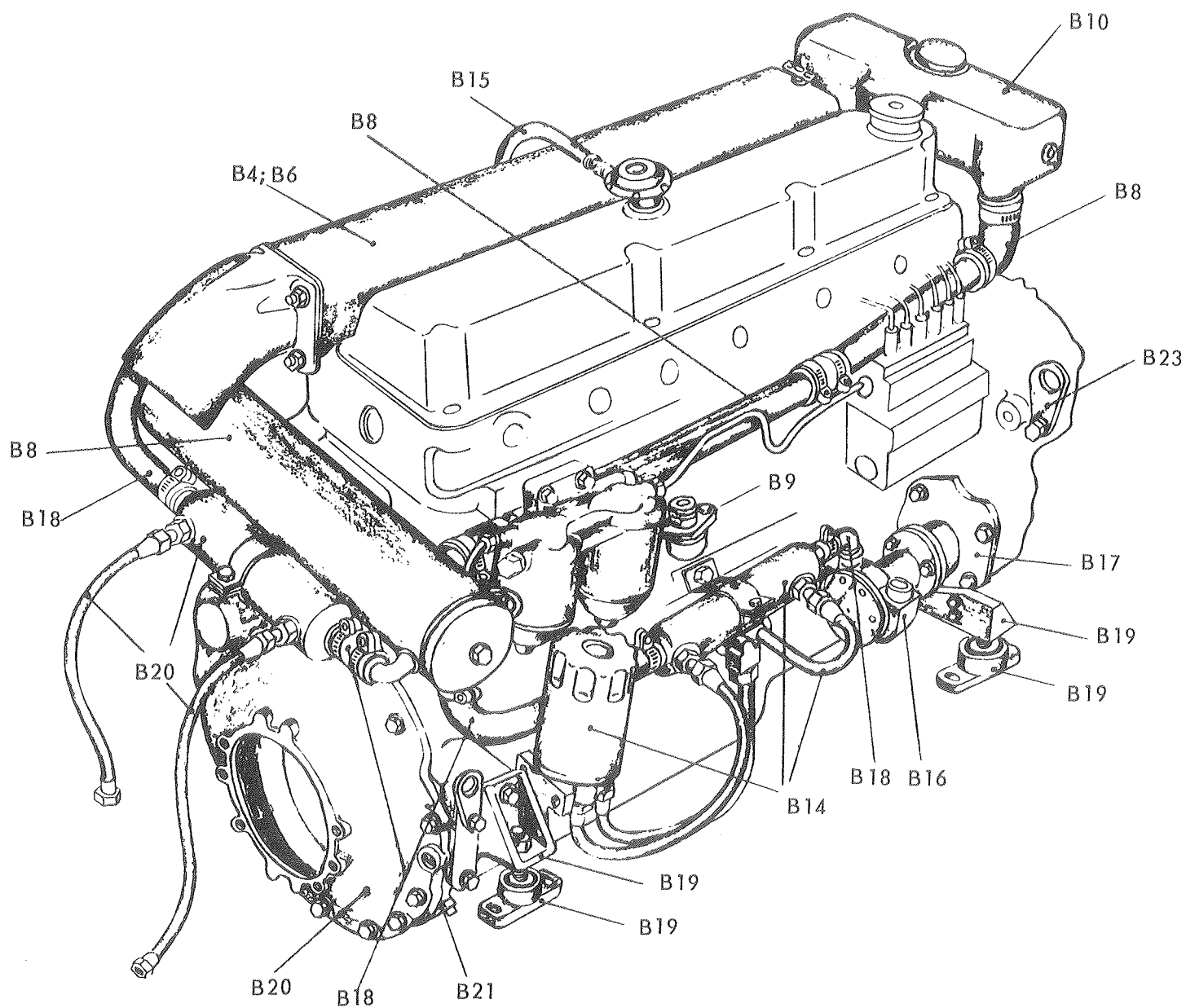
PAGE NUMBERS ARE SHOWN ON DRAWINGS BELOW



# INDEX TO LEHMAN MARINE EQUIPMENT

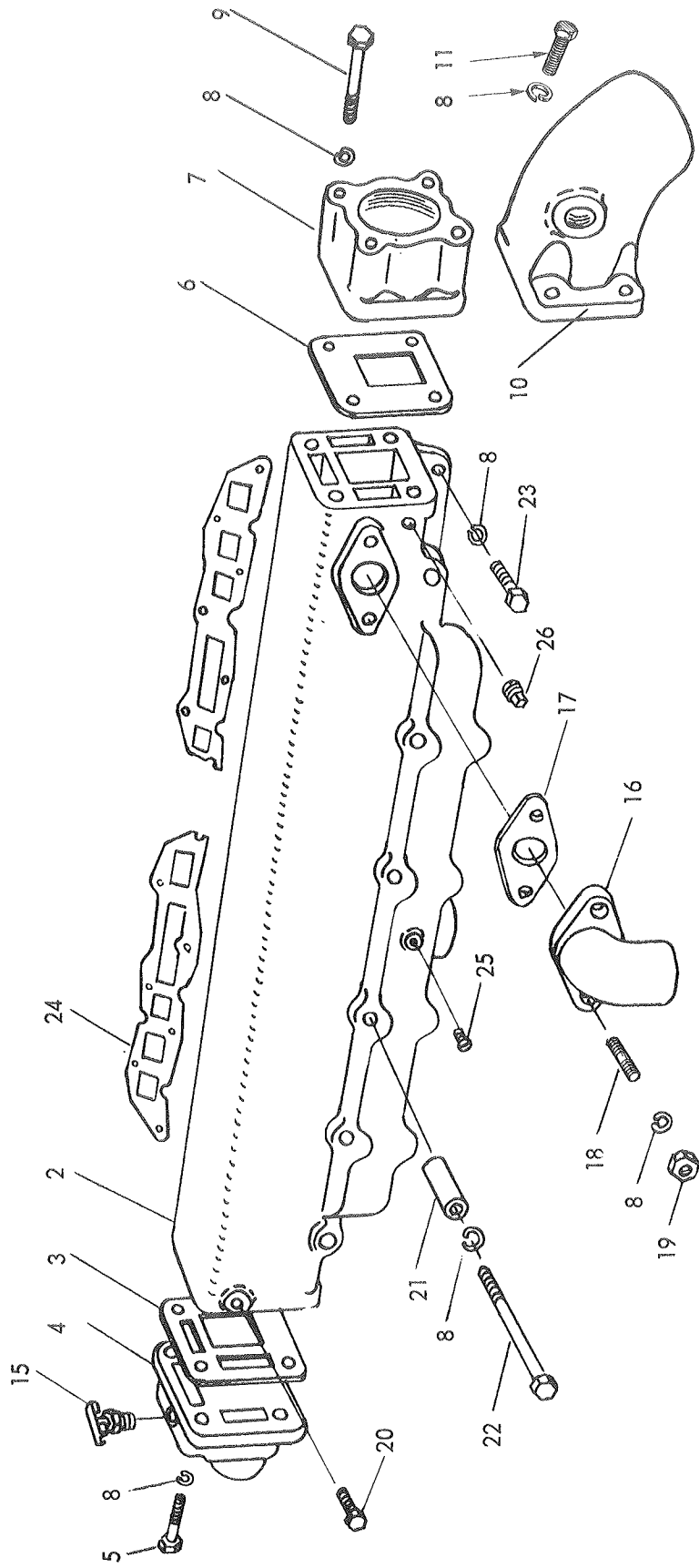
## PICTORIAL INDEX

PAGE NUMBERS ARE SHOWN ON DRAWINGS BELOW



6 CYLINDER MANIFOLD

6 CYLINDER MANIFOLD



KEY No. 1 - Complete assembly

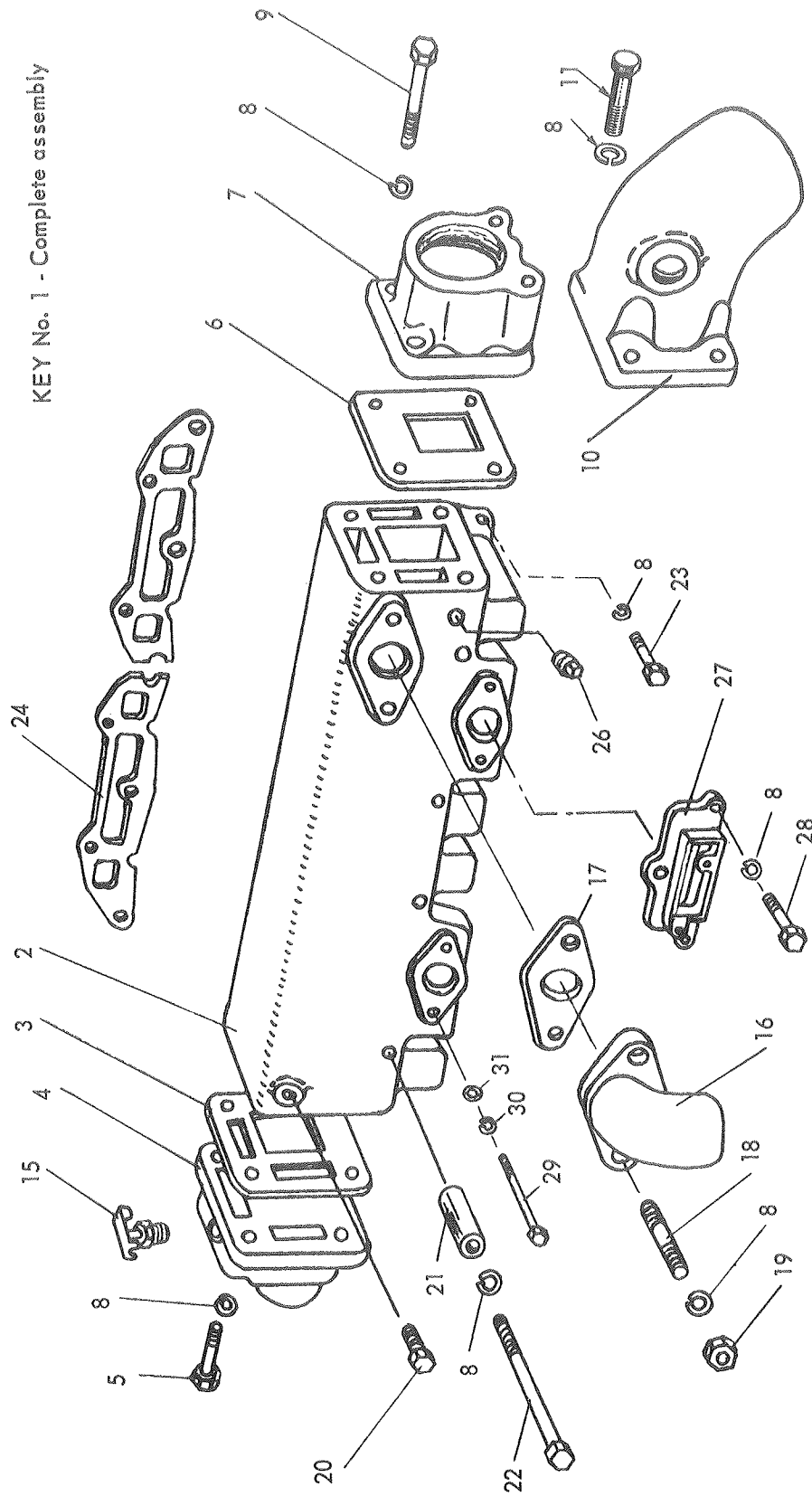
## 6 CYLINDER MANIFOLD

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	FHI	1	L	D1100	MANIFOLD ASSY. (WITH 3" NPT STRAIGHT EXHAUST)
1	FHI	1	L	D1100-A	MANIFOLD ASSY. (WITH 3" NPT EXHAUST ELBOW)
2	FHI	1	L	1A288	MANIFOLD BODY (550)
3	ALL	1	L	1C27	GASKET, FRONT
4	ALL	1	L	1A231	FRONT FLANGE (446)
5	ALL	4	L	OE303	BOLT, 3/8-16 x 1 1/4"
6	ALL	1	L	1C26	GASKET, REAR
7	FH	1	L	1A223	EXHAUST FLANGE, 3" NPT (432)
8	ALL	AR	L	OC41	LOCKWASHER, 3/8"
9	FH	4	L	OE307 1/2	BOLT, 3/8-16 x 2 3/4"
10	FH	1	L	1A283	EXHAUST ELBOW, 3" NPT (538)
10	FH	1	L	1A371	EXHAUST ELBOW-HOSE 3-1/2 " ID (731)
11	ALL	4	L	OE303-C	BOLT, 3/8-16 x 1-1/4"
15	ALL	1	L	3J2	PETCOCK
16	ALL	1	L	1A230	ELBOW, WATER CIRCULATION (445)
17	ALL	1	L	2D21	GASKET
18	ALL	2	L	OD41	STUD, 3/8 x 1 5/8"
19	ALL	2	L	OB34	NUT, 3/8-16
20	ALL	1	L	OE302-C	BOLT (LIFTING RING)
21	ALL	6	L	1B59	SLEEVE COUPLING
22	ALL	6	L	OE309.5	BOLT, 3/8-16 x 3 3/4"
23	ALL	7	L	OE303	BOLT, 3/8-16 x 1 1/4"
24	FH	2	L	2D28	GASKET, MANIFOLD TO HEAD
24	I	2	F	1418493	GASKET, MANIFOLD TO HEAD (TURBO)
25	FHI	1	L	OA16	SCREW, #10-32 x 5/16"
26	ALL	1	L	3L2	PLUG, 1/8 NPT

## 4 CYLINDER MANIFOLD

## 4 CYLINDER MANIFOLD ASSEMBLY

KEY No. 1 - Complete assembly



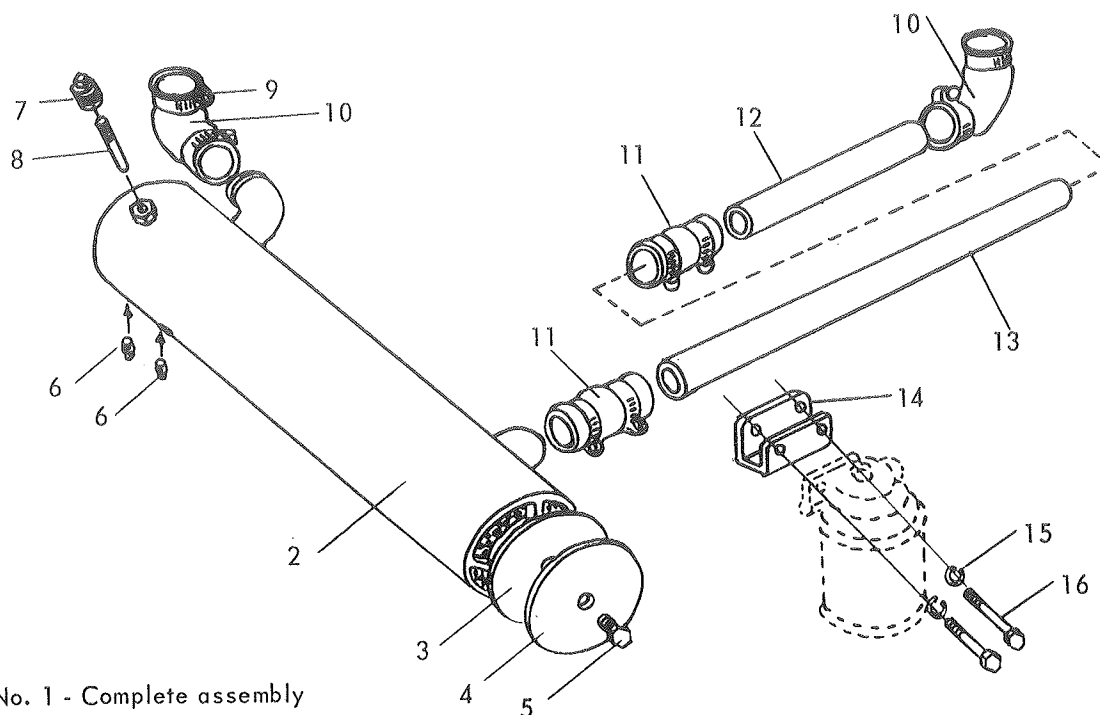


## 4 CYLINDER MANIFOLD

B7

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	EG	1	L	D1102	MANIFOLD ASSY. (WITH 2 1/2" NPT STRAIGHT EXHAUST)
1	EG	1	L	D1102-A	MANIFOLD ASSY. (WITH 2 1/2" NPT EXHAUST ELBOW)
2	EG	1	L	1A241	MANIFOLD BODY (469)
3	ALL	1	L	1C27	GASKET, FRONT
4	ALL	1	L	1A231	FRONT FLANGE (446)
5	ALL	4	L	OE303	BOLT, 3/8-16 x 1 1/4"
6	ALL	1	L	1C26	GASKET, REAR
7	EG	1	L	1A222	EXHAUST FLANGE, 2 1/2" NPT (431)
8	ALL	AR	L	OC41	LOCKWASHER, 3/8"
9	EG	2	L	OE304	BOLT, 3/8-16 x 1 1/2"
9	EG	2	L	OE307	BOLT, 3/8-16 x 2 1/2"
10	EG	1	L	1A284	EXHAUST ELBOW, 2 1/2 NPT (547)
10	EG	1	L	1A372	EXHAUST ELBOW, HOSE 2-7/8" ID (731)
11	ALL	4	L	OE303C	BOLT, 3/8-16 x 1-1/4"
15	ALL	1	L	3J2	PETCOCK
16	ALL	1	L	1A230	ELBOW, WATER CIRCULATION (445)
17	ALL	1	L	2D21	GASKET
18	ALL	2	L	OD41	STUD, 3/8 x 1 5/8"
19	ALL	2	L	OB34	NUT, 3/8-24
20	ALL	1	L	OE302-C	BOLT (LIFTING RING)
21	ALL	4	L	1B59	SLEEVE, COUPLING
22	ALL	4	L	OE309	BOLT, 3/8-16 x 3 1/2"
23	ALL	5	L	OE303	BOLT, 3/8-16 x 1 1/4"
24	EG	2	L	2D27	GASKET, MANIFOLD TO HEAD
26	ALL	1	L	3L2	PLUG, 1/8 NPT
27	EG	2	L	1A291	ADAPTOR, AIR FILTER (557) USED UNTIL JUNE 1972 ONLY.
28	EG	6	L	OE302	BOLT, 3/8-16 x 1"
29	EG	4	L	OE109	BOLT, 1/4-20 x 2 1/4"
30	EG	4	L	OC21	LOCKWASHER, 1/4"
31	EG	4	L	OC20	WASHER, FLAT, 1/4"

## HEAT EXCHANGER and PIPING ASSEMBLY



KEY No. 1 - Complete assembly

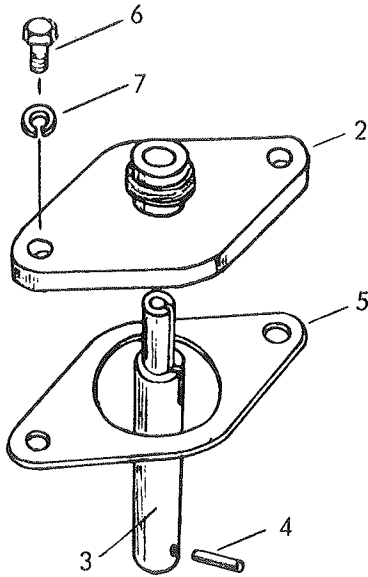
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	EG	1	L	D881	EXCHANGER ASSEMBLY
1	FHI	1	L	D880	EXCHANGER ASSEMBLY
2	EG	1	L	2C213	HEAT EXCHANGER, COPPER (NOTE 1)
2	EG	1	L	2C219	HEAT EXCHANGER, CUPRO-NICKEL (NOTE 1)
2	FH	1	L	2C211	HEAT EXCHANGER, COPPER (NOTE 1)
2	FH	1	L	2C218	HEAT EXCHANGER, CUPRO-NICKEL (NOTE 1)
2	I	1	L	2C225	HEAT EXCHANGER, COPPER (NOTE 1)
3	EG	2	L	2D24	GASKET, COVER
3	FH	2	L	2D25	GASKET, COVER
4	EG	2	L	2C213-A	COVER
4	FH	2	L	2C211-A	COVER
5	ALL	2	L	OE301-F	BOLT. 3/8-16 x 3/4 BRASS
6	ALL	2	L	3L1	PLUG, 1/8 NPT
7	ALL	1	L	EM21	ZINC PENCIL PLUG (NOTE 2)
8	ALL	1	L	EM21-A	ELEMENT, ZINC PENCIL
9	ALL	8	L	3K4	HOSE CLAMP
10	ALL	2	L	3K503	HOSE ELBOW
11	ALL	2	L	3K213 (3)	HOSE, 1 3/4 ID x 3"
12	EG	2	L	1D39	WATER TUBE, 1 3/4 x 10"
12	FHI	1	L	1D39	WATER TUBE, 1 3/4 x 10"

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
13	FHI	1	L	1D26	WATER TUBE, 1 3/4 x 20"
14	EFGH	1	L	1A233	SPACER, FUEL FILTER (NOTE 3)
15	EFGH	2	L	OC41	LOCKWASHER, 3/8" (NOTE 3)
16	EFGH	2	L	OE308	BOLT, 3/8-16 x 3" (NOTE 3)

NOTE 1: INCLUDES KEY NUMBERS 3 THROUGH 8.

NOTE 2: INCLUDES KEY 8.

NOTE 3: USED WITH SINGLE TYPE FILTER ONLY (UNTIL DEC. 1971)

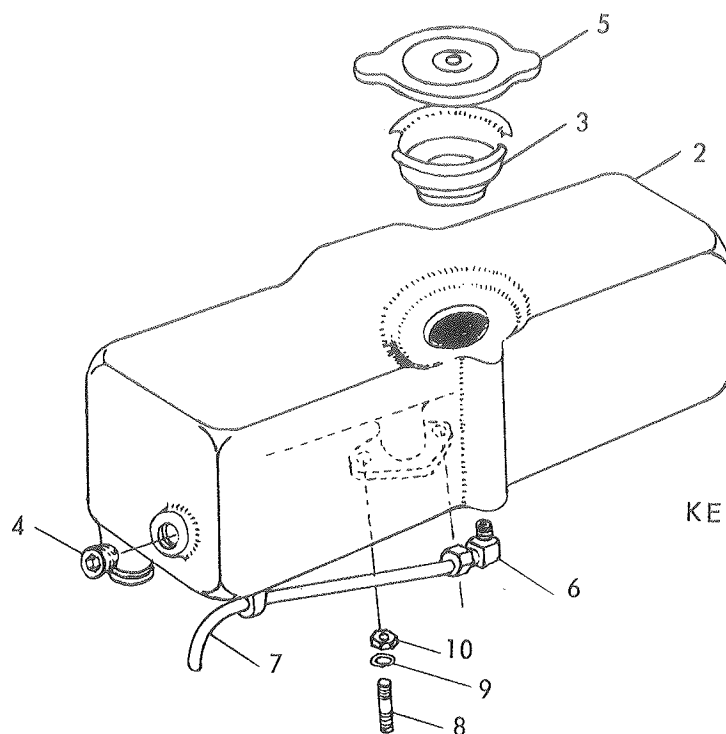


TACHOMETER ADAPTOR

Key No. 1 - Complete Assembly

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D160	TACHOMETER ADAPTOR
2	ALL	1	L	1A337	HOUSING, TACH. ADAPTOR (630)
3	ALL	1	L	1B62	DRIVE SHAFT (INCLUDES KEY 4)
4	ALL	1	L	2K209	ROLL PIN
5	ALL	1	L	2D21	GASKET
6	ALL	2	L	OE102	BOLT, 1/4-20 x 3/4"
7	ALL	2	L	OC21	LOCKWASHER, 1/4"
*	ALL	1	L	2F211	CAP, TACH. DRIVE SEALING (PLASTIC)

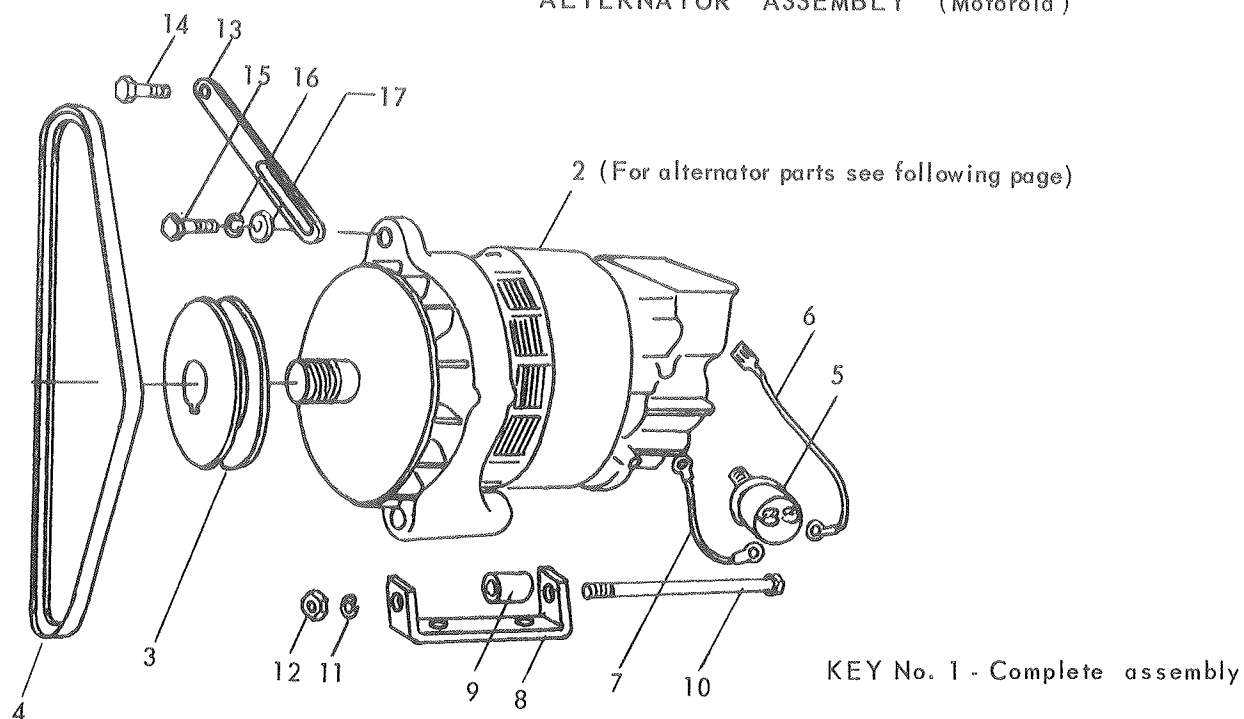
## EXPANSION TANK ASSEMBLY



KEY No. 1 - Complete assembly

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D876	EXPANSION TANK ASSY.
2	ALL	1	L	1A232	TANK (447)
3	ALL	1	L	2C300	NECK, FILLER
4	ALL	2	L	3L33	PLUG, 1/2" NPT
5	ALL	1	L	2C302	CAP, FILLER
6	ALL	1	L	3E150	ELBOW, TUBING
7	ALL	1	L	3A3-8.5	TUBE, OVERFLOW
8	ALL	2	L	OD10	STUD
9	ALL	2	L	OC31	WASHER, 5/16"
10	ALL	2	L	OB25	NUT, 5/16 -24
*	ALL		L	2M6	CLAMP, PLASTIC 1/4"
*	ALL		L	OA16	SCREW, #10-32 x 5/16"

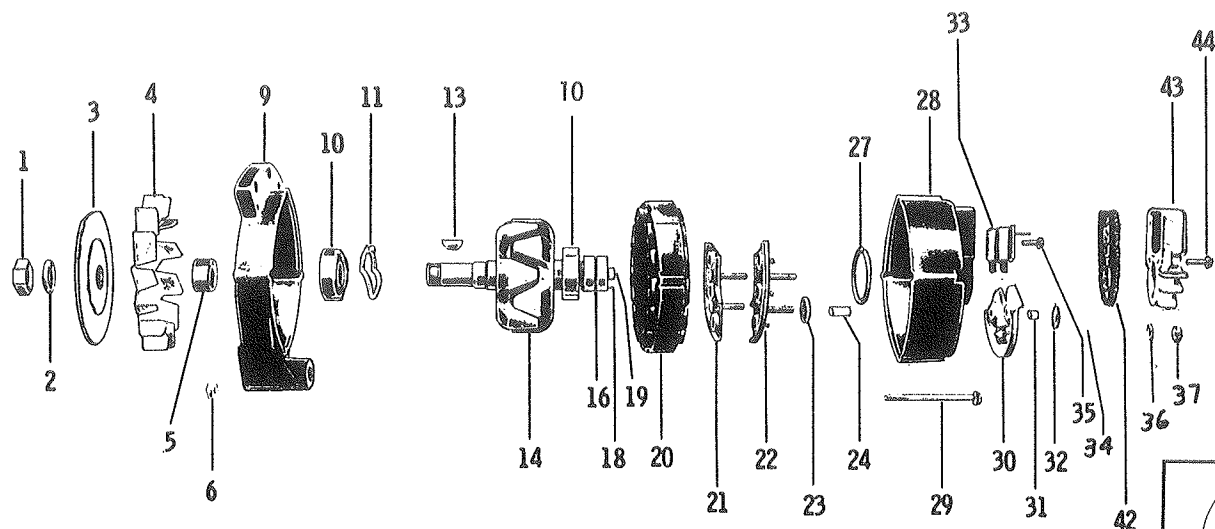
\* PARTS NOT SHOWN. USED UNTIL DECEMBER 1971 ONLY.



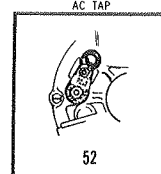
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D143	ALTERNATOR ASSY.
2	ALL	1	L	2E3	ALTERNATOR/REGULATOR/FAN ASSY. (See following page for parts)
3	ALL	1	L	2B19	PULLEY
4	ALL	1	L	2B209	VEE BELT
5	ALL	1	L	2E206	OIL PRESSURE SWITCH
6	ALL	1	L	2E401	WIRE ASSY, RING x SPADE
7	ALL	1	L	2E400	WIRE ASSY, RING x RING
8	ALL	1	L	1E18	BRACKET, ALTERNATOR
9	ALL	1	L	1B64	SPACER, 3/8 x 5/8 x 7/8
10	ALL	1	L	OE310	BOLT, 3/8-16 x 4
11	ALL	1	L	OC41	LOCKWASHER, 3/8"
12	ALL	1	L	OB35	NUT, 3/8-16
13	ALL	1	L	2M7	TENSIONING (SLIDE) BRACKET
14	ALL	1	L	OE203	BOLT, 5/16-18 x 1 1/4
15	ALL	1	L	OE201-C	BOLT, 5/16-18 x 3/4
16	ALL	1	L	OC30	LOCKWASHER, 5/16"
17	ALL	2	L	OC31	WASHER, FLAT, 5/16"

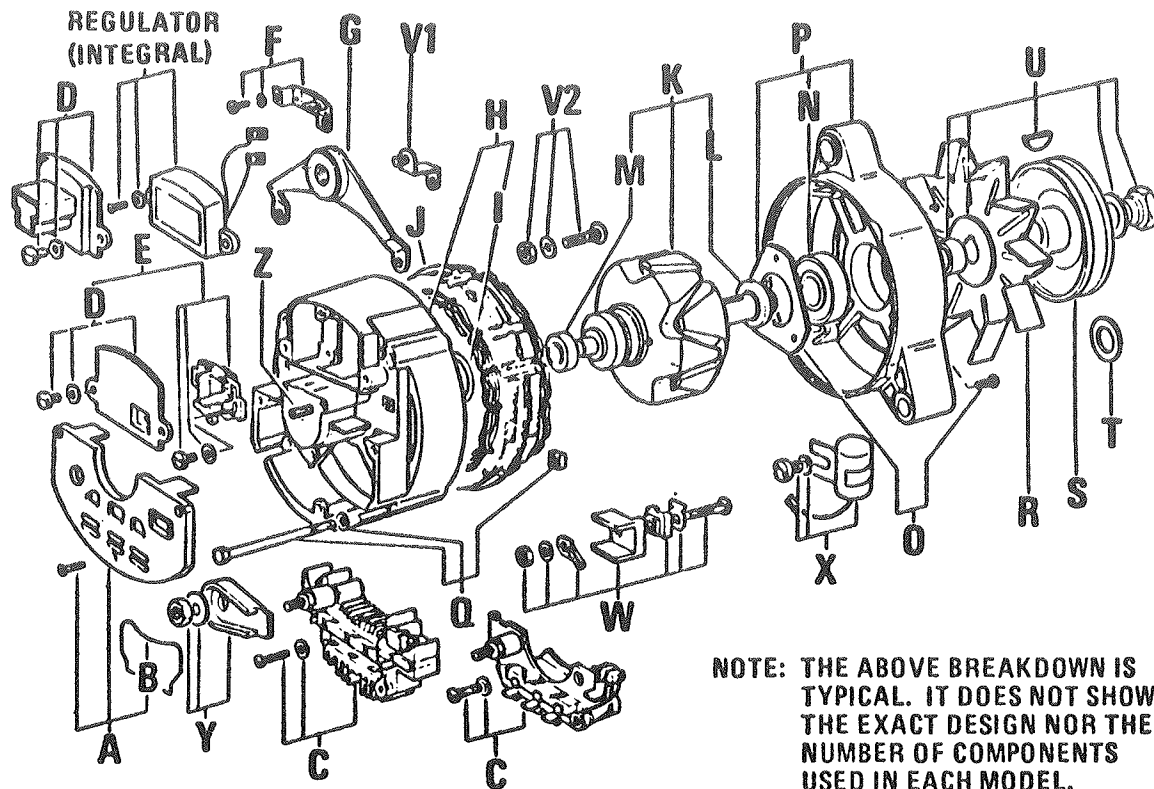
## PARTS FOR (2E3) MOTOROLA ALTERNATOR

All Lehman series 143 alternators may be serviced by any authorized Motorola distributor or repair facility. As all component parts are standard, no difficulty should be encountered securing same. When inquiring for parts or service, provide all data from nameplate on alternator. Lehman Manufacturing can provide the replacement parts indicated by asterik (\*) on the following parts list.



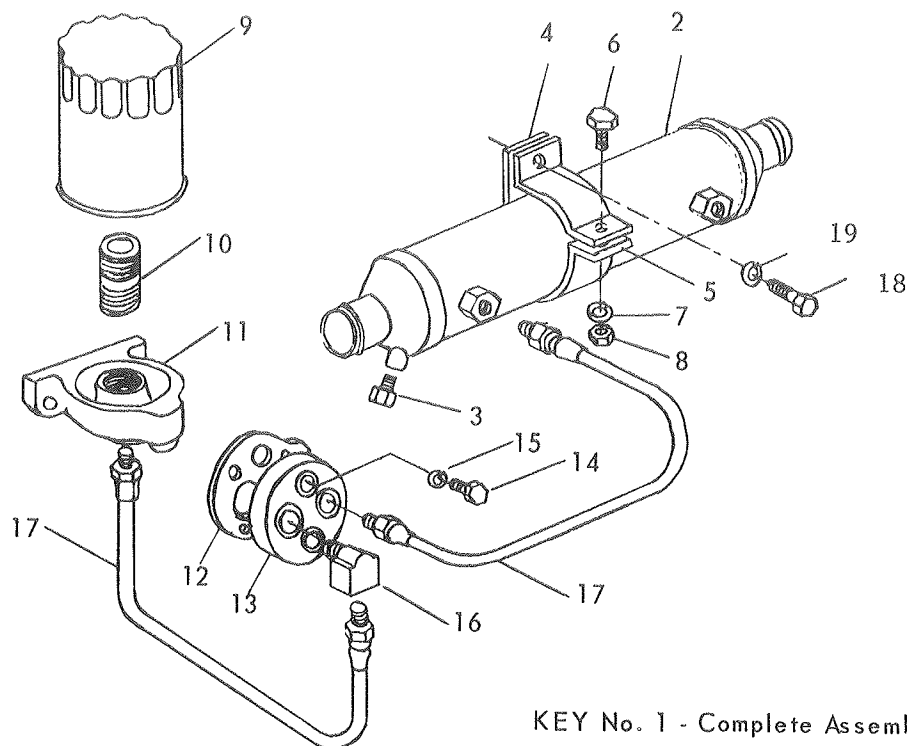
KEY No.	QUAN.	CODE	PART No.	DESCRIPTION
-	1	L	2E3	* Alternator, complete with fan
1	1	Motorola	20-136	Nut, pulley mounting, 5/8-18
2	1	Motorola	20-137	Washer, lock, 5/8
3	1	L	2B19	* Pulley
4	1	BY	7-68	* Fan
5	1	Motorola	20-152	Spacer, fan and pulley
6	4	Motorola	20-150	Nut, square, 10-32
9	1	Motorola	14-24	Housing, front
10	2	BY	11-21	* Bearing, front and rear
11	1	BY	11-3	* Retainer, front bearing
13	1	Motorola	20-7	Woodruff key, No. 5
14	1	Motorola	12-7	Rotor assembly
16	1	Motorola	12-22	Slip ring ass'y.
18	1	Motorola	20-111	Washer, lock, No. 10
19	1	Motorola	20-56	Screw, slip-ring retaining, 10-32
20	1	Motorola	13-3	Stator assembly
21	1	BY	1-18	* Diode ass'y., rect., neg.
22	1	BY	1-17	* Diode ass'y., rect., pos.
23	4	BY	15-4	* Washer, insulating, 1/2 x No. 10
24	2	BY	15-1	* Sleeve, insulating, 19/32 long
27	1	BY	11-26	* Retainer, rear bearing
28	1	Motorola	14-63	Housing, rear
29	4	Motorola	20-143	Bolt, 10-32 x 3 1/8
30	1	BY	1-30	* Diode ass'y., isolation, dual
31	1	Motorola	15-2	Sleeve, insulating, 3/32 long
32	1	Motorola	15-4	Washer, insulating, No. 10 x 1/2 o.d.
33	1	BY	3-7	* Brush assembly
34	8	Motorola	20-148	Locknut, 10-24
35	4	Motorola	20-116	Screw, 8-32 x 1/2
36	1	Motorola	20-113	Washer, lock, 1/4
37	1	Motorola	20-160	Nut, hex., 1/4-20
42	1	BY	3-14	* Gasket
43	1	BY	5-197	* Regulator R7-1
44	2	Motorola	20-117	Screw, reg. mounting
52	1	BY	2-17	Tachometer take-off (tap) kit





KEY	PART NO.	DESCRIPTION
	510-859	ALTERNATOR
	505-37	VOLTAGE REGULATOR
A	514-139	REAR COVER
B	--	CONNECTOR CLIP
C	501-43	BRIDGE ASSEMBLY
D	--	BRUSH COVER (ONLY)
E	503-12	BRUSH HOLDER ASSEMBLY
F	515-7	TERNINAL/BRACKET
G	--	REAR FOOT
H	514-212	REAR HOUSING ASSEMBLY
I	511-4	BEARING RETAINER (ONLY)
J	513-20	STATOR
K	512-45	ROTOR ASSEMBLY
L	NA	SPACER
M	11-23	REAR BEARING
N	11-21	FRONT BEARING
O	511-11	BEARING RETAINER (ONLY)
P	514-141	FRONT HOUSING ASSEMBLY
Q	520-92	THROUGH BOLTS (4)
R	507-55	FAN
S	507-101	PULLEY
T	--	SPACER
U	520-141	INSTALLATION KIT
V	--	GROUND TERMINAL ASSEMBLY
W	520-100	INS.TERMINAL ASSEMBLY
X	--	CAPACITOR
Y	--	B+ INSULATOR
Z	--	STUD

## OIL COOLER / FILTER ASSEMBLY



KEY No. 1 - Complete Assembly

KEY	ENGINE	QUAN.	CODE	PART NO.	DESCRIPTION
1	EG	1	L	D195B	OIL COOLER/FILTER ASSY.
1	FH	1	L	D195A	OIL COOLER/FILTER ASSY.
2	ALL	1	L	*2C207	OIL COOLER, COPPER, 1" WATER CONNECTIONS
2	ALL	1	L	*2C212	OIL COOLER, CUPRO-NICKEL, 1" WATER CONN.
2	ALL	1	L	*2C212Z	OIL COOLER, CUPRO-NICKEL, 1" WATER CONNECTIONS WITH ZINC ANODE
2	ALL	1	L	*2C220	OIL COOLER, COPPER, 1-3/4" WATER CONNECTIONS. USE WITH KEEL COOLER APPLICATIONS.
2	I	1	F	1A228	OIL COOLER TURBO
3	ALL	1	L	3L1	PLUG, DRAIN, 1/8 NPT
4	ALL	1	L	2M3	OIL COOLER BRACKET, LOWER
5	ALL	1	L	2M4	OIL COOLER BRACKET, UPPER
6	ALL	1	L	OE101	BOLT, HEX. HD., 1/4-20 x 5/8"
7	ALL	1	L	OC21	LOCKWASHER, 1/4"
8	ALL	1	L	OB16	NUT, HEX., 1/4-20
9	ALL	1	L	2N50	ELEMENT, OIL FILTER
10	ALL	1	L	3C450	NIPPLE, 11/16 x 1 1/4"
11	ALL	1	L	1A312	BASE, OIL FILTER

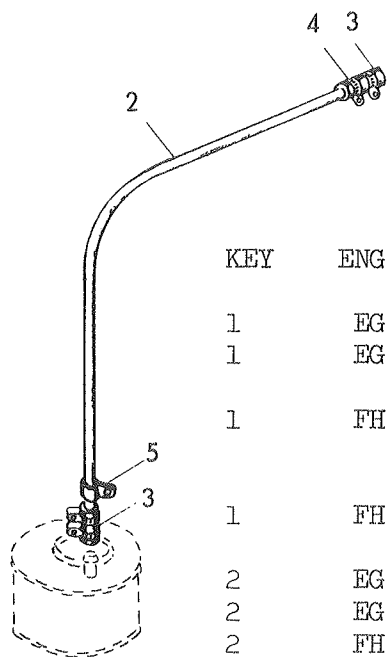
\* INCLUDES KEY 3 THRU 8



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION	B15
12	ALL	1	L	2D29	GASKET OIL PLATE	
13	ALL	1	L	1A309	PLATE, OIL TAKE-OFF (580)	
14	ALL	2	L	0E403	BOLT, 7/16-14 X 1 1/4"	
15	ALL	2	L	0C51	LOCKWASHER, 7/16"	
16	ALL	2	L	3D24	ELBOW, STREET, 3/8"	
17	EG	3	L	3K760	HOSE, OIL, 13 1/2"	
17	FH	1	L	3K760	HOSE, OIL, 13 1/2"	
17	FH	2	L	3K764	HOSE, OIL, 17"	
17	I	2	L	3K773	HOSE 18 1/2"	
18	ALL	1	L	0E402	BOLT 7/16-14 x 1"	
19	ALL	1	L	0C51	WASHER 7/16"	

### VENT TUBE ASSEMBLY

KEY No. 1 - Complete Assembly



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	EG	1	L	D1412	VENT TUBE (START AUG. '72)
1	EG	1	L	D1409	VENT TUBE ASSY. DISCONTINUED AUG. '72). NOTE 2.
1	FH	1	L	D1411	VENT TUBE ASSY. (FOR USE WITH SMOKE CONTROL VALVE ON ROCKER COVER).
1	FH	1	L	D1407	VENT TUBE ASSY. (NOTE 1)
2	EG	1	L	3K204A-13	HOSE, 1/2" ID x 13"
2	EG	1	L	1G145	TUBE, VENT (NOTE 1)
2	FH	1	L	1G146	TUBE, VENT
3	ALL	2	L	3K204A-1.25	HOSE, 1/2" ID x 1 1/4"
3	EG	1	L	3K204A-2.5	HOSE, 1/2" ID x 2 1/2"
4	FH	2/4	L	3K10	CLAMP, HOSE
5	ALL	1	L	2M9	CLIP
*	EG	1	L	3E372	ELBOW, COPPER. (NOTE 1)

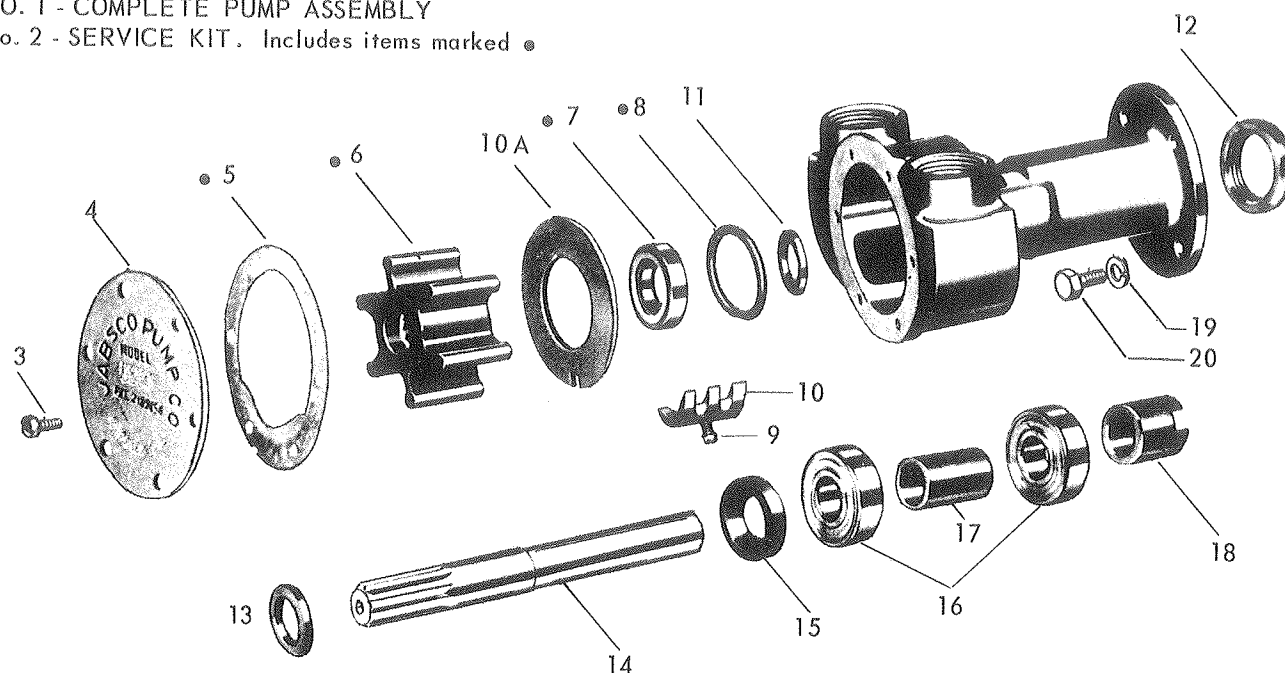
NOTE 1 - THESE PARTS USED ON ENGINES NOT EQUIPPED WITH SMOKE CONTROL VALVE ON ROCKER COVER.

NOTE 2 - CONNECTS TO UNDERSIDE OF MANIFOLD. USES FORMED COPPER TUBE, ADAPTOR AND SHORT CONNECTING HOSE.

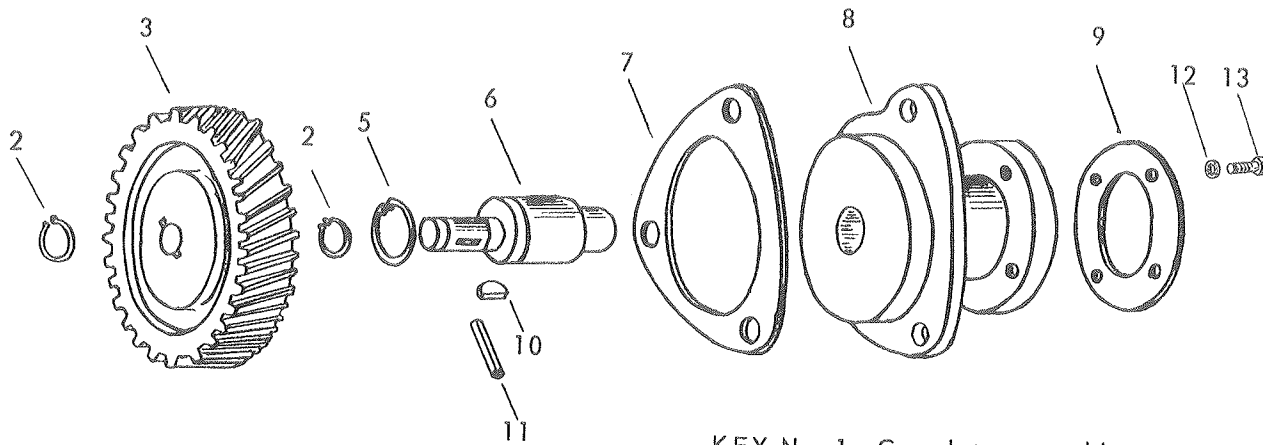
## PUMP, RAW WATER

KEY NO. 1 - COMPLETE PUMP ASSEMBLY

KEY No. 2 - SERVICE KIT. Includes items marked ●



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	2C45	PUMP, RAW WATER
2	ALL	1	T	90033-0001	SERVICE KIT. INCLUDES ITEMS MARKED ●
3	ALL	6	T	91002-0020	SCREW, END COVER
4	ALL	1	T	11830-0000	END COVER
5	ALL	1	T	3298-0000	● GASKET
6	ALL	1	T	1210-0003	● IMPELLER
7	ALL	1	T	92700-0060	● SEAL, SHAFT
8	ALL	1	T	92000-0210	● O RING
9	ALL	1	T	91003-0010	CAM SCREW
10	ALL	1	T	7884-0000	CAM & WEARPLATE ASSY. (INCLUDES KEY 9 & 10A)
10A	ALL	1	T		WEARPLATE (SUPPLIED WITH KEY 10 CAM, ONLY)
11	ALL	1	T	3166-0000	SEAL SPACER
12	ALL	1	T	3376-0000	ADAPTOR RING
13	ALL	1	T	3286-0000	SLINGER
14	ALL	1	T	5857-0000	SHAFT
15	ALL	1	T	92700-0180	BEARING SEAL, INNER
16	ALL	2	T	92600-0130	BEARING
17	ALL	1	T	3383-0000	BEARING SPACER
18	ALL	1	T	3278-0000	COUPLING
19	ALL	4	L	OC-21	LOCKWASHER, 1/4"
20	ALL	4	L	OE102	BOLT, 1/4-20 x 3/4"



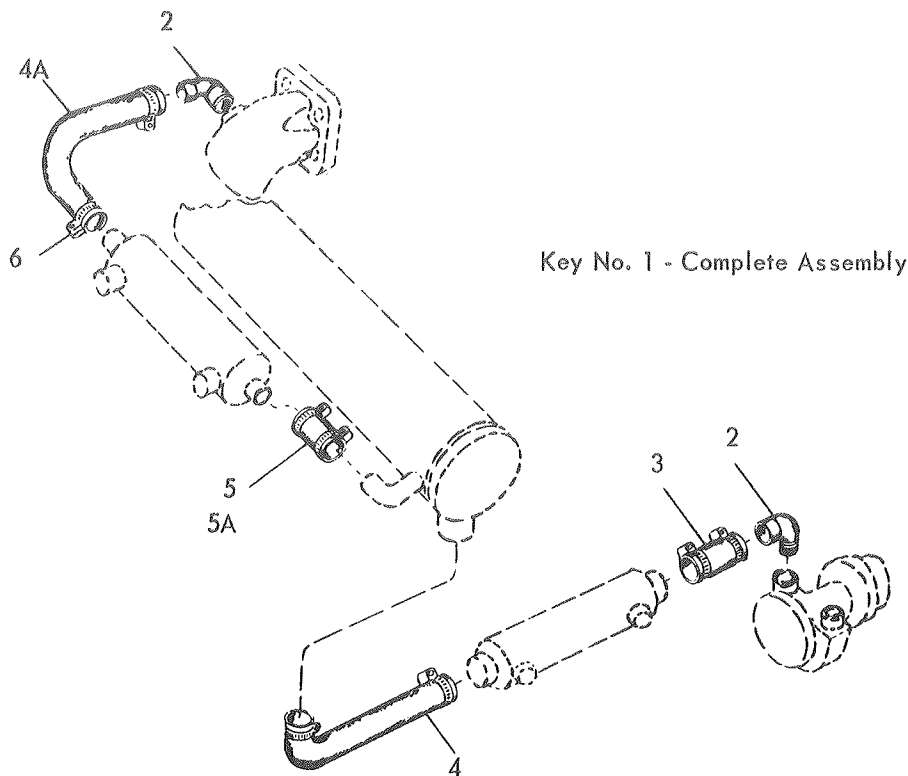
KEY No. 1 - Complete assembly

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D-365	PUMP ADAPTOR & GEAR DRIVE ASSY.
2	ALL	2	L	2M100	SNAP RING, 5/8"
3	ALL	1	L	2B101	GEAR
5	ALL	1	L	2M101	SNAP RING, 1 3/16"
6	ALL	1	L	2G13/1B60	BALL BEARING & COUPLING ASSY.
7	ALL	1	L	1C33	GASKET, ADAPTOR MOUNTING
8	ALL	1	L	1A327	HOUSING (609)
9	ALL	1	L	1C34	GASKET, PUMP MOUNTING
10	ALL	1	L	2K5	WOODRUFF KEY (NOTE 1)
11	ALL	1	L	2K213	ROLL PIN, 3/16 x 3/4 (NOTE 2)
12	ALL	4	L	OC21	LOCKWASHER, 1/4"
13	ALL	4	L	OE102	BOLT, 1/4-20 x 3/4"

NOTE 1) USED UNTIL JUNE 1972

NOTE 2) USED FROM JUNE 1972

RAW WATER PIPING

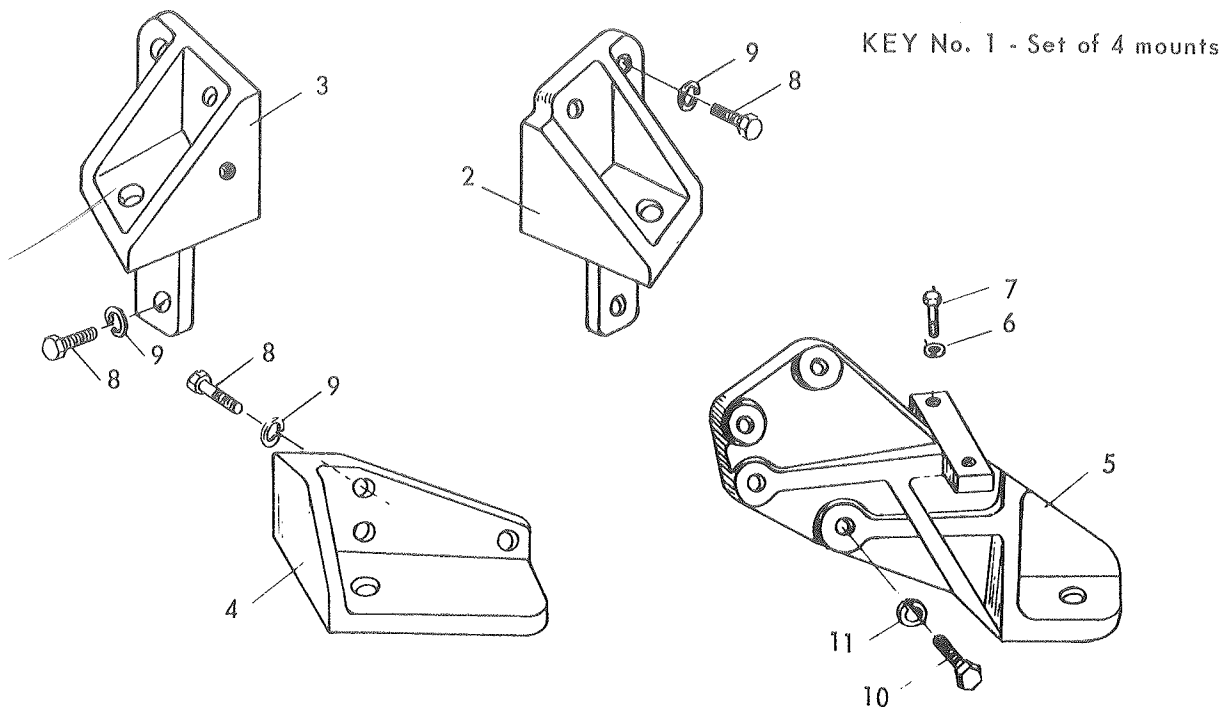


Key No. 1 - Complete Assembly

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	EG	1	L	D1490	RAW WATER PIPING
1	FHI	1	L	D894	RAW WATER PIPING
2	ALL	2	L	3E856	ELBOW, 3/4 NPT x 1" HOSE
3	EG	1	L	EW62-12	HOSE, 1" ID x 12"
3	FH	1	L	3K207A-5	HOSE, 1" ID x 5"
4	EG	1	L	3K816	MOLDED HOSE (NOTE 1)
4	FH	1	L	3K817	MOLDED HOSE (NOTE 1)
4A	ALL	1	L	3K818	MOLDED HOSE (NOTE 1)
5	FH	1	L	3K207A-2.25	HOSE, 1" ID x 2-1/4"
5A	EG	1	L	3K815	MOLDED HOSE (NOTE 1)
6	ALL	8	L	3K2	CLAMP, HOSE

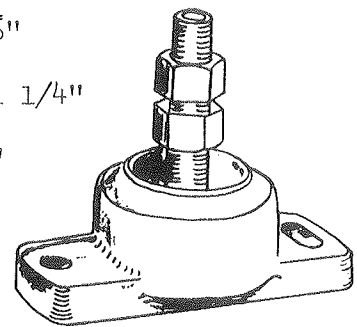
NOTE: 3K351 MOLDED HOSE TO BE CUT TO FIT APPLICATION. ONE HOSE 3K351 WILL MAKE 2 90° ELBOWS AS USED FOR KEY 4, 4A or 5A.

## ENGINE SUPPORTS



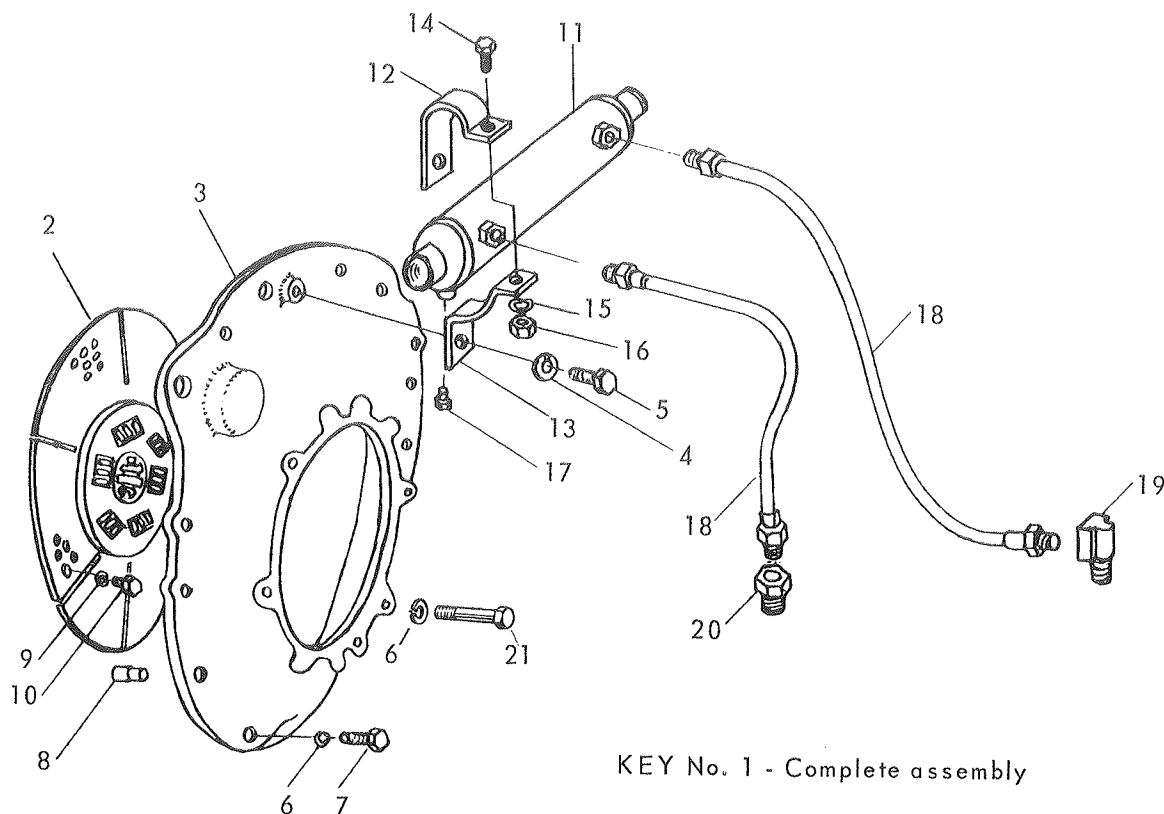
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D560	ENGINE SUPPORTS (SET OF 4)
2	ALL	1	L	1A277	SUPPORT, LEFT REAR (528)
3	ALL	1	L	1A332	SUPPORT, RIGHT REAR (626)
4	ALL	1	L	1A329	SUPPORT, RIGHT FRONT (600)
5	ALL	1	L	1A330	SUPPORT, LEFT FRONT (610)
6	ALL	2	L	OC31	LOCKWASHER, 5/16"
7	ALL	2	L	OE201	BOLT, 5/16-18 x 3/4"
8	ALL	9	L	OE403	BOLT, 7/16-14 x 1 1/4"
9	ALL	9	L	OC51	LOCKWASHER, 7/16"
10	ALL	4	L	OE303-C	BOLT, 3/8-16 x 1 1/4"
11	ALL	4	L	OC41	LOCKWASHER, 3/8"

## (FLEXIBLE) ENGINE MOUNTS



*	ALL	4	L	2M1	ENGINE MOUNT, USED TO JUNE 1974. (Identify by casting height 1 1/4")
*	ALL	4	L	2M5	ENGINE MOUNT, USED FROM JUNE 1974. (Identify by casting height 1 1/2")

## TRANSMISSION ADAPTION ASSEMBLY

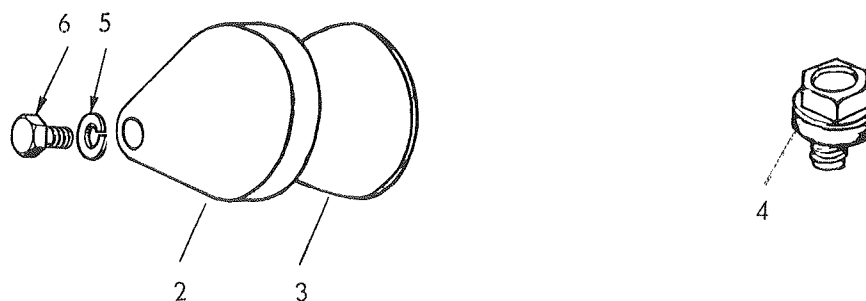


KEY No. 1 - Complete assembly

KEY	ENGINE	QUAN.	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D141-W	ADAPTION ASSY. FOR WARNER TRANSMISSIONS
1	ALL	1	L	D141-P	ADAPTION ASSY. FOR PARAGON TRANSMISSIONS
2	ALL	1	L	2L7	DRIVE DAMPER
3	ALL	1	L	1A285	ADAPTOR (548)
4	ALL	1	L	OC41	LOCKWASHER, 3/8"
5	ALL	1	L	OE302	BOLT, HEX. HD., 3/8-16 x 1"
6	ALL	21	L	OC51	LOCKWASHER, 7/16"
7	ALL	15	L	OE403	BOLT, HEX. HD., 7/16-14 x 1 1/4"
8	ALL	2	L	2K207	DOWEL
9	ALL	3	L	OC31	LOCKWASHER, 5/16"
10	ALL	3	L	OE201-C	BOLT, HEX. HD., 5/16-18 x 3/4"
11	ALL	1	L	2G207	OIL COOLER (COPPER) 1" WATER CONNECTIONS
11	ALL	1	L	2G212	OIL COOLER (CUPRO-NICKEL) 1" WATER CONN.
11	ALL	1	L	2G212-Z	OIL COOLER (CUPRO-NICKEL) 1" WATER CONNECTIONS & ZINC ANODE
11	ALL	1	L	2G220	OIL COOLER (COPPER) 1 3/4" WATER CONNECTIONS. FOR USE WITH KEEL COOLER.
12	ALL	1	L	2M3	OIL COOLER BRACKET, UPPER

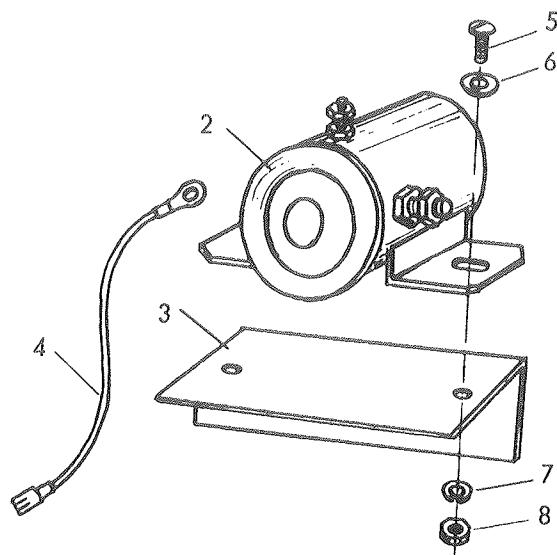
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
13	ALL	1	L	2M4	OIL COOLER BRACKET, LOWER
14	ALL	1	L	OE101	BOLT, 1/4-20 x 5/8"
15	ALL	1	L	OC21	LOCKWASHER, 1/4"
16	ALL	1	L	OB16	NUT, 1/4-20
17	ALL	1	L	3L1	PLUG, DRAIN, 1/8 NPT
18	ALL	A/R	L	3K760	HOSE, OIL, 13 1/2"
18	ALL	A/R	L	3K764	HOSE, OIL, 17"
18	ALL	A/R	L	3K772	HOSE, OIL, 22"
19	ALL	A/R	L	3D24	ELBOW, STREET, 3/8 NPT
20	ALL	1	L	3G25	ADAPTOR BUSHING, 3/8 x 3/8 NPT
21	ALL	6	L	OE409	BOLT, 7/16-14 x 3 1/2" (FOR WARNER)
21	ALL	6	L	OE405	BOLT, 7/16-14 x 1 3/4" (FOR PARAGON)

## APERTURE COVER



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D231	APERTURE COVER ASSY.
2	ALL	1	L	1A239	COVER (463)
3	ALL	1	L	1C28	GASKET
4	ALL	1	L	OE290	PLUG ASSY.
5	ALL	1	L	OC31	LOCKWASHER
6	ALL	1	L	OE201	BOLT, 5/16-18 x 3/4"

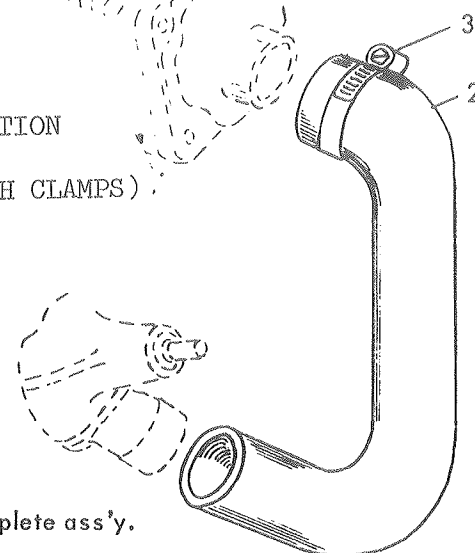
## D-1265 STARTER RELAY/SOLENOID ASSEMBLY



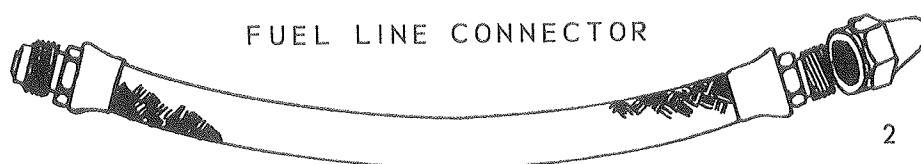
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D1265	STARTER SOLENOID/RELAY ASSY. (INCLUDES ALL FOLLOWING PARTS)
2	ALL	1	L	2E202	SOLENOID
3	ALL	1	L	1D2	ANGLE, SUPPORT
4	ALL	1	L	2E402	WIRE ASSY. (W/2 RING TERMINALS)
4	ALL	1	L	2E403	WIRE ASSY. (W/1 RING; 1 BAYONET TERMINAL)
5	ALL	2	L	OA4	MACHINE SCREW #10-32 x 1/2"
6	ALL	2	L	OC10	FLAT WASHER, 3/16"
7	ALL	2	L	OC5	LOCKWASHER, #10
8	ALL	2	L	OB1	NUT #10-32
				4C59	INSTRUCTIONS



KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	EFGH	1	L	D895	HOSE ASSY. (WITH CLAMPS)
2	ALL	1	L	3K507	HOSE, MOLDED
*	ALL	1	L	3K213-B	SPRING INSERT
3	ALL	2	L	3K4	CLAMP



Key No. 1 - Complete ass'y.



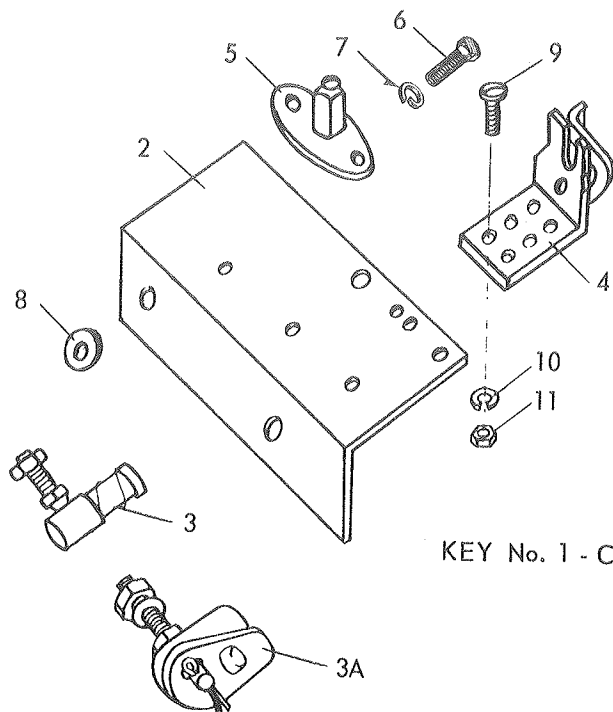
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D798	FUEL LINE, .9" LONG (INCLUDES KEY 2)
1	ALL	1	L	D799	FUEL LINE, 15" LONG (INCLUDES KEY 2)
1	ALL	1	L	D799-AA	FUEL LINE, 36" LONG
2	ALL	1	L	3E18	NUT, FUEL LINE

## MISCELLANEOUS EQUIPMENT

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
	ALL	4	L	1D12	RING, LIFTING
	EG	2	L	2H52	AIR FILTER, 2 9/16" BOLT SPACING. (USED UNTIL AUGUST 1972)
	EG	2	L	2H54	AIR FILTER, 2 7/8" BOLT SPACING. (USED FROM AUG. 1972) WITH 1F3 ELEMENT.
	EG	2	L	1F4	FILTER ELEMENT ONLY
	FH	1	L	2H53	AIR FILTER (WITH 1F1 ELEMENT)
	FH	1	L	1F1	FILTER ELEMENT ONLY
	ALL	1	L	2B209	VEE BELT
		A/R	L	EM103	PAINT, TOUCH-UP RED, 13 OZ. SPRAY CAN.

## OPTIONAL EQUIPMENT

## EK28 and EK28-A THROTTLE and STOP CONTROL HARDWARE KITS

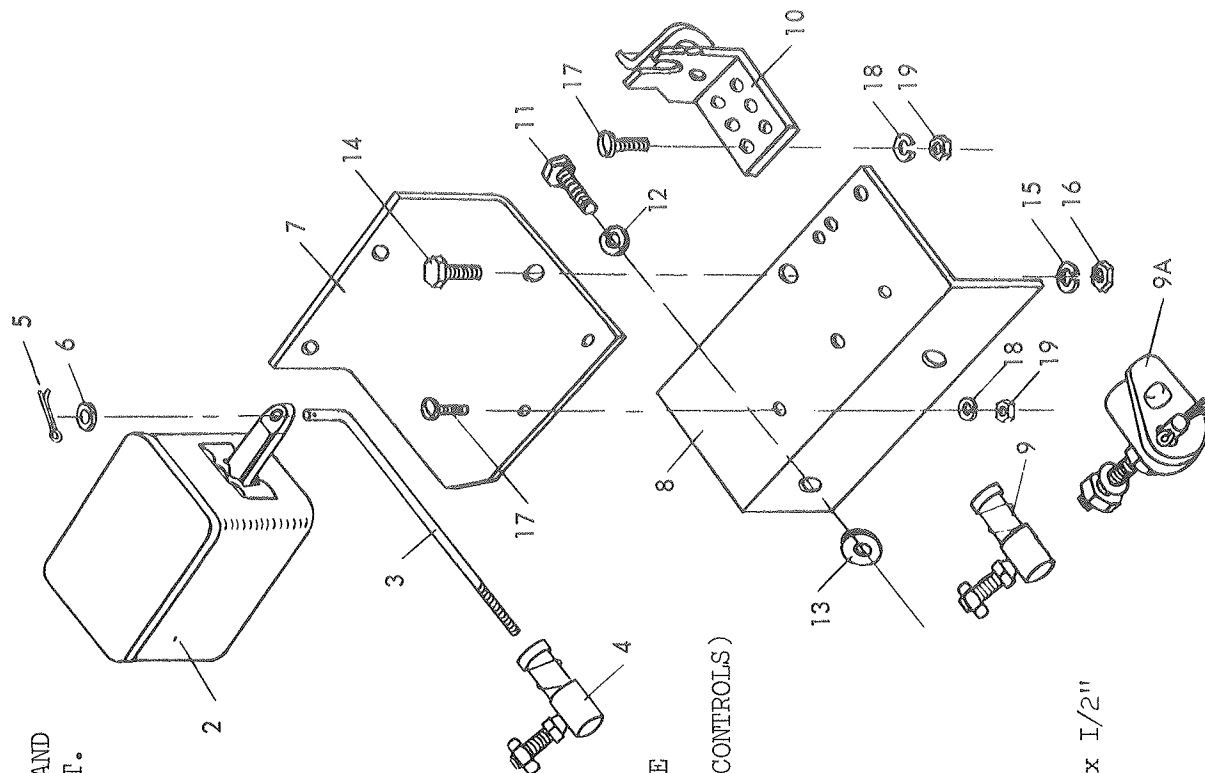


KEY No. 1 - Complete assembly

KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	EK28	THROTTLE AND STOP CONTROL ASSY.
1	ALL	1	L	EK28-A	DUAL THROTTLE AND STOP CONTROL ASSY.
2	ALL	1	L	1D40	ANGLE BRACKET
3	ALL	1	L	EC103	BALL JOINT (FOR SINGLE CONTROL)
3A	ALL	1	L	EC163	CABLE CONNECTORS (FOR DUAL CONTROL)*
4	ALL	1	L	EC104	ALSO INCLUDES EC110--SEE BELOW CABLE CLAMP (FOR SINGLE CONTROL)
4	ALL	1	L	* EC110	CABLE CLAMP (FOR DUAL CONTROL)
5	ALL	1	L	EC76	STOP CABLE CLAMP
6	ALL	2	L	OE202	BOLT, 5/16-18 x 1"
7	ALL	2	L	OC31	LOCKWASHER, 5/16
8	ALL	6	L	OC30	FLAT WASHER, 5/16
9	ALL	4	L	OA3	MACHINE SCREW, #10-32 x 3/8"
10	ALL	4	L	OC5	LOCKWASHER #10
11	ALL	4	L	OB1	NUT, #10-32
				4C51	INSTRUCTIONS

D-1266 ELECTRIC STOP AND THROTTLE CONNECTION KIT

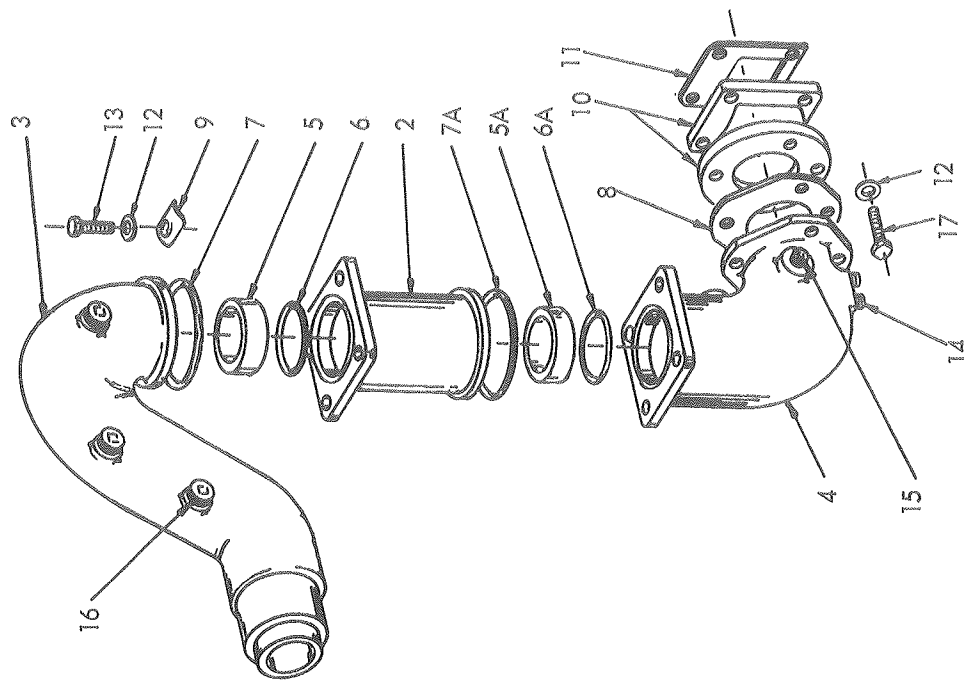
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D1266	ELECTRIC STOP CONTROL AND THROTTLE CONNECTION KIT.
1	ALL	1	L	D1266-A	SAME-FOR DUAL STATION
2	ALL	1	L	2E210	SOLENOID
2A	ALL	1	L	2E211	SOLENOID, NEW STYLE
3	ALL	1	L	1B65	ROD, CONNECTING
4	ALL	1	L	EC103	BALL JOINT
5	ALL	1	L	2K353	COTTER, 1/16 x 1/2"
6	ALL	1	L	OC11	FLAT WASHER, 3/16"
7	ALL	1	L	1D44	ANGLE BRACKET, UPPER
8	ALL	1	L	1D40	ANGLE BRACKET, LOWER
9	ALL	1	L	EC103	BALL JOINT (FOR SINGLE CONTROL)
9A	ALL	1	L	EC163	CABLE CONNECTORS (FOR DUAL CONTROLS)
10	ALL	1	L	EC104	CABLE CLAMP (FOR SINGLE CONTROL)
10	ALL	1	L	EC110	CABLE CLAMP (FOR DUAL CONTROLS)
11	ALL	2	L	OE202	BOLT, 5/16-18 x 1"
12	ALL	2	L	OC31	LOCKWASHER, 5/16"
13	ALL	6	L	OC30	FLAT WASHER, 5/16"
14	ALL	1	L	OE101	BOLT, 1/4-20 x 5/8"
15	ALL	1	L	OC21	LOCKWASHER, 1/4"
16	ALL	1	L	OB16	NUT, 1/4-20
17	ALL	4	L	OA4	MACHINE SCREW #10-32 x 1/2"
18	ALL	4	L	OC5	LOCKWASHER #10
19	ALL	4	L	OB1	NUT, #10-32



KEY No. 1 - Complete Assembly

# OPTIONAL EQUIPMENT D-1130 EXHAUST RISER ASSEMBLY

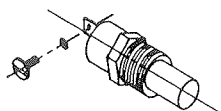
KEY	ENGINE	QUAN	CODE	PART NO.	DESCRIPTION
1	ALL	1	L	D1130	RISER ASSEMBLY. CONSISTS OF KEY NUMBERS 3 THROUGH 17.
2	ALL	1	L	EE25	RISER EXTENSION ASSEMBLY. CONSISTS OF KEY NUMBERS 2 AND 5A THROUGH 7A.
3	ALL	1	L	EE24-A	GOOSENECK
4	ALL	1	L	EE24-B	ELBOW
5	ALL	1	L	EE24-C	SLEEVE
6	ALL	1	L	EE24-D	O RING (SMALL)
7	ALL	1	L	EE24-E	O RING (LARGE)
8	ALL	1	L	EE24-F	GASKET
9	ALL	4	L	EE24-G	RETAINER
10	ALL	1	L	1A348	ADAPTOR, MANIFOLD (669)
11	ALL	1	L	1C26	GASKET
12	ALL	8	L	OC41	LOCKWASHER, 3/8"
13	ALL	4	L	OE303-C	BOLT, 3/8 x 1 1/4
14	ALL	2	L	3L10	PLUG, 1/4"
15	ALL	2	L	3L31	PLUG, 1/2"
16	ALL	4	L	3L41	PLUG, 3/4"
17	ALL	4	L	OE302-C	BOLT, 3/8 x 1 1/4



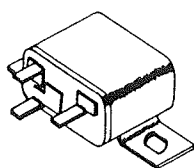
Key No. 1 - Complete riser assembly  
Key No. 2 - Extension assembly

EK31 and EK32 ALARM SYSTEMS

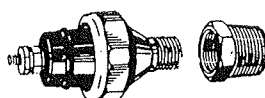
<u>CODE</u>	<u>PART</u>	<u>DESCRIPTION</u>
L	EG302	OIL ALARM SENDING UNIT, 1/8" NPT
L	3G9	BUSHING, 1/8 x 3/8 NPT
L	EG403	ALARM TEMPERATURE SENDER, 3/8" NPT
L	EI600	RELAY
L	EI601	BUZZER



TEMP SENDER

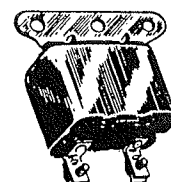


RELAY



OIL SENDER

BUSHING



BUZZER

OPTIONAL EQUIPMENT

D1495-A WATER HEATER CONNECTION KIT

KEY	CODE	PART No.	DESCRIPTION	2
1	L	D1495-A	WATER HEATER CONNECTION KIT	
2	L	2C303	HOSE SLEEVE	
3	L	3K4	CLAMP, HOSE	
4	L	3E499-A	ADAPTOR	
5	L	3F12	TEE	
*	L	4C68	INSTRUCTIONS	

KEY No. 1 - Complete kit

## "ON BOARD" SPARE PARTS KITS

The prudent boatman will stow spare engine parts aboard his vessel to be used in the event of emergency.

Ordinarily it is not practical to perform major engine repairs on a small vessel at sea, but such parts as hoses, vee belts, filter elements, etc. which may be serviced and which, upon failure, could cause engine failure, should certainly be carried aboard. For this purpose the following "Limited Cruising Kits" are offered.

For the vessel that may range to distant or foreign ports away from lines of communication or transportation, consideration should be given to stowage of additional parts. For such use the "Extended Cruising Range Kits" are available.

**LIMITED CRUISING RANGE KITS** include: complete set of fuel injection pipes; thermostat; end gaskets for manifold and exchanger; zinc pencil element; raw water pump impeller; lube oil filter element; fuel filter element; vee belt; complete set of hoses.

KIT No. 105 for 6D363 6 cylinder engines equipped with CAV injection pump

KIT No. 109 for 6D363 and 6D380 engines equipped with Simms injection pump

KIT No. 107 for 4D242 and 4D254 4 cylinder engines.

**EXTENDED CRUISING RANGE KITS** include: All parts as listed above for limited cruising range kits except for raw water pump impeller and fuel lift pump rebuild kit. Additional items include: complete gasket (overhaul) set (excepting transmission); complete injector; injector removal tool; complete fresh water pump; complete fuel supply (lift) pump; raw water pump overhaul kit.

Kit No. 106 for 6D363 6 cylinder engine equipped with CAV injection pump.

Kit No. 108 for 4D242 or 4D254 4 cylinder engines.

Kit No. 110 for 6D363 6 cylinder engines equipped with Simms injection pump.

Kit No. 110-A for all 6D380 6 cylinder engines.

## MANUALS, PARTS LISTS, Etc.

ENGINE	CODE	PART NO.	DESCRIPTION
ALL	F	4C62	FORD ENGINE REBUILDING (SHOP) MANUAL
TRANSMISSION	P	4C69	PARAGON G31 & G33 (LEHMAN 144)
TRANSMISSION	P	4C70	PARAGON P30 & P40 SERIES (LEHMAN 155 & 156)
TRANSMISSION	W	4C71	WARNER 71 (LEHMAN 71) TRANSMISSION ONLY
TRANSMISSION	W	4C72	WARNER 72 (LEHMAN 72) TRANSMISSION ONLY
TRANSMISSION	W	4C73	WARNER 73 (LEHMAN 73) TRANSMISSION (DIRECT DRIVE & REDUCTION)
TRANSMISSION	W	4C74	WARNER 1.5 REDUCTIONS ONLY
TRANSMISSION	W	4C75	WARNER 1.9 REDUCTIONS ONLY
TRANSMISSION	W	4C76	WARNER 2.1 REDUCTIONS ONLY
TRANSMISSION	W	4C77	WARNER 2.5 & 2.9 REDUCTIONS ONLY
TRANSMISSION	W	4C78	WARNER VEE DRIVE (ALL RATIOS)
TRANSMISSION	W	4C79	WARNER DROP CENTER (LEHMAN 161 & 162) TRANSMISSION & REDUCTIONS
TRANSMISSION	W	4C80	WARNER GENERAL INSTALLATION MANUAL

