LEHMAN POWER

A member of the CLAAS group

# MARINE DIESEL ENGINE

MODELS: SD80,SP90,SD120,SP135,SP160,SP225

# OPERATORS MANUAL AND PARTS IDENTIFICATION


Lehman Power Corporation
800 E. Elizabeth Avenue
Linden, New Jersey 07036
United States of America
(201) 486-5700
Telex: 6853185
Cable: Lehman Linden

Lehman Power Ltd.
Saxham, Bury St. Edmunds
Suffiok 1P28 6QZ, England
(44)-284-63100
Telex: 81133 Manns G


Price $7.50

THIS MANUAL IS AVAILABLE IN SEVERAL DIFFERENT LANGUAGES.
PLEASE CONTACT YOUR NEAREST LEHMAN COMPANY FOR AVAILABILITY.


4C91 July 1983

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 keep your 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.

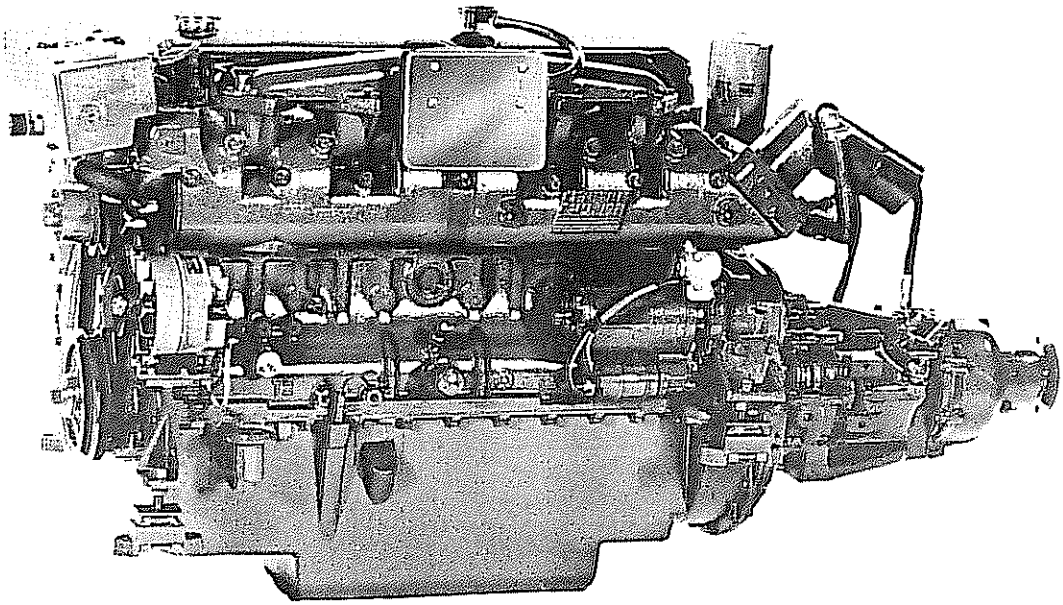
Finally, always insist on genuine Lehman Parts. There are many examples of good boating days ruined by the use of spurious engine and cooling circuit parts. Always specify Lehman parts. If you have difficulty in obtaining them, please contact Lehman.

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.

LEHMAN POWER CORPORATION

Allan Howell

President



## Forward

This book contains operating and maintenance instructions for the complete range of engines listed on the inside front cover.

The life of your engine unit and the delivery of the high performance built into it will depend on the care it receives throughout its life. It is the owners' responsibility to ensure that the engine is correctly oeprated and that the maintenance operations outlined in this book are carried out regularly after the specified hours of operation have been reached. We consider it in your best interests to enlist the aid of the authorized Lehman Power Distributor in your area not only when repairs are required, but also for regular maintenance with genuine Lehman parts. This regular maintenance will result in minimal operating and repair costs.

Where the terms left and right appear in this book, they refer to the respective sides of the engine when viewed from the rear (flywheel end). Pistons and valves are numbered from the front or timing cover end of the engine, commencing with number 1 cylinder.

You may find that your engine assembly includes optional equipment not specifically covered in this manual. If you have any questions, contact your local Lehman Distributor.

## Before Operation

Before operating a new engine it should be thoroughly inspected for damage likely to affect its subsequent operation that may have occured during shipment or during installation in the boat. Controls should be inspected to assure they perform and, of course, the operator should be familiar with all controls, instruments and proper engine operation, as well as, insuring that all fluids are at their proper capacities.

## Start Up Program

With this new range of engines, Lehman Power is initiating an "engine start up" program in many areas. This program consists of an installation inspection and we ask that owners follow the recommendations of the local Lehman distributor to ensure the maximum efficiency and pleasure is obtained from your Lehman diesel. Neither Lehman Power nor its distributors and dealers will be responsible for any travel and transportation costs associated with this program. These costs would be paid by the owners. Please contact your local Lehman Power distributor for more details concerning this subsidized program in your area. If this program is not yet available in your area, we suggest the engine not be started until the operator has read this manual thoroughly and familiarized himself with the manner of checking the engine oil level, coolant level, transmission oil level, etc. The chapters on "maintenance" and "running in" should be particularly noted.

NOTE: BEFORE STARTING TURBOCHARGED OR TURBO/INTERCOOLED ENGINES, REFER TO "LUBRICATION" SECTION FOR INFORMATION REGARDING PRIMING OF THAT TURBO UNIT WITH OIL.

## Running In:

DO NOT OPERATE YOUR NEW ENGINE AT HIGH SPEEDS IMMEDIATELY: 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;

| Running Time | RPM |
|---|---|
| 30 Min. | Idle (no load)* |
| 30 Min. | 800 |
| 1 Hour | 1000 |
| 1 Hour | 1200 |
| 2 Hours | 1400 |
| 4 Hours | 1500 |

Total - 9 Hours

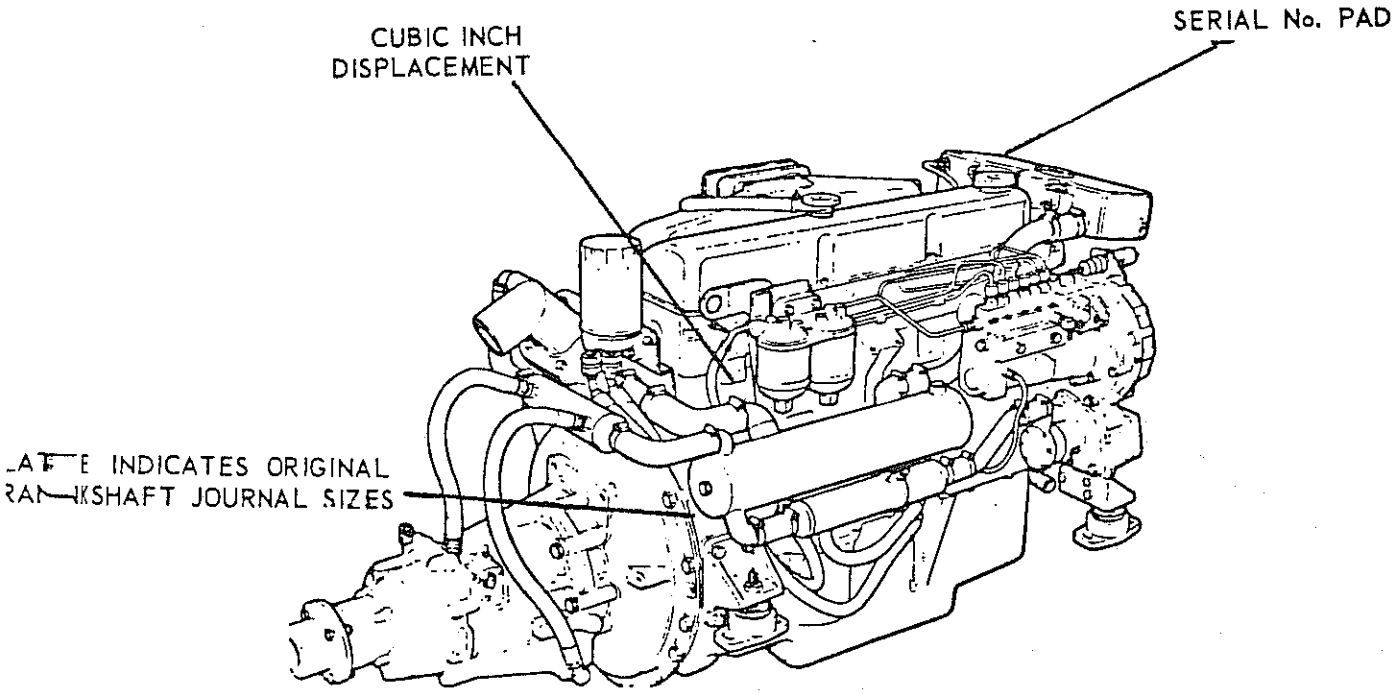
After the first 15 hours, complete the maintenance instructions as shown elsewhere in this manual.

*Turbo and Turbo Intercooled Engines will produce some white smoke during this phase, it is normal, particularly on a new engine, and will disappear when the engine starts to work and gets warm.

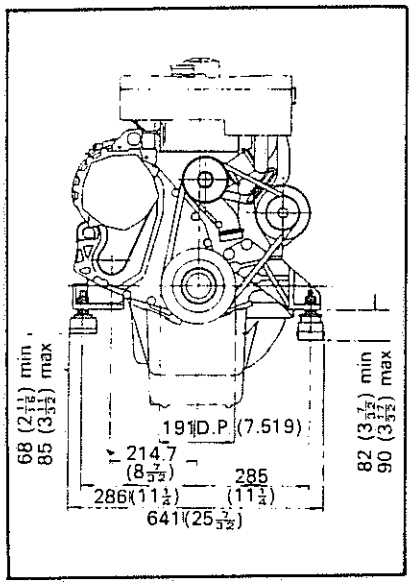
Do not operate your engine for excessive periods at low power - your engine wants to work - let it!

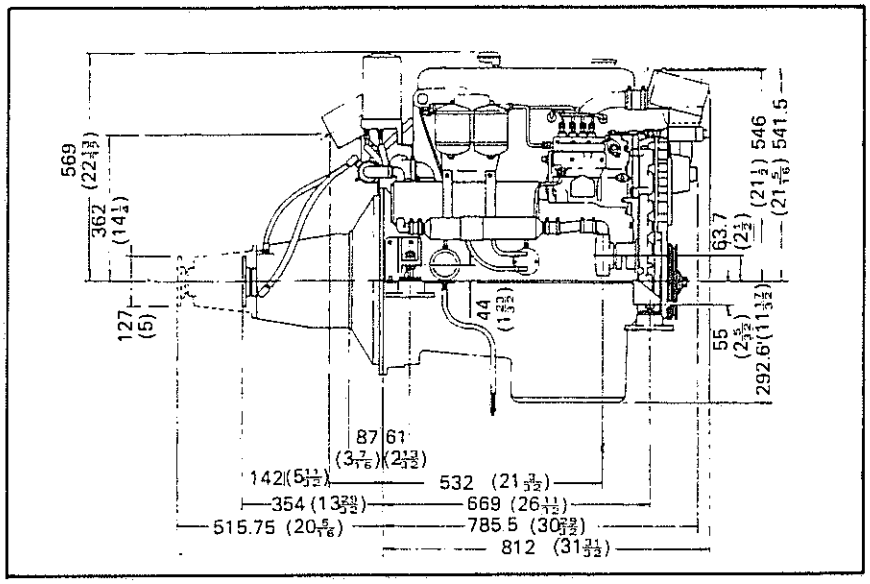
## MODEL IDENTIFICATION AND SERIAL NUMBERS

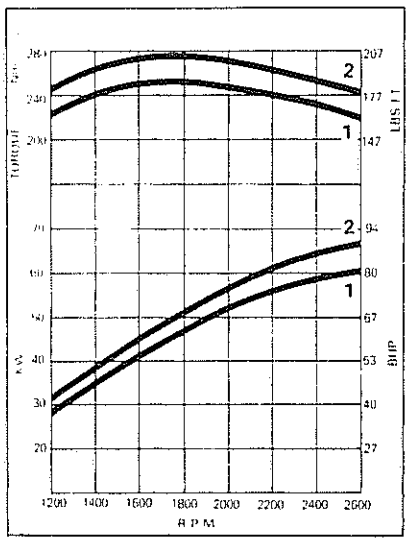
The model and serial number of your engine is easily located by reference to the following drawing. The Lehman Power serial number, necessary for warranty authorization and control, will be stamped on a raised pad on the expansion tank. A date code will be stamped on a pad located behind the injection pump. The cubic inch displacement of the unit is stamped on a similar pad at the rear, starboard side of the cylinder block.



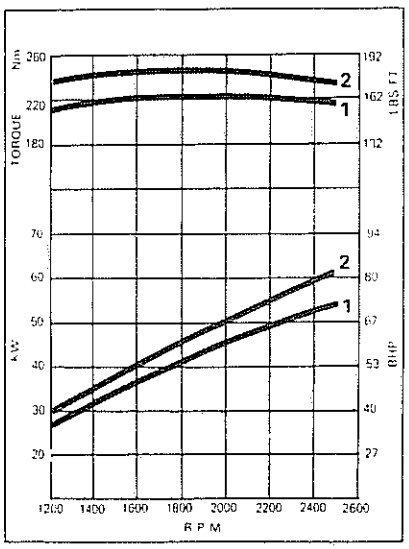
# Installation drawings and power curves




Super 90 DIN 6270




Standard 80 DIN 6270

**Specification Lehman Standard 80 and Super 90**

TYPE — 4 cyl in line, 4 cycle overhead valve naturally aspirated diesel engine.

BORE/STROKE — 4.22 ins x 4.524 ins; 107 mm x 115 mm.

DISPLACEMENT — 254 cu ins; 4.150 litres.

GROSS POWER — Standard 80-80 bhp at 2500 rpm. Super 90-90 bhp at 2600 rpm.

COMPRESSION RATIO — 16.1:1

FUEL — ASTM D975 Class 2D or BS2869 Class A1.

OIL CAPACITY — 9.9 US quarts; 10.5 litres.

OIL FILTER — full flow, disposable cartridge, spin on.

FUEL SYSTEM — in line fuel injection pump, engine oil lubricated, with mechanical governor, and flexible braided fuel supply line.

ELECTRICAL SYSTEM — 12 volt or 24 volt negative ground.

STARTING MOTOR — 12 volt or 24 volt, electrical solenoid.

ALTERNATOR — 70 amp with voltage regulator.

RAW WATER COOLING SYSTEM - tubular copper or cupro-nickel heat exchanger with zinc anti-corrosion pencil; optional 80% or 100% keel cooling.

RAW WATER PUMP — gear driven high flow rubber impeller type.

FRESH WATER COOLING SYSTEM — pressurised fresh water circuit for engine and exhaust manifold.

FRESH WATER CAPACITY — 14.1 US quarts;15 litres.

ENGINE MOUNTINGS — 4 in line or stepped, adjustable anti-vibration mounts; high grade on Super 90.

MAXIMUM INSTALLATION ANGLE — 15° rear down.

DRY WEIGHT LESS TRANSMISSION — 941 lbs; 428 kg.

EXHAUST OUTLET — 30° water cooled exhaust elbow, or straight dry exhaust flange.

TRANSMISSIONS — Borg Warner, Hurth, Newage PRM, Twin Disc — other available on request.

FINISH — Standard 80 all paint — Super 90 painted with chrome rocker box, air filter and filler caps.

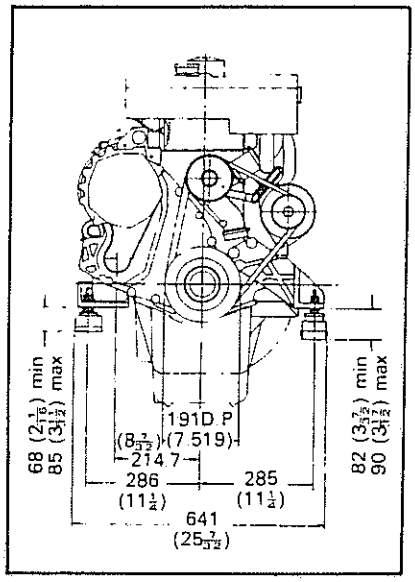
APPROVAL STANDARDS — Lloyds, RINA, DNV, ABS and others available.

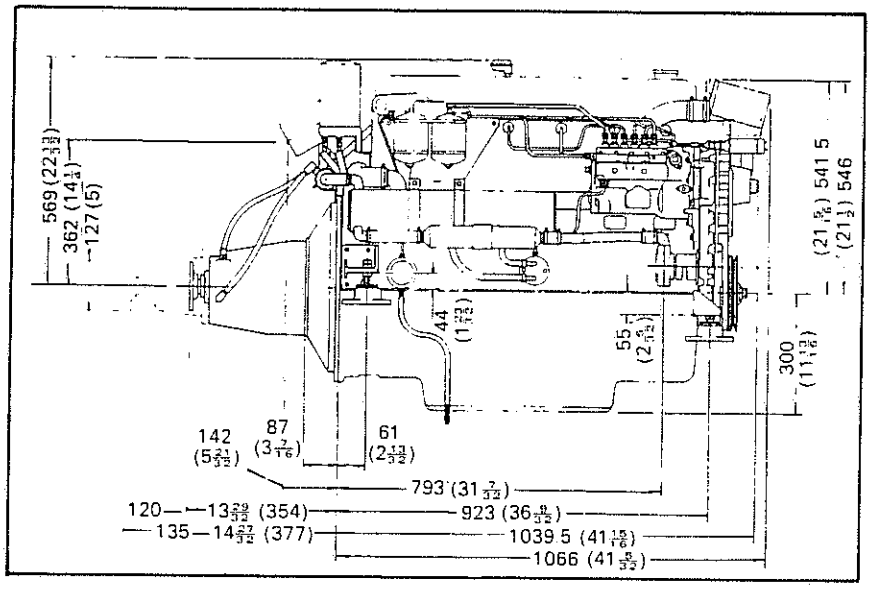
**Lehman Power Corporation**
800 East Elizabeth Ave.
Linden, New Jersey 07036
Telex: 6853185 Cable: Lehman Linden
Tel: (201) 486-5700

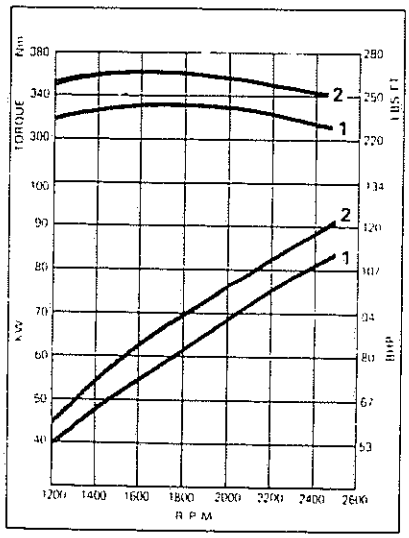
**Lehman Power Limited**
Saxham, Bury St. Edmunds
Suffolk IP28 6QZ, England
Tel: Bury St. Edmunds (0284) 63100
Telex: 81133 Manns G.

# Installation drawings and power curves

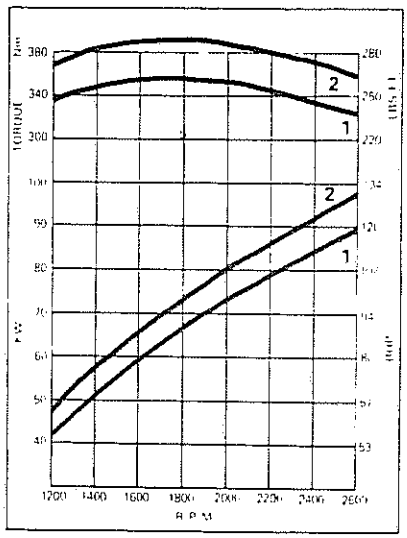





Standard 120 DIN 6270




Super 135 DIN 6270

**Specification Standard 120 and Super 135**

TYPE — 6 cyl in line, 4 cycle overhead valve naturally aspirated diesel engine.

BORE/STROKE — 4.22 ins x 4.524 ins; 107 mm x 115 mm.

DISPLACEMENT — 380 cu ins; 6.22 litres.

GROSS POWER — Standard 120-120 bhp at 2500 rpm.
Super 135-135 bhp at 2600 rpm.

COMPRESSION RATIO — 16.1:1.

FUEL — ASTM D975 Class 2D or BS2869 Class A1.

OIL CAPACITY — Standard 120 14.2 US quarts; 15 litres — Super 135 14.6 US quarts; 15.5 litres.

OIL FILTER — full flow, disposable cartridge, spin on.

FUEL SYSTEM — in line fuel injection pump, engine oil lubricated, with mechanical governor, and flexible braided fuel supply line.

ELECTRICAL SYSTEM — 12 volt or 24 volt negative ground.

STARTING MOTOR — 12 volt or 24 volt, electrical solenoid.

ALTERNATOR — 70 amp with voltage regulator.

RAW WATER COOLING SYSTEM — tubular copper or cupro-nickel heat exchanger with zinc anti-corrosion pencil; optional 80% or 100% keel cooling.

RAW WATER PUMP — gear driven high flow rubber impeller type.

FRESH WATER COOLING SYSTEM — pressurized fresh water circuit for engine and exhaust manifold.

ENGINE MOUNTINGS — 4 in line or stepped, adjustable anti-vibration mounts; high grade on Super 135.

MAXIMUM INSTALLATION ANGLE — 15° rear down.

DRY WEIGHT LESS TRANSMISSION — 1254 lbs; 570 kg.

EXHAUST OUTLET 30° water cooled exhaust elbow, or straight dry exhaust flange.

TRANSMISSION — Borg Warner, Hurth, Newage PRM, Twin Disc — others available on request.

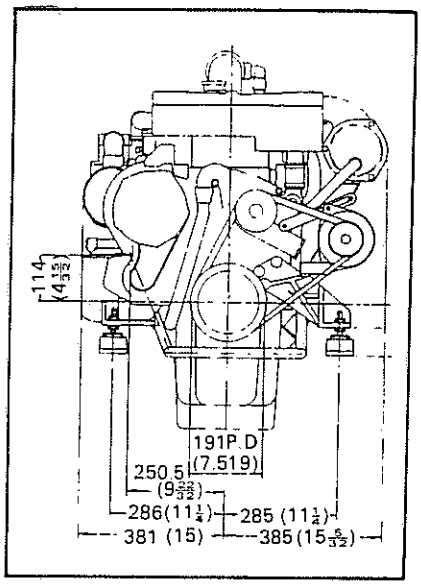
FINISH — Standard 120 all paint — Super 135 painted with chrome rocker box, air filter and filler caps.

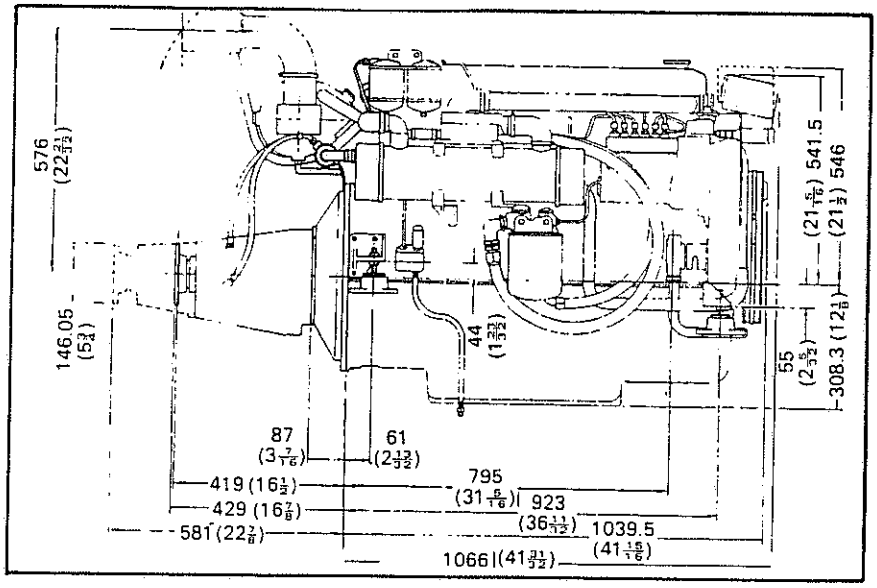
APPROVAL STANDARDS — Lloyds, RINA, DNV, ABS and others available.

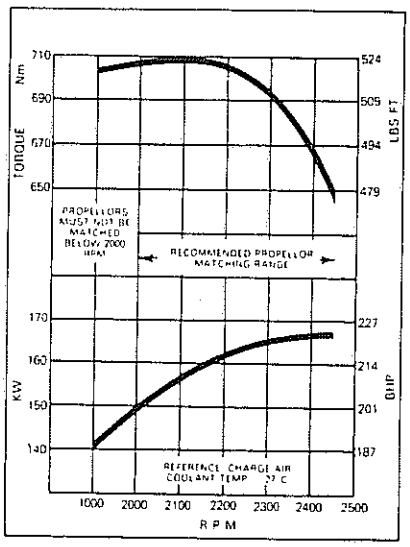
**Lehman Power Corporation**
800 East Elizabeth Ave.
Linden, New Jersey 07036
Telex: 6853185 Cable: Lehman Linden
Tel: (201) 486-5700

**Lehman Power Limited**
Saxham, Bury St. Edmunds
Suffolk IP28 6QZ, England
Tel: Bury St. Edmunds (0284) 63100
Telex: 81133 Manns G.

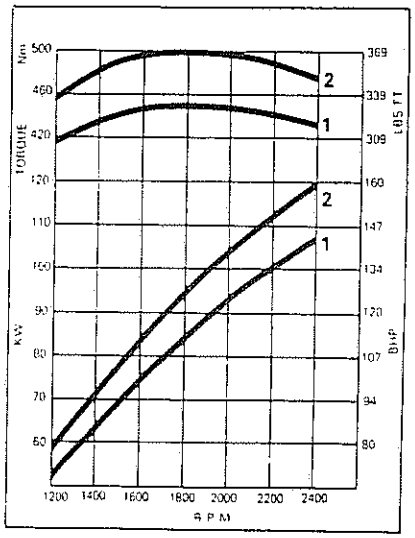
# Installation drawings and power curves




Super 225 BS AU 141 : 1971




Super 160 DIN 6270

**Specification Super 160 and Super 225**

TYPE — 6 cyl in line, 4 cycle overhead valve diesel engine — Super 160 turbo charged and Super 225 turbo charged and intercooled.

BORE/STROKE — 4.125 ins x 4.524 ins; 105 mm x 115 mm.

DISPLACEMENT — 363 cu. ins; 5.95 litres.

GROSS POWER — Super 160-160 bhp at 2400 rpm; Super 225-225 bhp at 2450 rpm.

COMPRESSION RATIO — Super 160 15.45:1; Super 225 14.7:1.

FUEL — ASTM D975 Class 2D or BS2869 Class A1.

OIL CAPACITY — Super 160 14.6 US quarts; 15.5 litres — Super 225 19.8 US quarts; 21 litres.

OIL FILTER — full flow, disposable cartridge, spin on.

FUEL SYSTEM — in line fuel injection pump, engine oil lubricated, with mechanical governor and flexible braided fuel supply line.

ELECTRICAL SYSTEM — 12 volt or 24 volt negative ground.

STARTING MOTOR — 12 volt or 24 volt, electrical solenoid.

ALTERNATOR — 70 amp with voltage regulator.

RAW WATER COOLING SYSTEM — tubular copper or cupro-nickel heat exchanger with zinc anti-corrosion pencil; optional 80% or 100% keel cooling.

RAW WATER PUMP — gear driven high flow rubber impeller type.

FRESH WATER COOLING SYSTEM — pressurized fresh water circuit for engine and exhaust manifold.

FRESH WATER CAPACITY — Super 160 19. 75 US quarts; 21 litres. Super 225 21.6 US quarts; 23 litres.

ENGINE MOUNTINGS — 4 in line or stepped, adjustable high grade anti-vibration mounts.

MAXIMUM INSTALLATION ANGLE — 15° rear down.

DRY WEIGHT LESS TRANSMISSION — Super 160 1275 lbs; 580 kg. Super 225 1310 lbs; 595 kg.

EXHAUST OUTLET — 30° water cooled exhaust elbow, or straight dry exhaust flange.

TRANSMISSIONS — Borg Warner, Twin Disc, PRM — others available on request.

FINISH — painted with chrome rocker box, air filter and caps.

APPROVAL STANDARDS — Lloyds, RINA, DNV, ABS and others available.

**Lehman Power Corporation**
800 East Elizabeth Ave.
Linden, New Jersey 07036
Telex: 6853185 Cable: Lehman Linden
Tel: (201) 486-5700

**Lehman Power Limited**
Saxham, Bury St. Edmunds
Suffolk IP28 6QZ, England
Tel: Bury St. Edmunds (0284) 63100
Telex: 81133 Manns G.

# LEHMAN POWER WARRANTY (LIMITED)

Lehman Power Corporation and Lehman Power Limited (hereinafter called "the Company") grant the following Limited Warranty to the first retail purchaser of Lehman Marine Engines in respect of which this Warranty is issued.

1 The Company warrants each new assembly or component part of our manufacture to be free from defects in material and workmanship for a period of one year from the date of purchase by the first retail purchaser. This Warranty is only initiated upon receipt by the Company of the completed Warranty Card, supplied with each new unit. Warranty service is obtainable from any authorized Lehman Power Distributor or Dealer. The Company reserves the right to repair or replace at our sole option any defective item.

2 In the event of any defect appearing in any part or parts in the list below within 12 months from the time when they are delivered new to the first retail purchaser thereof and the part or parts alleged to be defective are returned promptly to any authorized Lehman Distributor or Dealer the Company undertakes to have it or them examined, and should any defect due to faulty materials or workmanship be found on such examination to have it or them repaired or to have a replacement part or parts supplied Free of Charge. An allowance will be made for the labor normally involved in the removal of defective parts and the repair or replacement of these items, but this allowance will not include any additional work then required by reason of the type of equipment, the place or manner in which the engines are housed or installed. The allowance will be based on the direct labor times allowed by the Company to authorized Lehman Distributors or Dealers.

3 Parts repaired or replaced under terms of this Warranty are covered for the remaining part of the Warranty period.

4 This Warranty will not apply:

(a) If the defect is in any way due to the use of parts not made or approved by the Company.

(b) If the defect is in any way due to misuse, wrong application or neglect including poor servicing or bad storage when out of service.

(c) The articles are covered by a separate Warranty.

(d) If any identification numbers are altered or removed.

(e) If the goods are altered, modified or used in such a manner as to subject them to abnormal wear or strain.

(f) To engines which have been repaired or altered in a manner which in the Company's sole judgement may affect this performance or reliability.

(g) Failure resulting from improper installation of the engine and transmission.

5. Parts submitted for inspection will be scrapped upon completion of the claim unless prior arrangements were made to have them returned to the customer by the Lehman Distributor or Dealer.

6. Persons dealing with the Company's products are not the agents of the Company and have no authority to assume any obligations on its behalf.

7. For the purpose of this Warranty "owner" includes a person renting or leasing the goods for his own use under a lease purchase agreement.

8. The parts to which this Warranty applies are:

   (a) Fresh water expansion tank
   (b) Inlet and exhaust manifold
   (c) Air filter
   (d) Sea water pump
   (e) Sea water/fresh water heat exchanger
   (f) Sea water/transmission oil cooler if supplied by the Company
   (g) Sea water/engine oil cooler
   (h) Bell housing if supplied by Company
   (i) Transmission drive plate if supplied by the Company
   (j) Sea water pipes between the sea water pump output and the sea water outlet point
   (k) Fresh water pipes for the engine cooling circuit, excluding any pipework feeding heating appliances fitted to the vessel and any defect arising therefrom which may affect the normal performance of the engine and its marinization
   (l) Engine oil feed pipes and oil filter block
   (m) Transmission oil feed pipes if supplied by the Company
   (n) Engine stop solenoid if supplied by the Company
   (o) Engine mounting brackets
   (p) Engine flexible mountings if supplied by the Company
   (q) Other parts such as instruments controls, etc. which may have been supplied by the Company at the request of the boatbuilders, but which do not habitually form part of the Company's contract with the boatbuilder and which therefore cannot be itemized herein.
   (r) Other parts which may be supplied by the Company from time to time

9. The complete base engine is warranted by the company.

10. The transmission is covered by its manufacturer's Warranty.

11. The Peugeot base engine is covered by the Warranty from Peugeot Motors Societe De Moteur C.L.M. through LPC/LPL.

12. The following services, expenses and conditions are not covered by Lehman Power Warranty.

   (a) Damaged or loss related to shipping and handling.

   (b) Towing charges, dockage, storage fees, telephone calls, fuel, loss of revenue, transportation charges (other than mileage and the mechanic's travel time), overtime pay, loss of or damage to any personal property and cost of lubricants and transmission fluids except when replacement or replenishment of fluids is required following a warranty repair.

(c) Preparation costs related to warranty such as, moving furniture, bulk heads, deck plates, carpet, or any other equipment causing engine in-accessability.

(d) Failure caused by use of improper lubricant, overheating, or failure to follow recommended maintenance schedules as spelled out in the Lehman Power Manuals.

(e) Cost of repairs due to misuse, accident, neglect, racing and installation defects, as well as, shaft misalignment.

(f) Any consequential losses arising from failure of components under warranty.

13. All claims under the Warranty should be addressed to the nearest Lehman Distributor or Dealer. In the event that there is not a local authorized Distributor or Dealer, claims may be sent to:

Lehman Power Corporation
800 East Elizabeth Avenue
P.O. Box 647
Linden, New Jersey 07036-0647
U.S.A.

Tel: (201) 486-5658
Tlx: 138035 LehmanMfg

Lehman Power Limited
Saxham, Bury St. Edmunds
Suffolk, IP28 6QZ
England

Tel: 44-284-63100
Tlx: 81133 Manns G.

WARRANTY CARD.
Every Lehman Diesel is supplied with a warranty card that must be completed in its entirety and returned to LPC, prior to initial start up. A facsimile of this card is shown below.

----------WARRANTY REGISTRATION INFORMATION----------

Engine Model _____ Serial No. _____ Date _____

Transmission Model _____ Serial No. _____ Ratio _____

Owners Name/Adress _____

_____

Phone (___) _____ Boat Name _____ Hull No._____

Boat Home Port/Adress _____

Boat Mfgr. _____ Model _____ Length _____

Engine Purchased From _____

Address _____

*NOTE: SERIAL NUMBER TO BE TAKEN FROM EXPANSION TANK ONLY.

# HOW TO USE THIS MANUAL

This manual is divided into sections as follows:

SECTION A - Page Nos. A1/on - General data, specifications, installation, adjustments, maintenance, etc. See index below.

SECTION B - Page Nos. B1/on - Parts identification of Ford base engines. See index on page B-1.

SECTION C - Page Nos. C1/on - Parts identification of Lehman Marine parts. See index page C-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 |
|---|---|---|---|---|
| M-Super | 90 | 254 | 4 | 6/82- |
| N-Super | 135 | 380 | 6 | 6/82- |
| O-Super | 160 | 363 | 6 | 6/82- |
| P-Super | 225 | 363 | 6 | 6/82- |
| Q-STD | 80 | 254 | 4 | 6/82- |
| R-STD | 120 | 380 | 6 | 6/82- |

## INSTRUCTIONS FOR ORDERING PARTS

Parts listed in this manual may be ordered through any Lehman distributor or dealer or, in areas not served by a distributor/dealer, direct from the Lehman companies. Prices will be quoted upon request. In order to prevent errors, please order any required items by exact part number and name of part. When ordering parts, please advise model number and serial number of the engine.

## INDEX - SECTION A

# LEHMAN DIESEL OWNER'S FAULT - FINDING GUIDE

*Particular attention should be directed to the most common trouble-spots mark by an asterisk *

## ENGINE WILL NOT START

### Starter does not crank engine

*Battery run down
Battery cable or switch wire disconnected.
*Faulty starter switch.
Faulty starting motor
Starter drive does not engage flywheel.

### Starter cranks engine slowly

*Battery partly run down
*Battery terminals loose, dirty or corroded.
Faulty starter solenoid.
Faulty starter
Engine oil too heavy.

### Starter cranks engine

#### Mechanical

*Injection timing incorrect
Poor cylinder compression
Blocked air cleaner

#### Fuel System

##### Fuel Reaches Injection Pump

**Air in fuel system
*Stop control engaged
Controls binding
Faulty injectors

##### Fuel does NOT reach Injection pump

**Air leak in fuel line
Fuel tank empty
*Stoppage in fuel lin
Stoppage in fuel filt
Water in fuel system
Faulty lift pump

## 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
Sticking valves

### ROUGH IDLING

*Air in fuel system
*Idle adjustment set too low
Dirty or faulty injectors
Injector pipes loose, cracked or broken
Incorrect injection timing
Restricted fuel filter
Faulty lift pump
Sticking valves
Broken valve springs

### ENGINE NOT DELIVERING FULL POWER

**Air fuel system
Engine overheated
Injection timing incorrect
Incorrect valve clearances
Dirty air cleaner (s).
Faulty injectors
Faulty injection pump
Stop contro
partly eng
Sticking va
Worn piston
rings,or b
Faulty lift
Restricted
filters

### ENGINE KNOCKS

*Air in fuel system
Oil level (pressure) low, worn bearings
Incorrect grade fuel oil
Incorrect injection timing
Faulty injector
Sticking valve or rocker arm
Piston slap

# 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) Clogged heat exchanger
 e) 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 needs top overhaul

## 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)
Incorrect injection timing
Faulty boost control unit

## ENGINE MISFIRES

*Injector pipe loose, broken or cranked
Injectors dirty
*Air leaking in fuel system
Sticking valve or rocker arm
Sticking piston rings
Engine needs top overhaul

# CONTROLS, STARTING & STOPPING
# ENGINE

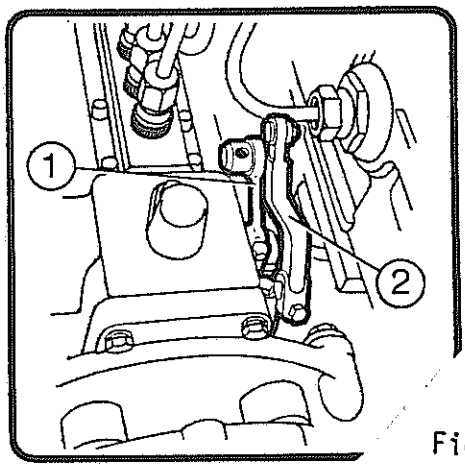
No amount of engineering ingenuity or care in manufacture can substitute for the need of knowledge on the operation and avoidance of mis-use by the operator. It is important to be familiar with all controls so as to know how to properly operate your engine.

Refer Fig. 1. To stop engine, the stop lever should be moved as far as it will travel towards the front of the 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 - This is particularly important with Turbo and Turbo Intercooled engines).

Engine speed control is the longer lever at side of injection pump (Fig. 1.) Moving toward front of engine increases engine speed.

An excess fuel device permits additional fuel to be supplied by the injection pump to assist in starting the engine from cold. This device is fully automatic in operation.

Note: Some engines are equipped with an electric shut down solenoid. To stop engines that are equipped with this shut down, press stop button until engine stops running, then release button.




Fig

***Injection Pump Controls***
**1.** *Stop Lever*
**2.** *Speed Control Lever*

## STARTING ALL NATURALLY ASPIRATED ENGINES

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 ¼ open position. 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.

STARTING ALL TURBOCHARGED ENGINES

Serious damage to the turbocharger bearing can result from inadequate lubrication if the following recommendations are now observed.

Prior to the first start after a turbocharger has been newly installed or if for any reason the oil supply to the turbocharger has been disconnected, you should insure that the turbocharger housing is filled with engine oil before reconnecting the oil feed pipe. In these circumstances, or in cases where the engine is being started for the first time after an oil change or after a period of 4 weeks or more without use, the following procedure must be used;

1) Engage either manual or electric stop control
2) Crank the engine with the starter motor for 15 seconds
3) Disengage stop control
4) Start engine in normal fashion and allow to idle for 30 seconds minimum before applying load

This ensures an adequate oil supply to the turbocharger bearing. The engine should be allowed to idle, without load, for 2 minutes prior to shut down to enable the oil to dissipate the heat from the turbocharger bearing.

STOPPING ALL ENGINES

The engine should be allowed to slow idle for approximately 2 minutes before stopping, especially after extended periods of full load and full speed operation. This is particularly important in the case of turbocharged engines.

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 fo 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.

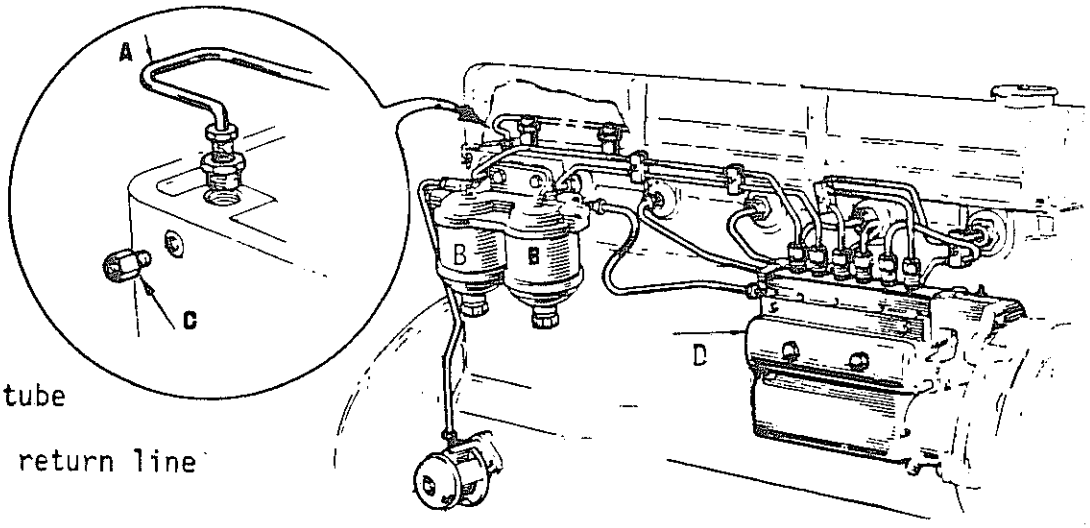



FIG. 2.

ENGINE FUEL SYSTEM

A - Excess fuel collector tube
B - Secondary fuel filters
C - Connector, excess fuel return line
D - 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 filter 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 contaminates that may find their way through the primary filter. These filters (see Fig. 2,3,4 & 5) located towards rear of engine block, right side, have elements which should be replaced once each season or at least each 200 hours (which ever 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 ¼" (min.) fuel line. It is recommended that the Boat Builders installs a short section of flexible tubing in this line to prevent breakage due to engine vibration.

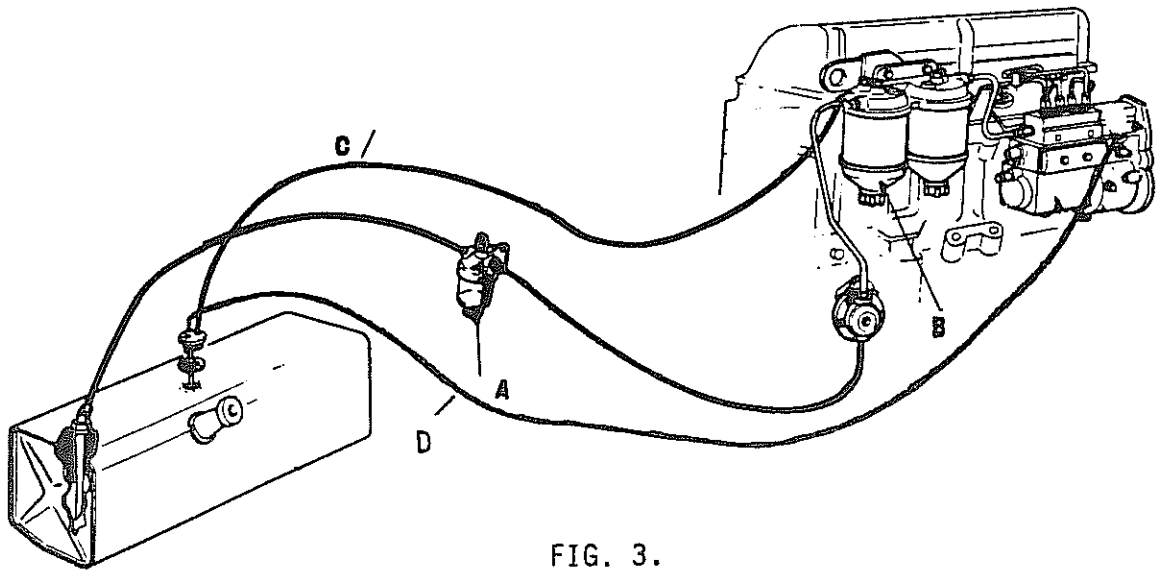



FIG. 3.

TYPICAL FUEL SYSTEM, NATURALLY ASPIRATED ENGINES

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

## FUEL SYSTEM (CONTINUED)

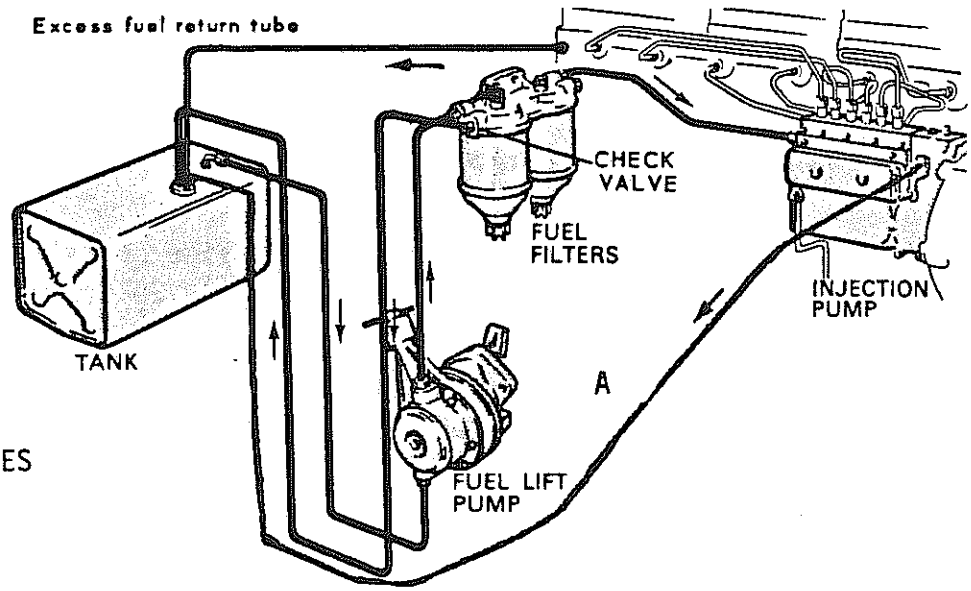



FIG. 4.

TYPICAL FUEL SYSTEM, TURBO ENGINES

A - Injection pump return tube

*NOTE:"ON ENGINES MADE IN LATE 1983 ONWARDS-
FUEL RETURN LINES MAY BE INTERCONNECTED
TO SIMPLIFY PIPING"

## 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.

## BLEEDING THE FUEL SYSTEM (CONTINUED)

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 - try to keep your tanks topped up).

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 on naturally aspirated unit (fig. 7.) or the pump plunger (Fig. 6.) on turbocharged engines until a flow of fuel, free of air, is expelled. Then close screw.

No bleeding of the injection pump is required as these are fitted with a self purge device - which should be separately connected back to the top of the fuel tank in a similar manner to the spill return.

On Turbo Charged engines a third fuel return line from the pressure relief valve or the secondary filters is also connected direct to the fuel tank.

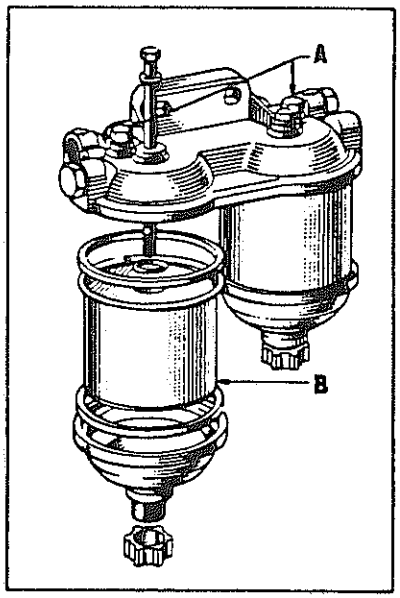



FIG. 5.

FUEL FILTER

A - Bleed screws
B - Replacable element

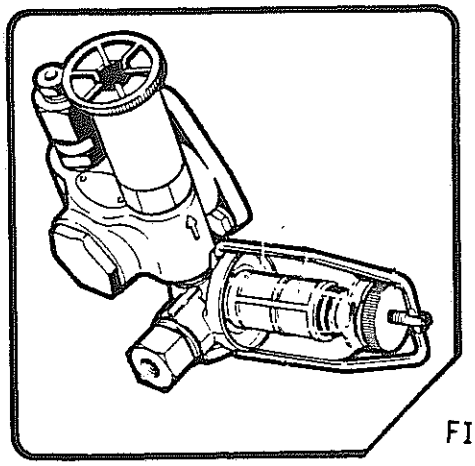


FIG. 6.

HIGH PRESSURE LIFT PUMP (ALL TURBO ENGINES)

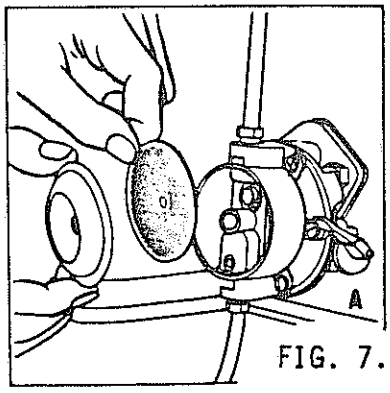



FIG. 7.

FUEL LIFT PUMP - (ALL N.A. ENGINI

A - Priming lever

## TIMING AND MAINTAINING THE FUEL INJECTION PUMP

The injection pump delivers an accurately metered quantity of fuel to each cylinder to suit any engines speed and load condition. The pump is a very accurately machined piece of equipment and requires careful handling and maintenance, which is beyond the scope of normal owner servicing. Since this pump should not require retiming except when being removed and reinstalled, and this is beyond the scope of normal owner servicing, the procedure will not be covered in this manual. Please contact your authorized Lehman Power distributor for this service. Warranty claims resulting from owner mishandling of the fuel injection pump will not normally be considered.

## COOLING SYSTEM

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 fuel lift pump on the starboard side of the 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. Please see Figures 8. and 9. . A Thermostat located in the cylinder head under the expansion tank on naturally aspirated units and in a separate unit on the starboard side of the turbo charged units promotes rapid warm up and maintains constant engine temperatures.

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 the top of the aluminum pillar. These engines are fitted with a cooling system de-airation service and no bleeding of the manifold is required during system filling.

When filling cooling system, fill to top of aluminum pillar, then run engine for several minutes to insure system is completely filled. Add coolant as necessary.

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. Lehman Power recommends the use of anti-freeze at all times used in accordance with the manufacturer's recommendations. Ethelyne Glycol based solutions are preferred, most of which includes various rust inhibitors. The use of "stop leak" type anti-freeze, which may still be available in some areas, is discouraged. If, for some reason 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 - The small "pillar" in the tank should just touch the water surface.

## COOLING SYSTEM (CONTINUED)

To assist in corrosion control, a zinc pencil is installed in your heat exchanger. 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 entire cooling circuit.

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, with a "twisting" action rather then a hammering action. A small caliber firearms cleaning kit or similar small brush may be used. Do not use a metal rod which may rupture the copper tubings.

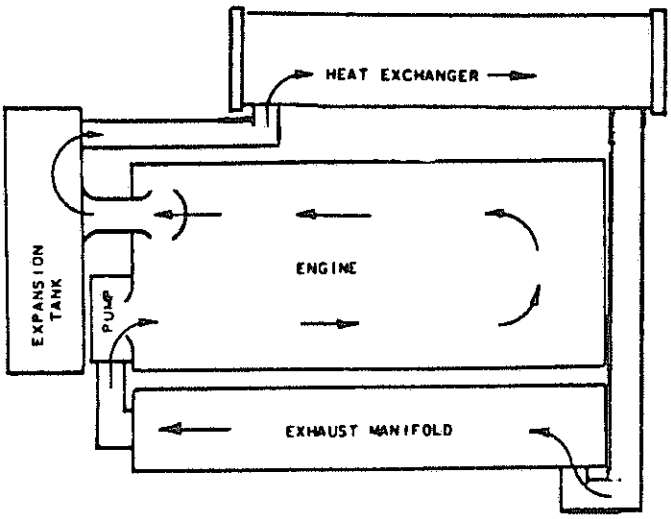



FIG. 8.

FRESH WATER CIRCULATION SYSTEM

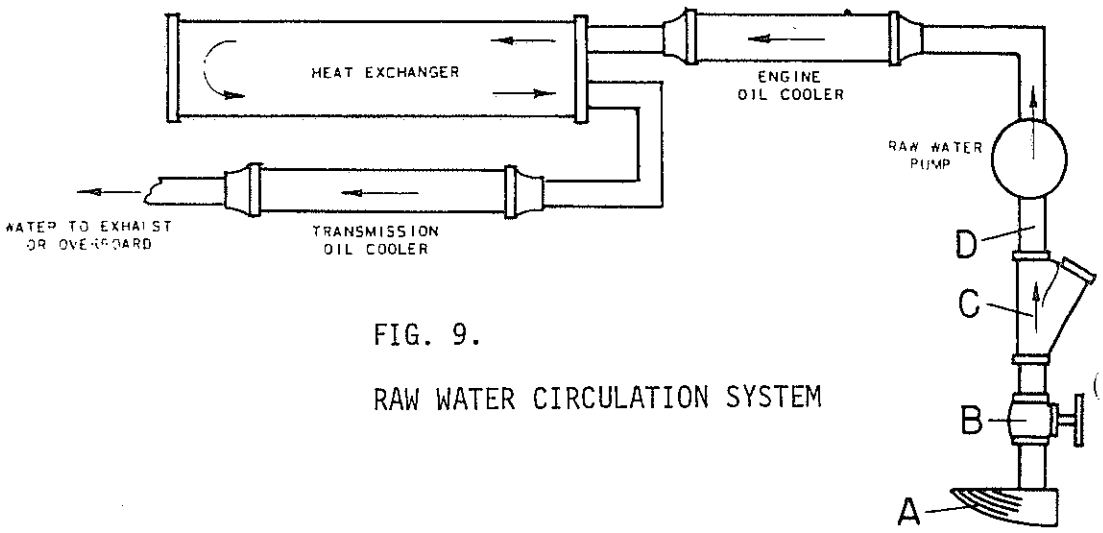



FIG. 9.

RAW WATER CIRCULATION SYSTEM

## COOLING SYSTEM (CONTINUED)

FIG. 9. - 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 - Lehman part NO. EW-3 is preferred.

B - Sea-cock should be 1" NPT minimum size, "gate" type that opens fully to allow full, unrestricted flow of water - Lehman part NO. EW-22 preferred.

C - The use of an efficient, full-flow raw water strainer is strongly recommended to prevent clogging of pump and exchangers by weeds, etc. Lehman part NO. EW-102 preferred.

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 - Lehman can provide such hose if required.

### WINTERIZATION OF COOLING SYSTEM

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.

If however, the vessel is being permanently laid up for the duration of the cold weather, we recommend mixing an anti-freeze solution and running this solution through the sea water system with the engine idling until discharged from the exhaust. This insures the sea strainer, coolers, heat exchanger, even the muffler and exhaust system will be protected.

Drain points for the fresh water system will be found on the port side of each engine block, on the aft end of the exhaust manifolds and on the heat exchanger.

Raw water drains are found on both engine and transmission coolers, as well as, the heat exchanger. To drain raw water pump, loosen rear cover.

## "KEEL COOLING" SYSTEMS

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. 10. 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 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.

## "KEEL COOLING" SYSTEMS (CONTINUED)

Installations using a "wet" exhaust will require raw water systems as shown in Fig. 9., but omitting heat exchanger.

When dry exhaust is employed, it is possible to eliminate use of 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. 11.

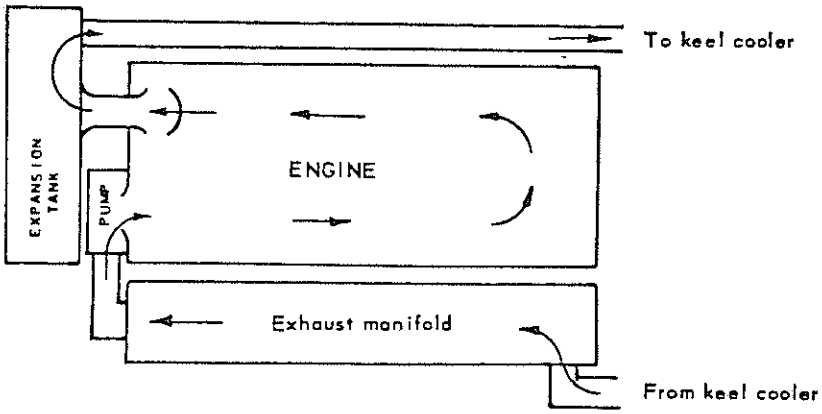



FIG. 10. FRESH WATER CIRCULATION SYSTEM (Keel Cooler Type)

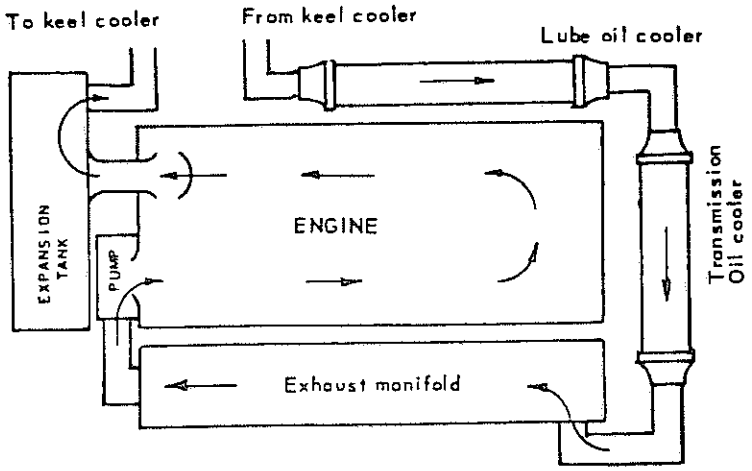



FIG. 11. WATER CIRCULATION SYSTEM (Keel Cooler Type) WITH LUBE and TRANSMISSION OIL COOLERS IN FRESH WATER FLOW.

## TACHOMETER ADAPTER

A tachometer "take-off" is provided on the starboard side of all naturally aspirated engines as an extra cost option. There is no provision for mechanical tachometer hook-up on turbocharged engines. This adapter accomodates a standard marine tachometer cable with 7/8" - 18 adaptor nut. Tip of cable core should be .187" diameter. Cable turns on-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 aperature 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.

## ELECTRICS

The standard electrical system for Lehman engines is 12 volt, NEGATIVE GROUND. Under no circumstances should polarity be reversed even for an instant for serious damage to alternator may result.

For special applications, optional electrical systems are available in 12 volt insulated return, 24 volt negative ground and 24 volt insulated return configurations.

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 has no moving parts and requires no adjustments. Alternator is lubricant packed for life at time of assembly and therefore requires no external lubrication. All alternators are equipped with a tapping for connection to operate a matching electric tachometer. (see Fig. 13)

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.

## ELECTRICS (CONTINUED)

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.

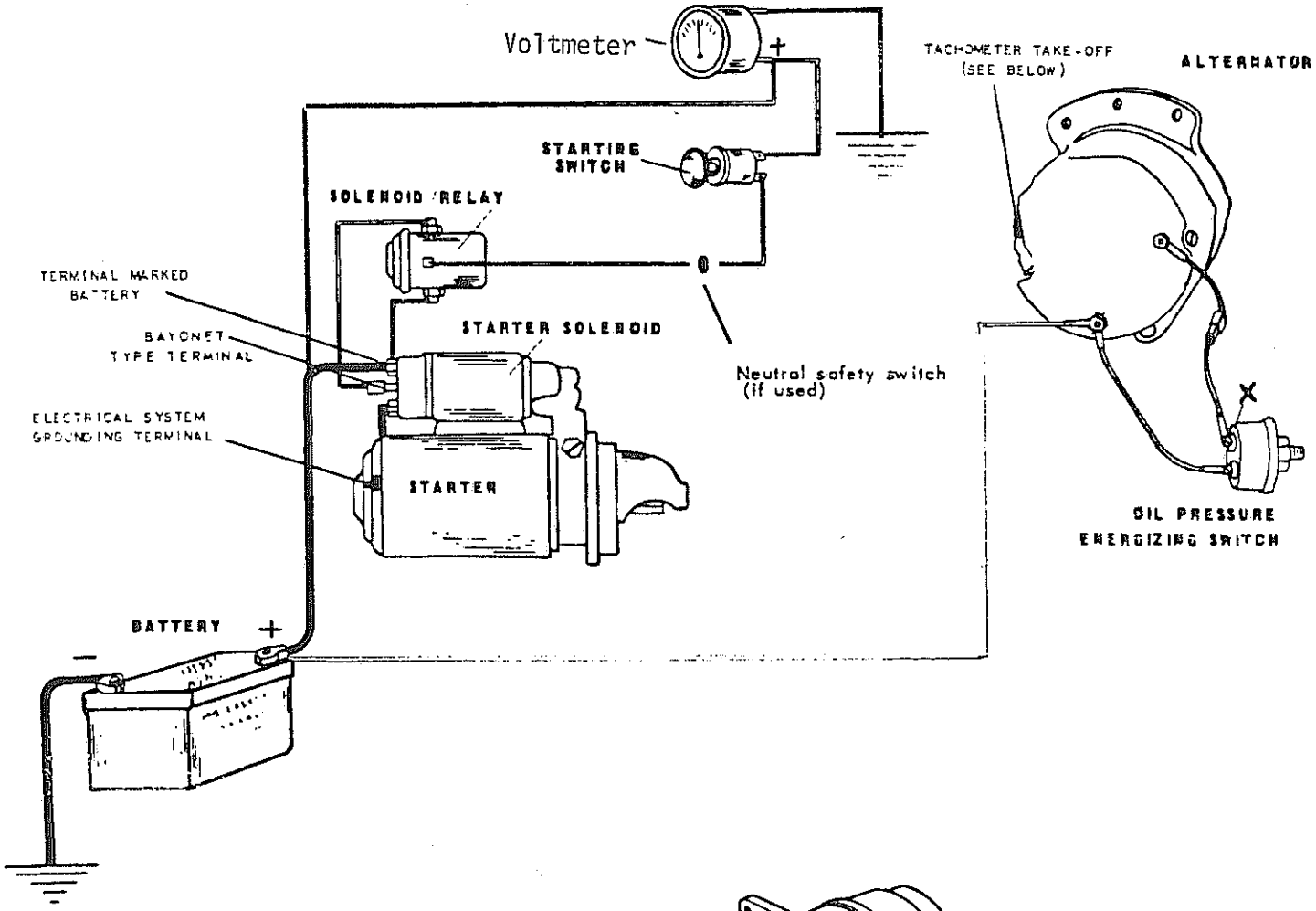



FIG. 12.
WIRING DIAGRAM

Note: Wiring diagrams of all standard applications are available from Lehman on request.

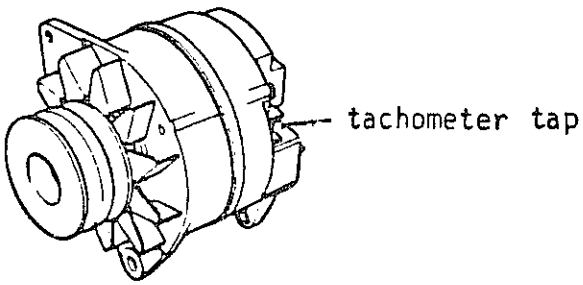



FIG. 13.

# 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. It should be replaced at each oil change, and is readily available from your Lehman dealer.

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 - Lehman has kits EK31 and EK31A available - contact your dealer.

When engine is first installed, provide the proper quantity of oil as indicated under "specifications" section. The oil cap is located on top of engine rocker are 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 Fig. 14.). If oil level measurement is different from the "full" mark on dipstick, a new mark should be scratched or filed at the correct level. Another method is to measure the distance between the new full level and the factory full mark on the dip stick, remove the dipstick tube from the sump, and cut that distance off the tube. After deburring and reinstalling the tube the dipstick will be lowered into the oil, thereby retaining the factory markings. Of course, the above procedure applies only to 6 cylinder N.A. and turbo units with dipstick at front of sump. Four cylinder models with stick at rear of sump, require scratching the appropriate marks. These procedures are necessitated by differing installation angles.

When measuring oil level in regular usage in all naturally aspirated engines 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.

On all turbocharged engines the oil should be checked prior to starting. After several minutes, shut engine down, wait for oil to drain back for several minutes, then check and add as required.

Add engine oil of the type and viscosity as follows. Oil should meet Ford specification 2M-2C-1017A, API classification CC or equivalent.

## LUBRICATION SYSTEM (CONTINUED)

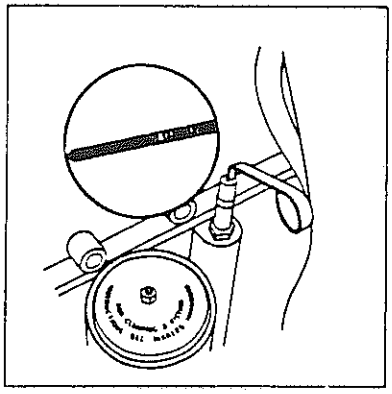


FIG. 14.
ENGINE OIL DIPSTICK

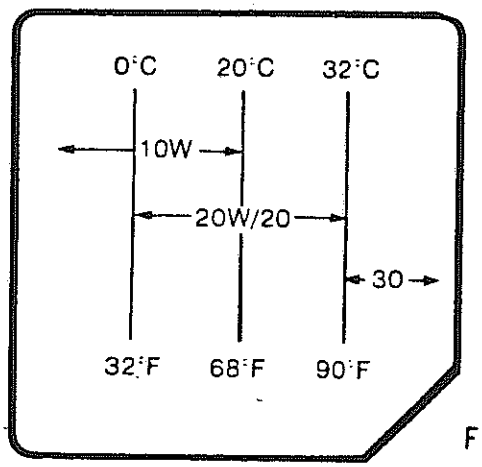



FIG. 15.
*Oil Viscosity Chart*

TURBO ENGINES: API classification CD oils only must be used in turbocharged engines. Use of other oil result in reduced engine life and 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 two minutes before shut-down to dissipate heat from turbocharger bearings.

Turbocharger must be oil-primed under any one of the 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 15 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.

## LUBRICATION SYSTEM (CONTINUED)

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 buttom of oil pan, for clearance to bilge of hull will be limited. A low-cost, suction type, hand operated sump pump is required. Available as an extra cost option is a Lehman approved, permanently mounted hand pump. This can be connected to the sump plug - installation permitting or....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 on naturally aspirated engines it is possible to rotate the oil filter, or remove it from its bracket, thus minimizing the risk of oil spillage. 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.

## TRANSMISSION (CONTINUED)

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 the Borg Warner transmission, the following information is offered for those 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 buttom right side. Removal of this plug and a small plug on the bottom of the reduction housing will completely drain the transmission. On some models the cooler return hose may be fed into the plug at the bottom of the transmission. In these instances, remove the hose and rotate the brass elbow as required for draining. If information on any other transmission is required, please contact Lehman and such information will be forwarded to you.

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

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

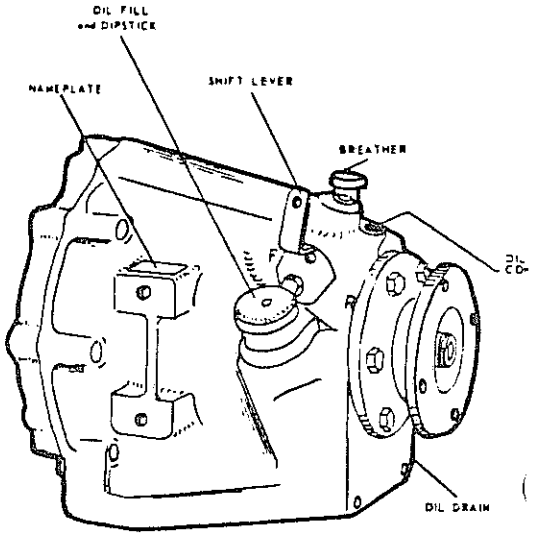



FIG. 16.

WARNER TRANSMISSION

# MAINTENANCE

The importance of correct lubrication, periodic inspection and adjustment cannot be over-emphasized. 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 Daily
B After first 15 hours running.
C After every 10 hours running.
D After every 50 hours running.
E After every 200 hours running.
F After every 400 hours running.

## SUMMARY OF REGULAR MAINTENANCE

| | |
|---|---|
| Daily..... | Check engine and transmission oil levels.<br>Check cooling water level. |
| After first 50 hrs of operation.... | Change Engine oil and filter.<br>Check belt tension and adjust if required.<br>Check cleanliness of intake air filter.<br>Check (exchanger) zinc pencil.*<br>Check for fuel, lube oil or coolant leaks.<br>Check all wiring connections, cables, etc.<br>Check valve clearances, adjust if required |
| Every 200 hrs of operation..... | Check idling speed, adjust if required.<br>Check exhaust components for leaks.<br>Check condition of all coolant and oil hoses.<br>Check all engine mount bolts.<br>Replace raw water pump impellor. |
| Every 1200 hrs of operation..... | Flush cooling system.<br>Replace anti freeze. |
| Every 1500 hrs of operation..... | Check end play of turbocharger rotating assembly. |

## SUMMARY OF REGULAR MAINTENANCE (CONTINUED)

Every 3000 hrs of operation..... Remove and dismantle turbocharger - repair as required.

Every 3600 hrs of operation..... Replace thermostats.

*Zinc pencil should be checked every 2 weeks, regardless of number of operating hours until owner determines how often zinc element must be replaced. Replace after 50% deterioration.

Injectors need not be serviced at regular intervals but rather, should be serviced after problem such as smoke, loss of power, hard starting, etc. develops and has been diagnosed.

## MINOR REPAIRS, MAINTENANCE AND ADJUSTMENTS

DUE TO REVISED HEAD GASKET, HEAD GASKET AND HEAD BOLT DESIGN RETORQUING OF CYLINDER HEAD IS NOT REQUIRED. AND MUST NOT BE ATTEMPTED.

TO ADJUST VALVE CLEARANCES: (Note...Adjustments should be made while engine is at normal operating temperature). Following removal or 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 pulley, 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 exhaust valve (on 6 cylinder) as shown in figure 25. Turn the valve clearance adjusting screw Fig. 18 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 the 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) - see specification section.

## SUMMARY OF REGULAR MAINTENANCE (CONTINUED)

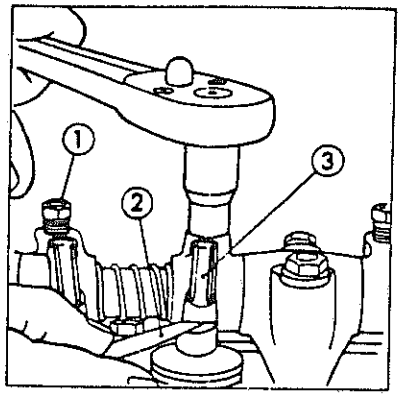



FIG. 18.
ADJUSTING VALVE CLEARANCE
1- Adjusting screw
2- Feeler blade
3- Rocker arm

| 4 Cylinder engines | | 6 Cylinder engines | |
|---|---|---|---|
| Valves Fully Open | Valves to Adjust | Valves Fully Open | Valves to Adjust |
| 1 and 6 | 3 and 8 | 1 and 4 | 9 and 12 |
| 2 and 4 | 5 and 7 | 8 and 10 | 3 and 5 |
| 3 and 8 | 1 and 6 | 2 and 6 | 7 and 1 |
| 5 and 7 | 2 and 4 | 9 and 12 | 1 and 4 |
| | | 3 and 5 | 8 and 10 |
| | | 7 and 11 | 2 and 6 |

TO ADJUST VEE BELT TENSION: Loosen alternator mounting and adjusting strap bolts as per figure 19. Move alternator to adjust belt tension. Tension is correct when your thumb pressure on belt at a point between alternator or and water pump pulleys does not exceed 1/4". Tighten alternator mounting and adjustment strap bolts.

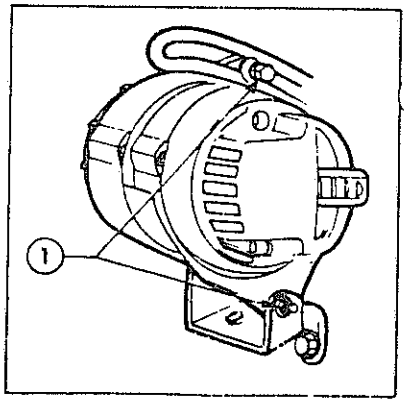
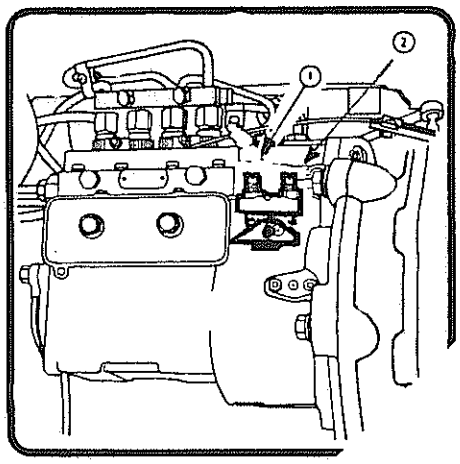



FIG. 19.
BELT ADJUSTMENT
1 - Adjusting bolts

## SUMMARY OF REGULAR MAINTENANCE (CONTINUED)

INTAKE AIR FILTER: The air filtering element(s) on all naturally aspirated engines is polyurethane foam which traps and holds dust and foreign matter which could be drawn into the engine and cause severe damage. Turbo Charged and Turbo/Intercooled engines only use a Mesh Screen.

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.




INJECTION PUMP (All N.A. Engines)
1 - Max. speed stop screw
2 - Idling stop screw

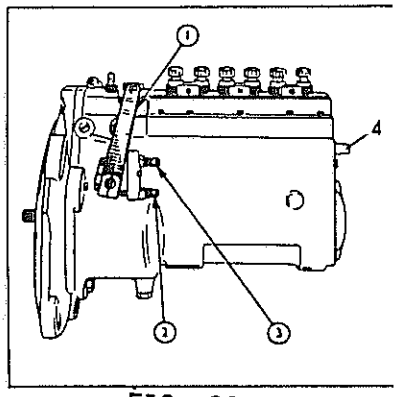



FIG. 20.
INJECTION PUMP (Turb E
1 - Speed control lever
2 - Max. speed stop screw
3 - Idling stop screw
4 - Idle damper screw

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 20) 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.

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.

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 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.

TO CHANGE SECONDARY FUEL FILTERS: (note-making 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 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.

## 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 it 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. Please refer to "cooling system" section of this manual for alternate winterizing method.

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 CLOSING PETLOCK AND INSTALLING PLUG IN HEAT EXCHANGER.

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 overlfow 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.

### GALLEY HOT WATER CONNECTIONS

It is common marine practice to utilize engine coolant passed through a hot water heater to provide domestic hot water. Connection to engine is made with Lehman Kit D1496. A coolant feed to the heater is made from the engine drain plug on the portside of block while the coolant return hose is attached to the forward, port side of the exhaust manifold.

# SECTION B

## 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 |
|---|---|---|---|---|
| M-Super | 90 | 254 | 4 | 6/82- |
| N-Super | 135 | 380 | 6 | 6/82- |
| O-Super | 160 | 363 | 6 | 6/82- |
| P-Super | 225 | 363 | 6 | 6/82- |
| Q-STD | 80 | 254 | 4 | 6/82- |
| R-STD | 120 | 380 | 6 | 6/82- |

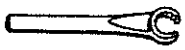
For ease in locating part numbers, turn to the applicable page:



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.

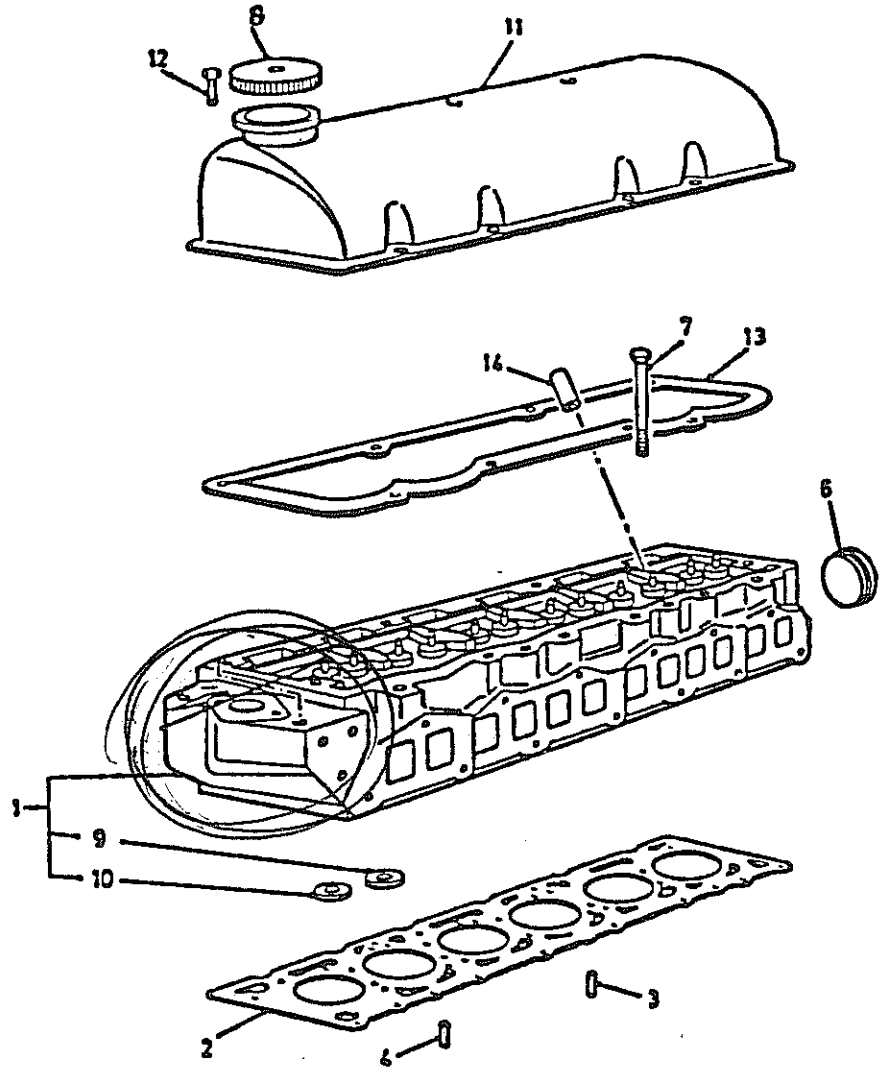
# SERVICE TOOLS

8A1 WRENCH FOR FUEL INJECTION PIPE NUTS (TOP OF INJECTION PUMP)

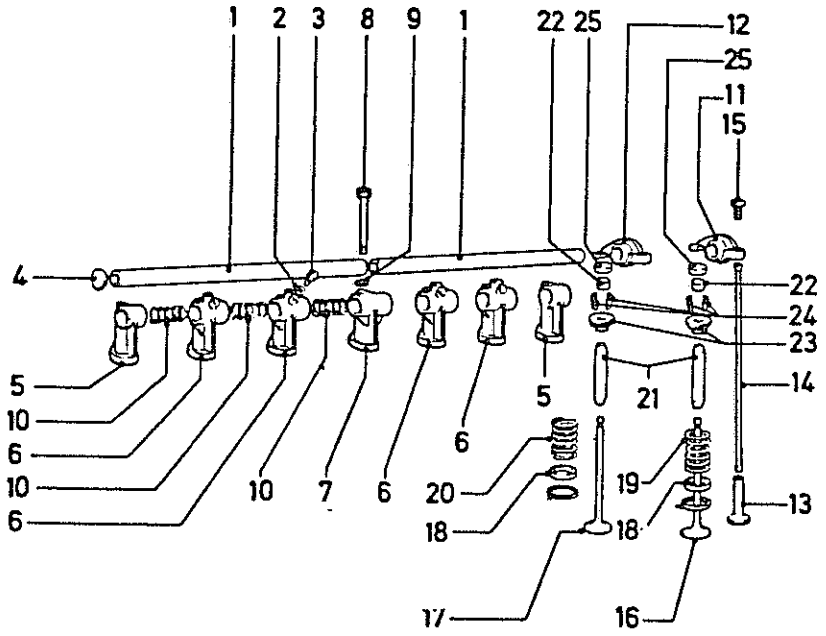


8A2 SOCKET TOOL - DELIVERY VALVE HOLDER

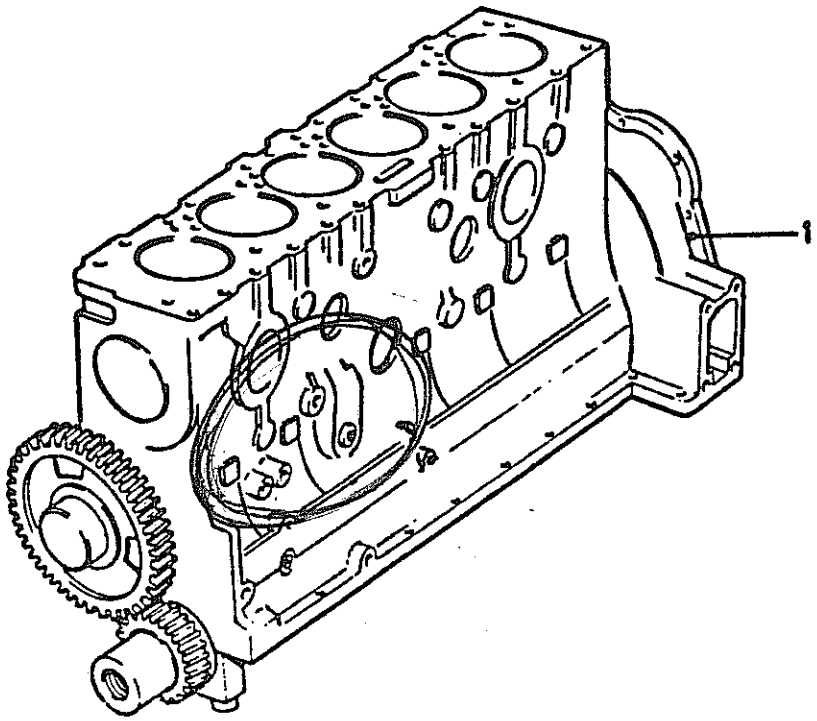
8A6 TAPPET WRENCH-FLEX FUEL LINE to LIFT PUMP (NOT SHOWN)




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 12 | ALL | 6/8 | 1568855 | SCREW | |
| 13 | M/Q | 1 | 6102562 | GASKET | |
| | N/R/O/P | 1 | 6102563 | GASKET | |
| 14 | ALL | 4/6 | 1798506 | SLEEVE | |

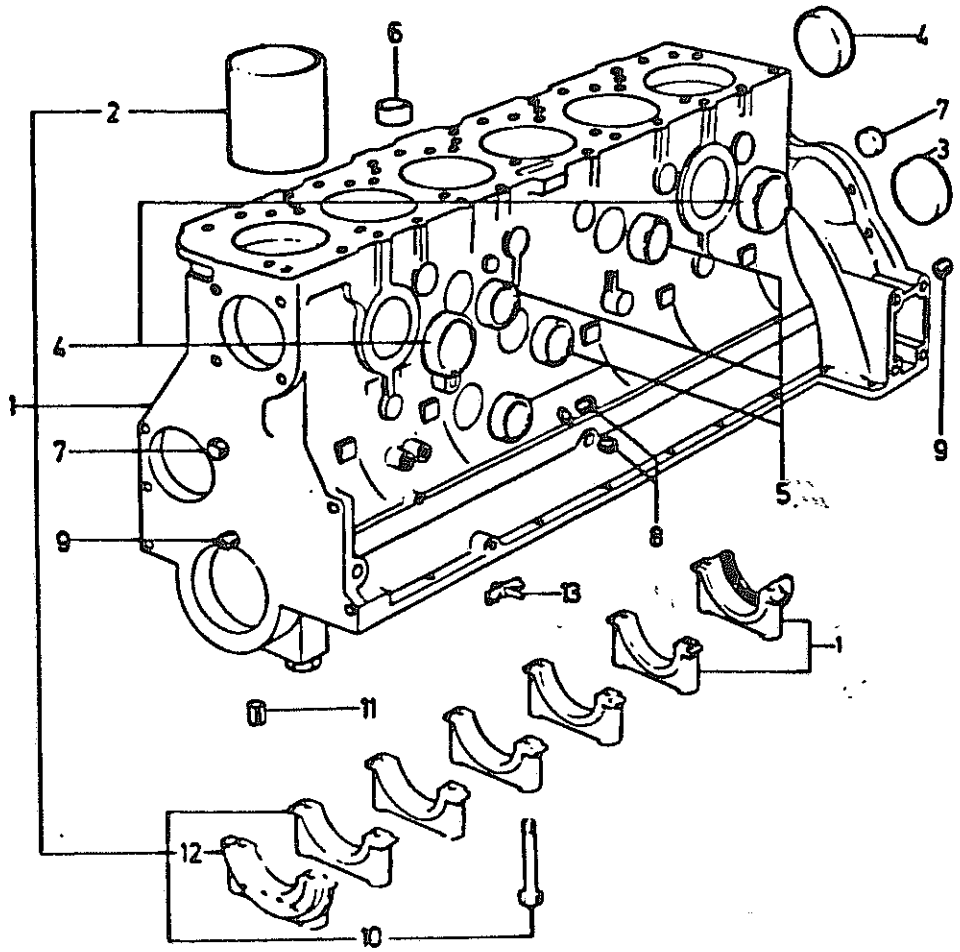



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M/Q | 1 | 1788868 | ROCKER ARM SHAFT | |
| | N/R/O/P | 2 | 6085961 | ROCKER ARM SHAFT | |
| 2 | ALL | 2/4 | 6089082 | WASHER | |
| 3 | ALL | 2/4 | 3424956 | BOLT | |
| 4 | ALL | 2 | 3416839 | PLUG | |
| 5 | ALL | 2 | 6116098 | ARM SUPPORT | |
| 6 | ALL | 2/4 | 6093618 | ARM SUPPORT | |
| 7 | ALL | 1 | 6093619 | ARM SUPPORT | |
| 8 | ALL | 5/7 | 1599911 | BOLT | |
| 9 | ALL | 5/7 | 1575329 | LOCK WASHER | |
| 10 | ALL | 4/6 | 1745333 | SPRING | |
| 11 | ALL | 4/6 | 6084185 | LEFT HAND ARM | |
| 12 | ALL | 4/6 | 6084186 | RIGHT HAND ARM | |
| 13 | ALL | 8/12 | 6079714 | VALVE TAPPET | 10/81 - 4 |
| | ALL | 8/12 | 6118749 | VALVE TAPPET | 5/82 - 1 |
| | ALL | 8/12 | 6125498 | VALVE TAPPET | 11/82 - |
| 14 | ALL | 8/12 | 6086866 | ROD | |
| 15 | ALL | 8/12 | 1504134 | SCREW | |
| 16 | ALL | 4/6 | 6093968 | VALVE (EX) | 10/81 - 1 |
| | ALL | 4/6 | 6133082 | VALVE (EX) | 1/83 - |
| 17 | ALL | 4/6 | 6093969 | VALVE (IN) | 10/81 - 1 |
| | ALL | 4/6 | 6133084 | VALVE (IN) | 1/83 - |
| 18 | ALL | 8/12 | 1789728 | VALVE SPRING CAP | |
| 19 | ALL | 4/6 | 1542662 | SPRING EXHAUST | |
| 20 | ALL | 4/6 | 1717773 | SPRING INLET | |
| 21 | ALL | 8/12 | 1543300 | VALVE GUIDE STD. | |
| | ALL | 8/12 | 6089288 | VALVE GUIDE O/S | |

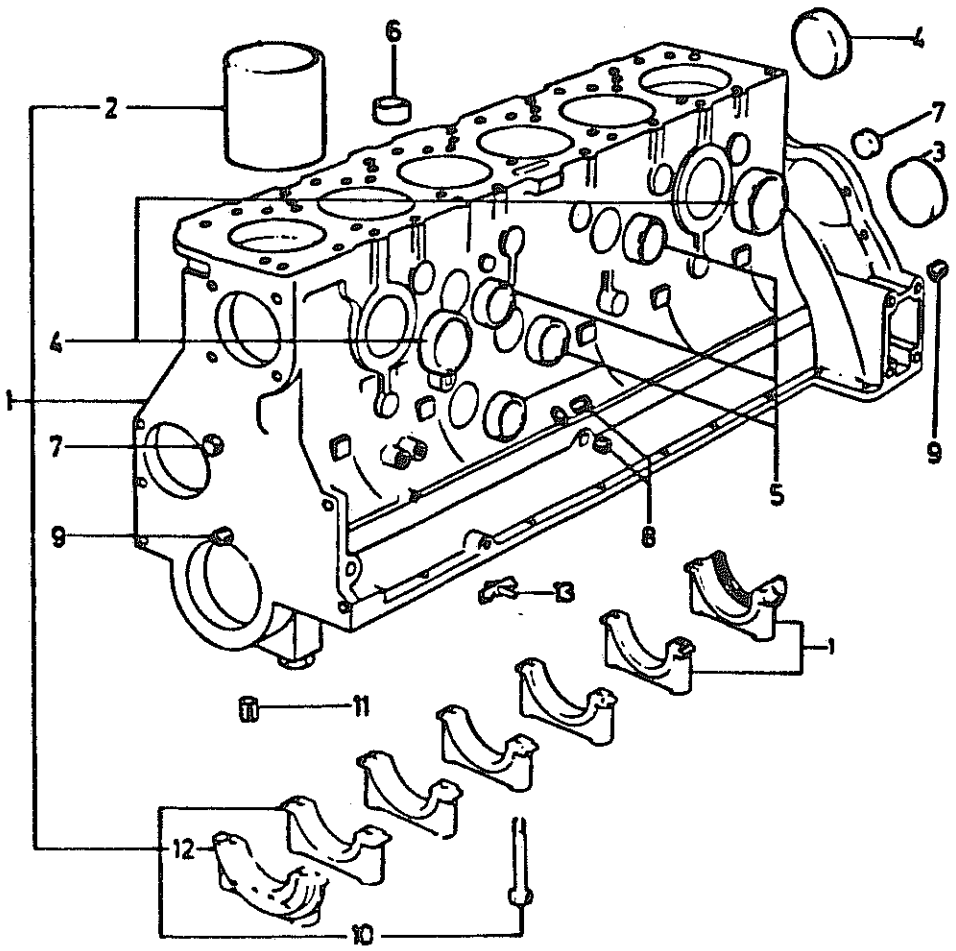



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M/Q | 1 | 6082059 | BLOCK ASSEMBLY | |
| | N/R | 1 | 6079410 | BLOCK ASSEMBLY | |
| | O | 1 | 6079405 | BLOCK ASSEMBLY | |
| | P | 1 | 6079407 | BLOCK ASSEMBLY | |
| 2 | M,Q, | 1 | 6104215 | GASKET KIT (OVERHAUL) | (B) |
| | N,R, | 1 | 6104217 | " " " | " |
| | O | 1 | 6104222 | " " " | " |
| | P | 1 | 6104223 | " " " | " |
| 3 | M,Q, | 1 | 6104227 | GASKET KIT (ENGINE DE- | (B) |
| | N,R,O, | 1 | 6104229 | " " CARBONISING) | (A) " |
| | P | 1 | 6104228 | " " " " | " |
| 4 | M,Q, | 1 | 6104224 | GASKET KIT(OIL PAN&FRONT | " |
| | N,R,O, | 1 | 6104226 | " " COVER) | " |
| | P | 1 | 6104225 | " " " " | " |
| 5 | M,Q | 1 | 6104236 | GASKET KIT (OIL PAN) | " |
| | N,R,O, | 1 | 6104238 | " " " " | " |
| | P | 1 | 6104237 | " " " " | " |

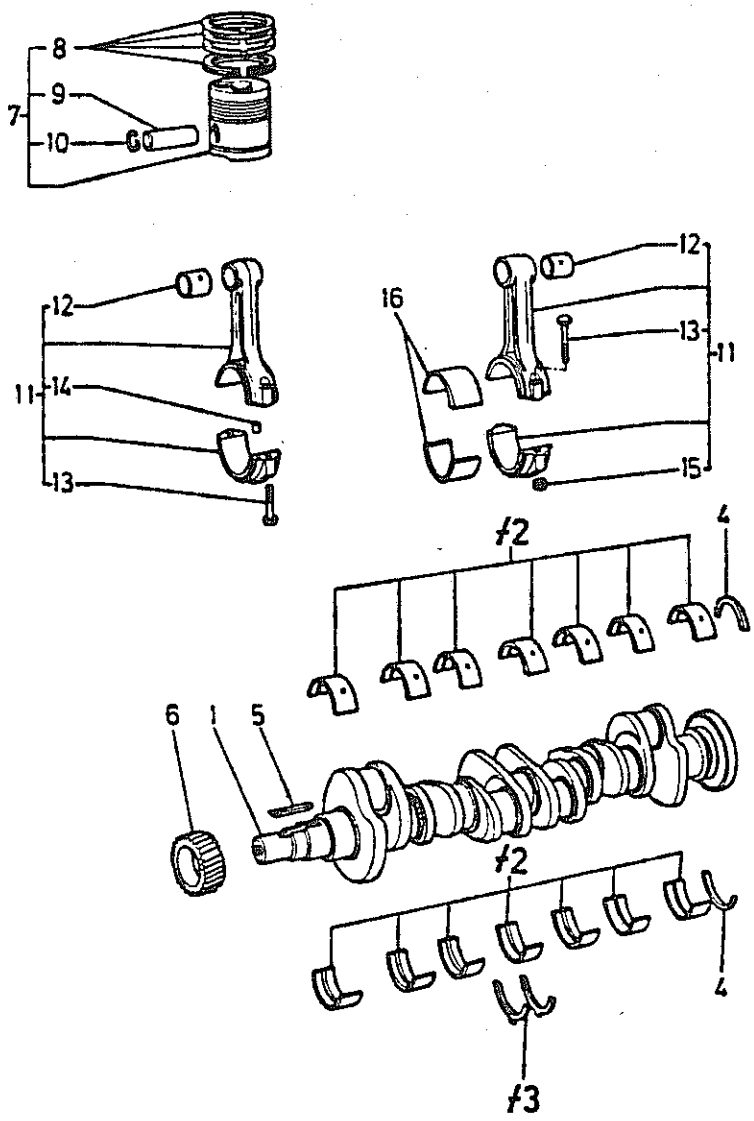
(A) HEAD GASKET NOT INCLUDED MUST BE ORDERED SEPARATELY.
(B) NOT SHOWN.




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M/Q | 1 | 6086757 | CYL BLOCK | |
| | N/R | 1 | 6086780 | CYL BLOCK | |
| | O | 1 | 6086781 | CYL BLOCK | |
| | P | 1 | 6086760 | CYL BLOCK | |
| 2 | O-P | 6 | 6077156 | CYL LINER 4.289"4.290 | 10/81-11/82 |
| | | 6 | 6077157 | CYL LINER 4.291"4.292" | 10/81-11/82 |
| | O/P | 6 | 6128842 | CYL LINER 4.289-4.290 | 11/82 |
| | O/P | 6 | 6128843 | CYL LINER 4,290"-4291 | 11/82 |
| | O/P | 6 | 6128844 | CYL LINER 4.291"-4.292 | 11/82 |
| 3 | ALL | 1 | 1788928 | CAM BEARING 2.33-2.31 | |
| | ALL | 1 | 1788931 | CAM BEARING 2.35-2.33 | |
| 4 | ALL | 3 | 6048528 | PLUG--2.18" | |
| | | 3 | 6048527 | PLUG--2.20" | |
| 5 | ALL | A/R | 6102931 | PLUG--1.680" | |
| 6 | ALL | 1 | 6107198 | DISTRIBUTOR APERTURE | |
| 7 | ALL | 1 | 1788927 | TAPPET OIL GALLERY | |
| 8 | ALL | 1 | 1503090 | OIL GALLERY PLUG | |
| 9 | ALL | 2 | 1551172 | OIL GALLERY PLUG | |
| 10 | M/Q | 10/14 | 1788352 | CRANK SHAFT BEARING CAP BOLT | |
| | N/R | 10/14 | 1788352 | CRANK SHAFT BEARING CAP BOLT | |

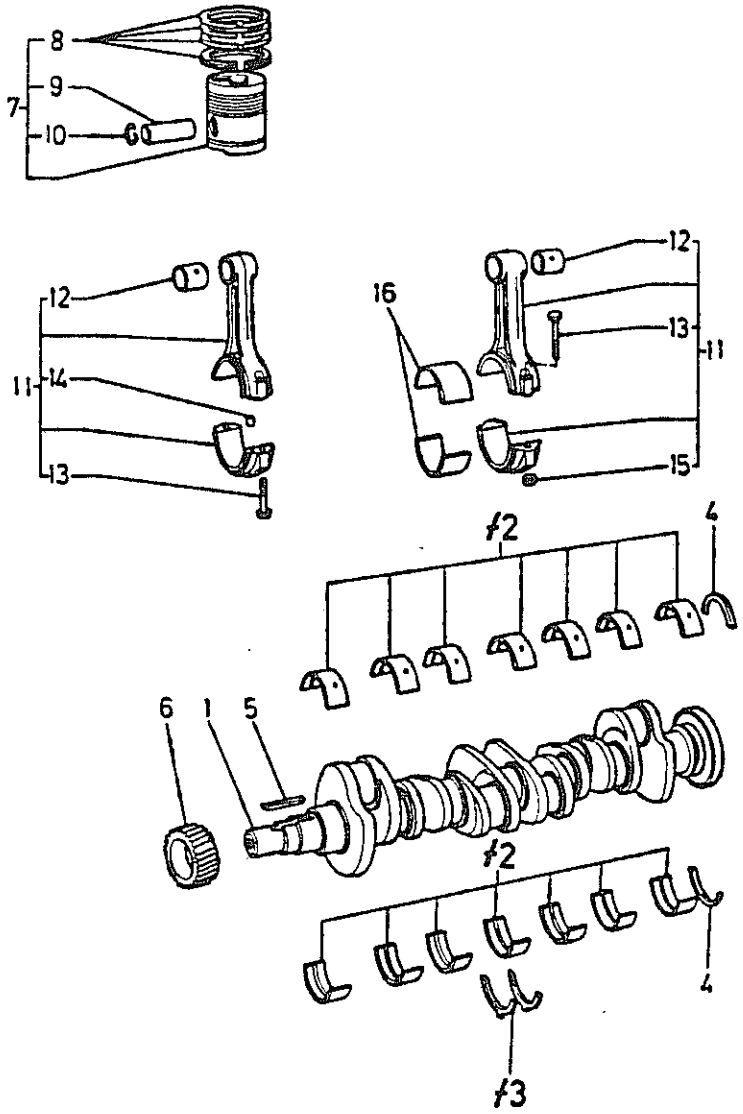



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 10 | O | 10/14 | 1788352 | CRANK SHAFT BEARING CAP BOLT | |
| | P | 10/14 | 1788352 | CRANK SHAFT BEARING CAP BOLT | |
| 11 | ALL | 2 | 1790306 | PIN | |
| 12 | ALL | | | PART OF BLOCK ASSEMBLY | |
| 13 | ALL | 1 | 1465471 | WATER DRAIN TAP | |

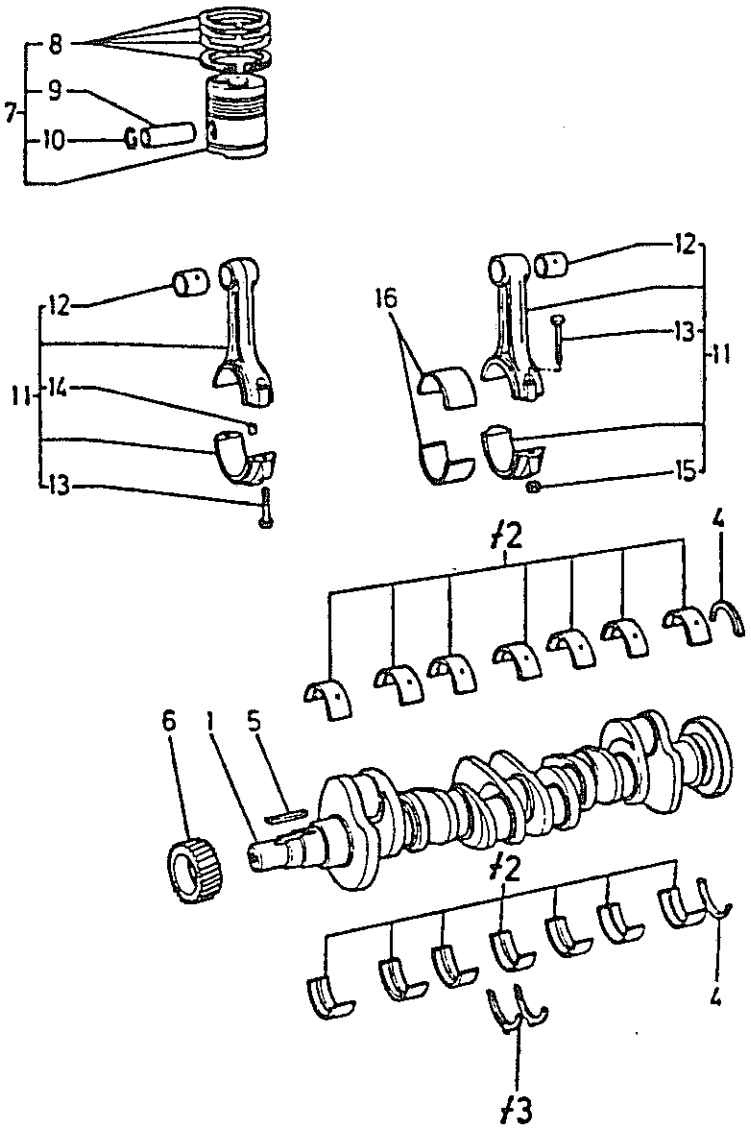



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M,Q | 1 | 6077423 | CRANKSHAFT | (A) |
| | M,Q | 1 | 1606655 | CRANKSHAFT | (B) |
| | N,R | 1 | 6077425 | CRANKSHAFT | (A) |
| | N,R | 1 | 1606657 | CRANKSHAFT | (B) |
| | O,P | 1 | 1512271 | CRANKSHAFT | |
| 2 | M,Q | 1 | 6106301 | CRANKSHAFT MAIN BEARING SET | STD |
| | N,R O,P | 1 | 6106304 | CRANKSHAFT MAIN BEARING SET | |
| | M,Q | 1 | 6106224 | CRANKSHAFT MAIN BEARING SET | -.010 |
| | N,R | 1 | 6106227 | CRANKSHAFT MAIN BEARING SET | |
| | O,P | | | | |
| | M,Q | 1 | 6106229 | CRANKSHAFT MAIN BEARING SET | -.020 |
| | N,R O,P | 1 | 6106232 | CRANKSHAFT MAIN BEARING SET | -.020 |

For footnotes turn to page B10

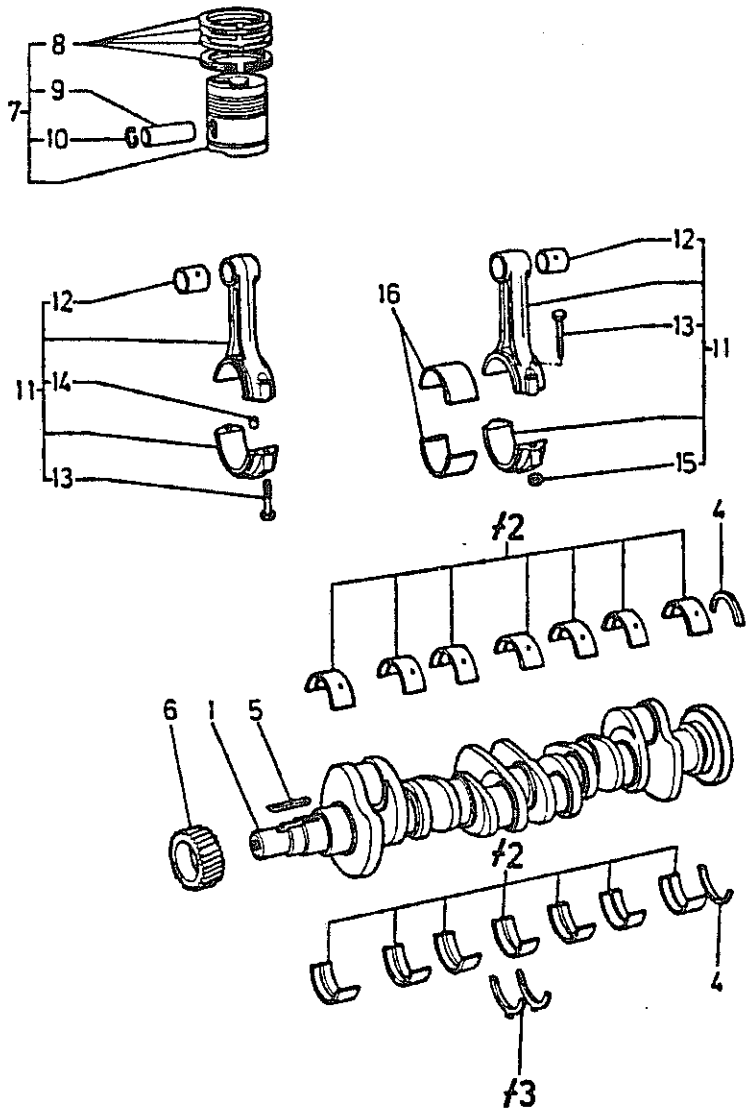



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 2 | M,Q | 1 | 6106306 | CRANKSHAFT MAIN BEARING SET | -.030 |
| | N,R O,P | 1 | 6106309 | CRANKSHAFT MAIN BEARING SET | -.030 |
| | M,Q | 1 | 6106312 | CRANKSHAFT MAIN BEARING SET | -.040 |
| | N,R O,P | 1 | 6106315 | CRANKSHAFT MAIN BEARING SET | -.040 |
| 3 | ALL | 1 | 6106285 6106286 | CRANKSHAFT THRUST WASHER | STD |
| | ALL | 1 | 6106287 6106288 | CRANKSHAFT THRUST WASHER | +.0025 |
| | ALL | 1 | 6106289 6106290 | CRANKSHAFT THRUST WASHER | +.005 |
| | ALL | 1 | 6106291 6106292 | CRANKSHAFT THRUST WASHER | +.0075 |
| | ALL | 1 | 6106293 6106294 | CRANKSHAFT THRUST WASHER | +.010 |
| | ALL | 1 | 6106295 6106296 | CRANKSHAFT THRUST WASHER | +.015 |



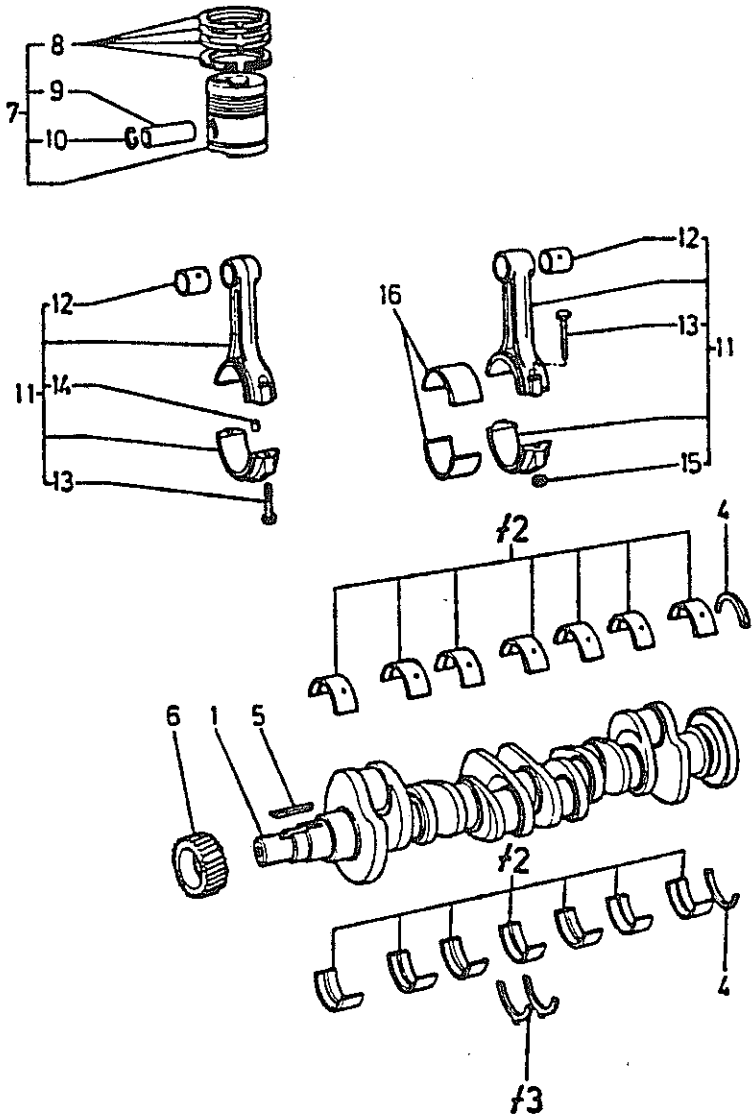

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARI |
|---|---|---|---|---|---|
| 3 | ALL | 1 | 6106297 | CRANKSHAFT THRUST | +.020 |
| | | | 6106298 | WASHER | |
| 4 | ALL | 1 | 6105490 | CRANKSHAFT OIL SEAL | |
| 5 | ALL | 1 | 6090885 | WOODRUFF KEY | |
| 6 | ALL | 1 | 1599715 | CRANKSHAFT GEAR | (C)BL |
| | | | 1599714 | CRANKSHAFT GEAR | (D)YE |
| | | | 1599713 | CRANKSHAFT GEAR | (E)RE |
| 7 | M,Q | 4 | 6103030 | PISTON,PIN,RING ASSEMBLY | STD. |
| | N,R | 6 | 6103030 | PISTON,PIN,RING,ASSEMBLY | STD. |
| | O | 6 | 1599870 | PISTON,PIN,RING,ASSEMBLY | STD. |
| | P | 6 | 6100051 | PISTON,PIN,RING,ASSEMBLY | STD. |
| | M,Q,N,R | 4/6 | 6103031 | PISTON,PIN,RING,ASSEMBLY | +.015 |
| | M,Q,N,R | 4/6 | 6103032 | PISTON,PIN,RING,ASSEMBLY | +.035 |
| | M,Q,N,R | 4/6 | 6103033 | PISTON,PIN,RING,ASSEMBLY | +.055 |
| 8 | M,Q,N,R | 4/6 | 1599871 | PISTON RING KIT | STD. |
| | O,P | 6 | 1599879 | PISTON RING KIT | STD. |
| | M,Q,N,R | 4/6 | 1599872 | PISTON RING KIT | +.015 |
| | M,Q,N,R | 4/6 | 1599873 | PISTON RING KIT | +.035 |
| | M,Q,N,R | 4/6 | 1599874 | PISTON RING KIT | +.055 |

For footnotes turn to page B10



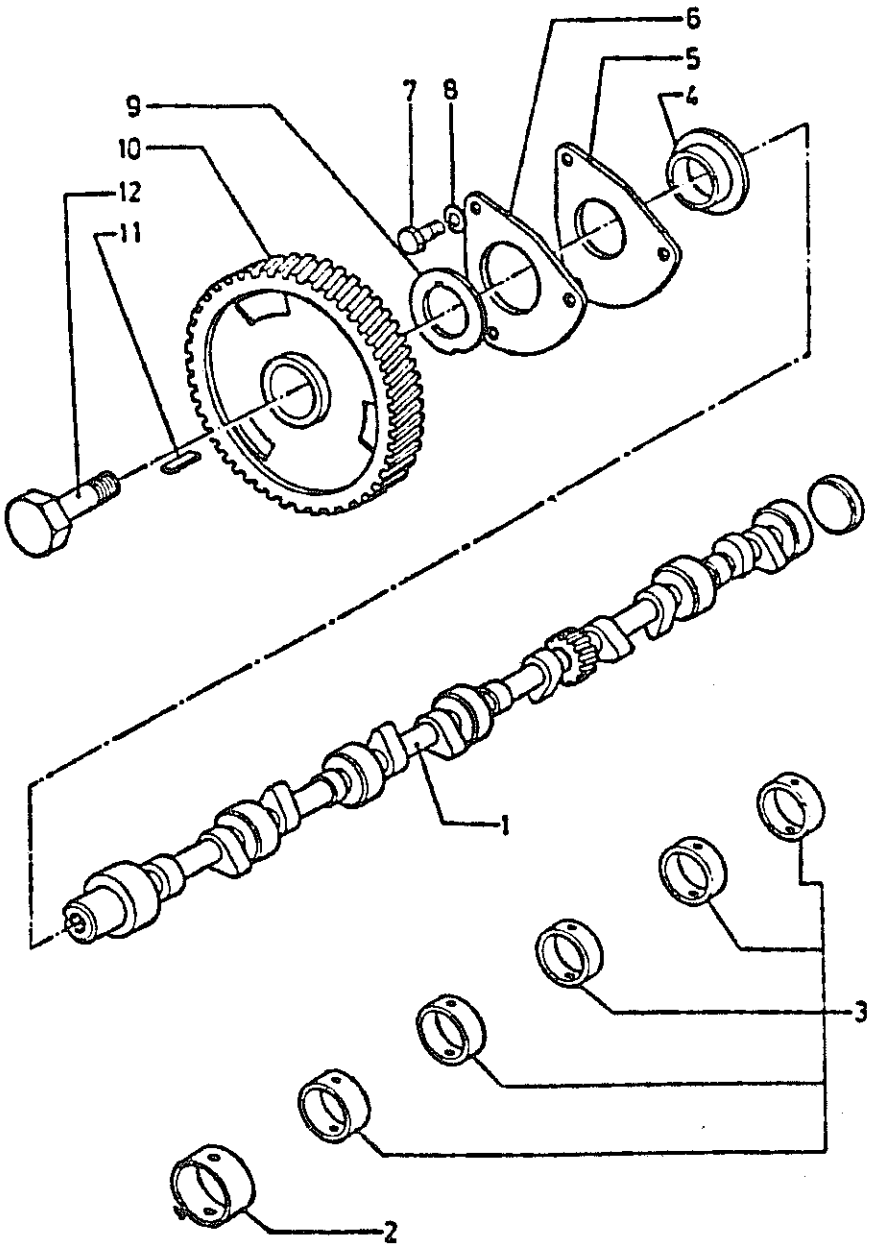

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 9 | M,Q,N,R | 4/6 | 6077162 | PISTON PIN | |
| | O,P | 6 | 6077163 | PISTON PIN | |
| 10 | M,Q,N,R | 8/12 | 1415288 | SNAP RING | |
| | O,P | 12 | 6077164 | SNAP RING | |
| 11 | M,Q,N,R | 4/6 | 6088942 | CONNECTING ROD | STD. (AAB) |
| | M,Q,N,R | 4/6 | 6088943 | CONNECTING ROD | .003 (ABB) |
| | M,Q,N,R | 4/6 | 6088944 | CONNECTING ROD | .006 (ACB) |
| | M,Q,N,R | 4/6 | 6088945 | CONNECTING ROD | .009 (ADB) |
| | O,P | 6 | 6088946 | CONNECTING ROD | STD. (GAB) |
| | O,P | 6 | 6088947 | CONNECTING ROD | .003 (GBB) |
| | O,P | 6 | 6088948 | CONNECTING ROD | .006 (GCB) |
| | O,P | 6 | 6088949 | CONNECTING ROD | .009 (GDB) |
| 12 | M,Q,N,R | 4/6 | 1497464 | CONNECTING ROD | |
| | O,P | 6 | 6078059 | BUSHING | |
| 13 | ALL | 8/12 | 1447624 | BOLTS | |
| 14 | ALL | 8/12 | 1428387 | PIN | |
| 16 | M,Q,N,R | 8/12 | 6101141 | CONNECTING ROD BEARINGS | STD. |

For footnotes turn to page B10

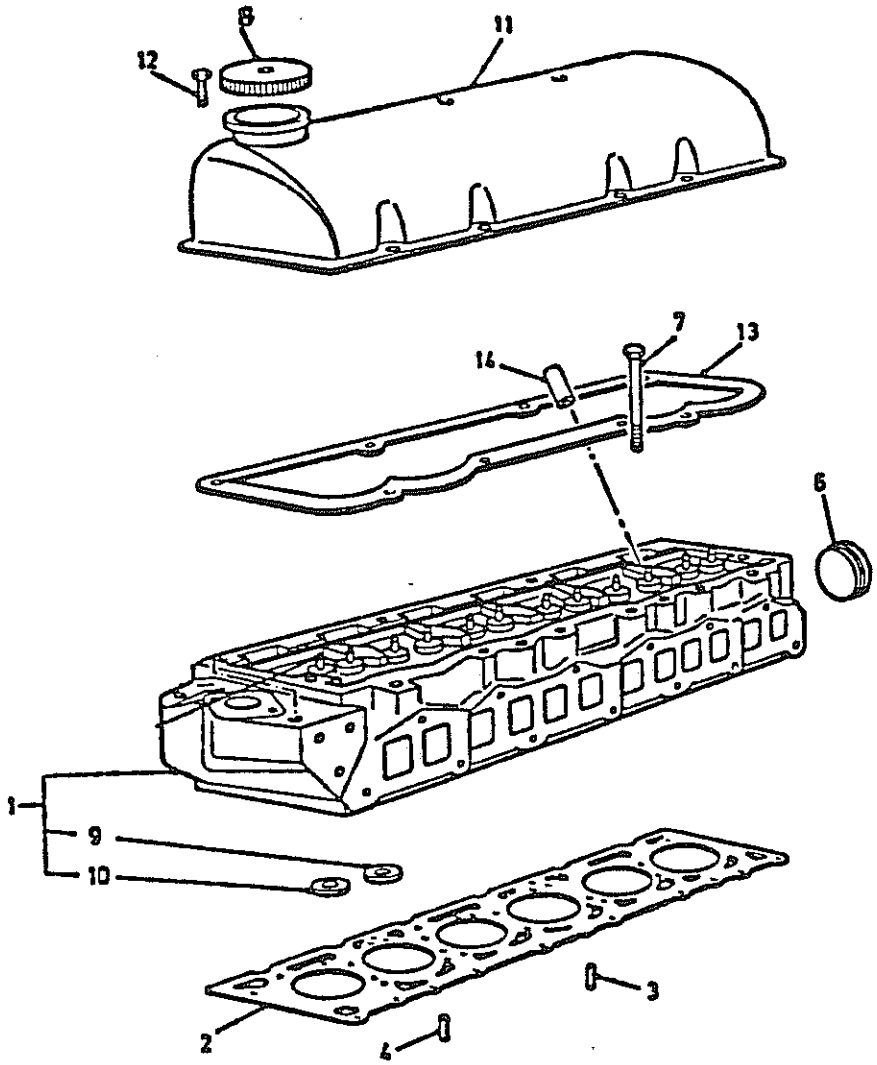



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARI |
|---|---|---|---|---|---|
| 16 | O,P | 6 | 6101142 | CONNECTING ROD BEARINGS | STD.UPPI |
| | | 6 | 6101141 | CONNECTING ROD BEARINGS | STD.LOWI |
| | M,Q,N,R | 8/12 | 6101143 | CONNECTING ROD BEARINGS | -.010 |
| | O,P | 6 | 6106203 | CONNECTING ROD BEARINGS | -.010UP |
| | | 6 | 6101143 | CONNECTING ROD BEARINGS | -.010LO |
| | M,Q,N,R | 8/12 | 6106200 | CONNECTING ROD BEARINGS | -.020 |
| | O,P | 6 | 6105660 | CONNECTING ROD BEARINGS | -.020UP |
| | | 6 | 6105656 | CONNECTING ROD BEARINGS | -.020LO |
| | M,Q,N,R | 8/12 | 6105657 | CONNECTING ROD BEARINGS | -.030 |
| | O,P | 6 | 6105661 | CONNECTING ROD BEARINGS | -.030UP |
| | | 6 | 6105657 | CONNECTING ROD BEARINGS | -.030LO |
| | M,Q,N,R | 8/12 | 6105658 | CONNECTING ROD BEARINGS | -.040 |
| | O,P | 6 | 6105662 | CONNECTING ROD BEARINGS | -.040UP |
| | | 6 | 6105658 | CONNECTING ROD BEARINGS | -.040LO |
| 17 | ALL | 6 | 1599712 | NOZZLE | |
| 18 | ALL | 6 | 1541955 | SEAL | |

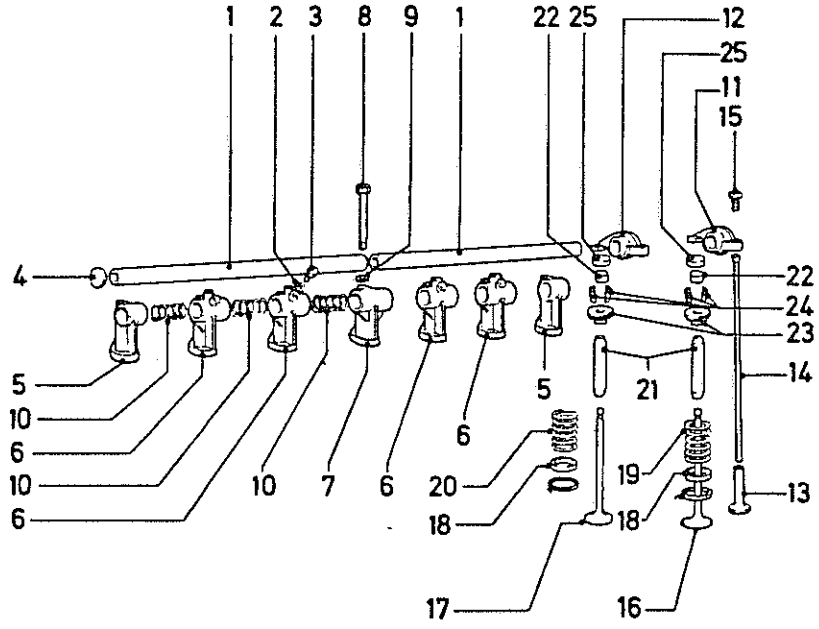
(A)TO BE USED IN ENGINE WITH GREEN DATA PLATE
(B)TO BE USED IN ENGINE WITH LIGHT BLUE DATA PLATE
(C)TO BE USED WITH 6103310 CAMSHAFT GEAR
(D)TO BE USED WITH 6103311 CAMSHAFT GEAR
(E)TO BE USED WITH 6103312 CAMSHAFT GEAR



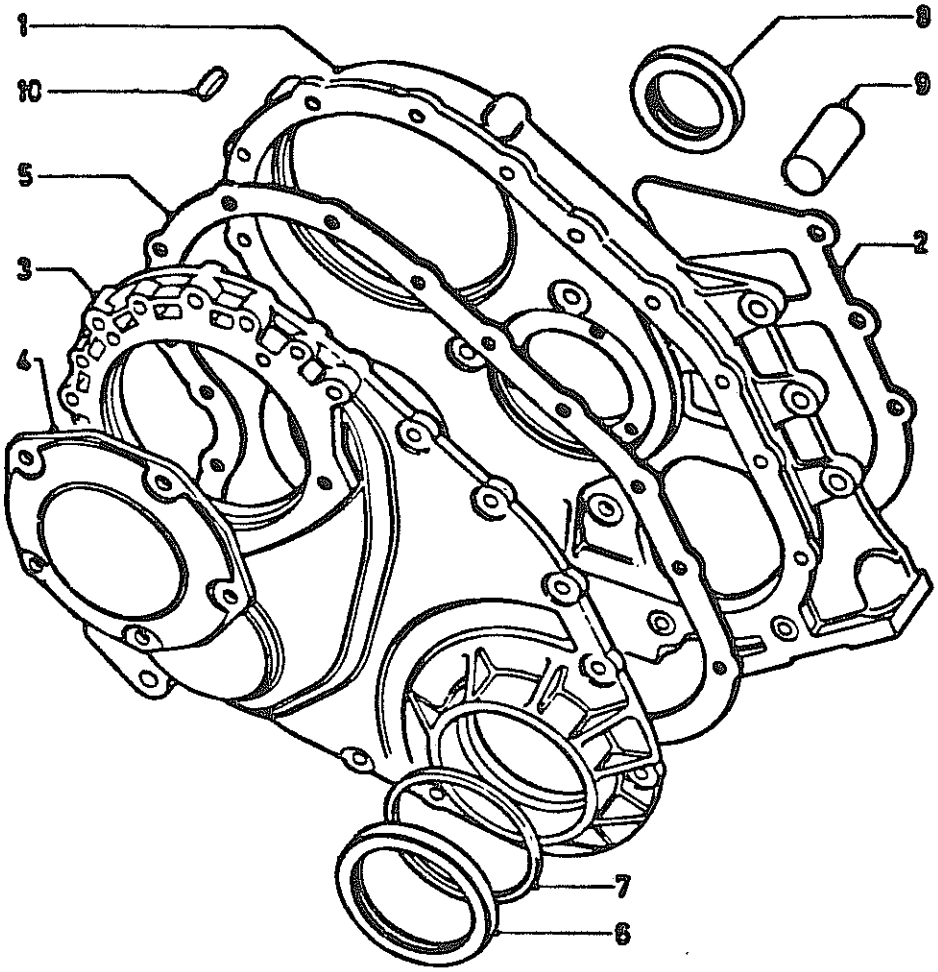

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M,Q | 1 | 6112042 | CAMSHAFT | 1081-0982 |
| | M,Q | 1 | 6129243 | CAMSHAFT | 0982- |
| | N,R | 1 | 6112043 | CAMSHAFT | 1081-0982 |
| | N,R | 1 | 6129244 | CAMSHAFT | 0982- |
| | O,P | 1 | 6112044 | CAMSHAFT | 1081-0982 |
| | " | | 6129245 | CAMSHAFT | 0982 |
| 2 | ALL | 1 | 1794742 | FRONT CAMSHAFT BEARING STD | |
| | ALL | 1 | 1794743 | FRONT CAMSHAFT BEARING STD | |
| 3 | ALL | 3/5 | 1789333 | CAMSHAFT BEARING STD | |
| | ALL | 3/5 | 1789334 | CAMSHAFT BEARING + .020 | |
| 4 | ALL | 1 | 1427085 | CAMSHAFT THRUST WASHER | |
| 5 | ALL | 1 | 1701616 | PLATE CAMSHAFT THRUST | |
| 6 | ALL | 1 | 1702841 | LOCKING PLATE | |
| 7 | ALL | 3 | 1568492 | BOLT | |
| 8 | ALL | 3 | 1575329 | WASHER | |
| 9 | ALL | 1 | 1793898 | THRUST WASHER | |
| 10 | ALL | 1 | 6103310 | GEAR CAMSHAFT | BLUE |
| | ALL | 1 | 6103311 | GEAR CAMSHAFT | YELLOW |
| | ALL | 1 | 6103312 | GEAR CAMSHAFT | RED |
| 11 | ALL | 1 | 1789748 | KEY | |
| 12 | ALL | 1 | 1487140 | BOLT | |



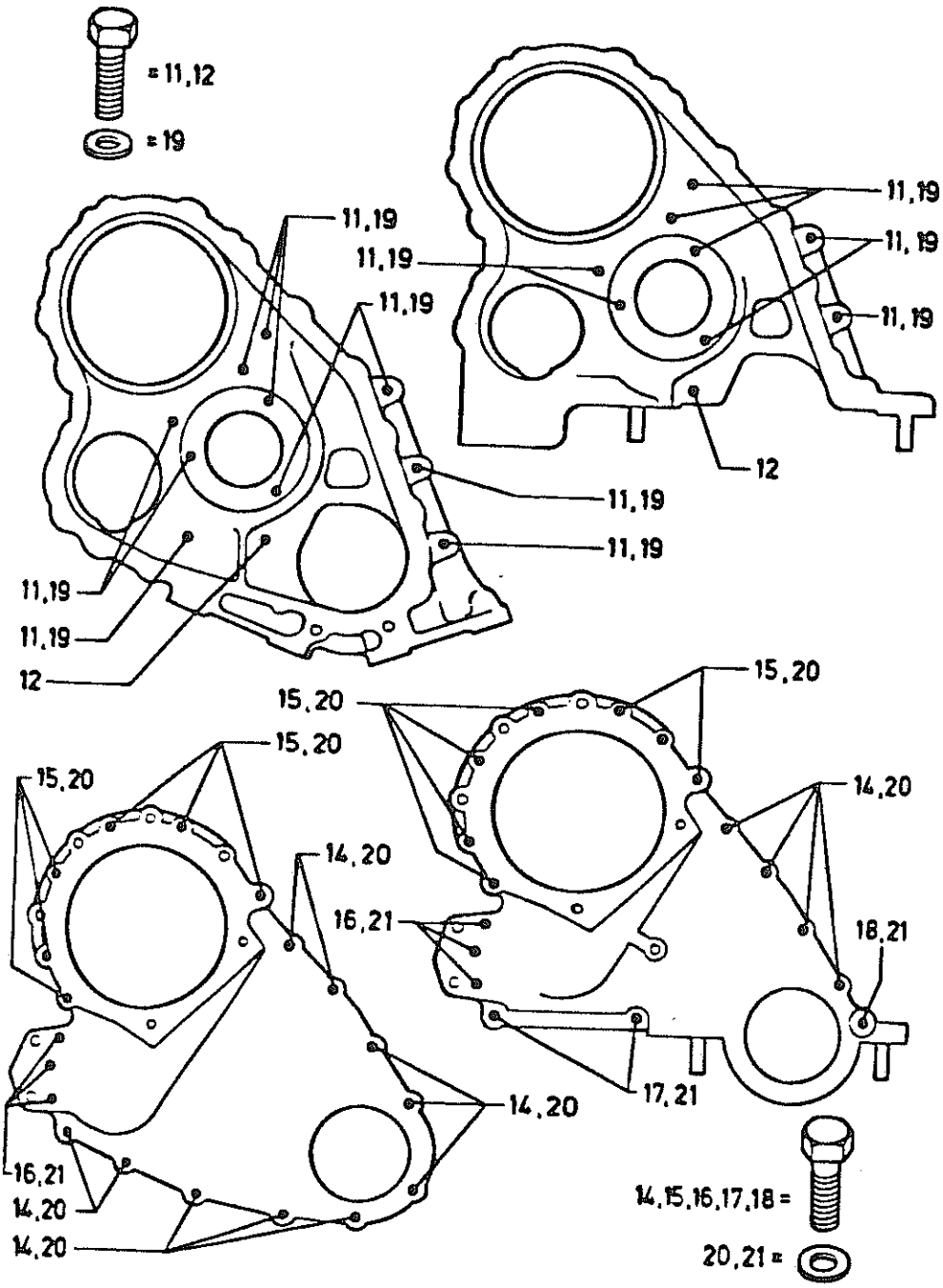

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M/Q | 1 | 6082577 | CYLINDER HEAD | |
| | N/R | 1 | 6082578 | CYLINDER HEAD | |
| | O/P | 1 | 6082579 | CYLINDER HEAD | |
| 2 | M/Q | 1 | 6103811 | HEAD GASKET | |
| | N/R | 1 | 6103813 | HEAD GASKET | |
| | O/P | 1 | 1602146 | HEAD GASKET | |
| 3 | ALL | 1 | 1788821 | DOWEL | |
| 4 | M/Q/N/R | 1 | 1790651 | DOWEL | |
| | O/P | 1 | 6077317 | DOWEL | |
| 6 | ALL | 1 | 1448568 | PLUG | |
| 7 | ALL | 17/25 | 6103719 | BOLT | |
| 8 | ALL | 1 | 6071651 | CAP | |
| 9 | ALL | 4/6 | 1430247 | INLET VALVE SEAT STD | |
| | ALL | 4/6 | 1430248 | INLET VALVE SEAT +.010 | |
| 10 | ALL | 4/6 | 1430249 | EXHAUST VALVE SEAT STD | |
| | ALL | 4/6 | 1430250 | EXHAUST VALVE SEAT +.010 | |
| 11 | M,Q | 1 | 6090236 | VALVE COVER | |
| | N,R | 1 | 6090237 | VALVE COVER | |
| | O/P | 1 | 6090238 | VALVE COVER | |



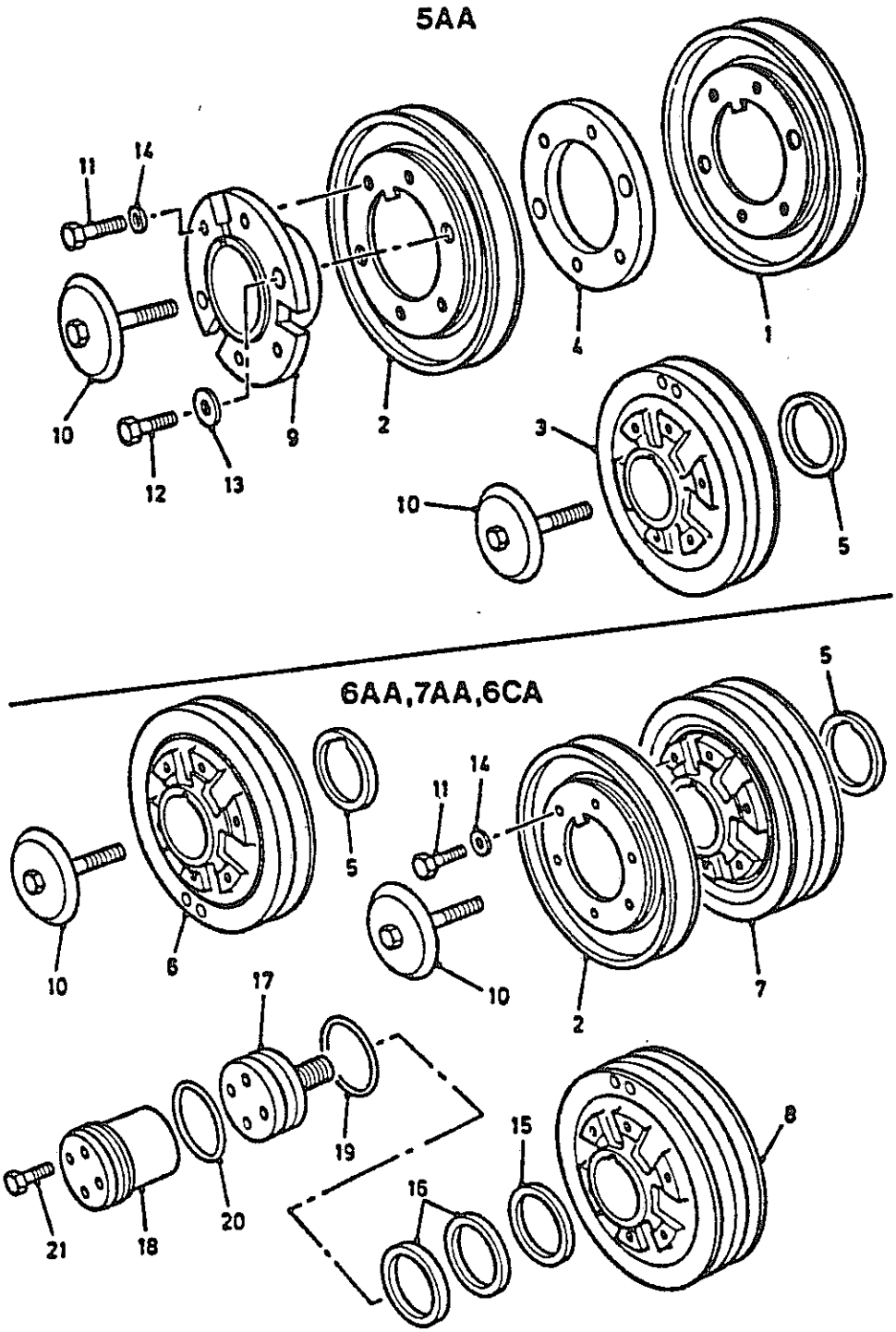

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 22 | M/Q/N/R | 4/6 | 6101533 | SEAL VALVE STEM (IN) | |
| | O/P | 6 | 1596817 | SEAL VALVE STEM (IN) | |
| | ALL | 4/6 | 1596817 | SEAL VALVE STEM (EX) | |
| 23 | ALL | 16/24 | 1473015 | RETAINER | |
| 24 | ALL | 8/12 | 6093972 | COLLET | |
| 25 | ALL | 8/12 | 1789727 | CAP | |




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 1 | M,Q,N,R,O | 1 | 6113977 | TIMING GEAR HOUSING | |
| | P | 1 | 6113978 | TIMING GEAR HOUSING | |
| 2 | M,Q,N,R,O | 1 | 6102560 | GASKET | |
| | P | 1 | 1599788 | GASKET | |
| 3 | M,Q,N,R,O | 1 | 6105291 | COVER | |
| | P | 1 | 6105292 | COVER | |
| 4 | ALL | 1 | 1599717 | COVER | |
| 5 | M,Q,N,R,O | 1 | 6102561 | GASKET | |
| | P | 1 | 1599789 | GASKET | |
| 6 | ALL | 1 | 6106840 | SEAL | |
| 7 | ALL | 1 | 1599790 | SPACER | |
| 8 | ALL | 1 | 6102559 | SEAL | |
| 9 | ALL | 1 | 1419959 | SLEEVE STD. | |
| | ALL | 1 | 1419960 | SLEEVE .020 O/S | |
| 10 | ALL | 1 | 1789541 | PLUG | |

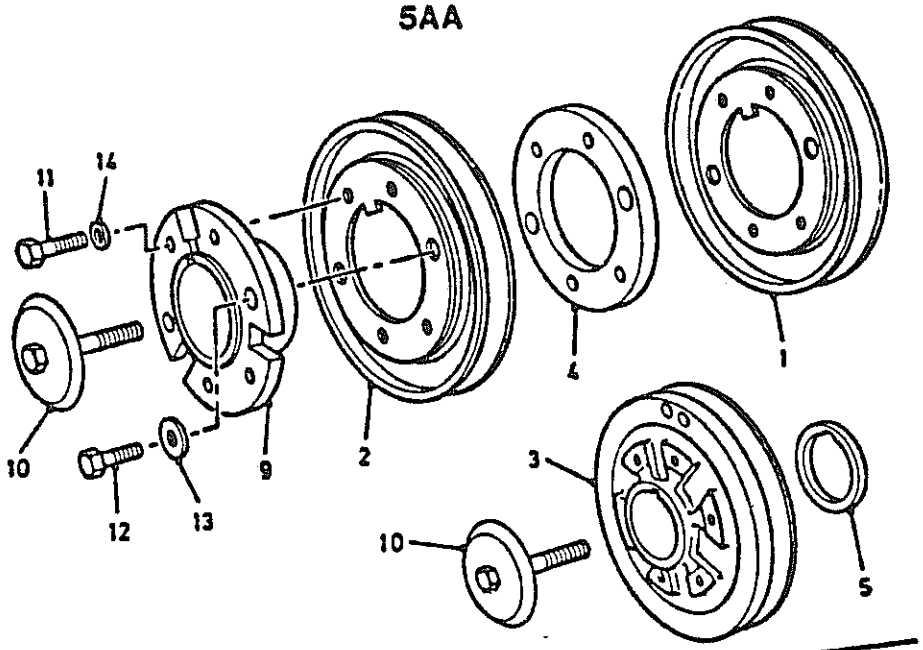



| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 11 | ALL | A/R | 1508431 | BOLT | |
| 12 | ALL | A/R | 1568867 | BOLT | |
| 13 | ALL | A/R | 0241729 | BOLT | |
| 14 | ALL | A/R | 1571467 | BOLT | |
| 15 | ALL | A/R | 1579207 | BOLT | |
| 16 | ALL | A/R | 1575027 | BOLT | |
| 17 | ALL | A/R | 1584241 | BOLT | |
| 18 | ALL | A/R | 1602500 | BOLT | |
| 19 | ALL | A/R | 2579329 | WASHER FLAT | |
| 20 | ALL | A/R | 1444685 | WASHER FLAT | |
| 21 | ALL | A/R | 1436268 | WASHER FLAT | |
| 22 | ALL | A/R | 1459510 | LOCKER WASHER | |

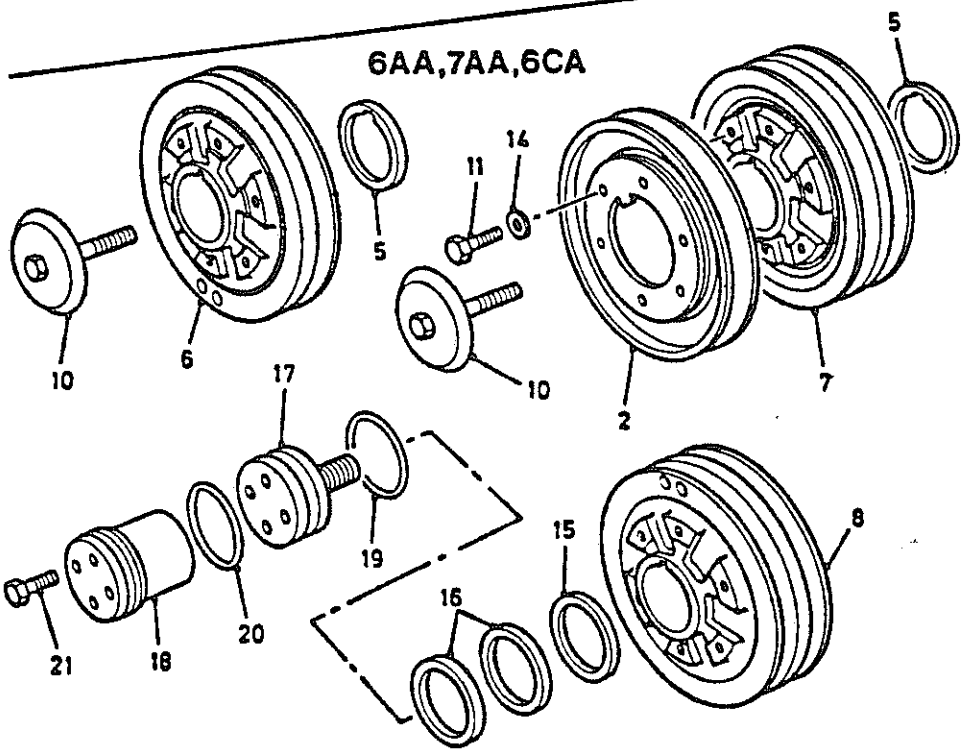



| KEY | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|
| 1 | 1 | 6091907 | PULLEY | |
| 2 | 1 | 6086402 | PULLEY | 5AA for SD80,SP9 |
| 3 | 1 | 6088051 | PULLEY | 6AA,7AA,6CA for SD120, SP13 |
| 4 | 1 | 6091906 | SPACER | SP160, SP22 |
| 5 | 1 | 1617390 | SPACER | |
| 6 | 1 | 6091908 | PULLEY | |
| 7 | 1 | 6091909 | PULLEY | |
| 8 | 1 | 6119026 | PULLEY | |
| 9 | 1 | 1409531 | HUB ASSEMBLY | |
| 10 | 1 | 6059090 | BOLT ASSEMBLY | |

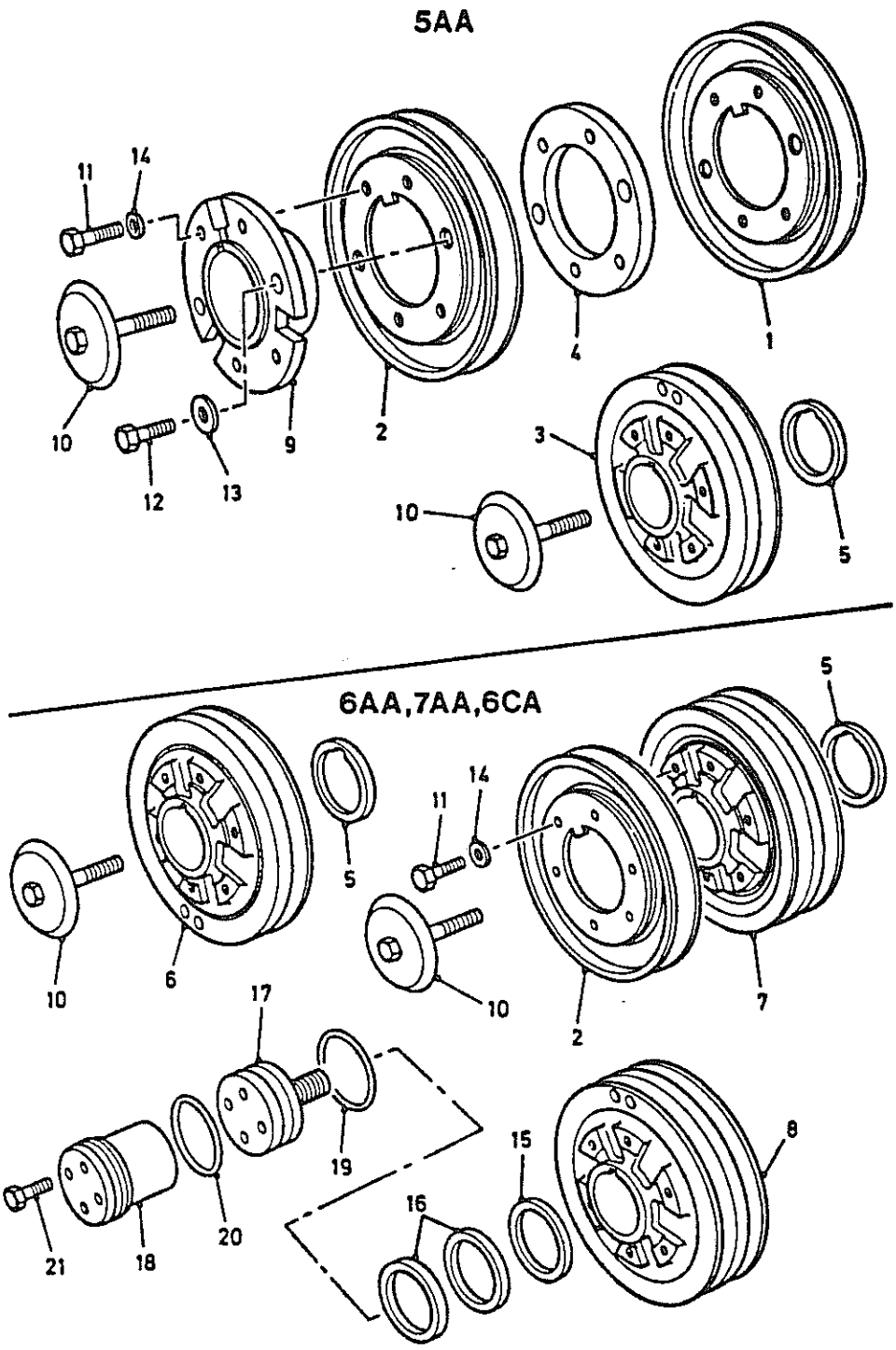
5AA



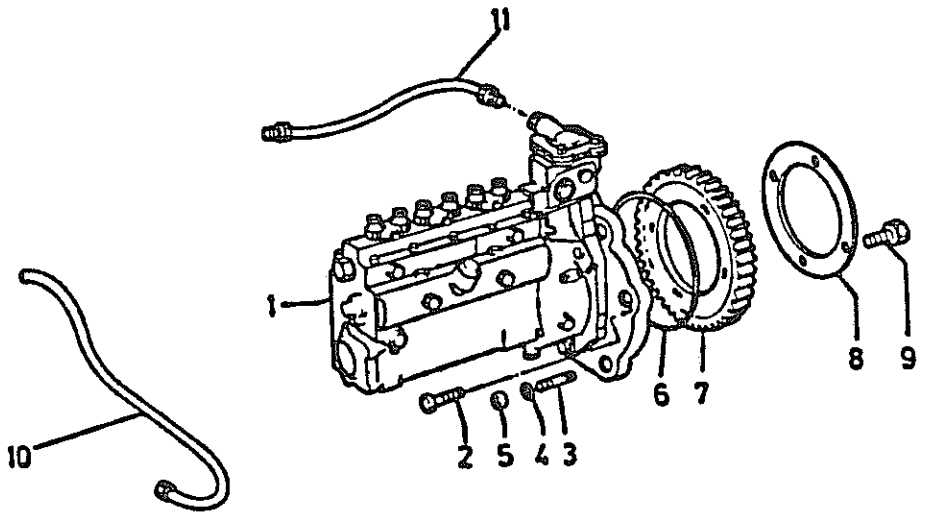

6AA,7AA,6CA

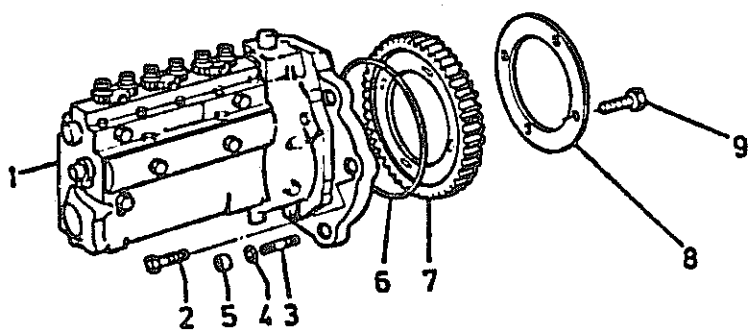



| KEY | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|
| 11 | 4 | 1575330 | BOLT | |
| 12 | 2 | 1568477 | BOOT | 5AA for SD80,SP90 |
| 13 | 2 | 1760723 | WASHER FLAT | |
| 14 | 4 | 1444685 | WASHER FLAT | 6AA,7AA,6CA for SD120 |
| 15 | 1 | 6090806 | WASHER (CRANKSHAFT DAMPER) | SP135 |
| 16 | 1 | 6090886 | WASHER ASSEMBLY (DAMPER LOCKING) | SP160 |
| 17 | 1 | 6090808 | BOLT | SP225 |
| 18 | 1 | 6090807 | HUB (CRANKSHAFT PULLEY) | |

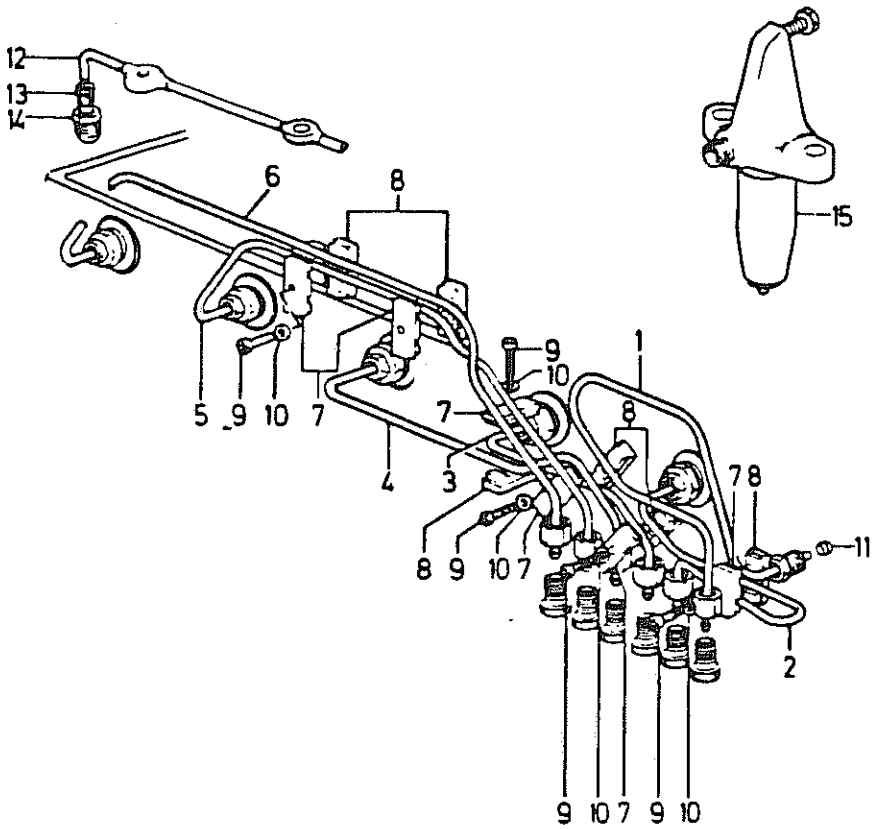


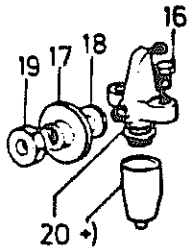

| KEY | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|
| 19 | 1 | 6090883 | O RING | 5AA for SD80, |
| 20 | 1 | 6090884 | O RING | |
| 21 | 4 | 1489492 | BOLT | 6AA,7AA,6CA for SD |
| 22 | 1 | 1556493 | PULLEY | SP |
| 23 | 6 | 1612348 | BOLT | SP |
| 24 | 4 | 1560616 | LOCK WASHER | SP |



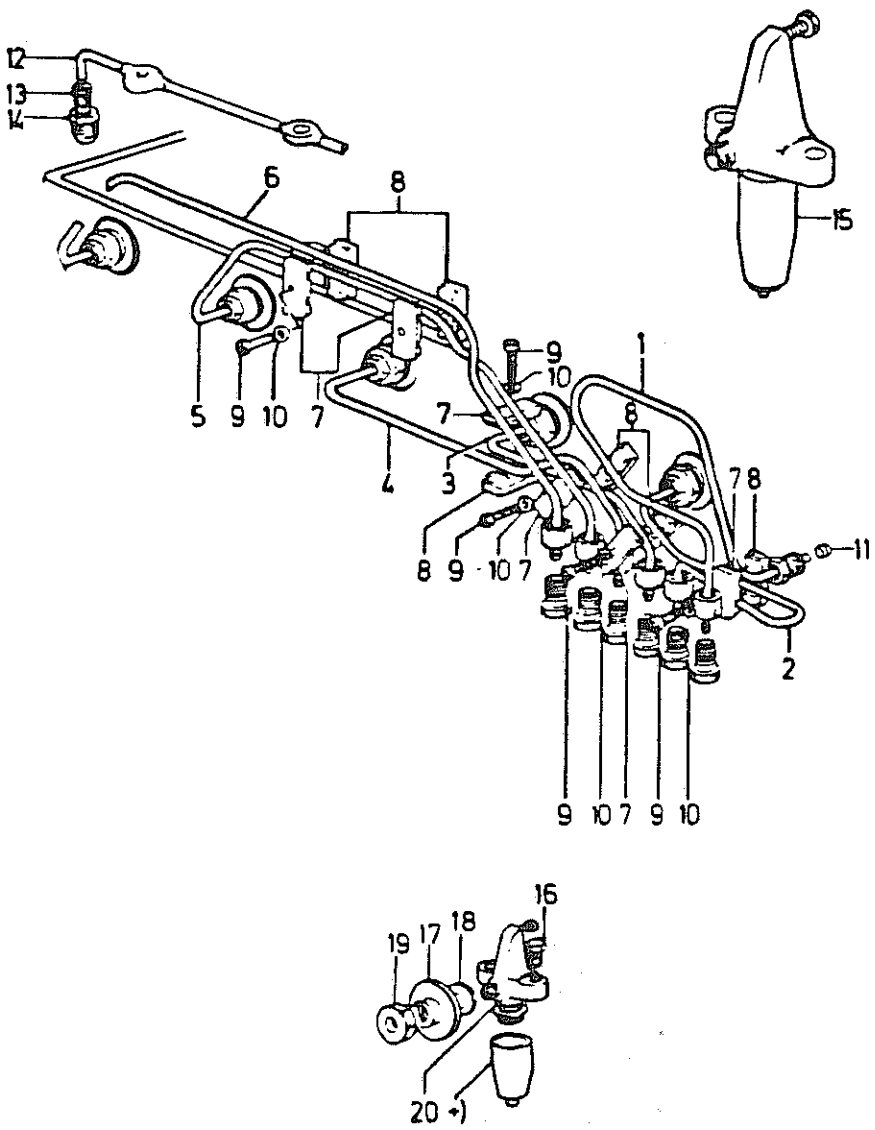




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | Q | 1 | 6108556 | FUEL INJECTION PUMP | |
| | R | 1 | 6108563 | FUEL INJECTION PUMP | |
| | M | 1 | 6108557 | FUEL INJECTION PUMP | |
| | N | 1 | 6108562 | FUEL INJECTION PUMP | |
| | O | 1 | 6077209 | FUEL INJECTION PUMP | |
| | P | 1 | 6108567 | FUEL INJECTION PUMP | |
| 2 | ALL | 4 | 1575271 | BOLT | |
| 3 | ALL | 1 | 6062230 | STUD | |
| 4 | ALL | 5 | 1415664 | WASHER | |
| 5 | ALL | 1 | 1575009 | NUT | |
| 6 | ALL | 1 | 1719874 | SEAL RING | |
| 7 | M,Q,N,R | 1 | 6077521 | GEAR | |
| | O,P | 1 | 6114477 | GEAR | |
| 8 | ALL | 1 | 6077523 | PLATE | |
| 9 | ALL | 4 | 6057435 | BOLT | |
| 10 | ALL | 1 | 6108572 | OIL TUBE | |
| | N-O-P | 1 | | OIL TUBE | |
| 11 | O-P | 1 | 6108571 | TUBE ASSEMBLY | |



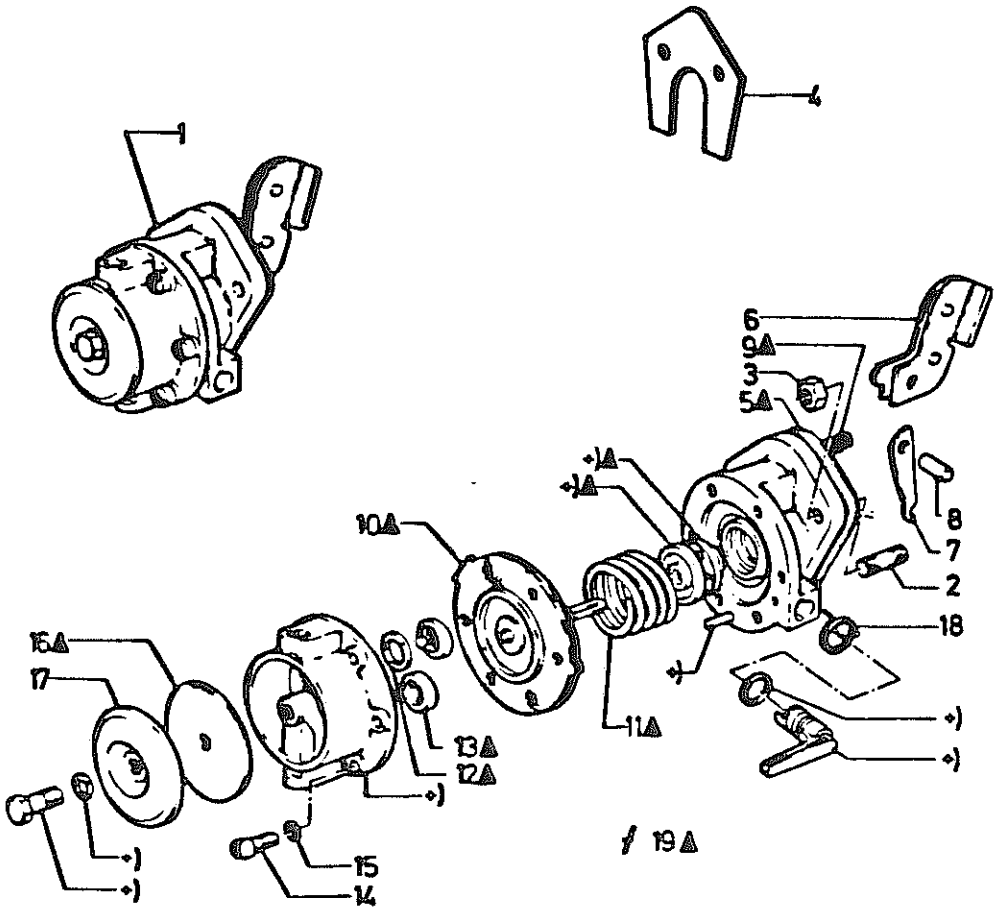

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M,Q | 1 | 6105606 | NO. 1 INJECTION LINE | |
| 2 | M,Q | 1 | 6105607 | NO. 2 INJECTION LINE | |
| 3 | M,Q | 1 | 6105608 | NO. 3 INJECTION LINE | |
| 4 | M,Q | 1 | 6105609 | NO. 4 INJECTION LINE | |
| 1 | N,R,O,P | 1 | 6097948 | NO. 1 INJECTION LINE | |
| 2 | N,R,O,P | 1 | 6097949 | NO. 2 INJECTION LINE | |
| 3 | N.R,O,P | 1 | 6098078 | NO. 3 INJECTION LINE | |
| 4 | N,R,O,P | 1 | 6097950 | NO. 4 INJECTION LINE | |
| 5 | N,R,O,P | 1 | 6098081 | NO. 5 INJECTION LINE | |
| 6 | N,R,O,P | 1 | 6098082 | NO. 6 INJECTION LINE | |
| 7 | ALL | A/R | 1514329 | LINE CLAMPS | |
| 8 | ALL | A/R | 1514330 | LINE CLAMPS | |
| 9 | ALL | A/R | 1572059 | SCREW | |
| 10 | ALL | A/R | 6029099 | LOCK WASHER | |
| 11 | ALL | A/R | 1602234 | FERRULE | |
| 12 | M | 1 | 6113157 | LEAK OFF PIPE | |
| | N-O-P | 1 | 6113158 | LEAK OFF PIPE | |



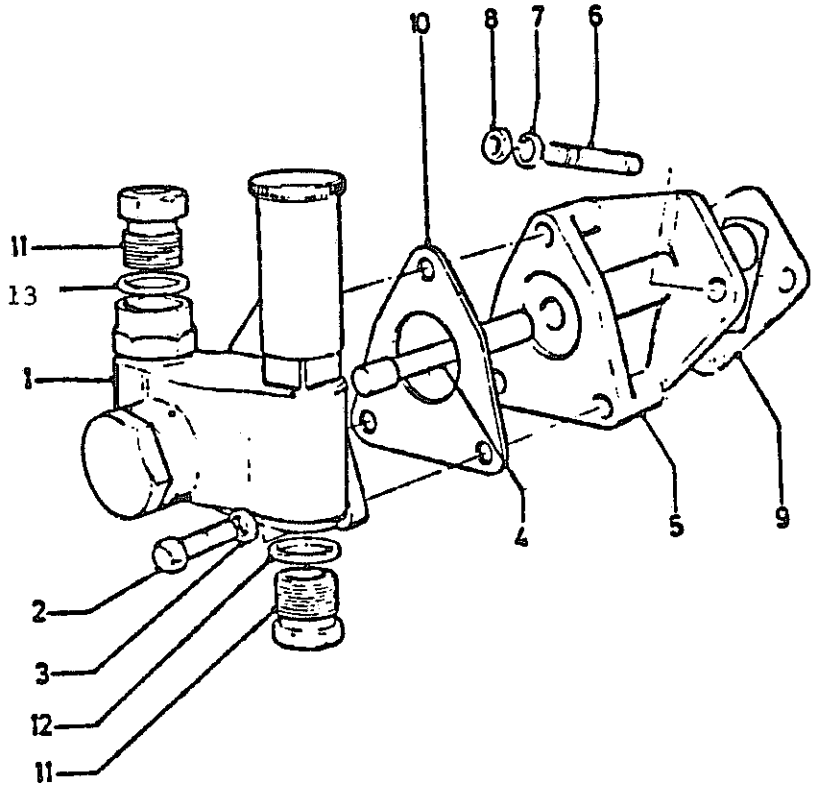




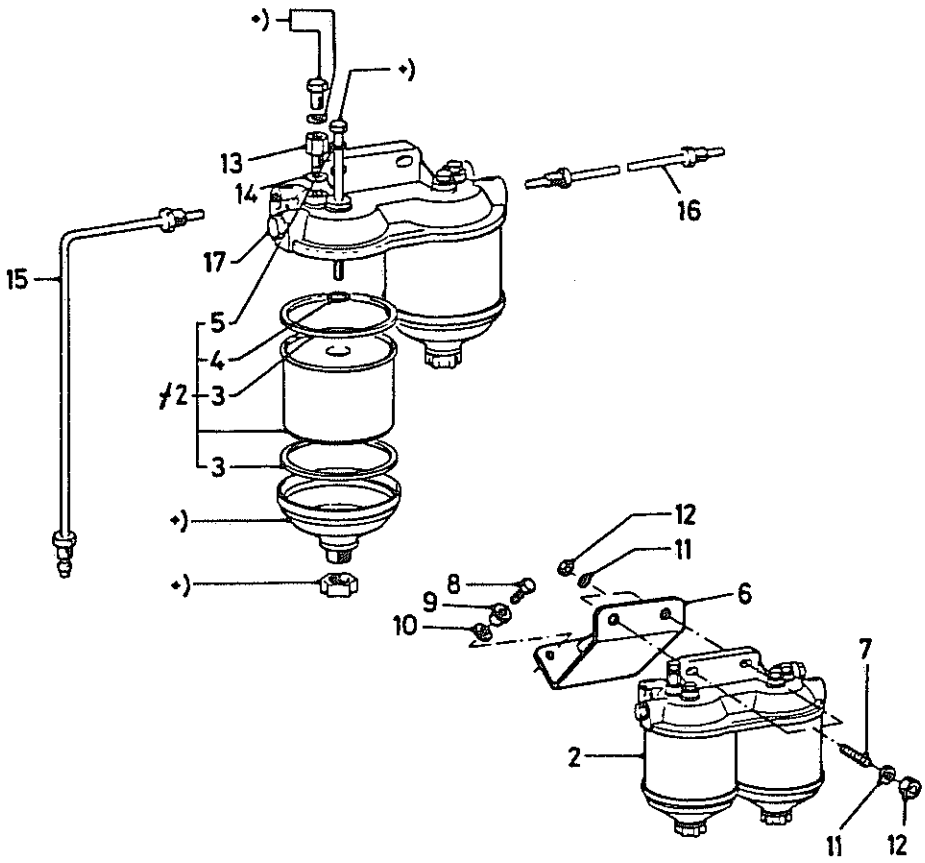
| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 13 | ALL | 1 | 1481753 | CONNECTOR | |
| 14 | ALL | 1 | 1514322 | CONNECTOR | |
| 15 | M,Q,N,R | 4/6 | 1599918 | NOZZLE | |
| | O-P | 6 | 1599919 | NOZZLE | |
| 16 | ALL | A/R | 1716286 | BOLT | |
| 17 | ALL | A/R | 1542666 | SEAL | |
| 18 | ALL | A/R | 1605353 | SEAL | |
| 19 | ALL | A/R | 1791101 | NUT | |
| 20 | ALL | A/R | 1707224 | WASHER | |



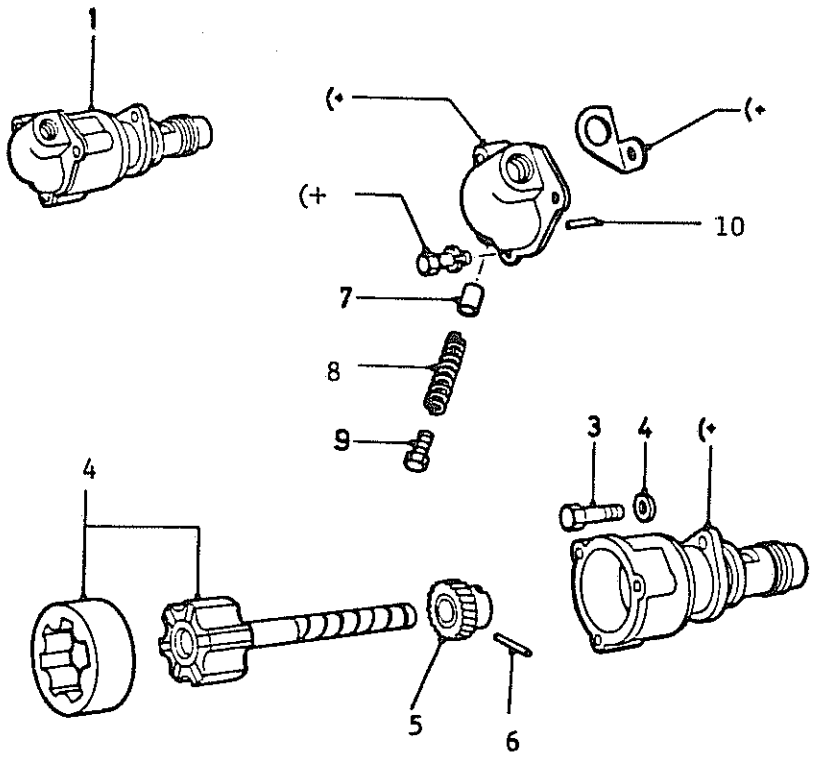

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M,Q,N,R | 1 | 6038718 | FUEL PUMP | |
| 2 | M,Q,N,R | 2 | 6115328 | STUD | |
| 3 | M,Q,N,R | 2 | 1582108 | NUT | |
| 4 | M,Q,N,R | 1 | 1459154 | PLATE | |
| 5 | M,Q,N,R | 1 | 1789436 | GASKET | |
| 6 | M,Q,N,R | 1 | 2703732 | ARM | |
| 7 | M,Q,N,R | 1 | 1491104 | ARM | |
| 8 | M,Q,N,R | 1 | 1749177 | PIN | |
| 9 | M,Q,N,R | 1 | 1749182 | SPRING | |
| 10 | M,Q,N,R | 1 | 6039028 | DIAPHRAM ASSEMBLY | |
| 11 | M,Q,N,R | 1 | 6039027 | SPRING | |
| 12 | M,Q,N,R | 2 | 1749061 | GASKET | |
| 13 | M,Q,N,R | 2 | 1706711 | VALVE ASSEMBLY | |
| 14 | M,Q,N,R | 6 | 1472222 | BOLT | |
| 15 | M,Q,N,R | 6 | 1757975 | WASHER | |
| 16 | M,Q,N,R | 2 | 1791854 | DIAPHRAM | |
| 17 | M,Q,N,R | 1 | 1749047 | COVER | |
| 18 | M,Q,N,R | 1 | 1405313 | SPRING | |
| 19 | M,Q,N,R | 1 | 1563606 | KIT | |




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | O-P | 1 | 1536780 | PUMP | FILTER |
| 2 | O-P | 2 | 1472061 | BOLT | ASSEMBLY |
| 3 | O-P | 2 | 1459510 | WASHER | PART NO. 6035908 |
| 4 | O-P | 2 | 1596717 | PLUNGER | FOR SP225 ONLY |
| 5 | O-P | 3 | 1596719 | ADAPTOR | (Not Shown) |
| 6 | O-P | 3 | 6115328 | STUD | |
| 7 | O-P | 1 | 1444686 | LOCK WASHER | |
| 8 | O-P | 1 | 1568200 | NUT | |
| 9 | O-P | 1 | 1789436 | GASKET | |
| 10 | O-P | 1 | 1501698 | GASKET | |
| 11 | O-P | 2 | 1501527 | ADAPTOR | |
| 12 | O-P | 3 | 1503882 | WASHER | |
| 13 | O-P | 1 | 6005925 | WASHER | |



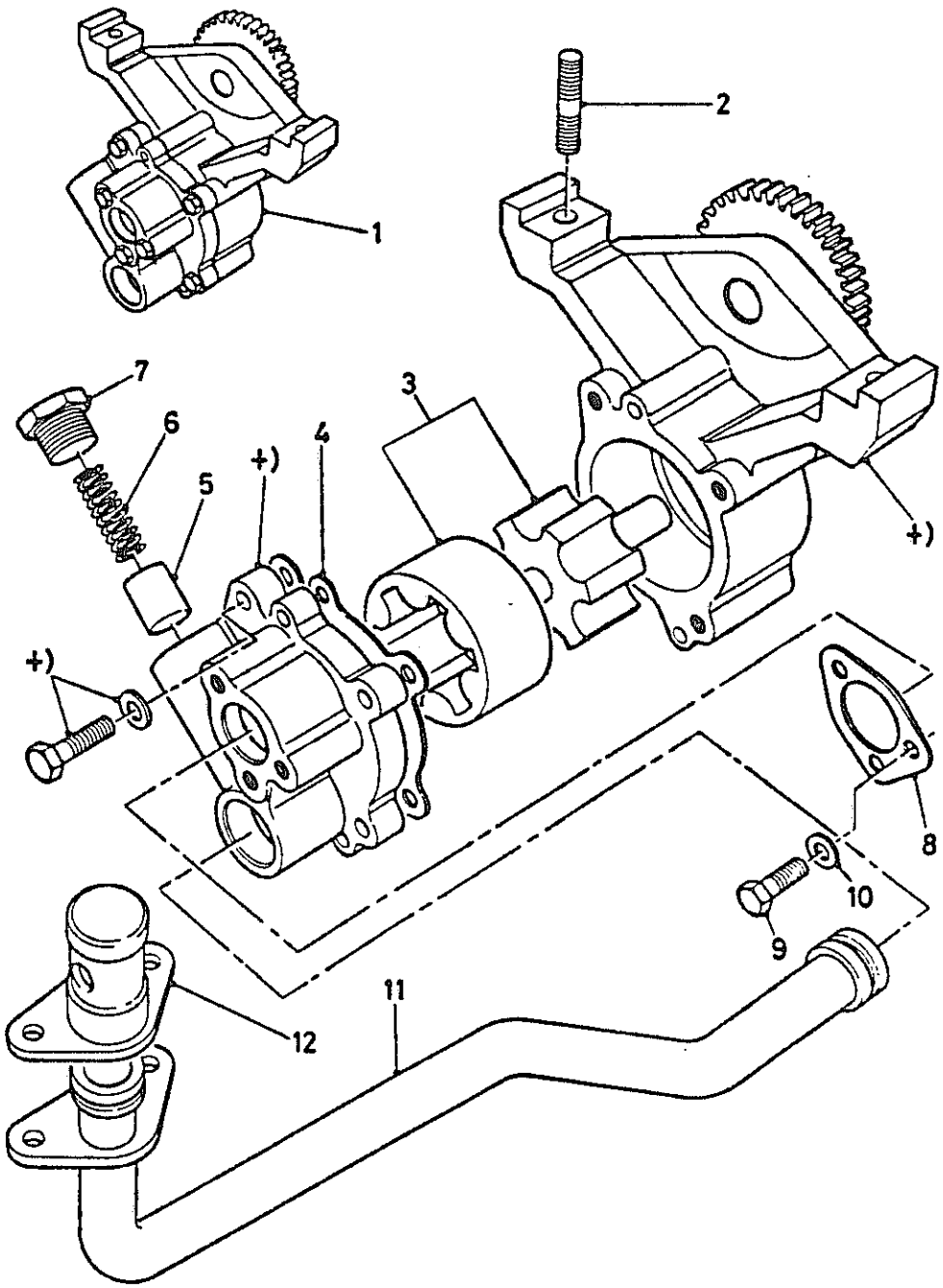

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | ALL | 1 | 6089149 | FUEL FILTER ASSEMBLY | |
| 2 | ALL | 2 | 1423477 | FUEL FILTER ELEMENTS | |
| 3 | ALL | 4 | 1422403 | SEAL | |
| 4 | ALL | 2 | 1760894 | WASHER | |
| 5 | ALL | 2 | 3416157 | WASHER | |
| 6 | ALL | 1 | 6119122 | BRACKET | |
| 7 | ALL | 2 | 1519781 | STUD | 10-81/05-8 2 |
| | | 2 | 0201029 | STUD | 05-82 |
| 8 | ALL | 2 | 1568867 | BOLT | |
| 9 | ALL | 2 | 6089628 | BUSH | |
| 10 | ALL | 2 | 6034917 | SEAL | |
| 11 | ALL | 4 | 1470359 | FLAT WASHER | |
| | | 4 | 1451781 | | |
| 12 | ALL | 4 | 1465503 | NUT | |
| | | 2 | 1465503 | | |
| 13 | ALL | 1 | 6104604 | VALVE ASSEMBLY | |
| 14 | ALL | 1 | +) | | PART OF 6104604 |
| 15 | M,N,Q,R | 1 | 3K776 | TUBE ASSEMBLY | |
| | O,P | 1 | 3K776 | TUBE ASSEMBLY | |
| 16 | M,Q | 1 | 6109580 | TUBE ASSEMBLY | |
| | N,R,O,P | 1 | 6109581 | TUBE ASSEMBLY | |
| 17 | ALL | A/R | 6107558 | PLUG | |




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M,Q,N,R,O | 1 | 6100762 | OIL PUMP | (A) |
| | " | 1 | 6100763 | " " | (B) |
| 2 | " | 2 | 1568869 | BOLT | |
| 3 | " | 2 | 1560616 | LOCK WASHER | |
| 4 | " | 1 | 6106323 | ROTOR & SHAFT | (A) |
| | " | 1 | 6106324 | " " " | (B) |
| 5 | " | 1 | 1793868 | GEAR | (A) |
| | " | 1 | 1606389 | " | (B) |
| 6 | " | 1 | 1606387 | SPRING PIN | (A) |
| | " | 1 | 1606388 | " " | (B) |
| 7 | " | 1 | 1605121 | PLUNGER | (A) |
| | " | 1 | 6106331 | " | (B) |
| 8 | " | 1 | 6106328 | SPRING | (A) |
| | " | 1 | 6106329 | " | (B) |
| 9 | " | 1 | 6106336 | CAP | (A) |
| 10 | " | 1 | 1433211 | PIN | (A) |

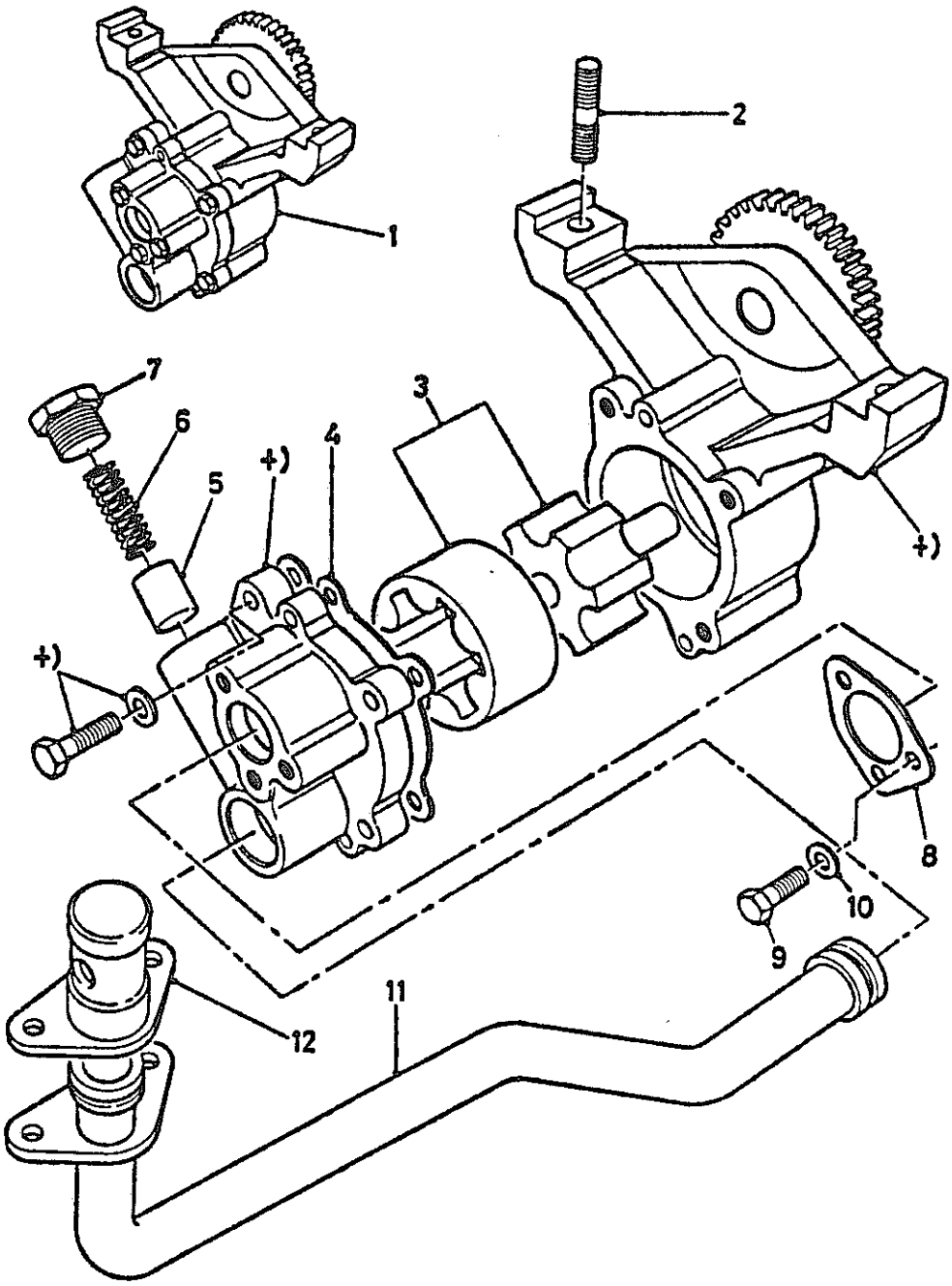
(A) HOLBOURN EATON

(B) WHITEHEAD



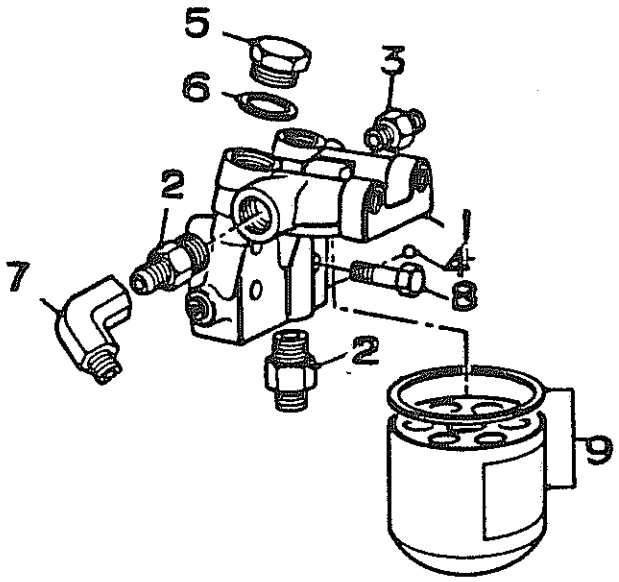

| KEY | QTY | PART NUMBER | DESCRIPTION | REMARKS |
|---|---|---|---|---|
| 1 | 1 | (A)6100766 | PUMP ASSEMBLY | |
| | 1 | (B)6100767 | PUMP ASSEMBLY | |
| 2 | 2 | 1602210 | STUD | SP225 ONLY |
| 3 | 1 | (A)6106325 | ROTOR & SHAFT ASSEMBLY | |
| | 1 | (B)6106326 | ROTOR & SHAFT ASSEMBLY | |
| 4 | 1 | (A)6106327 | THRUST PLATE | |
| 5 | 1 | (A)1605121 | PLUNGER (RELIEF VALVE) | |
| | 1 | (B)6106331 | PLUNGER (RELIEF VALVE) | |
| 6 | 1 | (A)6106328 | SPRING | |
| | 1 | (B)6106330 | SPRING | |
| 7 | 1 | (A)6106336 | CAP | |
| | 1 | (B)6106337 | CAP | |

**A-HOLBOURN EATON**
**B-WHITEHEAD MOTORIDES**

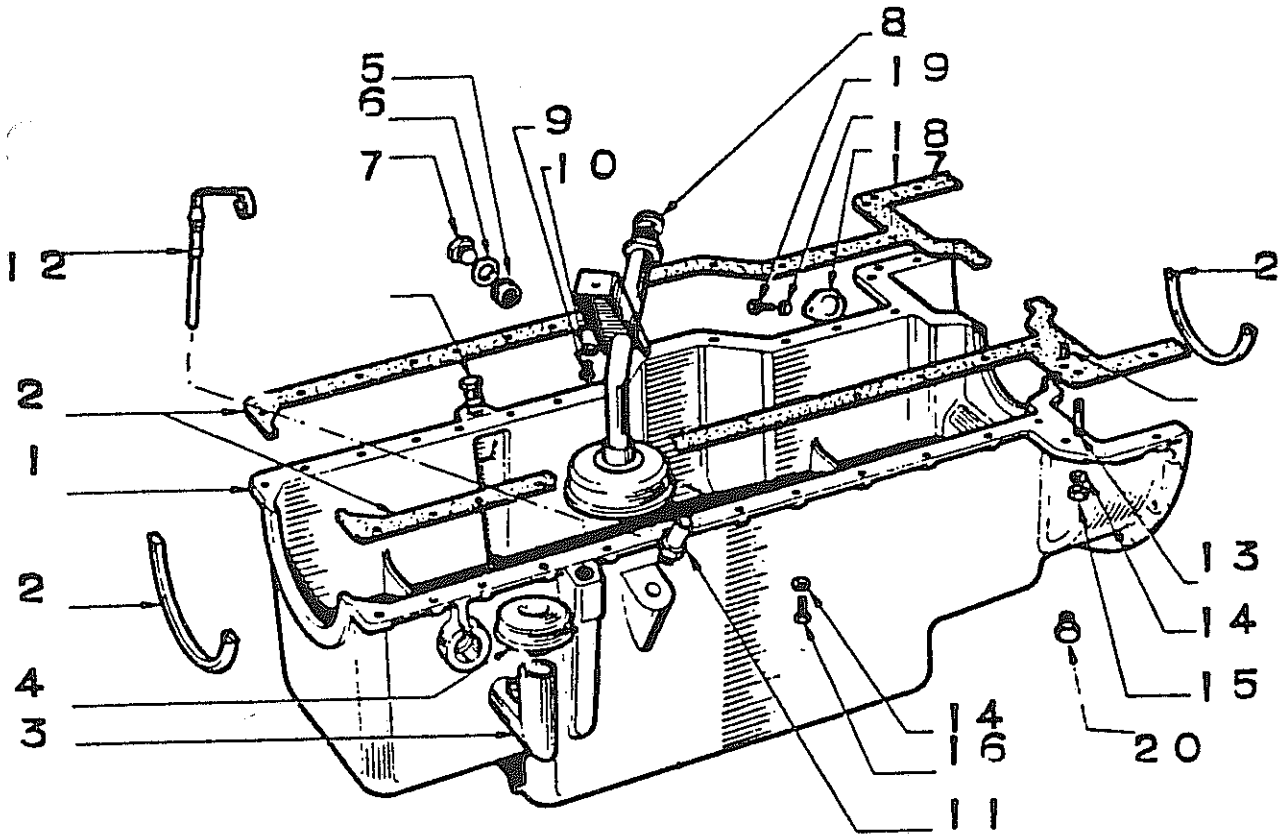



| KEY | QTY | PART NUMBER | DESCRIPTION | REMARKS |
|---|---|---|---|---|
| 8 | 1 | 1602162 | GASKET | SP225 ONL |
| 9 | 3 | 1589154 | BOLT | " |
| 10 | 3 | 1444685 | LOCKWASHER | " |
| 11 | 1 | 6103491 | TUBE ASSEMBLY | " |
| 12 | 1 | 6089943 | FLANGE | " |

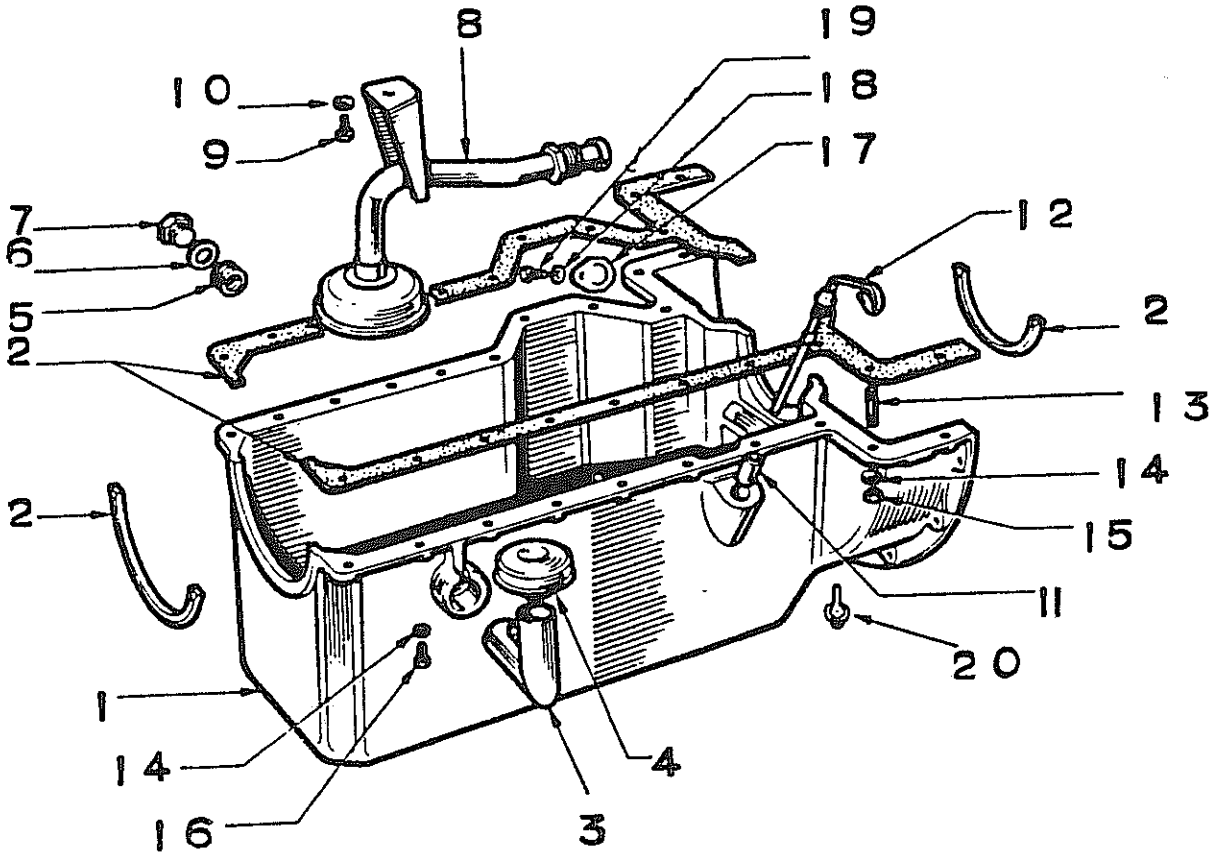
A-HOLBOURN EATON
B-WHITEHEAD MOTORIDES



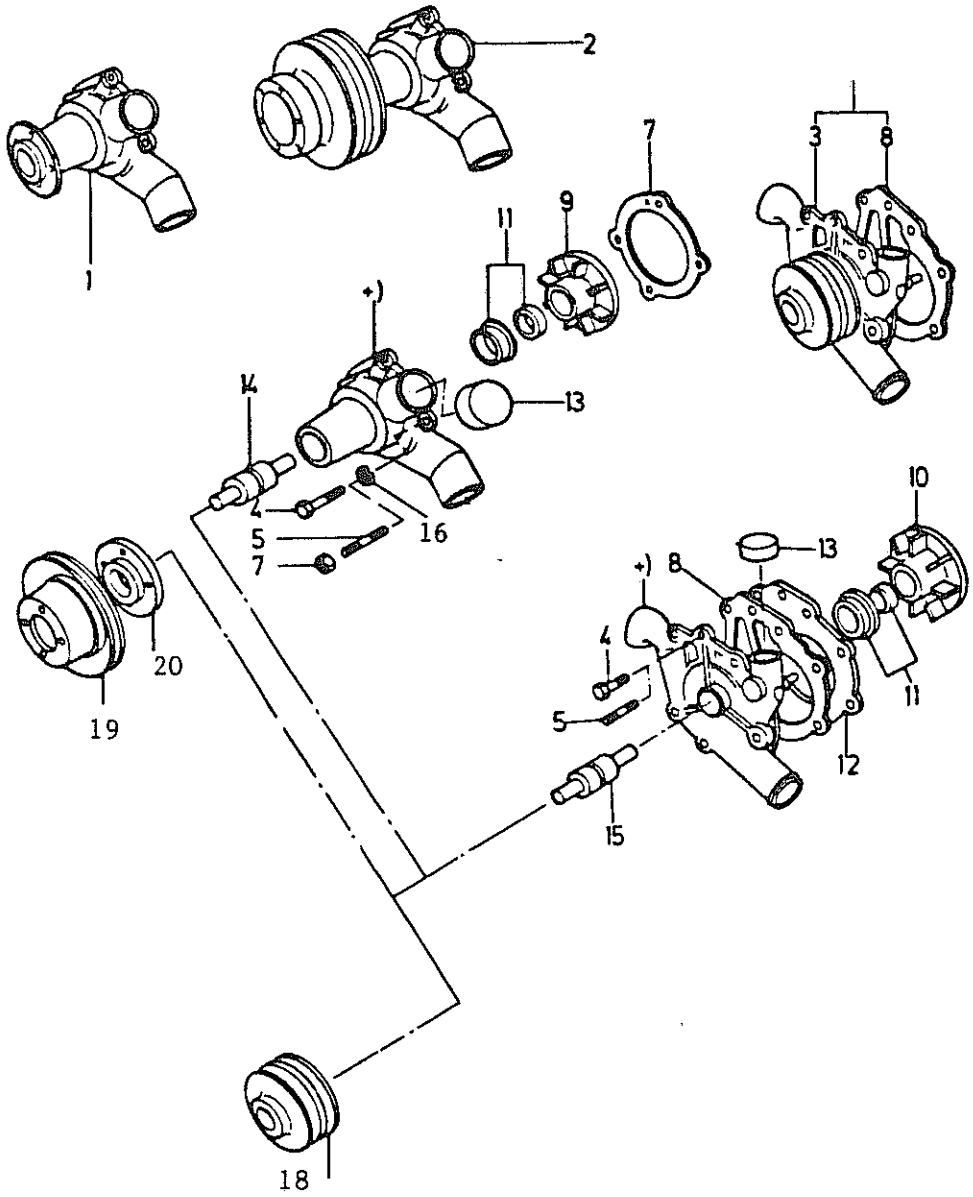

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 1 | P | 1 | 6104937 | ADAPTOR OIL FILTER | |
| 2 | P | 2 | 6103880 | CONNECTOR | |
| 3 | P | 1 | 6108606 | CONNECTOR | |
| 4 | P | 4 | 1502540 | BALL | |
| 5 | P | 1 | 6103879 | PLUG | |
| 6 | P | 1 | 6103620 | WASHER | |
| 7 | P | 1 | 6103880 | 90 ELBOW | |
| 8 | P | 3 | OE407.5 | BOLTS | |
| 9 | P | 1 | 1612468 | OIL FILTER | |



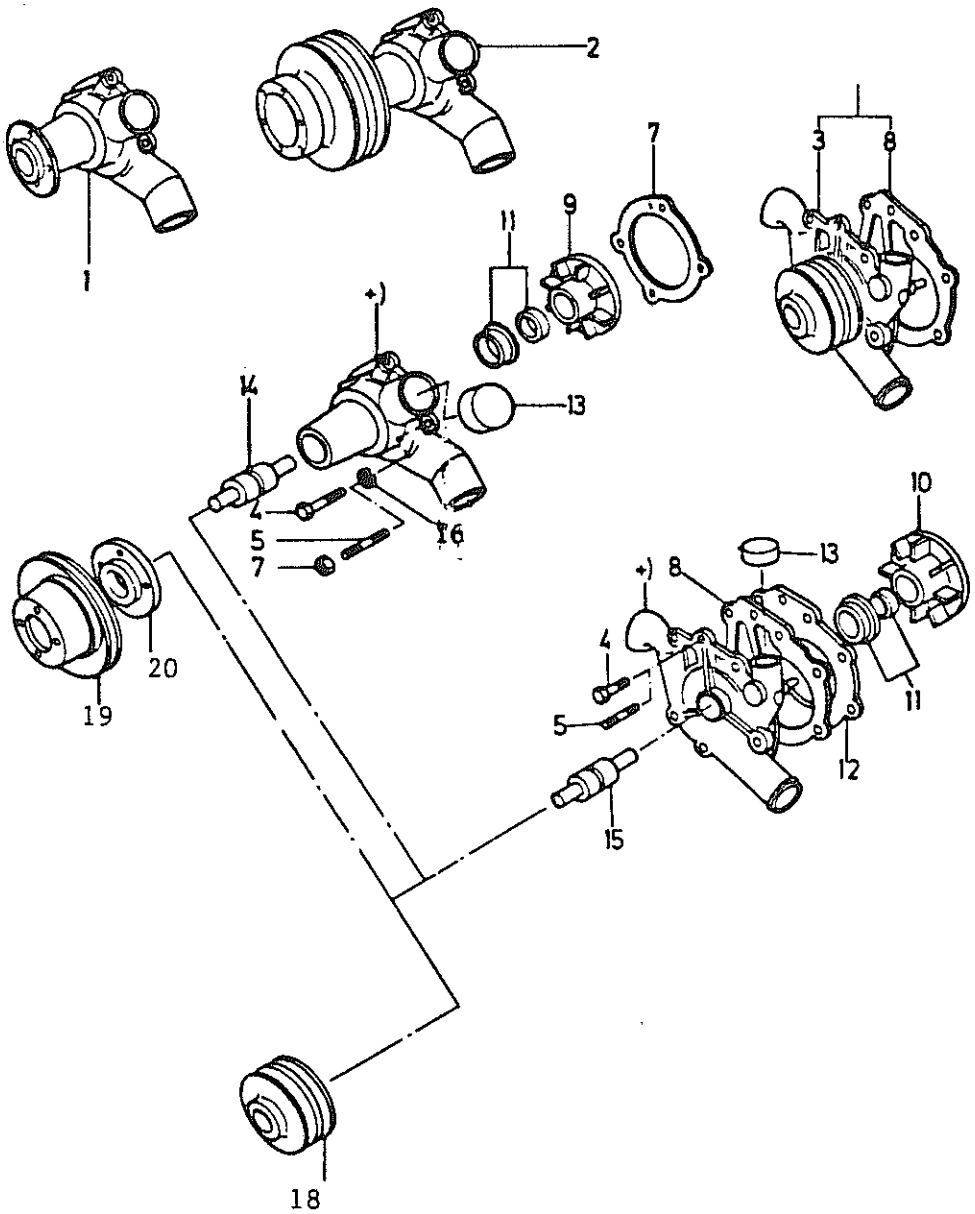

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 1 | N,R,O | 1 | 1403431 | OIL PAN | |
| | P | 1 | 6106334 | OIL PAN | |
| 2 | N,R,O | 1 | 6104238 | GASKET KIT OIL PAN | |
| | P | 1 | 6104237 | GASKET KIT OIL PAN | |
| 3 | ALL | 1 | 1411447 | TUBE | STD |
| | ALL | 1 | 1411448 | TUBE | O/S |
| 4 | ALL | 1 | 1608307 | CAP ASSEMBLY | |
| 5 | ALL | 1 | 1708048 | INSERT DRAIN PLUG | |
| 6 | ALL | 1 | 1710927 | WASHER | |
| 7 | ALL | 1 | 1595292 | PLUG OIL DRAIN | |
| 8 | N,R,O | 1 | 1508092 | OIL PUMP PICK UP TUBE & SCREEN | |
| | P | 1 | 6087682 | OIL PUMP PICK UP TUBE & SCREEN | |
| 9 | ALL | 1 | 1538040 | BOLT | |
| 10 | ALL | 1 | 1560616 | WASHER | |
| 11 | N,R | 1 | 1788795 | TUBE | |
| | O,P | 1 | 6097108 | TUBE | |
| 12 | N,R | 1 | 1403432 | DIP STICK | |
| | O,P | 1 | 6090988 | DIP STICK | |
| 13 | ALL | 4 | 1401461 | STUD | |
| 14 | ALL | A/R | 6113951 | WASHER LOCK | |
| 15 | ALL | 4 | 1575009 | NUT | |
| 16 | ALL | A/R | 1568479 | BOLT | |
| 17 | ALL | 1 | 1A239 | COVER APERTURE | |
| 17a | ALL | 1 | 1C28 | COVER APERTURE GASKET | |
| 18 | ALL | 1 | OC31 | LOCKWASHER | |
| 19 | ALL | 1 | OE201 | BOLT | |
| 20 | ALL | 1 | OE290 | PLUG ASSEMBLY | |



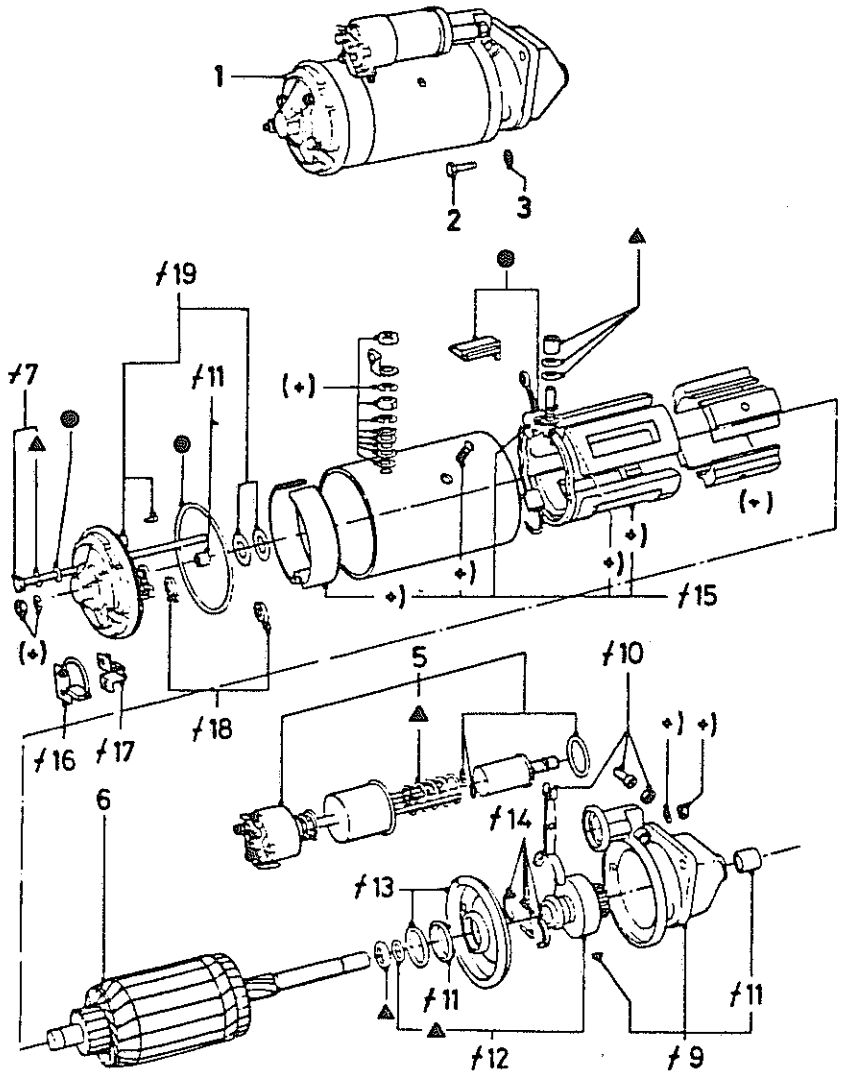

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARK |
|---|---|---|---|---|---|
| 1 | M,Q | 1 | 1509694 | OIL PAN | |
| 2 | M,Q | 1 | 6104236 | GASKET KIT OIL PAN | |
| 3 | ALL | 1 | 1411447 | TUBE | STD. |
| | ALL | 1 | 1411448 | TUBE | O/S |
| 4 | ALL | 1 | 1608307 | CAP ASSEMBLY | |
| 5 | ALL | 1 | 1708048 | INSERT DRAIN PLUG | |
| 6 | ALL | 1 | 1710927 | WASHER | |
| 7 | ALL | 1 | 1595292 | PLUG OIL DRAIN | |
| 8 | M,Q | 1 | 1508088 | OIL PUMP PICK UP TUBE & SCREEN | |
| 9 | ALL | 1 | 1538040 | BOLT | |
| 10 | ALL | 1 | 1560616 | WASHER | |
| 11 | M,Q | 1 | 1788795 | TUBE | |
| 12 | M,Q | 1 | 1791936 | DIP STICK | |
| 13 | ALL | 4 | 1401461 | STUD | |
| 14 | ALL | A/R | 6113951 | WASHER, LOCK | |
| 15 | ALL | 4 | 1575009 | NUT | |
| 16 | ALL | A/R | 1568479 | BOLT | |
| 17 | ALL | 1 | 1A239 | COVER APERTURE | |
| 17a | ALL | 1 | 1C28 | COVER APERTURE GASKET | |
| 18 | ALL | 1 | OC31 | LOCKWASHER | |
| 19 | ALL | 1 | OE201 | BOLT | |
| 20 | ALL | 1 | OE290 | PLUG ASSEMBLY | |



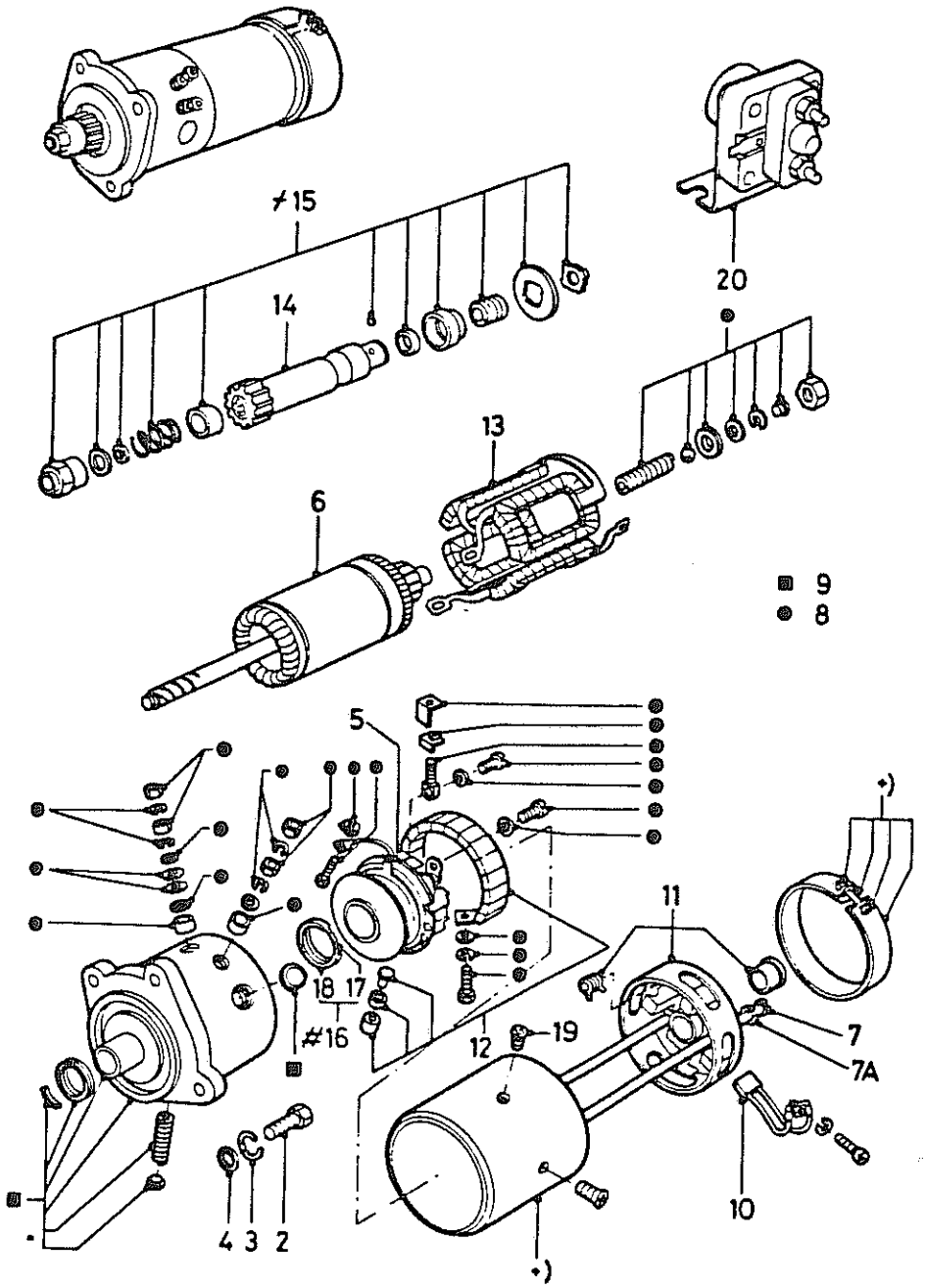

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | M-N-Q-R | 1 | 1602421 | WATER PUMP | |
| 2 | O | 1 | 1602418 | WATER PUMP | |
| 3 | P | 1 | 6089348 | WATER PUMP | |
| 4 | ALL | A/R | 1571467 | 5/16 / .75 BOLT | |
| | " | " | 1568491 | 5/16 /1.0 BOLT | |
| | " | " | 1568489 | 5/16 /1.0 BOLT | |
| | " | " | 1568489 | 5/16 / 1.25 BOLT | |
| | " | " | 1584477 | 5/16 / 1.75 BOLT | |
| | " | " | 1572232 | 5/16 / 2.25 BOLT | |
| | " | " | 1602361 | 5/16 / 3.50 BOLT | |
| | " | " | 1405658 | 5/16 / 4.00 BOLT | |
| 5 | ALL | 2 | 6102971 | 5/16 /1.77" STUD | |
| | | A/R | 6086189 | 5/16 /2.79" STUD | |
| | | 1 | 6102970 | 5/16 /2.83" STUD | |
| 6 | ALL | A/R | 1575209 | NUT | |
| 7 | M-N-O-Q-R | 1 | 6091842 | GASKET WATER | |
| 8 | P | 1 | 6094370 | GASKET WATER | |



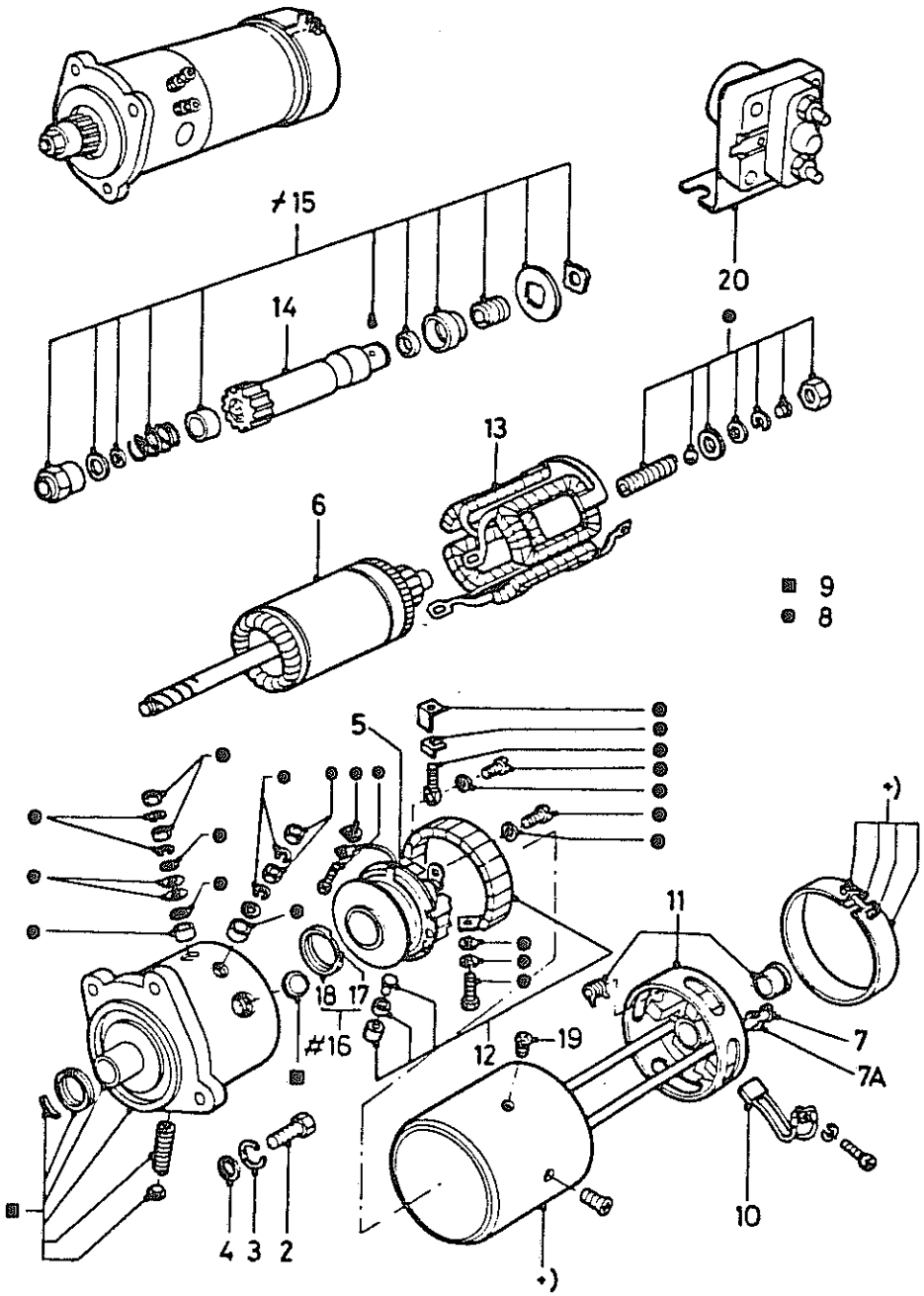

| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 9 | N-N-O-Q-R | 1 | 1602430 | IMPELLER | |
| 10 | P | 1 | 6077199 | IMPELLER | |
| 11 | ALL | 1 | 6086162 | SEAL | |
| 12 | P | 1 | 6077206 | BACK PLATE | |
| 13 | ALL | 1 | 6084165 | CAP | |
| 14 | M-M-O-Q-R | 1 | 1602434 | BEARING & SHAFT | |
| 15 | P | 1 | 6077200 | BEARING & SHAFT | |
| 16 | ALL | A/R | OC31 | LOCK WASHER | |
| 18 | O-P | 1 | 6089351 | DUAL SHEAVE PULLEY | |
| 19 | M-N | 1 | 1422360 | PULLEY | |
| 20 | M-N | 1 | 1602440 | HUB | |




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION |
|---|---|---|---|---|
| 1 | M,Q,N,R,O | 1 | 6099841 | STARTER MOTOR |
| 2 | M,Q,N,R,O | 3 | 1605123 | BOLT |
| 3 | M,Q,N,R,O | 3 | 1451781 | FLAT WASHER |
| 5 | M,Q,N,R,O | 1 | 1527447 | SOLENOID ASSEMBLY |
| 6 | M,Q,N,R,O | 1 | 1470620 | ARMATURE ASSEMBLY |
| 7 | M,Q,N,R,O | 1 | 6104802 | BOLT |
| 8 | M,Q,N,R,O | 1 | 1517314 | HARDWARE (KIT) |
| 9 | M,Q,N,R,O | 1 | 1596362 | DRIVE HOUSING (KIT) |
| 10 | M,Q,N,R,O | 1 | 1517316 | SOLENOID LINK (KIT) |
| 11 | M,Q,N,R,O | 1 | 1517315 | BRUSHES (KIT) |
| 12 | M,Q,N,R,O | 1 | 1527241 | DRIVE PINION (KIT) |
| 13 | M,Q,N,R,O | 1 | 1596361 | INTERMEDIATE BRACKET (KIT) |
| 14 | M,Q,N,R,O | 1 | 1522092 | BRAKE SHOES & SPRINGS (KIT) |
| 15 | M,Q,N,R,O | 1 | 1517313 | FIELD COIL (KIT) |
| 16 | M,Q,N,R,O | 1 | 1527442 | BRUSHES (KIT) |
| 17 | M,Q,N,R,O | 1 | 1517321 | BRUSH SUPPORTS (KIT) |
| 18 | M,Q,N,R,O | 1 | 1522094 | BRUSH SPRINGS (KIT) |
| 19 | M,Q,N,R,O | 1 | 1527444 | BRUSH END COVER (KIT) |
| 20 | M,Q,N,R,O | 1 | 1517318 | MOTOR SEALING (KIT) |




| KEY | ENGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 1 | P | 1 | 1590423 | STARTER MOTOR | 12V |
| | " | 1 | 1590422 | " " | 24V |
| 2 | " | 3 | 1605123 | BOLT | |
| 3 | " | 3 | 1575329 | LOCK WASHER | |
| 4 | " | 3 | 1451781 | FLAT WASHER | |
| 5 | " | 1 | 6104889 | SOLENOID | 12V |
| | " | 1 | 6104813 | " | 24V |
| 6 | " | 1 | 6104881 | ARMATRUE ASSEMBLY | 12V |
| | " | 1 | 6104797 | " " | 24V |
| 7 | " | 2 | 6117388 | BOLT | |
| 7A | " | 2 | 1444686 | LOCK WASHER | |
| 8 | " | 1 | 6104291 | HARDWARE (KIT) | |
| 9 | " | 1 | 6104887 | DRIVE END (KIT) | 12V |
| | " | 1 | 6104886 | " " " | 24V |




| KEY | ENIGINE | QTY | PART NO. | DESCRIPTION | REMARKS |
|---|---|---|---|---|---|
| 10 | P | 1 | 1523043 | BRUSHES (KIT) | 12V |
| | " | 1 | 1602404 | " " | 24V |
| 11 | " | 1 | 6104882 | COVER ASSEMBLY | 12V |
| | " | 1 | 6104799 | " " | 24V |
| 12 | " | 1 | 6104884 | RESISTOR ASSEMBLY | 12V |
| | " | 1 | 6104883 | " " | 24V |
| 13 | " | 1 | 6104885 | FIELD COIL (KIT) | 12V |
| | " | 1 | 6104804 | " " " | 24V |
| 14 | " | 1 | 6104888 | PINION ASSEMBLY | 12V |
| | " | 1 | 6104810 | " " | 24V |
| 15 | " | 1 | 6104290 | " " (KIT) | |
| 16 | " | 1 | 1523046 | SEGMENTS & SPRINGS (KIT) | |
| 17 | " | 1 | 1436394 | SPRING | |
| 18 | " | 4 | 1436382 | SEGMENTS | |
| 19 | " | | +) | (WITH# 13) | |
| 20 | " | 1 | 6017846 | RELAY ASSEMBLY | |

# SECTION C

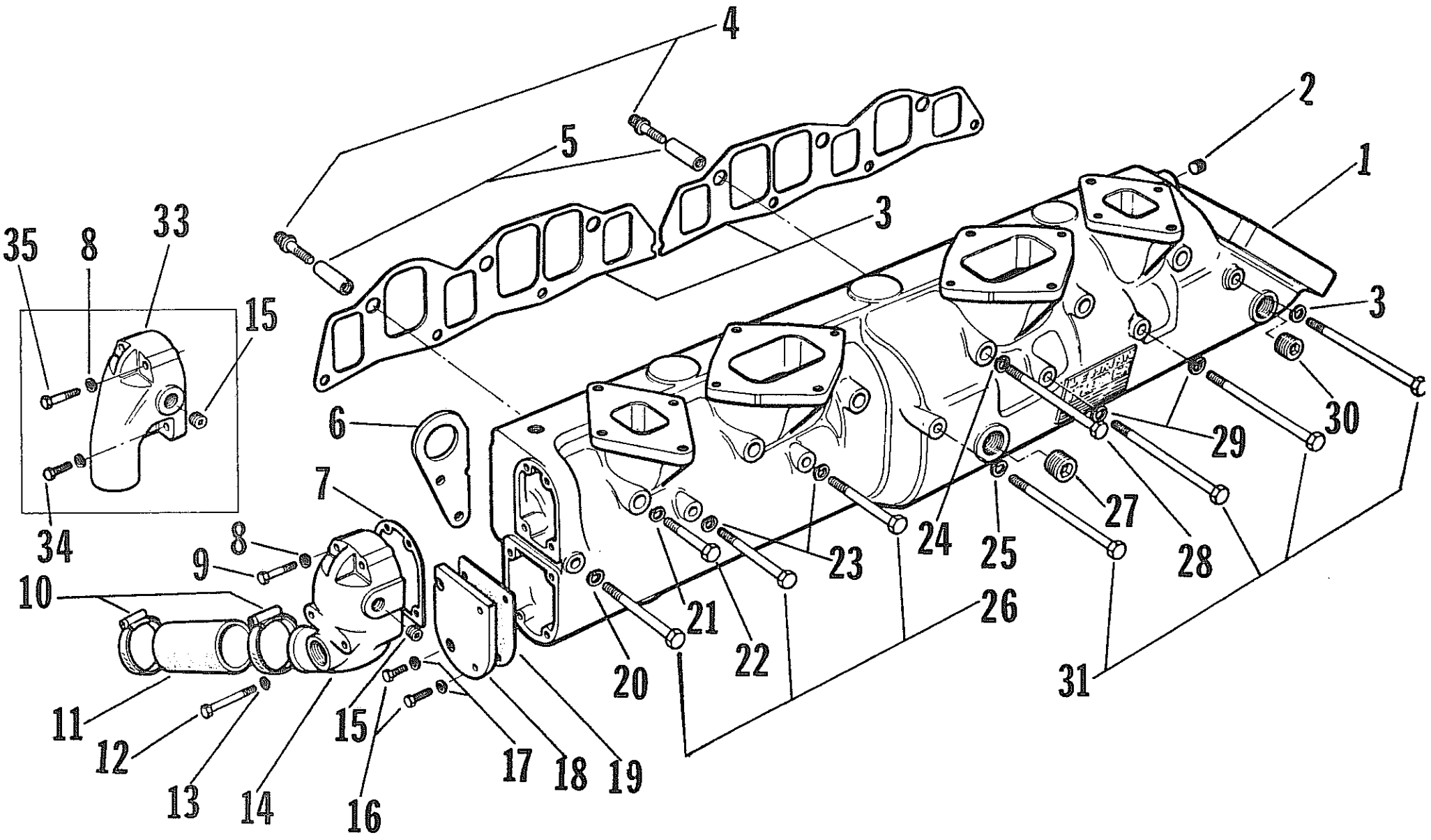
# INDEX TO LEHMAN MARINE EQUIPMENT

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 |
|---|---|---|---|---|
| M-Super | 90 | 254 | 4 | 6/82- |
| N-Super | 135 | 380 | 6 | 6/82- |
| O-Super | 160 | 363 | 6 | 6/82- |
| P-Super | 225 | 363 | 6 | 6/82- |
| Q-STD | 80 | 254 | 4 | 6/82- |
| R-STD | 120 | 380 | 6 | 6/82- |



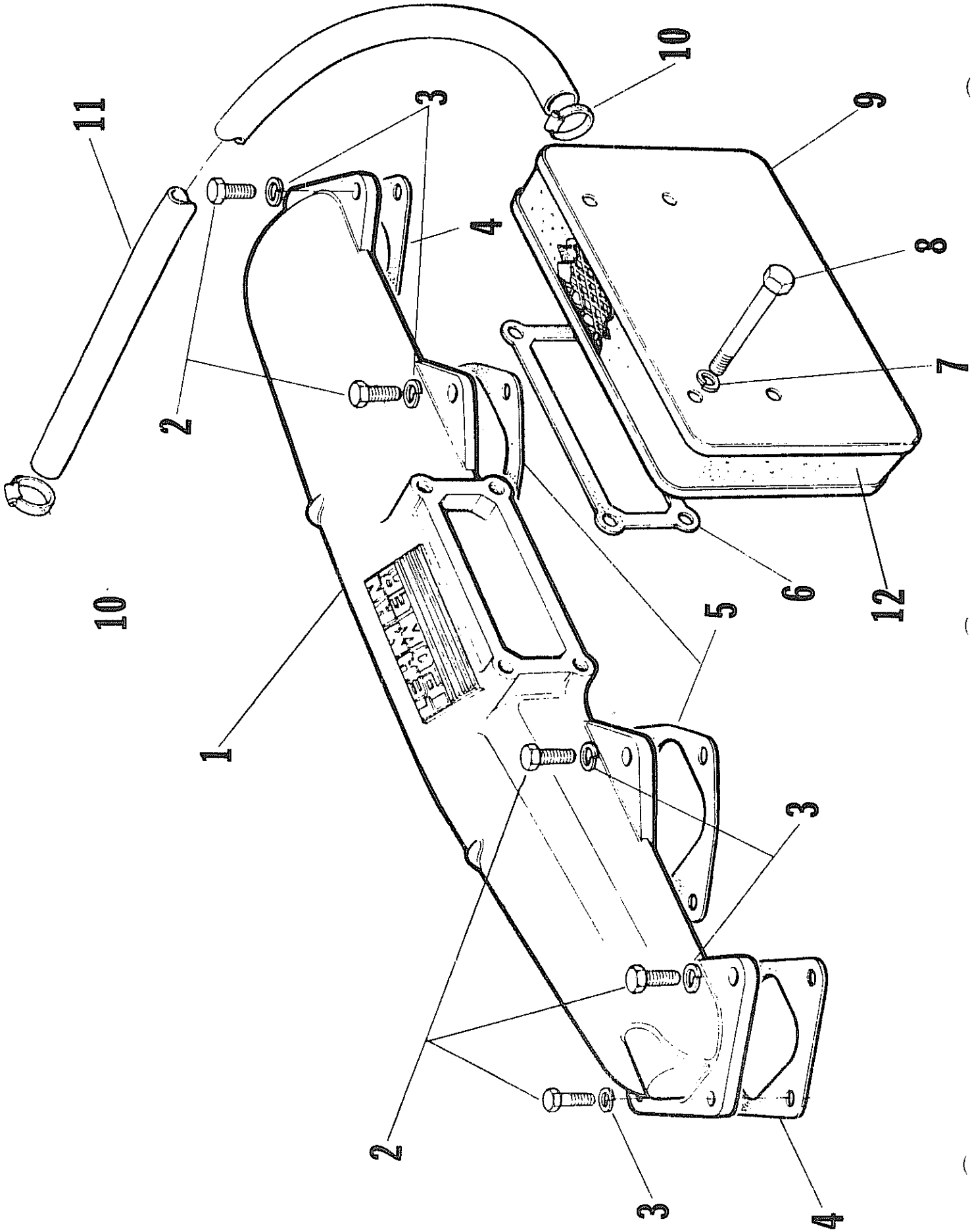
By reference to the drawing on the applicable page, select the required part and note the "key" number assigned to it. The key number will be repeated in the listing of parts following the drawing. The second column indicates the engine to which the part applies per the engine code letters shown above.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


4
5
3
2
1
35
8
33
15
6
7
34
9
10
11
12
13
14
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

# 6 CYLINDER MANIFOLD

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 1A389 | MANIFOLD BODY |
| 2 | 1 | 3L14 | PLUG 1/4 NPT |
| 3 | 2 | 2D34 | MANIFOLD GASKET |
| 4 | 6 | 6087437 | MANIFOLD STUD |
| 5 | 6 | 1B59 | BUSHING |
| 6 | 1 | 1D55 | LIFTING EYE |
| 7 | 1 | 1C42 | GASKET, WATER OUTLET |
| 8 | 2 | OC21 | WASHER |
| 9 | 2 | OE107 | BOLT |
| 10 | 2 | 3K4 | CLAMP |
| 11 | 1 | 3K2133 | HOSE |
| 12 | 2 | OE111 | BOLT |
| 13 | 2 | OC21 | WASHER |
| 14 | 1 | 1A396 | WATER OUTLET ADAPTOI |
| 15 | 1 | 3L14 | PLUG |
| 16 | 4 | OE102 | BOLT |
| 17 | 4 | OC21 | WASHER |
| 18 | 1 | 1D52 | BLANKING PLATE |
| 19 | 1 | 1C38 | GASKET |
| 20 | 1 | OC41 | WASHER |
| 21 | 1 | OC41 | WASHER |
| 22 | 3 | OE306.5 | BOLT |
| 23 | 2 | OC41 | WASHER |
| 24 | 1 | OC41 | WASHER |
| 25 | 1 | OC41 | WASHER |
| 26 | 3 | OE309 | BOLT |
| 27 | 1 | 3L40 | PLUG |
| 28 | 3 | OE309 | BOLT |
| 29 | 2 | OC41 | WASHER |
| 30 | 1 | 3L40 | PLUG |
| 31 | 4 | OE317 | BOLT |
| 32 | 1 | OC41 | WASHER |
| 33 | 1 | 1A411 | WATER OUTLET FOR TURBO |
| 34 | 2 | OE104 | SET SCREW |
| 35 | 2 | OE107 | BOLT |

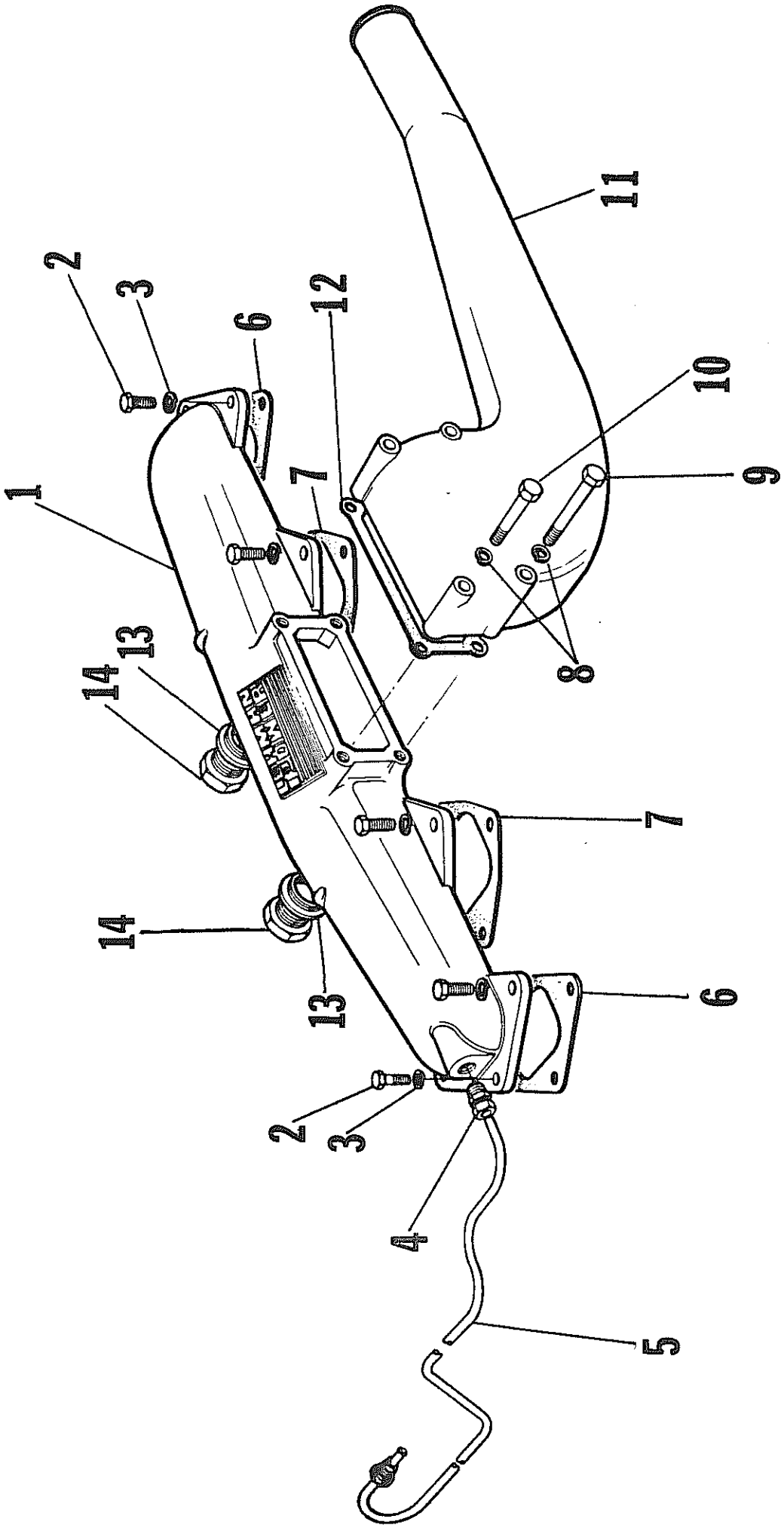
C4



## PLENUM CHAMBER/AIR FILTER ASSEMBLY
## SD120/SP135

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 1A403 | PLENUM CHAMBER |
| 2 | | 0E201 | BOLT |
| 3 | | 0C31 | WASHER |
| 4 | 2 | 1C39 | GASKET |
| 5 | 2 | 1C401C44 | GASKET |
| 6 | 1 | 0C31 | GASKET |
| 7 | 4 | 0E206 | WASHER |
| 8 | 4 | 2H75 | BOLT |
| 9 | 1 | 2H75 | AIR CLEANER, CHROMED |
| | 1 | 2H76 | AIR CLEANER |
| 10 | 2 | 3K10 | CLAMP |
| 11 | 1 | 3K204A13 | HOSE 13" |
| 12 | 1 | 1E7 | FOAM ELEMENT |

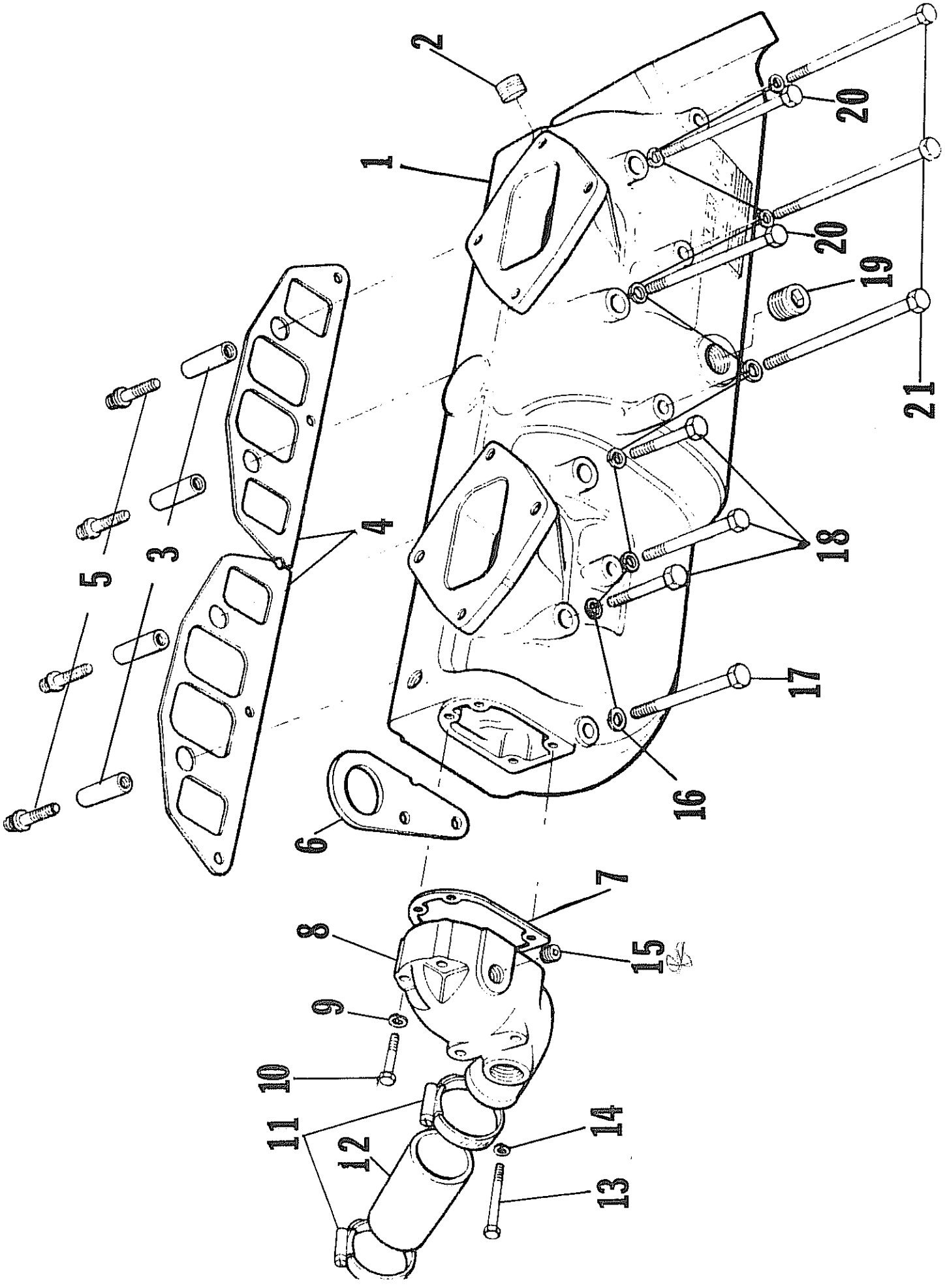
C6



## PLENUM CHAMBER

## SP160

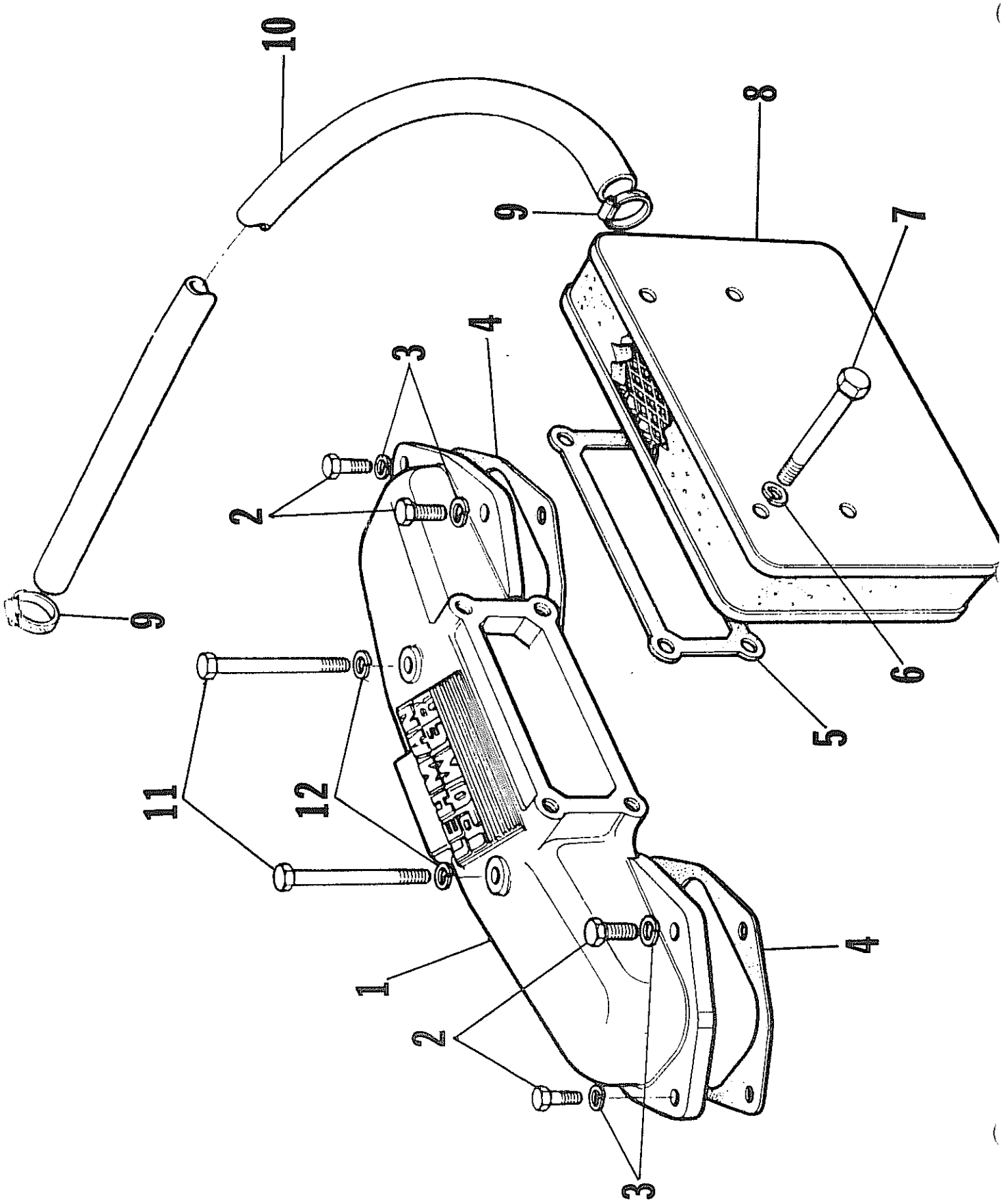
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 1A409 | PLENUM CHAMBER |
| 2 | 9 | OE201 | BOLT |
| 3 | 9 | OC31 | LOCK WASHER |
| 4 | 1 | 3E860 | FERRULE |
| 5 | 1 | 3E916 | TUBE |
| 6 | 2 | 1C39 | GASKET |
| 7 | 2 | 1C40 | GASKET |
| 8 | 4 | OC31 | LOCK WASHER |
| 9 | 2 | OE207 | BOLT |
| 10 | 2 | OE206 | BOLT |
| 11 | 1 | 1A414 | AIR INTAKE |
| 12 | 1 | 1C44 | GASKET |
| 13 | 2 | FP1486719 | WASHER |
| 14 | 2 | FP1472481 | PLUG |


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
20
21

## 4 CYLINDER MANIFOLD

### SD80/SP90

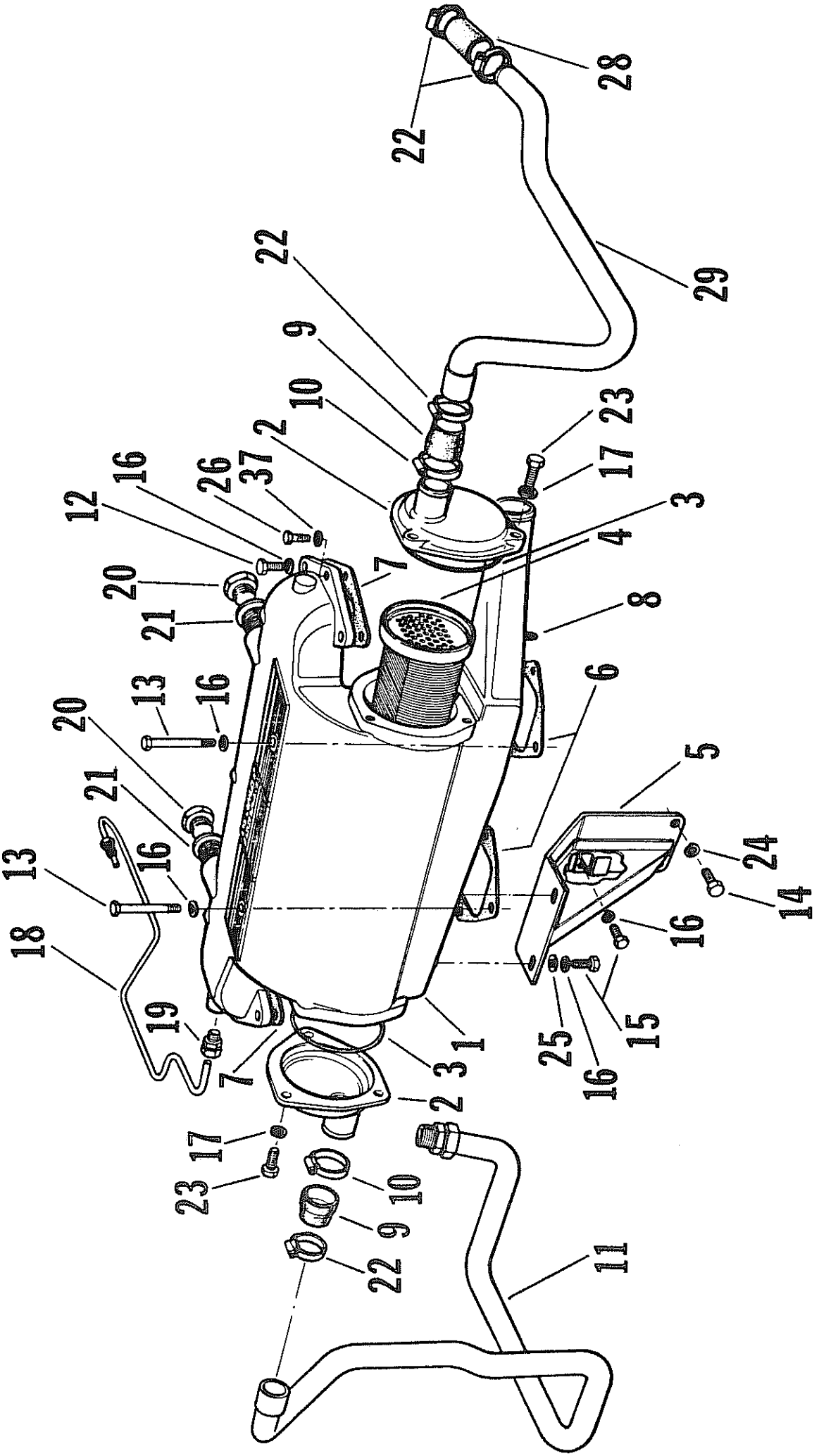
| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | MANIFOLD BODY | 1A390 |
| 2 | 1 | PLUG | 3L40 |
| 3 | 4 | BUSHING | 1B59 |
| 4 | 2 | GASKET, MANIFOLD | 2D35 |
| 5 | 4 | STUDS, MANIFOLD | 6087437 |
| 6 | 1 | LIFTING EYE | 1D55 |
| 7 | 1 | GASKET, WATER OUTLET | 1C42 |
| 8 | 1 | WATER OUTLET ADAPTOR MACHINED | 1A396 |
| 9 | 2 | WASHER | OC21 |
| 10 | 2 | BOLT | OE107 |
| 11 | 2 | CLAMP | 3K4 |
| 12 | 1 | HOSE | 3K2133 |
| 13 | 2 | BOLT | OE111 |
| 14 | 2 | WASHER | OC21 |
| 15 | 1 | PLUG | 3L14 |
| 16 | 9 | WASHER | OC41 |
| 17 | 1 | BOLT | OE309 |
| 18 | 3 | BOLT | OE306.5 |
| 19 | 1 | PLUG | 3L40 |
| 20 | 2 | BOLT | OE309 |
| 21 | 3 | BOLT | OE317 |


10
8
9
7
4
3
2
9
6
5
11
12
1
4
2
3

## PLENUM CHAMBER / AIR FILTER ASSEMBLY

### SD80/SP90

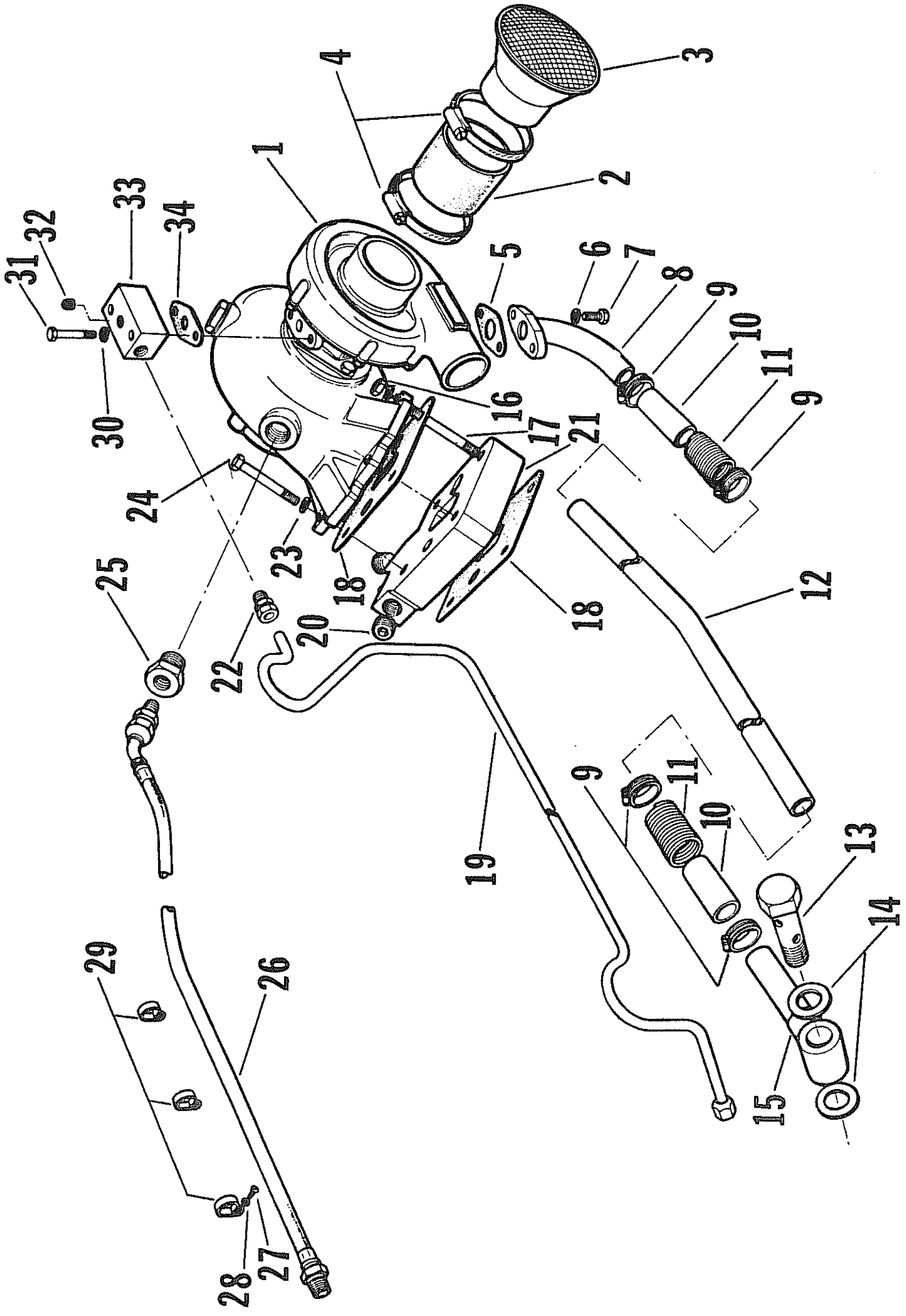
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 1A405 | PLENUM CHAMBER |
| 2 | 6 | OE201 | BOLT |
| 3 | 6 | OC21 | WASHER |
| 4 | 2 | 1C45 | GASKET |
| 5 | 1 | 1C44 | GASKET |
| 6 | 4 | OC21 | WASHER |
| 7 | 4 | OE206 | BOLT |
| 8 | 1 | 2H75 | AIR CLEANER, CHROMED |
| | 1 | 2H76 | AIR CLEANER |
| 9 | 1 | 3K10 | CLAMP |
| 10 | 1 | 3K204A13 | HOSE 13# |
| | 1 | 3K10 | CLAMP |
| 11 | 2 | OE113 | BOLT |
| 12 | 2 | OC21 | WASHER |


22
28
29
22
9
10
2
23
17
16
26
37
12
3
4
7
20
8
21
13
16
6
20
5
21
13
16
24
14
18
16
19
7
3
1
25
16
15
2
17
23
10
9
22
11

# INTERCOOLER ASSEMBLY

## SP225

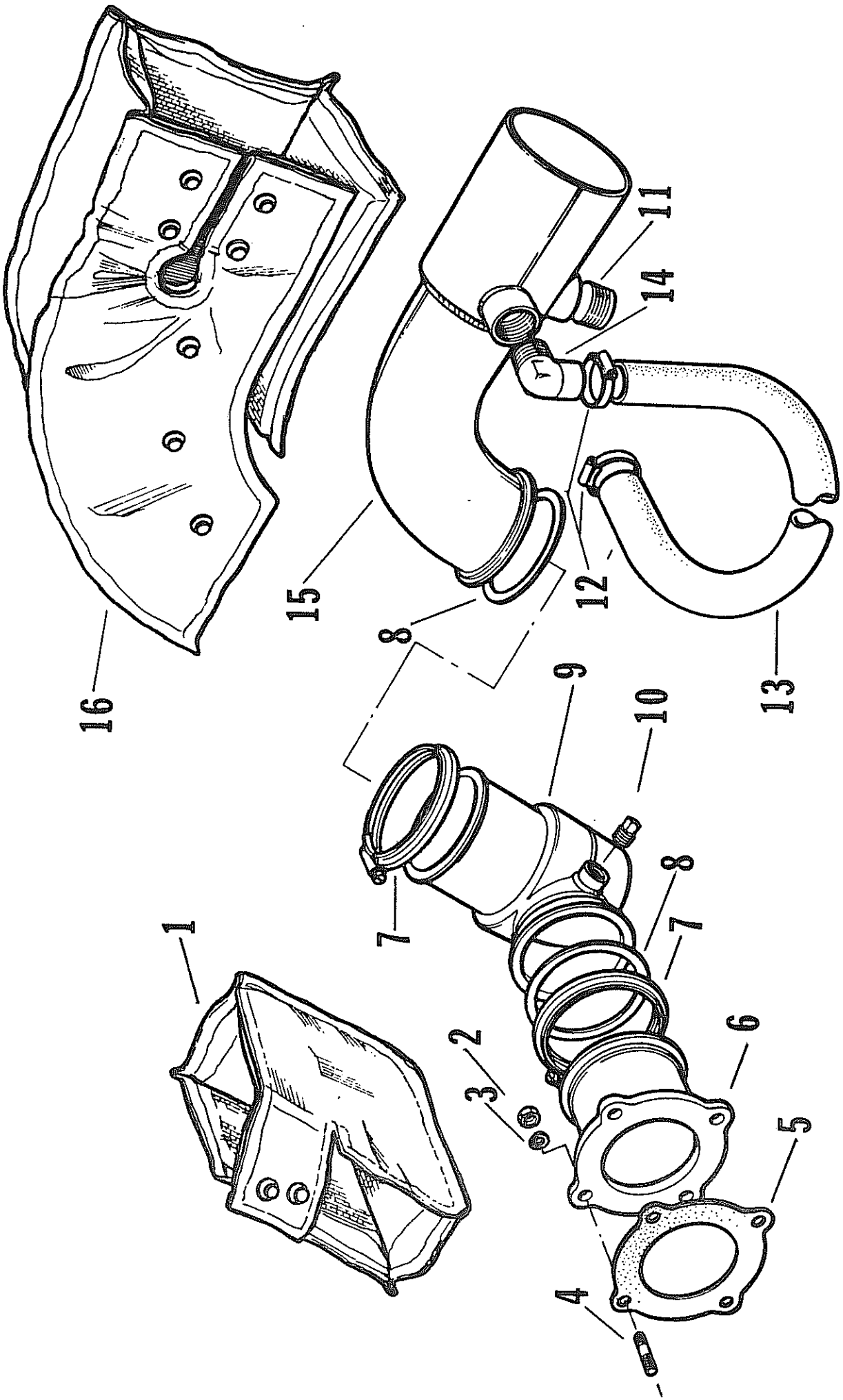
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2J30 | INTERCOOLER BODY |
| 2 | 2 | 2J31 | END CAP |
| 3 | 2 | 2J6 | "O" RING |
| 4 | 1 | 2J40 | INTERCOOLER CORE |
| 5 | 1 | 2J41 | SUPPORT |
| 6 | 2 | 1C39 | GASKET |
| 7 | 2 | 1C40 | GASKET |
| 8 | 1 | 3L1 | PLUG |
| 9 | 2 | 3K510 | HOSE REDUCING |
| 10 | 2 | 3K3B | HOSE CLIP |
| 11 | 1 | 1D62 | PIPE |
| 12 | 6 | OE202C | BOLT |
| 13 | 2 | OE208 | BOLT |
| 14 | 2 | OE401 | BOLT |
| 15 | 3 | OE201C | BOLT |
| 16 | 11 | OC31 | LOCK WASHER |
| 17 | 6 | OC41 | LOCK WASHER |
| 18 | 1 | 1D64 | PIPE ASSEMBLY |
| 19 | 1 | 3L45 | ADAPTOR |
| 20 | 2 | 3L50 | PLUG |
| 21 | 2 | 3E40 | ADAPTOR |
| 22 | 4 | 3K3 | HOSE CLIP |
| 23 | 6 | OE302 | SET SCREW |
| 24 | 2 | OC51 | LOCK WASHER |
| 25 | 2 | OC30 | WASHER |
| 26 | 2 | OE104 | SET SCREW |
| 27 | 2 | OC21 | LOCK WASHER |
| 28 | 10 | 3K220 | HOSE |
| 29 | 1 | 1D66 | PIPE |


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34

# TURBO CHARGER ASSEMBLY

## SP160/SP225 ENGINE

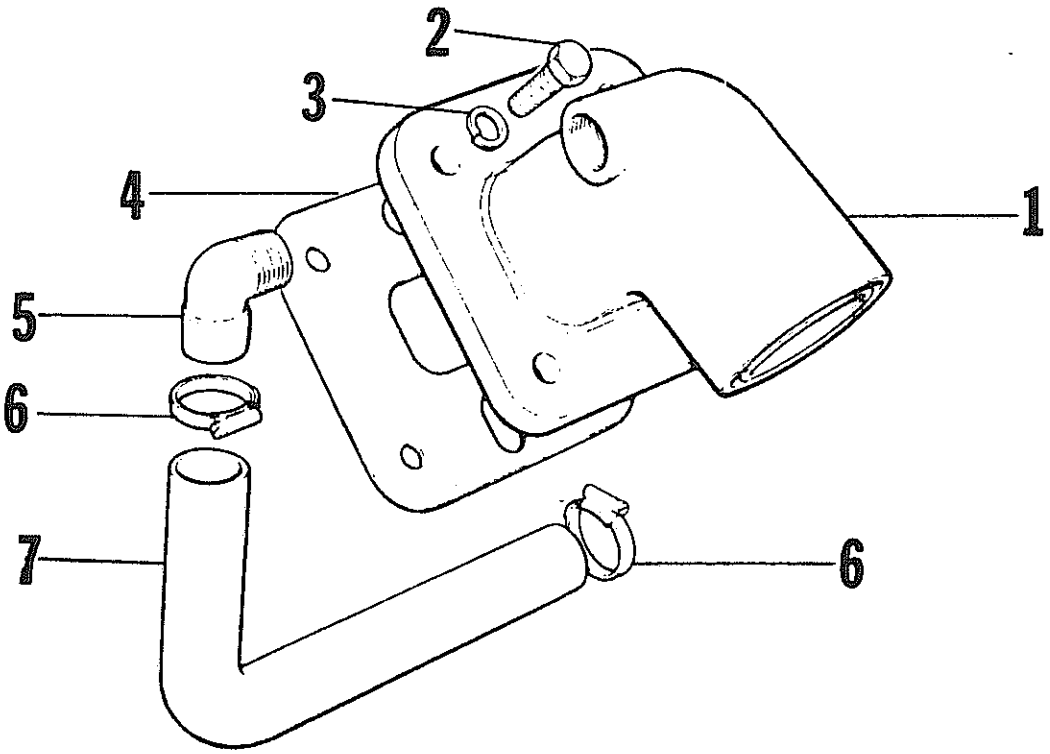
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2J45 | TURBO CHARGER HOLSET |
| 2 | 1 | 1456626 | HOSE |
| 3 | 1 | 1456620 | AIR CLEANER |
| 4 | 2 | 5001144 | CLAMP |
| 5 | 1 | 1C52 | OIL RETURN GASKET |
| 6 | 4 | 0GC32 | WASHER |
| 7 | 2 | 0GE201C | SET SCREW |
| 8 | 1 | 3E901 | OIL RETURN ELBOW |
| 9 | 4 | 6065049 | CLAMP |
| 10 | 2 | 6065027 | HOSE |
| 11 | 2 | 6065031 | SLEEVE |
| 12 | 1 | 6087966 | TUBE |
| 13 | 1 | 6097079 | BANJO BOLT |
| 14 | 2 | 1515382 | WASHER |
| 15 | 1 | 6087961 | CONNECTOR OIL DRAIN |
| 16 | 2 | 0B45 | NUT |
| 17 | 2 | 0D61 | STUD |
| 18 | 2 | 1C43 | GASKET |
| 19 | 1 | 3E903 | OIL FEED PIPE |
| 20 | 2 | 3E905 | PLUG |
| 21 | 1 | 3E910 | ADAPTOR BLOCK |
| 22 | 1 | 3E230 | ADAPTOR |
| 23 | 4 | 0C51 | WASHER |
| 24 | 2 | 0E408 | BOLT |
| 25 | 1 | 3E915 | PLUG |
| 26 | 1 | 3K790 | VENT HOSE |
| 27 | 2 | 0A3 | SCREW |
| 28 | 2 | 0C5 | LOCK WASHER |
| 29 | 2 | 2M6 | CLIP |
| 30 | 4 | 0GC32 | WASHER |
| 31 | 2 | 0GE207 | BOLT |
| 32 | 1 | 3L1 | PLUG |
| 33 | 1 | 3E912 | OIL FEED BLOCK |
| 34 | 1 | 1L53 | OIL FEED GASKET |
| 35 | 2 | 6065050 | CLIP |
| 36 | 1 | 2M9A | PIPE SUPPORT (NOT SHOWN ON DWG.) (FOR 19) |
| 37 | 1 | 0B1 | NUT ) GOES WITH 36 |
| 38 | 1 | 0C41 | SPRING WASHER ) |
| 39 | 7 | 3K215 | HOSE (GOES WITH 35 TURBO TO INJ. PIPE) |


16
15
8
12
14
11
13
9
10
7
8
7
1
2
3
6
6
5
4

## TURBO EXHAUST ASSEMBLY

### SP160/SP225 ENGINE

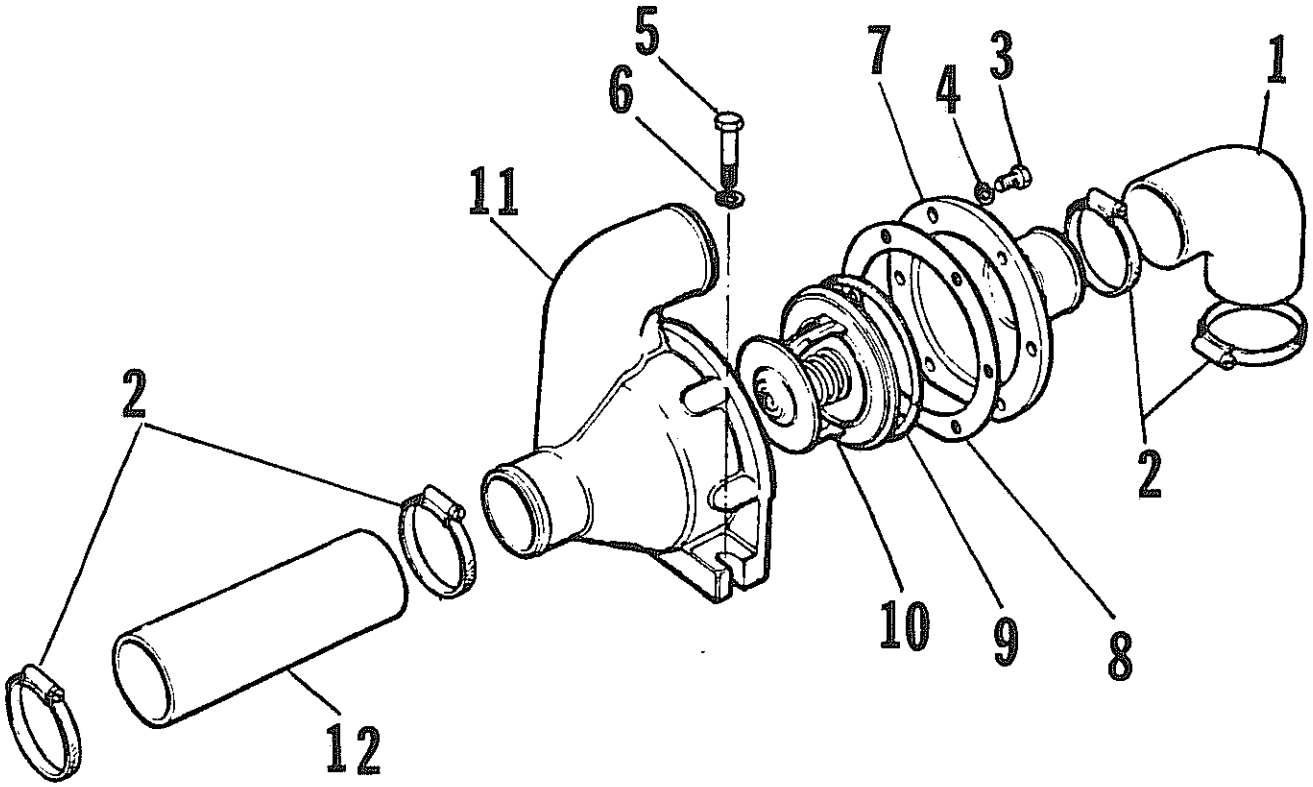
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2J15 | HEAT SHIELD |
| 2 | 1 | 0GB28 | NUT |
| 3 | 1 | 0GC31 | LOCK WASHER |
| 4 | 1 | 1500785 | STUD |
| 5 | 1 | 2J23 | GASKET |
| 6 | 1 | 2J20 | ADAPTOR |
| 7 | 2 | 2J21 | CLAMP |
| 8 | 2 | 2J22 | STEEL GASKET |
| 9 | 1 | 2J19 | RISER |
| 10 | 1 | 3L2 | PLUG 1/8" |
| 11 | 1 | 3L52 | PLUG |
| 12 | 1 | 3K3 | CLAMP |
| 13 | 1 | EW6424 24" | HOSE |
| 14 | 1 | 3E859 | ELBOW |
| 15 | 1 | 2J18 | EJECTION ELBOW |
| 16 | 1 | 2J17 | HEAT SHIELD |




EXHAUST ASSEMBLY

SD80 / SP90 / SD120 / SP135

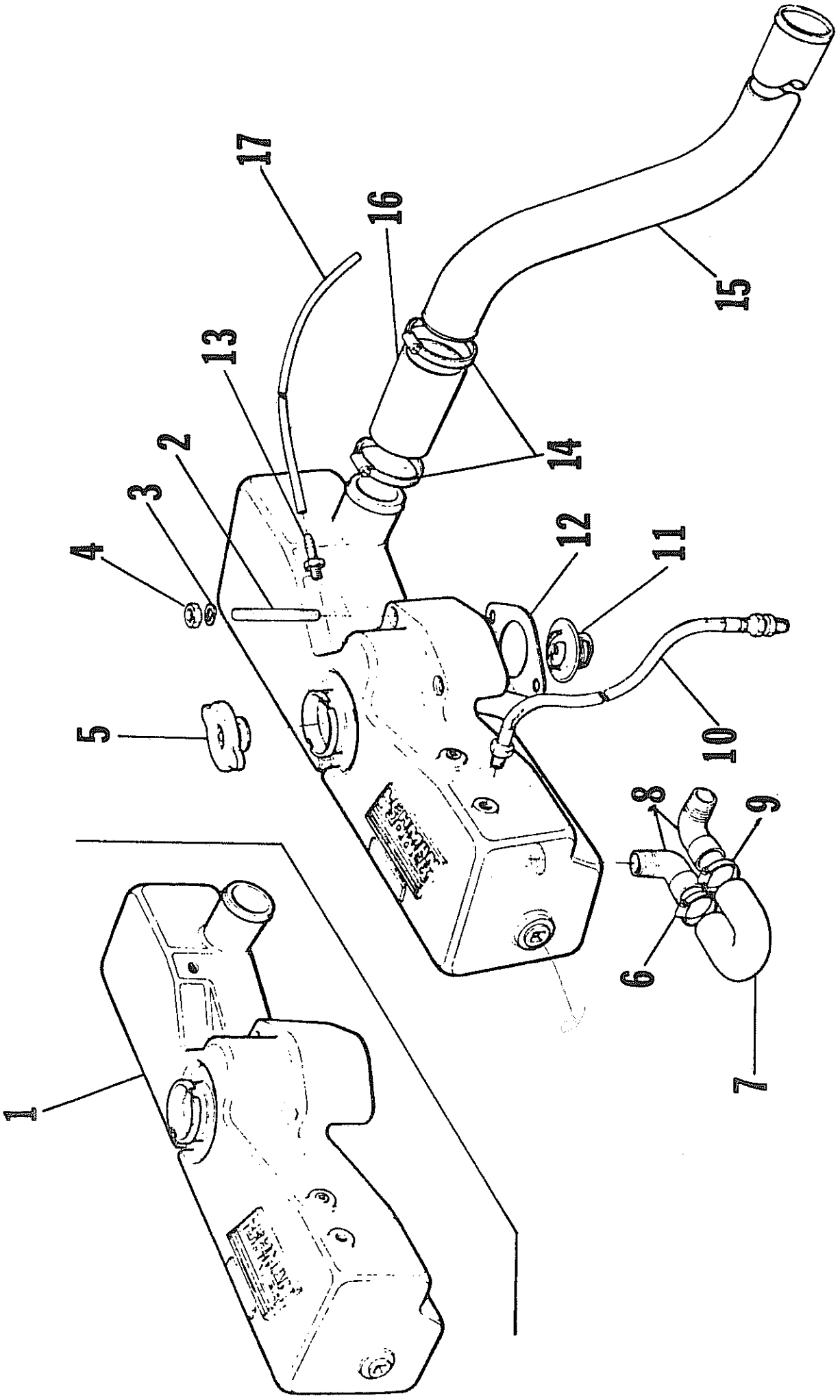
| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | EXHAUST OUTLET | 1A397 |
| 2 | 4 | BOLT | OE403 |
| 3 | 4 | LOCK WASHER | OC51 |
| 4 | 1 | GASKET | 1C43 |
| 5 | 1 | ELBOW | 3E856 |
| 6 | 2 | CLAMP | 3K2 |
| 7 | 1 | HOSE | 3K351 |




THERMOSTAT ASSEMBLY

SP160/SP225

| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | HOSE | 3K503 |
| 2 | 4 | CLAMP | 3K4 |
| 3 | 6 | BOLT | OE101 |
| 4 | 6 | LOCK WASHER | OC21 |
| 5 | 2 | BOLT | OE202 |
| 6 | 2 | LOCK WASHER | OC21 |
| 7 | 1 | THERMOSTAT COVER | 1A409 |
| 8 | 1 | GASKET | 1C47 |
| 9 | 1 | RUBBER SEAL | 1C46 |
| 10 | 1 | THERMOSTAT, SP160/225 | 2C250 |
| 11 | 1 | THERMOSTAT HOUSING | 1A410 |
| 12 | 1 | HOSE | 3K2133 |

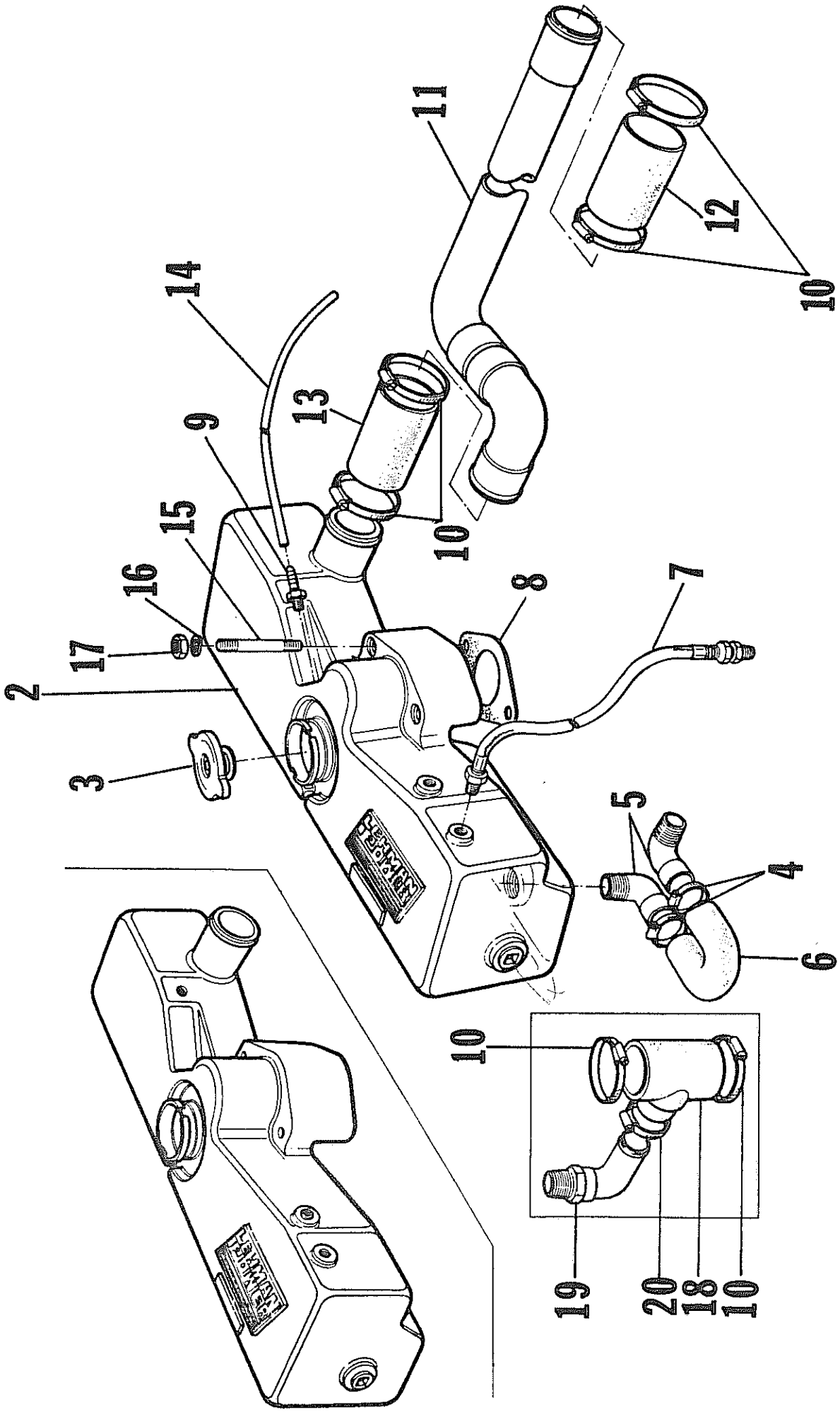

17
16
15
13
14
2
3
4
12
11
5
10
8
9
6
7
1

# EXPANSION TANK ASSEMBLY

## SD80-120/SP90-135

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 1A393 | HEADER TANK |
| 2 | 2 | OD71 | STUD 2.75x5/16 |
| 3 | 2 | OC31 | WASHER |
| 4 | 2 | OB26 | NUT |
| 5 | 1 | 2C305 | PRESSURE CAP 7 PSI |
| | 1 | 2C304 | PRESSURE CAP (CHROME) |
| 6 | 2 | 3K2 | CLAMP |
| 7 | 1 | 3K823 | HOSE |
| 8 | 2 | 3E858 | ELBOW |
| 9 | 2 | 3K2 | CLAMP |
| 10 | 1 | 3K775 | VENT HOSE |
| 11 | 1 | 6071841 | THERMOSTAT |
| 12 | 1 | 1541317 | GASKET |
| 13 | 1 | 3C27 | HOSE BARB |
| 14 | 2 | 3K4 | CLAMP |
| 15 | 1 | 1D60 | TUBE 4 CYLINDER |
| | 1 | 1D50 | TUBE 6 CYLINDER |
| 16 | 1 | 3K824 | REDUCING HOSE 4 CYLINDER |
| | 1 | 3K2133 | HOSE 6 CYLINDER |
| 17 | 1 | 3K825 | OVER FLOW HOSE |

NOTE: COLD START SWITCH SHOWN ON LAST PAGE.

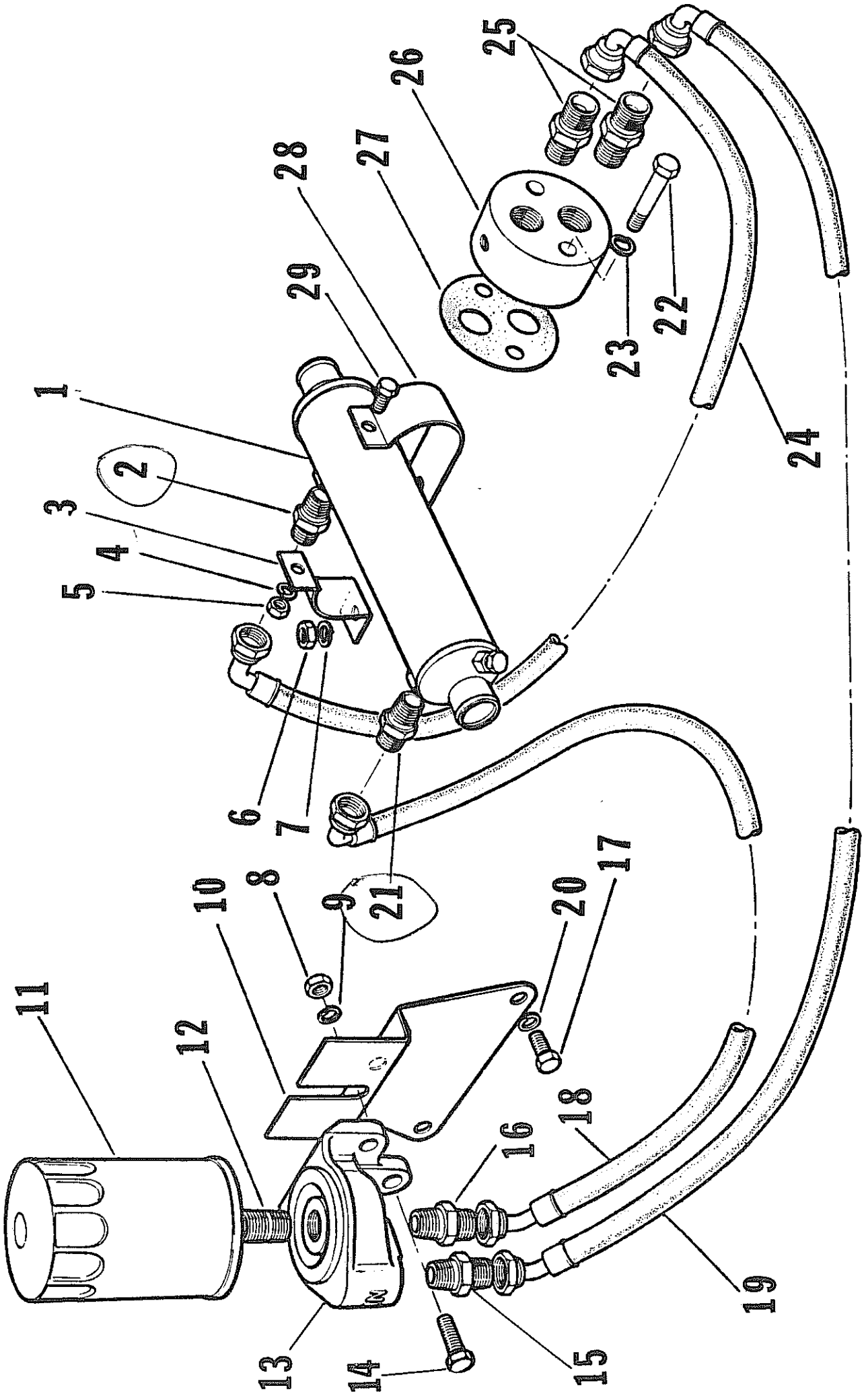

11
12
10
14
13
9
15
16
17
2
3
10
8
7
5
4
6
10
19
20
18
10

# EXPANSION TANK ASSEMBLY

## SP 160 / SP 225

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 1A393 | HEADER TANK |
| 2 | 1 | 1A393 | HEADER TANK |
| 3 | 1 | 2C304 | PRESSURE CAP |
| 4 | 2 | 3K2 | CLAMP |
| 5 | 2 | 3E858 | ELBOW |
| 6 | 1 | 3K823 | HOSE |
| 7 | 1 | 3K775 | VENT HOSE |
| 8 | 1 | 1541317 | GASKET |
| 9 | 1 | 3C27 | HOSE BARB |
| 10 | 6 | 3K4 | CLAMP |
| 11 | 1 | 1D73 | TUBE |
| 12 | 1 | 3K2133 | HOSE |
| 13 | 1 | 3K2133 | HOSE |
| 14 | 1 | 3K825 | HOSE, OVER FLOW |
| 15 | 2 | OD71 | STUD |
| 16 | 2 | OC31 | WASHER |
| 17 | 2 | OB26 | NUT |
| 18 | 1 | 3K826 | T-REDUCING HOSE |
| 19 | 1 | 3E860 | ELBOW |
| 20 | 1 | 3K2 | CLAMP |

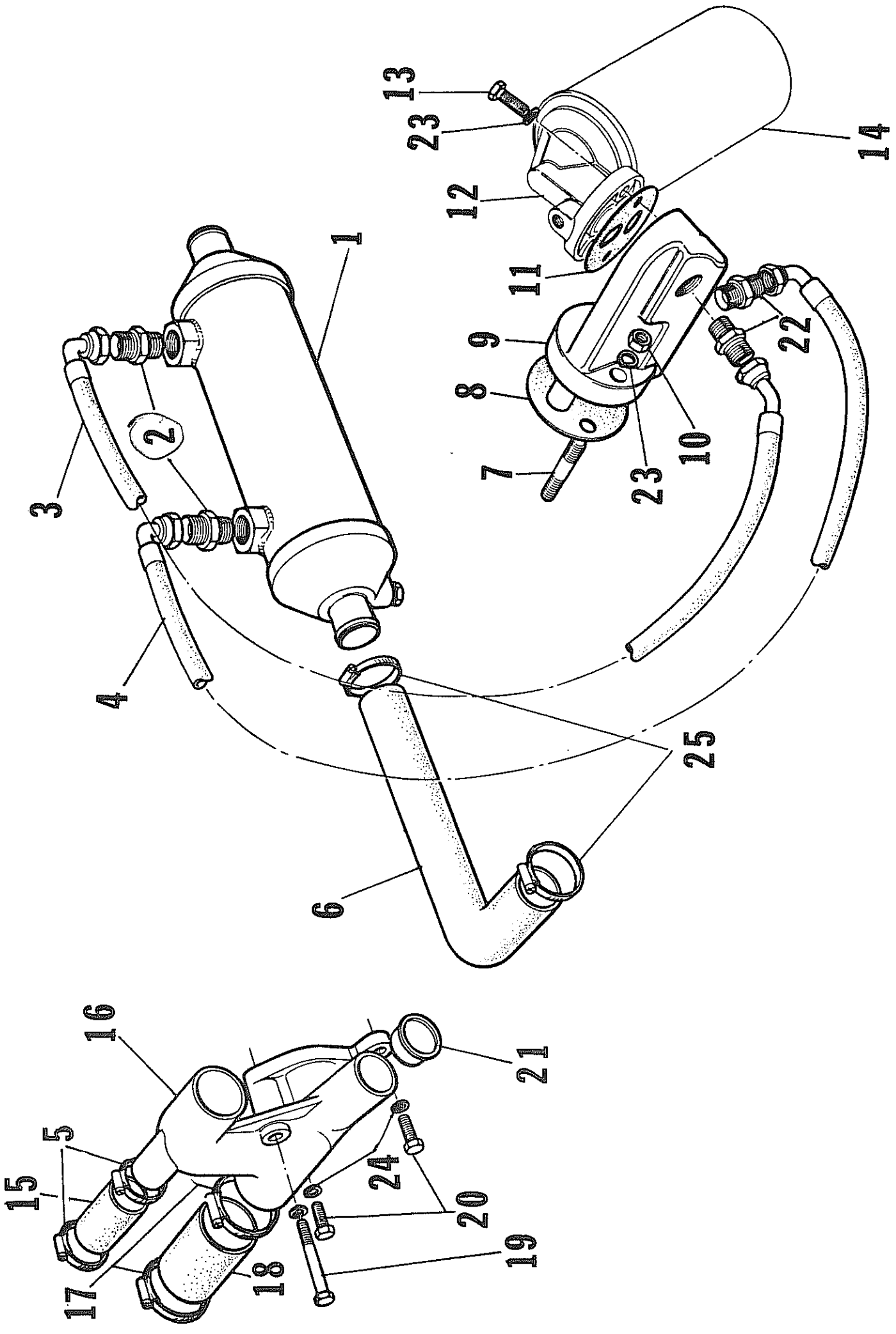
NOTE: COLD START SWITCH SHOWN ON LAST PAGE.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

## ENGINE OIL COOLER

| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | OIL COLLER, SD80 | 2C233 |
| | 1 | OIL COOLER, SP90 | 2C233 |
| | 1 | OIL COOLER, SD120 | 2C233 |
| | 1 | OIL COOLER, SP135 | 2C233 |
| → 2 | 2 | ADAPTOR | 3G35 |
| 3 | 1 | BRACKET, UPPER | 2M3 |
| 4 | 1 | LOCK WASHER | OC21 |
| 5 | 1 | NUT | OB15 |
| 6 | 1 | NUT | OB34 |
| 7 | 1 | LOCK WASHER | OC41 |
| 8 | 1 | NUT | OB34 |
| 9 | 1 | LOCK WASHER | OC41 |
| 10 | 1 | BRACKET | 1D51 |
| 11 | 1 | FILTER | 2N50 |
| 12 | 1 | NIPPLE | 3C450 |
| 13 | 1 | OIL BASE | 1A395 |
| 14 | 1 | BOLT | OE353 |
| 15 | 4 | ADAPTOR | 3G34 |
| 16 | 4 | ADAPTOR | 3G34 |
| 17 | 2 | BOLT | OE300 |
| 18 | 1 | OIL LINE | 3K778 |
| 19 | 1 | OIL LINE | 3K779 |
| 20 | 2 | LOCK WASHER | OC41 |
| → 21 | 2 | ADAPTOR | 3G35 |
| 22 | 2 | BOLT | OE406 |
| 23 | 2 | LOCK WASHER | OC51 |
| 24 | 1 | OIL LINE | 3K777 |
| 25 | 4 | ADAPTOR | 3G34 |
| 26 | 1 | ADAPTOR, OIL FEED | 1A391 |
| 27 | 1 | GASKET | 2D29 |
| 28 | 1 | BRACKET, LOWER | 2M4 |
| 29 | 1 | BOLT | OE101 |

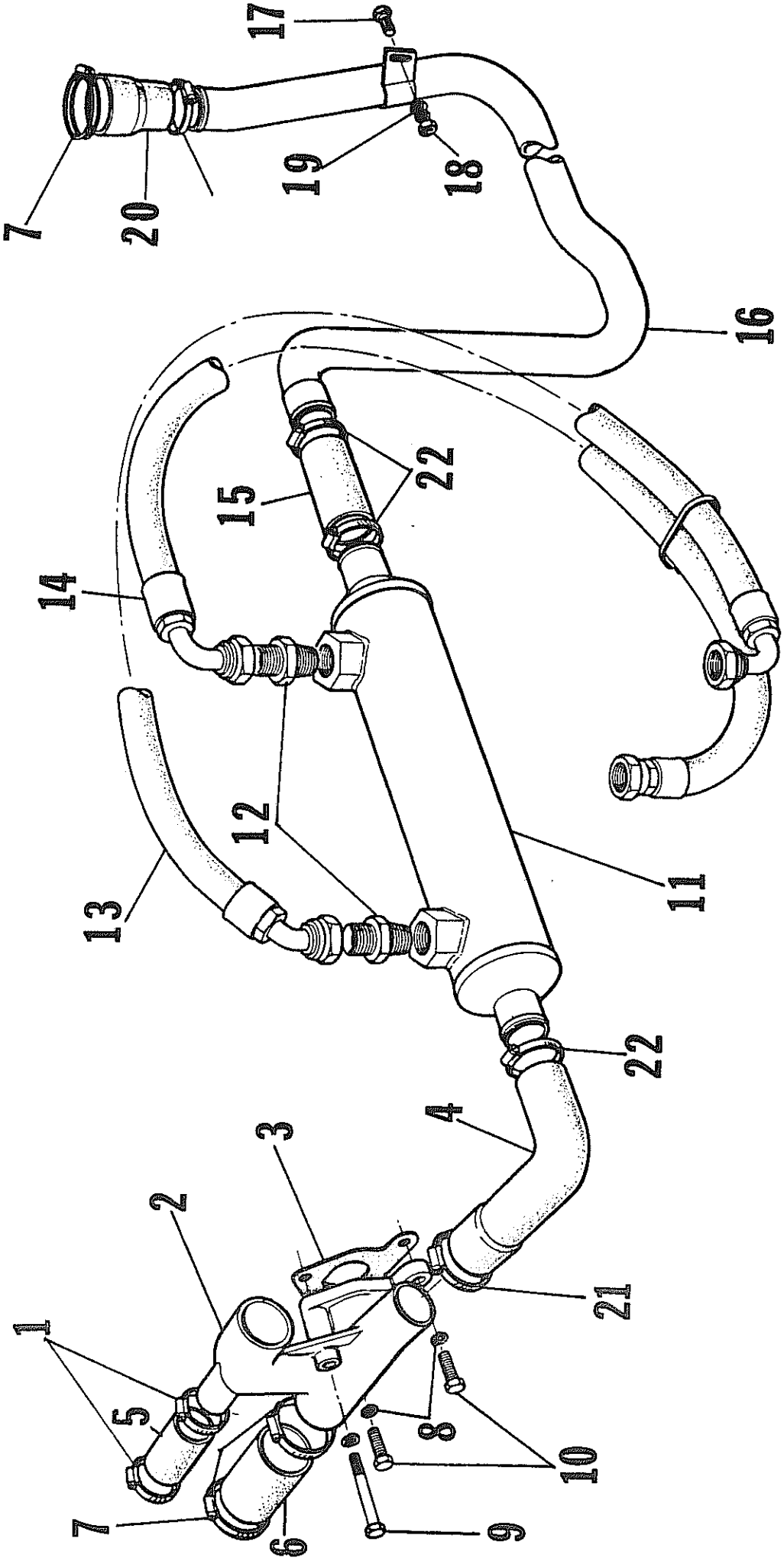
4 kpl 3G35


13
23
14
12
11
1
9
22
8
10
2
7
23
3
4
25
6
16
21
5
15
24
20
19
17
18

# ENGINE OIL COOLER

## SP160

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2C228 | ENGINE OIL COOLER |
| 2 | 2 | 3G35 | ADAPTOR |
| 3 | 1 | 3K782 | OIL HOSE ASSEMBLY |
| 4 | 1 | 3K783 | OIL HOSE ASSEMBLY |
| 5 | 2 | 3K14 | HOSE CLIP |
| 6 | 1 | 3K816 | HOSE |
| 7 | 2 | OD68 | STUDS OIL FILTER ADAPTOR |
| 8 | 2 | 1776462 | GASKET |
| 9 | 1 | 1A412 | OIL FILTER ADAPTOR |
| 10 | 2 | OB46 | NUT |
| 11 | 2 | 1776462 | STUDS OIL FILTER ADAPTOR |
| 12 | 1 | 1582035 | OIL FILTER BASE |
| 13 | 2 | OE403 | SET SCREW |
| 14 | 1 | 1582038 | OIL FILTER |
| 15 | 8 | 3K353 | WATER HOSE |
| 16 | 1 | 1A413 | APLIT FLOW RETURN |
| 17 | 2 | 3K12 | HOSE CLIP |
| 18 | 8 | 3K354 | HOSE |
| 19 | 1 | OE307.5 | SOCKET SCREW |
| 20 | 2 | OE302 | SET SCREW |
| 21 | 1 | 3L51 | PLUG |
| 22 | 2 | 3G37 | ADAPTOR |
| 23 | 4 | OC51 | LOCK WASHER |
| 24 | 3 | OC41 | LOCK WASHER |
| 25 | 2 | 3K2 | HOSE CLAMP |

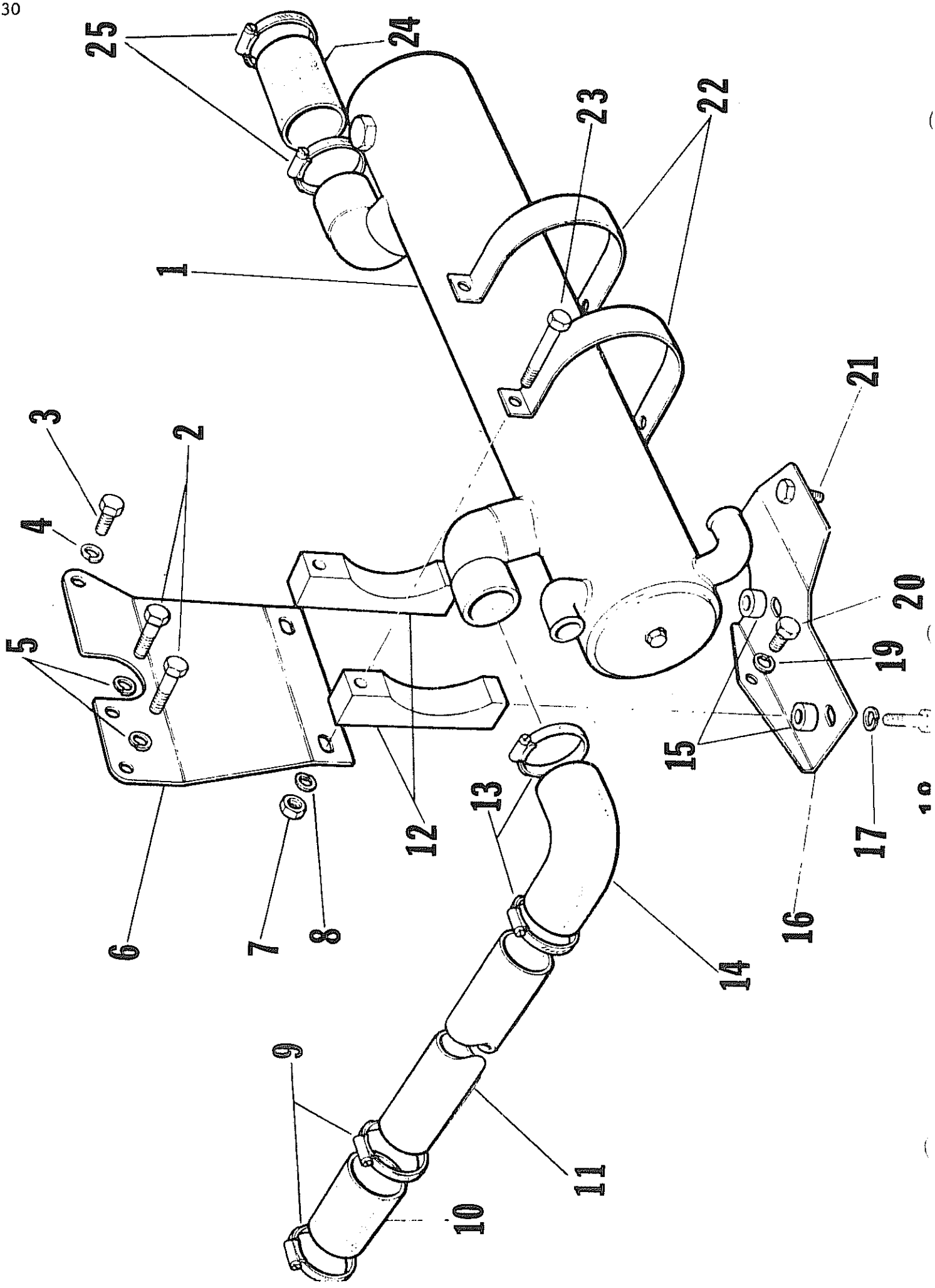

17
19
18
7
20
16
22
15
14
12
13
11
22
4
3
2
21
1
5
8
10
7
6
9

## ENGINE OIL COOLER

## SP225

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 2 | 3K14 | HOSE CLIP |
| 2 | 1 | 1A413 | SPLIT FLOW RETURN |
| 3 | 1 | 2D36 | GASKET |
| 4 | 1 | 3K786 | PIPE RUBBER |
| 5 | 1 | 3K353 | WATER HOSE |
| 6 | 1 | 3K354 | RADIATOR HOSE |
| 7 | 3 | 3K12 | HOSE CLIP |
| 8 | 3 | OC41 | LOCK WASHER |
| 9 | 1 | OE307.5 | SOCKET SCREW |
| 10 | 2 | OE302 | SET SCREW |
| 11 | 1 | 2C245 | OIL COOLER ENGINE |
| 12 | 2 | 3G38 | ADAPTOR |
| 13 | 1 | 3K784 | OIL HOSE ASSEMBLY |
| 14 | 1 | 3K785 | OIL HOSE ASSEMBLY |
| 15 | 1 | 3K209-2 | |
| 16 | 1 | 1G148 | PIPE |
| 17 | 1 | OGE201 | BOLT |
| 18 | 1 | OC30 | FLAT WASHER |
| 19 | 1 | OGC32 | LOCK WASHER |
| 20 | 1 | 6089349 | HOSE |
| 21 | 2 | 3K15 | HOSE CLIP |
| 22 | 3 | 3K3A | HOSE CLAMP |

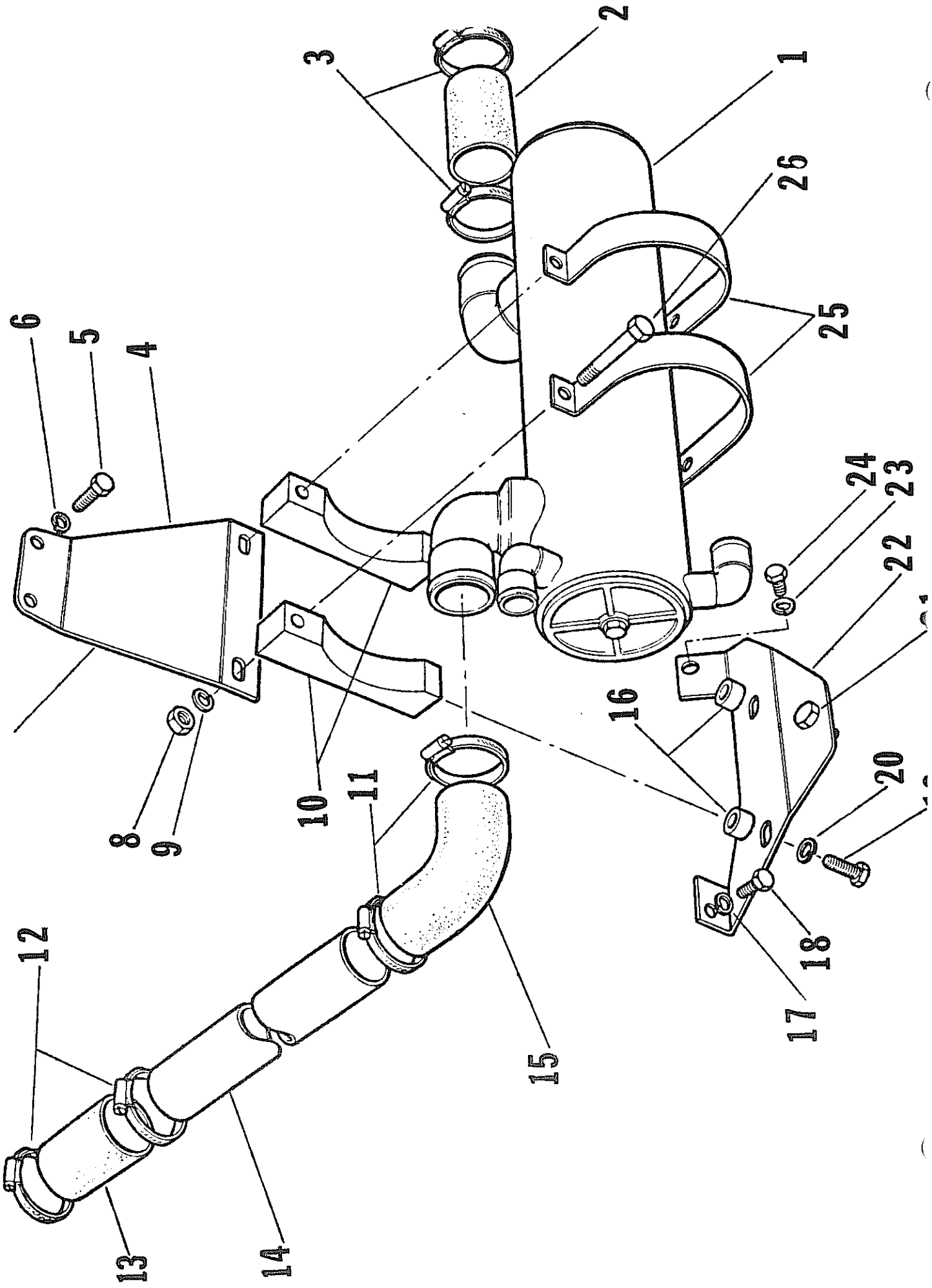
C30



# HEAT EXCHANGER ASSEMBLY

## SD120/SP135

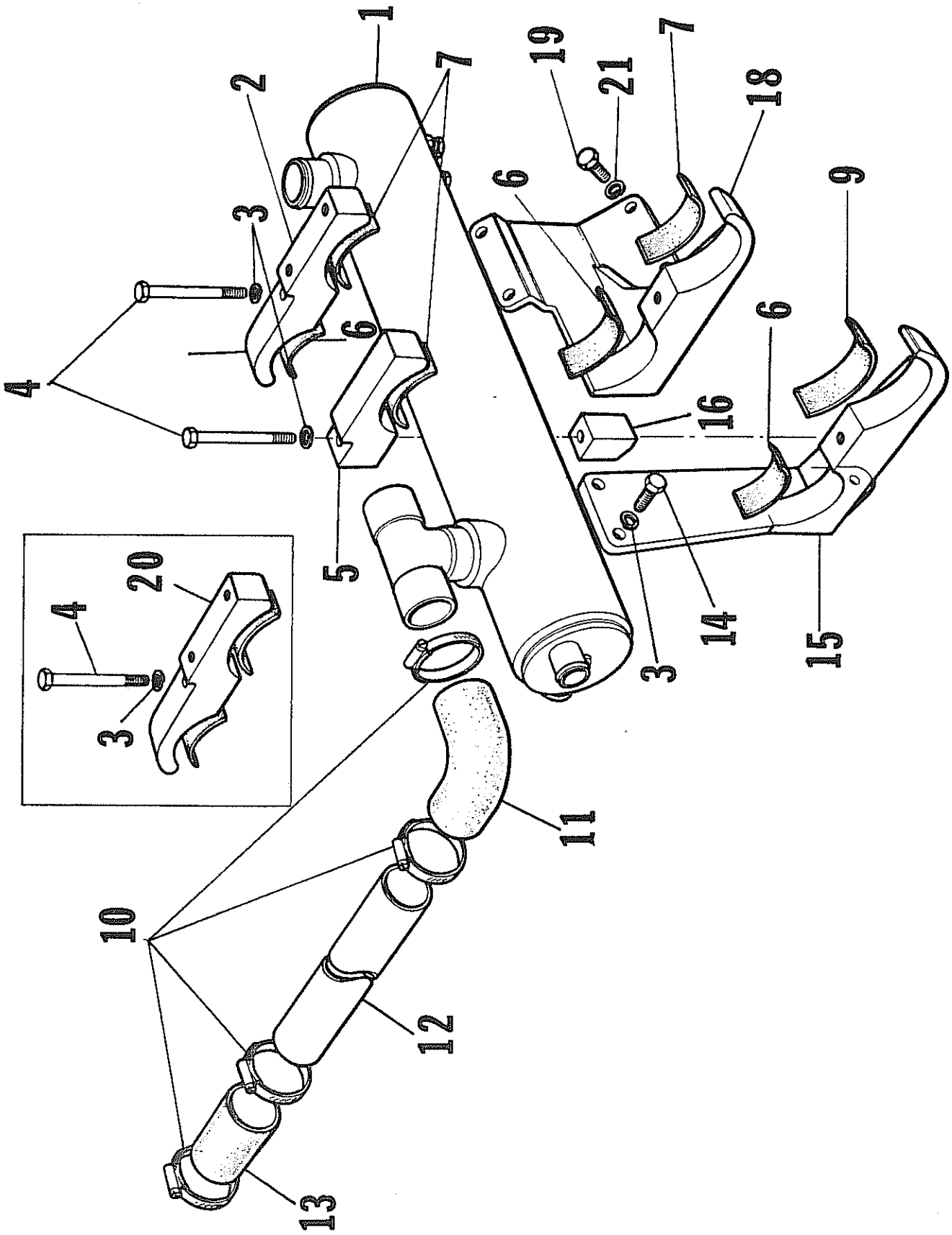
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2C232 | HEAT EXCHANGER |
| 2 | 2 | OE303C | BOLT |
| 3 | 1 | OE302C | BOLT |
| 4 | 6 | OC41 | WASHER |
| 5 | 6 | OC41 | WASHER |
| 6 | 1 | 1E44 | BRACKET |
| 7 | 2 | OB35 | NUT |
| 8 | 6 | OC41 | WASHER |
| 9 | 2 | 3K4 | CLAMP |
| 10 | 2 | 3K2133 | HOSE |
| 11 | 1 | 1D56 | PIPE |
| 12 | 2 | 2C306 | SADDLE |
| 13 | 2 | 3K4 | CLAMP |
| 14 | 1 | 3K503 | HOSE |
| 15 | 2 | 1B81 | SPACER |
| 16 | 1 | 1E45 | BRACKET, LOWER |
| 17 | 2 | OC40 | WASHER |
| 18 | 2 | OE303 | BOLT |
| 19 | 6 | OC41 | WASHER |
| 20 | 1 | OE370 | BOLT |
| 21 | 1 | oE303 | BOLT |
| 22 | 2 | 2C307 | STRAP |
| 23 | 2 | OE306.5 | BOLT |
| 24 | 2 | 2K2133 | HOSE |
| 25 | 2 | 3K4 | CLAMP |


1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
17
18
20
22
23
24
25
26

## HEAT EXCHANGER ASSEMBLY

### SD80/SP90

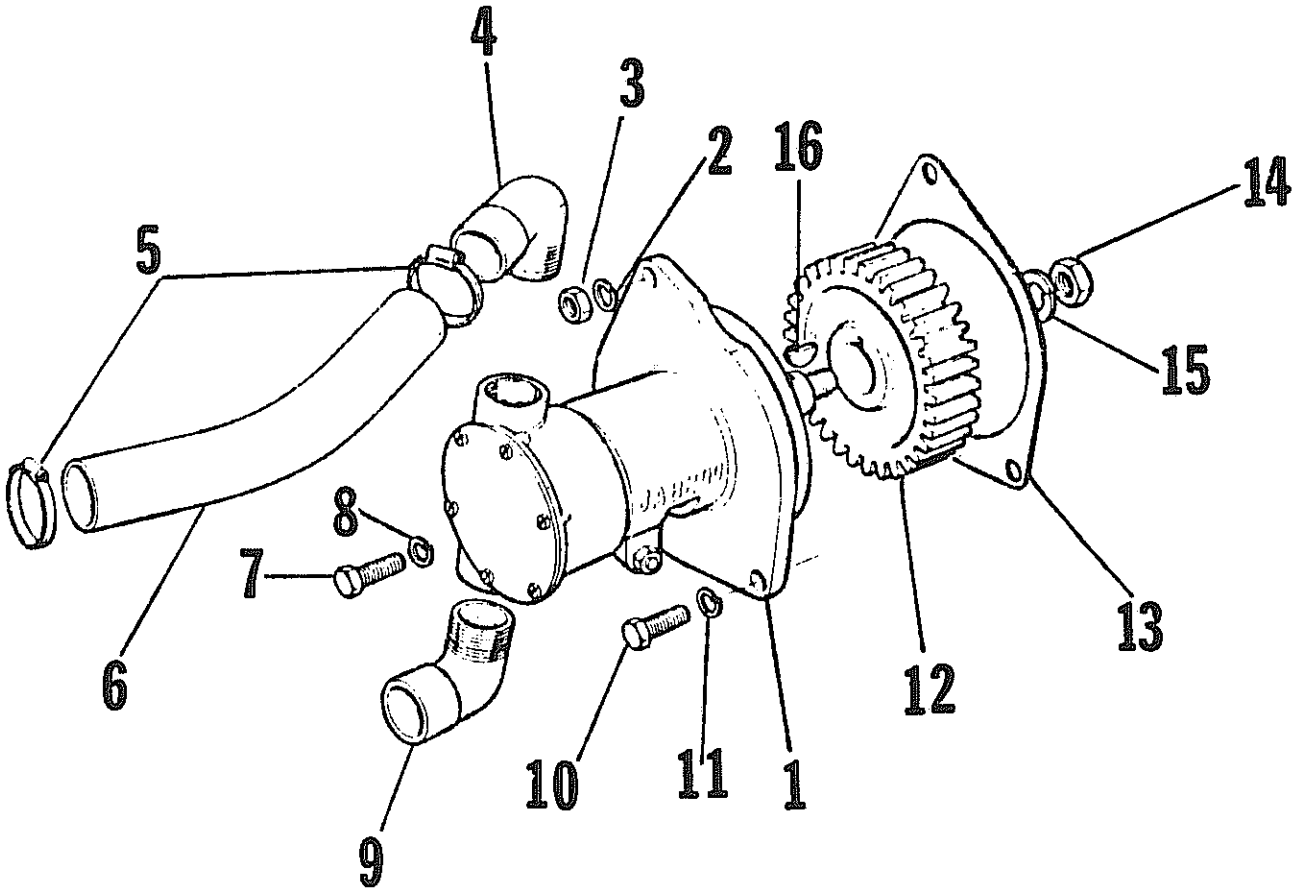
| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | HEAT EXCHANGER | 2C242 |
| 2 | 1 | HOSE 3" | 3K2133 |
| 3 | 3 | CLAMP | 3K4 |
| 4 | 1 | BRACKET, UPPER | 1E46 |
| 5 | 2 | BOLT | 0E303 |
| 6 | 2 | WASHER | 0C41 |
| 8 | 2 | NUT | 0B35 |
| 9 | 2 | WASHER | 0C41 |
| 10 | 2 | SADDLE | 2C306 |
| 11 | 2 | CLAMP | 3K4 |
| 12 | 2 | CLAMP | 3K4 |
| 13 | 1 | HOSE 3" | 3K2133 |
| 14 | 1 | TUBE | 1D56 |
| 15 | 1 | HOSE | 3K503 |
| 16 | 2 | SPACER | 1B81 |
| 17 | 2 | WASHER | 0C41 |
| 18 | 2 | BOLT | 0E303 |
| 19 | 2 | BOLT | 0E204 |
| 20 | 2 | WASHER | 0C41 |
| 21 | 1 | NUT | 0B35 |
| 22 | 1 | BRACKET, LOWER | 1E47 |
| 23 | 2 | LOCK WASHER | 0C31 |
| 24 | 2 | BOLT | 0E302 |
| 25 | 2 | STRAP | 2C307 |
| 26 | 2 | BOLT | 0E306.5 |


1
2
3
4
5
6
7
9
10
11
12
13
14
15
16
18
19
20
21

# HEAT EXCHANGER ASSEMBLY

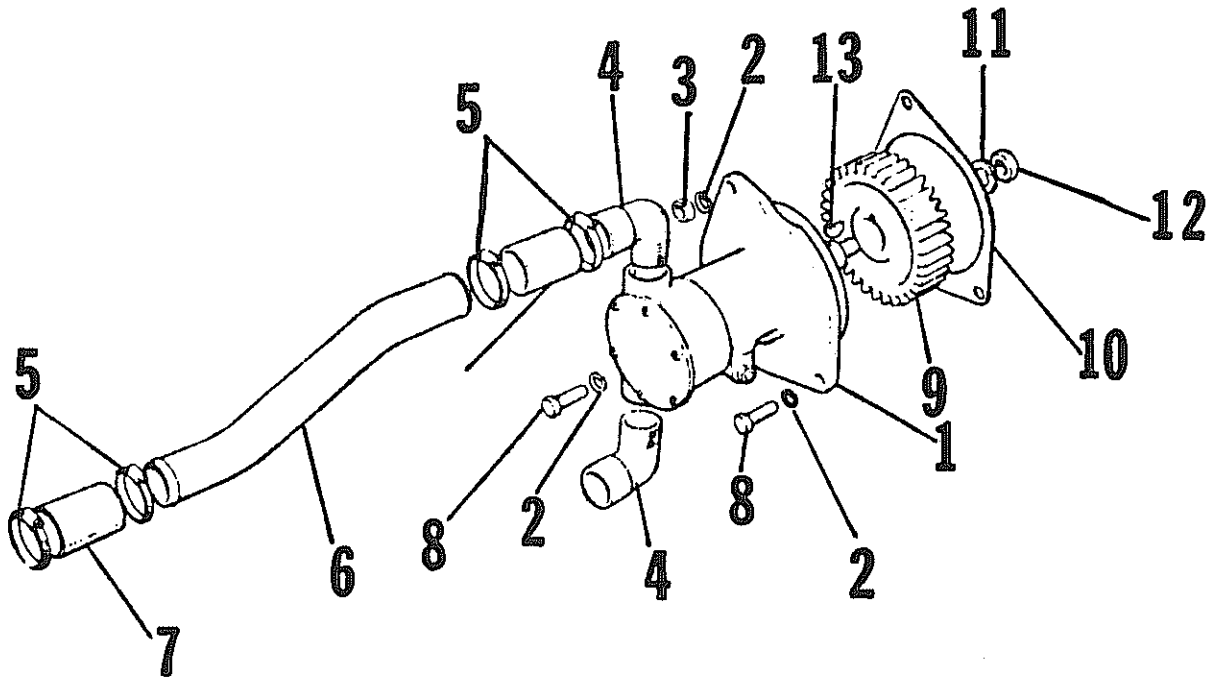
## SP160 / 225

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2C246 | HEAT EXCHANGER |
| 2 | 1 | 10517 | CLAMP |
| 3 | 5 | OC41 | LOCK WASHER |
| 4 | 2 | OE310 | BOLT |
| 5 | 1 | 1D70 | CLAMP, REAR |
| 6 | 4 | 1C54 | RUBBER STRIP |
| 7 | 2 | 1C54 | RUBBER STRIP |
| 8 | 1 | 3L1 | PLUG |
| 9 | 2 | 1C54 | RUBBER STRIP |
| 10 | 4 | 3K12 | HOSE CLIP |
| 11 | 1 | 3K511 | RADIATOR HOSE |
| 12 | 18 | 1056 | PIPE |
| 13 | 1 | 3K2133 | HOSE |
| 14 | 2 | OE303 | SET SCREW |
| 15 | 1 | 1D68 | SUPPORT REAR |
| 16 | 2 | 1D69 | CLAMP SPACER |
| 18 | 1 | 1058 | SUPPORT FRONT |
| 19 | 4 | OE403 | SET SCREW |
| 20 | 1 | 1D67 | CLAMP |
| 21 | 4 | OC51 | LOCK WASHER |
| 22 | 1 | OE302 | SET SCREW |




SD80/SP90

| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | JABSCO PUMP (LESS GEAR) | 2C48 |
| 2 | 3 | LOCK WASHER | OC41 |
| 3 | 1 | NUT | OB34 |
| 4 | 1 | ELBOW | 3E858 |
| 5 | 2 | CLAMP | 3K2 |
| 6 | 1 | HOSE | EW62 |
| 7 | 1 | BOLT | OE302 |
| 8 | 1 | LOCK WASHER | OC41 |
| 9 | 1 | ELBOW | 3E585 |
| 10 | 1 | BOLT | OE302 |
| 11 | 1 | LOCK WASHER | OC41 |
| 12 | 1 | GEAR | 2B102 |
| 13 | 1 | GASKET | 1C33 |
| 14 | 1 | NUT | OB59 |
| 15 | 1 | LOCK WASHER | OC61 |
| 16 | 1 | KEY | SP1401-10 |

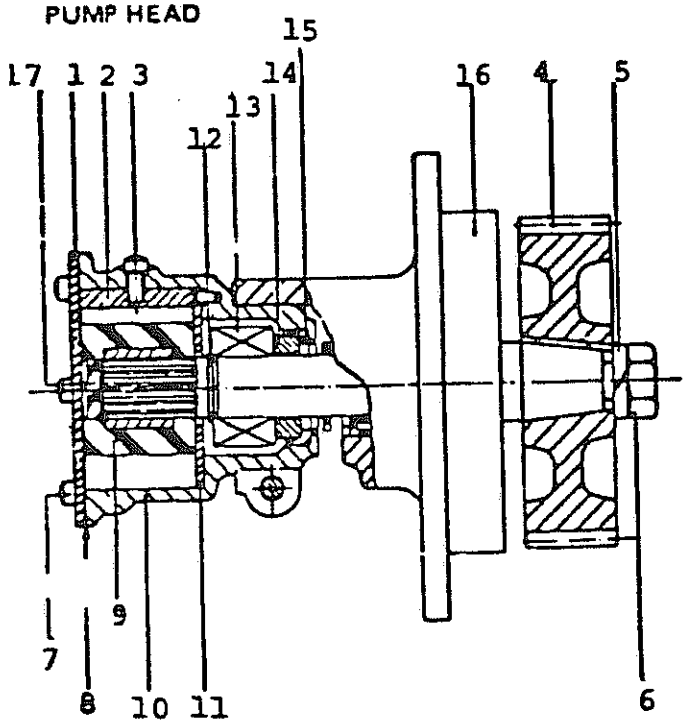



SD120/SP135

| KEY | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | JABSCO PUMP (LESS GEAR) | 2C48 |
| 2 | LOCK WASHER | OC41 |
| 3 | NUT | OB34 |
| 4 | ELBOW | 3E858 |
| 5 | CLAMP | 3K2 |
| 6 | TUBE | 1D59 |
| 7 | HOSE 2" | 3K207A2 |
| 8 | BOLT | OE302 |
| 9 | DRIVE GEAR | 2B102 |
| 10 | GASKET | 1C33 |
| 11 | WASHER | OC61 |
| 12 | NUT | OB59 |
| 13 | KEY | SP1401-10 |

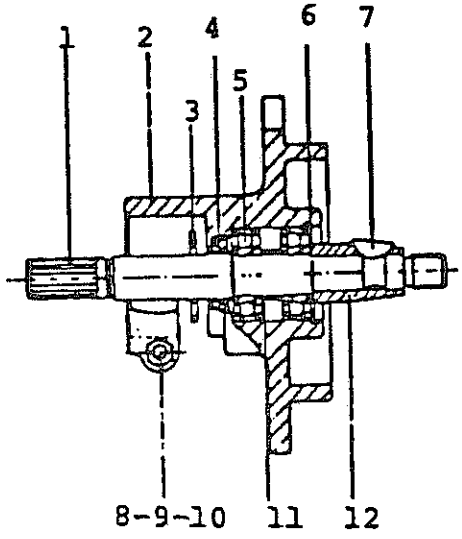
# Breakdown of 2C48 Pump

PUMP HEAD

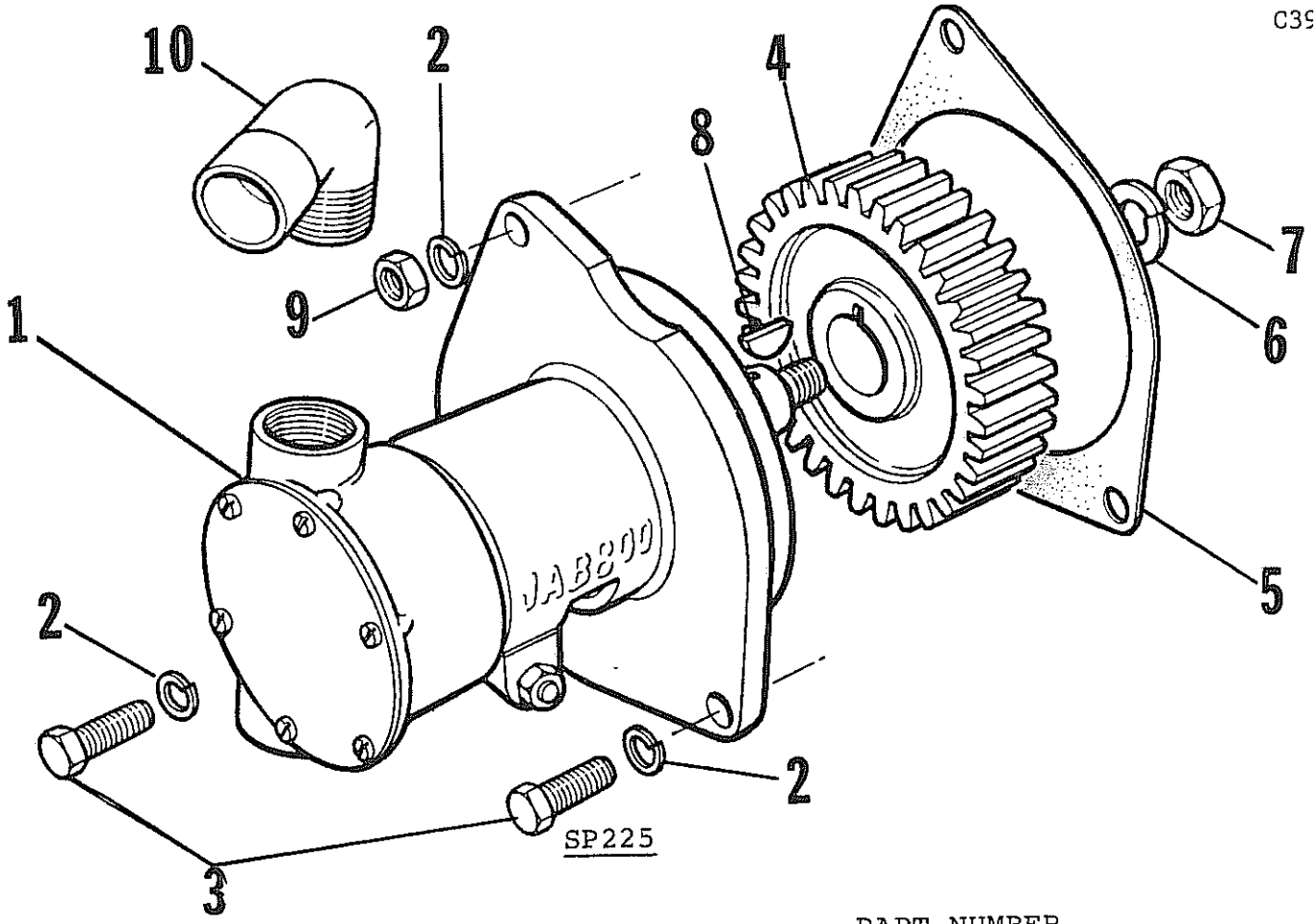



| KEY | DESCRIPTION | QTY | MODEL |
|---|---|---|---|
| 1 | ENDCOVER BLANK | 1 | 3992 |
| 2 | CAM | 1 | 490 |
| 3 | CAM SCREW | 1 | SP1003 |
| 4 | GEAR | 1 | - |
| 5 | WASHER | 1 | - |
| 6 | NUT | 1 | - |
| 7 | ENDCOVER SCREW | 6 | SP1002 |
| 8 | GASKET | 1 | 3298 |
| 9 | IMPELLER | 1 | 1210 |
| 10 | BODY | 1 | 10054- |
| 11 | WEARPLATE | 1 | 7883 |
| 12 | RETAINING RING | 1 | SP1700 |
| 13 | SEAL | 1 | SP6080 |
| 14 | SEAL SEAT | 1 | SP8022 |
| 15 | CUP RUBBER | 1 | 9722 |
| 16 | BEARING HOUSING ASSEMBLY | | |
| 17 | SPLINE SEAL | 1 | 4345 |

BEARING HOUSING




| KEY | DESCRIPTION | QTY | PART NUMB |
|---|---|---|---|
| 1 | SHAFT | 1 | 10957 |
| 2 | BEARING HOUSING | 1 | 10959 |
| 3 | SLINGER | 1 | 3286 |
| 4 | SEAL | 1 | SP2703-02 |
| 5 | BEARING | 2 | SP2601-39 |
| 6 | RETAINING RING | 1 | SP1700-24 |
| 7 | KEY | 1 | SP1401-10 |
| 8 | BOLT | 1 | SP1095-09 |
| 9 | WASHER | 1 | SP1602-06 |
| 10 | NUT | 1 | SP1105-03 |
| 11 | BEARING SPACER | 1 | 9998 |
| 12 | SLEEVE | 1 | 10958 |

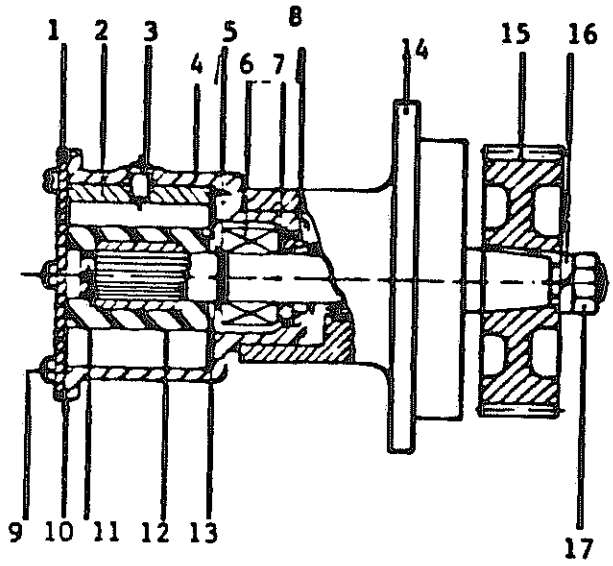



SP225

| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | JABSCO PUMP (LESS GEAR) | 2C49 |
| 2 | 3 | LOCK WASHER | OC41 |
| 3 | 2 | BOLT | OE302 |
| 4 | 1 | GEAR | 2B102 |
| 5 | 1 | GASKET | 1C33 |
| 6 | 1 | LOCK WASHER | OC61 |
| 7 | 1 | NUT | OB59 |
| 8 | 1 | KEY | SP1401-10 |
| 9 | 1 | NUT | OB34 |
| 10 | 1 | ELBOW | 3E859 |

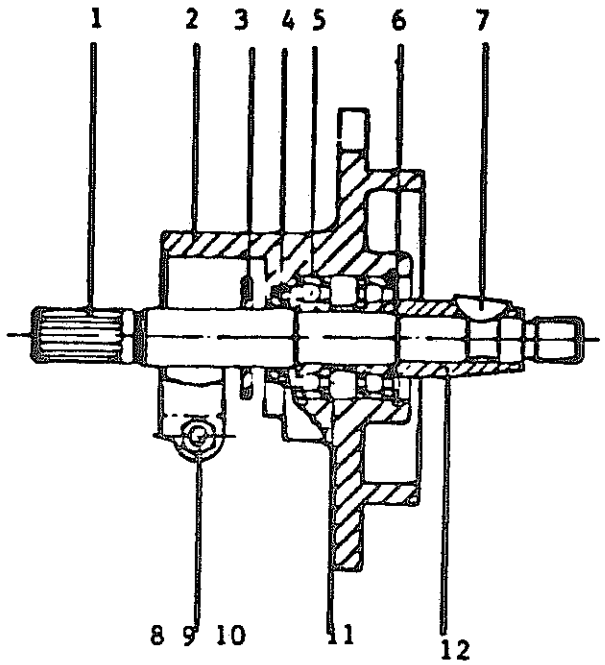
# BREAK DOWN OF 2C49 PUMP

## PUMP HEAD



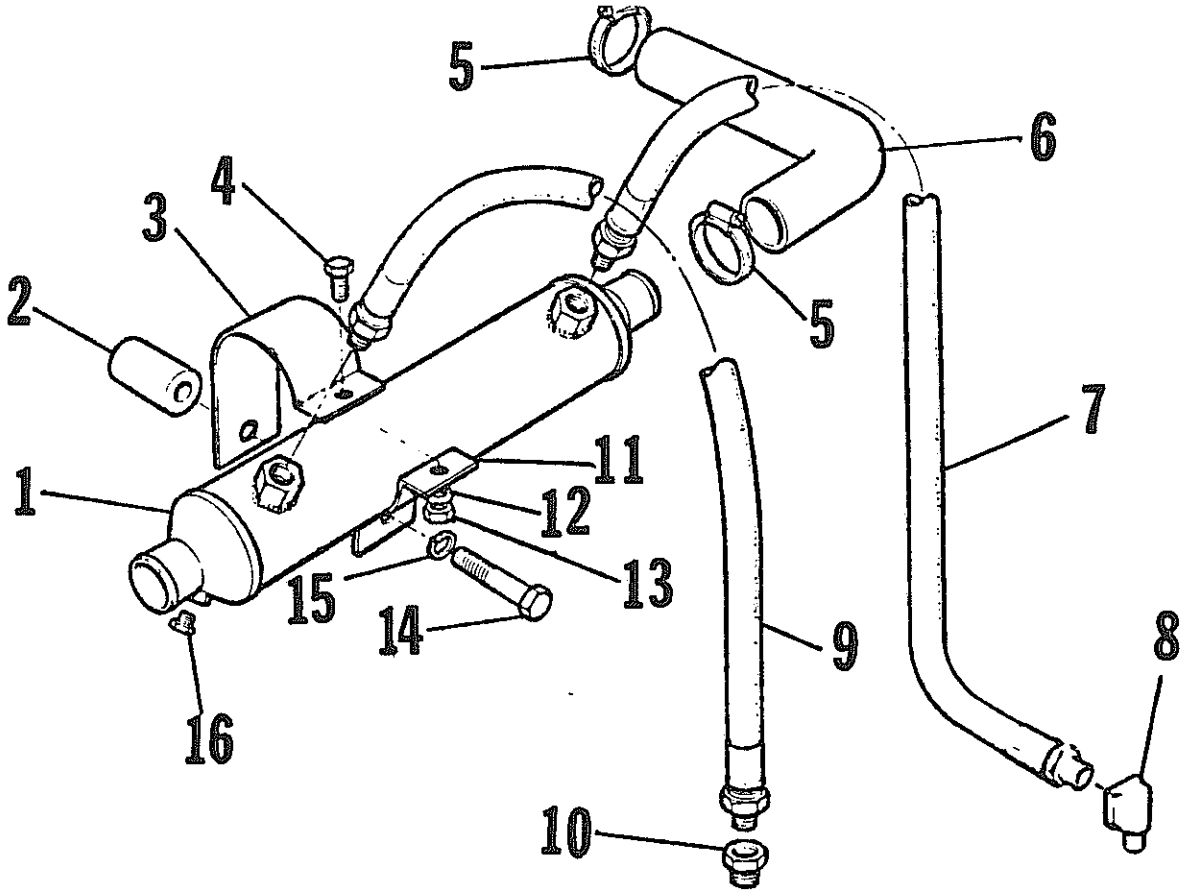

| KEY | DESCRIPTION | QTY | PART NUMBER |
|---|---|---|---|
| 1 | ENDCOVER BLANK | 1 | 3993 |
| 2 | CAM | 1 | 934 |
| 3 | CAM SCREW | 1 | SP1004-09 |
| 4 | BODY | 1 | 10329-200 |
| 5 | RETAINING RING | 1 | SP1700-62 |
| 6 | SEAL | 1 | SP6080-07 |
| 7 | SEAL SEAT | 1 | SP8022-07 |
| 8 | SEAL CUP | 1 | 9722 |
| 9 | END COVER SCREW | 6 | SP1003-09 |
| 10 | GASKET | 1 | 890 |
| 11 | SPLINE SEAL | 1 | 4345 |
| 12 | IMPELLER | 1 | 920 |
| 13 | WEARPLATE | 1 | 4156 |
| 14 | BEARING HOUSING | see below | "BEARING HOUS |
| 15 | GEAR | 1 | 11084 |
| 16 | WASHER | 1 | 11085 |
| 17 | NUT | 1 | 11086 |

## BEARING HOUSING




BEARING HOUSING

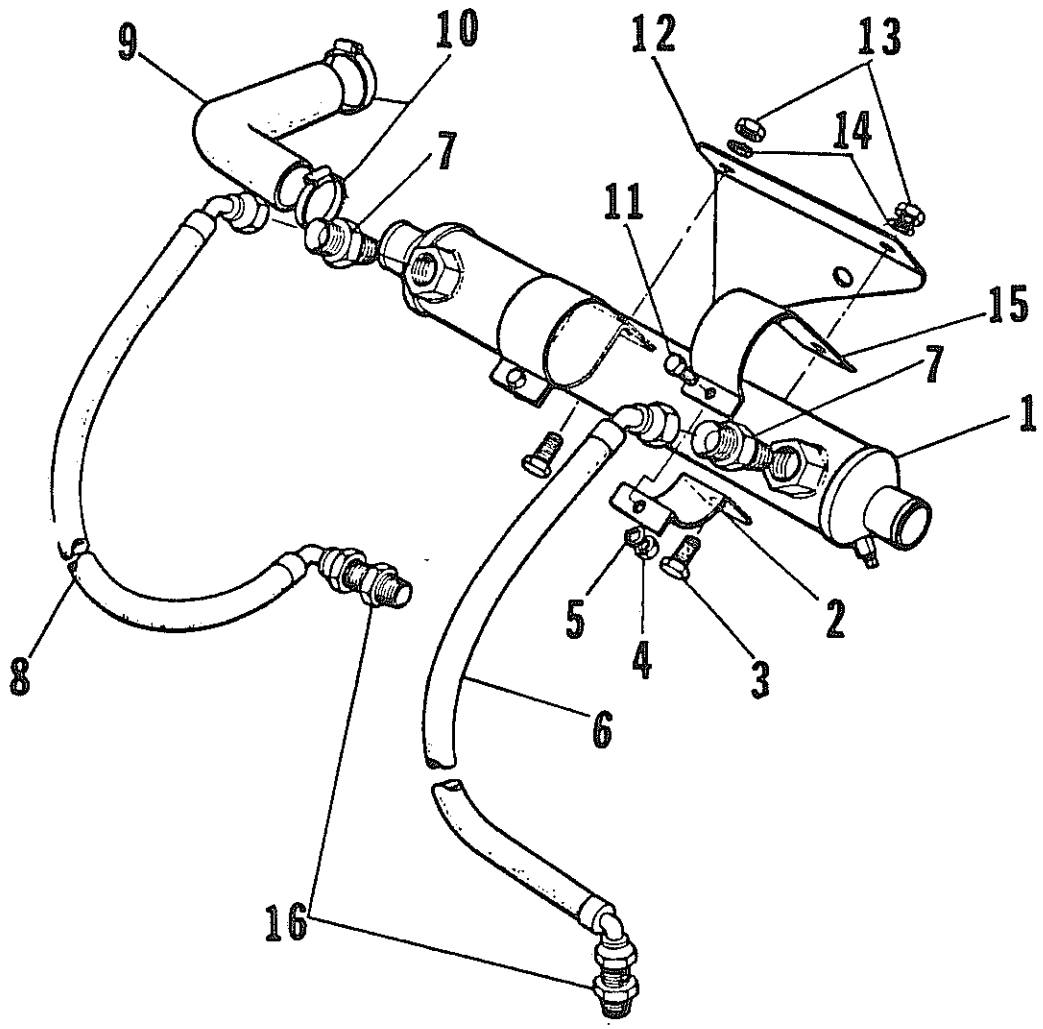
| KEY | DESCRIPTION | QTY | PART NUMBER |
|---|---|---|---|
| 1 | SHAFT | 1 | 10957-01 |
| 2 | BEARING HOUSING | 1 | 10959 |
| 3 | SLINGER | 1 | 3286 |
| 4 | SEALER | 1 | SP2703-02 |
| 5 | BEARING | 2 | SP2601-39 |
| 6 | RETAINING RING | 1 | SP1700-248 |
| 7 | KEY | 1 | SP1401-10 |
| 8 | BOLT | 1 | SP1095-09 |
| 9 | WASHER | 1 | SP1602-06 |
| 10 | NUT | 1 | SP1105-03 |
| 11 | BEARING SPACER | 1 | 9998 |
| 12 | SLEEVE | 1 | 10958 |




## TRANSMISSION OIL COOLER

## SD80/SP90/SD120/SP135

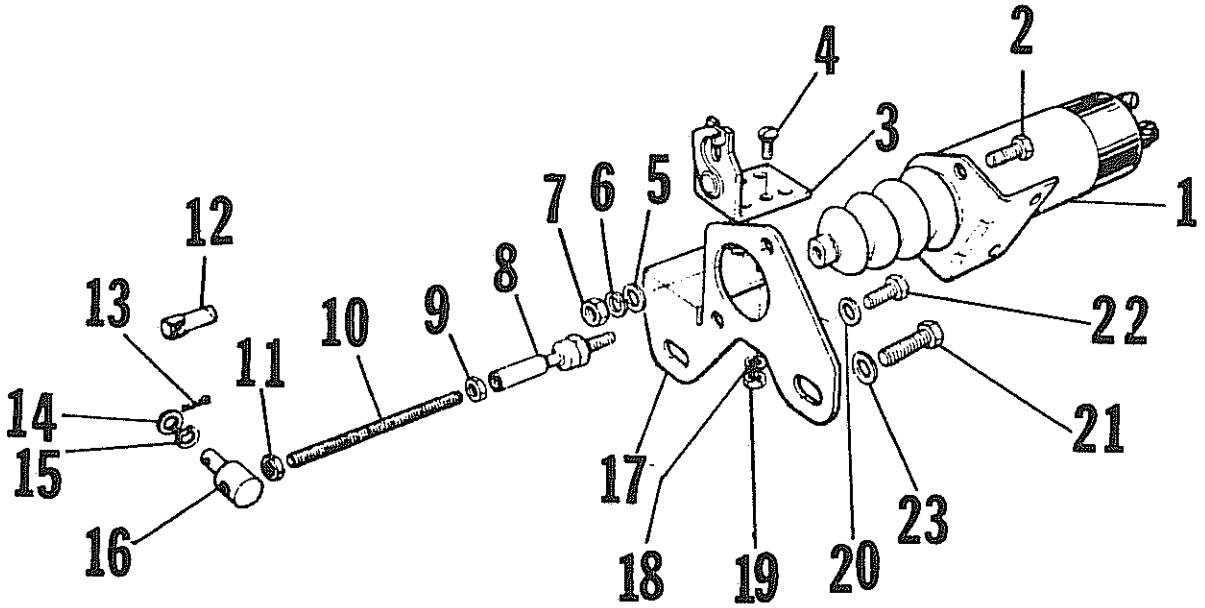
| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | TRANS OIL COOLER | 2C207 |
| 2 | 1 | SPACER | 1B81 |
| 3 | 1 | BRACKET, UPPER | 2M3 |
| 4 | 1 | BOLT | OE101 |
| 5 | 2 | CLAMP | 3K2 |
| 6 | 1 | HOSE | 3K351 |
| 7 | 1 | OIL LINE 22" | 3K772 |
| 8 | 1 | ELBOW | 3D24 |
| 9 | 1 | OIL LINE 17" | 3K764 |
| 10 | 1 | ADAPTOR BUSHING | 3G25 |
| 11 | 1 | BRACKET LOWER | 2M4 |
| 12 | 1 | LOCK WASHER | OC21 |
| 13 | 1 | NUT | OB16 |
| 14 | 1 | BOLT | OGE306 |
| 15 | 1 | LOCK WASHER | OGC41 |
| 16 | 1 | PLUG, DRAIN | 3L1 |




SP160 / 225

OIL COOLER TRANSMISSION

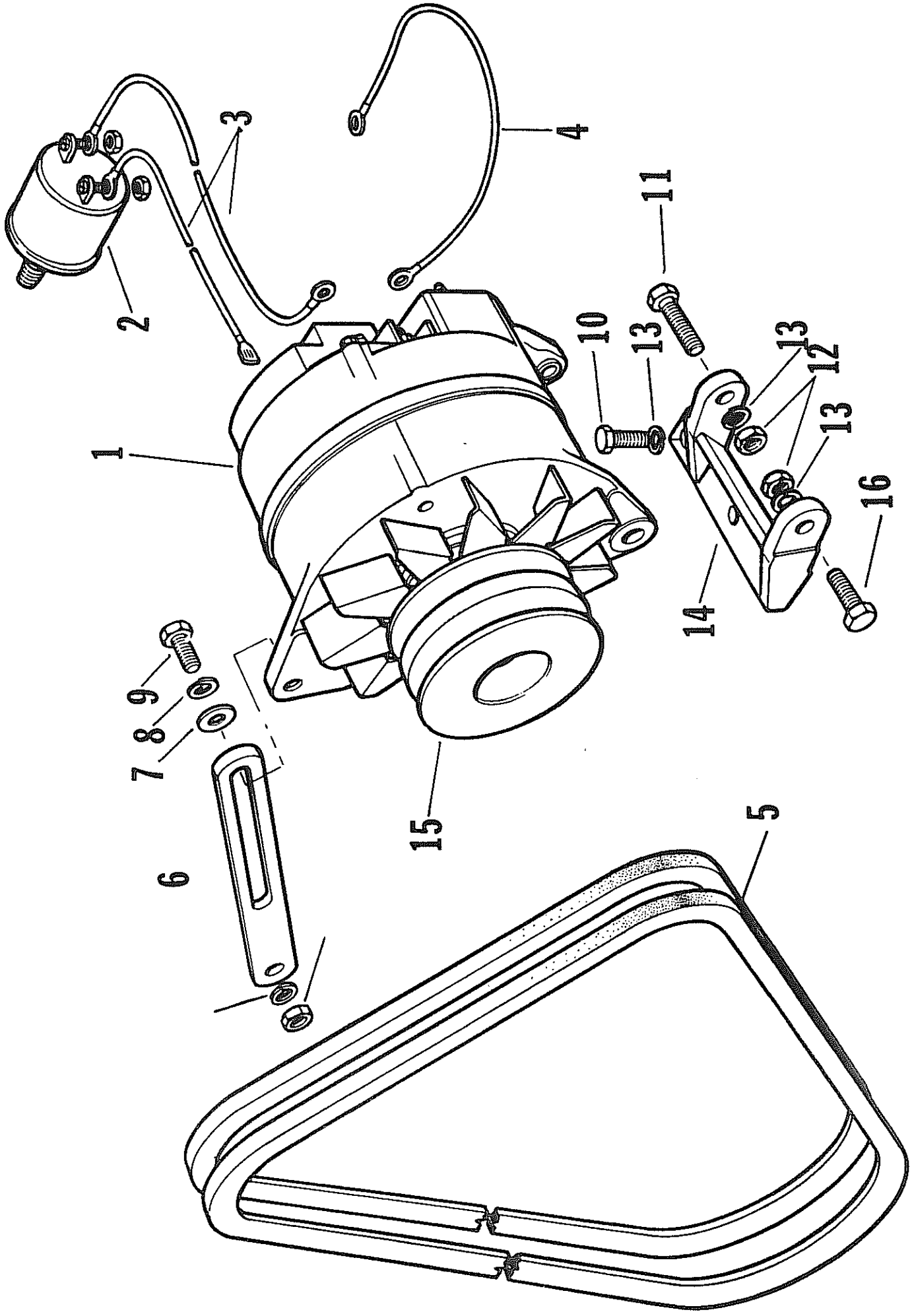
| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2C243 | TRANS OIL COOLER TWIN DISC ONLY |
| 1 | 1 | 2C234 | TRANS OIL COOLER |
| 2 | 2 | 2M3 | OIL COOLER BRACKET LOWER |
| 3 | 2 | 0E401 | SET SCREW |
| 4 | 2 | 0B15 | PLAIN NUT |
| 5 | 2 | 0C21 | LOCK WASHER |
| 6 | 1 | 3K780 | HOSE ASSEMBLY |
| 7 | 2 | 3G35 | ADAPTOR |
| 8 | 1 | 3K781 | HOSE ASSEMBLY |
| 9 | 1 | 3K352 | ELBOW |
| 10 | 2 | 3K13 | HOSE CLIP |
| 11 | 2 | 0E101 | SET SCREW |
| 12 | 1 | 1D71 | BRACKET |
| 13 | 2 | 0B35 | NUT |
| 14 | 2 | 0C41 | LOCK WASHER |
| 15 | 2 | 2M4 | OIL COOLER BRACKET UPPER |
| 16 | 2 | 3G36 | ADAPTOR |




ALL ENGINES

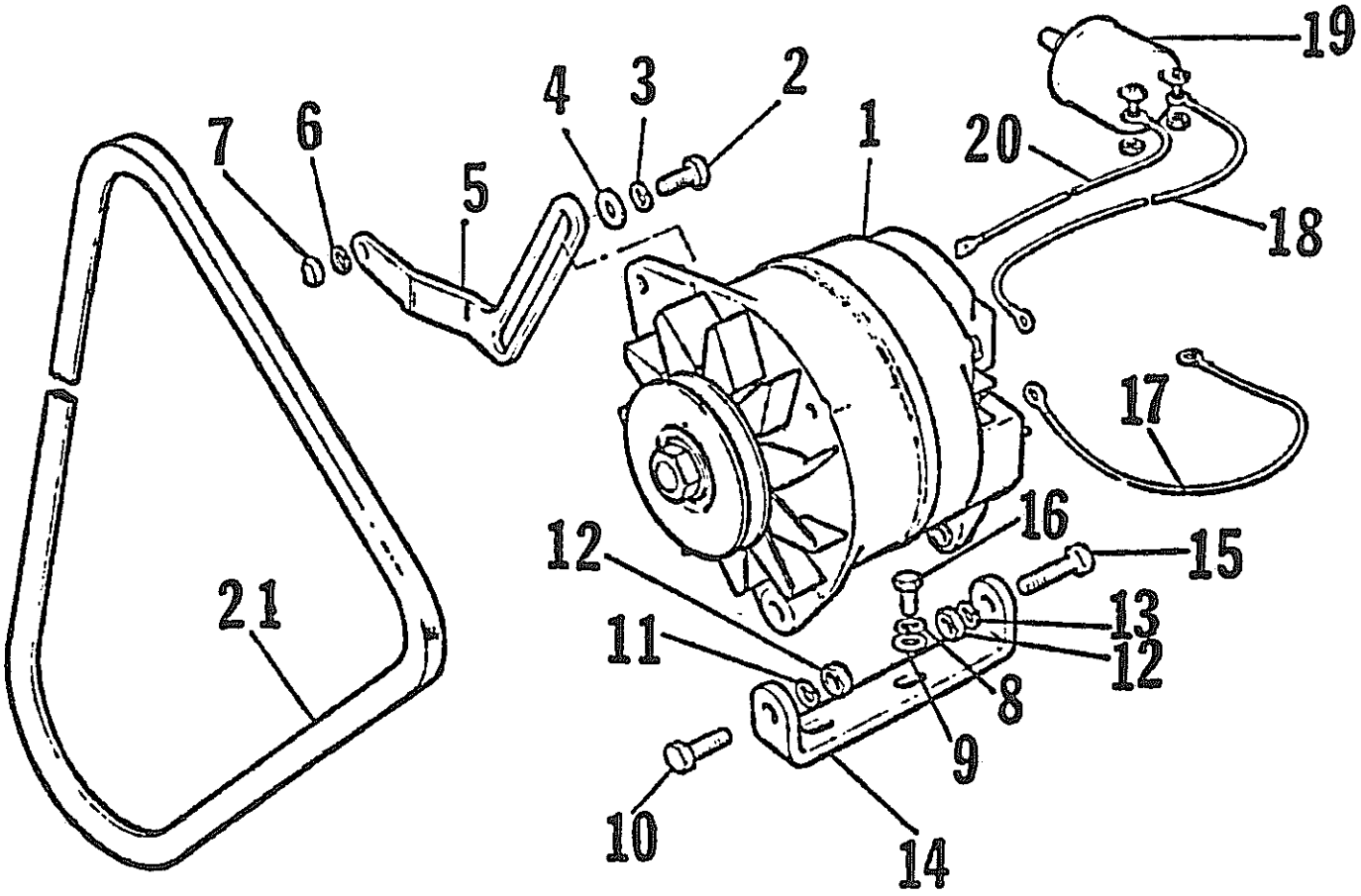
STOP SOLENOID

| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | SOLENOID | 2E211 |
| 2 | 2 | BOLT | OE101 |
| 3 | 1 | CABLE CLAMP | EC104 |
| 4 | 2 | BOLT 10/32 | OA3 |
| 5 | 2 | FLAT WASHER | OC20 |
| 6 | 2 | LOCK WASHER | OC21 |
| 7 | 2 | NUT | OB15 |
| 8 | 1 | SWIVEL JOINT | 3L43 |
| 9 | 1 | NUT | OB15 |
| 10 | 1 | ROD | 1B79 |
| 11 | 1 | NUT | OB15 |
| 12 | 1 | BALL JOINT | EC103 |
| 13 | 1 | COTTER PIN | 2K353 |
| 14 | 1 | WAVEY WASHER | OC23 |
| 15 | 1 | FLAT COPPER WASHER | OC24 |
| 16 | 1 | PIVOT | EC115 |
| 17 | 1 | BRACKET | 1B81 |
| 18 | 2 | LOCK WASHER | OC5 |
| 19 | 2 | NUT | OB1 |
| 20 | 1 | LOCK WASHER | OC21 |
| 21 | 1 | BOLT M10x20 | OGE301 |
| 22 | 1 | CAP SCREW | OE201 |
| 23 | 1 | LOCK WASHER | OGC38 |


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

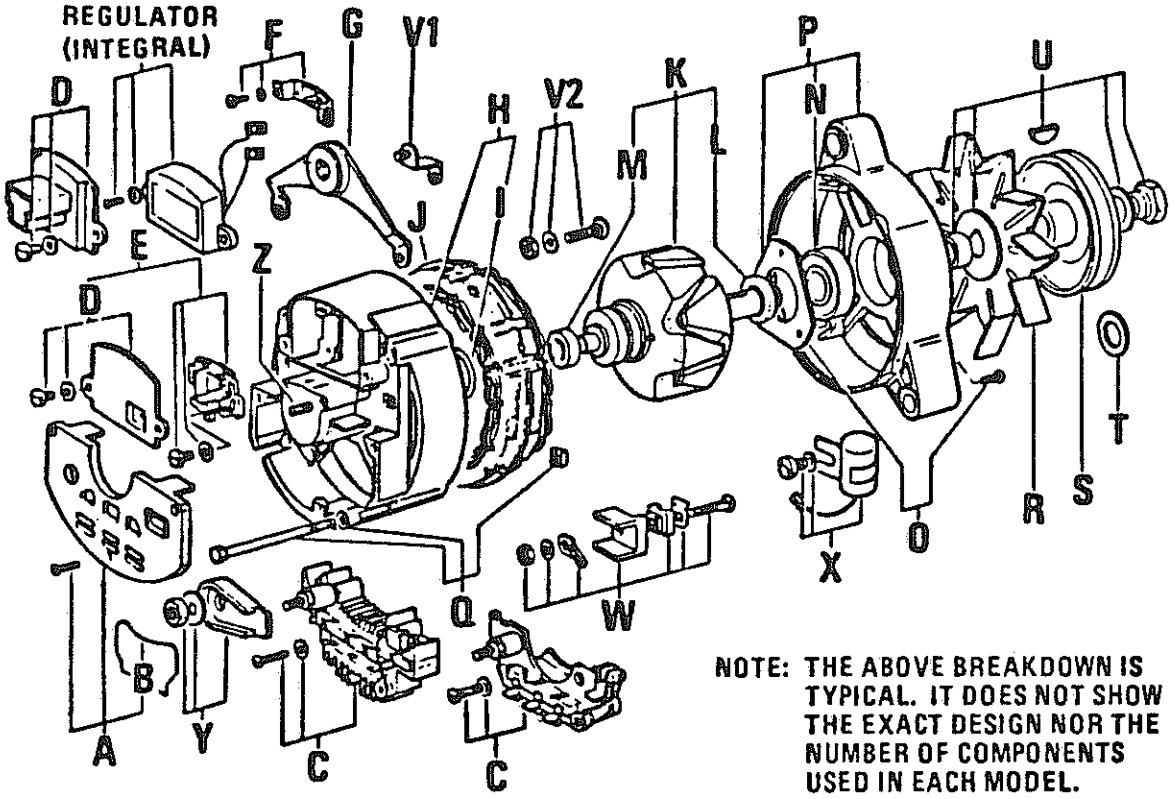
SP225

| KEY | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | 2E7 | ALTERNATOR 70 AMP |
| 2 | 1 | 2E206 | SWITCH |
| 3 | 1 | 2E400 | LINK WIRE ASSY |
| 4 | 1 | 2E401 | LINK WIRE ASSY |
| 5 | 1 | 2B240 | BELT, MATCHED SET |
| 6 | 1 | 2M40 | ADJUSTING ARM |
| 7 | 1 | OGC30 | WASHER |
| 8 | 1 | OGC31 | WASHER |
| 9 | 1 | OGE202 | BOLT |
| 10 | 2 | OE201 | BOLT |
| 11 | 1 | OE204 | BOLT |
| 12 | 3 | OB26 | NUT |
| 13 | 5 | OC31 | LOCK WASHER |
| 14 | 1 | 2M44 | PIVOT BRACKET |
| 15 | 1 | 2B25 | TWIN PULLEY |
| 16 | 1 | OE202 | BOLT |
| 17 | 1 | 2E450 | BLOCKING DIODE (NOT SHOWN) |
| 18 | 1 | 2E406 | TAIL WIRE (NOT SHOWN) |




SD80/SP90/SD120/SP135

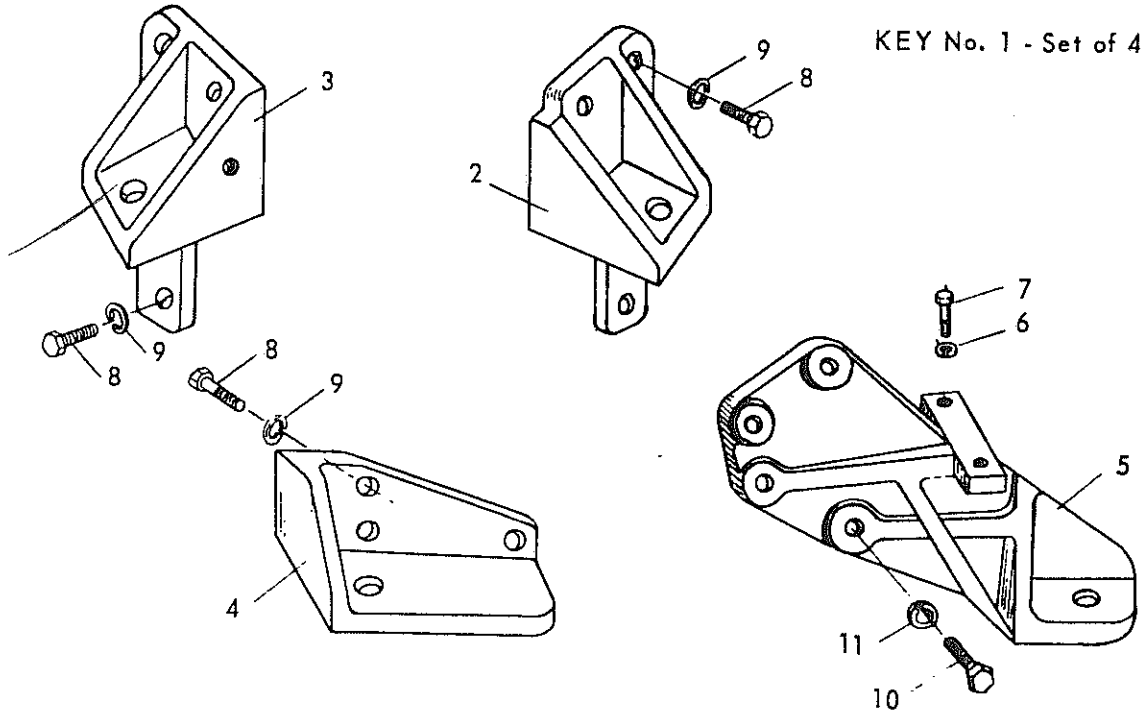
| KEY | QTY | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | 1 | ALTERNATOR, 70AMP. | 2E7 |
| 2 | 1 | BOLT | OGE202 |
| 3 | 1 | LOCK WASHER | OGC31 |
| 4 | 1 | FLAT WASHER | OGC30 |
| 5 | 1 | ADJUSTING BRACKET | 2M19 |
| 6 | 1 | WASHER | OC31 |
| 7 | 1 | NUT | OB26 |
| 8 | 2 | LOCK WASHER | OC31 |
| 9 | 2 | FLAT WASHER | OC30 |
| 10 | 1 | BOLT | OE202 |
| 11 | 1 | LOCK WASHER | OC31 |
| 12 | 2 | NUT | OB26 |
| 13 | 1 | LOCK WASHER | OC31 |
| 14 | 1 | PIVOT BRACKET | 1E43 |
| 15 | 1 | BOLT | OE204 |
| 16 | 2 | BOLT | OE201 |
| 17 | 1 | WIRE ASSEMBLY | 2E405 |
| 18 | 1 | WIRE ASSEMBLY | 2E401 |
| 19 | 1 | OIL PRESSURE SWITCH | 2E206 |
| 20 | 1 | WIRE ASSEMBLY | 2E400 |
| 21 | 1 | V-BELT | 2B209 |



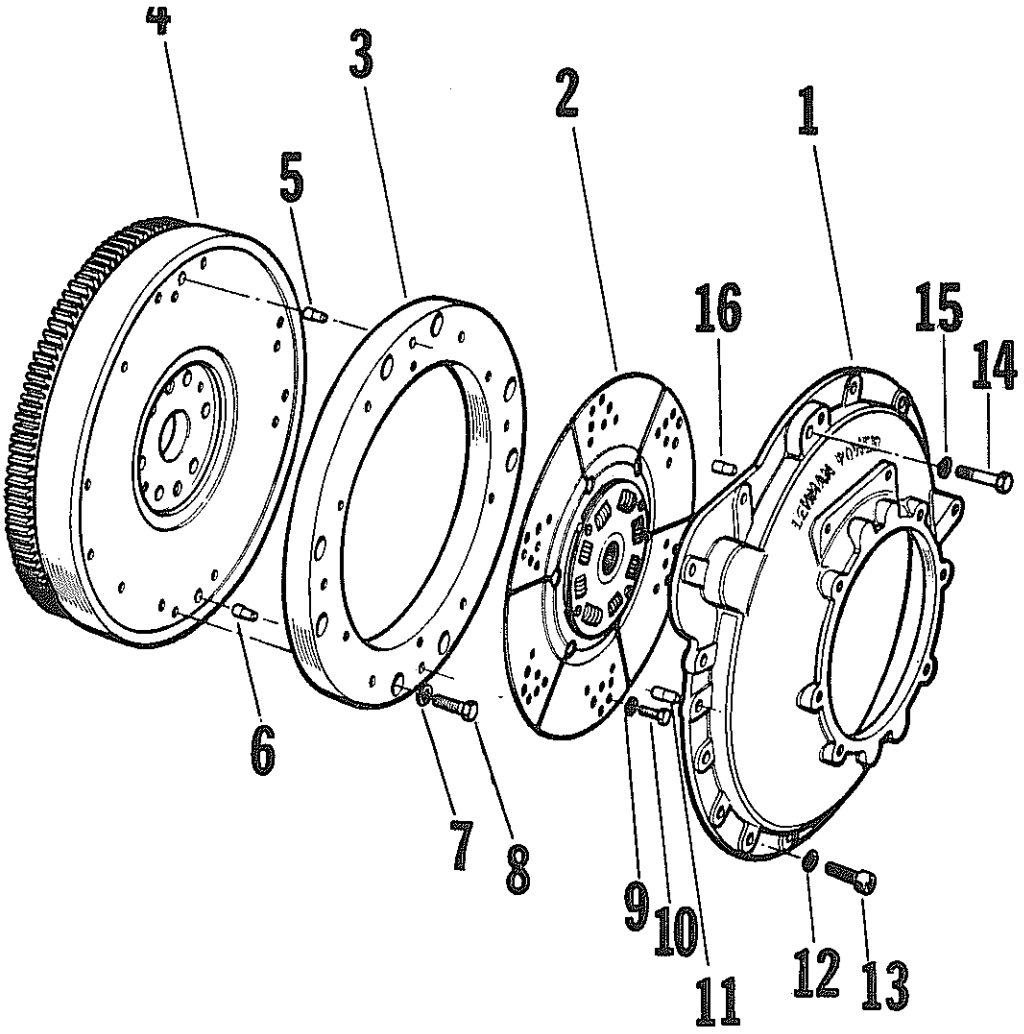

**NOTE: THE ABOVE BREAKDOWN IS TYPICAL. IT DOES NOT SHOW THE EXACT DESIGN NOR THE NUMBER OF COMPONENTS USED IN EACH MODEL.**

| 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 |

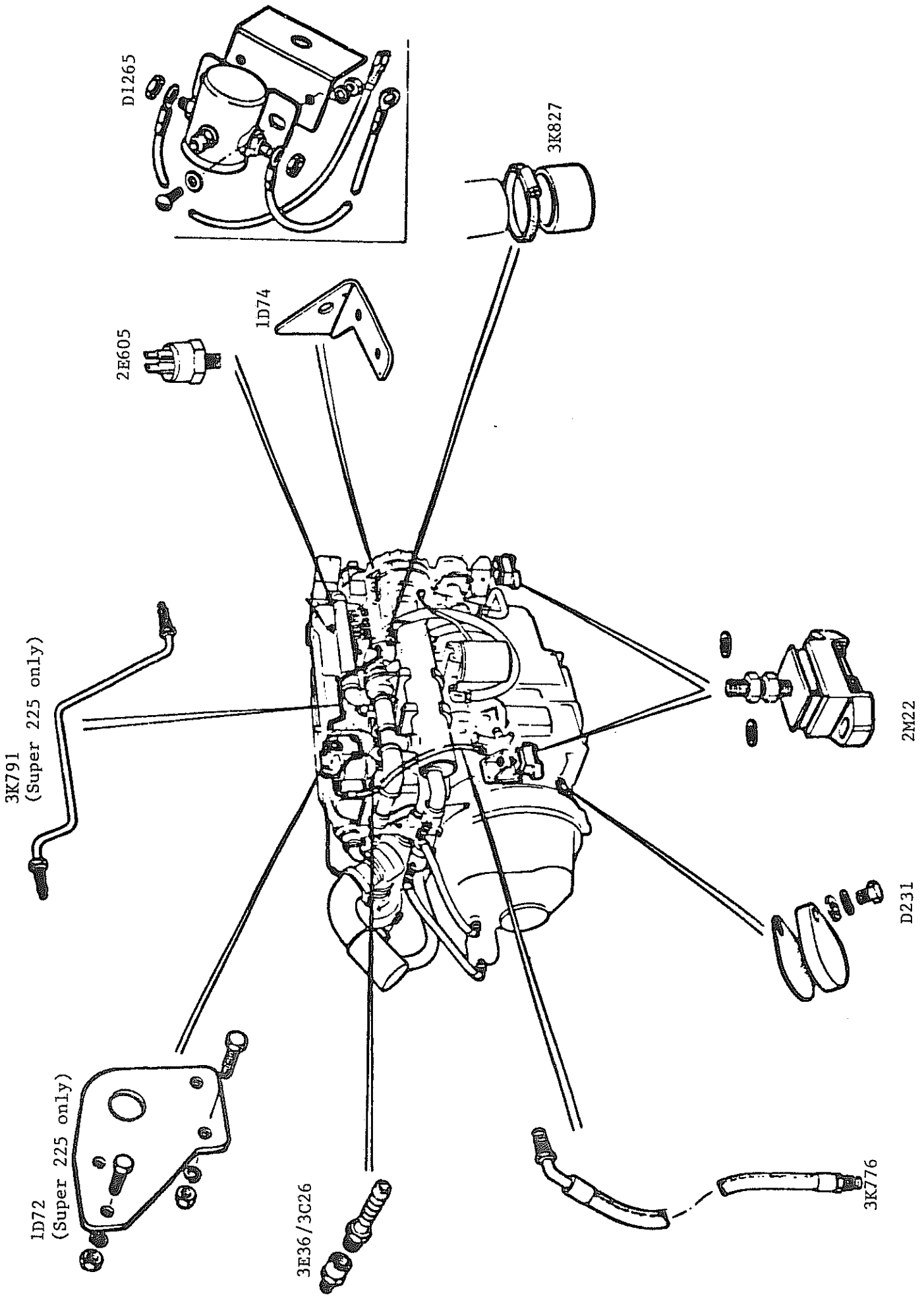
# ENGINE SUPPORTS




| KEY | ENGINE | QUAN | CODE | PART NO. | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | ALL | 1 | L | D660 | ENGINE SUPPORTS (SET OF 4) |
| 2 | ALL | 1 | L | 1A407 | SUPPORT, LEFT REAR (528) |
| 3 | ALL | 1 | L | 1A406 | 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" |

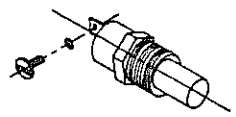



| KEY | QUANTITY | DESCRIPTION | | LEHMAN NUMBER |
|---|---|---|---|---|
| 1 | 1 | FLYWHEEL HOUSING | | 1A392 |
| 2 | 1 | DAMPER | | 2L7 |
| 3 | 1 | FLYWHEEL INERTIA RING) | | |
| 4 | 1 | FLYWHEEL ) | | |
| 5 | 1 | DOWEL ) | | |
| 6 | 1 | DOWEL ) | ONE ASSEMBLY | 1A415 |
| 7 | 6 | LOCK WASHER ) | | |
| 8 | 6 | BOLT ) | | |
| 9 | 3 | LOCK WASHER | | 0C31 |
| 10 | 3 | BOLT | | 0E201C |
| 11 | 2 | DOWEL | | 2K207 |
| 12 | 14 | LOCK WASHER | | 0C51 |
| 13 | 14 | BOLT | | 0E403 |
| 14 | 1 | BOLT | | 0E405 |
| 15 | 1 | LOCK WASHER | | 0C51 |
| 16 | 2 | DOWEL | | 2K207 |

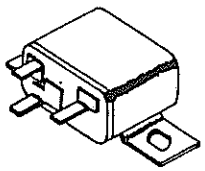

D1265
3K827
2E605
1D74
3K791
(Super 225 only)
2M22
D231
1D72
(Super 225 only)
3E36/3C26
3K776

# EK31 and EK32 ALARM SYSTEMS

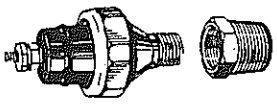
| CODE | PART | DESCRIPTION |
|---|---|---|
| L | EG302 | OIL ALARM SENDING UNIT, 1/8" NPT |
| L | 3G9 | BUSHING, 1/8 x 3/8 NPT |
| L | EG403 | ALARM TEMPERATURE SENDER, 3/8" NPT |
| L | EI600 | RELAY |
| L | EI601 | BUZZER |



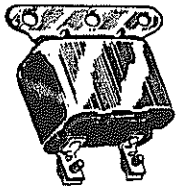
TEMP SENDER



RELAY

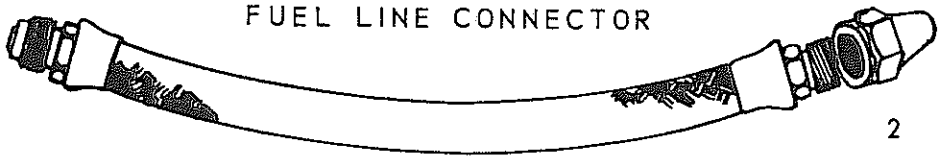


OIL SENDER BUSHING



BUZZER

## FUEL LINE CONNECTOR



2

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

## D1496.A WATER HEATER CONNECTION KIT

| KEY | QUAN | PART NO. | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | D1496.A | WATER HEATER CONNECTION KIT |
| 2 | 2 | 3G24 | HOSE BARB |
| 3 | 2 | 3E498 | ADAPTOR |
| 4 | 2 | 3F12 | TEE |

# "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. 115 for SD80/SP90

KIT No. 117 for SD120/SP135

KIT No. 119 for SP160

KIT No. 121 for SP225

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. 116 for SD80/SP90

KIT No. 118 for SD120/SP135

KIT No. 120 for SP160

KIT No. 122 for SP225

## MANUALS, PARTS LISTS, Etc.

| PART NO. | DESCRIPTION |
|---|---|
| 4C90 | FORD ENGINE REBUILDING (SHOP) MANUAL Volume 1 |
| 4C90A | FORD ENGINE MANUAL Volume 2 (Electrical) |
| 4C70 | PARAGON P30 & P40 SERIES (LEHMAN 155 & 156 |
| 4C71 | WARNER 71 (LEHMAN 71) TRANSMISSION ONLY |
| 4C72 | WARNER 72 (LEHMAN 72) TRANSMISSION ONLY |
| 4C73 | WARNER 73 (LEHMAN 73) TRANSMISSION (DIRECT DRIVE & REDUCTION) |
| 4C74 | WARNER 1.5 REDUCTIONS ONLY |
| 4C75 | WARNER 1.9 REDUCTIONS ONLY |
| 4C76 | WARNER 2.1 REDUCTIONS ONLY |
| 4C77 | WARNER 2.5 & 2.9 REDUCTIONS ONLY |
| 4C78 | WARNER VEE DRIVE (ALL RATIOS) |
| 4C79 | WARNER DROP CENTER (LEHMAN 161 & 162) TRANSMISSION & REDUCTIONS |
| 4C80 | WARNER GENERAL INSTALLATION MANUAL |