MARINE POWER

A CHRIS-CRAFT COMPANY

MODEL 454

Thermocon Marine Engine

REPRINT #2

OWNER'S MANUAL

PART NO. 16.99-08805

TABLE OF CONTENTS

MARINE POWER CORPORATION DEC. 1979 Printed in U.S.A.

TO ORDER PARTS

ENGINE MODEL and ENGINE SERIAL NUMBER must be furnished when replacement parts are required.

The model designation (*) and serial number (*) will be found stamped into a plate fastened on top of the exhaust manifold.

NOTICE: EARLIER MODELS WILL HAVE THE SERIAL NUMBER STAMPED ON THE SIDE OF EXHAUST MANIFOLD.

ILLUSTRATION OF ENGINE PLATE

(plate shown is for left hand rotation engine)

—IMPORTANT NOTICE—

THE USAGE OF STANDARD AUTOMOTIVE ENGINE PARTS IN A MARINE APPLICATION IS NOT RECOMMENDED BY MARINE POWER CORPORATION. SERIOUS COMPLICATIONS MAY ARISE WHEN ATTEMPTING TO DO SO.

Order parts from your nearest Chris-Craft dealer, Marine Power distributor, or Marine Power Corporation, Service Department 2001 Point Tremble Road, Algonac, Michigan 48001; Phone 1-313-794-4944.

For the best performance from your engine—
INSIST ON GENUINE MARINE POWER PARTS.

Instructions, specifications and illustrations shown are in accordance with experience and product information as developed at time of publication. The right is reserved to make changes at any time without notice.

ENGINE SPECIFICATIONS

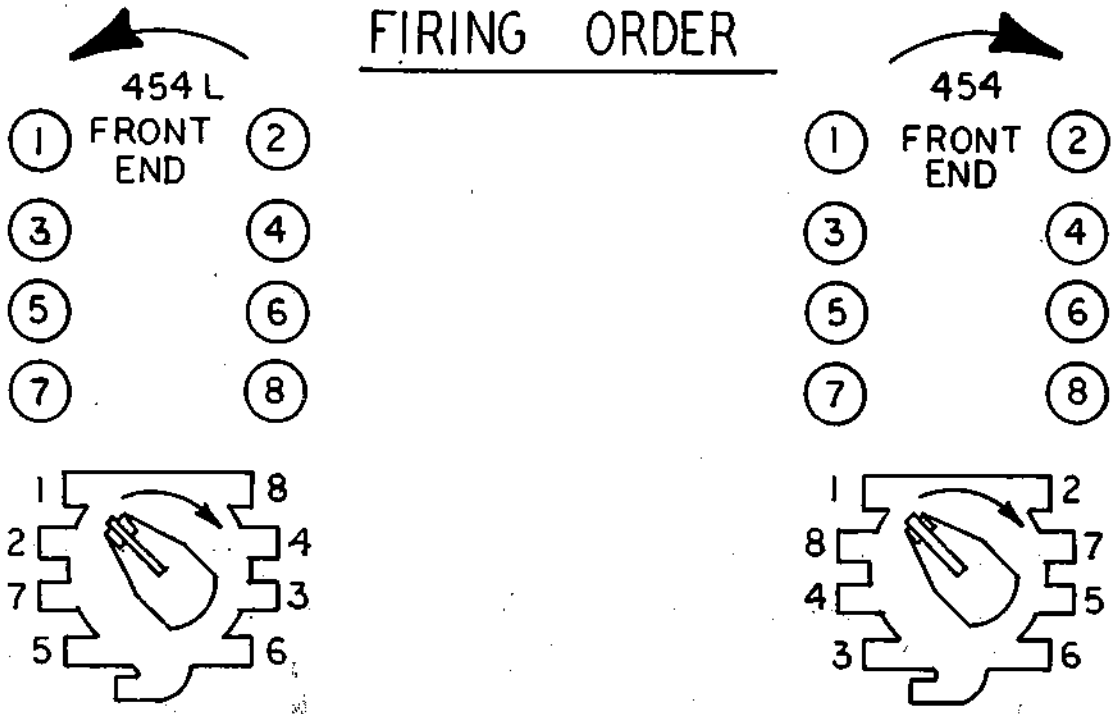
MODEL 454

Horsepower	330 at 4200 RPM
Maximum Torque	440 ft. lbs. at 3500 RPM
Bore	4¼ inches
Stroke	4 inches
Piston Displacement	454 cubic inches
Type	4 Cycle, Valve-in-Head, V-8
Revolutions	A maximum cruising speed not in excess of 85% of full throttle RPM is recommended.
Nominal Compression Ratio	8.5-1
Minimum Recommended Idle Speed	600 RPM (IN GEAR)
Engine Compression Gauge Readings	155 lbs. PSI (Not to vary more than 15 lbs. between any two cylinders.)
Oil Pressure	10 lbs. at Idle (Approximate) (Hot) 40 lbs. Maximum Speed (hot) 60 lbs. Maximum Speed (cold)
Oil Pan Capacity	Approximately 6 to 8 qts. (Capacity will vary with installation angle.)
Carburetion	Single four-barrel downdraft carburetor
Electrical System	12 Volt Hi-Output alternator-U.L. Listed Regulator controlled - Negative Ground
Reverse Gear Lubrication	Separate System 454 & 454-15 ..... 2 qts. 454-20 ..... 3 qts. 454-25 & 454-30 ..... 3.75 qts. 454-B (in reverse gear) ..... 2.5 qts. 454-B (in "V" drive unit) ..... 1.5 qts.

ADJUSTMENT INFORMATION

Spark Plug — 16.62-08737	Gap .035"
Distributor Point Gap (Mallory Distributor) (Single Point)	Gap .018" Cam Angle Dwell 28-30°
Distributor Point Gap (Mallory Distributor) (Dual Point)	Gap .020" Cam Angle Dwell (one set) . 26° Total 31°-35°
Distributor Point Gap (Prestolite Distributor) (Single Point)	Gap .017" Cam Angle Dwell 28-34°

FIRING ORDER



L.H. ROTATION

R.H. ROTATION

MODEL	ROTATION FROM FLYWHEEL END	FIRING ORDER
454	CLOCKWISE	1-2-7-5-6-3-4-8
454 L	COUNTER-CLOCKWISE	1-8-4-3-6-5-7-2

TORQUE SPECIFICATIONS

(Oiled threads)

Cylinder Head	80 ft. lbs.
Connecting Rod	50 ft. lbs.
Main Bearings	110 ft. lbs.
Flywheel	65 ft. lbs.
Intake Manifold	30 ft. lbs.
Exhaust Manifold	20 ft. lbs.
Spark Plug	15 ft. lbs.

YOUR NEW MARINE POWER MARINE ENGINE

Your Marine Power Marine Engine with power-plus performance is the product of long-term, skillful engineering combined with careful manufacturing and exhaustive testing. Marine Power's years of practical experience in the marine field are packed into every engine leaving our plant. With reasonable care during operation and a minimum amount of maintenance this engine will deliver a maximum amount of dependable, economical performance and long life.

IDENTIFICATION

On every engine there is a plate on top of the exhaust manifold giving the model and serial number. This information is important and must be included in all parts orders and correspondence relating to the engine. NOTE: On earlier models the Serial No. will be stamp on side of exhaust manifold.

USE GENUINE FACTORY REPLACEMENT PARTS

All Marine Power Marine Engines have special parts designed to give the best performance under conditions found only in marine use. To insure long life and dependable performance we strongly recommend that only factory replacement parts be used. These may be obtained from your Marine Power Dealer.

TO START ENGINE

Before starting the new engine check the oil level in the crankcase. Check fuel in tank and ventilate engine compartment thoroughly. Shift the drive unit to neutral position. Open the throttle to full open, then close to approximately 1/3 open.

With ignition key, turn on switch and engage the starter. Do not engage the starter for prolonged periods. If the engine does not start immediately, investigate the cause of trouble. As soon as the engine starts release the starter. Check to make sure that oil pressure is present and that cooling water is circulating.

The engine is equipped with an automatic choke. If the engine does not start due to flooding the throttle should be opened fully which will reduce the choking action. The starter should be engaged with throttle opened fully. As soon as engine starts close the throttle.

The engine should be idling below 1000 RPM before shifting into forward or reverse.

BREAK-IN

It is very important that the engine be broken in properly. All moving parts in the engine are new and have only been run for a few hours while the engine had its final test. Engines must be run carefully in the beginning until all parts are worn in and the engine becomes limber. Only then will it be safe to run the engine fast for sustained periods of time.

Running new engines or engines after a major overhaul at excessively low RPM for long periods should be avoided because it will tend to prolong the break-in period and delay proper seating of piston rings.

During the first twenty hours of operation, the engine should be run at moderate R.P.M. and at varied speeds. Avoid prolonged idle or trolling speed during this period. These procedures will contribute to a longer engine life.

During the entire life of the engine always run the engine at medium speeds to allow the oil to warm up before running at sustained high speeds. **When coming to the dock after a run always allow the engine to run at moderate speed for three to five minutes before turning off the ignition. This can be done by slowing down several hundred yards before you get to the dock or letting the engine idle after you have docked. This allows the valves to cool down while the water is still circulating thru the engine and will help prevent warped valves.**

LUBRICATION SYSTEM

OIL PRESSURE

Form the habit of watching the oil pressure gauge or light. Advance notice of serious trouble is nearly always indicated by oil pressure reading.

Oil pressure should be approximately 10 lbs. at idle speed and 35 to 45 lbs. at maximum speed with the engine hot.

ENGINE OIL RECOMMENDATION

Marine Power Marine Engines should be serviced with oil of good quality to insure smooth operation, freedom from trouble and best engine performance obtainable. A Marine Engine works at maximum capacity 90% of the time while an automobile engine rarely works at its maximum even 10-15% of the time. Therefore, the requirements for a good lubricating oil are far greater in a Marine Engine.

We recommend the use of S.A.E. No. 30 or 10W-40 lubricating oil containing detergents and additives conforming to API service classification SE and military specifications MIL-L-46152. It is not recommended that different brands of oil be mixed. Always replenish with the same make and type of oil that is in the crankcase. If it is necessary to change the make of oil, drain the crankcase completely before refilling.

TO CHANGE ENGINE OIL

The new engine, when shipped, is filled with S.A.E. 10W-30 break-in oil. After fifteen to twenty hours of running, replace with S.A.E. 30 or 10W-40 motor oil and also replace the oil filter. Subsequent oil and filter changes should be made every fifty to one hundred hours, depending on the type of service to which the engine is subjected. An engine used for short runs only will require an oil change more often than an engine used for long runs. During the longer run, the oil attains the proper operating temperature thereby reducing the possibility of contamination.

The best method for removing crankcase oil is with a suction pump. Insert the suction hose thru the oil dipstick tube. Most marine service stations are equipped with special pumps for removing oil, or a suitable oil sump pump (48.28-12948) may be purchased from your Marine Power Dealer.

The engine holds approximately six to eight quarts of oil with filter. The amount of oil will vary since engines are installed at different angles in different boat models.

ENGINE OIL FILTER

The full flow oil filter should be replaced in the new engine when the break-in oil is removed after fifteen to twenty hours running. Thereafter, replace the oil filter every 50 to 100 hours depending upon type of service. Approved oil filter replacements are as follows: Marine Power—16.81-08130.

If the normal oil pressure decreases at high engine speeds it may be due to a clogged oil filter. Run at reduced engine speed and change the oil filter promptly.

TO CHANGE REVERSE GEAR OIL

The hydraulic reverse gear has an oil supply that is separate from the engine oil supply and therefore requires individual checking and replacing. The best method for removing reverse gear oil is with a suction pump. Insert the suction hose thru the dipstick tube. We recommend the use of Dexron "II or Type "F" Transmission Fluid, which should be changed in the new engine when the break-in oil is removed after fifteen to twenty hours running and thereafter every 100 hours or once each season, whichever comes first.

When filling for the first time or refilling after an oil change, check the level after running for a few minutes to make certain that the oil cooler and the various passages are full. If necessary, refill to the mark on the dipstick to ensure proper operation of the transmission. The transmission oil level should be checked each time the engine oil level is checked, before running the engine. CAUTION: DO NOT OVER FILL.

OIL LEVEL IS CHECKED COLD which will permit checking reverse gear and engine oil level at the same time. Maintain oil level at mark on dipstick.

ELECTRICAL SYSTEM

e engine has a 12 volt electrical system. The starter, .ernator, regulator, distributor and coil all have identification affixed denoting the respective manufacturer. These units are warranted and serviced by these manufacturers. Apply directly to the manufacturer's distributor or dealer for warranty or service on these units.

It is important that all electrical connections be periodically inspected. Make certain that the condition of the insulation on all wires is good and all mechanical connections are tight and free from corrosion. In boats operated in salt water it is especially important that all connections be inspected two or three times each year. If necessary each connection should be taken apart, cleaned with fine sandpaper, given a light coating of CRC or petroleum jelly to retard corrosion and tightly reconnected. Battery terminals should be cleaned often with water and baking soda, coated with petroleum jelly and reconnected. High tension leads must be in good condition. Even a small crack in the insulation might permit oil or moisture to cause a partial ground requiring replacement of the lead. Spraying all of the electrical units, terminals and high tension wires with CRC, or equivalent, at each engine oil change helps to reduce corrosion and damage from dampness.

IGNITION CIRCUIT

The explosion proof distributor should be inspected every 100 operating hours or not less than every six months. After removing the distributor cap inspect the breaker contacts. If the contacts are grayish in color and are not more than slightly pitted they need not be replaced. We recommend that new breaker contacts be installed when required rather than attempting to reface the old contacts.

Breaker contacts should be set with a gap of .020" inch or 33° dwell in the Mallory distributor. The ignition ing should always be reset using a timing light each time the breaker contacts are adjusted and each 100 hours of operation. Inspect all wires and connections and clean up any corrosion at connections if present.

Spark plugs should be cleaned and regapped periodically. Make certain there are no cracks in the porcelain and that the terminals are clean and tight. Any spark plug which is found to have burned or badly worn electrodes should be replaced. For Model 454, Marine Power Engines we recommend "AC" spark plugs. Correct gap is .035 inch.

ALTERNATOR AND VOLTAGE REGULATOR

The engine is equipped with a Yacht Safety Bureau Approved Hi-Output Alternator. The alternator produces alternating current which is changed to direct current by a self contained rectifier. Alternators have the advantage of charging at low engine RPM which makes them ideal for marine use.

The following precautions should be observed to prevent damage to the alternator:

1. Engine is wired with a negative gound system. Do not reverse polarity.
2. When using a dockside battery charger disconnect battery terminals. Never use a "fast charger" to supply starting voltage.
3. Be careful not to accidentally ground the field circuit or output terminal on the alternator.
4. Never disconnect battery leads when the engine is running since this will damage the alternator diodes.
5. Be sure all electrical connections are tight. A loose connection can destroy the voltage regulator.

ALTERNATOR MAINTENANCE

Make sure the alternator is mounted securely in place. Check the drive belt tension and alignment carefully, particularly after installation of new belts. Retightening new belts is necessary after a few hours operation or after storage.

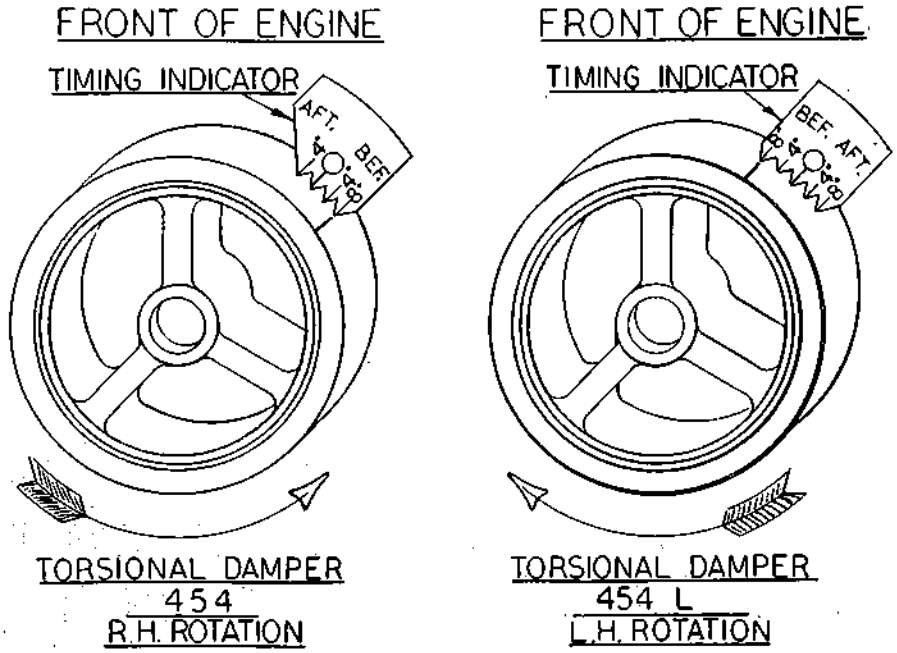
NOTE: If the alternator fan can be rotated by pulling on a fan blade with one finger, the belt is too loose and must be tightened.

The alternator should only be adjusted by authorized service stations which have instruments and information necessary to correctly repair this unit. The voltage regulator is a sealed unit and does not require servicing.

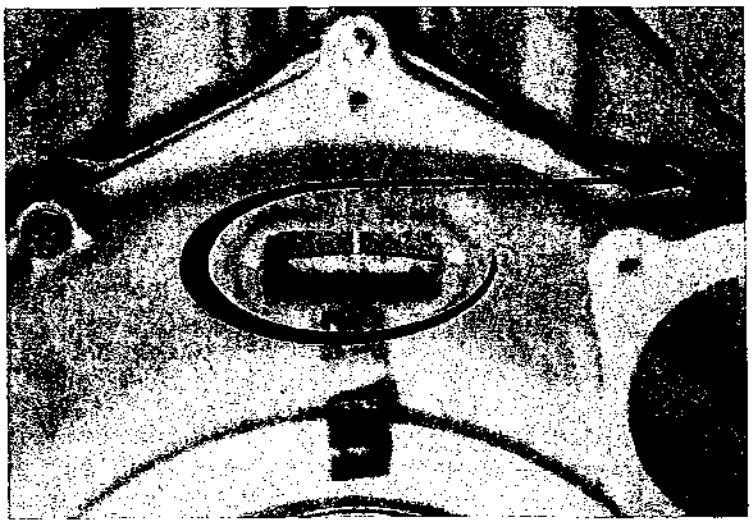
IGNITION TIMING

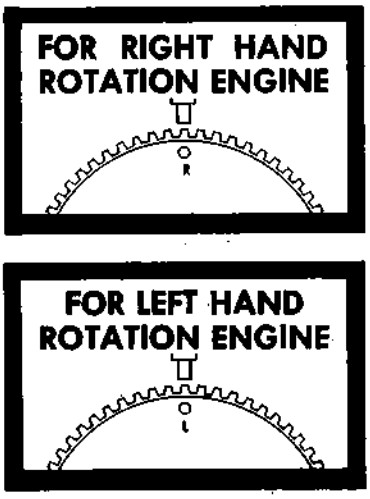
To set the ignition timing, use a timing light. The torsional damper at the front of the engine is provided with a saw mark, indicating T.D.C. This mark should be aligned with the 8° B.T.D.C. mark on the timing indicator, which is attached to the timing chain cover. The ignition timing should be rechecked after tightening the distributor hold down to be sure it is properly set. CAUTION: WHEN SETTING THE IGNITION TIMING, DO NOT LET THE ENGINE IDLE SPEED EXCEED 700 R.P.M.

IGNITION TIMING — [FRONT]



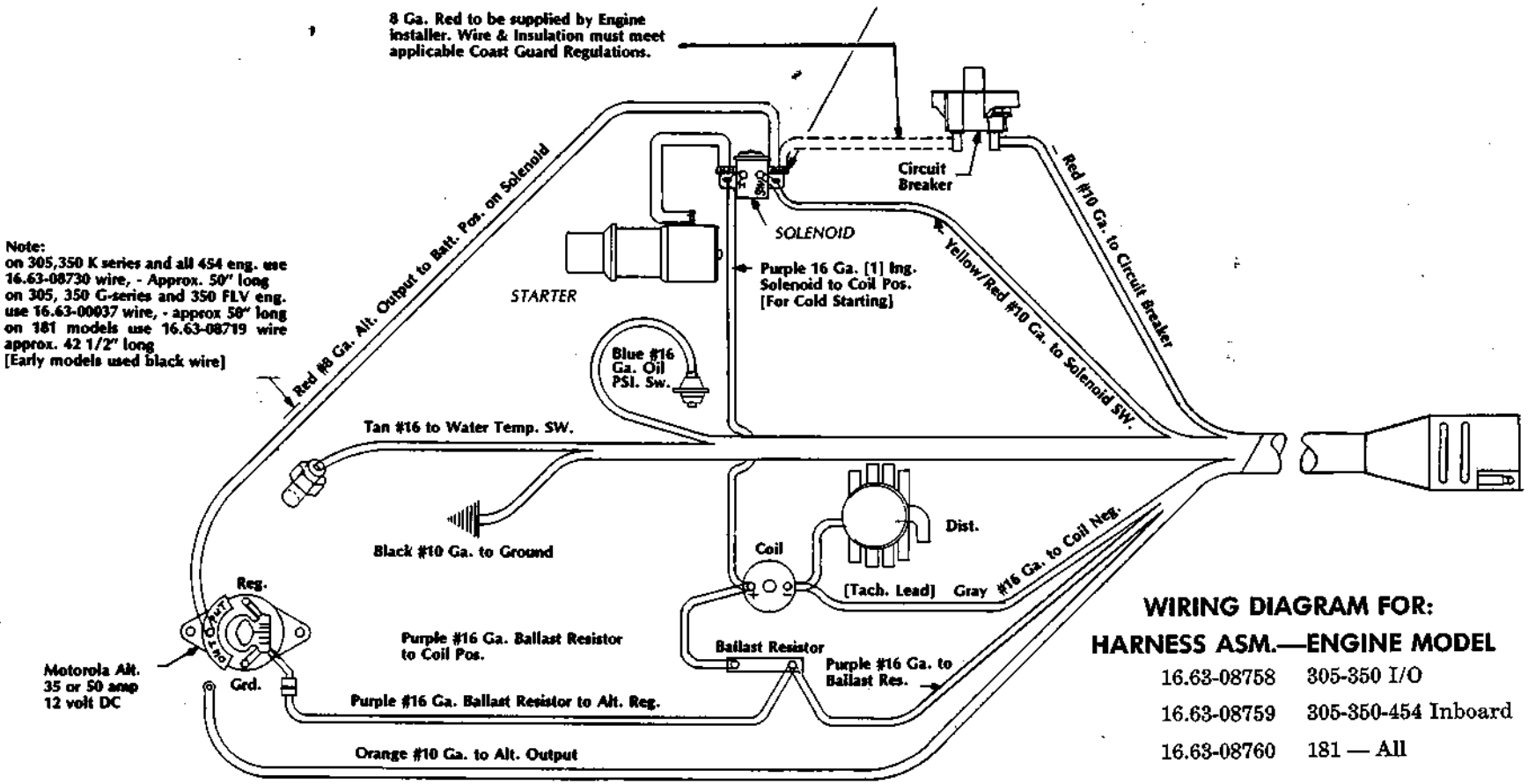
IGNITION TIMING — [REAR]





IGNITION TIMING PROCEDURE: In the event the harmonic damper on your engine is inaccessible for you to set the initial timing of the marine engine, late model Marine Power engines have been designed so that you may set engine ignition timing at the flywheel on the engine. 1. Remove plate marked "16.70-00200" attached to the flywheel housing. 2. Align correct engine rotation marking on flywheel with stainless steel pin. Once the mark and pin have been properly aligned, no additional distributor adjustment is necessary. Your marine engine is now correctly timed at 8 degrees "before top dead center".

ENGINE WIRING DIAGRAM
MODEL 454 WITH ALTERNATOR



WIRING DIAGRAM FOR:

HARNESS ASM.—	ENGINE MODEL
16.63-08758	305-350 I/O
16.63-08759	305-350-454 Inboard
16.63-08760	181 — All

Standard wiring is suitable for voltmeter or alternator indicator light. When using ammeter, see the engine installation recommendations below

INSTRUMENTS

An oil pressure gauge, tachometer, water temperature gauge and voltmeter (or ammeter) should be installed. An electric tachometer is recommended if there is no mechanical tachometer drive on the engine. If an ammeter is desired, the 16.63-08719 wire from the alternator output to the starter solenoid should be removed and discarded. Also the orange wire should be moved from the alternator auxiliary terminal to the output terminal.

STARTING MOTOR

No periodic lubrication of the starting motor or solenoid is required. Since the starting motor and brushes cannot be inspected without disassembling the unit, no service is required on these units between overhaul periods.

BATTERY

The battery should be kept near full charge. To check the condition of the battery, specific gravity readings should be taken. For further detail concerning batteries consult your Boat Owner's Manual.

Also keep the battery filled with pure water to the proper level (distilled water is best). Never let the level go below the top of the plates in the battery.

FUEL SYSTEM

It is very important that the gasoline used meets the requirements for your engine. Use of gasoline which does not meet these requirements can result in burned valves and pistons, poor engine performance and shorter engine life.

FUEL RECOMMENDATION

Gasoline used for this engine should be regular marine leaded or low lead gasoline of at least 92 research octane number. (87 antiknock index or number designation 2 as defined by the Cost of Living Council.)

CAUTION: When purchasing gasoline, be very careful not to get research octane confused with antiknock index (or octane number).

The use of marine white or unleaded gasoline should be avoided.

GASOLINE CONSUMPTION

GASOLINE CONSUMPTION
(gallons per hour)

MODEL	2400 RPM	2800 RPM	3200 RPM	3600 RPM	4000 RPM	4200 RPM
454	8.7	11.4	14.7	18.6	22.8	25.2

Note: This chart is based on the assumption that the top engine speed for the boat is 4200 RPM on the 454. If maximum speed is less than stated, fuel consumption will be somewhat higher at the intermediate speeds.

These figures were obtained by running the engine on a test stand under simulated propeller loads and are not guaranteed. To obtain accurate fuel consumption information for any boat, actual tests must be made by the boat owner under his particular operating and load conditions.

Port

CARBURETOR & FUEL LINES

The carburetor is warranted and serviced by the manufacturer and his distributors.

It is important that all fuel connections be kept tight and that dirt be kept out of the carburetor. Clean the carburetor flame arrestor regularly.

The carburetor is equipped with non-adjustable high speed jets which require no attention. The idle adjusting needles should be turned to the position where the engine idles smoothest. (600 RPM IN GEAR)

FUEL PUMP

The mechanical fuel pump furnished with the engine is warranted and serviced by the manufacturer and his distributors and should be inspected, repaired or replaced periodically as operating conditions warrant.

FUEL FILTER

The fuel filter is attached to the front of the engine on the right side. It has an extra large sediment bowl and is equipped with a pleated paper element. The paper element (16.81-00017) should be replaced at least seasonally or as operating conditions warrant.

Before removing the sediment bowl for cleaning be sure to turn off the fuel line valve to prevent gasoline from spilling in the boat. It is a good suggestion in removing the bowl to loosen it, then slip a plastic bag over the bowl and remove the bag and bowl as a unit thereby preventing gasoline from being spilled into the bilge.

VALVES

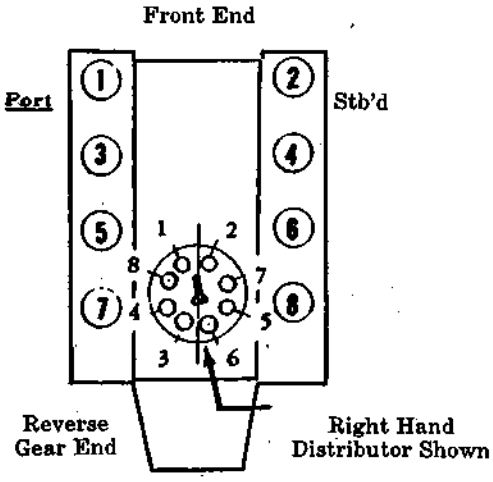
Good valve action is very important to the efficiency and smoothness of the engine. Engines operated with proper care will require a minimum amount of valve maintenance.

The need for valve service will first be indicated by loss of engine speed, increased fuel consumption and rough idling. A check of the compression in each cylinder is a reliable check of valve condition. The test should be made, with all spark plugs removed, at cranking speed with wide open throttle and engine hot. The reading will be approximately 155 P.S.I. A uniform reading on all cylinders is more important than the individual reading of each cylinder. If a low reading is shown in one or more cylinders a little oil on top of the piston will help to determine if the valves are at fault.

This engine is equipped with hydraulic valve lifters for quiet operation. It is important that the oil be kept clean to assure quiet and efficient operation. Hydraulic valve lifters very seldom require adjustment.

VALVE ADJUSTMENT

Cylinder Numbering:



Firing Order —

Right Hand Rotation	1-2-7-5-6-3-4-8
Left Hand Rotation	1-8-4-3-6-5-7-2

With No. 1 piston on top dead center, in firing position, the following valves may be adjusted.

R.H. Rotation Exhaust 1-2-5-7 Intake 1-3-4-8
L.H. Rotation Exhaust 1-3-4-8 Intake 1-2-5-7

Crank engine one complete revolution with No. 6 piston in firing position and following valves may be adjusted.

R.H. Rotation Exhaust 3-4-6-8 Intake 2-5-6-7
L.H. Rotation Exhaust 2-5-6-7 Intake 3-4-6-8

STANDARD COOLING SYSTEM

The Thermocon-Develvo marine engine cooling system is a patented arrangement which THERMOstatically CONtrols temperature at a pre-DEtermined VELocity and VOlume of water. Two water pumps (sea water and circulating), a thermostat and pressure relief valves are the primary units involved.

The sea water is taken in through an intake scoop through the bottom of the boat and through a positive displacement pump that is mounted on the right hand side of the engine. This is referred to as the sea water pump.

The seawater pump circulates water to the thermostat housing and to the reverse gear oil cooler. From the reverse gear oil cooler the water flows into two pressure relief valves, that are housed at the rear of engine. Each valve has a two-pound relief spring. Until such time that the engine is completely filled with water and has built up a two-pound back pressure, all the water from the sea water pump is forced into the thermostat housing leading to the circulating pump inlet, with the exception of a very small quantity that is allowed to pass through small vent holes in the pressure relief valves. This small quantity will go into the exhaust manifolds and overboard through the exhaust pipe. The reason for these vent holes is to eliminate any air from being trapped in this part of the system.

After the sea water pump has built up a pressure in the engine to two-pounds then the pressure relief valves are forced open by pressure from the positive displacement pump allowing the water to flow out through the exhaust pipe overboard.

The function of the sea water pump is as follows:

1. to cool the reverse gear oil to a satisfactory operating temperature.
2. to maintain a constant supply of water to the engine circulating system at all times.
3. to help cool and muffle the exhaust pipe.

The circulating system consists of a centrifugal pump mounted on the front of the engine which circulates water through the engine. The pump has one inlet and two outlets. Water from the two outlets is forced through the cylinder block, cylinder heads, and intake manifold to the thermostat housing. The water then makes one pass through the exhaust manifolds and overboard.

Located at the front end of the intake manifold is a thermostat and thermostat housing. This is a 143° to 165° thermostat. The function of this thermostat is to maintain a constant water temperature from the exhaust manifold water outlet. If the water in passing through the engine has not reached a high enough temperature to open the thermostat, it will return to the inlet of the centrifugal water pump and recirculate through the engine. If, however, the water has reached opening temperature the thremostat will allow a regulated amount of water to flow into the exhaust manifolds and overboard through the exhaust pipes. The water which passes through the thermostat is replaced by cool water from the sea water pump thus maintaining controlled engine temperature.

MAINTENANCE

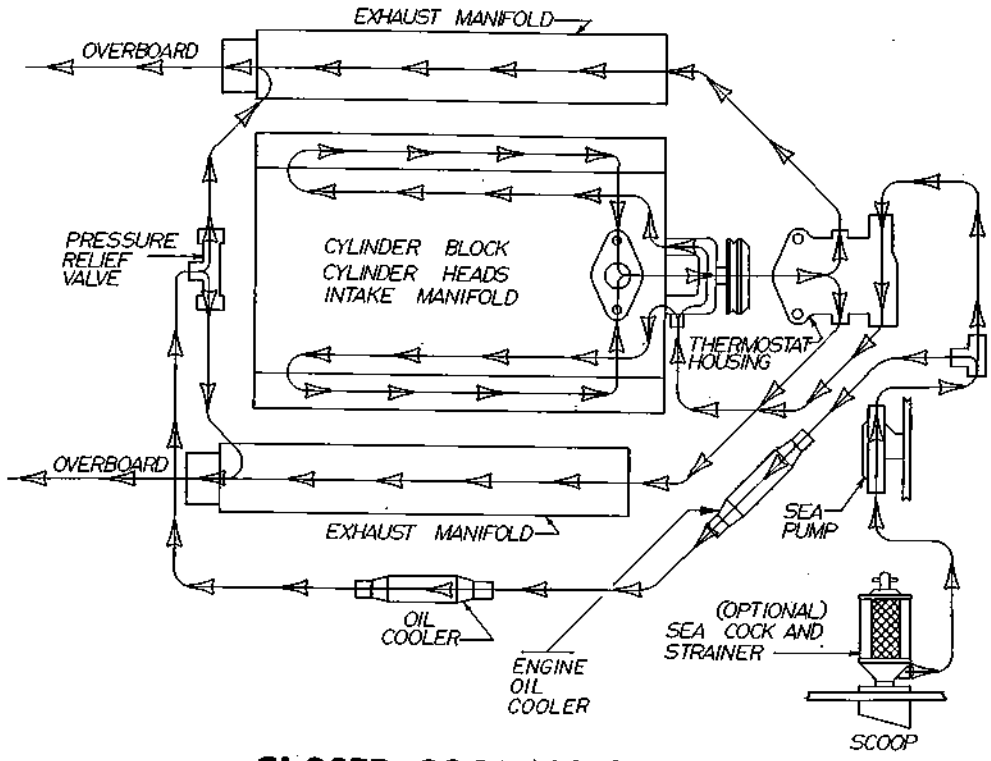
Normal maintenance for the pumps includes attention to drive belts and hoses, keeping them properly tightened and making replacement when inspection shows signs of deterioration. It is also recommended that the reverse gear oil cooler water passages be cleaned each time the oil filter is changed (100 hours). If the cooler is allowed to clog-up, efficiency will be reduced.

WATER TEMPERATURE

The operating temperature of the thermostatically controlled water cooling system is from 143°to 165°. The temperature sending element should be of such physical dimension as to extend into the water flow to insure a true temperature reading. Any radical change from this normal temperature would indicate a malfunction in the system.

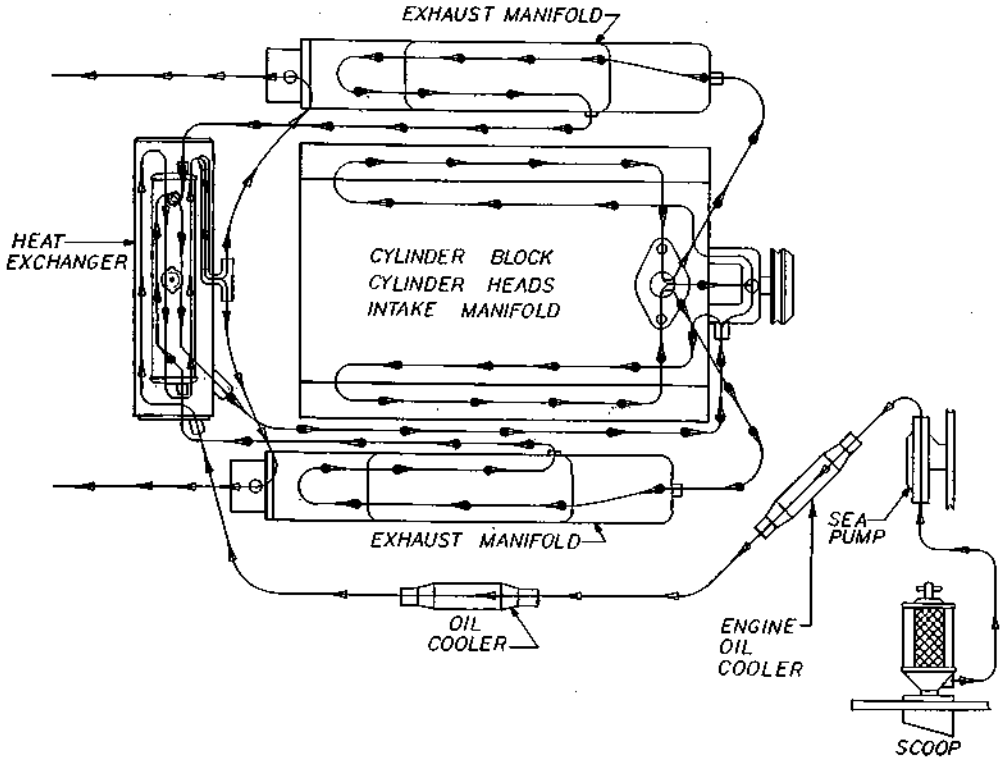
STANDARD COOLING SYSTEM

Model 454



CLOSED COOLING SYSTEM

Model 454



CLOSED COOLING SYSTEM

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The sea water is taken in through an intake scoop through the bottom of the boat and through a positive displacement pump that is mounted on the right hand side of the engine. This is referred to as the sea water pump.

The sea water pump circulates water thru the reverse gear oil cooler to the heat exchanger. From the heat exchanger the water is allowed to flow out thru the exhaust pipe and overboard.

The function of the sea water pump is as follows:

1. To cool the reverse gear oil to a satisfactory operating temperature.
2. To cool the heat exchanger, which in turn cools the circulating water.
3. To cool and muffle the exhaust pipe.

The circulating system consists of a centrifugal pump mounted on the front of the cylinder block, which circulates water through the engine. This pump has one inlet and two outlets. Water from the two outlets is forced through the cylinder block, cylinder heads and intake manifold to the heat exchanger.

A 143 to 165° thermostat is located at the front of the intake manifold. The function of this thermostat is to maintain a constant water temperature throughout the engine. If the water in passing through the engine has not reached a high enough temperature to open the thermostat, it will return to the inlet of the centrifugal water pump and recirculate through the engine.

If, however the water has reached opening temperature, the thermostat will allow a regulated amount of water to flow into exhaust manifolds and thru the heat exchanger back to the centrifugal water pump.

REVERSE GEAR

PARAGON HYDRAULIC REVERSE GEAR

The reverse gear is a self contained unit consisting of a hydraulically operated multiple disc clutch and planetary reverse gear train. The oil supply is separate from the engine and must be checked and replaced individually. Hydraulic fluid should be changed once each season or every 100 operating hours whichever comes first. Also drain and refill the reverse gear at annual lay-up time. It is recommended that shifting be done at speeds below 1000 RPM, and preferably in the 800 RPM, or idle engine range, to prolong the life of the engine, transmission, and boat.

TO CHECK OIL LEVEL

Check reverse gear oil before starting engine. Maintain oil level at high mark on dipstick. When adding or replacing fluid, always use "Dexron II" or Type "F" Automatic Transmission Fluid.
CAUTION: Do not over fill.

REVERSE GEAR ADJUSTMENT

No adjustment is necessary for the FORWARD drive multiple disc clutches. The reverse band is self adjusting to compensate for lining wear, so that no external reverse band adjustment is necessary.

SHAFT ALIGNMENT

Engine to shaft alignment should be checked after extended lay-up periods or whenever vibration becomes noticeable. Failure to immediately correct improper alignment places additional stress on the transmission, engine and drive train, resulting in early failure.

ANNUAL LAY-UP

In areas where freezing is a problem, preparing the engine becomes a major consideration because of the potential damage from freezing. This does not infer that lay-ups in more temperate climates are less important or less exacting. A thorough lay-up operation will include the following steps.

BEFORE LIFTING BOAT FROM WATER

1. Change Oil Filter, drain the engine oil and refill the crankcase. Add Marine Power Crankcase Oil Supplement, part number 56.00-20630, in the proportion of 16 ozs. for every four to six quarts of oil.
2. Drain the reverse gear and refill with new Type A Suffix A or Dexron Type Transmisson Fluid.
   EITHER OF THE FOLLOWING TWO METHODS FOR FOGGING THE ENGINE IS RECOMMENDED
3. Add Marine Power Fuel Conditioner and Valve Lubricant, part number 56.00-20629, to the gasoline supply in the proportion of 6 oz. to each 7 gallons of gasoline. We suggest running the fuel supply low at the end of the season, thereby, reducing the required amount of Fuel Conditioner. If preferred, the treated fuel may be fed from an auxiliary tank. An outboard motor gasoline tank would serve very well for this purpose. Run the engine for at least fifteen minutes to disperse the Conditioner throughout the engine. The conditioning properties lie in the residue resulting from the combustion of the Fuel Conditioner, therefore, it is very important to run the engine as directed. After approximately 15 minutes, close the fuel valves at the tank and run the engine until it stalls.
   Marine Power Fogging Oil in a handy 16 oz. spray can may be ordered from your Marine Power Dealer under part number 56.00-00204. The contents of this can is enough for two engines and the directions on the label must be followed.
4. Remove and clean the fuel filter sediment bowl and replace the pleated paper element 16.81-00017.
5. Pull the boat from the water, bow first, to insure complete drainage of the exhaust system. If the boat is lifted vertically, the same result can be accomplished by keeping the bow higher than the stern.

AFTER LIFTING BOAT FROM WATER

1. Drain the entire cooling system, and flush with fresh water. This is especially important for boats operated in salt water. Drain plugs and valves are located as follows:
   (a) Remove drain plugs in right and left exhaust manifolds. (total of four drain valves).
   (b) Remove drain valves in port and starboard side of cylinder block.
   NOTE: These openings are sometimes blocked with sediment and may require probing with a wire to dislodge the obstruction.
   (c) Open drain valve in sea water pump tee. Also, disconnect and drain hose from circulating pump to thermostat housing.
   (ca) Remove drain plug in reverse gear oil cooler.
   (d) Completely drain the sea water pump cavity of all water by opening drain valve at the pump tee and turning the engine over with the starting motor. When all trapped water has been dispelled inject a quantity of glycerine into the pump intake. Again rotate the engine to completely coat the impeller. The glycerine will prevent freeze-up and also aid in priming when the engine is reactivated.
   (e) Drain the hose running from the thru-hull water intake to the sea water pump inlet.
   (f) NOTE: Engines with closed cooling:
   (1) Disconnect and drain hose from sea water water pump to oil cooler
   (2) Remove ⅛" Hex Hd. Pipe Plugs in heat exchanger
2. Remove the battery or batteries and arrange to have them charged periodically throughout the inactive period. Wash the exterior of each battery with a soda solution to remove all traces of corrosion and acid.
3. Plug or tape the exhaust system to prevent moisture from entering valve chambers during storage.
4. Seal the flame arrestor against dirt and moisture This can be done by using an air-tight plastic bag in which to enclose the entire carburetor.
5. Cover the fuel-tank-thru-hull vents, making them airtight.
6. Repaint blemished area with Marine Power engine enamel which is available in handy "spray-on" cans from your Marine Power Dealer.
7. Apply a film of Marine Power Oil Supplement on all exposed and unpainted metal surfaces.
8. Remove the distributor cap and oil the advance mechanism. Apply a light coating of Marine Power Oil Supplement on the distributor cam. Replace the distributor cap.
9. Spray all electrical connections with CRC or its equivalent.

ANNUAL FITTING OUT

1. Replace all drain plugs and close all drain valves.
2. Crank engine and observe to see if the sea pump is primed.
3. Reconnect all hoses loosened during lay-up.
4. Replace and reconnect the battery or batteries, making certain they are adequately charged and filled with water.
5. Remove plugs or tape from the exhaust outlets, inspect and replace all exhaust fittings and hoses if necessary.
6. Remove covering from carburetor or flame arrestor.
7. Uncover fuel tank vents and open fuel valves.
8. Remove excess oil from internal distributor parts.
9. Start the engine. Refer to starting section.
10. Engines with closed cooling should be filled to a capacity of 33 qts. If anti-freeze is not used, we recommend the use of 16.99-00187 rust inhibitor or equivalent.

MAINTENANCE SCHEDULE

The following maintenance schedule is offered as a suggestion only. Maintenance requirements will vary according to engine usage.

1. Check oil level in engine and reverse gear. Maintain oil level at mark on dipsticks.
2. Check fuel level, fuel system and exhaust system, by visual inspection.
3. Make sure cooling water is circulating after starting engine by checking flow of water out exhaust pipe and observing temperature gage or indicator light.
4. Battery water should be brought up to level, if necessary.

EVERY 50 RUNNING HOURS:

1. Change oil and filter every 50 to 100 hours depending on type of service.
2. Clean carburetor flame arrestor every 50 to 100 hours.
3. Remove fuel filter bowl and replace pleated paper element (16.81-00017).
4. Clean ventilating valve located in the left hand valve cover each time oil is changed.
5. Correct any fuel, oil or water leaks.

EVERY 100 RUNNING HOURS (OR NOT LESS THAN EVERY 6 MONTHS):

1. Change Hydraulic Reverse Gear Oil.
2. Clean and tightly reconnect all dirty electrical connections.
3. Replace deteriorated rubber hoses.
4. Clean reverse gear oil cooler water passages.
5. Remove distributor cap and distributor rotor. Put 5 drops medium engine oil on felt at top of center shaft under rotor. Put 1 drop of light engine oil on breaker arm pivot pin. Wipe off excess. Put light film of grease on breaker cam. Wipe off excess. Examine condition of ignition breaker contacts and set gap to proper dimensions.
6. Examine spark plugs. Clean or replace plugs which are dirty or show evidence of burning.
7. Set ignition timing with timing light.
8. Examine condition of engine paint. "Aerosol Spray Paint" of engine enamel is available for touch-up from your Marine Power Dealer.

ENGINE INSTALLATION RECOMMENDATIONS

MOUNTING

A rigid bed should be prepared for mounting the engine. Heavy wood engine stringers running fore and aft in the boat with proper cutouts for mounting the engine supports are usually used.

ALIGNMENT

Proper alignment with the propeller shaft is important for engine efficiency and smoothness. The two coupling faces (one on engine and one on shaft) must be parallel. Use a feeler gauge or piece of shim stock not more than .003 inch in thickness. When coupling faces are brought together by hand, not bolted, the .003 feeler should be tightly gripped at all points around the edges of the couplings. Alignment must be correct when couplings are viewed from the side and top. It is necessary to lightly lift the shaft and coupling to compensate for the weight of those two items but be very careful that only the weight is lifted and the shaft is not sprung. To adjust any misalignment, the engine mounts may be raised or lowered. In addition the front and rear engine mounts are designed to permit lateral alignment.

EXHAUST

The cooling water overflow is routed into the exhaust tube directly out of the exhaust riser. The flow of water through the exhaust tube will cool the exhaust and in addition will help to quiet the exhaust noise.
We recommend that copper tubing or exhaust hose of proper diameter be used for the exhaust pipe. Copper tubing can be bent as needed to fit a particular installation or can be welded giving the required angles. Be sure to use correct diameter exhaust pipe and keep bends to a minimum to insure least amount of exhaust restriction possible.

RECOMMENDED EXHAUST SIZES

Model 454—dual exhaust, 3½" I.D. each.
Model 454—single exhaust, 4" I.D. each up to 10 ft. length. 4½" I.D. each 10 ft. or longer.
We strongly recommend the use of standard Marine Power exhaust elbows for connecting from the exhaust manifold to copper tube or exhaust hose. The exhaust elbows are designed to give minimum back pressure and are easy to install.

COOLING WATER INTAKE

The water pump requires a 1¼" I.D. Non-Collapsible rubber hose from the inlet side of the pump to the intake scoop. This intake hose should be as short and straight as possible. An intake scoop may be ordered from Marine Power.

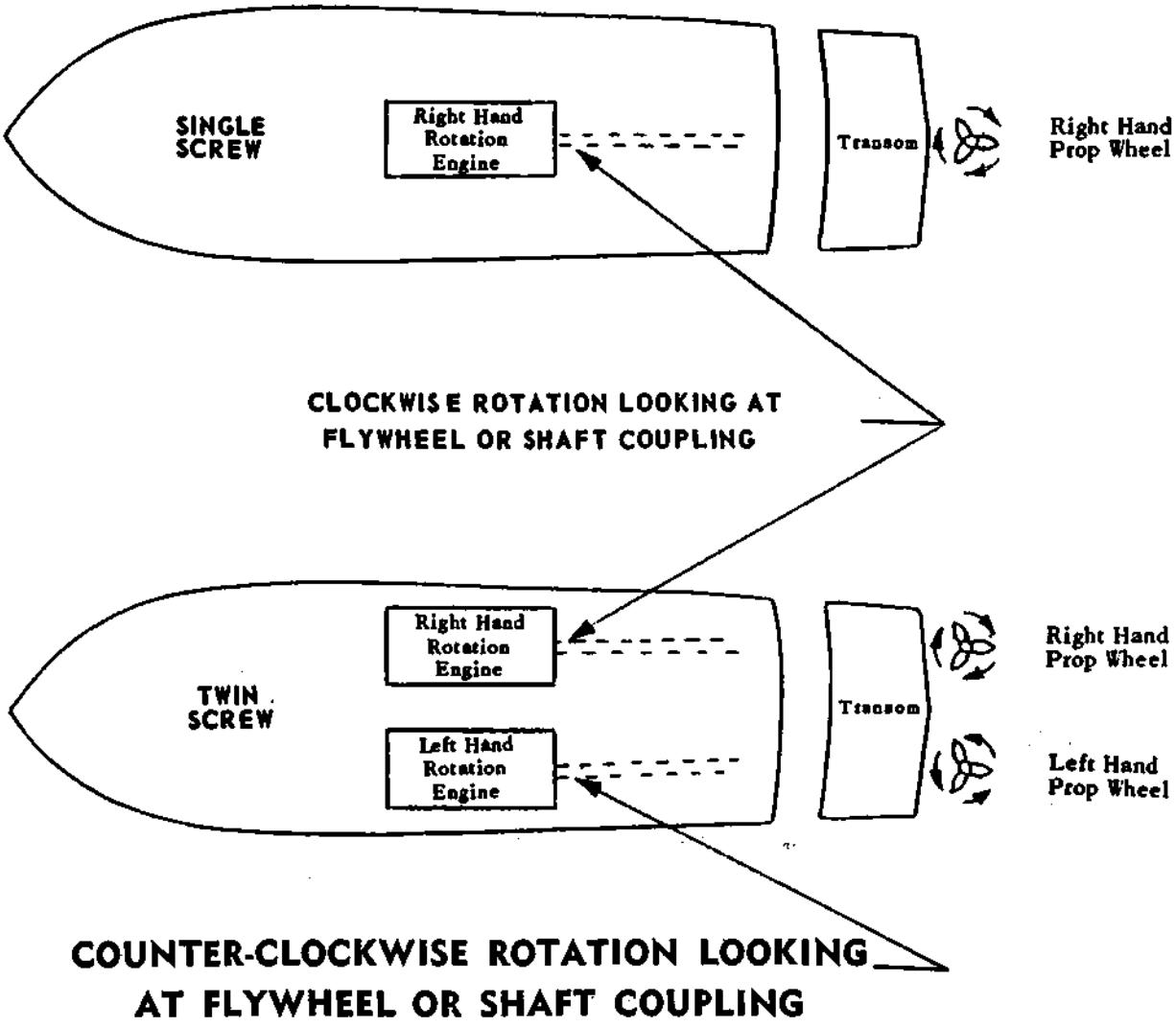
ENGINE CONTROLS

Adequate reverse gear and throttle controls to ensure positive engine control must be connected between the engine and control location. Generally, "push pull" type cables and associated throttle and clutch levers are used.
The throttle control should be adjusted to hold the throttle closed against the idle adjusting screw stop with the throttle lever in the closed position. Sufficient travel should be provided to open the throttle against the stop in the wide open position.
The reverse gear control must have sufficient travel to allow the shift lever, on top of the hydraulic reverse gear, to move freely from full ahead to full reverse positions. It should be adjusted so that the shift lever falls into each detent position when the reverse gear control is shifted through forward, neutral and reverse.

SEE PAGE 71 FOR DETAILS OF CONTROL KITS

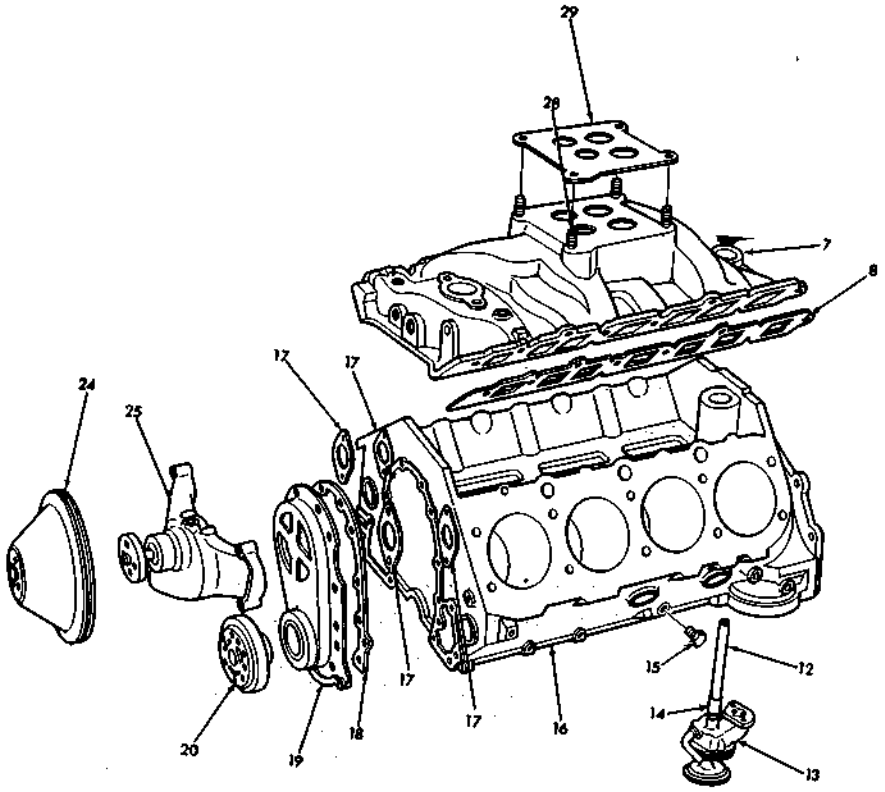
ROTATION DIAGRAM

454 Engine Installation



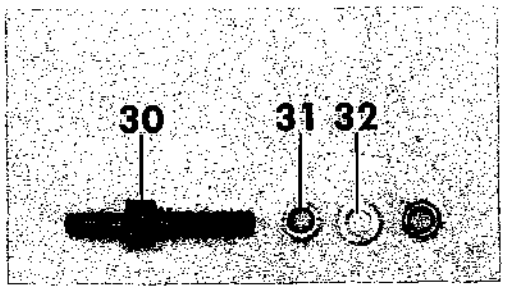
ENGINE PARTS

TABLE OF CONTENTS



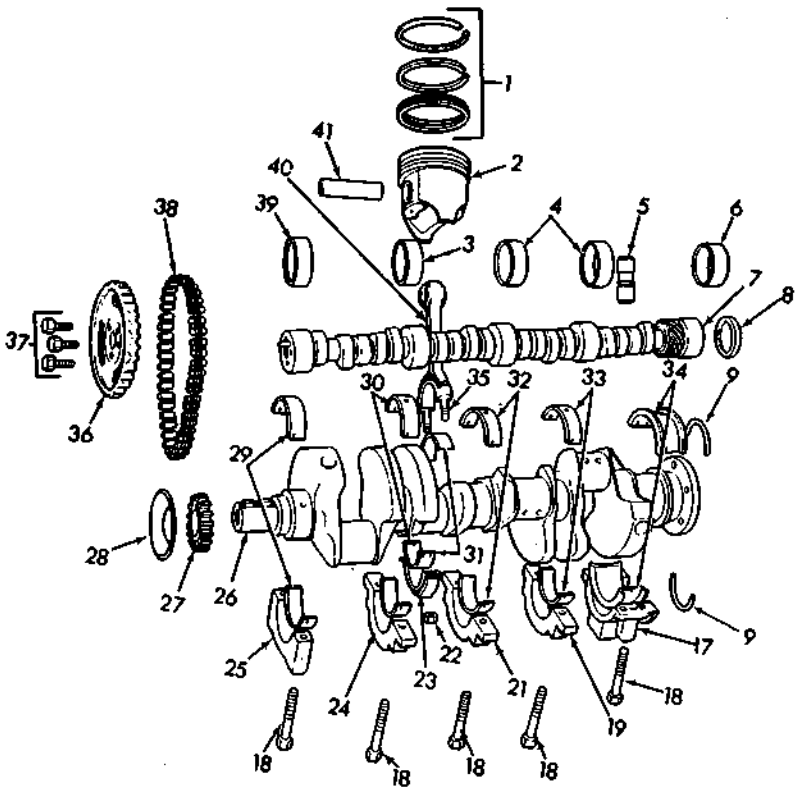
Code No.	Part No.	No. Req'd.	Name
			ENGINE CYL. BLOCK—OIL PUMP—INLET MANIFOLD—WATER PUMP —FOR 2-BOLT MAIN BEARING ENGINE—
7	16.11-00991	1	Inlet Manifold
	16.58-10164	1	Plug, Brass ½-14—In Inlet Manifold
8	16.50-00260	1	Set, Gasket Inl Man—(Includes 2 End Gaskets and 2 Side Gaskets)
12	16.11-01129	1	Shaft, Oil Pump
13	16.11-01122	1	Oil Pump and Screen
	16.50-00254	1	Gasket, Oil Pump Cover (Included in Oil Pump Assembly)
14	16.11-00446	1	Retainer, Oil Shaft
15	16.58-17982	2	Drain Valve ¼"
16	16.11-30127	A.R.	Engine Assy.—Partial (R.H. Rot.) 2 Bolt Main
16	16.11-30126	A.R.	Engine Assy.—Partial (L.H. Rot.) 2 Bolt Main
			NOTE: Partial Engine Consists of Complete ¾ Block—Inlet Manifold—Cyl. Heads—Water Pump and Flywheel.
16	16.11-20058	A.R.	Fitted Block Assy.—For Both Rotations.
			NOTE: Fitted Block Includes Block, Pistons, Pins, Rings, Crankshaft Brgs. & Rear Crankshaft Seal.
			Cylinder and Case—Bare—Not Available—Must Order Fitted Block.
17	16.11-01000	2	Gasket, Water Pump

18	16.11-0990	1	Gasket, Front Cover
19	16.11-00985	1	Cover Assy., Front End
	16.11-00986	A.R.	Seal, Front Cover—Both Rotations
	16.11-00987	A.R.	Pointer, Timing (R.H. Rot.)
	16.11-01123	A.R.	Pointer, Timing (L.H.Rot.)
20	16.11-01121	1	Torsional Damper
24	16.11-00815	1	Pulley, Water Pump
25	16.11-00997	1	Water Pump—Circulating
28			See Carburetor Section
29			See Carburetor Section
			GASKET SET
	16.50-00261	1	Gasket Set, Engine Overhaul—Complete
	16.50-00262	1	Gasket Set, Valve Grinding



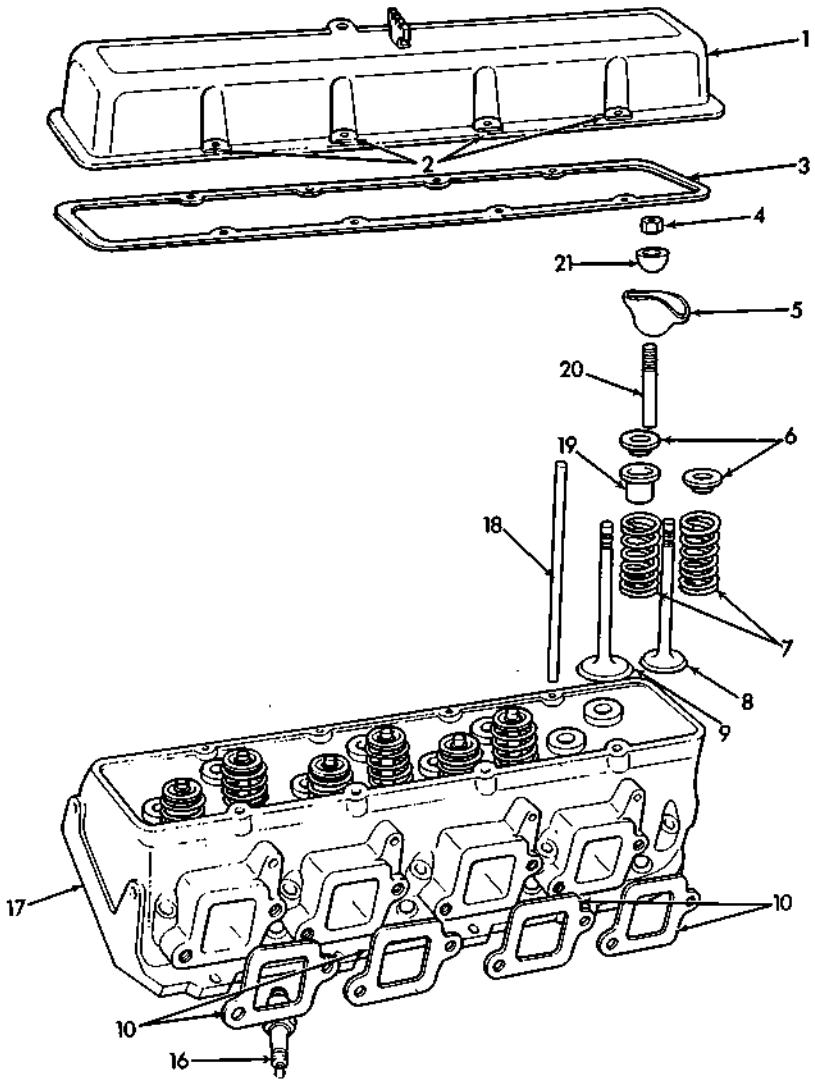
GROUND STUD

Code No.	Part No.	No. req'd.	Name
			GROUND STUD
30	16.44-47486	1	Stud, Ground—Install in Cyl. Block
31	16.36-10009	2	Nut, Hex Brass
32	16.41-10005	1	Washer, Flat



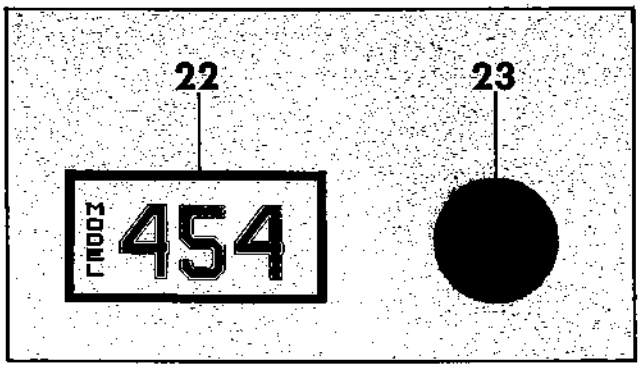
Code No.	Part No.	No. Req'd	Name
			CAMSHAFT—CRANKSHAFT—PISTON—RINGS—BEARING —FOR 2-BOLT MAIN BEARING ENGINE—
1	16.11-00975	8	Ring Set—Piston (Std.)
	16.11-00977	A.R.	Ring Set—Piston (.030 O.S.)
2	16.11-01101	8	Piston and Pin (Std.)
	16.11-01102	A.R.	Piston and Pin (.010 O.S.)
			Piston and Pin (.020 O.S.) Not Available
	16.11-01103	A.R.	Piston and Pin (.030 O.S.)
3	16.11-00908	1	Bearing, Camshaft—No. 2
4	16.11-00907	2	Bearing, Camshaft—No. 3 and 4
5	16.11-00954	16	Lifter, Hydraulic Valve
6	16.11-00908	1	Bearing, Camshaft—Rear
7	16.11-00928	1	Camshaft (Left Hand Rotation)
7	16.11-00929	1	Camshaft (Right Hand Rotation)
8	16.11-00909	1	Plug, Camshaft Rear Bearing
9	16.51-10040	2	Seal, Crankshaft (L.H. Rot.)
9	16.11-01072	2	Seal, Crankshaft (R.H. Rot.)
17	16.11-01115	1	Cap, Crankshaft Brg. Rear
18	16.11-00895	6	Bolt, Crankshaft Bearing Cap
18	16.11-00894	4	Stud, Crankshaft Bearing Cap

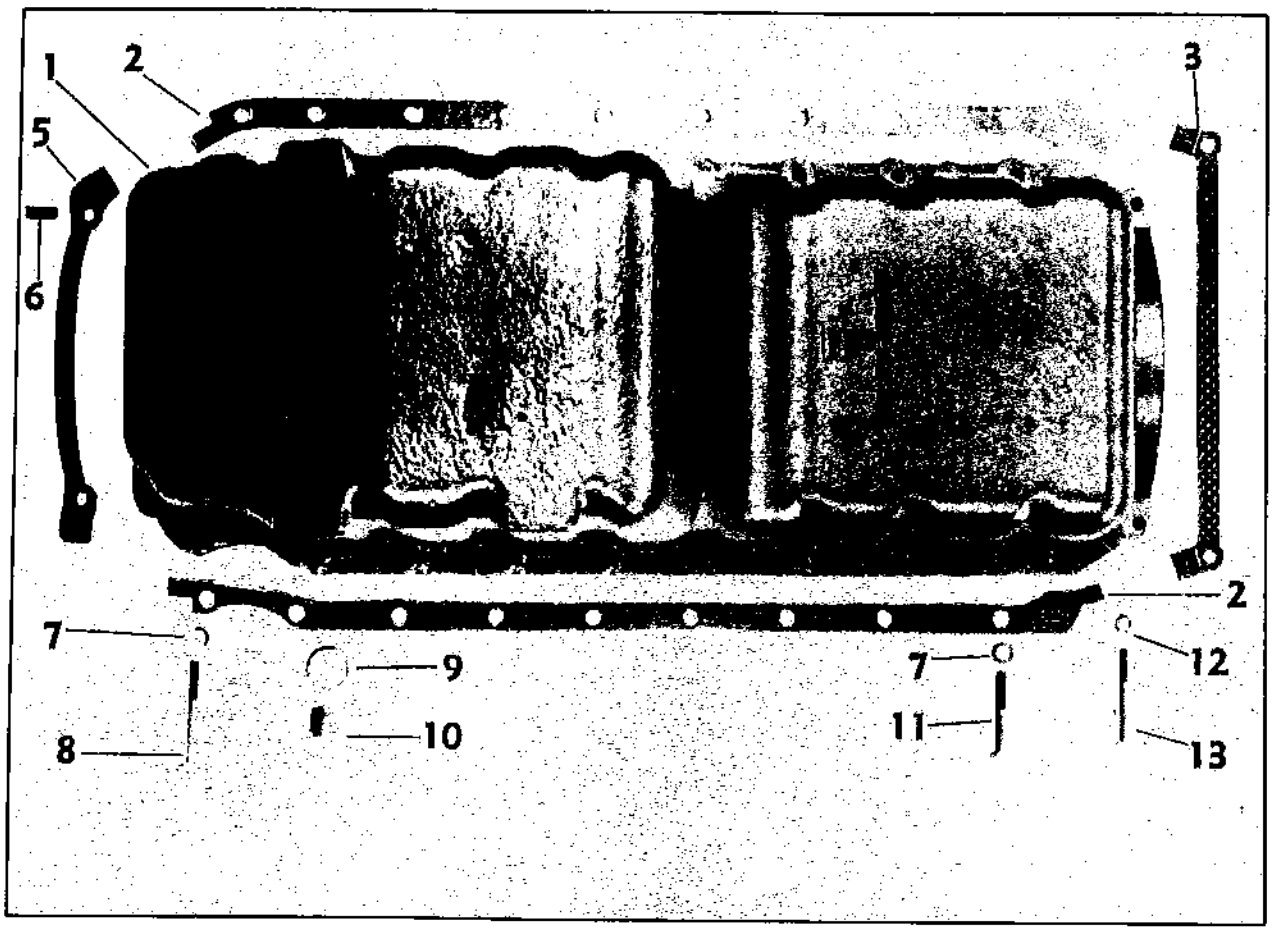
19	16.11-01114	1	Cap, Crankshaft Bearing
21	16.11-01114	1	Cap, Crankshaft Bearing
22	16.11-00979	16	Nut, Conn. Rod Bolt
23	See Item 40		
24	16.11-01114	1	Cap, Crankshaft Bearing
25	16.11-01114	1	Cap, Crankshaft Bearing
26	16.11-01119	1	Crankshaft—For Left Hand Rotation Engines
	16.11-01120	1	Crankshaft—For Right Hand Rotation Engines
27	16.11-01112	1	Sprocket, Crankshaft (L.H. Rot.)
27	16.11-00924	1	Gear, Crankshaft (R.H. Rot.)
28	Not Required		
29	16.11-00912	4	Bearing Unit—Crankshaft (Std.)
	16.11-00913	A.R.	Bearing Unit—Crankshaft (.001 U.S.)
	16.11-00914	A.R.	Bearing Unit—Crankshaft (.002 U.S.)
	16.11-00915	A.R.	Bearing Unit—Crankshaft (.010 U.S.)
	16.11-00916	A.R.	Bearing Unit—Crankshaft (.020 U.S.)
30	See Item 29		
31	16.11-00980	8	Bearing Unit, Conn. Rod (Std.)
31	16.11-00981	A.R.	Bearing Unit, Conn. Rod (.001 U.S.)
31	16.11-00982	A.R.	Bearing Unit, Conn. Rod (.002 U.S.)
31	16.11-00983	A.R.	Bearing Unit, Conn. Rod (.010 U.S.)
31	16.11-00984	A.R.	Bearing Unit, Conn. Rod (.020 U.S.)
32	See Item 29		
33	See Item 29		
34	16.11-00917	1	Bearing Unit, Crankshaft Rear (Std.)
34	16.11-00918	A.R.	Bearing Unit, Crankshaft Rear (.001 U.S.)
34	16.11-00919	A.R.	Bearing Unit, Crankshaft Rear (.002 U.S.)
34	16.11-00920	A.R.	Bearing Unit, Crankshaft Rear (.010 U.S.)
34	16.11-00921	A.R.	Bearing Unit, Crankshaft Rear (.020 U.S.)
35	16.11-01128	16	Bolt, Connecting Rod
36	16.11-01111	1	Sprocket, Camshaft (L.H. Rot.)
36	16.11-00931	1	Gear, Camshaft (R.H. Rot.)
37	16.11-00934	3	Bolt, Sprocket (L.H. Rot.)
37	16.11-00933	2	Bolt, Gear (R.H. Rot.)
38	16.11-01113	1	Chain, Sprocket (L.H. Rot.)
39	16.11-00906	1	Bearing, Camshaft No. 1
40	16.11-01127	8	ASM., Rod Connecting (Includes Items 22, 23, and 35)
41	See Item 2		



Code No.	Part No.	No. Req'd.	Name
			CYLINDER HEAD AND VALVE PARTS
1	16.11-01094	2	Cover, Valve—Use For Both RH & LH Sides of Engine. (Less Item 23)
2	16.11-00885	14	Bolt, Valve Cover—Use For Covers With Gasket
	16.11-01124	14	Bolt, Valve Cover—Use For Covers With Sealant Listed Below
2	16.11-00886	14	Reinforcement, Valve Cover
3	16.11-00958	2	Gasket, Valve Cover
	16.11-01086	A.R.	Sealant, RTV—3 Ounce Tube
4	16.11-00956	16	Nut, Rocker Arm
5	16.11-00955	16	Arm, Rocker
6	16.11-00967	16	Cap, Valve Spring
	16.11-01078	32	Keeper, Valve Stem (Both Inlet & Exhaust)
7	16.11-01116	16	Asm., Valve Spring & Damper

8	16.11-00964	8	Valve, Exhaust
9	16.11-00963	8	Valve, Intake
10			See Exhaust Manifold Section
Not Shown	16.50-00259	2	Gasket, Cylinder Head
Not Shown	16.11-00962	8	Shim, Intake Valve Spring
16	16.62-08737	8	Spark Plug— (Gap .035")
17	16.11-00960	2	Head Assy., Cylinder
			NOTE: The Head Ass'y Includes Valves and Springs
17	16.11-00961	A.R.	Cylinder Head—Only
18	16.11-01109	8	Push Rod, Intake Valve
	16.11-01110	8	Push Rod, Exhaust Valve
	16.11-01118	8	Guide, Push Rod
19	16.11-01117	16	Seal, Intake & Exhaust Valve Stem
20			Part of Cylinder Head
21	16.11-00957	16	Ball, Valve Rocker Arm
22	16.92-00068	2	Decal, Model
23	16.11-00532	2	Cap, Rubber Oil Filler





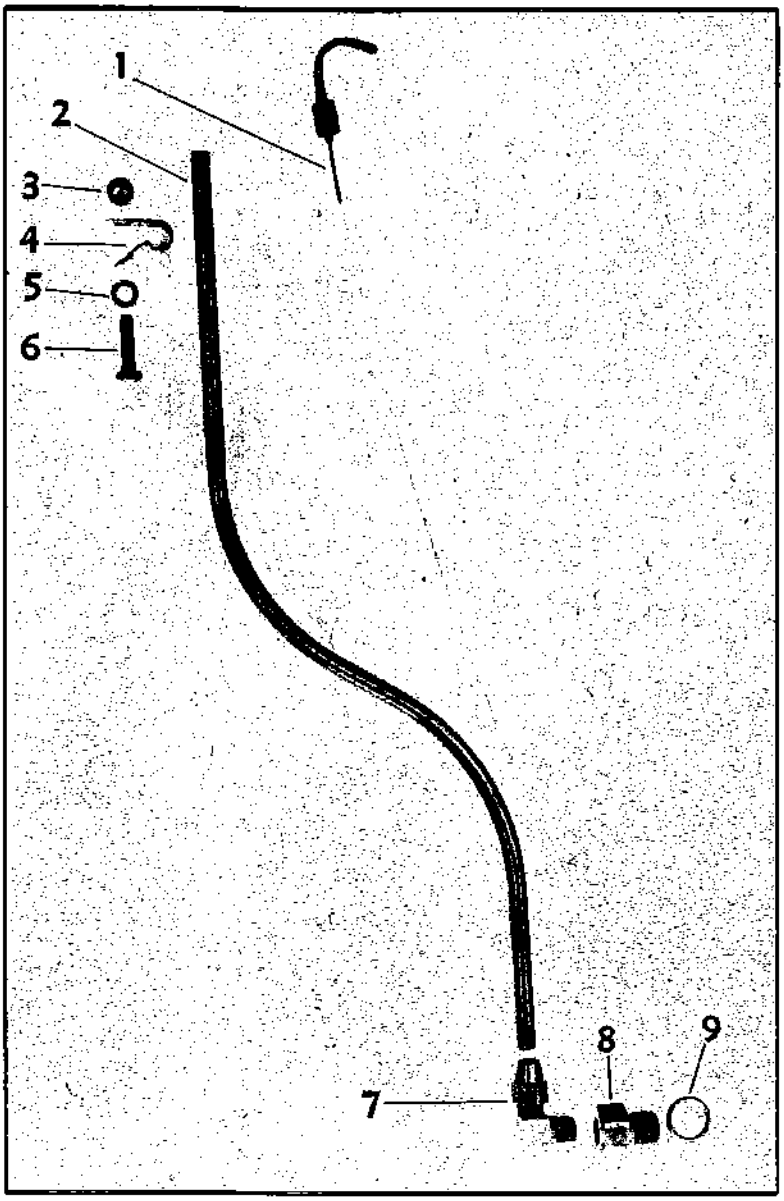
OIL PAN

Code No.	Part No.	No. Req'd.	Name
			OIL PAN
1	16.20-00147	1	Oil Pan
2	16.50-00245	1	Set, Gasket Oil Pan Rail
3	16.51-10033	1	Seal, Front
4			Not Listed
5	16.51-10034	1	Seal, Rear
6	16.32-00138	1	Dowel Pin, Oil Pan Seal—Insert In Cylinder Block Oil Pan Rail
7	16.42-00002	17	Washer, 5/16 Lock
8	16.30-00106	1	Screw, Cap 5/16-18×3½
9	16.50-00234	1	Gasket, Oil Pan Fitting Plastic
10	16.72-16266	1	Plug, Oil Pan
11	16.30-00082	16	Screw, Cap 5/16-18×2
	16.30-00086	2	Screw, Cap 5/16-18×2¼ (Attach Engine Oil Cooler)
12	16.42-00001	2	Washer, ¼ Lock
13	16.30-00028	2	Screw, Cap ¼-20×2¼
	16.70-00139	1	Baffle, Oil Pan

NOTE: Items 2, 3, and 5 may be ordered under the following:

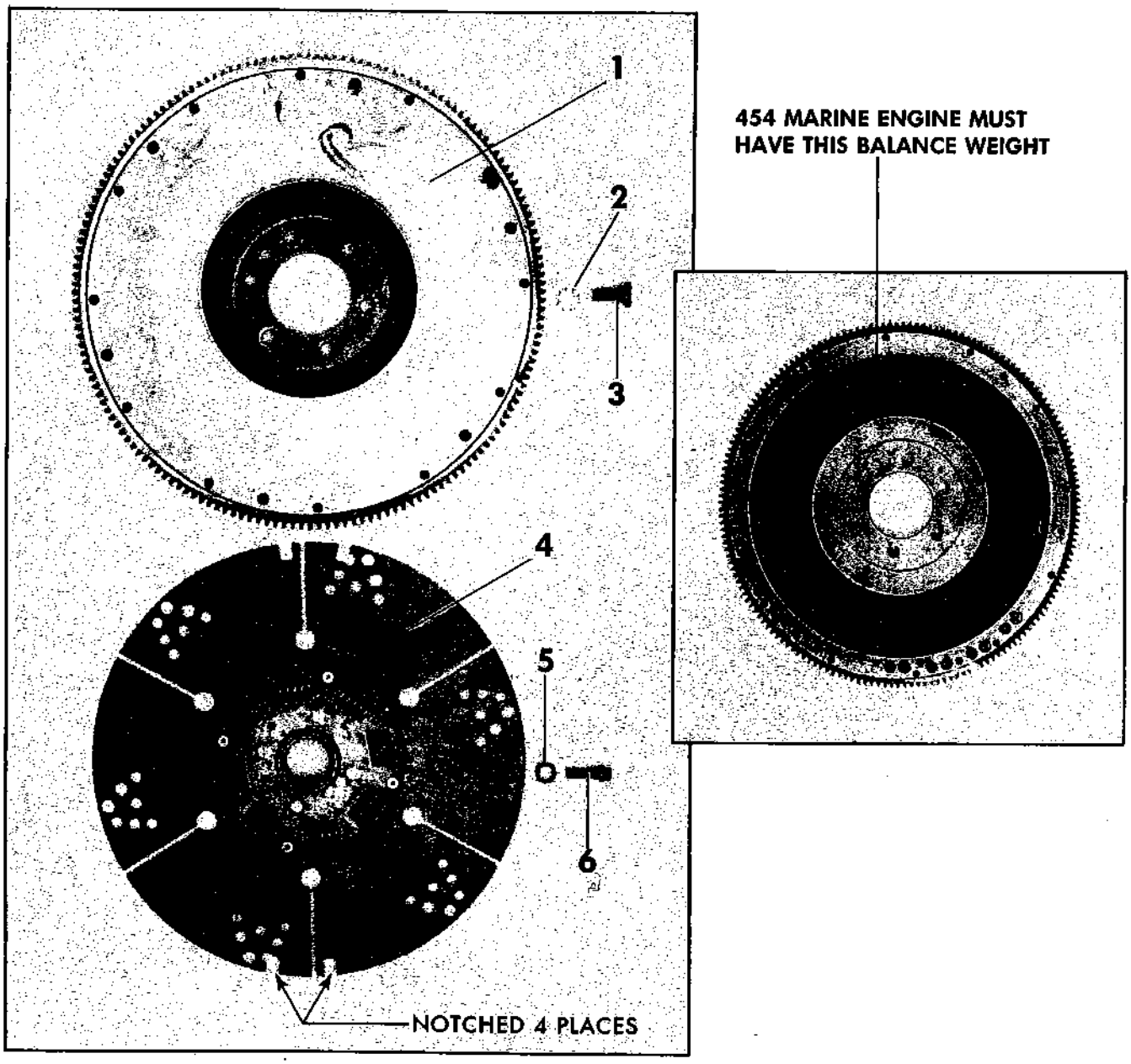
	16.50-00229	Set, Oil Pan Gasket

Oil Pan and Seal Installation Instructions are available free of charge by requesting the 16.99-08808 Instruction Sheet. These Instructions should be in every "454" Owner's Toolbox.



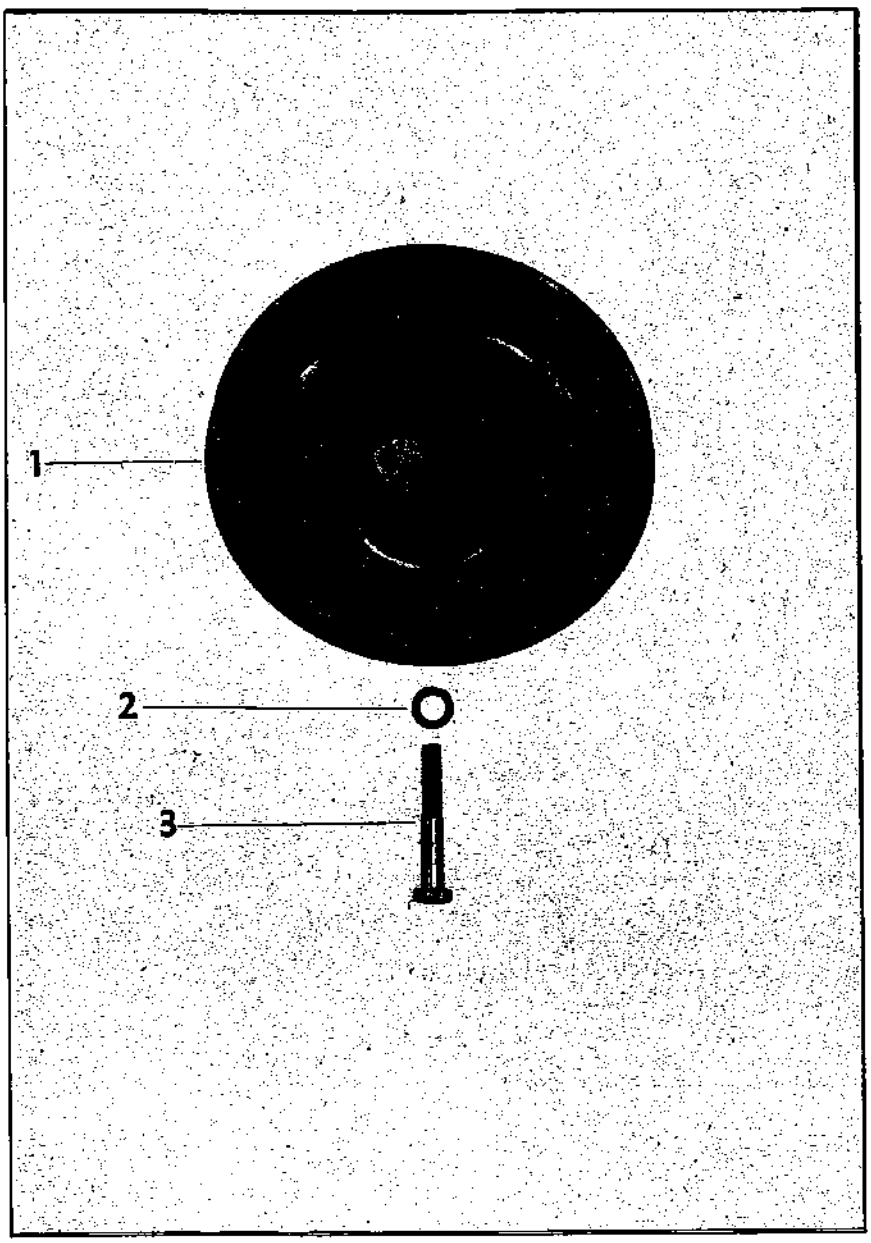
OIL DIPSTICK

Code No.	Part No.	No. Req'd.	Name
			OIL DIPSTICK
1	16.72-00011	1	Dipstick, Engine Oil
2	16.57-00028	1	Tube, Dipstick
3	16.57-08783	1	Spacer
4	16.99-00044	1	Clamp, Tube
5	16.42-00004	1	Washer, 3/8 Lock
6	16.30-00126	1	Screw, 3/8-16x1 1/8
7	16.59-10580	1	Elbow, 90°
8	16.72-17716	1	Fitting, Oil Pan
9	16.50-00234	1	Gasket, Oil Pan Fitting—Plastic



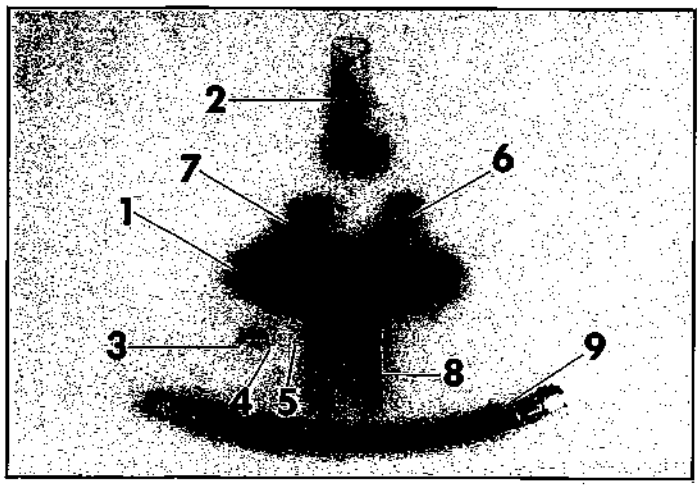
FLYWHEEL AND DRIVE PLATE

Code No.	Part No.	No. Req'd.	Name
			FLYWHEEL AND DRIVE PLATE
1	16.11-01075	1	Flywheel (with timing marks)
2	16.11-00158	6	Washer, Flywheel
3	16.11-00157	6	Bolt, Flywheel
4	16.99-08792	1	Drive Plate, Damper (with cutouts for timing marks)
5	16.42-00004	6	Washer, ⅜ Lock
6	16.30-00603	6	Screw, 12 Point Head



CRANKSHAFT PULLEY

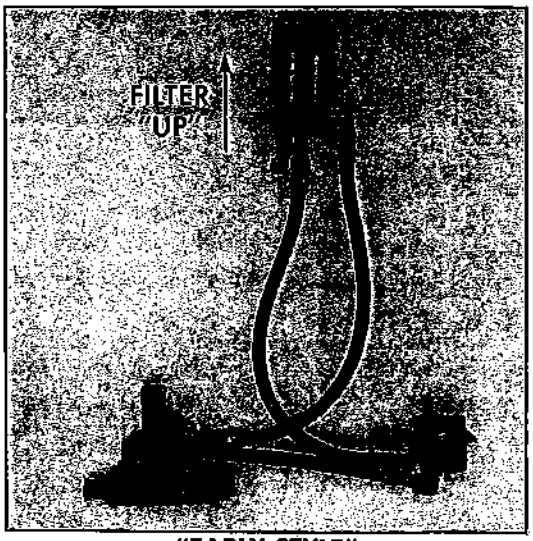
Code No.	Part No.	No. Req'd.	Name
			CRANKSHAFT PULLEY
1	16.20-00187	1	Pulley, Crankshaft
2	16.42-00004	3	Washer, ⅜ Lock
3	16.30-00144	3	Screw, Cap ⅜-16x2¼



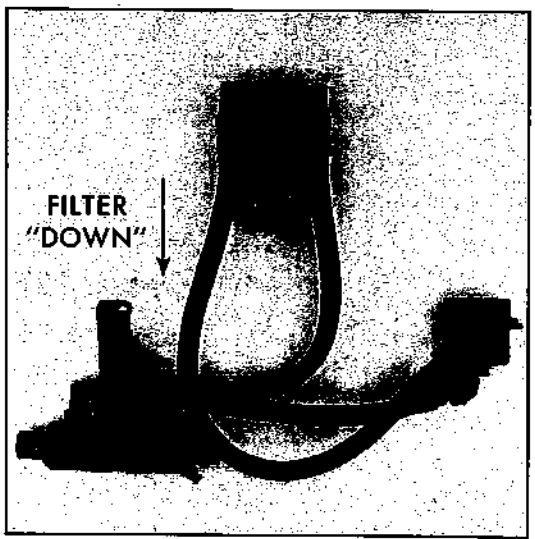
ENGINE OIL COOLER

Code No.	Part No.	No. Req'd.	Name
			ENGINE OIL COOLER
1	16.99-08772	1	Cooler, Engine Oil
2	16.70-00164	1	Bracket, Cooler
3	16.30-00062	2	Screw, Cap 5/16-18×3/4
4	16.42-00002	2	Washer, 5/16 Lock
5	16.36-00002	2	Nut, 5/16-18
6	16.58-18537	1	Elbow, 90°
7	16.58-08534	1	Elbow, 90°
8	16.70-00203	1	Bracket, Oil Cooler
9	16.95-00216	1	Assembly, Oil Line (Approx. 26" Overall Length)
9	16.95-00231	1	Assembly, Oil Line (Approx. 17½" Overall Length)
	16.99-00076	1	Tie, Oil Lines Plastic

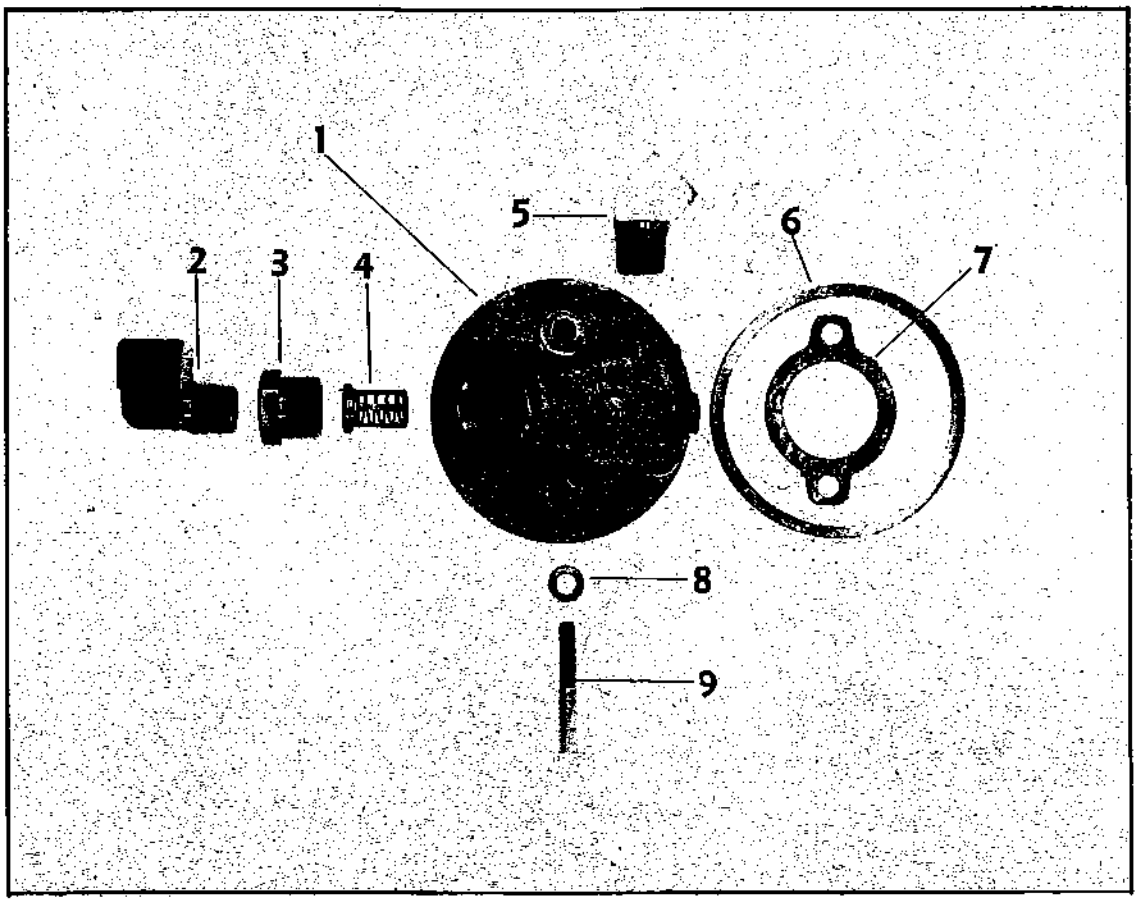
ENGINE OIL LINE HOOK-UP



"EARLY STYLE"

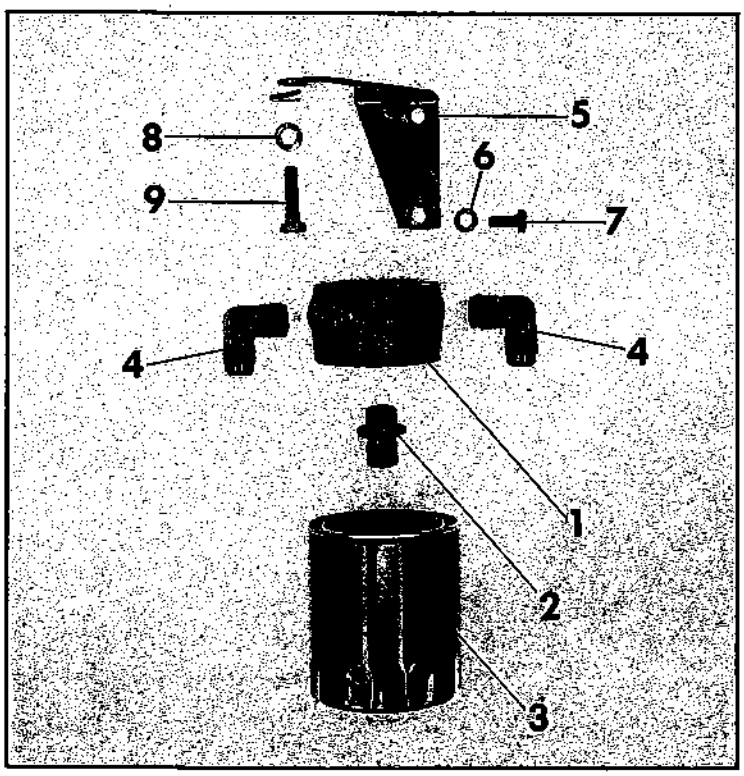


"LATE STYLE"



OIL FILTER ADAPTER

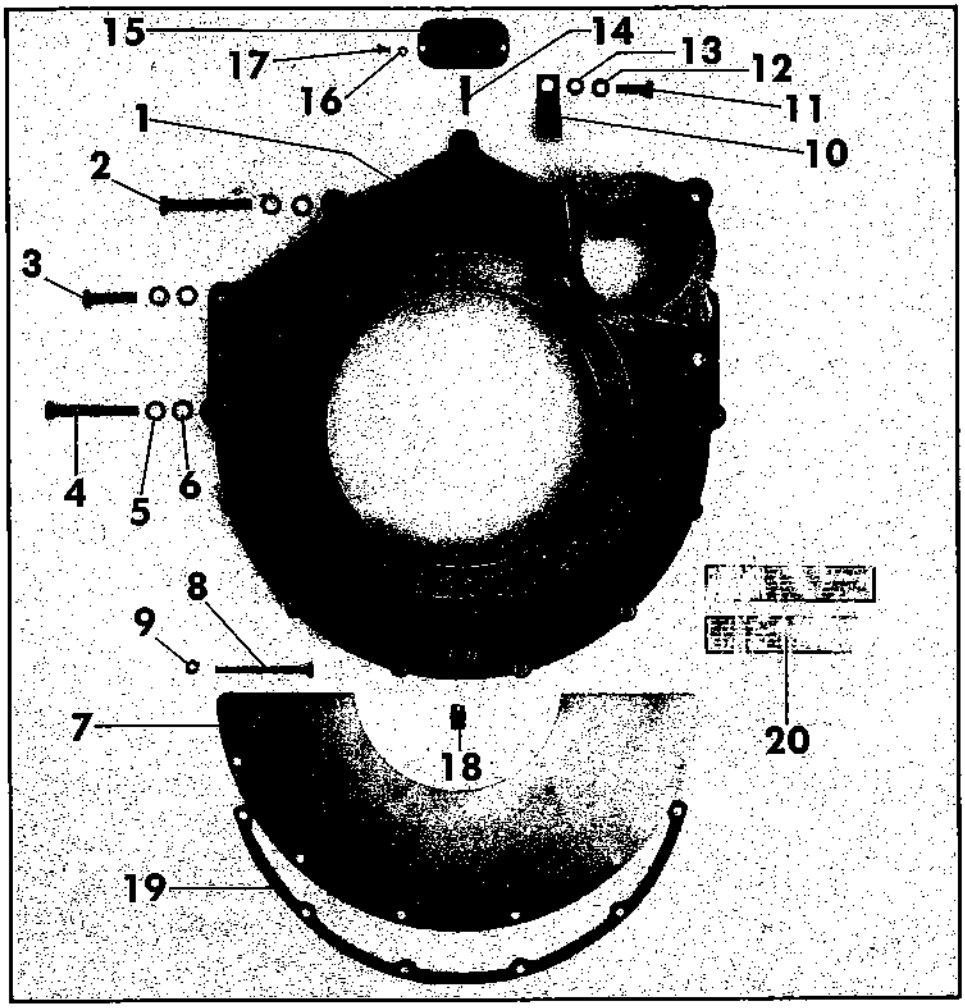
Code No.	Part No.	No. Req'd.	Name
			OIL FILTER ADAPTER
1	16.20-00193	1	Adapter
2	16.58-18551	1	Elbow, 90°—Special Machined Part
3	16.58-10215	1	Bushing, Reducer
4	16.99-08126	1	Valve Assy., By Pass
5	16.58-18536	1	Elbow, 45°
6	16.50-08356	1	Gasket, Adapter Ring
7	16.50-08351	1	Gasket, Adapter To Cyl. Blk.
8	16.42-00004	2	Washer, ⅜ Lock
9	16.30-00082	2	Screw, Cap ⅜-16x2



OIL FILTER AND BASE

Code No.	Part No.	No. Req'd.	Name
1	16.20-00273	1	Base, Oil Filter Mount
2	16.72-00026	1	Nipple, Oil Filter
3	16.81-08130	1	Oil Filter—Full Flow
4	16.58-08534	2	Elbow, 90°
5	16.70-00212	1	Bracket, Oil Filter Base
N.S.	16.70-00217	1	Bracket, Oil Filter Base (Used on Reverse Manifold Engines)
6	16.42-00003	2	Washer, Lock 5/16
7	16.30-00711	2	Screw, Cap Hex HD. 5/16-18×3/4
8	16.42-00005	2	Washer, Lock ⅜
9	16.30-00130	2	Screw, Cap Hex HD. ⅜-16×1⅜

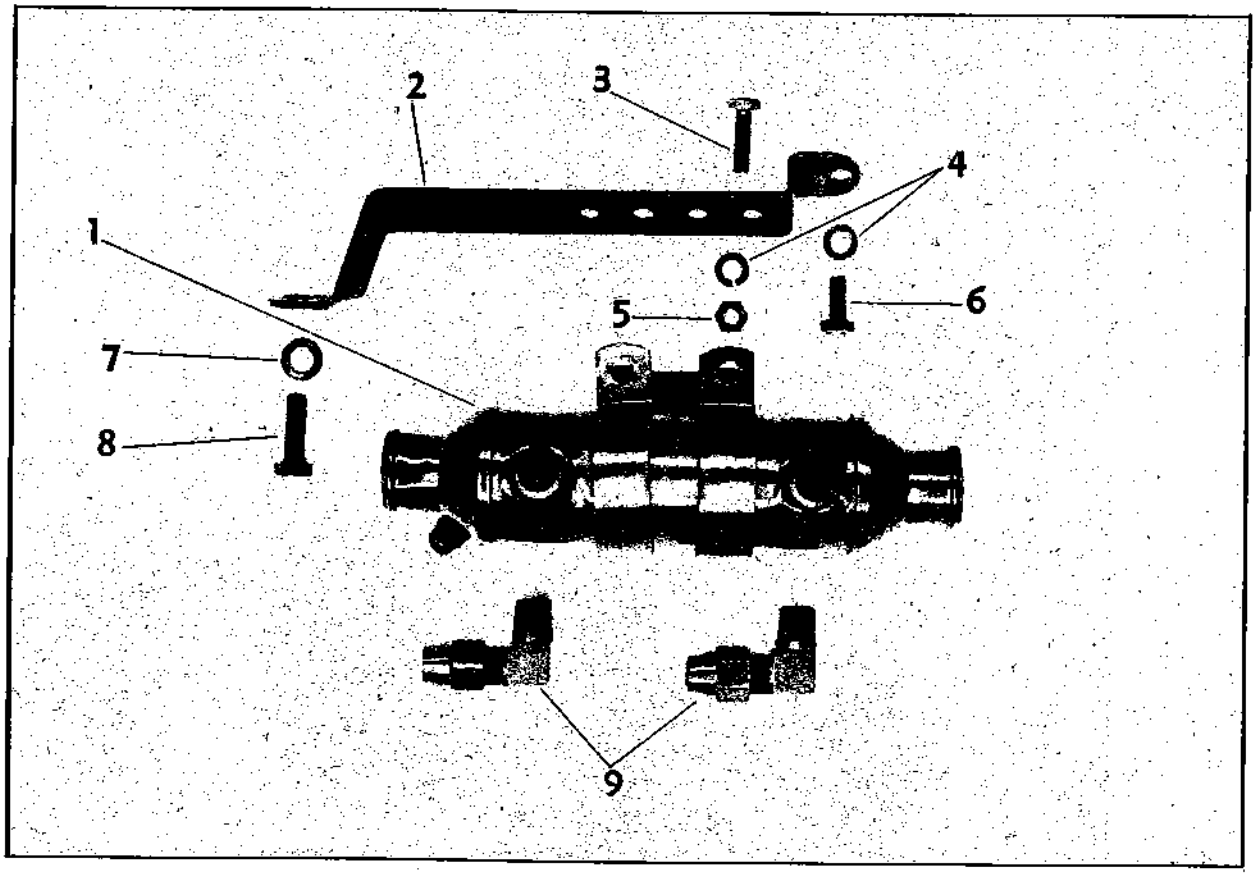
N.S.—Not Shown



FLYWHEEL HOUSING

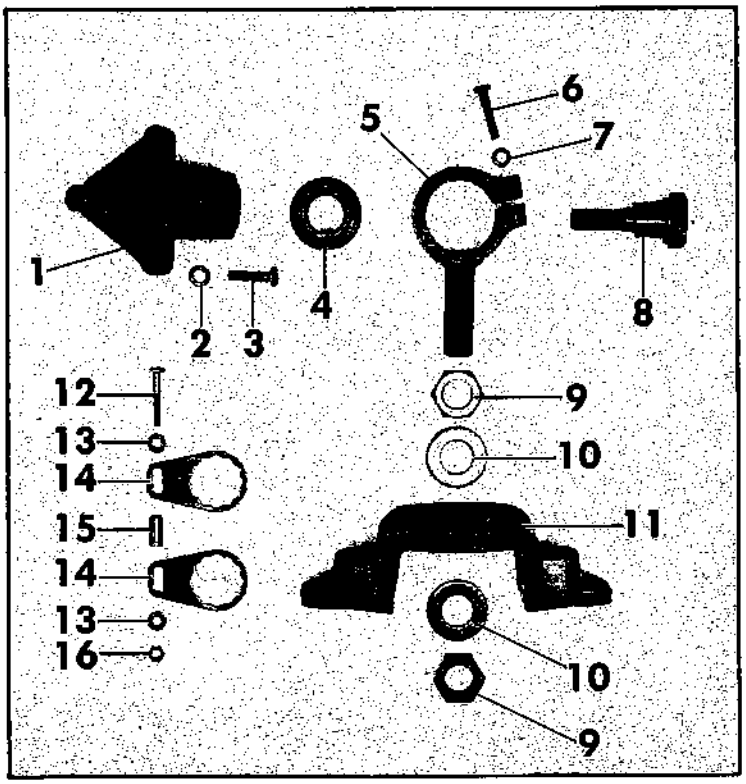
Code No.	Part No.	No. Req'd.	Name
			FLYWHEEL HOUSING
1	16.21-00010	1	Housing, Flywheel (Note: This unit supercedes the 16.21-0007 housing)
2	16.30-00148	1	Screw, Cap Hex Hd. ⅜-16×2½
3	16.30-00130	2	Screw, Cap Hex Hd. ⅜-16×1⅜
4	16.30-00156	2	Screw, Cap Hex Hd. ⅜-16× 3
5	16.42-00004	5	Washer, Lock ⅜
6	16.41-00006	5	Washer, Flat
7	16.70-00199	1	Plate, Flywheel Cover
8	16.30-00747	6	Screw, Cap Hex Hd. ¼-20×3 Cad Pl.
9	16.39-00018	6	Nut, Machine Hex ¼-20 Cad Pl. With Captured Washer
10	16.99-00188	1	Clamp, Wiring Harness
11	16.30-00060	1	Screw, Cap Hex Hd. 5/16-18×5/8
12	16.42-00003	1	Washer, Lock 5/16
13	16.41-00005	1	Washer, Flat
14	16.47-00014	1	Pin, Roll 5/32"×1" Zinc Plated
15	16.70-00200	1	Cover, Timing Indicator
16	16.42-00015	2	Washer, Lock #10 Cad Pl.
17	16.32-00143	2	Screw, Machine Rd. Hd. 10-24×⅜ Cad Pl.
18	16.75-90046	1	Plug, Plastic ¼ NPT Square Head
19	16.50-00242	*	Gasket, Flywheel Cover
20	16.92-00070	1	Decal, Timing (For RH Rot. Eng's. Only)
	16.92-00071	1	Decal, Timing (For LH Rot. Eng's. Only)

* - As Required



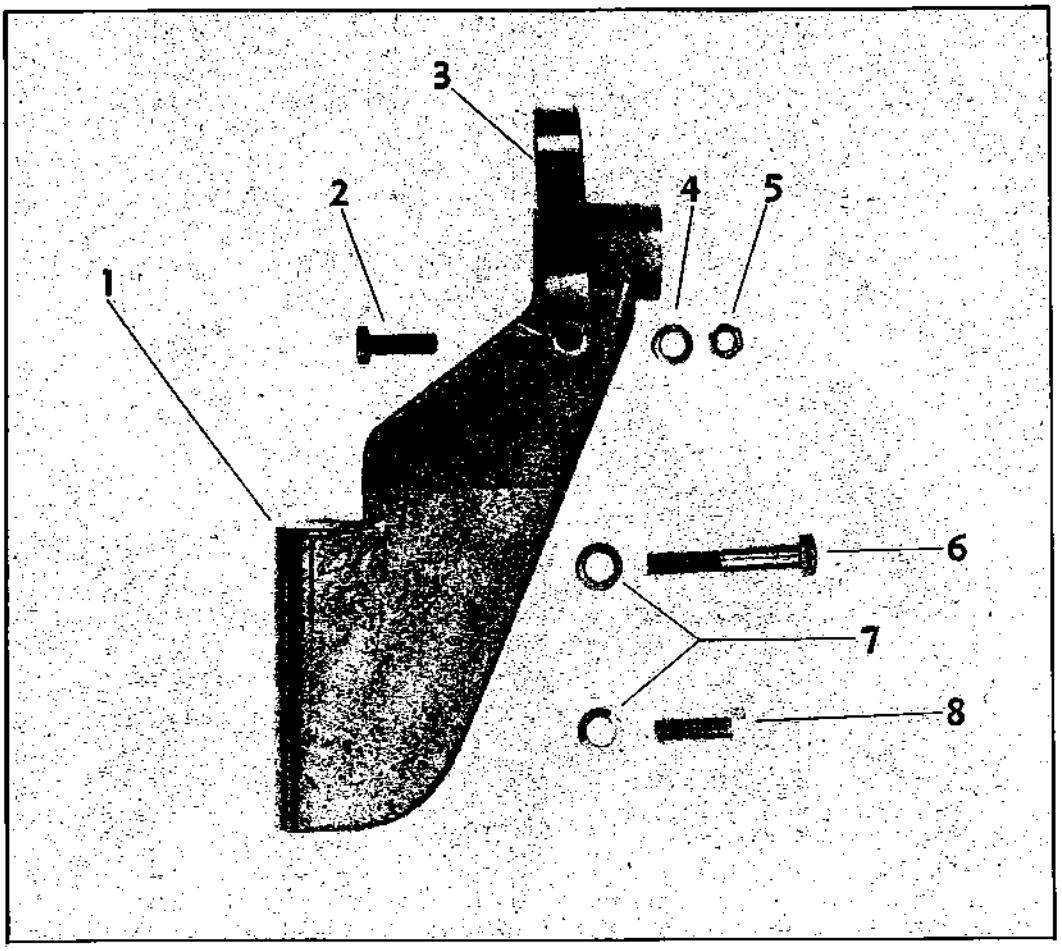
REVERSE GEAR OIL COOLER

Code No.	Part No.	No. Req'd.	Name
			REVERSE GEAR OIL COOLER
1	16.99-08780	1	Cooler, Reverse Gear 9 Inch With 1¼ Inch Hose Ends
1	16.99-08759	1	Cooler, Reverse Gear 6 Inch With 1¼ Inch Hose Ends
2	16.70-00133	1	Bracket, Oil Cooler
3	16.30-00066	2	Screw, Cap 5/16-18×1
4	16.42-00002	3	Washer, 5/16 Lock
5	16.36-00002	2	Nut, Hex 5/16-18
6	16.30-00062	1	Screw, Cap 5/16-18×3/4
7	16.42-00004	1	Washer, ⅜ Lock
8	16.30-00124	1	Screw, Cap ⅜-16×1
9	16.59-10580	3	Elbow, 90° (One in Reverse Gear) } FOR COPPER OIL LINES
	16.59-17989	1	Elbow, 45° (In Reverse Gear) } FOR COPPER OIL LINES
	16.57-50031	1	Line, Gear To Cooler—Short Copper Line
	16.57-50033	1	Line, Cooler To Gear—Long Copper Line
	16.99-00044	1	Clamp, Oil Cooler Line
	16.95-00284	1	Assembly, Rubber Oil Line—12" Hose
	16.95-00285	1	Assembly, Rubber Oil Line—31" Hose
	16.95-17994	3	Elbow, 90°-½×45° Flare } FOR RUBBER LINES
	16.58-18548	1	Elbow, St. 45°-⅜ MPT×⅜ FPT } FOR RUBBER LINES
	16.44-08626	2	Stud, Attach Reverse Gear To Engine
	16.43-00002	2	Washer, Toothlock
	16.36-00081	2	Nut, Hex 7/16-20
	16.30-00557	4	Screw, 12 Pt. Hd. 7/16-14×2—Attach Gear
	16.42-00006	4	Washer, Lock—High Collar



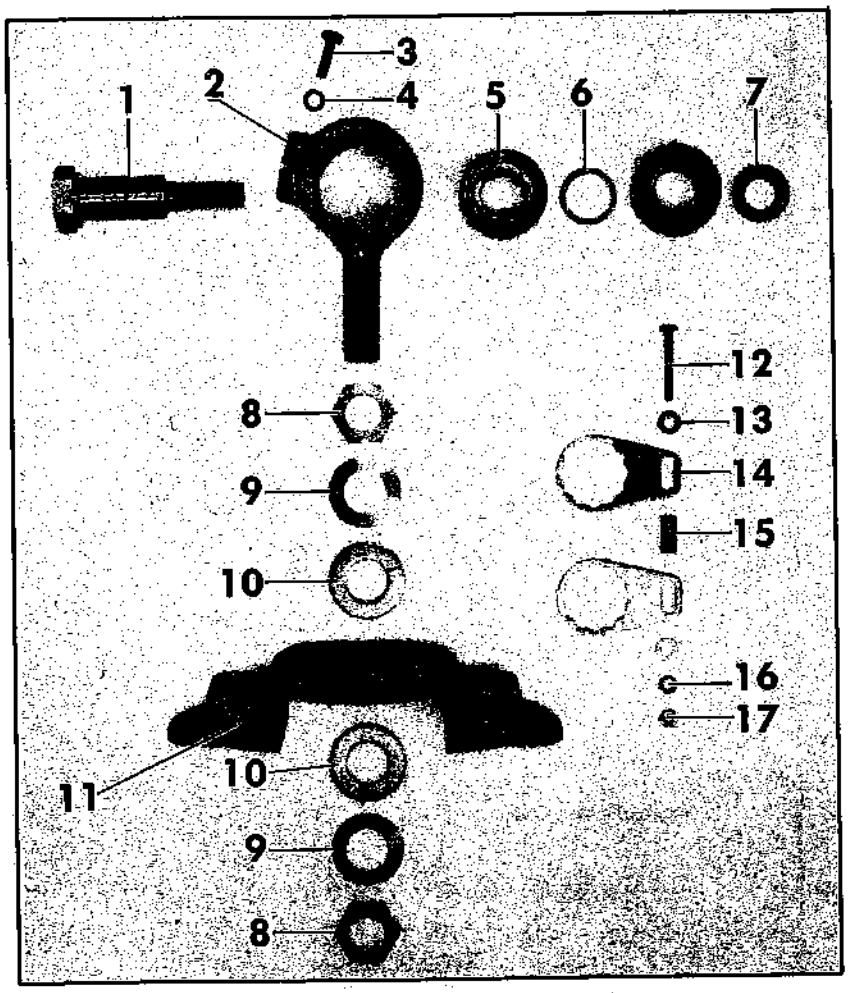
FRONT ENGINE MOUNT

Code No.	Part No.	No. Req'd.	Name
			FRONT ENGINE MOUNT
1	16.20-00276	2	Bracket, Front Engine Mount
2	16.42-00004	6	Washer, Lock ⅜
3	16.30-00130	4	Screw, Cap Hex Hd. ⅜-16×1⅜
	16.30-00132	2	Screw, Cap Hex Hd. ⅜-16×1½
4	16.93-05808	2	Mount, Rubber
5	16.20-07692	2	Housing, Front Engine Mount
6	16.30-00545	2	Screw, Cap Hex Hd. 5/16-18×1¾
7	16.42-00003	2	Washer, Lock 5/16
8	16.72-00002	2	Stud, Engine Mount
9	16.36-07694	4	Nut, Hex 1-16
10	16.41-07695	4	Washer, Flat
11	16.20-07696	2	Adapter, Engine Mount
12	16.30-00020	2	Screw, Cap Hex Hd. ¼-20×1¾
13	16.41-00002	4	Washer, Flat
14	16.70-08749	4	Lug, Keeper
15	16.57-08758	2	Spacer, Steel
16	16.36-00000	2	Nut, Lock ¼-20



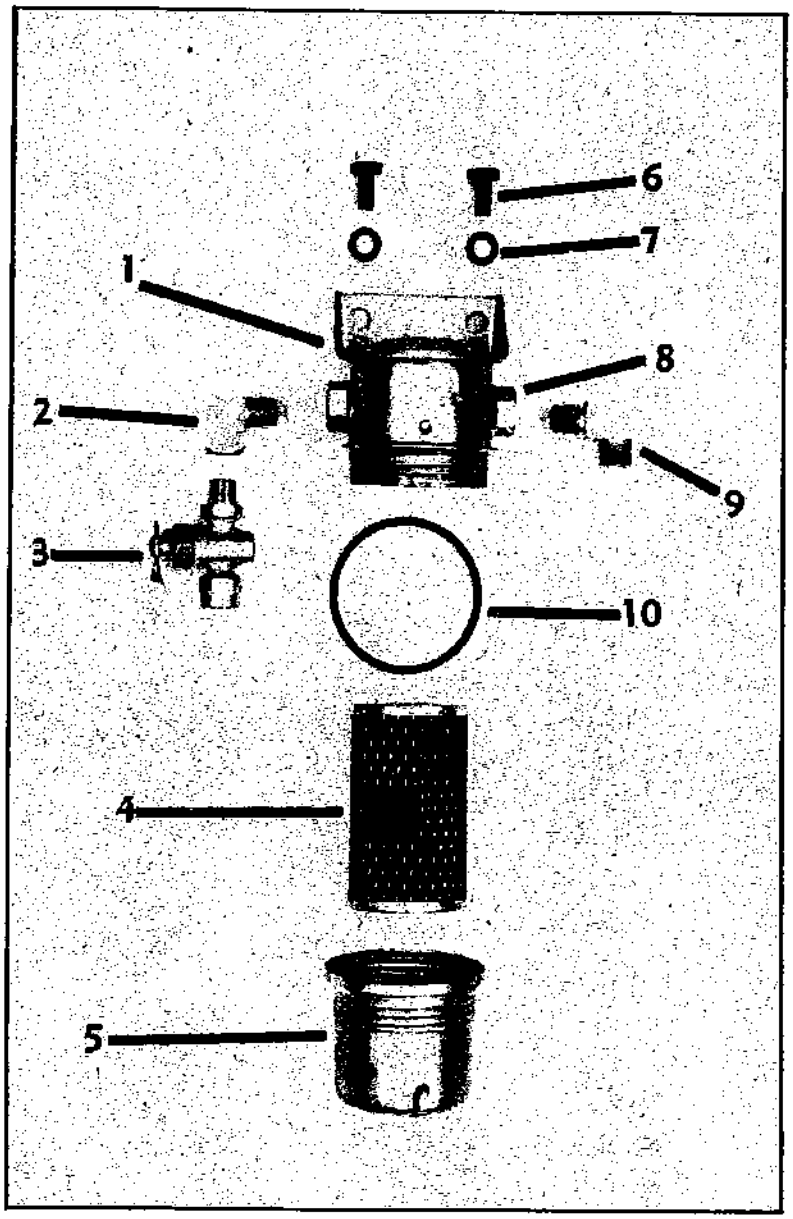
REAR MOUNT SUPPORT

Code No.	Part No.	No. Req'd.	Name
			REAR MOUNT SUPPORT
1	16.20-00180	2	Support, Rear Engine Mount
2	16.30-00127	4	Screw, Cap ⅜-24×1⅛
3	16.70-00145	2	Lifting Ring
4	16.42-00004	4	Washer ⅜ Lock
5	16.36-30000	4	Nut, Hex ⅜ SS
6	16.30-00222	2	Screw, Cap 7/16-14×2½
7	16.42-00007	4	Washer, Lock 7/16
8	16.30-00202	2	Screw, Cap 7/16-14×1¼



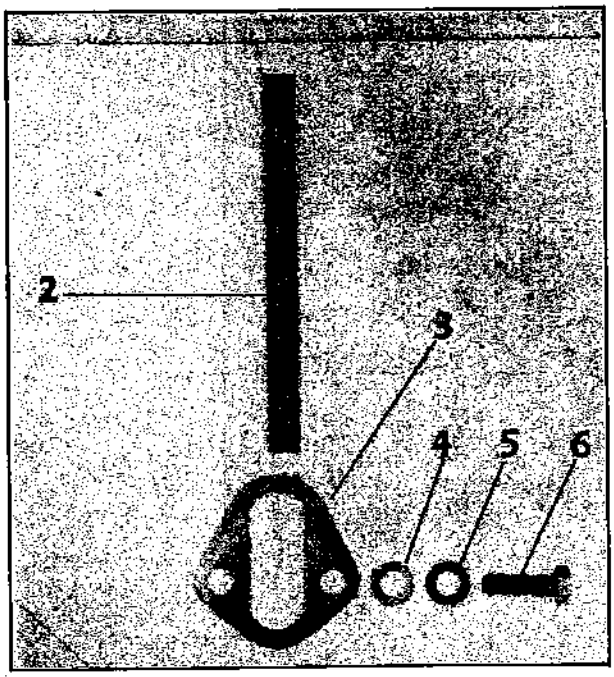
REAR ENGINE MOUNT

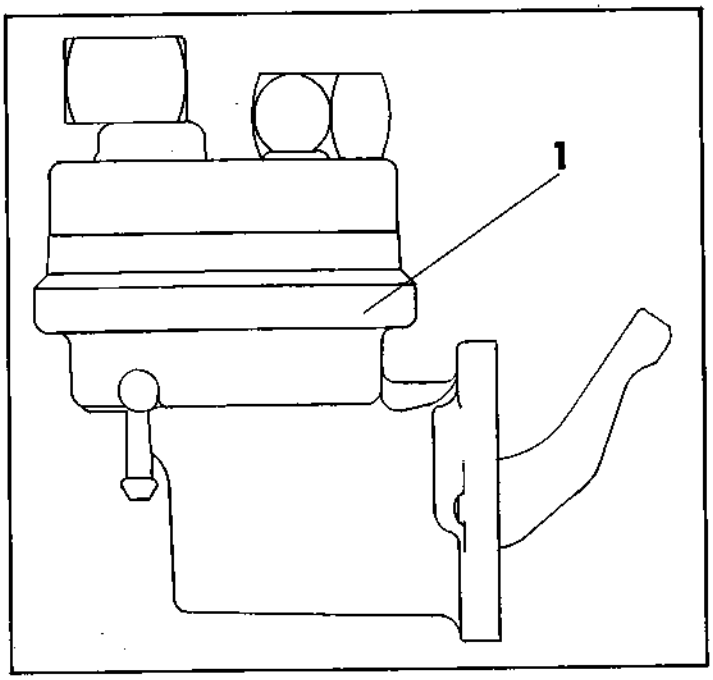
Code No.	Part No.	No. Req'd.	Name
			REAR ENGINE MOUNT
1	16.72-00006	2	Stud, Engine Mount
2	16.20-07693	2	Housing, Engine Mount
3	16.30-00546	2	Screw, Cap Hex Hd. ⅜-16×1¾"
4	16.42-00005	2	Washer, Lock ⅜"
5	16.93-05808	4	Mount, Engine Rubber
6	16.57-07660	2	Washer, Spacer
7	16.72-08731	2	Spacer, Engine Mount
8	16.36-07694	4	Nut, Hex 1"-16
9			Not Used On Model 454 Marine Engine
10	16.41-07695	4	Washer, Flat
11	16.20-07831	2	Adapter, Engine Mount
12	16.30-00020	2	Screw, Cap Hex Hd. ¼-20×⅜
13	16.41-00002	4	Washer, Flat
14	16.70-08749	4	Lug, Keeper
15	16.57-08758	2	Spacer, Steel
16	16.42-00001	2	Washer, Lock ¼"
17	16.36-00000	2	Nut, Hex ¼-20



Code No.	Part No.	No. Req'd.	Name
			FUEL FILTER
1	16.81-00014	1	Filter Assy., Fuel (Includes Items 4, 5, 8, And 10)
2	16.58-10056	1	Elbow, Street ¼ (Optional)
3	16.99-08785	1	Valve, Fuel Shut-Off ¼ Npt—90° Turn—
4	16.81-00017	1	Element, Filter
5			Case, Filter—Not Available As Individual Part
6	16.30-00711	2	Screw, Cap Hex Hd. 5/16-18×¾
7	16.42-00003	2	Washer, Lock 5/16
8			Cover, Filter—Not Available As Individual Part
9	16.59-00068	1	Elbow, Fuel ⅜Tx¼ Mpt (Earlier Models)
9	16.58-10061	1	Elbow 45° (Later Models)
9	16.59-00141	1	Connector (Later Models)
10	16.81-00019	1	Gasket, Filter Asbestos
*	16.57-50045	1	Line, Fuel-Filter To Pump
*	16.57-90102	2	Spacer, Phenolic (Used As Heat Dissipator, Install Between Fuel Filter And Exhaust Manifold

* - Not Shown

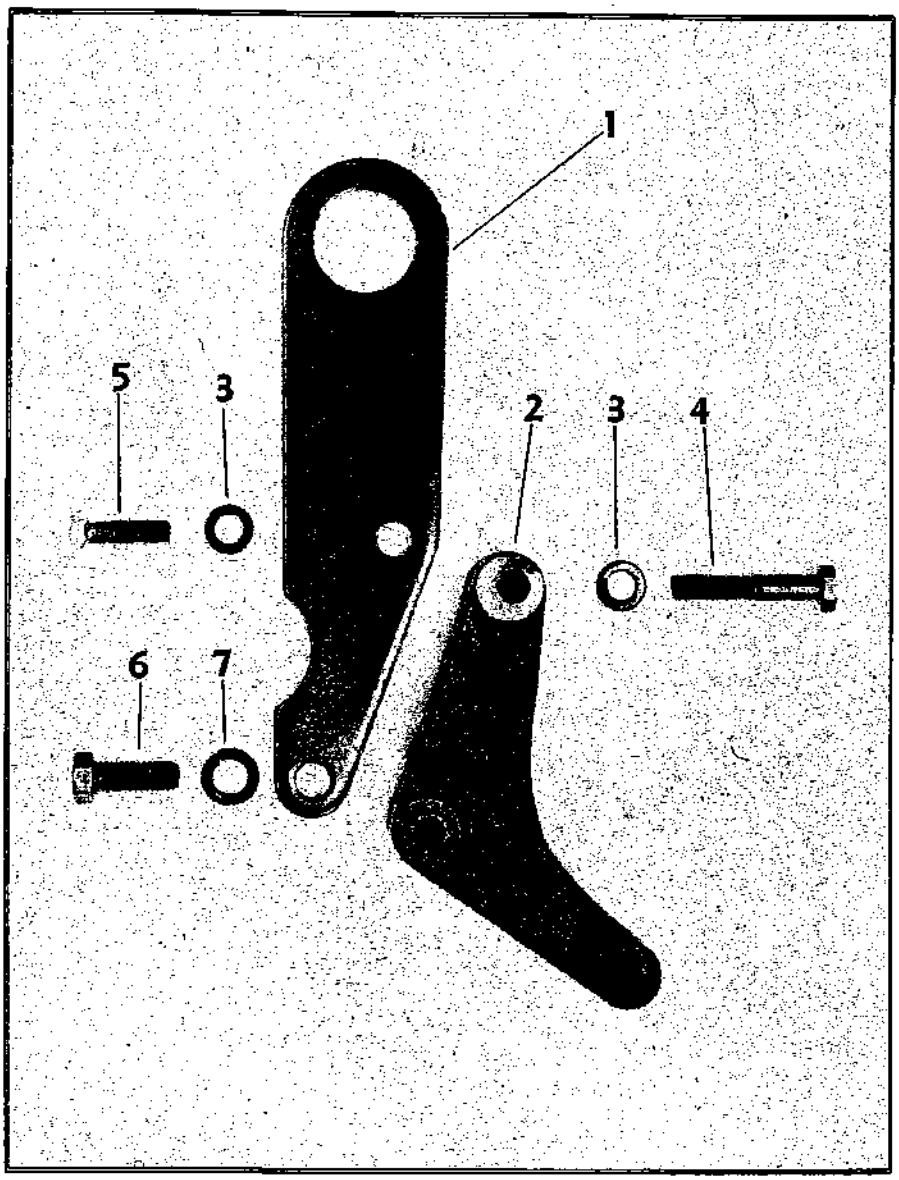




FUEL PUMP

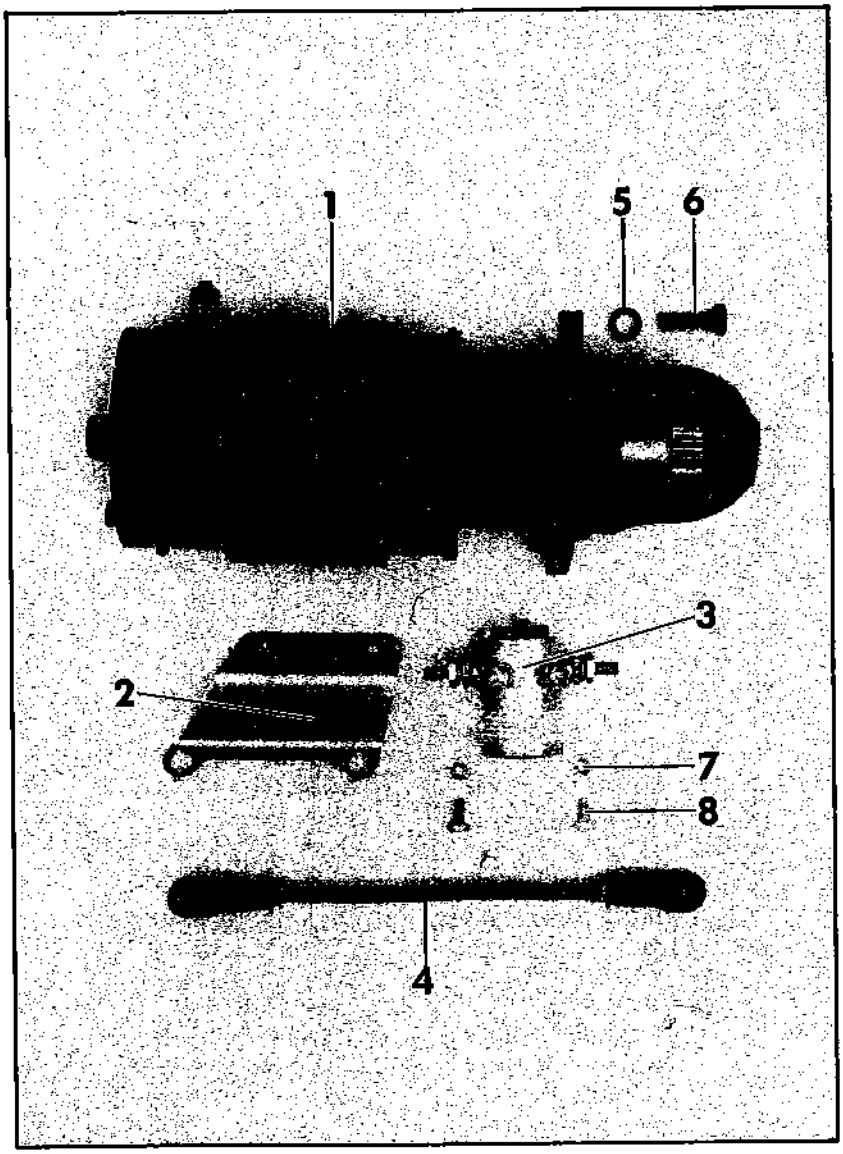
Code No.	Part No.	No. Req'd.	Name
			FUEL PUMP
1	16.83-08761	1	Pump, Fuel (Single Diaphragm)
2	16.11-00024	1	Rod, Fuel Pump Push
3	16.50-00074	1	Gasket, Fuel Pump
4	16.41-00029	2	Washer, Flat
5	16.42-00004	2	Washer, Lock ⅜
6	16.30-00130	2	Screw, Cap ⅜-16×1⅜"
N.S.	16.59-00068	2	Elbow, 90° Pump Inlet & Outlet
N.S.	16.57-50023	1	Line, Fuel-Pump To Carb.
N.S.	16.57-50045	1	Line, Fuel-Pump To Filter

N.S. - Not Shown



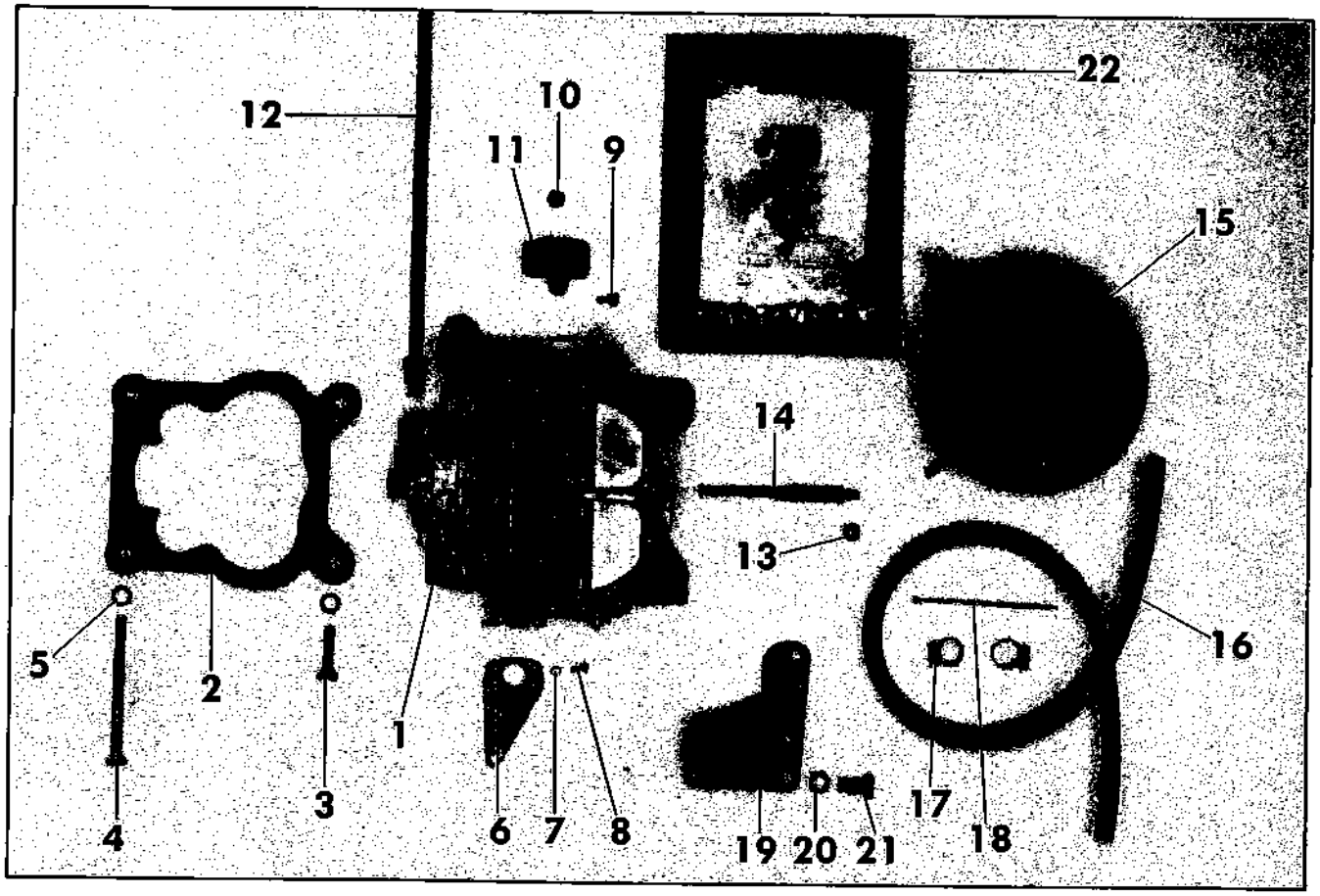
ALTERNATOR MT. AND FRT. LIFT BRACKETS

Code No.	Part No.	No. Req'd.	Name
			ALTERNATOR MT. AND FRT. LIFT BRACKETS
1	16.70-00138	2	Lifting Bracket, Engine
2	16.20-00172	1	Mounting Bracket, Alternator
3	16.42-00004	3	Washer, 3/8 Lock
4	16.30-00140	2	Screw, Cap 3/8-16x2
5	16.30-00124	1	Screw, Cap 3/8-16x1—Attach Right Lift Brk.
6	16.30-00198	1	Screw, Cap 7/16-14x1—Attach Right Lift Brk.
7	16.42-00007	1	Washer 7/16 Lock



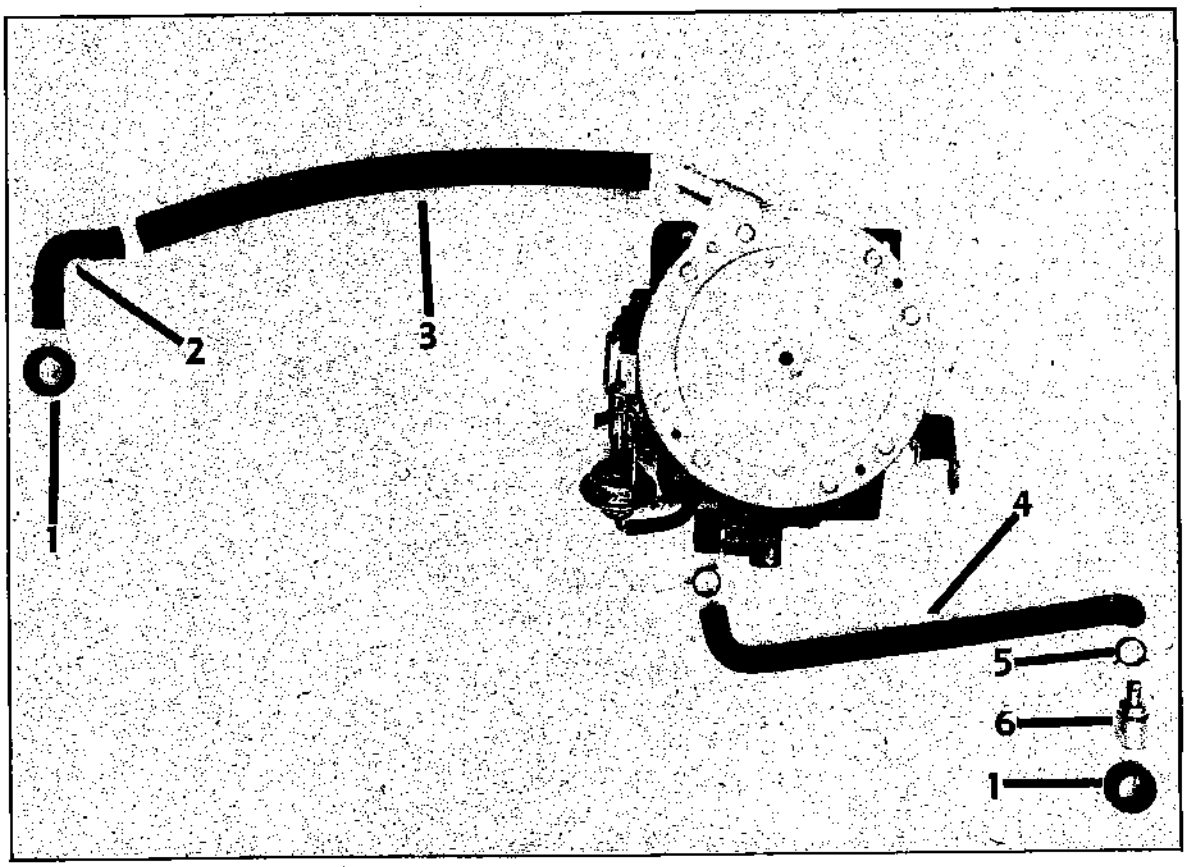
STARTING MOTOR AND SOLENOID

Code No.	Part No.	No. Req'd.	Name
			STARTING MOTOR AND SOLENOID
1	16.61-00050	1	Motor, Starting U.L. Listed (For RH Rot. Engines)
1	16.61-00051	1	Motor, Starting U.L. Listed (For LH Rot. Engines)
2	16.70-00163	1	Bracket, Solenoid Mounting
3	16.61-00059	1	Solenoid, Starter U.L. Listed
4	16.63-08733	1	Asm., Wire Solenoid To Starter
5	16.42-00004	3	Washer, ⅜ Lock
6	16.30-00126	3	Screw, Cap Hef Hd. ⅜-16×1⅛
7	16.39-00018	2	Nut, Mach. ¼-20 (With Captured Washer) Cad. Plated
8	16.30-00544	2	Screw, Cap Hex Hd. ¼-20×½ Cad. Plated



MARINE CARBURETOR AND FLAME ARRESTOR

Code No.	Part No.	No. Req'd.	Name
1	16.82-40022	1	Carburetor, Rochester Q-Jet Marine See Page 71 For Special Adjusting Tools
	16.96-08713	A.R.	Repair Kit, Carburetor Overhaul
2	16.11-01033	1	Insulator, Carburetor Gasket
3	16.30-00601	2	Screw, Cap Hex Hd. 5/16-18×1¼" Cad Pl
4	16.30-00037	2	Screw, Cap Hex Hd. 5/16-18×3¾" Cad Pl
5	16.41-00005	4	Washer, Flat
6	16.70-00121	1	Lever, Carb. Throttle-Cadmium Plated
7	16.42-00013	2	Washer, Lock No. 8-Cad Pl
8	16.32-00137	2	Screw, No. 8-32×½"
9	16.11-00702	1	Screw, Choke
10	16.11-00790	1	Clip, Choke Rod
11	16.11-00816	1	Asm., Thermostat Cover, Choke, And Rod
12	16.57-50023	1	Asm, Fuel Line-Pump To Carb.
13	16.39-00018	1	Nut, Mach. ¼-20 With Captured Washer
14	16.44-00010	1	Stud, Flame Arrestor
15	16.82-00044	1	Arrestor, Flame—Aluminum
16	16.54-10161	1	Hose, Fuel Pump Vent ¼"I.D.×26"
17	16.55-38482	2	Clamp, Hose "Mini"-All Stainless Steel
18	16.99-08795	1	Tie, Plastic
19	16.70-00110	1	Bracket, Throttle Control
20	16.42-00003	2	Washer, Loch 5/16-Cad Pl
21	16.30-00709	2	Screw, Cap Hex Hd. 5/16-18×⅝-Cad Pl
22		A.R.	Kit, Throttle-See Page 71



CRANKCASE VENT SYSTEM

Code No.	Part No.	No. Req'd.	Name
			CRANKCASE VENT SYSTEM
1	16.11-00581	2	Grommet, Vent System
2	16.11-00401	1	Connector, Vent Hose
3	16.54-10092	1	Hose 5/8×10
4	16.54-08362	1	Hose, Molded
5	16.11-01100	2	Clamp, Vent Hose
	16.55-39391	opt.	Clamp, Vent Hose
6	16.99-00072	1	Valve, Vent