ENGINE SPECIFICATIONS AND

SERIES	CYL.	DISPL. cc	BORE mm	STROKE mm	IDLE RPM IN WATER	IDLE RPM OUT OF WATER
JS550-C:SX 1992-1994	2	530	75	60	1500 ±100	1900 ± 100
JF650-A:X2 1992-1995	2	635	76	70	1250 ± 100	1800 ± 100
JF650-B:TS 1992-1996	2	635	76	70	1250 ± 100	1800 ± 100
JL650-A:SC 1992-1995	2	635	76	70	1250 ± 100	1800 ± 100
JS650-B:SX 1992-1993	2	635	76	70	1250 ± 100	1800 ± 100
JH750-A:SS 1992-1995	2	743	80	74	1250 ± 100	1700 ± 100
JH750-B:Xi 1992-1995	2	743	80	74	1250 ± 100	1700 ± 100
JH750-C:ZXi 1995 & on	2	743	80	74	1250 ± 100	1700 ± 100
JH750-D:XiR 1994	2	743	80	74	1250 ± 100	1700 ± 100
JS750-A:SX 1992-1995	2	743	80	74	1250 ± 100	1700 ± 100
JS750-B:SXi 1995-1996	2	743	80	74	1250 ± 100	1700 ± 100
JT750-A:ST 1994-1995	2	743	80	74	1250 ± 100	1700 ± 100
JT750-B:STS 1995 & on	2	743	80	74	1250 ± 100	1700 ± 100
JH900-A:ZXi 1995 & on	3	891	73	71	1250 ± 100	1700 ± 100
JT900-A:STX 1997	3	891	73	71	1250 ± 100	1800 ± 100
JH1100-A:ZXi 1996 & on	3	1071	80	71	1250 ± 100	1800 ± 100
JT1100-A:STX 1997	3	1071	80	71	1250 ± 100	1800 ± 100

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1
DESCRIPTION & OPERATION

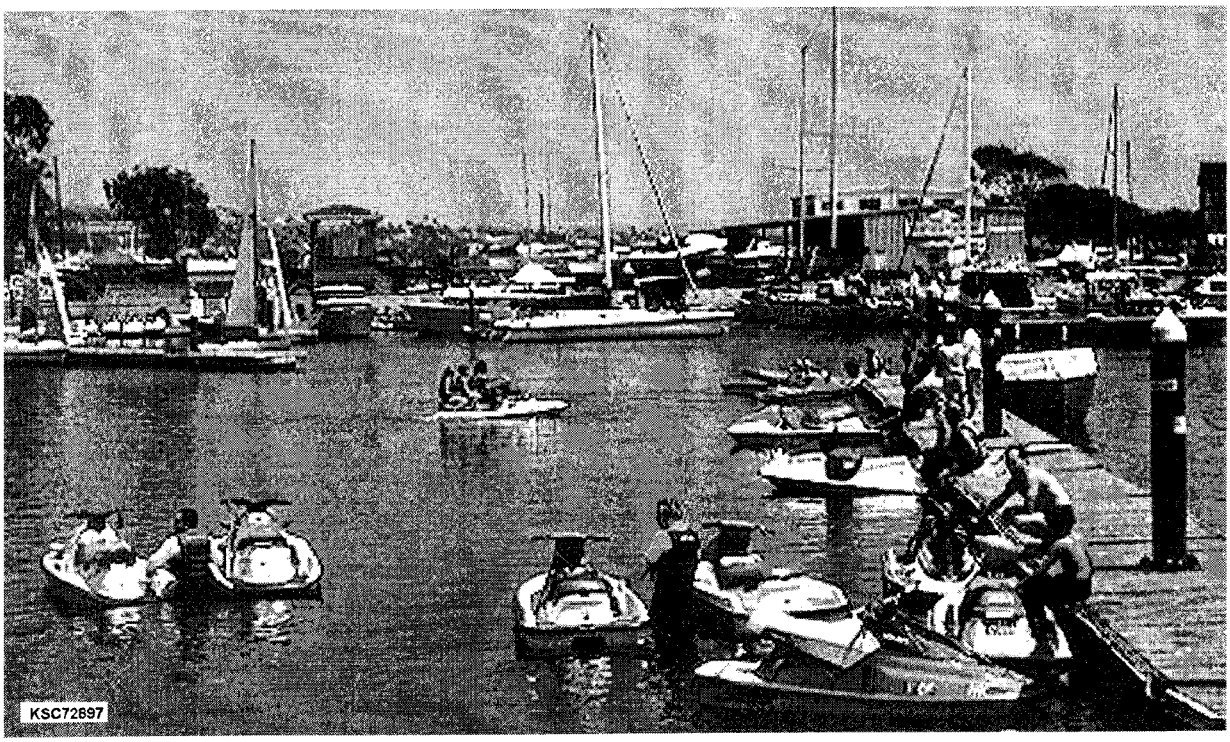
1-1 BRIEF HISTORY

The jet drive system for propelling a craft through the water arrived on the scene in the mid 1960's with the jet drive boat. In those early days, the jet drive system was mated only with high performance powerplants -- engines in the 454 cu. in. class and larger. For this reason, during the "gas crunch" in the 1970's the jet drives were labeled as inefficient and as "gas hogs".

In addition to these two negative terms, they earned the reputation as "bad boy" boats due to their noisy "straight" exhaust, high rpm operation, and their almost unbelievable maneuverability. These combined factors did little to enhance their image and certainly restricted their popularity.

With new and improved technology, personal watercraft arrived on the scene about the mid 1970's. Personal watercraft, as we know them today, were developed using the same principles as the jet boats, and originally powered with a single cylinder two-stroke engine.

In order to meet the demand for more speed and the ability to carry more than just



A typical inner harbor summer weekend with scores of personal watercraft preparing to leave or just returning from a "fun day" on the water in the "outer harbor" or at sea close to shore. Just a reasonable amount of "TLC", will reward the owner and his/her friends with hours of trouble free enjoyment.

one person, watercraft manufacturers were quick to respond. Today, most modern craft are powered with a twin cylinder or three-cylinder two-stroke powerplant, coupled to a single stage pump.

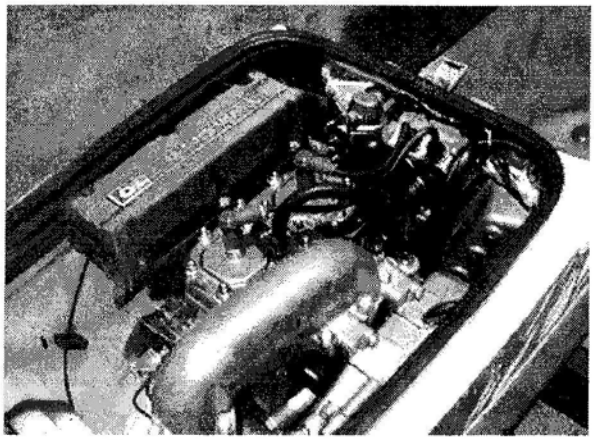
Aftermarket shops and manufacturers have come into existence all across the United States and Canada. Their output of specialty products and services permit the owner to gain more speed and in over the competition at racing events wherever enough water is available.

As mentioned in the "Foreword", this book has been designed and written to cover stock, factory "out the door" engines and jet drives. Modifications for higher than manufacurer's rated performance are so extensive and varied, no attempt has been made to include them in this volume. (Actually, for such coverage, a separate comprehensive book would be required.) In such cases the publisher's recommendation is to follow the after market instruction with the particular product or service.

Series Covered

The following Kawasaki series produced from 1992 thru 1998 are covered in this manual.

Model	Approx. Yr. of Production
JS550 Series	1992-1994
JF650 Series	1992-1996
JL650 Series	1992-1995
JS650 Series	1992-1993
JS750 Series	1992-1996
JH750 Series	1992 & On
JT750 Series	1994 & On
JH900 Series	1995 & On
JT900 Series	1997 & On
JH1100 Series	1996 & On
JT1100 Series	1997 & On



Overall view of the popular Model 750 Series twin cylinder installation.

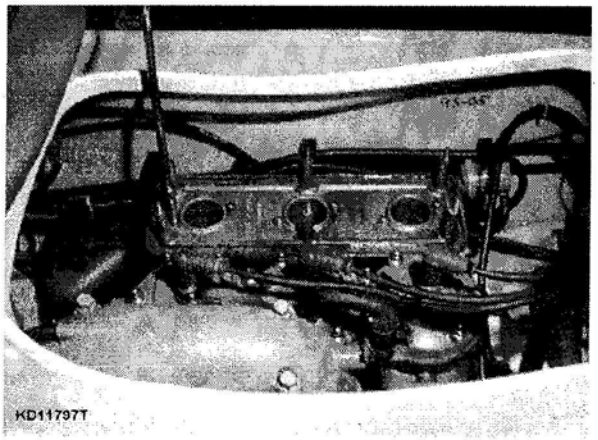
1-2 PRINCIPLES OF OPERATION

One of the first lessons to be learned in any elementary physics class is Newton's basic law: "For every force, there is an opposite and equal force". This statement is the basic principle of the jet pump. Water is "sucked" and "scooped" in from under the craft by a powerful pump rotating at incredible speed and then discharged, "blown" out, sternward in the opposite direction. In this manner the watercraft is propelled forward.

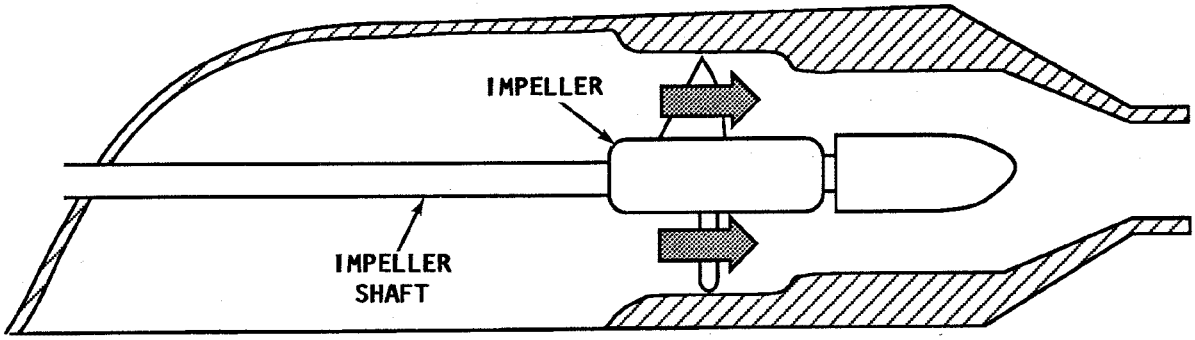
The personal water craft covered in this manual are all equipped with a twin or 3-cylinder water cooled two-stroke engine, matched with a single stage (one impeller) jet pump.

On a very few models, a reverse "gate" is swung down over the pump outlet nozzle forcing the exhausted water back in a forward direction thus moving the craft sternward.

Personal watercraft jet pumps may be classified as "axial flow" or "mixed flow".



Many times the Model 900ZXi Series engine is modified with aftermarket equipment and service for higher than factory "out-the-door" performance.



Cross-section line drawing to depict water flow through an axial flow jet pump. The water passes through parallel to the axis of impeller rotation.

Kawasaki watercraft are equipped with an axial flow jet pump, except the Model 550 which has a mixed flow pump -- see Chapter 10.

Axial Flow

Water in an axial pump moves on a single axis, as depicted in the adjacent illustration -- thus the word "axial" is used. In simple layman's terms -- water is ingested and discharged parallel to the axis of impeller rotation, as shown.

1-3 ENGINE AND JET DRIVE

The basic principle and arrangement of engine and pump are almost identical for all manufacturers.

The engine crankshaft is coupled either directly to the pump shaft through a coupler containing a rubber "shock absorber" or through a short driveshaft without any gear reduction. An impeller mounted on the pump shaft draws water into an opening in the hull through a suction and intake casting. Once the craft has attained forward motion the intake also serves as a "scoop" adding to the volume of water moved through the pump.

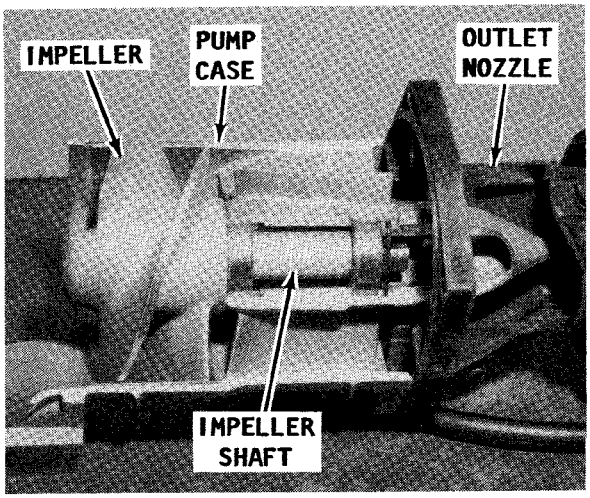
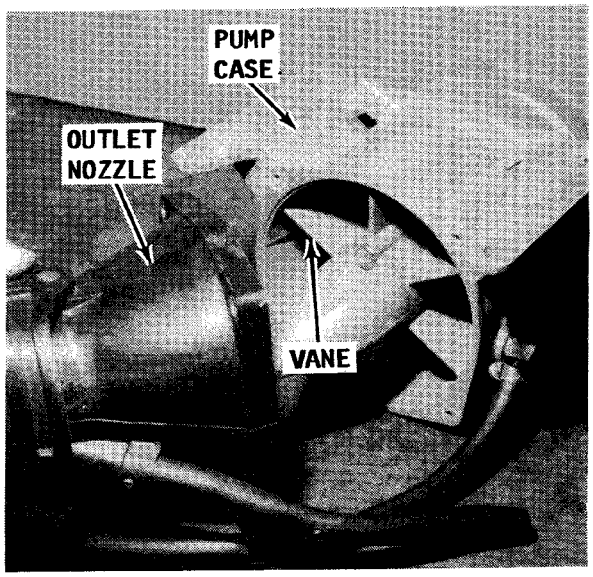


Photo of a cutaway "demonstration" type Kawasaki axial flow jet pump. A few major parts are identified.

Volume and Velocity

The outlet nozzle is slightly funnel shaped. This design coupled with the capacity of the pump (impeller) causes the volume of water entering the pump to exit the nozzle with increased velocity. This principle is similar to air passing through the venturi of a carburetor.

The amount of water ejected sternward from the nozzle at high velocity is the force propelling the craft through the water. This force can actually be measured and calculated in foot pounds or Newton meters. The



The vanes in the pump case straighten water flow and the conical shape of the outlet nozzle increases flow velocity in much the same way as air passing through a carburetor venturi.

greater the velocity of water mass moving through the nozzle, the greater the thrust to move the craft.

Cooling System

A fitting on the jet pump, aft of the impeller, syphens off cooling water. This water is delivered first to the exhaust manifold -- the hottest part of the engine. The water is then channeled around the cylinder walls, cylinder head and exhaust pipe.

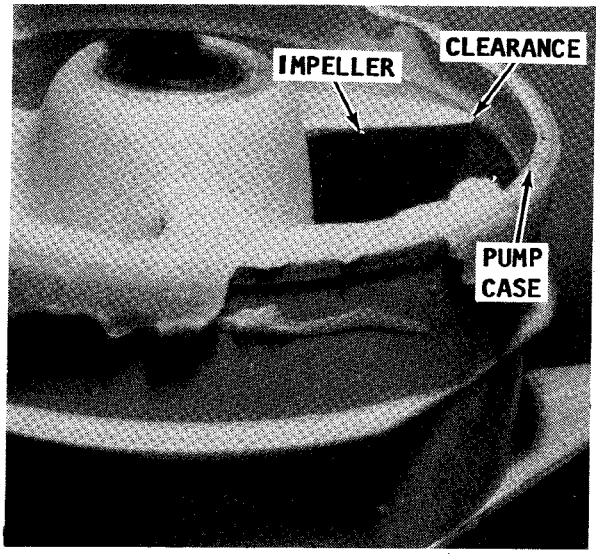
After the exhaust pipe, some water is channeled overboard through a bypass hose.

The remaining water is mixed with exhaust gases in an expansion chamber and finally discharged from the exhaust outlet. This mixture of water and exhaust gases has the affect of cooling and somewhat quieting the exhaust emission.

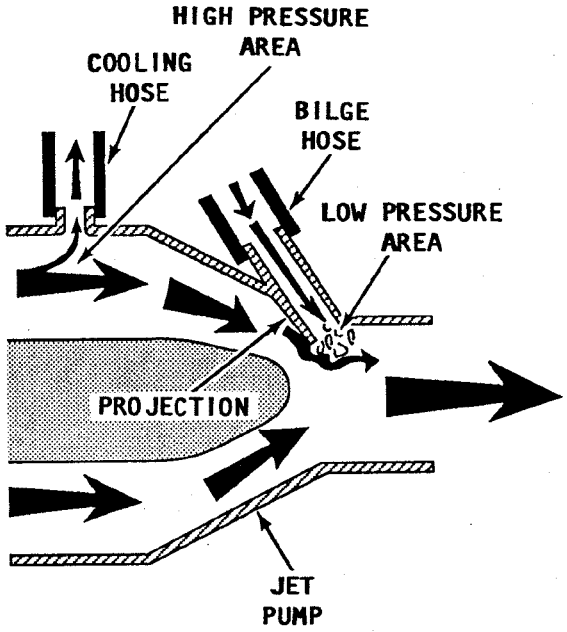
On all models, a bypass hose connects the exhaust pipe water jacket to an outlet on the starboard side of the hull. When water is discharged as a "tattle-tale" stream, the operator is assured cooling water is circulating through the engine properly.

Cooling Water and Bilge Hoses

On most pumps two hoses are attached to the pump case and outlet nozzle. One hose channels some of the water flowing through the pump to the exhaust manifold -- the hottest part of the engine -- to cool the block during operation. The other hose siphons water out of the bottom of the hull,



A feeler gauge may be used to measure the clearance between the impeller blades and the pump case.

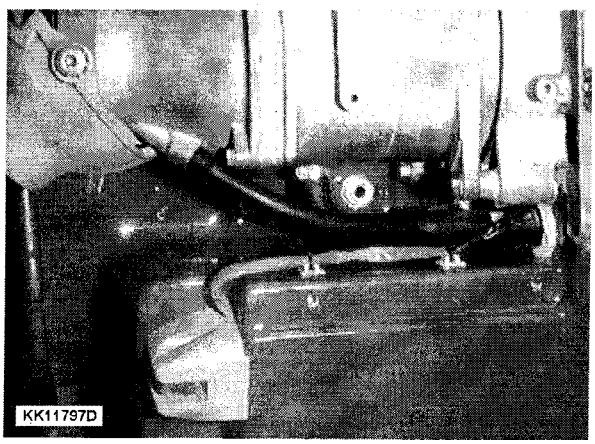


The direction of water flow through the cooling hose is opposite to the water flow moving through the bilge hose. The cooling hose routes water from the pump to the engine. Water is actually "vacuumed" from the bilge through the bilge hose to the pump where it is forced out through the nozzle.

and is referred to as the bilge system. The cooling hose has water flowing **FROM** the pump. The bilge hose has water flowing **TO** the pump. Both hoses attach to the pump in a similar manner.

What determines the direction of water flow?

The answer to this question is in a simple explanation of high and low pressure areas along the inside surface of the pump.



Close view of the nozzle with the cooling hose and the bilge hose clearly visible.