HamiltonJet 740 Series Jet Units

Owner's Manual

WARRANTY

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C.W.F. HAMILTON & CO. LTD.,
Lunns Road, Middleton.

INDUSTRIAL EQUIPMENT
CHRISTCHURCH, N.Z.

Jet boat

Series.....

No. .....

ENGINE

Type.....

No. .....

JET

Type.....

No. .....

NOTE

THE OWNER MUST FILL IN THE DETACHABLE HALF OF THIS PAGE AND RETURN TO:—

C. W. F. HAMILTON MARINE

P.O. BOX 709

CHRISTCHURCH

WITHIN 7 DAYS OF PURCHASE

IF NOT,

ALL WARRANTY

IS VOID

PLEASE RETURN THE WHOLE OF THIS SIDE

Jet boat

Series.....

No. .....

ENGINE

Type.....

No. .....

JET

Type.....

No. .....

DEALER

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OWNER

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Date.....

Signature of Owner

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HamiltonJet

"740" SERIES

OWNER'S MANUAL

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C. W. F. Hamilton & Co. Ltd.,
Jet Propulsion Division,
Christchurch, New Zealand.

INTRODUCTION

Very soon you will begin boating in your new Hamilton Jet Boat, a remarkable craft with unique capabilities.

Remember –

> "It takes a lot of experience with any given boat to learn all her whims and traits – to know her strong points and use them wisely to overcome the weak ones.
>
> But boats, like individuals, do respond to understanding treatment."
>
> Chapman, Charles F.
>
> Piloting, Seamanship &
> Small Boat Handling.

So before casting off, let's get familiar with the craft and the propulsion system, its features and capabilities.

Q. What is Jet Propulsion?

A. What happens when you release a balloon without knotting the neck? The balloon shoots across the room. The principle is quite simple. The air escaping out of the balloon produces a reaction on the balloon, shooting it across the room. The same principle is propelling your Jet Boat.

Hamilton Jets are purely reaction propelled. Over ten tons of water per minute, coming out from the back of your boat, produces the reaction to push your boat. Very similar to Jet aircraft, except that the medium used is water not air.

Q. Why is jet propulsion better than the conventional propeller driven boat?

A. The most important feature of Jet Propulsion is absence of underwater appendages such as rudder and propeller. This means lower drag and absence of things which could get damaged or cause concern to swimmers or skiers. Thus it opens new "Jet Only" territories for motor boating, which are out of bounds for propeller or outboard driven craft.

Can you imagine yourself moving at top speed through water that is only a few inches deep and littered with obstructions? Or slamming your boat into reverse at high speed? In a standard motor boat it would be impossible. But not in your Hamilton Jet boat. High acceleration, no fouling of propellor blades, incredible manoeuvrability, ease in driving on and off the trailer – these are some of the advantages Hamilton Jet Propulsion has brought to motor boating.

Q. Why Hamilton Jet . . . . . .?

A. (i) Because the Hamilton Jet unit uses an axial flow pump with efficient intake to give a highly favourable ratio of mass of water discharged to its exit velocity. This develops the required thrust with the lowest possible velocity of discharge and low power input, thus achieving high propulsive efficiency.

(ii) Because Hamilton Jet gives you incredible manoeuvrability. Whichever way you are travelling, forward or reverse, you have complete control of the boat with 'power' steering. Even in neutral you have full steering available by using reverse lever and the wheel.

(iii) Hamilton Jets have the longest experience and the most extensive background of Marine Jet Propulsion in the World.

SCOPE OF USE

The 740 Series Marine Jets are designed for the efficient propulsion of small and medium sized high speed (over 20 knots) planing craft, and to be driven by conventional gasoline inboard engines. If used as recommended, they will give brisk acceleration, excellent power for water-skiing, and an economical load-carrying for family, sporting and utility purposes of all descriptions.

These units can be used on heavier and larger boats, displacement craft, and a variety of special purpose vessels, with approximately equal efficiency to a direct-drive propeller. However, speeds may be low, and efficiency reduced. If the units are to be used outside their design range, the manufacturers should be consulted for guidance.

Generally, therefore, it is recommended that they be confined to the lighter, fast class of craft usually trailered (or slipped) when not in use. The units are built from lightweight materials for high performance. They can be used freely in the sea, but to avoid problems with fouling and excessive corrosion it is recommended that they are slipped or trailered when not in use.

MODEL	741	742	743
Impeller Diameter	7½"	7½"	7½"
No. of Stages	1	2	3
Horsepower Range	50 – 150	100 – 250	200–400
Engine Size	60–200 C.I.D. 1–3.3 litres	180–320 C.I.D. 3–5.5 litres	300-500 C.I.D. 5 – 8 litres
Maximum Revolutions	4000 – 5000	4000 – 5000	4000 – 5000
Hardy Spicer Coupling	1300 series	1300 series	1400 series
Nozzle (Std.)	4¾" (120 mm)	4" (102 mm)	3-7/8" (98 mm)
Nozzle Range (To Order)	4¼ – 5"	3¾ – 4¾"	3¾ – 4¾"
Unit Weight	90 lb (40 kg)	110 lb (50 kg)	120 lb (55 kg)
Boat Size	12' – 20' (3.7 – 6 m)	14' – 23' (4.3 – 7 m)	16' – 26' (4.9 – 8 m)
Unladen Boat Weight (Maximum)	1750 lb 800 kg	2650 lb 1200 kg	3500 lb 1600 kg

NOTE:– Use high R.P.M., high H.P. applications only on light high performance pleasure craft.

Use lower R.P.M. and move up one stage for heavier craft and commercial operation.

740 SERIES FEATURES

This series of units incorporates a number of improvements designed to make the units easier to fit, and more versatile on world markets. They are as follows:—

1. **5° Angled Shaftline** This angle is built in the intake casting, and therefore modern engines (with their large diameter flywheels) can be comfortably accommodated without risk of excessive drive shaft universal angles.

2. **Intake Screens** These are now longer than previously, but the types are reduced from four to two — now both of simple flat design. Increased screen area reduces risk of take-off cavitation, and gives greater flow area to the impellers.

3. **Mounting Arrangements** All installations will be FLAT MOUNT, (eliminating the 5° angled mounting block system). It will now not be necessary for the boat builder to use the more complex shape for big engines, but just to employ the much simpler and lighter flat base for **all** installations.

4. **Reverse Bucket** This now employs stronger, cleaner side arms and a stronger pushrod to ensure safe operation with the largest engines.

5. **Steering Arm** As well as containing the position for cable and pulley steering as used on Hamilton jet boats, there is provision for direct coupling of Teleflex, and other push-pull cable steering.

6. **Reverse Control** The reverse lever is designed for direct coupling to either Morse, Teleflex or Hamilton control linkages to suit most customers.

7. **Close Coupling** There is also a complete kit available (at extra cost) enabling the engine to be short-coupled direct to the jet unit through a flexible rubber coupling, saving about 4" in length over the standard Hardy Spicer universal shaft. This enables the use of a standard "bob-tailed" inboard marine engine with a Borg-Warner flywheel housing, and eliminates alignment problems.

8. **Power Ratings** Due to detail improvements, power ratings have been increased on all models, giving wider scope for each unit, and consequent reduction in unit costs.

SUITABLE HULL SHAPES

The 740 Series Jet units may be installed in a wide variety of hulls, both round bilge and hard chine. However, for best performance and handling the following points should be observed.

1. **Vee angle in bottom** Some vee-angle in the bottom at the transom is desirable for the following reasons:

(a) **Priming:** The Jet unit can be mounted lower than in a flat bottom, so that instant priming is assured when the engine is started. The unit should be at least half full of water when the craft is standing stationary.

(b) **Choppy Water:** The vee-angle assists in keeping the Jet unit intake down in "green water" at speed in choppy or rough conditions. Also entrained air entering at the bow is more successfully separated out to the sides, thus avoiding engine racing in these conditions.

2. **Running Lines** Running Lines should be "monohedron", that is constant deadrise — or close to it. Flatness aft is important. Deep vee designs are eminently suitable, and deadrise angles of 12° – 25° are commonly used.

3. **Stemline** Avoid a forefoot too fine and deep. This gives too much keeling forward in fast turns causing spinning out. Use a full and convex bow, with a rounded stem rising steadily from well back along the keel.

4. **Keeling** Do not use any centre keel or deadwood (more than 2" or so). If keeling is required aft to control turns, fit a pair of "sister" keels about 2 ft apart at the stern. These should be 2 – 6 feet long, 1" – 3" deep, and faired off to nothing at the front end.

NOTE: The larger the craft, the less the above points apply. Therefore, in general, you can choose any hull design that is suited to the purpose. Avoid lapstrake hulls or external stringers on the bottom as they can carry entrained air to the Jet intake causing engine racing. Avoid designs with severely warped bottoms, from very fine forward to very flat aft. They do not make good Jet boats. Make sure no "rocker" or "hook" is present as this will adversely affect trim.

FITTING INSTRUCTIONS

1. PREPARATION FOR FLAT MOUNTING

First prepare the keel area near the transom as in the mounting base diagram. A flat area, built up on the keel line from wood or fibreglass (whichever is preferred) is required. Note that the depth of the block must be such that the sides of the intake hole are 1-1/16" deep finally. A flat bottomed hull therefore, would require a block 1-1/16" deep all over. A vee bottomed hull would be deeper in the centre, but still 1-1/16" deep at the hole side.

INTAKE HOLE

Knowing the number of stages of the jet unit, and the transom angle of the boat, select the appropriate dimension "Y" from the table. Using the "Y" dimension mark off a 19¾ x 8-7/8" rectangle ensuring that it is truly central athwartships

Cut out the rectangular hole and check that the sides are 1-1/16" deep. Seal the cuts with paint. Make sure the top surface is really level and flat. Underneath, flatten off the bottom (9" wide) from the rear edge of the hole, clear back to the transom so that no "step" will remain when the flat intake screen is installed. This will only need to be done on vee-bottoms, as flat bottoms (or near flat) will leave no step in this area. In front of the intake hole, fair off from the flat area smoothly into the bottom on vee-bottomed hulls so that the water can flow smoothly up to the intake.

TRANSOM HOLE

Mark the centre line of intake. Extend it to the transom and mark the vertical centre line.

Place a straight edge on the top of the block so that it also touches the transom. Mark where the straight edge cuts the vertical line on the transom, Point "A". Select the appropriate dimension "Z" from the table and measure this distance from Point "A" up the vertical line on the transom to establish Point "B". Drill a small hole (1/8") through the transom at Point "B", keeping the drill parallel to the top of the block. Mark a vertical and a horizontal line on the outside of the transom from where the 1/8" hole breaks through. Take the full size shape on the drawing at the end of this book, and place the point marked shaft centre-line on the 1/8" location hole on the outside of the transom. Then mark the shape on the transom, making sure that the centrelines on the drawing are true with those marked on the transom. Cut out this hole through the transom parallel to the jet shaft centreline.

MOUNTING

The jet units are supplied with reverse bucket dismantled. If not, undo bolts and dismantle the bucket from the jet unit.

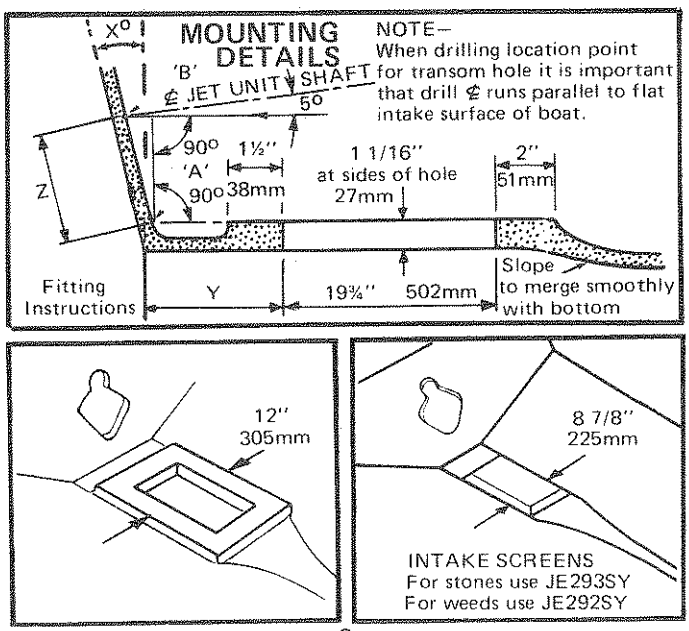
Remove tie bar, hinge pins and deflectors. Remove cotter pin, steering arm and shaft.

Temporarily screw intake screen directly on the bottom face of the jet unit with two screws only. Slide the jet unit through the transom hole in the boat, and drop over the intake hole so that the intake screen automatically locates the unit in the intake hole. Shift the unit in such a way as to get equal clearance on sides and fore and aft of screen. Mark through the fourteen holes on the base. Remove the jet unit and drill 5/16" dia. holes on positions marked. Countersink the holes on the underside.

Bolt the screen on the base of the jet unit with rubber foot gasket sandwiched in between. Smear both surfaces of gasket liberally with black Bostick cement, Ad Fast cement or equivalent. Screw up four screws holding screen firmly with sealant smeared on the threads.

Slide the unit into the hull and drop over intake hole. Put through fourteen holding down screws smeared with sealant around heads from the underside. (In hulls with soft wooden bottoms, a metal strip with a row of countersunk holes may be required along each side to prevent the head of the bolts pulling into the wood).

Put fibre washer then flat washer and the nut on all screws in the same order. Tighten the nuts to pull down the unit evenly all round. Make sure that the heads of the screws pull in just flush with the bottom of boat and do not protrude.



TRANSOM ANGLE	X°	0°	2°	4°	6°	8°	10°	12°	14°	16°
MODEL 741 SINGLE STAGE	Y inch	10-1/8	10-1/8	9-7/8	9½	9-1/8	8¾	8¼	7¾	7½
	mm	257	254	251	241	232	222	210	197	191
	Z inch	5¾	5¾	5¾	5¾	5-7/8	6	6-1/8	6-1/8	6-1/8
	mm	146	146	146	147	149	152	155	155	155
MODEL 742 TWO STAGE	Y inch	13-7/8	13-7/8	13-5/8	13-3/8	12-7/8	12-3/8	11-7/8	11-3/8	10-7/8
	mm	352	349	346	340	327	314	302	289	276
	Z inch	5-3/8	5-3/8	5-3/8	5-3/8	5½	5-5/8	5¾	5¾	5¾
	mm	137	137	138	139	141	144	146	147	148
MODEL 743 THREE STAGE	Y inch	18-1/8	18-1/8	17-7/8	17-5/8	17-1/8	16-5/8	16-1/8	15-5/8	15-3/8
	mm	460	457	454	448	435	422	410	397	391
	Z inch	5	5	5	5	5-1/8	5¼	5-3/8	5½	5-5/8
	mm	128	128	129	130	131	134	137	141	144

DIMENSIONS BECOME CRITICAL

TRANSOM SEAL

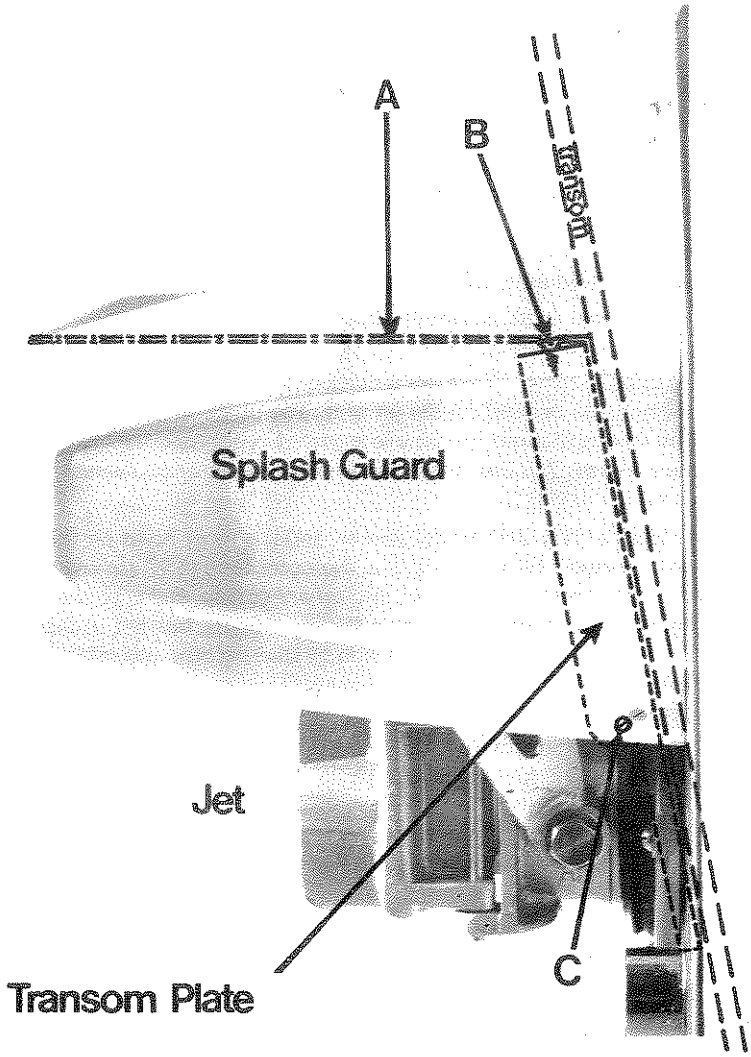
The transom seal assembly comes part assembled. Fit this assembly over the tailpipe. Fit steering shaft (59), reverse rod (80), and loosely assemble the reverse bucket on its pivot bolts. Position the plate so that the holes on its horizontal centreline are equally spaced over the previously marked horizontal centreline on the transom. Drill screw holes, fit the insulating washer head and fasten the transom plate with nuts and washer inside the boat. Stretch garter spring (93) around the moulded lip on the seal and hook both ends together. Replace deflectors.

2. **REVERSE GEAR**

Fit reverse pivot bushes (83) into holes in bucket side arms, put 5/8" dia. washers (71) and stainless steel sleeves (82) (as supplied on later models) on 5/8" dia. x 1½" bolts (81) and bolt the bucket onto the threaded bosses on the tailpipe. Tighten bolts. Put the reverse operation lever (88) onto the lower pivot pin (already fitted) so that the top of the lever is approximately 1" off the unit centre line. Fit on 5/8" dia. washer (71) and 1/8" split pin (87). Put the locking lever (86) onto the other pivot pin so that the short arm rubs on the operation lever and the longer arm clears the outside of the operation lever. Fit the sliding link (76) around the operation lever and bolt to the hole in the short arm of the locking lever with the head of the bolt (73) nearer the intake. Do not tighten the nut as the sliding link must be free to turn. Put on lock nut and tighten. Put spring (89) through 1/8" dia. hole in operation lever. Attach spring anchor (90) under 3rd from front bolt holding the intake down, (4th from front bolt in the case of the 3 stage unit). Fasten other end of spring to anchor. Finally assemble the push rod (80), i.e., fasten the bush end between the bucket lugs, fit the lock nut and clevis (78) to the push rod on the inner end, and fit with bolt, nut and lock nut to the top of the reverse lever.

When the locking lever is engaged in the neutral notch the boat should remain stationary with the engine running. Full steering is still available. With the bucket fully raised ("forward" position) the push rod (80) length should be adjusted in length so that the lowest portion of the bucket is ¾" above the steering deflectors. When full reverse is selected the top lip of the bucket should come down within ¼" of the steering deflectors. The Jet linkages automatically lock in neutral and reverse without the need for external stops.

Mounting splash guard on angle transom



1. Trim front of splash guard so that tread 'A' is horizontal when mounted against transom. (This is necessary to prevent bucket fouling splash guard).

2. Press firmly against transom and drill three 13/64" dia. holes at 'B' and one each side at 'C', through splash guard and transom plate flange.

3. Bolt home.

STEERING CONTROL

The steering arm on the jet unit can be operated by the driver in one of two basic arrangements:

1. **Cable and Pulley System** Hamilton Jet Boats use this arrangement. It consists of steering wheel unit forward, with either a cable drum, or a sprocket and chain behind the dash panel. This actuator is connected to the top holes of the steering arm on the jet unit through a wire rope and pulley arrangement around the sides of the boat. Use strong heavy duty pulleys and wire rope (6 x 19 ¾" circumference is suitable) and a turnbuckle tensioner in the system. Use no springs as used on outboard systems. Connect to the steering arm with 3/16" shackles, and lockwire all screw fittings throughout. It is most important to use only top quality heavy duty gear, fitted most carefully. Do not use plastic covered wire rope.

This system gives the lightest and most responsive steering available, and is most suitable to the quick ratios desirable with a Jet boat.

2. **Push/Pull Single Cable Systems** There are a number of proprietary brands of marine steerers on the market which can be used on the jet unit. The quickest possible steering ratios available should be used and avoid the very low geared types used for heavy outboards and stern drives. Choose a Morse, Teleflex, Steermaster, Rideguide, or equivalent, provided they will give a suitable ratio.

Our recommendation is the Teleflex 240 model steerer, and the inner holes on the jet steering arm are designed expressly for this unit. Use the outer hole (5¾" radius) for general purpose craft, with the anchor almost horizontal, and on either side. Refer to the diagram. The inner hole gives slightly faster steering desirable for small boats, but the anchor can only be used on the port side. Fit ball end fitting on aft side of steering arm and retaining nut (5/16" diameter) on front side.

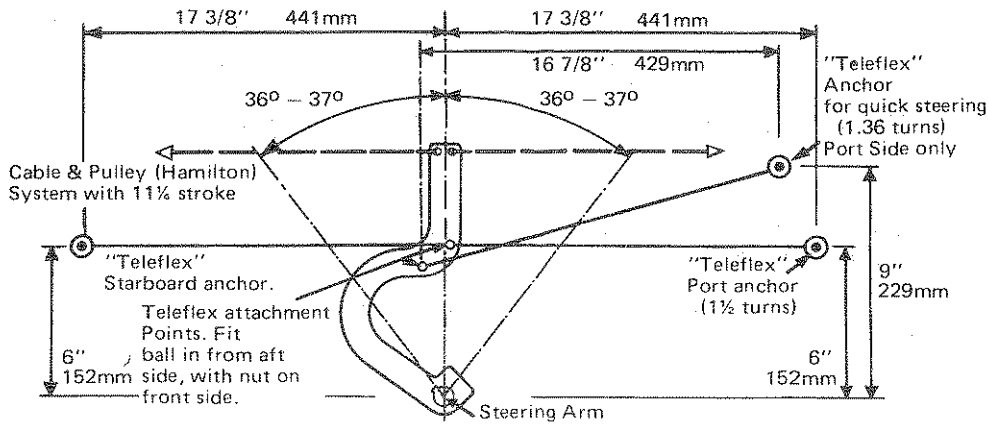
The following steering ratios are recommended:

(i) Small light craft ¾ – 1¼ turns lock to lock

(ii) Larger, heavier craft 1¼ – 1½ turns lock to lock

STEERING CONNECTIONS

(Looking aft when in boat)



REVERSE CONTROL

1. **Hamilton Push Rod System:** Uses a solid link and bell crank system from the driver's position to the end hole in the reverse locking lever on the jet unit. This gives simple low cost control. Kits are available from your nearest agent, or can be made up by any handyman from simple parts. All locking detents are built into the jet unit, and it is only necessary to run a tubular drag-link from the jet unit along the boat keel tunnel to a suitable hand lever at the driver's position. The stroke required is 8¾", and the builder should aim to have the hand lever move approximately 12 – 20" over the full movement from reverse to forward. Use sturdy linkage, with no flexing of brackets and levers.

2. **Morse Cable System:** A Morse control can be used with the following parts:

Hand Lever:	Morse MC (or MJ)
	Cable 64 Series
	Stroke 4"
	End Fitting 5/16" Morse ball joint (A38491)

The unit is available with a bracket on the side of the intake which will anchor the 64BC cable and connect with the ball joint to the rear hole in the jet locking lever. (See assembly sketch Page 14)

3. **Teleflex Cable System:** Similar to above. A suitable Teleflex set is as follows:

Hand Lever:	Teleflex D2
	Cable K30
	Stroke 6 – 9" (4" used)
	End fitting 5/16" clevis.

An anchor attachment is available as **an extra.** (See assembly sketch).

After the boat is launched, the neutral position can be adjusted as follows:

(i) Select the neutral position, making sure the jet locking lever is in the neutral notch (top one) on the reverse lever.

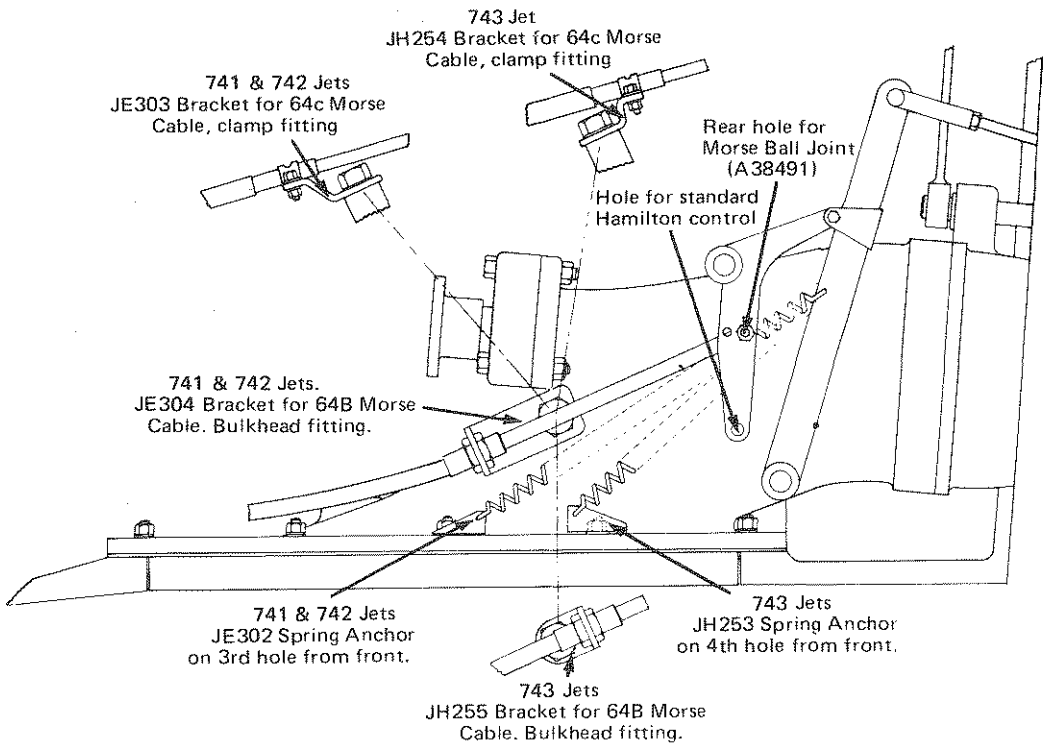
(ii) Run the boat at a fast idle in open water with no current or wind, with the steering straight ahead.

(iii) If the boat moves forward, stop and unscrew the reverse pushrod clevis end a little to lower the reverse bucket a little.

(iv) If the boat moves astern, stop, and screw in the clevis on the pushrod a little to raise the bucket.

(v) Move clevis until there is no movement of the boat in either direction in calm conditions.

REVERSE CONTROLS USING MORSE CABLES



ENGINE SELECTION

Your Hamilton Jet Unit is designed to be driven off the commonly obtainable gasoline inboard marine engines with the following characteristics.

(i) Peak design revolutions of 4,000 – 5,000 r.p.m.

(ii) Lightest possible weight, about 3 – 5 lbs/h.p.

(iii) Complete marine engines with water-cooled manifolds, etc.

(iv) Engines should be purchased in the "bob-tailed" condition, i.e. **without** marine transmission. Most inboard/outboard or stern drive engines are suitable.

(v) The raw water pump may be deleted, as the jet unit has a water supply point.

(vi) Oil coolers are optional, but are less necessary on jet drive engines since the cruising load is lighter than propeller craft, and oil heating is less.

(vii) Either direct raw water cooling, or fresh water heat exchanger cooled engines can be used.

(viii) Check the horsepower rating, remembering the S.A.E. rating can be up to 20% higher than actual shaft horsepower as installed.

The engine should be mounted horizontally, or near horizontally, preferably on soft rubber mountings similar to automotive mounts. For fast manoeuvring river boats, keep the engine a little forward near amidships, but as far aft as possible for most other applications. Check with the hull designer if in doubt. Aft engine positioning ensures quick jet priming, best top speed, and usually maximum cockpit space, but the boat should be designed for aft weight if imbalance is to be avoided.

COOLING SYSTEM

If you have a marinised engine, then there will be a built-in water cooling system and it is advisable to use the cooling water supply as recommended by the manufacturer of the engine. Otherwise one of the following systems could be used for cooling the engine.

1. Conventional System: use the raw water pump (preferably Jabsco or equivalent) provided with the engine to pump water from a skin fitting in the hull to the engine as used with inboard engines. Remember to block the jet unit offtake if this arrangement is used.

2. Delete raw water pump and use jet water offtake to feed a small amount of cold water in the hot water returnline to engine water pump. Provide a small overflow in the returnline just after the thermostat. This method should be very carefully engineered to get satisfactory engine temperatures when idling or at high loads, and as such it is not recommended to the amateur boat builder. It is advised to contact your nearest dealer for detailed information. It **should not** be used if the engine has an alloy cylinder head or block, which may suffer from corrosion in salt water.

3. The most satisfactory cooling system is attained by using a heat exchanger. Connect the Jet offtake by a hose to the heat exchanger and out into the exhaust manifold, and thence to waste. It is advisable to use a sand trap before the heat exchanger if dirty water conditions are expected.

The heat exchanger and auxiliaries could be bought from the factory. However, before adopting any cooling system, it is advisable to contact the factory or the engine manufacturer for further details.

If the engine is fitted with an oil sump cooling coil, connect a ½" hose from the jet unit offtake to the cooling coil, or it can be piped in series with the heat exchanger.

It is important to attain recommended operating temperatures in the engine. Adjust the cooling water flow to get close to the recommended temperature while idling as well as while driving hard.

Lack of cooling water flow can be noticed by the increase in exhaust noise even before it shows on the temperature gauge, if fitted. Switch off the engine immediately and check.

EXHAUST

It is advisable to use water jacketed Exhaust Manifolds. The cooling water out of these manifolds should be mixed with exhaust gases in the exhaust pipe outlet about 6" below the nearest exhaust port pointing along the flow of the gases. A silencer could also be used in the system, if desired, although the "wet" exhaust is silenced to some degree without further fittings. Exhaust "Risers" or goosenecks may be required if the engine is mounted low in a deep-vee boat.

AIR BLEED

Connect the plastic tube to the air bleed nipple on the jet unit and fix with hose clip. Leave the other end open and mount it on the engine or the transom so that the open end is as high above the waterline as possible. This fitting bleeds a controlled amount of air into the unit and aids quiet running.

BILGE PUMP

A jet bilge pump using water from the jet offtake can be fitted on the boat. Your agents stock this unit.

COUPLING ARRANGEMENTS

HARDY SPICER COUPLING

A standard Hardy Spicer universal shaft with twin universal joints, sliding spline central, and flange ends of a suitable length can be used to connect the engine flywheel to the jet unit shaft coupling. An adaptor on the engine flywheel will be necessary for the Hardy Spicer flange. The size of your Hardy Spicer jet coupling, which is standard equipment, is indicated in the jet unit specification. Take care to keep universal angles in the range $1^{\circ} - 5^{\circ}$ if this arrangement is used.

CLOSE COUPLING

A close coupling kit is available which enables the engine to be positioned closer to the jet and gives more room in the boat. This uses a flexible rubber drive, and gives a coupling distance of 6 to 7 inches. The engine should be ordered with a standard Borg Warner marine flywheel housing (the latter being obtainable with most engines). The Borg Warner 6 bolt, 8¼ ins. dia. spigot flywheel housing is standard for Borg Warner and the Hamilton close coupling kit.

With other special flywheel housings and small flywheels, the coupling distance (flywheel to jet coupling) can be reduced to approximately 4 ins.

NOTE: The close coupling kits also incorporate the rear engine mounts. The front engine mounts should be placed near the centre of the engine, in this case to reduce the load on the rear mounts.

ADJUSTMENTS & INSULATION CHECKS

Although most of the settings are done at the factory, some finer adjustments have to be done after installing the unit in the boat, mainly to match the different engines and boat hulls.

STEERING ADJUSTMENT

There should not be more than 1/8 of a turn of the steering wheel slack. If there is, check that the steering wires are taut. Steering deflectors can also be adjusted. This can be done by turning the eccentric bushes in the tie bar connecting the deflectors. To adjust, slacken the 3/8" bolts and turn the bushes outwards to reduce spacing, and inwards to increase spacing. Replace and tighten the bolts carefully. Eccentric angles should be kept the same both sides.

Do not reduce spacing too much as this will reduce the speed. A spacing of 1/8" less than the nozzle diameter at the deflector tips usually gives a satisfactory performance.

LEAKS

With boat well laden at the back, check the leakages at the transom seal and intake base joint. Well prepared surfaces and proper use of sealing cement generally provide leak proof joints.

INSULATION

1. The rotating parts of the Jet units are electrically insulated from the aluminium casing to prevent electrolytic corrosion in sea water. Insulation is tufnol washers, an insulating film on the front bearing housing, and by rubber in the rear bearing.

When a new boat is being fitted out, it is most important that the insulation should not be short-circuited by external fittings such as control links, fuel lines, steering cables or engine mountings which could provide an electrical circuit from the rotating shaft, through the engine, and back to the aluminium Jet casing. The use of rubber couplings insulates the engine from the jet shaft.

2. Ashore

(i) To check the insulation use an ohm-meter or a bulb and battery (3-12 volt) between the casing and the Jet shaft while the engine is stationary and the Jet is out of water. The resistance under these conditions should be 1,000 ohms (or, if you are using a bulb it should not light). A rear bearing, damp with sea water, may give a slightly lower resistance, but a metallic short circuit, which is dangerous, usually shows a very low resistance (under 10 ohms) and a test light will glow.

(ii) If there is a short circuit, find the cause and remove it.

(iii) To test the Jet unit alone, remove the coupling shaft and repeat the test, revolving the shaft slowly by hand.

3. **Floating**

(i) When a well insulated Jet unit is immersed in sea water, a small electrolyic voltage is generated between the shaft and the housing. However, no corroding current flows as there is no external metallic circuit. If boat fittings provide an electrical circuit, a current will flow and this will corrode the aluminium parts.

Although it is impossible to test the insulation of the Jet unit itself while the boat is afloat, it is possible to test for external short circuits.

(ii) Remove the coupling shaft and test between the engine and the Jet casing. There should be resistance of more than 1,000 ohms and a test light should not glow.

4. **Electrical Auxiliaries** Batteries, radio transmitters, or other electrical equipment should **not** be earthed to the Jet unit. It is safer to use an independent grounding plate which is electrically isolated from both the Jet casing and from the engine.

OPERATION

After installation of the Jet Unit you should check the following:—

1. Have you greased the bearing?

   If not, grease it with water repellant Lithium-based grease using an ordinary grease gun. Do not overgrease it.

2. Have you greased the drive shaft universals?

   If not, grease the universals and the sliding splines.

3. Have you checked that the reverse bucket operates freely?

   Put a light coat of grease on push rod (80) and operation lever where the loading lever comes in contact with it. Also oil all the pivot pins and moving links in the reverse and steering mechanisms.

4. Have you adjusted the steering deflectors and reverse bucket as instructed?

NOTE: It is advisable here to go through all the checks listed in the Owner's Manual of the engine you are using.

LOADING

Do not carry more weight aboard than is absolutely necessary. Remember, a high speed planing hull is very sensitive to weight.

STARTING OFF & STOPPING

Find a suitable place to launch the boat. Drive the trailer back enough to submerge the jet intake in water. (If there is a proper launching ramp then there is nothing to worry about but if you are launching in a river bed make sure that you can drive the trailer out with the boat on it).

Start the engine, engage reverse and open throttle slowly to get the boat in water. If you are in shallow water with a shingle bed, do not open full throttle to take off as this will suck the shingle in the unit damaging the impeller blades.

With the engine idling, or with small throttle opening, manoeuvre into deep water. Now open throttle fully until the craft is planing clear and then ease the throttle back to economical cruising revolutions (generally 75% of Max.), and maintain planing speed.

Avoid driving in the 10-15 m.p.h. range as at these speeds, the draught and drag are at maximum.

STEERING

Try your steering and make sure you get the feel of it. Steering is achieved by deflecting the jet, so the engine must be always running to get any steering. The larger the throttle opening, the more will be the steering effect.

NEVER – repeat **NEVER** stop the engine when approaching a mooring, rapid or any situation when steering would be required. With the engine stopped, there will be **NO** steering available.

REVERSE

Reverse thrust is obtained by directing the jet stream forward under the boat hull. Once again, reverse is only available when the engine is running. The boat could be brought to a stop from speed by engaging the reverse with throttle closed and then opening the throttle slowly. **FULL THROTTLE OPENING** could be dangerous in this condition, as instant reverse thrust is obtained.

Engage neutral and observe that the boat remains stationary when the engine is running (check this in still water). It is possible to creep forward or backward by moving the reverse lever towards forward or reverse. It is also possible to steer the boat in Reverse and Neutral. It must be noticed that the steering in reverse is opposite to that of car steering. An easy way to remember is, that "the bow goes in the same direction as the steering wheel is turned" OR "whichever way the wheel is turned – the bow will go the same way".

It is also possible to rotate the boat when neutral is engaged.

These manoeuvres need some practice but with experience they will enable you to handle the boat in extremely difficult conditions which would prove almost impossible in a conventional propeller driven boat.

BLOCKED INTAKE SCREEN

During operation in debris laden water, the intake screen of the jet unit might get clogged. Floating sticks, weeds and leaves are the worst offenders. The effect is falling off in thrust and speed, and in extreme cases, increased noise from the jet unit. Close the throttle momentarily and switch off the engine for a few seconds. In most cases it will fall from the screen bars. If this fails, stop the engine and remove the blockage manually. A rake is provided with all jet units for this purpose.

In shallow waters over shingle beds, full throttle sucks in the shingle and blocks the screen. Once again, the engine should be stopped for a short time to drop off the shingle. However, this problem will not be encountered while running at a reasonable speed over shallows or weeds when using a weed-free screen.

Two types of intake screens are available:—

(a) Solid bar screen for stony conditions, and where the bottom may be encountered frequently.

(b) Free-finger "comb" intake screens for weedy conditions.

NOTE: This screen should not be used if a stony bottom is to be encountered, as stones can pass the flexible bars and can seriously damage the interior of the unit.

MAINTENANCE

This unit has been designed to require the absolute minimum of maintenance. The main moving parts which may require occasional attention are described below. Routine checks and lubrication at regular intervals will ensure you a long trouble-free service.

1. **Thrust Bearing** This is a special high thrust capacity duplex ball bearing with separate grease seals. The bearing should be lubricated every 30 hours with a water repellant Lithium-based grease (preferably Shell Alvania 3 or equivalent).

2. **Rear Bearing** This is a water lubricated, Cutless rubber bearing. It requires no attention. DO NOT RUN THE UNIT OUT OF WATER as this will damage the bearing. Also because there will be no cooling water, the engine could also be damaged.

3. **Drive Shaft & Universal** Grease the joints and sliding splines sparingly every 30 hours. Do not over-grease. (Rubber coupling, if used, will need no attention other than periodic inspection and a check on the condition of rubber and the tightness of the bolts).

4. **Reverse & Steering Mechanisms** Grease the Push Rod and reverse operation lever sparingly, and oil the pivot pins and moving parts every time you take it for a run after having stored for a few days.

5. **Romet Shaft Seal** This is a carbon face seal with a bronze counterface and should need no attention.

If a leak appears below the bearing housing, this is an indication of a cracked or chipped carbon face. Replace it with another seal. For details see Servicing Section.

6. **Transom Seal** Occasionally inspect the rubber to check that it is sealing effectively and is in sound condition.

7. **Salt Water Operation** This unit is designed for high speed planing craft where light weight is important. Therefore, aluminium alloy components have been used. Use freely in the sea, but the boat should be trailered or slipped and flushed with fresh water or given a short run in fresh water before extended storage.

If it is extensively used in salt water, it is recommended that all casings and seals be inspected regularly. Occasionally dismantle and inspect all internal and external surfaces for corrosion. Rubber seals should be replaced where required.

Protective spray on machinery, fittings, wirings, instruments, etc., is recommended.

STORAGE

Always clean down the whole boat, and wash inside and out with fresh water (and detergent if desired). Hose out interior of jet unit through the intake and the nozzle. Allow to dry completely, and spray with a suitable corrosion protection liquid. Oil and lubricate all moving parts, including the steering gear and deflector pins and pivots.

Keep well aired in storage to avoid condensation.

THRUST BEARING AND GREASE SEAL

1. Unfasten the rear end of the drive shaft and remove the self-locking nut and washer (33 & 34). The coupling (32) will now slide off, freeing the coupling key (36). Undo the 3 nuts and bolts (16) and carefully remove the bearing housing (24), with the bearing inside. One half of the inner race will probably stay on the shaft. Remove this and keep with the bearing. **DO NOT EXCHANGE THE BEARING INNER RACE HALVES.**

KEEP THE BEARING CLEAN: Remove the locating ring (28). The "O" ring should remain on the shoulder. The bearing spacer (41) will now come off. Check the bearing spacer and the coupling for wear caused by the seals. Check the seals in the bearing housing and locating ring for wear and replace if necessary.

Remember, with this type of thrust bearing, even a new one will have considerable slack. Therefore excessive noise, obvious water damage or wear on the inner race halves and balls should be the only reason to replace the bearing.

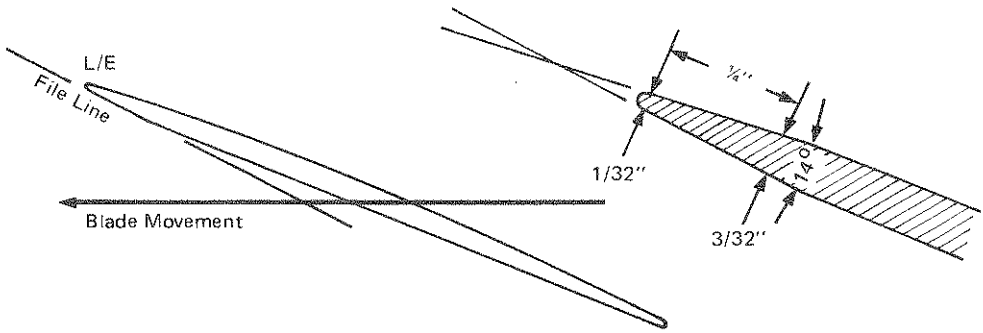
To reassemble, replace bearing spacer, locating ring with the "O" ring on the shoulder, bearing and housing. Some difficulty may be experienced here with one inner race half which may need to be pushed on with the coupling. Fasten the bearing housing with three bolts and nuts. Then fit coupling and key. Replace the washer and self locking nut, and tighten to 70-80 lb ft torque. Check that the shaft turns freely then refit drive shaft. Regrease the bearing with Lithium based water repellant grease.

2. The bearings are locked tight inside the housing for insulation purposes. If the bearing needs replacing, it is advisable to get it done at the factory or buy a factory assembled bearing housing from your nearest Hamilton Agent. An allowance is made on the used housing.

TO CHECK IMPELLER

From the aft end, remove the reverse bucket (84), pushrod (80), tie bar (63) and deflectors (64 and 65). Inside, remove the water leads, and unions and steering arm (53) and withdraw the steering shaft (59). Undo the ring of screws, and remove transom plate and seal off tail-pipe. Next remove the ring of six bolts holding the unit together, and withdraw tailpipe out through the hole in the transom. Watch for large "O" ring in its recess. Undo shaft nut, slide off bearing sleeve and impeller. (For 2 and 3 stage units, remove rear impeller, reaction casing, bearing sleeve, next impeller, etc.). Watch for keys in the shaft. Keep the impeller edges reasonably sharp and take care to sharpen only as shown in the sketch. Blunt leading edges can reduce performance considerably. Tip clearance of impeller blades should not be greater than about 0.060" (about 1/16") for best performance.

When reassembling, make sure all parts are clean, and grease all mating surfaces. Fit keys in keyways in shaft, and slide impellers over shaft and key. Slide on bearing sleeves and when tightening the nut, ensure that the washer is central, otherwise, it can prevent the tailpipe from fitting on. Tightening torque for the nut is 70 lb ft.



DETAILS OF IMPELLER SHARPENING

IMPORTANT: Clean all traces of grease from the bearing sleeves. It is often helpful to dust the sleeve with talc or French chalk to act as a lubricant for the bearings. If used in silty water conditions, the bearing sleeves may score and eventually wear. When the sleeve measures about 0.007" under 1½" diameter by micrometer, replacement is advised. The Cutless Rubber bearing should be replaced if wear is apparent on the fluted surfaces by eye, and the new sleeve is excessively slack.

REPLACING SEAL ASSEMBLY

A worn or damaged seal is indicated by water leakage from the hole beneath the bearing housing.

Remove coupling and bearing, etc. as indicated above. Remove locating ring. Remove shaft slinger (35). Seal face can now be easily withdrawn from the housing. One of the bolts (16) may be screwed into a hole in the sealing face to assist removal. Watch for the "O" ring seal. The carbon seal may now be removed completely with rubber driving ring, washer, sping, etc. Inspect the sealing faces. If faces are scored or chipped, they should be replaced. The seal can be bought from the factory or dealer as a unit.

Reassembly: Check the faces carefully. They must be in good condition. Check the locating split pin (39), then reassemble the seal with spring, flat washer, rubber driving ring, carbon in the order stated. Fit the 2¾" "O" ring to the sealing face and replace. Put the shaft slinger on. Slide on the locating ring (28) and bearing spacer. Replace locating ring and "O" ring, replace bearing housing and coupling as above.

NOTE: Always keep the seal parts and bearings clean, and regrease the bearing with the clean Lithium based water repellant grease.

GENERAL

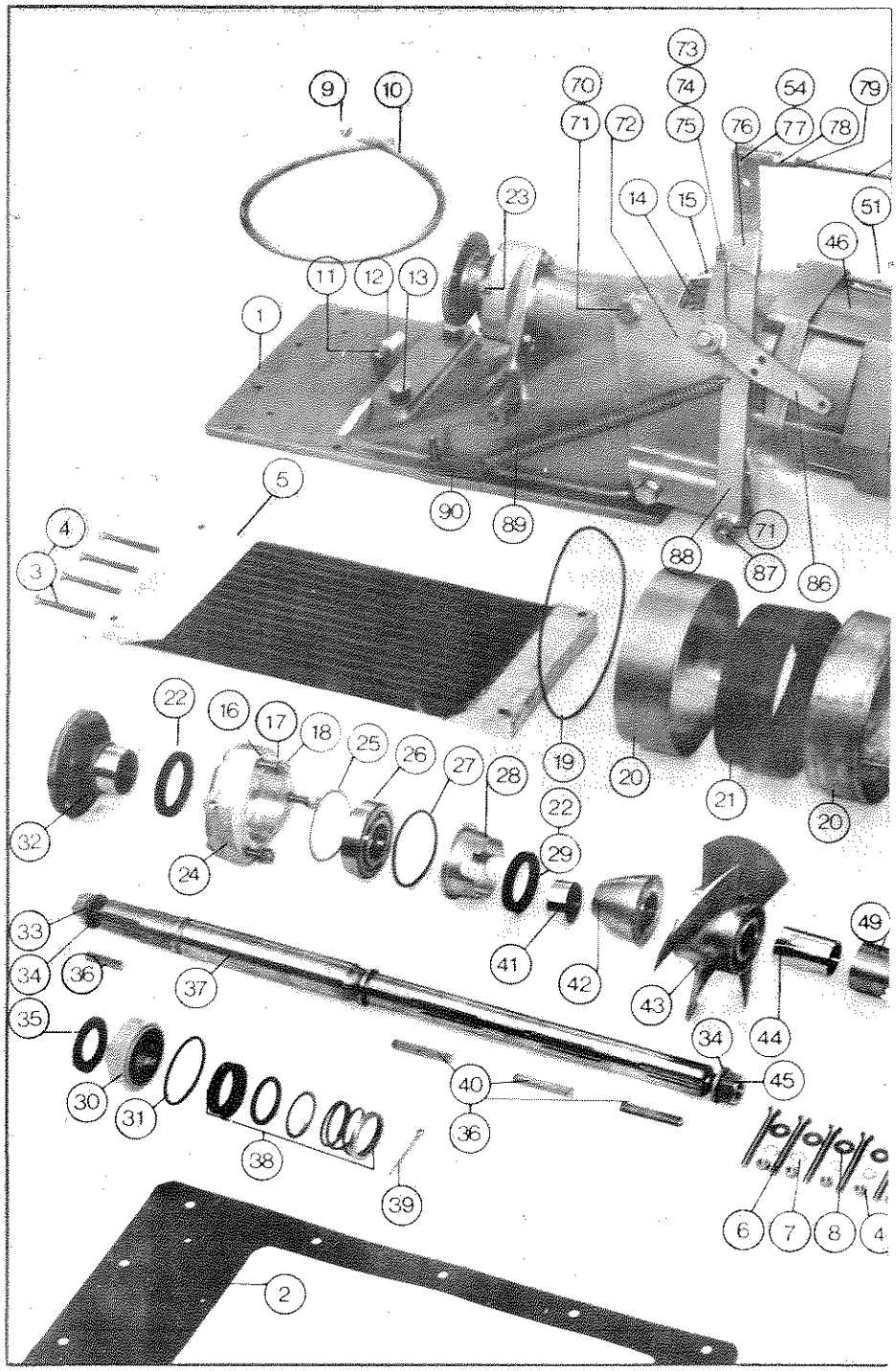
If you dismantle the unit, it is generally worth while examining the seals, bearings, grease seals and the impeller at the same time.

A complete check just before the start of the season usually pays dividends in terms of assured reliability and peak performance.

GENERAL PARTS LIST

INTAKE ASSEMBLY

Item No.	Description	Single Stage 741		Two Stage 742		Three Stage 743	
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.
1	Intake Housing	JE288	1	JE288	1	JE288	1
2	Intake Gasket	JE289	1	JE289	1	JE289	1
3	5/16 UNC x 2" CSK Hd M/C Screw S/S	—	4	—	4	—	4
4	5/16 UNC Nut S/S	—	16	—	16	—	16
5	Intake Screen — Optional						
	Std. Screen — General & River use	JE293	1	JE293	1	JE293	1
	Weed Free Screen	JE292		JE292		JE292	
6	5/16 UNC x 3" CSK Hd M/C Screw S/S	—	14	—	14	—	14
7	5/16 Flat Washer S/S	—	14	—	14	—	14
8	5/16 Fibre Washer	61213	14	61213	14	61213	14
9	Hose Clip	No. 00	1	No. 00	1	No. 00	1
10	Air Bleed Hose	J634	1	J634	1	J634	1
11	Brass Elbow ¼ BSP x 90°	422	1	422	1	422	1
12	Air Bleed Nipple	862N	1	862N	1	862N	1
13	5/8 UNC SKT Hd Set Screw S/S	—	2	—	2	—	2
14	Patent Name Plate	63135	1	63135	1	63135	1
15	Name Plate	63097	1	63097	1	63097	1
16	(3/8 UNC x 2½ Bolt S/S	—	3	—	—	—	—
	(3/8 UNC x 2¾ Bolt S/S	—	—	—	3	—	3
17	3/8 Flat Washer S/S	—	3	—	3	—	3
18	3/8 UNC Nut S/S	—	3	—	3	—	3
19	"O" Ring 7¾ x 8 x 1/8" W.S.	—	1	—	1	—	1
20	Wear Ring	JE144	1	JE185	1	JE185	1
21	Wear Ring Insulator	JE147	1	JE147	1	JE147	1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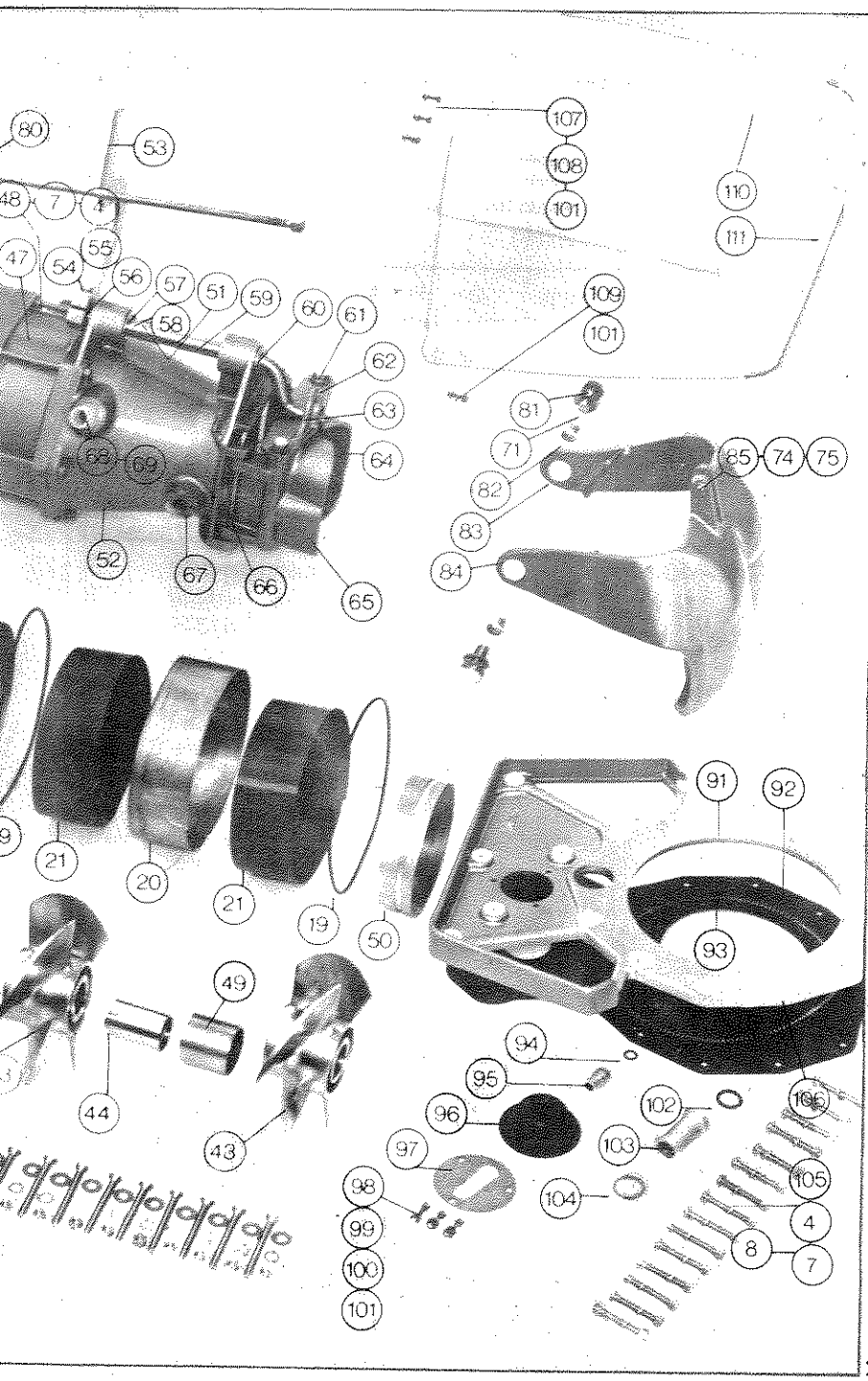
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SHAFT AND BEARING HOUSING ASSEMBLY

Item No.	Description	Single Stage 741		Two Stage 742		Three Stage 743	
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.
22	Oil Seal	61180	2	61316	1	61316	1
23	Str. Grease Nipple 1/8 BSP	—	1	—	1	—	1
24	Bearing Assembly	JE217SY	1	JH210SY	1	JH210SY	1
	Consisting Of:						
24	Housing	JE212	1	JH205	1	JH205	1
25	Tufnol Washer	JE216	1	JH209	1	JH209	1
26	Bearing (R & M)	DMJT25J	1	DMJT35JM	1	DMJT35JM	1
27	"O" Ring 3 x 3¼ x 1/8" W.S.	—	1	—	1	—	1
28	Locating Ring	JE298	1	JH252	1	JH252	1
29	Oil Seal	—	—	61315	1	61315	1
30	Sealing Face	JE295	1	JH250	1	JH250	1
31	"O" Ring 2½ x 2¾ x 1/8 G.S.	—	1	—	1	—	1
32	Coupling	JE244	1	JH110	1	JH221	1
33	Self Lock Nut	PPD246	1	PPD246	1	PPD246	1
34	(Washer ¾ x 1 3/8" x 15 S.W.G.	—	2	—	—	—	—
	(Washer S/S	—	—	JH117	2	JH117	2
35	Shaft Slinger	JE290	1	JH251	1	JH251	1
36	Key	JE121	2	JH132	1	JH132	1
37	Main Shaft	JE220	1	JH213	1	JH211	1
38	Carbon Seal	61317	1	61318	1	61318	1
39	(Split Pin 1/8" Dia x 1½" S/S	—	1	—	—	—	—
	(3/16" Dia x 2" S/S	—	—	—	1	—	1
40	Key	—	—	JH239	2	JH239	3
41	Bearing Spacer	JE205	1	JH204	1	JH204	1
42	(Thrust Collar	JE219 (NI)	1	—	—	—	—
	(Fairing	—	—	JH107	1	JH107	1
43	Impeller	80609*	1	JH106	2	JH106	3
44	Bearing Sleeve	JE122	1	JH159	2	JH159	2
45	¾ UNF Nut S/S	—	1	—	1	—	1

* Impeller Options Available:— JE104 "60 B.H.P."
80609 "100 B.H.P." (Standard)
80620 "120 B.H.P."

Note: Item 42, Thrust Collar JE219, Not Illustrated.

TAILPIPE (AND STATOR CASING ON MULTI-STAGE) ASSEMBLY

Item No.	Description	Single Stage 741		Two Stage 742		Three Stage 743	
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.
46	Front Stator	—	—	JH156	1	JH156	1
47	Rear Stator	—	—	—	—	JH157	1
19	"O" Ring 7¾ x 8 x 1/8" G.S.	—	—	—	1	—	2
20	Wear Ring	—	—	JE185	1	JE185	2
21	Wear Ring Insulator	—	—	JE147	1	JE147	2
48	(Tie Bolt 5/16 UNC x 2½" Bolt)	—	6	—	—	—	—
	Tie Bolt)	—	—	JH161	6	JH176Y	6
4	5/16 UNC Nut S/S	—	6	—	6	—	6
49	Cutless Bearing	JH160	1	JH160	2	JH160	2
50	Nozzle	JE112-1	1	JE112-4	1	JE112-6	1
51	¾ BSP Galv. Plug	—	1	—	2	—	3
52	Tailpipe	JE251	1	JH237	1	JH236	1
53	Steering Arm	JE291	1	JE291	1	JE291	1
54	3/8 UNC Bolt x 1½" Long S/S	—	1	—	1	—	1
55	3/8 Lockwasher S/S	—	1	—	1	—	1
56	Key	JE300	1	JE300	1	JE300	1
57	¾ Flat Washer S/S	—	1	—	1	—	1
58	Split Pin 1/8 x 1" S/S	—	1	—	1	—	1
59	Steering Control Shaft	JE299	1	JE299	1	JE299	1
60	Steering Shaft Bush	JE248	2	JE248	2	JE248	2
61	3/8 UNC x 1¼ Bolt S/S	—	2	—	2	—	2
62	Tie Bar Bush	JE162	2	JE162	2	JE162	2
63	Tie Bar	JE106	1	JE106	1	JE106	1
64	R.H. Deflector	JE102	1	JH144	1	JH144	1
65	L.H. Deflector	JE103	1	JH143	1	JH143	1
66	Hinge Pin	JE168	2	JE168	2	JE168	2
67	5/16 UNC x ¾ Skt Hd Set Screw S/S	—	2	—	2	—	2
68	Water Offtake	JE297	1	JH249	1	JH249	1
69	Screen	JE281	1	JE281	1	JE281	1

REVERSE ASSEMBLY

Item No.	Description	Single Stage 741		Two Stage 742		Three Stage 743	
		Part No.	Qty.	Part No.	Qty.	Part No.	Qty.
70	(Lever Pivot	JE151	2	JE151	2	—	—
	5/8 UNC x 1¼ Bolt S/S)	—	—	—	—	—	2
71	5/8 Flat Washer S/S	—	4	—	4	—	6
72	Adaptor Plate	—	—	—	—	JH227Y	1
73	¼ UNC x 1¼ Bolt S/S	—	1	—	1	—	1
74	¼ UNC Nut S/S	—	2	—	2	—	2
75	¼ UNC Lock Nut S/S	—	2	—	2	—	2
76	Sliding Link	JE152	1	JE152	1	JE152	1
54	3/8 UNC x 1½ Bolt S/S	—	1	—	1	—	1
77	3/8 UNC Self Locking Nut S/S	—	1	—	1	—	1
78	Clevis	57076	1	57076	1	57076	1
79	3/8 UNF Nut S/S	—	1	—	1	—	1
80	Pushrod	JE157Y	1	JH229Y	1	JH229Y	1
81	5/8 UNC x 1½ Bolt S/S	—	2	—	2	—	2
82	Sleeve S/S	JE252	2	JE252	2	JE252	2
83	Pivot Bush	JE249	2	JE249	2	JE249	2
84	Reverse Bucket	JE296Y	1	JE296Y	1	JE296Y	1
85	¼ UNC x 1¾ Bolt S/S	—	1	—	1	—	1
86	Locking Lever	JE294	1	JE294	1	JE294	1
87	1/8 Dia x 1 Split Pin S/S	—	2	—	2	—	2
88	Reverse Lever	JE301	1	JE149	1	JE149	1
89	Spring	JE169	1	JE169	1	JE169	1
90	Spring Anchor	JE302	1	JE302	1	JH253	1

TRANSOM SEAL ASSEMBLY

Item No.	Description	All Jets 741, 742, 743 Part No.	Qty.
	COMPLETE KIT (INCLUDES ALL ITEMS BELOW)	JE279SY	
91	Transom Plate	JE276	1
92	Transom Seal	JE275	1
93	Seal Spring	JE178	1
94	"O" Ring, 3/8 x 9/16 x 3/32" W.S. (Push Rod)	—	1
95	Sleeve (Push Rod)	JE273	1
96	Boot	JE274	1
97	Plate	JE272	1
98	3/16 BSW x 1" Rd Hd M/C Screw S/S	—	3
99	3/16 Fibre Washer (To Water Side of Screw)	61245	8
100	3/16 Flat Washer S/S	—	3
101	3/16 BSW Nut S/S	—	8
102	"O" Ring, ¾ x 1 x 1/8" W.S. (Steering Shaft)	—	1
103	Sleeve (Steering Shaft)	JE270	1
104	Garter Spring	JE269	1
105	5/16 UNC x 2" Rd Hd M/C Screw S/S	—	15
4	5/16 UNC Nut S/S	—	15
7	5/16 Flat Washer S/S	—	15
8	5/16 Fibre Washer	61213	15
106	Insulating Bush	JE262	15
107	3/16 BSW x 1" Raised Hd M/C Screw S/S	—	3
108	3/16 Cup Washer	—	5
109	3/16 BSW x 1" CSK Hd M/C Screw S/S	—	2
110	Splash Guard	JE277	1
111	Splash Guard Transfer	JE278	1
	MISCELLANEOUS PARTS		
	Screen Rake	J656SY	1
	J Transfer	63234	2

TRANSOM HOLE