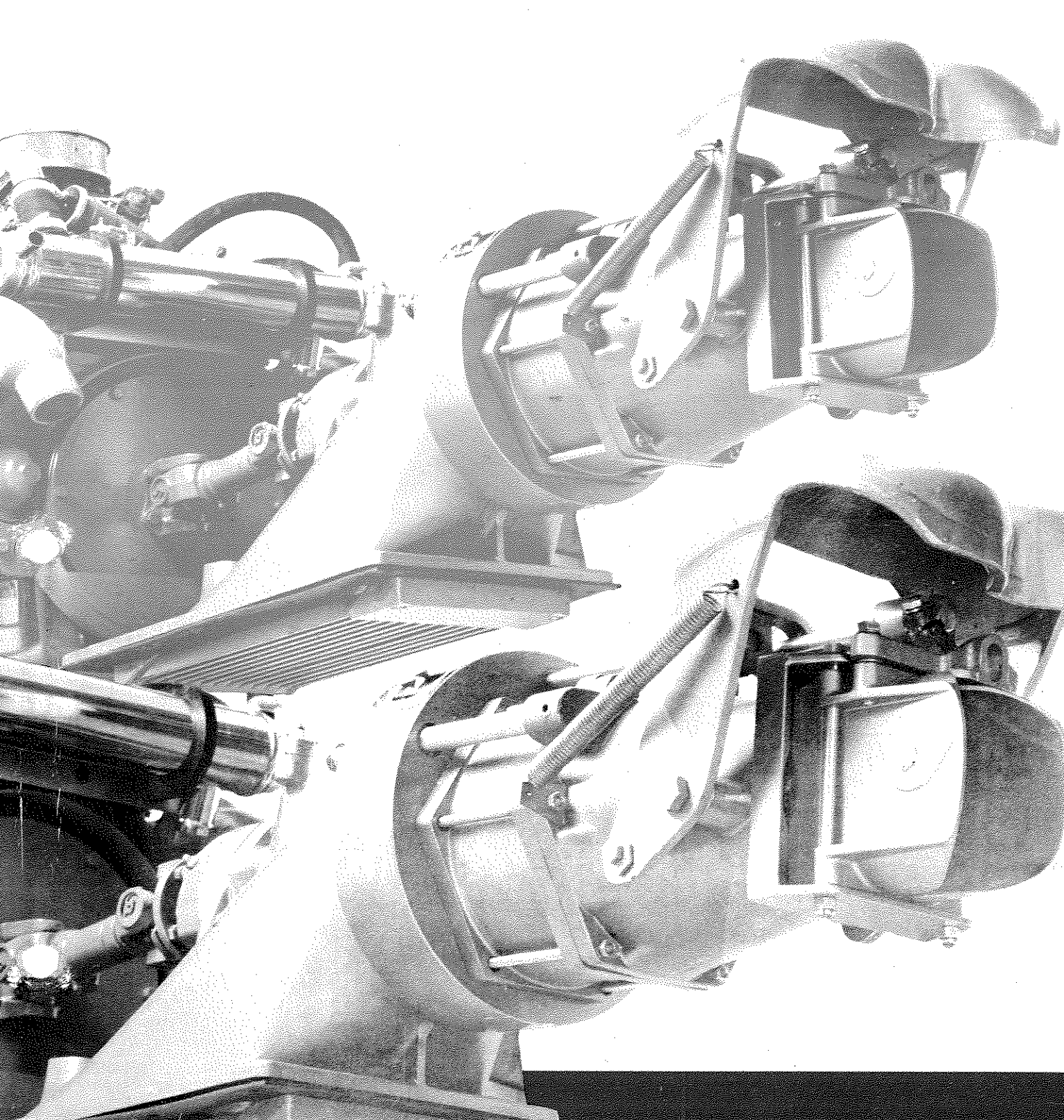
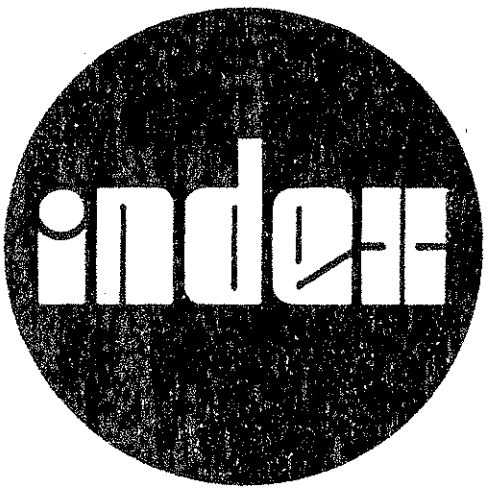


HamiltonJet
Workshop Manual
750 Series



The following Chapters contain a fully comprehensive technical guide to the 750 Series Hamilton Jet Unit. This section, as with all others in the manual, is designed and laid out to serve as a Customer Work Shop manual if required.

The 750 Series Marine Jets are designed for the efficient propulsion of small and medium sized high speed (over 20 knots) planing craft, with gasoline engine drive.

Built for high performance they are designed in light alloy, and stainless materials. An inboard mounted intake, and a discharge section through the transom gives a most compact and easily serviced propulsion unit. Special features include light balanced deflector steering and a removable inspection cover for internal access to the unit.

All information, illustrations and specifications contained in this 750 Series section are based on the latest production information available at the time of publication. The right is reserved to make changes at any time without notice.

PLANNING YOUR JET BOAT

SUITABILITY

Is your proposed boat:—

- a planing boat ?
- designed for speeds of 20 knots or more ?
- not more than 2 tons fully laden ?
- going to have a gasoline power Unit ?

A1
E5

SHAPE

Is your proposed boat the correct shape for Jet Propulsion ?

E1 — E5

WEIGHT

What is the maximum likely laden operating weight of the boat ?

E6

HORSE POWER

What Horsepower is necessary for the required Speed ?

E3

ENGINE

Knowing the Horsepower requirement, choose your engine.

E4 — D1
B1

JET

Match your Engine to one of the 750 Series Jet Units.

E5
D1 — D3

RECHECK

A final check of the selected Hull — Engine — Jet combination, i.e. Weight, B.H.P., Boat Length.

E5
B1

NOTE

Are you still within the Design Limits of the 750 Jet Unit Series ?

BUILDING YOUR JET BOAT

HULL PREPARATION

Prepare the hull for your 750 Series Jet.

F1 – F6

JET UNIT INSTALLATION

Fit the Jet Unit.

G1 – G3

INSTALL ENGINE

Install and couple to Jet.

I1 – I2
H1 – H3

MARINIZE ENGINE

Select Exhaust Systems – Cooling Systems.
(Both Raw and Salt Water.)

H3 – H6

CONTROLS

Couple up Steering and Reverse Controls.

J1 – J3

ELECTRICAL SYSTEM

Check insulation to guard against Electrolytic corrosion.

K1

OPERATING YOUR JET BOAT

For routine maintenance and general service work.

L1 – L2
M1 – M4

For Spare Parts and Optional Extras.

N1 – N4
O1

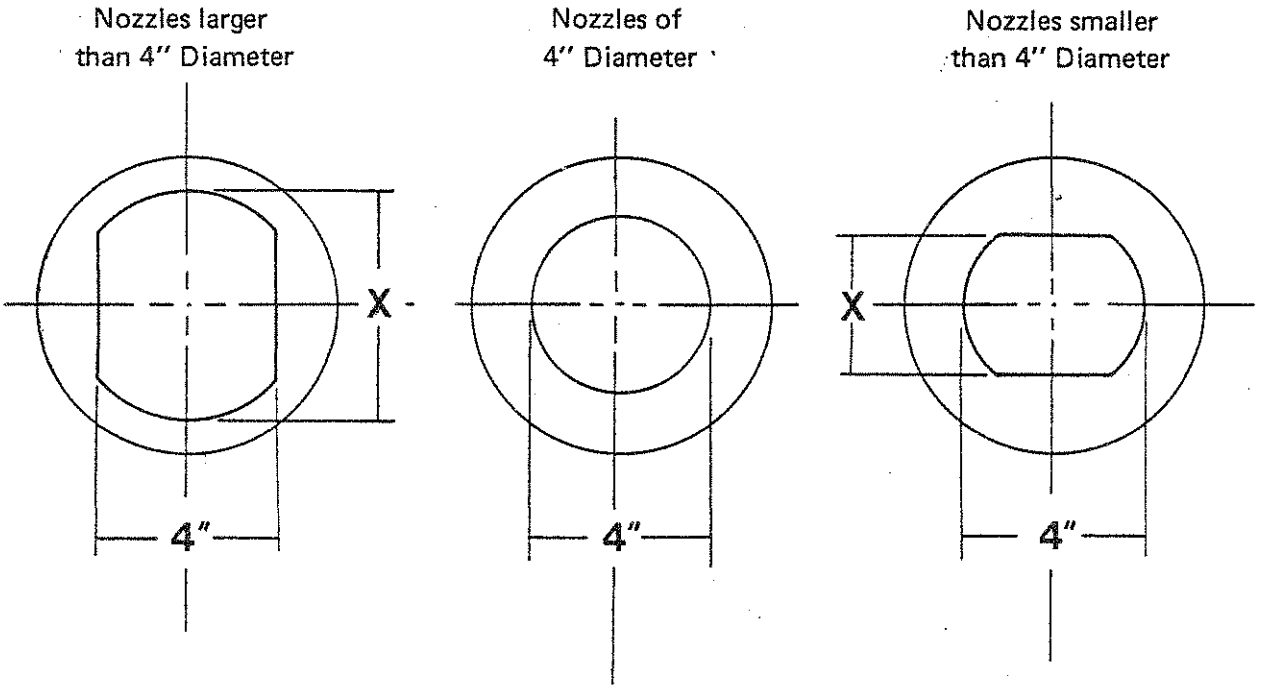
MODEL	751	752	753
No. of Stages	1	2	3
Impeller Diameter	190mm (7 1/2")	190mm (7 1/2")	190mm (7 1/2")
Nozzle Numbers (Std.)	No. 16	No. 15	No. 13
Nozzle Range (to order)	No. 15	No. 18 No. 13	No. 15 No. 12
Engine Size	1 - 3.3 litres 60-200 CID	3 - 5.5 litres 180-320 CID	5 - 8 litres 300-500 CID
Horse Power Range	50 - 150	100 - 250	120 - 300
Maximum RPM (Normal)	5,000	5,000	4,800
Drive Coupling Flange for: Hardy Spicer			
Hamilton 'Close Kit'	1300	1300	1300
Jet Unit Weight	41kg (90 lb)	50kg (109 lb)	59kg (126 lb)
Boat Size	3.7 - 6m (12'-20')	4.3 - 7m (14'-23')	4.9 - 8m (16'-26')
Unladen Boat Weight (Maximum)	800 kg (1750 lb)	1200 kg (2650 lb)	1600 kg (3500 lb)

NOTE: Only use high H.P. and high R.P.M. (over 4500 r.p.m.) on light high performance pleasure craft. Use lower R.P.M., and move up one stage for heavier craft and commercial operation. For heavy duty and commercial work or sustained high power the 1410 Series coupling and matching 1410 Series Hardy Spicer Drive Shaft is recommended for the 753 Jet Unit.

751 (Single Stage Only) is supplied with a standard pitch impeller. Fine, coarse pitch impellers available as options.

NOZZLES

The 750 Series Jet Units have a balanced deflector steering system. The width between deflectors is not adjustable. The nozzles are therefore designed to also have a constant width of 4 inches.



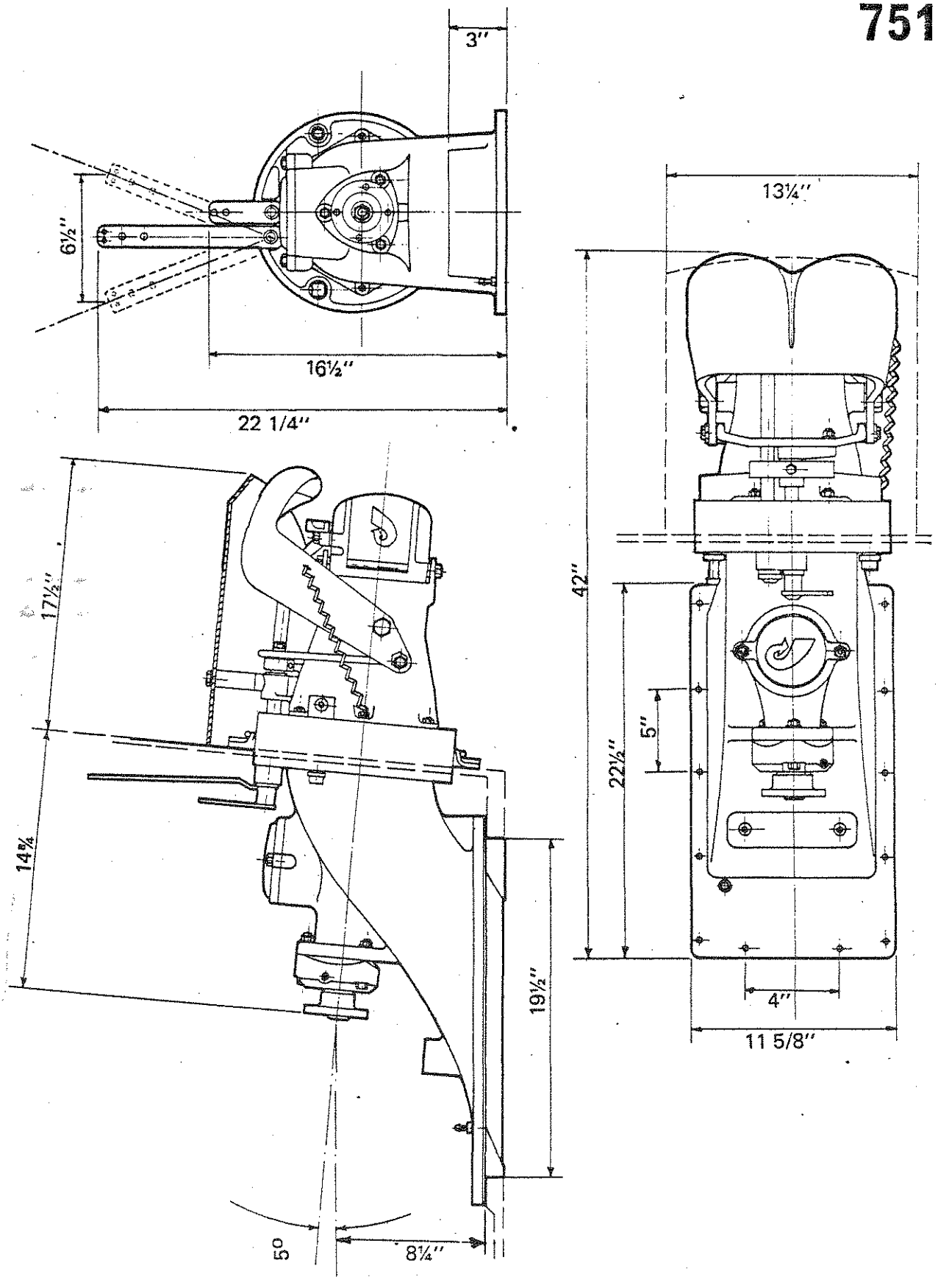
For information regarding the effect on performance using the Nozzle Unit combinations listed below refer to Section D (Performance Date).

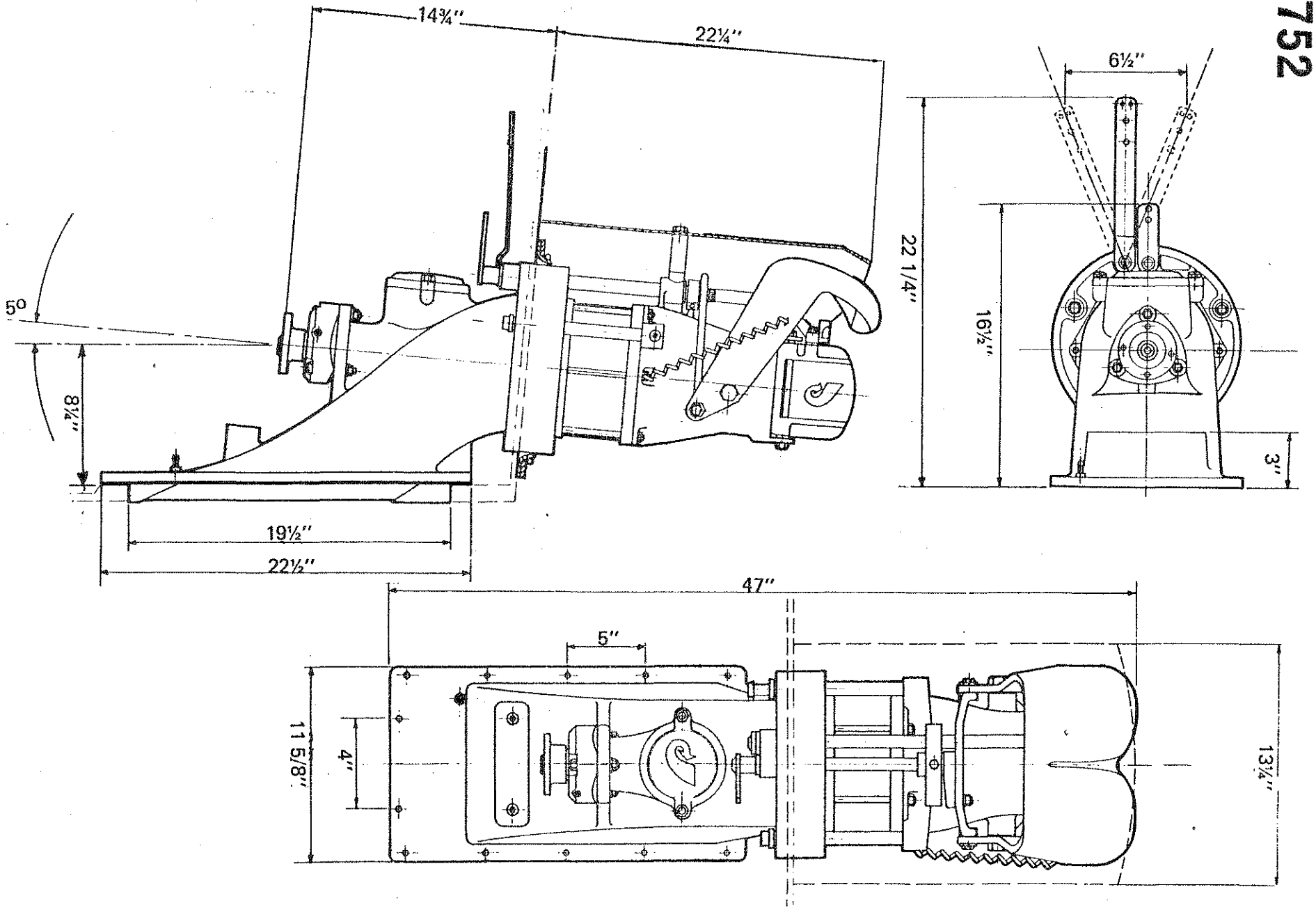
Nozzle Numbers	Nozzle-Unit Combination	Dimension X	Part Number	Equivalent DIA
12	— — 753	3 7/16"	102338–4	3 7/8" DIA
13	— — 753	4"	JE 112–4	4" "
14	— 752, 753	4¼"	JE 112–3	4¼" "
15	751, 752, 753	4 15/32"	102338–2	4 3/8" "
16	751, 752, —	4 21/32"	102338–5	4½" "
18	751, — —	5 1/32"	102338–1	4¾" "

NOTE

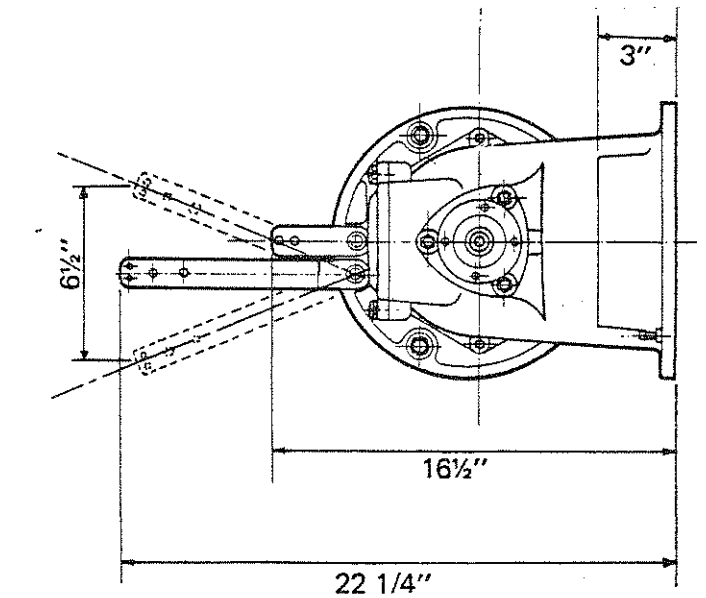
- Please quote Nozzle Number when ordering loose nozzles or jet units with non standard nozzles.
- Dimension "X" for reference only - do not quote with orders.
- 4" Diameter is the only round nozzle which can be used in 750 Series units.
- Standard Nozzles fitted to 751 are No. 16
  752 are No. 15
  753 are No. 13

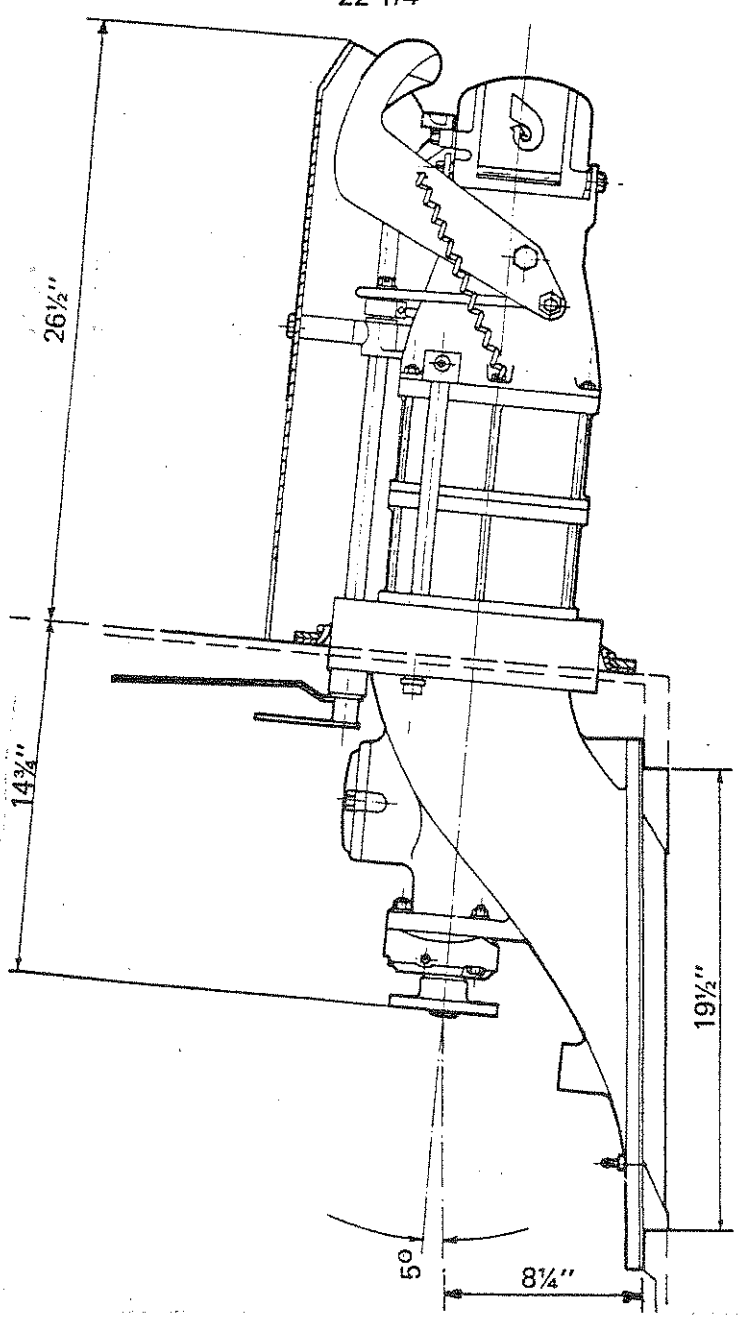
751

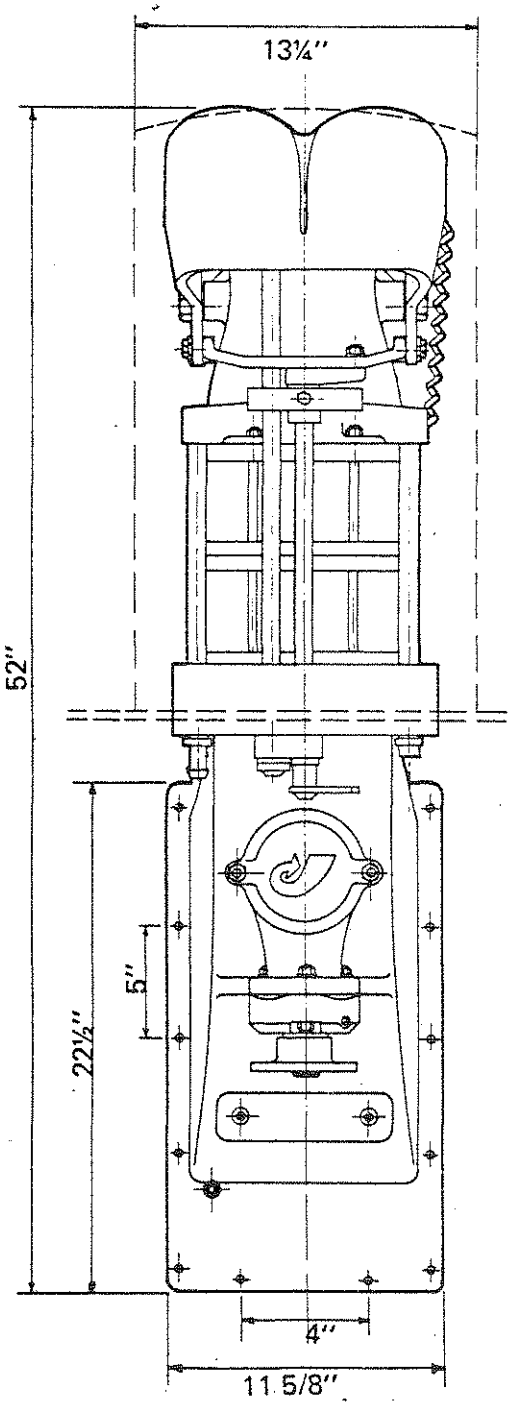



14¾"
22¼"
5°
8¼"
19½"
22½"
6½"
22 1/4"
16½"
3"
47"
5"
11 5/8"
4"
13¼"

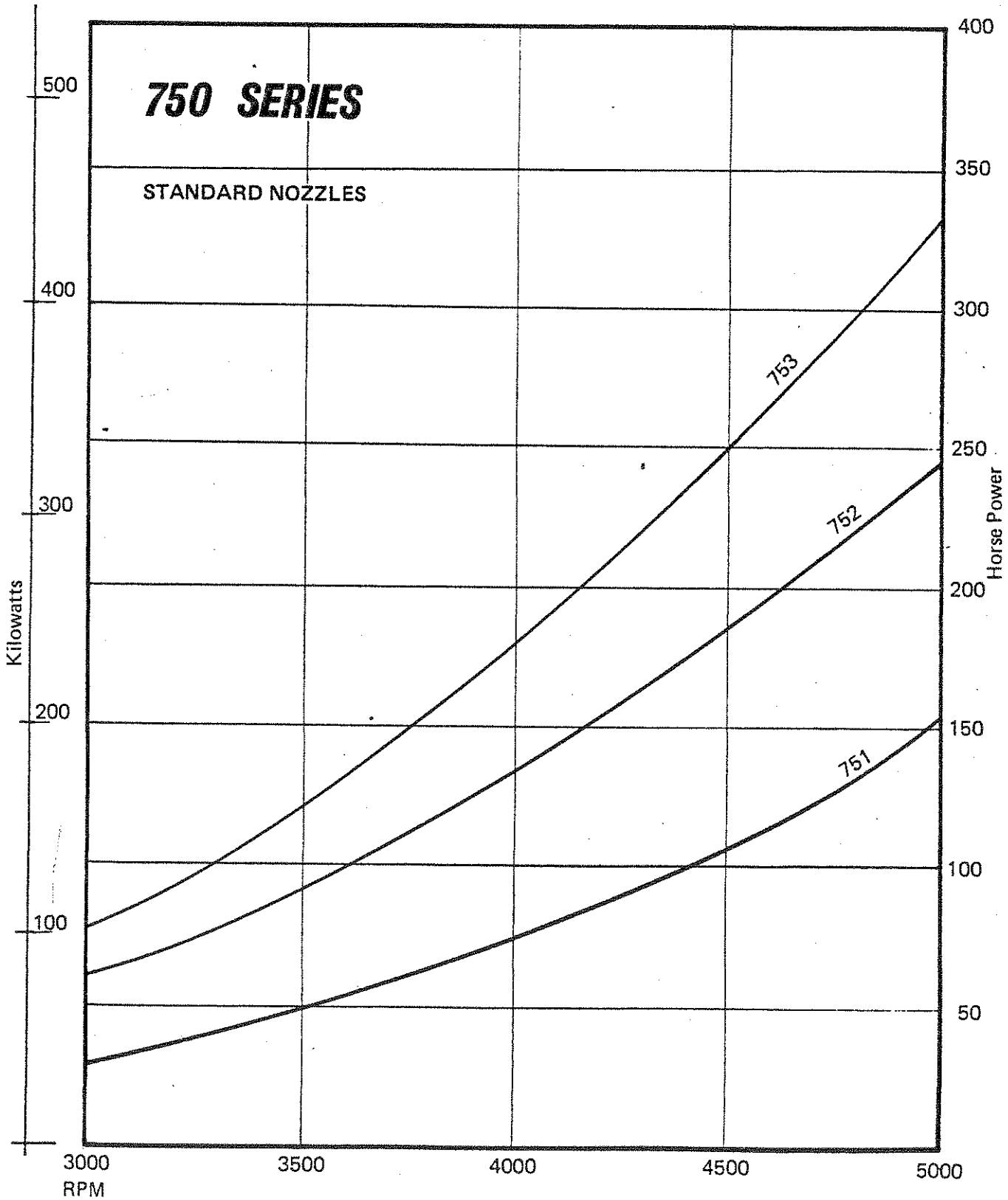
753

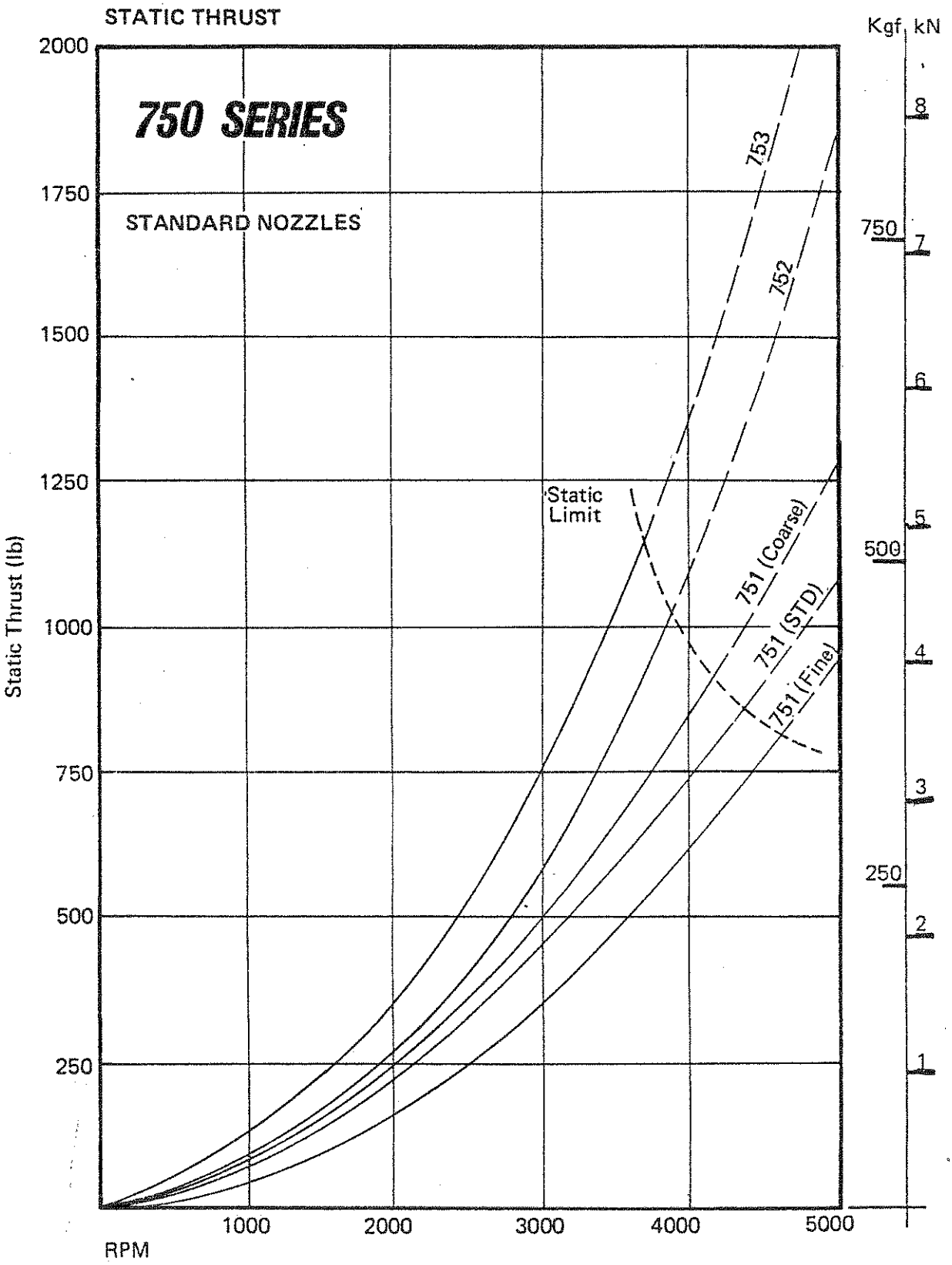






POWER REQUIREMENTS





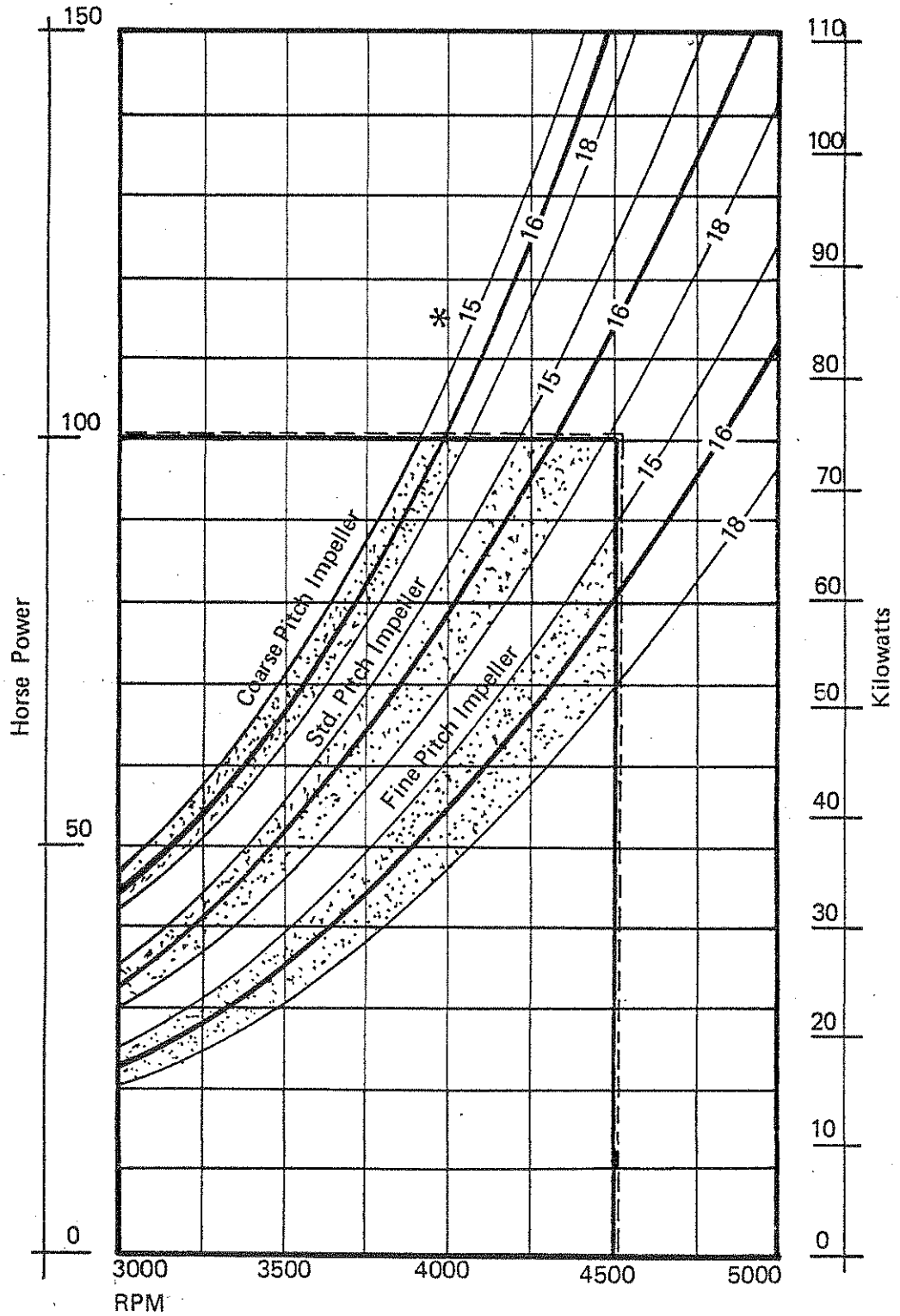
Kgf — Kilogramme Force

kN — Kilo Newtons

1 kg = 9.81N

NOTE: Coarse, Std., Fine indicates the pitch of the impellers offered as optional extras with the 751 Jet.

751

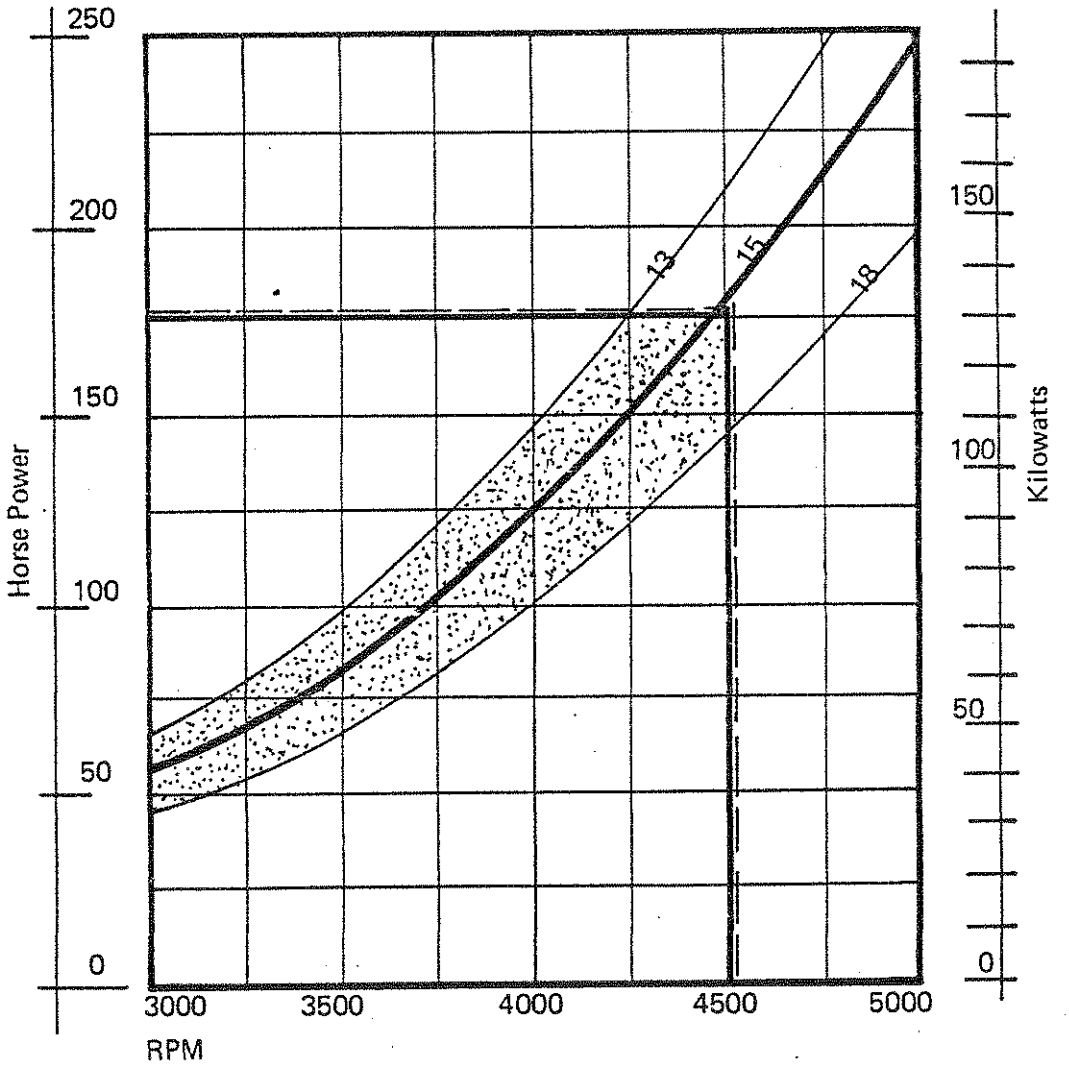


Limit for commercial and heavy duty operation

Standard Equipment

* Nozzle Numbers i.e. 15, 16, 18 refer Sections B1 and N, for nozzle data.

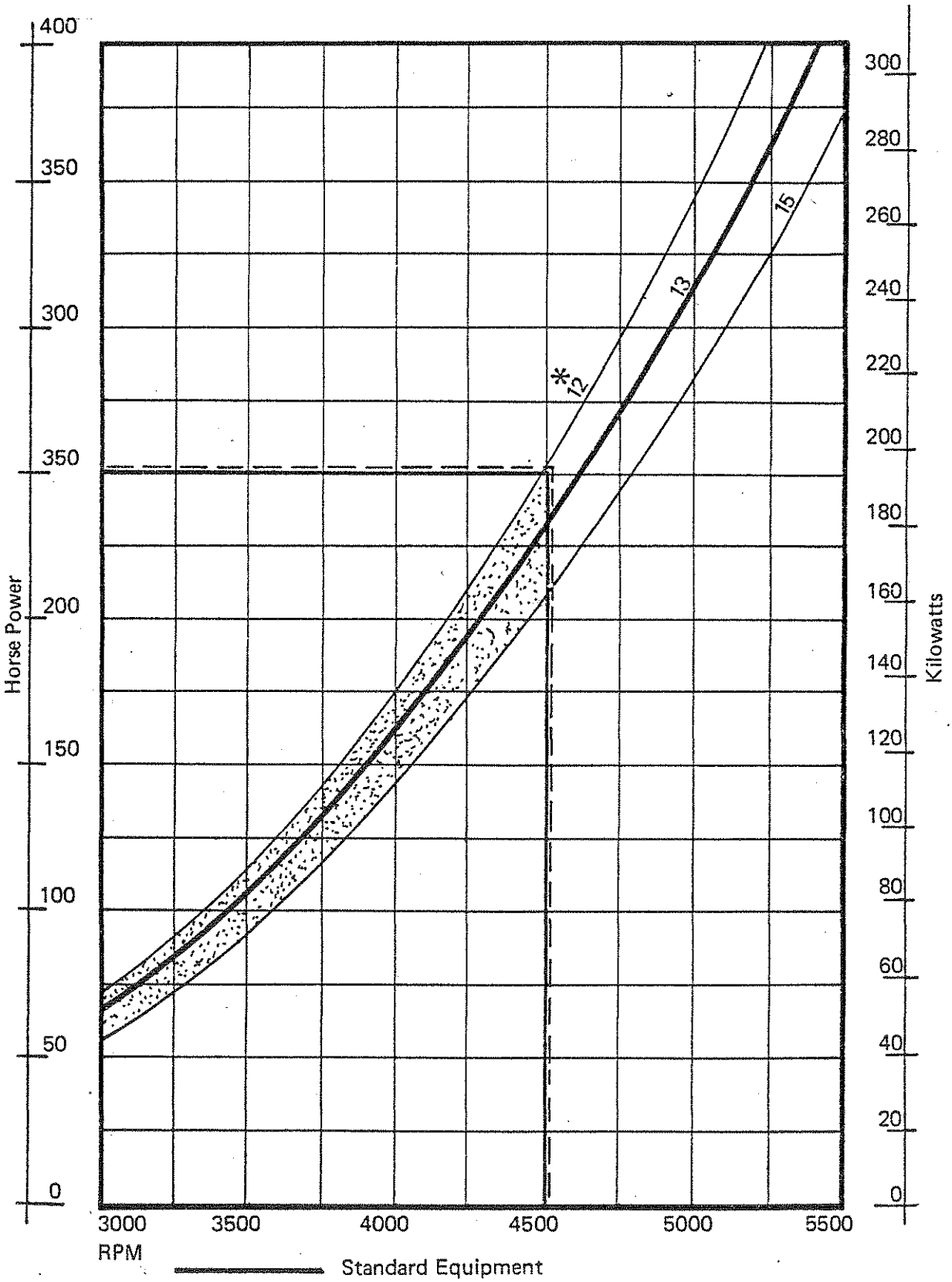
752



Standard Equipment

Limit for commercial and heavy duty operations.

753



Standard Equipment

Limit for commercial and heavy duty operations

*Nozzle Numbers i.e. 12, 13, 15 refer Sections B1 and N, for nozzle data.

INTRODUCTION

This section deals with the selection and matching of 750 Series Jet Units with appropriate Hull and Engine combinations.

The 750 Series Jet Unit is designed for the efficient propulsion of small and medium sized high speed planing craft. However this series of Jet can be used on heavier and larger boats, displacement craft and a variety of special purpose vessels. If units are to be used outside their normal design range the manufacturer or local dealer should be consulted for guidance.

There are factors that affect the performance and suitability of a Jet boat. They are:

a) Hull
b) Engine
c) Jet Unit
d) Weight

A guide to selecting and finally combining these factors , to suit particular requirements is laid out in the following chapter.

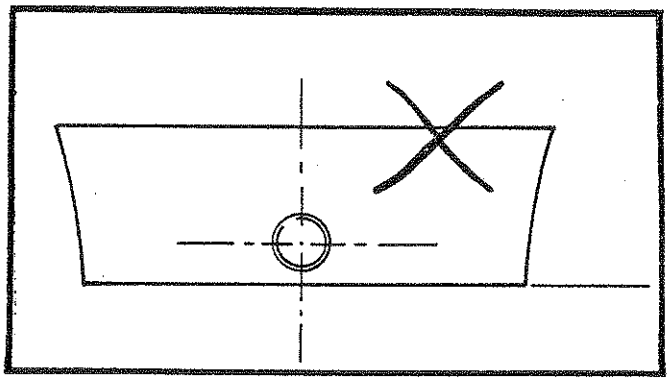
CHAPTER I

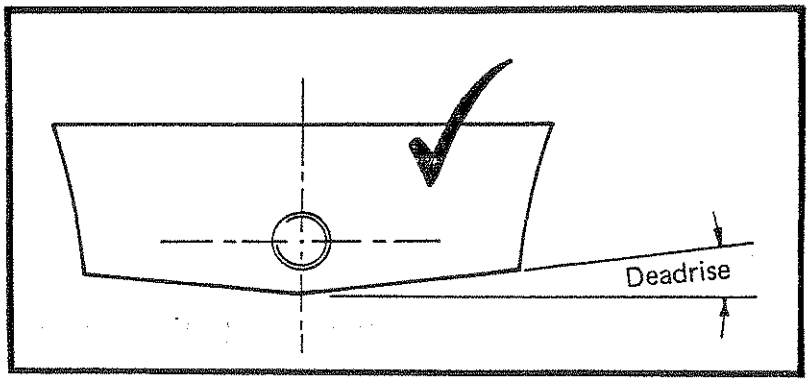
JET BOAT HULL SHAPES AND SIZES

Discussed here are the main features of the shape of the planing hull, leaving the layout, constructional possibilities, and building materials for later. Most of the information is based on a distillation of experience with a wide range of boats over the past ten years. It should be clearly understood that many other types of hulls either have, or could be used and that this dissertation is a summary of the present jet boats generally found most successful.

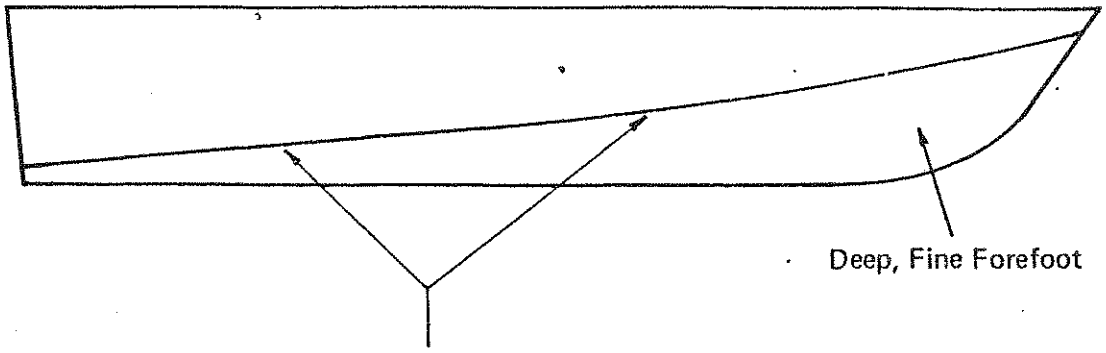
DEADRISE

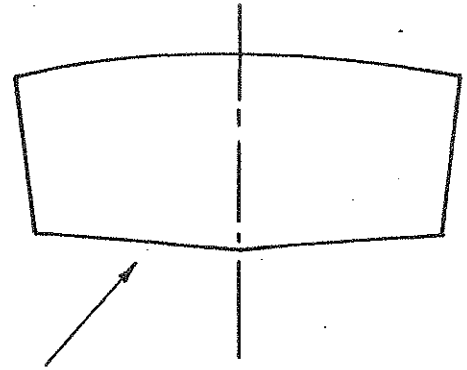
With jet boats up to about 20 feet in length, it is preferable to have some "deadrise", or vee angle in the bottom carried back to the transom. There are three reasons for this, namely -



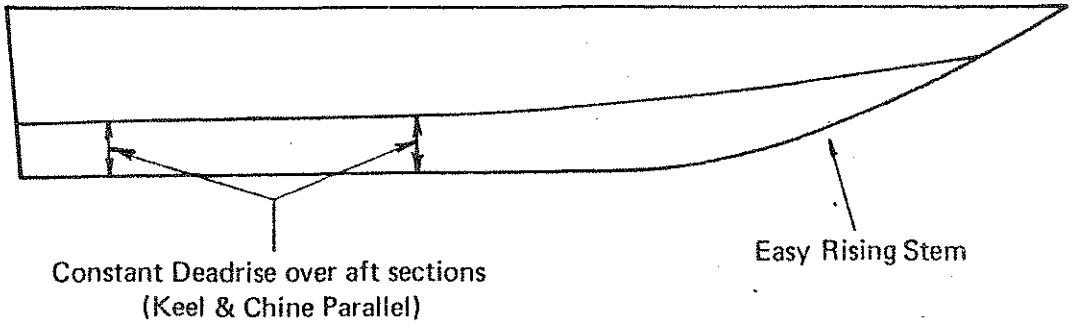


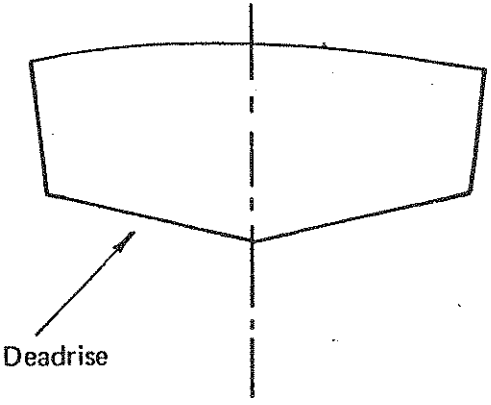
POOR JET HULL





IDEAL JET HULL





CHAPTER 1 (Cont'd)

1. Some vee angle makes sure that the centrally mounted jet unit is well immersed, thus quick priming is ensured when the engine is started. (The unit should be at least half full of water when standing idle).

2. At speed the vee bottom divides entrained air away from the intake in choppy conditions, thus avoiding excessive engine racing. This incidentally, is aeration, not cavitation.

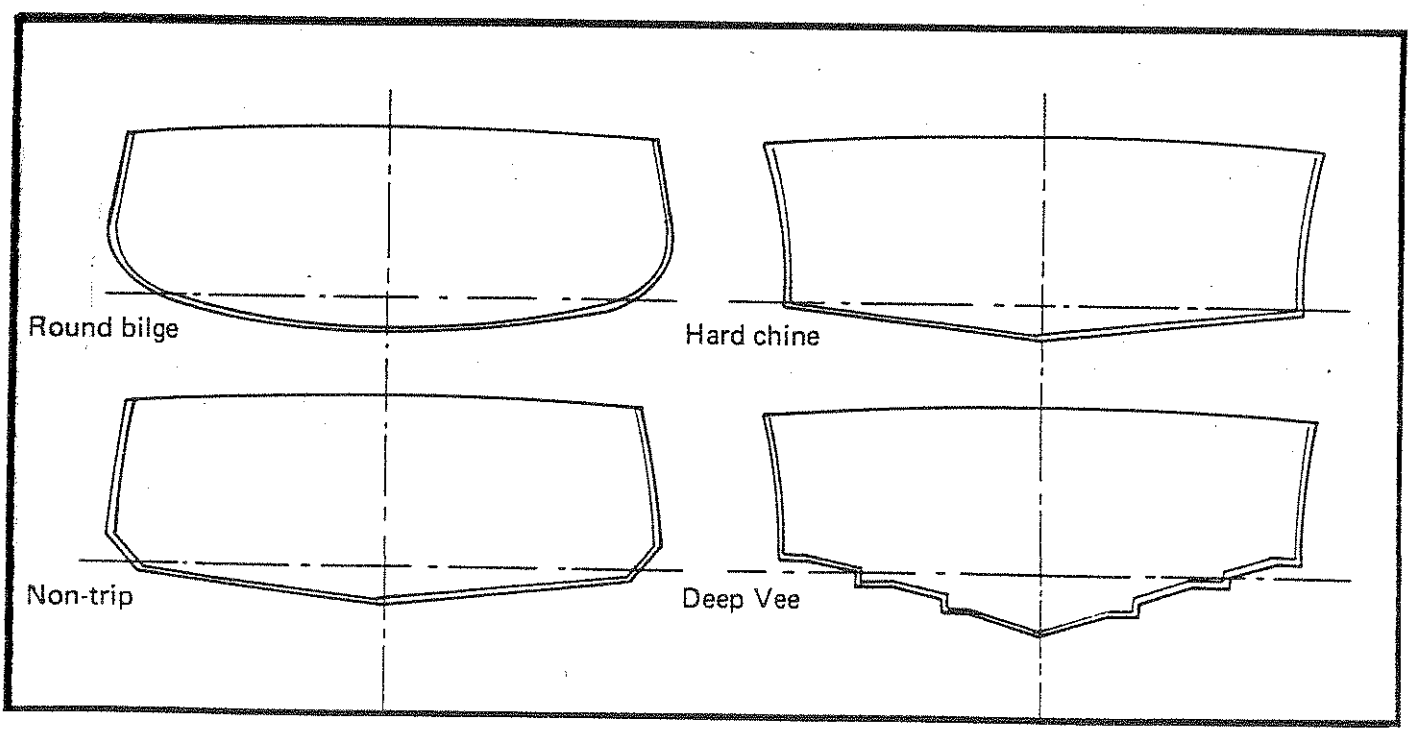
3. The more deadrise angle there is, the greater the banking in turns. Thus is probably safer, and generally more comfortable.

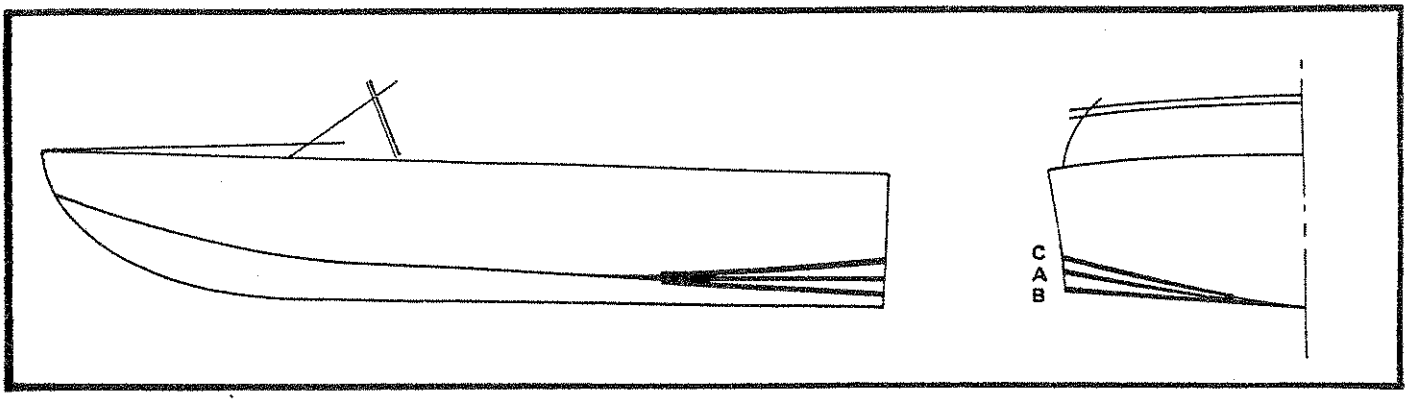
In long boats, the bottom angle is of less consequence and even flat bottoms are quite successful provided immersion is sufficient for the jet unit to prime. In any case, provided the boat has a good flat running trim, and does not squat, air entraining is usually not a worry. The new "deep vee" designs are particularly suitable for jet propulsion, but have more draught than average, and slightly more drag.

HARD CHINE OR ROUND BILGE?

The hard chine is the most efficient planing surface, has the best wave flattening properties, and gives the most planing area for a given size of boat. The round bilge gives pronounced banking in turns, and is the most manoeuvrable of the two types. Handling is excellent, provided the bank is not so extreme as to bare the jet intake to the air.

A small "hardened" step over the aft sections to improve efficiency is desirable. In either case some deadrise angle in the bottom is recommended. "Non-trip" chines do not do the job the name indicates, but give increased bank in the turns. They can be used if desired.





A "MONOHEDRON" bottom (A) is really the simplest shape, the aft sections having constant deadrise angle for some distance. This is easily seen by sighting along the bottom. They are best for high speed craft, the trim angle remaining constant as the speed rises in the planing range. They are not so good for medium speed, or lower powered craft as mentioned below.

The "WARPED-PLANE" lines (B) have the chine continuously dropping from the bow to the transom, the deadrise angle thus reducing all the way back. This gives the boat a "flaps-down" effect, and a flat planing attitude is obtained. This shape is preferable for lower-powered craft, and all boats where nice running in the 18-28 m.p.h. range is required. It is excellent for load-carrying boats, and gives improved riding in choppy conditions due to a generally flatter trim angle at normal cruising speeds. However, as the speed rises, the trim becomes over-flat, the bow may "plough", wetted area increase instead of decreasing and a limitation of speed results. Also in the case of jet boats, bad handling and spinning out can occur at the higher speeds.

The "ROCKER" (C) is roughly the opposite of the above, the deadrise running down to a minimum about amidships, and increasing again towards the transom. The bottom is something like a banana. This shape is easily driven in a displacement condition and is suitable for a slower craft that may operate below planing speeds, or in a semi-planing condition. If driven fast, the bow rides high due to suction at the stern and "grip" in turns may be inferior.

The "Hooked-chine" is an exaggeration of the dropping chine and actually curves downward at the transom. This makes a boat plane quickly and adopt a very even trim angle on accelerating. The effect is similar to having flaps on the transom. However, it is not good to have hook in the bottom at higher speeds, it is liable to cause a high speed broach and should be avoided.

BEAM

Plenty of beam is good, but don't overdo it. The wide beam boat is a great load carrier, can plane at low speeds, is roomy and very manoeuvrable. The worst feature is the excessive change of trim on accelerating onto a plane. It will also run with a greater angle of trim at cruising speeds and is generally inferior for sea-going conditions. The long thin boat will give the best ride in a sea, can have a flat, even take-off, and a wide cruising speed range. A compromise is probably the best for general use, a rule of thumb being : beam = 1/3 length.

CHAPTER I (Cont'd)

BOW SECTIONS

A hard chine boat should have a deadrise of about 25° at 1/4 - 1/3 back from the bow for a reasonably soft ride. The angle should be measured from a keel to the chine, ignoring the intermediate shape.

The normal developable convex shape achieved with a plywood boat is satisfactory for a jet boat. Avoid hollow sections and a deep fine forefoot. The stemline should rise from well back along the keel and a full rounded bow maintained. Have a smooth radius on the stem for preference, without any capping that can cause keeling in sharp turns. Due to the lack of rudder, etc. at the stern of a jet boat, surplus keeling effect forward must be avoided to ensure proper handling in turns.

Note that on round bilge or deep vee boats, the shallow bow shape does not seem necessary for satisfactory handling. Thus these latter shapes may be the best choice for a sea-going jet boat.

The real river boat generally has little or no keel at all. If more "grip" is required in turns, to reduce oversteering tendencies, a keel can be fitted ½ in—2 in deep along the keel, tapering off to nothing forward, and smoothly into the intake aft. Avoid any keel at all behind the intake. Another possibility is twin "sister" keels either side of the intake about 2'—4' apart from the transom forward to admidships of the hull. These should probably be used (quite deep) in larger sea-going boats to aid true running in rough conditions, and to improve slow speed manoeuvring. An alternative arrangement to sister keeling and often more effective for larger craft used in open sea conditions, is twin fixed rudders aft. This has a profound steadying effect when coming alongside in a crosswind, and will make the clean-bottomed sea going boat as easy to handle at slow speeds as the best propeller craft.

SPEEDS OF PLANING HULLS

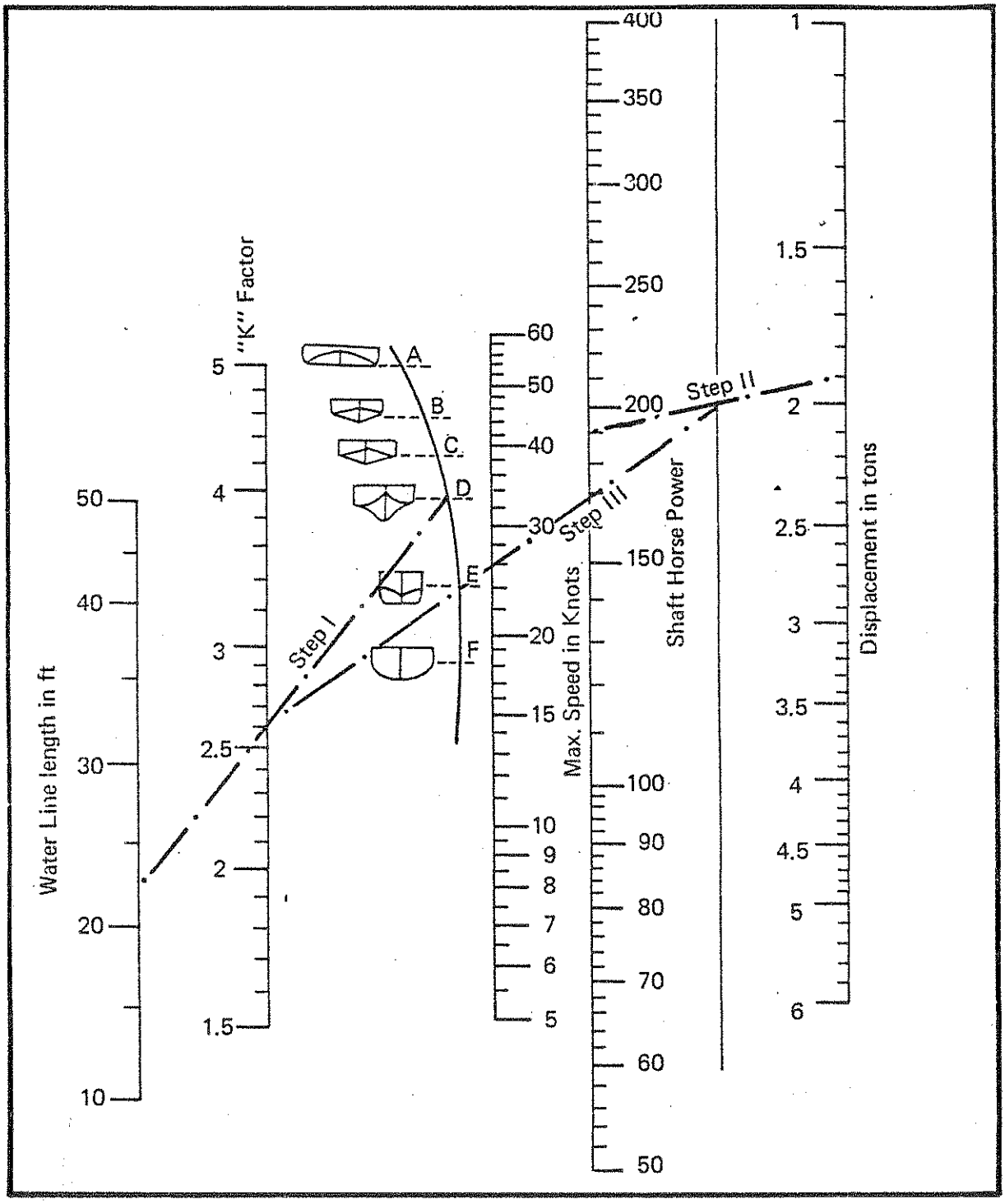
NOTATION FOR GRAPH (Over Page)

A	Highly efficient, hard chine, beamy, near flat bottom.
B	Less efficient hard chine, narrower, more trim angle.
C	Hard chine, more deadrise; also best deep vee hulls.
D	Normal deep vee, also moderate beam, hard chine hulls.
E	Softer shapes, narrow, semi-hard chine planing hulls.
F	Round bilge planing hulls.

HULL FORM

STEP 1	Line across hull form - Length in feet to determine "K" factor.
STEP 2	Line across horsepower - Displacement in tons giving intersection on plain line.
STEP 3	Join the intersections: gives speed in knots.

SPEEDS OF PLANING HULLS



SUMMARY

Almost any shaped hull can be used for jet propulsion in the larger sizes, but some deadrise angle is desirable for small boats. Hard-chine boats need some attention to the bow shape. Jet propulsion is perfectly satisfactory in the sea, but keeling may be desirable aft to improve behaviour in open-water conditions. The round bilge or deep vee hulls may be best for the latter, or adjustable transom flaps for fast hard-chine designs.

Keep a clean bottom for river conditions.

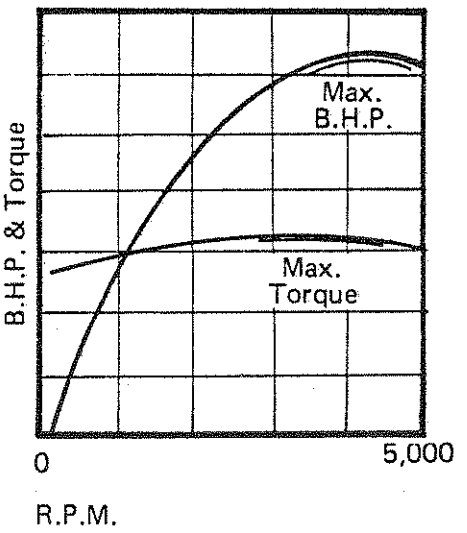
If heavy loads are to be carried, and good behaviour required at medium cruising speeds, some measure of dropping-chine is desirable in hard-chine boats, but always use the monohedron bottom for high speed craft. These findings should not be considered the be-all and end-all of jet boat hull design, but may be of assistance to those having difficulty choosing a suitable hull shape for their jet boat.

CHAPTER II

CORRECT ENGINE TYPE

The 750 Series Jet Units are matched to the average automotive type gasoline engine which develops its maximum power at between 4,000 - 5,000 R.P.M.

DESIRABLE POWER & TORQUE CURVES



The weight of the Engine should not be greater than 5 lbs/developed B.H.P. preferably lighter - around 4 lbs/developed B.H.P. for engines up to 250 B.H.P. Preferable, the maximum torque of the engine should be developed in the high R.P.M. region, making a sports type of engine a better choice than a commercial or Truck Engine, designed for good torque at low R.P.M.

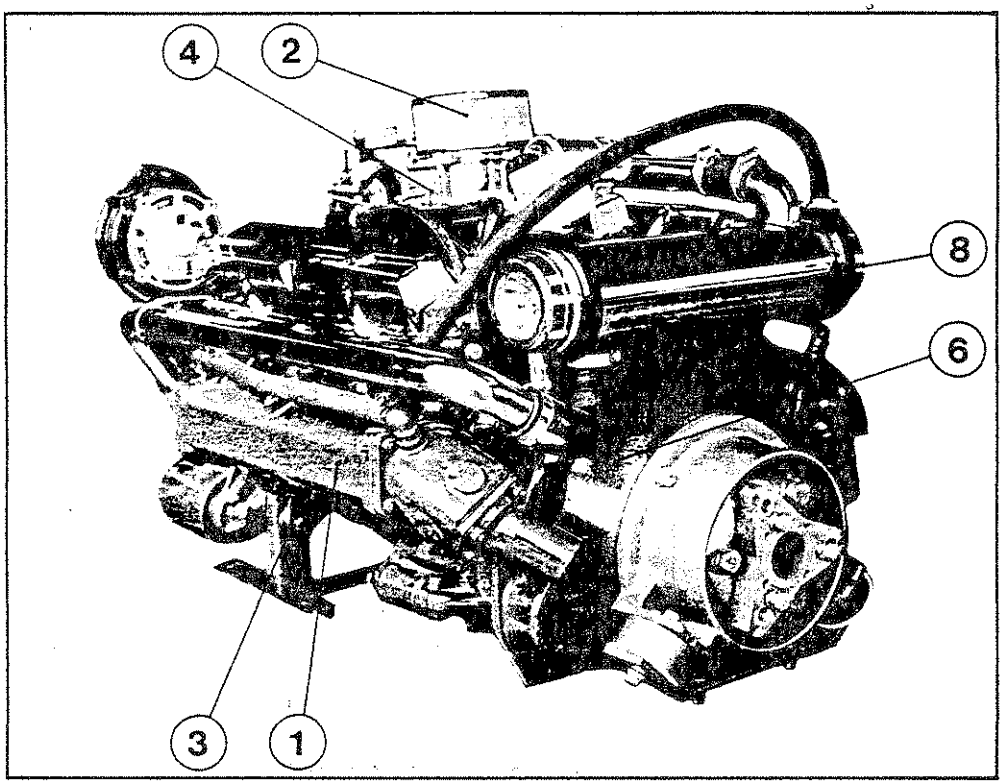
DIESELS

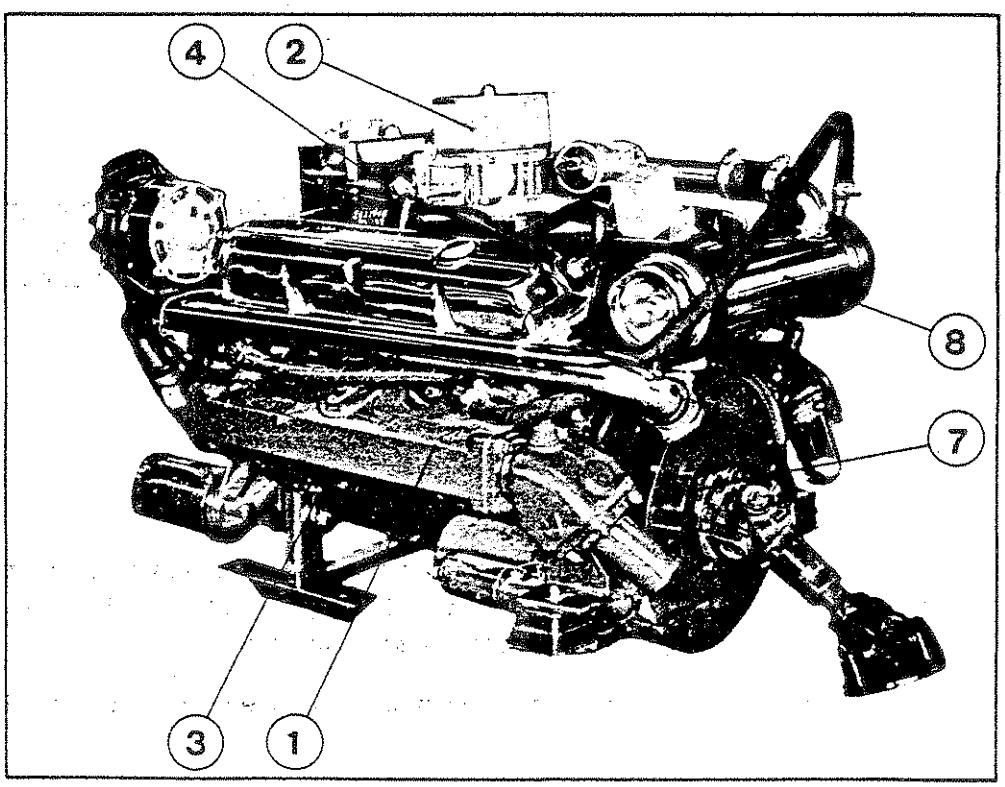
Very few Diesel engine specifications can come near these figures, although some Automotive Diesel conversions are now built with 4,000 R.P.M. peak speed and quite good power/weight ratios. But in general few Diesel engines or truck engines are suitable for small fast craft.

The 1000 and 1300 series of jet units are designed specicifically for diesel engines suitable for hulls from 22' - 0'' upwards.
Details can be obtained from your nearest agent.

The Basic Requirement is a Standard inboard gasoline Marine engine, less transmission (Bob-tailed) with the following features.

1. Water Jacketed exhaust manifolds.
2. Approved flame arrestor – fitted to caburettor air intake.
3. Flexible rubber front engine mounts (preferably adjustable).
4. Throttle connection to carburettor.
5. Instrument Panel with wiring loom.
6. Borg Warner flywheel housing)
7. Hardy Spicer flywheel adaptor) Suits Hamilton short coupling kit
8. Suitable Engine cooling arrangements.





CHAPTER III

MATCHING ENGINE & JET UNIT

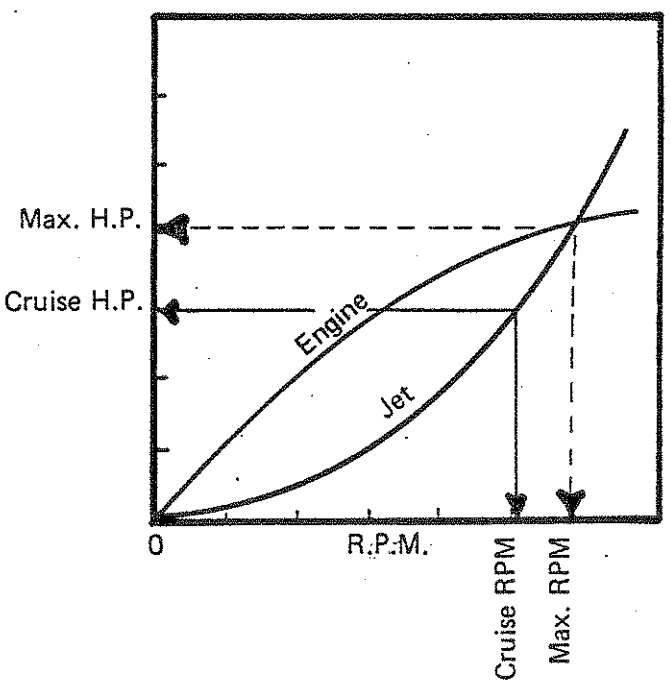
Having satisfied yourself that you have chosen the correct type of Engine and Hull the next step is to match your Engine with a suitable 750 Series Jet Unit.

A. First determine or estimate the Engine's NET SHAFT H.P. curve against revolutions. Remember that S.A.E. rated horse power maybe 10% - 20% higher than that actually obtainable.

B. Knowing the maximum Engine net shaft horse power choose the correct matching Jet Unit for this horsepower. Whether it be a 751, 752 or 753. (For 750 Series Power Requirements refer to Section D1. Performance Data).

C. Superimpose the engine power curve on the Jet unit Power Requirement Curves (Section D). The point where the curves intersect gives the maximum revolutions obtainable from the engine coupled to a 750 Series Jet.

D. For cruising, reduce revolutions as recommended by the engine manufacturers, but come down the jet curve to determine the horsepower used.



D. If a poor match results an alternative Jet Unit can sometimes be selected provided it covers the power range. There is some overlap between units for this purpose.

CHAPTER IV

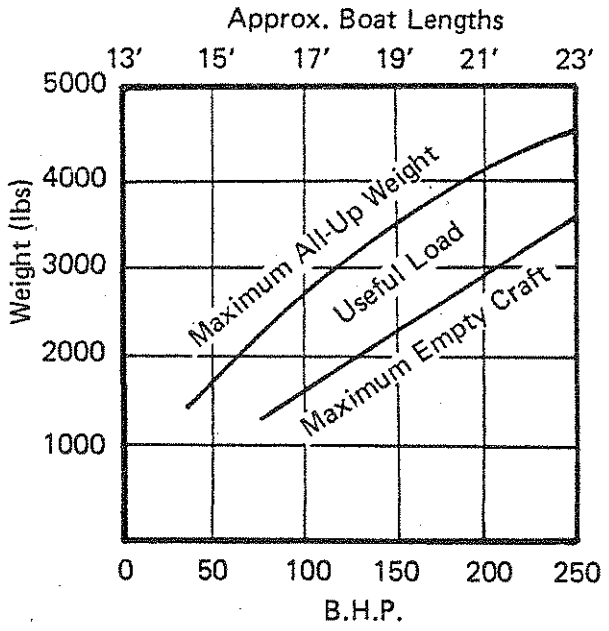
SELECTING ENGINE, JET AND HULL

This chapter is the combination of all the previous chapters where the final matching of the three factors i.e. (Hull, Engine, Jet) is formulated.

The correct combination of Jet unit-engine and hull is arrived at using the diagram below:

A. Knowing the size and weight of the craft, the ideal Horse Power required, then the correct model of Jet can be determined.

B. Having a certain size of Engine and matching Jet Unit, the largest size of craft can be determined and its payload.



NOTE: 1. The above Diagram indicates maximums for boat lengths and weights which will result in satisfactory acceleration onto a plane, reasonable cruising speed and top speeds around 30 m.p.h.

2. The Diagram is for a single instalation, weights can be approximately doubled for twin engines and jets.

SAMPLE CALCULATION:

Assuming we have a conventional 16 foot planing boat, and we require to know the necessary engine power and jet unit.

Weight of hull, complete with hardware, windscreen, steering, seats and all usual fittings (but without engine) ..... 800 lb.

Estimated weight of other items:

	Engine	450 lbs
	Jet Unit	100 lbs (say)
	Battery	50 lbs
Allowance for -	Drive shaft, fuel system, instruments, controls, engine cover, strengthening for inboard	150 lbs

Approximate total boat weight: 800 + 450 + 100 + 50 + 150 = 1550 lb.

Referring to the diagram, a boat of this weight requires 95 b.h.p. From the jet unit information this means a 751 is suitable.

Say we choose a light 95 b.h.p. marine engine that weighs 420 lb.

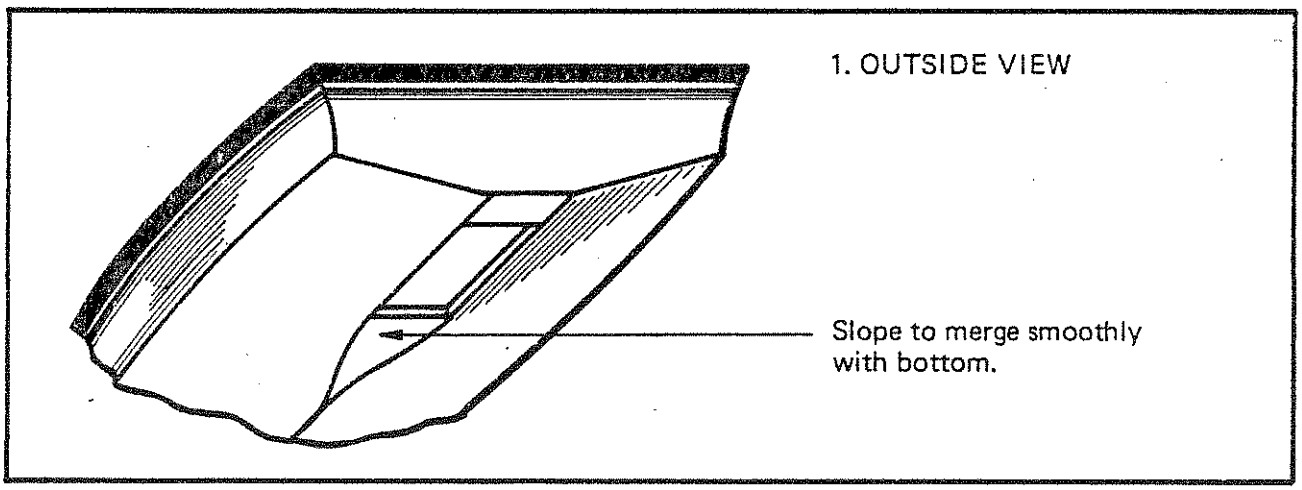
Recalculate boat weight: 800 + 420 + 100 + 50 + 150 = 1520 lb. with this particular engine and jet unit.

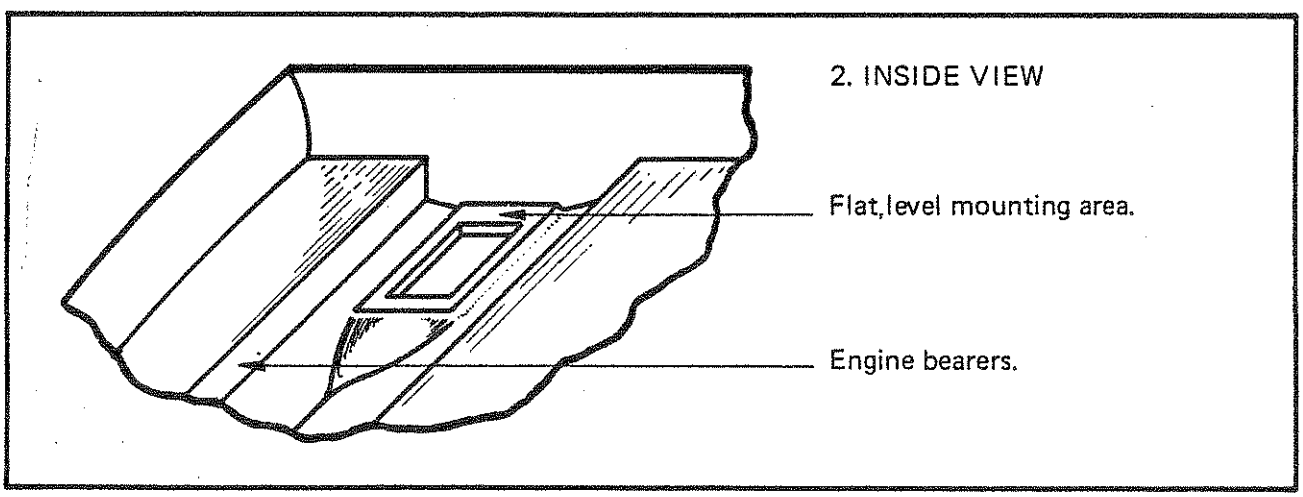
Maximum desirable laden boat weight for this power from the diagram is 2500 lb.; therefore, passenger and fuel load should not exceed 980 lb. if economical and efficient performance are desired.

MOUNTING AREAS FOR JET UNIT AND ENGINE

Having decided that the chosen hull is suitable for jet drive, it will then be necessary to prepare an area for mounting the jet unit and engine. The jet unit requires a flat area with a rectangular intake hole built up on the keel line; and two longitudinal bearers, parallel with the bottom of the boat are required for the engine.

The method of preparing these mounting areas may differ according to the material of the hull and whether the installation is a custom job or a quantity production run. Whichever is the case the finished appearance should be as in Figs 1 and 2. Dimensions as in Figs 3, 4 and 5.



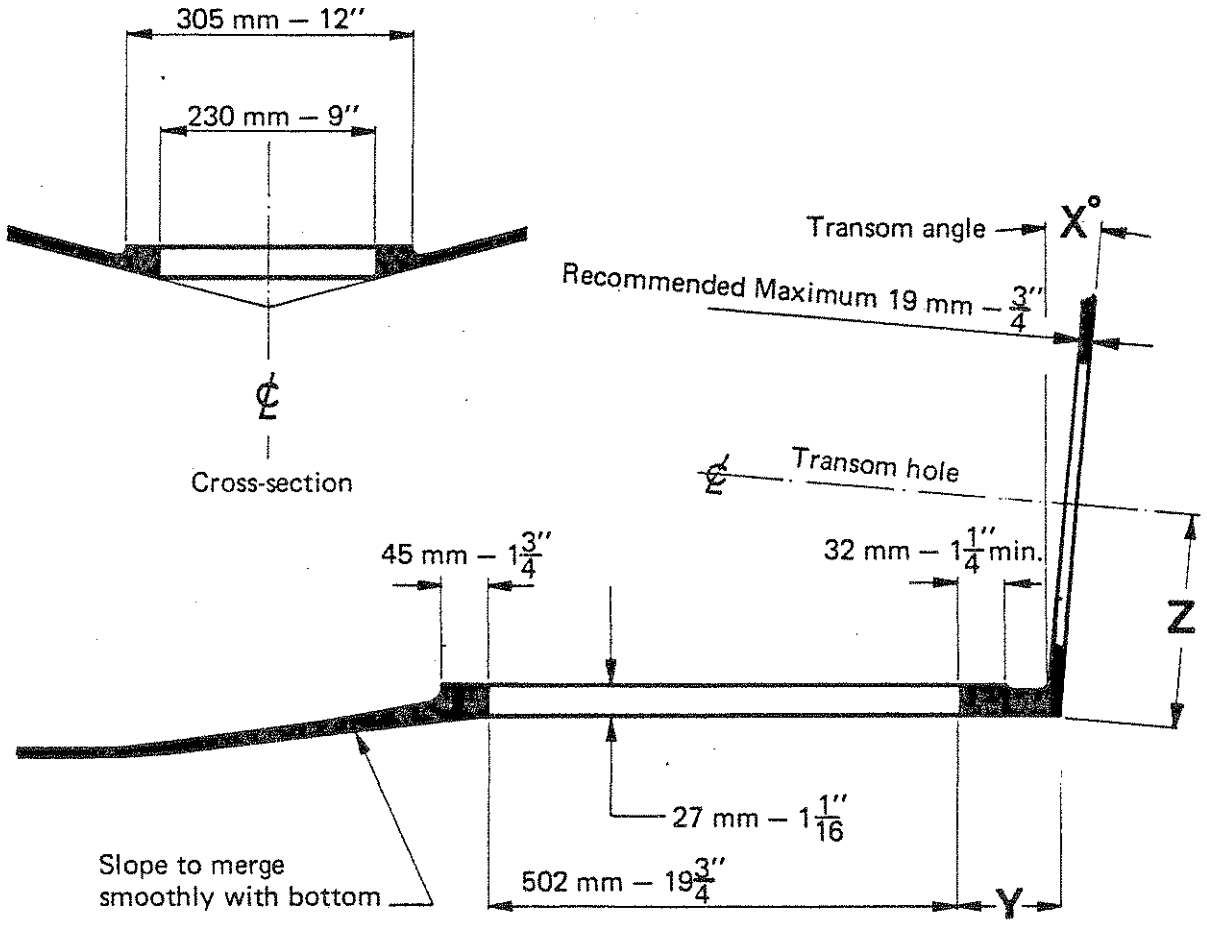


JET UNIT MOUNTING AREA

Using wood or fibreglass (depending on hull material), build up a flat, level area inside the hull, central about the keel line.

Underneath, flatten off the bottom (230mm – 9" wide) so that no 'step' will remain when the flat intake screen is installed. In front of the intake hole, fair off from the flat area smoothly into the bottom, so that the water can flow smoothly up to the intake. This will need to be done only on vee-bottomed hulls, as flat bottomed hulls will leave no step in this area.

3. JET UNIT MOUNTING AREA



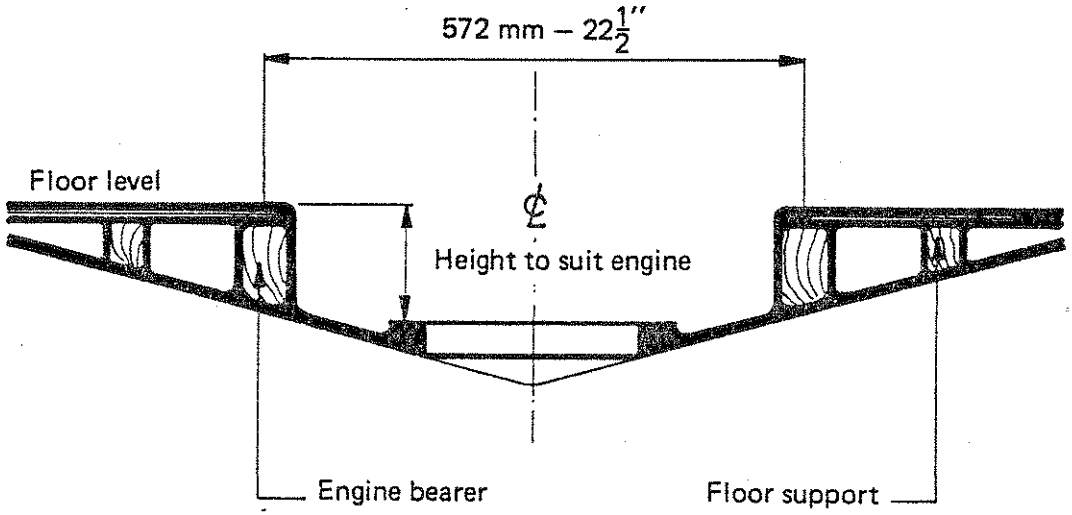
The dimensions Y and Z depend on the transom angle X° and can be determined from the table below or from the templates supplied.

Transom angle	X°		0	2	4	6	8	10	12	14	16
Intake hole Template No. 1	Y	mm	117	109	100	90	82	75	65	54	40
		inches	4 5/8"	4 5/16"	3 15/16"	3 9/16	3 1/4	2 15/16	2 9/16	2 1/8	1 9/16
Transom hole Template No. 2	Z	mm	224	224	224	224	227	227	227	232	232
		inches	8 13/16	8 13/16	8 13/16	8 13/16	8 15/16	8 15/16	8 15/16	9 1/8	9 1/8

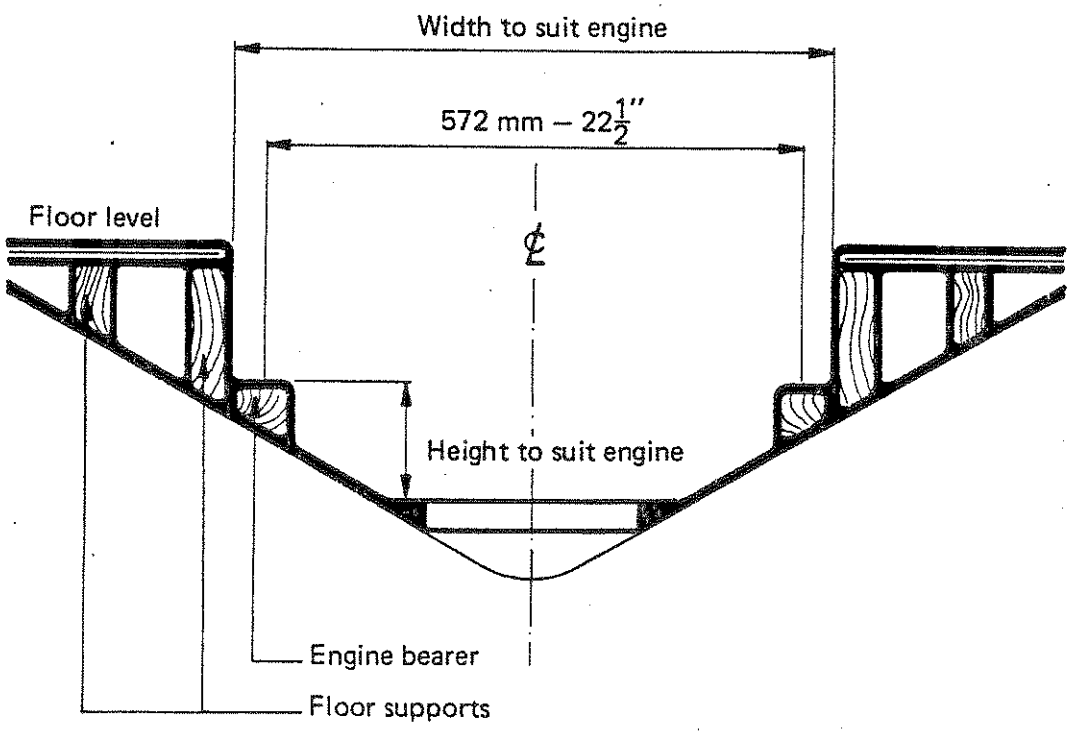
ENGINE COMPARTMENT

Leave an area clear of frames and floorboards down the centre of the boat for the engine and jet unit. The length of the recess will depend on the engine and coupling system used. With a deep vee hull, part of the engine may be below floor level, so make sure that there is adequate clearance around the engine for easy access.

4. SHALLOW VEE HULLS



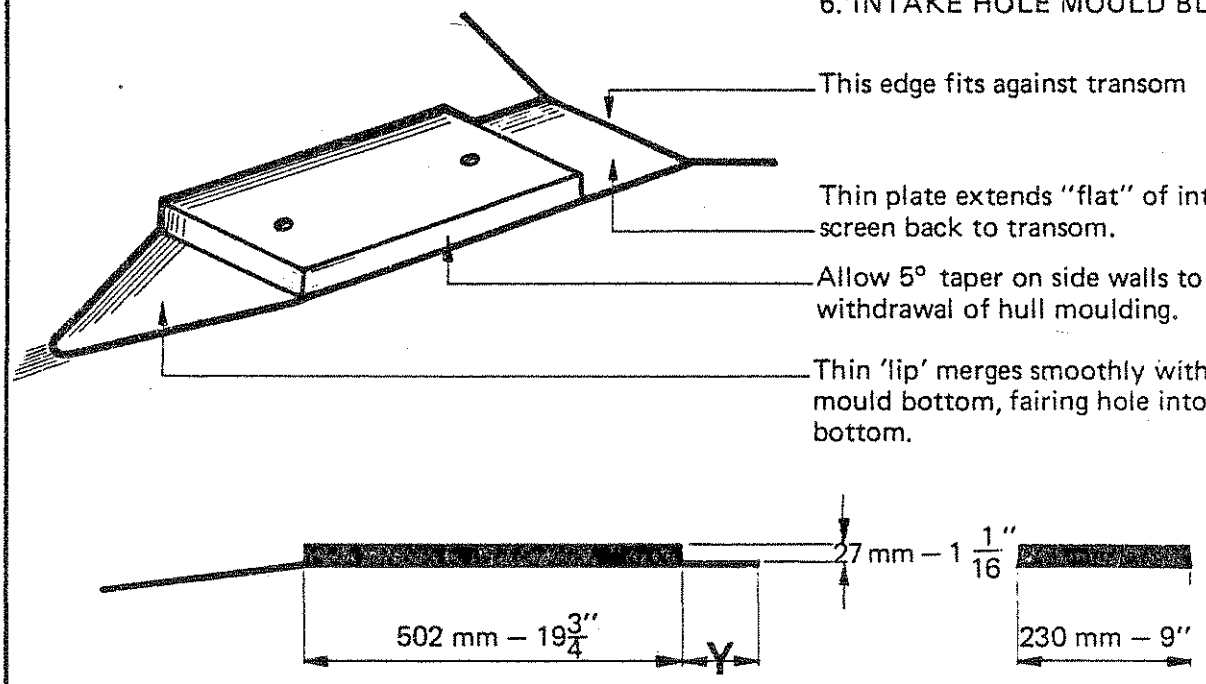
5. DEEP VEE HULLS



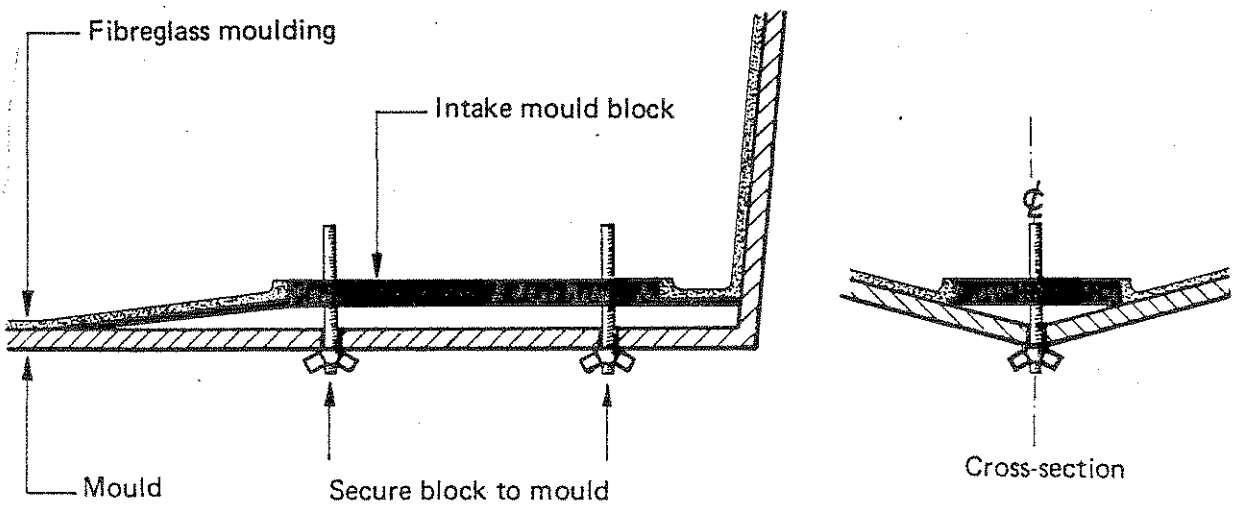
FIBREGLASS HULL PRODUCTION

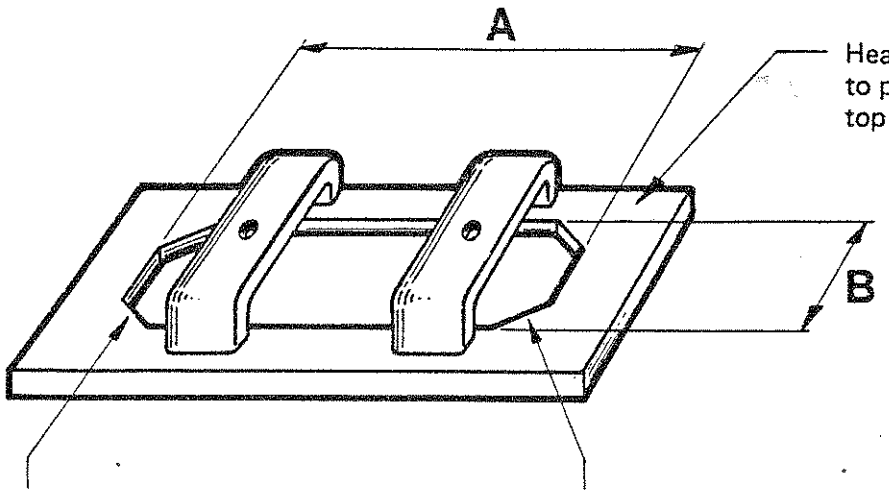
When moulding fibreglass hulls, the intake hole should be formed by securing a steel block to the mould. Figs 6 and 7. Build up a strong fibreglass surround and clamp a heavy plate to the top to provide a level, flat surface. Fig 8.

6. INTAKE HOLE MOULD BLOCK



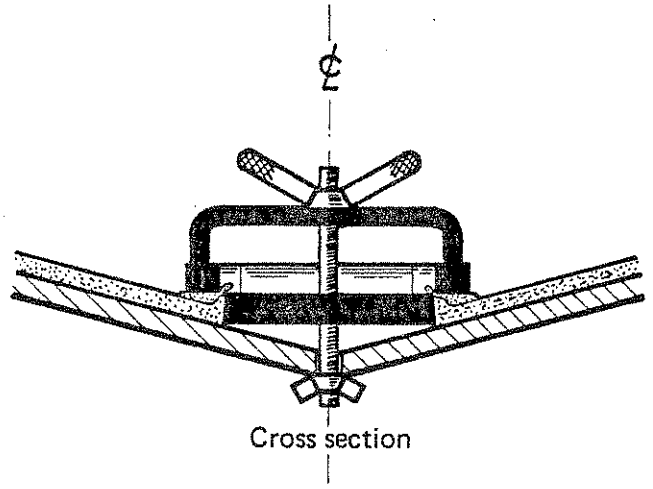
7. FITTING TO HULL MOULD

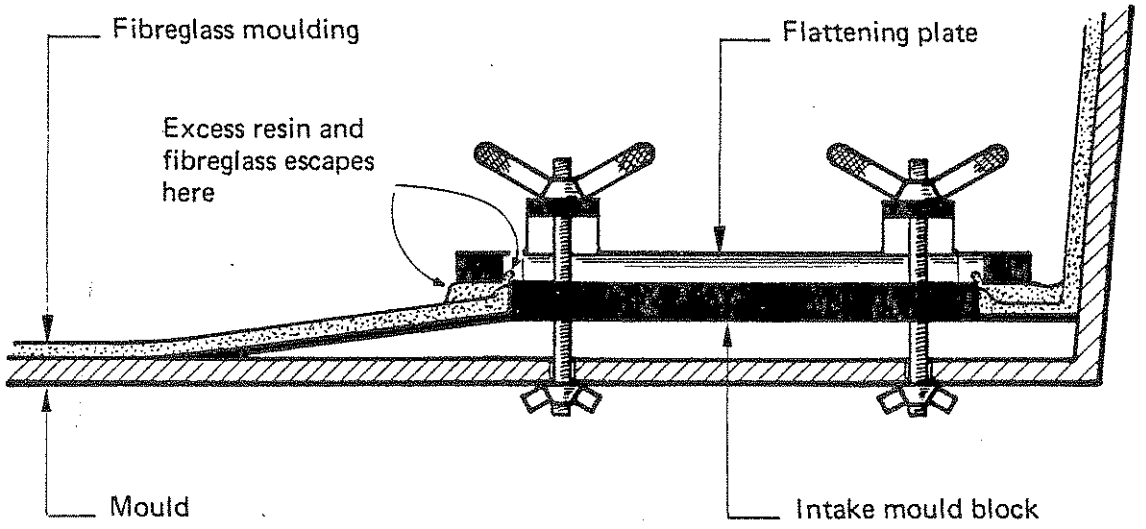




8. INTAKE SURROUND

The angled corners on the flattening plate should just catch on the mould block and dimensions A and B should be 4mm – 1/8" greater than the top of the block to allow excess resin and fibreglass to escape.





TEMPLATES

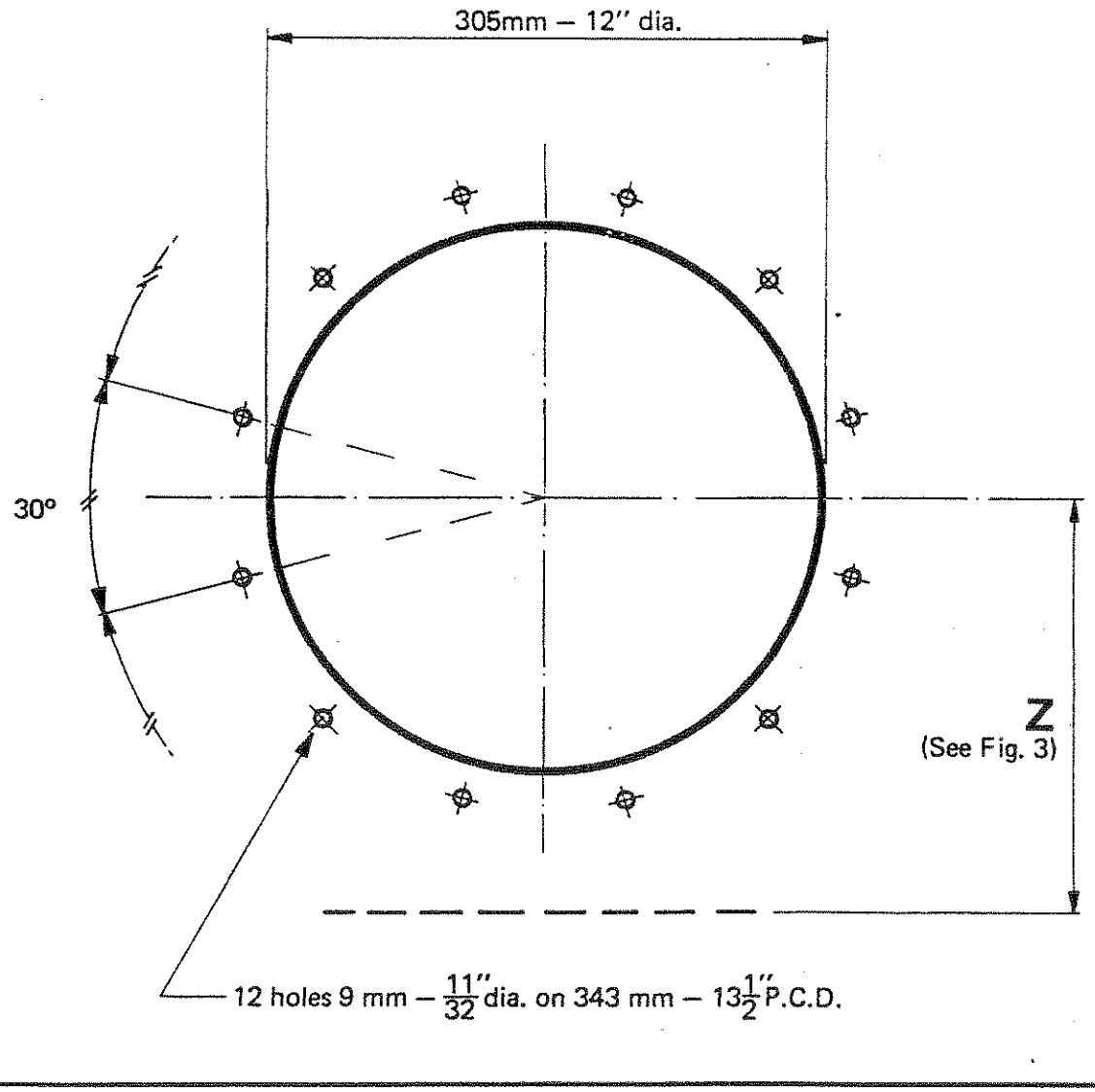
Three paper templates are supplied for custom installations.

No. 1 Intake hole
No. 2 Transom hole
No. 3 Intake bolt holes.

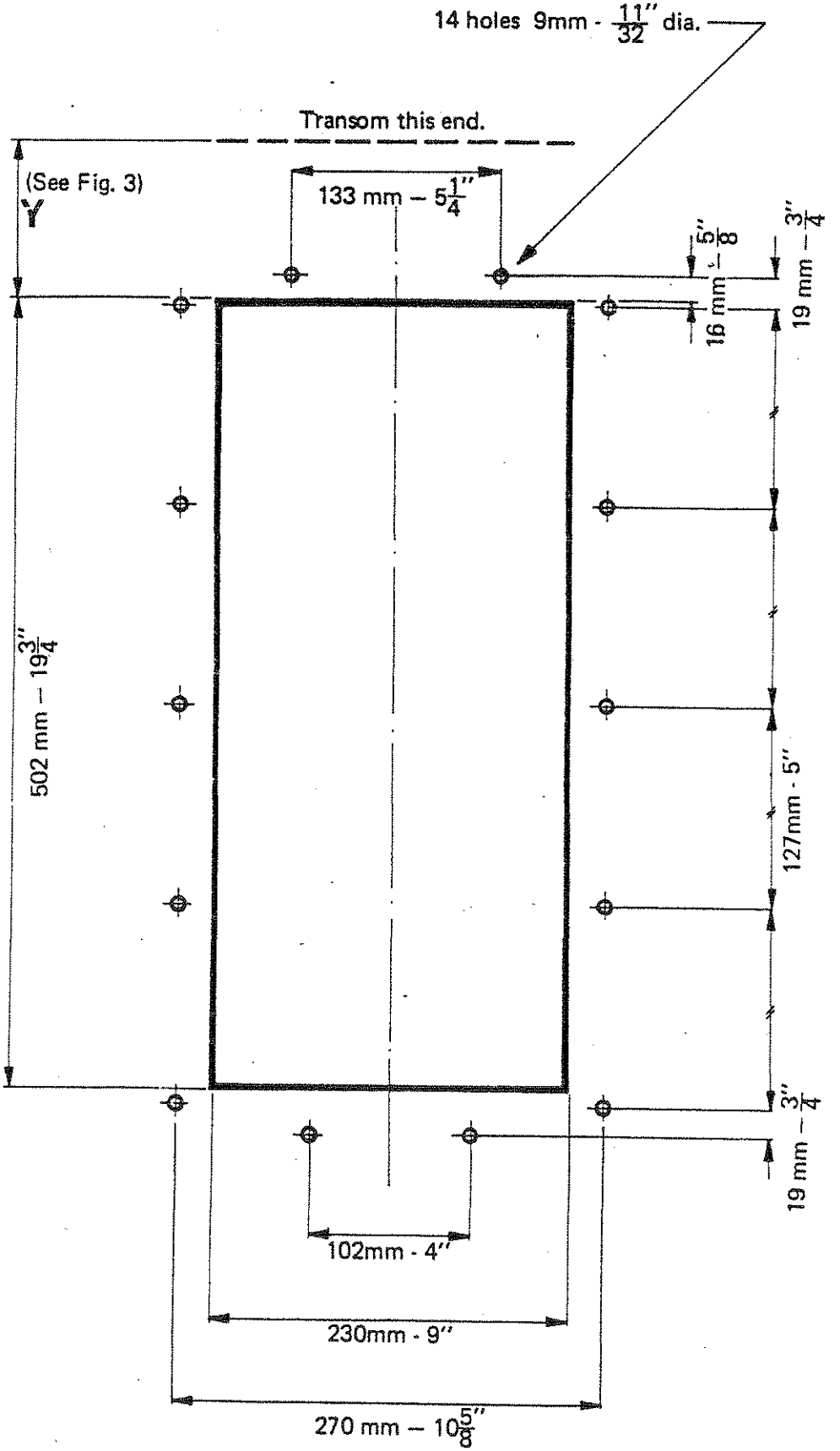
If the intake hole is to be moulded then only templates 2 and 3 will be required.

Paper templates will not be suitable for quantity production so templates of a more premanent nature should be constructed of steel or similar material using the dimensions given in Figs. 9 and 10. Template No. 3 (Intake bolt holes) should be made to locate in the intake hole and have suitable guides so that the holes are drilled perpendicular to the flat mounting area. As the hole spacing is assymetrical the template should be marked to show which end goes toward the transom.

9. TRANSOM HOLE DIMENSIONS

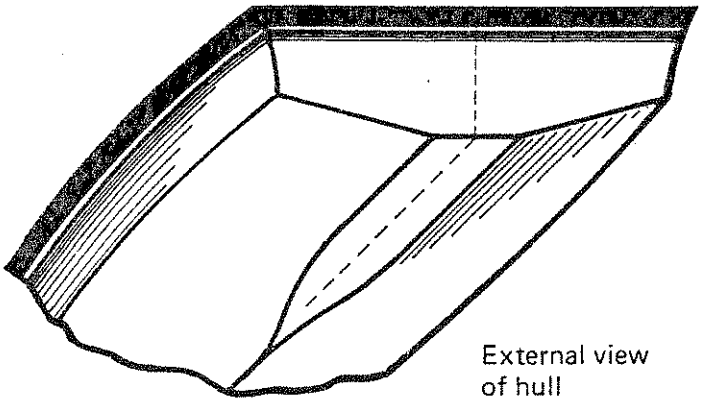


10. INTAKE HOLE DIMENSIONS



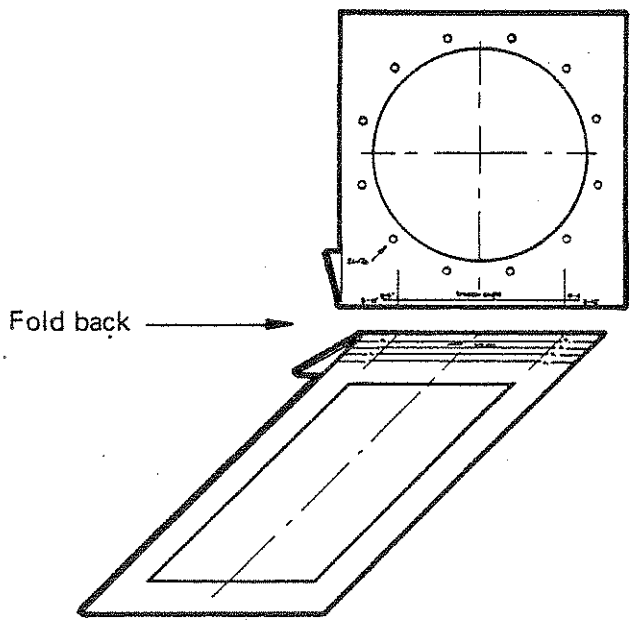
USING TEMPLATES TO CUT INTAKE AND TRANSOM HOLES — Figures 11 to 16.

If the intake hole has been moulded, then template No. 1 for the intake hole will not need to be used, otherwise proceed as follows:

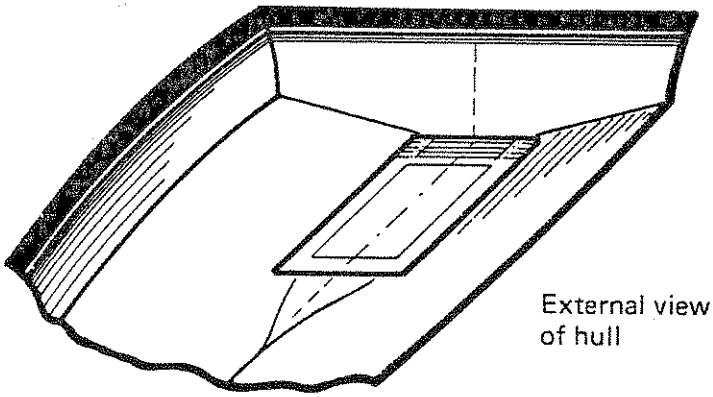


External view of hull

11. Locate the centre of the keel and draw the centre line on the flat area of the keel and up the transom.

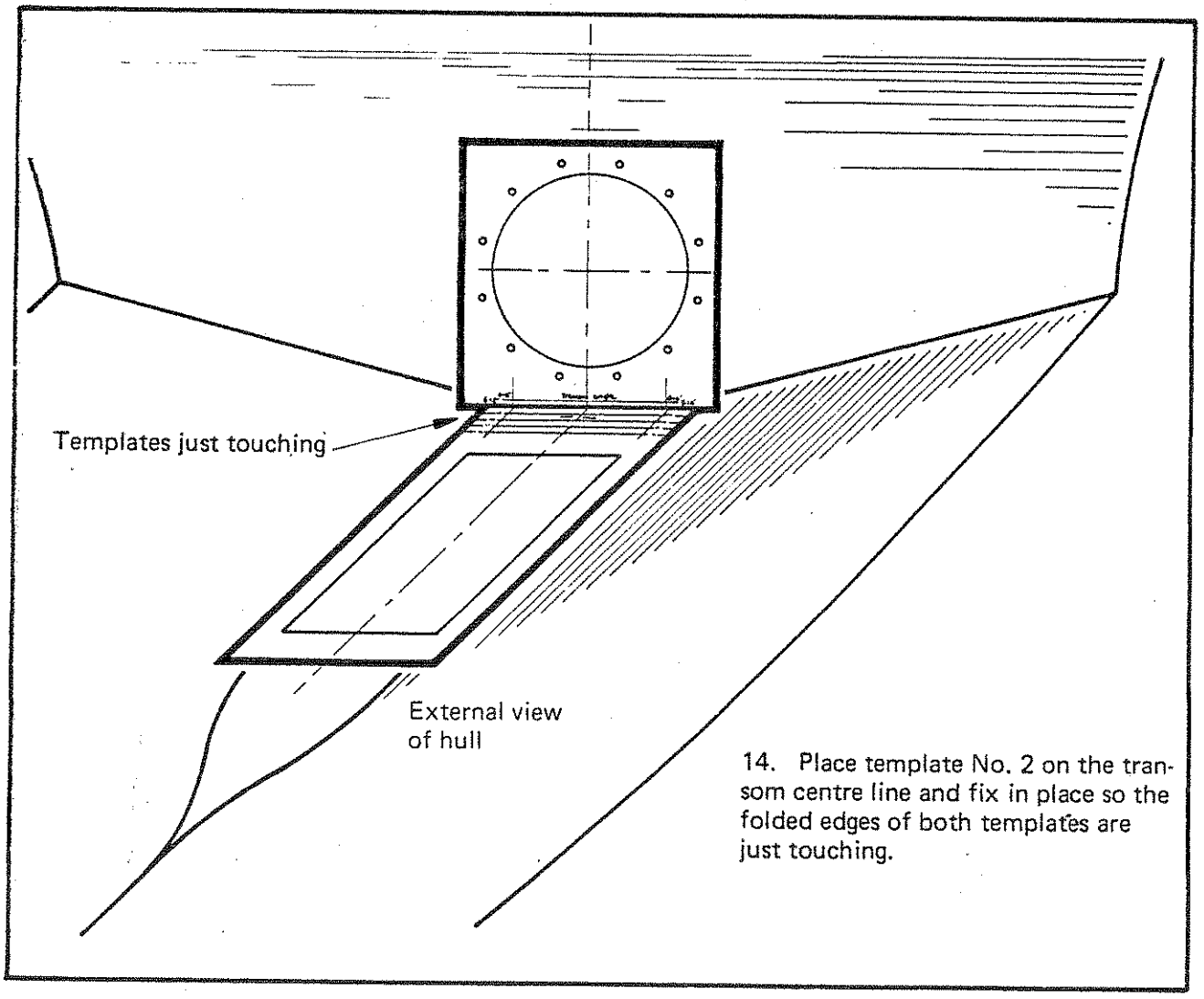


12. The position of intake and transom holes depends on the transom angle. Once this is determined, fold each template (Nos. 1 and 2) on the line corresponding to the transom angle.



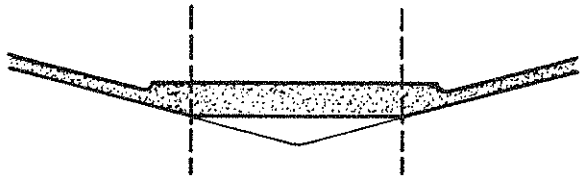
External view of hull

13. Place template No. 1 on the centre line of the keel and fix it in place so the folded end just meets the transom.



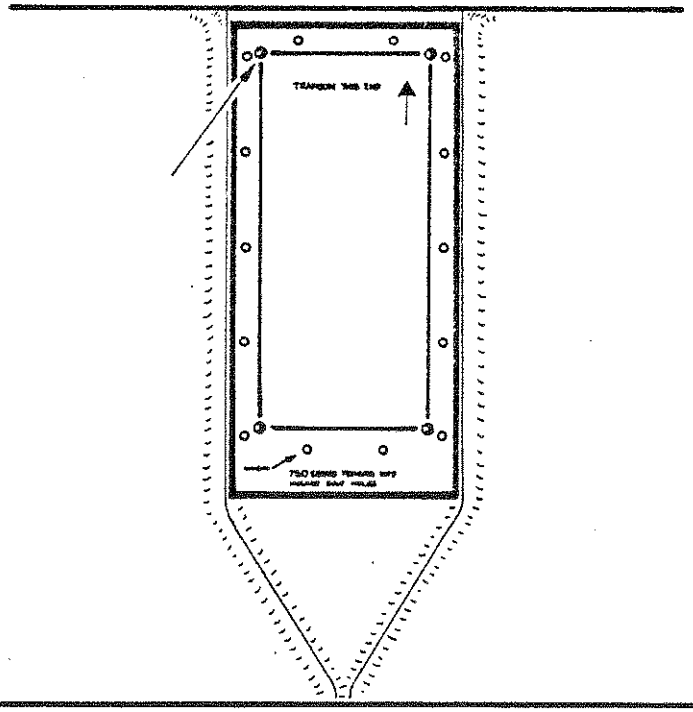
14. Place template No. 2 on the transom centre line and fix in place so the folded edges of both templates are just touching.

Cut the intake hole using a sabre saw, following the outline on the template. (If it is easier to cut the hole from inside the boat, drill a small hole through the hull in each corner of the template outline. Draw a line between the four holes inside the boat and cut along this line.



15. When cutting the intake hole, care should be taken to make the cut straight up and down.

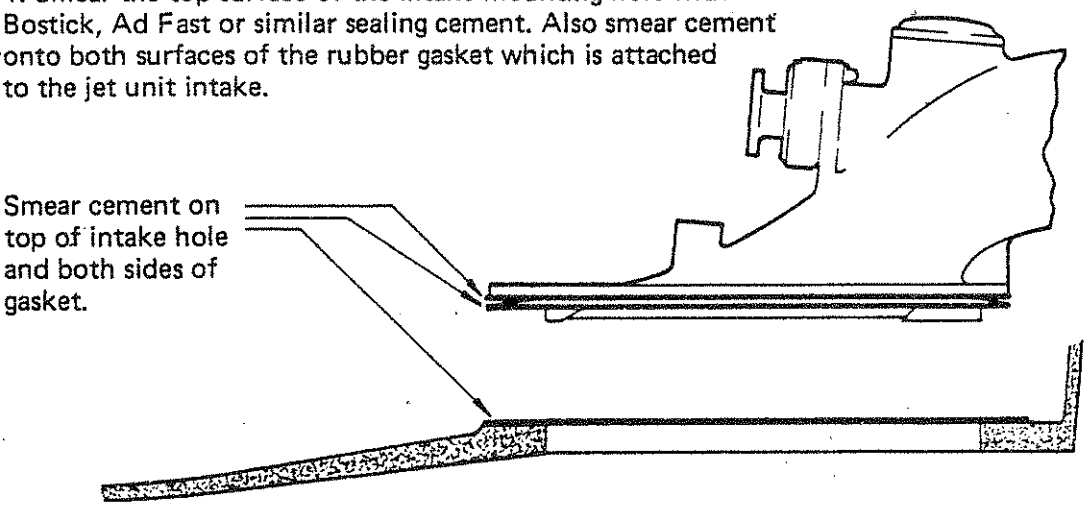
Drill the 12 bolt holes in the transom using a 9mm – 11/32" bit. Then cut the transom hole using a sabre saw, following the outline on the template.

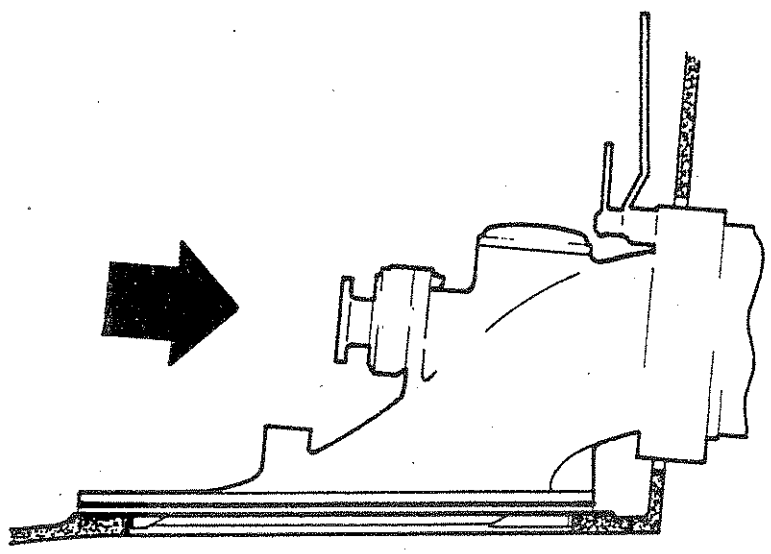


16. Insert a small nail or pin through each corner of the outline on template No. 3 to locate it over the intake hole inside the boat. Fix the template to the flat mounting area making sure the correct end is towards the transom. Drill the 14 bolt holes straight up and down using a 9mm –11/32" bit. Countersink the holes on the outside. With the hull preparation completed the jet unit can now be installed.

INTAKE SEAL

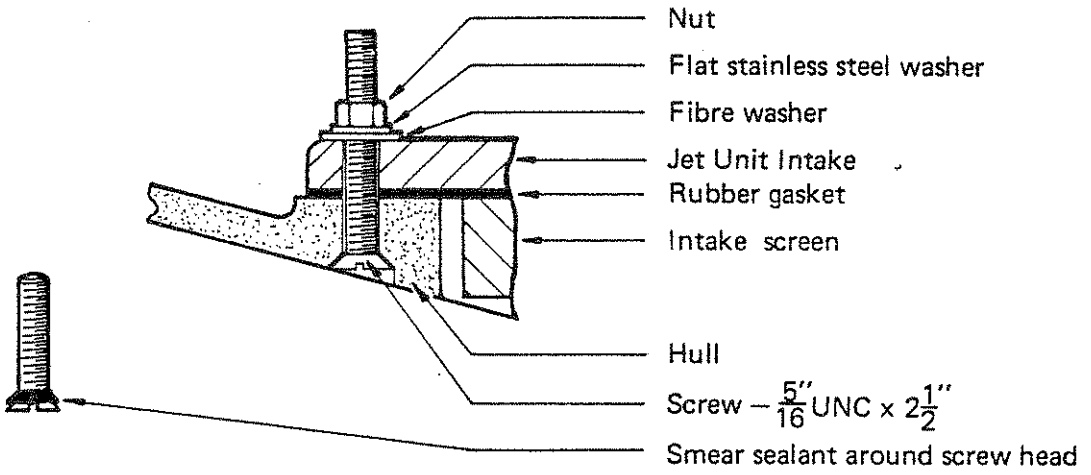
1. Smear the top surface of the intake mounting hole with Bostick, Ad Fast or similar sealing cement. Also smear cement onto both surfaces of the rubber gasket which is attached to the jet unit intake.



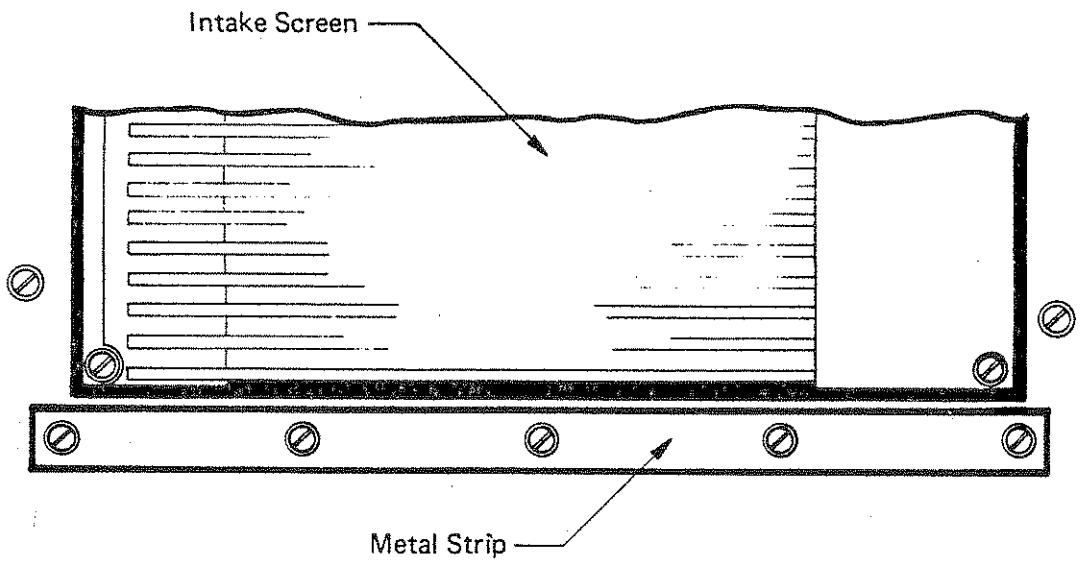


2. From inside the boat, slide the jet unit through the transom hole with the reverse deflector down in the neutral position at first, and then up in the forward position. This will allow the reverse deflector and saddle to pass through the transom hole easily.

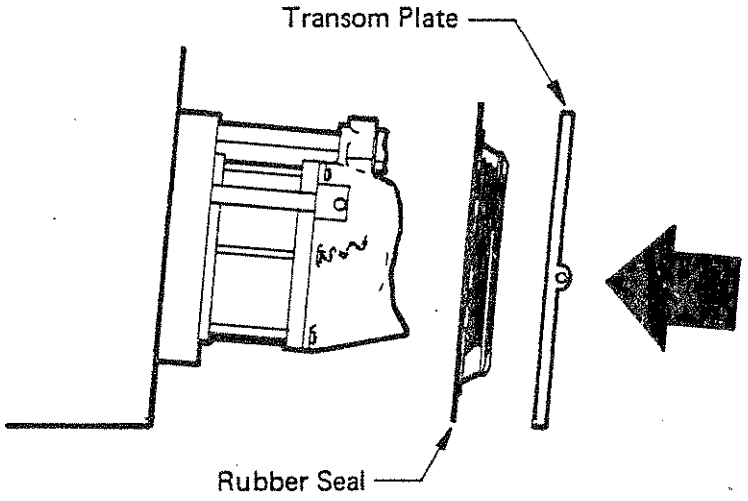
3. Place the jet unit over the intake hole and put the fourteen screws through from the underside, with sealant smearing around the screw heads. Put a fibre washer then a flat stainless steel washer and nut on all screws. Tighten evenly all round, making sure the screw heads pull in just flush with the bottom of the boat and do not protrude.



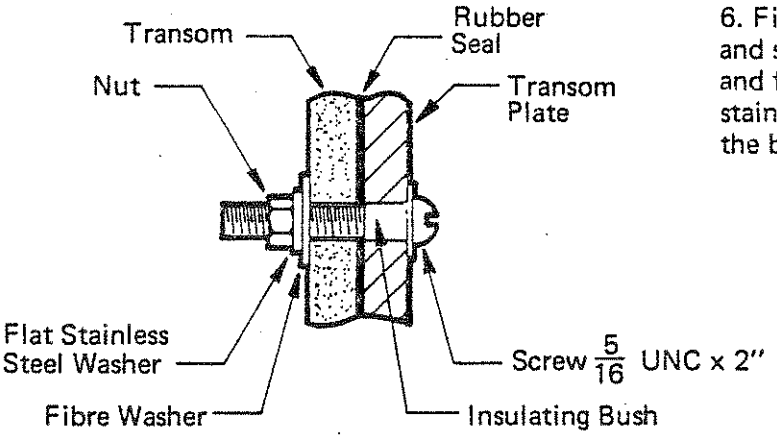
4. In soft wooden hulls, a metal strip with a row of countersunk holes may be required along each side to prevent the screw heads from pulling into the wood.



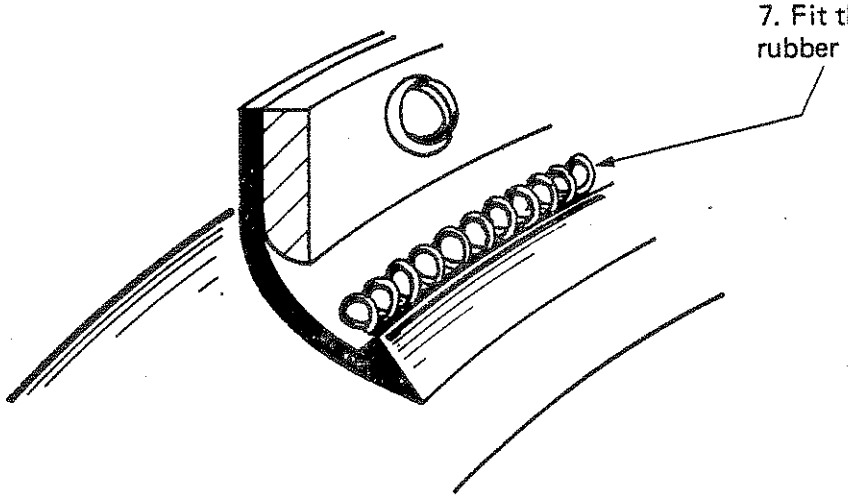
TRANSOM SEAL



5. From outside the boat, stretch the transom rubber seal onto the circular seal ring, and slide the metal transom plate on with the two bosses horizontal

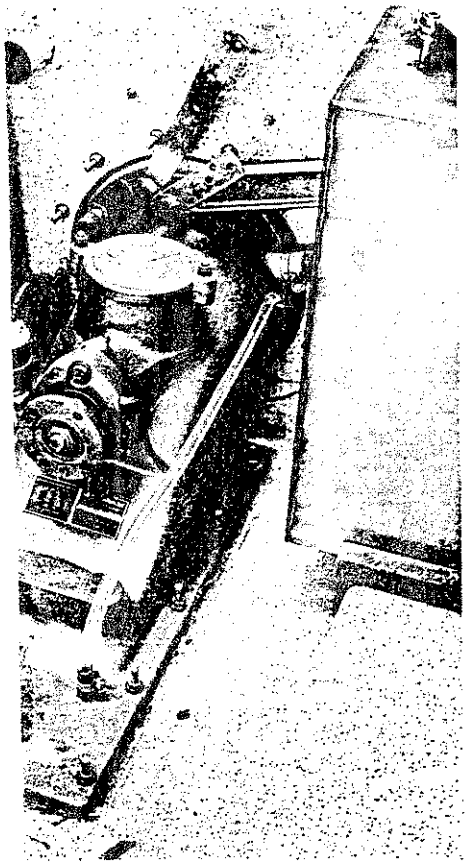


6. Fit the twelve insulating bushes and screws from outside the boat and fasten with a fibre washer, flat stainless steel washer and nut inside the boat.



7. Fit the seal spring onto the rubber seal.

TYPICAL INSTALLATION FOR 750 SERIES

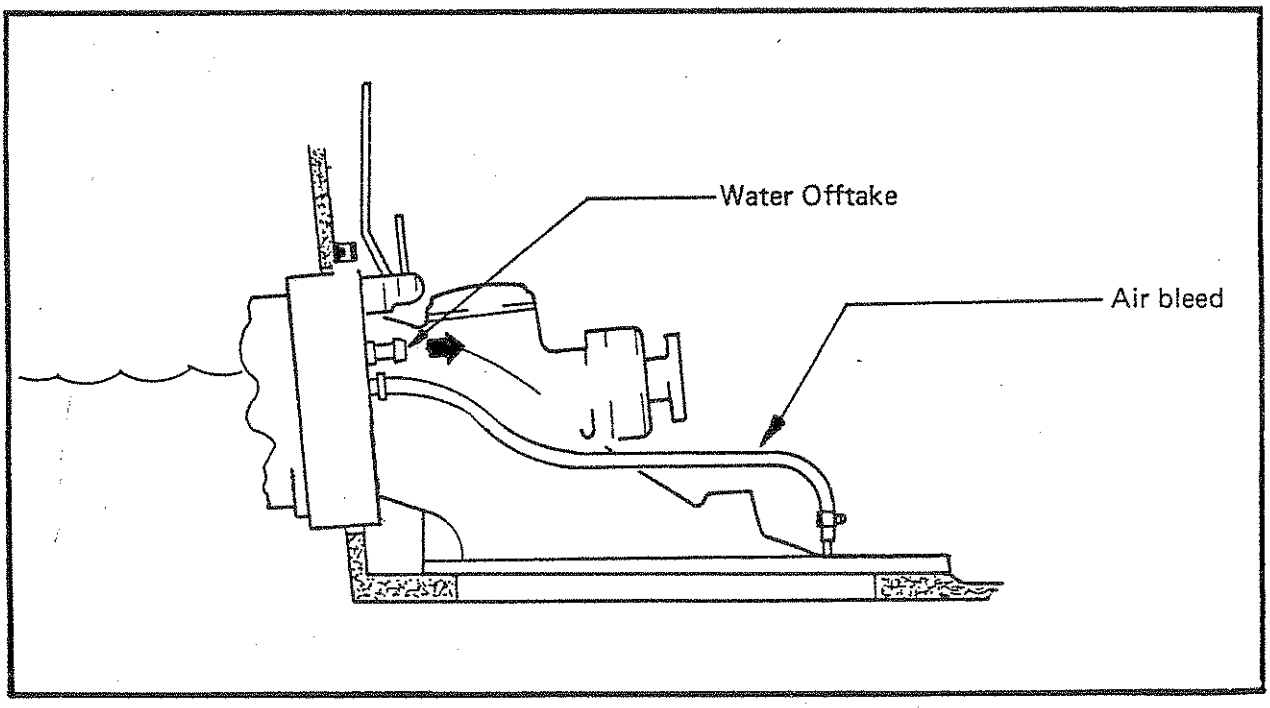


AIR BLEED

This fitting bleeds a controlled amount of air into the unit and aids quiet running. Make sure the plastic tube is firmly connected to the air bleed nipple on the jet unit intake. Connect the other end to the air bleed nipple on the transom plate.

WATER OFFTAKE

Two water offtakes are provided on all 750 models. These can be used for the engine cooling system or jet bilge pump as required. If the water offtake is not required the hose fitting should be removed and the hole plugged.



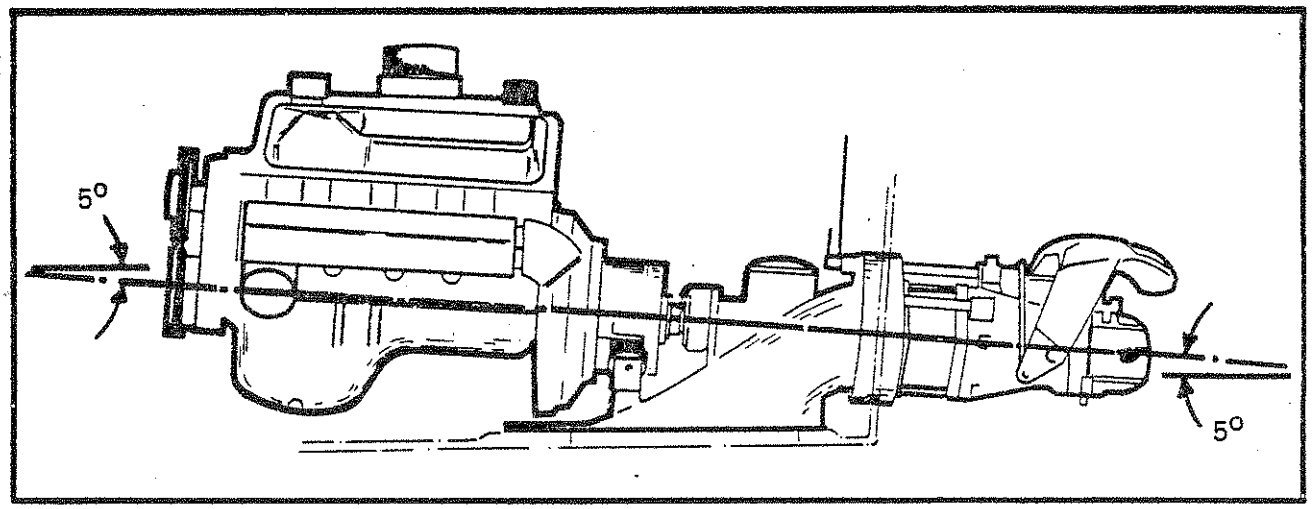
ENGINE INSTALLATION

1. ENGINE ANGLES

The relationship between the Engine Centre line and that of the jet is very important and varies with the type of coupling system used.

A. Using the Hamilton Short Coupling kit the engine centre line should lie along the Jet mainshaft centre line at 5^{o} ($\pm$ 1^{o} permissible) to the horizontal.

UNIT – ENGINE CENTRE LINES



B. When installing an engine using the Hardy Spicer Universal Coupling the engine should be mounted in such a manner as to comply with the standards laid down in Section I page 1. Figs I and II.

2. MOUNTINGS

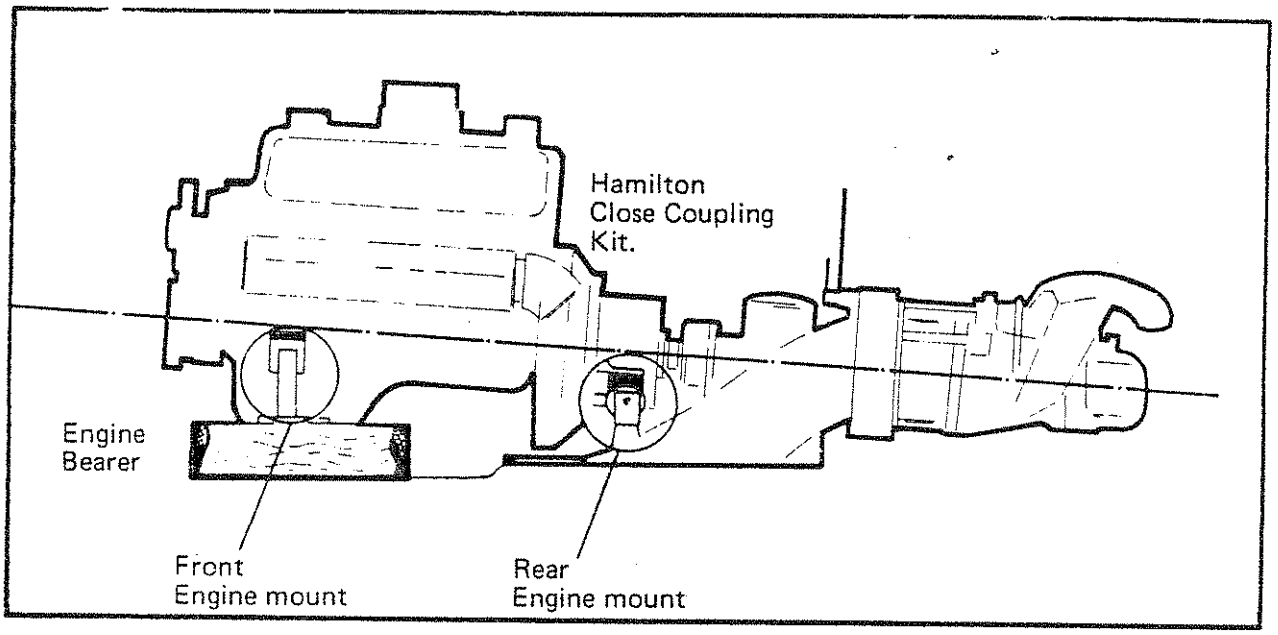
A. The Hamilton Close Coupling Kit.

This coupling system requires a front engine mount only since the rear engine mount is built into the close coupling kit (refer section I page 2).

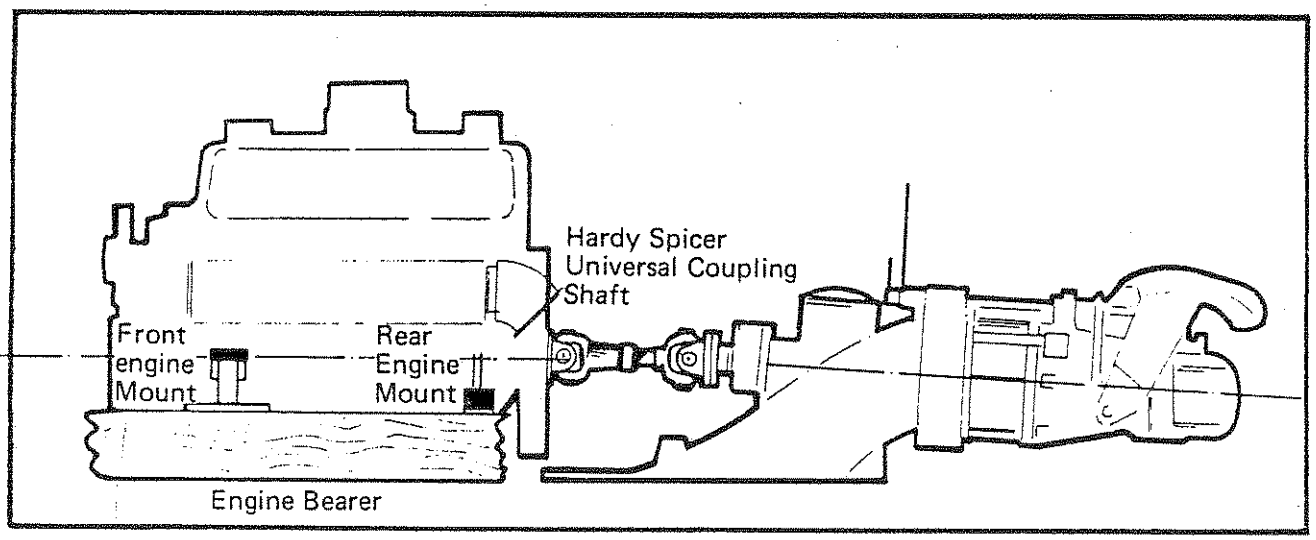
B. Using a Hardy Spicer Universal Coupling shaft both front and rear Engine mounts are required.

TYPICAL INSTALATIONS

A. Using Hamilton Close Coupling Kit.



B. Using the Hardy Spicer Universal Coupling Shaft.



A. ENGINE FITTED WITH HAMILTON CLOSE COUPLING KIT

(This chapter follows from section I page 2)

4. Using the rear engine support and rubber insulators as location points, the engine is offered complete with Hamilton short coupling kit to the jet roughly in line with the jet shaft.

5. Hook the two rear mounting angled feet (with slots) onto the rubber mount bolts and move the engine aft gently until the coupling and jet flanges are close.

6. Move the front engine mount up or down so that the short coupling flange face and jet coupling face are parallel and square when they are about to touch (A goodway to check is with feeler gauges.)

7. Bolt the coupling faces together, (coupling kit — Jet unit.)

8. When the above directions are satisfactory, finally fit and bolt the front engine mounts to the engine bearers.

9. Bolt down the bell housing support to the rubber insulators and rear engine support on the jet units.

B. ENGINE FITTED WITH HARDY SPICER UNIVERSAL SHAFT

1. Make sure the Hardy Spicer adaptor plate is securely bolted to the engine flywheel.

2. Bolt the Hardy Spicer universal coupling to the engine.

3. Offer the engine to the jet unit and loosely bolt the other Hardy Spicer flange to the jet unit.

NOTE

In some cases the engine mounts (front or rear) are made into one cradle and this is securely fixed into the boat prior to engine installation.

4. Lower the engine into the boat, with Front and Rear Engine Mounts bolted on, checking the angles of the Hardy Spicer coupling flanges 1^{o} — 5^{o} refer Section I page 1.

CAUTION

Do not exceed the recommended universal joint angles as vibration and damage may result.

5. BOLT UP THE ENGINE MOUNTS. Bolt up securely the Hardy Spicer coupling flanges.

PART II

EXHAUST AND COOLING SYSTEMS

1. Marinised engines required the following important items.

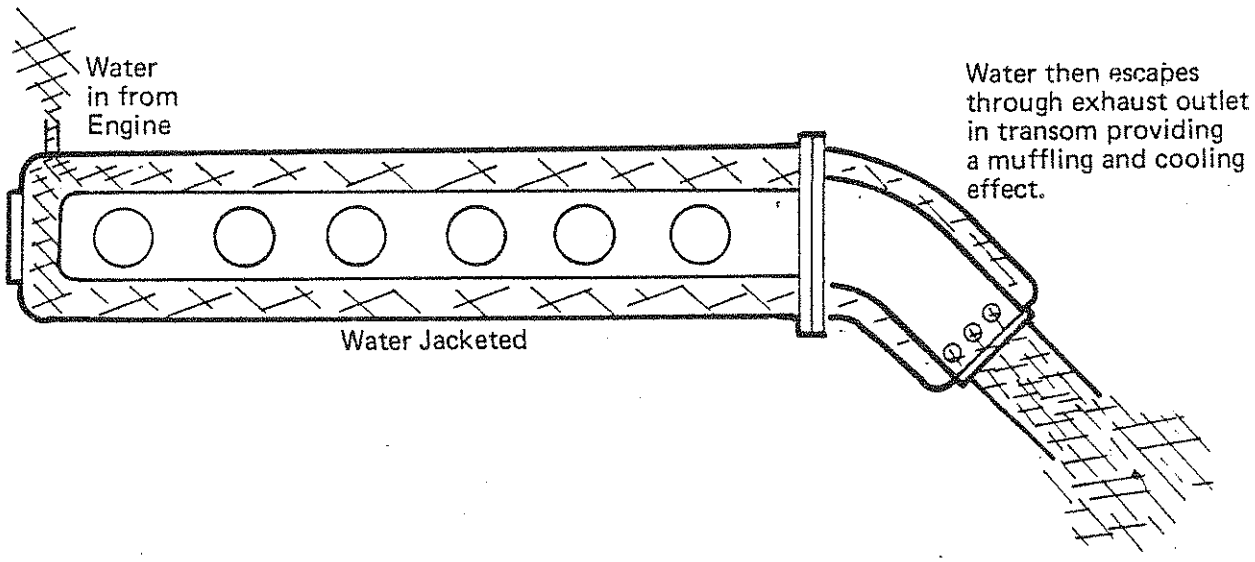
   A. Water jacket exhaust manifolds.

   B. Exhaust outlet system.

   C. Suitable engine cooling systems.

A. WATER JACKETED EXHAUST MANIFOLDS

1. Plain Water Jacketed Manifold.

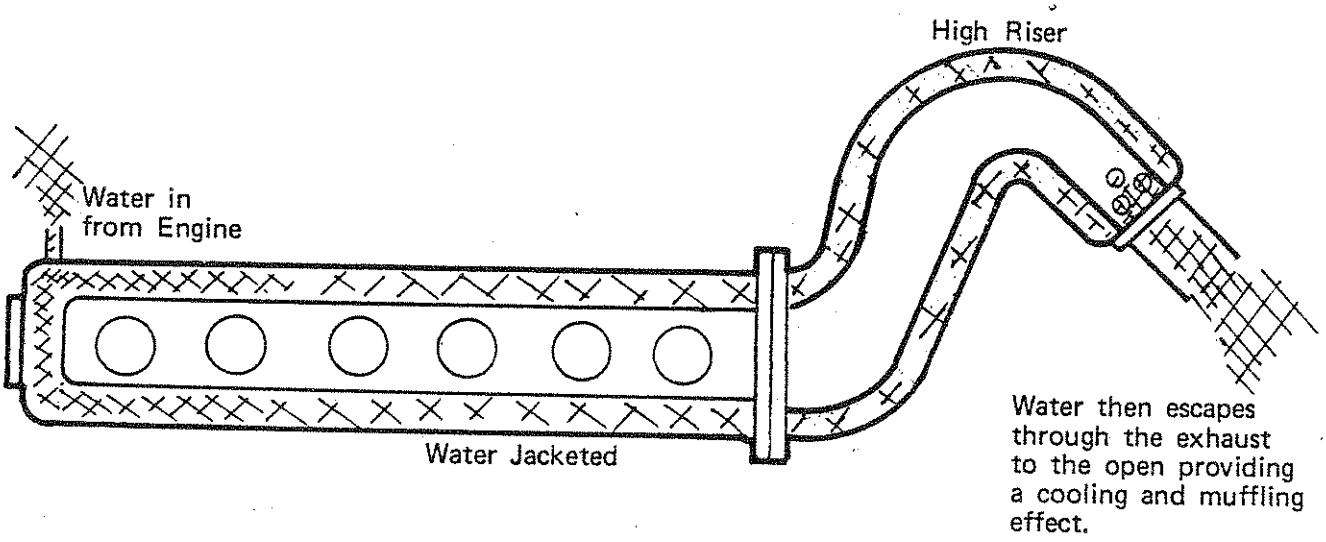


The above system is used on most conventional craft.

NOTE

What ever happens — water should never be able to return back up the exhaust system through the manifold and into the engine.

2. High Riser Exhaust Manifold

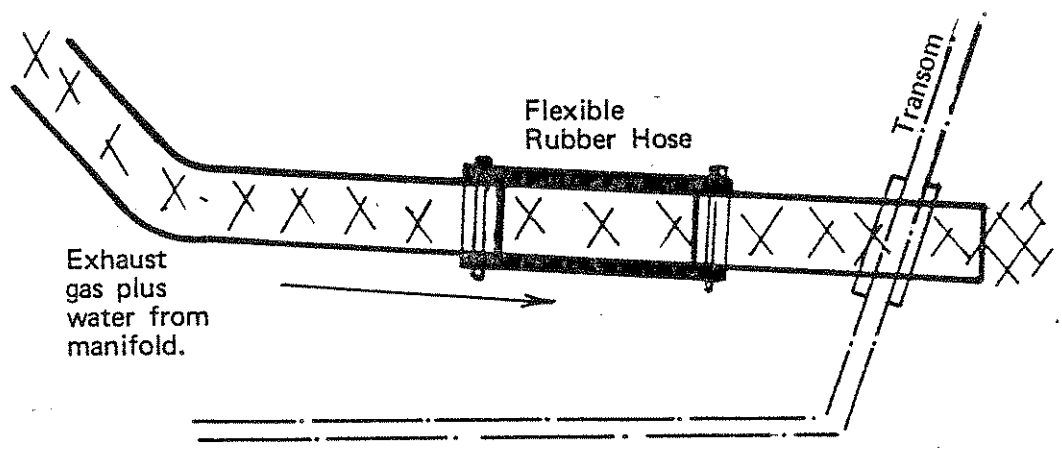


NOTE

This type of 'High Rise' Exhaust manifold is mainly used on 'DEEP VEE' craft or where there is a risk of back wash up the exhaust into the engine.

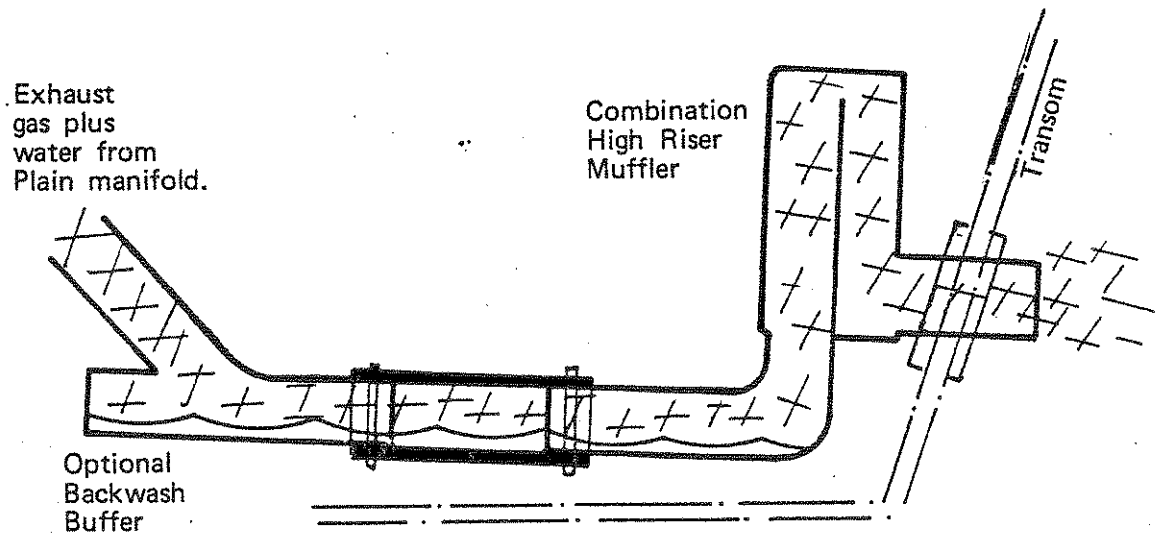
B. OPTIONAL EXHAUST SYSTEM OUTLETS

1. Conventional System



2. Hamilton System

NOTE:
It is essential that the engine is run briefly (2—3 secs.) at say 2,500 RPM directly the boat and trailer are clear of the water. This drives out any water from the exhaust system, which could otherwise surge forward into the engine when the trailer is braked sharply.



C. SUITABLE ENGINE COOLING SYSTEMS

I. RAW WATER SYSTEM

A. Water is taken from the Jet Unit water offtake passing through optional Sand Trap if desired.

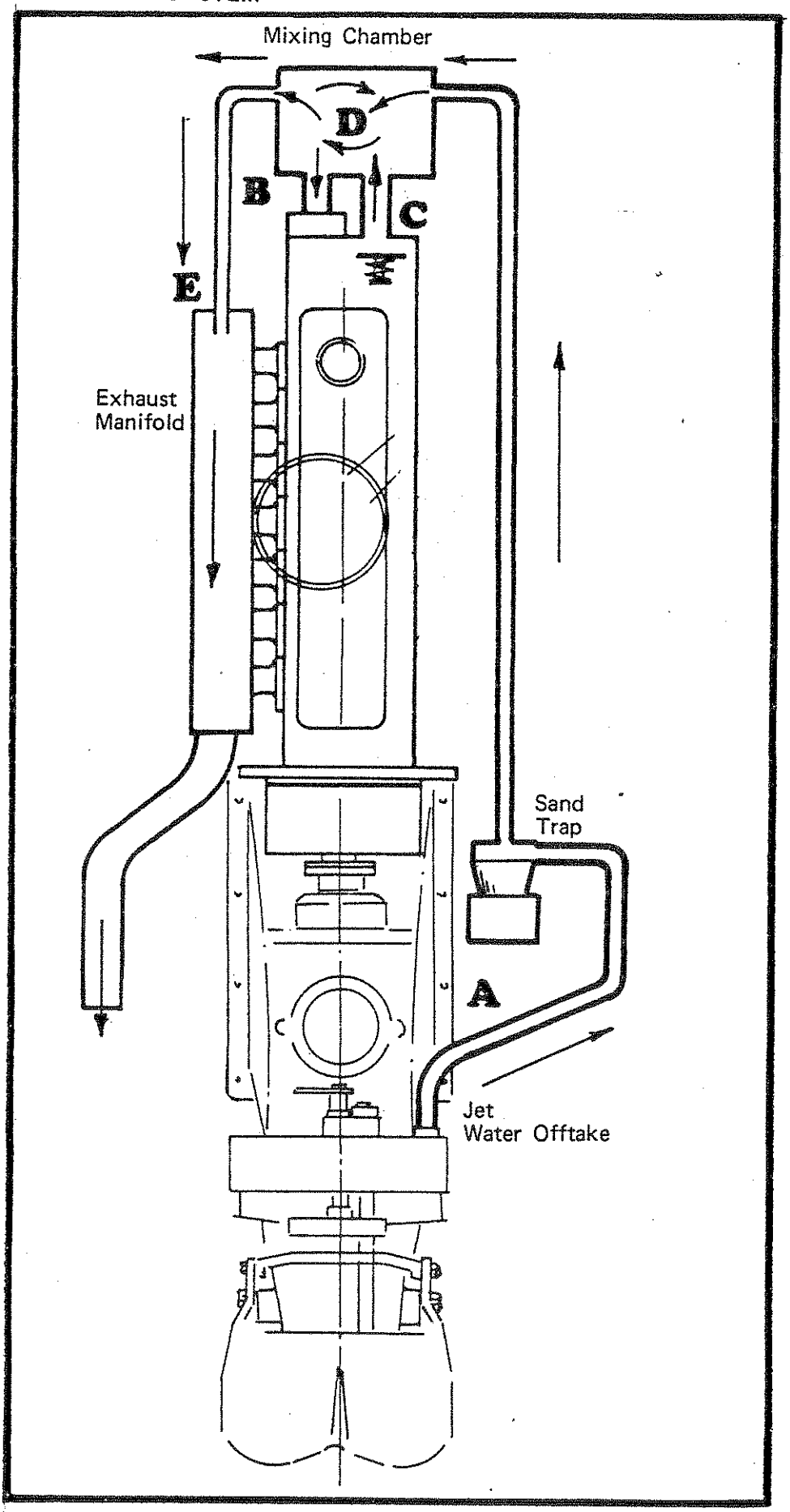
B. Enters Mixing Chamber (D) and passes (warm) into the engine of water pump inlet (B) and circulates through cylinder block.

C. Hot water passes out of engine at thermostat Housing.

D. Enters Mixing Tank recirculates back to engine, with added cold water from Jet supply water. Temperature, controlled by the thermostat is reduced in the mixing Chamber.

E. Surplus Hot water bleeds away to exhaust manifold and outlet. (This is cold water when engine cold and thermostat is closed, warm water during normal operation, recirculation controlled by thermostat.

RAW WATER SYSTEM



II. FRESH WATER SYSTEM

A. Cold (raw) water under pressure direct from the Jet Unit passes through the Sand Trap (recommended) to remove foreign particles.

B. Next this water passes through the Heat Exchanger Cooling Tubes in the opposite flow to engine circulating water.

C. From Heat Exchanger to Exhaust Manifold and out through the Exhaust Pipe.

B. Fresh water from Heat Exchanger (having been cooled) to engine block via Water Pump Inlet – circulates through cylinder block.

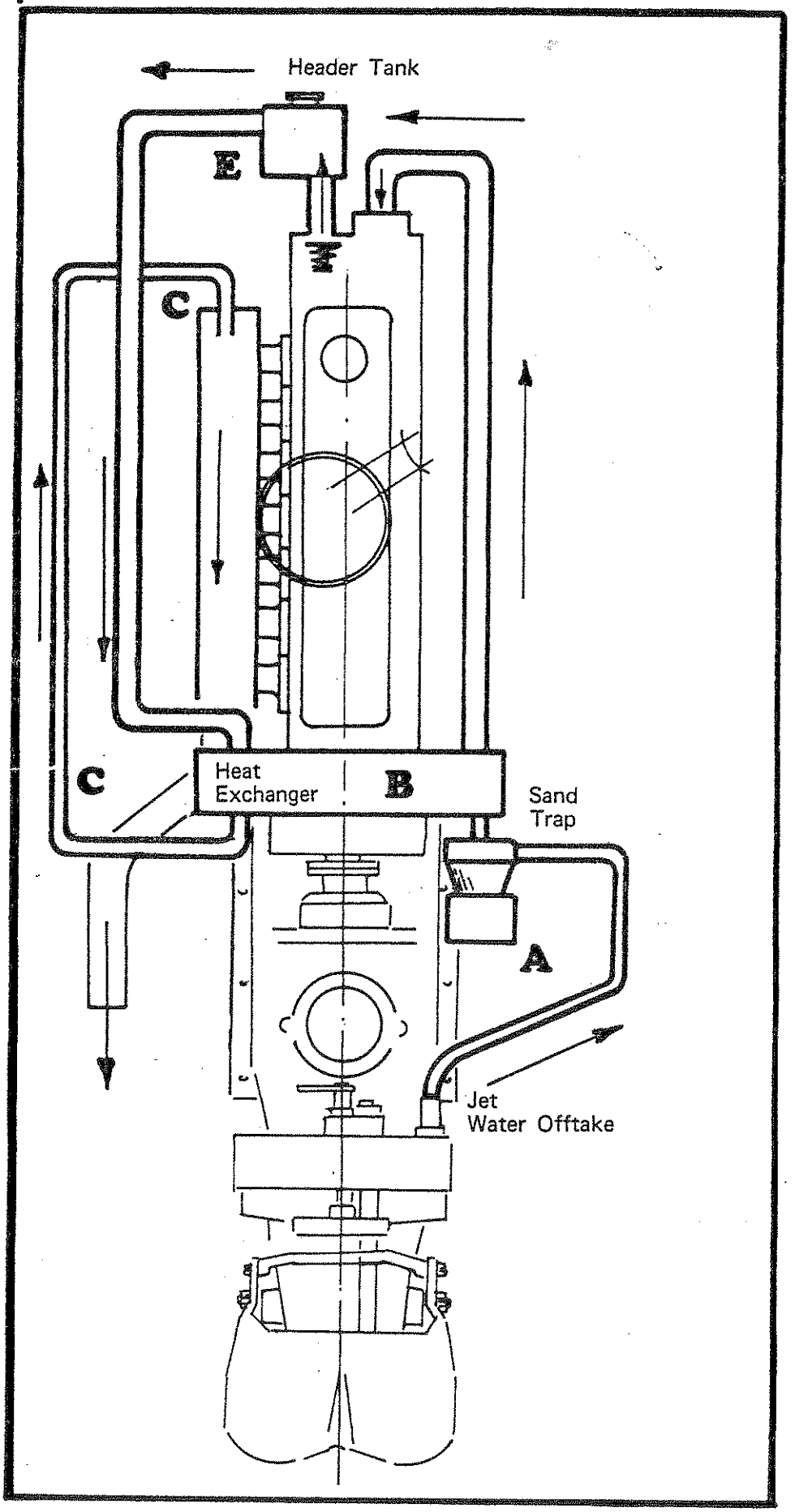
E. Out through Engine Thermostat Housing and into a Header Tank mounted high on the engine. (Includes fresh water filler cap.)

B. Back into Heat Exchanger for re-cooling.

NOTE:

This circuit closely resembles the standard automotive cooling system, except that the conventional radiator is replaced with a heat exchanger.

FRESH WATER SYSTEM



Hardy Spicer Coupling

The 750 Series Jet Unit drive Coupling is made to take the Hardy Spicer drive shaft with twin universal joints, central spline and flanged ends.

Installation

A. Selection

All 750 Series units have the same Hardy Spicer flange as shown, over the page however some early 753 units may have the heavier 1410 supplied as standard.

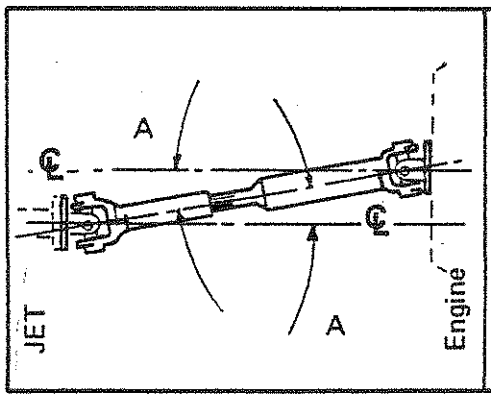
Hardy Spicer Series	750 Series
1310	751, 752, 753

Note: For heavy duty and commercial work or sustained high power the 1410 series Hardy Spicer is recommended for the 753 unit. The heavy coupling is obtainable from your Dealer if required.

B. Universal Angles

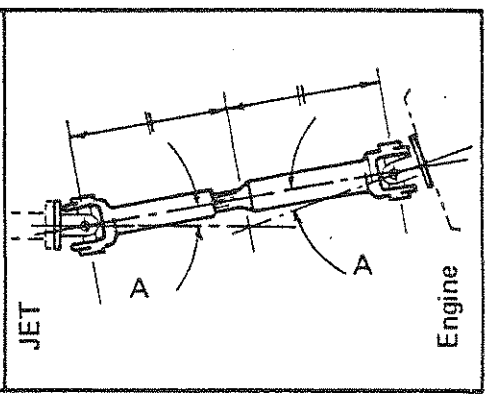
The angles on the universal joints should be equal and in the range of $1^{o} - 5^{o}$. Angles less than 1^{o} or greater than 5^{o} may cause vibration or undue wear. Also make sure the two centre yokes are in the same plane and the two outer yolks in the same plane to avoid tortional vibrations.

Fig. I



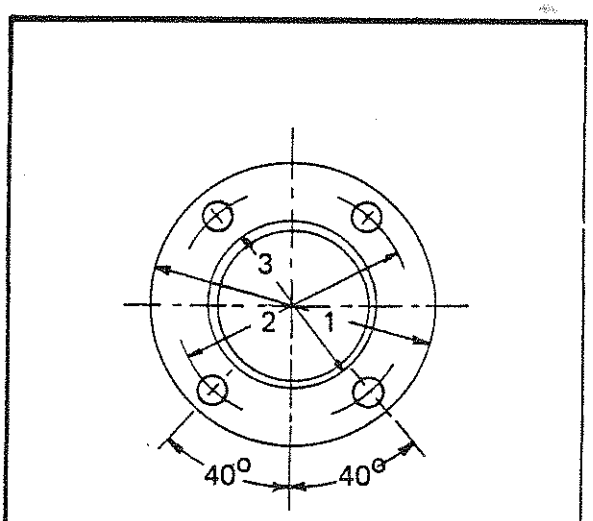
Parallel Shafts
Parallel Flanges
$A = 1^{o} - 5^{o}$

Fig. II



Angled Shafts
Angled Flanges
$A = 1^{o} - 5^{o}$

C. Flange Detail

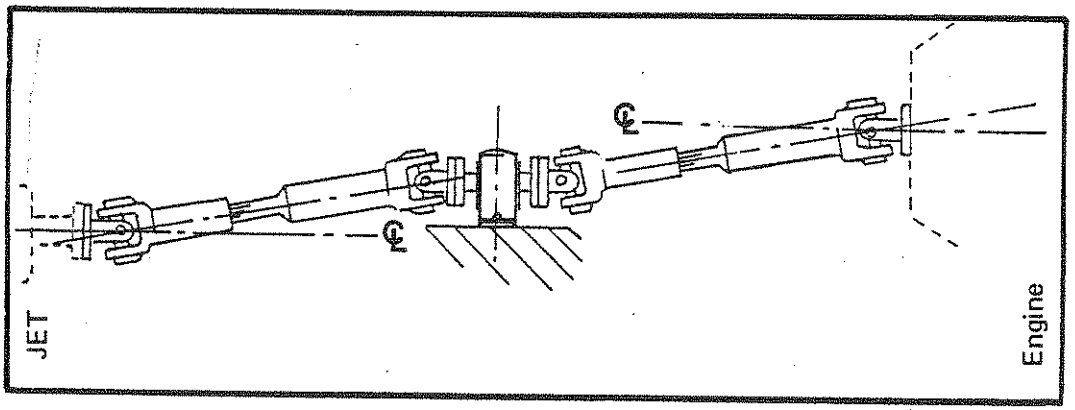


No.	1310	
1.	$3\frac{13}{16}$"	96.8mm
2.	$3\frac{1}{8}$"	79.3mm
3.	2.375" 2.373"	60.235mm 60.274mm
	4 Holes	$\frac{3}{8}$" Dia. (9.5mm)

D. Length of Shaft

The 1310 Series Hardy Spicer shaft centre can be safely run with a Flange to Flange length of up to 50" using 2" Dia. tube.

These figures are maximums, since usually the shaft is as short as possible, about 12" long. If the shaft has to be longer, use a two piece divided shaft with an intermediate fixed support bearing. Universal angle arrangements should be the same as for a single piece shaft as in Fig. I and Fig. II on the previous page.



In general follow Automotive and Commercial vehicle drive shaft practice.

DESCRIPTION

The Hamilton Close Coupling Kit enables the engine to be positioned closer to the Jet and so giving more usable cockpit space. Using a flexible silent rubber coupling the overall coupling distance is reduced to 6 - 5/16" (160 mm)

SPECIFICATION

(a) The close coupling kit is suitable for engines up to 350 CID and 5,000 RPM.

(b) The kit will fit a standard Borg Warner Marine flywheel housing - 6 bolts 8¼" Diameter spigot.

(c) The kit is complete with rear engine mounting arrangements, which bolt down directly onto the Jet unit.

KIT ASSEMBLY

The kit is arranged to bolt up directly to the 1310 series Hardy Spicer coupling flange used on all 750 series Jet units.

On the early Hamilton close coupling kits, the Star Plate (item 6) was reversible enabling it to match the heavier 1410 series Jet coupling on some early 753 units, also the Drive Plate (item 2) bolted onto a 1350 series Hardy Spicer flywheel adapter plate, however on the latest close coupling kits both the Star Plate and the flywheel adapter plate are now 1310 series Hardy Spicer. If you have an early close coupling kit remember that when turning the Star plate round make sure this is done before the Rubber Coupling restraining band is removed. Torque up the three 5/8" diameter bolts to 60/80 ft lbs.

KIT INSTALLATION PROCEDURE

1. Engine Rear Support Assembly (Items 3, 4)
   Bolt to Jet

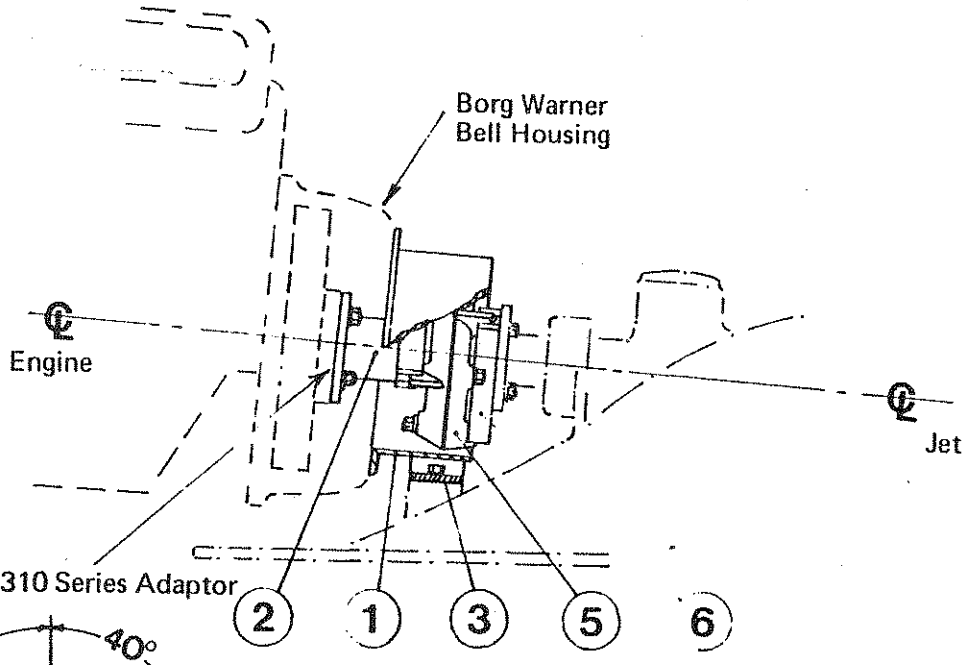
2.(a) Rubber Coupling Assembly (Items 2, 5, 6)
   Bolt to Hardy Spicer flywheel adaptor plate previously fixed to the engine flywheel centre.

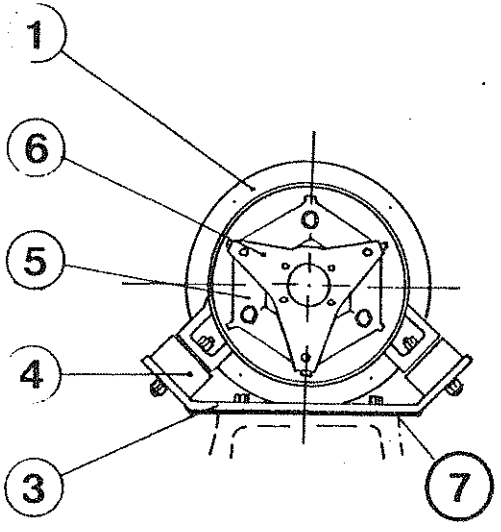
Note: The adaptor plate is not part of the kit but should be ordered with the engine.

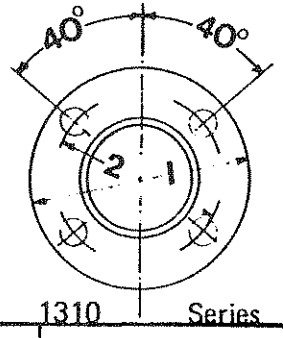
(b) Bell housing support (Item 1)
   Bolt to Engine Bell Housing (Borg Warner)

3. Offer Engine with complete kit attached, to the Jet Unit.

Note: For further Installation Procedure information refer to Section H1. (Engine Installation).







1310 Series

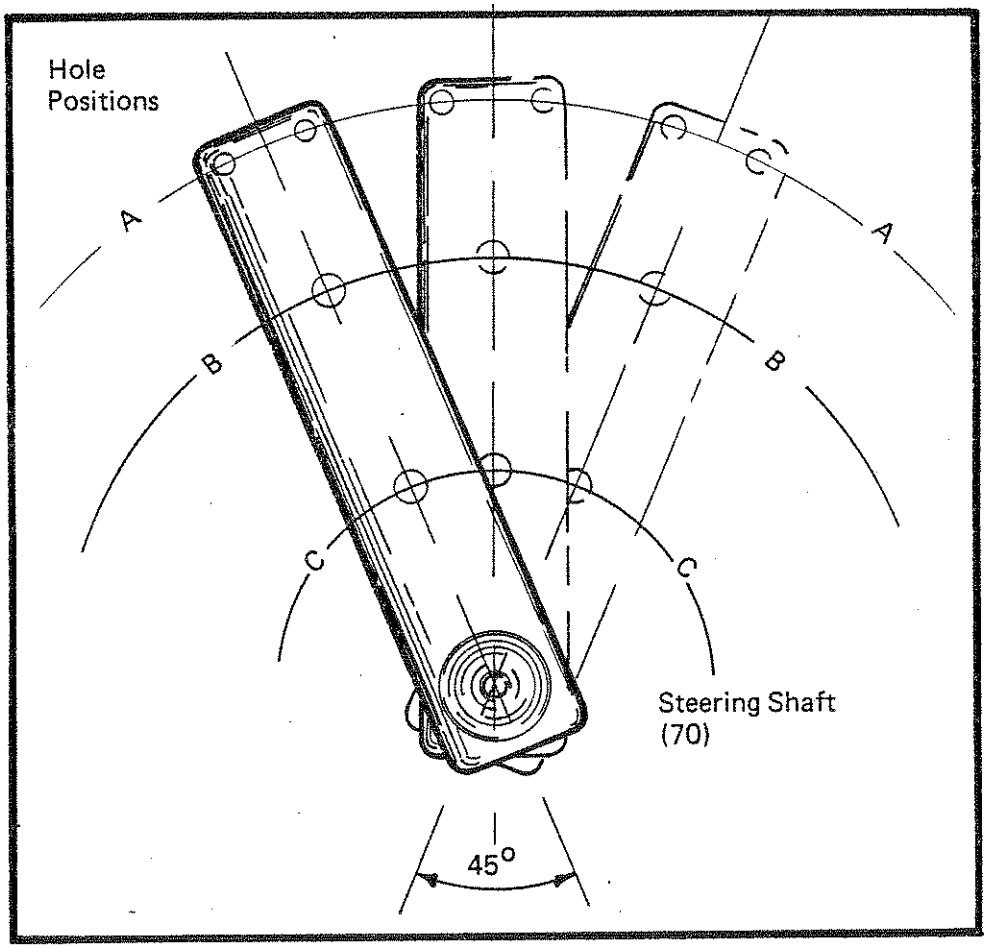
1	3 13/16" 96.8 mm
2	3 1/8" 79 mm
4 Holes 3/8" Ø9 mm	

Item	Description
1	Bell Housing Support
2	Drive Plate
3	Engine Support
4	Rubber Insulators
5	Rubber Coupling
6	Star Plate
7	Shims

This Section deals with the control systems associated with the 750 Series Jet Unit. The controls available are cable and pulley or push-pull single cable proprietary systems.

STEERING

Good quality steering is of paramount importance in a jet boat.



NOTE:

The Hole positions on the steering shaft are suitable for the connection of both cable and pulley or push-pull single cable systems as shown over the page.

Types of Steering Available	Number of Turns (L-L) of the steering wheel for the following classes of boats					
	Small Light Craft		Average Runabouts		Heavier Cruisers	
	Hole Pos.	Turns (L-L)	Hole Pos.	Turns (L-L)	Hole Pos.	Turns (L-L)
Hamilton Cable-Pulley	A	5/8 – 3/4	A	3/4 – 7/8	A	3/4 – 1¼
Teleflex	C	1	C	1	B	1-3/8
Steermaster	C	1¼	C	1¼	C	1¼

Note: L-L – Lock to Lock for the steering wheel.

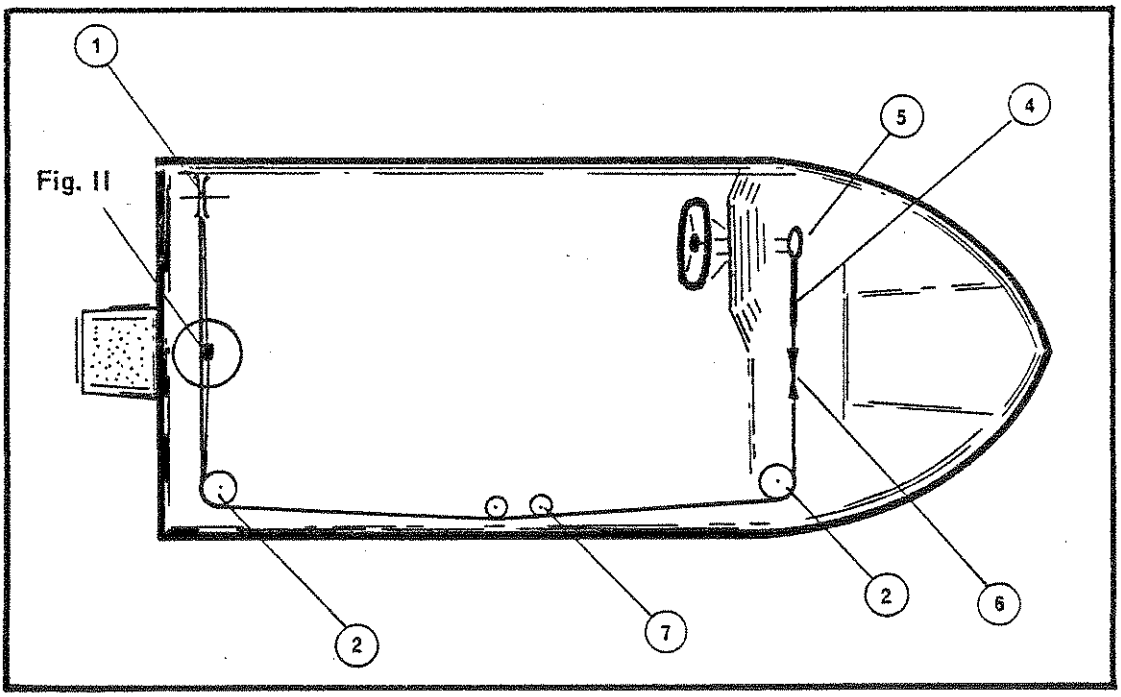
THE HAMILTON CABLE PULLEY STEERING SYSTEM

This Hamilton system takes a little longer to install, however it is the lightest method of connecting the steering wheel forward, to the unit steering arm aft. It is a positive type of steering allowing the normal self-centering feature, similar to a car.

The System is made up of : —

1. Single Nylon Pulley
2. Double Nylon Pulley
3. Galvanized or stainless steel wire rope
4. Chain
5. Chain Sprocket
6. Rigging Screw
7. Small Diameter Pulleys
   (Required for boats over 20 feet in length or boats required for heavy duty work.)

Fig. I

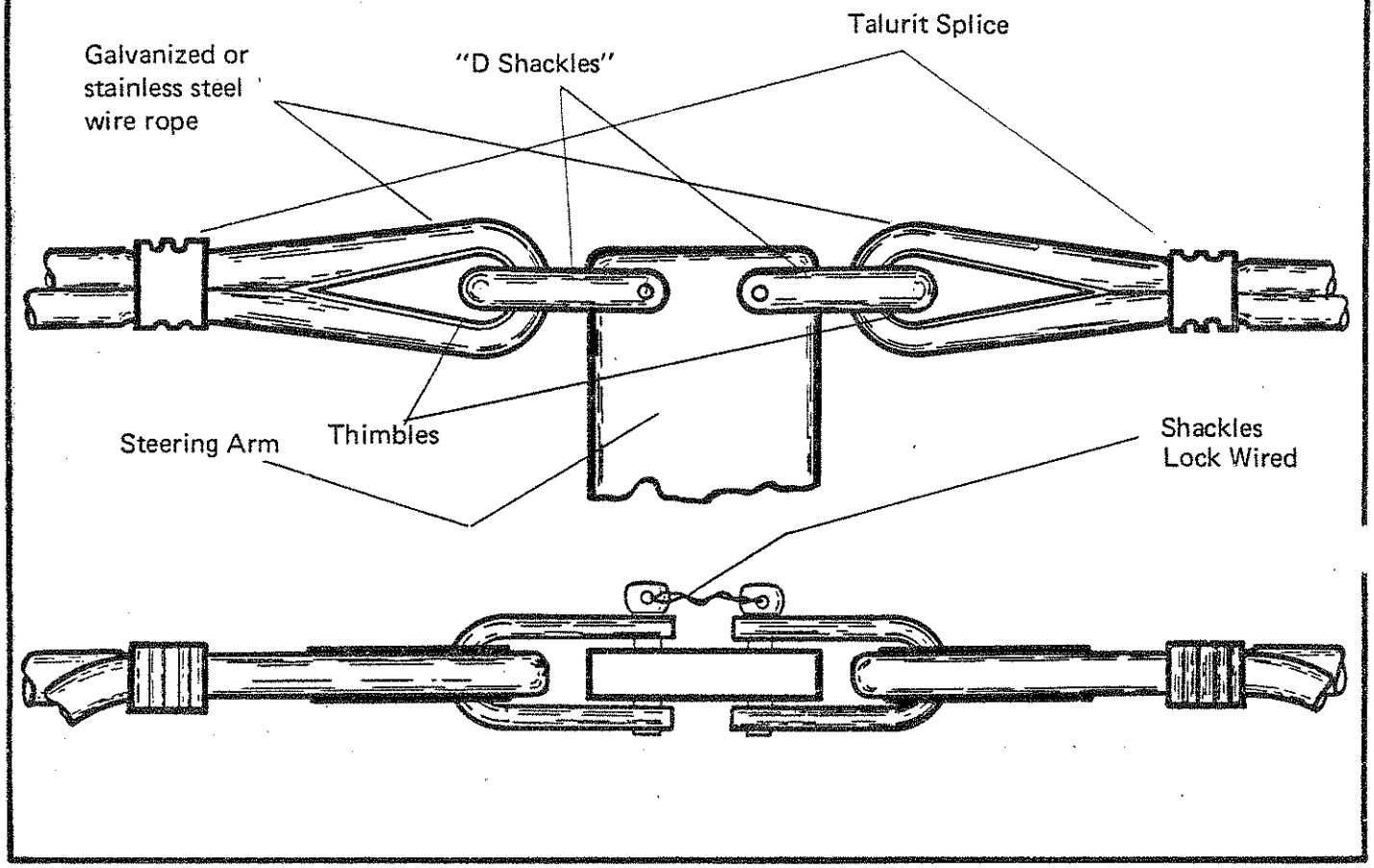


The Rigging Screw is an essential part of the cable pulley system for it allows you to correctly tension your wire rope. The Rigging Screw can either be at the front of your boat or the back.

NOTE:

The Rigging Screw should be lock-wired after tensioning.

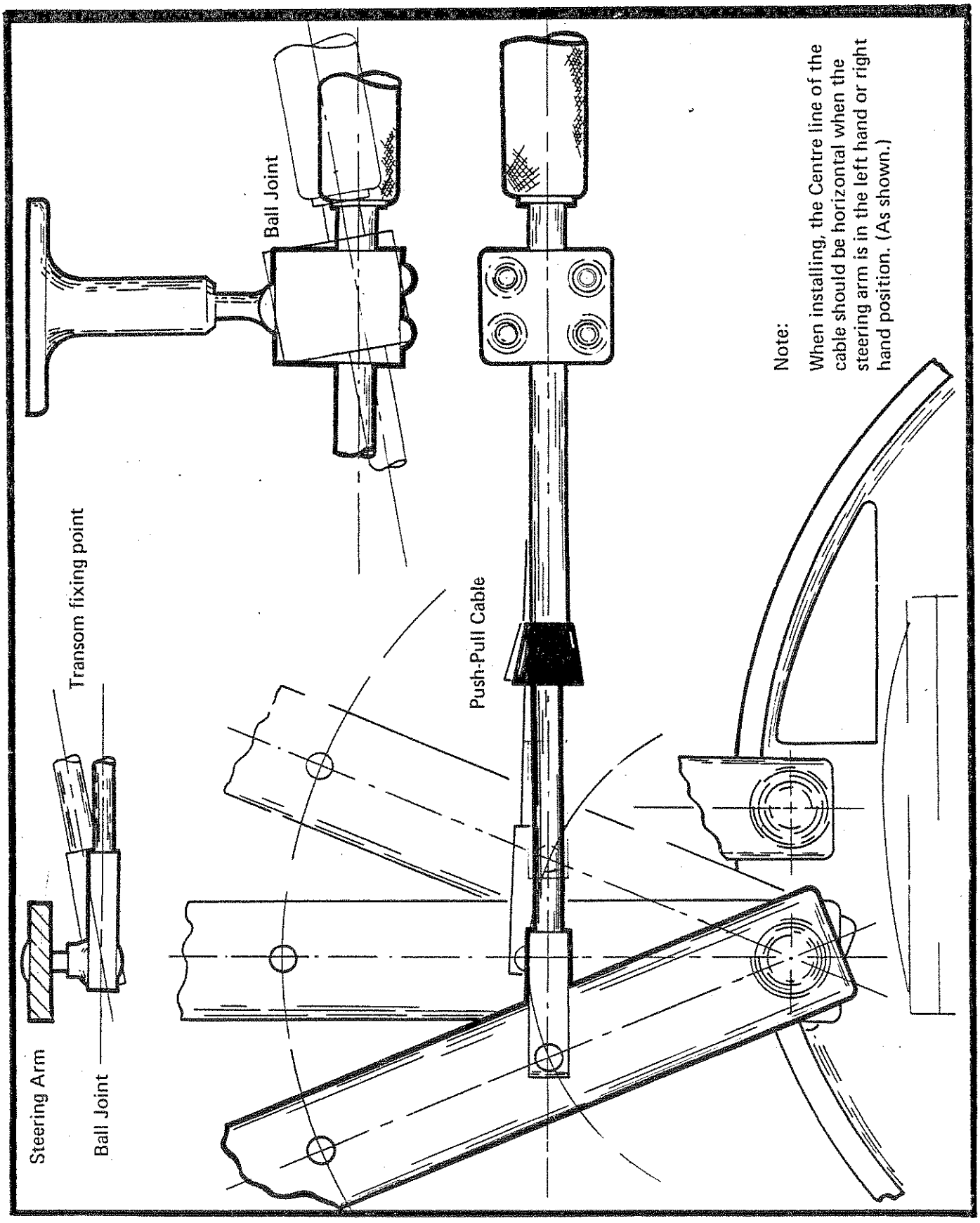
Fig. II



IMPORTANT:

1. The Cable should be shackled to the steering arm and not looped through the arm.
2. The wire rope must not be sheathed in plastic.
3. The Shackle pins and Rigging Screws should be LOCK WIRED after tensioning.

TYPICAL SINGLE CABLE STEERING INSTALATION



SINGLE CABLE CONTROL
(Push - Pull)

Single cable control systems take up very little room and are simple to instal. The Cable is lined with low friction flexible conduit, with a plastic outer covering. There are two types currently used and recommended suitable for the 750 Series Jet.

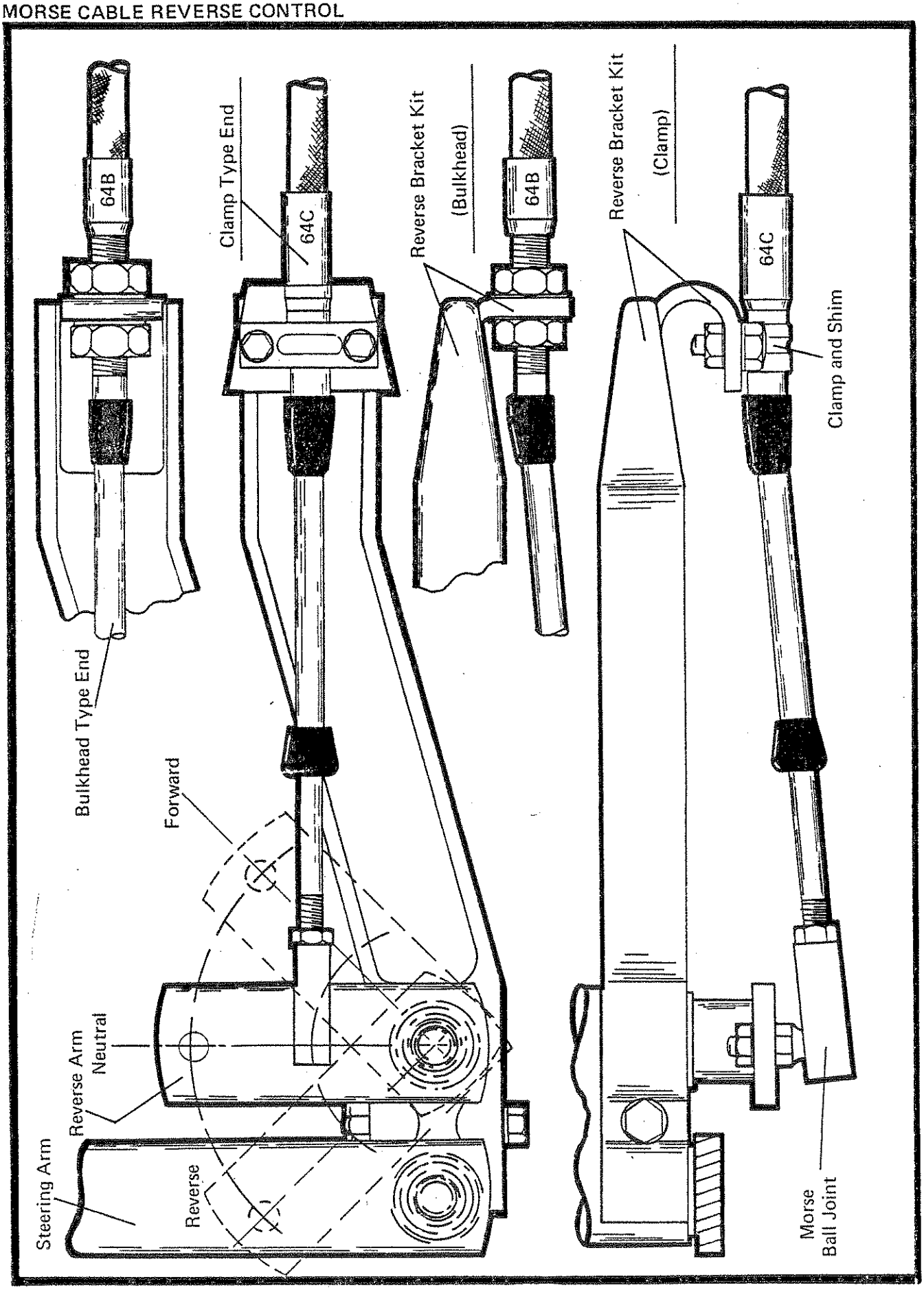
They are: TELEFLEX
STEERMASTER

NOTE:
Other brands may be used provided they can comply with the recommendation.

The single cable control system can either be installed on the left hand side or the right hand side of the craft depending on the required steering wheel position.

Always check that the installation is giving the correct sense of steering i.e. when the wheel is turned right, the craft will in fact also turn right.

MORSE CABLE REVERSE CONTROL



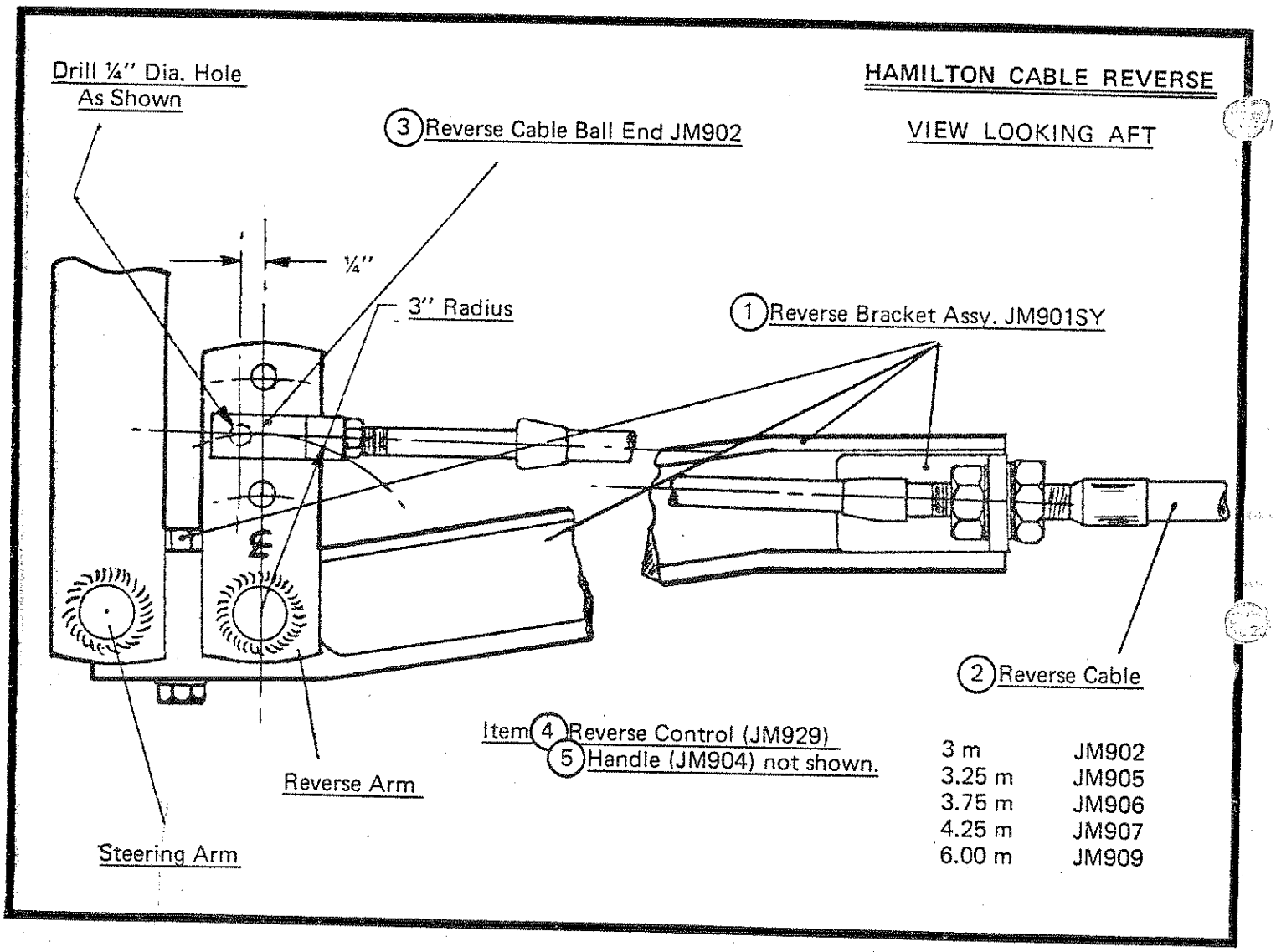
REVERSE CONTROLS

MORSE CABLE REVERSE

This is a single cable push-pull system using the Morse 64B (Bulkhead type) and 64C (Clamp Type) Cables.

NOTE:

Diagram shows on previous page the Hamilton Reverse Kit and Morse Cable fitted in the Port Control position. The whole assembly can be mounted in the starboard control position if desired.

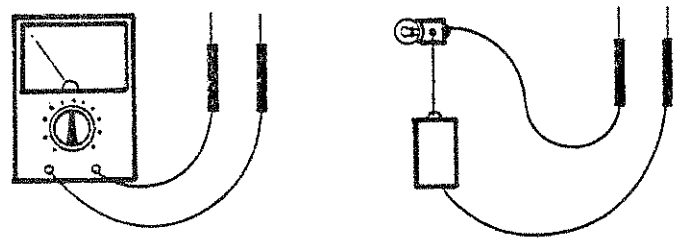


Apart from the need to check the jet unit insulation, normal marine practice should be followed when installing the electrical system in a jet boat.

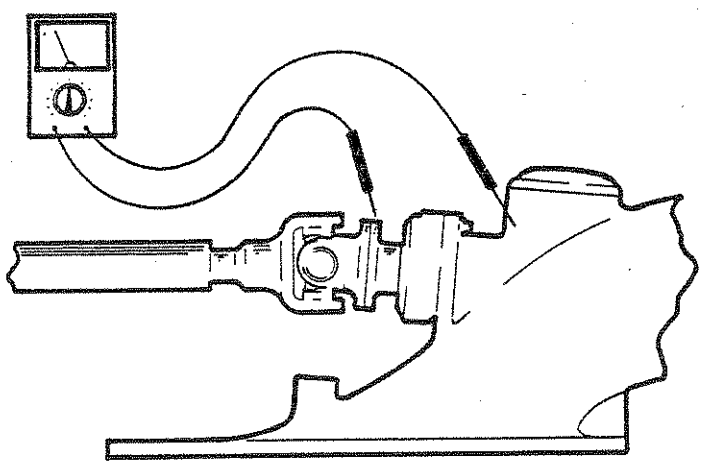
INSULATION

The rotating parts of the jet unit are electrically insulated from the aluminium casing to prevent electrolytic corrosion in sea water. Insulation is by tufnol washers, insulating film on the front bearing housing, and rubber in the rear bearing.
When a well insulated jet unit is immersed in sea water, a small electrolytic voltage is generated between the shaft and the housing. However, no corroding current flows as there is no external metallic circuit.

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 unit casing. If there is an electrical circuit, a current will flow and this will corrode the aluminium parts.

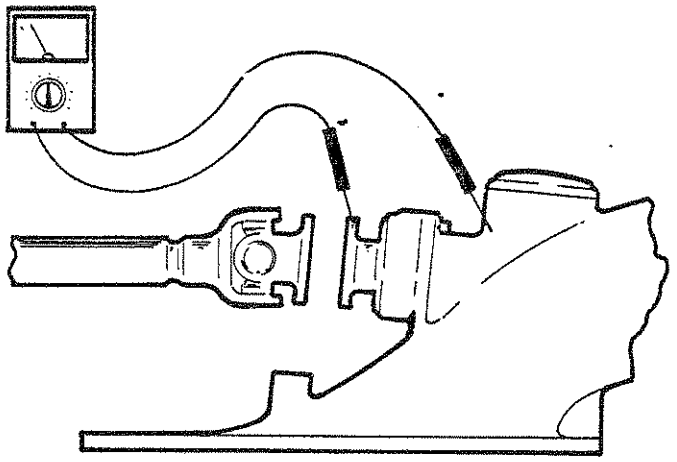


1. To check the insulation use an ohm-meter or bulb and battery (3 — 12 volt).



2. With the engine stationary and jet unit out of water, check the insulation between the casing and shaft. The resistance should not be less than 1000 ohms. (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.

IF THERE IS A SHORT CIRCUIT, FIND THE CAUSE AND REMOVE IT.



3. To test the jet unit alone, remove the coupling shaft and repeat the test, revolving the shaft slowly by hand.

ALUMINIUM HULLS

The engine should be insulated from the hull and also from the shaft of the jet. Rubber couplings can be used for this purpose.

ELECTRICAL AUXILIARIES

Batteries, radio transmitters or other electrical equipment should NOT be earthed to the jet unit. Use an independent grounding plate which is electrically isolated from the jet unit casing.

ZINC ANODES

If the jet boat is to be used extensively in salt water, the fitting of a sacrificial zinc anode is recommended. The anode, which can be a zinc block or plate, should be fixed to the outside of the hull below the water line, and electrically connected to the casing of the jet unit. If corrosion is taking place the zinc anode will be eaten away in preference to the aluminium jet unit casing, so the anode should be inspected and replaced when badly corroded.

The 750 Series Jet Unit is designed to require the minimum of maintenance. Routine checks and lubrication at regular intervals will ensure a long and trouble free life. The main moving parts which may require occasional attention are described below.

I THRUST BEARING

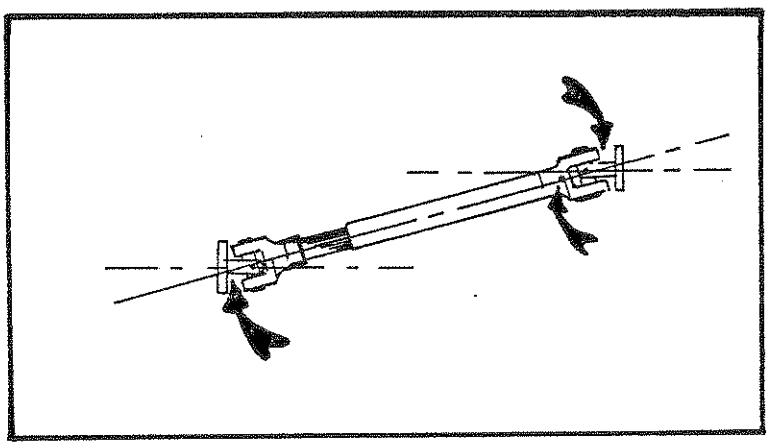
This is a special high thrust capacity duplex ball bearing with separate grease seals. The bearing should be lubricated every 30 hours with a water repellant lithium-based grease (preferably Shell Alvania 2 or equivalent.)
DO NOT OVER GREASE.

II REAR BEARING

This is a water lubricated rubber bearing. It requires no attention. DO NOT run the unit out of water, or damage will result to the Bearing if it is run dry.

III DRIVE SHAFT AND UNIVERSALS

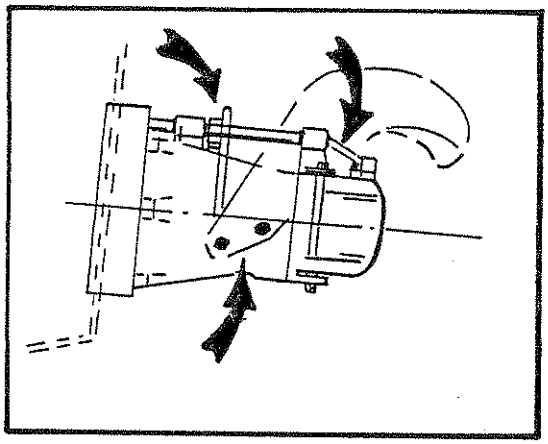
a) Grease the joints and sliding splines sparingly every 30 hours. DO NOT OVER GREASE.



b) If the Hamilton Close Coupling Kit is used only periodic inspections of the rubber coupling and locking bolts is required.

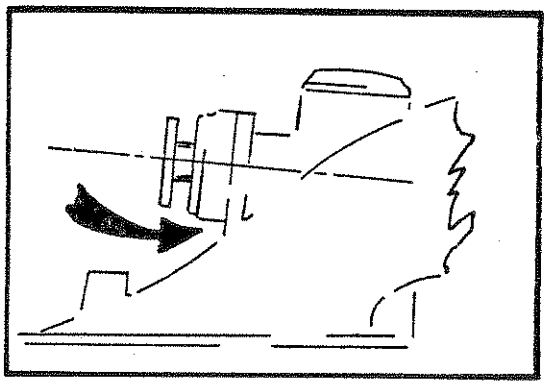
IV REVERSE & STEERING MECHANISMS

Occasionally check all bolts for tightness. If the deflectors are removed for any reason make sure the deflector pivot pins are tight when reassembled. They should not revolve with the deflectors.



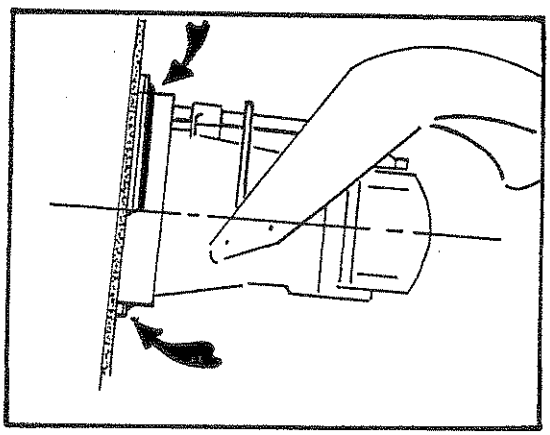
V ROMET SHAFT SEAL

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, or a worn seal face and the seal should be replaced.



VI TRANSOM SEAL

Occasionally inspect the Rubber Seal to check it is sealing effectively and is in sound condition.



VII SALT WATER OPERATION

If the Unit is used extensively in salt water it is recommended that all casings and seals be inspected regularly. Rubber seals, bushes and fibre washers should be replaced if showing signs of deterioration. Protective spray on all surfaces is recommended, especially nuts, bolts, levers, and small parts on the unit.

VIII SACRIFICIAL ANODES

If these are fitted and connected to the main body of the unit, inspect regularly for deterioration and replace as necessary.

IX STORAGE

Hose out interior of Jet Unit through the intake and 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 the unit well aired in storage to avoid condensation.

NOTE:

If the unit is used extensively in salt water occasionally dismantle and inspect all internal and external surfaces for corrosion. Rubber seals should be replaced where required.

This Section deals with the recommended Servicing Procedures of the 750 Series Jet Units.

A. THRUST BEARING AND GREASE SEALS. (Refer to Fig. 1)

Uncouple the drive shaft from the jet coupling. If a Close Coupling Kit is being used, the engine will have to be moved forward or removed from the boat. Stop the coupling (41) from turning and remove the self locking nut (51), washer (42), then slide the coupling (41) off and remove the key (40).

Loosen and remove the 3 bearing housing attaching bolts (13), nuts (14) and washers (15). With these bolts removed, the spring on the carbon face seal (49) may push the bearing assembly (28 - 31) away from the intake (1) and push the front bearing race inner half (31) off the mainshaft (38). If the bearing assembly does not come off the shaft, carefully prise it off with one lever on each side. The shaft where the bearing is located is a close tolerance ground surface and therefore the inner race halves must be moved very evenly along the shaft. One inner race half will stay on the mainshaft after the bearing assembly is removed and it will need to be carefully slid off the mainshaft.
DO NOT exchange the bearing race inner halves.

Slide the locating ring (35) and oil seal (34) out of the intake housing and the bearing spacer (37) off the mainshaft. The shaft slinger (39) will prevent the seal spring pushing the seal face (47) off the mainshaft.

Clean all the components and check for seal wear on the bearing spacer and coupling, and check the seals in the locating ring (34) and bearing housing (33) for wear. If there is wear towards one end of the bearing spacer on 752 or 753 Units, the spacer may be turned about to get another life from the other end. This cannot be done on 751 Units as the bearing spacer has a radiused inside corner to mate with the radiused shoulder on the mainshaft.
Check the O ring (36) for any damage.

Remember with this type of thrust bearing, even a new one will have a little running clearance. Therefore, excessive noise, obvious water damage or wear on the inner races and balls should be the only reason to replace the bearing. The bearing is locked tight inside the housing for insulation purposes and if it needs replacing it can be bought as a unit from your Hamilton Dealer.

Before reassembly, make sure all the components are clean and free from dirt or old grease.

To reassemble: Insert the locating ring and seal (34, 35) into the intake and slide the bearing spacer (37) into the mainshaft up to the shoulder. On 751 Units, be sure that the radiused inside corner is adjacent to the radiused shoulder on the mainshaft. It is immaterial which way around the bearing spacer on 752 and 753 Units is put on the mainshaft.

Slide on the rear inner race half and push it against the bearing spacer. If it is a 751 Unit, place the O ring (36) in the recess in the locating ring or if a 752 or 753 Unit, place in the bearing housing against the bearing. (It may be helpful to hold the O ring in place with a smear of clean grease).
Slide the bearing assembly onto the shaft with the front inner half in the cavity between the bearing and the seal.
Replace the bolts (13), nuts (14) and washers (15), and tighten them with the front inner race half still loose on the shaft.

Gently push on the front inner race half so that it locates on its section of the mainshaft or locates in the ball race. Insert the key (40) in the keyway and slide on the coupling (41) and replace the washer (42) and nut (51). Carefully do the nut up so that it pushes on the front inner race half square, until it goes against its mating half. Check that the mainshaft rotates freely and then tighten the nut up to 90 ft. lb. torque while stopping the coupling from turning. Recheck that the mainshaft turns freely. Regrease the bearing with a Lithium based water repellent grease (Shell Alvania 3 or equivalent).

B. REPLACING SEAL ASSEMBLY.

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

Remove the coupling, bearing assembly, locating ring and bearing spacer as indicated previously. Remove the inspection cover (2) from the intake and the split pin (50) from behind the carbon seal (49) on the mainshaft. Remove from the mainshaft the slinger (39) and slide the seal face (47) out of the housing with the O ring (48). To assist removal of the seal face, it may be necessary to screw two of the bearing housing attaching bolts (13) into the two holes in the front of the seal and then pull it forward. Slide the carbon seal (49) and rubber driving ring forward off the shaft.

Inspect the sealing faces and if they are scored or chipped, they should be replaced. They must be in good condition if being reused. It is recommended to replace the O ring (48) if a seal face is being replaced to ensure a perfect seal. Clean out the seal housing and remove all dirt and old grease from the components.

Reassembly:

Coat the rubber driving ring and carbon seal with lubricating oil and replace the seal assembly on the mainshaft; all the components being loose to each other: cup washer, spring, flat washer, rubber driving ring and carbon face in that order. Insert the O ring (48) and seal face (47) and replace the shaft slinger (39). Replace the locating ring, bearing spacer, bearing assembly and coupling as mentioned previously and tighten the mainshaft nut to the specified torque. Slide the carbon seal up to the seal face and push the rubber driving ring in behind it. Compress the spring and cup washer and replace the split pin. Replace the inspection cover.

If at the same time as doing thrust bearing and seal maintenance, the impellers and rear bearings are being serviced and the engine has been removed from the boat, it is easier to service the bearing and seal assembly, as assembled on the mainshaft, on the bench away from the boat.

Removal of mainshaft, bearing and seal assembly. (Assuming the engine is removed from the boat). Remove the tailpipe, impellers stators if 752 or 753 Unit, and fairing or thrust washer. Remove the three bearing housing bolts (13) and slide the mainshaft, bearing, seal, seal assembly out of the intake. It can now be bench serviced as previously described.

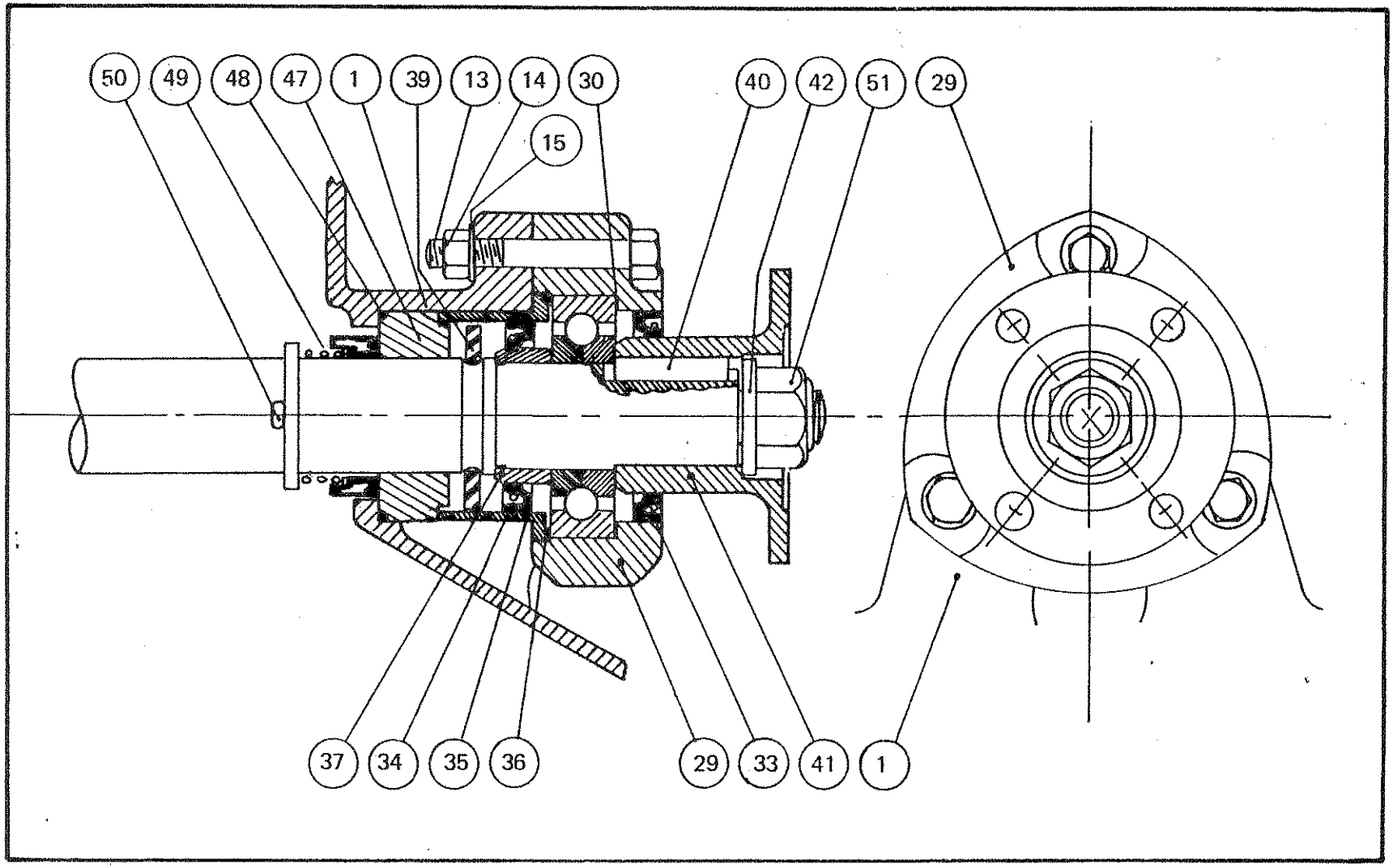


FIG. 1

NOTE: To identify the above item numbers either refer to your 750 Series Owners Manual or the 750 Series Workshop Manual.

C. TO REMOVE THE IMPELLER

Remove the two nuts (107), bolts (113) and coaming (104). Remove bolt (111), splash guard (100), support (105) and bucket spring (90). Loosen the pinch bolts (80) on the reverse and steering cranks (85 and 71) and remove both cranks by pushing the shafts slightly forward.

Remove the six stud nuts (68) and withdraw the tailpipe (54) with the reverse bucket and deflectors still attached. The two water delivery tubes (58) will now be free and care should be taken of the four O rings (66). Prevent the mainshaft from rotating and undo the mainshaft nut (52), remove washer (42), bearing sleeve (45), impeller (46), and key (44). (For two or three stage units, continue with stator casing (53), next bearing sleeve, impeller and key etc.) Take care not to damage the large O ring in the stator casing and intake recesses.

D. CHECKING OF COMPONENTS

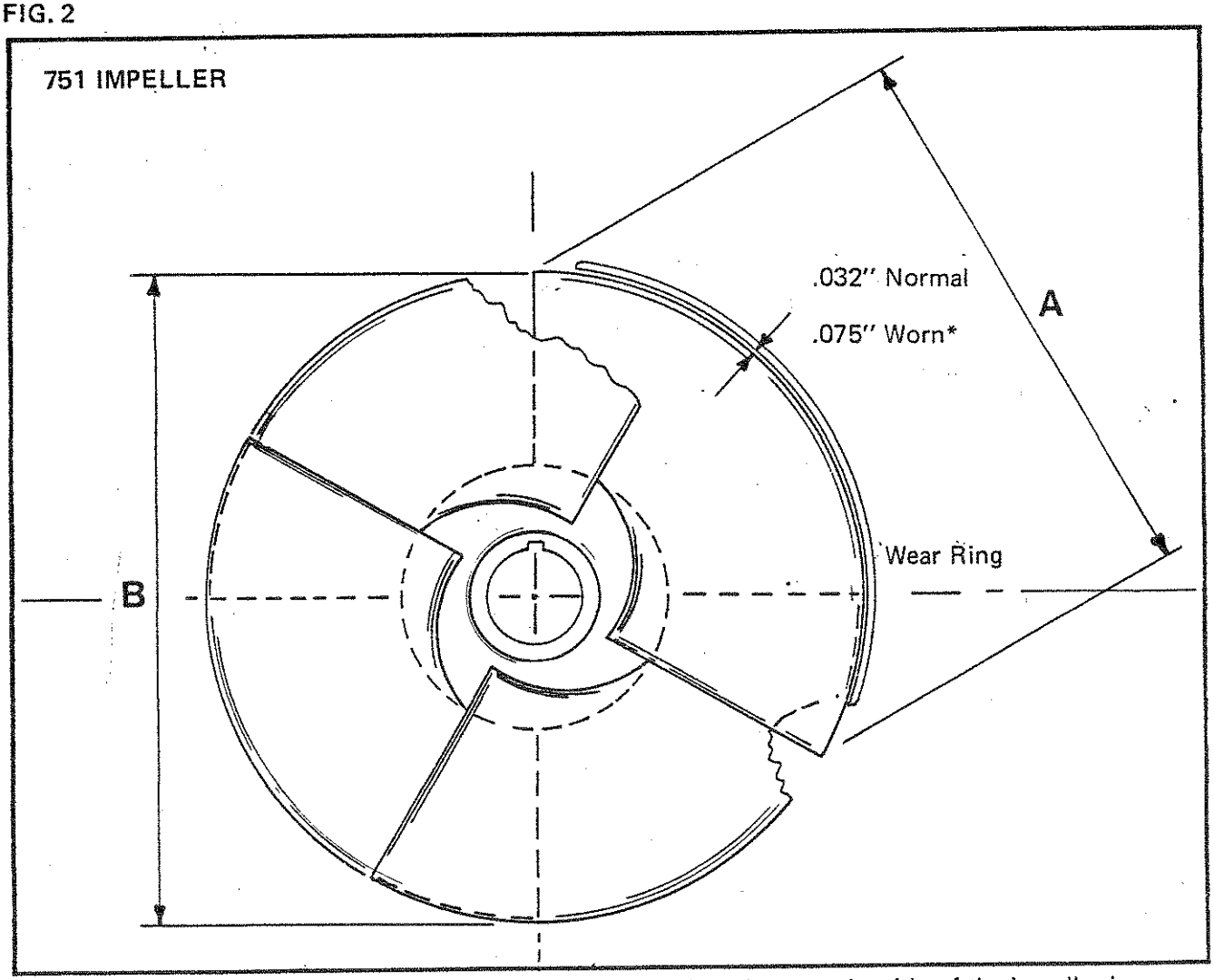
IMPELLERS

Check the impeller-wear ring clearance with a feeler gauge in the gap between them, and to check the impeller blade length, place a rule or tape across the leading and trailing tips of the blade. Recommended limits for wear on the outside diameter and leading edge of the impellers are shown in figures 2, 3 and 4, and impellers beyond these tolerances should be replaced.

The impeller leading edges should be kept sharp and sharpened only as shown in Figure 5. Worn impellers will reduce the efficiency and performance of the jet unit.

750 SERIES IMPELLER TOLERANCES

FIG. 2



* The maximum clearance of .075" must be measured when the opposite side of the impeller is hard against the Wear Ring.

FIG. 3

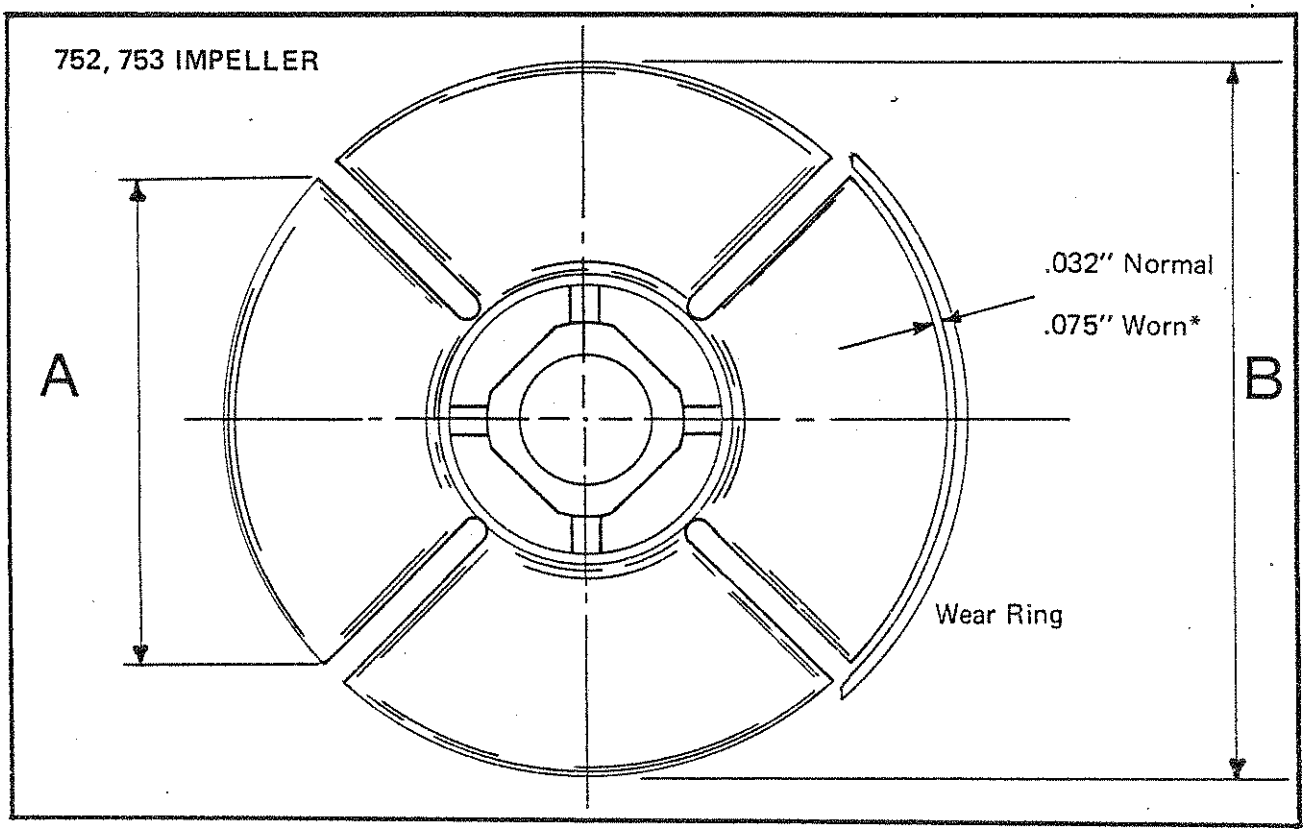


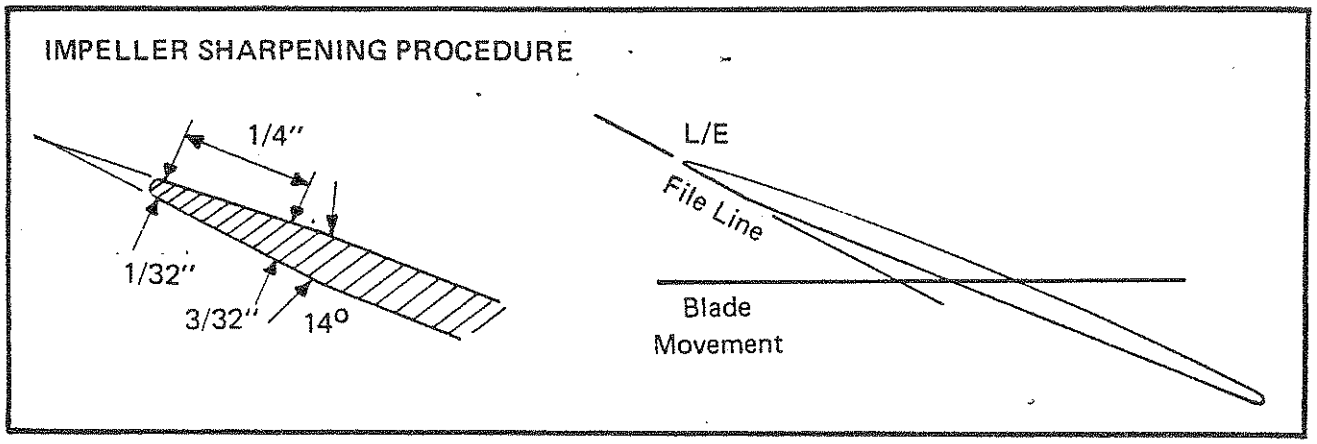
FIG. 4

IMPELLER TOLERANCES

Blade Dimensions	751 IMPELLERS			752 – 753 IMPELLERS
Blade Length	Coarse	Standard	Fine	Standard
A				
worn	6¾"	6½"	6"	4¾"
Normal	7¼"	7"	6½"	5¼"
Impeller Diameters				
B				
worn	7-5/16"	NOTE: The same Diameter for all units in the 750 Series.		
Normal	7-7/16"			

* The maximum clearance of 0.75" must be measured when the opposite side of the impeller is hard against the Wear Ring.

FIG. 5



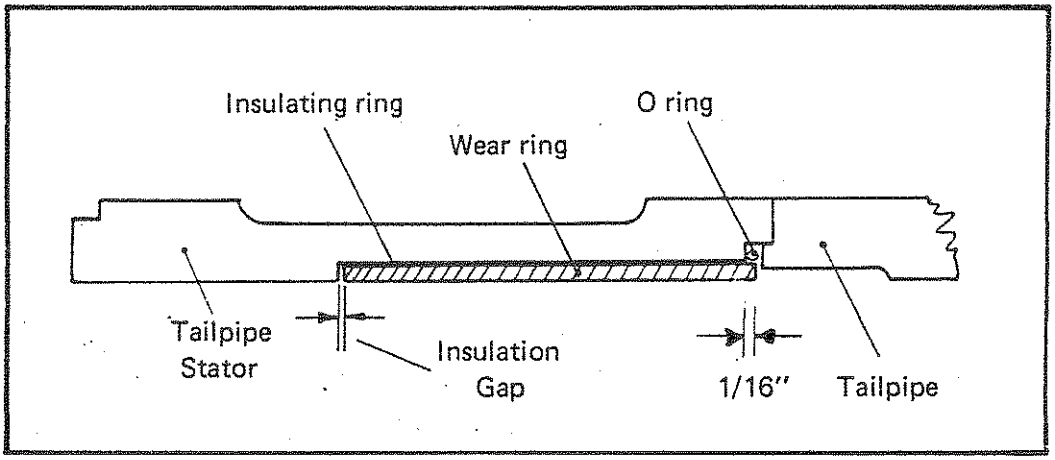
WEAR RINGS

Replacement of wear-rings (5 and 64) and wear-ring insulators (6 and 63).

1. Before replacing the wear-ring insulator, make sure its mating surface on the intake or stator has been thoroughly cleaned and scraped.
2. Apply a generous coat of bitumous paint to this surface.
3. Replace the wear-ring insulator. This insulator provides electrical insulation between the aluminium intake or stator and the stainless steel wear-ring.
4. Fit the wear-ring. The wear-ring has had two facing corners removed and thus allows it to have a smaller lead-in diameter, so that it may be started easier.

   Finally fit the wear-ring using a soft faced hammer and leave it protruding 1/16" from the O-ring groove as in Fig. 6. Make sure it does not touch the intake or stator at the front edge as this will short out the insulator.

FIG. 6



E. GENERAL

Assemble all components in the reverse order to the sequence in Section C.

Remove any dirt or old grease from all components and mating faces before assembly.

All mating faces and O ring recesses to be assembled with a liberal smear of lanoline.

Tighten mainshaft nuts to 90 ft. lb. torque.

Insulation quality between shaft and intake must not be less than 1000 ohms. resistance.

If the unit is dismantled, it is worth while examining the seals, bearings, and impellers at the same time. A complete check before the start of the season usually pays dividends in terms of assured reliability and peak performance.

BEARING SLEEVES AND CUTLESS BEARINGS:

The bearing sleeves (45) should be replaced if they are scored or worn. The cutless bearing (60) should be replaced if wear is apparent on the fluted surfaces by eye and the old or new bearing sleeve is excessively slack. It is often helpful to dust the sleeve with french chalk to act as a lubricant for the bearings during assembly.

CONTROL SHAFT SEALS

If water has been found to be leaking from the steering and reverse shaft (60 and 84), the O ring seal (66) may be replaced by two methods.

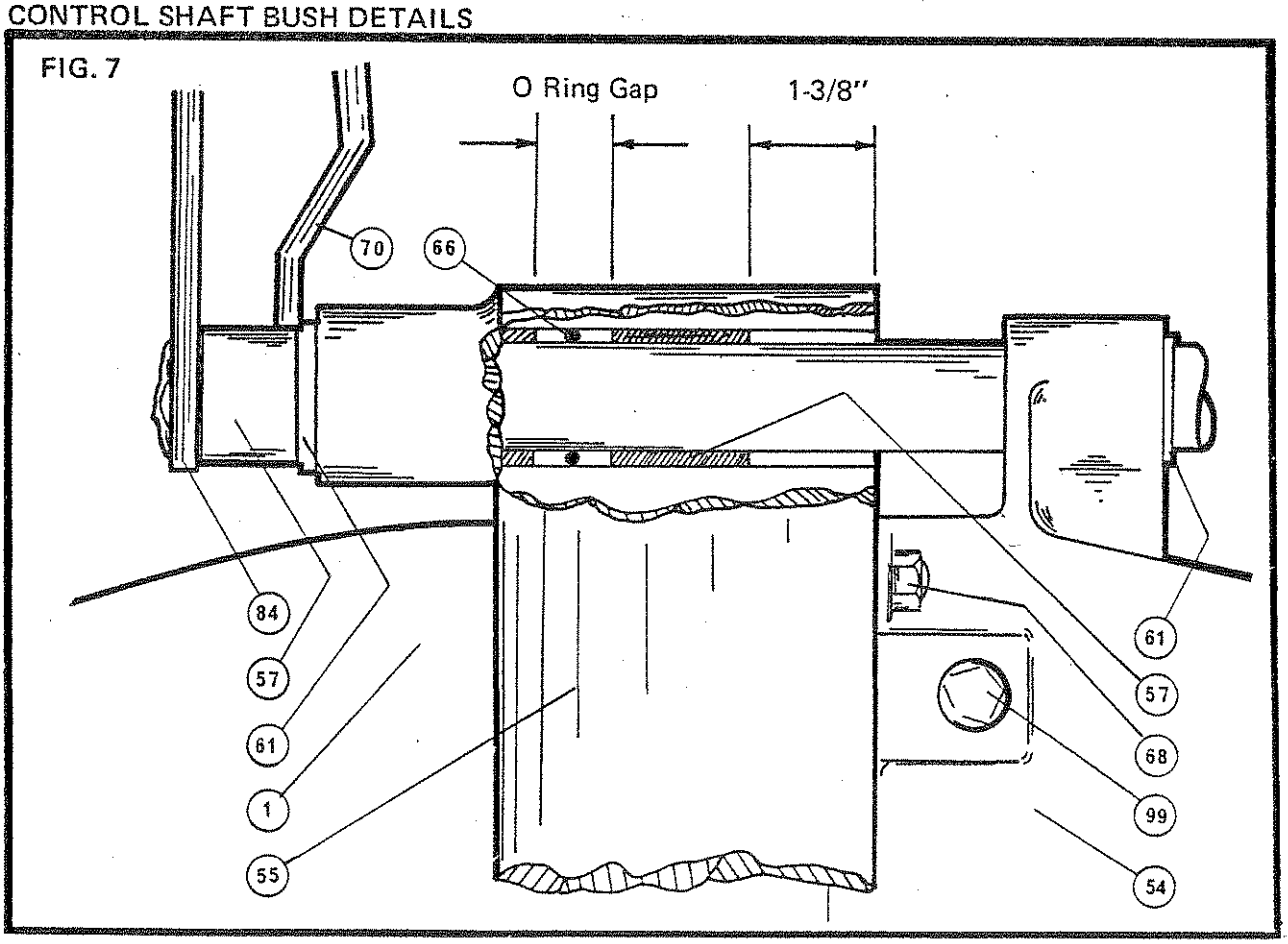
1. If there is sufficient room between the seal plate (55) and the engine to get the control shafts out: Loosen the steering and reverse crank clamp bolts (80) and remove any cables from the control arms then slide the shafts forward out of the seal plate. Drive out the sleeve (57), O ring (66) and control shaft bush (61). Clean the bore. Replace the sleeve (57) to the specified dimension in Fig. 7. (This gives the correct space for the O ring seal). Insert the O ring with a liberal smear of water repellent grease, replace the control shaft bush and the control shafts.
2. If the engine is close to the jet unit, so not allowing the control shaft to be pulled free of the seal plate (55): Remove the tailpipe, stators, and impellers as previously discussed.
   Remove the morse bracket (if used), hoses from the water offtakes (62), transom seal spring (103), and the large O ring (12) from its cavity. Slide the seal plate off the studs leaving the control shafts hanging.

   Replace with O ring as previously mentioned in this section.

   Clean the mating surfaces of the seal plate and intake. Slide the seal plate back along the studs feeding the control shafts through at the same time. Carefully prise the transom seal back over the seal plate and push it home. Replace water hoses, morse bracket, and O ring in its cavity.

CONTROL SHAFT BUSH DETAILS

FIG. 7



TRANSOM SEAL

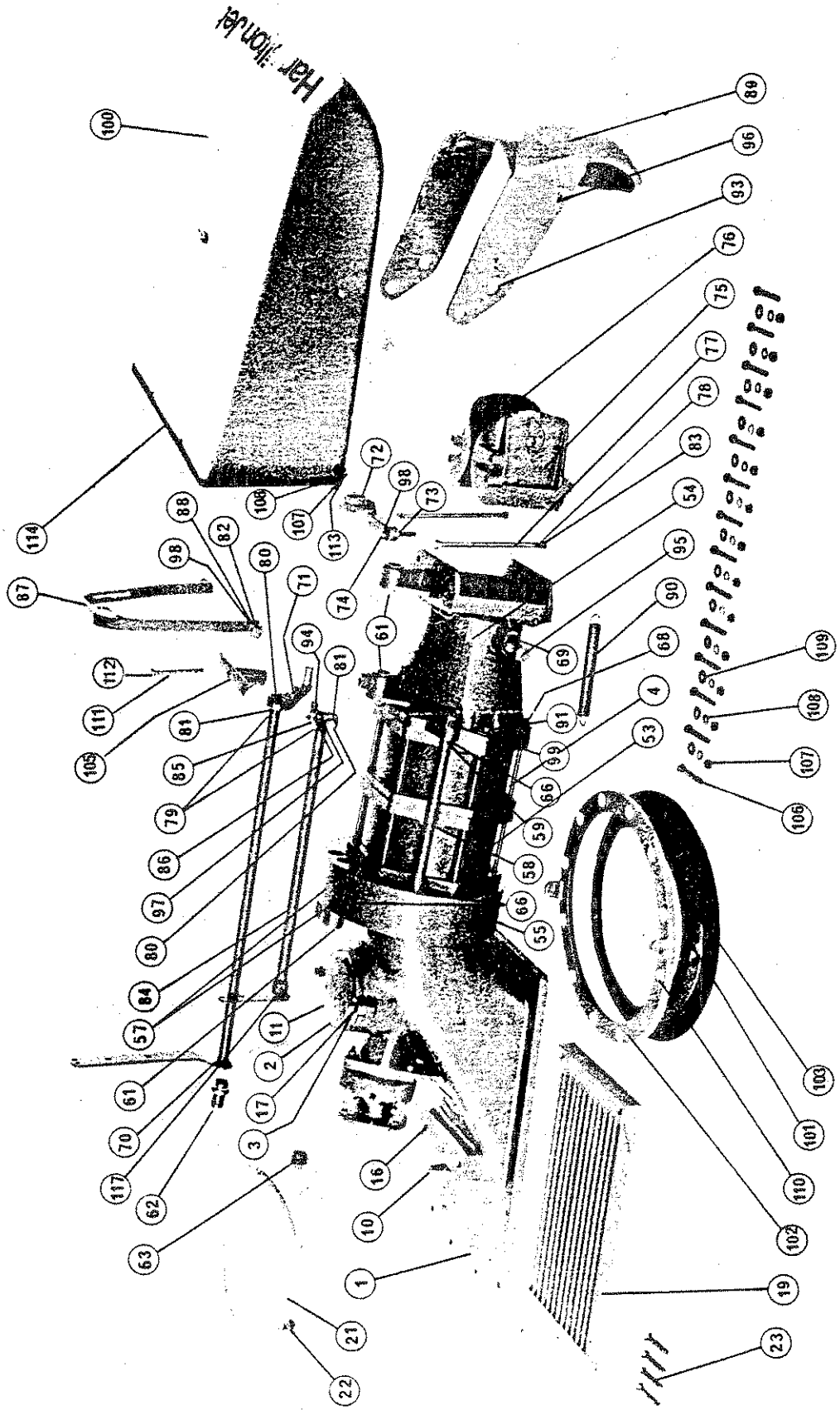
Inspect the transom seal occasionally and if it has deteriorated in condition or become damaged it should be replaced.

Remove all the transom plate bolts and nuts (106 and 107), seal spring (103), transom plate (102), transom seal (101). Replace in the reverse order. Refer to Section 2-750, page G2.

NOZZLE CHANGES

Remove the saddle pivot screw (82), adjusting sleeve (88) with lockwasher (98), reverse bucket pivot bolts (95), sleeves (93) and reverse bucket (89). Remove deflector pivot pins (77), deflectors (75,76) with tie bar (72) attached and watch for the flat washers (78) that the deflectors pivot on. Use a 5/32" A.F. Allen key and loosen the grub screws (69) from the reverse bucket boss. Pull the nozzle (56) rearwards out of the Tailpipe.

Replace the nozzle in the reverse order as above. When replacing the deflector pivot pins, nip the nuts up tight on the casting so that the pins do not revolve with the deflectors.
Tighten all bolts securely.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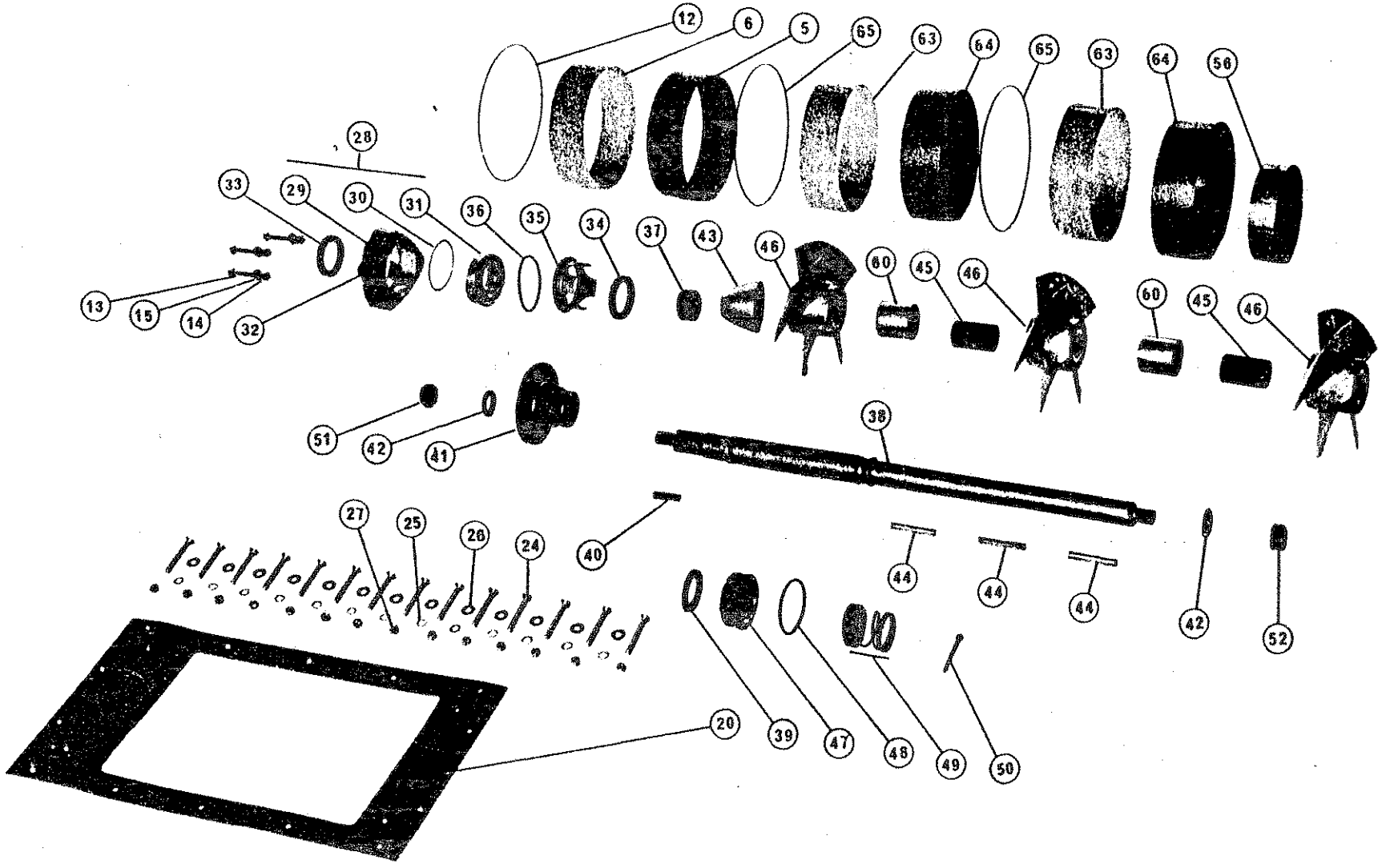
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ITEM NO	DESCRIPTION	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY
53	Casing	-	-	102326	1	102326	2
54	Tailpipe	102328	1	102328	1	102328	1
55	Seal Plate	102603	1	102603	1	102603	1
56	Nozzle	102338-5	1	102338-2	1	JE112-4	1
57	Sleeve	102337	3	102337	3	102337	3
58	Water Delivery Tube	102332	2	102333	2	102334	2
59	Screen Spring	JE309	2	JE309	2	JE309	2
60	Bearing	JH160	1	JH160	2	JH160	2
61	Control Shaft Bush	JE248	4	JE248	4	JE248	4
62	Water Off-take	JMNG AAE	1	JMNG AAE	1	JMNG AAE	1
63	Wear Ring Insulator	-	-	JE147	1	JE147	2
64	Wear Ring	-	-	JE185	1	JE185	2
65	O Ring	-	-	HMHO BEH	1	HMHO BEH	2
66	O Ring	HMHO BCC	6	HMHO BCC	6	HMHO BCC	6
67	Plug	HIHK AAE	1	HIHK AAE	1	HIHK AAE	1
68	Nut	JDJC AAC	6	JDJC AAC	6	JDJC AAC	6
69	Screw	JAJY AAS	2	JAJY AAS	2	JAJY AAS	2
99	Plug	102537	1	102537	1	102537	1

ITEM NO.	DESCRIPTION	PART NO.	QTY.	PART NO.	QTY.	PART NO.	QTY.
70	Steering Shaft	102345Y	1	102346Y	1	102347Y	1
71	Steering Crank Assy. (Was 102878SY)	103369SY	1	103369SY	1	103369SY	1
72	Tie Bar	102349	1	102349	1	102349	1
73	Tie Bar Pivot Sleeve	102350	2	102350	2	102350	2
74	Bolt	HYJC ABC	2	HYJC ABC	2	HYJC ABC	2
75	L.H. Deflector (was 102352)	103045	1	103045	1	103045	1
76	R.H. Deflector (was 102353)	103046	1	103046	1	103406	1
77	Deflector Pivot Pin	102354	2	102354	2	102354	2
78	Washer	JELK AAE	2	JELK AAE	2	JELK AAE	2
79	Key-Part of Stg. & Rev. Crank Assy.						
80	Screw	HZJC AAM	2	HZJC AAM	2	HZJC AAM	2
81	Washer	JELM AAC	2	JELM AAC	2	JELM AAC	2
82	Screw	HZJC AAV	2	HZJC AAV	2	HZJC AAV	2
83	Nut	JDQS AAD	2	JDQS AAD	2	JDQS AAD	2
84	Reverse Shaft	102356Y	1	102357Y	1	102358Y	1
85	Reverse Crank Assy.	102875-SY	1	102875-SY	1	102875-SY	1
86	Roller- Part of Rev. Crank Assy.						
87	Reverse Saddle	102361	1	102361	1	102361	1
88	Adjusting Sleeve	102538	2	102538	2	102538	2
89	Reverse Bucket	102539Y	1	102539Y	1	102539Y	1
90	Spring	102364	1	102364	1	102364	1
91	Spring Anchor	102365	1	102365	1	102365	1
93	Bucket Pivot Sleeve	102368	2	102368	2	102368	2
94	Split Pin	HUIL AAC	1	HUIL AAC	1	HUIL AAC	1
95	Bolt	HZJC ABR	2	HZJC ABR	2	HZJC ABR	2
96	Spring Retainer	HUIL AAO	1	HUIL AAO	1	HUIL AAO	1
97	Nut	JDLF AAA	1	J AA	1	JDLF AAA	1
98	Washer	JELM AAD	6	JEL AD	6	JELM AAD	6

ITEM NO.	DESCRIPTION	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY
1	Intake Housing	102319	1	102319	1	102319	1
2	Inspection Cover	102320	1	102320	1	102320	1
3	Inspection Cover Stud	102321	2	102321	2	102321	2
4	Intake Tailpipe Stud	102323	6	102324	6	102325	6
5	Wear Ring	JE144	1	JE185	1	JE185	1
6	Wear Ring Insulator	JE147	1	JE147	1	JE147	1
7	Name Plate	63097	1	63097	1	63097	1
8	Patent Plate	63135	1	63135	1	63135	1
10	Air Bleed Nipple	63366	1	63366	1	63366	1
11	O Ring	HMHO BHC	1	HMHO BHC	1	HMHO BHC	1
12	O Ring	HMHO BEH	1	HMHO BEH	1	HMHO BEH	1
13	Bolt	HYJC ABE	3	-	-	-	-
	Bolt	-	-	HYJC ABF	3	HYJC ABF	3
14	Nut	JDJC AAD	3	JDJC AAD	3	JDJC AAD	3
15	Washer	JELK AAE	3	JELK AAE	3	JELK AAE	3
16	Screw	JAJY AAF	2	JAJY AAF	2	JAJY AAF	2
17	Nut	JDQS AAD	2	JDQS AAD	2	JDQS AAD	2
18	Nut	JDJC AAC	6	JDJC AAC	6	JDJC AAC	6
19	Fixed Bar Intake Screen (was JE293)	103113	1	103113	1	103113	1
20	Intake Gasket (was JE289)	103149	1	103149	1	103149	1
21	Plastic Hose	63373	1	63373	1	63373	1
23	Screw	HZJW AAV	4	HZJW AAV	4	HZJW AAV	4
24	Screw	HZJW AAX	14	HZJW AAX	14	HZJW AAX	14
25	Washer	JELK AAD	14	JELK AAD	14	JELK AAD	14
26	Washer Fibre	61213	14	61213	14	61213	14
27	Nut	JDJC AAC	18	JDJC AAC	18	JDJC AAC	18

ITEM NO	DESCRIPTION	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY
28	Bearing Assembly (consisting of :	JE217SY	1	JH210SY	1	JH210SY	1
	29 Housing)	JE212	1	JH205	1	JH205	1
	30 Tufnol Washer) Not available	JE216	1	JH209	1	JH209	1
	31 Bearing) Separately	JNNU AAA	1	JNOD ACG	1	JNOD ACG	1
	32 Grease Nipple)	HEID AAA	1	HEID AAA	1	HEID AAA	1
	33 Oil Seal)	61180	1	61316	1	61316	1
34	Oil Seal	61180	1	61315	1	61315	1
35	Locating Ring	JE298	1	JH252	1	JH252	1
36	O Ring	HMHO BCP	1	-	-	-	-
	O Ring	-	-	HMHO BCV	1	HMHO BCV	1
37	Bearing Spacer	JE205	1	JH204	1	JH204	1
38	Mainshaft	JE220	1	JH213	1	JH211	1
39	Shaft Slinger	JE290	1	JH251	1	JH251	1
40	Key	JE121	1	JH132	1	JH132	1
41	Coupling	JE244	1	JH110	1	JH110	1
42	Washer	-	-	JH117	2	JH117	2
	Washer	JELL AAB	2	-	-	-	-
43	Thrust Collar	JE219	1	-	-	-	-
	Fairing	-	-	JH107	1	JH107	1
44	Key	JE121	1	JH239	2	JH239	3
45	Bearing Sleeve	JE122	1	JH159	2	JH159	2
46	Impeller	80609-JE104-80620	1	JH106	2	JH106	3
47	Seal Face	JE295	1	JH250	1	JH250	1
48	O Ring	HMHO BCR	1	HMHO BCR	1	HMHO BCR	1
49	Seal	61317	1	61318	1	61318	1
50	Split Pin	HUIL AAJ	1	HUIL AAZ	1	HUIL AAZ	1
51	Nut	JDKL AAH	1	-	-	-	-
	Nut	-	-	JDKM A	1	JDKM AAG	1
52	Nut	JDLA AAG	1	JDLA AAG	1	JDLA AAG	1

ITEM NO.	DESCRIPTION	751 PART NO.	QTY	752 PART NO.	QTY	753 PART NO.	QTY
100	Splash Guard	102977	1	102978	1	102979	1
101	Transom Seal	102330	1	102330	1	102330	1
102	Transom Plate	102331	1	102331	1	102331	1
103	Seal Spring	102336	1	102336	1	102336	1
105	Splash Guard Support	102339	1	102339	1	102339	1
106	Screw	HZJX AAT	12	HZJX AAT	12	HZJX AAT	12
107	Nut	JDJC AAC	14	JDJC AAC	14	JDJC AAC	14
108	Washer	JELK AAD	14	JELK AAD	14	JELK AAD	14
109	Washer	61213	12	61213	12	61213	12
110	Insulating Bush	JE262	12	JE262	12	JE262	12
111	Bolt	HYJC ABG	1	HYJC ABG	1	HYJC ABG	1
112	Washer	JELK AAE	1	JELK AAE	1	JELK AAE	1
113	Bolt	HYJC AAO	2	HYJC AAO	2	HYJC AAO	2
114	Sealing Strip	102543	1	102543	1	102543	1
	MISCELLANEOUS PARTS						
115	Screen Rake	J656SY	1	J656SY	1	J656SY	1
116	'J' Transfer	63234	2	63234	2	63234	2
117	Splash Guard Transfer	63349	1	63349	1	63349	1

REVERSE CONTROLS

		Part No.
I	HAMILTON MORSE BRACKET KIT (For clamp—type Morse Cable)	102694SY

Plus the following items from your Morse Stockist:

- Morse 64C Cable (length to suit)
- Morse Clamp and Shim A37885
- Morse Ball Joint A29108
- Morse Hand Control MC, MJ or MJB

II	HAMILTON MORSE BRACKET KIT (For Bulkhead — Type Morse Kit)	102592SY

Plus the following items from your Morse Stockist:

- Morse 64B Cable
- Morse Ball Joint A29108
- Morse Hand Control MC, MJ or MJB

NOZZLE OPTIONS (for all 750 Models)

Nozzle No.	(For details see reverse of page B1.)	
12		102338-4
13		JE112-4
13E	10° Eccentric	102338-3
15		102338-2
16		102338-5
18		102338-1

IMPELLER OPTIONS (751 only)

Coarse	(751)	80620
Standard	(751)	80609
Fine	(751)	JE104
Standard, stainless steel	(752,753)	80656
Extra coarse, stainless steel	(752,753)	102716

COUPLING OPTION

Heavy duty to suit 1410 series Spicer (753)	JH221

MISCELLANEOUS

Inspection Hatch Extension	102564
Free finger Intake Screen	JE292
Hamilton Close Coupling Kit	JH260SY

RACING JET UNIT	See your local agent	753R