HAMILTON MARINE JET UNITS

1300 SERIES

FOR DIESEL ENGINES

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OWNER'S MANUAL

INDEX

C.W.F. Hamilton & Co. Ltd.
Jet Propulsion Division.
October, 1971.

DESCRIPTION

The Hamilton Jet Unit is a device for propelling boats by harnessing the Reactionary Force generated by expelling a column of water rearwards. This is achieved by drawing water in from under the hull, and pumping it at high pressure via a nozzle from the transom. It is immaterial whether the water jetstream goes into the air or the water - the reactionary force is the same.

A prime mover, such as a conventional marine diesel engine, or gas turbine drives the unit through a short connecting shaft.

Efficiency is dependent on balancing the water flow and velocity, against the required boat displacement and speed. Hamilton jet units have comparable efficiency to propeller drive if applied as recommended - the first time this has been achieved in the history of marine propulsion.

The 1300 series units consist of four main parts:-

1. An Intake Duct - permanently mounted in the hull to convey water from outside the bottom of the boat to the pumping unit. This is made from a high strength non-corrodable GRP moulding, and contains a thrust bearing mounting face, and an inspection hatch. A screen or grill is mounted across the intake opening to keep debris out of the interior of the unit.

2. The Thrust Bearing Assembly - is mounted on the front face of the intake duct, and carries a heavy duty double unit roller bearing running in an oil bath, with appropriate seals. The stainless steel mainshaft finishes with a flanged drive coupling at the front end, which is connected to the engine flywheel through a flexible connecting shaft. An oil cooler is incorporated in the bearing housing with water circulation, and four tie bolts transmit the shaft thrust to the transom.

3. The Main Pumping Unit - is a single stage axial flow design mounted outside the transom, and easily detachable for servicing. Axial-flow design is chosen since it ensures the highest possible flow rate for most efficient propulsion of small boats and launches. The pump consists of a five-bladed bronze impeller, with an associated set of guide vanes, all mounted in a stainless steel casing. The water is eventually expelled from a large flow 8" - 9" nozzle, which handles over 30-tons of water per minute. This high flow capability is essential for efficient jet propulsion of this class of craft.

4. The Control Gear - consists of a pair of ganged deflectors for steering the jetstream left or right for quick and sensitive steering. Behind this again, is a large directional control deflector operated by a pair of hydraulic rams which can be lowered to slow, stop, or reverse the craft as desired. Full steering is always available no matter what manoeuvre is undertaken. Hamilton Jet Control Systems give complete and fine control under all circumstances.

All parts of the 1300 unit are constructed of stainless steel or other corrosion-resisting materials
They are designed expressly for DIESEL ENGINE DRIVE, and for the efficient propulsion of medium and high speed launches and barges.
The units give the advantages of:-

Shallow draught.

Clean-bottomed hulls.

No propeller damage.

Greatly increased manoeuvreability.

Low maintenance.

High speed capability.

No marine transmission or reduction gear box required on engine.

The following features are offered:-

1. R. P. M. range suitable for most popular diesel marine engines, driven direct off the flywheel.

2. Reverse control built-in to jet unit. No gearbox or reduction gear required on engine.

3. High degree of control at all speeds through powerful directed-jet steering, and reverse thrust deflector. Full steering response at all speeds and directions of travel, including the stationary position.

4. Manufactured from corrosion-resisting materials throughout. Main unit of stainless steel, mounted outboard of transom. Bronze impeller. Intake housing of high strength GRP moulding inside hull.

5. Anti-friction main and thrust bearings, oil bath lubricated. Water-lubricated fluted rear bearing for maximum reliability.

6. High efficiency Hamilton axial flow design giving optimum combination of jet velocity and mass flow. Hamilton Jets have highest mass flow for best boat performance.

7. Convenient design allowing dismantling of the unit from the transom without disturbing the watertight seal between the intake housing and the hull.

8. Inspection cover on intake housing enables access to the interior of the unit if necessary for weed clearance, or impeller inspection.

9. Adequate intake screen and base mounting designs available either supplied, or as drawings for the boat builder to build in during hull construction.

10. Two impeller pitches and interchangeable nozzles for fine match to engine.

11. Flange drive coupling supplied to suit heavy duty 1600 series Hardy Spicer universal drive shaft.

12. Manual hydraulic operation of reverse deflector supplied with rotary actuator unit. Power assist available if required.

13. Recommendations for intake mounting, engine coupling, and steering arrangements supplied with each unit.

IDENTIFICATION OF UNITS

The 1300 series units are identified as follows:-

Impeller Dia.	No. of Stages	Model Type No.
13"	1	Mark II

becomes: 1312 Model

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SERIES 1312 JET UNIT

Length of boat:	30-60ft. (9-20 metres)
Revolutions:	2000-3000 r.p.m.
Approx. comparable propeller:	16" - 20" diameter.
Weight of unit:	515 lb. approx (234 Kg.)
Rotation:	L.H. only available (Clockwise looking at jet drive coupling)

Ratings:
- (i) Slow speed displacement boats, barges, etc. Continuously rated up to 200 s.h.p.
- (ii) High speed applications for planing craft: 300 s.h.p.
- (iii) Available to special order. Multi-stage version up to 500 s.h.p. for high speed planing craft (Model 1322).

Speed range: 0 - 50 Knots.

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EQUIPMENT & OPTIONS.

NOTE:

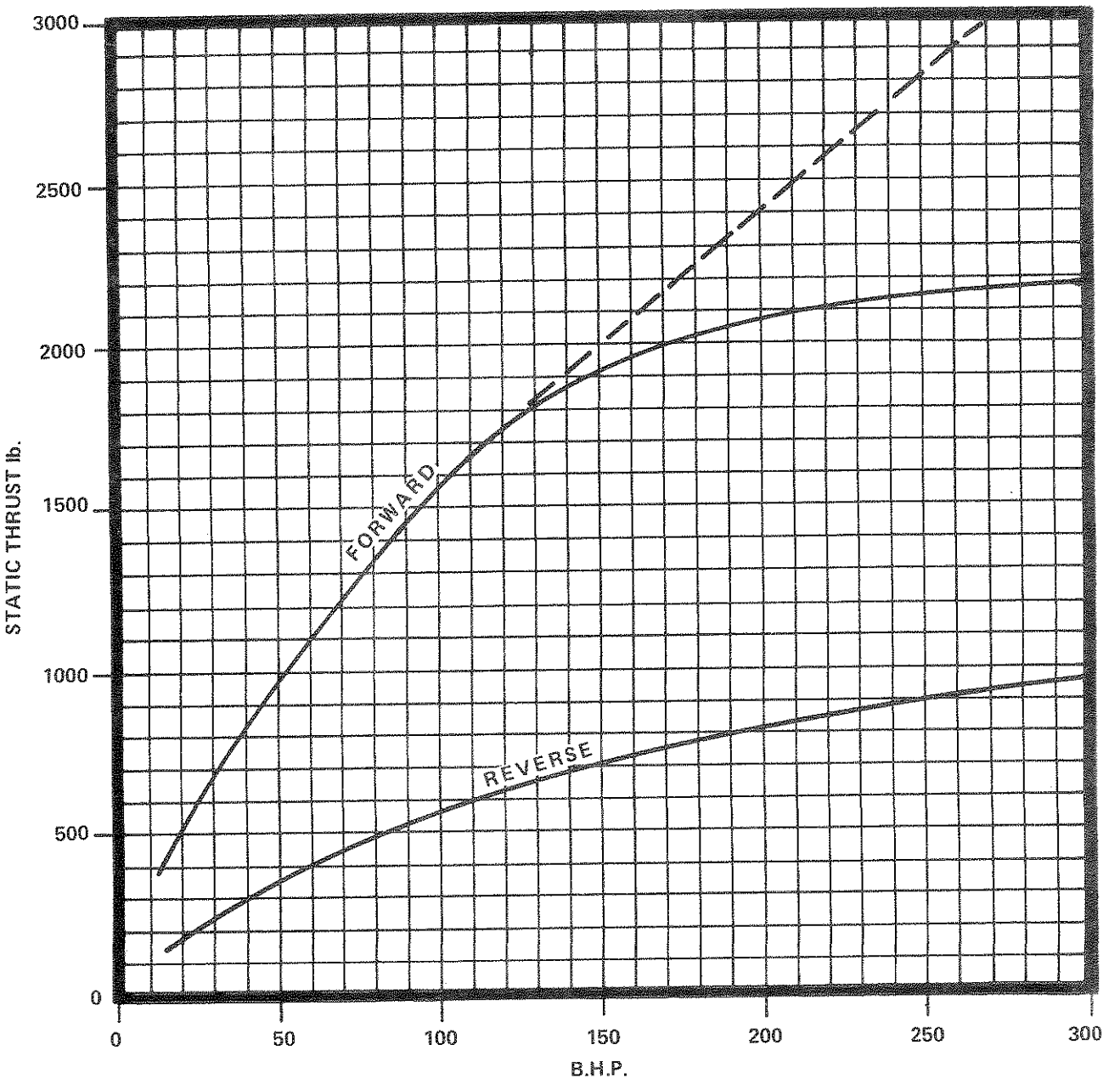
Standard equipment list below indicates items supplied automatically with each unit at standard list price. Optional items specified with order are at extra cost. U/D items are under development, and may not be yet available.

	ITEM	STANDARD EQUIPMENT	OPTIONAL (Extra cost)
1.	Impeller Diameter:	13" (330mm)	-
2.	Stages:	1	2
3.	Impeller Pitch:	Standard	Fine *
4.	Nozzle:	$8\frac{1}{2}$" (216mm)	$7\frac{1}{2}$", 8", 9", $9\frac{1}{2}$" * (191, 203, 229, 241 mm)
5.	Base Mounting:	(a) Metal hull drawings (b) GRP (or wood) hull drawings.	Aluminium Base Steel Base -
6.	Intake Screen:	Drawings only for building-in screen to metal hull during manufacture.	Intake screen in:- Aluminium Steel Stainless Steel.
7.	Screen Cleaning:	-	Opening screen bar kit, with manual operation.
8.	Reverse Operation:	Manually-operated Hydraulic Kit with driver control.	Power-assist Kit Position Indicator U/D.
9.	Steering:	Drawings only for Cable/Pulley arrangement. Morse cable recommendations.	-
10.	Coupling Shaft:	-	Hardy-Spicer 1600 series short shaft assembly.

* Choice of impeller and one nozzle supplied at standard price.

1312 SERIES JET SINGLE STAGE

STATIC THRUST GRAPH

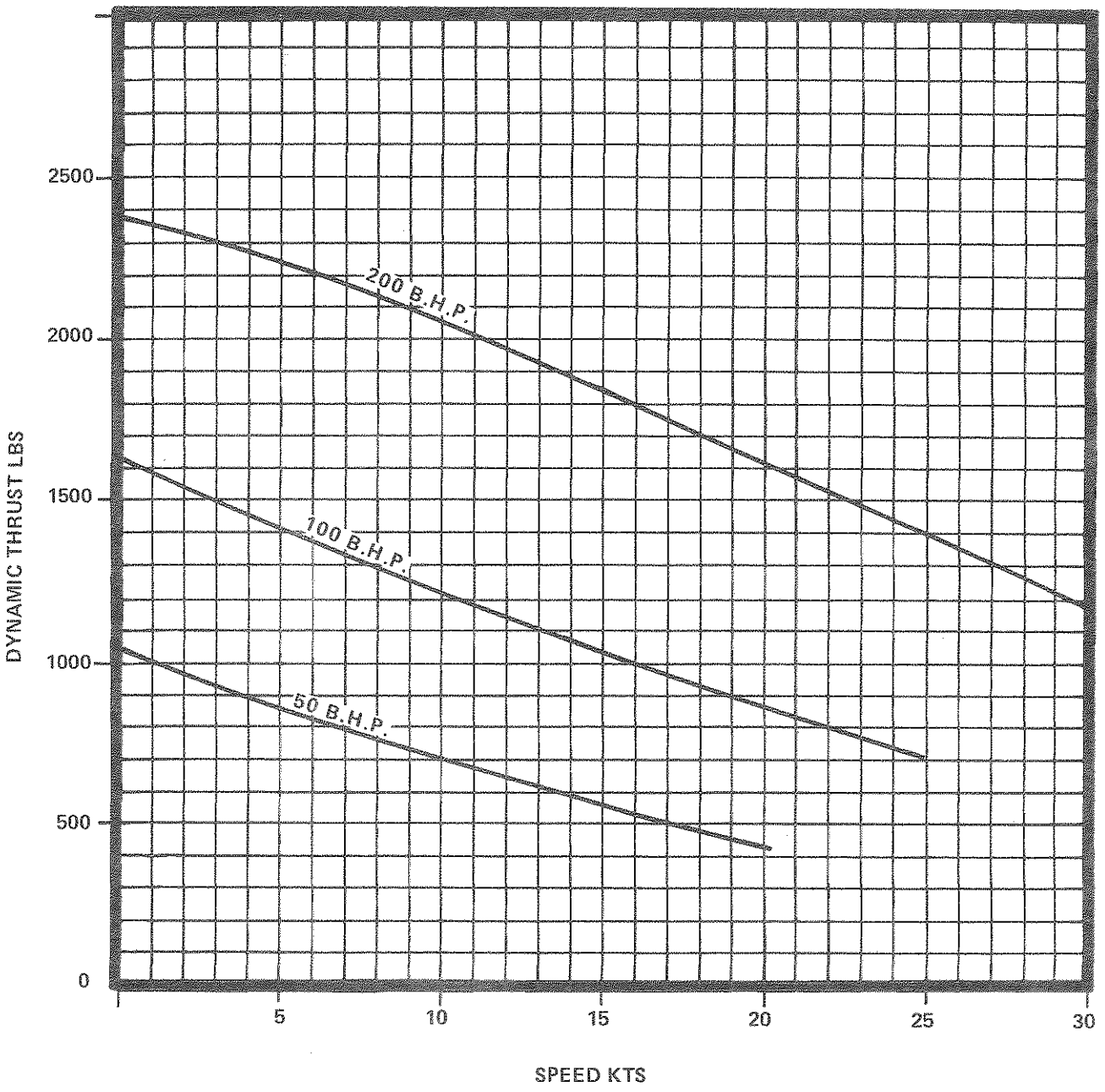


STANDARD IMPELLER
8½" NOZZLE

Information subject to change without notice.

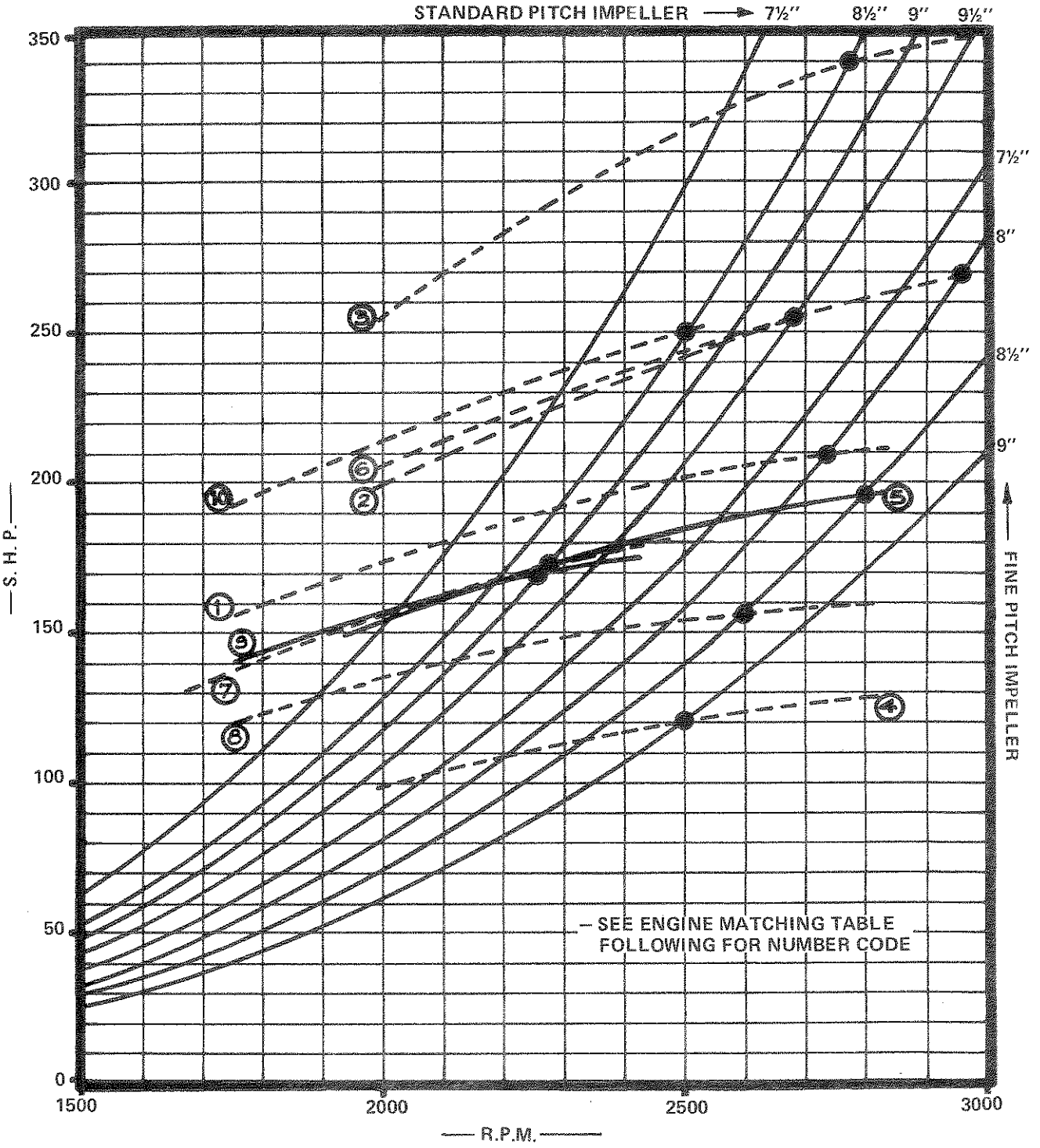
DYNAMIC THRUST 1312 SERIES JET UNIT

Information subject to change without notice



HAMILTON 1312 MODEL JET
"STANDARD POWER CURVES"

— with typical engine power curves, and recommended operating 'points' shown —



ENGINE MATCHING FOR 1312 MODEL JET UNIT.

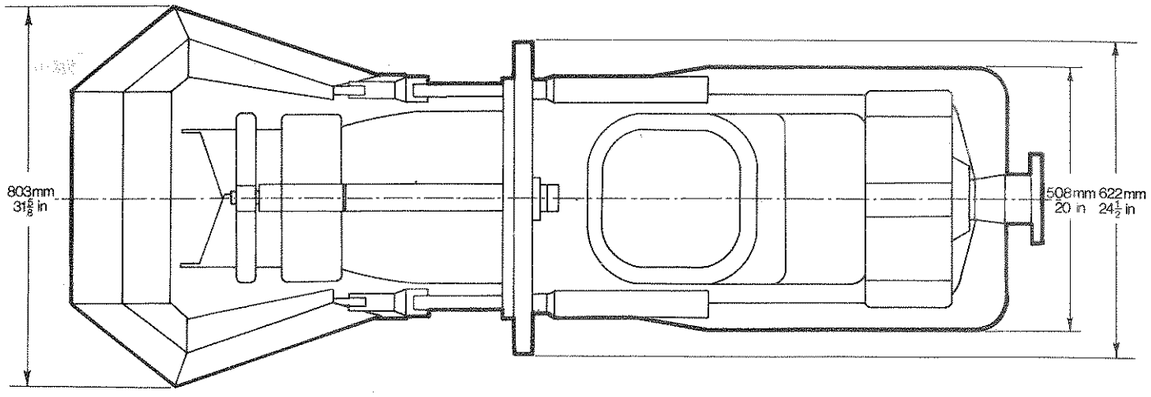
Note:

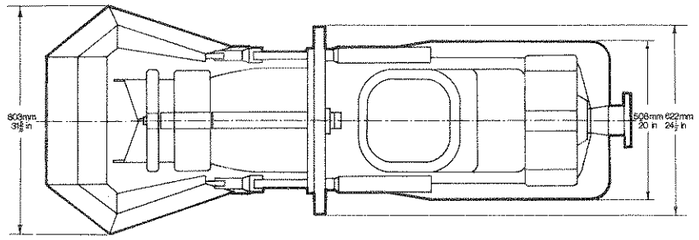
These figures are prepared as an initial guide to engine selection only. Final details of engine performance should always be obtained from the engine manufacturer.

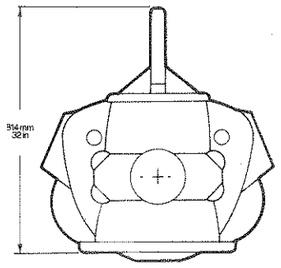
	MAKE	MODEL	CAPACITY	MAX S. H. P. AT R. P. M.	IMPELLER/ NOZZLE	S. H. P. AT R. P. M. (Driving Jet Unit)	RATING
1.	Caterpillar	3160	10,400 c. c.) 636 C. I. D.)	210 at 2800	Fine/8"	209 at 2740 150 at 2450	(Pleasure boat) (Commercial)
2.	Cummins	V8-300-M	12,870 c. c.) 785 C. I. D.)	280 at 3000	Fine/8½"	270 at 2980 200 at 2700	(Pleasure, int (Commercial)
3.	Cummins	VT8-370-M	12,870 c. c.) 785 C. I. D.)	350 at 3000	Std/ 9"	338 at 2760 285 at 2700	(Pleasure, int. (Commercial)
4.	Detroit	4-53N	3,475 c. c.) 212 C. I. D.)	128 at 2800	Fine/9"	120 at 2500 100 at 2350	(Rated S. H. P. (Commercial)
5.	Detroit	6V-53N	5,215 c. c.) 318 C. I. D.)	197 at 2800	Fine/8½"	197 at 2800 140 at 2400	(Rated S. H. P. (Commercial)
6.	Detroit	8V-53N	6,950 c. c.) 424 C. I. D.)	260 at 2800	Std. /9½"	253 at 2675 183 at 2400	(Rated S. H. P.) (Commercial)
7.	Ford	2704 ET	5,945 c. c.) 363 C. I. D.)	180 at 2450	Std. /9"	175 at 2300 152 at 2200	(Pleasure boat) (Commercial)
8.	Perkins	V8-510-M	8,360 c. c.) 510 C. I. D.)	162 at 2800	Fine/8½"	156 at 2580 140 at 2500	(Pleasure, 1 hr.) (Commercial)
9.	Perkins	T6-354-M	5,798 c. c.) 345 C. I. D.)	175 at 2400	Std. /9"	170 at 2275	
10.	Volvo	TAMD 70. B	6,730 c. c.) 410 C. I. D.)	250 at 2500	Std. /8½"	250 at 2500 180 at 2250	(Pleasure boat) (Commercial)

(S. H. P. = Shaft horsepower)
(Pleasure Boat = Max. power available for short intermittent periods)
(Commercial = Max. heavy duty or workboat rating)

Notes:- Engines should be purchased minus clutch and gearbox. For advice on other engines, refer to the Manufacturers. Marine Gas Turbines are suitable for specific applications with the 1312 Jet.







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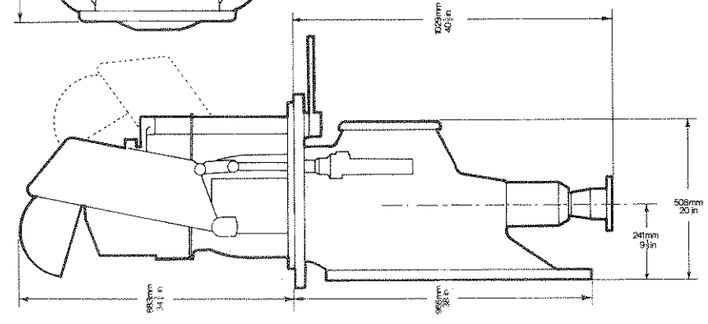
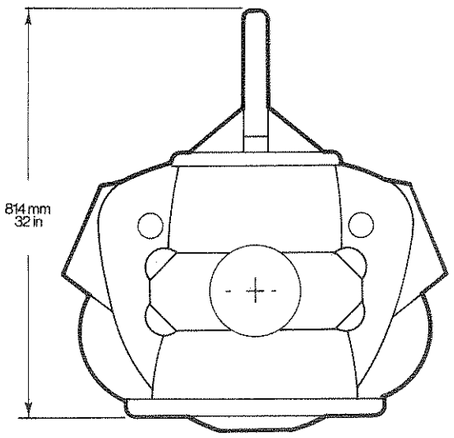


Hamilton Jet Model 1312 Scale Drawings



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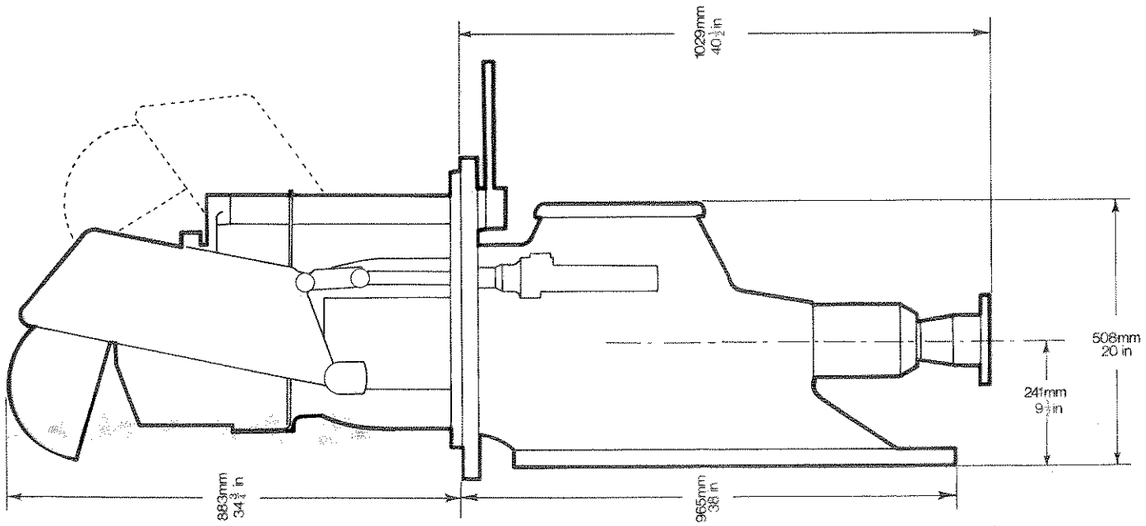

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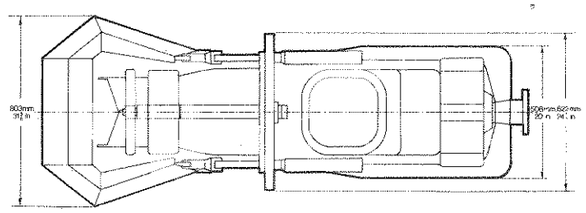
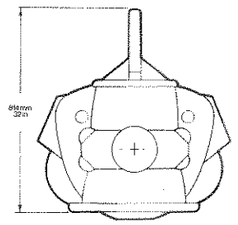
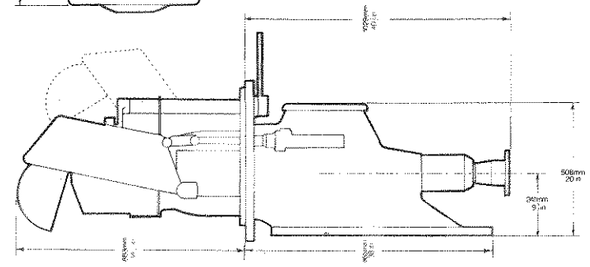




SCALE : 1/24
½″ = 1′0″



INSTALLATION FOR METAL HULLS - WIDE FIXED BAR SCREEN.

REFERENCE DRAWINGS 80682-613, 80682-200.

1. PREPARE HULL TO DRAWING.

2. PREMAKE OR PURCHASE (OPTIONAL EXTRA) BASE AND SCREEN W. A. (80682-592).
   This is detailed on Drawing 80682-613.

3. PREMAKE DUMMY TRANSOM PLATE.
   Cut out and drill to Drawing (template) 80682-487.

4. REMOVE REVERSE BUCKET FROM UNIT.
   (Reference 80682-200).

   (a) With reverse bucket (17) propped in the 'up' position, take out one split pin (2) from each cylinder pin (20) and remove the cylinder pins.

   (b) Lower the reverse bucket.

   (c) Noting the positions of the reverse bucket spacing washers (21) - (they should be reassembled in the same positions) - remove the pin retainer bolts (24) and washers (15) to withdraw each pivot pin (23).

   (d) Draw the reverse bucket away.

5. INSTALL UNIT.

   (a) Bolt the 'dummy transom plate' to the unit transom flange.

   Ensure that the transom gasket (38) is fitted between the two and that the red fibre washers (36) are next to the 'dummy transom plate' and on the outside of hull.

   (b) With the intake base gasket (56) between them bolt the intake to the 'base and screen' W. A. as shown on the drawing.

   (c) Position this assembly in the hull and line up. Tack weld in position.

   (d) Fully weld 'base and screen W. A.' and dummy transom plate to hull - N. B. do not burn transom or base gaskets (38) and (56) with welding heat.

6. REASSEMBLE REVERSE BUCKET WHEN DESIRED.
   Reverse the procedure in Part 4.

7. See General Installation Instructions for engine coupling, steering and reverse connections etc.

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INSTALLATION FOR FIBREGLASS AND WOODEN HULLS (FIXED SCREEN BARS).

REF. DRAWING 80682-543.

(A) PREPARE HULL TO DRAWING.

(B) MANUFACTURE OR PURCHASE SCREEN 80682-623.
(As on 80682-543 Drawing)

(C) PREPARE HULL FOR SCREEN AND INSTALL SCREEN -

i. Three of the rear intake base fixing bolts also hold the screen (80682-623) in place. Temporarily bolt the screen in place through these three holes. Drill remaining two holes (at 3" centres from ℄) through hull using screen to locate.

Counterbore $1\frac{1}{4}$" dia. by $\frac{1}{2}$" deep both these holes from inside hull, as shown on drawing.

ii. Clamp the front of the screen up to the hull and mark or pilot drill the front five mounting holes. Remove the screen and drill these holes 9/16 dia. through hull at 13° angle shown.

iii. Fibreglass heads of two bolts and $\frac{1}{2}$ dia. heavy flat washers in the $1\frac{1}{4}$ dia. counterboring done in Step 1.

iv. When fibreglass in Step 3 hard fit screen with these two bolts and also with front five bolts.

Leave the other three rear bolts until intake installation.

Note:- (i) $\frac{1}{2}$ dia. heavy stainless steel flat washers should be used under bolt heads and nuts and a red fibre washer should be used next to hull, on outside of hull.

(ii) Use "Bostik" or similar non-hardening glue on all joint faces of screen to hull and around all "through" bolts to seal.

(D) DISMANTLING UNIT FOR INSTALLATION.

(Ref. Drawing 80682- 200)

i. Remove Reverse Bucket (17).

(a) With the reverse bucket propped in the 'up' position remove the two cylinder pins (20) by taking out one split pin (2) from each cylinder pin (20).

(b) Lower the reverse bucket. Note the positions of the pivot spacing washers (21) - (they should be reassembled in the same positions) - and then remove the pin retainer bolts (24) and washers (15) to withdraw each pivot pin (23). Draw reverse bucket away.

ii. Remove Inspection Cover (39).

Remove the eight nuts (28) and washers (35) and draw the cover (39) off.

iii. Steering Arm (34).

Remove retaining nut,washer and bolt (12), (27), (28) from the steering arm (34). Slide the steering arm forward and off. Remove the key (25).

iv. Tailpipe Assembly.

(a) Remove the rearmost adjusting nut (90) from each hydraulic reverse cylinder. (Use two spanners one on each of front and rear nuts (90)).

(b) Remove the four tailpipe stud nuts and the four rear tie bolt nuts (49).

(c) Slide the tailpipe assembly away from the intake - take care not to damage the steering shaft seals (32) and the cutlass bearing (7).

The reverse cylinders and tie bars should be held sufficiently by their transom seals (91) and (52) to allow assembly of the intake assembly into the hull. If desired, however, both can be drawn forward and removed.

Care should be taken not to damage the transom seals (91) and (52).

If the hydraulic pipe work (107 - 112) is disconnected in any way the open ends of any part or connection should be plugged to prevent dirt entering the system.

The mainshaft and impeller will also remain in position and should not be removed. Take care not to bump or jar

the intake assembly while partly assembled, as damage could be done to the main bearings.

(E) INSTALL INTAKE ASSEMBLY.

Take four or so transom mounting bolts (37), red fibre washers (36) and flat washers (35) and place through transom holes - spaced to support the transom gasket (38) on the inside of the transom.

Note:- The red fibre washer (36) must be next to the transom.

Place the intake base gasket (56) in position on the prepared base inside the hull. Sit the intake assembly on the gasket and slide it back until it engages the transom bolts (37) and gasket (38). Install all transom and base bolts and tighten.

Note:- Use "Bostik" or similar non-hardening rubber glue around all bolts to seal.

The base bolts (not supplied) should be $\frac{1}{2}$ dia. stainless steel and long enough to pass through the hull and intake base. They should be installed as for the transom bolts i.e., head of the bolt outside the hull, $\frac{1}{2}$ dia. heavy stainless steel flat washer under the bolt head and a $\frac{1}{2}$ dia. red fibre washer under that and next to the hull. Also another $\frac{1}{2}$ dia. stainless steel heavy flat washer should be used next to the intake and under the nut.

(F) REASSEMBLE UNIT.

Reverse the procedure used in Section (D) to dismantle unit. The following points should be noted however:-

i. Coat the tailpipe bearing sleeve (62) with French chalk so that the cutlass bearing (7) is not damaged.

ii. Do not overtighten the inspection cover (39) - it is sufficient to "nip" nut two to three turns.

iii. Tailpipe stud nuts and tie bolt nuts (49) should be torqued to 100 pounds feet. *

iv. Reverse cylinders to be positioned so that both cylinders are bottomed when the reverse bucket (17) is fully up. (Reposition nuts (90)).

v. See General Installation Instructions Section for details of engine coupling, steering and reverse connections etc.

* Hand tighten sleeve adjusters (57) and undo one-third turn.

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GENERAL INSTALLATION DETAILS:

1. ENGINE INSTALLATION:

Position:

The engine should be mounted where recommended by the hull designer, or astern of this position. The latter may improve priming when starting, will give more forward cockpit space, and may improve top speed. The closest possible position to the jet unit will be determined by the length of the shortest possible drive shaft.

Level:

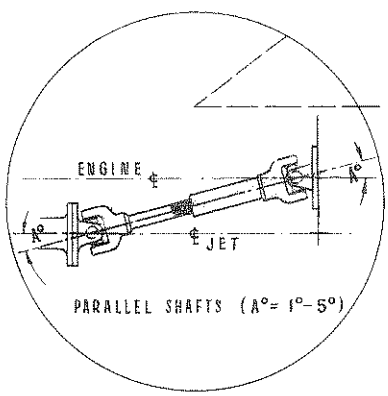
Mount the engine on longitudinal bearers so that the crankshaft line is preferably level and with a small clearance only under the oil sump.

Drive Shaft:

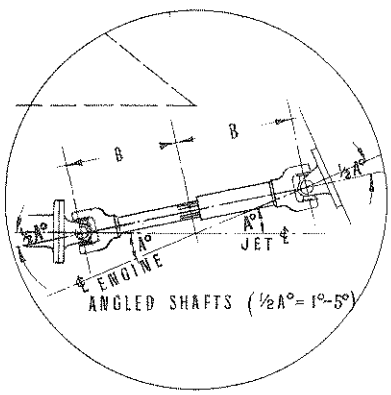
The drive coupling is made to match a Hardy Spicer 1600 series universal joint. A double universal joint shaft should be used with a sliding spline of a length to suit the chosen engine position. An adaptor plate is required so that the universal joint can be coupled to the engine flywheel.

The universal should be run at a slight angle, to avoid vibration, but not at too great an angle which would cause wear.

Make sure the two centre yokes are in the same plane to avoid tortional vibrations. No special care is required in lining up the engine, the universal taking up small differences.



ALTERNATIVE UNIVERSAL ARRANGEMENTS



IMPORTANT Limit universal angles to a maximum of 5° on each joint, which is about 1" offset on the usual short shaft.

GENERAL:

In all other respects, e.g., cooling, the engine should be installed as for any conventional (i.e. propeller) drive marine engine installation. Follow the engine manufacturers installation instructions where applicable.

2. STEERING:

This is effected by the pair of coupled deflectors arranged either side of the jet nozzle. Turning the steering wheel turns the deflectors which deflect the jet stream to the left or right giving powerful and accurate steering.

Good quality steering is of paramount importance in a jet boat. The most adaptable and lightest method of connecting the forward steering wheel to the aft steering arm is the cable and pulley system. It is almost completely frictionless, quite positive, and allows the normal self centering feature similar to an automobile.

Chain & Sprocket System:

The layout for a chain and sprocket system is shown on drawing number 80682-488.

To retain sensitive manoeuvring at slow speeds there should be two turns on the steering wheel to give full lock to full lock of the deflectors.

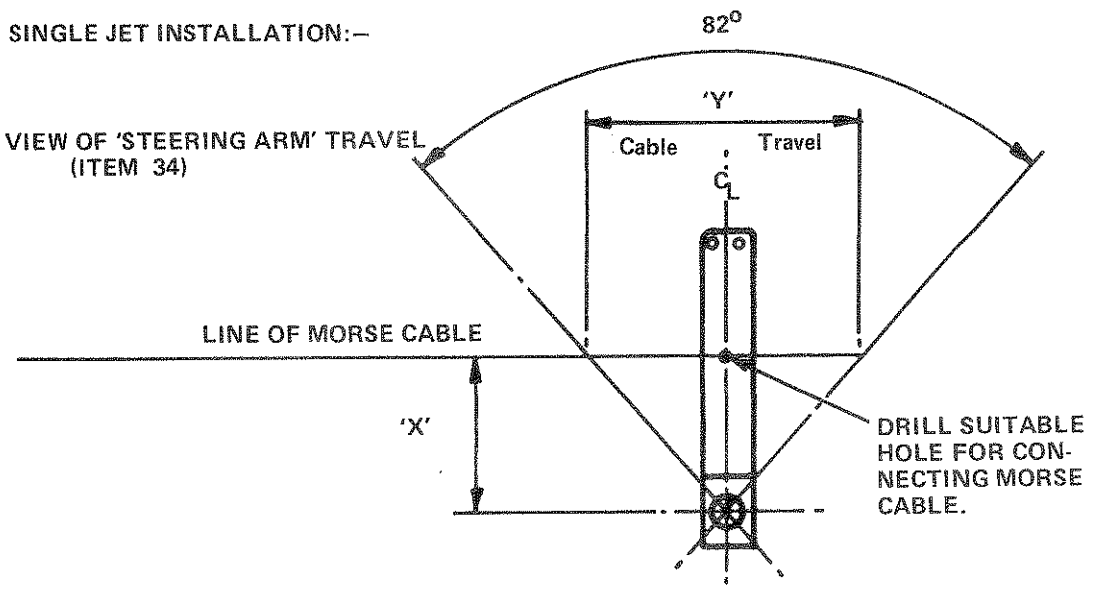
Cable Steering:

If a proprietary cable steering kit is desired for single jet unit installations the Morse 400 series is recommended - for craft up to 45ft. For larger craft or twin installations, the Morse 500 series is recommended. * (See sketches below)

Also for really heavy duties Morse Power Steering could be used.

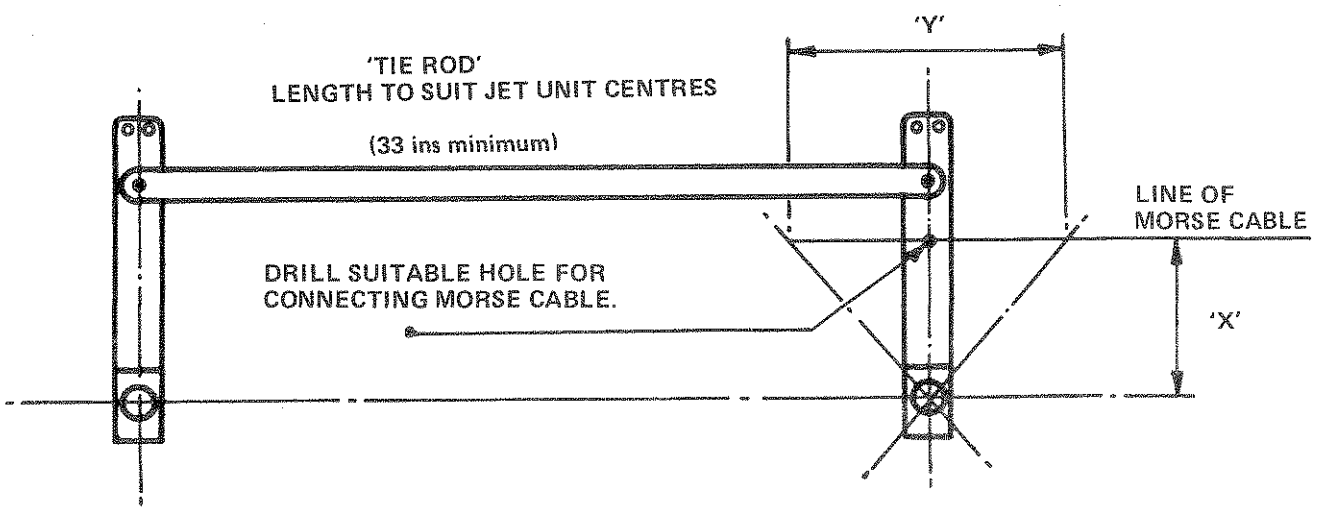
MORSE CABLE CONNECTIONS:–

(A) SINGLE JET INSTALLATION:–



	DIM 'X'	DIM 'Y'
MORSE 400 SERIES CABLE	6-5/8 ins.	8-3/4 ins.
MORSE POWER STEERING	6-5/8 ins.	8-3/4 ins.
MORSE 500 SERIES CABLE	7-1/8 ins.	9-7/16 ins.

(B) TWIN JET INSTALLATIONS:–



DIM. 'X' & 'Y' AS TABLE ABOVE.

Deflector Adjustment:

The deflectors (8) and (9) must be adjusted close to the jet stream for responsive steering. This adjustment will have been made at the factory prior to despatch and unless the deflectors have been dismantled or the nozzle (6) size changed during trials no adjustment will be necessary.

If resetting is necessary two adjustments are necessary:-

(i) The centres of the deflector pivot pins (4) should be set at a distance

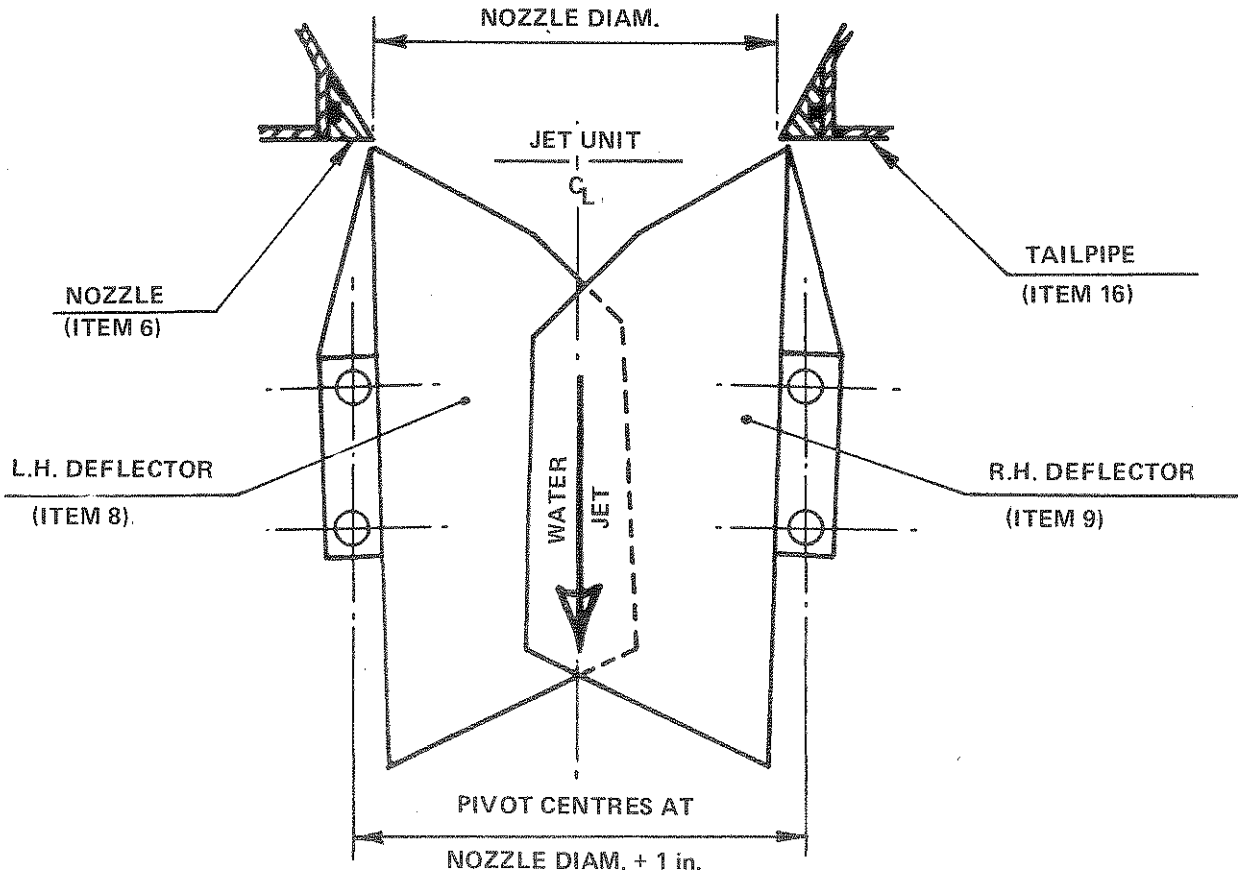
= Nozzle diameter + 1 inches

This is possible by undoing the eight bolts (11), moving the deflector guards (8) and (9) in or out the required distance and placing the bolts (11) back in the nearest hole combination showing between the tailpipe flange holes (16) and the deflector guard tapped holes (8) and (9).

Note: Make sure that the deflector guards are at equal distances from the centre line by checking that the bolts (11) are in similar hole combinations either side of the unit centre line.

(ii) The centres of the tie bar pins should now be made equal to the centres of the deflector pivot pins (4) set in (i) above.

This is done by changing or inverting the tie bar bushes (3). Two types of bush are supplied (with two holes and one hole) and the pair not assembled in the unit are packed loose with the jet.



3. FORWARD/NEUTRAL/REVERSE CONTROL:

(A) Principle of Operation:

The reverse bucket is the key to this forward, neutral and reverse control.

(a) Forward:

With the reverse bucket in the fully up position, the jet stream is able to pass out the back of the jet unit unimpeded. The resultant thrust on the boat is forwards.

(b) Reverse:

With the reverse bucket in the fully down position it cuts across the full jetstream, deflecting it down and forwards (relative to the boat). The resultant thrust on the boat is backwards.

(c) Neutral:

With the reverse bucket part way down so that it only partially cuts the jet stream some water is deflected forwards and some passes straight back. There is a position of the reverse bucket therefore where the forward thrust from the water, not being cut by the reverse bucket, will equal the reverse thrust of the water being cut by the reverse bucket - the resultant thrust on the boat being nil, i.e. neutral.

(d) Braking:

If, while the boat is moving forwards, the neutral or reverse positions of the reverse bucket are engaged (remember the throttle should be closed before engaging these positions) and the throttle gently opened, the boat will very quickly come to rest. (One to two boat lengths fromplaning speeds with pleasure craft). This is a safety factor which only jet drives can give.

(B) Description:

Standard equipment for forward/neutral/reverse control consists of a hand operated Char-Lynn Orbitral pump unit which activates two hydraulic cylinders on the jet unit. The hydraulic cylinders are linked to the reverse bucket and move it up and down.

The orbitral pump is mounted at the control console in a position which readily allows the crank handle to be rotated in either direction by the boat operator. By rotating the crank one way the reverse bucket goes up and, conversely with reversed rotation of the crank, the bucket goes down.

(C) Installation:

A sketch showing the parts and connections of the hydraulic reverse equipment is shown on drawing No. 80682-200. Items 107 to 112 are assembled on to the unit intake at the factory. Items 113 to 122 are packed loose and when assembled will be positioned at the control station for the boat. The oil tank (122) is best mounted above the orbitral pump (119) but if need be it can be mounted lower than the pump provided it is still above the rest of the hydraulic circuit. This will prevent the tank from being flooded should there be an air leak in the system.

It is left to the customer to connect items 112 at the jet unit ($\frac{1}{2}$ BSPT male thread required) to items (115) at the control station ($\frac{1}{2}$ BSPT female thread required). Connections made as shown in sketch.

The connecting line should be of tubing:-

(a) Not less than half inch normal bore with
(b) the bore cleaned and descaled as for purpose made hydraulic tubing and
(c) suitable for a working pressure of 700p. s. i.

Note:

(a) Care should be taken at all times to keep dirt out of hydraulic systems as seals and pumps can be seriously damaged by foreign matter.

(b) Use Shell Tellus 27 or equivalent oil for the hydraulic system.

(c) Bleeding - The system should be self bleeding as it is operated. However, to shorten the time required to work the air out of the system, the two lines should be disconnected at Item (112) from the jet unit and coupled together to short circuit the system. Rotate the orbitral crank (116) for a short period until the return oil to the tank is free of air bubbles, then reconnect circuit again. After working the bucket up and down several times, top up the oil level in the tank to dipstick mark.

4. BEARING HOUSING COOLING WATER:

A cold water supply is required to cool the jet thrust bearings. A small line (say half inch diameter) should be taken from the delivery side of the water pump which feeds the engine heat exchanger into the lower water intake (88). A half inch diameter return line should take the water from the upper water offtake (88) and dump it in the water cooled engine exhaust. (Only two or three gallons per min. flow is required and care should be taken not to take too much flow and starve the heat exchanger).

These feed lines to and from the bearing housing should be made with an electrically insulating material, e. g. rubber, nylon etc.

5. ELECTRICAL INSULATION:

(i) The engine must be insulated from a metal hull.

(ii) The jet unit must also be insulated from a metal hull. Note the following connections:-

Steering arm (34) to steering cable should be insulated or insulate the whole steering system from the hull.

Hydraulic reverse cylinders should be insulated from the oil lines back to the orbitral pump unit (116) - (119) or alternatively insulate all control gear items (107) - (121) from hull as well.

Water offtake (88) see part 4. above.

6. TWIN INSTALLATIONS:

(a) Spacing Between Jet Units:

The units should be mounted as close to one another as possible, especially in hulls of the deep 'Vee' type (to avoid getting air in the intake during turning).

Minimum centres possible:-

33 ins. (840 mm)

However, larger centres may be necessary to fit wide engines. The minimum engine centres possible is then the best jet unit centres.

(b) Steering:

The steering arms (34) of each jet unit should be linked. (See sketches with Part 2. this section).

Morse 500 series cable is recommended and if desired morse power steering is also recommended.

(c) Forward/Neutral/Reverse Control:

The controls (Orbitral pump unit, Items 116 - 119) should be mounted as for two single jet unit installations, i.e., the controls of one jet will be fully independent of the controls of the other.

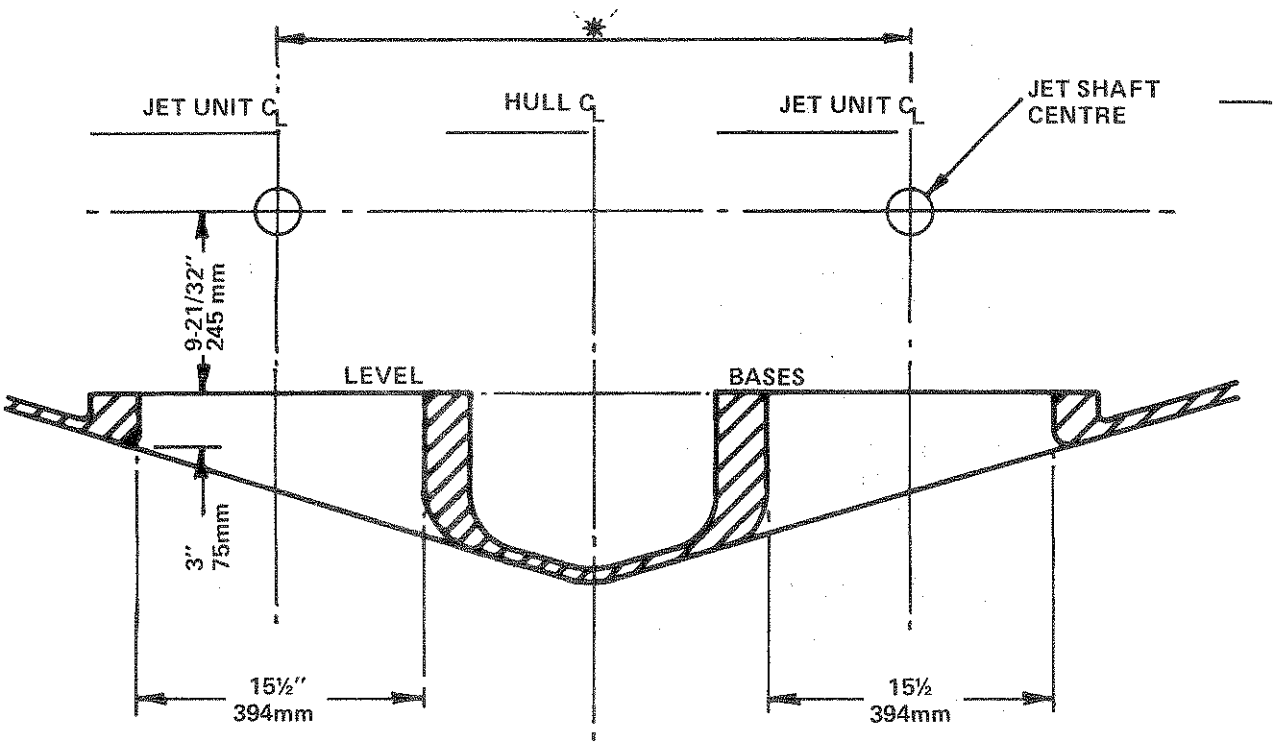
The orbitral pump (119) should be mounted so that the handles (116) are close together and the operator can readily turn both at once.

(d) Hull Preparation:

(i) Determine the spacing between jet units (see Part (a) above).

(ii) Prepare the hull as shown in the sketches following. Starting point for setting up is the (3" (75mm depth dimension on the outer sides of the intake bases. (The depth of the inner sides is then determined by the level line between the two(3" (75mm depths and the 'Vee' of the hull).

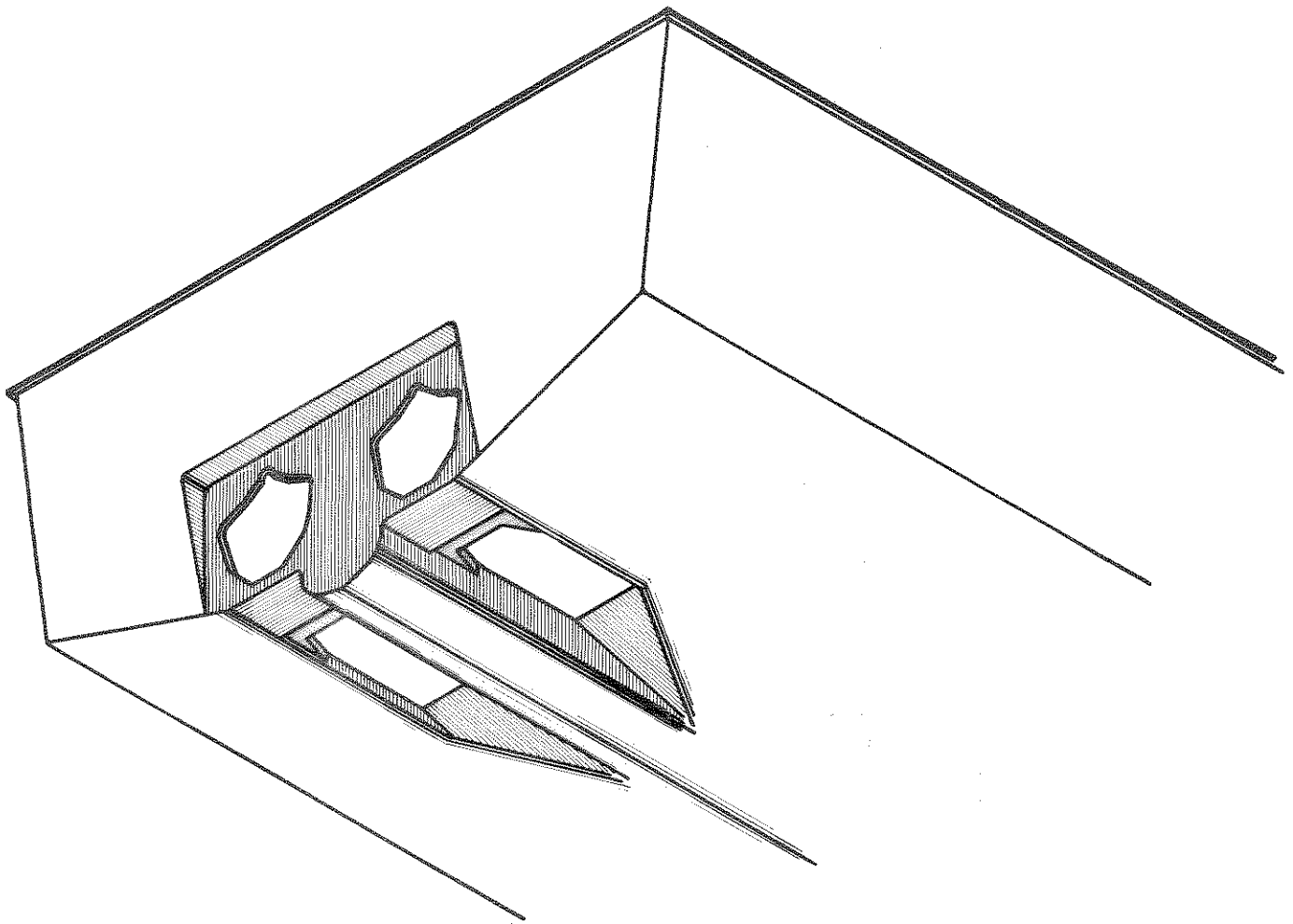
(iii) Other details of hull preparation will be as for single jet installations on drawings 80682-543 and 80682-487.



* SEE SCRIPT PART (A) 'SPACING BETWEEN JET UNITS'

SECTION THROUGH INTAKE BASES
IN HULL:—
TWIN INSTALLATIONS

TWIN 1300 SERIES
JET INSTALLATION



OPERATION OF THE JET UNIT:

1. Steering:

The deflectors (8) and (9) deflect the water jet to the left or right causing the boat to steer left and right respectively.

The following points should be remembered when operating a jet craft: -

(a) If the engine is stopped there is no water jet for the deflectors (8) and (9) to deflect and thus the craft cannot be steered.

Never stop the engine when approaching a mooring or at any time when steering will be required.

(b) The wider the throttle is opened the greater the steering effect - i. e. the sharper the turn.

(c) Steering is available in neutral and reverse as well as in forward control - a feature which gives the Hamilton Jet unrivalled manoeuvrability.

Remember though that whether going forwards, in neutral or in reverse the bow of the boat will always turn the way the steering wheel is turned, i. e. turn wheel right bow of boat will move right and vica versa.

This means that in reverse the boat has the opposite steering to a motor car, a feature which can be used to advantage when manoeuvring.

2. Forward/Neutral/Reverse Control:

For a working explanation see 'General Installation' section part 3A.

Caution:

If the reverse or neutral positions are selected with the throttle left open and the boat moving forward at speed, the resultant 'braking effect' is very severe - even more so than full braking with a motor car.

The above procedure should therefore be used only in emergency.

For normal operation to 'brake' the boat's forward motion: -

(i) Close the throttle.
(ii) Select reverse or neutral.
(iii) Open the throttle, gently at first.

3. Manoeuvring and Docking:

It has been found that the boat is best manoeuvred as follows:-

(i) Set the throttle up to 1/3 open (say approx. 1,500 r.p.m. with high speed diesel engines).

(ii) Wind the orbitral crank (116) until the boat neither moves forwards nor backwards - this is then the neutral position.

(iii) A quarter of a turn of the orbitral crank either way from this neutral position will be sufficient to move the boat forwards or backwards until the manoeuvre is complete.

(iv) Steering will be excellent also at this throttle opening.

To summarise:

Manoeuvre at fixed throttle opening, one hand on the steering wheel and the other on the orbitral crank (116). Move the orbitral crank only a quarter of a turn either side of the neutral position.

Note:

The angular position of the orbitral crank (116) will be different each time 'neutral' is selected because of slip in the hydraulic system.

A position indicator (which is directly attached to the reverse bucket (17) is thus recommended so that the operator knows accurately whether he is in forward, neutral, reverse or somewhere inbetween these positions.

4. Shallow Water Operation:

Avoid using large throttle openings at slow speeds in shallow water as stones, sand etc. will be sucked through the jet unit. Thus, when starting off and stopping, pick a deep water area and only travel over shallow water at a clean planing speed.

MAINTENANCE:

Note:

This unit has been designed to require the absolute minimum of maintenance. However, it is recommended that the unit be dismantled (as in Steps (1) - (5) in Dismantling Procedure section following), and inspected for wear on bearings, seals, etc. and corrosion annually as a minimum requirement.

Day to day maintenance should be negligible, but the following points and checks should be noted:-

(1) Thrust Bearings:

The two bearings are the oil lubricated type and run continuously in an oil bath or reservoir. The oil level is marked on the dipstick - filler cap (79). The oil should be checked daily to keep the level up and also to see that it has not been contaminated in any way. (The oil should be changed immediately if found to be contaminated).

Change the oil (Shell Tellus 27 or equivalent) every 250 hours or annually, whichever is the lesser. To drain reservoir unscrew plug (85). The oil is cooled by water in an adjacent jacket in the bearing housing. This water must not be allowed to freeze inside the bearing housing. (In such cold conditions the bearing oil should remain cold enough without water cooling).

(Also see oil supplier's recommendations of oils for low temperatures.

To inspect bearings or for oil seal failure see dismantling procedure section.

(2) Rear Bearing:

This is a water lubricated, cutless rubber bearing and requires no attention.

DO NOT RUN THE UNIT OUT OF WATER as this will damage the bearing. Application of a hose to the small hole at the back cone fairing of the tailpipe of a single stage unit will wet the bearing sufficiently to allow the unit to run for a short time, but remember the engine will have no water circulation and prolonged running will cause damage.

Multi-stage units must be immersed in water for test running.
To inspect the bearing see dismantling procedure section.

(3) Gland Seal:

This is a double carbon face seal type with bronze counterfaces and should require no attention. With two seal faces there is a built in safety factor (should one fail the other will adequately seal).

To inspect seals see dismantling procedure section.

(4) Drive Shaft Universals:

Every thirty hours sparingly grease the universal joints and sliding splines. Do not over grease.

(5) Hydraulic Reverse Equipment:

This will require no maintenance provided the oil is kept free of dirt, water and other contaminants which can severely damage the equipment.

The oil in the control station tank should be checked daily for level (dipstick on filler cap (79) and freedom from contamination.

If a large quantity of oil has been lost immediately check all connections in the system for signs of leaks and rectify.

If the oil at any time is contaminated, drain and flush whole system and refill. Bleed as in section "General Installation Details" note (c) at end.

Use Shell Tellus 27 oil or equivalent - in cold climates check with oil company for suitable oil at low temperatures.

(6) Debris Etc. in Unit:

Any debris such as wood, water weed etc., caught in the intake screen, impeller or tailpipe stator vanes will affect the jet unit's performance. The 1312 jet is provided with an inspection cover which readily gives access to the above blockages.

On most installations the static level of water inside the jet unit will be below the intake inspection cover lip and the cover can be removed provided the engine is stopped and the craft is stationary.

If the static water line is too high then often by moving the load to the bow of the boat or placing a heavy load on the bow end the stern is raised enough to allow the cover to be removed.

To remove the cover (39):-

Remove the eight nuts (28) and washers (35) and draw the cover off.

Blockages of the unit are usually noticed by (a) the engine 'racing' and/or (b) lack of jet thrust, i. e. boat speed.

Great care should be taken to avoid ropes or vines as these, if caught around the impeller shaft, will be wound into the jet unit.

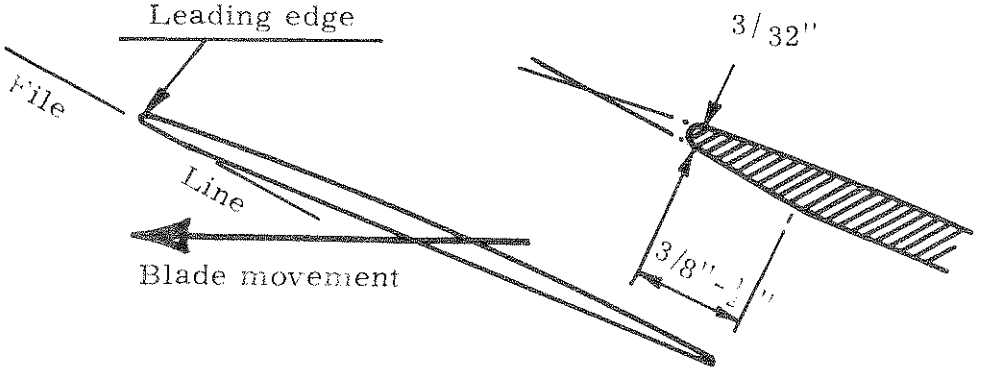
Recommended practice is to close the throttle or even stop the engine and coast over such bad debris if the boat cannot steer round it.

Smaller pieces of debris, water weed etc., will not normally foul the unit.

(7) Impeller:

The leading edges of the impeller may tend to become 'blunt' after a period of time with the action of water and small solid particles in the water. The performance of the impeller will drop with the blades blunt.

Anytime the inspection cover is removed (as in section (6) above) the leading edge of the blades should be inspected for wear. If badly worn, remove impeller (see section on Dismantling Unit) and sharpen as shown below.



Details of Impeller Sharpening

(8) Reverse and Steering Joints:

The reverse bucket and steering joints which are outside the hull may tend to seize if the boat is laid up or stationary for some time.

These joints should be oiled after such periods and checked to see they are operating freely. Once in the water these joints will be water lubricated and will not normally require attention.

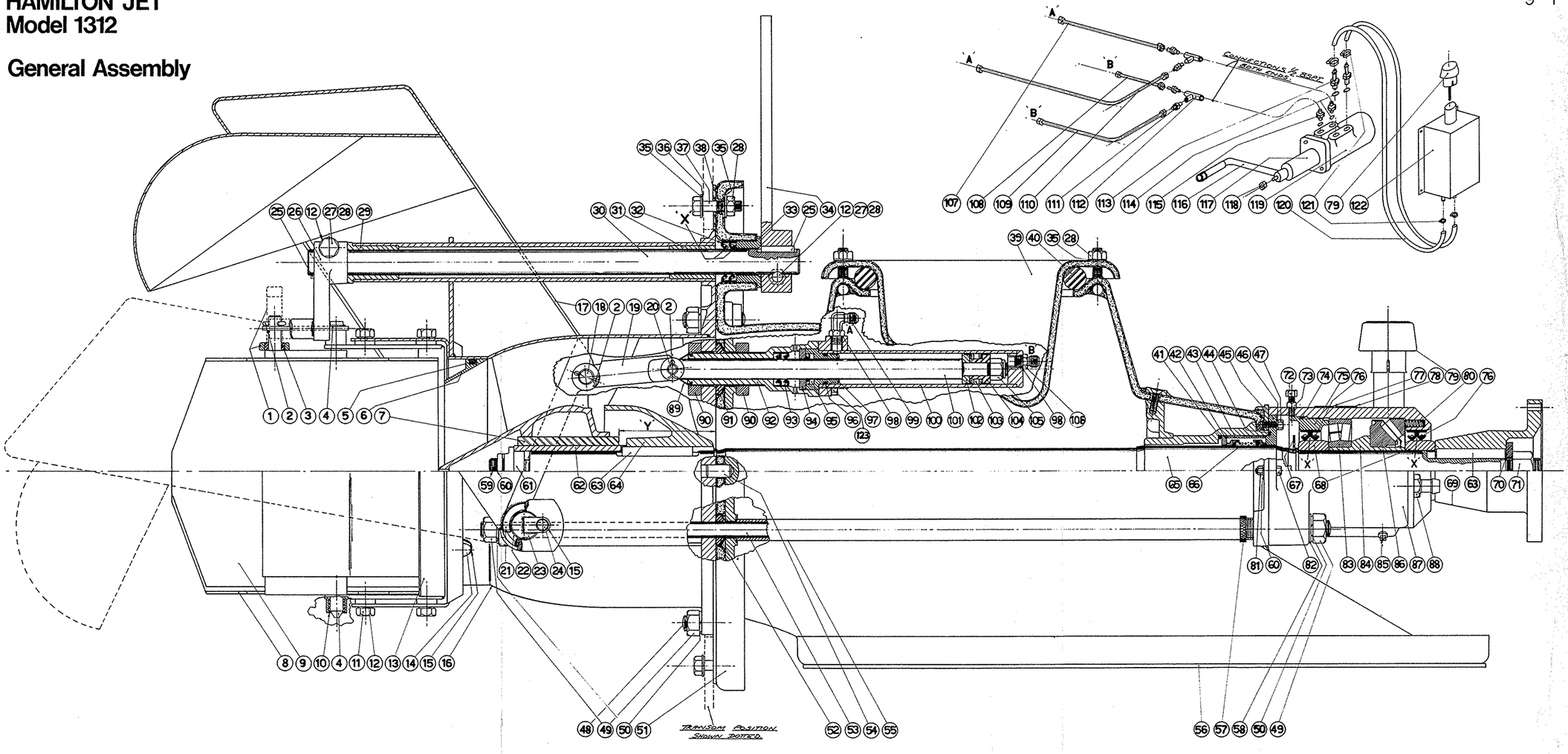
(9) Care of Stainless Steel:

Stainless steel should not be painted, coated with anti-fouling or any similar treatment normally associated with mild steels. Stainless steel best resists rust and corrosion when the surface is clean and highly polished. The surfaces of the stainless steel tailpipe (16), reverse bucket (17), deflectors (8) and (9), should be regularly inspected for signs of corrosion. Any areas of corrosion should be polished out with a fine emery cloth and the stainless steel brought back to a shiny surface finish.

In general, clean off oil slicks, chemical deposits etc. daily, as stainless steel will corrode under such a deposit.

HAMILTON JET
Model 1312

General Assembly



Fold out

MODEL 1312

PARTS LIST - (SERIAL NO. 139 ONWARDS)

TAILPIPE AND DEFLECTOR ASSY:

Item	Part No.	Description	Quantity
1	80682-14	Tie Bar	1
2		Split Pin $1\frac{1}{4}$ x 3/16 dia. St. St.	2
3	80682-255	Tie Bar Bush (1 Hole))	2
or	80682-15	Tie Bar Bush (2 Hole)) - options	2
4	80682-223	Deflector Pin	2
5	80682-628	Nozzle Seal	1
6	80682-5	Nozzle 8")	1
or	80682-6	Nozzle $8\frac{1}{2}$")	1
or	80682-7	Nozzle 9") - options	1
or	80682-8	Nozzle $9\frac{1}{2}$")	
7	80682-446	Cutless Bearing	1
8	80682-495	Deflector L. H.	1
9	80682-496	Deflector R. H.	1
10	80682-627	Deflector Pin Bush	4
11		$\frac{1}{2}$ B. S. W. x 5/8 Hex. Hd. Screw St. St.	8
12		$\frac{1}{2}$ dia. Spring Washer St. St.	8
13	80682-501	Deflector Guard	2
14		3/8 UNC x 3/4 Bolt St. St.	4
15		3/8 Spring Washer St. St.	4
16	80682-632	Tailpipe Welded Assy.	1

REVERSE BUCKET AND LINK ASSY:

2		Split Pin $1\frac{1}{4}$ x 3/16 dia. St. St.	8
15		3/8 Spring Washer St. St.	2
17	80682-631	Reverse Bucket	1
18	80682-352	Bucket Pin	2
19	80682-351	Connecting Link	2
20	80682-353	Cylinder Pin	2
21	80682-490	Washer	8
22	80682-167	Bucket Bush	2
23	80682-39	Pivot Pin	2
24		3/8 UNC x 5/8 Hex. Hd. Bolt St. St.	2

STEERING SHAFT ASSEMBLY:

Item	Part No.	Description	Quantity
12		$\frac{1}{2}$ dia. Spring Washer St. St.	2
25	80682-283	Key	2
26	80682-87	Steering Crank	1
27		$\frac{1}{2}$ B.S.W. x $2\frac{1}{2}$ Bolt St. St.	2
28		$\frac{1}{2}$ B.S.W. Nut St. St.	2
29	89682-275	Rear Shaft Bush	1
30	80682-510	Steering Shaft	1
31	80682-276	Rear Shaft Bush	1
32		2 x $1\frac{1}{4}$ x 3/8 Lip Seal (Rubber covered St. St. or bronze spr.)	2
33	80682-394	Steering Shaft Support Bush	1
34	80682-245	Steering Arm	1

INTAKE ASSEMBLY:

28		$\frac{1}{2}$ B.S.W. Nut St. St.	27
35		$\frac{1}{2}$ dia. Heavy Washer St. St.	46
36		1 x $\frac{1}{2}$ x 1/16 Red Fiber Washer	19
37		$\frac{1}{2}$ B.S.W. x 2" Bolt St. St.	19
38	80682-410	Transom Gasket	1
39	80682-397	Inspection Cover	1
40	80682-398	Inspection Cover Seal	1
41		'O' Ring 3-5/8 x 3-3/8 x 1/8 G.S.	1
42	80682-105	Auxiliary Seal Face	1
43	80682-170	Housing Sleeve	1
44		'O' Ring 3-7/8 x 3-5/8 x 1/8 G.S.	1
45	80682-93	Seal Counter Face	1
46		5/16 dia. Spring Washer St. St.	4
47		5/16 UNC x 3/4 Bolt St. St.	4
48	80682-395	Tailpipe Stud	4
49		3/4 - 10 B.S.W. Nut St. St.	12
50		3/4 dia. Spring Washer St. St.	12
51	80682-396	Intake Moulding Assy.	1
52	80682-399	Tie Rod Seal	4
53	80682-217	Tie Rod	4
54	80682-406	Tailpipe Dowel	2
55	80682-408	Tie Rod Sleeve	4
56	80682-409	Intake Base Gasket	1
57	80682-407	Sleeve Adjuster	4
58	80682-489	Washer St. St.	4

SHAFT ASSEMBLY:

Item	Part No.	Description	Quantity
59		¼ B.S.W. x 3/4 Skt. Hd. Capscrew St. St.	1
60		¼ dia. Spring Washer St. St.	1
61	80682-92	Rear Shaft Nut	1
62	80682-109	Tailpipe Bearing Sleeve	1
63	80682-117	Key	2
64	80682-100	Impeller Standard Pitch)	1
or	80682-447	Impeller Fine Pitch)	or
65	80682-101	Mainshaft	1
66	SCR691/250	Romet Seal 2½ Bore	1
67	80682-107	Shaft Slinger	1
68	80682-51	Seal Sleeve	2
69	80682-95	Coupling Flange (1600 Hardy Spicer)	1
70	80682-106	Coupling Washer	1
71	80682-282	Coupling End Nut	1

BEARING HOUSING ASSEMBLY:

60		¼ dia. Spring Washer St. St.	2
72		5/16 UNC x 1" Hex. Hd. Screw St. St.	1
73		5/16 UNC Nut St. St.	1
74		'O' Ring 5-3/8 x 5-1/8 x 1/8 G.S.	1
75	80682-49	Bearing Lockring	1
76		4 x 3 x ½ Lip Seal Syn. Rubber Cover	4
77	63097	Name Plate	1
78	63135	Patent Plate	1
79	97841	Filler Cap & Dipstick	1
80	80682-94	Bearing Preload Spring	6
81		¼ B.S.W. Nut St. St.	2
82		¼ B.S.W. x 1" Hex. Hd. Bolt St. St.	2
83	SKF 21312	60 x 130 x 31 Spherical Roller	1
84	80682-50	Bearing Sleeve	1
85		¼ B.S.P.T. Galv. Plug	2
86	SKF29412	60 x 130 x 42 Spher. Roller Thrust	1
87	80682-47	Bearing Housing	1
88	JE 282	Water Offtake	2

HYDRAULIC REVERSE CYLINDER ASSY:

89	61294	Scraper	1
90	80682-297	Nut	2
91	80682-400	Cylinder/Transom Seal	1
92	80682-298	Front Head	1
93	61340	Rubber Covered Seal 1-3/4 x 1 x 3/8	2

Hydraulic Reverse Cylinder Assy Contd. . .

Item	Part No.		Description	Quantity
94	80682-308		Seal Retainer	1
95	61286		Seal	1
96			'O' Ring $1\frac{1}{2}$ x $1\frac{1}{4}$ x 1/8 W.S.	1
97	80682-299		Front Head Bush	1
98	DR109		'O' Ring	2
99	D53/99		90° Elbow M/M U.N. 'O' Ring/J.I.C.	1
100	80682-300		Cylinder	1
101	80682-304		Shaft	1
102	80682-317	*	Piston Seal Retainer	1
103	61339	*	Seal	1
104	80682-305	*	Piston	1
105			5/8 UNF Self-locking nut. Thin.	1
106	D52/99		Nipple M/M UN 'O' Ring - J.I.C.	1
123			3/8 UNC x $1\frac{1}{4}$ Hex. Hd. Screw St. St.	4

* The above assy. would be stamped 80682-306 'A' and with the following alternatives - 80682-306 'B'.

	102	40218	*	Piston Seal Retainer	1
*	103	61338	*	Seal	1
	104	40217	*	Piston	1

HYDRAULIC EQUIPMENT ASSEMBLY FOR MANUAL REVERSE:

79	97841	Filler Cap and Dipstick	1
107	80682-385	Upper L.H. Tube	1
108	80682-386	Lower L.H. Tube	1
109	80682-384	Lower R.H. Tube	1
110	80682-387	Upper R.H. Tube	1
111	D815/89	B.S.P.T. x J.I.C. Nipple	4
112	D68/888	Duffield Tee $\frac{1}{2}$ x $\frac{1}{2}$ x $\frac{1}{2}$ B.S.P.T.	2
113	80682-423	Connector	2
114	DR 112	'O' Ring (For 3/4 U.N. Thread)	4
115	D95/128	U.N. 'O' Ring x B.S.P.T. Nipple	2
116	80682-416	Orbitrol Crank	1
117	S.C.C.	Orbitrol Column	1
118		3/4 UNF Locknut	1
119	U.B.11	Orbitrol Pump Unit	1
120		3/4 Oil & Grease Hose (Ham. Spec. 12) x 36"	2
121		Hose Clip - Rex No. 1A	4
122	80682-422	Oil Tank	1

DISMANTLING PROCEDURE:

(Ref. Drawing No. 80682-200)

(Note: It is assumed that the boat is slipped for all work in this section. (However, note that provided the gland seals (66) are not disturbed the thrust bearings can be examined (Part 2) with the boat in the water).

1. TO CHECK GLAND SEAL:

(a) Undo drain plug (85) and drain oil.

(b) Disconnect water cooling connections (88).

(c) Unfasten the rear end of the universal drive shaft.

(d) Using pin spanner on coupling holes (69) undo coupling end nut (71), and remove coupling washer (70).

(e) Draw off coupling (69) and remove the coupling key (63).

(f) Remove the four front tie bolt nuts (49), spring washers (50) and special flat washers (58).

(g) Remove two retaining bolts (82), nuts (81) and washers (60) on each side of the bearing housing.

(h) Pull the bearing housing assembly forwards and free from the shaft, taking care not to damage the seals (76). Note that the front seal sleeve (68) will come out with the bearing housing assembly, but is only supported by the seals. It can drop out and damage easily. The rear seal sleeve (68) should stay with the shaft and can now be drawn off - take care not to damage the outside chromed surface.

(i) Remove the shaft slinger (67). Remove the seal counter-face (45) and 'O' ring (44) by removing the four retaining bolts (47) and lock washers (46).

(Take care not to damage the face of the seal faces (45) and (42) against which the carbon seals run and seal).

(j) The housing sleeve (43), seal assembly (66), seal face (42) and 'O' ring (41) can now be removed.

(k) Examine all parts for wear, damage etc., and replace if necessary. The surface finish of the carbon seals and the seal faces (46) and (42) is most important to obtain a satisfactory seal, the seal faces having a lapped finish.

If the auxiliary seal face is damaged (42) then this component (being lapped on both sides) can be reversed - the seal running on the non-worn side.

(l) If the surface of the seal sleeves (68) is pitted or scratched where the seals run they should be replaced. The seals (76) should be tight still when assembled on the sleeves and when held up to the light no light should pass through the gap between seal and sleeve. If fit loose or light passes through joint, replace seals.

(m) Thoroughly clean all components in a grease solvent.

(n) Reassemble in reverse order from above, noting the following points:-

(i) Pack the seal (76) cavities marked 'X' with a lithium based grease on reassembly.

(ii) The contact surface between the bearing housing (87) and the intake (51) should be coated with lanoline.

(iii) The tie bolt nuts (49) should be torqued to 100ft. lbs. Take care to reassemble the flat washer (58) next to the bearing housing and then the spring washer (50) next to the nut (49).

(Before tightening tie bolt nuts check the four sleeve adjusters (57). They should be hand tightened and then undone one-third of a turn).

(iv) Retorque mainshaft coupling nut (71) to 160 ft. lbs.

(v) Refill the bearing housing with 'Shell Tellus 27' or equivalent up to dipstick mark (79) after replacing drain plug (85).

(vi) Avoid grit, dirt etc. at all times especially with the seal (42) surfaces.

2. TO CHECK THRUST BEARING ASSEMBLY:

(a) Proceed as in part 1 for Gland Seal, steps 1(a) to 1(h).

If it is intended to examine the gland seal continue with steps 1(i) and 1(j), otherwise proceed as follows:-

(b) Untighten lock nut (73) and withdraw locking screw (72). Unscrew the lock ring (75) and withdraw. The bearings (83) and (86) and sleeve (84) should also slide out now. Take care not to lose the six bearing preload springs (80) which are now free to drop out. If the bearing and sleeve assembly will not slide out do not force, but slightly heat the bearing housing (87).

(c) Examine the running surfaces of the bearing races for pitting and/or wear. Examine the cages of both bearings to ensure that they are still intact.

(d) Examine the seal sleeves (68) and seals (76) as outlined in section 1(l) of 'Gland Seal' procedure.

(e) Examine 'O' ring for cuts or deformities and replace if necessary.

(f) Thoroughly clean all components before reassembly in a grease solvent, and remove any sludge from the oil reservoir in the bearing housing itself (87).

(g) To reassemble:-

(i) Replace the preload springs (80) and slide the bearing and sleeve assembly (83), (84) and (85) back into the housing (87).

(ii) Assemble the 'O' ring (74) on the bearing lock ring (75) and screw the lock ring into the bearing housing (87).

(iii) The lock ring (75) should be tightened and then undone approximately 15^{o}, such that the axial bearing clearance is .005 - .007 inches. This can be measured by inserting feeler gauges between the bearing face (86) and the housing (87).

(iv) When the clearance is correct maintain the lock ring (75) position and make a dimple in it by placing a drill down the lock ring bolt (72) hole. (Take care not to damage the thread).

(v) Replace the locking bolt and its lock nut (72) and (73).

(vi) Proceed as under 'Gland Seal' procedure section 1(n).

3. TO CHECK REAR (CUTLESS) BEARING:

(a) Remove the reverse bucket (17).

(i) With the reverse bucket propped in the 'up' position remove the two cylinder pins (20) by taking out one split pin (2) from each cylinder pin (20).

(ii) Lower the reverse bucket (17). Note the positions of the pivot spacing washers (21) - (these should be reassembled in the same positions) - and then remove the pin retainer bolts (24) and washers (15) to withdraw each pivot pin (23).

(iii) Draw the reverse bucket (17) away.

(b) Remove the Inspection Cover (39).

(i) Remove the eight nuts (28) and washers (35).

(ii) Draw the cover off the studs.

(c) Remove the Steering Arm (34).

(i) Remove the retaining nut, washer and bolt (12), (27), (28) from the steering arm (34).

(ii) Slide the steering arm (34) forward and off.

(iii) Remove the key (25).

(d) Tailpipe Assembly.

(i) Remove the rear most adjusting nut (90) from each hydraulic reverse cylinder. (Use two spanners, one on each of front and rear nuts (90).

(ii) Remove the four tailpipe stud nuts (49) and the four rear tie bolt nuts (49).

(iii) Slide the tailpipe assembly away from the intake - take care not to damage the steering shaft seals (32) and the cutlass bearing (7).

(e) Examine the running surface of the rubber cutlass bearing (7). If badly worn or scored the bearing should be replaced. Use an internal 'puller' to remove worn bearing from the tailpipe (16). Fitting the new bearing should be done with a press. If this is not possible the bearing can be driven in with a suitable mandrel but the bearing itself should never be struck with a hammer or similar. Press or drive the bearing in till dimension 'Y' (Drawing 80682-200) equals 4-9/16. This dimension is from the front and face of the tailpipe flange (that which contacts the intake face on assembly) to the front end of the cutlass bearing. It is best measured by placing a 'straight edge' across the tailpipe flange and measuring down to the cutlass bearing.

(f) Examine the impeller (64) leading edges for damage and/or blunt edges. If the impeller (64) requires attention proceed with section 4. 'To Check Impeller'. If the impeller is satisfactory reassemble using the reverse of the procedure above used to dismantle. The following points should be noted however:-

(i) Coat the bearing sleeve (62) with french chalk so that the cutlass bearing (7) is not damaged on reassembly.

(ii) Do not overtighten the inspection cover (39) - it is sufficient to 'nip' the nuts (28) two to three turns.

(iii) Tailpipe stud nuts (49) should be torqued to 100 lbs. ft. after checking that the four sleeve adjusters (57) are correctly adjusted. (The latter should be hand tightened and then undone one-third of a turn).

(iv) The reverse cylinders should be repositioned (by altering the position of the adjusting nuts (90)) so that both cylinders are 'bottomed' when the reverse bucket (17) is fully up.

4. TO REMOVE IMPELLER:

(First refer to sections 6. and 7. of the maintenance section for details of inspecting impeller and sharpening blades.)

(i) Proceed as in Part 3. 'Rear (Cutlass) Bearing' of this section steps (a) to (d) and also examine the cutlass bearing as in step (e) and replace as outlined if necessary.

(ii) The shaft and impeller are now accessable from outside the boat. Lock the mainshaft (65) to stop it turning. (It is recommended that a pin spanner be applied to the front coupling (69) to do this).

(iii) Remove the capscrew (59) and spring washer (60) from the rear shaft nut (61).

(iv) Undo the rear shaft nut (61).

(v) Slide off the bearing sleeve (62) (stand on end to avoid damage to the chrome surface).

(vi) The impeller can now be drawn off and the key (63) removed. Should the impeller be difficult to remove from this position, dismantle the coupling end of the shaft assembly as in 'Gland Seal', part 1(a) to 1(j) and slide the impeller (64) and shaft (65) out from the rear of the intake (51).

(vii) When the impeller (64) and key (63) are removed from the shaft, clean shaft and keyway thoroughly. Polish lightly with a fine emery cloth if necessary to remove any scale etc.

(viii) If the shaft has been removed reassemble coupling end back in unit as per part 1(k) onwards as for 'Gland Seal Inspection'.

(ix) Overhaul the impeller as outlined in Part 7 in maintenance section.

(x) Smear shaft (65), key (63), sleeve (62) and impeller bores well with lanoline.

(xi) Replace key in shaft and slide the impeller on to shaft.

(xii) Replace sleeve (62), ensuring that the key (63) engages in the slot in the sleeve (62).

(xiii) Do up rear shaft nut (61) and retorque to 160 ft. lbs.

(xiv) Replace capscrew and washer (59) and (60) and tighten. (Do not overtighten).

(xv) Reassemble tailpipe as for part (3) step (f).

5. HYDRAULIC REVERSE EQUIPMENT:

(a) Orbitral Pump Unit (119):-

Providing the oil is kept clean and free of contaminates this pump should be trouble free. If, however, it is damaged or fails the pump should be returned to C.W.F. Hamilton & Company Ltd. for repair or replacement.

(b) Reverse Cylinders (Assembly Items (89-106):-

These should not be taken apart unless:-

(i) The oil has been contaminated, when all parts should be thoroughly cleaned and reassembled, or -

(ii) Oil is leaking from any of the seals.

If one cylinder leaks then strip the other at the same time and replace worn parts.

To Dismantle Cylinders:

(i) Disconnect reverse bucket -
With the reverse bucket propped in the 'up' position remove the two cylinder pins (20) by taking out one split pin (2) from each cylinder pin (20).
Lower the reverse bucket.

(ii) Drain the hydraulic oil -
Disconnect the circuit at its lowest point and let the oil drain into a container.

(iii) Disconnect pipes at points 'A' and 'B' (see Drawing 80682-200). (Arrange to catch leaking oil from pipe ends).

For each cylinder:-

(iv) Remove four 3/8 bolts (123).

(v) Draw the cylinder (100) away from the front head (92). Arrange container or cloth etc. to catch the oil which will be inside the cylinders (100).

(vi) The shaft (101) and piston assembly (102-105) may come apart with the cylinder. If they do then draw the shaft and piston out of the cylinder. If the shaft remains in the front head then withdraw it forward till clear.

(vii) Withdraw items (93) to (97).

(viii) Clean all parts with an oil solvent.

(ix) Inspect all rubber seals for wear, cuts etc., i.e. Items (89), (93), (95), (96), (103). Replace if worn or damaged.

(x) Inspect the surface of the shaft (101) for pits or scores and wear. Replace if badly worn or scored. If only lightly scored polish out the marks and fit new seals (89), (93), (95) as the seals will most certainly be damaged.

(xi) Inspect the bore of the cylinder (100) for scores, pits and/or wear. Replace cylinder if badly worn or scored. If only slightly worn or scored hone out the bore (to a maximum of 1.513 inches diameter), and fit new seals (96), (103).

Note:

Remember that the surface finish of the shaft (101) and cylinder bore (100) are critical for good sealing and if the cylinder is reassembled with faulty components the life of the cylinder will be very short before it fails again.

Also, it is not recommended to disturb the seal (91) by undoing the nuts (90) unless the jet itself is being dismantled.

To Reassemble:

(i) Replace items (89), (93), (94), (95), (97), (96) into the front head (92).

(ii) Refit items (102), (103), (104) and (105) to shaft (101) and tighten nut (105).

(iii) Slide the piston and shaft assembly into the cylinder (100) taking care not to damage the seals. It is good policy to oil the bore and seal surfaces before assembling.

(iv) Oil the protruding shaft (101) and then slide gently through the gland and seal assembly (93) - (97).

(v) Replace the four 3/8 bolts (123) and tighten.

(vi) Reconnect the hydraulic pipework in the circuit.

(vii) Reconnect the reverse bucket by replacing pins (20) and split pins (2). See note (iv) of Part 3.

(viii) Fill and bleed the hydraulic system as outlined in step (c) part 3. 'Forward/Neutral/Reverse Control' in the 'General Installation Details' section.

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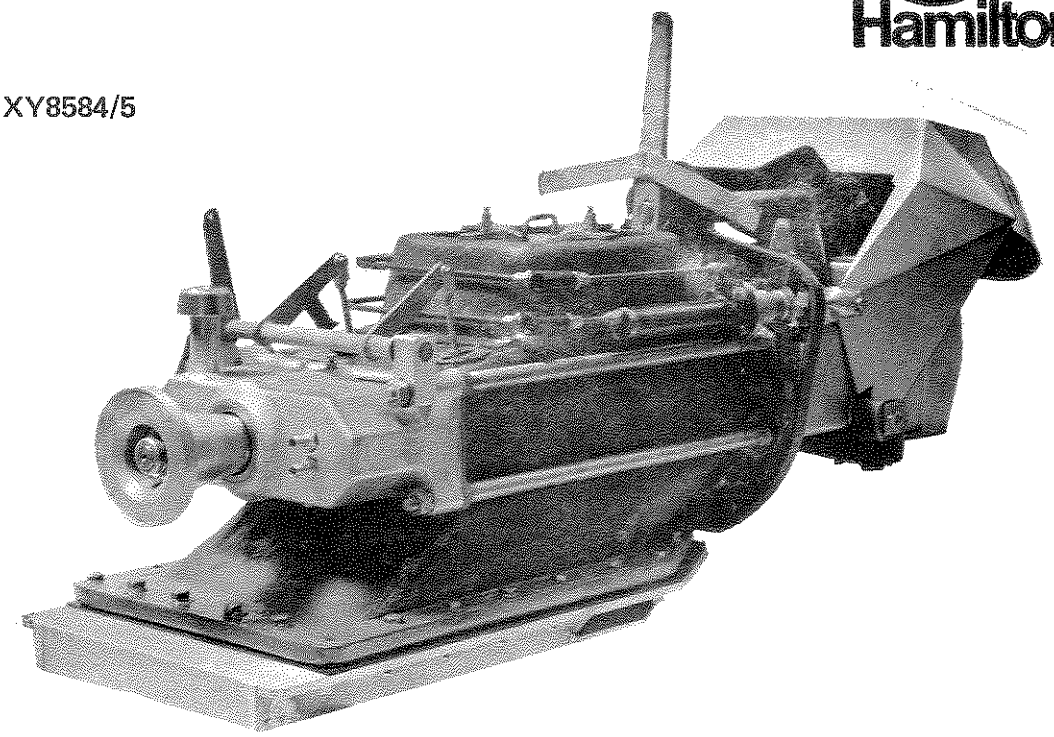
MARINA
DIESEL-POWERED JET
C.W.F.HAMILTON & CO.LTD. RESEARCH DIVISION

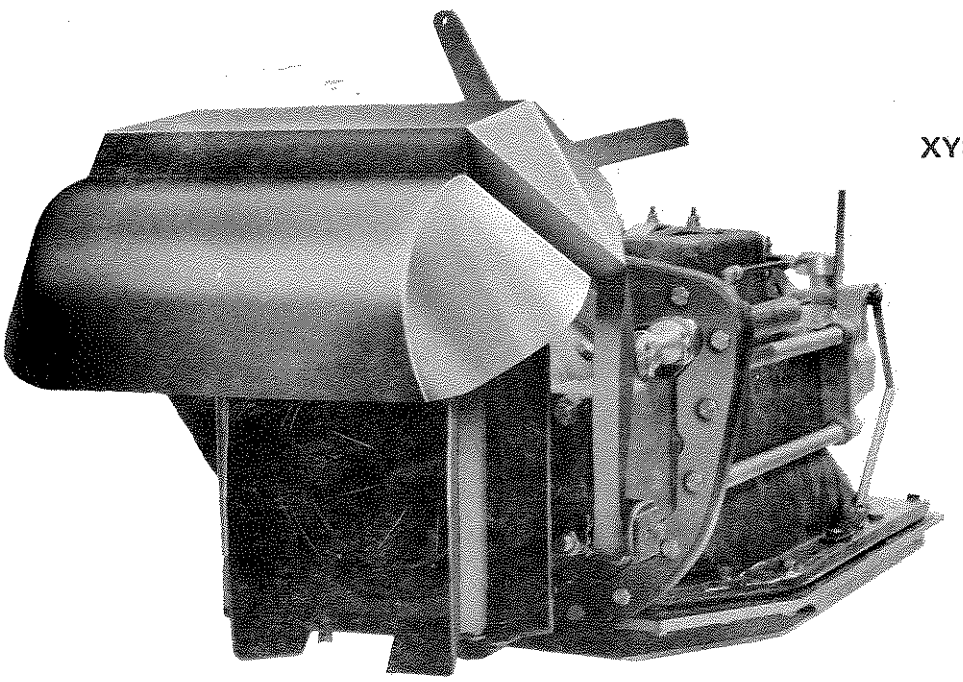

HamiltonJet

XY8584/5



Drive coupling end, and thrust bearing housing

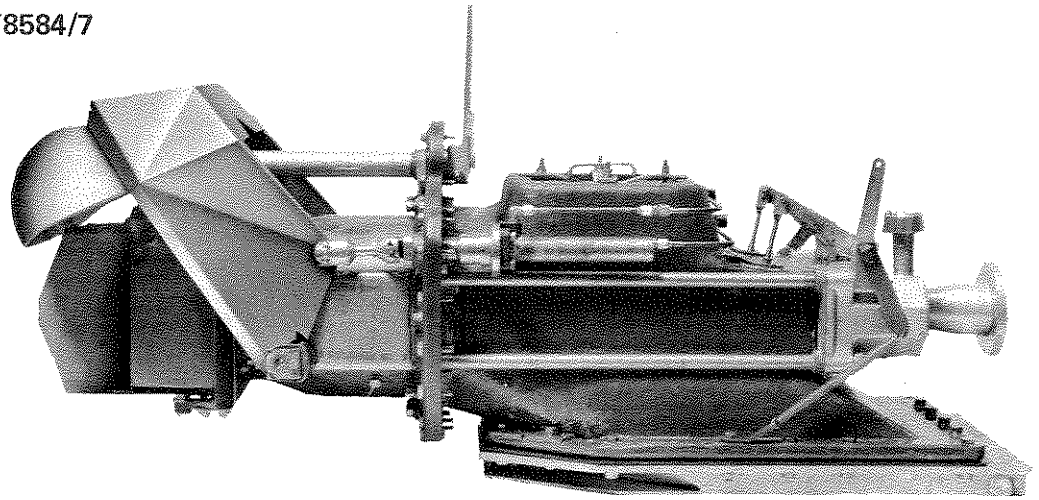
XY8584/1



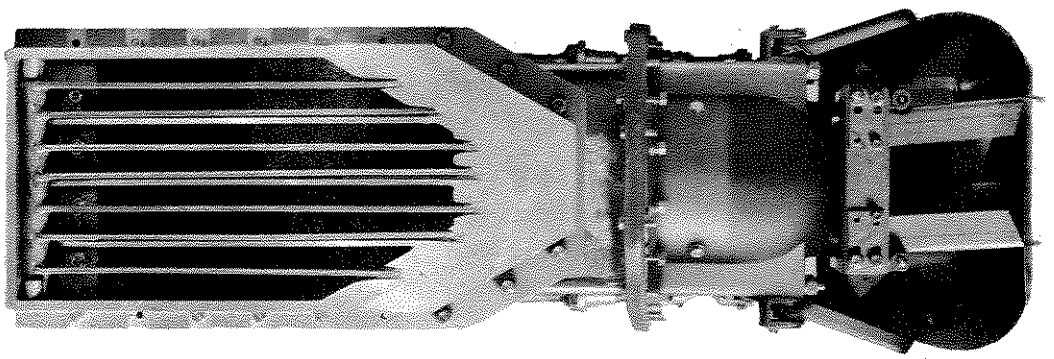
Outlet end, showing reverse bucket and nozzle

HAMILTON 1312 SERIES MARINE JET PROPULSION UNIT

XY8584/7



Side view, single stage, with aluminium base plate



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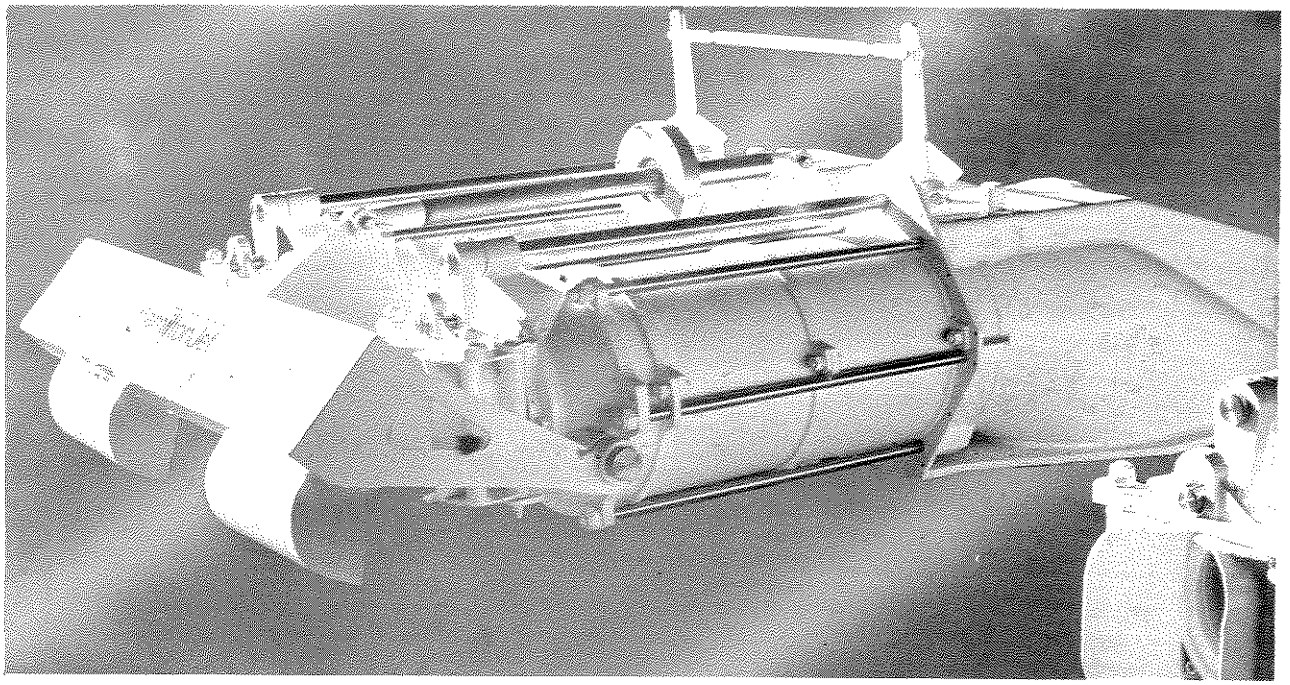
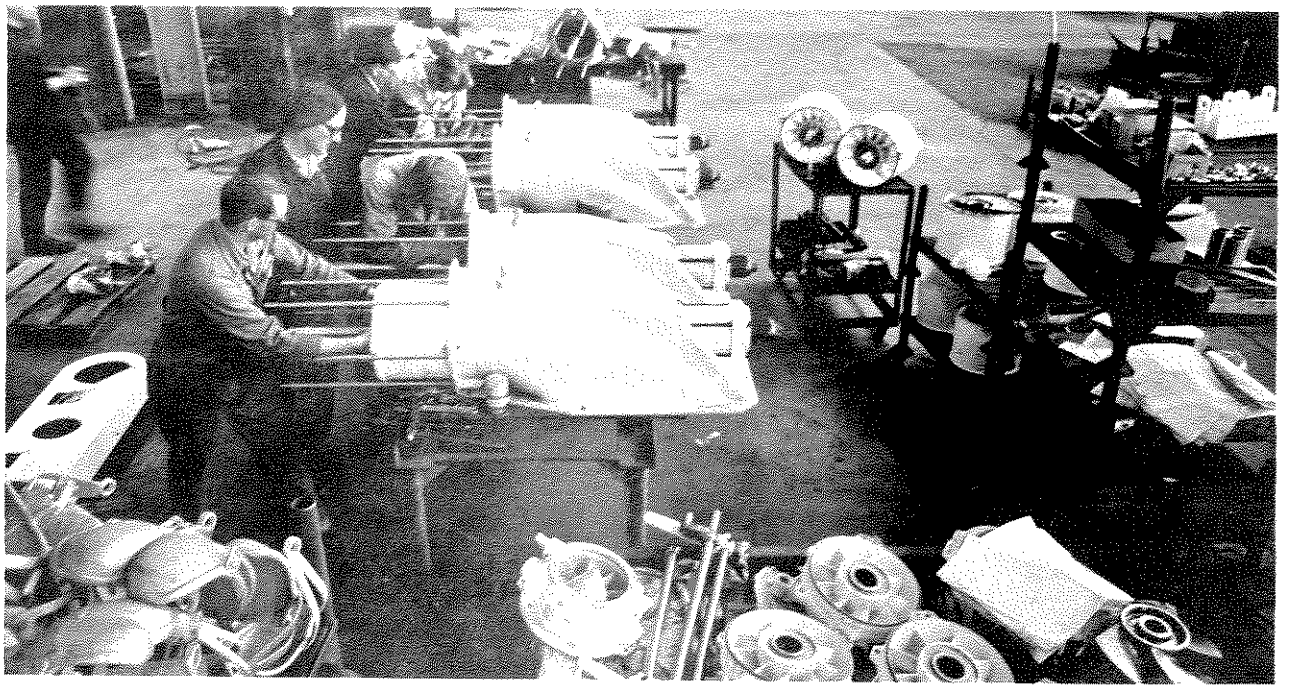
View underneath, showing optional weed-clearing screen arrangements

HAMILTON 1312 SERIES MARINE JET PROPULSION UNIT

HamiltonJet



Two jet units ganged for 1000 h.p. continuous input from twin gas turbines.



Assembly of 1331 Series jet units.

HAMILTON 1331 SERIES MARINE JET PROPULSION UNITS