

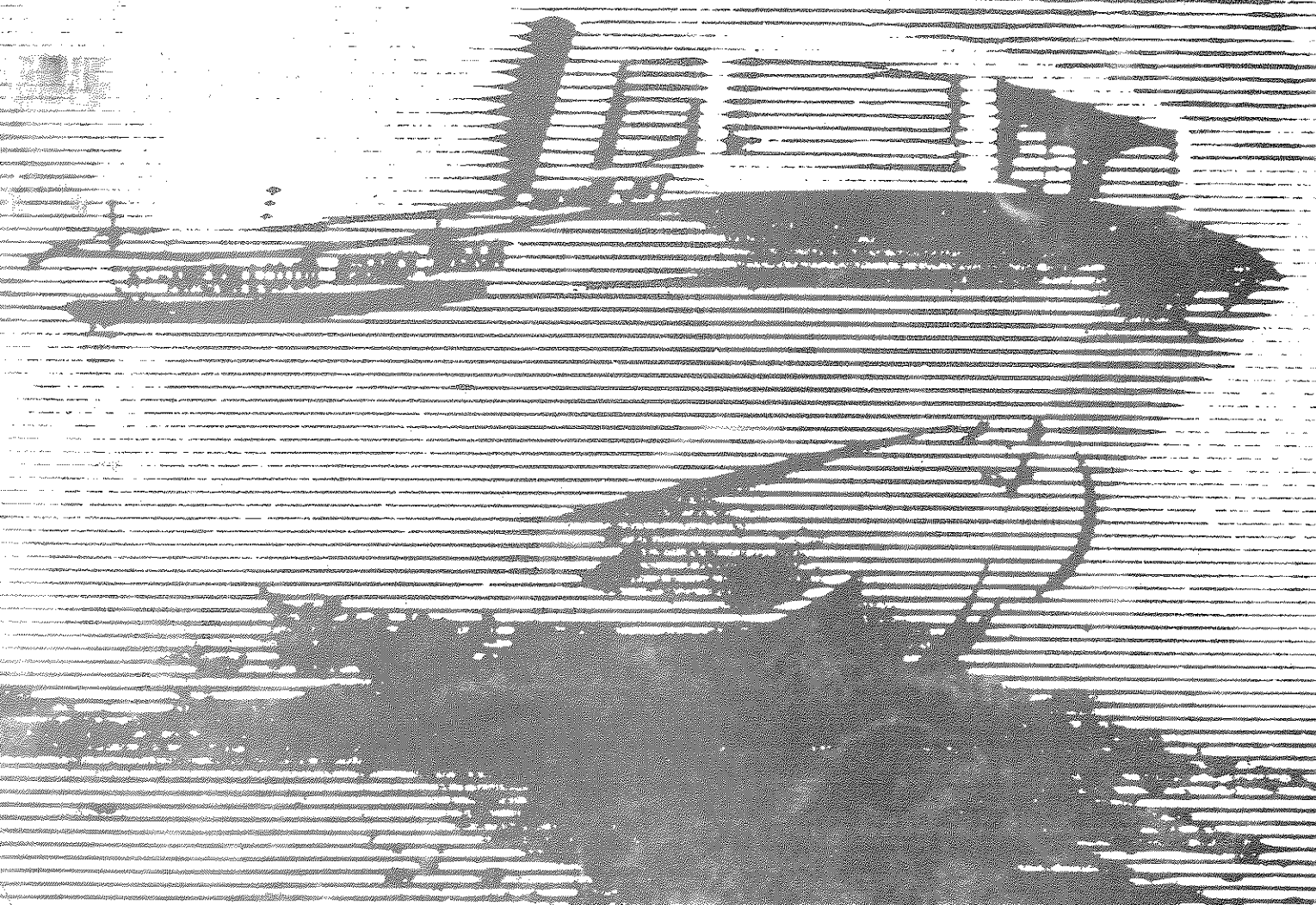
RJL



**HamiltonJet**

**1000 Series Unit**

**Owner's Manual**



HAMILTON MARINE JET UNITS

1000 SERIES

FOR DIESEL ENGINES

MODEL 1011

INDEX

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

September, 1972.

## GENERAL DESCRIPTION

The Hamilton Jet Unit is a device for propelling boats by harnessing the Reaction 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 reaction 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 1011 series units consist for four main parts:-

1. An Intake Duct - to convey water from the bottom of the boat to the pumping unit. This is made from corrosion resisting Silicon-Aluminium alloy, and contains a thrust bearing mounting, and an inspection hatch. A screen or grill is mounted across the intake opening to deflect debris from the interior of the unit.
2. The Thrust Bearing - is mounted on the front face of the intake duct, and carries a heavy duty duplex ball bearing 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. The bearing is cooled by the incoming water.
3. The Main Pumping Unit - is a single stage axial flow design mounted at the outlet end of the intake, and easily detachable for servicing. Axial-flow design is chosen since it ensures the highest possible flow rate to give the most efficient propulsion. The pump consists of a four-bladed impeller, running with in a stainless wear-ring, and an associated set of guide vanes in the tailpipe. The water is expelled from a large diameter nozzle, which handles about 17 tons of water per minute. This high flow capability is essential for efficient jet propulsion.
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 rod and lever system from inside the boat 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 1011 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 displacement launches and barges.

The units give the advantages of:-

- Extreme ease of fitting and removal
- Shallow draught
- Clean-bottomed hulls
- No propeller damage
- Greatly increased manoeuvrability
- Low maintenance
- High propulsive efficiency
- 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 mounted outboard of transom. Stainless steel impeller. Intake housing and tailpipe of cast Silicon-Aluminium alloy (LM6).
5. Anti-friction thrust bearing, grease 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 main pumping unit 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. Outboard mounting on single angled hull surface with only one hole in the hull.
10. Other impeller pitches available for different engine characteristics to special order.
11. Flange drive coupling supplied to suit 1350 /1400 series Hardy Spicer universal drive shaft. (Similar to 1313 Model.)
12. Manual operation of counter-balanced reverse deflector supplied with inboard lever.
13. Recommendations for hull modifications for mounting, engine coupling and steering arrangements supplied with each unit.

#### IDENTIFICATION OF UNITS

The 1000 series units are identified as follows:-

<u>Impeller Dia.</u>	<u>Model Type No.</u>	<u>No. of stages</u>
10" - 11"	Mark 1	1

becomes: 1011 Model

Note: All Hamilton Jet Models from June 1972 will use the above system.  
The last two categories have been interchanged from the 1300 series.

#### SERIES 1011 JET UNIT

Length of boat	:	22 - 50 ft (7 - 15 m.)
Weight	:	Up to 5 tons
Revolutions	:	1500-3000 r. p. m.
Weight of unit	:	approx. 280 lb. (127 kgs)
Rotation	:	L. H. only available (Clockwise looking at jet drive coupling)
Ratings		Slow speed displacement boats, barges, etc. Rated up to <u>64 s. h. p. maximum.</u>
Mountings		This unit is designed for complete outboard mounting, against a single angled surface easily arranged on the hull, through which pass all the necessary shafts, controls, and other inboard items. The whole unit can be mounted in the prepared boat in minutes, and be detached completely if required for inspection, maintenance or overhaul just as simply. (This arrangement is subject to Prov. N. Z. Patent Application No. 166824).

EQUIPMENT AND OPTIONS

ITEM		STANDARD EQUIPMENT
1.	Impeller diameter	270 mm (10.63")
2.	Stages	1
3.	Impeller	Part No. 102258
4.	Nozzle diameter	180 mm (7.1")
5.	Mounting	Single 30° flat surface
6.	Screen Cleaning method	Inspection hatch
7.	Reverse operation	Manual lever
8.	Steering	Tiller arm inboard
9.	Intake screen	Fixed bar (general use)
		OPTIONAL AT EXTRA COST
1.	Intake screen	Free finger (weedfree) *
2.	Intake screen	Mechanical opening bars *
3.	Coupling shaft	Hardy Spicer 1350/1400 Series short shaft assembly.

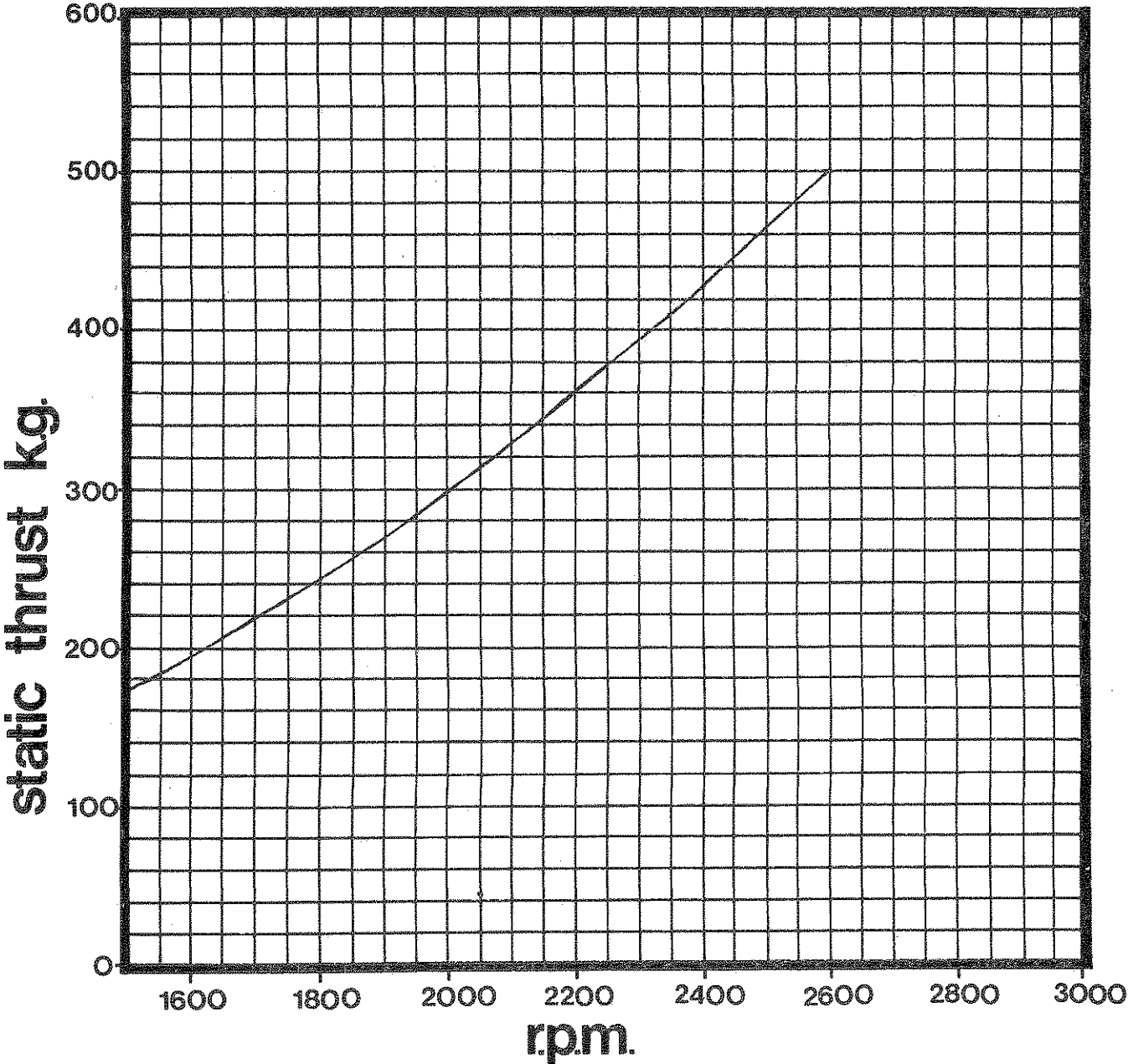
\* Under Development

ALL TECHNICAL INFORMATION CONTAINED IN  
THIS MANUAL IS SUBJECT TO CHANGE WITHOUT  
NOTICE

# Static Thrust Curve

## 1011 Jet

Nozzle 180 mm    Impeller 102258

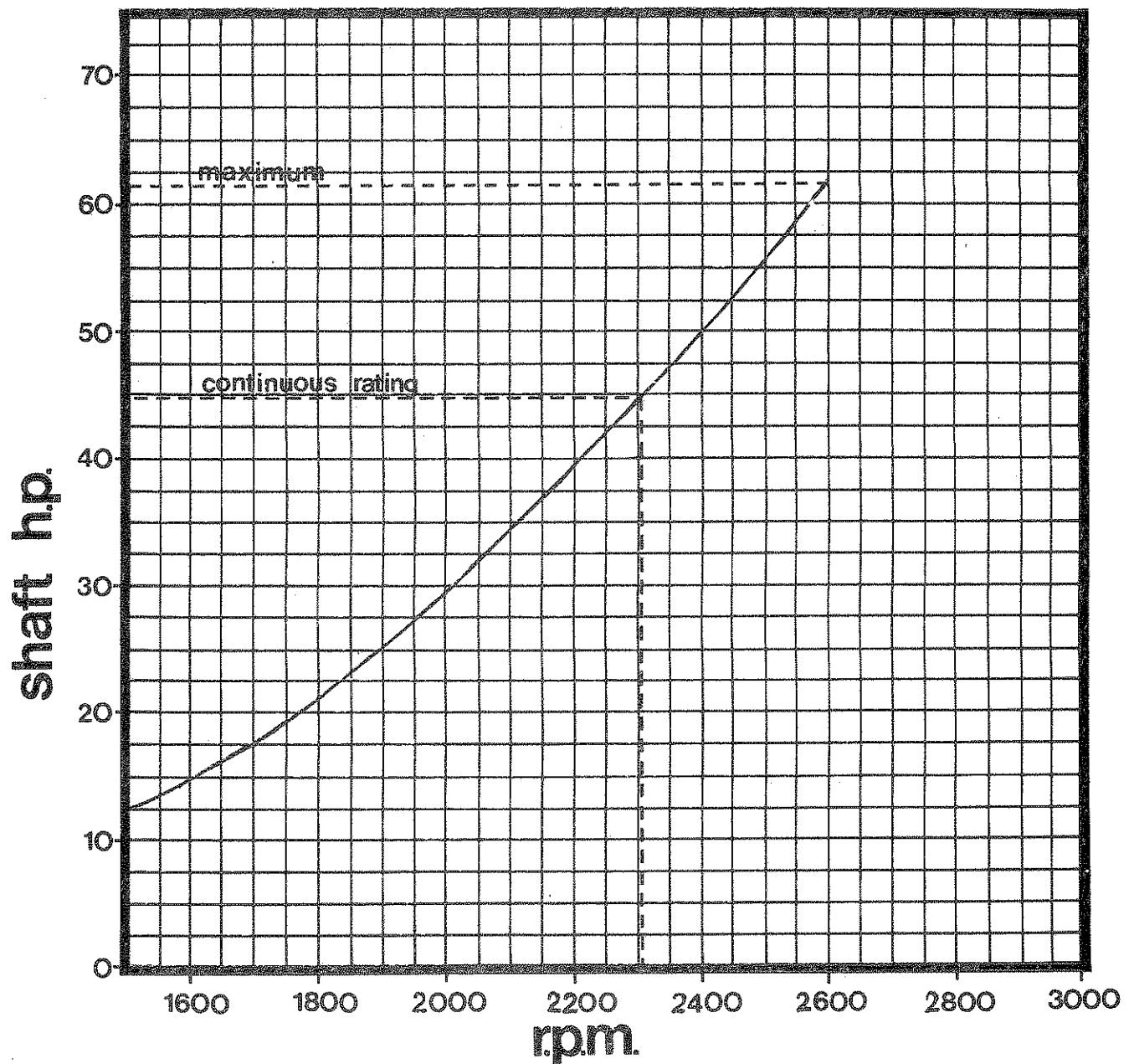


# Power Curve

## 1011 Jet

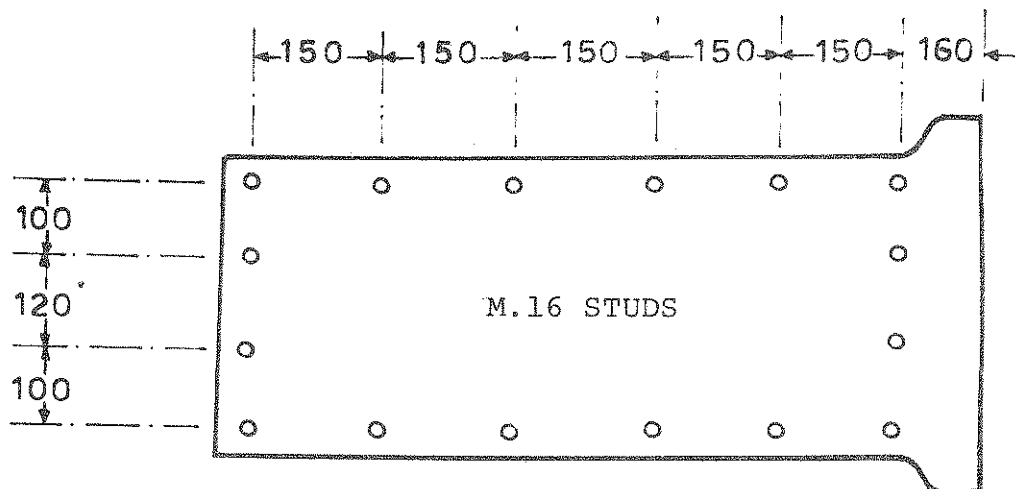
Nozzle 180 mm

Impeller 102258

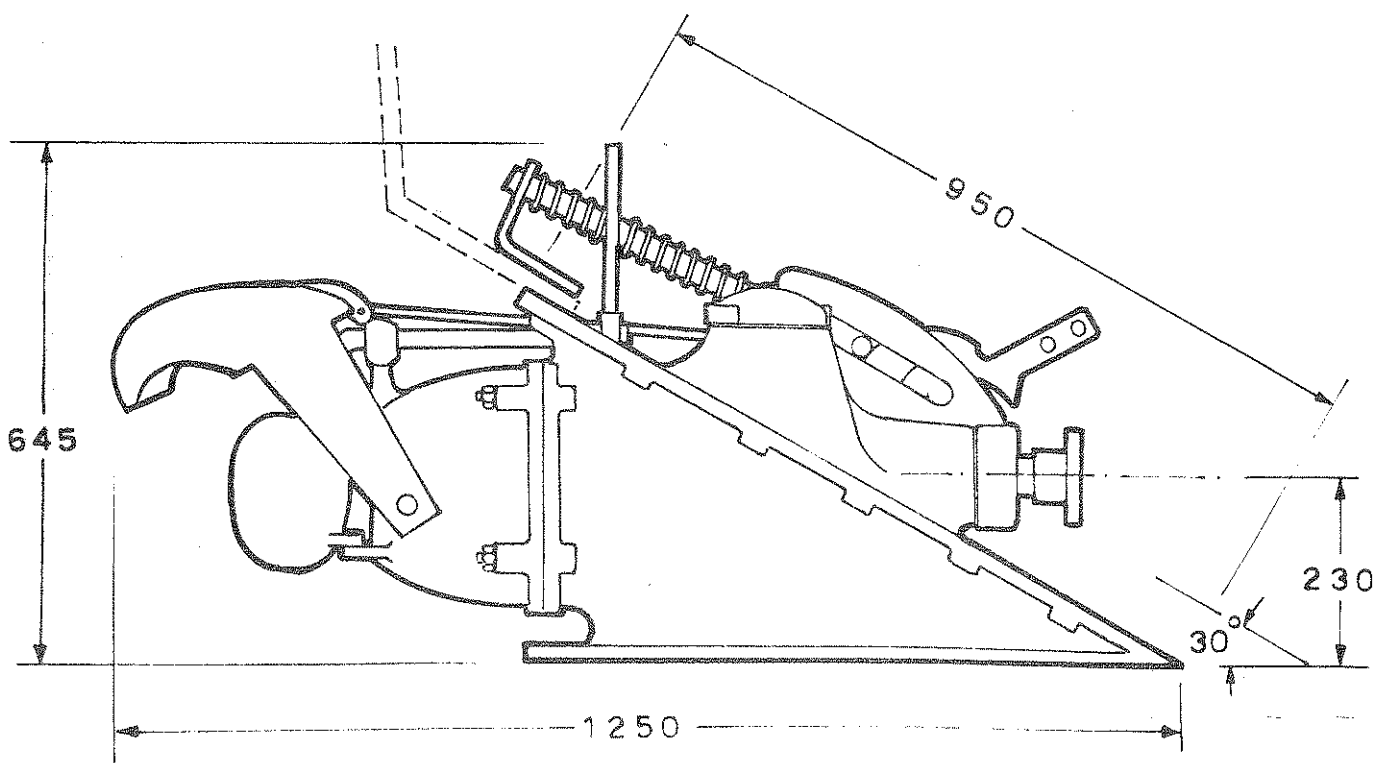
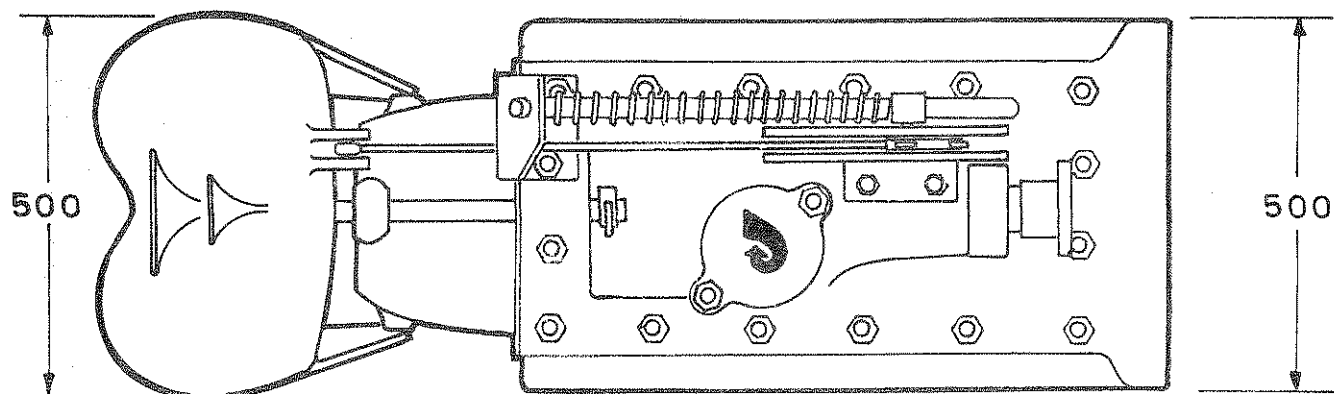




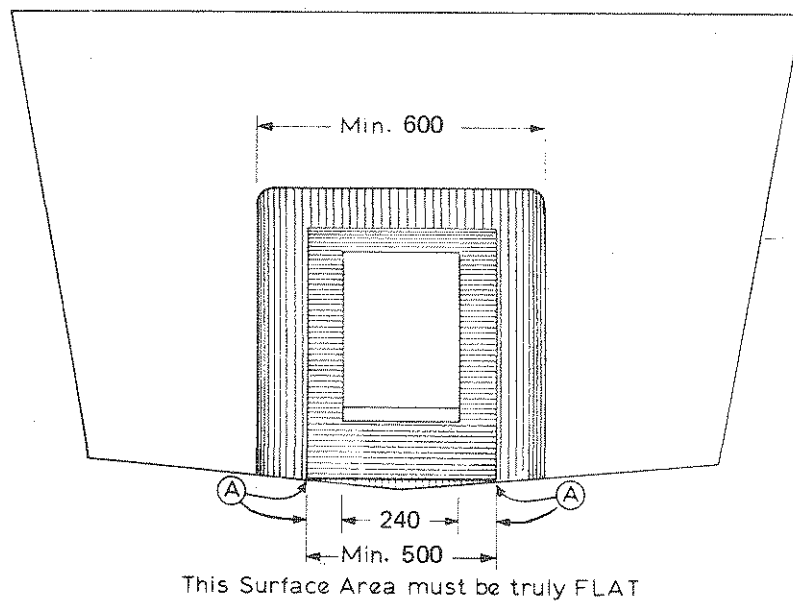
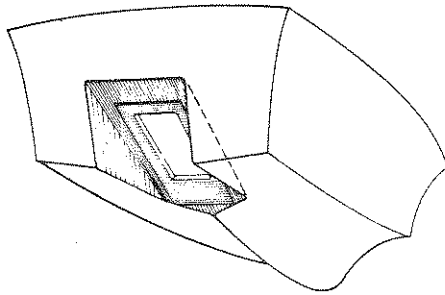
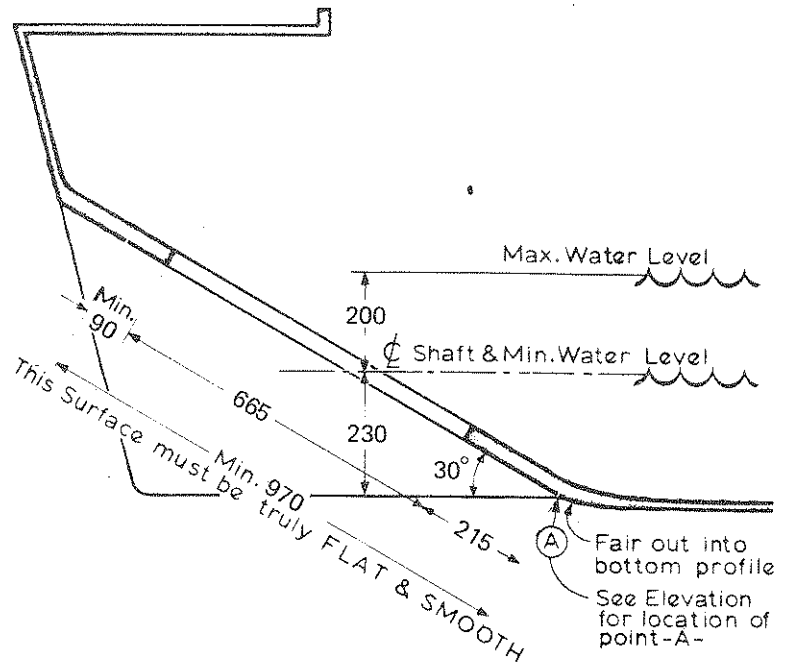
## DIMENSIONS



STUD PATTERN



# HULL PREPARATION FOR 1011 JET



## INSTALLATION DETAILS

### HULL PREPARATION

1. Prepare hull to accompanying installation drawings. Take care to arrange mounting in correct relation to the craft's minimum waterline, and to ensure a truly flat mounting surface at 30° to the waterline.
2. Cut hole through hull centrally in the mounting area. check its dimensions, and position in relation to the bottom edge of the 30° mounting face.
3. This angled face should be strong, rigid and securely attached to the hull and transom in such a way as to safely transfer the thrust of the unit to the hull proper.
4. Drill holes through the hull to the pattern laid down on the template for the purpose.
5. Have a trial fitting of the unit to check hole centres.
6. Liberally smear both surfaces of the sealing gasket with a suitable sealing cement, fit over the studs on the unit and offer the unit up to the hull. (If desired the unit may be slung by a crane by the two inspection hatch bolts with a short crossbar, and pulled up with a sling descending from above and through the mounting hole).
7. Make sure the unit comes up neatly all around, put on washers and nuts and evenly tighten all round. Make sure the bottom sharp edge is practically flush with the bottom edge of the 30° angled mounting surface, but should NOT PROTRUDE below it.
8. The unit now installed, engine can be linked to the coupling, steering connected, and reverse control lever arranged.

### 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:

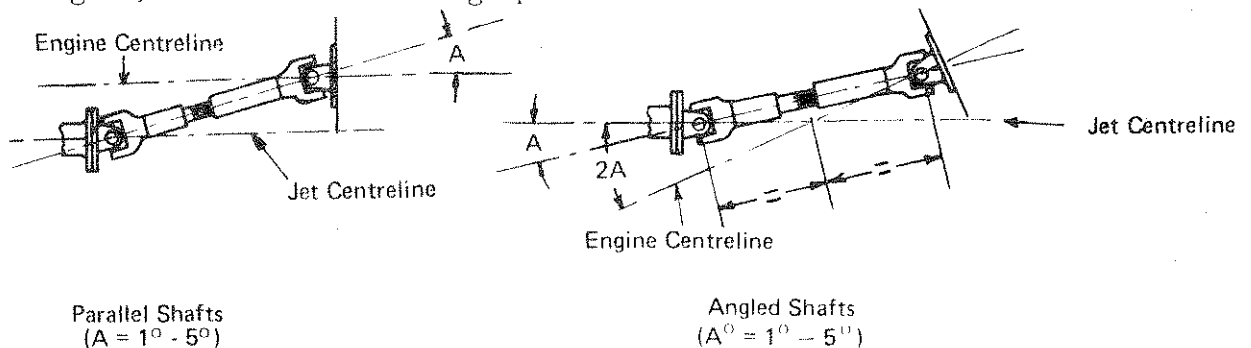
Mount the engine on longitudinal bearers so that the crankshaft line is preferably level and with a small clearance only under the oil sump.

### Drive Shaft:

The drive coupling is made to match a Hardy Spicer 1350/1400 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 too great an angle which would cause wear.

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



**IMPORTANT** Limit universal angles to a maximum of  $5^{\circ}$  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 102186.

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

### 3. FORWARD/NEUTRAL/REVERSE CONTROL

#### Principle of Operation:

The reverse bucket is the key to the 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, it is dispersing the water so the resultant thrust is 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 from planing speeds with pleasure craft). This is a safety factor which only jet drives can give.

### 4. 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 to steering cable should be insulated, or insulate the whole steering system from the hull.

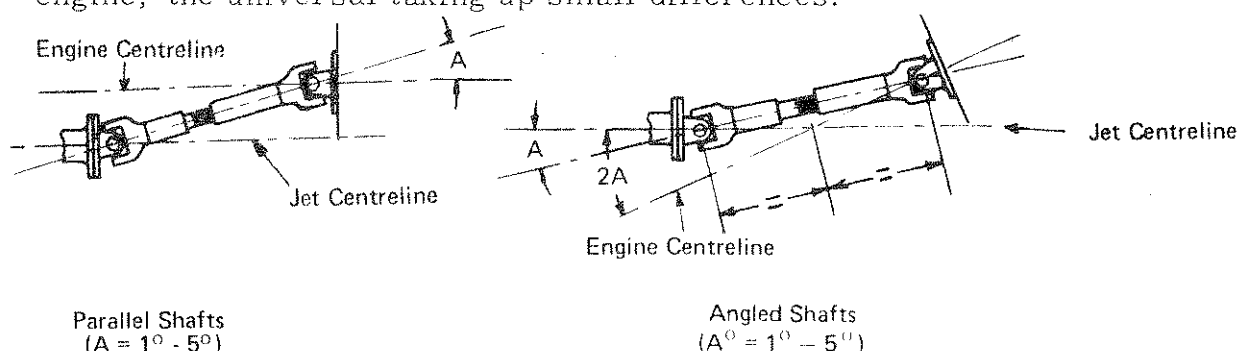
(iii) Use insulating bushes into the hull, and insulating washers under each heavy washer, before bolting up.

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(iii) Use insulating bushes into the hull, and insulating washers under each heavy washer, before bolting up.

## OPERATION & MAINTENANCE

### OPERATION OF THE JET UNIT

#### 1. Steering:

The deflectors 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 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 vice 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:

##### 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. 1,200 r. p. m. with high speed diesel engines).
- (ii) Move the lever control to the neutral position.
- (iii) A slight movement 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 reverse lever. Move the reverse lever a little either side of the neutral position.

### 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 with small throttle opening.

## 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 - 3 in Dismantling Procedure 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 Bearing:

Grease with a good quality Lithium-based ball bearing grease every 30 hours' operation. Do not overgrease.

#### 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 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.

To inspect the bearing see dismantling procedure section.

#### 3. Gland Seal:

This is a carbon face seal type with bronze counterface and should require no attention.

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. Sacrificial Anodes:

The unit is fitted with anodes on the intake casting which will waste away in sea or contaminated water. Regularly inspect these anodes, and replace immediately they are reduced in size to a serious degree. If allowed to disappear, corrosion will start on the Aluminium parts which could eventually damage the unit.

## 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 1011 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:-

Remove the two nuts and washers and draw the cover off.

Blockages of the unit are usually noticed by (a) the engine 'racing' and or (b) lack of jet thrust or 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.

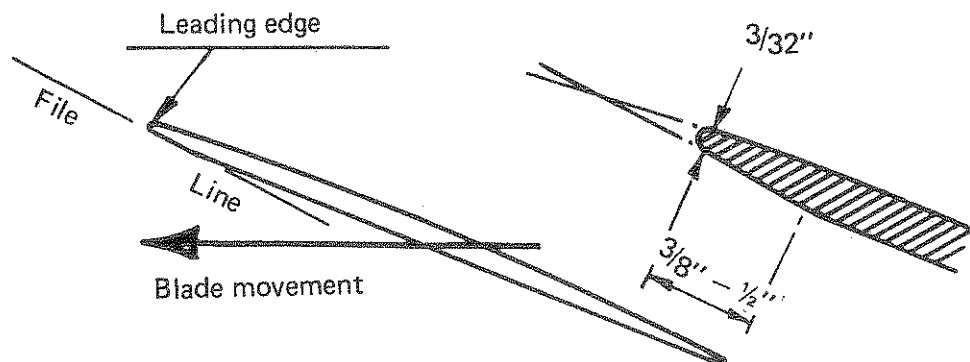
Recommended practice is to close the throttle or even stop the engine and coast over such bad debris if the boat cannot steer round it.

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 small solid particles in the water. The performance of the impeller will drop with the blades blunt.

Anytime the inspection cover is removed (as 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.

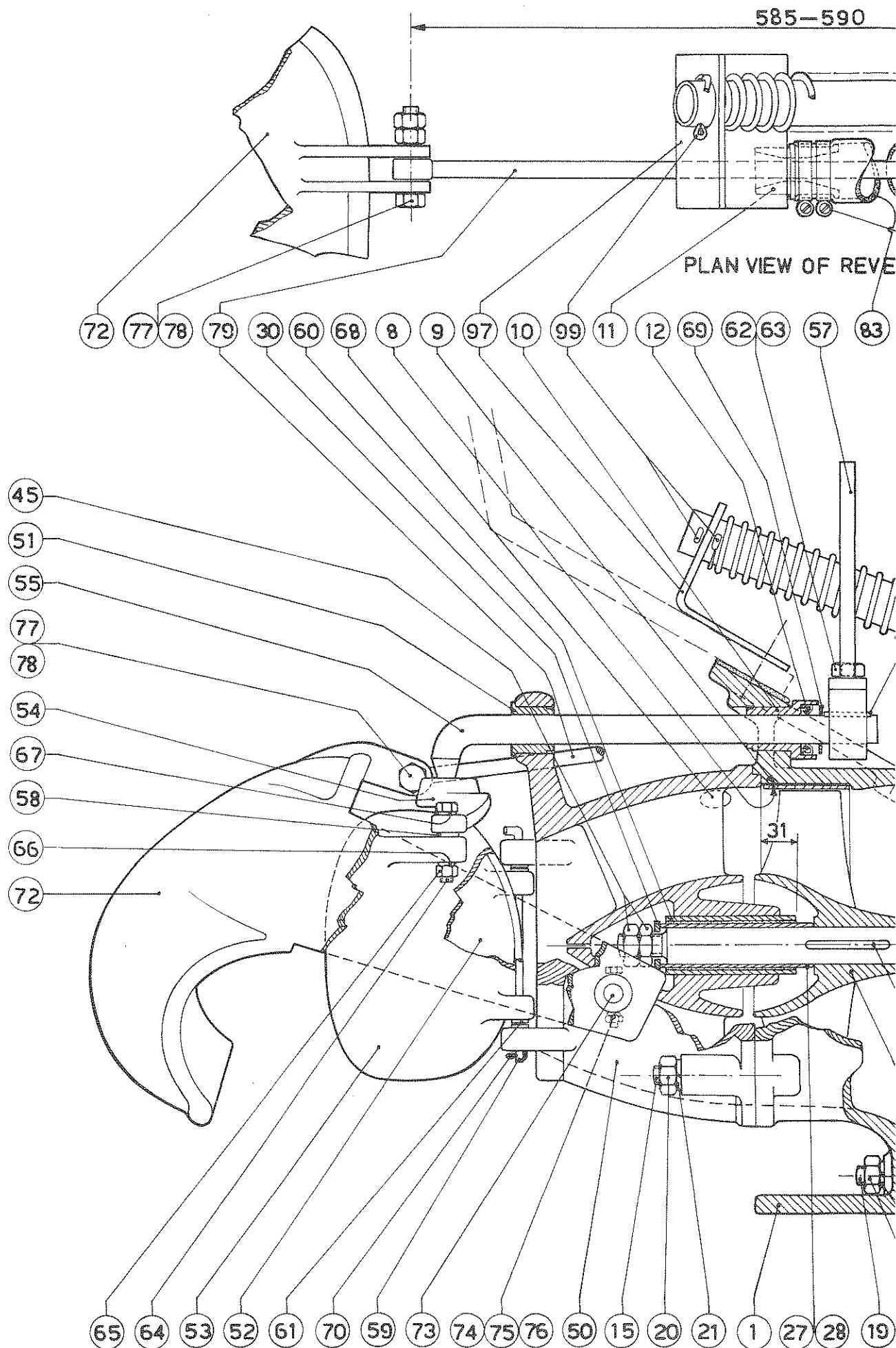
9. Care of Jet Unit Housings

The main body of the unit is constructed from Silicon-Aluminium alloy (LM6) which best resists corrosion from salt water. These castings are finished in a Poly-urethane paint finish. Periodic cleaning down, wire-brushing, and repainting may be necessary depending on water conditions prevailing, and extent of use.

10. Periodically when the craft is on the slip, or at least an annual survey, the complete unit should be removed from the boat, and inspected internally and externally for faults, corrosions, or breakages. Clean down and repaint the castings. (Do not use copper-based paints).

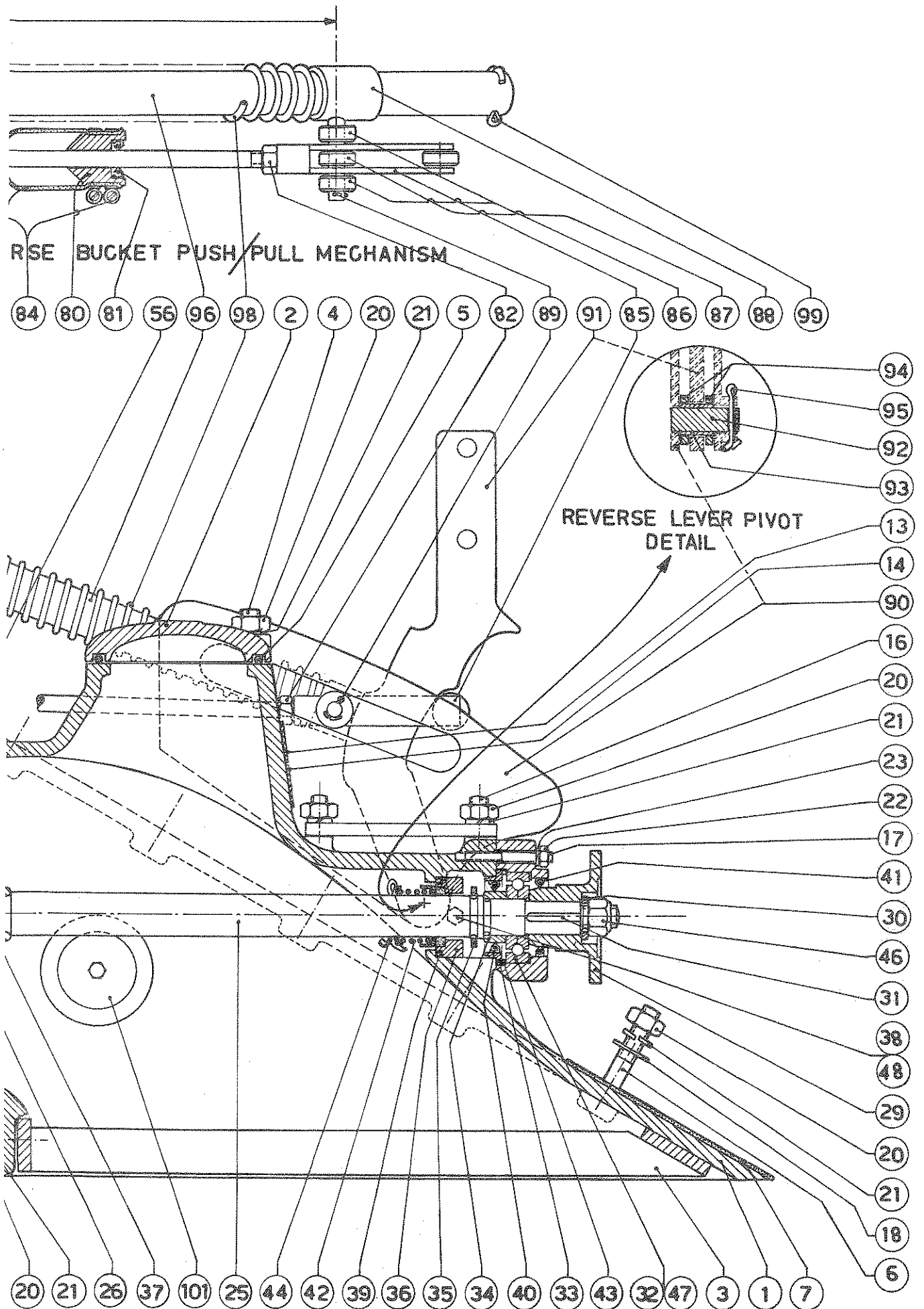
## 1011 JET UNIT

## General Assembly Diagram





<u>Item</u>	<u>Part No.</u>	<u>Req.</u>	<u>Description</u>	<u>Drawing No.</u>
51	102269	1	Steering Shaft Pivot Bush	102269
50	102253	1	Tailpipe	102253
48		2	Hex. Nut M.10 316 S.S.	
47		1	Grease nipple 1/8" BSP (Straight)	
46		1	Self locking Hex. Nut M.20 (cad. plated)	
45		2	Hex. Nut M.20 316 S.S.	
44		1	Split pin 3/16" $\phi$ x 2" S.S.	
43		1	O Ring 3" i.d. x 3 1/4" o.d. x 1/8" W.S.	
42	61318	1	Romet Seal SCR 664/150	
41	61316	1	Oil Seal	
40	61315	1	Oil Seal	
39		1	O Ring 2 1/2" i.d. x 2 3/4" o.d. x 1/8" G.S.	
38	102299	2	Set Screw	102299
37	102284	1	Impeller Key	102284
36	JH250	1	Sealing Face	J.H.250
35	JH202	1	Shaft Slinger	J.H.202
34	JH204	1	Bearing Spacer	J.H.204
33	JH206	1	Locating Ring	J.H.206
32	JH210	1	Bearing Assy. (Use SKF, QJ307)	J.H.210
31	JH132	1	Key	J.H.132
30	102289	2	Washer	102289
29	JH221	1	Coupling	J.H.221
28	102261	1	Bearing Sleeve	102260
27	102260	1	Bearing Sleeve	102260
26	102258	1	Impeller W.A. 58 H.P. @ 2500 RPM	102258
25	102259	1	Main shaft	102259
23		3	Spring Washer 3/8" $\phi$ 316 S.S.	
22		3	Hex. Nut M.10 316 S.S.	
21		26	Spring Washer 5/8" $\phi$ 316 S.S.	
20		26	Hex. Nut M.16 316 S.S.	
19		2	Bolt (for intake screen) M.16 x 60mm 316 S.S.	
18	102153	14	Washer	102153
17	102279	3	Bearing Housing Stud	102279
16	102178	2	Intake to Guide Stud	102175
15	102286	4	Intake to Tailpipe Stud	102175
14	63135	1	Patent Plate	63135
13	63097	1	Name Plate	63097
12	61340	1	Steering Shaft Seal	
11	102288	1	Bush for reverse rod	102288
10	102267	1	Bush for steering shaft	102267
9	102283	1	Wear ring insulator	102283
8	102282	1	Wear ring	102282
7	102281	1	Gasket Intake to Hull	102281
6	102176	16	Intake to Hull Stud	102175
5	102280	1	Inspection Cover Seal	102280
4	102307	2	Inspection Cover Stud	102175
3	102266	1	Intake Screen W.A.	102266
2	102252	1	Inspection Cover	102252
1	102251	1	Intake	102251





# 1011 JET UNIT PARTS LIST

Item	Part No.	Req.	Description	Drawing No.
101	102185	2	Anode Assy (for Alum. jet unit only)	102185
99		3	Split pin $\frac{1}{4}"\phi \times 2"$ S.S.	
98	102285	1	Spring (for reverse bucket)	102285
97	102370	1	Spring Bracket	102370
96	102371	1	Guide Tube	102371
95		1	Split pin $3/16" \phi \times 2"$ S.S.	
94	102277	2	Spacer	102277
93	102276	1	Bush	102276
92	102275	1	Pivot Pin	102275
91	102265	1	Reverse Lever	102265
90	102263	1	Guide W.A.	102263
89		1	Split pin $1/8" \phi \times 1"$ S.S.	
88	102272	1	Roller Shaft W.A.	102272
87	102165	1	Roller	102165
86	102182	2	Roller	102165
85	102271	1	Clevis W.A.	102271
84		4	Worm drive Hose Clip "Rex" No. 2 S.S.	
83	63327	1	Radiator Hose $\frac{3}{4}"\phi$ 2 ply x 150 mm (6")	63327
82		1	Hex. Nut M.16 316 S.S.	
81	61349	1	Seal	
80	102268	1	Seal Bush	102268
79	102273	1	Push/Pull Rod W.A.	102273
78		2	Hex. Nut M.10 316 S.S.	
77		1	Hex. Bolt M.10 x 80 mm 316 S.S.	
76		2	Spring Washer $5/16" \phi$ S.S.	
75		2	Hex. Nut $5/16"$ UNC S.S.	
74		2	Hex. Bolt $5/16"$ UNC x $2\frac{1}{2}"$ S.S.	
73	102274	2	Pivot Pin for reverse bucket	102274
72	102257	1	Reverse Bucket W.A.	102257
70		2	Split pin $1/8" \phi \times 1"$ S.S.	
69		1	Flat Washer 1" i.d. x $1\frac{7}{8}"$ o.d. x 14 SWG S.S.	
68		1	Plug 1" B.S.P. P.V.C. Nova Plast 837	
67		2	Flat Washer 12 i.d. x 24 o.d. x 1.6 316 S.S.	
66		2	Spring Washer $\frac{1}{2}"$ 316 S.S.	
65		2	Hex. Nut M.12 316 S.S.	
64		2	Hex. Bolt M.12 x 60 mm 316 S.S.	
63		1	Spring Washer $5/8" \phi$ 316 S.S.	
62		1	Hex. Bolt M.16 x 60 mm 316 S.S.	
61	102270	8	Deflector Pivot Bush	102270
60	JC49	1	Cutless Bearing	J.C.49
59	102264	2	Deflector Pivot Pin	102264
58	102287	2	Tie Bar Pivot Bush	102287
57	102278	1	Steering Arm W.A.	102278
56	JH132	1	Key	J.H.132
55	102262	1	Steering Shaft W.A.	102262
54	102256	1	Tie Bar	102256
53	102255	1	Deflector L.H.	102254
52	102254	1	Deflector R.H.	102254