



MARINE PROPULSION UNITS

Installation & Service Manual



Part No. 82026

Due to our policy of continuous development, specifications in this manual are subject to change without notice or obligation.

HAMILTON JET

12/10/95

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WARRANTY

- | | |
|-----------|----|
| -Warranty | W1 |
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WARNING

Warranty conditions include that the following are complied with:

Application:

- (i) The hull shape must be suitable for jet propulsion.
- (ii) The fully laden craft must exceed the "MINIMUM SPEED" criteria for the jet(s).

For advice on suitable hull shapes, estimating performance and engine matching etc. consult C.W.F. Hamilton & Co. Ltd (or their appointed distributor) with all relevant information.

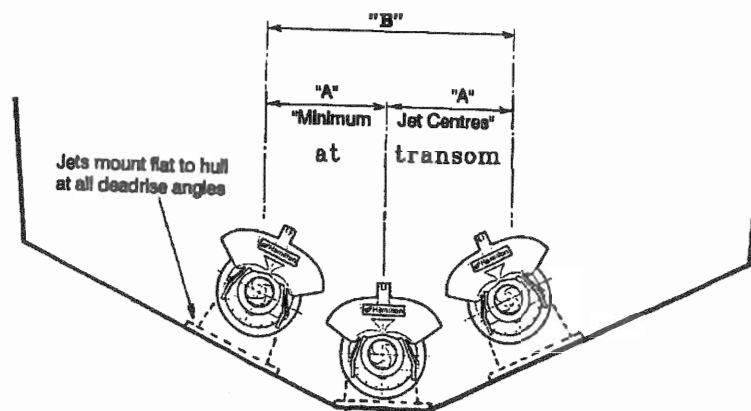
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- | | |
|---|--------------|
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SOME DESIGN BASICS

Mono-hulled craft

- (i) Aerated water generated by the craft's bow wave must not pass directly aft to the jet intake(s).
 - a) A vee'd bow stem in conjunction with 10° minimum deadrise angle is recommended.
 - b) Mount multiple jets as close to the keel line as possible ("staggered" engines recommended). Refer to "Minimum Jet Centres" below. (Dimension A $0-30^{\circ}$ Deadrise = 700mm)
 - c) Planing strakes, keelsons, "plank keels" etc must be removed in front of and closer to keel than the jet intake(s).
- (ii) Displacement speed and warped plane (reducing deadrise going aft) hulls may need additional directional stability. Twin small bilge keels aft are normally sufficient (these do not increase draft or interfere with water flow into the jet).
- (iii) For speeds over 30 knots monohedron (constant deadrise) hulls are recommended for directional stability without appendages.
- (iv) **Immersion** - the jet must be immersed with the water line at least up to the underside of the mainshaft (at the impeller) in order to prime (pump water) when the engine is started.

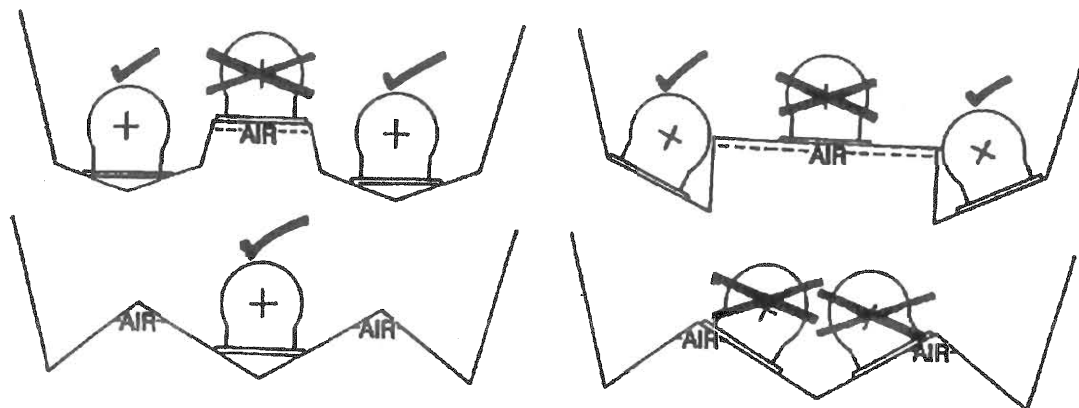


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Multi-hull (and Air Trapping) Craft

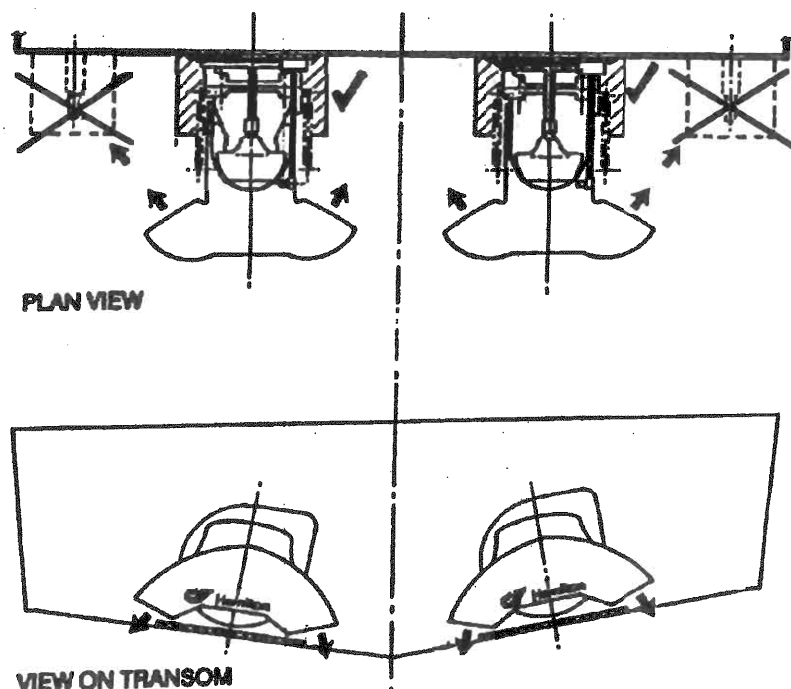
Jets can be fitted in catamaran or trimaran hulls. Air entrainment between the hulls is inherent with these craft. Care must be taken that this entrained air does not enter the jet intake(s). This is alleviated if the hulls are deep in relation to the air tunnels so that the jet(s) when mounted in the hull(s) sit well down in the water. The reverse duct of the jet, when in the "up" (ahead) position must not project beyond the sidewalls of a catamaran or trimaran hull otherwise substantial drag may be caused.



TRIM TABS

Trim tabs cannot be mounted immediately to either side of the jet as the water flow from the Reverse Duct will hit them the reverse thrust being destroyed.

It is possible to mount tabs under the jet with a control cylinder either side if the jet tailpipe - again providing the water flow from the Reverse Duct outlets does not hit the tab.



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JET MAINSHAFT ALIGNMENT (Port and Starboard Jets only).

The Waterjet mainshaft is inclined at an angle of 5° to the intake base. When port and starboard jets are mounted at the hull deadrise angle, the jet mainshafts are no longer parallel to the keel line in plan. The following table lists the angle deviation of the jet mainshaft when the jet base is mounted parallel to the keel line.

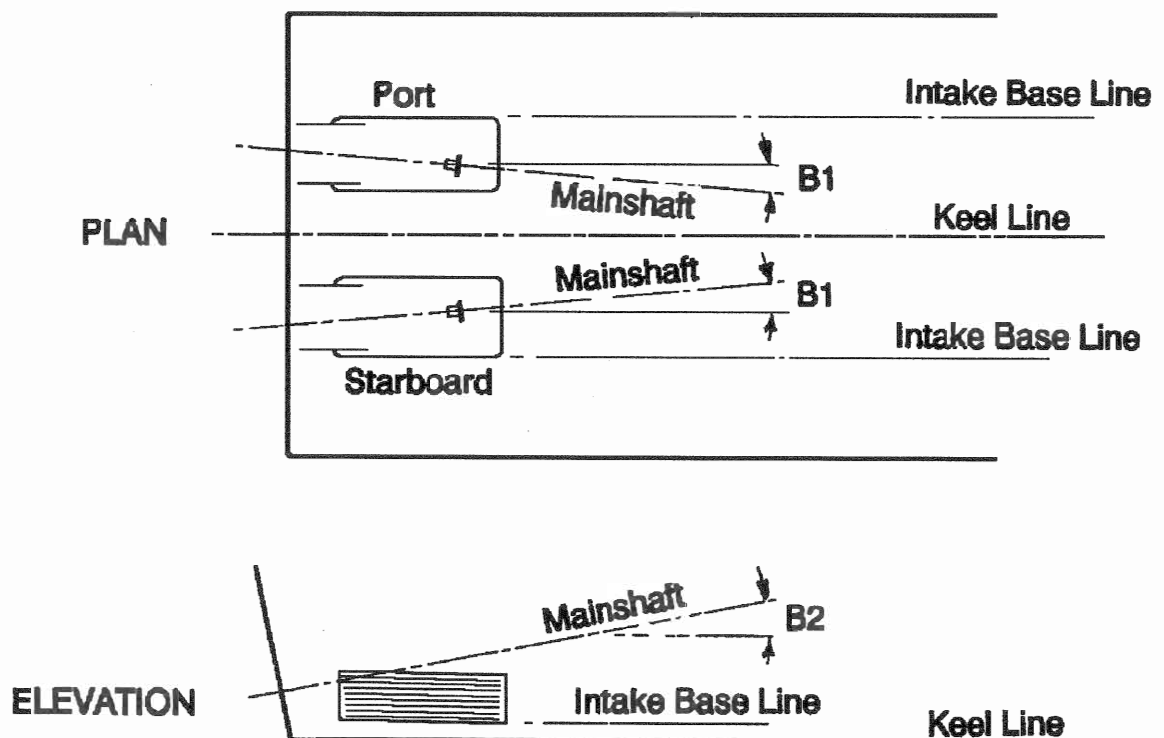
ANGLES (relative to keel line in degrees) :-

Hull Deadrise	B1	B2
0°	0	5.0
5°	0.4	5.0
10°	0.9	4.9
15°	1.3	4.8
20°	1.7	4.7
25°	2.1	4.5
30°	2.5	4.3

For Intake Base Parallel to Keel Line :

B1 = Shaft angle in Plan

B2 = Shaft Slope in Elevation



HULL PREPARATION AND DRAWING REFERENCES:

G.R.P. or Wooden Hulls:

An "Intake Block" manufactured in marine grade aluminium is supplied with the installation kit for fibreglass and wooden hulls. It can either be fitted in the hull mould prior to moulding the hull, or inserted into a prepared opening in an existing hull to fibreglass permanently into the hull. After moulding the intake block is additionally secured by bolting to the hull.

Refer to the following drawings at the rear of the manual:

106137 - Intake block (Note: part number for GRP Hull Block is 106138)

106042 - Hull Preparation

106041 - Installation Information

Aluminium Hulls:

An "Intake Block" manufactured in marine grade aluminium is supplied ready to weld into a prepared opening in the hull bottom.

It is assumed that the aluminium plating of the hull is one of the following types 5083, 5086, 6061, 6063, 6101, 6202, 6151 or 6951. If not consult Hamiltons.

The intake block is LM6 grade aluminium. Weld the intake block into the hull using the weld procedure on drawing 85080. ensure the contours between the hull and the intake block at front & rear are smooth to within 1mm.

Refer to the following installation drawings at the rear of the manual:

106137 - Intake Block (Note: part number for Aluminium hull Block is 106137)

106045 - Hull preparation

106044 - Installation Information

Steel Hulls:

A Steel "Intake Block" is supplied (or can be built by the boat builder if desired) to weld into a prepared opening in the hull bottom. An insulation kit is supplied to totally insulate the jet unit from the hull.

Refer to the following installation drawings at the rear of the manual:

106046Y - Intake block

106048 - Hull preparation

106047 - Installation Information

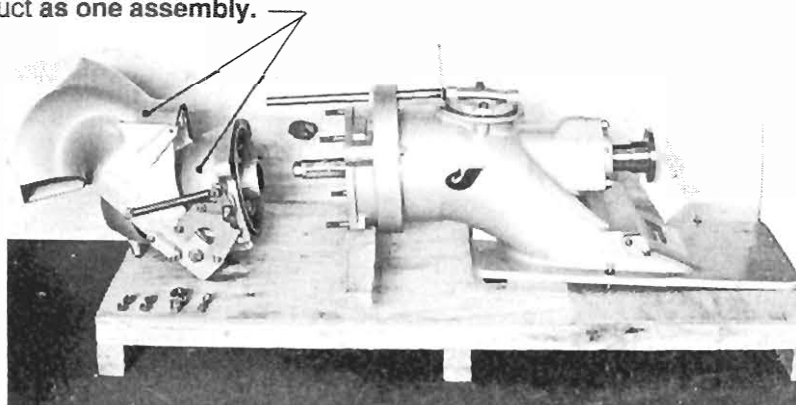
PREPARING THE JET FOR INSTALLATION

a) Remove the cotter (taper) pin and steering crank.

b) Remove the 4 tailpipe nuts and washers.

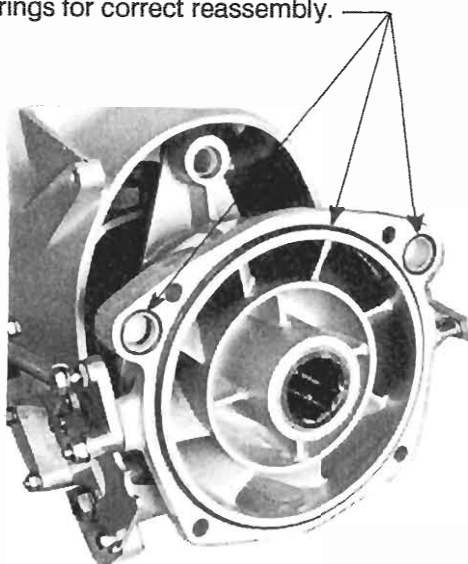


c) Remove the tailpipe and reverse duct as one assembly.



NOTES:-

- Do not disassemble the reverse duct or any other parts from the tailpipe as all bolts and studs have been fitted with thread locking fluid.
- Cover the mating surfaces and interior parts of the intake and tailpipe to keep clean.
- **Steel hulls only** - refer to drawing 106047: Drill 16 holes in intake base flange and 12 holes in transom seal plate out from 8mm to 11mm dia. to enable insulating bushes to be fitted.
- Note the location of the 3 O-rings for correct reassembly.



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INSTALLING THE JET INTAKE ASSEMBLY:

- a) Complete the hull preparation referring to the appropriate GRP (& Wooden), Aluminium or Steel Hull Preparation Drawing.

Refer to the appropriate Installation Drawing for GRP (& Wooden), Aluminium or Steel.

- b) **GRP (& Wooden) hulls only:** From under the hull, drill 24 x M9 dia. holes through the intake block and hull at the pre-countersunk locations. Apply silicon sealant to the 24 holes and M8 x 30 countersunk screws, fit flat washers (next to hull), spring washers and nuts and torque as for M8 bolt page M5.

Metal hulls only: Check the intake block top surface has remained flat during welding to within $\pm 0.5\text{mm}$. Do not remove more than 1mm from the top surface to correct flatness as water flow into the jet will be affected causing lower jet thrust.

- c) Ensure the intake block top surface and 16 x M8 stud holes are clean of GRP resin, weld splatter etc. Apply "Loctite" thread locking fluid supplied to the 16 x M8 studs and tighten into the intake block. (If a stud "runner" or fitting tool is not available temporarily tighten 2 x M8 nuts together on the stud so an M8 spanner can be used on the nuts to tighten the stud).

- d) Apply silicon sealant supplied to the top surface of the intake block and to the 16 x M8 studs.

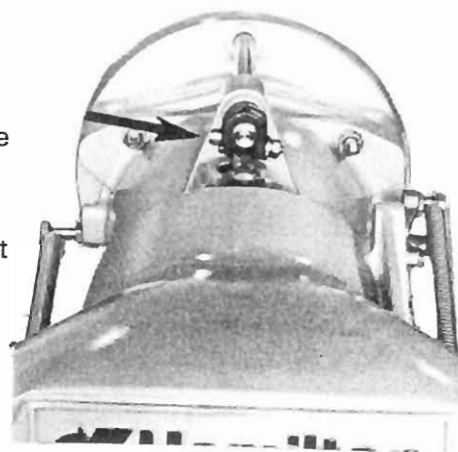
- e) Lower the intake assembly onto the 16 x M8 studs feeding the aft end out through the transom hole. **For steel hulls only** fit 16 insulating bushes. Apply silicon sealant to 16 x M8 flat washers and fit over studs next to intake. Fit spring washers and nuts and torque as for M8 nut page M5. **Clean off surplus silicon sealant - especially from the interior of the jet unit intake.**

FITTING TRANSOM SEAL ASSEMBLY :

- a) Place the transom seal assembly over the tailpipe, hold against the transom and centralise it in relation to the intake. Using a 9mm dia. drill bit drill through the 12 holes to just dimple the transom for correct hole location.
- b) Remove the transom seal assembly and drill 12 holes 9mm dia. through the transom at the dimpled holes.
- c) Liberally apply R.T.V. silicone sealant (supplied) to the transom plate contact area on the hull, the joint face of the transom plate and bolt heads. Fit the transom seal assembly into place against the transom. Fit bolts, washers and nuts etc to secure the transom plate as per the appropriate installation drawing (at rear of manual) - **in particular fit insulating gasket, bushes and washers as indicated for steel hulls. Install with bolt heads to the outside of the boat.**
- d) Torque the 12 x M8 transom seal nuts as for M8 nuts page M5 and remove excess sealant.

REFITTING TAILPIPE & REVERSE DUCT ASSEMBLY:

- a) Ensure all internal parts and mating surfaces are clean, check the 3 o-rings are correctly located and refit the assembly to the intake.
- b) Fit the 4 M12 spring washers and nuts and torque as per M12 nut page M5.
- c) Assemble steering crank and fit cotter (taper) pin (**from port to starboard**). Fit flat washer, spring washer and nut (**on starboard side of crank**) and torque as for M8 nut page M5.



NOZZLE SIZE (Refer page S5 for identification):

The standard 110 gives best resistance to take off slip. It should be used with all gasoline engines.

The optional 115 gives best performance with lower powered diesel engines (generally under 200 hp) (if in doubt refer Hamilton Jet) but should only be used with impellers type 3.2 and higher.

DO NOT use the 115 nozzle with impellers type 3 or lower.

To change nozzle refer page S6 - Remove cotter (taper) pin 73 and 2 pivot pins (79) so that steering deflector (77) and crank (71) can be withdrawn. Withdraw 2 hex. Head Screws (62) to allow nozzle (67) to be withdrawn.

On re-assembly note:-

- nozzle is fitted into tailpipe with sealant to keep water out of joint.
- 2 pins (79) should be refitted with "Loctite 222" or equivalent thread locking fluid.
- refer illustration above for correct fitting of cotter (taper) pin (73).
- refer page M5 for torques on nuts.

LUBRICATION:

Jet thrust bearing and, if factory fitted, the screen rake will have been greased ready to run. (See servicing information section M for details.) Other bearings are all water lubricated.

Do not run jet out of the water - unless the optional "Dry Run Kit" is fitted.

GENERAL

The engine(s) should be located in a position that will give the craft the most suitable fore and aft trim for the proposed boat speed. For semi-planing and moderate planing speed craft it is likely that the engine should be positioned well forward towards amidships for best trim and thus speed. For very high speed craft it is likely the engine should be positioned aft, close to the jet unit, to obtain best trim and speed. Follow the recommendations of the boat designer in this regard or consult C.W.F. Hamilton & Co Ltd.

MOUNTING

Mount the engine via mounting feet fixed to the engine bearers. The feet and bearers do not have to withstand the propulsion thrust load which is transmitted from the *jet directly* to the hull. Flexible engine mounts will reduce vibration and noise but these must be used in conjunction with a driveshaft system which does not cause a radial or side load at the jet coupling as the engine moves. Refer to DRIVE LINES Section pages H4, H5 & H6 for recommended driveshaft and engine installation angles.

COOLING

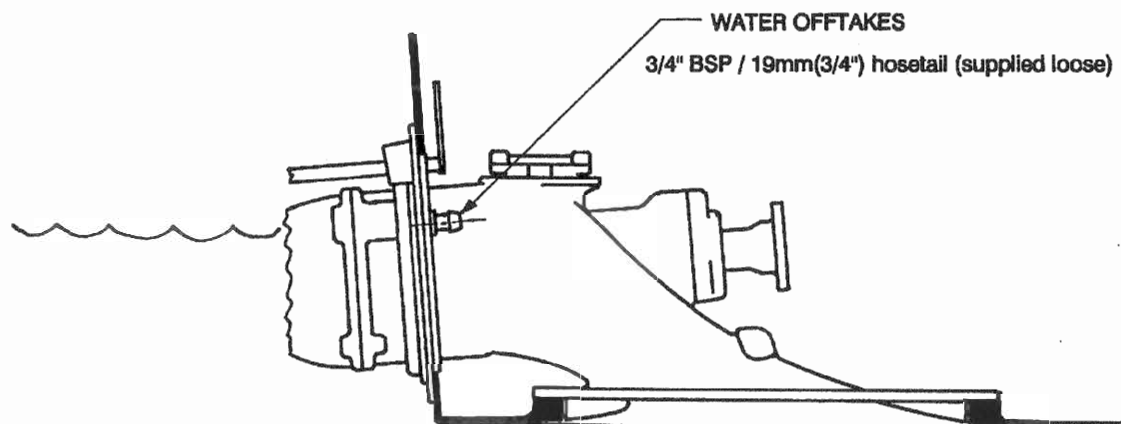
The jet has two 19mm (3/4") inboard water offtakes which provide water at approximately 7kN per sq.m. (1psi) at 600 rpm and 550kN per sq.m. (80psi) at 4000rpm. The water may be fed directly to the engine without the need for a raw water pump, provided

- (a) the pressure from the water offtake at idle is sufficient to cool the engine and
- (b) that the engine can withstand the full pressure from the jet offtake.

To be sure of correct flow for engine cooling a conventional water pick up and the engine raw water pump should be used. The jet water offtake can be used for a deck cleaning hose but the pressure is not high enough for a fire hose.

CAUTION : If a gearbox or clutch are fitted to the engine a conventional hull water pick-up and engine raw water pump must be used.

ENSURE ANY THROUGH HULL WATER PICK UP IS NOT DIRECTLY AHEAD OF THE JET INTAKE, BUT WELL TO THE SIDE TO AVOID TURBULENT WATER FLOW INTO THE JET.



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SANDTRAP (Optional Raw Water Sand Filter)

High pressure water from the jet is piped into the sandtrap before feeding into the engine cooling system.

Sea water (raw water) fed into a centrifuge, drops out foreign matter (sand, shells, stones, etc) into a clear perspex bowl, easily visually inspected. Opening the dump valve, while water is being fed in, drops out the collected material into the dump line which carries overboard via a skin fitting through the hull side or transom.

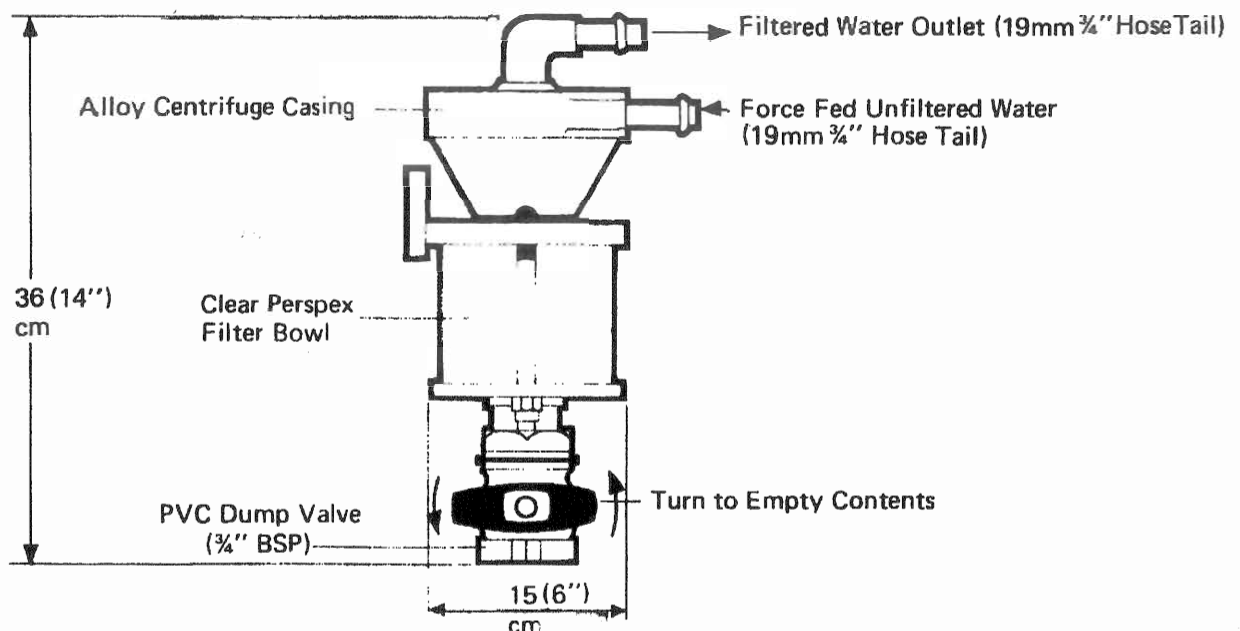
Part numbers:

Sandtrap and dump valve only

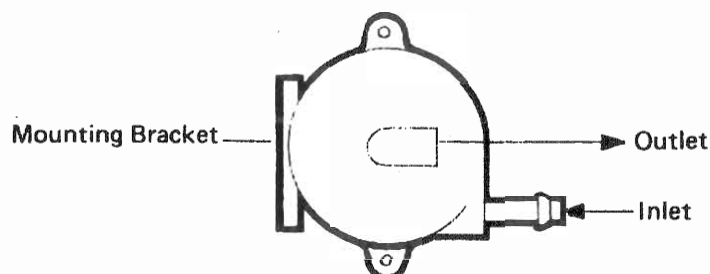
JM 529/SY - 770

Complete kit with hoses & skin fittings

JM 1104 - 770



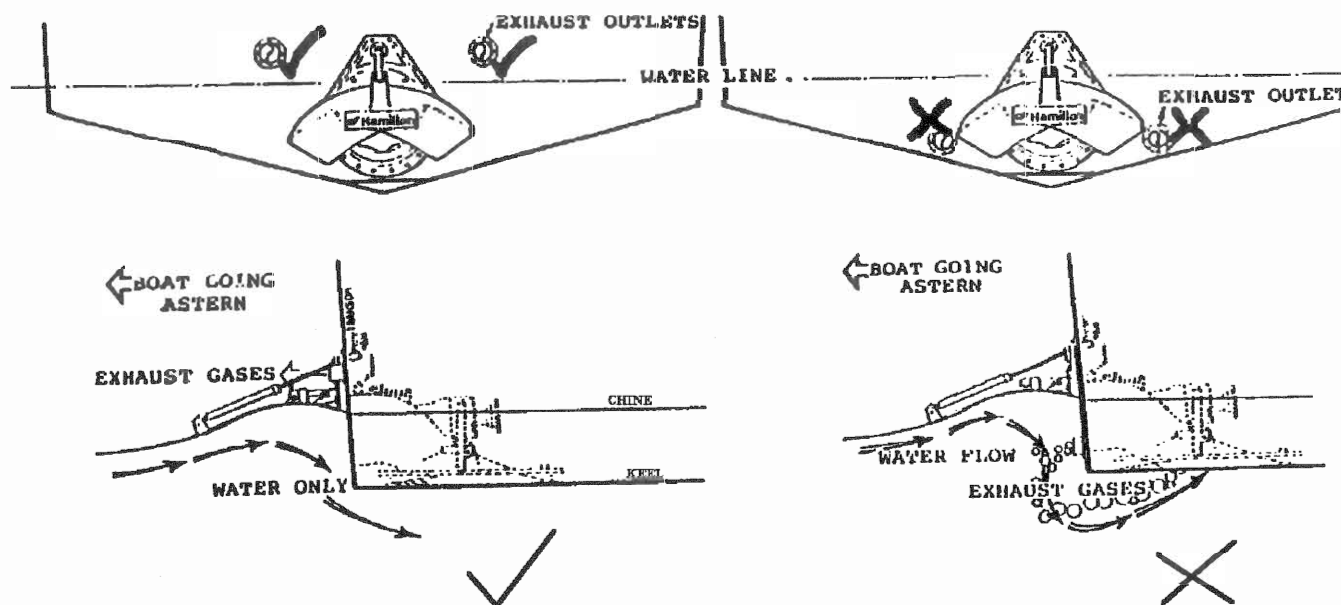
SIDE VIEW
(Sandtrap and Dump Valve only)



TOP VIEW
(Sandtrap and Dump Valve only)

EXHAUST SYSTEMS

The exhaust system can be any conventional system approved by the engine manufacturer, except that for the efficient operation of the jet in reverse, **exhaust outlets are best sited above the waterline.**



ENGINE SYSTEMS

Engine wiring, instrumentation and throttle systems are all conventional - follow the manufacturers recommendations. With the standard two lever control system (separate throttle & reverse) Hamiltons supply the Reverse Control Lever and the boat builder supplies the separate throttle control lever, cables and linkages.

An optional two lever throttle and reverse controller is available as an optional extra - refer illustrations pages 15, 16, 17.

GOVERNOR SETTINGS

The "no load" governor setting (or "high idle") on diesel engines should be set well clear of the full throttle R.P.M. achieved when driving the jet unit so that there is no chance of the governor reducing power (and performance) at full throttle.

WARNING

THE JET THRUST BEARING WILL NOT STAND RADIAL LOADS CAUSED BY ADAPTORS AND BELT PULLEYS OVERHANGING THE JET COUPLING FLANGE OR BY RIGID DRIVELINES WHICH DO NOT ACCOMMODATE MISALIGNMENT CAUSED BY ENGINE MOVEMENT. THERE IS A LIMIT TO THE DRIVESHAFT WEIGHT THAT CAN BE SUPPORTED AT THE JET.

REQUIREMENTS OF DRIVELINE

- i) It must accommodate parallel and angular misalignment plus allow axial movement.
- ii) It must transmit the torque input to the jet with an acceptable life expectancy. It does not have to transmit thrust as propulsion thrust loads are absorbed by the jet.
- iii) Torsional flexibility may be required - especially with diesel engines.

ENGINEERING CHECKS REQUIRED

All driveline component suppliers (including engine & jet suppliers) must be consulted with full driveline details to ensure suitability and compatibility of components.

Check must include:

- i) Critical Speed Check for whirling of jet mainshaft - consult C.W.F. Hamilton & Co. Ltd.
- ii) Critical Speed Check for whirling of the driveshaft - consult driveline supplier.
- iii) Engine to jet alignment - consult C.W.F. Hamilton & Co. Ltd.
- iv) Torsional Vibration Analysis - consult engine supplier. (Detail of the jet for this analysis are given on page H7).

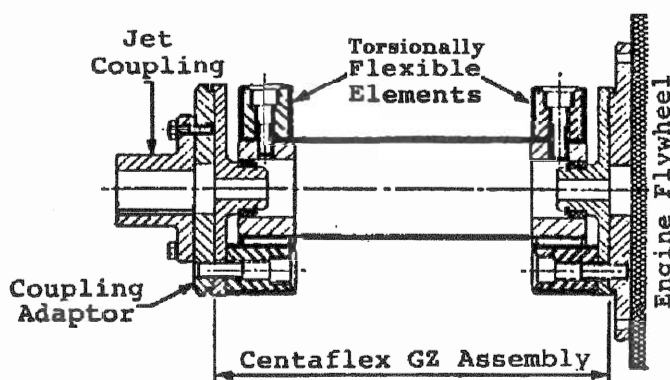
RECOMMENDED DRIVELINE SYSTEMS

Depending on the distance required between the engine and jet coupling flange, there are three recommended systems for coupling the engine to the jet:-

a) DOUBLE ELEMENT TORSIONALLY FLEXIBLE DRIVESHAFT -

Use a double element torsionally flexible driveshaft with support bearings such as the "Centaflex GZ" type illustrated. The engine is located in-line with the jet and can be flexibly mounted with this type of coupling.

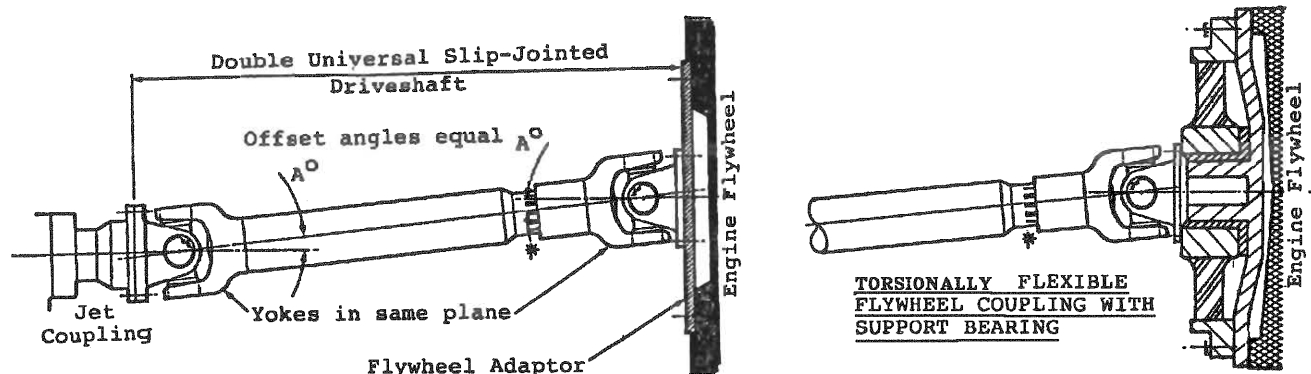
Length - from approximately 200mm (8") upwards but limited by the weight which can be allowed at the jet coupling (refer Critical Speed Check page H4)



b) DOUBLE UNIVERSAL SLIP-JOINTED DRIVESHAFT -

The usual method of coupling the engine to the jet is the double universal slip-jointed driveshaft (Cardan Shaft). It bolts directly to the jet coupling flange and to the engine flywheel (via an adaptor plate) or alternatively a suitable Torsionally Flexible Flywheel Coupling (TFFC) can be used between the universal driveshaft and the engine flywheel. The TFFC must be of the type with a support bearing to support the universal driveshaft. "Vulkan" or "Centa" have suitable couplings for use with universal driveshafts. Use of a TFFC is more appropriate for diesel engines and may be stipulated by some manufacturers.

Length - from approximately 250mm (10") upwards but limited by the weight which can be allowed at the jet coupling (refer Critical Speed Check page H4).



Notes :

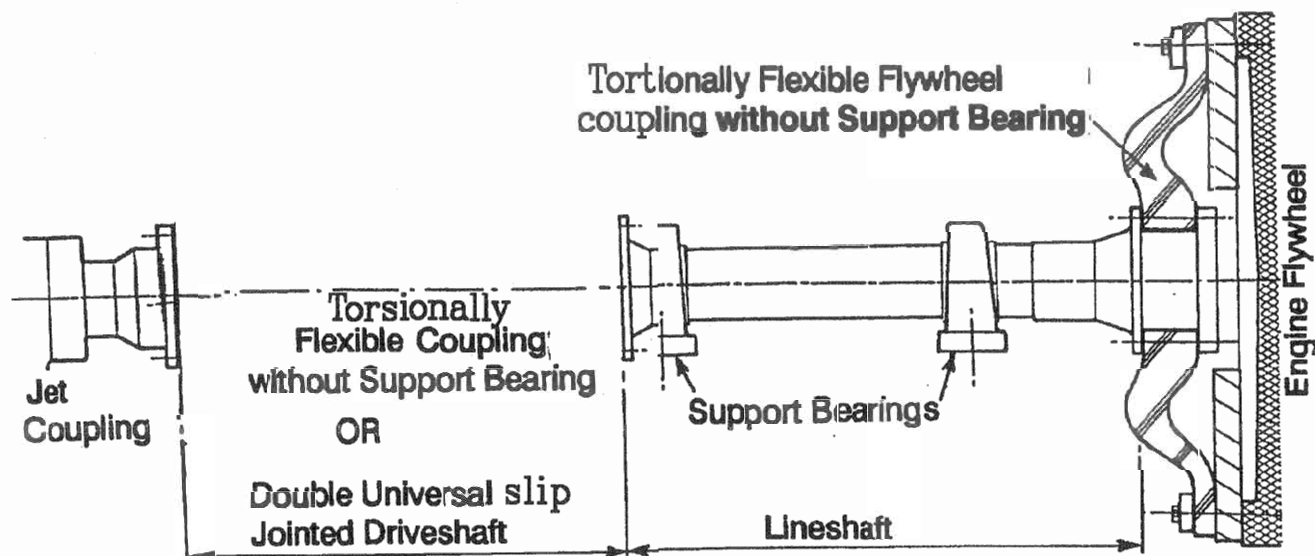
- * Correct running length of shaft is with the shaft extended to half the total spline extension.
- * The splined end of the driveshaft is the heavier end and should thus be installed at the engine and not the jet.
- The universal driveshaft must be assembled with the yokes (forks) in the same plane and the engine should be positioned so that the universal joints of the driveshaft each have equal offset angles (A° above) at each end. If not cavitation of jet and machinery damage can result because the drive motion to the jet is not constant velocity.
- 'Offset angle A° should be between 1.5 and 5° . Above 5° offset jet and driveshaft bearing life will be significantly reduced.
- If a gearbox is used a torsionally flexible coupling should already be fitted between the engine and gearbox. If so then the universal driveshaft can be bolted directly between the jet and the gearbox flange (an adaptor will normally be required at the gearbox flange).

Jet Coupling Flanges are available to directly match the following driveshafts which can be suitable subject to the Engineering Checks listed on page H4:-

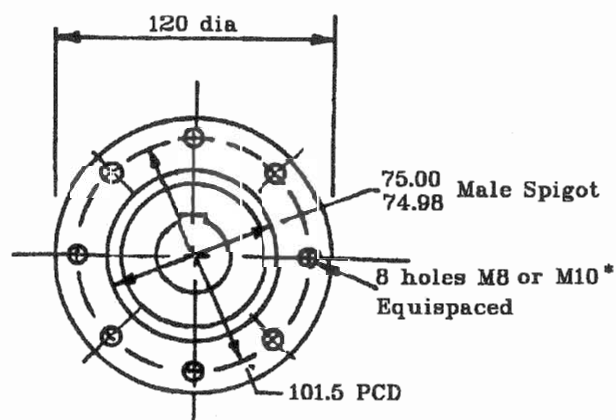
- ELBE: -110 or -112 series with 129mm 8 x M8 bolt flange
- G.W.B.: 287-20, 387-20, 587-10 or 587-15 series with 120mm 8 x M10 bolt flange
- SPICER: 1410 series

c) LONG DRIVESHAFT -

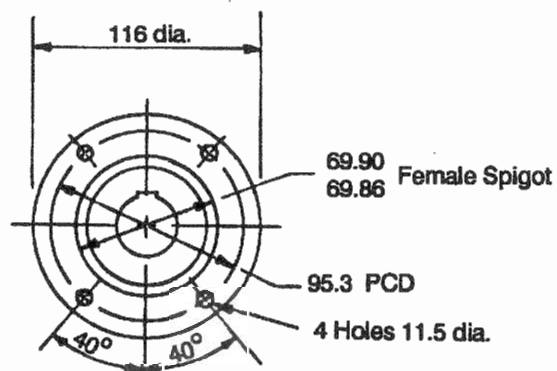
Where the driveshaft length and thus weight exceeds that allowable at the jet coupling a fixed lineshaft supported in pedestal bearings can be used in conjunction with either universal driveshafts or torsionally flexible couplings.



JET COUPLING FLANGE DETAILS :



120 mm dia metric



* **Standard:** 120mm ELBE 8 holes 8.2 dia.

* **Optional:** 120mm G.W.B. 8 holes 10.2 dia.

Optional: SPICER 1410

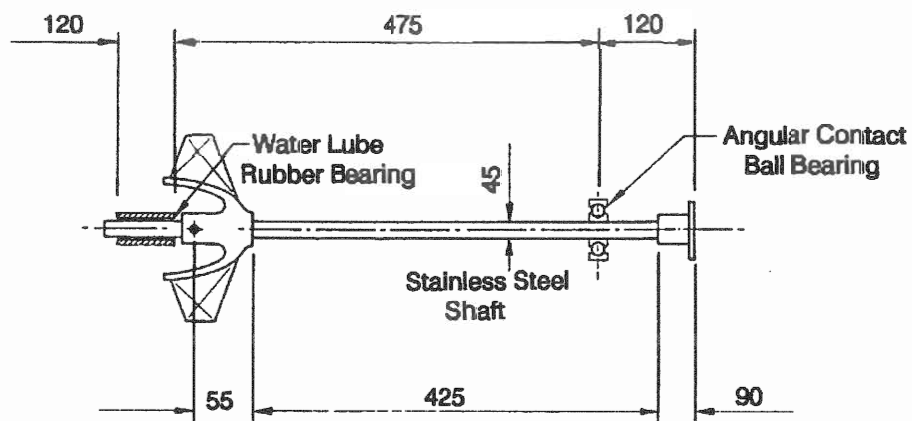
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MOMENTS OF INERTIA DATA :

A torsional vibration analysis should be undertaken for the complete engine, driveshaft and jet rotating assembly. The engine is the most complex and therefore the analysis is normally done by the engine supplier.

Detail of the jet required for a torsional vibration analysis are listed below



IMPELLER

Types 2.7 to 3.2 $M = 5.4\text{kg}$ $I_p = 0.020 \text{ kgm}^2$

Types 3.7 to 4.2 $M = 5.6\text{kg}$ $I_p = 0.021 \text{ kgm}^2$

SHAFT

$M = 6.85\text{kg}$ $I_p = 0.0015 \text{ kgm}^2$

120mm COUPLINGS

$M = 2.25\text{kg}$ $I_p = 0.0028 \text{ kgm}^2$

SPICER 1410 COUPLING

$M = 1.90\text{kg}$ $I_p = 0.0022 \text{ kgm}^2$

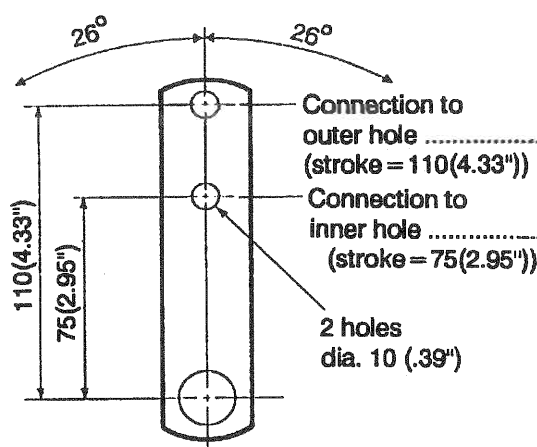
STEERING SPECIFICATIONS

The steering mechanism on the 211 Jet is balanced so that power assisted controls are not necessary even for multiple jet units. (Torque required at steering arm with full throttle and full lock is 75 Nm or 55 lbs ft .) Deflector & inboard steering arm (tiller) move through $\pm 30^\circ$ arc. While push-pull cable systems can be used a manual hydraulic system is recommended for the best results.

NUMBER OF TURNS ON STEERING WHEEL

Between 1 and 1 1/2 turns of the steering wheel from hard port to hard starboard is recommended. **A greater number of turns will reduce sensitivity of steering during low speed manoeuvring.** Do not extend the steering arm (tiller) to give a greater number of turns.

Note: This means that only part of the steering systems available stroke is used.



Number of turns lock to lock (approx.)

	Rotary cable	Rack & Pinion	Hydraulic
Connection to outer hole (stroke = 110(4.33"))	1.3	1.7*	1.8 or more *
Connection to inner hole (stroke = 75(2.95"))	0.9	1.2	1.2 or more

* Not recommended

PUSH PULL CABLE SYSTEMS

Use a heavy duty Rotary or a Rack and Pinion System complete with an inboard type transom mounting kit.

Twin drive tension systems can be used eliminating "back lash" or "free play" inherent with single cable systems (special transom mounting kits required).

Rotary Systems include:

- Morse D290
- Teleflex (Flexatrol) SAFE T or BIG T
- Ultraflex T55

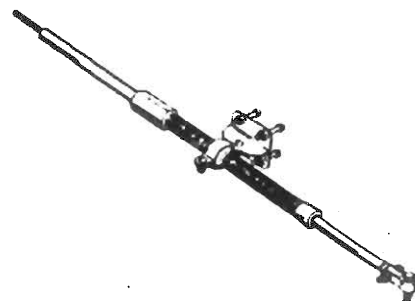
300617
SA27256
SA27256

Rack and Pinion Systems include:

- Morse Command 200
- Morse Command 401
- Teleflex (Flexatrol) "THE RACK"
- Ultraflex T57 or T59

300617
037215
SA27256
SA27256

Suitable transom kit



FOR LIGHTEST STEERING ACTION - KEEP THE NUMBER OF BENDS IN THE CABLE TO A MINIMUM AND ENSURE THAT BEND RADII ARE AS LARGE AS POSSIBLE. ENSURE CABLES ARE WELL LUBRICATED PRIOR TO INSTALLATION.

MANUAL HYDRAULIC SYSTEMS:

Select a short stroke system complete with inboard transom mounting anchor kit. Note that manual hydraulic systems generally have check (lock) valves which prevent feedback or self centering effect. If desired, these can be removed with single station jet control but not with dual stations.

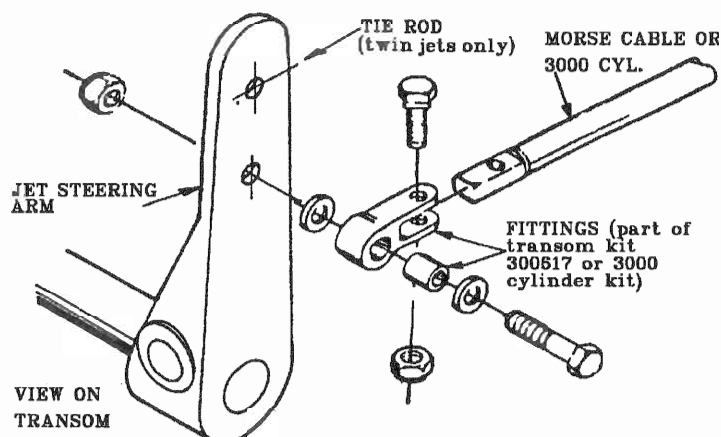
- Morse 3000 system.
- Teleflex (Flexatrol) Seastar II (with BA 125 7 BJ cylinder).
- Hynautic (USA) system.
- Hydrive (Australia) system.
- Wagner (Canada) 700

FOR LIGHTEST STEERING ACTION - USE A) A MINIMUM OF 12MM (.5") BORE LINES AND B) LOW VISCOSITY OIL - AS RECOMMENDED BY SUPPLIER

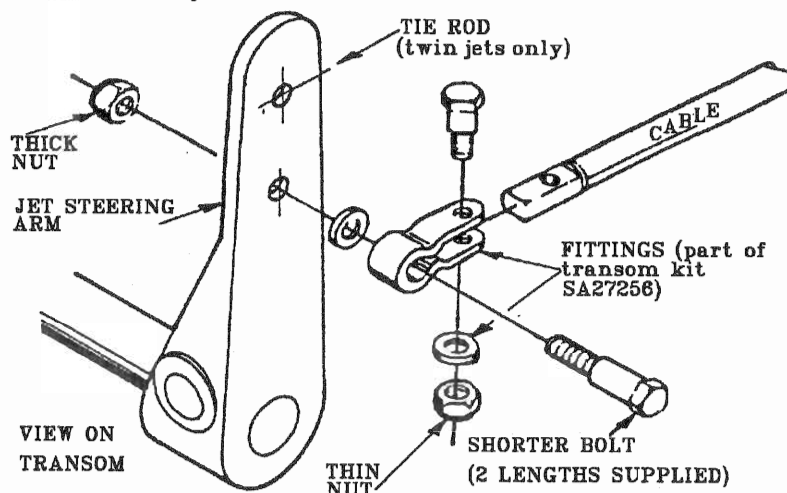
STEERING ARM (TILLER) CONNECTIONS:

Note: Steering Tie rod and cable connections to Steering Arm can be interchanged for more turns of helm lock to lock (see page I1).

Morse Systems:



Teleflex, Flexatrol, Ultraflex Cable Systems:



HELM SIZES:

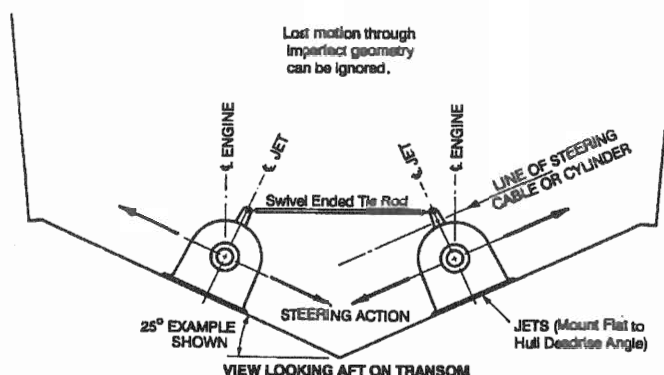
Large diameter wheels are not necessary.

Suitable wheels are:

Single Jet	400mm (16") diameter
Twin Jets	450mm (18") diameter
Triple Jets	500mm (20") diameter

TWIN JET INSTALLATIONS:

Connect the steering push-pull cable or hydraulic cylinder directly to the steering tiller of one of the jets. Connect the steering tillers of the two jets with a swivel ended tie rod (see sketches page 12 & below). The tie rod should have adjustable length so that the steering of both jets can be accurately adjusted to be centred at the same time (see details next page).

**TRIPLE JET INSTALLATIONS:**

Connect the steering push-pull cable or hydraulic cylinder directly to the steering arm of the **centre jet**.

Arrange swivel ended adjustable length tie rods from the centre jet to each of the side jets.

Adjust tie bar lengths so all jets steering deflectors are centralised together (see details next page).

Lost motion through the imperfect geometry of this system does not significantly reduce steering effectiveness.

MULTIPLE STATION CONTROL:

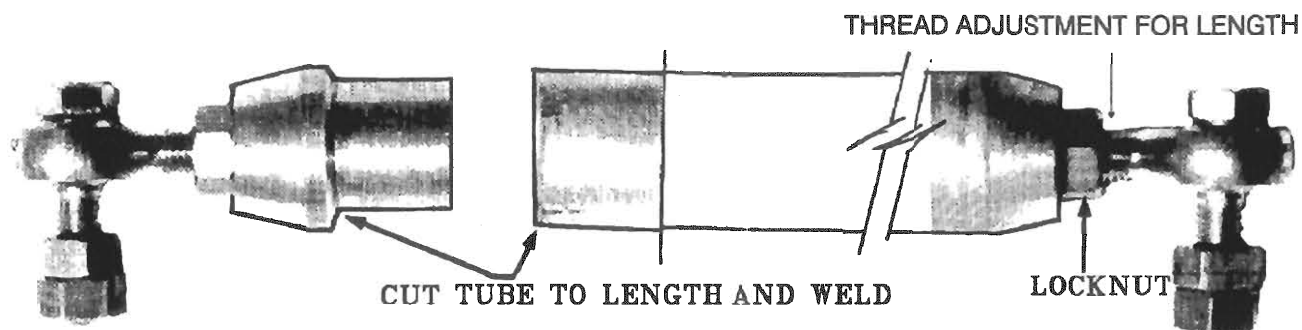
Use the multi-station control system offered with the steering system selected.

CATAMARAN STEERING:

The steering systems supplied with the 211 jet are NOT suitable for catamarans unless a mechanical link can be arranged between jets. Alternatively an electronic steering system should be considered to ensure jets steer in phase. If in doubt consult Hamilton Jet.

STEERING TIE ROD ASSEMBLY: (Multiple jets only)

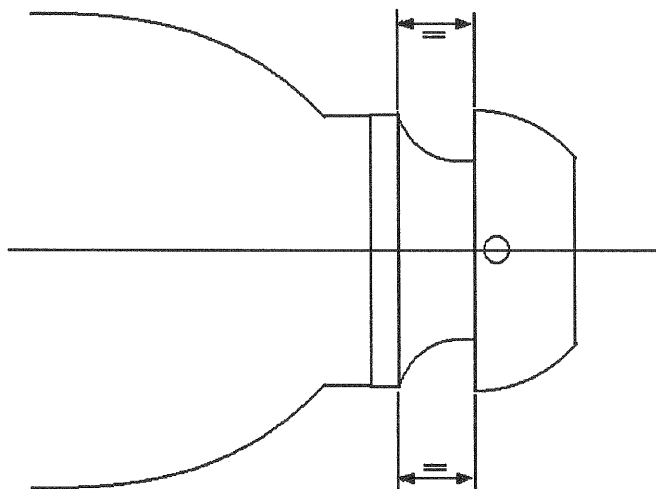
Optional Tie Rod kit (104673SY) is supplied with one end not welded so the rod tube can be cut to length required and welded.



To determine length and adjust:-

Locate and temporarily clamp each jet in central steering position (dead ahead).

The best way to ensure each jet is steering dead ahead is to measure the gap between the nozzle flange and the forward opening of the deflector on each side. Adjust until both gaps are the same. **Caution:** do not operate the reverse control during steering adjustment as the reverse duct may be lowered on a clamp.



- Offer the tie rod up to the upper holes of the steering tillers and mark the length to cut the tube. Cut tube and weld to rod end.
- Bolt one end of tie rod (to forward side of tiller). Adjust thread lengths at ends until the hole at the unbolted end exactly lines up with the hole in the tiller (make sure the jet deflectors have not moved) and bolt up.
- Check the rod end locknuts on the length adjustment are tight and **unclamp the deflectors**.

CABLE REVERSE CONTROL**SCOPE OF SUPPLY:**

Each jet unit is supplied with:

- a **reverse controller** (control lever) fitted with
 - **Morse** cable adaptor (standard)
 - or: - Teleflex cable adaptor (optional)
- a **through transom assembly** (for cable)

Refer to illustrations pages I6, I7, S10 and below.


Available as optional extras are:

- **control cable - reverse***
- **swivel (clevis) kit** for reverse duct* (refer illustrations page I6)
- **throttle cable** (Morse 33c or equivalent)*
- * these items can also be purchased from a suitable cable supplier - see details below.
- **reverse and throttle controller** (see details pages I6, I7, S10).


REVERSE CABLE DETAILS:

The reverse controller is supplied with two adaptors:-

- The **standard adaptor** (Hamilton part 103366) suits the following Morse cables (as used on Morse D290 steering system):-

Country	Adaptor 103366	Morse cable Part No.	Morse swivel kit Part No. (see illustration next page)
Australia, N.Z., Pacific, Asia		D0345	300618
Sweden		D0335	300618
U.K.		9208766	300618
North America		304415**	300618

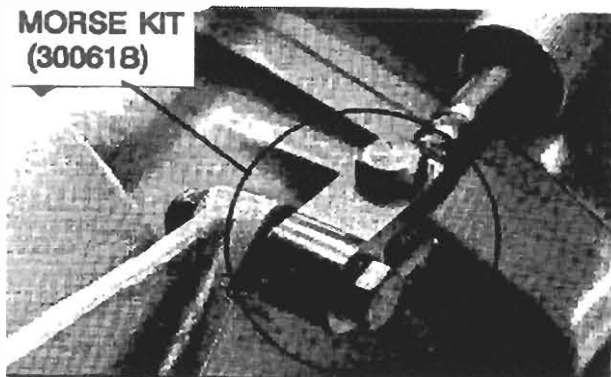
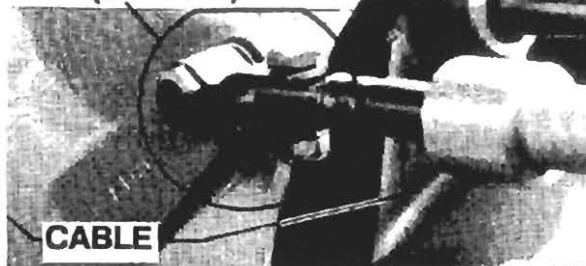
- The **alternative adaptor** (Hamilton part 104276) suits following cables:
(as used on Teleflex SAFE T or BIG T steering systems)

Manufacturer	104276	Cable Part No.	Swivel (clevis) kit Part No. (see illustration next page)
Teleflex or Flexatrol		SC72	SA27314
Ultraflex		M47	SA27314
Morse (North America)		304415**	300618

Notes:

- ** In North America the Morse TRC cable (Morse part 304415) fits either of the Hamilton adaptors.
- Any other cable equivalent to the above may be used, the cable is normally used as a rotary type steering cable.
- To specify cable length quote the distance from the pivot centre of the controller, along the actual cable path, the reverse duct attachment point with the reverse duct at mid-travel position.

ASSEMBLY OF SWIVEL (CLEVIS) KITS AT REVERSE DUCT:

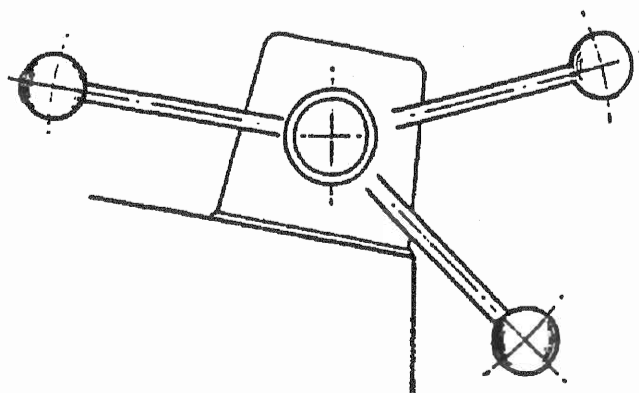
MORSE KIT
(300618)TELEFLEX, FLEXATROL
& ULTRAFLEX KIT
(SA 27314)**CONTROLLER :**

The controller must be mounted at the edge of the controls dashboard to obtain full lever travel.

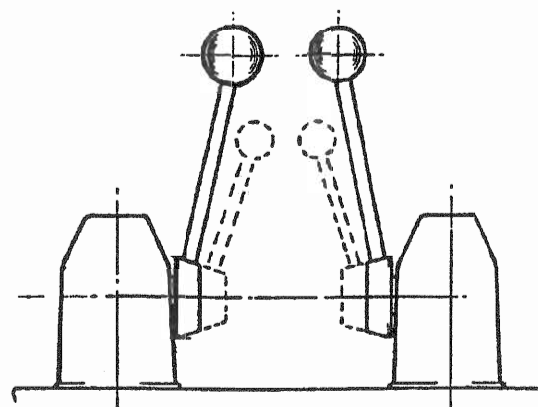
The controller can be assembled for left or right hand positioning of the lever.

Throttle control lever is an optional extra for which a Morse 33c or equivalent cable is also required.

The reverse control lever moves through an arc of 215°

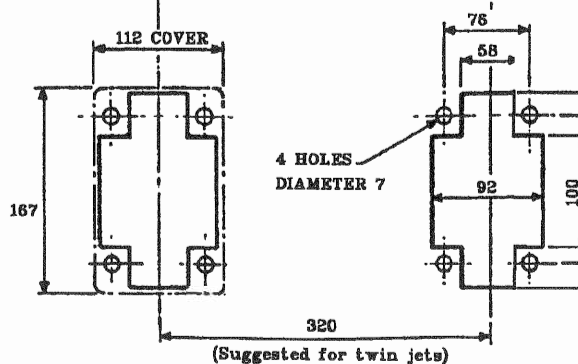


SIDE VIEW



TWIN JETS

(optional throttle levers shown dotted)



Dashboard Cutout and Control Cover Detail

HAMILTON JET

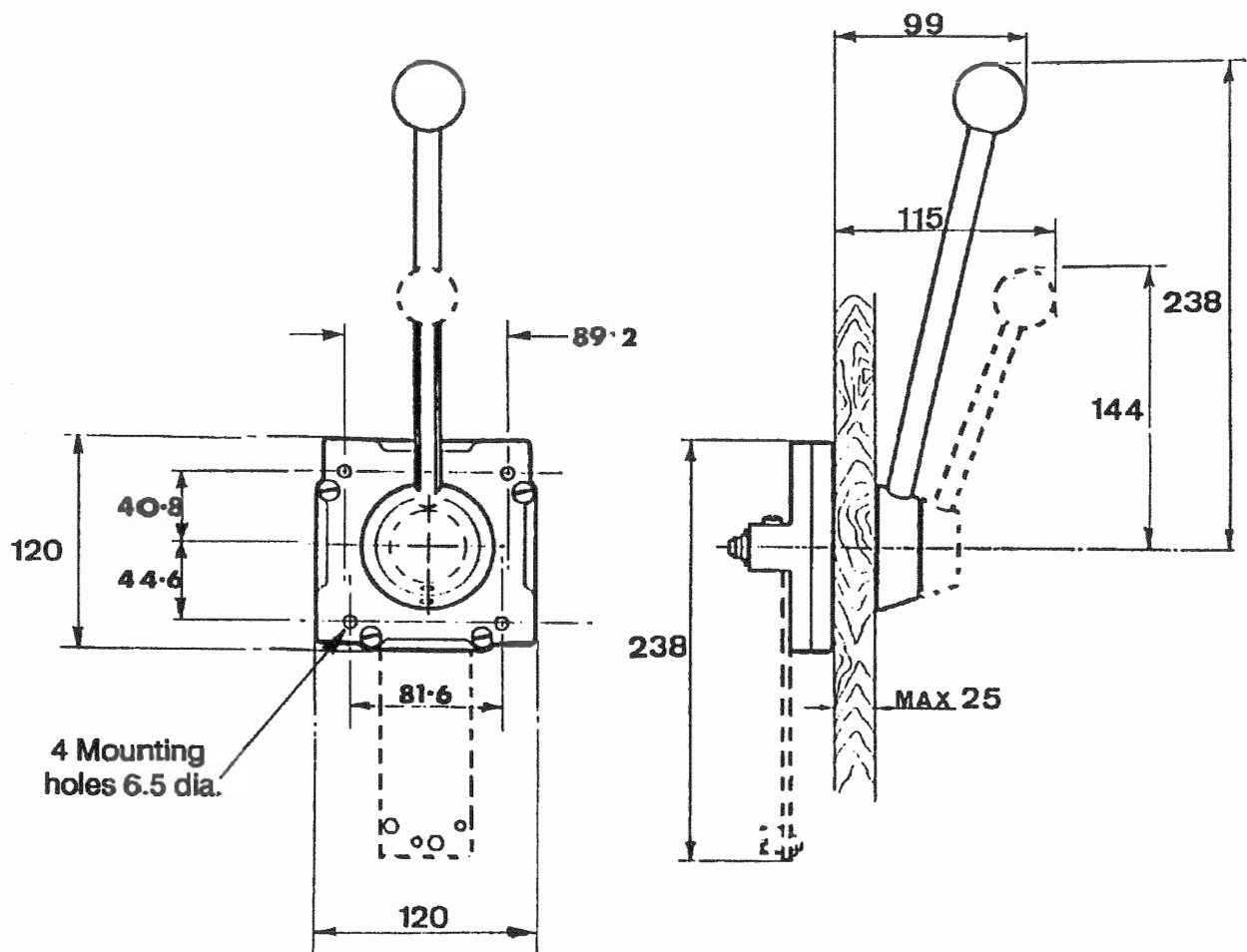
21/06/95

FOR LIGHTEST REVERSE OPERATION - KEEP THE NUMBER OF BENDS IN THE CABLE TO A MINIMUM AND ENSURE THAT ANY BEND RADII ARE AS LARGE AS POSSIBLE. ENSURE CABLES ARE WELL LUBRICATED PRIOR TO INSTALLATION. FILL THE JET "THROUGH TRANSOM ASSEMBLY" WITH GREASE (SEE GREASE NIPPLE (ZERK)) AFTER FITTING IN THE CABLE.

OPTIONAL SIDE MOUNTING OF CONTROLLER:

(Suitable for single jet installation only)

The mounting bracket and cover supplied can be discarded and the controller side mounted as shown if desired. Optional throttle shown with broken lines.



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WARNING

C.W.F. Hamilton & Co Ltd have taken precautions during manufacture and assembly of the jet unit, by using materials that are resistant to salt water corrosion and by placing anodes in the most effective places on the jet. **The unit however, is still vulnerable to the actions of the person who fits the propulsion system into the hull and to the actions of his electrician.**

THIS IS THUS A CONDITION OF WARRANTY THAT CRAFT FITTED WITH HAMILTON JETS MUST HAVE A NEGATIVE EARTH BONDING SYSTEM FITTED - as outlined in this section J.

Why is it necessary?

One of the major causes of corrosion of metal parts in salt water, particularly impeller, is stray currents emanating from the vessel's electrical system. These currents can be very small, often defying detection, but acting over a considerable period can cause heavy corrosion because the jet is in contact with the water and the aluminium in the jet can become an anode to a metal hull or any other metal object in the hull to which it may be electrically connected.

Basic Earth Bonding System

By bonding the jet,* hull and casings or body of all metal objects together to the hull anodes with a low resistance bonding system (**separate from "working" 2 wire electric system**) we ensure that the hull anodes corrode and not the jet, hull or metal object in the hull - **because we eliminate any voltage difference between the different metals.**

* **Exception is for steel hulls** when the jet must be totally insulated from the hull and machinery thus relying totally on its own anodes for protection.

Connection of Earth Bonding System to Battery Negative:

As a final move we can connect our Earth Bonding System to the negative battery terminal which then ensures all metal objects in the hull (and the hull if metal) are held at negative battery voltage. This imparts a common "impressed" voltage to all metal objects connected to the bonding system further ensuring they don't corrode but the anodes do. (No current leaks from battery can occur assuming an isolation switch is fitted on the positive battery terminal - assumed to be normal practice).

NOTE - Systems such as "**Impressed Cathodic Corrosion Protection**" use a similar principle to the Negative Earth Bonding System.

CORROSION TEST METERS

Your Hamilton Jet Distributor has details of corrosion test meters. These are available as a portable kit or can be permanently mounted in the boat. Simply pressing a button gives an instant indication of earth bonding and anode condition. An inexpensive and convenient method of ensuring your boat and jet unit(s) do not suffer corrosion.

EARTH BONDING SYSTEM FOR ALUMINIUM, GRP, WOOD HULLS (other than steel) :**1. BONDING SYSTEM (refer diagram page J4)**

The bond strip and connecting wires should be aluminium or copper of at least 14.5 sq.mm. cross section area (e.g. 5mm dia.) to give very low (e.g. 0.01ohm) electrical resistance. All junctions should preferably be welded, but if bolted, should be clean, have a good contact, and be regularly inspected. The bond wire or strip which runs fore and aft down the hull, should be kept clear of bilge water where possible, and connected to :-

- (a) The engine frame (the engine must have a negative earth).
- (b) The jet unit casing.
- (c) A shaft brush running on a slipring mounted on the jet coupling or on the line shaft close to the coupling.
- (d) All anodes attached to the hull.
- (e) The fuel tanks and any other major items.
- (f) Casings of all major items of electrical equipment.
- (g) In the case of a wood or fibreglass hull, to an external earth plate in the area of the hull bottom is always under water.
- (h) In the case of an aluminium hull, to a connection welded to the hull in an area where the hull is always touching water.
- (i) Direct to the **NEGATIVE** pole of the battery.
This connection is not necessary if:
 - 1. There is a two wire electrical system which is isolated from the hull, jet and engine and.
 - 2. there is an effective leakage monitoring system which is used regularly and the results are recorded.

Note that it is important to check for leakage:

- for every item of electrical equipment in operation
- when there is any alteration to the electrical system of this boat
- when any electrical connection is made to shore.*

2. ELECTRICAL WIRING SYSTEM

Every part of the electrical system should use **TWO** wires, positive and negative, i.e. the negative must not run through the frame of any major unit, through the hull of the boat, or through the bonding system. That is to say, **DO NOT USE AN EARTH RETURN SYSTEM.**

Starter motors should be the 2 wire type with a negative battery terminal rather than the casing of starter connected to the battery negative.

3. RADIO, TRANSCEIVERS, DEPTH SOUNDERS AND OTHER ELECTRICAL AUXILIARIES

Batteries, radio transmitter or other electrical equipment should **NOT** be earthed to the jet unit.

Be guided by your radio technician, but in general these systems should either be entirely insulated i.e. separate insulated alternator, separate batteries etc., or the system should be incorporated in the bonding system but with a separate earth plate well removed from the bonding earth strip and from the jet. The metal used for the separate earth plate must be compatible with the bonded earth strip metal and the hull material (stainless is likely to be the best option). Install earth plate as far away from jet as possible.

4. ZINC ANODES

The casing of the jet unit is electrically connected to the jet unit anodes. The anodes, which are zinc blocks, are fixed to various parts of the jet unit below the water line. If the anodes are being eaten away they are providing protection. **They should be inspected and replaced when half consumed.** Further anodes should be fitted on the hull, sufficient for hull protection (see diagram page J4).

5. IN-SERVICE CHECKS

In service, two items should be inspected regularly :-

(a) The bonding system - for loose or corroded connections and test to ensure that electrical resistance is still low.

(b) All anodes - if any are more than half-eaten away replace them with a new anode.

6. ANTI-FOULING PAINT / ANTI-SEIZE COMPOUND

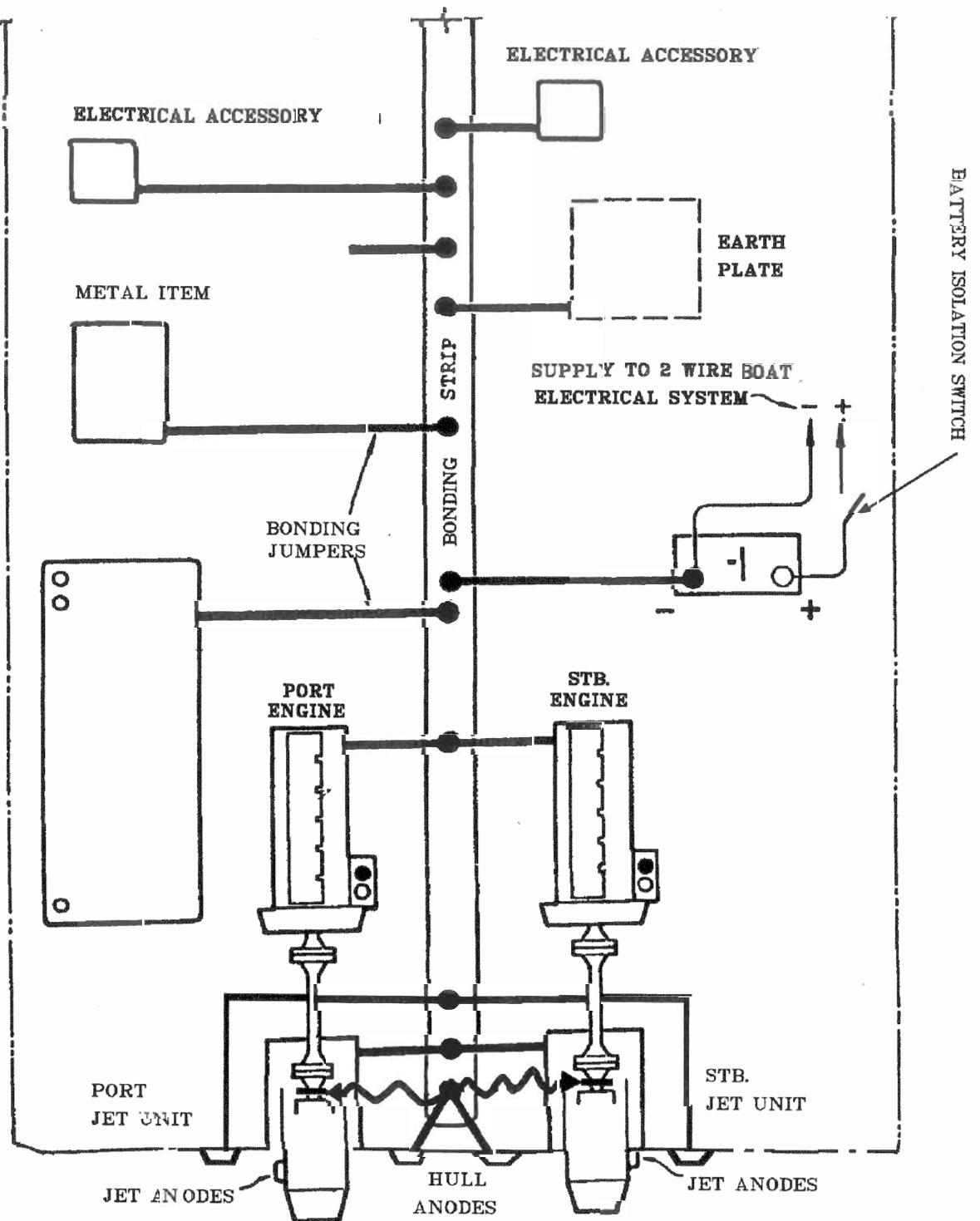
Keep stainless steel clean. **Only use tin-based anti-fouling or any antifouling paint suitable for an aluminium hull.** Anti-foul the interior of the jet aluminium casings if desired but note that if the jet is run at least approximately every two weeks barnacle growth does not normally occur in the jet interior.

DO NOT USE either paint containing copper or graphite based anti-seize compounds as these could cause corrosion of the jet unit.

7. IMPRESSED CURRENT PROTECTION

Impressed current protection may be used if desired. Follow the suppliers instructions.

EXAMPLE OF A BONDING LAYOUT (NOT STEEL HULLS)



HAMILTON JET

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STEEL HULLS (Refer diagram page J6):

THE COMPLETE JET UNIT MUST BE ELECTRICALLY ISOLATED FROM THE HULL, ENGINE ETC. For the insulation instructions see the steel hull installation section for your jet unit, but specifically, insulation of the jet unit must be accomplished. The remainder of the boat should, in all respects, employ the Bonding System described on pages J2 - J4.

Key areas for insulation of the jet unit are :-

- (a) Base mounting flange and bolts.
- (b) Transom seal to transom (sometimes by means of the rubber seal ring or gasket).
- (c) Control connections such as steering and reverse cables, hydraulic hoses, etc. (standard reverse hose are non wire wound - i.e. insulating) but the standard steering hoses must be replaced with non wire wound type).
- (d) Driveshaft. A coupling shaft using resilient rubber elements can provide the insulation most simply, or a flywheel plate insulated from engine flywheel by means of reinforced insulating sheet, bushes and washes(e.g. Tufnol).

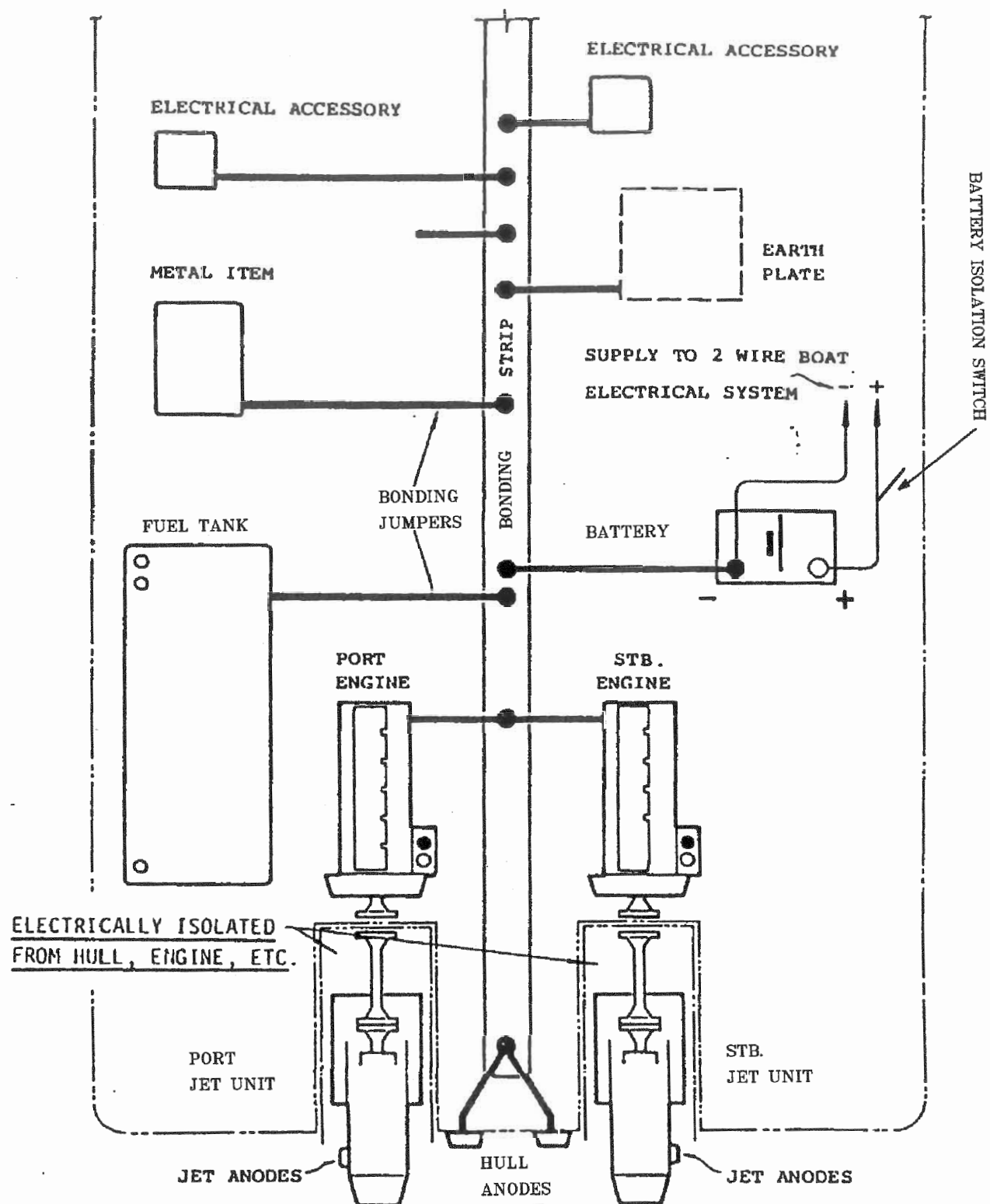
The following are additional details :-

- 1. If a negative earth system is used on the boat it must not be connected to the jet unit casing of its anodes.
- 2. Every part of the boat electrical system should have **TWO** wires to it , a positive and a negative wire.
- 3. With electrical auxilliary equipment installation be guided by your electrician. Do not earth electrical equipment to the jet unit, but to a separate earth installed as far away from the jet as possible.
- 4. Separate zinc anodes are provided on the jet to protect the jet unit against corrosion.
- 5. Regularly inspect all anodes and replace any that are more than half-eaten away.
- 6. Keep stainless steel clean.
- 7. If anti-fouling paint is used, **use tin-based or any anitfouling paint suitable for an aluminium hull**
Anti-foul the interior of the jet aluminium casings if desired but note that if the jet is run at least approximately every two weeks barnacle growth does not normally occur in the jet interior.

DO NOT USE paints containing any copper at all. Do not use graphic based anti-seize compounds.

- 8. A **separate** impressed current protection for the jet unit is also recommended if desired.

EXAMPLE OF A BONDING LAYOUT (STEEL HULLS ONLY)



HAMILTON JET

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STEERING:

The steering deflector deflects the jet of water to port or starboard causing the boat to steer to port or starboard respectively.

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

(a) If the engine is stopped there is no jet of water 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 at "**zero speed**" as well as all ahead and astern speeds - a feature which gives the Hamilton Jet unrivalled manoeuvrability.

REMEMBER whether going ahead, at "**zero speed**", or astern:-

The bow of the boat will always turn the way the steering wheel is turned.

i.e. turn wheel to port, bow of boat will move to port and vice versa.

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

AHEAD/ZERO SPEED/ASTERN CONTROL:

Astern and "**zero speed**" are achieved by redirecting the jetstream. If the reverse duct is lowered fully all of the jetstream is redirected back under the boat giving full astern thrust. If the reverse duct is lowered partially the jetstream is split giving some ahead and some astern thrust. At one reverse duct position the ahead and astern thrusts will be equal so the boat will not move ahead or astern regardless of the throttle opening.

This position is referred to by Hamiltons as "**zero speed**". (It should not be confused with the neutral position of a gearbox when the driveline stops rotating).

When operating the Hamilton reverse control **the jet unit is always rotating** regardless of the position of the reverse duct. Any intermediate position between ahead and astern can be selected to give infinitely variable speeds when manoeuvring.

Caution

If in lightweight planing craft the **astern** or **zero speed** 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 an emergency.

Emergency Braking:

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

- (i) Close the throttle.
- (ii) Select zero speed or astern.
- (iii) Open the throttle, gently at first.

MANOEUVRING AND DOCKING :

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

- (i) Move the reverse control lever to the "zero speed" position.

- (ii) Set the throttle up to 1/3 open - say approx. 1,200 r.p.m. (In strong tide or wind conditions increase the throttle opening to obtain greater response as necessary.)
- (iii) A slight movement either way from the "zero speed" position will be sufficient to move the boat ahead or astern until the manoeuvre is complete.
- (iv) Steering will be excellent also at this throttle opening. Full steering control is available at all Ahead/Astern control lever positions and there is no change of steering "sense" at any time.

Summary - manoeuvre at fixed throttle opening working the steering with one hand and the Ahead/Astern control lever with the other hand.

SHALLOW WATER OPERATION :

Avoid pumping stones, sand etc through the jet unit - this will blunt and wear the impeller.

- (a) At high planing speeds this is not a problem until the boat is nearly aground.
- (b) At slow displacement speeds avoid using large throttle openings in shallow water. If it is not possible to pick a deep water area to start off and stop in, "idle" over the shallow area into deep water before accelerating up to speed

AERATED WATER

When operating in areas where the water may be excessively aerated. (eg. fast flowing rapids) the following points should be noted:

1. There may be a loss in thrust due to the unit pumping a significant amount of air instead of water.
2. The impeller may unload suddenly causing the engine rpm to fluctuate wildly.

BLOCKAGES, DEBRIS, ETC, IN THE UNIT :

Small pieces of debris, water weed or large logs, etc will not normally block or harm the unit. However, it is good practice to steer around such debris if possible as any caught in the intake screen, impeller or tailpipe stator vanes can affect the jet unit's performance.

Blockages of the unit are usually noticed by :-

- (a) The engine unloading (rpm increases).
- (b) Lack of jet thrust (boat speed drops).
- (c) Excessive noise and vibration from the unit. If a blockage is indicated, close the throttle of the blocked unit, or stop the engine. Most times, especially if the boat is moving forwards, the obstruction will fall away.

If unsuccessful :-

- (a) If a gearbox is fitted, momentarily reversing the jet unit rotation very effectively clears debris from the intake screen,

or, **with the engine stopped**, either -

- (b) Operate the raking screen (an optional extra), or
- (c) Remove the inspection cover (6) on the intake housing and clear the obstruction.

CAUTION : Before removing the inspection cover () :-

- (i) Stop all engines.
- (ii) Check that the static water level will be below the intake inspection cover lip.

If the static water level is too high, weight can be placed on the bow end to raise the stern end enough to allow the cover to be removed. Alternatively, an optional extra Overflow Preventer (refer Optional Accessories page S11) can be fitted to the inspection point to allow higher water levels..

A. STEERING

Cable Systems

Heavy steering is usually caused by too many bends in the cable and bend radii too small. Disconnect the cable at the jet steering arm (tiller). Work the steering arm(s) by hand then work the steering wheel to determine whether it is the jet or the steering control or cable which is the problem. With multiple jets disconnect the tie rod to work each jet tiller individually.

Hydraulic Systems

Air continues to work its way out of manual hydraulic systems for some time. Regularly check the oil reservoir level for some weeks with a new boat and top up if necessary. With air in the system the steering will be soft and not accurate. Ensure all air is bled from the system - refer manufacturers instructions. Ensure number of turns of the wheel is not more than 1.5 full lock to full lock otherwise steering will be insensitive. Note with Wagner 700 system the helm pump oil plug has to have a bleed hole drilled in it but only if it is the highest station in elevation (including a single station system).

With multiple jets ensure the steering tie rod length is adjusted so that all jets steer straight ahead at the same time (refer section J).

If the steering wheel is still difficult to turn, disconnect the cylinder at the jet steering arm (tiller). Move the jet tillers by hand to check jet and then operate the wheel to determine whether it is the jet or the steering control system which is the problem. With multiple jets disconnect the tie rod to move each jet tiller individually.

1. If the cylinder does not move, and the wheel is still hard to turn, check :
 - (a) The system is free of entrapped air. (Refer manufacturers "Bleeding" instructions.)
 - (b) The system is piped using approved lines - **flexible hydraulic hoses are not suitable.**
 - (c) The hydraulic oil is one of the types recommended, that is, not more viscous (thicker) than automatic transmission fluid.
 - (d) The tubing used is at least the size recommended.
2. If the steering wheel continues to turn easily and the cylinder does not feel like it reaches full stroke, check the following :
 - (a) **The cylinder bypass valve (if installed) is in the closed (normal) position.**
 - (b) All system fittings are tight.
 - (c) The system is free of entrapped air. If air is in the system, the wheel will spring back when turned and released.
 - (d) A lockvalve on another helm pump is not seized open. This is indicated by the wheel turning at that station when the wheel is turned at another station. That lockvalve must be disassembled and cleaned. When removing the slotted lockvalve inserts, take care not to lose the retained spring and steel ball or to damage the seals.
 - (e) The cylinder piston seals are not damaged. All of the above should be checked and determined to be satisfactory first. Remove the cylinder rod end bolt and attempt to stroke the cylinder rod fully back and forth by hand. If the rod moves, the piston seals must be replaced. Oil leaking along the cylinder rod from either end of the cylinder indicates the rod seals are defective and must be replaced.
3. If the number of wheel turns is different when turning hardover to port and hardover to starboard, check the following :
 - (a) The system is free of entrapped air.
 - (b) The system is piped using approved lines - **flexible hydraulic hoses are not suitable.**

B. AHEAD/ASTERN

Poor reverse thrust

- Reverse duct not travelling fully down so whole jetstream enters it sufficiently (refer page I6). Jet transom cable anchor assembly in correct aluminium tube grooves (refer page S10).
- Boat has insufficient immersion at transom and air being sucked from rear into jet intake.
- Engine exhaust gases entering jet - refer Exhaust Systems page H3.

Reverse duct won't move - Disconnect cable at reverse duct and check whether reverse duct jammed or control cable seized outboard.

C. JET

Note - assuming the correct impeller and nozzle* combination are fitted then :-

High RPM - means jet is at fault.

Low RPM - means engine is at fault.

Symptom:

Possible Cause:

- | | |
|--|--|
| 1. Water leaking from under front bearing | - Faulty water seal or stationary face. |
| 2. Excessive high pitched rattling whine. | - Faulty thrust bearing. |
| 3. Bad vibrations. | - Cutless bearing worn or water drain hole blocked.
- Worn driveshaft universal joints. |
| 4. Engine revolutions gradually increasing over a period of time. Take off performance poor. | - Worn or blunt impellers.
- Excessive impeller tip clearance. |
| 5. Sudden increase in engine revolutions, no noticeable decrease in jet thrust. | - Faulty tachometer. |
| 6. Excessive engine revolutions, noisy jet | - Screen blocked with wood, debris or rope through screen and wrapped around unit shaft or object jammed in stators and / or impeller. |

NOTE: All the symptoms described in items 2, 3 and 4 may be caused by the same fault as in item 6.

* Refer **NOZZLE SIZES** page G4.

SERVICING SCHEDULE

1. Daily - Pre-Start Up

- (a) Check via intake inspection hatch that interior of jet is clear of debris - intake screen, impeller and stator blades.

CHECK WATER LEVEL IS SAFELY BELOW HATCH OR OVERFLOW PREVENTER BEFORE OPENING JET INSPECTION HATCHES.

- (b) With hydraulic steering, check oil level and condition. Top up if necessary. Drain and replace oil if it is discoloured or contaminated. (See manufacturer's instructions for bleeding and recommended lubricant).
- (c) Check hydraulic oil lines of steering for oil leaks - particularly if oil has had to be added to a reservoir.
- (d) Check reverse and steering move duct and deflector freely through full stroke.
- (e) Check for loose electrical connections or linkages at position indicator senders (transmitters) if fitted.
- (f) Check for signs of water leaking from under thrust bearing housing = leaking water seal. If water seal is leaking it should be replaced as soon as possible otherwise water may mix with thrust bearing grease causing corrosion and failure of the thrust bearing.
- (g) Check mounting linkages of steering cable or cylinder to Tiller are tight. Check any steering tie rod is securely fastened and the length adjusting locknuts secure.

2. Every 30 Hours Running : (Or monthly if not run for 30 hours).

Lightly grease the following :- (DO NOT OVERGREASE)

- Thrust bearing
- Driveshaft universals.
- Pivot point of steering cylinder (if fitted).
- Raking screen bearings (if fitted).
- Reverse cable at Transom anchor.

3. Every Month :

- Check condition of all anodes (refer to notes under "Sacrificial Anodes" page M2).
- Check Steering Crank Cotter (Taper) pin nut is tight (outboard) (refer item 75 page S6).

4. Every 6 Months :

- Replace all sacrificial anodes.

5. Every Year :

- Dismantle and inspect the jet for wear as per sections M and N of the Manual.
- Replace all anodes.

SERVICING NOTES

GENERAL

This unit has been designed to require the absolute minimum of maintenance. However, it is recommended that the unit be dismantled and inspected for the 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 :-

THRUST BEARING:

Grease lightly every 30 hours operation. Do not over grease . (See Recommended Lubricants page M4). Operating temperature for the bearing housing is normally 55°C (120-130°F) - it is possible to hold your hand on the housing for 2-3 seconds only. Note that the bearing can operate up to 120°C satisfactorily and that most of the heat generation is from the seals.

REAR BEARING :

This is a water lubricated, cutless bearing and requires no attention except to periodically check that the water drain hole is not blocked.

DO NOT RUN THE UNIT OUT OF WATER as this will damage the bearing and counterface. NOTE - Special cutless bearing and waterseal assembly are available at extra cost which enables the jet to be run dry. (Refer "Dry Run Kit", Optional Accessories page S11).

To inspect the bearing see dismantling procedure page N1.

WATER SEAL :

This is a carbon face seal type with a hardened counterface and should require no attention. **Any failure is detected by water leaking from under the bearing housing.**

To inspect seal see dismantling procedure page N1.

DRIVESHAFT UNIVERSALS :

Every 30 hours sparingly grease the universal joints and sliding splines. **Do not over grease.**

SACRIFICIAL ANODES :

The unit is fitted with anodes on the tailpipe, steering deflector and reverse duct which will waste away in sea or contaminated water. Regularly inspect these anodes and **replace if half eroded away or more.** If allowed to disappear, corrosion will start on the aluminium parts which could eventually damage the unit.

NOTES :

-The rate at which anodes erode away will vary considerably depending on the nature of the water. Check anodes monthly initially until a safe longer check interval can be established from experience.

-Hull anodes also need regular inspection and replacement.

If hull anodes become inactive the jet unit anodes will erode more rapidly leaving the jet vulnerable to corrosion.

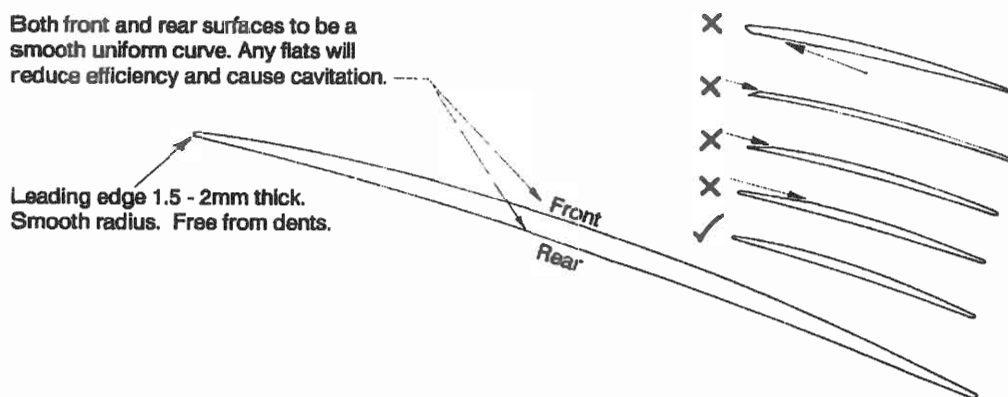
IMPELLER :

The leading edges of the impeller may tend to become "blunt" after a period of time if there are small solid particles in the water such as sand or stones. **The performance of the impeller will drop as a result.**

Anytime the inspection cover is removed (as above) the leading edge of the blades should be inspected for wear. If badly worn, remove impeller (refer page N2) and sharpen as shown below.

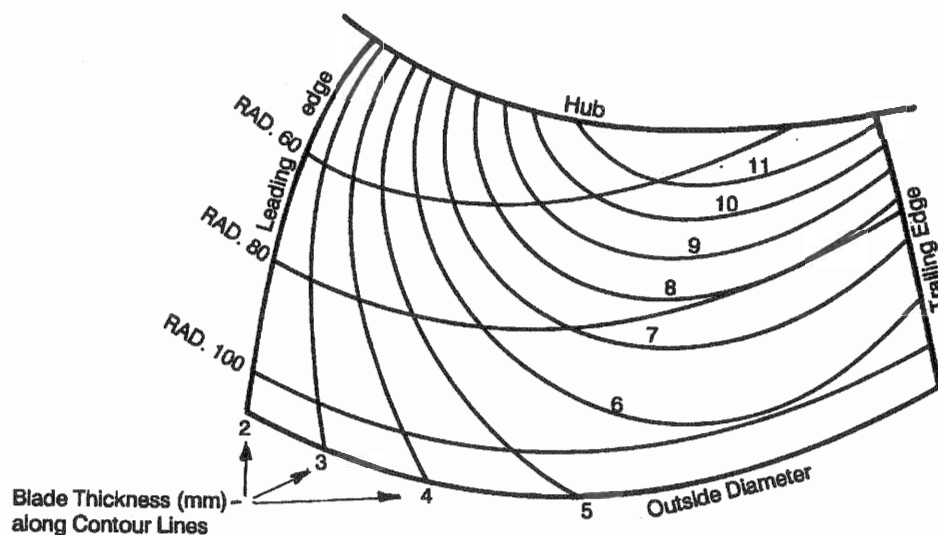
IMPELLER SHARPENING :

Both front and rear surfaces to be a smooth uniform curve. Any flats will reduce efficiency and cause cavitation.



VIEW OF IMPELLER TIP

IMPELLER SHARPENING - CONTOUR LINES



FRONT VIEW OF IMPELLER BLADE

HYDRAULIC STEERING (IF FITTED) :

Check oil level daily and externally inspect all system components to ensure no oil leaks have developed. Top up reservoir, if necessary. Change oil annually or if contaminated in any way - see steering manufacturers instruction for suitable oils and bleeding instructions.

CABLE REVERSE (AND STEERING IF CABLE OPERATED) :

All jet reverse duct and steering joints outside the hull should be oiled and checked to see they are operating freely. Once in the water these joints will be water lubricated and will not normally require attention. Fill the reverse cable transom anchor assembly with water repellant marine grease every 30 hours operation (via in-board grease nipple (ZERK) see page S10 for location). Lubricate cables at controllers as per cable manufacturer's instructions.

RAKING SCREEN BEARINGS (screen rake is an optional accessory) :

The screen rake should be checked at regular intervals for free operation. Stiffness or binding may be caused by debris caught in the screen or seized bearings. Grease bearings periodically. Use water repellant grease.

CARE OF JET UNIT PAINTWORK :

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. Periodic cleaning down, wire-brushing, and repainting may be necessary depending on water conditions prevailing, and extent of use.

When the craft is on the slip, or at least annually, the complete unit should be removed from the boat, and inspected internally and externally for faults, corrosions, or breakages (follow the maintenance instructions in Section N). Clean down and repaint the castings. **DO NOT use copper-based antifouling paints. Tin base antifouling paints are suitable. Leave all stainless steel parts polished and unpainted.** Antifoul paint interior of aluminium castings if desired but note that if the jet is run at least approximately every two weeks, barnacle growth does not normally occur in the jet interior.

ANTI-SEIZE COMPOUNDS :

Do not use graphite based anti-seize compounds - these will cause a corrosion problem.

RECOMMENDED LUBRICANTS :

For hydraulic steering systems refer to manufacturers recommendations.

For thrust bearing use **SHELL ALVANIA R2** or equivalent.

For all other applications (bearings, tapers, threads, mating joints and corrosion protection) - **BP ENERGREASE MM - EP2** (Marine multi-purpose extreme pressure grease) or equivalent.

DO NOT USE graphite based anti-seize compounds - these will cause a corrosion problem.

USE OF THREAD LOCKING FLUID

All bushes should be assembled using "Loctite 601" or equivalent. See (v) 2. page N4 for instructions. Special nuts and bolts are fitted using thread Locking fluid - refer **TIGHTENING TORQUES** page M5. All studs are fitted using "Loctite 262" or equivalent.

TIGHTENING TORQUES

Clean all threads thoroughly before reassembly. Apply light coating of grease (refer RECOMMENDED LUBRICANTS page M4) or thread Locking fluid as indicated below.

Thread Size	Description (Item No.)	Thread locking Fluid	Nm	Torque lbs ft
M6	Nut	-	5	3.7
M8	Nut	-	12	9
M10	Nut	-	24	18
M12	Nut	-	40	30
M16	Nut	-	60	45
M20	Nut	-	120	90
-	Impeller Nut (M20)	Loctite 242 *	200	150
-	Coupling Nut (M20)	Loctite 242 *	200	150
-	Reverse duct Pivot Pin	Loctite 222 *	80	60
-	Steering Deflector Pin	Loctite 222 *	80	60

* or equivalent.

STANDARD TOOLS RECOMMENDED (not part of jet supply scope)

- 1 1/2" drive torque wrench with capacity up to 200 Nm (150 lbs.ft.) - impeller nut, coupling nut.
- 1 1/2" drive ratchet, torque bar and short extension with minimum of 13mm, 19mm, 24mm & 30mm A/F sockets.
- 1 x 9mm, 1 x 10mm, 1 x 13mm, 2 x 17mm, 1 x 19mm and 1 x 24mm A/F spanners.
- Long nose pliers.
- Large and small screw driver.

SPECIAL TOOLS KIT - 106013 (OPTIONAL)**Includes:**

	Part No.
1. Puller - Coupling and impeller	106212
2. Puller Cutless bearing	106215 SY
3. Reaction Arm	105797
4. Socket 30mm A/F x 3/4" sq Drive	SPCMBDA
5. Bolt M8 x 55 long (zinc plated) (2 off)	HYIXXBR
6. Nut M8 (zinc plated) (2 off)	JDPVYAC
7. Bolt M10 x 55 long (zinc plated) (2 off)	HYIXXCB
8. Nut M10 (zinc plated) (2 off)	JDPVYAE

Refer to pages M4 and M5 for Recommended Lubricants, Tightening Torques, Standard and Special Tools.

THRUST BEARING ASSEMBLY AND WATER SEAL

Warning:

If boat is afloat check that water level is below bearing housing before proceeding.

(i) Dismantling Thrust bearing, Grease Seals And Water Seals:

1. Uncouple the driveshaft from the jet unit.
2. Prevent coupling flange (43) from turning with Reaction Arm and unscrew nut (44) approximately two turns only.
3. Use puller to free the coupling flange (43) from the mainshaft. Unscrew nut (44), remove washer (45), coupling flange and key (42).
4. Unscrew three bearing housing retainer nuts (33) from studs (4) and remove spring washers (32).
5. Slide bearing housing (30) off the main shaft (the housing will still contain bearing (41), outer sleeve (30) and seal (38). Check that the "O" Ring is in the bearing housing.
6. Withdraw the stationary face (37) and inner sleeve (30) and seal (38).
7. Slide water seal assembly (36) back off main shaft.

(ii) Checking for Wearing:

Check the following parts for wear and replace where necessary -

8. Oil seals (38) and sleeves (39).
9. Bearing (14).
10. Water seal (36) and stationary face assembly (37). Check to see if mating faces are scored or chipped. **Always replace both seal and stationary face even if one or other appears unworn.**
11. "O" Rings (46, 47). Check for cuts or deformation.
12. Thoroughly clean all parts.

(iii) Re-assembly of Water Seal:

(Refer Recommended Lubricants and Tightening Torques - pages M4 & M5.)

1. Lubricate the mainshaft with a 20:1 water and household detergent mix and carefully replace seal parts in the following order: - cup washer, spring, rubber drive ring and rotating carbon seal face.
2. Slide the assembly down the mainshaft, through the hole in the intake until the cup washer rests against the split pin (35) through the mainshaft.
3. Press inner oil seal (38) into stationary face (37) so that the lip faces towards the coupling end of shaft. (Refer drg. Shaft Group.)
4. Coat "O" Ring (47) and stationary face housing to intake (1) contact faces with marine grease, fit over mainshaft and push into place. *

* Warning:

Water Seal faces must remain free of dirt and grease.

Care must be taken not to damage the seal or stationary faces.

(iv) Re-assembly of Bearing Housing:

6. Grease outside surface of inner seal sleeve (39), slide over shaft and push through the seal until it rests firmly against the shoulder of the shaft
7. Press outer seal (38) into the bearing housing (30) so that the lip faces towards the coupling end of shaft (refer drawing shaft group) and is just in clear of the tapered "lead in".
8. Pre-pack bearing (41) with grease then press into bearing housing (30).
9. Coat "O" Ring (46) with grease and place in bore of bearing housing (30) next to bearing (41).
10. Feed bearing housing (30) over shaft and locate on three studs (4). Fit spring washers (32) and nuts (33) and torque for M12 Nut page M5.
11. Coat bearing carrier (40) in grease, push over shaft and gentle tap inside bearing (41) until it is flush with face of bearing.
12. Grease outside surface of outer seal sleeve (39), slide over shaft and push through the seal until it rests firmly against the bearing.
13. Lightly grease bore and keyway of coupling flange (43), and keyway of the mainshaft. Fit coupling key (42), coupling flange (43) apply Loctite 242 thread locking fluid or equivalent to thread and fit washer (45) and coupling nut (44). Prevent coupling flange (43) from turning and torque nut (44) as per Coupling Nut page M5.
14. Check mainshaft rotates before connecting up the drive shaft.

IMPELLER/WEAR RING**(i) Checking for Wear:**

Before dismantling the tailpipe end of the jet, remove the inspection cover (6) (or intake screen (16) if in dry dock) and carry out the following checks:

1. Using feeler gauges, check clearance between the tips of the impeller blades and wear ring (3) at each side of the unit (i.e. not top and bottom). Maximum recommended worn clearance is 0.9mm (.035 ins) **per side**.
2. Push the mainshaft (34) hard from side to side. Check total sideways movement at blade tips. Maximum recommended worn **total movement** is 0.5mm (.020 ins). This indicates the amount of wear in the cutless bearing (52) and shaft sleeve (48).

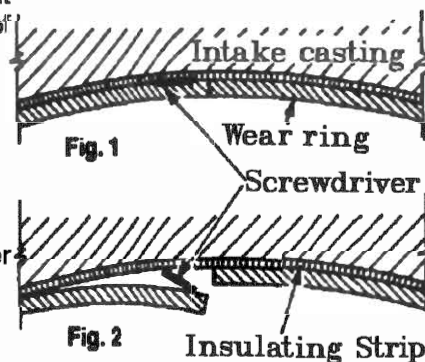
(ii) Dismantling:

3. Disconnect reverse control from duct (90) by removing the connecting pin, Disconnect the two springs (99) one from tailpipe (50) and one from crank assembly (95). Hold crank assembly (95) away from detent plate (92) and move duct through full arc to check for stiffness or slack bushes.
4. Remove pivot bolt (79) and washer (86), the reverse duct can now be removed complete with anode (56), detent plate (92), springs (99) attachment bolt (58), nut (10) and flanged bushes (80).
5. Disconnect steering control at steering tiller (70). Check steering shaft (70) for:
 - (a) Free rotation and axial movement
 - (b) Undue wear in bushes (21) and (55)
 - (c) Undue wear in ball end of crank (71), also check fit in deflector bush (85).
6. Remove cotter (taper pin) assembly (72) from steering crank (71) and ensure that crank rotates freely on shaft.

7. Rotate steering deflector (77) through full arc to check for stiffness or slack bushes (80) and (81). If these are in a reasonably good condition the deflector can remain on the tailpipe (50).
8. Remove the four tailpipe nuts (33) and lock washers (32). Hit tailpipe sideways with the heel of the hand or a rubber mallet to free the joint. Remove tailpipe (50) from the remainder of the jet unit, the steer crank (71) must be slipped off the shaft (70) at the same time.
9. Prevent coupling flange (43) from turning with Reaction Arm and unscrew impeller nut (44) and remove washer (45). If nut (44) is stiff apply gentle heat on nut to destroy the loctite thread locking fluid.
10. Withdraw shaft sleeve (48)
11. Use puller to withdraw impeller (121) from the shaft (34) and key (42), remove key (42).
12. Examine wear ring (3). In the unlikely event of this being very badly scored, or if it has swollen inwards, it should be replaced. If possible, request your local agent to carry out the replacement.

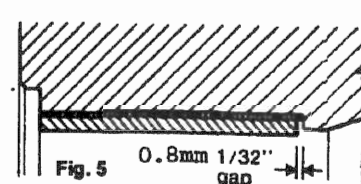
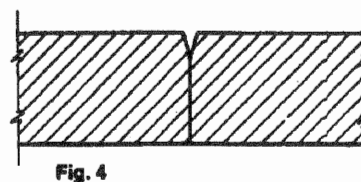
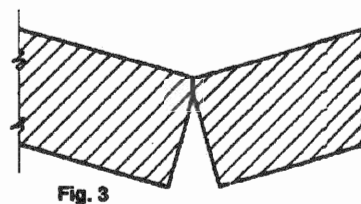
(iii) Replacing the Wear Ring:

- (a) Find the joint in the wear sleeve and force a fine screw driver between the sleeve and the intake casting adjacent to the joint until the end of the sleeve is free (fig. 1 and fig. 2). Pull the end of the sleeve inwards and remove it from intake.



- (b) Remove the insulating strip and thoroughly clean intake bore
- (c) Paint the intake bore first with a two pot zinc chromate etch primer and allow to dry and then with a zinc chromate primer.
- (d) Fit a new insulating strip while primer is still wet ensuring the insulator is in contact with the paint over the whole surface.

- (e) Smear the whole insulator surface with a thin layer of marine grease. Take a new wear strip and smooth off the mating ends. With chamfer end leading, butt the strip at the chamfers by twisting slightly Fig. 3, (this reduces the lead in diameter) and feed it inside the insulating strip, as it goes in straighten the strip gradually until it butts normally, Fig. 4. **N.B.** With variations in paint and grease layer thickness it may be necessary to reduce the length of the wear ring by careful filing - **DO NOT OVERFILE, the wear ring should have to be driven in.** Slide in evenly as far as is possible by hand. Then place a heavy steel plate against the edge of the wear ring, (plate should cover whole wear ring diameter) and drive wear ring evenly in by hitting on plate with a large hammer. The wearstrip is in the correct position when it is flush with the face of the bore, see Fig. 5. **The 0.8mm gap must be maintained to prevent electrical contact between the wear ring and the intake casting.**



(iv) Impeller Overhaul:

(a) Check the impeller leading edge, if blunt or dented file out the dents following the profile of the blade, and then sharpen in line with instruction on page M3.

(b) If you decided at this point in these instructions that the outside diameter of the impeller was badly worn, check it again in the new wear ring, if the clearance is still too great proceed as follows -

Build up impeller tips by welding. Stainless Steel: Filler metal chemical analysis similar to ASIM 2769 316L (carbon content less than .03%). Post weld heat treatment not required.

Turn the outside diameter to 214.75 - 214.60 making sure that it is concentric with the bore. (Light cuts should be taken when turning outside diameter to avoid deformation of the impeller blades).

File and polish to remove sharp edges and burrs .

Balance the impeller statically, preferably on its main shaft (34) with the coupling (43) **and all keys in place.**

Balance to within 38gm-cm (0.5 oz.ins.).

(v) Re-assembly:

1. Check the cutless bearing (52) and its sleeve (48) for wear (refer section B item 2 page N2) or bad scoring and if necessary replace. Replace automatically if the impeller has just been built up and the wear sleeve replaced. Use either an internal extractor to pull bearing (52) from the tailpipe (50) or carefully cut two slits 180° to each other in bearing and remove bearing with a screw driver (take care not to damage bore). Apply grease to tailpipe bore before inserting new bearing but keep grease away from rubber bearing surfaces. When pressing the new bearing in, use a wooden block under the point of the tailpipe fairing to take the load.

2. Remove all steering and reverse system bushes. Note that these have been fitted with thread locking fluid - gentle heat may be required to release them. Worn bushes should be replaced.

To refit bushes:-

All bores must be clean of any paint including etch primer and should be degreased.

It is recommended that the housing bore and bush OD are sprayed with a thin coating of "Loctite 747" (Loquic 'T' primer) a few minutes prior to fitting.

This is especially important in the field where the bores may not be cleaned easily.

When the 'T' primer is dry apply Loctite 262 or RC 680 (for large gaps) or equivalents to the bore and the bush OD. Press into position rotating the bush to ensure that the loctite is evenly spread and the bush is centralised in the bore.

3. Clean all parts thoroughly.

4. Smear a light coating of grease over complete mainshaft.

5. Insert impeller key (42) **chamfers down into shaft keyway.**

6. Slide impeller (121) onto shaft followed by the shaft sleeve (48) and then washer (45).

7. Apply "Loctite 242" or equivalent thread locking fluid to shaft thread of nut (44) and torque as for impeller nut page M5.

8. Dust bore of cutless bearing (52) with talc or french chalk.

9. Clean and grease tailpipe/intake contact faces. Refit seals (51), (53) (two) and replace tailpipe, at the same time steering crank (71) onto shaft (70). Screw on nuts with spring washers (32), (33) - threads greased. Torque as for M12 nut page M5.

10. Turn the coupling flange (43) to ensure assembly will rotate.

11. Replace and tighten cotter (taper pin) assembly (72) in steering crank (71). Torque to M8 nut page M5.
 12. Before replacing reverse bucket pivot bolt (79). Grease bushes (80) and (91), place washer (86) under head of bolt, bush (80) shoulder to tailpipe. Apply "Loctite 222" or equivalent thread locking fluid to bolt (79) thread, fit and torque as for Reverse Duct Pivot Pin page M5.
 13. Move duct through full arc check for stiffness, reposition crank assembly (95), check roller (96) for wear, attach the two springs (99) and move duct through arc again. Check that crank roller moves freely over detent plate (92)
 14. Check that reverse controller at helm is free (Apply marine grease at Controller internally and via grease nipple (Zerk) at transom. Run oil through cable) then connect operating system to reverse duct (90).
 15. Check that steering control from helm to lever (70) is free and then reconnect to lever (70).
- N.B. If deflector pivot pins (79) are removed these should be refitted using "Loctite 222" or equivalent thread locking fluid and torqued as for steering deflector pins page M5.

INTAKE GROUP

Item No.	Part No.	No. Req'd	Description	
1	105985	1	Intake	
2	105988	1	Insulator	
3	105987	1	Wear ring	
4	102769	7	Stud M12	316SS
5	JMNG AAE	*	Hose Tail (3/4" bsp)	
6	106002	1	Inspection Cover	
7	HMHR ACV	1	Inspection Cover Seal	
8	30671	3	Stud M10	316SS
9	JEQK XAE	3	Spring Washer M10	316SS
10	JDQH XAE	3	Nut M10	316SS
11	105999	2	Blanking Plug Screen Rake	
12	HMHR AEJ	2	Seal 'O' Ring	
13	30667	4	Stud M8	316SS
14	JEQK XAC	4	Spring Washer M8	316SS
15	JDQH XAC	4	Nut M8	316SS
16	105989	1	Intake Screen (Aluminium Bars)	
	106202		Intake Screen (Steel Bars)	
17	JCQH XAN	4	Stud M10	316SS
18	JEOZ XAI	4	Flat Washer M10	316SS
19	JDQS XAE	4	Nut Nyloc M10	316SS
20	HIQU AAE	*	Plug	
21	105998	2	Bush	
22	HMHR AAQ	1	Seal 'O' Ring	
23	63097	1	Name Plate	
24	63135	1	Patent Plate	
25	63610	1	Warning Plate	

* Jet assembled with 2 Plugs item 20 fitted. One or both of these can be replaced by Hosetail item 5 for water offtakes.

INTAKE SCREEN RAKE ASSEMBLY (OPTIONAL ACCESSORY)

Item No.	Part No.	No. Req'd	Description
131	105995	1	Bearing - Port
132	105991 Y	1	Screen Rake W.A.
133	105996	1	Bearing - Starboard
134	HMHR AAH	1	O-Ring 0.09" x 0.5" x 0.68"
135	102364	1	Spring
136	105359	1	Spring Anchor
137	106049	1	Spacer
138	106273 Y	1	Rake Actuating Arm
139		1	Cotter (Taper) Pin Assembly
Cotter (Taper) Pin Assembly consists of:			
140	105931	1	Cotter (Taper) Pin
74	103637	1	Flat Washer
14	JEQK XAC	1	Spring Washer
75	JDQH XAC	1	Hex. Nut M8
12	HMHR AEJ	2	O-Ring 0.06" x 1.00" x 1.125"
31	HEID AAA	2	Grease Nipple (Zerk) - 1/8 bsp.

Overflow preventor kit (106150) Optional Accessory

Item No.	Part No.	Qty	Description
161	106151	1	Overflow preventor W.A.
162	HZPPXCL	4	C'SK M/C screw, M6
163	HIHKAAD	1	Plug, 1/2"B.S.P.
164	JMNGAAS	1	75g R.T.V. Silicone Sealant (neutral cure)
165	LCINACD	1	Black back hatch rubber GP11 730 long.

MAINSHAFT GROUP

Item No.	Part No.	No. Req'd	Description	
30	102668	1	Bearing Housing	
31	HEID AAA	1	Grease Nipple	
32	JEQK XAH	3	Spring Washer M12	316SS
33	JDQH XAH	3	Nut M12	316SS
34	106003	1	Main shaft	
35	HUIL ABD	1	Split Pin	304SS
36	61351	1	Water Seal	
37	102742	1	Stationary Face	
38	JWKZ AEB	2	Seal	
39	106004	2	Sleeve (Seal))	
40	106005	1	Sleeve (Bearing)	
41	JNOD ABX	1	Bearing	
42	106006	2	Key-Coupling & Impeller	
43	106007	1	Coupling (ELBE 120dia. 8 x M8 bolt)	
	106217		Coupling (GWB 120dia. 8 x M10 bolt)	
	106149		Coupling (Spicer 1410)	
	106492		Coupling (Scatra 14200)	
	(For identification of Coupling Flanges - refer drawings page H6.)			
44	JDQH XAP	2	Nut M20 Coupling & Impeller	
45	106036	2	Washer	
46	HMHO BDB	1	Seal 'O' Ring	
47	HMHR ABH	1	Seal 'O' Ring	
48	106008	1	Sleeve Shaft	
121	106032	1	Impeller Type 2.5	
	106031		Impeller Type 2.7	
	106228		Impeller Type 2.9	
	107606		Impeller Type 3.0	
	106030		Impeller Type 3.2	
	106029		Impeller Type 3.4	
	106028		Impeller Type 3.7	
	106440		Impeller Type 3.9	
	106027	Impeller Type 4.2		

TAILPIPE GROUP

Item No.	Part No.	No. Req'd	Description	
50	106010	1	Tail (Less Nozzle)	
51	HMHR AEN	1	Seal 'O' Ring	
52	JNNH AAV	1	Cutless Bearing	
53	HMHR AEV	2	Seal 'O' Ring	
55	105998	1	Bush	
56	103359	2	Anode	
57	HZQH XBK	2	Screw Hex. Head M8	316SS
14	JEQK XAC	2	Spring Washer M8	316SS
15	JDQH XAC	2	Nut M8	316SS
62	HZQH XAE	2	Screw Hex. Head M6	316SS
66				
67	106056		Nozzle Type 115 *	
68	106057		Nozzle Type 110 *	
69				
32	JEQH XAH	4	Spring Washer M12	316SS
33	JDQH XAH	4	Nut M12	316SS
58	106148	1	Bolt - Spring Anchor	
10	JDQH XAE	1	Nut M10	316SS

SPARES TAILPIE KIT

106035SY

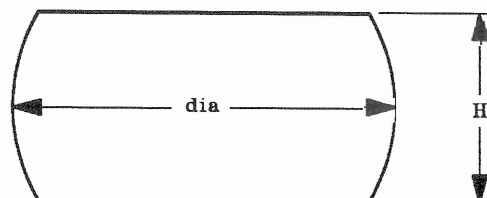
Tailpipe Assembly (Includes items: 14,15,51,52,55,56,57)

STEERING GROUP

Item No	Part No	No. Req'd	Description	
70	106021 Y	1	Steering Shaft	
71	103169	1	Steering Crank	
72	103171 SY	1	Cotter (Taper) Pin Assy	
Cotter (taper) Pin assembly consists of:				
73	103170	1	Cotter (Taper) Pin	
74	103637	1	Flat Washer	
14	JEQK XAC	1	Spring Washer M8	316SS
75	JDQH XAC	1	Nut M8	316SS
77	106023	1	Deflector	
78	106024	2	Deflector Pivot Bush	
79	HYQH XIM	2	Deflector Pivot Pin	316SS
80	106020	1	Steering Bush Upper	
81	106026	1	Steering Bush Lower	
56	103359	1	Anode	
84	30661	2	Stud M8	316SS
14	JEQK XAC	2	Spring Washer M8	316SS
15	JDQH XAC	2	Nut M8	316SS
85	103163 - 1	1	Crank Bush	
86	JEOZ XAM	3	Flat Washers M16	316SS

*** Identification of Nozzles**

	DIA. mm	H mm
TYPE 110	116	94
TYPE 115	118	104



REVERSE GROUP

Item No.	Part No.	No. Req'd	Description	
10	JDQHXAE	2	Nut M10	316SS
14	JEQKXAC	4	Spring Washer M8	316SS
15	JDQHXAC	4	Nut M8	316SS
18	JEOZXAI	2	Flat Washer M10	316SS
19	JDQSXAE	1	Nyloc Nut M10	316SS
56	103359	1	Anode	
58	106148	2	Bolt - Spring Anchor	
79	HYQHXIM	2	Pivot Bolt M16	316SS
80	106020	2	Bush Pivot - Shouldered	
84	30661	2	Stud M8	316SS
86	JEOZXAM	2	Flat Washers M16	
90	106230	1	Reverse Bucket (Serial No. 024 on)*	
91	106024	2	Bush Arm - Plain	
92	106224	1	Detent Plate (Serial No. 024 on)*	
93	JCQHXAG	2	Stud M8	316SS
94	JELKAAD	3	Flat washer M8	316SS
95	106131	1	Cank Ass'y	
96	106132	1	Roller	
97	HUILAAA	1	Split pin	316SS
98	30697	1	Stud M10	316SS
99	102364	2	Spring Tension	

* For serial no's 006 to 023 inclusive:-

- if replacing only item 92, order part no. 106136
- if replacing item 90 order both 106230 and 106224 (item 92)

TRANSOM SEAL GROUP

Item No.	Part No.	No. Req'd	Description
28	106012	1	Transom Plate
29	106039	1	Transom Seal

CABLE REVERSE CONTROLLER 106141 SY

OR OPTIONAL CABLE REVERSE AND THROTTLE CONTROLLER 106158 SY

Item No.	Part No.	No. Req'd	Description	
1	106144	1	Cover	
2	63529	1	Name Plate	
3	HZMS AAM	2	Screws Self Tapping	S.S.
5	63624	1	Control - Reverse only	
5	EXPO RUN	or 1	Control - Reverse and Throttle (Optional)	
6	106216	1	Bracket	
7				
8	HZMS ADJ	8	Screw $\frac{1}{4}$ " UNC x $1 \frac{1}{4}$ "	Z.P.
9	JELJ YAA	4	Spring Washers M6	Z.P.
10	JDKB PAC	8	Nuts $\frac{1}{4}$ " UNC	Z.P.
11				
12	JELH PAC	4	Washer $\frac{1}{4}$ "	Z.P.
13	103366	1	Adaptor - Morse	
14	104276	or 1	Adaptor - Teleflex	
15	HYQH XAB	1	Bolt M6x30	S.S.
16	JDQH XAA	1	Nut M6	S.S.
17	JEQK XAA	1	Spring Washer M6	S.S.
18	HZJW AAN	4	Screws $\frac{1}{4}$ " UNC x 2"	CSK
			(For Optional Side Mounting)	

* For Reverse Control replacement order:

63388 1 Morse Control Less Handle & Boss
(Fits either item 4 or 5 above.)

CABLE REVERSE TRANSOM ASSEMBLY 106033 SY

Item No.	Part No.	No. Req'd	Description	
1	HEID AAS	1	Grease Nipple	
2	103389	1	Guide Tube	
3	103000	1	Bush	
4	103003	1	Cap	
5	106193	2	Ball Quarter	
6	106192	1	Half Sphere	
7	HMHR AEL	1	O Ring ($1 \frac{1}{4}$ " x $1 \frac{3}{8}$ " x 0.07")	
8	HMHR AEK	1	O Ring ($\frac{13}{16}$ " x $\frac{15}{16}$ " x 0.07")	
9	HZQH XAY	2	Screw M8 x 20	S.S.
10	JEQK XAC	2	Spring Washer M8	S.S.
11	103388	1	Seal Housing	
12	63391	1	Nylon Bush	
13	61398	1	Scraper Seal	
19		1	Control Cable - Optional**	
20		1	Swivel Assembly - Optional**	

** Refer to pages I5 and I6 for details.

OPTIONS - IN LIEU OF STANDARD SUPPLY (May Involve Extra Cost)

Item No.	Description	Page Reference for Details
43	Coupling Flange	S3, H6
121	Impeller	S3 (also see "Designers Manual")
66	Nozzle	G4, S5
16	Intake Screen (steel or aluminium)	S1
Various	Intake Block & Installation Kit (to suit hull material)	G1, T2 - T9
106158 SY	Reverse and Throttle Controller	S5, S6
104276	Teleflex cable adaptor (for Reverse Controller)	I5,

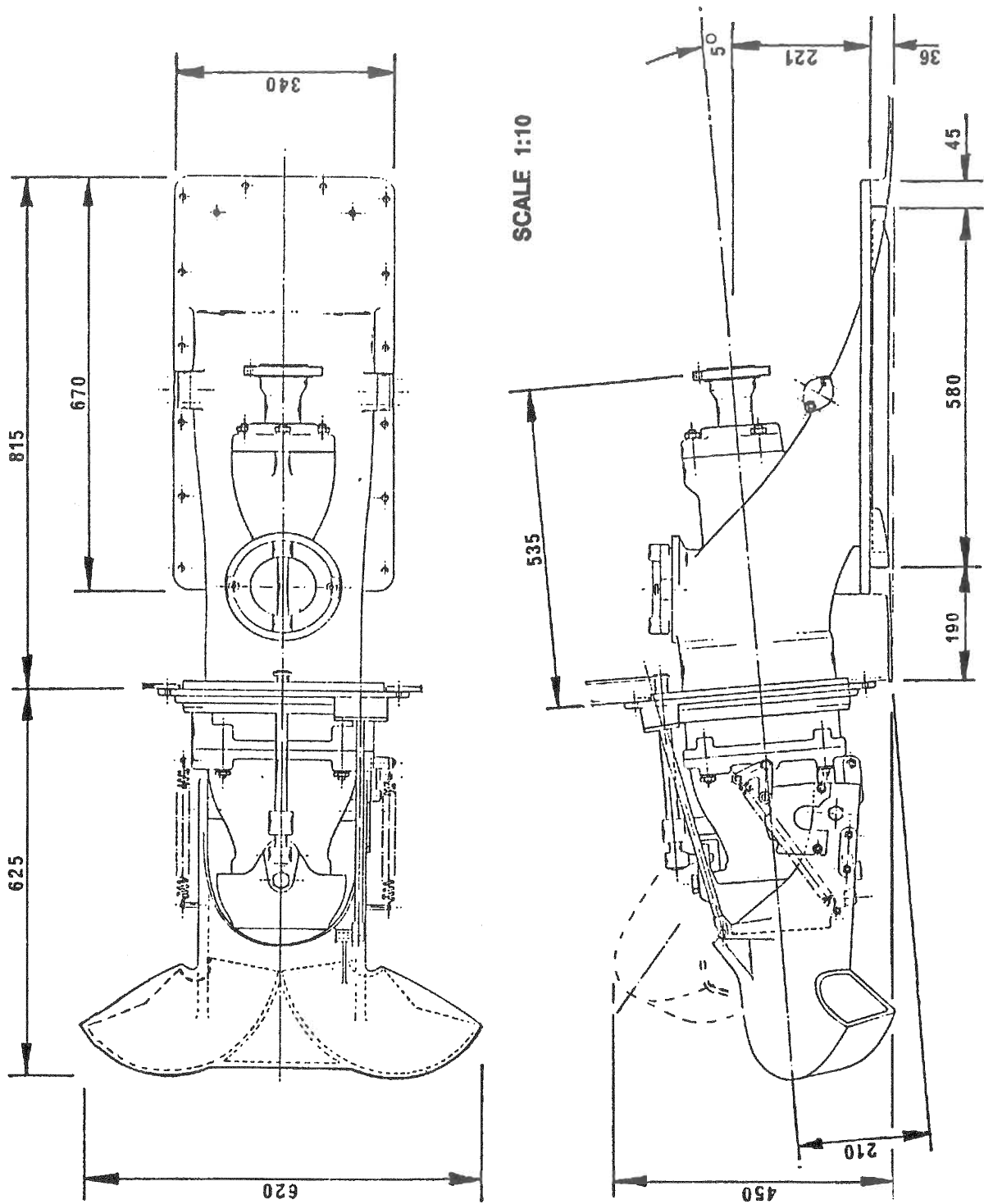
ACCESSORIES

A) Equipment Necessary to Complete The Jet Package

Item No.	Description	Page Reference for Details
106222	Morse D290 Steering Kit (Plastic helm)	-
or 106223	Morse D290 Steering Kit (400mm Stainless helm)	-
or -	Manual Hydraulic Steering Kit (400mm stainless helm)	-
104673 SY	Steering Tie Rod Kit (Multiple jets only)	I4
DO345	Reverse Cable - Morse (state length required)	I5.
-	Reverse Cable Swivel (Clevis) Kit (State Morse or Teleflex required)	I5, I6
-	Throttle Cable	-
-	Driveline	H4 - H6
Various	Flywheel Adaptor Plate (State engine model and driveshaft type)	H5

B) Non Essential Accessories

Item No.	Description	Page Reference
105990	Intake Screen Rake Kitset	S1, S2
106013	Special Tools Kit	M5
JM529-770	Sandtrap and Dump Valve only	H2
JM1104-770	Sandtrap and Dump Kit with hoses and skin fittings	H2
106150	Overflow Preventer Kit	-
-	Dry Run Kit	-



HAMILTON JET

21/06/95

WARRANTY

The Company warrants each new Hamilton product to be free from defects in materials and workmanship under normal use and service, its obligations under this Warranty being limited to make good at its factory or at the factory of any subsidiary or branch of the Company the product or any part or parts thereof which shall be returned to it with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been defective provided that the product or such part or parts thereof shall be so returned to it not later than 24 months from the date of the original purchase from the Company or its authorised distributor, or 12 months from commissioning date, whichever occurs first. No allowance shall be granted for any repairs or alterations made by the purchaser or its agent without the written consent of the Company. This Warranty is expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, including any liability under the Sale of Goods Act, 1908, and no other person or agent or dealer is authorised to give any other condition or warranty to assume for the Company any other liability in connection with the sale of its products whether new or second hand. Any obligation on the part of the Company under this Warranty does not apply to any Hamilton product which may have been repaired or altered in any way outside the factory of the Company or to damages caused in the opinion of the Company by overloading, misuse, mis-application, improper storage, abnormal wear and tear due to exposure to the elements, negligence, accident, or whilst being operated in any other way other than in accordance with the operating and maintenance instructions of the Company nor does it apply to repairs made necessary by the use of parts or accessories not recommended by the Company. There is no liability on the part of the Company with respect to any items incorporated in any Hamilton product when such items have been manufactured by others and are warranted by their respective manufacturers in favour of the purchaser or when they are supplied by the Company on special order. The Company shall not be liable for any consequential loss or damage resulting directly or indirectly from any defect in the product the subject of this agreement. No liability on the part of the Company with respect to this Warranty shall extend to second - hand and reconditioned goods and the Warranty does not cover the cost of labour involved in the replacement of defective parts. No liability on the part of the Company with respect to this Warranty shall exist if the Hamilton product is not, in the opinion of the Company, installed as per the "Installation and Service Manual", "Designer's Manual" and / or "Owner's Manual" supplied with each product. For some models of Hamilton product, as specified in the respective model manual, warranty conditions will not apply unless a negative earth bonding system has been installed in the vessel and a mainshaft critical speed check has been carried out to the Company's satisfaction.

C.W.F. HAMILTON & Co Ltd.

This portion must be completed in every detail and returned immediately to:
C.W.F. HAMILTON & CO LTD, PO BOX 709, CHRISTCHURCH, NEW ZEALAND.

Purchaser

Address

HamiltonJet model

Serial number

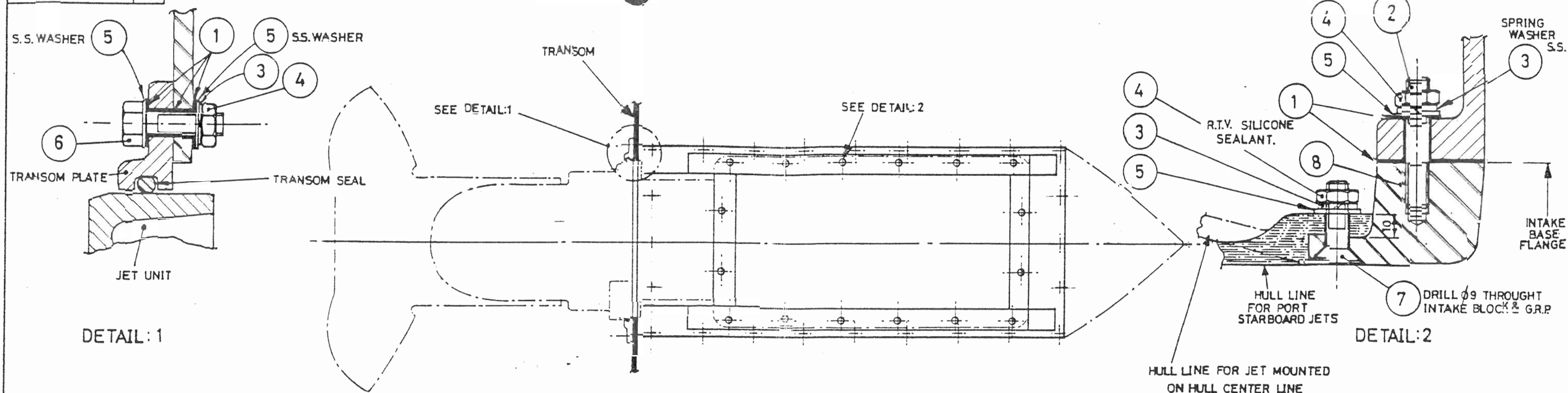
Signed

Date

Dealer

Delivery date

Dealer's signature



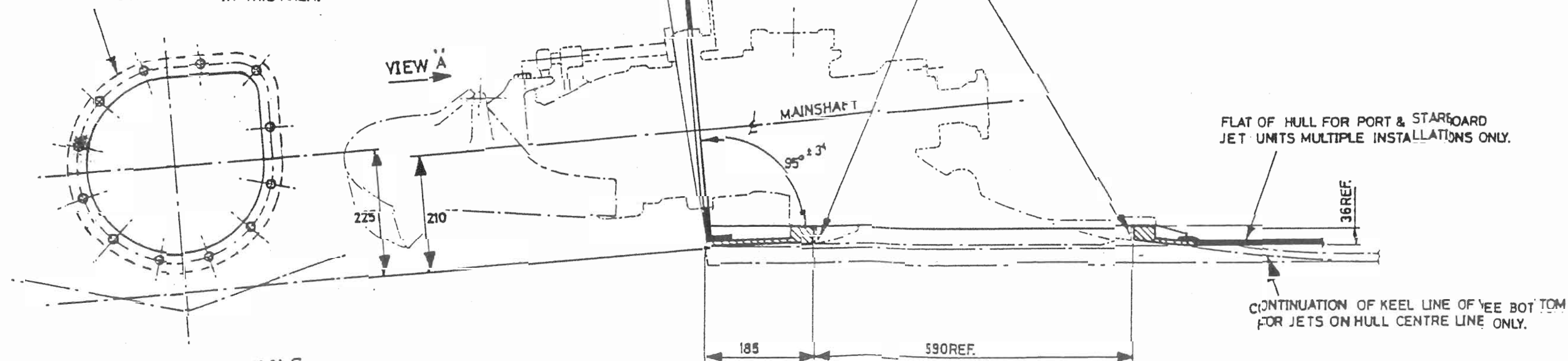
TRANSOM SEAL ASSEMBLY TO BE FASTENED ON OUTSIDE OF TRANSOM BY 12-M8 STAINLESS STEEL SCREWS (SUPPLIED)

ASSEMBLE TRANSOM PLATE TO JET UNIT & USE AS A JIG TO MARK HOLES FOR DRILLING, DRILL Ø9

REAR FACE OF TRANSOM MUST BE FLAT & FREE OF OBSTRUCTIONS WITHIN THIS AREA.

CONTOURS FROM HULL TO INTAKE BLOCK TO JET INTAKE SCREEN MUST BE WITHIN ±1mm (0.04") AT FRONT & REAR OF JET ANY STEPS OR RECESSES WILL CAUSE LOSS OF JET THRUST.

ITEM	PART NO.	QTY.	DESCRIPTION
1	JMNGAAR	1	TUBE R.T.V. SILICONE SEALANT-Neutral cure
2	30667	16	M8 STUD - 316 S.S.
3	JEQK XAC	52	8 DIA SPRING WASHER - 316 S.S.
4	JDQH XAC	52	M8 HEX. NUT - 316 S.S.
5	JEOZ XAF	64	8 DIA. FLAT WASHER - 316
6	HZQH XBA	12	M8x30 HEX. HEAD SET SCREW - 316 S.S.
7	HZPPXDI	24	M8x30 C'SK HEAD - 316 S.S.
8	MRINAAI	1	THREAD LOCKING FLUID, LOCTITE 262-10ml



TRANSOM HOLE DETAILS
VIEW ON ARROW A

NOTE:-
THIS DRAWING IS TO BE READ IN CLOSE CONJUNCTION WITH:-
ORG N° - 106042 - HULL PREPARATION

FIBERGLASS HULL

				C. W. F. HAMILTON & CO. LTD., CH. CH. N.Z.			
				✓ EXCEPT AS STATED			
				UNLIMITED DIMENSIONS TO BE ±			
				NAME 211 JET			
				INSTALLATION INFORMATION			
				FIBREGLASS HULL			
				SCALE 106041			
				E			

106042

B

REMOVE SHARP CORNERS DO NOT SCALE DIMENSIONS IN INCHES/M.M

ANGLE PROJECTION

1/ LOCATE INTAKE BLOCK IN HULL MOULD:

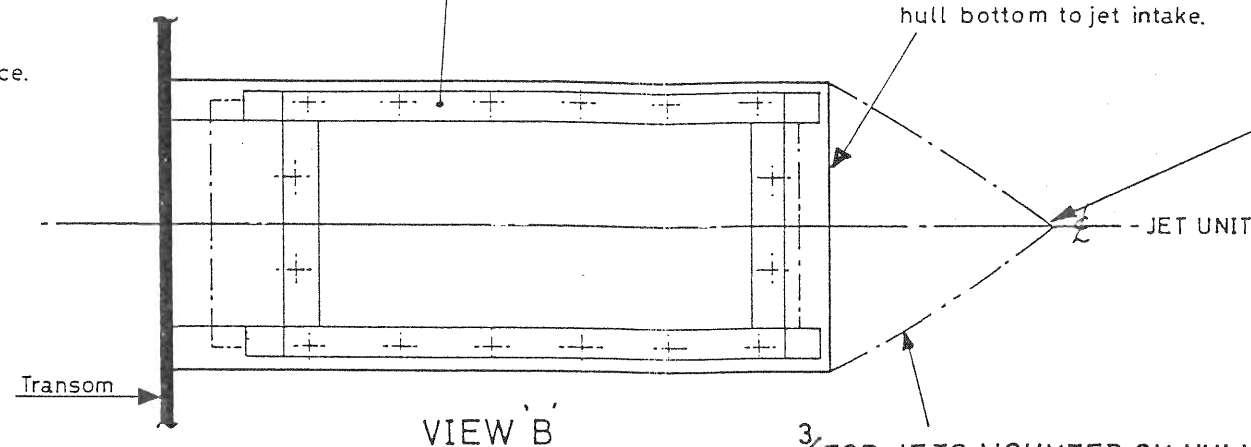
- AFT END AGAINST TRANSOM OF MOULD
- \bar{C} (CENTRE LINE) IN REQUIRED LOCATION
- (See notes on skewing jet \bar{C} on page)

Tape Intake Block into mould around inside opening to retain in place.
Cover top surface while moulding. SEE NOTES 2&3

4/ AFTER MOULDING HULL:

Smooth off and/or fill any steps or recesses in the curved contour from hull bottom to jet intake - refer 'CONTOURS' note on drg. 106041

USE 'HAMILTON' 211 JET INTAKE BLOCK
PART No. 106138

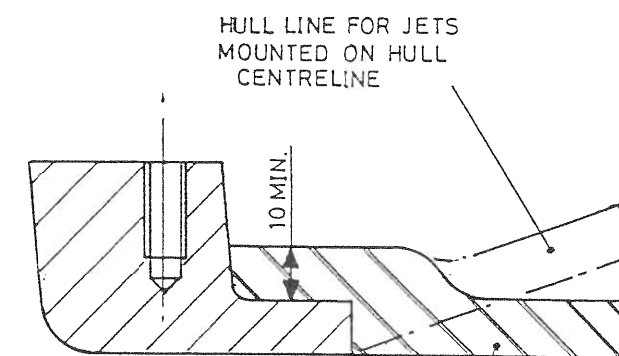
2/ FOR JETS MOUNTED IN FLAT OF HULL
(Port and starboard jets)

Any camber in hull should be faired into the mould surface with tape or filler to ensure a smooth curved contour is moulded from hull bottom to jet intake.

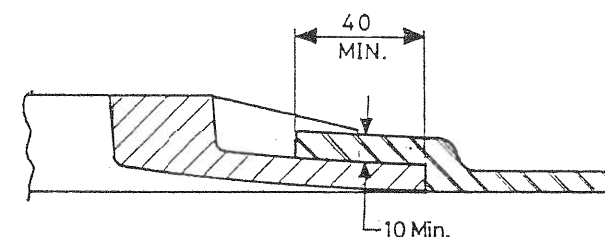
For jets mounted on hull centre-line only

Locate front of triangular shaped "fairing" in proportion to deadrise angle, e.g. approx. distance from front of intake block:-

- 300 - for 10° deadrise
- 600 - for 20° deadrise
- 900 for 30° deadrise

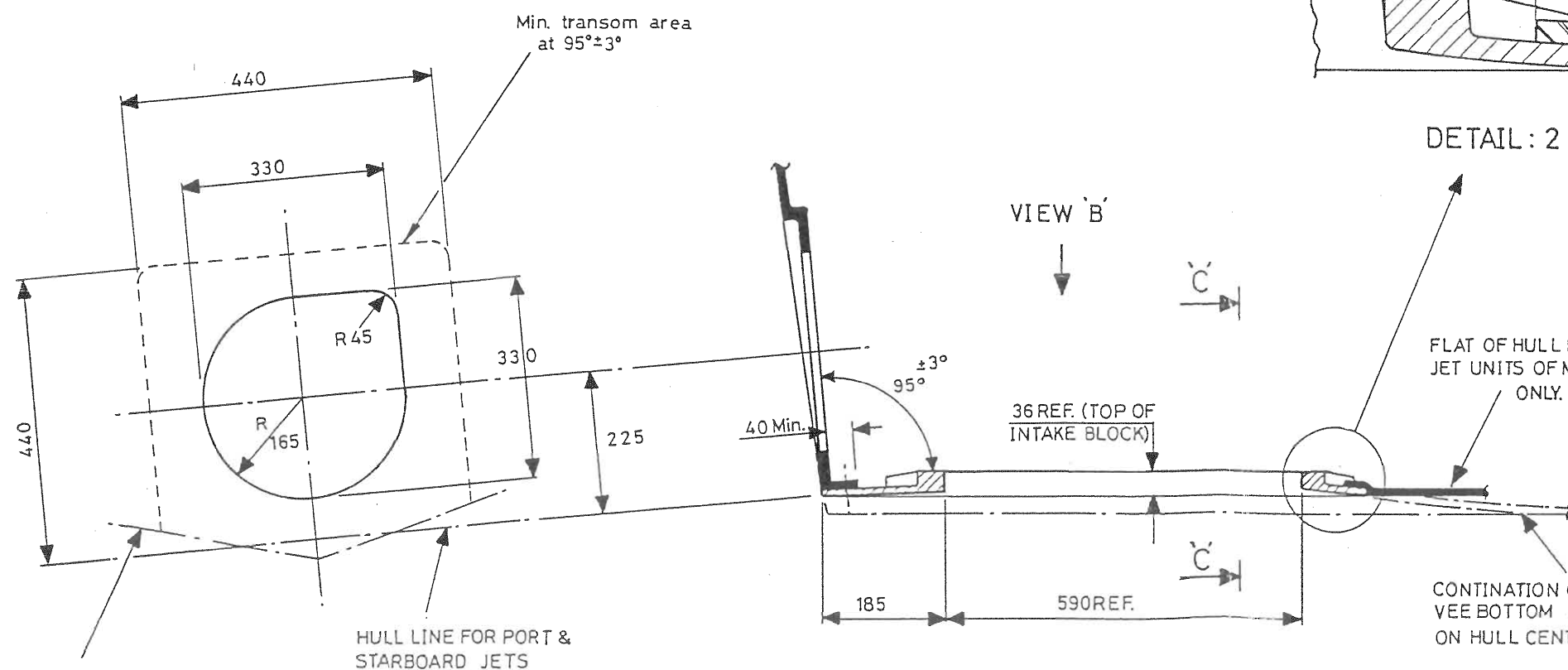
3/ FOR JETS MOUNTED ON HULL CENTRE-LINE
(Single or centre of triple jets)

Arrange a suitable surface to mould a triangular shaped "fairing" which blends from vee bottom hull to intake block IN A SMOOTHLY CURVED CONTOUR:- see view below



DETAIL : 1

HULL LINE FOR PORT & STARBOARD JETS



HULL LINE FOR JETS MOUNTED ON HULL CENTRELINE

VIEW A

NOTE:-
THIS DRAWING IS TO BE READ IN CLOSE CONJUNCTION WITH:-

DRG No. 106041 INSTALLATION INFORMATION
FIBREGLASS HULL
106138 INTAKE BLOCK

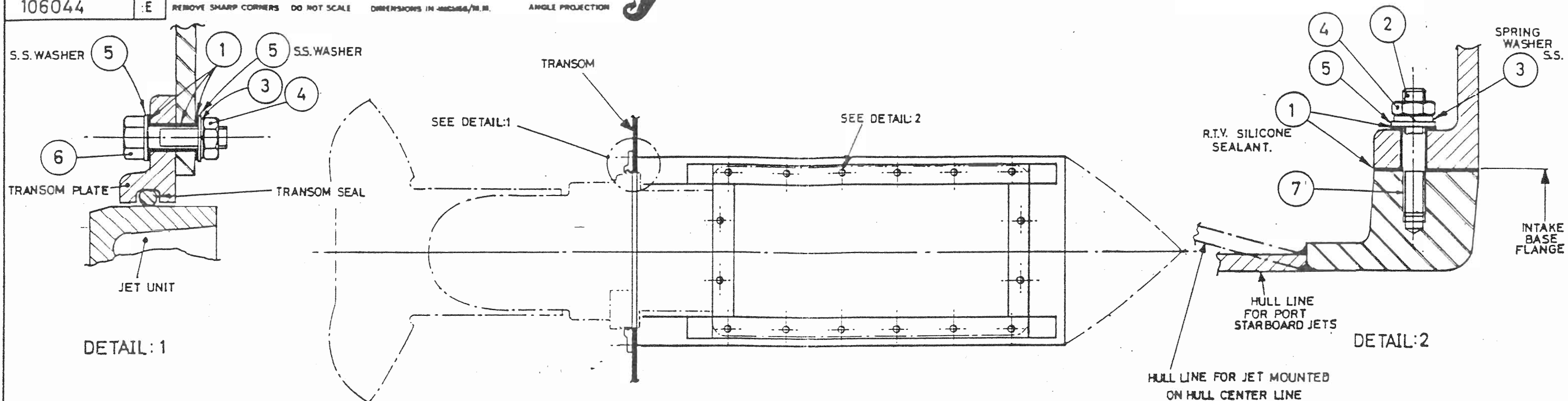
C. W. F. HAMILTON & CO. LTD., CH.CH., N.Z.					
MATERIAL					
✓ EXCEPT AS STATED					
UNLIMITED DIMENSIONS TO BE ±					
NAME					
211 JET					
HULL PREPARATION					
FIBREGLASS HULL					
SCALE					
NUMBER					
106042					
B					

106044

E

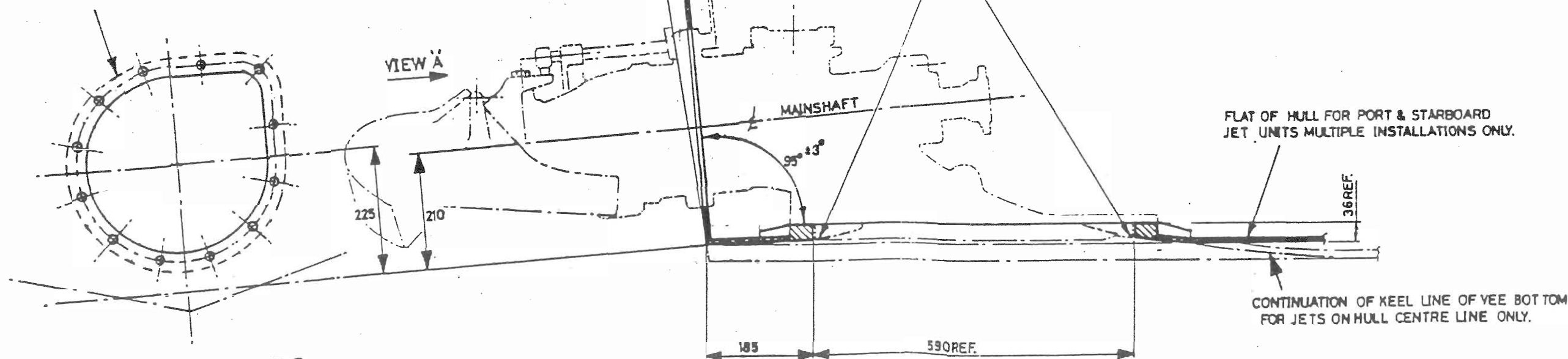
REMOVE SHARP CORNERS DO NOT SCALE DIMENSIONS IN MILLIMETERS/M.M.

ANGLE PROJECTION



ITEM	PART N°	QTY.	DESCRIPTION
1	JMNGAAR	1	TUBE R.T.V. SILICONE SEALANT-Neutral cure
2	30667	16	M8 STUD - 316 SS.
3	JEQK XAC	28	8 DIA. SPRING WASHER - 316 S.S.
4	JDQH XAC	28	M8 HEX. NUT - 316 SS.
5	JEOZ XAF	40	8 DIA. FLAT WASHER - 316
6	HZQH XBA	12	M8x30 HEX. HEAD SET SCREW - 316 S.S.
7	MRINAAL	1	THREAD LOCKING FLUID Loctite 262 $\pm 10\text{mL}$

TRANSOM HOLE DETAILS
VIEW ON ARROW A



NOTE:-
THIS DRAWING IS TO BE READ IN CLOSE CONJUNCTION WITH:-
ORG N° -106045-HULL PREPARATION

ALUMINIUM HULL

					C. W. F. HAMILTON & CO. LTD., CH.CH., N.Z.			
					MATERIAL		✓ EXCEPT AS STATED	
							UNLIMITED DIMENSIONS TO BE ±	
							211 JET	
							INSTALLATION INFORMATION	
							ALUMINIUM HULL	
							106044	
							E	

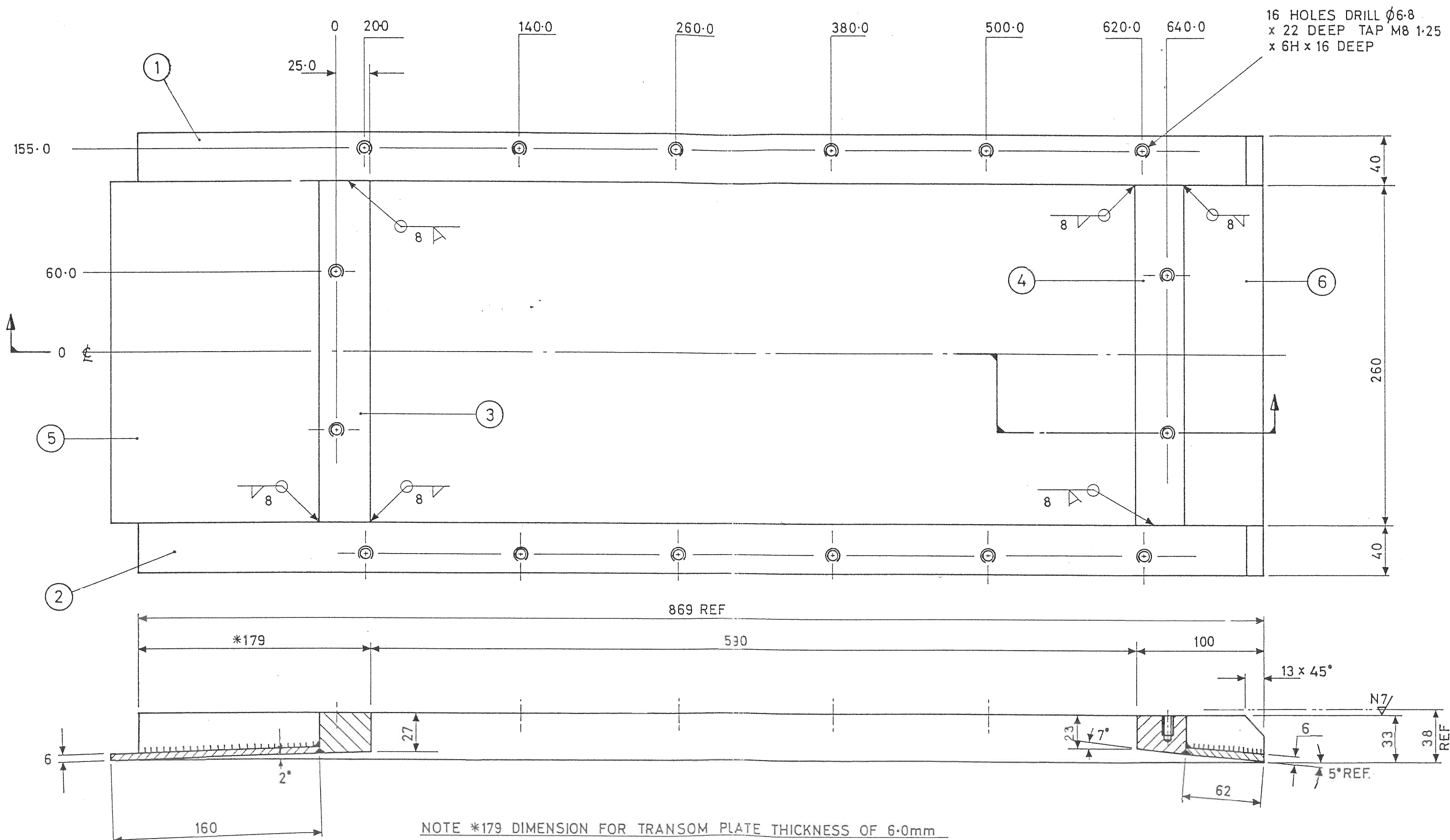
					C. W. F. HAMILTON & CO. LTD., CH.CH., N.Z.			
					MATERIAL		✓ EXCEPT AS STATED	
							UNLIMITED DIMENSIONS TO BE ±	
							211 JET	
							INSTALLATION INFORMATION	
							ALUMINIUM HULL	
							106044	
							E	

106046 Y

A

REMOVE SHARP CORNERS DO NOT SCALE DIMENSIONS IN INCHES/M.M.

ANGLE PROJECTION



Nº ITEM	PART Nº	Nº REQ
1 SIDE MEMBER PORT	106046/1	1
2 SIDE MEMBER STARBOARD	106046/2	1
3 CROSS MEMBER REAR	106046/3	1
4 CROSS MEMBER FRONT	106046/4	1
5 SLOPE SHEET REAR	106046/5	1
6 SLOPE SHEET FRONT	106046/6	1

				C. W. F. HAMILTON & CO. LTD., CH.CH., N.Z.			
				MATERIAL		✓ - ✓ EXCEPT AS STATED	
				MILD STEEL		UNLIMITED DIMENSIONS TO BE ±	
				MATERIAL CERT		YES NO	
				P.S.		8-8-89	
				CHECKED			
				APPROVED			
				SCALE		NUMBER	
				1:2		106046Y	
						A	

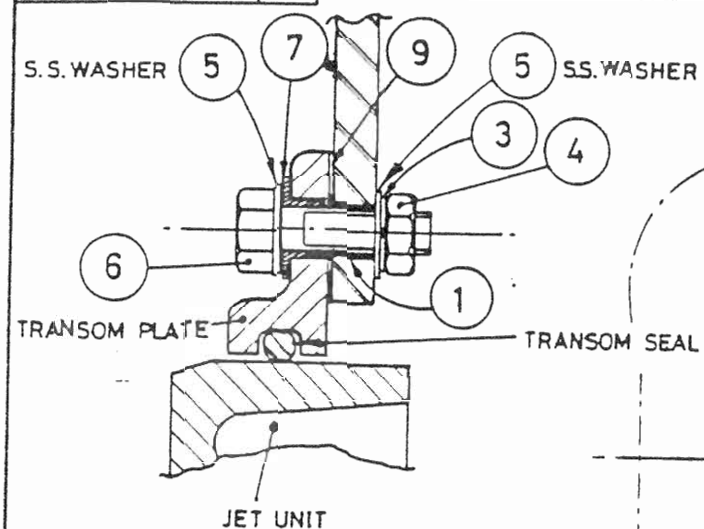
106047

B

REMOVE SHARP CORNERS DO NOT SCALE

DIMENSIONS IN INCHES/M.M.

ANGLE PROJECTION



DETAIL:1

SEE DETAIL:1

SEE DETAIL:2

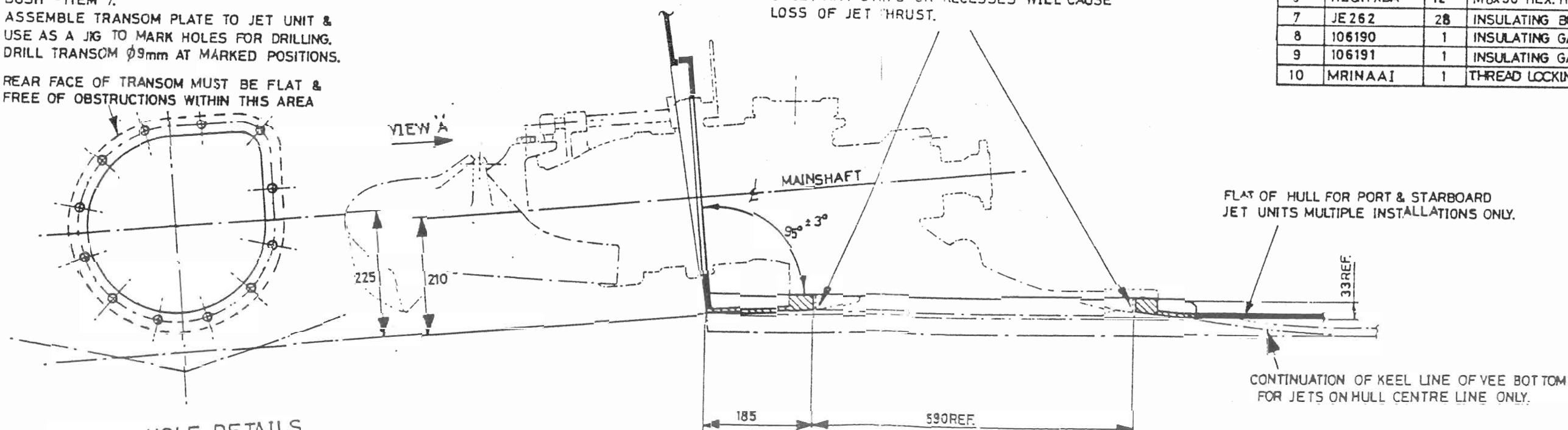
DRILL INTAKE FLANGE Ø11
FOR INSULATING BUSH ITEM 7R.T.V. SILICONE
SEALANT.SPRING
WASHER
S.S.INTAKE
BASE
FLANGEHULL LINE
FOR PORT
STARBOARD JETSHULL LINE FOR JET MOUNTED
ON HULL CENTER LINE

DETAIL:2

TRANSOM SEAL ASSEMBLY TO BE FASTENED
ON OUTSIDE OF TRANSOM BY 12-M8
STAINLESS STEEL SCREWS (SUPPLIED)
DRILL TRANSOM PLATE Ø11mm FOR INSULATING
BUSH - ITEM 7.
ASSEMBLE TRANSOM PLATE TO JET UNIT &
USE AS A JIG TO MARK HOLES FOR DRILLING.
DRILL TRANSOM Ø9mm AT MARKED POSITIONS.

REAR FACE OF TRANSOM MUST BE FLAT &
FREE OF OBSTRUCTIONS WITHIN THIS AREA

CONTOURS FROM HULL TO INTAKE BLOCK TO JET INTAKE
SCREEN MUST BE WITHIN ±1mm (0.04") AT FRONT & REAR
OF JET ANY STEPS OR RECESSES WILL CAUSE
LOSS OF JET THRUST.

TRANSOM HOLE DETAILS
VIEW ON ARROW A

NOTE:-
THIS DRAWING IS TO BE READ IN CLOSE CONJUNCTION
WITH:-
DRG No - 106048 - HULL PREPARATION

STEEL HULL

ITEM	PART NO.	QTY.	DESCRIPTION
1	JMNGAAR	1	TUBE R.T.V. SILICONE SEALANT-Neutral cure
2	30667	16	M8 STUD - 316 S.S.
3	JEQK XAC	28	8 DIA SPRING WASHER - 316 S.S.
4	JDQH XAC	28	M8 HEX. NUT - 316 S.S.
5	JEQZ XAF	42	8 DIA. FLAT WASHER - 316
6	HZQH XBA	12	M8x30 HEX. HEAD SET SCREW - 316 S.S.
7	JE 262	28	INSULATING BUSH - NYLON
8	106190	1	INSULATING GASKET - BASE
9	106191	1	INSULATING GASKET - TRANSOM
10	MRINAAI	1	THREAD LOCKING FLUID- LOCTITE 262-100ml

				C. W. F. HAMILTON & CO. LTD., CH.CH., N.Z.			
				EXCEPT AS STATED			
				UNLIMITED DIMENSIONS TO BE			
				211 JET			
				INSTALLATION INFORMATION			
				STEEL HULL			
				106047			
				B			

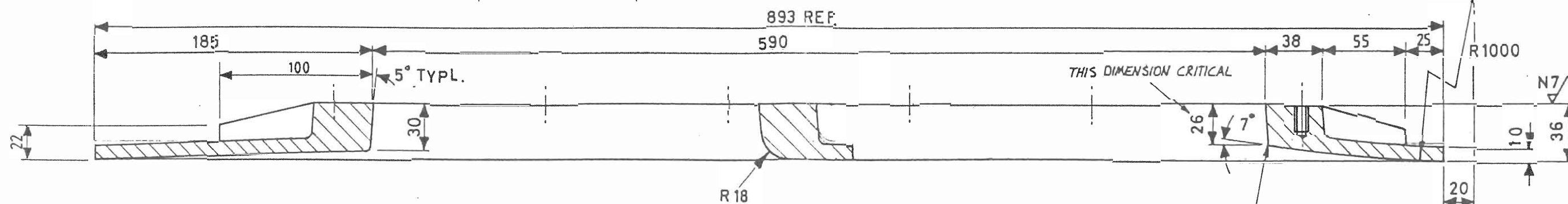
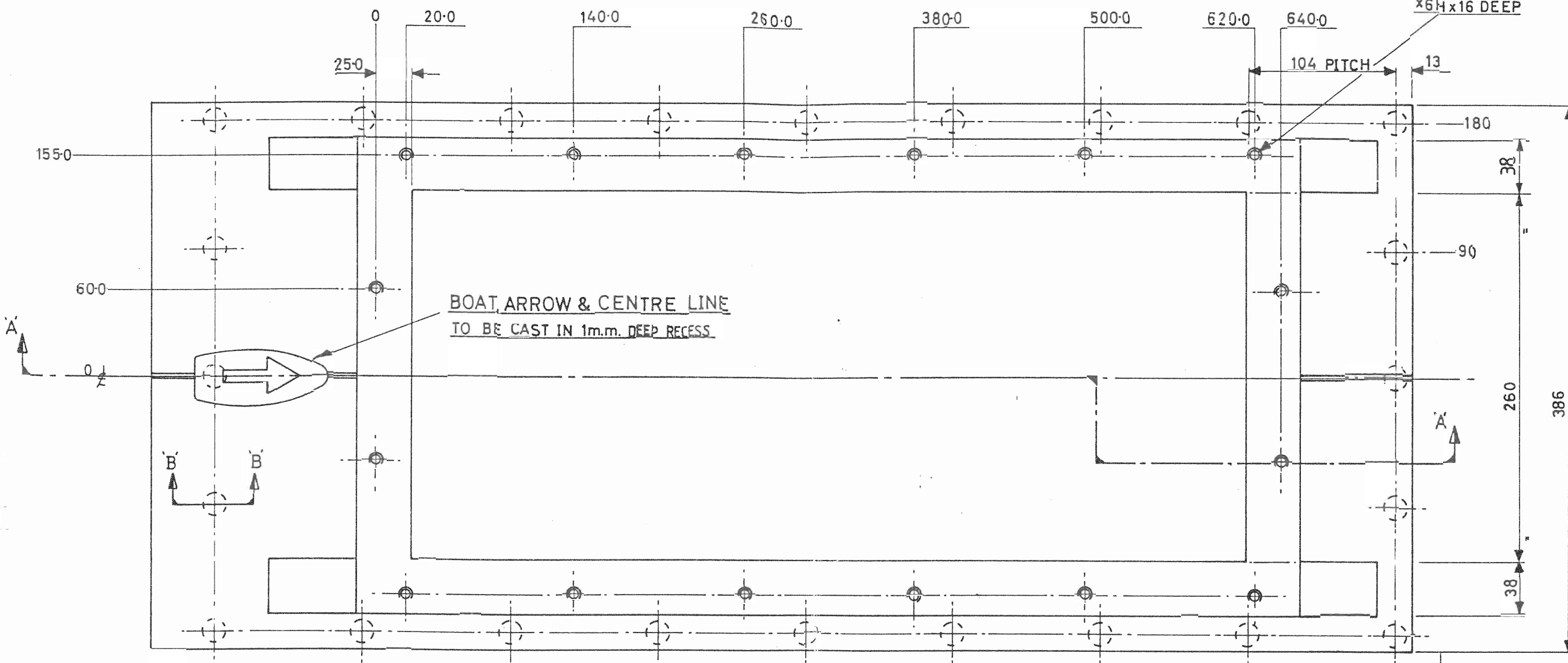
106137

A

REMOVE SHARP CORNERS DO NOT SCALE DIMENSIONS IN INCHES/M.M.

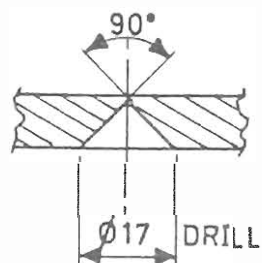
ANGLE PROJECTION

16 HOLES DRILL $\phi 6.8$
 $\times 22$ DEEP TAP M8-1.25
 $\times 6H \times 16$ DEEP



FOR GRP & WOODEN HULLS:
 INTAKE BLOCK PART N° 106138-AS DRAWN

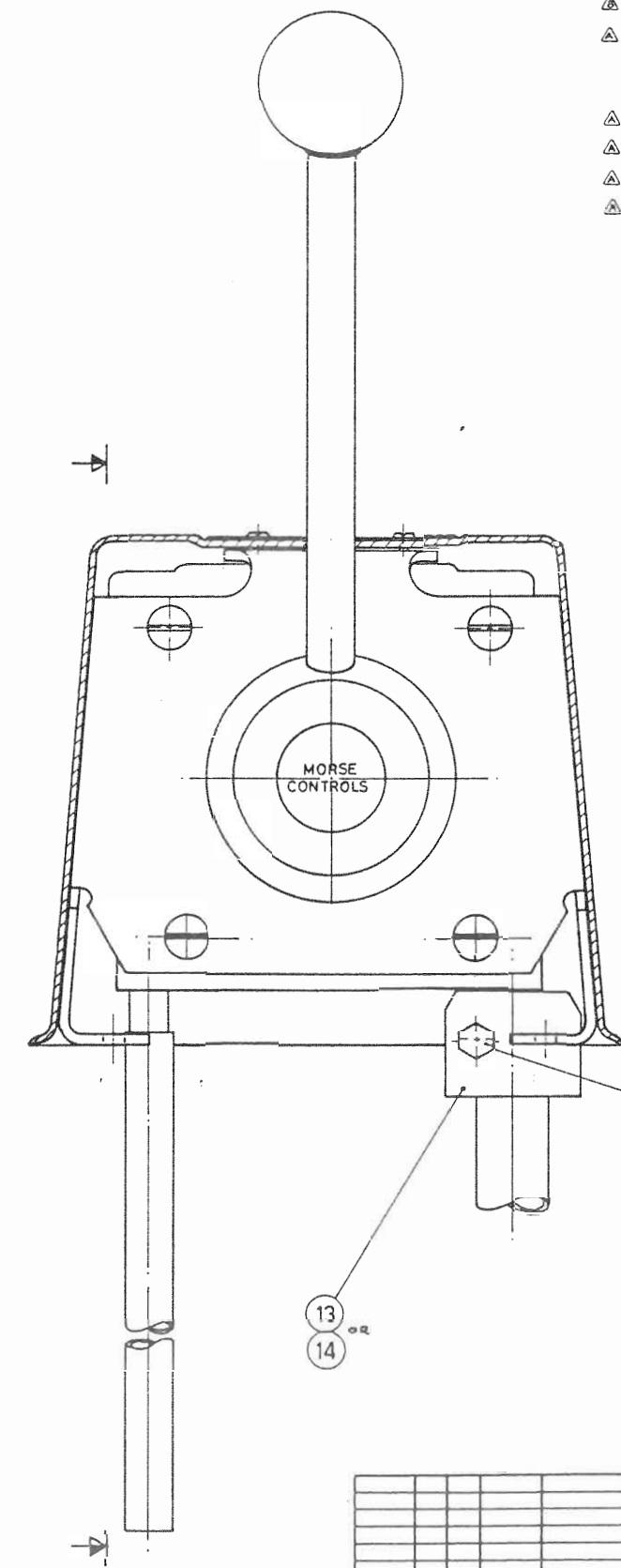
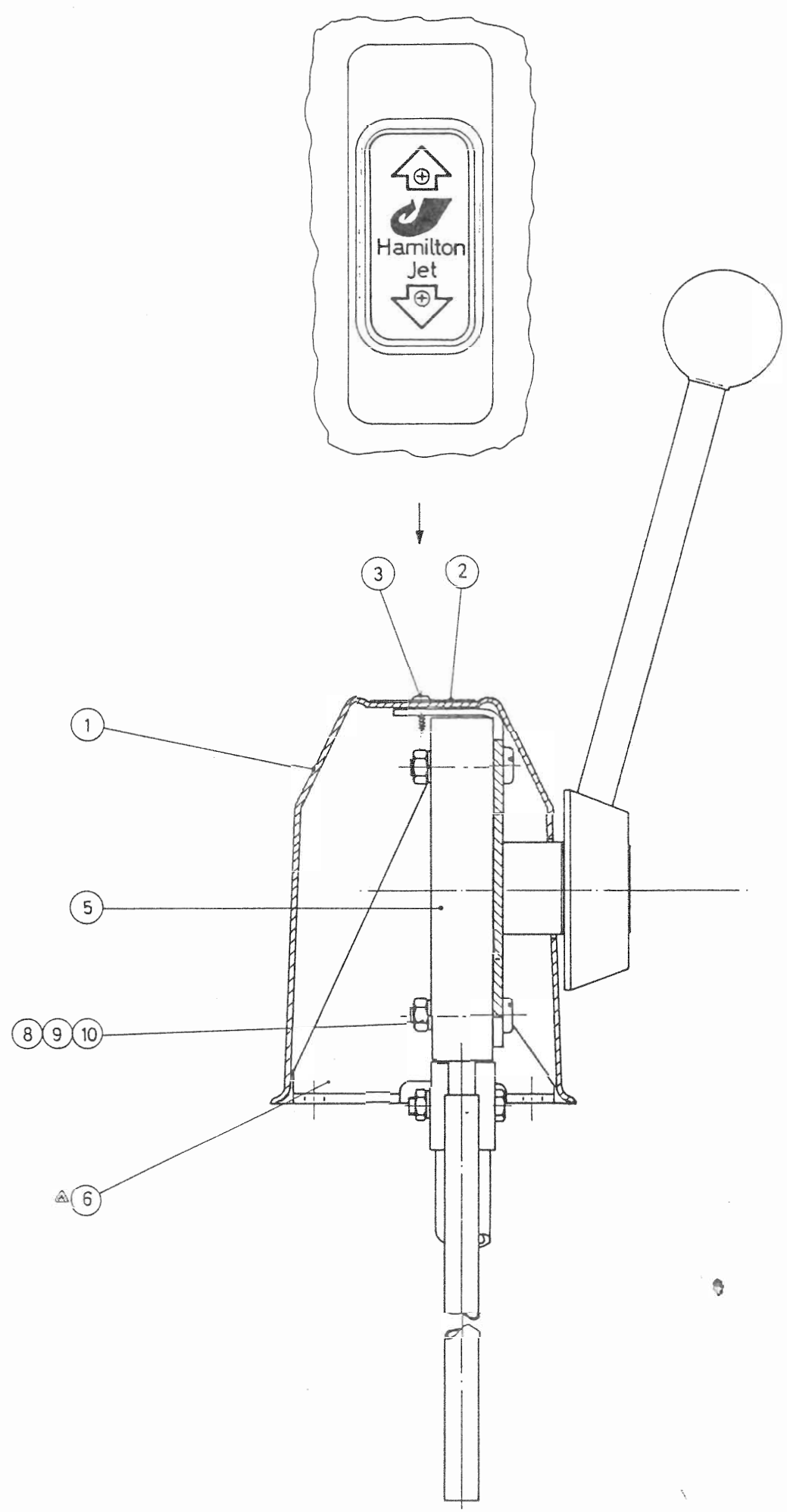
FOR ALUMINIUM HULLS:
 INTAKE BLOCK PART N° 106137 WITHOUT 24 HOLES
 SHOWN IN SECTION B-B



SECTION B-B

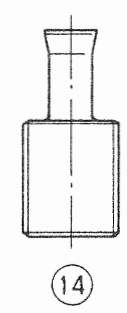
						C. W. F. HAMILTON & CO. LTD., CH. CH., N.Z.			
						MATERIAL	✓ UNLESS EXCEPT AS STATED		
						ALUMINIUM CASTING LM6M	UNLIMITED DIMENSIONS TO BE ± 1.0		
						MAT'L CERT	YES	NO	NAME
						C.W.R.	22-8-89		INTAKE BLOCK
						CHECKED			211 JET
						APPROVED			SCALE NUMBER
									1:2 (1:1) 106137 A
CL3780	A	P.S.	18-3-97	DATUM FOR MACHINING TOP OF INTAKE BLOCK ADDED.					
CL3486	O	RL	20-6-89	ISSUED FOR MANUFACTURE.					
REF	NO	BY	DATE	AMENDMENTS					

106141 SY B REMOVE SHARP CORNERS. DO NOT SCALE. DIMENSIONS IN INCHES/16mm ANGEL PROTECTION



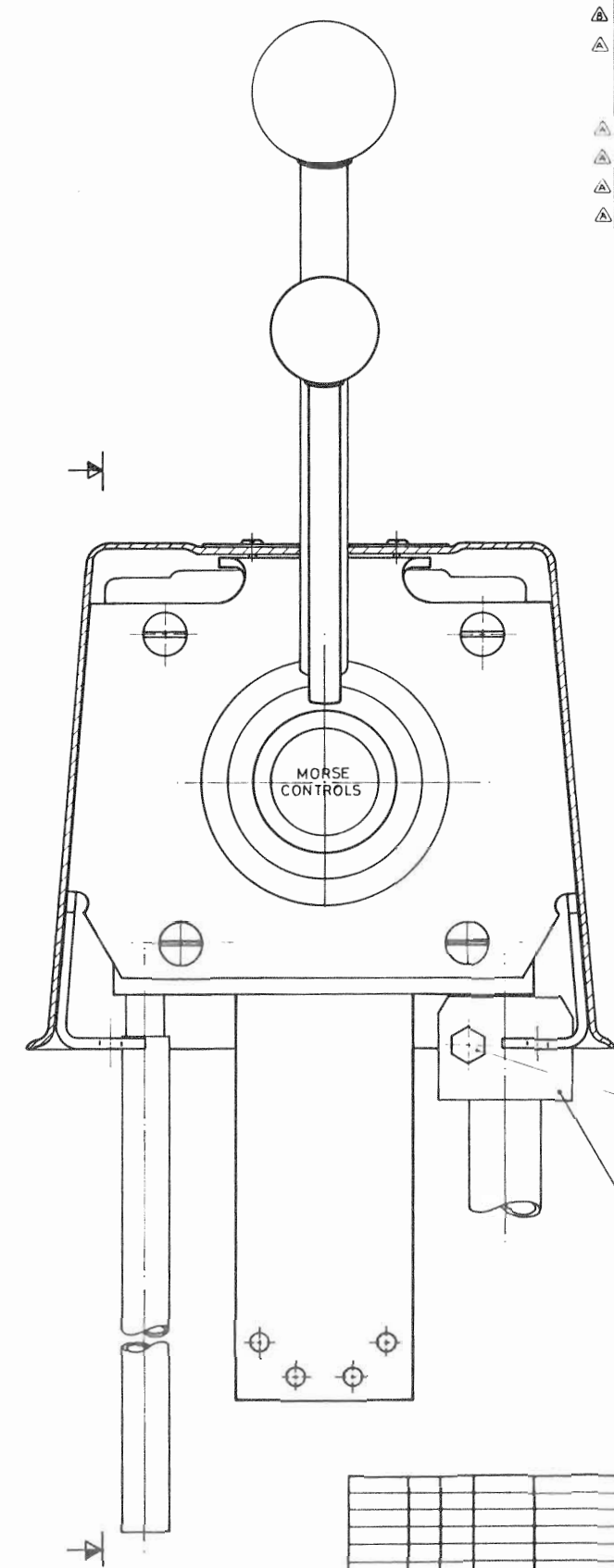
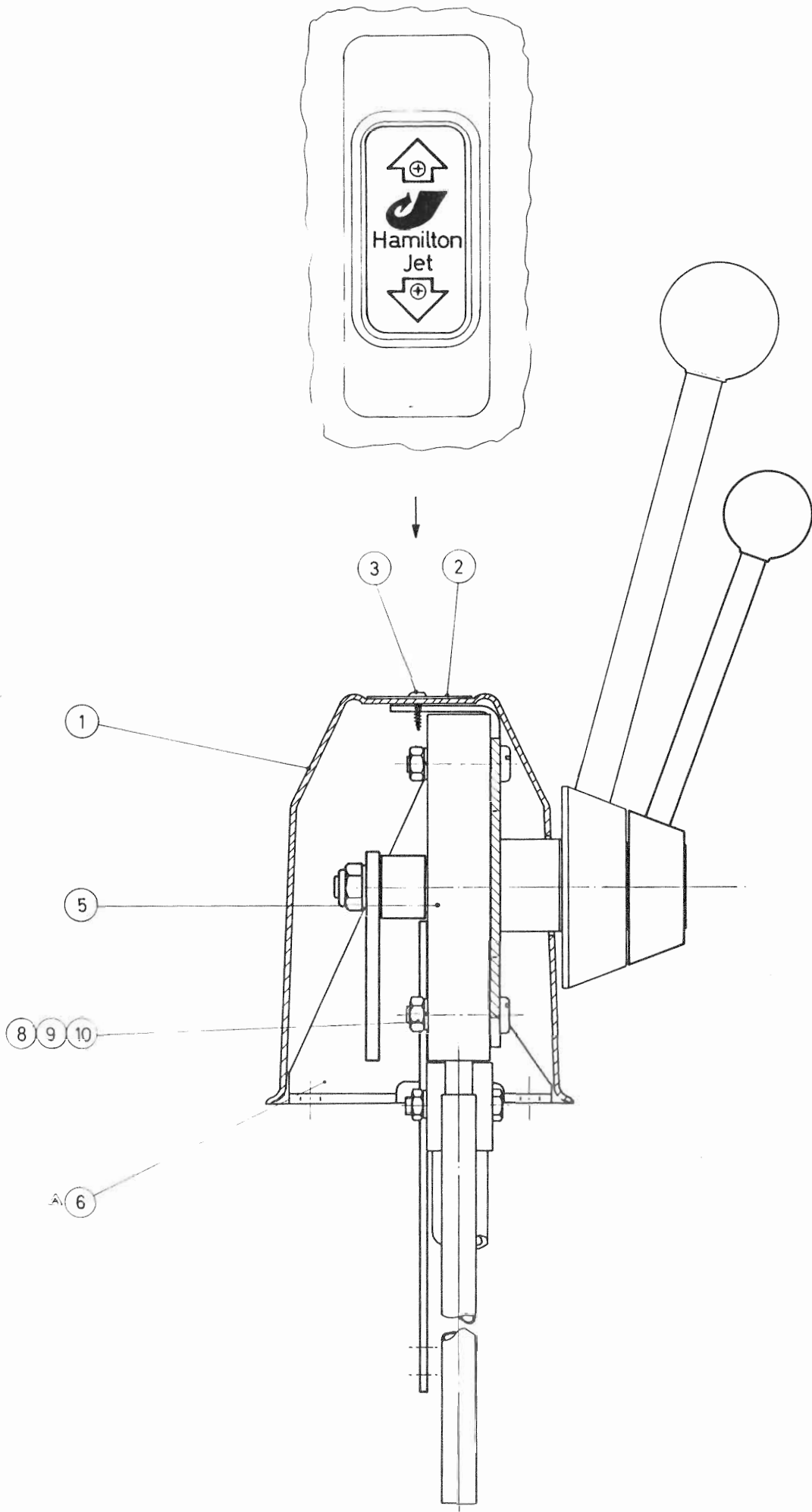
PART SCHEDULE				
ITEM NO	PART NO	QTY	DESCRIPTION	DRG. NO
1	106144	1	COVER	106144
2	63529	1	NAME PLATE	63529
3	HZMSAAM	2	SCREWS SELF TAPPING 4x 1/2 LG SS	
4				
5	63624	1	CONTROL MORSE 00002	THIS
6	106216	1	BRACKET	106216
7				
8	HZMSABJ	* 8	M/C SCREW PAN H. 1/4" UNC x 1 1/4 LG Z.P.	
9	JELTYAA	4	SPRING WASHERS Ø 6	Z.P.
10	JDKBPAC	* 8	NUTS 1/4" UNC.	Z.P.
11				
12	JELHPAC	* 4	WASHERS 1/4"	Z.P.
13	103366	1	ADAPTOR - MORSE CABLE.	103366
14	104276	REF	ADAPTOR - FLEXATROL CABLE.	104276
15	HYQHXA8	1	M6 x 30 LG BOLT	SS
16	JDQHXA	1	M6 NUT	SS
17	JEGKXAA	1	Ø 6 SPRING WASHER	SS
18	HZJWAAN	4	MACHINE SCREWS CEN HD 1/4" UNC x 2 1/2 LG	SS. SCREWS FOR OPTIONAL SIDE MOUNT

* 4 ADDITIONAL SCREWS, NUTS + WASHERS FOR HOLDING DOWN UNIT.



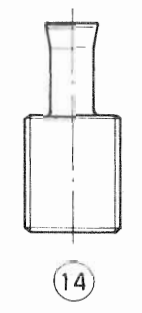
C. W. F. HAMILTON & CO. LTD., CHCH., N.Z.			
EXCEPT AS STATED			
UNLIMITED DIMENSIONS TO BE ±			
AS SHOWN			
MATERIAL			
MATERIAL CERT. YES NO			
DATE			
BY			
CHECKED			
APPROVED			
SCALE			
NUMBER			
106141 SY B			

KL1503 B PS. 28-2-90 ITEM 3 WAS HZMSAAL. ITEM 11 DELETED WAS HZMSAAL.
CL3489 A PS. 27-9-87 REVISED BRACKET. 12, 13, 16, 17, 18 ADDED BY 10/8/87 CHANGED.
CL3489 Q 21 8-8-87 ISSUED FOR MANUFACTURE



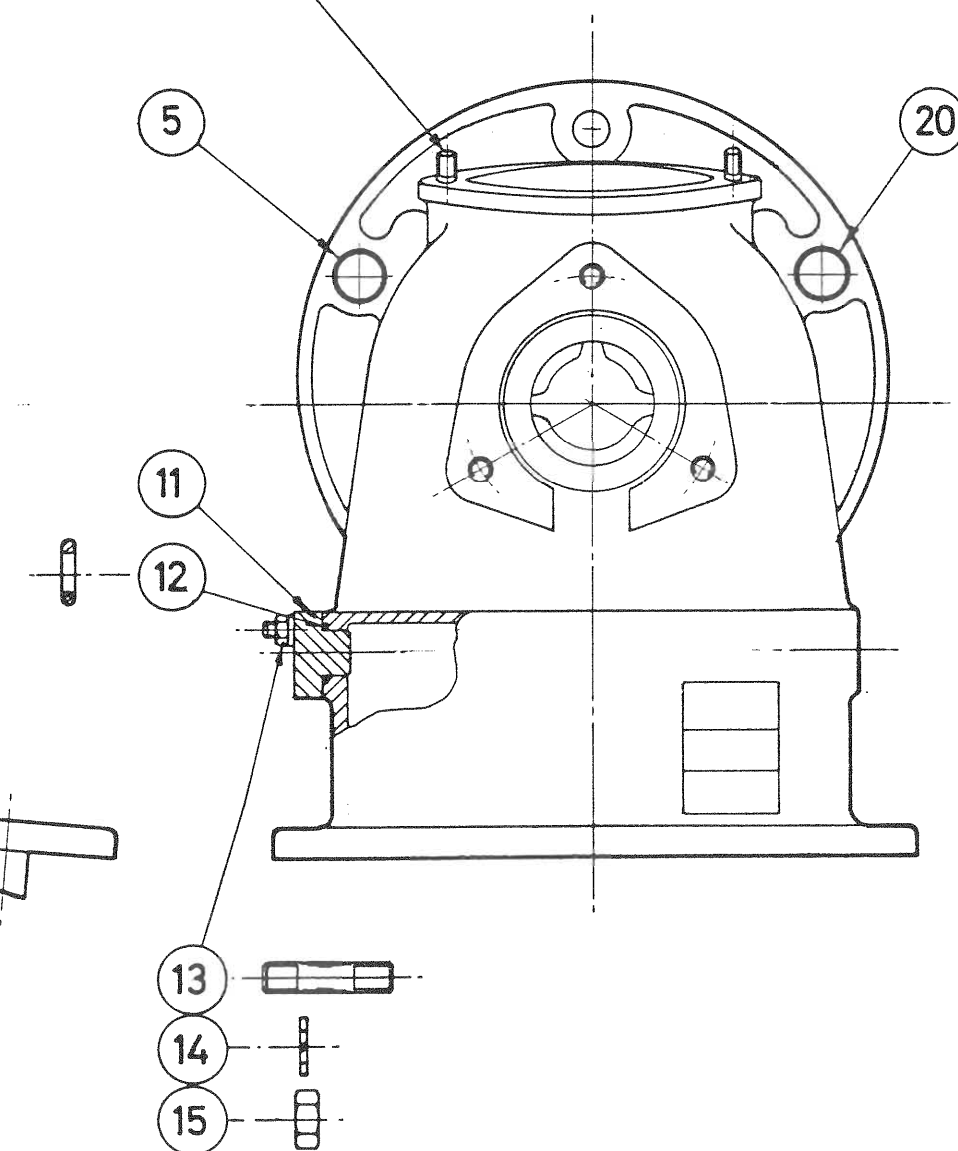
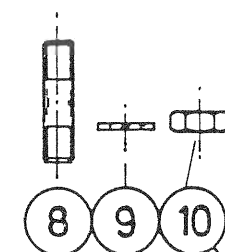
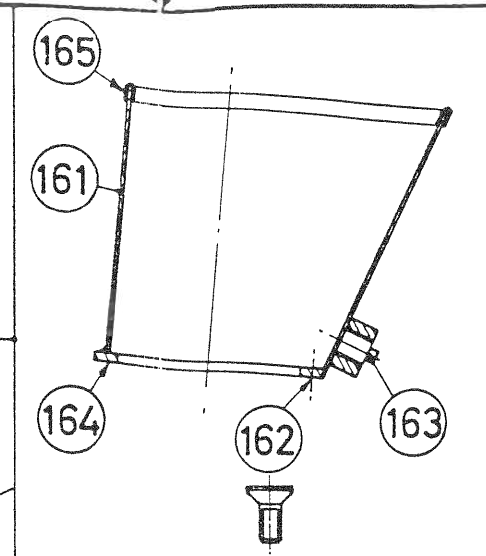
PART SCHEDULE				
ITEM N°	PART N°	N° OFF	DESCRIPTION	DRG. N°
1	106144	1	COVER	106144
2	63529	1	NAME PLATE	63529
3	HZMSAAM	2	SCREWS SELF TAPPING 4g x 1/2 LG SS	
4				
5	EXPORUN	1	CONTROL MORSE D0004	THIS
6	106216	1	BRACKET	106216
7				
8	HZMSADJ	* 8	M/C SCREW PAN H. 1/4" UNC x 1 1/4 LG Z.P.	
9	JELJYAA	4	SPRING WASHERS Ø 6	Z.P.
10	JDKBPAC	* 8	NUTS 1/4" UNC.	Z.P.
11				
12	JELHPAC	* 4	WASHERS 1/4"	Z.P.
13	103366	1	ADAPTOR - MORSE CABLE.	103366
14	104276	REF	ADAPTOR - FLEXATROL CABLE.	104276
15	HYQHAB	1	M6 x 30 LG BOLT	SS
16	JDGHXAA	1	M6 NUT	SS
17	JEGKXAA	1	Ø 6 SPRING WASHER	SS
18	HZJWAAN	4	MACHINE SCREWS CSK HD. 1/4" UNC x 2 LG	SS. SCREWS FOR OPTIONAL SIDE MOUNT.

* 4 ADDITIONAL SCREWS, NUTS & WASHERS FOR HOLDING DOWN UNIT.

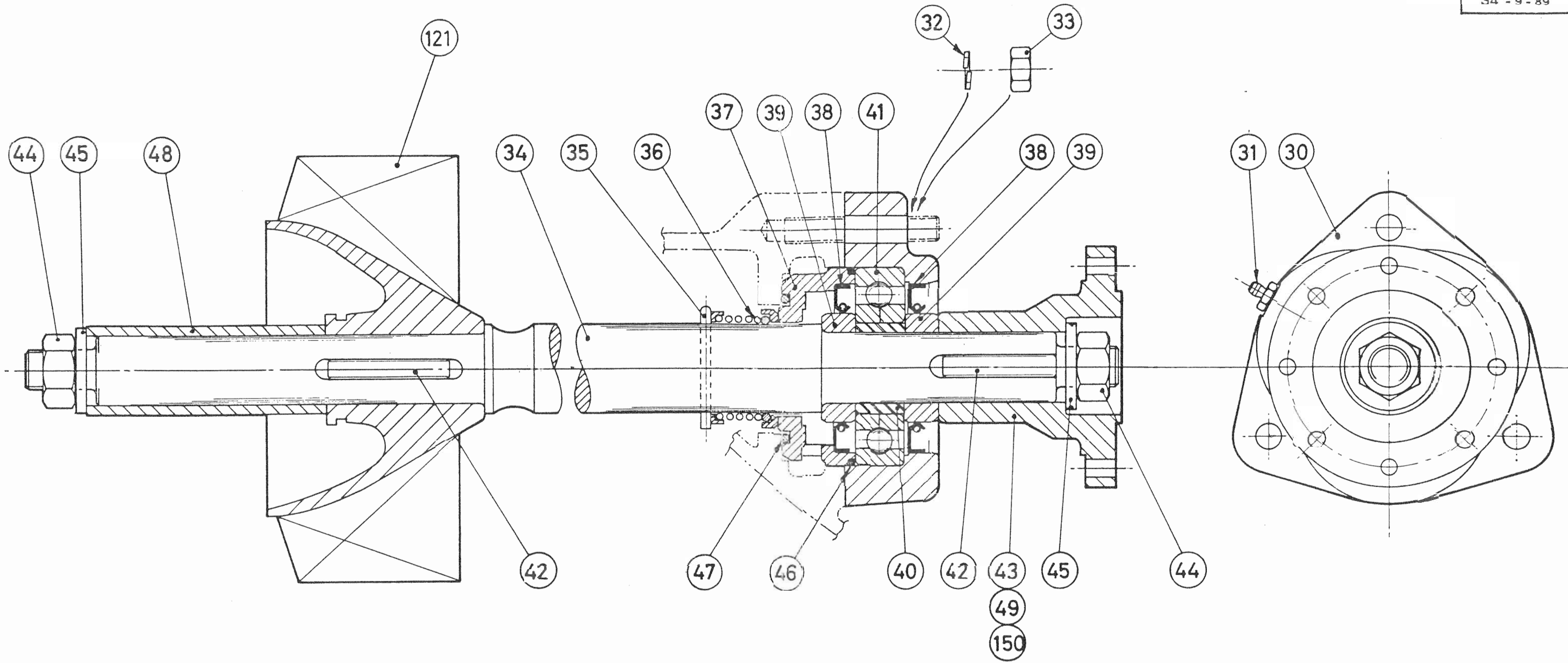


C W F HAMILTON & CO LTD. CHCH. N.Z.			
AS SHOWN		EXCEPT AS STATED	
UNLIMITED DIMENSIONS TO BE 2			
REVERSE AND THROTTLE CONTROLLER ASSEMBLY. 211 JET.			
1:1		106158SY 8	
REV	NO	BY	DATE
CL3505	B	P.S.	28-2-90
CL3493	A	P.S.	29-9-89
CL3489	Q	RL	8-8-89
MEMO 3 WAS HZMSAAL. ITEM 11 DELETED. WAS HZMSAAM.			
REVISED BRACKET. 12, 13, 14, 17 & 18 ADDED. 8, 9, 10 & 11 CHANGED.			
ISSUED FOR MANUFACTURE.			
APPROVED			

106158SY
 DIMENSIONS IN INCHES/MILLIMETERS
 ALL DIMENSIONS TO BE 2
 UNLESS OTHERWISE SPECIFIED
 ALL CORNERS TO BE ROUNDED
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS TO BE 2
 UNLESS OTHERWISE SPECIFIED

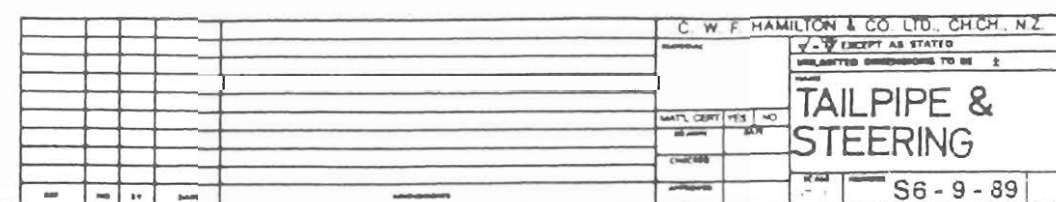


INTAKE
GROUP

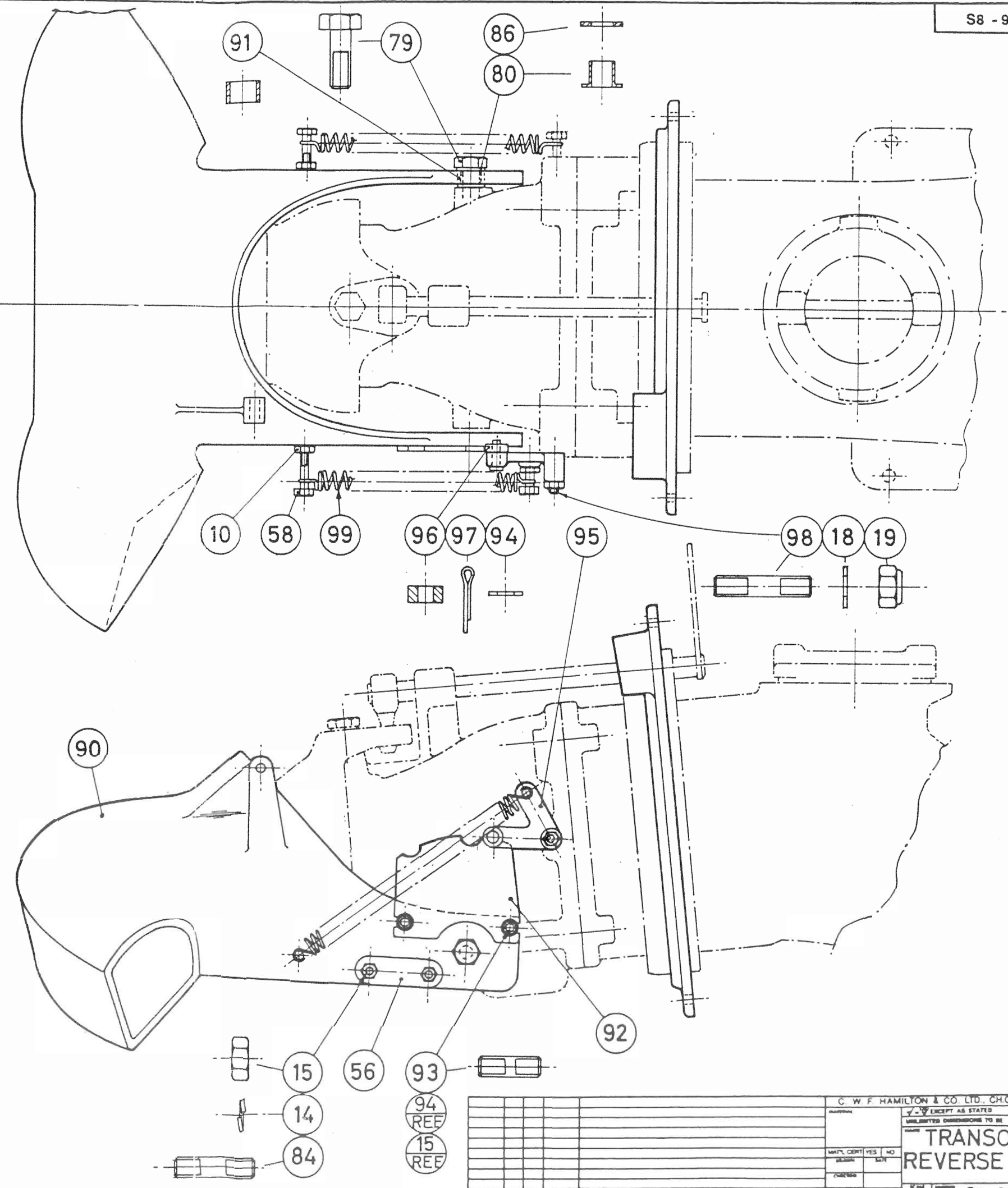
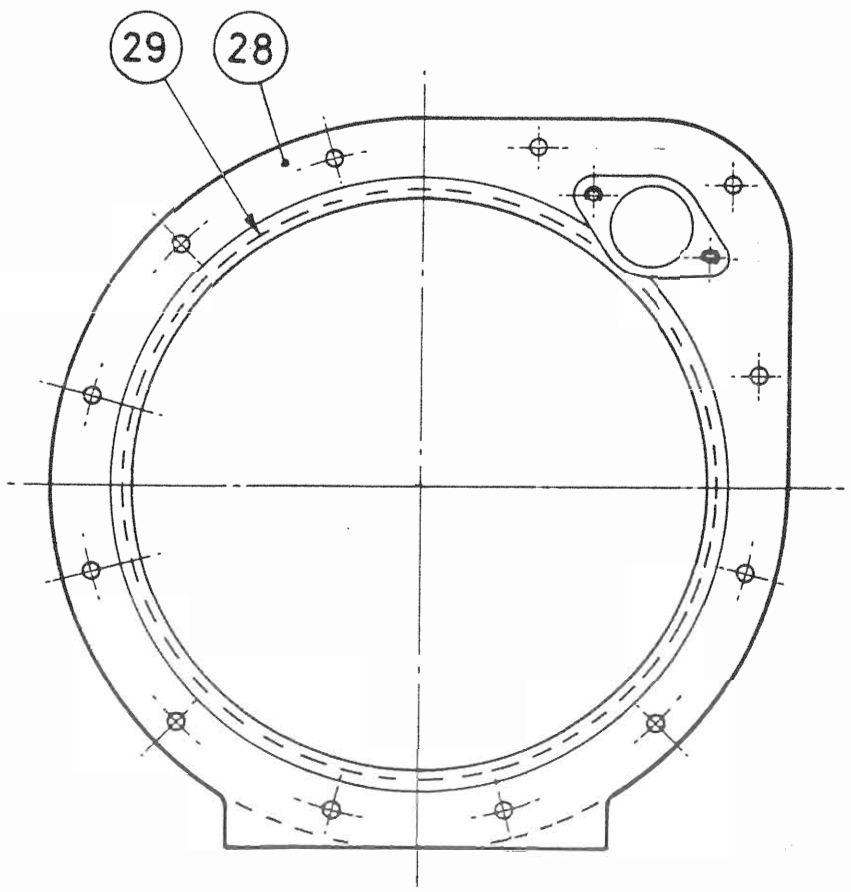


REMOVE SHARP CORNERS DO NOT SCALE DIMENSIONS IN INCHES/M.M. ANGLES PROJECTION

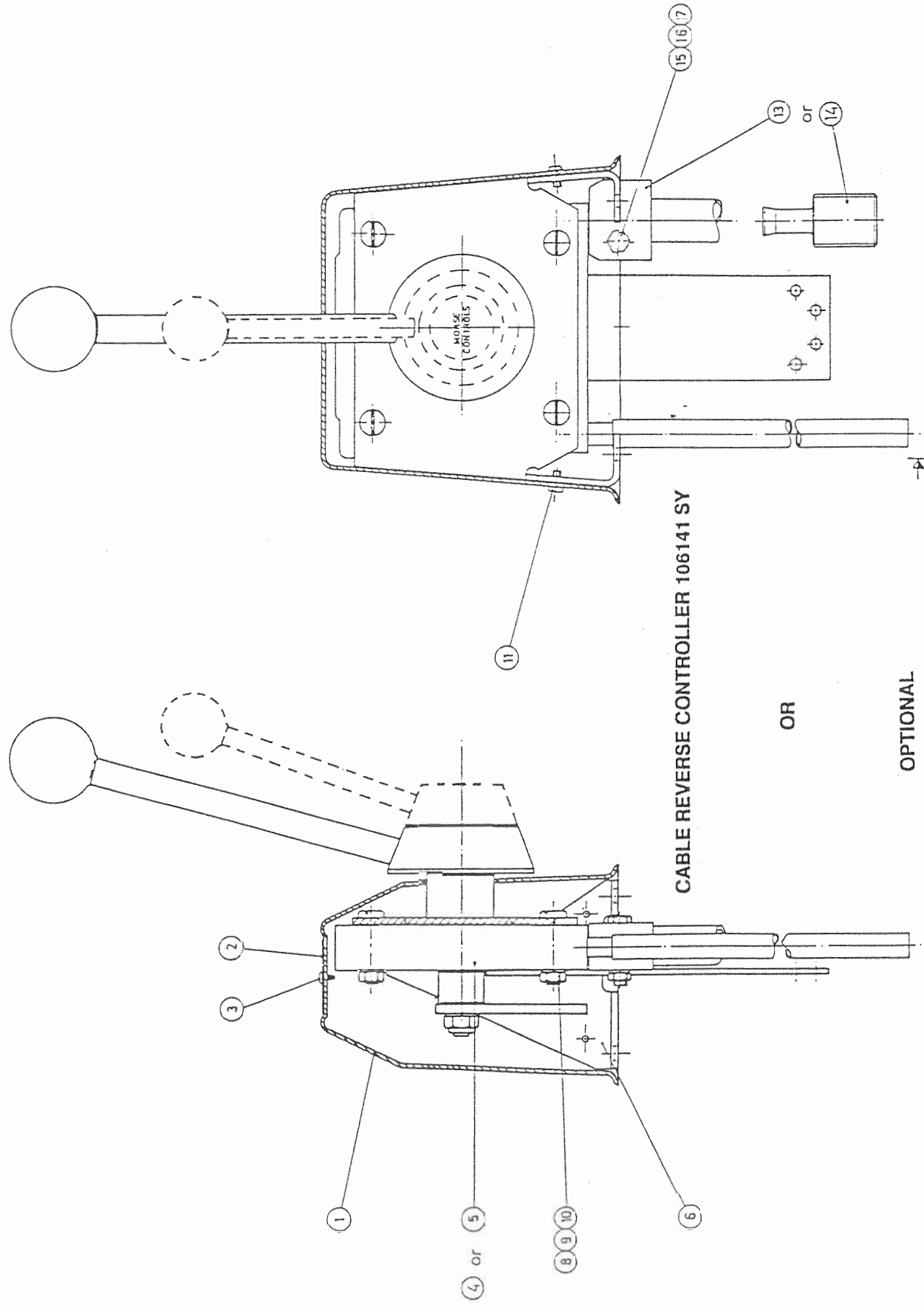
				C. W. F. HAMILTON & CO. LTD., CH. CH. N.Z.			
				EXCEPT AS STATED			
				UNLIMITED DIMENSIONS TO BE			
				SHAFT GROUP			
				S4 - 9 - 89			



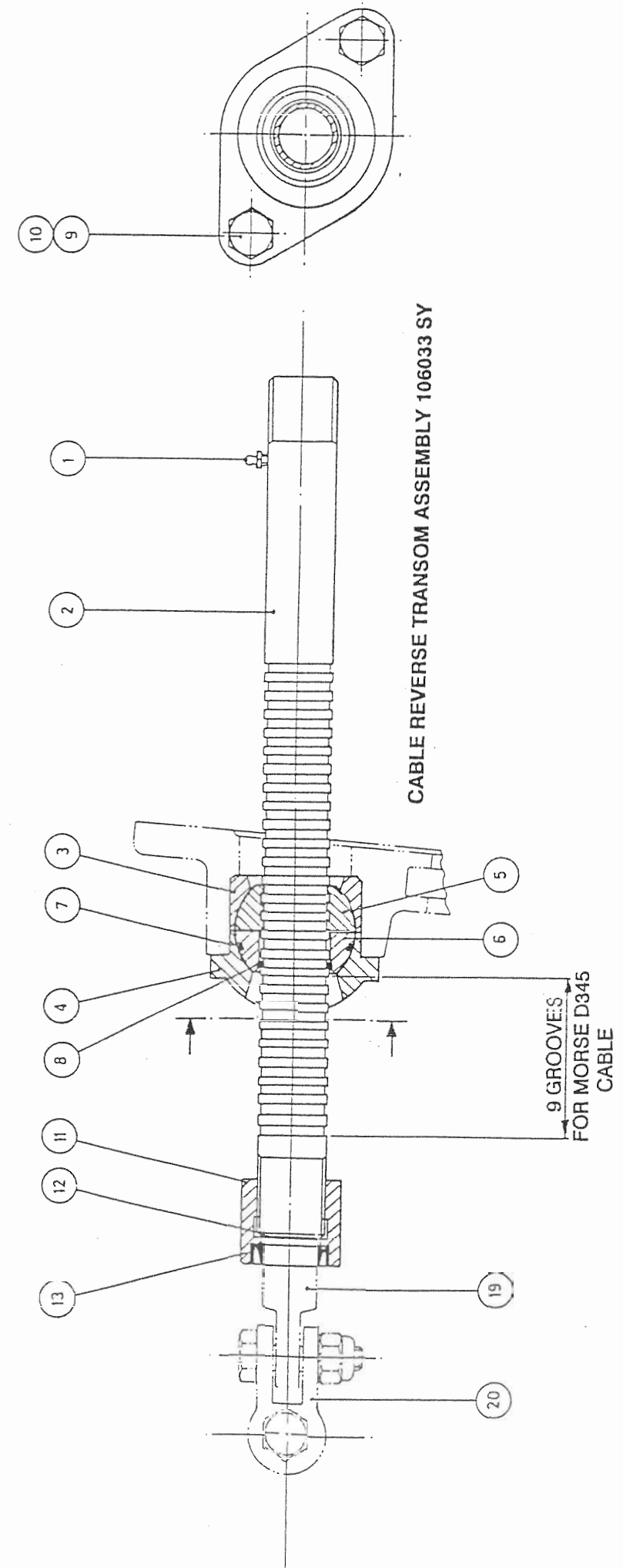
REMOVE SHARP CORNERS DO NOT SCALE DIMENSIONS IN INCHES/M.M. ANGULAR PROJECTION



C. W. F. HAMILTON & CO. LTD. CHCH. N.Z.			
✓ EXCEPT AS STATED			
UNLIMITED DIMENSIONS TO BE			
TRANSOM & REVERSE			
S8 - 9 - 89			



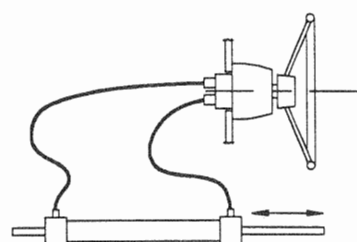
CABLE REVERSE AND THROTTLE CONTROLLER 106158 SY
(throttle shown with broken lines)



HYDRAULIC FLUIDS

TOTAL OIL
VOLUME
in LitresUSED
ON
JET MODEL

SEASTAR MANUAL HYDRAULIC STEERING



FLUID

HYDRAULIC OIL TO MIL STD. H-5606C
DO NOT USE:
BRAKE FLUID
HEAVIER VISCOSITY FLUIDS

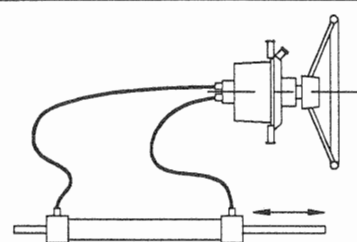
EXAMPLES

SEASTAR: HA5430
SHELL: AERO SHELL FLUID #4
ESSO: UNIS N15 OR J13
TEXACO: HD15

N/A

HJ241
HJ273
HJ291
HJ321

WAGNER MANUAL HYDRAULIC STEERING



FLUID

HYDRAULIC OIL OF VISCOSITY: I.S.O. GRADE 32
DO NOT USE:
BRAKE FLUID
HEAVIER VISCOSITY FLUIDS

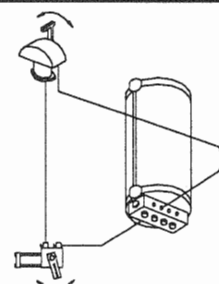
EXAMPLES

SHELL: TELLUS 32
ESSO: NUTO H32
TEXACO: RANDO HD32 or RANDO HD AZ

N/A

HJ362
HS363
HJ391
HM422
HM461
HM521
HM571

HYNAUTIC REMOTE CONTROL SYSTEMS



FLUID

50/50 VOLUMETRIC MIXTURE OF:
ETHYLENE-GLYCOL / DISTILLED WATER
DO NOT USE:
BRAKE FLUID or HYDRAULIC OILS.

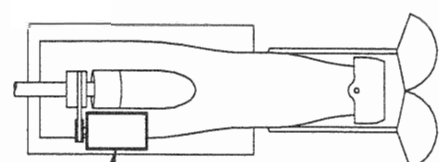
EXAMPLES

HYNAUTIC: MCO-03

N/A

HJ362
HS363
HJ391
HM422
HM461
HM521
HM571

JET POWERED HYDRAULIC SYSTEMS

JET DRIVEN HYDRAULIC POWER UNIT
NOTE: UNIT SHIPPED WITH NO OIL IN
HYDRAULIC POWER UNIT, BUT OIL IN COOLER
& CONTROL SYSTEM.
H.P.U OIL VOLUME = 4 ltrs.

FLUID

HYDRAULIC OIL OF I.S.O. 3448 VISCOSITY GRADE,
VISCOSITY: - 60cSt @ 40°C
10cSt @ 100°CDO NOT USE:
BRAKE FLUID
HEAVIER VISCOSITY FLUIDS

EXAMPLES

SHELL: TELLUS 46
CASTROL: HYPIN AWS 32/68

5.25

?

7.5

7.5

7.5

7.5

7.5

7.5

8.5

13

13

HJ362

HS363

HJ391

HM422

HM461

HM521

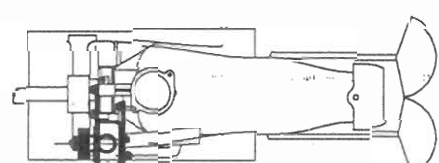
HM571

HM651

HM721

HM811

JET POWERED HSRX SYSTEMS

JET DRIVEN HYDRAULIC POWER UNIT
NOTE: UNIT SHIPPED FILLED WITH OIL.

FLUID

MINERAL BASED HYDRAULIC OIL.
VISCOSITY: - 20cSt @ 40°C
4cSt @ 100°CDO NOT USE:
BRAKE FLUID
HEAVIER VISCOSITY FLUIDS

EXAMPLES

SHELL: DONAX TM Auto Transmission Oil.
DEXRON 11D Auto Transmission Oil.
DEXRON 111D Auto Transmission Oil.
CASTROL: HYPIN AWS 22 Auto Transmission Oil.
TRANSMAX Auto Transmission Oil.
MOBIL: ATF Auto Transmission Oil.

1

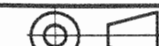
1.2

HJ213

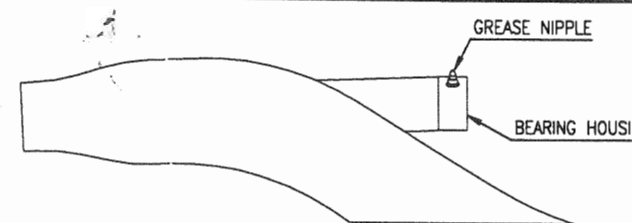
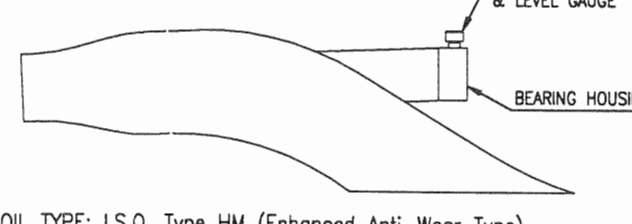
HJ241

HJ273

PROJECTION



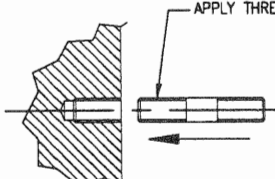
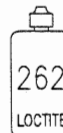
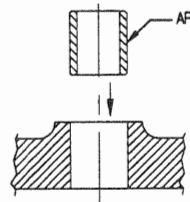
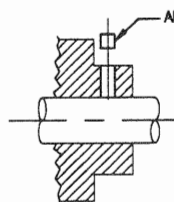
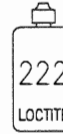
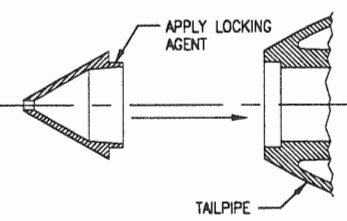
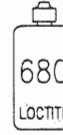
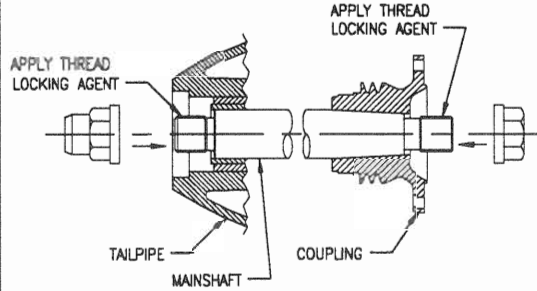
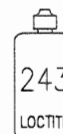
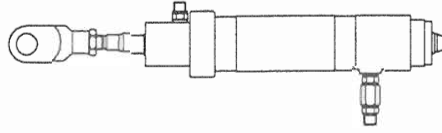

BEARING HOUSING LUBRICANT

JET UNIT	VOLUME (litres)	GREASE LUBRICATED
HJ211	0.3	 GREASE TYPE: Marine Extreme Pressure Grease EXAMPLE: SHELL; Alvania R2
HJ212	0.3	
HJ241	0.3	
HJ273	0.5	
HJ291	0.5	
HJ321	0.5	
JET UNIT	VOLUME (litres)	OIL LUBRICATED
HJ362	0.7	 OIL TYPE: I.S.O. Type HM (Enhanced Anti-Wear Type) Multigrade Oil to I.S.O. viscosity grade 32/68 OR Oil to I.S.O. viscosity grade 46 EXAMPLE: SHELL: Tellus 46 CASTROL: HYPIN AWS 32/68 NOTE: JET UNIT OIL VOLUMES SHOWN ON THE RIGHT THUS *5, ARE FITTED WITH BEARING HOUSING COOLER SYSTEM & VOLUMES SHOWN ARE THE COOLER VOLUME.
HS363	1.4	
HJ391	1.4	
HJ402	1.4	
HM422	1.4	
HM461	1.4	
HM521	2	
HM571	3.5	
HM651	5	*5
HM721	7	*5
HM811	10	*5

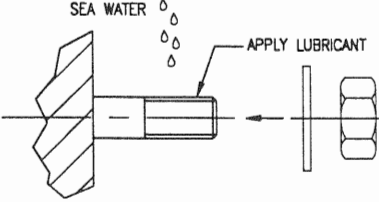

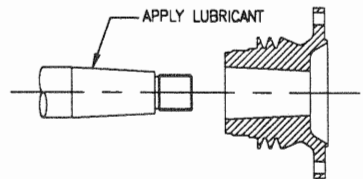
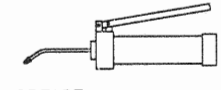
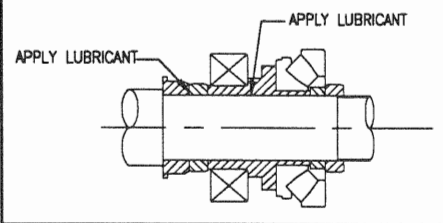
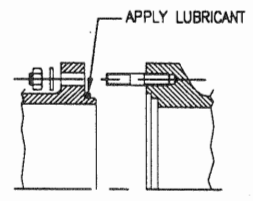
NOTE: JET UNIT OIL LEVELS WILL VARY DEPENDING ON DEADRISE OF HULL.
OIL VOLUMES SHOWN ARE FOR CENTRALLY MOUNTED UNITS NO DEADRISE.
OIL LEVELS MUST BE WITHIN MARKS SHOWN ON DIPSTICK.

C.W.F.HAMILTON & CO. LTD. CHCH. NZ.											
				MATERIAL		✓ = N9 EXCEPT AS STATED					
				N/A		UNLIMITED DIMENSIONS TO BE ± N/A					
CL3631				E		R.J.L.		9.09.98		OIL VOLUMES UP-DATED & NOTES ADDED.	
CL3740				D		R.J.L.		20.04.98		Sht.2 & HSRX ADDED & FASTENERS & LOCTITE MOVED TO SHEET 2	
CL3646				C		G.R.		15.2.96		REDRAWN ON CAD AND REFORMATTED	
REF				B		R.L.		21.12.93		REDRAWN ONTO A3 WAS A4 AND LUBRICANTS ADDED	
				NO.		BY		DATE		AMENDMENTS	
ET											
THIS PRINT IS PROVIDED ON A RESTRICTED BASIS AND IS NOT TO BE USED IN ANY WAY DETRIMENTAL TO THE INTERESTS OF C.W.F.HAMILTON AND CO LTD.											
				MAT'L CERT		N/A		NAME			
				DESIGNED		DATE		RECOMMENDATIONS, for LUBRICANTS & OILS			
				DRAWN		R.J.L.		21-12-93			
				CHECKED							
				APPROVED				SCALE			
								N/A		No. A3-85018 Sht.1	

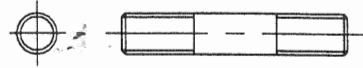
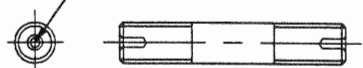
THREAD & JOINT LOCKING

STUDS AND THREADED BUSHES	LOCKING AGENT
	
BUSHES & SLEEVES	
	
SET SCREWS & GRUB SCREWS	LOCKING AGENT
	
TAILPIPE FAIRING (WITHOUT LOCKING DEVICE)	LOCKING AGENT
	
MAINSHAFT NUTS (WITHOUT LOCKING DEVICE)	LOCKING AGENT
	
HYDRAULIC FITTINGS & CYLINDERS	LOCKING AGENT
	

JOINT LUBRICATION

NUTS ON STUDS & BOLTS (IN WATER)	LUBRICANT
	 ANTI SEIZE LUBRICANT (NOT COPPER OR GRAPHITE BASED) OR: MARINE GREASE
TAPERS	LUBRICANT
	 GREASE: MARINE MULTI PURPOSE EXTREME PRESSURE TYPE
STEEL TO STEEL	
	
O-RINGS	
	


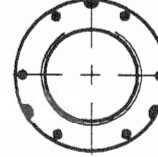
THREAD TIGHTENING TORQUES

SIZE	N.m	lbs.ft	GRADE 316 STAINLESS STEEL STUDS
M6	5	4	 (NON MAGNETIC)
M8	12	9	
M10	24	18	
M12	40	30	
M16	60	45	
M20	120	90	
SIZE	N.m	lbs.ft	SAF 2205 STAINLESS STEEL STUDS
M12	54	40	 (MAGNETIC) CENTRE DRILL
M16	130	95	
M20	260	190	
M24	450	330	

NOTE:

- ENSURE ALL THREADS ARE CLEAN & DRY OR LIGHTLY LUBRICATED AS STAINLESS STEEL THREADS HAVE A TENDENCY TO "PICK UP"
- RECOMMENDED LUBRICANT IS A MARINE GRADE MULTIPURPOSE EXTREME PRESSURE GREASE. EXAMPLE: BP ENERGREASE MM-EP2

TIGHTENING TORQUES

SCREW SIZE	N.m	lbs.ft	SKF KMT/KMTA NUT LOCKING SCREWS
M6	5	4	 LOCKING SCREW KMT NUT
M8	12	9	
M10	20	15	
			 KMTA NUT

PROJECTION 

C.W.F.HAMILTON & CO. LTD. CHCH. NZ.					
MATERIAL N/A			✓ = N9 EXCEPT AS STATED		
MATERIAL CERT N/A			UNLIMITED DIMENSIONS TO BE ± N/A		
DESIGNED DATE			NAME		
DRAWN R.J.L.			RECOMMENDATIONS for FASTENER LOCKING, TORQUES & THREAD LUBRICATION.		
CHECKED 21-12-93			SCALE		
APPROVED			No. A3-85018 Sht.2 E		
THIS PRINT IS PROVIDED ON A RESTRICTED BASIS AND IS NOT TO BE USED IN ANY WAY DETRIMENTAL TO THE INTERESTS OF C.W.F.HAMILTON AND CO LTD.					

Weld Procedure For Welding Cast Intake Blocks Into Aluminium Hulls

Welds: - To be full penetration and conform to ABS rules for Aluminium vessels section 30 (Welding in Hull construction).

2. Welder Qualification:

- Properly qualified welder to ABS Welder qualification (Q1) or equivalent, in downhand or overhead.

3. Inspection:

- Inspection to be done by a qualified welding inspector.

4. Site:

- The site must be

(a) dry and free from steel dust or any other contaminants that could effect the finished weld condition.
(b) sheltered from draughts to prevent disturbance to shielding gas.

5. Welding Process:

- M.I.G.

6. Welding Wire:

- Casting to Plate - use 4043 Filler Wire (LM6M) (5086 or 5083)

7. Shield Gas:

- Argon or helium..

8. Weld position:

- Flat downhand. Turn hull over to do the other side flat downhand.

- If hull cannot be turned to provide a downhand position for both inboard and outboard welds then a backing strip will be necessary. Weld downhand from one side only, then grind off backing strip.
- or use certified overhead welder.

9. Weld prep:

- If Hull can be turned over use double vee butt weld prep.



- If hull cannot be turned over use a single vee butt weld prep with backing strip.



0. Cleanliness:

- Dress all surfaces to be welded just prior to welding to remove surface oxides.

1. Preheat:

- Remove chill 50° - 60° C (120° - 140° F)

2. Support

- A rigid strong back should be clamped to the block during welding to prevent any distortion of the block

3. Weld runs

- Multipass runs may be necessary depending on plate and casting thickness.
- Stitch 75mm with 75mm gaps for first 2 runs to help eliminate distortion of block.
- Grind stop starts before filling in
- Subsequent runs may be full length runs

4. Back gouging:

- Chipping, Routing, Milling, Grinding or other suitable methods are to be employed at the root or underside of the weld to obtain sound metal before applying subsequent beads. Grind stop/start craters.

5. Visual Inspection of Welds

Acceptance Level:

- No cracks, Porosity, Lack of fusion, cold laps or undercut. Use dye penetrant to check outer surface of welds and intermediate weld passes, such as root passes, and also to check back-chipped, ground or gouged joints prior to depositing subsequent passes. Any dye penetrant used is to be thoroughly removed from area before rewelding.

- Dye penetrant is not to be used where complete removal of the dye penetrant material cannot be assured.

C.W.F.HAMILTON & CO. LTD. CHCH. NZ.									
MATERIAL									
✓ = N9 EXCEPT AS STATED									
UNLIMITED DIMENSIONS TO BE ±									
NAME									
WELD PROCEDURE for									
WELDING CAST INTAKEBLOCKS									
into ALUMINIUM HULLS									
SCALE									
No. A3-85080									
B									

REF	NO.	BY	DATE	AMENDMENTS
3765	B	P.S.	24/9/96	REDRAWN ON CAD.OVERHEAD OPTION ADDED
C3607	A	P.S.	6/6/95	
0				ISSUED FOR PRODUCTION.
211	212	213	241	273 272 291 321 363 391

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APPROVED LUG 30-10-96

