Tritech International Limited

EXCALIBUR-ZipJet

Operator Manual

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Warranty Policy

Tritech International Limited herein after referred to as **TIL**

TIL warrants that at the time of shipment all products shall be free from defects in material and workmanship and suitable for the purpose specified in the product literature.

The unit/system warranty commences immediately from the date of customer acceptance and runs for a period of 365 days. Customer acceptance will always be deemed to have occurred within 72 hours of delivery.

Note: Any customer acceptance testing (if applicable) must be performed at either TIL premises or at one of their approved distributors unless mutually agreed in writing prior to despatch.

Conditions:

These include, but are not limited to, the following:

1 The warranty is only deemed to be valid if the equipment was sold through TIL or one of its approved distributors.

2 The equipment must have been installed and commissioned in strict accordance with approved technical standards and specifications and for the purpose that the system was designed.

3 The warranty is not transferable, except or as applies to Purchaser first then to client.

4 TIL must be notified immediately (in writing) of any suspected defect and if advised by TIL, the equipment subject to the defect shall be returned by the customer to TIL, via a suitable mode of transportation and shall be freight paid.

5 The warranty does not apply to defects that have been caused by failure to follow the recommended installation or maintenance procedures. Or defects resulting from normal wear & tear, incorrect operation, fire, water ingress, lightning damage or fluctuations in vehicles supply voltages, or from any other circumstances that may arise after delivery that is out with the control of TIL.
(**Note:** The warranty does not apply in the event where a defect has been caused by isolation incompatibilities.)

6 The warranty does not cover the transportation of personnel and per diem allowances relating to any repair or replacement.

7 The warranty does not cover any direct, indirect, punitive, special consequential damages or any damages whatsoever arising out of or connected with misuse of this product.

8 Any equipment or parts returned under warranty provisions will be returned to the customer freight prepaid by TIL

9 The warranty shall become invalid if the customer attempts to repair or modify the equipment without appropriate written authority being first received from TIL.

10 TIL retains the sole right to accept or reject any warranty claim.

11 Each product is carefully examined and checked before it is shipped. It should therefore be visually and operationally checked as soon as it is received. If it is damaged in anyway, a claim should be filed with the courier and TIL notified of the damage.

Note: TIL reserve the right to change specifications at any time without notice and without any obligation to incorporate new features in instruments previously sold.

Note: If the instrument is not covered by warranty, or if it is determined that the fault is caused by misuse, repair will be billed to the customer, and an estimate submitted for customer approval before the commencement of repairs.

F167.1

SAFETY STATEMENTS & CE MARKING

The installation of the pump is fully the responsibility of the user. It is powered by high pressure hydraulics and contains moving parts. Full consideration has been given to the requirements for CE marking and the relevant safety information is contained within this manual. Since the pump as supplied as a subsystem and its safe use is installation specific, actual compliance is the responsibility of the installer. It must be operated in accordance with the following instruction manual.. Failure to follow the recommendations of this manual may lead to safety hazards or equipment failure.

Danger!

Throughout the manual certain safety related comments and requirements that could lead to injury or loss of life will be highlighted to the operator by indications in the margin identified as opposite.

Caution!

Throughout the manual certain safety related comments and requirements that could result in damage to the product or other property will be highlighted to the operator by indications in the margin identified as opposite.

Technical Support

Contact your local agent or Tritech International Ltd

	Mail	***Tritech International Ltd.*** Peregrine Road, Westhill Business Park, Westhill, Aberdeen, AB32 6JL, UK
	Telephone	++44 (0)1224 744111
	Fax	++44 (0)1224 741771
	Email	support@tritech.co.uk
	Web	www.tritech.co.uk

An out-of-hours emergency number is available by calling the above telephone number

If you have cause to use our Technical Support service, please ensure that you have the following details at hand **prior** to calling:

- Serial Numbers
- Fault Description
- Any remedial action implemented

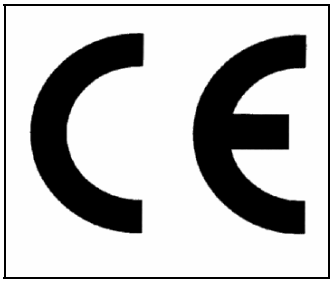
Due to the expansion of equipment capabilities and the fact that new sub-modules are continually being introduced, this manual cannot detail every aspect of the operation.

INTRODUCTION

The new ***EXCALIBUR-ZipJet*** has been developed from the highly successful ***ZipPump*** and ***ZipJet*** range of products.

The integrated eductor based excavation system is designed to pump mud, sand, and gravel, drill cuttings, shale etc. without risk of blockage. Two heavy-duty cylinder valves reverse the flow at the nozzle to eject any object, which may be causing an obstruction. A second cylinder operates a bypass valve to provide a powerful direct jet to break up heavy and cohesive seabed mud and sand prior to excavation.

CE mark & safety note



The installation of the pump is fully the responsibility of the user. It is powered by high-pressure hydraulics and contains moving parts. Full consideration has been given to the requirements for CE marking and the relevant safety information is contained within this manual.

This pump shall be operated in accordance with the following instruction manual. Failure to do so invalidates the CE mark of approval and may lead to safety hazards or equipment failure.

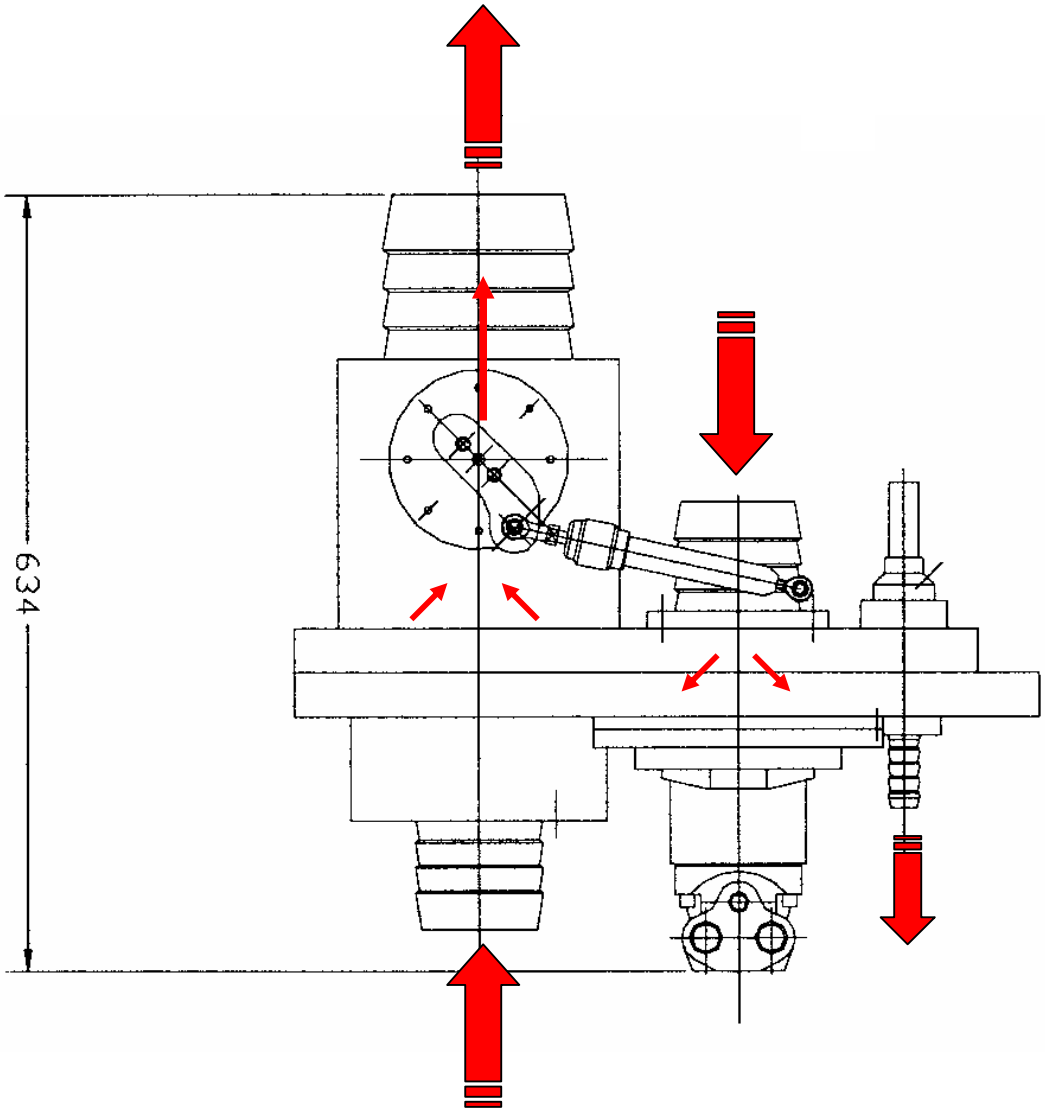
PRINCIPLES OF OPERATION

Suction Operation

The Excalibur ZipJet pump is based on the principles of the annular eductor pump. It has a monoblock configuration in which the eductor pump and power pump are contained within a common body.

The power for the eductor section of the pump is provided by a stream of clean water driven by the centrifugal impeller section.

Clean water is drawn into the inlet, passes through the impeller of the power pump and is then injected into the main suction stream via the annular eductor nozzle.



The main suction stream can convey heavy contamination of sand, mud, gravel and drilling debris.

The pump has a retro flush valve just behind the eductor. When this is closed (operating cylinder extended) the power fluid is then directed to the suction nozzle. This feature can be used to clear blocked suction nozzle or to complete a deburial operation by blowing away the last sand and mud from around an object.

The optimum performance will be obtained with the nozzle pushed deep into the debris and agitated gently. Where a great deal of debris is encountered it will be necessary to keep withdrawing the nozzle.

Jetting Operation

The body of the pump contains a jetting valve. The purpose of the valve is to provide water to the jetting outlet. Unlike previous ZipJet pumps this pump maintains suction during jetting operations. For normal dredging operations the jet valve should be maintained powered shut.

INSTALLATION.

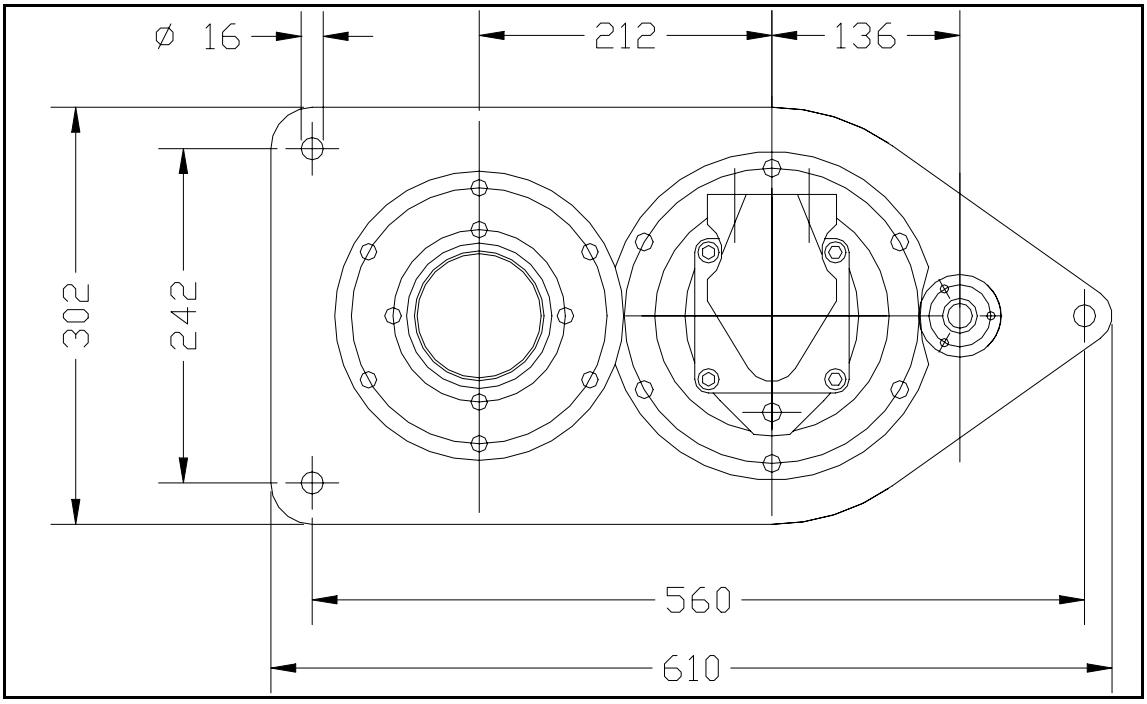
Do not power up the pump or hydraulic valve actuators until all hoses are properly connected to the pump.

There is a serious risk of injury to fingers if inserted in either the power water intake or the pump delivery port.

If the user wishes to power up the motor or actuators before the installation is complete it is his responsibility to ensure that suitable guards or other safety measures are in place to prevent injury.

Mechanical Installation

The pump may be mounted in any orientation on the vehicle. There are three mounting points.



The pump should not be mounted using the motor or hose nozzles as attachment points. Any case bolts can be used

Water Hose Installation.

Hoses

Clean water inlet hose	100mm ID
Dredge suction hose	100mm ID
Discharge hose	150mm ID
Recommended hose type	Kanaline AW

Kanaline AW has plastic reinforcement and a semi-transparent wall, which assists visual inspection for damage and blockages. Being all plastic it is light in water.

Alternative makes of suction and discharge hose may be used provided that they have a smooth internal bore and they come in the form of a spiral-reinforced hose.

Layflat style hoses are not recommended for discharge.

Fittings

Use standard Kanaline fittings or heavy-duty worm drive clips. Use of heavy-duty two bolt clamps will result in damage to the hose connections on the pump unit.

Jet hose	25mm ID
Recommended hose type	Kanaline AW

Clean Suction intake screen

It is recommended that a Tritech supplied suction strainer be used with the pump. If the user supplies his own strainer, then it must meet the following specifications.

Mesh types

Both rectangular and circular aperture suction screens may be used.

Square mesh	max.	4mm aperture
Circular perforations	max.	6mm dia
Total free flow area	min	0.025m^2

The pump should not be operated in any circumstances without a suction screen meeting the above specification.

Dredge Suction Nozzle

If the user wishes to make up special nozzles the following specification should be met to optimise performance.

Suction nozzles should be designed with a nozzle cross-section area of 80000mm^2.

Smaller nozzles may be used for special tasks but material removal rates will be reduced. Larger nozzles are of no benefit and will reduce performance.

A nozzle guard should be fitted that will pass a maximum of a 60mm dia sphere or 50mm sided cube. The pump can pass single objects of a larger size, but if the pump takes in a stream of objects of larger size then blockages can occur by bridging.

Jet Nozzle.

The user may make up jet nozzles as required.

The recommended size is 12 - 18 mm diameter or an equivalent area.
The optimum size will need to be determined by trial because the water output from the power pump will vary depending on the oil pressure and flow available from the ROV's hydraulic system.

Hydraulic Installation.

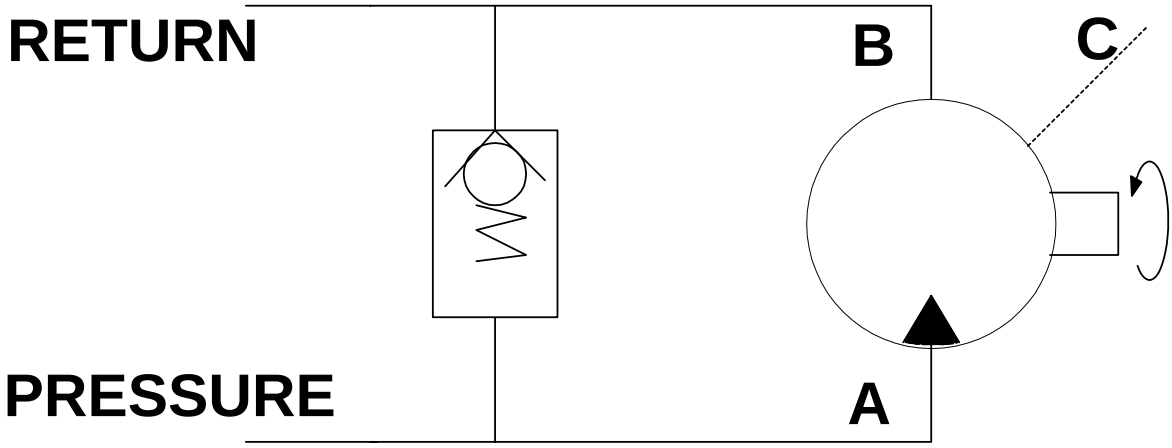
Hydraulic oil

The pump should be operated using a premium grade mineral based hydraulic oil of ISO VG 22 to 32.

Filtration

The hydraulic system filtration must be to a minimum of 10μm absolute standard. A 10um nominal standard is regarded as inadequate.
The recommended filtration is UN elements produced by Pall Industrial Hydraulics Ltd. or equivalent products.

Hydraulic Hook-up.



The pump is configured for correct rotation when the hydraulic supply is connected to the "A" port of the Volvo motor and the return line to the "B" port.

It is mandatory that the drain connection from the motor back to tank is a minimum of 3/8" bore. The drain line should return straight to tank without restriction. It is permissible to connect the drain line back into a larger bore drain manifold which has been correctly sized to accommodate all drains attached to it.

Safety Note.

It is not permissible to common up the drain line with return flow lines. It is strongly recommended that self sealing quick disconnects are not used on the drain line. Use of such fittings is at the users risk. If such a connection is used then it is mandatory to ensure that it has been fully and correctly fitted prior to starting the motor. Failure to do so may result in pressurisation of the motor casing, which could explosively burst under system hydraulic pressure with considerable risk of personal injury.

Warnings

Caution!

To avoid shock loading the motor when the supply is stopped it is essential to provide the check valve shown. This will allow the motor to run down steadily rather than coming to an abrupt stop. The check valve is normally provided within the *Tritech Volvo Protector* housing which is close coupled to the motor ports but if not fitted or removed for any reason then the following valve should be installed in the hydraulic hook-up.

Specification for check valve.

1/2" check valve, cracking pressure 0.5 bar.

Recommended valve

Integrated Hydraulics FPR-1/22-0.5

Hydraulic fittings.

The following fittings are supplied as standard: -

Motor A&B ports	No 12 JIC male
Motor case drain	No 6 JIC male

If it is desired to change these for any reason then the motor port threads are

Motor A&B ports	3/4" BSP parallel
Motor case drain	3/8" BSP parallel

Required hydraulic flow

For the Volvo F11-19 motor

The vehicle hydraulic system should be capable of supplying a minimum 75l/min at 195 bar to the motor ports. Less than this will adversely affect performance.

For significantly different operating conditions contact Tritech International Ltd for further advice.

The maximum permissible flow is 140l/min at 300bar.

Achieving these flows in an unloaded condition is no guarantee that the supply can actually be met in the working condition.

It is recommended that the installation be checked using a hydraulic flow meter equipped with a loading valve, which can simulate the motor running under load.
In order to avoid pressure losses it is mandatory that a minimum of 3/4" bore pipe work or hoses is used on the flow and return lines to the motor. 1" or larger is recommended.

Under no circumstances must the flow be allowed to exceed 150l/min when testing in air. There is no back pressure on the impeller to control its speed and some modern vehicle hydraulic systems are capable of higher deliveries when there are no thrusters running. Over speeding the motor can cause catastrophic failure.
To avoid excessive wear and the possibility of seizing the impeller and body, the unit should not be run for extended periods out of the water (More than 30 seconds). This is especially true when the unit is new. Absence of water around the plastic removes the natural cooling mechanism and may result in the moving parts becoming misshapen due to heat. In worst case the impeller can seize to the body of the pump.

Retro-flush valve and jet bypass valve actuators

Two independent controls are required, one for the jetting actuator and one configured in a T format for the retro valve.

The actuators can be connected to any standard three-position 4-way solenoid valve. Pilot operated check valves can be advantageous, but a closed centre spool valve is adequate. If either actuator is not used then they must be filled with oil and securely capped. This is particularly important for the jet bypass valve, which could easily be pulled open severely reducing efficiency.

The minimum supply pressure for reliable operation is 110bar.

The actuators are rated for working pressures of up to 240bar.

Actuator connection fittings

The actuators are supplied with No 4 JIC male fittings.

The Retro-flush valve is fitted with a pair of actuators. These should be connected to the same solenoid valve in parallel using “T” fittings in the hydraulic lines.

It is recommended that the jet valve be powered shut when jetting is not required.

Tritech Volvo Protector.

The Zip Jet Excalibur pumps are factory fitted with the Tritech Volvo Protector. This removes the necessity to fit an external check valve as described above.
To establish whether a Volvo Protector is fitted to the pump examine the Volvo motor hydraulic ports and compare with picture 3. The Volvo Protector is clearly identifiable and will be stamped with the serial number SZJ – VP19 .XXX.

Note: The BSP Volvo ports are no longer available with the Tritech Volvo Protector fitted.

Retrofitting the Volvo Protector.

A Volvo Protector kit for the F11-19 comprises:

1 x VVF 004 – Check valve body
2 x VVF 002 – JIC 12 fittings
1 x VVF 003 – JIC 6 fitting
4 x Dowty washer 3/4 BSP
2 x Dowty washer 3/8 BSP

The procedure to fit a Tritech SZJ – Volvo Protector is as follows:

Remove any existing port fittings from the F11 – 19 Volvo motor. Ensure that the faces of the F11 – 19 Volvo motor are free from any debris i.e. paint, dirt and grit etc. Clean and degrease surface. Place the 3 Dowty washers over their respective hydraulic fittings. Then push the hydraulic fittings through the motor protector as shown below in **Picture 1**, placing the 3 remaining Dowty washers on the adjacent end of the fittings.

Picture 1.

Place the completed motor protector onto the Volvo motor ensuring that on the top face of the protector the port stamped “P” is aligned with port “A” on the motor. As in **Picture 2.**

Picture 2.

Once the fittings have been inserted and tightened, blanking caps should then be fitted.

Safety Note

Caution!

Never use the same size fitting for pressure hoses and the case drain. If this is done there is a significant risk of incorrect hook-up causing pressure to be applied to the motor case, which could cause the case to burst explosively with high risk of personal injury.

MAINTENANCE

Caution!

Do not power up the pump or hydraulic valve actuators until all hoses are properly connected to the pump.

There is a serious risk of injury to fingers if inserted in either the power water intake or the pump delivery port.

If the user wishes to power up the motor or actuators before the installation is complete it is his responsibility to ensure that suitable guards or other safety measures are in place to prevent injury.

The pump is designed for low maintenance operation.
The main materials are stainless steel and wear resistant polymer plastics.

The only internal moving parts that may need maintenance are

The power pump impeller

The hydraulic motor

The retro-flush valve spool

The jet valve poppet

The eductor set may need replacement after prolonged use with extremely abrasive materials or if aggressive chemicals have been encountered.

Basic maintenance procedures

Hydraulic motor shaft seals

Volvo produces two seals.

"N" type coloured blue and

"H" type coloured red.

The "H" type is a high pressure seal and fitted as standard on the ZipJet Excalibur.

Replacement of seals with anything other than a genuine Volvo seal (or Tritech supplied seal) will invalidate warranty.

Pre- dive

Visual check for external damage

Check hoses are secure

Check mountings are secure

Check clean water suction strainer is in place and clear

In active time
If the vehicle will be in active for more than 48 hours or at demob

Run a fresh water hose into the clean water suction strainer for a few minutes, then spin the hydraulic motor for about 15 seconds (taking care not to allow it to over speed).

Storage

If the pump is removed from the vehicle, then the hydraulic ports should be blanked off with metal caps and the unit washed out with fresh water.

Leave the actuator valves in their retracted position.

Visually inspect the leading edges of the power pump impeller for damage and erosion.

Up to four blades may have leading edge damage of 5mm-width and 4 mm depth before replacement becomes essential.

If the majority of leading edges are eroded more than 3.5mm back from the bore of the inlet nozzle then consideration should be given to replacing the impeller.

Basic fault finding

Poor Performance

Check that the clean water suction strainer is clear and that there are no blockages in the hose.

Check that the retro-flush valve is opening fully.

Check that the jet valve is seating properly.

Check that the suction hose reinforcement is intact and that there is no sign of the hose collapsing under suction.

Check that the discharge hose is not damaged or kinked.

Remove the clean water suction hose from the pump and check that the face of the impeller is not obstructed by material like rope fibre or shreds of plastic bags.

Check that the hydraulic motor runs freely without excessive noise or vibration.

Check that the hydraulic flow meets the specification.

Dismantling

Tools and materials

The following tools are required to work on the pump.

19mm open ended spanner

19mm socket, short extension bar and ratchet

13mm open ended spanner

10mm Allen key

5mm Allen key

4mm Allen key

Dead blow hammer

3 jaw puller

Loctite - "Studlock" for reassembly

Removal of hydraulic motor and power pump impeller

Disconnect all hydraulic hoses from the motor and fit caps to the ports

Remove the 6 nuts holding the motor mounting plate to the pump.

Remove the mounting plate/motor/impeller assembly

Remove the four countersunk setscrews securing the impeller to the boss. (These will be tight since they are retained by Loctite) Remove the impeller.

Remove the retaining setscrew and endcap from the end of the motor shaft

Using a suitable 3 jaw puller remove the impeller boss from the motor shaft

Removal of the retro-flush valve

Disconnect all hoses and remove the pump from the vehicle.

Remove the actuators from the valve core arms.

Remove the 4 bolts holding the retro-flush valve body.

Remove the retro-flush valve body from the pump.

The valve core is located by the four long bolts so it is now free to be

Withdrawn from the valve body.

Removal of the jet valve poppet

Remove the four setscrews holding the actuator base onto its foundation ring.

Withdraw the actuator and poppet through the foundation ring.

Removal of the dredge eductor calibrating rings

Remove the four M12 bolts the dredge suction intake nozzle can now be removed.

Now unscrew the four Allen key bolts using a 10mm Allen key the Nozzle cone and the calibrating rings can now be separated from the dredge suction intake nozzle.

Reassembly

Reassembly is the reverse of the procedures above, but with particular attention to the following.

Hydraulic Motor and Impeller

Apply some anti-seize grease to the motor shaft before fitting the impeller. Press the impeller boss onto the shaft right up to the shoulder

Assemble the retainer onto the shaft end and secure the setscrew using a small quantity of Loctite.

Replace the impeller on the boss and secure the four countersunk screws with Loctite.

Retro-flush core

Check that the core is a loose fit in the valve body, and that the dirt relief grooves are clear. Replace the actuator arms.

Push the core into the body and refit to the case using the 4 long bolts to locate the valve core in the body.

Tighten the four bolts carefully to about 10-ft lbs. torque in a diagonal pattern. Check that the valve core continues to turn freely. If the bolts are over tightened, the valve core will start to bind.

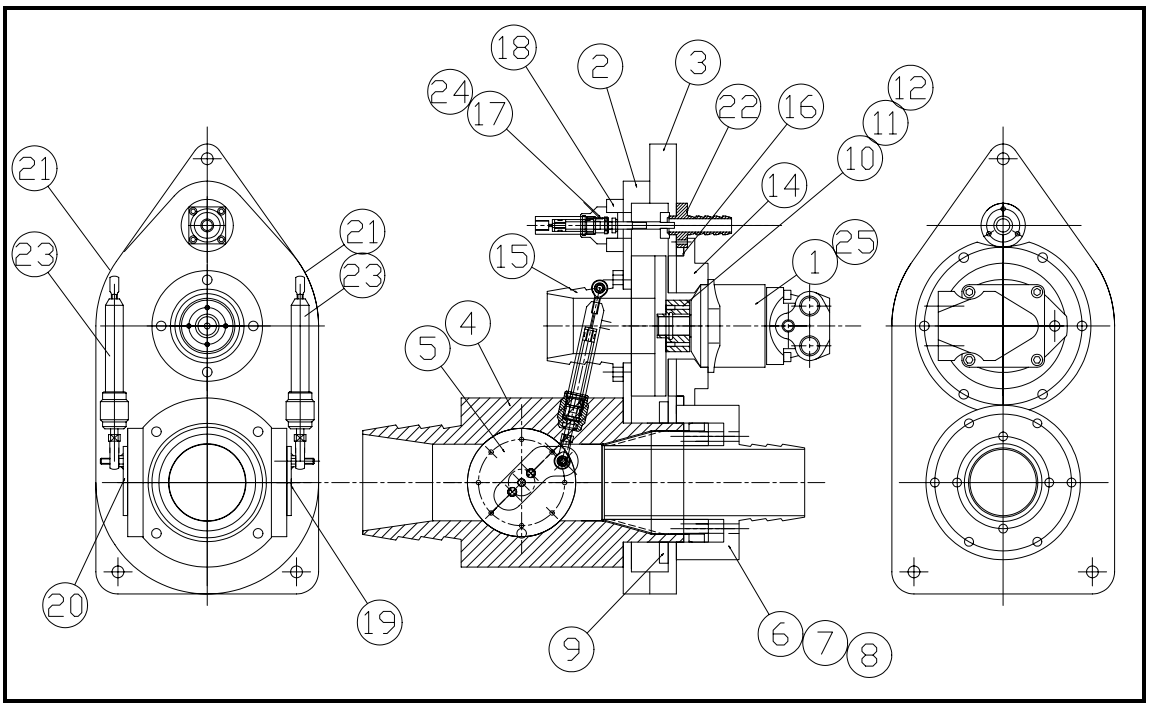
Jet Valve Actuator

Ensure that the actuator is moving freely before replacing it in the foundation ring.

Calibrating rings

Now screw the four Allen key bolts using a 10mm Allen key. Making sure the calibrating rings line up with the dredge body and the cone.

Grease the cone slightly and place onto the body of the pump now tighten up the four M12 bolts.



Parts List

1	DEF11-19MSCHK-99114 (F11-19 c/w Sleeve)	
2	AMI-TRI-ZJR-003	Case Section B
3	AMI-TRI-ZJR-002	Case Section A
4	AMI-TRI-ZJR-004	Retro Valve Body
5	AMI-TRI-ZJR-005	Retro Valve Core
6	AMI-TRI-ZJR-006	Dredge Suction Intake
7	AMI-TRI-ZJR-007	Eductor Cone
8	AMI-TRI-ZJR-008	Eductor Calibration Ring Pack
9	AMI-TRI-ZJR-009	Dredge Anchor Ring
10	AMI-TRI-ZJR-010	Impeller
11	AMI-TRI-ZJR-011	Impeller Boss
12	AMI-TRI-ZJR-012	Impeller Retainer
14	AMI-TRI-ZJR-014	Motor Mount
15	AMI-TRI-ZJR-015	Power Water Intake
16	AMI-TRI-ZJR-016	Motor Mount Anchor Plate
17	AMI-TRI-ZJR-017	Jet Valve Plate
18	AMI-TRI-ZJR-018	Jet Valve Actuator Foundation
19	AMI-TRI-ZJR-019	Retro Valve Actuator Arm RH
20	AMI-TRI-ZJR-020	Retro Valve Actuator Arm LH
21	AMI-TRI-ZJR-021	Retro Valve Actuator Anchor
22	AMI-TRI-ZJR-022	Jet Outlet
23	TI-SZJU-10/90-0-RSE	Retro Valve Actuator Cylinder
24	TI-SZJU-10/38-SPFF	Jet Valve Bypass Actuator Cylinder
25	TI-3003-00-000	F11-19 Motor Protector Assembly

CALIBRATION RING CHART

Impeller	**189**

Calibration Datum =	

		System Pressure bar			
		180	200	220	240
Flow l/min	65	D	D-1mm	D-2mm	D-3mm
	70	D	D	D-1mm	D-2mm
	75	D	D	D	D-1mm
	80	D	D	D	D
	90	D	D	D	D

D	Impeller Change advised

In the chart D = calibration datum when it is all bottomed out.