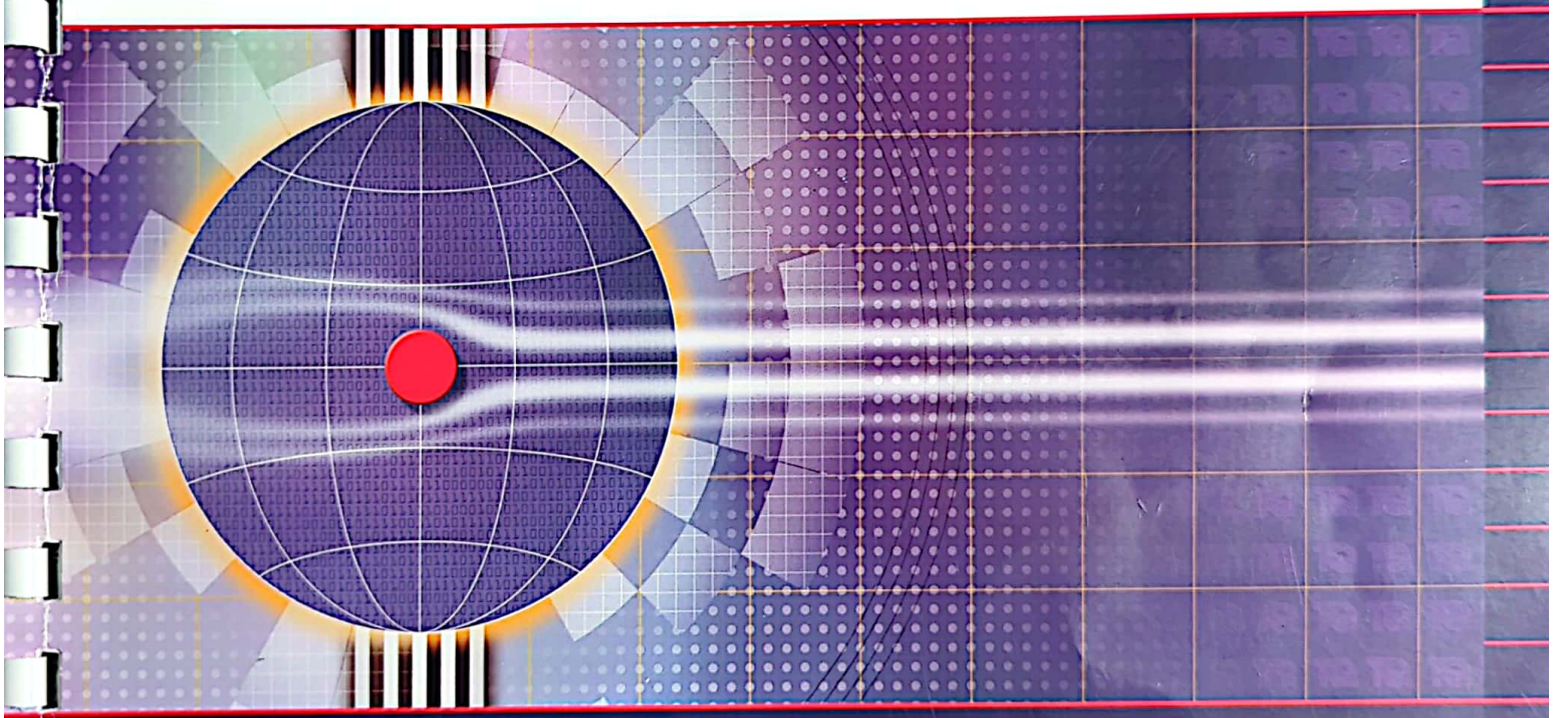
TecQuipment

H1D

Volumetric Hydraulic Bench

User Guide



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TecQuipment has taken care to make the contents of this manual accurate and up to date. However, if you find any errors, please let us know so we can rectify the problem.

TecQuipment supply a Packing Contents List (PCL) with the equipment. Carefully check the contents of the package(s) against the list. If any items are missing or damaged, contact TecQuipment or the local agent.

DB/0214

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Introduction

Figure 1 H1D Volumetric Hydraulic Bench

TecQuipment's Volumetric Hydraulic Bench works as a self-contained mobile water source and measuring system. It's body works as a water reservoir. An electric submersible pump and a hand-operated valve create a controllable and recirculating flow of water. A simple volume measuring system allows the user to accurately measure water flow. The Hydraulic Bench also has a flat lid with a small 'rim'. It allows users to put some of TecQuipments' Fluid Mechanics experiments on it to help save space in the laboratory and help contain any water spills.

TecQuipment recommend the Hydraulic Bench for use with selected experiments from their Fluid Mechanics Range, but it will work with any other suitable experiments as a useful water supply and flow measuring system. It will also connect to other water supplies in case you need a greater quantity of water or just need to measure their flow rate.

Description

Figure 1 shows an outside view of the Hydraulic Bench. Figure 4 is a simple drawing showing the inside view.

The body of the bench forms the water reservoir, or 'sump tank'. An electric submersible pump sits at the bottom of the sump tank and pumps water up to a hand-operated gate-type flow control valve. The valve controls the flow of water to an outlet pipe that passes through a hole in the lid of the bench and connects to your experiment.

The lid includes a volumetric (collecting) tank. You aim the outlet of your experiment into the volumetric tank. As the water fills the tank, a simple calibrated volume indicator shows the volume of water collected.

The flat lid also includes a removable plate that covers an open channel (see Figure 2). The open channel has a slot for experiments with the optional set of weirs (H1D/a and H1D/b). The outlet pipe can connect to a short internal pipe that supplies water to the entrance of the open channel. The water then flows along the open channel, over the optional weir and into the volumetric tank for volume flow measurement.

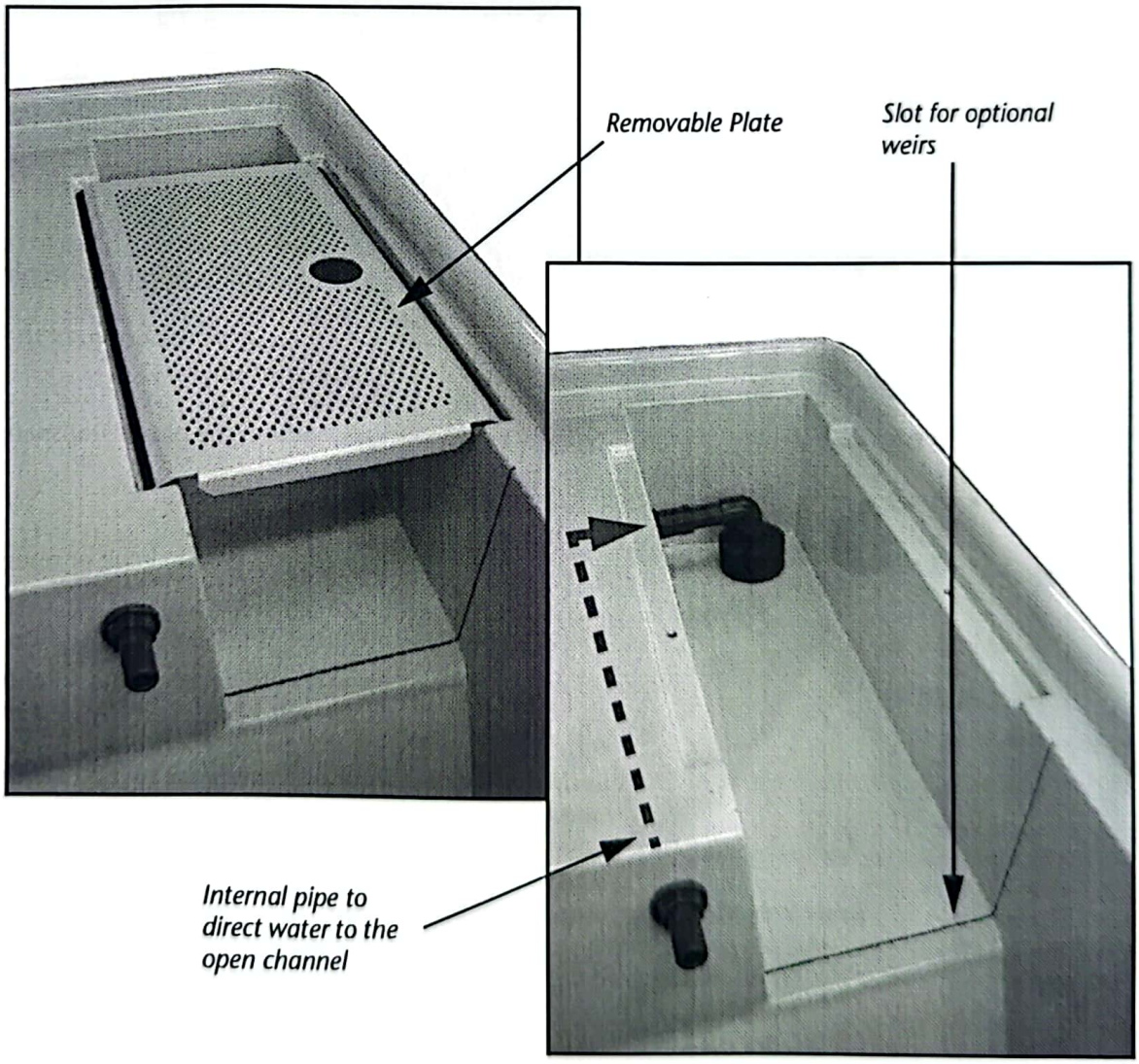

Figure 2 The Open Channel

You use a timer (not supplied) to time how long it takes to collect a measured volume of over a measured time to find flow rate (in Litres per minute or second). The water in the volumetric tank holds a Drain Valve in position - creating a 'plug' (see Figure 3). To empty the Volumetric Tank, you simply lift the Drain Valve and the collected water falls down back into the sump tank.

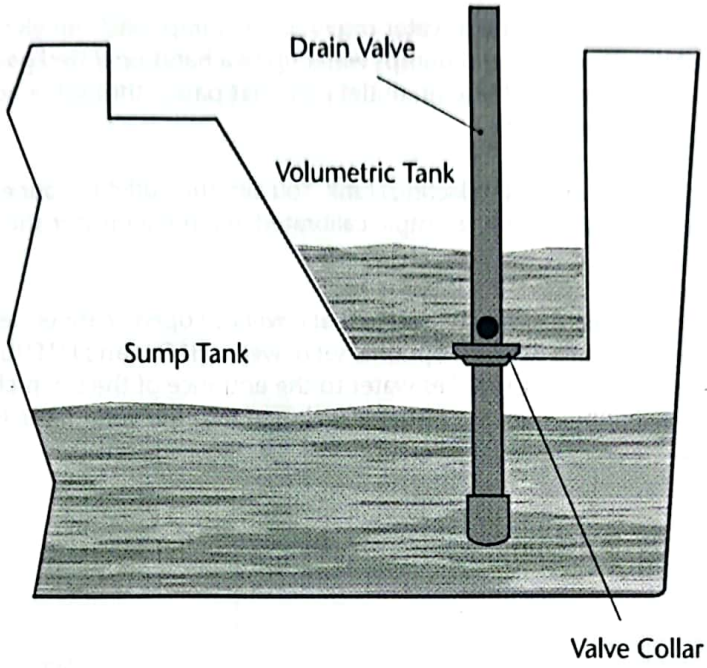

Figure 3 The Drain Valve

The Volumetric Tank includes several holes at a high level, these work as 'overflow' holes to help prevent spills caused by users forgetting to remove the drain valve when the volumetric tank becomes full.

The Hydraulic Bench also has a simple 'Stack Pipe' connecting directly to the bottom of the sump and held in position inside the bench (see Figure 6). This pipe does three things:

- It helps you to see the water level in the tank from the outside (the pipe is transparent).
- It helps you to drain the Hydraulic Bench if you need to change its water.
- It allows you to connect the Hydraulic Bench sump to another water circuit or reservoir.

CAUTION

If you connect the stack pipe to another water circuit:

- ***Remember to allow for the water fill level - if the level is too high, the Hydraulic Bench will not work correctly and may leak. If the level is too low, the pump will break.***
- ***The Bench can only measure accurately up to 120 L/min (2 kg/second).***

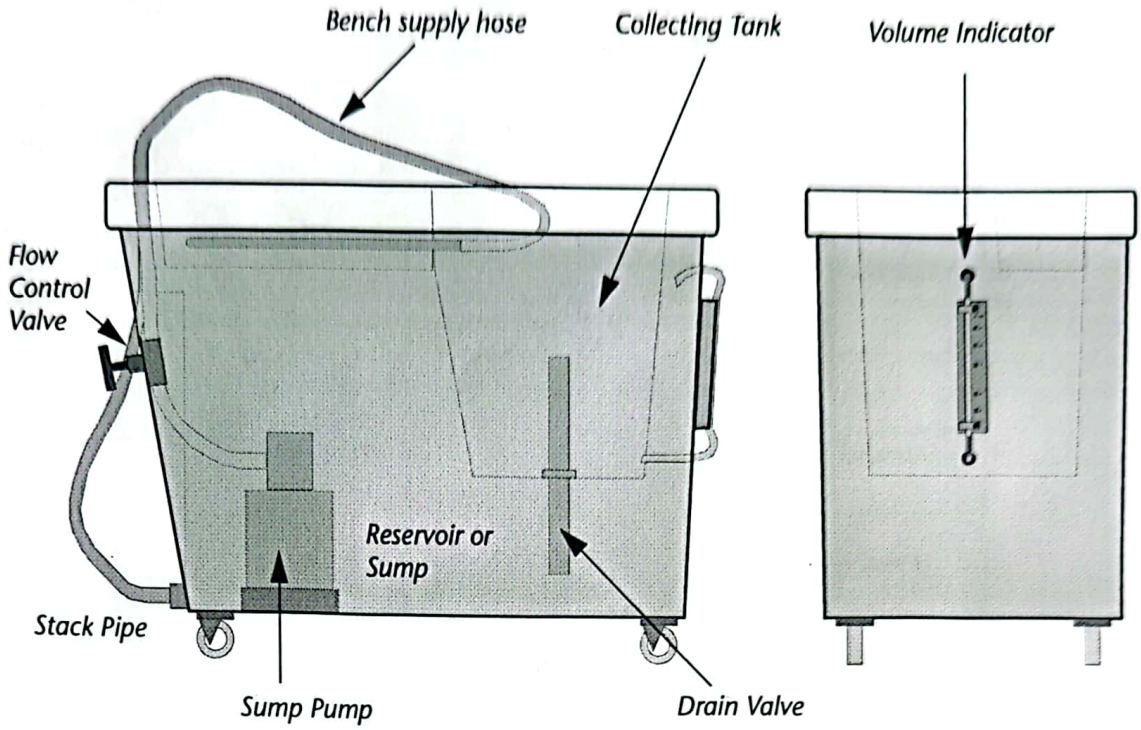

Figure 4 Inside View of the Hydraulic Bench

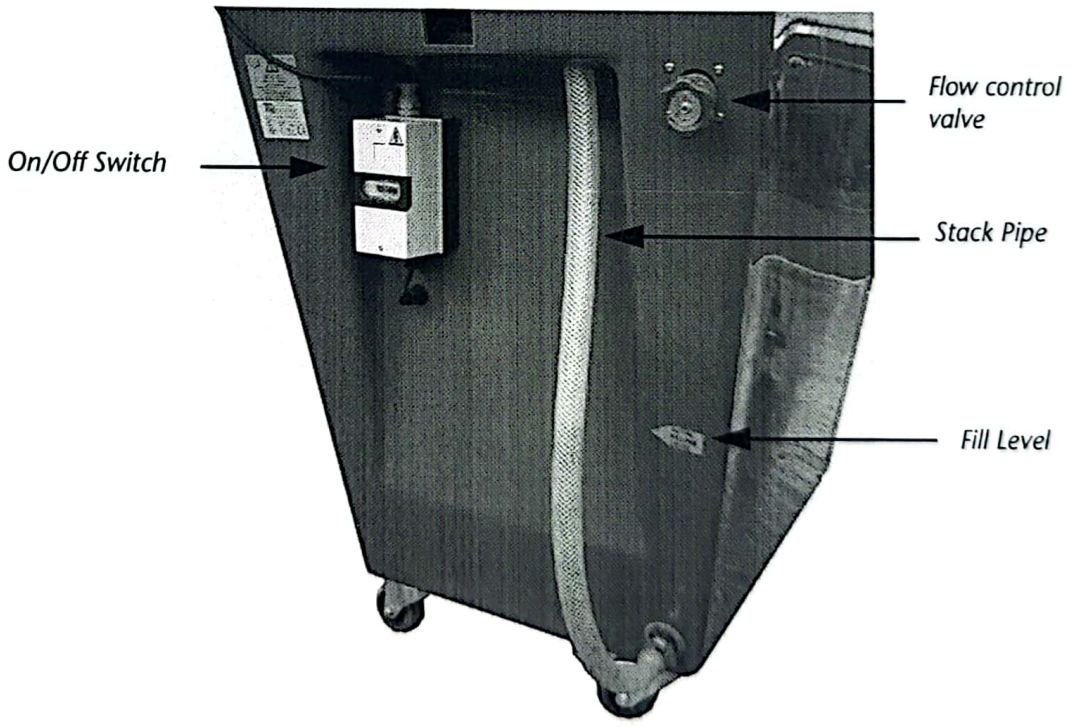

Figure 5 On/Off Switch, Fill Level, the Stack Pipe and the Flow Control Valve

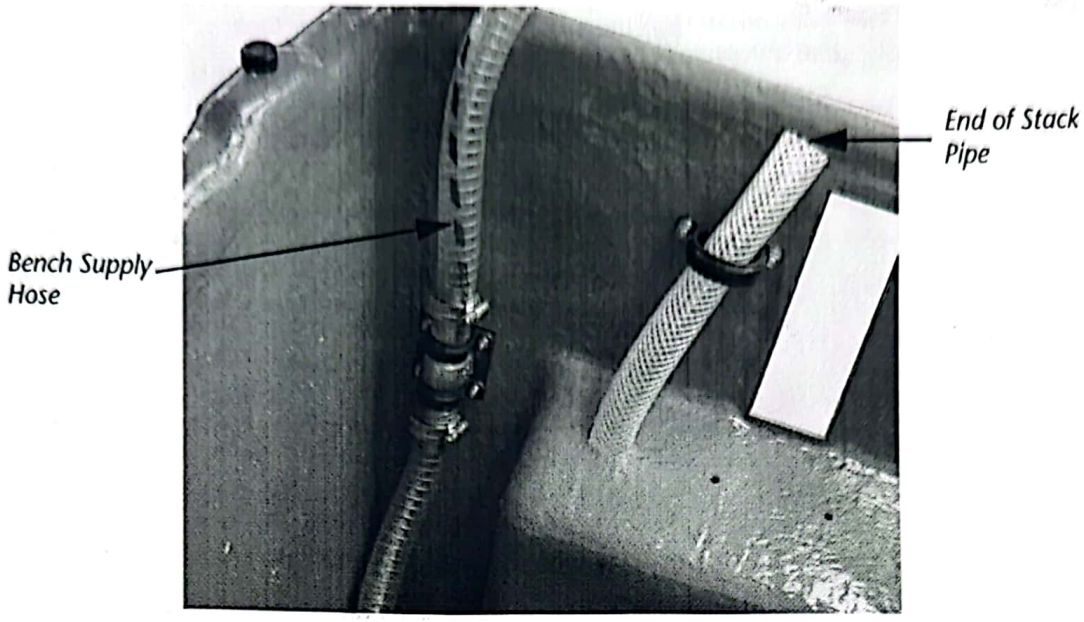

Figure 6 Inside View, Showing the end of the Stack Pipe

Technical Details

Item	Details
Dimensions and weight	Nett: 1200 mm long x 760 mm wide x 1100 mm high and 80 kg
Sump Tank Capacity	Approximately 160 Litres
Volumetric Tank Capacity	35 Litres
Maximum accurate measuring rate	2 L per second (flow is too turbulent for accurate measuring above this value)
Pump	Electric Submersible Approximately 60 L/minute maximum flow as fitted
Water treatment	See datasheet (supplied)
Electrical Supply	220 to 240 VAC 50 Hz 1 A or 110 to 120 VAC 60 Hz 5 A or 220 VAC 60 Hz 2.5 A Specified on order
Circuit protection	Thermal overload and under voltage sensor built into on/off switch. Not user serviceable.

Noise Levels

The noise levels recorded at this apparatus are lower than 70 dB (A).

Installation and Assembly

The terms **left, right, front** and **rear** of the apparatus refer to the operators' position, facing the unit.

NOTE

- *A wax coating may have been applied to parts of this apparatus to prevent corrosion during transport. Remove the wax coating by using paraffin or white spirit, applied with either a soft brush or a cloth.*
- *Follow any regulations that affect the installation, operation and maintenance of this apparatus in the country where it is to be used.*

1. Lift the Drain Valve from its hole in the Volumetric Tank.
2. Pour clean water into the Volumetric Tank until you see the water level in the stack pipe match the fill level marker. Add some of the water treatment supplied with the equipment. The water treatment container will show you the amount you need to add.
3. Connect the electrical supply as shown in **Electrical Connection** on page 9.
4. Make sure the bench supply hose either points into the volumetric tank or connects to the short return pipe that directs water around to the open channel (see Figure 7).
5. Press the on button of the on/off switch to start the pump and check for leaks.
6. Switch off the pump.

Electrical Connection

Use the cable supplied to connect the Hydraulic Bench to the electrical supply.

WARNING ***Connect the Hydraulic Bench to the electrical supply through a plug and socket. The apparatus must be connected to earth.***

These are the colours of each individual conductor:

GREEN AND YELLOW:	**EARTH E OR** ⏚
BROWN:	**LIVE or L1 or Hot 1**
BLUE:	**NEUTRAL**

WARNING ***Connect the Hydraulic Bench through a supply that includes a 30 mA RCD (Residual Current Detection) device.***

Make sure you use the Hydraulic Bench a good distance (2.4 m) away from any mains electrical switches and sockets.

How to Use the Hydraulic Bench

1. Find a suitable stopwatch or timer.
2. Check for the correct water level in the sump.

CAUTION  ***Never run the pump when the water level is low. The pump will overheat and break.***

3. If you are doing weir experiments in the open channel in the top of the bench; connect the supply pipe to the short internal return pipe that directs water back to the open channel (see Figure 7).

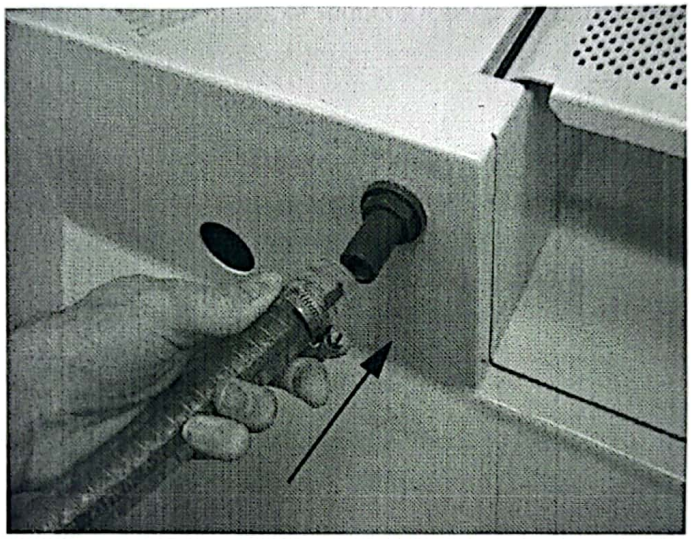

Figure 7 Connect Supply Pipe to Internal Pipe for Weir Experiments

4. If you are ***not*** doing weir experiments in the open channel in the top of the bench; connect the supply pipe to your experiment and direct the outlet of your experiment to the volumetric tank.
5. Switch on the pump.
6. Use the hand control to adjust the flow rate for your experiment.
7. Start your timer as soon as the water level in the volume indicator reaches 0.
8. Stop your timer when the level in the volume indicator reaches one of the marked levels (5, 10, 15, 25 or 35).

NOTE  *Your results will be more accurate if you can measure the time taken to fill a complete 35 Litres.*

9. Repeat the measurement two or three times to check your accuracy.

Maintenance, Spare Parts and Customer Care

General Maintenance

Regularly check all parts of the apparatus for damage, renew if necessary.

When not in use, store the apparatus in a dry, dust-free area, covered with a plastic sheet. If the apparatus becomes dirty, wipe the surfaces with a damp, clean cloth. Do not use abrasive cleaners.

Regularly check all fixings and fastenings for tightness, adjust where necessary.

NOTE  *Renew faulty or damaged parts with an equivalent item of the same type or rating.*

Change the water every three to four months, or sooner if it becomes dirty. Remember to add the water additive.

To drain the water:

1. Disconnect the electrical supply.
2. Lift the lid of the Hydraulic Bench (see **Removing the Lid**).
3. Undo the Stack Pipe fixings inside the Hydraulic Bench (see Figure 6).
4. Carefully lower the end of the stack pipe into a suitable drain.
5. Allow all the water to drain out (gently tilt over the Bench to help).
6. Refit the Stack Pipe.
7. Use a clean cloth to wipe any dirt from the inside of the Hydraulic Bench.

Removing the Lid

WARNING ***The lid is heavy. Ask someone to help you remove it.***

The bottom pipe of the water volume indicator connects to the volumetric tank, so take care when removing the lid.

1. Disconnect the electrical supply to the bench.
2. Referring to Figure 8, slacken the two retaining clips on the water volume indicator. Remove the plastic pipe from the top grommet and detach it from the groove in the indicator.

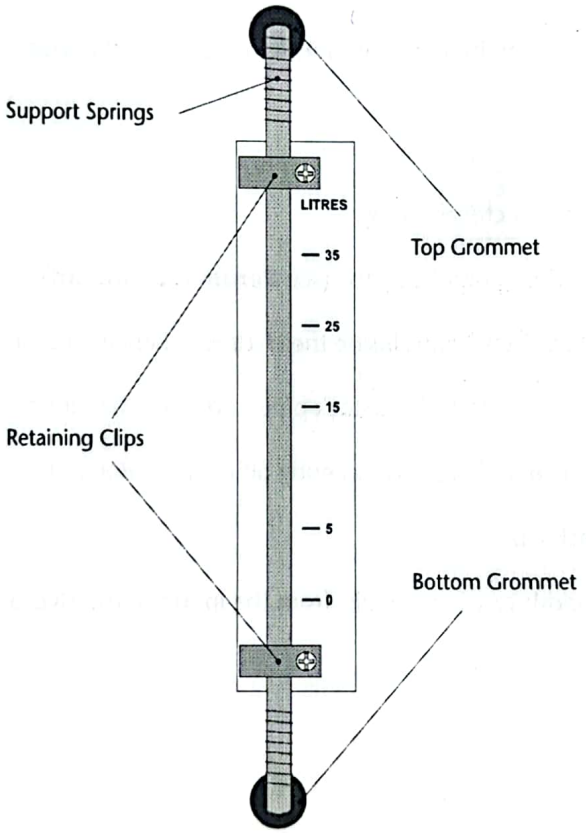

Figure 8 Water Volume Indicator

3. Remove and retain the two support springs that surround the exposed parts of the pipe.
4. Push the whole pipe back through the bottom grommet.
5. Remove any loose objects on the bench top.
6. If necessary, disconnect the supply hose from its connection to the internal pipe.
7. Carefully slide the bench supply hose back through its hole in the lid.
8. Put the lid safely onto suitable supports. Do not rest it on its side or it may break.
9. Reverse this procedure to refit the lid.

Electrical Maintenance

There are no user-serviceable electrical parts in this equipment. If the pump or switch fails, contact TecQuipment or their agent for advice.

WARNING  ***Only allow qualified electrical engineers to make any electrical repairs to this equipment.***

Spare Parts

Check the Packing Contents List to see what spare parts we send with the apparatus.

If you need technical help or spares, please contact your local TecQuipment agent, or contact TecQuipment direct.

When you ask for spares, please tell us:

- Your name
- The full name and address of your college, company or institution
- Your email address
- The TecQuipment product name and product reference
- The TecQuipment part number (if you know it)
- The serial number
- The year it was bought (if you know it)

Please give us as much detail as possible about the parts you need and check the details carefully before you contact us.

If the product is out of warranty, TecQuipment will let you know the price of the spare parts.

Customer Care

We hope you like our products and manuals. If you have any questions, please contact our Customer Care department:

Telephone: +44 115 954 0155

Fax: +44 115 973 1520

Email: **customer.care@tecquipment.com**

For information about all TecQuipment products visit: **www.tecquipment.com**