PumpLab™ Operator’s Manual

PumpLab™ Centrifugal Flow/ Process Control System
PumpLab™ Main Features

- Inlet Pressure Sensor
- Interchangeable Pump Impellers
- Master Power
- Prime Pump
- On/Off Switch
- Control Key
- Strobe Light
- Data Display/Record Computer
- Flow Meter
- Exit Pressure Sensor
- Pump Casing (Volute)
- Clear View Flow Circuit
- Inlet Valve
- Outlet Valve
- Fluid Primer Pump
- Impeller Spinner Tool
- Primer Pump Valve
- Reservoir Drain
- Lockable Casters
- Drive Motor
- Interchangeable Pump Impellers
- Control Key
- Master Power
- Prime Pump On/Off Switch
Thank you...

for displaying confidence in us by selecting the Turbine Technologies, Ltd. PumpLab™ system. You've just joined an ever-growing list of operators. Turbine Technologies Ltd. has a long history of strong customer support, resulting in an enviable level of operator satisfaction. We promise to do our best in assisting you with turning your new PumpLab™ into a true educational centerpiece.

SAFETY

As with any piece of laboratory equipment, basic lab safety precautions must be taken. Protective eyewear must be provided for all participants. Equipment familiarization should be completed prior to any operation.
Notifications

Any trademarks used in this manual are the property of their respective owners.
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General Description

PumpLab™, specifically designed for educational purposes, is a self-contained centrifugal-flow pump demonstrator. This ready-to-operate, hands-on system offers students a unique new opportunity - clear visualization of pump performance and operating characteristics.

Changeable impellers and a see-through flow circuit are key educational features. Lab participants can observe the entire flow path - from point of reservoir pick-up to reservoir return.

Inlet and outlet valves allow for a full adjustment of system flow for the creation of pump performance maps. Cavitation can be witnessed in the pump impeller and in the clear view test section. Additional NPT threaded test ports are installed for possible dye injection, flow velocity gradient studies and turbulence demonstrations.

EXPERIMENTAL OPPORTUNITIES

- Demonstration of pump characteristics at various speeds
- Development of performance maps, including surge line determination for three separate impeller designs (straight bladed, rearward swept and forward swept)
- Witness cavitation with electronic verification and data capture
- Record flow rates via the installed flow rotameter (paddle wheel type with clear housing)
- Determine pump power required, efficiency, volume vs. pressure relations
- Insert student designed impellers for testing and design verification
- Sensor/ software calibration studies
Shipping Information

Upon Delivery

PumpLab™ is shipped in a custom built container. This crate is intended for re-use. Therefore, do not force the shipping box open. Remove the screws marked red along the perimeter of the front panel. After removing the panel, unscrew the red screws that secure the PumpLab™’s “hold down” board. Then, unlock the front casters and slide the system out of the crate or remove the crate walls from around the unit and then unlock casters and move from pallet. Please assure shipping crate is stored for future use.

Once removed from its shipping container, a general inspection is necessary. Check for obvious external dents or damage that may have occurred during transit. If shipping damage is noticed, please notify us by calling 715 924 4876.

Production Dimensions

PumpLab™

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Shipping container dimensions

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<tr>
<td>Width:</td>
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<tr>
<td>Height:</td>
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Electrical Connection

Electrical connection is simple. However, it is imperative that the power connection be properly grounded (green wire). The system is pre-wired and is equipped with a 6-foot rubber electrical cord. The input electrical power required is single phase 220-240 V, 50/60 Hz. It should be protected by a standard 20 Amp circuit breaker.
Pump Lab Setup

Filling the Reservoir Tank

Note: A quarter cup of household bleach may be added to a full reservoir tank. This will help maintain water clarity.

1. You will need to remove 3 Philip head screws located in the tanks top cover. This will allow you to remove the left half of the acrylic cover.

2. Insert hose into tank and fill the tank to within 5 inches of the top (to the base of the grey collar)

3. Re-install tank cover (replace lid and the 3 screws removed in step 1)

If filling system with any other fluid besides water, please contact Turbine Technologies first.
Priming the Flow Circuit

1. Remove T-handle from holder (located directly below the stored impellers)
2. Insert T-handle and turn valve to clockwise stop
3. Open pump housing breather valve (located on top of the clear pump housing)
4. Turn on prime toggle switch (assure that pump inlet and outlet valves are open)
5. Close breather valve as water level reaches the top of the clear view impeller housing. If this is not done, water will spill out through the breather valve.
6. Turn master power key switch to on position
7. Press red stop button on motor controller key pad
8. Press forward button and adjust motor rpm with up and down keys
9. Turn primer pump switch off

* Inlet and outlet valves can now be adjusted to vary flow parameters
Changing Impellers

Note: Assure that master power key switch is turned off

1. Open breather valve to allow water to return to reservoir
2. Attach supplied hose to outlet spigot at bottom of pump housing. Open valve and drain water into a bucket, sink, or drain
3. Unscrew and remove inlet elbow fitting
4. Remove 8 silver pump housing clamps
5. Carefully remove acrylic pump cover (do not drop)
6. Remove impeller change tool from front storage cabinet
7. Remove spinner by turning spinner counter clockwise with change tool while holding impeller. Pull impeller off of shaft. Be careful not to lose shaft key as you pull the pump impeller off of the shaft
8. Remove desired impeller from storage cabinet and place onto shaft
9. Replace spinner nut and tighten with supplied change tool
10. Replace acrylic cover and 8 hold down clamps
11. Slide inlet elbow in and tighten clear, acrylic union
Draining Main Reservoir Tank

1. Drain pump housing as described in “changing impeller section”

2. Take supplied drain hose and attach to grey drain receptacle located in the front impeller storage cabinet

3. Turn drain valve to counter clockwise stop by using supplied T-handle

4. Turn on prime switch. The prime pump will pump the water through the hose into your drain/sink

It is imperative for the system to be completely drained and dried prior to storage in below freezing conditions.
Data Acquisition

The PumpLab™ is equipped with a data acquisition system. This USB connected system is fully integrated and precalibrated. Industrial grade sensors measure system parameters for real time display on the provided computer. Data can be recorded for playback or follow on analysis. Data acquisition software is user configurable without programming. The data outputs are graphically depicted and include the following values:

1. Pump Inlet Pressure
2. Pump Exit Pressure
3. Flow Rate
4. Pump Torque
5. Pump RPM

Two additional ports, located on the inlet and exit side of the pump, are provided for operator expansion and designed to accept thermocouples, pressure or flow transducers and other sensors as desires.

The data acquisition software offers Out-of-the-Box functionality for immediate configuration, display and recording of data without the need for programming. PumpLab™ is delivered with all software preinstalled and calibrated. Should these settings be accidentally lost or re-set, a CD-ROM is included with copies of all factory settings.
Software Setup and Installation

Data acquisition for the PumpLab™ centrifugal pump system is achieved with the PumpLab™ software application. All software is preinstalled and factory verified when purchased with accompanying computer. For instructions related to manual installation please refer to Appendix B.

Screenshot of the PumpLab™ PC application used for data acquisition
PumpLab™ Two (2) Year Limited Warranty

Turbine Technologies Ltd. warrants each PumpLab™, of its manufacture, to be free of defects in materials and workmanship at time of shipment, and to remain in serviceable condition for a period of 2 years (24 calendar months) following date of shipment.

In the event of malfunction or failure, purchaser may, at its expense, return the PumpLab™ to Turbine Technologies Ltd. for inspection. If, in its sole discretion, it determines that the malfunction or failure resulted from a defect in materials or workmanship, Turbine Technologies Ltd. will repair or replace any defective component(s).

Specific Exceptions

1. This warranty will become void if any person has made any attempt, except those specifically authorized by Turbine Technologies Ltd. (in writing), to repair or modify the PumpLab™

2. PumpLab™ is not offered as and shall not be construed by purchaser to be a "Consumer Product" (within the common definition or definitions of the Federal Trade Commission).

3. PumpLab™ is represented to be, and is offered as, experimental technology, subject to the limitations in performance and safety inherent to equipment so classified.

4. Purchaser shall be solely responsible for determining, prior to purchase, the suitability for any purpose(s) intended, of equipment offered or supplied by Turbine Technologies Ltd.

5. This Limited Warranty as written constitutes the entire warranty offered or intended, expressed or implied and is offered in lieu of all other warranties.

6. This Limited Warranty does not apply to on board hardware or software items that are covered by other OEM warranties. Examples include data acquisition software and computer hardware.
Appendix A – Changing Pump Impeller

How to change the pump impeller

Your PumpLab™ is supplied with 3 impellers with specific vane profiles;

- Black: Forward Swept
- Red: Straight
- Gold: Rearward Swept

Each impeller can be easily changed out to allow testing of the next one.

1. For safety, turn off power master key.
2. Open Bleeder Port to allow major portion of water in piping to drain back into tank.
3. Drain the volute into a bucket by attaching included drain hose and opening volute drain valve (Bleeder Port still open).
4. Loosen the threaded pipe connection.
5. Loosen and remove all volute clamps by unscrewing set screws and lifting them from volute.

6. Remove volute face by grasping with two hands and pulling forward. Set carefully on a towel (next picture).

7. Locate Impeller Spinner Tool in Accessory Compartment.

8. Remove impeller spinner using spinner tool (loosen counter-clockwise).

(In the event the spinner is difficult to loosen, use a block of wood to assist with removal).

9. Grasp and pull impeller from motor shaft. Retain key that is in keyway.

10. Remove new impeller from its storage peg and replace it with the pulled impeller.
11. Slide new impeller onto shaft, carefully aligning it with shaft key and keyway.

12. Screw on impeller spinner Clockwise.

13. Tighten with impeller tool.

14. Verify O-Ring Seal in volute face is still in place.

15. Position volute face onto volute housing.

16. Align threaded connection and tighten clockwise.

17. Reinsert volute clamps and tighten until snug.

18. Confirm clamps are properly seated.

20. Be sure bleeder port plug is open.
**Priming the System**

1. Turn on power master key.
2. Turn on primer pump switch on power panel.
3. As water slowly fills inlet piping and volute, start screwing in bleeder port plug. Time it so plug is completely closed as water reaches bleeder port hole.
4. Turn Prime Pump Switch off.
Appendix B – Software Setup and Installation

Installing USB drivers

1. Select the .inf and .sys files and copy them to a folder on your hard drive. These will be installed next.

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<tr>
<td>USBMotion.sys</td>
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2. Be sure the control is powered up

3. Connect the USB cable to the control. Windows should find a new USB device.

4. Install the USB drivers.
   a. Choose “install from a list or specific location” and click Next.
b. Choose “Don’t search I will choose the driver to install”.

c. Click “Have Disk”. Then enter the location that you stored the inf and sys files (in step 3) and click Next to install the driver files.
Installing Data Acquisition Software

1. To install the data acquisition software, simply double click the file setup.exe in the PumpLab folder on the included CD. This will launch the installer.

2. Choose the directory locations for the installed software or use the default locations.
3. Accept the license agreement.

4. Click next until finished.

5. The PumpLab™ program will now be available from the start menu or from the shortcut icon on the desktop.