



Peri-Star™ PRO

High performance digital peristaltic pump

INSTRUCTION MANUAL

Serial No. _____

032912

www.wpiinc.com

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ABOUT THIS MANUAL

The following symbols are used in this guide:



This symbol indicates a CAUTION. Cautions warn against actions that can cause damage to equipment. Please read these carefully.



This symbol indicates a WARNING. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.



The Peri-Star Pro offers four different pump heads.

INTRODUCTION

A peristaltic pump is a type of positive displacement pump used for pumping a variety of fluids, particularly clean, sterile or aggressive fluids. The fluid contacts only the interior of the flexible tube and thus avoids contamination from the pump or damage to the pump. It is easy to maintain and clean. The Peri-Star Pro peristaltic pump provides accurate and precise fluid delivery. It can run at flow rates from 0.1mL/min to 280mL/min with better than 0.5% accuracy.

Peri-Star Pro has a backlit digital LCD display and a water resistant membrane keypad. A unique planetary gear design with eight actively driven rollers (four rollers in the higher flow rate model), together with independent fine adjustment of tubing compression, increases flow accuracy and prolongs tubing life. The user-friendly interface makes the setup, calibration and operation easy and problem-free.

In a peristaltic pump, the flow rate is determined by both the size of the tubing and the rotor speed. WPI provides two sizes of silicone tubing: 1/16-inch ID tubing (for low flow rate at 0.2-18mL/min) and 1/4-inch ID tubing (for high flow rate at 3.5-280mL/min). Silicone tubing has a long service life and good chemical compatibility for aqueous and many organic solvents. Fluoroelastomer tubing should be used when pumping halogenated solvents. Vinyl tubing is used only with chemically compatible solvents.

This manual applies to peristaltic pumps **PERIPRO-4HS**, **PERIPRO-4LS**, **PERIPRO-8LS**, and **PERIPRO-2HS**.

Notes and Warnings



CAUTION: Some solvents can permanently damage the pump. The following rules are recommended to avoid leakage when running the peristaltic pump.

- Follow safety rules when handling aggressive solvents.
- Pull a fresh section of tubing into the tubing fixtures regularly – weekly if use is heavy. Change tubing immediately if it is visibly worn.
- Be sure the tubing used is compatible with the solution being pumped.
- A fresh section of tubing should be pulled through the pump rollers before the pump is left to run unattended.



CAUTION: Always turn off the power and unplug the power cord when changing the tubing. Unauthorized modification or repair will void the warranty.

Unpacking

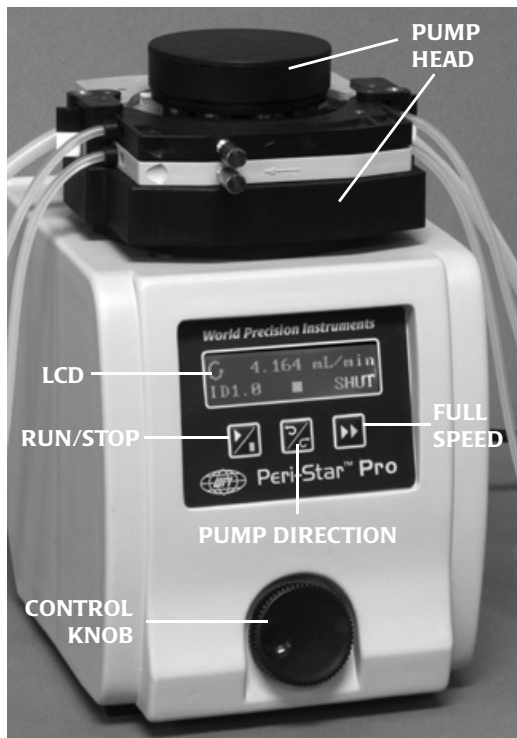
Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be

noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 19 of this manual. Please contact WPI Customer Service if any parts are missing at 941.371.1003 or customerservice@wpiinc.com.

Returns: Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 19 of this manual.

INSTRUMENT DESCRIPTION

In addition to the traditional RPM control, Peri-Star Pro also allows control of pump output by setting a calibrated flow rate. Flow rate is affected by tubing ID, tubing material, and rotor speed. Peri-Star Pro stores the flow rate relation of silicone tubing and rotor speed so the user can easily switch between controls for flow rate or RPM (revolutions per minute). However, calibration is required for high precision pumping or after changing to a different type of tubing.



Control Keypad and Knob

Setup and operation are controlled with a Control Knob and three membrane keys. Pressing a membrane key once activates the key function.

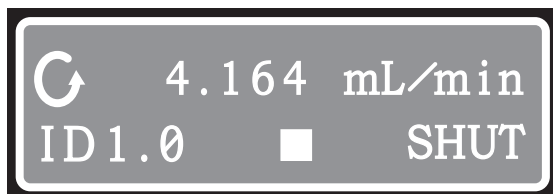
Run/Stop: switches the pump on or off. If the pump is running, pressing this key immediately stops pump. If the pump is off, pressing the key turns it on.

Rotation Direction: sets rotor direction clockwise or counter clockwise. The direction is shown in LCD display. (NOTE: The tubing in the fixtures on the opposite side of the pump head are pumped in the opposite direction.)

Full Speed: runs the pump at maximum flow rate. It is convenient to use when evacuating or cleaning the system.

Control Knob: provides two functions by rotating or pressing. Increase pump flow rate if the rotation is clockwise. Decrease the pump flow rate if the rotation is counterclockwise. Slow rotation makes a small change in the flow rate. Fast rotation makes a larger change. Press the knob once to choose/run the setup function shown in the LCD.

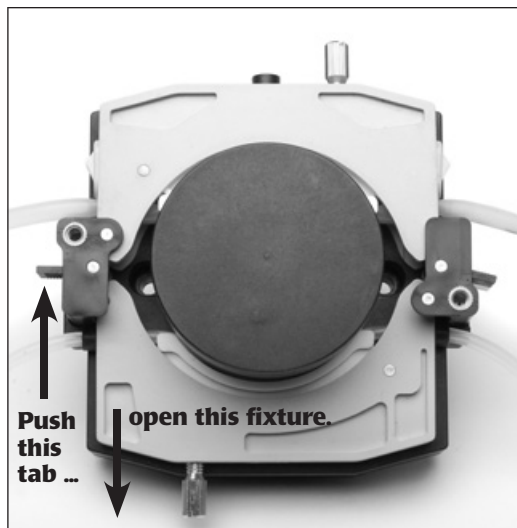
LCD Display



When the pump is turned on, the LCD shows the main menu immediately. The symbol at the top left shows pump direction. Flow rate or rotor speed is shown next. Tubing ID, pump status (run or idle), and control status (internal control or

remote control) are listed in the bottom line from left to right. During setup, the LCD displays the information for the functions being selected.

Pump Head

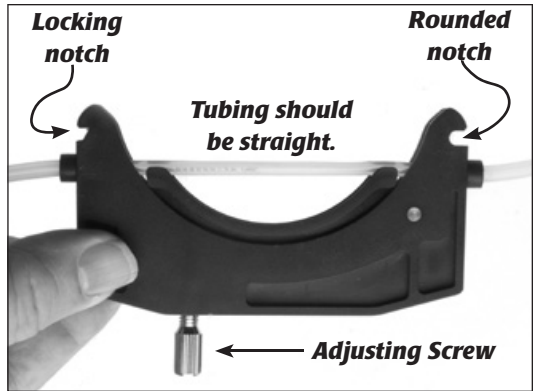


Push Locking Tabs to release tubing fixtures.

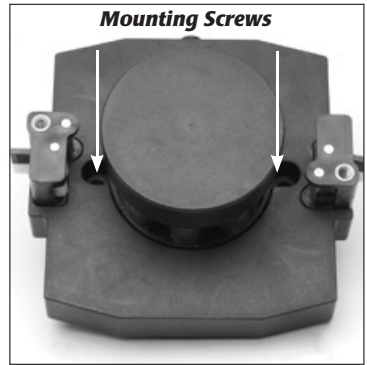
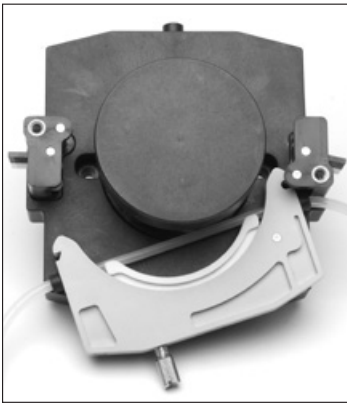
Peri-Star Pro offers four different pump heads — **PERIPRO-2H**, **PERIPRO-4H**, **PERIPRO-4L**, **PERIPRO-8L** — to optimize various applications (see page 9). The pump head has paired fixtures for tubing installation.

To install tubing, remove the tubing fixture by pressing the Locking Tab to the left of the fixture and pulling the fixture open. Pull the tubing through the fixture and make sure the tubing is straight inside the fixture.

Remount the fixture on the pump head. The rounded notch is on the right side of the fixture and fits against a steel rod on the Pump Head. When the other end of the fixture is pushed into place, the locking notch will snap into place against the inside of the Locking Tab. Turn the Adjusting Screw if necessary to get a smooth flow.



To change the Pump Head, remove the tubing fixture from the Pump Head. Unscrew the two mounting screws recessed in the base of the Pump Head (visible after tubing fixtures are removed). Lift the Pump Head off. When putting in the new Pump Head, match the slot on the axis of head to the tongue of motor axis. Fasten the Pump Head with the two mounting screws.



Fit rounded notch against metal post, then snap locking notch into place.

Back Panel



The power switch and power plug are in the back. The fuse is at the side of power plug. When the pump is switched on, the Main Menu appears. Turn off the power and also unplug the power cord when changing tubing. The DB15 socket is not presently configured for use by the pump operator.

Tubing

PeriStar Pro 2H/4H accepts tubing with ID from 3.1 mm to 6.4 mm; PeriStar Pro 4L/8L accepts tubing with ID from 0.5 mm to 2.4 mm. Use only tubing specified for peristaltic pumps.

OPERATING INSTRUCTIONS

One of the important and unique features of Peri-Star Pro is that the control of liquid flow can be expressed either as the rotation rate of the pump head (rotation per minute, or RPM) or directly as the flow rate in milliliters per minute (mL/min) or milliliter per hour (mL/hr). This feature makes reporting and repeating the experiment much easier. In the flow rate mode, the user need only input the tubing inner diameter (ID) for the pump to calculate the flow. The accuracy of the flow rate will depend on the accuracy of the tubing ID. For applications requiring a high precision pumping rate, the pump can be easily calibrated with the tubing used. After calibration, an accuracy of 0.5% can be achieved.

Setup

Press the Control Knob to enter setup mode in the Main Menu, then **Rotate** the Control Knob to switch between four functions: Calibration, System Setting, Control Mode, and Exit. **Click** the Control Knob to activate a selected function and the LCD display shows the corresponding submenu. The program diagram is shown on page 9. Submenu changes caused by clicking the Control Knob are indicated by lines ending with arrowheads. Lines without arrowheads indicate menu selections resulting from turning the Control Knob. Turning clockwise or counterclockwise leads to next or previous function.

1. **Calibration** — the first function after clicking the Control Knob in the Main Menu. This function calibrates the flow rate of current tubing. In RPM mode, there is no need for calibration.

The calibration can be done by pumping the fluid into a volumetric container in a specified time. However, a simple and convenient method is to pump the fluid into a beaker that is placed on top of a digital weighing scale. During the calibration, the tubing must not touch the beaker. With the digital weighing scale, the volume of pumped solution can be easily determined if the specific gravity of the fluid is known and the time is accurately measured.

Click the Control Knob to enter the Calibration mode. The screen will briefly display Test Time, then automatically switch to the submenu:

Cal Vol: xxxx mL – the solution volume to be pumped. The volume is measured by weighing the difference immediately before and after calibration. Distilled water can be used in the calibration.

Press “Run/Stop” membrane key to start. The calibration automatically stops after the test time. Several calibrations may be taken to get an average. Click the Control Knob to enter **Act Vol: xxxx mL** submenu (Actual Volume). Turn the knob to the calibrated solution volume and click the knob. After clicking, pump

Tubing ID (mm)	Required Solution Volume (mL)
0.8	>3
1.0	>5
1.6	>11
2.0	>15
3.1	>40
4.8	>84
6.4	>140

returns to Calibration menu. (Note: If the pump is in RPM mode, the calibration is not needed and clicking the Control Knob will return the display to Calibration menu.)

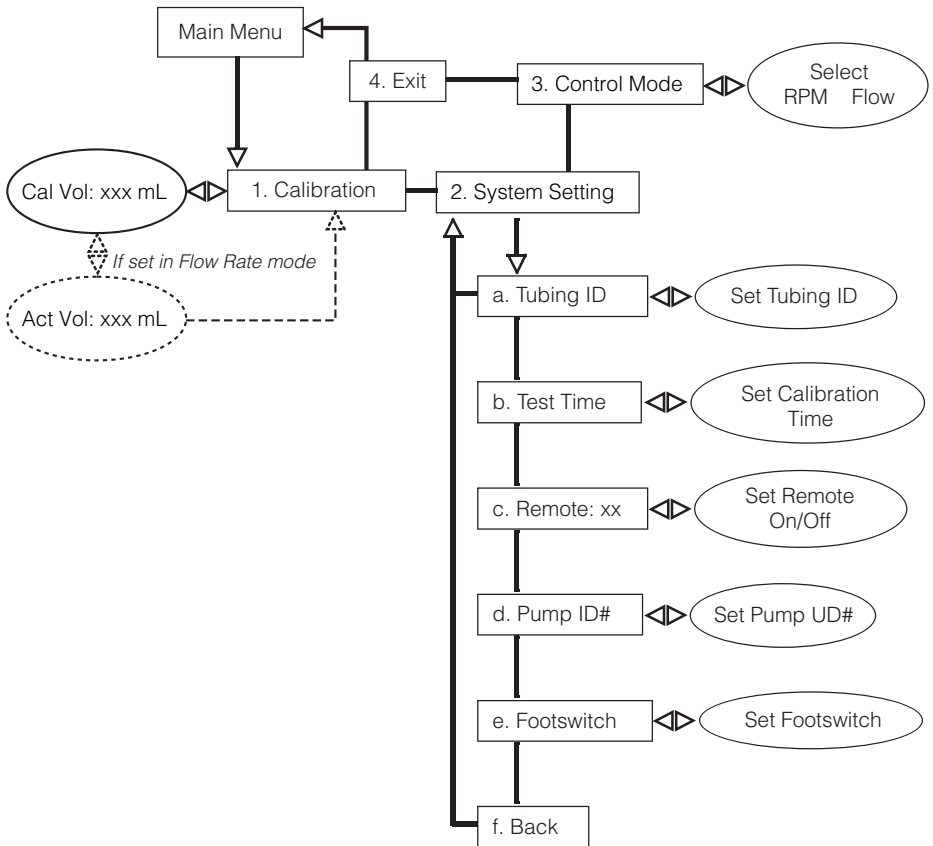
2. **System Setting** — the second function next to Calibration. It shows up when turning the Control Knob clockwise in the Calibration menu. Clicking the Control Knob leads to its submenus. Turning the Control Knob switches between the submenus.
 - a. **Tubing ID** — the first submenu. To change tubing ID (inside diameter), click the Control Knob in this submenu. After clicking, a list of tubing ID appears. Turn to the desired tubing ID and click the Control Knob on it. The display will return to the Tubing ID submenu and show the selected tubing ID.
 - b. **Test Time** — the second submenu, sets the flow time when performing a calibration. To change the time, click the Control Knob in this submenu, then turn the Control Knob to the desired test time and click the Control Knob to select it. The display will return to the Test Time submenu and show the selected flowing time.
 - c. **Remote** — the third submenu, enables or disables the external remote control module. When this menu option is enabled, you may use an external remote control module (WPI #503120) to control the PeriStar PRO. After clicking the Control Knob in the Remote submenu, turn the Control Knob to ON or OFF and click the Control Knob to select it. The display will return to the Remote submenu and show the selected remote status. See “External Remote Control (Optional)” on page 13 for information on connecting the external remote control module.

NOTE: If the external remote control module is installed AND the remote function in the menu is enabled (ON), then the front keypad is disabled and all control is transferred to the external remote control module, including the analog speed control. In this condition, no keypad or menu functions are enabled.

CAUTION: To avoid damaging the unit, always turn the power off before connecting or disconnecting the external remote control module.

To regain control of the keypad and menu knob, turn off the power switch, remove the external control module and re-power the pump. When this remote menu setting is enabled, the external remote control unit controls the pump when it is installed, and the front panel controls are active when the external remote control module is removed.
 - d. **Pump ID#** — the fourth submenu, sets the pump’s remote control identification number. To change the Pump ID#, click the Control Knob in this submenu. After clicking, turn to the desired identification number and click the Control Knob to select it. The display will return to the Pump ID# submenu and show the selected identification number.

- e. **Footswitch** — the fifth submenu, sets the working mode of the footswitch. In **Gated mode**, the pump runs while the footswitch is pressed; releasing the footswitch stops the pump. In **Trigger mode**, the pump starts running when the footswitch is pressed; it stops only when the “Run/Stop” membrane key is pressed. After clicking the Control Knob in the Footswitch submenu, turn the Control Knob to Gated or Trigger and click the Control Knob to select it. The display will return to the Footswitch submenu and show the selected status.
 - f. **Back** — the last submenu. Clicking the Control Knob returns to the System Setting menu. Turning the Control Knob cycles through these submenus.
3. **Control Mode** — the third function, sets the unit of measurement to be displayed in the Main Menu. After clicking the Control Knob, turning the Control Knob switches between the RPM or Flow. Click the selected unit and return to the menu.
4. **Exit** — clicking the Control Knob when in Exit mode returns to the Main Menu.



MAINTENANCE

- Loosen the tubing when the pump is idle. The tubing may be deformed and lose elasticity if compressed for a long time.
- Keep the tubing and rotor clean. If any solvent (including water) spills on it, stop the pump and clean the solvent immediately.

ACCESSORIES

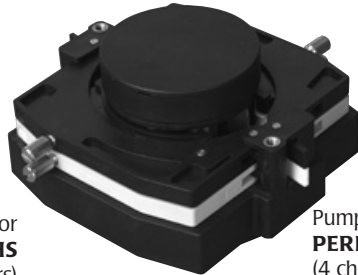
PERIPRO-2HS	Peri-Star™ Pro, 2-channel, High Rate, Large Tubing
PERIPRO-4HS	Peri-Star™ Pro, 4-channel, High Rate, Large Tubing
PERIPRO-4LS	Peri-Star™ Pro, 4-channel, Low Rate, Small Tubing
PERIPRO-8LS	Peri-Star™ Pro, 8-channel, Low Rate, Small Tubing

Optional Accessories

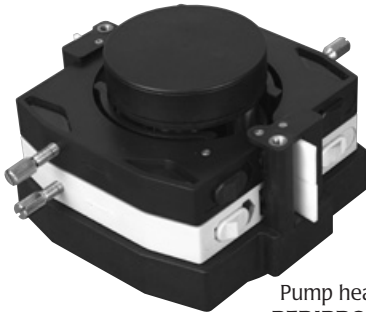
Part Number	Description
503049	Replacement Tubing Cartridge, Large
503050	Replacement Tubing Cartridge, Small
503022	Replacement Silicone Tubing, 1m, 1.6 mm I.D., #14, with stops
503023	Replacement –Silicone Tubing, 1m, 6.4 mm I.D., #17
503120	TTL External Remote Control Module



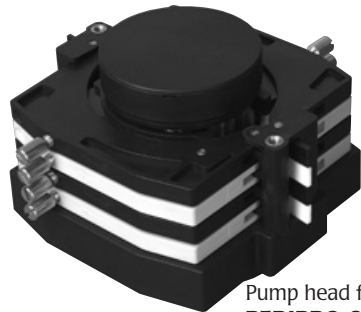
Pump head for
PERIPRO-2HS
(2 channels, 4 rollers)



Pump head for
PERIPRO-4LS
(4 channels, 8 rollers)

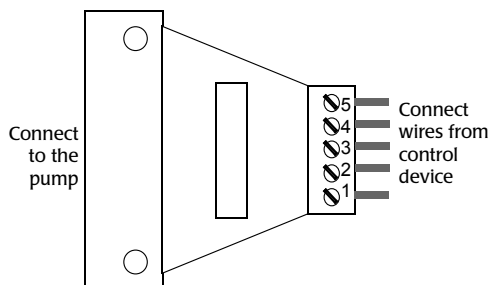


Pump head for
PERIPRO-4HS
(4 channels, 4 rollers)



Pump head for
PERIPRO-8LS
(8 channels, 8 rollers)

EXTERNAL REMOTE CONTROL (OPTIONAL)



If desired, an external remote control module (sold separately - WPI #503120) can be used to control the PeriStar PRO. The external remote control provides precise control over the pump using analog signals of 0~5V. (See 2. System Settings or page 8 for information on enabling the external remote control module using the menu options.) Then, connect the

external remote control module to the pump using the following pin connections:

1. "Start/Stop" Control: Connect PIN 2 to a logical input (TTL) so that the low level (0V) is the "Start" setting, and the high level (5V) is "Stop" setting. Connect PIN 5 to the digital ground of the controlling device.
2. Rotation Speed Control: Connect PIN 1 to an analog input a with 0-5VDC control. (The maximum rotation speed is achieved at 5V). Use PIN 4 to connect to the analog ground of the controlling device.
3. Rotation Direction Control: Connect PIN 3 to a logical input signal. Low level is clockwise and high level is counterclockwise. Connect PIN 5 to the digital ground of the controlling device.

Basic Tubing

	Peripro L-Series Heads			Peripro H-Series Heads		
Tubing Sizes	13#	14#	19#	16#	25#	17#
Tubing Cross Sections (1:1)		 WPI #503022 (included)				 WPI #503023 (included)
Wall Thickness (mm)	1.6					
Inner Diameter (mm)	0.8	1.6	2.4	3.1	4.8	6.4
Maximum Pressure (Mpa)	Continuous	0.17			0.14	0.1
	Intermittent	0.27			0.24	0.14

Recommend Tubing		Wall Thickness	Flow Range (mL/min)	Speed
No.	ID			
13#	0.8	1.5 mm	0.1 ~ 7	1 ~ 100 rpm
14#	1.6		0.2 ~ 19	
16#	3.1		0.8 ~ 82	
25#	4.8		1.7 ~ 170	
17#	6.4		2.9 ~ 290	

TROUBLESHOOTING

In the solutions shown below, the pump should be off and power cord unplugged unless otherwise specified. If the following suggestions cannot solve your problem, contact WPI for technical support at 941.371.1003 or technicalsupport@wpiinc.com.

What Happened	Possible Reason	Solution
Can not turn on pump: No fan, no LCD light	Power line is not connected.	Check the power connections. Check fuse.
LCD light is on but no display	Not stable.	Turn off the pump. Turn on pump after 15 seconds.
Pump is on but no flow	Tubing loose or damaged	Adjust the screws to tighten the tubing; or replace the tubing.
Tubing moves	Tubing is not mounted well	Check the tubing size. Tighten the tubing if the tubing size is correct.
Pump suddenly stops	Too much load	Turn off immediately. Check anything stuck in the rotor. Try again after removing the blockage.
Invalid flow rate or huge error	Different tubing condition	Recalibrate
The pump head rotates faster than indicated on the front panel	If the pump head is not loaded with tubing, the pump head planetary gears run at a faster RPM.	Load the pump head with tubing.

NOTE: If you have a problem/issue with that falls outside the definitions of this troubleshooting section, contact the WPI Technical Support team at 941.371.1003 or technicalsupport@wpiinc.com.

SPECIFICATIONS

This unit conforms to the following specifications:

	Peri-Star Pro 2H/4H <i>(High Flow Rate)</i>	Peri-Star Pro 4L/8L <i>(Low Flow Rate)</i>
Number of Rollers	4	8
Number of Channels	2-4	4-8
Rotor Rotation	clockwise, counterclockwise	clockwise, counterclockwise
Rotor Speed Range	1-100 RPM	1-100 RPM
Rotor Speed Resolution	0.1 RPM (Remote only) 1.0 RPM (Normal)	0.1 RPM (Remote only) 1.0 RPM (Normal)
Tubing ID Range	3.1 - 6.4mm	0.5 - 2.4mm
Flow Range (All tubing sizes)	0.8-280mL/min	0.1-80mL/min
Supplied Tubing	#17 6.4mm ID, 2.9–290mL/min	#14 1.6mm ID, 0.2–19mL/min
Flow Rate Accuracy	0.5%	0.5%
Self-calibration	Yes	Yes
Work Environment	0-45°C, humidity <80%	0-45°C, humidity <80%
Power (Universal)*	90-260V 50-60 Hz	90-260V 50-60 Hz
Fuse	1A 250V	1A 250V
Dimension	190 x 162 x 275 mm	190 x 162 x 275 mm
Shipping Weight	11 lb/5 kg	11 lb/5 kg

DECLARATION OF CONFORMITY



WORLD PRECISION INSTRUMENTS, INC.

175 Sarasota Center Boulevard
Sarasota, FL 34240-9258 USA

Telephone: (941) 371-1003 Fax: (941) 377-5428
e-mail wpi@wpiinc.com

DECLARATION OF CONFORMITY

We: World Precision Instruments, Inc.
175 Sarasota Center Boulevard
Sarasota FL 34240-9258
USA

as the distributors of the apparatus listed, declare that the products:

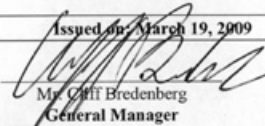
**Title: PERI-STAR PRO Model Numbers PERIPRO-2H, PERIPRO-4H,
PERIPRO-4L and PERIPRO-8L.**

to which this declaration relates are in conformity with the following standards or other normative documents:

Safety: EN61010-1:2001
EMC: EN61326-1:2006
EN55011:1998+A2:2002
EN61000-3-2:2006
EN61000-3-3:2001
EN61000-6-2:2005

and therefore conform(s) with the protection requirements of Council Directive 2004/108/EC relating to electromagnetic compatibility and Council Directive 2006/95/EC relating to safety requirements.

Issued on: March 19, 2009


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Mr. Glen Carlquist

Vice President of Manufacturing
World Precision Instruments, Inc.
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WARRANTY

WPI (World Precision Instruments, Inc.) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

** Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*



World Precision Instruments, Inc.

USA

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