



**VERI-TEST™**  
HP- PRT SENSOR  
VERIFICATION/SIMULATION  
PSI TESTER  
INSTRUCTION MANUAL

**United States** 

**EC REP**

Utah Medical Products, Inc.  
7043 South 300 West  
Midvale, Utah 84047  
(800) 533-4984 - Toll Free  
(801) 566-1200 - Local  
customer@utahmed.com

Utah Medical Products Ltd  
Athlone Business & Technology Park  
Athlone, Co. Westmeath N37 XK74  
Ireland  
(353) 90.647.3932

[www.utahmed.com](http://www.utahmed.com)





## TABLE OF CONTENTS

1.0	OVERVIEW	1
2.0	KEY FEATURES	1
3.0	THEORY OF OPERATION	3
3.1	Power Supply: Low Battery Indicator	3
3.2	Precision Pressure Transducer	4
3.3	Display	4
3.4	Pressure Generating Cylinder	4
4.0	OPERATING INSTRUCTIONS	5
4.1	Testing Sensore Non-invasively	5
4.2	Using as a Monitor Simulator to Test a Monitor	7
5.0	SERVICE INFORMATION	10
6.0	SPECIFICATIONS	11
7.0	LIMITED WARRANTY	12
8.0	SUPPLIES	13
	BLOCK DIAGRAM	15



# VERI-TEST™

## HP-PRT SENSOR TESTER

### 1.0 OVERVIEW

Veri-Test is a calibrated, small, hand-held device that can be used to verify proper functioning and accuracy of the Utah Medical Bio-Pharm HP-PRT single-use pressure sensors and pressure system non-invasively. It can be used to test the sensors without accessing the fluid path.

Utah Medical's sensors are 100% tested in the manufacturing process prior to shipment, however, Veri-Test allows the end-user to verify the performance of the sensor and pressure system.



### 2.0 KEY FEATURES

Veri-Test incorporates a specially designed pressure cylinder and precision solid-state transducer for generating and measuring static pressure from -7 to +10.5 PSI.

The adjustment knob is used to regulate the pressure, and the pressure value is shown on the liquid crystal display. A built-in pneumatic port provides the external connection for stopcocks or pressure fittings

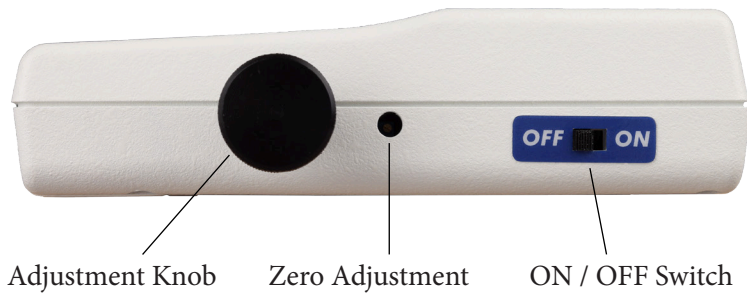
The monitor connector on Veri-Test enables the user to isolate the source of a problem by simulating the pressure sensor.

- Verify proper functioning of sensor and monitors
- Verify proper function of sensor non-invasively by accessing the atmospheric reference side of the sensor.
- NIST traceable.
- Battery operated for portability.

The connections on the left side panel are as shown below:



Controls on the right side panel are as shown below:



## 3.0 THEORY OF OPERATION

Veri-Test is a precision pressure sensor system tester, with the unique feature of combining a precision pressure transducer with associated circuitry, a digital display, a pneumatic pump, and a pressure transducer simulator into a small hand-held enclosure.

A pressure (or vacuum) generated externally, or internally by Veri-Test's pneumatic pump, is applied to both the precision pressure transducer (which is connected to the 3½ digit display) and to the pressure transducer simulator. Reference the block diagram on page 15. The signal from the precision pressure transducer is sent to the panel meter circuit, where it is converted from an analog voltage to a digital number and displayed in psi on Veri-Test's 3½ digit LCD readout. The signal from the transducer simulator is sent to the monitor to which it is connected, and from which it receives its excitation power. The signal amplitude is 0.2584 mV/PSI/V (0.2584 millivolts of signal per volt of excitation per PSI of applied pressure). The transducer input and output impedances are each approximately 350 ohms.

The pressure sensor simulator, which is housed in Veri-Test's Monitor Connector, is a pressure sensor of the same type as that used in the Utah Medical BioPharm HP-PRT single-use pressure sensor. Therefore, in using Veri-Test's exclusive sensor simulator feature, the BioPharm HP-PRT sensor is replaced with a device having identically the same operating characteristics and not with a device which only "simulates" some of its operating characteristics.

### 3.1 POWER SUPPLY: LOW BATTERY INDICATOR

The solid state electronics of Veri-Test are powered by a 9 volt alkaline battery. Because Veri-Test uses state-of-the-art CMOS circuitry, a 9 volt alkaline battery will last over a year in normal use. A low battery indicator is activated to alert the user when battery voltage drops below approximately 8 VDC. **When the BAT (low battery indicator) comes on, the battery must be replaced within a couple of hours of use for operation within specifications.**

**Caution:** Remove battery from unit before storing for an extended period of time. If the unit has not been used for 12-15 months, replace the battery (see "Battery Life", page 11).

## 3.2 PRECISION PRESSURE TRANSDUCER

Veri-Test's precision miniature piezoresistive pressure transducer generates electrical signals proportional to the pressure (or vacuum) generated by Veri-Test's pneumatic pump or applied externally to the pneumatic port. The specified operating pressure range is from -6 to +10.5 PSI. The maximum allowable (overpressure) is 14.5 PSI. If more than 14.5 PSI is applied to, or generated by the Veri-Test, its calibration accuracy could be affected and its precision pressure transducer could be permanently damaged.

To test the sensor, apply a known pressure to the pneumatic port of the Veri-Test and measure the voltage between pins 3 and 4 of J1 (the display connector), the voltmeter should read 10 mV per PSI of pressure. The 3½ digit Veri-Test display may change slightly as the voltmeter is connected to pins 3 and 4 of J1, due to meter loading effects.

## 3.3 DISPLAY

The PCIM 176 Digital Panel Meter is a multi-purpose device that converts analog voltages from the transducer into digital information and simultaneously displays it on the 3½ digit liquid crystal display. The PCIM 176 also contains the low battery voltage detection circuit.

## 3.4 PRESSURE GENERATING CYLINDER

Static pressure (or vacuum) levels are generated using a unique piston and cylinder arrangement. Turning the adjustment knob clockwise will generate pressure. Turning the adjustment knob counterclockwise will generate vacuum at the connection port. The pump is internally connected to Veri-Test's precision pressure transducer, the transducer simulator, and the pneumatic port. The pressure generating cylinder incorporates precision parts with controlled assembly techniques and testing. Therefore, if defective, it is not user serviceable and should be returned to the factory for repair or replacement.

## 4.0 OPERATING INSTRUCTIONS

### 4.1 TESTING SENSOR NON-INVASIVELY

Positive and vacuum pressures can be generated within Veri-Test and applied to a sensor under test. The pressure delivered is indicated on Veri-Test's liquid crystal display for quick comparison to the monitor. By applying a vacuum to the sensor test port, the linearity and accuracy of the pressure sensor can be tested. Since the pressure sensor is a true differential device (measure gauge pressure relative to atmosphere), applying vacuum is equivalent to applying a pressure to the fluid path so the system can be checked to verify calibration very easily without accessing the fluid path or breaking sterility if a sterile fluid path. Even though it may not be possible to test the entire range of the pressure sensor, the proper function and sensor output accuracy of 0.2584 mV/PSI/V can be verified to be within accuracy specification because this applies across the range of sensor pressure to 30 PSI.

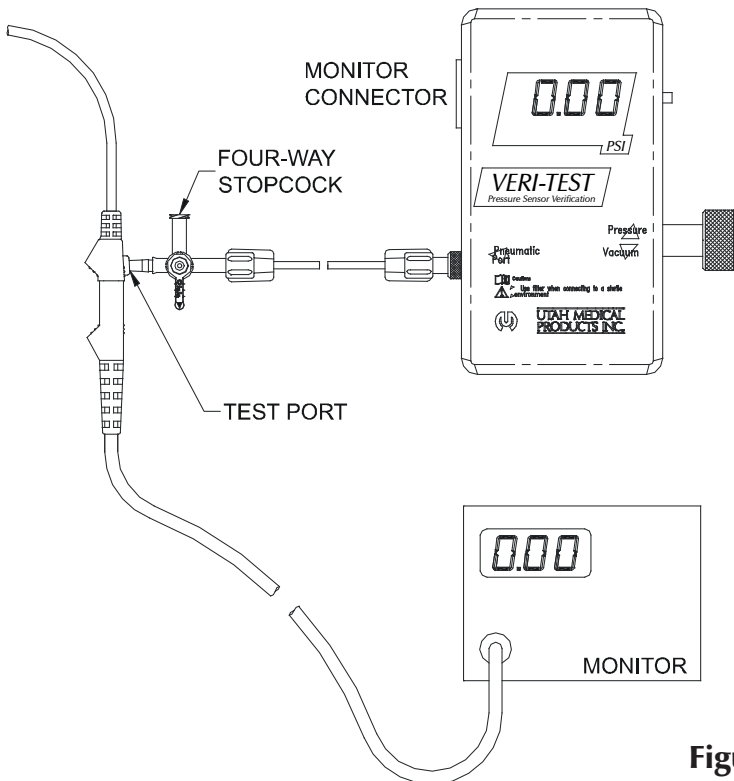


Figure 1

**NOTE:** During the following steps the fluid path of the sensor must be exposed to atmosphere

Steps:

1. Connect the sensor to the monitor cable
2. Connect the 4 foot tubing with 4-way Luer Slip Stopcock on one end to the sensor cable “test port” and the Veri-Test pneumatic port on the other end.
3. Zero the system through the following steps:
  - a. Position the handle on the stopcock to vent both the sensor and pneumatic port to atmosphere.
  - b. Tare the sensor at the monitor per its operating instructions
  - c. If the Veri-Test display does not read 0.00, turn the zero adjustment located on the right side of the Veri-Test using a small screwdriver
  - d. When both the monitor and Veri-Test read zero, position the stopcock as shown and the sensor and setup is ready for testing:

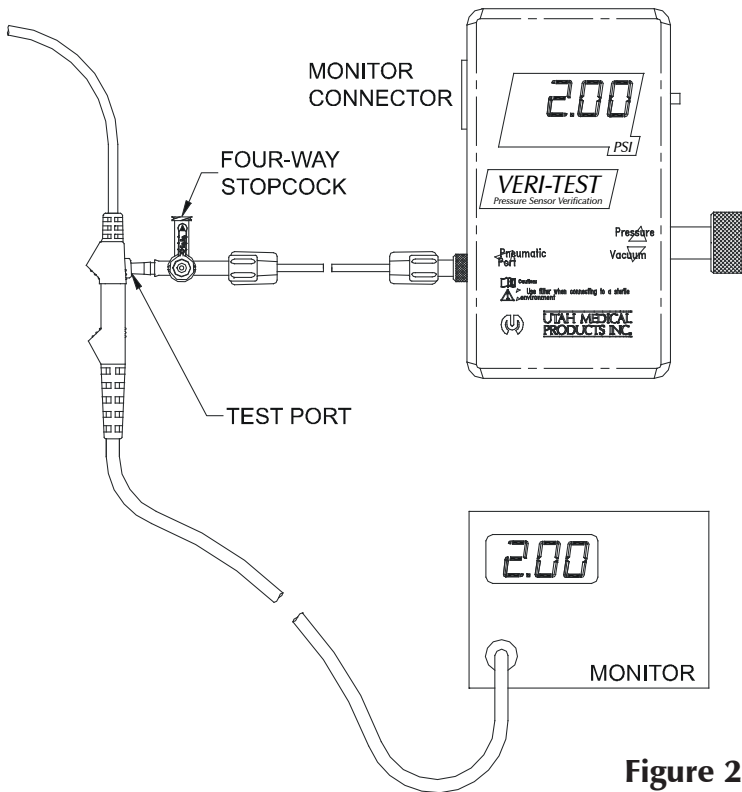


Figure 2

**WARNING: IF THE SYSTEM APPEARS TO BE LOSING PRESSURE, CAREFULLY CHECK ALL FITTINGS AND CONNECTIONS.**

**WARNING: DURING THIS TESTING DO NOT EXCEED +7 PSI OR THE SENSOR UNDER TEST MAY BE DAMAGED.**

**WARNING: DURING THIS TESTING DO NOT APPLY LESS THAN -7 PSI OR THE PRESSURE SENSOR SIMULATOR MAY BE DAMAGED.**

4. As pressure is generated by turning the adjustment knob, the pressure applied to the sensor is indicated on the Veri-Test display. This pressure reading is compared to the reading on the monitor to determine the sensor and setup accuracy.
5. Interpretation of Results  
Determining if a pressure sensor is accurate requires only one measurement at a known amount of applied pressure. This involves the following steps:
  - a. Apply a pressure from -6 PSI to +6 PSI as indicated on the Veri-Test display
  - b. Record the pressure from the monitor display
  - c. From the accuracy specification on each item in the setup (sensor, monitor, Veri-Test) determine the maximum allowable deviation in pressure.
  - d. Compare the results

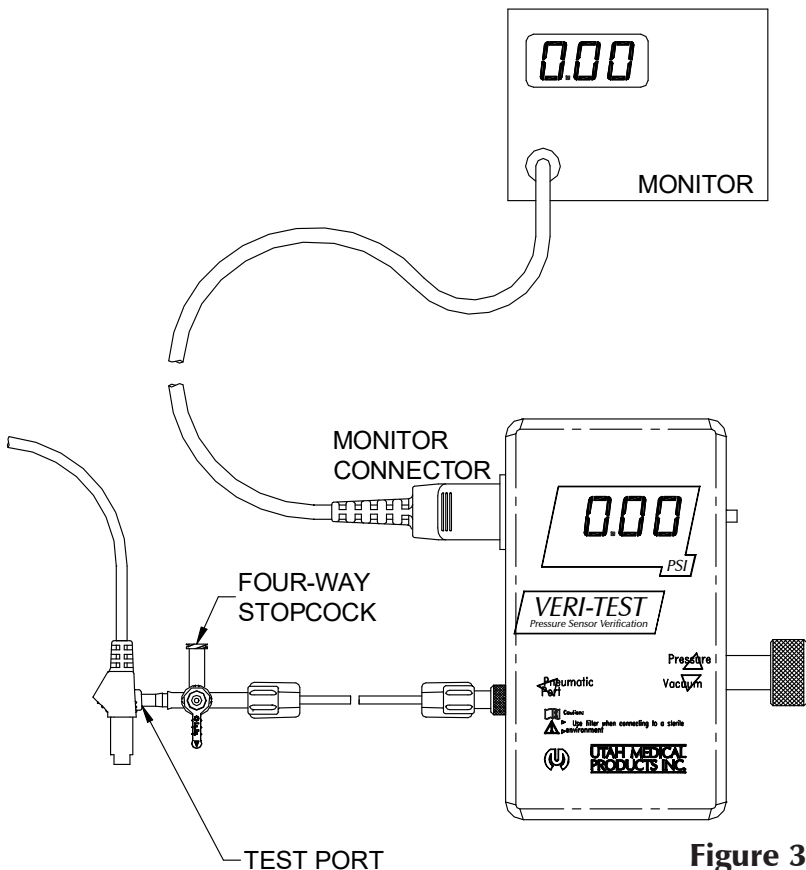
#### 4.2 USING AS A MONITOR SIMULATOR TO TEST A MONITOR

The pressure sensor simulator, which is housed inside Veri-Test's monitor connector, is a pressure sensor of the same type as that used in the Utah Medical BioPharm HP-PRT single-use sensor. When using the exclusive simulator feature of the Veri-Test, the pressure sensor is replaced with a device having the same operating characteristics and not with a device which "simulates" only some of its operating characteristics. A pressure (or vacuum) generated internally by Veri-Test's pneumatic pump, is applied to both the precision pressure transducer (which is connected to the 3.5 digit LCD display) and to the pressure sensor simulator.

**NOTE: During the following steps the fluid path of the sensor must be exposed to atmosphere.**

Steps:

1. Remove the 4 foot tubing with 4-way stopcock from the Veri-Test pneumatic port and place the non-vented cap on the pneumatic port and tighten in place (or the stopcock may be closed)
2. Connect the monitor cable to the Veri-Test Monitor Connector port
3. Zero the system by the following steps:
  - a. Zero the Veri-Test with the Adjustment Knob
  - b. Tare pressure simulator per the monitor operating instructions
  - c. If the Veri-Test display does not read 0.00, turn the zero adjustment located on the right side of the Veri-Test using a small screwdriver
  - d. When both the monitor and Veri-Test read zero, the sensor and setup is ready for testing



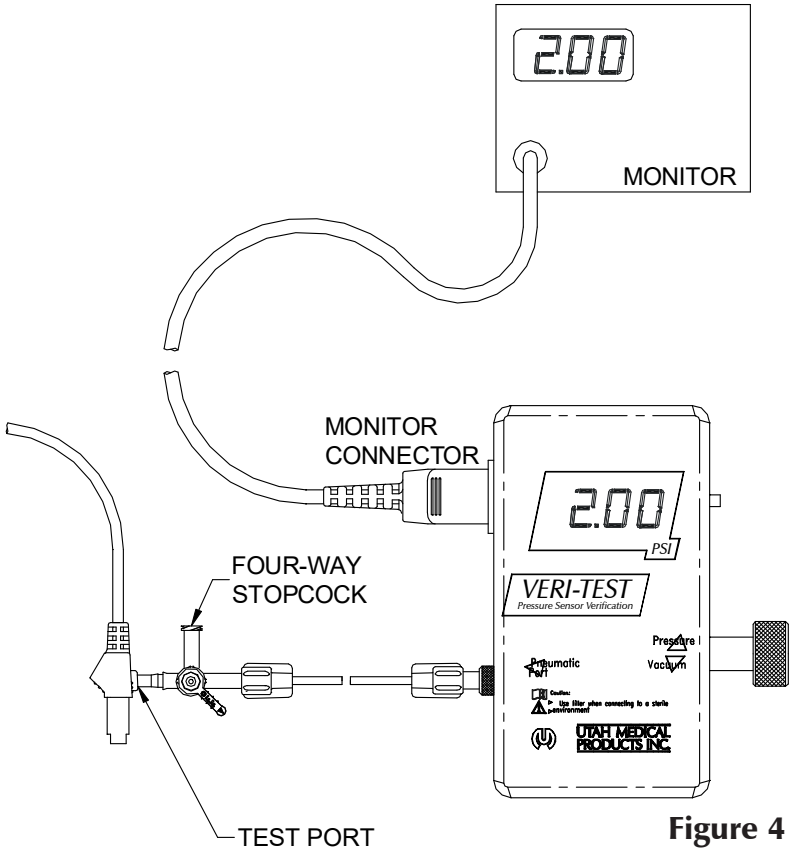
**Figure 3**

**WARNING: IF THE SYSTEM APPEARS TO BE LOSING PRESSURE, CHECK TO CONFIRM THE PNEUMATIC PORT IS CLOSED TO ATMOSPHERE.**

**WARNING: DURING THIS TESTING DO NOT EXCEED 14.5 PSI OR THE INTERNAL PRECISION PRESSURE TRANSDUCER MAY BE DAMAGED.**

**WARNING: DURING THIS TESTING DO NOT APPLY LESS THAN -7 PSI OR THE PRESSURE SENSOR SIMULATOR MAY BE DAMAGED.**

4. To test, the following is an example set-up



**Figure 4**

#### 5. Interpretation of Results

Determining if the monitor and interface cable are functioning properly requires only one measurement at a known amount of applied pressure. This involves the following steps:

- Apply a pressure from -6 PSI to +6 PSI as indicated on the Veri-Test display
- Record the pressure from the monitor display
- From the accuracy specification on each item in the setup (monitor, Veri-Test, and pressure sensor simulator) determine the maximum allowable deviation in pressure.
- Compare the results from step "b" with step "c". If the results from "b" fall into the range calculated in "c", the monitor and interface cables are within the specification.
- If the readings differ by more than allowable, first replace the monitor cable to make sure it is not faulty. If this is not the problem, it may be the monitor

## 5.0 SERVICE INFORMATION

Veri-Test units which are under warranty must be returned to Utah Medical for repair. If the Veri-Test is out of warranty it may also be serviced by Utah Medical or users knowledgeable in electronic repair and with the proper anti-static precautions for sensitive CMOS circuitry.

Veri-Test should be checked for calibration every twelve months, or as often as facility policy requires. For service or calibration, contact Utah Medical for a return authorization number. Pack the unit carefully in the original shipping container, insure, and ship to:

### United States

Utah Medical Products, Inc.  
7043 South 300 West  
Midvale, Utah 84047  
(801) 566-1200 - Local  
(801) 566-2062 - Fax  
customer@utahmed.com

### EU Representative

Utah Medical Products Ltd  
Athlone Business & Technology Park  
(800) 533-4984 - Toll Free  
Athlone, Co. Westmeath N37 XK74  
Ireland  
+(353) 90.647.3932  
customerservice\_ireland@utahmed.com

## 6.0 SPECIFICATIONS

Tester Operating Pressure Range:	-6 to +10 PSI, 0.01 PSI Resolution
Simulator Operating Pressure Range:	0 to 5.8 PSI, 0.01 PSI resolution
Temperature:	Operating 15° C to 40° C (60° F to 105° F) Storage -20° C to 65° C (-5° F to 150° F)
Operating Humidity:	80% RH Max. Non-condensing
Accuracy:	-6 to +5 PSI, $\pm 1\%$ or 0.02 PSI whichever is greater +7.5 to +10 PSI, $\pm 2\%$ or 0.02 PSI whichever is greater
Repeatability/Hysteresis:	$\pm 0.15\%$ Full Scale Output
Overpressure:	< -7 PSI, > +14.5 PSI
Pressure Sensor Simulator:	Sensitivity: 0.2584 mv/PSI/volt $\pm 1\%$ Excitation: 2 to 10 Vdc, or Vac rms to 5KHz Input Impedance: 350 Ohms $\pm 10\%$ Output Impedance: < 400 Ohms Asymmetry: < 1% Unbalance: 1.45 PSI
Power Requirements:	One 9 Volt Alkaline Battery
Battery Life:	150 hours constant use, 15 months intermittent use, low battery indicator (BAT) appears when battery voltage drops below approximately 8 volts. <b>Caution:</b> Change the battery when the low battery indicator (BAT) appears in the display. If the unit continues to be used, eventually there may not be sufficient power to display the “BAT” indicator. In addition, the display values may be inaccurate.
Display:	3½ Digit LCD (.5” High Digits) with “BAT” (Low Battery Indicator) and Negative Polarity Indicator (for Vacuum Indication)
Dimensions:	5.75” x 1.5” x 3.1” (L x D x W) (146mm x 38mm x 79mm)
Weight:	9.7 Ounces (275 Grams)

## 7.0 LIMITED WARRANTY

Utah Medical Products warrants to our immediate customer only that its products (other than products to which special warranties apply) will meet its published specifications and will be free from material defects in workmanship and materials. This warranty shall extend for a period of one year commencing on the date of shipment.

Liability under this warranty is limited to repair or replacement of materially defective parts with a new or equal part in exchange or, at our option, to refund the purchase price. All warranty work must be done through Utah Medical Products.

This warranty does not apply to appearance items or to any product subjected to misuse, abnormal service or handling, or to any product altered or repaired by anyone other than Utah Medical Products.

This warranty entitles the original purchaser to have the warranted parts repaired or replaced and labor rendered at no cost for the period of the warranty described above when the product is delivered or shipped at the purchaser's expense to Utah Medical Products together with proof of purchase.

Utah Medical Products agrees to repair or replace defective parts and to return the product to the purchaser at its expense.

This shall be the exclusive written warranty of the original purchaser and neither this warranty nor any other warranty expressed or implied shall extend beyond the period of time indicated above. **WE MAKE NO WARRANTY OF MERCHANTABILITY OR WARRANTY THAT THE PRODUCT IS FIT FOR ANY PARTICULAR PURPOSE OR USE.**

In no event shall Utah Medical Products be liable for consequential economic damage or consequential damage to property.

Some states do not allow a limitation on how long an implied warranty must last or an exclusion of consequential damages; thus the above limitation may not apply to you. In addition, this warranty gives specific legal rights. You may have other specific rights which vary from state to state.

## 8.0 SUPPLIES

To order Veri-Test supplies, contact:

Utah Medical Products, Inc.  
Attn: Customer Service  
7043 South 300 West  
Midvale, Utah 84047  
(800) 533-4984 - Toll Free  
(801) 566-1200 - In Utah  
customer@utahmed.com  
www.utahmed.com

Ireland Office:  
Athlone Business & Technology Park  
Athlone, Co. Westmeath N37 XK74  
Ireland  
+(353) 90.647.3932  
customerservice\_ireland@utahmed.com  
www.utahmed.com

### VERI-TEST HP-PRT PRESSURE SENSOR TESTER

<u>CATALOG</u> <u>NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u> <u>PER CASE</u>
650-950-P	Veri-Test HP-PRT Pressure Sensor Simulation/Tester, PSI Includes: one each Catalog No. 650-905 and 650-965-P.	1
650-905	4' Connecting Tube and 4-Way Stopcock with Luer Slip - Packaged Individually, Non-Sterile.	1
650-965-P	Veri-Test Instruction Manual	1



# BLOCK DIAGRAM

