

HYDRONIC MANOMETER MODEL HM675

OWNER'S MANUAL

P/N 6006821, REVISION A
MAY 2013



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HYDRONIC MANOMETER

MODEL HM675

OWNER'S MANUAL

P/N 6006821, REVISION A
MAY 2013

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Manual History

The following is a manual history of the Hydronic Manometer Model HM675 Owner's Manual (P/N 6006821).

Revision	Date
A	May 2013

Warranty

Part Number
Copyright
Address
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**Limitation of Warranty
and Liability**
(effective June 2011)

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About This Manual

This manual explains how to set up, operate, and maintain the TSI® Hydronic Manometer Model HM675. Please read it thoroughly before using the instrument.

Formatting and Typography

- Step-by-step instructions are numbered: 1, 2, 3, etc., set flush-left against the inside margin.
- References to keys on the manometer and the instrument's displayed readout are represented in bold typeface. In addition to the different typeface, displayed messages appear in quotes.

Technical Assistance—Help!

For technical assistance or questions about the instrument or this manual, or if the HM675 Hydronic Manometer needs repair or recalibration, call Technical Support at (651) 490-2811 or (800) 874-2811.

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Safety Information

Carefully read each of the following safety warnings prior to using the HM675 Hydronic Manometer.


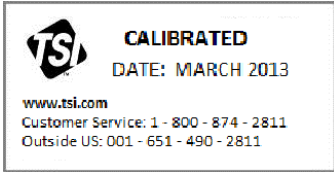

This section gives instructions to promote safe and proper handling of the HM675 Hydronic Manometer.

IMPORTANT

There are no user-serviceable parts inside the instrument. Refer all repair and maintenance to a qualified factory-authorized technician. All maintenance and repair information in this manual is included for use by a qualified factory-authorized technician.

Labels

Identification and calibration labels are attached to the outside of the hydronic manometer housing.

1. Serial number label (back panel))	
2. Calibration label (back panel)	
3. European symbol for non-disposable item. Item must be recycled.	

Description of Caution/Warning Symbols

Appropriate caution/warning statements are used throughout the manual and on the instrument that require you to take cautionary measures when working with the instrument.

Caution



C a u t i o n

Failure to follow the procedures prescribed in this manual might result in irreparable equipment damage. Important information about the operation and maintenance of this instrument is included in this manual.

Warning



W A R N I N G

Warning means that unsafe use of the instrument could result in serious injury to you or cause damage to the instrument. Follow the procedures prescribed.

Caution or Warning Symbols

The following symbols may accompany cautions and warnings to indicate the nature and consequences of hazards:

	Warns that uninsulated voltage within the instrument may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make contact with any part inside the instrument.
	Warns that the instrument is susceptible to electro-static dissipation (ESD) and ESD protection procedures should be followed to avoid damage.
	Indicates the connector is connected to earth ground and cabinet ground.

Carefully read each of the following safety warnings prior to using the HM675 Hydronic Manometer.



W A R N I N G

Never use the HM675 Hydronic Manometer or accessories on potable water systems or other systems which may be used to convey fluids for human or animal consumption.



W A R N I N G

Never charge non-rechargeable batteries by setting battery-type selection switch to NiMH when using alkaline or other non-rechargeable batteries. Fire, explosions, or other hazards may result.



C a u t i o n

Never use the HM675 Hydronic Manometer to measure the pressure of volatile, flammable, or otherwise hazardous fluids or gasses. The instrument is not designed to be intrinsically safe, nor is it designed for use with caustic or corrosive chemicals.



C a u t i o n

Never connect the HM675 Hydronic Manometer or accessories to systems which exceed the instrument's maximum pressure specification (300 psi; 2068 kPa).



C a u t i o n

Observe proper safety precautions and wear appropriate personal protective equipment, including gloves and eyewear, when working on high pressure or high temperature systems. Ruptured or leaking lines pose a potential risk of serious personal injury.



C a u t i o n

When using the HM675 Hydronic Manometer, verify all hose connections are secure prior to taking pressure measurements. Loose connections may result in the discharge of pressurized water or air, posing a potential risk of serious personal injury.



C a u t i o n

Exercise caution when disconnecting the HM675 Hydronic Manometer from a pressurized system. Water or air discharged under pressure poses a potential risk of severe injury.



C a u t i o n

Exercise caution in using the HM675 Hydronic Manometer near electrical equipment. Water spray associated with purging or disconnecting hoses presents a potential risk of damage to such equipment.



C a u t i o n

Thoroughly drain and dry the HM675 Hydronic Manometer hoses and internal piping after each use. This will help in limiting the potential for growth of hazardous microorganisms.



C a u t i o n

Never plug into the instrument any power supply other than the one provided with the instrument.



C a u t i o n

Always make certain that the battery switch is in the correct position for the type of battery being used (Alkaline/NiMH). Failure to do so may result in Fire, Explosions or other hazard.



C a u t i o n

Never use Alkaline and NiMH batteries together on the same instrument.



C a u t i o n

Always use the hoses with the provided Flow Restrictor connected in line with the shut-off valves to prevent “Water Hammer.” Water Hammer is a fast moving shock wave of pressure caused by sudden changes in the system such as a valve being opened or closed or a pump being turned on or off.

CHAPTER 1

Introduction

The HM675 Hydronic Manometer is an easy-to-use instrument designed for the accurate measurement of pressure in non-potable water and air systems. Features of the manometer include the following:

- Single-function keys for ease of use
- Simultaneous measurement and display of High-side gauge and Differential pressure
- Calculation and display of Low-side gauge pressure
- User-selectable units of measure
- User-selectable time constant
- Easy to read LCD with backlight
- Power input via AC adapter or batteries (alkaline or rechargeable NiMH)
- Internal NiMH battery charging
- Automatic power shutoff
- Splash-proof case
- Rugged carrying case for storage of meter, hoses, accessories, tools, and paperwork

Instrument Description

The HM675 Hydronic Manometer includes:

- Meter
- Hard carrying case
- (2) 6-foot (1.8 m) hoses with shut-off valves
- (2) P/T gauge adapter probes
- (2) B&G readout probes
- (2) 1/4" Flare male x 1/4" male NPT fittings
- (2) Female 1/4" NPT to Male 1/4" ISO Parallel Pipe Threads
- (2) Female 1/4" NPT to Male 1/4" ISO Tapered Pipe Threads
- AC adapter
- (4) NiMH batteries, neck strap
- Owner's manual
- NIST traceable certificate

An accessory temperature probe is available as an optional tool for the HM675 Hydronic Manometer. The 1/8" diameter, stainless steel sheathed immersion probe is designed for measurement of water line temperatures.

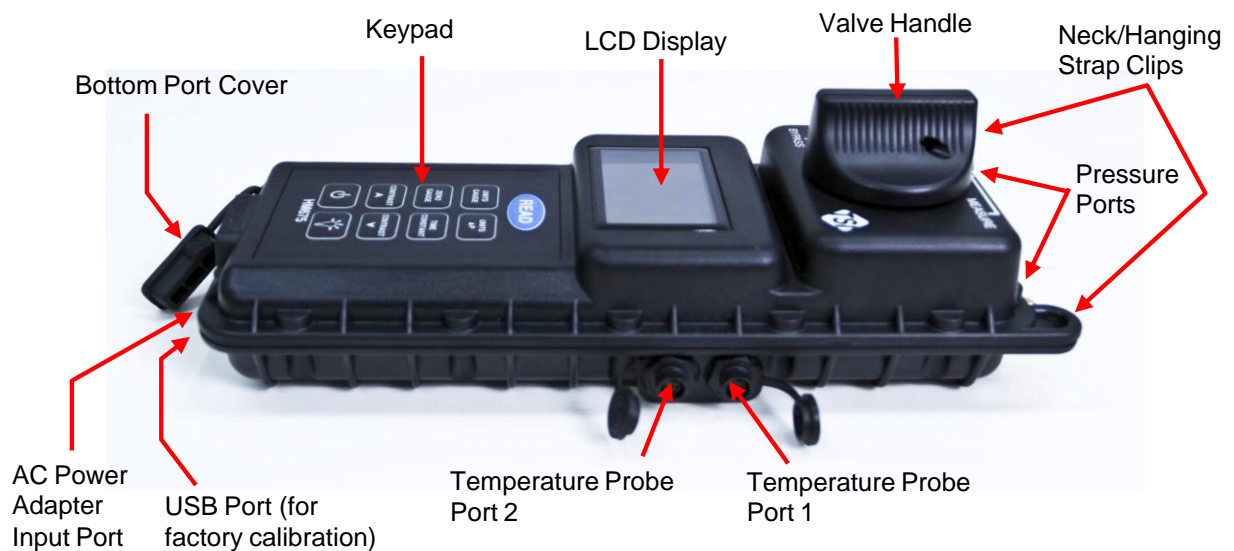


Figure 1-1
HM675 Meter Description

Unpacking

As you unpack the instrument and accessories, check the components against your packing list. If any parts are missing or damaged, notify TSI immediately. Tables 1-1 and 1-2 list available standard and optional components for the HM675 Hydronic Manometer.

Table 1-1

Standard Components

Item	Part No.
Carrying case	1319409
Blue and red hose kit with shut-off valves and flow restrictor	6006813
P/T gauge adapter probes (2)	632360004
B&G readout probes (2)	632360010
AC adapter	6004983
AA-size NiMH battery, four required	1208048
Battery holder	1801206
Neck strap	2913011
Owner's manual	1980517
Pocket screw driver	3012054

Table 1-2

Optional Components

Item	Part No.
Accessory fittings kit (USA only)	HMFIT
4 in. (10 cm) long, 0.125 in. (3.175 mm) dia. Temperature probe	801290
External battery charger with (4) AA NiMH batteries (USA only)	801093

Please register your HM675 promptly through our website at <http://register.tsi.com>. Registration of your product allows us to notify you of product updates.

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
CHAPTER 2

Instrument Operation

Keypad

Each key and its function are described below.

READ	Pressing the READ key initiates taking a time-averaged reading based on the current setting of the time constant (TC). Upon taking the reading, the values are displayed on-screen for a period of ten (10) seconds.
UNITS GAUGE	Pressing the UNITS GAUGE key allows for toggling through the available units for gauge pressure measurements (High P and Low P). The available units of measurement are: psi, inH ₂ O, ftH ₂ O, inHg, kPa, mH ₂ O, mmHg, and bar.
UNITS ΔP	<p>Pressing the UNITS ΔP key allows for toggling through the available units for differential pressure measurements (dP). The available units of measurement are: psi, inH₂O, ftH₂O, inHg, kPa, mH₂O, mmHg, and bar.</p> <p>Note: When using the accessory temperature probe, the unit of measurement for temperature (°F or °C) is driven by the selected unit of measurement for differential pressure:</p> <ul style="list-style-type: none">• Differential pressure in psi, inH₂O, ftH₂O, or inHg → temperature in °F• Differential pressure in kPa, mH₂O, mmHg, or bar → temperature in °C
ZERO GAUGE	<p>Pressing the ZERO GAUGE key initiates zeroing of the gauge pressure sensor.</p> <p>Note: Proper zeroing of the gauge pressure sensor is achieved with the High pressure (+) port open to atmosphere and the valve handle in the MEASURE position.</p>

TIME CONSTANT	<p>Pressing the TIME CONSTANT key allows for toggling through the available settings for the time constant (TC) as follows: 1, 5, 10, 20, and 30 seconds. The current setting of the time constant is indicated on the display.</p> <p>Notes:</p> <ul style="list-style-type: none"> The time constant is the sampling period over which the manometer averages pressure measurements. Example: with the time constant equal to 10 seconds, the displayed reading represents the average of measurements taken over the previous 10 seconds. Increasing the time constant will serve to improve measurement stability, particularly when measuring systems with fluctuating pressures.
CONTRAST ▲	Press the CONTRAST ▲ key to increase the display contrast.
CONTRAST ▼	Press the CONTRAST ▼ key to decrease the display contrast.
	Press the  key to turn the HM675 Hydronic Manometer on or off.
	<p>Press the BACKLIGHT key to turn the display's backlighting on or off.</p> <p>Note: Backlighting has a significant impact on battery life. Use backlighting only when working in areas where you cannot read the display with existing light.</p>

Powering the Instrument

The HM675 Hydronic Manometer can be powered by four (4) AA-size batteries (alkaline or rechargeable NiMH) or the AC adapter.

Using the AC Adapter

The AC adapter allows the HM675 Hydronic Manometer to be powered from a standard AC wall outlet. When using the AC adapter, alkaline batteries (if installed) will be bypassed. The AC adapter also charges the NiMH type batteries (if installed) in the unit.

Note	With the battery-type selection switch set to NiMH, the manometer will initiate charging the batteries whenever the AC adapter is connected.
-------------	--



Caution

Only use TSI P/N 6004983, the AC adapter supplied with the instrument, when powering the HM675 Hydronic Manometer externally. Do **not** connect the AC adapter or car adapter provided with the battery optional charger (801093) or any other AC adapter to the HM675/685. Using any other power cable or power supply may cause damage to the device and void the warranty.



WARNING

Never charge non-rechargeable batteries by setting battery-type selection switch to NiMH with alkaline or other non-rechargeable batteries. Fire, explosions, or other hazards may result.



Caution

Never plug into the instrument any power supply other than the one provided with the instrument.

Battery Installation

To install/replace the batteries:

1. Turn the manometer off and locate the battery cover on the back of the unit.
2. Loosen the screw on the battery compartment cover and lift to remove.
3. Remove the battery holder. Tapping the backside of the meter against your hand may assist in removing the battery holder.
4. Remove the old batteries and replace with fresh batteries (alkaline or rechargeable NiMH). Ensure that the batteries are correctly oriented within the battery holder.
5. Set the battery-type selection switch to indicate the type of batteries to be used (alkaline or rechargeable NiMH).

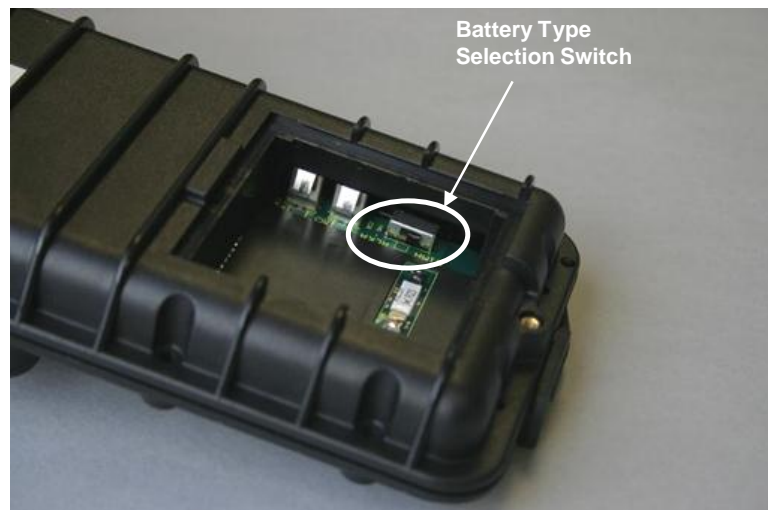


Figure 2-1

Location of Battery-Type Selection Switch



WARNING

Do **not** use Lithium batteries in this instrument. Fire, explosions, or other hazards may result.



Caution

Never use Alkaline and NiMH batteries together on the same instrument.



Caution

Always make certain that the battery switch is in the correct position for the type of battery being used (Alkaline/NiMH). Failure to do so may result in Fire, Explosions, or other hazard.

6. Reinstall the battery holder. Ensure the battery holder orientation is such that its terminals make contact with the spring contacts within the battery compartment.
7. Replace the battery compartment cover.

Notes:

- The NiMH batteries included with the instrument may require recharging prior to first use.
- Fully charged batteries should enable the instrument to operate for a period of at least twelve (12) hours
- Setting the battery-type selection switch properly will prevent unwanted charging of non-rechargeable alkaline batteries and provide charging of NiMH batteries when the AC adapter is connected.
- A battery charge life remaining indicator is shown on the display whenever the manometer is powered by batteries, and turned on.
- When using NiMH batteries, the indicator of battery charge life remaining will not be accurate due to their inherent non-linear voltage drop with power use.
- Due to the danger of battery leakage, remove batteries from the battery compartment prior to storage.
- **Never** mix battery types.
- For maximum battery life, ensure backlight is “off” when not needed.

Battery Charging



WARNING

Do **not** use Lithium batteries in this instrument. Fire, explosions, or other hazards may result.



Caution

Never plug into the instrument any power supply other than the one provided with the instrument.



C a u t i o n

Always make certain that the battery switch is in the correct position for the type of battery being used (Alkaline/NiMH). Failure to do so may result in Fire, Explosions or other hazard.



C a u t i o n

Never use Alkaline and NiMH batteries together on the same instrument.

The HM675 Hydronic Manometer allows for internal charging of AA-size type NiMH (only) batteries. Charging of the batteries is initiated as follows:

1. Turn the manometer off and locate the battery cover on the back of the unit.
2. Loosen the screw on the battery compartment cover and lift to remove.
3. Remove the battery holder. Tapping the backside of the meter against your hand may help in removing the battery holder.
4. Verify the batteries installed are rechargeable type NiMH.
5. Set the battery-type selection switch to NiMH (see Figure 2-1).
6. Reinstall the battery holder. Ensure the battery holder orientation is such that its terminals make contact with the spring contacts within the battery compartment.
7. Replace the battery compartment cover.
8. Plug in the AC adapter.

Notes:

- Full charge of the batteries is achieved within four (4) hours.
- Fully charged batteries should enable the instrument to operate for a period of at least twelve (12) hours.
- The manometer remains fully operational while charging batteries.
- **Never** attempt to charge battery types other than AA-size rechargeable NiMH.
- For maximum battery life, ensure the backlight is “off” when not needed.
- **Never** mix battery types.
- NiMH batteries should only be charged at room temperature. Starting with batteries that are too cold or too warm can cause the charge cycle to terminate early.

Zeroing the Manometer

The HM675 Hydronic Manometer is equipped with both a gauge and differential pressure sensor, allowing for simultaneous measurement and display of High-side gauge and Differential pressure. The gauge and differential pressure sensors are zeroed independently of one another.

Zeroing the Gauge Pressure Sensor

To ensure the most accurate gauge pressure (**High P**) measurements, the HM675 gauge pressure sensor should be zeroed prior to taking readings on each new system. The gauge pressure sensor is zeroed as follows:

1. Disconnect the High pressure (red) hose from the manometer such that the High pressure (+) port is open to atmosphere.
2. Turn the valve handle on the manometer to the **MEASURE** position.
3. Press the **ZERO GAUGE** key. Follow on screen instruction to zero the gauge pressure sensor.
4. Allow the manometer to stand undisturbed for five (5) seconds until the zero gauge pressure sensor function has completed.

Notes:

- Zeroing the gauge pressure sensor requires the user to disconnect the High pressure (red) hose; as such it is often most convenient to zero the gauge pressure sensor as part of the start-up sequence (i.e., before hoses have been connected).
- The zero offset of the gauge pressure sensor is sensitive to temperature changes. If moving the manometer between areas of extreme temperature difference, it is best to allow the meter to settle to the new temperature prior to zeroing.

Zeroing the Differential Pressure Sensor

To ensure the most accurate differential pressure (**dP**) measurements, the HM675 differential pressure sensor should be zeroed prior to taking readings on each new system. The differential pressure sensor is zeroed as follows:

1. Go to the **Measurement Screen**.
2. Turn the valve handle on the manometer to the **BYPASS** position.
3. The instrument will automatically zero the differential pressure sensor. Follow the on-screen instructions and return the knob to **MEASURE** once this is done.

Notes:

- Any pressures applied to the hoses will not affect the **dP** zeroing function. This feature allows for successful zeroing of the differential pressure sensor while maintaining connections to the system under test.
- Zeroing of the differential pressure sensor is initiated any time the valve handle has been turned to the **BYPASS** position with the meter turned on. This feature allows for successful zeroing of the differential pressure sensor while entrained air is being purged from the hoses.
- The zero offset of the differential pressure sensor is sensitive to temperature changes. If moving the manometer between areas with extreme temperature difference, it is best to allow the meter to settle to the new temperature prior to zeroing.

Connecting the Manometer to the Test Points

Attaching the Hoses to the Manometer

1. Connect the straight female flare fitting on the High pressure (red) hose to the male fitting on the top of the manometer marked with a plus (+) sign.
2. Connect the straight female flare fitting on the Low pressure (blue) hose to the male fitting on the top of the manometer marked with a minus (-) sign.

Bleeding the Entrained Air

To ensure the most accurate pressure measurements, purge all entrained air within the hoses as follows:

1. Turn the shut-off ball valve on both the High and Low pressure hoses to the closed position.
2. Turn the valve handle on the manometer to the **MEASURE** position.
3. Using an appropriate fitting, connect the open end of the High pressure (red) hose to the test point with the higher line pressure.
4. Attach the appropriate fitting to the open end of the Low pressure (blue) hose.
5. To ensure all the air is bled from the hoses, hold the open end of the Low pressure (blue) hose in an upright position over a suitable receptacle or near a drain.
6. Turn the shut-off ball valve on both the High and Low pressure hoses to the open position.
7. Turn the valve handle on the manometer to the **BYPASS** position to allow the liquid flow to displace the entrained air.

Note: Zeroing of the differential pressure sensor is initiated any time the valve handle has been turned to the **BYPASS** position with the meter turned on. This feature allows for successful zeroing of the differential pressure sensor while entrained air is being purged from the hoses.

8. Once the liquid is flowing steadily from the Low pressure (blue) hose, turn the valve handle on the manometer to the **MEASURE** position.

Note: The time to fully prime the hose with fluid may take up to one minute depending on the line pressure. Higher line pressure will reduce the bleed time.

Attaching the Hoses to the Test Points

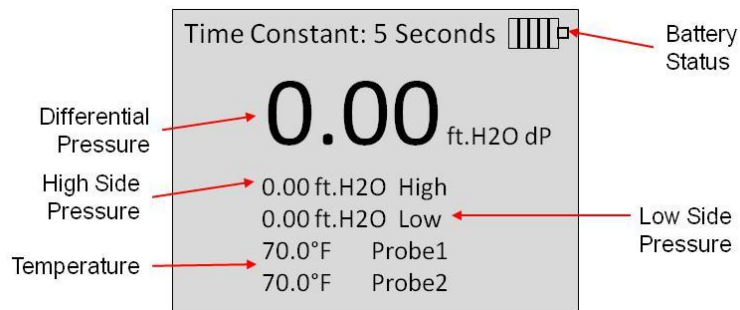
1. As indicated above, use an appropriate fitting to connect the open end of the High pressure (red) hose to the test point with the higher line pressure.
2. Using an appropriate fitting, connect the open end of the Low pressure (blue) hose to the test point with the lower line pressure.

Note: If the hoses are connected in the inverse orientation (i.e., High pressure (red) hose to the lower line pressure), the displayed High-side gauge pressure (**High P**) will be less than the Low-side gauge pressure (**Low P**), and the Differential pressure (**dP**) will be negative.

Performing Pressure Measurements

The HM675 Hydronic Manometer allows for simultaneous measurement and display of the High-side gauge and Differential pressure. The calculated Low-side gauge pressure is also displayed. The manometer is equipped to make and display either discrete or continuous pressure measurements.

Pressure Measurement Screen



*Shown with two optional accessory temperature probes attached.

High-Side Gauge Pressure	The High-side gauge pressure measurement is indicated as High on the manometer display.
Low-Side Gauge Pressure	The Low-side gauge pressure reading is indicated as Low on the manometer display. It represents a calculated value determined from the measured High-side gauge and Differential pressure as follows: Low P = High P – dP
Differential Pressure	The Differential pressure measurement is indicated as dP on the manometer display.

Continuous Measurements

The HM675 Hydronic Manometer continuously measures and displays pressure readings whenever the manometer is turned on, with the exception of when the **READ** key is pressed. When the **READ** key is pressed, the displayed readings are averaged measurements taken over the sampling period as defined by the current time constant setting. The display is updated once per second.

Discrete Pressure Measurements

Taking a discrete pressure measurement allows for measurement and display of a single time-averaged reading taken over the sampling period as defined by the current time constant setting. Discrete pressure measurement values are displayed on-screen for a period of 10 seconds and then returns to continuous measurement mode.

1. Press the **READ** key.
2. Allow the manometer to stand undisturbed until the reading is complete (time of completion dependent on the time constant setting).

Performing Temperature Measurements

The accessory temperature probe is an optional tool for the HM675 Hydronic Manometer. The 1/8" diameter, stainless steel sheathed immersion probe is designed for measurement of water line temperatures. When using the accessory temperature probe, the HM675 Hydronic Manometer is equipped to make and display either discrete or continuous temperature measurements. Two temperature probes can be connected to the instrument to measure upstream and downstream temperature simultaneously.

Connecting the Temperature Probe

Connect the keyed 3-pin plug of the accessory temperature probe to the mating connector located on the right-hand side of the manometer.

Notes:

A locking nut is provided on the accessory temperature probe plug to allow for a more secure attachment when connecting to the manometer.

When using the accessory temperature probe, the unit of measurement for temperature (°F or °C) is driven by the selected unit of measurement for differential pressure:

- Differential pressure in psi, inH₂O, ftH₂O, or inHg → temperature in °F
- Differential pressure in kPa, mH₂O, mmHg, or bar → temperature in °C

Disconnecting the Manometer from the Test Points

**Caution**

Exercise caution when disconnecting the HM675 Hydronic Manometer from a pressurized system. Water or air discharged under pressure poses a potential risk of severe injury.

**Caution**

Exercise caution in using the HM675 Hydronic Manometer near electrical equipment. Water spray associated with purging or disconnecting hoses presents a potential risk of damage to such equipment.

**Caution**

Thoroughly drain and dry the HM675 Hydronic Manometer hoses and internal piping after each use. This will help in limiting the potential for growth of hazardous microorganisms.

The following provides a guideline for disconnecting the manometer from the test points once measurements have been completed.

1. Turn the shut-off ball valve on both the High and Low pressure hoses to the closed position.
2. Disconnect the High pressure (red) hose from the higher line pressure test point.
3. Disconnect the Low pressure (blue) hose from the lower line pressure test point.

Note: If additional measurements at another location/system containing the same fluid are to be made, it is not necessary to proceed to step 4 and drain the fluid entrained within the hoses at this time. The fluid remaining within the hoses will help minimize the time necessary to bleed entrained air prior to making subsequent measurements.

4. Place the open end of the Low pressure (blue) hose in a suitable receptacle or near a drain.

5. Turn the valve handle on the manometer to the BYPASS position.
6. Turn the shut-off ball valve on the Low pressure (blue) hose to the open position to discharge the pressurized fluid out of the open end of the Low pressure (blue) hose.
7. Elevate the High pressure (red) hose and turn its shut-off ball valve to the open position to allow for draining of the remaining entrained fluid.

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CHAPTER 3

Maintenance and Troubleshooting

The HM675 Hydronic Manometer has been designed to provide long-term field use with minimum required maintenance. As with any precision electronic device, however, proper care, maintenance, and handling will further ensure its accurate and reliable operation.

IMPORTANT

There are no user-serviceable parts inside this instrument. Opening the instrument case may void the warranty. TSI recommends that you return the HM675 Hydronic Manometer to the factory for any required maintenance or service not described in this manual.

Routine Maintenance

The following guidelines should be followed whenever storing the HM675 Hydronic Manometer:

Draining the Hoses

Fluid within the High (red) and Low (blue) pressure hoses should be properly drained whenever the instrument is being stored after use.

1. Disconnect the manometer hoses from the test points (*Reference Chapter 2, "Disconnecting the Manometer from the Test Points"*).
2. Disconnect the High (red) and Low (blue) pressure hoses from the manometer.
3. Turn the shut-off ball valve on both the High and Low pressure hoses to the open position.
4. Using a suitable high pressure air source, blow the entrained liquid from both hoses.

Draining the Manometer Valve

Fluid within the manometer valve should be properly drained whenever the instrument is being stored after use.

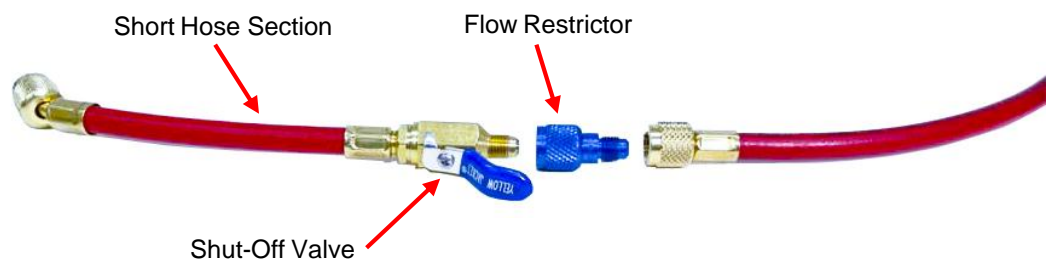
1. Disconnect the High (red) and Low (blue) pressure hoses from the manometer.
2. Turn the valve handle on the manometer to the **BYPASS** position.
3. Hold the manometer with the pressure ports directed downward to allow liquid to drain from the unit.

4. Turn the valve handle on the manometer to the **MEASURE** position.
5. Hold the manometer with the pressure ports directed downward to allow liquid to drain from the unit.

Note: The HM675 Hydronic Manometer should be stored with the valve handle in the **MEASURE** position.

In-Line Flow Restrictor

The blue and red hose assemblies include flow restrictors. The flow restrictors must be used to prevent damage to the pressure sensors from unexpected water hammering or pressure spikes and also acts as a filter. Do **not** use the HM675 Hydronic Manometer without the flow restrictors installed in the hose assemblies or sensor damage or clogging will occur.



Cleaning the In-line Flow Restrictors

These flow restrictors should be flushed periodically with clean water to minimize potential clogging.

1. Disconnect the hose from the manometer.
2. Turn the shut-off ball valve on the hose to the closed position.
3. Connect the straight female flare fitting (farthest from the hose shut-off valve) on the hose to a suitable water source.
4. Place the open end of the hose in a suitable receptacle or near a drain.
5. Turn the shut-off ball valve on the hose to the open position and allow water to flush through for several minutes.
6. Using a suitable high pressure air source, blow the entrained water from the hose.
7. Repeat with the second hose.

Note: If necessary, remove the flow restrictor for further cleaning or flushing. Reattach to hose assembly when complete.

Cleaning the Instrument Housing

The HM675 Hydronic Manometer may be cleaned using a soft, damp, clean cloth.

Note: Do **not** use solvents or abrasive cleaners to clean the instrument housing, keypad, or display.

Calibration

TSI recommends that the HM675 Hydronic Manometer receive an annual calibration. TSI will verify calibration of the instrument and re-issue a certificate of calibration with traceability to NIST. This “annual checkup” helps to ensure the specified accuracy of the instrument is maintained.

To calibrate the instrument, please ship TSI the complete package that includes the meter and accessory temperature probe. Everything should be packed carefully within the carrying case and then inside a shipping box. The original shipping box and packaging (carton and foam) is preferred.


Before returning the Hydronic Manometer to TSI for service, visit our website at <http://rma.tsi.com> or call TSI at 1-800-874-2811 (USA) or 001 (651) 490-2811 for specific return instructions. Customer Service will need the following information when you call:

- The instrument model number
- The instrument serial number
- A purchase order number (unless under warranty)
- A billing address
- A shipping address

(continued on next page)

Troubleshooting

The following table lists the symptoms, possible causes, and recommended solutions for common problems encountered with the instrument. If your symptom is not listed, or if the recommended solutions do not address your problem, please contact the factory.

Symptom	Possible Causes	Corrective Action
No display	Unit not turned on. Low or dead batteries. Dirty battery contacts. AC adapter not connected.	Press On/OFF key. Replace or recharge the batteries. Clean the battery contacts. Plug in AC adapter.
 flashing on display	Low battery charge. Dirty battery contacts.	Replace or recharge the batteries. Clean the battery contacts.
"8888" flashing on display	The indicated measurement is out of range.	The allowable ranges for pressure and temperature measurements are shown on the specifications page .
"----" on display	The temperature sensor is unplugged The pressure measurement is out of the meter's range.	Try one of the below two steps: 1. Plug in temperature probe. 2. Return the pressure measurement to the correct range
Instrument unresponsive to pressure	Hoses are clogged	Make sure hoses and flow restrictors are unclogged from any debris by following instructions on Cleaning the In-line Flow Restrictors .

The following table lists error messages which can be displayed should the instrument detect a problem. Should any of these error messages recur repeatedly, the instrument should be returned to the factory for servicing.

Error Message	Possible Causes & Corrective Action
"Saved Pressure Zero"	There was a problem with a pressure zero reading read from memory. Differential pressure and gauge pressure should both be re-zeroed.

Technical Contacts

- If you have any difficulty installing the Hydronic Manometer, or if you have technical or application questions about this instrument, contact an applications engineer at one of the locations listed below.
- If the Hydronic Manometer fails, or if you are returning it for service, visit our website at <http://service.tsi.com> or contact TSI at:

TSI Incorporated

500 Cardigan Road
Shoreview, MN 55126 USA

Phone: +1-800-874-2811 (USA) or +1 (651) 490-2811

E-mail: technical.service@tsi.com

TSI GmbH

Neuköllner Strasse 4
52068 Aachen
GERMANY

Telephone: +49 241-52303-0

Fax: +49 241-52303-49

E-mail: tsigmbh@tsi.com

Web: www.tsiinc.de

TSI Instruments Ltd.

Stirling Road
Cressex Business Park
High Wycombe, Bucks
HP12 3ST
UNITED KINGDOM

Telephone: +44 (0) 149 4 459200

Fax: +44 (0) 149 4 459700

E-mail: tsiuk@tsi.com

Web: www.tsiinc.co.uk

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APPENDIX A

Specifications

Model HM675 Hydronic Manometer specifications are as follows
(specifications are subject to change without notice).

Range	
Differential Pressure	0 to 300 psi (0 to 2068 kPa)
Gauge Pressure	0 to 300 psi (0 to 2068 kPa)
Operating Temperature	40 to 100°F (4 to 38°C) electronics
Storage Temperature	0 to 140°F (-18 to 60°C)
Temperature Probe	-40 to 250°F (-40 to 121°C)
Resolution	
Pressure (best)	0.001 psi (0.01 kPa)
Temperature	0.1°F (0.1°C)
Accuracy	
Pressure ¹	±1% of reading or .072 psi (0.5 kPa), whichever is greater
Temperature	±0.5°F (0.3°C) from 32 to 160°F (0 to 71°C); max ±2.0°F (1.2°C) from -40 to 32°F (-40 to 0°C) and from 160 to 250°F (71 to 121°C)
Units	
Pressure	psi, in. H ₂ O, ft H ₂ O, kPa, mm Hg, in. Hg, m H ₂ O, bar
Temperature	degrees F, degrees C
Time Constant	user selectable (1, 5, 10, 20, and 30 seconds)
Display	LCD with backlight
Instrument Temperature Range	
Operating (Electronics).....	40 to 113°F (5 to 45°C)
Storage	-4 to 140°F (-20 to 60°C)
Relative humidity	up to 95% RH, non-condensing
Dimensions (meter only)	11.1 in. x 4.7 in. x 3.5 in. (28.2 cm x 11.9 cm x 8.8 cm)
Pressure Connection	¼" 37° Flare Fitting, Male
Weight with Batteries	2.65 lb. (1.20 kg)
Power Requirements	four AA-size cells, alkaline or rechargeable NiMH (included), or AC adapter (included) 9 VDC, 2 A, regulated
Battery Life ²	minimum of 12 hours with backlight on minimum of 18 hours with backlight off

Recharge Time	4 hours (internal charger)
Warranty	2-year factory warranty

¹Accuracy statement applies from 0 to 250 psi (0 to 1724 kPa).

²The minimum battery life stated will occur after the NiMH batteries have been recharged 2 to 3 times after initial charge.

APPENDIX B

Compliance

CE Marking	EN61326 / EN 55011, Class B: Radiated Emissions EN61326 / EN 55011, Class B: Conducted Emissions EN61000-4-2: Electrostatic Discharge Immunity EN61000-4-3: Electromagnetic Field Immunity EN61000-4-4: Burst Immunity EN61000-4-5: Surge Immunity EN61000-4-6: Conducted PS Immunity EN61000-4-8: Rated Power-Frequency Field Immunity EN61000-4-11: Voltage Dips\Short Interruptions Immunity
RoHS Marking	Yes

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UNDERSTANDING, ACCELERATED

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