PROTIMETER

Protimeter Hygromaster2

Instruction Manual

Amphenol
Advanced Sensors

INS7750 Rev. A
October 2015

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QUICK START QUIDE

Hygromaster2 has 6 switches to Power On/OFF and navigate between different modes of operation.

1. **Enter button**  **:**
    a. Press once to switch ON the instrument
    b. Press and hold for more than 3secs to switch OFF the instrument
    c. Press once to enter into measurement or settings screens based on Selection

2. **Left button**  **:** Press once to navigate to one screen back

3. **Right button**  **:**
    a. Press once to freeze the readings in measurement screens
    b. Press and hold for 1.5sec to save the readings in measurement mode
    c. Press once to navigate to the next text box in DATE & TIME and LOG SETUP setting screens

4. **Up button**  **:** Press once to navigate up

5. **Down button**  **:** Press once to navigate down

6. **IR button**  **:** Press and hold to enter into IR measurement screen

1. Introduction

The Protimeter Hygromaster2 is a powerful and versatile thermo-hygrometer. This product is used to measure relative humidity, air temperature and surface temperature of structures. Additionally, the difference between dew point and Surface temperature can also be displayed for condensation risk assessment applications.

2. Safety Considerations

- **IR temperature measurement** - Please note that the readings are indicative readings outside the measurement range of the IR temperature mode and the accuracy of the measurement is not guaranteed outside the range.

- **Calibration of unit -** The accuracy specifications of the product are valid for one year after the date of calibration, and the product requires recalibration after this period.

Laser pointers are effective tools when used properly, but the following considerations must be observed when using laser pointers:

- Never look directly into the laser beam.

- Never point a laser beam at a person.

- Do not aim the laser beam at reflective surfaces.

- Never view a laser beam using an optical instrument, such as binoculars or a microscope.

- Do not allow children to use laser pointers unless under the supervision of an adult.

2. Safety Considerations (cont.)

- Use only laser pointers meeting the following criteria:
  - Labeled with FDA certification stating *“DANGER: Laser Radiation” for Class 3R lasers or “CAUTION: Laser Radiation” for Class 2 lasers.*
  - Classified as Class 2 or 3R according to the label. Do not use Class 3b or Class 4 products.
  - Operates at a wavelength between 630 nm and 680 nm.
  - Has a maximum output less than 0.4 mW, the lower the better.

3. Product Components and Accessories

The Hygromaster2 instrument measures air temperature, relative humidity and surface temperature. To measure all the above mentioned parameters, Hygromaster2 uses different sensors, along with a variety of accessories for convenient measurements. The following external connectors are found on the instrument (see *Figure1 on page 3):*

A - This edge connection socket is for use with a Hygrostick®, Quikstick or Short Quikstick probe.

B - This jack connection socket is for use with the Direct Contact Surface Temperature Sensor.

C - This USB socket is for connection to a PC when using the optional Hygromaster2 logging software.

3. Product Components and Accessories (cont.)

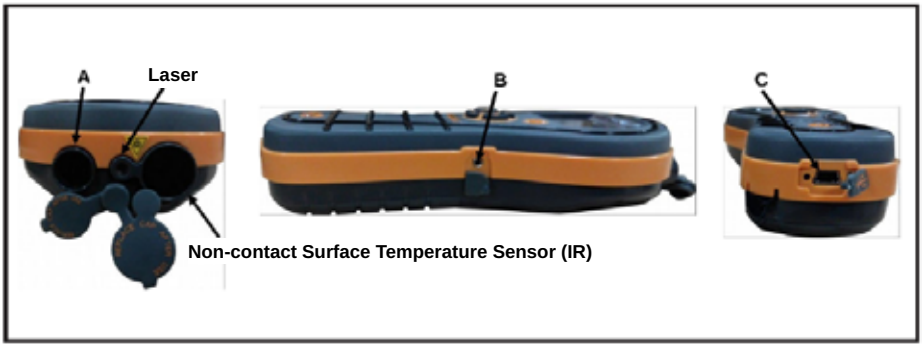

Figure 1: Connections for Probes and Sensors

- The Hygrostick (POL4750), Quikstick (POL8750), Short Quikstick (POL8751) and 30cm humidity probes (BLD8755) measure relative humidity (%RH) and ambient air temperature in rooms or materials. They can be connected to the Hygromaster2 instrument either directly or by means of the extension lead.
- The surface temperature sensor is used when investigating condensation situations.

3.1 Switching the Hygromaster2 ON and OFF

Prior to initial use, ensure that a 9V battery is correctly inserted in the battery compartment.

Note: *The battery status is indicated by an icon*  *on the display. When the LOW BATTERY message appears, replace the battery.*

To switch the Hygromaster2 ON, press the power button momentarily

Note: *The Hygromaster2 switches OFF automatically after 2 minutes if no activity is observed, unless the default settings are changed (see Section 4.7c, "Auto Off", on page 17 for instructions).*

To switch the instrument OFF immediately, press and hold for at least 3 seconds. Once has been depressed for 3 seconds or more, the text string **SWITCHING OFF THE DEVICE** appears on the display. When is released, the text string disappears and the unit switches OFF

Whenever the battery voltage falls below the threshold value, the battery symbol starts blinking. If the battery voltage falls below the operating level, the instrument prompts with the message

LOW BATTERY
SWITCHING OFF THE DEVICE

4. HYGROMASTER2 Modes

The Protimeter Hygromaster2 instrument measures air temperature, relative humidity and surface temperature.

4.1 Hygrometer - Selection and Use

Navigate to **SELECT MODE -> HYGROMETER** and press to select the *Hygrometer* mode.

To use the Protimeter Hygromaster2 as a Hygrometer (see *Figure 4 on page 11*), connect the Hygrostick, Quikstick or Short Quikstick probe into socket **A** either directly or indirectly with the extension lead.

Relative humidity and temperature measurements are made with the Hygrostick, Quikstick or Short Quikstick probe, and the Hygromaster2 Instrument uses these values to calculate a range of psychometric readings. When using the Hygromaster2 to measure the conditions in air, the humidity probe is normally connected directly to the instrument. However, when it is impractical or awkward to use the instrument in this way, the extension lead may be used to connect the Hygrostick, Quikstick or Short Quikstick to the instrument. Typically, the extension lead will be used when taking readings from probes that have been embedded in structures such as walls and floors.

Figure 4: Hygromaster2 as a Hygrometer

4.1 Hygrometer - Selection and Use (cont.)

Note: *For best response time, do not store the Hygromaster2 in excessively hot or cold locations, such as in a vehicle.*

4.2 Psychrometrics - Selection and Use

Navigate to **SELECT MODE -> PSYCHROMETRICS** and press to select the Psychrometrics mode.
Connect the Hygrostick, Quikstick or Short Quikstick probe into socket **A**.
The following parameters are displayed in this mode:

4.2a Dew Point

Navigate to **SELECT MODE -> PSYCHROMETRICS -> DEW POINT** and press to get the *Dew Point* reading.

4.2b Grains per Pound/Grams per Kilogram

Navigate to **SELECT MODE -> PSYCHROMETRICS -> GRAMS PER KILOGRAM/ GRAINS PER POUND** and press to get the *Mixing Ratio* reading.

4.2c Enthalpy

Navigate to **SELECT MODE -> PSYCHROMETRICS -> ENTHALPY** and press to get the *Enthalpy* reading.

4.2d Vapor Pressure

Navigate to **SELECT MODE -> PSYCHROMETRICS -> VAPOR PRESSURE** and press to get the *Vapor Pressure* reading.

4.2e Custom Psychrometrics

Hygromaster2 supports custom Psychrometrics option to read different Psychrometric parameters in single screen. Parameters to be displayed can be set in *custom* option in *settings* screen
Navigate to **SELECT MODE -> PSYCHROMETRICS -> CUSTOM** and press to get the *custom psychrometrics* readings.

Note: *Change the units in **Settings** (see page 16) to obtain both metric and non-metric equivalents.*

4.3 Condensator

The *Condensator Mode* enables the user to assess the risk of condensation occurring on surfaces or to confirm whether or not condensation is present On a surface.

The Hygromaster2 can be used as a *Condensato*r using two modes:

4.3a Surface Temperature Probe (Contact Based) - Selection and Use

Navigate to **SELECT MODE -> SURFACE TEMPERATURE PROBE** and press  to select the *Surface Temperature Probe* mode.

In this mode, the Hygromaster2 measures the surface temperature using an External *Surface Temperature* probe inserted into socket **B** and making contact with the surface to be assessed. In addition to the *Surface Temperature* probe, connect a *Humidity* probe into socket **A** for the Hygromaster2 to show the *Condensation* status.

TDIFF is a useful function when investigating condensation, as it tells the user how many degrees a surface temperature is above or below the prevailing dew point temperature.

4.3b Surface Temperature IR (Non-Contact Based) – Selection and Use

In this mode, the Hygromaster2 measures surface temperature using IR technology
Connect a humidity probe into socket **A**.

Hold the 

button to enable the *IR Thermometer*. Release the button and press it again within 1 second to enable the **LASER** pointer. The **LASER** pointer will indicate the area on the surface where the measurement is being Taken (see *Figure 5 on page 14*).

4.3b Surface Temperature IR (Non-Contact Based) – Selection and Use (cont.)

Figure 5: LASER Pointer

Table 3: TDIFF Readings

T. DIFF (DEGC)	Condensation Status	Background Colour
≤0	Condensation	**Red Blinking**
>0 but ≤3	Risk of Condensation	**Yellow Blinking**
>3	No Condensation	**Green**

If the Buzzer is ON, it will give beep at *Condensation* and *Risk of Condensation* Conditions.

4.4 Logging - Selection and Use

The Hygromaster2 supports both continuous and manual logging.

4.4a Manual Logging

If  is pressed for 1.5sec at any of the measurement screens, the data and *Timestamp a*t that instant will be logged and a **RECORD SAVED** message will be displayed on the bottom bar.

4.4b Continuous Logging

Continuous logging is used to sample and store data continuously. Continuous logging is enabled either by setting logging parameters through the Keypad or through a PC using *Logging Software*. (see *Section 4.7g, "Set Logging Parameters (Optional PC Logging Software Required)", on page 19.)*

*After the logging parameters are saved, logging starts after the **START AFTER** minutes have elapsed. The logging icon is displayed on the top left corner of the screen while logging is active.*

*When logging is in progress, an option to stop logging is provided under the **SETTINGS** menu. Logging can be stopped either by selecting **SELECT MODE -> SETTINGS -> STOP LOGGING** in the instrument, by clicking **STOP LOGGING** in the Logging Software or when the instrument is turned **OFF.***

4.5 Settings - Selection and Use

The Protimeter Hygromaster2 instrument has a range of user-selectable features.

Navigate to **SELECT MODE -> SETTINGS** and press to configure the Hygromaster2. The following options are available for configuring:

4.5a Language

Hygromaster2 has the option to select language among eight different Languages i.e., English, Norwegian, French, German, Swedish, Spanish, Italian and Dutch. Navigate to **SELECT MODE -> SETTINGS -> LANGUAGE** and press to open the language options. Use / to navigate among the options available, and press to save the desired language.

4.5b Set Units

Hygromaster2 has the option to select between **METRIC** and **NON METRIC** Units. Navigate to **SELECT MODE -> SETTINGS -> UNITS** and press to open the unit options. Use / to navigate between the options available and press to save the desired units.

Table 4 below shows how the units and the parameters measured appear in metric and non-metric units.

Table 4: Metric and Non-Metric Units for Parameters

	Metric	Non-Metric
Temperature	°C	°F
Dew Point	°C	°F
Mixing Ratio	g/kg	g/lb
Enthalpy	kJ/kg	BTU/lb
Vapor Pressure	kPa	inHg
Surface Temperature	°C	°F
T. Diff	°C	°F
Ambient Dew Point	°C	°F

4.5c Custom

Hygromaster2 supports custom Psychrometrics option to display different Psychrometric parameters in single screen. Parameters to be displayed can be set in Custom settings screen.

Navigate to ***SELECT MODE -> SETTINGS -> CUSTOM*** and press to configure the options. Use / to navigate between parameters and press to select. Maximum four parameters can be selected. The order in which the parameters selected will be displayed in Custom screen in Psychrometrics option.

4.5d Date and Time

Navigate to ***SELECT MODE -> SETTINGS -> DATE AND TIME*** and press to change the date and time. Initially device displays Date settings. Use to navigate to the required field. Then, use / to increment / decrement the value in that box. After entering the required date press to save date entered and go to Time setting screen.

Use to navigate to the required field. Then, use / to increment/ decrement the value in that box. After entering the required time press to save time entered. The new time is displayed at the top right corner of the screen. Date and time can also be set up by connecting to a PC and using the optional logging software.

4.5e Auto Off

The Hygromaster2 will spwitch ***OFF*** automatically after auto switch off time, if no activity/key press is observed. Navigate to ***SELECT MODE -> SETTINGS -> AUTO OFF*** and press to configure the Auto off time.

Use / to navigate between 0 to 6 minutes and press to set the Auto off time. To disable the Auto off feature, set the Auto switch off time to 0.

Note: *During continuous logging operation, auto switch off time is considered to be the display turnoff time.*

4.5f Set Brightness

Navigate to **SELECT MODE -> SETTINGS -> BRIGHTNESS** and press to set the Brightness level. Use / to navigate between the different brightness levels (1 to 10) and press to set the desired brightness. (Brightness level 2 is the default setting.)

4.5g Buzzer On-Off

This option is used to switch the Buzzer **ON/OFF**. When the Buzzer is ON:

- Any key press will make a beep sound.
- Instrument turn **ON/OFF** will be indicated

Navigate to **SELECT MODE -> SETTINGS -> BUZZER** and press to switch the Buzzer on/off.

Use / to navigate between the on and off options and press to save the desired configuration.

4.5h Calibration

The Calibration option is unavailable to the user.

4.5i Set Logging Parameters (Optional PC Logging Software Required)

Navigate to ***SELECT MODE -> SETTINGS -> LOGGING -> SETUP*** and press

To set the following logging parameters:

- ***Start After Mins:*** minutes after which logging should start (0 to 999).
- ***Log Interval Mins:*** sampling interval in minutes (1 to 60).
- ***Stop After Mins:*** minutes after which logging should stop after sampling begins (1 to 999).
- ***Job Number:*** 1 to 255

4.5i Set Logging Parameters (Optional PC Logging Software Required) (cont.)

Initially unit will display settings for Start after and Stop after. Use  to navigate to the required box. Then, use  /  to increment or decrement the value in that box and press  to save the entered parameters and go to Log interval and Job number settings. Use to  navigate to the required box. Then, use  /  to increment or decrement the value in that box and press  to save logging parameters.

Note: *You can also set up and conduct logging via the optional PC software.*

4.5j Clear Logging Data

Hygromaster2 has an option to erase the logging data in Flash. Navigate to **SELECT MODE -> SETTINGS -> LOGGING -> CLEAR DATA** and press  **.**

Then it will display confirmation message asking for erasing data. Select Yes and press  to erase the data.

4.5k USB Communication

Hygromaster2 can be configured to work with PC software or as Mass storage device. Navigate to ***SELECT MODE -> SETTINGS ->***

USB CONNECTION and press  to set the USB connection type. Use  /  to navigate between the PC Software and File Viewer and press  to set the desired Option.

If PC Software is selected, Data can be read through Logging Software.
If File Viewer is selected data will be available in CSV format under My Computer (like mass storage device)

5. Diagnostic Procedure Guidelines

When diagnosing dampness in buildings, three key criteria must be considered, as outlined in *Table 5* below.

Table 5: Diagnostic Criteria

Item	Criteria	Notes
2	Is the surface temperature of a wall or other building element above or below the dew point?	Dew point is the temperature at which a given quantity of air becomes saturated (100% RH) and forms dew, or condensation. If a surface is colder than the dew point, condensation occurs. When the Protimeter Hygromaster2 Condensator Mode is selected to measure TDIFF (the proximity of a surface to the dew point) the instrument identifies either a **NO CONDENSATION** Condition, an **AT RISK** condition, or a **CONDENSATION** occurring condition
3	Is a wall surface or other building element contaminated with hygroscopic salts or other conductive material?	Artificially high moisture meter readings may be obtained either in material that has been heavily contaminated by hygroscopic salts or in materials that are conductive by nature. The presence or absence of nitrates and chlorides should be established when investigating suspected rising dampness situations in particular.

5. Diagnostic Procedure Guidelines (cont.)

Item 1: Condensation related moisture problems are common. When assessing the risk of condensation, or confirming its existence, the proximity of the actual temperature of the surface under investigation to the dew point must be established. The **TDIFF** measurement in **CONDENSATOR** mode tells the user how many degrees the temperature of a surface is above or below the dew point.

As many condensation situations are transient, **TDIFF** readings should be taken in a methodical and regular manner, similar to moisture meter readings in materials. Ambient RH and temperature values should also be taken to assess the moisture condition of the room as a whole. Dwellings and working environments generally have an **RH** from 40% to 60%, so there may be cause to investigate environments that register **RH** values outside this range.

Item 2: Two hygroscopic salts, chlorides and nitrates, may build up on the surface of walls where rising dampness or wicking occurs. As groundwater moves through the wall and migrates to the surface, salts tend to accumulate where the rate of evaporation of this water is greatest. The salts themselves are non-conductive, but when mixed with a small amount of moisture a highly conductive solution is formed. The presence (or absence) of such salts should therefore be established when rising dampness is suspected by using the Protimeter Hygromaster2 in Measure mode as described. When required, the Protimeter Salts Analysis Kit (part number BLD4900) can be used to identify the relative concentrations of nitrates and chlorides.

In summary, effective dampness diagnosis is a process that draws on the knowledge and expertise of the surveyor. The Protimeter Hygromaster2 kit Enables the user to investigate moisture levels in materials and environments from various perspectives that, in turn, permits a more thorough and reliable judgement as to the cause of dampness related problems.

6. Calibration Checking

Working Hygrostick, Quikstick and Short Quikstick probes can be checked against reference probes and/or over standard salt solutions.

7. Care and Maintenance

The Protimeter Hygromaster2 is a precision-built electronic instrument that will provide many years of reliable service if the following points are observed:

- When not in use, keep the Hygromaster2 instrument and its accessories in the factory carry case. Store the case in a stable, dust-free environment and keep it out of direct sunlight.
- If the instrument is to be stored for more than four weeks or if the low battery power symbol appears on the display, remove the batteries from the instrument.
- Check the condition of the Hygromaster2 accessories on a regular basis, and replace them if they become worn or damaged.
- To preserve their calibration characteristics, Hygrostick probes should not be exposed to saturated environments. If this is unavoidable, Hygrostick probes should be replaced on a regular basis and their calibration should be checked frequently.

8. Displaying the Hygromaster2 Information

Go to ***SELECT MODE -> ABOUT*** to view the Hygromaster2 information.

The following information will be provided:

- Firmware version
- Date of build
- Device Model and Serial number
- Battery status
- Calibration date/status: Tair-RH-Ts, IR surface temperature
- System date
- Probe type (Hygrostick/Quikstick) and Probe serial number

9. Technical Specifications

9.1 Operating Conditions

Operating Temperature Range
Instrument Only: 0°C - 50°C

Humidity: 0 to 95% non-condensing

9.2 Measurement Specifications

9.2a Humidity Measurement

Hygrostick Data (Nominal)

Relative Humidity

Range: 30% to 40% RH, Accuracy: ±3% RH at 68°F (20°C)
Range: 41% to 98% RH, Accuracy: ±2% RH at 68°F (20°C)

Temperature

Range: 14°F to 122°F (-10°C to 50°C), Accuracy: ±0.6°F (±0.3°C)

Short Quikstick Data (Nominal)

Relative Humidity

Range: 0% to 10% RH, Accuracy: ±3% RH at 68°F (20°C)
Range: 10% to 90% RH, Accuracy: ±2% RH at 68°F (20°C)
Range: 90% to 100% RH, Accuracy: ±3% RH at 68°F (20°C)

Temperature Range

Range: 14°F to 122°F (-10°C to 50°C), Accuracy: ±0.6°F (±0.3°C)

9.2b Surface Temperature

Thermistor Based Remote Non-Integrated Probe

Range: -4°F to 176°F (-20°C to +80°C)
Accuracy: ±2.7°F (±1.5°C)

IR Based — With 12:1 (D:S) Ratio — With Laser Pointer

Range: 14°F to 122°F (-10°C to 50°C)
Accuracy: ±3.6°F (±2°C) @77°F (25°C)

9.3 Physical Specifications

9.3a Power

Battery
9V Alkaline ≥ 550mAH
Battery Life visual indication on LCD

9.3b Size (H x W x D)

6.9 in. x 3.2 in. x 1.5 in. (17.7 cm x 8.0 cm x 3.8 cm)

9.3c Gross Weight

Instrument only: 6.42 oz (182 g)

9.3d Buzzer

Audible buzzer for Key tone

9.4 Regulatory Compliance

CE, RoHS, ETL

9.5 User Interface

9.5a Keypad

Plastic/silicone keypad for easy navigation between different user menus on the unit, separate key for IR operation (non-contact based surface measurement)

9.5b Display

Graphical LCD
Size: 2.0"
Color: 256 bits
Resolution: 176 x 220 dpi
Backlight (with adjustable brightness)

9.5c Language

Multiple language support

9.5d User Application Profiles

Sticky memory last used application settings

9.5e PC Interface

USB interface:
mini B type USB port on instrument

PC Interface features:
Firmware Upgrade in field
User specific instrument setup
Data Logging setup
Stored data retrieval

9.5f Data Logging

RH-Tair-Ts Data logging
Easy user setup through Keypad
Samples with Date and Time stamp:
Manual/Continuous logging — 10000 samples

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