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INSTRUCTIONS
FOR
YSI
MODEL 91
DEW POINT
HYGROMETER

A-09124-A NOV. 1969

DRYING THE PROBE PRIOR TO USE

When an unpowered dew point probe is left or stored in a moist environment for more than a few minutes, the Lithium Chloride in the bobbin absorbs excess water which must be removed by forced drying prior to probe use.

Drying is best accomplished in a warm, dry oven at 65°C (150°F) for 1/2 hour; although any dry environment of less than 10% relative humidity for 1/2 hour will suffice.

To minimize the need for such drying, it is recommended that the probe be kept in operation with the instrument on between times of periodic use.

If the probe is not dried prior to use, electrode reactions in the bobbin can produce a red to orange precipitate which in time degrades the probe's accuracy.

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YSI MODEL 91 DEW POINT HYGROMETER

GENERAL DESCRIPTION

The YSI Model 91 Dew Point Hygrometer reads directly in dew point temperature, vapor pressure, and ambient temperature.

YSI Series 9100 moisture sensors consist of bifilar electrodes on a wick covering a hollow bobbin. The wick is impregnated with lithium chloride, a hygroscopic salt which becomes increasingly conductive as it absorbs moisture. When a voltage is applied to the electrodes, heat is generated as the wick conducts current between the electrodes. Moisture evaporates from the wick until a heat-moisture equilibrium is reached. This equilibrium temperature, related to dew point temperature, is sensed with high-accuracy YSI Thermilinear thermistors, mounted inside the hollow bobbin, and then converted to read in dew point temperature on the meter.

Ambient temperature can be sensed with any YSI Series 700 Probe. Outputs are provided for simultaneous recording of dew point and ambient temperatures, or for driving alarms, controllers, and other devices.

SPECIFICATIONS

RANGES:	Dew Point	Ambient	Vapor Pressure
91HC	-12 to +42°C	-12 to +42°C	1.8 to 61.5 mm. Hg.
91HF	11 to 107°F	11 to 107°F	1.9 to 60.4 mm. Hg.

READABILITY:	Temperature	Vapor Pressure
91HC	0.25°C	1 mm. or better
91HF	0.5°F	1 mm. or better

WORST CASE POSSIBLE ERROR: (Includes sensor interchangeability and accuracy)

Instrument	Dew Point and Ambient	Vapor Pressure
91HC	±0.9°C	The difference in vapor pressure which corresponds to the dew point temperature error possibility at the point of measurement.
91HF	±1.6°F	

Recorder Output	Dew Point and Ambient	Vapor Pressure
91HC	±0.4°C	The difference in vapor pressure which corresponds to the dew point temperature error possibility at the point of measurement.
91HF	±0.75°F	

PROBABLE ERROR: 65% of the stated Worst Case Error when the instrument is operated at 25°C.

OPERATING TEMPERATURE RANGE: 0 to 50°C (See Operation and Maintenance section)

POWER: 115V or 230V (50-60 Hz) 15 watts max.

RESPONSE TIME: Typically 1°C/Min. (See Operation and Maintenance)

RECORDER OUTPUT: 0 to 10 to 11 MV for both Dew Point and Ambient

OPERATION AND MAINTENANCE

DEW POINT OR VAPOR PRESSURE MEASUREMENT

1. With the instrument turned off, check the mechanical zero of the meter (Pointer should indicate highest temperature). Adjust with screw on meter case, if necessary.
2. Check probe bobbin(s) wires to see that they are plugged into their sockets.
3. Insert the probe connector into rear mounted receptacle marked DEW POINT.
4. Switch to STDBY position and allow at least a 15 minute warm up period. If the instrument and probe have been turned off for many hours warm up will require 30 to 45 minutes. (The instrument may be left on continuously to avoid warm up period, if desired).
5. Switch to DEW POINT and read meter indication.

AMBIENT TEMPERATURE MEASUREMENT

1. With the instrument turned off, check the mechanical zero of the meter (pointer should indicate highest temperature). Adjust with screw on meter case, if necessary.
2. Insert any YSI Series 700 Probe connector into rear mounted receptacle marked AMBIENT.
3. Switch to AMBIENT and read meter indication.

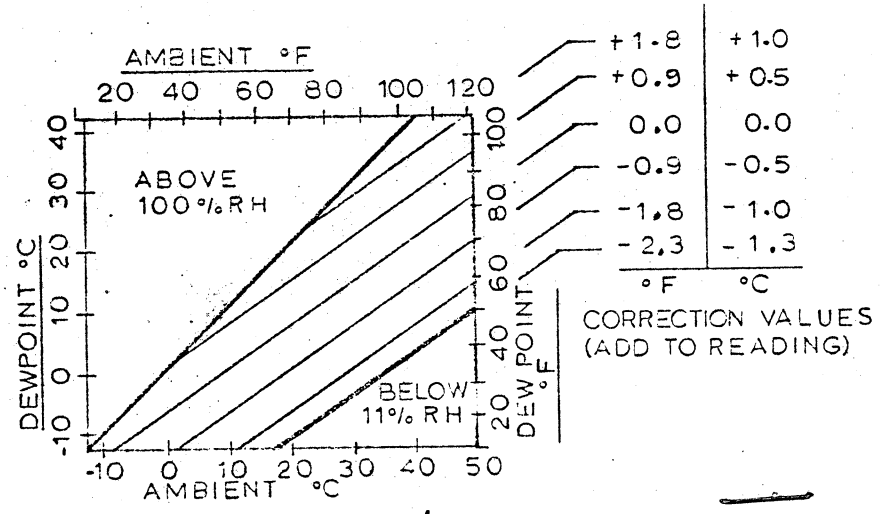
RECORDER OUTPUT

The recorder output signal for both the dew point and ambient temperature is available on the rear mounted terminal strip. The signal will be 0 to at least 10MV but no more than 11MV, is linear

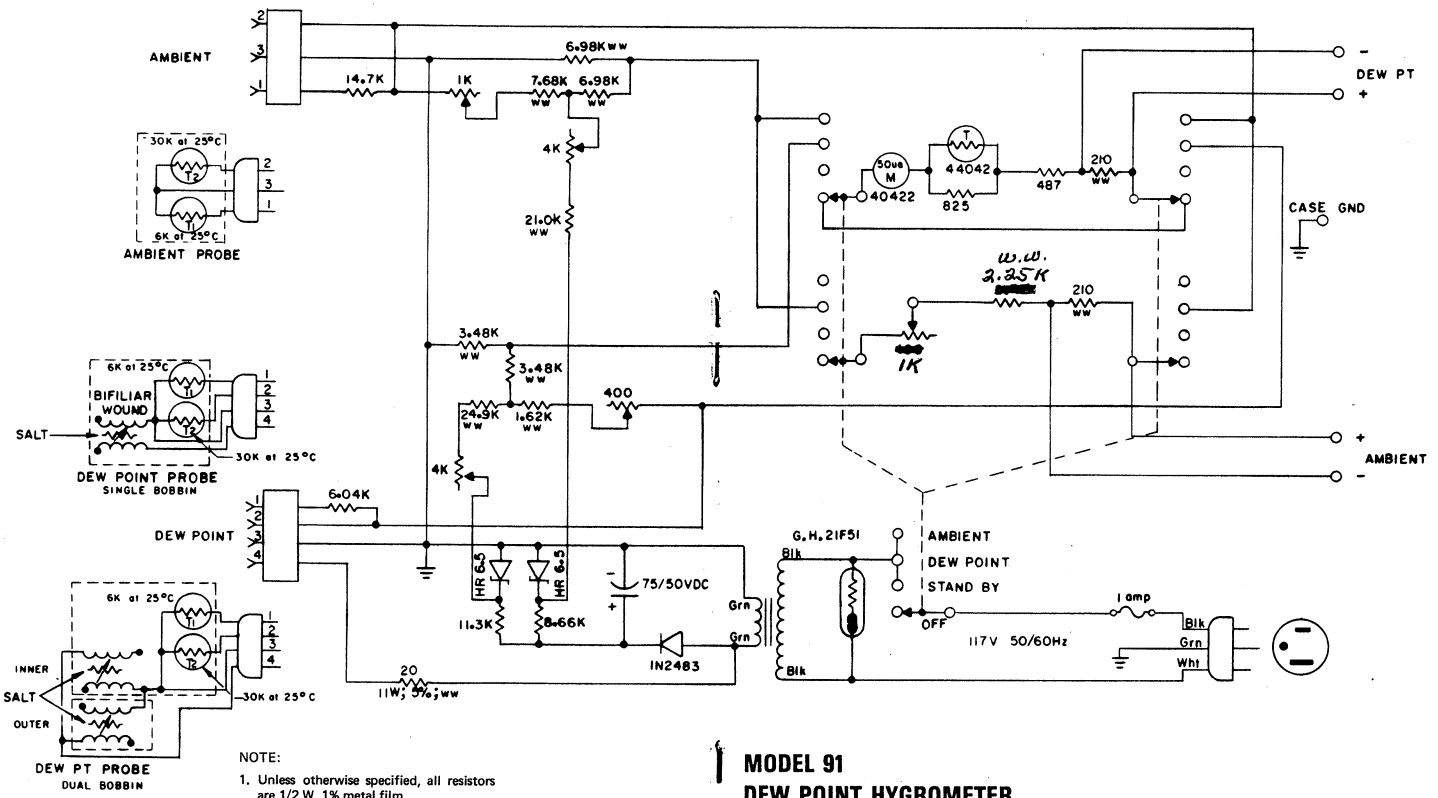
DEWPOINT CORRECTIONS FOR AMBIENT CONDITIONS

YSI interchangeable 9101 dew point probes are calibrated for maximum accuracy in still air under average conditions of dew point and ambient temperature. To improve the accuracy of measurements taken under extreme conditions of dew point and temperature the following correction values should be added to instrument dew point readings.

Excessively high or fluctuating ventilation rates reduce the 9101 probes accuracy. Airflow is acceptable if additional shielding of the probe does not significantly change the instruments reading.



4a



NOTE:

1. Unless otherwise specified, all resistors are 1/2 W, 1% metal film.
2. The values shown on the schematic may differ from those in the instrument; if so, either value can be used for replacement purposes.

MODEL 91
DEW POINT HYGROMETER

and 0 volts will appear when the instrument is reading the HIGHEST temperature. The signals appear as follows:

Front Panel SWITCH Position	Dew Point Terminals	Ambient Terminals
Dew Point	Dew Point	Ambient
Ambient	Ambient	Nothing

OPERATING TEMPERATURE

The instrument is designed to operate over the ambient temperature range of 0 to 50°C. However, as the ambient temperature moves away from the instrument calibrating temperature, 25°C, some errors occur. Typically they would be 1% of scale range at ±12°C from 25°C and 2% of range at ±25°C from 25°C.

TIME RESPONSE

Typically the sensor time response is 1°C/min. However, this may vary substantially due to the operating nature of the sensor. It is at all times, in real temperature, heated substantially higher than the indicated Dew Point temperature. Therefore time response will be affected by sensor ambient temperature. For example: Going from a low dew point low ambient to a moderate dew point high ambient will take less time than the inverse.

MEASUREMENT NOTES

The Heated Lithium Chloride Dew Point Sensor is subject to certain limitations which should be considered.

1. The nature of the sensor is such that it is always at a temperature substantially higher than its surroundings. Thus, it is subject to

errors arising from radiation, convection and forced ventilation. The YSI Model No. 9102 Probe is designed to eliminate these problems by surrounding the sensing bobbin with another bobbin, and should always be used in an application utilizing forced ventilation.

2. The YSI Model No. 9101 Probe may have errors of the order of 1°C in the region 35 to 42°C, due to convective heat loss especially when subjected to any forced ventilation.

3. *Most salts pass through several hydrate phases when changing from the anhydrous form to a saturated solution. Lithium Chloride has four hydrates marked by various temperature points. Those of interest occur at -12°C, +34°C and +41°C dew point.

4. As the bobbin passes through a point the hydrate form present may be either of two, and this possibility extends for some substantial distance beyond the phase change temperature.
   The effect of the preceding upon the YSI Model 91 System is the possibility of an error of the order of 1-1/2°C between 34 and 41°C.

5. The lower limit of relative humidity in which the sensor will function is 11%.

6. Care should be taken to avoid contaminates such as oil, other salts, etc., contacting the bobbin. They can cause large temperature errors.

*Wexler A. *Humidity and Moisture Measurement and Control* in Science and Industry, Vol I, 625.

BOBBIN CARE

In normal use the bobbin(s) on your probe should last many years with no maintenance. If, however, it becomes contaminated with dust, other salts, oil, etc., it must be cleaned or replaced.

If a bobbin(s) is to be cleaned, remove it from the probe body. (See Bobbin Replacement) Then any contaminant which can be removed by water can be cleaned away by repeated rinsing in distilled water (the entire bobbin may be submersed). If the contaminant is water soluble and has been absorbed by the bobbin wick, repeated rinsing and soaking in fresh water is necessary.

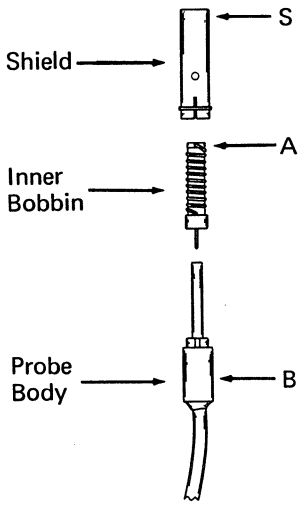
After rinsing, dry the wick by patting with paper towels or by placing in a drying oven. (65°C max.) Recharge the bobbin with a 15% by weight LiCl (Reagent grade) and water solution. Recharging is best accomplished by "painting" the LiCl solution on the wick with a common artists brush. The solution should be applied until the entire wick is wet. Excess should be removed by blotting with paper towels.

Return the bobbin to the probe body and plug the probe into the instrument. With the probe outer shield off, turn the instrument to STDBY and allow a 3 to 4 hour "warm up" period before returning the probe to service.

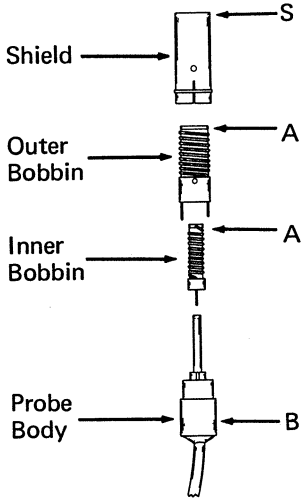
BOBBIN REPLACEMENT

If for any reason a bobbin must be removed from the probe body, it may be done quite simply.

Grasp the shield at point (S), the probe body at point (B), and pull the shield straight away from the probe body. Grasp the outer bobbin (YSI 9102 only) at point (A), the probe body at point (B), and pull the outer bobbin straight away from the probe body. Grasp the inner bobbin at point (A), the probe body at point (B), and pull the inner bobbin straight away from the probe body.



YSI 9101 PROBE



YSI 9102 PROBE

When re-assembling the probe, care should be taken to avoid bending or breaking the bobbin lead wires. Make sure *both* wires are started into their receptacles before pushing the bobbin into place.

REPLACEMENT PARTS AND ACCESSORIES

YSI Model 9101 Probe	YSI Model 9102 Probe
YSI 9122 Bobbin Assembly	YSI 9122 Inner Bobbin Assembly
YSI 9113 Shield	YSI 9123 Outer Bobbin Assembly
YSI 9126 Extension Lead 25'	YSI 9117 Shield
YSI 9127 Extension Lead 50'	

GUARANTEE

The YSI Model 91 Dew Point Hygrometer and Probes are unconditionally guaranteed for one year against defects in workmanship and components. Damage through accident, misuse, or tampering will be repaired at a nominal charge when the instrument is returned to the factory or to a YSI authorized dealer.

In communications regarding this instrument, please mention model and serial numbers.

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