If any failure occurs, the following steps should be taken:

1. Notify Ohmic Instruments Co. giving full details of the difficulty, and include the model, type, and serial numbers (where applicable). On receipt of this information, service data, or shipping instructions will be for-warded to you.

2. On receipt of shipping instructions, forward the instrument, transportation prepaid. Repairs will be made and the instrument returned, transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of Ohmic Instruments Co. instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original packing carton, or if it is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon delivery to purchaser. All material in the shipping container should be checked against the enclosed packing list. The manufacturer will not be respon-sible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact Ohmic Instruments.) Final claim and negotiations with the carrier must be completed by the cus-tomer.

Ohmic Instruments Company will be pleased to answer all application or use questions, which will enhance your use of this instrument. Please address your requests or correspondence to: Ohmic Instruments Com-pany, 508 August St., Easton, Maryland 21601, ATTN: Technical Support. Or call Ohmic Technical Support at 410-820-5111.

ohmic instruments co.

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ohmico

AIR-LINE MOISTURE MONITOR

Model AMM-10
& AMM-10L

OPERATING NOTES

U<*Enter*>   Upload stored data. Readings, including a time stamp, are transmitted in chronological order, one line corresponding to one scan of the sensors.

H<*Enter*>   Halt the uploading of data. This command will work only when uploading is in progress.

When halted, only two commands are accepted:

Q<*Enter*>   Terminate the uploading in progress and resume the measurement and logging functions. This command will work only following the "halt" command (**H**).

U<*Enter*>   Resume loading. This command will work only following the "halt" command (**H**).

4. The unit will not log when power is turned off.

LOGGING COMMANDS FOR LOGGER VERSION ONLY (AMM-10L)

1. When the unit is powered up, the computer's screen will display the following:

Mm/dd/yy hh:mm:ss   (RH%)   (Temp)   (Dew Point)   (Set Point)

2. A maximum of 2383 readings can be stored; however, once the memory logging space has been filled, a wrap feature of the memory storing will cause the oldest data to be overwritten. Thus, when the memory is full, the logger will hold a "sliding window" spanning 2383 readings.

Uploading the logged data can be done at any point. The stored readings are transmitted chronologically, each line of the display corresponding to one scan of the sensors. For a full logger memory of 2383 readings, uploading takes approximately three minutes. Note, however, that a slow scrolling speed of the terminal screen might stretch this interval to about four and a half minutes.

Uploading will not clear the logger memory; this makes repeated uploading of the same data possible. Data will be stored in the nonvolatile memory incorporated into the logger, without having power applied to the unit, for as long as ten years.

3. The following commands apply to the AMM-10L only:

S<*Enter*> Transmits current settings of parameters: C#, L#, N# (C is autotransmit data in seconds, L is logging rate in seconds, N is number of readings logged, 0 to 2383)

Ln<*Enter*> Set logging rate to "n" seconds ("n" is 3 to 32767). For n=0, 1, 2, logging is off.

TMM DD YY hh mm ss Set date and time for real time clock:
<*Enter*> MM = month (01--12)
DD = day (01--31)
YY = year (00--99)
hh = hours (00--23)
mm = minutes (00--59)
ss = seconds (00--59)

E9090<*Enter*> Clear stored data.

Contents

SPECIFICATIONS
AIR LINE MOISTURE MONITOR, MODEL AMM-10

Dew Point Range	-40 to +80°F (at 80°F dry bulb)
Dew Point Accuracy	4°F from –40 to +20°F (2°F above +20°F)
Relative Humidity Range	0 to 100% RH
Relative Humidity Accuracy	2% RH from 0 to 100% RH
Temperature Range	0-185°F
Temperature Accuracy	2°F
Temp. Comp. RH	Up to 160°F
Response Time	6 seconds for 63% step change
Display	3½ digit LCD, ½" character height
Alarm Range	-35 to +75°F DP (at 80°F dry bulb)
Remote Alarm	SPDT dry-contact relay 2 amp @ 115VAC
Analog Output	0-5 VDC & 4-20mA for Dew Point only
RS-232 Output Format	9600 baud, no parity, 8 data bits, 1 stop bit, Flow control Xon/Xoff, delimited ASCII text
Power Input	120 VAC; 50/60Hz
Fuse Ratings	Circuit board mounted: ½ amp Chassis mounted: 2 amp
Enclosure Dimensions	10" x 8" x 4" (H W D) steel NEMA
Weight	12 pounds
Sensor Probe Dimensions	½" NPT pipe fitting; extends into air line 1½" max.

RECALIBRATION

The AMM-10 is a microprocessor-based instrument. It has no user calibration adjustments. The unit can be certified to NIST traceable standards by returning it to Ohmic Instruments. Certification is valid for one year and is recommended on a yearly basis. Calibration consists of a computer based system to program a 9-point calibration curve which is stored in the unit's EEPROM. The calibration is referenced to a NIST traceable chilled mirror.

The AMM-10 and its accompanying sensor probe are calibrated as a system, due to slight variances between sensors. For this reason, the unit and its probe bear matching serial numbers and should be kept together if you have more than one set, to insure accuracy. When returning AMM-10's for service and calibration, be sure to include the corresponding probes.

INTRODUCTION

Ohmic Model AMM-10 (and **AMM-10L**, the time-stamp logging version) is a field-proven Dew Point Temperature monitoring and alarm system designed to meet the requirements for air-line moisture control of ANSI/ NFPA-99 Standard for Health Care Facilities. It will measure Dew Point Temperature from -40 to +80 degrees Fahrenheit, Relative Humidity from 0 to 100 percent, and Dry Bulb Temperature from 0 to 185°F, in still or flowing air or gas. The instrument is shipped with the alarm point preset to +39°F DP, in keeping with NFPA-99. However, the setpoint is fully adjustable over the entire measurement range. The units are intended to offer the user reliable and accurate systems that are simple to install and operate, and are virtually maintenance free.

Model AMM-10 is housed in a steel NEMA-12 rated enclosure intended for vertical mounting on a wall or equipment surface. The monitor features a 3-½ digit LCD readout with audible and visual alarms. A locking set-pot with "Push to Set" switch allows the alarm level to be set and locked against accidental mis-adjustment. Auxiliary contacts are included to connect to a remote alarm circuit if desired. Direct connection to a computer or serial printer is provided in the form of a 9-pin D-sub connector on the bottom of the unit.

The AMM-10 and AMM-10L are identical, except for the inclusion of a time-stamp logging function on the latter.

PRINCIPLE OF OPERATION

Model AMM-10 uses microprocessor-based electronics designed for use with Ohmic Polymer RH and NTC thermistor sensors. The basic system provides sensor excitation, direct analog to digital conversion in the microprocessor, psychrometric calculations to determine dew point (and compensate the relative humidity measurements for temperature variations), programmed setpoint comparison for alarm and relay output, analog and digital data outputs. The RH and temperature sensors determine local environmental conditions by attaining passive equilibrium with their surroundings. The RH sensor provides a DC voltage signal to an A/D input on the microprocessor, where it is conditioned, amplified, and then output in analog form to the display. The temperature signal is monitored in a similar fashion and is used for compensation of the RH measurement as well as for display. Dew point is then calculated from the measured parameters using psychrometric equations developed especially for the AMM-10. The dew point value is also compared to a setpoint value for the alarm.

COMPONENT FUNCTIONAL DESCRIPTION

Sensor / Probe
Model AMM-10 is designed for use with Ohmic's Polymer type humidity sensors. The basic humidity sensing element provides a DC voltage output varying in proportion to the amount of moisture in the surrounding environment. Temperature sensing is performed via an NTC thermistor which varies its resistance inversely proportional to the changing temperature in the surrounding environment. The standard probe houses both sensing elements in a ½" NPT stainless steel pipe fitting with a 100 x 100 mesh screen. It has a maximum working pressure of 175 psi.

Display
3-½ digit Liquid Crystal Display module with 0.5" character height.

Display Selector Switch
Three-position rotary switch selects process variable for display. When in the Dew Point position, the alarm setpoint value will be displayed when the setpoint push-button is depressed.

Dew Point Alarm Setpoint Push-button
Depressing the "Push To Set" setpoint push-button causes the LCD display to indicate the dew point alarm setpoint level. This setpoint can be displayed only when the display selector switch is in the dew point position.

Dew Point Alarm Setpoint Adjustment
Lockable adjustment to change the dew point alarm setpoint to any value within the normal operating range. The dew point alarm "Push to Set" push-button should always be fully depressed while making any setpoint adjustments.

Visual Alarm Indicator
Red Light-Emitting-Diode (LED) comes on when the setpoint level is exceeded.

Audible Alarm Annunciator
90-dB Piezo buzzer type annunciator (Sonalert) sounds when the setpoint level is exceeded.

Note: Before you close HyperTerminal, you might want to save your settings so you won't have to configure the program every time you use it with the AMM-10. Go to the menu bar, select File, then select Save. Then, next time you start HyperTerminal, simply cancel out of the New Connection window, then select Open from the File menu, click on the name you gave your settings, and click on Open. You can now use HyperTerminal to communicate without reconfiguring. For more convenience, you may want to drag the desired name from the Open dialog box to your desktop using the mouse; this will place an icon there that you can double-click to start your session.

Communications Commands

All commands are in upper-case characters (set your **CAPS LOCK** on). *n* indicates where a number must be entered.

C*n*<*Enter*>   Set auto data transmit interval for displayed readings to *n* seconds (*n* is an integer from 3 to 32767). For *n*=0, 1, and 2, automatic transmission is turned off. Default value is *n*=3 seconds.

D<*Enter*>   Transmits the latest set of readings.

S<*Enter*>   Transmit current settings of parameters.

Note: If the computer does not display what you are typing, go to the menu bar in HyperTerminal, click on File, select Properties, click on the Settings tab, click on the ASCII Setup button, and checkmark the "Echo typed characters locally" box.

SENSOR PRECAUTIONS

- Never connect the AMM-10 sensor probe to any other device; the signal conditioning circuitry in the AMM-10 is specific to the sensor. *Connecting the probe to other circuits or meters (including multimeters) can cause damage to the sensor.*

- The probe should never be used without its protective screen. Never sample the air of gases with oil mist or separated water. Exposure to corrosive or reactive chemicals should be avoided.

RS-232 INTERFACE– Connecting the AMM-10 to your Computer

The AMM-10 can be plugged into any 9-pin PC serial (COM) port using a 9-pin serial cable, available from most computer stores. If your computer has a 25-pin COM port, 25-pin to 9-pin serial adapters are also available from most computer stores and can be used with the cable.

Some computers use COM ports which are not fully implemented in that not all of the pins are used. Additionally, some serial adapters are also not fully implemented. If the AMM-10 is connected to a partially implemented serial port, functions may be erratic or the unit may fail to communicate. Please consult the owner's manual for your computer if difficulties are encountered.

Communications Program

The AMM-10 transmits data via its RS-232 output as soon as it is powered up. In order to receive the data, a communications program must be running on your computer. In Windows 95 and later this will be *HyperTerminal* (in older versions of Windows this will be *Windows Terminal)*.

To configure HyperTerminal to communicate with the AMM-10, start the program; you will get a box asking for a name for the new connection. Type in a name, such as AMM-10, select an icon and click OK. In the next window that comes up, go to the drop-down box and select the COM port you wish to use. Click on OK. You will then see a window where you can configure your connection. Select these items in the drop-down boxes: For Bits per Second, select 9600. For Data Bits, select 8. For Parity, select None. For Stop bits, select 1. For Flow Control, select Xon/Xoff. Now click on OK.

HyperTerminal is now ready to receive data from the AMM-10. Make sure they are connected via the serial cable, and power up the AMM-10. Introductory text will be displayed indicating the version of the imbedded program. The computer's screen will then display four numbers: Relative Humidity, Dry Bulb Temperature, Dew Point, and Set Point. New readings will be displayed every few seconds.

Silence Push Button
When the AMM-10 is in alarm mode, pressing this button will silence the audible alarm (Sonalert). The Sonalert will automatically reset to sound with the next alarm occurrence. Silencing the audible alarm will not affect the visual alarm indicator (LED).

7-Pin Sensor Input Connector
This connector accepts the 7-pin male connector from the sensor cable.

9-Pin RS-232 Interface Connector
Allows connection to any computer serial port or serial line printer. Instructions for setting up your computer to communicate with the AMM-10 are on page 10.

Analog Output / Remote Alarm Connector
7-terminal barrier strip connector supplies analog outputs in DC volts or current loop. The analog output provides the Dew Point measurement in analog form for chart recorders or other instrumentation, in both 0 to 5 VDC and 4-20 mA form, from -40 to +80°F. The response is linear with 0-volts & 4-mA equal to -40 degrees and 5-volts & 20-mA equal to +80 degrees. The barrier strip also provides a 2-amp rated contact closure when the dew point rises above or falls below the setpoint value. The connector pinout is clearly labeled in the unit.

Fuse
The AMM-10 is protected by a 2-amp, 250 volt 3AG fast-blow fuse. We do not recommend substituting higher-value or slow-blow fuses, as this can cause circuit damage and void the warranty.

Special Order
For a nominal fee, the AMM-10 can be retrofitted by Ohmic with either or both of these options:

24 Volt: The AMM-10 can be modified so it will operate from a 24 volt DC source instead of AC.

Time Stamp Datalogging: Adds time stamp and logging functions to the unit's communication with your computer. This is standard on the AMM-10L.

OPERATING INSTRUCTIONS

1. Mount the AMM-10 enclosure and the dew point probe in an appropriate location for sensing the moisture level in the controlled environment. Avoid wet or dusty areas if possible since these conditions can shorten the usable life of the sensor.

2. Plug the male 7-pin connector on the dew point probe into the Sensor Input connector on the bottom of the AMM-10. This connector has a twist-to-lock retainer which provides a secure connection.

3. Apply power by having a qualified electrician connect the AMM-10 in accordance with local electrical codes. The 120 VAC line (fused at 2-amps) should be connected to the correct terminals on the control board as indicated on the circuit board label. Alternatively, if the line cord option was specified, plug the power cord into a 120-volt, 60 Hz grounded receptacle.

4. Select %R.H. on the display selector switch. The display should indicate the ambient humidity. To verify system operation, blow lightly on the sensor. This will cause a humidity increase.

5. Select Dew Point on the display selector switch. The display should indicate a dew point value corresponding to the ambient humidity and dry bulb temperature (derived via psychrometric equation). The alarm will activate whenever the dew point rises above the setpoint.

6. Check the dew point setpoint by depressing the "Push To Set" pushbutton on the front panel. The display should show the factory preset value of 39°F. The dew point alarm setpoint may be readjusted by turning the setpoint adjustment on the front panel until the display indicates the desired control value. *Note:* The display selector switch must be in the Dew Point position in order for the display to show the setpoint.

7. Change the display selector switch to Dry Bulb Temperature. The ambient dry bulb temperature should be displayed.

8. If you are using a remote alarm circuit, connect it to the COM, NO, and NC terminals on the barrier strip inside the unit.

9. If you are using external monitoring equipment, connect them to the appropriate barrier strip terminals inside the unit. For analog output values refer to the output table on Page 9.

F-DP	V-out	I-out	F-DP	V-out	I-out	F-DP	V-out	I-out	F-DP	V-out	I-out
-45	0.000	4.000	-11	1.259	8.030	23	2.519	12.059	57	3.778	16.089
-44	0.037	4.119	-10	1.296	8.148	24	2.556	12.178	58	3.815	16.207
-43	0.074	4.237	-9	1.333	8.267	25	2.593	12.296	59	3.852	16.326
-42	0.111	4.356	-8	1.370	8.385	26	2.630	12.415	60	3.889	16.444
-41	0.148	4.474	-7	1.407	8.504	27	2.667	12.533	61	3.926	16.563
-40	0.185	4.593	-6	1.444	8.622	28	2.704	12.652	62	3.963	16.681
-39	0.222	4.711	-5	1.481	8.741	29	2.741	12.770	63	4.000	16.800
-38	0.259	4.830	-4	1.519	8.859	30	2.778	12.889	64	4.037	16.919
-37	0.296	4.948	-3	1.556	8.978	31	2.815	13.007	65	4.074	17.037
-36	0.333	5.067	-2	1.593	9.096	32	2.852	13.126	66	4.111	17.156
-35	0.370	5.185	-1	1.630	9.215	33	2.889	13.244	67	4.148	17.274
-34	0.407	5.304	0	1.667	9.333	34	2.926	13.363	68	4.185	17.393
-33	0.444	5.422	1	1.704	9.452	35	2.963	13.481	69	4.222	17.511
-32	0.481	5.541	2	1.741	9.570	36	3.000	13.600	70	4.259	17.630
-31	0.519	5.659	3	1.778	9.689	37	3.037	13.719	71	4.296	17.748
-30	0.556	5.778	4	1.815	9.807	38	3.074	13.837	72	4.333	17.867
-29	0.593	5.896	5	1.852	9.926	39	3.111	13.956	73	4.370	17.985
-28	0.630	6.015	6	1.889	10.044	40	3.148	14.074	74	4.407	18.104
-27	0.667	6.133	7	1.926	10.163	41	3.185	14.193	75	4.444	18.222
-26	0.704	6.252	8	1.963	10.281	42	3.222	14.311	76	4.481	18.341
-25	0.741	6.370	9	2.000	10.400	43	3.259	14.430	77	4.519	18.459
-24	0.778	6.489	10	2.037	10.519	44	3.296	14.548	78	4.556	18.578
-23	0.815	6.607	11	2.074	10.637	45	3.333	14.667	79	4.593	18.696
-22	0.852	6.726	12	2.111	10.756	46	3.370	14.785	80	4.630	18.815
-21	0.889	6.844	13	2.148	10.874	47	3.407	14.904	81	4.667	18.933
-20	0.926	6.963	14	2.185	10.993	48	3.444	15.022	82	4.704	19.052
-19	0.963	7.081	15	2.222	11.111	49	3.481	15.141	83	4.741	19.170
-18	1.000	7.200	16	2.259	11.230	50	3.519	15.259	84	4.778	19.289
-17	1.037	7.319	17	2.296	11.348	51	3.556	15.378	85	4.815	19.407
-16	1.074	7.437	18	2.333	11.467	52	3.593	15.496	86	4.852	19.526
-15	1.111	7.556	19	2.370	11.585	53	3.630	15.615	87	4.889	19.644
-14	1.148	7.674	20	2.407	11.704	54	3.667	15.733	88	4.926	19.763
-13	1.185	7.793	21	2.444	11.822	55	3.704	15.852	89	4.963	19.881
-12	1.222	7.911	22	2.481	11.941	56	3.741	15.970	90	5.000	20.000

Analog Output Table