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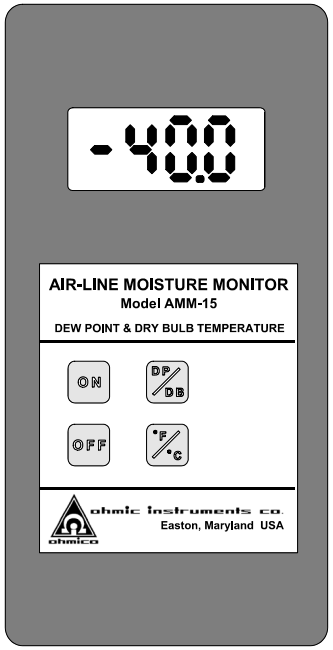
AIR-LINE MOISTURE MONITOR

Model AMM-15



OPERATING NOTES

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

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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 responsible 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 customer.

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 Company, 508 August St., Easton, Maryland 21601, ATTN: Technical Support. Or call Ohmic Technical Support at 410-820-5111.

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GENERAL SPECIFICATIONS
AIR-LINE MOISTURE MONITOR - Model AMM-15

ELECTRICAL
Water Vapor Sensor: HC-610 (Thin Film Polymer)
Temperature Sensor: 10K NTC Thermistor
Dewpoint Range: -40 to +80 °F
Dewpoint Accuracy: ±4 °F from -40 to +20; ±2 °F from +20 to +80
Dry-Bulb Range: 0 to 140 °F
Dry-Bulb Accuracy: ±1 °F
Average Response Time: 10 Seconds / 63% Step
Max. Inlet Temperature: 140 °F 550°F with Heat Sink Tubing
Maximum Line Pressure: 120 PSIG
Display: 3-1/2 Digit LCD, 0.5" Character Height
Power: 4-AA Alkaline Batteries
Microprocessor: Philips 80C552
Clock Rate: 3.6864 MHz

COMMUNICATIONS
Type: RS-232C
Rate: 9600 Baud
Parity: None
Data Bits: 8
Stop Bits: 1
Flow Control: Xon-Xoff
Format: ASCII
Connector: DB9 Female

PHYSICAL
Housing: High Impact ABS Plastic
Size: 8.25” x 4.0” x 1.6” (LWH)
Weight: 24 Ounces

Contents

* Storage recommendations:

To prevent damage to the unit or changes to the sensor elements the unit should be stored at 0 to 125 Deg. F. at less than 90 % RH. Long term storage of the AMM-15 out of these conditions is not recommended by Ohmic Instruments Co..

AMM-15 ANALOG OUTPUT TABLE

DP	Vout (mV)	DP	Vout (mV)	DP	Vout (mV)	DP	Vout (mV)
-55	0.00	-17	253.33	21	506.67	59	760.00
-54	6.67	-16	260.00	22	513.33	60	766.67
-53	13.33	-15	266.67	23	520.00	61	773.33
-52	20.00	-14	273.33	24	526.67	62	780.00
-51	26.67	-13	280.00	25	533.33	63	786.67
-50	33.33	-12	286.67	26	540.00	64	793.33
-49	40.00	-11	293.33	27	546.67	65	800.00
-48	46.67	-10	300.00	28	553.33	66	806.67
-47	53.33	-9	306.67	29	560.00	67	813.33
-46	60.00	-8	313.33	30	566.67	68	820.00
-45	66.67	-7	320.00	31	573.33	69	826.67
-44	73.33	-6	326.67	32	580.00	70	833.33
-43	80.00	-5	333.33	33	586.67	71	840.00
-42	86.67	-4	340.00	34	593.33	72	846.67
-41	93.33	-3	346.67	35	600.00	73	853.33
-40	100.00	-2	353.33	36	606.67	74	860.00
-39	106.67	-1	360.00	37	613.33	75	866.67
-38	113.33	0	366.67	38	620.00	76	873.33
-37	120.00	1	373.33	39	626.67	77	880.00
-36	126.67	2	380.00	40	633.33	78	886.67
-35	133.33	3	386.67	41	640.00	79	893.33
-34	140.00	4	393.33	42	646.67	80	900.00
-33	146.67	5	400.00	43	653.33	81	906.67
-32	153.33	6	406.67	44	660.00	82	913.33
-31	160.00	7	413.33	45	666.67	83	920.00
-30	166.67	8	420.00	46	673.33	84	926.67
-29	173.33	9	426.67	47	680.00	85	933.33
-28	180.00	10	433.33	48	686.67	86	940.00
-27	186.67	11	440.00	49	693.33	87	946.67
-26	193.33	12	446.67	50	700.00	88	953.33
-25	200.00	13	453.33	51	706.67	89	960.00
-24	206.67	14	460.00	52	713.33	90	966.67
-23	213.33	15	466.67	53	720.00	91	973.33
-22	220.00	16	473.33	54	726.67	92	980.00
-21	226.67	17	480.00	55	733.33	93	986.67
-20	233.33	18	486.67	56	740.00	94	993.33
-19	240.00	19	493.33	57	746.67	95	1000.00
-18	246.67	20	500.00	58	753.33		

NOTE: Output is calibrated only in the range of –40°F to +80°F and –40°C to +27°C.

NOTES ON COMMUNICATION AND COMMAND STRUCTURE

If the computer screen 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.

1. All alpha characters are in UPPER CASE (turn on your Caps Lock key).

2. All transmissions from the AMM-15 to the host computer end with a Carriage Return (CR) followed by a Line Feed (LF), except for uploads, which end with just a (CR).

3. An invalid command, followed by pressing the *Enter* key, generates the transmission of a "?" character.

4. The data transmission format is:

   (TAB)##.#,(TAB)###.#(CR)(LF)

where the numbers (#) correspond to Dew Point and Temperature respectively.

Each scan of the sensors is preceded by a time stamp in the form:

MM/DD/YY hh:mm:ss

For example, 04/10/04 16:30:05 is April 10, 2004 at 4:30:05 PM.

5. The time interval between commands should be at least 1 second.

6. During the execution of a command, the scanning of the sensors will be suspended. This fact should be taken into consideration, mainly in connection with the uploading command.

REPLACEMENT PARTS

Inline Filter .....#5355
¼" OD Polypropylene Tubing (6-foot)..... ST-AMM-15

If you need additional help for your particular application, contact Ohmic at (410) 820-5111, or e-mail us at ohmic@ohmicinstruments.com.

INTRODUCTION

Ohmic Model AMM-15 Air-line Moisture Monitor is a portable hand-held instrument designed to accurately monitor the dew point and dry-bulb temperatures in compressed air lines as well as low pressure systems. The unit is Microprocessor-based and is powered by four size-AA alkaline batteries or by the enclosed AC Adapter. Four front-panel keypad switches provide power on, power off, choice of Dewpoint / dry-bulb temperature display, and choice of °F / °C units. The display is a 3-½ digit LCD with 0.5" digit height. The AMM-15 determines the dew point temperature from measurements of humidity and dry-bulb temperature of the sample air from the system under test. Dew point is then calculated from these measurements using pre-programmed psychrometric equations and is fully compensated for variations in sample dry-bulb temperature. Connection to system is accomplished via plastic quick disconnects provided with the unit. Model AMM-15 is an ideal choice for personnel involved in operating, maintaining, or inspecting compressed air systems in medical, commercial, and industrial facilities.

Features of the AMM-15 include:

- Dew point measurement range from -40 to +80 °F
- Durable case with sealed membrane keypad and 3-½ digit display
- Sample compressed air or low pressure systems
- Analog and RS-232 outputs for data transmission
- 32-Kbytes Data Logger memory

SAMPLE MODES / CONNECTING INFORMATION

The AMM-15 is designed for use with both compressed and low pressure air systems, and can accurately measure conditions in air lines operating at pressures from 0 to 120 psi. Two ports are provided for flexibility: free flow mode can be used when the pressure or flow-rate is very low; alternatively, for systems with line pressures above 5 psi, an 0.008" orifice is provided to maintain controlled flow rates for highest accuracy.

Monitoring Plastic Resin Dryers, Ovens, and Low Pressure Vessels
In low pressure applications (pressure less than 5 psig), use the free-flow mode. This is done by connecting the inlet port to the sample air source using the quick connect fitting provided, making sure that the filter is connected between the unit and the sampled air source. A suggested hook-up diagram of this is on the following page. If there is sufficient pressure and flow, the second sample port can be exhausted to ambient or reconnected to the sample source at a lower pressure point, providing closed-loop monitoring. If necessary where the source pressure is insufficient to provide positive flow, a vacuum pump can be connected to the second sample port to help draw a sample.

Monitoring Compressed Air or Pressurized Vessels
In compressed air applications (above 5 psi), the dew point measurements are made at line, rather than atmospheric pressure, eliminating the need to calculate pressure dew points. The air is vented to ambient through a back-pressure orifice installed on the exhaust. Install the exhaust orifice, provided with the AMM-15, in the outlet port. The 0.008" orifice restricts the exhaust flow with a negligible pressure loss to maintain controlled flow rates for highest accuracy. Connect the inlet port to the air source following the diagram on the next page. **Be careful not to connect the AMM-15 to line pressure in free-flow mode; the resulting high flow rate will damage the internal sensors.**

Note on High Temperature Applications
For temperatures up to 140°F, the poly tubing supplied with the AMM-15 is sufficient. Air sources above 140°F and up to 550°F can safely be measured using a 6-foot length of ¼" O.D. copper tubing to dissipate the excess heat. Cooling the sample will not change the dew point, but will protect the AMM-15 from damage.

SUMMARY OF COMPUTER COMMANDS

The following is a list of commands accepted by the AMM-15. Make sure you read through the notes on Page 10 before attempting to change any of the settings. **Each command should be followed by pressing the *Enter* key.**

C	Toggles display of readings On / Off. Logging always comes on when the unit is powered up using the keypad ON button.
S	Transmit current settings of parameters.
SC	Change computer display to Celsius.
SF	Change computer display to Fahrenheit.
TMM DD YY hh mm ss	Set date and time for real time clock: 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	Clear stored data.
U	Upload stored data. Readings, including a time stamp, are transmitted in chronological order, one line corresponding to one scan of the sensors.
H	Halt the uploading of data. This command can be used only when uploading is in progress.

When halted, only two commands are accepted:

Q	Terminate the uploading in progress and resume the measurement and logging functions. This command can be used only following the Halt command (**H**).
U	Resume uploading data. This command can be used only following the Halt command (**H**).

See the note on the next page if the computer does not display what you are typing.

LOGGING AND DATA UPLOADING

The AMM-15 can be set to log data at four fixed intervals of 5, 10, 30, and 60 seconds. The factory preset default is 60 seconds, but this can be changed using the DIP switch and chart below.

A maximum of 2860 Dew Point and Temperature readings can be stored. However, once the memory logging space has been filled, a wrap feature of the memory storing causes the oldest data to be overwritten. Thus, when the memory is full, the logger will hold a "sliding window" spanning the 2860 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 2860 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.

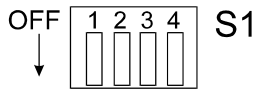
Uploading will not clear the logger memory, which makes repeated uploading of the same data possible. Data will be stored in the nonvolatile memory incorporated into the AMM-15, without having power applied to the unit, for as long as ten years.

CHANGING SETTINGS USING THE INTERIOR DIP SWITCH

S1 is a 4-pole DIP switch that can be accessed by removing the 4 screws from the back of the unit and carefully opening the case. When reassembling the AMM-15 be careful not to pinch any wires.

The log rate and baud rate can be adjusted using switches 1, 2, and 3.

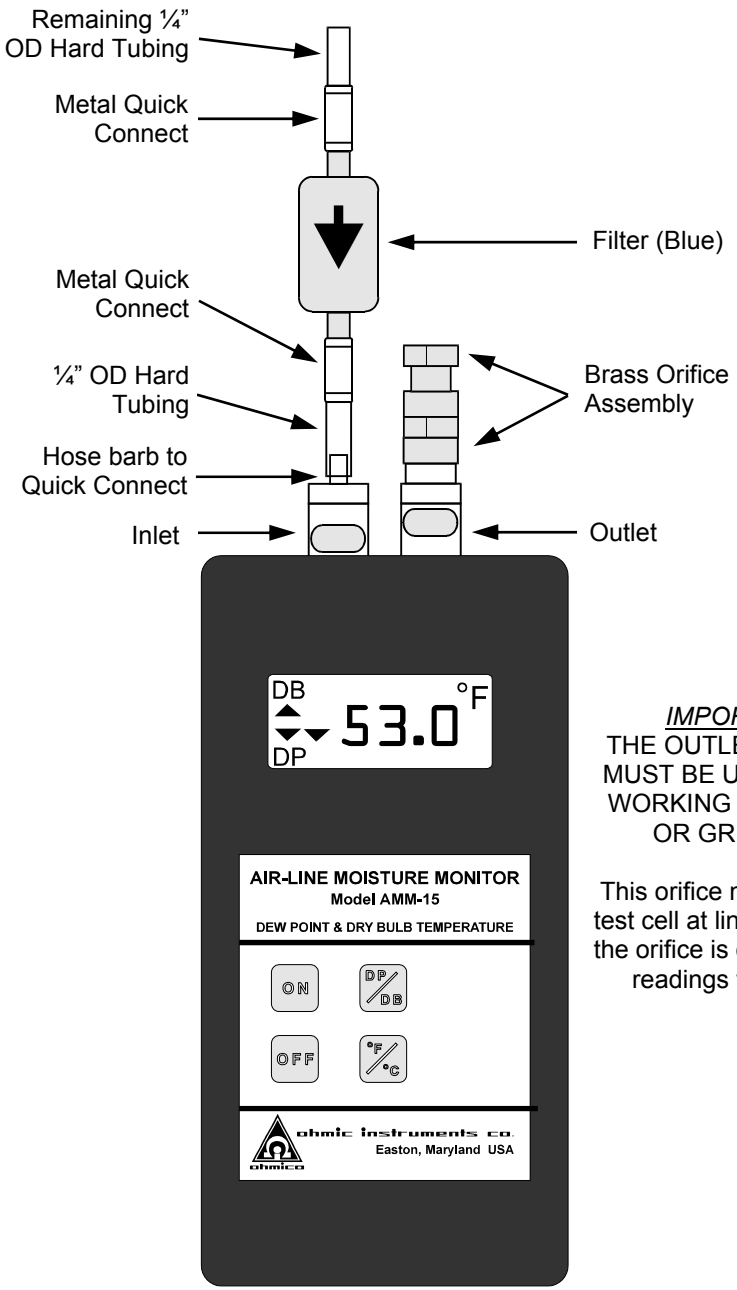
Caution: Switch #4 locks the calibration points for the AMM-15 and should be left in the ON position.



LOG RATE			BAUD RATE	LOCKOUT
sec.	1	2	3	4
60	OFF	OFF	9600 = OFF 1200 = ON	UNLOCKED = OFF LOCKED = ON
30	OFF	ON		
10	ON	OFF		
5	ON	ON		

Each AMM-15 ships with DIP switches 1, 2, and 3 off, and 4 on.

AMM-15 CONNECTIONS



IMPORTANT
THE OUTLET ORIFICE MUST BE USED WHEN WORKING WITH 5 PSI OR GREATER.

This orifice maintains the test cell at line pressure; if the orifice is omitted, false readings will result.

OPERATING INSTRUCTIONS

1. Make sure the alkaline batteries have sufficient power. The display will show the low battery symbol if the batteries are inadequate. If the instrument has not been used for a period of time, the batteries should be checked and replaced if necessary. If desired, the AMM-15 can be operated from the AC Adapter (it does not charge the batteries). As with all such equipment, if the unit is not to be used for an extended period, the batteries should be removed.

2. Purge the air line to be tested of any water, oil, or other foreign matter. The sensors are susceptible to contamination and damage from impurities such as water, oil, dust, chemicals, etc. **THE PROVIDED FILTER MUST BE BETWEEN THE AMM-15 AND THE SYSTEM BEING SAMPLED FROM. FAILURE TO USE THE FILTER VOIDS THE WARRANTY. OHMIC INSTRUMENTS IS NOT RESPONSIBLE FOR MISUSE OR NEGLECT OF THE UNIT.**

3. Connect the AMM-15 to the air line following the recommendations on the Sample Modes / Connecting Information page. [AIR LINE PRESSURE IS NOT TO EXCEED 120 PSI]

4. Press the ON button. The AMM-15 always displays Dewpoint on power up. The DP / DB selector button will change the displayed parameter from Dewpoint to Dry Bulb Temperature. The display will show a "down" arrow when displaying Dewpoint and an "up" arrow when displaying Dry Bulb Temperature. The °F / °C selector button will change the displayed parameter from degrees Fahrenheit to degrees Celsius.

5. Allow sufficient time for the readings to stabilize. Normal stabilization will occur within 1 to 1-½ minutes. Very low readings, less than -10°F DP, will take up to 10 or 15 minutes for stabilization.

Analog Output
The AMM-15 provides an analog output of 0-1 VDC (from –55 to +95°F Dew Point). Use the enclosed 2-wire plug adapter, and connect a voltmeter to the wires: Red/white to positive (+) and black/white to negative (-). Plug the adapter into the jack marked Analog Out, and see the table on Page 13 for values.

RS-232 INTERFACE– Connecting the AMM-15 to your Computer

Connecting to a serial port The AMM-15 can be plugged into any 9-pin PC serial (COM) port using the enclosed adapter cable. If your computer has a 25-pin COM port, 25-pin to 9-pin serial adapters are available from most computer stores and can be used with the adapter cable [Serial data is transmitted using Pin 5 (ground), Pin 3 (transmit), and Pin 2 (receive)]. Some computer COM ports and serial adapters are not fully implemented (not all pins are used). If the AMM-15 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 this occurs. Set up HyperTerminal as described next in Communications Programs.

Connecting to a USB port If your computer has USB ports you can get an optional RS-232 to USB adapter from Ohmic. Ohmic recommends using an RS-232 to USB adapter only with Windows XP© and Windows Vista©. Connect the AMM-15 using the RS-232 adapter and RS-232 to USB adapter. Turn on your computer. When your computer recognizes the device click OK and follow the instructions for installing the driver software. Set up HyperTerminal as described next in Communications Programs.

Communications Programs
The AMM-15 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*. To configure HyperTerminal to communicate with the AMM-15, start the program; you will get a box asking for a name for the new connection. Type in a name, such as AMM-15, 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-15. Make sure they are connected via the adapter cable, and power up the AMM-15. Real-time data is transmitted every few seconds, as shown below:

Date	Time	Dew Point	Temperature
mm/dd/yy,	hh/mm/ss,	xx.x,	xxx.x

* If the readings are not displayed, turn AMM-15 off, disconnect HyperTerminal by clicking on the Phone icon in the task bar. Go to File/Properties. In this box change the "Connect using:" box to another COM port and try again. Once you get a working display remember to save those settings as described below.

To save your settings: 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.