



# MODEL RHB-CAC1

Compressed Air Dew Point Monitor

## OPERATOR'S MANUAL



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## 1.0 GENERAL DESCRIPTION

The Model RHB-CAC1 is a chilled mirror based hygrometer designed especially to monitor the dew point in compressed air systems.

It is an integrated system including a microprocessor-based instrument, a chilled mirror dew point sensor, a sample flow meter and valve, and associated tubing and fittings.

The wall mount enclosure is easily mounted to any vertical surface.

The Instrument includes:

- An eight-digit, alphanumeric, LED display to report the dew point and system status.
- Periodic sensor balance check.
- Programmable Alarm Set Point with visual, audible, and contact closure alarm indications.
- An SPDT (Form C) Alarm Relay.
- A 4 to 20mA analog output.

## 2.0 INSTALLATION

### 2.1 MOUNTING

The RHB-CAC1 can be installed on any flat vertical surface with four ¼ inch screws.

See Figure 2-1 for dimensional information.

### 2.2 WIRING CONNECTIONS

The RHB-CAC1 is designed to operate on AC voltages of 90 to 260 VAC with a maximum power requirement of 40 Watts. The power entrance hole, located on the bottom of the enclosure, is designed to accept a standard conduit, clamp type fitting or a compression type fitting (supplied). The power line connections to the instrument are made using pigtail leads and wire nuts.

Connect the power leads as follows:

1. Remove the three thumbscrews and the access cover as shown in Figure 2-2
2. Pull the three wires, black, white and green out of the wire box as shown in Figure 2-3.
3. Insert the power line wires into the bottom of the enclosure and feed them up through the wire box and out the access opening. Strip the wire ends back about ½". Using the three wire nuts, connect the wires black to black, white to white and green to green. Tighten the wire nuts securely, making sure there are no exposed wires.
4. Push the wires down into the wire box.

### 2.3 SAMPLE CONNECTIONS

The sample may be brought to the instrument with ¼" copper, stainless steel, or plastic tubing and terminated in a ¼" female fitting.

Connect the sample supply line to the ¼" tubing fitting located on the top of the enclosure (Figure 2.2).

**NOTE:** The maximum inlet pressure is 150 PSIG.

## 2.4 ALARM RELAY CONNECTIONS

When the programmed Alarm Set Point is exceeded, the alarm relay will be energized. Before connecting any device to the Alarm Relay contacts, check the contact ratings in the Specifications section.

1. Remove the Access Panel as in Figure 2-2.
2. Referring to Figure 2-3, feed the wires to be connected to the relay through the “signals out” fitting on the bottom of the enclosure and up to the PCB connector, marked P2, “ALARM RELAY”.

NOTE: To connect a wire to the terminal: loosen the screw, insert the wire in the opening, and tighten the screw.

3. Connect one of the signal wires to the CA (Center Arm) and the other wire to either the NO (Normally Open) or NC (Normally Closed) terminal.
4. Replace the Access Cover.

## 2.5 ANALOG OUTPUT CONNECTIONS

1. Remove the Access Panel as in Figure 2-2.
2. Referring to Figure 2-3, feed the wires to be connected to the analog output through the ‘signals out’ fitting on the bottom of the enclosure and up to the PCB connector, P1, “4-20mA out”.

NOTE: To connect a wire to the terminal: loosen the screw, insert the wire in the opening, and tighten the screw.

3. Connect the high signal wire to the “+” terminal and the low side to the “-“ terminal.
4. Replace the Access Cover.

## 2.6 RS232 SERIAL (Optional)

1. For hygrometers equipped with optional RS232 only. The RS232 is 2 wire, Simplex, RS232 serial output, data is transmitted at an interval of 1/sec, and is space delimited. The BAUD rate is fixed at 19.2kbps. The protocol is N81 (No Parity, 8 data bits, 1 stop bit). The parameter sequence is “dew point ABC status.”  
(example: "xx.xC(or F)"" "ABC on")
2. For RS232 output connect to P11-1 for LO(-) and P11-2 for HI(+) located on the small Pressure X-Ducer input/ Analog output/ RS232 PCB which is mounted parallel to the main PCB.

FIGURE 2-1 MOUNTING

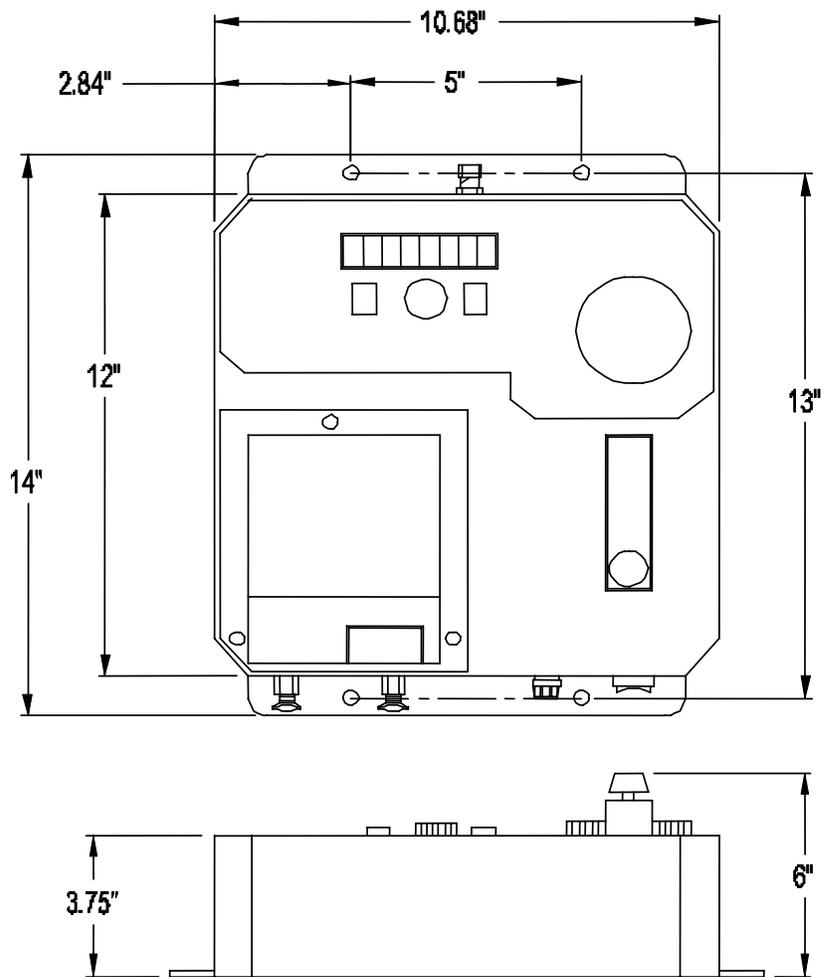


FIGURE 2-2 ACCESS PANEL REMOVAL  
FRONT VIEW

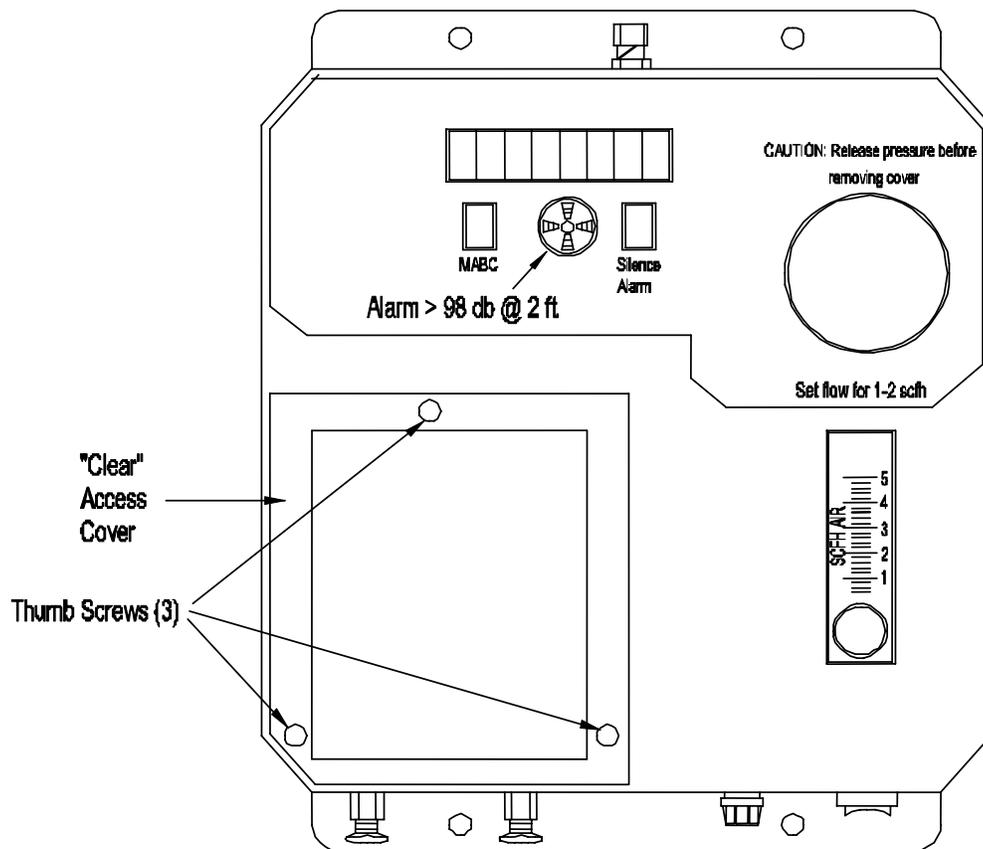
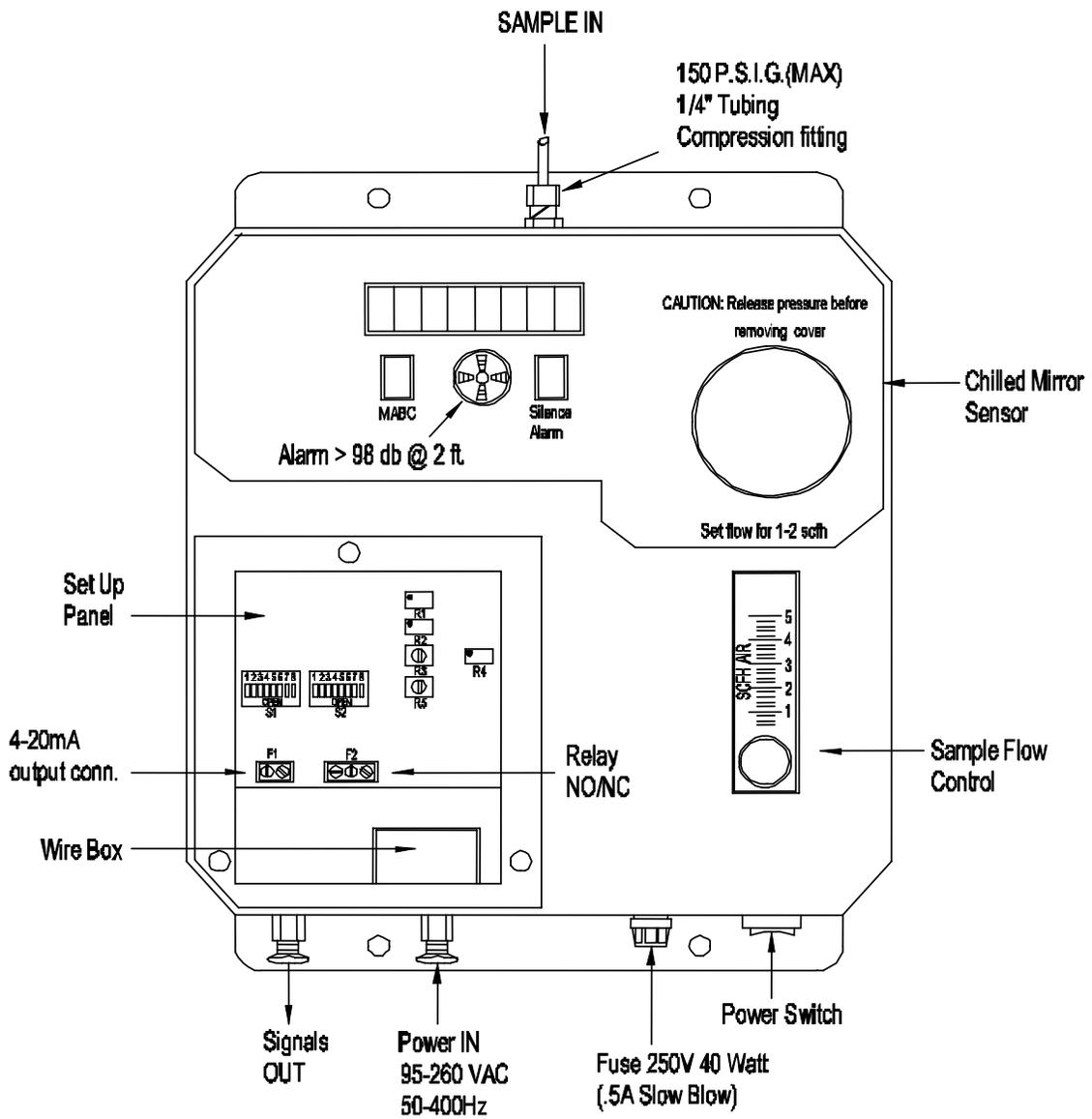


FIGURE 2-3 WIRING CONNECTIONS  
FRONT VIEW



INSTALLATION & WIRING

### 3.0 FUNCTIONAL DESCRIPTION

The front panel of the RHB-CAC1 consists of an LED Display, an audible alarm, two push-button switches, and a sample flow meter with valve.

#### 3.1 Display

The eight character alphanumeric LED display is used to display dew point data and status messages.

Dew point data is displayed as “DP 34.8 F”, with the units in degrees C or F.  
(See Set-Up section)

When a status message is necessary, the display will alternate between the data and the message at about 2 second intervals.

The possible status messages and their meanings are:

- **“ABC CYCL”** : Indicates that an Automatic Balance Cycle is in progress.  
During an ABC Cycle:  
The mirror is heated above the ambient temperature for a period of 1 to 3 minutes as determined by the last measured dew point.  
After sufficient time has elapsed to ensure that the mirror is dry, the reflected light level of the mirror is measured and if necessary, adjusted to the reference level.  
After the adjustment is made, the instrument will begin cooling and seeking the dew point. When a stable lock on the dew point is achieved, the “ABC CYCL” message will disappear, and normal operation will resume.  
The analog output is held to the dew point value just before the cycle started until the completion of the ABC cycle.  
If an alarm condition is present when the ABC cycle begins, the audible alarm and the ALARM display are disabled but the Alarm Relay remains energized.
- **“ALARM ”** : The Alarm Set Point has been exceeded. The Alarm Relay will be energized and the audible alarm will sound. The audible alarm can be silenced for one hour by depressing the “SILENCE” push-button.
- **“CLN MIRR”** : During an ABC Cycle, the condition of the sensor mirror and optics are analyzed and a correction is made for changes in the reflectivity since the last cycle. If the mirror reflectivity has *decreased* beyond the automatic correction range, this message will appear at the end of the ABC cycle and indicates that the sensor mirror needs a manual cleaning. Perform the “Mirror Cleaning Procedure” in the MAINTENANCE and CALIBRATION Section.  
**Note:** The instrument may *appear* to operate normally with this message present, but the data should not be relied upon, until the appropriate maintenance is performed.

### 3.0 FUNCTIONAL DESCRIPTION (CONTINUED)

- “**CHK SNSR**” : If during the ABC Cycle, the reflectivity has *increased* significantly due to excessive drift of the optics, or abnormal circuit performance, this message will appear. To determine the cause take the following steps.
  - Clean the mirror.
  - Initiate an MABC Cycle.
  - Check the sample system for proper flow.
  - Check for loose connections or components on the printed circuit board and sensor.

If the condition cannot be resolved with these checks, contact Omega for service

#### 3.2 MABC Button

Pressing the MABC Button (**M**anual **A**utomatic **B**alance **C**ycle) at any time will initiate an ABC Cycle.

#### 3.3 SILENCE Button

If the measured dew point exceeds the Alarm Set Point, the audible alarm will sound. Pressing this button will silence or disable the audible alarm for a period of about 60 minutes. After the 60 minutes, the audible alarm will be automatically re-enabled. The alarm message on the display and the alarm relay will remain on.

#### 3.4 Flow Control Valve

The sample flow rate is adjusted using this valve. Although the sample flow rate is not critical for proper operation, the recommended rate is 1 – 2 SCFH (**S**tandard **C**ubic **F**oot per **H**our).

#### 3.5 Alarm Relay Output

The Alarm Relay is an SPDT relay that is energized whenever the dew point exceeds the Alarm Set Point.

During an ABC cycle, all alarm functions, including the relay, are disabled.

However, if an ABC Cycle is initiated when an alarm condition is present, the relay will remain energized until the cycle is complete.

At the end of the cycle the relay will remain energized if the alarm condition is still present or be de-energized if the alarm condition has passed.

#### 3.6 Analog Output

The analog output is a 4 to 20 mA output, proportional to the dew point, and scaled at the factory for –58 to 122 °F (-50 to 50 °C) for S1 and S2 Sensors; -103 to 167°F (-75 to 75°C) for S3 sensors.

During an ABC Cycle, the output is “held” at the last dew point until the routine is completed.

## 4.0 SETUP

### 4.1 Alarm Set Point (Figure 4.1)

The alarm set point temperature is set by dip switch S2 as an integer. The switch setting represents an eight bit binary number in degrees C with position 8 as the least significant bit (LSB) and position 2 as the most significant bit (MSB). Position 1 is the sign bit.

An 'open' switch is a '1' and 'closed' is a '0'.

If the desired set point is in degrees F, convert it to Celsius before proceeding.

Set the switches as follows:

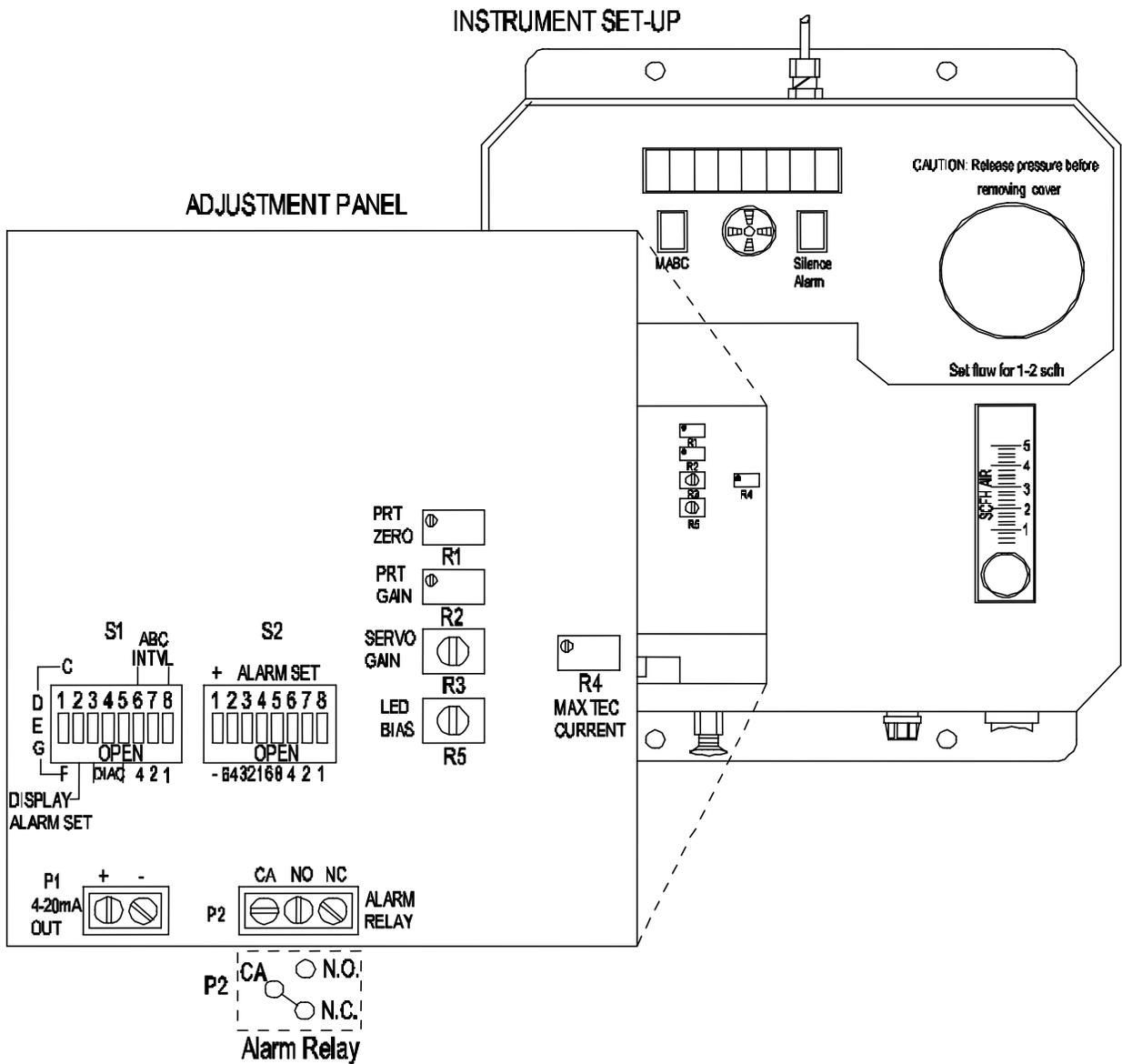
1. Convert the desired set point temperature from degrees C to its eight bit binary equivalent code. Table 4.1 is provided to convert F to C and the equivalent eight bit binary code.
2. Set S1-1 'closed' and S1-2 'open'. The alarm temperature setting will be displayed in degrees C.

NOTE: S1-1 determines whether C or F is displayed in both the measurement and alarm set modes.

S1-2 will switch the display between the dew point and the Alarm Setting.

3. Set S2, positions 1 through 8 according to the eight bit binary number determined in step 1. A '1' is 'open', and a '0' is 'closed'.
4. The display should now read the set point temperature in degrees Celsius.
5. If Fahrenheit units are desired, set S1-1 to 'open'.
6. Return to dew point display by setting S1-2 'closed'.

FIGURE 4-1 SET-UP  
FRONT VIEW



**TABLE 4.1 SETUP**

C	F	BINARY	C	F	BINARY
-50.0	-58.0	10110010	0.0	32.0	00000000
-49.0	-56.0	10110001	1.0	33.0	00000001
-48.0	-54.0	10110000	2.0	35.0	00000010
-47.0	-52.0	10101111	3.0	37.0	00000011
-46.0	-50.0	10101110	4.0	39.0	00000100
-45.0	-49.0	10101101	5.0	41.0	00000101
-44.0	-47.0	10101100	6.0	42.0	00000110
-43.0	-45.0	10101011	7.0	44.0	00000111
-42.0	-43.0	10101010	8.0	46.0	00001000
-41.0	-41.0	10101001	9.0	48.0	00001001
-40.0	-40.0	10101000	10.0	50.0	00001010
-39.0	-38.0	10100111	11.0	51.0	00001011
-38.0	-36.0	10100110	12.0	53.0	00001100
-37.0	-34.0	10100101	13.0	55.0	00001101
-36.0	-32.0	10100100	14.0	57.0	00001110
-35.0	-31.0	10100011	15.0	59.0	00001111
-34.0	-29.0	10100010	16.0	60.0	00010000
-33.0	-27.0	10100001	17.0	62.0	00010001
-32.0	-25.0	10100000	18.0	64.0	00010010
-31.0	-23.0	10011111	19.0	66.0	00010011
-30.0	-22.0	10011110	20.0	68.0	00010100
-29.0	-20.0	10011101	21.0	69.0	00010101
-28.0	-18.0	10011100	22.0	71.0	00010110
-27.0	-16.0	10011011	23.0	73.0	00010111
-26.0	-14.0	10011010	24.0	75.0	00011000
-25.0	-13.0	10011001	25.0	77.0	00011001
-24.0	-11.0	10011000	26.0	78.0	00011010
-23.0	-9.0	10010111	27.0	80.0	00011011
-22.0	-7.0	10010110	28.0	82.0	00011100
-21.0	-5.0	10010101	29.0	84.0	00011101
-20.0	-4.0	10010100	30.0	86.0	00011110
-19.0	-2.0	10010011	31.0	87.0	00011111
-18.0	0.0	10010010	32.0	89.0	00100000
-17.0	1.0	10010001	33.0	91.0	00100001
-16.0	3.0	10010000	34.0	93.0	00100010
-15.0	5.0	10001111	35.0	95.0	00100011
-14.0	6.0	10001110	36.0	96.0	00100100
-13.0	8.0	10001101	37.0	98.0	00100101
-12.0	10.0	10001100	38.0	100.0	00100110
-11.0	12.0	10001011	39.0	102.0	00100111
-10.0	14.0	10001010	40.0	104.0	00101000
-9.0	15.0	10001001	41.0	105.0	00101001
-8.0	17.0	10001000	42.0	107.0	00101010
-7.0	19.0	10000111	43.0	109.0	00101011
-6.0	21.0	10000110	44.0	111.0	00101100
-5.0	23.0	10000101	45.0	113.0	00101101
-4.0	24.0	10000100	46.0	114.0	00101110
-3.0	26.0	10000011	47.0	116.0	00101111
-2.0	28.0	10000010	48.0	118.0	00110000
-1.0	30.0	10000001	49.0	120.0	00110001
0.0	32.0	00000000	50.0	122.0	00110010

#### 4.2 ABC Interval

The ABC Interval is the time between the automatic initiation of ABC Cycles. In typical applications, an interval of 24 hours is recommended and set at the factory. However, in cases where ambient conditions are more variable, or the sample gas is higher in contaminants, a shorter interval may be required.

The times listed below are approximate.

The interval is adjustable in 4 hour increments from 4 to 28 hours.

Switch positions S1-6, -7, and -8 represent a three bit binary code with a weight of 4 hrs. per unit.

To set the interval, set S1-6, S1-7, and S1-8 according to the binary number from Table 4.2 below. The factory default is 24 hrs.

**NOTE:** 'CLOSED' is a zero and 'OPEN' is a one.

ABC INTERVAL	S1- 6	S1- 7	S1- 8
OFF	0	0	0
4 hrs.	0	0	1
8 hrs.	0	1	0
12 hrs.	0	1	1
16 hrs.	1	0	0
10 hrs.	1	0	1
24 hrs.	1	1	0
28 hrs.	1	1	1

Table 4.2 converts the required interval in hours to a three bit binary number.

## 5.0 MAINTENANCE

### 5.1 ROUTINE MAINTENANCE

To ensure the maximum in accurate and reliable operation of any optical chilled mirror system, a periodic maintenance program should be established.

### 5.2 MIRROR CLEANING SCHEDULE

Over time particulates and other matter present in the sample gas and not captured by filters build up on the mirror. The result of the buildup of contaminants on the mirror surface is reduced dry mirror reflectivity and a change in the optical reference point. The ABC Cycle will automatically readjust the optics to the reference point periodically, but eventually the adjustment range will be exceeded and a manual cleaning of the mirror may be necessary. When the contamination becomes too much to be adjusted automatically an error will be displayed at the end of the ABC Cycle.

Normally intervals of 90 days between routine mirror cleanings can be easily achieved. However, if the sample gas contaminants are particularly high, more frequent mirror cleanings may be required.

### 5.3 MIRROR CLEANING PROCEDURE (Figure 5.1)

When mirror cleaning is required as a periodic maintenance item or the “CLN MIRR” or “CHK SNSR” message appears on the display, proceed as follows:

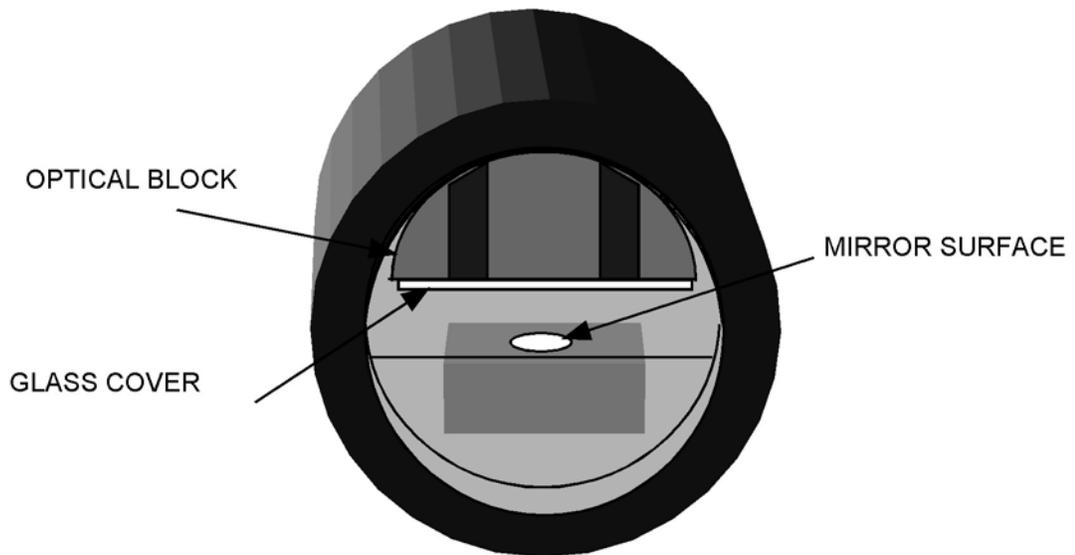
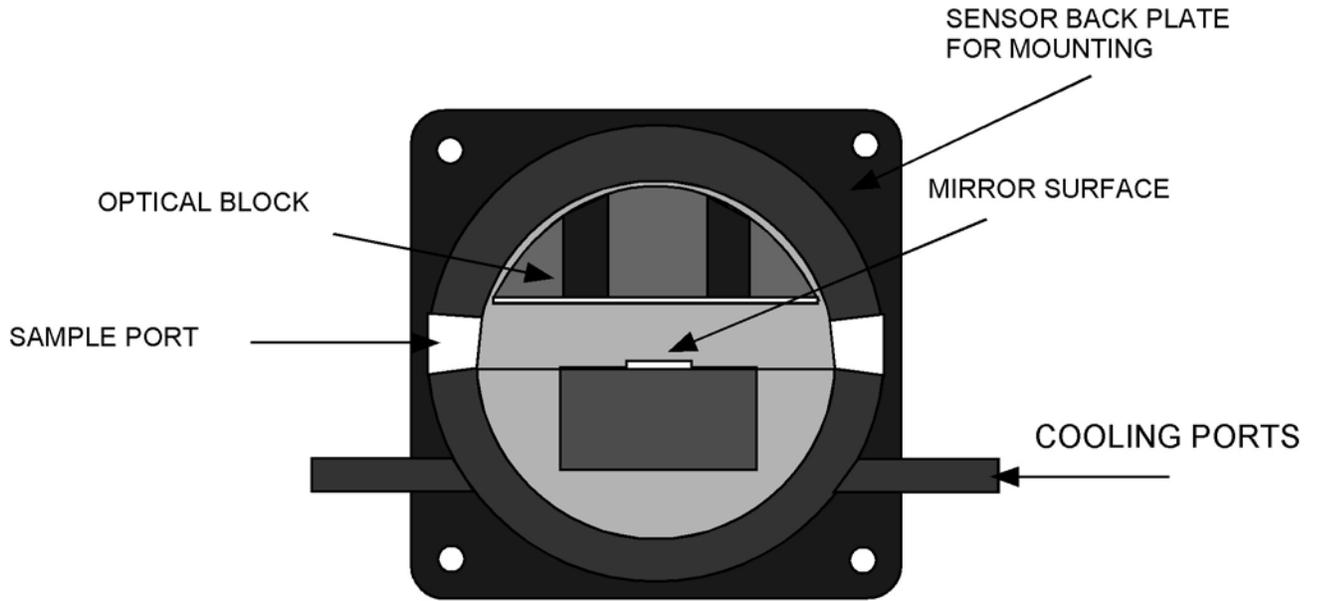
1. Turn power off.

#### CAUTION

**When operating with a pressurized sampling system, be sure to remove pressure from the Sensor prior to removing the Sensor cover.**

2. Remove the spin-off cover from the Sensor to expose the mirror.
3. Moisten a clean cotton swab with isopropyl alcohol. Cotton swabs and cleaning bottle are provided in the Cleaning Kit supplied with the system.
4. Wipe the mirror surface and the optics surface in a circular motion.
5. After cleaning the mirror surface, wipe the surfaces dry with a clean Q-tip.
6. Next, moisten a clean Q-tip with clean, preferably distilled water and wipe the mirror and optics areas.
7. Dry these areas thoroughly with a clean, dry Q-tip.
8. Replace the sensor cover.
9. Re-establish sample pressure and flow.
10. Turn power on.

**FIGURE 5.1**      **SENSOR COVER REMOVED FOR MIRROR CLEANING**



**Front View**  
**"Cover Removed"**  
**S1/S2 Sensor**

## 6.0 SPECIFICATIONS

### Measurement Range

-Dew/ Frost Point -58 to 122°F (-50 to 50°C)(Optional S2Sensor)  
-103 to 167°F (-75 to 75°C)(Optional S3Sensor)

### Measurement Accuracy

-Dew/ Frost Point (±0.28°C) ±0.5°F (Entire Range)

### Functional

Power: 90-260VAC, 50-400Hz, 40 Watts

Operating Temperature:  
Control Unit/Sensor 32 to 122°F (0 to 50°C)

Sample Connection: ¼ female compression tubing fitting  
Sample Flow: 0.5 to 5.0scfh, Integral flow meter and valve  
Sample Pressure: 0 to 150psig max.

Analog Output: 4 to 20mA,  
Range: -58 to 122°F (-50 to 50 °C)

Compliance: 9.0 VDC, 450 ohms  
Display: Eight Digit Alphanumeric LED, 0.5" High.

High dew point Alarm:  
- Audible >98 dba at 2 ft  
- Visual Flashing Message on Display  
- Relay Contacts 1 Form C, non-latching,  
10A @ 240VAC  
8A @ 24 VDC  
½ HP @ 240VAC

### Physical

Dimensions: 14" (35.6 cm)H, 10.7" (27.18 Kg)W,  
3.75" (9.525 Kg)D.

Weight: 7 lbs. (3.18 Kg)

Mounting: Wall mount standard

Material: Aluminum

### Standard Features

- Microprocessor Controlled.
- 8 Digit Alphanumeric LED Display.
- **Automatic Balance Control (ABC)**
- User settable high alarm limit.
- Alarm Relay, Form C.
- Analog Output, 4 – 20mA.
- Integral flow meter and valve.
- Audible and visual alarms.
- Wall mountable.

### Optional Accessories

Low Dew Point Kit: 2 or 3 stage sensor.

Filter Kit: In-line, particulate/coalescing filter.

Dual Alarms

RS232 (2-wire)



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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

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1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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3. Repair instructions and/or specific problems relative to the product.

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Displacement Transducers  
Instrumentation & Accessories

**FLOW / LEVEL**

Rotameters, Gas Mass Flowmeters & Flow Computers  
Air Velocity Indicators  
Turbine / Paddlewheel Systems  
Totalizers & Batch Controllers

**pH / CONDUCTIVITY**

pH Electrodes, Testers & Accessories  
Benchtop / Laboratory Meters  
Controllers, Calibrators, Simulators & Pumps  
Industrial pH & Conductivity Equipment

**DATA ACQUISITION**

Data Acquisition & Engineering Software  
Communications-Based Acquisition Systems  
Plug-in Cards for Apple, IBM & Compatibles  
Datalogging Systems  
Recorders, Printers & Plotters

**HEATERS**

Heating Cable  
Cartridge & Strip Heaters  
Immersion & Band Heaters  
Flexible Heaters  
Laboratory Heaters

**ENVIRONMENTAL**

**MONITORING AND CONTROL**

Metering & Control Instrumentation  
Refractometers  
Pumps & Tubing  
Air, Soil & Water Monitors  
Industrial Water & Wastewater Treatment  
pH, Conductivity & Dissolved Oxygen Instruments