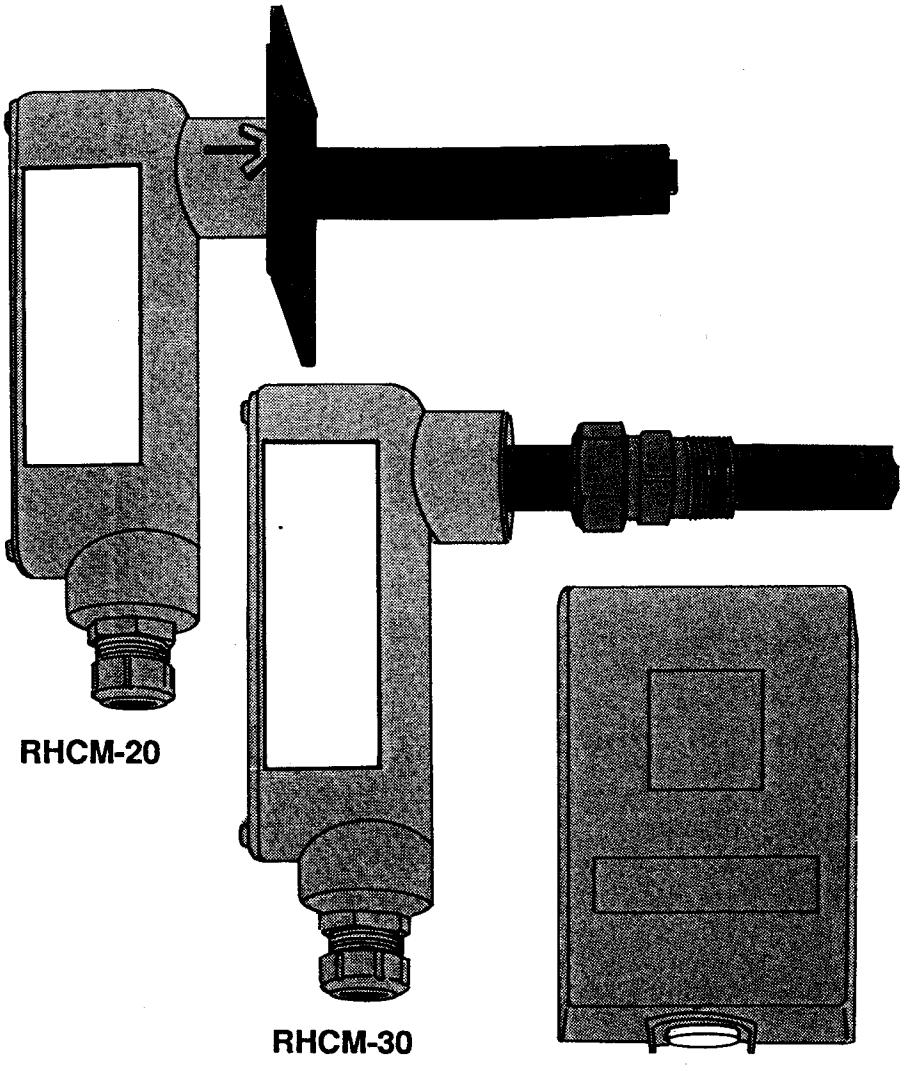
RHCM-10, RHCM-20, RHCM-30
Chilled Mirror Dewpoint Transmitters



RHCM-20

RHCM-30

RHCM-10

OMEGA®
An OMEGA Technologies Company

Operator's Manual
M1459/0792

WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

We are glad to offer suggestions on the use of our various products. Nevertheless OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.

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Direct all warranty and repair requests/inquiries to the OMEGA ENGINEERING Customer Service Department. Call toll free in the USA and Canada: 1-800-622-2378, FAX: 203-359-7811; International: 203-359-1660, FAX: 203-359-7807.

BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, YOU MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OUR CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. 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 you are having with the product.

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2. Model and serial number of product,
3. Repair instructions and/or specific problems you are having with the product.

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TABLE OF CONTENTS
RHCM-10, RHCM-20, RHCM-30
CHILLED MIRROR DEWPOINT TRANSMITTER

SECTION PAGE

SECTION 1 INTRODUCTION 1

1.1 Description 1
1.2 Features 2
1.3 Theory of Operation 2

SECTION 2 UNPACKING 2

SECTION 3 PARTS OF THE RHCM 3

3.1 Printed Circuit Board #1 3
3.2 Printed Circuit Board #2 4
3.3 Sensor Subassembly 5

SECTION 4 INSTALLATION 5

4.1 RHCM-10 5
4.2 RHCM-20 6
4.3 RHCM-30 7

SECTION 5 WIRING THE RHCM-10, RHCM-20 OR RHCM-30 9

5.1 Power Connections 10
5.2 Signal Connections for Dewpoint 10
5.3 Signal Connections for Air Temperature (RHCM-10T Only) 10
5.4 Conversion of Internal Transmitter to Loop Power 11
5.5 Connection of Internal Transmitters to Printed Circuit Board #1 11

SECTION 6 MAINTENANCE 12

6.1 Why Do You Need to Periodically Clean the Sensor? 12
6.2 Maintenance Procedure 12
6.2.1 Procedure for Mirror Surface Condition Check 12
6.2.2 Procedure for Mirror Surface Cleaning 13
6.2.3 Procedure for Fine Optical Balance Adjustment 14
6.2.4 Coarse Bias Adjustment Procedure 14
6.2.5 Diagnostic Procedures for RHCM Transmitter Subassemblies 15

SECTION 7 TROUBLESHOOTING GUIDE 17

SECTION 8 SPARE PARTS 18

SECTION 9 DIMENSIONS 18

SECTION 1 INTRODUCTION

1.1 DESCRIPTION

The OMEGA RHCM Series is a family of high performance chilled mirror dewpoint transmitters. The sensor provides accurate long term repeatability and high reliability performance for process control and energy management. The RHCM-10 sensor electronics are housed in a rugged enclosure which can be wall mounted for climate control. The RHCM-20 and RHCM-30 sensors are designed for duct and pipe mounting respectively for process control in HVAC/Energy management applications. Field calibration is not required and the ambient temperature effects, hysteresis, and calibration drift with age are all virtually eliminated. In the sensor, a metal mirror surface is controlled at the dewpoint, the temperature at which water vapor condenses from the surrounding air.

The RHCM series offer a wide range of user specified power inputs including 24VDC, 24VAC, 115VAC, and 230VAC, for many applications. The user specified outputs include 100Ω platinum RTD (4-wire) or 4-20mA, which can be scaled over three different temperature ranges of 0° to 100°F, 0° to 50°C, and -40° to 140°F. Either output can be directly connected to a panel meter, controller or data acquisition system.

The measurements of dewpoint and air temperature are stable, accurate and traceable to the NIST (formerly NBS) Standard. As long as the transmitter is in good working order, outputs are accurate to ± 0.5 °C. The calibration of each platinum resistance thermometer is confirmed by OMEGA against transfer standards calibrated by the NIST.

AVAILABLE MODELS

PART NUMBER	DESCRIPTION
RHCM-10-(*)-(**)	Wall mount dewpoint transmitter
RHCM-10T-(*)-(**)-(***)	Wall mount dewpoint/temperature transmitter
RHCM-20-(*)-(**)	Duct mount dewpoint transmitter
RHCM-30-(*)-(**)	Pipe mount dewpoint transmitter

(*) - Insert power code from power supply chart (1, 2, 3, or 4)
(**) - Insert output code from output chart (PT100, 100F, 50C or 140F)
(***) - Insert second output code for temperature output (PT100, 100F, 50C or 140F)

POWER SUPPLY OPTIONS

CODE	DESCRIPTION
-1	24VDC
-2	24VAC
-3	115VAC
-4	230VAC

OUTPUT OPTIONS

CODE	DESCRIPTION
-PT100	100Ω RTD
-100F	4-20mA (0° to 100°F)
-50C	4-20mA (0° to 50°C)
-140F	4-20mA (-40° to 140°F)

1.2 FEATURES

✓ No routine calibration needed

✓ Minimum drift

✓ ± 1°F dewpoint accuracy

✓ 24VDC, 24VAC, 115VAC and 230VAC power available

✓ RTD simulator or 4 to 20mA output

1.3 THEORY OF OPERATION

The RHCM-10, RHCM-20 and RHCM-30 utilize a chilled mirror sensor to measure dewpoint, the temperature at which water vapor condenses from the surrounding air. The control of the mirror surface is done automatically by comparing the intensity of a reference light bridge to the primary bridge that reflects light across the surface of the mirror. A thermoelectric heat pump under the mirror cools the surface of the mirror until dew forms and scatters light reflected across the mirror reducing the intensity of the primary light bridge. The electronics in the transmitter controls the heat pump to maintain a constant mirror temperature at the dewpoint. The temperature of the mirror is continuously measured by a platinum resistance thermometer (PRT) with the measurement available as resistance or optionally as a linear analog signal. The ability of the transmitter to control the mirror at the dewpoint is dependent on the mirror surface condition and the optical balance of the primary and reference light bridges. Figure 1-1 shows chilled mirror sensor operation.

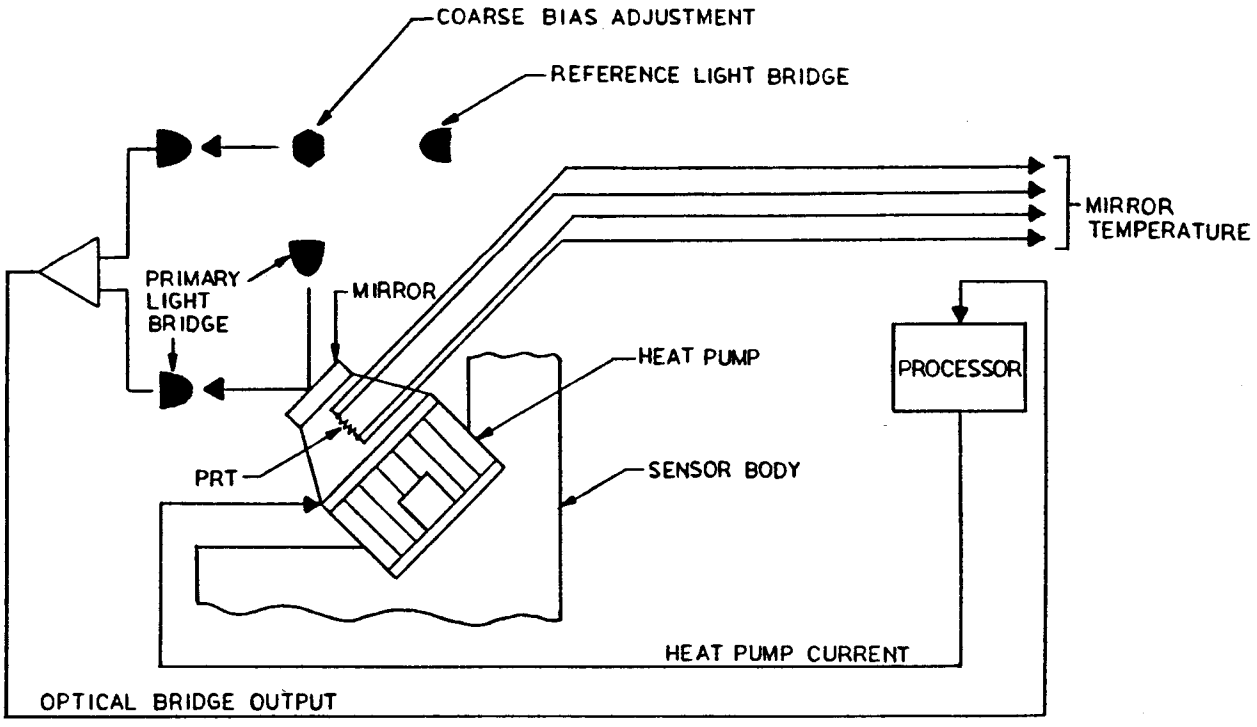


Figure 1-1. Chilled Mirror Sensor Operation

SECTION 2 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Make sure the following is in the packing box:

QTY	DESCRIPTION
1	RHCM-10, RHCM-20, or RHCM-30
1	Cleaning kit (Q-tips, cleaning solution, instruction sheet)
1	Operator's manual

SECTION 3 PARTS OF THE RHCM

There are three (3) major components of the RHCM-10, RHCM-20, and RHCM-30 transmitters: Printed Circuit Boards #1 and #2 and the sensor subassembly. Each one is discussed in detail below.

3.1 PRINTED CIRCUIT BOARD #1

Refer to Figure 3-1.

Wiring to Printed Circuit Board #1 is connected to the P4 terminal strip at the edge of the board. To the left of the terminal strip are the trimpot and Light Emitting Diode. SW1 is needed to control the operating mode of the transmitter. The center position is the normal operating mode - OP. BAL position is for optical balance and CHK is the mirror check position. By moving SW1 to either BAL or CHK, you are disabling the thermoelectric heat pump allowing the mirror to warm to air temperature.

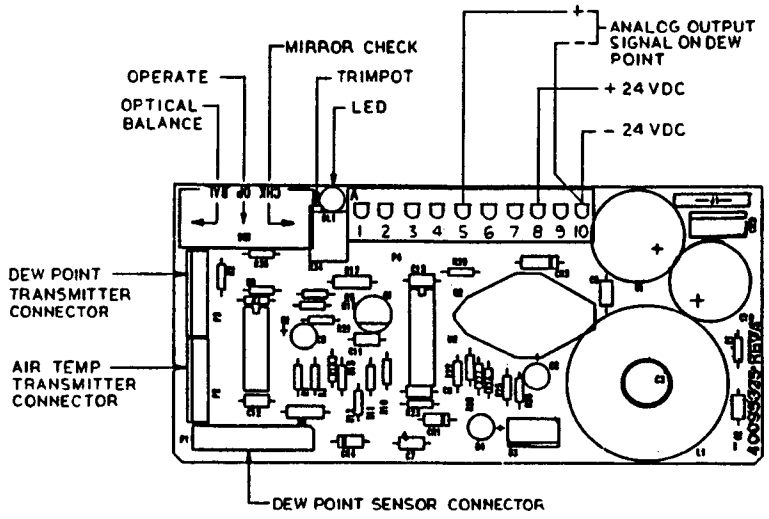


Figure 3-1. Printed Circuit Board #1

3.2 PRINTED CIRCUIT BOARD #2

Refer to Figure 3-2.

Printed Circuit Board #2, the transformer board, accepts 24, 115 or 230VAC ± 10% and converts it to 24VDC to power Printed Circuit Board #1. Refer to Section 5 for wiring information. The red and black wires from Printed Circuit Board #2 must be connected to terminals 8 and 10 respectively on Printed Circuit Board #1. The fuse is rated at 250mA and 250 volts.

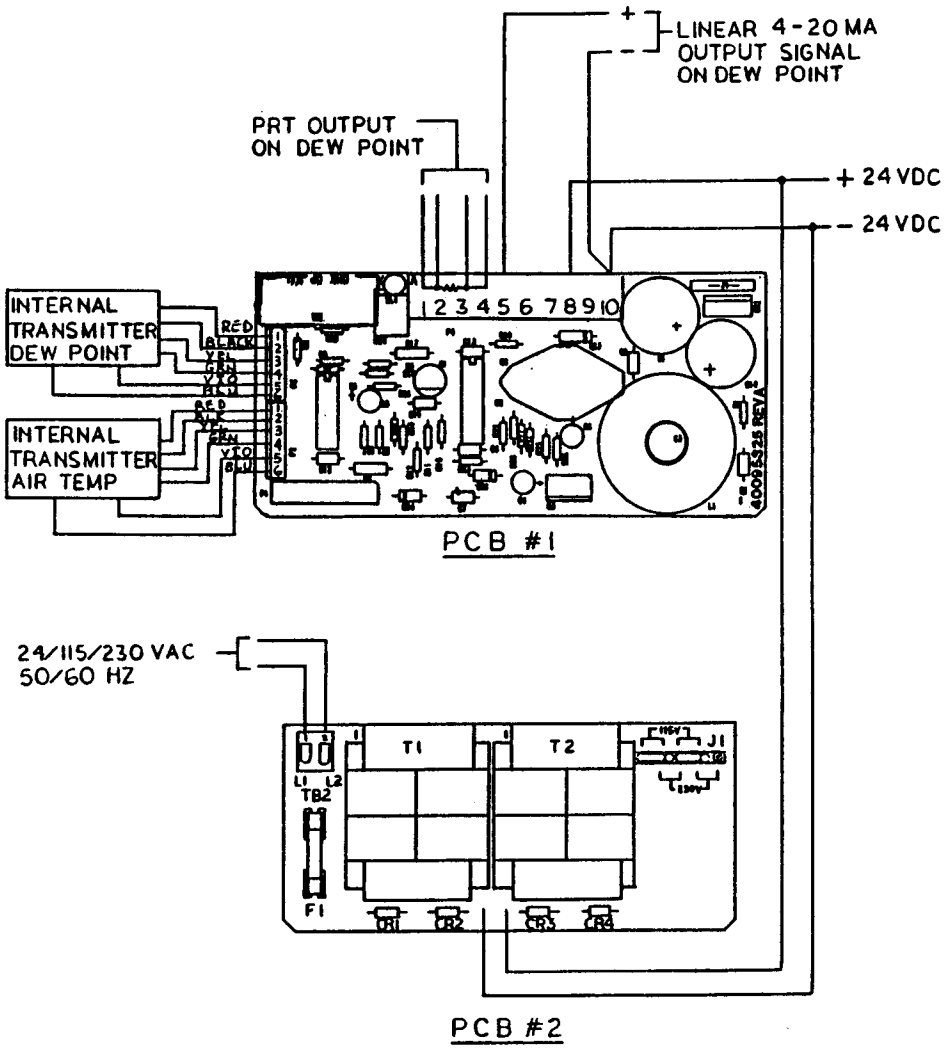


Figure 3-2. Printed Circuit Board #2 Connected to Printed Circuit Board #1

3.3 SENSOR SUBASSEMBLY

The components of the chilled mirror sensor are in the sensor cavity. In the RHCM-10 the sensor cavity is accessed by pulling the plastic cover from the chassis and removing the sintered bronze filter. The sensor cavity may be accessed in the RHCM-20 and RHCM-30 by sliding the shield away from the electronics housing . The mirror is a tiny metal reflector on top of the black plastic-coated pyramid mounted at a 45° angle. Figures 3-3 and 3-4 show the location of the sensor cavity in the three models of the RHCM.

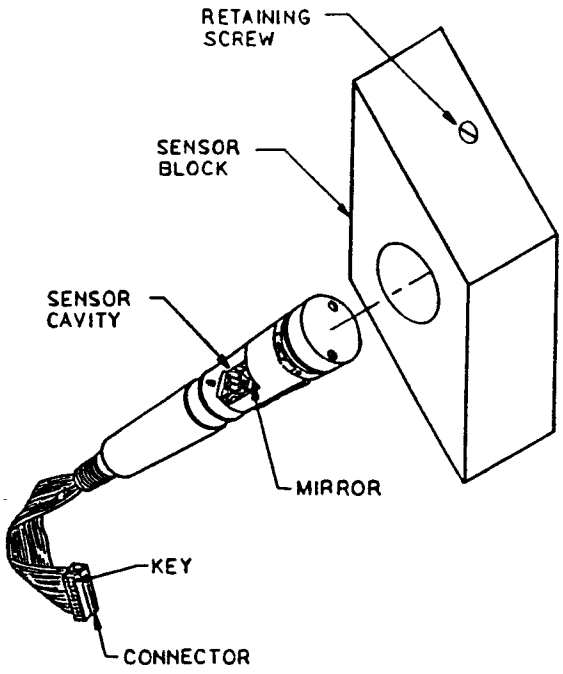


Figure 3-3. Sensor Cavity Location in the RHCM-10

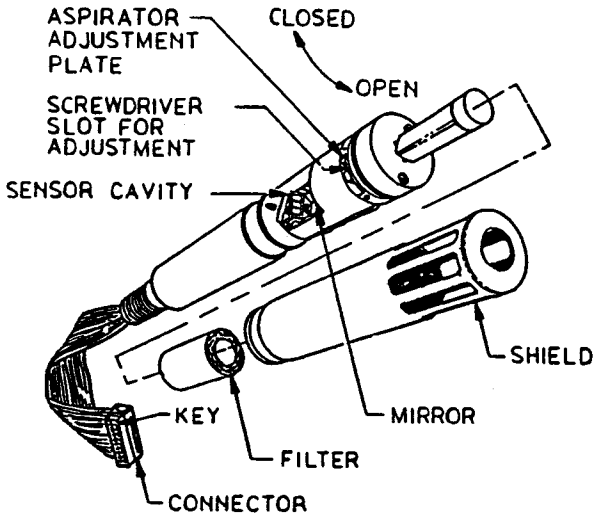


Figure 3-4. Sensor Cavity Location in the RHCM-20 or RHCM-30

SECTION 4 INSTALLATION

4.1 RHCM-10

1. Identify the installation point. The RHCM-10 is mounted with the chassis against the wall and metal cap or air temperature probe (in the RHCM-10T) towards the floor. Avoid detectable downdrafts and allow easy access for periodic maintenance.

2. Remove the plastic cover and use holes in the chassis as a template for locating the mounting screws. The plastic cover is attached to the chassis by velcro strips. To remove the cover, pull it away from the chassis.

3. Install according to Figure 4-1. The unit will power up immediately upon connection to power.

4. Check operation by moving switch SW1 on printed circuit board #1 (shown in Figure 3-1) to the CHECK (CHK) position. The Light Emitting Diode (LED) should light within two minutes to confirm that the RHCM-10 can operate correctly. If the LED does light, return SW1 to the OPERATE (OP) position. The LED will go out as dew condenses on the metal mirror in the sensor.

5. Replace the plastic cover.

INSTALLATION HINT

As air is sampled by convection currents through the sensor cavity, the transmitter is sensitive to down drafts and orientation. If down drafts cannot be eliminated, a baffle may be mounted above the transmitter to deflect the air flow around the unit.

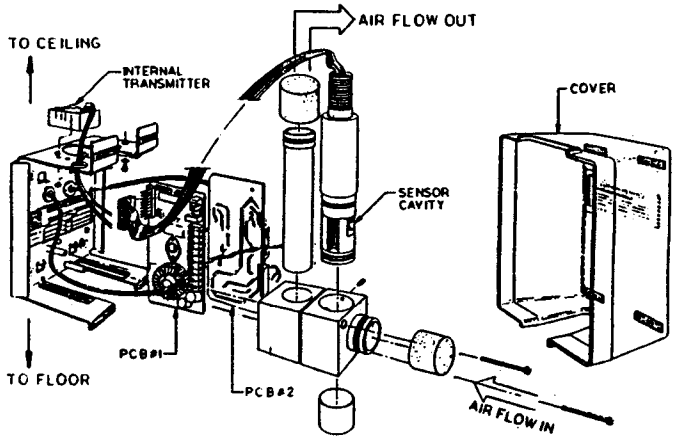


Figure 4-1. Installation Diagram

4.2 RHCM-20

1. Identify the installation point. Flow through the duct at the location should be non-turbulent at a rate of 300 to 3000 feet (100 to 1000 meters) per minute. The location should allow for removal of the RHCM-20 from the duct for periodic maintenance.

2. Remove the duct mounting plate from the RHCM-20 and use a template to locate the mounting screws. An access hole through the duct wall of 1.25" (3.25 cm) diameter at the center of the installation point is required to insert the sensor into the duct. Refer to Figure 4-2.

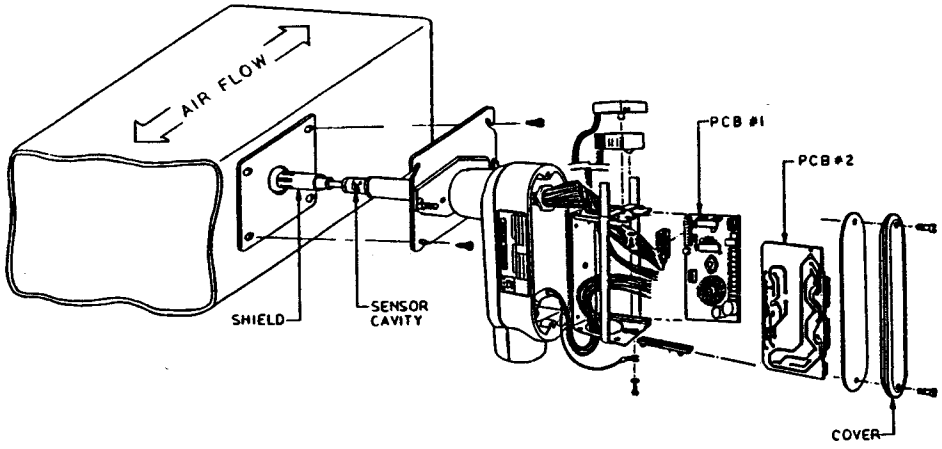


Figure 4-2. Installation Diagram

3. Install duct mounting plate to the duct wall. Insert the sensor through the duct wall and secure the RHCM-20 to the plate.

4. Gain access to the printed circuit board #1 (shown in Figure 4-2) by removing one screw holding the back cover of the electronics housing. Loosen second screw and pivot cover and gasket around this screw. The RHCM-20 will power up immediately upon connection of power.

5. Check the operation by moving SW1 on the printed circuit board #1 to the CHECK (CHK) position (shown in Figure 3-1). The LED should light within two minutes to confirm that the RHCM-20 can operate correctly. If the LED does not light, refer to Section 6.2.1, Procedure for Mirror Surface Condition Check. If the LED does light, return SW1 to the OPERATE (OP) position. The LED will go out as dew condenses on the metal mirror in the sensor.

6. Replace the back cover.

INSTALLATION HINTS

The sampling system of the RHCM-20 requires non-turbulent flow between 300 to 3000 feet (100 and 1000 meters) per minute. Avoid plenums, dampers, turns, etc. that create turbulent flow or manifolds with dead flow zones. The RHCM-20 is shipped with an air sample flow choke positioned for maximum flow through the sensor cavity. If high flow rates through the duct cause excessive signal oscillation, remove the sensor shield and move the aspirator adjustment plate clockwise to reduce flow through the sensor.

Install the RHCM-20 well downstream of air washers or steam injectors as water carryover can flood and damage the sensor.

Avoid installation points with negative pressure relative to outside the duct such as at a fan inlet since the RHCM-20 is not pressure tight. Air may be drawn through the electronics housing into the sample cavity making incorrect dewpoint measurements.

4.3 RHCM-30

1. Identify the installation point. Flow through the pipe at a location should be non-turbulent at a rate of 300 to 3000 feet (100 to 1000 meters) per minute. Location should allow for the RHCM-30 to be removed for periodic maintenance.

2. Mount a pipe flange with a female 1" NPT thread for the male compression fitting on the sensor. Refer to Figure 4-3.

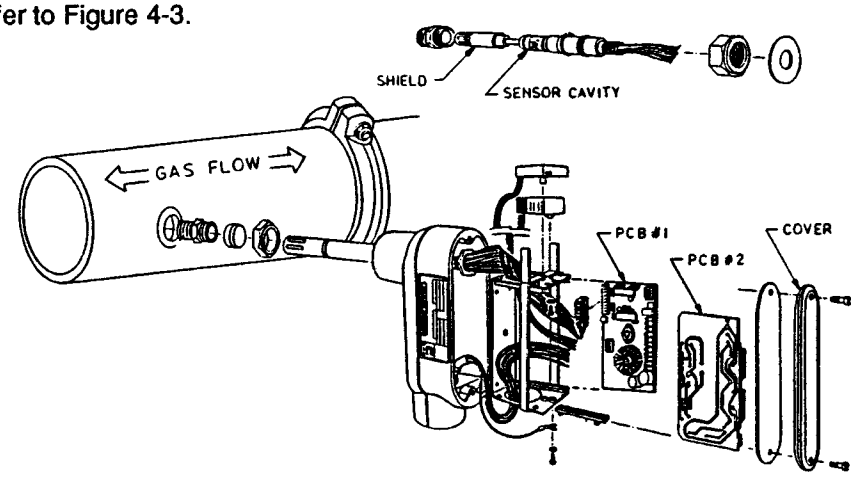


Figure 4-4. Installation Diagram

3. Position the compression fitting just below the sensor shield. Insert the sensor into the flange and screw in the compression fitting. Hand-tighten until the sensor is secure. Hold the electronics housing in the desired orientation and tighten the compression fitting until the sensor is held securely in place.

4. Gain access to the printed circuit board #1 by removing one screw holding the back cover of the housing. Loosen the second screw and pivot cover and gasket around this screw. The RHCM-30 will power up upon connection to power

5. Check the operation by moving SW1 on the printed circuit board #1 to the CHECK (CHK) position (shown in Figure 3-1). The LED should light within two minutes to confirm that the RHCM-30 can operate correctly. If the LED does not light, refer to Section 6.2.1, Procedure for Mirror Surface Condition Check. If the LED does light, return SW1 to the OPERATE position. The LED will go out as dew condenses on the metal mirror in the sensor.

6. Replace the back cover.

INSTALLATION HINTS

The sampling system of the RHCM-30 requires non-turbulent flow between 300 to 3000 feet (100 and 1000 meters) per minute. Avoid plenums, dampers, turns, etc. that create turbulent flow or manifolds with dead flow zones. The RHCM-30 is shipped with an air sample flow choke positioned for maximum flow through the sensor cavity. If high flow rates through the duct cause excessive signal oscillation, remove the sensor shield and move the aspirator adjustment plate clockwise to reduce flow through the sensor.

Install the unit well downstream of air washers or steam injectors as water carryover can flood and damage the sensor.

Avoid installation points with negative pressure relative to ambient conditions such as a fan inlet since the RHCM-30 is not pressure tight.

The shield may be removed for flow rates below 5 cubic feet per hour or 1 liter per minute if ambient light is prevented from entering the sample cavity. Consult OMEGA for additional support.

SECTION 5 WIRING THE RHCM-10, RHCM-20 OR RHCM-30

The controller circuit, Printed Circuit Board #1, operates on 18 to 30VDC at 350mA maximum. The transformer Printed Circuit Board #2, converts 24/115/230VAC to 24VDC to the power board (#1). The standard output for dewpoint and air temperature that is an option on the RHCM-10 is 4-wire platinum resistance thermometer (PRT). Internal transmitters to provide linear analog signals are available as loop or source powered. All wiring to the RHCM transmitters should be 22AWG.

PRINTED CIRCUIT BOARD #1 (CONNECTOR P4)

TERMINAL	DESCRIPTION
1	PRT high for dewpoint
2	PRT high for dewpoint
3	PRT low for dewpoint
4	PRT low for dewpoint
5	Linear 4 to 20mA out for dewpoint
6	Linear 4 to 20mA out for air temperature
7	Power in for internal transmitter
8	24VDC power in for Printed Circuit Board #1
9	Chassis ground
10	24VDC signal return from Printed Circuit Board #1

PRINTED CIRCUIT BOARD #1 (CONNECTOR P3 - INTERNAL TRANSMITTER CONNECTOR)

TERMINAL	DESCRIPTION
1	PRT high for dewpoint
2	PRT high for dewpoint
3	PRT low for dewpoint
4	PRT low for dewpoint
5	Linear 4 to 20mA out for dewpoint
6	Linear 4 to 20mA out for air temperature

PRINTED CIRCUIT BOARD #1 (CONNECTOR P2 - INTERNAL TRANSMITTER CONNECTOR)

TERMINAL	DESCRIPTION
1	PRT high for air temperature
2	PRT high for air temperature
3	PRT low for air temperature
4	PRT low for air temperature
5	Power to internal transmitter
6	Signal output of transmitter

PRINTED CIRCUIT BOARD #2 INCOMING AC POWER AND 24VDC TO PRINTED CIRCUIT BOARD #1

AC CONNECTOR	DESCRIPTION
1	AC power high
2	AC power low

24VDC LEADS	CONNECTION TO PRINTED CIRCUIT BOARD #1
Red	Terminal 8 24VDC power in (+24VDC)
Black	Terminal 10 24VDC power return (-24VDC)

5.1 POWER CONNECTIONS

For 24VDC to RHCM, connect leads to P4 on Printed Circuit Board #1.

Terminal 8 <---------> 24VDC in (+24VDC)
Terminal 10 <---------> 24VDC return (-24VDC)

OR

For 24/115/230VAC to RHCM, connect leads to L1 and L2 on Printed Circuit Board #2.

Terminal 1 (L1) <----------> VAC in (High)
Terminal 2 (L2) <----------> VAC return (Low)
Card Cage Lug <----------> VAC common

5.2 SIGNAL CONNECTIONS FOR DEWPOINT (Refer to Figure 3-2 for reference)

For dewpoint as 4-wire RTD output, connect leads to P4 on Printed Circuit Board #1.

P4 Terminal	to	Printed Circuit Board #1
1	<---------->	High
2	<---------->	High
3	<---------->	Low
4	<---------->	Low

For dewpoint as linear 4-20mA signal, connect leads to P4 on Printed Circuit Board #1.

P4 Terminal	TO
5 <---------->	Signal Out (+)
10 <---------->	Signal Return (-)

To obtain 1-5VDC signal, make same connections and connect 250Ω resistor across load terminals, which are putting out 4-20mA.

5.3 SIGNAL CONNECTIONS FOR AIR TEMPERATURE (RHCM-10T ONLY)

For air temperature as 4-wire RTD output, connect leads to P2 on Printed Circuit Board #1.

P2 Terminal	TO
5 <---------->	High
6 <---------->	High
3 <---------->	Low
4 <---------->	Low

For air temperature as linear 4-20mA signal, connect leads to P4 on Printed Circuit Board #1.

P4 Terminal	TO
6 <---------->	Signal Out
10 <---------->	Signal Return

To obtain 1-5VDC signal, make same connections and connect 250Ω resistor across load terminals, which are putting out 4-20mA.

5.4 CONVERSION OF INTERNAL TRANSMITTER TO LOOP POWER

Internal transmitter configured at factory as source powered unless specified as loop powered at time of ordering. Cut jumper J1 shown in Figure 5-1, on the edge of Printed Circuit Board #1 . Connect leads to P4 on Printed Circuit Board #1.

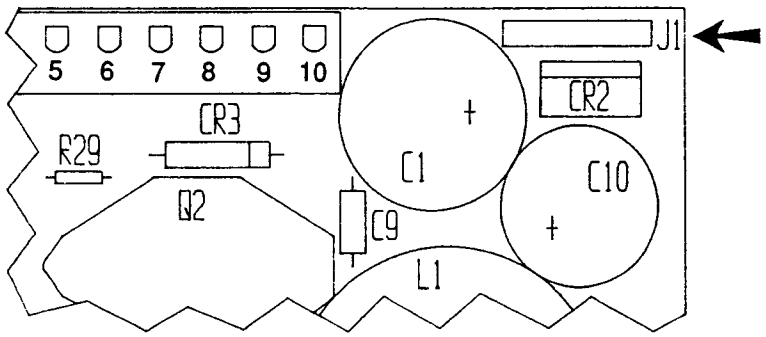


Figure 5-1. Portion of Printed Circuit Board #1

For dewpoint, connect leads as follows:

P4 Terminal	TO
5 <---------->	Signal Return
7 <---------->	20mA Power In

For air temperature, connect leads as follows:

P4 Terminal	TO
6 <---------->	Signal Return
7 <---------->	20mA Power In

5.5 CONNECTION OF INTERNAL TRANSMITTERS TO PRINTED CIRCUIT BOARD #1

The internal transmitters accept 4-wire platinum resistance thermometer output and convert it to a linear 4-20mA signal that spans a preset temperature. The transmitter for dewpoint is wired to P3. The transmitter for air temperature is wired to P2. The leads are color coded.

For dewpoint, connect transmitter leads as follows:

TRANSMITTER LEAD COLOR	PRINTED CIRCUIT BOARD #1 CONNECTION TO P3	
Red	1	Power in
Black	2	Signal return
Yellow	3	High
Green	4	High
Violet	5	Low
Blue	6	Low

For air temperature, connect transmitter leads as follows:

TRANSMITTER LEAD COLOR	PRINTED CIRCUIT BOARD #1 CONNECTION TO P2	
Red	1	Power in
Black	2	Signal return
Yellow	3	High
Green	4	High
Violet	5	Low
Blue	6	Low

SECTION 6 MAINTENANCE

6.1 WHY DO YOU NEED TO PERIODICALLY CLEAN THE SENSOR?

The RHCM-10, RHCM-20 and RHCM-30 utilize a chilled mirror sensor to measure dewpoint, the temperature at which water vapor condenses from the surrounding air. The control of the mirror surface is done automatically by comparing the intensity of a reference light bridge to the primary bridge that reflects light across the surface of the mirror. A thermoelectric heat pump under the mirror cools the surface of the mirror until dew forms and scatters light reflected across the mirror reducing the intensity of the primary light bridge. The electronics in the transmitter controls the heat pump to maintain a constant mirror temperature at the dewpoint. The temperature of the mirror is continuously measured by a platinum resistance thermometer (PRT) with the measurement available as resistance or optionally as a linear analog signal.

The ability of the transmitter to control the mirror at the dewpoint is dependent on the mirror surface condition and the optical balance of the primary and reference light bridges. Contaminants trapped in dew on the mirror may alter the dewpoint at its surface as well as reduce its reflectance. The optical balance performed at the factory may be altered by a physical change in the mirror surface as well as aging of the optical components. The mirror condition and optical balance must be checked regularly and serviced if required.

Service checks should be performed each month, although the service period is specific to the installation.

6.2 MAINTENANCE PROCEDURE

6.2.1 Procedure for Mirror Surface Condition Check

1. Open the RHCM transmitter to gain access to Printed Circuit Board #1. In the RHCM-10, the plastic front cover is mounted to the transmitter chassis by velcro tabs. Pull the cover away from the chassis. In the RHCM-20 and RHCM-30, remove one screw from the back cover. Loosen the other screw. Pivot the cover and gasket around the loose screw to expose the edge of the printed circuit board.

2. Locate SW1 on Printed Circuit Board #1 (refer to Figure 6-1 for the location of SW1). SW1 should be in the OP position for general operating.

3. Move SW1 to the CHK position. Wait 2 minutes for the LED next to SW1 to light.

4. If the LED lights, then the mirror condition is acceptable. Return the SW1 to the OP position. Replace the cover. NOTE: If the LED does not light, then perform the mirror cleaning procedure.

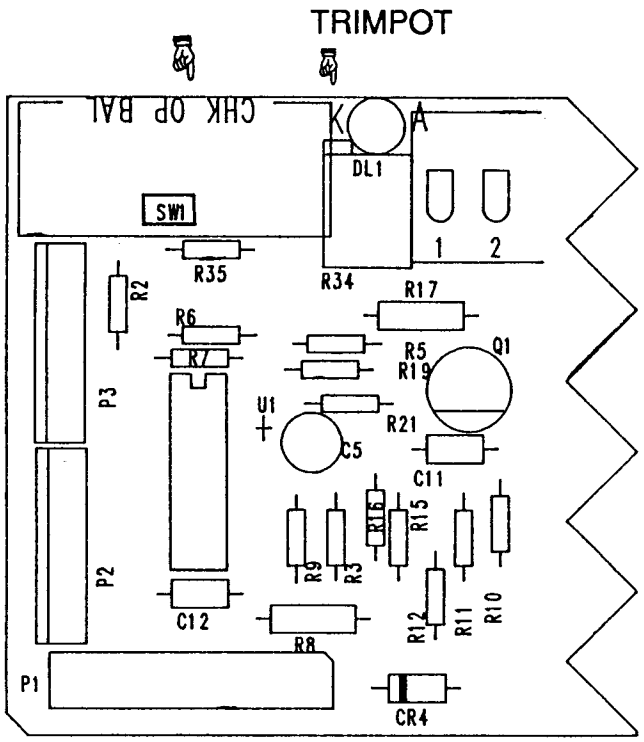


Figure 6-1. SW1 Location on Printed Circuit Board #1

6.2.2 Procedure for Mirror Surface Cleaning

1. Obtain the cleaning kit packed with the RHCM transmitter.

2. Open the RHCM transmitter to gain access to Printed Circuit Board #1. In the RHCM-10, the plastic front cover is mounted to the transmitter chassis by velcro tabs. Pull the cover away from the chassis. In the RHCM-20 and RHCM-30, remove one screw from the back cover. Loosen the other screw. Pivot the cover and gasket around the loose screw to expose the edge of the printed circuit board.

3. Locate SW1 on Printed Circuit Board #1 (refer to Figure 6-1 for the location of SW1). Set the SW1 to CHK.

4. Gain access to the sensor cavity: RHCM-10 - remove the plastic cover by pulling away from velcro tabs on chassis. Remove sintered bronze filter; RHCM-20 and RHCM-30 - remove sensor from duct or pipe. Pull shield away from electronics housing.

5. Locate mirror surface in the sensor cavity. Soak cotton swab in cleaning solution and wipe across mirror. Dry mirror with second swab.

6. Return shield or filter to original position.

7. If the LED lights, move SW1 to the OP (operate) position. Replace cover. NOTE: If LED does not light, perform fine optical balance adjustment procedure in Section 6.2.3.

8. For RHCM-20 and RHCM-30, reinsert sensor in-line and secure transmitter.

6.2.3 Procedure for Fine Optical Balance Adjustment

The intensity of the primary light bridge should be matched to the light intensity of the reference bridge. The mirror should be clear and dry and ambient light must be prevented from entering the sensor cavity during the adjustment.

1. Open the RHCM transmitter to gain access to Printed Circuit Board #1. In the RHCM-10, the plastic front cover is mounted to the transmitter chassis by velcro tabs. Pull the cover away from the chassis. In the RHCM-20 and RHCM-30, remove one screw from the back cover. Loosen the other screw. Pivot the cover and gasket around the loose screw to expose the edge of the printed circuit board.

2. Locate SW1 on Printed Circuit Board #1 (refer to Figure 6-1 for the location of SW1). Set the SW1 to BAL. Clean the mirror according to the mirror cleaning procedure in Section 6.2.2. Replace the filter in the RHCM-10 or the shield in the RHCM-20 or RHCM-30 to block ambient light from sensor cavity.

3. To balance the optics, start with the LED off. If it is not off at this point, turn the trimpot counter-clockwise until it is turned off. Then slowly turn the trimpot clockwise until the LED just lights. The trimpot is shown in Figure 6-1. If, after the trimpot adjustment the LED does not light, proceed to Coarse Bias Adjustment in Section 6.2.4.

4. Move SW1 to the OP position. The LED should go out within 40 seconds as dew is condensed on the mirror. If the LED does not go out, replace Printed Circuit Board #1 (identify each wire connection by wire color and terminal number, disconnect the Printed Circuit Board #1, replace with a new board, and reconnect the wires) and perform this procedure again. Refer to Section 8 for a listing of spare parts.

6.2.4 Coarse Bias Adjustment Procedure

This procedure adjusts the intensity of the reference light bridge to be within the range of the trimpot that controls the intensity of the primary light bridge. The mirror should be clear and dry and ambient light must be prevented from entering the sensor cavity during the adjustment.

1. Open the RHCM transmitter to gain access to Printed Circuit Board #1. In the RHCM-10, the plastic front cover is mounted to the transmitter chassis by velcro tabs. Pull the cover away from the chassis. In the RHCM-20 and RHCM-30, remove one screw from the back cover. Loosen the other screw. Pivot the cover and gasket around the loose screw to expose the edge of the printed circuit board.

2. Perform the mirror cleaning procedure. To block ambient light, replace the filter over the cavity in the RHCM-10 or replace the shield over the cavity in the RHCM-20 or RHCM-30.

3. On the Printed Circuit Board #1, move SW1 to the BAL position. Power to the thermoelectric heat pump is interrupted allowing the mirror to warm to ambient temperature. Turn the screwhead of the trimpot (shown in Figure 6-1) next to the LED counter-clockwise until it gives an audible click as it is turned through to the end of its range. Now turn the trimpot 5 turns in the clockwise direction. If the LED lights, then no coarse adjustment is required. Continue to Step 5, otherwise continue to Step 4.

4. **Coarse adjustment:** identify the coarse bias adjustment screw above the sensor cavity. The screw is aluminum and requires a 1/16" Allen wrench to be adjusted. Block light from entering the sensor cavity and turn the screw clockwise and counter-clockwise until the LED on the Printed Circuit Board #1 just lights. Then turn the screw until the LED light has just gone out.

5. Perform fine optical adjustment procedure detailed in Section 6.2.3.

6.2.5 Diagnostic Procedures for RHCM Transmitter Subassemblies

For these procedures the RHCM-10, RHCM-20 or RHCM-30 is powered up and SW1 is in the OP position. A volt/ohm/ammeter is required.

Diagnostics for Printed Circuit Board #1

DC Power Supply: Check the voltage across terminals 8 and 10 of the P4 terminal strip for 24 ± 6 VDC. This voltage powers Printed Circuit Board #1 and sensor.

If the voltage is out of range, check power supply and power leads in the P4 terminal strip. Replace Printed Circuit Board #1, if necessary.

Primary Optics Voltage: Check voltage across pin 5 of LM324 (U1) and power loop return (terminal 10 of P4) for 2.3 to 2.7 VDC. Move SW1 to BAL position and wait 2 minutes. Voltage should be 3.1 VDC maximum.

If the voltage with SW1 in the OP position is out of range, return your unit to OMEGA for replacement and recalibration. If the voltage with SW1 in the BAL position is out of range, adjust the trimpot so that the voltage falls within range. If the voltage is in range but the LED does not light, then return to OMEGA for service or replace the Printed Circuit Board #1.

Diagnostics for Printed Circuit Board #2

Power Loop: Check the voltage input across terminals 1 and 2 of the terminal strip located in the upper left corner of the board (with the fuse located at the left side of the board) for appropriate input voltage. Check the output leads (red and black wires) for 24VDC. Refer to Figure 6-2.

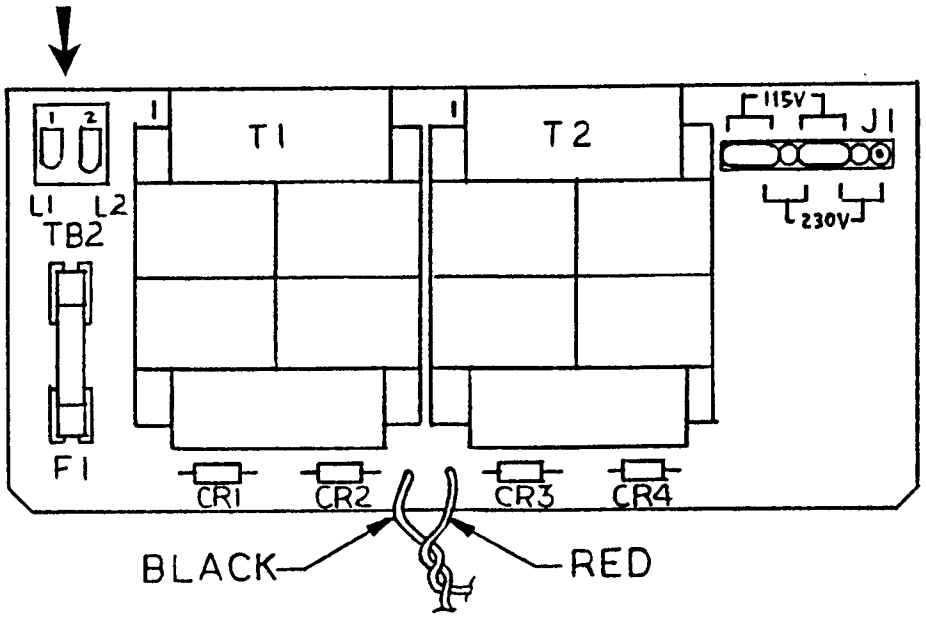


Figure 6-2. Printed Circuit Board #2

If the voltage in or out is out of range then check power supply or connection of leads to the terminal strip. Also check the fuse. Replace the fuse if it is open. Replace the board if the fuse is good.

Diagnostics for Sensor

4-Wire Platinum Resistance Thermometer Dewpoint Output: Disconnect the optional temperature transmitter at Printed Circuit Board #1 P3 connector or if connected to P4 connections then remove from P4. Check continuity across terminals 2 and 3 of P4. Measure the resistance across these terminals. DIN standard 43760 platinum resistance thermometer provides a resistance of 100Ω at 32°F (0°C). For example, the platinum resistance thermometer would have a resistance of 103.85Ω at 50°F (10°C) and 96.15Ω at 14°F (-10°C).

If the platinum resistance thermometer shows discontinuity or the resistance output is inconsistant with the ambient temperature, return the sensor to OMEGA for servicing.

Diagnostics for Internal Transmitter

This check compares the 4-wire platinum resistance thermometer resistance to the internal transmitter output at the dewpoint and air temperature. The measurements for air temperature may be checked against an air temperature thermometer.

Record the analog signal with SW1 in the OP position. Move SW1 to the mirror check position (CHK position) and record the signal when the LED lights. Refer to 4-wire platinum resistance thermometer output diagnostic to disconnect the internal transmitter. Record the resistance output of the platinum resistance thermometer across terminals 2 and 3. Move SW1 to the OP position and record the resistance output 40 seconds after the LED goes out. Convert resistances to temperatures. The calculated temperatures for dewpoint and ambient temperatures from the platinum resistance thermometer should match within ± 1.0°F (± 0.5°C) to the temperatures from the internal transmitter signal.

Quick Calibration Check

Move SW1 on Printed Circuit Board #1 to the CHK position. Power to the thermoelectric heat pump is interrupted. The mirror warms to ambient temperature in 2 minutes. Compare the dewpoint output to a reliable air temperature probe. The two temperatures should agree to within 2.0°F (1°C).

SECTION 7 TROUBLESHOOTING GUIDE

To check for symptoms attach the ammeter for linear 4 to 20 mA signal at terminals 5 and 10 of P4 on Printed Circuit Board #1 with the RHCM transmitter under power. If 4-wire platinum resistance thermometer output is taken from the transmitter then check the resistance across terminals 2 and 3 of P4.

	SYMPTOM	RESPONSE
1.	Zero Analog Output Zero platinum resistance thermometer output	- Check power to Printed Circuit Board #2 - Check power to Printed Circuit Board #1 - Check 4-wire platinum resistance thermometer for continuity. If all check out, then internal transmitter requires factory service.
2.	Oscillating output	- Perform mirror cleaning - Adjust optical balance - For RHCM-20 and RHCM-30 confirm that air flow past the sensor is non-turbulent and is above 300 feet (100 meters) per minute. If all check out, then contact OMEGA.
3.	4mA output only Low platinum resistance thermometer output	- Clean mirror - Adjust optical balance - Confirm that air flow past sensor is non-turbulent and is above 300 feet (100 meters) per minute. Put sensor back into service and observe the LED. If the LED remains on then the dewpoint is out of sensor range. If minimum output persists (about 4 mA), return the transmitter to OMEGA.
4.	20mA output only Infinite platinum resistance thermometer output	- Check 4-wire platinum resistance thermometer for continuity.
5.	Output tracks ambient temperature	- Check SW1 and move to OP position - Check power to Printed Circuit Board #2 - Check power to Printed Circuit Board #1 - Check 4-wire platinum resistance thermometer for continuity. If all check out, then internal transmitter requires OMEGA servicing.

SECTION 8 SPARE PARTS

The following are spare parts that are available from OMEGA Engineering.

PART NUMBER	DESCRIPTION
C40095333	Printed Circuit Board #1
C40057564	RHCM-10 Transformer Board (Printed Circuit Board #2) 24VAC
C40057556	RHCM-10 Transformer Board (Printed Circuit Board #2) 115VAC
P40101081	RHCM-10 Transformer Board (Printed Circuit Board #2) 230VAC
C40003444	RHCM-20 Transformer Board (Printed Circuit Board #2) 24VAC
C40003089	RHCM-20 Transformer Board (Printed Circuit Board #2) 115VAC
P40101099	RHCM-20 Transformer Board (Printed Circuit Board #2) 230VAC
P40101172	Transmitter, 4-20mA (1-5VDC), 0° to 100°F
P4010´214	Transmitter, 4-20mA (1-5VDC), 0° to 50°C
P40101198	Transmitter, 4-20mA (1-5VDC), -40° to 140°F
P70000454	RHCM-10 Sensor Assembly
P70001055	RHCM-10T Sensor Assembly with air temperature
P70000445	RHCM-20/RHCM-30 Sensor Assembly
B40055386	Sensor Maintenance Kit for RHCM-10
P40055592	Six sintered bronze replacement filters
B40050403	Sensor Maintenance Kit for RHCM-20/RHCM-30
P40055543	Six sintered bronze replacement filters

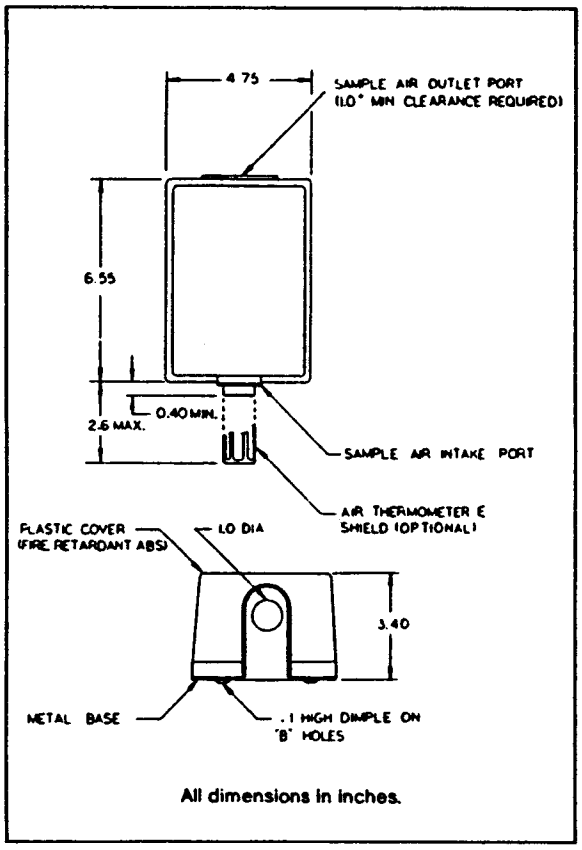
SECTION 9 SPECIFICATIONS

MIRROR DEPRESSION:	72°F (40°C) at 77°F (25°C) ambient
ACCURACY:	± 1.0°F (±0.5°C)
REPEATABILITY:	± 0.1°F (±0.05°C) max.
RESPONSE TIME:	2 minutes max. for RHCM-20 and RHCM-30; 4 minutes max. for RHCM-10
HYSTERESIS:	None
RTD OUTPUT:	100Ω Pt, 4-wire
ENVIRONMENTAL LIMITS	
OPERATING RANGE (MIN/MAX) SENSOR:	0° to 160°F (-18° to 71°C)
OPERATING RANGE MIN/MAX ELECTRONICS:	32° to 120°F (0° to 49°C)
CURRENT OUTPUT:	4-20mA, scaled to range of 0° to 100°F, 0° to 50°C, -40° to 140°F; all ranges also provide 1-5VDC using 250Ω shunt
FLOW RATE:	300 to 3000 feet (100 to 1000 meters) per minute for RHCM-20 and RHCM-30
MAX PRESSURE:	0 to 5 PSIG (0 to 300mbar)
HUMIDITY:	10% to 90% at 80°F (27°C)
POWER REQUIREMENTS	
STANDARD POWER:	24 ± 6VDC at 350mA
OPTIONAL POWER:	24/115/230VAC ± 10%; 50/60 Hz; 10 watts max.

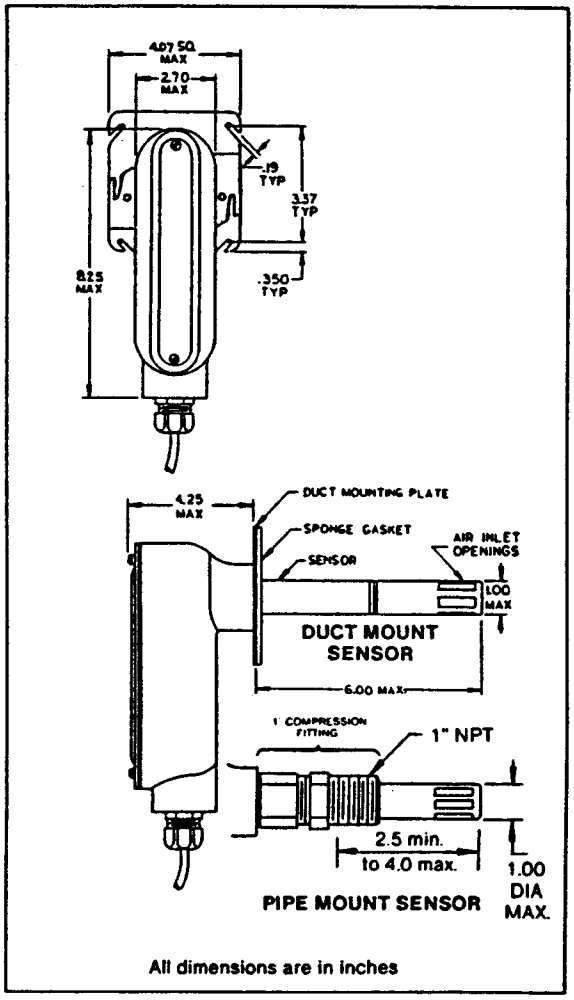
SPECIFICATIONS (Cont'd)

PHYSICAL

SHIPPING WEIGHT:	10 pounds (4.55 kg)
DRY WEIGHT:	6 pounds (2.73 kg)
DIMENSIONS:	Refer to Figure 9-1

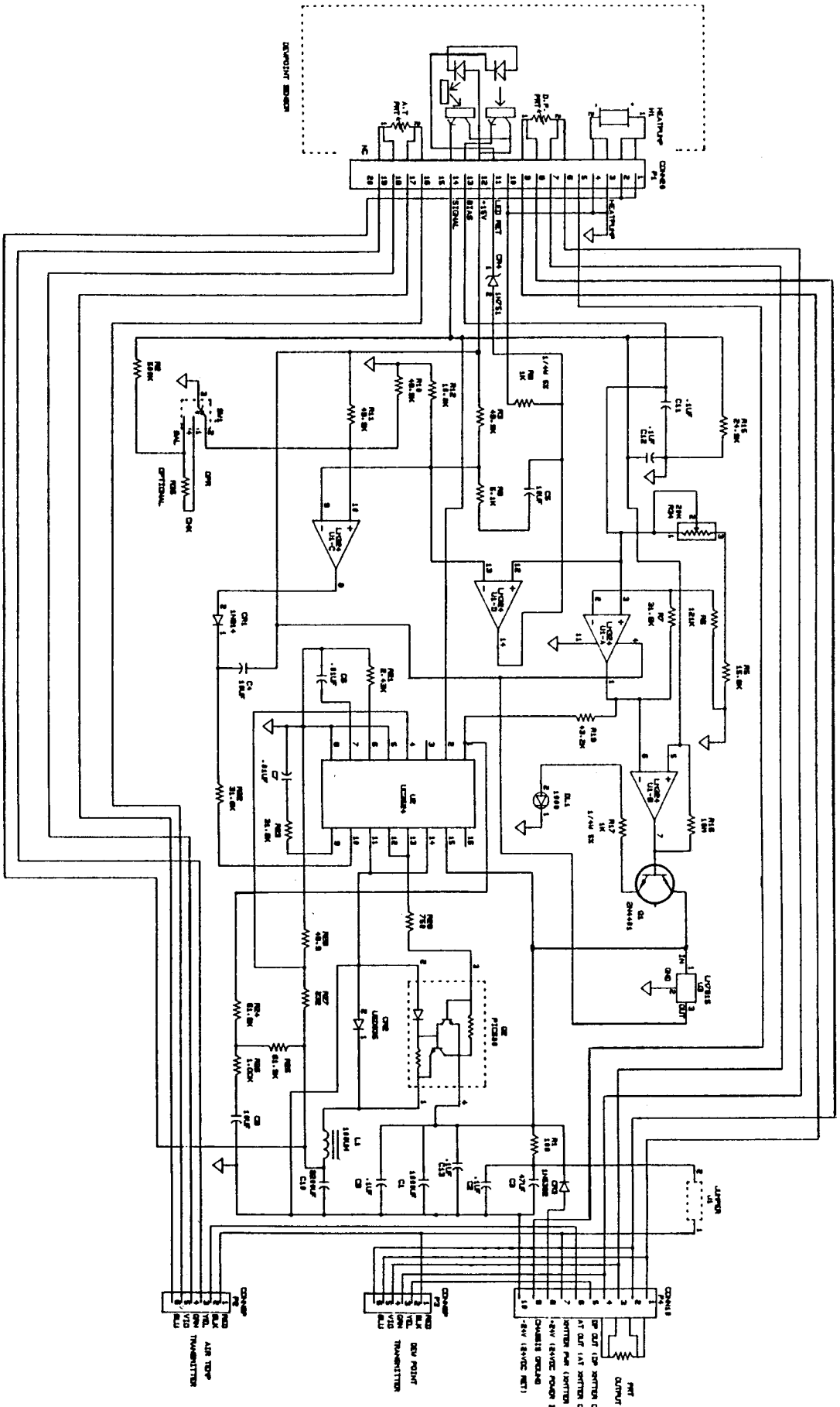


RHCM-10



RHCM-20/RHCM-30

Figure 9-1. Dimensions



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