CRCBDIOX001B00

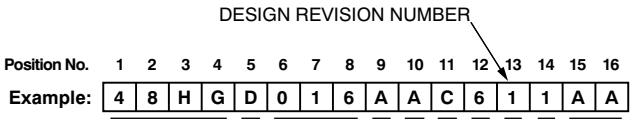
48/50PD05–06, 48/50HG014–028, 48/50PG03–28, 48/50PM16–28 CO_2 Sensor Accessory Single Package Rooftop Units with *COMFORT*Link™ Controls

Installation, Start-Up and Service Instructions

TABLE OF CONTENTS

IMPORTANT: Read and become familiar with all instructions before beginning installation of CO_2 sensor accessory.

IMPORTANT: There are two different design revision 48/50HG units currently being produced. Because of these differences, there are two different versions of this accessory. This accessory literature covers accessories manufactured for units with design revision 1. Design revision 0 units are not covered in this accessory book. To determine the design revision, refer to the full unit model number. See Fig. 1 for an example of an HG model number. The design revision number in the model number nomenclature is located in position 13.



C07172

Fig. 1 - Model Number Chart

PACKAGE CONTENTS

PART NUMBER	DESCRIPTION	QUANTITY
HH99ZZ009	CO_2 Sensor	1
HH99ZZ015	Enclosure	1
AL56AU166	Screw – No. 8 x 1/2–in.	4
50TG403323	Unit Wiring Harness (48/50HG014–028, 48/50PG20–28, 48/50PM16–28)	1
48HG400595	Unit Wiring Harness (48/50PG03–16, 48/50PD05–06)	1
50TG403368	Sensor Wiring Harness	1
HY93NH069	Snap Bushing	2
HY76TB110	Wire Tie	2

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

When working on equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies a hazard which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ WARNING

ELECTRICAL SHOCK, FIRE AND EXPLOSION HAZARD

Failure to follow this warning could result in personal injury, death or property damage.

Before performing service or maintenance operation on unit, turn off main power switch to unit. Shut off gas supply before shutting off main power. Tag gas shut off and power disconnect switch with a suitable warning label.

GENERAL

The CO_2 Sensor (Fig. 2) is designed to monitor carbon dioxide (CO_2) levels in the return air and interface with the *Comfort*Link™ controller on the rooftop air-conditioning unit. The sensor perceives CO_2 levels in the 0 to 2,000 parts per million (ppm) range and provides outputs indicating this level.

Printed in U.S.A. Edition Date: 11/09 **Catalog No:IIK–CRCBDI01–02**

Replaces: IIK–CRCBDI01–01

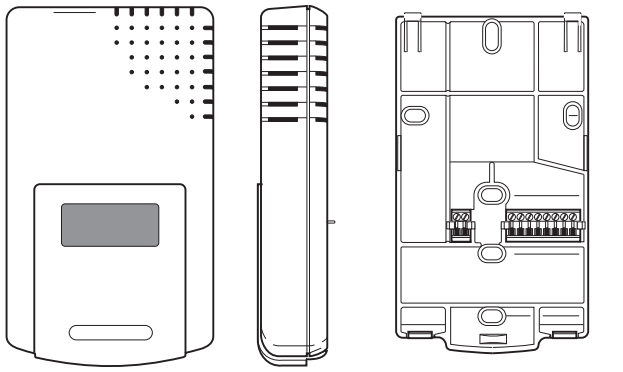


Fig. 2 - CO_2 Sensor

The unit utilizes a 4 to 20-mA analog signal. The *Comfort*Link™ controller uses this signal to control the economizer damper position and ensure an adequate level of outside air in the building. This is one of several approved methods of controlling the indoor-air quality (IAQ) in a building and meets the requirements of local building codes and ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Standard 62-1999. The control sensor features a membrane-covered waveguide and sample chamber that produces stable, reliable, and highly accurate carbon dioxide readings.

The standard RS-232 port is used to interface directly with a personal computer for easy customization and calibration. A software program is required for calibration of the sensor. The UIP (User Interface Program) and RS-232 serial cable are required (P/N CGCDXPRM001A00).

Check Package Contents

Remove accessory packaging and inspect shipment for damage. If any damage is found, file a claim with the shipping agent immediately. If any item is missing or any part does not assemble properly, notify your Carrier distributor. The Package Contents table on page 1 lists the accessory package contents. Table 1 lists the controller specifications. Fig. 3 shows the CO_2 sensor enclosure dimensions.

Table 1 – CO_2 Specifications

ACCURACY	
At Constant Temperature (78°F)	20 ppm (also repeatability)
Typical Conditions (60° to 90°F) (16° to 32°C)	± 2.5% of reading or ± 50 ppm whichever is greater
Extended Conditions (32° to 145°F) (0° to 63°C)	± 5.0% of reading or ± 100 ppm whichever is greater
Percent Change in Reading per °F	± 0.05% of reading
Pressure Dependence	0.19% per mm hg
Annual Drift	<20 ppm with TEMA Self Calibration Feature
Maximum Drift (per year)	± 100 ppm
Response Time (at 500 ml/min.)	< 1 min.
Warm-up Time at 72°F (at 22°C)	< 6 min.
GENERAL PERFORMANCE	
Operating Principle	Non-dispersive infrared (NDIR)
Gas Sampling Mode	Diffusion
EMI Interface	FCC Part 15 Class B
Certification	By the California Energy Commission
Shock Resistance	40 Gs
Sensor Life	15 years
Data Interface	Via RS-232 serial port
Alarm Threshold Adjust Range	50 to 50,000 ppm, programmable
Alarm Threshold Adjust Resolution	± 20 ppm
Alarm Threshold Hysteresis	50 ppm
Calibration Adjustments	Zero and span via RS-232 serial port
Calibration Procedure	Automated with UIP
Recommended Calibration Interval	One Year
Operating Temperature Range	32° to 113°F (0° to 45°C)
Storage Temperature Range	–40° to 158° F (–40° to 70°C)
Operating Humidity Range	0 to 95% RH (non-condensing)
Operating Pressure Range	± 1.5% local mean pressure
Dimensions (L x W x D)	6.4 x 2.2 x 1.7 in. (16.3 x 5.6 x 4.3 cm)
Weight	16 oz (454 gm)
Power Input	Nominal 24 vac (50/60 Hz)
Isolation Transformer	Not required with half-wave rectification
OUTPUT	
Optional Display	4-digit green LED display
Analog Output Maximum Range	0 to 10 v or 4 to 20 mA (jumper selected on circuit board)
Analog Output Customization	Can be set to any output within maximum range using PC-based UIP
Measurement Range	Fully adjustable using PC-based program and RS-232 interface. Max: 0 to 2,000 ppm
Relay	Gold bifurcated, 2 A rating, close on CO_2 rise
Relay Contact Resistance	100 mW max (measured at 6 v DC, 0.1 A)
User Relay Adjustments	Set point and deadband via PC-based UIP
Current Requirements	300 mA average, 500 mA peak
Wiring Requirements	16 to 20 gauge stranded wire

LEGEND
TEMA – Time Extended Measurement Algorithm
UIP – User Interface Program

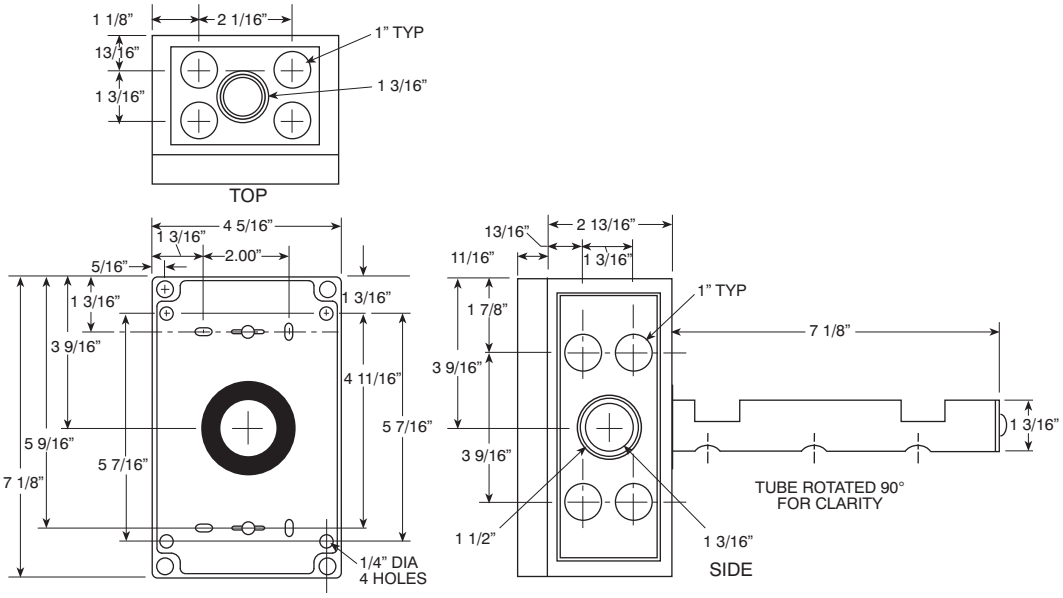


Fig. 3 - CO_2 Sensor Enclosure Dimensions

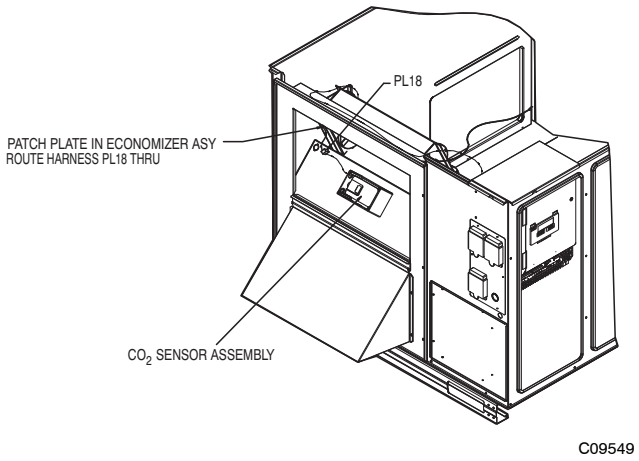


Fig. 4 - CO_2 Sensor Location in 48/50PD05-06 and 48/50PG03-16 Units

INSTALLATION

48/50PD05-06 and 48/50PG03-16

The CO_2 sensor is to be installed in the pre-drilled holes located in the economizer block as shown in Fig. 4.

1. Shut off unit power supply.
2. Open the hinged economizer door and secure.
3. Prepare the sensor enclosure (P/N HH99ZZ015) for mounting by removing the 4 screws on the Plexiglas cover.
4. Remove the CO_2 sensor (P/N HH99ZZ009) from the mounting plate.
5. Attach mounting plate to standoffs in the enclosure using the 4 machine screws.
6. Hold the enclosure vertically with the terminal blocks at the bottom and install a snap bushing in the conduit hole located on the right-hand side of the enclosure at the top.
7. Wire the sensor wiring harness (P/N 50TG403368) to the sensor as shown in Fig. 5. Be sure to route the wires through the bottom of the mounting plate and the snap bushing.
8. Remove plastic plug from economizer partition. Mount enclosure box to the partition using 4 sheet metal screws, verifying that the 3 cutouts on the inlet tube are facing downward as shown in Fig. 6.
9. Caulk the snap bushing to make sure that the box is completely sealed.
10. Attach sensor to the mounting plate.
11. Route unit wiring harness (P/N 48HG400595) through patch plate on economizer. (See Fig. 4.) Continue running harness with economizer harness, using metal clips and wire ties along top of filter plate. Be sure to leave enough slack so economizer can be tilted out.
12. Remove grommet from compressor partition and route harness through the slot. Replace grommet.
13. Open compressor access panel and locate end of harness. Wire the electrical harness (P/N 48HG400595) to the terminal strips as shown in Fig. 5.
14. Because the return air sensor is at a static zero or negative pressure, relative to ambient air, *it is vital that the box be completely sealed*. This includes areas where the control wiring enters the box and the perforated tubing enters the box. Once the enclosure is mounted, the return air will enter the inlet holes of the perforated tube, circulate through the sensor chamber and exhaust through the exit slots on the other side of the tube.
15. Connect the ends of the plug (PL18) together. Secure wires so they do not interfere with normal operation.
16. Close and secure the economizer panel and replace the Plexiglas cover.
17. Restore power to unit.

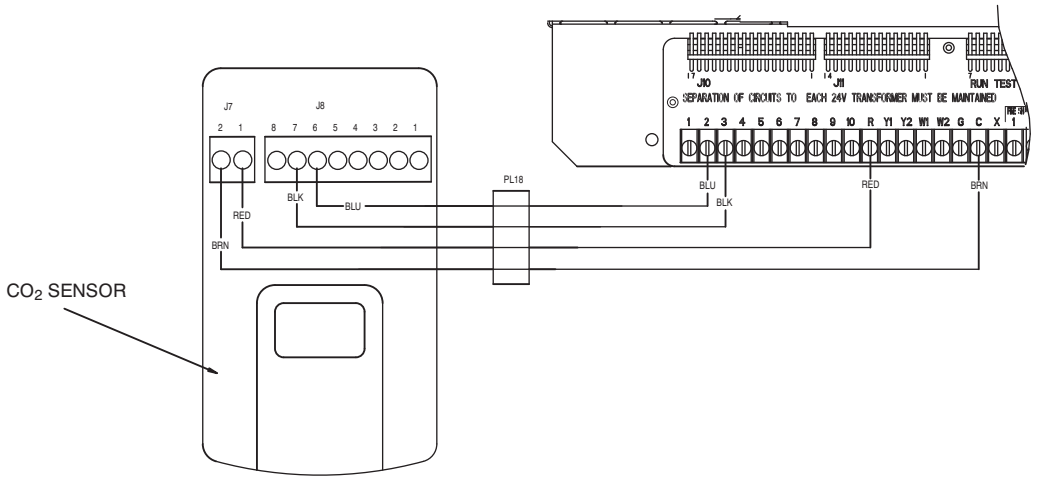


Fig. 5 - Wiring Diagram

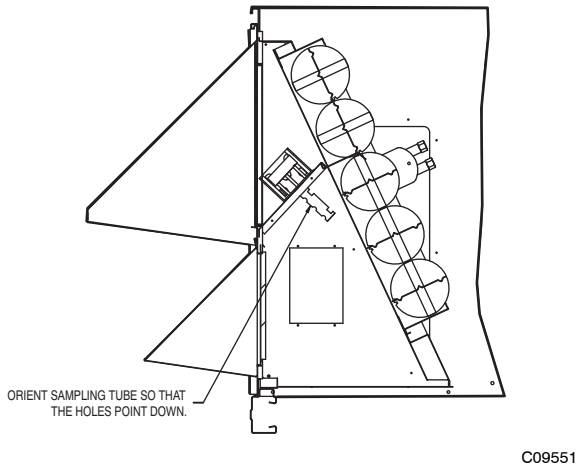


Fig. 6 - Economizer Block Off

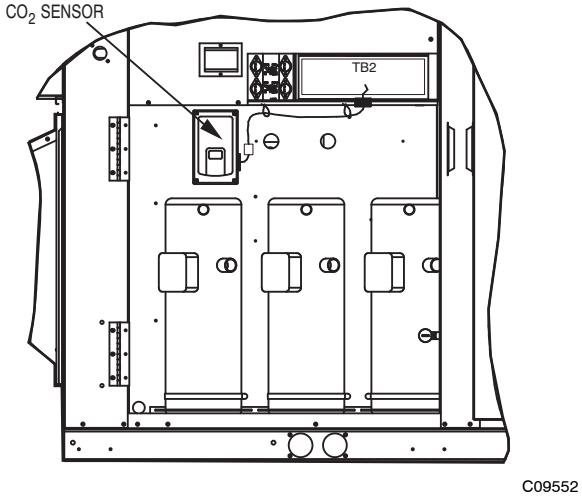


Fig. 7 - CO_2 Sensor Location in 48/50HG014-028, 48/50PG20-28 Units

48/50HG014-024, 48/50PG20-28 and 48/50PM16-28

The CO_2 sensor is to be installed in the pre-drilled holes located above compressor C1 location in the Electrical/Compressor Section. (See Fig. 7.) If the unit does not have a third compressor, the sensor will still be installed above where the third compressor would be.

1. Shut off unit power supply.
2. Open the hinged Electrical/Compressor door and secure.
3. Prepare sensor enclosure (P/N HH99ZZ015) for mounting by removing the 4 screws on the Plexiglas cover.
4. Remove the sensor CO_2 (P/N HH99ZZ009) from the mounting plate.
5. Attach mounting plate to standoffs in the enclosure using the 4 machine screws.
6. Hold the enclosure vertically with the terminal blocks at the bottom and install a snap bushing in the conduit hole located on the right-hand side of the enclosure at the top.
7. Wire the sensor wiring harness (P/N 50TG403368) to the sensor as shown in Fig. 5. Be sure to the route the wires through the bottom of the mounting plate and the snap bushing.
8. Mount enclosure box to the partition using 4 sheet metal screws, verifying that the 3 cutouts on the inlet tube are facing down and that the terminal blocks are located at the bottom.
9. Caulk the snap bushing to make sure that the box is completely sealed.
10. Attach sensor to the mounting plate.
11. Install the snap bushing in the center knockout underneath the control terminal strips located in the bottom right-hand corner of the control box.
12. Wire the electrical harness (P/N 50TG403323) to the terminal strips as shown in Fig. 5. Connect the ends of the plug (PL18) together. Secure wires so they do not interfere with normal operation.
13. Because the return air sensor is at a static zero or negative pressure, relative to ambient air, *it is vital that the box be completely sealed*. This includes areas where the control wiring enters the box and the perforated tubing enters the box. Once the enclosure is mounted, the return air will enter the inlet holes of the perforated tube, circulate through the sensor chamber and exhaust through the exit slots on the other side of the tube.
14. Re-attach the Plexiglas cover.
15. Restore power to unit.

START-UP

After applying power, the CO_2 sensor will enter a warm-up mode, indicated by the word "HEAT" in green on the display. Warm-up duration will be from 1 to 10 minutes. The warm-up duration will be shorter in warmer temperatures and longer in cooler temperatures. During warm-up, the signal output will be 4 mA. Once the unit has warmed up, the voltage or current output will be set up to indicate the CO_2 level. The display will show a steady reading 1 minute later.

Configuring the *Comfort*Link™ Controller

The CO_2 sensor is defaulted to provide 4 mA at 0 ppm and 20 mA at 2000 ppm. If a different range is necessary, the User Interface Program (UIP) accessory (P/N CGDXPRM001A00) must be used to reconfigure the sensor. If the sensor is reconfigured, the mA range on the *Comfort*Link controller must be configured to match the new values.

*Comfort*Link configurations are changed by using the Scrolling Marquee display. A password may be required to edit the configurations, depending on the previous settings configured in the unit. Default password is "1111". All configurations can be changed by using the arrow keys to scroll the red LED on the display to the "Configuration" position and press ENTER. Scroll through the menu until IAQ is found and press ENTER. After reaching the IAQ sub-menu, all configurations can be changed by finding the desired configuration by scrolling, pressing ENTER twice, changing the value with the arrow keys, pressing ENTER once and then pressing ESCAPE. Once one configuration has been changed, the remaining configurations can be changed by repeating the above steps. The configurations are listed in Table 2.

Verification and Calibration

The control can be verified for accuracy or calibrated with the accessory IAQ Calibration Kit. It is recommended that the user verify and/or calibrate the unit at least once a year. Contact a Carrier representative to obtain the accessory calibration kit. Calibration Kit (P/N CGCDXGAS001A00) includes:

- Calibration Adapter Blanket (CAB)
- Tygon® Tubing
- Clip Retainers
- Bottle of N_2 Gas (0 ppm CO_2)
- Bottle of CO_2 Gas (~2,000 ppm) in Nitrogen
- Pressure-Regulator Valve
- User Interface Program (UIP) Disk (3.5 in.) (Version 3.0)
- RS-232 Serial Cable

NOTE: The UIP is used for interfacing the controller with an IBM® PC, or equivalent. The UIP uses the DOS operating system and is menu driven.

SERVICE

Cleaning

The controller is a rugged and lightweight unit that requires very little maintenance. Clean external surfaces periodically with a dampened cloth.

TROUBLESHOOTING

The following occurrences may indicate abnormal operation, caused primarily by power input fluctuations, surges, or spikes.

- The unit remains in warm-up mode for more than 10 minutes.
- The LED glows with no pulse.
- CO_2 indication (display numbers or signal output) is frozen.
- Numbers on the display change continuously for longer than 1 minute.

Normal operation can usually be restored by removing power, shutting down the unit for at least 15 seconds, then reconnecting power. The unit should warm up, as described above, then return to normal operation. If the situation continues, remove and replace the sensor.

For additional troubleshooting information, see Controls and Troubleshooting Guide for Centurion unit.

Table 2 – IAQ Configurations

ITEM	EXPANSION	DESCRIPTION	DEFAULT
IA.CF	IAQ Analog Input Configuration	Control method to be used for analog input. 0: No IAQ 1: Demand Control Ventilation (DCV) 2: Override IAQ 3: Control Minimum Position	0
IA.FN	Fan Enable for Analog IAQ Input	Indicates whether the indoor fan must be operating before IAQ can operate. 0: Never 1: Occupied 2: Always	0
II.CF	IAQ Switch Input Configuration	Control method used for switch input. 0: No IAQ 1: Demand Control Ventilation (DCV) — Normally Open 2: Demand Control Ventilation (DCV) — Normally Closed 3: Override IAQ — Normally Open 4: Override IAQ — Normally Closed	0
II.FN	Fan Enable for Switch IAQ Input	Indicates whether the indoor fan must be operating before IAQ can operate. 0: Never 1: Occupied 2: Always	0
AQ.MP or AQ.MN	Minimum IAQ Position	Damper position necessary to remove contaminants and CO_2 from sources other than people.	10%
MIN.P or EC.MN	Economizer Min Position	Damper position necessary to remove contaminants and CO_2 from all sources including people. This is the design value for maximum occupancy.	30%
OVR.P	Economizer Position	Position when economizer is in Override IAQ	100%
OA.CF	OAQ Sensor Operation	0: No OAQ 1: OAQ is used in DCV calculations 2: OAQ is used to lockout IAQ.	0
AQD.L	AQ Differential Low	Differential AQ value above Outdoor Air Quality (OAQ) when the building is “occupied” but no was has arrived and the economizer should be at AQ.MP. When the differential between IAQ and OAQ begins to exceed AQD.L, the economizer will begin to open from AQ.MP, moving towards MIN.P. If an OAQ sensor is not installed, the default value is 400 PPM.	100 PPM
AQD.H	AQ Differential High	Differential AQ value above Outdoor Air Quality (OAQ) when the building is fully occupied and the economizer should be at MIN.P. When the differential between IAQ and OAQ is less than AQD.H, the economizer will begin to close from MIN.P, moving towards AQ.MP. If an OAQ sensor is not installed, the default value is 400 PPM.	700 PPM
OAQ.L	OAQ Lockout Value	If OAQ is greater than OAQ.L, then the economizer will not try to control IAQ and it will operate at AQ.MP.	600 PPM
DF.ON	Fan On AQ	Differential needed to turn on indoor fan if specified by IA.FN or II.FN	600 PPM
DF.OF	Fan Off AQ	Differential needed to turn off indoor fan if specified by IA.FN or II.FN	200 PPM
I.4M	IAQ Sensor Value at 4 mA	PPM corresponding to 4 mA from the IAQ CO_2 sensor.	0 PPM
I.20M	IAQ Sensor Value at 20 mA	PPM corresponding to 20 mA from the IAQ CO_2 sensor.	2000 PPM
O.4M	OAQ Sensor Value at 4 mA	PPM corresponding to 4 mA from the OAQ CO_2 sensor.	0 PPM
O.20M	OAQ Sensor Value at 20 mA	PPM corresponding to 20 mA from the OAQ CO_2 sensor.	2000 PPM