

CM Series

Precision Air Conditioning

Installation, Start-up,

Operation and Maintenance

Procedures Manual

CM - () A/W/G/C/PC
Air, Water, Glycol, Chilled Water,
& PreCool Models

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CM Series Air Conditioning

Precision Air Conditioning Installation, Start-up, Operation and Maintenance Procedures Manual

Important Notice Read Before Installation

Congratulations - You have purchased another quality product from Airflow Company. Everything has been done to make it perfect!

However, should you find a quality problem during start-up that you feel may require compensation, a **repair authorization number** must be obtained from Airflow Company **in advance**.

Call the Service Department, (301) 695-6500 to obtain your repair authorization number. We are available 24 hours a day, 365 days a year.

NO CLAIMS WILL BE HONORED WITHOUT A REPAIR AUTHORIZATION NUMBER

Due to an ongoing program dedicated to product improvement, specifications are subject to revision without notice. Airflow Company assumes no responsibility, and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

AIRFLOW COMPANY WARRANTY

We warrant that your AIRFLOW COMPANY product shall be free from defects in materials manufactured by us and in our workmanship for a period of two (2) years following shipment (the "Warranty Period") for new equipment and ninety (90) days following shipment for spare parts. This limited warranty shall apply only in favor of Buyer, shall expire on the last day of such two (2) year or ninety (90) day period, whichever the case may be, and shall be subject to the following:

(a) This warranty shall not apply to Goods which have been (i) repaired or altered by any Person other than AIRFLOW COMPANY; (ii) subjected to unreasonable or improper use or use beyond rated conditions, improper storage, negligence or accident; (iii) damaged because of use of the Goods, or the incorporation of any Goods into or use of any Goods with other materials or equipment after Buyer (or any other Person using the Goods) has or reasonably should have knowledge of any defect; (iv) manufactured, fabricated or assembled by any Person other than AIRFLOW COMPANY (We shall assign to Buyer, to the extent same is assignable, any warranty we have received from the manufacturer of such Goods); or (v) improperly installed by any Person (including Buyer) other than AIRFLOW COMPANY.

(b) This warranty shall not be effective unless we receive a written claim within thirty (30) days after discovery of any defect with respect to which a claim is made.

(c) AIRFLOW COMPANY shall have the right (but not the obligation) to verify, with its own representatives, the nature and extent of any claimed defect prior to return of the Goods to us. Upon request by AIRFLOW COMPANY, Buyer shall, at its own risk and expense, promptly return the Goods in question to our Plant in Frederick, Maryland.

(d) Buyer covenants to inform all subsequent buyers of the Goods of the limitation on and exclusion of warranty-ties provided for herein. Buyer hereby indemnifies and agrees to hold AIRFLOW COMPANY harmless from and against

SAMPLE

all losses, costs and expenses, including reasonable attorney's fees, incurred by AIRFLOW COMPANY as a result of any third party claim relating to the purchase, sale or use of, or otherwise relating to, the Goods covered by this Agreement.

(e) AIRFLOW COMPANY's liability for any breach of warranty shall be limited either to (i) repair or replacement (whichever we shall elect) at our Plant of any Goods determined by us to be defective, or (ii) payment of an amount equal to the invoiced cost to Buyer of the part or material which is defective, as we may elect. In no event shall AIRFLOW COMPANY be required to repair, replace or reimburse Buyer for more than the part or material that is found to be defective and AIRFLOW COMPANY's liability shall in no event be greater than the invoiced price of the items and shall not include labor, shipping or other costs incurred in connection with the reshipment of defective Goods to us or the reinstallation of such Goods after any repair or replacement. The Goods, as a whole, shall not be construed to be a "part" or "material" for the purpose of the immediately preceding sentence. Any Goods that are repaired or replaced by us shall be re-delivered to Buyer F.O.B. our Plant and shall be warranted for the remaining term of the original Warranty Period for such Goods. THE REMEDY SET FORTH IN THIS PARAGRAPH IS EXPRESSLY AND AGREED TO BE THE SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

(f) THE WARRANTY SET FORTH IN THIS PARAGRAPH IS IN LIEU OF ALL OTHER WARRANTIES (EXCEPT OF TITLE), EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY IMPLIED OR EXPRESS WARRANTIES OF MERCHANTABILITY/FITNESS FOR A PARTICULAR PURPOSE AND CONFORMITY TO MODELS OR SAMPLES. ALL OTHER LIABILITY, WHETHER IN CONTRACT OR TORT, STRICT LIABILITY, NEGLIGENCE OR OTHERWISE, IS HEREBY EXCLUDED.

OWNER'S RESPONSIBILITIES

Protect your investment — read this carefully

The following are not manufacturing defects or results of manufacturing defects and are not covered by the AIRFLOW COMPANY factory warranty, they are the responsibility of the owner:

1. Damage resulting from handling during installation or damage resulting from transportation.
2. Incorrect or fluctuating power supply.
3. Damage resulting from failure to keep air side of evaporator or air cooled condensers clean.
4. Damage resulting from freezing of condenser water or condensate, inadequate or interrupted water supply, use of corrosive water,

re-arrangement of unit plumbing system, fouling or restriction of the water circuit by foreign material.

5. Inaccessibility of unit for service or parts installation that prevents equipment from operating with adequate supply of condenser air or water.
6. Damage resulting from the use of the unit in corrosive atmosphere.
7. Damage caused by not cleaning or replacing filters.
8. Damage caused by accident, alteration of unit design, or tampering.

Model No. _____

Serial No. _____

Date of Shipment from Plant _____

Introduction

Congratulations on the selection of an Airflow Company environmental control system. The unit incorporates the latest system design innovations to provide you with optimum efficiency, reliability and control accuracy.

The CM Series System will provide years of trouble free service, provided it is installed and maintained by technically qualified personnel in accordance with the guidelines set forth in this manual.

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The CM Series - a flexible range of ceiling mounted systems

Hidden away above the ceiling, the CM Series of air conditioners has been designed to create the ideal operating environment for computers, telecommunications devices, and all other types of sensitive electronics. The CM Series controls both temperature and humidity, 24 hours a day, operating at the high sensible heat ratios required to satisfy electronic equipment heat loads. The CM Series offers a broad line of products, one of which will be the perfect match for your own environmental control requirements.

► **Flexibility** - Available as a ducted or spot cooling system, split or self-contained, coupled with remote mounted condensers or condensing units, suitable for indoor or outdoor operation, the CM Series offers a wide range of different configurations.

► **Ease of Installation** - the system that is right for your application is quick and easy to install with plug in controls and single point power connection on close coupled systems.

► **Serviceability** - Panels are removable in place allowing full service access to all components with the unit in place.

► **State of the art** - the CM Series is available with the steam canister humidifier and microprocessor controller, features normally reserved for much larger computer grade systems.

Airflow Company

In 1967, Airflow Company entered the commercial computer room air conditioning market and developed its EAC Series of air conditioners. As requirements continue to become more stringent and data center managers require more reliable and efficient air conditioners, the design features of the Airflow Company's current AFX series become even more important.

Airflow Company's Impact Division designs special purpose air conditioning and refrigeration units for military and industrial markets throughout the world.

As a result, Airflow Company has an unprecedented design capability backed by an impressive number of field proven units - mobile, self-contained, self-powered, shipboard and airborne systems - that are satisfying the most demanding requirements.

Airflow Company's Dryomatic Division manufactures a wide range of continuous duty desiccant dehumidifiers. Dehumidifiers meet the humidity control requirements for critical storage areas such as paper, film or tape records retention, museum artifacts, hygroscopic material in pharmaceuticals, chemicals, agricultural and ornamental seeds, as well as providing dry air for many important commercial processes. Units including factory designed and installed systems with pre-cooling and/or after-cooling are available for either indoor or outdoor installations.

Worldwide Sales and Service

Airflow Company's worldwide network of representatives are fully qualified to provide engineering, sales, installation and service for our products. Airflow Company's computer room air conditioners are installed in over 85 countries.

Standard Features

The CM series of ceiling mounted units offers a wide range of potential system configurations. The evaporator section can be either a spot cooler or have ducted delivery and/or return (5 ton systems must be ducted).

Air cooled systems can utilize condensers or condensing

units, indoors or outdoors, with centrifugal or propeller fans. The condensers can be close coupled or remote.

Water/Glycol cooled systems can be self-contained or split with a remote indoor condensing unit. Glycol cooled systems also include an outdoor drycooler and a pump package.

Chilled water units are self-contained and include a 2-way slow close valve rated for 125 psi as standard.

Systems are available in a wide range of voltage and phase supply combinations, including 208/230/1/60, 277/1/60, 208/230/3/60 and 460/3/60. See Electrical Data section for more details.

Optional Equipment

Filter Box

Optional filter boxes can be incorporated to allow higher efficiency filters up to 65% on the ASHRAE 52.1-95 standard.

Condensate Pump

The unit can be supplied with a factory wired condensate pump equipped with automatic pump switch and check valve.

Humidifier

Unit can include a steam generating canister type humidifier including strainer, fill and drain valves, and steam distribution wand.

Optional Microprocessor Control

The unit can be supplied with a microprocessor control with LCD display, non-volatile memory and manual override capability.

External Chilled Water Supply System

A design that uses building chilled water supply when available and automatically switches to on independent internal DX mode. When chilled water can't be used due to servicing or shut down.

Freecool Systems (PC)

An efficient, energy-conserving design that reduces operating costs by taking advantage of low outdoor air temperature to provide "free" cooling. These systems greatly reduce compressor operating hours, saving energy and extending component operating life.

Hot Gas Reheat

The unit can be supplied with a factory installed hot gas reheat coil in place of the electrical heater elements (excluding CM20).

Hot Gas Bypass

The unit can include a factory installed hot gas bypass system to fully modulate the unit's cooling capacity (excluding CM20).

High Pressure Water Regulating Valves

The water cooled units can be supplied with field installable, 350 psi rated, head pressure control valves.

Head Pressure Controls

Air cooled systems shall include one of the following head pressure control systems:

► Fan Cycling (FC) control provides 0°F head pressure control by cycling the condenser fans on and off in response to changing ambient temperature.

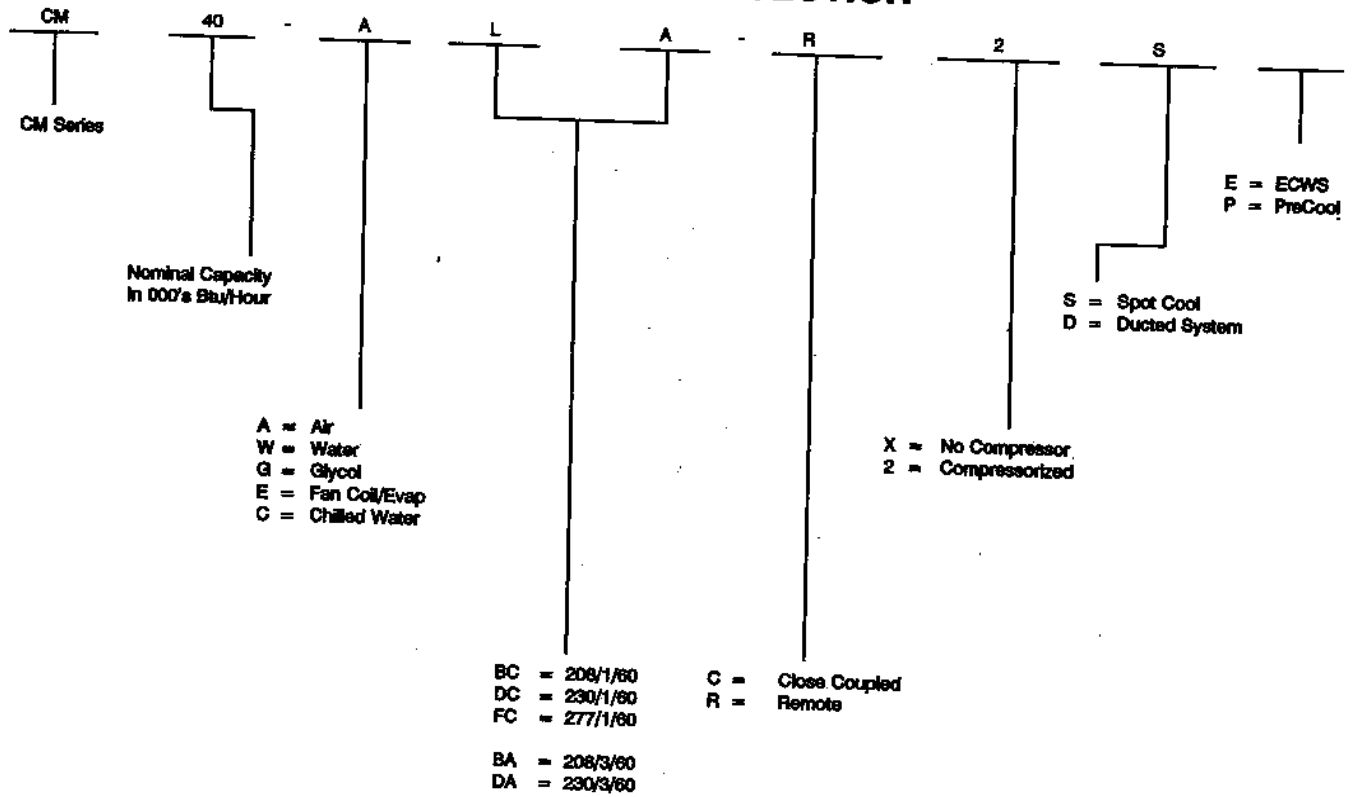
► Fan Speed Control (FSC) varies the speed of one single phase motor on an air cooled condenser by directly sensing head pressure changes. FSC provides air delivery in direct proportion to heat rejection requirements. On condensers with more than one fan, the first position fan motor is single phase variable speed. FSC will control to -20°F.

► Flood Condenser Control (FCC) provides head pressure control to -30°F "flooding" the condenser with liquid refrigerant. The amount of flooding is controlled by a head pressure control valve. On condensers with more than one fan, all but the first position fan motor are cycled on and off in response to changing ambient temperature.

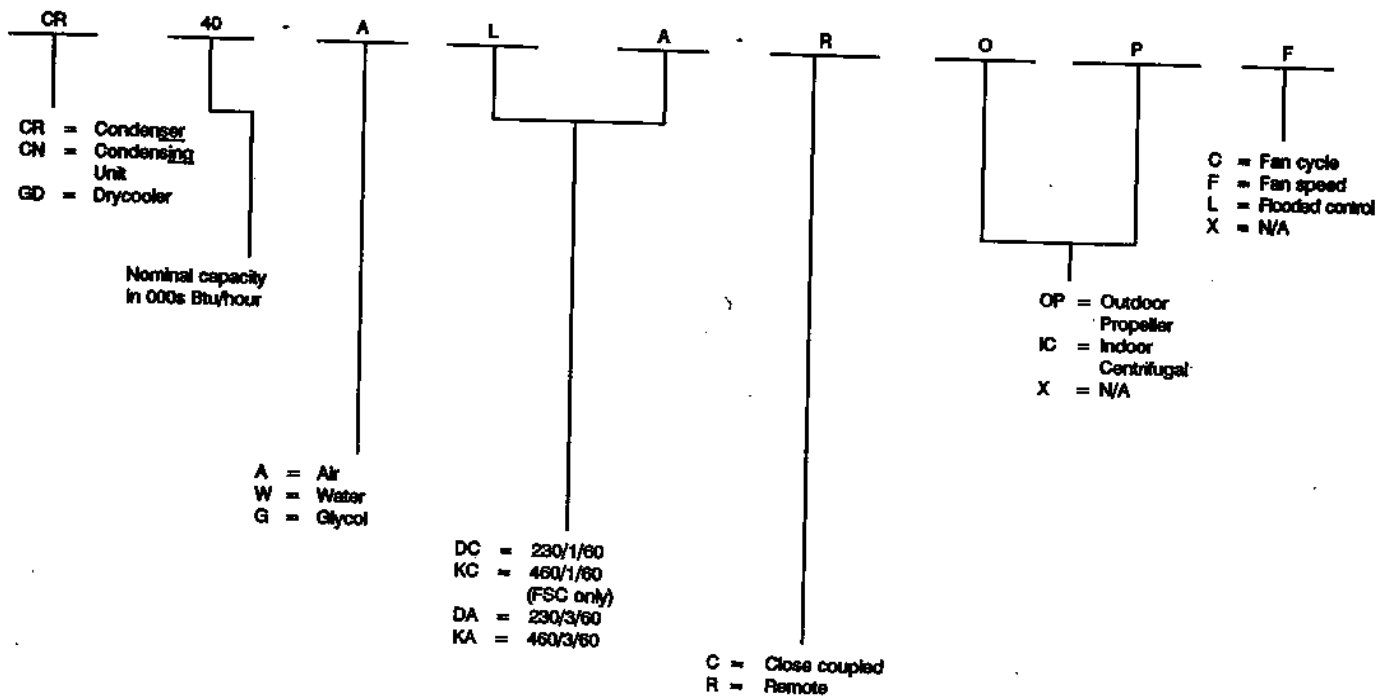
NOTE: Combinations of the above options may not be available on all systems.

Model Numbers

EVAPORATOR SECTION



CONDENSER/CONDENSING UNIT



Mounting

Mounting of the CM Series should be accomplished using a minimum of 3/8" all-thread rod. Isolation devices should also be used to prevent the transmission of vibration to the support structure. The unit level should be to within 1/8" of all corners with a slight tilt toward the condensate drain connection.

Clearance for ease of serviceability should be approximately 24" on both sides.

GRILLE INSTALLATION

After the air conditioner has been securely mounted and all utilities connected, install the supply and return air grilles beneath the air conditioner. Both supply and return air grilles are one-way directional grilles and must be installed so that the airflow will not short circuit from the evaporator outlet to the return air grille. Cut the gasketing material and place around the perimeter of the grilles, with the pre-glued side applied to the bottom of the unit. Slide both return and supply grilles into place beneath the air conditioner. Insert the filter into the filter frame of the return air grille. Lower the CM unit down onto the return air grilles, compressing the gasketing material to provide an air tight seal around the perimeter of the bottom of the unit. Check that the unit is leveled to $\pm 1/8$ " inch.

NOTE: Every precaution must be taken to make sure that the unit is securely mounted in the ceiling with adequate support.

Installation

POWER CONNECTION

The CM unit may use single or three phase power for operation. Bring the service cable through the 3/4" bulk head hole near the electric box and connect it to the power distribution block provided on the left side of the electric box. All wiring must be done in accordance with local and national electric codes.

GROUNDING

A ground lug is located next to the high voltage connection. It *must* be used.

UTILITY CONNECTIONS

All connections are made through the side of the mechanical section of the air conditioner for ease of service connection.

CONDENSATE DRAIN CONNECTION

Condensation from the evaporator pan and the discharge from the optional humidifier system drains through a drain in the side of the unit. The installing agency should provide a P-trap and the piping for this zero drain with slope to allow for free drainage.

OPTIONAL HUMIDIFIER CONNECTION

The humidifier inlet connection is in the bottom mechanical section. A 1/4" compression connection is supplied with the unit.

WATER SUPPLY TO HUMIDIFIER CONNECTION

1. The humidifier fill valve(s) orifice is sized for supply water pressure from 30 to 85 psig.
2. For water pressure between 15 and 30 psig, notify the factory and a larger fill valve will be supplied.
3. For installation with less than 15 psig, notify the factory and a fill valve with a specially sized orifice will be supplied.
4. For applications above 85 psig, install a pressure reducing valve in the water feed line to the unit.
5. With extremely dirty or muddy water sources, proper filtration is required on the unit's entering water line.
6. DO NOT use softened water with the humidifier because it is too conductive.

7. DO NOT use completely demineralized water with the humidifier because it is the minerals that allow the electrode principle to work.
8. DO NOT use a hot water source. It will cause deposits to eventually block the fill valve orifice.
9. Water supplies with high conductivity (above 700 microhms) must be preconditioned for proper humidifier operation and longevity.
10. Consult the Humidifier Operation & Maintenance Manual included with this CM unit for more in-depth information and troubleshooting procedures.

OUTDOOR HEAT EXCHANGER INSTALLATION

The Outdoor Heat Exchanger (OHE) should be located in a high security area. Consideration must be given to ensure a minimum of 24" clearance from any adjacent wall. The area should be clear of paper and debris that might be drawn into the coil.

Be aware of air movements that may cause short circuiting of the entering and leaving condenser air.

The OHE must be mounted on a level surface with sufficient support to carry the unit's weight when fully charged. The heat exchanger has mounting holes to permit the unit to be bolted down to prevent shifting. Consult the OHE Installation Manual for proper set-up.

Before operating, all OHEs should be checked as follows:

1. Check set screws on all fan hubs.
2. Ensure that fans turn freely and that the blades are not distorted.
3. Insure that fans rotate in proper direction.

The installing agency should provide a main power disconnect to isolate the OHE during routine service or an emergency. Consult the OHE electrical data table for specific electrical information.

Installation (continued)

DRY COOLER AND PUMP PACKAGE INSTALLATION

Provide sufficient valves and unions to isolate the dry cooler and pump package during routine service or in the event of an emergency.

Pipe should be welded wherever possible to minimize leak possibility.

Pipe and wire the dry cooler/precool system in accordance with local and national codes. A wiring diagram is attached to the inside of each control panel cover. The control enclosures are weather protected and should be mounted close to the header end of the drycooler. All thermostats should be checked for the proper setpoint per the wiring diagram. Any remote bulb thermostats should be mounted and insulated at this time.

The pump package is weather-protected and has been factory wired with branch fusing and pump motor overloads. Consult the nameplate for electrical information on the pump package for disconnect sizing. Your pump size may have been increased or decreased from the standard pump package due to pressure drop requirements.

The pump package should be mounted as close as possible to the drycooler and the glycol solution should flow from the drycooler to the pump package.

The expansion tank with airtrol fitting must be mounted at the highest point in the piping system. A fill hose bib should also be provided to facilitate filling the system.

Installation of an air separator will enhance the ability to remove the air during start-up.

AIR COOLED CONDENSER INSTALLATION

All refrigerant piping should comply with ASHRAE, local and national codes. Use only refrigerant grade pipe, and pipe joints should be high temperature brazed.

The discharge line should loop above the hot gas header at the condenser.

The risers must be properly sized to ensure oil return.

Discharge lines should be sized to maintain sufficient return oil to the compressor by maintaining high gas velocity while keeping the refrigerant pressure drop within normal ranges.

Piping should be adequately supported and should allow for normal expansion and contraction.

CHILLED WATER INSTALLATION

Chilled Water Connections: Care should be taken in correct connection of the water inlet and outlet. Consult the applicable piping diagram to identify the inlet and outlet ports and location.

Caution - units are shipped from the factory with a holding charge. Use the schraeder valves on the internal piping to remove the charge before any piping is attempted.

It is recommended that shut off valves be installed for use during routing service and emergency isolation of the system.

GENERAL AIR DISTRIBUTION

The CM unit provides full rated air delivery at 0.5 external static pressure. All other CM units are rated for 0.3" external static pressure.

Piping Connections

Refrigerant Pipe Connections CM()A

When piping air cooled systems, care must be taken to use only clean refrigerant grade (Type L) pipe and follow standard procedures for pipe size selection. Maximum recommended distance between the evaporator and condenser is 200 equivalent feet. Vertical runs (hot gas) require a trap every 20 feet of rise.

Water/Glycol Piping Connections CM()W or CM()G

Care should be taken in the correct connection of the water/glycol inlet and outlet connections.

It is recommended that shut off valves be installed for use during routine service and emergency isolation of the air conditioner.

NOMINAL DISCHARGE LINE SIZES R-22

Capacity BTU/hr	Equivalent Length, Ft.			
	50	100	150	200
12,000	1/2	1/2	5/8	5/8
18,000	5/8	5/8	5/8	7/8
24,000	5/8	7/8	7/8	7/8
36,000	7/8	7/8	7/8	7/8
60,000	7/8	1-1/8	1-1/8	1-1/8

Nominal sizes are applicable with evaporating temperatures from -40°F to 130°F.

NOMINAL LIQUID LINE SIZES R-22

Capacity BTU/hr	Condenser to Evaporator Equivalent Length, Ft.			
	50	100	150	200
12,000	3/8	3/8	3/8	3/8
18,000	3/8	3/8	1/2	1/2
24,000	3/8	1/2	1/2	1/2
36,000	1/2	1/2	1/2	1/2
60,000	1/2	5/8	5/8	5/8

Nominal sizes are applicable with evaporating temperatures from -40°F to 130°F.

Piping Connection Chart

Air Cooled Models

MODEL	CM15A	CM20A	CM25A	CM40A	CM65A
Condensate drain, O.D.	7/8"	7/8"	7/8"	7/8"	7/8"
Humidifier inlet, O.D.	1/4"	1/4"	1/4"	1/4"	1/4"
Hot gas line, O.D.	1/2"	1/2"	5/8"	5/8"	7/8"
Liquid line, O.D.	3/8"	3/8"	3/8"	1/2"	5/8"
Suction line, (Condensing O.D.)	5/8"	5/8"	7/8"	7/8"	1-1/8"

Water Cooled Models

MODEL	CM15W	CM20W	CM25W	CM40W	CM65W
Condensate drain, O.D.	7/8"	7/8"	7/8"	7/8"	7/8"
Humidifier inlet, O.D.	1/4"	1/4"	1/4"	1/4"	1/4"
Condenser Water In/Out O.D.	5/8"	5/8"	3/4"	7/8"	1-3/8"

Glycol Cooled Models

MODEL	CM15G	CM20G	CM25G	CM40G	CM65G
Condensate drain, O.D.	7/8"	7/8"	7/8"	7/8"	7/8"
Humidifier inlet, O.D.	1/4"	1/4"	1/4"	1/4"	1/4"
Condenser Water In/Out O.D.	5/8"	5/8"	3/4"	7/8"	1-3/8"

Chilled Water Models

MODEL	CM15C	CM20C	CM25C	CM40C	CM65C
Condensate drain, O.D.	7/8"	7/8"	7/8"	7/8"	7/8"
Humidifier inlet, O.D.	1/4"	1/4"	1/4"	1/4"	1/4"
Condenser Water In/Out O.D.	1/2"	1/2"	7/8"	7/8"	1-3/8"

System Control

This unit is supplied as standard with a return air thermostat. Field installation is required and wiring should be per the included electrical schematic. Options may include a heater and humidifier. If so equipped an additional 2 humidistats will need to be mounted and wired. Both the thermostat and the humidistat should be mounted five feet above the floor and in an area that gives a true indication of the conditions within the room.

Optional controls will be a microprocessor which will also need to be field mounted and wired. A separate Operation and Maintenance Manual will be provided within the equipment package.

Field Control Wiring

Control wiring must be done in accordance with local and national electric codes. The CM Series control voltage is 24 VAC.

NOTE: Minimum wire gauge, AWG 18, maximum length, 100 feet.

Optional Control System

The CM System has the option to be controlled by a microprocessor. Please consult the Operation and Maintenance manual provided with each CM unit for configuration and in-depth troubleshooting information.

Pre Start-Up

Prior to initial start-up, perform the following checks to ensure proper unit operation:

Electrical Checks

1. Check to make sure that incoming voltages match the nameplate's phase and voltage listings.
2. Make sure that the unit is properly grounded to an earth ground.
3. Check all internal electrical components and terminal blocks for loose connections which may have been caused by shipping vibrations.
4. Check that all fuses are correct and securely in the fuse blocks.
5. Check the overloads for correct setting (FLA of nameplate) and make sure that the overloads have not been tripped.
6. Check that the interconnecting control wiring (if required) is correct.
7. Check that all switches are turned off before supplying power.

Mechanical Checks

1. Make sure that all DX and water/glycol isolation valves are open in the system.
2. Check to make sure that water/glycol will flow through the unit for heat rejection.
3. Bleed any air from the water/glycol/chilled water systems.
4. Check for water/glycol/chilled water leaks.
5. Make sure that the blower belts are adjusted correctly.
6. Before replacing the unit's panels, make sure the inside of the unit - especially the blower wheels - are free from debris.
7. Make sure the air filters are in place and clean.

When all of these checks have been performed, replace and secure all of the unit's panels.

Charging the System

The CM Series Water/Glycol and the integral mounted Air Cooled Systems are factory charged with refrigerant. All other DX systems must have the piping evacuated and the system charged.

All refrigerant connections should be leak tested before the system is charged with refrigerant. The complete system should be pressured to 250 psig with a trace amount of refrigerant and dry nitrogen. Use an electronic leak detector to carefully check each joint. Leaks should be repaired and the system pressurized again to 250 psig to double check all joints.

After the leak check has been performed, a vacuum pump should be used to evacuate the total system (the unit, condenser and inter-connecting piping) after the condenser has been installed in the system. Pull vacuum on the total system of 29 inches or 50 microns and hold it for four hours. Then break the vacuum with dry refrigerant. At this point the system can be fully charged.

Follow standard HVAC charging practices but use the following recommendations: when the system is properly charged, the superheat should be nominally 15°F and the subcooling 10°F.

System Function

After connecting all the utilities to the unit and ensuring that the unit is securely mounted in place, start the air conditioner by enabling the ON/OFF switch on the thermostat in the ON position. This will start the evaporator blower. Turn the thermostat to the lowest setting and the compressor will start. After the refrigeration system has functioned for approximately 15 minutes, observe the suction and discharge pressure gauges and inspect

the sight glass. The system should be fully charged (sight glass clear). The gauges should indicate between 58-75 psig suction pressure and approximately 225-275 psig discharge pressure. If the unit is functioning properly, the controls may be set at the desired setting and the return air grille closed.

Complete the start-up sheet and return it to Airflow Company

Control/Safety Adjustments

After the installation and start-up of the CM Series unit has been completed, "fine tuning" of the system's controls and safety systems is necessary as described below.

Evaporator Fan

The CM unit uses a direct drive fan to deliver the condition air. Check the blower set screws; making sure that they are tight to the motor shaft.

Belt Tension (CM 65 only)

The blower motor is mounted on an adjustable base. Belt tension can be increased or decreased by raising or lowering the base.

A deflection of about 3/4 - 1" per foot of span between the blower and motor pulleys should be obtained by pressing the belt firmly. The adjusting belt should be locked in position after adjustment is made.

WARNING

Too much tension will shorten bearing, shaft and belt life.

For quiet operation, the belt should be as loose as possible without slippage. Slippage may result in belt squeal or insufficient airflow, or both. A simple test for the belt slippage is to check the temperature of the smaller pulley in relation to the larger pulley. If the small pulley is noticeably warmer, this is an indication of belt slippage and the belt should be tightened slightly. **DO NOT TEST TEMPERATURE WHILE PULLEYS ARE TURNING.**

Belt tension should be readjusted if the variable speed pulley setting is changed or if the belt is replaced.

Motor Pulley (CM 65 only)

The pulley on the blower motor has a variable pitch diameter to allow the blowers to be sped up or slowed down to compensate for higher or lower external static pressure, or in some cases, high altitude compensation.

The motor pulley has been factory sized and the unit has been factory tested with the pitch in the middle of its adjustment range.

To increase blower speed, remove the belt from the pulley by taking it off the larger non-adjustable blower pulley first. Loosen the set screw on both movable sheaves. Turn them inward toward the center stationary sheave to increase the effective pitch diameter. To decrease the blower speed, spread the sheaves further apart.

TURN BOTH SHEAVES THE SAME NUMBER OF TIMES.

This is necessary to maintain uniform tension on both belts.

Tighten the set screws again, making sure that they are not on the threaded portion of the sheave, and put the belts back on.

Check for proper alignment between the driving and driven sheaves (pulleys). Improper alignment will cause premature wear on the blower belts.

Air Pressure Differential (APD) (OPTIONAL)

The CM unit uses an APD switch to sense airflow loss through the unit. The APD is factory set to make the switch close at 0.2" W.G. across the internal APD bellows. The pressure setting is adjustable by turning the adjustment screw clockwise to increase the setting.

Clogged Filter Switch (OPTIONAL)

The clogged filter switch senses the air pressure drop across the filters. When the pressure drop is too high due to dirty filters, the switch closes and causes an alarm. While the clogged filter switch has been set at the factory for approximately 1.0 of pressure drop across the filters, the setting should be checked at unit start-up. Cover one-third of the filter area and increase or decrease the clogged filter switch sensitivity so that the switch closes when one-third of the filter area is blocked. **THIS PROCEDURE CAN ONLY BE USED WITH NEW, CLEAN FILTERS.**

Overload Relay (OPTIONAL)

The blower motor starter has an adjustable overload relay. The adjustment dial should be set to correspond to the full load amperes (FLA) on the blower motor. The overload has a manual reset button to prevent the motor from cycling on the overload switch.

Water/Glycol Regulating Valve

All glycol and water cooled CM Series units are supplied with discharge pressure actuated valves to control the water or glycol flow through the condensers. The valves should be adjusted to control the water cooled systems

at 105°F condensing temperature and the glycol systems at 130°F condensing temperature.

Smoke Detector (OPTIONAL)

This detector is not adjustable and can be activated by dust and/or smoke. Due to the electrical latching circuit in the detector, all line power must be removed from the unit then reapplied to reset this device.

Manual Start Protectors (OPTIONAL)

Manual start protectors should be set for the FLA of the device it is protecting.

Humidifier Operation

Your CM Series unit may be equipped with a pure steam generator type humidifier as an option.

Check all electrical connections for wires which may have become loose in shipping.

Components burnt due to loose connections are NOT covered under warranty.

Check electrode plugs to ensure they are pressed firmly onto the electrode pins.

Important: Loose connections will cause overheating of the cylinder plugs and probable melting of the plugs and/or cylinder.

Turn on the main disconnect in the primary service feeding the unit and check that the unit has power at the primary terminal block.

On the humidifier controller attached to the left side of the humidifier assembly, push the black switch to 'AUTO/ON' so that it clicks into the depressed position.

Water will start to enter the cylinder through its bottom port and rise in the cylinder to a point determined by the solid state control circuitry.

It is not unusual upon initial start-up for water to fill the cylinder and cycle on the red change cylinder light. The high level probe simply acts as a safety to shut off the fill valve and prevent overfilling. With the red light on, the water in the cylinder will continue to heat and after a few minutes start to boil. After the boiling action of the water has lowered the water level below the sensor at the top of the cylinder, the

red light will go out and the fill solenoid will again open until the cylinder is again full. This cycling of the red light and fill valve will continue until the unit's full output capacity is reached, after which the water level will automatically lower itself in the cylinder. (The increased mineral concentration allows for lower electrode coverage while maintaining the same steam output.) When a stabilized condition is reached, the water will be boiling close to the cylinder seam level. The solid state circuitry will maintain the proper concentration in the cylinder by introducing short drains only when necessary. If the cylinder is manually drained, the above process will repeat itself.

NOTE: The CM Series unit must be in the humidification mode to fill or to manually drain.

Areas With Low Water Conductivity

Should normalization of the unit be required immediately after start-up, the installer may speed up the process by artificially increasing water conductivity. The installer should dissolve not more than half a teaspoon of table salt in a cup of water and add it to the cylinder by means of the fill cup attached to the plumbing section during a fill cycle.

Excessive amounts of salt will result in erratic operation of the unit; however, normalization of the unit will be obtained automatically through the solid state control sequence.

For further information, consult the Humidifier Operation and Maintenance Manual included with each unit equipped with a humidifier.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Controls erratic or inoperative.	Wiring improperly connected or broken.	Check wiring connections at schematic.
Evaporator coil ices (DX system).	Usually caused by lack of proper quantity of airflow across coil.	Check filters; clean if necessary.
	Low return air temperature.	Check for obstruction of airflow in duct system. Unit is designed for 1/2" s.p. (ext.) W.P. approximate.
	Low refrigerant.	Insure correct rotation of evaporator blowers. Raise return air temperature setpoint.
Blower fails to start.	Power failure.	Check DX system for correct operation.
	Control circuit fuse blown.	Check power source and input cable.
	Defective contactor.	Replace fuse.
	Overload tripped.	Repair or replace.
	Controller alarm.	Reset and check cause.
Compressor fails to start (DX system).	Setpoint too high.	Clear alarm(s).
	Compressor fuses open.	None required. Adjust to desired temperature.
	Complete loss of refrigerant charge.	Check compressor electrical circuit for shorts or loss of phase.
	Head pressure too high (high pressure switch open).	Repair leak and recharge system.
		Check condenser for obstructions. Manually reset switch.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Compressor short cycles.	Low line voltage causing compressor electric motor to overheat.	Check power source for cause of variation of line voltage.
	Dirty or icy evaporator (reduced air flow).	Defrost and/or clean.
	Lack of refrigerant (bubbly sight glass).	Repair leak and recharge system.
	Light load.	Configure controller for light load.
Noisy compressor.	Expansion valve stuck in open position (abnormally cold suction line).	Ensure feeler bulb is tight on suction line. Check operation and superheat.
	Broken compressor valve.	Replace compressor.
	Worn or scarred compressor bearings (excessive knocking).	Replace compressor.
	Excessive head pressure (compressor knocks).	Reduce head pressure (see below).
System short of capacity.	Flash gas in liquid refrigerant line (bubbly sight glass).	Repair leak and recharge.
	Expansion valve stuck or possibly obstructed (short cycling or continuous running).	Replace valve.
	Clogged drier-strainer (feels cold).	Replace with new drier-strainer.
	Ice or dirt on evaporator coil (excessively warm air from evaporator blower). See "evaporator coil ices" section above.	Defrost and/or clean.

(cont.)

Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
System short of capacity (cont.)	Valve not fully open (chilled water).	Check leakage. Check control wiring to valve.
	Chilled water flow not ample or balanced.	Balance chilled water flow to specifications.
	Chilled water temperature too high.	Check chilled water supply.
Head pressure too high.	Condenser clogged or dirty.	Clean condenser.
	Air or other non-condensable gas in system.	Evacuate system and recharge. Install new drier strainer.
	OHE air intake blocked.	Clean away debris.
	Overcharge of refrigerant.	Recover excess from high pressure side of system.
	Pump overloads tripped (glycol system).	Reset and check cause.
	OHE fans not operating.	Check fuses and motor. Replace as needed. Check thermostat setting and location.
	Glycol head pressure regulating valve not adjusted.	Adjust as needed to obtain correct pressures.
	Glycol flow too low. Pump cavitating, valve not open.	Check glycol solution level and concentration at pump.
	Glycol % higher than 40%.	Reduce to maximum 40% concentration.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Head pressure too low.	See "compressor fails to start", "compressor short cycles" and "system short of capacity" above.	Correct as indicated.
Suction pressure too low.	Flash gas in liquid refrigerant line (bubbly sight glass).	Repair leak and recharge.
	Clogged drier strainer (feels cold).	Replace with new drier strainer.
	Obstructed expansion valve (loss of capacity).	Repair or replace valve.
	Loss of fluid within expansion valve (erratic valve response).	Replace valve and feeler bulb assembly.
	Lack of refrigerant (bubbly sight glass).	Repair leak and recharge system.
	Dirty air filters/clogged filter light on.	Clean as required.
	Clogged or icy coil.	Defrost and/or clean/check fan.
Humidifier inoperative.	Water not hooked up.	Turn on water.
	Electrical connections loose.	Tighten electrical connections.
	Humidifier fuse open.	Check for short circuit. Replace if necessary.
	Relative humidity is above the setpoint.	No corrective action needed.
Heat Inoperative	Overheat switch actuated.	Reset and check.
	Fuse open.	Check for short circuit. Replace if necessary.
	Thermostat set too low.	None required. Adjust to required temperature.
	Thermal line in heater open.	Replace line.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Water carryover.	Insufficient air quantity over the evaporator coil.	Load fan to nameplate amps. Remove discharge air restrictions. Clean filters.
	Liquid line temperature.	Adjust condensing temperature to specifications and reduce excessive subcooling.
	Dirty coil.	Clean the coil.
	Excessive air.	Reduce cfm to unit specifications.
Controller fails to start	No power to controller.	Check control fuse. Check controller fuse.

Preventive Maintenance

The operating life of the CM Series System can be extended by following a simple preventive maintenance schedule. The schedule will reduce the possibility of failure of components and unnecessary malfunction of the system. The service technicians must be thoroughly familiar with the special design features of this equipment before attempting any service or repair.

MONTHLY

1. Check that filters are clean and in place.
2. Check that condensate drain is open.
3. Check that humidifier cylinder replacement light is not on and verify operation of the humidifier.
4. Check unit for conformance to temperature and humidity setpoints.
5. Check the DX system for signs for refrigerant leaks.
6. Check the water/glycol/chilled water system for leaks.
7. Check the DX system for the proper operation.
8. Ensure heater operation.
9. Check electrical components and ensure correct amp draws and secure connections.
10. Check the controller configuration.
11. Check the controller for any alarm.
12. Check the chilled water valve and ensure correct operation.

SEASONALLY

1. Check electrical components for loose wire connections.
2. Check fan(s).
3. Check glycol % if applicable.
4. Complete all items listed on the monthly checklist.

ANNUALLY

1. Thoroughly check the system and clean unit interior.
2. Clean the cooling coil.
3. Perform all items listed on the monthly and seasonal checklist.

BI-ANNUALLY

1. Lubricate the blower motor bearings if applicable.
2. Perform all items listed under the preventive maintenance schedules.