



Energy Wise HVAC Equipment

FHP MANUFACTURING
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FHP brings to the market a first in large capacity modular reverse cycle units. The many features and energy efficiency of the **MB Series** make them the ideal choice for either new construction or retrofit projects.

UNIT FEATURES

Modular Construction

- Separate modules (VH series) will pass through a 36" wide standard door
- No breaking of refrigerant lines required
- Water connections are heavy-duty bronze bodied unions
- Single power point connection

State of the art MCS control system

- Optional Microprocessor based DDC controller allows multiple configurations for specific applications strategies
- LCD display of operating status and fault conditions in plain English

Reverse Cycle Heat Pump Operation

- Optional reverse cycle heating
- Takes full advantage of building diversity

Energy Efficiency

- High efficiency in the cooling mode
- Economical operation in heating with reverse cycle operation
- Economizer operation reduces compressor operating hours increases system efficiency
- Individual units can be monitored for actual electrical usage by tenants

Variable Air Volume capability

- Units can be fitted with VFD for additional energy savings
- Increased operational flexibility

Quiet Operation

- Scroll compressors for efficient quiet operation
- Heavy duty structural components
- Multi-density coated glass fiber insulation

Reliability

- Units are fully assembled and tested at the factory to ensure smooth assembly and start up in the field
- No reliance on central plant equipment for building climate control
- Multiple refrigerant circuits provide redundancy in the event of component failure

100 % Outside air capability

- Hot gas reheat for humidity control

Hot Gas Bypass

- Allows operation under a wide variety of conditions
- Provides protection against coil freezing



MODULE-AIRE

MB SERIES

VERTICAL PACKAGE UNITS

ISO 9001:2000 Certified

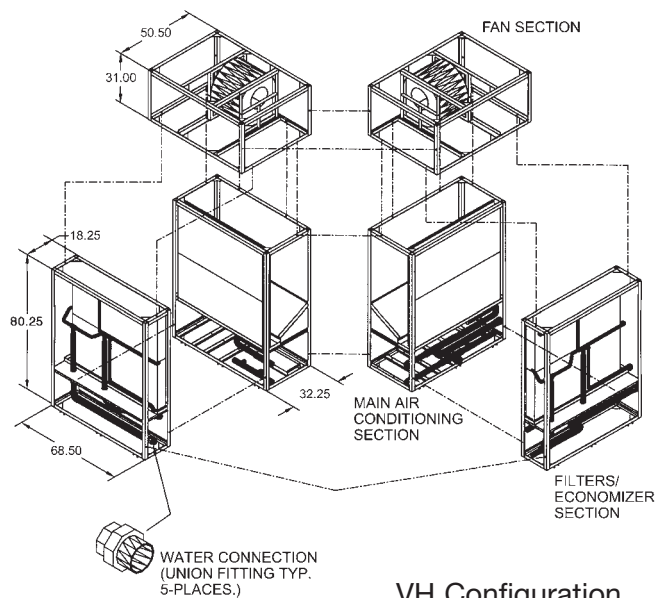
DESIGN FEATURES:

Unit Construction

The FHP MB series is available in two basic configurations:

VH CONFIGURATION

The VH design concept is to provide a unit that will facilitate on site handling and can be installed in locations difficult to access. All units can be broken down into separate modules that can pass through a 36" wide standard door or service elevator. No refrigerant piping requires disconnection, maintaining circuit integrity. Water piping connections are made with the use of heavy-duty bronze-bodied unions so no welding or brazing is required in the field. Single supply and return connection to the unit are standard. This creative design allows the installer to transport and locate the modules in the equipment room without the use of heavy-duty cranes or lifts. Building penetrations or interior wall penetrations are not normally required on retrofit jobs where space is at a premium. The 30 ton module can be easily broken down into 3 separate modules - the fan module, main heating/cooling module and the economizer/filter bank. The 40 through 60 ton units can be broken into 6 separate modules, two each as previously mentioned. Very few competitive equipment manufacturers have this capability.



VL CONFIGURATION

The VL is designed for those applications where there is a restriction in the height of the unit. In this model the blower is dropped into the main coil section reducing the units overall height and increasing unit depth. Unit sizes MB480 through MB720 can be split into two sections for transportation and access into the plant room.

FLEXIBILITY

The FHP MB series is available in cooling only or with reverse cycle heating with either constant or variable air volume discharge to provide a highly efficient operating system. Water-side economizer packages are available to take advantage of free cooling. Optional field installed hot water coils provide preheating or heating. Hot gas bypass allows the unit to operate under a wide variation of conditions and the hot gas reheat option provides a means of controlling humidity, a major concern in the interior environment of a building.

UNIT PERFORMANCE

The units are available in four sizes from nominal 30 through 60 tons.

Performance is with nominal CFM and rated in accordance with ARI 320 conditions. **Performance numbers are gross.**

Unit Size	CFM Range	Cooling Capacity	EER	Heating Capacity	COP
		Tons		MBH	
MB360	4,800 - 14,400	33.0	16.2	425.0	5.0
MB480	6,400 - 19,200	43.0	16.2	680.0	5.0
MB600	8,000 - 24,000	54.0	16.2	800.0	5.0
MB720	9,600 - 28,000	66.0	16.2	850.0	5.0

CABINET, CASING AND FRAME

For heavy-duty structural support an internal angle iron framework is utilized. The angle iron members are attached using 1/2 inch bolts and locking nuts for ease of disassembly and re-assembly. The base-pan assembly is constructed of 14 gauge galvanized steel. Exterior panels are made of 18 gauge, G90 galvanized steel providing protection against corrosion. All panels are insulated with 1/2 inch thick dual density Neoprene backed fiberglass insulation for thermal and acoustic performance. Insulation meets the erosion requirements of UL 181. Base rails are provided to assist rigging the unit on site. All components are located for ease of inspection and service. Major components are out of the units air stream to allow maintenance while the unit is in operation. Service access is through the removal of access panels located on the unit.

MAIN COOLING / HEATING MODULE

COMPRESSORS

All units utilize high efficiency scroll compressors. The MB360 has two compressors while the MB480 through MB720 units contain four compressors for efficient part load control, quiet operation and system redundancy. Each compressor has its own independent refrigerant circuit and is protected by individual branch fusing. Additional protection is provided by thermal overloads and high and low pressure safety switches. Suction and

discharge schrader valves are provided for manifold gauge connections to facilitate servicing. Compressors are mounted on vibration isolators.



The entire condensing section is isolated from the air-handling compartment by the use of an insulated bulkhead partition designed to minimize sound transmission.

Externally equalized balanced port thermostatic expansion valves are utilized for wide range refrigerant metering control. Superheat shifts are minimal from cooling to heating operation ensuring stable operation in both the heating and cooling modes. All TXV's are factory set and are field adjustable for specific operating conditions. Reversing valves are large bodied to minimize refrigerant pressure drop. Line voltage solenoids are utilized to reduce transformer loading. All refrigerant components are accessible from the front of the unit for service and maintenance.

CONDENSERS

(water to refrigerant heat exchangers)

All condensers are coaxial tube-in-tube for maximum heat transfer efficiency and performance. Inner water tubes are either copper or optional cupro-nickel with large internal diameters for reduced waterside pressure drops. Outer tubes are steel, painted for corrosion protection. All condensers are rated at 450 PSIG operating refrigerant pressures and 400 PSIG waterside pressures. Condensers are individually leak tested. All condensers are chemically cleanable. Please consult the factory for cleaning procedures. Units are designed for single water supply/return connections with modules being connected by the use of heavy-duty bronze unions.

DX COOLING/HEATING COIL

Evaporators are enhanced fin, rifled tube type for maximum performance. Large face areas ensure low air-side pressure drops and reduced face velocities to prevent condensate carry over and maximum moisture removal.

Coils are either three or four rows deep depending on unit model and mounted in small area, sealed drain pans to inhibit condensate buildup levels.

All drain pans are galvanized steel with Archem type coating for corrosion protection. Optional stainless steel drain pans are available. Bottom outlet fittings in drain pans ensure free draining. Optional condensate overflow switches are available.

Each refrigerant circuit is independently piped allowing

part load operation in the event of a component failure.

Compressor/evaporator staging is such that air stratification is kept to a minimum. The lower evaporators on each module are staged first to keep coils wet and enhance condensate removal. In the event of an evaporator failure only the individual coil need be changed compared to the full face evaporators utilized by some manufacturers.

ELECTRICAL

All units are completely wired and tested at the factory prior to shipment. Wiring complies with NEC requirements and units are UL 1995 safety certified and listed. Single point power supply is standard on all models. Each module has its own power block simplifying wiring in the field for knock down capabilities. Supply air fan motors are protected by use of a solid state adjustable current motor starter with reset.

Extra starter heaters are not required. All compressor power circuits are branch fuse protected. Control circuit power is provided by a factory mounted 100 VA low voltage transformer with an integral re-settable circuit breaker. Solenoid valves are line voltage to reduce transformer loading. All refrigerant circuits contain a high pressure cut out switch, low-pressure safety switch for loss of charge protection.

MCS (MODULAR CONTROL SYSTEMS DDC CONTROLLER)

OPTIONAL MCS DDC CONTROLLER

An optional MCS DDC controller is available on the MB series. This controller can act as a stand-alone controller or interface with a building management system or be connected to a PC. Remote dial in capability through an optional modem is also available. The MCS has the capability to interface with BACNET communication protocol.



The controller is capable of monitoring and controlling temperatures, static pressure (VAV applications), humidity, fluid flow and airflow as required and when ordered with the appropriate sensors.

The standard unit controller is configured for constant volume, return air control. Optional control strategies are available, for example, humidity/reheat control and variable air volume discharge air temperature control with return air reset. All safety inputs are monitored and alarm signals can be generated. The controller will automatically restart the machine following a non-critical alarm condition, not taking the unit off line unless the same alarm has occurred twice within an adjustable time period. Nuisance shut down of the unit is avoided while still providing protection against possible equipment failure. A record of faults and time of occurrence is kept in the controller to facilitate trouble shooting and servicing of the unit. A systems time clock is standard on all MCS controllers enabling programming for daily operations.

All necessary sensors are factory provided, field installed for application specific control strategy. The controller is conveniently located on the unit for easy reading and programming. A 2 line 16 character LCD displays all temperature, pressure and control functions in easy to read English. Battery back up is standard to prevent loss of operating parameters during power interruptions/losses. A four layered printed circuit board protects the microprocessor from power surges or fast transients across or over the lines. Please refer to the unit controller manual for further details

REVERSE CYCLE OPERATION

All MB series units are capable of operating in the reverse cycle heat pump mode for efficient, cost effective heating. The MB series is the only self-contained heat pump unit in its class. This feature allows the designer to take full advantage of building diversity, transferring excess heat from areas with a net cooling load to areas requiring heating providing a truly energy efficient system.

HOT WATER COIL

Bolt on one or two row hot water coils for hydronic preheat are available as a field installed option. Please consult factory with requirements for coil design and selection.

ECONOMIZER/FILTER BANK MODULE

Factory installed water-side economizer coils are available on all MB series units. The economizer package consists of full-face area multi-row copper tube, aluminum fin coils designed for low water-side pressure drops. A 3-way motorized ball valve is included in the package for water flow control. The valve includes a manual clutch option for field over-ride capability while an optional minimum positioner for the valve is also

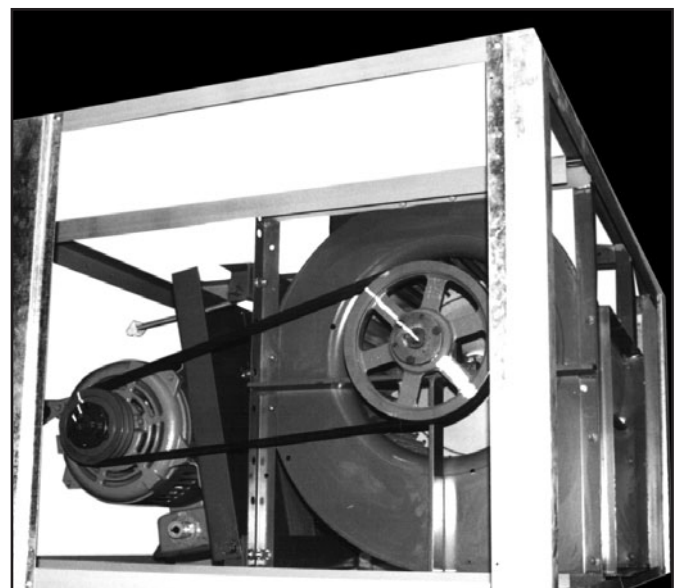
available. The economizer may be controlled through the optional MCS controller which senses entering fluid temperature to the unit and opens the valve to allow flow through the economizer coil and condenser in series. In normal operation, flow is through the condenser only. The set point is adjustable between 45 °F and 70 °F in the cooling mode. A heating economizer cycle is also available for heating utilizing high temperature loop fluid or high temperature fluid from a heat exchanger that is on a hot water hydronic loop. The package has a 400 PSIG design working pressure and is pressure tested for leaks at the factory.

FILTERS

All MB series units come with standard 4 inch 30% efficiency pleated filters. Optional 65% 4 inch pleated filters are available. Filters are removable from the sides of the frames through filter access panels. Throw away construction filters should be field installed to protect the main filters during the construction period.

FAN MODULE

MB units contain either one or two forward curved high-pressure class II fan assemblies depending on the model size. The fans are double width, double inlet welded assemblies statically and dynamically balanced. The fan module is isolated from the main module by the use of rubertex gaskets providing excellent vibration isolation and quiet operation. The modules are bolted together with 1/2 inch diameter bolts and locking nuts. Each fan is powered by it's own motor and drive assembly. Motors are mounted on individual motor platforms for stable operation and belt tension adjustment. All assemblies include 150,000-hour re-greaseable pillow block bearings with large diameter solid steel shafts for high torque/speed operation. Drive packages comprise multiple belt, fixed pitch blower pulleys and motor sheaves sized for specific application requirements of CFM, external static pressures, and motor horsepower.



All components are easily accessible for general maintenance. Motors are open drip proof NEMA T-Frame E high efficiency EPACT rated with sealed ball bearings.

Optional factory installed variable frequency drives are available for variable air volume systems. The drives are located in the fan module and may be controlled by the MCS+ controller. A static pressure sensor is field installed in the supply duct plenum dictating motor speed based on an increase or decrease in the supply duct static pressure. VFD's are factory programmed per job specific design criteria.

All drives are NEMA 4/12 enclosed with an integral keypad for program adjustments. Removable access panels allow drive adjustments during motor operation. Constant power line reactors are also furnished with each drive for power supply filtration. Please refer to the Engineering Application Manual for VAV Self Contained Units for further details.

AVAILABLE OPTIONS

- Proof of fluid flow - factory installed differential pressure switch
- Entering/leaving fluid temperature sensors.
- Factory installed freeze protection sensor.
- Control algorithm options - space/return air control, discharge air with space/return air reset control, VAV control. (Only available with optional MCS controller.)
- Water-side economizer.
- Hot gas reheat on constant volume units with or without 100% outside air introduction.
- Bolt on hot water heating coils, one or two rows.
- Hot gas bypass for extended capacity operation and to prevent coil freezing at low load conditions.

TESTING

All completed units are leak checked, evacuated and factory charged with R-22. Units are 100% run tested prior to shipment.

PERFORMANCE

For unit performance under specific conditions please contact your FHP Manufacturing representative.

TYPICAL APPLICATIONS

CONSTANT VOLUME AIRFLOW

MB units are ideally suited to air condition large spaces in offices, and shops providing a total climate control system. The units may be applied on a floor by floor

basis or serve a specific area. Unit control is accomplished by sensing the space or return air temperature and staging the unit based on the control set point.

VARIABLE AIR VOLUME

MB units are available with a factory installed variable frequency drive package for modulating the airflow in response to changes in the system duct static pressure. VAV units have the ability to control temperatures in areas of different loading such as the interior and exterior zones of a building. Only the volume of air that is required to satisfy the space load is delivered providing significant savings in energy. Typically the system is designed to provide supply air at a constant temperature through the control of discharge air temperature. VAV terminals in the space modulate open or closed as the load varies increasing or reducing the airflow to satisfy the demand. Temperature reset based on return air temperature is also available.

DEHUMIDIFICATION

Indoor air quality is a major concern in the design and operation of today's buildings. Humidity levels, if not properly controlled, can play a major role in the development of fungal growth which is a major cause of the problem. Controlling the space temperature alone will not assure proper humidity control. To bring the humidity to an acceptable level requires cooling the air to a relatively low temperature, which can result in uncomfortable conditions within the space. The air, after dehumidification, needs to be reheated to avoid this problem. Typically electric heat has been applied to do this but is probably the most expensive option adding significantly to operating costs. An alternative would be to use hot water if it is available. Again this represents an additional operating cost. Additional hot water piping will be needed, increasing initial costs. MB units offer a factory installed hot gas reheat option that uses the hot refrigerant gas to reheat the air. All of the heat of rejection is not used to reheat the air so there is a net cooling effect but not enough to create uncomfortable conditions within the occupied space. Hot gas reheat operation is controlled through space humidity levels so only operates when needed.

Further information on MB units for specific applications is available by contacting your local FHP representative.

HVAC EQUIPMENT

ENERGY WISE

COMMERCIAL PRODUCTS

ISO 9001:2000 Certified



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Commercial Water Source and Geothermal Products



LARGE VERTICAL MODELS
6-60 TONS

ROOFTOP MODELS
4 - 35 TONS

SMALL VERTICAL MODELS
1/2 - 5 TONS

LARGE HORIZONTAL MODELS
6 - 20 TONS

SMALL HORIZONTAL MODELS
1/2 - 5 TONS

CONSOLE MODELS
3/4 - 1 1/2 TONS



PRODUCT OFFERING

- Vertical Units 1/2 - 60 Tons
- Horizontal Units 1/2 - 20 Tons
- Console Units 3/4 - 1 1/2 Tons
- Rooftop Units 4 - 35 Tons
- Water to Water Chillers / Boilers 3 - 35 Tons
- Split Systems 1/2 - 25 Tons
- Variable Air Volume 6 - 60 Tons

FACTORY INSTALLED OPTIONS

- Hot Gas Reheat (Dehumidification)
- Water-side Economizer
- Heat Recovery (Desuperheater)
- 100% Outside / Make up Air Units
- Cupronickel Water Coil
- Custom Options Available Upon Request

SOFTWARE

Our Engineering Application Data Software (EAD) is customized for the professional HVAC designer. Professional HVAC designers will find this software to be a valuable tool for equipment selection. EAD Software is available for HVAC designers through our network of representatives. To locate the FHP representative nearest you please refer to our web site at www.fhp-mfg.com.