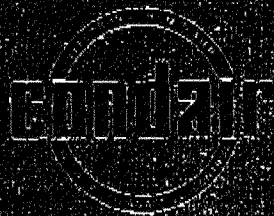


IMPORTANT: READ AND SAVE THESE INSTRUCTIONS
THIS MANUAL TO BE LEFT WITH EQUIPMENT OWNER

623-582-1107



INSTALLATION, OPERATION AND MAINTENANCE MANUAL



MP SERIES HUMIDIFIERS



UL LISTED
E3185



UL 2868

NORTEC INDUSTRIES INC.

1401 B. Street, E. Box 121

Odessa, Fla. 33455

Phone 345-2325

NORTEC AIR CONDITIONING INDUSTRIES LTD.

2701 Faber Road, Box 900

P.O. Box 100, Fort Lauderdale, Fla. 33304

Phone 345-2243

Telex 1513354

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RECEIVING EQUIPMENT

1. Check packing slip to ensure ALL material has been delivered.
2. All material shortages are to be reported to the factory within 48 hours from receipt of goods. NORTEC assumes no responsibility for any material shortages beyond this period.
3. Inspect shipping crate(s) for damage and note on shipping waybill accordingly.
4. After uncrating, inspect unit for damage and if damage is found, notify the shipper promptly.
5. ALL NORTEC PRODUCTS ARE SHIPPED ON AN F.O.B. FACTORY BASIS. ANY AND ALL DAMAGE, BREAKAGE OR LOSS CLAIMS ARE TO BE MADE DIRECTLY TO THE SHIPPING COMPANY.

PRE-INSTALLATION CHECKPOINTS

1. Confirm that the voltage and phase of the unit corresponds with available voltage and phase.
2. Ensure that the fused main breaker is of sufficient size to handle the maximum fuse rating as indicated on the specification label.

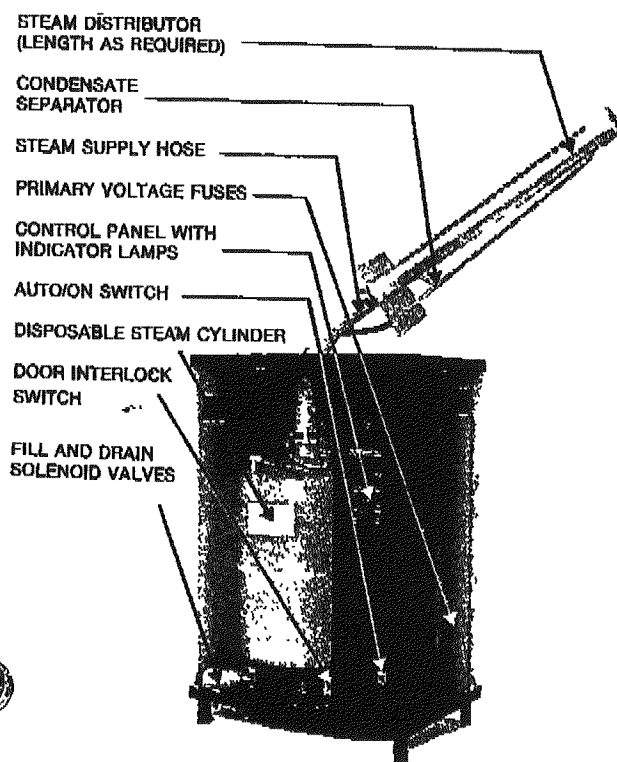


PHOTO #1

BASIC HUMIDIFIER CONFIGURATION

The MP humidifier has a sheet metal cabinet consisting of three compartments: plumbing, low voltage, and high voltage.

Remove front key-locked metal door to access plumbing compartment which contains fill valve, drain valve (each with 24V holding coil), fill cup assembly, and disposable steam cylinder. Door interlock switch breaks circuit when door is removed, but offers override position for qualified serviceman.

Low voltage compartment is accessed through key-locked hinge-down front plastic panel. It contains display and microprocessor circuit p.c. boards, main on-off switch, 3A control circuit (24V) fuse, modulation adaptor board if present, and control terminal strip.

High voltage compartment is accessed from right hand side by removing key-locked metal door and unscrewing high voltage cover plate. It contains line voltage terminal block, internal fuses on each primary line, contactor with 24 V holding coil, current transformer p.c. board and all inter-component wiring.

MOUNTING PROCEDURE

1. Location of unit should be as close to and below steam distributor location as possible.
2. Provide a minimum clearance of 24" (600 mm) to the right of the unit and a minimum of 30" (750 mm) in front of the unit without blower pack. Refer to Diagram 1. For units with blower packs, see chart 2 on page 9.

INSTALLATION CLEARANCES

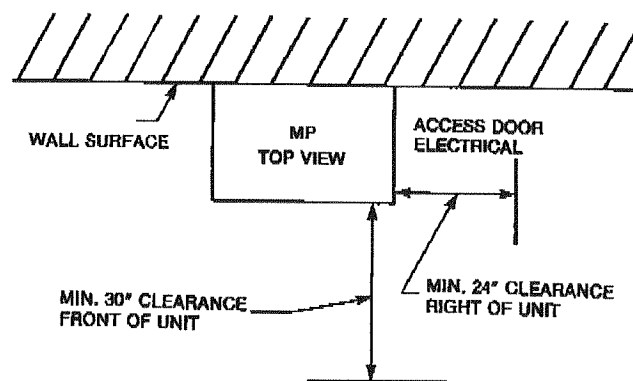


DIAGRAM 1
CLEARANCES

3. If possible, avoid locating humidifier any further than absolutely necessary from steam distributor location. At this distance, net output will be approximately 88% of unit capacity, as a result of condensation losses. Refer to Chart 1 and to steam hose section. Also the increased static pressure may necessitate using an accessory fill cup extension kit. Consult factory. See also page 8.

UNIT CAPACITY CORRECTION FACTORS

DISTANCE OF STEAM DISTRIBUTOR FROM CABINET		UNIT CAPACITY CORRECTION FACTOR
FEET	METERS	
0 to 15	0 to 4.6	1.00
15 to 20	4.6 to 6.1	0.97
21 to 26	6.4 to 7.9	0.94
27 to 32	8.2 to 10.0	0.88

Note: For longer distances, consult factory.

CHART 1
UNIT CAPACITY CORRECTION FACTORS

- Where possible, mount unit at a height convenient for servicing.
- Mounting bracket provided should be securely attached, open edge upwards, horizontally, using three (3) fasteners to a vertical, solid surface. See Diagram 2.
- Make sure unit is level.
- Do not mount unit on hot surfaces or where temperatures exceed 180°F (82°C).
- If units are mounted on roof, a thermostatically ventilated weatherproof cabinet should be used.
- Do not mount units in an area where freezing may occur. Use Low Temperature Protection Kit #185-9503, if necessary.

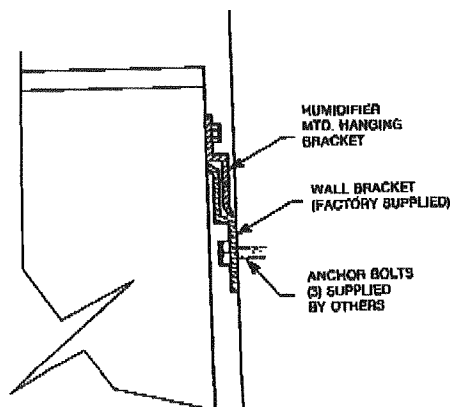


DIAGRAM 2
WALL BRACKET MOUNTING DETAIL
(See page 23 for dimensions)

WATER SUPPLY

- Do not use pre-treated water supplies. Use only potable (cold) tap water.
- Do not use water treated with a softener. The chemical exchange process often produces unacceptably high treated water conductivity.
- Do not use reverse osmosis or de-ionized water treatments. The resulting water cannot conduct electricity in an electrode humidifier.
- Do not use a hot water supply to the unit. Minerals will adhere more easily to surfaces and the fill valve's small orifice could plug.
- Standard fill valves are sized for water pressure ranging from 30 to 80 psig (ideally 55 to 60 psig). For other pressures, consult factory.
- Use 1/4" copper tubing (1/4" O.D.) for the last 4 feet of water supply line. Connect to the factory-supplied 1/4" olive compression fitting on the fill valve stem located on the underside of the unit.
- Install an isolating shut-off valve in the water supply line to facilitate servicing of the humidifier.

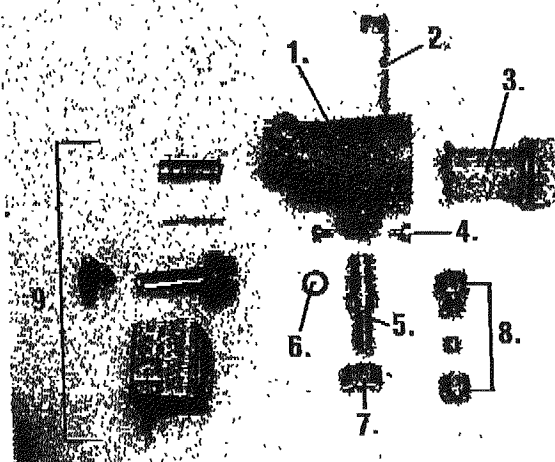


PHOTO NO. 2
EXPLODED VIEW OF FILL VALVE

ITEM NO.	DESCRIPTION	NORTEC P/N
1	FILL VALVE BODY	4 TYPES
2	STRAINER LOCKING BAR	132-1048
3	STRAINER C/W O-RING	132-4031
4	VALVE STEM SCREW	132-5059
5	FILL VALVE INLET STEM	132-5072
6	O-RING FOR STEM	132-5012
7	HEX NUT	132-1049
8	COMPRESSION FITTING	132-6130
9	COIL ASSEMBLY COMPLETE	132-6001

DRAIN CONNECTION

1. Unit is equipped with a $\frac{7}{8}$ " O.D. unthreaded drain outlet on underside of drain canal on bottom of unit.
2. Use 6" (150 mm) length of steam hose (supplied with unit) to connect drain outlet to funnel drain as shown.
3. If no floor drain is available, route drain line to slop sink. If sink drain is higher than or level with humidifier, a drain pump may be necessary. (Available from factory, Part Number 132-9504). See Diagram 4.

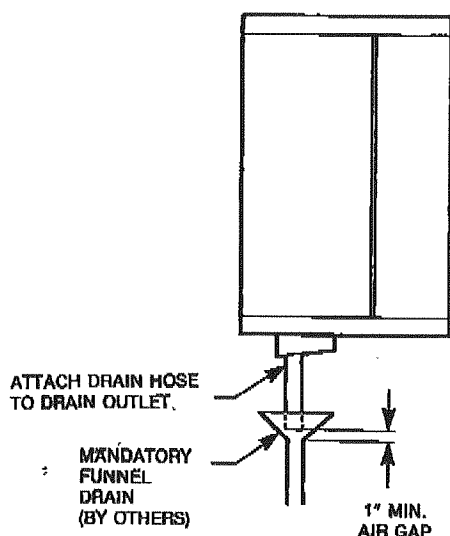
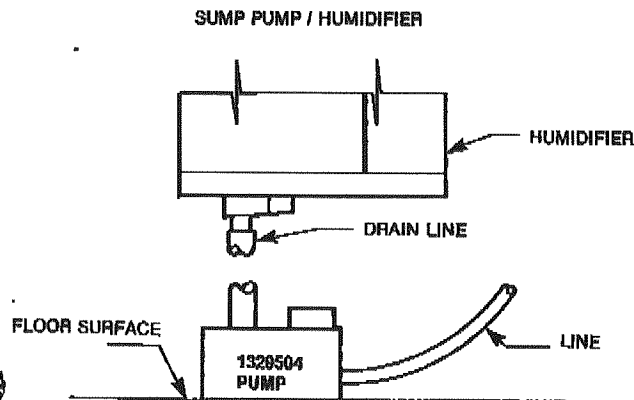


DIAGRAM 3
FUNNEL DRAIN

CAUTION:

Drain water from humidifier can be very hot. For safety reasons, water should not drain into sinks used frequently by personnel, or where plumbing codes prohibit it.



NOTE: DUE TO DRAIN WATER TEMPERATURE, ONLY CONDENSATE PUMPS RATED FOR USE WITH HOT WATER ARE SUITABLE. CONSULT FACTORY.

DIAGRAM 4

STEAM DISTRIBUTORS

Each cylinder outlet requires a minimum of one (1) steam distributor. Any one outlet may be divided into multiple branches, each requiring an additional steam distributor. Steam supply 'tees' are available for this purpose. (Consult factory or agent for pricing.)

STEAM DISTRIBUTOR LOCATION

1. Steam distributors can be mounted in supply or return air ducts. Proper location should consider duct temperature, air flow, R.H., outdoor air intake, etc. Additional details are located on following pages. Consult factory or local agent with questions.
2. Steam distributor should be located in a straight length of duct, at least six (6) feet (two (2) meters) before any elbow or other fitting so the air has sufficient distance to absorb the steam. Otherwise, surfaces contacted by visible (unabsorbed) steam will be wetted. Use a distributor that spans the width of the duct to minimize absorption distance. Multiple steam distributors, arranged as shown on the following pages, also minimize absorption distance.

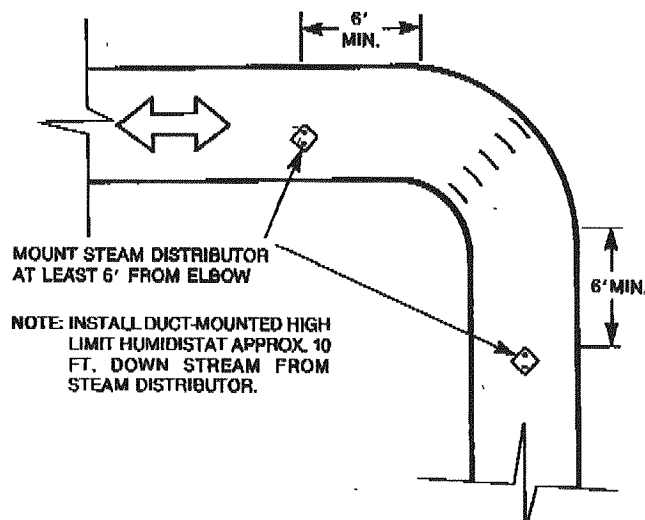
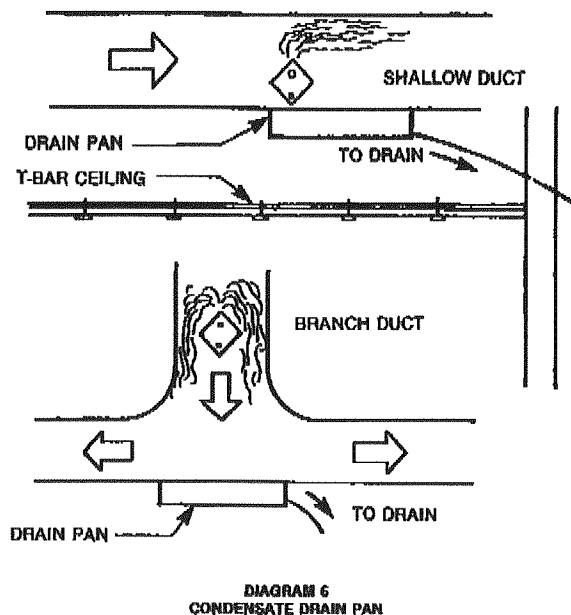


DIAGRAM 5
STEAM DISTRIBUTOR LOCATION

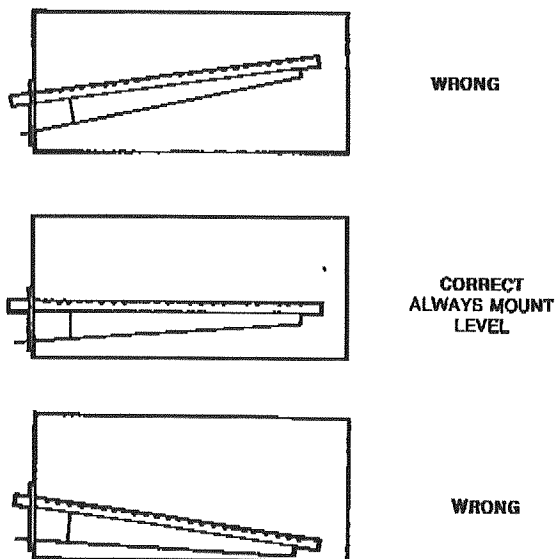
3. Where possible, avoid mounting the steam distributor ducts where air temperatures are below 60°F (15°C). Unabsorbed steam could result in wet ducts and possible water damage. See point 5.
4. An on-off duct high limit humidistat, set to 80 or 85% RH should be incorporated to prevent the possibility of condensation. See On/Off Controls section.
5. Duct air temperatures below 60°F (15°C) might require the use of a field-supplied condensate drain pan below the steam distributor. See Diagram 6.

INSTALLATION

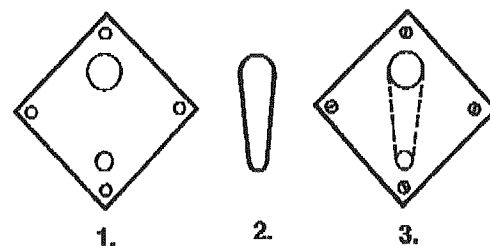
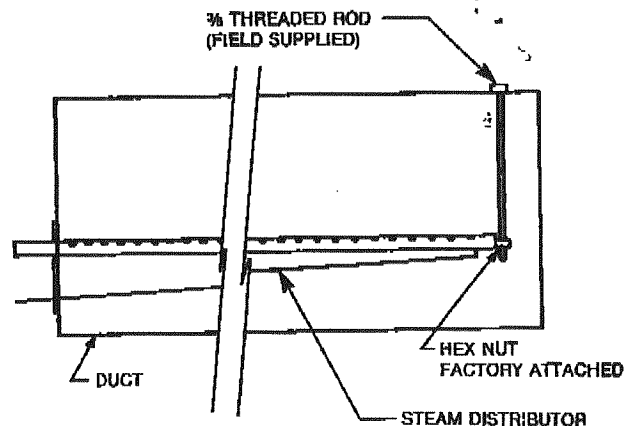


STEAM DISTRIBUTOR INSTALLATION

1. The Distributor mounting plate is perpendicular to the steam manifold so that when the plate is attached to the side of the duct, the manifold is level. An upward or downward slope to the manifold will result in poor condensate drainage and 'spitting' of condensate in the duct. See Diagram 7.

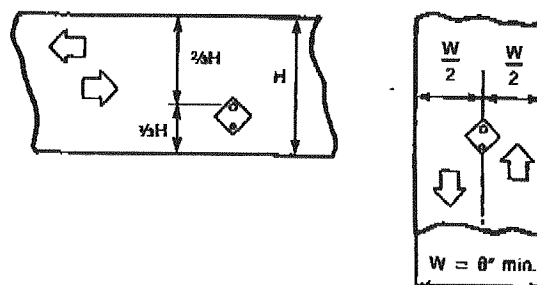


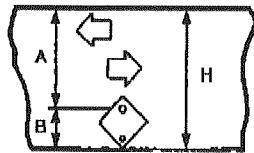
2. Any distributor longer than three (3) feet (one (1) meter) should be supported at its end with threaded rod through the top or bottom of the duct. See Diagram 8.



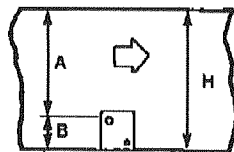
1. STEAM DISTRIBUTOR MOUNTING PLATE
2. CUT HOLE IN DUCT FOR INSERTION USING TEMPLATE
3. MOUNT WITH FOUR SHEET METAL SCREWS

3. Using the duct mounting template provided, cut a hole in the side of the duct just large enough to admit the steam manifold and condensate drain pipe assembly. Use four sheet metal screws to attach mounting plate to side of duct. See Diagrams 9 and 10.





S.D.	H Min.	A	B
ASD	8"	4.125"	3.875"
BSD	10"	5.875"	4.125"
CSD	14"	8.25 "	5.75 "



S.D.	H Min.	A	B
ASD	6"	3.25 "	2.75 "
BSD	8"	5.125"	2.875"
CSD	12"	7.625"	4.375"

DIAGRAM 10
SINGLE STEAM DISTRIBUTOR INSTALLATION

ARRANGEMENT OF TWO (2) STEAM DISTRIBUTORS

Relative mounting locations are shown for normal duct, shallow duct, and wide and narrow vertical ducts. Multiple distributors provide better mixing and reduce absorption distance.

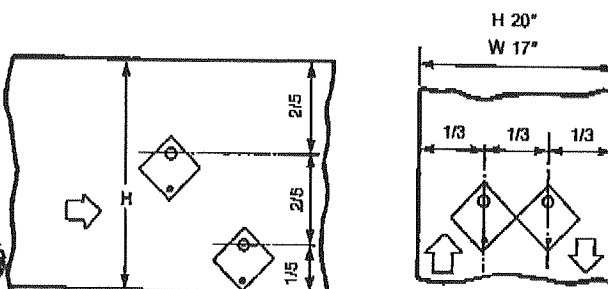
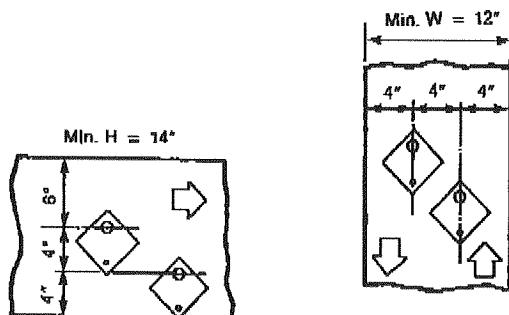


DIAGRAM 11

LARGE DUCT WIDTHS

Steam distributors are available to span very wide ducts as outlined in product catalogue. Whenever both sides of duct are accessible, branch into two distributors, one on each side as illustrated as an alternative to one long awkward distributor. See Diagram 12.

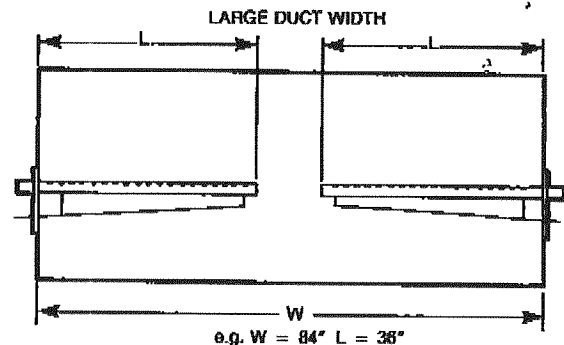


DIAGRAM 12

DIFFERENT LENGTH STEAM DISTRIBUTORS

With two steam distributors of different lengths, the longest one is mounted higher and is met by air flow first, as shown. Space distributors approximately 8" (200 mm) apart. See Diagram 13.

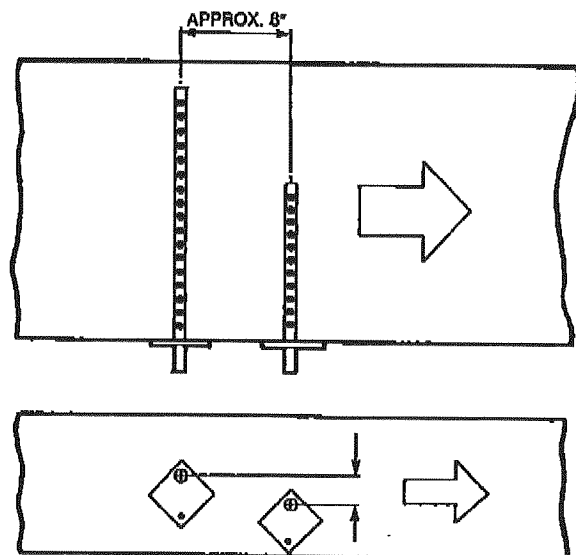


DIAGRAM 13

ARRANGEMENT OF 3 OR MORE STEAM DISTRIBUTORS

The top steam distributor is met by air flow first. It should be at least 6" below top of duct to avoid possible condensation on surface of the duct. The remainder of space below is proportioned accordingly. See Diagram 14.

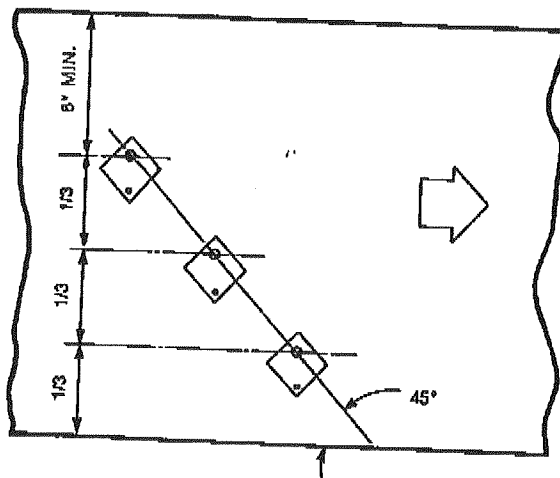


DIAGRAM 14
MULTIPLE STEAM DISTRIBUTORS

STEAM SUPPLY HOSE ROUTING

1. Insulated hard copper pipe with 1" thick snap-on insulation applications for steam supply, with flexible hose used to make connections to the cylinder(s) and steam distributor(s).
2. Steam supply hose or piping must be pitched downwards from the steam distributors to the unit. Pitch should be 2" in 12" to promote condensate runback. See Diagram 15.

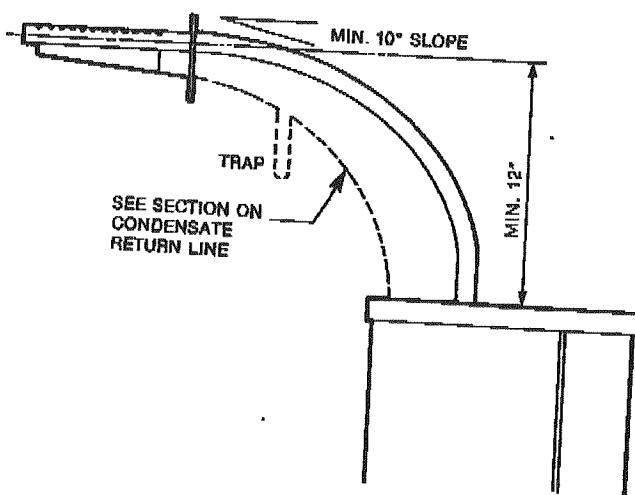


DIAGRAM 15

3. Ensure that the steam hose does not crimp or sag. The steam hose becomes more flexible when hot. The hose should be supported to prevent water traps. See Diagram 16.

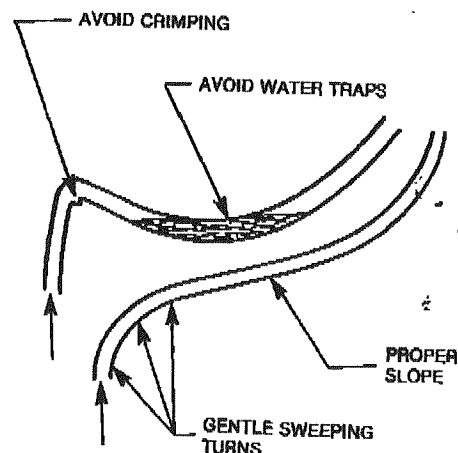


DIAGRAM 16
STEAM HOSE ROUTING

HARD COPPER IN PLACE OF STEAM HOSE

1. Insulated hard copper piping with 1" thick snap-on insulation is recommended for all applications if possible.
2. Copper pipe should be the same size as the cylinder outlet and I.D. of the steam hose.
 - A) MP-50, 100, 200, 300 and 400 series: 7/8" O.D. (nominal 3/4").
 - B) MP-500, 600, 700 and 800 series; 1 5/8" O.D. (nominal 1 1/2") dependent on cylinder and steam distributor selection.
3. INSULATION for copper pipe is recommended to minimize condensation within pipe. 1" thick rigid-glass fiber snap-on insulation is suggested.
4. Short lengths of flexible steam hose are supplied by the factory to connect the steam cylinder outlet to the pipe and the pipe to the steam distributor. Use clamps supplied from factory.

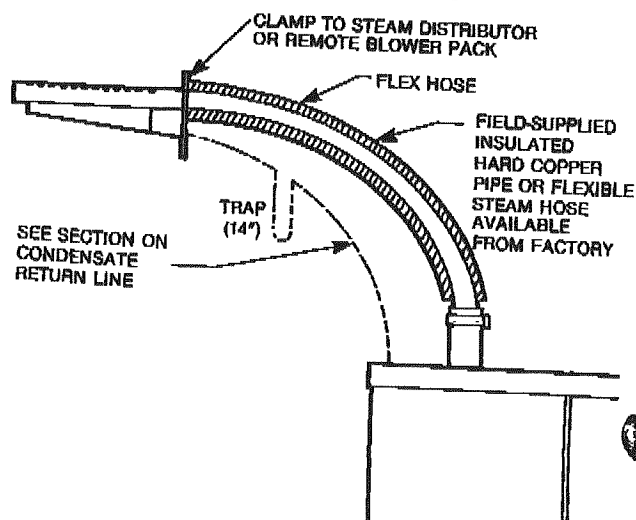


DIAGRAM 17

CONDENSATE RETURN LINE

1. Each steam distributor has a built-in condensate return ($\frac{3}{8}$ " O.D. copper tubing). Flexible condensate return hose ($\frac{3}{8}$ " I.D.) is recommended for routing condensate back into the humidifier, or to drain when required. It is available in any length from the factory as part no. 132-8840.
2. Always incorporate a trap in the routing of the condensate return line. The condensate which accumulates in the trap will prevent the possibility of steam escaping from the end. The depth of the trap should be a minimum of 12" plus the duct static pressure in inches of water column.
3. The condensate return line may be run back to fill cup of unit as long as humidifier is located below steam distributor. Note: DO NOT insert line far enough to block fill cup passages.
4. If steam distributor is mounted level with or below steam generator, the condensate line must be routed to the nearest floor drain or to a condensate pump (available from factory, Part Number 132-9504). (Diagrams 18 and 19).

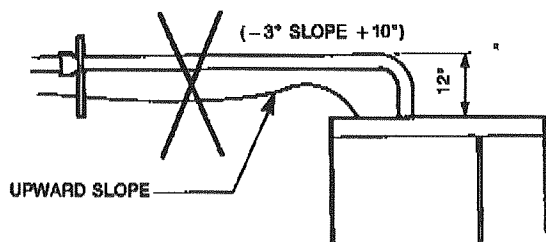


DIAGRAM 18

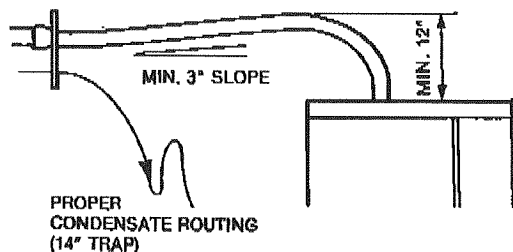


DIAGRAM 19

5. If steam line is routed below steam distributor location, a condensate trap 'tee' will be required to prevent blockage of steam line. Run condensate return hose to nearest floor drain. See Diagram 20.

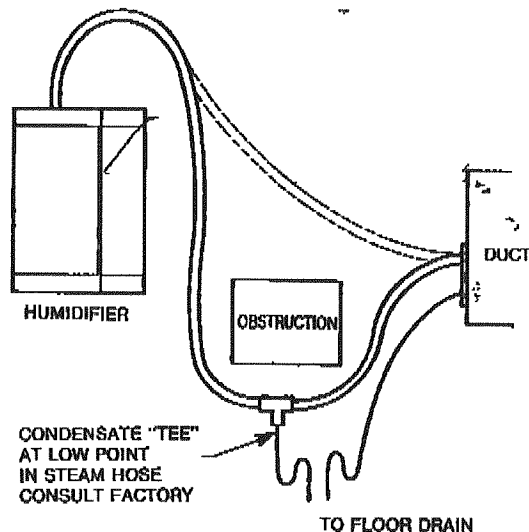


DIAGRAM 20

6. Do not allow restrictions or crimps in condensate line that would obstruct condensate flow.

STEAM DISTRIBUTOR MOUNTED ON RETURN AIR DUCT

Provide a 'U' trap in condensate line as illustrated in Diagram 21 when distributor is located in return air plenum. It stops a suction action from impeding condensate flow with duct pressures below atmosphere.

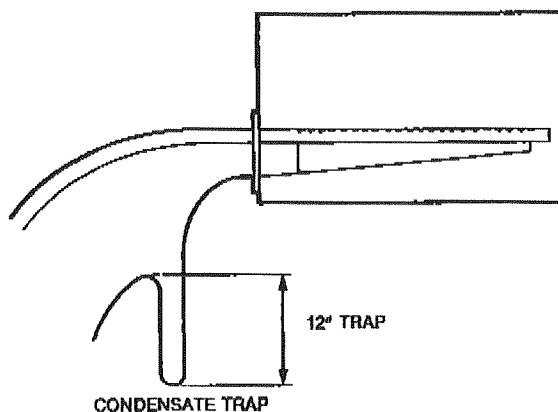


DIAGRAM 21

FILL CUP EXTENSION KITS

1. The electrode humidifier produces steam at essentially atmospheric pressure. Enough pressure head must develop to push the steam into the duct.

2. The combined resistance of duct static pressure and steam line resistance creates a small pressure head in the steam cylinder. The total amount of static pressure head is reflected directly by the water column differential that develops between the water in the fill cup hose feeding the cylinder and the water level in the cylinder.
3. The standard dimensions of the humidifier limit the static that can be tolerated before water will be pushed high enough to spill over into the overflow tube in the fill cup assembly.
4. To increase the allowable water column (static pressure) a FILL CUP EXTENSION KIT is available from the factory as an option. See Diagram 22.

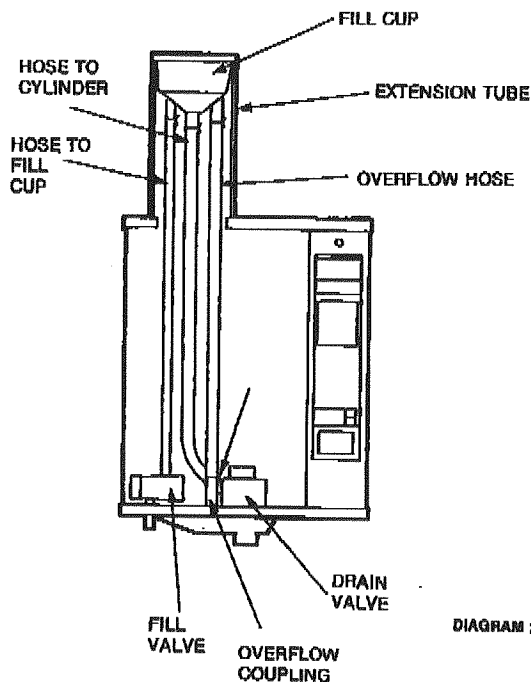


DIAGRAM 22

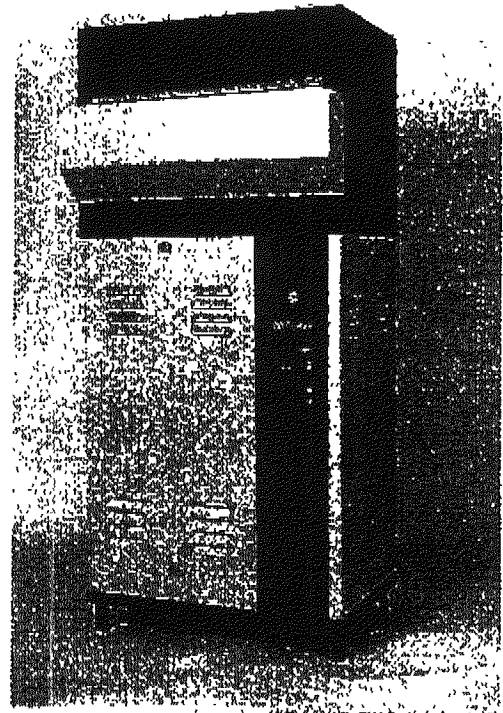
CHART 1.1
ALLOWABLE STATIC PRESSURE
FOR STANDARD UNITS.*

MP 50 and 100	5½"
MP 200 and 300	7"
MP 400	6"
MP 500 and 600	9"
MP 700 and 800	11"

* A FILL CUP EXTENSION KIT IS REQUIRED IF TOTAL PRESSURE EXCEEDS THESE VALUES

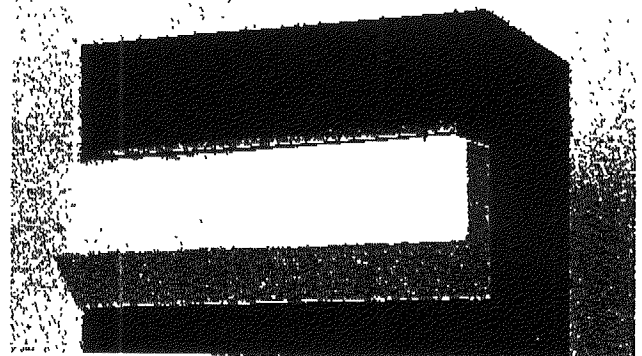
BLOWER PACKS

1. Accessory blower packs are used to distribute steam to localized areas (i.e. computer rooms) or in structures that do not have a built-in air distribution system.



MP 500 WITH BUILT-ON BLOWER PACK
PHOTO 3

2. Blower packs are available integrally-mounted with the humidifier unit (built-on blower pack, B.O.B.P., see Photo 3) or detached units field-piped and wired to the humidifier unit (remote mounted blower pack, R.M.B.P., see Photo 4).



REMOTE-MOUNTED BLOWER PACK
PHOTO 4

3. All MP blower packs consist of a steel cabinet containing: blower fan powered by line voltage from the humidifier, with built-in transformer (when necessary), fuse, chromed copper steam manifold and internal piping, return air louvres/openings and supply air grilles/openings.

4. All blower packs are wired (by factory if built on, by others if remote mounted) to the load side of the primary contactor so as to operate simultaneously with the humidifier.
5. Blower packs equipped with optional air-proving switch (185-9204) are equipped with an additional contactor built into the blower pack cabinet. With this accessory, the blower fan must operate before the humidifier will generate steam.
6. Remote mounted blower packs equipped with the optional 185-9204 air proving switch require field wiring between the primary voltage terminal blocks and the low-voltage control terminal strips; one of each located in the humidifier and the blower pack cabinet. Refer to wiring diagram supplied with unit on inside of access door.
7. Field wiring of remote blower packs must conform to national and local electrical codes.
8. The MP50 and MP100 blower packs have 100 CFM propeller (axial) fans. The MP 200 to MP 600 blower packs have 460 CFM centrifugal blowers.

BLOWER PACK SERVICE

All MP 200-600 built-on or remote blower packs feature an advanced hinge-down front panel for easy service. With the panel open, all components are easily accessible. To allow the panel to open, the following steps are required.

- disconnect the steam hose from the cylinder
- remove the service cover (top plate); the screws holding it must first be removed
- remove the two screws on the front of the blower pack on either side of the air outlet grille above the steam distributor.
- remove the two screws remaining on the top of the unit which hold the front piece to the top.
- firmly grasp the front panel near the top and pull it downward and out; the panel will open forward until it reaches the end of allowable travel.

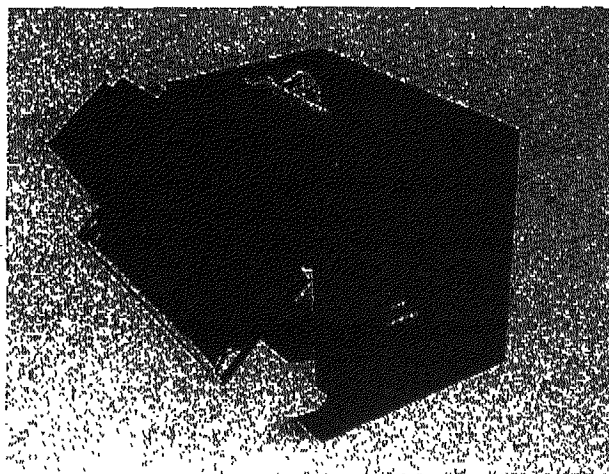


PHOTO 5
HINGED OPEN BLOWER PACK

MOUNTING AND CONNECTIONS

1. Refer to Chart 2 for ceiling and frontal clearances required for each model unit. Dimensions apply to both built-on and remote-mounted versions of blower packs.

UNIT MODEL	CAPACITY LBS/HR	NO. OF BLOWER PACKS	MIN. CEILING CLEARANCE INCHES (CM)	HORIZONTAL TRAVEL OF VISIBLE STEAM INCHES (CM)
MP-50	5	1	18 (45)	14 (36)
MP-100	10	1	18 (45)	18 (46)
MP-200	10	1	18 (45)	18 (46)
MP-300	20	1	18 (45)	36 (91)
MP-400	30	1	18 (45)	84 (213)
MP-500	60	1	36 (91)	156 (396)
MP-500	60	2*	18 (46)	84 (213)
MP-600	90	1	48 (122)	300 (762)
MP-600	90	2*	24 (61)	108 (274)
MP-700	120	2*	36 (91)	156 (396)
MP-700	120	4*	18 (46)	84 (213)
MP-800	180	2*	48 (122)	300 (762)
MP-800	180	4*	24 (61)	108 (274)

* Remote mounted model only.

CHART 2

2. Mount remote blower pack(s) using supplied bracket(s) with clearance as recommended in Chart 2.

BLOWER PACK STEAM HOSE CONNECTION

1. All built-on blower packs are factory-fitted with all steam hose connections. No further work is required.
2. Remote mounted blower packs require removal of the bottom coverplate to gain access to the steam manifold fittings. Feed steam supply and condensate return hoses through appropriate holes in bottom plate and replace bottom plate. For steam and condensate hose routing, follow the same steps outlined for steam and condensate lines for steam distributors in the previous section.

ELECTRICAL CONNECTION

1. All built-on blower packs are factory wired to the humidifier. Line voltage wiring to the humidifier, as described below, is all that is required to power the humidifier and blower pack.
2. Steps 3, 4 and 5 relate only to remote mounted blower packs.
3. Use approved 16 ga. or heavier wire for power connection from two pole terminal block of blower pack to the two pole terminal block inside electrical section of humidifier.

4. Use approved wire to connect from ground clamp of blower pack to ground clamp provided in the electrical compartment of the humidifier.
5. All field wiring should be encased in conduit and conform to national and local building codes.

PRIMARY (LINE) VOLTAGE WIRING TO UNIT

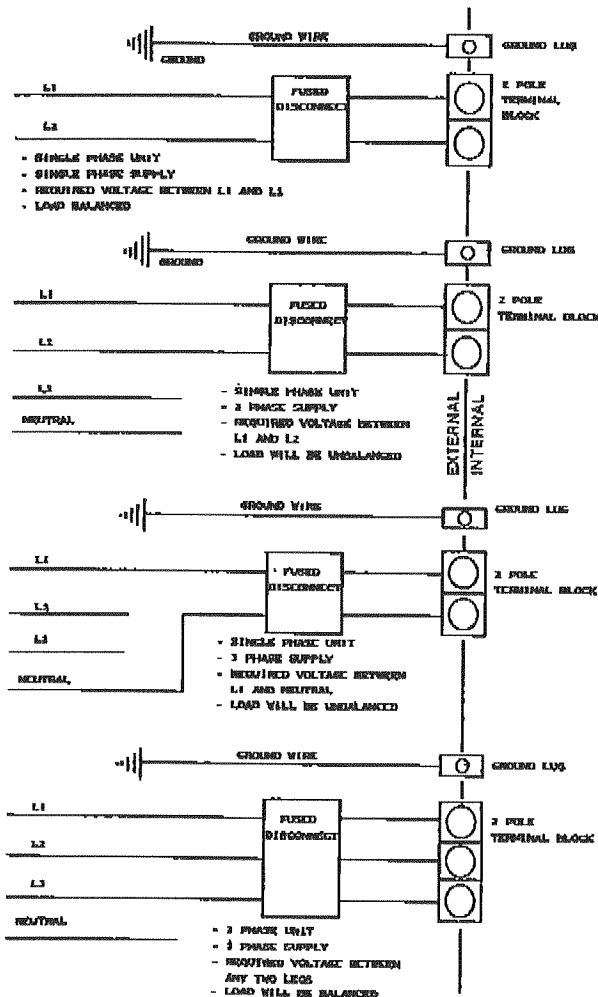


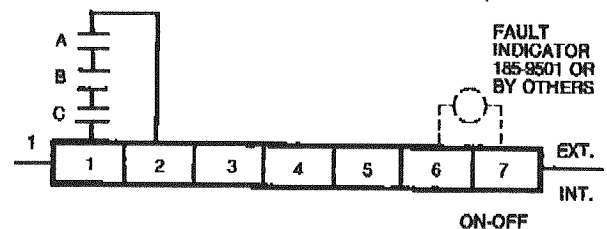
DIAGRAM 23.0 PRIMARY (LINE) VOLTAGE WIRING

1. Check and ensure that available voltage and phase corresponds with operating voltage and phase of unit as indicated on the humidifier spec. label.
2. Ensure that an adequate service is available to carry full unit amperage drawn as specified by fuse size on the humidifier spec. label.
3. A dedicated fused disconnect breaker assembly must be installed to protect unit and to provide complete system shutdown during periods of non-use.
4. Required fuse size for disconnect is stated on humidifier spec. label and in engineering manual. Refer to chart on page 20.

5. Connect cabinet ground terminal to ground. Do NOT use neutral wire of four wire supply as ground.
6. Single-phase units may be run on three-phase power, but load may unbalance power grid.
7. Never use the neutral wire of a four wire system as a power lead connection, with the exception of 277V and 347V single-phase, tapped from 480 V and 575V three phase respectively.
8. Field-supplied primary (line) voltage wiring must be connected to humidifier's primary terminal block accessed through knockouts in bottom right-hand corner of humidifier. On two- and three-electrode model humidifiers, factory uses fuse block in place of terminal block. Refer to mactac wiring diagram on inside face of door.
9. Wiring sizes should be in accordance with national and local electrical codes and by-laws, unit electrical codes and by-laws.

CONTROLS

ON/OFF CONTROL



(Control Wiring Diagram 23.1)

All controls are available from the factory as options. If controls were not ordered with the humidifier, they may be purchased/supplied by others. The following information is relevant to all controls, factory supplied or otherwise.

A, B and C are to be wired in series (only one path for current) across terminals 1 and 2 on the low voltage control terminal strip, or replaced with a jumper wire for constant operation.

A — Control On/Off Humidistat

Wired to make on drop in humidity, break on rise. Set to desired % RH.

B — High Limit On/Off Humidistat

Wired to make on drop in humidity, break on rise.

Set to a higher set point (max. 85% R.H.) as a safety to prevent saturation.

C — Air-Proving On/Off Switch

Wired to make when sensing air flow, break when no air flow.

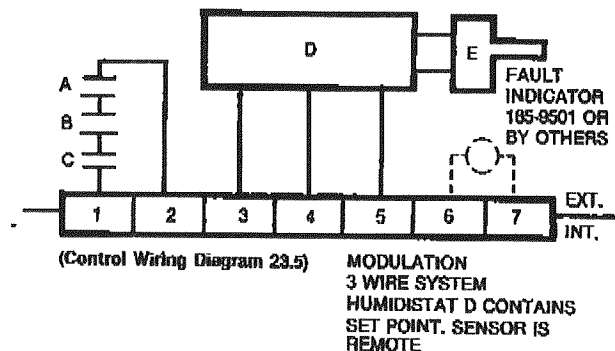
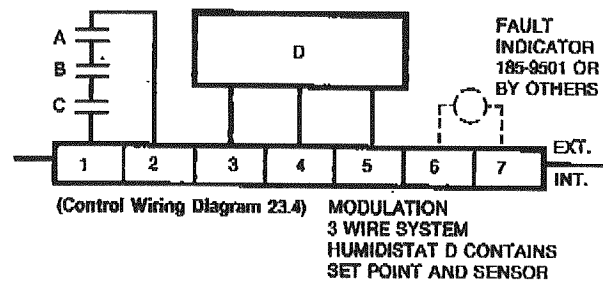
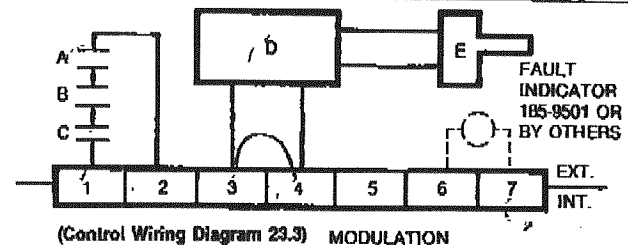
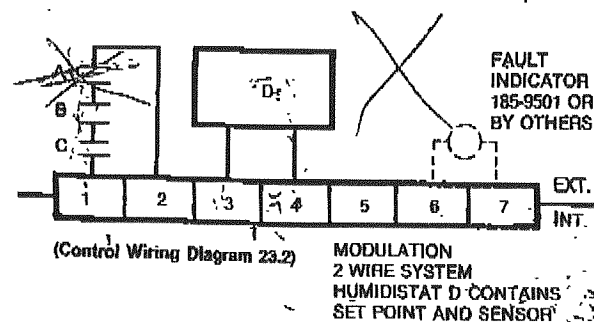
As a safety to prevent saturation when no air flow.

INSTALLATION

1. The factory offers various versions of A, B and C to suit each application. In general, A is essential, whereas B and C are highly recommended.
2. Field-wiring from humidistat to humidifier and between devices should be 18 AWG or heavier.
3. The low-voltage (7 point) control terminal strip is provided in the electrical compartment. The internal side is factory-wired. The external side is to be field-wired, unless the external controls have been cabinet-mounted at the factory.
4. Each unit is supplied with a wiring diagram adhered to the inside face of the cabinet door.
5. **A and B:** Mount any wall humidistat (control or high limit) over a standard electrical box at a height similar to a typical thermostat. Any wall humidistat should be in a location representative of the overall space being humidified and not in the path of a blower pack or an air supply grille.
6. **A:** Mount any duct control humidistat in a location representative of the overall air humidity, usually the return duct. Do not mount it directly in front of the steam distributor or in a turbulent or mixing zone. Mount it where the air's humidity and temperature are uniform and representative of the space(s) being humidified.
7. **B:** Mount any duct high limit humidistat downstream of the steam distributors far enough that under normal humidity and air flow conditions the steam will have been fully absorbed (typically 10 ft.). It must be located to sense high humidity only when the uniform and representative air is over-humidified or approaching saturation.
8. **C:** Mount any air-proving switch so that it is able to sense air flow or the lack of it. Wire it to make when air flow is sensed and break when no air flow.
9. Check operation of A, B and C before starting unit.

MODULATION (CONTINUOUS CONTROL)

Modulation (continuous control) packages are offered as accessories by NORTEC. Refer to the sections entitled "Packages". Alternatively, external hardware may be purchased/supplied by others for interfacing with a factory-supplied "Adapter" built into the humidifier. For this type of system, refer to the sections entitled "Adapters".



Read ON/OFF CONTROLS section FIRST since it is necessary to ALL control systems.

1. Modulation (continuous control) for use with NORTEC humidifiers involves one of four CONTROL WIRING DIAGRAMS 23.2, 23.3, 23.4 and 23.5. In all cases, the external modulating signal interfaces through the control terminal strip to a modulating p.c. board inside the humidifier.
2. If the humidity sensor E is built into D, see wiring diagrams 23.2 or 23.4. If the sensor is remote-mounted, see wiring diagrams 23.3 or 23.5 and use shielded two conductor wire (Belden type 8760 or 8762) or equivalent between D and E to prevent electromagnetic interference (E.M.I.).
3. The external modulation signal is generated by D, a humidistat. This signal from D to the humidifier must first be identified as a varying v.d.c. signal, a varying milliamp d.c. signal, or a varying resistance signal. Then the appropriate wiring diagram can be selected according to the following notes.

4. **Varying V.D.C. Signal Adapters:** Four different settings of the continuous Control Adaptor board within the unit are offered by the factory for use with the appropriate field-supplied varying v.d.c. signal humidistat. Ensure that the output signal of the field-supplied humidistat is in accordance with the factory-supplied adapter board setting as follows:

NORTEC Accessory No.	Description	Wiring Diagram
185-9325	0-10 v.d.c.	23.2
185-9326	0-16 v.d.c.	23.2
185-9327	1- 5 v.d.c.	23.2
185-9328	2.5-10 v.d.c.	23.2

Only two wires are involved. The — signal wires to terminal 3 and the + signal wires to terminal 4. Polarity is critical. The signal must reduce as humidity rises.

5. **Varying Milliamp D.C. Signal Adapters:** Two different adapter boards are offered by the factory for use with the appropriate field-supplied varying milliamp d.c. signal humidistat. Ensure that the output of the field-supplied humidistat is in accordance with the factory-supplied adapter board setting as follows:

NORTEC Accessory No.	Description	Wiring Diagram
185-9323	0-20 mA d.c.	23.2
185-9324	4-20 mA d.c.	23.2

Only two wires are involved. The — signal wires to terminal 3 and the + signal wires to terminal 4. Polarity is critical. The signal must reduce as humidity rises.

6. **Varying Three-Wire Resistance Signal Adapters:** One adapter board is offered by the factory for use with the appropriate field-supplied varying three-wire resistance signal humidistat. Ensure that the resistance signal of the field-supplied humidistat is in accordance with the NORTEC-supplied adapter board setting as follows:

NORTEC Accessory No.	Description	Wiring Diagram
185-9321	0-135 ... 1000 ohm	23.4

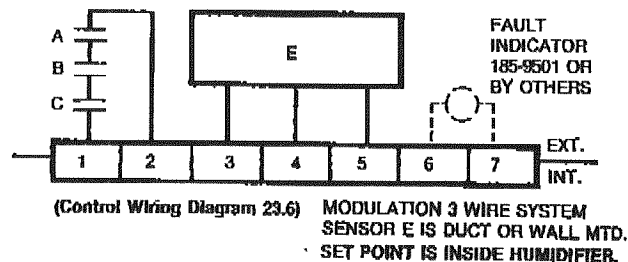
Wire the sweep arm connection to terminal 4. Wire the remaining two wires to 3 and 5 such that resistance from 3 to 4 decreases and 4 to 5 increases as humidity rises.

7. **Varying Three-Wire Resistance Signal Packages:** Only one type of D in this format is presently offered by the factory. It is a Honeywell H915A which is to be wired to terminals 3, 4 and 5 as follows: screw "W" to terminal 3, screw "R" to terminal 4, screw "B" to terminal 5. In this way, resistance from 3 to 4 decreases and 4 to 5 increases as humidity rises. Terminal 4 is the sweep arm.

NORTEC Accessory No.	Description	Wiring Diagram
5. 185-9331	wall mtd., single circuits	23.4
185-9334	duct mtd., single circuits	23.4
185-9336	wall mtd., coupled circuits	23.4
185-9339	duct mtd., coupled circuits	23.4

8. **Stafa Control-Based Packages:** An advanced modulating control package is available utilizing a special factory-supplied internal adaptor board with built-in humidistat set-point circuitry for use with (a) a room humidity sensor or (b) a remote duct sensor. Locate sensors as you would humidistats. See notes A and B on page 11. In either case, the sensor is wired as follows: Terminal #3 on the sensor is wired to terminal #3 on the external controls strip, #4 on the sensor to #4 on the controls strip, and #6 on the sensor to #5 on the controls strip.

NORTEC Accessory No.	Description	Wiring Diagram
185-9301	wall mtd., single circuits	23.6
185-9304	duct mtd., single circuits	23.6
185-9306	wall mtd., coupled circuits	23.6
185-9309	duct mtd., coupled circuits	23.6



PRINCIPLE OF OPERATION

- Refer to Diagram 24.
- When controlling humidistat detects drop in RH, (relative humidity) its points close, turning on unit, which has been on standby.
- After 30 seconds, fill valve opens and cylinder fills until 110% F.L.A. (full load amperage) or top of cylinder is reached.
- If 110% F.L.A. is reached water heats and boils away until 90% F.L.A. If water stopped at top of cylinder, water will boil off sensor pin until concentration is sufficient for normal operation. Red "full cylinder" light will be on. This is normal on start-up.
- The patented auto-adaptive control system continually monitors the rate of amperage drop between the 110% and 90% trigger points. It optimizes contained-water concentration to achieve maximum cylinder life and minimize energy lost in draining. It does so by automatically adjusting the frequency and duration of drains to suit changing conditions. No other humidifier is this adaptable.



CUT OPEN VIEW SHOWS CYLINDER
AFTER NORMAL OPERATION
(Build-up depends on water conditions)
PHOTO 6

6. When 90% F.L.A. is reached, the fill valve will open, refilling cylinder to 110% F.L.A. On occasion, the drain valve will also come on if water level is too low, indicating too high a concentration and the requirements for a dilution of the water in the cylinder.
7. As mineral build-up occurs on lower portions of electrodes, water level will automatically rise in cylinder, thus employing fresh electrode mesh and maintaining full-rated steam output.
8. When all electrode surface is mineral-coated, the cylinder life is exhausted and is indicated by the cylinder full indicator light coming on and an "F4" indication. If ignored, the humidifier will shut itself off. See required maintenance on page 14.
9. If humidifier does not appear to function properly, refer to "Troubleshooting" section.

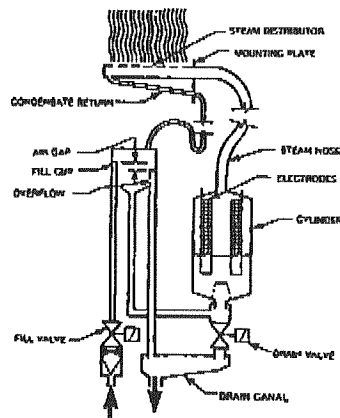


DIAGRAM 24
PRINCIPLE OF OPERATION
SCHEMATIC DIAGRAM

INITIAL START-UP

1. Check that the unit is securely mounted on a vertical surface and that the unit is level.
2. Confirm that unit is properly connected to water supply and drain pipes and that correct voltage and amperage services are supplied.
3. Check that the steam distributor is correctly mounted and the steam supply and condensate return hose are properly routed.

4. Ensure that the external controlling humidistat is located in an area to accurately sense the relative humidity to be maintained by the unit. Check that all controls are correctly wired to unit.
5. With power off, check all electrical connections in unit for wires that may have come loose in shipping.
6. With power off, check that electrode plugs are firmly clamped on electrode pins on cylinder. **IMPORTANT: Loose electrode plugs may cause overheating and failure of the plugs. A temporary fix is to squeeze them with pliers.**
7. Turn on the main fused circuit breaker in the primary service feeding the unit and check unit has power.
8. Open the isolating gate valve in supply water line of unit.
9. Ensure that control humidistat is set high enough to call for humidification. If in doubt, temporarily remove humidistat and put a jumper across control terminals 1 and 2.
10. Depress the switch to 'ON' position to activate unit. Activation will be indicated by green "Automatic Operation" lamp and by sound of electrical contactor pulling in.
11. When unit comes on, digital display will read "——". Push display select switch once to monitor amps. Push again to monitor humidistat demand. Push again to monitor steam output. Push again to monitor capacity adjustment setting. Push again to read "——".
12. After a 30 second delay, water will enter the cylinder through its bottom connection and rise in the cylinder to a level determined by the microprocessor control circuitry.
13. It is normal, upon initial start-up, for the water level in the cylinder to rise to the top of the cylinder, causing the red "CYL FULL" lamp to activate. Amps may be lower than F.L.A. This condition is due to the supply water having a low conductivity. The unit is designed to prevent a drain of water until it has reached design running conductivity.

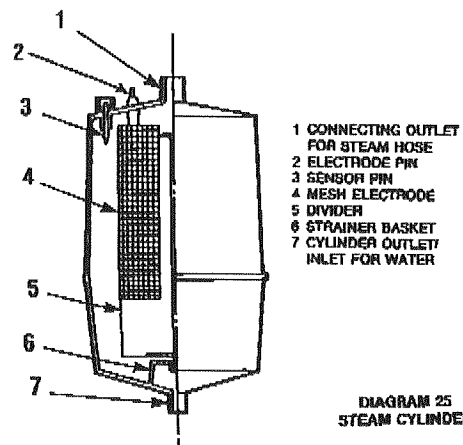
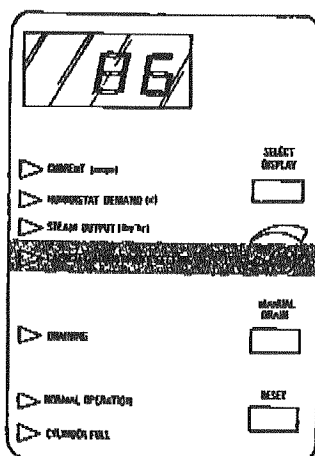


DIAGRAM 25
STEAM CYLINDER

CAPACITY ADJUSTMENT

- Each NORTEC MP series humidifier is rated at its maximum output capacity. It is externally adjustable so that a reduced output of between 20% and 100% is obtainable.
- The capacity adjustment control is a small P.C. board-mounted potentiometer on the unit's microprocessor control board. It is accessible through a designated small hole on the front panel, using a small flat-end screwdriver.



- To adjust the capacity, press the "Select" button until the triangular lamp labelled "Capacity Adjustment Setting" is lit. Allow for a momentary delay between each push. The three-digit display will now be indicating the setting of the capacity adjustment screw. The screw will originally be set fully clockwise and the readout will be 100%. Capacity can be reduced by turning the screw counter-clockwise and watching the display. Slowly turn the screw until the readout indicates the level you desire.
- CAUTION:**
The capacity adjustment dial is not to be confused with the control humidistat set point. The control humidistat is designed to maintain a desired relative humidity level in a space. The capacity adjustment feature controls only the steam generation rate.

WARNING

ARCING OR FLASHING IN CYLINDER

If this condition occurs, it requires your immediate attention. Do not operate the unit. Shut off the unit and consult factory.

REQUIRED MAINTENANCE

The plumbing and electrical compartments contain high voltage components and wiring. Each access door is equipped with a keyed lock. Do not leave key in lock. Access should be limited to authorized personnel only.

The steam cylinder is disposable and must be replaced on a routine basis. Cylinder life is dependent on water supply conditions and humidifier usage. There are many

indications, each of which signifies the end of cylinder life:

- After a period of operation (not on start-up), the water level will approach the top of the cylinder. (Life varies from 500 to 2000 operating hours.)

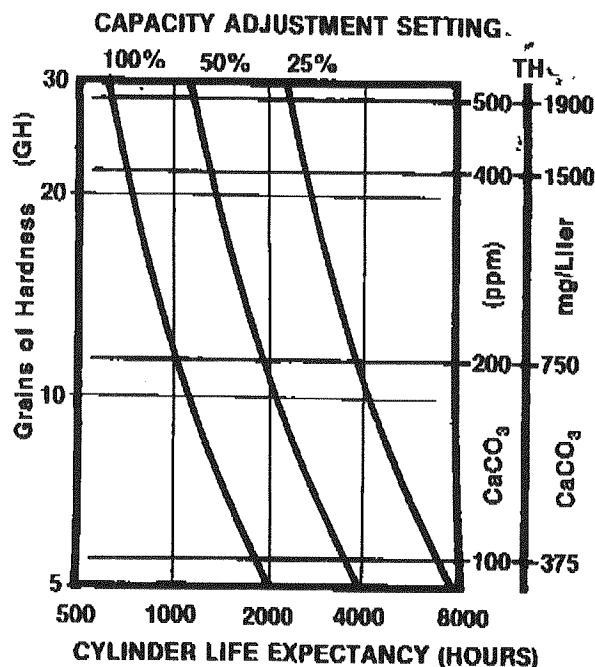


FIGURE 24. WATER CONDITION VS. CYLINDER LIFE

- There will be reduced output in spite of a 100% capacity setting and/or an unsatisfied demand from the humidistat for more humidity. This is evident by monitoring the unit's output on the digital display.
- A red "cylinder full" light will normally be illuminated during these conditions. However, do not rely solely on the red light to know when to replace the cylinder.
- Each MP humidifier has an internal logic circuit that can detect end of cylinder life. If maintenance personnel have not changed the cylinder, the humidifier will automatically shut down to avoid potentially unsafe operation beyond end of life.
- A code F4 flashes on the digital display as definite indication of end of cylinder life.
- If the humidifier is not in easy view, an external remote indicator, such as the lamp/buzzer package 185-9501 factory offered, can be field connected across terminals 6 and 7 to provide an indication, virtually anywhere in the building, that the humidifier requires maintenance.
- Each MP humidifier comes factory wired to provide power (24vac, 50VA max.) internally to terminals 6 and 7 of the control terminal strip. This power appears at 6 and 7 any time that the MP has diagnosed a fault, F4 or otherwise. (See FAULT-CODES beginning on page 18.) Until the cylinder is replaced with a new one and the reset button pushed, the MP humidifier will stay off, will flash

the F4 fault code on the built-in digital display and will provide power to terminals 6 and 7.

STEAM CYLINDER REPLACEMENT

(It is advisable to keep a spare cylinder in stock throughout the humidification season). When ordering a replacement steam cylinder, always quote the three digit model number on the white label applied to the cylinder.

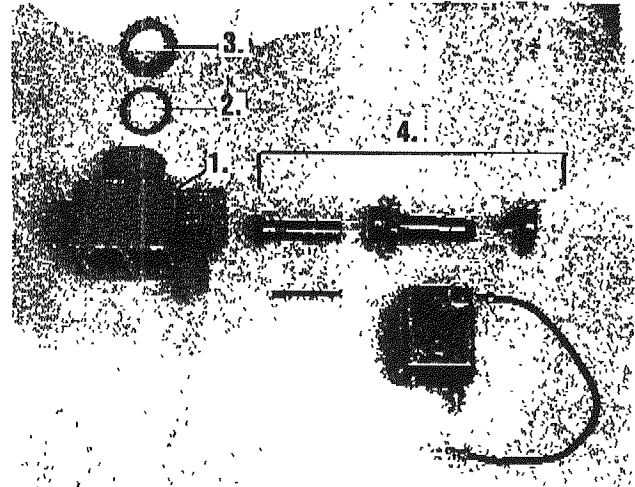
1. Turn off water supply to unit.
2. The used cylinder must be drained completely before removing. Push the green ON/OFF switch to the ON position. Push the white MANUAL DRAIN switch once. (Pushing it again stops the drain.)
3. When completely drained, push the green ON/OFF switch to the OFF position.
4. Once drained, open the main electrical disconnect during the entire cylinder change operation.
5. Use key to remove plumbing door. Pull interlock switch "out".
6. Power wires to cylinder are attached to cylinder plugs to electrode pins on top of the cylinder.
7. Pull the cylinder plugs off the pins with a vertical twisting action. See photo 8. Note: Plugs will fatigue with use. If plugs feel loose, a temporary fix is to squeeze them with pliers to provide a tighter fit. **New plugs should be ordered as soon as possible.**
8. Using slot screwdriver, loosen the steam hose clamp(s) and pull steam hose off vertically.
9. Shipping clips which retain the cylinder in the holding brackets, if not already removed, can be pulled off with pliers and need not be replaced.
10. Replacement cylinders come with a re-useable tie wrap. The old tie wrap can be discarded. See instruction sheets included with each replacement cylinder.
11. Cylinder is now ready to be lifted out of the unit. (See photo 9.) **CAUTION — Cylinder and any undrained water will be HOT.**

MANDATORY CLEANING OF THE DRAIN VALVE

Always clean the drain valve when installing a new cylinder since the valve port is likely to be as dirty as the used cylinder.

- remove old cylinder as described above
- remove two screws securing drain valve body to drain pan
- note that ring terminal for drain valve green ground wire is sandwiched between drain valve body and drain pan
- remove hose clip from hose connection
- drain valve assembly is now free to be taken to a sink for disassembly and cleaning
- remove snap-fit red cap from coil assembly and slide coil off the actuator
- loosen actuator with wrench and screw out of plastic valve body

- clean the exposed core and spring and plastic drain valve port
- reassemble, tighten actuator ¼-turn past hand-tight
- fit mounting screws through drain valve body, one through ring terminal on green ground wire
- **WARNING:** to prevent the possibility of electric shock the green ground wire must be reinstalled before power is restored



EXPLODED VIEW OF DRAIN VALVE

PHOTO 7

1. Valve body (132-4042 small, 132-4041 large)
2. O Ring (132-5014)
3. Stuffing Block (132-1042)
4. Coil Assembly complete (132-6002)

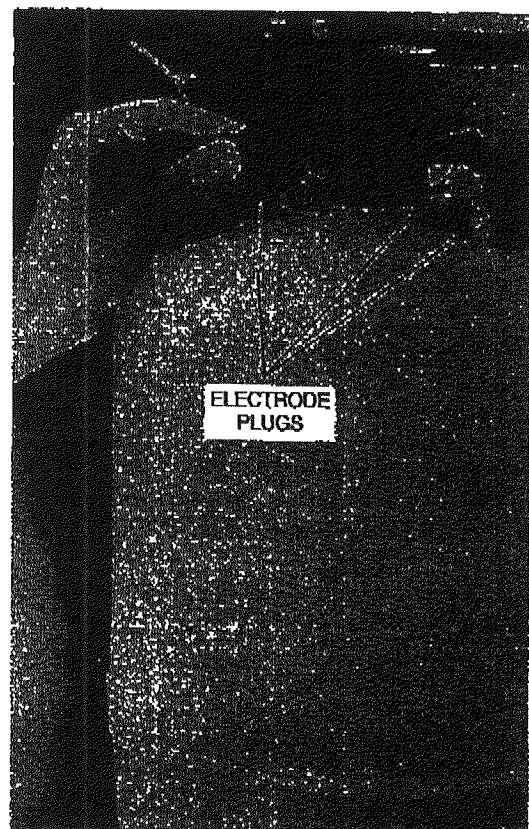
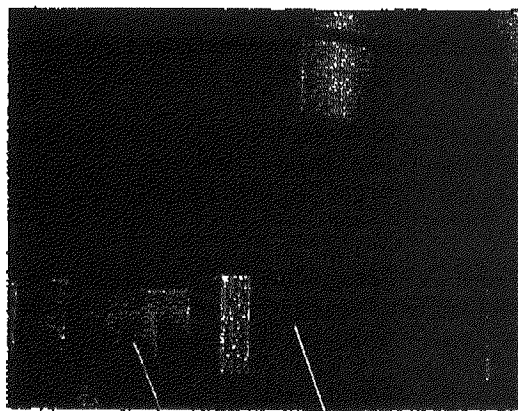


PHOTO 8



FILL VALVE DRAIN VALVE WITH O-RING SEAL

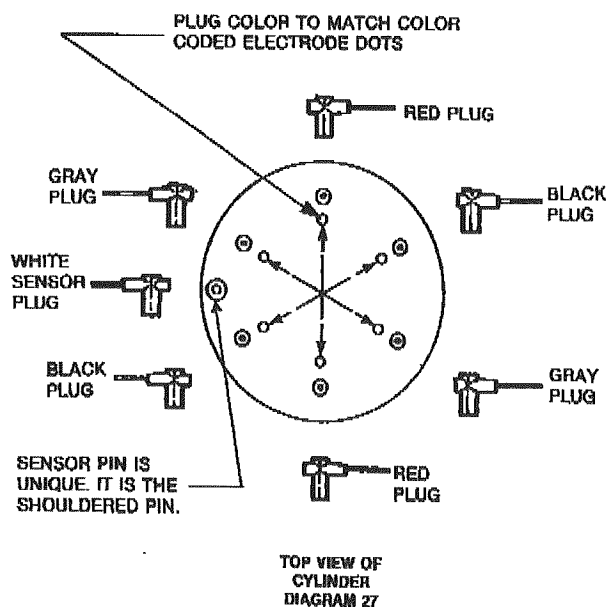
PHOTO 9

RETURNING DEFECTIVE VALVES

Should it be necessary to return a valve for warranty in winter, please disassemble to avoid freezing and cracking.

INSTALLING NEW CYLINDER

1. Reverse procedure should be followed to install new cylinder. Main disconnect is to be left open until cylinder is completely installed and reconnected.
2. Ensure that cylinder mounting stubs (plastic "ears") are seated properly in the allotted side mounting brackets within the unit.
3. The cylinder plugs are color-coded in accordance with colored dots beside the electrode pins on top of the cylinder.
4. This color-coding must be adhered to when replacing cylinder plugs on pins.



5. With cylinders having six primary voltage cylinder plugs, it should be noted that there are two of each color. See Diagram 27.
6. Care should be taken that cylinder plugs of the same color are always directly opposite each other as indicated by the dot formation on the top of the cylinder.
7. The white cylinder plug on all units is for the sensor electrode which always goes on the single pin surrounded by a plastic shoulder.
8. Ensure that cylinder plugs are very snug on the pins.
9. If cylinder plugs become loose, it is best to obtain a new replacement plug. Consult factory. Refer to page 15 item 7.

EXTENDED SHUTDOWN

Any time that the unit is going to be shut down for an extended period of time, including summer shutdown, ALWAYS drain down the cylinder before disconnecting power. Otherwise, the electrodes are subject to harmful corrosion which drastically shortens cylinder life.

BUILT-ON AND REMOTE BLOWER PACKS

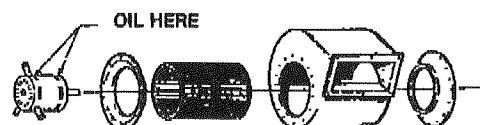


DIAGRAM 28

FAN MOTOR OILING: The blower pack fan motor (on MP 200 and larger) requires occasional oiling of motor bearings. To do this, open up the blower pack front (see Blower Pack Service Section). The fan motor is on the left-hand side of the fan and is partially recessed. Oil the motor with ten drops of SAE-20 grade motor oil. Refer to diagram 28 for oiling slots. It is important to oil the fan motor every four months to preserve long life and to maintain the fan's warranty.

TROUBLESHOOTING

SAFETY

Digital display normally indicates one of four parameters: current (amps), humidistat demand (%), steam output (lbs/hr) and capacity adjustment setting (%). "SELECT DISPLAY" button provides choice of display. If and when a fault or end of cylinder life is detected by units' self-diagnostics, unit shuts down (for safety reasons) and display reverts to a flashing fault code.

Until cause of fault is identified and corrected, fault code will continue to be displayed. Humidifier will remain off. Furthermore, a 24V signal will be present across points 6 and 7 on control terminal strip so that remote fault indication is available.

Fault-finding should only be performed by qualified personnel using accepted industrial and electrical code practices.

Line voltages to 600V are present in some circuits, so safety procedures must be adhered to.

The following procedures apply to units with on/off humidistat type controls. If your unit is equipped with continuous controls, it is wise to check these first to see if they are the cause of the operational problem.

This can be done by disconnecting the continuous control adaptor board from the narrow grey ribbon connector. This procedure instantly converts the unit to on/off type control. The procedures which follow are then entirely applicable. It is possible that the problem will disappear when the adaptor board is disconnected from the ribbon connector. If this is the case and the unit runs normally as an on/off unit, then the problem is with the continuous control board, or the modulating humidistat. Refer back to the Modulation (Continuous Control) section to ensure proper wiring.

CAUTION: Do not operate humidifier for long periods of time with adapter disconnected. This will cause the humidifier to operate uncontrolled and excessive humidity could be experienced.

PROCEDURES

Refer to wiring diagram on inside of door. Standard sequence: pri-to-24V transformer is powered from two white wires from line voltage. 24V secondary circuit "hot" leg is 3A fuse-protected, passes through door interlock switch in plumbing compartment, through main on-off (green-lighted) switch, through external on-off controls across positions 1 and 2 on the control terminal strip, and finally to position 12 on the support board. Jumper across 1-2 on the control terminal strip for the sake of troubleshooting. If this action alone solves the problem, the fault is external to the humidifier. Primary contactor's 24V holding coil gets its "hot" leg from position 1 on support board through relay C. The "ground" leg of the 24V circuit goes to contactor holding coil, position 10 on support board (as well as to green light and position 6 on control terminal strip).

An open circuit in either leg will prevent the contac-

tor from activating. If contactor "clunk" is not heard when green on-off switch is pushed on, then an open circuit exists. Step by step, a test jumper wire can be used to bypass and identify source of open circuit. Repair as necessary or obtain new component(s) from factory or agent. Do not permanently bypass any open circuit!

Contactor and/or support board are defective if described circuits are functioning properly. Divert 24V directly to contactor coil. If it activates and circuits are functioning, support board is defective. If it does not activate, replace contactor.

After the necessary components have been replaced and the contactor pulls in, there is line voltage to the cylinder, and the control sequence can begin. The lamp labelled "normal operation" should be lit.

Approximately 15 to 30 seconds after contactor pulls in, fill valve 24V coil should energize. Its "hot" leg is an orange wire powered from position 9 on support board through relay F. Its "ground" leg is a black wire from position 7 on support board. Ensure continuity of these two wires. Divert 24V directly to fill valve to test for faulty coil.

If fill valve will not activate after described checks, then "full cylinder" sensor may be interfering. First of all, ensure white sensor plug is connected to plastic shouldered sensor pin on cylinder, not to a cylinder electrode pin and ensure water is not already at top of cylinder.

If plug is correct and water is low, observe if red lamp labelled "Cylinder Full" on front of unit is lit. If so, temporarily disconnect red and black wires of sensor assembly from connections 4 and 5 on support board for 30 seconds. If red lamp goes out, and fill valve then energizes, sensor assembly is definitely faulty and must be replaced.

If fill valve coil still won't activate with 4 and 5 disconnected and all described checks done, support board and/or digital board is faulty.

Now that all faulty components have been changed, water should start filling cylinder, submerging electrodes. Because of line voltage across electrodes, water will begin to conduct electricity and heat up.

The Concentration Process now takes place through a series of filling and boiling cycles (described earlier, in the principle of operation section).

Usually, on first fill, water fills to top of cylinder. High water level sensor pin is touched by water's surface, which activates sensor assembly, and this in turn directs support board to open relay F and shut off fill valve. Because fresh supply water is unconcentrated, it cannot conduct electricity well enough to produce full output. Nonetheless, it will come to a boil, and when water level drops below sensor probe, fill valve is allowed to re-energize until water reaches top again. Each time this happens, more minerals are accumulating in cylinder,

and contained water is becoming more conductive i.e. "contained water conductivity" is increasing.

In time, cylinder will reach 100% output, assuming capacity adjustment is set at 100%. See previous "CAPACITY ADJUSTMENT SECTION". Concentration process does not stop here; no drain will be allowed to take place yet. Instead, unit enters a number of fill and boil down cycles, filling to 110% of F.L.A. and boiling down to 90%. Each time this happens, contained water conductivity increases, and average water level drops lower and lower in cylinder. Eventually, water reaches high conductivity and low level that represents optimum design point. At this point, the microprocessor will monitor boil-down times, and provide necessary automatic drains of controlled duration and frequency to maintain design conductivity. Typically, only an inch or two of electrode surface will be utilized.

This is an extremely important design feature. The cylinder is a disposable item, and in order to maximize its life, it is important to use minimum amount of electrode surface. As minerals inevitably accumulate on exposed surfaces, water will gradually rise to higher and higher levels to utilize clean surface as required. When cylinder is all used up, water level will remain at top of cylinder, and output will start to drop as no new surface is available. Digital board will detect this condition, and signal operator with flashing message "F4" on L.E.D. display. Digital board will then disconnect power to expired cylinder, and will not allow operation of machine until a new cylinder is installed.

FAULT CODES

Digital board is capable of diagnosing faults. If and when improper conditions or operations occur, unit takes three actions. First, it displays a fault code on L.E.D. display. Then it disengages primary power to cylinder, halting operation. Thirdly, it provides power (24vac, 50VA max.) internally to terminals 6 and 7 of the control terminal strip. An external remote indicator, such as the lamp/buzzer package 185-9501 factory offered, can be field connected across terminals 6 and 7 to alert the operator that the humidifier is off.

Unit can be reset, but in all likelihood fault will be detected again, and unit will once again shut down. It should be noted that conditions detected by the fault diagnostics systems are serious enough to warrant shut-down for reasons of safety or since output is severely hampered anyway. Thus, indication of a fault code requires a repair action.

To detect faults, unit relies heavily upon its current transformer transducer, which monitors current in one of cylinder's primary legs. First action that should be taken when a fault message is displayed is to verify that a fault has not developed in current transformer core itself. This may be verified as follows:

Temporarily disconnect two yellow wires from C.T. board's stake-ons and isolate them. Connect an ohmmeter to the board's stake-ons and measure the resistance on a zero-to-100 ohm scale. Also take careful visual note of

original setting of C.T. board's potentiometer. Tests will require adjusting pot but if board passes tests, pot must be returned to this setting to maintain calibration.

Adjust pot full clockwise and note resistance on ohmmeter. It should be between 58 and 70 ohms. If a higher or close to zero resistance is read, C.T. board is defective and must be replaced. If C.T. board passes this test, adjust pot fully counterclockwise and take another resistance reading. Reading should be between 85 and 105 ohms. If not, replace C.T. board.

If C.T. board passes both tests, it is good. Return pot to original setting.

NORTEC MP FAULT CODES

If you are certain that your current transformer board is okay, and fault message persists, even after resetting, use guide below to help you find source of problem.

Fault Message "F1" Excessive Current

Code "F1" appears on L.E.D. display if excessive current (140% F.L.A.) persists for any reason in primary circuit. Any higher abnormal current draw would blow line voltage fuse(s). F1 saves on costly fuses by detecting excessive current before fuses blow. Safety action taken by digital board is to disengage primary contactor so no power goes to cylinder. Do not attempt to reset unit if this fault occurs. Search for following problems:

1. Incorrect cylinder (too conductive for application or inconsistent with primary voltage).
2. Inoperative drain valve, or discontinuity in wiring to drain valve.
3. Plugged up drain valve, that does not allow proper drain rate.
4. Failure of microprocessor controller black box which allows overfilling, or does not activate drain valve when required.

Fault Message "F2" Zero Current and Sensor On

Code "F2" appears on L.E.D. display if there is zero current being read by C.T. board, and if high water level sensor is activated, as indicated by red lamp labelled "Cylinder Full" being lit. Try resetting unit once. If fault re-occurs, search for the following problems:

1. Primary leg being monitored by C.T. board may be dead, i.e., leg has become open, likely because of a blown fuse or tripped breaker. Check external and internal line voltage fuses for continuity. If unit is three-phase, uncontrolled boiling would result on other two legs, were it not for unit's safety shut-down.
2. Sensor assembly may be faulty, sending a signal to controller which causes it to lock out fill valve. Or, polarity of red and black wires from sensor to support board may be reversed, which gives same sort of false signal.

Fault Message "F3" Non-Zero Slowly Increasing Current

"F3" appears on the L.E.D. display if current fails to reach 110% of F.L.A. within 40 minutes, or if sensor fails to be tripped within 40 minutes. In general, failure of one of these two events to occur within 40 minutes indicates a water quantity problem. Reset unit once. If fault re-occurs after 40 minutes, search for the following problems:

1. A partially blocked fill valve is restricting water flow to cylinder. It should be taken apart and cleaned. Fill valve may be wrong size. Check parts booklet.
2. Water supply line to unit has become restricted, or delivery pressure has dropped too low. Check for proper water delivery.
3. Sensor assembly has failed to detect high water level, resulting in a constant overflow situation. Ensure that the sensor assembly connections are correctly in place. If they are, and problem persists, replace sensor.
4. The drain valve may be leaking, not allowing cylinder to fill properly. Disassemble and clean the drain valve to restore proper operation.

Change Cylinder Message "F4" Change Cylinder

Code "F4" will appear sooner or later on every unit. The digital board looks for conditions found at end of cylinder life. To judge end of life, digital board looks for three consecutive cycles where timer drain is activated (indicating contained water has reached stabilized water conductivity) yet on refill, full cylinder sensor (indicating full output is no longer possible) is also activated. When the MP humidifier stops and flashes F4, it can be one of three reasons:

- 1) End of Cylinder Life
- 2) Low Incoming Water Conductivity (IWC)
- 3) Foaming

1) End of Cylinder Life:

In this case, F4 is not a fault, but a reminder. Cylinder replacement is inevitable. Refer to cylinder life chart. It estimates 500-2000 operating hours, but high silica content may significantly reduce this. Refer to "Maintenance" section of this manual.

2) Low IWC:

Below 300 $\mu\text{S}/\text{cm}$, factory might be able to recommend a more conductive cylinder and/or more restrictive timer to lower the stabilized water level and prolong F4.

3) Foaming:

a) Bad Supply Water: Before the unit can stabilize, the water foams. Filter or treat the water to remove the constituent that causes foam. Organics (algae) are one possible cause.

b) Blocked or Inadequate Drain System: The water overconcentrates. Measure manual drain rate.

Compare to standard.

c) Short Cycling: Controls are too close to steam source before air and moisture are properly mixed. Fluttering air proving switch or contact is loose in vibration. Auto-adaptive control system is interrupted too frequently and can't drain, so the cylinder overconcentrates.

Fault Message "F5" Zero Current

Code "F5" occurs if no current appears between electrodes within 12 minutes of signal from support board to fill valve. Try resetting unit once. If fault reappears, look for the following problems:

1. Primary leg being monitored by C.T. board may be dead, i.e., leg has become open, likely because of a blown fuse or a tripped breaker. Check external and internal line voltage fuses for continuity. If unit is three-phase, uncontrolled boiling would result on other two legs, if it were not for unit's safety shut-down.
2. Wiring from support board to fill valve is open, or fill valve is inoperative. Fill valve strainer could be badly blocked-up. Inspect these areas, and make required repair.
3. Water supply is absent, or very restricted. Check for adequate water supply at adequate delivery pressure.
4. Drain valve is leaking at a rate greater than fill rate, so that cylinder cannot fill at all. Disassemble and repair drain valve, or replace it if necessary.

Fault Message "F6" Non-Zero Non-Increasing Current

Code "F6" occurs if water supply to cylinder ceases entirely during course of normal operation. Try resetting unit once. If fault persists, look for the following problems:

1. Water supply has stopped or been blocked off completely.
2. Fill valve has become inoperative, or strainer has become completely blocked up.

ELECTRICAL TABLES

MODEL	VOLTAGE	PHASE	K.W.	UNIT FLA	MAX. UNIT FUSE (AMPS)	MIN. DISCONNECT FUSE (AMPS)	NO. OF UNIT FUSES*
MP-50	110-120	1	1.5	13.0	15	15	2
MP-100	208	1	3.4	16.4	20	20	2
MP-100	220-240	1	3.4	14.8	20	20	2
MP-100	277	1	3.4	12.4	15	15	2
MP-100	347	1	3.4	9.8	12	12	2
MP-100	380	1	3.4	9.0	12	12	2
MP-100	416	1	3.4	8.2	10	10	2
MP-100	440-480	1	3.4	7.4	10	10	2
MP-200	208	1	3.4	16.4	20	20	2
MP-200	220-240	1	3.4	14.8	20	20	2
MP-200	277	1	3.4	12.4	15	15	2
MP-200	347	1	3.4	9.8	12	12	2
MP-200	380	1	3.4	9.0	12	12	2
MP-200	416	1	3.4	8.2	10	10	2
MP-200	440-480	1	3.4	7.4	10	10	2
MP-200	550-600	1	3.4	6.0	8	8	2
MP-300	208	1	6.8	32.8	40	40	2
MP-300	220-240	1	6.8	29.6	40	40	2
MP-300	277	1	6.8	24.6	35	35	2
MP-300	347	1	6.8	19.6	25	25	2
MP-300	380	1	6.8	18.0	25	25	2
MP-300	416	1	6.8	16.4	20	20	2
MP-300	440-480	1	6.8	14.8	20	20	2
MP-300	550-600	1	6.8	11.8	15	15	2

ELECTRICAL TABLES

MODEL	VOLTAGE	PHASE	K.W.	UNIT FLA	MAX. UNIT FUSE (AMPS)	MIN. DISCONNECT FUSE (AMPS)	NO. OF UNIT FUSES *
MP-400	208	3	10.2	28.4	40	40	3
MP-400	220-240	3	10.2	25.6	35	35	3
MP-400	380	3	10.2	15.6	20	20	3
MP-400	416	3	10.2	14.2	20	20	3
MP-400	440-480	3	10.2	12.8	15	15	3
MP-400	550-600	3	10.2	10.2	15	15	3
MP-500	208	3	20.4	56.6	40	80	6
MP-500	220-240	3	20.4	51.2	35	70	6
MP-500	380	3	20.4	31.0	20	40	6
MP-500	416	3	20.4	28.4	20	40	6
MP-500	440-480	3	20.4	25.6	35	35	3
MP-500	550-600	3	20.4	20.6	30	30	3
MP-600	208	3	30.6	85.0	60	120	6
MP-600	220-240	3	30.6	76.8	50	100	6
MP-600	380	3	30.6	46.5	30	60	6
MP-600	416	3	30.6	42.5	30	60	6
MP-600	440-480	3	30.6	38.4	25	50	6
MP-600	550-600	3	30.6	30.7	40	40	3
MP-700	208	3	40.8	113.2	40	160	12
MP-700	220-240	3	40.8	102.4	35	140	12
MP-700	380	3	40.8	62.0	20	80	12
MP-700	416	3	40.8	56.6	20	80	12
MP-700	440-480	3	40.8	51.2	35	70	6
MP-700	550-600	3	40.8	41.0	30	60	6
MP-800	208	3	61.2	169.8	60	240	12
MP-800	220-240	3	61.2	153.6	50	200	12
MP-800	380	3	61.2	93.0	30	120	12
MP-800	416	3	61.2	85.0	30	120	12
MP-800	440-480	3	61.2	76.8	25	100	12
MP-800	550-600	3	61.2	61.5	40	80	6

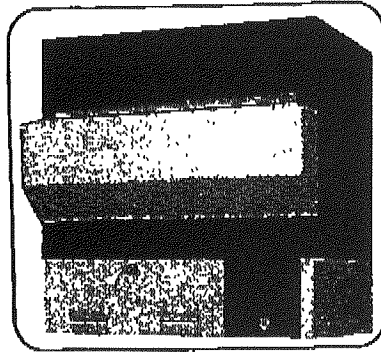
* Each branch of each leg of primary voltage internal wiring is fundamentally protected by a factory-mounted internal fuse sized to blow first. Nonetheless, a dedicated primary line voltage fused disconnect must be field supplied and installed, according to codes.

ELECTRICAL TABLES
FOR MP HUMIDIFIERS COMPLETE WITH BLOWER PACK
(BUILT ON OR REMOTE)

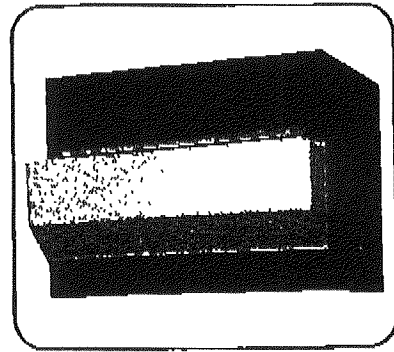
MODEL	VOLTAGE	PHASE	K.W.	UNIT FLA	MAX. UNIT FUSE (AMPS)	MIN. DISCONNECT FUSE (AMPS)	NO. OF UNIT FUSES
MP-50	110-120	1	1.53	13.3	15	15	2
MP-100	208	1	3.43	16.5	20	20	2
MP-100	220-240	1	3.43	14.9	20	20	2
MP-100	277	1	3.43	12.5	15	15	2
MP-100	347	1	3.43	9.9	12	12	2
MP-100	380	1	3.43	9.1	12	12	2
MP-100	416	1	3.43	8.3	10	10	2
MP-100	440-480	1	3.43	7.5	10	10	2
MP-200	208	1	3.75	18.0	25	25	2
MP-200	220-240	1	3.75	16.3	20	20	2
MP-200	277	1	3.75	13.6	20	20	2
MP-200	347	1	3.75	10.8	15	15	2
MP-200	380	1	3.75	9.9	12	12	2
MP-200	416	1	3.75	9.0	12	12	2
MP-200	440-480	1	3.75	8.1	10	10	2
MP-200	550-600	1	3.75	6.6	8	8	2
MP-300	208	1	7.15	34.4	45	45	2
MP-300	220-240	1	7.15	31.1	40	40	2
MP-300	277	1	7.15	25.8	35	35	2
MP-300	347	1	7.15	20.6	25	25	2
MP-300	380	1	7.15	18.9	25	25	2
MP-300	416	1	7.15	17.2	25	25	2
MP-300	440-480	1	7.15	15.5	20	20	2
MP-300	550-600	1	7.15	12.4	15	15	2
MP-400	208	3	10.55	30.0	40	40	3
MP-400	220-240	3	10.55	27.1	35	35	3
MP-400	380	3	10.55	16.5	20	20	3
MP-400	416	3	10.55	15.0	20	20	3
MP-400	440-480	3	10.55	13.5	20	20	3
MP-400	550-600	3	10.55	10.8	15	15	3
MP-500	208	3	20.75	58.2	40	80	6
MP-500	220-240	3	20.75	52.7	35	70	6
MP-500	380	3	20.75	31.9	20	40	6
MP-500	416	3	20.75	29.2	20	40	6
MP-500	440-480	3	20.75	26.3	35	35	3
MP-500	550-600	3	20.75	21.2	30	30	3
MP-600	208	3	30.95	86.6	60	120	6
MP-600	220-240	3	30.95	78.3	50	100	6
MP-600	380	3	30.95	47.4	30	60	6
MP-600	416	3	30.95	43.3	30	60	6
MP-600	440-480	3	30.95	39.1	25	50	6
MP-600	550-600	3	30.95	31.3	40	40	3
MP-700	208	3	41.50	116.5	40	160	12
MP-700	220-240	3	41.50	105.4	35	140	12
MP-700	380	3	41.50	63.0	20	80	12
MP-700	416	3	41.50	58.2	20	80	12
MP-700	440-480	3	41.50	52.6	35	70	6
MP-700	550-600	3	41.50	42.2	30	60	6
MP-800	208	3	61.90	173.0	60	240	12
MP-800	220-240	3	61.90	156.6	50	200	12
MP-800	380	3	61.90	94.8	30	120	12
MP-800	416	3	61.90	86.9	30	120	12
MP-800	440-480	3	61.90	78.2	25	100	12
MP-800	550-600	3	61.90	62.7	40	80	6

NOTE: MP7/800 DATA BASED ON USING 2 REMOTE BLOWER PACKS. FASTER STEAM ABSORPTION REQUIRES 4.

Physical Data

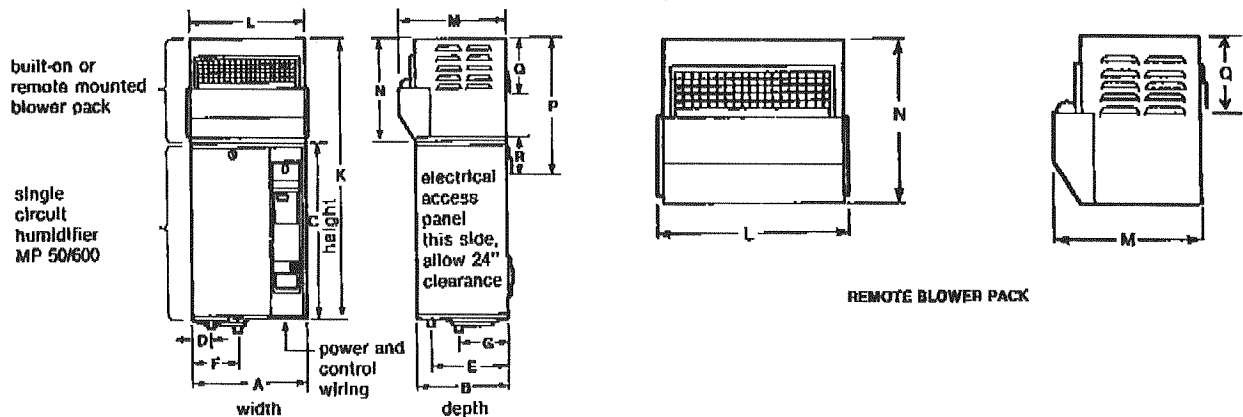


HUMIDIFIER WITH
BUILT-ON BLOWER PACK



REMOTE MOUNTED BLOWER PACK

Dimensions



Physical Data

MP unit model	Humidifiers						Water (1/4")			Drain (1/4")			Blower packs						Wall brackets		
	A	B	C	weight		D	E	H	F	G	J	K	L	M	N	weight	P	Q	R		
				net	full																
				in.	in.															in.	lbs.
MP-50	15.2	9.0	18.4	27	38	1.6	7.4	—	5.6	2.5	—	24.9	15.2	9.1	7.1	12	13 ³ / ₁₆	2 ³ / ₈	6 ¹ / ₂		
MP-100	15.2	9.0	18.4	27	38	1.6	7.4	—	5.6	2.5	—	24.9	15.2	9.1	7.1	12	13 ³ / ₁₆	2 ³ / ₈	6 ¹ / ₂		
MP-200	17.1	11.0	23.8	46	63	1.6	9.3	—	6.1	7.2	—	38.8	17.5	12.3	15.1	47	22 ¹ / ₁₆	7 ¹¹ / ₁₆	7 ¹¹ / ₁₆		
MP-300	17.1	11.0	23.8	46	63	1.6	9.3	—	6.1	7.2	—	38.8	17.5	12.3	15.1	47	22 ¹ / ₁₆	7 ¹¹ / ₁₆	7 ¹¹ / ₁₆		
MP-400	17.1	11.0	23.8	46	63	1.6	9.3	—	6.1	7.2	—	38.8	17.5	12.3	15.1	47	22 ¹ / ₁₆	7 ¹¹ / ₁₆	7 ¹¹ / ₁₆		
MP-500	21.0	14.3	27.7	70	158	1.6	12.6	—	7.7	7.7	—	42.7	21.1	14.3	15.1	55	21 ³ / ₈	7 ³ / ₈	7 ³ / ₈		
MP-600	21.0	14.3	27.7	70	158	1.6	12.6	—	7.7	7.7	—	42.7	21.1	14.3	15.1	55	21 ³ / ₈	7 ³ / ₈	7 ³ / ₈		
MP-700	39.6	17.4	30.1	115	289	1.6	15.7	14.2	7.7	10.8	14.2	—	21.1	14.3	15.1	55	—	7 ³ / ₈	8 ¹ / ₈		
MP-800	39.6	17.4	30.1	115	289	1.6	15.7	14.2	7.7	10.8	14.2	—	21.1	14.3	15.1	55	—	7 ³ / ₈	8 ¹ / ₈		

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NOTES:

LIMITED WARRANTY

NORTEC INDUSTRIES INCORPORATED or NORTEC AIR CONDITIONING INDUSTRIES LIMITED, (hereinafter referred to as THE COMPANY) warrants for a period of two (2) years from date of shipment, that all the COMPANY's products, not otherwise expressly warranted (with the exception of the cylinder), are free from defects in material and workmanship and have the capacities and ratings set forth in THE COMPANY's catalogues and bulletins. No warranty is made against corrosion, deterioration or suitability of substituted materials used because of government regulations, or damages consequent to these conditions.

THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the part(s) is returned freight prepaid by the customer.

The warranties and liabilities set forth in these paragraphs are in lieu of all other warranties and liabilities, expressed or implied. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the purchase price. Any further warranty must be in writing, signed by an officer of THE COMPANY. THE COMPANY makes no warranty and assumes no liability whatsoever for the installation of any and all defective parts or equipment.

THE COMPANY makes no warranty with respect to motors, switches and controls.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with the catalogue and installation manual by a contractor approved by THE COMPANY.

THE COMPANY makes no warranty and assumes no liability whatsoever, for consequential damage, or damage resulting directly from misapplication, incorrect sizing or lack of maintenance to the equipment.

THE COMPANY retains the right to change the design, specification and performance of its products without notice or obligation.

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CYLINDER LAST REPLACED DATE _____

REPLACED BY _____