



GH Series Gas-fired Humidifier

Version D



Installation, User & Maintenance Guide



FOR YOUR SAFETY:

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

Do not try to light any appliance.
Do not touch any electrical switch; do not use any telephone in your building.
Immediately call your gas supplier from a neighbor's telephone.
Follow the gas supplier's instructions. If you can not reach your gas supplier, call the fire department.

WARNING:

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency, or the gas supplier.

WARNING:

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

IMPORTANT: Read and save this guide for future reference. This guide to be left with equipment owner.

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GENERAL

WARNING

- Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, an explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory authorized and listed kits or accessories when modifying this product. A failure to follow this warning can cause electrical shock, fire, personal injury, or death.
- Should overheating occur, or the gas fail to shut off, shut off the manual gas valve to the appliance before shutting off the electrical supply.
- Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

This installation guide has been designed to provide assistance when installing, mounting, and sizing a GH Series humidifier. Actual on site application may vary. Consult Technical Services or your local NORTEC representative.

RECEIVING & UNPACKING EQUIPMENT

1. Check packing slip to ensure ALL material has been delivered.
2. All material shortages are to be reported to NORTEC within 48 hours from receipt of goods. NORTEC assumes no responsibility for any material shortages beyond this period.
3. Inspect shipping boxes for damage and note on shipping waybill accordingly.
4. After unpacking, inspect equipment 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.

GENERAL SPECIFICATIONS

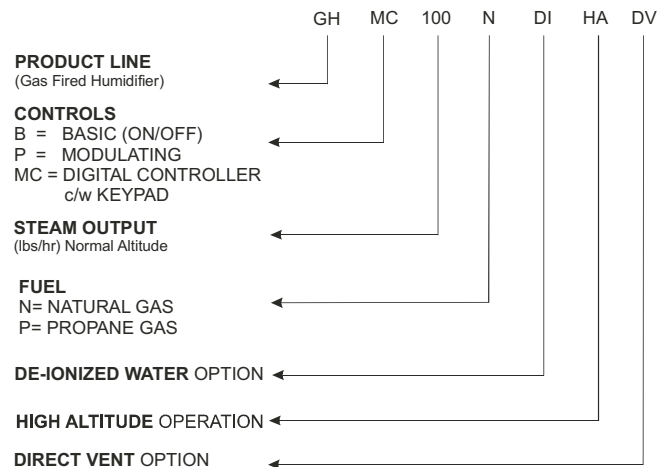
The NORTEC GH Series humidifier is a completely new patented design based on leading edge technology. The GH is designed to provide clean steam humidification at an economical price.

All GH models are available for normal altitude (0-2000 ft elevation) or for high altitude (2000-4500 ft elevation) applications.

GHMC models are also available with enclosure for mounting outside when space is not available. The unit will ship completely installed inside the outdoor enclosure ready for field connection. The enclosure will protect the unit from wind, sun and precipitation.

MODEL DESIGNATION

The unit specification label indicates the model of gas humidifier according to the following chart:



INSTALLATION

1. The installation must conform with local building codes or, in the absence of local codes, with the ANSI Z223.1, National Fuel Gas Code, and/or CAN/CGA B149 Installation Codes. Refer to the Gas Piping section of this manual.
2. The humidifier shall not be connected to a chimney flue serving any other appliances.
3. Provide for adequate combustion and ventilation air in accordance with Sections 7.2, 7.3 or 7.4, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1, or Section 5.3 of CAN/CGA B149 Installation

MODEL GH 100 SPECIFICATIONS								
FUEL	BLOWER SPEED	INPUT (BTUH)*		STEAM CAPACITY (LBS/HR)		MANIFOLD PRESS. IN W.C.	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
		STD	DV	STD	DV			
NATURAL GAS	MAX	119,000	119,000	100	100	-0.05	300	500
	MIN (B,P)	60,000	60,000	50	50	-0.05		
	MIN (MC)	40,000	60,000	25	50	-0.05		
PROPANE (LP GAS)	MAX	119,000	119,000	100	100	-0.05	300	500
	MIN (B,P)	60,000	60,000	50	50	-0.05		
	MIN (MC)	48,000	60,000	30	50	-0.05		

* For high altitude units (2000-4500 ft) the input and steam capacities are de-rated by 10%. STD: Standard Gas Unit DV: Direct Vent Unit

MODEL GH 200 SPECIFICATIONS								
FUEL	BLOWER SPEED	INPUT (BTUH)*		STEAM CAPACITY (LBS/HR)		MANIFOLD PRESS. IN W.C.	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
		STD	DV	STD	DV			
NATURAL GAS	MAX	238,000	238,000	200	200	-0.05	350	660
	MIN (B,P)	120,000	120,000	100	100	-0.05		
	MIN (MC)	40,000	60,000	25	50	-0.05		
PROPANE (LP GAS)	MAX	238,000	238,000	200	200	-0.05	350	660
	MIN (B,P)	120,000	120,000	100	100	-0.05		
	MIN (MC)	48,000	60,000	30	50	-0.05		

* For high altitude units (2000-4500 ft) the input and steam capacities are de-rated by 10%. STD: Standard Gas Unit DV: Direct Vent Unit

MODEL GH 300 SPECIFICATIONS								
FUEL	BLOWER SPEED	INPUT (BTUH)*		STEAM CAPACITY (LBS/HR)		MANIFOLD PRESS. IN W.C.	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
		STD	DV	STD	DV			
NATURAL GAS	MAX	357,000	357,000	300	300	-0.05	800	1200
	MIN (B,P)	180,000	180,000	150	150	-0.05		
	MIN (MC)	40,000	60,000	25	50	-0.05		
PROPANE (LP GAS)	MAX	357,000	357,000	300	300	-0.05	800	1200
	MIN (B,P)	180,000	180,000	150	150	-0.05		
	MIN (MC)	48,000	60,000	30	50	-0.05		

* For high altitude units (2000-4500 ft) the input and steam capacities are de-rated by 10%. STD: Standard Gas Unit DV: Direct Vent Unit

MODEL GH 400 SPECIFICATIONS								
FUEL	BLOWER SPEED	INPUT (BTUH)*		STEAM CAPACITY (LBS/HR)		MANIFOLD PRESS. IN W.C.	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
		STD	DV	STD	DV			
NATURAL GAS	MAX	476,000	476,000	400	400	-0.05	800	1200
	MIN (B,P)	240,000	240,000	200	200	-0.05		
	MIN (MC)	40,000	60,000	25	50	-0.05		
PROPANE (LP GAS)	MAX	476,000	476,000	400	400	-0.05	800	1200
	MIN (B,P)	240,000	240,000	200	200	-0.05		
	MIN (MC)	48,000	60,000	30	50	-0.05		

* For high altitude units (2000-4500 ft) the input and steam capacities are de-rated by 10%. STD: Standard Gas Unit DV: Direct Vent Unit

Codes, or applicable provisions of the local building codes.

- The required free area of supply air opening is:
11 in. sq. (7,000 mm²), for GH 100
20 in. sq. (13,000 mm²), for GH 200
30 in. Sq. (19,500 mm²), for GH 300
40 in. Sq. (26,000 mm²), for GH 400

NOTE FOR DIRECT VENT OPTION:

The combustion supply air opening is not required to the room where the appliance is installed since the combustion air requirements will be provided through the inlet air duct (see installation section). To keep electronic components cooled, it is required to keep the environment around the unit at room temperature.

NOTE FOR OUTDOOR ENCLOSURE:

Required free area of supply air is provided through the bottom of the unit. Front louvers ensure good air circulation in the summer. These louvers should be blocked for winter operation.

- Cabinet back and bottom contain air openings to provide combustion air to the forced draft blower. Either the back or bottom set of openings must have at least 2" (50 mm) clearance to allow for adequate combustion air. For example, if the humidifier is floor mounted, 2" clearance must be maintained to the unit's back surface.
- Excessive exposure to contaminated combustion air will result in safety and performance related problems. Known contaminants include halogens, ammonia, and chlorides, excessive dust, lime or dirt. Excessive exposure of electronics to the contaminants will also result in performance related problems. Contact NORTEC Technical Services if you have any questions. If contaminants exist, it is recommended to use the outdoor enclosure option to isolate the unit.
- All surfaces are zero clearance to combustible construction.

NOTES:

The leveling legs must be left in place when floor mounted on combustible material.

The humidifier shall not be installed directly on carpeting, tile or other combustible material other than wood flooring.

- For recommended clearances for servicing refer to Figure #2.
- During installation cover the humidifier to prevent any dust or other contaminants from entering the cabinet when activities such as drilling are taking place.

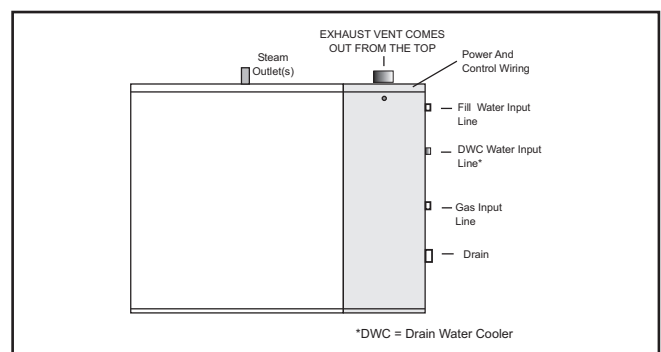
NOTE: Some insulating materials may be combustible. Prior to installing this appliance examine the area for insulating material. If this appliance is installed in an insulated space, it must be kept free and clear of insulating materials. If insulation is added after the appliance is installed, it will be necessary to examine the area again.

LOCATING AND MOUNTING

GH Series humidifiers are designed to mount on a suitable wall (GH 100 only), GH Stand, or floor. The clearance dimensions shown in this manual are for reference only and are the minimum required for maintenance of the humidifier. Local and National Codes should be consulted prior to final location and installation of the humidifier. NORTEC cannot accept responsibility for installation code violations.

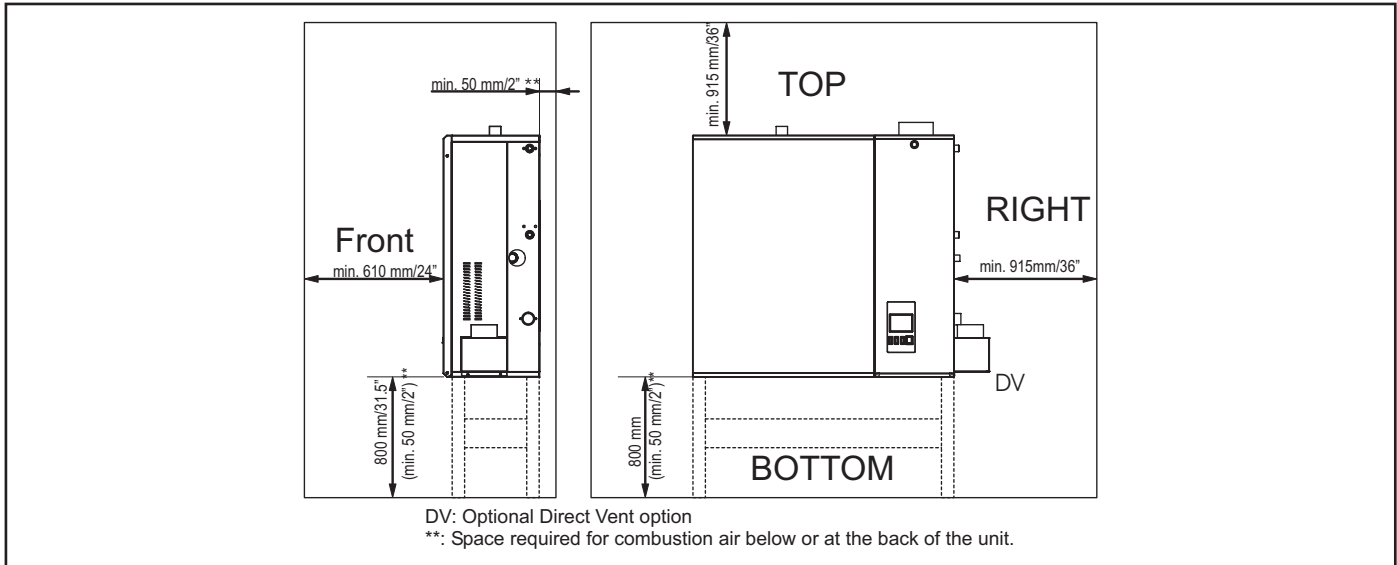
- Figure #1 shows the locations of all required connections to the Gas Humidifier. Careful consideration should be given to all of these connections when choosing a location for the humidifier.

Figure #1



- For front and side clearance requirements (for access during installation, maintenance and troubleshooting), see Figure #2.
- Location of the steam distributor should be minimum of 36" above the humidifier.
- DO NOT locate humidifier any further than absolutely necessary from steam distributor location. Net output will be reduced as a result of heat loss through steam hose (see Engineering Manual, Form # -163D). Also,

Figure #2



increased static pressure (over 4.5" W.C.) will result in hot water leaking down the drain. Consult factory if this situation occurs.

5. Where possible, mount humidifier at a height convenient for servicing.
6. Wall mounting brackets (provided with GH 100) should be securely attached open edge upwards, horizontal, using field-supplied fasteners (minimum of four 3/8" diameter fasteners in each bracket). Attach to a vertical, solid surface. Put a security bolt through the hole provided in the back of the cabinet so that the unit cannot be bumped off the wall bracket. See Figure #3.

7. Make sure humidifier is mounted level. If floor mounted adjust using leveling legs.

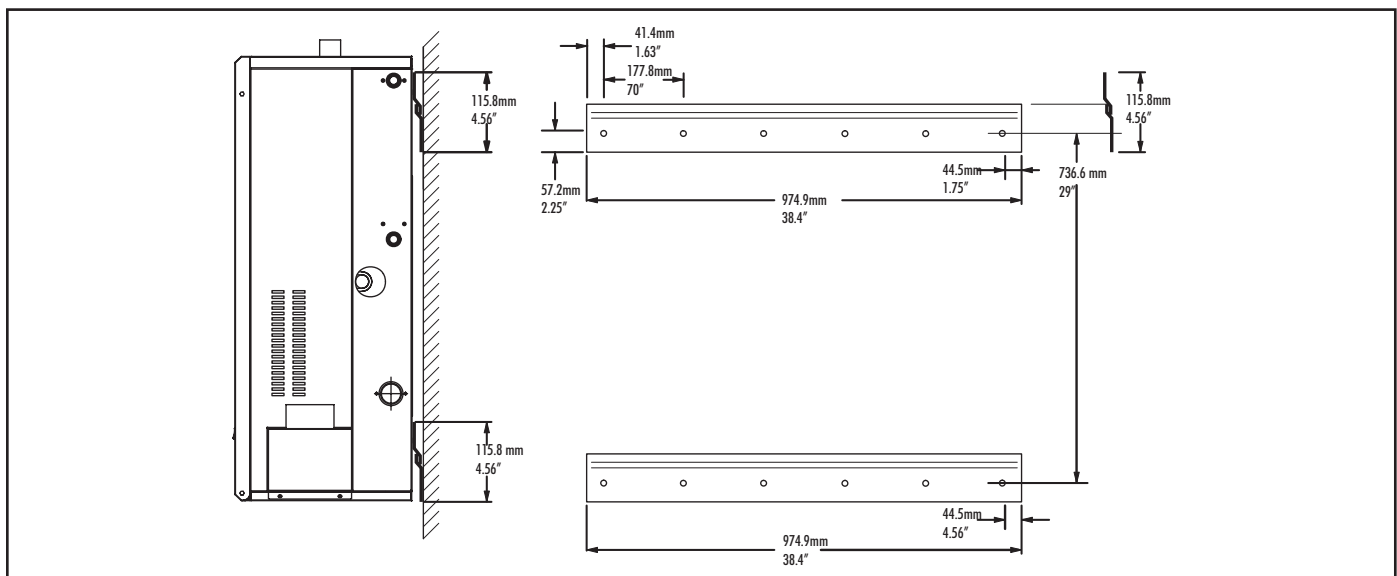
All GH models are equipped with adjustable leveling legs which have a maximum travel of 1.5".

- These legs may be used to allow mounting of an optional stand.

- These legs may be removed and replaced by longer legs. Factory approval is needed.

- Removal or adjustment of legs requires a 1 1/8" wrench.

Figure #3



8. Optional stands are available for all GH Series humidifiers. Refer to Shop Drawing Package, Form # 273 for details and part numbers.
9. Clearances around the unit should also be maintained for good access to the gas humidifier. 3 feet clearance is needed on the right side of the cabinet for GH100/200, 4 feet is needed on the right side of the cabinet for the GH300/400. The front requires 3 feet clearance for all capacities.
10. DO NOT mount humidifier on hot surfaces.
11. DO NOT mount humidifiers in an area where freezing may occur.
12. If humidifiers are mounted on roof, a properly ventilated, temperature controlled, (above freezing), weatherproof enclosure must be used. Consult your local representative for more information on Nortec's enclosure.
13. DO NOT mount humidifiers on vibrating surface. Consult factory.
14. In earthquake prone areas do not wall mount. Use the existing wall mount brackets to fasten unit to the wall with it sitting on the floor. Maintain spacing for air openings. (See "Installation" item 8).

NOTE FOR OUTDOOR ENCLOSURE:

1. Optional outdoor enclosure can also be used; unit is factory mounted inside the enclosure.
2. The enclosure should be installed at a secure distance from any air or exhaust system. (also see local code).
3. The enclosure should be bolted down or secured if it is to be exposed to high winds.
4. If lifting the enclosure on the roof using a forklift, lift under the unit at cross members for stability. (Strapping belts can also be used.)
5. Clearances around the unit should also be maintained for good access to the gas humidifier. 3 feet of clearance is needed on the right side of the cabinet for GH100/200, 4 feet is needed on the right side of the cabinet for the GH300/400. The front requires 3 feet clearance for all capacities.

GAS PIPING

Installation of piping must be in accordance with local codes, and ANSI Z233.1, "National Fuel Gas Code," in the United States or CAN/CGA-B149 Installation Codes in Canada.

The following table indicates the maximum and minimum allowable gas pressures for the Gas Humidifier.

GAS	INCHES W.C.	
	MIN.	MAX.
Natural	4.5	14.0
Propane	9.0	14.0

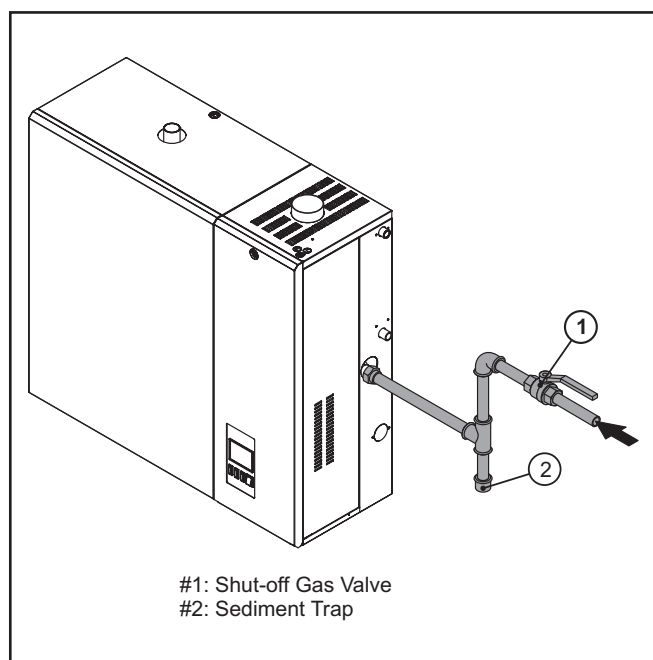
The gas inlet pipe size to the appliance is:

- 1/2" NPT for GH 100
- 3/4" NPT for GH 200
- 1" NPT for GH 300 / 400

Provide an adequate size gas supply line.

When black iron gas pipe is used, a sediment trap must be located ahead of the humidifier gas controls. In all installations, a manual shut off valve, located outside the cabinet, must be installed. See Figure #4.

Figure #4



Leak test all gas connections using a commercial soap solution made to detect leaks. Bubbles indicate

gas leakage. Seal all leaks before placing the humidifier in operation.

WARNING: Never use an open flame to check for gas leaks. If a leak does exist, a fire or explosion could occur, resulting in damage, injury or death.

The appliance must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or greater than 14" w.c. (3.5 kPa).

Dissipate test pressure from the gas supply line before re-opening the manual shut off valve to the appliance.

NOTES:

1. Failure to follow this procedure may damage the gas valve. Over pressured gas valves are not covered by warranty.
2. DO NOT use Teflon tape on gas line pipe threads. A flexible sealant suitable for use with Natural Gas and Propane Gas is recommended.
3. Plan gas supply piping so it will not interfere with removal of gas valves or blower assemblies and front or side service doors.

The gas valve is provided with pressure taps to measure gas pressure upstream and downstream, (manifold pressure). The minimum gas pressure shown is for the purpose of input adjustment.

A 1/8" NPT plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the appliance.

NOTE FOR OUTDOOR ENCLOSURE: Gas lines should be routed through the bottom of the enclosure.

NOTE FOR DIRECT VENT UNITS: The combustion supply air opening is not required to the room where the appliance is installed since the combustion air will be provided through the inlet air duct (see installation notes below). Ventilation is required for cooling of the electronic components

AIR MANIFOLD/CONNECTOR HOSE INSTALLATION FOR DIRECT VENT

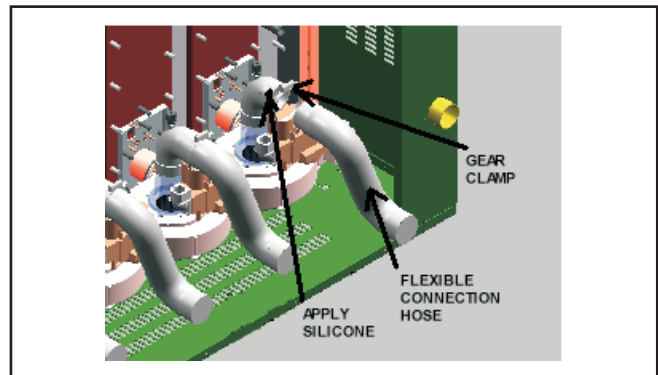
All direct vent units are shipped with the air manifold and connector hoses packaged separately. The connector hoses and air manifold must be

installed by a qualified installer prior to commissioning the unit.

Procedure:

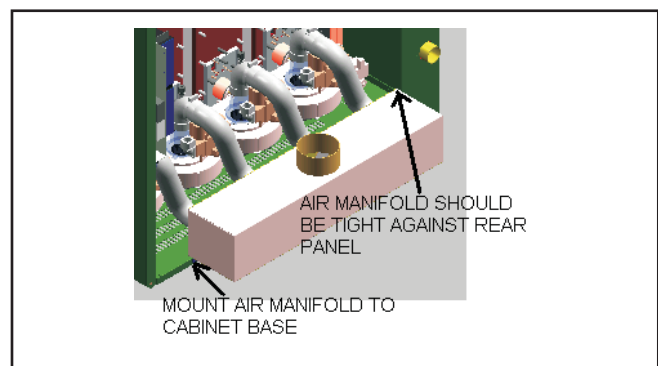
1. Apply a ring of silicone around the outside of each of the blower adapter connector.
2. Mount a flexible connector hose over the hose connection on each blower adapter and secure using a gear clamp provided with the unit. Care should be taken not to kink or damage the flexible hose. Refer to Figure #5.

Figure #5



3. Carefully bend the flexible hose(s) to give the "S" shape as shown in the diagram.
4. Mount the air intake manifold to the cabinet base using the mounting bracket located on the bottom of the air manifold (refer to Figure 6). DO NOT PUNCTURE OR ADD ANY HOLES TO THE AIR MANIFOLD.
5. Apply a ring of silicone to the outside of each hose connection on the air manifold.
6. Mount the corresponding flexible connector hose over each hose connection on the air manifold and secure using a gear clamp provided with the unit.

Figure #5



INTAKE AIR DUCT

All direct vent units require an intake air duct to provide fresh outside air for combustion.

Each air intake manifold has a single 4-inch (100mm) diameter inlet to which the supply air duct must be connected.

Intake material must be UL or ULC listed 4-inch diameter (I.D.) corrugated 2-Ply aluminum ducting. The following table lists several suppliers of approved intake material.

Supplier	Product
Z-Flex	Z-Flex Aluminum Chimney Liner
Flex-L International Inc.	Flexi-Liner
MICHIGAN CHIM-FLEX	CHIM-FLEX Aluminum Liner
Chim Cap Corp.	Flex-All Aluminum Liner

The following table details the allowable duct length that can be connected to the direct vent option. Each 90 degree elbow equals 10ft and each 45 degree elbow equals 5ft. If flexible vent material is used, all bends should be smooth and have as large a radius as possible to avoid restricting the combustion air supply.

Allowable Equivalent Intake Lengths	
Maximum	Minimum
70 ft (21m)	7ft (2.1 m)

All joints must be positively sealed with a silicone sealant to ensure that there are no leaks in the duct.

When installed, the intake duct and exhaust vent should be the same equivalent length.

Condensate may form on the outside of the intake duct, particularly in colder climates. It is recommended to insulate the intake duct to prevent condensation from occurring.

To connect the intake duct to the air manifold:

1. Apply silicone around the outside of the connector on the top of the air manifold. See Figure #6.
2. Mount the intake duct over the connector and secure with an appropriate clamp to ensure a proper seal has been achieved.

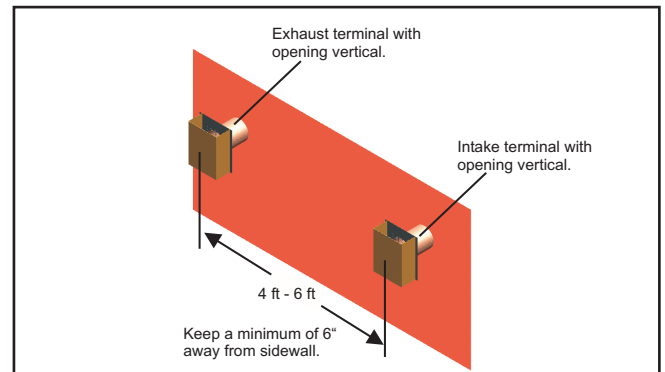
TERMINAL LOCATION

The intake duct must terminate at an outside location with the supplied vent terminal.

The intake and vent terminals must be installed as shown in Figure 7.

When locating the intake terminal, a minimum distance must be maintained from the exhaust vent terminal to prevent re-circulation of exhaust gases. Figure 7 shows the proper location of intake and exhaust terminals on an outside wall.

Figure #7



Periodic cleaning of the screens in the terminal is required for proper operation.

Location of intake & vent terminal must comply with all local and national codes.

VENTING

CAUTION: The humidifier shall not be connected to a chimney flue serving any other appliances. All venting must be installed in accordance with local and national codes.

NOTE: These requirements apply to both standard, direct vent units and units with outdoor enclosure.

NOTE FOR OUTDOOR ENCLOSURE: It is recommended to vent the gas unit through the sidewalls of the gas enclosure to eliminate possible leakage through the enclosure roof.

The vent pipe must be the same diameter as the vent connector. The supplied vent termination at the humidifier is a MALE CONNECTION. Standard venting hook ups require a female to male path. It is highly recommended that a female to female adapter be assembled directly onto the humidifier. This will establish the proper vent sequencing. Consult with venting contractor/supplier for proper hook up or

consult manufacturer listing, see page 28. Contact NORTEC for additional information.

Class B vent must **not** be used. Class “BH” vent must be used based on list of approved manufacturers shown in the installation manual.

GH100 exhaust manifold terminates with 3”O.D. Stainless Steel Tubing. GH200, 300 and 400 exhaust manifolds terminate with 4”O.D. Stainless Steel Tubing.

The maximum flue gas temperature at the humidifier vent connector will not exceed 480°F. Use only special gas vents listed for use with Category III or IV gas burning appliances, such as those listed in the venting system chart, see page 28. (Listed to UL Standard 1738 in the USA and ULC-S636 in Canada.)

All venting joints must be positively sealed with high temperature RTV silicone sealant rated for at least 480°F.

Operating Venting Temperature		
	Normal	Maximum
All GH	360-380°F (182-193°C)	450°F (232°C)

When venting a category IV appliance it is necessary to provide for condensate removal in the venting system. This provision may be met by using the special drain tee as listed in the venting system chart.

When a drain tee is used it is necessary to install a trap in the drain to ensure that flue gases do not vent into the drain. Install the trap with a 12” minimum height of standing water column.

Install the trap a minimum of 12” below flue vent with a depth minimum of 3”.

Prior to activating the appliance, ensure that the trap is filled with water and that the drain terminates in accordance with local plumbing codes.

For any vent lengths over 20 feet long, use insulated vent. Also provide condensate removal in the venting system.

WARNING: Provide a screen or barrier to prevent personal injury in areas where inadvertent personnel contact with vent pipe can occur.

Standard Unit

The maximum recommended vent length is 100 equivalent feet where each 90° elbow equals 10' and

each 45° elbow equals 5'. For lengths over 100', consult factory.

Direct Vent Unit

A maximum exhaust vent length of only 70 equivalent feet (21m) is permitted with the direct vent option, where each 90° elbow equals 10ft and each 45° elbow equals 5ft. This maximum cannot be exceeded.

All horizontal runs of the vent pipe shall have a minimum rise of 1/4” per foot (21 mm/m) and shall be supported at maximum intervals of 5' (1.5 m) and at each point where an elbow is used.

The vent terminal must be installed within the same atmospheric pressure zone as the combustion air inlet of the humidifier.

Periodic cleaning of the screens in the vent terminal is required for proper operation of the humidifier.

NOTE OUTDOOR ENCLOSURE: Flue gases must be vented out of the enclosure.

ADDITIONAL REQUIREMENTS WHEN VENTING THROUGH A SIDEWALL

For sidewall venting, locate the humidifier as close as possible to the wall being used.

Locate the vent terminal at least three feet above any forced air inlet located within ten feet; or at least four feet below, four feet horizontally from, or one foot above any door, window, or gravity air inlet into any building.

A minimum horizontal clearance of four feet from electric meters, gas meters, regulator and relief equipment is required.

Locate the vent terminal at least seven feet above grade when it is adjacent to public walkways.

Locate the bottom of the vent terminal at least twelve inches above grade or ground, or normally expected snow accumulation level. The snow level may be higher on walls exposed to prevailing winds.

Avoid areas where local experience indicates that condensate drip may cause problems such as above planters, patios, or over public walkways, or over an area where condensate or vapor could create a nuisance or hazard, or could be detrimental to the operation of regulators, relief valves, or other equipment.

Refer to the vent manufacturer's installation instructions.

ELECTRICAL

PRIMARY WIRING

- Humidifiers require field wiring to primary voltage terminal blocks. Power requirement is 120 Vac, 15A fused circuit, single phase. Wiring is fed through a 7/8" hole on upper right hand side of control compartment. See figure #1.
- When installed, the appliance must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70, and/or the CSA C22.1 Electrical Code, if an external electrical source is utilized.
- Connect ground wire to cabinet ground clamp.
- External wiring sizes must be in accordance with NEC and/or CEC and existing local electrical codes and by-laws.

NOTE FOR OUTDOOR ENCLOSURE:

- Primary power should be routed through the grille at the bottom of the unit.
- If backup heater is used, separate 240 V supply must be provided with disconnect brought to the Enclosure for the heater. (Heater uses 20A – consult local codes for wiring size) See installation drawing provided with the heater for instructions on page 32. Note: Heater may be plugged into 3-pronged, 30 ampere, 240 V outlet.
- If units operates during the summer, wire exhaust fan provided with the enclosure (120V wires supplied with enclosure), from independent supply.

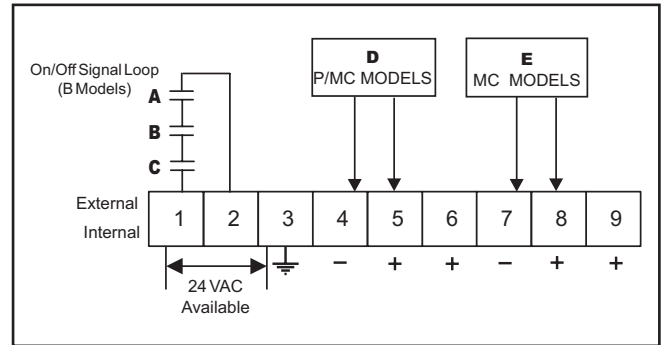
LOW VOLTAGE CONTROL WIRING

All GH models require at least one type of input control signal for unit operation. Refer to the sections below that detail the types of controls that can be used with each model.

Low voltage control terminal strips are provided in the electrical compartment. Internal sides are factory wired. External sides are to be field wired. Refer to the specific control-wiring diagram supplied with each unit.

Field wiring from humidistat to humidifier and between devices should be 18 AWG or heavier and kept as short as possible.

Figure #8



Controls are available from NORTEC as accessories and can be ordered with the humidifier. Controls by others may also be used as long as they meet the criteria noted below. The following is a summary of the common types of controls that may be used with NORTEC Gas Humidifiers.

A – Wall or Duct Mounted Control On/Off Humidistat: Wired to make on drop in humidity, break on rise to setpoint. Set to desired RH. Can be a make/break set of contacts from a Building Automation System.

B – Duct Mounted Safety High Limit On/Off Humidistat: Wired to make on drop in humidity, break on rise to safety setpoint. Set to approximately 85% RH as a safety to prevent saturation and wetting in the duct. Highly recommended for ducted applications.

C – Duct Mounted Safety Air Proving On/Off Switch: Wired to make when sensing air flow, break when no air flow. Used as a safety to prevent saturation when there is no air flow. Highly recommended for ducted applications.

D&E – Wall or Duct Mounted Modulating Humidistat: Provides a modulating signal to the unit that represents the output (up to 100%) required from the humidifier. Refer to the sections below that detail the signal ranges that can be used with each model.

NOTE FOR OUTDOOR ENCLOSURE: Control wiring should be routed through the grille at the bottom of the unit.

GHB MODELS

GHB models will accept on/off controls only (see **A, B & C** on figure #8). In general, **A** is essential whereas **B** and **C** are optional. On/Off controls are to be wired in series (only one path for current) across terminals 1 and 2 on the low voltage control terminal strip. All on/off controls used must be of the type that the contacts are closed when operation is required and open to shut off the unit. A jumper wire may be placed

across these terminals to replace on/off controls and provide for constant operation.

Caution: Terminal 1 is the “hot” wire from the 24Vac control transformer; it will trip the 3A breaker on the transformer if any control field wiring touches ground metal.

GHP MODELS

GHP models accept a single 0-10 VDC or 0-20 mA control signal (see **D** on Figure #8) across terminals 4 and 5 on the low voltage terminal strip to generate a modulating output from the humidifier. Terminals 1 and 3 are 24 Vac and ground respectively and may be used to power a remote mounted modulating humidistat.

An on/off security loop exists across terminals 1 and 2 and should be wired as described for GHB models.

GHMC MODELS

GHMC models may be configured for either single or dual channel modulation. Control signals can be 0-10 VDC or 0-20 mA (0-5 VDC, 1-5 VDC, 4-20 mA and 2-10 VDC are also available). The unit must be ordered from the factory for the desired signal type and number of channels. When configured for 2-channel modulation the humidifier will generate steam only if both channels indicate a demand (see D&E on figure #8). If both channels are demanding steam the humidifier will satisfy the lower demand signal.

An on/off security loop exists across terminals 1 and 2 and should be wired as described for GHB models.

CONTROL INSTALLATION

1. Mount any wall humidistat (control or high limit) over standard electrical box at height similar to typical thermostat. Any wall humidistat should be in location representative of overall space being humidified and not in path of blower pack or air supply grille. Do not mount on an outside wall where temperature fluctuations can affect control response.
2. Mount duct humidistat in location representative of overall air humidity, usually in return duct. Do not mount it directly in front of steam distributor or in turbulent or mixing zone. Mount humidistat where air's humidity and temperature are uniform and representative of spaces being humidified.

3. Mount duct high limit humidistat downstream of steam distributors far enough that, under normal humidity and air flow conditions, steam will have been fully absorbed (typically at least 10 feet). It must be located to sense high humidity only when uniform and representative air is over-humidified or approaching saturation.
4. Mount duct air-proving switch so that it is able to sense air flow or lack of it. Wire it to make when air flow is sensed and break when air flow fails.
5. Check operation of all on/off controls before starting humidifier.
6. Calibration of controls (on/off or modulation) in the field may be necessary due to shipping and handling. Verify humidistat accuracy before commissioning system.

OUTDOOR ENCLOSURE HEATER SETTING

Position #1 on the heater will maintain the air around the heater at around 60°F. Each increment changes the set-point by an additional 16°F. The off position can be obtained by turning the knob counter clockwise. The set-point position is at 3 O'clock.

BLOWER PACKS

1. Blower packs are an optional accessory used to directly distribute steam to localized areas (such as computer rooms) or in structures that do not have a built-in air distribution system.
2. Blower packs are remote mounted only. See Blower Pack Manual XX-277 for requirements and installation instructions.

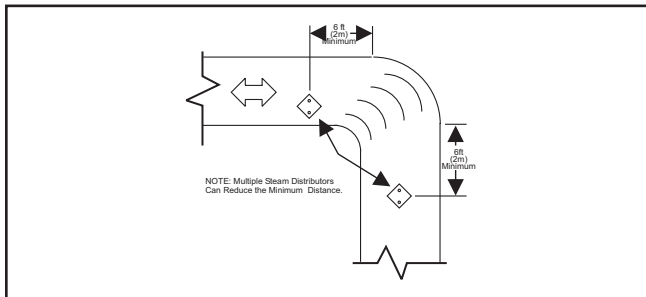
STEAM DISTRIBUTORS FOR DUCTED APPLICATIONS

1. Any humidifier's steam line may be divided into multiple branches to feed more than one distributor. Steam supply line “tees” are common copper fittings that are available for this purpose. Do not install zone valves on any of the steam supply lines.
2. Steam distributor locations are typically as follows: supply air duct, return air duct, air handling unit. Proper location should consider: air temperature, relative humidity before the distributor, air velocity, dimensions

of the location, amount of steam being introduced into the duct, downstream obstructions, and surfaces vulnerable to wetting.

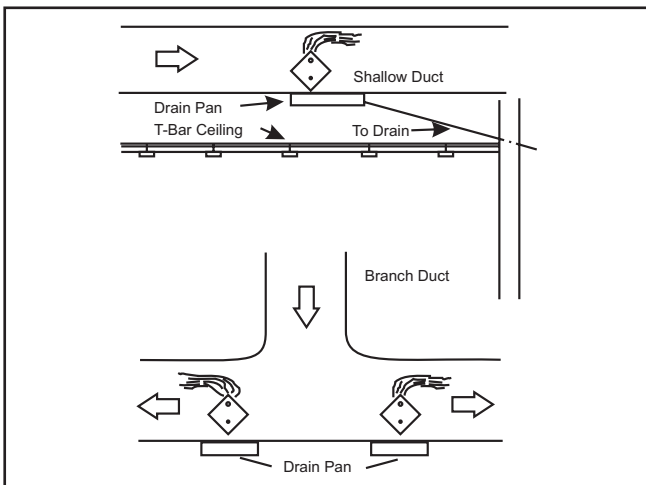
3. When steam distributors are located in a duct, they should be in a straight section of duct at least 6 feet (2 meters) from any elbow or obstruction. If the duct or plenum conditions result in poor absorption distance characteristics, please consult your local representative or the factory. (See Engineering Manual, Form # -163D for information on absorption distances.) See Figure #9.
4. Steam distributors should always span the full width of the air stream. Multiple steam distributors, arranged in a bank, can minimize absorption distance.
5. Exercise extreme caution when installing in fiberglass or internally lined ducts. If necessary, remove 4-6 feet of the lining where the steam is being introduced.

Figure #9



6. High positive or negative static pressure ducts or plenums have special requirements. High positive static pressure ducts may require the

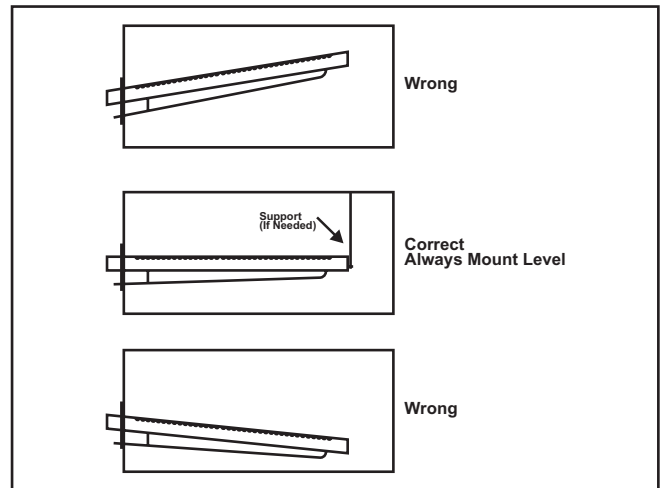
Figure #10



unit to be fitted with an extended external water trap. Consult factory.

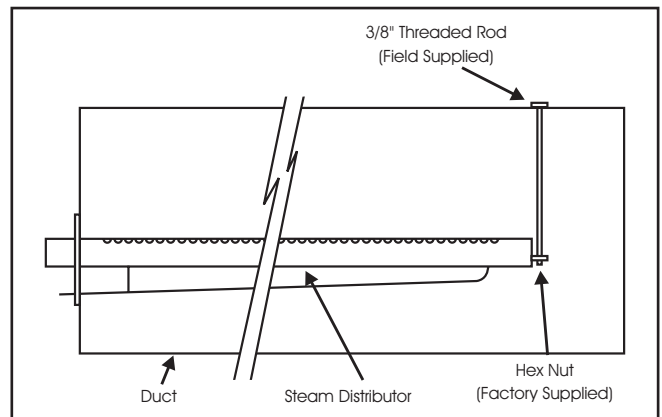
7. Low temperature ducts below 60°F (15°C), shallow ducts, or branch ducts might require the use of a field supplied condensate drain pan below the steam distributor. See Figure #10.
8. The steam distributor mounting plate is perpendicular to the steam distributor. When the mounting plate is attached to the side of the duct, the distributor is level. An upward or downward slope to the distributor will result in poor condensate drainage and "spitting" of condensate in duct. See Figure #11.

Figure #11



9. Any distributor longer than 3 feet (1 meter) should be supported at its end with a threaded rod through top or bottom of duct. See Figure #12.

Figure #12



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

attach mounting plate to side of duct. See Figure #13 and #14.

11. It is recommended that single distributors are mounted near the bottom of the duct to ensure the steam is dispersed into the majority of the air flow. See Figure #14.

Figure #13

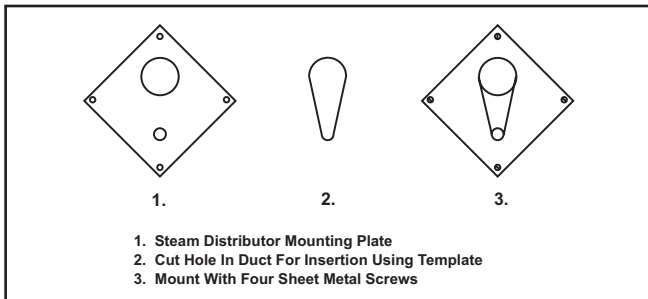


Figure #14

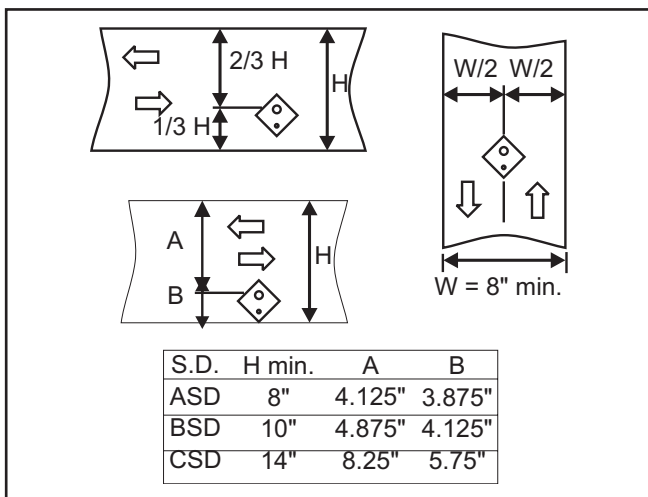
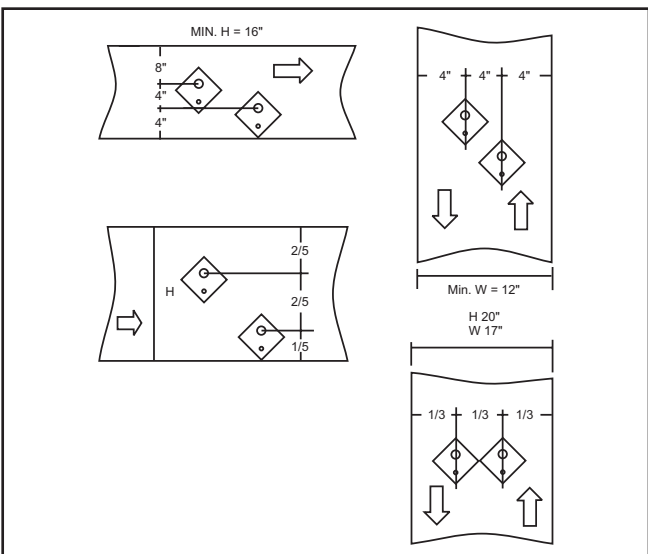
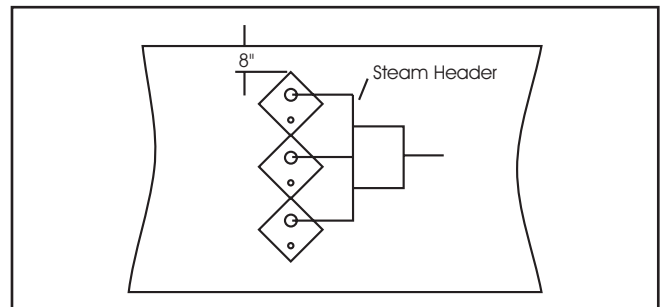


Figure #15



12. With multiple steam distributors, the top steam distributor should be at least 8" below top of duct to avoid possible condensation on surface of duct. The remainder of space below is proportioned accordingly. See Figure #15. For short steam absorption systems see Figure #16.

Figure #16



PLUMBING

NOTE: All water supply and drain line connections should be installed in accordance with local plumbing codes.

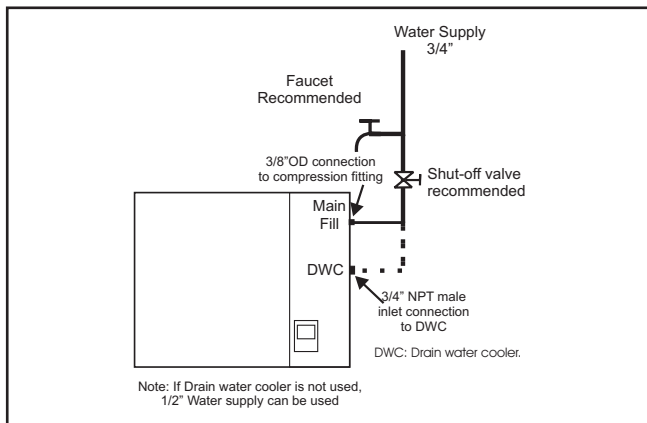
NOTE FOR OUTDOOR ENCLOSURE: Water supply should be routed through the bottom grille of the enclosure. If freezing conditions may occur, water lines must be heat traced up to the unit.

FILL WATER SUPPLY LINE

1. The humidifier is intended to operate on cold potable tap water.
2. DO NOT use a hot water source to supply the humidifier. Minerals will adhere more easily to surfaces and the fill valve's small flow regulating orifice could become plugged.
3. Consider using a water softener. Longer operating times between tank cleaning will be reached on softened water.
4. Reverse osmosis (RO) water can provide very long times before cleaning is required since it is cleaner than softened water. However, it is also more corrosive. Deionized (DI) water may be used with all models. Consult NORTEC representative for DI water unit.
5. Standard fill valves are sized for water pressure ranging from 30 to 80 psig (ideally 55 to 60 psig). For other pressures, consult factory. This pressure should be measured at the humidifier if the water pressure is suspect.

- It is recommended to have a faucet installed close to the inlet water supply to allow quick filling of the system on initial start up. This can also be very useful for mandatory cleaning of the unit. See Figure #17.
- ALWAYS supply and install a shut off valve in the water supply line dedicated to the humidifier to facilitate servicing. Use 3/4" O.D. to within 4 feet of the humidifier. Reduce copper to 3/8" OD and connect to the factory-supplied 3/8" olive compression fitting on the side of the humidifier. The DWC fill valve should be supplied with a 3/4" fill (See Figure #17).

Figure #17

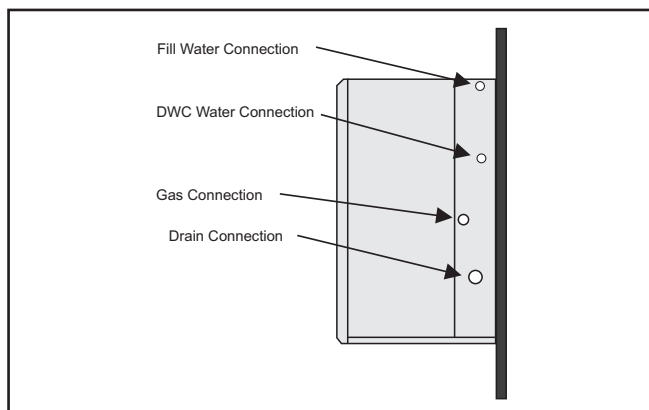


- NOTE FOR OUTDOOR ENCLOSURE:** Manual shut off valve should be provided both at the unit and inside the building for additional safety if freezing condition may occur.

DRAIN LINE

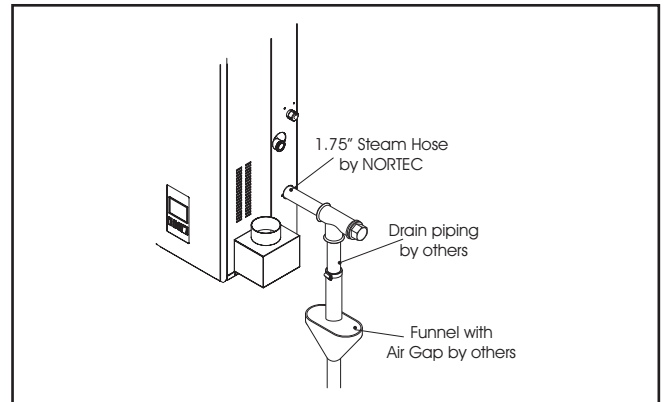
- The humidifier is equipped with a 1-3/4" O.D. Unthreaded drain outlet connection on the side of the humidifier. See Figure #18. A

Figure #18



field-supplied funnel is required for correct operation of the unit's drain system. See Figure #19. It will also prevent backup due to partially blocked or badly installed drain lines.

Figure #19



- The drain line should not end in a sink used frequently by personnel, or where plumbing codes prohibit it. Route to a floor drain or equivalent for safety reasons. Sump/Condensate pumps are available (refer to Engineering Manual Form #XX-261) if an appropriate drain is not available.
- Keep drain lines as short as possible. Keep drain lines sloped down, not level and not up since low spots in drain lines will accumulate sediment and cause backup. The drain line should be 1-3/4" O.D. or larger. Drain water is tempered to be below 60°C, so any kind of plumbing tubing may be used. Consult local codes.

NOTE FOR OUTDOOR ENCLOSURE:

- Humidifier must not be drained on the roof.
- If freezing condition may occur, drain lines should be heat traced.

DRAIN WATER COOLER SUPPLY LINE

- Drain Water Cooler valves are sized for water pressure ranging from 30 to 80 psig (ideally 55 to 60 psig). For other pressures, consult factory. This pressure should be measured at the humidifier if the water pressure is suspect.
- ALWAYS supply and install a shut off valve in the water supply line dedicated to the humidifier to facilitate servicing. Use 3/4" O.D. pipe with standard 3/4" female NPT fitting to connect to DWC valve on the side of the

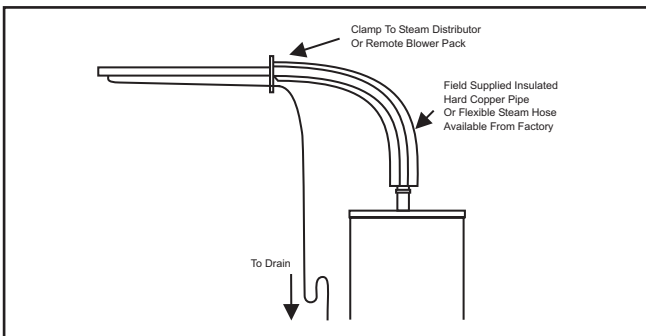
humidifier (Must be hammer free). See Figure #17 & 18.

- For proper operation of DWC, water line must deliver at least 8 gal/min (30 l/min) of water at the temperature of no more than 68°F (20° C).

STEAM LINE

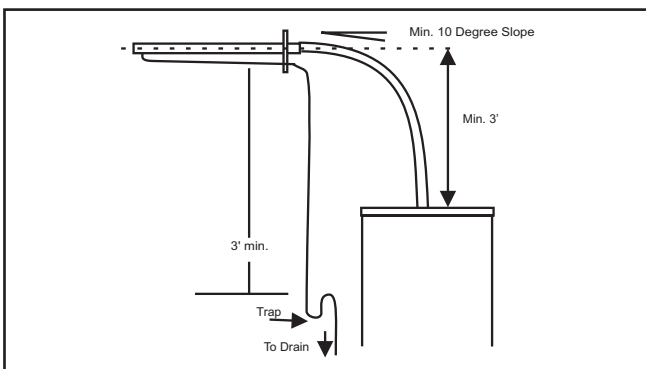
- Field-supplied hard copper with 1/2" thick (min.) insulation is recommended for steam supply, with NORTEC supplied steam hose coupling used to make connection to humidifier. See Figure #20.

Figure #20



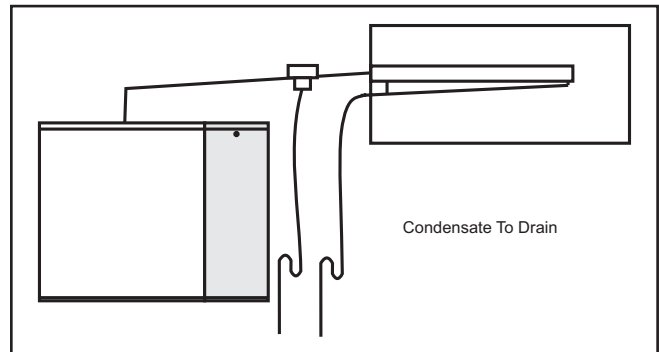
- Do not install zone valves on steam lines. Improper adjustment will over-pressurize the gas humidifier
- NORTEC steam supply hose or field-supplied piping should be sloped upwards from the humidifier to the steam distributors. Slope should be at least 2" in 12" (10 degree slope) to promote condensate runback. See Figure #20. If this slope is not possible, condensate must be removed before the distributor. See Figure #22. If downward slope is necessary, slope should be 1/2" in 12" to promote condensate to run towards the distributor. Condensate should be removed just before entering distributor. See Figure #24.

Figure #21



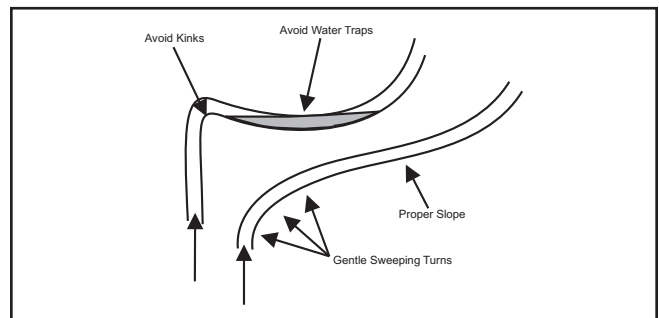
- Minimize the length of steam line and keep it as straight as possible, minimizing bends. Avoid using 90° elbows. Wherever possible, use long radius turns (using tube bender on oversized copper or pairs of 45° elbows). This will reduce the condensate generated by heat loss. This will also reduce the back pressure and avoid the need to install an extended water trap.

Figure #22



- Ensure that the steam hose does not kink or sag. The steam hose becomes more flexible when hot. The hose should be supported to prevent water traps. Only use steam hose for connections or steam line runs of 5 feet or less. See Figure #23.

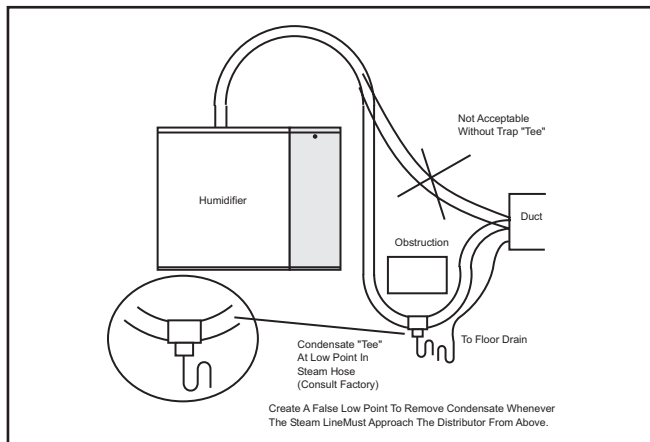
Figure #23



- To ensure odor-free steam, always use NORTEC steam hose. Check steam hose and hose couplings periodically for cracks, breaks, kinks. Replace as required. DO NOT substitute hose. NORTEC is not responsible for health effects or damage from substitute hose.
- Steam lines require 1-5/8" O.D. (nominal 1-1/2") copper pipe. For steam runs longer than 40 feet use insulated nominal 2" copper to ensure the draining of condensate.
- Do not use steel or plastic pipe for steam distribution or hose other than NORTEC supplied. Substitution will void warranty.

- If steam line is routed below steam distributor or if the steam distributor is lower than the humidifier, a condensate trap "tee" will be required to remove water at this low point. Run condensate from trap to nearest drain lower than the distributor. See Figure #24.

Figure #24



- Do not run steam line more than 1 foot per lb/hr output. Example, 10 lbs/hr should not have a steam run longer than 10 feet. If long runs are unavoidable, the humidifier should be sized larger to compensate for condensate losses and insulated copper should definitely be used.

NOTE FOR OUTDOOR ENCLOSURE: It is recommended to insulate steam lines between the enclosure and the building or air handling unit specifically if freezing conditions may occur.

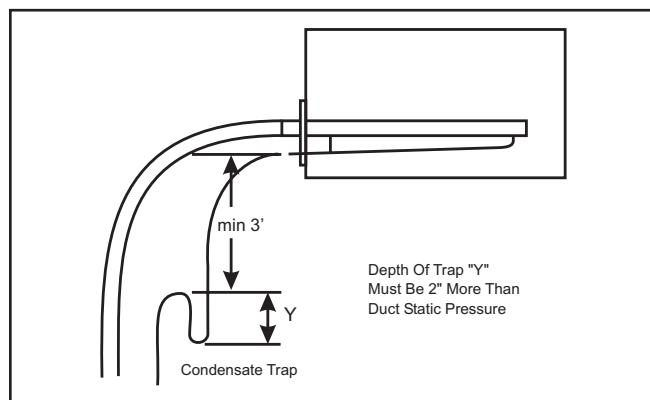
WATER TRAP

- The GH Series humidifier produces steam at atmospheric pressure. Pressure head must develop to push steam through supply line and into air duct.
- Combined resistance of duct positive static pressure and steam line resistance creates a small pressure head in water tank. Total amount of positive static pressure head is reflected directly by water column differential that develops in the built in water trap.
- The built in water trap allows a maximum of 4.5" W.C. pressure before tank water escapes through drain. This pressure should not be exceeded.
- Static pressure is usually higher when distributor's steam outlets are faced upstream in a duct.

CONDENSATE RETURN LINES FOR STEAM DISTRIBUTORS

- Nortec steam distributors and blower packs have built-in connections for draining off condensate. These condensate lines must be connected to the nearest floor drain or to a condensate pump (available from NORTEC). A flexible condensate hose, (available from NORTEC), may be used for short condensate runs.
- Always incorporate a trap in routing of individual condensate return lines. Condensate that accumulates in trap will prevent possibility of steam escaping. Depth of trap must exceed duct static pressure in inches of water column. See Figure #25.
- Ensure the trap is 3' minimum under the steam distributor and have the trap as close to the floor drain as possible.
- Provide a "U" trap in condensate line even when distributor is located in return air plenum. It stops a suction action from impeding condensate flow with duct pressures below atmosphere.

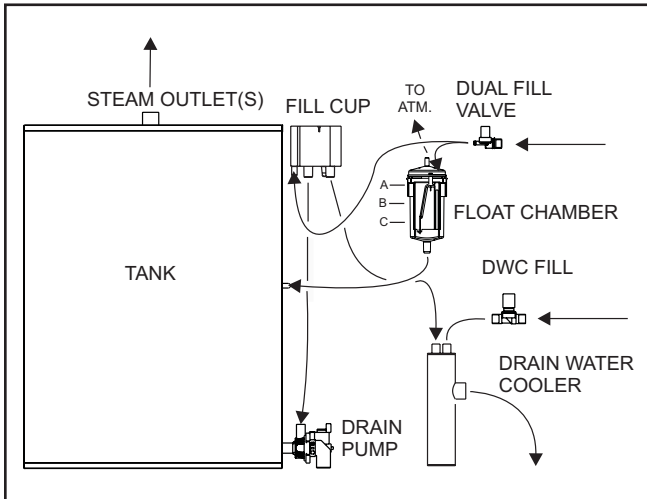
Figure #25



OPERATION

WATER LEVEL CONTROL

Figure #26



A float chamber with two floats and a controller board maintains water level and controls the fill cycles through a solenoid operated valve. Cold fill water from one of the fill valve outlets is routed through fill cup and introduced to the bottom of the water tank. The second fill valve outlet is connected to the float chamber to provide additional cooling. The fill cup incorporates a 1" (25mm) minimum air gap, to meet plumbing codes.

B and P Models

On initial startup, with a call for humidity, the solenoid operated water fill valve opens and fills the water tank. When the water level reaches switch "C", see Figure #26, the firing sequence is initiated. The water fill continues until switch "B" is reached. Float "B" will initiate a time delay relay which maintains water flow for a preset amount of time. When that time expires the drain pump is engaged to blow down a manually adjustable amount of water.

During operation, the water level in the tank will lower by evaporation until switch "B" initiates the fill and overflow cycle again.

If the water level ever falls below switch "C" the burners will shut down to prevent any damage to the unit.

MC Model

On initial startup, with a call for humidity, the solenoid operated water fill valve opens and fills the water tank. When the water level reaches switch "C",

see Figure #26, the firing sequence will be initiated. The water fill continues until switch "B" is reached. While the water level is between switch "A" and "B" the fill valve will be pulsed for intervals proportional to the demand for humidity. When the water level reaches switch "A" the fill valve will be disabled. 60 seconds after the fill valve is disabled the drain pump will be activated (for a period of 0-240 seconds set by programmable parameter DRN1). For setting of this blow down time, refer to the GHMC Display Manual, Form #XX-274.

During this time water will be drained from the tank until the timed cycle is complete.

The fill valve is disabled following the above sequence until water level in the tank drops below switch "B" (due to evaporation). At that time the above sequence is repeated. If the water level ever falls below switch "C" the burner(s) will shut down to prevent any damage to the unit.

DRAIN WATER COOLER OPERATION - *NEW*

The unique design for the internal Drain Water Cooler from NORTEC will ensure water tempering at all times of the water going to drain. The fresh fill water coming from the separate fill line to the unit will completely mix with incoming water from the tank during blow down or drain cycles and ensure water does not exit the system at more than 140°F (60°C).

START UP PROCEDURE

Also see Startup Sheet on page 27.

Prior to filling the unit, it is necessary to ensure that no dirt or dust has accumulated in the control compartment. If necessary, clean this area to prevent contaminants from being drawn into the combustion blower. All water, gas, electrical and venting connections must be properly completed and tested before commissioning the unit.

FILLING THE SYSTEM (approximate time to fill: 1 hour)

Before the GH unit will initiate combustion it must be filled with water to the low level setting of the water level controller. (Refer to water level control). To fill with water, turn the gas supply off and switch the unit on at the power switch. After turning the unit on, give it a call for humidity to start the fill cycle. The unit will fill automatically until the low water level is reached and then trial for ignition will begin. After three tries the ignition module(s) will lock-out. Leave the unit switched on until the fill sequence is complete. Then switch off the power and proceed with the ignition safety shut-off test.

TESTING THE IGNITION SAFETY SHUT-OFF

The ignition system safety shut-off must be tested by conducting the following method of test:

1. With the gas supply off, turn power on.

2. Blower pre-purges for 30 seconds.
NOTE: On multi-blower models, it is necessary to wait for all blowers to cycle.
3. After seven seconds the gas valve is energized for four seconds, then de-energized. After three trials for ignition (complete with pre-purge) the unit goes into a safety lockout.
4. Manually re-open the gas supply. No gas should flow to the main burner. End of test.
5. To reset the system, momentarily shut off power switch, then turn it back on again. After a pre-purge the igniter will start to heat up and normal operating cycle will occur as described in the IGNITION SEQUENCE.

PRE-PURGE OF GAS VALVE AND MANIFOLD

1. Disconnect all igniters from ignition modules.
2. Turn unit on at main power switch. The blower will pre-purge for 30 seconds. After 7 seconds the gas valve will energize for 4 seconds, then de-energize. After 3 tries the ignition module will go into safety lockout.
3. Repeat this minimum 2 times in order to ensure no air is left in the line.
4. Turn unit OFF at main power switch.
5. Re-connect all igniters to ignition modules.

GHB and GHP	Water Hardness	Inspection Interval	Blowdown Potentiometer Setting <small>(located on the electrical panel behind the locked door)</small> All GHB and GHP Models
	<4 grains	Annual	Between low & midpoint
	4-10 grains	Semi-Annual	Between midpoint and maximum
	>10 grains	Bi-monthly	Maximum

GHMC	Water Hardness	Inspection Interval	Blowdown DRN1 Setting			
			GHMC 100	GHMC 200	GHMC 300	GHMC 400
<4 grains	Annual	2	2	3	8	
4-10 grains	Semi-Annual	3	4	6	10	
>10 grains	Bi-monthly	4	6	8	12	

*Refer to GHMC instruction manual for programming instructions.

SEQUENCE OF OPERATION

Provided the necessary power, water, gas and vent connections are completed, the unit is started by the activation of the on/off switch located on the front panel.

When the operating humidistat and safety controls are closed, the ignition module will energize the igniter. The hot surface igniter then heats up, and after about seven seconds, the gas valve is energized. The burner will then be lit and the igniter will shut off. If the burner flame is not sensed by the flame sensor within 4 seconds, the gas valve will shut off and this cycle will be repeated a maximum of three times. When the humidity in the space matches the setting of the operating controller, the burners will shut down and the unit will remain idle until the next call for humidity.

BLOWDOWN CALIBRATION

The gas humidifier will periodically “blowdown” water from the tank to reduce the concentration of total dissolved solids that accumulate during long term operation. Gas Humidifiers are shipped factory set at maximum blowdown (approximately 20% of output). This setting ensures that scale build-up will be minimized for all water conditions. The amount of blowdown is field adjustable. Two parameters will help determine the proper blowdown setting of the Gas-fired Humidifier

- Water hardness
- Silica content

Due to the wide range of water conditions found throughout North America it is important that the blowdown is set according to the local water conditions. By water conditions we are referring to the hardness of the water supplied to the humidifier. The hardness is measured in grains per gallon. It is also important to test for silica content. Silicates may cause foaming and contribute to scale buildup in the humidifier tank and float chamber. When excessive

foaming occurs, an optional foam separator is available from NORTEC.

If you are unaware of the hardness or silica content of your water supply, there are many “do it yourself” kits which can be purchased, or there are several companies that will perform the tests for a reasonable price. You can even contact your municipality for your water condition.

It is possible to reduce this setting according to observation and guidelines in the tables above. Also, when high silica content has been identified, the humidifier tank and float chamber will require increased maintenance and the blowdown setting should be increased to factory setting. In this case silica content may determine the appropriate blowdown setting.

DRAIN RATE AND BLOWDOWN VOLUME

When the drain pump is activated, the tank drains at a rate of 8 gal/min (30 l/min). If the Drain Water Cooler is in use, the actual drain rate of the unit doubles. For details on total blowdown volume, refer to the chart below.

MANUAL STEAM OUTPUT ADJUSTMENT

B Models

Manual rate adjustment for GHB units is accomplished by rotating the output adjustment selector that is located on the switch panel behind the locked door panel. Rotate the knob labeled “Output” clockwise to increase output and counter clockwise to decrease output. See specifications for output values.

GHMC DISPLAY OPERATION

Refer to the GHMC Display Unit Operating Instructions, Form #XX-274, for information on programming and operating the display unit.

GH Blowdown Volume - l/hr (gal/hr)								
	GH 100		GH 200		GH 300		GH 400	
	With DWC	Without DWC	With DWC	Without DWC	With DWC	Without DWC	With DWC	Without DWC
< 4 grains	8 (2.0)	4 (1.1)	16 (4.0)	8 (2.0)	32 (8.5)	16 (4.0)	64 (16.9)	32 (8.5)
4-10 grains	12 (3.0)	6 (1.6)	24 (6.3)	12 (3.0)	48 (12.7)	24 (6.3)	96 (25.3)	48 (12.7)
> 10 grains	16 (4.0)	8 (2.0)	32 (8.5)	16 (4.0)	64 (16.9)	32 (8.5)	128 (33.8)	64 (16.9)

These values are dependant of the water inlet pressures, gas inlet pressures, and steam output. These setting vary from site to site. If your blowdown volume is different then the values given adjust the blowdown setting accordingly. Consult factory for more details.

SAFETY INSTRUCTIONS

Refer to front cover and page 1 of this guide.

MAINTENANCE

Poorly maintained humidification systems may endanger health and affect proper operation. Therefore it is mandatory to observe the specified maintenance intervals and to carry out maintenance work in strict accordance to the instructions. See maintenance schedule on page 25.

Note: The water supplied to the GH Series contains minerals which continuously accumulate inside the water tank during the evaporation process. To prevent excess accumulation the water tank must be cleaned on a regular schedule.

DRAINING THE TANK

During extended periods of inactivity such as off season or periods of very low demand, it is advisable to drain the water from the tank. On all models this is accomplished by switching the unit to "Drain".

Note: It is recommended to wait until the water temperature inside the tank is below local code requirements before manually draining the unit.

MC models can also be programmed to drain automatically after being inactive for a specified time. Refer to the GHMC Display Unit Operating Instructions, Form #XX-274.

Ensure that power is switched on again during periods of demand.

CLEANING THE STAINLESS STEEL TANK & FLOAT CHAMBER

CAUTION: Water and scale may be hot enough to cause burns. Turn off humidifier and allow it to cool before cleaning.

The combustion chamber walls are usually self cleaning. The mineral buildup flakes off, due to the expansion and contraction and violent boiling action during on/off cycles, and settles to the bottom of the tank. A scale accumulation of up to 2" thick on the bottom of the tank will not affect operation of the GH unit.

It is recommended that the tank and float chamber be cleaned at least once every season to maintain optimum operation. It may be necessary to increase the frequency of cleaning or increase the blowdown

setting in areas of hard water or prolonged annual usage (see the "Blowdown Setting section of this manual).

To clean tank, remove steam lines and remove cabinet lid. Lid is held down by keyed lock at rear lip. Remove tank lid by removing hold down knobs or nuts being careful to not damage the insulation or gasket. Do not remove the heat exchangers without consulting NORTEC.

Scoop out loose scale with a small shovel such as those used for gardening. Once loose scale is removed, use a scraper such as a plastic windshield scraper to remove scale adhering to the tank or combustion chamber walls. DO NOT use a metal scraper that will scratch the stainless steel surfaces of the tank. Once all large pieces of scale have been removed, vacuum the tank out with a shop vacuum, fill part way with water, and flush remaining sediment from the tank through the drain.

Due to the presence of polymer gaskets around the heat exchangers, do not use any harsh cleaning chemicals. Please consult NORTEC prior to using any chemicals. Once the lid has been replaced, fill the unit with water and examine for leaks.

Inspect the drain and fill lines assembly for scale build-up and if necessary remove them from the humidifier for cleaning. If the blowdown assembly becomes blocked, scale build-up in the tank will be accelerated and damage to the humidifier could result. The drain pump may be opened and cleaned. Consult NORTEC for proper procedure.

Reassemble the drain and blowdown if they were removed. Re-install tank and cabinet lid making sure tank cover gasket is intact. Do not over tighten hold down knobs. If using a torque wrench do not exceed 10 ft-lb. Re-connect all steam and condensate lines.

Cleaning the float chamber is accomplished by removing the hold down screws to access the floats and using a small brush to gently clean the scale from the floats and chamber. Ensure that floats are back in place and o-ring is properly seated before tightening screws on float chamber. Special attention must be used when removing or re-installing the float chamber. The switch board must be replaced into the same position as before cleaning and the tie-wrap must be used to hold the float chamber in position. For proper installation see Figure #26.

COMBUSTION BLOWER

The combustion air blower motors are permanently lubricated and require no other maintenance.

BURNER

The burners are made of ceramic fabric material and operate in the infrared mode. Depending on the environment, the burner(s) may require removal of lint or grease-laden dust periodically. This may be achieved by removing the burner and applying pressurized air to the external surface of the material. Refer to the Servicing Section related to burner removal.

BURNER REMOVAL/INSPECTION

1. Shut off electrical power and gas supply to the appliance.
2. Disconnect wiring to hot surface igniter and flame sensor and remove. See section on removal of these components.
3. Remove blower. See Blower Removal Section.
4. Remove (5) burner flange mounting bolts.
5. Gently remove the burner assembly from the appliance being careful not to damage the burner material.
6. To reinstall, reverse above procedure and ensure that flange gasket is not damaged and a good seal is maintained. **Replace the burner gaskets.**
7. Always test for leaks after any service has been performed on the gas train as there is an explosive gas mixture present downstream of the combustion blower.

ADJUSTMENTS/REPLACEMENTS OF COMPONENTS

CONSULT FACTORY PRIOR TO THE REPLACEMENT OF ANY COMPONENT.

DANGER - SHOCK HAZARD - Make sure electrical power to the appliance is disconnected to avoid potential serious injury or damage to components.

Gas Valve Replacement

1. Shut off electrical power and gas supply to the appliance.
2. Remove front door and right side panel.

3. On units with multiple burners, disconnect gas supply line from the Gas Intake Manifold. On units with a single burner, disconnect the gas supply line from the gas valve.
4. Disconnect wiring connections to gas valve.
5. Disconnect hoses at air proving switch.
6. Remove entire gas valve / venturi assembly from blower by removing the 2 screws.
7. On units with multiple burners, remove the gas supply manifold with valves attached.
8. Reverse above procedure to reinstall.
9. Leak test the gas train before re-commissioning unit.

Hot Surface Igniter Replacement

NOTE: Replacement igniters must be supplied by NORTEC or damage to the unit may occur.

1. Shut off electrical power and gas supply to the appliance.
2. Disconnect wiring leads to the igniter.
3. Remove nut holding igniter cylinder to burner flange and carefully remove igniter.
4. Inspect igniter gasket and replace if necessary.
5. Reverse above procedure to re-install.

CAUTION: Silicon carbide igniter is fragile and brittle. Exercise extreme care in handling the assembly to avoid damage.

Ignition Module Replacement

1. Shut off electrical power to the appliance.
2. Remove access door.
3. Disconnect wiring connections to the module labeling as required.
4. Remove screws (2) holding module.
5. Reverse above procedure to re-install.

Transformer Replacement

1. Shut off electrical power to the appliance.
2. Remove access door.

3. Disconnect wiring connections from transformer leads labeling as required.
4. Remove screws (2) holding transformer.
5. Reverse above procedure to re-install.

Air Switch Replacement

1. Shut off electrical power to the appliance.
2. Remove front panel.
3. Remove wiring connections to switch.
4. Remove screws (2) holding the switch.
5. Remove pressure hoses from switch noting proper location.
6. Reverse above procedure to re-install.

Drain Pump Replacement

1. Drain the unit completely. If the pump is broken see (4.) below.
2. Shut off electrical power to the appliance.
3. Remove front and right doors.
4. If the pump is broken detach hose connecting the pump with fill cup from fill cup and drain water manually. Make sure water is cold enough not to cause injury.
5. Remove wiring connections to the pump.
6. Remove hoses attached to the pump.
7. Remove the pump from the cabinet bracket.
8. Remove the pump bracket and install it on new pump.
9. Reverse above procedure to re-install.

NOTE: To avoid water spillage (some water will be left on the tank bottom after manual draining) use shop vac to remove left over water.

Combustion Air Blower Replacement

1. Shut off electrical power and gas supply to the appliance.
2. Remove front door and right side panel.

3. Disconnect electrical plug connection to blower motor.
4. Disconnect the pressure hoses at the air proving switch.
5. Remove gas train with gas valve / venturi assembly as described in Gas Valve Replacement section on page 19.
6. Remove nuts (4) on discharge outlet of blower.
7. Remove blower.
8. Attach gas valve/ venturi assembly onto new combustion blower ensuring that the cork gasket is properly seated and undamaged.
9. Reverse the above procedure to install new blower assembly.
10. Leak test the gas train before re-commissioning unit.

Tank Replacement

1. Drain water from unit. See section "Draining The Tank".
2. Switch off power to the unit and open front and right door.
3. Disconnect steam and condensate lines.
4. Remove top cabinet panel with lock key and lift the door out of the overlapped edge.
5. Remove tank lid by unscrewing the knobs.
6. Remove left door/panel.
7. Disconnect float chamber by releasing the hose clamps (top and bottom).
8. Disconnect the blowdown -drain assembly by releasing the hose clamp.
9. Remove gas manifold by disconnecting the coupling bellow the gas valve.
10. Disconnect high stack unit sensor wires. Remove exhaust manifold.
11. Disconnect the wire harnesses from each burner, ignition module, air proving switch.
12. Remove nuts holding the heat exchanger. And pull heat exchanger out. Do not remove the burners.

13. Remove nuts which hold tank mount brackets
14. Disconnect the left end tank brackets from the frame.
15. Carefully slide tank out the left end of the casing.
16. Reverse procedure to replace tank. Inspect heat exchanger gasket to ensure it is not damaged. Tighten the nuts to 75 in lbs.

Heat Exchanger Replacement

1. Drain water from unit. See section "Draining the Tank".
2. Switch off power to the unit and open front and right doors.
3. Shut off gas supply to the unit.
4. Remove gas train as described under Gas Valve Replacement on page 19.
5. Disconnect wire harness at blower, ignition module, air proving.
6. Disconnect vent connection to the unit.
7. Remove exhaust manifold.
8. Remove heat exchanger nuts.
9. Slide heat exchanger out.
10. Re-assemble in reverse order. Inspect all gaskets to ensure that they are not damaged. (Exhaust manifold gasket and burner gasket must be replaced; clean surfaces from any leftovers.)

SERVICING THE UNIT

Caution: Disconnect power before servicing this appliance.

Caution: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

The combustion chamber, heat exchanger and flue baffles are all fabricated from stainless steel and do not require cleaning.

Should the main burner fail to light, or flame is not detected during the first trial for ignition period, the gas valve is de-energized and the control goes through an interpurge delay before another ignition attempt. The control will attempt two additional ignition trials before going into lockout. The valve relay will be de-energized immediately, and the combustion blower will be turned off.

FAULT CONDITIONS

This appliance is equipped with a self diagnostic ignition module which identifies a fault code when it occurs.

B and P Models

Faults are indicated with a flashing LED on B and P units. The LED's are located on the switch panel and correspond to their respective ignition modules from left to right looking from the burner entry side.

Counting the number of flashes of the LED's and referring to the Fault Conditions given below can identify most ignition problems. Recovery from lockout requires resetting of the humidifier. Momentarily shut off the power switch, then turn it back on again.

Error Mode	LED Indication
Internal Control Failure	Steady on
Air Flow Fault	1 Flash
Flame With No Call For Heat	2 Flashes
Ignition Lockout	3 Flashes

B/P Remote Fault Indiction

On GHB / P units, the remote fault alarm options allow warning and errors to be via set of dry contact at the humidifier.

MC MODELS

Faults are indicated with a fault message on the display of MC models. Refer to "GHMC Display Unit Operating Instructions" (Form #XX-274) for an explanation of fault messages. Recovery from lockout requires resetting of the humidifier. This can be achieved by momentarily shutting off the power switch then turning it back on, or by pressing the reset button on the main MC control board mounted on the Electrical Swing Panel inside the electrical cabinet.

Remote Fault Indication Option MC Model

The unit operating status is signaled via the indicator lamps on the humidifier and via the operating and remote fault alarm, as follows:

Operating status / mean	Indication on Unit	Activated remote display relay
Warning (Humidification continuing) or error (Humidification off)	Red lamp lights	(Error)
Security loop open (on/off relays)	Yellow lamp lights	(Security loop)
Unit receiving demand signal	Green lamp lights	(Humidity demand)
Set maintenance interval has expired	Red lamp flashes	(Maintenance)

SERVICE CHECKS

Flame Sensor

Flame current is the current which passes through the flame from the sensor to ground. The ignition module must detect a minimum flame current of 0.7 microamps or a flame proving lockout will occur. To measure flame current, connect an DC micrometer to the FC- FC+ terminals on the module. Meter should read 0.7 uA or higher. If meter reads below "0" on scale, meter leads are reversed. Disconnect power and reconnect meter leads for proper polarity.

NOTE: Proper polarity of supply voltage to the unit is necessary for flame sensing to occur.

NOTE: Oxidation on flame sensing rod can reduce measured current. The oxidation can be cleaned from the sensing rod using steel wool or an emery cloth.

Igniter Check

If the igniter is suspected of being defective then the following test may be carried out;

1. Ensure that the power and gas is switched off before servicing.
2. To test the igniter, disconnect the igniter leads from their terminal connections, one on the ignition module the other is part of the wire harness. Keep note of where they attach.
3. Using a multimeter set the Ohm's scale and place one of the meter leads on one of the igniter wire ends and the other meter lead on the end of the other igniter wire.
4. You should obtain a reading between 50 and 300 Ohm's. This indicates the igniter is okay, otherwise it should be replaced.

Gas Valve Setting

The gas valves used in the GH series humidifier are negative-pressure-regulated valves. The valve setting listed on the product rating plate is shown relative to atmosphere – this setting will always remain constant. In the direct vent application, the actual manifold (outlet) pressure of each gas valve will vary depending on the vent length and on the firing rate. The table below lists the outlet pressure of the gas valve under different conditions. This table should be used as a guide when servicing/troubleshooting the unit. The actual measured manifold pressure should fall within the range shown.

	Maximum Vent Length (70 ft. 21m)	Minimum Vent length
Maximum firing rate	-0.62" w.c.	-0.40" w.c.
Minimum firing rate	-0.25" w.c.	-0.15" w.c.

TROUBLESHOOTING GUIDE

Symptom	Causes / Service Checks
On-off Switch Energized, Humidistat calling for operation. Unit does not operate.	<ul style="list-style-type: none"> - No power to appliance. Check circuit breaker. Check disconnect switch. - Defective Transformer. Check secondary voltage. If no 24 volts, replace transformer if breaker is not blown. - Check re-settable stack high limit switch and reset if necessary. - Low voltage breaker blown. Check breaker (located on bottom of interface panel). If breaker blown, reset breaker. - Fault LED not operating. Loose connection at ignition module. Defective LED. Check wiring connections. Check for continuity between FC1 And FC2 on ignition control module using multimeter. - Ignition module locked out. Check LED diagnostic light MC display for failure identification. See Fault Conditions for identification of fault codes.
Unit energized/Ignition module okay. Blower NOT running.	<ul style="list-style-type: none"> - Loose wire(s). Check wiring connection(s). - No call for humidity. - Defective or loose blower driver board. Check blower driver board for green LED. Check if properly seated. Replace if properly seated but no LED. - Defective blower. Replace blower. - 24VDC power supply defective or fuse blown. Check fuse on power supply.
Power to unit on, humidistat on, indicator lights on except humidity demand.	<ul style="list-style-type: none"> - Control signal miswired. Check signal. - Low water level. Check water supply. - Low float switch stuck or defective. Check continuity of float switch and inspect floats. Clean floats if scaled up; replace if defective.
	<ul style="list-style-type: none"> - Bad control. Check LED for steady on or check MC display.
Pressure switch input okay but no trial for ignition after purge delay.	<ul style="list-style-type: none"> - Miswired. Check PSW terminal voltage. - Check for change of state when unit is turned down. - Bad control. Check LED for steady on.
Valve activates. No ignition. LED displays 3 flashes.	<ul style="list-style-type: none"> - Defective hot surface ignitor. Check resistance (see service checks). - No gas supply, turn on gas. - Mis-wired ignitor. Check wiring. - Bad control. Replace.
Igniter on. No valve operation. LED displays 3 flashes	<ul style="list-style-type: none"> - Valve wiring not connected. Connect. - Damaged valve coil. Replace valve. - Bad control. Check voltage between MV1 & ground. Replace control.
Valve activates. Ignition occurs, LED displays 3 flashes.	<ul style="list-style-type: none"> - Defective flame sensor. Check flame current (see service checks). - S2 wire not connected or loose. Connect.
	<ul style="list-style-type: none"> - L1 and neutral wires to unit reversed. Correct polarity.
Flame with no call for heat.	<ul style="list-style-type: none"> - Stuck valve. Shut off gas supply. Check LED for 2 flashes. Replace valve.

MANDATORY MAINTENANCE SCHEDULE

PARTS	30 DAYS after initial start-up	MID	END OF SEASON	WHAT NEEDS TO BE DONE?	
				REGULAR MAINTENANCE	PREVENTIVE MAINTENANCE
Hot Surface Ignitor			X	- Check for continuity 50-300 ohms.	- Replace hot surface ignitor and flame sensor with replacement kit P/N 150-3884.
Flame Sensor			X	- Check that Flame Sensor is straight.	
				- Clean sensor with fine steel wool.	
Gas Burner			X	- Remove from the unit and clean with compressed air from outside matting.	
				NOTE: It is recommended to replace the burner gasket (PN1708206) each time a burner is removed.	
Drain Lines			X	- Switch to drain and make sure water flows freely. Unit should be completely drained after a maximum of 10 min.	
Tank	X	X	X	- Adjust blow down time when required. Check that scale has not accumulated above 2".	- Drill out tank nipples when required to ensure nipples are not blocked with scale.
				- Clean tank when required.	- Clean tank.
Float Chamber	X	X	X	- Ensure floats move freely.	- Clean scale from float chamber and hose connecting to hit. (Replacement hose P/N 150-4443 P/N 150-4442)
Fill Lines	X	X	X	- Inspect for leaks. (P/N 150-4443 for hose set).	
Drain Lines	X	X	X	- Inspect for leaks at the drain pump, fill cup and float chamber. (P/N 150-4444 for hose set).	
	X	X	X	- Inspect for leaks. Ensure terminal cap is clear and any condensation produced flows to condensate traps. Flue temp should be between 350-400°F.	
Direct Vent		X	X	- Inspect for leaks. Ensure intake terminal is clear.	
H/L Stack Sensor	X	X	X	- Visual check that sensor is intact, wired and attached to the exhaust.	

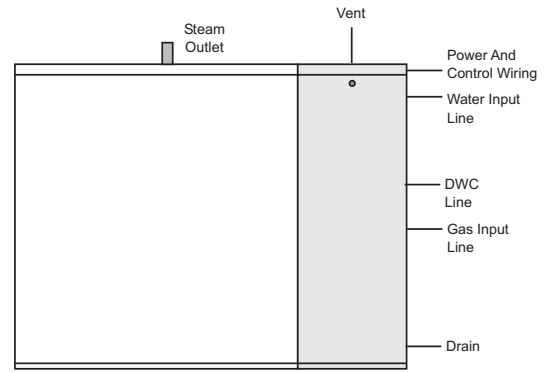
Date: _____

Reference Order #: _____

Job Name: _____

Model: _____

System ID #: _____



MECHANICAL

- Steam Lines installed and sloped properly¹
- Venting installed properly² <100ft equivalent length
- Gas supply line connected and purged of air
- Gas Pressure at Gas Valve
- Fill valve installed and has its own shut off valve
- DWC valve installed and has its own shut off valve
- Drain piping installed with AIR GAP and sloped properly³

ELECTRICAL & CONTROLS

- Primary Voltage (120 VAC) connected, unit grounded
- Control ON/OFF Security loop installed
- Modulating controls connected
- Blower Packs powered by independent supply

STARTUP PROCEDURE

1.Filling system

Manually close gas supply to unit
 Turn unit ON at the main power switch.
 ... Unit will fill automatically until low water float is reached and trial for ignition will begin...
 ... After 3 tries, the ignition module will lockout
 ... Unit will shut down on fault (ignition lockout)
 Wait until fill sequence is completed
 Turn unit OFF at the main power switch

2.Testing the ignition safety Shut-OFF

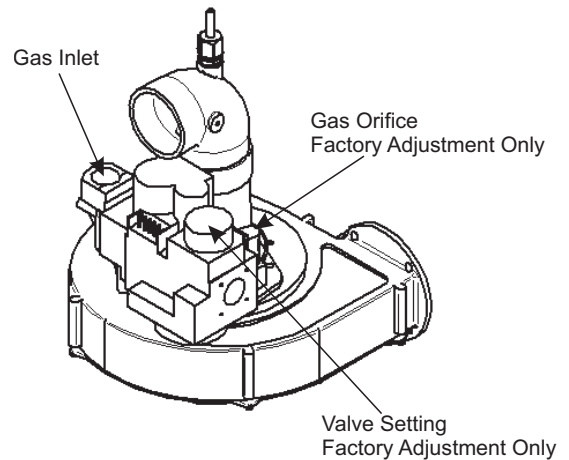
Manually close gas supply to the unit
 Turn unit ON at the main power switch
 ... Blower will pre-purge for 30 seconds...
 ... On multiple blower units, wait until all blowers have cycle...
 ... The igniter will glow and after 7 seconds the gas valve will energize for 4 seconds, the de-energize...
 ... After 3 tries, the ignition module will go into a safety lockout...
 Manually re-open Gas Supply to the unit.
 No gas should flow to the main burner....
 End of test....

3.Purge gas valves and gas manifold

Disconnect all igniters from ignition modules
 Turn unit ON at main power switch
 ... Blower will pre-purge for 30 seconds...
 ... After 7 seconds the gas valve will energize for 4 seconds, the de-energize...
 ... After 3 tries the ignition module will go into safety lockout...
 Repeat
 Turn unit OFF at main power switch
 Re-connect all igniters to ignition modules

4.Normal operation

Reset system by momentarily shutting OFF main power switch and switching back ON
 ... Igniter will start to heat up and normal operation cycle will occur...



¹ Steam line use 3ft above unit before sloping min 10° to distribution system.

² BH Venting in stainless steel only (class III for GH 100 and class IV for GH 200 & 400). Co-venting with other appliance is prohibited. Vent must be same diameter as the vent connector. 100-ft equivalent length maximum including elbows.

³ Drain lines must be kept as short as possible and sloped downwards.



START-UP AND INSPECTION

VENTING MANUFACTURER

- Venting must be listed as Categories III(GH 100) or IV(GH 200/300/400).
- BH type venting made of stainless steel must be used.
- Follow venting installation instructions recommended by manufacturer.

FLEX-L INTERNATIONAL -

Telephone:(800)561-1980 - US & Canada
Fax:(800)768-2385

Female / Female Adapter
3" : SRANT6-3 4" : SRANT6-4

Please call to locate the wholesaler closest to you.

HEAT-FAB INC. - www.heat-fab.com/

Telephone:(800)772-0739
Fax:(413)863-4803

E-mail: sales@heat-fab.com

Female / Female Adapter
3":FSA-NOR-3 4":FSAA4

Please call or see their website to locate the wholesaler closest to you.

FAS N SEAL -

www.protechinfo.com/fasnseal.html

Telephone:(800)766-3473
Fax:(518)463-5271
E-mail: sales@protechinfo.com
Female / Female Adapter
3" : FSAA3 4" : FSAA4

Please call or see their website to locate the wholesaler closest to you.

Z-FLEX- www.flexmaster.com/zflex/ -

United States

Telephone:(603)669-5136
Telephone:(800)654-5600
Fax:(603)669-0309

Canada

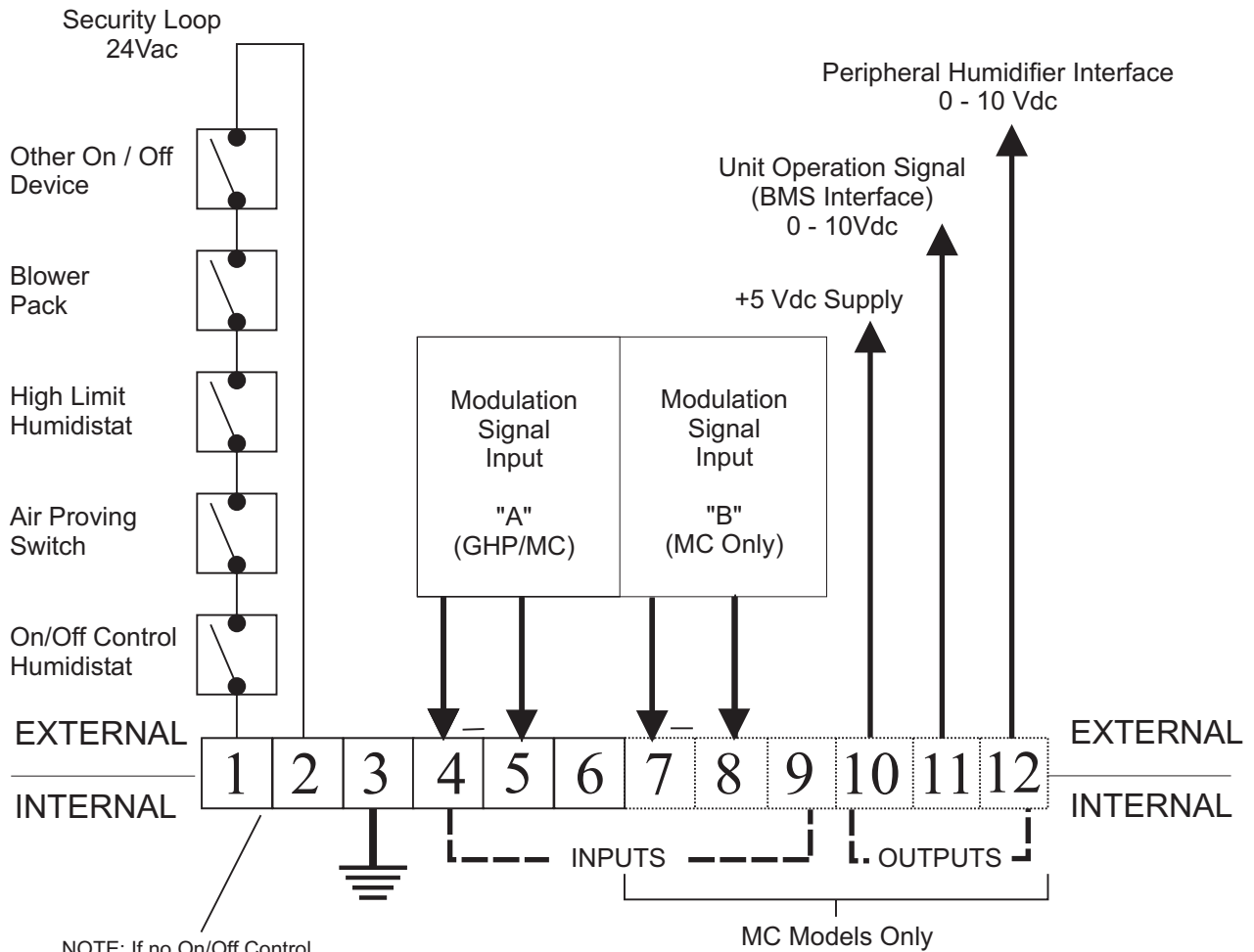
Telephone: (905)731-9411
Fax: (905)731-7086
Female / Female Adapter
3" : 02SVSLBX03 4" : 02SVSLBX04

Please call or see their website to locate the wholesaler closest to you.

GH SERIES EXTERNAL CONTROLS WIRING CONNECTIONS LOW VOLTAGE TERMINAL STRIP

NOTE: This is a *generic* wiring diagram only. For specific wiring instructions, it is necessary to refer to the wiring diagram which is supplied with each unit.

WARNING: Failure to wire the controller in accordance with the wiring diagram supplied with the unit could permanently damage the electronics. Such errors will void the unit warranty.



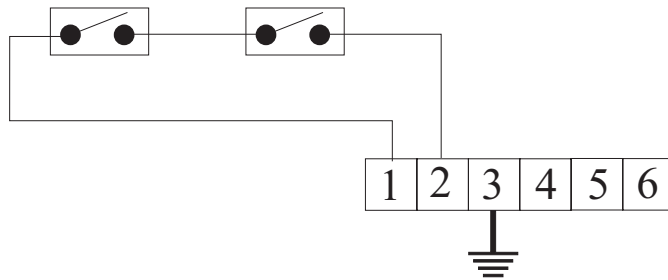
NOTE: If no On/Off Control is used then a field jumper must be connected across terminals 1 and 2 in order for the humidifier to operate.



**GH SERIES
EXTERNAL CONTROLS WIRING CONNECTIONS
LOW VOLTAGE TERMINAL STRIP**
Diagram number GHX3001 Rev. B January 2, 2001

Field wiring for GHB ON/OFF By others

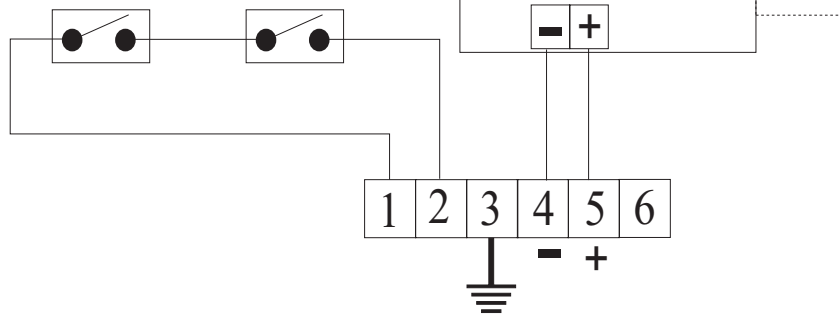
ON/OFF Controls
in series



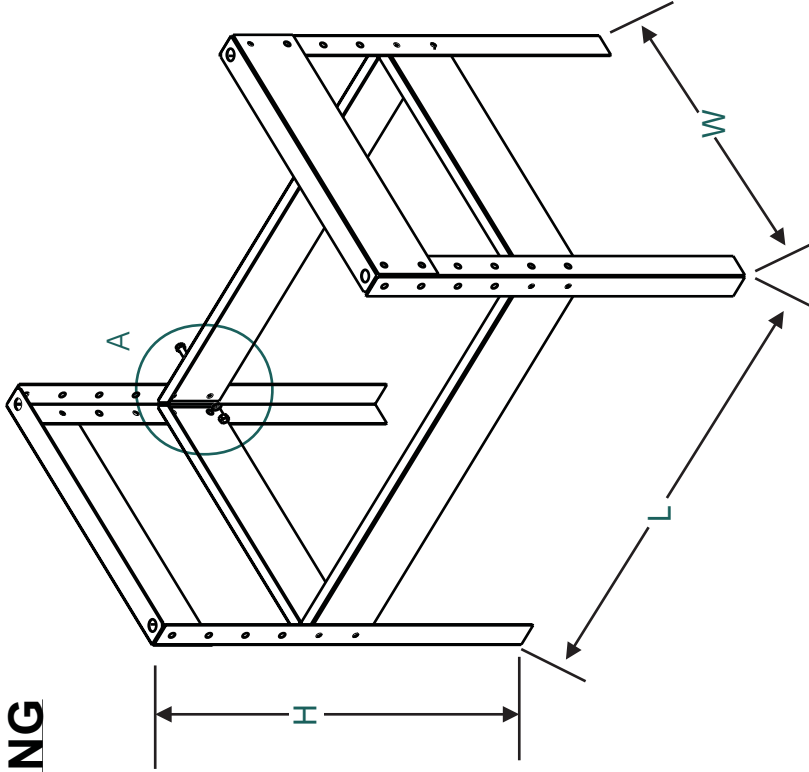
Field wiring for GHP 0-10 Vdc Modulation By Others

ON/OFF Controls
in series

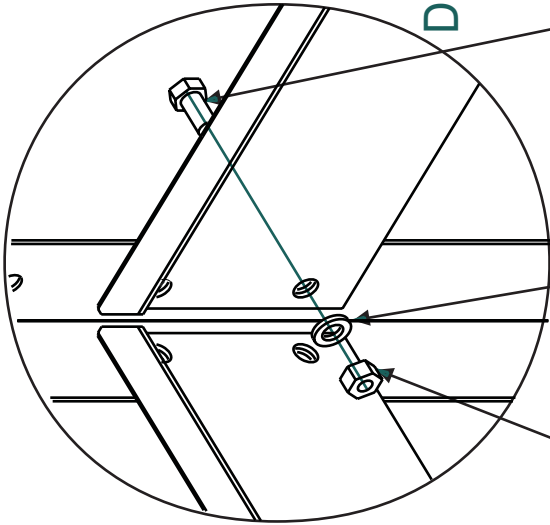
0-10 Vdc Modulating Humidistat By Others
Wall Or Duct



GH STANDS SHOP DRAWING



DETAIL A



BOLT 3/8"-16" x 3/4"

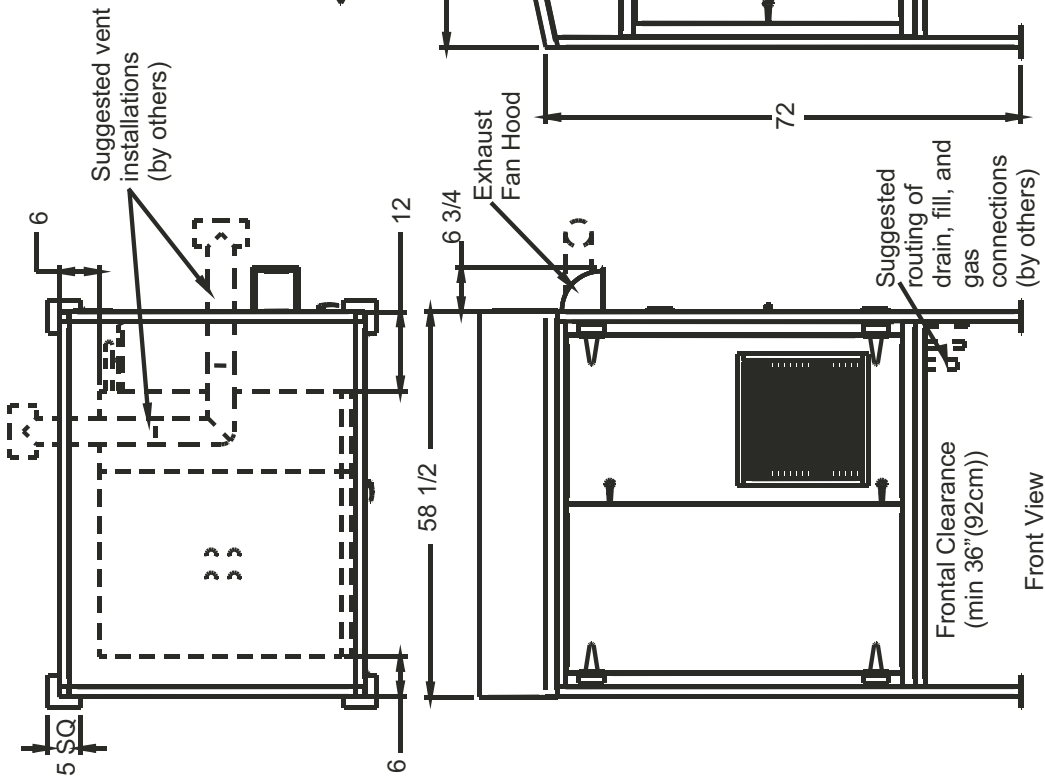
NUT U.N. COARSE 3/8"

LOCK WASHER 3/8"
ALL ABOVE TYPICAL (X 24)

MODEL DIMENSION				
Part #	Model	L in (cm)	W in (cm)	H in (cm)
150-2412	GH 100	12.6 (32)	26.4 (67)	30.0 (77)
150-2413	GH 200	20.3 (52)	23.8 (61)	30.0 (77)
150-2414	GH 300 / 400	36.7 (94)	23.8 (61)	30.0 (77)



GH STANDS
Assembly
February 21, 2002



NOTES:

1. See suggested mounting location of vent, fill, drain, and gas lines on drawing. Connections and materials for connections to be made by others at site (refer to the GH installation manual).
2. 120V connection for exhaust fan to be made at site by others.
3. See GH Shop Drawings for dimensions locating vent, fill, drain, steam, and gas connections.
4. As a standard the GH unit is factory mounted inside the enclosure.
5. Steam lines should be routed through the back or sides of the enclosure.
6. Insulate and minimize steam run length to reduce steam losses.
7. If freezing conditions occur, enclosure should be used in conjunction with freeze protection feature and back up heater. All lines should also be heat traced up to the unit.

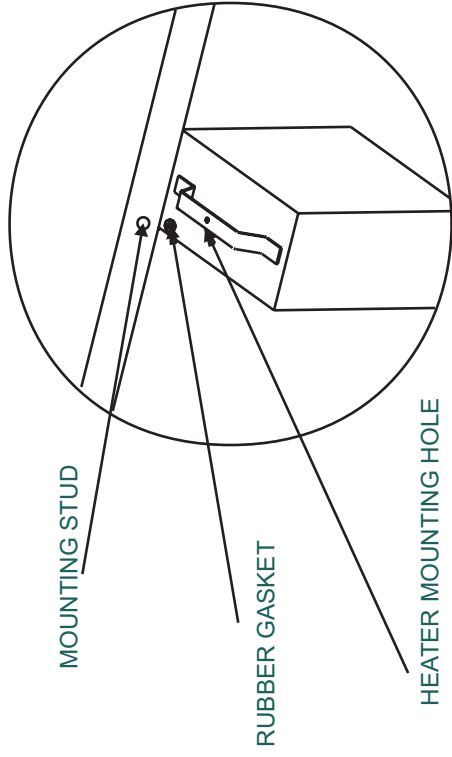
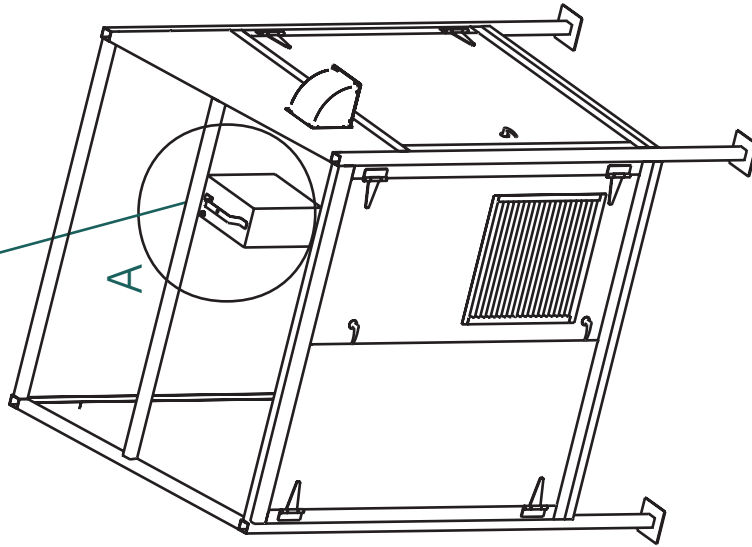
PART NO.	DESCRIPTION	DIM A	WEIGHT
1502024	Enclosure - GH300/400	46.25	320 LB
1502025	Enclosure - GH200	27.25	280 LB
1502026	Enclosure - GH100	27.25	280 LB



GH ENCLOSURE
Physical Data
November 13th, 2000

OPTIONAL HEATER INSTALLATION

MOUNTING STUD IS LOCATED ON THE
ENCLOSURE'S MAIN BEAM

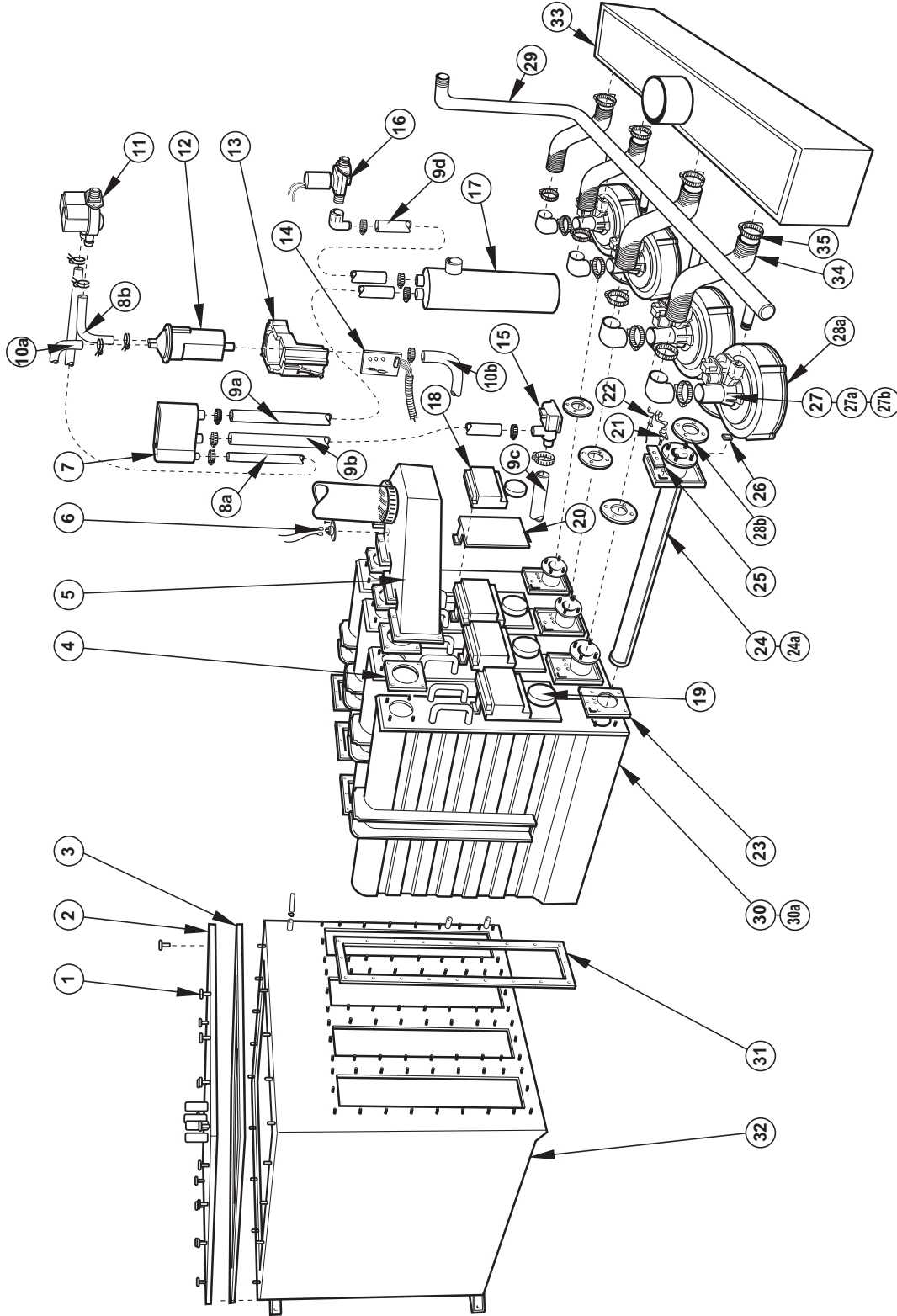


DETAIL A

INSERT RUBBER GASKET PROVIDED
ONTO MOUNTING STUD THEN INSTALL THE
HEATER THROUGH THE HOLE IN THE HANDLE,
PLACE THE WASHER AND SECURE
INSTALLATION WITH THE NUT.



GH ECLOSURE
Heater Installation instructions DWG. # 1502303.

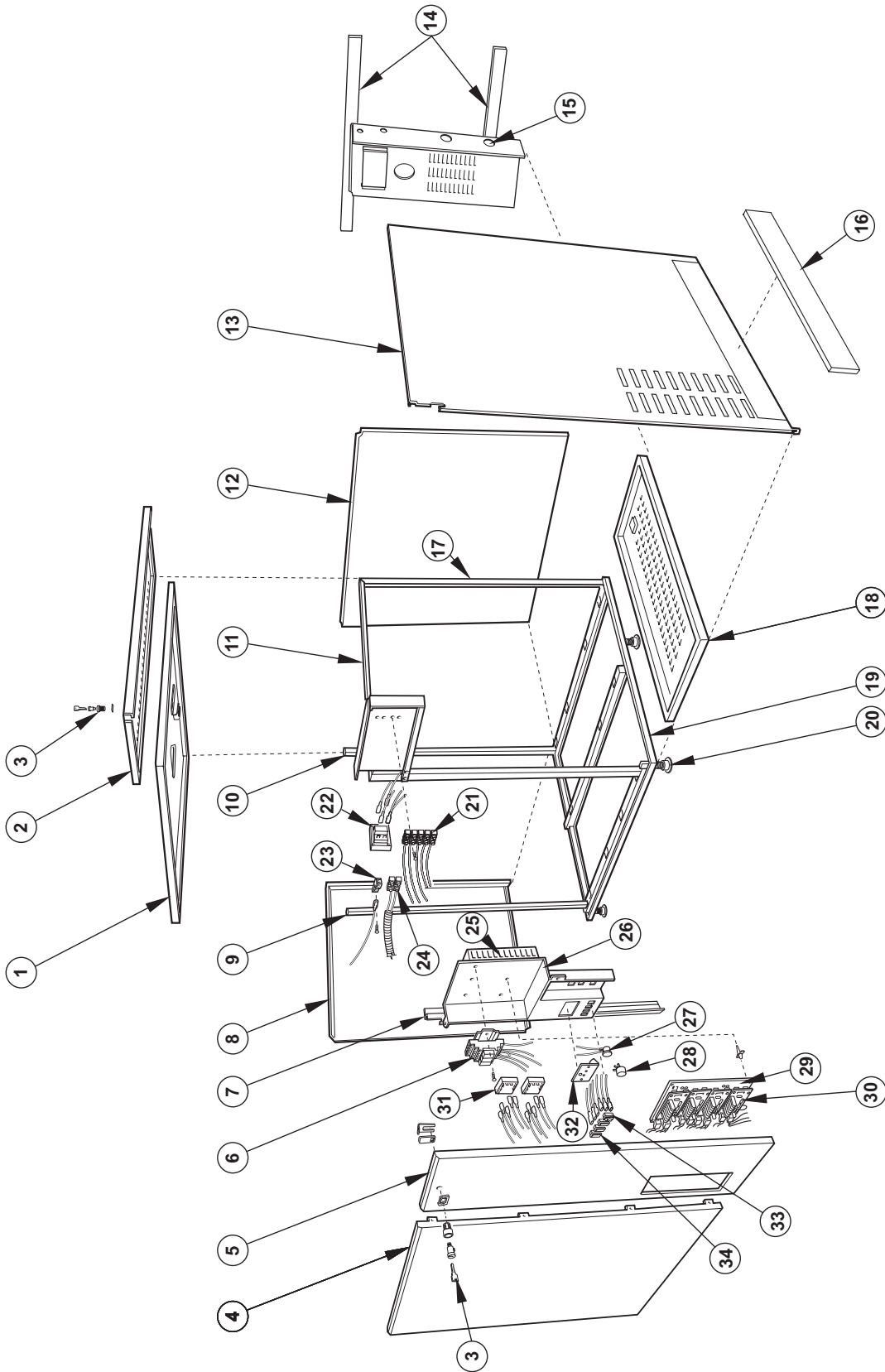


REPLACEMENT PARTS
GH SERIES



GH SERIES REPLACEMENT PARTS

Item #	Description	Model Type	GH 100	GH 200	GH 300	GH 400
1	Knob, Tank lid -Hold down	all models	170-8828			
2	Tank Lid	all models	170-5010	170-5012	170-5014	170-5014
3	Gasket, Tank Lid	all models	170-8201	170-8210	170-8214	
4	Gasket, Exhaust manifold	all models	170-8215	150-1653	150-1654	
5	Exhaust Assembly	all models	170-5038	170-5044	170-5048	
6	Sensor, Stack Hi-Limit Manual Reset	all models	170-3202			
7	Fill Cup Assembly	all models	150-4039			
8a,b	Hose Kit - Fill Valve Lines	all models	150-4443			
9a,b,c,d	Hose Kit - Drain Pump and DWC	all models	150-4444			
10a,b	Hose Kit - Float Chamber to Tank	all models	150-4442			
11	Dual Fill Valve	all models	170-4231	170-4232	150-1357	170-4234
12	Float Chamber Dual Fill	all models	150-3031			
13	Float Chamber Bracket	all models	150-2647			
14	Float Chamber Board	all models	150-3810			
15	Pump, Drain 24V 60Hz	all models	150-2644			
16	Drain Water Cooler Valve Assembly	all models	150-3100			
17	Drain Water Cooler Body Assembly	all models	150-3089			
18	Ignition Module (all Burners)	GHMC	170-2502			
	Ignition Module, Main (Burner A only)	GHB, GHP	170-2501			
	Ignition Module, Auxiliary (Burners B, C, D)	GHB, GHP	n/a	170-2502		
19	Switch, Air Proving, 0.2"w.c. differential	regular models	150-4175			
	Switch, Air Proving, 0.45"w.c. differential	direct vent models	150-2166			
20	Bracket, Ignition Control	all models	170-5861			
21	Igniter, Hot Surface Shielded with gasket	all models	170-9601			
22	Sensor, Flame Proving with gasket	all models	150-3886			
23	Gasket, Burner plate	all models	170-8206			
not shown	Flame Sensor / Ignitor Kit	all models	150-3884			
24	Burner Assembly	all models	150-4182			
24a	Burner Assembly complete	all models	150-4202			
25	Gasket, Igniter (Shielded)	all models	170-8219			
26	Sight Window Replacement Kit	all models	150-4031			
27	Gas Valve/Venturi, 36kW	all models	150-4191			
27a	Elbow Assembly, Air Intake Adapter	all models	150-4204			
27b	Gasket, Blower/CVI air intake	all models	150-4172			
28a	Blower 24V dc, with CVI	all models	150-4174			
28b	Gasket, Blower/Burner	all models	170-8208			
29	Manifold, Gas Intake	all models	150-4187	150-4188	150-4190	
30	Removable Heat Exchanger	all models	170-5015			
30a	Seal Plate for GH 300 only (not shown)	all models	n/a	n/a	150-2002	n/a
31	Gasket, Heat Exchanger	all models	170-8220			
32	Tank Weld Assembly with insulation	all models	150-3881	150-3882	150-3883	
33	Direct Vent - Air Manifold	all models	150-2030	150-2029	150-2320	150-1634
34	Direct Vent - Hose, Flexible Connector	all models	150-2148			
35	Direct Vent - Clamp, Gear	all models	132-5009			



REPLACEMENT PARTS
GH Series



GH SERIES REPLACEMENT PARTS

Item #	Description	Model Type	GH 100	GH 200	GH 300	GH 400
1	Cabinet top door	all models	150-2551	170-7222	170-7422	170-7422
2	Top, Control Cabinet	all models	150-2546	170-7204	170-7404	170-7404
3	Lock, c/w Keys	all models	185-3104	185-3104	185-3104	185-3104
4	Cabinet front panel	all models	170-7101	170-7101	170-7101	170-7101
5	Cabinet front door	all models	150-2552	150-2552	150-2552	150-2552
6a	Relay DPDT 24V	GHB, GHP	145-3020	145-3020	145-3020	145-3020
6b	Relay 4PDT 24V latch	GHB, GHP	n/a	n/a	149-3005	149-3005
7	Bracket, Terminal Mounting, GH	all models	150-2543	150-2543	150-2543	150-2543
8	Cabinet left door	all models	150-2550	170-7221	170-7421	170-7421
9	Frame left front	all models	170-7141	170-7141	170-7141	170-7141
10	Frame left rear	all models	170-7143	170-7143	170-7143	170-7143
11	Frame right front	all models	150-2544	170-7242	170-7442	170-7442
12	Cabinet left rear panel	all models	170-7102	170-7102	170-7102	170-7102
13	Door, Control Cabinet, Right	all models	150-2549	150-3080	150-3083	150-3083
14a	Bracket, Stiffening/Mounting	all models	170-7133	170-7233	170-7233	170-7233
14b	Bracket, Wall (not shown)	all models	170-7134	n/a	n/a	n/a
15	Panel, Control Cabinet, Rear	all models	150-2548	150-2548	150-2548	150-2548
16	Panel, Direct Vent	all models	150-2560	150-3081	150-3082	150-3082
17	Frame right rear	all models	170-7144	170-7144	170-7144	170-7144
18	Cabinet right base	all models	150-2545	170-7206	170-7406	170-7406
19	Cabinet left base	all models	150-2553	170-7203	170-7403	170-7403
20	Hex Head Cap Screw	all models	170-8890	150-1703	150-1703	150-1703
21	Terminal Strip	all models	1453952	1453952	1453952	1453952
22	Transformer 120/24 75VA	all models	170-3121	170-3121	170-3121	170-3121
23	Ground CLamp	all models	1323020	1323020	1323020	1323020
24	Terminal Block 2 Pole	all models	1473002	1473002	1473002	1473002
25	Power Supply 24VDC	all models	150-3609	150-3609	150-3610	150-3610
26	Electrical Component panel	all models	150-2559	150-2559	150-2559	150-2559
27	Potentiometer 10.0 K ohm (for Output)	GHB	170-3952	170-3952	170-3952	170-3952
28	Potentiometer 1.0 M ohm (for Blowdown)	GHB, GHP	170-3950	170-3950	170-3950	170-3950
29a	Controller Base	GHB, GHP	170-3041	170-3056	170-3081	170-3081
29b	Controller Base	GHMC	170-3600	170-3600	170-3600	170-3600
30	Blower Driver	all models	170-3604	170-3604	170-3604	170-3604
31a	Timer 0.5-10 min D.on break	GHB, GHP	170-3102	170-3102	170-3102	170-3102
31b	Timer 0.5-10 sec D.on break	GHB, GHP	170-3102	170-3102	170-3102	170-3102
32a	PCB Keypad/Display	GHMC	170-3606	170-3606	170-3606	170-3606
32b	Diagnostic Display	GHB, GHP	150-3105	150-3104	150-3103	150-3104
33	Switch On/Off/Drain	all models	145-3001	145-3001	145-3001	145-3001
34a	Lamp green	all models	132-3096	132-3096	132-3096	132-3096
34b	Lamp amber	all models	132-3098	132-3098	132-3098	132-3098
34c	Lamp - Red	GHMC	145-3095	145-3095	145-3095	145-3095
not shown	Switch, Lockout/Run	GHMC	147-3010	147-3010	147-3010	147-3010

LIMITED WARRANTY

NORTEC INDUSTRIES INCORPORATED and/or NORTEC AIR CONDITIONING INDUSTRIES LIMITED (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years from date of shipment, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted, are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

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 defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. 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 original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.

THE COMPANY's limited warranty on accessories, not of NORTEC's manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.

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

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



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