



Important: Read and save these instructions. This guide to be left with equipment.



GS Series

Installation and Operation Manual

Includes installation, operation, maintenance, and troubleshooting information for your Nortec GSTC gas steam humidifier.



WARNING:

FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury, death or property damage.

Be sure to read and understand the installation, operation and service instructions in this manual.

Improper installation, adjustment, alteration, service or maintenance can cause serious injury, death or property damage.

- 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 phone in your building.
 - Leave the building immediately.
 - Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.

- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Thank you for choosing Condair.

INSTALLATION DATE (MM/DD/YYYY)

MODEL #

SERIAL #

Proprietary Notice

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Liability Notice

Condair Ltd. does not accept any liability for installations of humidity equipment installed by unqualified personnel or the use of parts/components/equipment that are not authorized by Condair Ltd..

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Introduction



CAUTION: General

- The Nortec GS series must be kept clear and free of combustible materials, gasoline, and other flammable vapors and liquids.
- The indoor GS humidifier located in an insulated space must be kept free and clear of insulating material. Do not add combustible insulating material to the appliance.
- The GS humidifier requires proper ducting for combustion air and exhaust ventilation for safe operation. Avoid blocking or obstructing air openings on the appliance, air openings communicating with the area in which the appliance is installed and the spacing around the appliance.
- Should overheating occur, or the gas supply fails to shutoff, shut off the manual gas valve to the appliance before switching 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.



CAUTION: Servicing

- Condaire does not accept any liability for installations of humidity equipment installed by unqualified personnel or the use of parts/components/equipment that are not authorized or approved by Condaire.
- Every person working with the Nortec GS Series must read and understand the installation and operating instructions before carrying out any work.
- Disconnect main power and shut off gas supply before any servicing.
- During and following operation of the humidifier, the steam and components in contact with the steam can become hot and burn if touched.
- Poorly maintained humidifiers can endanger health of building occupants.
- The GS must be serviced in the intervals described in the maintenance section of this manual.
- Be mindful of weather. Opening a GSTC Outdoor enclosure exposes internal components that should not come into contact with water. It is not recommended to perform any service on an Outdoor GSTC during rain, snow, sleet or hail.



CAUTION: Electrical

- All electrical work should be done according to local electrical code.
- Electrical connection to be performed by a licensed electrician.



CAUTION: Plumbing

- Plumbing to be performed by a licensed plumber.
- All plumbing work should be done according to local plumbing code.
- Unit damage caused by water quality outside of the specified ranges is not covered under warranty.



CAUTION: Installation

- Installation and service must be performed by a qualified installer, service agency or the gas supplier
- The GS produces steam at atmospheric pressure. No devices which could block steam output should be connected to the steam outlet.
- Steam lines must be installed so that no restriction can produce backpressure in the humidifier. Failure to follow installation instructions will result in improper operation and could void warranty.
- Regardless of selecting On/Off or modulating control method, Nortec humidifiers must have a closed circuit across its On/Off security loop control terminal to operate. Nortec highly recommends the use of a high limit humidistat and an air proving switch in series for this function.



Figure 1: GSTC-100

General

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

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, 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 fails 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.

Delivery

The standard delivery includes:

- Gas Steam humidifier equipped with desired options.
- In a bag you will find:
 - Manuals.
 - Adapter fittings for water connection.
 - Steam hose for steam outlet with clamps.
 - Hose and clamps for drain connection.

The GS Indoor Series offers an optional telescopic stand mounted inside the unit legs. Stand cross bracing are shipped with the unit.

The GS Outdoor Series comes with all required venting to be installed on site.

Desired accessories ordered.

Receiving And Unpacking Equipment

- Check packing slip to ensure ALL material has been delivered.
- All material shortages are to be reported to Condair within 48 hours from receipt of goods. Condair assumes no responsibility for any material shortages beyond this period.
- Inspect shipping boxes for damage and note on shipping waybill accordingly.
- After unpacking, inspect equipment for damage and if damage is found, notify the shipper promptly.
- All Condair 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 GS Series humidifier is a completely new patented design based on leading edge technology. The GS is designed to provide clean steam humidification at an economical price.

The GS Series humidifiers are designed exclusively for humidification in ventilation systems or direct room humidification. Any other type of application, without the written consent of Condaire or your Condaire agent, is considered as not conforming to the intended purposes. The manufacturer/supplier cannot be held liable for any damages resulting from improper use.

Model Designation

The unit specification label indicates the model of gas humidifier according to Figure 2.

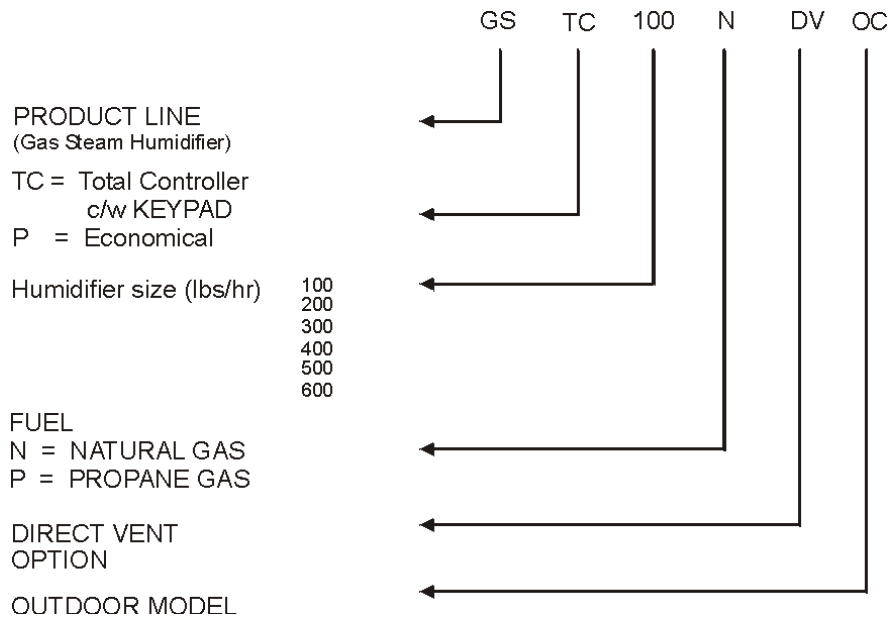


Figure 2: Model Designation

High Altitude

A derate in input exists for installations at higher altitudes. For Canadian models, an automatic 10% derate applies to installations from 2000-4500 feet. For U.S. Models, refer to the chart below for high altitudes derate information.

Table 1: High Altitude

Altitude		Derate %
Feet	Meters	
0-2000	0-610	0
2001-3000	610-915	8
3001-4000	915-1220	12
4001-4500	1220-1370	16
4501-higher	1370-higher	Contact Factory

Table 2: Model Specification

MODEL GSTC 100 SPECIFICATIONS				
FUEL	BLOWER SPEED	INPUT (BTUH)	STEAM CAPACITY (LBS/HR)	MANIFOLD PRESS. IN W.C.
NATURAL GAS	MAX	140,000	105	-0.05
	MIN	45,000	25	-0.05
PROPANE	MAX	140,000	105	-0.35
	MIN	50,000	25	-0.35

MODEL GSTC 200 SPECIFICATIONS				
FUEL	BLOWER SPEED	INPUT (BTUH)	STEAM CAPACITY (LBS/HR)	MANIFOLD PRESS. IN W.C.
NATURAL GAS	MAX	280,000	210	-0.05
	MIN	45,000	25	-0.05
PROPANE	MAX	280,000	210	-0.35
	MIN	50,000	25	-0.35

MODEL GSTC 300 SPECIFICATIONS				
FUEL	BLOWER SPEED	INPUT (BTUH)	STEAM CAPACITY (LBS/HR)	MANIFOLD PRESS. IN W.C.
NATURAL GAS	MAX	420,000	315	-0.05
	MIN	45,000	25	-0.05
PROPANE	MAX	420,000	315	-0.35
	MIN	50,000	25	-0.35

MODEL GSTC 400 SPECIFICATIONS				
FUEL	BLOWER SPEED	INPUT (BTUH)	STEAM CAPACITY (LBS/HR)	MANIFOLD PRESS. IN W.C.
NATURAL GAS	MAX	560,000	420	-0.05
	MIN	45,000	25	-0.05
PROPANE	MAX	560,000	420	-0.35
	MIN	50,000	25	-0.35

MODEL GSTC 500 SPECIFICATIONS				
FUEL	BLOWER SPEED	INPUT (BTUH)	STEAM CAPACITY (LBS/HR)	MANIFOLD PRESS. IN W.C.
NATURAL GAS	MAX	700,000	525	-0.05
	MIN	45,000	25	-0.05
PROPANE	MAX	700,000	525	-0.35
	MIN	50,000	25	-0.35

MODEL GSTC 600 SPECIFICATIONS				
FUEL	BLOWER SPEED	INPUT (BTUH)	STEAM CAPACITY (LBS/HR)	MANIFOLD PRESS. IN W.C.
NATURAL GAS	MAX	840,000	630	-0.05
	MIN	45,000	25	-0.05
PROPANE	MAX	840,000	630	-0.35
	MIN	50,000	25	-0.35

Installation

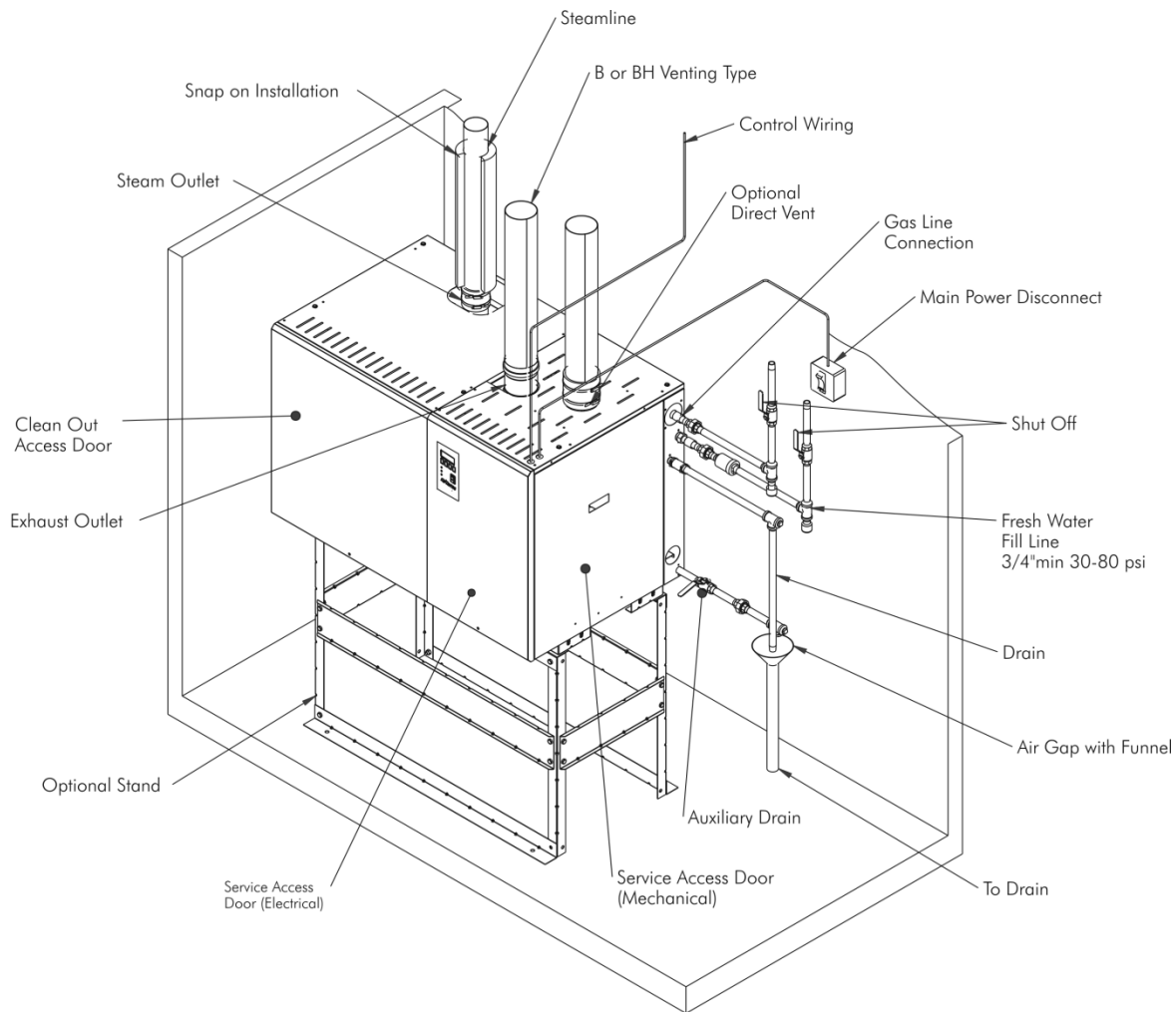


Figure 3: Typical Installation Indoor

Indoor Installation

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 CSA B149.1 installation codes. Refer to the Gas Piping section of this manual.

Locating and Mounting

GS Series humidifiers are designed for floor mounting or on a GS stand (optional). 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. Condaire cannot accept responsibility for installation code violations.

Figure 3 shows a typical installation with all required connections to the GS humidifier. Careful consideration should be given to all of these connections when choosing a location for the humidifier.



Warning: Steam distributor on the built-on and remote mounted blower packs have a hot surface that could result in burns if touched. Condair recommends mounting at least 8 feet above the floor.

Ambient temperature location for humidifier: 41°F - 104°F (5°C - 40°C).

Relative humidity location for humidifiers: 5% rh - 80% rh.

All GS humidifiers are rated for the clearance as shown in Figure 4.

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 line. Also, increased static pressure (over 12" W.C.) will result in hot water going down the drain. Consult factory if this situation occurs.

Where possible, mount humidifier at a height convenient for servicing.

Make sure the humidifier is mounted level.

Do not mount humidifier on hot surfaces.

The humidifier must be installed so that all electrical components are protected from exposure to water.

Do not mount humidifiers in an area where freezing may occur.

If humidifiers are mounted outdoors, a properly ventilated, temperature controlled (above freezing), weatherproof enclosure must be used.

Do not mount humidifiers on vibrating surface.

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

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.

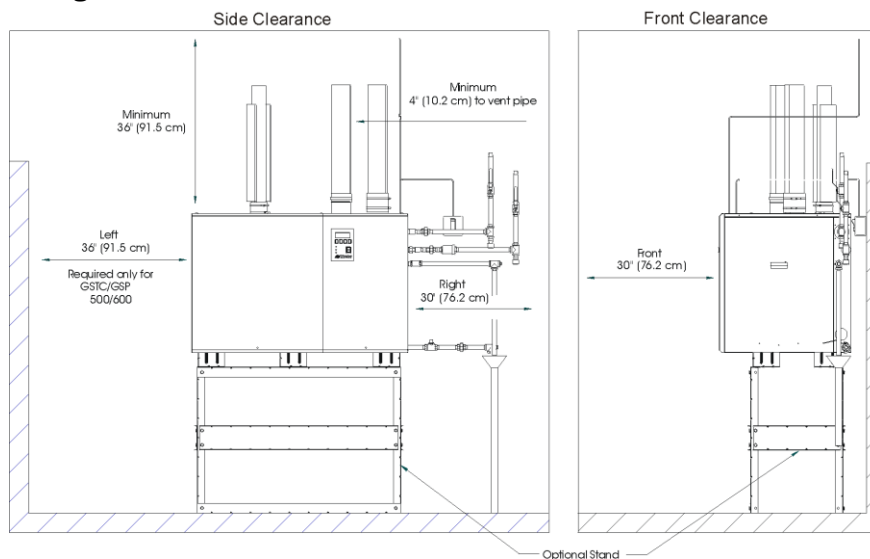


Figure 4: Mounting Clearances

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 CSA B149.1 installation codes in Canada.

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

Table 3: Max & Min Gas Pressure

Gas	Inches w.c.	
	Min	Max
Natural	4.5	9.0
Propane	9.0	13.0

The gas inlet pipe size to the appliance is:

- ½” NPT for GSTC 100
- ¾” NPT for GSTC 200
- 1” NPT for GSTC 300 / 400
- 1 ¼” NPT for GSTC 500 / 600

Provide an adequate size gas supply line.

In all installations, a certified manual shut off valve, located outside the cabinet, must be installed.

When black iron gas pipe is used, a sediment trap must be located ahead of the humidifier gas controls.

See Figure 5: Gas Connection.

Leak test all gas connections external to the humidifier, 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 and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures equal to or greater than 14” w.c. (3.5 kPa).

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 or less 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.

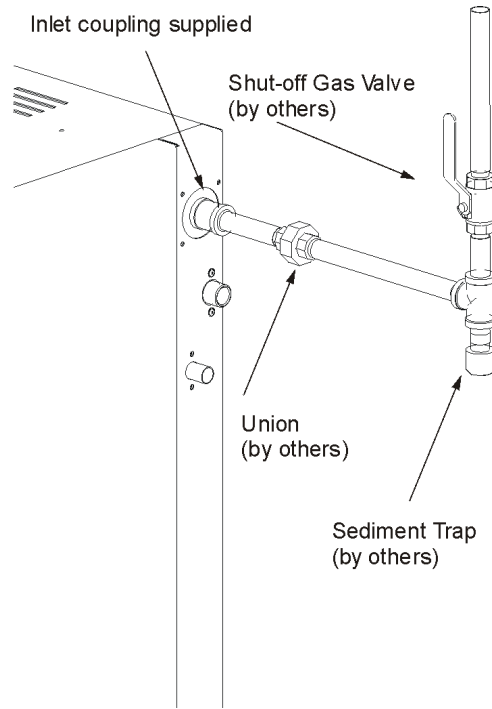


Figure 5: Gas Connection

Failure to follow this procedure may damage the gas valve. Over pressured gas valves are not covered by warranty.

Do not use Teflon tape on gas line pipe threads. A flexible sealant suitable for use with natural gas and propane gas is recommended.

Plan gas supply piping so that it will not interfere with removal of gas valves, blower assemblies, and front or side service doors.

All gas piping should be adequately supported to prevent any strain on inlet piping.

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 gauge connection, must be installed immediately upstream of the gas supply connection to the appliance.

Combustion Air Requirements

General

Provide for adequate combustion and ventilation air in accordance with sections 5.3, air for combustion and ventilation, of the national fuel gas code, ANSI z223.1, or sections 7.2, 7.3, 7.4 of CSA B149.1 installation codes, or applicable provisions of the local building codes.

The required free area of supply air opening is:

- 13 in. Sq. (8,387 mm²), for GS 100
- 23 in. Sq. (14,839 mm²), for GS 200
- 35 in. Sq. (22,581 mm²), for GS 300
- 47 in. Sq. (30,323 mm²), for GS 400
- 59 in. Sq. (38,064 mm²), for GS 500
- 71 in. Sq. (45,806 mm²), for GS 600

Cabinet top and bottom contain air openings to provide combustion air to the forced draft blower. Do not block these openings.

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 Condair technical services if you have any questions. If contaminants exist, isolate the unit from the contaminated space.

Sealed Combustion Guidelines

Installation of the combustion air supply line must be carried out by adequately qualified personnel. All local regulations relating to the provision of air supply systems must be observed and adhered to.

The air supply line and the exhaust must individually not exceed a respective equivalent length of 70 ft. (21 m). The vent pipe diameter must be maintained over the overall length of the vent.

The air supply line should be approximately as long as the flue gas venting and must be supported at every 5 ft. (1.5 m) and additionally at every pipe bend. At low temperatures, water condensation can form on the outside of the pipe. To prevent this, it is recommended that the supply air line is insulated and an in line heat is added. Consult factory.

Attach the air supply line to the manifold using a hose clamp or hose coupling if required. See Figure 6.

The air intake terminal and the flue gas terminal must end at an outside location. See Figure 8: Location of air intake and flue gas terminal must comply with all local and national regulations.



Warning: Air supply line should not obstruct any services going to the humidifier front and right side cabinet panels.

Direct Vent Guidelines

Follow “sealed combustion guidelines”

All air piping must be listed type for direct vent application with sealed joints and seams, such as z flex. The air supply line must be installed with air supply terminals provided.

Air hookup may be in plastic provided that it has fully sealed joints per CSA requirements.

Warning: Horizontal BH type venting must be used in a direct vent application.

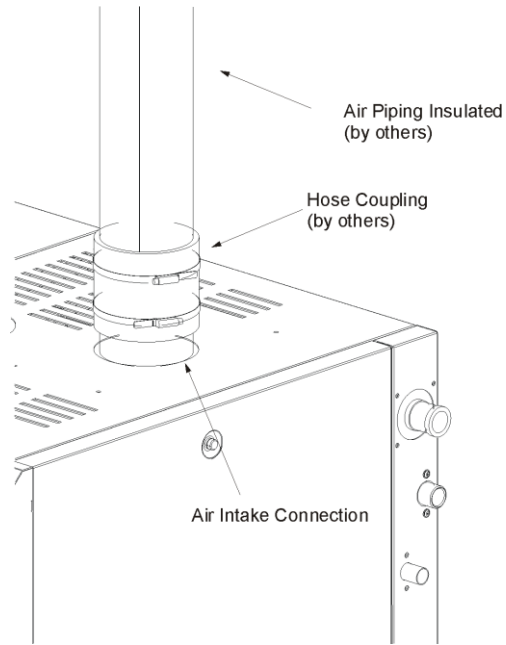


Figure 6: Sealed Combustion and Direct Vent Connection

Exhaust Venting

General

The GSTC is classed category I and III fan assisted gas appliances. This allows two methods of venting. Listed below are instructions for both venting systems, followed by specific requirements for each system.

Review the requirements for both category I and III installations and select the venting method best suited for the installation.

The maximum flue temperature is 400°F for category I and category III installations. Normal operating range is 360 to 380°F.

Category I and III class can be used with sealed combustion option

Category III class must be used with direct vent option.

General Requirements

The vent systems shall be listed to UL or UL/CSA standard and meet the installation requirements of the national fuel code in the USA (ANSI z223.1) and the Canadian standards CSA B149.1 installation codes. Any local jurisdictions reflecting changes to the above codes should be observed.

In applying the codes, reference should be given to the venting manufactures instructions, the serving gas supplier regulations, and the specific instructions provided in this manual.

This appliance must be installed to comply with national regulations and codes. A qualified technician, competent with these codes and the local requirements of the jurisdiction must carry out the installation.

Proper removal of combustion gases must be assured, and building materials must be protected from degradation by flue gases.

Never mix venting types (B to BH or vice versa.) Never use two different manufacturer's equipment for the same chimney.

All vent runs should be as direct as possible with no more than 6 elbows in the system. Maintain an upward slope of $\frac{1}{4}$ " per ft on all horizontal vent pipe runs.

This appliance shall not be connected to a chimney flue servicing a separate appliance designed to burn solid fuel.

This appliance may not be used in conjunction with a power venter or draft inducer.

For any vent lengths over 20 feet long, insulate the vent pipe to reduce the amount of condensate that could form in the flue gases.

When the venting passes through a cold area or location that has large amounts of air passing over the venting, it should be insulated to prevent condensation from forming inside the venting.

Vent pipe passing through walls, floors, and ceilings, must be installed with the proper clearances from combustible materials, and venting manufactures fire stop equipment.

The venting shall not pass through any circulation air duct or plenum.

A drip "T" should be used for condensate removal. When a condensate drain is used it will be necessary to install a trap to prevent flue gases from escaping. Install a trap with a minimum 12" standing water column.

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

Never vent into an unlined masonry or concrete chimney unless the chimney is sized and installed according to the provisions of the national fuel code in the USA (ANSI z223.1) or the Canadian standards CSA B149.

Chimney or vent should extend at least 3' (1 m) above a roof and at least 2' (.6 m) above any ridge within 10' (3 m) of the chimney. Local codes apply.

Install venting so as to prevent accumulation of condensate and have a means for condensate removal.

Plastic, PVC, CPVC and HTPV special gas vents are not approved for use with this appliance.

Select vent material and clearance according to the max vent gas temperature.

All horizontal runs must be adequately supported with hangers or straps to prevent sagging.

The vent must terminate at a sufficient height above the roof to prevent blockage by expected snowfall.

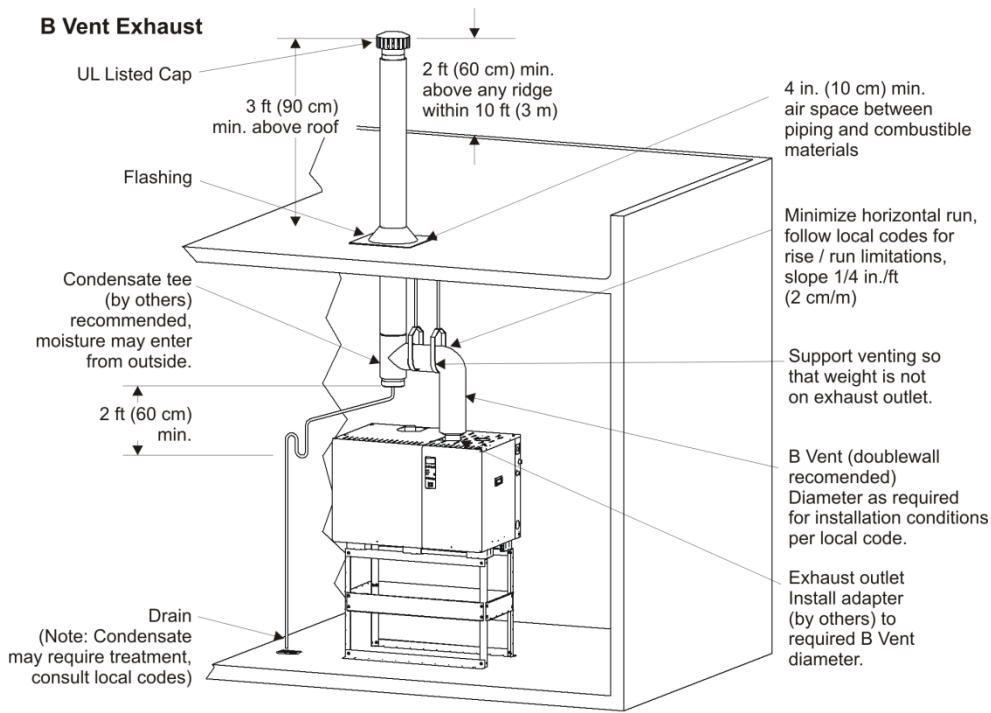


Figure 7: Vertical Venting Using B Type

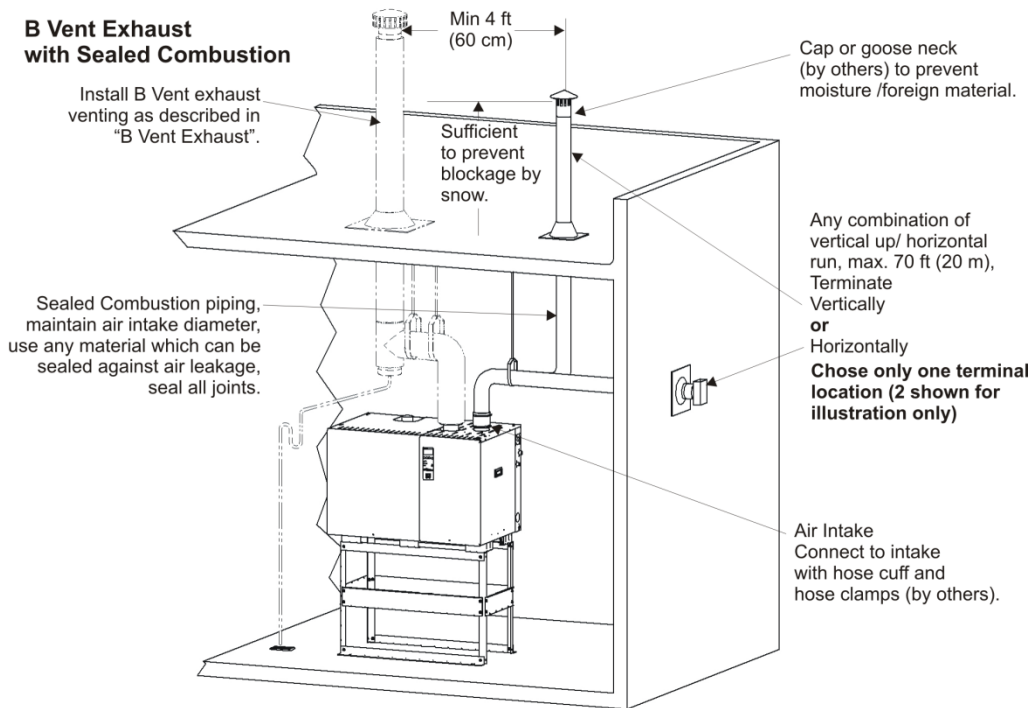


Figure 8: Vertical Venting Using B Type with Sealed Combustion

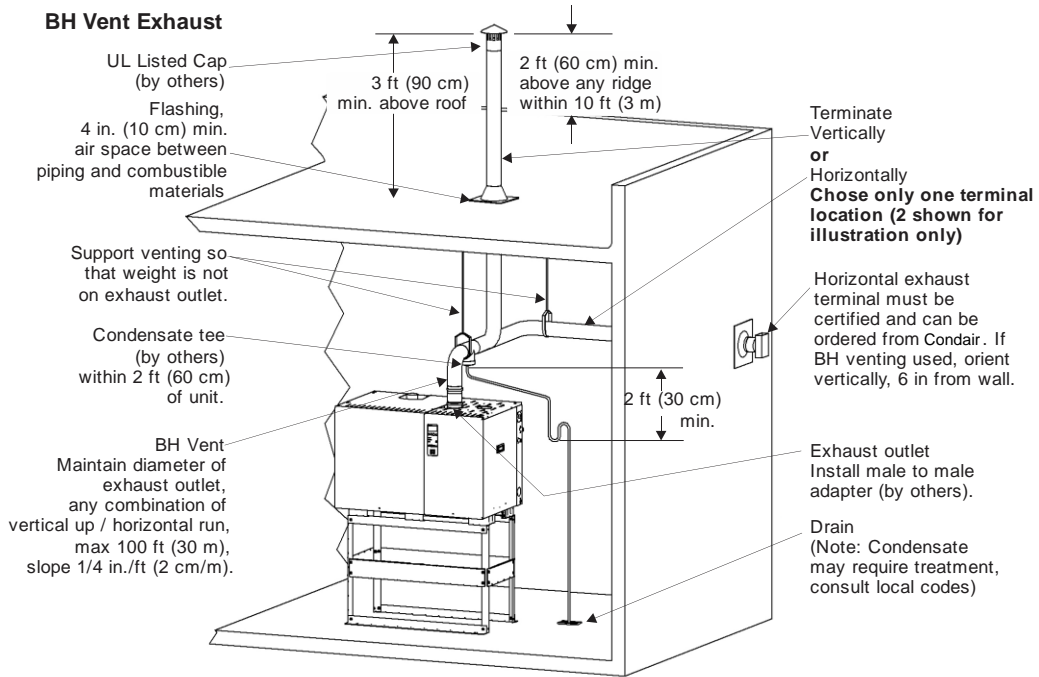


Figure 9: Vertical and Horizontal Venting Using BH Type

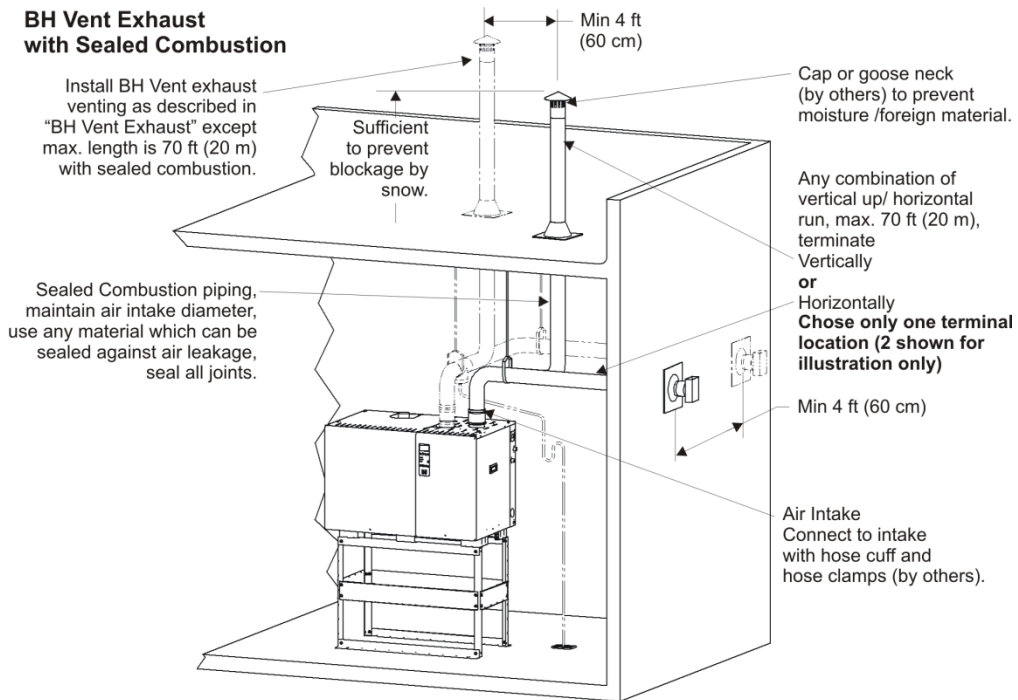
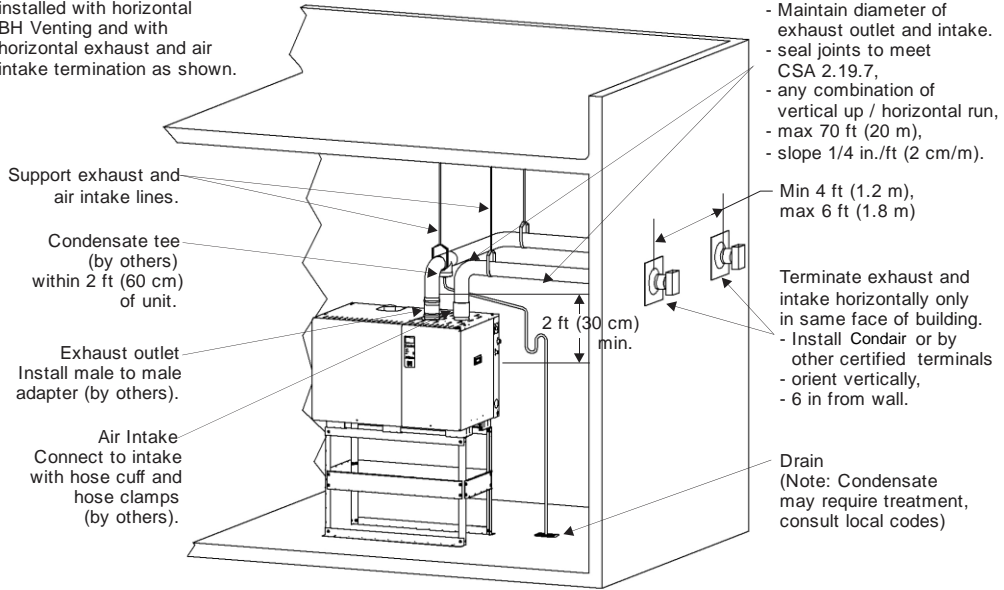


Figure 10: Vertical and Horizontal Venting Using BH Type With Sealed Combustion

Direct Vent Installation

Direct Vent may only be installed with horizontal BH Venting and with horizontal exhaust and air intake termination as shown.



Use BH Vent for exhaust and direct vent air intake.

- Maintain diameter of exhaust outlet and intake.
- seal joints to meet CSA 2.19.7,
- any combination of vertical up / horizontal run,
- max 70 ft (20 m),
- slope 1/4 in./ft (2 cm/m).

Min 4 ft (1.2 m), max 6 ft (1.8 m)

Terminate exhaust and intake horizontally only in same face of building.

- Install Condaire or by other certified terminals
- orient vertically,
- 6 in from wall.

Drain (Note: Condensate may require treatment, consult local codes)

Figure 11: Direct Vent Installation

B Vent Co-venting Installation

Multiple units installed with B Vent may be co-vented into a common chimney. Install venting as described in B Vent Exhaust.

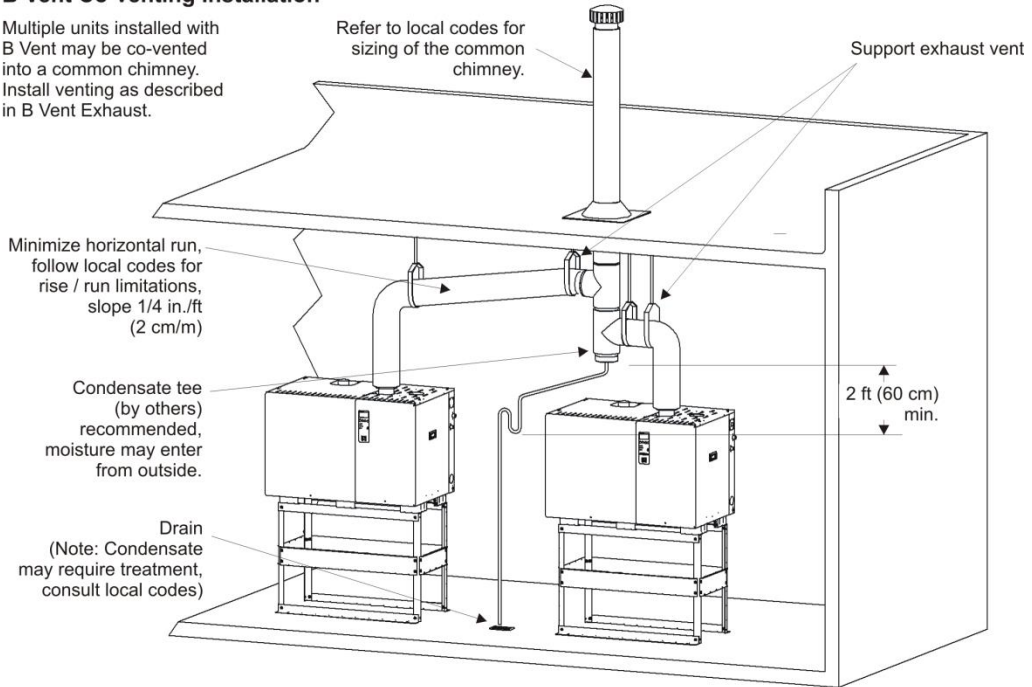


Figure 12: Vertical Co-Venting Using B Type

Installation As A Category I Appliance

General

The GS Series humidifiers have a fan-assisted combustion which operates with a non-positive vent static pressure when installed with the appropriate vent diameter.

Category I appliances must be vented vertically or nearly vertically (see Figure 7, 8, 9, 10 & 11).

This category appliance is restricted to vertical venting installations with limits placed on horizontal lengths and vent diameters. Refer to the tables in local and/or national codes. No sidewall termination is accepted.

Vent piping must be UL or UL/CSA listed Type B. Required clearance for Type B vent piping is 1" (25 mm).

A minimum equivalent vent length of 7 feet must be connected to the humidifier. Vent lengths must not exceed 100' (30 m), 70' (21 m) if sealed combustion is used. Each 90° elbow is equivalent to 10' and each 45° elbow equals 5'. The vent run should be as direct as possible with no more than 6 elbows in the system. Contact Condair Technical Services if you have any questions.

The vent pipe exiting the humidifier is sized for category III installations. A field supplied adapter is required to increase the pipe immediately at the exit of the humidifier. The vent pipe must be expanded to the minimum sizes listed below for each model, increasing as code requires.

GSTC 100	4" minimum diameter
GSTC 200	5"
GSTC 300/400	7"
GSTC 500/600	8"

The termination at the humidifier is a male connection. Standard venting hook-ups require a female path. It is highly recommended that a female to female adapter be assembled onto the humidifier to establish the proper venting sequence. Consult with the venting manufacturer for proper hook up.

Vent connectors shall not be connected into any portion of a mechanical draft system operating under positive pressure.

Use only double wall (aluminum inner wall) b vent. Single wall venting cannot be used due to the increased wet time in the lining. If the vent connector attaches to a lined masonry chimney, the chimney must be sized and installed according to the provisions of the national fuel gas code or Canadian CSA B149.1 standards. An approved venting manufacturer's termination cap for the stack outlet must be used.

When the category I installation is selected it may be commonly vented with other listed gas fire appliances. Total input rates of all appliances will determine the vent size the chimney must be sized and installed according to the provisions of the national fuel gas code or Canadian CSA B149.1 standards.

A maximum of 4 gas appliances may be common vented on the same floor. Multiple story common venting is not recommended.

Refer to the vent manufacturer's instructions for proper clearances to combustibles.

Recommended B-Venting Manufacturers

Simpson Dura-vent

Selkirk Canada corporation

American metal products

Metal-fab Inc.

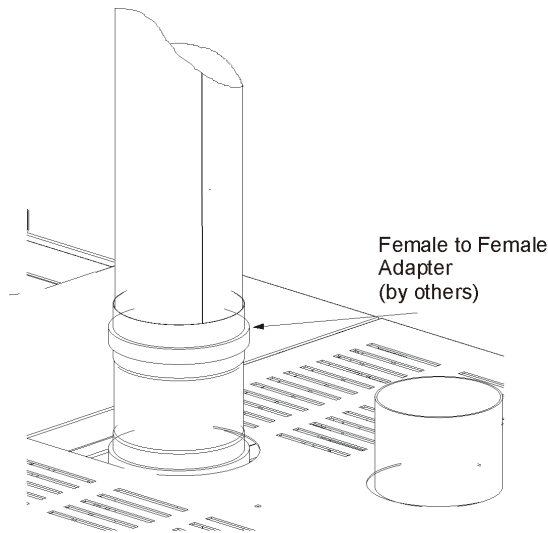


Figure 13: Exhaust Connection

Installation As A Category III Appliance

General

This venting system can be installed horizontally or vertically and can terminate on a rooftop or sidewall provided the NFGC (Nation Fuel Gas Code) and CAN/CGA- B149 codes are followed. The venting manufacturer instructions must also be followed.

Venting must be UL or UL/CSA listed, tested to ULC-5636 standard. Venting may be BH, L vent or Special Gas Vent. The vent shall be listed and installed in accordance with the terms of the vent listing and the manufacturer's instructions. The instructions listed below should be followed as well.

A minimum equivalent vent length of 7 feet must be connected to the humidifier. Vent lengths must not exceed 100' (30 m), 70' (21 m) if sealed combustion is used. Each 90° elbow is equivalent to 10' and each 45° elbow equals 5'. The vent run should be as direct as possible with no more than 6 elbows in the system. Contact Condaire technical service if you have any questions

This category installation may not be common vented with any other natural draft gas appliance or power assist appliance.

All joints must be sealed using high temperature rtv silicone.

The gas humidifier is supplied with the following exhaust outlets.

GSTC 100	3"
GSTC 200	4"
GSTC 300/400	5"
GSTC 500/600	6"

The venting must remain the same diameter throughout the installation.

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



BH Vent Manufacturers

Flex-I international

Fas-n seal

Heat-fab Inc.

Z flex



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

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.

For sidewall vent terminations, the humidifier must be installed with a certified vent terminal that can be purchased from Condair.

GS 100	3"	Condair P/N 1502321
GS 200	4"	Condair P/N 1502322
GS 300/400	5"	Condair P/N 1507320
GS 500/600	6"	Condair P/N 1507321

Locate the vent terminal at least 7 feet or 2.1 m above grade from public walkways, adjacent buildings, operable windows and building openings, consistent with the National Fuel Gas Code ANSI Z223.1 and/or CSA B149.1 Installation codes.

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.

Locate terminal at least 4 feet or 1.22 m from electric meter, gas meters, regulators, and relief equipment.

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.

The vent terminal must be installed in the same atmospheric pressure zone as the combustion air inlet of the humidifier. If this is not possible (as in cases of positive or negative room pressures) the humidifier should be installed with the sealed combustion or direct vent option.

Electrical and Plumbing

Electrical

Primary Wiring

All work concerning the electrical installation must be performed by qualified personnel.

Warning: The electrical parts inside the humidifier are very sensitive to electrostatic discharge. Appropriate measures against electrostatic discharge (esd protection) must be taken when carrying out installation work.



The humidifier should only be connected to primary power (main power) after all installation work has been completed.

An external disconnect switch must be installed close to the unit to allow for power interruption during servicing and/or maintenance.

Humidifiers require field wiring to primary voltage terminal blocks. Depending on the unit, power requirement must be 120 Vac or 208-240 Vac, 15 A, 20 A or 30 A separately fused circuit, single phase. See Table 4 for details. Use only copper wire with a minimum 70 °C (158 °F) temperature rating. Wiring can be fed through a 7/8" hole on the bottom or the top of the control compartment.

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.

External wiring sizes must be in accordance with NEC and/or CEC and existing local electrical codes and by-laws.

Low Voltage Control Wiring

All GS 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 shielded 18 AWG or heavier and kept as short as possible.

Controls are available from CONDAIR 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 CONDAIR Gas Humidifiers.

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.

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.

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.

Wall or Duct Mounted Modulating Humidistat: Provides a modulating signal to the unit that represents the output (up to 100%) required from the humidifier. Signal type can be changed in the field.

All GS 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. If both channels are demanding steam the humidifier will satisfy the lower demand signal.

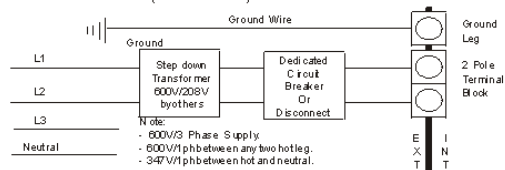
Table 4: Current and Breaker Requirements for GS Series Units

	Voltage (V)	Rated Amps (A)	Suggested Breaker (A)
GSTC 100 Indoor	120	2.1	15
	208-240	1.1	15
GSTC 200 Indoor	120	3.7	15
	208-240	1.9	15
GSTC 300 Indoor	120	5.3	15
	208-240	2.7	15
GSTC 400 Indoor	120	6.8	15
	208-240	3.5	15
GSTC 500 Indoor	120	8.4	15
	208-240	4.3	15
GSTC 600 Indoor	120	10	15
	208-240	5.2	15
GSTC Outdoor 100	120	6.3	15
	208-240	3.2	15
GSTC Outdoor 200	120	7.4	15
	208-240	4	15
GSTC Outdoor 300	120	13.7	20
	208-240	6.9	15
GSTC Outdoor 400	120	15.2	20
	208-240	7.7	15
GSTC Outdoor 500	120	21	30
	208-240	10.6	15
GSTC Outdoor 600	120	22.6	30
	208-240	11.5	15

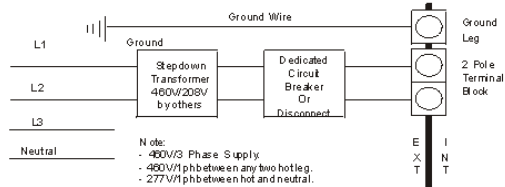
PRIMARY 208-240V 1 phase line voltage wiring to unit
(BY OTHERS)

VOLTAGE
(ACTUAL)

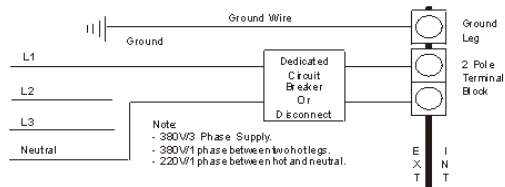
600V/3ph



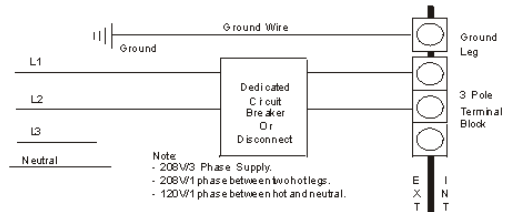
460V/3ph



380V/3ph

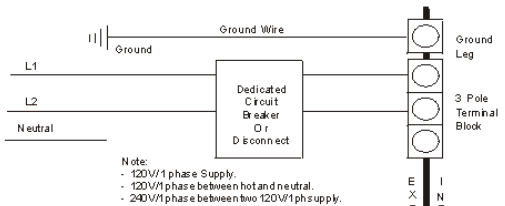


208V/3ph

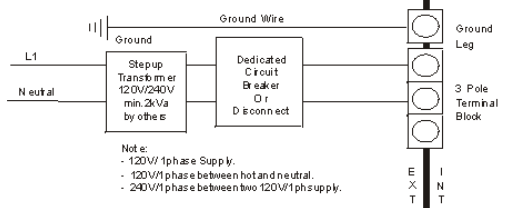


120V/1 ph

120V/1 ph



120V/1 ph



NOTE: Voltage At Terminal Block Must Be In Accordance With Spec. Label.
All Wiring To Be In Accordance With Existing National And Local Electrical Codes.

Figure 14: Primary 208-240 V 1 Phase Line Voltage Wiring To Unit

GS/GS-E SERIES EXTERNAL CONTROLS WIRING CONNECTIONS LOW VOLTAGE TERMINAL STRIP

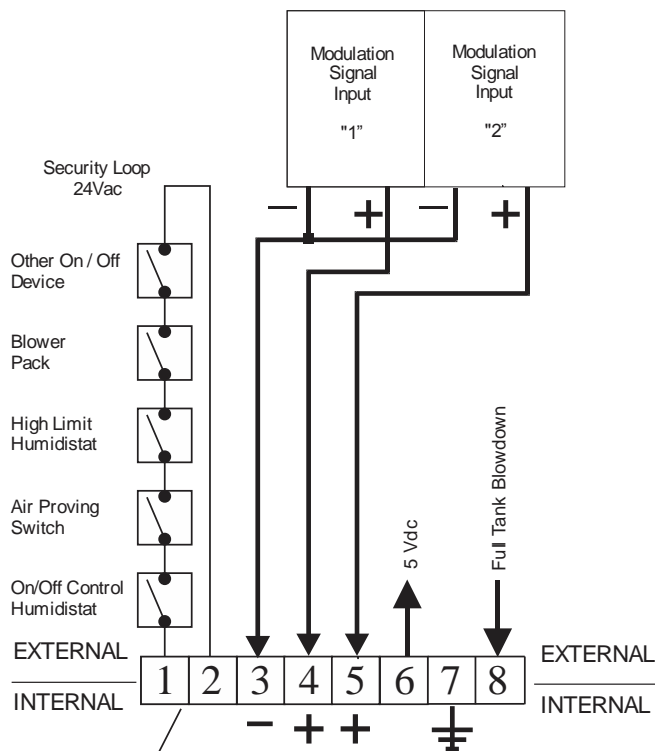
WARNING: Failure to wire the controller in accordance with the wiring diagram supplied with the unit could permanently damage the electronics. Such errors will void the unit warranty.

Transducers:
To be complete with sensing element, power source and 2 wire varying output signal. RH set point adjustment is made at unit keypad. RH set point and %RH sensed are viewed on display

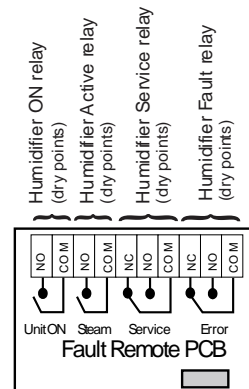
Output signal across 3 - 4 and 3 - 5 increase on RH rise

Controllers (Humidistat):
To be complete with RH set point adjustment, sensor circuit. Sensing element, power source and 2 wire varying output signal. RH demand are viewed on display

Output signal across 3 - 4 and 3 - 5 decrease on RH rise



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.



**GS/GS-E SERIES
EXTERNAL CONTROLS WIRING CONNECTIONS
LOW VOLTAGE TERMINAL STRIP**

Diagram No. 2545435 Rev. A Jan. 29, 2009

Figure 15: GS Series External Controls and Wiring Connections Low Voltage Terminal Strip

Control Installation

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 grill. Do not mount on an outside wall where temperature fluctuations can affect control response.

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.

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.

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.

Check operation of all on/off controls before starting humidifier.

Calibration of controls (on/off or modulation) in the field may be necessary due to shipping and handling. Verify humidistat accuracy before commissioning system.

Plumbing

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

Fill Water Supply Line

Each unit is supplied with an adapter for the fill valve (1/2" NPT). Fill rate 10 l/min all unit sizes. Size of piping is a minimum 1/2" copper; recommend 3/4" up to within 4 feet of unit.

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 humidifier to allow quick filling of the system on initial startup. This can also be very useful for mandatory cleaning of the unit.

ALWAYS supply and install a shut off valve and union in the water supply line dedicated to the humidifier to facilitate servicing. See figure 16.

If water hammer occurs, install a shock arrester on the fill water line just before the inlet to the fill valve. Water hammer will damage the fill valve.

A 1" air gap is designed into the fill system of the GS humidifier. Some local plumbing codes may still require the installation of a double check valve on the fill line to the humidifier to prevent contamination of the supply water system. Verify with local codes and install if necessary.

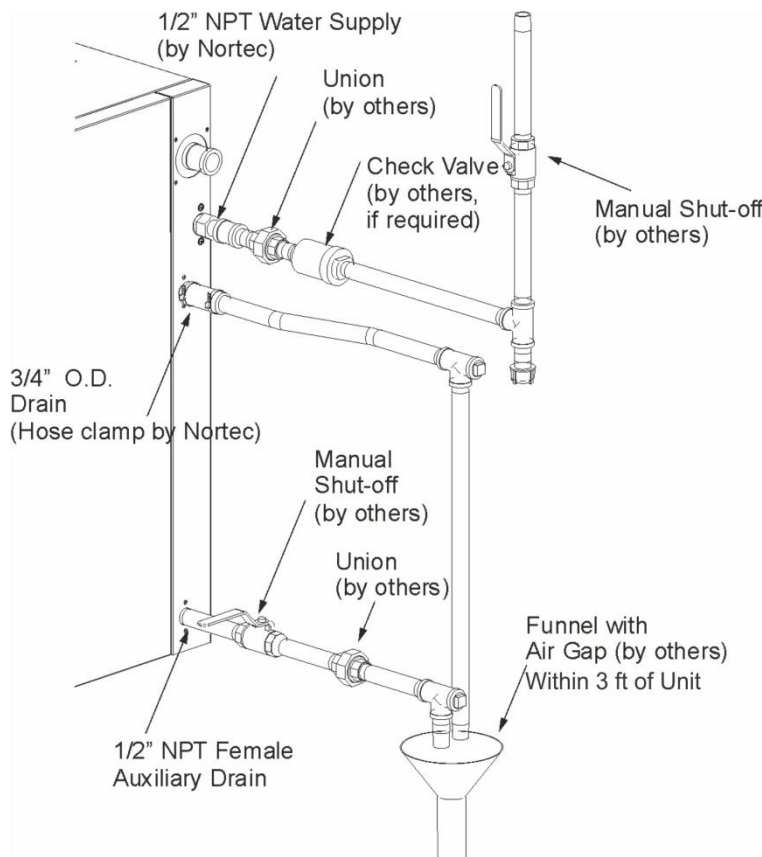


Figure 16: Plumbing Connections

Drain Line

The humidifier is equipped with a 3/4" O.D. unthreaded drain outlet connection on the side of the humidifier. A vacuum break valve is installed internal to the unit on the drain line. The drain water line must be piped to a drain funnel to provide an air gap before connection to the building drainage system. The air gap must be within 3 ft (1 m) of the humidifier.

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. Internal drain water tempering will ensure a maximum of 140°F (60°C) exiting water temperature, unless Freeze Protection is activated.

Never install PVC piping as a drain line material. Always use material suitable for with-standing 212°F (100°C) if freeze protection is included.

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 1-1.5" O.D. or larger. Consult local codes.

When the drain pump is activated, the tank drains at a rate of 4.5-5.3 gal/min (18-20 l/min).

NOTE: If the GSTC is installed in a cold area, or if the unit is a GSTC Outdoor unit, avoid installing the drain directly under the humidifier. In cold ambient air, the warm drain water can evaporate into water vapor, which can damage the electronics inside the humidifier if that vapor is allowed into the unit.

Aux Drain Port

An auxiliary drain port is also provided on the side of the humidifier. It can be used to manually drain the unit, if required. The unit is shipped with this connection plugged. It is recommended to install a shut off valve on this line (see Figure 16).

The auxiliary drain port is used with the standard freeze protection on Outdoor units. Install a shut off valve on this line and pipe to the drain funnel (see Figure 16). The manual shut off valve must always be in the open position when the unit is operating but can be closed for servicing of the unit.

Steam Lines and Condensate Line

Steam hoses and clamps are provided with the GS humidifier for connection to the steam lines. Refer to Figure 17 for connection details.

For steam line installation between the humidifier and distribution system, consult the distribution system installation manual. Steam Distributor Installation Manual. See Table 5: Steam Line Sizing for details on the sizing and lengths of steam lines.

The GS Series of Gas-Steam humidifiers can develop steam pressures up to 12" w.c. to overcome duct and steam line pressures. An enclosed trap on the drain line prevents steam from going to drain. Duct pressures above 12" will cause steam to exit through the drain line. Consult factory.

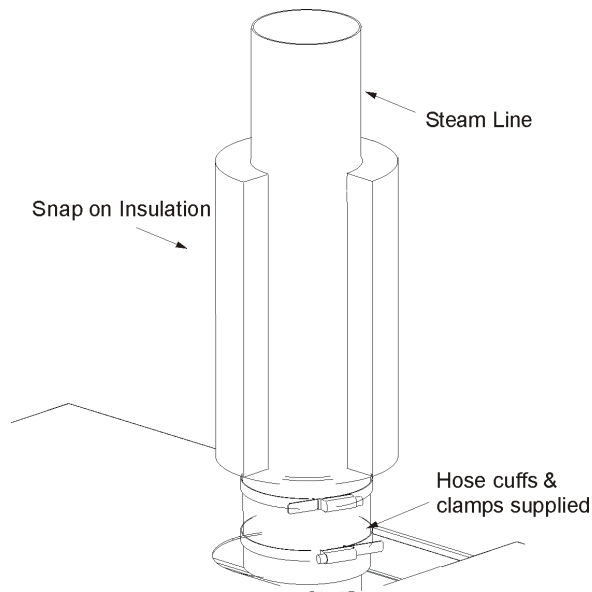


Figure 17: Steam Line Connection

Table 5: Steam Line Sizing

Humidifier	Steam output [lb]	MED-L copper tube nominal steam line size	Stainless steel tube diameter (wall thickness 0.065")	Steam loss per foot in condensation [lb/ft]	Steam line maximum equivalent length
GS 100	100	1-1/2"	1-3/4"	0.11	90 ft
GS 200	200	3"	3"	0.16	90 ft
GS 300	300	3"	3"	0.16	180 ft
GS 400	400	4"	4"	0.22	180 ft
GS 500	500	4"	4"	0.22	220 ft
GS 600	600	4"	4"	0.22	260 ft

*Based on 3" duct static pressure, Maximum duct static pressure for GS is 12" w.c.

Table 6: Effective Lengths of Typical Steam-Line Fittings

Nominal tube size	Standard 90°-elbow	Standard 45°-elbow	Side-outlet tee	Gate valve*	Globe valve*
1-1/2"	3.5 ft	1.75 ft	7 ft	0.8 ft	34 ft
1- 3/4"	3.5 ft	1.75 ft	7 ft	0.8 ft	34 ft
3"	5 ft	2.5 ft	11 ft	1.1 ft	54 ft
4"	8 ft	4 ft	15 ft	1.6 ft	80 ft

*Valve in full open position.

Outdoor Installation

GS Outdoor units are CSA certified for outdoor installation and come complete with exhaust venting and internal ventilation (cooling) for the electronics. Heaters for freeze protection are standard with outdoor units. All installations must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code ANSI Z223.1 in the United States or CSA B149.1 Installation codes in Canada. CONDAIR cannot accept responsibility for installation code violations.

Mounting

NOTE: Whenever possible do not expose drain water within the outdoor cabinetry. This could result in water damage to electronic components. If a drain pan needs to be inside the cabinetry be sure to seal around it so the cabinet doesn't become over humidified during the drain cycles.

NOTE: If the GSTC is installed in a cold area, or if the unit is a GSTC Outdoor unit, avoid installing the drain directly under the humidifier. In cold ambient air, the warm drain water can evaporate into water vapor, which can damage the electronics inside the humidifier if that vapor is allowed into the unit.

Typical rooftop installations are shown in Figure 18 & 19.

The GS Outdoor unit comes standard with cutouts in the base to allow for lifting by a forklift. When lifting by this method, ensure that the forks extend across the entire base to prevent tipping or damage to the unit.

Always ensure proper safety precautions are taken when using cables or chains to lift the GSTC Outdoor unit. The unit should be properly supported on all sides and the cabinet should be protected from potential damage caused by the lifting cables/chains used during lifting.

See Figure 20 for clearance details.

The integral base of the GS Outdoor model is designed to mount on a curb. The curb must be built to structurally support the entire weight of the humidifier when in operation. Required curb dimensions are given in Figure 21.

Ensure that the humidifier is mounted level.

The pan in the bottom of all outdoor models has a pipe chase for routing of services into the humidifier from below.

It is not necessary to make the hole in the roof the same size as the curb. The curb drawing shows the location and size of the pipe chase required. The pipe chase should be sealed when the installation is complete to ensure positive or negative pressure from the building.

The panels of the outdoor model have louvers to provide ventilation for the electronics and air for the combustion process. Locate the unit so that louvered panels are a minimum of 10 ft from any mechanical exhaust outlet.

When mounted on the curb, the lowest air intake louvers must be a minimum of 12" above any surface where snow or ice could accumulate. In areas where normal snow accumulation is higher, mount the unit accordingly.

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

The humidifier may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.

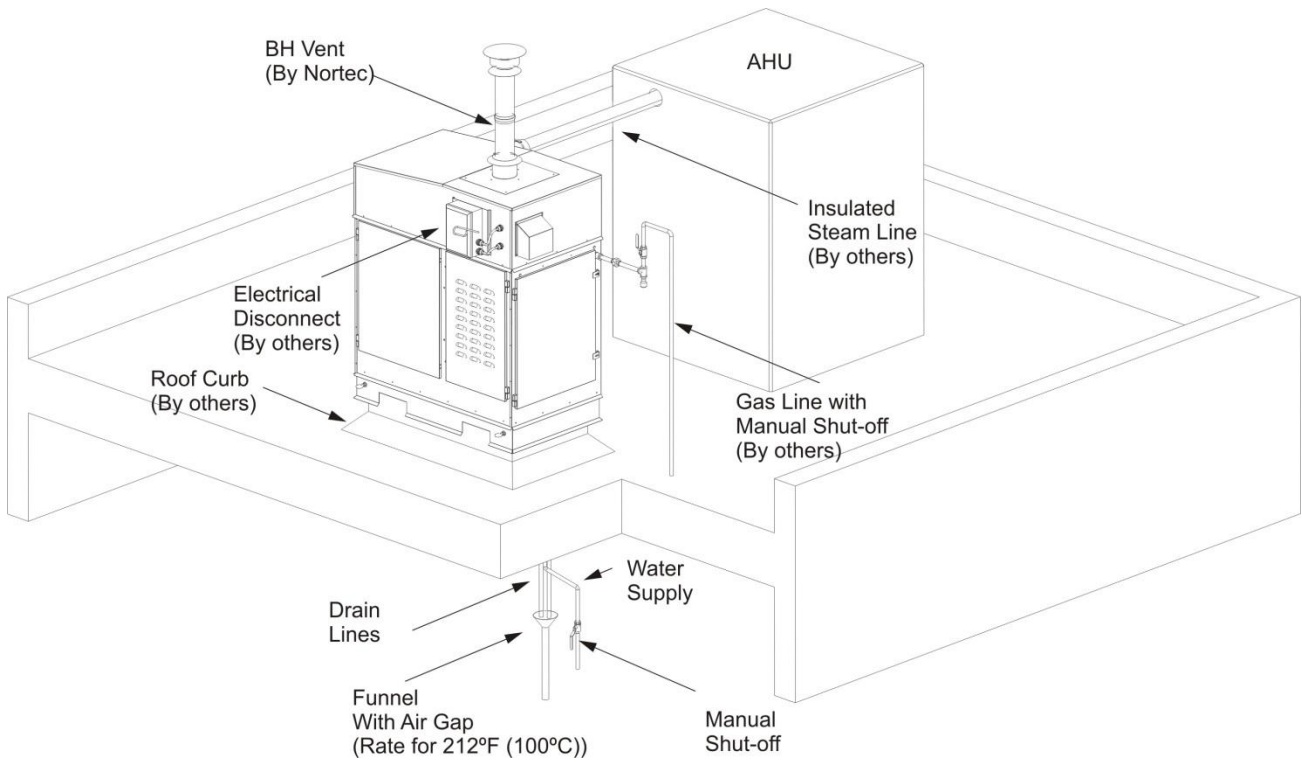


Figure 18: GSTC Outdoor Typical Installation Rooftop with AHU

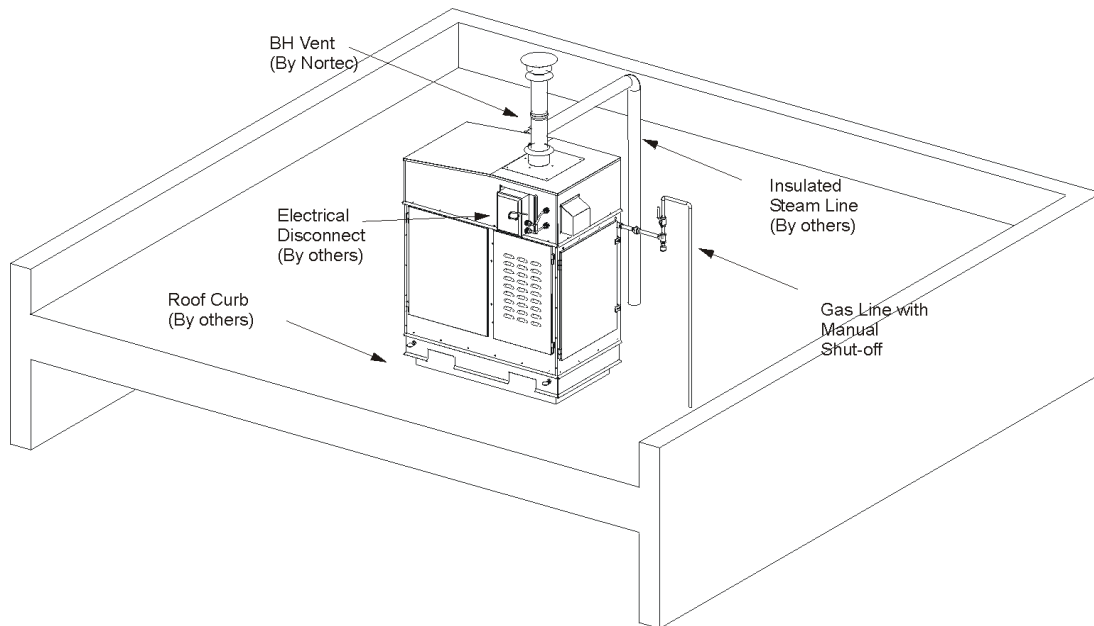


Figure 19: GSTC Outdoor Typical Installation Rooftop without AHU

Model	Minimum Required Clearances			
	Front	Left	Right	Back
GSTC Outdoor 100	30" (76cm)	0	40" (101.6 cm)	6" (15.25 cm)
GSTC Outdoor 200	30" (76cm)	0	40" (101.6 cm)	6" (15.25 cm)
GSTC Outdoor 300	30" (76cm)	30" (76cm)	40" (101.6 cm)	6" (15.25 cm)
GSTC Outdoor 400	30" (76cm)	30" (76cm)	40" (101.6 cm)	6" (15.25 cm)
GSTC Outdoor 500	30" (76cm)	30" (76cm)	40" (101.6 cm)	6" (15.25 cm)
GSTC Outdoor 600	30" (76cm)	30" (76cm)	40" (101.6 cm)	6" (15.25 cm)

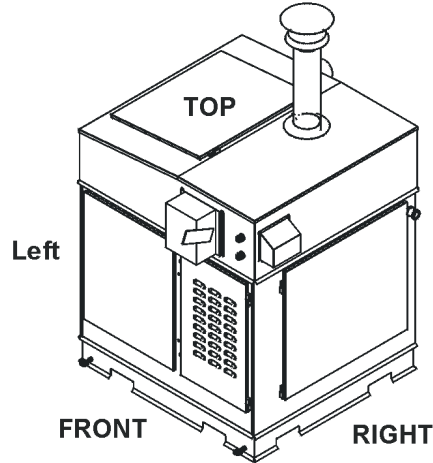


Figure 20: GSTC Outdoor Clearance

Model	Roof Curb Dimensions			
	Dimension A	Curb Height	Shipping Weight	Operating Weight
GSTC Outdoor 100	8.63" (27.91cm)	15" (38.1cm) Min.	400 lbs (181 kg)	556 lbs (252 kg)
GSTC Outdoor 200	15.06" (38.25cm)	15" (38.1cm) Min.	500 lbs (227 kg)	744 lbs (338 kg)
GSTC Outdoor 300	30.63" (77.8cm)	15" (38.1cm) Min.	700 lbs (318 kg)	1185 lbs (539 kg)
GSTC Outdoor 400	30.63" (77.8cm)	15" (38.1cm) Min.	745 lbs (339 kg)	1210 lbs (550 kg)
GSTC Outdoor 500	46.25" (117.5cm)	15" (38.1cm) Min.	800 lbs (363 kg)	1505 lbs (684 kg)
GSTC Outdoor 600	46.25" (117.5cm)	15" (38.1cm) Min.	844 lbs (384 kg)	1525 lbs (693 kg)

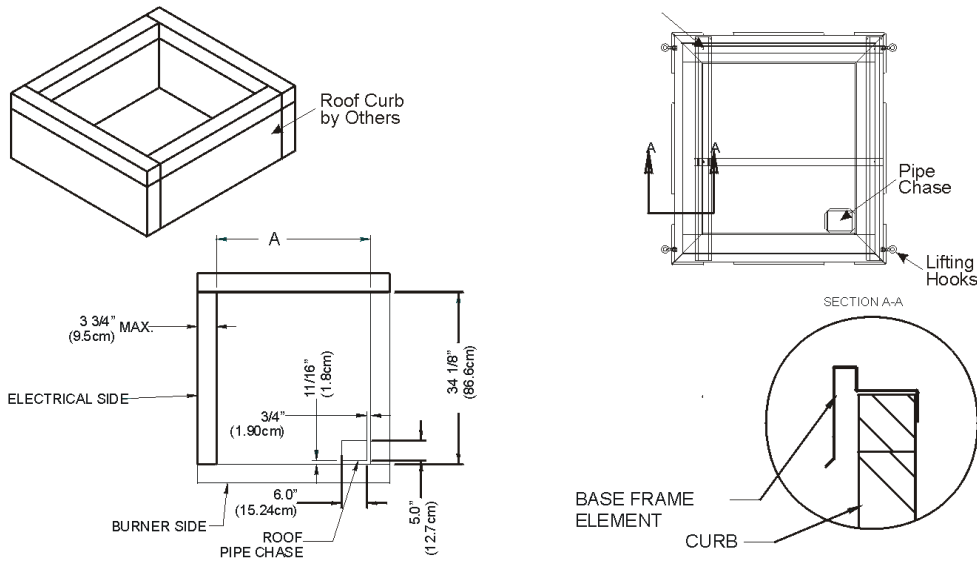


Figure 21: Roof Curb Dimensions

Gas Piping

Installation of piping must be in accordance with local codes, and the National Fuel Gas Code ANSI Z223.1 in the United States or CSA B149.1 Installation Codes in Canada.

Refer to the indoor gas piping installation guidelines for gas line sizes, pressures, leak testing procedures, and safety instructions.

Gas lines are to be routed to the outside connection on the right side near the back of the unit. The installation of a sediment trap and a certified manual shut-off valve are required outside of the unit. The gas piping must not block access to or prevent opening of the right side service door. Refer to Figure 22 for details.

Condaire recommends that each Gas Fired Humidifier has its own regulator installed in line to the unit. The operating Natural Gas pressure supplied for the GS units must be in the range of 5-9" of Water Column and 10-14" of Water Column for Propane version.

Over pressure protection devices shall be provided to prevent the pressure in the piping system from exceeding that value that would cause unsafe operation of any connected and properly adjusted Gas utilization equipment. See Figure 23.

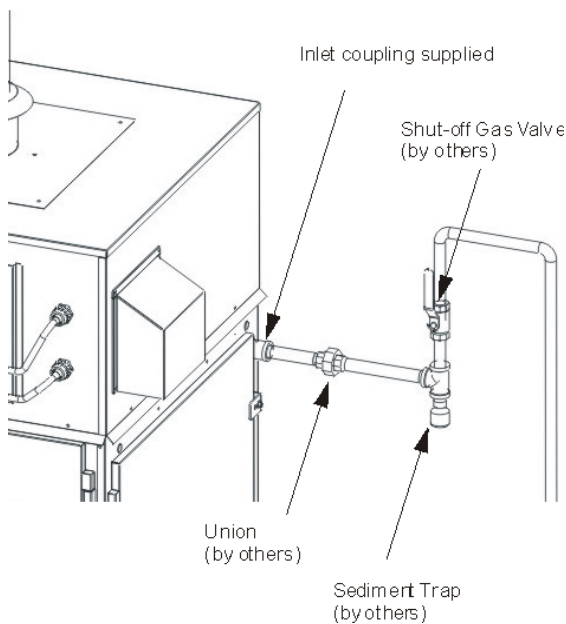


Figure 22: Gas Piping

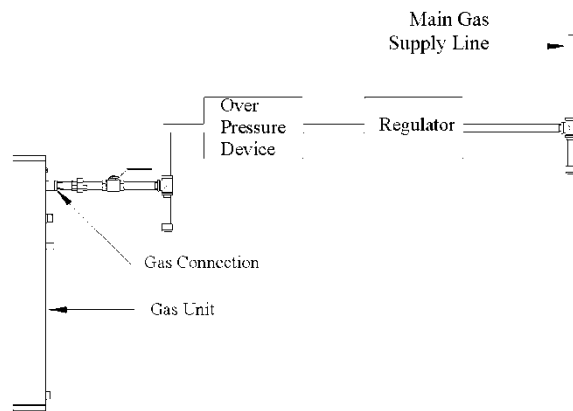


Figure 23: Gas Piping with Over Pressure Device

If the system has a pressure that is higher than the max working pressure of our humidifier, then an Over pressure protection system is required. If there is an Over pressure protection device installed, it must consist of 2 devices in Series, (a pressure regulator plus one other device). Both these devices must be able to work on their own without damaging any downstream piping or appliance, and the only way the downstream system can be damaged is by the failure of both devices.

Exhaust Venting – Outdoor Units

All required exhaust venting is provided with each GSTC Outdoor model, by Condaire, including rain cap and storm collar. All venting components external to the unit are shipped with the unit and must be installed on site. Refer to Figure 24 for venting components.

Each vent length and the rain cap have a built-in mechanical locking band and gasket. Simply push together each component to the stop bead, which provides an air & water-tight seal. Then tighten the integrated locking band on each component to complete the installation of the exhaust venting.

The rain cap must extend at least 2 feet above any ridge within 10 feet of the unit. The exhaust venting can be extended using additional vent lengths purchased from Condaire.

Electrical Installation

Power and control wiring is to be routed into the humidifier through the pipe chase in the base pan of the outdoor models located in the burner area.

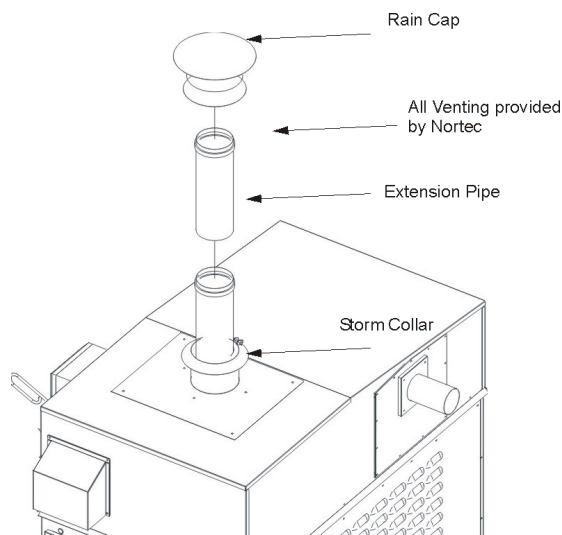


Figure 24: Exhaust - Outdoor Units

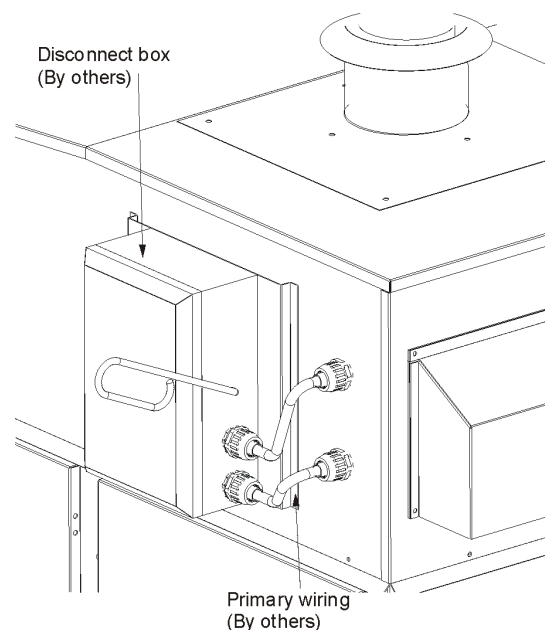


Figure 25: Electrical Box

Installation details for primary and low voltage control wiring are the same as for indoor units.

A field supplied NEMA rated weatherproof disconnect switch must be mounted external to the GS Outdoor unit to allow for power interruption during servicing and/or maintenance. A mounting plate, located on the front of each outdoor model above the electrical access door, is available for mounting of the disconnect switch. Two electrical conduits are provided for routing the primary wiring to the disconnect switch and then back inside the enclosure to the main power terminal strip. See Figure 25 for details.

Fill Water Supply Line

Each unit is supplied with a 1/2" NPT male connection to the fill valve. Refer to Figure 26 for connection details. A minimum fill rate of 10 l/min (2.6 gal/min) is required for all unit sizes. Allowable pressure range is 30-80 psig.

Always install a manual shut off within the building to allow isolation of the water to the unit. A union must be installed on the fill line prior to the fill valve to allow for servicing.

Heat trace fill line piping above rooftop from the pipe chase up to the fill valve.

Drain Line

GS Outdoor units have an integrated 12" w.c. trap and vacuum break valve on the drain line. A drain hose, connected to the outlet of the internal trap, terminates at the pipe chase in the burner section.

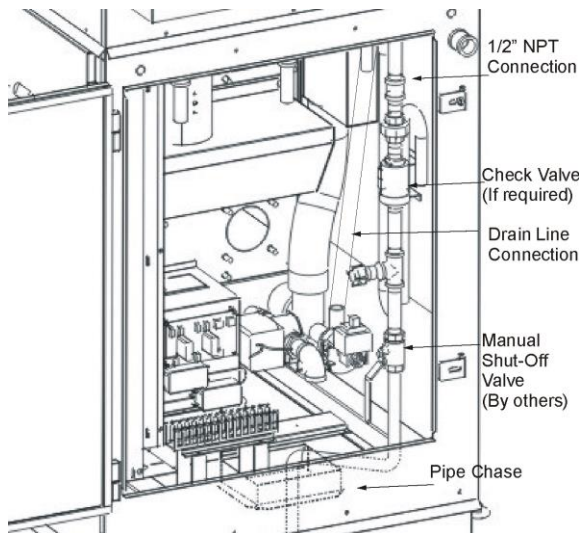


Figure 26: Fill Water Connection

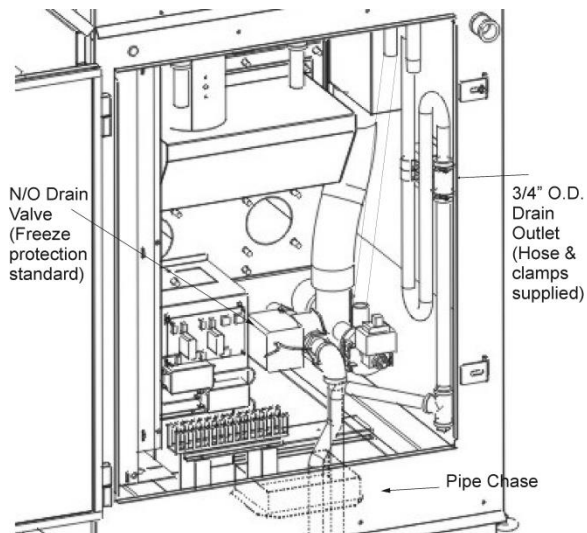


Figure 27: Drain Connection

Route the drain hose to a drain funnel in the building to provide an air gap before entering main building drain/sewage system.

When the drain pump is activated, the tank drains at a rate of 18-20 l/min (7-8 gal/min).

Drain piping must be rated for 212°F (100°C).

NOTE: Whenever possible do not expose drain water within the outdoor cabinetry. This could result in water damage to electronic components. If a drain pan needs to be inside the cabinetry be sure to seal around it so the cabinet doesn't become over humidified during the drain cycles.

NOTE: If the GSTC is installed in a cold area, or if the unit is a GSTC Outdoor unit, avoid installing the drain directly under the humidifier. In cold ambient air, the warm drain water can evaporate into water vapor, which can damage the electronics inside the humidifier if that vapor is allowed into the unit.

Auxiliary Drain

Standard GS Outdoor units come with a capped $\frac{3}{4}$ "NPT auxiliary drain connection at the bottom of the tank. It is recommended to install a manual shut-off valve on this connection and route to drain (field supplied air gap required).

GS Outdoor units standard with a freeze protection package have a normally open drain valve mounted at the auxiliary drain connection and piping that terminates at the pipe chase in the base pan. This valve opens and will drain the contents of the tank in the event of a power failure, regardless of the temperature of the tank. When freeze protection is activated, there is no drain water cooling. Install a manual shut off valve on this line and pipe to the drain funnel. This valve must always be left in the open position when in operation but can be closed for servicing of the unit.

Drain pipe should be capable of withstanding 212 °F (100 °C) temperatures.

Steam Lines

The steam outlet connection is located at the back of the GS Outdoor unit. Steam hose(s) and clamps are supplied with the unit and are intended to provide a flexible coupling outside of the unit to the building steam lines. See Figure 28.

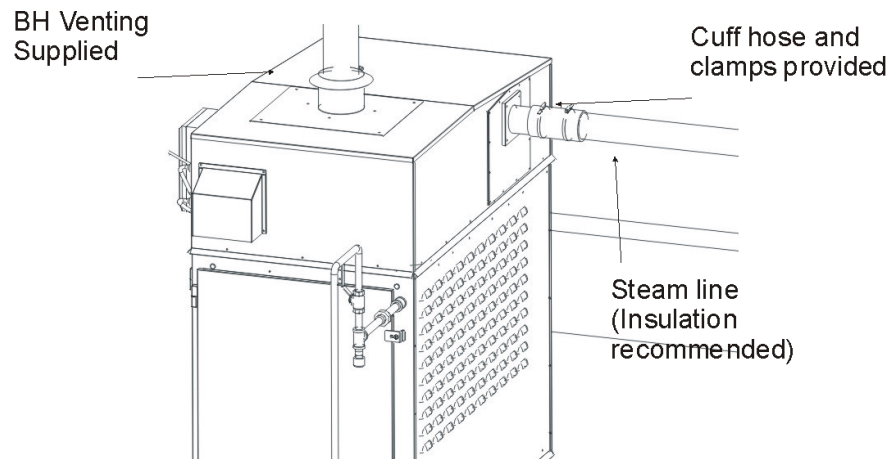


Figure 28: Steam Connection

GS Outdoor models can develop steam pressures up to 12" w.c. to overcome duct and steam line pressures. Pressures above 12" w.c. will cause steam to exit through the drain line.

Steam lines can be routed to an air handler on the roof or pipe chased (external to the unit) through the rooftop to enter the building.

All steam lines must be insulated to reduce losses.

For steam line installation guidelines, consult the distribution system installation manual (Steam Distributor Installation Manual).

Operation

Combustion

The combustion system is based on a fully modulating forced draft combustion air blower(s), a negative pressure regulated gas valve, and a 100% premix burner. On a call for humidity, the combustion air blower(s) starts and creates a negative pressure(s) across an orifice located at the air inlet. The blower is energized to purge the system, and then the hot surface igniter is activated. During this time, the electronic ignition module does a diagnostic check of safety systems including the air proving switch which senses the negative pressure at the air inlet orifice. After the function of the safety systems has been verified, the gas valve(s) will open and the gas/air mixture is ignited by the hot surface igniter. If a flame is sensed by the flame sensor, the gas valve(s) remains open and combustion continues. If a flame is not sensed, the above sequence is repeated to a maximum of three times after which the ignition module will lock out. The gas valve(s) maintains a constant air to gas ratio independent of blower speed or external conditions. This air and fuel is thoroughly mixed in the blower(s) and then forced through the burner ports where ignition occurs.

Hot products of combustion are forced through a baffle inside the heat exchanger and then vented outside. The heat exchanger has a large flat surface to minimize scale build-up and promote scale shedding to the bottom of the tank. This self-cleaning action helps to maintain the efficiency of the heat exchanger while the smooth surfaces allow for easy cleaning when necessary. The heat exchanger has been heat treated to protect against possible stress-corrosion cracking.

The GS 100 has a single removable combustion chamber/heat exchanger. The combustion system is duplicated on larger units with multiple chambers inside a common tank.

Water Management

The GS Series of humidifiers is equipped with a unique float chamber water level monitoring device. Two magnetic floats (one is a backup) measure 5 different water levels in the humidifier for proper operation. The float chamber and board are located away from the boiling action to increase reading accuracy and reduce mineral build-up since it is not in the boiling water. The float chamber is connected to the tank under the water level and above the water level to ensure equalization of pressure between the tank and float chamber. In addition, cooling water is introduced in the float chamber to reduce scale build-up. The unit also includes an internal 1" air gap and a vacuum breaker to prevent siphoning effect.

On initial start-up, the solenoid operated fill valve fills the tank. The water level reaches the backup float first and then the main float. If the backup and main floats do not read the same water level during the operation of the unit, the unit will shut down on a fault. The unit will continue to fill the unit to the top green position. The drain pump will then be energized to drain the water level down to just below the bottom red position and then the fill valve will energize again to fill the unit to the middle yellow position. During this time the software is performing a test on the fill valve and drain pump.

If a demand signal is present, the unit will then begin the combustion sequence. As the unit operates, the fill valve will be pulsed to maintain the water level between the yellow and green positions. During steam production the unit will also check if the floats and drain pump are operational by activating a drain sequence every 24 hours (adjustable to time of day).

Start-Up Procedure

Start-Up Checklist

Before the GS humidifier is operated for the first time, a complete inspection must be performed to ensure that the installation and all water, gas, steam, electrical and venting connections to the humidifier conform to the guidelines in this manual. Complete the checklist before commissioning the unit.

Qualified personnel must correct any deficiencies with the installation before commissioning takes place.

Prior to starting the humidifier, it is necessary to ensure that no dirt or dust has accumulated in the electronics compartment or the burner area. A buildup of dust on the electronics can cause overheating and early failure of the components. If necessary, clean the area around the humidifier to prevent contaminants from being drawn into the combustion blowers.

Filling the System

Before the GS unit will initiate combustion, it must be filled with water and the internal controller must have completed a self-test to verify that the water fill system, level controller, and drain pump are functioning correctly.

Close the shut-off valve in the gas supply line.

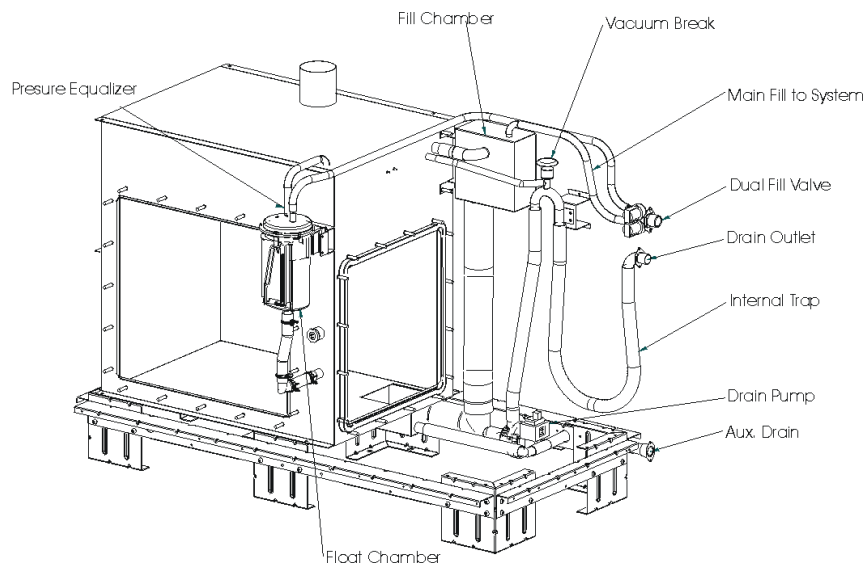


Figure 29: Plumbing Connections

Remove any demand signal to the unit.

Open the shut-off valve in the water supply line.

Switch the humidifier on.

The fill valve will energize and the tank will begin to fill (fill time is approximately 10 to 30 minutes depending on unit size). Once the float chamber has registered low water level, the unit will perform an internal test of the fill and drain systems as described in the Water Management section.

At the completion of the test, the float chamber will indicate middle float position (green LED) and the unit will go into standby mode until a demand signal is received.

Proceed to the safety shut-off test.

Testing the Ignition Safety Shut-Off

Test the ignition system safety shut-off in the following method.

Close the shut-off valve in the gas supply line.

Set the demand signal to the humidifier to 100%.

Ensure all external controls connected to the security loop are closed.

Switch the humidifier on.

At the completion of the float test, the humidifier will begin the combustion sequence by energizing the combustion blowers.

All blowers will run at full output for 30 seconds to pre-purge the combustion chamber. During this time the controller will monitor that all air proving switches closed to prove air flow.

The igniter(s) will be energized for 15 seconds, allowing it time to heat to the appropriate ignition temperature and the gas valve will be energized.

After 4 seconds both the gas valve(s) and the igniter will be de-energized.

After three trials for ignition (complete with pre-purge) the red LED on the ignition control module will begin blinking to indicate a safety lockout and a fault message will be displayed on the humidifier display.

NOTE: On multiple burner models, each burner tries to ignite in sequence. It is necessary to wait for all burners to cycle to complete the test.

Manually re-open the gas supply to the humidifier. No gas should flow to the burner(s).

To reset the humidifier, shut off the power switch, and then turn the power back on.

Starting the Humidifier

Once the tank has been filled and the ignition safety test has been performed as outlined above, the humidifier is ready to be put into operation.

Verify that the inspection checklist has been completed and all deficiencies with the installation have been corrected.

Open the shut-off valve in the gas supply line.

Open the shut-off valve in the water supply line.

Ensure all external controls connected to the security loop are closed.

Verify that the building demand signal is connected to the humidifier.

Install and secure all cabinet service doors.

Switch the humidifier on.

At the completion of the float test, the humidifier will begin the combustion sequence and each burner will ignite in sequence.

Depending on the system demand the combustion blowers will modulate faster or slower to control the burner input.

The water in the tank will heat up and begin to boil, delivering steam to the distribution system.

During the boiling sequence the water fill valve will periodically activate to replenish water that has evaporated from the tank.

Once the humidity requirements have been satisfied (demand drops below minimum %) all gas valves will be de-energized and the blowers will be shut off after performing a post purge of the combustion chamber.

The humidifier will go into standby mode until the next call for humidity (demand rises above minimum %) at which time the unit will again begin the combustion sequence.

Table 7: GS Inspection Check List

Unit Serial #: _____ Unit Model: _____
 Unit Voltage: _____ Steam Output: _____
 Customer: _____ Address: _____

Humidifier Mounting

<input type="checkbox"/>	Verify proper clearances around the unit.
<input type="checkbox"/>	Humidifier mounted level.
<input type="checkbox"/>	Humidifier properly secured to stand and stand bolted to floor.
<input type="checkbox"/>	All service doors accessible.
<input type="checkbox"/>	Roof curb sized correctly (Outdoor Model Only).

Gas Piping

<input type="checkbox"/>	Correct gas line size installed.
<input type="checkbox"/>	Certified manual shut off valve and union installed.
<input type="checkbox"/>	Sediment trap installed.
<input type="checkbox"/>	Gas piping leak tested.
<input type="checkbox"/>	Air purged from lines.
<input type="checkbox"/>	Proper gas supply pressure.
<input type="checkbox"/>	Regulator dedicated for each gas unit.

Exhaust Gas Venting

<input type="checkbox"/>	Comply with local regulations.
<input type="checkbox"/>	Proper venting materials used (B or BH) – refer to gas codes.
<input type="checkbox"/>	Maximum vent length of 100 feet (70 feet for direct vent models).
<input type="checkbox"/>	Proper pipe diameter used.
<input type="checkbox"/>	Condensate tee installed.

Steam Lines

<input type="checkbox"/>	Slope up 2" per 12"
<input type="checkbox"/>	Sloped back to drain
<input type="checkbox"/>	Slope down ½" per 12"
<input type="checkbox"/>	Trapped 2" more than static duct pressure
<input type="checkbox"/>	Traps size _____
<input type="checkbox"/>	Insulated
<input type="checkbox"/>	Length/Size _____
<input type="checkbox"/>	90 deg. Elbows qty: ____
<input type="checkbox"/>	45 deg. Elbows qty: ____
<input type="checkbox"/>	Can condensate be trapped anywhere in the steam line? yes ___ no ___

Condensate Lines

<input type="checkbox"/>	Sloped back to drain
<input type="checkbox"/>	Trap is greater than 2" duct static pressure
<input type="checkbox"/>	Size of trap _____

Supply Water Line

<input type="checkbox"/>	Condair supplied adapter installed on fill valve (½”NPT)
<input type="checkbox"/>	Manual shut off valve and union installed
<input type="checkbox"/>	Verified pressure (30 – 80 psig)
<input type="checkbox"/>	Water source of 10 l/min (2.6 gpm)
<input type="checkbox"/>	Leak tested
<input type="checkbox"/>	½” dia. At max 4ft of the unit

Drain Lines

<input type="checkbox"/>	Air gap located within 3ft of the unit
<input type="checkbox"/>	Minimum drain line size of 1” in dia.
<input type="checkbox"/>	Downward slope
<input type="checkbox"/>	Tundish (funnel) installed to provide air gap
<input type="checkbox"/>	Temperature rating of piping
<input type="checkbox"/>	Hose connections tightened
<input type="checkbox"/>	Auxiliary drain piped with shut off valve to tundish

Water Quality

<input type="checkbox"/>	Well water
<input type="checkbox"/>	City water
<input type="checkbox"/>	Softened water
<input type="checkbox"/>	RO/DI water
<input type="checkbox"/>	Conductivity: _____mhmos
<input type="checkbox"/>	Hardness: _____GPG
<input type="checkbox"/>	Silica _____ppm
<input type="checkbox"/>	Chlorides: _____ppm
<input type="checkbox"/>	pH: _____

NOTE: Failure due to chloride corrosion is not covered under Condair’s standard warranty ifchloride concentration is allowed to reach elevated levels in the tank. Consult factory formore information.

Electrical Installation

<input type="checkbox"/>	Comply with local regulations
<input type="checkbox"/>	Proper supply voltage (must match rating plate) and breaker size
<input type="checkbox"/>	Electrical disconnect switch close to humidifier
<input type="checkbox"/>	Cables properly affixed
<input type="checkbox"/>	Low voltage wiring & control signal(s) wired to correct terminals
<input type="checkbox"/>	Humidifier configured for correct control signal(s)

Type Of Controls Installed / Location Wiring / Setting

<input type="checkbox"/>	High Limit _____
<input type="checkbox"/>	Air Proving _____
<input type="checkbox"/>	Modulation Control _____
<input type="checkbox"/>	On/Off Control _____
<input type="checkbox"/>	Controls by Condair _____
<input type="checkbox"/>	Controls by Others _____

Scale Management

General

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 with a blowdown of 25%. This setting ensures that scale build-up will be minimized for all water conditions.

Once the water conditions are known, the blowdown rate can be adjusted by software.

Another effective means of controlling the amount of scale in the tank is with the use of the Full Tank Blowdown (FTBD) built into the software. When this feature is activated, the drain pump will be energized to drain the entire contents of the tank and then the tank will be refilled with fresh water, thus keeping the amount of total dissolved solids to a minimum. The feature can be programmed in the software to occur after a specific amount of operating time and can also be triggered by a signal sent to the humidifier from a building management system.

Water Quality

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.



Figure 30: Site Water Test Kit P/N 1507214

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 or order the CONDAIR water test kit.

NOTE: Water quality conditions resulting in component failures are not covered under CONDAIR’s standard warranty.

Silica Test: Measured in ppm (parts per million) Follow the directions with the kit. A high reading will decrease the performance of your system. The recommended operating range for silica is 0 ppm to 14 ppm. Note: A high silica content along with a high hardness content may increase the service intervals of the system. Consult the factory if this condition exists at the site.

Hardness: Measured in gpg (grains per gallon). Follow the instructions on each individually wrapped test strip and use the colour chart provided. The recommended operating range for hardness is 0 gpg to 12 gpg. Note: High hardness along with high silica may increase the service intervals of the system. Consult the factory if this condition exists at the site.

pH: Follow the directions on the test strip bottle. The recommended operating range for pH is 6.5 to 7.5 on the colour scale. Consult the factory if outside these parameters.

Chlorides: Measured in ppm (parts per million). Follow the directions on the test strip bottle. The recommended level for chlorides is not to exceed 40 ppm.

NOTE: Failure due to chloride corrosion is not covered under Condair’s standard warranty if chloride concentration is allowed to reach elevated levels in the tank. Consult factory for more information.

High levels of chlorides will attack stainless steel. Consult the factory for additional information if your water contains high levels of chlorides.

Conductivity: Measured in micromhos. Follow the directions for the conductivity pen found inside the box. Multiply the digital reading by 1.5. The recommended operating range for conductivity is 0 - 1500 micromhos. Consult the factory if you measure outside these parameters.

Table 8: Water Quality Ranges

Technology	Water / Type	Water Cond. Range	Hardness Range	Silica Range	Alkaline Range	Chlor. Range
Gas-fired		Micromhos	GPG	PPM	pH	PPM
	Potable	0-1500	0-12	0-14	6.5-7.5	0-40
	Treated	0-100	0-1	0-1	7-7.5	0-40

Condair recommends performing a semi-annual water analysis to ensure optimal performance.

The humidifier is intended to operate on cold potable tap water.

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.

Consider using a water softener. Longer operating times between tank cleaning will be reached on softened water.

Reverse osmosis (RO) water can provide very long times before cleaning is required since it is cleaner than softened water. Deionized (DI) water may be used with all models. Consult your Condair representative for quote on a water treatment system.

Safety Instructions

Refer to pages 1 and 2 of this guide, as well as all other marked safety instructions.

Fault Conditions

General

This appliance is equipped with a self-diagnostic ignition module which identifies a fault code when it occurs. Refer to the fault & warning list.

GSTC Models

Faults are indicated with a fault message on the display of GSTC models. 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 logic control board mounted inside the electrical cabinet.

A history of all faults is stored in memory of the software and can be viewed through the service level on the display. Refer to the keypad display menu structure at the end of the manual.

Maintenance

General

To ensure proper performance and long operating life of the GS humidifier, it is recommended that the appliance and installation be inspected at least once a year by a qualified service person. A proper maintenance schedule should be followed. Since the amount and type of maintenance required is generally as a result of how much the humidifier operates, all GS humidifiers monitor the amount of steam produced over time and will indicate when service is required. All units come factory set with a service interval of 500 hours. This service interval can be adjusted through software.

All maintenance work must be performed by experienced and trained personnel.

Periodic cleaning of the screens in the vent terminal (where applicable) is recommended.

NOTE: Use only CONDAIR original parts to replace damaged or defective components. Failure to do so may cause improper operation of the humidifier and will void warranty.

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”. The GSTC has an automatic drain after 3 days without demand, which can be disabled in the software.

Do not remove the front clean out port on the tank until the unit has completely drained. On GS 300-600 units do not remove the top clean out ports on the tank unless the water has cooled or the unit has completely drained.

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

The GSTC model of the Gas Steam humidifier includes a pre-cleaning sequence feature. When activated (through the keypad), the unit will flush the humidifier, refill with cold water, and flush again reducing the scale accumulated at the bottom of the tank.

Taking Out Of Operation

If it is required that the humidifier be taken out of operation (e.g. for service or end of season shut-down), proceed as follows:

If the unit is firing, remove the demand signal or open the security loop, allowing the burners to shut off and the blowers to perform a post purge of the heat exchangers before shutting off.

Switch the main power switch from On to Off and then to the Drain position. The drain pump will be energized and the tank will begin to drain.

Once the tank has completely emptied shut off the drain switch.

Close the shut-off valve in the gas supply line.

Close the shut-off valve in the water supply line.

Isolate the humidifier from the electrical power supply at the main disconnect switch.

Table 9: Mandatory Maintenance Schedule

Parts	30-days after initial start-up	Mid	End of Season (2000 hours)	What needs to be done?	
				Regular Maintenance	Preventive Maintenance
Hot Surface Ignitor			X	Check for continuity. Recommend replacement.	Replace hot surface igniter and flame sensor with replacement kit.
Flame Sensor			X	Check that Flame Sensor is straight. Recommend replacement.	
				Clean sensor with fine steel wool. Recommend replacement.	
Gas Burner			X	Remove from the unit and clean with compressed air from outside matting.	
				NOTE: It is recommended to replace the burner gasket each time a burner is removed.	
Drain Lines			X	Switch to drain and make sure water flows freely.	
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.
Magnesium Anode			x	Check for severe corrosion or scale build up on anode. Replace or scrape off scale if necessary.	
Float Chamber	X	X	X	Ensure floats move freely.	Clean scale from float chamber and hose connecting to it.
Fill Lines	X	X	X	Adjust blow down time when required. Check that scale has not accumulated above 2".	
Drain Lines	X	X	X	Clean tank when required.	
Gas Venting	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.	

Cleaning the Steel Tank

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



General

It is recommended that the tank 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).

Cleaning of the humidifier is mandatory and must be performed on a regular basis.

To reduce cleaning time, use the pre-cleaning sequence on the GSTC model to help evacuate mineral debris from the unit. Check the controller operation to activate this feature.

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. The combustion end block will have scale build up, as will the heat transfer tubes. These surfaces must be cleaned at regular intervals.

Frontal port cleaning will be done through the front door of the unit. Remove cabinet door on the left of the LCD display using a Philips screwdriver. Remove the side tank port opening, by removing the 3/16 nuts (1/2" key or socket is needed). When removed, check the magnesium anode on the inside of the clean out port for severe corrosion or scale build up. Replace or clean the anode as necessary. Do not use chemicals to clean the anode, scrape off scale only.

Warning: Do not clean the magnesium anode using any chemicals – the anode can react with acids to create flammable hydrogen gas.



Additional clean out ports are available on the top of the 300/400 and 500/600 lb/h tanks. To access these ports, remove the top cabinet panel using a Phillips screwdriver. Remove the top clean out ports by removing the nuts.

Removal of the heat exchanger(s) is not necessary to clean the inside of the tank.

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 heat exchanger 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 exchanger, do not use any harsh cleaning chemicals. Please consult CONDAIR 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 CONDAIR for proper procedure.

Reassemble the drain and blowdown if they were removed. Re-install tank top and side lids making sure tank cover gasket is intact. Do not over tighten hold down nuts. If using a torque wrench do not exceed 50 in/lb (5 ft/lb). Re-seal all cabinet lids.

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.

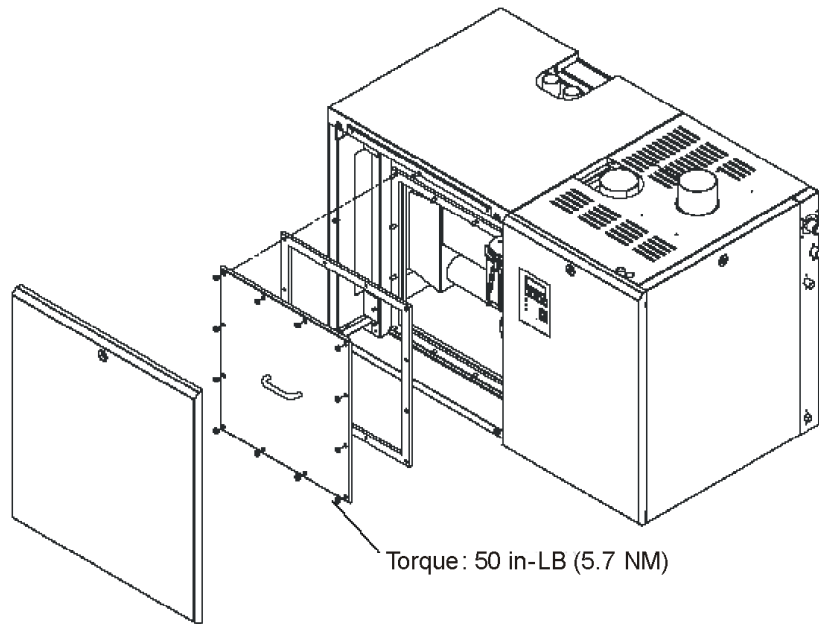


Figure 31: Cleaning Tank Access

Servicing the Unit

General

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

Warning: Disconnect power before servicing this appliance.

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



Service Checks

Combustion Blower

The combustion air blower motors are permanently lubricated and do not require lubrication. Clean out any dust that has accumulated in the blower housing using an air gun.

Burner

The combustion air blower motors are permanently lubricated and do not require lubrication. Clean out any dust that has accumulated in the blower housing using an air gun.

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 a 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. 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; Ensure that the power and gas is switched off before servicing.

To test the igniter, disconnect the igniter leads from their terminal connections. 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. The 110 V models should read 30-300 Ohms, and the 208-240 V model should read 300-1300 Ohms.

Gas Valve Setting

The gas valves used in the GS 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.

The valves come preset from the factory for the correct gas type. If an adjustment is required, use the following steps:

Remove the screw from the pressure port marked "out" on the back side of the gas valve.

Connect a hose from a digital manometer (or an inclined manometer capable of reading below 0.1" w.c.) to the "out" pressure port.

Activate the humidifier and measure the gas valve pressure once the valve is energized and a flame is established in the combustion chamber. Verify this pressure to the pressure listed on the unit specification label. If the pressure needs adjusting, remove the locking cap on the top of the gas valve.

Below the locking cap is an adjustment screw. Increase the pressure by turning the adjustment screw clockwise, decrease by turning counter-clockwise.

NOTE: The pressure will fluctuate slightly as the unit operates, especially with very sensitive measuring devices. Use the mean pressure value as the set pressure.

Once the pressure has been adjusted, replace the locking cap. Replace the screw in the "out" pressure port and tighten firmly.

Component Replacement

Consult factory prior to the replacement of any component.

All service work must be performed by experienced and trained personnel.

Only use original CONDAIR spare parts to replace defective components. Damage caused by non-approved parts is not covered under CONDAIR's standard warranty.

Hot surface igniter and flame sensor replacement

Shut off electrical power and gas supply to the humidifier.

Remove the right side service access door.

Disconnect all wiring to the igniter and flame sensor.

Unscrew the fixing nuts for the igniter and flame sensor. Carefully remove the igniter and flame sensor.

Reverse the sequence above to install the new igniter and flame sensor. Always install a new gasket when replacing the flame sensor and igniter.

CAUTION: The silicon carbide igniter is breakable. Handle with great care to avoid damage.

Burner Removal and Installation

Shut off electrical power and gas supply to the humidifier.

Remove the right side service access door.

Disconnect all wiring to the combustion blower, gas valve, air proving switch, igniter and flame sensor (note the connector assignment).

Undo the union on the flexible gas hose and disconnect the gas hose from the gas valve.

Undo the 4 nuts on the blower outlet and remove blower, leaving the gas valve/air inlet assembly and the fan-board mounting bracket (if present) mounted to the blower.

Undo the 4 large nuts that secure the burner mounting plate to the face of the heat exchanger and carefully remove the burner assembly. Handle the burner only by the metal surfaces. Do not grip the burner material as grease, dust or dirt can affect the performance of the burner.

Reverse the sequence above to re-install the burner after cleaning or, if necessary, replace with a new burner. Inspect and replace any gaskets that may be damaged. Tighten the 4 brass nuts of burner mounting plate to a torque of 95 in-lb.

Leak test the gas train before re-commissioning the humidifier.

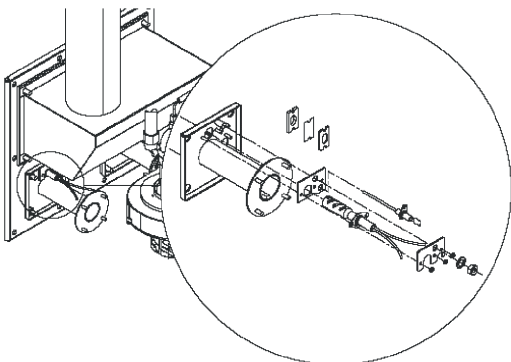


Figure 32: Flame Sensor and Igniter Assembly

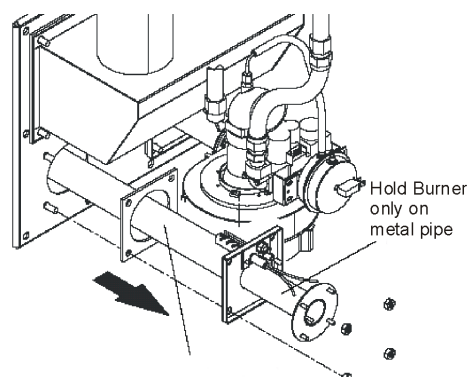


Figure 33: Burner Assembly

Removal and Installation Of The Combustion Blower

Shut off electrical power and gas supply to the humidifier.

Remove the right side service access door.

Disconnect all wiring to the combustion blower, gas valve and air proving switch (note the connector assignment).

Undo the coupling on the flexible gas hose and disconnect the gas hose from the gas valve.

Undo the 2 screws that mount the gas valve/air inlet assembly to the blower and remove the assembly.

Undo the 2 screws of the fan-board mounting bracket (if present) and remove bracket, leaving electronic board and igniter jump start module(s) attached.

Undo the 4 nuts on the blower outlet and remove blower.

Reverse the sequence above to install the new combustion blower. Inspect and replace any gaskets that may be damaged. When mounting the gas valve/air inlet assembly to the combustion blower, ensure that the cork gasket is properly oriented or gas flow through the valve will be impeded.

Leak test the gas train before re-commissioning the humidifier.

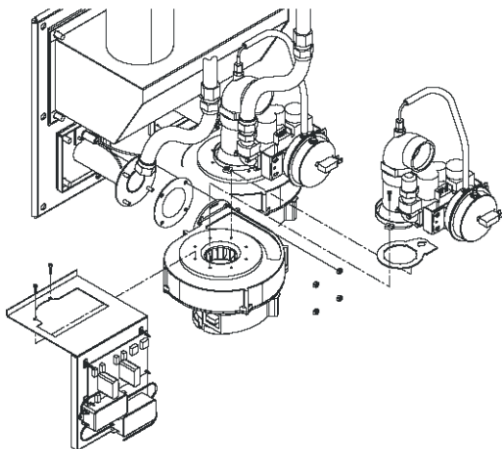


Figure 34: Combustion Blower Replacement

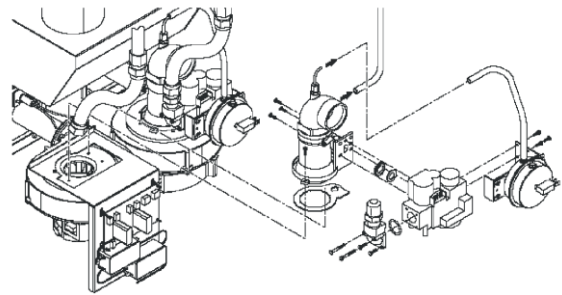


Figure 35: Gas Valve Replacement

Gas Valve Replacement

Shut off electrical power and gas supply to the humidifier.

Remove the right side service access door.

Disconnect all wiring to the gas valve and air proving switch (note the connector assignment).

Undo the coupling on the flexible gas hose and disconnect the gas hose from the gas valve.

Remove the hoses from the air proving switch (note the connection layout).

Undo the 2 screws that mount the gas valve/air inlet assembly to the blower and remove the assembly.

Undo the 4 screws and remove the gas pipe connection from the inlet of the gas pressure regulating valve.

Undo the 3 screws that hold the air inlet venturi to the gas valve. Remove the rubber grommet and brass orifice mounted in the outlet of the gas valve.

Undo the 3 screws of the pressure switch support bracket and remove the assembly from the gas valve.

Reverse the sequence above to install the new gas pressure regulating valve. Inspect and replace any gaskets that may be damaged. When mounting the gas valve/air inlet assembly to the combustion blower, ensure that the cork gasket is properly oriented or gas flow through the valve will be impeded.

Leak test the gas train before re-commissioning the humidifier.

Air Switch Replacement

Shut off electrical power to the appliance.

Remove right side service panel.

Remove wiring connections to switch.

Remove pressure hose(s) from switch noting proper location.

Remove screws (2) holding the switch.

Reverse above procedure to re-install.

Float Chamber Replacement

Drain the contents of the tank and then shut off electrical power and water supply to the humidifier.

Remove the left front service access door.

Remove the cable connection to the float board.

Remove the hose clamps on the float chamber and remove all hoses (note the correct hose assignment).

Squeeze both sides of the mounting bracket to release it from the slots in the support bracket behind the float chamber.

Reverse the above sequence to install the new module.

Leak test all water connections before re-commissioning the humidifier.

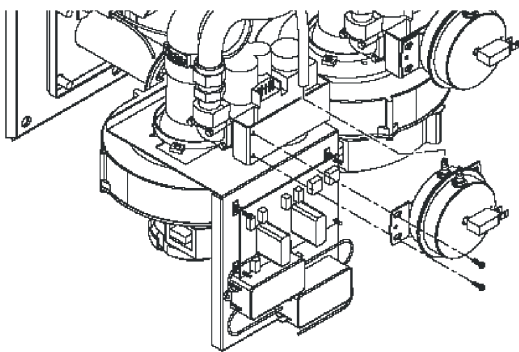


Figure 36: Air Switch Replacement

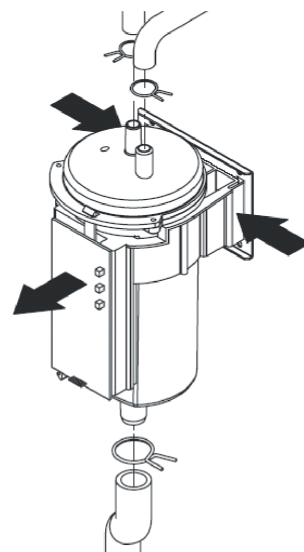


Figure 37: Float Chamber Replacement

Ignition Module Replacement

Shut off electrical power to the humidifier.

Remove the front electrical access door.

Disconnect all wiring connections to the ignition module, labeling as required.

Remove the 2 screws securing the ignition module and remove.

Reverse the above sequence to install the new module.

Transformer Replacement

Shut off electrical power to the appliance.

Remove front access door.

Disconnect wiring connections from transformer leads labeling as required.

Remove screws (2) holding transformer.

Reverse above procedure to re-install.

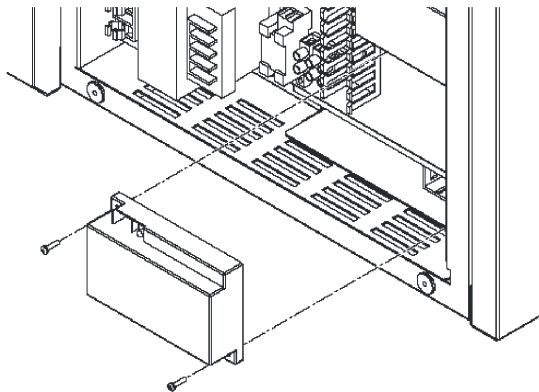


Figure 38: Ignition Module Assembly

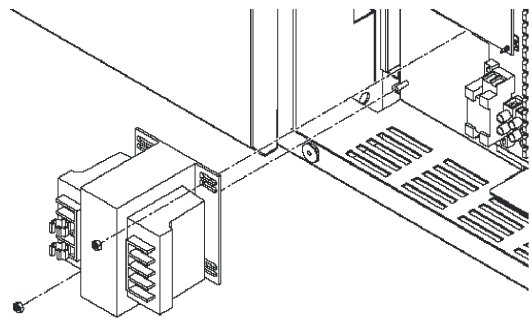


Figure 39: Transformer Assembly

Fill Valve Replacement

Shut off electrical power and water supply to the humidifier.

Remove the right side service access door.

Remove all wiring connections to the fill valve.

Remove the hose clamps on the fill valve outlets and remove hoses (note the correct hose assignment).

Remove the 2 screws securing the fill valve to the cabinet and remove the valve.

Reverse the above sequence to install the new module. Leak test all water connections before re-commissioning the humidifier.

Anode Replacement

Follow the steps in Cleaning the Steam Tank on page 46 to remove the clean-out port.

Lift the corroded anode off the steel rod. Replace with a new anode.

Re-attach the clean-out port.

Drain Pump Replacement

Drain the unit completely. If the pump is broken use the auxiliary drain out port.

Shut off electrical power to the appliance.

Remove front and right doors.

Remove wiring connections to the pump.

Remove hoses attached to the pump.

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.

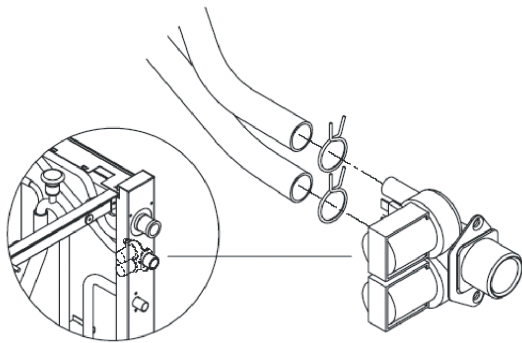


Figure 40: Fill Valve Replacement

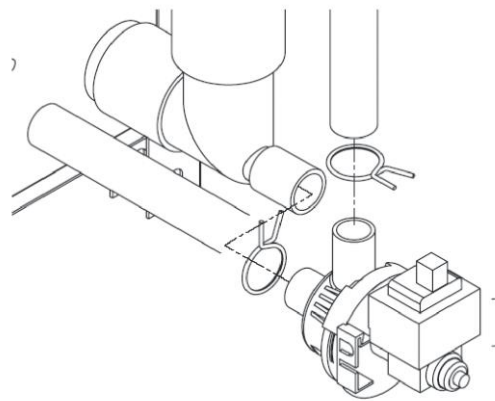


Figure 41: Drain Pump Assembly

Fill Box Replacement

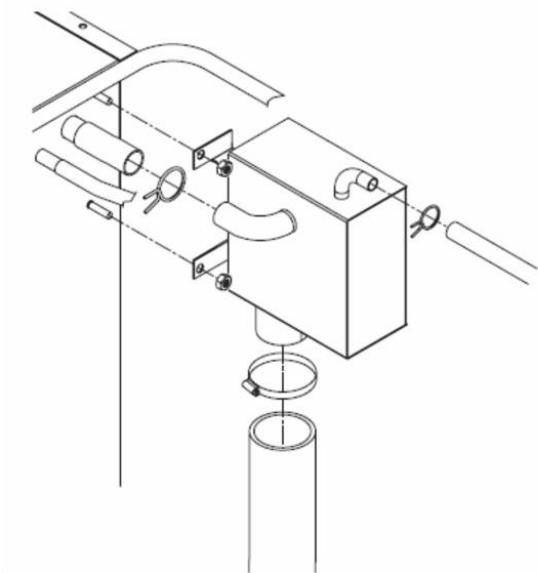


Figure 42: Fill Box Replacement

Take the humidifier out of operation.

Undo the screw (Phillips screwdriver) and remove the right side panel.

Remove hose clamps on the fill box connections and pull off the hoses.

Undo the two nuts securing the fill box to the face of the tank, then remove the fill box.

Re-installation is carried out in the reverse sequence. Make sure the hoses are correctly secured with the hose clamps.

Removal of the Heat Exchanger

Take the humidifier out of operation.

Disconnect the gas supply pipe from the connection on the humidifier and close off the pipe.

Unlock and remove the right side panel(s).

On Direct Vent units only: Remove hoses from air intake manifold and air inlet elbows.

Dismount flue gas pipe at the flue gas outlet connection.

On Direct Vent units only: Dismount air supply pipe at the air supply connection.

Unlock and remove the left and the right top panels.

Free all cable connections to the components (combustion blower, ignition module, air pressure switch, etc.) of the respective heat exchanger.

IMPORTANT: Note the connector assignment.

Undo the coupling of the respective flexible gas pipe and remove the flexible gas pipe.

Dismount the burner with the air blower and the gas pressure regulating valve of the respective heat exchanger.

Unscrew the nuts and remove the flue gas manifold from the tank.

Unscrew the nuts on the heat exchanger and pull out the heat exchanger from the tank.

Re-installation is carried out in the reverse sequence. Replace all seals with new ones.

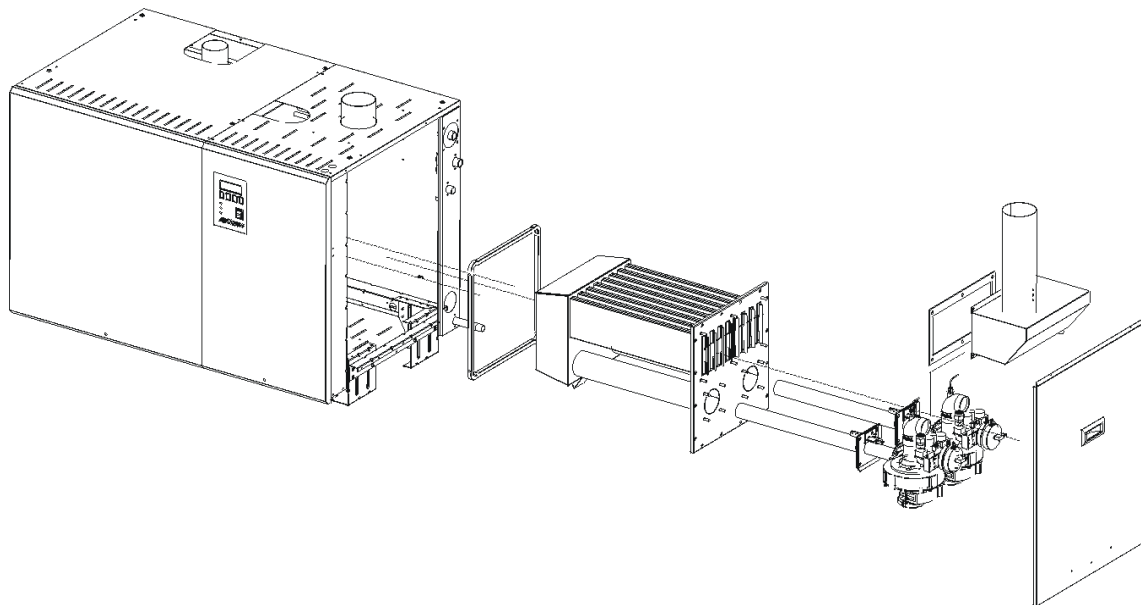


Figure 43: Heat Exchanger Assembly

Key Pad

GSTC Total Controller Flow Chart

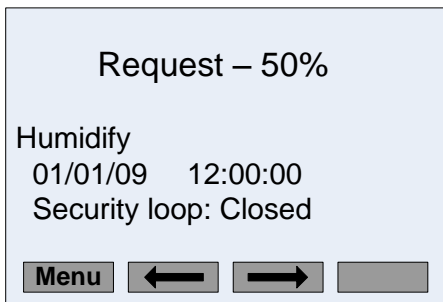
Total Controller

Upon start up, the LCD display will illuminate, the humidifier will start filling and the software will perform a float chamber level check. After the system test, the humidifier will enter normal operation mode and wait for a demand signal. See troubleshooting section for corrective action if error is detected and displayed during start up.

Note: The displayed parameters depend on the configuration of the GSTC and the operation conditions; the display may vary from the following screenshots.

Information Level

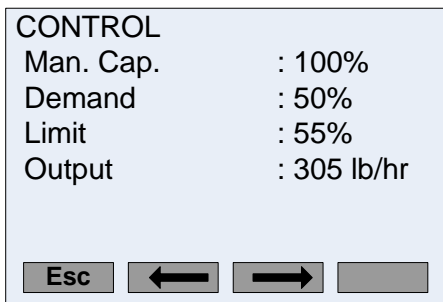
Pressing the right and left arrow keys of the Total Controller displays the current humidifier setting screens. NO changes can be made to the settings at this level. Access the User Level to change the parameters displayed.



Main Screen

The Total Controller main screen displays general information including the current demand, the status of the humidifier, the status of the security loop, the current date and current time.

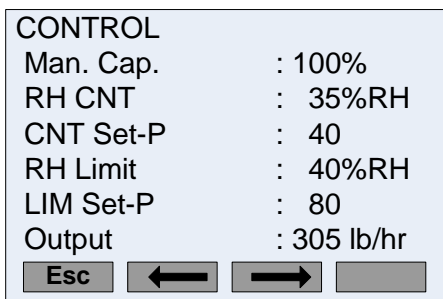
NOTE: If a warning is displayed, press the “?” button to display the troubleshooting information.



Control Information (Humidistat/BMS Control)

Displays the limited manual capacity, the current demand from the controller to the humidifier and the current output.

NOTE: If the humidifier is set to dual channel, the demand of the high limit humidistat will be displayed next to Limit.



Control Information (Humidity Sensor Control)

Displays the limited manual capacity, the current space relative humidity and the relative humidity set point. The current output of the unit is displayed at the bottom of the screen.

NOTE: If the humidifier is set to dual channel, the limiting humidity sensor’s measured RH and the desired set point is also displayed.

HUMIDIFIER

Model : GSTC 600
 Capacity : 600 lb/hr
 Multi Mode : StandAlone
 REG Mode : Demand
 Software V : 1.07

Esc ← →

Humidifier Information

Displays humidifier information and settings, including the model name and output, the control signal type and the software version.

NOTE: The Multi Mode indicates if the humidifier is operating alone (StandAlone) or if is linked to other units (Master or Slave). The REG mode indicates the control type, either humidistat (Demand) or Transducer (RH).

BURNERS

Burners : 6
 Active : 4
 Capacity : 600 lb/hr
 Total O/P : 305 lb/hr
 Lead : 1
 Disabled : ----X

Esc ← →

Burner Information

Displays burner information. The lead burner is the first burner to ignite for the present cycle. If burners are disabled, they will be denoted by an X.

NOTE: In this view, burner 6 is disabled (denoted by X).

TANK STATUS

Fill Valve : Off
 Drain Pump : Off
 Float Level : 5
 Run Time : 12 hr
 Serv. Time : 500hr
 Serv. Due : 425hr

Esc ← →

Tank Status

Displays information about the tank, operating time and service time. The run time is the total operating time. The service time indicates the fixed service interval length. The service due time is the time remaining until service is required.

NOTE: The service interval can be set in the Service Level.

SENSOR INPUTS

Sec. Loop : Closed
 OT Sensors : Closed
 Tank Temp : Closed

Esc ← →

Sensor Status

The SENSOR INPUTS screen displays the current status of the Security Loop, the Over Temperature Sensors and the Tank Temperature Sensor.

NOTE: The Security Loop and the Over Temperature Sensors must be Closed for the humidifier to operate.

FEATURES LIST

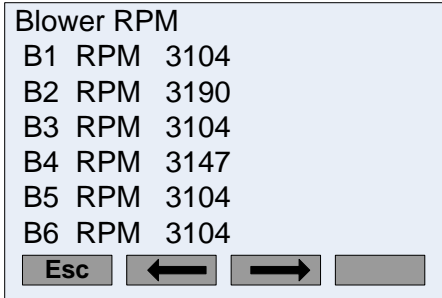
Idle Mode : Idle Drain
 FTBD : On
 Time Prop. : On
 BD rate : 25
 Drain Cool : Smart
 Float Ck : On

Esc ← →

Features Information

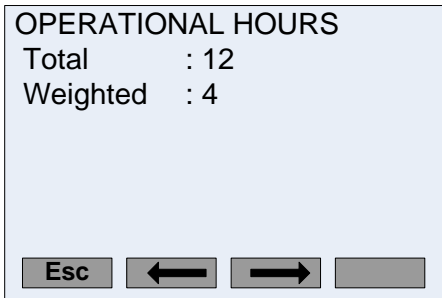
Displays information of the User Settings including the idle mode, the Full Tank Blow Down status, the Time Proportioning status, the Blow Down rate percentage, the Drain Cool mode and the Float Check status.

NOTE: See User Defined Settings to change these parameters.



Blower RPM Information

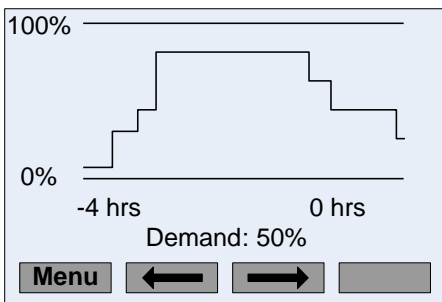
The Blower RPM screen displays the current RPM of each blower.



Operational Hours Information

Displays the total operation hours and the weighted hours. The weighted hours is calculated based on percentage of the output of the unit.

NOTE: If the unit operates for 2 hours at 50% output, the resulting weighted hour is 1 hour.

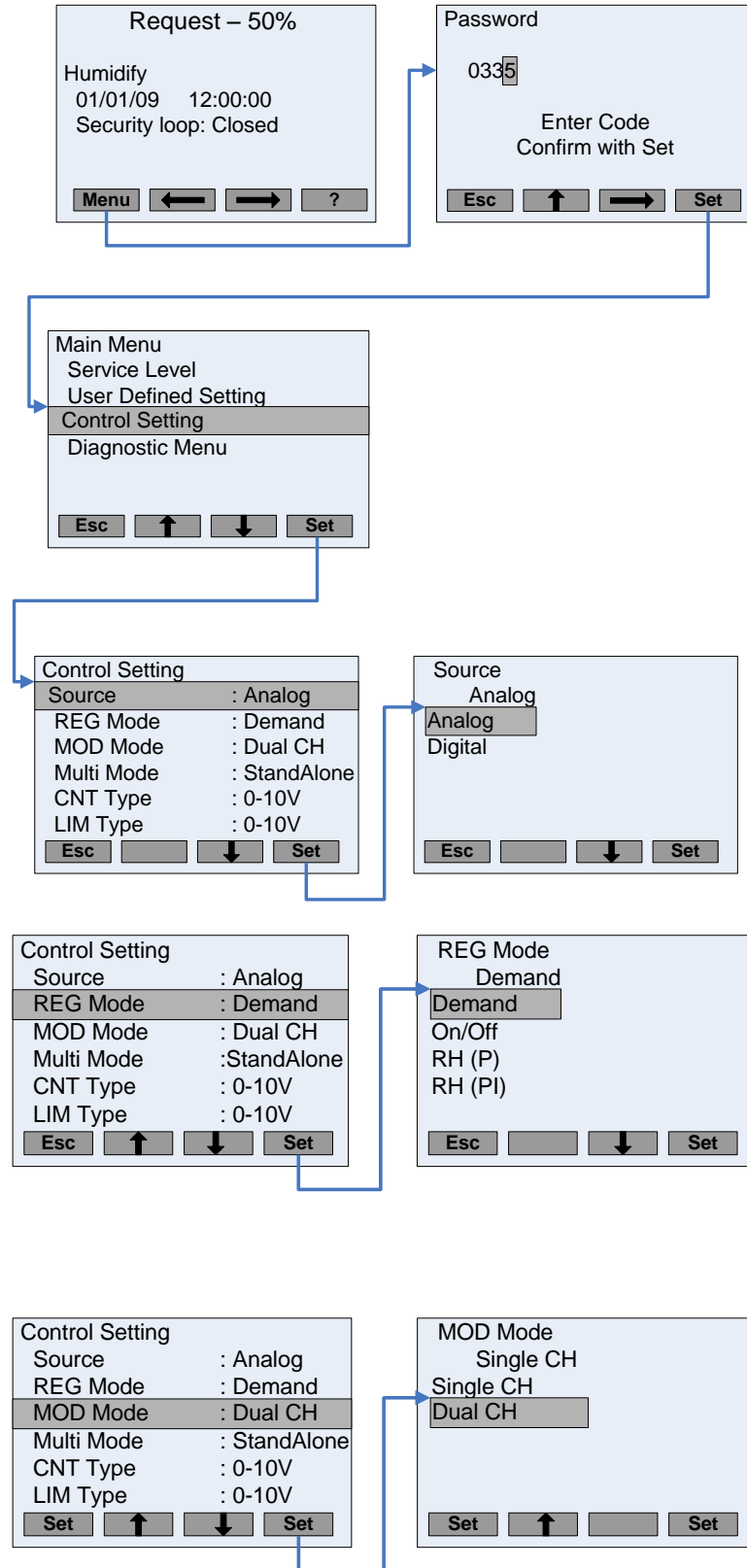


Humidity Demand Trend

This screen displays the humidity output over the past 4 hours. The current demand is also displayed numerically at the bottom of the screen.

User Level

Control Settings



Enter Password

Press the “Menu” button from any status screen.

Enter the user level code **0335** using the UP arrow key to change the numbers. The RIGHT arrow key moves to the next digit.

Control Setting

The Control Setting menu allows the user to modify humidifier communication settings and limit the maximum capacity.

Source

Verify that the control signal matches the control type.

Typically, **analog** signals are sent from a humidistat and are 0-10VDC or 0-20mA.

Digital signals are sent through a network connection.

REG Mode

Corresponds to the type of control used.

Demand: Modulating control (Humidistat or BMS) signal range usually 0-10VDC or 0-20mA.

On/Off : On/Off space controllers.

RH(P) and RH(PI): Humidity sensors, generally signals between 2-10VDC and 4-20mA.

MOD Mode

Configures the humidifier to operate with a Single Channel (control only) or Dual Channel (control and high limit).

NOTE: In Dual Channel MOD Mode, a second Limiting control signal is required.

Control Setting	
REG Mode	: Demand
MOD Mode	: Single CH
Multi Mode	: StandAlone
CNT Type	: 0-10V
LIM Type	: 0-10V
Short CD	: On
Set ↑ ↓ Set	

Multi Mode	
StandAlone	
Master	
Slave	
Set ↑ ↓ Set	

Multi Mode

Sets the humidifier to either independent operation (StandAlone) or linked operation (Master or Slave).

NOTE: If Master or Slave is selected see Multi Unit Op. Range Settings, displayed after the Manual Capacity.

Control Setting	
MOD Mode	: Dual CH
Multi Mode	: StandAlone
CNT Type	: 0-10V
LIM Type	: 0-10V
Short CD	: On
Short CD T	: 300
Esc ↑ ↓ Set	

CNT Type	
0-10 V	
0-5 V	
1-5 V	
0-10 V	
2-10 V	
0-16 V	
3.2-16 V	
0-20 mA	
4-20 mA	
Esc ↑ ↓ Set	

CNT Type

Configures the voltage or amperage range of the control signal. Verify that the signal matches the controller (humidistat, transducer or network connection).

Control Setting	
Multi Mode	: StandAlone
CNT Type	: 0-10V
LIM Type	: 0-10V
Short CD	: On
Short CD T	: 300
Time Prop.	: On
Esc ↑ ↓ Set	

LIM Type	
0-10 V	
0-5 V	
1-5 V	
0-10 V	
2-10 V	
0-16 V	
3.2-16 V	
0-20 mA	
4-20 mA	
Esc ↑ ↓ Set	

LIM Type

Configures the voltage or amperage range of the **high limit** control signal. Verify that the signal matches the high limit controller.

Control Setting	
CNT Type	: 0-10V
Lim Type	: 0-10V
Short CD	: On
Short CD T	: 300
Time Prop	: On
Manual Cap.	: 100
Esc ↑ ↓ Set	

Short Cycle Delay	
Off	
On	
Esc ↑ ↓ Set	

Short Cycle Delay

Prevents short cycling or frequent turning on and off of humidifier. When turned On, unit continues to operate for set period of time after demand is met.

NOTE: When Short CD is turned On, time must be specified. See Short CD T.

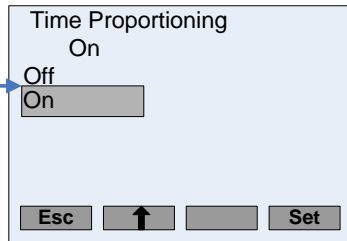
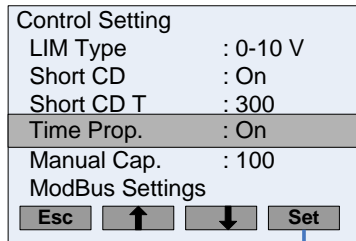
Control Setting	
LIM Type	: 0-10V
Short CD	: Off
Short CD T	: 300
Time Prop	: On
Manual Cap.	: 100
ModBus Settings	
Esc ↑ ↓ Set	

Short Cycle Delay Tm	
300 s	
300s	
Esc ↑ ↓ Set	

Short Cycle Delay Time

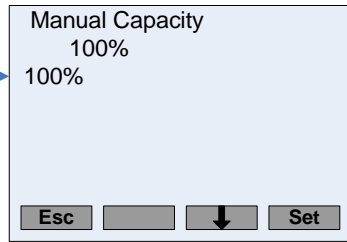
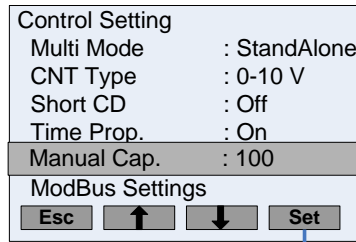
Time humidifier stays on after demand is satisfied.

NOTE: Short CD has to be turned On. See above.



Time Proportioning

Allows the humidifier to modulate at low demand.

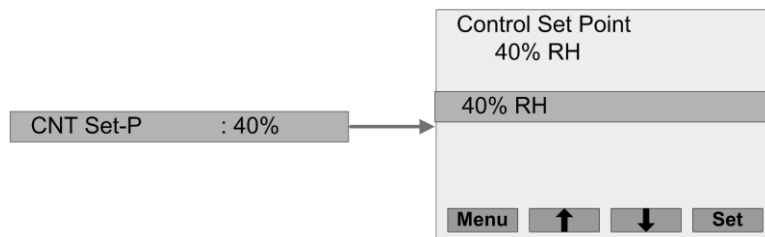
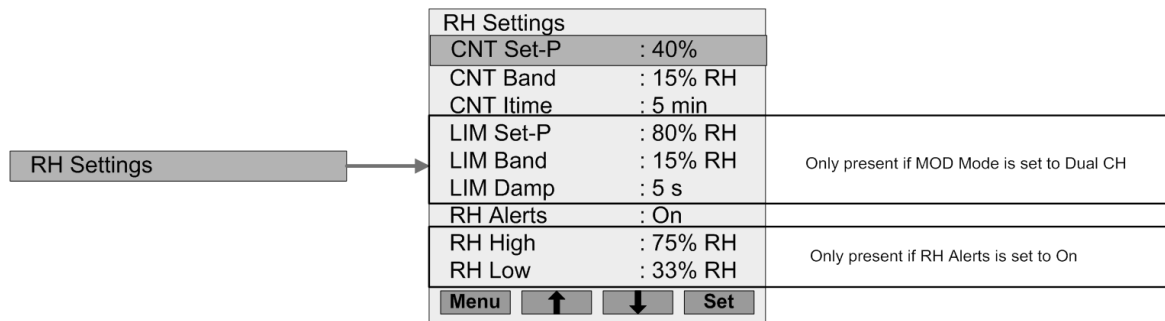


Manual Capacity

Allows the user to manually set the maximum output of the humidifier.

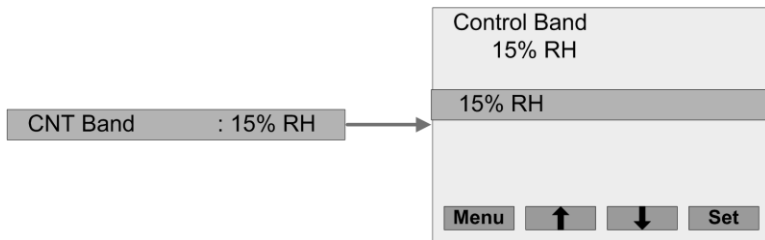
RH Settings

The **RH Settings** submenu is used to adjust setpoint, the proportional band, and the integral time if **REG Mode** is set to **RH (P)** or **RH (PI)** and the humidifier is connected to humidity sensors. Access the **RH Settings** submenu by pressing the menu key while **RH Settings** is highlighted in the **Control Settings** menu.



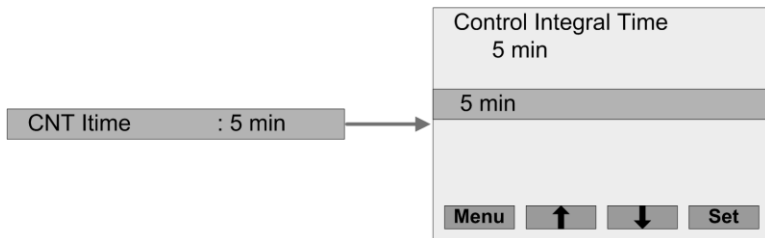
CNT Set-P

Sets the humidity setpoint value. The humidifier will attempt to maintain this humidity level in the space where the control transducer is installed.



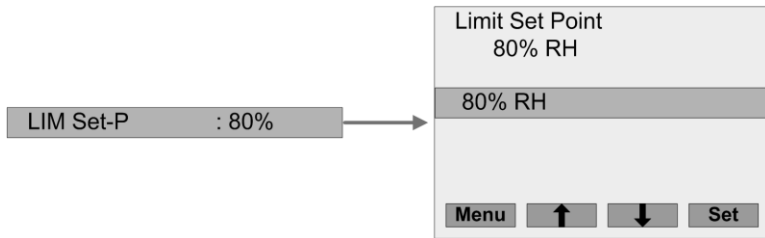
CNT Band

CNT Band should not normally be changed. The **CNT Band** setting adjusts the band within which the humidifier will modulate between 0 and 100% output. (Default = 15%)



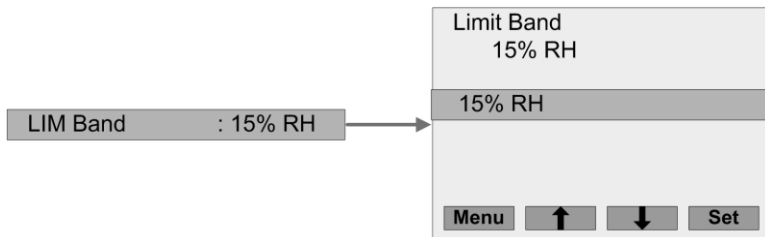
Int Time

Int Time should not normally be changed. **Int Time** adjusts the frequency at which the controller corrects for proportional control error. It is only displayed if REG Mode is set to RH (PI)



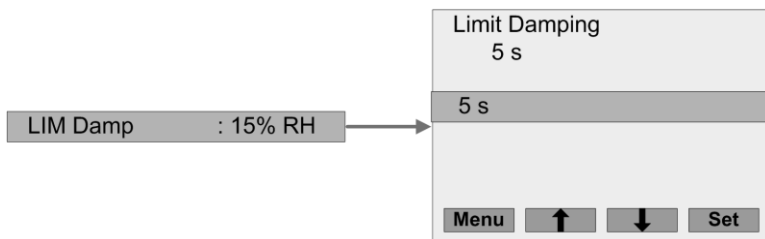
LIM Set-P

Sets the duct high limit setpoint value. As RH in the duct approaches the high limit the output of the humidifier will be throttled back to prevent wetting the duct. (Default = 80%)



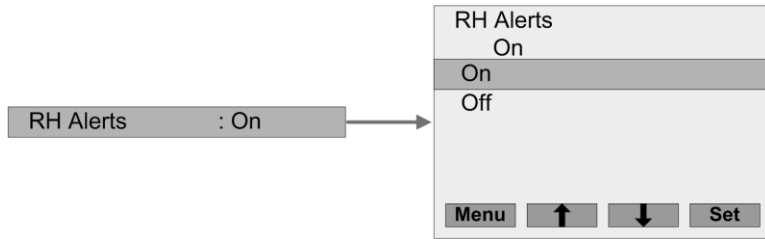
LIM Band

Should not normally be changed. The **LIM Band** setting adjusts the band within which the humidifier will throttle down the humidifier output from 100 to 0%. (Default = 15%)



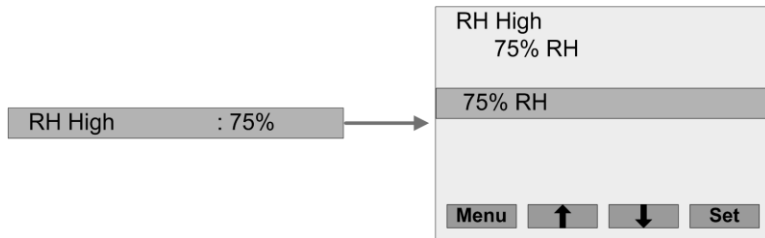
Limit Damping

Sets the number of seconds the sensed RH must exceed the limit band before output is throttled down. (Default = 5 s)



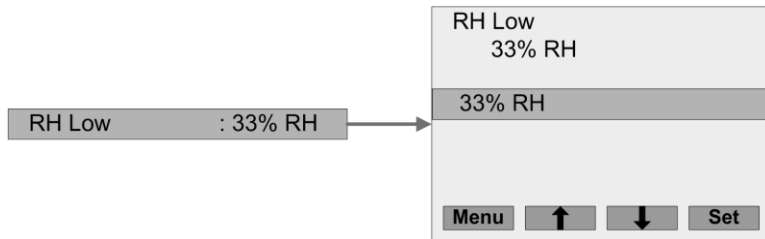
RH Alerts

Sets whether the humidifier will display warnings when humidity rises above or falls below configured limits. (Default = Off)



RH High

Sets the RH level above which the humidity must rise before a warning is generated. Warning is only generated if **RH Alerts** is set to on.



RH Low

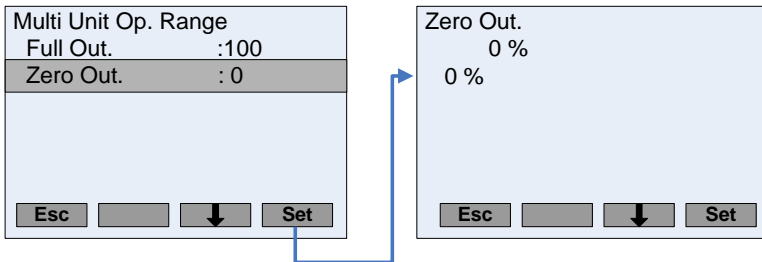
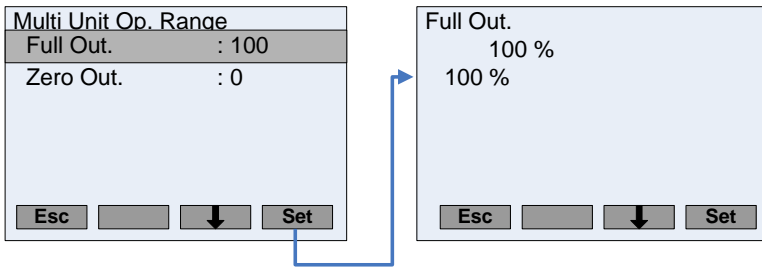
Sets the RH level below which the humidity must fall before a warning is generated . Warning is only generated if **RH Alerts** is set to on.

Control Settings - Multi Unit Operation Range

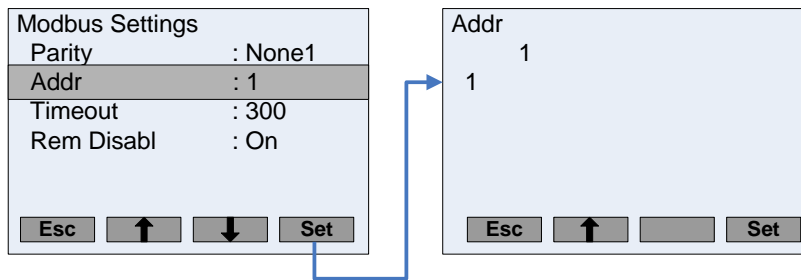
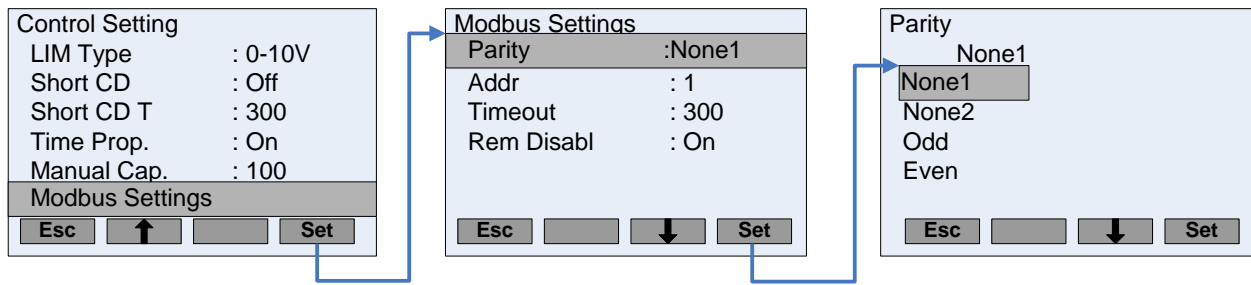
Control Setting			
Short CD	: Off		
Short CD T	: 300		
Time Prop.	: On		
Manual Cap.	: 100		
Multi Unit Op. Range			
ModBus Settings			
Esc	↑	↓	Set

Multi Unit Op. Range

Consult GSTC Networking 2-10 Units
Installation and Wiring Diagram
Instructions for configuration details.

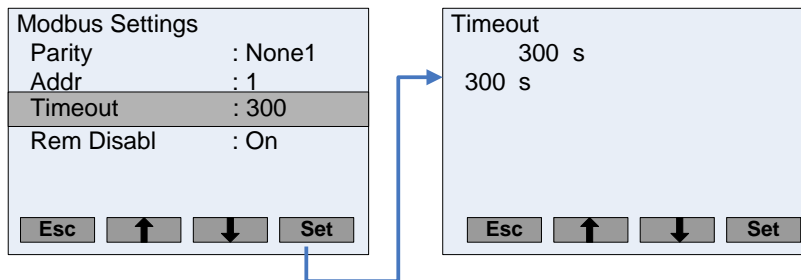


Control Settings - Modbus Settings



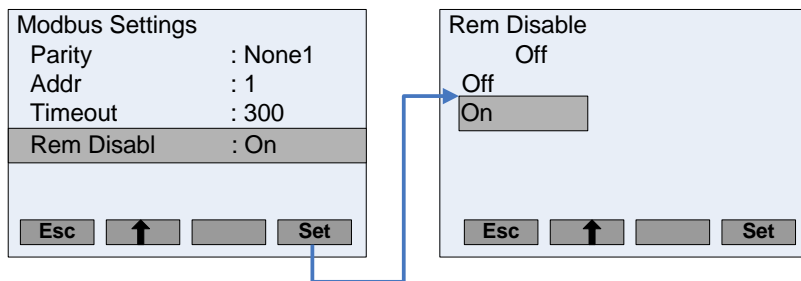
ModBus
Settings for network communication to BMS.

Parity
Error check for network communication.



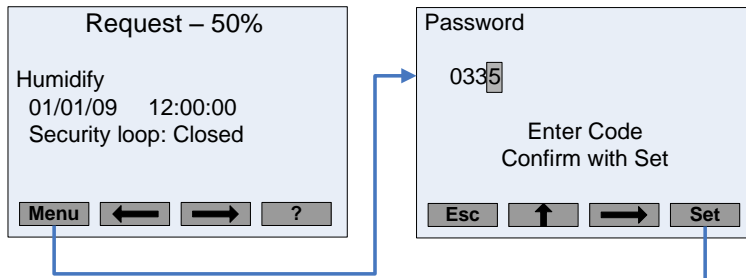
Address
Modbus Address

Timeout
Time to ModBus timeout in the absence of a digital demand signal.



Remote Disable
Allows unit to be disabled remotely through the network.

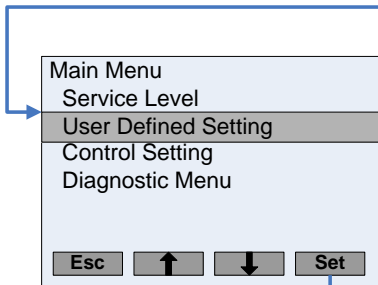
User Defined Settings



Enter Password

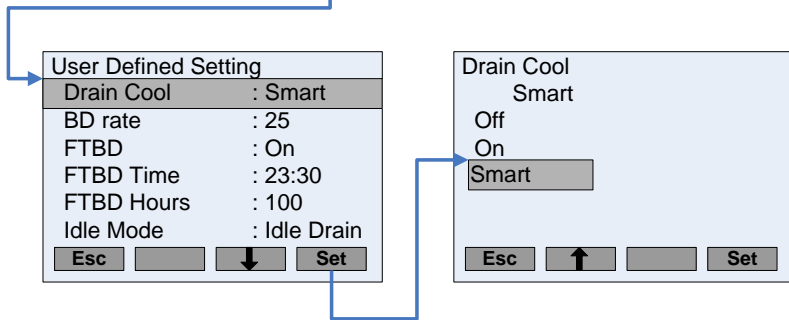
Press the "Menu" button from any status screen.

Enter the user level code **0335** using the UP arrow key to change the numbers. The RIGHT arrow key moves to the next digit.



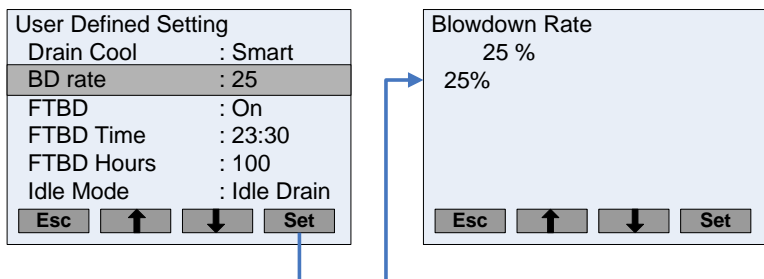
User Defined Settings

Allows the user to configure humidifier operation parameters.



Drain Cool

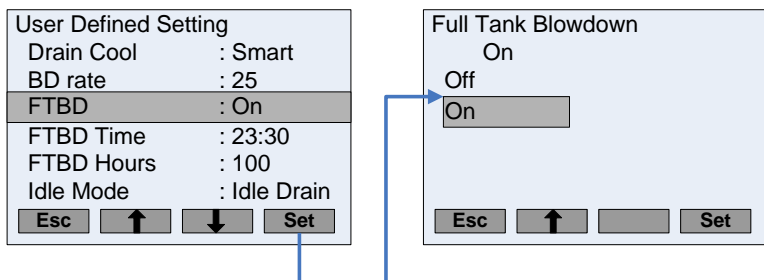
Configure drain tempering. Set to Smart for efficient drain water cooling.



Blowdown Rate

The blowdown rate adjusts the amount of water that is drained each hour. The percentage relates to the tank volume.

NOTE: Current setting: 25% of the tank each hour.



Full Tank Blow Down

The tank can be set to drain completely at a set time of day after a set interval of weighted hours.

NOTE: See FTBD Time to set time of day and FTBD Hours to set interval.

User Defined Setting	
BD rate	: 25
FTBD	: On
FTBD Time	: 23:30
FTBD Hours	: 100
Idle Mode	: Idle Drain
Idle Drain	: 72
Esc	↑ ↓ Set

FTBD Time	
Hour	: 23
Minute	: 30
Esc	↑ ↓ Set

Full Tank Blow Down Time
Set the desired time of day to completely drain the tank and refill.

NOTE: Since the FTBD interrupts humidifier operation, it is recommended to set time outside peak operation time.

User Defined Setting	
FTBD	: On
FTBD Time	: 23:30
FTBD Hours	: 100
Idle Mode	: Idle Drain
Idle Drain	: 72
Fill Corr	: 100
Esc	↑ ↓ Set

FTBD Hours	
100 h	
100 h	
Esc	↑ ↓ Set

Full Tank Blow Down Interval
Set the desired weighted time interval between FTBDs.

User Defined Setting	
FTBD Time	: 23:30
FTBD Hours	: 100
Idle Mode	: Idle Drain
Idle Drain	: 72
Fill Corr	: 100
Drain Corr	: 100
Esc	↑ ↓ Set

Idle Mode	
Idle Drain	
Idle Only	
Idle Drain	
Keep Warm	
Esc	↑ ↓ Set

Idle Mode
Configures humidifier operation when there is no call for humidity.

Idle Only: Humidifier is on standby.

Idle Drain: Humidifier drains after specified idling time (see Idle Drain).

Keep Warm: Water in tank is kept between 140-160°F (60 -70°C)

User Defined Setting	
Idle Mode	: Idle Drain
Idle Drain	: 72
Fill Corr	: 100
Drain Corr.	: 100
Float Ck	: 23:30
Date	: 01/01/09
Esc	↑ ↓ Set

Fill Correction	
100 %	
100 %	
Esc	↑ ↓ Set

Fill Correction
Adjust the fill on and fill off times. Values above 100% will increase the fill on time and values below 100% decrease fill on time.

User Defined Setting	
Idle Drain	: 72
Fill Corr.	: 100
Drain Corr	: 100
Float Ck	: 23:30
Date	: 01/01/09
Time	: 12:00:00
Esc	↑ ↓ Set

Drain Correction	
100 %	
100 %	
Esc	↑ ↓ Set

Drain Correction
Used to compensate for variation in drain pump flow rates. The drain correction adjusts the actual drain duration by drain time. Increasing drain correction increases drain duration and decreasing correction decreases drain time.

User Defined Setting	
Fill Corr.	: 100
Drain Corr.	: 100
Float Ck	: 23:30
Date	: 01/01/09
Time	: 12:00:00
Unit Steam	: lb/hr
Esc	↑ ↓ Set

Float Check	
Hour	: 23
Minutes	: 30
Status	: On
Esc	↓ Set

Float Check

Set the time of day the humidifier performs a test of the float chamber levels. The test can be turned On or Off.

NOTE: The Float Check does not interrupt humidifier operation and can be set at any time of day.

User Defined Setting	
Drain Corr.	: 100
Float Ck	: 23:30
Date	: 01/01/09
Time	: 12:00:00
Unit Steam	: lb/hr
Language	: English
Esc	↑ ↓ Set

Date	
Day	: 1
Month	: 1
Year	: 9
Esc	↓ Set

Date

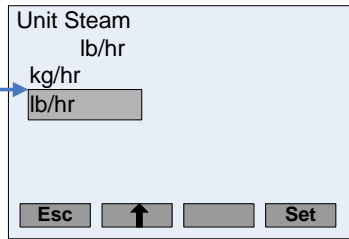
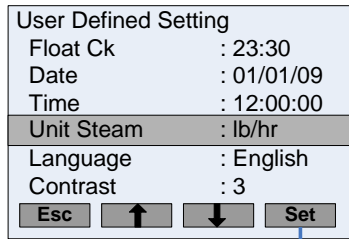
Set the current date displayed on the main screen. The date is factory set.

User Defined Setting	
Float Ck	: 23:30
Date	: 01/01/09
Time	: 12:00:00
Unit Steam	: lb/hr
Language	: English
Contrast	: 3
Esc	↑ ↓ Set

Time	
Hour	: 12
Minute	: 0
Esc	↓ Set

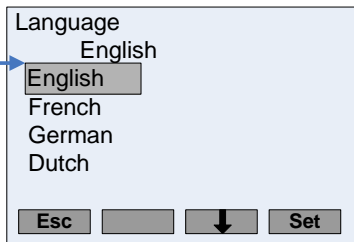
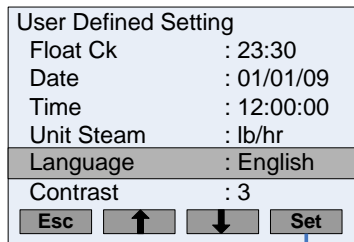
Time

Set the current time displayed on the main screen. The time is set at the factory.



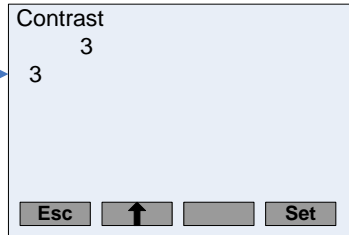
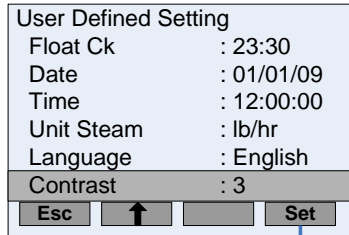
Unit Steam

Set the units of the steam output. Can be set to either pounds per hour or kilograms per hour.



Language

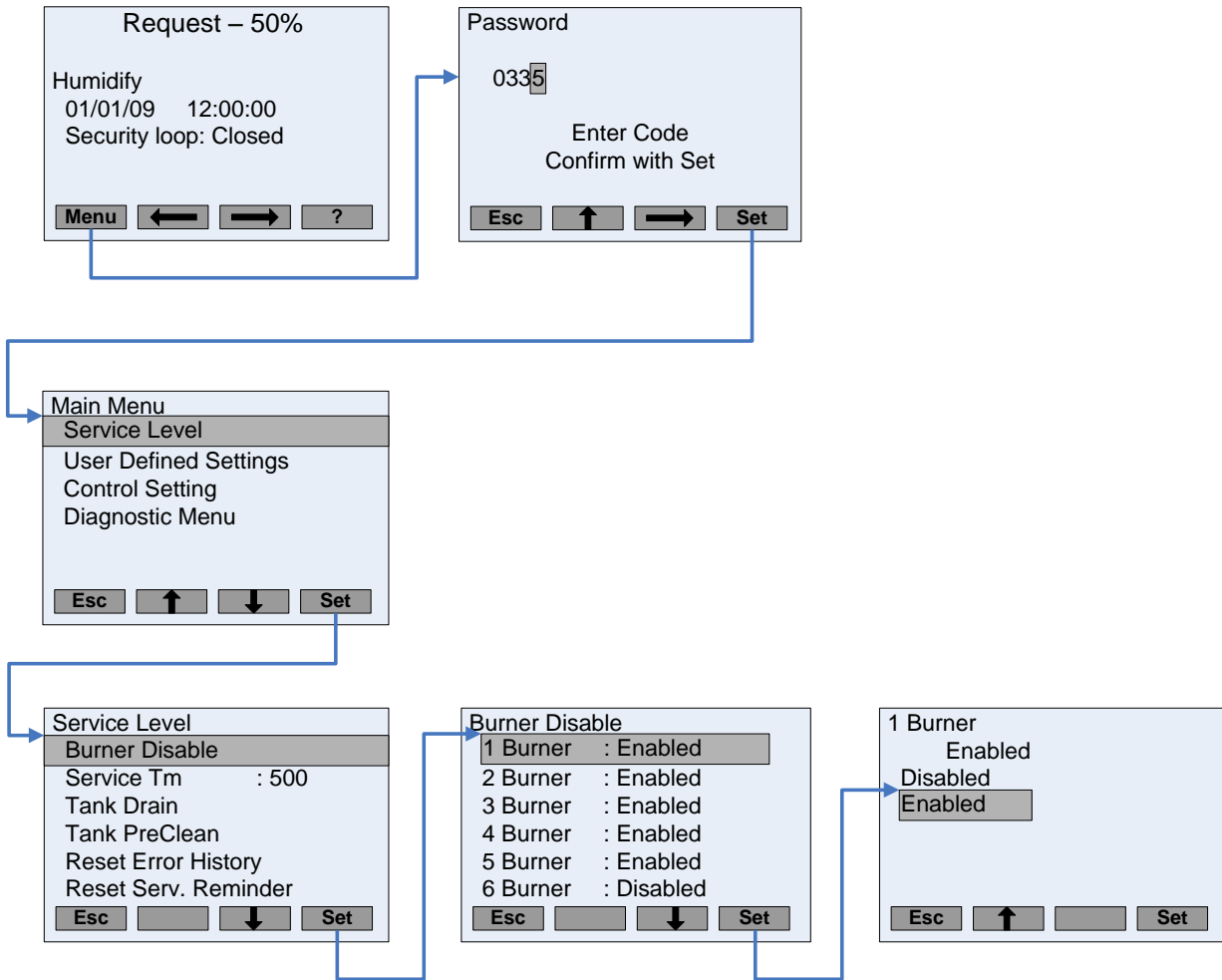
Set the Total Controller's displayed language.



Contrast

Set the Total Controller's LCD display contrast.

Service Level

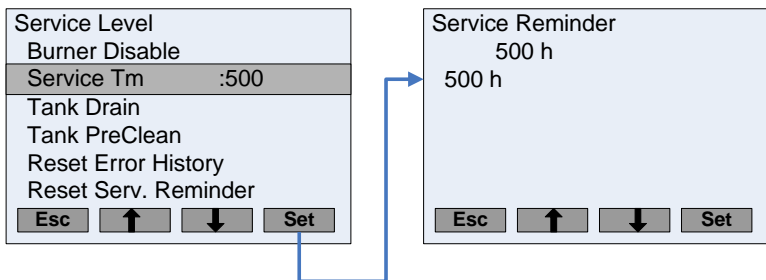


Service Level

The service level allows access to software controlled service tools and access to service time intervals and reminders.

Burner Disable

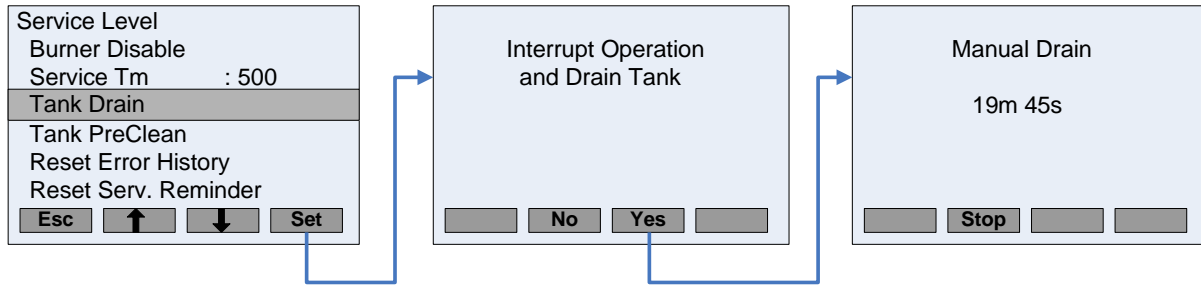
Allows the user to disable and enable burners. Disabled burners are displayed in the information level. Burners can only be disabled when the security loop is open.



Service Tm

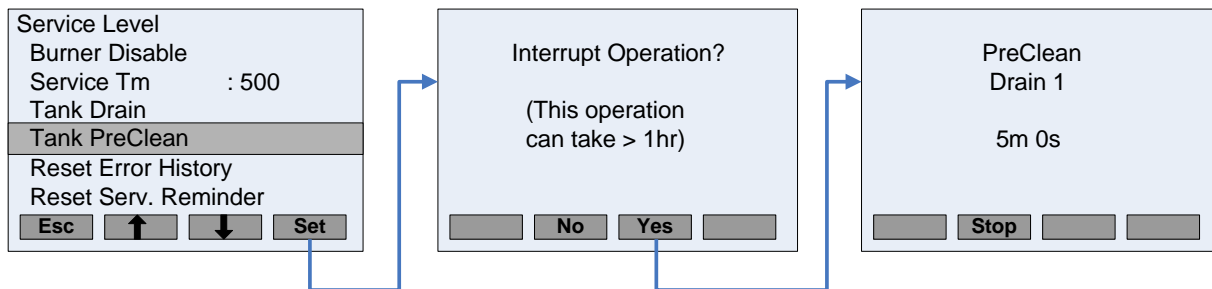
Set time interval of the service reminder.

NOTE: Do not modify. Interval set from factory.



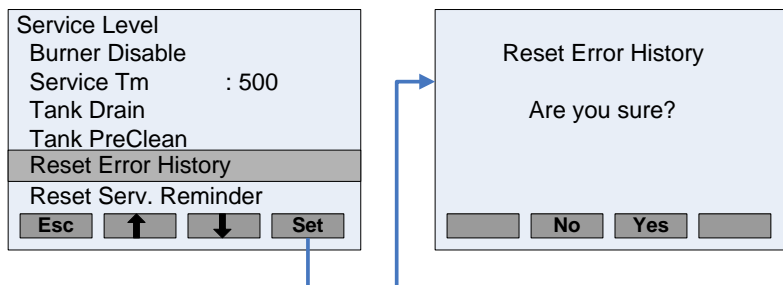
Tank Drain

Initiate software controlled complete drain of the tank.

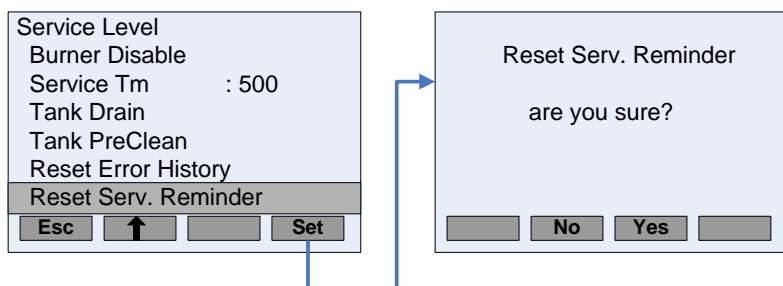


Tank Pre-clean

Initiate pre-clean of the tank before major servicing. During pre-clean, the tank is drained, refilled and then drained a second time.



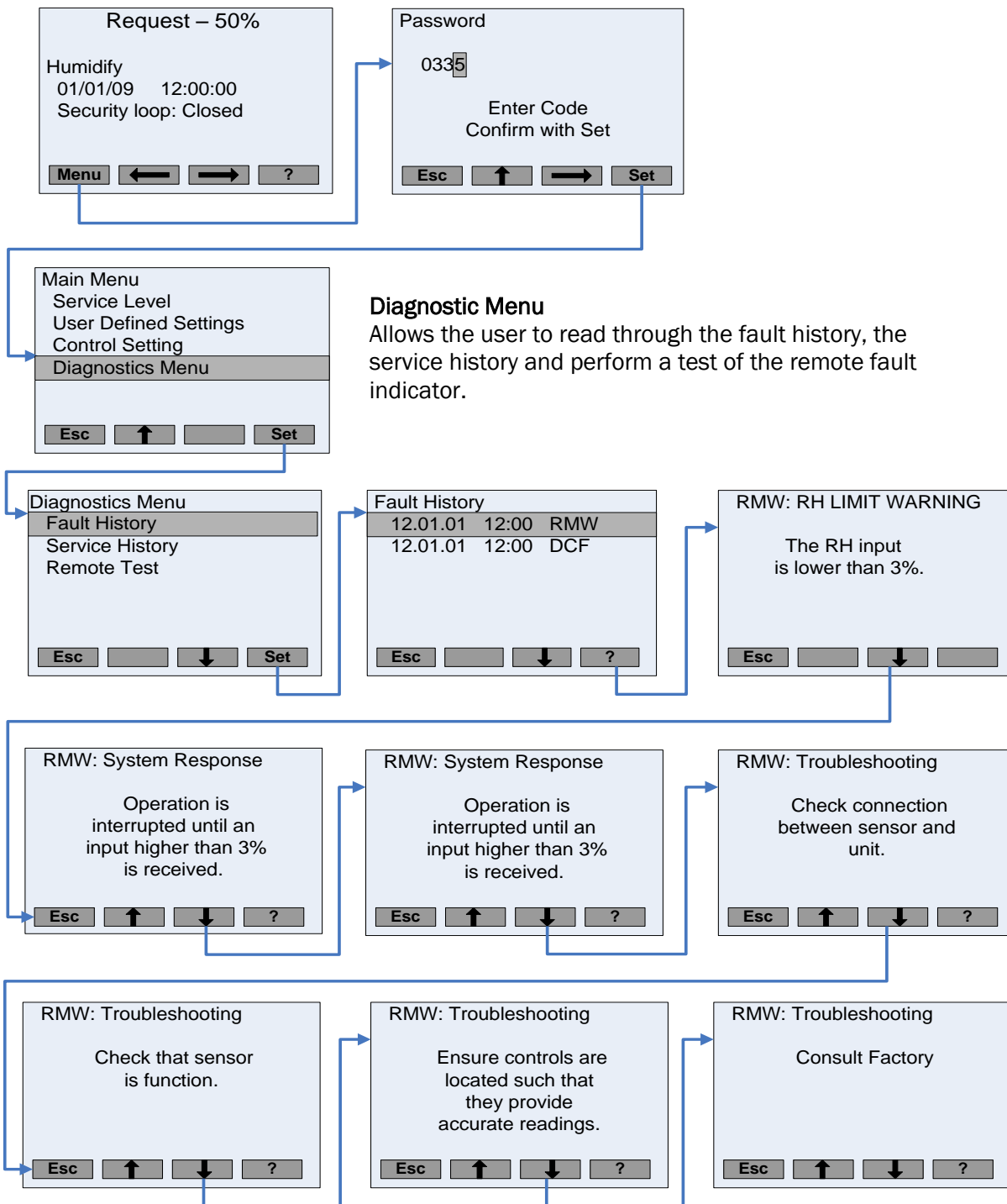
Reset Error History
Resets error history.



Reset Serv. Reminder
Resets service reminder.

NOTE: Service reminder should only be reset after servicing.

Diagnostic Menu



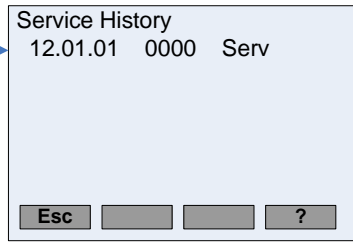
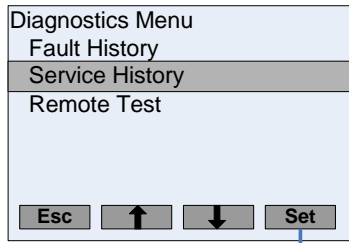
Diagnostic Menu

Allows the user to read through the fault history, the service history and perform a test of the remote fault indicator.

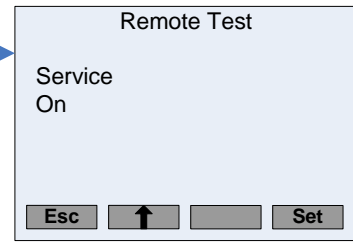
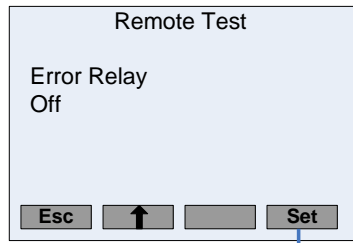
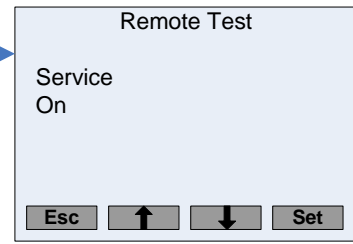
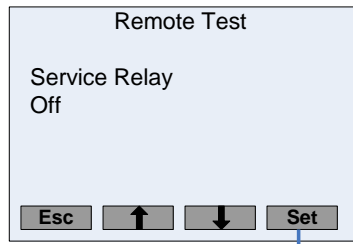
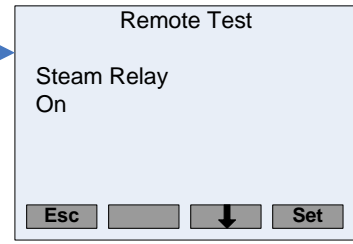
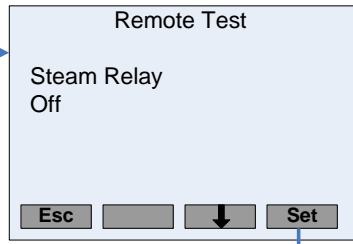
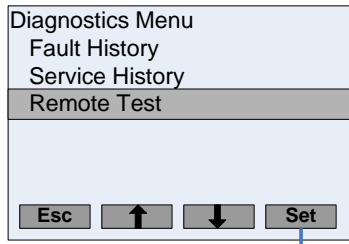
Faulty History

Fault history reads as the following: MM/DD/YY HOUR:MINUTE Error Code

Press the “?” for an explanation of the error code and access to the troubleshooting guide. Use the UP and DOWN arrow keys to navigate through the explanations and corrective action required.



Service History
 Display service history according to date and time.



Remote Test

Allows the user to test manually the remote fault indication. Three relays are available:

- Steam Production
- Service Needed
- Humidifier Error

Troubleshooting

Table 10: GSTC Warning Troubleshooting

GSTC Warning Displayed	Description of Warning	Corrective action by unit	Troubleshooting (screen)
IMW-X:IGNITION FAIL	The Ignition module identified has failed to ignite within the allotted time (4 minutes).	The unit will index to next available burner in the sequence.	<ol style="list-style-type: none"> (1) Check sight port of problematic burner. Watch for hot igniter (glowing red) followed by a flame. (2) If igniter not hot, check for voltage. Check wiring. Replace igniter if necessary. (3) If igniter is hot but no flame, ensure gas supply connected. Check for 24V at gas valve. (4) If flame visible, check flame sensor wiring. Check L1 not wired to N. Consult Factory.
APW-X:AP OPEN WARN	The air proving switch identified has opened while the unit was operating.	<p>Unit will interrupt operation and retry three times.</p> <p>After a third try a fault is generated.</p>	<ol style="list-style-type: none"> (1) Ensure pressure tubes are secure. Check wiring to A/P switch and to driver board. (2) Ensure blower is operating. If not, check wiring and power to blower. Check blower relay. (3) Perform blower diagnostic test to ensure A/P switch remains closed during operation. (4) Check for suction In pressure tubes. If switch does not close it may be defective. Consult Factory.
AOW-X:AP OPEN WARN	The air proving switch identified did not close during blower start-up.	<p>Unit will interrupt operation and retry three times.</p> <p>After a third try a fault is generated.</p>	<ol style="list-style-type: none"> (1) Ensure pressure tubes are secure. Check wiring to A/P switch and to driver board. (2) Ensure blower is operating. If not, check wiring and power to blower. Check blower relay. (3) Perform blower diagnostic test to ensure A/P switch remains closed during operation. (4) Check for suction In pressure tubes. If switch does not close it may be defective. Consult Factory.
BHW-X:BLOWER RPM HIGH	The indicated blower has an RPM higher than the lead blower by more than the allowable tolerance.	The unit will keep monitoring blower RPM and display this warning if RPM remains high.	<ol style="list-style-type: none"> (1) Ensure pressure tubes are secure. Check wiring to A/P switch and to driver board. (2) Ensure blower is operating. If not check wiring and power to blower. Check blower relay. (3) Perform blower diagnostic test to ensure A/P switch remains closed during operation. (4) Check for suction In pressure tubes. If switch does not close it may be defective. Consult Factory.
BLW-X:BLOWER RPM LOW	The indicated blower has an RPM lower than the lead blower by more than the allowable tolerance.	The unit will keep monitoring blower RPM and display this warning if RPM remains low.	<ol style="list-style-type: none"> (1) Ensure blower in question is securely connected and is receiving correct voltage. (2) Verify blower control wiring connection. Check blower diagnostic test for abnormalities. (3) Ensure no restriction on blower. Ensure no blockage of blower inlet.

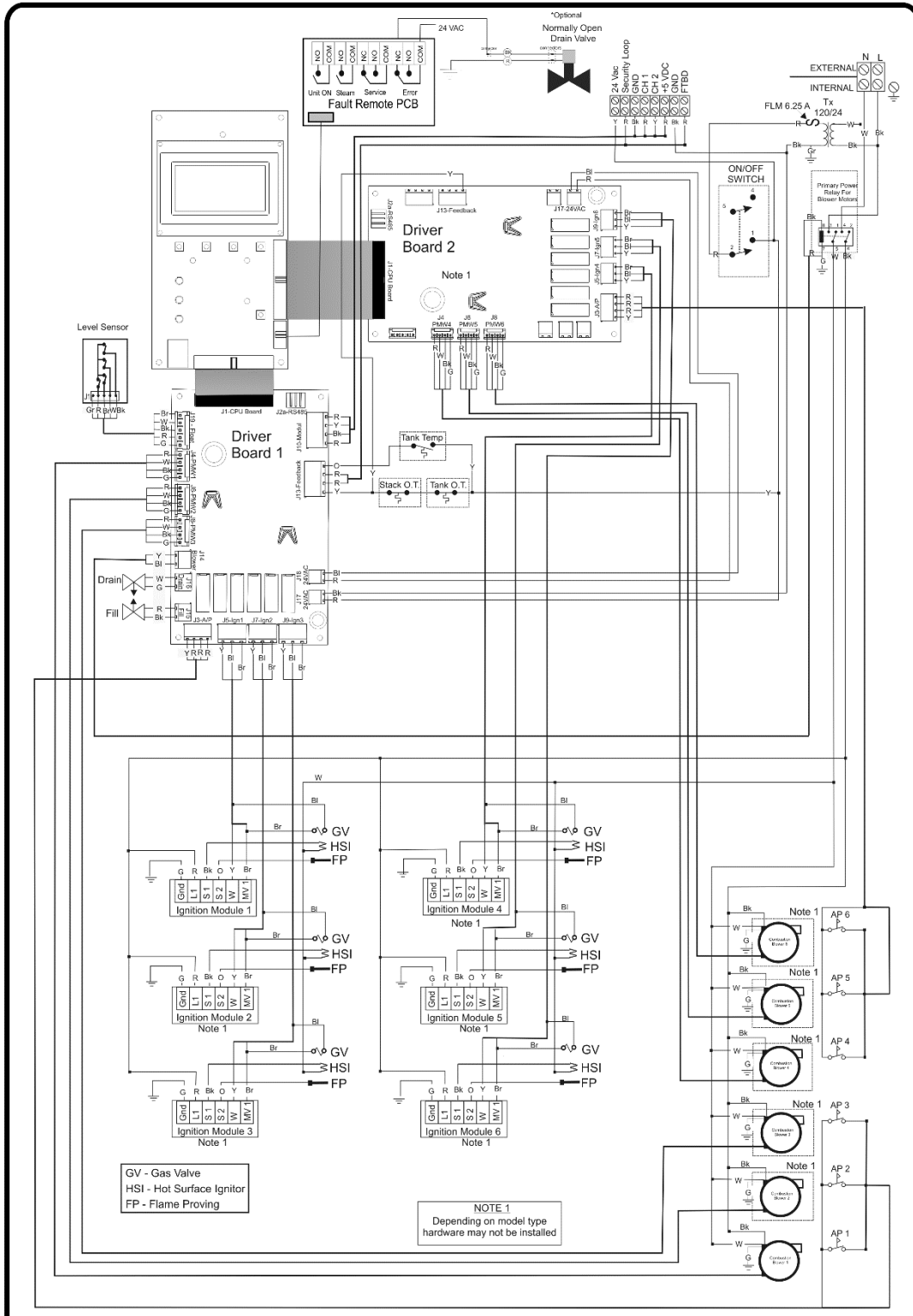
			(4) Blower speed may decrease due to wear. Safe to operate but output may be reduced. Order new blower.
HMW: MAINT. WARNING	The preset service interval time has expired.	The unit will continue to run for 200 hours before a fault is generated.	(1) Service unit. Consult maintenance guide in the Condaire manual. (2) Reset service interval time after maintenance has been completed.
FTW:FILL WARNING	The fill valve has been active for an extended length of time and the water level is still zero	Fill valve remains activated. Warning will change to fault if float level remains at zero.	(1) Ensure water line is open and that adequate water supply and pressure is available. (2) Check wiring to float board and fill valve. Check strainer on fill valve inlet. (3) Check that drain valve, auxiliary drain valve or manual drain switch are not activated. (4) Check fill valve using diagnostic output test. Consult Factory.
RHW:RH HIGH WARNING	The measured RH is above the RH High alarm setting.	The humidifier will remain idle until the measured RH drops below setpoint.	(1) Check that RH high setting is correct for the application. (2) Check sensor location (too close to steam distributor or other sources that affect measurement). (3) System may be oversized. Lower manual capacity of the unit. (4) Consult Factory.
RLW:RH LOW WARNING	The measured RH is below the "RH Low" alarm setting.	The humidifier should be operating unless in standby or lockout mode.	(1) Check that RH low setting is correct for the application. (2) Check sensor location (too close to door, window, or other sources that affect measurement). (3) Humidifier may be in lockout or standby. Check security loop. Check that all burners operational. (4) System may be undersized. Check manual capacity setting. Consult factory.
RMW:RH LIMIT WARNING	The RH input is lower than 3%.	Operation is interrupted until an input higher than 3% is received.	(1) Check connection between sensor and unit. (2) Check that sensor is functional. (3) Ensure controls are located such that they provide accurate readings. (4) Consult factory.
NSW:NO SIGNAL WARNING	No communication is detected from Master unit. (This unit is set up as slave)	Operation is interrupted until signal is received.	(1) Verify that one unit is configured as master. (2) Check connection between master and slave. (3) Consult factory.
RDW: REMOTE DISABLED	The unit has been remotely disabled through modbus communication	Operation is interrupted until unit is re-enabled via modbus or software.	(1) Enable unit through building management system (BMS). (2) If unit cannot be enabled remotely, try enabling unit under software Modbus Settings. (3) Consult factory.
NBW: NO BURNERS AVAIL	All burners have been disabled via software. No burners are available for operation.	The unit will not be able to respond to a demand until 1 or more burners are enabled.	

Table 11: GSTC Fault Troubleshooting

GSTC Fault Displayed	Description of Warning	Corrective action by unit	Troubleshooting (screen)
IMF:NO BURNERS AVAIL	All burners have produced an ignition module failure. No burners are available to produce steam.	Unit is unsafe to operate with this fault. Investigate the problem before restarting unit.	<ol style="list-style-type: none"> (1) Ensure gas supply is connected and open. Verify gas supply pressure matches specification label. (2) Check that igniters get hot/glow during ignition sequence, followed by a flame. Check wiring/voltage (3) If igniter hot but no flame, check for 24V at gas valve. (4) If flame visible, check flame sensor wiring. Verify L1 not wired to N. Consult factory.
AOF-X:AP FAIL FAULT	The air proving switch identified did not close during blower start-up after 3 attempts.	Unit is unsafe to operate with this fault. Investigate the problem before restarting unit.	<ol style="list-style-type: none"> (1) Ensure pressure tubes are secure. Check wiring to A/P switch and to driver board. (2) Ensure blower is operating. If not, check wiring and power to blower. Check blower relay. (3) Perform blower diagnostic test to ensure A/P switch closes and opens during operation. (4) Check for suction In pressure tubes. If switch does not close it may be defective. Consult factory.
ACF-X:AP CLOSED	The air proving switch identified was closed while the blowers were inactive.	Unit will remain in fault mode until condition is corrected or unit is reset.	<ol style="list-style-type: none"> (1) Ensure pressure tubes are secure. Check wiring to A/P switch and to driver board. (2) Check for over/under pressure in room. Verify proper vent installation. Check termination for wind. (3) Perform blower diagnostic test to ensure A/P switch closes and opens during operation. (4) Potential faulty air proving switch. Contact factory.
BNF- X:BLOWER NOT OP	The indicated blower is not operating or registered an RPM below 500 RPM while being energized.	Unit is unsafe to operate with this fault. Investigate the problem before restarting unit.	<ol style="list-style-type: none"> (1) Check electrical connections. Ensure feedback and power cables are connected to blower and PCB. (2) If blower not operating, ensure blower relay is operating. Check output from PCB. (3) If blower is operating, feedback signal could be missing. (4) Perform blower diagnostic test to verify controller is receiving signal. Consult factory.
GVF-X:GAS VALVE FAIL	The indicated gas valve was energized out of sequence or when not expected to be energized.	Unit is unsafe to operate with this fault. Investigate the problem before restarting unit.	<ol style="list-style-type: none"> (1) Ensure electronics are connected according to the wiring diagram. (2) Check connections to all ignition modules and gas valves. Ensure adequate supply voltage. (3) Consult factory.
FTF:FILL FAULT	The fill valve has been active for an extended time without reaching level 1.	Unit will not operate without proper water level. Investigate the problem before restarting unit.	<ol style="list-style-type: none"> (1) Ensure water line is open and that adequate water supply and pressure is available. (2) Check wiring to float board and fill valve. Check strainer on fill valve inlet. (3) Check that drain valve, auxiliary drain valve or manual drain switch are not activated. (4) Check fill valve using diagnostic output test. Consult factory.

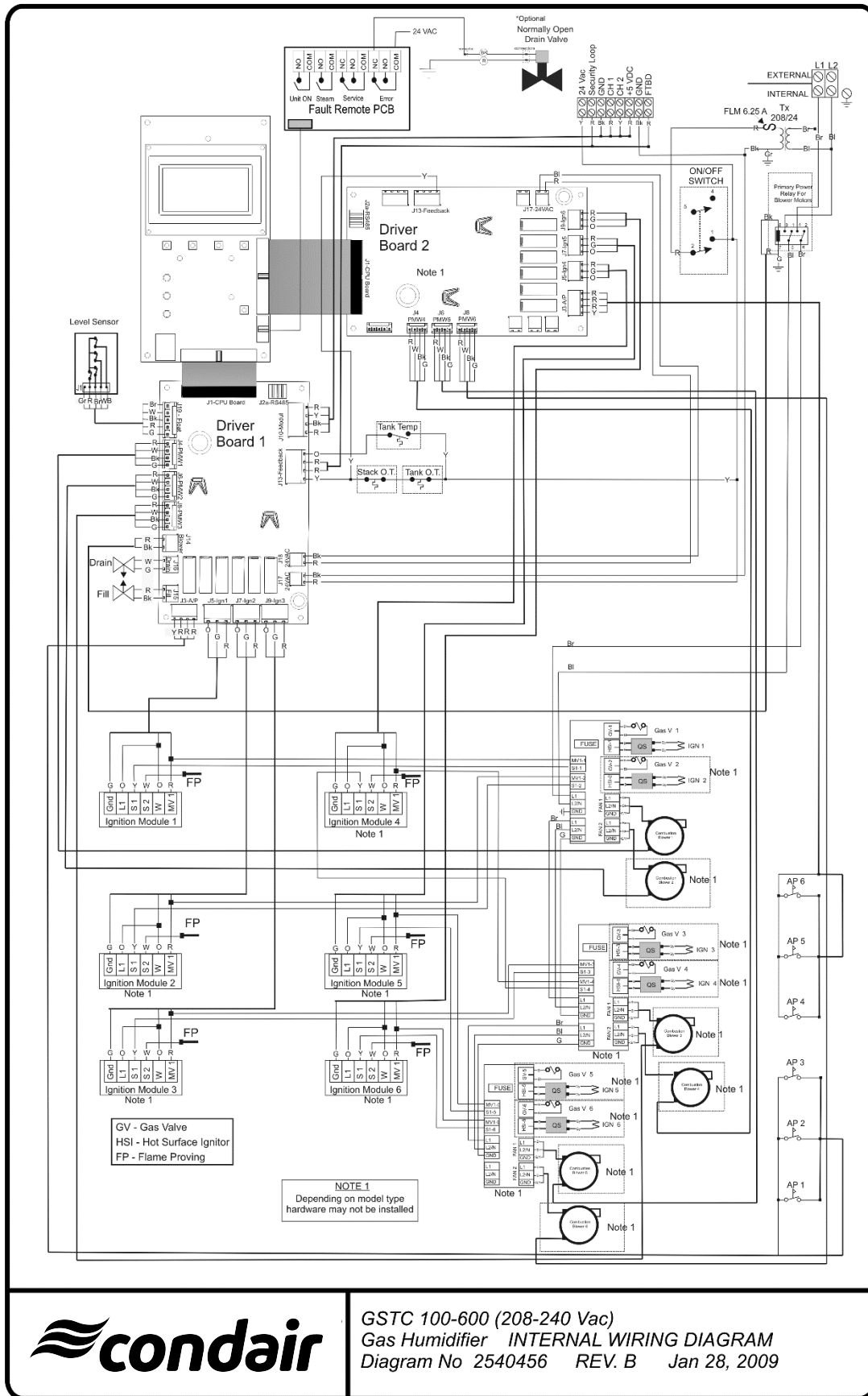
FCF: FILL CHECK FAULT	The fill valve has been active for an extended time without increasing a float level	Unit will not operate without accurate float level reading. Investigate before restarting unit.	<ol style="list-style-type: none"> (1) Ensure water line is open and that adequate water supply and pressure is available. (2) Check wiring to float board and fill valve. Check strainer on fill valve inlet. (3) Check that drain valve, auxiliary drain valve or manual drain switch are not activated. (4) Check fill valve using diagnostic output test. Consult factory.
DCF: DRAIN CHECK	Drain Pump activated for extended period without changing float level	Unit needs to drain for optimal performance	<ol style="list-style-type: none"> (1) Back pressure from drain lines can slow draining of unit. (2) Drain Pump could be obstructed. Clean Drain pump. Check that the drain Pump is powered. (3) Ensure Float Level Sensor connected and that levels change on fill.
FIF: FLOAT INCONSIST.	On startup the unit registers that the float levels do not increase logically from 1 to 5	Unit cannot operate without accurate float level reading	<ol style="list-style-type: none"> (1) Float level sensor is malfunctioning (2) Inspect all hoses. Inspect all connections. Consult factory.
FLF: FLOAT LEVEL	More than one float level is registering at the same time	Unit cannot operate without accurate float level readings.	<ol style="list-style-type: none"> (1) Float level sensor is malfunctioning. Inspect all connections. (2) Ensure that hoses are properly connected and unobstructed. (3) Ensure correct hose from fill valve is connected to chamber. Consult factory.
KWF: KEEP WARM FAULT	Keep Warm activated but tank temperature has not increased within time allotted	Unit cannot operate in such condition.	<ol style="list-style-type: none"> (1) Check connection to tank temperature Sensor. Check to ensure no more than One burner is disabled. (2) Check tank to See if hot (caution). Check electrical Signal to sensor. (3) Tank temperature Sensor may be Defective. Consult factory.
OTF: OVER TEMP FAULT	The exhaust or tank Safety sensor has exceeded the safety limit	Unit cannot operate in such condition	<ol style="list-style-type: none"> (1) Check unit float system. Unit may not be operating with the correct water levels. (2) Ensure that exhaust line is open and free of obstructions. (3) Consult factory.
HMF: MAINT. FAULT	The humidifier maintenance interval and 72hour window for cleaning has expired.	Unit cannot operate in such a condition	<ol style="list-style-type: none"> (1) Unit requires servicing. Consult maintenance guide in the Condaire manual. Service reminder must be cleared after maintenance. Refer to manual. (2)

Wiring Diagrams & Spare Parts



GSTC 100-600 (110-120 Vac)
 Gas Humidifier INTERNAL WIRING DIAGRAM
 Diagram No 2540455 REV. B Jan 28, 2009

Figure 44: GSTC 100-600 (110-120 VAC) Internal Wiring Diagram



GSTC 100-600 (208-240 Vac)
 Gas Humidifier INTERNAL WIRING DIAGRAM
 Diagram No 2540456 REV. B Jan 28, 2009

Figure 45: GSTC 100-600 (208-240 VAC) Internal Wiring Diagram

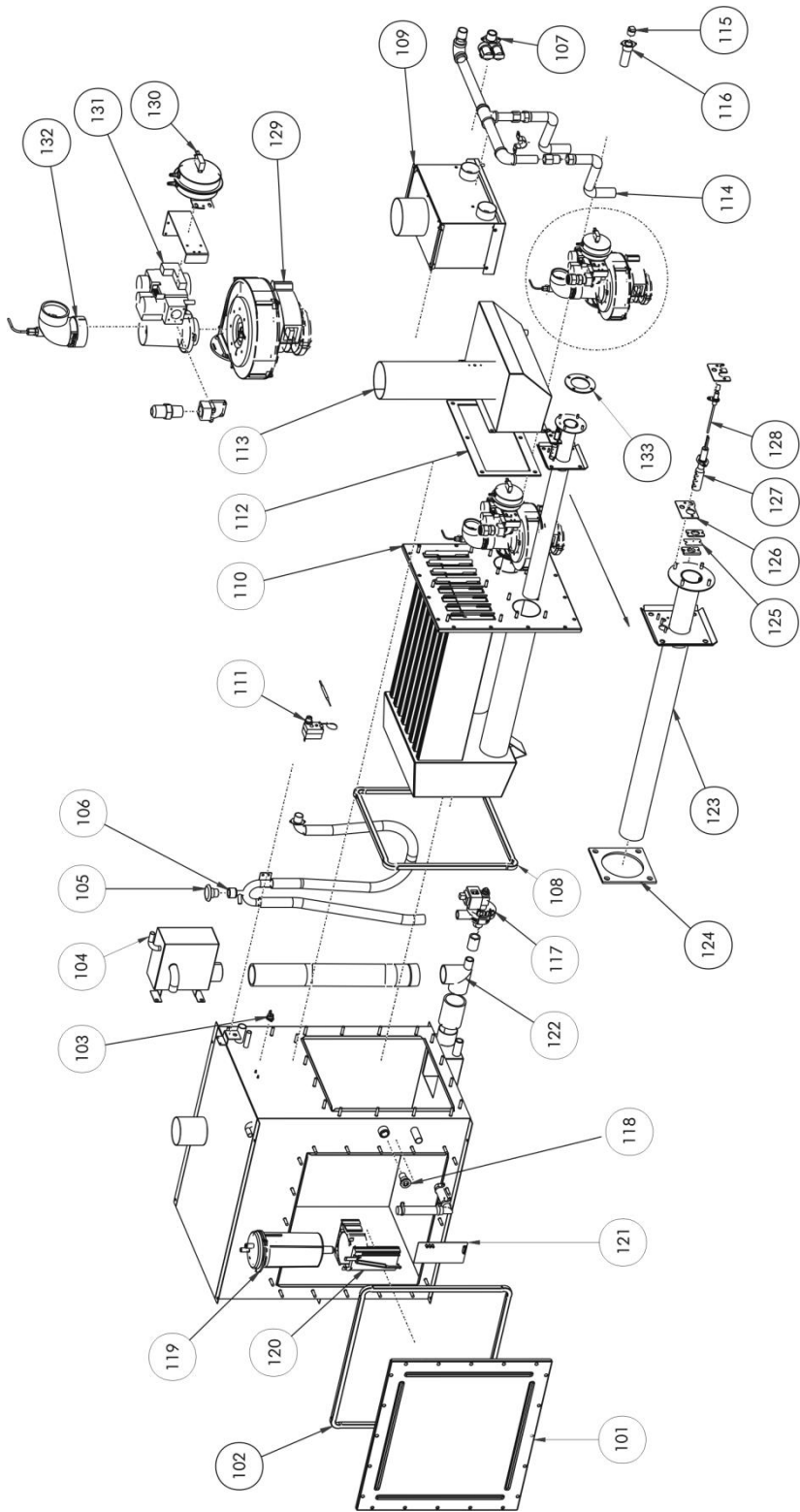


Figure 46: GS Series INDOOR Exploded View - Internal Component

Table 12: GS Series INDOOR Exploded View - Internal Components

#	Description	Part #	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600
101	SP Sacrif. Anode Upgrade Kit,GS/SE,B-B+	2570309	1	1	1	1	1	1
	SP Clean-Out Door Kit,w/o Anode,GS,B/B+	2548607	1	1	2	2	3	3
	SP Sacrificial Anode Kit, GS/SE,B-B+	2575147	1	1	1	1	1	1
102	Gasket, Tank Cover Plate	2524361	1	1	2	2	3	3
103	Secondary Safety Switch	1504832	1	1	1	1	1	1
104	Fill Box	2526152	1	1	1	1	1	1
105	Vacuum Break Valve 1/2"npt	1505959	1	1	1	1	1	1
106	Retrofit Kit: P-Trap Assembly	2553825	1	1	1	1	1	1
107	SP Fill Valve, 10.0L/Min:0.35L/Min, Dual	2573528	1	1	1	1	1	1
108	Heat Exchanger Gasket							
	Single	2524405	1					
	Dual	2524403		1	2	2	3	3
109	Direct Vent Air Manifold	Contact Factory						
110	Heat Exchanger Replacement Kit							
	Mini	2528422	1					
	Single	2528423			1		1	
	Dual	2528424		1	1	2	2	3
111	Stack High Limit Switch	1506745	1	1	1	1	1	1
112	Exhaust Manifold Gasket							
	Single	2578291	1					
	Dual	2578290		1	2	2	3	3
113	Exhaust Manifold							
	GS 100	1505875	1					
	GS 200	1505861		1				
	GS 300/400	1505843			1	1		
	GS 500/600	1505828					1	1
114	Flexible Gas Hose with fittings	1505960	1	2	3	4	5	6
115	Auxiliary Drain Plug	1507043	1	1	1	1	1	1
116	Auxiliary Drain termination	2573309	1	1	1	1	1	1
117	Drain Pump 24v 60 Hz	1502644	1	1	1	1	1	1
118	Tank Thermal sensor	1506026	1	1	1	1	1	1
119	Float Chamber	2573513	1	1	1	1	1	1
120	Float Chamber Mounting Bracket	1113777	1	1	1	1	1	1
121	Float Board	2573846	1	1	1	1	1	1
122	Lower Mixing Box	1506749	1	1	1	1	1	1
123	Replacement Burner Ass'y							
	110 - 120V Models	2528416	1	2	3	4	5	6
	208-240V Models	1507669	1	2	3	4	5	6
124	Burner Plate Gasket	1505936	1	2	3	4	5	6
125	Sight Port Replacement kit	2528417	1	2	3	4	5	6

Table 12: GS Series INDOOR Exploded View - Internal Components - continued

#	Description	Part #	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600
126	Igniter/flame sensor gasket	2549802	1	2	3	4	5	6
127	Hot Surface Igniter Replacement Kit							
	110 - 120V Models	2528418	1	2	3	4	5	6
	208-240V Models	1507695	1	2	3	4	5	6
128	Flame Sensor Replacement Kit	1507694	1	2	3	4	5	6
	Igniter/flame sensor Replacement Kit							
	110 - 120V Models	2528420	1	2	3	4	5	6
	208-240V Models	1507712	1	2	3	4	5	6
129	Combustion Blower							
	110 - 120V Models	2573844	1	2	3	4	5	6
	208-240V Models	2573845	1	2	3	4	5	6
130	Air Proving Switch	1504175	1	2	3	4	5	6
131	Gas Valve Assembly							
	Natural Gas	1507713	1	2	3	4	5	6
	Propane	1507714	1	2	3	4	5	6
132	Elbow Assembly for Air Intake	1504204	1	2	3	4	5	6
133	Burner/Blower Gasket	1708208	1	2	3	4	5	6
Not shown	Fan Board	1505689	1	1	2	2	3	3
Not shown	Igniter Jump Start Module	1506793	1	2	3	4	5	6
Not shown	Hose Replacement kit	1507696	1	1	1	1	1	1
Not shown	Flexible hose for Direct Vent	1502148	1	2	3	4	5	6
Not shown	Rod, Sacrificial Anode, MG 1" x 4"	2575147	1	1	1	1	1	1
Not shown	1/4" Tube for air proving (per inch)	1605227	Order (by foot) as required					

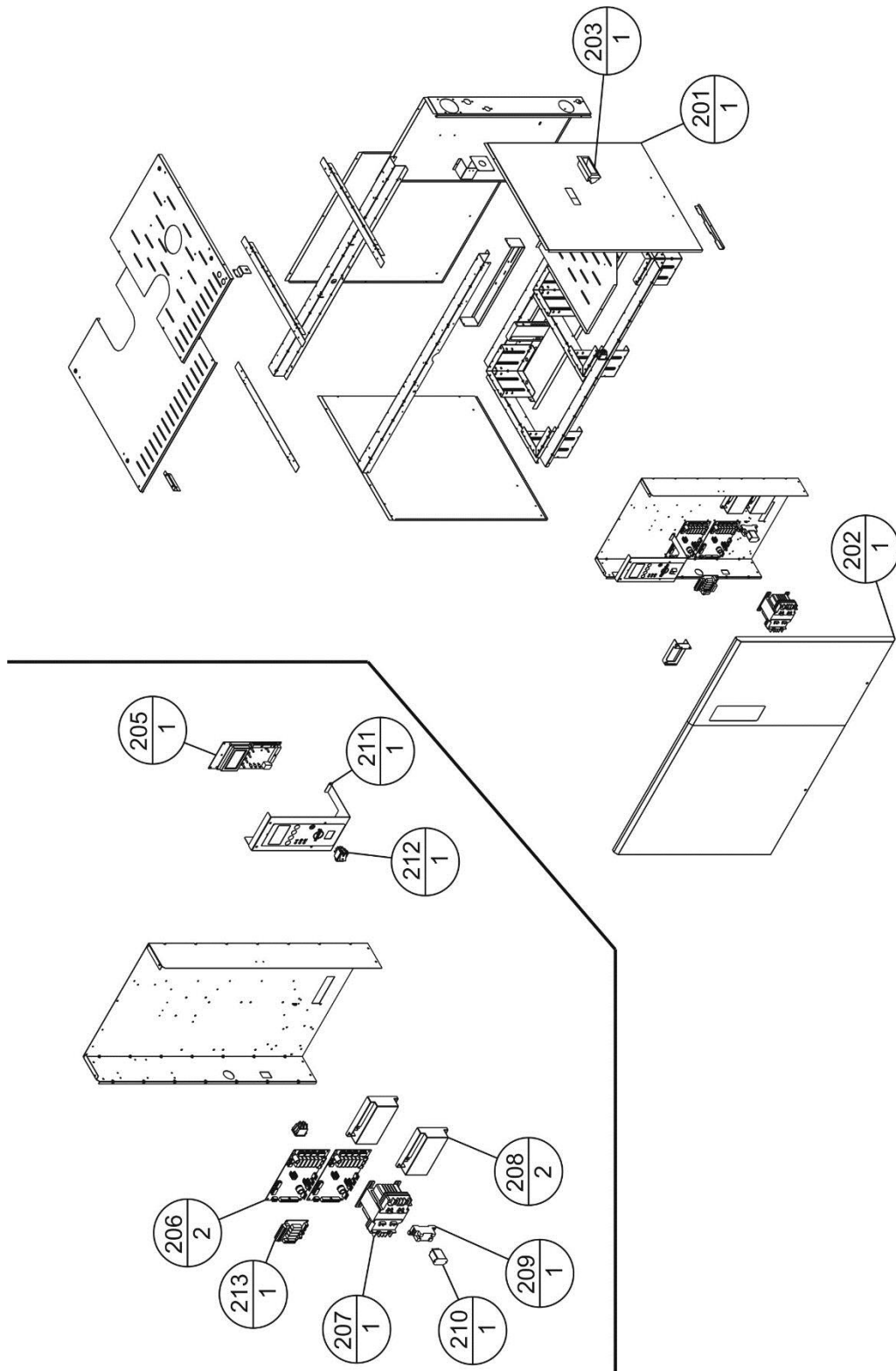


Figure 47: GS Series INDOOR Exploded View - Cabinetry

Table 13: GS Series INDOOR Exploded View - Cabinetry

#	Description	Part #	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600
201	Service Door Assembly							
	Mini	2524439	1					
	Single	2524440		1				
	Double	2524441			1	1		
	Triple	2524458					1	1
202	Front Door Assembly	2535268	1	1	1	1	1	1
203	Recessed Handle	2523444	1	1	1	1	1	1
205	GSTC Processor Board Replacement	2544252	1	1	1	1	1	1
206	Driver Board	2535504	1	1	1	1	1	1
207	Primary Transformer							
	110 - 120V Models	2532672	1	1	1	1	1	1
	208-240V Models	2532673	1	1	1	1	1	1
	Fuse for Primary transformer, 6.25 Amp	2523526	1	1	1	1	1	1
208	Ignition Control Module							
	110 - 120V Models	2525914	1	2	3	4	5	6
	208-240V Models	1505987	1	2	3	4	5	6
209	Relay Mount Socket	1703250	1	1	1	1	1	1
210	Blower Relay	1453020	1	1	1	1	1	1
<small>Not Shown</small>	Slotted wire duct	1506041	order by length required					
211	Display Panel w/keypad indoor	2544253	1	1	1	1	1	1
212	On/Off Drain Switch	1453001	1	1	1	1	1	1
213	Remote Fault Board	2522170	1	1	1	1	1	1
<small>Not Shown</small>	Remote Fault Board Ribbon Cable	2522062	1	1	1	1	1	1

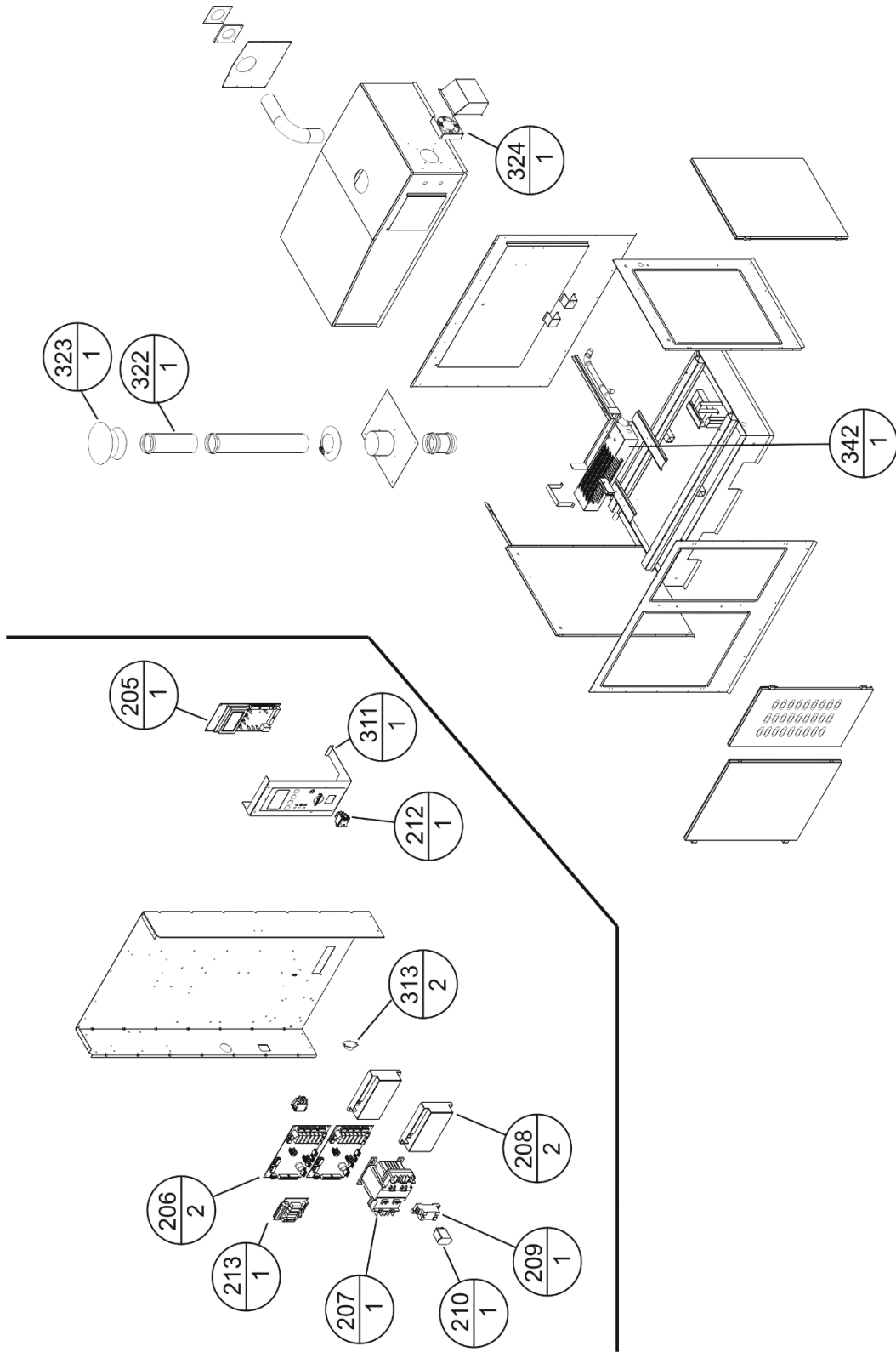


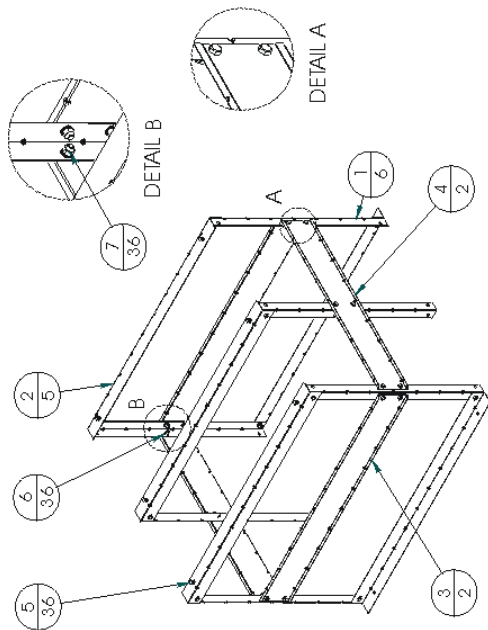
Figure 48: GS Series OUTDOOR Exploded View – Cabinetry

Table 14: GS Series OUTDOOR Exploded View - Cabinetry

#	Description	Part #	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600	
205	GSTC Processor Board Replacement	2544252	1	1	1	1	1	1	
206	Driver board	2535504	1	1	1	1	1	1	
207	Primary Transformer								
	110 - 120V Models	2532672	1	1	1	1	1	1	
	208-240V Models	2532673	1	1	1	1	1	1	
	Fuse for Primary transformer, 6.25 Amp	2523526	1	1	1	1	1	1	
208	Ignition Control Module								
	110 - 120V Models	2525914	1	2	3	4	5	6	
	208-240V Models	1505987	1	2	3	4	5	6	
209	Relay Mount Socket	1703250	1	1	1	1	1	1	
210	Blower Relay	1453020	1	1	1	1	1	1	
213	Remote Fault Board	2522170	1	1	1	1	1	1	
<small>Not Shown</small>	Remote Fault Board ribbon cable	2522062	1	1	1	1	1	1	
<small>Not Shown</small>	Slotted wire duct	1506041	order by length required						
311	Display Panel w/keypad outdoor	2544255	1	1	1	1	1	1	
212	On-Off-Drain Switch	1453001	1	1	1	1	1	1	
313	Thermostat, On/Off, 80F	1508042	1	1	1	1	1	1	
323	Rain Cap								
	Mini	1508130	1						
	Single	1508129		1					
	Double	1507889			1	1			
	Triple	1507883					1	1	
324	Cooling Fan	1507891	1	1	1	1	1	1	
342	Pump House Heater 500 watts	1508039	1	1	2	2	3	3	

Item	Description	Qty
1	LEG, FLOOR STAND, GS/SE, B STYLE	4
2	PLATE, CARRIER, FLOOR STAND, GS/SE, B STYLE	4
3	BRACE, COMMON, FLOOR STAND, GS/SE, B STYLE	2
4	BRACE, FLOOR STAND, GS/SE, B STYLE	2
5	BOIT, 3/8"-16 UNC X 3/4 LG	28
6	Lock washer, 0.575	28
7	Nut, 3/8"-16 UNC, SST	28

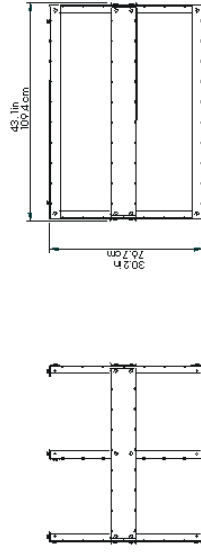
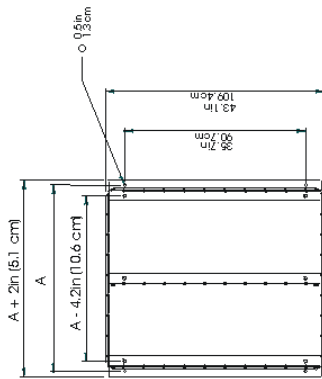
UNIT SIZE	DIMENSION A
GS 100, GHE E80	14.25in (37.7 cm)
GS200, GHE E80	21.15in (53.7 cm)
GS300, GS400, GHE E120, GHE E160	36.7in (93.3 cm)
GS600, GS800, GHE E200, GHE E240	62.25in (158 cm)



THE MIDDLE SECTION IS USED ONLY FOR GS300/400 AND GS600/600 (SHOWN THE STAND FOR GS300/400)

ASSEMBLY INSTRUCTIONS

1. UNPACK STAND AND CHECK THAT ALL PIECES ARE PRESENT AND UNDAMAGED.
2. ASSEMBLE STAND TO CONFIGURATION SHOWN ON SHEET 1. HAND TIGHTEN ALL BOLTS ONLY. DO NOT TIGHTEN ABOVE THE FLOOR. MINIMUM OF 5/32 IN (1.25 MM) POSITION STAND BELOW THE LEGS OF THE HUMIDIFIER. CAUTION: NEVER ASSEMBLE STAND SO THAT THICK LEGS IN THE HUMIDIFIER BASE ALIGN WITH HOLES IN STAND.
3. LOWER HUMIDIFIER 1/4" ABOVE STAND. TO ALIGN WITH NEAREST HOLE.
4. FASTEN STAND TO HUMIDIFIER USING THE BOLTS, LOCKWASHERS AND NUTS PROVIDED.
5. TIGHTEN NUT AND BOLTS TO 200 IN-LB (23 kg-m) OR UNTIL SECURE.
6. LOWER ENTIRE ASSEMBLY TO FLOOR AND ENSURE THAT IT IS STABLE.
7. SHIMMING OF THE FLOOR BELOW THE LEGS OF THE STANDS MAY BE NECESSARY TO ENSURE BALANCE OF THE HUMIDIFIER.
8. THE STAND MAY BE PERMANENTLY FASTENED TO THE FLOOR VIA THE HOLES IN THE LEG SUPPORT PLATES.



FLOOR STAND, ASSEMBLY INSTRUCTIONS, GS/SE

2525888 REV A



GS Stand Assembly Instructions
150-7308
06/26/2003

Table 15: GS Quick Reference

Item	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600
Gas Pressure						
Natural Gas min (in wc/mbar)	4.5/11.2					
Natural Gas max (in wc/mbar)	9/22.4					
Propane min (in wc/mbar)	9/22.4					
Propane max (in wc/mbar)	13/32.3					
Min free air opening (in/cm)	13/33	23/58	35/89	47/119	59/150	71/180
Input						
Max (BTU)	140,000	280,000	420,000	560,000	700,000	840,000
Min GSTC (BTU)	45,000					
Direct vent min (BTU)	60,000					
Gas Piping Size (in/cm)	1/2/1.3	3/4/1.9	1/2.5	1/2.5	1.25/3.2	1.25/3.2
"BH" Vent	X	X	X	X	X	X
"B" Vent	X	X	X	X	X	X
"BH" Exhaust Piping (in/cm)	3/7.6	4/10.2	5/12.7	5/12.7	6/15.2	6/15.2
	4/10.2	5/12.7	7/17.8	7/17.8	8/20.3	8/20.3
Appliance Category	I or III	I or III	I or III	I or III	I or III	I or III
Full Weight In (lbs/kg)	416/188	588/266	970/440	992/450	1364/619	1384/628
Empty Weight In (lbs/kg)	267/121	354/160	485/217	529/239	659/298	703/318
User level password	0335					
Water consumption (25% bd)						
Gallons/liters per hour	18/68	36/137	54/205	72/273	90/342	108/410
Tank Water Volume						
Gallons/liters	18/68	29/111	58/221	55/210	84/320	81/309
Fill valve flow rates						
To tank: Gallons/liters per minute	2.64/10					
To float chamber: Gallons/liters per minute	0.09/0.35					
Supply water pressure						
Min. (psi/kPa)	30/206					
Max. (psi/kPa)	80/551					
Drain rate (includes D.W.C)						
Gallons/Litres per minute	5.2/20					
Min drain pipe size (in/cm)	1 to 1.5 / 2.5 to 3.8 OD or larger					
Power supply requirements						
120 volts a/c	X	X	X	X	X	X
208-240 volts a/c 1PH	X	X	X	X	X	X
Steam Outlet size (in/cm)	1.75/4.4	3/7.6	3/7.6	4/10.2	4/10.2	4/10.2

Warranty

Condair Inc. and/or Condair Ltd. (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years after installation or 30 months from manufacturer's ship date, whichever date is earlier, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted (with the exception of the media) are free from defects in material and workmanship. The heat exchanger (s) will have an additional warranty that ensures the heat exchanger will be free from defects in materials and workmanship for an additional year, for a total period of 3 years from installation or 40 months from the manufacturer's ship date, whichever is earlier. 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 the companies 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 makes no warranty and assumes no liability whatsoever for damage resulting from freezing of the humidifier, supply lines, or drain lines.

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

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U.S. Patent 5,816,496
Canadian Patent 2,203,332



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