Rev. 4_2023

SDM(E) SERIES

DIRECT GAS-FIRED MAKE-UP AIR HEATERS

Indoor and Outdoor installation

INSTALLATION AND OPERATION MANUAL

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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 instruction in this manual.
- Improper installation, adjustment, alteration, service or maintenance can cause serious injury, death or property damages.

- 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.

Before starting the installation of the unit, read, understand, and follow all the instructions given in this manual, including all safety precautions and warnings.

This unit is connected to high voltages and contains moving parts that can start unexpectedly.

Electrical shock, severe injury or death could occur if instructions given in this manual are not followed. Always disconnect and lock out power before servicing this equipment. All work should be done by a qualified technician. DO NOT bypass any interlock or safety switches under any circumstances.

- Be sure to read and understand the installation, operation, and service instruction in this manual.
- Failure to follow safety warnings exactly, could result in serious injury, death, or property damage.
- Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damages.
- Installation and service must be done by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Never open access doors to the unit while it is running.
- Unit must be securely and adequately grounded.

1. GENERAL INFORMATION

1.1. Introduction

This manual has been made to simplify the installation, maintenance, and the operation of this equipment. The strict application of these instructions will ensure the conformity of the installation to **Nagas innovation** recommendations manufacturer of Nagas Express units.

The application of the instructions given in this manual is one of the conditions of the warranty, however it does not guarantee at any time conformity with the applicable laws, rules, codes, and regulations of the country of destination of the equipment installed.

1.2. Listed product

This direct gas-fired make-up air heater has been declared to conform to applicable Canadian and American standards **CSA 3.7 / ANSI Z83.4** and bear the CSA marking.

This equipment is intended for industrial or commercial use only. This equipment must be installed according to local installation codes for gas equipment and any provincial or state regulations applying to this category of equipment. The installation must comply with the latest laws and regulation for gas heating units **CSA B149.1, ANSI Z223.1 / NFPA 54**, to the electrical code **C22.1/ NFPA 70** and to local laws, rules, and regulations. All the electrical installation located inside or outside of this equipment must comply with the unit's electrical diagrams.

Moreover, when suspending this unit, the following ANSI standards must be followed: **ANSI/NFPA 409** for aircraft hangars; **ANSI/NFPA 88A** for public garages; **ANSI/NFPA 88B** for vehicle repair garages. Electrical

installations must meet the standards stated in the local electrical code for this category of equipment.

All indoor and outdoor electrical installations must comply with the electric diagrams of the heater. For more information, refer to the start-up instructions, operating sequence, and adjustment instructions.

1.3. Responsibility

This equipment must be used expressly for the purpose for which **Nagas innovation** has designed and manufactured it. Any contractual liability of **Nagas innovation** is therefore excluded in case of injury to persons, animals or damage caused to goods, following errors in installation, settings, maintenance, or inappropriate use.

Nagas innovation is responsible for the conformity of the device to the codes and standards of construction in force at the time of sale. Knowledge and respect for the legal provisions as well as the standards inherent in the design, implantation, installation, commissioning, or maintenance are exclusively the responsibility of the installer or integrator.

Be advised that this manual does not cover all possibilities, situations, or eventualities. Regular service is necessary to ensure proper and safe operation of this equipment. If you have any doubts about performing these tasks yourself, you should hire a qualified specialist. Negligence in maintenance can cause failure of the equipment, property damage and/or harm to the building occupants and will void the warranty of the equipment.

1.4. Reception & storage

Immediately upon receipt of the equipment, check the crating and contents for any damage that may have occurred during the shipment. Inspect protective covers for perforations or other signs that there may be damage. Remove protective covers and check for external damage. Open all the access doors and check for internal damage. Close access doors when the inspection is finished. Replace covers if the unit is not being assembled or installed at that moment.

All the units that leave our factory are tested and carefully inspected immediately prior to shipping to ensure that they are in good operating condition at that time. Check the packing slip to make sure that all loose parts for field installation were received, they can be found inside the unit. If damages are found or parts are missing, please contact your local authorized distributor or call factory.

If the equipment is to be stored prior to assembly and installation you must observe the following precautions:

- Store in a well-drained and dry area that will not accumulate surface water to prevent damage by moisture from wet ground, dew, or rain.
- Do not store where the equipment could be physically damaged.
- Make sure that all protective coverings that were provided for shipping are not damaged and are properly installed over the equipment.
- The entire perimeter and any full height cross members of the unit must be supported by a level surface and the supporting surface must be adequate for supporting the entire weight of the unit.
- Do not stack split unit sections one over the other for storage purpose.

1.5. Limited warranty

Subject to the terms and conditions hereof, during the first year after the original installation of the product or eighteen (18) months from date of shipment by **Nagas innovation** Inc. whichever occurs first, we will supply free of charge any component part(s) of our product found to be defective in material or workmanship. Any replacement part(s) so supplied will be warranted for the balance of our product's original warranty. The part(s) to be replaced must be available in exchange for the replacement part(s). Any labor, material, transportation, freight, or other charges incurred in connection with the performance of this warranty will be the responsibility of the owner at the hourly rates and prices then in force. This limited warranty is only applicable to new and unused products purchased from us or from our authorized distributors, provided that our user instructions contained in our user guide have been adhered to. You recognize and understand that our obligation is limited to replacing the part found to be defective and that you have no further recourse against us.

THIS WARRANTY DOES NOT COVER:

(a) damages caused by accident, abuse, negligence, misuse, riot, fire, flood or Acts of God (b) damages caused by operating the product in a corrosive atmosphere (c) damages caused by any unauthorized alteration or repair of the system affecting the product's reliability or performance (d) damages caused by improper matching or applications of the product or the product's components (e) damages caused by failing to provide routine and proper maintenance or service to the product (f) expenses incurred for erecting, disconnecting or dismantling the product (g) parts used in connection with normal maintenance, such as filters or belts (h) products no longer at the site of the original installation (i) products installed or operated other than in accordance with the printed instructions, with the local installation or building codes or with good trade practices (j) products lost or stolen.

No one is authorized to change this WARRANTY or to create for us or on our behalf any other obligation or liability in connection with our product(s). There is no other representation, warranty, or condition in any respect, expressed or implied, made by or binding upon us other than the above, nor will we be liable in any way for incidental, consequential, or special damages however caused such as but not limited to: loss of productivity, damages caused by delays, loss of profits and management time.

To obtain replacement parts under this product's warranty, contact the dealer or contractor who installed or services our products. Only dealers or contractors who are registered with us are authorized to perform this warranty. Should the dealer or the contractor need assistance, the authorized agent for **Nagas innovation** is available for support, and we, at **Nagas innovation**, in turn, support our agent's efforts.

RETAIN THIS WARRANTY IN YOUR FILES FOR FUTURE REFERENCE

This warranty is expressly given and accepted in lieu of all other warranties, expressed or implied, including without any limitation any warranty of merchantability or fitness for a particular purpose. Some states/provinces do not allow for the disclaimers, limitations and exclusions identified above; as a result, they may not apply to you.

1.6. Parts, repairs, and service

Any replacement part must be the same as or an approved alternate to the original part supplied. The replacement part must meet the original's specification in terms of functionality including certifications, timing, input and output range, accuracy, and operation. Failure to replace parts or components with equivalent parts can cause equipment failure, equipment damage, injury, or death, and can void the

warranty of the equipment.

When contacting **Nagas innovation** customer service (or an authorized distributor) for parts, repairs or service please be ready to provide the Model Number, Serial Number, Date of installation and/or Nature of failure along with the description of the parts required. Be advised that some parts may not be stocked items, that these parts must be made or ordered; variable delays can be expected depending on the nature of the equipment damage or defective part.

DANGER!

Always disconnect power before working on or near this equipment. Lock and tag the disconnect switch or breaker to prevent accidental power up. This unit is equipped with optional gas accessories, turn off gas supply whenever power is disconnected.

DANGER!

When servicing the unit, the internal components may be hot enough to cause pain or injury. Allow time for cooling before servicing.

1.7. Normal usage

This equipment is designed to offset building heat loss. All air to the heater is ducted directly from outdoors and the products of combustion generated by the heater are released into the air stream being heated. This direct gas-fired make-up air heater is intended for indoor or outdoor installation as a complete ventilation system with gas heating complete with factory installed air and gas controls. This equipment uses natural or propane gas. The heating output capacities available range from 250 to 3,000 MBH (from 73 to 879 kW) and from 1,500 to 25,000 SCFM (from 708 to 11,799 L/s). **The maximum discharge temperature is limited to 90°F (32°C).** The unit must be installed on non-combustible surfaces, duct, or wall, and located in a neutral pressure environment.

THIS AIR HEATER MUST ALWAYS:

- Be used only to heat up outside air (100% fresh air); neither air return nor recirculation are allowed.
- Be used only to replace air exhausted from a building or through process equipment.
- Supply air at a temperature not exceeding 32°C (90°F) or as stated in the applicable local code.
- Be used with proper air filters in good condition upstream of the unit.

NOTE: THIS HEATER IS NOT A SPACE HEATER AND SHOULD NOT BE USED AS SUCH.

1.8. Hazard definitions

Hazard risk identification is the first step in conducting a risk assessment, please read carefully.

DANGER!	*Indicates an imminently risky situation which, if not avoided, will result in death or serious injury.*
WARNING!	*Indicates a potentially risky situation which, if not avoided, could result in death or serious injury.*
CAUTION!	*Indicates a potentially risky situation which, if not avoided, may result in personal injury or property damage.*

NOTICE	*Indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury or property damage.*

Table 1: Hazard definitions

2. EQUIPMENT INSTALLATION

CAUTION!

All electrical wiring, gas piping and fuel line installation must be completed by qualified persons in accordance with all federal, state, provincial and/or local codes.

NOTICE

Installation must be in accordance with this manual AND all other related components controls manuals.

2.1. Installation codes

Specific differences exist between Canada and the USA, installations acceptable under one Code may not entirely comply with the other. Always follow the applicable installation code of the country where the equipment is installed.

The air intake must be located and oriented to prevent infiltration of snow, rain, flammable, and toxic gas as well as any other harmful material in the make-up air heater.

Where air ducts or plenums directly connected to the make-up air heater create a pocket where gas could accumulate, an initial purge cycle equivalent to at least four air changes is required before proceeding to ignition.

The heater will not operate (interlocked) unless corresponding exhaust system is in operation. When fire dampers are used in the ducts, they must be equipped with an electric switch wired to the safety control circuit of the unit, so that the make-up air heater shuts down if fire is detected in the ducts. These electric switches must be wired so that the safety circuit is energized only when the fire damper is completely open.

2.2. Minimum clearances

Minimum clearances must be observed for proper unit performance, safety, and serviceability.

COMBUSTIBLE CLEARANCE					SERVICE CLEARANCE		
Top	**Front**	**Back**	**Side**	**Bottom**	**Opposite burner side**	**Service burner side**	**Control panel***
1" (25mm)	1" (25mm)	1" (25mm)	1" (25mm)	0" (0mm)	N/A	24" (610mm)	42" (1067mm)

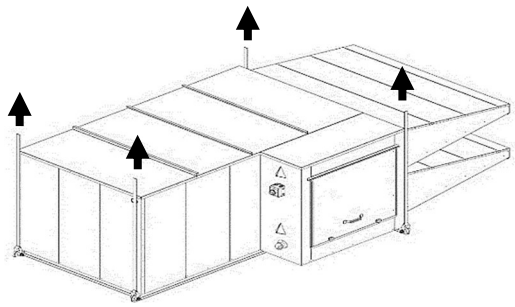
Table 2: Minimum combustible and service clearances

* As required by the Canadian Electrical Code or the National Electrical Code.

2.3. Equipment lifting

The SDME series from **Nagas Express** are built on a galvanized steel-metal base frame equipped with lifting lugs specifically located to help proper lifting of the unit. Employ the use of spreader bar to maintain a vertical position of the slings and keep them away from the unit casing to prevent *scratches*, surface blemishes or other structural damages. The lifting lugs are designed to be lifted straight up vertically; the maximum angle from a vertical lift which is allowed is 30 degrees. All lifting lugs must be used at to distribute load properly and the equipment must be lifted simultaneously by all the lifting lugs.

Figure 1: Typical lifting method



NOTICE

If using a lift truck, ONLY lift using the perimeter base frame. DO NOT allow forks to lift on unit casing or unit floor.

There may be bottom mounted external components, such as drain piping, that can be easily damaged.

WARNING!

Injury or death can result from incorrect rigging and lifting, these manoeuvres must be performed by qualified crane operator with proper equipment using appropriate and approved safety precautions.

2.4. Equipment mounting

This equipment must be mounted level to the ground to prevent water from being trapped inside drain pans and to avoid other operational issues.

CAUTION!

Standing water contributes to poor indoor air quality and unit corrosion.

This equipment is designed for two types of mounting:

1. Base mounting: The total perimeter base frame structure must be supported level by high density concrete or adequate steel beam. Refer to the shop drawing for mounting information.
2. Roof curb mounting: The roof curbs are fabricated of heavy gauge load bearing, galvanized steel, and must be fully insulated after installation by the installing contractor. Wood nailed strips are provided for easy attachment of roof flashing. Gasket material is supplied with the unit and must be field mounted on the curb to seal the joint between the curb and the unit frame. The curb must be supported along its entire perimeter and any full height cross members as shown on the shop drawing. Point loading of the roof curbs is not acceptable.

IMPORTANT!: Secure the unit on the roof curb through vertical portion of base assembly flange. Use a minimum of eight (8) lug screws, anchor bolts or another suitable fastener (not furnished). Shims may be required to get the unit on level.

The gasket material provided for the curb is closed cell foam. Closed cell foam is dense and does not compress easily.

NOTICE: ONLY USE THE CLOSED CELL FOAM GASKET PROVIDED FOR SEALING THE CURB.

Field assembly of the roof curb must be completed by the installing contractor. Refer to assembly instructions provided with roof curb.

WARNING!

This equipment has not been designed for suspended mounting without special mounting frame. If you intend to suspend this equipment you must provide your own custom base mounting. DO NOT USE lifting lugs to attach hanger rods. This special installation must comply with local codes and applicable OSHA standards/requirements.

2.5. Equipment assembly

If the inlet hood is shipped separately, it must be assembled and installed on the field. An instruction will be included with the shipment.

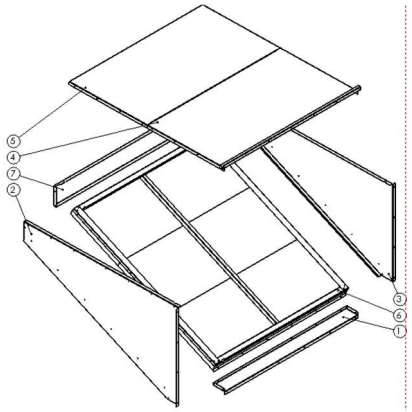


Figure 2: Inlet hood to be assembled

CAUTION!

DO NOT handle the unit by attaching hooks, jacks, slings, or chains to any component or parts protruding outside of the unit casing or base frame (except lifting lugs for vertical lifting only) otherwise it may result in equipment damage, incorrect system operation or personal injury.

2.6. Piping, electrical or control service connections

This equipment is built with unit casing and floors designed to prevent water from penetrating the building

through the installed equipment.

All penetrations through the unit walls must be caulked and sealed to prevent air and/or water from entering the unit.

NOTICE

DO NOT install anything that will interfere with equipment access or the rating labels.
THE FLOOR OF THE UNIT HAS BEEN MADE WATER-RESISTANT. DO NOT CUT OR DRILL HOLES IN THE FLOOR OR USE PENETRATING FASTENERS.

NOTICE

- **Control voltage is as indicated on the rating label.**
- **Follow the wiring diagram supplied with the equipment.**
- **Field wiring to be done by a qualified electrician is denoted by dotted lines on the wiring diagram, solid lines indicated factory wiring by the manufacturer.**

CAUTION!

Screw terminals may become loose during equipment shipment; they should be retightened prior to starting and operating unit.

3. GAS CONNECTION AND PIPING

The gas inlet pressure should not exceed ½ psig (14 inches of water) for all the SDM-E series heaters.

If the gas inlet pressure exceeds ½ psig (14 inches of water), a high-pressure regulator must be installed. This regulator must be suitable to modulate in a ratio of 40:1 to properly regulate gas pressure at low fire.

GAS CONNECTIONS PIPE SIZE (NPT)			
Capacity	≤ 750 MBH	from 751 MBH to 1000 MBH	from 1001 MBH to 2850 MBH
Diameter	¾ inch	1 inch	1 1/2 inches

Table 3: Gas pipe sizes

The table above should not be used to size the gas supply line.

4. ELECTRICAL INSTALLATION

The unit must be electrically grounded, and all wiring must be installed by a qualified electrician in accordance with the **National Electrical Code (ANSI/NFPA 70)** and/or the **Canadian Electric Code (CSA 22.1)** and to the approval of the authorities having jurisdiction.

Field wiring diagrams and internal wiring diagrams are included in the control cabinet. The power requirements are indicated on the rating label. See the field wiring diagram for requirements for shielded or twisted pair wire for solid state devices.

WARNING!

No unspecified and unapproved external load shall be added to the control transformer circuit or to the main

power circuit without the written consent from Nagas Innovation or the warranty will be void.

5. START-UP INSTRUCTIONS

Before beginning a start-up on this equipment make sure you followed all the instructions in the above sections correctly.

WARNING!

This unit is connected to high voltages and contains moving parts that can start unexpectedly. Electrical shock, severe injury or death could occur if instructions given in this manual are not followed. Always disconnect and lock out power before servicing this equipment. All work should be done by a qualified technician. DO NOT bypass any interlock or safety switches under any circumstances.

Proper commissioning of this equipment is the responsibility of the installing contractor. It is recommended that an air balance be completed before the unit start up by a certified air balancing contractor to ensure that the air volume being sent downstream of the unit into the ventilation system matches the unit rating label. Failure to perform a proper air balance can cause injury or death, damage to the equipment, property damage, system operational problems, or be a cause of poor indoor air quality. Moisture carry over can also result from improper air flow.

5.1. Recommended tools

- Multi-meter
- Air temperature reading device
- Tachometer (Fan & motor [rpm])
- Pressure gauge
    - (1x) 0-5 in. w.c.
    - (1x) 0-20 in. w.c.
- Combustion analyzer

5.2. Fan adjustment

1. Check voltage of each phase at main electrical disconnect.
2. Check fan rotation and modify electrical connection if required.
3. Ensure that the VFD (if equipped) is set according to the full load amperage (FLA) as indicated on motor name plate.
4. Check alignment and belts tension.
5. Check for vibration or unusual noise.
6. When dampers are completely opened, with fan running, read amperage at each motor phase and check if it corresponds to the project design BHP, as shown on the unit rating label.

CAUTION!

Excessive vibration may be experienced during the initial start-up. Left unchecked, it can cause a multitude of problems including structural and/or component failure.

5.3. Motor check

Measure the motor's voltage, amps and RPM. Compare to the specifications.

5.4. Air volume measurement and check

Measure the unit's air volume (CFM) and compare it with its rated air volume. If the measured air volume is off, adjust the fan's RPM by changing/adjusting the VFD settings. See Annexe A for details.

CAUTION!

Changing the air volume can significantly increase the motor's amps. If the air volume is changed, the motor's amps must be checked to prevent overloading the motor.

5.5. Gas inlet pressure adjustment

- Ensure that the gas inlet pressure complies with the following table:

SDME MODEL	NATURAL GAS Max: **14** in.w.c. (3487 Pa)	PROPANE GAS Max: **14** in.w.c. (3487 Pa)
25	Min.: **6** in. w.c. (1493 Pa)	Min.: **6** in. w.c. (1493 Pa)
50	Min.*: **6** in. w.c. (1493 Pa) or **9** in. w.c. (2240 Pa)	
75	Min.*: **7** in. w.c. (1741 Pa) or **12** in. w.c. (2986 Pa)	
100		
150	Min.*: **6** in. w.c. (1493 Pa) or **8** in. w.c. (1991 Pa)	Min.: **8** in. w.c. (1991 Pa)
200	Min.*: **6** in. w.c. (1493 Pa) or **13** in. w.c. (3235 Pa)	

*: Depend on burner configuration. See name plate for exact value.

Table 4: Gas pressure adjustments

- Ensure that the air is completely purged from the gas piping.
- The inlet gas pressure difference measured at the inlet of the unit should be less than 2 in.w.c., from the burner operating at low fire and the burner operating at high fire.
- While the burner is in operation, ensure that there are no gas leaks in the entire piping using a leak detection fluid.

5.6. Burner air differential pressure adjustment

NOTE: Always read the air differential pressure when the filters are clean.

- For direct gas-fired burners, the air flow rate through the burner is very important. If the air differential pressure at the burner profile plate is too high or too low, the unit will not function properly. This could produce an excess of carbon monoxide (CO) or trigger a FLAME FAILURE alarm.
- To measure the differential pressure at the burner profile plate, the blower must be in operation and

discharge air temperature be maintained at 70°F (21°C). In winter, to maintain this temperature, the burner must be in operation and the temperature selector must be set at 70°F (21°C).

- Using an air pressure gage, read the differential pressure as shown:

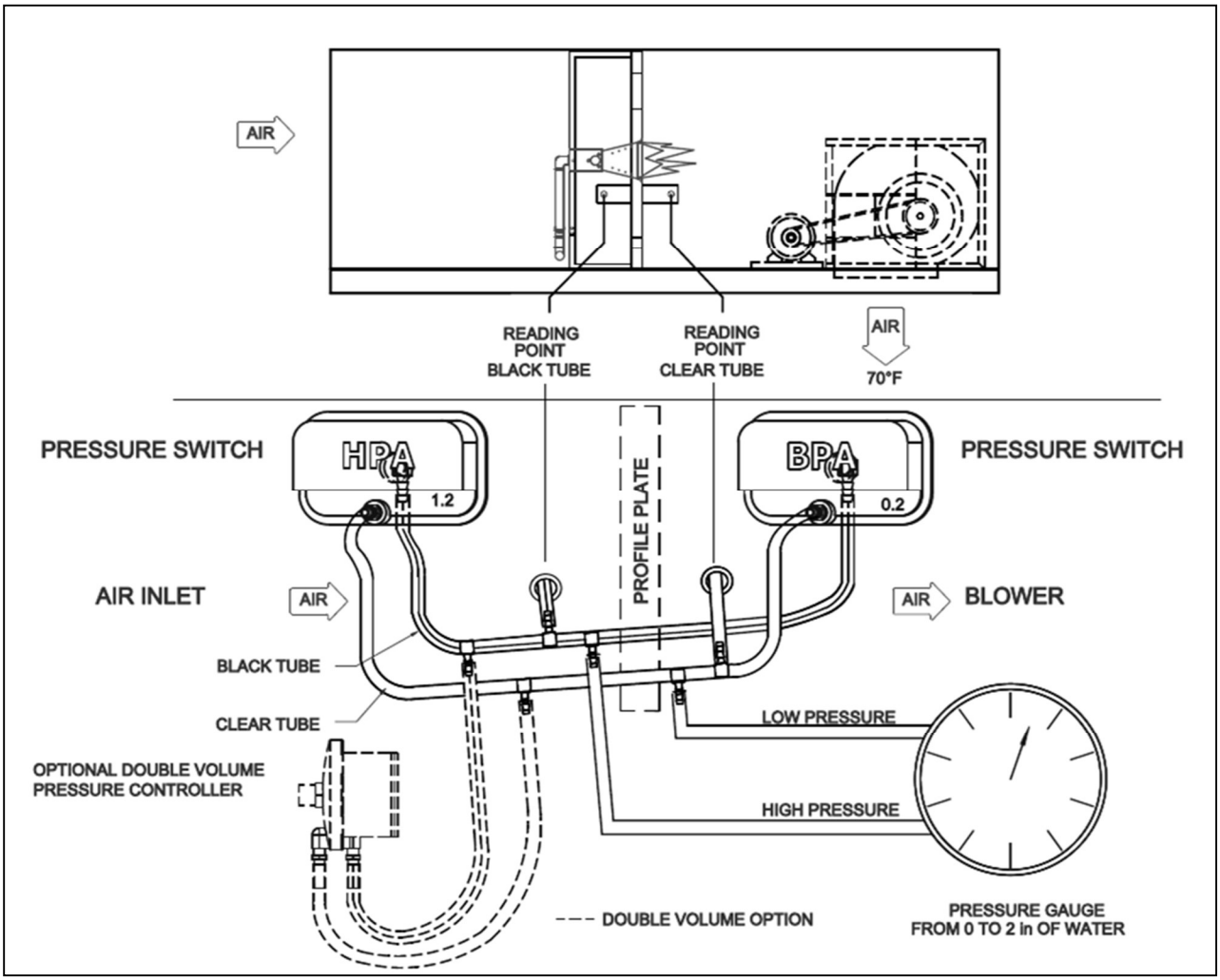


Figure 3: Pressure differential

- The value of the differential pressure drop observed through the profile plate must be set **between 0.60 in.w.c. and 0.65 in.w.c.**

- For unit with variable air volume option, the differential pressure is self-adjusted. No needs to be adjusted.

- If the unit supplies the specified airflow rate and the pressure differential is greater or smaller than the desired pressure drop, the adjustment plates of the burner profile plate must be repositioned.

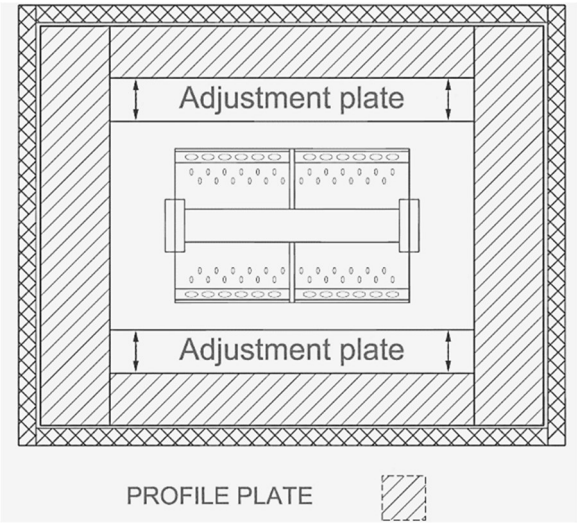


Figure 4: Profile plate

WARNING!
Shut off power supply before making any adjustment.

If differential pressure obtained is **under** the desired value:

- **Reduce** the opening of the profile plate by moving the adjustment plates closer to the burner.

If differential pressure obtained is **over** the desired value:

- **Increase** the opening of the profile plate by moving the adjustment plates away from the burner.

NOTE: For a single volume system, both adjustment plates should be equidistant from the burner.

- Then, read the differential pressure again and repeat the operation if necessary.

NOTE: These adjustments may change the airflow rate of the ventilation system.

Check the airflow rate to ensure that the proper amount of air is obtained. (Air balancing test)

- Adjustment plates of the profile plate must not be used to adjust the final system airflow rate. When the airflow rate must be modified, another set of pulleys may be required.

5.7. Pilot adjustment

- The pilot is factory-set.
- When adjusting the pilot gas pressure with the regulator, the main burner should not be in operation (close the main burner gas supply hand valve).
- Adjust the pilot regulator to obtain a good reading of the flame signal (5 to 10VDC).

5.8. Burner adjustment – High fire

- Set the maximum capacity of the burner according to the desired maximum temperature rise.

Example of calculation of the maximum temperature rise:

Minimum outside temperature:	-20°F (-29°C)
Desired final temperature:	70°F (21°C)
Differential temperature (ΔT):	90°F (50°C)

- When outside temperature does not allow for the simulation of specified temperature rise across the burner, adjust its maximum capacity according to the required gas pressure indicated on the name plates of the unit.
- The adjustment is made using the main burner pressure regulator (figure 5). For units with a capacity over 1000 MBH, use the regulator included in the MAXITROL modulating valve (see MAXITROL service manual) (figure 6).

NOTE:

- Turning the adjustment screw clockwise increases the gas pressure to the burner.
- Turning the adjustment screw counterclockwise decreases the gas pressure to the burner.
- With the MAXITROL series 14 device, disconnect terminal 4 to obtain the maximum capacity of the burner.

Figure 5: Pressure regulator

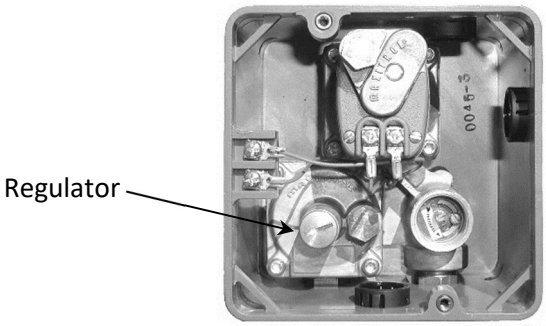
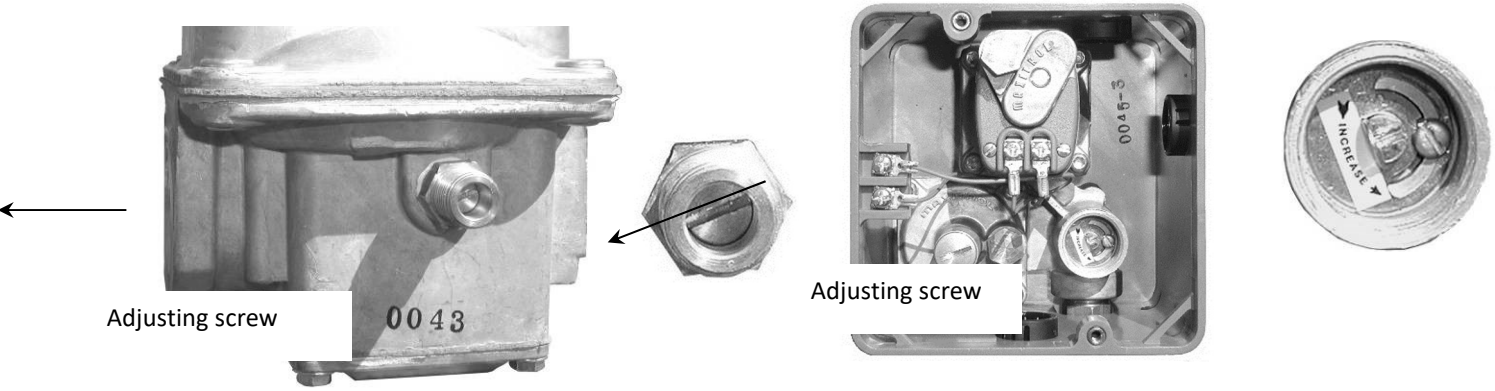


Figure 6: Modulating valve

5.9. Burner adjustment – Low fire

- After having set the burner at high fire, disconnect terminal 8 from the MAXITROL amplifier to set the burner at low fire.

- Set the burner at low fire with the adjusting screw intended for this purpose and located on the MAXITROL modulating valve (see MAXITROL service manual); the burner should then be lit over its entire length.
- After having set the burner at low fire, the unit must be turned off and then turned on to ensure that the burner lit over is entire length.



M511, M611 or ES371 MR212

Figure 7: Modulating valves adjustment

FOR ANY OTHER INFORMATION, REFER TO THE MAXITROL DOCUMENTATION.

5.10. Final air temperature adjustment

- Set the MAXITROL temperature selector (TD 114) to the desired final temperature (refer to local code for maximum temperature allowed). This selector is located either in the control panel on the unit or the remote control station.

NOTE: When the MAXITROL temperature selector (TD 114) is installed in a remote control station, the wires used to make the connections must be shielded wires (with metal sheath).

WARNING!
With an adequate leak detection fluid ensure that there are no gas leaks in the piping. Make the necessary repairs if needed. Do not let the heater operate if a gas leak is detected.

6. UNIT OPERATING SEQUENCE

6.1. Starting up the blower

1. Set the STOP/BLOWER/BURNER switch to BLOWER.
2. The interlock contact provides the proof that the exhaust fan is in operation.
3. The fresh air intake damper opens.
4. The damper end switch closes.
5. The blower motor starter is energized.

6. The blower is in operation.

6.2. Starting up the burner – Single volume

1. Set the STOP/BLOWER/BURNER switch to BURNER.
2. If the outside temperature is under 70°F, the outside temperature selector allows for the flame safeguard relay to be energized.
3. Authorization for pilot to ignite is complete when the low and high air pressure differential and high temperature limit switches are closed.
4. Then the burner starts.
5. The MAXITROL series 14 controller modulates the burner to maintain the selected set point of the temperature selector (TD114).

6.3. Starting up the burner – Double volume

1. Set the STOP/BLOWER/BURNER switch to BURNER.
2. If the outside temperature is under 70°F, the outside temperature selector allows for the flame safeguard relay to be energized.
3. The burner then starts.
4. In low volume mode, the outside air damper is partially open to a predetermined position for the desired airflow rate; the profile plate damper opens partially and modulates to maintain the required air pressure difference across the burner.
5. In high volume mode, the outside air damper opens completely; the profile plate damper opens wider and modulates its position in order to maintain the required air pressure difference across the burner.

6.4. Starting up the burner – Variable volume

1. Set the STOP/BLOWER/BURNER switch to BURNER.
2. If the outside temperature is under 70°F, the outside temperature selector allows for the flame safeguard relay to be energized.
3. The burner then starts.
4. In modulation, the outside air damper is partially open to a predetermined position for the desired airflow rate; the profile plate damper opens partially and modulates to maintain the required air pressure difference across the burner.
5. In maximum air volume mode (10Vdc signal), the outside air damper opens completely; the profile plate damper opens wider and modulates its position in order to maintain the required air pressure difference across the burner.

7. HEATER SHUTDOWN

7.1. Extended shutdown

When the heater is shut down for an extended period, it is recommended that the gas and electric power supply be shut off.

Before turning on the heater after an extended shutdown, make sure the air is purged from the gas pipes and that the gas pressure is adequate. An inspection is recommended to make sure that everything is in order.

7.2. Heater emergency shutdown

When the heater shuts down due to an emergency, the main power disconnect should be turned OFF and gas supply, shut off by closing the gas supply hand valve located in the main gas supply line to the heater.

7.3. Turning on the heater after a flame failure alarm

After a flame failure alarm, the following checks must be performed:

1. Set the main power switch to OFF.
2. Ensure that all gas supply hand valves are open.
3. Check the blower belts; replace or adjust them if necessary.
4. Check flame safeguard relay and fire rod condition.
5. Check condition of filters and replace them if necessary.
6. Ensure that nothing obstructs the air inlet and outlet of the heater.
7. Ensure that nothing prevents proper operation of inlet or outlet air dampers.
8. Turn ON main disconnect.
9. Press the reset button of the flame safeguard relay.
10. Ensure that the air inlet and outlet dampers are operating properly.
11. Ensure that the blower motor is operating.
12. Ensure that the pilot ignites properly.

If the heater still does not start, call the manufacturer or an authorized service company for assistance.

8. TROUBLESHOOTING

8.1. Normal operating sequence

- The (FIREYE) flame safeguard relay includes five lights to indicate that the operating sequence is normal and to also show a burner malfunction.

NORMAL OPERATING SEQUENCE

1. The OPR CTRL light is on when there is a heating demand and terminal 7 is energized.
2. The AIR FLOW light is on when all the safety devices as well as the low and high air pressure and high temperature limit switches are closed and terminal 6 is energized.
3. The PTFL light is on only during the pilot ignition cycle.
4. The FLAME light is on only when the flame safeguard relay detects a flame signal and is not in alarm mode.
5. The ALARM light flashes when a malfunction is detected.

NOTE:

1. During an alarm, the ALARM light that corresponds to the malfunction flashes at intervals of one second. The status of the other four lights indicates the type of malfunction (see table on next page).
2. Pressing down the reset button brings the flame safeguard relay back to its normal operating mode.

8.2. Status of warning lights (FIREYE)

The table below lists the most important trouble codes concerning the operation of the unit. (Refer to the manufacturer for any code not listed in this table.) (A complete troubleshooting list is presented down in the document)

TROUBLE CODES	TROUBLE DESCRIPTION (ALARM)	OPR CTRL	AIR FLOW	PTFI	FLAME	ALARM
6	FREQUENCY NOISE	●	○	○	●	*
7	FLAME FAILURE (PTFI)	○	●	●	●	*
19	FLAME FAILURE (MTFI)	○	○	●	●	*

21	OPEN AIR PRESSURE SWITCH	●	●	●	○	*
54	GROUND FAULT	○	○	○	●	*
55	FAULTY PROGRAMMER	○	○	●	○	*
56	FAULTY AMPLIFIER	●	○	○	○	*

LIGHT:

○ = OFF

● = ON

* = FLASHING

FIREYE AND MAXITROL

NOTE: Refer to the normal operating sequence and the service check list below to identify the cause of the problem.

8.3. Fireye - Troubleshooting check list

SYMPTOMS	ACTIONS
The blower is not in operation. The burner is not in operation. The fresh air damper is closed.	1. Turn ON main disconnect switch. 2. Check the input voltage. 3. Check 120-volt secondary circuit fuse. 4. Check the position of the switch on the remote control panel it should be set to BURNER. 5. Check the contactor indicating that the exhaust fan is in operation. 6. Press down the reset button of the (FIREYE) flame safeguard relay if an Alarm light flashes. 7. Check the adjustment of the overload relay of the blower motor re-adjust it if necessary. 8. Check the freeze protection control its contact opens after around 300 seconds if the supplied temperature remains under 42°F. To start the heater, set the burner and blower switch located on the remote control panel to STOP and then to BURNER. 9. Refer to the manufacturer.
The blower is not in operation. The burner is not in operation. The fresh air damper is open.	1. Make sure that the fresh air damper switch is closed. 2. Refer to the manufacturer.

The blower is in operation. The burner is not in operation. The flame safeguard relay is operating normally.	1. Check if the auxiliary contact of the blower motor starter works. 2. Check selector position on the remote control panel it should be set to BURNER. 3. Check the outside temperature thermostat it prevents the burner from running if the outside temperature is over 70°F. 4. Check the burner purge lime delay relay. 5. Refer to the manufacturer.
CODE (6) Frequency noise detected	1. Check if a high voltage source is located near the flame safeguard relay. 2. Check electrical wiring from the building junction box to the heater. 3. Refer to the manufacturer.
CODE (7) Flame Failure (PTFI) NOTE: The flame safeguard relay goes into alarm mode during the pilot ignition cycle.	1. Check gas supply to the pilot. 2. Check pilot ignition transformer. 3. Check flame signal intensity (pilot only it should range between 5 and 10 VDC). 4. Check if manual and electric pilot gas supply valves are open. 5. Check condition of the flame rod ceramic replace the flame rod if necessary. 6. Refer to the manufacturer.
CODE (19) Flame Failure (MTFI) NOTE: The flame safeguard relay goes into alarm mode during the main burner ignition period.	1. Check if there has been a gas supply shut-off while the heater was in operation. 2. Check the gas inlet pressure while the burner is in operation. 3. Check the intensity of the flame signal (while the burner is in operation it should be between 5 and 10 VDC over the entire modulation range). 4. Refer to the manufacturer.

<table>
<tr><th>SYMPTOMS</th><th colspan="3">ACTIONS</th></tr>
<tr><td rowspan="3">CODE (21) Open air pressure switch

NOTE: While the heater is in operation, the safe contacts located between terminals 6 and 7 of the flame safeguard relay must be closed.</td><td colspan="3">There are three safety devices in series between terminals 6 and 7 of the flame safeguard relay.</td></tr>
<tr><td>A) Low air pressure switch
(set at 0.25 inch of water)
The low pressure air switch will open on an insufficient air flow and cause an alarm.
Its contacts are normally open (N.O.) when the blower starts and they close if the differential pressure at the burner exceeds 0.25 inch of water (see the Start-up Instructions section for more information on the adjustment of the burner plates).</td><td>AT START UP
1. The static pressure drop in the air ducts is higher than specified.
2. Check the size of the pulleys and adjust or change them if necessary.
3. Adjust the opening of the profile plate if necessary.
4. Check blower rotation.</td><td>WHEN HEATER IS IN USE
1. Check condition of filters.
2. Check condition of belts
3. Look for dual work modifications.
4. Check fresh air damper operation.
5. Replace the defective switch.
6. Refer to the manufacturer.</td></tr>
<tr><td>B) High air pressure switch
(set at 1.2 inches of water)
The high pressure air switch will open on an excessive air flow and cause an alarm.
Its contacts are normally closed (N.C) and open if the differential pressure at the burner exceeds 1.2 inches of water (see the Start-up Instructions section for more information on the adjustment of the burner plates).</td><td colspan="2">AT START UP OR WHEN THE HEATER IS IN USE
1. The dual work static pressure drop is lower than specified.
2. Check size of pulleys and adjust or change them if necessary.
3. Adjust the profile plate opening if necessary.
4. Replace the defective switch.
5. Refer to the manufacturer.</td></tr>
</table>

	C) Safety high temperature limit switch (set at 160oF) Its contacts are normally closed (N.C) and open when the temperature of the air after the burner exceeds 160°F.	AT START UP OR WHEN THE HEATER IS IN USE 1. Check air temperature downstream of the burner (the safety high temperature limit switch opens at 160°F). 2. Check modulation of the Maxitrol valve and controls as well as the amplifier and temperature signal. 3. Check gas pressure at the burner when set at high fire. 4. Replace defective switch. 5. Refer to the manufacturer.
CODE (54) Ground fault	1. Check for proper grounding of the heater and (Fireye) flame safeguard relay. 2. Check for faulty ground in the wiring between the heater and electrical distribution panel. 3. Refer to the manufacturer.	
CODE (55) Faulty programmer	1. Replace the programmer. 2. Refer to the manufacturer.	
CODE (56) Faulty amplifier	1. Replace the amplifier. 2. Refer to the manufacturer.	

8.4. Maxitrol - Troubleshooting check list

SYMPTOMS	POSSIBLE CAUSES	ON-SITE CHECKS	ACTIONS
A. No gas flow	l. Modulating valve improperly installed or defective	1. The arrow on the side of the valve must point in the direction of the gas flow.	1. Install the valve properly.
B. Continuous low fire (electronic problem)	2. No voltage to the amplifier 3. Open circuit in TD114 (circuit or wiring) 4. Short circuit in TS114 (circuit or wiring) 5. Defective amplifier	2. Check for 24 VAC supply at amplifier terminals 7 and 8. 3. Check for loose or broken wires between amplifier terminals 1 and 2 and between TD114 terminals 1 and 3. 4. Connect the test resistor between terminals 3 and 4 of the amplifier and disconnect the wiring. Follow Maxitrol analysis procedure. 5. Perform checks 2, 3 and 4.	2. Verify the power source. 3. Tighten connections or replace wiring. 4. If a modulating signal is obtained, check TS114 for short circuits. Replace the TS114 if necessary. 5. If steps 2, 3 and 4 do not solve the problem and a modulating signal is still not obtained, replace the amplifier.

C. Continuous low fire (electronic problem)	6. Short circuit or open circuit in the amplifier coil 7. Missing, jammed or improperly installed valve plunger	6. With control wires disconnected, check the resistance at the connecting terminals of the modulating valve. 7. Check the plunger; it should move freely upward.	6. Replace the modulating valve head if the resistance is not approximately 45-55 ohms for the M511 or ES371 valves and approximately 60-80 ohms for the MR212 valve. 7. Clean the plunger or replace it if necessary. Install according to the instructions provided.
D. Low fire - Pulsating or erratic flame or improper capacity	8. Incorrect low fire adjustment 9. Excessive negative pressure at burner	8. Make sure that low fires properly adjusted. There should be a low flame throughout the burner. 9. Shut off main gas supply and check the suction at the elbow located before the burner while the blower is in operation; the negative pressure should not exceed 1.5 inches of water for the M511.	8. Adjust the low fire. 9. If the negative pressure exceeds 1.5 inches of water, check for clogged filters or air inlet restrictions. Refer to the manufacturer for other suggestions.
E. Continuous high fire (electronic problem)	10. Short circuit in TD114 (circuit or wiring) 11. Open circuit in TS114/TS1007 (circuit or wiring) 12. Jumper not connected between terminals 2 and 3 of the amplifier	10. Check for short circuits at amplifier terminals 1 and 2 and TD114 terminals 1 and 3. 11. Check TS114 for open circuits. Follow step 4. 12. Make sure jumper is connected.	10. Correct wiring if necessary. 11. If a modulating signal is obtained, check TS114 for open circuits. Replace the TS114 if necessary. 12. Correct the wiring.
F. Continuous high fire (electronic problem)	13. Foreign object holding the valve open 14. Jammed plunger	13. Remove valve bottom plate and inspect the valve plunger and seat. 14. Check the plunger; it should be clean, smooth and move freely in the valve.	13. Clean the seat. Clean the valve or replace it if necessary. 14. Clean the plunger or replace it if necessary.
G. Abnormal high fire	15. Gas inlet pressure too low 16. Incorrect adjustment of regulator outlet pressure	15. Make sure that the minimum inlet pressure recommended by the manufacturer is respected. 16. Adjust the gas inlet pressure according to the manufacturer's specifications.	15. Increase the inlet pressure if possible. 16. Adjust the regulator to obtain the required pressure.

SYMPTOMS	POSSIBLE CAUSES	ON-SITE CHECKS	ACTIONS
H. Erratic or pulsating flame	17. Signal instability (hunting) 18. Air turbulence or TS114 installed in improper location 19 Control system wiring running along high voltage wires, causing induction	17. Adjust the amplifier sensitivity counter clockwise. 18. Follow step 4. Turn the TD114 button to check the entire modulation range. 19. Temporarily connect the TD114, TS114 and MR212 with new wires. Observe the burner operation.	17. If the flame is unstable, adjust the sensitivity of the amplifier to obtain an even flame. 18. If the flame remains unstable over the entire modulation range, change the location of the TS114. 19. If normal operation is restored, isolate the affected wires from the wires causing induction.

1. Incorrect discharge air temperature	20. Faulty amplifier or incorrect input voltage 21. Incorrect wiring 22. System improperly adjusted 23. Air stratification 24. The room thermostat controls the burner	20. Follow step 18. Note the DC voltage at the amplifier terminals. 21. Check the electric connections. 22. The temperature sensed by the TS114 does not correspond to the TD114 setting. 23. The temperature sensed by the TS114 does not correspond to the desired average discharge air temperature. 24. Disconnect the room thermostat from terminals of the TD114.	20. If the OC voltage is unstable over the entire modulation range, replace the amplifier. If unstable operation is noted over a small part of the range (2 or 3 volts only), this might indicate the occurrence of surges. Refer to the Maxitrol manufacturer. 21. Correct wiring. 22. Adjust the TD114. 23. Move the TS114 to a location where the temperature corresponds to the desired average temperature. 24. Make sure that the temperature corresponds to the TD114 set point. Check the room thermostat setting and check wiring for short circuits.
J. Burnt out transformer	25. Short circuit in the amplifier coil 26. Short circuit between the amplifier and the modulating valve	25. Check the resistance of the modulating valve head (with red wires disconnected on the MR212). 26. Check the wiring.	25. Replace the modulating valve head if the resistance is under 40 ohms. 26. Correct the wiring if a short circuit is found.
K. Discharge air temperature too low when the room thermostat controls the burner	27. Second temperature set point too low 28. Insufficient burner capacity	27. Check the setting of the second control point inside the TD114. 28. Make sure that the heater operates at high fire and that the gas inlet pressure corresponds to the manufacturer's specifications.	27. Set at desired temperature. 28. If the heater operates at high fire, the control signal cannot be increased. The burner may not be of sufficient capacity to perform the desired temperature rise.
L. No reaction from the modulating valve with 20 VDC between terminals 3 and 4	29. Faulty modulating valve 30. Broken wires between the amplifier and the modulating valve	29. Read voltage directly on the modulating valve; if 24 VOC, the valve is faulty. 30. Read voltage between terminals 5 and 6 of the amplifier; if 24 VDC, check for broken wires leading to the modulating valve.	29. Replace modulating valve. 30. Correct wiring.

9. MAINTENANCE

Keeping an HVAC system running efficiently and reliably also helps maintain high indoor air quality.

The following maintenance instructions are to be carried out each spring and fall or as otherwise indicated by qualified service personnel.

WARNING!

This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out

power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.

WARNING!

Follow the cleaning instructions and recommended inspection schedule to reduce the risk of mold or other bacterial growth. Property damage or personal injury claims may result from mold or biological growth arising from improper installation, inadequate maintenance, or failure to inspect. Nagas Innovation has no responsibility for and makes no express or implied warranties regarding mold or bacterial growth or any other indoor air quality issues. If mold or biological growth is present, determine and fix the cause. Properly remove and dispose of the contamination. Properly clean and sanitize the affected area using only approved sanitizers suitable for HVAC equipment.

DANGER!

When servicing the unit, the internal components may be hot enough to cause pain or injury. Allow time for cooling before servicing.

CAUTION!

Label all wires prior to removal when servicing controls or critical components. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

NOTICE

For additional information always refer to the part manufacturers' literature.

If you don't have a maintenance history the warranty can be voided for failure to prove reasonable and necessary maintenance. It is recommended that the owner of the equipment keep a maintenance file for each unit for future reference, including, but not limited to, the installation date, which parts have been replaced or repaired and when, and any other servicing history that could be relevant.

9.1. Electrical components

1. Check all wiring for loose connections.
2. Check voltage at unit (while in operation).
3. Check amperages draw against unit rating plate.
4. Where possible, all contactors should be inspected to ensure that contacts are clean and are making good contact. If contacts are abnormally pitted or burned badly, replace contactor. Single phasing and motor burnouts can result from bad contacts.

9.2. Belt and Pulley adjustments

For maximum belt and bearing life, pulley alignment and belt tension must be properly maintained. Only replace with belts of the proper type and size.

Alignment: Pulleys must be aligned to within 1/16" per foot (1 mm per 760 mm) of span.

Belt Deflection: Allow 1/64” (0.4 mm) of deflection for each 1” (25.4 mm) of span length.

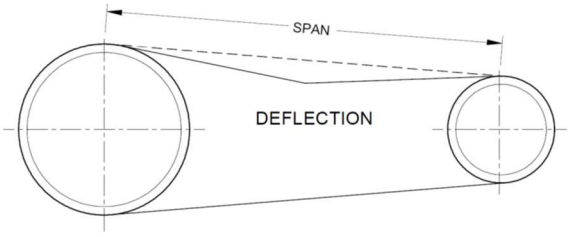


Figure 8: Belt deflection

NOTICE

If belts are too tight or improperly aligned, the life expectancy of the motor(s), fan bearings and belt(s) are reduced.

9.3. Set screws

Check set screws on fan wheel, fan bearings, fan and motor pulleys for looseness on the shaft. Tighten where required.

NOTICE

IT IS IMPORTANT TO PERFORM THIS CHECK BEFORE INITIAL START-UP, AFTER A RUN-IN PERIOD OF 2 WEEKS AND THEN ON 4 MONTH INTERVALS.

CAUTION!

OVERTIGHTENING SET SCREWS CAN DAMAGE BEARINGS.

9.4. Bearing lubrication

Fan bearings:

Some fans, depending on equipment model and size, have permanently lubricated sealed ball bearings which should not require lubrication. These bearings are factory packed 30 to 50% full.

Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

NOTICE

Bearings that require lubrication should be greased while the bearing is rotating slowly.

CAUTION!

DO NOT OVERGREASE AND DO NOT USE NON-LITHIUM BASED GREASE.

Motor bearings:

Refer to motor manufacturer literature for lubrication recommendations.

9.5. Vent terminals

The vent terminal should be checked and cleaned every fall. If the terminal is found to have accumulations of leaves or other debris, clean more often as necessary.

9.6. Air Filters

Air Filter changing intervals can be based on the pressure drop across the filter or by calendar scheduling or visual inspection. Scheduled intervals should be between one and six months, depending on the pollutant loading from indoor and outdoor air.

See shop drawing for filter quantities, sizes and types. Use same size and type for replacement.

NOTICE

More frequent changes may be required during the economizer season.

CAUTION!

Do not operate without the bird screens installed, it prevents the entry of foreign objects such as leaves, birds, etc.

Plugged or excessively dirty filters can cause damage to the equipment.

9.7. Controls and sensors

Annually clean and recalibrate all controls, check for proper operation, and repair or replace any faulty controls. Check all damper hardware settings every three months. Replace blown fuses with equivalent size and type fuse. Failure to do so can result in damage to the unit.

9.8. Outdoor air intakes, exhaust outlet, mixing sections, and dampers

Outdoor air intakes, outlets, screens, and adjacent areas shall be checked semi-annually for cleanliness, integrity and proper operation. Adjust dampers where required.

9.9. Snow accumulation

Clear snow away from units installed outdoors. Keep the snow clear of the ventilation air intake, combustion air intake, and all access doors.

9.10. Maintenance check list

CHECK LIST	INSPECTION			
	WEEKLY	MONIHLY	SEMI· ANNUALLY	ANNUALLY
Inspect the filters; replace them if necessary.	•			
Ensure that no flammable material is stored near the heater.	•			
Ensure that nothing obtrudes the air inlet and outlet of the heater.	•			
Check the flame and combustion quality.		•		
Check belts; adjust or replace them if necessary.		•		
Lubricate blower and motor bearings as needed.		•		
Ensure that the fresh air dampers are completely open.			•	

Ensure that all safety controls are operational.			•	
Check the high limit temperature switch.				•
Ensure that there are no gas leaks in the piping (fittings and valves).				•
Inspect all electric connections.				•
Ensure that the blower and motor are firmly anchored.				•
Inspect the flame detector and pilot ignitor electrode; change if necessary.				•
Inspect the burner and clean the orifices if necessary.				•

IMPORTANT!

BEFORE START-UP AND AFTER 8 HOURS OF OPERATION

- Check bearing alignment and lubrication.
- Check bearing clamps.
- Check alignment and tension of belts.

AFTER 24 HOURS OF OPERATION

- Check tension of belts

10. START-UP REPORT

General information

Unit tag: _____ Project: _____

Technician: _____ Mailing Address: _____

Contractor: _____ Email Address: _____

Phone #: _____

Manufacturer information

Model number: _____ Serial number: _____

Pre-Start Inspection check list

Unit casing:	☐	Airflow switch:	☐
Gas leak:	☐	Gas vents (if applicable):	☐
Combustion air opening:	☐	Chimney:	☐
Combustion air proving switch:	☐	Verify control wiring wire gauge	☐
Verify supply voltage main disconnect	☐	Verify supply gas pressure	☐

Notes: _____

_____

Blower Start-up

Check line voltage:	☐	Supply fan RPM:	_____ RPM
Check Blower rotation:	☐	Motor nameplate amperage:	_____ Amps
Check for vibration:	☐	Actual motor amperage:	_____ Amps
		Actual air flow delivered:	_____ CFM

Heater Start-up

Gas pressure:

_____	_____	_____	_____	_____	_____
STOP	LOW FIRE	HIGH FIRE	STOP	LOW FIRE	HIGH FIRE
|_____ INLET GAS PRESSURE _____|			|_____ GAS PRESSURE AT THE MANIFOLD_____|		

Differential pressure: _____ (Low volume) _____ (High volume) Flame signal: _____ VDC

Adjustment

Low limit stat (freezestat): _____ºF Low limit delay: _____sec.

Inlet duct thermostat:	_____ºF	Pre-purge delay:	_____sec.
Start-up delay on low fire:	_____sec	Inlet temperature thermostat:	_____sec.
Profile plate openings:	_____ X _____	_____ X _____	
	(Main - fixed)	(Auxiliary motorized)	

Start-Up completed: ☐ if not, why?

_____

_____

_____

_____

Signature: _____ Date: _____

PLEASE FAX THIS REPORT TO FACTORY AFTER STARTUP IS COMPLETED 1-450-649-8756

11. INSPECTION & MAINTENANCE NOTES

Unit model no.: _____

Unit serial no.: _____

Serviced by: _____

Tel. no.:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

12. ANNEXE A – AIR BALANCING – VFD ATV 320

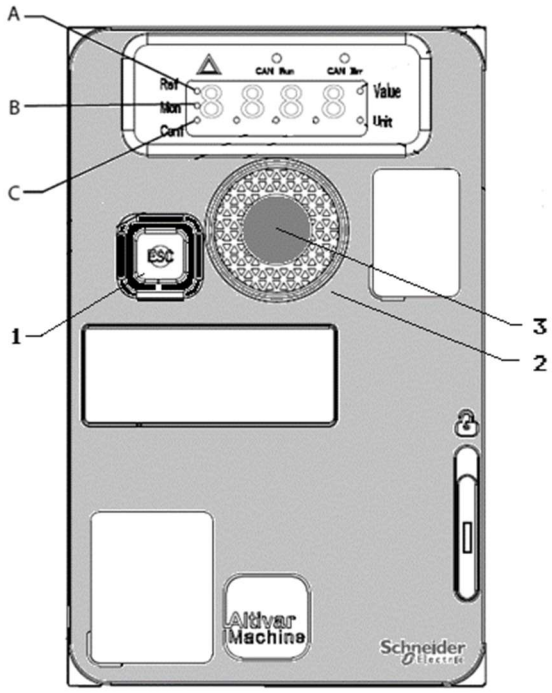


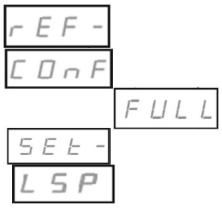
Figure 9: Pressure regulator

1 The **ESC** key is used for menu navigation (backward) and parameters adjustment (cancel)
2 The **Jog dial** is used for menu navigation (up or down) and parameters adjustment (increase/decrease value or element choice).
3 The **ENT** key (push on the Jog dial) is used for menu navigation (forward) and parameters adjustment (validate)
A REF mode selected (rEF-)
B MON mode selected (MOn-)
C CONF mode selected (COnF)

12.1. Two speed VFD

When the unit is running: the display should show the current frequency of the drive.

1. Push on the jog dial (3). The screen should display ***rEF-***.
2. Turn the jog dial up to ***COnF-*** (configuration) then push the jog dial.
3. Turn the jog dial up to ***FULL*** then push the jog dial.
4. Turn the jog dial up to ***SET-*** (settings) then push the jog dial.
5. Turn the jog dial up to ***LSP*** (minimum speed*,* equivalent to first speed.) then push the jog dial.
    a. Turn the jog dial to a minimum speed frequency (25Hz default).
    b. Press the jog knob for 2 seconds to confirm the value.
6. If ***LSP*** has been set to a value below 25Hz otherwise, you can skip this step.
    a. Turn the jog dial up to ***Ftd*** (frequency threshold) then push the jog dial.
    b. Change settings with the same frequency value found for the ***LSP*** (*Low Speed* Hz) by turning the jog wheel.



c. Press the jog knob for 2 seconds to confirm the value

7. Turn the jog dial up to ***HSP*** (High speed*,* equivalent to the second speed) then push the jog dial.

   a. Change settings if needed (60 Hz default) by turning the jog dial.
   b. Press the jog knob for 2 seconds to confirm the value.
8. Press the ***ESC*** button many times until the display shows the current frequency of the drive.

12.2. Variable speed VFD

When the unit is running: the display should show the current frequency of the drive.

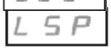
1. Push on the jog dial (3). The screen should display ***rEF-***.

2. Turn the jog dial up to ***COnF-*** (configuration) then push the jog dial.

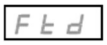
3. Turn the jog dial up to ***FULL*** then push the jog dial.

4. Turn the jog dial up to ***SET-*** (settings) then push the jog dial.

5. Turn the jog dial up to ***LSP*** (minimal speed*,* equivalent to the input signal (0 Volt.) then push the jog dial.



   a. Turn the jog dial to a minimum speed frequency (25Hz default).
   b. Press the jog knob for 2 seconds to confirm the value.
6. If ***LSP*** has been set to a value below 25Hz otherwise, you can skip this step
   a. Turn the jog dial up to ***Ftd*** (frequency threshold) then push the jog dial.



   b. Change settings with the same frequency value found for the ***LSP*** (*Low Speed* Hz) by turning the jog wheel.
   c. Press the jog knob for 2 seconds to confirm the value.
7. Turn the jog dial up to ***HSP*** (High speed*,* equivalent to the input signal 10 Volt) then push the jog dial.

   a. Change settings if needed (60 Hz default) by turning the jog dial.
   b. Press the jog knob for 2 seconds to confirm the value
8. Press the ***ESC*** button many times until the display shows the current frequency.