

TECHNICAL MANUAL FOR INSTALLATION, OPERATION AND MAINTENANCE OF THE GAYLORD "ClearAir" MODEL "TPF" SERIES POLLUTION CONTROL UNITS WITH FM-100 SERIES MONITOR STATION

WARNING

Improper installation, adjustment, alteration service or maintenance can cause property damage, injury or death. Read the installation, operation and maintenance instructions thoroughly before installing or servicing this equipment. Only trained and qualified service personnel should install or service this equipment.



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TECHNICAL MANUAL FOR INSTALLATION, OPERATION AND MAINTENANCE

OF

THE GAYLORD "ClearAir"™ MODEL "TPF" SERIES POLLUTION CONTROL UNITS WITH FM-100 SERIES MONITOR STATION

Published by:

GAYLORD INDUSTRIES, INC. Tualatin, Oregon 97062-1149 U.S.A.

First Printing: January, 2003

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The Gaylord ClearAir Unit is designed and engineered by GAYLORD INDUSTRIES, INC. P.O. Box 1149, Tualatin, Oregon 97062-1149.

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INTRODUCTION

Air quality is becoming a major concern in America's large cities and as a result, many commercial kitchens will require pollution control equipment in their exhaust systems to comply with the increasing demands of environmental control agencies. In addition, pollution control equipment is being used for kitchens in high-rise buildings allowing the exhaust to discharge out the side of the structure which saves the cost of running the duct up many floors to the roof.

Pollution control in kitchen exhaust systems has typically been accomplished by any one of the following methods gas fired incinerators, scrubbers, filtration units or electrostatic precipitators. Incinerators and afterburners literally burn the pollutants and, while effective, can be very costly and hazardous to operate. Scrubbers consist of a water bath and extraction baffles to remove the pollutants and though quite effective on grease removal, they typically require the addition of high efficiency filters to abate smoke below control agencies' standards. Filtration units use a series of impingement filters to remove the pollutants and if done properly can be quite effective on both smoke and grease.

The Gaylord pollution control unit, trademarked "ClearAir"[™], can be manufactured with either electrostatic precipitation (ESP) or Filtration (TPF). Gaylord Industries, Inc. has been manufacturing ESP's specifically designed for commercial kitchen exhaust systems since the early 1970's, longer than any other manufacturer. However, when initial cost is a greater concern the TPF unit is a sound alternative.

The ClearAir TPF unit is available in several configurations, as illustrated on the following pages, ranging in capacity from 1000 to 24,000 CFM (472 to 11,328 L/s). Most models can include an exhaust fan and odor abatement equipment as an option.

Basic Facts About Smoke

Smoke particles are extremely small and not visible to the human eye unless thousands of them are grouped together to form what we see as smoke. Individual particles are measured in units called microns and one micron equals 1/25,400 of an inch (1/64,516 of a cm).

Smoke generated by commercial cooking equipment has a particulate size of between 0.3 and 0.8 microns and it is these very small particles that smoke abatement equipment must remove from the airstream. The amount of smoke being discharged from a kitchen exhaust duct is measured in terms of its density, referred to as opacity - the degree to which emissions block light. A 100% opacity level would be solid black and 0% would be perfectly clear. Control agencies that have adopted smoke pollution ordinances are requiring an opacity level of no more than 20%, which is a very light blue smoke.

Typically, heavy smoke producing cooking such as charbroiling, creates an opacity level of 60% to 70%. Opacity readings are taken by the human eye by viewing the smoke being discharged and then assigning a percentage of opacity to what is seen. Though this method is quite subjective, it is the method practiced by control agency inspectors who are trained and certified in determining opacity percentages. Other more technical methods of determining opacity or particulate density are achieved through the use of opacity meters and cascade impactors. This level of analysis is usually referred to as source testing. Control agencies occasionally require this type of analysis and if so, the testing is conducted by state certified contractors which can be quite costly and time-consuming. The efficiency of an TPF is based on how well it reduces the opacity level of a given airstream. The Gaylord ClearAir unit will reduce the opacity level below 20%, thereby meeting the requirements of environmental control agencies.

Basic Facts About Odor

Cooking odors (molecules) generated by the combustion of animal and vegetable matter result in an extremely complex mixture of reactive organic gases (ROG's). A small percentage of these odors may be absorbed by the grease particles but the vast majority exist separately in the airstream. The ROG molecules are much too small to be removed by any type of filter and therefore, other methods must be used. There are several methods with which to manage the odor. One method is to use a media bed. The two most popular types of media bed are activated charcoal, which absorbs and retains the odor molecules, and the use of an odor-oxidant (potassium permanganate) which oxidizes the molecules to solids and then retains them. The other method involves the use of a liquid delivered with a finely atomized spray. This spray performs a similar function to potassium permanganate in that is adsorbs or chemically neutralizes odors. This process has the benefit of the end user being able to adjust the amount of spray and thus the effectiveness and cost of the odor control.

The life of the media bed type of odor control is dependent upon several factors such as how much media is used, type of odor, amount of odor molecules, grease loading and air temperature. Typically, any of the above mentioned types of media can remove 85% - 90% of the molecules. Determining the efficiency of odor control can be very subjective, as testing is usually conducted by the human nose. More scientific testing is available through ROG analysis, but this involves considerable costs.

Grease Removal - The Important First Step

Grease particles are also measured in terms of microns and grease generated by commercial cooking equipment has a particulate size of 10 microns and up. Pollution control equipment is not limited to removing smoke particles, but will also remove a majority of the grease particles remaining in the airstream. Therefore, the grease extraction efficiency of the exhaust hood plays an important role in the operation and performance of pollution control equipment.

Removal of grease particles before they reach smoke and odor control equipment will significantly increase the smoke abatement efficiency and the life of the odor abatement media. It is highly recommended that a Gaylord CG3 Series Ventilator be used with the ClearAir unit as it has a grease extraction efficiency of 95%. Other high efficiency exhaust hoods and standard filter type hoods may be used with the ClearAir unit. Contact Gaylord Industries for details.

ClearAir Unit - Principle Of Operation

Smoke Control Section

The smoke control section has three phases of filters located prior to the odor control section. These filters consist of replaceable 30% pre-filter, 95% bag filter and a replaceable 99% final filter. Replaceable filters are mounted in filter slide tracks to prevent air bypass around the ends of the installed filter bank. Filters are accessed through removable side access panels with lift and turn latches.

Phase one filters have an average efficiency of 25 to 30% and an average arrestance of 90 to 92% in accordance with ASHRAE test standard 52.1-1992. Media support grid is on 1" centers with an open area 96%. Filter enclosing frame is a rigid, high wet strength beverage board, with diagonal support members 4" deep.

Phase two filters have an average efficiency of 90 to 95% in accordance with ASHRAE test standard 52.1-1992. Sealing surface and pocket retainers are configured to provide 84% open area. Seams in bag filters are sealed with foamseal adhesive to completely eliminate air leakage through stitch holes.

Phase three filters are 95% efficient on .03 micron particles (DOP smoke test), 97% efficient on nebulized staphylococcus aerosols, 99+% efficient on atmospheric test dust (ASHRAE standard 52.1-92). The casing is 16 gauge steel with corrugated aluminum separators to insure media stability. Media is fine-fiber, high strength microfiberglass paper. Media end cuts are encapsulated in urethane potting adhesive.

All Gaylord ClearAir units include, as standard equipment, a fan start stop switch and filter monitor panel. If a Gaylord water-wash ventilator is used, a common control panel which would wash the ventilator and provide the monitor station for the Clear Air Unit is provided.

The ClearAir the unit includes a UL listed fire damper, with a 280 degree fusible link, located down stream of the filters to prevent passage of fire to the duct downstream of the unit. A fire-stat, set at 250 degrees, is located in the filter section to shut down the exhaust fan in the event of a fire.

Model Application

The Gaylord ClearAir unit is available in various configurations, as shown on the following The simplest configuration is the Filtration unit alone with out a fan or odor control. A second configuration includes the exhaust fan but no odor control. This is used when smoke abatement is the only concern. The third, and most common unit, is the Model TPF-H- Series. This model would also be located either in a mechanical room or on the roof and includes odor control and the exhaust fan. The size of each of the configurations varies with the air volume, type of cooking equipment and options chosen. Contact Gaylord Industries for complete details.

Construction

The housing is constructed of a minimum of 16 gauge g-90 heat treated galvanized steel. The perimeter base is 12 gauge formed channel with lifting lugs at each corner and along the length as required. The internal housing is externally welded liquid tight for compliance to the International Mechanical Code grease duct construction requirements. The smoke control and odor control sections all include a drain at the side bottom of the housings for interconnection to a common drain to facilitate removal of water from steam cleaning or pressure washing. The exhaust fan includes a scroll drain with a grease receptacle.

Monitor Panel

A monitor panel, for remote location, is supplied for the operation and monitoring of the unit. The panel is be constructed of 18 gauge stainless steel, number 4 finish, and is suitable for surface or recessed mounting. The panel face has a gasketed hinged door with a lift and turn flush latch. The panel includes an air proving time delay, relays and indicator lights to continuously monitor the unit. Indicator lights are "Fan On", "Normal Air", "Low Air", "Replace Pre-Filters", "Replace Bag Filters", "Replace Final Filter", "Missing Filter", and "Fire In Unit". An audible alarm, with an alarm cancel button, is included and will activate whenever the unit status is low air, replace filters, missing filters or fire in the unit. Status other than "Fire In The Unit" will not shut down the exhaust fan.

Specifier Note: If the ClearAir unit is used in conjunction with a water wash ventilator, the monitor panel is built into the main water wash control cabinet model GPC-6000 series.

FILTER MONITORING STATION FM-100



CLEARAIR TPF TYPICAL MODELS

MODEL TPF-H

Horizontal Style

The model TPF-H is a Filtration smoke abatement unit designed for use with a remote exhaust fan and odor control unit(if required) which can be supplied by Gaylord Industries as an option.



OUTLET TO FAN

 \Box

Model TPF-H-EF

Horizontal Style with Exhaust Fan

The Model TPF-H-EF is an Filtration smoke abatement unit that includes a built-in exhaust fan. The primary feature of this unit is that the interconnecting ductwork, transitions and fan are factory installed in a single roof top package. The unit comes pre-wired for single point electrical connection and includes a magnetic starter, fuses, and a disconnect switch. This model is available for both indoor and outdoor installations in sizes from 1000 to 24,000 CFM (472 to 11,328 L/s).



Model TPF-H-SO

Horizontal Style with Odor Control

The Model TPF-H-SO is an Filtration smoke abatement unit that includes built-in odor control and is designed for use with a remote exhaust fan which can be supplied by Gaylord Industries as an option. The odor control section includes a 30% pre-filter, and a single pass odor control media. This model is available for both indoor and outdoor installations in sizes from 1000 to 24,000 CFM (472 to 11,328 L/s).



Model TPF-H-SO-EF

Horizontal Style with Odor Control and Exhaust Fan

The Model TPF-H-SO-EF is an Filtration smoke abatement unit that includes built-in odor control and exhaust fan. The primary feature of this unit is that the interconnecting ductwork, transitions and fan are factory installed in a single roof top package. The unit comes pre-wired for single point electrical connection and includes a magnetic starter, fuses and a disconnect switch. The odor control section includes a 30% pre-filter, and a single pass of odor control media. This model is available for both indoor and outdoor installations in sizes from 1000 to 24,000 CFM (472 to 11,328 L/s).



Model TPF-H-DO-EF

Horizontal Style with Double Odor Control and Exhaust Fan

The Model TPF-H-DO-EF is an Filtration smoke abatement unit that includes built-in odor control and exhaust fan. The primary feature of this unit is that the interconnecting ductwork, transitions and fan are factory installed in a single roof top package. The unit comes pre-wired for single point electrical connection and includes a magnetic starter, fuses and a disconnect switch. The odor control section includes a 30% pre-filter, and a double pass of odor control media. This model is available for both indoor and outdoor installations in sizes from 1000 to 24,000 CFM (472 to 11,328 L/s).



Monitor Panel

Model FM-100

Every ClearAir unit comes complete with a remote monitor station, Model FM -100 Series. The monitor panel contains switch for controlling the exhaust fan, indicator lights for monitoring the filters and internal fire protection system. This monitor panel can be combined with the ventilator's wash and fire cycle functions if a Gaylord water-wash type ventilator was used. The cabinet is constructed of all stainless steel and would typically be located within the kitchen.



GENERAL INFORMATION

General

The pollution control unit consists of a smoke control section, odor control section and an exhaust fan all built on a common base as an integral unit. Smoke control will be accomplished by a three stage high efficiency filter section and odor control by an odor oxidant media. The unit is ETL listed and labeled. The unit should be used in conjunction with a listed water wash or cartridge extractor ventilator with a minimum grease extraction efficiency of 90%.

Smoke Control Section

The smoke control section has three phases of filters located prior to the odor control section. These filters consist of replaceable 30% pre-filter, 95% bag filter and a replaceable 99% final filter. Replaceable filters are mounted in filter slide tracks to prevent air bypass around the ends of the installed filter bank. Filters are accessed through removable side access panels with lift and turn latches.

Phase one filters shall have an average efficiency of 25 to 30% and an average arrestance of 90 to 92% in accordance with ASHRAE test standard 52.1-1992. Media support grid is on 1" centers with an open area 96%. Filter enclosing frame is a rigid, high wet strength beverage board, with diagonal support members 4" deep.

Phase two filters have an average efficiency of 90 to 95% in accordance with ASHRAE test standard 52.1-1992. Sealing surface and pocket retainers are configured to provide 84% open area. Seams in bag filters are sealed with foamseal adhesive to completely eliminate air leakage through stitch holes.

Phase three filters are 95% efficient on .03 micron particles (DOP smoke test), 97% efficient on nebulized staphylococcus aerosols, 99+% efficient on atmospheric test dust (ASHRAE standard 52.1-92). The casing is 16 gauge steel with corrugated aluminum separators to insure media stability. Media is fine-fiber, high strength microfiberglass paper. Media end cuts are encapsulated in urethane potting adhesive.

The unit includes a UL listed fire damper, with a 280 degree fusible link, located down stream of the filters to prevent passage of fire to the duct downstream of the unit. A fire-stat, set at 250 degrees, is located in the filter section to shut down the exhaust fan in the event of a fire.

Odor Control Section

Odor control can be provided by either:

Carbon and potassium permanganate blend, Carbon only or Chemical Spray Odor control

If an media bed type of odor control is selected. The odor removal media is a 50% potassium permanganate 50% carbon blend or 100% carbon and is housed in slide out reusable steel modules. There is a 30% pleated media after filter located immediately downstream of the odor control media. The odor control media and after filters are removable through removable side access doors with lift and turn latches.

Chemical Spray Odor Control

The odor removal is performed through the injection of an adsorbing chemical. This is done with a compressor pushing air through an atomizing type nozzle that draws the chemical from the resevoir. The 5 gallon resevoir is in the cabinet on the side of the unit that houses the compressor. The spray system can be set for continuous spray or intermittent spray with timers in the control cabinet. This unit can be provided with an optional heater for cold climates.

Exhaust Fan Section (Standard Centrifugal Fan)

The exhaust fan is an SWSI upblast arrangement #9 or #10 with a non-overloading BI or AF wheel. The motor, drives, bearings and fan mounting base are located out of the exhaust air stream. The fan is AMCA certified and bears the AMCA seal for performance. The fan housing is constructed of heavy gauge steel and all seams are continuously welded. The fan bearings are heavy duty self-aligning pillow block type rigidly mounted on heavy structural steel supports. The motor is OPD three phase mounted on a common base with the fan and is pre-wired to the electrical control cabinet. The factory provided drive assembly is adjustable pitch on 7.5 HP and smaller, fixed pitch on 10 HP and larger. It will also be sized for a minimum 1.5 service factor. After final system balancing, fixed pitch sheaves are to be provided and installed by the air balancing contractor to provide proper flow at actual installed conditions. The exhaust fan section is equipped with removable panels for access to the fan.

Exhaust Fan Section (Optional Tubular Fan)

The exhaust fan is a tubular centrifugal or SWSI arrangement #9 or #10 with a non-overloading BI or AF wheel. The motor, drives, bearings and fan mounting base are located out of the exhaust air stream as required by the IMC (International Mechanical Code) and NFPA-96. The fan is AMCA certified and bears the AMCA seal for performance. The fan housing is constructed of heavy gauge steel and all seams are continuously welded. The fan bearings are heavy duty self-aligning pillow block type rigidly mounted on heavy structural steel supports. The motor is OPD three phase mounted on a common base with the fan and is pre-wired to the fan control cabinet. The fan control cabinet includes the disconnect switch, motor starter, overloads and fuses. The factory provided drive assembly is adjustable pitch on 7.5 HP and smaller, fixed pitch on 10 HP and larger. It is sized for a minimum 1.5 service factor. After final system balancing, fixed pitch sheaves are provided and installed by the air balancing contractor to provide proper flow at actual installed conditions.

Construction

The housing is constructed of a minimum of 16 gauge g-90 heat treated galvanized steel. The perimeter base is 12 gauge formed channel with lifting lugs at each corner and along the length as required. The internal housing is externally welded liquid tight for compliance to the International Mechanical Code grease duct construction requirements. The smoke control and odor control sections and all include a drain at the side bottom of the housings for interconnection to a common drain to facilitate removal of water from steam cleaning or pressure washing. The exhaust fan includes a scroll drain with a grease receptacle.

Monitor Panel

A monitor panel, for remote location, is supplied for the operation and monitoring of the unit. The panel is be constructed of 18 gauge stainless steel, number 4 finish, and is suitable for surface or recessed mounting. The panel face has a gasketed hinged door with a lift and turn flush latch. The panel includes an air proving time delay, relays and indicator lights to continuously monitor the unit. Indicator lights are "Fan On", "Normal Air", "Low Air", "Replace Pre-Filters", "Replace Bag Filters", "Replace Final Filter", "Missing Filter", and "Fire In Unit". An audible alarm, with an alarm cancel button, is included and will activate whenever the unit status is low air, replace filters, missing filters or fire in the unit. Status other than "Fire In The Unit" will not shut down the exhaust fan.

Specifier Note: If the ClearAir unit is used in conjunction with a water wash ventilator, the monitor panel is built into the main water wash control cabinet model GPC-6000 Series.

Optional Fire Extinguishing System

NFPA-96 requires a fire extinguishing system for protection of the smoke and odor control sections and protection of the duct down stream of any filters or dampers although not all authorities having jurisdiction require protection. Check with your AHJ. As an option a complete factory mounted wet chemical system can be provided, or factory pre-piped only for a wet chemical system that includes nozzle piping and detection runs. Units that are located indoors may be factory pre-piped for a building sprinkler system or for interconnection to a kitchen exhaust hood water spray fire system.

TYPICAL INSTALLATION



SAMPLE ClearAir TPF CONFIGURATIONS

The ClearAir unit is available in sizes ranging in capacity from 1000 to 32,000 CFM (472 to 15,102 L/s). Each unit is equipped with Three Phase Filters and may include an exhaust fan, odor abatement equipment and Quencher System, or Ansul System as an option. The following illustrations are examples of the most common configurations.

KEY

- AF = 30% After Filter BF
- = Bag Filter DO = Double Pass Odor
 - Kor48/Carbon blend
- EF = Exhaust Fan
- = Curtain Fire Damper FD
- = 95% Final Filter FF PF
- = 30% Pre-Filter SO = Single Pass Odor
 - Kor48/Carbon blend
- SP = Spray Odor Manifold





SMOKE CONTROL WITH PLENUM (Remote Fan)



SMOKE CONTROL WITH DOUBLE PASS ODOR CONTROL (Remote Fan)



(Remote Fan)

SAMPLE ClearAir TPF CONFIGURATIONS

KEY

- AF = 30% After Filter ΒF
 - = 95% Bag Filter
- FF = Chlorine Odor Control PF = Double Pass Odor SO CL
- DO SO
- Kor48/Carbon blend EF
 - = Exhaust Fan
- = Single Pass Odor Kor48/Carbon blend

= Curtain Fire Damper

= Spray Odor Manifold SP

= 99% Final Filter

= 3-% Pre-Filter

FD

QM = Quencher Manifold



NAMEPLATE DATA

The ClearAir nameplate is located on the electrical compartment access door of the unit. If inquiring on service or ordering parts, please have model number and serial number available.

GAYLORD	ENGINEERING DATA
SMOKEPOLLUTION CONTROL UNIT MODEL NUMBER	FILTER SECTION CFM INT. STATIC PRESSUREW.G.
RSPC -TPF -	VOLTS PHASE HERTZ AMPS WATTS
SERIAL NUMBER	MAX. FUSE SIZE AMPS
SUITABLE FOR USE WITH CONTROL MODEL NO.	
	TOTAL STATIC PRESSURE "W.G.
FOR EITHER INDOOR OR OUTDOOR INSTALLATION	EXHAUST FAN POWER CIRCUIT: VOLTS PHASE HERTZ AMPS
GAYLORD INDUSTRIES, INC. P.O. BOX 1149 • 10900 S.W. AVERY STREET TUALATIN, OREGON 97062-8549	MIN. CIRCUIT AMPACITY
FOR NAME OF THE NEAREST SERVICE AGENCY CALL: 800-547-9696	MAX. FUSE SIZE AMPS
Or Visit www.gaylordusa.com	MAX. BREAKER SIZE AMPS
The ClearAir unit Model RSPC-TPF Series is ETL Listed under the category Air Filtering Device, Report #3028598-1 FORM NO. CATPFNP 902/19039	-CAUTION- THE FILTER INDICATOR LIGHTS SHOULD BE INSPECTED FREQUENTLY TO ENSURE THAT COLLECTED GREASE IS BEING REMOVED BY THE FILTER. REFER TO THE TECHNICAL MANUAL FOR SPECIFIC INSTRUCTIONS.

ClearAir NAMEPLATE

NAMEPLATE DATA

The assigned model number of a ClearAir unit will indicate the number of Filter Banks and if it has odor control or double pass odor control, if it has an exhaust fan plus other data. The following example shows the make-up of a model number. The model number of your ClearAir unit along with other data can be found on the nameplate which is attached to the electrical control panel on the ClearAir unit.



RECEIVING

Most ClearAir units are shipped in one piece. However, some units, because of size or special jobsite conditions, may be shipped in multiple sections. Follow the instructions provided with the unit to join sections back together. If the unit includes odor control, the KOR48/carbon odor control media is packaged separately. Verify against the shipping documents that you have received all items and note any shipping damage, obvious or hidden, to your carrier and on your Bill of Lading. If damage is found, immediately file a claim with the transport company. All units are thoroughly inspected and fully operation tested at the factory prior to shipment.

Verify that the electrical and air flow ratings on the unit name plate agrees with jobsite requirements. If a contradiction arises notify the factory prior to proceeding with installation.

SAFETY CONSIDERATIONS

Installing and servicing the ClearAir unit can be hazardous due to the presence of electrical components. Only trained and qualified service personnel should install or service this equipment.

Untrained personnel can perform basic maintenance, such as cleaning and replacing filters. All other operations should be performed by trained service personnel. When installing or servicing, observe precautions in literature and on tags and labels attached to unit.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly.

WARNING

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Electrical shock can cause personal injury or death.

RIGGING

All units are provided with a minimum of four (4) lifting points for rigging attachment. WARNING: Use all lifting points provided. (Refer to Page 13) Spreader bars are mandatory to prevent contact and damage to the unit by lifting hooks, straps, cables, or chains. Consult the mechanical or structural engineer before moving the unit across the roof deck.

INSTALLATION CODES

This unit requires external plumbing and electrical connections to be made in the field. It is recommended that the authority having jurisdiction (AHJ) be consulted regarding local codes and installation procedures. Gaylord Industries is not responsible for obtaining necessary approvals and permits which may be required for installation, nor is it responsible for verifying that the unit has been installed in accordance with national, state, and local codes. In the absence of locally adopted codes use the latest editions of the national electrical code and the uniform mechanical code. Connections of the exhaust duct to the inlet and outlet of the ClearAir unit must be fully welded to comply with NFPA-96.

INSTALLATION PRECAUTIONS

1. The services of qualified contractors are essential for safe and proper installation of this equipment.

2. The air volumes and external static pressures that are listed on the unit are for the middle of the operating range of the filters. The initial air volume should be at least 10% higher than the listed CFM. As the filters load up the air volume will drop. This is inherent to this type of unit. If the unit is set up at or below the design CFM, as the filters load up, the kitchen hood may experience smoke loss problems. Please consult the factory if you have questions.

3. The unit is designed for installation on a level surface.

4. When installed in an enclosed space a fire rated enclosure may be required for the unit and associated duct work. Consult the authority having jurisdiction.

5. Consult the authority having jurisdiction regarding requirements covering the point of termination of the exhaust outlet of this unit. Minimum distances must usually be maintained between the exhaust outlet and any outside air intakes and/or adjacent structures or property lines.

6. Do not apply power to the unit until all electrical connections have been made and a pre-start-up preliminary inspection has been completed.

7. Allow a minimum of 36 inches clearance in front of the filter access door and electrical compartment door for service and routine maintenance.

SHORT TERM STORAGE

Units that include odor control are provided with KOR48/ carbon media which is shipped separate from the unit. KOR48/carbon media must be stored in a dry place with less than 95% relative humidity.

LONG TERM STORAGE (OVER ONE MONTH)

If the unit is equipped with an exhaust fan it must be re-lubricated as soon as it arrives. To prevent corrosion all bearings should receive grease and be rotated the first of every month. Turn the wheel by hand while greasing bearings. A clean 1/16" bead of grease must appear on each side of each bearing. Refer to specific bearing lubricating instructions on the fan. Also, refer to bearing lubricating instructions found in the exhaust fan section of this manual.

Bearings which are to be stored or idle for an extended period of time should be wrapped in a neutral grease-proof paper, foil, or plastic film. Compounds can be recommended by the bearing manufacturer to provide protection for several months to several years.

After long-term storage, grease should be purged from the bearings and fresh grease injected prior to start-up.

EQUIPMENT LIFTING PROCEDURE



- 1. All units are provided with a minimum of four lifting points for rigging attachment. All lifting points must be used.
- 2. Spreader bars are mandatory to prevent contact and damage to the unit by lifting hooks, straps, cables or chains.

General Description

ClearAir units that include odor control have an "SO" suffix for single pass and "DO" suffix for double pass odor control in the model number. Refer to the nameplate on the unit (see page 10 for sample). As shown in the illustration below, the odor control section consists of two major components: Odor control media and 30% after filters.



Odor Control Media (bed type)

The odor control media furnished with your Gaylord Clear-Air unit is either a product trade named KOR48/Carbon Blend manufactured by Cameron/Great Lakes, Inc. of Portland, Oregon. KOR48/Carbon Blend is made from a unique 50% aluminosilicate compound impregnated with 6% potassium permanganate and 50% activated carbon or 100% activated carbon.

The granules are approximately .10 inch in diameter and are poured into metal modules (see page 15) which slide into racks in the odor control section of the unit. As the air is drawn through the modules, the KOR48 the media oxidizes the lighter odor molecules and chemically changes them into harmless solids which remain the media and the carbon absorbs the heavier odor molecules. This combination provides very effective odor control. The 100% carbon is lower cost alternative that must have fire suppression system installed to protect it as it is flammable. This material absorbs odor and will gradually decrease in effectiveness until it starts to release the odors it has absorbed.

The life of the odor control media is dependent upon several factors such as the type of odor, amount of odor molecules, grease loading and air temperature. KOR48

ODOR CONTROL MEDIA INSPECTION FREQUENCY CHART			
TYPE OF COOKING EQUIPMENT	FREQUENCY IN DAYS		
LIGHT DUTY Ovens, steamers, and kettles	. 120		
MEDIUM DUTY Braising pans/Tilting skillets, fryers, griddles, grooved griddles, open burner ranges, hot top ranges, and conveyor o	. 90 vens		
HEAVY DUTY Gas and electric char broilers, upright broilers, woks and conveyor broilers	. 60		
EXTRA HEAVY DUTY	. 30		

media has a flat efficiency curve - meaning that the efficiency, or effectiveness, stays constant until the media has expended and then the efficiency drops off rapidly. The carbon portion of the media's efficiency drops continually during its life. Thus a regular schedule of change out needs to be established and followed.

Service and Maintenance

The KOR48/ carbon media is deep purple in color when new, turning to a dark brown during use and light tan when expended. Carbon media is black at the time of delivery. It is recommended that both medias be checked in accordance with the table below.

The ClearAir unit incorporates an "Odor Control Media Monitoring Tube" to facilitate inspection (refer to page 15). Using an open end wrench, turn the tube nut counter clockwise and remove the monitoring tube assembly. If the KOR48/Carbon media is dark brown, break a granule open and if the inside is light tan there is very little life left and it should be replaced. If the outside of the granules are light tan the media is completely expended and must be replaced. If you are unable to determine the status send a small sample, one teaspoon, to Cameron Great Lakes noting the date of installation. They will conduct a life test and advise the results by fax or phone within 2 days of receipt. For further details call Cameron Great Lakes at 800-777-4044.

Cameron Great Lakes

2335 NW 29th Portland, OR 97210

The label next to the monitoring tube includes an area where the date of initial fill and the date of inspection can be filled in with a grease pencil.



Replacing the Media

There are two methods of replacing the media, the "Advancing Program" or Site Refill.

Advancing Program - This is a program offered by Cameron/ Great Lakes, Inc. where they will ship recycled pre-filled modules in exchange for used modules. The pre-filled modules are shipped two to a box, box size 25" x 25" x 13", which weigh approximately 90 lbs. The boxes are palletized, 36 to a pallet, and are shrink wrapped. Three primary advantages of the "Advancing Program" are: 1) virtually no requirement for storage except for the short period of time

ODOR CONTROL SECTION

needed to switch the new modules for the expended ones 2) minimizes unit down time and 3) avoids filling on site. To participate in the "Advancing Program" proceed as follows:

- 1. Contact the local Cameron/Great Lakes distributor and order the number of modules required.
- 2. Upon receipt, remove the depleted modules and replace with the new modules.
- 3. Empty the media from the depleted modules into containers for disposal.
- 4. Pack the empty used modules into the boxes the new ones came in and ship back to the distributor.
- 5. Fill the media monitoring tube with new media and mark the date on the monitoring tube label.

Site Refill - Site refill involves the purchase and storage of new media, emptying and refilling the modules and disposing of the spent media. New media may be purchased from your local Cameron Great Lakes distributor. For the name and phone number of the local distributor call Cameron/Great Lakes at 630-377-0711.

New media comes in standard five gallon buckets which weigh 40 lbs each. One bucket will refill approximately 1.33 modules. It is recommended that new media is purchased no more than 2 weeks in advance of its use. The buckets should be protected against physical damage as KOR48/carbon will begin to oxidize any odor molecule when exposed to atmosphere. The buckets should be stored in a cool dry area.

Removing the Modules

<u>Caution</u> - each module weighs approximately 30 lbs. and may be awkward to handle particularly in the upper racks. It is highly recommended that a heavy duty steel wheeled ladder be used when removing the upper modules.

<u>Caution</u> - Exhaust fan must be off before opening the odor control media access door.

Refilling the modules is a relatively simple task not requiring any special tools. Follow steps 1-11:

- Step 1. Set the module on end so the securing screw is on top.
- Step 2. Remove the securing screw and slide the cover plate off.



- Step 3. Place the filling jig over opening.
- Step 4. Pour the media into the module.
- Step 5. To eliminate voids, shake or vibrate the module to ensure that the media settles.
- Step 6. Continue adding media until module is full. Caution: Do not overfill as it may cause the sides to bulge.
- Step 7. Replace cover plate and install securing screw.
- Step 8. Optional some dusting may occur on initial start up of the unit. To minimize this, vacuum or blow out the modules.



Step 9. Slide the modules back into the rack being cautious that the airflow label is matching the airflow of the unit.



- Step 10. Close the odor control media access door.
- Step 11. Pour new media into the media monitoring tube and re-install. Record the date on the label.



ODOR CONTROL SECTION

FILTERS

There are filters in the odor control section as shown in the illustration on page 14. Proper operation of the system requires the replacement of the filters prior to them becoming loaded. It is recommended that the filters be inspected in accordance with the "Odor Control Media Inspection Frequency Chart" on page 14, and replaced if necessary. The following chart provides data for ordering filters.

ODOR SPRAY SECTION (Optional)



CYCLE AND SPRAY TIMERS



Odor Spray System Control Cabinet Assembly			
Illustration No.	Description	Part #'s	
1	TPF Interior Wall Section	NA	
2	Cabinet 23" x 23" x 11" Deep	NA	
3	Time Delay Relays	19073	
4	Level sensor	19071	
5	3/8" Copper Tubing	NA	
6	1/4" Flexible Suction Line	10272	
7	Air Compressor	19072	
8	Spray Nozzle Assembly	19065	
9	Pressure Gauge	10870	
10	Needle Valve	19070	
11	5 Gallon (18.9 Liter) Container	19097	
12	1/4" Foot Valve	10269	
13	Heater (optional)	19075	

ODOR CONTROL SECTION

Electrical Controls

To adjust the cycle and spray timers, open the Odor Spray Cabinet, and remove the screwed-in-place timer control cover plate.

CAUTION: Always de-energize the RSPC-TPF before opening the Electrical and Timer Control Panel inside the Odor Spray Cabinet.

The Odor Spray Unit operates on spray-on and spray-off timed cycles while the TPF unit is in the "Fan On" mode.

The Odor Spray Control includes two (2) timers, one (1) for the "Cycle Timer" (this is the spray "OFF" timer) and one (1) for the "Spray Timer" (this is the spray "ON" timer). Both timers are calibrated and can be set between 5 and 600 seconds. The factory/setting is always 15 seconds "ON" and 15 seconds "OFF".

CYCLE TIMER

To set the "Off" period, turn the dial to the desired off time interval.

SPRAY TIMER

To set the "On" period, turn the dial to the desired on time interval.

AIR PRESSURE Factory set to 20 PSIG

ODOR CONTROL SPRAY NOZZLE ASSEMBLY

NOZZLE MAINTENANCE

To obtain the best performance from your nozzle, it may become necessary to clean it periodically.

The nozzle may become clogged and cease spraying due to factors such as dust, foreign particles accumulated in the orifice, and/or leakage in the air or liquid section of the nozzle.

The following procedure should be done to maintain the nozzle's performance:

- 1. Check the air line, which is connected from the compressor unit to the compression fitting and threaded into the air inlet side of the nozzle, for any leakage.
- 2. Check the liquid suction line, which is connected to the liquid inlet side of the nozzle, and ensure that it is immersed in the odor control solution.
- 3. If it appears that the nozzle is only blowing air and does not lift up the odor control solution out of the container, do the following:

Remove the cleanout plug from the nozzle body and,

using a very thin pin or wire, clean the hole in the fluid cap (orifice) and replace the cleanout plug. Remove the foot valve from the liquid container and inspect screen for clogging. Brush clean if clogged.

ODOR SPRAY CHEMICAL

In order for the spray odor system to work correctly the system must be supplied with a chemical solution. This solution in conjunction with the delivery nozzle system that finely atomizes the spray is what makes the system work. We recommend the use of **FORMULA GS-710**. This material has been effective at removing between 80% and 90% of the odors from the kitchen exhaust in many applications. For the contact information of the nearest distributor of **FORMULA GS-710**:

Gaylord Industries, Inc.

P.O. Box 1149 Tualatin, OR 97062 Phone: (800) 547-9696 Fax: (503) 692-6048 Website www.gaylordusa.com

EXHAUST FAN SECTION

GENERAL

The exhaust fan in the ClearAir Unit is a heavy duty utility set type. The size of the fan, motor, and drives have been chosen for the most efficient operation.

INITIAL SET-UP

For shipping purposes the spring isolators under the fan have been bolted down to prevent movement. To un-bolt and set up the springs properly proceed as follows:

1. Referring to Figure 1, remove two (2) nuts and one shoulder washer from each side.



FIGURE 1 SHIPPING POSITION (SIDE VIEW)

- 2. Remove tubes from wire, and discard wire.
- 3. Referring to Figure 2, place tubes on studs and place shoulder washers, shoulder up, on studs.



FIGURE 2 EXPANDED ASSEMBLY 4. Referring to Figure 3, place one (1) nut on each stud, and tighten it to shoulder washer. Place remaining nuts on studs and tighten to lower nuts to lock in place.



FIGURE 3 OPERATING POSITION (SIDE VIEW)

If, after completion of the above spring set-up procedure, the springs are not adjusted, proceed as follows:

- 1. Refering to Figure 4. remove nut "A".
- 2. Turn nut "B" clockwise or counter-clockwise to raise or lower the fan. The spring bolts should be adjusted equally, checking the other spring bolts as adjustments are made. Clearance between the bottom of the spring clip and the bottom of the base plate should be approximately 1".



FIGURE 4 ISOLATOR ADJUSTING

PRE-OPERATIONAL MAINTENANCE

Before starting the exhaust fan perform the following preoperational maintenance:

- 1. Set screws & Belts:
 - a. Rotate fan impeller to check for shifting that may have occured during shipment. If necessary, shift wheel position and re-tighten. Refer to Table 1 for overlap dimension.
 - b. Check belt and pulley alignment.
 - c. Check tightness of setscrews in blower wheel hub.d. Check tightness of setscrews in bearing locking
 - collar.e. Check tightness of setscrews in motor and fan pulleys.
 - f. Check tightness of all frame bolts and base bolts.
 - g. Check tightness of bearing mounting bolts.
- Belt tension. Take up or relieve tension in belts so that there is approximately ³/₄" to 1" deflection under 3 pounds pressure based on 2¹/₂ to 3 foot centers on drive. Adjustment of belt tension is accomplished by use of adjustable motor base.

INITIAL FAN LUBRICATION

To prevent corrosion bearings should receive grease and be rotated. Turn the wheel by hand while greasing bearings. A clean 1/16" bead of grease must appear on each side of each bearing. Refer to specific bearing lubricating instructions on the fan.

Bearings which are to be stored or idle for an extended period of time should be wrapped in a neutral grease-proof paper, foil, or plastic film.

After long-term storage, grease should be purged from the bearings and fresh grease injected prior to start-up.

INITIAL OPERATION

After pre-operational checks, unit is ready for operation:

- 1. Start up blower. Check rotation.
- 2. If blower impeller is turning in the wrong direction, reverse rotation per instructions furnished by motor manufacturer.

FAN PREVENTIVE MAINTENANCE

Every six months conduct the following maintenance:

- Check for condition and tension of belts. Replace cracked, glazed or frayed belts. Re-check tension after 48 hours and re-tension if necessary. Do not overtighten belts or bearing damage may result. Belt should depress its width when pressed firmly inward at midway point between the pulleys and belt should be tight enough to prevent slippage. When replacing worn belt, replace motor pulley if "shoulder" has a worn-in groove.
- Check fan and motor bearings for possible binding, noise or overheating. Lubricate fan in accordance with instructions on fan housing.

 Motors generally used are of the sleeve bearing type and require periodic oiling. A good grade of ASE No. 10 lubricating oil should be inserted into the oiler connections on each end of the motro about every two months. Not more than a teaspoonful should be used; over-oiling will result in oil drip.

TROUBLESHOOTING

- 1. Reduced Airflow:
 - a. Blower impellers operating in wrong direction.
 - b. Belt slippage or belts broken.
 - c. Overload, starter cutout.
- 2. Noise in Blower:
 - a. Bad bearings.
 - b. Loose tie rods or blades.
 - c. Blower wheels loose on shaft, wheels rubbing on housing.
 - d. Drive pulley loose on shaft.
 - e. Foreign object located in blower wheel or blower housing.

Necessary Action - Correct situation found immediately, as continued operation can shorten life of component parts and result in poor airflow and eventual general shutdown of system until needed repair is made.



FAN SIZE	"A" DIMENSION (IN INCHES)
105	1/8
122	5/16
135	11/32
150	3/8
165	7/16
182	9/16
200	5/8
222	5/8
245	3/4
270	7/8
300	1-1/16
330	1-1/8
365	1-1/8
402	1-1/4
445	1-3/8

TABLE 1

Daily maintenance

The filter monitor station should be checked to see if there are dirty filters. If the indicator lights show a dirty filter (too high of a pressure drop across the filter) they should be replaced. A schedule should be developed based on the operation of this kitchen to replace the filters. See Figure and Filter replacement for a starting point.

Six Months

Remove the filters and inspect the unit for grease build up. If needed the unit should be cleaned the to the same standards as the grease duct as described in NFPA 96.

Annually

The exhaust fan belts should be checked for wear and tension. If the belt is cracked, frayed, or other wise displaying signs of damage it should be replaced.

The fusible links on the fire dampers need to be replaced annually per NFPA 96. See Fire Damper below.

Filter Replacement

To achieve maximum smoke removal it is necessary to have clean filters. The indicator lights on the monitor panel will indicate when the filter(s) need to be changed. If the filters are not changed when the monitor indicates, a dirty filter and a lower exhaust air flow rate is occurring at the ventilator. This may result in lower grease extraction efficiency and smoke loss at the ventilator.

The life span of the filters varies greatly based on the amount and type of cooking. The chart below is a starting point and is not to be considered as accurate for cost purposes. Your results will vary.

Approximate number of filter changes per year				
	Light Duty	Medium	Heavy	Extra Heavy
30/30 Filter	17	26	52	122
Bag Filter	2	3	6	8
Final Filter	1.5	2	4	6
Odor Control Media type	3	4	6	12
Total Filters changed per year	23.5	35	68	148

Fire Damper

The TPF unit is equipped with a fire damper on the outlet side of the final filter. There are fusible links on the dampers that will sense a fire. Replace with a 280°F (138°C) link of the same type if they break and the damper closes.

- 1. Open the filter access door and remove the final filters and the odor control modules if so equipped.
- 2. Remove the defective link.
- 3. Replace with a new link by wrapping the link support across the blades and securing at the clip on the other side of the frame.
- 4. Replace the filters and odor modules.
- 5. Replace the access doors
- Start the fan. 6.

Filter replacement

To replace the filters perform the following.

- 1. Shut off the fan
- 2. Open the filter access doors
- 3. Look at how the filters are installed to prevent air bypassing the filters.
- 4. Remove the clamps on the final filters
- 5. Remove all filters by sliding out along the lower filter rack
- 6. Insert the new filters by sliding in along the lower filter rack. Seat properly along the filter bypass gasket. Replace all filters in this way. Lock the final filters in place with the filter clamp.
- 7. Make sure that the filter pressure switch air tubes connections have not been disturbed by opening the electrical chase and inspecting.
- 8. Close all access doors and lock all latches.
- 9. Start fan.
- 10. If the fan does not start. Open access doors and make sure that all of the filters have been replaced and are seated properly.
- 11. Should the fan continue to shut off. Check the pressure switch settings and adjust if needed.

Pressure Switch Adjustments

The pressure switches have been set at the factory.

- 1. Remove the electrical chase and the front cover of the switch.
- 2. Turn the adjusting screw as needed to set the switch.
- 3. Replace the cover and the electrical chase cover.

Pressure switch settings

- 1. "Prefilter" .50" W.C. (.124 KPA)
- 2. "Bag filter" 1.25 W.C. (.310 KPA)
- 3. "Final Filter"
- 2.00 W.C. (.497 KPA) 4. "Overall filter" turn overall pressure switch fully clock-
- wise. Start fan and turn adjusting screw counter clockwise until fan shuts off, Adjust set screw clockwise 1/2 turn.

Filter removal test

To test the filter missing monitor

- 1. Open the filter access and remove 1 final filter.
- 2. Close the access and restart the units
- 3. Start fan. The alarm should sound and the fan should shut down within 1 minute.
- 4. Replace the final filter and restart unit. The alarm should stop.

PARTS - MISCELLANEOUS

DESCRIPTION	PART NUMBER	ILLUSTRATION
Lift And Turn Latch	11118	
Thermostat 12" Length 250°F N.O.	18781	
30% After Filter	30072	
30% Pre Filter	30070	
99% Bag Filter	30515	T.C.
99% Final Filter	30514	
C-150 Switch Relay CR1,2,6,7 Time Delay Relay Relay CR3 Relay CR4,5,8	18314 11403 30375 10283 11399	Image: Second
Alarm Cancel Button		
Lights Red Green Clear	30527 30526 18178	
Pressure Switch	30524	
Fuse FU2,FU3	10761	



WIRING DIAGRAM

FM-100 TERMINAL VOLTAGES

TERMINAL	DESCRIPTION	FAN OFF	FAN ON	INT. FIRE	
L1	Main Power Connection : Hot	120 VAC	120 VAC	120 VAC	
L2	Main Power Connection : Neutral	Common			
31	Output to Supply Fan Motor Starter	0 VAC	120 VAC	0 VAC	
33	Thermostat Return	0 VAC	0 VAC	120 VAC	
34	Fused Supply to Press. Sw. & T-Stat.	120 VAC	120 VAC	120 VAC	
35	120 VAC Neutral Leg	High Voltage Common			
36	Spray Odor Power	0 VAC	120 VAC	0 VAC	
38	Output to Exhaust Fan Motor Starter	0 VAC	120 VAC	0 VAC	
P1	Pressure Switch #1 - Pre-Filters	0 VAC	See Note 1	0 VAC	
P2	Pressure Switch #2 - Bag Filters	0 VAC	See Note 2	0 VAC	
P3	Pressure Switch #3 - Final Filters	0 VAC	See Note 3	0 VAC	
P4	Pressure Switch #1 - Missing Filter	0 VAC	See Note 4	0 VAC	
RF1	Remote On/Off Switch Terminals for	NI/A	NI/A	NI/A	
RF2	RSPC-TPF	IN/A	IN/A	IN/A	
SF3	N.O. Dry Contacts for Supply Fan	Onen Cleard		Onen	
SF4	Remote Control Center	Open	Closed	Open	
EF3	N.O. Dry Contacts for Exhaust Fan	0		Onen	
EF4	Remote Control Center	Open	Closed	Open	
A11	N.O. Dry Contacts for Interface to	Open	Onen	Closed	
A12	Building Fire Alarm / Monitor System	Open	Open	Closed	
Q11	N.C. Dry Contacts for Interface to	Closed	Closed	Open	
Q12	Fire System Fuel Shutoff Control	Ciuseu	Ciuseu	Open	
LC	Low Chemical (if unit has Spray Odor)	See Note 5	See Note 5	See Note 5	

Notes Notes

(1) Measures HIGH Pressure, when Filters are Dirty - 120 VAC when Pressure is HIGH & Fan is On

(2) Measures HIGH Pressure, when Filters are Dirty - 120 VAC when Pressure is HIGH & Fan is On

(3) Measures HIGH Pressure, when Filters are Dirty - 120 VAC when Pressure is HIGH & Fan is On

(4) Measures LOW Pressure, when a Filter is Missing - 120 VAC when Pressure is LOW & Fan is On

(5) Measures LOW Chemical

- 120 VAC when Chemical is LOW (anytime)

THE GAYLORD ClearAir POLLUTION CONTROL UNIT

LIMITED WARRANTY

The Gaylord ClearAir Pollution Control Unit is warranted by GAYLORD INDUSTRIES, INC., to be free from defects of material and workmanship under normal use when installed, operated and serviced in accordance with factory recommendations.

GAYLORD INDUSTRIES, INC.'s obligation under this warranty shall be limited to repairing or replacing at its option any part of said equipment which GAYLORD INDUSTRIES, INC.'s examination shall disclose to its satisfaction to be thus defective, for a period of one (1) year from the date of installation provided proper and acceptable evidence of such installation is recorded at the factory, or 18 months from date of shipment whichever occurs first.

GAYLORD INDUSTRIES, INC. SHALL NOT BE RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM A BREACH OF THIS WARRANTY.

All replacement parts furnished under this warranty shall be F.O.B. Gaylord Industries, Inc., Tualatin, Oregon. The owner shall pay the necessary freight delivery charges, and necessary labor for removal and installation of parts, and any federal, state or local taxes.

SPECIFIC ITEMS NOT COVERED BY THIS WARRANTY:

- 1. Fan belts if equipped with an exhaust fan.
- 2. Pre filters, bag filters, final filters, after filters, and KOR48/carbon media if equipped with odor control.
- 3. Routine maintenance and cleaning as spelled out in The Gaylord ClearAir Model TPFC-H Series Unit Technical Manual.
- 4. Malfunction or improper operation caused by fluctuating electrical or power surges or improper installation.

This is the sole warranty with respect to the aforesaid items. NEITHER GAYLORD INDUSTRIES, INC. OR ANY OTHER PARTY MAKES ANY OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID OBLIGATIONS ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS AGREEMENT.





WORLDWIDE SALES, MANUFACTURING AND SERVICE FOR THE NAME AND LOCATION OF THE NEAREST CERTIFIED SERVICE AGENCY, CALL,WRITE, OR EMAIL TO: GAYLORD INDUSTRIES, INC.

P.O. BOX 1149 • 10900 S.W. AVERY STREET TUALATIN, OREGON 97062-1149 U.S.A. Call: 503-691-2010 1-800-547-9696 FAX: 503-692-6048 email:info@gaylordusa.com

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