

AD-400 Pre-Installation Manual Volume II

American Dryer Corporation
88 Currant Road
Fall River, MA 02720-4781
Telephone: (508) 678-9010 / Fax: (508) 678-9447

ADC Part No. 450102

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Installation / Service

NOTE: This manual covers the ADG-400 and ADS-400. Refer to the sections and information concerning your particular model.

Section I

Important Information

A. RECEIVING AND HANDLING

The dryer is shipped in a protective wrap cover as a means of preventing damage in transit. Upon delivery, the dryer and protective packaging should be visually inspected for shipping damage. If any damage whatsoever is noticed, inspect further before delivering carrier leaves.

Dryers Damaged in Shipment

1. The dryer should be inspected upon receipt and before it is signed for.
2. If there is suspected damage or actual damage, the trucker's receipt should be so noted.
3. If the dryer is damaged beyond repair, it should be refused. Those dryers which were not damaged in a damaged shipment should be accepted, but the number received and number refused must be noted on the receipt.
4. If you determine that the dryer was damaged after the trucker has left your location, you should call the delivering carrier's freight terminal immediately and file a claim. The freight company considers this concealed damage. This type of freight claim is very difficult to get paid and becomes extremely difficult when more than a day or two passes after the freight was delivered. It is your responsibility to file freight claims. Dryers/parts damaged in transit cannot be claimed under warranty.

Freight claims are the responsibility of the consignee, and all claims must be filed at the receiving end. ADC assumes no responsibility for freight claims or damages.

5. If you need assistance in handling the situation, please contact the traffic manager at American Dryer Corp. (ADC) at (508) 678-9000.

IMPORTANT: The dryer tumbler section must be transported and handled in an upright position at all times.

B. SAFETY PRECAUTIONS

1. **Warning:** For your safety, the information in this manual must be followed to minimize the risk of fire or explosion or to prevent property damage, personal injury, or loss of life.
2. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
3. Purchaser/user should consult the local gas supplier for proper instructions to be followed in the event the user smells gas. The instructions should be posted in a prominent location.
4. 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.
 - Clear the room, building, or area of all occupants.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
5. Installation and service must be performed by a qualified installer, service agency, or the gas supplier.
6. Dryer must be exhausted to the outdoors.
7. Although ADC produces a very versatile machine, there are some articles that, due to fabric composition or cleaning method, should not be dried in it.

WARNING: Dry only water-washed fabrics. Do not dry articles spotted or washed in dry cleaning solvents, a combustible detergent, or "all purpose" cleaners. Fire or explosion could result.

WARNING: Do not dry rags or articles coated or contaminated with gasoline, kerosene, oil, paint, wax, or grease. Fire or explosion could result.

WARNING: Do not dry mop heads. Contamination by wax or flammable solvents will create a fire hazard.

WARNING: Do not use heat for drying articles that contain plastic, foam, or sponge rubber, or similarly textured rubber like materials. Drying in a heated tumbler may damage plastics or rubber and also may be a fire hazard.

8. A program should be established for the inspection and cleaning of the lint in the gas burner area, exhaust duct work, inside the dryer and in the base of the dryer. The frequency of inspection and cleaning can best be determined from experience at each location.

WARNING: The collection of lint in the burner area and exhaust duct work can create a potential fire hazard.

9. For personal safety, the dryer must be electrically grounded in accordance with local codes and/or the National Electric Code ANSI/NFPA No. 70-Latest Edition.

NOTE: Failure to do so will void warranty.

10. Under no circumstances should the dryer door switches, airflow switches, or heat circuit safety devices ever be disabled.

WARNING: Personal injury or fire could result.

11. This dryer is not to be used in the presence of dry cleaning solvents or fumes.

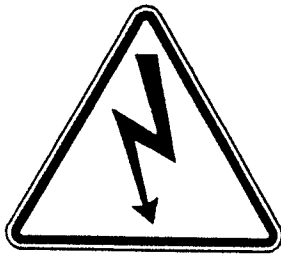
12. Remove articles from the dryer as soon as the drying and cool down cycles have been completed.

WARNING: Articles left in the dryer after the drying and cool down cycles have been completed can create a fire hazard.

13. Do not operate steam dryers with more than 125 psi steam pressure. Excessive steam pressure can damage steam coil or harm personnel.

14. Replace leaking flexible steam hoses or other steam fixtures immediately. Do not operate dryer with leaking flexible hoses. Personal injury may result.

15. Read and follow all caution and direction labels attached to dryer.

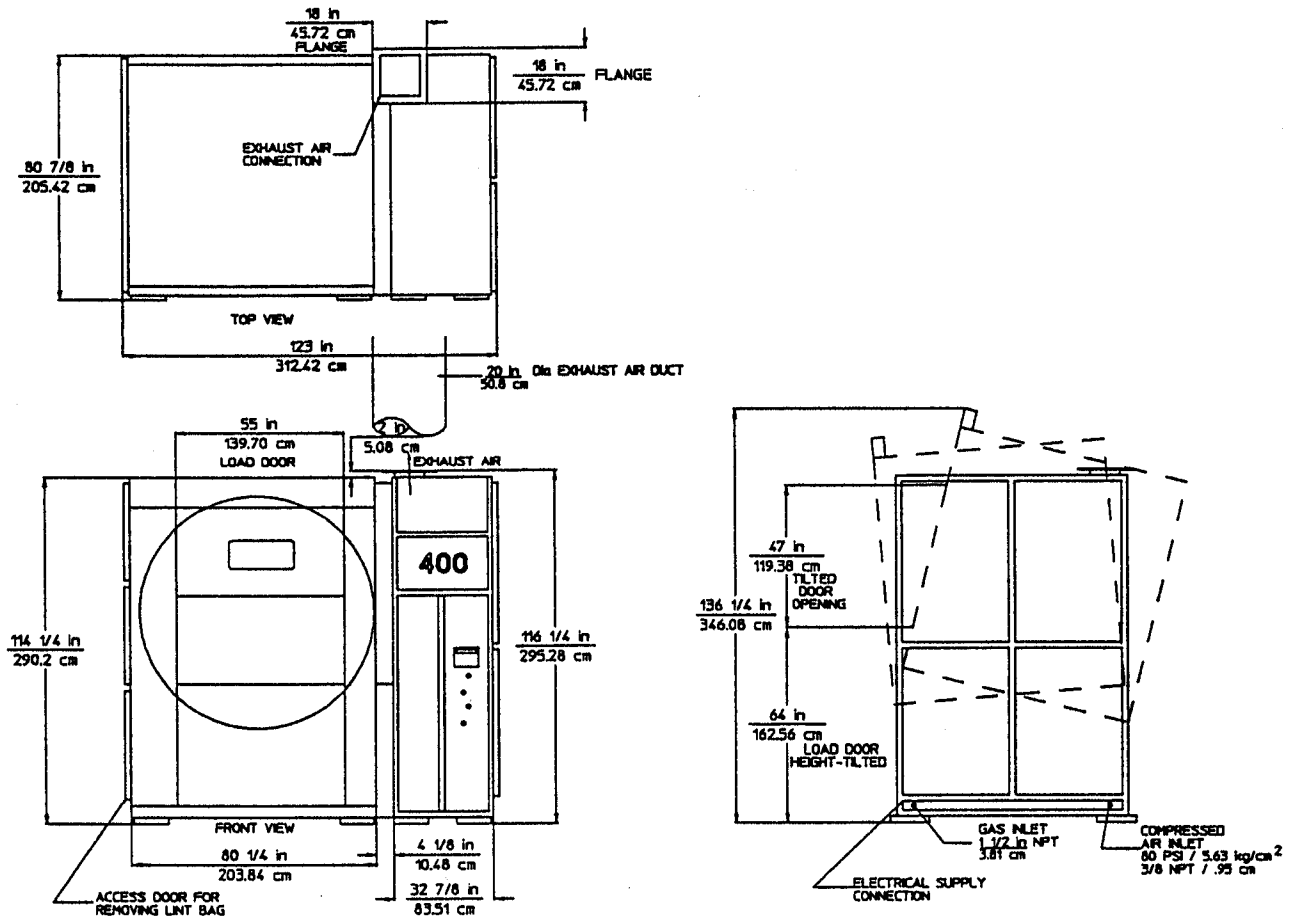


The lightning flash with an arrow head symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the products enclosure that may be sufficient in magnitude to constitute a risk of electric shock to persons.



The exclamation point "!" within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

C. SPECIFICATIONS/DIMENSIONS



Gas/Steam Electrical Service Specifications					
Note: Values for 240 volts, 3 phase, 60 Hz are measured; all other ratings are calculated.					
Service Voltage	Phase	Wire Service	Approx. Amp Draw	Dual Element Fuse	Circuit Breaker
208	3	3/4	86	150	150
240	3	3/4	75	125	150
380	3	3/4	47	75	100
416	3	3/4	43	70	90
460	3	3/4	39	70	90

Specifications	AD-400 400 lbs.	Metric Equivalents 182 kg
Total weight	9,800 lbs	4,454.5 kg
Total weight crated	10,100 lbs	4,590.9 kg
Tilt height	136.25"	346.08 cm
Operating height	114.25"	290.20 cm
Full tilt height	95"	241.30 cm
Operating depth	80.875"	205.42 cm
Width	123"	312.42 cm
Tilt load (rear tilt)	16 degrees	16 degrees
Tilt load (front load)	6 degrees	6 degrees
Unloading height from floor	43"	109.22 cm
Loading height from floor	64"	162.56 cm
Door opening	55" x 49"	134.70 cm x 124.46 cm
Basket diameter	68.75"	174.63 cm
Basket depth	66.375"	168.59 cm
Basket volume	143 cu ft.	4.03 cu m
Minimum load size	200 lbs	90.72 kg
Maximum load size	400 lbs	181.44 kg
Gas burner type	Hi /Lo	Hi/Lo
Maximum heat input, gas dryers	1,600,000 btu/h	403,200 kcal/hr
Minimum heat input, gas dryers	40,000 btu/h	10,080 kcal/hr
Blower motor	25 hp	18.65 kw
Basket motors (2 motors)	two 5 hp	two 3.73 kw
Burner blower motors	3/4 hp	.56 kw
Maximum airflow	9,000 cfm	255 cmm
Maximum exhaust duct back pressure	1.25" (wc)	3.1 mbar
Minimum exhaust duct diameter	20"	50.80 cm
Compressed air required	80 psi	5.63 kg/cm ²

Section II

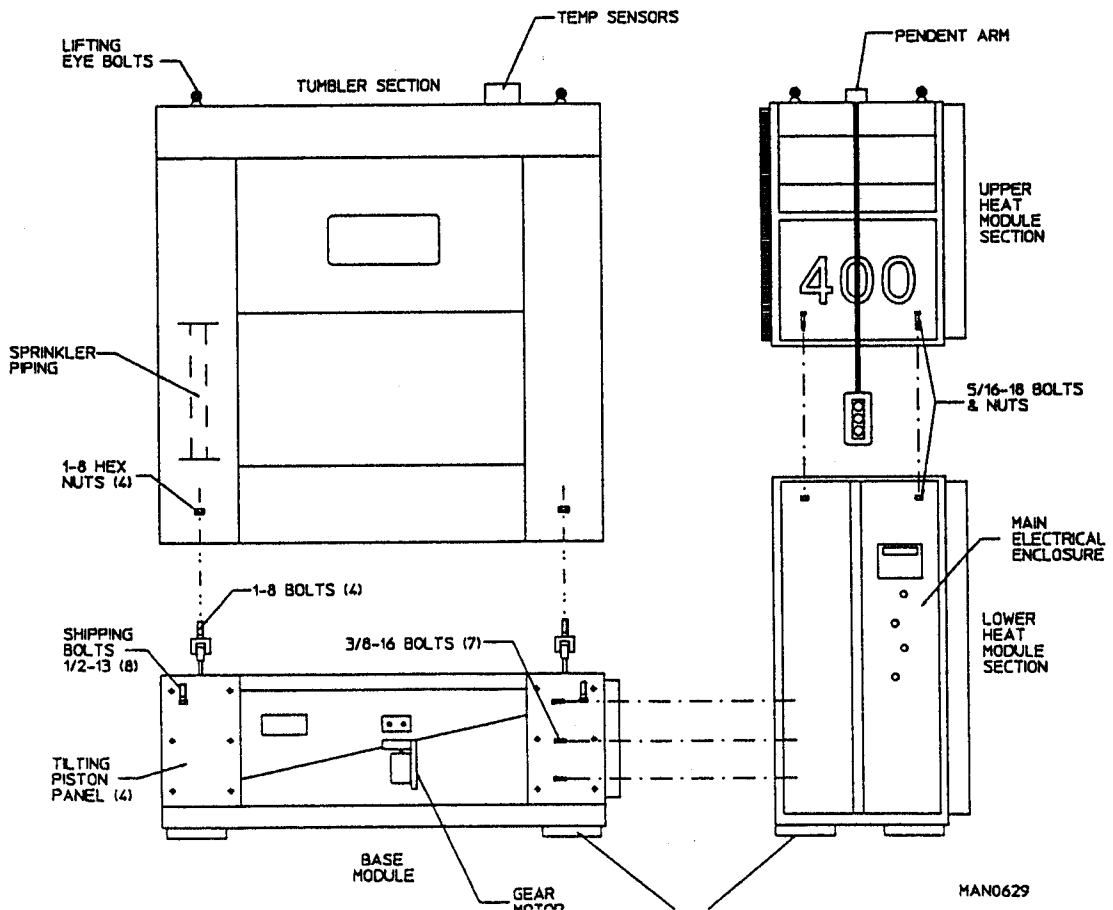
Installation

A. MOVING THE DRYER INTO POSITION/REASSEMBLY

The AD-400 dryer is shipped broken down into either two, three, or four pieces.

1. Two-Piece Shipment

In this method of shipment, the tumbler section and base module are shipped as one piece, and the burner section comprises the second piece. Move both pieces into position by lifting them with cables through the eyebolts on top. These pieces may also be moved by lifting from underneath with a fork truck. The tumbler section/base module weighs about 6,600 pounds, and the Burner Section weighs about 3,200 pounds. Put the sections together and match the seven (7) clearance holes in the base module right side channels with the seven (7) 3/8-16 tapped holes in the left side of the burner module. Use the 3/8-16 bolts provided with the dryer to bolt the two sections together. Remove the eight (8) 1/2-13 shipping bolts that fasten the tumbler section to the base. Remove the four (4) tilting piston panels to gain access to these shipping bolts.



2. Three-Piece Shipment

The tumbler section is shipped separately from the base module, and the burner section is shipped as the third piece.

Move the base module into position with a fork truck. Lift the tumbler section onto the base module by cables through the lifting eye bolts on top of the tumbler section. There is a 1-inch bolt in each corner of the base module. These must pass through the 1-1/8-inch diameter holes in each corner of the tumbler section bottom so that the tumbler section sits flat on the four (4) base piston clevis blocks. Use the four (4) sets of 1-inch nuts and washers provided to bolt the basket section to the base.

Make sure that the front of the tumbler section lines up with the front of the base module. The small gear motor sits on the base module front. The sprinkler piping is on the left side of the tumbler section.

Bolt the burner/heater section to the base module as per the instructions in the previous two-piece shipment section.

3. Four-Piece Shipment

The tumbler section is shipped apart from the base module, and the burner section is broken down into two separate pieces.

Apply a bead of silicone to the top flanges of the lower burner/heater section. A tube of silicone is included with the dryer. Lift the upper burner/heater section onto the lower burner/heater section by cables through the lifting eye bolts on top of the upper burner/heater section. Bolt these sections together with the 5/16-18 hardware provided. Assemble the rest of the dryer using the information provided in the previous sections.

4. Additional Reassembly

The pendant arm now can be rebolted to the top of the burner section. Pass the 5/16-18 bolts through the pendant arm tube and screw them into the weld nuts located on the top of the burner section.

B. INTERNAL ELECTRICAL CONDUIT, AIR AND WATER HOSE RECONNECTIONS

Because the dryer is shipped in sections, wiring and hose connections must be reattached.

1. Air Hoses

These air hose reconnections must be completed:

a. Front Tilt Piston Lines

This reconnection is made at the front of the dryer in the space between the base and lower burner/heater section. Connect the red marked 3/8 poly flo tube into the red marked brass elbow. Connect the black marked tube into the black marked brass elbow.

b. Rear Tilt Piston Lines

This reconnection is made at the rear of the dryer in the space between the base and lower burner/heater section. Connect the red marked 3/8 poly flo tube into the red marked 3/8 poly flo tube union. Do the same for the black marked tube and union.

c. Sprinkler Valve Lines

The 1/4-inch aluminum tube reconnection is made at the rear of the dryer in the space between the base and lower burner/heater section. Connect the 1/4-inch aluminum tube into the 1/4-inch aluminum tube union.

d. Load Door Piston Lines

These reconnections are made inside the lower burner section. Open the lower burner/heater section access doors and reconnect the red marked 1/4-inch poly flo tubes into the red-marked 1/4-inch poly flo unions. Do the same with the black marked tubes.

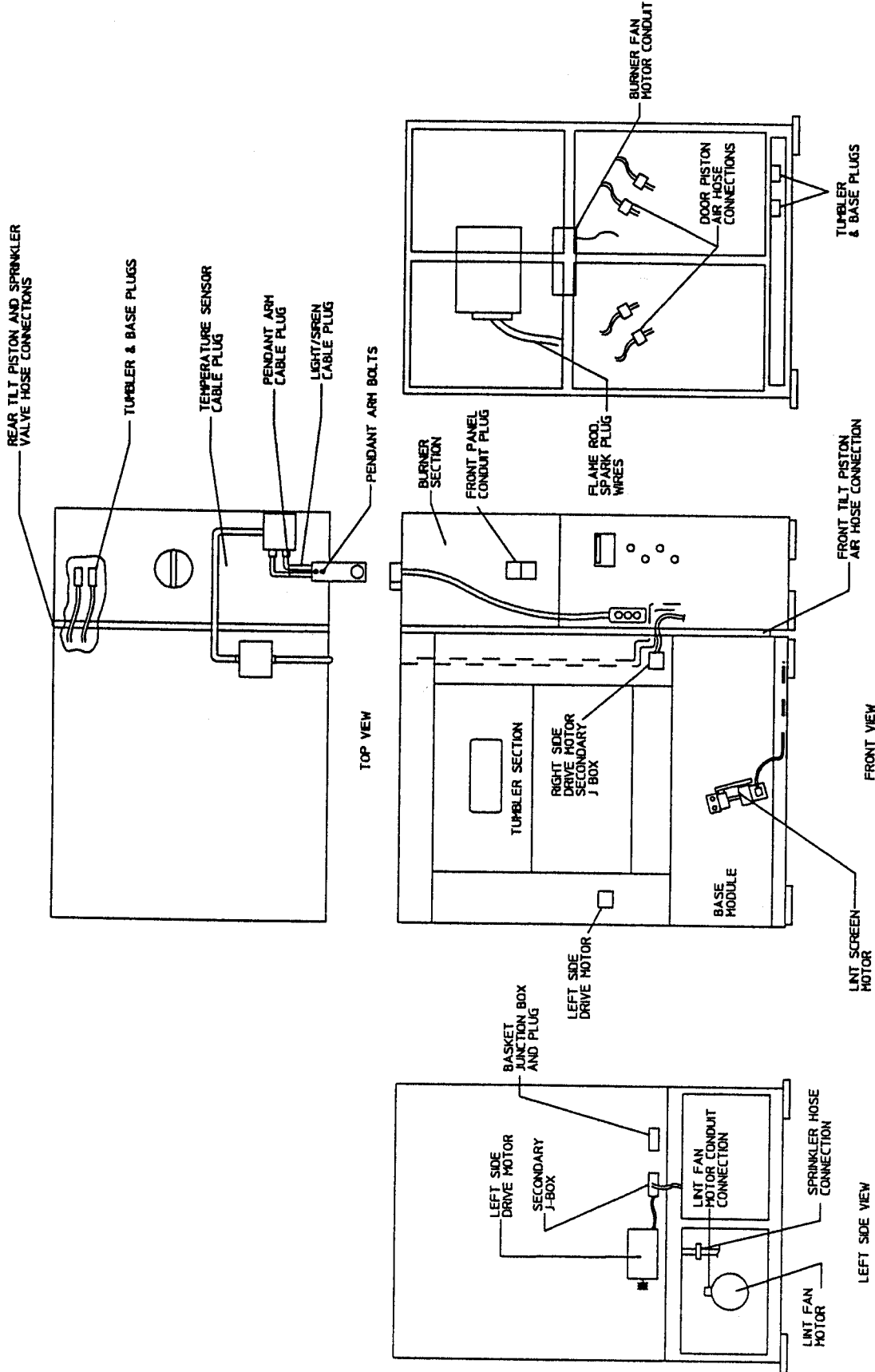
2. Water Hose

a. Sprinkler water hose

If the tumbler section was shipped apart from the base module, reconnect the 1-inch sprinkler water pipe union located on the left side of the base. This will reconnect the 1-inch rubber hose on the base into the mating 1-inch piping on the tumbler section.

3. Electrical Conduit Reconnections

If the dryer was shipped in two (2) pieces, the following electrical conduits and plugs must be reconnected.



HOSE AND ELECTRIC CONDUIT RECONNECTIONS

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- **Tumbler and Base Input Signal Plugs**

These two (2) large plugs are shipped with the base module. They must be fed through the large hole in the rear of the lower burner section and plugged into the mating plugs mounted on the floor of the burner/heater section.

- **Lint Fan Motor Conduit**

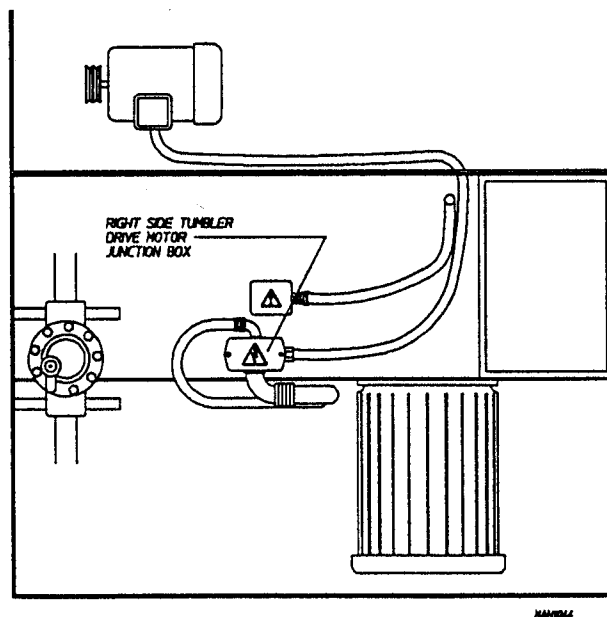
This conduit is shipped in the bottom of the burner/heater section and must be fed through the rear of the base module and reconnected into the lint fan motor's junction box. Reconnect the conduit wire marked L1 to the motor wire marked L1. Do the same for L2 and L3. Also reconnect the ground wire.

- **Left Side Tumbler Drive Motor Conduit**

This conduit is shipped in the bottom of the burner/heater section and must be fed through the rear of the base and reconnected to the left side tumbler drive motor junction box, sitting behind the motor. Reconnect the conduit red wire to the junction box red wire. Do the same for orange and blue. Also reconnect the ground wire.

- **Right Side Tumbler Drive Motor Conduit**

This conduit is shipped along side the right side tumbler drive motor. Locate and route this conduit into the burner/heater section and reconnect into its junction box located on the burner/heater section blower motor housing. (see drawing below) Reconnect the conduit's wires to the junction box wires, matching the colors. Also, reconnect the ground.



- **Lint Screen Motor Conduit**

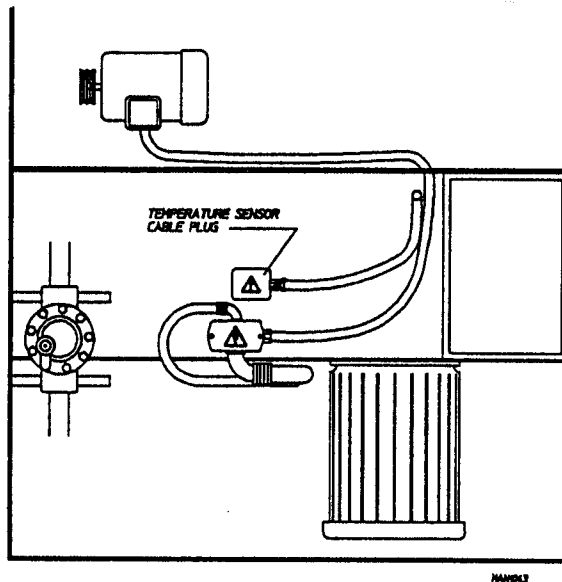
This conduit is shipped inside the main electrical enclosure in the lower burner/heater section. Feed this conduit through the bottom front of the base and reconnect it into the lint screen motor junction box. This motor is single phase. Connect the conduit wire to the motor wires, matching the colors. Reconnect the ground wire also.

- Pendant Arm and Light/Siren Cable Plugs

Reconnect the pendant arm cable plug, the light/siren cable plug. These are located on top of the burner/heater section of the dryer.

- Temperature Sensor Cable Plug

This cable is shipped along side the right hand side tumber drive motor. Locate and route this cable into the burner/heater section and reconnect onto its mating receptacle and latch together. (see drawing below)



- If the tumbler section was shipped apart from the base module, then the basket junction box cable plug will be shipped with the base near the lint fan motor. Pull this plug and cable up through the large hole in the floor of the tumbler section and reconnect the plug into the basket junction box. This cable will be pulled up whenever the tumbler tilts, so be sure it has enough slack to it.
- If the burner section was shipped in two (2) pieces, then the burner fan motor conduit must be reconnected to the burner fan motor. The spark plug and flame rod cables must be plugged back into the spark plug and flame rod on the burner box. Also, reconnect the front panel conduit plug located behind the upper burner section front panel.

C. LEVELING THE DRYER

The dryer weighs 9,800 pounds. It must be installed on a level floor that can support its weight.

Place a large level on all four sides of the dryer base to ensure it is level. If shimming is required, place 9-1/2-inch by 9-1/2-inch square pieces of sheet metal under the mounting pads of the dryer.

The dryer must be lagged to the floor through the holes in the mounting pads.

D. SERVICE CONNECTIONS

1. Electrical Service

The electrical power is connected to the dryer at the high voltage section of the control cabinet. On the AD-400 dryer, this section is located at the bottom left of the front enclosure.

The AD-400 must be supplied with two (2) independent input power lines. One electric service feeds the dryer itself, and the other, the safety sprinkler system. Both input lines must be independent of each other and individually protected by their own individual fused disconnects.

| NOTE: The AD-400 will not operate without power fed to the safety sprinkler system.

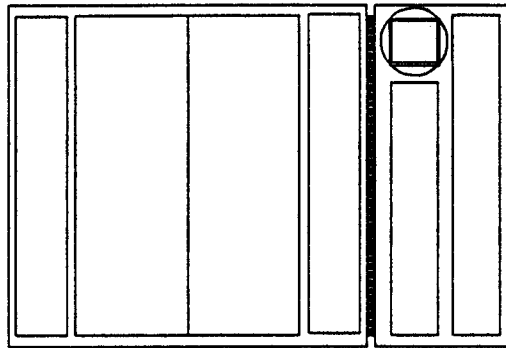
Feed the electrical service cables to the dryer using the pre-punched knockouts at the bottom section of the electrical cabinet right wall.

Connect the input power lines to the power distribution terminals mounted at the bottom on the panel inside the enclosure.

Connect the ground wires directly to the ground lug located at the same approximate location.

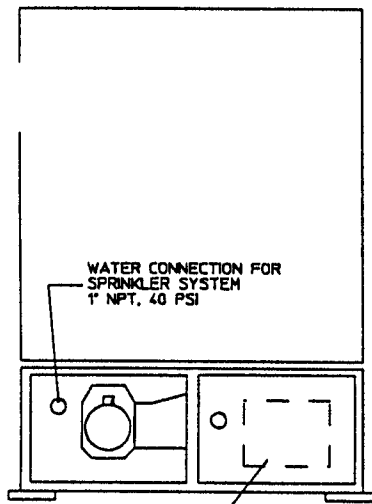
Before turning the power on to the dryer, measure the supply voltage to ensure that it matches the dryer's specified input voltage. This input voltage is marked on the aluminum data plate located on the inner right wall of the electrical cabinet door.

AD-400 Gas/Steam Electrical Specifications					
Voltage (V)	Phase	Wires	Current (A)	Fuses	Breakers
208	3	3,4	86	150	150
240	3	3,4	75	125	150
380	3	3,4	47	75	100
416	3	3,4	43	70	90
460	3	3,4	39	70	90



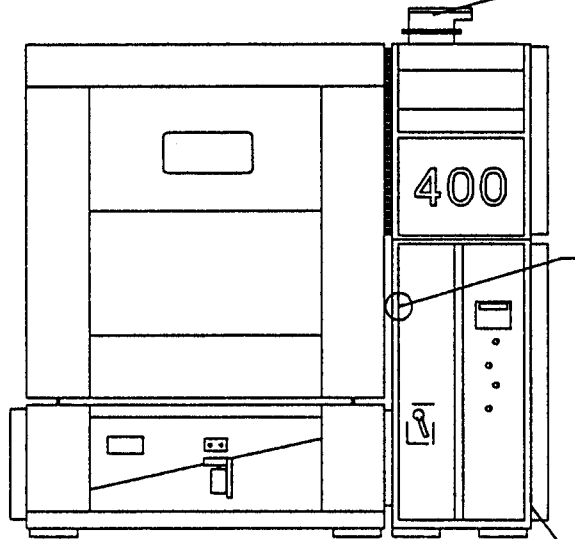
TOP VIEW

EXHAUST DUCT
20" DIA ROUND
TRANSITION



WATER CONNECTION FOR
SPRINKLER SYSTEM
1" NPT, 40 PSI

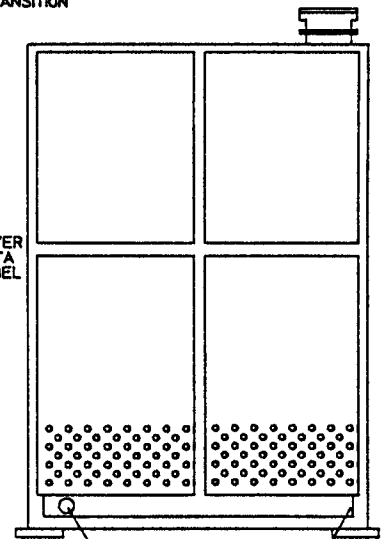
LNT BAG
ACCESS DOOR



FRONT VIEW

ELECTRICAL INPUT
CONNECTIONS

DRYER
DATA
LABEL



GAS CONNECTION
1 1/2" NPT

COMPRESSED AIR
CONNECTION
3/8" NPT
80 PSI

SERVICE CONNECTIONS

MAN0632

Supplying the wrong voltage or low voltage to the dryer can result in poor performance or in serious damage to the dryer components. Fused disconnect switches must be provided near the dryer to supply power.

NOTES:

1. The AD-400 approximate load is 39 HP.
2. Fuse ratings are for dual-element, time-delay, current-limiting type.
3. Circuit breakers are thermal-magnetic and 3-pole type.
4. Dryer must be grounded for proper operation.
5. The AD-400 safety sprinkler system load is approximately 200VA

IMPORTANT: Installation of this dryer should be performed by qualified and trained professionals in accordance with all applicable local and state electric codes and ordinances. In the absence of these codes, installation must conform to the American National Standard: National Electric Code ANSI/NFPA 70, latest edition.

CAUTION: Use only copper cable for electric hookup. Use of aluminum cable will void your warranty.

2. Compressed air supply

A minimum of 20 cubic feet per hour of 80 psi compressed air must be supplied to the dryer.

The compressed air supply must be connected into the 3/8-inch FPT fitting in the dryer's filter/lubricator/regulator which is located in the bottom rear corner of the lower burner/heater section.

The filter bulb should be emptied monthly, and the oiler bulb should be refilled monthly with an SAE 150-200 SSU misting oil, such as Mobil DTE lightweight oil or equivalent. Do not use synthetic oils.

3. Gas Piping (gas-heated dryers only)

The gas connection to the dryer is made into the 1-1/2-inch FPT shut-off valve located in the bottom front corner of the lower burner/heater section.

The gas pressure supplied to the dryer must be between 7 inches and 13 inches water column for natural gas and between 10 inches and 11 inches water column for L.P. gas.

If the plant's gas pressure is higher than these values, then an external pressure regulator must be installed prior to the dryer to reduce the gas pressure to within the appropriate range.

The dryer must be connected to either natural or L.P. gas as indicated on the dryer data label located on the inner right wall of the electric cabinet door. If your gas supply does not match the type of gas for which the dryer was built, contact your distributor or the ADC factory.

The gas dryer piping installation must meet the National Fuel Gas Code ANSI Z223.1- (latest edition), as well as local codes and ordinances and must be done by a qualified technician.

Pipe joint compounds that resist the action of natural and L.P. gas **MUST** be used.

Test all pipe connections for leaks by brushing on a soapy water solution. **NEVER TEST FOR LEAKS WITH A FLAME.**

4. Exhaust Air Ducting

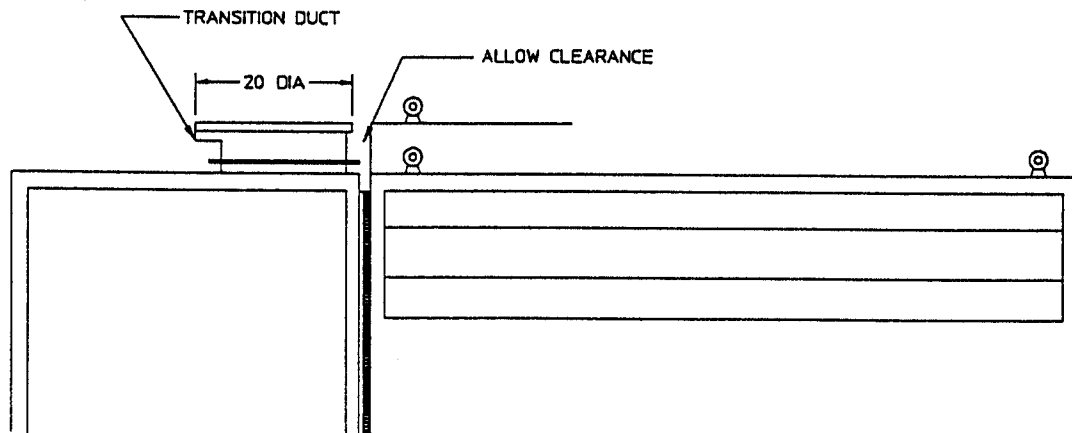
The dryer's exhaust air must be vented to the outdoors by the shortest route possible with the number of elbows kept to a minimum. The duct work should be designed and installed by qualified technicians.

Improperly designed duct work may reduce the airflow through the dryer, causing improper and unsafe drying conditions. The static pressure of the exhaust air in the duct work must not exceed 1.25 inches water column (3.1 millibar). The dryer exhausts 4,500 cfm of air during the drying cycle.

The exhaust vent connection is located on top of the burner/heater section of the dryer. It has a rectangular cross-section and is flanged.

The duct work connecting the vent to the outdoors must be a minimum of 20 inches in diameter for a round duct or 324 square inches for a rectangular duct (18 inches by 18 inches square duct would be sufficient).

A sheet metal transition piece is supplied to connect the 20-inch diameter exhaust duct to the dryer's exhaust vent connection. Care must be taken in locating this transition piece so that the tilting tumbler section does not hit the transition piece.



HAN0630

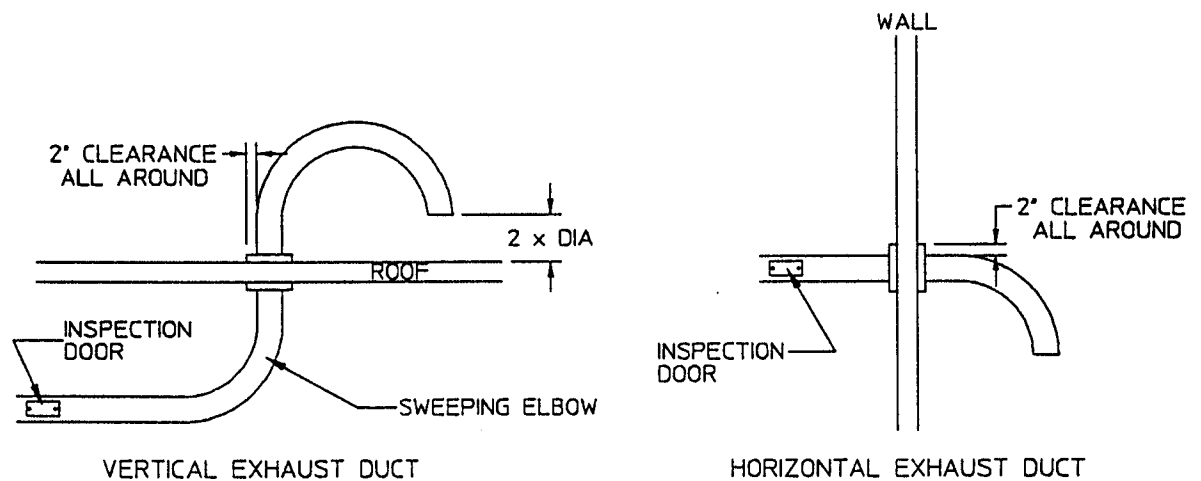
The duct work must be smooth on the inside with no projections from sheet metal screws or other obstructions which will collect lint. Inspection doors must be installed at strategic points in the duct work for periodic lint removal.

Use smooth sweeping elbows instead of sharp 90-degree elbows. The radius of an elbow should be at least 1-1/2 times the duct diameter.

When the exhaust duct goes through a combustible wall on a roof, leave a 2-inch clearance space between the exhaust ducting and the wall or roof.

When adding ducts, the duct to be added should overlap the duct to which it is to be connected. This will allow for smoother airflow.

The end of the duct that leaves the building must be protected from the weather. For horizontal ducting, use a 90-degree turn down and for vertical duct work, use a 180-degree turn down. In either case, allow at least twice the diameter of the duct between the duct opening and nearest obstruction. (If the duct is rectangular, leave twice the smallest face dimension.)



IMPORTANT: Do not use screens or caps on the outside opening of the exhaust duct work. Screens will clog with lint and caps will restrict the exhaust airflow.

5. Fresh Air Supply

The dryer takes 4,500 cfm of air from the room, heats it, draws it through the basket, and exhausts it out of the building. This 4,500 cfm of air must be replenished in the room for the dryer to operate properly.

An inadequate fresh air supply will lead to increased drying times and unsafe operating conditions.

6. Steam Piping (steam dryers only)

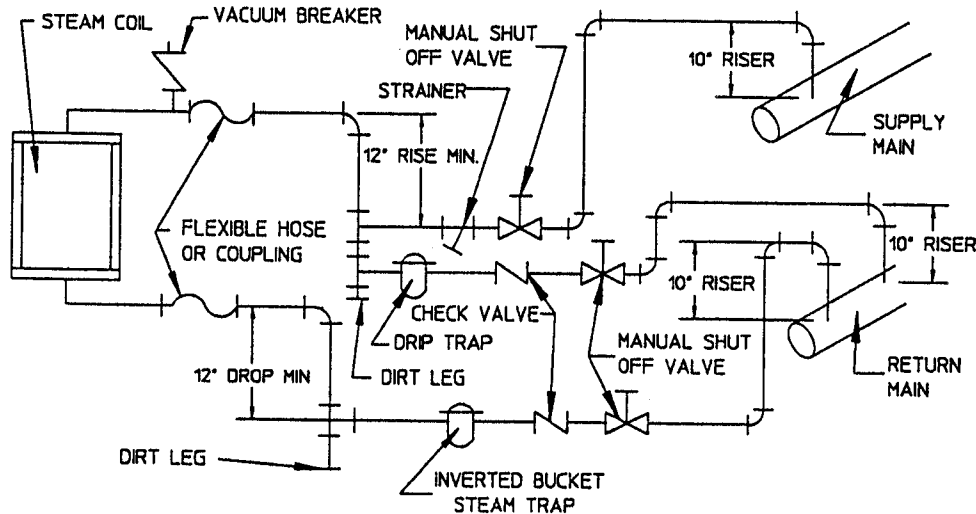
It is your responsibility to have all steam plumbing connections made by a qualified professional to ensure that the installation is adequate and conforms with local and state regulations or codes.

IMPORTANT: Failure to comply with the requirements stated in this manual can result in component failure which will void the warranty.

The steam inlet connection of the steam coils is 2 inches MPT, and the condensate outlet connection is 2 inches MPT. The working steam pressure of the dryer is 125 psi at 23 boiler horsepower. Supplying a lower steam pressure to the dryer will result in slower drying times. The condensate outlet can be reduced to 3/4-inch pipe.

This unit is not equipped with a steam valve. It utilizes an air damper bypass system with continuously charged steam coils. With this system, the coils will always be energized and hot. Upon a call for heat, the damper pivots about the steam coils, allowing the intake air to pass through the coils, thereby heating the dryer. When the set point temperature in the dryer is reached, the damper will pivot back onto the coils, directing cool room air directly into the basket, bypassing the coils. With this system, hot air and cool air are provided instantaneously; consequently, there is a direct reduction in drying time, cool down time, and energy usage. In addition, the life of the steam coils will be extended because they are not constantly expanding and contracting.

NOTE: No electrically operated steam valve is supplied, and none should be installed.



STEAM DAMPER SYSTEM

MAN0582

Adherence to the following instructions is necessary to eliminate coil failures due to water hammer caused by wet steam.

1. The presence of condensate in the steam supply will cause water hammer and subsequent steam coil failure. The steam supply connection from the main supply line must be made with a minimum 10-inch riser. This will prevent any condensate from draining towards the dryer.

2. The steam supply piping to the dryer must include a 12-inch rise, along with a drip trap and check valve. This will prevent any condensate from entering the steam coils.
3. Flexible hoses or couplings must be used. The dryer vibrates slightly when it runs, and this will cause the steam coil connections to crack if they are hard piped to the supply and return mains.
4. Manual Shut-off valves for each dryer should be installed in the supply, return, and drip trap return lines. This will allow the dryer to be isolated from the supply and return mains if the dryer needs maintenance work.
5. Install an inverted bucket steam trap and check valve at least 12 inches below the steam coils and as near to the coils as possible.
6. A vacuum breaker should be installed in the supply piping as near to the coils as possible. This will prevent the condensing steam from causing a vacuum inside the coils possibly damaging them.
7. The supply and return lines should be insulated. This will save energy and provide for the safety of the operator and maintenance personnel.
8. Water pockets in the supply line, caused by low points, will provide wet steam to the coil possibly causing coil damage. All horizontal runs of steam supply piping should be pitched 1/4 inch every foot back towards the steam supply header, causing any condensate in the line to drain to the header. Install a bypass trap in any low point to eliminate wet steam.

7. Sprinkler Water Supply

A 40 psi supply of water must be connected into the 1-inch MPT sprinkler connection located on the left side of the base.

SECTION III

PRE-STARTUP

A. PREPARATION FOR OPERATION

A technician from the factory will start up the dryer. The following items must be completed before the technician arrives.

1. The supply voltage must match the dryer voltage as stated on the aluminum dryer data label which is located on the inner right wall of the electric cabinet door.
2. A separately fused power supply must be connected into the safety sprinkler supply inlet connection.
3. Gas dryers
 - a. The gas supply must be either natural or L.P. gas, matching what is stated on the dryer data label.
 - b. The gas supply pressure must be between 7 and 13 inches water column for natural gas and 10 and 11 inches water column for L.P. gas. If the supply pressure is too high, then a pressure regulator must be installed on the gas piping upstream of the dryer.
4. A compressed air supply of 80 psi must be connected into the dryer's filter/lubricator/regulator.
5. The dryer exhaust duct must be vented to the outdoors.
6. On steam dryers, the steam supply line and condensate return line must be plumbed according to the requirements of this manual. The steam supply pressure cannot exceed 125 psi.
7. A water supply of 40 psi must be connected into the 1-inch sprinkler pipe connection.
8. The dryer must be lagged to the floor and leveled for proper operation.
9. A fresh air supply from the outdoors of 4,500 cfm must be available to the dryer.

SECTION IV

ROUTINE MAINTENANCE

Daily

- Clean lint accumulation from the lint mesh bag.
- Clean the gas burner fan lint screen (gas dryers only).
- Clean the steam coil lint screen (steam dryers only).

Weekly

- Clean any lint accumulation from inside the burner/heater section.

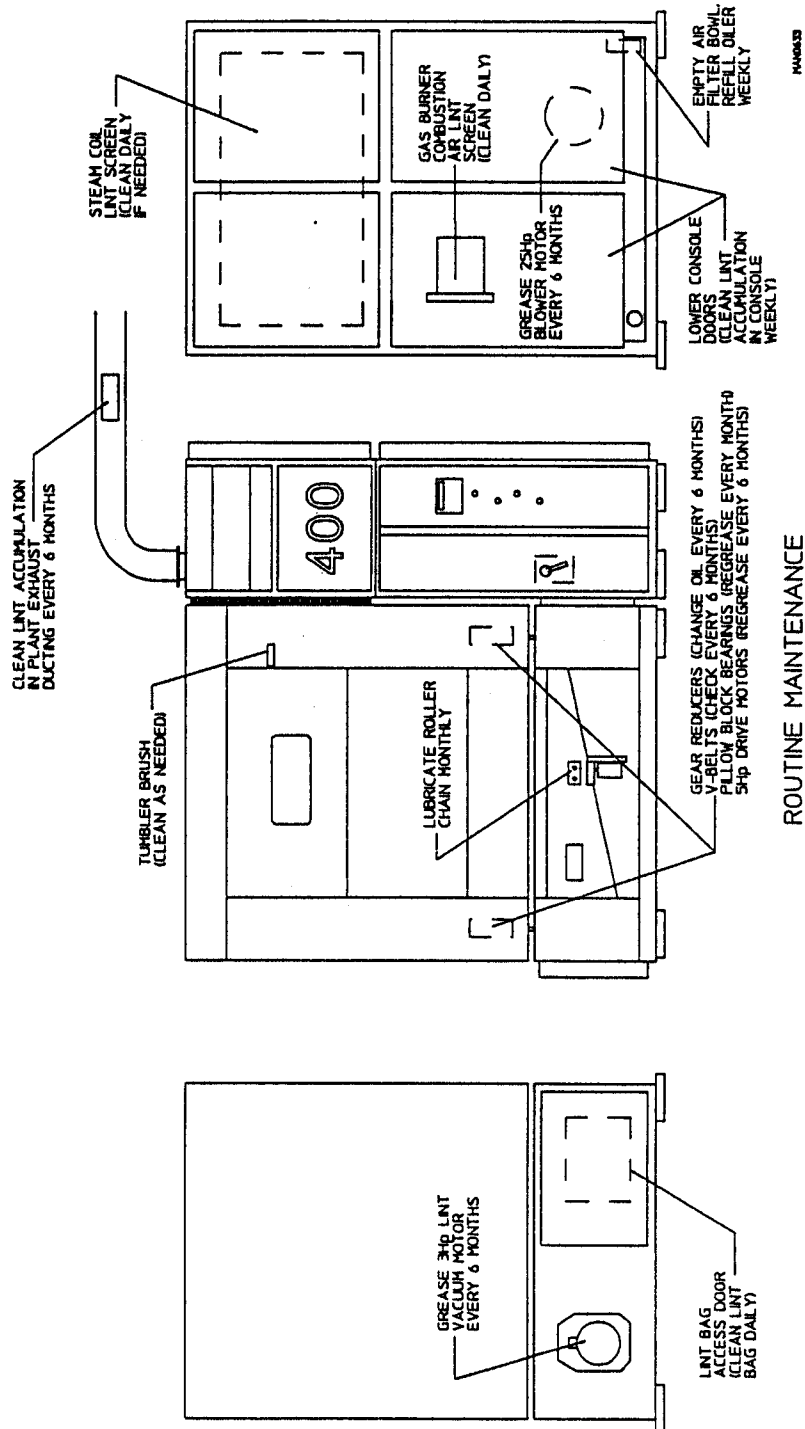
Monthly

- Grease the four (4) tumbler shaft pillow block bearings with DC-44 (Dow Corning) grease or equivalent. DC-44 is a lithium grease that conforms to NLGI Grade 2 and has a temperature range of 40 degrees F. to 400 degrees F. Refer to the Morse bearing data sheet included with this manual.
- Empty the compressed air filter bowl.
- Add oil to the compressed air lubricator bowl. Use a petroleum-based non-detergent lightweight oil, SAE 10/150 SSU, which will readily break up into a mist, such as Mobil DTE Light oil or equivalent. Do not use synthetic oils.
- Lubricate the lint vacuum arm chain with a dry silicone lubricant.

Six Months

- Remove the gear oil in both tumbler drive shaft gear reducers. Replace with 1.4 liters in each reducer of Mobil oil DTE HH5G (I.S.O. viscosity grade 460) or equivalent.
- Check drive V-belts for tightness.
- Clean lint accumulation from inside the plant's exhaust duct.
- Open access door on top of tumbler and remove lint accumulation from tumbler brush.

- Regrease both 5 hp tumbler drive motors, 25 hp main blower motor, and 3 hp lint vacuum motor. Use Chevron SRI-2 or equivalent. Refer to regreasing instructions in the Louis Allis motor data sheet which is included with this manual.



SECTION V

SERVICE/PARTS INFORMATION

A. SERVICE

1. Service must be performed by a qualified trained technician or service agency, or gas supplier. If service is required, contact the distributor from whom the ADC equipment was purchased. If the distributor cannot be contacted or is unknown, contact the ADC service department for a distributor in your area.

NOTE: When contacting the ADC service department, be sure to give them the correct model number and serial number so that your inquiry is handled in an expeditious manner.

B. PARTS

1. Replacement parts should be purchased from the distributor from whom the ADC equipment was purchased. If the distributor cannot be contacted or is unknown, contact the ADC parts department for a distributor in your area. Parts may also be purchased directly from the factory by calling the ADC parts department at (508) 678-9010.

NOTE: When ordering replacement parts from the ADC dealer or ADC factory, be sure to give them the correct model number and serial number so that your parts order can be processed in an expeditious manner.

SECTION VI

WARRANTY INFORMATION

A. RETURNING WARRANTY CARD(S)

1. Before any dryer leaves the ADC factory test area, a warranty card (P/N 112250) is attached to the dryer. These warranty cards are intended to serve the customer in two ways. First, when ADC receives the warranty card(s) back from a customer, we mail the appropriate parts manual to the address indicated on the returned card. Second, we record the individual installation date and warranty information to better serve you should you file a warranty claim.

If a warranty card (P/N 112250) did not come with your dryer, contact the ADC warranty or service department at (508) 678-9000.

B. WARRANTY

For a copy of ADC's commercial warranty covering your particular dryer(s), contact the ADC distributor from whom you purchased the equipment and request Commercial Dryer Warranty form P/N 450199. If the distributor cannot be contacted or is unknown, warranty information can be obtained from the factory by contacting the ADC warranty department at (508) 678-9000.

NOTE: Whenever contacting the ADC factory for warranty information, be sure to have the model number and serial number available so that your inquiry can be handled in an expeditious manner.

C. RETURNING WARRANTY PARTS

All dryer or parts warranty claims or inquiries should be addressed to the ADC warranty parts department. To expedite processing, the following procedures must be followed:

1. No parts are to be returned to ADC without prior written authorization (Return Material Authorization) from the factory.

NOTE: R.M.A.'s are valid for only sixty (60) days from date of issue.

- a. The R.M.A. issued by the factory, as well as any other correspondence pertaining to the returned part(s), must be included inside the package with the defective merchandise.

2. Each part must be tagged with the following information:

- a. Model and serial number of the dryer from which part was removed.
- b. Nature of defect (be specific).
- c. Date of dryer installation.
- d. Date of part failure.
- e. Specify whether the part(s) being returned is for a replacement, a credit, or a refund.

NOTE: If a part is marked for a credit or a refund, the invoice number covering the purchase of the replacement part must be provided.

NOTE: Warranty tags (P/N 450064) are available at "no charge" from ADC upon request.

3. The company returning the part(s) must clearly note the complete company name and address on the outside of the package.
4. All returns must be properly packaged to insure that they are not damaged in transit. No replacements, credits, or refunds will be issued for merchandise damaged in transit. Damage claims are the responsibility of the shipper.
5. All returns should be shipped to the ADC factory in such a manner that they are insured and a proof of delivery can be obtained by the sender.
6. Shipping charges are not the responsibility of ADC. All returns should be "prepaid" to the factory. Any "COD" or "collect" returns will not be accepted.

IMPORTANT: No replacements, credits, or refunds will be issued if the claim cannot be processed due to insufficient information. The party filing the claim will be notified in writing either by "fax" or "certified mail - return receipt requested," as to the information necessary to process the claim. If a reply is not received by the ADC warranty department within thirty (30) days from fax/letter date, then no replacement, credit, or refund will be issued, and the merchandise will be discarded.

SECTION VII

DESCRIPTION

A. TUMBLER SUPPORT AND DRIVE SYSTEM

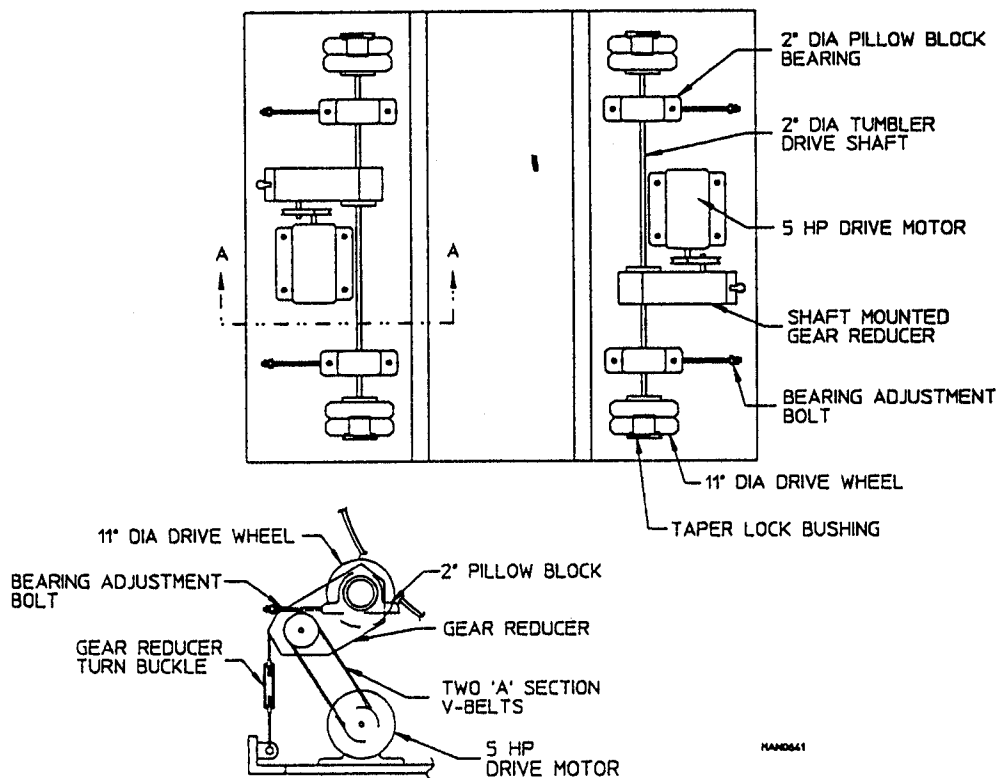
1. Tumbler

The tumbler is made of five (5) 14-gauge stainless steel perforated panels, five (5) stainless steel lifting ribs, and two (2) outer tumbler rings which have been machined on a lathe. The tumbler is a completely welded assembly so the perforated panels are not removable.

2. Tumbler Support System

The tumbler sits on eight (8) 11-inch diameter heavy-duty rubber roller wheels which support the tumbler and drive it. Two (2) rubber wheels are pressed onto each of four (4) steel hubs. The steel hubs are fastened to the 2-inch diameter drive shafts by taper lock bushings. Each drive shaft is supported by two (2) 2-inch diameter heavy-duty roller bearings. The position of the tumbler is adjusted by moving these bearings inward or outward by screwing in or unscrewing the four (4) bearing adjustment bolts.

AD - 400 TUMBLER DRIVE SYSTEM



3. Tumbler or Basket drive system

There are two (2) 5 hp tumbler drive motors. Each motor drives one of the 2-inch diameter tumbler drive shafts, and the motors spin simultaneously so that all four (4) drive wheels work together to spin the tumbler.

Each motor is connected to the drive shaft by two (2) "A" section V-belts, driving a shaft-mounted (5 to 1 ratio) gear reducer. This produces a tumbler shaft speed of 200 to 205 rpm and a tumbler speed of 31.5 rpm. Proper tension is maintained on the V-belts by tightening the gear reducer turnbuckle support. The oil in each gear reducer must be replaced every six (6) months by 1.4 Liters of I.S.O. viscosity Grade 460 gear oil.

4. Tumbler retaining wheels

There are eight (8) 4-7/16 diameter retaining wheels which stabilize the tumbler's position from front to back. Four (4) of these are mounted on the front panel of the dryer (two [2] on the left side and two [2] on the right side), and four (4) are mounted on the rear panel (two [2] on the left side and two [2] on the right side). Access to these wheels is obtained by removing the vertical front and rear panel covers.

5. Servicing the drive system

a. Removing a Drive Wheel

The drive wheels are removed through the front and back panels of the dryer, not through the sides. The front and back loading door panels are hinged at the top. Remove the bolts holding these panels to tumbler section frame and swing the panel out. The two (2) 1/4-inch poly flo tubes connected to the load door piston may have to be removed to allow the panel to swing up far enough out to get access to the drive wheels. Likewise the following electrical disconnections must be performed.

Front Panel Electrical Connections.

1. Front Door Position Switch Disconnect Plug: The front door position switch disconnect plug is located on the left side of the front doors. Disconnect this plug and feed the cable through the right hand side of the tumbler section
2. Intake Temperature Probe Disconnect Plug: The intake temperature probe disconnect plug is located in the burner/heater section, just above the 25Hp motor. Disconnect this plug and route through the hole located on the right of the front panel.

Rear Panel Electrical Connections.

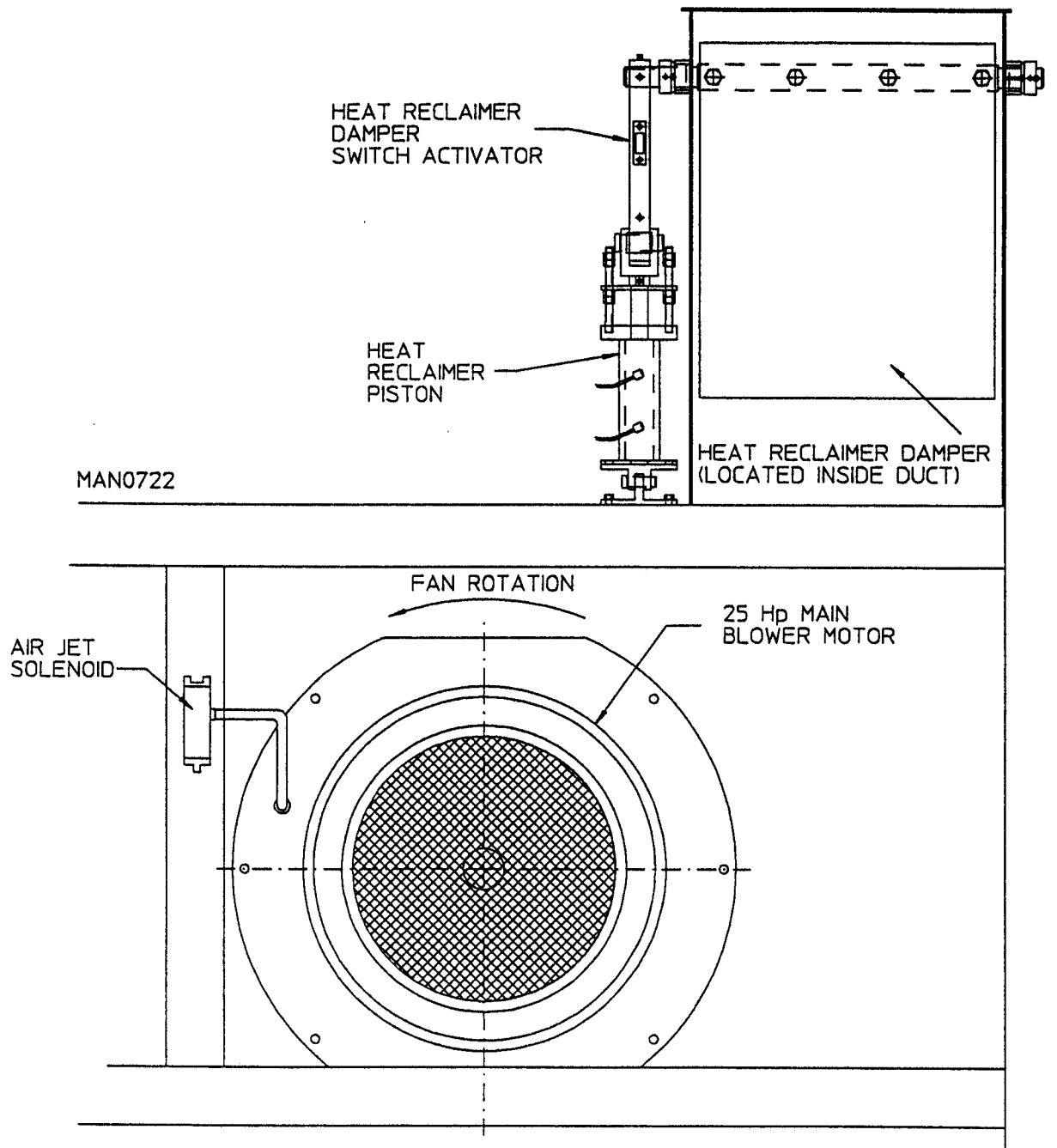
1. Rear Panel Controls Disconnect Plug: The rear panel controls disconnect plug is located behind the rear panel controls. Disconnect this plug and feed through hole towards the left hand drum motor section.
2. Rear Door Position Switch Disconnect Plug: The rear door position switch disconnect plug is located on the left side of the rear doors. Disconnect this plug and feed the cable through the right hand side of the tumbler section.

Put a block of wood under the tumbler; loosen and back out the tumbler shaft support bearings so that the drive wheel lines up with the large hole in the frame. The drive wheel taper lock bushing can now be loosened and removed through the hole in the frame, and the drive wheel pulled out of the dryer through this hole. Before backing out the tumbler shaft bearings, mark their position on the frame to make reassembly easier.

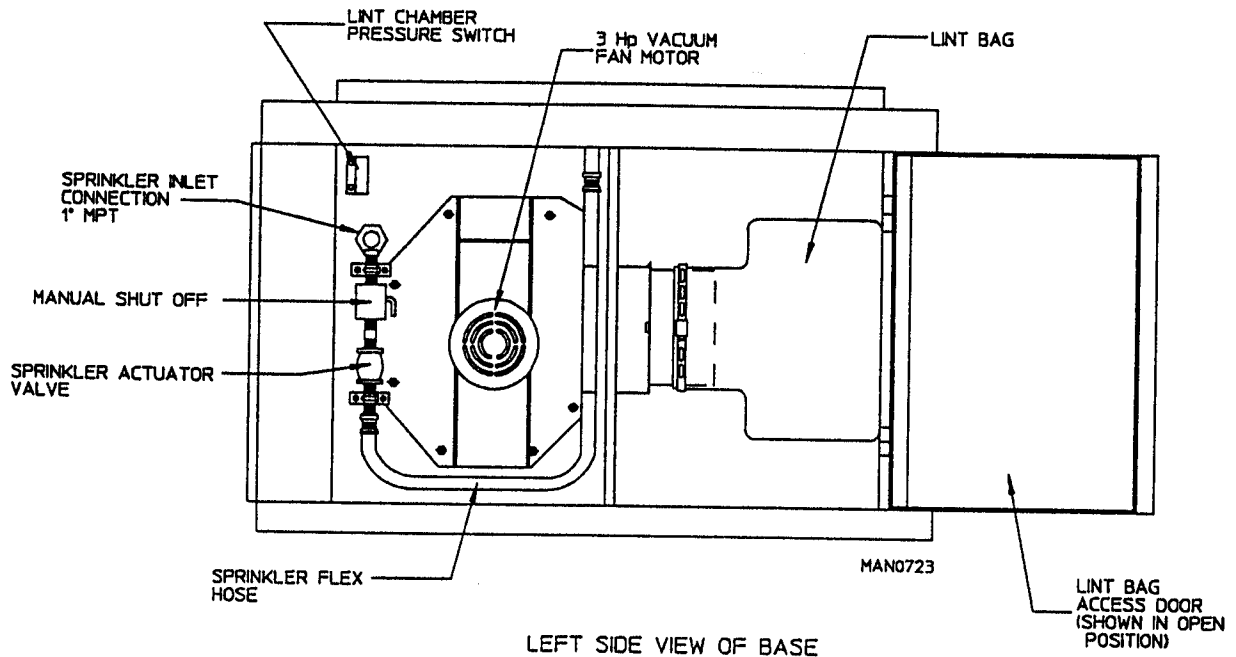
B. MAIN AIR BLOWER/HEAT RECLAIMER SYSTEM

The fan which moves the exhaust air through the AD-400 dryer is an 18-inch diameter, backwardly inclined, steel PLR wheel that is driven at 3,450 rpm by a 25 hp motor. This fan moves a maximum of 9,000 cfm of air through the dryer.

The dryer is equipped with a pneumatically operated heat reclaimer damper, which when opened, will recirculate approximately 50 percent of the dryer's exhaust air.



On a gas-heated dryer, the heat reclaimer damper is closed until ignition of flame has been established. Then, the damper piston is actuated, opening the damper and recirculating half of the exhaust air back over the gas burner and into the tumbler. The damper remains open for the rest of the drying cycle. On cool down, the damper closes, exhausting all of the 9,000 cfm which insures a fast cool down of the load.



1. Lint Chamber Pressure Switch

This switch is located in the left side of the dryer base. It insures that adequate air is circulating through the dryer. If there is an airflow problem possibly caused by poor fresh air supply, an overly long or partially blocked exhaust duct, or by a clogged up lint screen, this switch will shut off the heat and display "AIR FAULT" on the computer display.

2. Main Blower Wheel Air Jet

Lint can accumulate on the main blower wheel which over a period of time can cause the wheel to become unbalanced, an unbalanced motor will vibrate and damage motor bearings. An air jet has been provided which will shoot an 80 psi stream of air onto the blower wheel, cleaning off any lint accumulation. The air jet is activated by a solenoid valve which is opened for a period of thirty (30) seconds at the end of each drying cycle.

C. AUTOMATIC LINT REMOVAL SYSTEM

The AD-400 dryer incorporates a lint removal system which captures any lint in the dryer's air stream and deposits it into a mesh bag. The system is made up of a lint collecting screen, rotating vacuum arm, lint fan/motor, and the mesh bag.

1. Lint Collecting Screen

When the heated air passes through the load in the tumbler, it picks up moisture and lint from the material. This lint-filled, moist air then passes through the lint collecting screen and collects on top of this stainless steel mesh screen, located in the dryer base section.

The lint screen assembly can be removed from the dryer by opening the rear base access panels and sliding the screen out the back of the dryer.

2. Rotating Vacuum Arm

A vacuum arm rotates on top of the lint collecting screen, drawing up the accumulated lint and depositing it into the mesh bag. The rotating arm spins at a speed of one revolution every 7-1/2 minutes and is driven by a 3/8-inch pitch chain and a parallel shaft speed reducer connected to a gear motor.

3. Lint Fan

The lint fan draws air through the vacuum arm which draws the accumulated lint off the screen. The fan then blows this lint into the mesh bag. The lint fan is an 18-inch diameter pressure blower wheel which is spun at 3,450 rpm by a 3 hp motor.

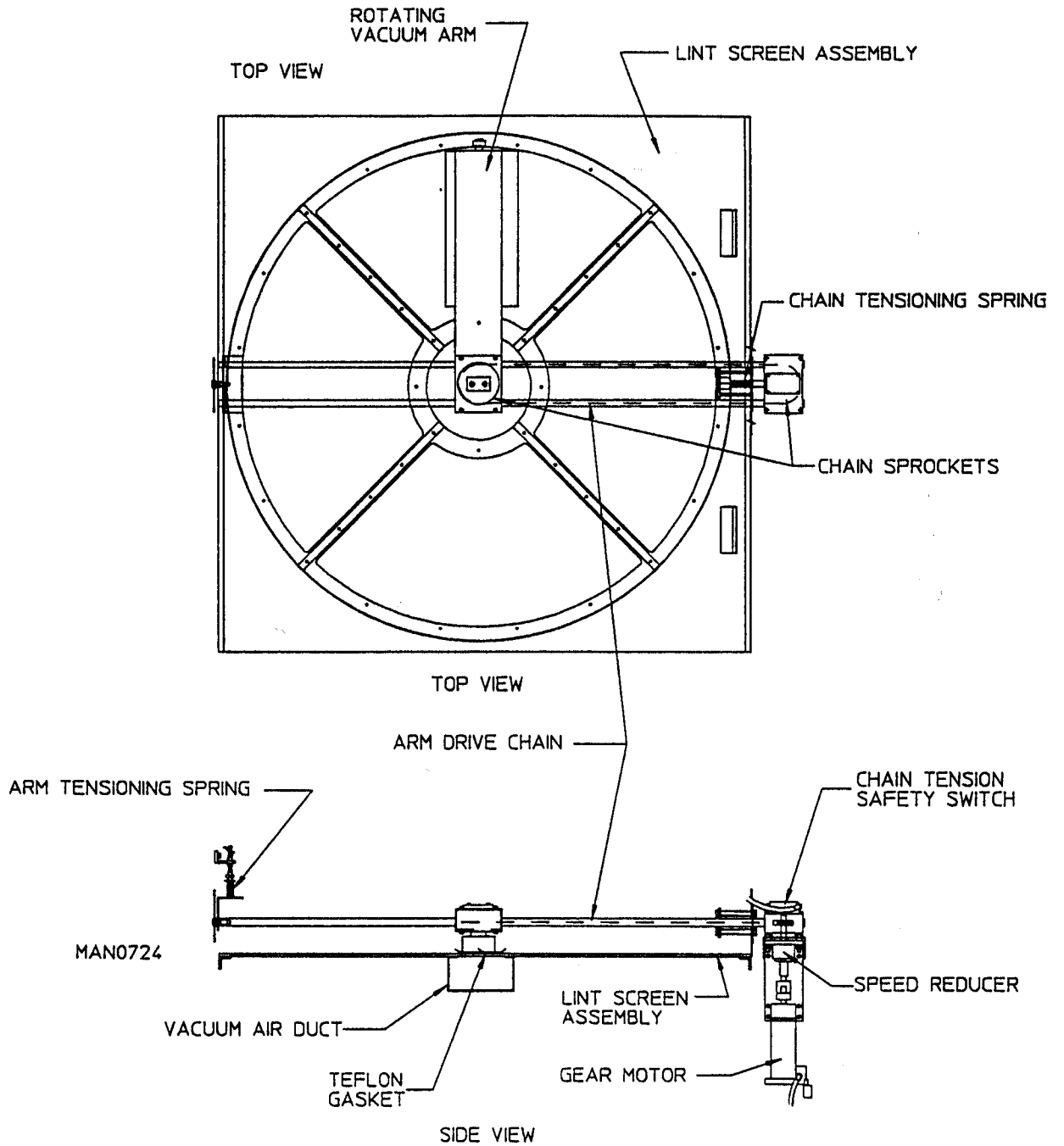
4. Mesh Bag

The lint collection bag is made of fine mesh cloth that is attached to a steel mounting collar. When the bag needs to be emptied simply pulled out of the dryer, and replaced with the second bag supplied with each dryer. The clogged bag can now be emptied, without delaying the next drying cycle.

5. Lint Screen Mechanism Switch

This switch insures that there is proper tension on the vacuum arm drive chain. A loose or broken chain will cause this switch to open and the computer display to show "SCREEN FAULT." The proper tension on the chain is maintained by the chain tensioning spring. Spring tension can be adjusted by a threaded nut assembly.

AUTOMATIC LINT REMOVAL SYSTEM



D. COMPRESSED AIR SYSTEM

The compressed air system of the AD-400 dryer consists of a number of pneumatic pistons located throughout the dryer. The pistons are actuated by solenoid and flow control valves that are under computer control. The pneumatic pistons are used to:

- Tilt the Dryer For Loading and Unloading.
- Open and Close Load and Unload Doors
- Operate Heat Reclaimer
- Operate Steam Coil and Cool Down Dampers (Steam Heated Dryer Only)

1. Filter/Lubricator/Regulator/Gauge Assembly

The compressed air supply to the dryer is connected into the 3/8-inch FPT fitting of the filter/lubricator/regulator/gauge (F/L/R/G) assembly which is located at the bottom rear of the lower burner section.

The F/L/R/G assembly performs three essential functions. The filter removes most solids and liquid particles from the compressed air stream and traps them in its bowl where this waste can be readily removed through the drain valve at the bottom of the bowl.

The filter bowl should be cleaned monthly.

The lubricator injects a mist of oil into the compressed air stream so that the pistons and solenoid valves will function smoothly.

The oiling rate can be adjusted by turning the oil adjustment screw on top of the lubricator.

Oil is added to the bowl through the large fill port located on top of the lubricator. Oil can be added without turning off the air pressure to the dryer.

The lubricator bowl should be refilled on a monthly basis with any petroleum-based, non-detergent lightweight oil (SAE 10/150 SSU) which will readily break up into a mist. Do not use synthetic oil or oils containing additives or solvents.

The regulator will maintain a nearly constant outlet air pressure of 80 psi so that the dryer's air pistons will function normally despite upstream air pressure variation.

NOTE: For complete operation and maintenance information on the F/L/R/G assembly, refer to the manufacturers data sheets accompanying this manual.

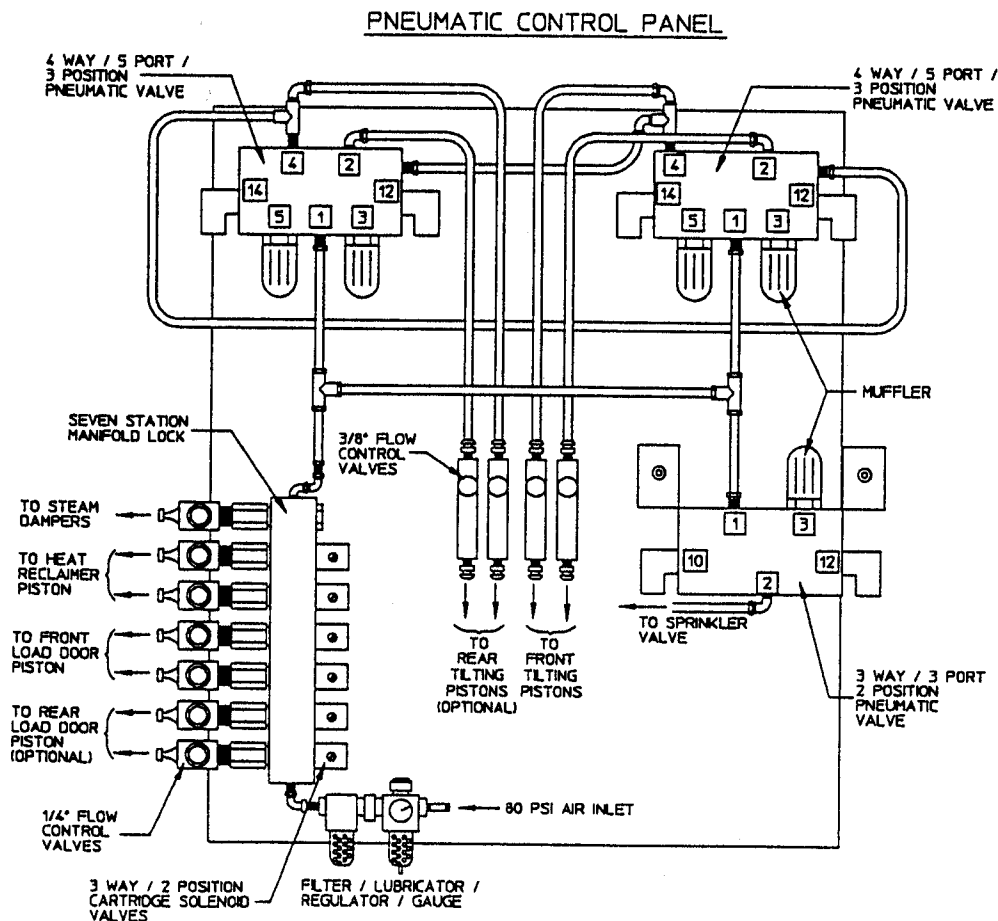
2. Tilting-Piston Solenoid Valves

A two-way-tilt dryer has two (2) of these solenoid valves - one to control the front set of tilting pistons and a second to control the rear set of tilting pistons. A one-way-tilt dryer has only one (1) tilting solenoid valve.

Each valve has five (5) 3/8-inch FPT ports and two (2) electric solenoids, one on each side of the valve.

To tilt the dryer back, a 115-volt signal is applied to the Front Pistons solenoid connector #12, and no voltage is applied to solenoid connector #14. The internal spool in the valve will move and 80 psi of air will enter the bottom port of the front tilting pistons, extending the front tilting piston rods and tilting the dryer back for loading. The top piston ports are bled to the atmosphere.

To level the dryer after loading, the voltage signals are reversed. No voltage is applied to the "12" solenoid, and 115 volts is applied to the "14" solenoid. The valve spool will now move so that 80 psi of air is applied at the top piston ports, while the bottom piston ports are bled to the atmosphere. The piston rods will now retract, leveling the dryer. On two-way-tilt dryers, the rear tilting piston solenoid valve acts in the same manner.



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The tilting piston valves are three(3)-position valves. This means that, if no voltage is applied to both positions "12" and "14" all five valve ports are blocked. This means that, if the dryer is tilting or leveling and power to the dryer is shut off, the pistons will lock in position, holding the dryer in a partially tilted position.

The dryer can be made to tilt faster or slower by adjusting the tilting pistons 3/8" flow control valves which are located on the pneumatic control panel.

3. Internal/External Pilot Air Supply

On two-way-tilt dryers, a pneumatic safety circuit is incorporated to prevent both front and rear tilting pistons from extending their rods at the same time. When 115 volts is supplied to the "12" side of the front tilting piston solenoid valve coil, the round internal spool in the core of the solenoid will move, allowing 80 psi air to flow into the bottom ports of the front tilting pistons, while the top ports of these pistons are bled to the atmosphere. In addition to this 115-volt electrical signal, the spool also requires a 30 psi supply of compressed air to change its position. This pilot air can either be supplied internally, tapped off the 80 psi air supply connected to port no. 1 through holes in the body of the solenoid valve or it can be supplied externally through the 1/8-inch FPT connection located on either end of the solenoid valve. If no pilot air is supplied to the solenoid valve, then the spool cannot move, even with voltage supplied to the solenoid valve coil.

This can be used to prevent both sets of tilting pistons from extending their rods at the same time. When the front tilting piston rods are extended, 80 psi air is connected to the bottom piston ports, while the top piston ports are bled to the atmosphere. So, by tapping the external pilot air supply to the rear tilting piston solenoid valve off the air line to the front tilting piston top port, whenever the front tilting piston rods are extended, then there is no pilot pressure available to the rear tilting piston solenoid valve so that its spool cannot move and the rear tilting piston rods cannot extend even if a 115-volt signal is sent to its "12" side solenoid valve coil.

The external pilot air supply to the front tilting piston is tapped off the rear tilting piston top port air line so that whenever the rear piston rods are extended, there is no pilot air supplied to the front tilting piston solenoid valve and the front tilting piston rods cannot extend. On the solenoid valve supplied on the dryer, the "12" side valve is externally piloted, while the "14" side valve is internally piloted.

A valve can easily be checked for internal or external piloting by removing the two (2) screws which hold the solenoid operator onto the valve. For an internal pilot, the "o" ring should be positioned over the internal pilot supply port. This allows internal pilot air to be supplied to the valve spool. For an external pilot, the solid sealing disc must be positioned on top of the internal port.

4. Loading Doors, Heat Reclaimer Damper, Solenoid Valves

These solenoid valves are located in the 7-station manifold block on the pneumatic control panel. Each door piston and the heat reclaimer piston is controlled by two (2) of the 3-port/2-position cartridge solenoid valves in this manifold block.

To open the loading door, a 115-volt signal is applied to S1, the coil of the valve that supplies air to the door piston's bottom port. The valve will open, and 80 psi of air is supplied to the bottom port of the door piston. The piston rod will extend, and the door will open. No voltage is applied to S2, the coil of the valve that controls the air supply to the door piston top port so that this line is bled to atmosphere.

To close the loading door, the voltage signals are reversed, and the loading door will close.

The solenoid coils on the 7-station manifold have a pilot light that illuminates when coil power is applied. This feature will ease servicing.

NOTE: If there is a power loss to the dryer, all cartridge valves will bleed to atmosphere so loading doors can be opened or closed by hand.

Connected to each of these cartridge valves is an adjustable flow control valve, to adjust the speed at which the doors open or the heat reclaimer damper operates.

5. Sprinkler Valves

The sprinkler is controlled by an air-operated on/off water control valve. This valve is actuated by a 3-way/3-port/2-position double solenoid pneumatic valve, located on the pneumatic control panel. This solenoid is the double solenoid type so that if power to the sprinkler is cut off after the sprinkler activates, then the 3-way solenoid valve will lock in position, keeping the sprinkler on.

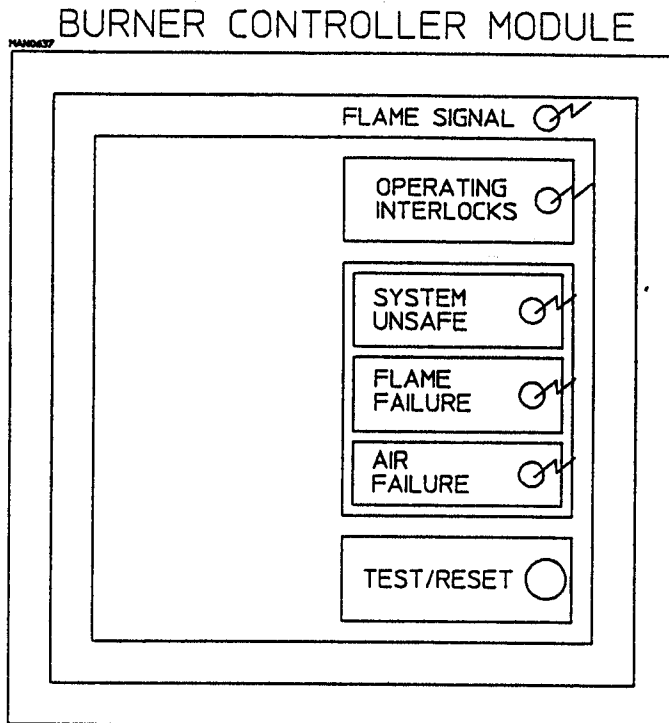
E. GAS BURNER AND IGNITION SYSTEM

The ADG-400 dryer gas burner system operates on a hi-fire/lo-fire gas rate sequence to accurately control the tumbler's drying temperature. Hi-fire is set at 1.6 mil. Btuh, and lo-fire is set at 40,000 Btuh. The burner always ignites in the lo-fire mode before cycling to hi-fire.

Upon a call for heat, the dryer computer sends a 120-volt signal to the burner controller module (BCM) which initiates and controls the ignition sequence. The BCM insures that all the dryer safety switches are closed before turning on the combustion air burner fan, then checks to insure that the burner fan air switch has closed. The pilot gas line solenoid valve is then opened, and a spark is generated by the spark plug, igniting the pilot flame. Once the pilot flame is established, the flame rod, which sits in this pilot flame, heats up and signals the BCM. The main motorized gas valves open in sequence, and the hi/lo electric butterfly valve modulates from lo-fire to hi-fire.

The burner controller module (BCM) has five (5) LED's on its cover for ease of troubleshooting, as well as dip switches inside for ease of programming.

The burner controller module controls all of the gas burner ignition components except for the hi/lo electric butterfly valve actuator. When the drying set point temperature is reached, the dryer computer cycles this actuator to lo-fire.



1. Major Burner Components

a. Burner Controller Module (BCM)

The burner controller module provides effective burner flame safeguard control through adjustable purge and trial-for-ignition timing. The BCM insures that all dryer safety switch circuits are closed, delays ignition to allow the combustion chamber to vent, and insures that a healthy pilot flame is established before opening the main gas valves. Five (5) LED's on the cover of the BCM allow for easy trouble shooting. Dip switches on the back of the module allow for easy programming.

- Dip Switch Selections

Loosen the two (2) screws on the burner control module cover and pull the module cover off its base. The dip switches are on the back of the cover.

Switch #1 Recycling Mode

With this switch in the "on" position, the burner will recycle the ignition sequence once during each drying cycle after a burner fan air switch or main flame failure, but only if the failure occurs more than 35 seconds after ignition. If this switch is "off," the burner will lock out at once.

Switch #2 Intermittent Pilot

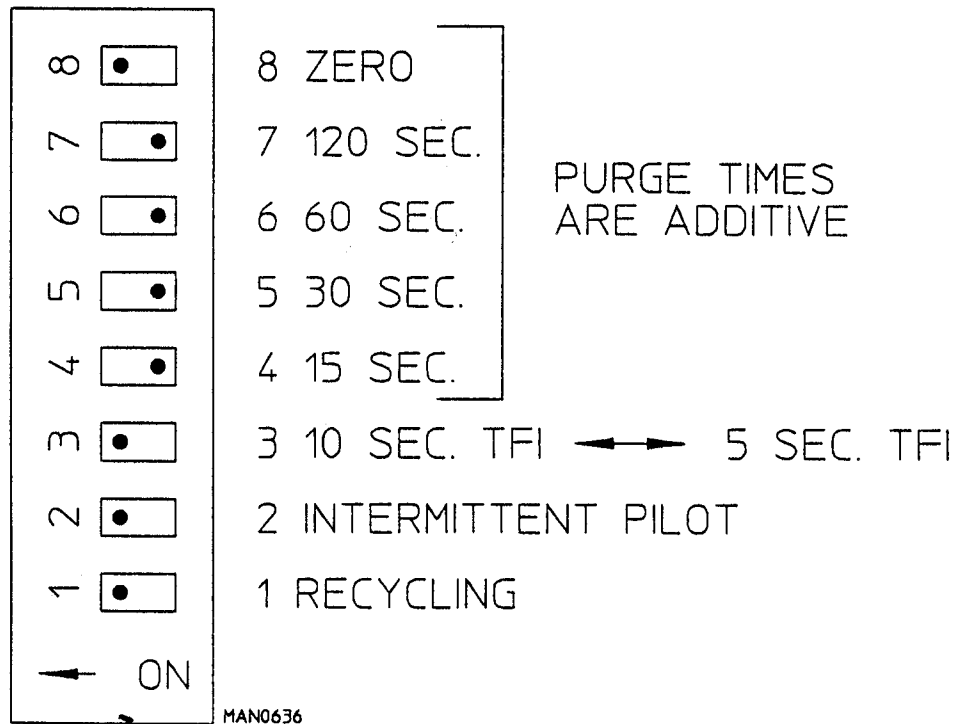
This switch is "on" for intermittent pilot or "off" for interrupted pilot. We use intermittent pilot so that the pilot flame stays lit during the entire drying cycle. With interrupted pilot, the pilot flame would go out once the main flame is established. This is used mainly on oil burners lit by a gas pilot.

Switch #3 Trial for Ignition (TFI) Time

When this switch is "on" a TFI of 10 seconds is set. If it is in the "off" position, the TFI is 5 seconds. The trial/for/ignition time is the length of time that the pilot is given to light. A 10-second TFI is best for the dryer.

Switches #4, 5, 6, 7, and 8 Purge Time

Switch #8 is in the "on" position, and switches #5, 6, and 7 are in the "off" position. This gives a purge time of 0 seconds.



• LED Displays of the Burner Controller Module

- Operating Interlock - LED is lit when:

- all safety interlock switches are closed applying a 110 Vac signal to terminal 7 of the burner controller module.

- Operating Interlock - LED is not lit when:

- one or more safety interlock switches are open. If any safety interlock switch is open the burner ignition sequence will not be attempted.

- **Flame Failure - LED is lit if:**

- Pilot is not established during 10-second trial-for-ignition
- Main flame is not established during TFI
- Main flame fails within 35 seconds of pilot TFI
- Flame fails during operation and is not re-established after one retry. (recycle mode)

- **Air Failure - LED is lit if:**

- Air switch is not closed within 10 seconds of startup of blower
- Air switch is open during firing cycle.

- **System Unsafe - LED is lit if:**

- A dryer safety device, connected in series with terminal 7, is opened. These safety devices include the door switches, tilt switches, tumbler stop motion detector, high temperature limit switches, airflow switches, and hi/lo gas pressure switch.
- A loose connection on the flame rod or spark plug.
- All purge time dip switches are in the off position
- Flame is detected out of sequence.
- Inductance is detected on sensor wires.
- Wiring fault on terminals 3, 4, and 5.
- Internal controller failure.
- Air switch closed before startup.

- **Flame Signal - LED is lit when:**

- The flame rod is heated by the pilot flame and applies a 3-11 VDC signal to the BCM. Insert one probe of a DC volt meter into the flame signal port and put the other probe to ground. The meter will read out the 3-11 VDC flame signal. If the flame signal LED flickers on and off, this is a result of a weak flame signal which can be caused by an intermittent wiring connection between the flame rod and BCM, a faulty ground connection, bad ground of the dryer, weak pilot flame, or a dirty or defective flame rod.

- **Test/Reset Button**

When this button is pushed in, the BCM will halt the ignition sequence, once pilot flame is established. This allows the pilot flame to be adjusted.

b. Flame Rod/Spark Plug

The pilot flame is lit by the spark plug, while flame sensing is done through the flame rod. The spark plug is energized when the pilot solenoid valve opens, igniting the pilot flame. The flame rod sits in the pilot flame and sends a 3-11 DC volt signal to the burner controller module when it

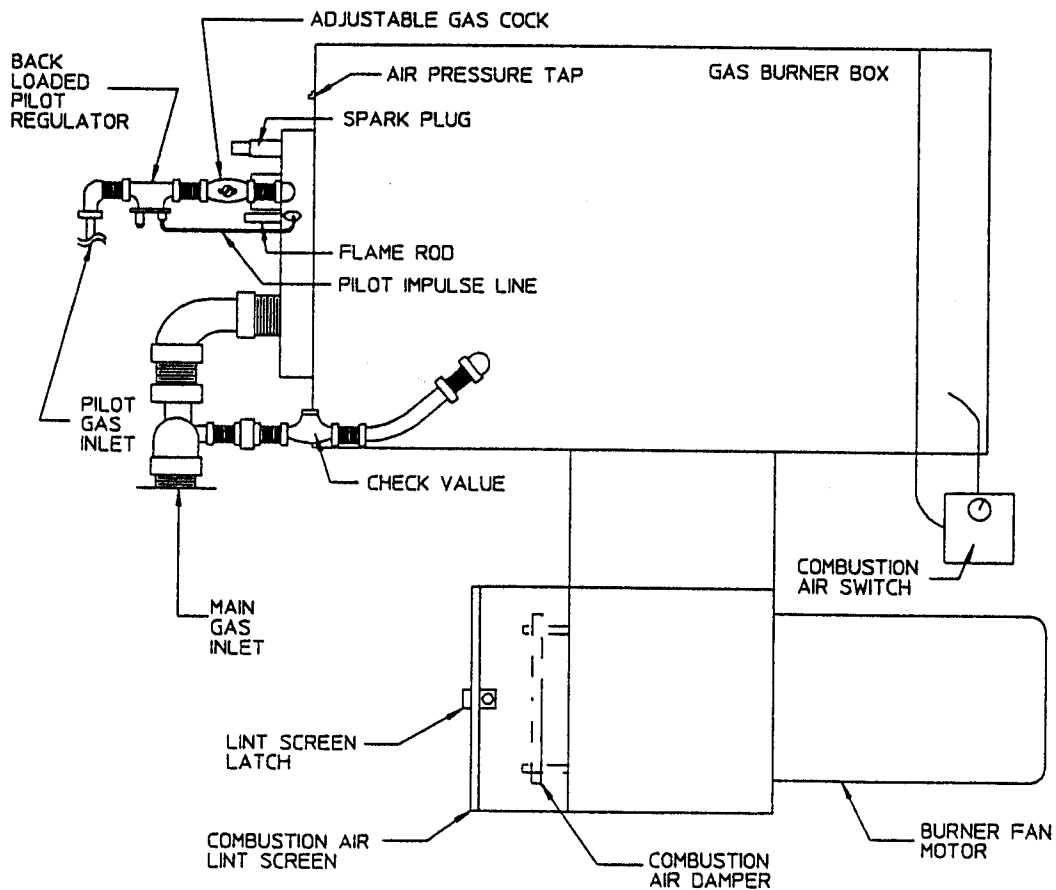
is heated by the pilot flame. The pilot flame should be about the size of a tennis ball and should heat the flame rod so it is red hot.

c. Burner Fan System

The burner fan provides additional combustion air for proper gas combustion. The fan provides approximately 400 cfm of air to the gas burner box. This airflow is obtained when the air pressure as measured at the air pressure tap on the gas burner box is approximately 1.25 inches water column (3.1 millibar). The combustion air system is comprised of the following components.

- Burner Fan Air Switch

The differential air pressure is measured by the burner fan air switch, which is located next to the burner fan motor. If the combustion air is inadequate, this switch will prevent ignition. The setting of this switch is adjustable, and it should be set at 1 inch water column (2.5 millibar).



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- Burner Fan/Motor

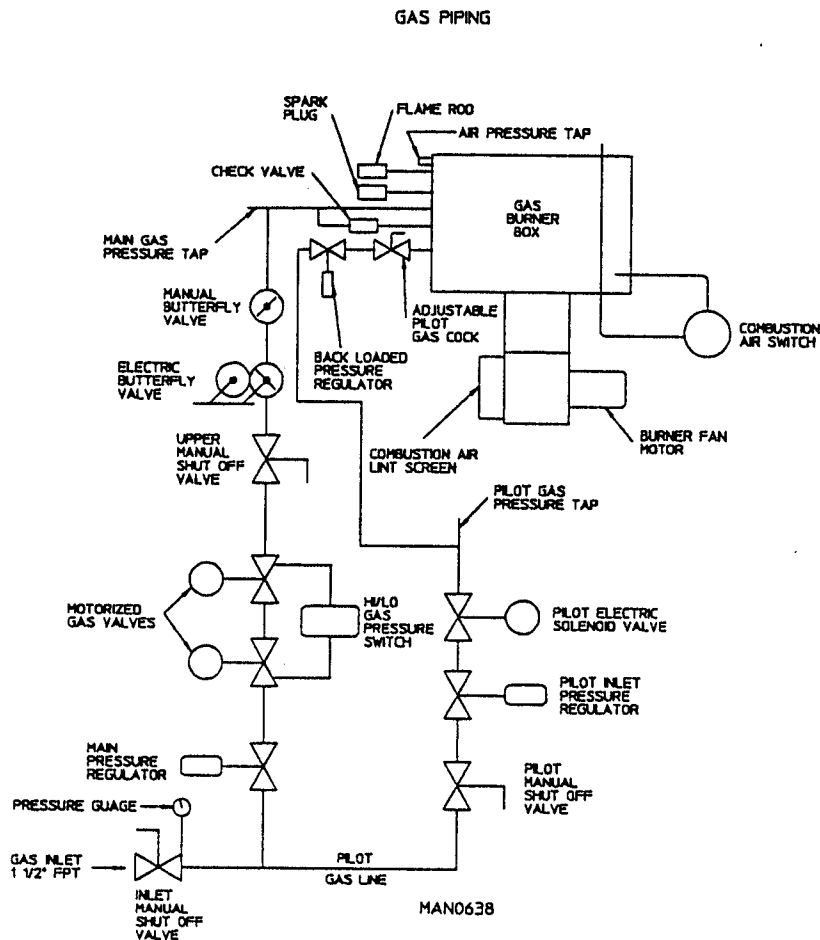
The combustion air is produced by a 6-inch diameter by 2-1/2-inch deep squirrel cage fan attached to a 3/4 hp, 3,600 rpm motor. The motor must spin counterclockwise as viewed from the rear of the motor.

- Combustion Air Lint Filter

The combustion air lint filter is made of a fine mesh stainless steel screen which must be cleaned regularly. This screen prevents any lint from entering the burner box.

- Combustion Air Damper

To produce the required combustion airflow, this damper can be adjusted. Remove the lint screen to get access to the damper. Moving the damper closer to the blower inlet opening will reduce the combustion airflow, and moving it away from the blower inlet opening will increase the airflow. To measure the combustion airflow, attach a manometer to the air pressure tap on the burner box. The air pressure should measure 1.25 to 1.5 inches water column.



d Pilot Gas Supply Line

The pilot gas supply line consists of a manual shut-off valve, pressure regulator, electric solenoid valve, back-loaded pressure regulator, and an adjustable gas cock.

The gas pressure in this line should be approximately 3.5 inches water column for natural gas and 1.5 inches water column for L.P. gas. This will provide a bushy pilot flame, which produces a 3-11 DC volt signal from the flame rod to the burner controller module.

This flame can be adjusted in two (2) ways.

1. Pilot Inlet Pressure Regulator - Remove the cap and turn the slotted adjustment screw clockwise for more gas and counterclockwise for less gas.
2. Adjustable Pilot Gas Cock - Remove the cap and turn the slotted adjustment screw clockwise for less gas and counterclockwise for more gas.

The pilot line contains a back-loaded pressure regulator with an impulse line connected to the gas burner inlet. This regulator will maintain a constant pilot supply pressure as the pressure in the burner changes due to an increase in temperature. Do not adjust this regulator

e. Main Gas Supply Line

The main gas supply line consists of a pressure regulator, two (2) motorized shut-off valves, hi/lo gas pressure switch, manual shut-off valve, electric butterfly valve, manual butterfly valve, and lo-fire check valve.

The gas pressure at the burner should be 2.2 inches water column above the duct pressure for natural gas and .9 inches water column for L.P. gas. This pressure is measured by a differential pressure gauge or water tube. Connect the hi port of the gauge to the main gas pressure tap, and the lo port of the gauge to the air pressure tap on the side of the burner box. This pressure can be adjusted by the pressure regulator. Remove the cap of the regulator and turn the slotted adjustment screw clockwise for higher gas pressure and counterclockwise for lower gas pressure. The gas pressure can also be changed by adjusting the manual butterfly valve.

The gas burner works on a hi-fire/lo-fire system. Hi-fire is set at 1,600,000 Btuh, while lo-fire is set at 40,000 Btuh. The hi-fire rate is set by the manual butterfly valve while the lo-fire rate is set by the electric butterfly valve.

• Motorized Gas Valves

The Eclipse series 500"MV" 1-1/2 FPT motorized valves are "on/off" gas flow control valves. The valves open slowly, and the internal spring return closes the valves within one (1) second of power shutoff. The valve motors operate on 115 VAC and are electrically "cascaded" so that upper valve will not open until the lower valve has fully opened. A limit switch inside each motorized valve provides the signal that the valve is fully opened. These valves will begin to open only when the burner controller module is receiving a 3-11 DC signal from the flame rod proving that the pilot flame is established.

- Electric Butterfly Valve

The butterfly valve and its electric actuator cycle the gas burner from hi fire to low fire. The electric actuator (EMA-418) operates on 115 volts single phase power and has a stroke of 90 degrees. When no voltage is applied to the actuator, the valve is in the lo-fire position, and modulates to hi-fire position when 115 volts is applied. Control power will not be applied to this actuator until the second motorized gas valve has fully opened. This feature is controlled by an internal limit switch in the second gas valve. Once Enabled this valve will now modulate from the lo-fire position to hi-fire. The gas burner flame will always start at the lo-fire and then slowly increase to the hi-fire rate.

The lo-fire rate is set by adjusting the electric butterfly valve stroke arm to connecting linkage. When no voltage is supplied to the electric actuator, the butterfly valve should be set to allow only enough gas to the burner box to cause a small flame on all gas ports on the burner box floor. When the electric actuator is powered, the connecting linkage should be set so that the butterfly valve is at its maximum open position. The hi-fire rate is set by a manual butterfly valve. The electric actuator's power supply is controlled by the dryer's computer, not the burner controller module.

- Manual Butterfly Valve

The manual butterfly valve sets the hi-fire gas rate of 1,600,000 Btuh. To achieve this rate, the differential pressure between the gas inlet pressure and the burner box air pressure must be set for 2.2 inches water column for natural gas and .9 inches water column for L.P. gas. To adjust, simply loosen the adjustment dial screw and move the dial so that the proper pressure is obtained. Retighten screw.

- Check Valve

At hi-fire, the gas pressure in the gas supply piping is higher than the air pressure in the burner box, and the check valve will be closed and only raw gas is fed into the gas burner. When the electric butterfly valve reduces the gas flow to cause lo-fire, the gas pressure in the gas supply pipe will be less than the air pressure in the burner box. The check valve will now open, allowing some air to bleed into the lo-fire gas supply. This gives a premix of gas and air which results in excellent flame stability at the lo-fire gas rate, and it helps pressurize the gas inlet pipe so that gas flow is uniform at all gas ports. If the check valve disc sticks closed, this will result in a yellow lo-fire flame.

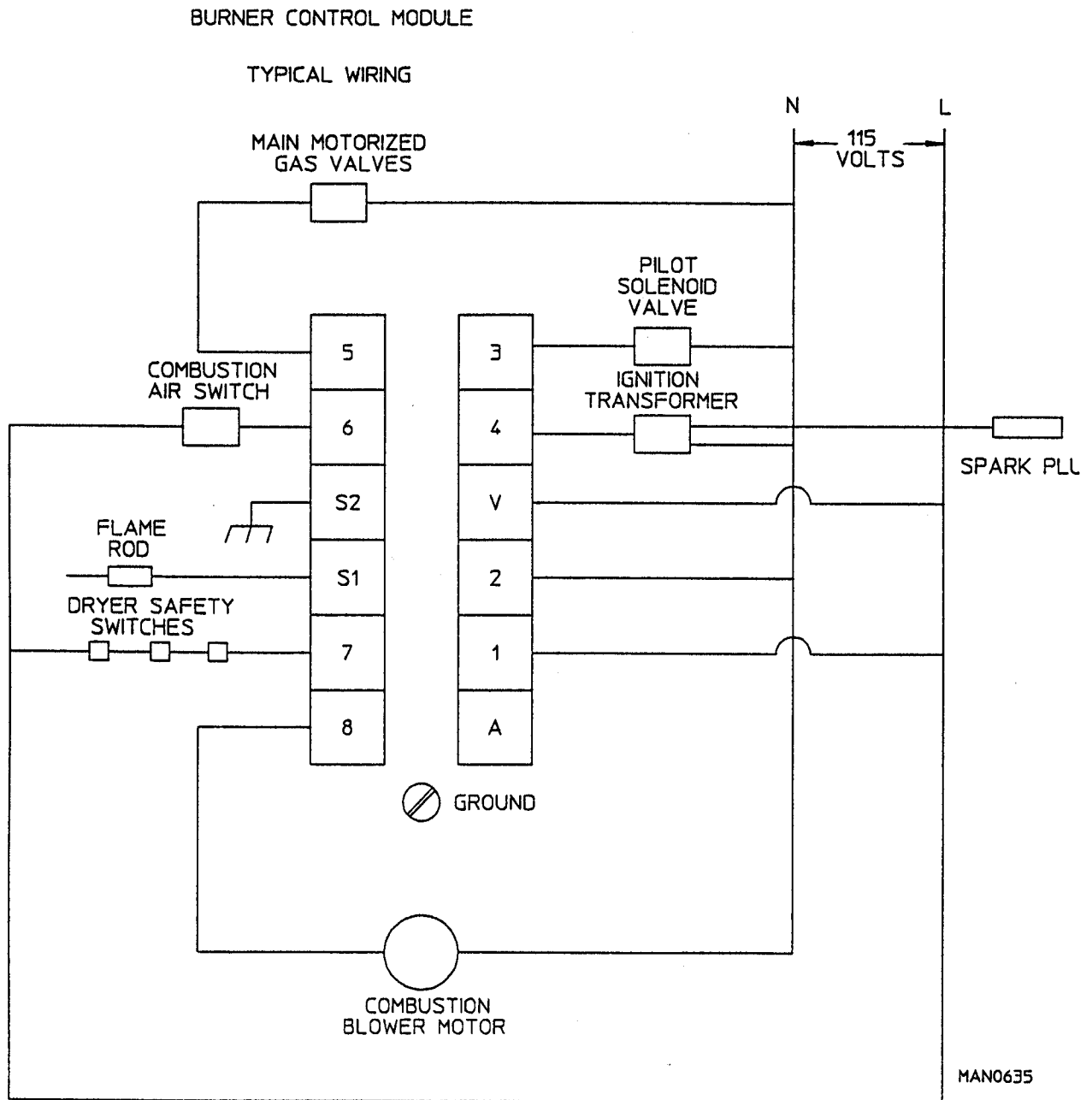
2. Sequence of Operation

1. With dryer power on a 115-volt signal is sent to terminals 1 and 2 of the Burner Controller Module (BCM). A power indicator light has been added to the controller base for troubleshooting purposes.
2. A drying cycle is started.
3. Dryer computer calls for heat.
4. The BCM checks that all of the dryer's safety circuits are closed (terminal no. 7 of the BCM). If this is the case, then the green "operating interlocks" LED on the BCM will light. If a safety switch is open, the green LED will not light, and the red "system unsafe" LED will light. The ignition sequence will stop.

If all safety switches are closed, the BCM will start the burner fan motor (BCM terminal no. 8).

The BCM waits 10 seconds to allow the blower motor to get up to speed, and then checks that the burner fan combustion air switch (BCM Terminal No. 6) circuit is closed. If this circuit is open during the drying cycle, the "Air Failure" LED will light. The gas valve will close, and a "HEATER FAULT" message will be displayed.

In order to prevent this air switch from being jumped out, the BCM checks to insure that this circuit is open prior to startup, closed during operation, and open again after shutdown. If the airflow switch is closed prior to startup, then, the "system unsafe" LED will light.



If the air flow switch closes after the burner fan is turned on, the pilot solenoid valve (BCM Terminal No. 3) is opened for 10 seconds, and a spark is produced (BCM Terminal No. 4) by the burner spark plug, igniting the pilot flame.

The flame rod, which extends into the pilot flame, heats up and sends a 3-11 DC voltage signal to the BCM (Terminal No. S1). The "flame signal" LED on the BCM lights up.

The spark plug will turn off 1.5 seconds after the pilot flame is detected. If the pilot flame should fail during the 10-second period that the pilot solenoid is opened, the BCM will re energize the spark. If the pilot flame is not established at the end of this 10-second period, the system will lock out and the "Flame Failure" LED will light.

The 10-second period when the pilot solenoid opens and a spark is produced is called the trial-for-ignition (TFI) time. It is selected at either 5 or 10 seconds by a dip switch located on the back cover of the BCM.

The 3-11 DC volt signal from the flame rod to the BCM can be measured by:

1. Closing the manual shut-off valve in the main gas line to the burner. Leave the pilot manual valve open.
2. Push the Test/Reset button on the cover of the burner control module in to the "Test" position.
3. Start a drying cycle. The BCM will halt the ignition sequence after the pilot is ignited. The pilot flame should be about the size of a tennis ball and should make the flame rod red hot.
4. Insert the positive probe of a DC volt meter into the "flame signal" port on the cover of the BCM. Connect the negative probe to ground.
5. If the signal is less than 3 VDC, then the pilot may be too small or too large, there may be a faulty wiring connection between the flame rod and burner controller module, the flame rod may be dirty, (wash it with soap and water) or defective, or the grounding may be faulty.

Once the 3-11 VDC flame probe signal is detected by the BCM, it waits 5 seconds to allow the pilot to stabilize and then opens the main motorized gas valves (Terminal No. 5 on the BCM) in sequence.

The lower valve opens first. Upon fully opening, its internal switch closes, enabling the second motorized valve to open. When the second motorized gas valve is fully open an internal limit switch is closed causing the Hi-Lo Signal from the dryer's computer to be applied.

If a flame failure occurs within 35 seconds of the beginning of this sequence, the system will lock out and the "Flame Failure" LED will light.

If the flame should fail after this 35-second period, the burner controller module will recycle the ignition sequence once. If the flame fails a second time, the system will lock out and the "Flame Failure" pilot will light.

Once main flame is established, the burner will remain in the hi-fire mode until the drying set point temperature has been reached. At this point, the dryer computer will cycle the hi/lo butterfly valve to the lo-fire position. The lo-fire mode will be maintained until the dryer's temperature falls below the drying set point temperature. The butterfly valve will then be returned to the hi-fire position. The hi-fire to lo-fire cycling will continue for the remainder of the drying cycle. When 115 volts AC is applied to the motor of the butterfly valve, it moves to the hi-fire position. Lo-fire is achieved when no voltage is applied to the butterfly valve motor.

3. Gas Burner Startup

New gas lines are filled with air and must be purged before the burner will light.

1. Close the upper manual shut-off valve, but leave the pilot line shut-off valve open. Push in the test/reset button on the cover of the burner controller module (BCM). This will "freeze" the ignition sequence when the pilot flame ignites. This will allow time to examine the pilot flame, and measure the flame rod signal to the burner controller module.

Connect a pressure gauge or water tube to the pilot gas pressure tap.

2. Start the dryer. Follow the ignition process by referring to the "Sequence of Operation" section of this manual.

When the pilot flame is ignited, the pilot gas pressure should measure 3.5 inches water column for natural gas and 1.5 inches water column for L.P. gas. The pilot flame should be about as big as a tennis ball.

Insert the positive probe of a DC volt meter into the "flame signal" port on the cover of the burner controller module. Connect the negative probe to ground. A 3-11 VDC reading must be obtained. If the reading is less than 3 VDC, then adjust the pilot inlet pressure regulator so that the pilot gas pressure is at the proper setting. If the voltage reading is still below 3 VDC, then adjust the internal screw of the pilot gas cock to increase the size of the pilot flame.

If the voltage reading is still too low, then remove the flame rod and clean it with soap and water. This should provide a better signal. The pilot flame should heat the flame rod so it is red hot.

3. Once the pilot flame has been properly set, remove the pressure gauge from the pilot line and connect a differential pressure gauge between the main gas pressure tap (hi port) and the air pressure tap (lo port) on the side of the gas burner box. The lines connecting the gauge to these taps must be long enough to allow the gauge to sit outside of the dryer so that the burner section access doors can be closed when the dryer runs. Running the dryer with these doors open will give an incorrect air pressure reading.

Once this differential gauge is installed, open the main gas shut-off valve and push the test/reset button on the burner controller module so that the button springs out.

4. Restart the dryer. The ignition process should now continue to the hi-fire gas flow state. The differential gauge should read 2.2 inches water column for natural gas and .9 inches water column for L.P. gas. This pressure can be adjusted in the following manner:

1. Main Pressure Regulator

Remove the cap of the regulator and turn the adjustment screw clockwise to increase the pressure or counterclockwise to decrease the pressure.

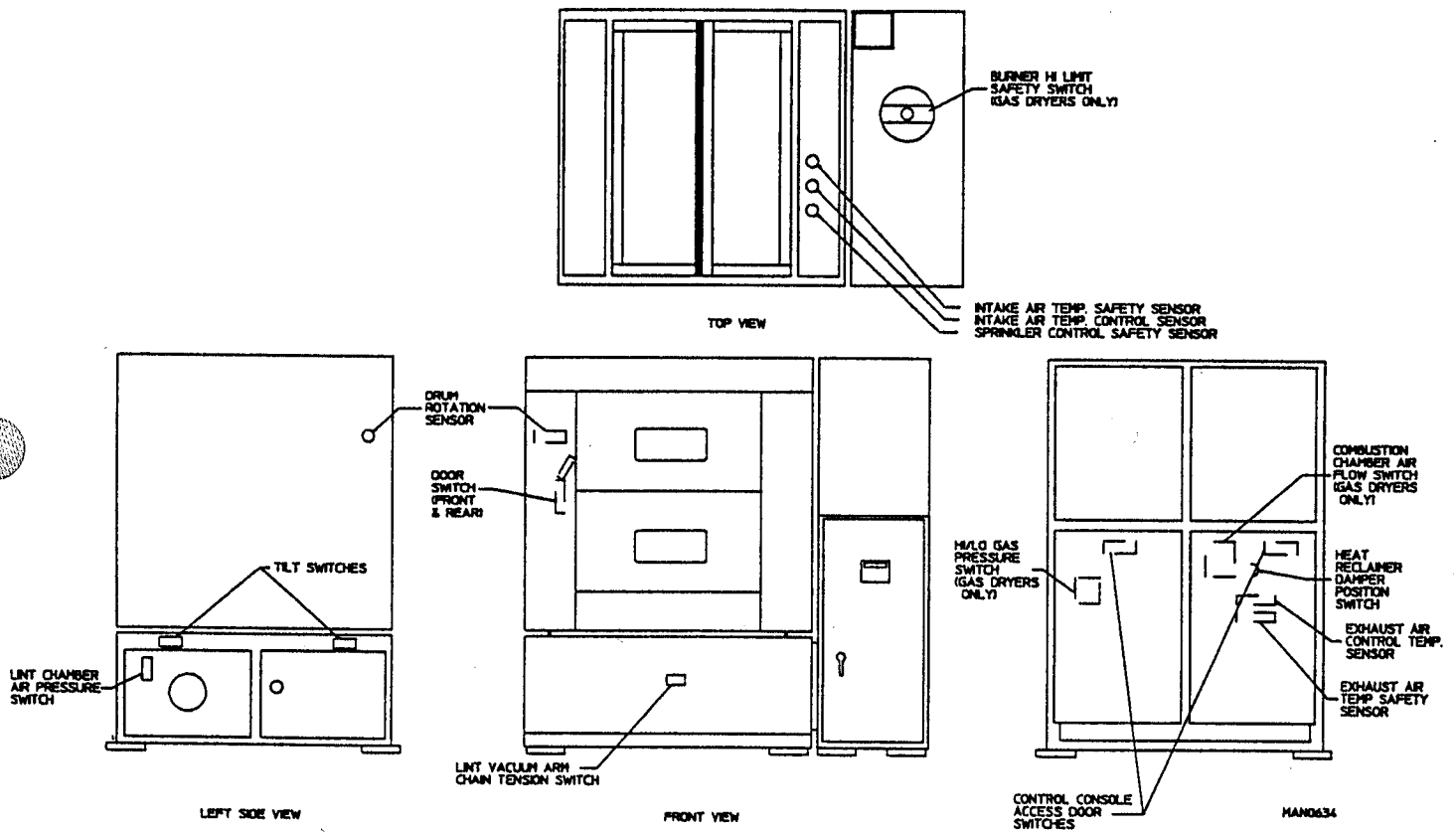
2. Manual Butterfly Valve

Loosen the locking screw on the adjusting dial on the valve. Turn the dial clockwise to increase gas flow and counterclockwise to decrease gas flow.

The lo-fire flame is set by the motorized butterfly valve. Lo-fire should be set at a minimum so that all of the ports on the burner box floor have a flame approximately 3/4 inches high.

F. SAFETY DEVICES

The AD-400 dryer is equipped with a numerous safety devices to insure that the dryer operates safely. The following chart lists each device with its location, function, computer display message, and the result of tripping.



Safety Device	Location	Function	Computer Display Message	Result Of Tripping
Load Door Switch	Left side of load door	Insures dryer load doors are closed	"DOOR OPEN," Dryer will not run	Dryer will not run
Unload door switch	Right side of unload door	Insures dryer unload doors are closed	"DOOR OPEN," Dryer will not run	
Tilting Switches	Top left side of base module	Insures dryer is level	"LEVEL FAULT," Dryer will not run	Dryer will not run
Drum Rotation Sensor	Left side of tumbler section	Insures tumbler is rotating	"DRUM FAULT," Stops heat only	Stops heat only
Lint chamber air pressure switch	Left side of base	Insures proper air flow through dryer	"AIR FAULT," Stops heat only	Stops heat only
Burner Fan Air Flow Switch (Gas Dryers Only)	Center of heater section	Insures proper combustion air flow into the burner box	"HEATER FAULT," Stops heat only	Stops heat only
HI/LO Gas Pressure Switch (Gas Dryers Only)	Lower left of heater section	Insures proper gas supply pressure for adequate ignition	"GAS FAULT," Stops heat only	Stops heat only
Lint Screen Mechanism Switch	Front of base	Insures that chain is not loose or broken	"SCREEN FAULT," Dryer will not run	Dryer will not run
Heat Reclaimer Damper Switch	Right side of heater	Insures that the heat reclaimer damper is either opened or closed	Input LED #13 of the PLC is off	None
Heater Door Access Door Switches	Inside heater section	Insures that access doors are closed	"DOOR OPEN," Dryer will not run	Dryer will not run
Exhaust Air Temp Control Sensor	Inside burner section exhaust duct	Monitors tumbler exhaust air temp	"EXHAUST DSFL," Stops the heat only	Stops heat only
Exhaust Air Hi Temp Safety Sensor	Inside burner section exhaust duct	Monitors tumbler exhaust air temp	"HI-TEMP FAULT"	Stops heat only
Intake Air Temp Control Sensor	Top right of tumbler section	Monitors tumbler air intake temp	"INTAKE DSFL," Stops the heat only	Stops heat only
Intake Air Hi Temp Safety Sensor	Top right of tumbler section	Monitors tumbler air intake temp	"HI-TEMP FAULT," Stops the heat only	Stops heat only
Burner Hi Limit Safety Sensor (Gas Dryers Only)	Top of burner section	Monitors air temp above the burner box	"HI-TEMP FAULT," Stops the heat only	Stops heat only
Sprinkler Control Safety Sensor	Top right of tumbler section	Opens sprinkler system water valve on hi-temp condition	Orange sprinkler pilot light comes on. Alarm horn sounds	Opens the sprinkler water valve and powers down the whole dryer

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