INSTALLATION, OPERATION & MAINTENANCE MANUAL
FOR

HEATLESS REGENERATIVE

COMPRESSED AIR DRYER

Model
RD1600A

This manual contains important safety information.
Do not destroy this manual. This manual must be available to the personnel who operate and maintain this machine.

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Book: 22948434 (7-21-06) Rev A **Revised (10-12)**

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INGERSOLL-RAND AIR DRYER WARRANTY

Ingersoll-Rand, through its distributors, warrants to the initial user that each **AIR DRYER** manufactured by it, will be free of defects in material and workmanship for a period of twelve (12) months from shipment to the initial user or eighteen months from date of delivery from the factory to the distributor, whichever occurs first.

Ingersoll-Rand will provide a new part or repaired part, at its election, in place of any part, which is found upon its inspection to be defective in material and workmanship during the period prescribed above. Such part will be repaired or replaced without charge to the initial user during normal working hours at the place of business of an Ingersoll-Rand distributor authorized to sell the type of equipment involved or other establishment authorized by Ingersoll-Rand. User must present proof of purchase at the time of exercising warranty.

The above warranty does not apply to failures occurring as a result of abuse; misuse, negligent repairs, corrosion, erosion and normal wear and tear, alterations or modifications made to the product without express written consent of Ingersoll-Rand; or failure to follow the recommended operating practices and maintenance procedures as provided in the product's operating and maintenance publications.

Accessories or equipment furnished by Ingersoll-Rand, but manufactured by others, including, but not limited to, engines, shall carry whatever warranty the manufacturers have conveyed to Ingersoll-Rand and which can be passed on to the initial user.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, (EXCEPT THAT OF TITLE),AND THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THIS DRYER WHILE IT IS PRESSURIZED.

1.1 HANDLING INSTRUCTIONS

Lift the dryer by the skid (see fork lift access in SECTION 3) or the lifting lugs on the dryer vessels.

If the unit is to be lifted by an overhead device, attach the lifting chains or cables to the vessel lifting lugs. Make sure that the chains or cables are clear of all piping and dryer components.

WARNING

DO NOT LIFT THE DRYER BY PIPING OR CONTROL BOX. THESE COMPONENTS ARE NOT DESIGNED TO HOLD THE WEIGHT OF THE DRYER. PERSONAL INJURY AND/OR EQUIPMENT DAMAGE MAY RESULT.

1.2 STORAGE INSTRUCTIONS

The unit should be stored indoors and covered with a tarpaulin to keep it clean. The location should be free from corrosive gasses and extreme humidity, which will cause damage to the unit.

If outside storage is required, the unit MUST BE adequately covered to prevent rain or snow from accumulating on the dryer. The unit must be placed on a paved surface to keep it out of standing water and mud.

1.3 EQUIPMENT CHECK

Inspect the dryer for any damage that may have occurred during shipment. Inspect all fittings, piping connections, fasteners, etc. for loose connections. Also check gauges and lights for cracks or breakage.

IF DRYER HAS BEEN DAMAGED DURING SHIPMENT:

(1) NOTIFY CARRIER IMMEDIATELY AND FILE A CLAIM.

(2) CONSULT FACTORY BEFORE OPERATING THE DRYER.

DECALS

Decals are located on the machine to point out potential safety hazards. Read and follow these instructions. If you do not understand the instructions, inform your supervisor.

Note that there are different decal headings:

(Red Background) Indicates the presence of a hazard which WILL cause serious injury, death or property damage, if ignored.

(Orange Background) Indicates the presence of a hazard which CAN cause serious injury, death or property damage, if ignored.

(Yellow Background) Indicates the presence of a hazard which WILL cause serious injury or property damage, if ignored.

(Blue Background) Indicates important set-up, operating or maintenance information.

FREE SAFETY DECALS

To promote communication of Safety Warnings on products manufactured by the Portable Compressor Division in Mocksville, N.C. safety decals are free of charge. Safety decals are identified by the decal heading: DANGER, WARNING or CAUTION. Decal part numbers are on the bottom of each decal and are also listed in the compressor's parts manual.

Submit orders for safety decals to the Mocksville Parts Service Department. The no charge order should contain only safety decals. Help promote product safety! Replace decals that are not readable.

2.1 INSTALLATION

BEFORE STARTING INSTALLATION PROCEDURES, TURN OFF POWER. SERIOUS PERSONAL INJURY MAY RESULT IF THIS SAFETY RULE IS NOT FOLLOWED.

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON DRYER WHILE IT IS PRESSURIZED.

THESE ASME CODE VESSELS MUST BE PROTECTED BY PRESSURE RELIEF VALVES. Refer to OSHA 1910.169 Par. b, Sub. Par (3) and ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, UG-125 through UG-136. Also comply with all applicable state and local codes.

WHEN INSTALLING AND OPERATING THIS EQUIPMENT, COMPLY WITH THE NATIONAL ELECTRICAL CODE AND ALL APPLICABLE FEDERAL, STATE, AND LOCAL CODES.

WHEN INSTALLING THIS DRYER, MAKE SURE THAT THE NEMA RATING OF THE CONTROL BOX IS APPLICABLE TO THE INSTALLATION.

MAKE SURE THAT ALL CUSTOMER SUPPLIED WIRING AND ELECTRICAL DEVICES ARE PROPERLY SIZED TO HANDLE THE ELECTRICAL REQUIREMENTS OF THE DRYER.

ALWAYS WEAR EYE PROTECTION, GLOVES AND A RESPIRATORY PROTECTIVE DEVICE WHEN HANDLING THE DESICCANT. DESICCANT DUST MAY CAUSE EYE AND SKIN IRRITATION. AVOID BREATHING THE DUST AND PROLONGED CONTACT WITH THE SKIN.

FIRST AID IN CASE OF EYE CONTACT WITH DESICCANT DUST; IMMEDIATELY FLUSH THE EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN.

ALL AIR PRESSURE EQUIPMENT INSTALLED IN OR CONNECTED TO THE MACHINE MUST HAVE SAFE WORKING PRESSURE RATINGS OF AT LEAST THE MACHINE SAFETY VALVE SETTING.

DISCONNECTED AIR HOSES WHIP AND CAN CAUSE SERIOUS INJURY OR DEATH. ALWAYS ATTACH A SAFETY FLOW RESTRICTOR TO EACH HOSE AT THE SOURCE OF SUPPLY OR BRANCH LINE IN ACCORDANCE WITH OSHA REGULATION 29CFR SECTION 1926.302 (b).

WHEN LOADING OR TRANSPORTING MACHINES, ENSURE THAT THE SPECIFIED LIFTING AND TIE DOWN POINTS ARE USED.

2.2 OPERATION

NEVER OPERATE UNIT WITHOUT FIRST OBSERVING ALL SAFETY WARNINGS AND CAREFULLY READING THE OPERATION AND MAINTENANCE MANUAL SHIPPED FROM THE FACTORY WITH THIS MACHINE.

ENSURE THAT THE OPERATOR READS AND UNDERSTANDS THE DECALS AND CONSULTS THE MANUALS BEFORE MAINTENANCE OR OPERATION.

AIR DISCHARGED FROM THIS MACHINE MAY CONTAIN CARBON MONOXIDE OR OTHER CONTAMINANTS WHICH WILL CAUSE SERIOUS INJURY OR DEATH. DO NOT BREATHE THIS AIR.

AIR PRESSURE CAN REMAIN TRAPPED IN AIR SUPPLY LINE WHICH CAN RESULT IN SERIOUS INJURY OR DEATH. ALWAYS CAREFULLY VENT AIR SUPPLY LINE AT TOOL OR VENT VALVE BEFORE PERFORMING ANY SERVICE.

WHEN USING COMPRESSED AIR, ALWAYS USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT.

AVOID BODILY CONTACT WITH COMPRESSED AIR. NEVER ALLOW THE UNIT TO SIT STOPPED WITH PRESSURE IN THE RECEIVER-SEPARATOR SYSTEM.

DO NOT OPERATE DRYER IF EITHER VESSEL IS LEAKING. IMMEDIATELY TAKE THE DRYER OUT OF SERVICE AND NOTIFY YOUR CERTIFYING AUTHORITY. DO NOT OPERATE THIS DRYER ABOVE THE MAXIMUM WORKING PRESSURE.

OPERATING CONDITIONS FOR PROPER PERFORMANCE OF THIS DRYER ARE DIFFERENT THAN MAXIMUM OPERATING CONDITIONS FOR THE VESSELS. BE SURE TO CHECK THE DRYER OPERATING CONDITIONS.

USE THIS DRYER FOR COMPRESSED AIR ONLY. AIR FROM THIS DRYER IS NOT SUITABLE FOR BREATHABLE AIR SYSTEMS WITHOUT FURTHER TREATMENT.

DO NOT OPERATE THIS DRYER IF EITHER VESSEL HAS BEEN DAMAGED BY FIRE. TAKE OUT OF SERVICE IMMEDIATELY.

2.3 MAINTENANCE

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THE DRYER WHILE IT IS PRESSURIZED. TURN OFF MAIN POWER TO THE DRYER AND DEPRESSURIZE THE DRYER COM- PLETELY BEFORE STARTING MAINTENANCE PROCEDURES.

DO NOT WELD OR GRIND EITHER VESSEL. IT WILL NOT BE SAFE TO OPERATE. (Note: Any uncertified alteration to the vessels VOIDS the ASME Code Certification.)

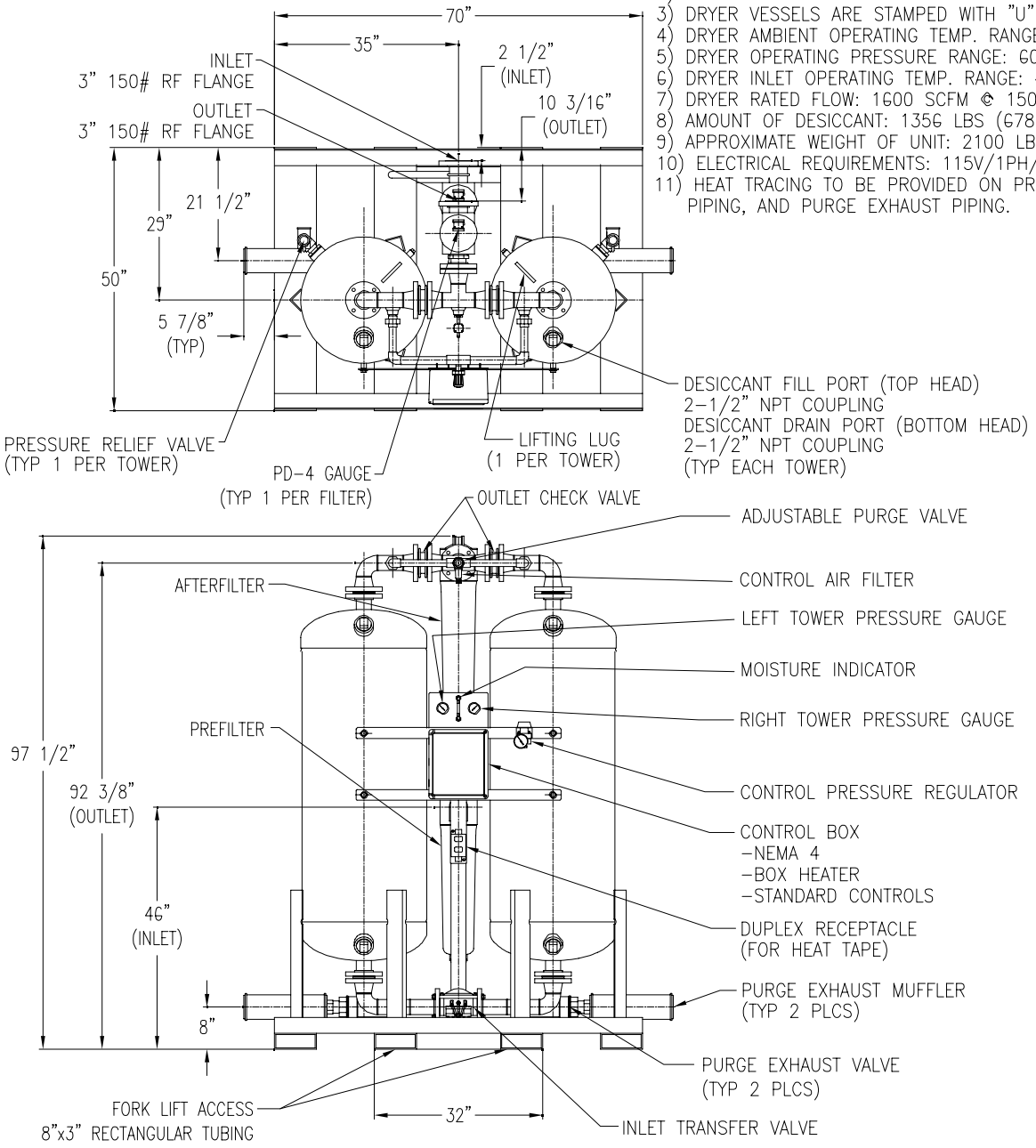
INSPECT OUTSIDE AND INSIDE OF VESSELS REGULARLY FOR CORROSION AND DAMAGE (I.E., DENTS, GOUGES OR BULGES). ANY DAMAGE TO THE VESSELS CAN MAKE THEM UNSAFE TO USE. IF DAMAGED, TAKE OUT OF SERVICE IMMEDIATELY.

ENSURE THAT MAINTENANCE PERSONNEL ARE ADEQUATELY TRAINED, COMPETENT AND HAVE READ THE MANUALS.

HIGH PRESSURE AIR CAN CAUSE SERIOUS INJURY OR DEATH. RELIEVE PRESSURE BEFORE REMOVING FILLER PLUGS/CAPS, FITTINGS OR COVERS.

ALL PRESSURE CONTAINING PARTS, ESPECIALLY FLEXIBLE HOSES AND THEIR COUPLINGS, MUST BE REGULARLY INSPECTED, BE FREE FROM DEFECTS AND BE REPLACED ACCORDING TO THE MANUAL INSTRUCTIONS.

NOTES:
1) FLANGE BOLT HOLES STRADDLE CENTERLINES.
2) DRYER VESSELS BUILT TO ASME CODE PLUS CURRENT ADDENDA.
3) DRYER VESSELS ARE STAMPED WITH "U" SYMBOL.
4) DRYER AMBIENT OPERATING TEMP. RANGE: 40°F TO 120°F.
5) DRYER OPERATING PRESSURE RANGE: 60 TO 175 PSIG.
6) DRYER INLET OPERATING TEMP. RANGE: 40°F TO 120°F.
7) DRYER RATED FLOW: 1600 SCFM @ 150 PSIG, 100°F.
8) AMOUNT OF DESICCANT: 1356 LBS (678 LBS PER TOWER).
9) APPROXIMATE WEIGHT OF UNIT: 2100 LBS.(W/O DESICCANT)
10) ELECTRICAL REQUIREMENTS: 115V/1PH/60HZ.
11) HEAT TRACING TO BE PROVIDED ON PREFILTER BOWL, INLET PIPING, AND PURGE EXHAUST PIPING.



FLOW CAPACITIES (SCFM) at various pressures (100°F)

60 PSIG	80 PSIG	100 PSIG	110 PSIG	125 PSIG	140 PSIG	150 PSIG	175 PSIG
726	920	1114	1211	1357	1503	1600	1843

4.1 LOCATION

WARNING

DO NOT INSTALL THIS DRYER IN AN ENVIRONMENT OF CORROSIVE CHEMICALS, EXPLOSIVE GASSES, POISONOUS GASSES, OR SATURATED STEAM HEAT.

Locate dryer in a protected, well vented area where ambient temperatures are between 40°F and 120°F. Allow sufficient clearance over and around the dryer for access to desiccant fill and drain ports and controls. **Refer to SECTIONS 3.**

This dryer was equipped with insulation and heat tracing installed on the inlet piping, purge exhaust lines and the prefilter housing to prevent freezing of the equipment when it is used in ambient temperatures below 40°F. The control box is also equipped with a box heater to protect the control circuit from freezing.

Position the dryer in the upright position on a solid, level, vibration free surface capable of supporting the dryer's weight.

The dryer should not be located in extremely dirty areas where airborne contaminants can accumulate on the dryer. If this cannot be prevented, the dryer should be cleaned periodically. An accumulation of dirt on the dryer may cause the inlet transfer valve to fail.

4.2 PIPING AND ANCILLARY EQUIPMENT

CAUTION

Make sure that the inlet air piping to the dryer and the outlet piping are connected as shown in Section 3.

Make sure that the inlet and outlet piping assemblies are properly supported. Excessive stress may cause damage and/or dryer malfunctions.

Remove protective caps or covers from all valves before installing this dryer.

If this dryer is to be installed into an existing piping system, clean the existing inlet piping to remove all accumulated dirt, pipe scale, etc., before connecting the dryer. Make sure that the inlet and outlet shutoff valves are tightly closed before connecting to the existing piping system.

If excessive vibrations are present in the piping, install a flexible hose between the compressor and the dryer inlet.

When installing the piping and any additional components, make sure that adequate pipe supports are used. Excessive stress on the dryer and components may cause damage or premature failure. Use either overhead or stiff-leg type supports.

Once the location has been determined, place the dryer into position per **SECTION 1.1.**

4.2-1 BYPASS PIPING (optional)

The installation of bypass piping is not required, but will allow the dryer and filter(s) to be taken off stream without interrupting the air system.

In Figure 4A, recommended bypass piping layout and components are shown.

Basic bypass piping should include an inlet isolation valve, a bypass valve, and an outlet isolation valve. The isolation and bypass valves must be bubble-tight.

4.2-2 FILTERS

CAUTION

MAKE SURE THAT THE ELEMENTS ARE INSTALLED IN ALL FILTER HOUSINGS PRIOR TO START-UP.

THE DRYER AND PREFILTER ARE NOT DESIGNED TO HANDLE LIQUID WATER. IF LIQUID WATER IS PRESENT IN THE AIR SYSTEM, A SEPARATOR WITH AN AUTOMATIC DRAIN MUST BE INSTALLED UPSTREAM OF THE PREFILTER AND DRYER TO PREVENT FLOODING.

A coalescing prefilter has been installed before the dryer to remove lubricating oils, dust and pipe scale contamination. The filter is equipped with a automatic float drain and a pressure differential indicator to monitor the condition of the element.

A particulate afterfilter has been installed downstream of the dryer to remove any desiccant dust. The filter is equipped with a manual drain and a pressure differential indicator to monitor the condition of the element.

4.3 PRESSURE RELIEF VALVES

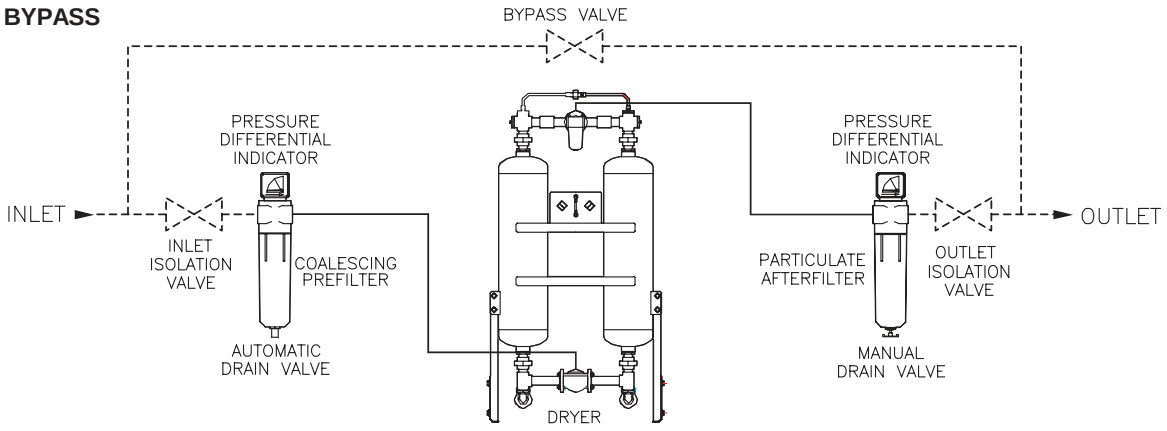
CAUTION

PRESSURE RELIEF VALVES. Refer to OSHA 1910.169 Par. b, Sub. Par (3) and ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, UG-125 through UG-136. Also comply with all applicable state and local codes.

A full flow pressure relief valve has been installed on each tower.

FIGURE 4A RECOMMENDED BYPASS PIPING LAYOUT AND COMPONENTS

3 VALVE BYPASS



4.4 REMOTE PURGE EXHAUST PIPING

To reduce noise during purging and tower depressurization, this dryer was supplied with mufflers for installation on the purge exhaust valves. If the noise or humidity discharged from the dryer is unacceptable at the dryer location, the purge of this dryer can be piped to a remote location.

IMPORTANT

Make sure that the piping is as short as possible and does not create back pressure on the dryer. The purge line must be vented to atmospheric pressure.

To prevent liquid accumulation in the piping and purge valves, the piping must be at the same level or lower than the purge valves.

The purge valves have threaded pipe connections. Reference Section 3 for location. Use adequate pipe supports to prevent stress on valves.

The distance will determine the size of piping that is recommended. For distances of 10 feet or less, use piping of the same size as the purge valves. For distances up to 20 feet, use piping one size larger than the purge valves.

4.5 INSTALLING THE PURGE MUFFLERS

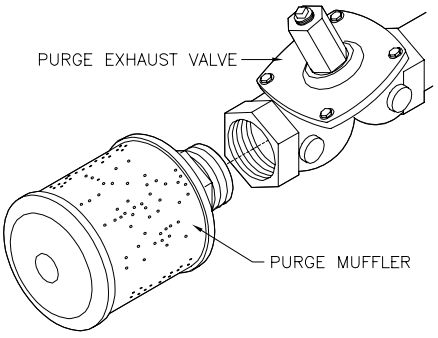
To reduce the sound level during purge and tower depressurization, this dryer was supplied with mufflers for installation on the purge exhaust valves.

Mufflers were shipped separately. They should **NOT** be installed until the dryer has been operated for several hours. From desiccant installation, some dust may be present in the desiccant towers. Operating the dryer with the mufflers installed immediately after the towers have been filled with the desiccant or during initial start up may cause the mufflers to clog.

IMPORTANT

The dryer must be operated for several hours without the mufflers after the towers have been filled with desiccant. This will prevent the mufflers from becoming clogged.

FIGURE 4B PURGE MUFFLER INSTALLATION



4.6 ELECTRICAL CONNECTIONS

WARNING

SERIOUS PERSONAL INJURY AND DAMAGE TO THE DRYER WILL OCCUR IF THE DRYER IS CONNECTED TO A POWER SOURCE OTHER THAN THE VOLTAGE LISTED ON THE DATA TAG.

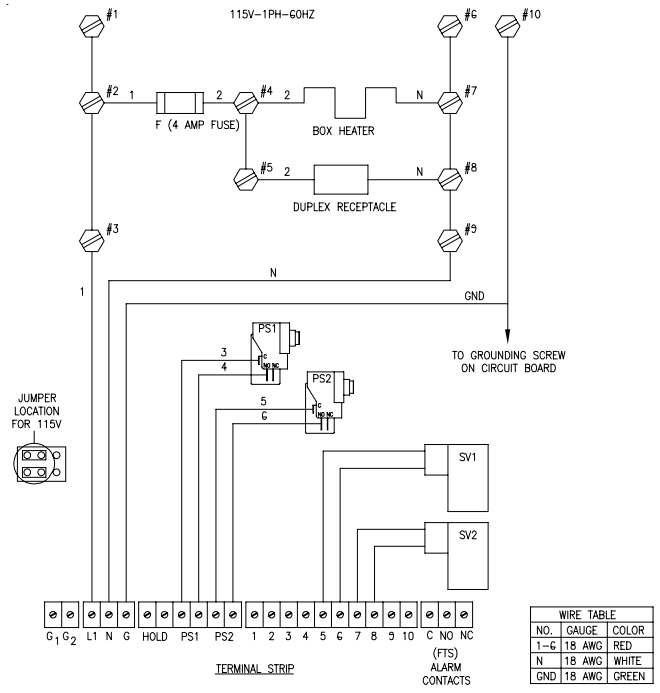
WHEN INSTALLING THE ELECTRICAL CONNECTIONS FOR THIS DRYER, COMPLY WITH NATIONAL ELECTRICAL CODE AND ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES

Power must be connected to the dryer's control box.

Check the electrical rating of the dryer as listed on the dryer data tag. Make sure that the power source is correct for the dryer rating.

Open the box cover to access the power and alarm terminals. Wire the power supply as shown in **Figure 4C**. Comply with all codes applicable for this installation.

FIGURE 4C ELECTRICAL CONNECTIONS



Control Power: 115V /1PH/60Hz
Max amp draw: 4.3 AMPS
General Alarm Contacts: 115V-230V/1PH/60Hz, 0.25 amps

5.1 START UP

WARNING

BEFORE STARTING THIS DRYER, FOLLOW THE INSTALLATION INSTRUCTIONS AND PROCEDURES COMPLETELY. SERIOUS PERSONAL INJURY CAN RESULT IF INSTRUCTIONS ARE NOT CAREFULLY AND COMPLETELY FOLLOWED.

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THIS DRYER WHILE IT IS PRESSURIZED.

Make sure the Stop button is pressed.

If the dryer is being started up for the first time, or after the desiccant has been changed, the purge mufflers must be removed. The dryer should be operated until no desiccant dust is visible at the purge valves. Then the mufflers can be reinstalled. See Section 2.1 for safety precautions concerning desiccant dust.

WARNING

WHEN OPERATING THIS DRYER WITHOUT THE MUFFLERS INSTALLED, USE HEARING PROTECTION.

If bypass piping was installed on this dryer as outlined in SECTION 4.2, close the inlet and outlet isolation valves. Open the bypass valve.

Pressurize the air system. Once the air system is pressurized, slowly open the inlet isolation valve. DO NOT open the outlet isolation valve.

To start the dryer, press the Run button which will light the Run LED. One tower will already be pressurized. The other tower will depressurize. The purge valve on the tower that is not pressurized will be open, air should be exhausting from the muffler.

5.2 ADJUSTING THE PURGE FLOW

IMPORTANT

NEVER OPERATE THE DRYER WITH THE PURGE METERING VALVE CLOSED. IF THE VALVE IS CLOSED, THE TOWERS WILL NOT REPRESSURIZE AND SWITCHING FAILURE WILL OCCUR.

DO NOT ADJUST THE PURGE METERING VALVE ABOVE OR BELOW THE RECOMMENDED SETTING FOR THE OPERATING CONDITIONS OF THIS INSTALLATION. IMPROPER SETTING MAY CAUSE POOR DRYER PERFORMANCE AND/OR EXCESSIVE USE OF PROCESS AIR.

The purge flow can be adjusted for the operating conditions. This dryer is equipped with a micrometer type needle valve. The valve can be adjusted to the desired setting.

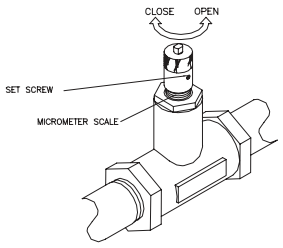
This dryer was shipped with the purge flow set for the rated inlet flow At 150 PSIG. Reference Section 3 for rated flow. This setting should be correct for most installations. Before placing the dryer on stream, check the purge metering valve setting.

The required purge flow for this dryer is 200 SCFM. This flow is required to properly regenerate the desiccant beds.

If the dryer is being operated at a pressure other than rated inlet conditions, the purge metering valve must be adjusted to maintain 200 SCFM purge flow.

Determine the dryer minimum operating pressure. Using the chart in Figure 5A, find the valve setting for that pressure. The valve is equipped with a set screw which must be loosened before the valve is adjusted. Adjust the needle valve to the desired setting. Tighten the set screw to prevent tampering.

FIGURE 5A PURGE METERING VALVE SETTINGS



60 PSIG	80 PSIG	100 PSIG	125 PSIG	FACTORY SETTING 150 PSIG	175 PSIG
3.2 turns	2.95 turns	2.80 turns	2.65 turns	2.60 turns	2.50 turns

5.3 CONDITIONING THE DESICCANT BED

To condition the desiccant bed, the dryer is operated without any outlet flow, while the towers regenerate with purge air.

To start the dryer, press the RUN button which will light the Run LED. The dryer should be set on the 10 minute time cycle. Observe the dryer for several cycles. Make sure that it is operating properly.

At initial start up or after extended shutdowns (over one month), the dryer may take 24 to 48 hours of continuous operation for the bed to be conditioned. Moisture that has accumulated on the desiccant bed should be removed before the dryer is placed on stream.

Once the moisture indicator on the dryer turns blue, the desiccant bed is ready. Place the dryer on stream by opening the outlet isolation valve. Make sure that the by-pass valve is closed.

6.1 PRINCIPLE OF OPERATION

The RD1600A Heatless Regenerative Air Dryer utilizes the pressure swing principle of operation. The desiccant bed in one tower dries the air stream while the desiccant bed in the other tower is regenerated.

A purge of dry air is used for tower regeneration. It is taken from the outlet of the dryer.

The dryer is equipped with a purge metering valve to allow the correct amount of dry air to flow into the regenerating tower. The heat created during adsorption of moisture in the drying tower is retained in the desiccant bed and increases the moisture removal capacity of the purge air.

The timing cycle of the dryer is controlled by two 3-way pilot valves.

A patented shuttle valve system is used to repressurize, changeover, and depressurize the towers. The inlet transfer valve is controlled by the pilot valves. The movement of the shuttle in the inlet transfer valve mechanically actuates the external pneumatic limit switches, which open the purge valves and depressurize the tower. The shuttle cannot shift until the tower pressures are nearly equal. The dryer cannot depressurize until the shuttle has fully seated and the one of the limit switches is engaged.

To achieve maximum performance from this dryer, it should be operated continuously. Operating this dryer for single shift periods may result in varied outlet dew point performance.

The dryer operation consists of four stages; REPRESSURIZATION, CHANGEOVER/DEPRESSURIZATION, DRYING and REGENERATION.

6.1-1 REPRESSURIZATION STAGE

Repressurization occurs in the regenerating tower. Repressurization must occur before tower changeover. This reduces shock to the desiccant and the possibility of downstream pressure spikes.

The purge valve is closed and the purge air, which was vented to atmosphere earlier in the cycle, is now used to repressurize the regenerated tower.

The pilot valves SV1 & SV2 de-energize causing the purge valve on the regenerating tower to close. The purge air, which was vented to atmosphere earlier in the cycle, is now used to repressurize the regenerated tower.

6.1-2 CHANGEOVER/DEPRESSURIZATION STAGE

Tower changeover occurs after the previous regenerating tower is pressurized. The controller signals the inlet transfer valve to switch. The tower that was on line and drying the process air will begin to depressurize.

Pressure in the regenerating tower will approach full line pressure. The pilot valves SV1 or SV2 will energize. Pilot air will be supplied to one side of the inlet transfer valve. The inlet transfer valve shuttle will move to the side that has pilot pressure.

When the inlet transfer valve changes position, the position indicator will move and actuate the other pneumatic limit switch. This will open the purge valve on the tower that was drying the process air, causing the tower to depressurize.

6.1-3 DRYING AND REGENERATION STAGE

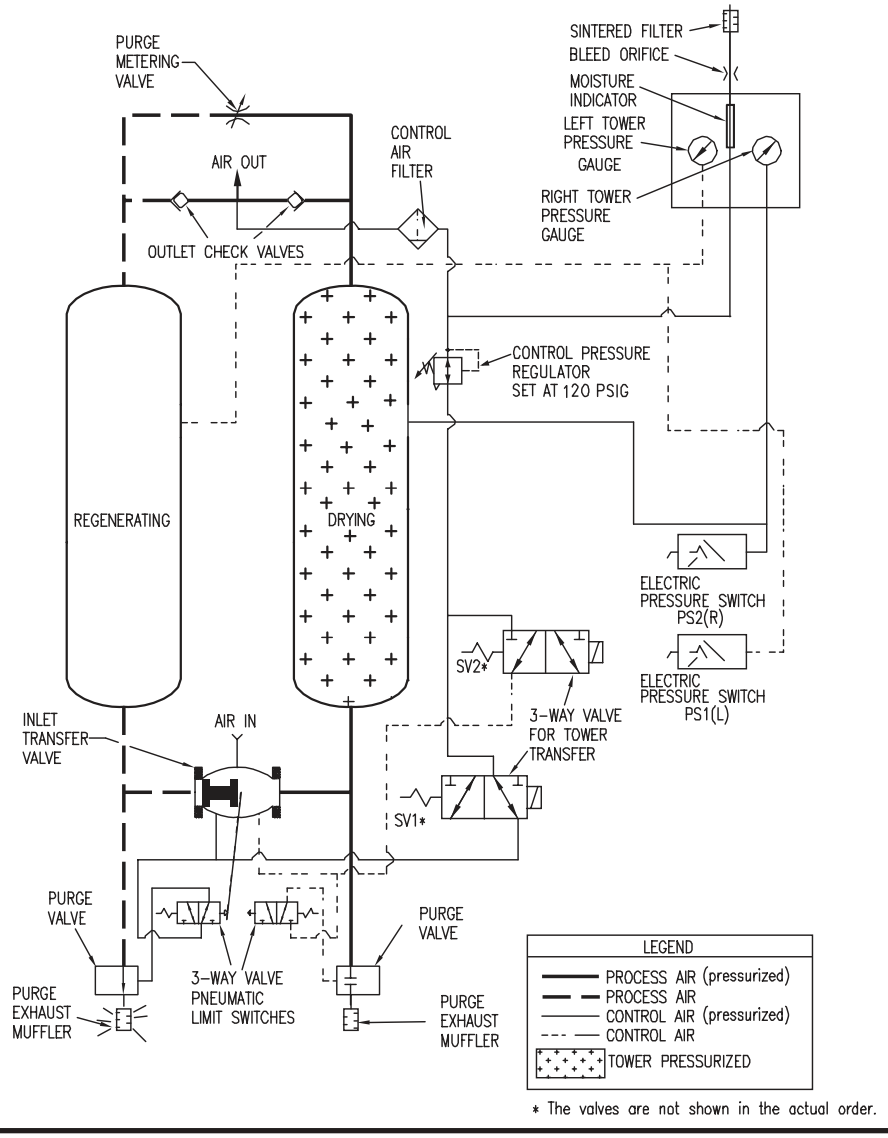
During the drying stage, one tower is pressurized with process air. This tower is in the drying stage. The process air passes through the desiccant bed, which adsorbs moisture from the air. The regeneration stage of one tower occurs at the same time as the drying stage in the opposite tower. During the regeneration stage, a percentage of dry air is directed through the desiccant bed of the offstream tower. The purge air is vented through the purge valve to the atmosphere.

The pilot valves SV1 or SV2 are either energized or de-energized depending on which tower is on stream (drying). If SV2 is energized, the LEFT tower is drying and if SV1 is energized, the RIGHT tower is drying.

6.2 MOISTURE INDICATOR

The moisture indicator is in the center of the gauge panel. A sample of outlet air is directed through the indicator. The moisture indicator is a clear plastic tube filled with moisture sensing crystals that will change color from **PINK (indicating wet air)** to **BLUE (indicating dry air)** as the dew point of the air changes from +20°F to -40°F.

FIGURE 6A PNEUMATIC SCHEMATIC



7.1 CONTROL BOX

The control box is a compact NEMA 4X enclosure. It has the following Dryer Status LEDs

- **POWER ON**
- **RUN**
- **HOLD**
- **SWITCHING FAILURE**
- **L/R TOWER DRYING**
- **L/R TOWER REGENERATING**
- **DRYER PURGING**

The Dryer Status LEDs are located on the front panel of the control box. Figure 7A shows the location of each. **Note: There is a Red LED located on the inside of the control box. This LED flashes on and off indicating the timer is active**.

Start the dryer per SECTION 5.1. When the Left tower is pressurized and on line drying the process air, the corresponding LEFT TOWER DRYING LED is illuminated. When the right tower is pressurized and on line drying the process air, the corresponding RIGHT TOWER DRYING LED is illuminated.
The DRYER PURGING LED is illuminated when the corresponding purge exhaust valve is open. During repressurization this LED will not be illuminated. Repressurization occurs for approximately 20 seconds just before tower changeover. The operation timing sequence of the dryer is shown in Figure 7C TIMING CHART.

SWITCHING FAILURE:

When there is a switching failure, the LED will be lit. This will energize the contacts shown in Figure 4C. The contacts can be wired for remote annunciation. To reset the Switching Failure Alarm press the Run button on the control box front panel.

HOLD FEATURE:

For Low load or Static pressure conditions, the hold contacts shown on Figure 4C can be wired to an auxiliary set of normally closed contacts on the compressor starter. This will stop the cycling of the dryer and repressurize both towers of the dryer, until there is demand on the compressor. The Hold LED will light, if the dryer is wired as described and the compressor is not running.

FIGURE 7A CONTROL BOX FRONT PANEL

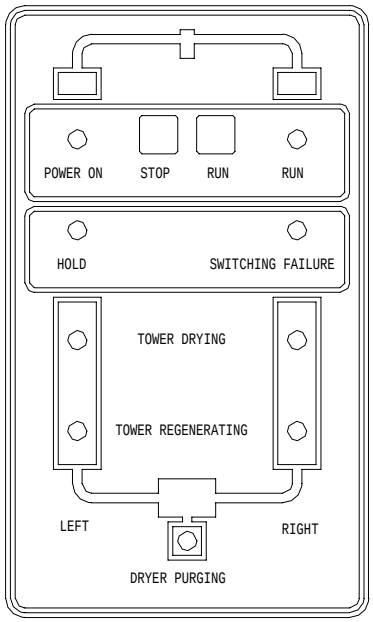
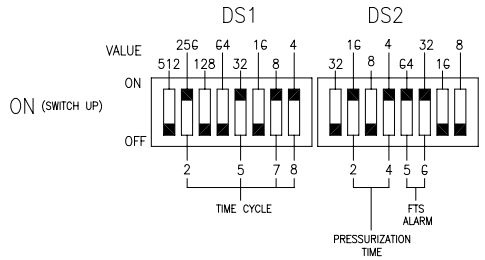


FIGURE 7B CYCLE TIME DETAIL



7.2 SETTING THE CYCLE TIME

Reference Figure 7B:

The setting for the time cycle is a **5 min/half cycle**. For the half cycle time setting, the switches indicated for **DS1 (2, 5, 7, & 8)** as shown in the **CYCLE TIME DETAIL** have been factory set by pushing the switches up. The values for these switches are **(256, 32, 8, & 4) sec.**, so when added together equal **300 sec or 5 min. WE DO NOT RECOMMEND** a time cycle setting below **2 min/half cycle.** For this half cycle time setting, the switches that need to be pushed up are **DS1 (4, 5, 6, & 7)** their values are **(64, 32, 16, & 8) sec.** so when added together equal **120 sec or 2 min.**

The setting for the pressurization time is **20 sec.** For the pressurization time setting, the switches indicated for **DS2 (2 & 4)** as shown in the **CYCLE TIME DETAIL** have been factory set by pushing the switches up. The values for these switches are **(16 & 4) sec.**, so when added together equal **20sec. WE DO NOT RECOMMEND CHANGING THIS SETTING.**

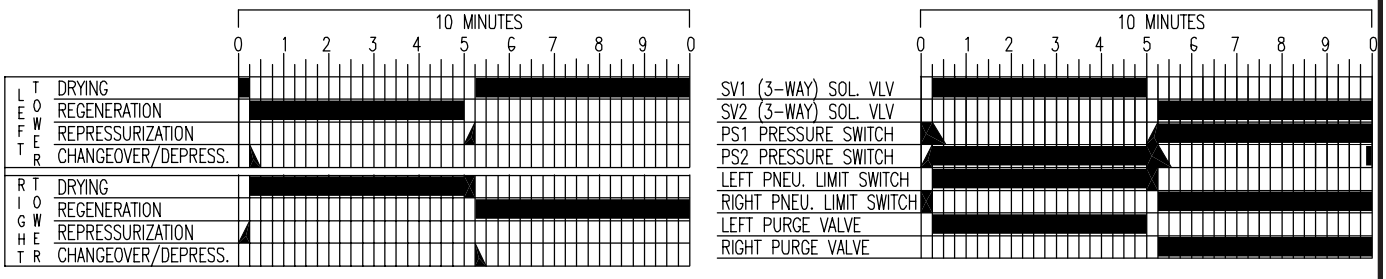
The setting for the alarm time is **96 sec.** For the alarm time setting, the switches indicated for **DS2 (5 & 6)** as shown in the **CYCLE TIME DETAIL** have been factory set by pushing the switches up. The values for these switches are **(64 & 32) sec.**, so when added together equal **96 sec. WE DO NOT RECOMMEND CHANGING THIS SETTING.**

NOTE: THE ALARM TIME SETTING NEEDS TO BE LESS THAN THE HALF CYCLE TIME SETTING OR THIS WILL NEGATE THE ALARM FUNCTION.

IMPORTANT

Operating this dryer on the 4 minute cycle will more than double the wear on the dryer components. To reduce wear on the dryer, operate the dryer on the 10 minute cycle if the -40°F dew point is acceptable.

FIGURE 7C TIMING CHART



Close the inlet and outlet isolation valves (if installed). Open the bypass valve (if installed). Let the dryer depressurize completely.

Turn the dryer off by pressing the Stop button.

If maintenance is to be preformed on the dryer, make sure the dryer is completely depressurized. Tower pressure gauges must read 0 PSIG before removing any item on the dryer.

9.1 DAILY INSPECTION

The following procedures should be performed daily:

- Check the dryer operating conditions, inlet temperature, ambient temperature, inlet pressure and inlet flow.
- Monitor the dryer for one complete cycle. Make sure it is operating properly.
- Check the purge mufflers. Purge air should be exhausting from one of the valves. If oil is present, the dryer and air system may be contaminated with lubricants.
- Inspect all upstream equipment, aftercoolers, separators, drains and filters.
- Check the pressure differential indicator on all prefilters and afterfilters. If the differential pressure is above 10 PSID, replace the elements.
- Check the prefilter(s) for proper draining.
- Make sure that all bypass valves are tightly closed.
- Visually check the dryer and piping for damage.

Visually check the dryer moisture indicator (blue dry or pink wet)

9.2 SCHEDULED MAINTENANCE

12 MONTHS

- Replace purge muffler elements
- Replace the control air filter element

24-60 MONTHS

- The desiccant in the towers should be replaced every two to five years. The life of the desiccant will vary depending on the inlet air conditions. Systems with excessive contaminants and/or inadequate filtration will decrease the life span of the desiccant drastically. Once the desiccant is contaminated with lubricants, it must be replaced.

9.3 DESICCANT REPLACEMENT

WARNING

DO NOT ATTEMPT TO REMOVE PLUGS UNTIL ALL AIR PRESSURE IS OUT OF THE VESSEL. CHECK ALL TOWER PRESSURE GAUGES, MAKING SURE THAT THEY ARE AT 0 PSIG AND INCOMING PRESSURE HAS BEEN TURNED OFF. ALWAYS WEAR EYE PROTECTION AND GLOVES WHEN HANDLING THE DESICCANT. DESICCANT DUST MAY CAUSE EYE AND SKIN IRRITATION. AVOID BREATHING THE DUST AND PROLONGED CONTACT WITH THE SKIN.

FIRST AID IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN.

Take dryer off stream following the **SHUTDOWN PROCEDURES IN SECTION 8.**

Remove the plugs from the desiccant drain and fill ports; drain old desiccant from each tower.

Remove any oil, dirt, or scale from the towers and inlet piping. Do NOT weld, grind or sandblast the vessels as this voids the ASME Certification. The vessels may be steam cleaned internally and externally to remove dirt and oil.

CAUTION

Make sure that the towers are clean to prevent contamination of new desiccant.

Replace plugs securely on desiccant drain ports. Apply pipe thread sealant as necessary.

Make sure that the drain ports or hatch covers are installed before attempting to fill the towers. Load desiccant through the desiccant filler ports or hatches. **REFER TO SECTION 3 FOR PROPER DESICCANT AMOUNTS.**

Reinstall the fill port plugs. Use pipe sealant.

Follow **START UP PROCEDURES IN SECTION 5.1** to start up and place dryer in operation.

9.4 CONTROL AIR FILTER REPLACEMENT

Close the dryer inlet and outlet isolation valves (and open bypass valve if provided). Turn off the power and completely depressurize the dryer.

WARNING

DO NOT REMOVE THE FILTER BOWL FROM HEAD UNTIL HOUSING IS COMPLETELY DEPRESSURIZED.

After all pressure is out of the dryer, grasp the filter bowl firmly, while pushing the bowl upward turn it clockwise to remove it from the filter head.

Remove the used element from the head. Discard used element properly.

Remove new element from the shipping package. Place the new element into the filter head.

While pushing the bowl upward into the head turn the bowl counterclockwise to lock it in place.

Following the start up procedures for the dryer, place the dryer on stream.

9.5 TROUBLESHOOTING

The following check list should be used as a guideline for troubleshooting problems. Each of the topics will reference other sections in this manual for further information.

IS THE POWER ON?

Check the main power source. Make sure the Run button is pressed and the Run LED is lit.

IS THE SYSTEM PRESSURIZED?

The dryer is designed to operate at 60 to 150 psig. Check the upstream equipment and any isolation or bypass valves.

IS THE DRYER CYCLING?

- **IS THE FAILURE TO SWITCH ALARM ACTIVATED?**
  If the dryer is not cycling the FAILURE TO SWITCH ALARM should be activated. The dryer should be checked to determine the cause of switching failure.
- **IS THERE CONTROL AIR PRESSURE, 60 PSIG MINIMUM.**
  Make sure that the dryer inlet pressure is above 60 PSIG. Check the control air filter element and replace it with a new element. Reference Section 9.4 for element replacement instructions.
- **ARE THE PILOT VALVES FAULTY? (SV1 & SV2) Reference Section 9.5-3 for procedures to check the operation of the 3-way valves.**
  Replace any faulty 3-way valves.
- **IS THE INLET VALVE FAULTY? Reference Section 9.5-2 for procedures to check the operation of the inlet transfer valve.**
  Rebuild or replace the inlet valve as necessary. Reference Section 10.3 for valve breakdown and repair kit details.
- **IS A PURGE EXHAUST VALVE FAULTY? Reference Section 9.5-4 for procedures to check the operation of the purge exhaust valves.**
  Rebuild or replace the faulty purge exhaust valve. Reference Section 10 for valve repair kit details.
- **IS AN OUTLET CHECK VALVE FAULTY? Reference Section 9.5-5 for procedures to check the operation of the outlet check valves.**
  If a valve is faulty, replace it.
- **IS THE PURGE METERING VALVE SET PROPERLY? Reference Section 5.2 for purge metering valve settings and procedures.**
  If the purge metering valve requires adjustment, follow the procedures in Section 5.2.

ARE THE TOWERS DEPRESSURIZING?

- **ARE THE PNEUMATIC LIMIT SWITCHES FAULTY? Reference Section 9.5-3 for procedures to check the operation of the pneumatic limit switches.**
  If either of the pneumatic limit switches are faulty, replace them both.

IS THE VISIBLE MOISTURE INDICATOR BLUE? Reference Section 6.2 for an explanation of operation for the moisture indicator.

- **IS THE BLEED ORIFICE FITTING OR SINTERED MUFFLER ON THE MOISTURE INDICATOR CLOGGED?**
  Inspect the bleed orifice fitting and the sintered filter on the back of the moisture indicator. They can be cleaned or replaced.

IS THE DEW POINT ACCEPTABLE?

- **ARE THE INLET CONDITIONS WITHIN THE SPECIFICATIONS? Reference Section 3 for the inlet conditions of the dryer.**
  Correct the inlet conditions if necessary. Excessive inlet flow will greatly reduce the performance of the dryer.
- **IS THE PURGE METERING VALVE SET PROPERLY? Reference Section 5.2 for purge metering valve settings and procedures.**
  If the purge metering valve requires adjustment, follow the procedures in Section 5.2.
- **WAS THE DESICCANT INSTALLED?**
  Make sure that the desiccant was installed. Reference Section 9.3 for desiccant replacement procedures.

IS THE DEW POINT ACCEPTABLE? (Cont'd.)

- **IS THE DESICCANT CONTAMINATED WITH LUBRICANTS?**
  Check the condition of the desiccant bed. If the bed is contaminated with lubricants, replace the desiccant following the procedures in Section 9.3.
- **IS THE DESICCANT CONTAMINATED WITH MOISTURE?**
  If the dryer was operated under excessive inlet conditions, the desiccant bed may be saturated with liquid moisture. Check upstream equipment such as aftercoolers. Check the actual inlet conditions, correct them and condition the bed following the procedures in Section 5.3.
- **ARE THE BYPASS VALVES OPEN OR LEAKING?**
  Check the valves (if installed). Repair or replace if faulty.

9.5-1 CHECKIING THE 3-WAY PILOT VALVES (SV1 & SV2) TOWER CHANGEOVER

All 3-way pilot valves have manual override buttons on the top of the valve. To test SV1 and SV2 do the following:

Make sure the Stop button is pressed and the dryer is pressurized. Both towers should be at full line pressure. Pushing the manual override of SV1 should cause the left tower to depressurize. Allow the left tower to come back up to full line pressure. Pushing the manual override of SV2 should cause the right tower to depressurize. If this does not happen, replace that solenoid valve.

9.5-2 CHECKING THE INLET TRANSFER VALVE

The inlet transfer valve will not switch positions unless the pressure in both desiccant towers is nearly equal. At tower changeover, the regenerating tower should approach full line pressure before the inlet valve will switch. Make sure that there are no leaks in the piping or fittings. Make sure that the purge exhaust valves are closing and that the purge metering valve is properly set.

The exhaust ports on top of the pilot valves (SV1 & SV2) should not have air exhausting through them continuously. If air is exhausting continuously through either of the exhaust ports, the inlet transfer valve is faulty and should be rebuilt or replaced.

To test the inlet transfer valve for proper operation, turn off the power, isolate and depressurize the dryer.

Remove the two pilot lines to the inlet valve. The pilot lines are connected to the outside flanges of the valve. Using an air nozzle and clean air, pressurize one of the ports. Observe the position indicator. It should move in the direction of the port that is being pressurized. No air should be exhausting from the other port.

Pressurize the other port. The valve should move to the other side. If the valve does not move or air is being exhausted out of the port that is not pressurized, the inlet transfer valve must be rebuilt or replaced. Reference Section 10.3 for valve breakdown and parts listing.

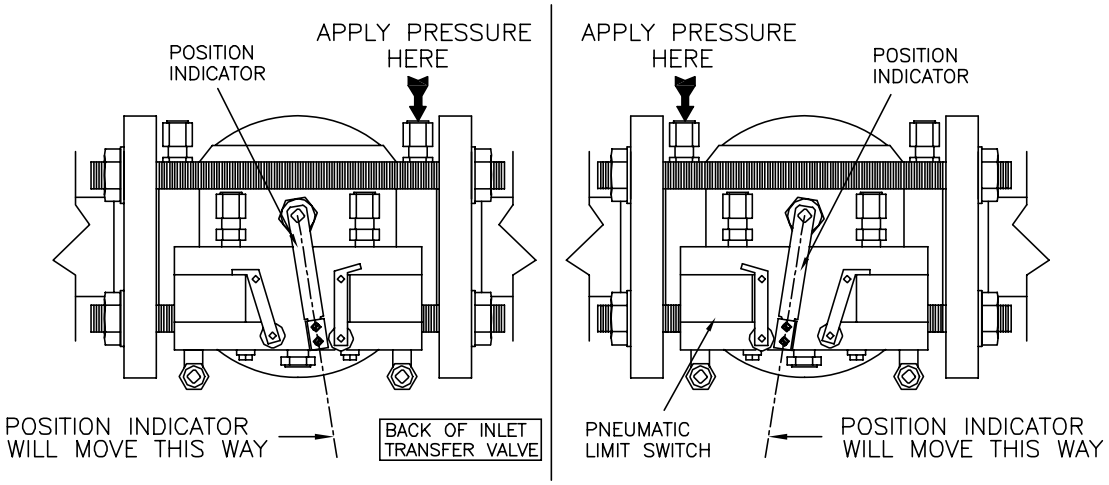
9.5-3 CHECKING THE PNEUMATIC LIMIT SWITCHES

Mounted on the inlet transfer valve is a set of 3-way pneumatic limit switches. These switches control the pilot air to open and close the purge exhaust valves.

When a pneumatic limit switch is activated by the inlet transfer valve position indicator, pilot air is supplied to the purge exhaust valve on that side of the dryer.

To check the pneumatic limit switches, allow the dryer to cycle. Check the pilot line to the purge exhaust valve on the side of the activated limit switch. If no air is present, the limit switch must be replaced. The limit switches are sold in sets only.

FIGURE 11A INLET TRANSFER VALVE DETAIL



9.5-4 CHECKING THE PURGE EXHAUST VALVES

The purge exhaust valves are normally closed. They can be checked by removing the pilot air lines to them. The valves should be closed.

Using an air nozzle and clean air, pressurize the purge exhaust valves. The valves should open when pressurized. If valve does not open and close, it should be rebuilt or replaced. See Section 10.4 for valve and parts listing.

9.5-5 CHECKING THE OUTLET CHECK VALVES

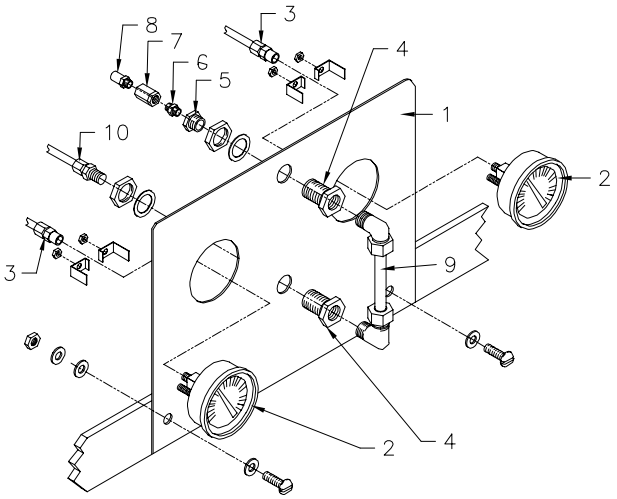
This dryer uses two check valves for outlet air control. If either of the outlet valves fails, one of the following will occur:

- A large amount of air will purge from one tower
- The outlet air flow will be blocked

If either happens, the faulty check valve must be replaced.

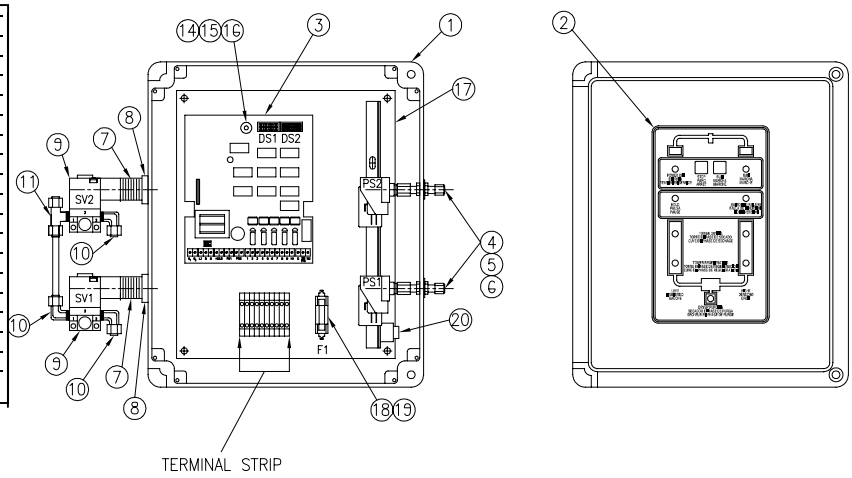
10.1 GAUGE PANEL REPLACEMENT PARTS

ITEM	QTY	DESCRIPTION	Part No.
1	1	Panel	22938948
2	2	2" Pressure Gauge, 0-200 psig	22938971
3	2	1/8" NPT x ¼ Female St. Tube Fitting	22938989
4	2	¼" Npt Anchor Tube Fitting	22938997
5	1	¼" NPT x 10-32 Reducer Bushing	22939003
6	1	10-32 Short Coupling	22939011
7	1	10-32 Choke Fitting	22939029
8	1	10-32 Sintered Filter	22939037
9	1	Visible Moisture Indicator Assy	22938963
10	1	¼" NPT x ¼ Male Straight Tube Ftg	22938955

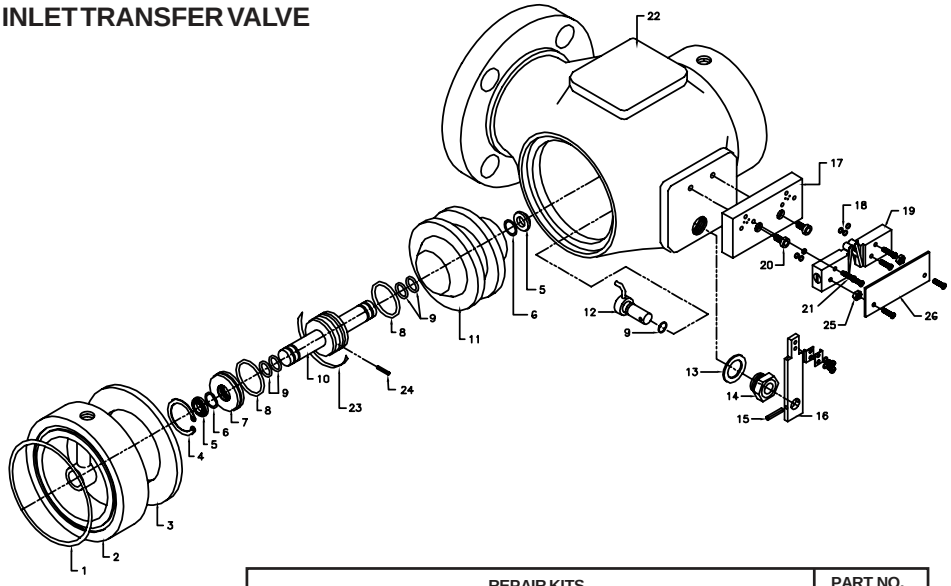


10.2 CONTROL BOX REPLACEMENT PARTS

Item	QTY	DESCRIPTION	Part No.
1	1	Enclosure	22939045
2	1	Panel Membrane & Ribbon Connector	22939052
3	1	Circuit Board	33939060
4	2	Pressure Switch Female	22939102
5	2	Bulkhead Fitting	22939110
6	2	Threaded Seal Fitting	22939128
7	2	½"NPT x 2" LG Close Nipple, Galvanized	22939136
8	2	Hub Connector	22939144
9	2	1/8" Solenoid Valve Male	22939201
10	3	Elbow Tube Fitting Male	22939219
11	1	Tee Tube Fitting	22939193
14	1	8-32 Washer Stat-O-Seal	22939185
15	1	8-32UNF x 1: LG Rd Mach Grd Screw	22939177
16	1	8-32UNF Hex Nut	22939169
17	1	Enclosure Panel	22939151
18	1	Fuse Block	22939086
19	1	Fuse (5 amp)	22939094
20	1	Heater for Enclosure	22939078



10.3 INLET TRANSFER VALVE



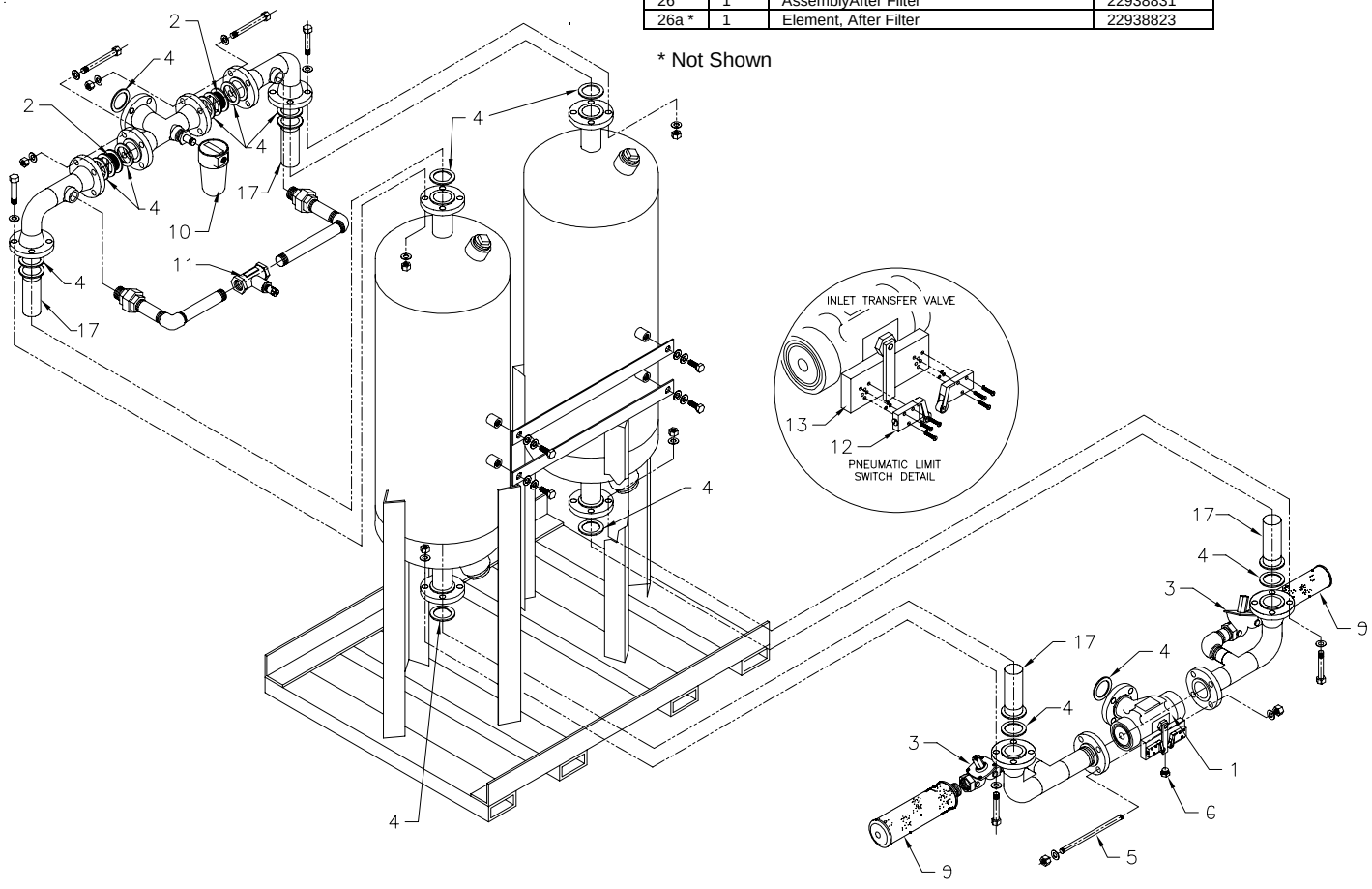
REPAIR KITS	PART NO.
SEAT & SEAL KIT Consists of Item Numbers: 1(2), 3(2), 5(2), 6(2), 8(2), 9(5),13, 18(6) & 23	22937940
POSITION INDICATOR KIT Consists of Item Numbers: 12, 14, & 16	22937957
SHUTTLE ASSEMBLY KIT Consists of Item Numbers: 4, 7, 10, 11, & 24	22937965
PNEUMATIC LIMIT SWITCH SET Consists of Item Numbers: 19	22938070
MANIFOLD BLOCK WITH PNEUMATIC LIMIT SWITCHES Consists of Item Numbers: 17, 19 , & 21	22938088

ITEM	QTY	DESCRIPTION
1	2	Flange O-Ring
2	2	Flange Support Ring
3	2	Shuttle Seat
4	1	Snap Ring
5	2	Wiper RIng
6	2	Sealing O-Ring
7	1	Removable End Plate
8	2	Sealing O-Ring
9	5	Sealing O-RIng
10	1	Shuttle Stem
11	1	Shuttle
12	1	Lever Arm
13	1	Washer
14	1	Bushing
15	1	Roll Pin
16	1	Position Indicator
17	1	Manifold Block
18	6	Sealing O-ring
19	1	Pneumatic Limit Switch (set)
20	2	Cap Screw
21	6	Machine Screw
22	1	Valve Body Split
23	1	Ring
24	1	Roll Pin
25	2	Spacer Nut
26	1	Guard

10.4 REPLACEMENT PARTS

ITEM	QTY	DESCRIPTION	Part No.
1	1	Inlet Transfer Valve	22937932
1a	1	Seat & Seal Kit for Inlet Trans Valve	22937940
1b	1	Position Indicator Kit for Inlet Trans Valve	33937957
1c	1	Shuttle Assy Kit for Inlet Trans. Valve	22937965
2	2	Check Valve	22937973
3	2	Purge Valve	22937981
4	14	Gasket	22937999
5	4	Stud	22938005
6	1	Sintered Filter	22938013
9	2	Purge Exhaust Muffler	22938021
9a	2	Element, Purge Exhaust Muffler	22938039
10	1	Control Air Filter	22938047
10a	1	Element, Control Air Filter	22938054
11	1	Purge Metering Valve	22938062
12	1	Pneumatic Limit Switch (Set)	22938070
13	1	Manifold Block w/pneumatic limit switch	22938088
14		Dessicant	
	10	Activated Alumina, 1/8" dia. 25# pail	22938096
	3	Activated Alumina, 1/8" dia. 375# drum	22938104
15 *	1	Touch Up Paint, 9 oz spray can	22938112
16 *	2	Relief Valve	22938120
17	4	Diffuser, removable	22938930
18 *	1	Regulator	22938914
19 *	1	Regulator Mounting Bracket	22938922
20 *	1	Insulation Wrap (30' roll)	22938906
21 *	2	Tape (18")	22938898
22	1	Duplex Receptacle	22938864
23	1	Receptacle Box	22938872
24	1	Receptacle Box Cover	22938880
25	1	Assembly Prefilter	22938849
25a	1	Element, Prefilter	22938856
26	1	AssemblyAfter Filter	22938831
26a *	1	Element, After Filter	22938823

* Not Shown



10.5 Parts Ordering

General

This publication, which contains an illustrated parts breakdown, has been prepared as an aid in locating those parts which may be required in the maintenance of the unit. Always insist on genuine Ingersoll-Rand Company parts for your air dryer.

NOTICE

Ingersoll-Rand can bear no responsibility for injury or damages resulting directly from the use of non-approved repair parts.

Ingersoll-Rand Company service facilities and parts are available worldwide. Consult local yellow pages or visit: www.portablepower.irco.com.

Special order parts may not be included in this manual. Contact the Mocksville Parts Department with the unit serial number for assistance with these special parts.

Description

The illustrated parts breakdown illustrates and lists the various assemblies, subassemblies and detailed parts which make up this particular machine.

How to Order

Always specify the dryer model, dryer serial number and the dryer part number. This information can be found on the dryer data tag located inside the door of the control box.

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious.