

# CONTINUOUS FEED PRESSURE SYSTEMS

## D AIR DRYER

### MAINTENANCE AND REPLACEMENT PARTS

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**1. GENERAL**

**1.01** This section covers the maintenance and procedures for replacing parts of the D air dryer.

**1.02** This section is reissued to:

- Delete reference to 1213 check valve.
- Include reference to B-318 check valve for Serial No. 380 and above. Also include B-319 check valve assembly for Serial No. 379 and below.

**\*\*Restricted to comply with modified final judgment.**

- Change Fig. 5 (Right Front View) to reflect new check valve part number.
- Correct the method of detecting if moisture has affected the D desiccant (silica gel).

**1.03** The D air dryer (desiccant type) is rated Manufacture Discontinued.

**1.04** This section includes information formerly contained in Section 637-510-301. This section is issued for maintenance purposes only, since there are considerable D air dryers in plant.

**1.05** Refer to Section 637-301-102 for the description and installation of the dryer.

**2. MAINTENANCE**

**GENERAL**

**2.01** It is essential for continued good operation that the D air dryer be inspected and maintained at scheduled intervals.

**2.02** The maximum time interval between inspections is determined by the daily average air delivery of the dryer. The approximate air delivery can be determined from the air meter reading at the meter panel. The following may be used as a guide for scheduling inspections (shorter intervals may be required on occasion as a result of alarm indications).

DAILY AVERAGE AIR DELIVERY (SCFD)	MAXIMUM SCHEDULED INSPEC- TION INTERVAL
200	3 months
300	2 months
400	6 weeks
500	1 month

**ANNUAL MAINTENANCE KIT**

**2.03** The B-300 annual maintenance kit, which must be ordered separately, provides the following materials which are normally required as maintenance replacements during a full year of operation.

Four—B-288 Filter Elements

One—B-201 Exhaust Valve

One—B-203 Intake Valve

One—B-205 Piston Ring Spring

Two—B-204 Piston Rings

Two—B-199 Valve Gaskets

**SCHEDULED MAINTENANCE**

**2.04** On scheduled maintenance visits the following procedure is necessary.

- (1) Disconnect the alarm plug at the dryer to prevent false operation.
- (2) Drain the water from the condensate receiver (2.05).
- (3) Replace the silica gel in the main gel tower (2.07).
- (4) **Annually** replace the air compressor piston rings, ring spring, valve gaskets, and intake exhaust valve (2.08).
- (5) On dryers modified by the addition of the B-310 filter screen assembly (Fig. 1), brush the screen and wipe with a clean dry cloth. Place a new B-288 filter element in the B-287 filter housing (2.08). The polyurethane filter element is a soft spongy material that is easily compressed for placing in or removing from the housing.)
- (6) If the filter housing has not been modified by the addition of the B-310 filter screen assembly, convert the housing per the instructions in the filter screen package and reconnect the B-286 filter assembly (2.08). (The formed wire filter screen improves airflow distribution through the B-286 filter assembly and prevents holes from forming in the filter element.)

- (7) Check the operation of the humidity alarm (2.10).
- (8) Observe that the heat exchanger temperature (2.11) and pressure (2.12 through 2.15) are cycling within proper limits.
- (9) Check the output air pressure of the pressure testing valve on the regulator and adjust if necessary (2.16).
- (10) Check for leakage within the dryer with the 5-minute test described in 2.09.
- (11) Reconnect the alarm plug when all work has been completed.

**PRELIMINARY PROCEDURE**

**2.05 Water Drain:** With normal operating pressure in the dryer, place the end of the water drain hose into a suitable container and drain off the water by opening the water drain valve slowly. Close the valve securely after water has drained.

**2.06** Before replacing the gel or working on the air compressor:

- (1) Close the shutoff valve in the copper tubing feeding the cable system.
- (2) Shut off the master stop-start switch.
- (3) Lower the air pressure in the dryer until the high pressure gauge reads approximately zero by depressing the valve core in the pressure-testing valve on the air pressure regulator or by opening the water drain valve.

**GEL REPLACEMENT**

**2.07** To replace the gel proceed as follows:

- (1) Position the gel drain chute on the fan guard plate so that it is directly under the gel drain plug at the bottom of the main gel tower. The chute is normally stored on the front of the guard plate.
- (2) Place a suitable bag or container under the chute.
- (3) Remove the gel fill plug on the top of the main gel tower with a suitable wrench.

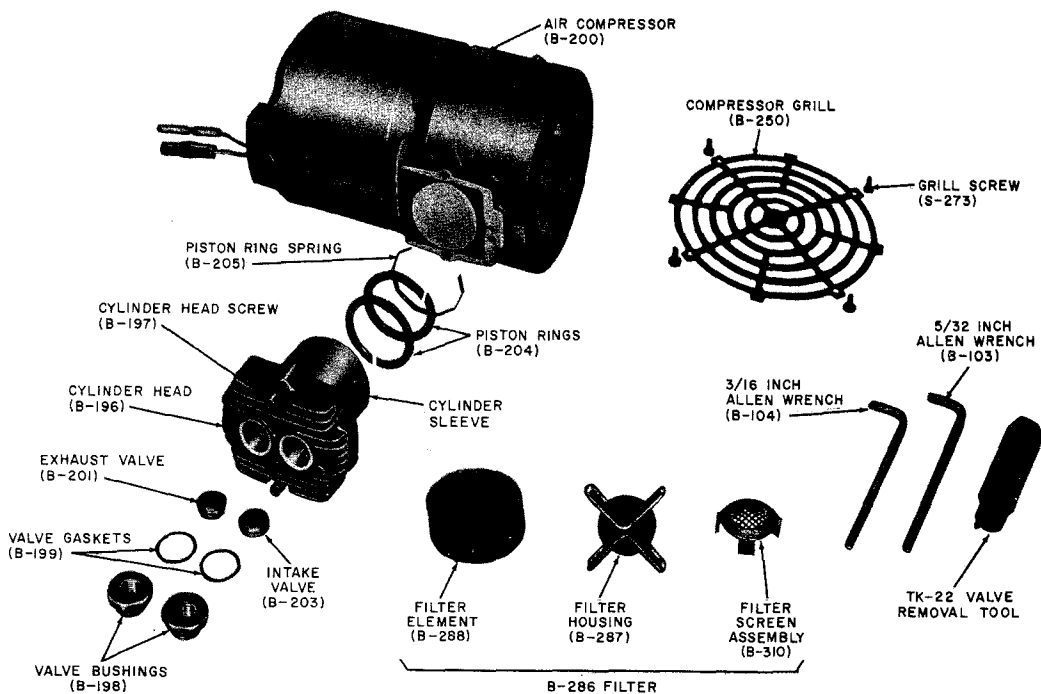


Fig. 1—B-200 Air Compressor—D Air Dryer

(4) Remove the gel drain plug with a suitable wrench, allowing the gel beads to go down the chute into the bag. When the gel has stopped flowing, probe inside the tower or tap the tower to release any gel that may remain. Clean the drain plug threads of any gel particles, as these will prevent obtaining a good airtight seal. Replace the drain plug using pipe compound on the threads and tighten securely.

(5) Remove the cover from each of two 5-pound cans of D desiccant (silica gel) and inspect the color of the test capsule fastened to the inside cover. A blue color indicates that the gel is adequately dry, while a pink color indicates that moisture has affected the gel and it should not be used.

(6) If the gel is found satisfactory, pour the entire contents of each can carefully into the tower. A commercial type of oil spout, such

as that used in service stations for puncturing and pouring from oil cans, can be used to advantage for pouring the gel. (The Plews 5 PJ oil spout made by Plews Oiler Incorporated, Minneapolis, Minnesota is an example of such a device.)

(7) Replace the fill plug using pipe compound on the threads and tighten securely.

**Note:** The reserve gel tower normally requires no maintenance. However, if as a result of some external failure, liquid water enters the tower through the dry air line, the reserve gel tower will become saturated and must be replaced.

#### AIR COMPRESSOR MAINTENANCE

**2.08** The B-200 air compressor (Fig. 1) requires no lubrication. However at **annual** intervals

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replace the piston rings, ring spring, valve gaskets, and intake and exhaust valves as follows:

- (1) Follow the preliminary procedures covered in 2.06.
- (2) Remove the B-286 filter assembly.
- (3) Disconnect the flare nut connecting the compressor discharge line to the check valve assembly using a 7/8-inch open-end wrench.
- (4) Remove the intake (front) valve bushing and gasket using a 1-1/16 inch open-end wrench.
- (5) Turn the intake valve in a counterclockwise direction and remove it using the TK-22 valve removal tool and a 3/4-inch open-end wrench.
- (6) With the check valve left in place, loosen the exhaust valve bushing 1/4 turn in a counterclockwise direction while it is still seated in the compressor head using a 1-1/16 inch open-end wrench.
- (7) With the check valve still in place, remove the three cylinder head screws from the cylinder head using the 3/16-inch Allen wrench.
- (8) Lift out the cylinder sleeve, rotating it slightly to facilitate removal from the piston.
- (9) Remove the exhaust (rear) valve bushing and gasket using a 1-1/16 inch open-end wrench.
- (10) Turn the cylinder head over. Using the TK-22 valve removal tool and 3/4-inch open-end wrench, turn the exhaust valve *clockwise* until the valve turns out through the upper side of the cylinder head.  
  
**Note:** It may be necessary to tap the wrench used on the TK-22 valve removal tool lightly with a hammer to free the valve.
- (11) Install new intake and exhaust valves through the top of the cylinder head. Tighten in a clockwise motion using the 5/32-inch Allen wrench. Make certain that the intake valve is placed in front and the exhaust valve in the rear of the cylinder head.
- (12) Install a new exhaust valve gasket and hand tighten exhaust valve bushing.
- (13) Remove the air compressor grill and rotate the shaft until the piston reaches its highest position and remove both piston rings.
- (14) Remove the piston ring spring.
- (15) Install the new piston ring spring and piston rings. The joints of the rings will be in a diametrical position.
- (16) With the piston in its highest position, carefully slide the cylinder sleeve on the piston and position it on the compressor frame. A slight lubrication of the lower end of the sleeve with pressure-testing solution will facilitate this operation.
- (17) Replace the three cylinder head screws using the 3/16-inch Allen wrench.
- (18) Replace the air compressor grill.
- (19) Using a 1-1/16 inch open-end wrench, tighten the exhaust (rear) valve bushing securely. Line up the discharge line, reconnect the flare nut, and tighten with a 7/8-inch open-end wrench.
- (20) Install a new intake gasket and tighten the intake valve bushing.
- (21) Reconnect the B-286 filter assembly after replacing the B-288 filter element and B-310 filter screen assembly.

### 2.09 Check for leakage within the dryer as follows:

- (1) With the shutoff valve on the copper tubing feeding the cable system closed, observe the high pressure gauge reading for 5 minutes. A drop of 1 psi or less indicates that all fittings are satisfactorily tight.
- (2) If the 5-minute test reveals a drop of more than 1 psi, check for leaks at all air connections and fittings with pressure-testing solution. Particularly check the gel drain, the fill plugs, and the sensing element manifold hexagon nut.

## HUMIDITY ALARM

2.10 With the master stop-start switch turned on, verify the operation of the humidity alarm system as follows:

- (1) *Put on rubber gloves.*
- (2) Referring to Fig. 2 and 3, remove wire 21 from -1- binding post on the relay assembly terminal strip. This disconnects the high-low pressure switch from the circuit while the humidity alarm test is being made.
- (3) Connect a KS-8455 test set, using the ohmmeter circuit, to -1- and -2- binding posts of the relay assembly terminal strip. A full-scale deflection of the pointer indicates that the

humidity alarm relay is operated. Bleed air from the valve on the air pressure regulator until the alarm clears. The alarm should clear within a few minutes.

- (4) If there is no pointer deflection when the connection is made, it indicates either that the alarm has cleared or that it is not functioning properly. Verify for proper operation of the alarm by removing the sensing element from the manifold. This is accomplished by slowly loosening the large hexagon nut on the right-hand side of the instrument panel until the air pressure has been released. Then remove the nut and withdraw the element by pulling gently on the cable. Make certain not to lose the O-ring behind the retaining ring molded on the cable. Removal of the element, even momentarily, is

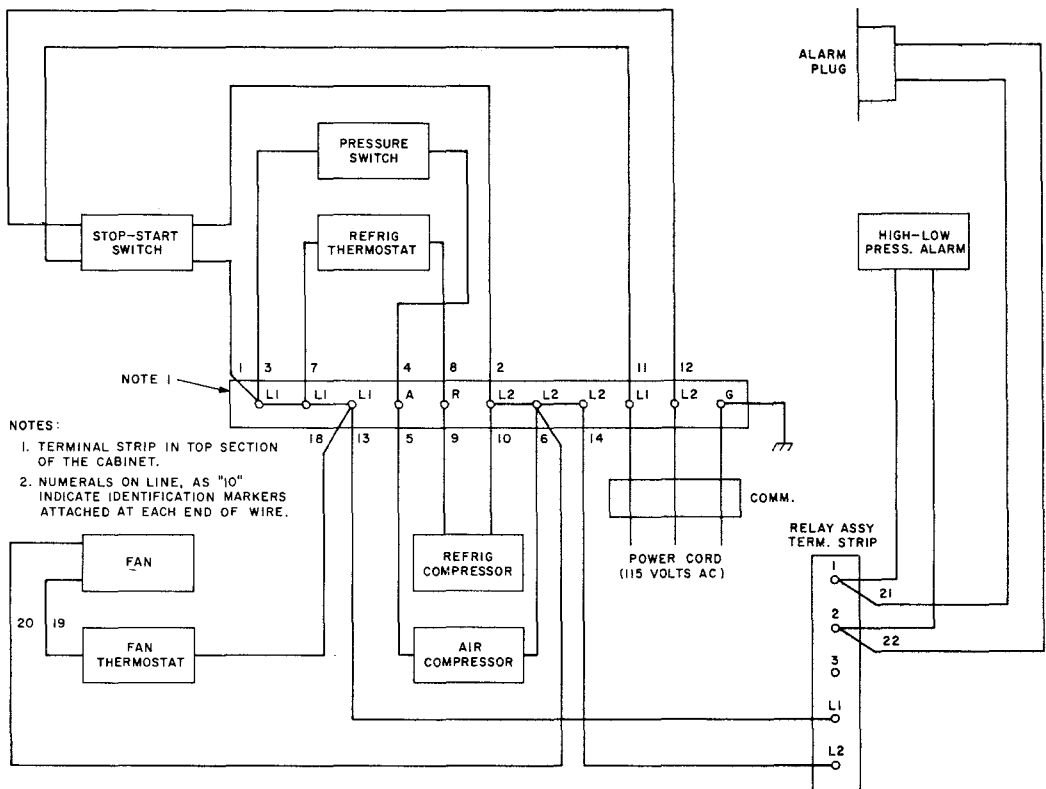


Fig. 2—Block Diagram of Electrical System

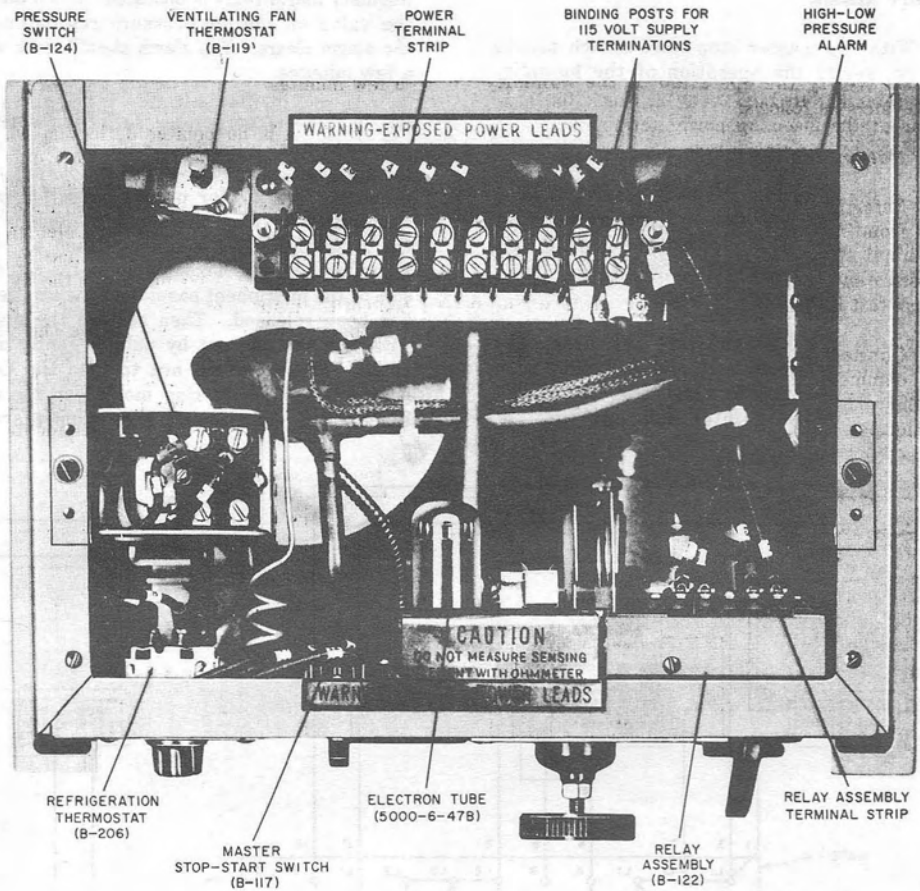


Fig. 3—Top View of D Air Dryer

usually sufficient to bring in the alarm. If this fails to bring in the alarm, breathe on the element. If there is still no alarm indication, examine the element cable for indication of a break and make certain that the cable is securely plugged into the receptacle in the alarm relay assembly. Continued failure to provide an alarm indicates either a weak electron tube or a faulty element.

**Caution:** Avoid excessive flexing of the sensing element cable, as this may damage the leads. Do not use an ohmmeter to

*measure the resistance of the sensing element or in any manner apply a dc voltage to the element as this will damage it.*

- (5) When the alarm operation has been verified and the alarm has cleared, disconnect the test set and reconnect wire 21 to -1- binding post.
- (6) Remove rubber gloves.

**HEAT EXCHANGER TEMPERATURE AND PRESSURE**

**2.11** With the dryer in normal operation, the temperature in the heat exchanger should cycle but not exceed 50°F. However, where an hour or more has elapsed with the dryer turned off, as may occur during routine maintenance procedures, the temperature indicator may have risen above 50°F. The temperature will gradually drop to 50°F or lower when the dryer is turned on again. If the temperature rises above 50°F and there is no pull-down within 15 minutes, **turn off the master stop-start switch** and disconnect the 3-conductor incoming power cord. Check all power wiring connections. If no loose connection or broken wire is found, **connect the 3-conductor incoming power cord and turn on the master stop-start switch**. Proceed as follows:

- (1) Put on rubber gloves.
- (2) Using an approved ac voltmeter and referring to Fig. 2 and 3, check for 115 volts at the incoming power terminations L1 and L2 on the power strip. Check for 115 volts through the master stop-start switch by measuring across the L1 and L2 binding posts on the power terminal strip. Then, check the refrigeration thermostat by testing at the power terminal strip for 115 volts across R and L2 binding posts.
- (3) If no voltage is measured across R and L2 binding posts and the heat exchanger temperature indicator shows higher than 50°F the refrigeration thermostat is defective and should be replaced. If 115 volts is measured and the temperature indicator shows higher than 50°F, the **refrigerant** discharge line (Fig. 5) should be warm to the touch indicating proper refrigeration (these conditions point to a faulty temperature indicator which should be replaced). If the discharge line is not warm, it indicates a faulty refrigeration system. In the latter case refer the condition to the supervisor so that arrangements can be made for replacement of the dryer (see information on guaranty in Section 161-315-201).
- (4) If neither the refrigeration system nor the thermostat is found to be defective, check the heat exchanger temperature indicator as follows:

(a) **Turn off the master stop-start switch and disconnect the 3-conductor incoming power cord**. Note the temperature shown on the indicator. Remove the indicator element and the refrigeration thermostat tubing from the top of the heat exchanger (both the element and the tubing enter the heat exchanger through a single rubber grommet). Check the temperature in the well of the heat exchanger with a KS-5499 thermometer or equivalent. Replace the heat exchanger temperature indicator if found defective.

(5) A possibility of higher than permissible heat exchanger temperature exists where the temperature within the cabinet exceeds 80°F and the ventilating fan fails to operate. Where the fan does not operate under such conditions, proceed as follows:

(a) **Turn off the master stop-start switch, disconnect the 3-conductor incoming power cord**, and check all power wiring connections. If no loose connection or broken wiring is found, **connect the 3-conductor incoming power cord and turn on the master stop-start switch**.

(b) Using an approved ac voltmeter and referring to Fig. 2 and 3, check for 115 volts first across the leads of the fan thermostat and then across the leads of the fan motor to determine which component is defective and must be replaced.

(6) Remove rubber gloves.

**2.12** With the master stop-start switch in the ON position, the high pressure gauge should cycle between 20 and 30 psi. When the pressure reaches approximately 30 psi, the air compressor should shut off, and when it drops to approximately 20 psi, the air compressor should start.

(1) **If the pressure is between 20 and 30 psi and the compressor is not running**, bleed air from the system at the regulator valve until the compressor starts. Note the pressure at which it starts, then note the pressure at which it stops. If it starts within a range of 18 to 22 psi and stops within a range of 28 to 32 psi,

the compressor and pressure switch can be considered to be operating satisfactorily.

- (2) **If the pressure exceeds 32 psi**, the trouble is probably in the B-124 pressure switch (in the top section of the cabinet) and adjustment or replacement of the switch will be necessary (Fig. 4).

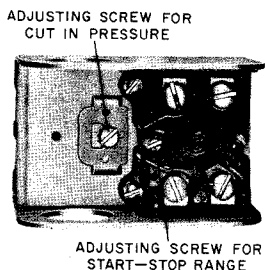


Fig. 4—B-124 Pressure Switch

#### PRESSURE SWITCH ADJUSTMENT

- 2.13** To adjust the pressure switch proceed as follows:

- (1) **Put on rubber gloves.**
- (2) With the 3-conductor incoming power cord connector and the master stop-start switch on, remove the top cover of the cabinet.
- (3) Check the operation of the pressure switch by noting the pressure at which the air compressor starts and stops. The high pressure gauge should cycle within an approximate range of 20 to 30 psi.
- (4) To **increase** the start and stop range, turn the adjusting screw at the top of the terminal block in a clockwise direction (Fig. 4).
- (5) To **decrease** the start and stop range, turn the adjusting screw at the top of the terminal block in a counterclockwise direction.
- (6) If the 10-psi range difference between start and stop settings of the switch requires adjustment, turn the adjusting screw at the base of the terminal block counterclockwise to increase,

or clockwise to decrease, the cut-in pressure. This adjustment will not change the cutoff pressure setting.

- (7) Remove rubber gloves.

- 2.14** If the compressor is running continuously over a 15-minute period and the pressure is **not** building up, it is an indication that either the cable system is draining more than the normal rated capacity of the unit, or that there is a major leak in the dryer system.

- (1) Close the shutoff valve in the dry air line and observe the pressure reading. If the pressure builds up satisfactorily, it indicates that the continuous running of the air compressor was due to the requirements of the cable system.

**Note:** If the pressure was being maintained at less than 25 psi before the shutoff valve was closed, it is probable that there is a serious leak nearby in the cable system, which will require attention.

- (2) If the pressure fails to build up, it indicates wear in the air compressor or a major leak in the dryer system which can be detected readily with pressure-testing solution.

- 2.15** **If the pressure is less than 18 psi and the air compressor is not operating**, it indicates a trouble in the pressure switch, in the power supply or electrical wiring, or in the compressor motor.

- (1) Check first for pressure switch trouble by bleeding air from the pressure-testing valve on the regulator or from the water drain valve. If lowering of the pressure causes the compressor to operate, adjustment or replacement of the pressure switch will be necessary [2.12(2)].
- (2) If lowering the pressure does not result in compressor operation, **turn off the master stop-start switch and disconnect the 3-conductor incoming power cord**, then check all power wiring connections. If no loose connection or broken wiring is found, **connect the incoming power cord and turn on the master stop-start switch**, and proceed as follows:



- (a) Put on rubber gloves.
- (b) Using an approved ac voltmeter and referring to Fig. 2 and 3, check for 115 volts at the incoming power terminations L1 and L2 on the power terminal strip. Check for 115 volts through the master stop-start switch by measuring across the L1 and L2 binding posts on the power terminal strip. Then, as necessary, check the air compressor motor and the pressure switch by testing at the power terminal strip for 115 volts across the A and the L1 binding posts, and A and L2 binding posts, respectively. Replace the air compressor and motor or the pressure switch if found defective.
- (c) Remove rubber gloves.

B-198	Bushing, Valve
5000-6-47C	Cable, Element, Sensing (including plug)
B-066	Chute, Drain, Gel
S-171	Clamp, Mounting, Compressor, Air
B-200	Compressor and Motor, Air
B-288	Element, Filter (pkg of 4)
B-123	Element, Sensing
B-199	Gasket, Valve (pkg of 6)
B-101	Gauge, Pressure, High
B-250	Grill, Compressor
B-196	Head, Cylinder
B-287	Housing, Filter
5000-6-35	Indicator, Temperature, Exchanger, Heat
B-300	Kit, Maintenance, Annual
B-284	Line, Discharge, Compressor, Air
B-110	Motor, Fan, Ventilating
5000-6-47J	Nut, Hex (for manifold containing sensing element)
B-081	Plug, Drain, Gel
B-081	Plug, Fill, Gel
DPP-25-3	Regulator, Pressure, Air
B-142	Resistor
B-204	Ring, Piston (pkg of 2)
S-273	Screw, Grill (pkg of 4)
B-197	Screw, Head, Cylinder (pkg of 3)
B-205	Spring, Ring, Piston

**OUTPUT PRESSURE REGULATOR ADJUSTMENT**

**2.16** With a C pressure gauge check the output pressure at the pressure-testing valve on the air pressure regulator. If adjustment is required, loosen the handwheel locknut at the top of the regulator bonnet and turn the handwheel clockwise to increase or counterclockwise to decrease the output air pressure, then tighten the locknut securely.

**3. REPLACEMENT PARTS**

**3.01** The replacement parts which can be ordered for the D air dryer are listed in 3.02. The majority of these parts are also identified by name and code number in Fig. 5.

**3.02** Replacement parts for D air dryer:

**PUREGAS EQUIP.  
CORP. CODE NO.**

**NAME OF ITEM**

5000-6-33C	Alarm, Pressure, High-Low
B-286	Assembly, Filter
B-122	Assembly, Relay
B-310	Assembly, Screen, Filter
B-319	◆Assembly, Valve, Check (Serial No. 379 and below)◆
B-111	Blade, Fan Ventilating

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B-124	Switch, Pressure	B-201	Valve, Exhaust
B-117	Switch, Stop-Start, Master	B-203	Valve, Intake
B-119	Thermostat, Fan, Ventilating	B-103	Wrench, Allen, 5/32 in.
B-206	Thermostat, Refrigeration	B-104	Wrench, Allen, 3/16 in.
TK-22	Tool, Removal, Valve		
B-068	Tower and Tubing, Gel, Reserve		
5000-6-47B	Tube, Electron		
B-318	Valve, Check (Serial No. 380 and above)		
1310	Valve, Drain, Water		

**ORDERING INFORMATION**

**3.03** When ordering a replacement part, state the name of the part, the manufacturer's name, and the code number of the part, for example:

Switch, Pressure, Puregas Equipment, Corp.,  
No. B-124

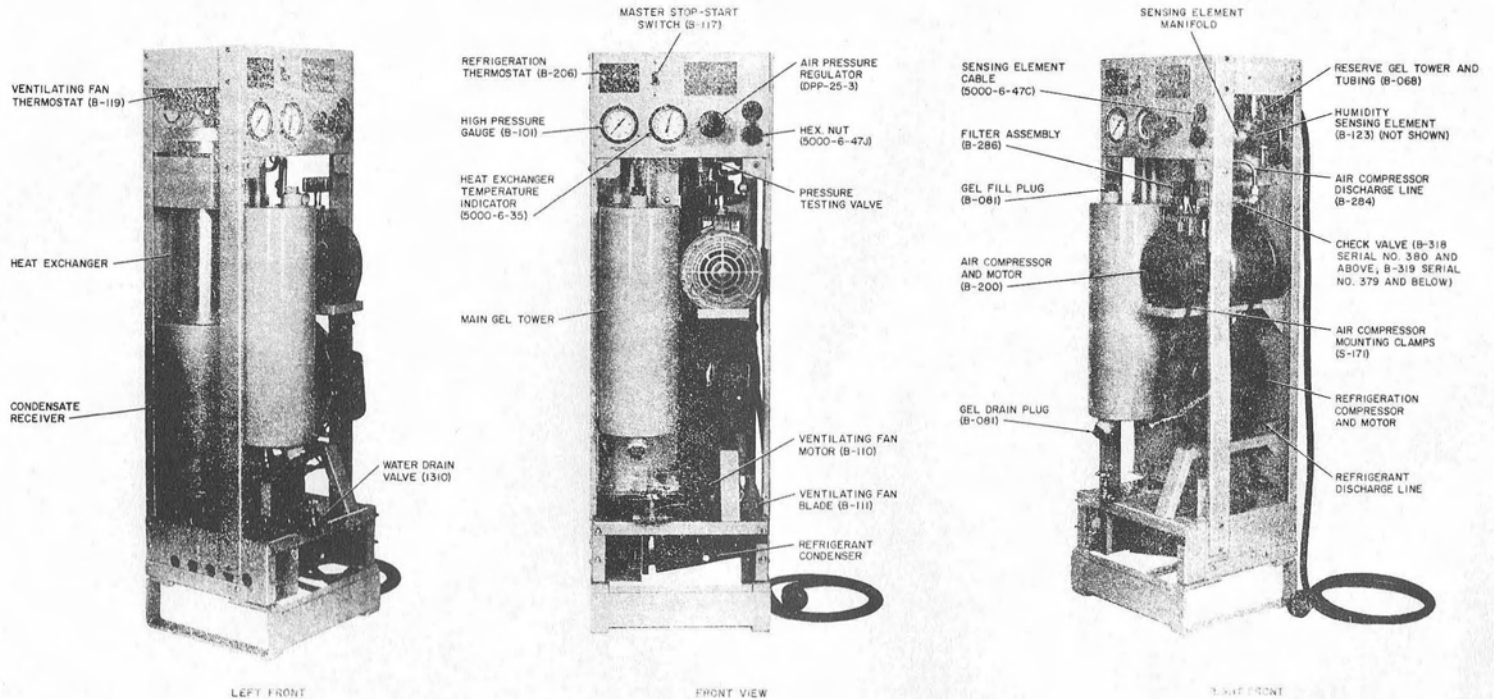


Fig. 5— $\phi$ O Air Dryer Chassis Showing Arrangement and Names of Components