

KS-16432 L1 AND L2 AIR DRYERS REQUIREMENTS AND ADJUSTING PROCEDURES

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1. GENERAL

1.01 This section covers requirements and adjusting procedures for KS-16432 L1 and L2 Air Dryers. The dryers are of the refrigeration type and are used to supply dry compressed air to cable in continuous feed pressure systems.

1.02 This section is reissued to:

- Include modification of B-287 and B-308 Filter Housings.
- Reorganize existing material.
- Update illustrations.
- Add Table of Contents.

Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Tools, gauges, materials, and replacement parts used for maintenance and adjustments on the dryers are listed in Part 7 of this section. Refer to Section 161-305-801 for ordering information and replacement procedures for parts used in maintaining the dryers. Refer to Section 020-011-711 for general requirements and definitions when additional information is needed for the proper application of this section.

EQUIPMENT—L1 AND L2 DRYERS

1.04 L1 Dryers with serial numbers 3000 and up and all L2 Dryers have identical cabinets and chassis. L1 Dryers with serial numbers below 3000 are of an earlier design and differ in various components and arrangements described as follows and elsewhere in the text of this section. The cabinets contain the following equipment (Fig. 1 through 3):

- (a) Double pole master stop-start switch (single pole in L1 Dryers with serial numbers below 3000).
- (b) Air compressor with air intake filter and 115-volt ac, 1/2-hp motor on L1 Dryers and 3/4-hp on L2 Dryers.
- (c) Pilot unloader and safety relief valve.
- (d) Refrigeration compressor and 115-volt ac, 1/6-hp motor (1/8-hp in L1 Dryers with serial numbers below 3000).
- (e) Refrigeration fan, thermostat, and refrigeration condenser.
- (f) Air dehydrating tank, cooling coil, and porous bronze filter assembly.
- (g) Temperature gauge.
- (h) High pressure gauge and low pressure gauge.
- (i) Humidity alarm relay assembly and humidity-sensing element and manifold.
- (j) Pressure regulator and high-low pressure alarm.
- (k) Water drain valve.

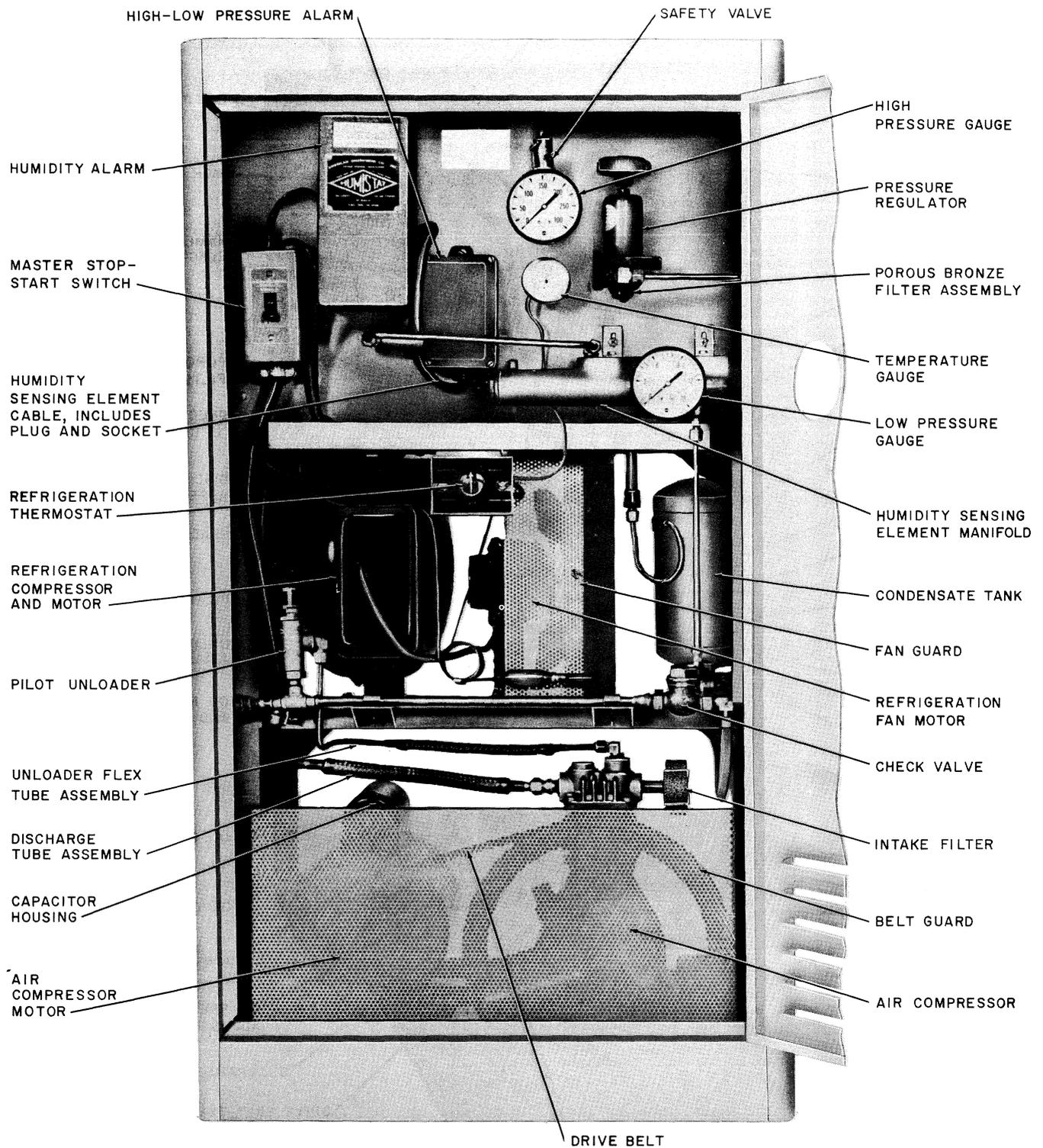


Fig. 1—KS-16432 L1 Air Dryers With Serial Numbers Below 3000—Interior View

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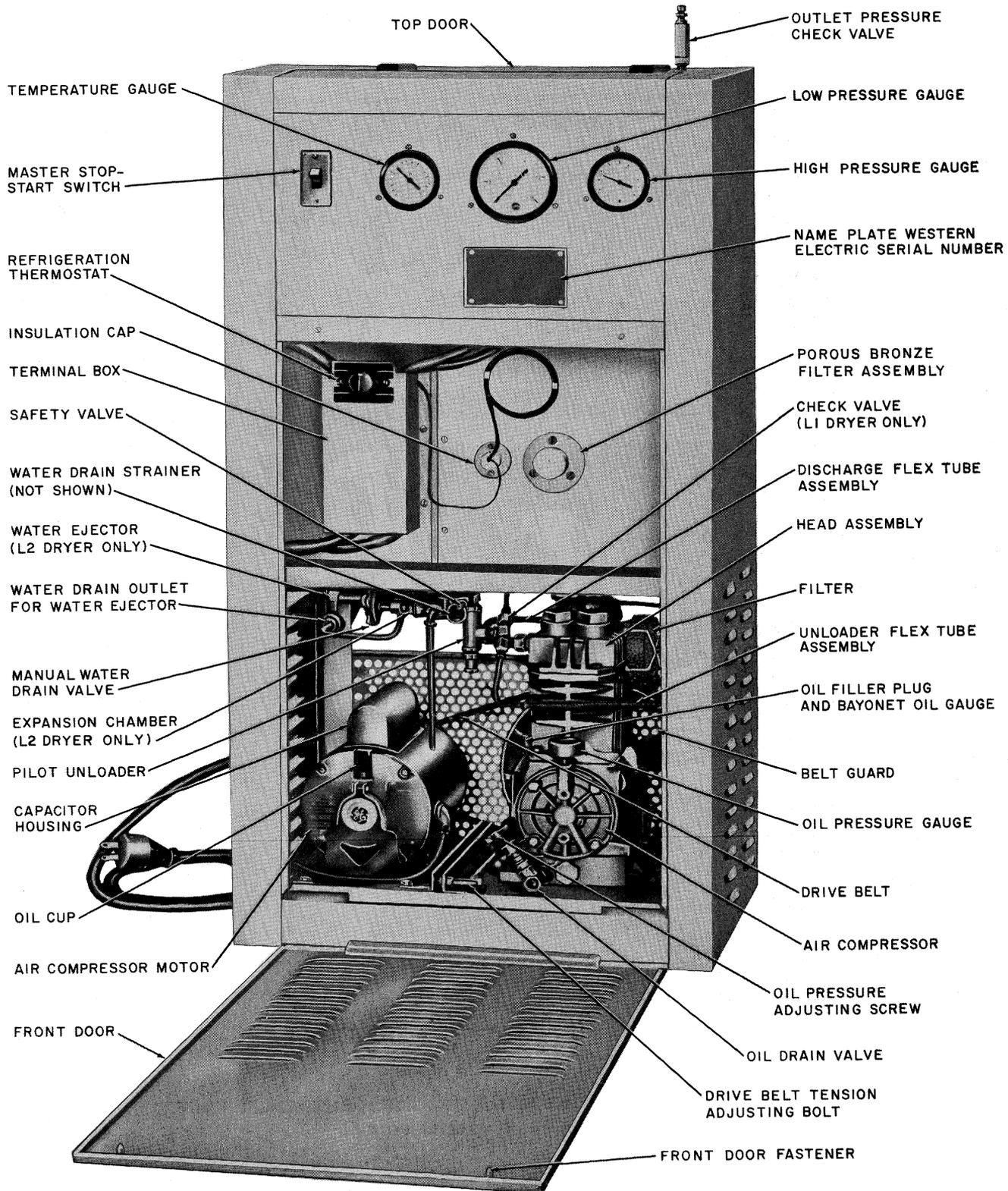


Fig. 2—KS-16432 L2 Air Dryers (KS-16432 L1 Air Dryers With Serial Numbers 3000 and Up Are Similar)

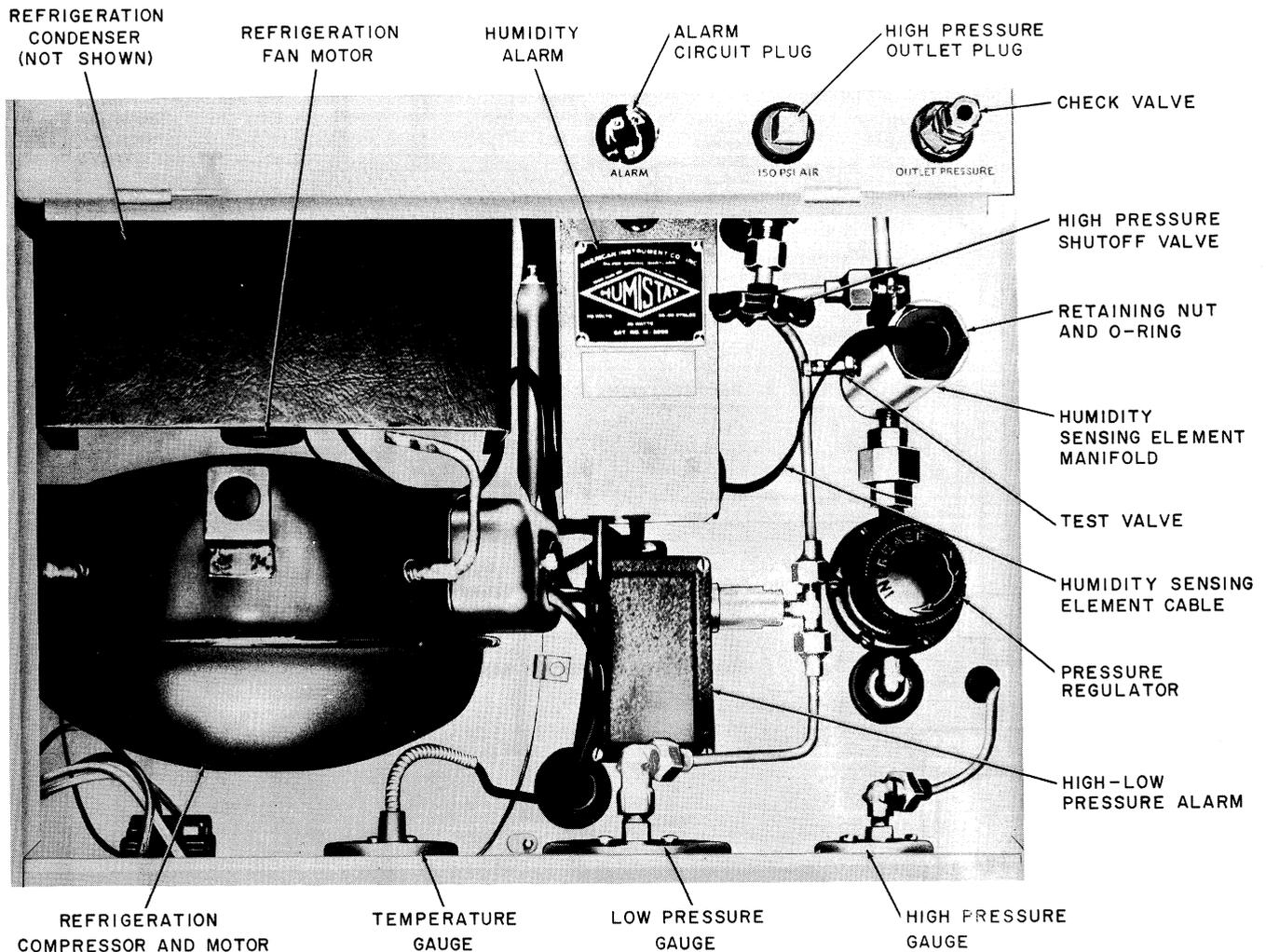


Fig. 3—KS-16432 L1 Air Dryers With Serial Numbers 3000 and Up and All L2 Dryers—Top View With Cover Removed

1.05 Additional equipment not common to both dryers is included in the cabinets as follows:

(a) **L1 Dryers only:** A check valve between the air compressor and condensation tank (Fig. 1 and 4).

(b) **L1 Dryers with serial numbers 3000 and up and all L2 Dryers only:** A heat exchanger and check valve in the low pressure outlet and a 150 psi (pounds per square inch) air outlet with pipe plug and high pressure shutoff valve (Fig. 2, 3, and 4).

(c) **L2 Dryers only:** A water drain strainer, automatic water ejector, expansion chamber, and orifice at the water drain outlet (Fig. 2 and 4).

MAINTENANCE KITS

1.06 The 500M and 1500M Maintenance Kits, furnished with L1 and L2 Dryers, respectively, contain replacement parts as covered in Section 161-305-801.

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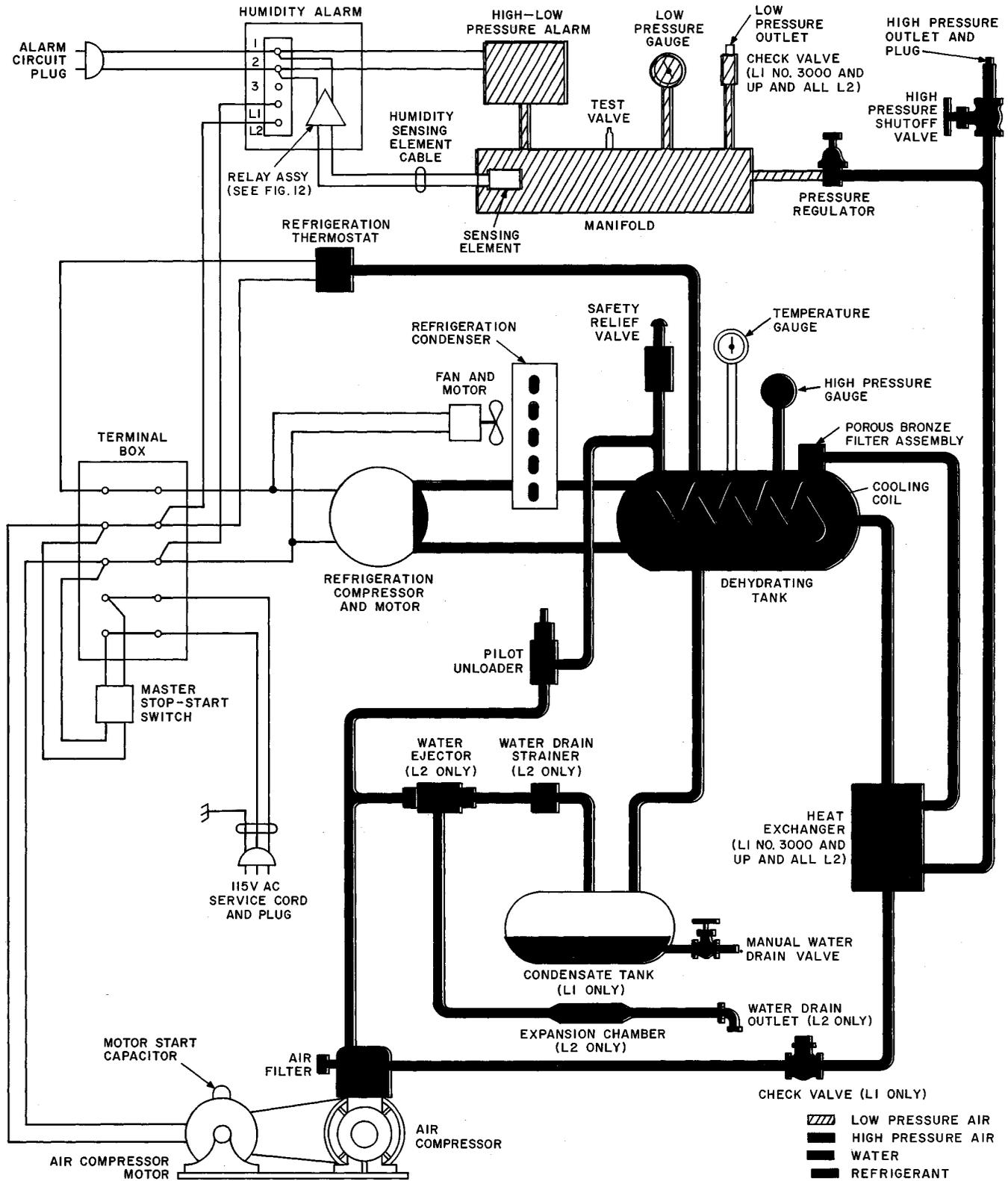


Fig. 4—KS-16432 Type Air Dryer—Block Diagram of Air Flow and Wiring

DUAL PRESSURE KIT

1.07 The KS-16648 Dual Pressure Kit can be used with the dryers to supply air at a different pressure to a second cable system. The plug is removed from the 150 psi air outlet, and the kit is connected to the outlet by copper tubing. The kit consists of a pressure regulator, low pressure gauge, and a high-low pressure alarm identical to those in the dryers. A humidity alarm is not included.

AIR DELIVERY CAPACITY

1.08 These dryers are designed to deliver air at low relative humidity to pressurized cable systems. Normal and maximum continuous air delivery capacities of the dryers at atmospheric, 7 psi, and 10 psi pressures are given in Table A. Air delivery or usage is measured at the gas meter, or meters, adjacent to the dryer. Accordingly, it is necessary to note the pressure at the meter when determining air usage. Air delivery above the recommended maximum may result in oil contamination of air leaving the tank and subsequent contamination of the humidity-sensing element and a failure of the humidity alarm.

SAFETY FEATURES

1.09 Safety features are provided in the dryers as follows:

- (a) The cabinet is grounded by one conductor in a 3-conductor service cord (Fig. 4).

- (b) The master stop-start switch and the air and refrigeration compressor motors have thermal overload devices. At overload the master stop-start switch opens the circuit and moves the switch lever to midposition, giving positive overload indication. After 2 minutes the switch may be reset by moving the lever to OFF and then to ON. The motor overload devices reset automatically when motors cool to normal temperature.

- (c) A safety relief valve connected to the tank prevents excessive tank pressure if the pilot unloader fails to operate properly.

- (d) A relief port in the pressure regulator bonnet prevents air delivery from the low pressure outlet exceeding the regulator setting by more than 1-1/2 psi.

- (e) The air compressor drive belt and refrigeration fan are provided with guards (Fig. 1).

- (f) An adjustable high-low pressure alarm (Fig. 1, 3, and 4) operates when pressure from the pressure regulator is outside required limits.

- (g) Humidity alarm (Fig. 1, 3, and 4) operates if humidity becomes too high, humidity alarm electron tube fails, or dryer power is cut off.

2. INSTALLATION

2.01 Inspect the dryer for any evidence of exterior or interior shipping damage and report any such damage to the carrier.

| TABLE A — L1 AND L2 DRYER AIR DELIVERY CAPACITY VS PRESSURE | | | | |
|---|----------------------------------|------------------------|-----------------------|------------------------|
| WHEN DELIVERED AIR IS MEASURED AT | CONTINUOUS AIR DELIVERY CAPACITY | | | |
| | NORMAL | | MAXIMUM | |
| | L1 | L2 | L1 | L2 |
| Atmospheric Pressure | 600 scfd ¹ | 1200 scfd ¹ | 750 scfd ¹ | 1500 scfd ¹ |
| 7 psi | 400 cfd | 800 cfd | 500 cfd | 1000 cfd |
| 10 psi | 350 cfd | 700 cfd | 450 cfd | 900 cfd |

Note 1: scfd = standard cubic feet per day

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- 2.02** Remove the two shipping bolts holding down the compressor base, the wooden spacer block beneath the compressor base, and the refrigeration compressor wooden shipping block.
- 2.03** Install the dryer at least four inches from the wall to allow proper air circulation.
- 2.04** Pour the KS-16729 L1 Oil supplied with the dryer into the air compressor crankcase until the oil level is just below the top mark on the bayonet oil gauge.
- 2.05** The L2 Dryer is supplied with a 1/2-inch water drain elbow and nipple to be installed in the water drain outlet located at the left rear of the unit (Fig. 2). Water can be piped to a floor drain or may also be discharged through a short length of copper tubing into a bucket. Water is drained automatically from the L2 Dryer by the water ejector. L1 Dryers must be drained manually at weekly intervals.
- 2.06** Make certain that the stop-start switch is in the OFF position and plug the dryer power cord into a 115-volt ac, 20-amp outlet.
- 2.07** Move the stop-start switch to the ON position and observe the high pressure and temperature gauges.
- 2.08** The pressure indicated on the high pressure gauge should cycle between 135 and 150 psi ± 2.5 . If the pressure does not cycle within these limits, adjust the pilot unloader as outlined in 4.14, B.
- 2.09** The refrigeration compressor and fan motor should cycle between 30 and 40°F ± 4 as indicated on the temperature gauge. If these limits are not met, see 4.25.
- 2.10** Check all external air fittings for leaks using E Pressure Testing Solution.
- 2.11** Open the pressure regulator slightly to let a small amount of air pass through the humidity-sensing element manifold and out through the low pressure outlet.
- 2.12** Disconnect the low pressure alarm from the alarm circuit (terminal #1 in the humidity alarm housing) in order to determine when the humidity alarm clears.
- 2.13** The clearing of the humidity alarm, which may remain *IN* for this period is a satisfactory indication that the tank pressure and temperature are at satisfactory levels and that the dryer is ready for service. After the humidity alarm has cleared, reconnect the low pressure alarm.
- 2.14** A low pressure air outlet check valve with a 3/8-inch pipe nipple is supplied with all L2 Dryers and L1 Dryers with serial numbers above 3000. Install the check valve in the outlet marked OUTLET PRESSURE at the right rear top of the cabinet. Connect the dryer to the cable pressurization system through the 3/8-inch female pipe connection on the check valve.
- 2.15** Adjust the high-low pressure alarm as outlined in 4.20, D.
- 2.16** Adjust the air-outlet pressure to the desired setting as outlined in 4.19.
- 2.17** A small pressure drop exists between the dryer and the meter panel. This drop will increase as air flow to the cable pressurization system increases. It may be necessary, therefore, to adjust the dryer outlet pressure upward to compensate for this drop and obtain a satisfactory pressure on the cables in the vault.
- 2.18** Connect the central office alarm pair to the alarm plug located at the top rear of the dryer (Fig. 3).
- 2.19** Allow the dryer to operate for 24 hours after it has been connected to the cable pressurization system and all adjustments have been made. After the 24-hour period, reinspect the dryer to ensure that it is operating properly and within the limits previously described.

3. OPERATION

- 3.01** A schematic of the air flow, refrigeration system, and electrical system is shown in Fig. 4.

REFRIGERATION SYSTEM

- 3.02** The refrigeration system consists of a sealed motor and refrigeration compressor unit, tank cooling coil, external refrigeration condenser, fan, and thermostat. A full charge of R-12 Refrigerant weighs 6 ounces.

3.03 The compressor draws refrigerant vapor from the tank cooling coil, compresses it, and forces it into the condenser where it liquefies. The liquid refrigerant then passes into the cooling coil through a capillary tube where it expands to a gas. Evaporation of the liquid through expansion cools the coil and the air in the tank to near freezing. Refrigerant vapor is then drawn back to the compressor for recycling.

3.04 The cooling coil maintains an average air temperature in the tank slightly above freezing. This temperature is controlled by the refrigeration thermostat which senses the tank interior air temperature and starts and stops the refrigeration compressor and fan. The refrigeration thermostat operates independently of the temperature gauge.

3.05 The fan, located between the condenser and sealed unit, draws air through the condenser and blows it onto the sealed unit, cooling both condenser and unit.

ELECTRICAL SYSTEM

3.06 The air compressor motor, refrigeration motor, and humidity alarm operate on 115-volt ac power.

DRYING OPERATION

3.07 The air compressor runs continuously and maintains tank air pressure between 135 and 150 psi. The pilot unloader permits air delivery to the tank when the tank pressure falls to 135 psi. When the pressure reaches 150 psi, the unloader stops delivery by holding open the suction unloader valve in the compressor head assembly.

3.08 Compression and cooling of the air in the tank condenses about 75 percent of its water vapor. The cooled high pressure air then flows from the tank through the porous bronze filter assembly (and heat exchanger if present) to the pressure regulator. The regulator reduces the pressure to that required for the cable. The pressure reduction further decreases the relative humidity to less than 2 percent at 70°F.

3.09 *L1 Dryer:* The water drains from the dehydrating tank into the condensation tank, then through the manually-operated water drain valve into a suitable external receptacle.

3.10 *L2 Dryer:* The pilot unloader operates the automatic water ejector to release water from the tank. The water discharges from the water ejector to the expansion chamber and then through the orifice and water drain outlet into a receptacle. The expansion chamber reduces the discharge pressure and noise.

OPENING CABINET DOORS

3.11 *L1 Dryers With Serial Numbers Below 3000:* To open the hinged door assembly, turn the door latches counterclockwise using the 1-1/4 inch screwdriver until the door is released.

3.12 *L1 Dryers With Serial Numbers 3000 and Up and All L2 Dryers:* To open the front door, turn latch handles about one-fourth turn counterclockwise, pull the door top slightly forward by the latch rings to clear latches and lift door out of cabinet. To remove the hinged top door, raise the front edge until door is vertical and slide it to the right and off the hinge pins.

4. REQUIREMENTS AND ADJUSTING PROCEDURES

DRYER SHUTDOWN

4.01 When taking the dryer out of service, follow local instructions regarding the need for supplying an interim gas source such as the Emergency Air Dryer or nitrogen cylinder.

INTERVALS FOR CHECKING REQUIREMENTS

4.02 Most requirements specify checking intervals. Other requirements may vary with local conditions and practices and are not specified, but suitable intervals are recommended and included with those specified in Table B.

DISABLING ALARM

4.03 Before turning off the master stop-start switch or making adjustments that might cause undesired operation of an alarm, remove the central office alarm circuit plug from the receptacle in the cabinet. Also remove the plug from the receptacle in the dual pressure kit if connected.

| TABLE B — INTERVALS FOR CHECKING REQUIREMENTS | | | | | |
|---|--|----------------------|------|------|------|
| PAR. NO. | PARAGRAPH COVERS | RECOMMENDED INTERVAL | | | |
| | | 1 WK | 3 MO | 6 MO | 1 YR |
| 4.06-4.09 | Cleaning | | X | | |
| 4.10, A | Air compressor operation | X | | | |
| 4.10, B | Air compressor crankcase oil change | | X | | |
| 4.10, B | Air compressor oil pressure — L2 dryers | X | | | |
| 4.10, B | Air compressor lubrication | X | | | |
| 4.10, C | Air compressor filter maintenance | | X | | |
| 4.10, D | Air compressor drive belt tension | X | | | |
| 4.10, E | Air compressor breather valve operation — L1 dryers | | X | | |
| 4.10, F | Air compressor suction unloader valve — parts replacement | | | | X |
| 4.11, A | Air compressor motor lubrication | | | | X |
| 4.11, B | Air compressor motor grounding | | | | X |
| 4.12 | Air compressor discharge line check valve cleaning — L1 dryers | | | X | |
| 4.13 | Tank safety relief valve operation | | X | | |
| 4.14, A | Pilot unloader operation | X | | | |
| 4.14, C | Pilot unloader cleaning | | | X | |
| 4.15 | Water ejector cleaning — L2 dryers | | | X | |
| 4.16 | Water drain strainer cleaning | | X | | |
| 4.17 | Water drain outlet orifice cleaning — L2 dryers | | X | | |
| 4.18 | Tank draining | X | | | |
| 4.19 | Pressure regulator operation | X | | | |
| 4.20 | High-low pressure alarm operation | | X | | |
| 4.21(1)-(5) | Humidity sensing element condition | | X | | |
| 4.21(6) | Humidity sensing element replacement | | | | X |
| 4.22 | Humidity alarm operation | | X | | |
| 4.23 | Refrigeration system operation: tank temperature | X | | | |
| 4.24 | Refrigeration system operation: refrigeration thermostat | | X | | |

PRESSURE REDUCTION

4.04 For Adjustments: When tank pressure must be reduced, release the air through the manual water drain valve. Some early models require manual operation of the safety relief valve to release air. *Do not use the high pressure shutoff valve, since oil may be drawn through the porous bronze filter assembly, contaminate the humidity-sensing element, and prevent operation of the humidity alarm. The high pressure shutoff valve shall only be opened to supply air to a dual pressure kit.*

4.05 Due to Leakage: Locate and stop leaks as follows:

- (a) Apply E Pressure Testing Solution, then wipe off using a clean cloth.
- (b) If air is leaking at a compression or flared fitting, tighten the nut just enough to stop the leak.
- (c) If air is leaking at a threaded pipe fitting, disconnect the tubing, remove the fitting, and apply a small amount of KS-6824 Sealing Compound to the pipe threads using the KS-14164 Card Brush. Do not apply compound to the threads engaging a tubing nut, or get compound inside the fitting.

- (d) Replace the fitting, reconnect tubing, and recheck for leaks.
- (e) If air is leaking at the air compressor head gasket, use a 7/16- by 1/2-inch wrench to tighten the head screws while the compressor is hot. If the leak continues, replace the gasket.

CLEANING

4.06 General: Failure to keep the equipment clean will result in excessive maintenance. When dryer parts are cleaned with petroleum spirits near dc machinery, provide adequate ventilation beforehand. Use the least amount of spirits necessary and keep the container closed between cleanings. These precautions will prevent the fumes from damaging the dc machinery. Before starting cleaning, turn off the master stop-start switch and disconnect the dryer from the power supply, then proceed as follows.

4.07 Cabinet: Clean the cabinet and the external surfaces of equipment in the cabinet, using a clean, dry KS-14666 Cloth. Clean the cabinet louvers with a No. 8 sash brush.

4.08 Refrigeration System: Clean the refrigeration fan blades, and condenser using clean, dry cloths, a sash brush, and vacuum cleaner. (Clean the fan blades first using a cloth moistened with petroleum spirits, then a dry cloth.)

4.09 Air Compressor: Remove dust from the compressor cooling fins using the sash brush. Clean the pulley and crankcase surfaces using a cloth moistened with petroleum spirits and then a dry cloth. Use a dry cloth to remove dust from the motor.

AIR COMPRESSOR

4.10 The requirements and adjusting procedures for the air compressor and its associated parts are as follows:

A. Operation

- (1) Check weekly to ensure that the compressor, controlled by the pilot unloader, shall be capable of increasing the tank pressure to 150 psi \pm 2.5 as observed on the high pressure gauge (Fig. 1 and 2).

- (2) Three consecutive pumping cycles as observed on the high pressure gauge should be timed weekly to ensure that the compressor pumps air to the tank for not more than 80 percent of the total operating time.
- (3) Failure to meet the requirements of (1) and (2) may be due to one or more of the following causes:

- (a) Low crankcase oil level or oil pressure
- (b) Dirty air filter
- (c) Slipping drive belts
- (d) Incorrect pilot unloader setting
- (e) Leaking water ejector
- (f) Leaking compressor discharge line check valve
- (g) Air delivery to cable system exceeds dryer capacity
- (h) Air leaks at fittings, etc
- (i) Low ac supply voltage
- (j) Sticking or leaking suction unloader and discharge valves in compressor head assembly.

B. Lubrication

(1) Weekly Requirements

- (a) **Oil Pressure—L2 Only:** Observe during compressor operation that the oil pressure is between the high and low ranges on the oil pressure gauge scale. If the oil pressure is incorrect, proceed as follows:
 - Loosen the oil pressure adjusting screw locknut using the R-2652 9-inch monkey wrench.
 - Using the 4-inch screwdriver, slowly turn the screw clockwise to increase or counter-clockwise to decrease the oil pressure until the requirement is met. Hold the screw from turning and tighten the locknut securely.

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(b) **Oil Level:** Check the oil level as follows:

- Turn off the master stop-start switch.
- Take care to avoid touching the compressor cylinder which may be hot. Rotate the bayonet oil gauge (Fig. 2) in its fully seated position in the crankcase. This is necessary to obtain an accurate reading because of the angle at which the gauge enters the crankcase oil.
- Withdraw the gauge from the crankcase filler hole and observe the oil level with reference to the two gauge marks.

Note: Failure of the compressor may result from keeping the crankcase oil at too high as well as too low a level. If two successive weekly checks show that the oil level has dropped from just below the top gauge mark to below the gauge end, if the oil pressure is satisfactory and if the Breather Valve (L1 Dryer only) is operating satisfactorily, consider replacing the compressor.

- If the oil level is below the lower gauge mark and the compressor does not need replacing, proceed as follows:
 - After withdrawing the gauge, add fresh KS-16729 L1 Oil to the crankcase to bring the oil level to just below the top gauge mark. On L1 dryers, add oil using the oil filler syringe. **Do not fill above the top gauge mark. Overfilling the crankcase may cause oil to be pumped into the airstream.**
 - Replace the plug and gauge making certain the gauge is fully seated in the filler hole.
 - Turn on the master stop-start switch.

(2) **Quarterly Requirements**

(a) **L1 Dryers:** Change the crankcase oil as follows:

- Turn off the master stop-start switch.
- Remove the bayonet oil gauge from the crankcase filler hole.

- Remove the oil from the crankcase using the oil filler syringe. Discard the oil.
- Fill the crankcase with fresh KS-16729 L1 Oil to just below the top mark on the bayonet oil gauge.
- Turn on the master stop-start switch, operate the compressor for several minutes to flush the crankcase, then turn off the switch, remove and dispose of the oil.
- Refill the crankcase with fresh KS-16729 L1 Oil to just below the top mark on the bayonet gauge.

- Turn on the master stop-start switch.

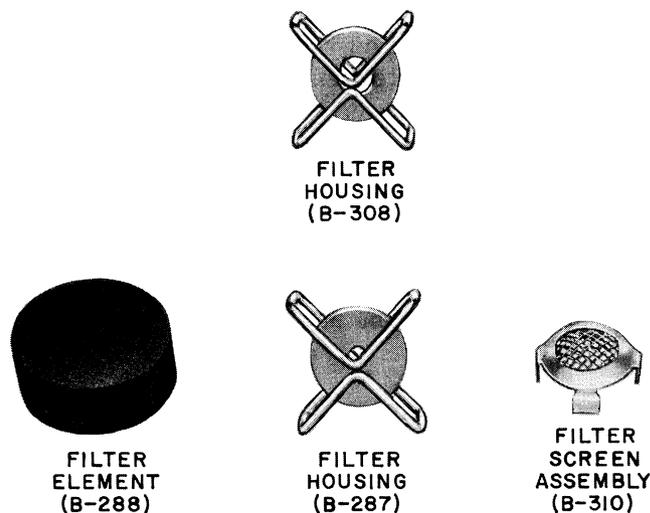
(b) **L2 Dryers:** Change the crankcase oil as follows:

- Turn off the master stop-start switch.
- Mount the oil drain extension pipe on the oil drain valve.
- Remove the bayonet oil gauge from the crankcase filler hole.
- Open the oil drain valve, drain the oil into a receptacle, then close the valve.
- Fill the crankcase to just below the top mark on the bayonet gauge and replace the gauge.
- Turn on the master stop-start switch, operate the compressor for several minutes to flush the crankcase, then turn off the switch and drain the oil into a receptacle.
- Remove the oil drain extension pipe from the oil drain valve and close the valve.
- Refill the crankcase with fresh KS-16729 L1 Oil to just below the top mark on the bayonet gauge and replace the gauge.
- Turn on the master stop-start switch.

C. **Air Filter**

- (1) At 3-month intervals remove and discard the B-288 Filter Element.

- (2) Brush the filter screen assembly (Fig. 5), and wipe it with a clean, dry cloth.



NOTES:

1. THE B-286 FILTER CONSISTS OF THE B-288 FILTER ELEMENT, B-287 FILTER HOUSING, AND B-310 FILTER SCREEN ASSEMBLY.
2. THE B-307 FILTER CONSISTS OF THE B-288 FILTER ELEMENT, B-308 FILTER HOUSING, AND B-310 FILTER SCREEN ASSEMBLY.

Fig. 5—B-286 and B-307 Air Filters for KS-16432 L1 and L2 Dryers

- (3) Install a new filter element.

Note: If the superseded 7371A (1237 on L2 Dryers) Intake Filter is on the compressor, it should be replaced with the B-286 (B-307 on L2 Dryers) Filter. If the B-286 Filter is not equipped with a B-310 Filter Screen Assembly, one should be installed before replacing the filter element.

D. Drive Belt

Requirement: Check the drive belt tension weekly for noticeable slipping or excessive tightness as follows:

- (1) Turn off the master stop-start switch.
- (2) Apply finger pressure downward on the belt (Fig. 1 and 2) at a point equidistant between the compressor and motor pulleys and observe

that a deflection of about 1/2 inch is obtained. If the belt is not at the proper tension, adjust it as follows:

L1 Dryers With Serial Numbers Below 3000

- Turn off the master stop-start switch.
- Disconnect the dryer from the ac power supply.
- Remove the belt guard mounting screws using the 3-inch C screwdriver and remove the guard.
- Loosen the setscrew in the motor pulley front hub using the R-2485 5/32-inch Allen wrench.
- Turn the outer face of the pulley clockwise to increase or counterclockwise to decrease the belt tension.
- Tighten the setscrew when the belt tension is correct.
- Remount the guard.
- Reconnect the ac power supply and turn on the master stop-start switch.

L1 Dryers With Serial Numbers 3000 and Up and All L2 Dryers

- Turn off the master stop-start switch.
- Disconnect the dryer from the ac power supply.
- Loosen the motor mounting plate screws using the 7/16- by 1/2-inch wrench (Williams No. 8725).
- Loosen the locknuts on the two motor adjusting bolts using the R-2652 9-inch wrench.
- To increase the belt tension, turn both adjusting bolts clockwise the same amount using the 9-inch wrench. To decrease the belt tension, turn both adjusting bolts counterclockwise the same amount and slide the motor against the bolts.
- When the belt tension is correct, check the

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alignment of the motor pulley with the belt and reposition the motor to obtain correct alignment as necessary.

- Tighten the locknuts, then tighten the motor mounting plate screws.
- Reconnect the ac power supply and turn on the master stop-start switch.

E. Breather Valve—L1 Only

Requirement: Check at 3-month intervals that the valve flapper vibrates while the compressor is operating but that oil does not blow through it from the crankcase. (Sticking of the valve, which is located behind the compressor pulley, may cause excessive oil consumption.) If this requirement is not met, proceed as follows:

- (1) Turn off the master stop-start switch and disconnect the dryer from the ac supply.
- (2) Remove the belt guard mounting screws at each end of the guard using the 3-inch screwdriver and remove the guard.
- (3) Remove the valve mounting screw using the 7/16- by 1/2-inch wrench (Williams No. 8725).
- (4) Remove the valve stop and flapper.
- (5) Wipe the valve seat, stop, and flapper with a KS-14666 Cloth slightly moistened with petroleum spirits.
- (6) Replace the valve on the compressor. Clearance between the valve stop and free end of the flapper should be 0.030 to 0.035 inch. Use the KS-6938 Gauge to measure the clearance and manually bend the stop as necessary.
- (7) Replace the belt guard.
- (8) Reconnect the ac power supply and turn on the master stop-start switch.

F. Suction Unloader and Discharge Valves (Fig. 6 and 7)

Requirement: The plunger spring and plunger O-ring of the suction unloader valve

shall be replaced annually and at that time the valve, valve seat, bumper, and gasket shall also be cleaned and replaced as necessary. The discharge valve shall be cleaned only when a sticking or leaking valve is indicated. Before working on valves, turn off the master stop-start switch and disconnect the dryer from the ac power supply.

Suction Unloader Valves—L1 Dryers (Fig. 6)

- (1) **Serial Numbers Below 3000:** Disconnect the flexible tube assembly from the elbow on the suction unloader valve cover cap using the R-2512 8-inch wrench and remove the assembly.
- (2) **Serial Numbers 3000 and Up:** Disconnect the two flexible tube assemblies at both ends of the head using the R-2512 8-inch and R-2652 9-inch wrenches, and remove the assemblies.
- (3) **All L1 Dryers:** After completing (1) or (2), remove the suction unloader valve cover cap (Fig. 6) using the R-2593 7/8- by 1-1/16 inch wrench. Remove the kickoff plunger, kickoff plunger spring, suction valve seat, valve, valve spring, and valve bumper. Examine the valve bumper gasket and replace if necessary. Remove and discard the kickoff plunger O-ring and spring.
- (4) Clean the parts removed with a KS-14666 Cloth moistened with petroleum spirits and then a clean, dry cloth. Before reassembling the valve parts, check the suction valve spring by placing the spring and the valve in the valve bumper and then compressing and releasing the valve. If the valve does not snap back when released, replace the valve spring. Substitute other new parts if necessary.
- (5) Reassemble the valve, using a new kickoff plunger spring, as shown in Fig. 6. **Make certain the valve bumper is seated properly.** This is done by aligning one of the indented ribs of the valve bumper with the air inlet port of the head assembly. Before mounting the kickoff plunger in the valve seat, put a new O-ring in the groove and wipe the plunger using a clean cloth moistened with KS-16729 L1 Oil. Wipe the inside of the valve cover cap using a clean cloth moistened with KS-16729 L1 Oil and then mount the cap. Remount the flexible tube assemblies if the discharge valve is not to be cleaned.

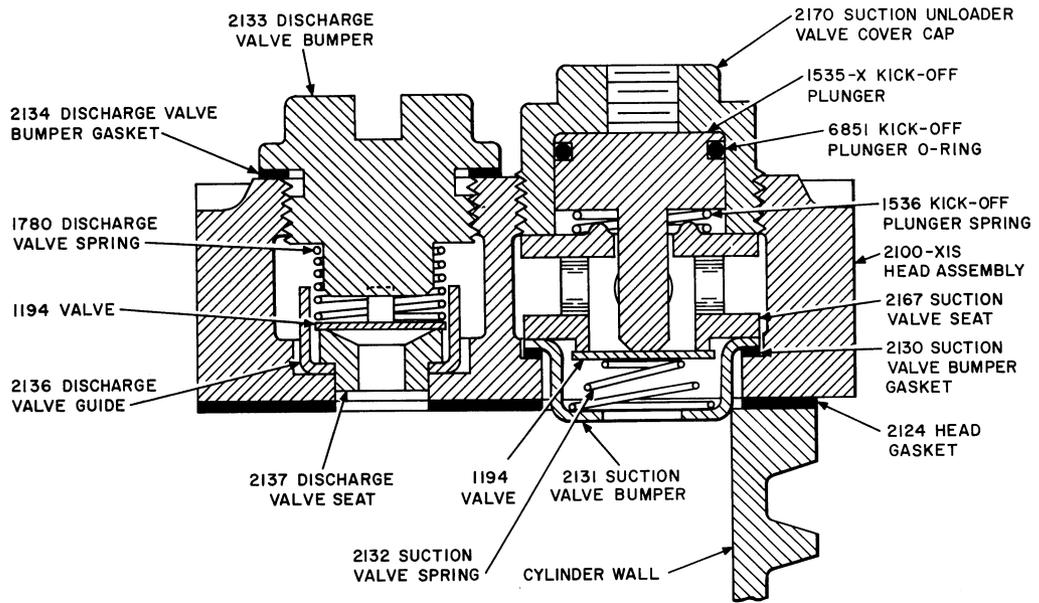


Fig. 6—KS-16432 L1 Air Dryer—Air Compressor Head Assembly (Suction Unloader and Discharge Valves)

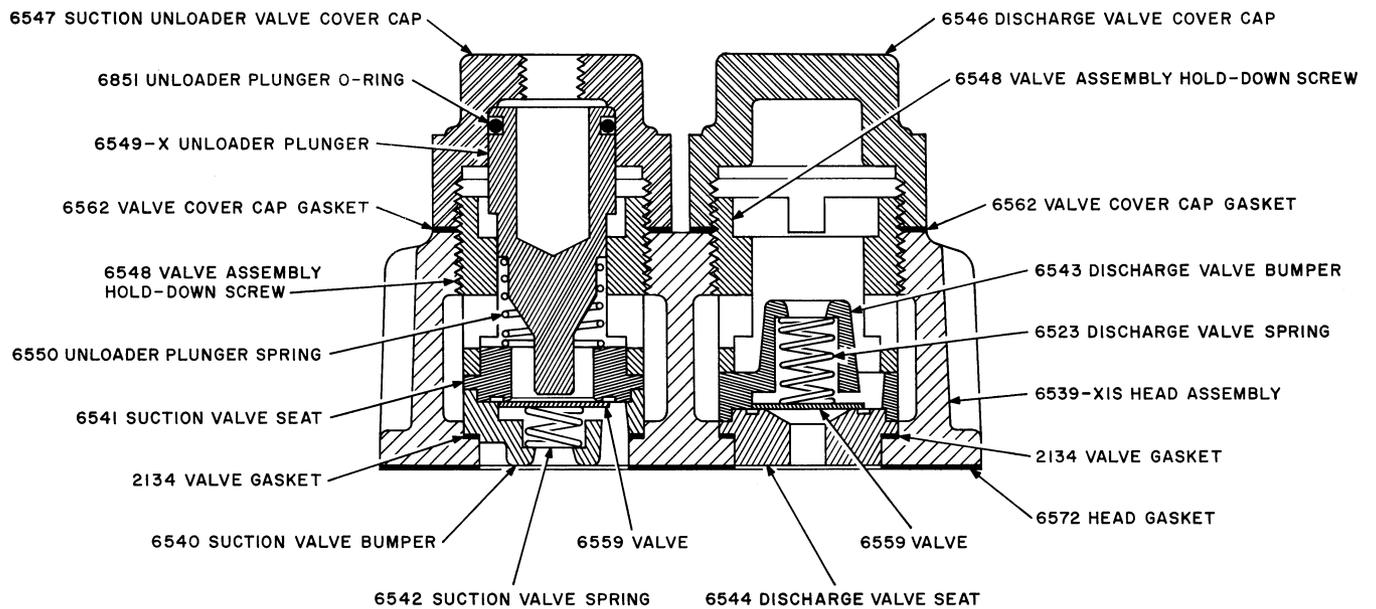


Fig. 7—KS-16432 L2 Air Dryer—Air Compressor Head Assembly (Suction Unloader and Discharge Valves)

Note: Kickoff plungers without an O-ring groove in the piston, or without a seat on the underside for the spring, shall be replaced with a 1535 Kickoff Plunger.

Discharge Valve—L1 Dryers

(1) Remove the discharge valve bumper using the Quincy No. N6663 Valve Removal Tool and the R-2806 ratchet handle. Remove the valve spring and valve. Clean the parts removed and the valve seat with a KS-14666 Cloth moistened with petroleum spirits and then a clean, dry cloth. Examine the cleaned parts and make replacements if necessary.

(2) Reassemble the discharge valve as shown in Fig. 6. Before assembling the valve parts, check the valve spring by placing the spring and valve on the valve bumper and then depressing and releasing the valve. If the valve does not snap back when released, replace the valve spring. When mounting the valve bumper, examine the gasket and replace if necessary. Reconnect any flexible tube assemblies removed.

Suction Unloader Valves—L2 Dryers (Fig. 7)

(1) Disconnect the tubing attached to the fittings in the two suction unloader valve cover caps (Fig. 7) using the R-2512 8-inch wrench. Remove one suction unloader valve cover cap using the No. 247 1-1/4 inch wrench. Remove the unloader plunger and plunger spring. Remove and discard the plunger O-ring, spring, and the valve cover cap gasket.

(2) Clean the parts removed, including inside the cover cap, with a KS-14666 Cloth moistened with petroleum spirits, then wipe with a clean, dry cloth.

(3) Place the unloader plunger spring in the holddown screw. Mount a new O-ring on the unloader plunger. Wipe the outside of the plunger and the inside of the valve cover cap with a KS-14666 Cloth moistened with KS-16729 L1 Oil. Replace the cover cap gasket and mount the cap.

Note: Where the plunger has two O-ring grooves, place the O-ring in the top groove.

(4) Similarly clean the other suction unloader valve and then reconnect the tubing to the valve caps if the discharge valves are not to be cleaned.

Discharge Valves—L2 Dryers

(1) If necessary to gain access to the discharge valve cover caps (Fig. 7), remove the tubing connected between the two suction unloader valve cover caps using the R-2512 8-inch wrench. Remove one of the discharge valve cover caps and the valve assembly holddown screw using the Quincy No. N6843 Valve Removal Tool and 15-inch monkey wrench (Billings and Spencer No. 90). Remove the discharge valve bumper, valve spring, valve, and valve seat. Examine the valve gasket and replace if necessary.

(2) Clean the parts removed with a KS-14666 Cloth moistened with petroleum spirits and then a clean, dry cloth. Before reassembling the valve parts, check the valve spring by placing the spring and the valve in the valve bumper and depressing and releasing the valve. If the valve does not snap back when released, replace the valve spring. Substitute other new parts if necessary and then reassemble the valve parts as shown in Fig. 7. Replace the cap gasket before mounting the valve cover cap.

(3) Similarly clean the other discharge valve and reconnect the flexible tubing.

(4) Reconnect the ac power supply and turn on the master stop-start switch.

AIR COMPRESSOR MOTOR

4.11 Lubrication and grounding requirements for the air compressor motor are as follows:

A. Lubrication

Lubricate motor bearings annually as follows:

- (1) Turn off the master stop-start switch.
- (2) Using the oiler, put about 10 drops of KS-16326 L1 Oil in the oil cup on each bearing housing.
- (3) Turn on the master stop-start switch.

B. Grounding

L1 Dryers with Serial Numbers Below 3000

Requirement: These dryers have resilient motor mounts. An annual check shall be made to verify that the motor is grounded to the dryer chassis by an external grounding strap between the motor nameplate screw and the clamping screw of one of the mounts (Fig. 8). If a motor is ungrounded, place the strap as described.

Note: The motors on L1 Dryers with serial numbers above 3000 and on all L2 Dryers are grounded to the dryer chassis through the mounting bolts.

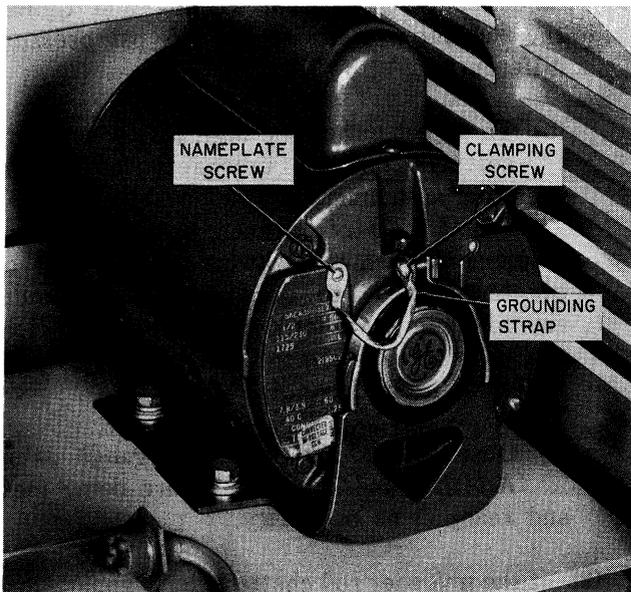


Fig. 8—KS-16432 L1 Air Dryers With Serial Numbers Below 3000—Placement of Grounding Strap on Motor

CHECK VALVE ON COMPRESSOR DISCHARGE LINE—L1 DRYER ONLY

4.12 The check valve (Fig. 1) shall be cleaned and the valve disc washer replaced every 6 months as follows:

- (1) Shut off the air supply to the cable system.

- (2) Turn off the master stop-start switch and disconnect the dryer from the ac power supply.
- (3) Open the water drain valve to release the tank pressure.
- (4) Use a suitable wrench to prevent the valve body from turning and unscrew the valve cap using the R-2652 9-inch wrench. Remove the valve from the body.
- (5) Clean the cap, valve, and valve seat with a KS-14666 Cloth slightly moistened with petroleum spirits and then wipe with a clean, dry cloth.
- (6) Replace the valve disc, ensuring that the disc nut is tight.
- (7) Place the valve in the body and mount the cap.
- (8) Open the air supply to the cable system.
- (9) Reconnect the ac power supply and turn on the master stop-start switch.

SAFETY VALVE

4.13 The safety valve (Fig. 1 and 2) shall discharge between 155 and 175 psi. Test the valve every 3 months as follows:

- (1) Increase the tank pressure by holding down the pilot unloader valve rod and note the high pressure gauge reading at which the valve discharges. **Do not permit the tank pressure to exceed 180 psi.**
- (2) Release the pilot unloader valve rod. When the valve stops discharging, listen to determine that the valve is not leaking.
- (3) If the valve leaks or does not discharge between 155 and 175 psi, it may be dirty or defective. Pull up on the finger ring several times to blow out dirt. If operation is still unsatisfactory, replace the valve. New valves should be manually operated under pressure at least once before being tested.

PILOT UNLOADER (Fig. 9)

4.14 The pilot unloader shall be checked weekly for proper operation and shall be cleaned at 6-month intervals.

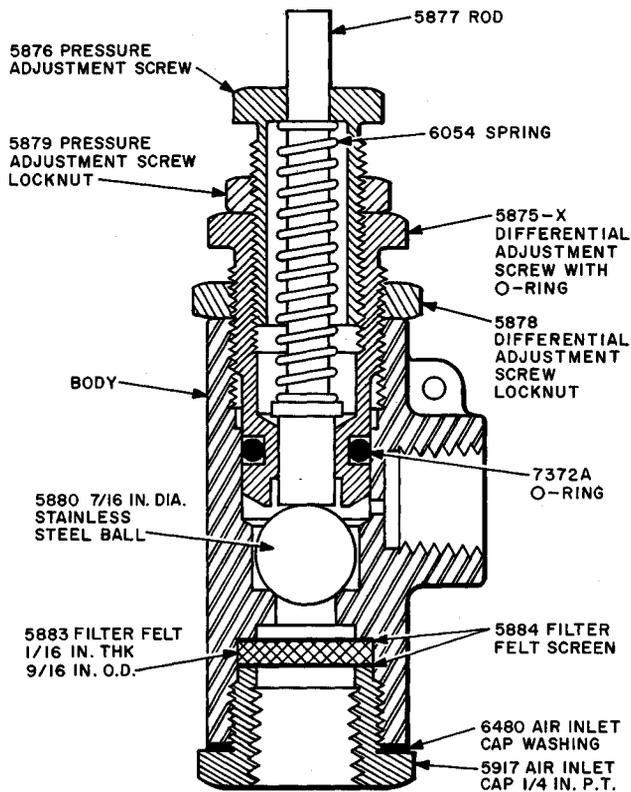


Fig. 9—KS-16432 L1 and L2 Air Dryers—Pilot Unloader

A. Operation Check

- (1) Observe the high pressure gauge and check that the unloader:
 - (a) Allows the air compressor to start delivering air to the tank when the tank pressure decreases to 135 ± 2.5 psi. (To lower the pressure, slowly open the manual water drain valve. **Do not use the high pressure shutoff valve.**)
 - (b) Stops the compressor from delivering air when the tank pressure increases to 150 ± 2.5 psi.

- (2) Observe that the unloader rod (Fig. 9) moves between its two extreme positions with no appreciable chatter.

B. Adjustments

- (1) If air delivery to the tank starts or stops outside the limits of 135 to 150 psi ± 2.5 , proceed as follows:

- (a) To adjust the pressure differential on the unloader, loosen the differential adjustment screw locknut (Fig. 9). Then using the 9-inch wrench, turn the differential adjustment screw clockwise to increase or counterclockwise to decrease the unloader pressure differential to approximately 15 psi. Hold the differential adjustment screw from turning and tighten the locknut. Recheck the 15 psi pressure differential.

- (b) To adjust either the high or low pressure settings on the unloader, loosen the pressure adjustment screw locknut (Fig. 9). Then using the 9-inch wrench, turn the pressure adjustment screw clockwise to increase or counterclockwise to decrease the maximum and minimum unloader pressure settings. Hold the pressure adjustment screw from turning and tighten the locknut.

- (c) Observe the high pressure gauge as in A (1), to see if the limits are being met, and readjust as necessary.

- (2) If the unloader rod chatters during operation, clean the unloader and replace the filter felt.
- (3) Failure of the unloader to start delivery of air to the tank may be due to a defective spring, dirt in the unloader valve, or sticking of the suction unloader valve in the compressor. If the unloader rod remains in the raised position at low pressure, replace the spring. If air blows continuously out past the rod, clean the unloader and replace the filter felt as covered in C. If the trouble is not in the unloader, clean the air compressor suction unloader valves.

C. Cleaning Procedure

- (1) Close the air supply to the cable system.
- (2) Turn off the master stop-start switch.
- (3) Completely release the tank pressure by opening the manual water drain valve.
- (4) Disconnect the unloader tubing using the R-2512 8-inch wrench. Then remove the unloader using the 3/4- by 13/16-inch wrench (Williams No. 731).
- (5) Clamp the unloader in a vise, then loosen the pressure and differential adjustment screw locknuts and the air inlet cap (Fig. 9) using the 9-inch wrench.
- (6) Remove the two adjustment screws, spring, rod, and stainless steel ball from one end of the unloader body. Remove the air inlet cap, washer, filter felt, and screens from the other end.
- (7) Discard the felt, O-ring, and washer; then clean the other parts removed, including the inside of the unloader body, with a KS-14666 Cloth moistened with petroleum spirits.
- (8) Reassemble the unloader as shown in Fig. 9 replacing the filter felt, O-ring, and cap washer during assembly.
- (9) Remount the unloader in the dryer and reconnect the tubing.
- (10) Recheck the operation of the unloader and adjust if necessary.
- (11) Open the air supply to the cable system.
- (12) Turn on the master stop-start switch.

WATER EJECTOR—L2 DRYER (Fig. 10)

4.15 The water ejector shall be cleaned at 6-month intervals as follows:

- (1) Shut off the air supply to the cable system.
- (2) Turn off the master stop-start switch.

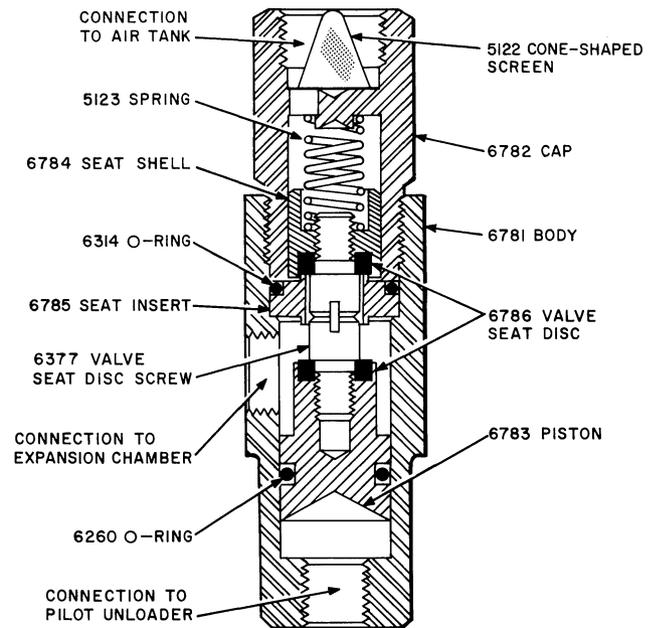


Fig. 10—KS-16432 L2 Air Dryer—Water Ejector

- (3) Completely release the tank pressure by opening the manual water drain valve.
- (4) Remove the water ejector using the R-2512 8-inch and R-2652 9-inch wrenches.
- (5) Grip the ejector body in a vise and remove the cap.
- (6) Remove the seat insert and the piston from the body, and the seat shell, spring, and cone-shaped screen from the cap.
- (7) Remove and discard the O-rings on the seat insert and on the piston.
- (8) Remove the valve seat disc screws from the seat shell and the piston using the combination pliers.
- (9) Remove and discard the valve seat discs.
- (10) Clean the valve parts and the inside of the cap and body with a KS-14666 Cloth moistened with petroleum spirits.
- (11) Rinse the screen in petroleum spirits.

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- (12) Wipe the valve parts with a clean, dry cloth.
- (13) Replace O-rings and valve seat discs.
- (14) Reassemble the ejector as shown in Fig. 10, and remount.
- (15) Open the air supply to the cable system.
- (16) Turn on the master stop-start switch.

WATER DRAIN STRAINER—L2 DRYER

4.16 The screen in the strainer shall be cleaned at 3-month intervals as follows:

- (1) Shut off the air supply to the cable system.
- (2) Turn off the master stop-start switch.
- (3) Completely release the tank pressure by opening the manual water drain valve.
- (4) Loosen the strainer cap with the No 247 1-1/4 inch wrench.
- (5) Unscrew and remove the cap and screen from the strainer housing while holding a receptacle under the strainer to catch remaining tank condensate.
- (6) Clean the inside of the strainer housing and cap with a clean, dry cloth.
- (7) Rinse the screen in petroleum spirits and dry with a clean, dry cloth.
- (8) Place the screen and cap in the strainer housing.
- (9) Turn on the master stop-start switch.

WATER DRAIN OUTLET—L2 DRYER

4.17 The water drain outlet orifice shall be cleaned at 3-month intervals as follows:

- (1) Remove the drain tubing attached to the elbow at the back of the dryer cabinet using the R-2512 8-inch and R-2562 9-inch wrenches.

- (2) Remove the elbow and nipple from the fitting in the cabinet using the R-1538 10-inch wrench.
- (3) Using a bare wire less than 1/8 inch in diameter, clean the orifice (located at the back of the fitting).
- (4) Remount the nipple and elbow and reconnect the drain tubing.

TANK DRAINING

4.18 The condensation tank on L1 Dryers shall be manually drained weekly and the automatic water ejector on L2 Dryers shall be checked weekly for proper operation.

A. L1 Dryers

Requirement: Drain the condensation tank at weekly intervals as follows:

- (1) Place a receptacle under the manual water drain valve.
- (2) Slightly open the valve and drain off the condensate.
- (3) Close the valve when the condensate has been drained, as indicated by a discharge of air from the valve.

B. L2 Dryers

- (1) Tank drainage is accomplished by the water ejector (Fig. 2 and 4) which discharges air and condensate from the tank during operation and release of the pilot unloader.
- (2) Check this weekly by opening the manual water drain valve and observing the volume of water released. If an amount appreciably greater than 8 ounces is discharged, proceed as in C.

C. Unsatisfactory Draining (L2 Dryers)

- (1) Little or no discharge of air and condensate during operation and release of the pilot unloader or continuous leakage at other times is an indication of unsatisfactory tank drainage.

- (2) Inadequate discharge is due to obstructions in the water drain strainer or of the orifice at the water drain outlet.
- (3) Continuous leakage is probably due to foreign matter in the water ejector.
- (4) If draining is unsatisfactory, proceed as follows:
 - (a) Open the manual water drain valve.
 - (b) Clean the water drain strainer as covered in 4.16.
 - (c) Recheck for proper tank draining (4.18, B).
- (5) If draining is still unsatisfactory, clean the water drain outlet orifice as covered in 4.17, then recheck for proper draining.
- (6) If draining is still unsatisfactory, clean the water ejector as covered in 4.15 and recheck for proper draining.

PRESSURE REGULATOR

4.19 The regulator (including regulator on Dual Pressure Kit) shall be checked weekly to verify that the pressure is maintained within $\pm 1/4$ psi of the required pressure as observed on the output pressure gauge. If the pressure has varied more than $\pm 1/4$ psi, proceed as follows:

- (1) Loosen the handwheel locknut at the top of the regulator bonnet using the R-1542 6-inch wrench.
- (2) Turn the handwheel clockwise to increase, or counterclockwise to decrease, the output air pressure to the required value.
- (3) Tighten the handwheel locknut.

Note: Slight air leakage from the relief port in the bonnet is normal during regulator operation. If air blows continuously from the port, or the adjustment in (2) cannot be made, replace the regulator. If the regulator cannot maintain the output pressure and the tank pressure gauge shows normal pressure, **release the tank pressure through the manual water drain** and replace the porous bronze filter assembly (Section 161-305-801).

AIR PRESSURE ALARM

4.20 The high-low pressure alarm (including alarm on Dual Pressure Kit) shall be checked at 3-month intervals.

A. High Pressure Alarm (Fig. 11)

The alarm switch contacts shall make on increasing pressure and break on decreasing pressure in the manifold (Fig. 4) within $\pm 1/2$ psi of the selected alarm operate pressure. The alarm should be set to operate at 2 psi above the required outlet pressure.

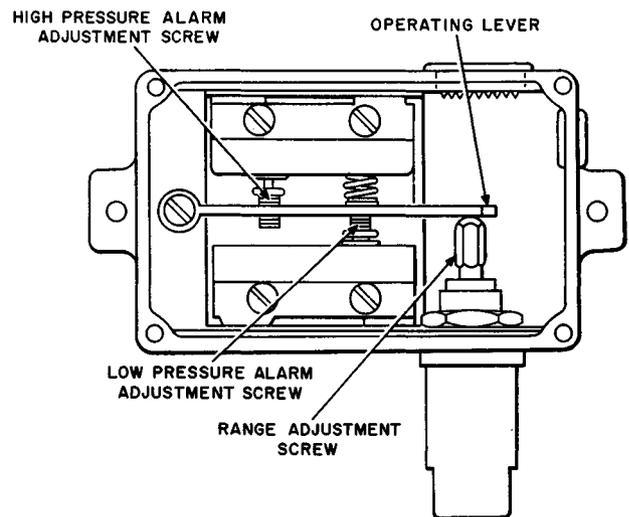


Fig. 11—High-Low Pressure Alarm

B. Low Pressure Alarm (Fig. 11)

The switch contacts shall make on decreasing pressure and break on increasing pressure in the manifold within $\pm 1/2$ psi of the selected alarm operate pressure. The alarm should be set to operate at 2 psi below the required outlet pressure.

C. Alarm Operation Check

- (1) If the dryer is not equipped with a check valve in the low pressure outlet, close the valve in the air supply line between the dryer equipment and the meter panel.
- (2) Remove the central office alarm circuit plug from the receptacle in the dryer cabinet.

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- (3) Connect the 81A Test Set to the two pins of the alarm plug with two WIAG Cords to indicate the make and break of the alarm contacts.
- (4) Loosen the handwheel locknut at the top of the pressure regulator using the R-1542 6-inch wrench.
- (5) Observing the test set meter needle, check **high pressure** alarm operation by turning the handwheel clockwise to increase the pressure, then counterclockwise to decrease the pressure, until the switch contacts make and break, respectively. **It may be necessary to vent air to decrease the pressure.** Note the low pressure gauge readings when the contacts make and break.
- (6) Check **low pressure** alarm operation as in (5), except turn the handwheel counterclockwise, then clockwise, until the switch contacts break and make, respectively. Note the gauge readings.
- (7) If alarm operation is as required, open the air supply to the cable system and adjust the regulator to the required output pressure. Tighten the handwheel locknut, remove the test set, and replace the alarm circuit plug in the receptacle.

D. Alarm Adjustment

Remove the housing cover using the 3-inch screwdriver.

Adjustment: To adjust the high and low pressure alarm operate settings, follow steps 4.20, C (1) through (4). Then proceed as follows:

(1) Alarm with rectangular housing

(a) High pressure alarm

- Observing the low pressure gauge, adjust the pressure regulator to provide the required outlet pressure +2 psi.
- Turn the high pressure alarm adjustment screw (Fig. 11) using the 539A 1/4-inch wrench until the contacts just make, as observed on the test set. One-sixth turn of the screw counterclockwise increases, or clockwise decreases, the setting approximately 1.4 psi.

(b) Low pressure alarm

- Observing the low pressure gauge, adjust the pressure regulator to provide the required low pressure -2 psi.
- Using the 1/4-inch wrench, turn the low pressure alarm adjustment screw (Fig. 11) until the contacts make, as observed on the test set. One-sixth turn of the screw counterclockwise increases, or clockwise decreases, the setting approximately 0.8 psi.
- After adjusting, recheck the requirements of 4.20, A and B.
- Replace the housing cover.

(2) Alarm with cylindrical housing

(a) High pressure alarm

- Observing the low pressure gauge, adjust the pressure regulator to provide the required outlet pressure +2 psi.
- Turn the left adjustment screw on top of the housing using the 1-1/4 inch screwdriver (Stanley 2012) until the contacts make, as observed on the test set. The left adjustment screw, designated No. 1 or "H", controls the setting of the high pressure alarm. Turn the screw clockwise to raise the operate point and counterclockwise to decrease it.

(b) Low Pressure Alarm

- Observing the low pressure gauge, adjust the pressure regulator to provide the required outlet pressure -2 psi.
- Turn the right adjustment screw on top of the housing using the 1-1/4 inch screwdriver until the contacts make, as observed on the test set. The right adjustment screw, designated No. 2 or "L", controls the setting of the low pressure alarm. Turn the screw clockwise to raise and counterclockwise to lower the operation point.
- After adjusting, recheck the requirements of 4.20, A and B. If alarm operation is satisfactory, adjust the regulator to the required outlet pressure, tighten the handwheel

locknut, remove the test set, and replace the alarm circuit plug in the receptacle.

HUMIDITY-SENSING ELEMENT (Fig. 1 and 2)

4.21 The sensing element shall be inspected for the presence of oil at 3-month intervals and shall be replaced annually. Inspect and replace the element as follows:

- (1) Remove the alarm circuit plug from the alarm receptacle in the cabinet to prevent operation of the office alarm.
- (2) Loosen the locknut under the handwheel of the pressure regulator using the 8-inch wrench. Shut off the regulator by turning the handwheel fully counterclockwise. If the low pressure outlet is not provided with a check valve (Fig. 3), close the air line to the cable.
- (3) Remove the retaining nut from the end of the manifold containing the sensing element (Fig. 1 and 3) using the 9-inch wrench if it is a hexagonal nut and the spanner wrench if it is a ring nut. Remove the retaining ring, socket, shield, and element from the manifold by pulling gently on the cable, taking care not to lose the O-ring used to seal the manifold.

Caution: *Avoid excessive flexing of the cable since this might damage the leads. Extreme care should be taken in removing and handling the sensing element.*

- (4) Clean the outer surfaces of the sensing element shield by wiping with a clean dry cloth. Also clean the interior of the manifold, using different sections of the cloth until the appearance of the cloth indicates the inner surface of the manifold is clean and dry.
- (5) If there is an indication of oil on the sensing element:
 - (a) **On L1 Dryers with Serial Numbers below 3000**, replace the sensing element as in (6).
 - (b) **On L2 Dryers and L1 Dryers with Serial Numbers 3000 and up**, it will be necessary to flush out the dryer as described in Part 5.

- (6) On annual inspections, remove and discard the element and install a new one. To do this, remove the mounting screw at the bottom of the axial hole through the element, using the 3-inch screwdriver. Unplug and discard the element and insert a new one.
- (7) Check for humidity alarm operation as covered in 4.22.
- (8) Ensure that the sensing element mounting screw is securely tightened and the O-ring is positioned in the manifold. Carefully insert the sensing element into the manifold, seat the retaining ring in the manifold, and finger-tighten the retaining nut.
- (9) Open the air line to the meter panel. If the KS-16648 Dual Pressure Kit is provided, open the low pressure line from the kit to the cable system. Adjust the output pressure regulator to furnish the required pressure and tighten the locknut under the handwheel. Replace the office alarm circuit connector.

HUMIDITY ALARM

4.22 The humidity alarm (Fig. 12), designed to operate if the relative humidity of the air passing through the manifold exceeds 10 percent at 70°F, shall be checked at 3-month intervals. After removing the alarm circuit plug from the alarm receptacle in the cabinet, check as follows:

Sensing Element Removed From Manifold

- (1) Using the 1-1/4 inch screwdriver (Stanley No. 2012), remove the humidity alarm cover.
- (2) Using the 3-inch screwdriver, disconnect the lead to the pressure alarm from terminal 1, taking care not to remove the lead to the alarm plug.
- (3) With the master stop-start switch turned on, connect the 81A Test Set to the alarm receptacle. Operation of the test set buzzer indicates operation of the alarm.
- (4) If the buzzer does not operate, breathe on the sensing element. If the buzzer still does not operate, make sure the cable from the

(2) The alarm is set with the dryer delivering air to the cable system and the tank temperature at about 40°F. To set the alarm, remove the office alarm circuit plug from the alarm receptacle at the top of the cabinet and connect the 81A test set to the receptacle. Remove the alarm cover using the 1-1/4 inch screwdriver and turn the slotted shaft counterclockwise to the stop. Turn the shaft slowly clockwise until the test set buzzer operates, then counterclockwise just sufficiently to stop the buzzer. Remove the test set and reconnect the office alarm circuit plug.

REFRIGERATION SYSTEM

4.23 Tank Temperature: The tank temperature shall be maintained between 44°F maximum and 26°F minimum. Check this weekly by observing that the temperature gauge is reading within this range.

4.24 Refrigeration Thermostat: The refrigeration thermostat shall start the refrigeration compressor and fan when the tank temperature rises to 40°F \pm 4, and shall stop the compressor and fan when the temperature falls to 30°F \pm 4. Check this at 3-month intervals by observing the gauge.

Note: After the refrigeration compressor starts or stops, the temperature of the tank may continue to rise or fall several degrees for a short time. Allow several minutes for the temperature to stabilize before attempting any corrective action.

4.25 Failure to meet the requirements of 4.23 and 4.24 may be due to one or more of the following conditions:

- (a) Refrigeration thermostat knob at OFF position. Turn the knob to position 4. Further adjustments can be made by turning the knob to other positions. Turning the knob from 4 to 8 will lower cut-in and cutout temperatures about 3°F. Turning the knob from 4 to 1 will raise these temperatures the same amount. If the cutout temperature cannot be raised to 30°F \pm 4, replace the thermostat.
- (b) Exterior of refrigeration condenser clogged with dust. Clean the coil as covered in 4.08.

(c) Fan not operating when refrigeration compressor operates. Check for faulty connection or defective motor.

(d) High tank temperature indication with no operation of humidity alarm. Check for a faulty tank temperature indicator. Remove the temperature gauge (Fig. 1) or the insulation cap (Fig. 2) from the temperature well on the front of the cabinet. Remove the rubber bushing and insert a KS-5499 L1352 Thermometer until the bulb is touching the back of the well. After several minutes, withdraw the thermometer and note the temperature. If the temperature indicator is faulty, replace it.

(e) If the requirements are not met after following procedures in (a) through (d), inform the supervisor. Maintenance of the refrigeration system requires the services of personnel trained in refrigeration equipment maintenance.

FINAL CHECK

4.26 After completing inspection, ensure that the air compressor belt guard is in place, and doors are closed and latched. Switch on the master stop-start switch. When the high and output pressure gauges and the temperature gauge show correct pressures and temperature, reconnect the central office alarm circuit to the dryer and to the KS-16648 Dual Pressure Kit (if present) and resume supplying air to the cable.

5. FLUSHING PROCEDURES

L1 Dryers with Serial Numbers 3000 and Up and All L2 Dryers

5.01 Where oil is found on the humidity-sensing element (4.21), it will be necessary to flush out the dryer as follows.

Caution: Flushing requires the use of trichloroethane. When using trichloroethane, provide adequate ventilation and if necessary a fan to exhaust the fumes. Avoid inhaling the fumes or allowing the liquid to contact the skin.

- (a) Turn off the master stop-start switch. Close the air line to the meter panel. If the KS-16648 Dual Pressure Kit is connected to the

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150 psi air outlet, close the low pressure line from the kit to the meter panel.

- (b) Place a 2-quart receptacle under the manual water drain valve and slowly open the valve to release the air pressure and condensate. Leave the valve open.
- (c) Disconnect the tubing at the low pressure outlet using the 15/16- by 1-inch wrench (Williams No. 33C). Remove the check valve (Fig. 3) on the outlet. If the KS-16648 Dual Pressure Kit is provided, disconnect the tubing from the kit at the high pressure outlet. If the kit is not provided, remove the pipe plug from the 150 psi air outlet and open the high pressure shutoff valve.
- (d) Remove the pressure regulator (Fig. 3) from the dryer and take out the valve parts as follows. Disconnect the tubing attached to the front of the regulator using the 15/16- by 1-inch wrench. Separate the union at the back using the R-2512 8-inch and No. 247 1-1/4 inch wrenches and remove the regulator. Using the 8-inch wrench, remove the body plug from the bottom of the regulator and remove the valve spring and valve stem. Replace the plug in the regulator and reconnect the regulator to the tubing.
- (e) Ensure that the 2-quart receptacle is positioned under the manual water drain valve. Place the funnel in the low pressure outlet and slowly pour 2 pints of KS-19578 L1 Trichloroethane into the funnel. Since pouring too rapidly will cause an overflow from the sensing element manifold, watch the liquid level in the manifold while pouring. Then, using the funnel, slowly pour 1 pint of trichloroethane into the 150 psi air outlet. When the liquid stops draining into the receptacle, close the manual water drain valve and the high pressure shutoff valve.
- (f) Mount the sensing element socket (without the sensing element) in the manifold and finger-tighten the retaining nut. Fold a clean, dry cloth and fasten loosely over the low pressure outlet to trap any liquid discharge when the air compressor is operated.
- (g) Start the air compressor by turning on the master stop-start switch. Remove the cloth after operating the compressor for a few minutes,

after which there should be no further discharge of liquid from the low pressure outlet. Continue operating the compressor for about 2 hours, then partly open the high pressure shutoff valve for a few minutes to dry out the high pressure line. Close the high pressure shutoff valve and stop the compressor by turning off the master stop-start switch.

- (h) Remove the pressure regulator as covered in (d) and remove the body plug. Replace the valve stem, valve spring, and body plug. Reconnect the regulator to the tubing.
- (i) Open the manual water drain valve and drain any additional liquid which has collected in the tank into the receptacle. Then close the valve and remove the receptacle. Make sure the high pressure shutoff valve is closed.
- (j) Turn on the master stop-start switch. While the compressor delivers air to the tank, slowly open the pressure regulator by turning the handwheel clockwise just enough to maintain 145 psi pressure in the tank with the compressor operating continuously.
- (k) When the temperature gauge reads below 35°F, shut off the air discharge from the low pressure outlet by turning the handwheel of the pressure regulator counterclockwise. Reconnect the tubing [5.01 (c)] to this outlet and check valve. Mount the pipe plug in the 150 psi air outlet, or if the KS-16648 Dual Pressure Kit is provided, reconnect the kit to the outlet and open the high pressure shutoff valve.
- (l) Remove the sensing element socket from the manifold as covered in 4.21 (3). Remove the retaining ring and socket and the O-ring and wipe any moisture from the parts with a clean, dry cloth. Examine the inside of the manifold for moisture and, if moisture is present, remove it with a clean, dry cloth. Place the O-ring on the retaining ring. Plug a new sensing element into the socket and tighten the mounting screw. Check the sensing element for operation of the humidity alarm as covered in 4.22.

6. DIAGNOSING ALARM OPERATION

6.01 The high-low pressure and humidity alarm contacts are connected in parallel across the office alarm circuit. The contacts are also paralleled

with those of the KS-16648 Dual Pressure Kit when it is used.

6.02 The cause of an operated alarm can be determined from observation of the pressure gauges and temperature gauge. Table C shows the alarm which has operated by reference to pressure and temperature gauge readings, and also provides a text reference for checking the probable cause of the alarm.

Note: If pressure and temperature gauge readings are normal and the alarm is operated, proceed as follows:

- (1) Check that the master stop-start switch is turned ON and air compressor is operating.
- (2) Check operation of humidity alarm electron tube. If defective, replace tube.

| TABLE C — DETERMINING CAUSE FOR OPERATED ALARM BY GAUGE INDICATIONS AND TROUBLE CHECK REFERENCE | | | | |
|---|-----------------|------------|----------------|--------------------|
| LOW PRES GAUGE | HIGH PRES GAUGE | TEMP GAUGE | OPERATED ALARM | CHECK FOR PAR. NO. |
| Low | Low | Normal | Low Pres | 4.10 4.14 |
| Low | Normal | Normal | Low Pres | 4.19 |
| High | Normal | Normal | High Pres | 4.19 |
| Normal | Normal | High | Humidity | 4.23 |
| Normal | Normal | Normal | Humidity | 6.02, Note |

(3) Remove sensing element cable plug from receptacle in humidity alarm. If alarm signal stops, check 4.18 covering tank draining and 4.21 covering inspection of humidity-sensing element. If alarm continues, check 4.20 covering high-low pressure alarm operation.

(4) Check that line voltage to dryer is 115 ±10 volts ac.

7. TOOLS, GAUGES, AND MATERIALS

7.01 The following tools, gauges, and materials are used for maintenance and adjustments on the KS-16432 L1 and L2 Dryers.

| CODE OR SPEC NO. | DESCRIPTION |
|------------------|---|
| TOOLS | |
| — | Pliers, Long-Nose, P |
| — | Receptacle, 2-quart, for receiving KS-19578, L1 Trichloroethane |
| — | Receptacles for oil or condensate |
| — | Screwdriver, 1-1/4 inch, Stanley, No. 2012 |
| — | Screwdriver, 3-inch, C |
| — | Screwdriver, 4-inch, E |

SECTION 161-305-701

| CODE OR SPEC NO. | DESCRIPTION |
|------------------|---|
| TOOLS | |
| — | Screwdriver, No. 2B |
| AT-8287 | Sprayer (for E Pressure Testing Solution) |
| — | Syringe, Oil Filler, Puregas Equipment, No. 5000-5-18 |
| — | Tool, Valve Removal, Quincy Compressor, No. N-6663 |
| — | Tool, Valve Removal, Quincy Compressor, No. N-6843 |
| — | Wrench, 7/16- x 1/2-inch, 12-point offset, box, Williams, No. 8725 |
| — | Wrench, 3/4- x 13/16-inch, Open, Double-End, Flat, Williams No. 731 |
| — | Wrench, 15/16- x 1-inch, Open Double-End, Flat, Williams No. 33C |
| — | Wrench, Monkey, 15-inch, Billings and Spencer, No. 90 |
| — | Wrench, Spanner, American Instrument, No. 4-4896A |
| 81A | Set, Test |
| 247 | Wrench, 1-1/4 Inch, Open, Single-End, Flat |
| 539A | Wrench, 1/4-Inch, Open, Double-End |
| KS-6737 | Funnel |
| KS-14164 | Brush, Show Card, Artists |
| R-1538 | Wrench, 10-Inch, Pipe |
| R-1542 | Wrench, 6-Inch, Adjustable |
| R-2485 | Wrench, 5/32-Inch, Allen, Socket Screw |
| R-2512 | Wrench, 8-Inch, Adjustable |
| R-2593 | Wrench, 7/8- x 1-1/16 Inch, Open, Double-End, Flat |
| R-2652 | Wrench, Monkey, 9-Inch, Thin |
| R-2806 | Handle, Ratchet |
| R-2969 | Brush, General Purpose |
| W1AG | Cord (two required for 81A Test Set) |

| CODE OR SPEC NO. | DESCRIPTION |
|------------------|---|
| TOOLS | |
| — | Brush, No. 8, Sash, Devoe & Raynolds, No. 65274 |
| — | Cleaner, Vacuum |
| — | Oiler, Gem, Plews, Oiler, No. 1706 |
| — | Pump, Pressure Testing, B (or equivalent bicycle tire type) |
| — | Pliers, Combination |
| GAUGES | |
| KS-5499 L1352 | Thermometer, 6-5/8 Inch, (20 to 120°F) |
| KS-6938 | Gauge, Feeler |
| MATERIALS | |
| KS-6824 | Compound, Sealing |
| KS-7860 | Spirits, Petroleum |
| KS-14666 | Cloths |
| KS-16326 L1 | Oil |
| KS-16729 L1 | Oil |
| KS-19578 L1 | Trichloroethane |
| AT-8287 | Solution, Pressure Testing, E |

8. GUARANTY

8.01 Each air dryer carries a 1-year guaranty against defective workmanship and material. This period starts 1 month after date of shipment. Not included in this guaranty are components subject to normal replacement during the year such as the electron tube, air compressor gaskets, valves, piston rings, and ring spring.

8.02 This guaranty includes the offering of immediate replacement with an equivalent air dryer for any unit which cannot be repaired in the field. This category will probably include only those units having a basic refrigeration fault. Transportation costs for both the defective and replacement dryers are included in this guaranty. The replacement dryer will be shipped without

cabinet or hardware. On receipt of the replacement unit, the defective unit should be removed from its cabinet and returned in the same crate to the manufacturer. Cabinet removal and reerating instructions are furnished with the replacement dryer by the manufacturer.

8.03 The basic refrigeration system carries a 5-year guaranty. This guaranty covers the refrigeration compressor, the refrigeration tubing, refrigeration condenser, and heat exchanger, but not the refrigeration thermostat or the heat exchanger temperature gauge. On failure of any guaranteed refrigeration component after the first year but before the end of 5 years, the guaranty may be applied as follows in either (1) or (2):

(1) The dryer may be returned (without cabinet) prepaid to the manufacturer who will bear the entire cost of repairing the refrigeration system. When the unit has been repaired and tested, it will be returned transportation collect to the telephone company.

(2) An equivalent rebuilt air dryer without cabinet will immediately be shipped by the manufacturer transportation collect. This unit would bear the same guaranty as a new unit. On receipt of the replacement unit, the defective unit should be removed from its cabinet, placed in the replacement unit crate, and shipped prepaid to the manufacturer. The manufacturer will repair the refrigeration defect at no charge. He will also replace any other damaged or worn parts to bring the unit up to the condition of

the unit sent out as a replacement. The cost of this work would be billed to the telephone company.

8.04 The manufacturer should be notified by telephone in the event of a refrigeration failure requiring replacement of the unit. The manufacturer's name and address appear on the nameplate of the dryer. The manufacturer can be reached by telephone at any time, day or night.

8.05 The manufacturer has reserved the right to judge all claims for in-warranty replacement after inspection of the returned material and to issue billing to cover the cost of repairing the unit if the return was not justified under the terms of the guaranty.

8.06 The manufacturer will accept parts for repair or credit only when accompanied by the returned material tag, which he will send to the telephone company in the event of a reported defective part.

8.07 Damages incurred in transportation are the responsibility of the telephone company which shall make the necessary arrangements for filing claim against the carrier.

8.08 None of the information in this part is intended to replace normal procedures of the telephone company regarding the instituting of engineering complaints covering defective equipment.