KS-20183 L2 and L3 AIR DRYERS
(LECTRODRYER DIVISION, AJAX MAGNETHERMIC)
REQUIREMENTS AND ADJUSTING PROCEDURES

CONTENTS PAGE

1. GENERAL

1.01 These dryers, through refrigeration, and absorption, provide dry air to pressurized waveguide runs and a maximum of four horn reflector antennas in microwave radio systems. *L3* dryers are designed to operate satisfactorily within the ambient temperature range of +20°F to +105°F. *L2* dryers are designed to operate satisfactorily within the ambient temperature range of +35°F to +105°F. (See Note.)

> ***Note:*** For ambient temperatures down to +20°F, the L101 modification kit may be installed on L2 dryers as covered in 2.28.

1.02 The KS-20183 L2 and L3 air dryers have been rated Manufacture Discontinued. This section is for the requirements and adjusting procedures of those dryers still in service and incorporates information on various modifications which have been added.

1.03 Section 161-309-802 covers the maintenance and replacement parts for KS-20183 L2 and L3 air dryers manufactured by Lectrodryer Division, Ajax Magnethermic.

1.04 The KS-20183 L1 and L2 air dryers, manufactured by Dielectric Communications,

are also rated Manufacture Discontinued and are covered in Section 161-309-701 and 161-309-801.

EQUIPMENT

1.05 Both air dryer cabinets (L2 and L3) are approximately 60 inches high, 24 inches wide, and 15 inches deep (Fig. 1). The units weigh approximately 200 pounds.

1.06 Both the L2 and L3 dryer cabinets house the following major components (Fig. 2 through 6):

(a) ON-OFF power switch

(b) Rotron spiral blower

(c) Refrigeration system consisting of:

- Heat exchanger and heat exchanger temperature gauge
- Refrigeration compressor
- Refrigeration condenser
- Fan and fan motor

(d) Two desiccant towers with timer controlled heaters

(e) Timer controlled solenoid valves

(f) Dead-weight relief valve

(g) Humidity alarm and alarm light

(h) Pressure alarm and alarm light

(i) Blown fuse light.

AIR DELIVERY CAPACITY

1.07 These dryers are designed to continuously supply up to 100 standard cubic feet of dry air per hour (scfh) at pressures between 7 to 9 inches of water at sea level (minimum 5 inches of water at 10,000 feet elevation).

PROTECTION AND ALARM FEATURES

1.08 Protection and alarm features are provided in the dryer as follows:

(a) The dryer cabinet and all metallic parts of the assembly are interconnected to a common ground. Holes are provided at the back top left-hand corner of the cabinet to accommodate a KS-5517 L1 grounding lug.

(b) 3 amp fuse to provide circuit protection for the alarm circuit.

(c) Refrigeration fan guard.

(d) Pressure alarm which operates if pressure decreases to 1.4 $\pm$0.5 inches water gauge (wg).

(g) Humidity alarm which operates if the humidity of the delivered air is in excess of 4 percent, $\pm$1.5 percent, at 70°F.

(h) Blown fuse light.

(i) Each alarm condition is identified by a lamp on the front panel of the cabinet.

Note: All air dryer alarms are considered major alarms.

2. INSTALLATION

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

2.02 Locate the dryer in accordance with the station floor plan and, if required, secure the dryer to the floor.

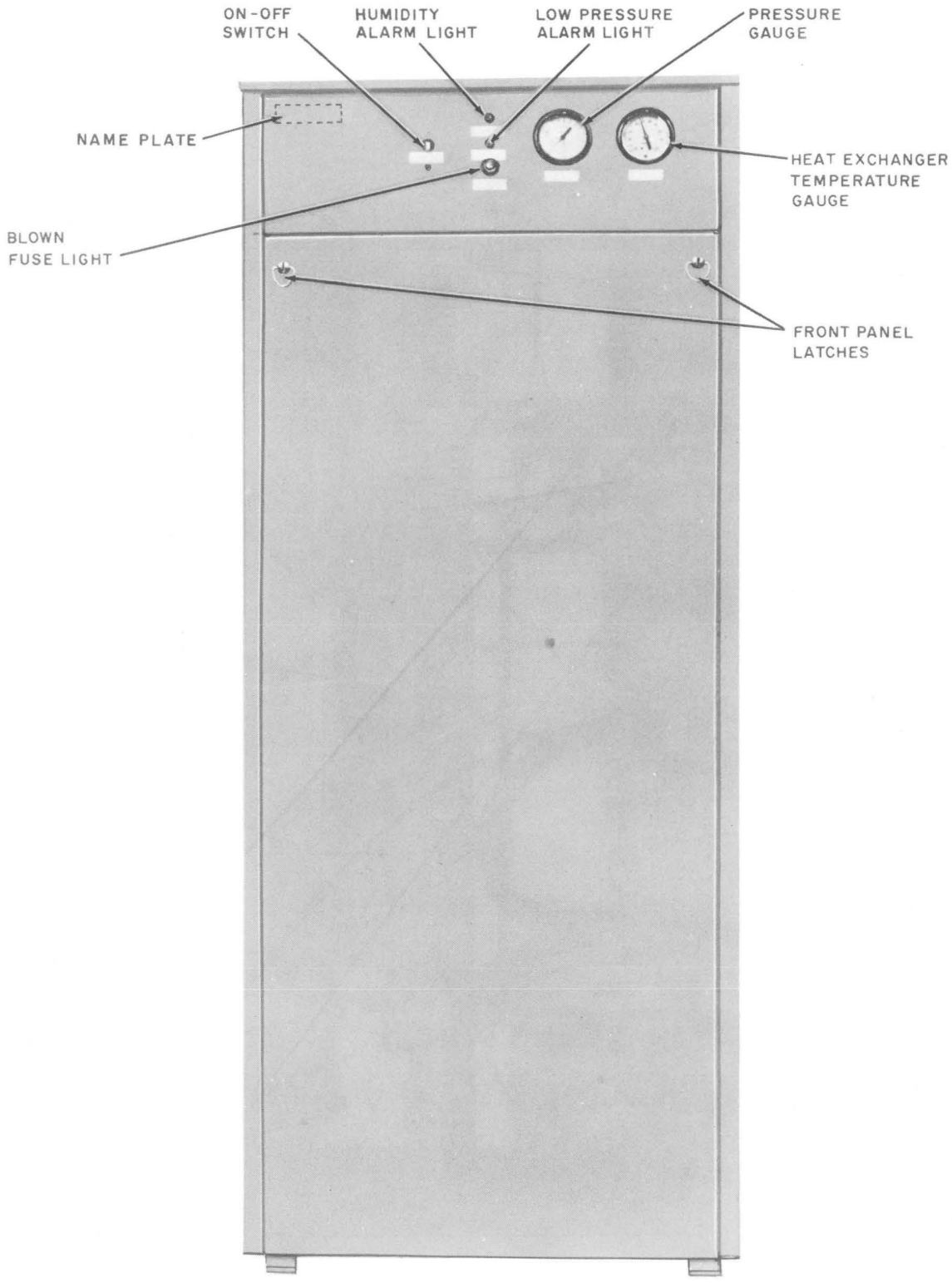

Fig. 1—KS-20183 L2 and L3 Air Dryer Cabinet

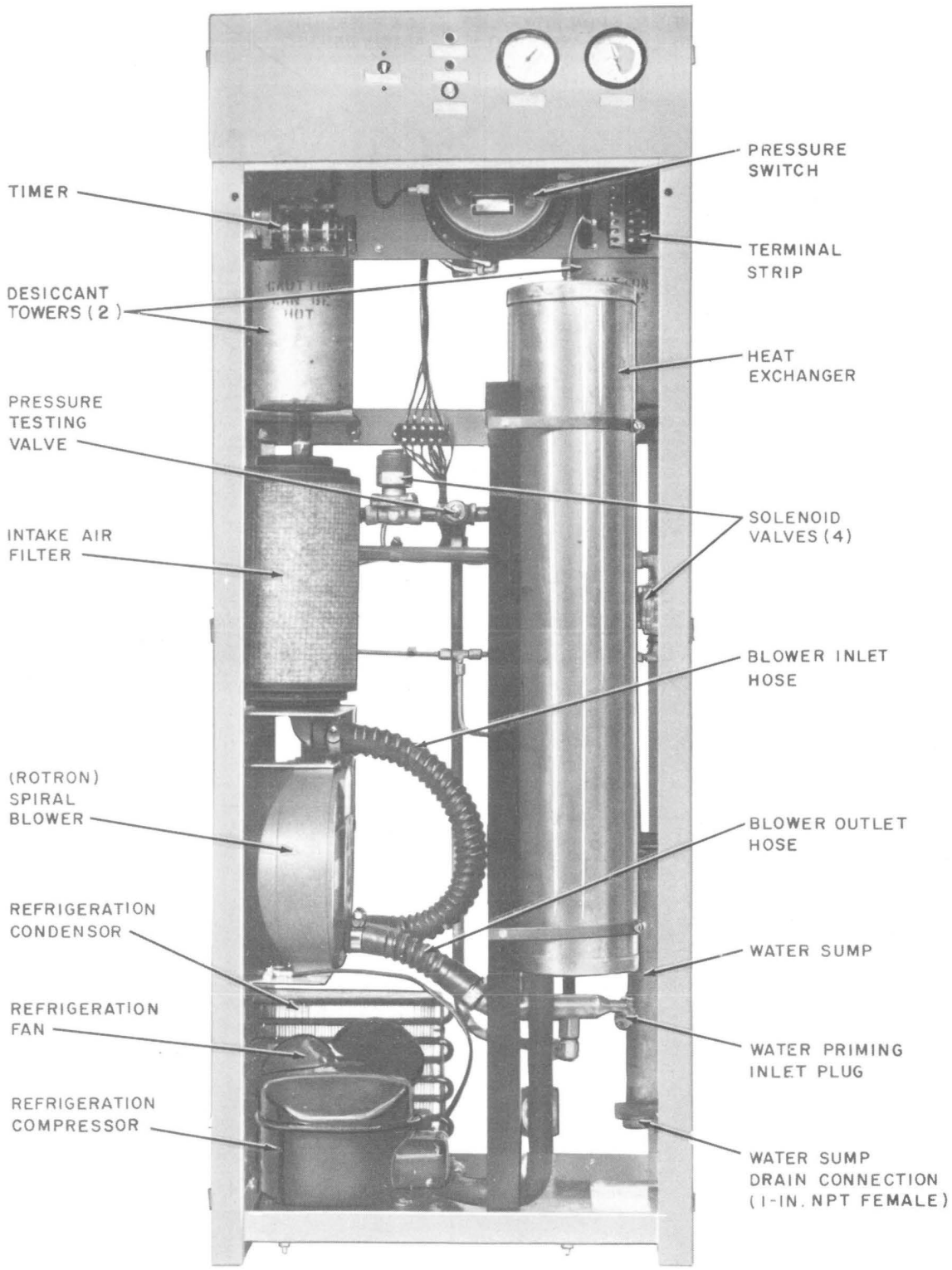

Fig. 2—KS-20183 L2 and L3 Air Dryers—Front Cover Removed

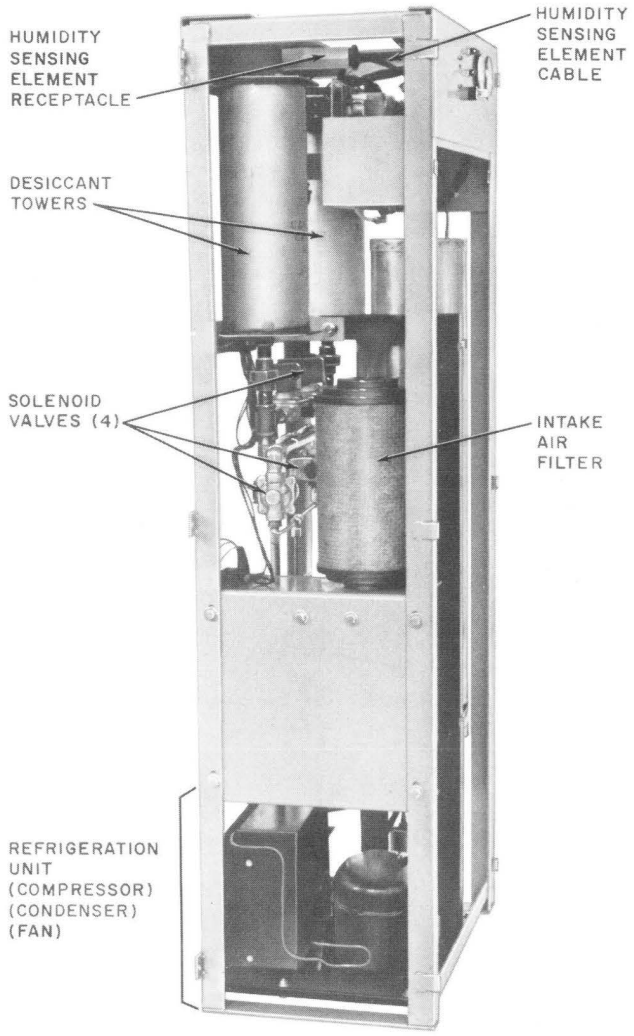

Fig. 3—KS-20183 L2 and L3 Air Dryers—Left Side Panel Removed

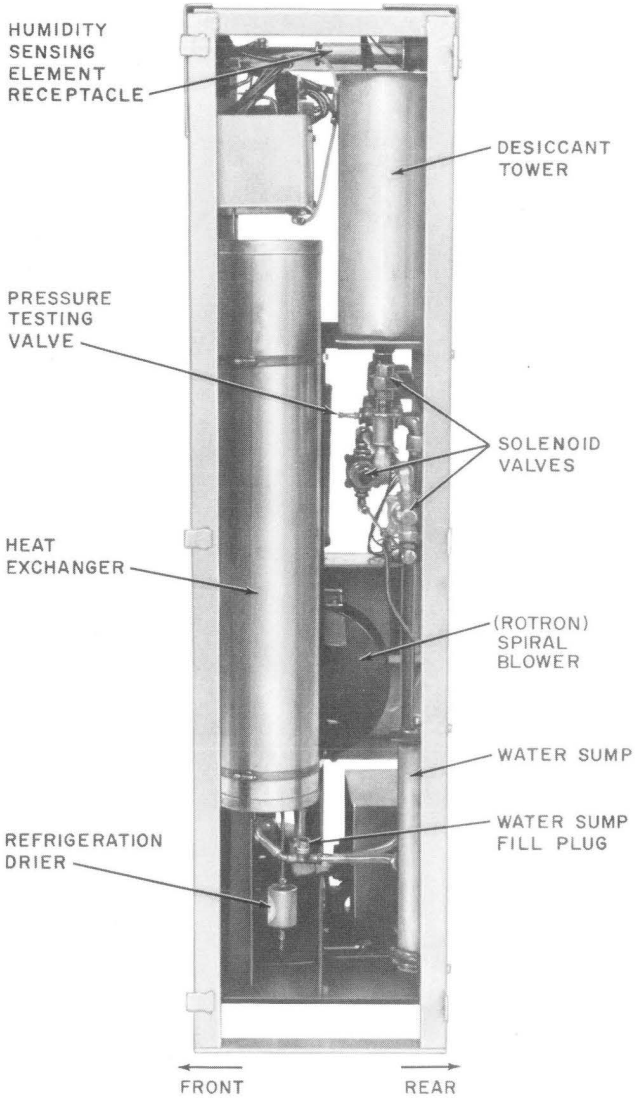

Fig. 4—KS-20183 L2 and L3 Air Dryers—Right Side Removed

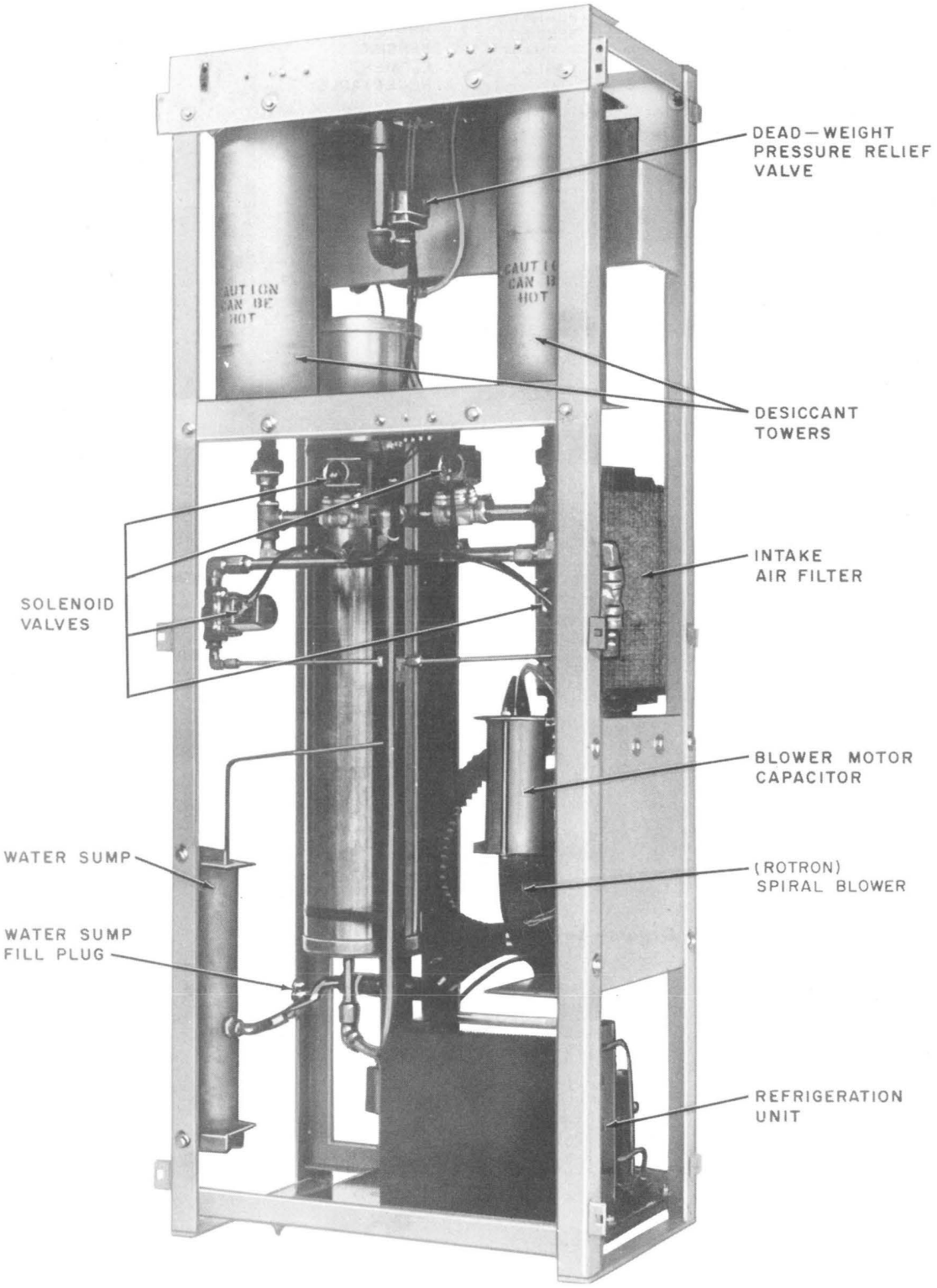

Fig. 5—KS-20183 L2 and L3 Air Dryers—Rear View—All Panels Removed

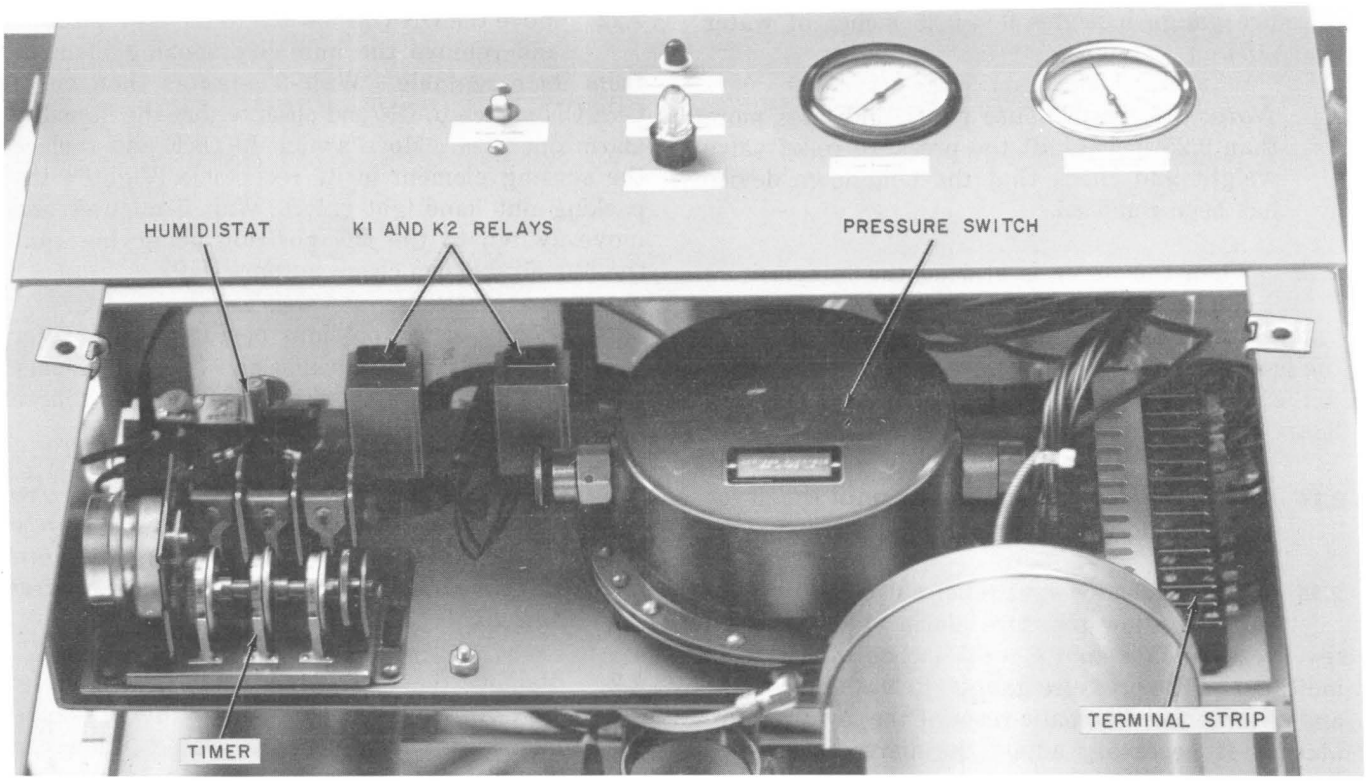

Fig. 6—KS-20183 L2 and L3 Air Dryers—Electrical Panel

2.03 Remove the dust cap from the dry air outlet (Fig. 7).

2.04 Fill the water sump with approximately 1 pint of water.

2.05 Remove the hold-down device securing the dead-weight relief valve.

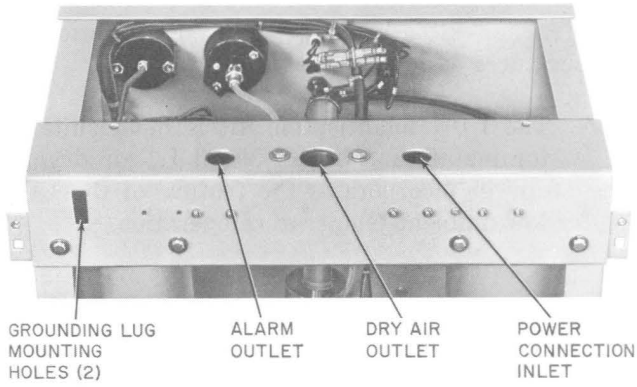

Fig. 7—External Connection Facilities—KS-20183 L2 and L3 Air Dryers

2.06 Remove the cover from the pressure switch and remove the switch tiedown.

2.07 Check and comply with all tags and instructions provided by the manufacturer.

2.08 Mount a KS-5517 L1 grounding lug in the holes provided at the back top left-hand corner of the dryer cabinet (Fig. 7). Connect the station ground to the grounding lug.

2.09 Connect the alarm leads to the local station and C1 alarm panels.

2.10 Make certain the dryer ON-OFF switch is in the OFF position. Connect the dryer to the 115V 60 Hz 1 phase power supply.

2.11 Start the air dryer by moving the ON-OFF switch to the ON position.

2.12 Check for operation of the refrigeration fan and a flow of air from the dry air outlet. Block off the dry air outlet with a wadded lint-free cloth or other suitable plug and check that the

pressure gauge indicates 9 $\pm$0.25 inches of water (see 1.07).

Note: If the pressure gauge indicates more than 9.25 inches, lift the pressure relief valve weight and check that the hold-down device has been removed.

2.13 When the dryer is started the temperature gauge should indicate approximately room temperature. As the dryer continues to operate, the heat exchanger temperature should rapidly drop to the normal operating temperature of approximately 38 to 40°F.

2.14 An alarm condition will exist until the dryer reaches normal operating pressure.

2.15 Lift the dead-weight relief valve and observe that the low pressure alarm operates when the pressure falls to 1.4 $\pm$0.5 inches of water as indicated on the pressure gauge. Release the weight and observe for automatic reset of the low pressure alarm. If necessary adjust the alarm as covered in 4.13.

2.16 Note the position of the pointer on the timer dial, then slowly rotate the knurled thumbwheel on the right until the solenoids are heard to operate.

2.17 Identify the two energized solenoids by bringing a small metal object (iron or steel) close to each one in turn to detect magnetization.

2.18 Check for tower heating by bringing the hand near enough to detect radiant heat.

Caution: Do not touch the towers, since the outer surfaces can reach 250°F.

2.19 Continue slowly rotating the knurled timer thumbwheel until the solenoids are again heard to operate.

2.20 Check again for solenoid operation and tower heating as in 2.17 and 2.18. The solenoids which were not energized should now be energized and the tower previously cool should now be warm.

2.21 Continue rotating the timer thumbwheel until it returns to the original position as noted in 2.16.

2.22 Move the ON-OFF switch to the OFF position and remove the humidity sensing element from its receptacle. Wait 5 minutes then move OFF-ON switch to ON and observe that the humidity alarm operates. Move switch to OFF and replace the sensing element in its receptacle. (Tighten the packing nut handtight only.) Wait 5 minutes and move switch to the ON position observing that the humidity alarm clears automatically.

2.23 If any of the previous operations fail, refer to the circuit drawings and make necessary continuity and voltage tests to locate the source of trouble.

Caution: Do not attempt to measure resistance, check continuity, or apply voltage to the humidity sensing element or expose the element to temperature greater than 160°F.

2.24 Remove the 1-inch plug in the dry air outlet and restrict the flow until the pressure gauge indicates 7 to 8 inches of water. Flow can be restricted by inserting the plastic shipping plug with a small hole punched in it into the dry air outlet.

2.25 Allow the unit to operate for at least 24 hours, then if all operations are satisfactory connect the unit to the waveguide system.

L101 LOW AMBIENT TEMPERATURE MODIFICATION KIT

2.26 When an L2 dryer is installed in a location where the ambient temperature is expected to drop below the dryer's minimum operating temperature of +35°F, an L101 low ambient temperature modification kit may be installed. The modification kit allows the dryer to function at temperatures as low as +20°F.

2.27 The L101 modification kit is most suitable for installation on KS-20183 L2 air dryers. The L3 dryer incorporates the feature of the L101 kit for low ambient temperature operation.

2.28 The L101 modification kit is installed on L2 dryers as follows:

(1) De-energize the power supply and move the ON-OFF switch to OFF.

(2) Mount the thermostat from the kit on a wall adjacent to the dryer, approximately 5 feet from the floor.

(3) Disconnect the tagged jumper (Fig. 8) from the terminal block.

(4) Connect new leads from terminal "R" on the thermostat to power lead 41 terminal and from terminal "W" to power lead 48 terminal on the terminal block in the dryer.

(5) Resume dryer operation.

L102 BYPASS BLOCK MODIFICATION KIT

2.29 The L102 bypass block modification kit is designed to eliminate the trimmer valve adjustment on the spiral blowers used on L2 and L3 air dryers.

2.30 This kit also reduces the noise level of the spiral blower by eliminating the bleeding of excess air through the trimmer valve to the atmosphere.

2.31 The L102 modification kit is installed on L2 and L3 dryers as follows:

(1) Shut off power to the air dryer and disconnect ac power supply.

(2) Disconnect the input and output hoses from the blower (Fig. 2).

(3) With a Phillip's head screwdriver, remove the four screws holding the blower face plate.

(4) Close the trimmer valve with a screwdriver.

(5) Remove the adjusting screw (furnished with kit) from the adaptor block.

(6) Place the adaptor, block over the ports of the blower face plate and secure with four set screws provided.

Note: Position the adaptor block to allow the surface of the adjustment screw to face top of dryer.

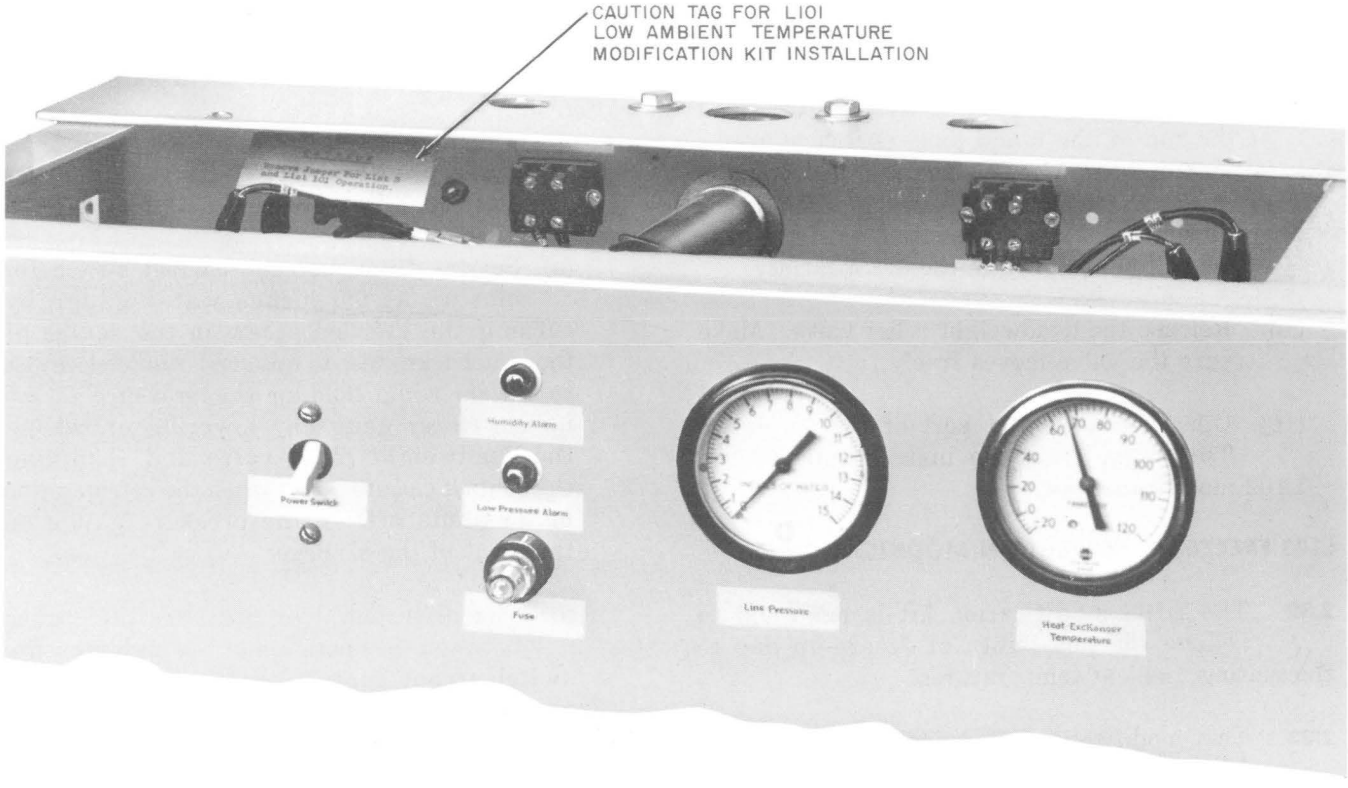

Fig. 8—Jumper Removal Tag for L101 Modification of L2 Dryers

(7) Replace the blower faceplate in reverse order of removal. Make sure rubber seal is properly located in groove.

(8) Replace the adjustment screw removed from adapter block in Step 5.

(9) Place the blower hoses over the pipe nipples on the adaptor block and secure.

(10) Close the air outlet port of the air dryer.

(11) Tie down the dead-weight relief valve in the air dryer.

(12) Turn the adjustment screw on the adaptor block ***clockwise*** (facing front of spiral blower) until the bypass is completely opened.

(13) Restore power to the air dryer.

(14) Turn the adjustment screw on the adaptor block ***counterclockwise*** (facing front of spiral blower) until the pressure gauge reads approximately 10 1/2 to 11 inches water gauge and then lock adjustment screw with hex nut.

Note: Check the water sump to ensure sufficient water in the system by feeling for air leaking from stand pipe at the top of sump tank. If no air is leaking at the "U" bend at the top of the stand pipe, sufficient water is present in system. If there is a detectable air leak, water must be added and Steps 12 through 14 must be repeated. Any excess water will be expelled to the drain facility.

(15) Release the deadweight relief valve. Make sure the valve moves freely.

(16) Open the air outlet port of the air dryer. This completes, the installation for the L102 modification kit.

L103 FREEZE-UP PROTECTION MODIFICATION KIT

2.32 The L103 modification kit is designed to reduce the possibility of freeze-up due to fluctuating ambient temperatures.

2.33 This modification kit is installed on L2 and L3 air dryers as follows:

(1) Shut off power to the air dryer and disconnect ac power supply.

(2) Disconnect all leads and copper tubing from the KS-5793 L3 pressure switch (Fig. 2) and remove switch from unit.

(3) Install dual pressure switch provided with kit using the same screws removed in Step 2.

(4) Wire leads 42 and 24, which were disconnected from the KS-5793 L3 pressure switch in Step 2, should be reconnected to the terminals located in the top right hand corner of the new switch.

(5) Using the front mounting bracket provided with the relay as a drilling templet, drill four (4) 3/16 inch holes in the left hand horizontal support bracket.

(6) Mount the bracket to the relay and the relay assembly to the air dryer horizontal support bracket using screws, nuts, and lockwashers provided with kit.

(7) Using an adjustable wrench, remove top cover of relay and check time delay setting of 120 seconds (2 minutes).

(8) Using the 12 feet of wire provided with the kit, wire time delay relay, pressure switch contacts (top left hand terminals), and lead 41 located at terminal strip as shown in Fig. 9.

(9) Resume proper operation of the air dryer and set dual pressure switch as follows:

(a) Set the front mercury contact switch for closure at 5.5 inches water gauge by turning the knurled screw in the center of the switch (clockwise to raise and counterclockwise to lower) while holding the pressure at 5.5 inches water gauge by lowering or raising the deadweight relief valve and observing the contact closure point (when the refrigeration motor shuts off) on the pressure gauge on the front of the air dryer.

(b) The differential or pressure difference between the operation of the high pressure switch (front contact—refrigeration motor shut-off) and the low pressure switch (rear contact—low pressure alarm) can be adjusted to approximately 3 inches water gauge (or a low pressure setting of 2 to 2.5 inches water gauge) by the knurled screw to the right of the front mercury contact. To widen the

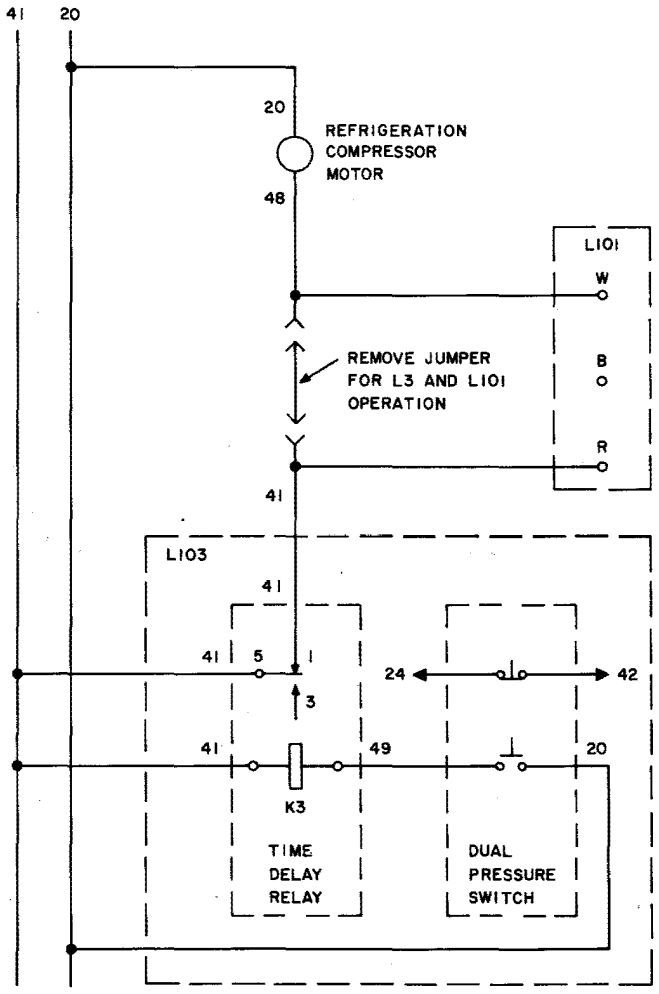

Fig. 9—Wiring for L101 and L103 Modification Kits

differential, turn screw clockwise, (widest differential should be used). To decrease, turn screw counterclockwise. Do not turn this screw too far in either direction, otherwise the magnetic switch to the left will not operate in the proper sequence.

(10) The switch operation should then be checked by slowly raising the deadweight relief valve and observing the refrigeration motor shut-off at approximately 5.5 inches water gauge and the low pressure alarm operating at approximately 2 to 2.5 inches water gauge as observed on the front panel pressure gauge of the dryer.

3. OPERATION

AIRFLOW

3.01 A flow diagram of the air circuit is shown in Fig. 10. Ambient air is drawn through the intake air filter by the blower which operates continuously. Ambient air from the blower enters the refrigerated heat exchanger where 75 percent of the moisture content is condensed and removed through the water sump and drain outlet. From the heat exchanger, cooled air is routed through the timer controlled solenoid valves to one of the two desiccant towers for final drying. Dry air

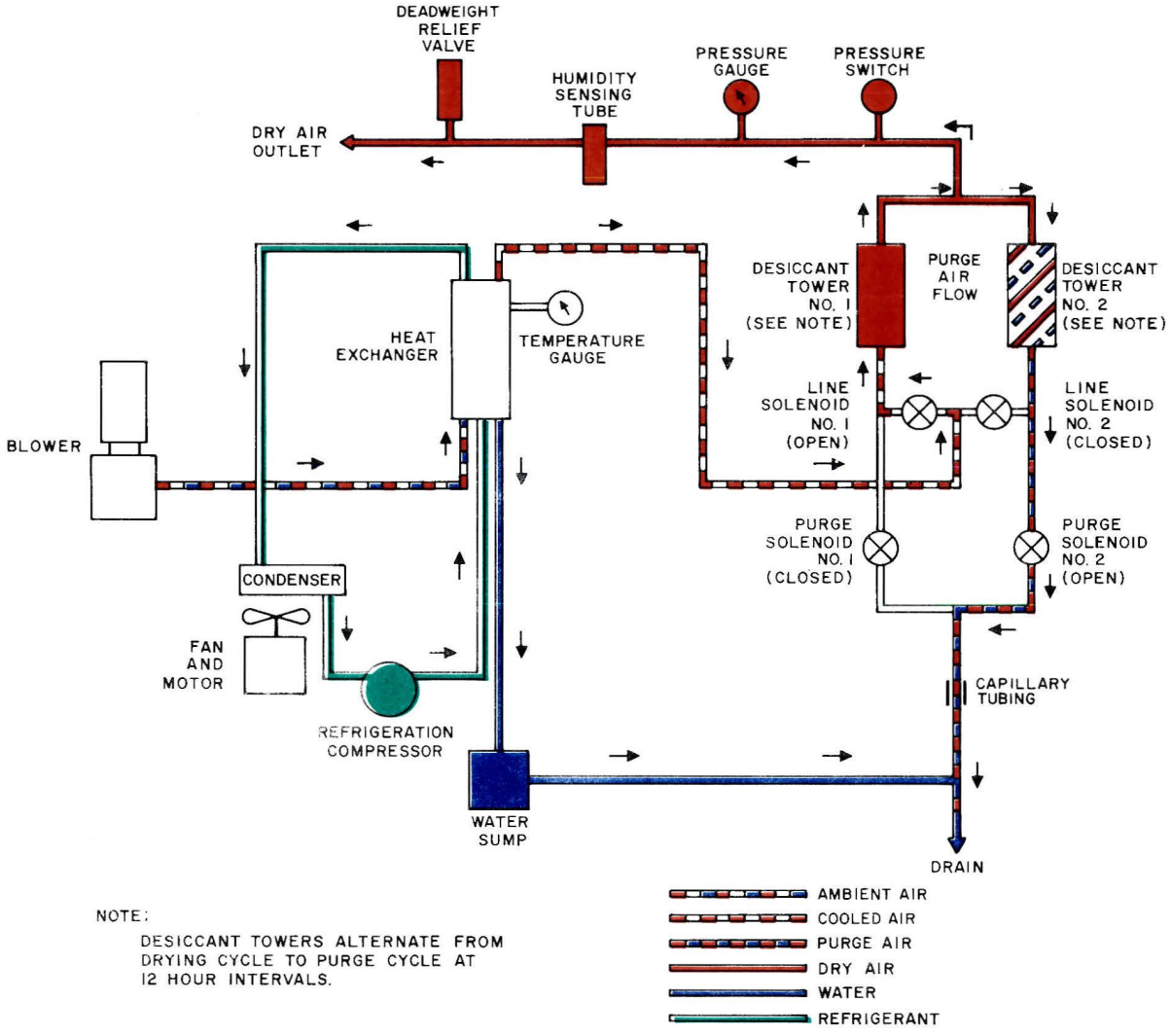

Fig. 10—KS-20183 L2 and L3 Air Dryers—Flow Diagram

from the desiccant tower is monitored by the humidity and pressure alarms and flows to the dry air outlet. A small portion of the dry air output is routed to the other tower for purging (3.04).

REFRIGERATION SYSTEM

3.02 The refrigeration compressor and fan motor operate continuously. The refrigeration unit maintains the heat exchanger temperature at approximately 40°F.

ELECTRICAL SYSTEM

3.03 The wiring schematics of the KS-20183 L2 and L3 air dryers are shown in Fig. 11 through 14.

DESICCANT TOWERS

3.04 Air flow to the desiccant towers is automatically diverted from one tower to the other every twelve hours by the timer controlled solenoid valves. When the air is rerouted, the timer automatically energizes the heater in the tower to be reactivated. The desiccant is reactivated by a combination of heating and purging by a portion of the dry air output of the other tower. The heater remains energized for a minimum of four hours. The reactivated tower then cools, with the aid of a continuous purge air flow, for the remaining portion of the cycle.

Warning: Avoid contact with the tower during and immediately after the heating period. The outer surface of the tower reaches temperatures of over 250°F during this period.

4. REQUIREMENTS AND ADJUSTING PROCEDURES

DRYER SHUTDOWN

4.01 When removing a dryer from service, follow local instructions regarding the need for providing a substitute air source.

DISABLING ALARMS

4.02 Before either moving the ON-OFF switch to the OFF position or making adjustments that might cause an undesired alarm operation, disable the alarm circuit.

CLEANING

4.03 ***General:*** Failure to keep the equipment clean may result in excessive maintenance.

Caution: Before starting to clean the dryer, de-energize the power supply and move the ON-OFF switch to the OFF position. If either tower is in the heating portion of the reactivation cycle, delay cleaning until the tower has cooled.

4.04 ***Cabinet:*** Clean the cabinet with a clean, dry KS-14666 cloth. Clean the cabinet louvers with an 8 sash brush.

4.05 ***Refrigeration Unit:*** Remove the protective guard. Clean the condenser with a sash brush and vacuum cleaner. Clean the fan blades using a cloth moistened with an approved cleaner then wipe with a dry cloth.

Note: If dryer parts are cleaned with petroleum spirits near dc machinery, provide adequate ventilation beforehand. Use the least amount of petroleum spirits necessary and keep the container closed when not in use. These precautions will prevent the fumes from damaging the dc machinery.

4.06 ***Equipment:*** Clean the external surfaces of the equipment inside the cabinet with a clean, dry cloth.

INTAKE AIR FILTER CANNISTER

4.07 The complete filter cannister shall be replaced when dirty. Replacement procedures are covered in Section 161-309-802. The intervals between replacement will vary with local atmospheric conditions, as follows:

REPLACEMENT INTERVAL	AREA:
6 Months	Heavy Industry, Coal Burning, Heavy Air Pollution
9 Months	Light Industry, Populous, Medium Air Pollution
12 Months	Rural, Mild Air Pollution

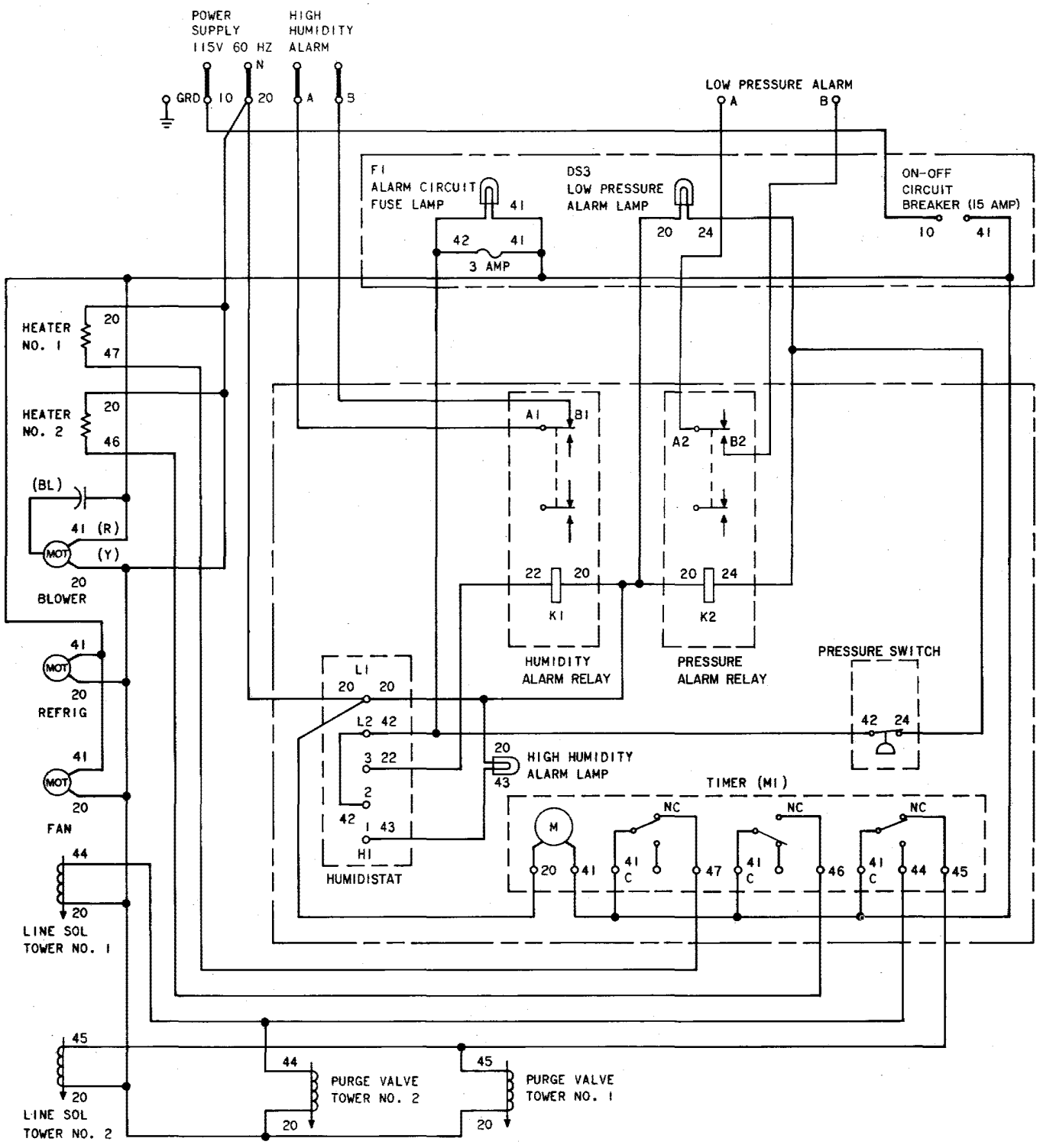

Fig. 11—KS-20183 L2 Air Dryers—Wiring Diagram (L101 and L103 Wiring not Included)

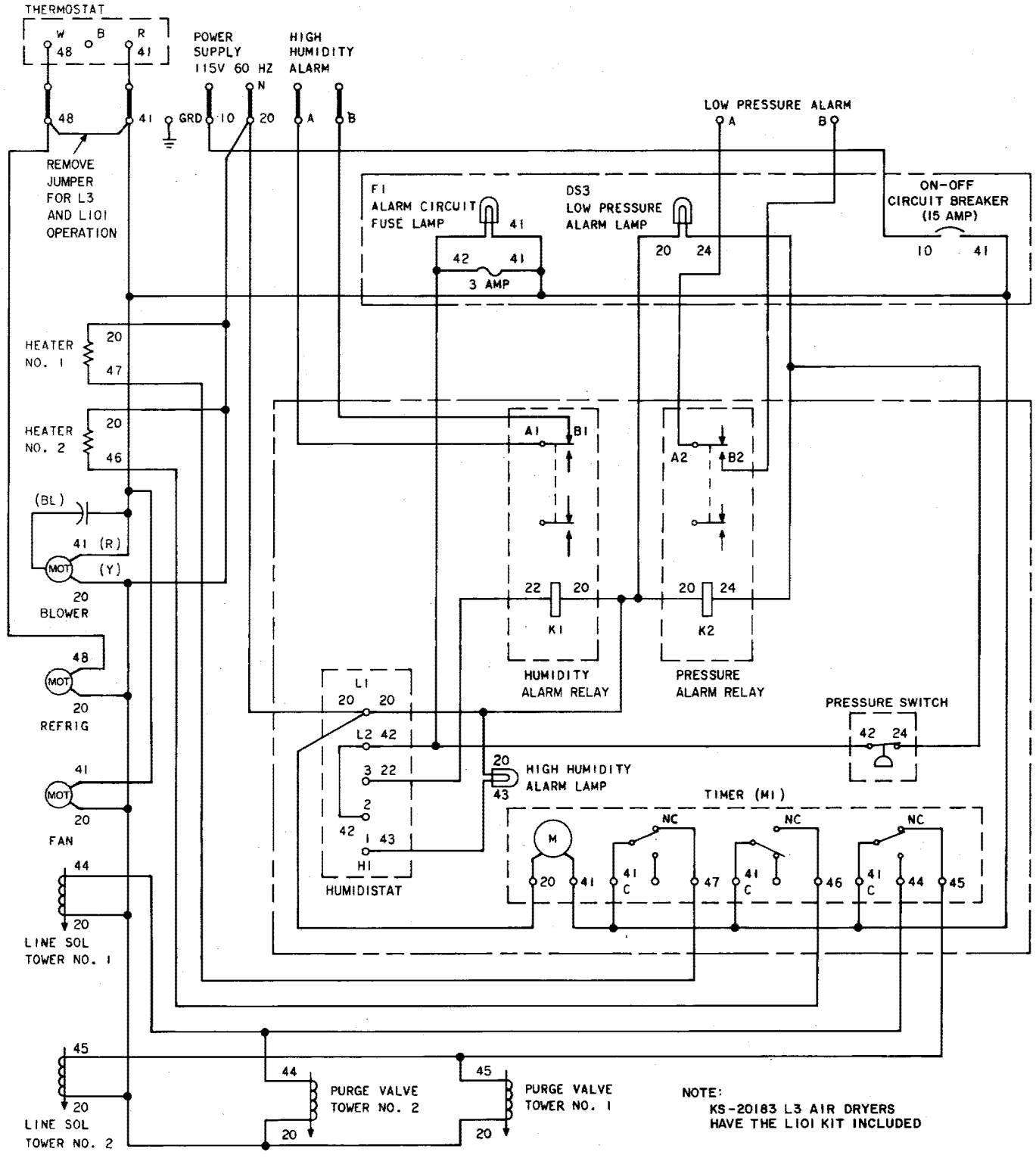

Fig. 12—KS-20183 L2 and L3 Air Dryers—Wiring Diagram (L101 Wiring Included for KS-20183 L2)

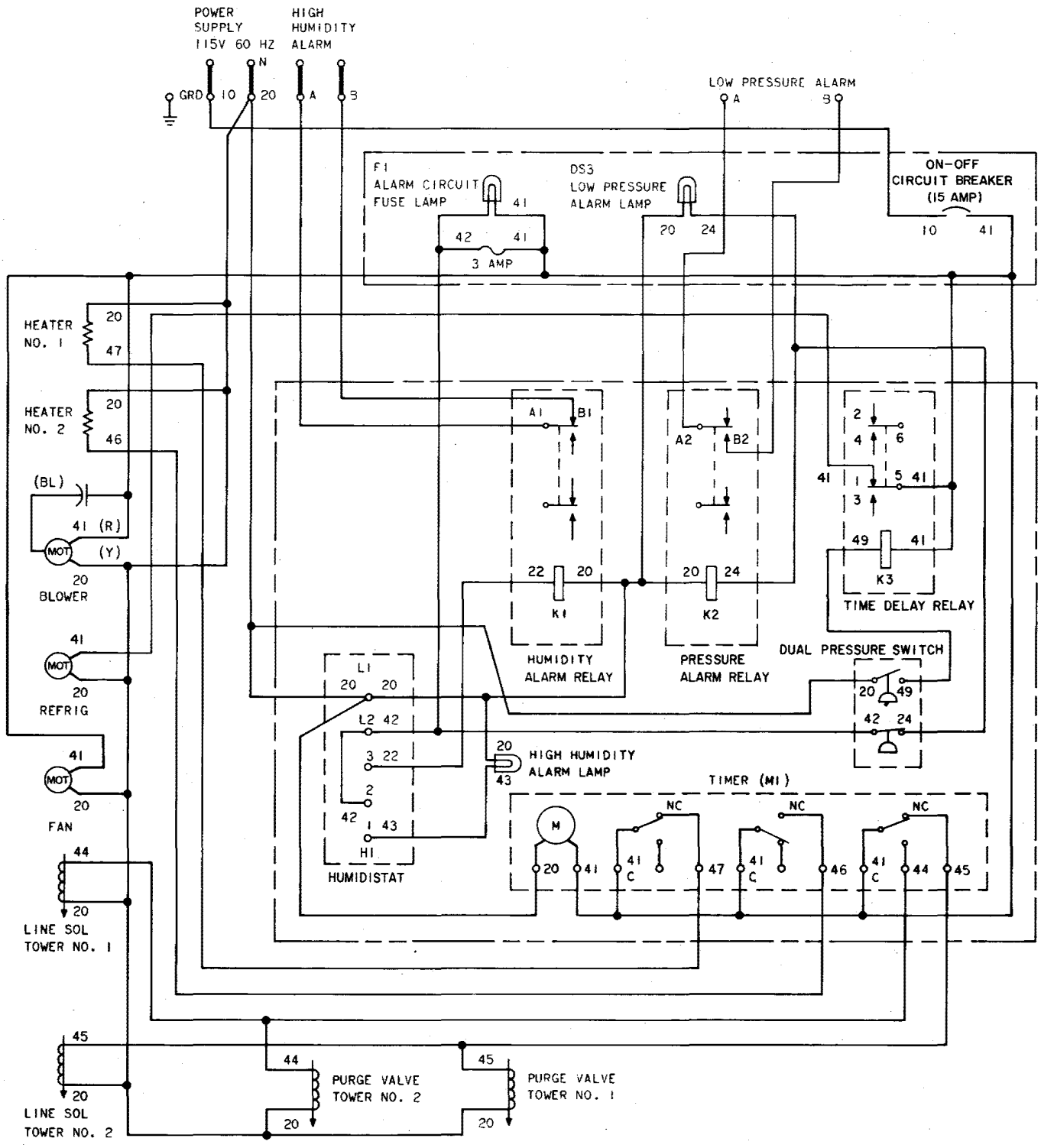

Fig. 13—KS-20183 L2 Air Dryers—Wiring Diagram (L103 Wiring Included)

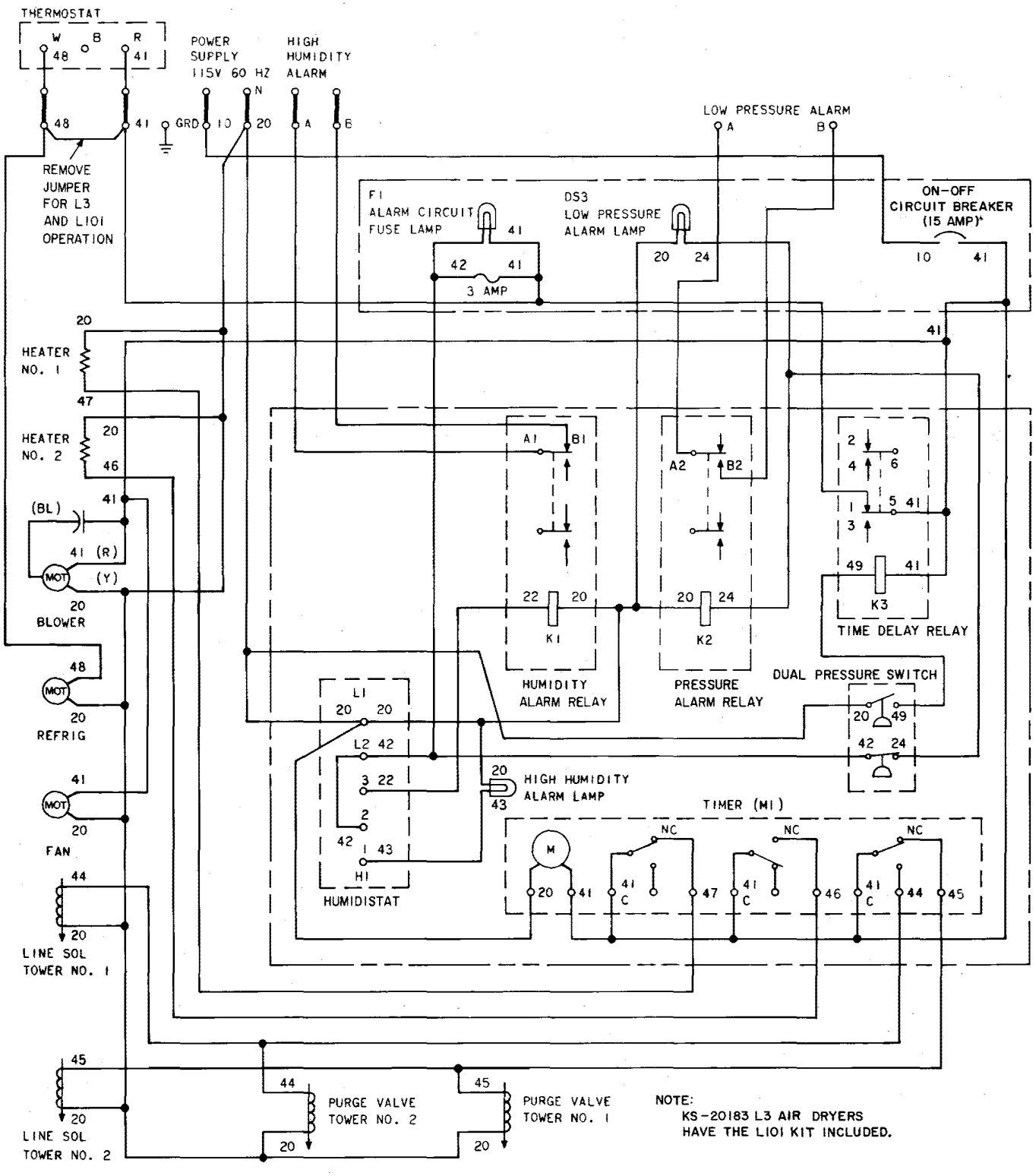

Fig. 14—KS-20183 L2 and L3 Air Dryers—Wiring Diagram (L101 Wiring Included for L2 and L103 Wiring Included for L2 and L3)

Note: If a low pressure condition exists as the result of a clogged filter prior to normal replacement interval, replace the filter as required.

(ROTRON) SPIRAL BLOWER

4.08 The (Rotron) spiral blower is furnished as original equipment on all L2 and L3 dryers.

4.09 ***Lubrication:*** The blower is factory lubricated and sealed. No further lubrication is necessary.

4.10 ***Adjustment:*** The blower is factory adjusted to deliver the proper amount of air to the dryer. This pressure shall be 10 1/2 to 11 wg with the air supply closed off and the dead weight relief valve tied down. If the pressure is not within this range, adjust the pressure as follows:

(1) Move the ON-OFF switch to the OFF position and disconnect the dryer from the ac power supply.

(2) Close off air supply at machine outlet.

(3) Tie down dead weight relief valve.

(4) Check the blower for baffle. If baffle is installed, remove so bleed valve can be adjusted.

(5) Turn bleed valve clockwise (looking at the front of spiral blower) all the way until resistance is met.

(6) Add approximately 4 ounces (about 1/2 cup) of water to sump reservoir).

(7) Turn on dryer.

(8) Adjust bleed valve until pressure gauge reads approximately 10 1/2 to 11 inches water gauge pressure.

(9) Open up air supply and remove dead weight tie-down.

(10) Turn off dryer and reinstall baffle.

(11) Turn on dryer.

4.11 ***Requirement:*** The Rotron spiral blower shall be replaced every four years. (Section 161-309-802)

LOW PRESSURE ALARM

4.12 ***Requirement:*** The low pressure alarm and alarm lamp shall operate when the outlet pressure drops to 1.4 $\pm$0.5 inch of water as indicated on the pressure gauge.

4.13 ***Quarterly Check:*** Check the operation of the low pressure alarm every three months, as follows:

(1) Raise the deadweight relief valve and observe that when the gauge pressure drops to 1.4 $\pm$0.5 inch the alarm operates and the alarm lamp lights.

(2) If the requirement in 4.16 is not met, adjust the pressure switch as covered in 4.14.

(3) If operation is satisfactory, release the valve weight and observe that the alarm resets automatically.

4.14 ***Low Pressure Alarm Adjustments:*** If the switch fails to operate satisfactorily, proceed as follows:

(1) Loosen the two setscrews which hold the switch cover in place, using the 3-inch C screwdriver, and remove the cover.

(2) If the contacts are open with the pressure at 1.4 inches, the adjusting screw should be rotated clockwise until the "just close" point is reached. If the contacts are closed with pressure at 1.4 inches, rotate the adjusting screw counterclockwise until the "just open" point is reached.

(3) Repeat 4.13(1).

(4) After completing the adjustment, remount the switch cover.

HUMIDITY ALARM

4.15 ***Requirement:*** The humidity alarm and alarm lamp are designed to operate if the

relative humidity of the delivered air rises to 4 percent at 70° F.

4.16 ***Quarterly Check:*** The humidity alarm shall be checked every three months, as follows:

(1) Move the ON-OFF switch to the OFF position.

(2) Remove the humidity sensing element from its receptacle. Plug the receptacle opening with a wadded, lint-free cloth, or other suitable plug so that the low pressure alarm will clear when the ON-OFF switch is moved to the ON position.

(3) Wait five minutes and return the ON-OFF switch to the ON position.

(4) After the low pressure alarm has cleared observe that the humidity alarm has operated and the alarm lamp has lighted.

(5) Move the ON-OFF switch to the OFF position.

(6) Remove the temporary plug (2) and return the sensing element to its receptacle. Tighten the packing nut handtight only.

(7) Wait 5 minutes and move the ON-OFF switch to the ON position.

(8) Observe that the alarm resets automatically.

HUMIDITY SENSING ELEMENT

4.17 ***Requirement:*** The humidity sensing element shall be replaced annually. (Section 161-309-802)

Caution: Do not use an ohmmeter to measure the resistance of the sensing element, or apply any voltage to it. This will permanently damage the element. Do not expose the sensing element to temperatures greater than 160°F.

BLOWN FUSE LAMP

4.18 ***Requirement:*** The blown fuse lamp will operate when the 3 ampere fuse operates.

4.19 ***Quarterly Check:*** The blown fuse light shall be checked every three months, as follows:

(1) Remove the fuse holder from the front panel of the dryer.

(2) Remove the fuse from the holder and reinsert the holder. Check that the lamp lights.

(3) Remove the fuse holder from the panel and return the fuse to the holder.

(4) Reinsert the holder.

TIMER

4.20 ***Requirement:*** The timer assembly shall be replaced every five years. (Section 161-309-802)

FINAL CHECK

4.21 Make certain cabinet covers are closed securely and that the ON-OFF switch is in the ON position. Make certain the temperature gauge and pressure gauge indicate proper operating temperature and pressure and alarm lamps have automatically reset.

5. DIAGNOSING ALARM OPERATION

5.01 The cause and remedy of an operated humidity or pressure alarm may be determined from observations listed in Tables A and B, respectively.

TABLE A

DIAGNOSING OPERATED HUMIDITY ALARMS

KEY TO HUMIDITY ALARMS

(A) ALARM BEFORE TOWER SHIFT

1. Reactivation inadequate.
2. Excessive air usage.
3. Heater on before tower shift.

(B) ALARM AFTER TOWER SHIFT

1. Tower not sufficiently cooled to permit desiccant to absorb.
2. Solenoid valves permitting purge air in dry air line.
3. Improper reactivation.

CONDITION	CAUSE OR OBSERVATION	REMEDY
Excessive air usage	More than 4 horn reflector antennas being fed.	Additional dryer required.
	Humidity alarm at end of tower cycle.	Excessive leakage on antennas, repair leaks.
	Dead weight relief valve in open position (below 9″ wg.)	Adjust or replace.
	Blower improperly adjusted	Adjust dead end pressure
Defective humidistat	Check operation per 4.15	Replace humidistat per 3.08 in Section 161-309-802
High refrigeration temperature setting	Observe temperature setting greater than 42° F.	Readjust temperature setting
Improper heater reactivation	Check heater operation by rotating timer cam through cycle.	Replace defective tower per 3.12 in Section 161-309-802
Improper timer operation (Timer motor)	Check operation	Replace timer per 3.18 in Section 161-309-802
Improper timer operation (Sequence of timer micro-switches)	Heater energized before tower switch	Readjust sequence
Improper timer operation (Insufficient heating on timer cam)	Heating time (6-8 hrs.) 25 to 33% on cam has shifted	Readjust heating time

TABLE A (Cont)

DIAGNOSING OPERATED HUMIDITY ALARMS

CONDITION	CAUSE OR OBSERVATION	REMEDY
Improper purge flow	Check solenoid valve operation	Repair solenoid with solenoid valve maintenance kit per 3.17 in Section 161-309-802
Excessive heat to tower	Scorched or deteriorated desiccant	Replace tower per 3.12 in Section 161-309-802
Deteriorated desiccant	Humidity alarm before end of drying cycle	Replace desiccant charge

TABLE B

DIAGNOSING OPERATED PRESSURE ALARMS

CONDITION	CAUSE OR OBSERVATION	REMEDY
Excessive airflow	Leak in system or in dryer	Repair or correct leak
Insufficient water in sump	Air lost through water sump	Fill water sump
Low voltage condition	Blower operating at less than full speed	Correct low voltage problem
Hung-up solenoid	Check solenoid operation	Repair with solenoid valve maintenance kit per 3.17 in Section 161-309-802
Defective blower	Loud whining sound from blower	Replace blower per 3.06 in Section 161-309-802
Defective dead-weight relief valve	Leakage from valve under 9″ wg.	Repair or replace valve
Refrigeration freeze-up	Low refrigeration temperature	Shut down dryer for half an hour restart and adjust refrigeration system