INSTRUCTIONS FOR REPAIRING AND TESTING

A. RELIEF VALVES
1. Using 5250126 hexagon wrench, unscrew cap (31Z73). The complete assembly will come out with the cap.
2. Using 5250128 spanner wrench on the body (80283) and 5250126 in the cap, unscrew the cap from the body.
3. Remove spring and seat (33Y56) from body.
4. Reassemble spring and new seat in relief valve body. Screw cap onto body, hand-tight.
5. Screw the complete assembly into the regulator by hand, then using 5250126 hexagon wrench, pull the assembly down tightly. (Use of 5250128 is not necessary in reassembling relief valve.)

B. FIRST- AND SECOND-STAGE SEATS
1. Using 5200075 screwdriver, remove the four screws (85W31) which fasten the top cap (31Z63) to the body.
2. Remove top cap and gasket (77Z69).
3. Hold the yoke (61Z59) to keep it from turning. Using a screwdriver, unscrew the nozzle guide (77Z73).
4. Insert a wire or pin into the hole (located in screwdriver slot) in the nozzle guide and push the valve seat out.
5. Push the new valve seat down into the nozzle guide until it is flush against the bottom of the guide.
6. Screw nozzle guide into yoke. (Hold yoke while tightening.)
7. Complete assembly of regulator being sure the gasket is properly located in the body.

C. FIRST- AND SECOND-STAGE DIAPHRAGMS AND NOZZLES
1. Follow directions in B-1, 2 and 3.
2. Remove sealing wax from locking screw (34Z64) and remove the locking screw and the pressure-adjusting screw (34Z63).
3. Remove bottom cap (31Z64) and guide (77Z72).
4. Turn the yoke (with diaphragm attached) 90 degrees, and slide it down through the body.

NOTE: If the corner of the hex on the nozzle (02Z21 or 02Z26) prevents the yoke from passing through the core in the body, loosen the nozzle (use 127-W), and turn it so that it will not interfere. In reassembling, screw the nozzle into the body, but do not tighten until after the yoke has been inserted. IN TIGHTENING THE NOZZLE, DO NOT USE EXCESSIVE FORCE.

5. If the seating surface of the nozzle is marred, replace the nozzle with a new one.
6. Hold the bottom of the yoke (solid part just above the diaphragm) in a vise and unscrew the nut (85W13). Remove the diaphragm plate (30257), and diaphragm (30258).
7. Assemble the new diaphragm (30258), with diaphragm plate (30257), and nut (85W13) to the yoke.
8. Insert the yoke (with diaphragm attached) up through the body and turn it so that it is at right (Continued on page 3)
*THIS PART SHOULD BE REPLACED ONLY AT A "LINDE" REPAIR STATION.

R-504 Regulator Part No. 5510072
## TOOL LIST

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Tool No.</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP-O</td>
<td>5150015</td>
<td>To adapt regulator to test stand.</td>
</tr>
<tr>
<td>R-501-TV</td>
<td>5150049</td>
<td>First stage test valve.</td>
</tr>
<tr>
<td>R-501-FSTA</td>
<td>5150050</td>
<td>First stage test adaptor.</td>
</tr>
<tr>
<td>RTPA</td>
<td>5150051</td>
<td>Relief valve test adaptor.</td>
</tr>
<tr>
<td>R-501-FSTAW</td>
<td>5150052</td>
<td>Washer for first stage test adaptor.</td>
</tr>
<tr>
<td>IPA</td>
<td>5150062</td>
<td>Injector Plug adaptor for first and second stage test.</td>
</tr>
<tr>
<td>9/16-18 Die</td>
<td>5180010</td>
<td>To redie hose connection on outlet body.</td>
</tr>
<tr>
<td>11/16-20 Die</td>
<td>5180035</td>
<td>To redie body for valve stem assembly.</td>
</tr>
<tr>
<td>Screwdriver</td>
<td>5200075</td>
<td>For clutch type screws.</td>
</tr>
<tr>
<td>48-0-48M</td>
<td>5200115</td>
<td>Kit for assembly of water manometer.</td>
</tr>
<tr>
<td>DHC</td>
<td>5220021</td>
<td>Drop hose for first and second stage test.</td>
</tr>
<tr>
<td>BHC</td>
<td>5220029</td>
<td>Blank hose connection.</td>
</tr>
<tr>
<td>No. 3 “Ezy-out”</td>
<td>5220055</td>
<td>To extract filter from nipple.</td>
</tr>
<tr>
<td>4-LPM-OR</td>
<td>5220057</td>
<td>Orifice for first stage test.</td>
</tr>
<tr>
<td>PGS</td>
<td>5220065</td>
<td>To replace packing gland.</td>
</tr>
<tr>
<td>#77-OR</td>
<td>5220069</td>
<td>To hold inlet nut in position when soldering nipple.</td>
</tr>
<tr>
<td>IPAC</td>
<td>5220077</td>
<td>Orifice for second stage test.</td>
</tr>
<tr>
<td>FTT</td>
<td>5220079</td>
<td>Clamp for “IPA” adaptor.</td>
</tr>
<tr>
<td>ATF</td>
<td>5220080</td>
<td>Tank for flow test.</td>
</tr>
<tr>
<td>ATH</td>
<td>5220081</td>
<td>Hose for aspiration test.</td>
</tr>
<tr>
<td>BNSO</td>
<td>5230127</td>
<td>To reseat hose connection on outlet body.</td>
</tr>
<tr>
<td>3/4-32 Tap</td>
<td>5240003</td>
<td>To retap body for fillister head screw.</td>
</tr>
<tr>
<td>1/4-in. Pipe Tap</td>
<td>5240006</td>
<td>To retap body for gauge.</td>
</tr>
<tr>
<td>1/4-20 Tap</td>
<td>5240007</td>
<td>To retap body for P.A. screw.</td>
</tr>
<tr>
<td>1/4-28 Tap</td>
<td>5240008</td>
<td>To retap body for nozzle.</td>
</tr>
<tr>
<td>9/16-25 Tap</td>
<td>5240034</td>
<td>To retap body for inlet nipple.</td>
</tr>
<tr>
<td>7/8-20 Tap</td>
<td>5240035</td>
<td>To retap body for packing gland.</td>
</tr>
<tr>
<td>#8-32 Tap</td>
<td>5240046</td>
<td>To retap body for fillister head screw.</td>
</tr>
<tr>
<td>3/8-32 Tap</td>
<td>5240067</td>
<td>To retap body for valve stem assembly.</td>
</tr>
<tr>
<td>5-40 Tap</td>
<td>5240086</td>
<td>To retap body for outlet body screw.</td>
</tr>
<tr>
<td>9/16-in. x 3/8-in. Wrench</td>
<td>5250124</td>
<td>For gauge and valve packing nut.</td>
</tr>
<tr>
<td>7/32-in. Hex. Allen</td>
<td>5250126</td>
<td>To remove and replace relief valve cap.</td>
</tr>
<tr>
<td>Spanner Wrench</td>
<td>5250128</td>
<td>For assembling and disassembling safety relief valve.</td>
</tr>
<tr>
<td>1-in. x 1-1/8-in. Wrench</td>
<td>41-W</td>
<td>For inlet connection nut.</td>
</tr>
<tr>
<td>3/8-in. x 7/16-in. Hex. Box</td>
<td>127-W</td>
<td>To remove and replace nozzle and acorn nuts.</td>
</tr>
</tbody>
</table>

(Continued from page 1)

angles to the cross bar in the body and free from bodily contact. The diaphragm must be flush in the body recess.

9. Complete assembly of regulator. (See B-6 and 7.)

10. Reset both stages as described on Page 4 (first-stage) and Page 5 (second-stage) of Test Instructions.


### D. FLOWMETER PARTS

1. Place the regulator in an upright position. Remove the screw (S-B-B-192) and lock washer (W-SHL-4) located at the base of the plastic tube.

2. Unscrew the plastic tube (27284) by hand. (The bumper (78Z62) and insert (88Z35) will remain in place in the tube and the “O” ring (84W84) will come out with the tube.)

3. Unscrew (use 5220065) the gland (82243) and lift out the calibrated tube, gland, and sealing washer (78260). Slide gland and washer off the tube.

4. With one hand, tilt the regulator carefully and permit the ball float (78Z15) and screens (05236) to drop into the other hand. Be sure all 5 screens drop out.

5. Examine all parts carefully and replace any that are worn or damaged.

6. Reassemble the 5 screens, carefully fitting them into place in the body.

7. Slide the gland over the bottom end of the calibrated tube with the small diameter of the gland toward the bottom of the tube. Replace the washer, locating it about 1/8-in. from the bottom end of the tube.

8. Position the calibrated tube in the body so that the center-line of the calibration scale is in line with the center-line of the flow-adjusting valve. Using 5220065, tighten the gland, but do not use excessive force.

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9. Drop the ball float gently into the tube from the top.
10. Screw the plastic tube (with the "O" ring on it) into place, tightening it firmly by hand.
11. Replace the lock washer and screw.

E. VALVE LEAKAGE
1. If there is leakage around the stem, replace the "O" packing ring. To allow the "O" ring to function properly, pull the packing nut down snug, but not too tight.

F. INLET NIPPLE FILTER
1. Remove the filter (71233) with a No. 3 "Ezy-out" (5220055) or a suitable wood screw.
2. Press the new filter into position against the shoulder in the nipple.

G. INLET NIPPLE
1. Using 5250124 remove the gauge. (Care should be used so the chrome finish will not be damaged.)
2. Using 127-W remove the two acorn nuts (N-HAB7) and lock washers (W-SH-L-22).
3. Pull the nipple assembly off the two studs. If gasket 82210 comes out with the assembly, remove it.
4. Hold the assembly between fibre or wooden vise jaws and assemble a 6425 adaptor to the inlet nipple. Tighten the connection nut on the 6425 adaptor using two suitable wrenches.
5. With just a little heat on the nipple and a wrench used on nut (36233), the nipple (03270) will break loose.
6. Using the wrench on the nut, screw the nipple out of the body.
7. Remove the 6425 adaptor. Disassemble the nut and washers from the nipple.
8. Examine the nut and washers. If they are damaged or show signs of excessive wear, they should be replaced.
9. Clean the threads of the new nipple with a wire brush.
10. Assemble the three anti-friction washers in the nut with the hardened washer (53243) in the middle. Slide the nut onto the nipple and using two wrenches, tighten 6425 adaptor in the nut.
11. Apply sufficient heat to cause the solder left in the body to start to melt. While the solder is still soft, insert the nipple into the body and screw it in about three threads.
12. Heat the nipple, apply soldering paste or acid, then tin the threads.
13. Use just enough heat at the joint to keep the solder soft. Screw the nipple all the way in and run a fillet of solder around the joint. This operation should be done without damage to the chrome, although it may become discolored.
14. Wash the part in a solution of Oakite and hot water.
15. Insert filter in nipple. Follow direction in F-2.
16. Replace the gasket (82210) being sure the new gasket is down flush in the body (80252) recess.
17. Reassemble the body and nipple assembly to the regulator. Reassemble gauge to regulator.

H. INJECTOR PARTS
1. The injector parts are assembled in the regulator after all tests prior to the injector tests have been made.
2. Before assembling injector parts in regulator, apply anti-friction compound No. 61 to wall of injector chamber in flowmeter body and around the shoulder of the outlet body, where it contacts the flowmeter body. Do not screw the throat all the way in. Do not assemble the lock screw until aspiration adjustment has been made.

TESTING INSTRUCTIONS
Nitrogen or oxygen may be used in testing the R-504 regulator.
If a regulator has been completely disassembled, or if repairs have been made in either stage, the following tests and adjustments must be made.

First-Stage Test and Adjustment

A. SETUP
1. Remove all parts (including nozzle) of the first-stage relief valve from regulator and replace with washer R-501-FSTAW and adaptor R-501-FSTA.

3. Using 3380 Nut, assemble 4 LPM-OR to R-501-TV.

NOTE: Check accuracy of the DHC drop hose gauge. (See R Sec. 4-B, Item 3, Page 2.)

B. DELIVERY TEST AND ADJUSTMENT
1. Set supply pressure at 1100 psi.
2. Open test valve R-501-TV wide. Reading on test gauge should be 140-160 psi. If reading
is not within this range, readjustment of delivery pressure is necessary. This adjustment is made as follows:

Using a screwdriver, remove screw 34264, then turn the pressure adjusting screw (34263) until a reading of 150 psi is obtained on the DHC gauge. Alternately open and close the R-501-TV valve. If necessary, reset at 150 psi. Screw in the locking screw (34264) until the needle on the DHC gauge just starts to deflect.

**C. CREEP TEST**

1. Using same setup as in "B" above, open and close test valve rapidly a few times, then close tightly. Creep should not exceed 20 psi.

**Second-Stage Test and Adjustment**

**A. SETUP**

1. Remove all parts (including injector) from injector chamber of flowmeter body and replace with adapter IPA held in place by clamp IPAC.
2. Attach DHC drop hose to IPA adapter. Replace DHC hose with 3395 needle valve.
3. Using 3380 nut, assemble No. 77-OR to 3395 needle valve.

**B. DELIVERY TEST AND ADJUSTMENT**

1. Use 1100 psi inlet pressure. Be sure the calibrated tube is in the vertical position.
2. Open flow adjusting valve and needle valve 3395, wide. Reading on test gauge should be 95-105 psi. If reading is not within this range, readjustment of delivery pressure is necessary. This adjustment is made as follows:

   Using a screwdriver, remove screw 34264, then turn the pressure-adjusting screw (34263) until a reading of 100 psi is obtained on the DHC gauge. Alternately open and close the needle valve. If necessary, reset at 100 psi. Screw in the locking screw (34264) until the needle on the DHC gauge just starts to deflect.
3. Check ball reading in calibrated tube. Ball should read between 77 and 80 per cent for reasonable assurance that there are no cross leaks within the rotameter tube and the plastic external tube, and that the second stage has been correctly set - that is, that all the gas going through the orifice is also going through the calibrated tube.

**C. LEAK TEST**

1. Use 1600 to 2000 psi inlet pressure. Remove DHC hose, needle valve and No. 77-OR orifice from the IPA adapter. Blank off the IPA adaptor with the BHC connection and open the flow adjusting valve two full turns.

2. Paint entire regulator with OXWELD No. 23 Leak Test Solution. No leakage anywhere is permissible.
3. Clean the regulator carefully to remove all solution.
4. Remove the BHC connection, and using the thumb and forefinger, close the flow adjusting valve finger tight.
5. Check for bubble at outlet of the IPA adaptor. The flow adjusting valve should seal when closed finger tight.

**Injector Test and Adjustment**

**A. ASPIRATION ADJUSTMENT**

1. Setup for aspiration adjustment as shown on drawing ATSU.
2. Set inlet pressure at 1100 psi.
3. Fully open and close the flow adjusting valve several times rapidly to allow the injector "O" ring to wear in and seat itself properly.
4. Securely plug the nipple end of the ATH hose into the air intake hole at side of flowmeter body and slowly open the flow adjustment valve until 60 per cent is reached on the flowmeter tube. Water should bubble free in flask.
5. Slowly open the flow adjustment valve until 100 per cent is reached on the flowmeter tube. Using a screwdriver, slowly screw the throat in until the bubbling in the flask has stopped completely and the water level in the glass tube is the same as the water level in the flask. This adjustment must be made, always, from full aspiration to zero aspiration. If, at any time, the water level in the glass tube goes higher than the water level in the flask, the throat should be backed off and a new adjustment made.
6. When adjustment is completed the locking screw should be secured against throat to hold it in place. Remove the ATH hose nipple from the body and proceed with further tests.

**B. FLOW TEST**

1. Setup for flow test as shown on drawing FTSU.
2. Set supply pressure at 110 psi.
3. Close needle valve on FTT tank. Set flowmeter at 100 per cent and check time cycle between 1 psi and 3 psi on manometer. For time cycle see note below:

   **CAUTION:** After check is made, immediately open needle valve on FTT tank to relieve pressure. If this is not done immediately, the water will spill out of the manometer.
at 80 per cent and repeat time cycle check. Relieve tank pressure.

5. Close needle valve on FTT tank. Set flowmeter at 60 per cent and repeat time cycle check. Relieve tank pressure.

NOTE: The following time cycles are for use with the FTT tank only. All regulators should meet the following specifications:

1. No time cycle will be less than 7.8 seconds.
2. No time cycle will be greater than 11.4 seconds.
3. No individual regulator will have a time variation between any settings greater than 2.2 seconds.

**Safety Relief Valve Test**

1. Assemble relief valve test adaptor RVTA to the outlet of a 400 psi regulator.
2. Assemble completely, all relief valve parts (in correct sequence) in RVTA adaptor.

3. Cover relief valves with OXWELD No. 23 leak test solution and apply pressure.
4. First-stage valve should start to vent between 225, 275 psi; second-stage between 125 and 175 psi.
5. First-stage valve should completely reseal at 175 psi, or above; second-stage at 75 psi, or above.

**Appearance**

1. The calibrated tube must be positioned so that the center-line of the calibration scale is in line with the center-line of the flow-adjusting valve.
2. The gauge face must face square and toward the flowmeter tube.
3. The regulator must present a clean, lacquered appearance. The gauge crystal and transparent outer tube must be clean and free from lacquer, and other conditions which would make reading the calibration difficult.

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REPAIR MANUAL
Sec. 119-A, Item 1-B

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