



Models 15LH, 15LHX Small Volume High Pressure Regulator (Loader) MAINTENANCE INSTRUCTIONS

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NOTE: The following drawings form a part of this Instruction:

Assembly Drawing:	As Applicable
Parts List:	As Applicable
Special Tools:	041-00006

Refer to Section VII Appendix for the applicable assembly drawing and parts list. Item numbers used in the test are the same as those on the assembly drawing.

Description of Components

The 15LH/15LHX Regulator body contains the inlet and outlet port fittings and the inlet valve assembly. The regulating diaphragm assembly is mounted over the body cavity at the base of the valve stem unit, and is held in place by the clamp ring and spring barrel. The relief is mounted in the head of the diaphragm bolt.

The spring barrel houses the operating spring, stem unit, and thrust bearing, and is vented to permit flow from relief valve to atmosphere. The handwheel, mounted on the stem unit controls the compression of the operating spring, and the relief valve adjustment is controlled by a screw in the top of the stem unit.

A filter unit is provided inside the inlet port fitting, and a panel mounting plate assembly is included with the unit.

Disassembly Procedure

1. Remove Model 15LH/15LHX Regulator from mounting as follows:
 - a. Remove pressure supply from inlet port.
 - b. Turn handwheel (33) counterclockwise to limit.
 - c. Disconnect line fittings.
 - d. Remove regulator from mounting. If panel mounted, remove cap nut (17), name plate

(22), and handwheel (33). Mounting plate can now be removed.

2. Clamp body of regulator in vise, clamping across port fitting faces. Use soft jaws or protect port fittings with cloth or cardboard.
3. Working through side slot in spring barrel, remove guide button (6) from the stem adjusting nut.
4. Remove spring barrel (1) from body (4), using special wrench 041-00006.
5. Lift out stem unit subassembly and operating spring (3).
6. Remove thrust bearing (32) and shim (61) if any. These may have remained seated either in the spring barrel, or on stem unit.
7. If desired, stem nut (59) may be removed from stem unit (14) by removing snap ring (60) and stop collar (19).
8. Stem unit (14) is not to be further disassembled.
9. Lift out diaphragm assembly from body. Clamp ring (28) is loose. Use care not to damage diaphragm (49) or gasket (11) (if any). Support spring (51) and guide (50) are now free.
10. Disassemble diaphragm assembly as follows:
 - a. Clamp flats of diaphragm bolt (23) in vise, diaphragm up.
 - b. Using 7/16 hex wrench, loosen diaphragm nut (24).

- c. Diaphragm plate (5), diaphragm (49), diaphragm gasket (11), if any, and clamp ring (28) are now free.
- d. Turn diaphragm bolt (23) over and hold flats with 5/8" open end wrench which has been clamped in a visa.
- e. Remove relief valve seat retainer (12). This frees all relief valve parts.

If relief valve seat sticks in relief seat retainer, clamp hex end of retainer carefully in vise. Using 1/16" drift pin, tap end of valve pin very lightly, to force valve seat out. Valve seat and valve pin will drop through retainer.

- 11. Disassemble inlet valve from body as follows:
 - a. Remove inlet seat retainer (13).
 - b. Remove valve seat (21) and valve pin (27) from retainer. If necessary, use 1/16" drift pin and very lightly tap top end of valve pin to force seat out. Inlet valve seat shims are now free.
 - c. Lift out inlet valve and spring.
- 12. Remove body (4) from visa and re-clamp carefully across top and bottom surfaces. Remove port fittings (65).
- 13. Remove filter (48) from inlet port fitting.

Cleaning and Inspection

- 1. All parts should be clean before inspection. Metal parts may be cleaned with a petroleum solvent. Non-metallic parts should be cleaned in a mild alkaline solution with a water rinse.
- 2. Examine all threads and sealing surfaces of valves, valve seats, and port fittings for damage which might impair fluid-tight seals.
- 3. Examine thrust bearing and stem threads for galling or other damage which might impair smooth operation.
- 4. Examine clamping surfaces of body clamp ring, and diaphragm plate, for roughness which might affect diaphragm seal.
- 5. Examine diaphragms and gaskets for damage which might impair sealing, especially at inner and outer edges.
- 6. Examine filter. If feasible, it may be cleaned and re-used. If not, discard and replace with a new one.

Discard any parts found to be defective and replace. Use only RedQ spare parts. The 15LH/15LHX Regulator is manufactured to extremely close tolerances which must be maintained if the regulator is to function properly.

On all spares or replacement parts order, give part #, name, and serial number of the regulator involved.

Lubrication

For best performance, use Molykote Type G lubricant. If hydrocarbons cannot be tolerated in the system, it is permissible to use Kel-F 90 or Fluorolube LG-160 grease, or Fluorolube FS-5 oil. Apply sparingly to the following parts:

- 1. Thread only, inlet and outlet port fittings.
- 2. Thread on spring barrel.
- 3. Thread on stem unit and relief adjusting screw
- 4. Races on thrust bearing.

Regulator parts are now ready for reassembly.

Reassembly Procedure

Provide equipment for bench testing with dry compressed air or nitrogen at rated inlet pressure, while unit is being assembled.

A. BODY UNIT ASSEMBLY

- 1. Install filter unit in one port fitting. This becomes the inlet port fitting.
- 2. Install port fitting (65) in body (4) as follows:
 - a. Clamp body top and bottom carefully and securely in visa with soft jaws.
 - b. Screw in inlet and outlet port fittings, using 140 ft-lb torque on each, to ensure a tight metal-to-metal seal.
- 3. Assemble inlet valve parts and install in body unit (4) as follows:

CAUTION

On model 15LH, inlet and relief valve parts are identical; on 15LHX they are not. Be sure 15LHX parts are correctly identified before assembling.

Also be sure these parts are oriented as shown on the assembly drawing. Avoid "upside down assembly" as this will result in leaks and damage to parts.

- a. Mount body in vise with soft jaws, clamping across port fitting faces.
- b. Insert spring and inlet valve in body recess.
- c. Insert four shims (37) (Part No. 299179, .006" thick) into inlet seat retainer (13).
- d. Insert valve pin and inlet valve seat in inlet seat retainer (13).
- e. Screw inlet seat retainer (13) over valve in body recess. Be sure valve is seated properly, then tighten retainer, using 15 to 17 ft-lb. torque.

4. Before proceeding further, measure projection of valve pin above inlet seat retainer, using depth micrometer.

If pin projects more than .010 or less than .008 inches, disassemble and adjust shims as required to bring this projection within tolerance. (Shim No. 299179 is .006" thick; shim No. 299245 is .002" thick. Use as required).

Torque seat retainer 15 to 17 ft-lb. before measuring.

5. Test inlet valve assembly:
 - a. Mount regulator in bench test set-up.
 - b. Apply rated inlet gas pressure to inlet port and check for leaks at inlet valve and inlet port fitting, using bubble fluid compatible with cleaning requirements.
 - c. If inlet leak is detected, re-torque inlet seat retainer. If leak persists, disassemble and re-inspect valve seating surfaces and retainer threads for damage. Reassemble with care, being sure all parts are seated properly.
 - d. If port fitting leak is detected, re-torque. If leak persists, inspect seating surfaces and threads for damage.
6. After leaks are eliminated, wipe off bubble fluid and continue reassembly.

B. DIAPHRAGM BOLT SUBASSEMBLY

1. Install relief valve parts in diaphragm bolt (23) as follows:
 - a. Drop relief valve spring into cavity in diaphragm bolt.
 - b. Position relief valve over spring.
 - c. Insert end of relief valve pin into cavity in relief seat retainer.

- d. Position relief valve seat over relief valve pin and press into relief seat retainer (no shims on relief valve). This will be a light snap fit.
- e. Screw relief seat retainer into cavity in diaphragm bolt over end of relief valve.
- f. Clamp 5/8" open end wrench in vise. Hold flats of diaphragm bolt in wrench and tighten relief seat retainer, using 15 to 17 ft-lb torque.

NOTE: This torque is necessary to assure proper metal-to-metal seat between retainer, valve seat, and diaphragm bolt.

2. Turn diaphragm bolt over and clamp flats in vise.
3. Before proceeding further, place clamp ring (28) in body (4) and measure distance from top surface of clamp ring to top surface of inlet valve pin, using depth micrometer. Note this reading.
4. Remove clamp ring (28), insert diaphragm (49) in recess in clamp ring, and replace clamp ring in body. Re-measure distance above, and note reading.
5. If the difference between readings (with and without diaphragm) is less than .005 inch, add one diaphragm gasket (11).
6. Position diaphragm gasket (11) (if any) and diaphragm (49) in recess in clamp ring (28), and place clamp ring over diaphragm bolt.
7. Place diaphragm plate (5) over end of diaphragm bolt.
8. Screw diaphragm nut (24) over end of diaphragm bolt (23) and tighten with 7/16" hex wrench, using 3 ft-lb torque.

CAUTION

Do not over-tighten, as this will case the diaphragm to buckle. Use care not to damage diaphragm (49) or gasket (11) with vise jaws.

C. OPERTING PARTS AND FINAL ASSEMBLY

1. Assembly stem unit subassembly as follows:
 - a. If stem nut (59) was removed, replace. Run stem nut to top of threads (left hand thread). Replace spacer (62) (on units with outlet range to 3100 psi), stop collar (19) and snap ring (60).
 - b. Mount thrust bearing (32) and two shims (61) on top shoulder of stem.

2. Clamp body subassembly tightly in vise with soft jaws, holding across port fitting faces.
3. Place support spring (51) in body over head of inlet valve retainer (13) and place spring guide (50) over top of support spring.
4. Insert diaphragm bolt assembly in body (4).
5. Place operating spring (3) over diaphragm bolt and set stem unit inside spring.
6. Screw spring barrel (1) over body unit (4) making sure thrust bearing at top of stem unit seats properly in top of spring barrel. Tighten spring barrel with special wrench 041-0006 using 150ft-lb. torque.
7. Omit mounting attachments until after Performance Tests, Section VI.
8. Install handwheel (33), nameplate (22), and cap nut (17).

Model 15LH/15LHX Regulator is now ready for Performance Tests.

Performance Tests

A. PREPARATION OF UNIT

1. Turn handwheel counterclockwise to limit (this is "off" position) and mount regulator in bench set-up with dry air or nitrogen pressure not exceeding rated inlet, but not less than rated outlet pressure of the regulator being tested.
2. To the outlet line attached a suitable pressure gauge and a means of shutting off outlet flow, such as a needle valve.
3. Admit rated pressure to inlet port of regulator.
4. Check relief mechanism.

NOTE: Normally two bearing shims (61) (at top of stem unit) will give proper relief performance, but number may be varied from zero to three as required to produce the following:

- (1) Continuous venting must occur at a zero outlet setting with relief screw backed out.
- (2) Continuous venting must occur at maximum outlet setting with relief screw turned in.

Proceed as follows:

- a. Close outlet needle valve.
 - b. With handwheel set for zero outlet pressure, turn relief screw counterclockwise at least three turns. There should be no relief venting.
 - c. If no venting occurs at zero outlet; turn handwheel clockwise to get maximum outlet pressure. Turn relief screw clockwise until venting occurs.
 5. If relief mechanism fails to respond as above, correct as follows:
 - a. If venting cannot be stopped at zero outlet; disassemble unit and remove one bearing shim (61) from top of stem unit. If it still cannot be stopped, remove another shim. If venting still occurs, inspect inlet valve parts for damage to threads and sealing surfaces.
 - b. If venting cannot be obtained at maximum outlet setting, add one shim.
 6. For performance test, set relief adjusting screw as follows:
 - a. Close outlet needle valve.
 - b. Turn handwheel clockwise to about 20% of maximum rated outlet pressure.
 - c. Remove cap nut and turn relief adjusting screw clockwise until venting occurs, then turn counterclockwise until venting just stops.
 - d. Replace cap nut.
- ### B. TEST PROCEDURE:
1. Turn handwheel slowly clockwise to get maximum outlet pressure. Outlet pressure should follow smoothly without excessive lags or jumps.
 2. Watch outlet pressure gauge. Outlet locked-up pressure should not creep up.
 3. Crack outlet needle valve momentarily and re-close. Outlet pressure should return quickly to set level and should not creep up.
 4. Check for leaks around port fittings, using soap solution or other bubble fluid compatible with cleaning requirements.
 5. Check for leak through side slot in spring barrel.

It may be necessary to improvise a testing device such as a flexible rubber sleeve around the spring barrel with a pin-hole over the slot. Check for gas flow through the pin-hole, using bubble fluid. If necessary, handwheel may be removed while making this check. Replace handwheel before continuing tests.

6. Turn relief screw clockwise until steady venting occurs. Turn counterclockwise until venting just stops; then turn about one turn further to get a stable setting.
7. Turn handwheel counterclockwise to limit, to give zero outlet pressure. Relief system should bleed outlet pressure as handwheel setting is reduced.
8. Open outlet needle valve. There should be no flow to outlet line.

C. TEST RESULTS:

If the regulator fails to pass the foregoing tests, it must be disassembled and re-inspected as follows, and damaged parts replaced:

1. Erratic response to handwheel may be caused by distorted diaphragm, or out-of-tolerance ends on operating spring.
2. 3. & 8. Outlet creep and flow are caused by inlet valve leak. Inspect inlet seat retainer and inlet valve parts for damage to threads and/or sealing surfaces. Reassemble with care, using 15 to 17 ft-lb torque on inlet seat retainer.
4. If port fittings leak, check torque (140 ft-lb). If leak persists, inspect fittings and body for damage to threads and/or sealing surfaces. Be sure proper lubricant is used on threads.

5. If relief valve is set properly, leak through spring barrel slot may be caused by defective relief valve assembly or by damaged diaphragm. Inspect relief seat retainer and relief valve parts for damage to threads and/or sealing surfaces. Inspect diaphragm for damage especially at inner and outer edges. Reassemble with care, using 5 ft-lb torque on diaphragm nut, and 15 to 17 ft-lb on relief seat retainer.
6. & 7. If relief valve will not stop venting when adjusting screw is turned counterclockwise, or does not bleed outlet pressure as handwheel setting is reduced, inspect relief valve seating and sliding surfaces, and valve spring.

D. FINAL ASSEMBLY

1. After regulator passes satisfactory all tests under Section B. remove handwheel and install mounting plate (29), screws (15), and nuts (16) for panel mounting. Replace handwheel, nameplate, and cap nut.

RedQ Model 15LH/15LHX regulator is now ready for service.

Final adjustments to be made after regulator is installed in its operating location are given in W-15LH-BOO-1, INSTALLATION AND OPERTING INSTRUCTIONS.

Appendix

Assembly Drawing	As Applicable
Installation Drawing	W-15L-BO1
Parts List	As Applicable
Special tools:	Spring Barrel Wrench, 041-00006

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