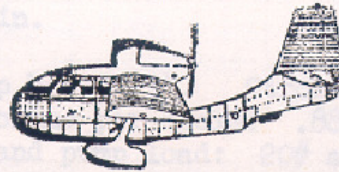


*The*  
**ELECTROL POWERPAK**

*(Model #430)*



MAINTENANCE

MANUAL

**Electrol**

INCORPORATED

**KINGSTON, NEW YORK**

CYLINDERS • SELECTOR VALVES • FOLLOW-UP VALVES  
 CHECK VALVES • RELIEF VALVES • HAND PUMPS  
 POWERPAKS • LANDING GEAR OLEOS • SOLENOID  
 VALVES • ON-OFF VALVES • SERVO CYLINDERS • TRANSFER  
 VALVES • CUT-OUT VALVES • SPEED CONTROL VALVES

**FOR BETTER HYDRAULIC DEVICES**

POWERPAK DATA

1. Operating pressure: 500 p.s.i.
  - (a) Relief valve cracking open at 800 to 1,000 p.s.i.
  - (b) Relief valve closes at 600 p.s.i. min.
2. Hand pump bore: 1". Stroke: 1-1/8".
  - (a) Volume per cycle: .88 cu. In.
  - (b) Hand pump load: 20# at 500 p.s.i.
3. Flap check cracks at 75 p.s.i. max.
4. Reservoir capacity: Approximately 14.5 cu. in. max.
5. Port screens: 60 mesh.
6. Dry weight: Approximately 5#.

## DESCRIPTION

The purpose of this manual is to provide information that will enable users and mechanics to familiarize themselves with the function and operation of the Electrol Powerpak.

As you read and refer to the assembly drawing, which appears in the center of this manual, consider as the "front view" the section where the six plugs are located, and as the "rear view", the section where the plunger and handle are located.

The reservoir is located on the top section of the Powerpak and has two purposes: to supply all necessary fluid to the unit and to act as a surge chamber.

The fluid flows from the reservoir through a Suction Intake Check Valve, composed of a spring, ball and aluminum seat. This unit is located on the front top section of the Powerpak, in the reservoir.

The pump incorporates a double acting piston which discharges pressurized fluid on both the "out" and "in" stroke of the piston. When the piston is actuated on the "out" stroke, it forces fluid into the hydraulic system on one side of the piston head and simultaneously draws fluid from the reservoir on the opposite side. This is accomplished by incorporating a one-way Check Valve in the piston head.

On the "in" stroke of the piston, the action of the Check Valve is the reverse of that on the previous stroke. The Intake Suction Check Valve closes and the compressed fluid flows out the "open" piston check valve into the hydraulic system.

The pressurized fluid is directed by Selector Valves to either of the actuating cylinders.

This selector system is composed of two shafts, each having four cams working against four lifting rods, which in turn un-seats the ball from its seat to permit fluid flow.

When the selector handle is moved, either to an "up" or "down" position, one pressure port and one return port are opened. Pressurized fluid then flows out the pressure port into the actuating cylinder. The fluid, displaced by the movement of the cylinder, flows back through the return port into the reservoir.

A Relief Valve, adjusted to relieve pressure at 1,000 p.s.i., is located on the top section of the Powerpak in the reservoir area. This Relief Valve functions automatically whenever the system becomes pressurized over its maximum operating pressure of 1,000 p.s.i. Below this pressure the Relief Valve is completely closed.

The #1 Check Valve is located behind the "front" upper left retaining plug and is used to retain pressure which has been diverted to the #1 cylinder until the #1 selector handle is moved from its "down" position.

#### TROUBLE SHOOTING

1. Lack of pressure on "in" stroke of piston (A-4058).

Probable cause:

- (a) Intake suction seat becoming dirty or damaged (A-3714).
- (b) "O" ring seal on piston damaged (AN-6227-15).
- (c) Air in system or loose fitting.

2. Lack of pressure on "out" stroke of piston (A-4058).

Probable cause:

- (a) Pressure seat in piston becoming damaged or dirty (A-3714).
- (b) "O" ring seal on piston damaged (AN-6227-15).
- (c) Relief Valve becoming dirty or damaged.

3. Lack of pressure on both "out" and "in" stroke of piston.

Probable cause:

- (a) Relief Valve stuck open.
- (b) Air in system.
- (c) Scored piston chamber.

4. Heavy handle load on hand pump handle.

Probable cause:

- (a) Fluid restriction at selector ball and seat.

Method of locating restriction:

- (1) With Powerpak in place, move selector Handle to position which offers the heavy handle load.
- (2) Remove the return line at the Powerpak. Note: If a selector handle is used as an "arrow", it will always point to the pressurized port when in either actuating position.
- (3) Pump Powerpak: if heavy load is eliminated the restriction is in the return ball and seat. If restriction is still present, then the restriction is on the pressure ball and seat. (see assembly and disassembly instructions to remedy this condition).

5. Cylinder rod creeping "up" with #1 Selector Valve handle in "down" position.

Probable cause:

- (a) Check valve seat damaged (A-4339).
- (b) "O" ring seal on seat damaged (AN-6227-3).
- (c) External leak.
- (d) Internal Powerpak leak at pressure ball and seat. Note: If this condition exists, leakage will be noted externally at selector handle shaft.

6. Leakage around piston stop (A-4059).

Probable cause:

- (a) "O" ring seals damaged on piston stop due to loose linkage (AN-6227-13).
- (b) Piston marred and not sealing (A-4058). Note: Keep Powerpak handle and linkage free of side play.

7. Leakage around retainer plugs (A-4927).

Probable cause:

- (a) "O" ring damaged (ELB-19-6).

- (b) Sealing wall for "O" ring seal marred.
- (c) If a 1/8 (AC895-100) pipe plug is used, instead of a retainer plug and "O" ring seal, tighten same if leak occurs. If tightening of the pipe plug fails to halt leak, remove and "tin" plug.

8. External leakage around selector cam shaft.

Probable cause:

- (a) "O" ring seal located on plunger ball lifter damaged (AN-6227-1).  
(See page for assembly and disassembly to remedy this condition).

DISASSEMBLY AND REASSEMBLY CAUTIONS AND HINTS

1. Keep unit free of foreign material.
2. Use internal snap ring pliers (Sizes #1 and #3) to remove all snap rings.
3. Use generous coating of Vaseline on all "O" ring seal installations to prevent cutting.
4. Removal of external plugs:
  - (a) Apply air pressure to cylinder port nearest plug (A-4927) being removed.
  - (b) Place opposite selector handle in neutral (vertical position).
  - (c) Place selector handle on same side of Powerpak as plug, in a position in which air pressure can be felt under plug being removed.
  - (d) With air pressure applied, gently tap plug.
5. Removal of lifter plungers:
  - (a) Do not remove plungers unless leakage is found externally around selector handle shafts. If it becomes necessary to remove plunger ball lifters (A-4054 or 4055), the following procedure should be followed:  
First, the directions for removing external retainer plugs (A-4927), springs (A-4056 or A-4057), and balls (ELA-16-8) must be followed.  
Next, a pin vise is used to grip the plunger ball

lifters stem via the spring and ball passage chamber. The plunger ball lifter is then pulled straight out through the same passage.

All plunger ball lifter sections on one half of the Powerpak must be relieved of their retainer rings (A-4927), springs (A-4056 and 4057), and balls (ELA-16-8); then remove the small set screw (AN-565-C8-8) on the bottom of the Powerpak to disassemble the selector handle and camshaft.

6. Pressure Plunger installation:

- (a) Remove pipe fittings and their strainers at C1 and C2 ports. (Always assemble pressure chamber before return chamber).
- (b) Obtain a small quantity of beeswax or similar material and roll into a 1/8" diameter roll, 1/4" long. Adhere wax to a 1/8" diameter rod and insert into cylinder port C1 or C2 until wax protrudes into plunger chamber.
- (c) Smooth the surface of wax that protrudes into plunger ball lifter chamber, providing a tangent surface for admittance of "O" ring and plunger.
- (d) Install AN-6227-1 "O" ring on plunger ball lifter (A-4055).
- (e) Coat plunger and "O" ring with lubricating Vaseline and insert carefully into chamber. Do not force or hammer plunger lifter into place; the plunger should work smoothly by the ball seat and wax.
- (f) Remove 1/8" diameter rod and wax using air pressure; blow out remaining wax.

7. Return Plunger installation:

- (a) Insert wax with the 1/8" diameter rod through the return hole that connects the "return plunger chamber" with the reservoir.
- (b) Smooth-off protruding wax.
- (c) Install "O" ring AN-6227-1 on plunger A-4054.
- (d) Lubricate with Vaseline and insert into chamber. (Do not force).
- (e) Remove all traces of wax with air pressure.

SECTIONAL DISASSEMBLY AND REASSEMBLY

1. Relief Valve:

Disassemble and reassemble in the following sequence:

- (a) A-1872 - Screw
- (b) A-1977 - Screw
- (c) A-4976 - Retainer (short).
- (d) A-1976 - Spring
- (e) A-1975 - Retainer (long).
- (f) AN-316-7 - Nut.
- (g) ELA-16-6 - Ball.
- (h) A-4874 - Body.
- (i) A-4873 - Seat.
- (j) ELB-19-5 - "O" ring seal.

Note: Complete relief valve may be removed from unit by loosening A-316-7 lock nut and by unscrewing body.

2. Intake Check Valve:

Disassemble and reassemble in the following sequence:

- (a) NAS-50-43 - Snap ring.
- (b) A-4749 - Strainer.
- (c) NAS-50-43 - Snap ring.
- (d) A-3714 - Check seat and AN-6227-6 "O" ring seal.
- (e) ELA-16-8 - Ball.
- (f) A-1993 - Spring.

Note: Intake seat may be removed by one of two methods:

(1) File method:

- (a) Obtain a rat tail file of sufficient size to be forced into the 1/8" hole of the intake suction seat.
- (b) Force file into seat hole and put out seat.

Use file method only when seat is to be scrapped.

(2) Pressure method:

- (a) Proceed with disassembly procedure steps (a) through (c).
- (b) Place reservoir on Powerpak, but do not bolt fast.
- (c) Fill reservoir with hydraulic fluid.



- (d) Pump Powerpak with handle in any selected position until fluid flows out ports.
- (e) Place both selector handles in neutral (vertical) position.
- (f) Pump hand pump and intake seat will be forced out.
- (g) ELA-16-8 - Ball.
- (h) A-1993 - Spring.

3. Selector Plunger (Ball Lifter) Assembly:

Assemble and disassemble in the following sequence:

- (a) NAS-50-43 - Snap ring.
- (b) A-4927 - Retaining plug.
- (c) A-4056 - Spring (if on pressure port).
- (d) A-4057 - Spring (if on return port).
- (e) ELA-16-8 - Ball.
- (f) A-4055 - Plunger ball lifter.

4. #1 Check Seat Assembly:

Assemble and disassemble in the following sequence:

Note: On late type Powerpak the seat spacers A-4338 and A-4330 were eliminated and the check seats A-4329 were machined into the body.

Old type:

- (a) NAS-50-43 - Snap ring.
- (b) A-4927 - Retainer plug and ELB-19-6 "O" ring seal.
- (c) A-4331 - Spring.
- (d) ELA-16-6 - Ball.
- (e) A-4330 - Spacer.
- (f) A-4329 - Seat.
- (g) AN-6227-3 "O" ring seal.
- (h) A-4338 - Spacer.

Note: #1 check seat A-4329 may be removed by one of two methods:

- (1) File Method:
  - (a) Obtain a rat tail file of sufficient size to be forced into the 1/8" hole of the flap check seat.
  - (b) Force file into seat hole and pull out seat.

Note: Use file method only when seat is to be scrapped.

- (2) Pressure Method:
- (a) Proceed with disassembly procedure steps (a) through (c).
  - (b) Place reservoir on Powerpak but do not fasten.
  - (c) Fill reservoir with fluid.
  - (d) Place wheel selector handle in neutral (vertical) position.
  - (e) Hold ball against seat with drift punch or similar tool.
  - (f) While ball is being held in place pump Powerpak and seat will be forced out.

New type seat:

- (a) NAS-50-43 - Snap ring.
- (b) A-4927 - Retainer plug and ELB-19-6 "O" ring seal.
- (c) A-1993 - Spring.
- (d) ELA-16-8 - Ball.

P A R T S L I S T

TOTAL QUANTITY	PART NUMBER	QUANTITY PER ASSEMBLY	PART NUMBER	DESCRIPTION
	430-R			Powerpak - Aero
1	A4193			Body & Bushing Assembly
1	D4194			Body - Powerpak
1	D4127			Forging - Body
4	A5165			Bushing
4	A1489	2		Bushing
1	A5527			Wheels Lever Assembly
1	A4045			Lever & Shaft Assembly
2	B4046	1		Shaft - Cam
1	A4047			Adapter - Landing Gear
1	A4048			Lever - Landing Gear
2	A4050	1		Pin
4	A4053	1		Pin
1	A4051			Lock & Pin Assembly
1	A4052			Lock - Landing Gear
1	A4977			End - Lock
1		2	A4053	Pin
1	A4087			Spring
1	A4168			Washer
1	NAS50-37			Ring - Snap
1	A4485			Knob - Landing Gear
2	AN565C8-8	1		Screw - Set (Dog Point)
1	A4124			Lever & Shaft Assembly
		1	B4046	Shaft - Cam
1	A4122			Adapter - Wing Flap
1	A4123			Lever - Wing Flap
		1	A4050	Pin
		1	A4053	Pin
1	A4486			Knob - Wing Flap
1	A4601			Insert - Knob
2	A1976	1		Spring
12	ELA16-8	1		Ball - Precision Ground
		1	AN565C8-8	Screw - Set (Dog Point)
8	AN6227-1			Packing - "O" ring
4	A4054			Plunger
4	A4055			Plunger

P A R T S L I S T  
(Continued)

TOTAL QUANTITY	PART NUMBER	QUANTITY PER ASSEMBLY	PART NUMBER	DESCRIPTION
		9	ELA16-8	Ball - Precision Ground
4	A4056			Spring
4	A4057			Spring
3	A1993	1		Spring
10	ELB19-6			Packing - "O" Ring
10	A4927			Plug
13	NAS50-43	10		Ring - Snap
1	ELB19-5			Packing - "O" Ring
1	A4873			Seat - Relief Valve
1	A4874			Boy - relief Valve
1	AN316-7R			Nut - Check
1	ELA16-6			Ball - Precision Ground
1	A1975			Retainer - Spring
		1	A1976	Spring
1	A4976			Retainer - Spring
1	A1977			Screw - Set
1	A1872			Screw - Lock
1	A4058			Piston - Hand Pump
		2	A1993	Spring
		2	ELA16-8	Ball - Precision Ground
2	AN6227-6			Packing - "O" Ring
2	A3714			Seat - Valve
1	A4749			Strainer - Suction
		3	NAS50-43	Ring - Snap
1	AN6227-13			Packing - "O" Ring
1	AN6227-15			Packing - "O" Ring
1	ELB19-16			Packing
1	A4059			Stop - Piston
1	NAS50-106			Ring - Snap
1	B4063			Fork & Tube Assembly
1	A4064			Fork
		2	A1489	Bushing
1	D4066			Tube - Handle
1	AN425AD4-16			Rivet - Flat Head
1	A4368			Grip - Handle

P A R T S   L I S T  
(Continued)

TOTAL QUANTITY	PART NUMBER	QUANTITY PER ASSEMBLY	PART NUMBER	DESCRIPTION
1	AN44-10A			Bolt - Eye
1	AN364-52A			Nut - Self-locking
1	A4067			Link
1	AN24-13A			Bolt - Clevis
2	AN24-17A			Bolt - Clevis
3	AN364-428			Nut - Self-Locking
1	ELB20-13			Gasket - "O" Ring
4	A4750			Strainer - Port
1	A1323			Nameplate
2	AN535-00-2			Screw - Drive

# 4 3 0 P O W E R P A K

(Spare Parts Kit)

Seals and Snap Rings

<u>Quantity</u>	<u>Part No.</u>	<u>Name</u>	<u>Price Each</u>	<u>Total Price</u>
8	AN6227-1	Packing "O" Ring	\$.18	\$1.44
2	AN6227-6	Packing "O" Ring	.18	.36
1	AN6227-13	Packing "O" Ring	.18	.18
1	AN6227-15	Packing "O" Ring	.18	.18
1	ELB19-5	Packing "O" Ring	.09	.09
10	ELB19-6	Packing "O" Ring	.09	.09
1	ELB19-16	Packing "O" Ring	.11	.11
1	ELB20-13	Gasket "O" Ring	.15	.15
1	NAS50-37	Ring - Snap	.05	.05
13	NAS50-43	Ring - Snap	.02	.26
1	NAS50-106	Ring - Snap	.08	<u>.08</u>
				<u>\$3.80</u>