



# **R-SERIES**

## **SHOCK ABSORBER**

### **INSTALLATION, OPERATION, AND SERVICE MANUAL**

[sales@efdyn.com](mailto:sales@efdyn.com)

**7734 E. 11<sup>TH</sup> ST.**

**TULSA, OK 74112**

[www.efdyn.com](http://www.efdyn.com)

**(800) 950-1172**

**FAX (918) 835-3334**



## I. General Instructions

The EFDYN R-Series Model shock absorbers are reliable units designed to cushion a moving load to the most gentle stop possible. They are ruggedly built and will perform for many years of trouble – free service provided adequate maintenance procedures are followed.

### A. Surface Finish

All standard shock absorbers are painted EFDYN Blue per EFDYN Spec. 1-3238-02-01. Shocks used in outdoor environments are painted with Anchor Paint black epoxy #3900. **THE PISTON ROD SHOULD NEVER BE PAINTED.**

### B. Serial Number

Every unit manufactured by EFDYN is assigned a serial number. It is stamped on the unit. This number should always be given when ordering a unit for an identical application or spare parts.

### C. Fluid Filling

All self-contained (spring return, air charge return, and mechanical return) shock absorbers are shipped filled with oil unless special conditions dictate otherwise. Air return shock absorbers are shipped dry. (See Filling Instructions, Section IV).

### D. Spring Return

Spring return models incorporate internal or external springs, which return the piston rod to the outward position with sufficient force to overcome friction. Do not rely on the spring force to return outside members which might be part of the – moving load.

### E. Air Charged Shock Absorbers

Air charged shock absorbers are shipped filled with oil to proper level and without air charge (piston rod in compressed position). Prior to usage unit must be charged to air pressure specified.

## II. INSTALLATION

### A. General

R-Series standard self-contained (spring return) shock absorbers may be mounted horizontally or vertically with piston rod up. If a unit has been specified to operate at an angle of more than five degrees either side of horizontal or vertical centerline, bleeder screws will have not been relocated accordingly before shipment. However, if an accumulator is used, a standard shock absorber may be mounted at any angle.

### B. Mounting Support

1. The supporting structure must be rigid and so constructed that deflection under full stopping force is negligible.



2. The moving load must be well guided and in line with the shock absorber at point of impact. If it is subject to lateral wandering, side forces may be imposed on the piston rod resulting in excessive bearing wear. If the contacting surface on the load is soft in comparison to the cap, a depression may be formed which could trap the bumper cap and result in a bent rod if the load shifts. To avoid this, attach a hardened plate at the point of impact on the moving load.

**C. Protecting Piston Rod**

Trouble free performance depends largely on smooth functioning of the piston rod. Utmost care should be taken during installation and operation to prevent bending, denting, scratching or gouging.

**D. Special Safety Measures**

1. Mounting screws should be of high strength alloy steel.
2. External mechanical stops are recommended for the load, set to contact just before the bumper cap on the piston rod strikes the shock absorber front head. This added protection is desirable in order to prevent the bumper cap from impinging against the front head.
3. Back up bar, keyed or welded to base, must be provided at rear of lug mounted models to prevent shear loading on mounting bolts.
4. Run the load into the bumper at slow speed (after the shock absorber has been mounted and filled) to test for proper operation.

**III. HYDRAULIC FLUIDS**

**Dexron®-III/ Mercon® Hydraulic Fluid**

Typical specifications are:

Gravity API .....	31.0
Viscosity, Saybolt Universal Seconds	
at 100 degrees F .....	175
at 210 degrees F .....	51
Viscosity, CP, Brookfield (CRC L-45)	
At -40 degrees F .....	17,500
Viscosity Index ASTM D-2270 .....	183
Flash, COC Degrees F .....	367
Pour Point, Degrees F (not less than) .....	-60
Corrosion – ASTM D-665 .....	Pass
Color .....	Red



#### IV. **OIL FILLING**

- A. With shock absorber in a horizontal fill port up position, remove filler port plug.
- B. Remove bleeder screw.
- C. Pour oil into filler port until a steady flow of oil without air bubbles emerges from the bleed screw hole. Let shock absorber oil level bleed down to the bleed screw hole.
- D. Replace filler port plug and bleeder screw.
- E. Force piston rod in slowly several times.
- F. Remove port plug and bleed screw – recheck oil level, adding more if required. DO NOT OVERFILL - This can cause distortion of the outer jacket tube during operation.

#### V. **OPERATION**

##### A. **Uniform Deceleration**

This principle governing the operation of EFDYN shock absorbers provides the gentlest possible cushioning throughout the complete stopping range. The precision non-adjustable orifices specifically engineered and designed for conditions of each load range to ensure optimum performance.

##### 1. Velocity

If the load to be stopped has no propelling force (such as gravity, air cylinder, hydraulic or electric drive) then the stopping force results from inertia only – velocity at impact does not affect uniform deceleration. Under these conditions hydraulic pressure in the shock absorber will be proportional to impact velocity which is limited to the maximum capacity rating of the shock absorber.

##### 2. Propelling Force

If any significant propelling force is present, any change in moving load weight, velocity, or propelling force will adversely affect the stopping characteristics of the shock absorber. For all practical purposes, a load variation of 15% above or below the design load will not seriously alter the uniform deceleration characteristics of the shock absorber.

##### B. **Operating Temperature**

1. Range with Dexron®-III/ Mercon® Hydraulic Fluid ---- -40 to +190 F
2. Temperature Rise: Hydraulic shock absorbers convert all the kinetic energy of the moving load into heat during operation. This heat build-up causes a temperature rise within the shock absorber which is proportional to the energy absorbed, cycle rate, bore and stroke of the shock and ambient temperature. Radiation from the sun or other hot bodies and contact area of mounting members are factors to be considered.



### **C. Other factors Influencing Successful Operation**

1. Polyurethane rod packings are standard on all EFDYN shock absorbers. Petroleum base and silicone fluids are compatible with these compounds. The shock absorber should be flushed with a suitable flushing agent when changing from one type of oil to another.
2. A polyurethane wiper-scraper is provided on the piston rod to effectively exclude contaminants from vital working parts.
3. Hydraulic fluid used must be clean, free from contaminants and filtered to a cleanliness level of 100 microns absolute.
4. Do not use fire resistant fluids unless packing compatibility has been determined. Special piston rod packing is required for phosphate ester fluids.

## **VI. MAINTENANCE**

EFDYN shock absorbers will provide many years of trouble-free service provided they are properly maintained. To ensure optimum performance, they should be inspected periodically for wear and proper fluid operating level. Heavy-duty applications require more frequent maintenance.

Replacement of working parts should be made to prevent irreparable damage.

The following service inspection schedule is recommended:

<u>Class of Service</u>	<u>Inspection Schedule</u>
<u>Heavy Duty</u> (Foundries, Steel Mills, High cycle applications, outdoor service)	60 days
<u>Moderate Duty</u> (Automotive plants, Packaging Plants, Low cycle applications, Indoor service)	120 days

### **A. Oil Replacement**

A small amount of oil wipage is normal at the piston rod gland. In fact, if a controlled amount of lubrication were not present, the seals would run dry and wear out prematurely. After long service, the piston rod seals will wear to the extent that oil replacement will become necessary more frequently. Replacement oil must be filtered to at least 100 microns (absolute) and be the same type as is in the unit. (See Section IV)

## B. Parts Replacement

1. A new set of packing and seals may be ordered and installed if oil loss becomes excessive after long service. These packing and seal kits consist of the following parts:

<u>Item No.</u>	<u>Description</u>	<u>No. Required</u>
10	Rod Wiper Standard	1
15	Gland Seal	1
26	Bleeder Screw	2
56	Rod Seal (Standard)	1

2. Replacement can be made as follows:
  - a. Remove bumper retaining screw and the bumper cap (taking care not to score the piston rod).
  - b. Place unit in a vertical position with piston rod upward and remove snap ring at the front head. (CAUTION – Piston rod assembly is spring-loaded. It is recommended that the unit be placed under a press prior to removing the snap ring).
  - c. With piston rod restrained against return spring force the gland may be removed by compressing the rod and allowing the piston rod assembly to bump out the gland on return.
  - d. Slowly relieve rod restraint and remove piston rod and gland assembly.
  - e. Remove gland and retainer assembly from piston rod.
  - f. Remove rod seal from gland, notice that rod seal lip ends face inward into gland. Remove rod wiper from retainer and gland seal from gland.
  - g. Install new rod seal, rod wiper and gland seal.
3. The gland Assembly (item no. 118), should be checked at the time of disassembly. If there is evidence of excessive wear or scoring of gland bearing, the Gland Assembly and Wiper Retainer (item no. 59) should be replaced.
4. Inspect the piston ring and the piston bearing for wear or scoring. If these signs are present, the parts should be replaced.
5. To replace Rod Seal Assembly (item no. 88):
  - a. Remove bumper cap.
  - b. Hold piston and rod assembly vertically in bench vise by clamping on piston nut.
  - c. Place “torpedo” (EFDYN assembly tool item #148) against matching holes.
  - d. Pre-assemble Gland Assembly (item #188), Rod Seal (item #56), Wiper Retainer (item #59, Rod Wiper (item #10) and Wiper Retainer Snap Ring (item #16) as a group and slide over “torpedo” onto piston rod.
  - e. Replace bumper cap and secure cap screw with a medium strength thread locking fluid. Torque cap screw (item @21) to 1000 in lbs.

6. Replace Gland Seal (item #15) in groove of gland assembly.
7. Before re-assembling unit, inspect the cylinder bore for wear marks or scoring. Bore was originally honed to a 10 – 15 micro-finish. If the bore is scored, shock absorber performance could be adversely affected by oil leakage past the piston ring. Proceed as follows:
  - a. Remove springs and spring spacers.
  - b. Remove hydraulic oil from unit.
  - c. Inspect bore – re-hone if necessary.
  - d. Replace springs and spring spacers.
8. To re-assemble shock absorber:
  - a. Place unit under arbor press.
  - b. Insert piston ring starting sleeve (item #86) in open bore of front head. Since return spring will extend beyond the head, starting sleeve must be passed over spring.
  - c. Place pre-assembled piston and rod assembly on spring and press in slowly until piston has entered the cylinder bore about 3 ½ inches beyond the starting sleeve.
  - d. Hold assembly in place and remove starting sleeve.
  - e. Press gland and rod seal assembly into head bore and insert rod wiper retainer ring (item #16).
  - f. Release press and replenish oil as required.
  - g. Compress and retract piston rod several times to ensure ease of piston rod return and proper assembly. The gland well around the retaining ring and piston rod should be inspected for leakage or excessive rod wipage (heavy film on rod) to ensure packing tightness.
  - h. Unit should be ready for operation.

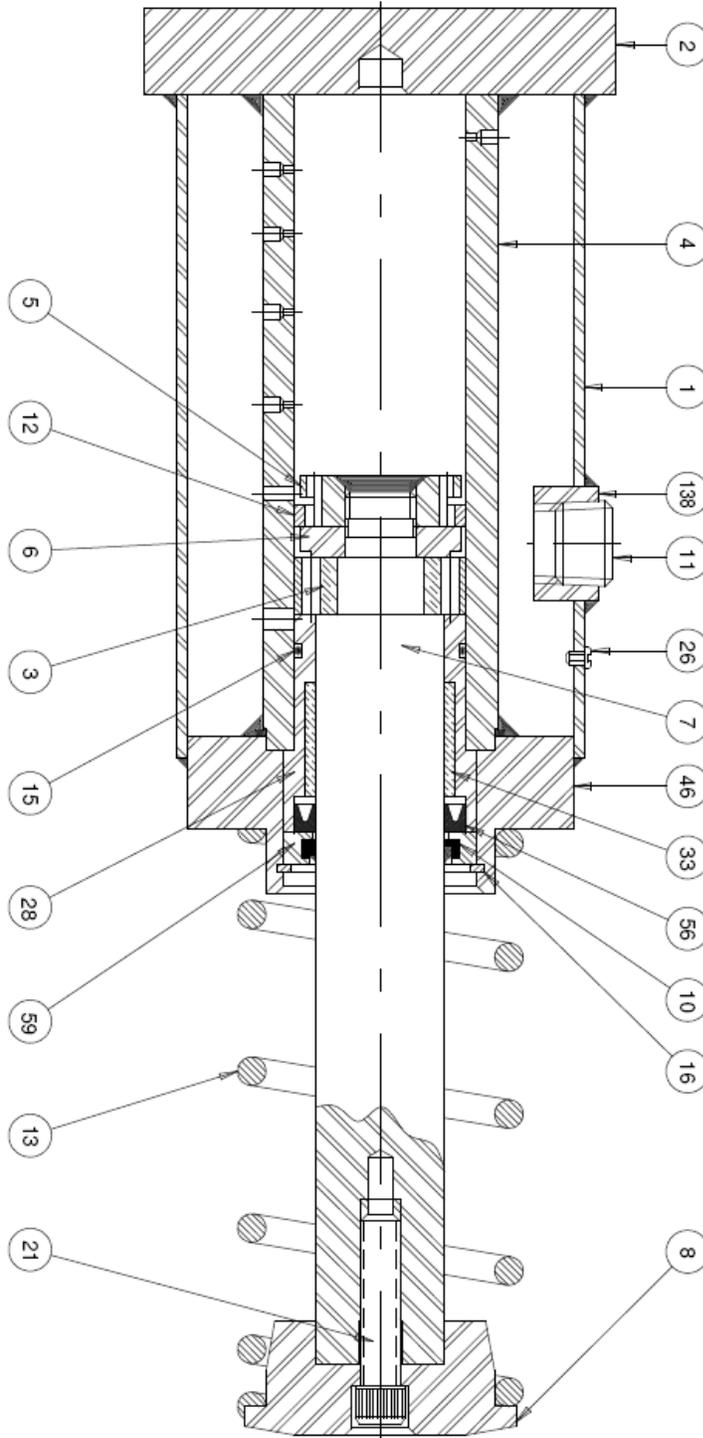
## TROUBLE SHOOTING

DIFFICULTY	POSSIBLE CAUSE	REMEDY
A. Piston rod fails to return outward when load is removed. (continued)	2) Dents or gouges on surface of piston rod caused by hard objects striking it.	If a piston rod is bent, or the surface is significantly damaged it is usually best to order a new piston rod assembly rather than try to straighten or smooth the damaged part. Such repairs are difficult to perform effectively enough to prevent further rod seal damage.
	3) Bent piston rod.	
	4) Broken piston ring. (Foreign matter wedged between piston and cylinder wall).	Remove piston rod assembly and examine piston ring for breakage; especially at thin joint sections. If piston ring is broken or shows evidence of excessive wear or scoring, examine hydraulic fluid for contamination. If cylinder walls are not scored, replace piston ring, purge unit clean and refill with clean fluid.
<b>B. Improper Cushioning</b>		
1) Load meets little or no resistance during the stroke and hammers heavily at end of stroke.	a) Oil level low.	Refill properly-See Section IV.
	b) Load conditions not matched to shock absorber orificing.	Consult factory.
	c) Worn or broken piston ring, causing excessive oil bypass to rod end of piston.	Remove piston rod assembly and examine piston ring. If wear or damage is evident replace ring.
2) Load jars heavily at beginning of stroke, but finishes stroke gently.	Load conditions not matched to shock absorber orificing.	Consult factory.
3) Load jars heavily at beginning of stroke and does not complete full stroke.	a) Shock absorber is over filled with fluid and there is no room for piston rod displacement. (This is apt to rupture outer jacket tube or blow seals).	Bleed off excess oil to proper fill point. (See Section IV).
	b) Load conditions not matched to shock absorber orificing.	Consult factory.

DIFFICULTY	POSSIBLE CAUSE	REMEDY
4) Load cushions softly but jars at end of stroke and then bounces back.	a) Improper load conditions.	Consult Factory.
	b) Excessive aeration of the fluid (soft, springy action) 1. Low oil level.  2. With spring returned, self-contained units, duty cycle may be too high.	Refill properly. (See Section IV). Install external accumulator.
	c) Mounting structure too flexible for transmitted stopping forces.	Stiffen unit mounting structure or use shock absorber with longer stroke. In cases of emergency, operate at reduced velocity.
C. Excessive ware or scoring of piston rod and / or rod bearing.	Hydraulic fluid is contaminated with abrasive particles.	Purge and refill with clean fluid.

## "R" Series Part List

<b>ITEM NO.</b>	<b>DESCRIPTION</b>
1	Jacket Tube
2	Flange
3	Piston Bearing
4	Pressure Tube
5	Piston Ring Retainer
6	Piston
7	Piston Rod
8	Bumper Cap
10	Rod Wiper
11	Fill Port Plug
12	Piston Ring
13	Return Spring
15	"O" Ring-Gland
16	Retaining Ring-Gland
21	Cap Screw-Bumper
26	Bleed Screw
28	Gland
33	Rod Bearing
46	Front Head
56	Rod Seal
59	Wiper Retainer
138	Fill Port Bushing



6-4608-1-00

**ASSEMBLY, COMPLETE  
"R" Series**

<b>EFDYN INC.</b> 7734 E. 11th STREET TULSA, OK. 74112 Phone: (918) 838-1170 Fax: (918) 838-3334	
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6-4608-1-00 SUPERSEDES 6-4608-0-00  
UPDATED PART NUMBERS

REV.	DATE	C.O.
<b>TOLERANCES AND MACHINED FINISHES UNLESS OTHERWISE SPECIFIED:</b>		
FRACTIONS OR TWO DECIMAL PLACES		± .015
THREE DECIMAL PLACES		± .005
FOUR DECIMAL PLACES		± .0005
ANGLES		± 0.5°
FILLET'S .020 RADIUS		
BREAK SHARP CORNERS .010		
REMOVE BURRS		
MACHINED SURFACES 125 RMS OR BETTER		