



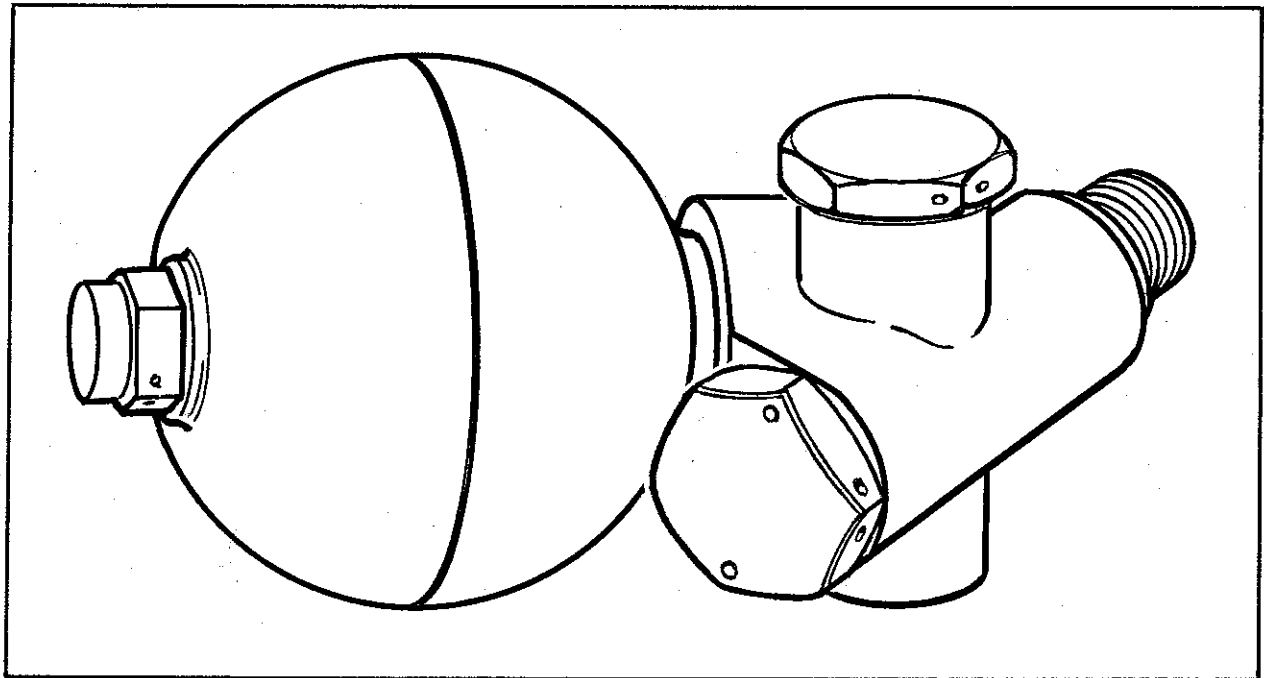
Essex Cryogenics Industries

8213 Gravois Avenue
St. Louis, Missouri 63123

OVERHAUL MANUAL WITH ILLUSTRATED PARTS LIST

HYDRAULIC PUMP RIPPLE ATTENUATOR ASSEMBLY

Part Number 9011520100



29-12-02

Nov. 1/75



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**Overhaul Manual with Illustrated Parts List
P/N 9011520100**

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SERVICE BULLETIN LIST

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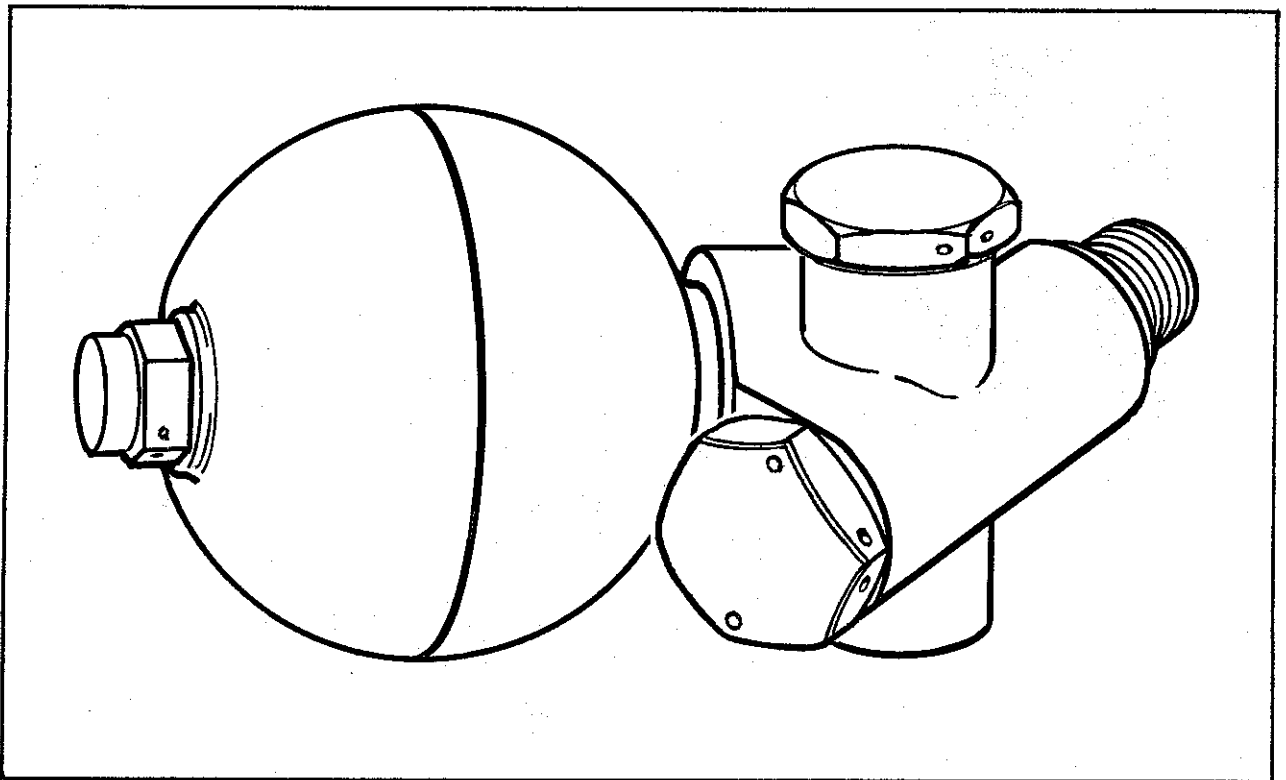
1. Description and Operations

A. Physical Description (See Figures 1 and 2)

- (1) The Hydraulic Pump Ripple Attenuator Assembly is designed for installation in aircraft hydraulic systems.

The Assembly consists of a Spherical Reservoir or Suppressor (7 Figure 8), which when in operation is filled with hydraulic fluid.

Fluid enters the Attenuator through the Stud (2 Figure 8) and leaves the unit through the outlet port of the Housing (9 Figure 8).



**HYDRAULIC PUMP RIPPLE ATTENUATOR ASSEMBLY 9011520100
FIGURE 1**

B. Operation (See Figure 2).

The Hydraulic Pump Ripple Attenuator Assembly functions to dampen out high frequency hydraulic pressure surges, shocks and pulses, by compression and expansion of the hydraulic fluid within the surge chamber or Suppressor, (7 Figure 8).

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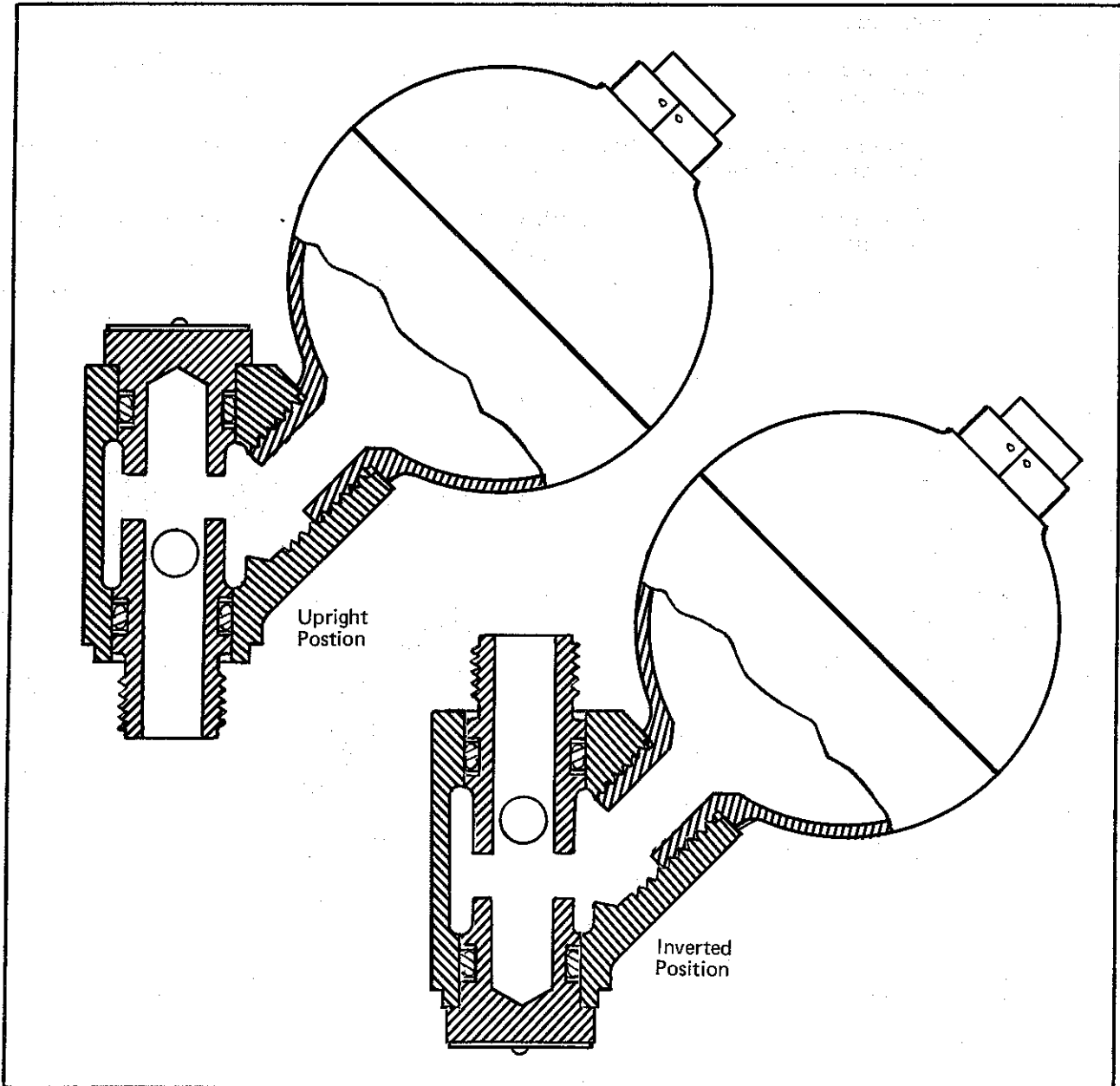
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**CROSS SECTIONAL VIEW OF THE HYDRAULIC PUMP RIPPLE ATTENUATOR
WITH THE STUD IN THE UPRIGHT POSITION AND IN THE INVERTED POSITION.
FIGURE 2**

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C. Leading Particulars

Figure 3 lists principal characteristics of the Ripple Attenuator.

Fluids

Operating Fire Resistant Hydraulic
 Fluid of the following types:
 Monsanto Chemical Co.
 St. Louis, Mo.
 Skydrol LD
 Skydrol 500A
 Skydrol 500B
 Skydrol 500C
 Skydrol 7000
 Stauffer Chemical Co.
 New York, N.Y.
 Aerosafe 2300
 Aerosafe 2300W
 Chevron Chemical Co.
 San Francisco, Calif.
 Hyjet
 Hyjet W
 Hyjet III

Test Any of the above fluids

Normal Operating System Pressure 3000 Psig.
 Proof Pressure 4500 Psig.
 Burst Pressure 7500 Psig.
 External Leakage None

Dimensions

Length (from bottom of threads on Stud to 5.84 Inches
 top of threaded boss on Suppressor, Normal orientation of Stud).

Length (from bottom of Stud Hex Nut to 5.48 Inches
 top of threaded boss on Suppressor, with Stud inverted).

Dome Diameter 3.56 Inches
 Weight (maximum) 4.0 Pounds
 Fluid Capacity (minimum) 19.5 Cubic Inches

**LEADING PARTICULARS
FIGURE 3**

2. DISASSEMBLY (See Figure 8)

NOTE: See Testing, for operational test and trouble shooting to establish the condition of unit or most probable cause of malfunction. This is to determine the extent of disassembly required without completely tearing down and rebuilding the unit. If unit checks OK, return unit to service.



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- A. Cut and remove the lockwire from the 5/16 inch bolt on the Suppressor (7) and remove the bolt. Cut the lockwire and remove, from the Plug (8A) when so equipped.
- B. Cut and remove the lockwire from Stud (2) and carefully remove the assembly from its mounting boss by rotating the hex nut on the Stud (2) counterclockwise.
- C. Remove Stud (2) from the Housing (9).
- D. Carefully remove all Packings (3 and 6), and Retainers, (4 and 5), from Stud (2).
- E. Remove the Suppressor (7) from the Stud (2) by rotating counterclockwise.
- F. Remove the Plug (8) or (8A) from the Housing (9) by rotating it counterclockwise.
- G. Discard all used Packings, (3 and 6), and Retainers, (4 and 5).

3. CLEANING

- A. Remove dirt, metal particles and other contamination from all metal parts by washing with clean Stoddard Solvent per Federal Specification P-D-680 or clean hydraulic fluid per Boeing BMS 3-11, filtered to 15 microns or better. Refer to Figure 4.
- B. Use a stiff, natural bristle brush to remove stubborn accumulations of dirt or other foreign material.
- C. Dry parts with clean, dry, filtered air at 20 psig maximum, filtered to 15 microns or better.

CAUTION: EXERCISE CARE DURING CLEANING AND HANDLING PARTS TO AVOID DAMAGE TO THE STUD (2) SEALING SURFACE.

- D. Immediately after cleaning, coat all external bare metallic surfaces and tube fittings, with a light film of clean fingerprint neutralizer, per MIL-C-15074, to prevent corrosion during handling. Acceptable types may be found in Qualified Products List QPL-15074

CAUTION: DRAIN ALL PARTS THOROUGHLY AND DRY WITH CLEAN, DRY AIR (FILTERED TO 15 MICRONS OR BETTER) PRIOR TO ASSEMBLY TO PREVENT THE ACCUMULATION OF FINGERPRINT NEUTRALIZER WHICH IS DAMAGING TO RUBBER.

NOTE: Equivalent Substitutes may be used for listed items.

Stoddard Solvent
Hydraulic fluid, Fire Resistant
Brush, stiff natural bristle

Federal Spec P-D-680
Boeing BMS 3-11
Commercially available.

**CLEANING MATERIALS
FIGURE 4**

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4. CHECK

- A. Visually check all metal parts under a strong light for cracks or corrosion. No cracks are allowed.
- B. Visually check the O'Ring, packing grooves in Stud (2) and the sealing surfaces of the Stud (2).
- C. Visually check all threads for cross-threading, stripped threads or dirt accumulations.

5. REPAIR

- A. Any minor nicks, scratches or corrosion may be polished out of metal parts with an abrasive cloth 220 grit or finer. Refinish any polished parts as required for corrosion protection.
- B. Chase or file minor thread damage, using a thread chaser or small triangular file, if necessary.
- C. Replace all O'Ring Packings and O'Ring Retainers.
- D. Replace any metallic part which is damaged to the point of being unserviceable or damaged beyond simple repair.

6. ASSEMBLY (See Figure 8)

NOTE: Immediately prior to assembly, clean all metallic parts by vapor degreasing. Dry with clean, dry, filtered air at 20 psig maximum. Assembly shall be accomplished in a clean area. Air shall be filtered to 15 microns or better.

- A. Lubricate all O'Ring Packings with Monsanto Chemical Company MCS352 Skydrol Assembly Lubricant. If this lubricant is not available, use clean hydraulic fluid. Never use petrolatum or any other lubricant.
- B. Place an O'Ring Packing (3) on the Plug (8) and thread this assembly into the appropriate arm of the Housing (9). Tighten until snug.
- C. Place an O'Ring Packing (3) on the threaded nipple of the Suppressor (7) and thread this assembly onto the angled boss on the Housing (9). Tighten until snug.
- D. (1) Install Retainer (5) on Stud (2), in the top groove.
(2) Next install Packing (6) on Stud (2) in the top groove.
(3) Finally install Retainer (5) on Stud (2) in the top groove.
- E. (1) Install Retainer (5), on Stud (2) in the bottom groove.
(2) Next install Packing (6), on Stud (2) in the bottom groove.
(3) Finally install Retainer (5) on Stud (2) in the bottom groove.
- F. Carefully insert Stud (2) into the Housing assembly (9).
- G. Install the Retainer (4) and the Packing (3) over the threads of the Stud (2).

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- H. The Unit is now assembled and ready for installation.
- J. Thread the Stud (2) into its mounting boss, orienting the Suppressor (7) so that it can be secured to its brace. Torque the Stud (2) to 450-500 inch pounds. (Verify that the Housing (9) contacts the pump port surface).
- K. Secure the Suppressor (7) to its brace and Lockwire the Hex Nuts on the Stud (2) and Plug (8A) and the Suppressor hold down nut.

7. FITS and CLEARANCES – Not Applicable

8. TESTING (Operational Test and Trouble Shooting)

- A. Equipment and Materials for Testing. (See Figure 5).

NOTE: Equivalent substitutes may be used for listed items

Equipment/Materials	Description
Fluid Pressure Source (filtered to 15 microns or better)	Regulated Hydraulic Fluid supply capable of supplying a pressure up to 4500 psig.
Valves	As required to control the source of test fluid
Gage	A pressure gage to read in excess of 4500 psig.
Fittings	As required to connect Attenuator to pressure source.

**TEST EQUIPMENT AND MATERIALS
FIGURE 5**

CAUTION: TEST OR FLUSH THE UNIT WITH CLEAN HYDRAULIC FLUID, FILTERED TO 15 MICRONS OR BETTER, WITHIN 24 HOURS AFTER ASSEMBLY.

Perform verification test of the Attenuator as follows:

B. Proof Pressure and External Leakage Test (See Figure 6)

- (1) Install the Attenuator in test setup as shown in Figure 6.
- (2) Bleed all entrapped air from the Attenuator.
- (3) Apply 4500 psig hydraulic fluid pressure to the inlet (stud) port at least two successive times. The pressure shall be maintained for two minutes for each application. There shall be no structural damage or external leakage.

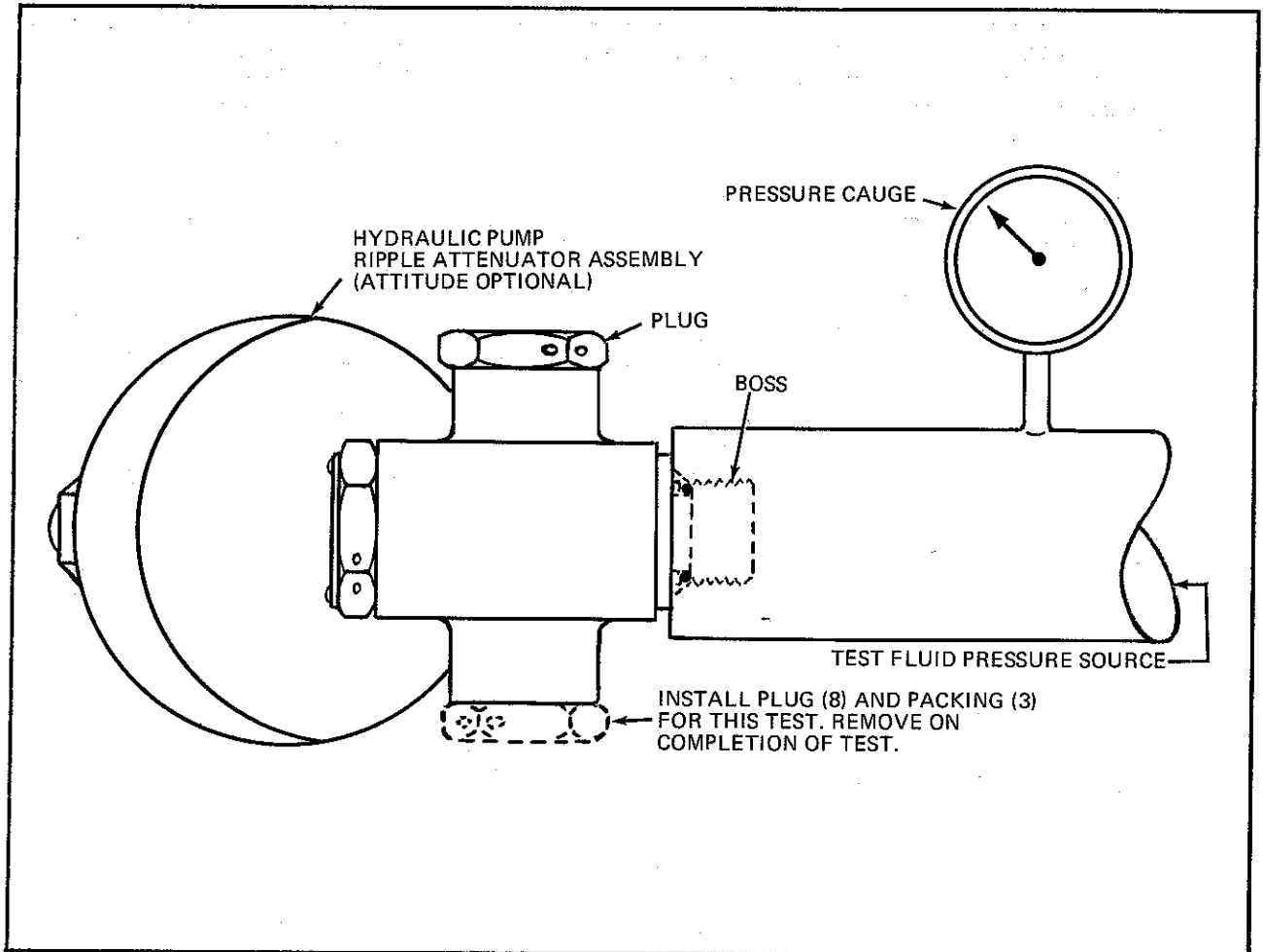
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**PROOF PRESSURE and EXTERNAL LEAKAGE TEST SETUP
FIGURE 6**

CAUTION: DO NOT ADMIT ANY OTHER TYPE OF HYDRAULIC FLUID OR PRESERVATIVE INTO A SKYDROL UNIT AT ANY TIME. DURING TESTING OR FLUSHING, MAKE CERTAIN THAT A FILM OF SKYDROL COATS ALL INTERIOR SURFACES TO PREVENT CORROSION. UPON COMPLETION OF TESTING OR FLUSHING, POUR OUT SURPLUS FLUID BUT DO NOT DRAIN TO THE DRIP POINT. INSTALL CLEAN HARD PORT CLOSURES. WIPE OUTER SURFACE DRY AND REPACKAGE ALL UNITS WITHIN 48 HOURS.

- C. If the Attenuator successfully passes the proof pressure and external leakage test, it may be used immediately or prepared for storage as outlined in the Storage section. If the Attenuator fails this test, disassemble the unit and replace any part that examination reveals to be defective. Reassemble the unit and perform the test again outlined in the Testing Section. The "seated" Retainer (4) need not be replaced prior to installation of the assembly into pump pressure port. The replacement of the Packing (3) after the test is recommended.

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Malfunction	Probable Cause	Corrective Action
Leakage – junction of fitting and Suppressor dome	Defective weld	Replace Suppressor (7) and Packing assy (3).
Leakage – girth weld area of Suppressor dome	Defective weld	Replace Suppressor (7) and Packing assy (3).
Leakage – pump – Attenuator interface area	Retainer (4) and/or Packing (3) damaged Retainer (4) and/or Packing (3) improperly installed Damaged Stud (2).	Replace Retainer (4) and Packing (3) Replace Retainer (4) and Packing (3) Replace Stud (2).
Leakage around the Stud.	Defective Retainers (5) and Packing (6) around the Stud (2).	Replace the Retainers (5) and Packing (6) on the Stud (2).

TROUBLE SHOOTING FIGURE 7

9. TROUBLE SHOOTING (See Figure 7).

NOTE: See Testing for Operational Test and Troubleshooting

10. STORAGE INSTRUCTIONS

A. Unless the Attenuator is scheduled for immediate installation, it shall be preserved as follows:

- (1) Install hard closures to protect inlet and outlet ports of Attenuator.
- (2) Wrap or seal tested or flushed units in polyethylene bags.
- (3) Stamp the flushing date and the words "Skydrol Flushed" on a "Corrosion Prevention Treatment Record Tag" and attach tag to part.
- (4) Place item in a unit set-up box or corrugated paper container.

B. Re-flush all items every year.

- (1) Examine packaged units each year for damaged containers or expired flushing dates.

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- (2) When containers are damaged or flushing date is expired, accomplish the following:
 - (a) Examine items for corrosion.
 - (b) Rework the unit, if necessary.
 - (c) Reassemble, retest, and reflush the unit.
 - (d) Repackage as in paragraph 10.A.

C. Storage.

- (1) Keep attenuators in original containers until ready for installation.
- (2) Store units indoors, protected from extremes of temperature and moisture.

11. SPECIAL TOOLS, FIXTURES AND EQUIPMENT – Not applicable.

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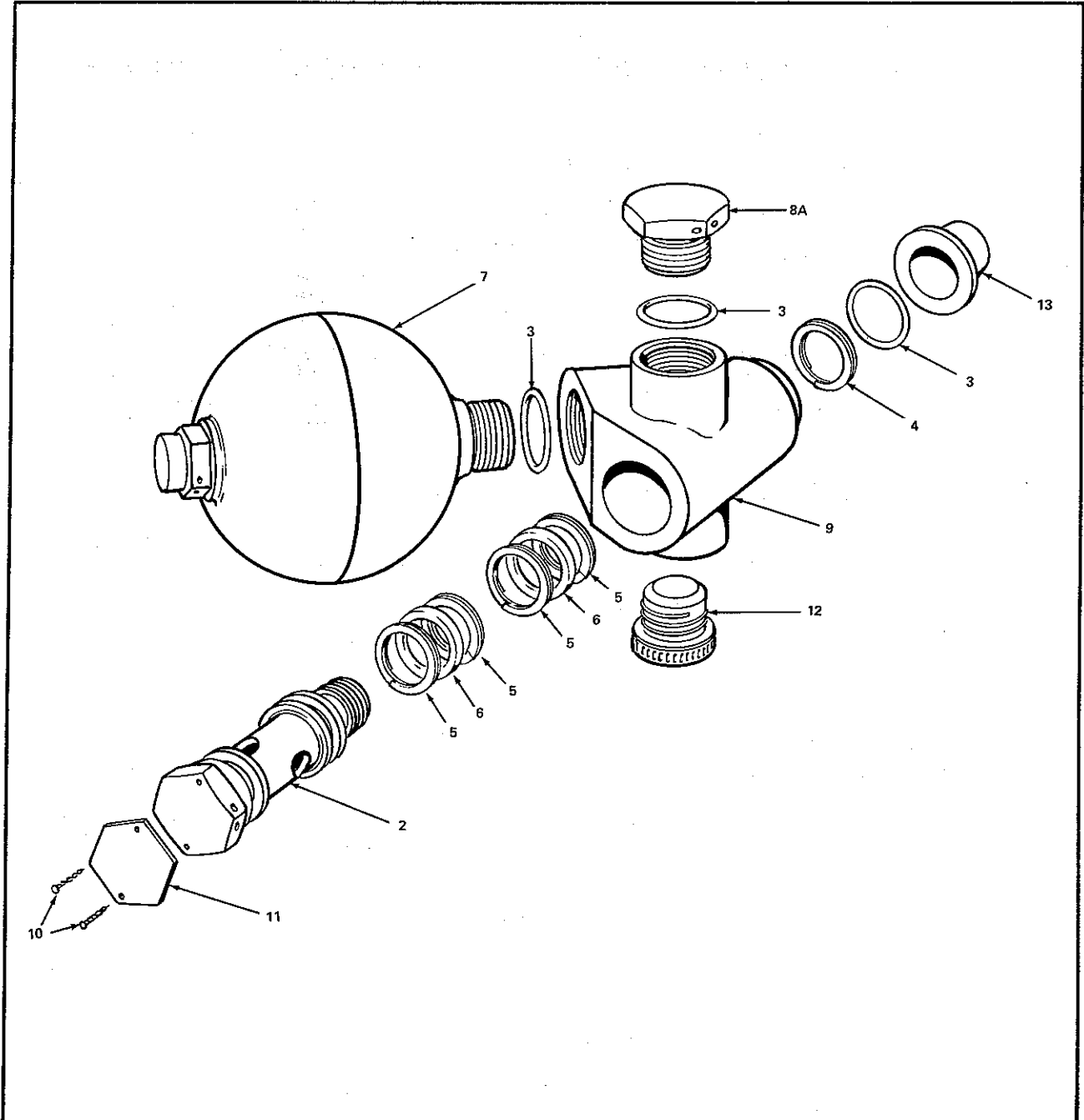


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12. ILLUSTRATED PARTS LIST



**HYDRAULIC PUMP RIPPLE ATTENUATOR ASSEMBLY
FIGURE 8**

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12. ILLUSTRATED PARTS LIST

Fig. Item	Part Number					Nomenclature	Effect Code	Units per Assy.
		1	2	3	4			
8 -1	9011520100					Attenuator Assembly - Hydraulic Pump Ripple		RF
2	9011520103-1					Stud		1
3	NAS 1612-10					Packing		3
4	MS28773-10					Retainer		1
5	MS28774-210					Retainer		4
6	NAS 1611-210					Packing		2
7	485000-22					Suppressor		1
-8	AN 814-10					Plug	A	1
8A	AN 814-10L					Plug	B	1
9	9011520101-1					Housing		1
10	AN 535-00-2					Drive Screw		2
11	9011520104-1					Nameplate		1
12	8C-0003-0003					Plug (P-10)*		1
13	8C-0011-0001					Cap (TY-14)*		1
-	ITEMS NOT ILLUSTRATED							

* For use during storage and shipment only.
Manufactured by Clover Industries Division,
GTI Corporation.

All Items with an effectivity code of A are used on units with serial numbers from 0001 thru 0524

All Items with an effectivity code of B are used on units with serial number 0525 and above.

Non-coded items are used on both the early and late serial numbered units.

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