

DMWR 55-1650-406

**DEPOT MAINTENANCE
WORK REQUIREMENT
FOR
FLIGHT CONTROL ACTUATOR
ASSEMBLY**

PART NUMBER

205-076-056-107

NATIONAL STOCK NUMBER

1650-01-187-9395

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**US ARMY AVIATION AND
MISSILE COMMAND**

30 MAY 1987



WARNING

An operating procedure, practice, etc., which, if not strictly observed, could result in personnel injury or loss of life.

CAUTION

An operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

NOTE

An operating procedure, condition, etc., which it is essential to highlight.

The use of any alcohol in cleaning components which contact hydraulic fluids is prohibited. Formation of a polymeric residue can result, which could impair mechanical operation of the component.

WARNING**PRECAUTIONARY DATA**

Personnel performing operations, procedures, and practices which are included or implied in this work requirement shall observe the following warnings. Disregard of these warnings and precautionary information can cause serious injury, death or destruction of material.

WARNING**GENERAL WARNING**

Observe all cautions and warnings on containers when using consumables. When applicable, wear necessary protective gear during handling and use. If a consumable is flammable or explosive, MAKE CERTAIN consumable and its vapors are kept away from heat, spark, and flame. MAKE CERTAIN firefighting equipment is readily available prior to use. (All other notes are picked up as applicable. However, they must be rewritten to provide specific details).

WARNING**FLIGHT SAFETY PARTS**

This manual contains procedures identifying critical characteristics of Flight Safety Parts. Critical characteristics may be identified as dimensions, tolerances, finishes, materials, assembly, or inspection procedures. Some processes may require qualified sources. Flight Safety Parts indicating a maximum allowable limit shall not be continued in use when limits have been exceeded. These parts must be replaced.

WARNING**CLEANING SOLVENTS**

Cleaning solvent is toxic and flammable. To minimize danger to health, use cleaning solvent in a well-ventilated area, and avoid excessive skin contact. Do not breath solvent fumes. To prevent fires, keep solvent and solvent fumes away from flames and other ignition sources. Solvent flash-point must not be less than 100° F.

WARNING

COMPRESSED AIR

Do not direct compressed air near or directly against skin. Do not use air under high pressure, or from a source not having a moisture trap when drying parts. Do not roll bearings with compressed air. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and only then with an effective chip guarding and personnel protective equipment.

WARNING

TOXIC POISONS

Contains additives which are poisonous and are readily absorbed through the skin. Avoid prolonged contact with the skin.

WARNING

TEST EQUIPMENT OPERATION

Test equipment shall be operated by authorized personnel only.

WARNING

NOISE

Operation and maintenance personnel shall wear ear protection devices when working near or around an operation transmission test stand.

CHANGE
NO. 5

U.S. ARMY AVIATION
MISSILE COMMAND
Redstone Arsenal, AL 35898-5000
10 May 2004

DEPOT MAINTENANCE WORK REQUIREMENT
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4-27 and 4-28
4-31 and 4-32
4-43 and 4-44
4-47 and 4-48
A-1 through A-3/(A-4 blank)
C-1 and C-2
Cover

Insert Pages

a and b
A(B blank)
i and ii
4-19 and 4-20
4-23 and 4-24
4-27 and 4-28
4-31 and 4-32
4-43 and 4-44
4-47 and 4-48
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Cover

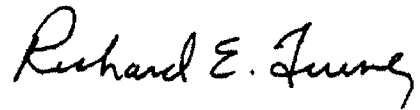
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Acting Chief of Staff

OFFICIAL:

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RICHARD E. TURNER
Deputy Director
Integrated Materiel Management Center

CHANGE }
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U.S. ARMY AVIATION
SYSTEMS COMMAND
30 June 1992

DEPOT MAINTENANCE WORK REQUIREMENT

FOR

FLIGHT CONTROL ACTUATOR ASSEMBLY

NSN 1650-01-187-9395

P/N 205-076-056-107

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2-1 through 2-3/2-4
4-39 and 4-40
6-1 and 6-2
- - - -

Insert pages

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a and b
i and ii
2-1 through 2-3/2-4
4-39 and 4-40
6-1/6-2
2028s and Envelopes

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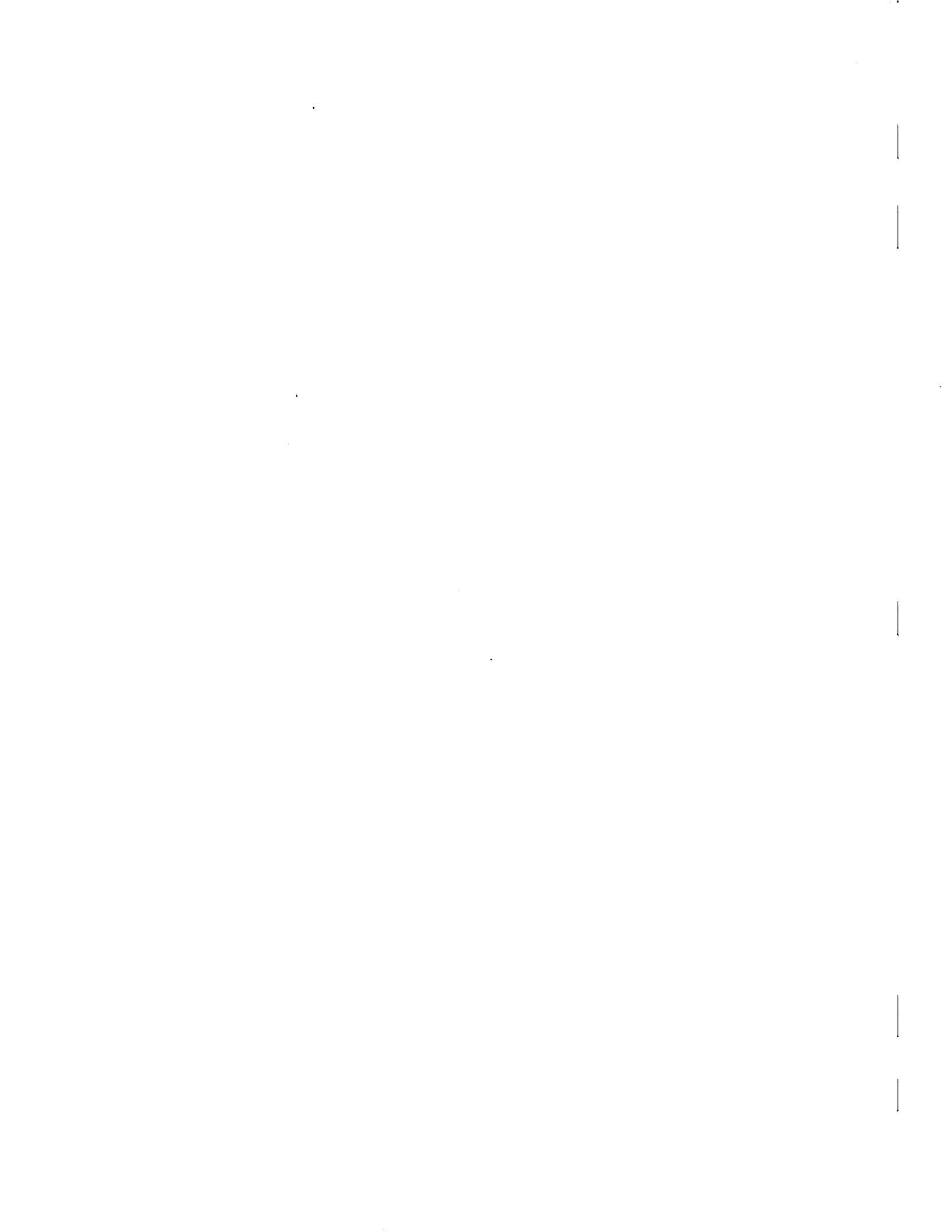
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U.S. ARMY AVIATION
SYSTEMS COMMAND
29 May 1992

DEPOT MAINTENANCE WORK REQUIREMENT

FOR

FLIGHT CONTROL ACTUATOR ASSEMBLY

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4-25 through 4-34
4-41 through 4-48

Insert pages


Cover 1/Cover 2
1-1 through 1-4
4-17 and 4-18
4-25 through 4-34
4-41 through 4-48

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U.S. ARMY AVIATION
SYSTEMS COMMAND
29 March 1991

Depot Maintenance Work Requirements

for

Flight Control Actuator Assembly

NSN 1650-01-187-9395

P/N 205-076-056-107

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4-29 and 4-30

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CHANGE }
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Depot Maintenance Work Requirements

for

Flight Control Actuator Assembly

NSN 1650-01-187-9395

P/N 205-076-056-107

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---	banner 1 and banner 2
i and ii	i and ii
1-1 through 1-4	1-1 through 1-4
*2-1 through 2-3/2-4	*2-1 through 2-3/2-4
*3-1 and 3-2	*3-1 and 3-2
*4-1 through 4-50	*4-1 through 4-50
5-1 through 5-4	5-1 through 5-4
6-1 through 6-4	6-1 and 6-2
A-1 and A-2	A-1 and A-2
*A-3/A-4	*A-3/A-4
*B-1/B-2	*B-1/B-2
*C-1 and C-2	*C-1 and C-2
*D-1/D-2	*D-1/D-2
E-1/E-2	E-1/E-2
*Glossary 1/Glossary 2	*Glossary 1/Glossary 2
Index 1 and Index 2	Index 1 and Index 2
*Index 3/Index 4	*Index 3/Index 4
Authentication	Authentication
---	1379
---	2028's and envelopes
*Metric Cover	*Metric Cover

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Dates of issue for original and changed pages are:

Original	30 May 1987	Change 3	29 May 1992
Change 1	30 May 1990	Change 4	30 June 1992
Change 2	29 March 1991	Change 5	10 May 2004

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Page No.	*Change No.	Page No.	*Change No.
Cover	5	4-41 and 4-42	3
a and b	5	4-43	0
A	5	4-44	5
B blank	5	4-45 and 4-46	3
i and ii	5	4-47	5
1-1	2	4-48	3
1-2 – 1-3	3	4-49 and 4-50	0
1-4	0	5-1 – 5-4	1
2-1	4	6-1	4
2-2	0	6-2 blank	0
2-3	4	A-1	5
2-4 blank	0	A-2 blank	5
3-1 and 3-2	0	A-3 deleted	5
4-1 – 4-17	0	A-4 blank/deleted	5
4-18	3	B-1	0
4-19	5	B-2 blank	0
4-20 – 4-23	0	C-1	0
4-24	5	C-2	5
4-25	0	D-1	0
4-26	3	D-2 blank	0
4-27	5	E-1	1
4-28 – 4-30	3	E-2 blank	0
4-31	5	Glossary 1	0
4-32	3	Glossary 2 blank	0
4-33	3	Index 1	1
4-34 – 4-38	0	Index 2	0
4-39	4	Index 3	0
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WORK REQUIREMENT
NO. 55-1650-406

US ARMY AVIATION AND MISSILE COMMAND
REDSTONE ARSENAL, AL 35898-5000
30 May 1987

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PART NUMBER NATIONAL STOCK NUMBER
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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual, directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028. For the World Wide Web use: <https://amcom2028.redstone.army.mil>.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. **Scope.** These instructions are for use by depot/contractor personnel. They apply to the flight control actuator assembly, and in case of conflict, take precedence over all other documents pertinent to overhaul and inspection.

1-2. **Maintenance Forms and Records.** Department of the Army forms and procedures used for equipment maintenance shall be those prescribed by DA PAM 738-751.

1-3. **Reporting Equipment Improvement Recommendations (EIR).** EIRs will be prepared using SF 368, Quality Deficiency Report. Instructions for preparing EIRs are provided in DA PAM 738-751, Functional User's Manual for the Army Maintenance Management System (TAMMS-A). EIRs should be mailed directly to: Commander, U.S. Army Aviation Systems Command, ATTN: AMSAV-QRF, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

1-4. **Engineering Change Proposals (ECPs).** ECPs will be prepared using DD Form 1693, Engineering Change Proposal. Instructions for preparing ECPs are provided in MIL-STD-481, configuration control-engineering changes, deviations and waivers (short form). ECPs should be mailed directly to AVSCOM Engineering. A reply will be furnished directly to you.

1-5. **Deviations and Exceptions.**

a. **Contractor.** When any work segment as set forth in this depot maintenance work requirement cannot be accomplished, or can be accomplished only in a manner other than specified, the Contractor shall submit a Request for Action Form AMSAV-M 1379, located in the back of this manual, through the Contracting Officer to AMSAV-MC with a copy to AMSAV-MD. If the problem is publications related or requires a change to a publication, a DA Form 2028 shall also accompany the request for action. The request for action shall state the problems, the reason for urgency, and give the following specifics:

- (1) Serial Number (if applicable), part number, and NSN of affected equipment.
- (2) Work elements which will not be completed or which will not be accomplished exactly as specified herein.
- (3) Reason for nonaccomplishment or deviation.
- (4) Action taken to correct condition causing nonaccomplishment or need for deviation.
- (5) Data relative to availability of parts required, if applicable.
- (6) Estimated man-hours.
- (7) Instructions and inspection required to maintain the integrity of the end item because of such omission or deviation.

b. **Depot.** Defects shall be processed in accordance with DESCOM-R 702-1.

1-6. **Description.** The flight control actuator assembly consists of a cylinder and a servo head assembly which incorporates a main control valve, differential relief valve, thermal relief valve, accumulator, two check valves, main control valve input lever, two filters, two pressure ports, return port, and three test ports. The actuator is used in an aircraft hydraulic system at 1000 psi. (Figure 1-1).

1-7. **Data Plates.**

a. **Overhaul Data Plate.** (Figure 1-2.) The existing overhaul data plate will at all times be attached to the equipment, next to the manufacturer's identification plate. The data plate will include: initials of the facility doing the overhaul, contract number, date of overhaul, part number, and total operating time since new. The data will be stamped on the data plate using 1/8 inch (8-point) high letters and figures. Stamp the required information on the data plate before installation. When sufficient space is not available on the existing data plate to

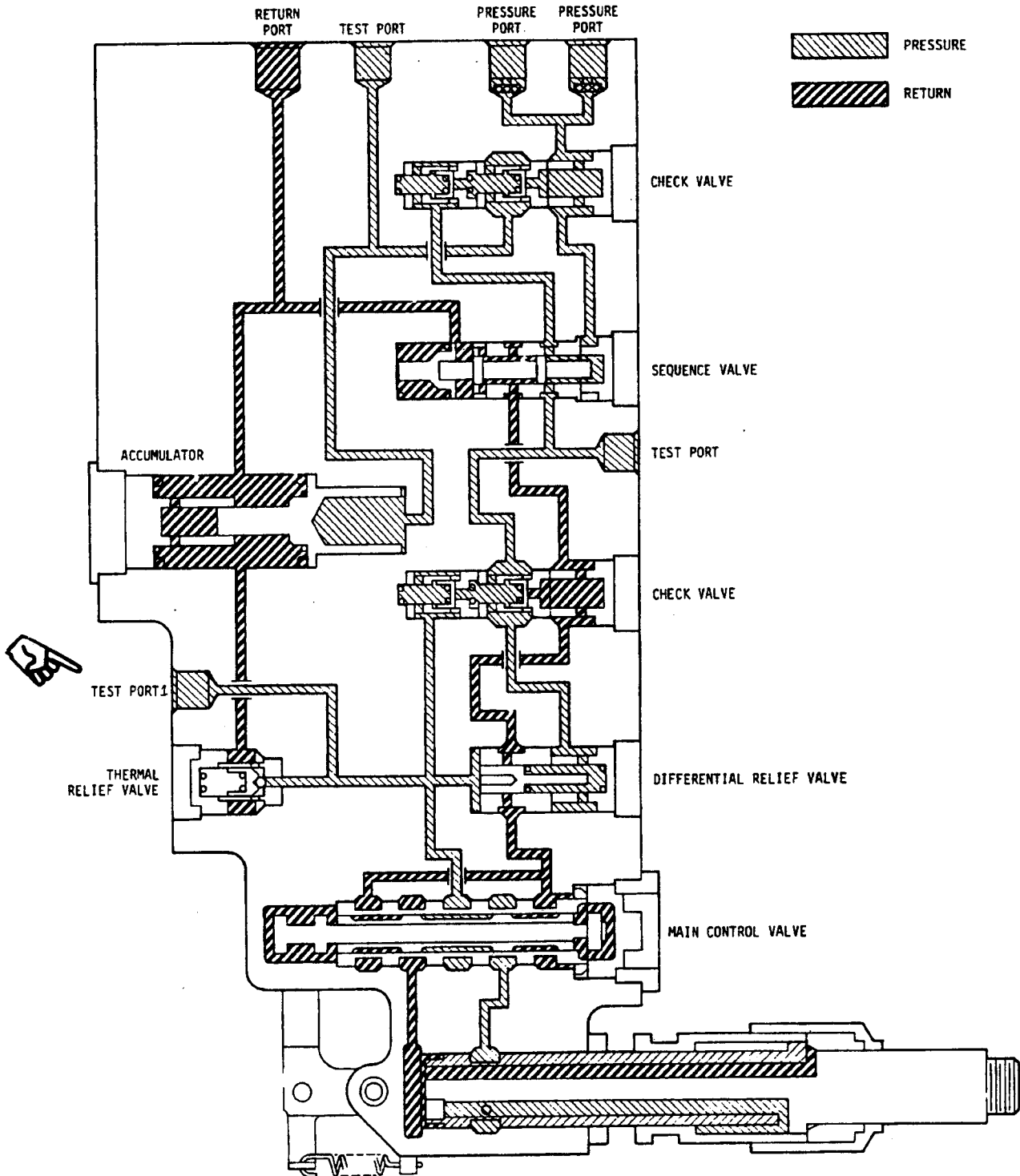


FIGURE 1-1. Flow diagram.

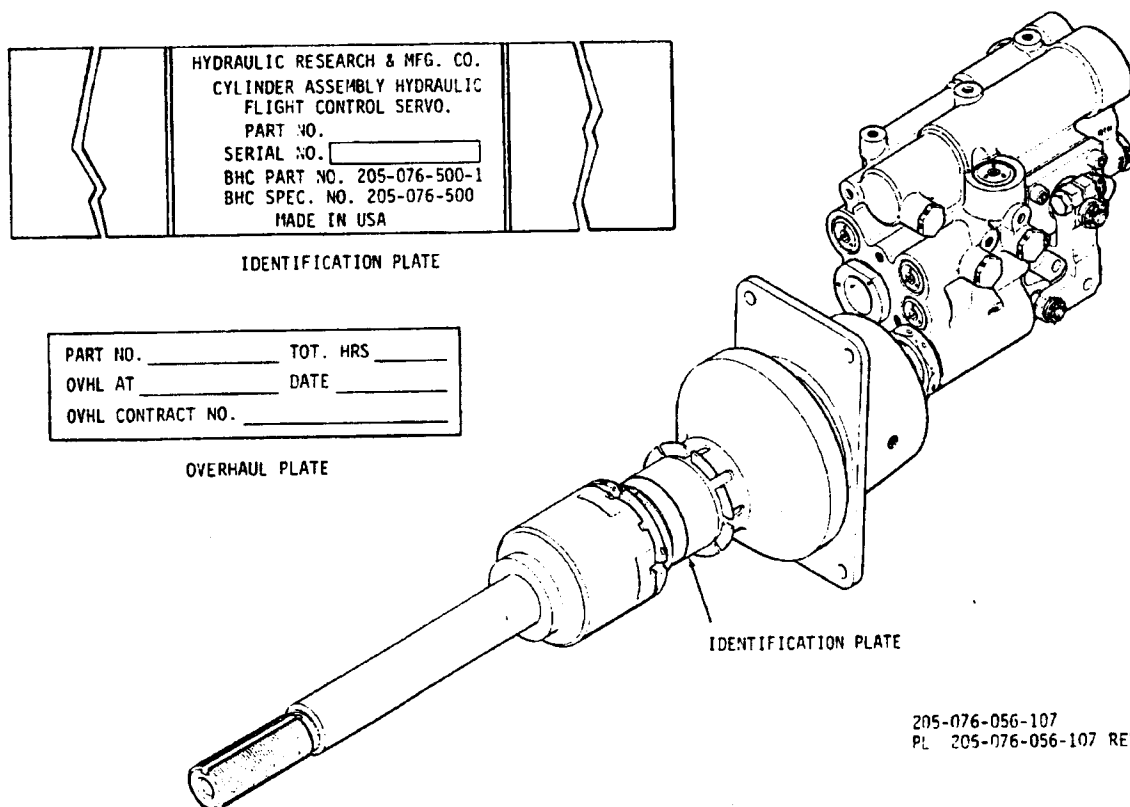


Figure 1-2. Flight control actuator assembly data plates.

add information, the plate shall be replaced and all pertinent data transferred to the new data plate. Data shall not be stamped directly on any part, assembly or item of equipment except when approved by the government.

b. Identification Plate (Figure 1-2). The identification plate includes: manufacturer's name, part number, equipment nomenclature, and serial number. The data is stamped on the plate using a minimum 0.045 inch high letters and numbers. Stamp required information on the plate before installation. Data shall not be stamped directly on any part, assembly or item of equipment.

1-8. Tabulated Data. Table 1-1 lists the principal physical and functional technical data for the flight control actuator assembly.

Section III - DEPOT MOBILIZATION REQUIREMENTS

1-9. General. Depot Mobilization Requirements are identified in Appendix E.

Table 1-1. Leading Particulars

Operating Hydraulic Fluid.....	MIL-H-83282
Typical Test Fluid.....	MIL-H-46170
Operating Temperature.....	-65° to +180°F
Operating Pressure.....	Supply: 1000 psi
Proof Pressure.....	Supply: 2250 psi, Return: 2250 psi
Cylinder Stroke.....	5.50 inch
Effective Area.....	1.00 square inch
Ultimate Tension or Compression.....	1245 pounds (0 psi system pressure)
Weight (Dry).....	8.10 pounds
Dimensions:	
Length (extended).....	24.53 inches
Width.....	5.00 inches
Height.....	5.25 inches

CHAPTER 2

TECHNICAL SUPPORT REQUIREMENTS

Section I. SUPPORT ITEMS

2-1. **Facilities.** A clean, well-lighted, work station shall be provided for disassembly, cleaning, inspection, and reassembly of the actuator assembly.

2-2. **Tools and Equipment.**

a. **Special Tools and Equipment.** Required special tools and equipment are listed in Table 2-1 (equivalent items may be used).

b. **Inspection and Test Equipment.** Required inspection and test equipment are listed in Table 2-2 (equivalent items may be used).

Section II. PARTS AND MODIFICATIONS

2-3. **Repair Parts.** Refer to Appendix B.

2-4. **Modifications.** Refer to DA PAM 310-1 and DA PAM 750-10, for all published MWOs applicable to the actuator assembly.

Section III. STANDARDS

2-5. **Quality of Material.** Parts and material used for replacement, repair, or modification shall meet the requirements of the equipment drawings and specifications.

2-6. **Man-Hour Standards.** Estimated man-hour standards for performance of depot maintenance are listed in table 2-3.

2-7. **Flight Safety Parts Program.** Parts, assemblies or installations identified under the Flight Safety Parts Program require special handling during overhaul. Throughout the overhaul procedures, warnings will appear emphasizing critical instructions to be followed. These warnings are identified as "Flight Safety Parts" warnings and will be inserted whenever and wherever necessary.

a. A Flight Safety Part is defined as a part, assembly or installation procedure with one or more critical characteristics that, if not conforming to the design data or quality requirements, could result in serious injury or death of crew members and/or serious damage to the helicopter or aircraft.

b. A critical characteristic is any dimension, tolerance, finish, material, manufacturing, assembly or inspection process, or other feature which, if nonconforming or missing could cause failure or malfunction of the critical item. No deviation is allowed on a critical characteristic.

c. Flight Safety Parts are listed in Table 2-4.

Table 2-1. Special Tools and Equipment

Nomenclature	NSN or Part No.	Reference Paragraph of Use
Piston Holder	T100324-2	4-19, ad
Lockwire Fixture	T100615-13LW	4-34, b
Torque Adapter	T41000870-1	4-19, aj; 4-19, am
Puller	T41001290-5	4-5, e (1)
Accumulator Piston Remover	T42550-4	4-5, f
Differential Valve Installer	T42550-8-2	4-19, g
Poppet Installation Tool	T44047900-7-1	4-19, i; 4-19, k
Cap Extracting Tool	T44047900-26	4-5, m
Channel Seal Forming Tool	T555-7	4-19, aa; 4-19, ac; 4-19, ah
Seal Sizing Sleeve	T557-13	4-19, x
Bushing Gages	T569-4-6, -16	4-7
Puller	T668-1, -2, -4	4-5, h; 4-5, i; 4-5, l; 4-5, m; 4-5 o; 4-5, 8; 4-5, t; 4-19, i; 4-19, j; 4-19, k; 4-19, l
Cap Nut Wrench	100622-1A-1	4-5, c(5)
Bearing Installation Aid	87000702-ASTO	4-19, q
Bearing Disassembly Tool	87000703-ASTO	4-5, d(3)
Torque Fixture	87000704-ASTO	4-5, b; 4-19, am
Seal Installation Tool Set	87000706-ASTO	4-19, y; 4-19, af
Tread Cover	87000707-ASTO	4-19, ad
Tread Cover	87000708-ASTO	4-19, ak
Torque Wrench Adapter	87000714-ASTO	4-34, a
Puller	87000715-ASTO	4-5, q; 4-19, m
Sleeve Pusher	87000716-ASAD	4-19, p
Wrench	87000717-ASTO	4-5, e(2); 4-19, o
Puller	87000718-ASTO	4-5, e(2)
Test Fixture	87000719-TSFX	4-21
Set Block	87000724-CKGA	4-19, ap
Axial Play Checking Tool	KPS-6099-1T41	4-7

Table 2-2. Inspection and Test Equipment

Nomenclature	NSN or Part No.	Reference Paragraph of Use	Calibration Document
Test Fixture	87000719-TSFX	4-21a	

Table 2-3. Man-Hour Standards

Task	Estimated Average Man-Hours
Disassembly	2.0
Cleaning	1.0
Inspection	1.0
Repair	1.0
Assembly	2.5
Testing	2.0

Table 2-4. Flight Safety Parts

Part Number	Nomenclature	Critical Characteristic
204-076-202-7	Nut	Installation Torque of 1100 to 1180 inch-pounds

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CHAPTER 3

PRESHOP ANALYSIS OPERATIONS

Section I. Purpose, Test and Analysis Standards

3-1. Purpose. The purpose of preshop analysis operations is to determine at the highest assembly level possible, the work required to return the actuator assembly to a serviceable condition as specified in the DMWR. If inspection at the highest level of assembly is precluded by missing, damaged or diagnosed defective assemblies, consideration shall be given to techniques that will allow continued inspection at that level. If this is not possible, inspection shall proceed at the next lower level. The preshop analysis checklist shall be used to record the results of the analysis and any required maintenance.

3-2. General. General instructions for inspection of forms, removal of the actuator assembly from shipping container, external inspection, cleaning, temporary preservation, and testing are contained in the following paragraphs:

3-3. Inspection of Forms. Examine all tags and forms attached to the actuator assembly to determine the reason(s) for removal from service, or statements describing any malfunction or improper operation. Tags and forms shall not be removed from the actuator assembly. If there are no tags or forms request instructions from the Contracting Officer.

3-4. Removal of Actuator Assembly from Shipping Container. Remove all packing material and inspect for damage and condition before disassembly.

3-5. External Inspection. Visually inspect actuator assembly for completeness and evidence of damage.

3-6. Cleaning.

WARNING

Use solvent in well-ventilated area. Avoid prolonged inhalation of fumes or contact with skin. Observe necessary fire precautions. Failure to comply may result in serious injury or death.

a. Clean actuator assembly in solvent (item 1, Appendix C) or equivalent.

b. Air dry with clean, dry compressed air at 5 to 10 psig.

3-7. Test. Perform applicable test (paragraph 4-20) and trouble analysis (paragraph 4-33) required to confirm damage/malfunction of actuator assembly.

3-8. Temporary Preservation/Protection. Apply a light coat of hydraulic fluid (item 5, Appendix C) to metal surfaces of actuator assembly.

Section II. Preshop Analysis Checklist

3-9. General. The preshop analysis checklist shall be used to evaluate the actuator assembly to determine the extent of overhaul operations required. (Table 3-1).

Table 3-1. Preshop Analysis Checklist

Inspection/Test	Para Ref	Condition/Dimensions Found	Recommended Maintenance Action	Signature and Date of Person Performing Analysis
Visual external inspection	4-8			
Review of records and data	3-3			
Test	3-7			
Overhaul operations	4-1			
Inspection	4-7			
Repair	4-13			
Assembly	4-19			
Testing	4-20			
Trouble analysis	4-33			

CHAPTER 4

OVERHAUL OPERATIONS

Section I. GENERAL REQUIREMENTS

4-1. Scope. This chapter provides instructions for depot level maintenance for the flight control actuator assembly. First, make visual check to find any physical damage. The second check is an operational test to find the fault. The third check is to use fault isolation to pinpoint the faulty component or subassembly. When the repair has been done, the unit is retested to make sure that the repair has corrected the fault. The unit is then reassembled and final-tested to be sure that it meets all standards.

4-2. References. References are contained in Appendix A.

4-3. Safety. No special safety precautions need to be taken for overhaul and repair of the flight control actuator assembly. Standard warnings, cautions, and notes are provided where required. Observe all cautions and warnings on containers when using consumables. When applicable, wear necessary protective gear during handling and use. If a consumable is flammable or explosive, make certain consumable and its vapors are kept away from heat, spark, and flame. Make certain firefighting equipment is readily available.

Section II. DISASSEMBLY

4-4. General. During disassembly, look for damage that may not be seen after parts have been removed and cleaned. Bring this type damage to the attention of inspection personnel before continuing with disassembly.

4-5. Disassembly.

a. Noting location and orientation, cut and remove lockwire. Remove identification plate (27, Figure 4-2).

b. Mount unit in Torque Fixture 87000704-AST0. Loosen lock nut (10), then remove unit from torque fixture.

c. Cylinder Assembly

WARNING

Hydraulic fluid may contain tricresyl phosphate which may be absorbed through the skin, and produce paralysis if taken internally. Appropriate protective measures shall be taken to avoid such exposure.

(1) Separate cylinder assembly (8) from housing assembly (134). Remove lock washer (9) and lock nut (10). Purge residual hydraulic fluid from cylinder assembly.

(2) Mount unit in Torque Fixture 87000704-AST0, loosen retainer (11) and remove unit from torque fixture. Remove retainer (11), scraper (12) and tab washer (13).

(3) Lift off housing (1) and remove two plugs (2) and decals (3).

(4) Remove bearing assembly (4), nut (5) and shield assembly (6).

(5) Using Torque Adapter T41000870-1 and Cap Nut Wrench 100622-1A-1, remove lock nut (14), lock key (15) and cylinder cap (16). Remove one packing (17) inner gland (18), rod seal (19), outer gland (20), scraper (21) and remaining packing (17).

(6) Remove piston rod assembly (22) from cylinder (26). Remove cap seal (23), seal ring (24) and rod seal (25).

d. Crank Assembly

(1) Remove cotter pin (28), nut (29) and screw (30). Remove four screws (31). Remove crank assembly (32).

(2) Remove cotter pin (33), nut (34), cotter pin (35), nut (36) and bolt (37). Lift off input lever (38) with shims (39).

NOTE

Retain shims (39) together as a set for use during assembly.

(3) Remove crank (42). Using Bearing Disassembly Tool 87000703-ASTO, press bearing set (48) from crank (42). Remove packing (49).

NOTE

Bearing set (48) consists of a matched set. Do not intermix with similar bearings.

NOTE

Crank (42) and shaft (43) are a matched set. Do not interchange with similar items. Retain items together as a set. Shaft (43) is removed in step e (3).

(4) Remove rotary seal (46), spacer (47), packing (45), spacer (44), and G-T seal (50).

e. Spool and Sleeve Assembly

(1) Remove retainer (51). Using Puller T41001290-5, remove plug (52). Remove packing (53).

(2) Using Puller 87000718-ASTO, remove spool and sleeve assembly (57). Straighten tabs on tab washer (55). Using Wrench 87000717-ASTO, remove nut (54). Remove tab washer (55) and washer (56).

(3) Carefully pull shaft (43) from spool and sleeve assembly (57). Remove shims (61) and retain for use during assembly.

NOTE

Spool (59) and sleeve (58) are a lap-matched set. Do not interchange with similar parts. Retain together as a matched set.

- (4) Remove spool (59) from sleeve (58) and remove packings (60).
- f. Remove retainer (62). Using Accumulator Piston Remover T42550-4, remove guide (63), packing (64), washer (65), and springs (66 and 67).
- g. Using Puller 87000715-AST0, remove piston (68) and seal (69).
- h. Remove retainer (70), cap (71), and packing (72). Using Puller T668-1, remove seat (73), packing (74), poppet (75), spring (76), and guide (77).
- i. Using Puller T668-1, remove seat (78) and packing (79).
- j. Remove poppet (80), spring (81), guide (82), and washer (83).
- k. Remove retainer (84), cap (85) and packing (86).
- l. Using Puller T668-2, remove seat (87), packing (88), poppet (89), spring (90), and guide (91).
- m. Using Puller T668-1, remove seat (92), packing (93), poppet (94), spring (95), guide (96), and washer (97).
- n. Remove retainer (98), cap (99), packing (100), spring (101) and, if present, shim (102).
- o. Remove spool (104) from sleeve (105). Using Puller T668-2, remove sleeve (105). Remove two packings (106) and stop (107).

NOTE

Spool (104) and sleeve (105) are a lap-matched set. Do not interchange with similar parts. Retain together as a matched set.

- p. Remove retainer (108) and cap (109). Remove packing (110).
- q. Remove slide (112) from sleeve (113). Using Puller T668-1, remove sleeve assembly (113). Remove packings (114).

NOTE

Slide (112) and sleeve (113) are a lap-matched set. Do not interchange with similar parts. Retain together as a matched set.

- r. Remove retainer (115), spring (116) and washer (117).

- s. Remove three test plugs (118) from test ports 1, 2, and 3. Remove packings (119). Remove two pressure port plugs (120). Remove packings (121).
- t. Using Puller T668-4, remove filter assembly (122). Remove packings (123).
- u. Remove retainer (124). Using Cap Extracting Tool T44047900-26, remove cap (125). Remove packing (126). Remove shim (127), spring (128) and seat and poppet assembly (129). Separate seat (130) from poppet assembly (131). Remove packings (132 and 133).

4-6. Cleaning.

WARNING

Use solvent in well-ventilated area. Avoid prolonged inhalation of fumes or contact with skin. Observe necessary fire precautions. Failure to comply may result in serious injury or death.

- a. Perform cleaning in a clean, well-ventilated, area. Clean parts, noting the following:
- b. Clean metal parts by washing in solvent (item 1, App C). Use a nonmetallic, stiff bristle brush to dislodge stubborn accumulations.
- c. Air dry parts with clean, dry compressed air at 5 to 10 psi.
- d. After cleaning, lightly coat ferrous metal surfaces with hydraulic fluid (item 5, App C).

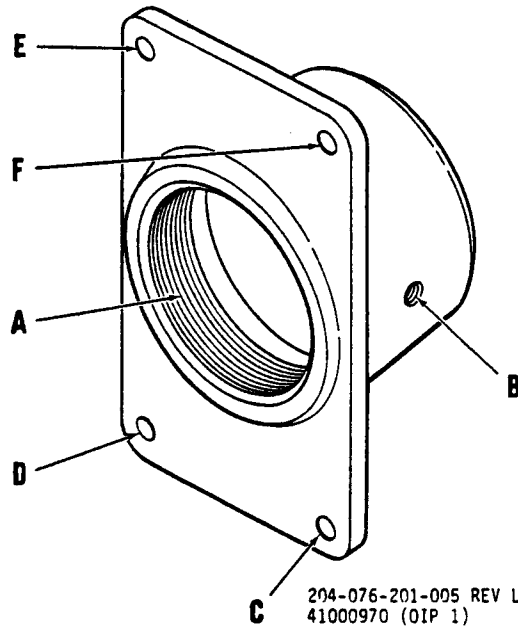
Section III. IN-PROCESS INSPECTION

4-7. Inspection. In-process inspection is a visual and mechanical examination of component parts to detect damage or wear and determine the serviceability of parts. Detailed inspection requirements for individual parts are specified in the Overhaul Inspection Procedures (OIP) in this chapter. Inspect all parts for any damage or condition that might affect their safe reuse. Detail-inspect parts showing signs of wear for service tolerances specified in the applicable OIP. Remove parts from service that are worn beyond allowable limits, or that cannot be repaired. Any component or subassembly that is repaired, shall meet the requirements specified in the applicable OIP. All used components and refinished parts shall be examined 100 percent by the contractor to determine serviceability in accordance with the limits, fits, and tolerances established in this DMWR.

4-8. Visual and Mechanical Inspection. Magnifying glass and amplified lighting shall be used as necessary, during visual inspection, to determine cracks. Damage indicated by visual inspection shall be verified by measurement or gage before discarding parts. When cracks are indicated do a magnetic particle or fluorescent penetrant inspection check to aid the visual inspection. Mechanical inspection shall be done using standard micrometers and gages. A surface table or flat surface shall be used to check for distortion of parts.

OVERHAUL INSPECTION PROCEDURE: 1

ITEM	PART NUMBER
Housing (1, Figure 4-2)	204-076-201-005

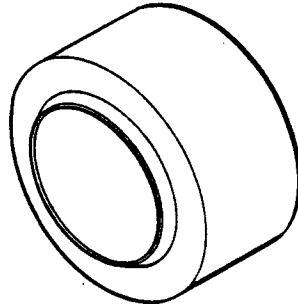


NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1	A,B	Damaged thread	Gage	Repair in accordance with para 4-14d
2	C,D,E,F	Elongated bolt	SIE	D,E,F, 0.285 inch maximum diameter. C, 0.350 inch diameter
3		Damaged coating	Visual	Repair or replace
4		Cracks	Flourescent penetrate per para 4-10. (Remove decals (3) and coating prior to inspection; paint and install decals following inspection.)	No cracks, replace
5		Corrosion	Visual	Repair

maximum

OVERHAUL INSPECTION PROCEDURE: 2

ITEM	PART NUMBER
Bearing Assembly (4)	KSP6099-1



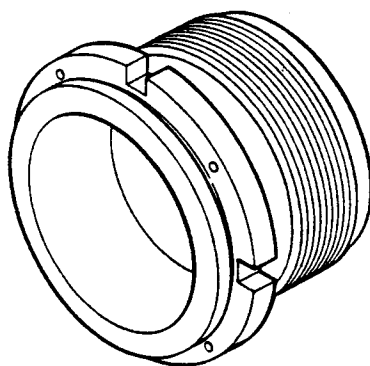
KSP6099-1
41000970 (OIP 2)

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Cracks, nicks, dents, scoring, wear	Visual - SIE	Repair/replace
2		Axial play	Axial Play Checking Tool KPS-6099-IT41	Not to exceed 0.007 inch

OVERHAUL INSPECTION PROCEDURE: 3

ITEM
Nut (5)

PART NUMBER
204-076-202-007

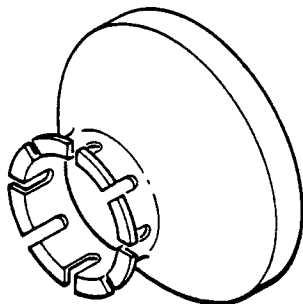


204-076-202-007 REV M
41000970 (OIP 3)

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Damaged thread	Gage	Repair in accordance with para 4-14d
2		Corrosion	Visual	Repair
3		Cracks	Fluorescent penetrant per para 4-10. (Remove coating prior to inspection and repaint following inspection.)	No cracks allowed
4		Pitting	Visual	Replace
5		Missing or damaged coating	Visual	Repair
6		Missing or damaged nylock pellet	Visual	Replace
7		Nick, burrs	Visual	Repair

OVERHAUL INSPECTION PROCEDURE: 4

ITEM	PART NUMBER
Shield Assembly (6)	KSP9046-5



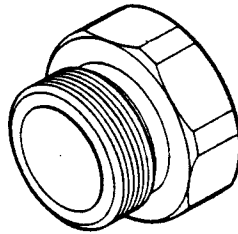
KSP9046-5

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Bent, damaged	Visual	Replace

OVERHAUL INSPECTION PROCEDURE: 5

ITEM
Retainer (11)

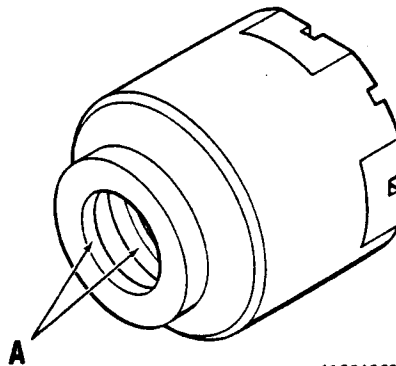
PART NUMBER
41004875



41004875 REV A
41000970 (OIP 5)

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Damaged thread	Gage	Repair in accordance with para 4-14d
2		Fractures and cracks	Fluorescent penetrant per para 4-10	No fractures or cracks allowed
3		Pitting	Visual	Replace

ITEM	PART NUMBER
Cylinder Cap (16)	41004868

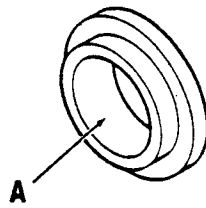


41004868 REV A
41000970 (OIP 6)

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Damaged thread	Gage	Repair in accordance with para 4-14d
2		Fractures and cracks	Fluorescent penetrant per para 4-10	No fractures or cracks
3		Missing or damaged protective coating	Visual	Anodize in accordance with para 4-13
4	A	Worn bore	SIE	1.001 inch maximum diameter

OVERHAUL INSPECTION PROCEDURE: 7

ITEM	PART NUMBER
Outer Gland (20)	41004871

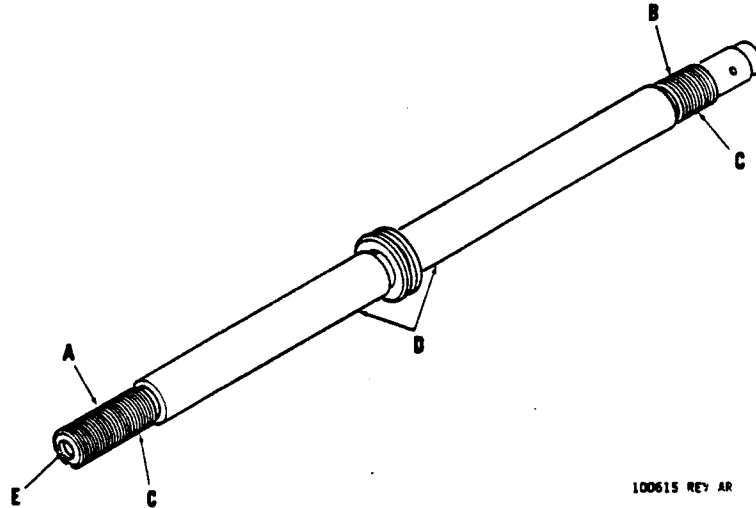


41004871 REV A

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1	A	Worn bore	SIE	1.001 inch maximum diameter

OVERHAUL INSPECTION PROCEDURE: 8

ITEM	PART NUMBER
Piston Rod Assembly (22)	100615

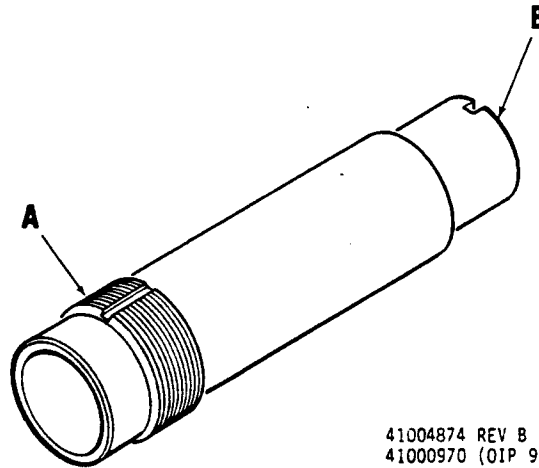


NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1	A,B	Damaged thread	Gage	Repair in accordance with para 4-14d
2	C	Missing or damaged protective coating	Visual	Cadmium plate per QQ-P-416, Type I, Class 2
4	D	Missing or damaged protective coating	Visual	Chromium plate per QQ-C-320, Class 2
5	E	Corrosion	SIE	Repair or replace
6		Fractures and cracks	Magnetic particle per para 4-9	No fractures or cracks
7		Nicks or scratches on sealing areas	Visual	Repair or replace

OVERHAUL INSPECTION PROCEDURE: 9 .

ITEM
Cylinder (26)

PART NUMBER
41004874

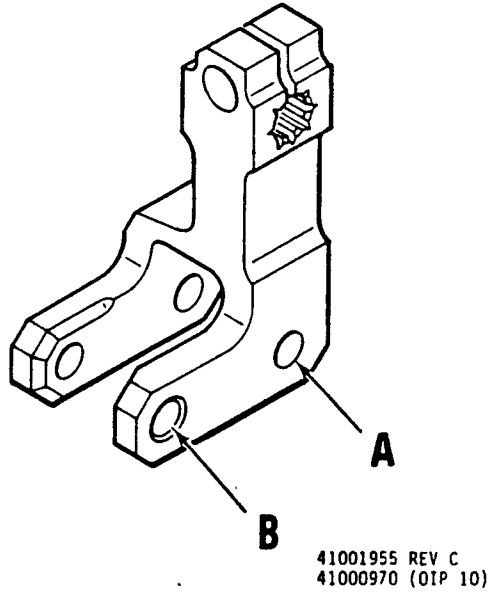


NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1	A,B	Damaged thread	Gage	Repair in accordance with para 4-14d
2		Fractures and cracks	Fluorescent penetrant per para 4-10	No fractures or cracks
3		Missing or damaged protective coating	Visual	Anodize per para 4-14f
4		Wear from shield assembly	Visual	Replace

OVERHAUL INSPECTION PROCEDURE: 10

ITEM
Input Lever (38)

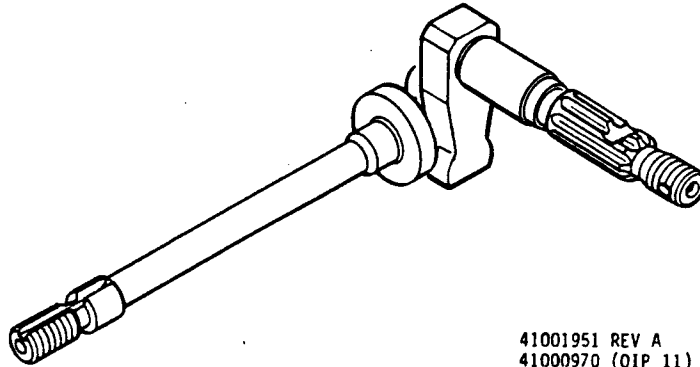
PART NUMBER
41001955



NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Fractures and cracks	Magnetic particle per para 4-9	No fractures or cracks
2	A	Elongated bolt holes	Bushing Gage T569-4-6	0.2495-0.2505 inch diameter
3	B	Elongated bolt holes	Bushing Gage T569-4-16	0.2505-0.2515 inch diameter

OVERHAUL INSPECTION PROCEDURE: 11

ITEM	PART NUMBER
Matched Shaft Assembly (41)	41001951

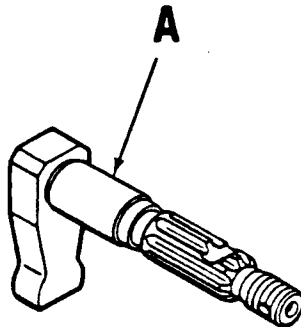


NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Clearance between shaft and crank exceeds 0.0001 to 0.0005 inch	SIE	Replace matched shaft assembly
2		Worn or damaged splines	Visual	Replace matched shaft assembly

OVERHAUL INSPECTION PROCEDURE: 12

ITEM
Crank (42)

PART NUMBER
41001953

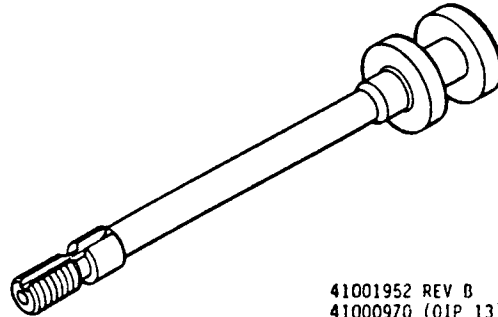


41001953 REV B
41000970 (OIP 12)

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Damaged thread	Gage	Repair in accordance with para 4-14d
2		Fractures and cracks	Magnetic particle per para 4-9	No fractures or cracks
3		Missing or damaged protective coating	Visual	Chromium plate per QQ-C-320, Class 2C
4	A	Worn surface	SIE	0.3149 inch minimum diameter

OVERHAUL INSPECTION PROCEDURE: 13

ITEM	PART NUMBER
Shaft (43)	41001952

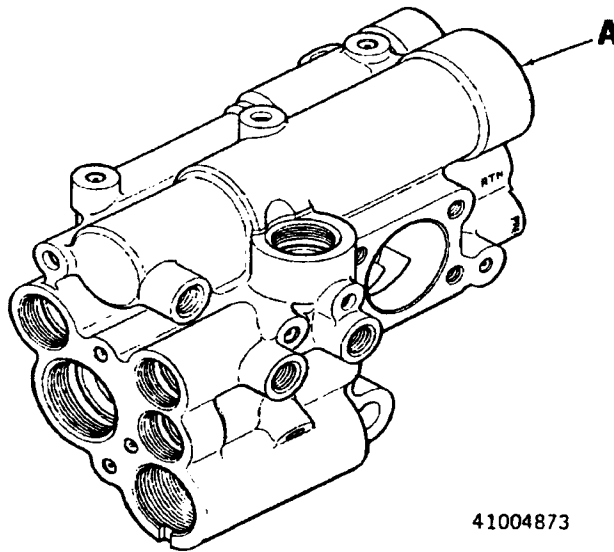


41001952 REV B
4100097G (OIP 13)

NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Damaged thread	Gage	Repair in accordance with para 4-14d
2		Fractures and cracks	Magnetic particle per para 4-9	No fractures or cracks

OVERHAUL INSPECTION PROCEDURE: 14

ITEM	PART NUMBER
Housing (134)	41006783



NO.	REFERENCE LETTER	CHARACTERISTIC	INSPECTION METHOD	REQUISITE
1		Damaged thread	Gage	Repair in accordance with para 4-14d
2		Fractures and cracks	Fluorescent penetrant per para 4-10	No fractures or cracks
3		Nicks or scratches on sealing surfaces		Visual Replace housing
4	A	Worn accumulator bore	SIE	0.751 inch maximum diameter

4-9. Magnetic Particle Inspection. Ferrous parts requiring magnetic particle inspection by an OIP shall be inspected per MIL-STD-1949A.

4-10. Fluorescent Penetrant Inspection. Nonferrous parts requiring fluorescent penetrant inspection by an OIP shall be inspected per MIL-I-6866 Type I, Method A, using penetrant inspection material MIL-I-25135, Group VI or VII.

4-11. Mandatory Replacement Parts. Mandatory replacement parts at overhaul are listed in Table 4-1.

4-12. Free Length of Springs. Replace any of the following springs that are not within tolerance, plus or minus 0.010 inch.

<u>Index No.</u>	<u>Part No.</u>	<u>Length (inch)</u>
(66)	41001154	3.220
(67)	41101151	3.091
(90)	42579	0.612
(101)	42571	0.825
(116)	42556	1.133
(128)	42593	0.589

SECTION IV. REPAIR

4-13. Repair. Parts that fail to meet inspection requirements listed in OIP shall be either repaired or replaced. Only those authorized repair instructions given in this section shall be done. When no repair is given for a part, it is considered nonrepairable and it shall be replaced.

4-14. Removal of Nicks, Scratches, and Corrosion.

NOTE

Minor nicks and scratches are defined as material raised above the parent metal which, if not removed, would damage packings during installation or affect their sealing qualities during operation. Gouges in the parent metal which could impair sealing surfaces during operation are cause for rejection of the part.

- a. Remove nicks and scratches on steel parts and aluminum parts with abrasive crocus cloth (item 4, Appendix C).
- b. After completion of polishing, reclean parts per paragraph 4-6.
- c. Remove burrs with a fine-tooth file.

Table 4-1. Mandatory Replacement Parts

Item Description	Part No. (FSCM No.)	NSN	Item and Figure No.	Quantity
Washer	41001386 (81873)		13, Figure 4-2	1
Packing	MS28775-224		17	2
Seal	CEC6001-214-55 (07060)		19, 25	2
Scraper	CEC5091-0998-55 (07060)		12, 21	2
Seal	105886 (81873)		23	1
Ring	100647 (81873)		24	1
Pin, cotter	MS24665-151		28	1
Pin, cotter	MS24665-155		33, 35	2
Packing	MS28775-014		45, 126	2
Seal	S32216 (25220)		46	1
Packing	82005527-005 (81873)		49	1
Seal	7024MR-160 (72902)		50	1
Packing	MS28775-019		53	1
Washer	41001582 (81873)		55	1
Packing	MS28775-017		60	4
Packing	MS28775-020		64	1
Seal	711A3MR-160A-7 (72902)		69	1

Table 4-1. Mandatory Replacement Parts (Continued)

Item Description	Part No. (FSCM No.)	NSN	Item and Figure No.	Quantity
Packing	MS28775-012		72, 86, 100, 106, 114, 132	9
Packing	MS28775-011		74, 79, 88, 93	4
Packing	MS28775-111		110	1
Packing	MS28775-2		119	3
Packing	MS28778-4		121	2
Packing	MS28775-010		123	2
Packing	MS28775-211		133	2

d. Replace threaded parts if thread damage exceeds 50 percent of one thread. Chase threads with proper tap or die to remove damage not exceeding limits.

e. Replace all parts which cannot be reworked to meet inspection requirements.

f. Damaged anodized finishes on aluminum parts shall be repaired by applying a protective chemical film per MIL-C-5541, Type 2.

g. Damaged finishes on steel parts shall be repaired by passivating per QQ-P-35, Type IV.

4-15. Coating Repair. If coating on housing (1) or nut (5) require repair, proceed as follows:

WARNING

Methyl ethyl ketone is flammable and toxic. Keep away from heat and open flame. Use with adequate ventilation. Avoid prolonged breathing of vapors. Avoid prolonged or repeated contact with skin.

a. Immerse parts in bath of methyl ethyl ketone (item 8, App C) to remove acrylic lacquer, then air dry parts with low pressure compressed air.

WARNING

When using coating remover, avoid prolonged exposure to temperatures above 110⁰F. Do not use in confined spaces. Provide adequate ventilation. Avoid contact with skin and eyes. Use face shield, apron, gloves and boots. Open containers slowly to avoid splashing contents.

b. Apply A202 coating remover (item 9, App C) to coating to be removed, by brushing, flowing on, or spraying with nonatomizing spray. Surfaces should be dry and between 50⁰ and 80⁰F. Allow coating remover to dwell until coating is wrinkled and loosened from surfaces. Shake parts lightly.

c. Reapply A202 coating remover (item 9, App C) to areas of coating that are not completely released from base metal. Flush loosened coating from surface with water spray.

d. Dry parts thoroughly.

e. Paint parts in accordance with Table 4-2.

Table 4-2. Paint Requirements

Paint components I/A/W TM 55-1500-345-23.

4-16. Poppet Rework. Rework check valve poppet (75, 80, 89, 94) as follows:

- a. Remove minor defects and scratches from poppet seating surface by lapping poppet in a figure-eight motion on a flat surface using 1000 to 1200 grit lapping compound (item 13, Appendix C).
- b. Using cleaning solvent (item 1, Appendix C), thoroughly clean poppet to remove lapping compound.

4-17. Check Valve Seat Rework. Rework check valve seat (73, 78, 87, 92) as follows:

- a. Repeat paragraph 4-15 for check valve seat.

4-18. Piston Rod Assembly Rework. Rework piston rod assembly (22) that does not meet inspection requirements as follows:

- a. Inspect piston rod surface for wear below diameter shown in Figure 4-1.
- b. Make sure rod assembly is free of packings, seals, hydraulic fluid, and/or lubricants.
- c. Make sure stripping procedures and solutions are in conformance to generally accepted plating industry standards.
- d. Do not use reverse current stripping in chromic acid baths and other acids such as muriatic/hydrochloric.
- e. The following chrome stripping bath is recommended:
 - (1) Solution of 6-1/2 ounces Na_2CO_3 per gallon of water at room temperature.
 - (2) Anodic current at 40 to 50 amperes per square foot area.
- f. Chrome Stripping Procedure.
 - (1) Mask or plug all holes to prevent solution from entering internal passages. Mask off all nonchrome-plated surfaces. See Figure 4-1.

CAUTION

Do not submerge lee plug end of piston rod assembly in solution or piston rod may crack.

- (2) Inspect piston rod assembly for presence of Lee plug in bore. Keeping Lee plug end above surface of solution, strip existing chrome plate from piston rod assembly in accordance with standard shop procedures.
- (3) Bake piston rod assembly in oven at $375 \pm 25^\circ\text{F}$ ($191 \pm 19^\circ\text{C}$) for a minimum of 23 hours, beginning within 1 hour after chrome plating.
- (4) Allow piston rod assembly to cool to room temperature. Remove all masking material and/or plugs.

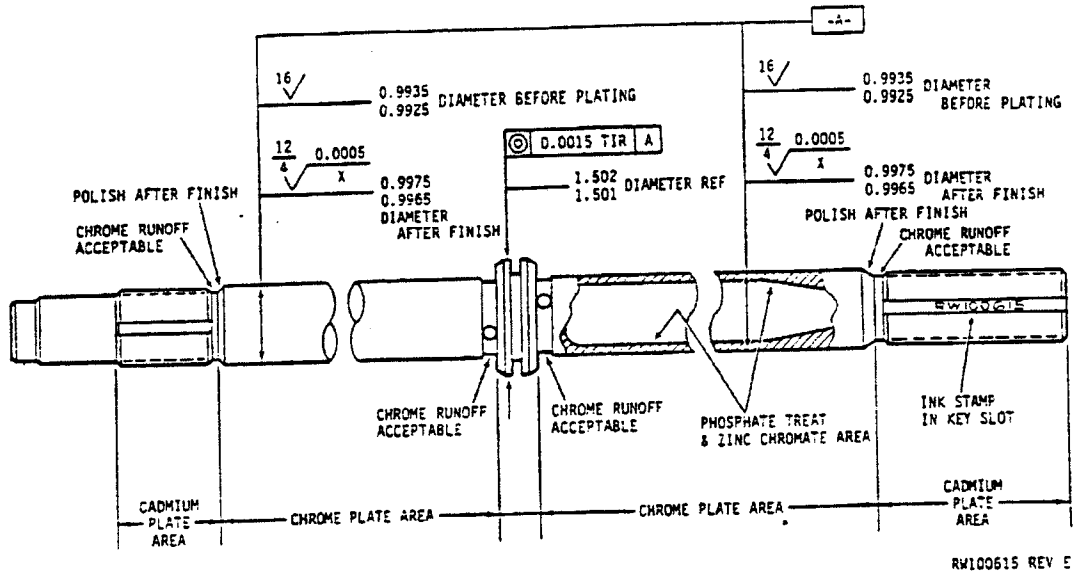


Figure 4-1. Piston rod plating and grinding data.

CAUTION

Use of heavy stone pressure may crack piston rod assembly. Piston rod was manufactured by centerless grind and may not remain within tolerances if ground between centers.

(5) Grind chrome-plated areas in accordance with dimensional data in Figure 4-1. Deburr and break all sharp edges 0.005 to 0.010 inch radius.

(6) Super finish chrome-plated areas, using a fine stone cleaned regularly, to establish $\frac{12}{4} \sqrt{\frac{0.0005}{X}}$ finish with cross-hatch pattern. Inspect to verify finish and pattern.

(7) Conduct magnetic particle inspection in accordance with MIL-I-6868.

(8) Demagnetize piston rod assembly 100 percent.

(9) Electrochemical etch piston rod assembly with part number preceded by letters RW, to indicate that part has been reworked.

(10) Flush piston rod assembly interior and exterior with MIL-H-46107 hydraulic preservative fluid (Item 5, Appendix C).

Section V. ASSEMBLY

4-19. Assembly.

a. Install two packings (133, Figure 4-2) into cylinder bore of housing assembly (134).

b. Install packing (132) into thermal relief bore of housing (134). Install seat (130) into poppet assembly (131), and install seat and poppet assembly (129).

c. Install spring (128) and shim (127). Install packing (126) on cap (125) and install cap. Install retainer (124) and torque 70 to 90 inch-pounds.

d. Install one packing (119) onto each of three test port plugs (118), and install plugs. Install one packing (123) onto each of two filters (122) and install filters to bottom in filter bores. Install one packing (121) onto each of two plugs (120), and install plugs.

e. Install flat washer (117), spring (116), and retainer (115) in sequence valve port. Install three packings (114) on sleeve (113) and install sleeve over retainer in sequence valve port.

f. Install slide (112), long stem out, into sleeve (113). Install packing (110) in groove of cap (109) and install cap over slide and sleeve assembly (111). Install retainer (108) and torque 160 to 180 inch-pounds.

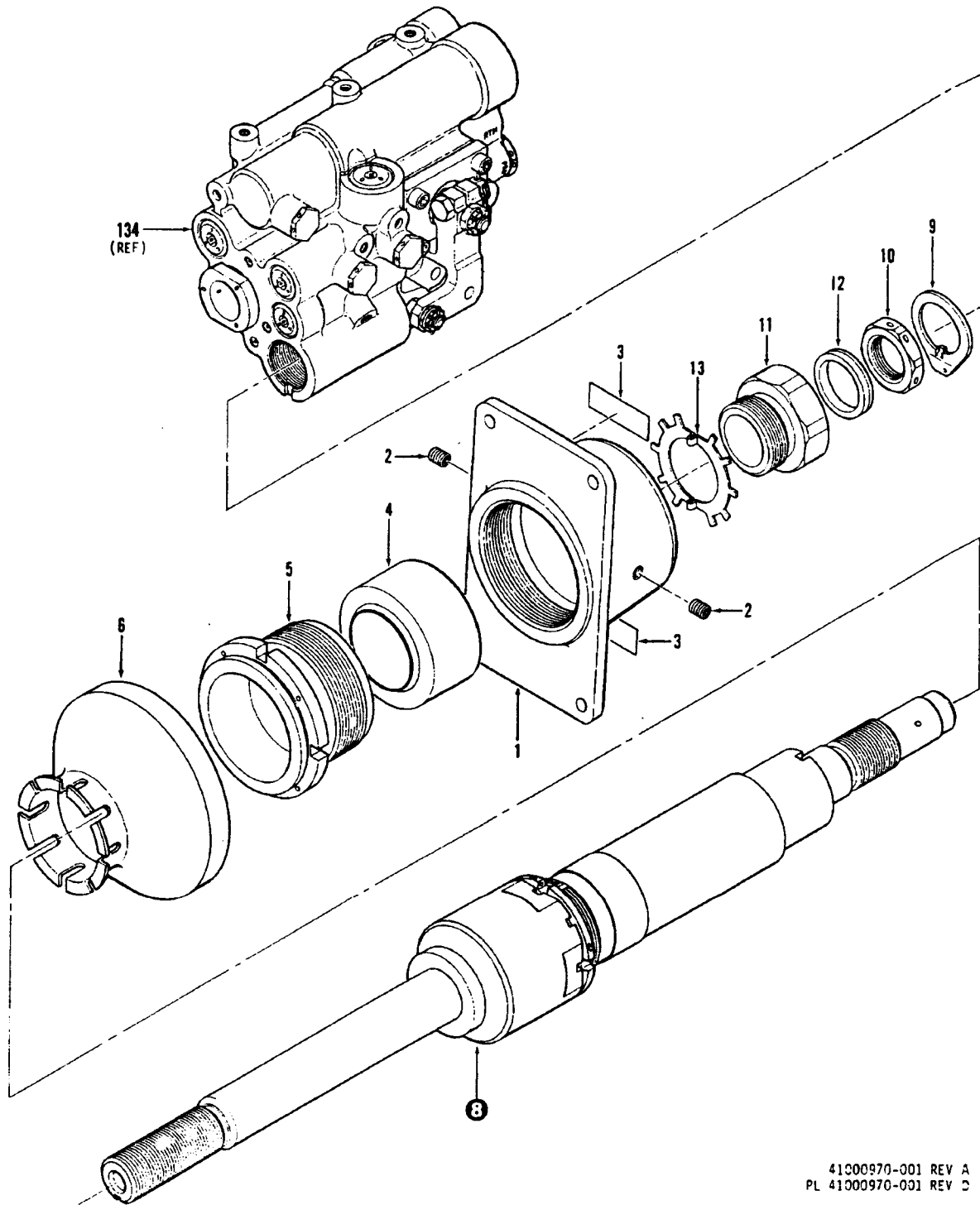
g. Install stop (107), with chamfered end down, into bottom of differential relief port. Install two packings (106) on sleeve (105) and install spool (104) into sleeve. Using Differential Valve Installer T42550-8-2, install relief valve slide assembly (103). If removed during disassembly, install shim(s) (102).

h. Install spring (101) over spool (104). Install packing (100) on cap (99) and install cap over spring (101). Install retainer (98) and torque 90 to 110 inch-pounds.

i. Install flat washer (97), guide (96), and spring (95). Using Poppet Installation Tool T44047900-7-1, install poppet (94) with seating surface out. Install packing (93) on seat (92). Using Puller T668-1, install seat (92) with seating surface in. Install guide (91) and spring (90). Using Poppet Installation Tool T44047900-7-1, install poppet (89) with seating surface out.

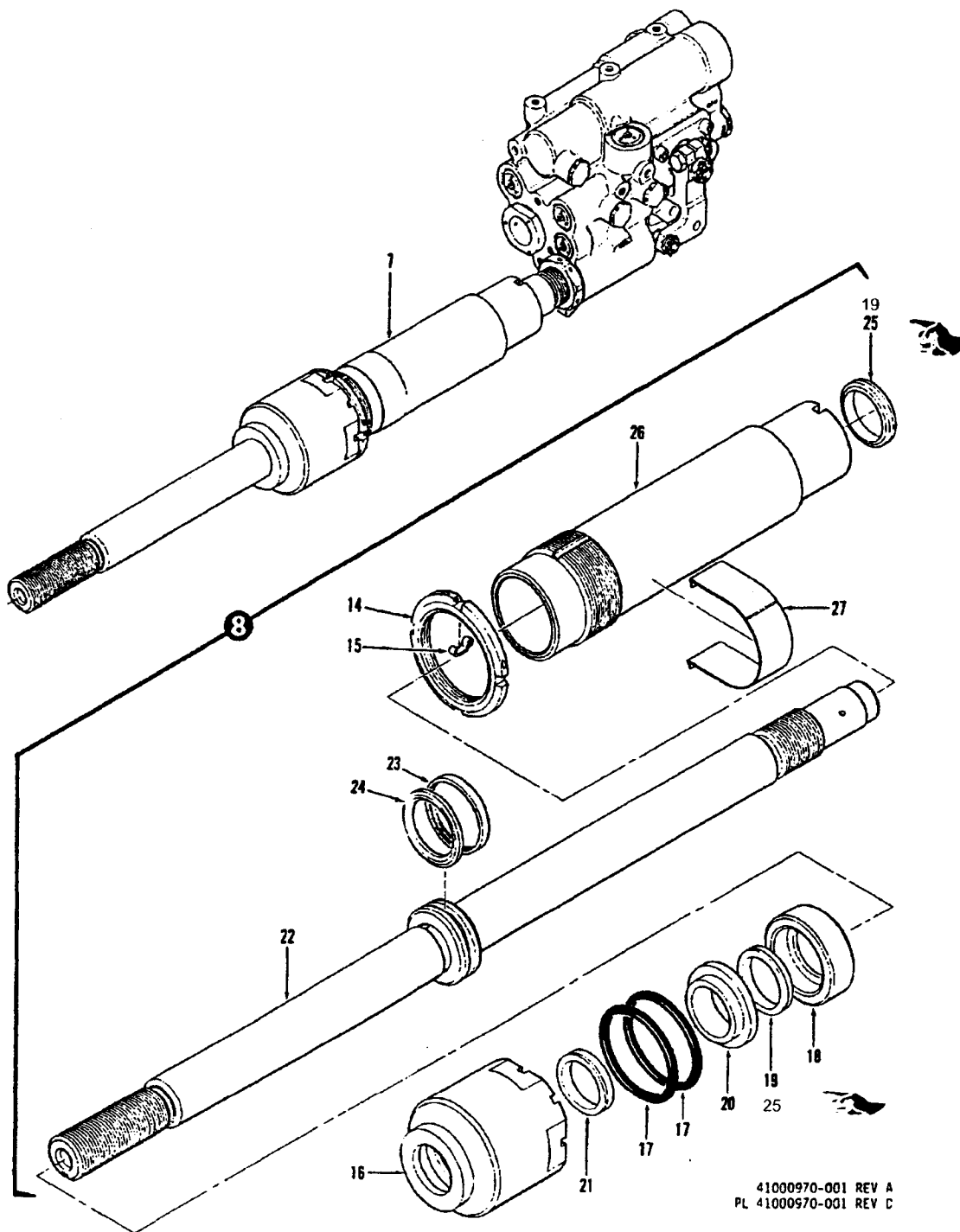
j. Install packing (88) on seat (87). Using Puller T668-1, install seat (87) with seating surface in. Install packing (86) on cap (85) and install cap. Install retainer (84) and torque 90 to 110 inch-pounds.

k. Install flat washer (83), guide (82), and spring (81). Using Poppet Installation Tool T44047900-7-1, install poppet (80) with seating surface out. Install packing (79) on seat (78). Using Puller T668-1, install seat (78) with seating surface in. Install guide (77) and spring (76). Using Poppet Installation Tool T44047900-7-1, install poppet (75) with seating surface out.



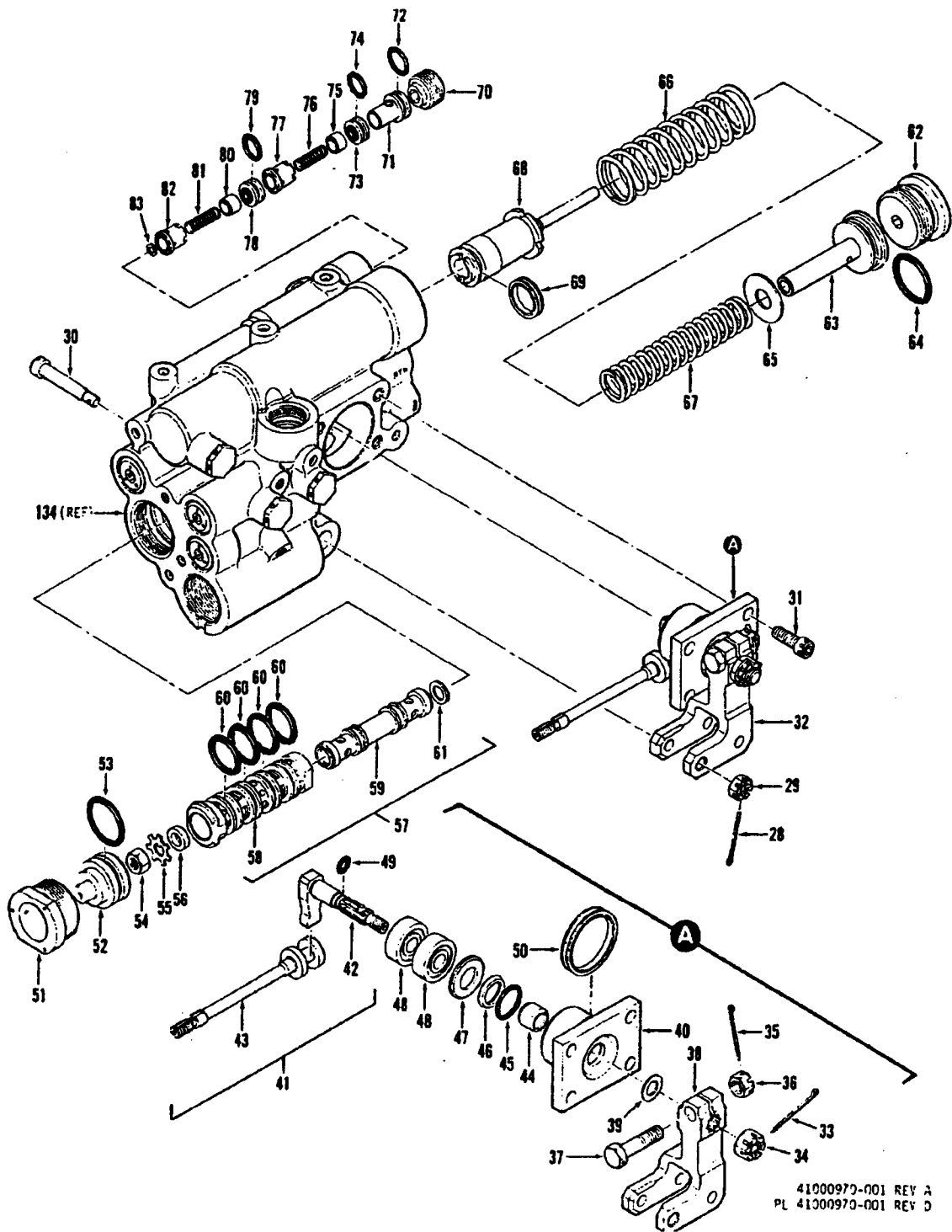
41000970-001 REV A
PL 41000970-001 REV C

FIGURE 4-2. Flight control actuator assembly exploded view (Sheet 1 of 8)



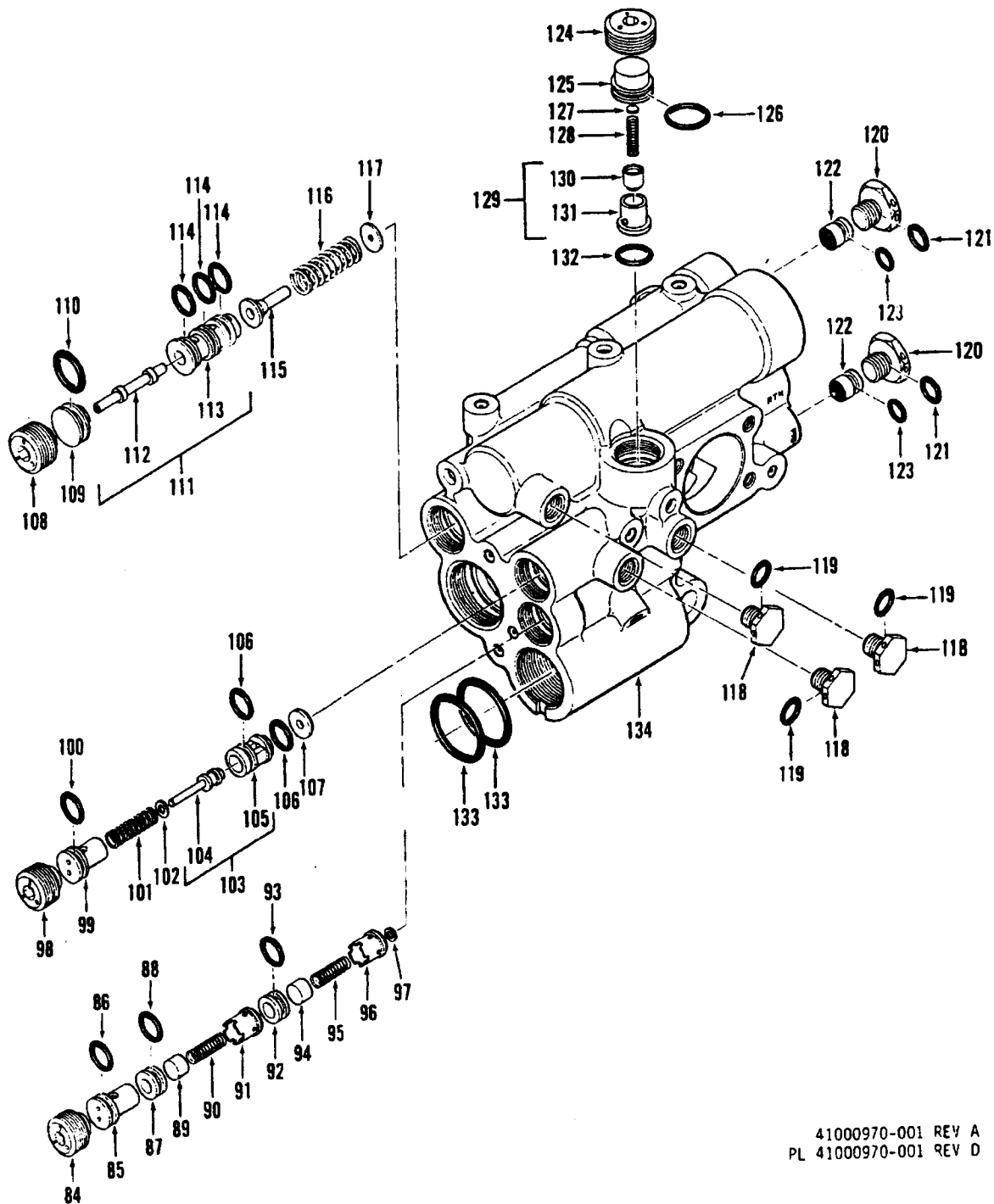
41000970-001 REV A
PL 41000970-001 REV C

Figure 4-2. Flight control actuator assembly exploded view (Sheet 2)



41000970-001 REV A
PL 41000970-001 REV D

Figure 4-2. Flight control actuator assembly exploded view (Sheet 3)



41000970-001 REV A
PL 41000970-001 REV D

FIGURE 4-2. Flight control actuator assembly exploded view (Sheet 4)

Figure and Index No.	Part No.	Description	Qty Per Assy
4-2	205-076-056-107	ACTUATOR ASSEMBLY, Flight Control (97499)	REF
-1	204-076-201-005	• HOUSING (97499)	1
-2	1604-129Y	• PLUG (65301)	2
-3	205-076-386-001	• DECAL (97499)	2
-4	KSP6099-1	• BEARING ASSEMBLY (97499)	1
-5	204-076-202-007	• NUT (97499).....	1
-6	KSP9046-5	• SHIELD ASSEMBLY (97499).....	1
-7	41000970-001	• CYLINDER ASSEMBLY, Flight Control, Servo-hydraulic (BHT 205-076-055-101)	1
-8	41004948	•• CYLINDER ASSEMBLY	1
-9	100641-1	••• WASHER, Lock	1
-10	100624	••• NUT, Lock.....	1
-11	41004875	••• RETAINER.....	1
-12	CEC5091-0998-55	••• SCRAPER (07060)	1
-13	41001386	••• WASHER, Tab	1
-14	41000607	••• NUT, Lock.....	1
-15	105883	••• KEY, Lock	1
-16	41004868	••• CAP, Cylinder	1
-17	MS28775-224	••• PACKING, Preformed	2
-18	41004869	••• GLAND, Inner	1
-19	TF 1163-214-901	••• SEAL, Rod (07060).....	1
-20	41004871	••• GLAND, Outer	1
-21	CEC5091-0998-55	••• SCRAPER (07060)	1
-22	100615	••• ROD ASSEMBLY, Piston	1
-23	105886	••• SEAL, Cap	1
-24	100647	••• RING, Seal.....	1
-25	MS 28775-121	••• SEAL, Rod	1
-26	41004874	••• CYLINDER.....	1
-27	41001941	•• PLATE, Identification.....	1
-28	MS24665-151	•• PIN, Cotter	1
-29	MS17825-3	•• NUT, Castellated.....	1
-30	41001956	•• SCREW, Shoulder	1
-31	NAS1351C4H8	•• SCREW, Cap.....	4
-32	41001947	•• CRANK ASSEMBLY	1
-33	MS24665-155	••• PIN, Cotter	1
-34	MS17825-4	••• NUT.....	1
-35	MS24665-155	••• PIN, Cotter	1
-36	MS17826-4	••• NUT.....	1
-37	AN4CH7	••• BOLT.....	1
-38	41001955	••• LEVER, Input	1
-39	41002499-001	••• SHIM (0.001 inch thick)	AR
	41002499-002	••• SHIM (0.002 inch thick)	AR
	41002499-003	••• SHIM (0.005 inch thick)	AR
	41002499-004	••• SHIM (0.010 inch thick)	AR
-40	410011948	••• HOUSING, CRANK	1

FIGURE 4-2. Flight control actuator assembly exploded view (Sheet 5).

Figure and Index No.	Part No.	Description	Qty Per Assy
4-2-41	41001951	... SHAFT ASSEMBLY, Matched (Matched set)	1
-42	41001953 CRANK (Matched part, order NHA)	1
-43	41001952 SHAFT (Matched part, order NHA)	1
-44	41001954	... SPACER, Sleeve	1
-45	MS28775-014	... PACKING, Preformed	1
-46	S32216	... SEAL, Rotary (25220)	1
-47	41001949	... SPACER	1
-48	38HDB	... BEARING SET, Duplex Matched Pair (70854)	1
-49	82005527-005	... PACKING, Preformed	1
-50	7024MR-160-T	. SEAL, G-T (72902)	1
-51	41001935	. RETAINER	1
-52	41001934	. PLUG	1
-53	MS28775-019	. PACKING, Preformed	1
-54	MS21083C4	. NUT, Self-locking	1
-55	41001582	. WASHER, Tab	1
-56	41001936	. WASHER	1
-57	41001929	. SPOOL AND SLEEVE ASSEMBLY (Matched set)	1
-58	41001932	.. SLEEVE (Lap-matched, order NHA)	1
-59	41001931	.. SPOOL (Lap-matched, order NHA)	1
-60	MS28775-017	. PACKING, Preformed	4
-61	41001933-001	. SHIM (0.001 inch thick)	AR
	41001933-002	. SHIM (0.002 inch thick)	AR
	41001933-003	. SHIM (0.005 inch thick)	AR
	41001933-004	. SHIM (0.010 inch thick)	AR
-62	41001938	. RETAINER	1
-63	41001939	. GUIDE	1
-64	MS28775-020	. PACKING, Preformed	1
-65	41001937	. WASHER	1
-66	41001154	. SPRING	1
-67	41101151	. SPRING	1
-68	41001124	. PISTON	1
-69	711A3MR-160A-7	. SEAL, G-T (72902)	1
-70	41001957	. RETAINER	1
-71	42581	. CAP	1
-72	MS28775-012	. PACKING, Preformed	1
-73	42576	. SEAT, Check Valve	1
-74	MS28775-011	. PACKING, Preformed	1
-75	41001728	. POPPET	1
-76	42579	. SPRING	1
-77	41001727	. GUIDE, Check Valve	1
-78	42576	. SEAT, Check Valve	1
-79	MS28775-011	. PACKING, Preformed	1

Figure 4-2. Flight control actuator assembly exploded view (Sheet 6)

Figure and Index No.	Part No.	Description							Qty Per Assy
		1	2	3	4	5	6	7	
4-2-80	41001728	.							1
-81	42579	.							1
-82	41001727	.							1
-83	NAS620C5L	.							1
-84	41001957	.							1
-85	42581	.							1
-86	MS28775-012	.							1
-87	42576	.							1
-88	MS28775-011	.							1
-89	41001728	.							1
-90	42579	.							1
-91	41001727	.							1
-92	42576	.							1
-93	MS28775-011	.							1
-94	41001728	.							1
-95	42579	.							1
-96	41001727	.							1
-97	NAS620C5L	.							1
-98	41001957	.							1
-99	42581	.							1
-100	MS28775-012	.							1
-101	42571	.							1
-102	41100363-001	.							AR
-103	42584	.							1
-104	42569	..							1
-105	42568	..							1
-106	MS28775-012	.							2
-107	42567	.							1
-108	41001958	.							1
-109	42559	.							1
-110	MS28775-111	.							1
-111	42558	.							1
-112	42583	..							1
-113	42582	..							1
-114	MS28775-012	.							3
-115	42557	.							1
-116	42556	.							1
-117	41001945	.							1
-118	41000667	.							3
-119	MS28778-2	.							3
-120	AN814-4DL	.							2
-121	MS28778-4	.							2
-122	42588	.							2
-123	MS28775-010	.							2
-124	41001946	.							1

Figure 4-2. Flight control actuator assembly exploded view (Sheet 7)

Figure and Index No.	Part No.	Description	Qty Per Assy
4-2-125	42592	• CAP	1
-126	MS28775-014	• PACKING, Preformed	1
-127	42597	• SHIM (0.005 inch thick)	AR
-128	42593	• SPRING	1
-129	42610	• SEAT AND POPPET ASSEMBLY,	1
		Thermal Relief (Matched set)	
-130	42591	• SEAT (Lap-matched, order NHA)	1
-131	42590	• POPPET ASSEMBLY (Lap-matched	1
		order NHA)	
-132	MS28775-012	• PACKING, Preformed	1
-133	MS28775-211	• PACKING, Preformed	2
-134	41006783	• HOUSING ASSEMBLY	1

FIGURE 4-2. Flight control actuator assembly exploded view (Sheet 8).

l. Install packing (74) on seat (73). Using Puller T668-1, install seat (73) with seating surface in. Install packing (72) on cap (71) and install cap. Install retainer (70) and torque 90 to 110 inch-pounds.

m. Install G-T seal (69) on piston (68). Using Puller 87000715-ASTO, install piston (68). Install spring (66), spring (67), and washer (65). Install packing (64) on guide (63), and install guide (63). Install retainer (62) and torque 270 to 290 inch-pounds.

n. Spool and Sleeve Assembly

(1) Install four packings (60) onto sleeve (58). Install spool (59) into sleeve (58). Install shims (61) removed during disassembly or install approximately 0.037 inch of shims (61) on shaft (43) and install shaft (43) through spool and sleeve assembly (57).

(2) Install washer (56) and tab washer (55). Using Wrench 87000717-ASTO, install nut (54). Tighten nut (54) just enough to eliminate all end play. Do not overtighten nut (54).

(3) Using Sleeve Pusher 87000716-ASAD, install spool and sleeve assembly (57). Install packing (53) on plug (52) and install plug and retainer (51).

o. Crank Assembly

(1) Install packing (49). Place one bearing from bearing set (48) with stamped side facing outward on Bearing Installation Aid 87000702-ASTO and second bearing from bearing set (48) with stamped side facing inward. Install crank (42) into bearing set (48) and using an arbor press, press crank (42) into bearing set (48) until bottomed. Remove tooling.

(2) Install sleeve spacer (44), and spacer (46) with cupped side facing bearing set (48). Install rotary seal (47) with small outside diameter facing outward.

(3) Install packing (45) and G-T seal (50) on crank housing (40). Install crank (42) in crank housing (40). Install shims (39) removed during disassembly or install amount of shims (39) which will align bolt hole on input lever (38) with slot on crank (42).

(4) Install nut (34) and torque 20 to 60 inch-pounds. Check for alignment of slot on crank (42) with bolt hole on input lever (38). If misaligned, continue to torque until slot on crank is aligned with bolt hole, but do not exceed 60 inch-pounds. If alignment cannot be made, adjust amount of shims (39) and repeat this step.

(5) Install bolt (37) and nut (36). Torque nut (36) 70 to 80 inch-pounds. Install cotter pins (33,35) in accordance with MS33540.

CAUTION

Use care during installation of crank assembly (32) to prevent damage to mating components.

(6) Carefully install crank assembly (32) into housing assembly (134) and secure with four screws (31). Torque screws 25 to 30 inch-pounds.

(7) Install screw (30) and nut (29). Tighten nut (29) until fully bottomed, then back out nut to line up cotter pin hole on screw (30) with first castellation on nut (29). Install cotter pin (28).

p. Cylinder Assembly

(1) Install seal ring (24) on piston rod assembly (22). Make sure seal ring is not twisted. Install cap seal (23). Using Seal Sizing Sleeve T557-13, size cap seal (23).

(2) Using Seal Installation Tool Set 87000706-AST0, mount detail 1 (spud) over detail 3 (extender) of tool set and place cylinder (26) over tooling details. Remove hex ring from rod seal (25). Lubricate hex ring with lubricant (item 7, App C) and install hex ring on seal ring. See Figure 4-3.

(3) Install rod seal (25), without backup ring, over detail 1 (spud) of tool set. Using detail 2 (pusher) of tool set, push rod seal into place. See Figure 4-3 for direction of rod seal.

(4) Install backup ring of rod seal (25). Using detail 2 (pusher) of tool set, push backup ring into place. Remove tooling. Using Channel Seal Forming Tool T555-7, size rod seal (25).

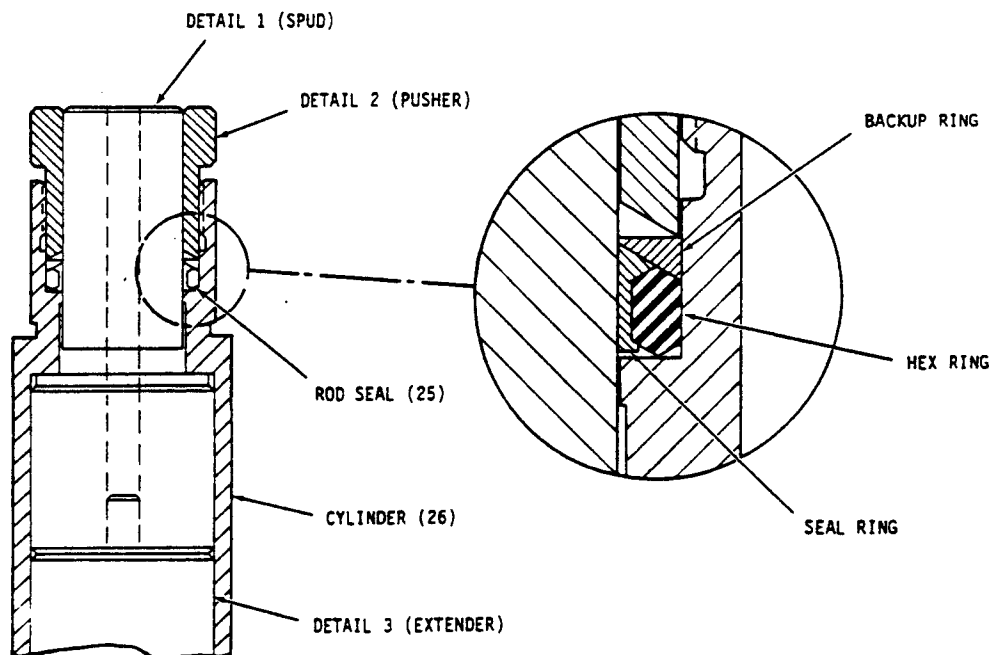


FIGURE 4-3. Rod seal installation data for cylinder.

(5) Remove ring from scraper (12). Lubricate ring with lubricant (item 7, App C) and install ring in retainer (11). See Figure 4-4 for direction of ring.

(6) Install scraper of scraper (12) in retainer (11). See Figure 4-4 for direction of scraper. Using Channel Seal Forming Tool T555-7, form scraper (12). Check that scraper (12) is not damaged and that scraper is correctly installed. Using Channel Seal Forming Tool T555-7, size scraper (12).

(7) Mount piston rod assembly (22), fluid hole up, in piston Holder T100324-2. Install Thread Cover 87000707-AST0 over end of piston rod assembly (22).

(8) Install cylinder (26) on piston rod assembly (22). Remove piston holder and thread cover. Remove assembly from piston holder, and reinstall assembly with fluid hole down, into piston holder.

(9) Using Seal Installation Tool Set 87000706-AST0, mount inner gland (18) over detail 1 (spud) of tool set. Remove hex ring from rod seal (19). Lightly lubricate hex ring with lubricant (item 7, App C) and reinstall hex ring on rod seal (19). See Figure 4-5.

(10) Install rod seal (19), without backup ring, over detail 1 (spud) of tool set. Using detail 2 (pusher) of tool set, push rod seal into place. See Figure 4-5 for direction of rod seal.

(11) Install backup ring of rod seal (19). Using detail 2 (pusher) of tool set, push backup ring into place. Using Channel Seal Forming Tool T555-7, size rod seal (19).

(12) Install two packings (17) in cylinder cap (16). Install scraper of scraper (21) in cylinder cap (16). Lightly lubricate ring of scraper (21) and install. See Figure 4-6 for direction of scraper and ring.

(13) Install lock key (15) on lock nut (14). Using Torque Adapter T41000870-1, install locknut (14). See Figure 4-7 for orientation of lockwire holes.

(14) Place Thread Cover 87000708-AST0 over threads on end of piston rod assembly (22). Install outer gland (20), with shorter end facing toward cylinder (26). Install gland assembly on piston and position against cylinder (26).

(15) Install cylinder cap (16) until bottomed, then back out until first available slot lines up with lock key (15). Turn lock nut (14) until bottomed on cylinder cap (16). Remove tooling.

(16) Mount unit in Torque Fixture 87000704-AST0. Using Torque Adapter T41000870-1, torque lock nut (14) 400 to 500 inch-pounds.

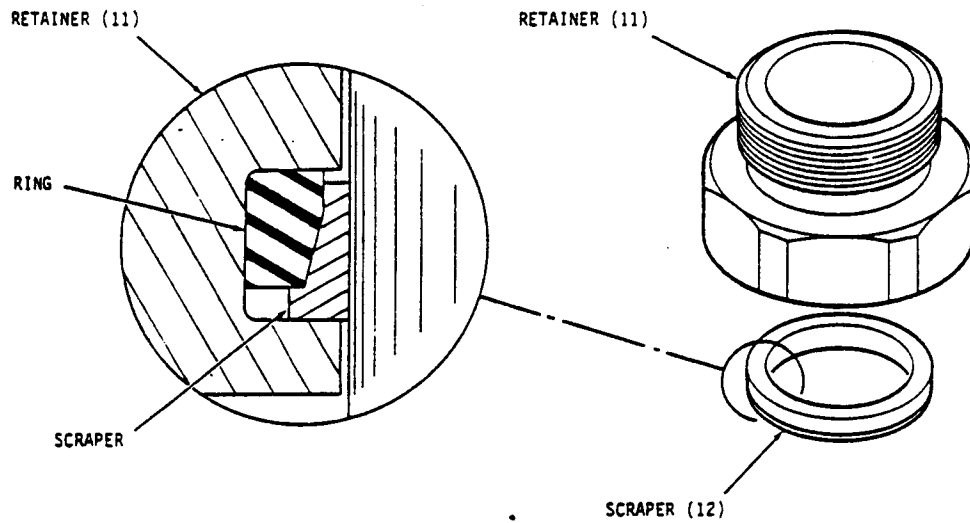


FIGURE 4-4. Scraper installation data for retainer.

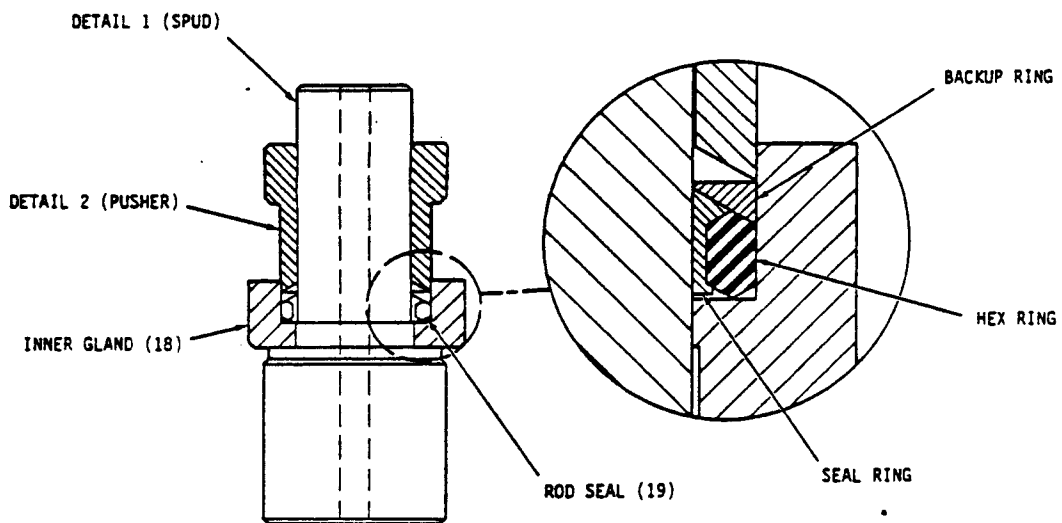


FIGURE 4-5. Rod seal installation data for inner gland.

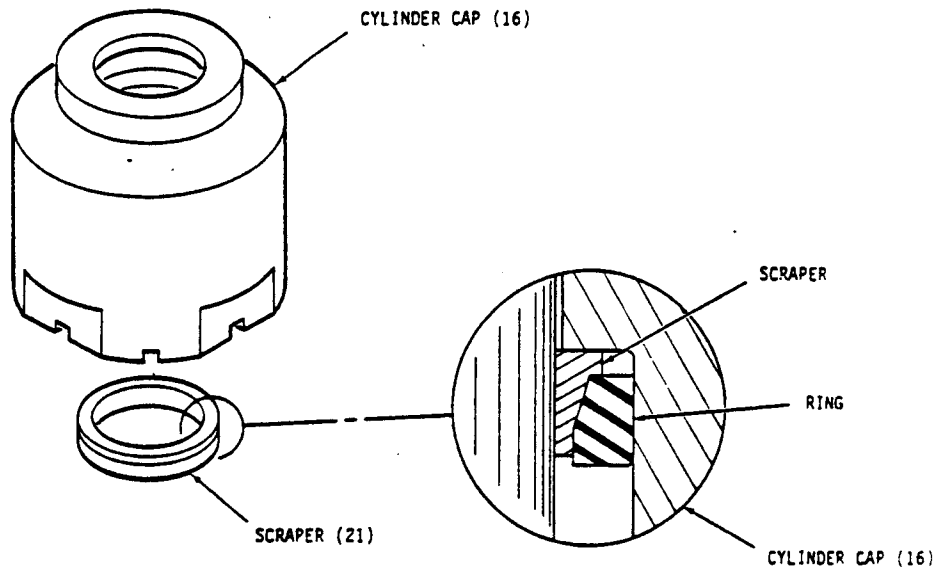


FIGURE 4-6. Scraper installation data for cylinder cap.

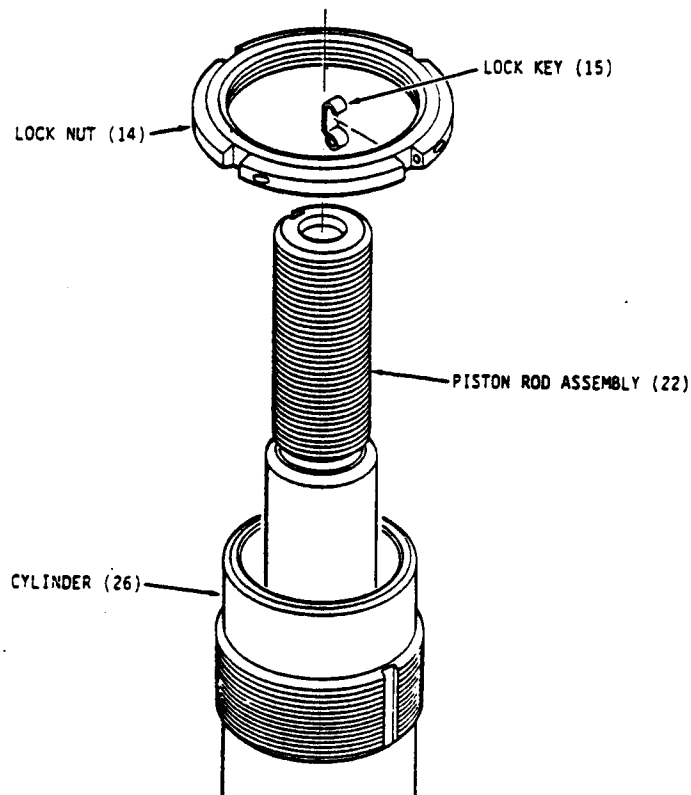


FIGURE 4-7. Orientation of lock key and lock nut.

FLIGHT SAFETY PART

The installation torque of nut (5) to be 1100 to 1180 inch-pounds; this is the critical characteristic.

(17) Install shield assembly (6) on cylinder (26). Install housing (1), bearing assembly (4) and nut (5) into housing (1). Torque nut (5) 1100 to 1180 inch-pounds. Install housing (1) on cylinder (26). Install tab washer (13) with tangs into nut (5), and install retainer (11). Torque retainer (11) 600 to 650 inch-pounds. Bend at least two tabs of tab washer (13) on flats of nut (5) to provide positive locking. Remove tooling.

(18) Mount two decals (3) on housing (1). Install two plugs (2) in housing (1).

(19) Install nut (10) and lock washer (9). Using Set Block 87000724-CKGA, install cylinder assembly (7) into housing assembly (134). Rotate piston rod assembly (22) to nearest slot alignment. Torque nut (10) 400 to 450 inch-pounds.

q. Install identification plate (27)

Section VI. TESTING

4-20. General. Conduct testing in a clean, well-lighted area, noting the following:

a. The test medium shall be hydraulic fluid (item 5, App C). Test medium temperature shall be maintained between 70°F (21°C) and 110°F (43°C).

b. The ambient temperature shall be maintained between 70°F (21°C) and 90°F (32°C).

c. Only the main control valve shimming and proof pressure test must be performed in sequence.

d. A final acceptance test checklist is provided in Table 4-3.

4-21. Main Control Valve Shimming.

a. Mount actuator assembly in Test Fixture 87000719-TSFX as shown in Figure 4-8.

b. Using dial indicator on test fixture, determine mechanical null, which is midpoint between two stops.

c. Apply 700 to 800 psi to pressure port and cycle input lever several times to bleed all air from unit.

d. Increase supply pressure to 1500 psi and determine hydraulic null, which is midpoint at which actuator assembly starts to move in each direction. Note difference between mechanical and hydraulic nulls and which side of mechanical null the hydraulic null is on. Nulls must be within 0.002 inch of each other.

Table 4-3. Final Acceptance Test Checklist

Operational Test	Requirement	Result	Initial
Proof Pressure	No external leakage, loosening of parts, deformation, or damage	<u> </u> Pass <u> </u> Fail	
Normal Operation	Force required to move input lever full stroke in each direction shall not exceed 8 ounces in each direction	<u> </u> oz	
Internal Leakage	Leakage at return port with input lever at neutral, full extend, then full retract, shall in each case, not exceed 30 cc per minute	<u> </u> lb	
Manual Operation and Irreversibility	With input lever towards cylinder, and load applied to cylinder toward housing assembly, cylinder shall move full travel at 30 pounds maximum	<u> </u> lb	
	With 50-pound load applied to cylinder away from housing assembly, cylinder shall not move.	<u> </u> Pass <u> </u> Fail	
	With input lever away from housing assembly and load applied to cylinder, cylinder shall move full travel at 30 pounds maximum	<u> </u> Pass <u> </u> Fail	
	With 50-pound load applied to cylinder toward housing assembly, cylinder shall not move	<u> </u> Pass <u> </u> Fail	
Sequence Valve Operation	Valve shall open between 525 and 575 psi	<u> </u> psi	
	Full flow between 600 and 650 psi	<u> </u> psi	
	Valve shall close between 475 and 495 psi	<u> </u> psi	
Differential Relief Valve	Valve shall open between 1500 and 1600 psi	<u> </u> psi	

Table 4-3. Final Acceptance Test Checklist (continued)

Operational Test	Requirement	Result	Initial
Accumulator Operation	Discharge volume at test port 3 shall be 0.45 cubic inches (7.38 cc) minimum	___ in ²	
Accumulator Check Valve Leakage	There shall be no leakage	___ Pass ___ Fail	
Check Valve Operation	Flow at test ports 1, 2, and 3 shall start between 2 to 5 psi and stop within 1 psi of start	___ si	
Thermal Relief Valve Operation	Valve shall open between 2100 and 2300 psi	___ psi	
	After reduction of pressure to 1900 psi, there shall be no leakage at return port	___ Pass ___ Fail	
Sequence Valve Leakage	Leakage at pressure port and return port shall not exceed two drops in 20 minutes	___ Pass ___ Fail	

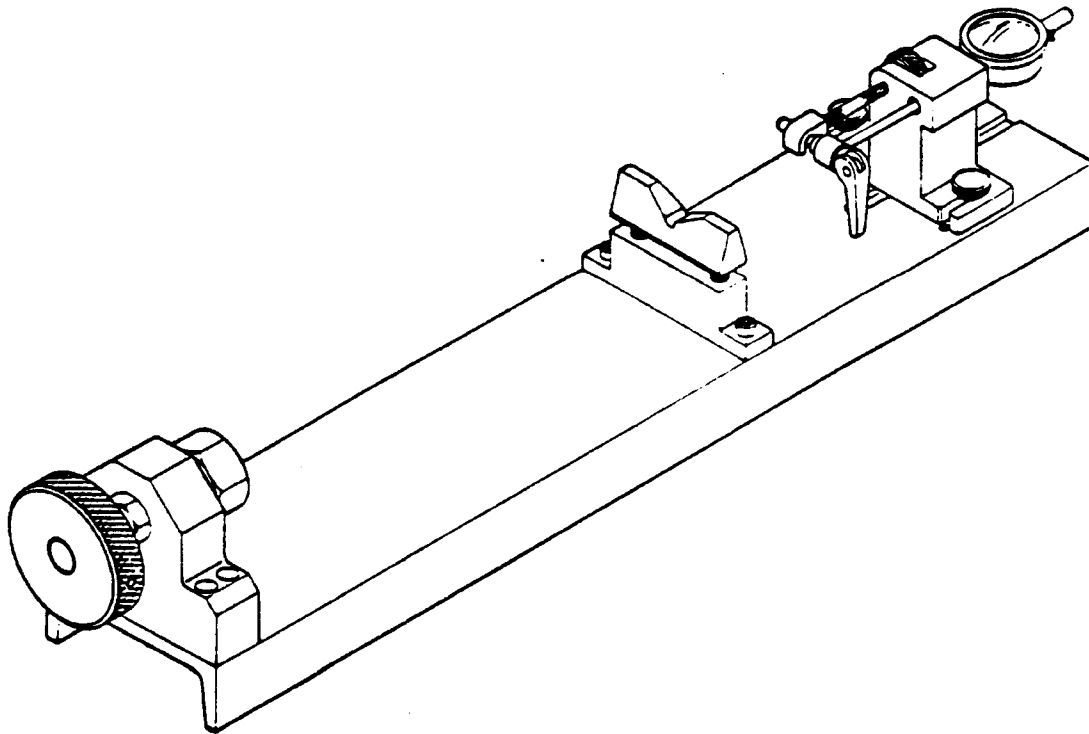


FIGURE 4-8. Test fixture setup.

e. Add shims (61, Figure 4-2) if hydraulic null is on side of mechanical null that has input lever towards servo head. Remove shims if hydraulic null is on side of mechanical null that has input lever away from servo head. The amount of shims to be added or removed is one-half the difference of the two nulls.

f. Bend two tabs of tab washer (55) over nut (54).

4-22. Proof Pressure Test.

a. Connect unit in test setup as shown in Figure 4-9. With return port closed, apply 2250 psi to pressure port and hold for 3 minutes.

b. Check actuator assembly for leakage or damage. There shall be no external leakage of parts, permanent deformation, or damage to components.

4-23. Normal Operation Test.

a. In same test setup as for proof pressure test, apply 1500 psig to pressure port with return port open. Cycle cylinder assembly at a minimum of 25 full-stroke cycles.

b. Check actuator assembly for external leakage. Leakage rate at each dynamic external seal shall not exceed one drop in 25 cycles.

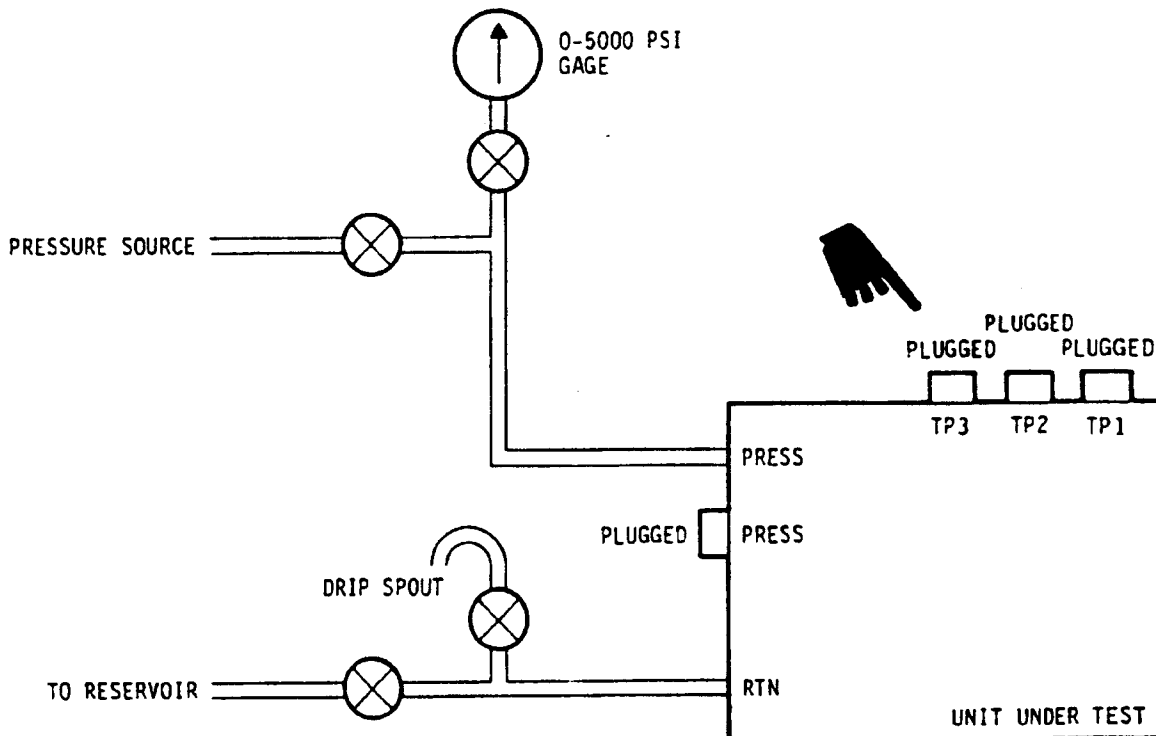


FIGURE 4-9. Proof pressure test setup.

c. Measure force required to move input lever one full stroke in each direction. Force required shall not exceed 8 ounces in either direction.

4-24. Internal Leakage Test.

a. In same test setup as for proof pressure test, apply 1500 psi to pressure port with return port open. With piston at midstroke and input lever at neutral, measure leakage at return port. Leakage shall not exceed 30 cc per minute.

b. Repeat step a, except with input lever at fully extended position. Leakage shall not exceed 30 cc per minute.

c. Repeat step a, except with input lever at fully retracted position. Leakage shall not exceed 30 cc per minute.

4-25. Manual Operation and Irreversibility Test.

a. In same test setup as for proof pressure test, bottom cylinder away from housing assembly, reduce pressure to zero, and bleed pressure through test port 2.

b. Move input lever towards cylinder and apply a load to cylinder towards housing assembly. Cylinder shall move full travel at a maximum of 30 pounds.

c. Apply a 50-pound load to cylinder away from housing assembly. Cylinder shall not move.

d. Move input lever away from housing assembly and apply a load to cylinder to move cylinder away from housing assembly. Cylinder shall move full travel at a maximum 30 pounds.

e. Apply a 50-pound load to cylinder toward housing assembly. Cylinder shall not move.

4-26. Sequence Valve Operation Test.

a. In same test setup as for proof pressure test, with piston a minimum of 1 inch off bottom, and input lever fully stroked in either direction, gradually apply increasing pressure to pressure port. Monitor flow at return port. Flow shall start between 525 and 575 psi. Full flow shall be obtained when pressure is between 600 and 650 psi.

NOTE

Flow will stop if cylinder bottoms, in which case, input lever shall be shifted to opposite extreme.

b. Gradually reduce pressure until flow stops (cylinder not bottomed). Monitor flow at return port. Flow shall stop when pressure is reduced to 475 psi minimum.

4-27. Differential Relief Valve Operation Test.

- a. Connect unit in test setup as shown in Figure 4-10. With piston in approximate center position and input lever in neutral position, apply and maintain 1000 psi to pressure port and an increasing pressure to test port 1 until flow at return port increase more than 30 cc minute.
- b. Check for differential relief valve operation. Valve shall crack at 1500 to 1600 psi.

NOTE

Adjust quantity of shims (102, figure 4-1) to achieve flow/pressure requirements.

4-28. Accumulator Operation Test.

- a. Connect unit in test setup as shown in Figure 4-11. With valve and drip spout connected to test port 3, apply 475 to 500 psi to pressure port, then reduce pressure to zero.
- b. Measure accumulator discharge volume at test port 3. Volume shall be 0.45 cubic inches (7.38 cubic centimeters) minimum.

4-29. Accumulator Check Valve Leakage Test.

- a. Apply 475 to 500 psi to pressure port. Reduce pressure to zero.
- b. Check pressure port for leakage. There shall be no leakage.

4-30. Check Valve Operation Test.

- a. Connect unit in test setup as shown in Figure 4-12. With test port 3 and return port open, gradually apply pressure to pressure port.
- b. Check flow at test port 3. Flow shall start at 2 to 5 psi and stop within 1 psig of start pressure.
- c. With test port 2 open, gradually apply pressure to test port 3.
- d. Check flow at test port 2. Flow shall start at 2 to 5 psig and stop within 1 psig of start pressure.
- e. With test port 1 open, gradually apply pressure to test port 2.
- f. Check flow at test port 1. Flow shall start at 2 to 5 psig and stop within 1 psig of start pressure.

4-31. Thermal Relief Valve Operation Test.

- a. Connect unit in test setup as shown in Figure 4-13. With return port open, apply increasing pressure to test port 1.

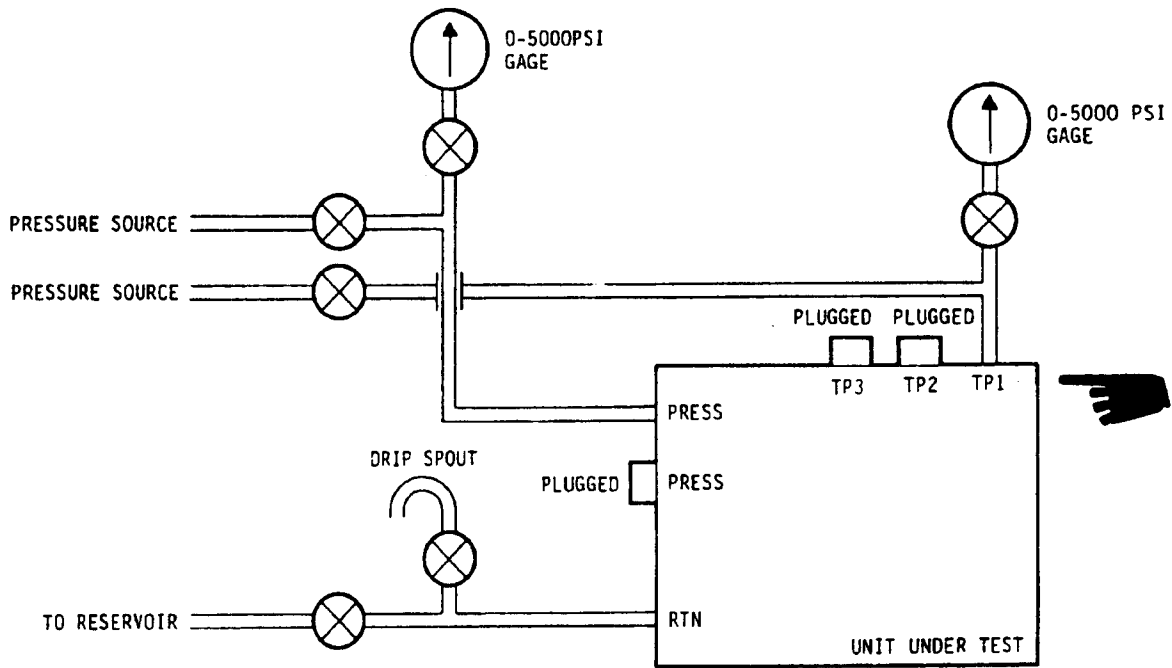


FIGURE 4-10. Differential relief valve test setup.

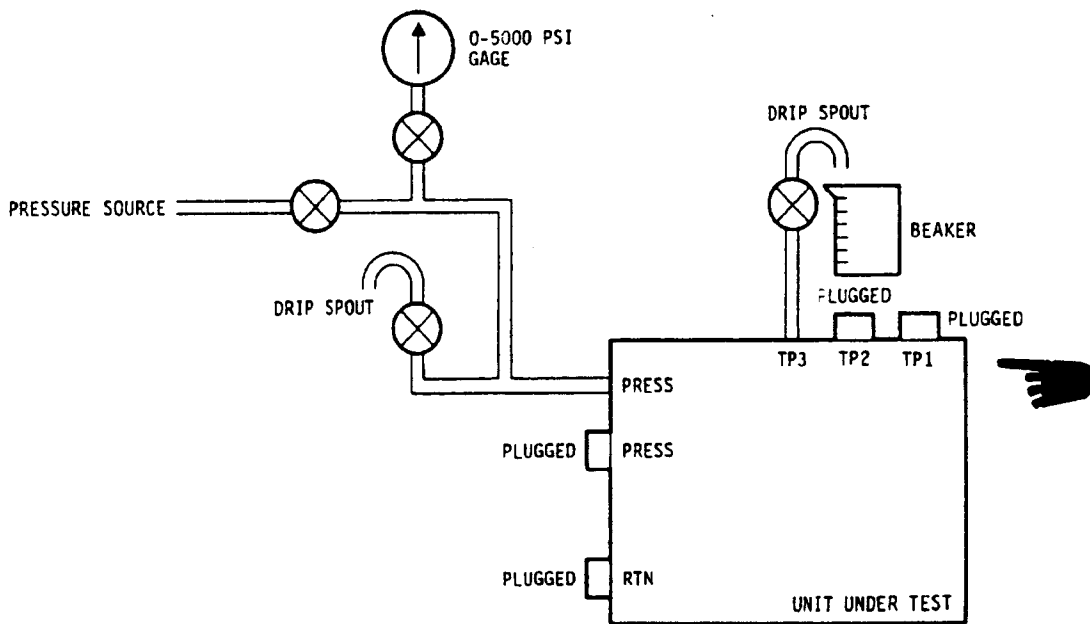


FIGURE 4-11. Accumulator test setup.

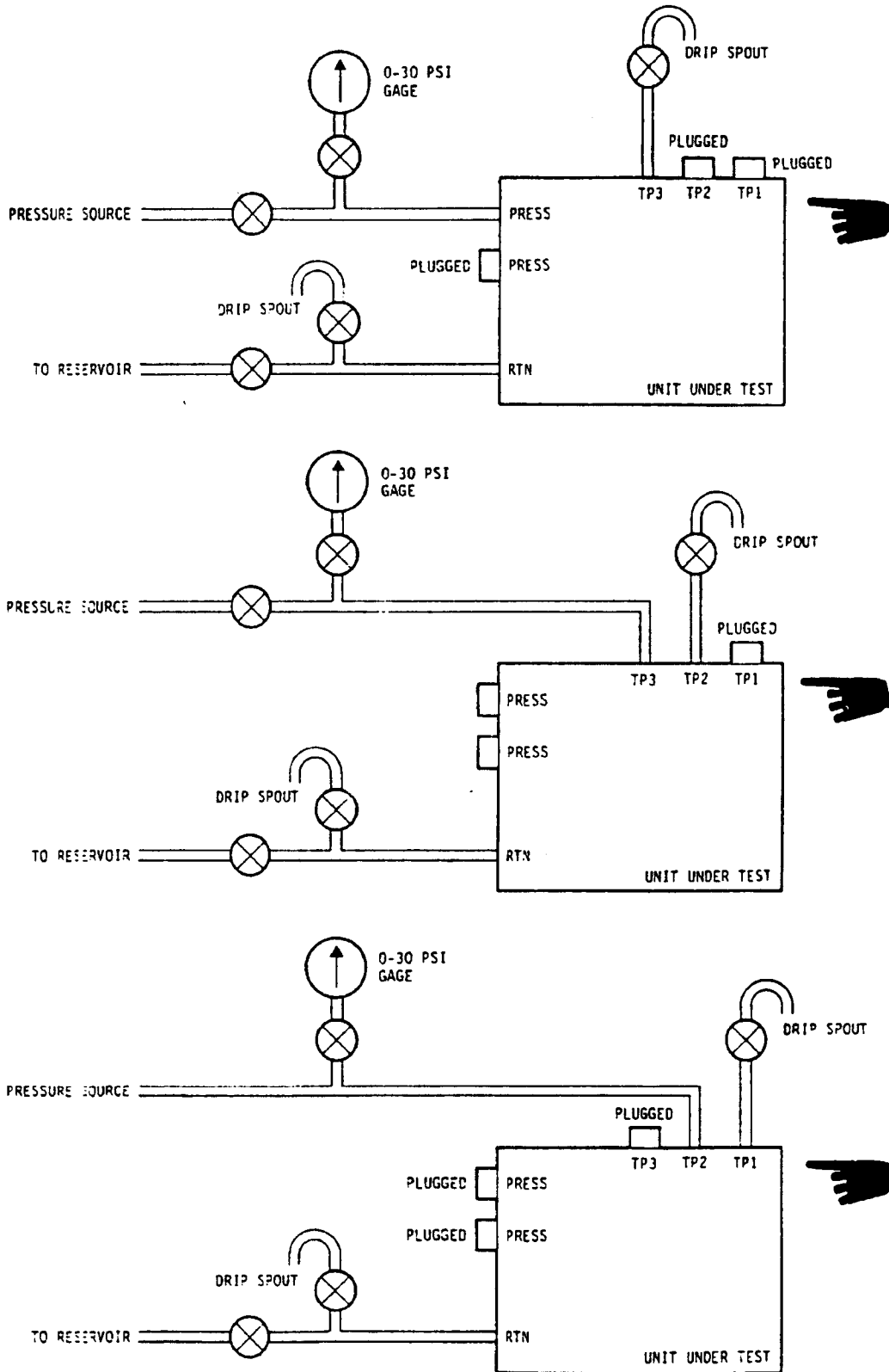


FIGURE 4-12. Check valve test setup.

b. Record pressure at which valve cracks, which is defined as pressure at which fluid level rises at return port. Valve shall crack at 2100 to 2300 psi.

c. Slowly reduce pressure to 1900 psi and stabilize pressure. Check leakage at return port after 1 minute. There shall be no leakage.

4-32. Sequence Valve Leakage Test.

a. Connect unit in test setup as shown in Figure 4-14. Install fillable drip spouts at pressure port and return port.

b. Fill drip spouts and apply 650 psi to test port 2. After 1 minute, monitor leakage for 20 minutes. Leakage at either drip spout shall not exceed two drops in 20 minutes.

c. At successful conclusion of testing, reduce pressure to zero, remove unit from test fixture, and install port closures.

4-33. Trouble Analysis. Table 4-4 lists probable causes and remedies for troubles that may occur during testing.

4-34. Post-test Assembly.

a. Using Torque Wrench Adapter 87000714-ASTO, torque retainer (51) 210 to 230 inch-pounds.

b. Using Lockwire Fixture T100615-13LW, lockwire all fasteners in accordance with MS33540A using lockwire (Item 3, Appendix C).

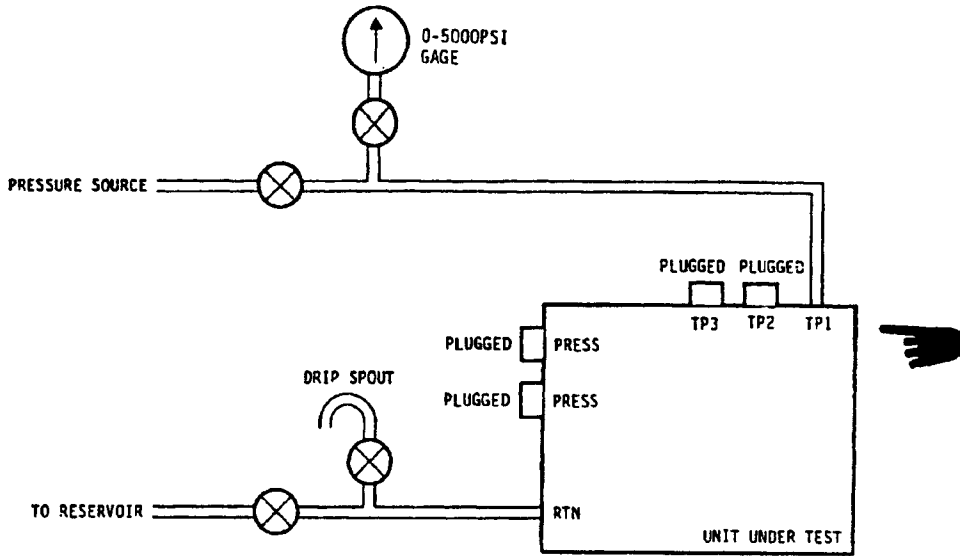


Figure 4-13. Thermal relief valve test setup

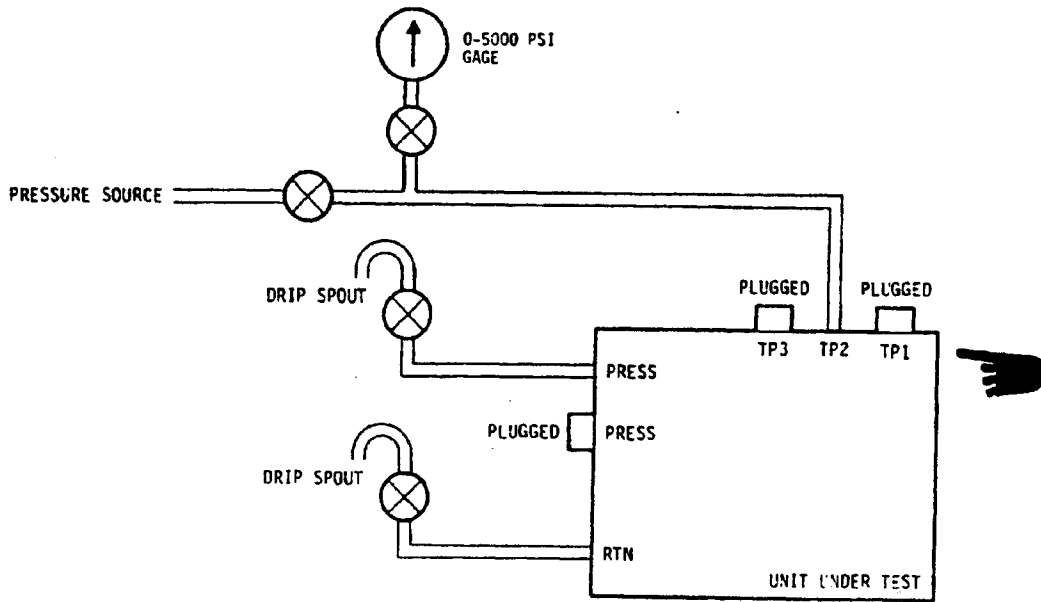


Figure 4-14. Sequence valve test setup

Table 4-4. Trouble Analysis

Trouble	Probable Cause	Remedy
External leakage during proof pressure	Damaged packings	Replace affected packings
	Damaged components	Replace affected components
External leakage during full cycling of actuator	Defective rod seals (19, 25 Figure 4-2)	Replace seals
	Scratched piston rod assembly (22)	Repair or replace
Servo cylinder extends or retracts with 50-pound load	Defective poppet (75) or spring (76)	Replace poppet or spring
	Damaged packings (60)	Replace packings
	Defective scraper (12) or (21)	Replace scrapers
	Defective cap seal (23) and seal ring (24)	Replace cap seal and seal ring
Input force to move servo spool exceeds 8 ounces	Damaged spool and sleeve assembly (57)	Replace spool and sleeve assembly as a set
	Defective bearing set (48)	Replace bearing set as matched pair
	Nut (54) too tight	Readjust nut
Flow at test port does not start within 2 to 5 psig during check valve operation	Defective spring (76)	Replace spring
	Improperly installed seat (73) or poppet (75)	Reinstall seat and poppet
With servo valve in neutral, leakage at return port exceeds 30 cc/minute	Worn main control valve	Replace main control valve
With servo valve in each extreme position, leakage at return port exceeds 30 cc/minute	Worn main control valve or defective cap seal (23) and seal ring (24)	Replace main control valve or cap seal and seal ring

Table 4-4. Trouble Analysis (Continued)

Trouble	Probable Cause	Remedy
Full flow at return port is not obtained, or actuator operates at 475 to 495 psi	Defective spring (116)	Replace spring
	Sequence valve is binding	Replace sequence valve
Leakage at pressure and return ports is more than 2 drops in 20 minutes	Defective seat (73) or poppet (75)	Replace seat and/or poppet
Differential relief valve does not crack within 1500 and 1600 psi	Defective spring (101), slide assembly (103), or packing (106)	Replace affected component
	Improperly shimmed	Re-shim
Thermal relief valve does not crack within 2100 to 2300 psi	Defective spring (128), seat and poppet assembly (129), or packing (132)	Replace affected component
	Improperly shimmed	Re-shim
Leakage is present at return port after thermal relief valve reseal	Defective packing (132)	Replace packing
	Defective seat and poppet assembly (129)	Replace seat and poppet assembly
Accumulator discharge is less than 0.45 cubic inches (7.38 cc)	Defective guide (63), springs (66, 67), piston (68), G-T seal (69) or housing assembly (134)	Replace affected component
Accumulator inlet check valve leakage	Defective seat (73), packing (74), or poppet (75)	Replace affected component
	Scratched bore of check valve seat (73)	Replace seat
Servo cylinder does not extend or retract with 30-pound maximum load	Defective cap seal (23) and seal ring (24) or rod seals (19 and 25)	Replace cap seal and seal ring, or rod seals
	Defective scraper (12) or (21)	Replace scrapers
	Defective spring (76)	Replace spring

CHAPTER 5

QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Section I. GENERAL

5-1. Responsibility. The contractor/depot quality assurance activity is responsible for the performance of the inspections specified in the DMWR. The contractor/depot may utilize their own facilities or any commercial laboratory acceptable to the procuring activity/commodity manager (PA/CM). The PA/CM reserves the right to perform any of the inspections specified in the DMWR, when such inspections are necessary to assure that supplies or services conform to the prescribed requirements.

5-2. Quality Assurance Terms and Definitions. For quality assurance terms and definitions refer to MIL-STD-109 and the glossary in the DMWR.

5-3. Inspection and Test Equipment. The overhaul facility is responsible for acquisitions, maintenance, calibration, and disposition of all inspection and test equipment. Test equipment to be used by AMC (Army) elements will be acquired in accordance with AR 750-43 and AMC Supplement 1 to AR 750-43. All instrumentation and inspection equipment used in compliance with this DMWR shall be calibrated and controlled in accordance with MIL-I-45607 and MIL-STD-45662 (Commercial facility) or DESCOM-R 702-1, Depot Quality Systems (Army facility), with all standards traceable to the National Bureau of Standards. Descriptions of inspecting and measuring equipment are left to the discretion of the overhauling facility to be considered as good shop practice.

5-4. Certification of Personnel, Materials, and Processes. The contractor/depot QA activity shall be responsible for ascertaining and certifying personnel skills, equipment, and material meet the requirements of the work to be accomplished. Unless otherwise specified in the contract or by PA/CM representative, the contractor/depot QA activity shall provide the PA/CM with statements or other evidence that specifications for such special processes as welding, nondestructive testing, plating, and the like, have been complied with. Personnel performing magnetic particle and penetrant tests shall be certified in accordance with MIL-STD-410.

Section II. INSPECTION REQUIREMENTS

5-5. General.

a. Quality Inspectors (QI) are required to witness all tests and those inspections which are marked "QI" or otherwise designated by the PA/CM.

b. The Maintenance Technicians shall inspect, check, and determine the conditions of all other areas to insure compliance with the DMWR.

5-6. Product Verification Audit. A product verification audit may be performed in accordance with AVSCOM-R 702-1 on one of the first five items produced to verify compliance with the DMWR and contractual terms.

5-7. In-Process and Acceptance Inspections.

a. Used components and refinished parts recovered as products of disassembly shall be examined 100% by the contractor/depot, to determine serviceability. A copy of this log shall be submitted to the PA/CM as part of the overhaul contract. The log shall contain the Maintenance Technician's comments for all parts, removed; such as, parts inspected, replaced, inspected by QI, tested by NDI, modified by MWO, or other notes or actions.

b. Diagnostic and nondestructive tests such as magnetic particle, penetrant, radiographic, and ultrasonic inspections as required by this DMWR shall be in accordance with referenced military specifications, and AVSCOM AA-STD-1 and AA-STD-2 where not otherwise specified. A qualified QI shall either perform or witness these tests.

c. A list of inspection definitions, Table 5-1, are included at the end of this chapter. Accept and reject criteria for these inspections and unique repair methods are found in applicable areas of this DMWR.

5-8. Test Check List. A check list indicating each required test shall be included as part of this DMWR. The list shall show name of test and test set-up (per figure if applicable). List the input readings, such as position of valves, switches, etc. List the required readings, such as time, meter readings, etc. List the accept/reject criteria for each test as applicable.

Table 5-1. Inspection Definitions

TERM	DEFINITION	PROBABLE CAUSE
Abrasion	Roughened surface, varying from light to severe	Foreign material present between moving parts
Bend	Any change in the intended configuration	Application of severe or excessive force
Break	Separation of part	Severe force, pressure or overload
Burn	Loss of metal	Excessive heat
Burnishing	The smoothing of a metal surface by mechanical action, but without loss of material. Generally found on plain bearing surfaces. Surface discoloration is sometimes present around outer edges of burnished area	Excessive heat
NOTE		
Normal burnishing from operational service is not detrimental if coverage approximates the carrying load and if there is no evidence of burns.		
Burr	A rough edge or sharp projection	Impact from foreign object, or poor machining
Chipping	Breaking away of small metallic particles	Heavy impact of foreign object
Corrosion	Surface chemical action that results in surface discoloration, a layer of oxide, rust, and removal of surface metal	Improper corrosion preventive procedures and excessive moisture
Crack	A break in material	Severe stress from overloading or shock; possible extension of a scratch

Table 5-1. Inspection Definitions (continued)

TERM	DEFINITION	PROBABLE CAUSE
Dent	A small smoothly rounded depression	A sharp blow or excessive pressure
Distortion	A change from original shape	Application of severe heat or irregular forces
Erosion	Wearing away of metal	Hot gases, corrosive liquids, or grit
Fatigue failure	Sharp indentions, cracks toolmarks, and inclusions that result in progressive yielding of one or more local areas	Cyclic stress. As stress is repeated, cracks develop, then spread, usually from surfaces (or near surface) of the particular section. Finally, so little sound material remains that normal stress on part exceeds strength of the remaining material. This type of failure is not caused by metal crystalization. This condition can easily be determined by visual inspection of part. Striations will be evidence by several lines, more or less concentric. The center (or focus) of lines indicates origin of the failure
Flaking	Loose particles of metal or evidence of surface covering removal	Imperfect bond or severe load
Fracture	See break	
Gouging	Removal of surface metal. Typified by rough and deep depressions	Protruding objects, misalignment
Heat oxidizing	Characterized by a discoloring film. Color varies from yellow to brown and blue to purple	High temperature operation
Indenting	Cavities with smooth bottoms and sides. Occurs on rolling contact surfaces of bearing components	Loose or foreign particles rolling between rotating elements of a bearing
Nick	A sharp-bottomed depression that may have rough outer edges	Dropping, banging
Off-square or misalignment of Anti-Friction Bearing	Indicated by retainer deterioration, retainer bore erosion, and gouged retainer rolling element pockets of the inner and outer race. Two distinct rolling element paths may be seen on the race where off-square conditions exist	Caused by rolling element speed variation, which jams rolling elements into separator pockets

Table 5-1. Inspection Definitions (continued)

TERM	DEFINITION	PROBABLE CAUSE
Pitting	Small indentions in a surface	Chemical pitting: Oxidation of surface or electrolytic action. Mechanical pitting: Chipping of loaded surfaces caused by improper clearances and over-loading, and by pressure of foreign material
Scoring	Deep scratch following path of part travel	Result of localized lubrication breakdown between sliding surfaces
Scraping	A furrow	Rubbing with any hard, or rough pointed object
Scratch	A very shallow furrow or irregularity, usually longer than wide	Movement of a sharp object across the surface
Seizure	Fusion or binding of two adjacent surfaces preventing continued movement	Improper lubrication or wear
Stripped thread	Thread of a nut, stud, bolt, or screw damaged by tearing away part of thread	Improper installation or thread pitch or size
Tear	Parting of parent material	Excess tension, caused by an external force
Wear	Slow removal of parent material. Frequently, wear is not visible to the naked eye	Result of abrasive substances contacting rolling surfaces, and acting as a lapping compound

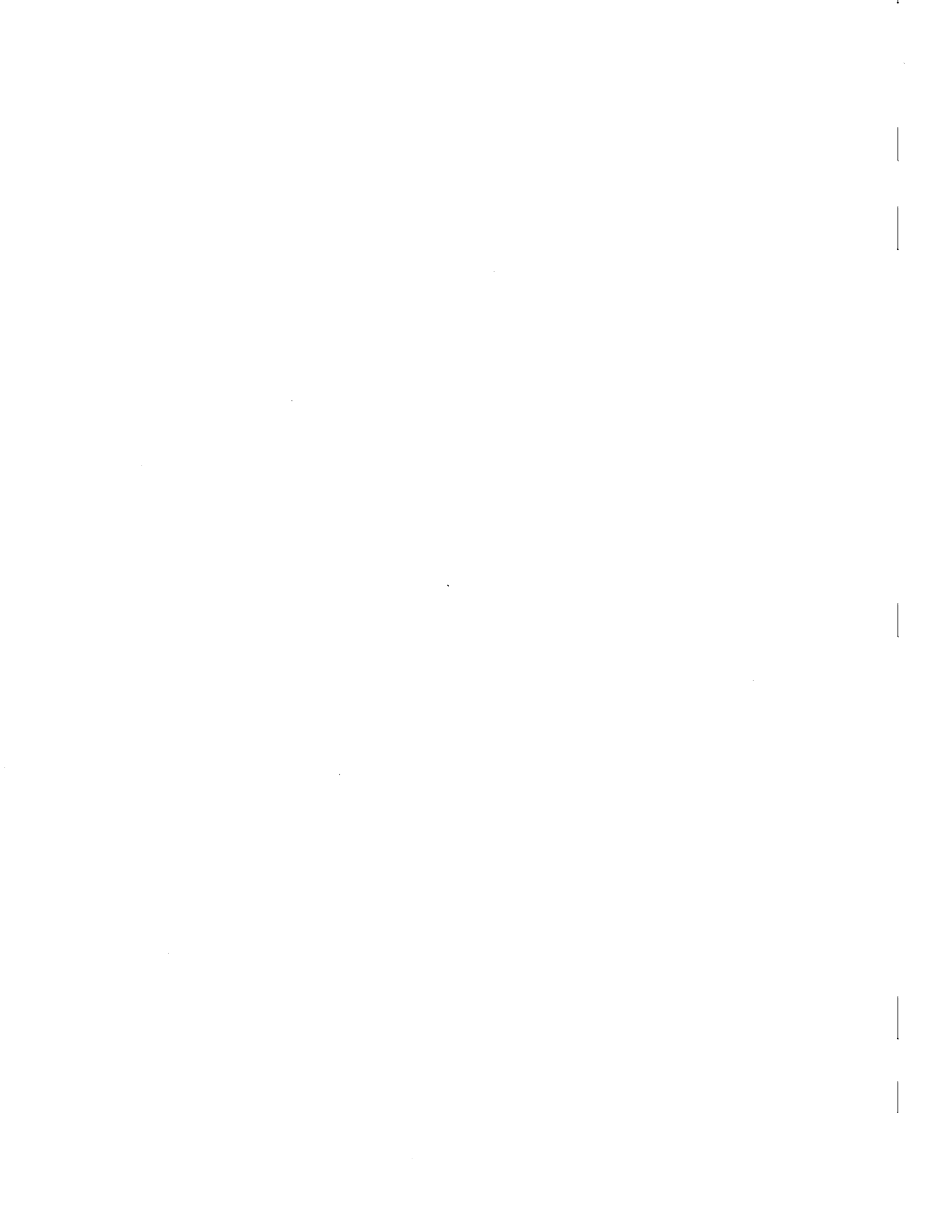
CHAPTER 6
PACKAGING

6-1. Components will be preserved, packed, and marked in accordance with the Delivery Order/Contract, Depot Maintenance Interservice Support Agreement (DMISA), Statement of Work (SOW) including AMSAV Form 6525(J), Memorandum of Agreement, or other authorized document.

6-2. Organic Depots shall contact AVSCOM Packaging and Transportability Branch, HQ AVSCOM, AMSAV-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 for preservation and packaging requirements.

6-3. For further information, contact AVSCOM Packaging and Transportability Branch, HQ AVSCOM, AMSAV-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. All contracts or inquiries shall be through the Contracting Officer (KO).

Figure 6-1, Page 6-2 has been deleted



APPENDIX A REFERENCES

AMSAV Form 6525(J)	Memorandum of Agreement, Preservation and Packaging
AMSAV-M 1379	Request for Action Form
AR 750-43	Test, Measurement and Diagnostic Equipment Including Prognostic Equipment and Calibration Test Measurement Equipment
AVSCOM AA-STD-1	AVSCOM Acceptance Standard Quality Acceptance Criteria for Magnetic Particle Inspection
AVSCOM AA-STD-2	AVSCOM Acceptance Standard Quality Acceptance Criteria for Penetrant Inspection
AVSCOM-R 702-1	Depot Quality System
CTA 50-970	Expendable Items (Except Medical, Class V, Repair Parts and Heraldic Items)
DA Form 2028	Recommended Change to Publications and Blank Forms
DA PAM 25-30	Consolidated Index of Army Publications and Blank Forms
DAM PAM 310-1	Consolidated Index of Army Publications and Blank Forms
DA PAM 738-751	The Army Maintenance Management, System Aircraft (TAMMS-A)
DA PAM 750-10	US Army Equipment Index of Modification Work Orders
DD Form 1693	Engineering Change Proposal
DESCOM-R 702-1	Depot Quality System
MIL-C-5541, Type 2	Chemical Conversion Coatings on Aluminum and Aluminum Coatings
MIL-C-45662	Calibration System Requirements
MIL-H-83282	Hydraulic Fluid for Aircraft, Missile and Ordnance
MIL-H-46170	Hydraulic Fluid for Preservation and Operation
MIL-I-25135	Penetrant Inspection Material
MIL-I-45607	Supply and Maintenance Inspection Equipment for Ordnance
MIL-I-6866 TYPE I, METHOD A	Fluorescent Penetrant Inspection Process
MIL-I-6868	Magnetic Particle Inspection Process
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-1949A	Inspection, Magnetic Particle
MIL-STD-410	Nondestructive Testing Personnel Qualification and Certification
MIL-STD-481	Configuration Control - Engineering Changes, Deviations and Waivers
MS33540	General Practices for Safety Wiring and Cotter Pinning
QQ-P-35	Passivation
QQ-C-320 CLASS 2	Chromium Plate
QQ-P-416 TYPE I, CLASS 2	Cadmium Plate
SF 368	Quality Deficiency Report (QDR)
TM 55-1500-345-23	Painting and Marking of Army Aircraft

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APPENDIX B

REPAIR PARTS AND SPECIAL TOOLS LIST

Intentionally left blank for future use.

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APPENDIX C

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

C-1. Scope. This appendix lists expendable supplies and materials you will need to operate and maintain the flight control actuator assembly. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

C-2. Explanation of Columns.

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., Use Freon (item 1, Appendix C).

b. Column (2) - National Stock Number. This is the National Stock Number assigned to the item: use it to request or requisition the item.

c. Column (3) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturers (FSCM) in parentheses, if applicable.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) U/M
1	6850-00-264-9038	Solvent, Type I, P-D-680	PT
2		Deleted	
3	9505-00-293-4208	Lockwire MS20995C32	LB
4	5350-00-221-0872	Abrasive Crocus Cloth (grit 600) P-C-458	SH
5	9150-00-111-6256	Hydraulic Fluid, MIL-H-46170	QT
6	9150-00-149-7431	Hydraulic Fluid, MIL-H-83282	QT
7	9150-00-250-0926	Petrolatum, VV-P-236	LB
8	6810-00-281-2785	Methyl Ethyl Ketone, TT-M-261	GL
9	8010-00-886-7681	A202 Coating Remover (CEEBEE, 9520 E. Ceebee Dr., Downey, CA 90241)	GL
10		Deleted	
11		Deleted	
12		Deleted	
13	5350-00-286-8349	Lapping Compound, United States Products Co., 518 Melwood Ave., Pittsburgh, PA 15213 (1000 Grit)	LB

APPENDIX D
EXEMPTIONS/REVISIONS

(To be supplied by procuring activity.)

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APPENDIX E

DEPOT MOBILIZATION REQUIREMENTS

This DMWR pertains to an 'on condition' item and is used as a guide during depot maintenance to perform only those corrective maintenance tasks essential to achieving serviceability. The exception is when mandatory convenience maintenance tasks, necessary to assure the inherent reliability and/or longevity of the item, are stipulated in the Preshop Analysis Section of the DMWR. All of the above are essential, even under a state of mobilization.

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GLOSSARY

C

- Corrosion - Deterioration of surface due to oxidation or other chemical action. Evidenced by pitting, scaling, or discoloration of surface.
- Crack - A break without complete separation. Visibly evidenced by hairline mark or obvious separation of surface.

D

- Damage - Generally - any obvious defect or injury in a part due to failure, wear or handling, that can cause the part to be unserviceable.

E

- Elongation - As applied to a bore or hole in a part, out of round due to wear or distortion.

N

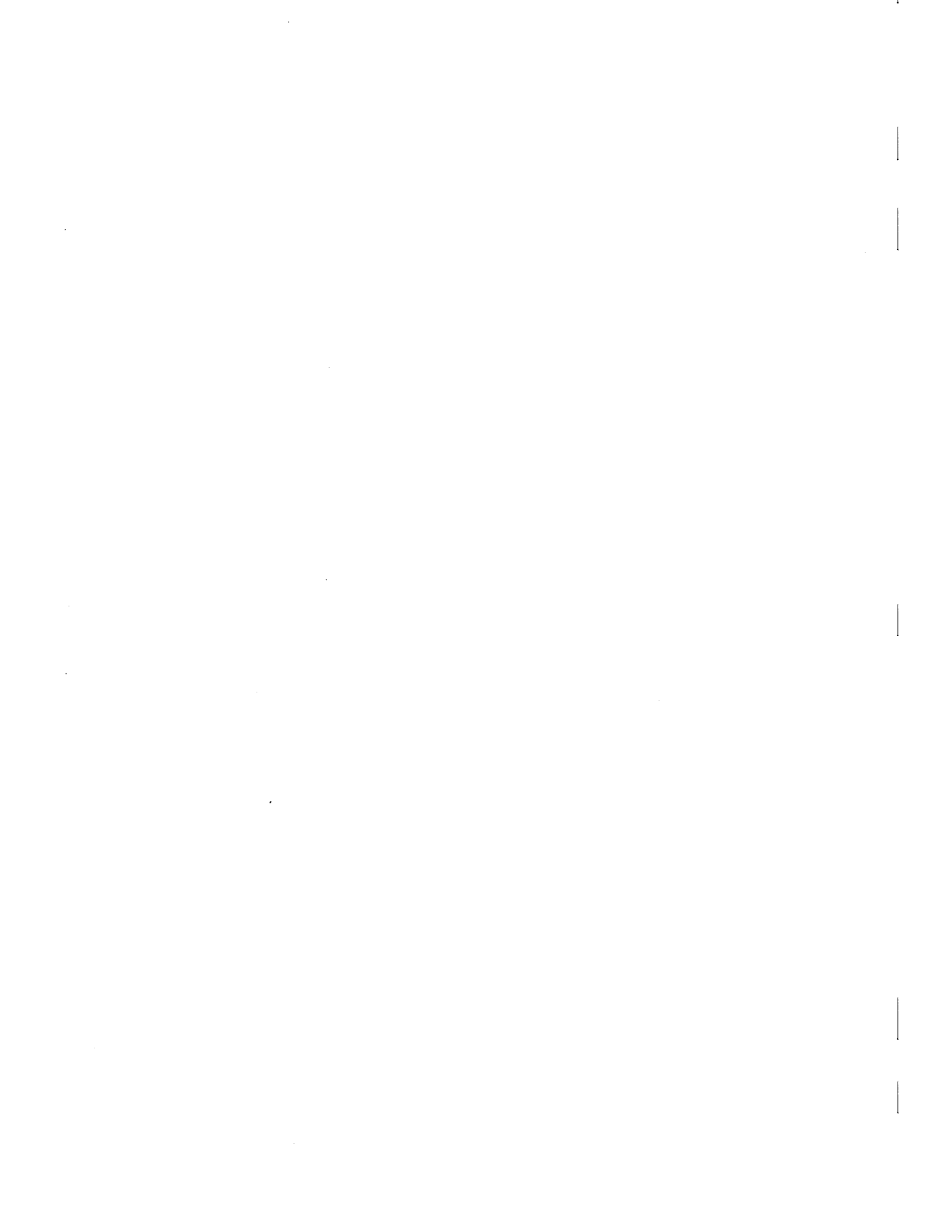
- Nick - A small notch or chip cut into the surface of a part.

S

- Scratch - Thin line surface injury due to scraping by a mating part or foreign object.

T

- Torque - To tighten a threaded part to a specified degree of tightness, using a torque wrench.
- Toxic - Poisonous.



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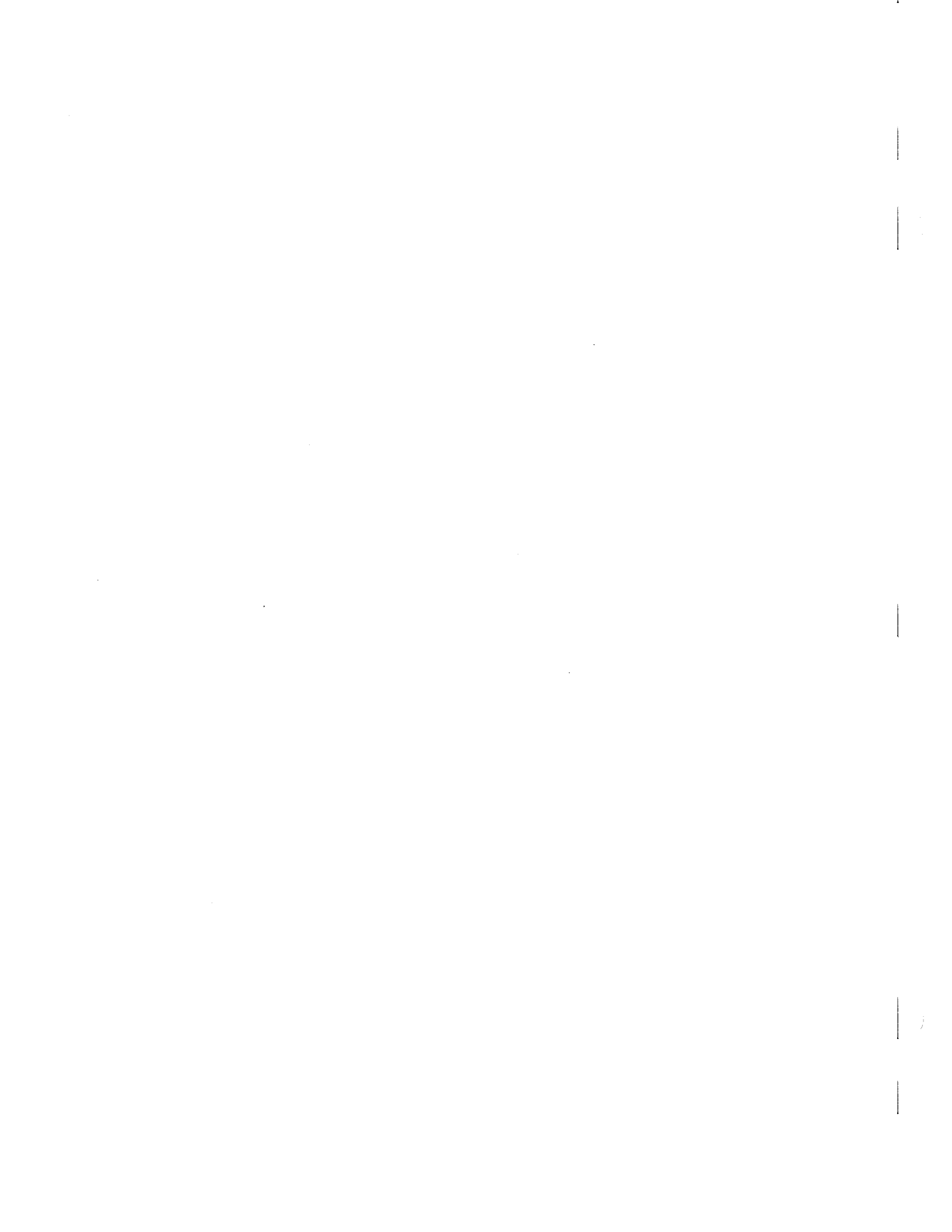
FOR THE COMMANDER:

ROBERT A. WAGG, JR
Colonel, GS
Chief of Staff

OFFICIAL:



RICHARD E. BRUCE
USAAVSCOM Equipment Publications Control Officer



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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

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 Key West, FL 33040

DATE SENT
 10 Jun 79

PUBLICATION NUMBER
 TM 9-1430-550-34-1

PUBLICATION DATE
 7 Sep 72 .

PUBLICATION TITLE Unit of Radar Set
 AN/MPQ-50 Tested at the HFC

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
9-19		9-5	
21-2	step 1C	21-2	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

"B" Ready Relay K11 is shown with two #9 contacts. That contact which is wired to pin 8 of relay K16 should be changed to contact #10.

Reads: Multimeter B indicates 600 K ohms to 9000 K ohms.

Change to read: Multimeter B indicates 600 K ohms minimum.

Reason: Circuit being checked could measure infinity. Multimeter can read above 9000 K ohms and still be correct.

SAMPLE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SP4 J.T. Brown, Jr.

SIGN HERE

SP4 James Brown, Jr.

DA FORM 2028-2
 2 JUL 79

REPLACES DA FORM 2028-2 1 APR 78 WHICH WILL BE USED UNTIL EXHAUSTED

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG PERFORATED LINE

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander
U.S. Army Aviation Systems Command
ATTN: AMSAV-MC
4300 Goodfellow Blvd.
St. Louis, MO 63120-1798

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THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

DMWR 55-1615-406

PUBLICATION DATE

30 MAY 1987

PUBLICATION TITLE

Flight Control Actuator Assembly

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO

PARA-GRAPH

FIGURE NO

TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander
U.S. Army Aviation Systems Command
ATTN: AMSAV-MC
4300 Goodfellow Blvd.
St. Louis, MO 63120-1798

TEAR ALONG PERFORATED LINE

These are the instructions for sending an electronic 2028

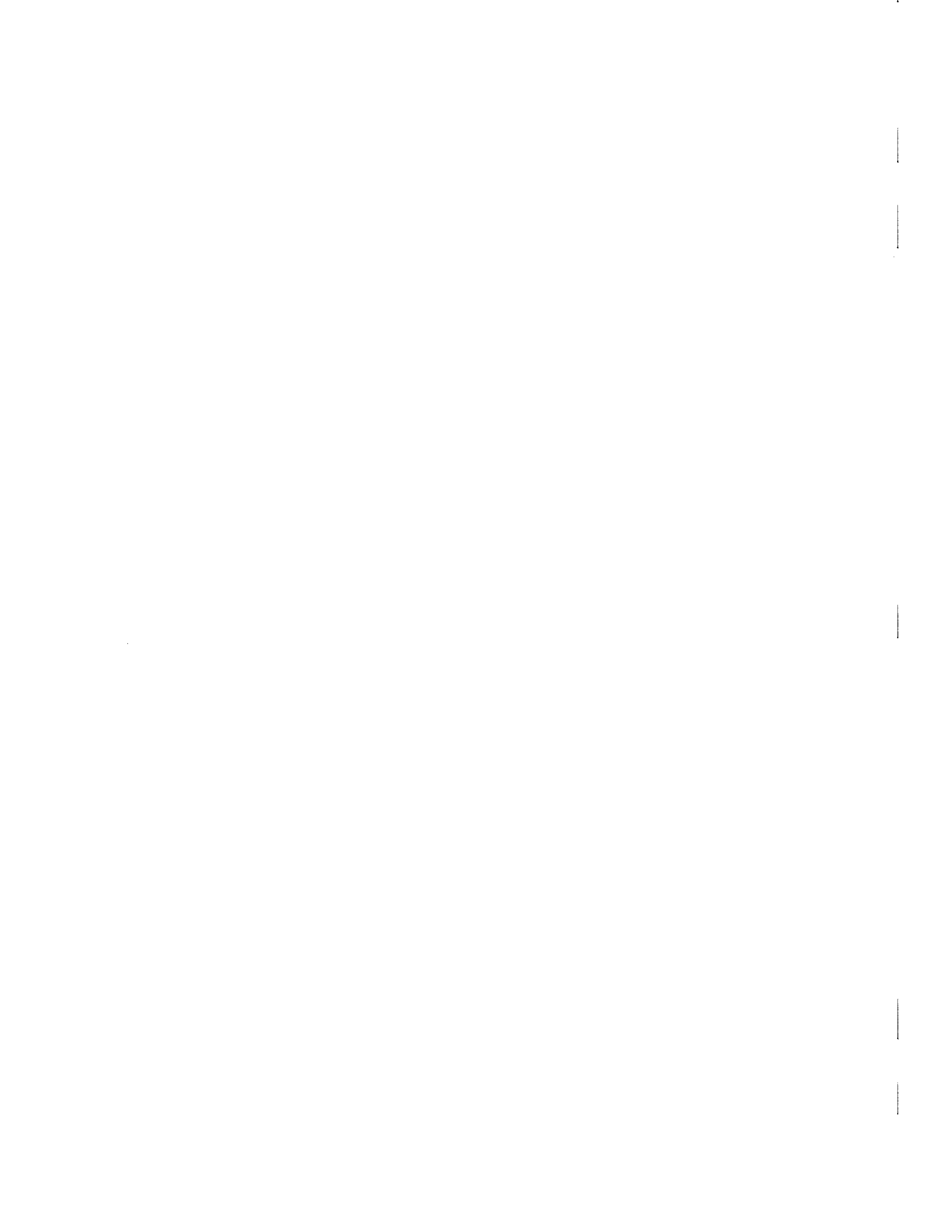
The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@wherever.army.mil>
To: 2028@redstone.army.mil

Subject: DA Form 2028

1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. **Change Number:** 7
12. **Submitter Rank:** MSG
13. **Submitter FName:** Joe
14. **Submitter MName:** T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 2
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text:**

This is the text for the problem below line 27.



RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.						Use Part II (<i>reverse</i>) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)	DATE 8/30/02
TO: (<i>Forward to proponent of publication or form</i>)(Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL. 35898						FROM: (<i>Activity and location</i>)(Include ZIP Code) MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	
PART 1 - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER TM 9-1005-433-24						DATE 16 Sep 2002	TITLE Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON	
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.	
<i>* Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE MSG, Jane Q. Doe, SFC				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 788-1234		SIGNATURE	

EXAMPLE

TO: (Forward direct to addressee listed in publication) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: (Activity and location) (Include ZIP Code) MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	DATE 8/30/02
--	--	------------------------

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER			DATE	TITLE				
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS (Any general remarks, recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

EXAMPLE

TYPED NAME, GRADE OR TITLE MSG, Jane Q. Doe, SFC	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 788-1234	SIGNATURE
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TO: (Forward direct to addressee listed in publication) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: (Activity and location) (Include ZIP Code)	DATE
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PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER DMWR 55-1650-406	DATE 30 June 1992	TITLE Depot Maintenance Work Requirement For Flight Control Actuator Assembly
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS (Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)	DATE
TO: (Forward to proponent of publication or form)(Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898						FROM: (Activity and location)(Include ZIP Code)	
PART 1 – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER DMWR 55-1650-406						DATE 30 June 1992	TITLE Depot Maintenance Work Requirement For Flight Control Actuator Assembly
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON	
* Reference to line numbers within the paragraph or subparagraph.							
TYPED NAME, GRADE OR TITLE						TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (Forward direct to addressee listed in publication) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: (Activity and location) (Include ZIP Code)	DATE
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TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

The Metric System and Equivalents

Linear Measure

1 centimeter= 10 millimeters = .39 inch
 1 decimeter= 10 centimeters= 3.94 inches
 1 meter= 10 decimeters= 39.37 inches
 1 dekameter = 10 meters= 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Liquid Measure

1 centiliter = 10 mililiters = .34 fl. ounce
 1 deciliter = 10 centiliters= 3.38 fl. ounces
 1 liter = 10 deciliters= 33.81 fl. ounces
 1 dekaliter = 10 liters= 2.64 gallons
 1 hectoliter = 10 dekaliters = 27.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigram = .035 ounce
 1 dekegram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Square Measure

1 sq centimeter= 100 sq. millimeters = .155 sq. inch
 1 sq decimeter= 100 sq. centimeters = 125.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. dekameters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. decimeters = 61.02 cu. inches
 1 cu. meter= 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	Inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

$^{\circ}\text{F}$ Fahrenheit Temperature $\frac{5}{9}$ (after subtracting 32) Celsius Temperature $^{\circ}\text{C}$

