DEPOT MAINTENANCE WORK REQUIREMENT FOR

ELECTRIC MOTOR-OPERATED SHUTOFF VALVES INLCUDING REPAIR PARTS AND SPECIAL TOOLS LIST

PART NUMBER	NATIONAL STOCK NUMBER
AV16B1700B	2915-00-936-8549
AV16B1667D	2915-00-991-3255
AV16B1296D	2915-00-778-2298
AV16B1294D	4810-00-778-2299

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THIS PUBLICATION IS A REPRINT OF DMWR 55-2915-300, DATED 30 DECEMBER 1974, INCLUDING CHANGES 1 THROUGH 4.

U.S. ARMY AVIATION AND TROOP COMMAND
1 DECEMBER 1974

WARNING

Cleaning solvent is toxic and flammable. Use cleaning solvent in a well-ventilated area, and avoid breathing fumes or contact with skin, to minimize danger to health. Keep away from flames to avoid fire hazard. Solvent flash point must not be less than 100°F.

WARNING

AIR UNDER PRESSURE
88 PSI AIR PRESSURE
is used in the operation of this valve.
DEATH
or severe injury may result if personnel fail to observe safety precautions.

WARNING

AIR AND FLUID UNDER PRESSURE
185 PSI AIR AND FLUID PRESSURE
is used in testing this valve.
DEATH
or severe injury may result if personnel fail to observe safety precautions.

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original - 1 December 1974
Change 1 - 22 February 1979
Change 2 - 31 March 1987
Change 3 - 15 August 1988
Change 4 - 30 July 1993

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*Zero in this column indicates an original page.

DEPOT MAINTENANCE
WORK REQUIREMENT
NO. 55-2915-300

U.S. ARMY AVIATION AND
TROOP COMMAND
ST. LOUIS, MO 63120-1798
1 December 1974

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help 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 or 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, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

SECTION 1. GENERAL

1-1. PURPOSE

1-2. This Depot Maintenance Work Requirement (DMWR) is intended to provide overhaul instructions for Electric Motor Operated Gates Shutoff Valves, Part No. AV16B1294D, AV16B1296D, AV16B1667D, and AV16B1700B (see Figure 1-1), Manufactured by ITT General Controls, Aerospace Products, Burbank, California 91502.

1-3. SCOPE

1-4. This DMWR contains all information necessary to impact and test the valves and their components to determine their serviceability, and to disassemble, inspect components, repair and/or replace defective components, reassemble and return the valves to service after such overhaul. Instructions for preparation for shipment and storage are also provided. Where the requirements of this DMWR conflict with any referenced documnerts, the requirements of this DMWR shall apply.

1-5. MAINTENANCE FORMS AND RECORDS

1-6. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-751 and in the contract.

1-7. REPORTING OF ERRORS

1-8. DEVIATIONS AND EXCEPTIONS

When any work segment as set forth in this DMWR 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 Form 1379, figure 1-1.1 through the contracting officer to AMSAT-I-MP with a copy to AMSAT-I-MDO. If the problem is publications related or requires a change to a publicaiton, a DA Form 2028, figure 1-1.2, shall also accompany the Request for Action. The request for action shall state the problems, the reason for urgency, and the following specifics:

a. Serial number (if applicable), part number, and NSN of affected equipment.

b. Work elements which will not be completed or which will not be accomplished as specified herein.

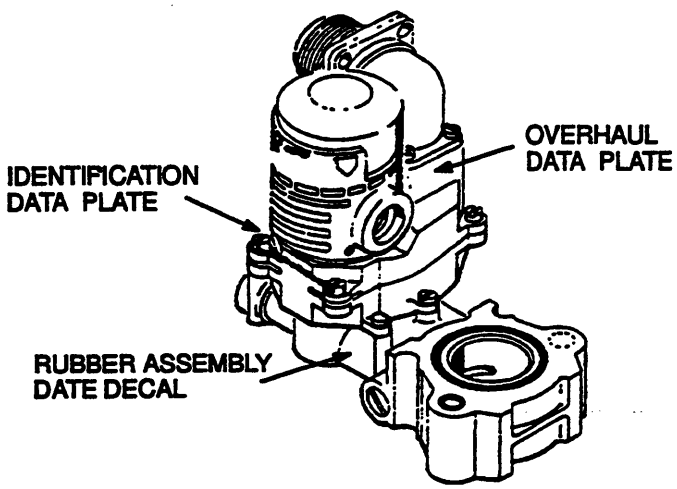
c. Reason for nonaccomplishment or deviation.

d. Action taken to correct condition causing nonaccomplishment or deviation.

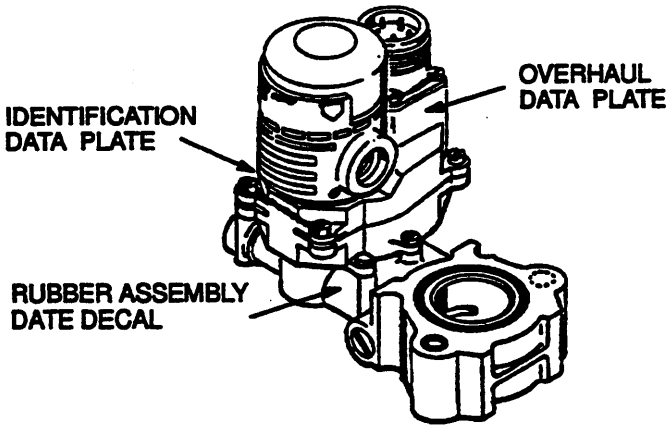
e. Data relative to availability of parts required, if applicable

f. Estimate man-hours

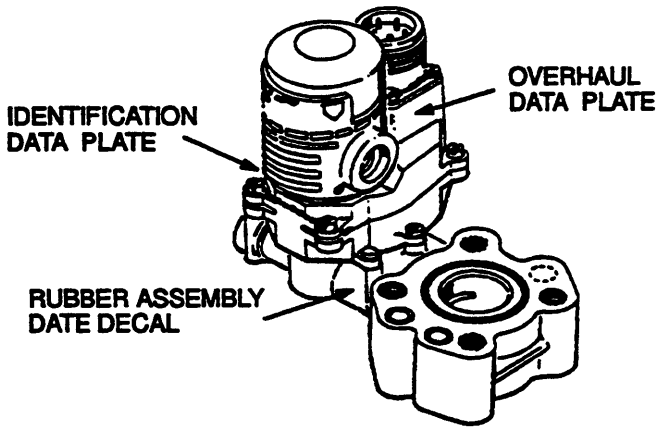
g. Instructions and inspection required to maintain the integrity of the end items because of such omission or deviation.



PART NUMBER AV16B1294D



PART NUMBER AV16B1296D



PART NUMBER AV16B1700B

Figure 1-1. Electric Motor Operated Gate Shutoff Valves, Part No. AV16B1294D, AV16B1296D, AV16B1667D, and AV16B1700B.

Section II. DESCRIPTION AND DATA

1-9. DESCRIPTION

1-10. The valve consists of a gate valve, operated by an actuator assembly. The actuator assembly includes a motor assembly. The gate valve is a two-position valve, with two ports in the valve body. When the valve gate (or slide) is extended, the valve ports are closed. When the slide is retracted, the valve ports are open. The slide of the valve is operated by the output shaft of the actuator assembly on the valve. The actuator output shaft rotates to place the slide in the open or closed position.

1-11. The actuator includes a two-page gear train. The gear train reduces the rotational speed of the output shaft of the motor to a usable power level. The output shaft of the motor is serrated, engages an idler gear in the actuator housing assembly. The idler gear rides on an oilite bushing on an idler shaft that is swaged into the actuator housing. The pinion gear of the idler gear engages the output shaft of the of the idler gear engages the output shaft of the motor. The spur gear of the idler gear drives the pinion gear of an input gear. The input gear rides on a center pin (shaft) that is installed through the center of the two planetary gear assemblies in the gear train. The spur gear of the input gear drives three planet gears. The three planet gears drive against a ring gear in the gear housing assembly of the actuator. This set of planet gears, when rotating, turn the input planetary assembly in the gear housing ring gear. The spur gear on the bottom of input planetary drives three more planet gears on the on the output planetary gear assembly. The last three planet gears also rotate in the ring gear of the gear housing assembly, causing the output planetary to rotate. The effective output rotational speed of the motor is reduced to approximately 60 rpm at the output planetary of of the actuator. The output shaft of the actuator is operated by the output planetary through a clutch ring. The clutch ring will slip when shaft forces of over 70 pound-inches are encountered; otherwise, the clutch ring and output planetary operates as a one-piece unit.

1-12. The output shaft of the actuator engages with a slot in an arm in the gate valve body. A roller on the opposite end of the arm engages in a slot in the valve slide. Rotation of the actuator output shaft rotates the arm, extending or withdrawing the and slide in the valve body.

1-13. The slide rides in a groove in the valve body. Two seal rings, one on either side of the slide, provide sealing. The seal rings are carried in individual seal ring shells, and contained in two port retainers. Port springs behind the seal rings provide seal ring pressure against the slide. Packings on each port retainer on each port retainer provide flange or mounting leakage protection.

REQUEST FOR ACTION	CONTRACT NO	PRIORITY OF REQUEST ☐ URGENT ☐ ROUTINE	DATE OF REQUEST
TO THRU COPIES	FROM POINT OF CONTACT		
	PUBLICATION NO AND TITLE		

STATEMENT OF THE PROBLEM ☐ PUBLICATIONS PROCEDURES ☐ OTHER

(USE CONTINUATION SHEET IF NECESSARY)

REASONS FOR URGENCY

RECOMMENDED SOLUTIONS OR DISPOSITION

☐ DA FORM 12-32 ATTACHED

(USE CONTINUATION SHEET IF NECESSARY)

	SIGNATURE	DATE

AMSAV-M Form 1379

FIGURE 1-1. AMSAV-M Form 1379

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	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)	FROM: (Activity and location; include ZIP Code)	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO	PAGE NO	PARAGRAPH	LINE NO*	FIGURE NO	TABLE NO	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

DA FORM 2028

REPLACES DA FORM 2028, DEC 68, WHICH WILL BE USED

FIGURE 1-1.2 DA Form 2028

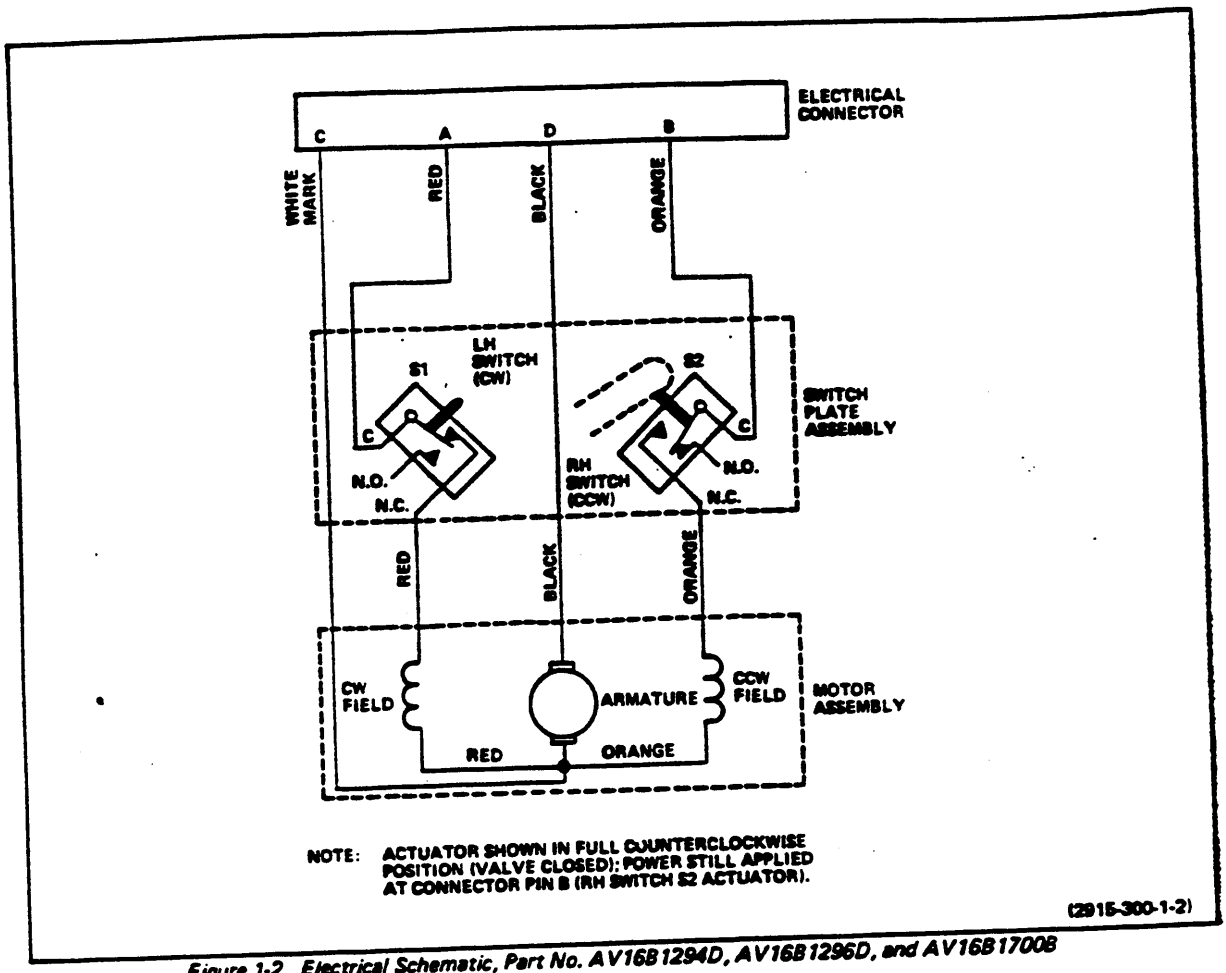


Figure 1-2. Electrical Schematic, Part No. AV16B1294D, AV16B1296D, and AV16B1700B

1-14. DIFFERENCES BETWEEN MODELS

1-15. Valves, Part No. AV16B1294D, AV16B1296D, and AV16B1700B, are operated electrically as follows (see figure 1-2):

a. With operating voltage applied to pins A (positive) and D (negative), the valve operates to the open position. When the valve reaches full open, the motor will be automatically deenergized, and pin A will be disconnected from the actuator motor.

b. With operating voltage connected to pins B (positive) and D (negative), the valve operates to the closed position. When the valve reaches full closed, the motor will be automatically deenergized, and pin D will be disconnected from the actuator motor.

c. Whenever the actuator motor is energized, a signal voltage will appear at pin C of the electrical connector. When the valve reaches the extreme closed or open position selected, the internal limit switch will actuate, and the signal voltage (in-transit signal) will be automatically removed from pin C of the electrical connector.

1-16. Valve, Part No. AV16B1667D, is operated electrically as follows (see figure 1-3):

a. With operating voltage applied to pins A (positive) and E (negative), the valve operates to the open position. When the valve reaches full open, the motor will be automatically deenergized, and pin A will be connected to pin C.

b. With operating voltage connected to pins B (positive) and E (negative), the valve operates to the closed position. When the valve reaches full closed, the motor will be automatically deenergized, and pin B will be connected to pin D.

c. The connection of pin A to pin C in step a provides a valve-open indication. The connection of pin B to pin D in step b provides a valve-closed indication. When operating voltage is removed from pin A or B, as applicable, the voltages at pin C or D will also be removed, removing the valve position indicating voltage.

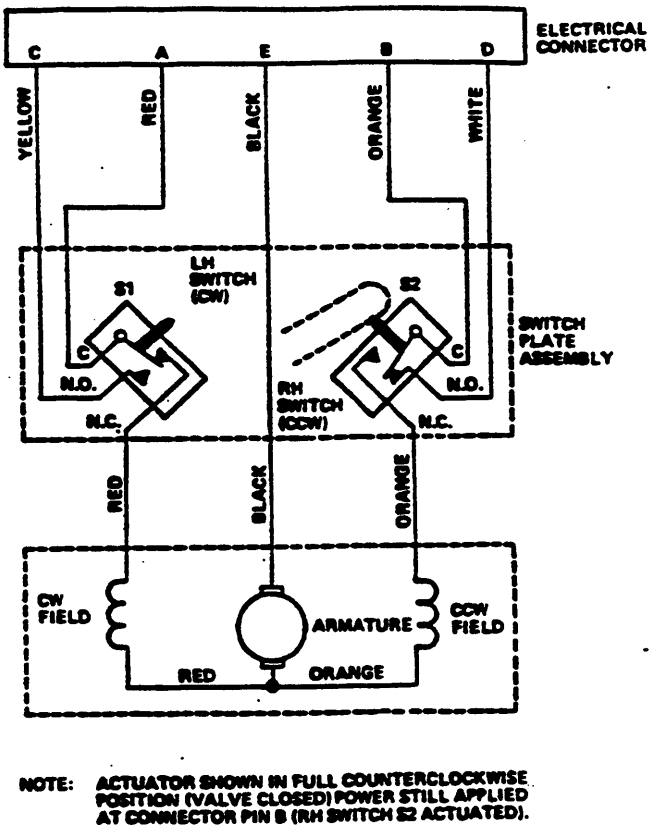


Figure 1-3. Electrical Schematic, Part No. AV16B1667D

1-17. An indicator arm or override arm on the valve acturator indicates valve position. The override arm (on Part No. AV16B1294D, AV16B1667D) may be used to manually operate the valve.

1-18. TABULATED DATA

1-19. REFER TO TABLE 1-1.

1-20. DATA PLATES

Equipment data plates used on this valve are the identification plate and the overhaul plate. Figure 1-1 shows the location of these data plates.

a. IDENTIFICATION DATA PLATES (FIGURE 1-4). The identification data plate must contain, as a minimum, the manufacture's name and part number, the contact number, serial number, modification data (as applicable), and the specification number (or customer part number). It shall also contain the fluid type, maximum pressure, voltage requirement, power usage and size.

b. OVERHAUL DATA PLATES (FIGURE 1-6.). The overhaul data contains the date and the place of overhaul. It is installed at the first overhaul, and replaced at each overhaul thereafter and must contain the overhaul's agency's name or code symbol, a quality control stamp from the agency or an inspector's initials, the word "overhauled," and the date the valve was overhauled. Overhaul data plates shall be fabricated from adhesive-backed, photo sensitive aluminum sticker (item 22, table 2-2 consumable materials) or scotchcal vinyl (item 23), 0.005 inch thick or equivalent. In accordance with figure 1-6.

c. RUBBER ASSEMBLY DATE DECAL (FIGURE 1-6). The rubber assembly data decal contains the date on which all rubber parts in the motor operated gate valve have been replaced and the words " rubber assy date." Rubber assembly date decal shall be fabricated for adhesive backed scotchcal vinyl (item 24) or equivalent, in accordance with figure 1-6. Stenciling shall employ silk screen process or indelible ink stamping.

Table 1-1. Table of Leading Particulars

Type Fluid ..... Fuel per Military Specification MIL-F-5572, MIL-F-5616, MIL-J-5624, and MIL-H-3136

Temperatures:
Fluid ..... −65°F to +135°F (−53.9°C to +57.2°C)
Ambient ..... −65°F to +160°F (−53.9°C to +71.1°C)

Operating Pressure ..... 0 to 60 psig

Proof Pressure ..... 188 psig

Thermal Relief Valve Data:

Part No.	Line (psig)			Body (psig)		
	Cracking		Reseat	Cracking		Reseat
	Max	Min	Max	Min	Max	Min
AV16B1294D	135	105	105	135	105	105
AV16B1296D	135	105	105	135	105	105
AV16B1667D	120	90	80	150	–	125
AV16B1700B	95	–	65	135	105	105

Operating Time ..... 1/2 second minimum to 1 second maximum at 28 ±1 volts dc at +70°F (+21.1°C) at operating pressure

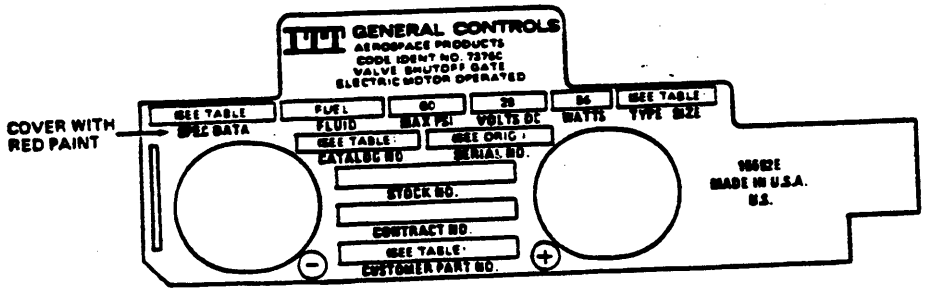
Port Connections:
Part No. AV16B1294D ..... Per MS33786-12-16
Part No. AV16B1296D ..... Per MS33786-20
Part No. AV16B1667D ..... Per MS33786-16
Part No. AV16B1700B ..... Per MS33786-16

Electrical Connector:
Part No. AV16B1294D ..... Per MS33678C14S2P
Part No. AV16B1296D .... Per AND100066C14S2P
Part No. AV16B1667D ..... Per MS3102R14S5P
Part No. AV16B1700B ..... Per MS33678R14S2P

Voltage ..... 18 to 30 volts dc (28 volts dc nominal)

Current Drain ..... 2 amperes, running

Weight:
Part No. AV16B1294D and AV16B1667D ..... 1.56 pounds (estimated)
Part No. AV16B1296D .... 1.68 pounds (estimated)
Part No. AV16B1700B .... 1.60 pounds (estimated)



CATALOG NO.	CUSTOMER PART NO.	TYPE SIZE	SPEC DATA
AV16B1294D		1-3/4"	
AV16B1296D		1-1/4"	
AV16B1667D	205-080-612-3	1"	105-080-612-3
AV16B1700B		1"	

(2915-300-1-4)

Figure 1-4. Identification Plate, Part No. 15562E

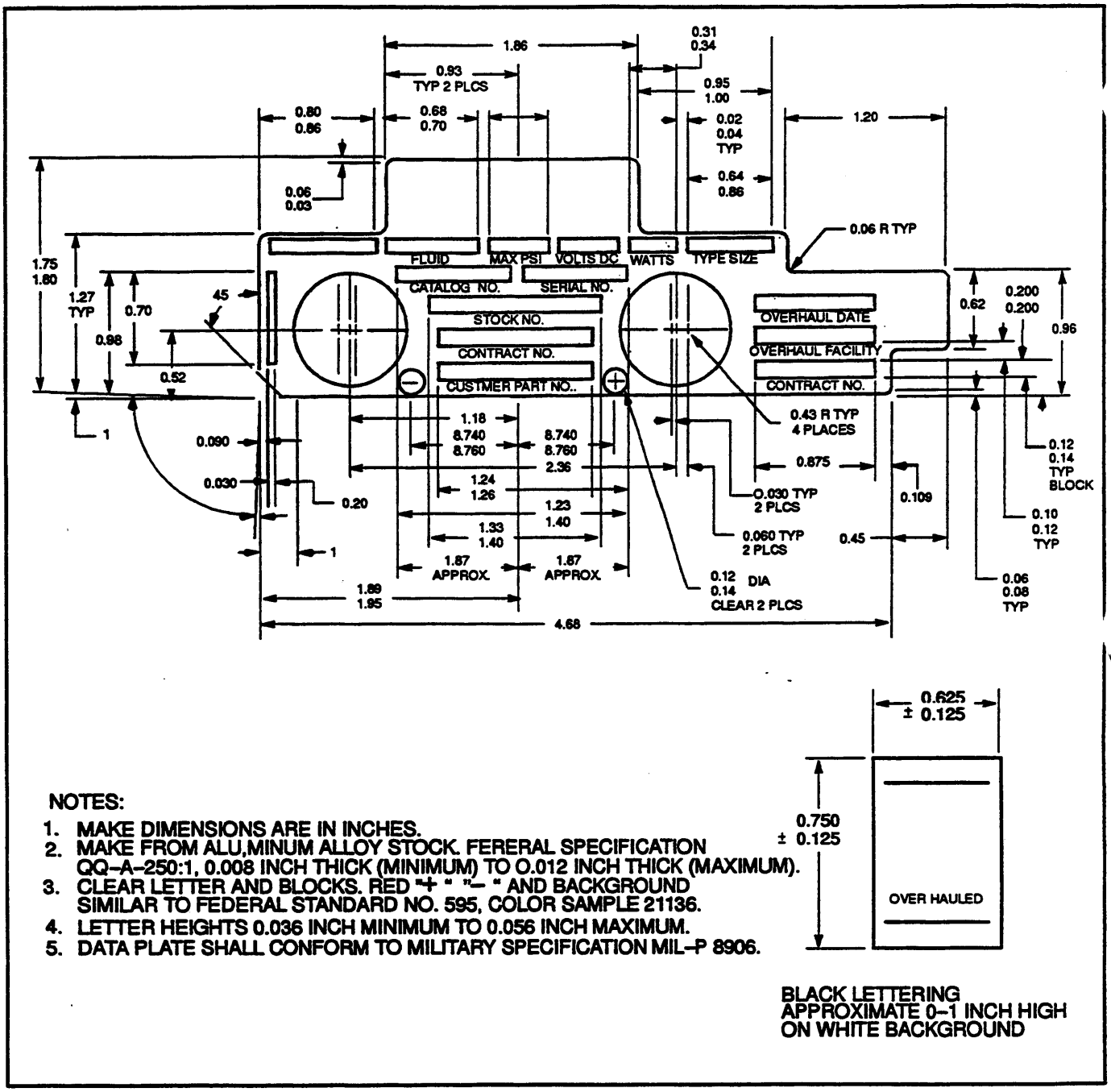
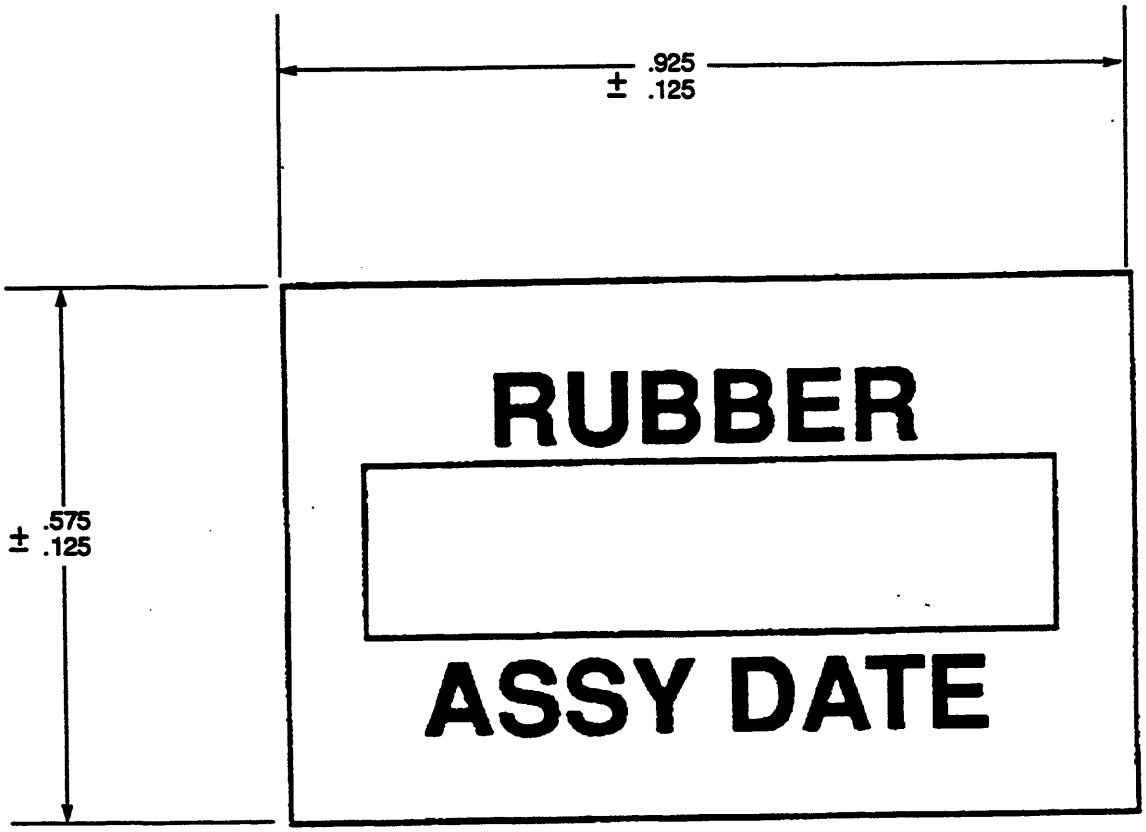


Figure 1-5. Overall Data Plate.



WHITE LETTERING
APPROX 0.1 INCH HIGH
ON RED BACKGROUND

Figure 106. Rubber Assembly Date Decal.

CHAPTER 2

TECHNICAL REQUIREMENTS

SECTION I. FACILITIES, TOOLS, AND EQUIPMENT

2-1. FACILITIES

2-2. Facilities required to perform the tests described in this manual include the following:

a. A test stand capable of supplying test fluid, Federal Specification P-D-680, or equivalent, at pressures from 0 to 188 psig. The test stand shall include pressure gages to read pressures within the stated pressure range with an accuracy of ±0.5%.

b. An air pressure source capable of supplying air at pressures to 188 psig. The supply source shall include a pressure gage to read supply pressure with an accuracy of ± 5%.

c. A water tank of approximately 5 gallons capacity, of overall dimensions suitable for water submersion tests of the valve.

2-3. TOOLS AND EQUIPMENT

2-4. Special tools, inspection, test equipment and consummable materials required for the procedures described in this manual are listed in tables 2-1 and 2-2.

2-5. FABRICATED TOOLS AND EQUIPMENT

2-6. Instructions and illustrations of tools and equipment that are considered necessary to the performance of the operation described in this DMWR and that must be locally fabricated are shown in table 2-3.

Section II. STANDARDS

2-7. QUALITY OF MATERIAL

2-8. Parts and materials used for replacement, repair, or modification will comply with applicable drawings and specifications unless otherwise specified.

2-9. TIME SCHEDULE GUIDE

2-10. (NOT APPLICABLE.)

2-11. WEAR LIMITS, FITS, AND TOLERANCES

2-12. Wear limits, fits, and tolerances specified throughout this manual will be complied with unless otherwise stated in the contract/work directive.

2-13. REPAIR PARTS

2-14. Repair parts required for overhaul, repair, or modification of the equipment are listed in Appendix B.

2-15. MODIFICATIONS

2-16. All MWO and Engineering Orders (EO) required for application to the item as specified by the contract/work directive will be applied.

2-17. FLIGHT SAFETY PARTS PROGRAM

2-18. This DMWR is not impacted by the Flight Safety Parts Program.

Table 2-1. Special Tools, Inspection and Test Equipment

NOMENCLATURE	FSN OR PART NO.	REFERENCE PARAGRAPH OF USE
Cylinder, Graduated Laboratory	6640-419-7000	Para 3-61, step g
Drilling Machine, Upright	3413-529-0809	Para 3-30, 3-31
End Play, Rotor, Multi-Purpose	4920-601-1144	Para 3-40, step h & i
Fluorescent Inspection Kit; or Fluorescent Penetrant Inspection Unit	6635-566-5198 6635-641-2661	Table 3-1; Para 3-31, step h
Kit, Magnetic Inspection; or Magnetic Inspection Unit Stationary	6635-566-5197 4940-869-0444 6635-530-1130	Table 3-1
Multimeter	6625-553-0142 6625-933-2406 6130-504-0327	Table 3-1, Fig. 3-5, 3-6
Power Supply	6130-504-0347 6625-841-8917	Para 3-40, step l, Para 3-45, step a & b, Para 3-46, Para 3-58
Press, Arbor, Hand Operated	3444-243-2654	Para 3-19, step j, Para 3-40, step b
Driver, Vessel Impact (Goodkin Hardware Corporation, 3669 7th Avenue, Los Angeles, California 90007)	Part or Type No. 250CN	Para 3-21, step b
Stopwatch, 1-second markings	6645-250-4680	Table 3-1; Para 3-46, Para 3-64, step e & g
Test Stand, Fuel Components	4920-874-0876	Para 3-56
Test Set, Insulation Breakdown	6625-765-9079 6625-648-9931 6625-366-1494 6625-540-8761	Table 3-1; Para 3-46, step h, Para 3-62 and 3-63
Tester, Spring: or Gage, Spring Testing	4920-567-3050 4933-122-1101 4933-122-1100	Table 3-1; Para 3-40, step g4
Gage, Depth, Dial Indicating	5210-921-5036	
Gage, Depth, Dial Indicator (Surface Finish)	5210-116-3485	Table 3-1
Multimeter, Simpson 270R5; or Multimeter, AN/PSM-6B; or Multimeter, AN/PSM-4A & 4B	6625-897-4051 6625-957-4374 6625-643-1668	
Ohmmeter, Portable	6625-648-8685	
Ohmmeter, Insulation Resistance; or Tester, Insulation	6625-246-5880 6625-342-4268 6625-366-1447	
Megohmmeter	6625-473-6365	

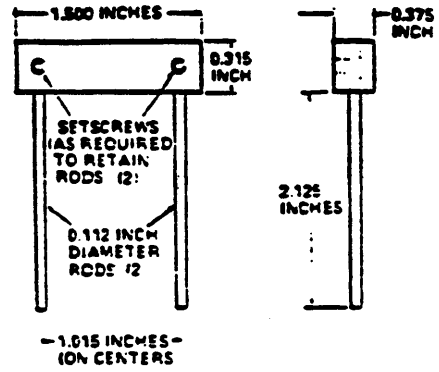
Table 2-2. Consummable Materials

ITEM NO.	NOMENCLATURE	SPECIFICATION OR SOURCE
1	Thinner, Lacquer	MIL-L-19357
2	Fluid, Preservative	MIL-H-6083
3	Bags, Plastic	PPP-B-26
4	Solvent, Cleaning	P-D-680
5	Solder	QQ-S-571, Composition Sn63
6	Varnish, Insulating	MIL-V-1137, Type M, Grade CB
7	Solder	QQ-S-571, Composition Sn10
8	Grease	MIL-L-15719
9	Grease	MIL-G-23827B
10	Grease, No. 630AA	
11	Lockwire	MS20995NC20
12	Tape, Insulating	MIL-I-15126A
13	Lockwire	MS20995NC32
14	Protective Covers	1/4 x 1/4 x 4 inch cardboard
15	Tape, Masking	UU-T-416
16	Ink, Black, permanent	TT-I-558
17	Lacquer, Clear	TT-L-58
18	Desiccant	MIL-D-3464, Class 1
19	Polyurethane Foam	MIL-P-26514, Type 1
20	Box, Fiberboard	PPP-B-636, Type SF, Grade V2
21	Aluminum, 1100 to 1/2 hard, 0.008 to 0.012 thick	QQ-A-250/1
22	Aluminum, Sticker photo	6750-00-485-9914
23	Vinyl, Scotchcal, P/N 8015 (34360)	6750-00-297-3944
24	Plastic, Vinyl material Scotchcal	9330-00-264-7629

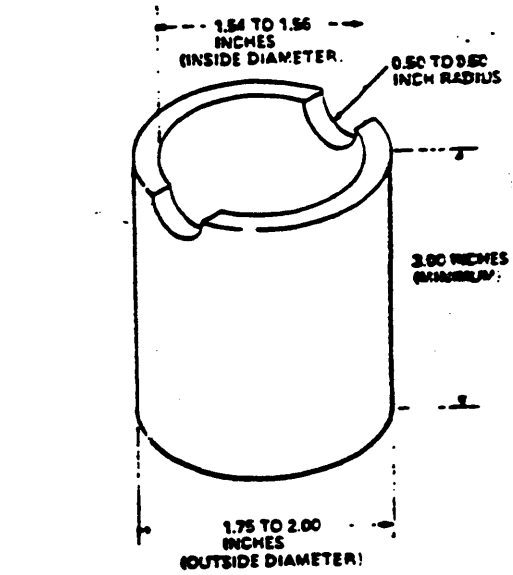
Table 2-3. Fabricated Tools and Test Equipment

NOMENCLATURE	REFERENCE OR PART NO.	MATERIAL REQUIRED
Motor Assembly Tool	Sketch A below	Tool Steel
Motor Housing Support	Sketch B below	Refer to Sketch B.
Port Adapter – AV16B1294D, AV16B1296D, and AV16B1667D	Sketch C	Aluminum Plate.
Port Adapter – AV16B1700B	Sketch D	Aluminum Plate.

Fabrication Instructions: Fabricate per sketches below. All dimensions given are in inches unless otherwise noted.



SKETCH A – MOTOR ASSEMBLY TOOL

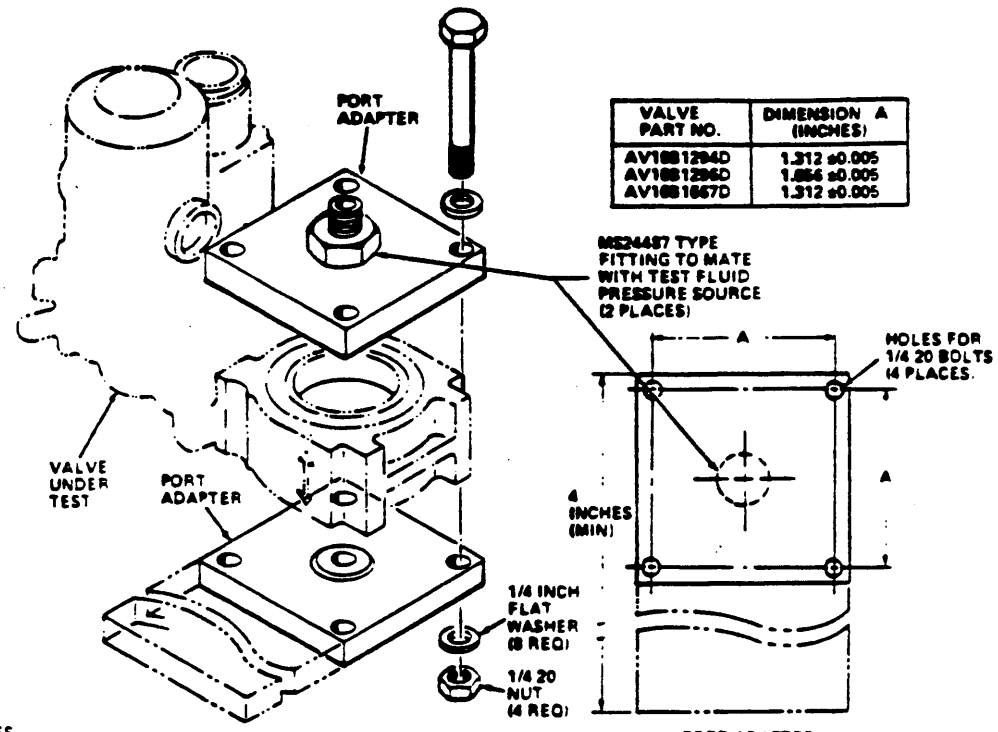


MAKE FROM: ALUMINUM, STEEL, BAKELITE, HARDWOOD, OR OTHER EQUIVALENT MATERIAL.

SKETCH B – MOTOR HOUSING SUPPORT

(2915-300-T2-3-1)

Table 2-3. Fabricated Tools and Test Equipment – Continued



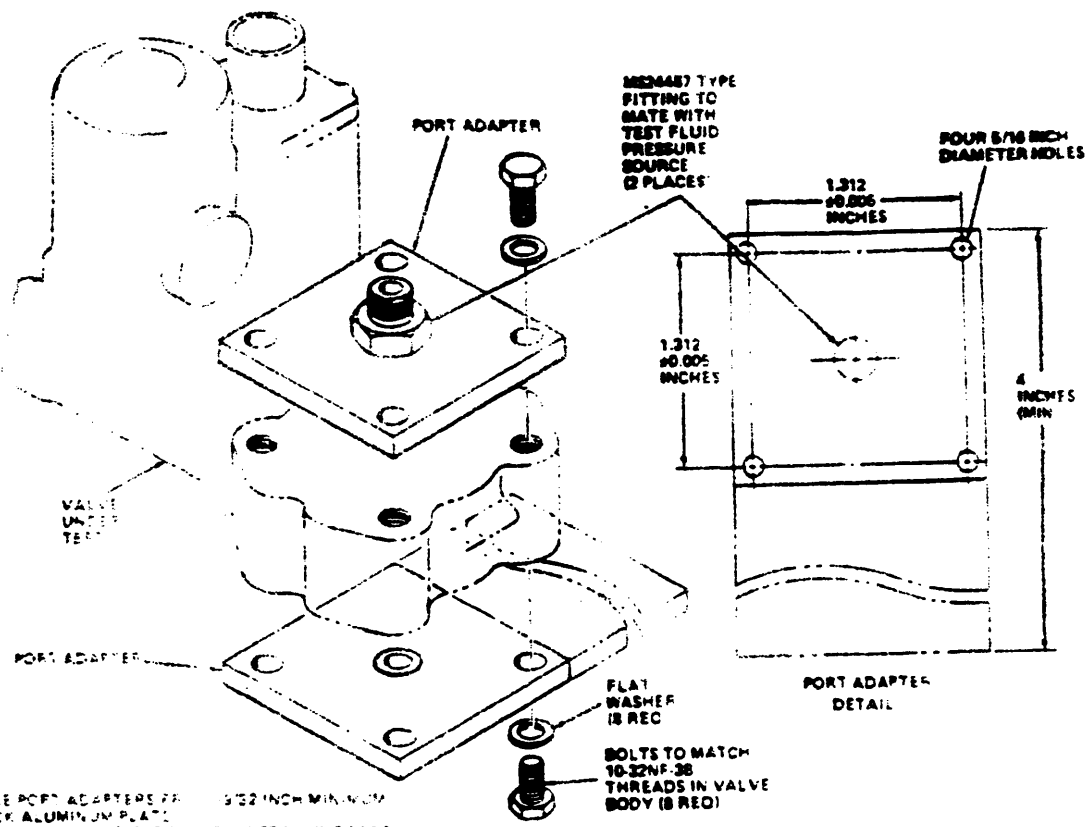
VALVE PART NO.	DIMENSION A (INCHES)
AV16B1294D	1.312 ±0.005
AV16B1296D	1.856 ±0.005
AV16B1667D	1.312 ±0.005

NOTES
1. MAKE PORT ADAPTERS FROM 19/32 INCH MINIMUM THICK ALUMINUM PLATE
2. USE PACKINGS (2 FIG 3-1 OR 3-2) WHEN INSTALLING PORT ADAPTERS ON BOTH PORTS OF VALVE
3. MS24487 TYPE FITTING SHALL BE FLUSH OR BELOW SURFACE OF PORT ADAPTER TO PREVENT FITTING FROM PROTRUDING INTO VALVE PORT
4. SUPPORT EXTENSION REQUIRED ON ONE PORT ADAPTER

SKETCH C – PORT ADAPTER, PART NO. AV16B1294D, AV16B1296D, AND AV16B1667D

(2915-300-T2-3-2)

Table 2-3. Fabricated Tools and Test Equipment – Continued



NOTES
1. MAKE PORT ADAPTERS FROM 3/32 INCH MINIMUM THICK ALUMINUM PLATE.
2. USE PACKINGS [illegible] WHEN INSTALLING PORT ADAPTERS ON BOTH PORTS OF VALVE.
3. MS2446[illegible] TYPE FITTING SHALL BE FLUSH OR BELOW SURFACE OF PORT ADAPTER TO PREVENT FITTING FROM RESTRICTING INTO VALVE PORT.
4. SUPPORT EXTENSION PER [illegible] TO ONE PORT ADAPTER.

SKETCH D – PORT ADAPTER, PART NO. AV16B1700B

(2915-300-T2-3-3)

CHAPTER 3

MAINTENANCE

Section I. PRESHOP ANALYSIS, UNPACKING, AND CLEANING

3-1. DIAGNOSTIC DISASSEMBLY

3-2. Diagnostic disassembly instructions are provided as a guide to examination of an incoming valve for the use of the overhaul facility in preparing estimates of work and parts required for performing depot maintenance on the valve. All quality standards specified in this manual shall be adhered to during such work.

3-3. UNPACKING

3-4. No special unpacking procedures are required.

3-5. PHYSICAL CHECK

3-6. Physically check all tags and forms attached to the valve to determine the reason for removal from service and other discrepancies. Also, determine what open items of work or delayed discrepancies, including any TM's, or MWO's, are not accomplished. The contractor will disassemble the valve in order to perform a complete evaluation of the components or subassemblies to determine the repair, modification, and replacements required to overhaul the valve as specified in this DMWR.

NOTE

A valve removed from stock for modification(s) only shall be disassembled by the contractor only to the extent required to accomplish the modification(s).

3-7. EVALUATION OF REPAIR, MODIFICATION, OR REPLACEMENT REQUIREMENT

3-8. Test the valve as instructed in paragraph 3-56. If malfunctions are observed, refer to table 3-4. If faults are found in the actuator, remove from the valve (paragraph 3-18 or 3-19, and test per paragraph 3-47. Refer to table 3-3 for actuator fault isolation data. If faults are found in the motor, remove from the actuator (paragraph 3-20), and test per paragraph 3-46. Refer to table 3-2 for motor fault isolation data.

3-9. TEMPORARY PRESERVATION. Apply a light film of preservative fluid (item 2, table 2-2) to any bare metal surfaces exposed during preliminary disassembly. Place disassembled parts in a plastic bag (item 3, table 2-2) or other protective enclosure to prevent corrosion of unfinished surfaces.

Section II. DISASSEMBLY OF END ITEM

3-10. GENERAL

3-11. The selector valve consists of three major subassemblies: (1) the gate valve, (2) the actuator assembly, and (3) the motor assembly. The evaluation of repair, modification, and replacement requirements (paragraph 3-8) included testing the complete valve assembly. After the actuator assembly is removed from the gate valve, test in accordance with paragraph 3-47. After the motor assembly is removed from the actuator assembly, test in accordance with paragraph 3-46.

3-12. DISASSEMBLY OF END ITEM INTO MAJOR SUBASSEMBLIES

3-13. Remove actuator assembly from gate valve as instructed in paragraph 3-18 or 3-19. Remove motor assembly from actuator assembly as instructed in paragraph 3-19. Remove any dirt and other foreign matter from the removed subassemblies by wiping with a clean cloth. Moisten cloth with cleaning solvent (item 4, table 2-2) to remove stubborn materials. Do not immerse assemblies in solvent.

3-14. INSPECTION OF DISASSEMBLED END ITEM

3-15. Visually inspect disassembled components of end item for obvious damage. Inspect visible components per instructions in table 3-1.

Table 3-1. Overhaul Inspection Procedures

NOMENCLATURE OF ITEM	REF LTR OR FIG. NO.	CHARACTERISTICS	MAJOR DEFECT	METHOD OF INSPECTION	MINOR DEFECT	METHOD OF INSPECTION	AQL	INSPECTION REQUISITE
Retainer (1, fig 3-1, 3-3, 1, 2, fig. 3-2)		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating not worn through to bare metal.
		Damage to packing and ring grooves.	Rough or damaged.	Dimensional				Smooth to 32 microinch, no corrosion visible.
		Damage to face that is towards slide of valve.	Rough or damaged.	Dimensional				Smooth to 16 microinch.
Seal Ring Shell (3, fig. 3-1, 3-4, 5, fig. 3-2)		Wear through plating.	Bare metal visible.	Visual				Nickel plating not worn through to bare metal.
		Distortion	Out of round.	Dimensional				Maximum out-of-round 0.005 inch on diameter.
Seal Ring (4, fig. 3-1, 3-3, 6, fig. 3-2)		Wear or damage	Excess wear or damage.	Dimensional				Not worn below 0.115 inch thick. Seal must be free of all defects and irregularities.
Belleville Spring (6, fig. 3-1, 3-3, 8, fig. 3-2)		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating not worn through to bare metal.
End Cap (8, fig. 3-1, 3-3, 10, fig. 3-2)		Wear through anodic coating.	Bare metal visible	Visual				Anodic coating not worn through to bare metal.
Needle Bearing Assy (11, fig 3-1, 3-3, 15, fig 3-2)		Damaged assembly	Loose or damaged	Visual				Roller shall be free on shaft and able to rotate without sticking or catching. Rivet shall be tight in arm.
		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating on arm shall not be worn through to bare metal.
		Worn roller	Worn or damaged	Dimensional				OD smooth to 32 microinch not worn below 0.3725 inch.
Slide (17, fig. 3-1, 3-3, 18, fig. 3-2)		Surface damage	Excess wear marks	Dimensional				Sealing surface smooth to 8 microinch.
		Distortion	Bent or damaged	Dimensional				Sealing faces parallel within 0.002 inch per inch.
Valve body (19, fig. 3-1, 3-3, 22, fig. 3-2)		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating not worn through to bare metal.
		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
		Worn shaft bore.	Excess wear	Dimensional				ID for output shaft of actuator not worn over 0.4390 inch, smooth to 32 microinch.
		Cracks in body	Cracked or broken	Fluorescent penetrant				Per MIL-I-6866. No defects permissible.
		Obstructions in body passages for thermal relief valve	Clogged or corroded	Visual				No obstructions or foreign matter in passages, not corroded.
Screw (20, fig. 3-1, 3-3, 21, fig. 3-2)		Thread damage	Crossed threads	Visual				Clean and undamaged.
Input Gear (23, fig. 3-1, 3-3, 24, fig. 3-2)		Damaged teeth.	Chipped or broken	Visual				Not chipped or broken.
	A (fig 3-5)	Wear to small gear teeth	Excess wear	Dimensional				0.7228 to 0.7254 inch (measure over 0.027 inch diameter wires).
	B (fig 3-6)	Wear to pinion gear teeth	Excess wear	Dimensional				0.2743 to 0.2760 inch (measure over 0.030 inch diameter wires).

Table 3-1. Overhaul Inspection Procedures – Continued

NOMENCLATURE OF ITEM	REF LTR OR FIG. NO.	CHARACTER-ISTICS	MAJOR DEFECT	METHOD OF INSPECTION	MINOR DEFECT	METHOD OF INSPECTION	AQL	INSPECTION REQUISITE
Idler Gear (4, fig. 3-4)		Damaged teeth.	Chipped or broken.	Visual				Teeth clean and undamaged.
	C Fig. 3-6	Wear to spur gear teeth.	Excess wear.	Dimensional				Measure over 0.027 inch diameter wires; shall be: Part No. Dimension (in.) 9785D 0.7228 to 0.7254 9785K 0.7175 to 0.7210 9785M 0.7190 to 0.7225 9785V 0.7142 to 0.7179 9785X 0.7158 to 0.7179
	D Fig. 3-6	Wear to pinion gear teeth.	Excess wear.	Dimensional				Measure over 0.030 inch diameter wires; shall be 0.2743 to 0.2760 inch.
Screws (6, fig. 3-4)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
Electrical Connector (8, fig. 3-4)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
		Sealing surface damage.	Excessive scratches and nicks.	Visual				Surface that mates with connector adaptor (12, fig. 3-4) or actuator housing (23) must be free of scratches, nicks, stampings, etc.
		Pin damage.	Loose or broken.	Visual				Pins must be secure in shell with no evidence of electrical or heat damage.
Screws (12, fig. 3-4)		Thread damage	Crossed threads.	Visual				Clean and undamaged.
Connector Adaptor (13, fig. 3-4)		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating shall not be not be worn through to bare metal.
		Thread damage	Crossed threads.	Visual				Clean and undamaged.
		Damage to sealing surfaces.	Nicked or scratched.	Visual				Surfaces in contact with electrical connector (8, fig. 3-4) and gaskets (11, 14) free of nicks, scratches, and other defects greater than 63 microinch finish. Entire bottom surface for gasket (14) flat within 0.0015 inch-per-inch.
Screws (15, fig. 3-4)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
Switch Plate Assembly (16, fig. 3-4)		Broken wires, cracked or burned insulation..	Broken or damaged.	Visual				Red and orange lead wires to contacts of limit switches secure at switch terminals; clean, not discolored from heat or fluid damage; not less than 4.75 inches long each.
		Loose switches.	Loose or missing.	Visual				Limit switches secure to limit switch plate with tubular rivets.
	Fig. 3-7	Defective switches	Inoperative or defective.	Electrical				Check per fig. 3-7.
			Terminals damaged.	Visual				Clean and free of corrosion; not loose or broken.
Limit Switch Plate Assembly (16, fig. 3-4)		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating not worn through to bare metal.
Screws (17, fig. 3-4)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.

Table 3-1. Overhaul Inspection Procedures – Continued

NOMENCLATURE OF ITEM	RFF LTR OR FIG NO.	CHARACTERISTICS	MAJOR DEFECT	METHOD OF INSPECTION	MINOR DEFECT	METHOD OF INSPECTION	AQL	INSPECTION REQUISITE
Idler Shaft (22, fig. 3-4)	Fig 3-9	Looseness, not installed perpendicularly	Loose in housing bent.	Visual				Shall be securely swaged in actuator housing (23, fig. 3-4), 90° to housing (fig. 3-9)
	E Fig 3-6	Worn or damaged	Excess wear or scored.	Dimensional				OD not worn below 0.0925 inch smooth to 32 microinch.
Actuator Housing (23, fig. 3-4)		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating not worn through to bare metal.
		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
		Sealing surface damage.	Scored or damaged.	Dimensional				All surfaces in contact with soft seals and packings smooth to 32 microinch.
		Cracks in housing.	Cracked or broken.	Fluorescent				Per MIL-I-6866; no defects permissible.
Switch Lever Spring (24, fig. 3-4)		Loss of strength.	Weak.	Dimensional				Shall compress to 0.338 inch long under a load of 0.75 to 1.00 pound.
Switch Arm Pin (25, fig. 3-4)		Scored or worn.	Excess wear.	Dimensional				No nicks, scratches, or wear marks deeper than 30 microinch.
Switch Arm Assembly, fig. 3-4		Loose assembly.	Parts loose.	Visual				Switch actuator and switch lever securely held together with rivet.
		Broken or defective switch actuator.	Broken.	Visual				Ears not broken.
			Weak.	Dimensional				Spring load of ears shall be 12 ounces minimum when deflected from approximately 94° free position to 90° position.
		Switch lever broken or damaged.	Broken.	Visual				Not cracked or broken.
Seal Plate Assembly, fig. 3-4.		Damaged seal.	Rubber broken.	Visual and dimensional.				Rubber seal shall protrude 0.065 to 0.085 inch from metal plate; and shall be free of nicks, scratches, and other defects.
Center Pin (26, fig. 3-4)		Damaged OD and length.	Scored or worn.	Dimensional.				OD smooth to 10 microinch, straight within 0.001 inch over entire length. No sharp edges or burrs.
Bearing Pin (29, fig. 3-4)		Damaged.	Nicked or broken.	Visual.				No nicks, burrs, or sharp corners, not broken.
Planet Gear (30, 32, fig. 3-4)	B Fig 3-4	Worn bearing surface.	Excess wear.	Dimensional.				Measure over 0.027 inch diameter wires, shall be 0.6252 to 0.6277 inch.
	C Fig 3-4	Worn bearing surface for bearing pin.	Excess wear.	Dimensional.				ID for bearing pins (29, fig. 3-4) not worn over 0.190 inch.
Input Sun Gear Assembly, fig. 3-4	F Fig 3-4	Worn bearing surface.	Excess wear.	Dimensional.				Measure over 0.030 inch diameter wires, shall be 0.2743 to 0.2760 inch.
	F Fig 3-4	Worn in bosses for planet gear (30, fig. 3-4).	Excess wear.	Dimensional.				Not worn below 0.1847 inch.
Output Sun Gear Assembly, fig. 3-4	K Fig 3-4	Worn in bosses for planet gear (30, fig. 3-4).	Excess wear.	Dimensional.				Not worn below 0.1847 inch.

Table 3-1. Overhaul Inspection Procedures – Continued

NOMENCLATURE OF ITEM	REF LTR OR FIG. NO.	CHARACTERISTICS	MAJOR DEFECT	METHOD OF INSPECTION	MINOR DEFECT	METHOD OF INSPECTION	AQL	INSPECTION REQUISITE
	L Fig. 3-6	Wear to groove for clutch ring (34, fig. 3-5).	Deep markings.	Dimensional				No nicks, scratches, or wear marks deeper than 32 microinch.
		Cracked or broken	Cracks or breaks.	Magnetic particle.				Per MIL-I-6868; no defects permissible.
	M Fig. 3-6	Wear to ID for output shaft (40, fig. 3-4).	Excess wear.	Dimensional				Not worn over 0.3130 inch; smooth to 32 microinch.
Clutch Ring (34, fig. 3-4)		Nicks or burrs.	Any defects.	Visual				No nicks or burrs that might prevent smooth rotation in groove of output planetary assembly (33, fig. 3-4).
Stop Ring (35, fig. 3-4)		Cracked or broken.	Visible damage.	Visual				Clean and undamaged.
		Cracked or broken.	Cracks or breaks.	Magnetic				Per MIL-I-6868; no defects permissible.
Override Arm or Indicator Arm (36, fig. 3-4)		Cracked or broken.	Visible damage.	Visual				Clean and undamaged.
		Wear through anodic coating.	Bare metal visible.	Visual				Anodic coating not worn through to bare metal.
Output Shaft (40, fig. 3-4)	N Fig. 3-6	OD for gear housing assembly (44, fig. 3-4).	Excess wear.	Dimensional				Not worn below 0.4975 inch; smooth to 63 microinch.
		Cracked or broken.	Cracks or breaks.	Magnetic Particle				Per MIL-I-6868; no defects permissible.
Gear Housing Assembly (44, fig. 3-4)	P Fig. 3-6	Wear to ID for output shaft (40, fig 3-4).	Excess wear.	Dimensional				Not worn over 0.5005 inch; smooth to 32 microinch.
		Wear through iridite coating	Bare metal visible.	Visible				Iridite coating shall not be worn through to bare metal.
	R Fig 3-6	Wear to spur gear teeth.	Excess wear.	Dimensional				Measure over 0.0225 inch diameter pins; shall be 1.3992 to 1.4019 inch.
		Looseness of assembly.	Any looseness.	Visual				Ring gear shall be securely installed in gear housing, and retained with two locating pins.
Brush Port Caps (2, fig. 3-5)		Damage	Cracked.	Visual				Free of any visible cracks.
Screws (4, fig 3-5)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
Cap Assembly (5, fig 3-5)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.
		Wear through iridite coating.	Bare metal visible.	Visual				Not worn through to bare metal.
		Bushing wear.	Excess wear.	Dimensional				Bushing ID for bearing (20, fig. 3-5) not worn over 0.5003 inch.
Belleville Springs (6, fig 3-5)		Loss of strength.	Weak.	Dimensional				Free height approximately 0.023 inch. Shall compress to 0.018 inch with load of 7 pounds minimum, and 11 pounds maximum.
Hexagon Nut (10, fig. 3-5)		Thread damage.	Crossed threads.	Visual				Clean and undamaged.

Table 3-1. Overhaul Inspection Procedures – Continued

NOMENCLATURE OF ITEM	REF LTR OR FIG. NO.	CHARACTERISTICS	MAJOR DEFECT	METHOD OF INSPECTION	MINOR DEFECT	METHOD OF INSPECTION	AQL	INSPECTION REQUISITE
Field & Brush Holder Plate Assy (components 11 through 18, fig 3-5)		Loose solder connections and damaged wires	Loose or broken	Visual				Solder connections between plate and field, between brush terminals and field, and to brush terminals clean, secure and without evidence of heat damage
Field Assembly (12, fig 3-5)		Open coil	Discontinuity	Electrical				Resistance across red and black leads, and across orange and black leads shall be 1.78 ohms ±10% per coil.
		Dielectric breakdown	Test breakdown	Electrical				Apply 1000 volts (rms) at 60 Hz between field coil leads and metal core for 1 second; there shall be no flashover or breakdown.
Screws (14, fig 3-5)		Thread damage	Crossed threads	Visual				Clean and undamaged.
Brush Springs (17, fig 3-5)		Loss of strength	Weak	Dimensional				Shall compress to 0.144 inch long under a load of 55 grams ±5%.
Brush Terminal Assemblies (16 fig 3-5)		Worn	Excess wear	Dimensional				Brush length not less than 0.122 inch (minimum length indicated by drilled hole). Maximum length, 0.250 inch.
Brush Holder Plate Assembly (13, fig 3-5)		Misalignment or looseness of guides	Loose or bent	Dimensional				Centerline of brush guides shall line up 180° ±1/2°. Ends of brush guides shall clear ID of plate by 0.005 inch minimum.
Bearings (20, fig 3-5)		Loss of rotational freedom	Sticking or binding	Feel				Shall rotate freely without sticking or binding
Armature Assembly (22, fig 3-5)		Damaged insulation	Cracked or chipped	Visual				Not cracked or chipped.
		Open winding	Open circuit	Electrical				Bar-to-bar resistance measured at commutator shall be 0.48 ohms ±10% for lowest resistance pair, and 0.57 ohms ±10% for highest resistance pair.
		Dielectric breakdown	Test breakdown	Electrical				Apply 600 volts (rms) at 60 Hz for 1 minute, or 1000 volts (rms) at 60 Hz for 1 second, from any one bar of commutator to shaft; no breakdown or flashover permissible
		Commutator bar damage	Excess roughness	Dimensional				Smooth to 20 microinch.
			Excess wear	Dimensional				Not worn below 0.509 inch (indicated by wear groove in end of armature assembly).
		Bearing journal misalignment	Out of alignment	Dimensional				Insulation between commutator bars not flush or above commutator bars.
								Concentric within 0.001 inch total-indicator-reading
Studs (24, fig 3-5)		Thread damage	Crossed threads	Visual				Clean and undamaged.
Bushing (25, fig 3-5)		Worn or scored	Excess wear or scoring	Dimensional				ID not worn over 0.5003 inch (do not remove from housing).
Housing (26, fig 3-5)		Scaling area	Excess corrosion or nicks	Dimensional				No corrosion, nicks, or scratches in area in contact with packings deeper than 32 microinch.
		Wear through undrite coating	Bare metal visible	Visual				Not worn through to bare metal.

Section III. MAINTENANCE, OVERHAUL, AND REPAIR

3-16. DISASSEMBLY

3-17. In general, the extent of disassembly of the gate valve, actuator assembly, and/or motor assembly shall be based on the results of preshop analysis. Perform thorough visual and mechanical inspections during disassembly. Disassembly shall not be limited to the removal and separation of mechanical items such as housings, gears, and shafts. Normally, do not separate bonded, press-fit, soldered, welded, or riveted parts unless such removal is necessary to clean, inspect, or test a part.

3-18. DISASSEMBLY OF VALVE, PART NO. AV16B1294D, AV16B1296D, AND AV16B1700B. Disassemble as follows (see figure 3-1 or 3-3):

a. Remove any protective closures from ports of valve body (22).

b. Remove port retainers (1) from ports of valve body (22).

c. Remove two preformed packings (2) from each port retainer (1). Discard packings.

d. Remove one seal ring shell (3), seal ring (4), flat washer (5), and belleville spring (6) from each port retainer (1). Discard seal ring.

e. Remove lockwire, and pull two retaining pins (7) from valve body (22).

f. Remove end cap (8) from valve body (22). Remove packing (9) from end cap. Discard packing.

g. Using long-nose pliers, or a piece of 0.020 inch thick, 1/4-inch wide, by 6-inch long metal strip (with one end bent up approximately 1/4 inch to 90 degrees), remove clip (10) from needle bearing assembly (11).

h. Remove needle bearing assembly (11) from shaft of actuator assembly (14), and remove needle bearing assembly and slide (12) from valve body (22).

i. Remove lockwire and four screws (13), and remove actuator assembly (14) from valve body (22). Remove packing (15) from output shaft of actuator assembly. Discard packing. Disassemble actuator assembly as instructed in paragraph 3-20.

j. Remove two (three used on Part No. AV16B1700B) retaining rings (16) in line thermal relief valve assemblies (17) (and body thermal relief valve assembly (19) on Part No. AV16B1700B) from valve body (22). Remove two packings (18) from each thermal relief valve. Discard packings, thermal relief valve assemblies, and retaining rings.

k. On Part No. AV16B1294D and AV16B1296D, remove body thermal relief valve assembly (19, figure 3-1 or 3-3) from valve body (22) with a screwdriver. Remove two packings (18) from body thermal relief valve assembly. Discard packings and thermal relief valve assembly.

l. Unfold tab on end of identification plate (20), pull tab through slot in opposite end of identification plate, and remove identification plate from actuator assembly (14).

m. Remove assembly date decal (21) from valve body (22).

n. On Valve, Part No. AV16B1700B, remove any damaged or loose inserts (23, figure 3-3).

3-19. DISASSEMBLY OF VALVE, PART NO. AV16B1667B. Disassemble as follows (see figure 3-2):

a. Remove any protective closures from ports of valve body (25).

b. Remove port retainers (1 and 2) from ports of valve body (25).

c. Remove preformed packings (3 and 4) from each port retainer (1 and 2). Discard packings.

d. Remove one seal ring shell (5), seal ring (6), flat washer (7), and belleville spring (8) from each port retainer (1 and 2). Discard seal ring.

e. Remove lockwire, and pull two retaining pins (9) from valve body (25).

f. Remove end cap (10) from valve body (25). Remove packing (11) from end cap. Discard packing.

g. Using long-nose pliers, or a piece of 0.020 inch thick, 1/4 inch wide, by 6-inch long metal strip (with one end bent up approximately 1/4 inch to 90 degrees), remove clip (12) from needle bearing assembly (13).

h. Remove needle bearing assembly (13) from shaft of actuator assembly (16), and remove needle bearing assembly and slide (14) from valve body (25).

i. Remove lockwire and four screws (15), and remove actuator assembly (16) from valve body (25). Remove packing (17) from output shaft of actuator assembly. Discard packing. Disassemble actuator assembly as instructed in paragraph 3-20.

j. Remove two retaining rings (18) and line thermal relief valve assemblies (19) from valve body (25). Remove two packings (20) from each line thermal relief valve. Discard packings, line thermal relief valves, and retaining rings.

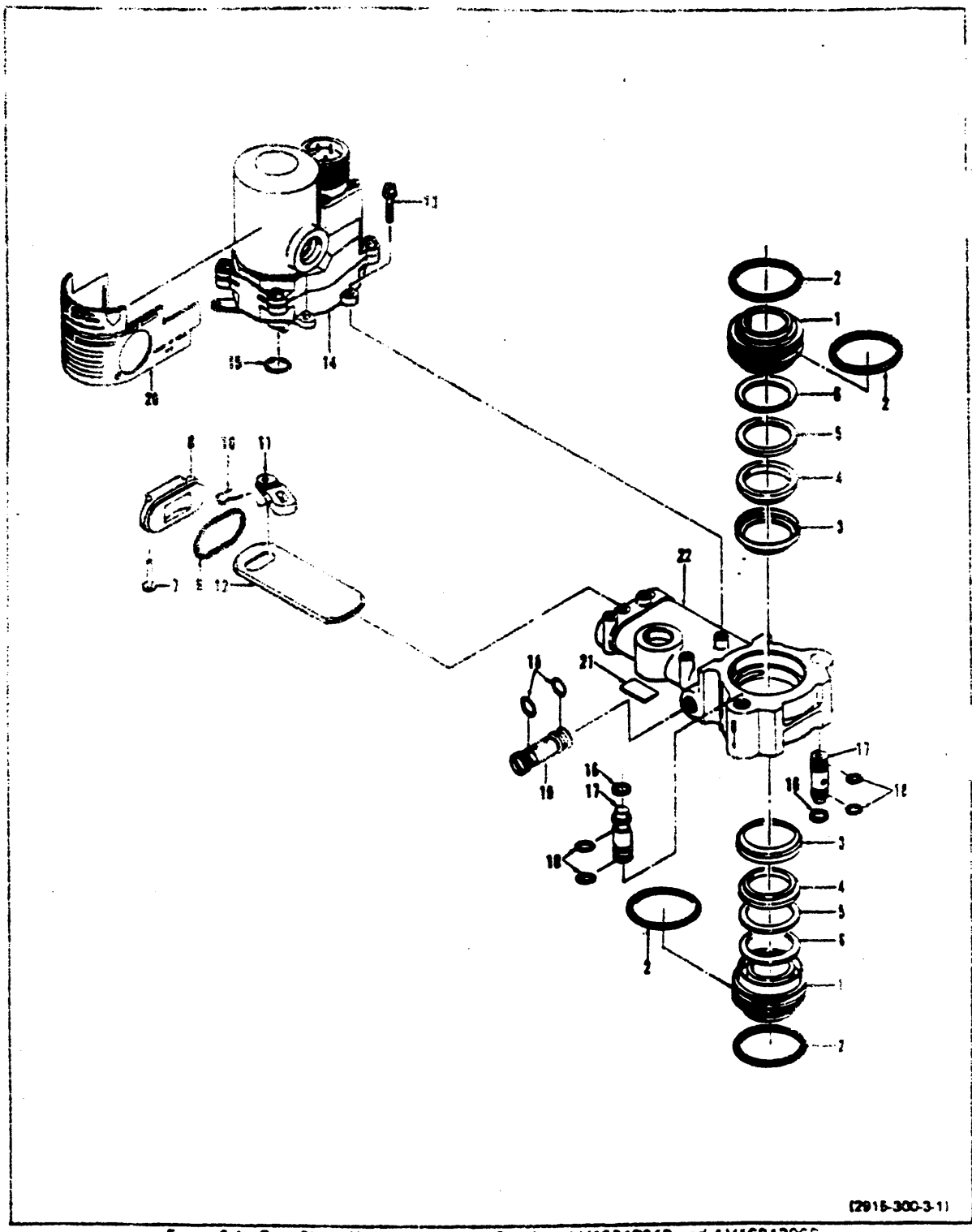


Figure 3-1. Gate Shutoff Valve Assembly, Part No. AV16B1294D and AV16B1296D

KEY to figure 3-1:

1. Retainer
2. Preformed packing
3. Seal ring shell
4. Seal ring
5. Flat washer
6. Belleville spring
7. Retaining pin
8. End cap
9. Preformed packing
10. Clip
11. Needle bearing assembly
12. Slide
13. Screw
14. Actuator assembly (see figure 3-4 for breakdown)
15. Preformed packing
16. Retaining ring
17. Line thermal relief valve assembly
18. Preformed packing
19. Body thermal relief valve assembly
20. Identification plate
21. Assembly date decal
22. Valve body

k. Using a screwdriver, remove body thermal relief valve assembly (21, figure 3-2) from valve body (25). Remove two packings (22) from body thermal relief valve assembly. Discard packings and body thermal relief valve assembly.

l. Unfold tab on end of identification plate (23), pull tab through slot in opposite end of identification plate, and remove identification plate from actuator assembly (16).

m. Remove assembly date decal (24) from valve body (25).

3-20. DISASSEMBLY OF ACTUATOR ASSEMBLY. Disassemble the actuator assembly as follows (see figure 3-4):

a. Remove four screws (1), and lift actuator housing assembly (components 2 through 23, intact) off gear housing assembly (44).

b. Remove input gear (2) and spacer (3) from actuator housing (23) or center pin (28).

c. Remove idler gear (4) and oilite bushing (5) from idler shaft (22). Discard oilite bushing.

d. Remove four screws (6) and lockwire clip (7) from actuator housing (23). Pull electrical connector (8) sufficiently away from actuator housing (23) or connector adaptor (13) to cut away insulation tubing (9) from electrical leadwire, and unsolder electrical leadwires from electrical connector. Tag or mark electrical lead wires to identify from which pins removed. Discard insulation tubing.

e. On Part No. 106788A101 or 106788B100, remove packing (10) from actuator housing (23). Discard packing.

f. On Part No. 102842MB, remove connector gasket (11) from connector adapter (13). Discard gasket.

g. On Part No. 102842MB, remove four screws (12) and connector adaptor (13) from actuator housing (23). Remove adaptor gasket (14) from actuator housing (23). Discard gasket.

h. Remove two screws (13, figure 3-4) and partially withdraw switch plate assembly (16) from actuator housing (23).

NOTE

Tag or mark electrical lead wires to identify from which terminals they were removed.

i. Unsolder red and orange electrical lead wires from motor assembly (19) to the switch plate assembly (16). Remove switch plate assembly completely from actuator housing (23).

NOTE

Do not disassemble switch plate assembly (16); if either limit switch of switch plate assembly is damaged, replace switch plate assembly as a complete assembly.

j. Remove insulation tubing (21) from motor assembly (19) lead wires. Discard insulation tubing.

k. Remove two screws (17) and one clip (18) from inside actuator housing (23). Remove motor assembly (19) from top of actuator housing. Remove packing (20) from actuator housing. Discard packing. Refer to paragraph 3-21 for disassembly instructions for the motor assembly.

l. If idler shaft (22) is to be removed, remove and replace as instructed in paragraph 3-32.

m. Remove switch lever spring (24) from switch arm pin (25).

n. Pull switch arm pin (25) out of plate seal (27) and gear housing assembly (44).

o. Turn switch arm assembly (26) 90 degrees, and remove from plate seal (27) and gear housing assembly (44).

p. If switch actuator or switch lever is defective, replace switch arm assembly (26).

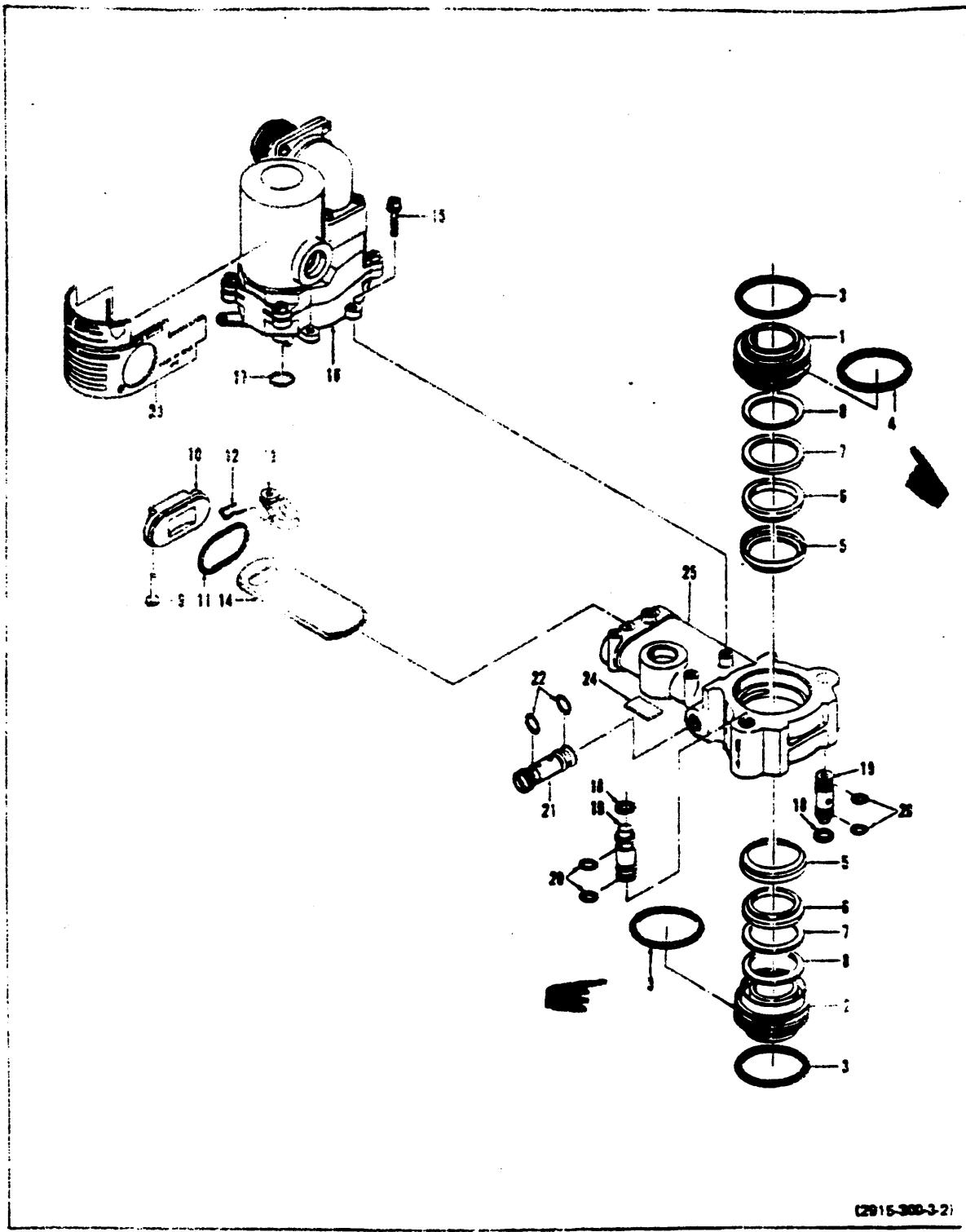


Figure 3-2 Gate Shutoff Valve Assembly, Part No. AV16B1667D

KEY to figure 3-2:

1. Retainer
2. Retainer
3. Preformed packing
4. Preformed packing
5. Seal ring shell
6. Seal ring
7. Flat washer
8. Belleville spring
9. Retaining pin
10. End cap
11. Preformed packing
12. Clip
13. Needle bearing assembly
14. Slide
15. Screw
16. Actuator assembly (see figure 3-4 for breakdown)
17. Preformed packing
18. Retaining ring
19. Line thermal relief valve assembly
20. Preformed packing
21. Body thermal relief valve assembly
22. Preformed packing
23. Identification plate
24. Assembly date decal
25. Valve body

q. Remove plate seal (27, figure 3-4) from gear housing assembly (44). Discard plate seal.

r. Remove center pin (28) from gear train in gear housing assembly (44).

s. Remove three bearing pins (29), planet gears (30), and input planetary gear assembly (31) from ring gear in gear housing assembly (44), remove planet gears from posts on input planetary gear assembly. Discard bearing pins.

t. Remove three bearing pins (29), planet gears (32) and output planetary gear assembly (33) from ring gear in gear housing assembly (44); remove planet gears from posts on output planetary gear assembly. Remove clutch ring (34) from groove in output planetary gear assembly. Discard bearing pins and clutch ring.

u. Remove override stop ring (35) from gear housing assembly (44).

v. On Part No. 102842MB and 106788A101, remove pin lock (36) from output shaft (40).

w. Remove pin (37) from position indicator or override arm (38) and output shaft (40), and remove arm and flat washers (39) from output shaft.

x. Remove output shaft (40) from gear housing assembly (44). Remove packing (41) from output shaft. Discard packing.

y. On Part No. 106788A101 and 102843MB, remove override actuating shaft (42) from output shaft (40). Remove packing (43) from override actuating shaft. Discard packing.

3-21. DISASSEMBLY OF MOTOR ASSEMBLY. Disassemble the motor assembly as follows (see figure 3-5):

a. Remove retaining ring (1), brush port cap (2), and packing (3) from each brush port of motor housing (26). Discard packings.

CAUTION

Damage to motor housing and cap assembly may result if impact driver and motor housing support are not used during removal of screws securing cap assembly to motor housing.

b. Insert motor assembly into motor housing support (table 2-3); then, using impact driver (table 2-1), remove two screws (4, figure 3-5) and cap assembly (5) from motor housing (26). Remove packing (6) from cap assembly. Discard packing.

c. Remove spacer washers (7), two belleville springs (8), and spacer washer (9) from shaft of armature assembly (22).

CAUTION

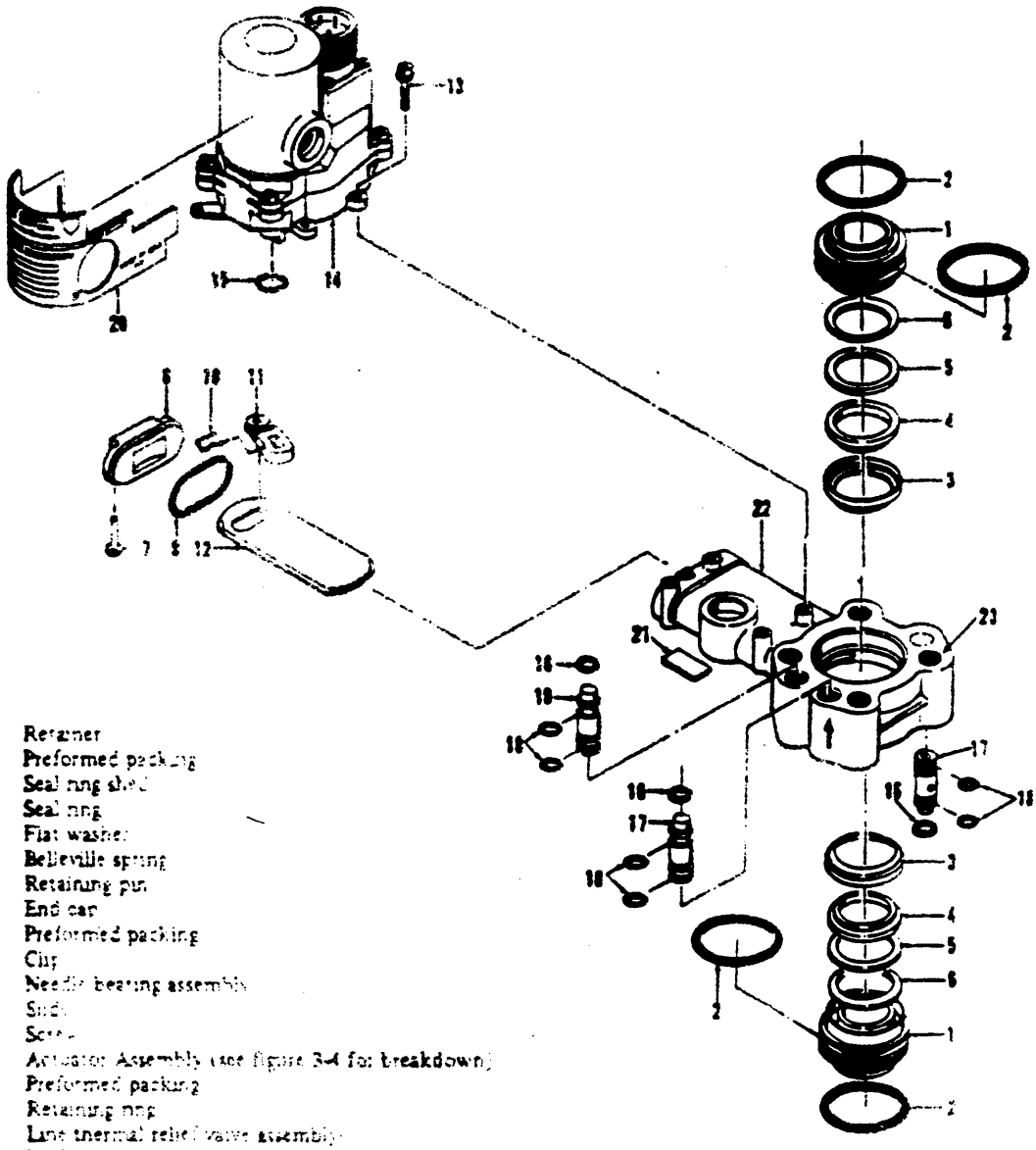
Slightly tilt field and brush holder plate assembly (components 12 through 19, intact) when removing. Do not allow screws (14) to scratch sealing surface for packing (6) on inside diameter of motor housing (26).

d. Remove two hexagon nuts (10) from studs (24) in motor housing (26). Pull field and brush holder plate assembly (components 12 through 19, intact) out of motor housing (26).

e. Remove two spacers (11) from between brush holder plate assembly (13) and field assembly (12).

f. If field assembly (12) is damaged, unsolder electrical lead wires between field assembly and brush holder plate assembly (13). Remove field assembly from brush holder plate assembly.

g. Unsolder lead wires from two brush terminal assemblies (18) to brush holder plate assembly (13).



1. Retainer
2. Preformed packing
3. Seal ring shield
4. Seal ring
5. Flat washer
6. Belleville spring
7. Retaining pin
8. End cap
9. Preformed packing
10. Clip
11. Needle bearing assembly
12. Stud
13. Screw
14. Actuator Assembly (see figure 3-4 for breakdown)
15. Preformed packing
16. Retaining ring
17. Line thermal relief valve assembly
18. Preformed packing
19. Body thermal relief valve assembly
20. Identification plate
21. Assembly gate decal
22. Valve body
23. Inlet

(2915-300-3-3)

Figure 3-3. Gate Shutoff Valve Assembly, Part No. AV16B1700B

h. Remove two each screws (14, figure 3-5), lock washers (15), brackets (16), brush springs (17), and brush terminal assemblies from brush guides. Discard brush terminal assemblies.

i. If brush guides or plate of brush holder plate assembly (13) are damaged, do not disassemble; replace complete brush holder plate assembly (13).

j. If jumper assembly (19) (used only on Motor Assembly, Part No. 106785C100) is damaged, unsolder from brush holder plate assembly (13). Discard jumper assembly.

k. Remove armature assembly (22) from motor housing (26).

l. Remove two bearings (20), stem washer (21), and spacer washers (23) from armature assembly (22). If bearings are tight on shaft of armature assembly, use a hand operated arbor press to remove bearings. Discard bearings.

m. If threads of either stud (24) are damaged, or the stud is bent, remove from motor housing (26). Discard removed stud.

n. Do not remove bushing (25) from motor housing (26); if damaged, replace complete motor housing assembly (components 24, 25, 26, intact).

3-22. CLEANING

WARNING

Cleaning solvent is toxic and flammable. To minimize danger to health, use cleaning solvent in a well-ventilated area, avoid excessive skin contact of solvent, and do not inhale or breath solvent fumes. To prevent fires, keep solvent and solvent fumes away from flames.

3-23. Clean disassembled parts as follows:

a. Clean metallic parts in cleaning solvent (item 4, table 2-2). Use a soft bristle brush to remove caked sediment and other foreign matter from cavities, gear teeth, and small passages.

b. Clean electrical components by wiping with a cloth moistened in solvent.

c. Dry parts with clean, lint-free cloth, or use compressed air (25 psig maximum nozzle pressure), if available.

CAUTION

Do not immerse electrical parts in solvent; insulation may soak up solvent, and retain for long periods.

d. If parts are not to be inspected immediately, place in clean plastic bags (item 3, table 2-2) to protect from contamination.

3-24. IN-PROCESS INSPECTION

NOTE

The contractor's inspection system shall be in accordance with the requirements of Military Specification MIL-I-45208.

3-25. Inspect disassembled parts in accordance with instructions in table 3-1.

3-26. PROCESSING

3-27. Those parts listed in table 3-1 that require inspection for penetration or wear through the anodic or iridite coatings, or through the nickel plating are processed as follows:

a. Anodic Coating: Military Specification MIL-A-8625, Type II (Indicator or Override Arm, 38, fig. 3-4, color: red).

b. Iridite Coating: Military Specification MIL-C-5541, Grade B, Class 3.

c. Nickel Plating: Federal Specification QQ-N-290, Class I, Type VII.

3-28. REPAIR

3-29. Repair damage to anodic coatings and iridite coatings per specifications given in paragraph 3-27. Replace all parts that are damaged or worn beyond repair. Replace all packings and the following parts during each overhaul:

a. On valve assembly (figures 3-1, 3-2, 3-3):

Seal Rings (4, figure 3-1 and 3-3; 6, figure 3-2).
Retaining Rings (16, figure 3-1 and 3-3; 18, figure 3-2).
Thermal Relief Valve Assemblies (17, 19, figure 3-1 and 3-3; 19, 21, figure 3-2).

b. On actuator assembly (figure 3-4):

Oilite Bushing (5)
Insulation Tubing (9, 21)
Plate Seal (27)
Bearing Pins (29)
Clutch Ring (34) (select during assembly)

c. On motor assembly (figure 3-5):

Brush Terminal Assemblies (18).

3-30. REPLACEMENT OF LIMIT SWITCHES. (See figure 3-4). If either or both limit switches require replacing; replace complete switch plate assembly (16).

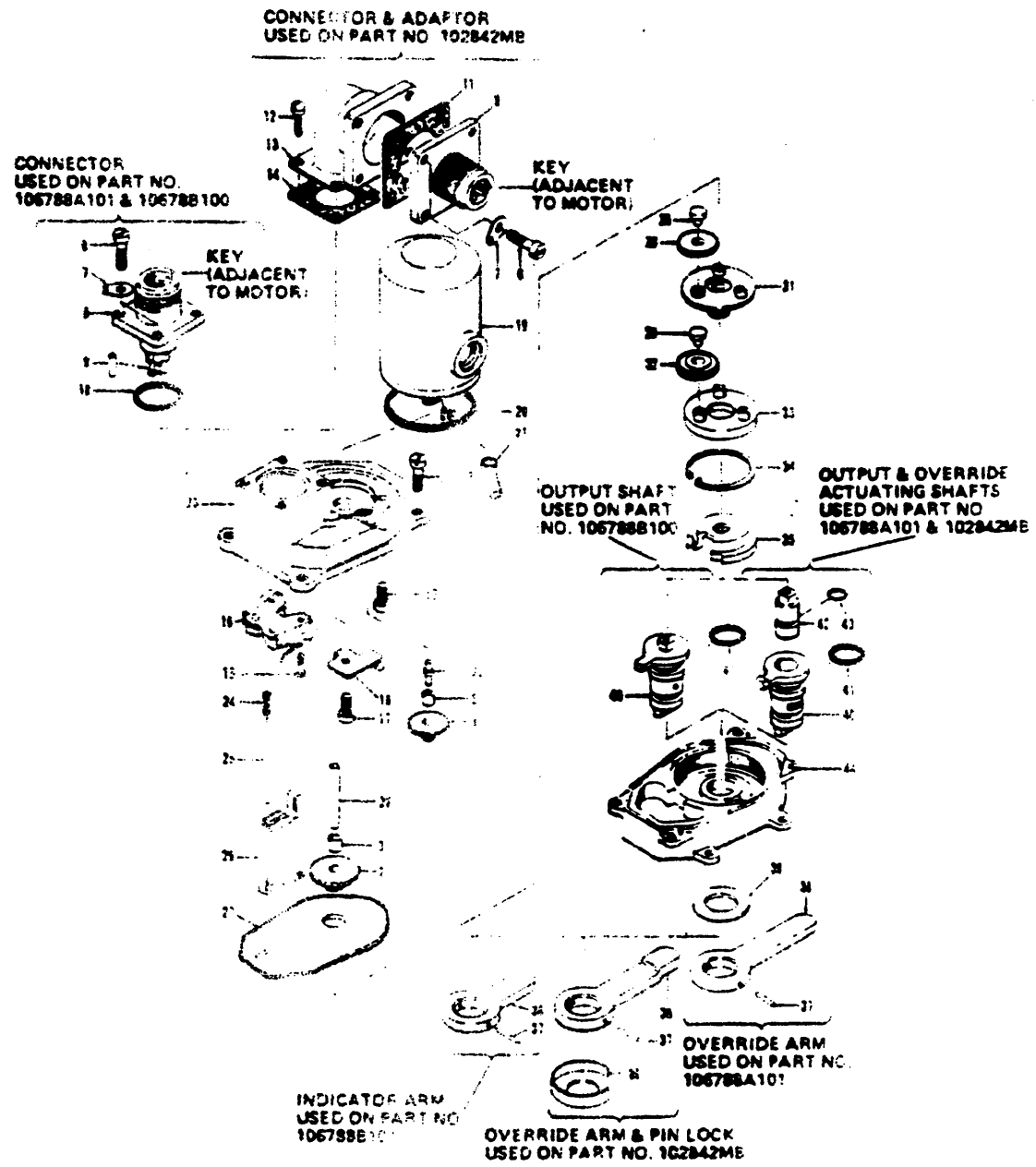


Figure 3-4. Actuator Assembly, Part No. 106788A101, 106788B100, and 102842MB – Exploded View

KEY to figure 3-4:

1.	Screw	16.	Switch plate assembly	31.	Input planetary assembly
2.	Input gear	17.	Screw	32.	Planet gear
3.	Input gear spacer	18.	Clip	33.	Output planetary assembly
4.	Idler gear	19.	Motor assembly (Ref fig. 3-5)	34.	Clutch ring
5.	Oilite bushing	20.	Preformed packing	35.	Override stop ring
6.	Screw	21.	Insulation tubing	36.	Pin lock
7.	Lockwire clip	22.	Idler shaft	37.	Pin
8.	Electrical connector	23.	Actuator housing	38.	Position indicator or override arm
9.	Insulation tubing	24.	Switch lever spring	39.	Flat washer
10.	Preformed packing	25.	Switch arm pin	40.	Output shaft
11.	Connector gasket	26.	Switch arm assembly	41.	Preformed packing
12.	Screw	27.	Plate seal	42.	Override actuating shaft
13.	Connector adaptor	28.	Center pin	43.	Preformed packing
14.	Adaptor gasket	29.	Bearing pin	44.	Gear housing assembly
15.	Screw	30.	Planet gear		

3-31. REPAIR OF SWITCH ARM ASSEMBLY. (See figure 3-4.) If any part of the switch arm assembly (26) is found to be defective, replace complete switch arm assembly.

3-32. REPLACEMENT OF IDLER SHAFT. (See figure 3-4.) If idler shaft (22) is to be replaced, proceed as follows:

a. Carefully drill out swaged head of shaft with No. 40 drill. Do not drill completely through shaft; drill only enough to remove swaged head of shaft. Do not remove any material from actuator housing (23).

b. Remove swaged head, then, carefully tap out shaft, with back of housing assembly supported, using a suitable punch.

c. Install new idler shaft in actuator housing, and check that idler shaft is $90^{\circ} \pm 1/2^{\circ}$ to actuator housing as shown in figure 3-8. If idler shaft is not vertical as specified, replacement shaft may be defective, or hole in actuator housing is distorted. Replace defective part before proceeding.

d. Hold idler shaft so that shoulder of idler shaft bears uniformly on actuator housing. Swage head of idler shaft flush with casting of actuator housing. Shaft shall be vertical, $90^{\circ} \pm 1/2^{\circ}$, to casting as shown in figure 3-8.

e. Perform fluorescent penetrant inspection, in accordance with Military Specification MIL-I-6866, on area adjacent to new idler shaft, to make sure idler shaft replacement has not cracked actuator housing.

3-33. ARMATURE REPAIRS. (See figure 3-5.) If the commutator of the armature assembly (22) is scratched deeper than 20 microinch, repair as follows:

a. Resurface as necessary to remove the scratches. Do not turn down to a diameter smaller than 0.509 inch. This minimum diameter is indicated by a wear groove in the end of the commutator section of the armature assembly. Do not turn down below this wear groove.

b. Clean slots between commutator bars. Slot widths shall be 0.020 to 0.021 inch wide. Slot depth shall be 0.027 inch to 0.031 inch deep.

c. Touch up varnish with insulating varnish (item 6, table 2-2).

3-34. FIELD ASSEMBLY REPAIR. (See figure 3-5.) If field assembly (12) is to be repaired or replaced, proceed as follows:

a. Use insulating varnish (item 6, table 2-2) to touch up varnished surfaces of the field assembly. Do not apply varnish to diameter of 0.250-inch around assembly holes of field assembly. These surfaces are electrical bonding surfaces.

b. If the field assembly is being replaced, attach the electrical leads from the field assembly to the same points on brush holder plate assembly (13) as from which removed. (See figure 3-9.) Use solder (item 5, table 2-2) for connections from field assembly.

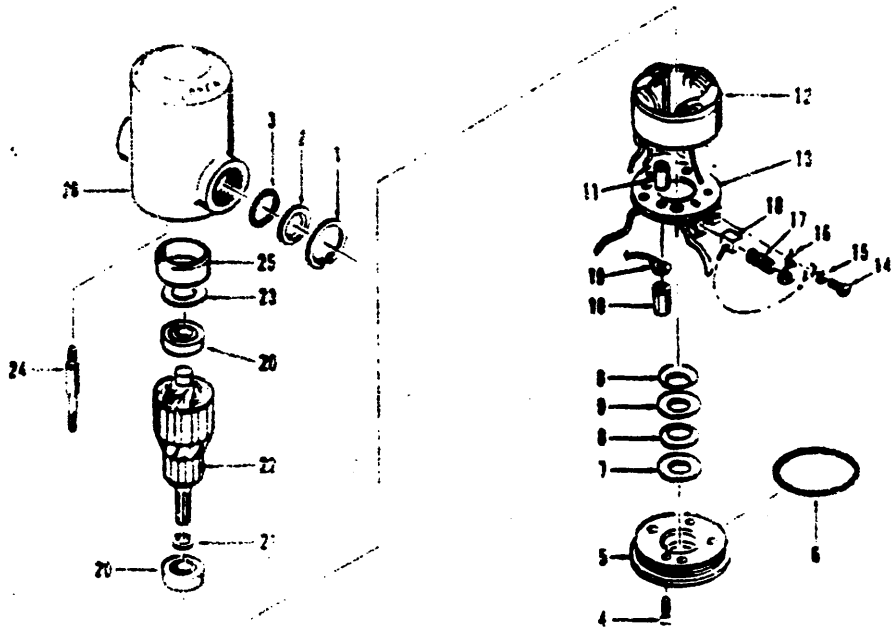
3-35. BRUSH GUIDE REPLACEMENT. (See figure 3-6.) If brush guides (20) are damaged, replace complete brush holder plate assembly (13).

3-36. PRESERVATION

3-37. The following interim corrosion-resistant treatment and environmental protection instructions shall be accomplished during processing and repair:

a. Apply preservative fluid (item 2, table 2-2) to those parts with exposed bare metal surfaces. Wipe on only a thin film of preservative fluid. Wipe off any excess that is sufficient to form drops or run off the surfaces to which applied.

b. Place parts with exposed bare metal in plastic bags (item 3, table 2-2) until ready for processing, repair, or reassembly.



1. Retaining ring
2. Brush port cap
3. Preformed packing
4. Screw
5. Cap assembly
6. Preformed packing
7. Spacer washer
8. Belleville spring
9. Spacer washer
10. Hex jam nut
11. Spacer
12. Field assembly
13. Brush holder plate assembly
14. Screw
15. Lock washer
16. Bracket
17. Brush spring
18. Brush terminal assembly
19. Jumper assembly (use only on Motor Assembly Part No. 106785C100)
20. Bearing
21. Stem washer
22. Armature assembly
23. Spacer washer
24. Stud
25. Bushing
26. Motor housing

(2915-300-3-5)

Figure 3-5. Motor Assembly, Part No. 106785C100 and 102650U100 -- Exploded View

3-38. ASSEMBLY.

3-39. Assemble as instructed in paragraphs 3-40 through 3-42. In general, assembly is accomplished in reverse order of disassembly, except as noted in these paragraphs. Install all lockwire in accordance with Military Standard MS33540. After assembling the motor assembly, test per paragraph 3-46 before installing on the actuator assembly. After assembling the actuator, test per paragraph 3-47 before installing on the valve. Test the completely assembled selector valve assembly per paragraph 3-56.

3-40. ASSEMBLY OF MOTOR ASSEMBLY. Assemble motor assembly as follows (see figure 3-5):

a. Apply a light film of MIL-G-15719 grease (item, table 2-2) to packing (6). Do not lubricate packings (3).

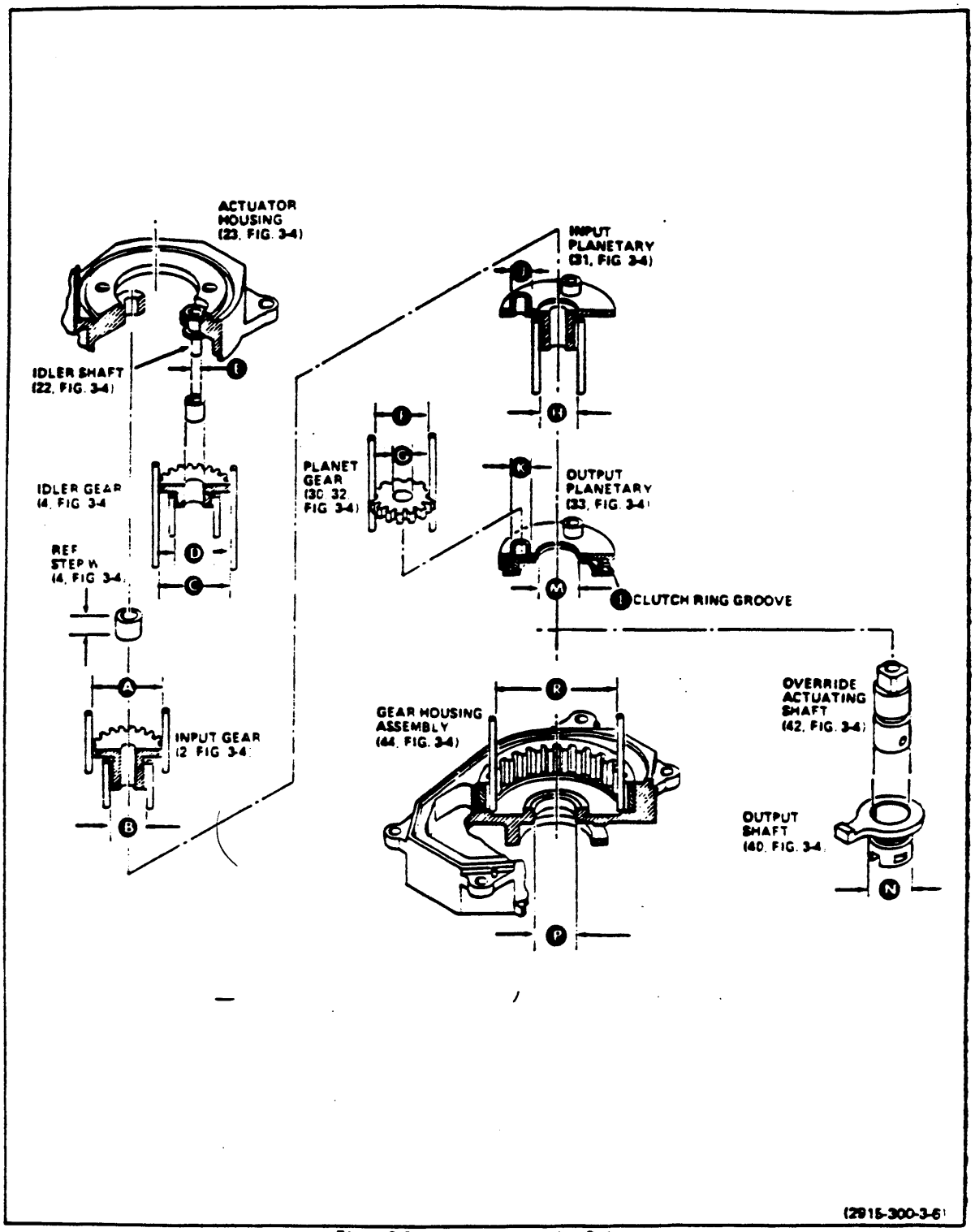
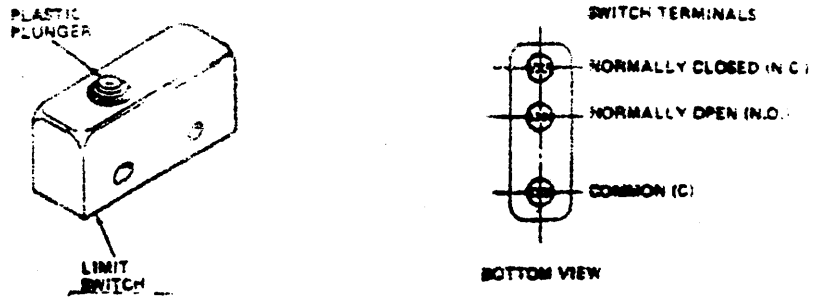


Figure 3-6. Actuator Inspection Points



CHECK RESISTANCE ACROSS ABOVE PINS		
PLUNGER STATUS	OPEN CIRCUIT (OVER 1 MEGOHM)	CLOSED CIRCUIT (LESS THAN 1 OHM)
NOT DEPRESSED	C – N.O	C – N.C
DEPRESSED	C – N.C	C – N.O

(2915-300-3-7)

Figure 3-7. Limit Switch Inspection Data

b. Using hand operated arbor press, press bearings (20, figure 3-5) onto shaft of armature assembly (22), with stem washer (21) in place on output shaft end of armature assembly. Select bearings to obtain a tight fit in bushing (25) and cap assembly (5). Bearings shall be press fit, with radial play of 0.0005 inch minimum to 0.0012 inch maximum.

c. Assemble armature assembly (22) and cap assembly (5) to motor housing assembly (24, 25, 26), without spacer washers (23). Push in on the end of the armature assembly and measure distance from end of armature assembly shaft

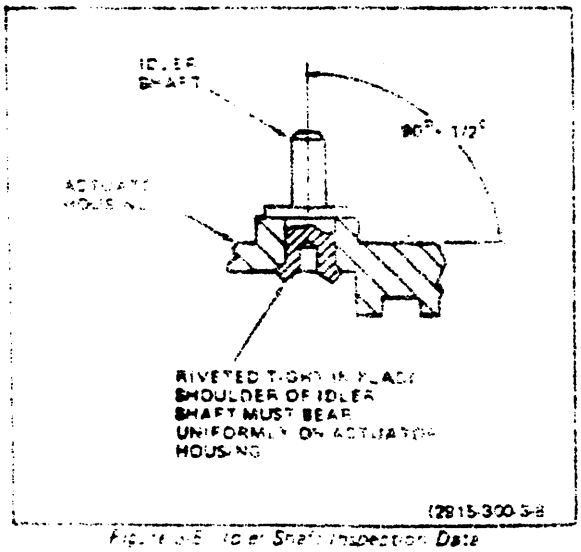


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Figure 3-8. Idler Shaft Inspection Data

to cap assembly lower land (see figure 3-10). Projecting shaft length shall be 0.397 +0.000, –0.015 inch. If shaft projection is insufficient, add spacer washers (23, figure 3-5) in housing assembly (24, 25, 26) between upper bearing (20) and housing assembly. If shaft projection is excessive, add spacer washers (7) in cap assembly (5) in position shown in figure 3-10. Spacer washers (7 and 23) are available in thicknesses of 0.003, 0.005, and 0.010 inch.

d. On Motor Assembly, Part No. 106785C100, solder (item 7, table 2-2) lead wire of jumper assembly (19) to brush holder plate assembly (13) corresponding to negative (–) marking on motor housing (26). See figure 3-9.

e. Install brush terminal assemblies (18) and brush springs (17) in brush guide on brush holder plate assembly (13). Secure with brackets (16), screws (14), and lock washers (15). Torque screws to 4 to 6 pound-inches. Bend the end of each brush terminal assembly over the head of each screw.

f. Using suggested motor assembly tool (refer to table 2-3), assemble field assembly (12), brush holder plate assembly (components 13 through 18), and spacers (11) into motor housing assembly (24, 25, 26), observing the following:

1. Insert motor assembly tool through field assembly (12).

2. Pull electrical lead wires through holes in brush holder plate assembly (13). Connect electrical lead wires shown in figure 3-10. Use solder (item 7, table 2-2) to connect wires to brush holder plate assembly (13).

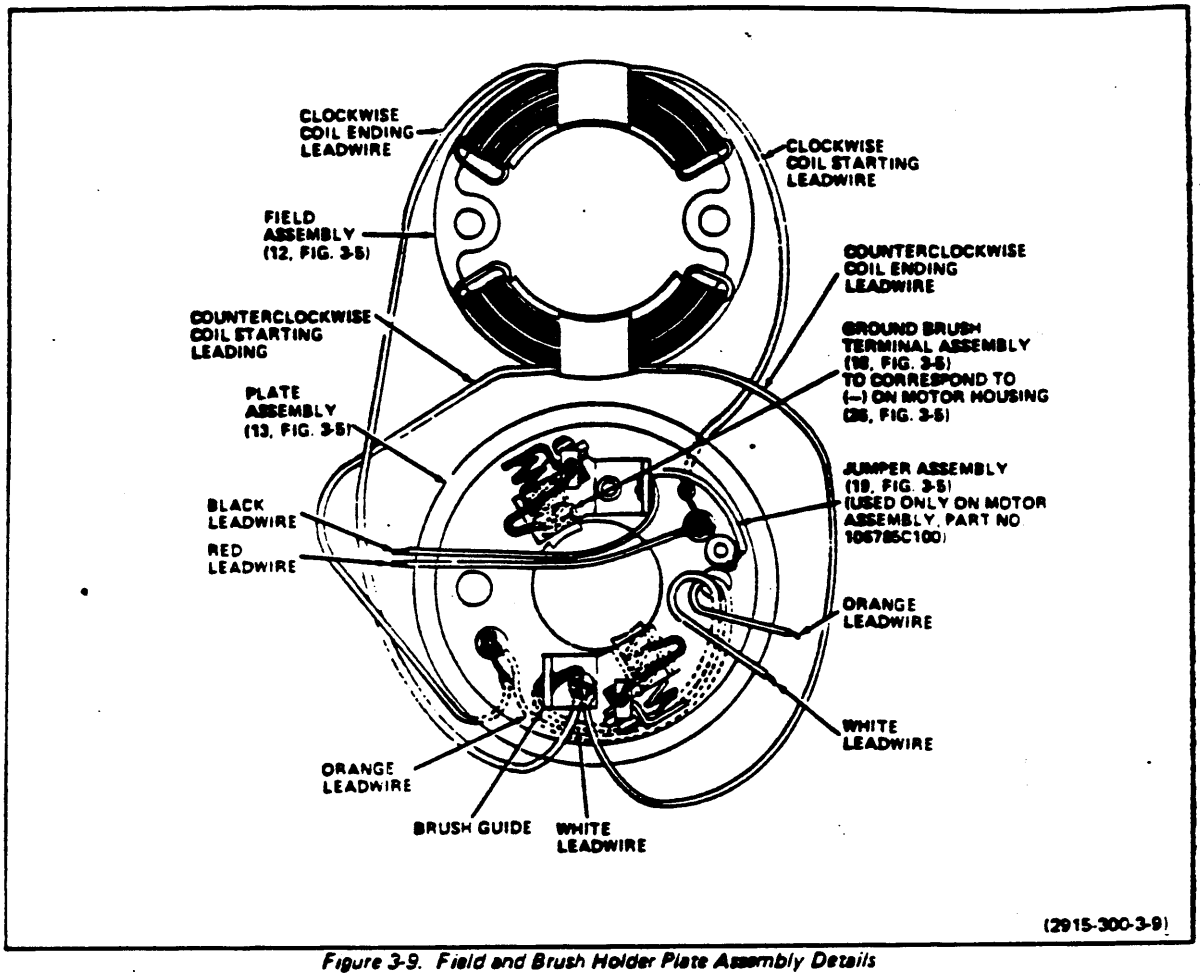

Figure 3-9. Field and Brush Holder Plate Assembly Details

3. Install spacers (11, figure 3-5) and terminal lug of jumper assembly (19) (used only on Motor Assembly, Part No. 106785C100) on rods of motor assembly tool. Insert motor assembly tool rods through holes in brush holder plate assembly (13) for studs (24) in motor housing (26).

4. Pull brush holder plate assembly (components 13 through 18) up against spacers (11) and field assembly (12). Make sure none of the lead wires are caught between the spacers (11), field assembly (12), or brush holder plate assemblies (13).

5. Pull electrical lead wires just under the outside diameter of brush holder plate assembly (13).

6. Position ends of motor assembly tool rods against the studs (24) in motor housing (26) so that negative bracket (16) (with black wire) is adjacent to the (—) mark near the port on the side of the motor housing.

7. Slide the assembly group down off the rods of the motor assembly tool and onto studs (24) of motor housing (26, figure 3-5). Jiggle the assembly as necessary to work the assembly group into the motor housing. Make sure that the electrical lead wires are not obstructing insertion, and that they are not trapped between field assembly (12), spacers (11), or brush holder plate assembly (13).

8. Install nuts (10) finger tight. Then, tighten each nut, alternately, only to a snug fit. Finally, tighten both nuts 1/4 to 1/2 turn only.

g. Wipe packings (3) clean and dry; use no lubricants.

h. With motor assembly complete as described in preceding steps, less belleville springs (8), proceed as follows:

1. Push on the end of the shaft of armature assembly (22), and measure protrusion of shaft from cap assembly (5). Pull on the shaft of the armature assembly, and repeat the measurement. Subtract the smaller dimension from the larger, and record the difference.

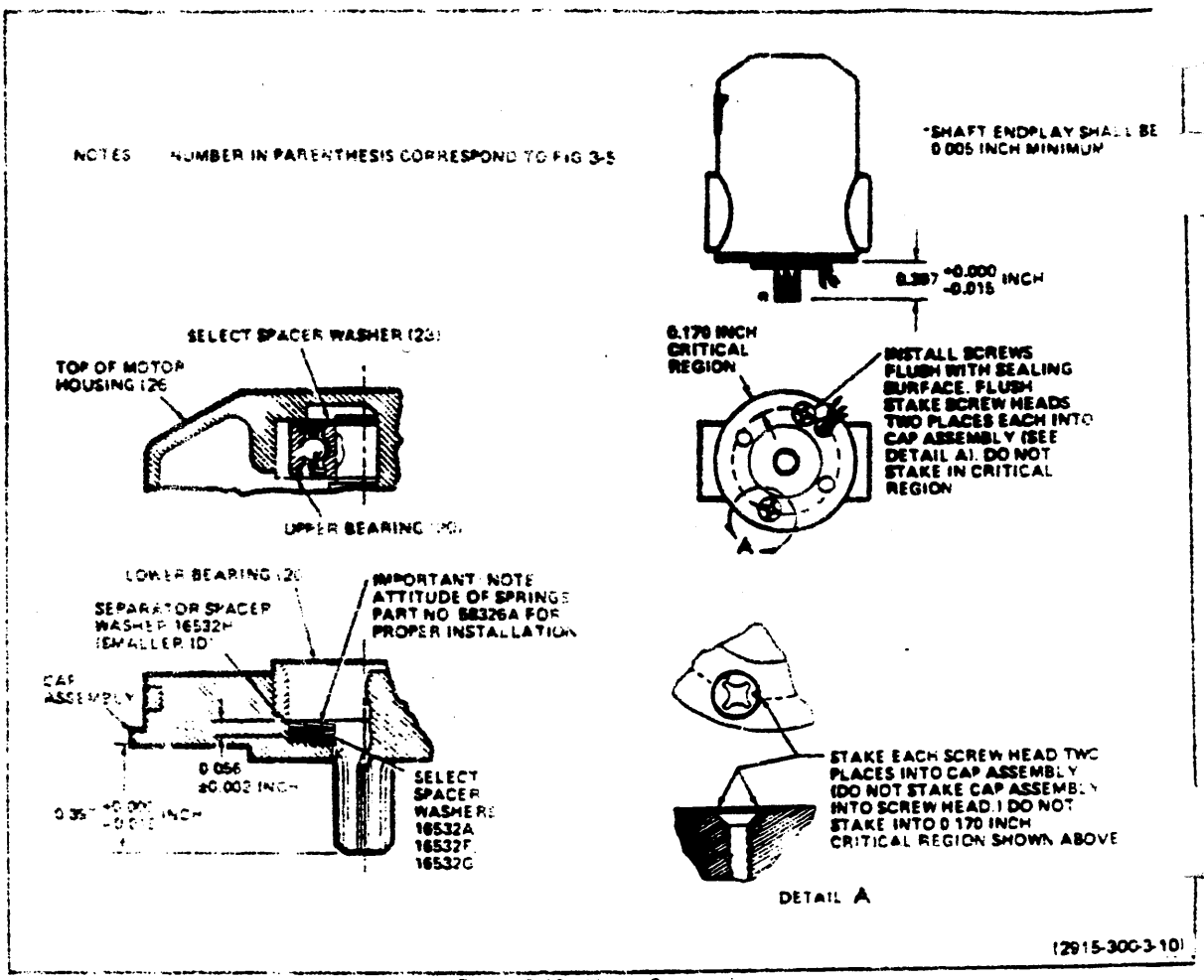

Figure 3-10. Motor Crossection

2. Subtract 0.036 inch from difference dimension computed in preceding step 1. The result is the thickness of spacer washer (7, figure 3-5) needed. (These spacer washers are in addition to any added in step c of this paragraph.) After selection, measure the thickness of the selected spacer washer stack to make sure that the actual thickness is relatively exact (within ±0.002 inch). It may be necessary to select spacer washers until the proper total stack thickness is obtained.

3. Reassemble motor with spacer washers (7), belleville springs (8), and spacer washer (9). Install belleville springs, which are saucer-shaped, back-to-back (major outside diameters away from each other), with inside diameters of belleville springs separated by spacer washer (9). This arrangement exerts full pressure against the lower bearing (20) outside race.

4. Using compression and tension tester, apply a pulling load on the end of the shaft of the armature assembly (22, figure 3-5). The load required to move the shaft shall be 6 to 11 pounds. This is the force applied by the belleville springs (8). If the load is not within the specified range, add or delete spacer washers (7) as required to obtain the specified load. A spacer washer increase or decrease in thickness of 0.001 inch should increase or decrease, respectively, the armature assembly shaft load by approximately 1 pound. (Not a linear function. The 0.001 inch per pound is approximate only.)

i. Check the end play of armature assembly (22) shaft; shall be 0.005 inch minimum. If insufficient, reduce the thickness of spacer washers (23) without reducing shaft protrusion below 0.382 inch. (Refer to step c of this paragraph.)

j. Check that shaft of armature assembly (22) is concentric to end boss of cap assembly (5) within 0.005 total-indicator-reading. If out-of-round, replace bearing (20) and/or armature assembly (22).

k. Repeat step h4 as necessary to obtain specified 6 to 11 pound shaft load.

l. Torque screws (4, figure 3-5) to 4 to 6 pound-inches. Flush stake screws in two places. (Exercise care not to stake in the critical 0.170-inch sealing surface shown in figure 3-10.)

m. Seat new brush terminal assemblies (18, figure 3-5):

1. Use DC power supply, apply 16 to 17 volts dc across red (positive) and black (negative) electrical lead wires from motor for 5 minutes.

2. Repeat for 5 minutes with voltage applied across orange (positive) and black (negative) lead wires.

3. Repeat substeps 1 and 2 until a total of 30 minutes run-in time has been accumulated.

3-41. ASSEMBLY OF ACTUATOR ASSEMBLY. Assemble actuator assembly as follows (see figure 3-4):

CAUTION

Use grease specified in step a sparingly; excessive grease may cause critically slow operation at low temperatures.

a. Lubricate teeth of gears (2, 4, 30, and 32) on each part of gear train, bearing surfaces of planetaries (31, 33), and ring gear in gear housing assembly (44) with a light film of Aero Lubriplate Grease (item 9, table 2-2).

CAUTION

Do not permit any grease around solder terminals on connector (8, figure 3-4), switch plate assembly (16), or in switch compartment of actuator housing (23).

b. Apply a heavy coat of No. 930AA Grease (item 10, table 2-2) in clutch ring groove in bottom of output planetary (33) before installing clutch ring (34). Apply additional grease on the side of clutch ring after installation. (See figure 3-11.)

c. Ensure that actuator housing (23) and gear housing assembly (44) are positioned uniformly against seal plate (27) when partially reassembled (without interior components of actuator in place). Parts shall mate without distortion or uneveness that might prevent sealing between actuator housing and gear housing assembly. Replace either or both of the housings if distortion prevents sealing.

d. On Part No. 106788A101 and 102842MB, install packing (43) on override actuating shaft (42). Insert override actuating shaft into output shaft (40).

e. Install packing (41) on output shaft (40).

f. Insert output shaft (40) through bore in gear housing assembly (44).

g. On Part No. 106788A101 and 106788B100, select flat washers (39) so as to provide 0.005 inch maximum end

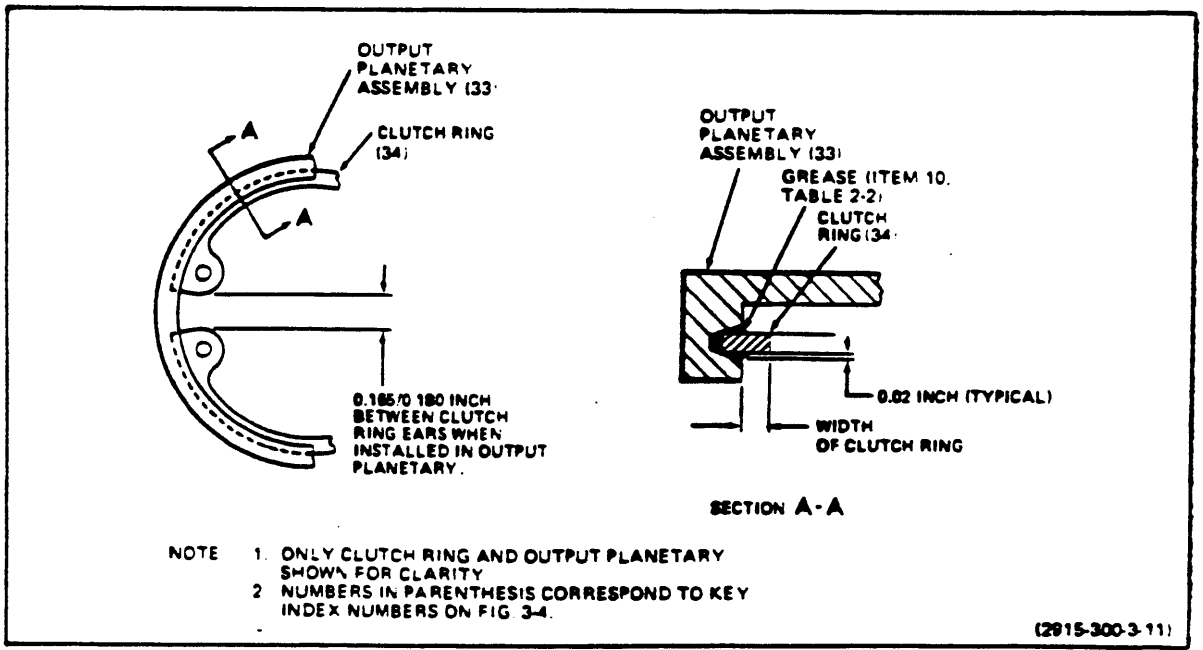

Figure 3-11. Clutch Ring Installation

play of override output shaft (40, figure 3-4) without binding. Turning override or position indicator arm (38) over provides some additional adjustment as well as selection of flat washers. On Part No. 102842MB, use one washer (39). The override or indicator arm shall turn freely without binding against the gear housing assembly (44) after adjustment of end play. Install override or indicator arm on output shaft with pin (37) installed through arm and output shaft. Diameter over ends of pin after installation shall not exceed 0.880 inch. No end play of pin is allowable. On Part No. 102842MB secure with pin lock (36).

h. Install stop ring (35) in gear housing assembly (44) over output shaft (40).

i. Insert clutch ring (34) in groove of output planetary assembly (33). Dimension between ears of clutch ring shall be 0.160 to 0.175 inch. (See figure 3-11.) Select clutch ring as required to obtain the specified dimension. The groove in the output planetary assembly for the clutch ring is tapered. The thicker the clutch ring, the closer the ears are together.

j. Lower output planetary assembly (33) into gear housing assembly (44) over stop ring (35). Install three planet gears (32) on posts of the output planetary assembly. Install three pin bearings (29, figure 3-4) over planet gears and in small holes in posts of output planetary assembly.

k. Install input planetary assembly (31) in gear housing assembly (44). Install three planet gears (30) on posts of input planetary assembly, and install three pin bearings (29) over planet gears and into small holes in posts of input planetary assembly.

l. Measure distance between top of bearing pin (29) on posts of input planetary assembly (31) and upper land surface of gear housing assembly (44). (See figure 3-12.) During measurement hold output shaft (40) against the top of a work bench, and apply downward pressure on the gear train assembly to take out all excess clearance. Distance between the top bearing pin (29) and the gear housing assembly upper land shall be 0.005 to 0.015 inch to prevent binding of the gear train against the plate seal (27). If the required clearance is not present, lightly tap internal components in the gear housing assembly to settle the gear train components. If stack of parts is still too high, replace individual parts as necessary to decrease the overall thickness of the gear train until specified clearance is obtained.

m. Insert switch arm assembly (26) through plate seal (27), and rotate 90 degrees. Then, insert the lower end of

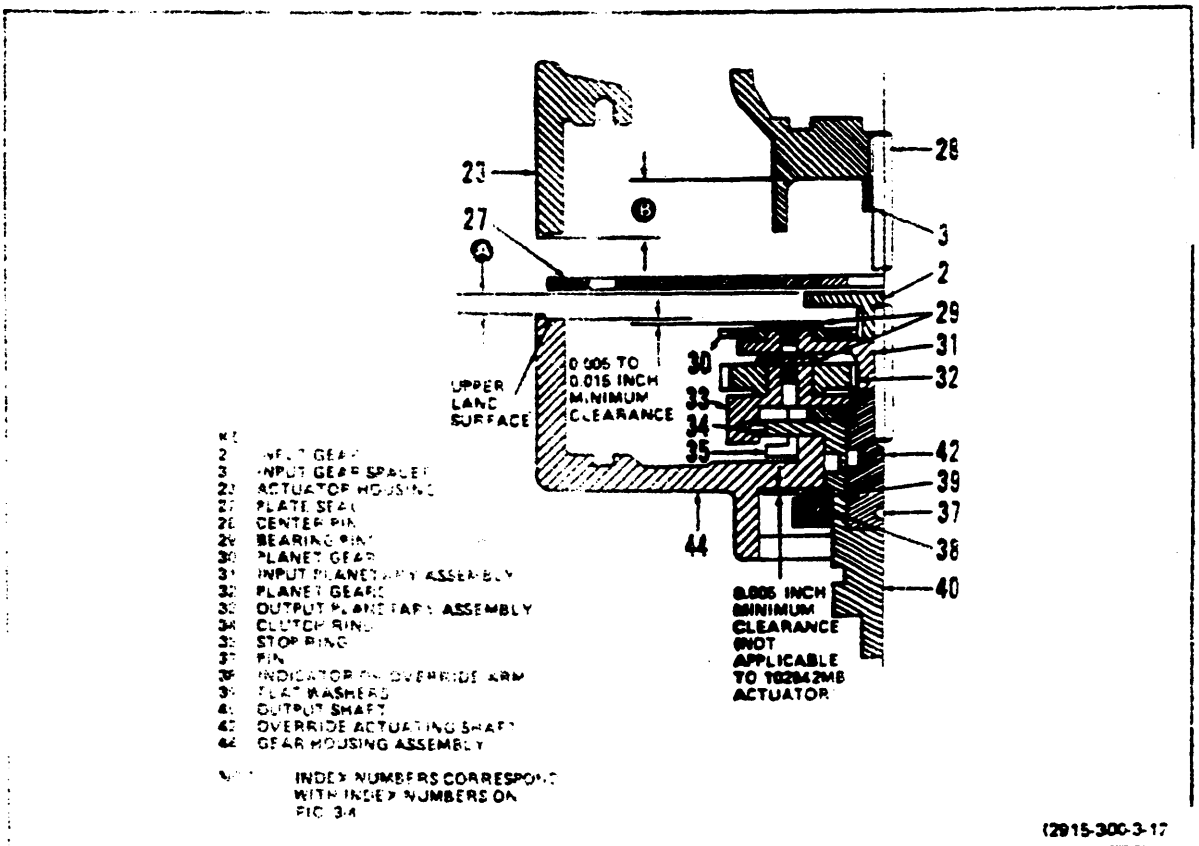

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Figure 3-12. Actuator Assembly Crossection

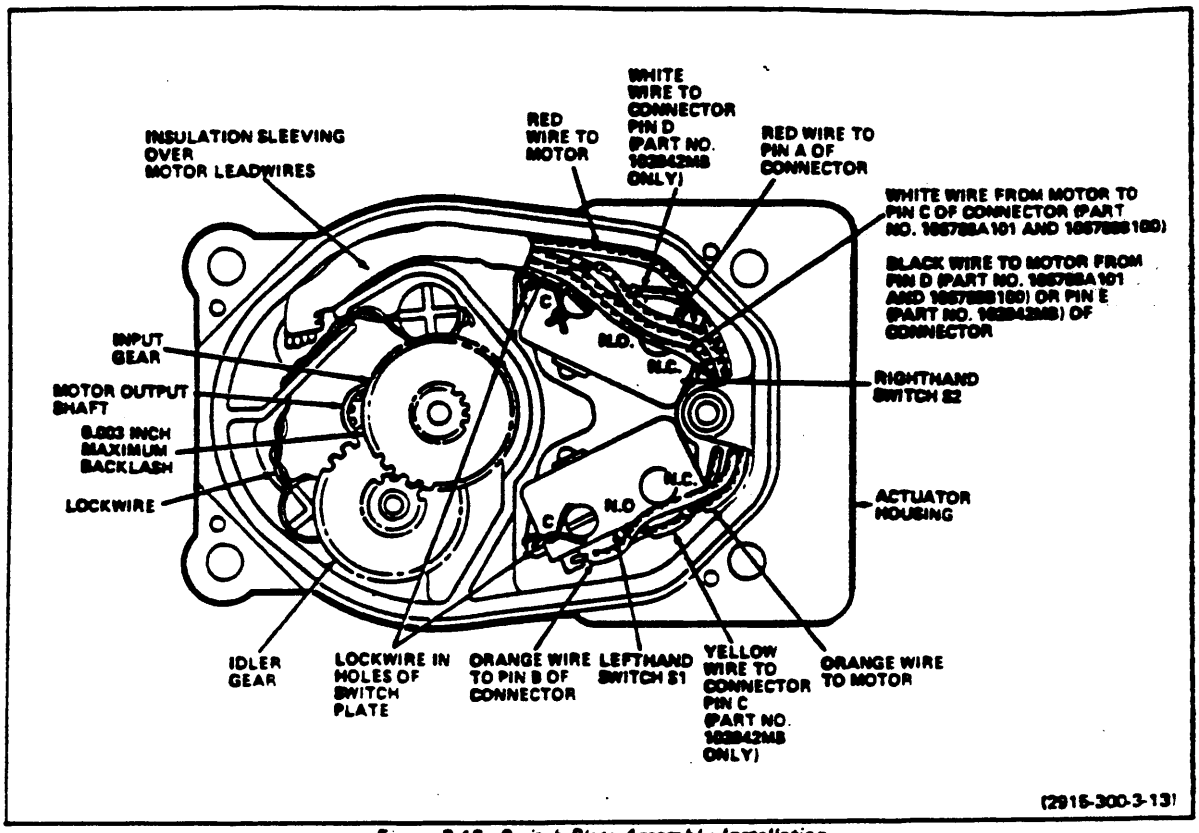

Figure 3-13. Switch Plate Assembly Installation

the switch arm assembly into the opening in the gear housing assembly (44, figure 3-4). Locate switch arm assembly so it will be contacted by the arm on output shaft (40) at the extreme limits of actuator rotation. Insert switch arm pin (25) through pivot holes in switch arm assembly and into boss in bottom of gear housing assembly (44) that acts as the lower bearing point for the pin. Place switch lever spring (24) on top of pin.

n. Insert center pin (28) through plate seal (27), through center holes in the input and output planetary assemblies (31, 33), and into pivot hole in the top center of the output shaft (40). Set this assembly group aside, and proceed with assembly of the housing assembly (components 2 through 23) as follows.

o. Place packing (20) on actuator housing (23). Thread lead wires from motor assembly (19) through wire passage in actuator housing. Install insulation tubing (21) over motor lead wires. (See figure 3-13.) Assemble motor to actuator housing with two screws (17, figure 3-4) and clips (18). Tighten screws to 16 to 22 pound-inches torque, and install lockwire (item 11, table 2-2).

p. Connect orange and red lead wires from motor assembly (19) to N.C. contacts on switch plate assembly (16). (See figure 3-13.) Check for presence of white and yellow wires (if used) on contacts of limit switches. Replace if missing.

q. Install lockwire (item 11, table 2-2) through the two holes in switch plate assembly (16, figure 3-4) for use after screws (15) are installed. (See figure 3-13.) Install switch plate assembly in actuator housing (23, figure 3-4). Secure with two screws (15). Make sure that the insulator tabs on the outside of the switch plate assembly are positioned between the limit switch terminals and the actuator housing. Tighten screws to 2.2 to 2.7 inch-pounds torque, and lockwire with lockwire installed in limit switch plate holes.

r. On Part No. 102842MB, install adaptor gasket (14) and connector adaptor (13) on actuator housing (23) with four screws (12). Torque screws to 4 to 6 pound-inches, and install lockwire (item 11, table 2-2). Place connector gasket (11) on top of connector adaptor.

s. On Part No. 106788A101 and 106788B100, install packing (10) on actuator housing (23).

t. Install one piece of insulation tubing (9) over each of the lead wires from the motor and switch plate assembly. Solder (item 5, table 2-2) the electrical lead wires to the

proper terminals of the connector (8, figure 3-4). (See figure 1-2 or 1-3.) Slide tubing up over soldered connections on terminals of connector and wrap with 1/4-inch wide tape (item 12, table 2-2).

u. Position the index key on the electrical connector (8, figure 3-4) adjacent to the motor assembly (19) and attach electrical connector to actuator housing (23) or connector adaptor (13) with four screws (6) and one lockwire clip (7) positioned as shown in figure 3-4. Torque screws to 4 to 6 pound-inches, and install lockwire (item 11, table 2-2). The lockwire clip is for use when lockwiring the external plug to the connector. The lockwire clip is not for use in lockwiring the four screws (6).

v. Select idler gear (4) as necessary to obtain 0.001 inch minimum to 0.003 inch maximum backlash with the shaft of motor assembly (19). (See figure 3-13.)

w. If the input gear (2, figure 3-4) or any part of the gear train was replaced during overhaul, select correct thickness input gear spacer as follows:

1. Measure distance from top of gear housing assembly (44) to surface of input gear (2) that will contact the spacer. (See Dimension A, figure 3-12.)

2. Measure distance from bottom of actuator housing (23, figure 3-4) to surface that will contact spacer. (See Dimension B, figure 3-12.)

3. Subtract Dimension A from Dimension B, and record as Dimension C.

4. Subtract 0.013 ±0.003 inch plus output shaft end play (0.005 inch maximum) from Dimension C. This is the required thickness of input gear spacer (3, figure 3-4).

5. Install selected input gear spacer (3) on top of input gear (2) on center pin (28).

x. Position actuator housing (23) on gear housing assembly (44) with all assembled components in place. Install four screws (6), finger tight only.

y. Hold actuator with output shaft (40) down and apply operating voltage across pins A (positive) and E (Part No. 102842MB1 or D (Part No. 10C788A101 or 10C788B100) of the electrical connector (8) to operate actuator in the clockwise direction. Apply operating voltage across pins B (positive) and E or D (see above) to operate in the counterclockwise direction. The motor shall automatically stop at the end of travel in each direction so as to provide 89 to 95 degrees rotation of the actuator output shaft. Repeat this check with the actuator held so as to have the output shaft pointing up. Tap actuator lightly to settle parts. If the actuator produces more than 95 degrees of output shaft rotation, repair or replace the switch plate assembly (16), and/or replace the stop ring (35). After any component repair or replacement, repeat rotational check.

z. Tighten four screws (1, figure 3-4) to 16 to 22 pound-inches torque, and install lockwire (item 13, table 2-2).

3-42. ASSEMBLY OF VALVES, PART NO. AV16B1294D, AV16B1296D, AND AV16B1700B. Assemble as follows (see figure 3-1 or 3-3):

a. Apply a light film of grease (item 8, table 2-2) to port retainers (1), packings (2, 9, 18), seal ring shells (3), seal rings (4), and slide (12) to facilitate reassembly.

b. On Part No. AV16B1700B, replace any removed inserts (23) 3/4 to 1-1/2 turns below the surface of valve body (22).

c. Install two packings (18) on each thermal relief valve assembly (17, 19). Install the two line thermal relief valve assemblies (17) in valve body (22), and secure with one retaining ring (16) per relief valve. On Part No. AV16B1700B, install body thermal relief valve (19) in valve body (22) with one retaining ring (16). On Part No. AV16B1294D and AV16B1296D, install the body thermal relief valve (19) in the valve body (22) with a screwdriver. Torque body thermal relief valve to 16 to 18 pound-inches, and install lockwire (item 11, table 2-2) between head of body thermal relief valve and valve body.

d. Install packing (15) on output shaft of actuator assembly (14). Operate actuator to CLOSED position with override arm or electrically by applying 27 ±1 volts dc across pins B (positive) and D (negative).

e. Insert slide (12) with needle bearing assembly (11) into valve body (22). Make sure roller of needle bearing assembly is engaged in slot of slide. Extend slide fully in valve body so that it covers the ports of the valve (valve closed).

f. Lower actuator assembly (14) onto the valve body (22), and engage the output shaft of the actuator with the slot in the needle bearing assembly (11). Secure with the clip (10). The long end of the clip should pass through the arm of the needle bearing assembly and the output shaft of the actuator. The short end of the clip should snap into place in the other hole of the needle bearing assembly arm.

g. Secure actuator assembly (14) to valve body (22) with four screws (13). Torque screws to 10 to 13 pound-inches, and install lockwire (item 13, table 2-2) on the four screws.

h. Install packing (9) on end cap (8), and install end cap in valve body (22). Secure with two retaining pins (7). Install lockwire (item 11, table 2-2) on retaining pins.

i. Install one belleville spring (6), flat washer (5), seal ring (4), and seal ring shell (3) in each port retainer (1). Install two packings (2) on each port retainer (1).

j. With slide (12) fully extended to valve closed position (per step e), install port retainers (1) in each of the two

ports of the valve body (22, figure 3-1 or 3-3). Place protective covers (item 14, table 2-2) over ports and tape (item 15, table 2-2) to hold port retainers in valve body.

k. Prepare an overhaul data plate (refer to paragraph 1-22) and install around actuator assembly (14) of valve.

3-43. ASSEMBLY OF VALVE, PART NO. AV16B1667D. Assemble as follows (see figure 3-2):

a. Apply a light film of grease (item 8, table 2-2) to port retainers (1, 2), packings (3, 4, 11, 20, 22), seal ring shells (5), seal rings (6), and slide (14) to facilitate reassembly.

b. Install two packings (20) on each line thermal relief valve assembly (19).

c. Install two packings (22) on body thermal relief valve assembly (21).

d. Install the two line thermal relief valve assemblies (19) in valve body (25), and secure with one retaining ring (18) per relief valve. Install the body thermal relief valve (21) in the valve body with a screwdriver. Torque body thermal relief valve to 16 to 18 pound-inches, and install lockwire (item 11, table 2-2) between head of body thermal relief valve and valve body.

e. Install packing (17) on output shaft of actuator assembly (16). Operate actuator to CLOSED position with override arm or electrically by applying 27 ±1 volts dc across pins B (positive) and E (negative).

f. Insert slide (14) with needle bearing assembly (13) into valve body (25). Make sure roller or needle bearing assembly is engaged in slot of slide. Extend slide fully into valve body so that it covers the ports of the valve (valve closed).

g. Lower actuator assembly (16) onto the valve body (25). Engage the output shaft of the actuator with the slot in the needle bearing assembly (13). Secure with clip (12). The long end of the clip should pass through the arm of the needle bearing assembly and the output shaft of the actuator. Snap short end of the clip into place in the other hole of the needle bearing assembly arm.

h. Secure actuator assembly (16) to valve body (25) with four screws (15). Torque screws to 10 to 13 pound-inches. Install lockwire (item 11, table 2-2) on the four screws.

i. Install packing (11) on end cap (10), and install end cap in valve body (25). Secure with two retaining pins (9). Install lockwire (item 11, table 2-2) on retaining pins.

j. Install one belleville spring (8), flat washer (7), seal ring (6), and seal ring shell (7) in each port retainer (1, 2). Install one packing (3) and one packing (4) on port retainer (1). Install two packings (3) on port retainer (2). See figure 3-2 for position of packings (3, 4) on retainers (1, 2).

k. Install port retainers (1, 2, figure 3-2) in the two ports of the valve body (25), with slide (14) fully extended to valve closed position (per step f). Place protective covers (item 14, table 2-2) over ports and tape (item 15, table 2-2) to hold port retainers in valve body.

l. Prepare an overhaul data plate (refer to paragraph 1-22) and intall around actuator assembly (16) of valve.

3-44. TESTING

3-45. The motor assembly shall be tested prior to installation on the actuator assembly. The actuator assembly test shall be tested prior to installation on the valve. If troubles are encountered refer to tables 3-2 and 3-3.

3-46. MOTOR ASSEMBLY TESTS. Test the motor assembly as follows:

a. Dielectric Strength and Insulation Resistance Tests.

NOTE

Motor Assembly, Part No. 106785C100, has an internal ground. Perform the dielectric strength test with the terminal lug of the jumper assembly (19, figure 3-5) disconnected from stud (24) of motor housing (26).

1. Apply 1000 volts rms at 60 Hz for 1 second across all lead wires (connected together) and the motor housing. There shall be no flashover or breakdown of the motor electrical insulation.

2. On motor assembly, Part No. 102650U100, apply 500 volts dc across all lead wires (connected together) and the motor housing. Insulation resistance shall be 10 megohms minimum.

b. Load Test.

CAUTION

Do not exceed an operating time of over 8 seconds of continuous operation in either direction of rotation. Longer times may cause the motor to overheat.

1. Apply 26 ±1 volts dc across the red (positive) and black (negative) lead wires. The motor shall rotate in a clockwise rotation (as viewed from the output shaft) at 20,900 rpm minimum (Part No. 102650U100), or 19,500 rpm minimum (Part No. 106785C100), and the current drain shall not exceed 2.3 amperes (Part No. 102650U100), or 2.4 amperes (Part No. 106785C100).

2. Repeat step 1 except with voltage applied across the orange (positive) and black (negative) lead wires. Results shall be the same, except that the motor shall rotate in a counterclockwise direction.

Table 3-2. Motor Troubleshooting Data

TROUBLE	PROBABLE CAUSE (See figure 3-5)	REMEDY (See figure 3-5)
Dielectric failure or low insulation	Defective field assembly (12) or armature assembly (22).	Replace defective component
Motor does not operate in either direction	Brush terminal assembly (18) binding in brush guides.	Free assembly.
	Black lead wire from field assembly (12) broken.	Replace wire or field assembly (12)
Motor does not operate in one direction (operates in other direction)	Defective field assembly (12) field coil.	Replace field assembly (12).
	Broken orange or red lead wire to field assembly (12).	Replace wire or field assembly (12) (Red wire, CW; Orange wire, CCW).
Excessive current drain	Bearings (20) over-greased.	Replace bearings
	Brush terminal assembly (18) binding in brush guides.	Free assembly
	Armature assembly (22) binding in field assembly (12)	Free assembly, or replace damaged components. Check clearance per para 3-35, step a
	Brushes binding.	Replace brush terminal assembly (18) and run-in per para 3-40, step m. Make sure bearings (20) are not turning on press-fit surfaces

c. Locked Rotor Current.

CAUTION

Do not hold motor output shaft in the locked position for the following test more than 5 seconds. Longer periods may damage motor.

(1) Hold motor output shaft to prevent rotation, and apply 26 ± 1 volts dc across red (positive) and black (negative) lead wires; current drain shall not exceed 6 amperes.

(2) Repeat step (1), except with voltage applied across orange (positive) and black (negative) lead wires.

3-47. ACTUATOR ASSEMBLY TESTS. Test the actuator assembly as follows:

a. Run-In Operation.

(1) Connect actuator to dc power supply (see figure 3-14 or 3-15) and dc power supply at 27 ± 1 volts dc.

(2) Position TEST SWITCH to CW until FULL CW light illuminates, then position TEST SWITCH to CCW until FULL CCW light illuminates.

(3) Repeat step (2) for 200 complete CW-CCW cycles; cycle rate shall be such that the motor housing temperature does not exceed +82.2°C (+180°F). There shall be no binding or hesitation.

b. Actuator Housing Pressure Test.

(1) Apply 15 psig dry filtered air pressure through a No. 10 micron filter to motor brush port; there shall be no external leakage (see figure 3-16).

(2) A fixture for this test may be made by using a spare brush port cap (2, figure 3-5). Drill a hole through the brush port cap, and solder a fitting on the brush port cap to receive the air pressure source. Attach air pressure source to the brush port cap, and install in normal manner in motor housing brush port. After completion of test, remove test brush port cap, and replace with original brush port cap (2), packing (3), and retaining ring (1).

c. Power and Time of Operation.

(1) Set dc power supply (see figure 3-14 or 3-15) at 27 ±1 volts dc.

(2) Operate actuator through five complete cycles; running current shall not exceed 2.0 amperes, and tim

Table 3-3. Actuator Assembly Troubleshooting Data

TROUBLE	PROBABLE CAUSE (See figure 3-4)	REMEDY (See figure 3-4)
Actuator does not operate in either direction	Black wire from connector disconnected or broken.	Repair as necessary (see figure 1-2, 1-3, and 3-13).
	Motor defective.	(Refer to table 3-2.)
Actuator operates in clockwise direction only	One of orange wires disconnected or broken.	Repair as necessary (see figure 1-2, 1-3, and 3-13).
	Defective RH limit switch.	Replace switch plate assembly (16).
	Defective motor.	(Refer to table 3-2.)
Actuator operates in counter-clockwise direction only	One of red wires disconnected or broken.	Repair as necessary (see figure 1-2, 1-3, and 3-13).
	Defective LH limit switch.	Replace switch plate assembly (16).
	Defective motor.	(Refer to table 3-2.)
Actuator does not stop automatically at end of 89 to 95 degree rotation of output shaft	Defective limit switch. (RH stops CCW travel; LH stops CW travel).	Replace switch plate assembly (16).
	Defective stop ring (35).	Replace stop ring (35).
	Defective switch arm assembly (26).	Replace switch arm assembly (26).
Leakage during actuator housing pressure test	Loose actuator housing mounting screws (1); or loose motor mounting screws (17).	Torque screws to 16 to 22 pound-inches.
	Defective packing (9, 20, 41) on motor, connector, or shaft; defective plate seal (27) between actuator housing (23) and gear housing assembly (44).	Replace defective components.
Excessive current drain, slow operation, low stall torque; failure of intermittent operation test; excessive manual override force required	Defective motor.	(Refer to table 3-2.)
	Excessive lubrication.	Refer to paragraph 3-41, steps a and b.
	Worn gears (binding).	Replace any worn parts of gear train.

operation shall be 1.0 second maximum and 0.5 second minimum.

d. Low Voltage Operation.

1. Set dc power supply (see figure 3-14 or 3-15) at 18 volts dc.

2. Cycle valve two or three times; stall torque shall be 75 inch-pounds minimum (measure with torque wrench on output shaft), and time of operation shall be 2.0 seconds maximum.

e. Stall Torque (Part No. 102842MB only).

1. Set dc power supply (see figure 3-14) at 24 ±1 volts dc.

2. Output torque shall be 55 pound-inches minimum.

f. Shaft Rotation.

1. Operate actuator through five full clockwise-counterclockwise cycles.

2. Check that output shaft travels 89 to 95 degrees, from stop-to-stop.

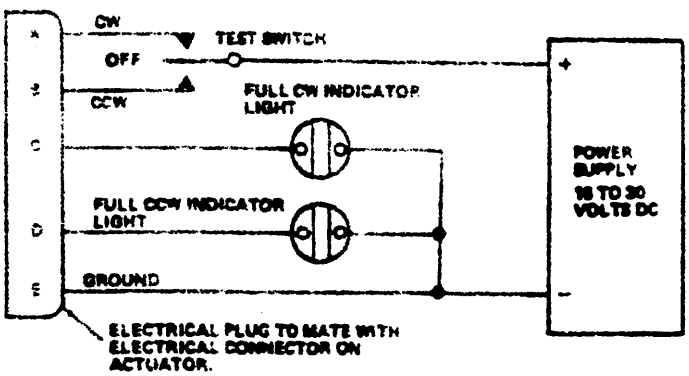

Figure 3-14. Actuator, Part No. 102842MB – Electrical Test Setup

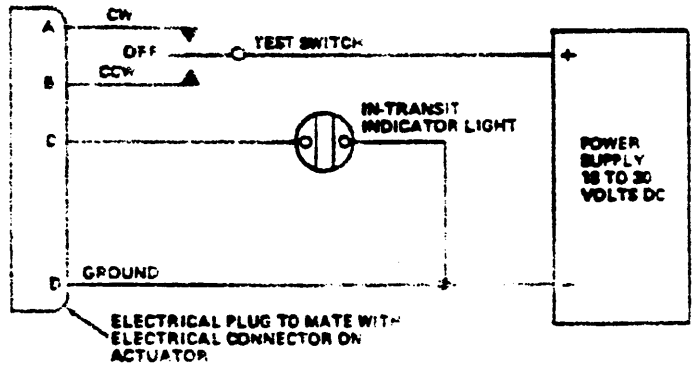

Figure 3-15. Actuator, Part No. 106788A101 and 106788B100 – Electrical Test Setup

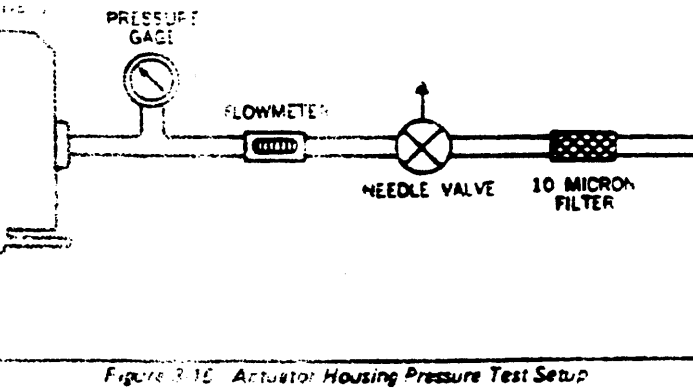

Figure 3-16. Actuator Housing Pressure Test Setup

g. Manual Override (Part No. 106788A101 and 102842-MB only).

1. Operate actuator full clockwise and counterclockwise with manual override arm. Actuator shall operate smoothly.

2. Measure (with spring scale) force necessary to operate actuator with manual override arm. Load required shall not exceed 10 pounds (Part No. 106788A101), or 31 pound-inches (Part No. 102842MB).

h. Dielectric Strength and Insulation Resistance Tests (Part No. 102842MB only).

1. Apply 600 volts rms at commercial frequency between mutually connected pins A, B, and E of the actuator electrical connector and the motor housing for 10 seconds.

2. There shall be no arc-over or sudden fluctuation of voltage. Leakage current shall not exceed 0.2 milliampere.

3-48. PAINTING, REFINISHING, AND MARKING

3-49. None required.

3-50. LUBRICATION

3-51. There are no lubrication orders applicable to the equipment covered in this manual. The assembled selector valve requires no lubrication. Lubrication instructions applicable during assembly of the parts and subassemblies of the valve are provided at the point in the detail work requirements where such lubrication is required.

Section IV. FINAL ASSEMBLY

3-52. ASSEMBLY

3-53. Assemble the actuator and valve as instructed in paragraph 3-42 and 3-43.

3-54. INSPECTION

3-55. The final assembled valve shall be inspected prior to, during, and after testing (refer to paragraph 3-56) for obvious defects in operation, workmanship, or other details for which there are no specific test requirements listed.

3-56. TESTING

3-57. The following tests shall be conducted under the ambient conditions existing in the test area. The test fluid shall be solvent (item 4, table 2-2), or equivalent.

3-58. Connect valve into test setups such as shown in figures 3-17 and 3-18 or 3-19. Use port adaptors (refer to table 2-3) to connect test fluid pressure source to ports of valve under test. Set dc power supply at 27 ±1 volts dc unless otherwise specified during the following tests.

3-59. PROOF PRESSURE TEST

a. Connect air pressure source to one port of valve. Block the opposite port.

b. Raise air pressure to 188 psig. Submerge valve body (but do not submerge actuator assembly) in water. There shall be no external leakage (air bubbles).

c. Reduce air pressure to 60 psig. There shall be no external leakage.

d. Remove valve from water. Reduce air pressure to zero. Wipe exterior of valve clean and dry.

3-60. CYCLE TEST

a. With no pressure applied to valve, cycle OPEN-CLOSE-OPEN 25 times with TEST SWITCH.

b. There shall be no hesitation or obvious malfunctions of the valve.

3-61. OPERATION TEST

a. With valve connected into a test setup as shown in figure 3-17, raise fluid pressure to 60 psig.

b. With power supply set at 27 ±1 volts dc, operate valve through five OPEN-CLOSE-OPEN cycles with TEST SWITCH (see figure 3-18 and 3-19). The valve shall operate from OPEN to CLOSE, and from CLOSE to OPEN within 0.5 to 1 second. Running current shall not exceed 2.0 amperes. Starting current shall not exceed 5 ampere.

c. Repeat step b, except with power supply set at 18 and then 30 volts dc. The same requirements shall be met.

3-62. INTERNAL LEAKAGE TEST

a. Connect valve as shown in figure 3-17.

b. Operate valve CLOSED with TEST SWITCH (see figure 3-18 or 3-19).

c. Raise test fluid pressure to 4 inches of mercury. After a 1-minute seating period internal leakage shall not exceed 0.5 cubic centimeters per minute.

d. Repeat step c at 25 and 60 psig. The same requirements shall be met.

e. Repeat steps a through d, except with test fluid pressure source connected to opposite port of valve. The same requirements shall be met.

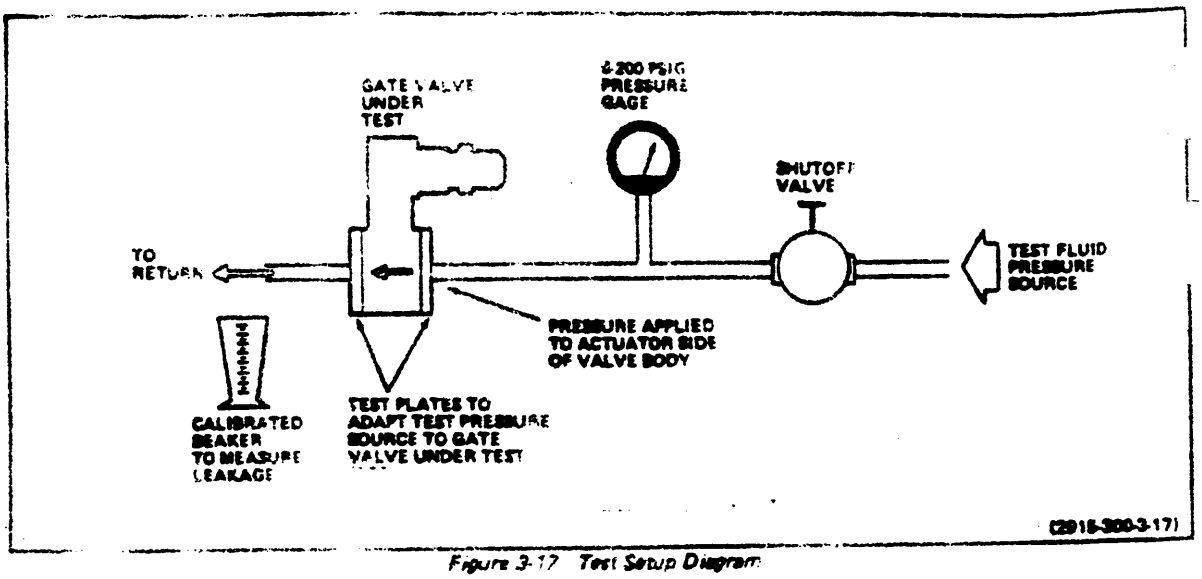

Figure 3-17. Test Setup Diagram

3-63. [illegible] THERMAL RELIEF VALVE TEST

a. Connect valve as shown in figure 3-17.

b. Position valve CLOSED with TEST SWITCH (see figure 3-18 or 3-19).

c. Apply increasing test fluid pressure to valve to 95 psig maximum. Flow from valve shall exceed 1 cubic centimeter per minute.

d. Reduce test fluid pressure to 65 psig minimum. Leakage shall drop to less than 0.5 cubic centimeters per minute.

e. Repeat steps a through d except with test fluid pressure source connected to opposite port. The same requirements shall be met.

NOTE

The tests in paragraph 3-64 need not be performed if there is adequate evidence of them having been performed on the subassemblies (refer to step a, paragraph 3-46, and step h, paragraph 3-47).

3-64. DIELECTRIC STRENGTH AND INSULATION RESISTANCE TESTS (Part No. AV16B1667D only).

a. Connect all pins of the electrical connector together and apply 600 volts at 60 Hz between the connected and the actuator housing for 10 seconds maximum. There shall be no arc-over or sudden fluctuation of voltage. Leakage current shall not exceed 2 milliamperes.

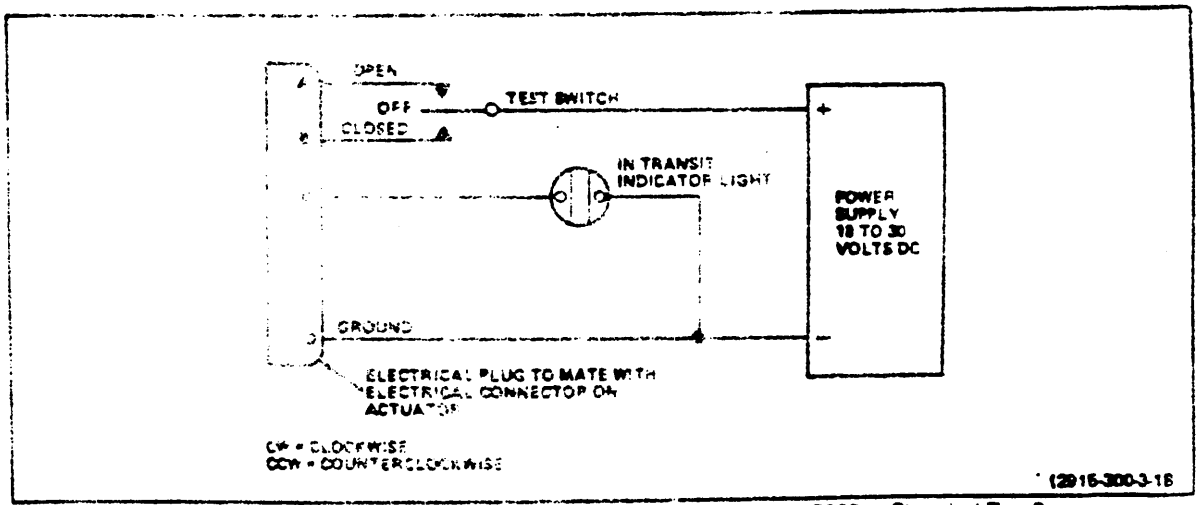

Figure 3-18. Valve, Part No. AV16B1294D, AV16B1296D, and AV16B1700B – Electrical Test Setup

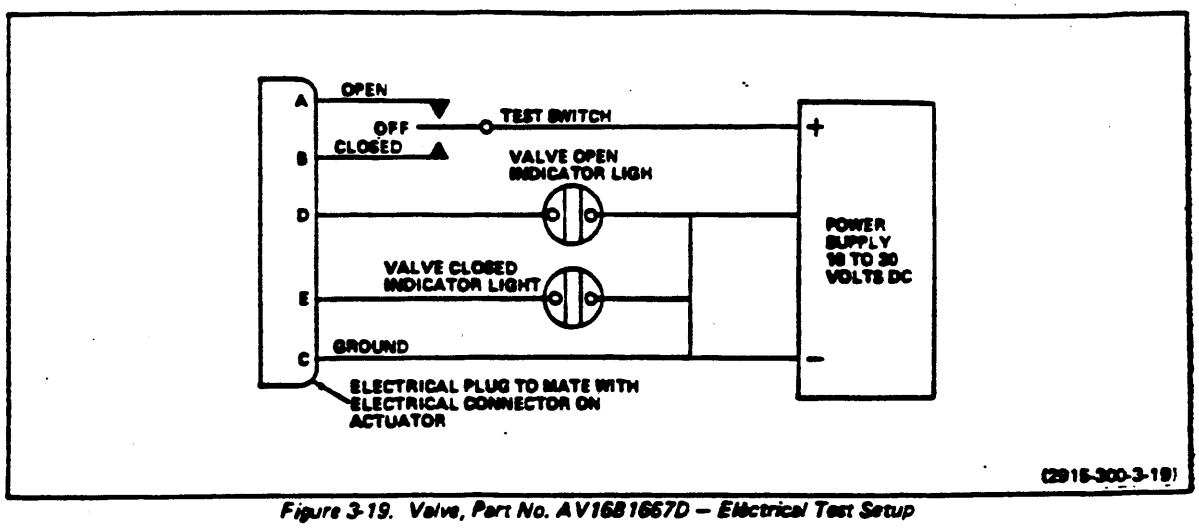

Figure 3-19. Valve, Part No. AV16B1667D – Electrical Test Setup

b. Apply 500 volts dc across the above connected connector pins and the actuator housing. Insulation resistance shall be not less than 100 megohms.

3-65. MANUAL OVERRIDE TEST (Part No. AV16B1667D and AV16B1296D only).

a. With no test fluid pressure applied to valve, and electrical power removed from actuator, operate valve through five complete OPEN-CLOSE-OPEN cycles. The valve operation shall be smooth, with no binding or catching.

b. Force required at manual override arm in step a shall not exceed 18 pounds (AV16B1667D) or 31 pound-inches (AV16B1296D).

3-66. SHELF-LIFE ITEMS. All packings used in the motor assembly, actuator assembly, and final assembly of the valve have a 36 month shelf life.

3-67. PAINTING, REFINISHING, AND MARKING

3-68. There are no painting or refinishing requirements applicable to the valve. Marking of the identification plate or overhaul plate is described in Chapter 1, paragraph 1-22. If the flow arrow on the side of the valve body has deteriorated, it should be touched up with black permanent ink (item 16, table 2-2) and protected with a coating of clear lacquer (item 17, table 2-2).

3-69. FINAL INSPECTION

3-70. Test as instructed in paragraph 3-56 through 3-64.

3-71. CALIBRATION

3-72. Not applicable.

Table 3-4. Selector Valve Troubleshooting Data

TROUBLE	PROBABLE CAUSE	REMEDY
External leakage at shaft seal	Defective packing on actuator output shaft.	Replace defective packing (15, fig. 3-1 or 3-3; 17, fig. 3-2)
External leakage at end cap	Defective packing	Replace defective packing (9, fig. 3-1 or 3-3; 11, fig. 3-2).
Valve binds or hesitates during operation	Defective actuator.	Refer to table 3-3.
	Defective slide	Check slide (12, fig. 3-1 or 3-3; 14, fig. 3-2) or needle bearing assembly (11, fig. 3-1 or 3-3; 13, fig. 3-2) not binding in valve body; check seal rings (4, fig. 3-1 or 3-3; 6, fig. 3-2) not defective Replace defective parts.
Excessive internal leakage	Defective seal rings.	Replace defective seal rings (3, fig. 3-1 or 3-3; 5, fig. 3-2). Check seal ring shells and belleville springs for damage.
	Defective slide	Check slide (12, fig. 3-1 or 3-3; 14, fig. 3-2) operating to full OPEN and CLOSED positions. Replace slide if defective.
	Actuator defective, and not operating ball to full extreme positions	Refer to table 3-3
Failure of dielectric strength or insulation resistance tests	Defective actuator or motor.	Refer to tables 3-2 and 3-3
Running current excessive and or running time excessive	Slide sticking	Check for freedom of movement. Replace defective components
	Defective actuator.	Refer to table 3-3.
Line thermal relief valve leaks internally, cycles or fails to relieve	Defective line thermal relief valve.	Replace.

CHAPTER 4

PACKAGING

4-1 Components will be preserved, packed, and marked in accordance with the Delivery Order/Contract, Depot Maintenance interservice Support Agreement (DMISA), Statement of Work (SOW), Memorandum of Agreement or other authorized document, and the accompanying AMSAV Form 6525 (J).

4-2 Organic Depot shall contact ATCOM Packaging and transportability Branch, HQ ATCOM, AMSAT-I-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120 for preservation and packaging requirements.

4-3 For further information, contact ATCOM Packaging and transportability Branch, HQ ATCOM, AMSAT-I-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120. All contracts or inquiries shall be through the Contracting Officer (KO).

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-45607B 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 NOTE Normal burnishing from operational service is not detrimental if coverage approximates the carrying load and if there is no evidence of burns.	Excessive heat
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
Fatique 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

Table 5-1. Inspection Definitions (continued)

TERM	DEFINITION	PROBABLE CAUSE
Off-square or mis-alignment 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
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 overloading, 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

Appendix A – References

Technical Manuals

DA PAM 738-751	Functional Users Manual for the Army Maintenance Management System Aviation (TAMMS-A)

Military Specifications

MIL-A-8625	Coatings, Anodic
MIL-B-121	Bags
MIL-C-5541	Coatings, Iridite
MIL-C-7769	Containers
MIL-C-45662	Calibration System Requirements
MIL-D-3464	Desiccant
MIL-D-6055	Dunnage
MIL-D-6055	Dunnage
MIL-G-23827B	Grease
MIL-I-6866	Fluorescent Penetrant Inspection
MIL-I-6868	Magnetic Particle Inspection
MIL-I-15126A	Tape, Insulation
MIL-I-45208	Inspection System Requirements
MIL-I-45607	Inspection Equipment, Acquisition, Maintenance, and Disposition of
MIL-L-7808	Oil, Lubricating
MIL-L-15719	Grease
MIL-M-38784*	Technical Manual, General Requirements
MIL-N-6011	Nitrogen
MIL-P-116	Preservation
MIL-P-19644A	Packaging
MIL-P-26514	Packaging
MIL-Q-9858	Quality Program Requirements
MIL-S-7742	Screw Threads
MIL-V-1137	Varnish, Insulating

Federal Specifications

P-C-451	Abrasive Cloth, Aluminum Oxide
P-C-458	Abrasive Cloth, Crocus
P-D-680	Solvent, Cleaning
PPP-B-26	Bags, Plastic
QQ-S-571	Solder
TT-L-58	Lacquer
TT-I-558	Ink, Permanent

Military Standards

MIL-STD-109	Quality Assurance Terms & Definitions
MIL-STD-120	Gage, Inspection
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-794	Parts and Equipment
MS20995	Lockwire
MS24487	Union – Tube, Flared, Universal
MS33540	Safety Wiring and Cotter Pinning, General Practices for
MS33558C	Numerals and Letters, Aircraft Instruments Dial, Standard form of
MS33678	Connectors, Electrical

APPENDIX B
REPAIR PARTS AND SPECIAL TOOLS LIST
(Current as of 15 April 1975)

Section I. INTRODUCTION

B-1. Scope.

This appendix lists repair parts for operation and performance of depot maintenance of the aircraft gate valve, P/N AV16B1294D, P/N AV16B129 D, P/N AV16B1667D and P/N AV16B1700B.

B-2. General.

This Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of repair parts authorized for use in the performance of maintenance. Parts are listed in figure and item number sequence. Bulk materials are listed in NSN sequence.

b. Section III. Special Tools List. (Not applicable)

c. Section IV. National Stock Number and Part Number Index. A list, in ascending numerical sequence, of all National stock numbers appearing in the listings, followed by a list, in alphanumeric sequence, of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

B-3. Explanation of Columns.

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item Number.* The number used to identify each item called out in the illustration.

b. Source, Maintenance and Recoverability Codes (SMR)

(1) *Source Code.* Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

Code		*Definition*
PA	---	Item procured and stocked for anticipated or known usage.
PB	---	Item procured and stocked for insurance purpose because essentiality dictates that a minimum quantity be available in the supply systems.
PC	---	Item procured and stocked and which otherwise would be coded PA except that it is deteriorative in nature.
MD	---	Item to be manufactured or fabricated at the depot maintenance level.
XA	---	Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
XB	---	Item is not procured or stocked. If not available through salvage, requisition.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded XA, and aircraft support items as restricted by AR 700-42.

(2) *Maintenance Code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level

authorized to remove, replace and use the support item. The maintenance code entered in the third position will indicate the following level of maintenance.

Code	Application/Explanation
D	Support items that are removed, replaced, used at depot, mobile depot, specialized repair activity only.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code	Application/Explanation
D	The lowest maintenance level capable of complete repair of the support item is the depot level.
Z	Nonreparable. No repair is authorized.

(3) *Recoverability Code.* Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SMR Code format as follows:

Code	Definition
Z	Nonreparable item. When unserviceable, condemn and dispose at the level indicated in position 3.
D	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal not authorized below depot level.

c. National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements, to identify an item or range of items.

NOTE

When a stock numbered item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code listed in SB 708-42 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr, etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakdown shown on the illustration figure, which is prepared for a functional group, subfunctional group or an assembly. A "V" appearing in this column in lieu of a quantity indicates that no specific quantity is applicable (e.g., shims, spacers, etc.).

B-4. Special Information

a. Usable on codes are shown in the description column. Uncoded items are applicable to all models. Identification of the usable on codes used in this appendix are:

Code	Used On
A	P/N AV16B1294D
B	P/N AV16B1296D
C	P/N AV16B1667D
D	P/N AV16B1700E

b. Detailed manufacturing instructions for items source coded to be manufactured or fabricated are found in the narrative portion of this publication. Bulk materials required to manufacture items are listed in the Bulk Material Group of this appendix.

B-5. How to Locate Repair Parts.

a. When National Stock Number or Part Number is Unknown:

(1) *First.* Find the illustration covering the assembly to which the repair part belongs.

(2) *Second.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(3) *Third.* Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National Stock Number or Part Number is Known.

(1) *First.* Using the Index of National Stock Numbers and Part Numbers, find the pertinent National stock number or part number. This index is in ascending NSN sequence followed by a list of part numbers in ascending alphanumeric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* After finding the figure and item number, locate the figure and item number in the repair parts list.

B-6. Abbreviations. (Not applicable)

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
9-1			4810-00-776-2209	AV16B1200D	73760	VALVE,GATE,AIRCRAFT....B		
9-1			2915-00-776-2208	AV16B1200D	73760	VALVE,GATE,AIRCRAFT....B		
9-1			2915-00-091-3265	AV16B1067B	73760	VALVE,GATE,AIRCRAFT....C		
9-1			2915-00-526-0849	AV16B17005	73760	VALVE,GATE,AIRCRAFT....B		
						SECTION II. REPAIR PARTS LIST		
						AIRCRAFT GATE VALVE (P/N AV16B1200D & P/N AV16B1200D)		
3-1	1	PADZZ	4820-00-600-7721	155109	73760	RETAINER,VALVE PORT....A	EA	2
3-1	1	PADZZ	[illegible]	62188	73760	RETAINER,VALVE PORT....B	EA	2
3-1	2	PCDZZ	[illegible]-250-6235	[illegible]9513-215	96906	PACKING,PREFORMED....A	EA	4
3-1	2	PCDZZ	[illegible]-265-[illegible]	[illegible]9513-2[illegible]	96906	PACKING,PREFORMED....B	EA	4
3-1	3	PADZZ	[illegible]-373-7527	155068	73760	SHELL,SEAL DISC....A	EA	2
3-1	3	PADZZ	[illegible]-422-120[illegible]	156238	73760	SHELL,SEAL DISC....B	EA	2
3-1	4	PADZZ	[illegible]-824-4789	15078	73760	PACKING,PREFORMED....A	EA	2
3-1	4	PADZZ	[illegible]-180-900[illegible]	158073	73760	PACKING,PREFORMED....B	EA	2
3-1	5	PADZZ	[illegible]-00-090-[illegible]	155043	73760	SPACER,DISC....A	EA	2
3-1	5	PADZZ	[illegible]-00-530-[illegible]	155005	73760	SPACER,DISC....B	EA	2
3-1	6	PADZZ	[illegible]-816-5062	155035	73760	WASHER,SPRING TENSION....A	EA	2
3-1	6	PADZZ	[illegible]-619-7195	156220	73760	WASHER,SPRING TENSION....B	EA	2
3-1	7	PADZZ	5315-[illegible]-290-3704	155610	73760	PIN,STRAIGHT,HEADED....A,B	EA	2
3-1	8	PADZD	2915-00-373-7561	155958	73760	END CAP,VALVE....A	EA	1
3-1	8	PADZZ	2915-00-083-1315	158264C	73760	END CAP,VALVE....B	EA	1
3-1	9	PCDZZ	[illegible]-327-[illegible]	MA29513-[illegible]	96906	PACKING,PREFORMED....A	EA	1
3-1	9	PCDZZ	[illegible]-265-[illegible]	[illegible]	96906	PACKING,PREFORMED....B	EA	1
3-1	10	PADZZ	2915-[illegible]-373-754[illegible]	155081	73760	CLIP,ARM RETAINING....A,B	EA	1
3-1	11	PADZZ	2915-00-373-7592	1420555	73760	BEARING AND ARM ASSEMBLY....A	EA	1
3-1	11	PADZZ	[illegible]-562-52[illegible]	[illegible]	73760	BEARING AND ARM ASSEMBLY....B	EA	1
3-1	12	XDDZZ		[illegible]	73760	GATE,VALVE,GATE....A	EA	1
3-1	12	XDDZZ		155575	73760	GATE,VALVE,GATE....B	EA	1
3-1	13	PADZZ	[illegible]	[illegible]	73760	SCREW,MACHINE....A,B	EA	4
3-1	14	XADDZ		[illegible]	73760	ACTUATOR,ELECTRO-MECHANICAL; SEE FIG. 3-4 FOR BKDN....A,B	EA	1
3-1	15	PCDZZ	[illegible]-249-[illegible]	[illegible]	96906	PACKING,PREFORMED....A,B	EA	1
3-1	16	PADZZ	[illegible]-809-7735	[illegible]	96906	DISC,RETAINING....A,B	EA	2
3-1	17	PADZZ	[illegible]-562-2692	[illegible]	73760	VALVE SUBASSEMBLY,THERMAL RELIEF 110S....A,B	EA	2
3-1	18	PCDZZ	[illegible]-216-[illegible]	[illegible]9513-[illegible]	96906	PACKING,PREFORMED....A,B	EA	6
3-1	19	PADZZ	2915-[illegible]-661-8626	1034520	73760	VALVE SUBASSEMBLY,THERMAL RELIEF, 930S....A,B	EA	1
3-1	20	XDDZZ		155625	73760	PLATE,IDENTIFICATION....A,B	EA	1
3-1	21	PADZZ	9905-[illegible]-9961	[illegible]	96906	MARKER,IDENTIFICATION; MARKING ASSEMBLY DATE....A,B	EA	1
3-1	22	XBDLZ		10306881-07	73760	BODY,VALVE....A	EA	1
3-1	22	XBDLZ		[illegible]-05	73760	BODY,VALVE....B	EA	1

(1) ILLUSTRATION (a) FIG NO	(b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION / USABLE ON CODE		(7) U/M	(8) QTY INC IN UNIT
						AIRCRAFT GATE VALVE (P/N AV16B16670)			
-2	1	PADZZ	5330-00-400-3590	155104A	73760	RETAINER,VALVE PORT	C	EA	1
3-2	2	PADZZ	5330-00-400-3600	155105	73760	RETAINER,VALVE PORT	C	EA	1
3-2	3	PCDZZ	5330-00-250-0235	MS29513-215	96906	PACKING,PREFORMED	C	EA	1
3-2	4	PCDZZ	5330-00-250-0233	MS29513-214	96906	PACKING,PREFORMED	C	EA	1
3-2	5	PADZZ	2915-00-373-7537	155068	73760	SHELL,SEAL RING	C	EA	2
3-2	6	PADZZ	5330-00-824-4788	155087A	73760	PACKING,PREFORMED	C	EA	2
3-2	7	PADZZ	5340-00-496-6036	155048	73760	SPACER,RING	C	EA	2
3-2	8	PADZZ	5310-00-373-7536	155058	73760	WASHER,SPRING TENSION	C	EA	8
3-2	9	PADZZ	5315-00-163-6321	155615	73760	PIN,STRAIGHT,HEADED	C	EA	2
3-2	10	PADZZ	2995-00-373-7541	155118A	73760	END CAP,VALVE	C	EA	1
3-2	11	PCDZZ	5330-00-337-0593	MS29513-121	96906	PACKING,PREFORMED	C	EA	1
3-2	12	PADZZ	2915-00-373-7544	155491	73760	CLIP,ARM RETAINING	C	EA	1
3-2	13	XBDZZ		1028555	73760	BEARING AND ARM ASSEMBLY	C	EA	1
3-2	14	XBDZZ		155080C	73760	SLIDE,VALVE,GATE	C	EA	1
3-2	15	PADZZ	5305-00-531-1539	4996D	73760	SCREW,MACHINE	C	EA	4
3-2	16	XADDD		10284288	73760	ACTUATOR,ELECTRO-MECHANICAL: SEE FIG. 3-4 FOR BKDN	C	EA	1
	17	PCDZZ	5330-00-248-3831	MS29513-011	96906	PACKING,PREFORMED	C	EA	1
2	18	PADZZ	5365-00-804-9735	MS16625-1037	96906	RING,RETAINING	C	EA	2
3-2	19	PADZZ	4820-00-433-0657	10291388	73760	VALVE SUBASSEMBLY,THERMAL RELIEF: LINE	C	EA	2
3-2	20	PCDZZ	5330-00-248-3833	MS29513-008	96906	PACKING,PREFORMED	C	EA	4
3-2	21	PADZZ	4820-00-403-9540	10285286	73760	VALVE SUBASSEMBLY,THERMAL RELIEF: BODY	C	EA	1
3-2	22	PCDZZ	5330-00-248-3834	MS29513-009	96906	PACKING,PREFORMED	C	EA	2
3-2	23	XDDZZ		155628	73760	PLATE,IDENTIFICATION	C	EA	1
3-2	24	PADZZ	7690-00-112-8981	MS9244-01	96906	MARKER,IDENTIFICATION: RUBBER ASSEMBLY DATE	C	EA	1
3-2	25	XBDZZ		58170A83-03	73760	BODY,VALVE	C	EA	1
						AIRCRAFT GATE VALVE (P/N AV16B17000)			
3-3	1	PADZZ	2915-00-344-0039	155108	73760	RETAINER,VALVE PORT	D	EA	2
3-3	2	PCDZZ	5330-00-250-0235	MS29513-215	96906	PACKING,PREFORMED	D	EA	4
3-3	3	PADZZ	2915-00-373-7537	155068	73760	SHELL,SEAL RING	D	EA	2
3-3	4	PADZZ	5330-00-824-4788	155087A	73760	PACKING,PREFORMED	D	EA	2
3-3	5	PADZZ	5340-00-496-6036	155048	73760	SPACER,RING	D	EA	2
3-3	6	PADZZ	5310-00-016-8072	155050	73760	WASHER,SPRING TENSION	D	EA	2
	7	PADZZ	5315-00-298-3704	155610	73760	PIN,STRAIGHT,HEADED	D	EA	2
	8	PADZZ	2995-00-373-7541	155118A	73760	END CAP,VALVE	D	EA	1
3-3	9	PCDZZ	5330-00-337-0593	MS29513-121	96906	PACKING,PREFORMED	D	EA	1
3-3	10	PADZZ	2915-00-373-7544	155491	73760	CLIP,ARM RETAINING	D	EA	1
3-3	11	PADZZ	2915-00-373-7542	1028558	73760	BEARING AND ARM ASSEMBLY	D	EA	1
3-3	12	PADZZ	2915-00-373-7539	155088	73760	SLIDE,VALVE,GATE	D	EA	1

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION / USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
3-3	13	PAOZZ	5305-00-[illegible]	[illegible]	73760	SCREW,MACHINE .... D	EA	4
3-3	14	XAD00		[illegible]	73760	ACTUATOR,ELECTRO-MECHANICAL: SEE FIG. 3-4 FOR BKDN .... D	EA	1
3-3	15	PCOZZ	5330-00-[illegible]	MS29513-[illegible]	96906	PACKING,PREFORMED .... D	EA	1
3-3	16	PAOZZ	5365-00-[illegible]	MS16625-[illegible]	96906	RING,RETAINING .... D	EA	3
3-3	17	PAOZZ	2915-00-[illegible]	[illegible]	73760	VALVE SUBASSEMBLY,THERMAL RELIEF: LINE .... D	EA	2
3-3	18	PCOZZ	5330-00-[illegible]	MS29513-[illegible]	96906	PACKING,PREFORMED .... D	EA	4
3-3	19	PAOZZ	2915-00-[illegible]	[illegible]	73760	VALVE SUBASSEMBLY,THERMAL RELIEF: BODY .... D	EA	1
3-3	20	XDOZZ		[illegible]	73760	PLATE,IDENTIFICATION .... D	EA	1
3-3	21	PAOZZ	[illegible]	[illegible]	96906	MARKER,IDENTIFICATION: HOSES ASSEMBLY SETS .... D	EA	1
3-3	22	XAOZZ		[illegible]	73760	BODY,VALVE .... D	EA	1
3-3	23	PAOZZ	[illegible]	MS21209F[illegible]-15	96906	INSERT,SCREW THREAD .... D	EA	8
						ACTUATOR ASSEMBLIES		
3-4		XADDZ		[illegible]	73760	ACTUATOR,ELECTRO-MECHANICAL .... A,B	EA	1
3-4		XADDZ		[illegible]	73760	ACTUATOR,ELECTRO-MECHANICAL C	EA	1
3-4		XADDZ		[illegible]	73760	ACTUATOR,ELECTRO-MECHANICAL .... D	EA	1
3-4	1	PAOZZ	[illegible]	[illegible]	73760	.SCREW,MACHINE	EA	4
3-4		XADDZ		[illegible]	73760	.ACTUATOR HOUSING ASSEMBLY .... A,B,D	EA	1
3-4		XADDZ		[illegible]	73760	.ACTUATOR HOUSING ASSEMBLY C	EA	1
3-4	2	PADZZ	[illegible]	[illegible]	73760	..GEAR,SPUR	EA	1
3-4	3	XDOZZ		[illegible]	73760	..SPACER,SLEEVE: [illegible] IN.THK	EA	1
3-4	3	PADZZ	[illegible]	[illegible]	73760	..SPACER,SLEEVE: [illegible] IN.THK	EA	1
3-4	3	PADZZ	[illegible]	[illegible]	73760	..SPACER,SLEEVE: [illegible] IN.THK	EA	1
3-4	3	PADZZ	[illegible]	[illegible]	73760	..SPACER,SLEEVE: [illegible] IN.THK	EA	1
3-4	3	XDOZZ		[illegible]	73760	..SPACER,SLEEVE: [illegible] IN.THK	EA	1
3-4	4	PADZZ	[illegible]	[illegible]	73760	..GEAR CLUSTER [illegible]	EA	1
3-4	4	PADZZ	[illegible]	[illegible]	73760	..GEAR CLUSTER,SPUR: [illegible] IN.UNDERSIZE	EA	1
3-4	4	PADZZ	[illegible]	[illegible]	73760	..GEAR CLUSTER,SPUR: [illegible] IN.UNDERSIZE	EA	1
3-4	4	PADZZ	[illegible]	[illegible]	73760	..GEAR CLUSTER,SPUR: [illegible] IN.UNDERSIZE	EA	1
3-4	4	PADZZ	[illegible]	[illegible]	73760	..GEAR CLUSTER,SPUR: [illegible] IN.UNDERSIZE	EA	1
3-4	5	PAOZZ	[illegible]	[illegible]	73760	..BEARING,SLEEVE: [illegible]	EA	1
3-4	6	PAOZZ	5305-[illegible]	[illegible]	96906	..SCREW,MACHINE	EA	4
3-4	7	PAOZZ	[illegible]	[illegible]	73760	..TERMINAL,LUG: LOCKING	EA	1
3-4	8	PAOZZ	[illegible]	[illegible]	96906	..CONNECTOR,RECEPTACLE,ELECTRICAL .... A,B,D	EA	1
3-4	8	PAOZZ	[illegible]	[illegible]	96906	..CONNECTOR,RECEPTACLE,ELECTRICAL C	EA	1
3-4	10	PCOZZ	5330-00-[illegible]	MS29513-[illegible]	96906	..PACKING,PREFORMED .... A,B,D	EA	1
3-4	11	PAOZZ	5330-00-[illegible]	[illegible]	73760	..GASKET: CONNECTOR KIT C	EA	1
3-4	12	PAOZZ	5305-00-[illegible]	[illegible]	96906	..SCREW,MACHINE C	EA	4
3-4	13	PAOZZ	2915-00-[illegible]	[illegible]	73760	..ADAPTER,ELECTRICAL CONNECTOR C	EA	1
3-4	14	PAOZZ	5330-00-[illegible]	[illegible]	73760	..GASKET: ADAPTER KIT C	EA	1
3-4	15	PAOZZ	5305-00-[illegible]	[illegible]	96906	..SCREW,MACHINE	EA	2
3-4	16	PAOZZ	2915-00-[illegible]	[illegible]	73760	..SWITCH ASSEMBLY,ACTUATOR .... A,B,D	EA	1

(1) ILLUSTRATION (a) FIG NO	(1) (b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UOM	(8) QTY INC IN UNIT
	16	PAZZZ	5930-00-111-1963	10266318	73760	..SWITCH ASSEMBLY,ACTUATOR.....C	EA	1
	17	PAZZZ	5305-00-614-3623	MS35265-43	96906	..SCREW,MACHINE.....	EA	2
-4	18	PAZZZ	2915-00-992-6867	187268	73760	..CLIP.....	EA	1
3-4	19	XAZZZ		10678DC100	73760	..BOTTOM,DIRECT CURRENT: SEE FIG. 3-5 FOR ITEMS.....A,B,D	EA	1
3-4	19	XAZZZ		10265DC100	73760	..BOTTOM,DIRECT CURRENT: SEE FIG. 3-5 FOR ITEMS.....C	EA	1
3-4	20	PCZZZ	5330-00-001-2150	MS29513-026	96906	..PACKING,PREFORMED.....	EA	1
3-4	22	PAZZZ	1680-00-273-7695	97708	73760	..SHAFT,SHOULDERED.....	EA	1
3-4	23	XAZZZ		9778CA	73760	..HOUSING,ACTUATOR.....A,B,D	EA	1
3-4	23	XAZZZ		9778CB	73760	..HOUSING,ACTUATOR.....C	EA	1
3-4	24	PAZZZ	5360-00-247-0015	52428	73760	.SPRING,HELICAL,COMPRESSION.....	EA	1
3-4	25	PAZZZ	5315-00-663-0520	97028	73760	.PIN,STRAIGHT,HEADLESS.....	EA	1
3-4	26	PAZZZ	2915-00-205-0894	106611A	73760	.LEVER ASSEMBLY,SWITCH.....A,B,D	EA	1
3-4	26	XAZZZ		10266998	73760	.LEVER ASSEMBLY,SWITCH.....C	EA	1 -
3-4	27	PAZZZ	1680-00-245-0438	10265G1	73760	.SEAL AND PLATE,VALVE.....	EA	1 -
3-4	28	PAZZZ	5315-00-663-0518	13610A	73760	.PIN,STRAIGHT,HEADLESS: CENTER.....	EA	1
3-4	29	PAZZZ	5315-00-273-7843	155431	73760	.PIN,STRAIGHT,HEADED: HEADING.....	EA	6
3-4	30	PAZZZ	3020-00-273-7625	67010	73760	.GEAR,SPUR.....	EA	3 -
3-4	31	PAZZZ	2915-00-246-0336	97790	73760	.GEAR,PLANETARY,INPUT,ACTUATING.....	EA	1 -
	32	PAZZZ	3020-00-273-7626	67010	73760	.GEAR,SPUR.....	EA	3 -
	33	PAZZZ	2915-00-561-7287	156031	73760	.GEAR,PLANETARY,OUTPUT,ACTUATING.....	EA	1 -
-4	34	PAZZZ	5365-00-530-4892	16040BA	73760	.RING,RETAINING: 0.042/0.043 IN.THK,STD SIZE.....	EA	1 -
3-4	34	PAZZZ	5365-00-531-7700	16040BB	73760	.RING,RETAINING: 0.001 IN.THK OVERSIZE.....	EA	1 -
3-4	34	PAZZZ	5365-00-531-7699	16040BC	73760	.RING,RETAINING: 0.001 IN.THK OVERSIZE.....	EA	1
3-4	34	PAZZZ	5365-00-531-7697	16040BD	73760	.RING,RETAINING: 0.002 IN.THK OVERSIZE.....	EA	1 -
3-4	34	PAZZZ	5365-00-531-7701	16040BE	73760	.RING,RETAINING: 0.003 IN.THK OVERSIZE.....	EA	1
3-4	35	PAZZZ	2915-00-510-3029	156058	73760	.RING,STOP,ACTUATOR OVERRIDE.....A,B,C	EA	1 -
3-4	35	PAZZZ	2915-00-324-8272	156059	73760	.RING,STOP,ACTUATOR OVERRIDE.....D	EA	1 -
3-4	36	PAZZZ	1420-00-807-9388	193381	73760	.LOCK,ACTUATOR PIN.....C	EA	1
3-4	37	PAZZZ	5315-00-731-7487	156091	73760	.PIN,STRAIGHT.....A,B	EA	1
3-4	37	PAZZZ	5315-00-177-0957	156098	73760	.PIN,STRAIGHT.....C	EA	1 -
3-4	37	PAZZZ	5315-00-660-9401	156099	73760	.PIN,STRAIGHT.....D	EA	1 -
3-4	38	XAZZZ		161511	73760	.ARM,ACTUATOR,OVERRIDE.....A,B	EA	1
3-4	38	XAZZZ		161511AH	73760	.ARM,ACTUATOR,OVERRIDE.....C	EA	1
3-4	38	PAZZZ	5355-00-660-9399	156068	73760	.ARM,INDICATOR.....D	EA	1
3-4	39	PAZZZ	5310-00-639-5561	156078	73760	.WASHER,FLAT: 0.032/0.040 IN.THK.....	EA	1
3-4	39	PAZZZ	5340-00-666-1230	156079	73760	.SHIM: 0.007/0.009 IN.THK.....	EA	1
	39	PAZZZ	5310-00-666-6262	156077	73760	.WASHER,FLAT: 0.020/0.020 IN.THK.....	EA	1
	39	PAZZZ	5340-00-666-1233	156078L	73760	.SHIM: 0.004/0.004 IN.THK.....	EA	1
	39	PAZZZ	5365-00-666-7105	156087C	73760	.WASHER,FLAT: 0.012/0.008 IN.THK.....	EA	1
3-4	40	XAZZZ		9778C	73760	.SHAFT,ACTUATOR,OUTPUT.....A,B,C	EA	1
3-4	40	PAZZZ	2915-00-273-7693	97708	73760	.SHAFT,ACTUATOR,OUTPUT.....D	EA	1
-4	41	PCZZZ	5330-00-248-3836	MS29513-012	96906	.PACKING,PREFORMED.....	EA	1
3-4	42	PAZZZ	2915-00-511-4989	161698	73760	.SHAFT,ACTUATOR,OVERRIDE.....A,B,C	EA	1

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
3-4	43	PCOZZ	5330-00-368-7933	MS29513-044	96906	.PACKING,PREFORMED ....A,B,C	EA	1
3-4	44	XBOZZ		1020552	72760	.HOUSING ASSEMBLY,GEAR	EA	1
						ROTOR ASSEMBLIES		
3-5		XAOOD		1067560-104	72760	ROTOR,DIRECT CURRENT ....A,B,D	EA	1
3-5		XAOOD		1026507-104	72760	ROTOR,DIRECT CURRENT C	EA	1
3-5	1	PAOZZ	5365-00-[illegible]	MS16625-[illegible]	96906	.RING,RETAINING	EA	1
3-5	2	PAOZZ	5999-00-403-5200	165424	72760	.CAP,BRUSH POST	EA	2
3-5	3	PCOZZ	5330-00-[illegible]	MS9021-[illegible]	96906	.PACKING,PREFORMED	EA	1
3-5	4	PAOZZ	5305-00-[illegible]-5636	MS35190-[illegible]	96906	.SCREW,MACHINE	EA	2
3-5	5	PAOZZ	6105-00-[illegible]-757	1032058	72760	.CAP ASSEMBLY,ROTOR	EA	
3-5	6	PCOZZ	5330-00-[illegible]-2500	MS9021-[illegible]	96906	.PACKING,PREFORMED	EA	1
3-5	7	PAOZZ	5365-00-536-[illegible]	165324	72760	.SHIM; 0.005 IN.THK	EA	[illegible]
3-5	7	XBOZZ		165327	72760	.SHIM; 0.003 IN.THK	EA	[illegible]
3-5	7	PAOZZ	5365-00-[illegible]	165326	72760	.SHIM; 0.010 IN.THK	EA	[illegible]
3-5	8	PAOZZ	5310-00-[illegible]-2040	503261	72760	.WASHER,SPECIAL	EA	1
3-5	9	PAOZZ	5365-00-[illegible]-2754	165328	72760	.SHIM	EA	1
3-5	10	PAOZZ	5310-00-[illegible]	165303	72760	.NUT,PLAIN,ROTATOR	EA	2
3-5	11	PAOZZ	5365-00-[illegible]-5545	157152	72760	.SPACER,SLEEVE	EA	2
3-5		XAOOD		1032024	72760	.STATOR AND BRUSH HOLDER ASSEMBLY ....A,B,D	EA	1
3-5		XAOOD		1032036	72760	.STATOR AND BRUSH HOLDER ASSEMBLY C	EA	1
3-5	12	XBOZZ		1032011	72760	..STATOR,ROTOR	EA	1
3-5	13	PBOOD	[illegible]	1032044	72760	..HOLDER ASSEMBLY,ELECTRICAL CONTACT BRUSH	EA	1
3-5	14	PAOZZ	5305-00-[illegible]	MS35265-[illegible]	96906	...SCREW,MACHINE	EA	[illegible]
3-5	15	PAOZZ	5310-00-[illegible]	MS35333-[illegible]	96906	...WASHER,LOCK	EA	
3-5	16	PAOZZ	[illegible]	165360	72760	...BRACKET,BRUSH SPRING	EA	2
3-5	17	PAOZZ	[illegible]	[illegible]	72760	...SPRING,HELICAL,COMPRESSION	EA	
3-5	18	PAOZZ	[illegible]	[illegible]	72760	...BRUSH,ELECTRICAL CONTACT	EA	
3-5	19	PAOZZ	[illegible]	103207	72760	...LEAD,ELECTRICAL; BRUSH ....A,B,D	EA	
3-5	20	PAOZZ	[illegible]	7781[illegible]	03334	.BEARING,BALL,ANNULAR	EA	[illegible]
3-5	21	XBOZZ		59564	72760	.SPACER,RING	EA	
3-5	22	PAOZZ	[illegible]	103598	72760	.ARMATURE,MOTOR	EA	
3-5	23	PAOZZ	536[illegible]-00-538-[illegible]	165328	72760	.SHIM; 0.005 IN.THK	EA	
3-5	23	XBOZZ		165327	72760	.SHIM; 0.003 IN.THK	EA	
3-5	23	PAOZZ	[illegible]	165326	72760	.SHIM; 0.010 IN.THK	EA	
3-5		XBOOD		1032014	72760	.HOUSING,ELECTRICAL ROTATING EQUIPMENT	EA	
3-5	24	PAOZZ	[illegible]-8182	[illegible]	72760	..STUD,SHOULDERED	EA	2
3-5	25	XAOZZ		165413	72760	..BUSHING,SLEEVE	EA	1
3-5	26	XAOZZ		1039014	72760	..HOUSING,ROTOR	EA	1

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						BULK MATERIAL		
BULK		PAOZZ	5340-00-837-0408	MS35178-14	96906	CAP,PROTECTIVE,DUST AND MOISTURE SEAL:........................ PLASTIC, 5/8 0.063 IN. OD TUBE	EA	V
BULK		PAOZZ	8310-00-141-7295			CARDBOARD: GRAY,36 IN.W,0.04 IN.LG,0.065 IN.THK,................ SHEET,50 SHEETS PER PKG,MIL-C-83207,TYPE II	EA	V
BULK		PAOZZ	9535-00-074-2732			METAL SHEET: ALUMINUM ALLOY,36 IN.W,96 IN.LG,................ 0.07 IN.THK,FED QQ-A-250-1	EA	V

SECTION III. SPECIAL TOOLS LIST

(NOT APPLICABLE)

SECTION IV. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
1620-00-607-9388	3-8	36
1650-00-373-7695	3-4	22
1650-00-511-1379	3-1	1
1680-00-345-9438	3-2	27
2815-00-883-1315	3-1	8
2915-00-143-4732	3-6	13
2915-00-205-0894	3-4	26
2915-00-324-8222	3-4	35
2915-00-344-0039	3-5	1
2915-00-345-9439	3-4	2
2915-00-346-4334	3-4	31
2915-00-373-7507	3-4	16
2915-00-373-7512	3-1	11
2915-00-373-7512	3-2	11
2915-00-373-7537	3-1	5
2915-00-373-7537	3-2	5
2915-00-373-7537	3-3	3
2915-00-373-7539	3-3	12
2915-00-373-7544	3-1	10
2915-00-373-7544	3-2	12
2915-00-373-7544	3-3	10
2915-00-373-7693	3-6	40
2915-00-510-3029	3-4	35
2915-00-511-4969	3-4	42
2915-00-561-7207	3-4	33
2915-00-562-2093	3-1	17
2915-00-562-2093	3-3	19
2915-00-562-5264	3-1	11
2915-00-592-8867	3-4	16
2915-00-594-0397	3-2	17
2915-00-601-8828	3-1	19
2915-00-794-4825	3-4	4
2995-00-373-7541	3-1	8
2995-00-373-7541	3-1	10
2995-00-373-7541	3-1	8
3020-00-345-9440	3-1	6
3020-00-347-9016	3-1	6
3020-00-348-6744	3-1	4
3020-00-348-6747	3-1	6
3020-00-373-7625	3-1	30
3020-00-373-7626	3-1	30
3110-00-734-8510	3-1	20
3120-00-516-9743	3-4	5
4140-00-400-7724	3-1	7
4810-00-890-6301	3-1	10
4820-00-403-9540	3-1	23
4820-00-433-0657	3-1	15
5305-00-373-7575	3-1	7
5305-00-531-1539	3-1	12
5305-00-531-1535	3-1	13
5305-00-531-1539	3-1	13
5305-00-543-2024	3-1	8
5305-00-558-4887	3-4	12
5305-00-579-2138	3-1	14
5305-00-584-8682	3-1	15
5305-00-614-3423	3-4	17
5305-00-957-6636	3-1	9
5307-00-576-0102	3-1	24
5310-00-016-5012	3-1	6
5310-00-016-5012	3	6
5310-00-373-7566	3-1	8
5310-00-489-6267	3-1	38
5310-00-583-5060	3-1	15
5310-00-550-3671	3-1	15
5310-00-619-2198	3-1	6
5310-00-639-9567	3-1	36
5310-00-830-2010	3-5	8
5315-00-103-6321	3-2	9
5315-00-177-0957	3-4	37
5315-00-298-3704	3-1	7
5315-00-298-3704	3-3	7
5315-00-373-7543	3-4	29
5315-00-663-0518	3-4	28
5315-00-663-0520	3-4	45
5315-00-664-0441	3-4	37
5315-00-731-7687	3-4	37
5330-00-152-3273	3-4	11
5330-00-180-9001	3-1	4
5330-00-248-3831	3-1	15
5330-00-248-3831	3-2	17
5330-00-248-3831	3-3	15
5330-00-248-3833	3-3	20
5330-00-248-3835	3-4	43
5330-00-248-3836	3-1	18
5330-00-248-3836	3-2	22
5330-00-248-3836	3-3	19
5330-00-248-3836	3-4	41
5330-00-248-3848	3-4	10
5330-00-250-0232	3-2	4
5330-00-250-0235	3-1	2
5330-00-250-0235	3-2	3
5330-00-250-0235	3-3	2
5330-00-265-1074	3-1	9
5330-00-265-1092	3-1	2
5330-00-337-8593	3-1	9
5330-00-337-8593	3-2	11
5330-00-337-8593	3-3	9
5330-00-400-3595	3-2	1
5330-00-400-3605	3-2	2
5330-00-584-1222	3-5	3
5330-00-622-1209	3-1	3
5330-00-701-1946	3-4	14
5330-00-811-3508	3-5	6
5330-00-824-8788	3-1	4
5330-00-824-8788	3-2	6
5330-00-824-8788	3-3	4
5330-00-951-3150	3-4	20
5340-00-597-3302	3-3	23
5340-00-686-1234	3-4	39
5340-00-686-1235	3-4	39
5340-00-696-6036	3-1	5
5340-00-696-6036	3-2	7
5340-00-696-6036	3-3	5
5340-00-837-9408	BULK	
5355-00-668-9389	3-4	33
5360-00-347-9015	3-4	24
5360-00-602-0679	3-5	17
5365-00-898-7105	3-4	39
5365-00-516-2800	3-4	3
5365-00-528-6515	3-5	11
5365-00-530-4992	3-4	34
5365-00-530-6026	3-5	7
5365-00-530-6026	3-5	23
5365-00-530-9668	3-1	5
5365-00-531-7597	3-4	34
5365-00-531-7699	3-4	38
5365-00-531-7700	3-4	31
5365-00-531-7701	3-4	34
5365-00-540-5570	3-4	1
5365-00-540-7066	3-4	3
5365-00-804-9735	3-1	16
5365-00-804-9735	3-2	18

SECTION IV. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
5365-00-804-8735	3-3	16	5977-00-697-0850	3-5	13
5365-00-807-7968	3-5	1	5999-00-808-4260	3-5	2
5365-00-944-2756	3-5	9	6105-00-587-0981	3-5	10
5365-00-997-9061	3-5	7	6105-00-669-8482	3-5	22
5365-00-997-9061	3-5	23	6105-00-976-1757	3-5	5
5930-00-111-1985	3-4	16	7690-00-112-8981	3-1	21
5935-00-813-8722	3-4	8	7690-00-112-8981	3-2	26
5935-00-814-4120	3-4	8	7690-00-112-8981	3-3	21
5940-00-518-8522	3-4	7	9310-00-141-7295	BULK	
5977-00-556-8787	3-5	18	9535-00-076-2732	BULK	

SECTION IV. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

PART NUMBER	FSCM	FIG NUMBER	ITEM NUMBER
MS16625-1037	96906	3-1	16
MS16625-1037	96906	3-2	18
MS16625-1037	96906	3-3	16
MS16625-1068	96906	3-5	1
MS21208F1-15	96906	3-3	23
MS2b170-14	96906	BULK	
MS29513-008	96906	3-2	20
MS29513-008	96906	3-4	43
MS29513-009	96906	3-1	18
MS29513-009	96906	3-2	22
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106708A101	73760	3-1	14
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155048	73760	3-1	5
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155048	73760	3-3	5
155048	73760	3-1	5
155056	73760	3-2	4
155056	73760	3-1	6
155056	73760	3-3	6
155066	73760	3-1	3
155066	73760	3-2	5
155066	73760	3-3	3
155074	73760	3-1	6
155074	73760	3-2	6
155074	73760	3-3	4
155084	73760	3-3	12
155080	73760	3-1	12
155080	73760	3-2	14
155104A	73760	3-2	1
155106	73760	3-3	1
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155494	73760	3-3	10
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155626	73760	3-2	23
155626	73760	3-3	20
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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

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 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

Liquid Measure

1 centiliter = 10 milliliters = .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 = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 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. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 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)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C