TM 55-6680-260-40

TECHNICAL MANUAL

GS MAINTENANCE MANUAL

INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST

TACHOMETER INDICATOR

MODEL NUMBER 8DJ120AAE1,

FSN 6680-948-0532

HEADQUARTERS, DEPARTMENT OF THE ARMY

12 NOVEMBER 1971

WARNING

PRECAUTIONARY DATA

Personnel performing instructions involving operations, procedures. and practices which are included or implied in this technical manual shall observe the following instructions. Disregard of these warnings and precautionary information can cause serious injury, death, or an aborted mission.

CLEANING. During cleaning operations, when using toxic or volatile materials, perform all procedures in a ventilated area. Protect the eyes with safety glasses and the hands with rubber gloves. Keep flame or sparks away from the fluids being used.

TESTING. Except for supply voltages to the test equipment, voltages are not harmful Make certain that test equipment is properly grounded and that cables and connectors are in good condition. During tests and adjustments involving extremely high or low temperatures, wear protective gloves.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. Introduction.

This technical manual contains overhaul instructions for the Model 8DJ12AAE1 Tachometer Indicator, manufactured by the Aerospace Electrical Equipment Department, General Electric Company (97429). Wilmington, Massachusetts.

1-2. Equipment Records.

The Army Maintenance Management system procedures established in TM 38-750 apply to this equipment. The applicable forms as required by TM 38-750 shall be used

1-3. Reporting of Improvements.

The individual user is encouraged to report errors and omissions, and to make recommendations for improving this publication. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded directly to Commanding General, U.S. Army Aviation Systems Command, ATTN: AMSAV-M, P O. Box 209, St Louis. Missouri 63166.

1-4. Quality Control Personnel.

Quality control personnel shall insure complete compliance with quality program and /or inspection system requirements specified in the contract and this manual. Any deviations from the established requirements shall be approved by the contracting officer or his designated representative, in the case of commercial contracts, or by the maintenance officer when the overhaul is performed by an Army unit.

1-5. Purpose of Equipment.

The Model 8DJ120AAE1 Tachometer Indicator (fig 1-1) provides a visual indication of helicopter rotor speed and the per cent of speed of the N2 rotor of the helicopter engine.

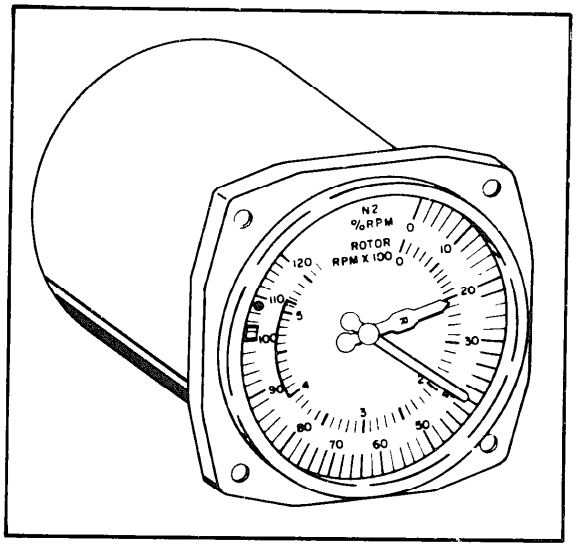

Figure 1-1. Model 8DJ120AAE1 Tachometer Indicator.

Section II. DESCRIPTION AND LEADING PARTICUALRS

1-6. Visual Indicator.

Model 8DJ120AAE1 Tachometer Indicator is a dual indicator that is designed for helicopter use. It provides visual indication of the speed (0 to 500 rpm) of the helicopter rotor and the speed (0 to 120 per cent of rpm) of the N2 rotor of the helicopter engine. The two elements of the tachometer indicator operate independently. Each element consists of a synchronous motor, a magnetic coupling, and an indicating mechanism. Two concentri pointers independently display rotational speeds on a single graduated scale: The front pointer (R) indicates rpm x 100 of the helilcopter rotor. The rear pointer indicates per cent of rpm of the N2 rotor of the helicopter engine. The two synchronous motors of the dual tachometer indicator are driven separately by the 3-phase supplies of the rotor and N2 tachometer generators which are coupled to the rotor drive and the engine Frequencies of the supply voltages from the generators, which vary directly with rotor and engine speeds, determine the speeds of the syn-

chronous indicator motors. The synchronous **motors** are the self-starting, permanent-magnet type. The indicating mechanisms are coupled to the synchronous motors through magnetic couplings which permit slippage between the drives and the indicating mechanisms, but transmit a torque proportional to motor speed. Each indicating mechanism is spring-loaded against motor torque and deflects through an angle that is proportional to the monitored speeds. For leading particulars of the Model 8DJ120AAE1 Tachometer Indicator, refer to table 1-1.

Section III. TEST EQUIPMENT, SPECIAL TOOLS, AND MATERIALS

1-7. Test Equipment.

Special test equipment is not required for maintenance of the tachometer indicator. Commercial test equipment required is listed in table 1-2.

1-8. Special Tools.

No special tools are required for maintenance of the tachometer indicator. Tools referred to in this technical manual are listed in table 1-2.

Table 1-1. Leading Particulars

Stator resistance	Approx 105 ohms, lead-to-lead
Number of elements	2
Number of poles (motor rotor)	4
Ambient temperature range	—30F(—35C) to +158F(+70C)
Scale	
Rotor	0 to 5.5 rpm x 100
	Red line at 4 and 5.14 rpm x 100
	Green arc 4 to 5.14 rpm x 100
N2	0 to 120% rpm
	Red line at 100 and 103% rpm
	Red dots at 110% rpm
	Green arc 100 to 103% rpm
Scale marking	
Background	Dull black
Lettering and marking	Non-radiating white paint
Dimensions	
Length (less connector)	4.50 in. max
Diameter (con)	3.12 in. max
Weight	1.3 lb max
Receptacle connector	Amphenol 126-218
Mating plug	Amphenol 126-217

Table 1-2. Test Equipment and Tools Required

Part No	Nomenclature	Technical Description
TTU27E	Tachometer indicator tester (2 required)	Used for calibration and test.
MS25038-4	Tachometer generator (2 required)	Used in conjunction with tachometer tester TTU27E.
Model 325A	Electronic counter (2 required)	Used in conjunction with tachometer tester TTU27E.
107A	Magnetizer	Manufactured by Radio Frequency Laboratories, Inc., 49073. Used for magnetizing the magnet and shaft assemblies
405X64P6	Keeper	Manufactured by General Electric Company, 97424. Used in conjunction with Magnetizer 107A.

1-9. Consumable Materials.

Consumable materials required for general support of the tachometer indicator are listed in table 1-3.

Table 1-3. Consumable Materials

Item No.	Material	Type Or Grade	Government Specification
1	Toluene	TECH	TT-T-548
2	Chlorethane	TYPE 1	0-T-620
3	Ace tone	TECH	0-A-51
4	Naphtha		MIL-N-15178
5	Benzine	TECH GR A	VV-B-231
6	Isopropyl Alcohol	GRB	TT-I-735
7	Silicone Fluid	LUBRICANT	MIL-S-21568
8	Epoxy	12	
9	Black Paint	Color 37038TY3	MIL-E-5557
10	Clear Lacquer	TYPE 1	TT-L-58
11	Glyptol	1201	
12	Solder	SN60WRP2	QQ-S-571
13	Hypodermic Syringe (NO. 25)	TYPE 1 CL1	GG-S-00945
14	Aluminum Foil Tape		LT80
15	Dow 510 (5000 Centishtokes)		MIL-L-27694

CHAPTER 2

GENERAL SUPPORT MAINTENANCE

Section I. GENERAL

2-1. Introduction.

This chapter provides an illustrated parts breakdown, disassembly instructions, cleaning instructions, repair and replacement instructions, modification criteria, reassembly and testing assemblies, painting requirements, and final reassembly instructions for the tachometer indicator.

2-2. Illustrated Parts Break Down.

The illustrated parts breakdown lists and illustrates all replaceable parts for tachometer indicator, model 8BJ120AAE1, (fig. 1-1). The exploded view of the tachometer indicator is provided in figure 2-1. The index numbers on the exploded view are keyed to the parts list for easy parts identification. Parts are listed by the General Electric Company (97424) part number except where they may be purchased directly from a vendor When vendor's part numbers are listed, the applicable Federal manufacturer's code number is listed in the description column. The symbol "Δ" preceding a part number in the description column indicates a GE control number for the vendor's part.

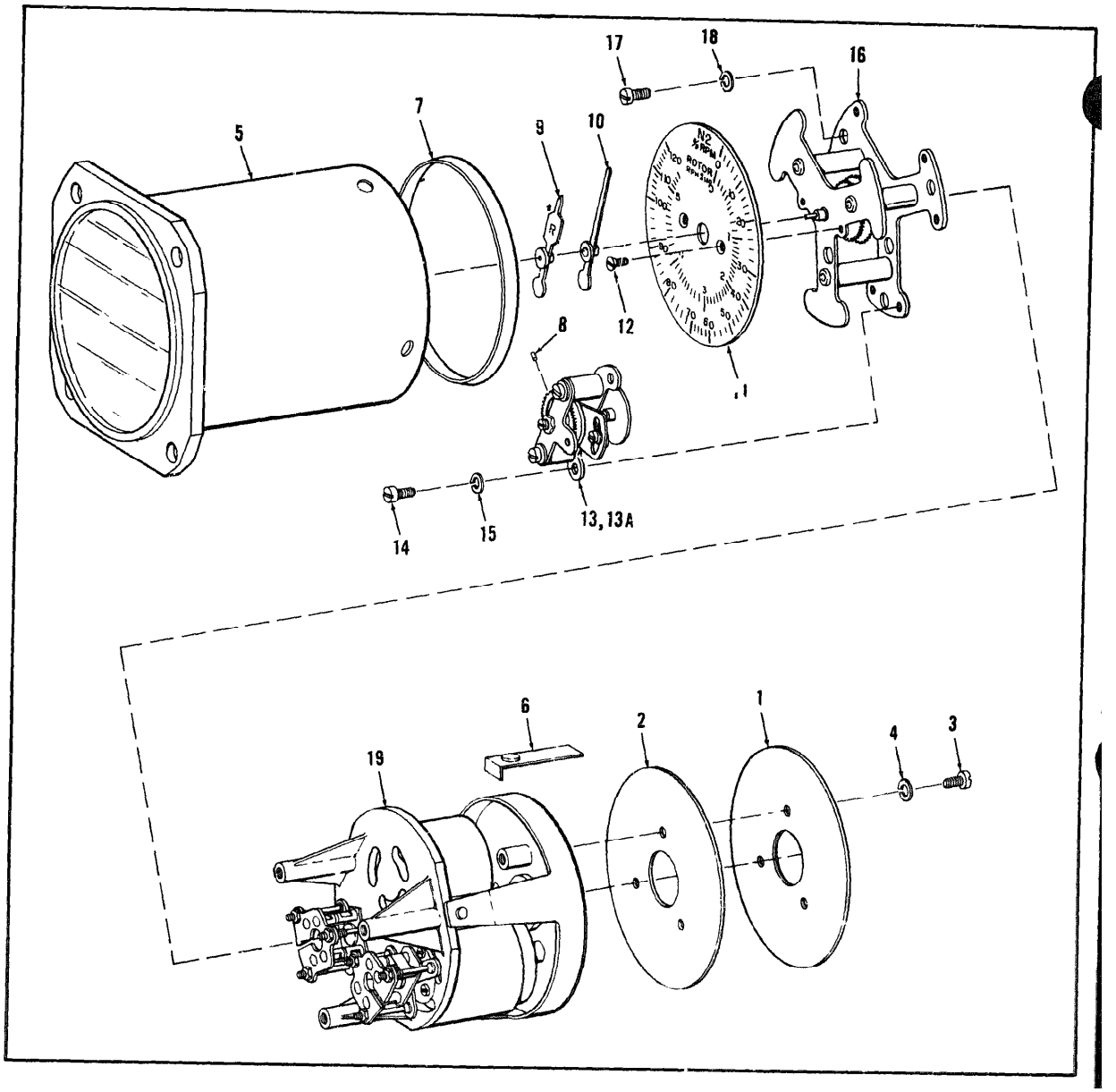

Figure 2-1. Tachometer Indicator Exploded View.

Fig. & Index No	Part No	Description 1 2 3 4 5 6 7	Qty Per Assy
2-1-	8DJ120AAE1	INDICATOR, TACHOMETER	1
-1	5690W26P001	. NAMEPLATE	1
-2	3830K75P00	. GASKET, Dust	1
		(ATTACHING PARTS FOR INDEX NO. 1 and 2)	
-3	N33P1003E	. SCREW, Machine, slotted rd hd, No. 0-80 by 3 / 16 in. lg.	3
-4	N406P1	. LOCKWASHER, Spring type No. 0	3
		- - - * - - -	
-5	2037K75G700	. CAN ASSEMBLY	1
—	5637W12P001	. PIN	1
-6	8222K70G701	TAB ASSEMBLY	3
-7	1497K75P001	. BEZEL	1
—	5362K71G702	MOTOR AND HEAD ASSEMBLY	1
-8	4152244P003	. COUNTERWEIGHT	AR
-9	4145642G15	. . POINTER ASSEMBLY, Front	1
-10	4145642G316	. . POINTER ASSEMBLY, Rear	1
-11	6466K29P001	. . PLATE, Scale	1
		(ATTACHING PARTS)	
-12	4149392P006	. . SCREW, Scale plate	2
		- - - * - - -	
-13	1230K71G704	. ARMATURE ASSEMBLY, Rear pointer (See figure 2-2 for details)	1
-13A	1230K71G705	. . ARMATURE ASSEMBLY, Front pointer (See figure 2-2 for details)	1
		(ATTACHING PARTS)	
-14	N55P9003	. . SCREW, Machine slotted fil hd No. 4-40 by 3 / 16 in. lg.	4
-15	MS35337-78	. . WASHER, Lock, No. 4	4
		- - - * - - -	
—	54C1W10G700	. . MOUNT ASSEMBLY, Vibration	3
-16	4167K71G701	. HEAD ASSEMBLY (See fig. 2-3 for details)	1
		(ATTACHING PARTS)	
-17	N54P13005	SCREW, Machine, rd hd, No. 6-32 by 5 / 16 in. lg	3
-18	N406P7	. LOCKWASHER, Spring type, No. 6	3
-19	5360K72G702	. MOTOR ASSEMBLY (See fig. 2-4 for details)	1

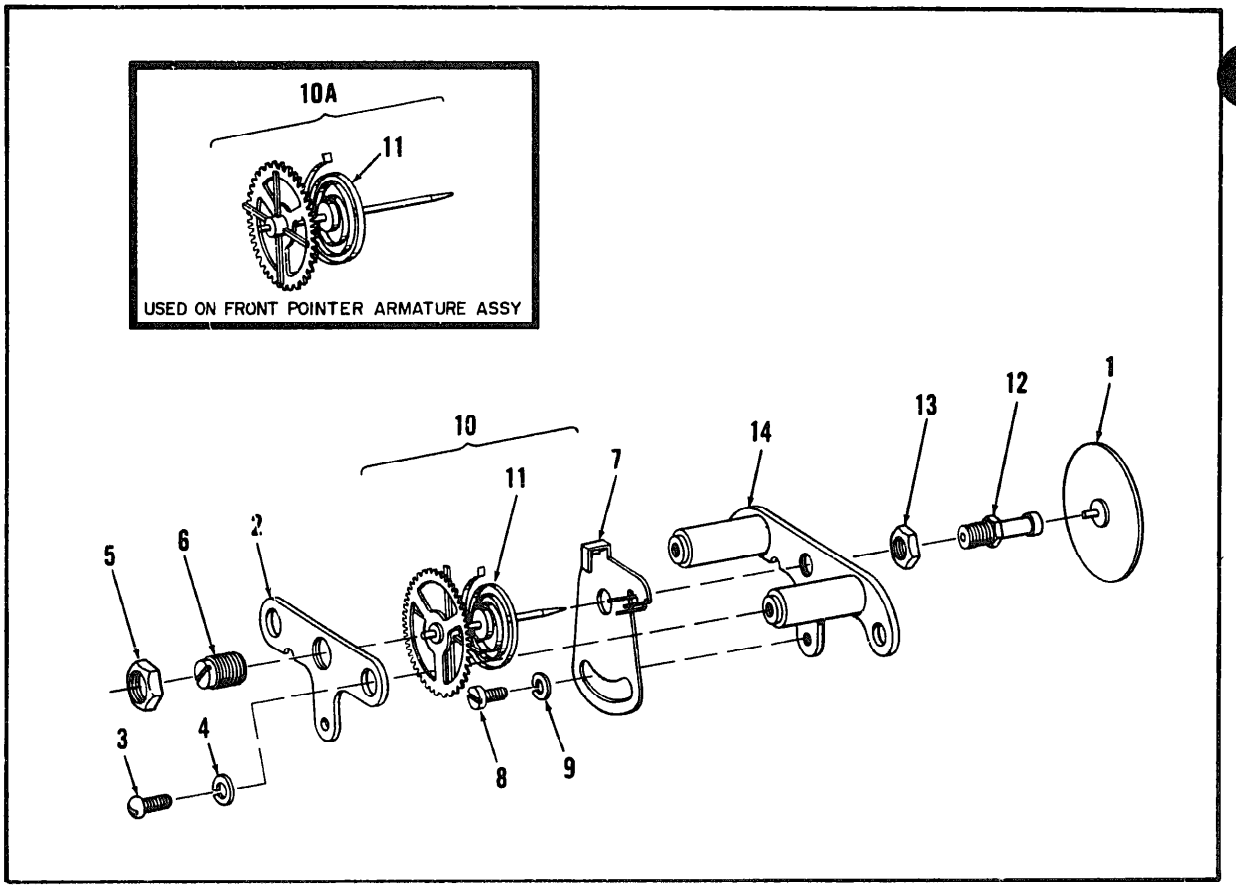

Figure 2-2. Armature Assembly Exploded View.

Fig. & Index No.	Part No	Description 1 2 3 4 5 6 7	Qty Per Assy
2-2-	1230K1G704	ARMATURE ASSEMBLY, Rear pointer (See fig. 2-1 for NHA)	REF
	1230K71G705	ARMATURE ASSEMBLY, Front pointer (See fig. 2-1 for NHA)	REF
-1	4152232G015	. DISK and HUB ASSEMBLY	1
-2	5674K62P001	. PLATE	1
		(ATTACHING PARTS)	
-3	N97P4003	. SCREW, Machine, slotted pan hd, No. 2-64 by 3 / 16 in. lg.	2
-4	N406P3	. LOCKWASHER, Spring type, No. 2	2
		. . .* . . .	
-5	4137168P001	. NUT, Adjusting	1
-6	4694K70G704	JEWEL AND SCREW ASSEMBLY	1
-7	1181K74P003	. ARM, Adjusting	1
		(ATTACHING PARTS)	
-8	4149355P002	. SCREW, Machine, hex hd, No. 2-64 by ⅛ in. lg	1
-9	4136043P117	. WASHER, Plain	1
		. . .* . . .	
-10	4152127G017	. ARMATURE ASSEMBLY (rear pointer)	1
2-10A	4152127G018	ARMATURE ASSEMBLY (front pointer)	1
-11	7925K2P002	. . SPRING, Control	1
-12	414939G005	. JEWEL ASSEMBLY	1

Fig & Index No.	Part No	Description 1 2 3 4 5 6 7	Qty Per Assy
-13	4137168P001	NUT, Adjusting	
-14	5709K88G700	POST AND PLATE, ASSEMBLY	

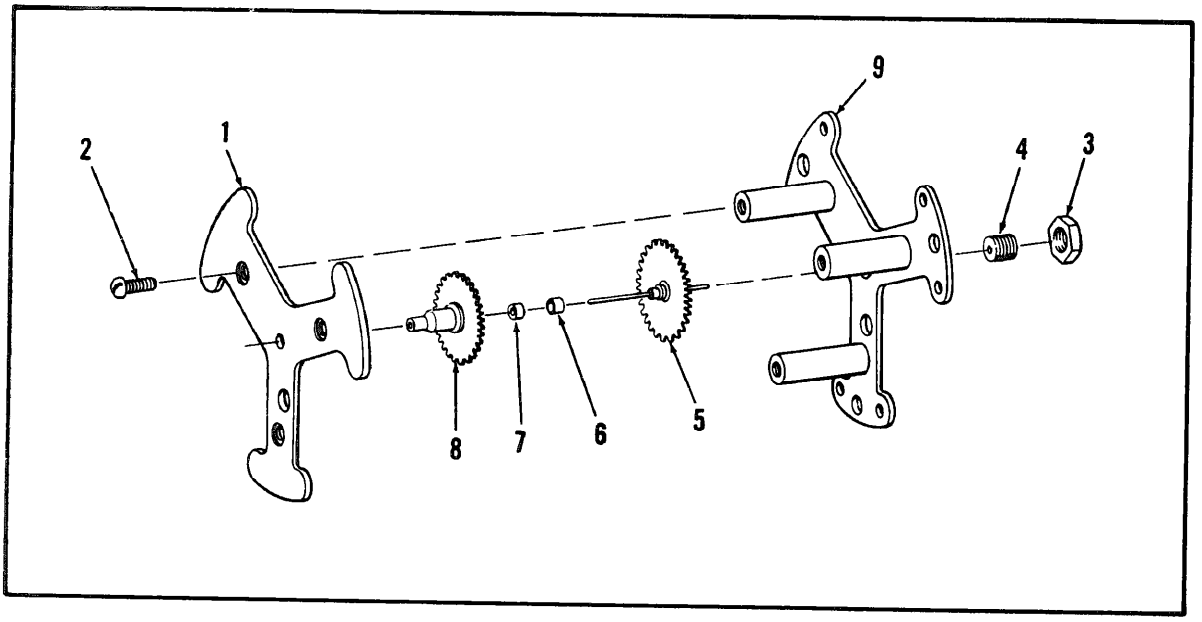

Figure 2-3. Mead Assembly Exploded View.

Fig & Index No	Part No	Description 1 2 3 4 5 6 7	Qty Per Assy
2-3-	4167K71G701	HEAD ASSEMBLY (See fig. 2-1 for NHA)	REF
-1	5711K78G700	SUPPORT ASSEMBLY, Plate	1
		(ATTACHING PARTS)	
-2	4149392P007	SCREW	3
		- - - * - - -	
-3	4137168P001	NUT, Adjusting	1
-4	4694K70G704	JEWEL AND SCREW ASSEMBLY	1
-5	7425K74G701	SHAFT ASSEMBLY	1
-6	4688K74P002	JEWEL	1
-7	4688K74P001	JEWEL	1
-8	3880K73G701	GEAR AND SHAFT ASSEMBLY	1
-9	5709K87G700	PLATE AND POST ASSEMBLY	1

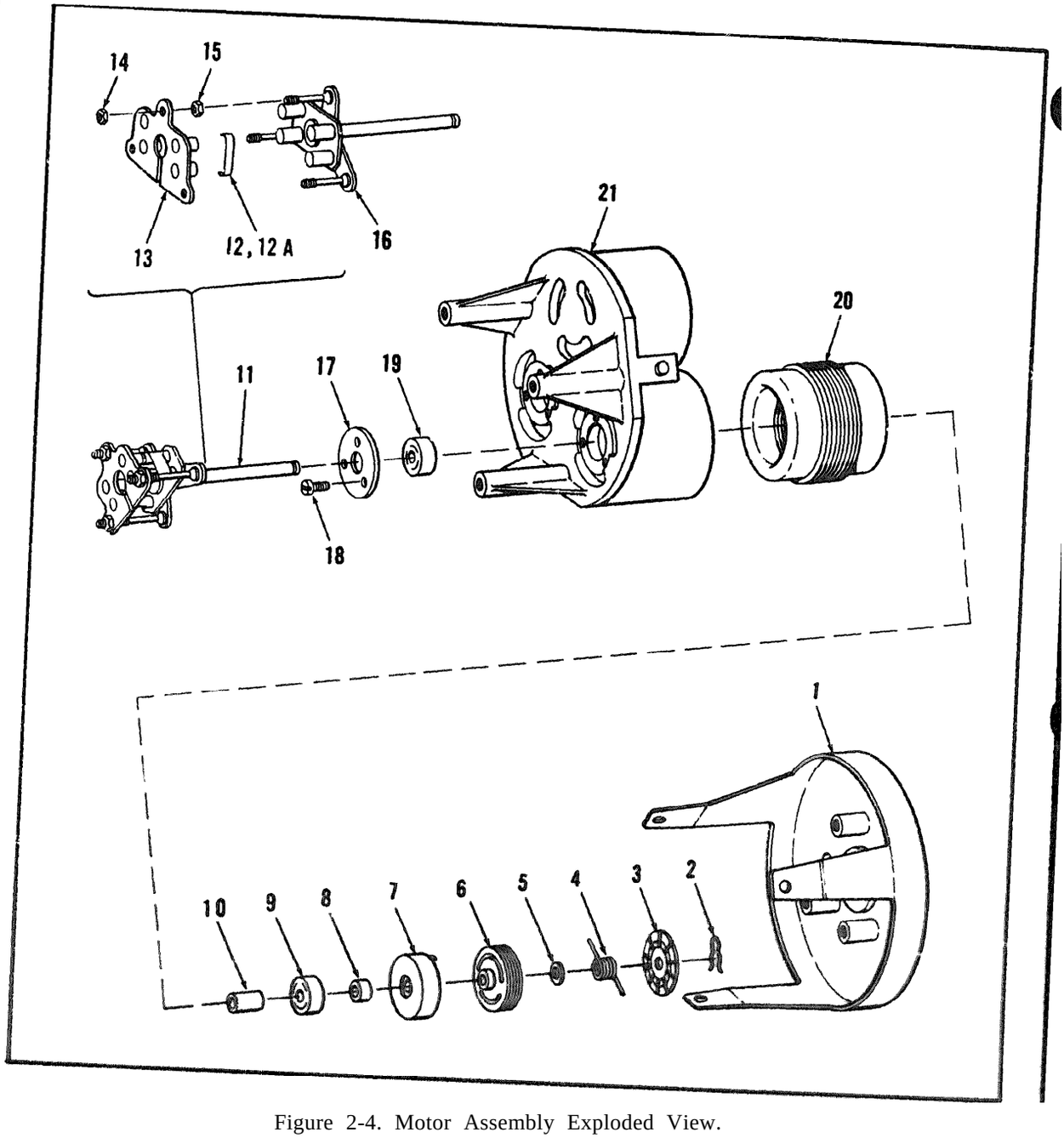

Figure 2-4. Motor Assembly Exploded View.

Fig & Index No	Part No	Description 1 2 3 4 5 6 7	Qty Per Assy
2-4-	5360K72G702	MOTOR ASSEMBLY (See fig. 2-1 for NHA)	REF
-1	5463435G040	. CUP ASSEMBLY, Support	1
-	126-218	. . CONNECTOR, Receptacle (02260) (△2603K91P026)	1
-2	150A-10	. PIN, Spring (71500) (△5462491P001)	2
-3	5468417P001	. WHEEL, Balance	2
-4	5468416P001	. SPRING	2
-5	4136043P076	. WASHER, Plain	2
-6	5462078G001	. ROTOR ASSEMBLY, Hysteresis	2
-7	5468427G001	ROTOR ASSEMBLY	2
-8	5468421P002	. SPACER	2
-9	4152116P001	. BEARING, Ball	2
-10	5468421P001	SPACER	2
-11	5151K71G700	MAGNET AND SHAFT ASSEMBLY	2
-12	5468461P001	COMPENSATOR, Temperature	AR
-12A	5468461P002	. COMPENSATOR, Temperature	AR
-13	5147K73G701	MAGNET ASSEMBLY	1
		(ATTACHING PARTS)	
-14	1297794P001	. NUT, Hex	3
		. . . * . . .	
-15	1297794P001	. . NUT, Hex	3
-16	7425K75G702	. . SHAFT ASSEMBLY	1
-17	6220K70P001	. RETAINER, Bearing	2
		(ATTACHING PARTS)	
-18	4149392P007	. SCREW	6
		. . . * . . .	
-19	4152116P001	. BEARING, Ball	2
-	4322K73G701	HOUSING ASSEMBLY	1
-20	5468434G007	. STATOR AND COIL ASSEMBLY	2
-21	4329K70P003	. .HOUSING, Motor	1

Section II. DISASSEMBLY

2-3. General.

Prior to disassembly, study the exploded views (figs. 2-1 through 2-4) to become familiar with the detailed parts of the indicator and their assembly relationship.

NOTE

Use of non-magnetic tools is essential.

2-4. Tachometer Indicator.

Refer to figure 2-1 and proceed as follows to disassemble the tachometer indicator:

a. Remove nameplate (1) and dust gasket (2) by removing screws (3) and lockwashers (4).

b. Unsolder and straighten the tab assembly and/or assemblies (6).

c. Ease the tab assemblies out of their holes in can assembly. Using pliers, grasp one of the tab assemblies and carefully pull to ease the motor and head assembly out of can assembly.

d. Remove bezel (7) from can assembly (5).

NOTE

Troubleshooting should be performed at this time in accordance with paragraph 3-3.

e. Remove pointers (9 and 10) from their respective shafts.

f. Remove scale plate (11) by removing scale plate screws (12).

NOTE

To facilitate reassembly mark each group of assemblies (armature, head and motor) before removal.

g. Remove screws (14) and lockwashers (15) which secure each armature assembly (13, 13A) to the head assembly (16), then, remove the armature assemblies (13, 13A). When removing the armature assemblies, rotate the applicable magnet and shaft assembly of motor assembly (19) so that

the slot in the magnet and shaft assembly is facing outwards. Slide out the armature assembly radially, so that the disk of the armature assembly passes between the magnets of the magnet and shaft assembly.

NOTE

Mark top of support cup assembly, motor housing, and head assembly to assure correct reassembly position

h. Remove screws (17) and lockwashers (18), and remove head assembly (16) from motor assembly (19).

2-5. Armature Assemblies.

Refer to figure 2-2 and proceed as follows to disassemble the armature assemblies:

a. Using a soldering iron, apply heat at the hub of disk and hub assembly (1). Remove disk and hub assembly (1) from shaft of armature assemblies (10 or 10A).

NOTE

Clean all solder from the shaft of armature assemblies, while the solder is still molten, in order to facilitate reassembly.

h. Remove screws (3) and lockwashers (4); then, remove plate (2) from post and plate assembly (14).

c. Free adjusting arm (7) from post and plate assembly (14) by removing screw (8) and plain washer (9).

d. Lift out together the armature assembly (10) or 110A) with its control spring (11) and adjusting arm (7) from post and plate assembly (14).

NOTE

Do not disassemble armature assemblies (10 or 10A), adjusting arm (7) or control spring (11) unless replacement is necessary.

e. Remove adjusting nut (5) and jewel and screw assembly (6) from plate (2).

f. Remove jewel assembly (12) and adjusting nut (13) from post and plate assembly (14).

2-6. Head Assembly.

Refer to figure 2-3 and proceed as follows to disassemble the head assembly:

a. Remove screws (2) and remove support plate assembly (1).

b. Remove together the shaft assembly (5), gear and shaft assembly (8), and jewels (6 and 7)

c. Remove gear and shaft assembly (8), then, remove jewels (6 and 7) from shaft assembly (5).

d. Remove adjusting nut (3) and jewel and screw assembly (4) from plate and post assembly (9)

2-7. Motor Assembly.

Refer to figure 2-4 and proceed as follows to disassemble the motor assembly :

a. Remove the support cup assembly (1) from the motor housing (21) by carefully springing the three arms outward so that they are free of the bosses on the housing. If receptacle connector needs replacement unsolder the leads from the connector, taking care not to put a strain on the leads at the soldering points, and label the leads.

NOTE

Mark surface of each of the balance wheels so that they can be replaced in the same position and on the same magnet and shaft assembly during reassembly (same side facing out).

b. Hold magnet and shaft assemblies (11), then, remove spring pins (2) and slide balance wheels (3) from the shaft of magnet and shaft assemblies (11).

c. Remove each spring (4) by grasping the spring tab and turning it counterclockwise.

d. Remove plain washers (5), hysteresis rotor assemblies (6), rotor assemblies (7), and spacers (8), hall bearings (9) and spacers (10) from shafts of magnet and shaft assemblies (11).

c. Remove magnet and shaft assemblies (11) from motor housing (21), being careful not to damage bearing (19). Place magnet and shaft assemblies on a Il on-metallic surface

Do not disassemble the magnet and shaft assemblies (11) unnecessarily because remagnetization and temperature stabilization will be required upon reassembly.

f. Remove screws (18); then remove bearing retainers (17) and ball bearings (19) from motor housing (21).

g. If necessary for replacement, unstake and remove stator and coil assemblies (20) from motor housing (21)

h. If necessary to disassemble magnet and shaft assemblies (11), proceed as follows:

(1) Remove hex nuts (14), then remove magnet assemblies (13) from shaft assembly (16) and place on a non-metallic surface

NOTE

Do not remove or reposition temperature compensators (12 or 12A) unless components of magnet and shaft assembly (11) are to be replaced. This will likely avoid readjusting of the compensators at reassembly, provided the components of armature assemblies are not replaced

(2) Remove temperature compensators (12 or 12A) from shaft assemblies (16).

(3) Remove adjusting nuts (15) from shaft assembly (16).

Section III. CLEANING

2-8. General.

After disassembly, clean all parts of the tachometer Indicator as follows.

d. Wash metal parts in toluene (item 1, table 1-3) or benzine (item 5, table 1-3).

b. Wash receptacle connectors in isopropyl alcohol (item 6, table 1-3).

NOTE

Rinse parts cleaned in toluene or isopropyl alcohol in acetone (item 3, table 1-3); then, dry them with a jet of clean, moisture-free air not exceeding 20 psig.

Remove petroleum base materials from ball bearings and other metal parts by washing them in cholrethane (item 2, table 1-3).

CAUTION

When handling cleaned ball bearing. use tweezers or wear gloves to avoid damage to bearings from moisture on bare hands.

NOTE

Immediately after cleaning ball bearings, lubricate bearings with two drops of silicone fluid (item 7, table 1-3). Apply the fluid directly into the bearings with a hypodermic syringe item 13, table 1-3) and spin the bearings so that the fluid will completely cover the balls and races.

d. Clean parts preserved in anti-rust preservative in naphtha (item 4, table 1-3).

e. Clean the scale plate with warm water and a mild non-abrasive soap or detergent and a soft clean cloth.

f. Clean jewel bearings with toluene (item 1, table 1-3) and a pith stick.

2-9. Inspection.

Inspection defects of the tachometer indicator are classified in table 2-1. Because the tachometer indicator is a small and basically simple electromechanical instrument, inspection procedures are provided in this single all-inclusive section of the manual. Table 2-2 provides complete details as to appropriate inspections and inspection methods together with cross references to appropriate instructions in the text.

Table 2-1. Classification of Dejects

MAJOR DEFECTS

1 Instrument out of balance
2 Pointer oscillation
3 Mechanical interference
4. Damaged or broken can assembly
5 Bent or broken receptacle connector pins

MIN OR DEFECTS

100. Cracks. scoring. pitting. nicks, or distortion of parts that do not affect function or interchangeability
101 Improper coverage and adherence of paint
102. Scratched, dirty, or discolored window or scale plate
103 Poor general workmanship during overhaul

NOT CLASSIFIED

1. Inconsistent or improper casting or forging dimensions
2. Nonfunctional radii or chamfers
3. Improper fractional dimensions which do not affect basic configuration of the indicator

Table 2-2. Detailed Inspection Requirements (Sheet 1 of 1)

FIGURE NO.	INDEX NO.	NOMENCLATURE	REF NO	MAJOR DEFECTS	METHOD OF INSPECTION	REF NO	MINOR DEFECTS	METHOD OF INSPECTION	REMARKS
2-1	5	Can Assembly	4	Damaged or broken	Visual	100 101 and 102	Scratched, dirty or discolored window	Visual	Repair or replace
2-1	7	Bezel				102	Scores or scratches	Visual	Repair or replace
2-1	8	Counter-weights	1	Instrument unbalanced	SIE*				Para 2-27*e*
2-1	9, 10	Pointer Assembly				101	Faded or deteriorated	Visual	Repair or replace
2-1	11	Scale Plate				101	Faded or deteriorated	Visual	Repair or replace
2-2	10,10A	Armature Assembly (Gears)	3	Tooth damage	Visual	103	Stripped or worn teeth	Visual	Replace
2-2	11	Control Spring	3	Distortion	Visual				Para 2-21*j*
2-2	12	Jewel Holder Assembly	3	Chipped, dirty or cracked surface	Visual	103	Stripped or worn threads	Visual	Replace
2-3	4	Jewel and Screw Assembly	3	Chipped, dirty, or cracked surface	Visual	103	Stripped or worn threads	Visual	Replace
2-3	6,7	Jewel	3	Chipped, dirty, or cracked surface	Visual				Replace
2-4	1	Support Cup	5	Broken or bent connector pins	Visual				Repair or replace
2-4	7	Rotor Assembly	2	Pointer oscillation	SIE				Para 2-19*h*
2-4	9,19	Ball Bearings	2	Pointer oscillation	Visual and feel				Para 2-8*c*
2-4	11	Magnet and shaft assembly	2	Pointer oscillation	SIE				Para 2-24
2-4	20	Stator frame and coil assembly	1	Improper winding resistance	SIE				Replace if over 105 ohms
			1	Insulation break-down	SIE				Replace if under 400 volts

* Standard Inspection Equipment

Section IV. REPAIR AND REPLACEMENT

2-10. General.

Replace all parts which are worn or broken or contain defects as outlined in table 2-2.

2-11. Replacement of Armature Assembly or Adjusting Arm.

NOTE

Replacement armature assemblies are supplied with the control spring installed.

a Release the outer turn of control spring (11, fig. 2-2) from the tab on adjusting arm (7) by applying heat with a soldering iron to the epoxy bond (fig. 2-5). Chip away the epoxy remaining after release of the spring from adjusting arm (l).

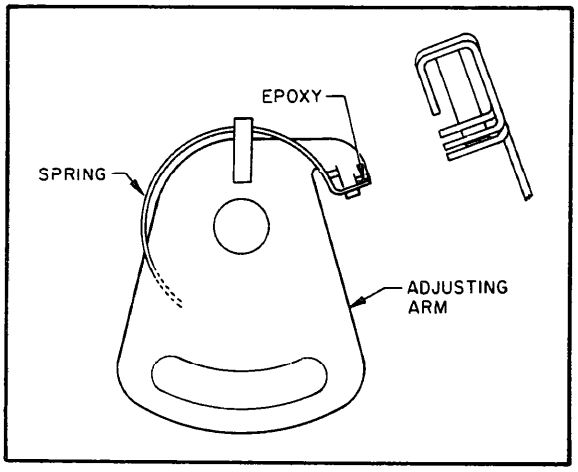

Figure 2-5. Control Spring Attachment Details.

b. Using solder (item 12, table 1-3), tin the end of the shaft of the replacement armature assembly (10 or 10A) which accepts disk and hub assembly (1). Thoroughly clean the tinned portion of the shaft. An acceptable method consists of washing the parts in boiling water, using three successive washes and a separate container for each wash. Then wash in isopropyl alcohol (item 6, table 1-3) and air-dry.

NOTE

The control spring (11) is positioned in the adjusting arm (7) and cemented in place during reassembly.

Section V. MODIFICATION CRITERIA

2-12. General.

The following modifications should be accomplished to bring the tachometer indicator up to the latest configuration.

2-13. Can Assembly (fig. 2-10).

a The addition of a third tab hole by drilling the can assembly.

b. The addition of a hole by drilling in the flange for insertion of pin.

c. Touch-up can assembly with black paint (item 9, table 1-3)

2-14. Bezel.

a. The bezel material was changed for better temperature stabilization.

b. The new bezel can be identified as having a wider ring with an overall width of 0.500 inch.

C. The new bezel should be used if, at overhaul, the old bezel shows signs of distortion.

2-15. Motor and Head Assembly (fig. 2-11).

a. Locate vibration mount assemblies on motor housing. Apply 450 F heat to edges of tape of assemblies to seal edges to housing

b. Puncture assemblies with needle at points marked "X" as shown on figure 2-11.

2-16. Damping Fluid For Jewels.

a. The addition of damping lubrication to all jewels is covered in the reassembly of the subassemblies of the indicator.

b. Use one drop of lubricant (item 15, table 1-3), applied with a hypodermic syringe (item 13, table 1-3).

2-17. Soldering of Tab Assemblies.

The soldering of the 3 tab assemblies is covered in the final reassembly of the indicator.

Section VI. REASSEMBLY AND TESTING OF ASSEMBLIES

2-18. General.

During reassembly refer to figures 2-1 through 2-4 for identification of parts; to table 1-2 for identification of test equipment and tools; and to table 1-3 for consumable materials.

2-19. Motor Assembly.

Refer to figure 2-4, and proceed as follows to assemble the motor assembly.

a. If they have been disassembled, reassemble magnet and shaft assemblies (11) as follows:

(1) Assemble adjusting nuts (15) on the studs of shaft assembly (16).

(2) Assemble temperature compensator (12) on shaft assembly (16) magnets.

NOTE

The temperature compensator (12) provides an adjustment for the affect of temperature on the magnet and shaft assembly (11), the disk and hub assembly (1, fig. 2-2), and the control spring (7). If any of these parts have been replaced, it will be necessary to readjust the position of the temperature compensator. In addition, if the disk and hub assembly (1) has been replaced, a different number of compensators may be required. When only one compensator is required, a dummy compensator (12A, fig. 2-4) must be added to the diametrically opposite set of magnets for balance purposes. As the dummy compensator will not affect compensation, it can be located at any convenient distance from the air gap. Final adjustment of the temperature compensator is made during unit's calibration.

(3) Assemble magnet assembly (13) on to shaft assembly (16). Adjust nuts (15) so that the air gap clearance between the two sets of magnets is within 0.045 to 0.050 inch.

(4) Assemble hex nuts (14) to hold magnet assembly (13) in place.

(5) Magnetize magnet and shaft assembly (11) to saturation using magnetizer (table 1-2). Insert the magnetizing fixture through the long narrow opening formed by the drag magnets and the top and bottom plates of the magnet and shaft assembly. Pass sufficient current through the magnetizer to produce a full saturation.

(6) After completing magnetization, temperature stabilize the magnet and shaft assembly (11) as follows:

(a) Soak for one hour minimum (in air) at -94F (-70C) to -112F (-80C).

(b) Soak for one hour minimum (in air) at +212F (+100C) to +257F (+125C)

(c) Repeat (a) and (b), above.

NOTE

The time of one hour may he reduced to 15 minutes if the magnets are submerged alternately in a -84F (-70C) alcohol-dry ice bath and a boiling water bath. Transport the magnet assemblies rapidly between the low and high temperatures so as to avoid condensation. Care should be taken to avoid having the magnets contact any magnetic material.

b. If disassembled, assemble stator and coil assemblies (20) into motor housing (21) so that the stator leads fall between the legs of support cup assembly (1). Stake motor housing over each stator and coil assemblies at three points 120 degrees apart. Stake marks should be approximately 3 / 16-inch wide.

c. Assemble ball bearings (19) into motor housing (21), and secure with bearing retainers (17) and screws (18). Secure screws (18) with glyptol (item 11, table 1-3).

d. Insert the magnet and shaft assemblies (11) through the ball bearings in the motor housing. Slide spacers (10), ball bearings (9), and spacers (8) on the shafts of the magnet and shaft assemblies (11).

e. Assemble rotor assemblies (7) onto the shafts with the arms facing to the rear of the indicator

f. Assemble hysteresis rotor assemblies (6) on the shafts, carefully engaging the arms of rotor assemblies (7) with the slots in hysteresis rotor assemblies (6)

g. Assemble plain washers (5) onto the shafts, then, install springs (4)

h Assemble balance wheels (3) onto the shafts and secure in place with spring pins (2)

NOTE

Make sure that the balance wheels are reassembled in the same position marked during disassembly; then, balance complete rotor assembly by removing sections of the balance wheels. When properly balanced, the rotating assembly will not assume a repetitive position when tapped or vibrated.

i. Check the end play of the complete assembly. End play of motor shafts must be within 0.001-0.004 inch.

,.If disassembled, assembly receptacle connector to support cup assembly (1) with its nut; then secure nut with glyptol (item 11, table 1-3).

k. Using solder (item 12, table 1-3), solder the stator leads to the receptacle connector as shown in figure 2-6.

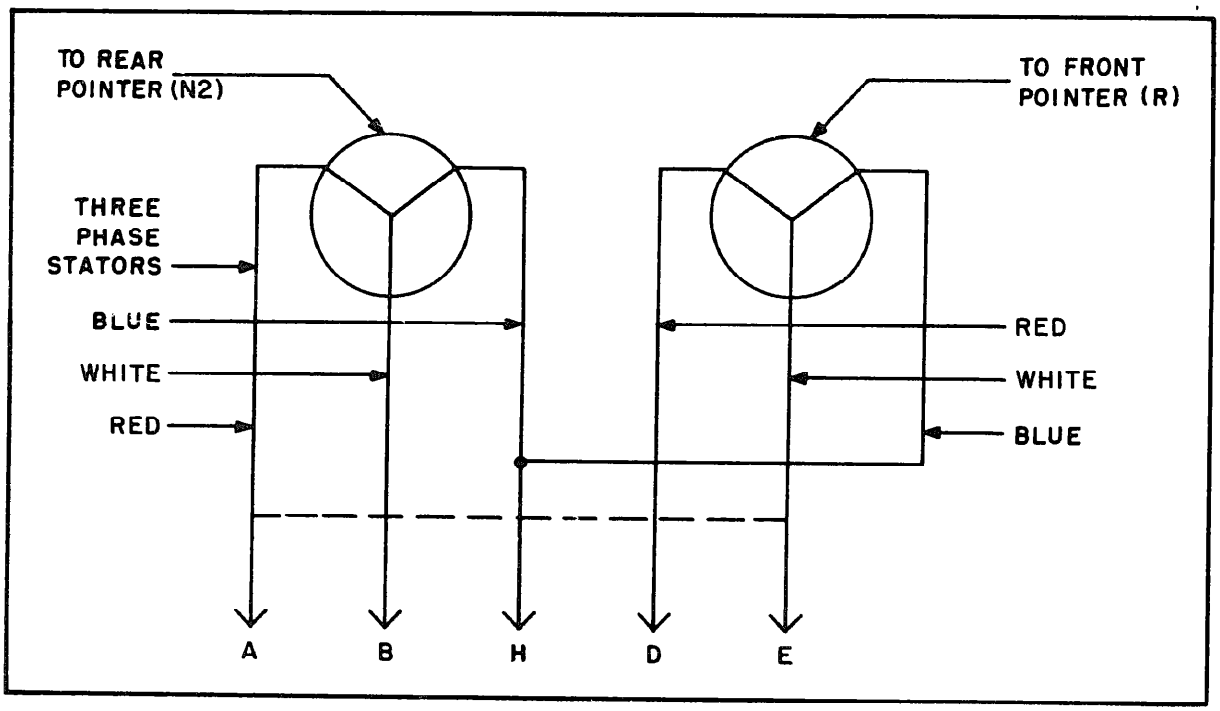

Figure 2-6. Internal Connections.

I. Snap the cup support assembly (1, fig. 2-4) over the motor housing (21), using position marked during disassembly.

m. Form the stator leads neatly so that they follow the inside curve of the support cup assembly away from the shafts and balance wheels.

2-20. Head Assembly.

Refer to figure 2-3, and proceed as follows to assemble the head assembly.

CAUTION

The shafts of this assembly are designed for a slip fit with the mating ball bearings. Any forcing of parts during assembly must be avoided, as interference fitting of parts may cause erratic and sticky operation or failure to operate at high or low temperatures.

NOTE

Lubricate all jewels and jewel screws with **one drop** of lubricant (item 15, table 1-3) **using hy**podermic syringe (item 13, table 1-

a. **Assemble jewels** (7 and 6, figure 2-3) into gear and shaft assembly (8).

NOTE

Make sure that the jewels are seated properly and that they are not cocked or excessively loose.

b **Install gear and shaft assembly (8) into plate** support assembly (1).

c **Install shaft assembly (5) through the bore of** jewels (6 and 7) and gear and shaft assembly (8).

d **Install jewel and screw assembly (4) into plate**

and post assembly (9) so that the jewel and screw assembly will just accept the pivot of shaft assembly (5) when the plate support assembly (1) is positioned on plate and post assembly (9).

e. Assemble plate support assembly (1) to plate and post assembly (9), and secure with screws (2).

NOTE

Make sure that small hole in leg of plate support assembly (1) is lined up with corresponding hole in plate and post assembly (9).

f. Adjust jewel and screw assembly (4) to provide a shaft endshake of 0.002-0.004 inch. Assemble and tighten adjusting nut (3).

g. Seal the head of screws (2) with glyptol (item J1, table 1-3).

2-21. Armature Assemblies.

Refer to figure 2-2, and proceed as follows to assemble the armature assemblies:

NOTE

Lubricate all jewel screws with one drop of lubricant (item 15, table 1-3) using hypodermic syringe (item 13, table 1-3).

a. Assemble jewel assembly (12) and adjusting nut (13) to post and plate assembly (14).

h. If disassembled, assemble adjusting arm (7) to post and plate assembly (14) and secure with screw (8) and washer (9).

c. When assembling armature assemblies (10, 10A) to adjusting arm (7), slip outer turn of control spring (11) through the support eye of adjusting arm and bend 1 / 16 inch of the spring tab up, at a right angle to the turn. Position the sprang, with bent up portion, against the anchor arm. (See fig. 2-5.)

d. Install armature (10 or 10A) into jewel assembly (12).

e. Assemble jewel and screw assembly (6) and adjusting nut (5) to plate (2).

NOTE

When installing jewel and screw assembly (6), make sure to install it into the front end of the plate (2). The front end of the plate (2) is established by a small notch which should be positioned on your left when looking at the plate.

f. Assemble plate (2) to post and plate assembly (14), and secure with lockwashers (4) and screws (3).

g. Adjust jewel assembly (6) so that the distance between the mounting surface of post and plate assembly (14) and the front surface of gear on armature assembly (10 or 10A) is within 0.538 ± 0.002 inch for the rear pointer and within 0.368 ± 0.002 inch for the front pointer.

NOTE

When setting the above dimensions, make sure that the shaft of armature assembly (10 or 10A) is against the jewel of jewel-and-screw assembly (6).

h. Adjust jewel assembly (12) to provide an endshake of 0.0015-0.002 inch.

i. When assembling disk and hub assembly (1) on to shaft of armature assembly (10 or 10A) position disk so that the distance between the mounting surface of post and plate assembly t (14) and the front surface of the disk and hub assembly (1) is within 0.545-0.549 inch. Then, solder magnet disk assembly to armature shaft, using solder (item 12, table 1-3).

NOTE

When positioning disk and hub assembly (1), make sure that the shaft of armature assembly (10 or 10A) is against the jewel of jewel-and-screw assembly (6).

J. Upon completion of assembly, level control spring (11), and apply a small amount of epoxy (item 8, table 1-3) to the straight tab of adjusting arm (7) at the point of attachment of the control spring (11) (fig. 2-5). Quick cure by heating in a +257F(+125C) oven for 15 to 20 minutes.

NOTE

When assembled, the turns of control spring should appear flat to the unaided eyes; that is, the edges of all turns should lie in one plane perpendicular to the shaft. In addition, the spring should appear concentric about the shaft at one-half windup.

k. Upon completion of assembly, seal the armature jewel adjusting nuts (5 and 13) with glyptol (item 11, table 1-4).

2-22. Tachometer Indicator.

Refer to figure 2-1, and proceed as follows to assemble the tachometer indicator using markings established during disassembly.

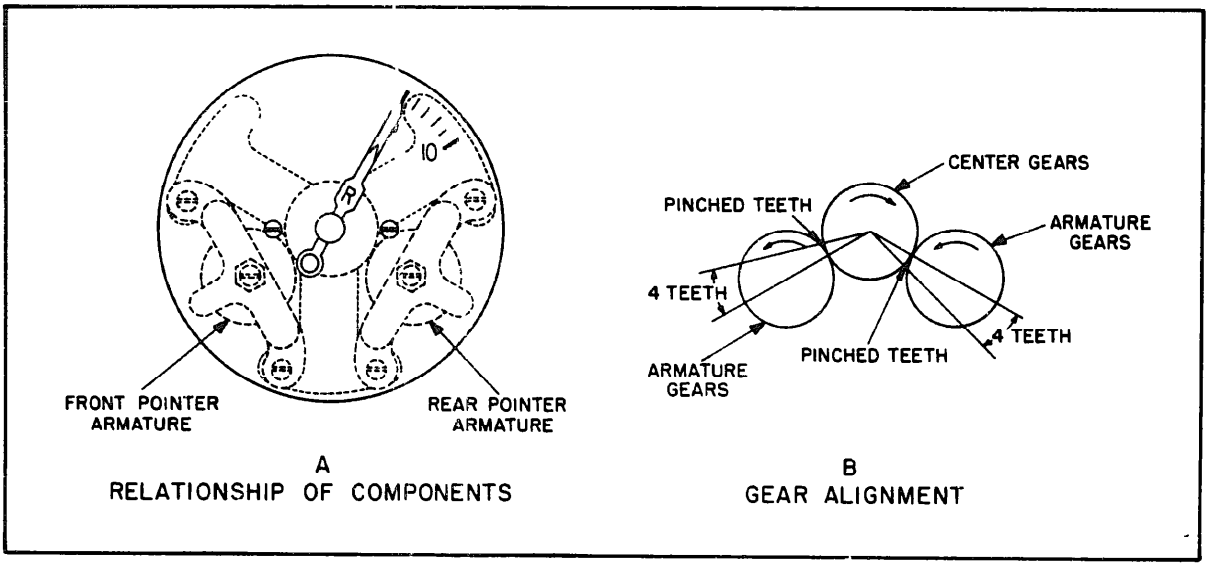

Figure 2-7. Component Relationship and Alignment Data.

a. Assemble head assembly (16) to motor assembly (19), and secure with lockwashers (18) and screws (17).

b. Assemble armature assemblies (13, 13A) to agree with markings, and secure with lockwashers (15) and screws (14). Prior to tightening screws (14), position armature gears and bead assembly gears as shown in figure 2-7, and adjust gear mesh to 1/2-3/4 full depth of tooth.

NOTE

When assembling armature assemblies (13 13A) install each assembly in a radial direction so that the armature shaft passes through the slot in the respective magnet and shaft assembly, and the armatnred isk passes between its magnets.

c. Assemble scale plate (11) to head assembly (16) with scale plate screws (12).

d. Assemble pointers (10 and 9) on shafts, making sure that the pointer hubs are flush with the ends of their respective shafts within 0.005 inch.

e. Counterweights (8), if removed, should not be assembled at this time as they are added during indicator calibration.

NOTE

Prior to installation of the indicator components in the can assembly (5), perform the adjustments and checks described in the following paragraphs.

2-23. Adjustments.

The tests and adjustments in this paragraph should be performed in the given sequence. In addition, observe the following conditions:

a. All room temperature tests shall be made at approximately + 77F (+25C).

b. Unless otherwise specified, the indicator shall be tested in its normal operating position with the dial vertical.

c. Unless otherwise specified, the indicator shall be tapped gently axially before each test reading.

d. Unless otherwise specified, voltages noted herein are AC RMS values. Voltmeters used to measure voltages to the indicator shall be free from wave form and frequency errors over the frequency range used and shall have a minimum resistance of 1000 ohms per volt.

e. Connect the indicator to test setup as shown in figure 2-8.

f. To obtain accurate reading, take precautions to minimize external vibrations from heavy machinery operating nearby, building vibrations from traffic, etc

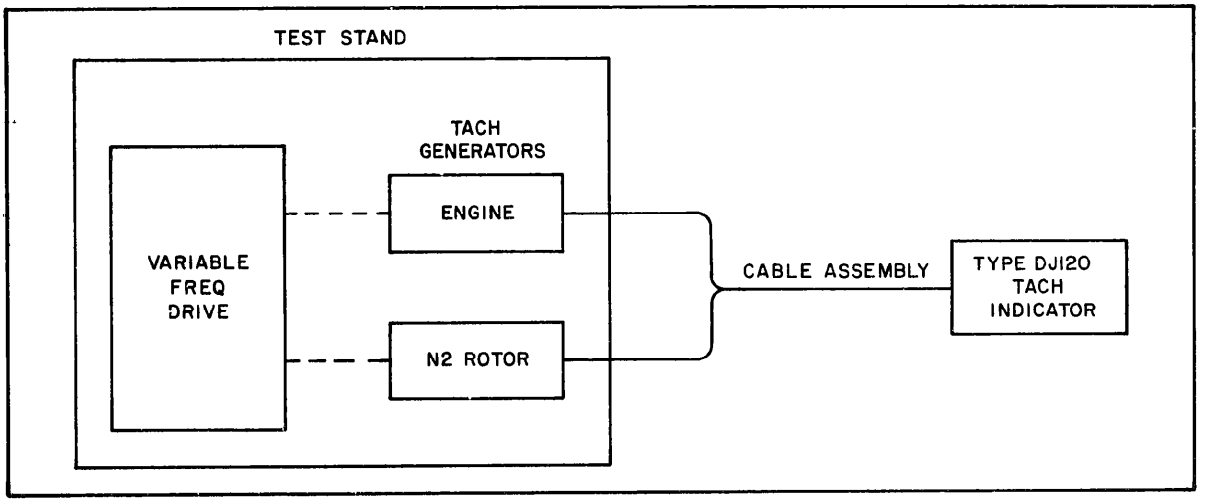

Figure 2-8. Test Setup.

2-24. Temperature Compensation Adjustment.

NOTE

Temperature compensation must be checked whenever a magnet assembly, disk and hub assembly, temperature compensator, or control spring is changed or replaced.

This adjustment is based on the change indicator readings obtained when the indicator is run first at -31F (---35C), +158F(+70C), and then at room temperature at + 77F(+25C). To make termperature-compensation adjustments, proceed as follows using any one of the methods given.

NOTE

When running the test below, energize and read the indicator as quickly as possible to prevent temperature changes due to operation of the indicator. The order of tests should be cold, hot, then room temperature to limit condensation of moisture in the indicator.

2-25. Method Number 1.

The following method of temperature compensation is for use where high accuracy of indication at temperature extremes is required and where —31F(—35C) and/or +158F(+70C) temperature boxes are available.

a. **Soak the indicator (in air) at —31F (—35C) for a minimum of two hours. Remove and run the indicator at 4184 rpm for engine (4200 rpm for rotor) as shown on readout. Read and record the indication of each pointer.**

b. **Repeat *a*, above at + 158F(+70C)**

NOTE

Temperature compensation at + 158F has been added to provide users with a check under more nearly standard operating temperature conditions.

c. Leave the indicator at room temperature for a minimum of one hour and then run the indicator as in a, above. Rend and record the indication of each pointer, This is the reference reading

d. Compare respective reading in a and b above with those in *c*, above When the indicator is correctly temperatur-compensated, the reading of *a*, above, should not differ from the reference reading of *c*,above, by more than 0 6 per cent (25 rpm) The reading of *b*, above, should not differ from the reference reading of *c*, above, by more than ±0.3 per cent (13 rpm). If out of tolerance, perform *e* through *g* below; then, repeat *a*, *b*, and *c* above

NOTE

If any temperature-compensation adjustment is made, a new reference reading *c* above, must be taken

e. Adjust the temperature compensation by using temperature compensators (12 fig 2-4) and dummy compensators (12A) Movement of a single compensator 0 038 inch toward or away from the air gap will change the compensation at —31F (—35C) about 0 1 per cent (4 rpm) at 4184 rpm for engine (4200 rpm for rotor) At + 158F (+ 70C) the effect at 4184 rpm for engine (4200 rpm for rotor) is approximately 0 07 per cent (0 28 rpm) The addition of a single compensator 0 120

inch from the air gap on either the upper or lower magnets will increase the compensation 0.4 per cent (16 rpm) at -31F(-35C) and 0.3 per cent (13 rpm) at +158F(+70C).

f. If the indicator is under-compensated at -31F(-35C) (indication is high), move the temperature compensator(s) toward the air gap, or add compensators. If the indicator is over-compensated at -31F(-35C) (indication is low), move the compensator(s) away from the air gap or remove compensators. For tests at + 158F(+70C), reverse the adjustments.

g. Preferred compensation is obtained when the compensators are located a maximum distance from the gap Thus, when 0.4 per cent (16 rpm) added compensation is needed, add one compensator and one dummy 0.120 inch from the air gap in preference to sliding two compensators 0076 inch toward the gap

CAUTION

Never place the temperature compensators closer than 0.060 inch from the air gap.

h When compensator(s) have finally been positioned, cement in place with glyptol (item 11, table 1-3).

2-26. Methods No. 2 and No. 3.

The following simplified methods of temperature compensation are included for use where high accuracy of indication at temperature extremes is not required or -31F(-35C) and/or +158F(+ 70C) temperature boxes are not available Indication accuracy at normal operating temperatures will not be adversely affected and may be improved.

a For method number 2 operate the indicator at room temperature at 4184 rpm for engine (4200 rpm for rotor) reading as shown on readout. Read and record the indication of each pointer.

b. Place the indicator in a +104F(+40C) ambient and operate as in *a* above for 20 minutes. Read and record the indication at the end of the 20 minutes

c. Compare respective readings *a* and *b*, above. The reading of *b* above shall not differ from *a* above reading by more than 0.2 per cent (8 rpm).

d. Make any necessary compensatory adjustments according to paragraph 2-25 *e* thru *g*; then, repeat *a*, *b*, and *c* above

NOTE

It is preferable that any change in indication at +104F(+40C) be in the negative direction as this will tend to compensate for any slight position change in the zero reading over a period of time.

e. If + 104F(+40C) oven is not available for b above), an alternate method number 3 may be used by wrapping the indicator in two layers of aluminum foil to reduce loss of heat

f. Place the indicator on a surface of low heat conductivity, such as a wooden "V" block, and proceed as in (b) above.

NOTE

Self heat of the indicator will raise its internal temperature as required for the + 140F(+ 40C) reading.

g. When compensator(s) have finally been positioned, cement in place with glyptol (item 11, table 1-3).

2-27. Calibration and Test.

Final calibration adjustment is accomplished through magnetic knockdown, adjustment of magnet air gap, and balance of the indicating elements. Connect the indicator as shown in figure 2-8, and proceed as follows:

a. Operate the indicator and adjust signal of engine element so that the engine (N2) pointer indication is 70 per cent: then, observe the readout. If the engine element's magnet and shaft assembly is saturated, the readout will read under 2932 rpm. Apply a magnetic field of sufficient strength to gradually knockdown the magnet and shaft assembly so that the readout reading is raised to 2932. rpm. If the magnetic field products excessive knockdown for the engine element. either remagnetization of its magnet and shaft assembly or a mew assembly is required.

CAUTION

In applying the field to the indicator, **position field so that the** rotor of the **synchronous motor is free of field.**

b. Repeat (*a* above, using rotor element with an indication of 350 rpm and a reading or 3128 rpm on readout.

c. With the pointers adjusted at zero, operate the indicator at 4184 rpm for engines and 4200 rpm for rotor as shown on readout. Adjust the indicator as accurately as possible at this point by adjusting the air gap so that the indicator reads 100 per cent indication. Distance between the disk and hub assembly and the magnets in the air gap should never be less than 0.010 inch.

NOTE

If the indicator cannot be adjusted at this point, the individual magnet and shaft assemblies should be remagnetized, and the indicator recalibrated.

d. Check balance by scanning calibration at points of approximately 120, 100, 80, 60, 40, and 20 per cent. This will quickly locate, by the degree of calibration error, areas affected by unbalance of the indicating mechanism.

e. Locate the area of greatest error, and position the pointer to the apparent center of this area. Then, holding the indicator in the normal (dial vertical) operating position, observe which balance arm is in the horizontal position and to which adding weight will have a corrective effect. Add counterweights (8, fig. 2-1) as required to the arm determined. If, at the point of greatest error, no balance arm is on the horizontal, it will be necessary to add weight to the two arms straddling this position.

f. Repeat d and e above, as required, until calibration within limits is achieved.

g. Bend the balance arms slightly toward the adjacent gear as a precaution against spring hang up.

2-28. Calibration Check.

Connect the indicator as shown in figure 2-8 and run the tester at the points shown in table 2-3. Indicator readings should be taken at room temperature and should not exceed the tolerances listed in table 2-3.

Table 2-3. Calibration Data

ENGINE (N2) SCALE		GENERATOR			ROTOR SCALE		GENERATOR			INDICATOR FRICTION TOLERANCE ±		POINTER OSCILLATION TOLERANCE ±	
INDICATION	TOL ±	RPM COUNTER READOUT			INDICATION	TOL ±	RPM COUNTER READOUT			ENGINE	ROTOR	ENGINE	ROTOR
%RPM	%RPM	NOMINAL	MINIMUM	MAXIMUM	RPM	RPM	NOMINAL	MINIMUM	MAXIMUM	%RPM	RPM	% RPM	RPM
0	1.0	0	—	—	0	1.0	0	—	—	—	—	—	—
10	1.0	419	377	461	50	1 0	447	405	489	0 5	2	1	—
20	1 0	838	796	880	100	1 0	894	852	936	0.5	2	0.5	2 5
30	1.0	1257	1215	1299	150	1.0	1340	1298	1382	0.5	2	0.5	2.5
40	1.0	1676	1634	1718	200	1.0	1787	1745	1829	0.5	2	0.5	2.5
50	1.0	2095	2053	2137	250	1.0	2234	2192	2276	0 5	2	0 5	2.5
60	1.0	2513	2471	2555	300	1 0	2681	2639	2723	0 5	2	0 5	2 5
70	1.0	2932	2890	2974	350	1.0	3128	3086	3170	0.5	2	0.5	2 5
80	0.8	3351	3371	3385	400	0 8	3574	3541	3607	0 5	2	0 5	2.5
90	0 8	3770	3736	3804	450	0 8	4021	3988	4054	0 5	2	0.5	2.5
100	0 8	4184	4155	4213	470	0 8	4200	4167	4233	0.5	2	0 5	2.5
110	0 8	4608	4574	4642	500	0 8	4468	4435	4501	0 5	2	0 5	2 5
120	1 0	5027	4985	5069	550	1 0	4915	4873	4957	0 5	2	0.5	2.5

2-29. Tests.

Connect the indicator as shown in figure 2-8 and perform the following tests :

a. Scale Error. Take tapped readings for both increasing and decreasing speeds at the calibration points indicated in table 2-3. Accuracy at each scale point should fall within the tolerance specified.

NOTE

For increasing speeds, bring the speed up to but not in excess of the desired speed. For decreasing speeds, the speed should be brought down to, but not below, the desired speed.

b. Friction Error. Operate the indicator at the speeds specified in table 2-3, and note the indication before and after tapping. No reading should be taken until the pointer comes to rest. The friction values {difference between tapped and untapped readings) shall be as specified in table 2-3.

c. Pointer Oscillation. Check oscillation (total excursion of pointer). Maximum allowable oscillation should be within the limits noted in table 2-3.

d. Positron Error. Operate the indicator at 100 per cent indication in normal (dial vertical position and note reading. Then note readings when indicator is rotated 45 degrees to left and right of normal position, and tilted 45 degrees forward or backward from normal position. Readings should not differ more than 0.6 per cent (25 rpm) from the normal position reading.

e. Interaction of Pointers. Check for movement of one of the two pointers held first at zero, then at approximately 50 per cent and 100 per cent speeds, while the second pointer is moved through its entire range. Interaction of pointers must not exceed 0.6 per cent (25 rpm).

f. Low Speed Starting. Run each synchronous rotor separately. Increase test generator speed slowly from start and observe speed at which the motor "kicks" into synchronism. The kick-in point must not exceed 180 cpm.

g. High Speed Starting. Run the two motors simultaneously at generator speeds of 500, 1500, 2500, 3500 and 4500 rpm. At each speed reading disconnect one motor so that its pointer returns to zero; then, reconnect motor- The two motors must attain synchronism within 2.5 seconds after being reconnected.

h. Free Return Check. With the indicator held at approximately 45 degrees downward pitch, increase the signal from zero slowly up to 4000 rpm on readout. Move the indicator to a 45 degree toward pitch. Remove power to indicator allowing indicator to coast down to zero. There shall not be any catching or hesitation of the pointers that might be caused by mechanical interference.

i. Hipot Test. Short all receptacle connector pins together and temporarily place in can. Apply 400 volts, 60 Hz, between the shorted pins and can for five seconds. There must be no insulation breakdown. Remove can assembly.

Section VII. PAINTING AND FINAL REASSEMBLY

2-30. Painting

Touch-up or refinish the painted surface of the can assembly (5, fig. 2-1) with paint (item 9, table 1-3). Prior to painting, mask the window and receptacle connector.

NOTE

Make sure that the surface to be painted is clean.

2-31. Final Reassembly.

Refer to figure 2-1 and proceed as follows to complete final assembly of the tachometer indicator

a. Seal all adjustment points with Glyptol (item 11, table 1-3).

NOTE

Make final visual inspection before installing mechanism into can assembly.

b. Assemble bezel (7) into can assembly (5).

c. With the three tab assemblies (6) positioned on the end of the support cup of the motor assembly (19) as shown in figure 2-9, step 1, carefully slide motor and head assembly into can assembly (5). Make sure that the small vent hole on the forward end of the can assembly is located at the 6 o'clock position.

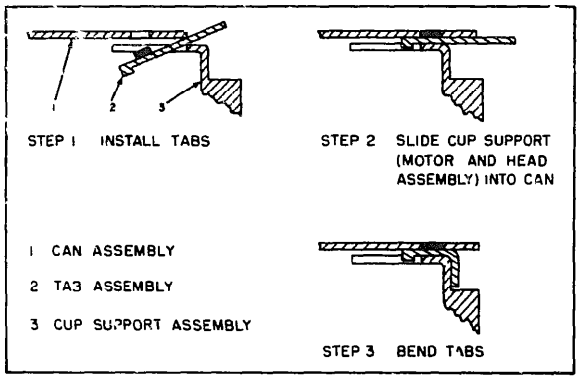

Figure 2-9. Installation of Tab Assemblies.

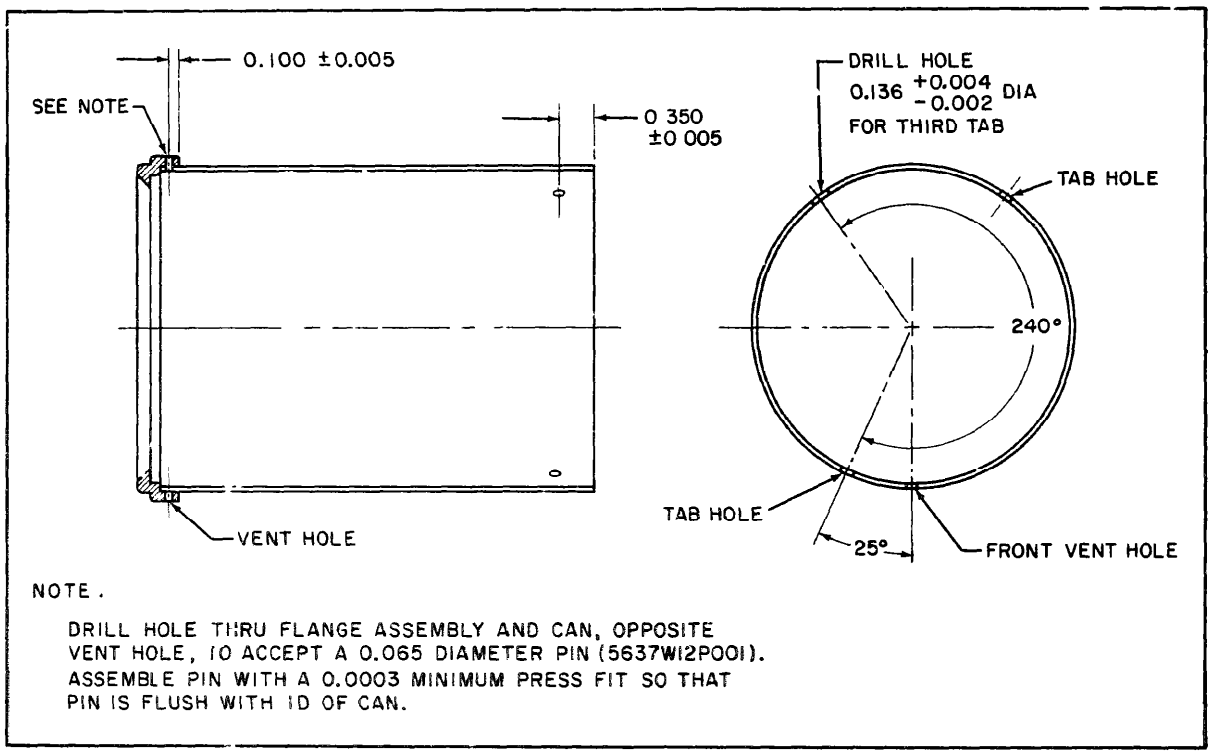

Figure 2-10. Addition of Third Tab Hole.

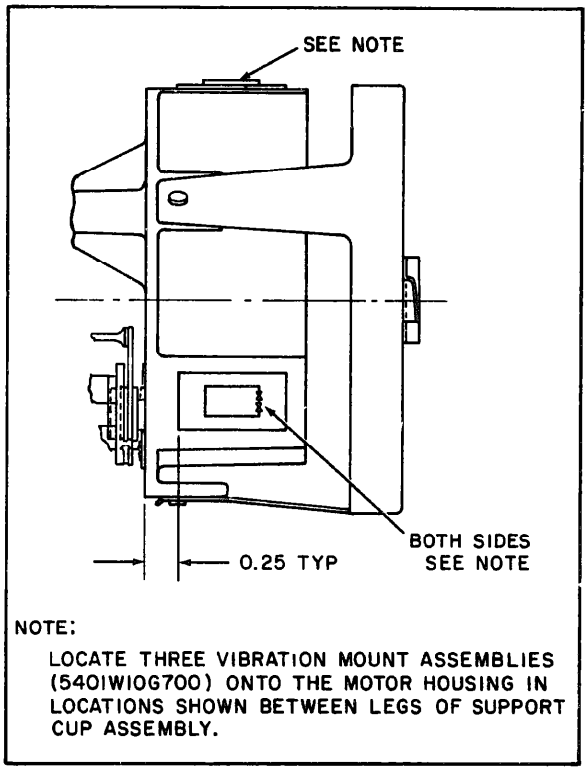

Figure 2-11. Location of Three Vibration Mount Assemblies.

d. Lock tab assemblies (6) in place and secure motor and head assembly in can assembly by bending tabs as shown in figure 2-9, steps 2 and 3.

NOTE

Press motor and head assembly firmly forward against bezel and glass as each tab is pulled to the rear and bent into place.

e. Solder the tab assemblies (6) to the support cup using solder (item 12, table 1-3).

NOTE

Solder area must be confined to center portion of each tab within 1 / 16 inch of both edges.

f. **Assen ble gasket (2), nameplate (1) to the indicator, and secure with lockwasher (4) and** screws (3).

g. **Upon completion of final reassembly, subject the tachometer indicator to final test as described in Chapter 3.**

CHAPTER 3

FINAL TEST PROCEDURES

3-1. Performance Tests.

Repeat the checks and tests in paragraph 2-29.

3-2. Record of Overhaul.

To provide a convenient record of overhaul or modification, a data plate shall be fabricated and installed as follows :

a. Fabricate data plate 1 inch wide by 2 inches long using aluminum foil tape (item 14, table 1-3).

CAUTION

Data shall not be stamped on an installed data plate nor shall the data be stamped directly on any part of this equipment.

b. The markings on the data plate, using letters and figures 1 / 8-inch high, shall include the name of facility performing the overhaul or modification, date of overhaul or modification, contract number.

c. The data plate shall be placed on the can adjacent to the nameplate.

3-3. Troubleshooting.

If trouble occurs during calibration or adjustment of the indicator, refer to the troubleshooting chart, table 3-1, to determine what corrective action is required.

Table 3-1. Troubleshooting Chart

Symptom	Probable Cause	Corrective Action
1. Instrument not within calibration limits	*a.* Magnets not at correct strength	*a.* Resaturate, restabilize and knock-down
	b. Magnet gap not correct	*b.* Re-gap to correct dimension
	c. Wrong spring tension	*c.* Replace spring
	d. Motor does not come up to speed due to dirt or misalignment	*d.* Check for dirty or worn motor bearings; clean or replace
2 Instrument out of limits on friction check	*a.* Dirty jewel bearings and pivots	*a.* Clean
	b. Dirty or broken gears or pinons	*b.* Clean or replace
	c. Dirty ball bearings	*c.* Replace
	d. Dirty disk shaft	*d.* Clean
3. Position error out of limits	*a.* Pointer shaft assembly out of balance	*a.* Balance, using balance weight on balance arms
4. Pointer alignment not within limits	*a.* Improperly set	*a.* Reset pointers
5. Pointer oscillation out of limits	*a.* Motor out of balance or rough bearing	*a.* Correct motor balance; or clean or replace rough bearing.
6. Starting test requirements not met	*a.* Bearing friction or weak magnet rotor.	*a.* Check ball-bearing torque (2 gr mm max (1.8 oz per in)). If bearings are all right, replace magnet rotor.
7. Free return check shows mechanical interference	*a.* Mechanical interference.	*a.* Examine gear train, spring, pointer, bearings, end-shake, etc. for interference and replace parts as necessary

CHAPTER 4

PRESERVATION, PACKING AND MARKING REQUIREMENTS

Preserve, package, pack and mark tachometer indicator package in accordance with instructions contained in figure 4-1.

PRESERVATION, PACKAGING, PACKING AND MARKING REQUIREMENTS

NOMENCLATURE	STOCK NUMBER	
Electrical Tachometer Indicator	6680-948-0532	
	PART NUMBER 8DJ120AAE1	
NET WEIGHT / DIMENSIONS	GROSS WEIGHT	CUBIC FEET

All specifications and standards applicable to the requirements herein shall be the issue in effect on date of invitation for bids

PACKAGING

☒ LEVEL A ☐ LEVEL C

☒ PACKAGING SHALL BE IN ACCORDANCE WITH SPECIFICATION MIL-P-116, THE FOLLOWING DETAILED REQUIREMENTS SHALL APPLY

UNIT PKG QTY	METHOD	PRESERVATIVE	WRAP	DUNNAGE	CONTAINER
1	11d	_____	MIL-B-121 Grade A	PPP-C-1120 Type IV Class A	MIL-D-6055

☐ OTHER

☐ PRESERVATION AND PACKAGING SHALL BE SUCH AS TO PREVENT DETERIORATION OR DAMAGE DURING HANDLING AND SHIPMENT TO THE FIRST DESTINATION

PACKING ☐ LEVEL A ☒ LEVEL C

☐ ITEMS SHALL BE PACKED IN CONTAINERS CONFORMING TO SPECIFICATION NO

☐ PLYWOOD USED SHALL BE STANDARD GRADE WITH EXTERIOR GLUE OF GROUP B OF NN P-530 THIS PLYWOOD SHALL BE TREATED WITH A WATER REPELLANT CONFORMING TO TT-W-572 PLYWOOD CONTAINERS SHALL BE CONSTRUCTED WITH FILLER CLEATS ON ALL PANELS EITHER BE BEVELED OR NOTCHED 1/4 INCH ON THE BOTTOM OF EACH END, OR SHALL BE OF SUCH LENGTH AS TO LEAVE A 1/4 INCH CHANNEL FOR DRAINAGE ON EACH END PER PPP-B-601

☒ ITEM SHALL BE PACKED IN A MANNER TO INSURE CARRIER ACCEPTANCE AND SAFE DELIVERY AT DESTINATION CONTAINERS SHALL BE IN ACCORDANCE WITH UNIFORM FREIGHT CLASSIFICATION RULES OR REGULATIONS OF OTHER CARRIERS APPLICABLE TO THE MODE OF TRANSPORTATION

☐ OTHER

MARKING

☒ a MARKING FOR SHIPMENTS (1968 JUN)
THE CONTRACTOR SHALL MARK ALL SHIPMENTS UNDER THIS CONTRACT IN ACCORDANCE WITH THE EDITION OF MIL STD-129, MARKING FOR SHIPMENT AND STORAGE IN EFFECT AS OF THE DATE OF THIS SOLICITATION (ASPR 7 104 68) IN ADDITION, PART NUMBER AND SERIAL NUMBER SHALL BE MARKED ON UNIT CONTAINER

☐ b ADDITIONAL MARKING REQUIREMENTS. EACH INTERIOR PACKAGE SHALL BE MARKED ON AT LEAST TWO (2) SIDES WITH A SILHOUETTE OF THE AIRCRAFT. (WHERE THE SIZE OF THE UNIT CONTAINER IS TOO SMALL TO PERMIT THE APPLICATION OF TWO (2) LABELS, A SINGLE LABEL SHALL BE APPLIED. IF THE PACKAGE IS TOO SMALL FOR ONE (1) NONE WILL BE REQUIRED.) WHEN THE UNIT CONTAINER IS THE SHIPPING CONTAINER AND THE ITEM IS PACKED LEVEL A EACH CONTAINER SHALL BE MARKED ON TWO (2) SIDES, TOP AND ONE (1) END WITH A SILHOUETTE OF THE AIRCRAFT THE SIZE OF THE SILHOUETTE MAY VARY BUT WILL BE LARGE ENOUGH TO FACILITATE EASY VISUAL IDENTIFICATION WITHOUT OBSCURING OTHER MARKINGS THE CONTRACTING OFFICER WILL SUPPLY LABELS ON REQUEST THE NOMENCLATURE OF THE MAJOR COMPONENTS SHALL BE EXTENDED TO INDICATE THE END ITEM APPLICATION AND THE POSITION OF THE PART e.g., GEAR BOX MAIN FOR (APPLICABLE AIRCRAFT) WING ASSEMBLY RIGHT FOR (APPLICABLE AIRCRAFT)

☒ c MATERIEL CONDITION MARKING SHALL BE APPLIED IN ACCORDANCE WITH PARAGRAPH 5 5 17 OF MIL STD-129 A MATERIEL CONDITION TAG OF THE APPLICABLE TYPE WILL BE SECURELY ATTACHED DIRECTLY TO ALL UNINSTALLED OR STORED AERONAUTICAL OR AIR DELIVERY ITEMS WHEN SUCH ITEMS ARE PLACED OR STORED IN CARTONS PACKAGES CRATES OR METAL SHIPPING CONTAINERS A DUPLICATE MATERIEL CONDITION TAG OR LABEL WILL BE SECURELY ATTACHED TO THE EXTERIOR OF THE PACKAGE OR CONTAINER IN SUCH A MANNER THAT WILL AFFORD MAXIMUM PROTECTION FROM HANDLING AND WEATHER TAGS WILL BE COMPLETED EITHER BY TYPEWRITTEN OR PRINTED BLACK LEAD PENCIL ENTRIES ITEMS OF A COMMON OR NONTECHNICAL NATURE (i e , COMMON HARDWARE, BULK MATERIALS ETC) THE SERVICEABILITY OF WHICH IS OBVIOUS, AND THE IDENTITY AND INSPECTION REQUIREMENTS ADEQUATELY INDICATED BY COMMERCIAL TAGS LABELS OR MARKINGS MAY BE RECEIVED STORED ISSUED OR SHIPPED WITHOUT MATERIEL CONDITION TAGS

☐ d OTHER

Figure 4-1. Preservation, Packing, and Marking Requirements.

APPENDIX A

REFERENCES

NUMBER	TITLE
TM 38-750	The Army Maintenance Management System

APPENDIX B

REPAIR PARTS AND SPECIAL TOOLS LIST

(Current as of 16 March 1971)

Section I. INTRODUCTION

B-1. Scope.

This appendix lists repair parts, special tools, test and support equipment, and maintenance supplies required for the performance of general support maintenance of the indicator, electrical tachometer.

B-2. General.

This repair parts and special tools listing is divided into the following sections:

a. Repair Parts - Section II. A list of repair parts authorized for the performance of maintenance at the general support level in figure and item number sequence. Maintenance supplies (MSUP) are listed within the section in ascending Federal stock number sequence.

b. Special Tools, Test and Support Equipment -Section III. Not applicable.

c. Federal Stock Number and Reference Number Index - Section IV. This section is divided as follows :

(1) A list of Federal stock numbers in ascending numerical sequence cross-referenced to the illustration figure and item number.

(2) A list of reference numbers in ascending alphanumerical sequence cross-referenced to the manufacturer's Federal supply code, illustration figure and item number.

-3. Explanation of Columns.

The following provides an explanation of columns in the tabular lists in section II :

a. Source, Maintenance and Recoverability Codes (SMR), Column I.

(1) Source code indicates the selection status and source for the listed item. Source codes are:

CODE	EXPLANATION
P	Repair Parts, Special Tools and Test Equipment supplied from the GSA / DSA, or Army supply system, and authorized for use at indicated maintenance categories.
P2	Repair Parts, Special Tools and Test Equipment which are procured and stocked for insurance purpose because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
P9	Assigned to items which are NSA design controlled: Unique repair parts; special tools; test, measuring and diagnostic equipment—which are stocked and supplied by the Army COMSEC Logistic System and which are not subject to the provisions of AR 380-41.
P10	Assigned to items which are NSA design controlled: Special tools; test, measuring and diagnostic equipment for COMSEC support which are accountable under the provisions of AR 380-41 and which are stocked and supplied by the Army COMSEC Logistic System.
M	Repair parts, special tools and test equipment which are not procured or stocked, as such, in the supply system but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.

CODE	EXPLANATION
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item of component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked The requirement for such items will be filled by the next higher assembly or component.
X2	Repair parts, special tools, and test equipment which are not stocked and have no foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage The item may be requisitioned with exception data from the end item manager for immediate use.
G	Major assemblies that are procured with PEMA funds initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above the DS and GS level or returned to depot supply level

NOTE: Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded X1 and aircraft support items are restricted by AR 700-42.

(2) Maintenance code indicates the lowest category of maintenance authorized to !l the listed item. The maintenance level codes are:

CODE	EXPLANATION
C	Crew or operator maintenance.
O	Organizational maintenance.
F	Direct support maintenance
H	General support maintenance

(3) Recoverability code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are nonrecoverable. Recoverability codes are:

CODE	EXPLANATION
R	Applied to repair parts (assemblies and components). special tools, and test equipment which are considered economically reparable at direct and general support maintenance levels When the item is no longer economically reparable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts, special tools, test equipment, and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	Higher dollar value recoverable repair parts, special tools and test equipment which are subject to special handling and are issued on an exchange basis Such items will be repaired or overhauled at depot maintenance activities only No repair may be accomplished at lower levels
L	Repair parts, special tools, and test equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value, or reusable casings or castings

b. Federal Stock Number, Column 2 Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes Items source coded A, M, X1, or X2 are not assigned a Federal stock number.

c. Description, Column 3 Indicates the Federal item name and any additional description of the item required The description column contains the following subcolumns

(1) Reference number and manufacturer's code. Indicates a part number or other reference number for the listed item followed by the applicable five-digit Federal supply code for manufacturers, in parentheses.

(2) Usable on code. Not applicable.

d. Unit of Measure (U / M), Column 4. A Z-character alphabetical abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., FT, EA, PR.

e. Quantity Incorporated in Unit, Column 5. Indicates the quantity of the item used in the assembly. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated.

f. Thirty-day GS Maintenance Allowance, Column 6.

(1) The allowance column is divided into three subcolumns. Indicated in each subcolumn, opposite the first appearance of each item, is the total quantity of items authorized for the number of equipments supported Subsequent appearances of the same item will have the letters "REF" in this column. Items authorized for use as required, but not for initial stockage, are identified with an asterisk (*) in the allowance column.

(2) The quantitative allowance for GS level of maintenance will represent initial stockage for a 30-day period for the number of equipments supported.

(3) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized allowance for 51-100 allowance column. Example: authorized allowance for 51-100 equipments is 40; for 150 equipments, multiply 40 by 1.50, or 60 parts required.

(4) The basis of issue for authorized special tools, test, and support equipment is the number of end items of equipment supported.

g. One-year Allowance per 100 Equipments / Contingency Planning Purposes, Column 7. Indicates opposite the first appearance of each item, the total quantity required for distribution and contingency planning purposes. The range of items indicates total quantities of all authorized items required to provide for adequate support of 100 equipments for 1 year.

h Depot Maintenance Allowance per 100 Equipments, Column 3. Not applicable.

i. Illustration. Column 9. Illustrations appear in the narrative portion of this manual. This column is divided as follows:

(1) Figure number. column 9a. Indicates the figure number of the illustration in which the item is shown. Appearances of the letters "**MSUP**" in this column indicate maintenance supplies located in section II

(2) Item number, column *9b*. **Indicates the callout number to reference the item in the illustration.**

B-4. Special Information.

Action codes indicated in the left-hand margin of the listing page denote the following:

N - Indicates an added item not included in previous publication.

C - Indicates a change in data.

F - Indicates a change in FSN only.

B-5. How to locate Repair Parts.

a. When Federal Stock Number or Reference Number is Unknown:

(1) *First.* **Find the exploded view illustration of the assembly or subassembly 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 listed in the illustration column.**

b. When Federal Stock Number or Reference Number is Known:

(1) First. Using the index of Federal stock numbers and reference numbers, find the pertinent Federal stock number or reference number. This index is in ascending Federal stock number sequence followed by a list of reference numbers in ascending alphanumerical sequence, cross-referenced to the illustration figure and item number.

(2) Second. Using the repair parts listing, find the figure and item number listed in the illustration column referenced in the index of Federal stock numbers and reference numbers.

-6. Federal Supply Codes for Manufacturers.

CODE	MANUFACTURER
13499	Collins Radio Co 5225 Ave C NE Cedar Rapids IA 52406
18876	Army Missile Command Redstone Arsenal AL
80510	Allen R C Inc 678 Front Ave NW Grand Rapids MI 49501
81348	Federal Specifications Promulgated by General Services Administration
81349	Military Specifications Promulgated by Standardization Div Directorate of Logistic Services DSA
89954	General Electrical Co Avionic Controls Dept P O Box 5000 Binghamton NY 13902
96906	Military Standards Promulgated by Standardization Div Directorate of Logistic Services DSA
97424	General Electric Co Aerospace Electrical Equipment Dept 40 Federal St West Lynn MA 01905
98911	Armstrong Products Co Inc P O Box 657 Warsaw IN 46580

(1) SMR CODE	FEDERAL STOCK NUMBER	REFERENCE NUM	MFR CODE	(3) DESCRIPTION	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY MAINT ALW GS (a) 1 20	(b) 21 50	(c) 51 100	(7) 1 YR ALWPER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
	6680-948-0532	8DJ12CAAE1	(97424)	INDICATOR,ELECTRICAL TACHOMETER...		EA							1-1	
				SECTION II REPAIR PARTS INDICATOR,ELECTRICAL TACHOMETER										
P--H--	6680-113-0733	3830K75P004	(97424)	GASKET.....		EA	1	*	*	*			2-1	2
P--H--	5305-925-9948	320-0010-00	(13499)	SCREW,MACHINE.....		EA	3	*	*	*			2-1	3
P--H--	5310-062-1889	N406P1	(97424)	WASHER,LOCK.....		EA	3	*	*	*			2-1	4
P--H--	6680-113-0737	2037K75G700	(97424)	HOUSING,TACHOMETER.....		EA	1	*	*	*			2-1	5
P--H--	6680-113-0730	8222K70G701	(97424)	TAB ASSEMBLY.....		EA	3	*	*	*			2-1	6
P--H--	6695-104-4649	1497K75P001	(97424)	BEZEL,INSTRUMENT.....		EA	1	*	*	*			2-1	7
P--H--	6662-181-4249	5362K71G702	(97424)	MOTOR AND HEAD ASSEMBLY.....			1						2-1	
P--H--	5355-144-6944	4152244P003	(97424)	.COUNTERWEIGHT.....		EA	V	*	*	*			2-1	8
P--H--	5355-131-7462	4145642G315	(97424)	.POINTER,DIAL.....		EA	1	*	*	*			2-1	9
P--H--	6680-113-0735	4145642G316	(97424)	.POINTER,DIAL.....		EA	1	*	*	*			2-1	10
P--H--	5305-603-2146	6466K29P001	(97424)	.SCALE,TACHOMETER.....		EA	1	*	*	*			2-1	11
X1----		4149392P006	(97424)	.SCREW,MACHINE.....		EA	2	*	*	*			2-1	12
X1----		1230K71G704	(97424)	.ARMATURE ASSEMBLY.....			1						2-1	13
P--H--	5305-945-0505	1230K71G705	(97424)	.ARMATURE ASSEMBLY.....			1						2-1	13A
P--H--	5310-933-8118	MS35275-212	(96906)	.SCREW,MACHINE.....		EA	4	*	*	*			2-1	14
X1----		MS35338-135	(96906)	.WASHER,LOCK.....		EA	4	*	*	*			2-1	15
P--H--	5305-054-6652	4167K71G701	(97424)	HEAD ASSEMBLY.....			1						2-1	16
P--H--	5310-262-1743	MS51957-28	(96906)	SCREW,MACHINE.....		EA	3	*	*	*			2-1	17
X1----		N40697	(97424)	WASHER,LOCK.....		EA	3	*	*	*			2-1	18
		5360K72G702	(97424)	MOTOR,ASSEMBLY.....			1						2-1	19
				ARMATURE ASSEMBLY										
X1----														
X1----		1230K71G704	(97424)	ARMATURE ASSEMBLY.....			1						2-2	
P--H--	6680-126-3753	1230K71G705	(97424)	ARMATURE ASSEMBLY.....			1						2-2	
X2-H--		4152232G015	(97424)	.DISK AND HUB ASSEMBLY.....		EA	1	*	*	*			2-2	1
P--H--	5305-054-5636	5674K62P001	(97424)	.PLATE,ARMATURE.....		EA	1						2-2	2
P--H--	5310-993-0662	MS51957-2	(96906)	.SCREW,MACHINE.....		EA	2	*	*	*			2-2	3
P--H--	5310-945-4474	N406P3	(97424)	.WASHER,LOCK.....		EA	2	*	*	*			2-2	4
P--H--	6695-103-0012	4137168P001	(97424)	.NUT,SPECIAL.....		EA	1	*	*	*			2-2	5
X2-H--		4694K70G704	(97424)	.JEWEL AND SCREW...		EA	1	*	*	*			2-2	6
P--H--	5305-619-6148	1181K74P003	(97424)	.ARM,ADJUSTING.....		EA	1						2-2	7
P--H--	5310-966-5687	4149355P002	(97424)	.SCREW,MACHINE.....		EA	1	*	*	*			2-2	8
P--H--	6680-113-5601	310-6230-00	(13499)	.WASHER,FLAT.....		EA	1	*	*	*			2-2	9
		4152127G017	(97424)	.ARMATURE SUBASSEMBLY..... U/O PN 1230K71G704		EA	1	*	*	*			2-2	10

(1) SMR CODE	FEDERAL STOCK NUMBER	REFERENCE NUMBER & MFR CODE	(3) DESCRIPTION	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY CS MAINT ALW (a) 1 20	(b) 21 50	(c) 51 100	(7) 1 YR ALWPER 100 EQUIP NTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
P--H--	6680-113-5602	4152127C018	(97424) .ARMATURE SUBASSEMBLY..... U/O PN 123OK71G705		EA	1	*	*	*			2-2	10A
P--H--	5360-151-7351	7925K72P002	(97424) ..SPRING,CONTACT.....		EA	1	*	*	*			2-2	11
P--H--	6695-102-3925	4249399G005	(97424) .JEWEL AND SCREW ASSEMBLY.....		EA	1	*	*	*			2-2	12
P--H--	5310-945-4474	4137168P001	(97424) .NUT,SPECIAL.....		EA	1	*	*	*			2-2	13
P--H--		5709K883700	(97424) .POST AND ASSEMBLY.....		EA	1						2-2	14
			HEAD ASSEMBLY										
X1----		4167K71G701	(97424) HEAD ASSEMBLY.....			1						2-3	
X2-H--		5711178G700	(97424) .PLATE,SUPPORT.....		EA	1						2-3	1
P--H--	5305-820-7616	41W362P007	(97424) .SCREW,MACHINE.....		EA	3	*	*	*			2-3	2
P--H--	5310-945-4474	4137168P001	(97424) .NUT,SPECIAL.....		EA	1	*	*	*			2-3	3
P--H--	6695-103-0012	4694K7GG704	(97424) .JEWEL AND SCREW ASSEMBLY.....		EA	1	*	*	*			2-3	4
X2-H--		7925K74G701	(97424) .SHAFT ASSEMBLY.....		EA	1						2-3	5
P--H--	6695-104-4655	4688K74P002	(97424) .JEWEL,BEARING.....		EA	1	*	*	*			2-3	6
P--H--	6695-10-4654	4688K74P001	(97424) .JEWEL,BEARING.....		EA	1	*	*	*			2-3	7
P--H--	3040-113-0736	3880K73G701	(97424) .GEARSHAFT.....		EA	1	*	*	*			2-3	8
X2-H--		5709K87G700	(97424) .PLATE AND POST ASSEMBLY.....		EA	1						2-3	9
			MOTOR ASSEMBLY										
X1----		5306K72G702	(97424) MOTOR ASSEMBLY.....			1						2-4	
P--H--	5315-523-6136	5468435-040	(97424) .CUP ASSEMBLY.....		EA	1	*	*	*			2-4	1
P--H--	6626-606-0412	5468435P001	(97424) .PIN.....		EA	2	*	*	*			2-4	2
P--H--	6620-606-0441	5468417P001	(97424) .WHEEL,BALANCE.....		EA	2	*	*	*			2-4	3
P--H--	5319-033-5399	5468434P001	(97424) .SPRING.....		EA	2	*	*	*			2-4	4
P--H--	6620-606-0440	063105	(80510) .WASHER,FLAT.....		EA	2	*	*	*			2-4	5
P--H--	6620-606-0443	5468479G001	(97424) .ROTOR ASSEMBLY.....		EA	2	*	*	*			2-4	6
P--H--	5306-595-3778	5468401P001	(97424) .ROTOR ASSEMBLY.....		EA	2	*	*	*			2-4	7
P--H--	3110-791-0817	4152111P001	(97424) .SPACER,SLEEVE.....		EA	2	*	*	*			2-4	8
P--H--	5306-595-3778	5468401P001	(97424) .BEARING,BALL,ANNULAR.....		EA	2	*	*	*			2-4	9
P--H--	6626-176-1515	5124K71G700	(97424) .SPACER,SLEEVE.....		EA	2	*	*	*			2-4	10
P--H--	5306-595-3128	5468401P001	(97424) .SHAFT AND GEAR ASSEMBLY.....		EA	2	*	*	*			2-4	11
			(97424) ..COMMUTATOR,[illegible].....		EA	V	*	*	*			2-	12
X1----		5117-3C-52	(97424) ..[illegible].....		EA	V	*	*	*			2-4	13
P--H--	531-113-11	10[illegible]	(97424) ..BRACKET ASSEMBLY.....			1						2-4	14
P--H--	531-113-1106	10[illegible]	(97424) ..[illegible],PLAT,[illegible].....		EA	2	*	*	*			2-4	15
X1----		[illegible]	(97424) ..STUD,PLAT,[illegible].....			1						2-	16
P--H--	5315-071-7651	[illegible]	(97424) .. [illegible].....		EA	2	*	*	*			2-	17
P--H--	5305-[illegible]	[illegible]	(97424) ..[illegible],PLAIN.....		EA	4	*	*	*			2-	18
P--H--	3110-791-0819	4152111P001	(97424) .CONE,[illegible].....		EA	2	*	*	*			2-4	19
			(97424) .BEARING,BALL,ANNULAR.....		EA	2	*	*	*			2-4	20

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY GS MAINT ALW (a) 1 20	(b) 21 50	(c) 51 100	(7) 1 YR ALWPER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
X1----		4322K73G701	(97424)	.HOUSING ASSEMBLY.....			1						2-4	
X2-H--		5468434G007	(97424)	..STATOR AND COIL ASSEMBLY.....		EA	2						2-4	20
X2-H--		4329K70P003	(97424)	..HOUSING,MOTOR.....		EA	1						2-4	21
				MAINTENANCE SUPPLIES										
P--H--	3439-224-3567			SOLDER,TIN ALLOY-FED QQ-S-571.....		E.	V	*	*	*			MSUP	
P--H--	5790-161-7421	1201	(89954)	INSULATING VARNISH.....		PT	V	*	*	*			MSUP	
P--H--	6615-719-7217			SYRINGE AND NEEDLE HYPODERMIC-..... FED GG-S-00945		EA	V	*	*	*			MSUP	
P--H--	6810-184-4796			ACETONE,TECHNICAL-FED O-A-51.....		GL	V	*	*	*			MSUP	
P--F--	6810-238-8119			NAPHTHA,ALIPHATIC-FED TT-N-95.....		GL	V	*	*	*			MSUP	
P--H--	6810-281-5275			BENZENE,TECHNICAL-FED VV-B-231.....		GL	V	*	*	*			MSUP	
P--H--	6810-290-0048			TOLUENE,TECHNICAL-FED TT-T-548.....		GL	V	*	*	*			MSUP	
P--H--	6810-664-0387			TRICHLOROETHANE.....		GL	J	*	*	*			MSUP	
P--F--	6810-855-6160	801032	(18876)	ISOPROPYL ALCOHOL,TECHNICAL-..... FED TT-I-735		GL	V	*	*	*			MSUP	
P--O--	8010-161-7253			LACQUER-FED TT-L-58.....		PT	V	*	*	*			MSUP	
P--H--	8010-664-8263			ENAMEL,HEAT RESISTING, MIL-E-5557...		QT	V	*	*	*			MSUP	
P--F--	8030-720-7516			TAPE,PRESSURE SENSITIVE ADHESIVE-.. FED L-T-80		YD	V	*	*	*			MSUP	
P--H--	8040-068-8668			ADHESIVE.....		OZ	V	*	*	*			MSUP	
P--H--	9150-664-0047	12	(98911)	DAMPING FLUID,MIL-S-21568.....		EA	V	*	*	*			MSUP	

SECTION III
SPECIAL TOOLS, TEST
AND SUPPORT EQUIPMENT
(NOT APPLICABLE)

SECTION IV
FEDERAL STOCK NUMBER AND REFERENCE NUMBER INDEX

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
3040-113-0736	2-3	8
3110-791-9847	2-4	9
3110-791-9847	2-4	19
3400-224-3567	MSUP	
5305-054-5636	2-2	3
5305-054-6652	2-1	17
5305-603-2146	2-1	12
5305-619-6148	2-2	8
5305-820-7616	2-3	2
5305-820-7616	2-4	18
5305-925-994s	2-1	3
5305-945-0505	2-1	14
5310-033-5329	2-4	5
5310-062-1889	2-1	4
5310-262-1743	2-1	18
5310-443-1196	2-4	14
5310-443-1196	2-4	15
5310-933-8118	2-1	15
5310-945-4474	2-2	5
5310-945-4474	2-2	13
5310-945-4474	2-3	3
5310-966-5687	2-2	9
5310-993-0662	2-2	4
5315-523-6136	2-4	2
5355-131-7462	2-1	10
5355-144-6944	2-1	9
5360-151-7351	2-2	11
5970-161-7421	MSUP	
6615-719-7217	MSUP	
6620-182-4249	2-1	8
6620-585-3778	2-4	8
6620-585-3779	2-4	10
6620-606-0440	2-4	6
6620-606-0441	2-4	4
6620-606-0442	2-4	3
6620-606-0443	2-4	7
6620-628-2120	2-4	12A
6620-628-2123	2-4	12
6680-113-0730	2-1	6
6680-113-0733	2-1	2
6680-113-0735	2-1	11
6680-113-0737	2-1	5
6680-113-5600	2-4	1
6680-113-5601	2-2	10
6680-113-5602	2-2	10A
6680-126-3753	2-2	1
6680-179-1515	2-4	11
6680-871-7061	2-4	17
6680-948-0532	1-1	
6695-102-3925	2-2	12
6695-103-0012	2-2	6
6695-103-0012	2 3	4
6695-104-4649	2-1	7
6695-134-4654	2-3	7
6695-104-4655	2-3	6
6810-184-4796	MSUP	
6810-238-8119	MSUP	
6810-281-5275	MSUP	
6810-290-0048	MSUP	
6810-664-0387	MSUP	
6810-855-6160	MSUP	
8010-161-7253	MSUP	
8010-644-8263	MSUP	
8030-720-7516	MSUP	
8040-068-8668	MSUP	
9150-664-0047	MSUP	

SECTION IV (Cont)

REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER
C63105	80510	2-4	5
MS35275-212	96906	2-1	14
MS35338-135	96906	2-1	15
MS51957-2	96906	2-2	3
MS51957-28	96906	2-1	17
N406P1	97424	2-1	4
N406P3	97424	2-2	4
N40697	97424	2-1	18
1181K74P003	97424	2-2	7
12	98911	MSUP	
1201	89954	MSUP	
1230K71G704	97424	2-1	13
1230K71G704	97424	2-2	
1230K71G705	97424	2-1	13A
1230K71G705	97424	2-2	
1297794P001	97424	2-4	14
1297794P00l	97424	2-4	15
1497K75P001	97424	2-1	7
2037K75G700	97424	2-1	5
310-6230-00	13499	2-2	9
320-0010-00	13499	2-1	3
3830K75P004	97424	2-1	2
3880K73G701	97424	2-3	8
4137168P001	97424	2-2	5
4137168P00l	9742..	2-2	13
4137168P001	97424	2-3	3
4145642G315	97424	2-1	9
4145642G316	97424	2-1	10
4149355P002	97424	2-2	8
4149392P006	97424	2-1	12
4149392P007	97424	2-3	2
4149392P007	97424	2-4	18
4149399G005	97424	2-2	12
4152216P001	97424	2-4	9
4152116P001	97424	2-4	19
4152127G017	97424	2-2	10
4152127C018	97424	2-2	10A
4152232G0L5	97424	2-2	1
4152244P003	97424	2-1	8
4167K71G701	97424	2-1	16
4167K71G701	97424	2-3	
4322K736701	97424	2-4	
4329K70P003	97424	2-4	21
4688K74P001	97424	2-3	7
4688K74P00	97424	2-3	6
4694K70G704	97424	2-2	6
4694K70G704	97424	2-3	4
5147K73G701	97424	2-4	13
5151K7lG700	97424	2-4	11
5360K72G702	97424	2-1	19
5360372G702	97424	2-4	
5362K716702	97424	2-1	
5462078G001	97424	2-4	6
5462491P001	97424	2-4	2
5468416P00	97424	2-4	4
5468417P001	97424	2-4	3
5468421P001	97424	2-4	10
5468421P00	97424	2-4	8
5468427G01	97424	2-4	7
5468434G00	97424	2-4	20
5468435G00	97424	2-4	1
546846LP001	97424	2-4	12
5468461P002	97424	2-4	12A
5674K62P00l	97424	2-2	2
5709K876700	97424	2-3	9
5709K88G700	97424	2-2	14
5711K78G700	97424	2-3	1
6220K70P001	97424	2-4	17
646GK29P001	97424	2-1	11
7425K74G701	97424	2-3	5
7425K75G702	97424	2-4	16
7925K72P002	97424	2-2	11
8DJ120AAE1	97424	1-1	
801032	18876	MSUP	
8222K70G701	97424	2-1	6

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official

VERNE L BOWERS,
Major General. United States Army,
The Adjutant General.

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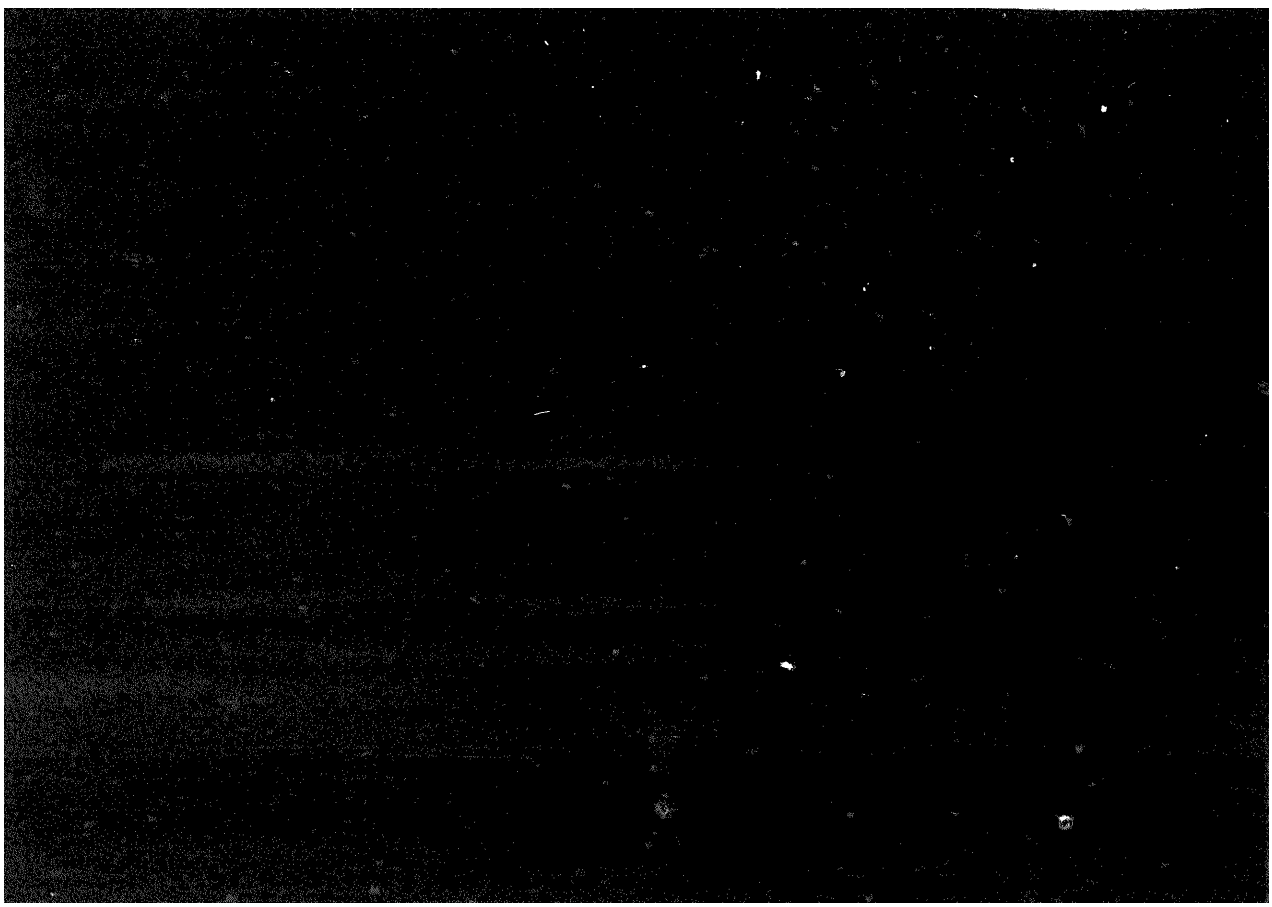

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