1/10 AND 1/8 HP DC MOTORS
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the 1/10 and 1/8 hp d-c precision interrupter motors and the 1/8 hp d-c test frame motors per KS-5224, KS-5109, and KS-5072, respectively.

1.02 It is reissued to change lubrication requirement intervals, to change form of temperature requirements from rise above ambient to total, to include information on rotating speed regulator contacts that may be replaced in the field, to rearrange and reword the text, and in general bring the section up-to-date. Significant changes are marked by arrows.

1.03 Reference shall be made to Section 020-010-711 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

1.04 Requirements and associated procedures marked with a number (#) sign need not be checked by the installer unless it is thought that the requirement is not being met or performance indicates that such a check is advisable.

1.05 Requirements and associated procedures marked with an asterisk (*) need not be checked during maintenance unless the apparatus or part is made accessible for other reasons, or performance indicates that such a check is advisable.

1.06 Successful commutation may be said to have been obtained if neither the brushes, the commutator nor the collector rings are burned or damaged during normal service to the extent that abnormal maintenance is required.

1.07 Normal operation may be defined as a condition in which the motor is carrying any load from no load to full load, with the input voltage within the limits stamped on the nameplate.

1.08 The field resistors or rheostats associated with these d-c motors are not interchangeable. It has been the general practice to stamp the field resistors or rheostats with the serial number of the associated motor. Should it be necessary to replace a motor the field resistors or rheostats shall also be replaced.

2. REQUIREMENTS

2.01 Lubrication: The bearings shall be cleaned and relubricated with 260-300P grease after every three years of operating service, when being put into service after one or more years of storage or after having been dismantled.

*#2.02 The bearings shall be free from excessive wear. If the maching operates satisfactorily under all conditions of normal operation and with 2.04 and 2.11 met, the bearings shall be considered to be in satisfactory condition.

Note: Abnormal noise from a ball bearing is an indication of excessive wear.

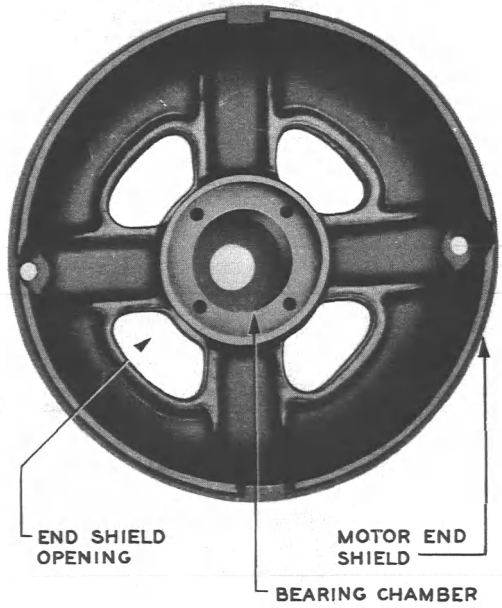

Fig. 1 - Motor End Shield and Bearing Details

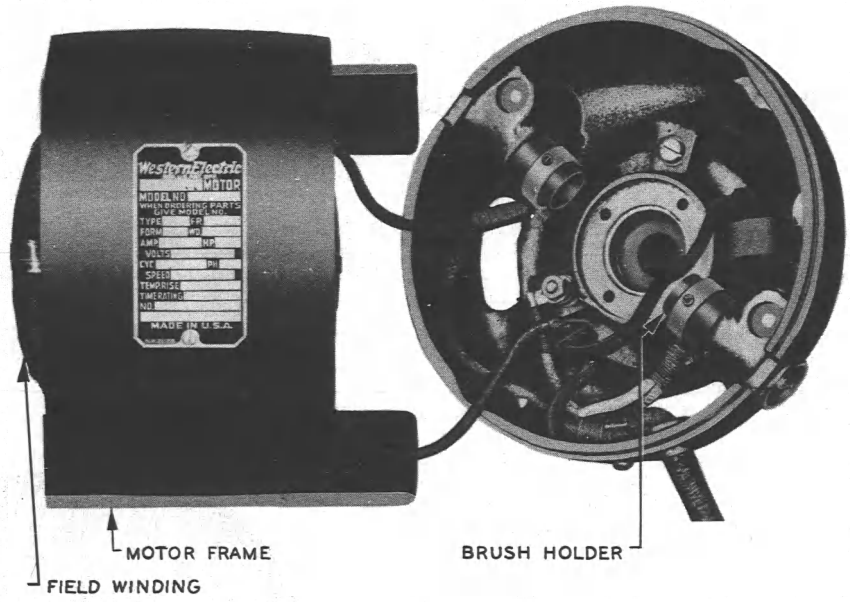

Fig. 2 - Motor Frame and End Shield

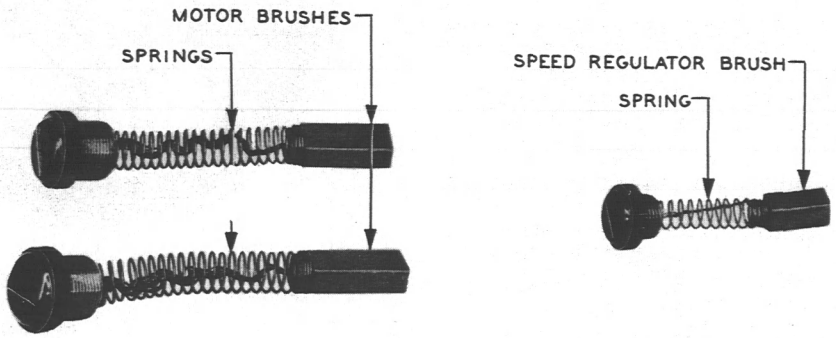

Fig. 3 - Brushes

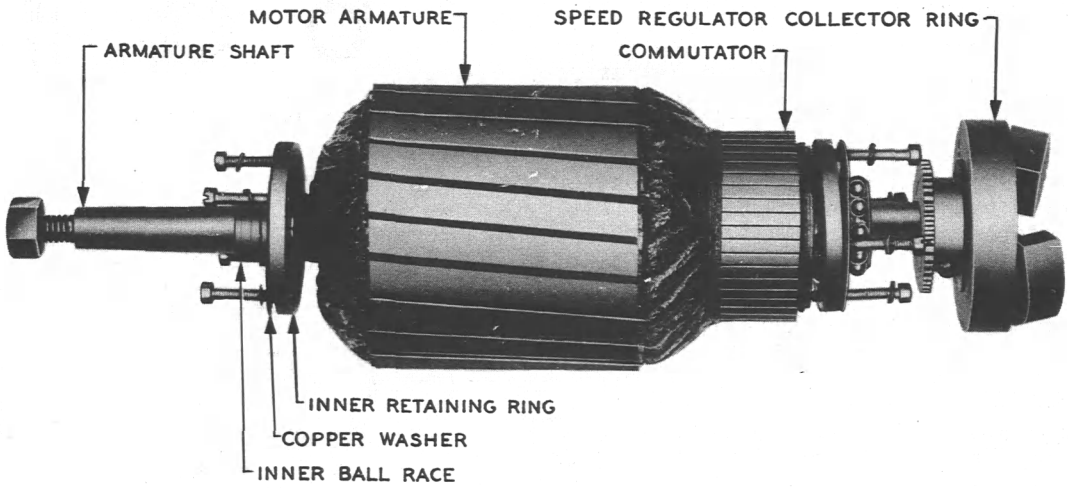

Fig. 4 - Armature Assembly

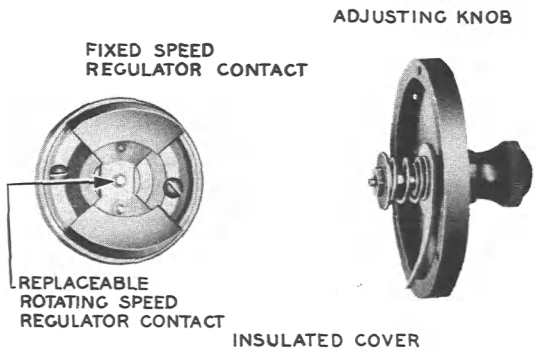

Fig. 5 - Speed Regulator

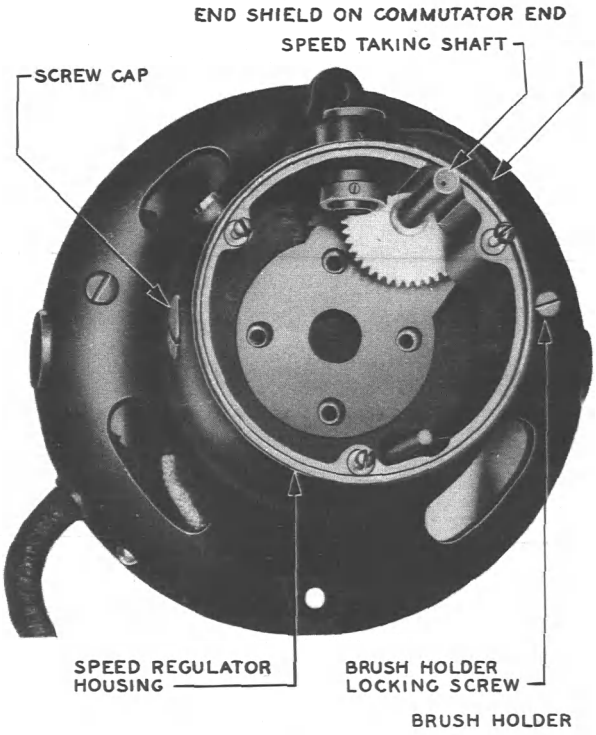

Fig. 6 - Speed Regulator Housing

2.03 Freedom of Rotation: The shaft of the motor armature shall turn freely in the bearings.
Gauge by feel.

2.04 The noise and vibration of the motor, under all conditions of normal operation, shall not be excessive. Gauge by sound and feel.

2.05 Speed

(a) During normal operation the motor speed shall be:

Minimum 1752 rpm
Maximum 1790 rpm

(b) When it is necessary to readjust the motor speed, the regulator contacts shall be so adjusted that the speed will be approximately 1770 rpm.

Use Speed Indicator.

#2.06 Commutator and collector rings shall be clean, smooth and free from scoring, pitting, or other deformation except that caused by normal wear. The eccentricity shall not be enough to cause poor operation.

*#2.07 Commutation shall be successful under all conditions of normal operation.
Gauge by eye.

*#2.08 Brush Holders

(a) The clearance between the commutator or collector ring and the edge of the brush holder shall be:

Minimum 1/32 inch
Maximum 5/64 inch

Gauge by eye.

(b) The speed regulator brush holder shall be set so that two sides of the brush are parallel to the shaft.
Gauge by eye.

(c) Brush holder set screws shall be tight. Gauge by feel with a screwdriver.

2.09 Brushes

(a) The brush length outside of the spring shall be:

	Minimum
Motor brushes	3/8 inch
Speed regulator brushes	1/4 inch

Use scale.

(b) Brushes shall not bind in their holders; neither shall they be loose enough to cause poor commutation.
Gauge by eye.

#2.10 Speed Regulator Contacts

(a) The contact surfaces shall be clean and smooth.

(b) The length of each fixed or rotating center contact metal shall be:

Minimum 0.015 inch

Gauge by eye.

*#2.11 Temperature: Under normal operating conditions the temperature shall not exceed:

	Maximum
Bearings	80C(176F)
Frame	90C(194F)

If the temperature is thought to be excessive measure by thermometer.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges and Materials (Equivalents may be substituted)

Tools

- Bellows, Hand, 10"
- Brush, Typewriter, Toothbrush Type
- Pliers, P-long-nose, 6-1/2"
- Puller, Inner Race, E13IRP-1
- Puller, Outer Race, E130RP-1
- Screwdriver, Regular, 4"
- Screwdriver, 3-1/2", KS-6854
- Stone, Carborundum, 87698M
- Stud, 309 Tool
- Wrench, Socket, 3/8" Hex. 46 Tool

Gauges

- Indicator, Speed, Hasler Style A or Jones 5B
- Scale, Steel, 6" R-8550
- Thermometer, R-1032, Detail 1

Materials

- Cloth, Cleaning, KS-14666
- Grease, 260-300P
- Pad, Felt
- Sandpaper, 4/0
- Spirits, Petroleum

3.002 Before making any tests or adjustments not requiring power be sure to open the circuit so that the motor cannot be started and cause personal injury while it is being worked on.

3.003 In removing brushes note the position of each brush in its holder and put it back in the same position and same holder to insure that the contact will be the same as before removal. In replacing a brush holder cap after fitting a brush see that the inside of the cap is smooth and clean to reduce the possibility of the pigtail becoming twisted as the cap is screwed in place.

3.004 Whenever the motor is disassembled so that the speed regulator contacts are accessible, wipe them with a clean dry cloth to remove dirt or finger marks. Replace the cover in such a position that the contact arm will press against the contact post.

3.005 When the motor is disassembled blow out with air and wipe off the armature with a dry cloth; also wipe out the machine frame removing dust and accumulated dirt. The metal parts of some motors are protected against rusting by a thin film of anti-rust compound which is an oil that dries semi-hard. It is desirable that removal of this film be avoided as much as practicable.

3.01 Lubrication (Rq.2.01)

(1) To clean and relubricate the ball bearings, remove all brushes and insulating covers. Remove the large screw cap on the side of the motor and loosen the set screws to release the speed regulator assembly. Remove the screws which secure the inside bearing retainer to the end shields. Remove the nuts from the end shields and pry the end shields from the frame by inserting a screwdriver in the small openings on the sides. To avoid straining the leads, when removing the end shield, support the end shields by some means other than by allowing them to hang on the leads. Remove the armature.

(2) Remove the outer ball races, springs, washers, etc., and note their positions so that they may be replaced properly. The outer race may be removed from the end shield with the puller. Hold the puller by the knurled end and screw the large hand nut close to that end. Turn the jack screw in the center to allow the collets to close together. Place the bridge part against the end shield and insert the puller until the points of the collets are just behind the race. Turn the jack screw to expand the collets and then turn in on the large knurled nut to remove the race. Clean the parts and housing with petroleum spirits and wipe dry. A typewriter brush will be useful for this purpose.

(3) Pack the ball races with a moderate amount of grease and assemble the various springs and washers in the end shield housings. The outer race will slide into the housing without the aid of any special tool but should have a fairly snug fit. It may be desirable to wipe the inside of the bearing chamber with a trace of grease on the end of the finger before sliding the race into place. The screws may be replaced more readily if a 309 tool is used. This tool is similar to one of the regular screws except that the head is removed and, therefore, it can be screwed into the bearing retainer and through the copper gasket and end shield from the inside before sliding the end shield into place. After the end shield is put into place, three of the screws may be put in and then the stud may be removed and the fourth screw put in place. See that the shaft turns freely. Push the shaft toward the thrust spring and release it to check that the thrust spring returns the shaft to its original position.

(4) In replacing the speed regulator rotating assembly the set screw should register on the spot on the shaft provided for that purpose. Before putting on the regulator insulating cover, wipe the speed regulator contacts with a dry cloth avoiding touching the contacts with the bare fingers. Put on

the insulating cover on the speed regulator end in such a position that the flat contact arm on the inside will press against the contact post.

*#3.02 Bearings (Rq.2.02)

(1) To replace a worn bearing dismantle the motor as outlined in 3.01. Remove the inner and outer ball races using the respective pullers. Slip the inner race of the new bearing on the shaft and using a short piece of clean pipe which will push against the inner but not the outer race, tap the bearing gently into place against the shoulder on the shaft. Fill the spaces between the balls on the retainer with a moderate amount of grease and reassemble the motor in the reverse order.

(2) If the inner race of a bearing is removed from the shaft for any reason, a new bearing should be installed.

3.03 Freedom of Rotation (Rq.2.03)

(1) If binding is present examine the motor and remove any foreign matter. Also check to see that all bolts and screws are firm. Tighten if necessary. See that the brushes are free in their holders. Binding may be due to short brushes, pitted or dirty speed regulator collector ring or commutator surfaces; damaged bearings; gummed or caked grease in the bearings; or the fixed regulator contact being screwed in too far counterclockwise against the rotating regulator contact. Roughened or pitted commutator or speed regulator collector ring surfaces should be turned down (See Section 171-110-801) or smoothed with sandpaper. Gummed or caked grease in the bearings should be thoroughly removed and the bearings cleaned or replaced. Place new grease in the bearings. Reassemble the armature and speed regulator in the reverse order.

3.04 Noise and Vibration (Rq.2.04)

(1) See that all bolts, nuts and screws are drawn up firmly.

(2) If the noise and vibration continue a complete overhauling of the set should be made and new bearings installed.

3.05 Speed (Rq. 2.05)

(1) The normal wear of the speed regulator contacts causes a gradual increase in the speed of the motor. When the speed reaches the upper limit, at any motor voltage within the range specified on the nameplate; and with the motor hot and carrying minimum load, the speed regulator should be readjusted.

(2) To adjust the speed, the adjusting knob should be turned in a counterclockwise direction facing the regulator to lower the speed, or a clockwise direction to increase the speed. In making adjustments, the adjusting knob should be turned only 10 or 15 degrees at a time and the speed checked before proceeding further.

#3.06 Commutator and Collector Rings (Rq. 2.06)

(1) The commutator may be cleaned of dust with air blown through the brush holder or end shield openings. Turn the armature slowly by hand while blowing out the dirt. If necessary, dismantle the machine as outlined in 3.01 and clean the commutator with a cloth moistened with petroleum spirits and then wipe dry. If the commutator surface becomes sufficiently rough or pitted to cause poor commutation, it will be necessary to resurface it (See Section 171-110-801) and the matter should be referred to the supervisor.

(2) The collector rings may be cleaned by blowing out the dust or wiping with a clean cloth moistened with petroleum spirits. Wipe dry after cleaning. If necessary, remove the armature and smooth the rings with sandpaper.

*#3.07 Commutation (Rq.2.07)

(1) If the commutation is not satisfactory see that 2.06, 2.08, and 2.09 are met.

(2) Slight visible sparking is not necessarily an indication of unsatisfactory commutation. Where the commutator is enclosed and cannot be observed in operation, commutation should be judged by the condition of the commutator surface.

*#3.08 Brush Holders (Rq.2.08)

(1) To adjust the clearance of a brush holder, loosen the associated locking screw and move the holder to the desired position. Be sure that the alignment of the brush holder is not changed when adjusting the clearance. Tighten the locking screw after an adjustment has been made.

3.09 Brushes (Rq 2.09)

(1) Replace brushes as necessary to maintain at least the minimum length specified.

(2) Replace loose brushes. Brushes which are too tight can usually be fitted by cleaning the brush and brush holder. Remove any burrs or rough places in the brush holders.

(3) Brushes are generally furnished with their faces curved to the approximate curvature of the commutator or collector ring. After inserting new brushes run the motor for a few hours without load so they may be seated properly.

#3.10 Speed Regulator Contacts (Rq. 2.10)

(1) Replace short or badly roughened contacts.

Note: New rotating elements ordered for existing motors, and on motors of later design, will be equipped with replaceable rotating contacts.

(2) If the rotating contact is rough, the build-ups should be removed by using the carborundum stone held against the contact while the motor is running. The build-ups on the fixed contact may be removed by holding the insulating cover in one hand, and with the other hand applying the carborundum stone lightly to the contact with a rotary motion. Clean the contacts, and all surfaces subject to finger marks, with a clean cloth moistened with petroleum spirits; and rub dry with another clean cloth.

*#3.11 Temperature (Rq. 2.11)

(1) The temperature of any accessible part of the motor can be measured by holding the bulb of the thermometer against that part, covering with a piece of felt that portion of the bulb which does not touch the part, and observing the maximum temperature reading.

(2) If the temperature exceeds the specified limits refer the matter to the supervisor.