MOTORS — DIRECT CURRENT
1/4 HORSEPOWER OR LARGER
OPERATING METHOD

1. GENERAL

1.01 This Section describes the method of operating the ¼ hp. or larger d-c. commercial type motors and outlines in general troubles which may interfere with the operation of these machines.

1.02 Reference should be made to the section covering the apparatus requirements and adjusting procedures for these motors for information necessary for the proper maintenance of the apparatus referred to herein.

1.03 This Section is reissued to include several motors which are covered in various Specifications of motor-driven generator sets employing d-c. motors within this range of sizes.

2. OPERATION

Preparation for Starting

2.01 Before starting make a general inspection to insure that nothing is in or on the motor or driven member which will interfere with the operation of the motor.

2.02 For motors with oil ring bearings, check the height of the oil in the bearing oil wells and replenish, if necessary.

2.03 Make certain that the starting box handle is in the open position.

Starting

2.04 Close the associated line switch or circuit breaker.

2.05 If starting manually, draw the handle of the starting box across the starting buttons, giving the motor sufficient time to obtain its maximum speed on each button, yet not lingering on any step longer than is necessary. When the last button is reached see that the starting handle is held in the running position by the no voltage release mechanism. Under no condition should it require more than thirty seconds to bring a motor from a stand-still to full rated speed and usually this speed will be attained in about fifteen seconds.

2.06 If automatically started, operate the controlling relay or pushbutton station.

2.07 Apply load to the driven member in accordance with the section pertaining to the particular equipment.

Running

2.08 After starting, inspect the oil rings to see that they are turning on the shaft and delivering oil to the shaft and bearings. On long continuous runs over extended periods of a month or more, examine the oil in the bearing oil wells periodically and raise the level of the oil if necessary.

2.09 On machines having waste packed bearings where the run is continuous over extended periods of a week or more, each bearing shall be lubricated at least once a week with 2 to 4 drops of dynamo oil.

Stopping

2.10 Remove the load from the driven member in accordance with the section pertaining to the particular equipment.

2.11 Trip the controlling relay or push-button station or operate the no voltage or overload release on the starter by hand if readily accessible or if not accessible trip the no-voltage release by opening the line switch or circuit breaker.

2.12 Make certain that the arm on the starting box returns to its open position.

2.13 Open the line switch or circuit breaker if provided.

3. TROUBLES

3.01 **Motor will not start**

Cause	Action
Fuses blown.	Locate cause and replace fuses.
Defective field circuit.	Repair field circuit.
Defective armature winding.	Repair or replace armature.
Poor contact of brushes with commutator.	Clean and adjust the brushes or replace if too short.
Poor connections or loose wiring.	Repair or tighten connections.

Cause	Action
Defective starting resistance.	Repair or replace resistance.
Defective control circuit.	Repair control circuit.

3.02 **Failure to Come Up tc Speed**

Cause	Action
Low voltage.	Notify supervisor.
Poor contact of brushes with commutator.	Refit brushes and clean brush holders and commutator.
Overload.	Reduce load.
Failure of starting contacts of speed regulator to open.	Adjust starting contact spring of speed regulator.

3.03 **Excessive Speed—Shut down immediately**

Cause	Action
High voltage.	Notify supervisor.
Abnormal resistance in field circuit.	Inspect field rheostat and tighten all field connections.
Open field circuit.	Repair open circuit.
Improper setting of speed regulator.	Adjust retractile spring on main contact of speed regulator.

3.04 **Overheating of Motor Windings**

Cause	Action
Overload.	Reduce load.
Short circuited or grounded windings.	Repair or replace, if in field winding check voltages across each coil.
Clogged ventilating passages.	Clean ventilating passages.

3.05 **Overheating of Commutator**

Cause	Action
Overload.	Reduce load.
Excessive brush pressure.	Reduce brush pressure.
Excessive sparking.	See paragraph 3.07.
Defective commutator or winding trouble.	Repair or replace armature.

NOTE: If the commutator appears excessively heated the load should be removed, the machine stopped at once, the temperature checked with a thermometer and the condition corrected if necessary, before replacing load on the motor.

3.06 **Overheating of Bearings**

Cause	Action
Bent shaft.	Replace armature and shaft.
Dirt or grit in oil.	Clean out bearings and lubricate with fresh oil.
Improper alignment.	Re-align.
Improper grade of oil.	Clean out bearings and lubricate with proper oil.
Improper fitting, lining too tight.	Refit or replace bearings.
Insufficient oil.	Add oil.
Oil rings not functioning.	Adjust or replace oil rings.
Rough bearing surface.	Smooth or replace bearing.

NOTE: If a hot bearing develops do not stop the machine but remove the load immediately. The bearing should then be flushed with dynamo oil until cool. The set should, in no case, be stopped until the bearing is cool, unless there is danger of the armature striking a polepiece. Stopping a machine with a hot bearing before the bearing has cooled may result in the shaft adhering to the bearing lining and making the replacement of the bearing more difficult. After cooling the bearing, the machine should be shut down and an inspection made to determine the cause of the heating, and the condition corrected before again placing a load on the motor.

3.07 **Excessive Sparking**

Cause	Action
Brushes not properly seated.	Refit brushes.
Brushes too short.	Replace brushes.
Incorrect brush pressure.	Adjust pressure or replace brush and spring as required.
Oily or dirty commutator.	Clean commutator.
Rough or pitted commutator.	Smooth commutator.
High, low or loose commutator bars.	Repair or replace armature.
Defective armature winding such as an open or short-circuit.	Repair or replace armature.
Neutral not marked correctly.	Reset neutral point.

3.08 Excessive Noise and Vibration

Cause	Action
Set not level.	Level set
Shafts out of alignment.	Realign.
Loose commutator segments.	Repair or replace armature.
Worn bearings.	Replace bearings.
Armature striking pole-piece.	Tighten pole-piece if loose or replace bearings.
Loose bolts and nuts.	Tighten bolts and nuts.
Loosc coupling.	Tighten or replace worn parts.
Bent shaft.	Replace armature and shaft.
Unbalanced armature.	Balance or replace armature.
Rough commutator.	Smooth commutator.
Improper end play.	Adjust end play.

3.09 Motor Stops

Cause	Action
Power failure.	Use emergency power or restore regular service.
Fuses blown.	Locate cause and replace fuses.
Overload trip operated.	Reduce load. Start motor again avoiding overload.
No-voltage release operated.	Start motor again.