



INSTRUCTIONS

GEI-43714B

DIRECT CURRENT ELECTRIC VEHICLE MOTORS TYPE BT FRAMES 1300 AND 2300

INTRODUCTION

This instruction book covers Types BT1300 and BT2300 D-C Motors. Type BT1300 motors are low voltage (12 to 72 volts), low speed (4000 RPM max.), self-ventilated, non-commutating pole motors used typically as battery powered, fork lift truck pump, steering and drive motors. Type BT2300 motors are higher voltage (up to 240 volts), higher speed (up to 9000 RPM), blower ventilated commutating pole motors used typically as electric vehicle (car, bus, truck, etc.) drive motors. Either type can be face or foot mounted with splined or keyed shaft extension(s). For application information refer to the General Electric Company.

WARNING: HIGH VOLTAGE AND ROTATING PARTS CAN CAUSE SERIOUS OR FATAL INJURY. THE USE OF ELECTRIC MACHINERY, LIKE ALL OTHER UTILIZATION OF CONCENTRATED POWER AND ROTATING EQUIPMENT, CAN BE HAZARDOUS. INSTALLATION, OPERATION, AND MAINTENANCE OF ELECTRIC MACHINERY SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. FAMILIARIZATION WITH NEMA SAFETY STANDARDS FOR CONSTRUCTION AND GUIDE FOR SELECTION, INSTALLATION, AND USE OF INTEGRAL HORSEPOWER MOTORS AND GENERATORS, NATIONAL ELECTRIC CODE AND SOUND LOCAL PRACTICES IS RECOMMENDED.

WARNING: INSTALLATION OF THE MACHINE WHERE HAZARDOUS, INFLAMMABLE, OR COMBUSTIBLE VAPORS OR DUSTS PRESENT A POSSIBILITY OF EXPLOSION OR FIRE SHOULD BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, ARTICLES 500-503, AND CONSISTENT WITH SOUND LOCAL PRACTICES.

These instructions do not purport to cover all details or variations in equipment, nor to provide every possible contingency or hazard which may be met in connection with installation, operation and maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

RECEIVING

These motors should be placed in a suitable storage area immediately upon receipt, as packing coverings are NOT suitable for out-of-doors or unprotected storage.

Each shipment should be carefully examined upon arrival. Any damage should be reported promptly to the carrier and to the nearest office of the General Electric Company.

STORAGE

If a motor is not to be installed immediately, it should be stored in a clean dry place and protected from low temperatures and sudden changes in temperature and humidity. The brushes should be lifted off the commutator during extended storage periods otherwise corrosion may occur and later result in flat spots on the commutator. Shaft extensions and machined surfaces are slushed before shipment to prevent rusting. Slushing compound can be removed readily with mineral spirits or any other suitable solvent which can be obtained at any hardware or paint store.

WARNING: MINERAL SPIRITS ARE FLAMMABLE AND MODERATELY TOXIC. THE USUAL PRECAUTIONS FOR HANDLING CHEMICALS OF THIS TYPE SHOULD BE OBSERVED. THESE INCLUDE:

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1. AVOID EXCESSIVE CONTACT WITH SKIN.
2. USE IN WELL VENTILATED AREAS.
3. TAKE NECESSARY PRECAUTIONS TO PREVENT FIRE OR EXPLOSION HAZARDS.

HANDLING

CAUTION: MOTORS WHICH ARE PACKED IN CARDBOARD CARTONS WITH THE DRIVE END EXTENSION VERTICAL SHOULD BE LIFTED OUT OF THE CARTON WITH A 3/8" SHOULDER TYPE EYEBOLT SCREWED SECURELY INTO THE SHAFT CENTER. THE LARGER MOTORS HAVE A SPOT FACED TAPPED HOLE FOR A LIFTING SHOULDER TYPE EYEBOLT IN THE FRAME. THIS MAY BE USED FOR LIFTING AND HANDLING ONCE THE MOTOR IS REMOVED FROM THE CARTON. SMALLER MOTORS THAT DO NOT HAVE THE LIFTING EYEBOLT HOLE MUST BE LIFTED AND HANDLED WITH A SLING AROUND THE MAGNET FRAME WHEN HANDLING IN A HORIZONTAL POSITION IS REQUIRED. CARE SHOULD BE EXERCISED TO PROTECT TERMINALS, SHAFT EXTENSION(S) AND ACCESSORIES FROM DAMAGE DURING HANDLING.

INSTALLATION

WARNING: GROUND THE MACHINE PROPERLY TO AVOID SERIOUS INJURY TO PERSONNEL. GROUNDING SHOULD BE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE AND CONSISTENT WITH SOUND LOCAL PRACTICES.

Before installation the motor should be given a general overall inspection to verify that there has been no damage during shipping and handling. Connections should be made according to the connection diagram. A careful alignment is recommended for smooth operation. A check for unusual noises and vibration after starting is good practice and may save later serious trouble. In general, vibration should not exceed .002" as measured on a G.E. light beam indicator. The most likely causes of vibration in a new motor are misalignment due to improper installation, loose mounting bolts, distortion of the frame caused by mismatching of the feet to the mounting surface, or damage in shipment. Most openings in the motor are screened. Those which are left completely open should be protected so as to avoid all possibility to motor damage or personnel injury.

WARNING: DO NOT OPERATE A SERIES MOTOR UNLOADED AS EXCESSIVE SPEED MAY OCCUR WHICH CAN CAUSE DAMAGE TO THE MOTOR AND INJURY TO PERSONNEL.

DESCRIPTION

Electric vehicle motors are built in a variety of shaft extensions, end shield mounting interfaces, with and without feet, open and enclosed, series, shunt and compound wound, and in four pole designs. Type BT1300 motors have main poles and coils only and non-adjustable brush riggings. Type BT2300 motors have both main and commutating poles and coils and adjustable brush riggings.

The armature assembly consists of a shaft, armature core, armature windings, and commutator. The coiled frame consists of the magnet frame, main poles and coils, commutating poles and coils (BT2300 only) and the field terminals. Other basic parts of the motor include the drive end bearing bracket, commutator end bearing bracket, bearings, bearing seals (when equipped), brushholder yoke with brushholders, brushes and brushholder springs, and covers. Openings over the brushholders provide accessibility to the brush rigging and commutator for inspection and brush replacement. Standard bearings are the single row, doubled shielded, Conrad type pre-lubricated with high temperature grease (G.E. spec D6A2C9) with ABEC1 tolerance and AFBMA #3 internal radial clearance.

MAINTENANCE

WARNING: IF POSSIBLE, MAKE SURE MOTOR IS DISCONNECTED FROM POWER SOURCE BEFORE PERFORMING ANY MAINTENANCE OPERATIONS ON THE MOTOR OR THE TRUCK. WHEN POWER IS REQUIRED TO PERFORM ANY MAINTENANCE, VIGILANT CARE AND ATTENTION SHOULD BE EXERCISED.

BEARINGS

Standard bearings are double shielded and pre-lubricated and normally do not require lubrication. Under normal conditions the bearings fail after several years service due to lack of proper lubrication, either from dirty contaminant in the grease or insufficient oil in the grease. New grease consists of about 80% oil, 20% soap. When bleeding results in a reduction of oil to about 60%, the bleed rate is reduced to a level that may not supply sufficient lubrication. For this reason when maintenance overhauls are performed after several years of service, bearings are automatically replaced as a routine practice. A bearing should be replaced with an exact replacement or one with all interchangeable features. It is especially important that the bearing have high temperature grease.

INSULATION

Insulation resistance should be checked during each maintenance inspection. Low resistance may be caused by excessive dirt, moisture or impending failure. Although motors can be successfully run with insulation resistance as low as 1/4 megohm it is well to investigate the reasons for any insulation resistance below 1 megohm. Low resistance values due to dirt can usually be corrected by cleaning followed by a varnish dip and bake. Low resistance due to moisture can be corrected by baking the motor in a 90°C oven until the insulation resistance rises above this value and stabilizes to a nearly constant value. A new motor should withstand for one minute without breakdown the application of a 60 Hertz potential of 500 volts for voltage up to 60 volts or 1000 volts plus twice rated voltage for voltages higher than 60 volts. Old motors should be tested at 75% of these values.

BRUSHES

Brush condition and remaining brush life should be checked at each maintenance inspection. Each brush should be checked for length and each spring for proper pressure. When installing new brushes, each brush should be sanded into the curvature of the commutator for most reliable performance. A minimum of 85% surface contact with 100% brush arc is recommended. Replacement brushes should be exactly the same brush grade as original.

COMMUTATOR

Commutator runout should not exceed .002" total indicated runout with a bar-to-bar variation of .0002". The mica bar-to-bar insulation should always be kept below the copper surface. When commutator wear results in flush or protruding mica, the mica should be undercut to a depth equal to the thickness of the mica or about .025". The undercut slot should be kept clean and free of dirt.

CLEANING

Both the interior and exterior of the motor should be kept clean and free of dirt and grease. Loose dirt may be removed by vacuum cleaning or dry compressed air. Vacuum cleaning is preferred because compressed air may drive dirt deeper into cracks and voids in the insulation system. Loose dirt can be removed with a cleaning rag or a soft bristle brush. Clogged air openings should be cleaned out using care not to damage insulated parts.

CAUTION: SOLVENTS MUST NOT BE USED. LIQUID SOLVENT MAY CARRY ELECTRICAL CONDUCTING DIRT DEEP INTO CRACKS AND VOIDS IN THE INSULATION SYSTEM.

If insulation resistance is low after cleaning it may be necessary to either bake the armature at 90°C to remove moisture or to varnish treat and bake for reliable repair.

MECHANICAL

Check for unusual noises or vibration which were not present when the unit was originally installed. Check all electrical and mechanical connections for tightness. Clean screen covers and ventilating ducts.

DISASSEMBLY INSTRUCTION

The following instruction will describe the disassembly process of a standard motor. It should be recognized that special requirements and special applications require special construction and there will be many variations to which standard instructions do not apply. The following steps can still serve as a helpful guide when disassembling a motor:

1. Remove the brushholder springs and brushes from the brushholders.
2. With the motor in a vertical position, drive end up, remove the drive end bearing bracket bolts.
 3. a. On motors which do not have a restrained drive end bearing the drive end bearing bracket can be tapped loose and removed. Next the armature can be removed using a lifting eyebolt in the center hole in the shaft.
 - b. On motors which have a restrained drive end bearing, lift the armature and drive end bearing bracket using the lifting eyebolt in the center hole in the shaft, tapping the bracket loose from the magnet frame as it is lifted.
 - c. Both motors with and without restrained drive end bearings may be disassembled as described in 3 b. After removal the drive end bracket may be slid off the bearing.
4. Disconnect all connections between the magnet frame and the commutator end bearing bracket. Remove all bolts holding the commutator end bracket to the magnet frame. Remove the bracket from the frame, tapping it loose to disengage the rabbet.
5. Further disassembly or replacement of parts can now be accomplished as required by the situation.

6. Reassembly is accomplished in reverse order of steps 1 through 4.

FAILURE

WARNING: IF AN ELECTRICAL FAILURE OR AN EXTREME OVERLOAD OCCURS, ESPECIALLY IN A TOTALLY ENCLOSED MOTOR, PERSONNEL SHOULD NOT BREATHE THE FUMES WHICH HAVE BEEN GENERATED INSIDE THE MACHINE. THE HEAT OF THE FAILURE ARC OR OVERLOAD MAY GENERATE NOXIOUS FUMES BY PYROLYSIS OF THE INSULATION MATERIALS. ALL POWER SHOULD BE DISCONNECTED FROM THE MOTOR BEFORE ANY INVESTIGATION OF THE FAILURE IS ATTEMPTED. THE AREA AROUND THE MOTOR SHOULD BE WELL VENTILATED. PERSONNEL SHOULD NOT BREATHE THE TOXIC FUMES PRODUCED BY THE FAILURE. IF POSSIBLE, TIME SHOULD BE ALLOWED FOR THE MOTOR TO COOL AND FOR DILUTION OF THE FUMES WITH AIR.

Water should not be applied to any electrically energized equipment because of the danger of electric shock which can result in serious or fatal injury. In case of fire, disconnect all power and use a carbon dioxide extinguisher to quench the flame.

REPAIR

Repairs should be made only by qualified personnel using original or verified equivalent materials and processes for which the motor was designed. Many repairs can be

easily performed with only assembly operations involving available General Electric replacement parts. If major repairs are undertaken (such as rewinding an armature) proper facilities should be available and suitable precautions observed.

WARNING: IN BURNING OFF OLD INSULATION MATERIALS (AS IN PREPARING TO REWIND A MOTOR) ADEQUATE VENTILATION MUST BE PROVIDED TO AVOID EXPOSING PERSONNEL TO NOXIOUS FUMES. THE OVEN MUST TAKE IN SUFFICIENT VOLUME OF AIR TO PERMIT COMPLETE COMBUSTION AND THE COMBUSTION PRODUCTS MUST BE CONFINED TO THE OVEN AND ADEQUATELY VENTED TO THE OUTSIDE ATMOSPHERE AWAY FROM PERSONNEL.

If warranty repair is to be claimed it is imperative that the work be done by a General Electric Service Shop. In cases of major repair it is usually less expensive to replace the component than to rewind or attempt extensive repair work.

RENEWAL PARTS

The motor serial number completely identifies the motor and every part therein. It must be given when ordering replacement parts. Any order for motor parts should give the number of parts desired, the description of the part, the serial number of the motor, and either the General Electric Company's model number or the OEM-customer identification number.

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