



SERVICE DEPARTMENT

ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION

MAINTENANCE INSTRUCTION

AR10 TRACTION GENERATOR OVERHAUL – BEARING ASSEMBLY INSPECTION

INTRODUCTION

Traction generator bearings have been carefully designed to withstand the rigorous conditions encountered in normal operation. They are manufactured from the finest materials available and to exacting tolerances necessary for this vital area of the generator.

In consideration of their importance, bearings and their associated components should be given the most careful handling and thorough inspection possible to qualify them for return to service. Certainly their condition should be such that no doubt exists as to their ability to perform successfully until the next overhaul period. For this reason, all doubtful parts should either be repaired or discarded.

BEARING ASSOCIATED COMPONENTS

CLEANING

Components associated with the bearing assembly, such as housing, caps, covers, and seals should be thoroughly cleaned prior to inspection to remove all dirt, oil, grease and other foreign materials. Stoddards solvent (ASTM D474-40) or similar non-corrosive solvent having a flash point of 115° F. or higher can be used.

NOTE: Do not wash bearing housing assembly in caustic or submit to cob blast.

A clean brush or lintless cloth can be used to facilitate cleaning. Gasket surfaces should be given special attention to remove all traces of remaining gasket material.

NOTE: Condemning limit dimensions are shown on the figure references either as maximum or minimum allowance along with the manufacturing tolerance for the same dimension. The condemning limits are given only where wear or distortion is permitted.

BEARING HOUSING INSPECTION,

Fig. 1

1. Check inside diameter of the bearing bore.
2. Check the housing to frame pilot diameter.

3. Check that insulating inserts are tight in bearing housing and are not cracked, gouged, or damaged in any way.

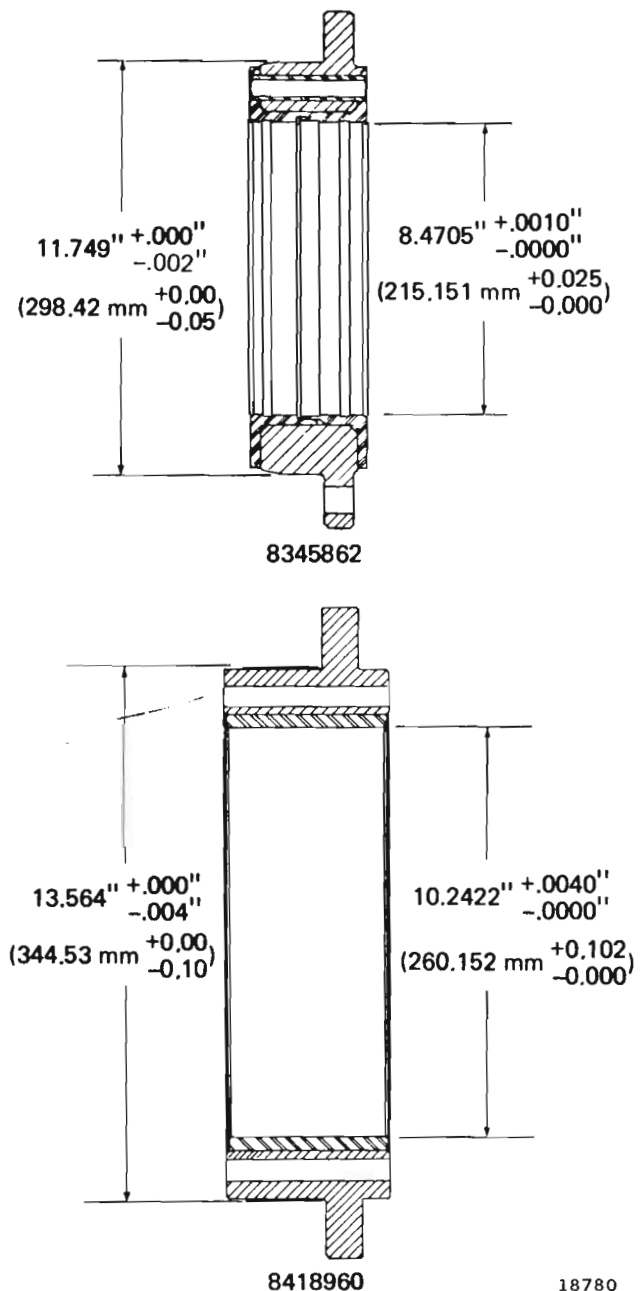


Fig. 1 – Bearing Housing Assembly

BEARING CAP INSPECTION,

Fig. 2

1. Check pilot diameter.
2. Check counterbore inside and outside diameters.
3. Check labyrinth bore diameter.
4. Inspect the labyrinth lands for wear and broken lands, and reject if found. Small nicks should be blended.

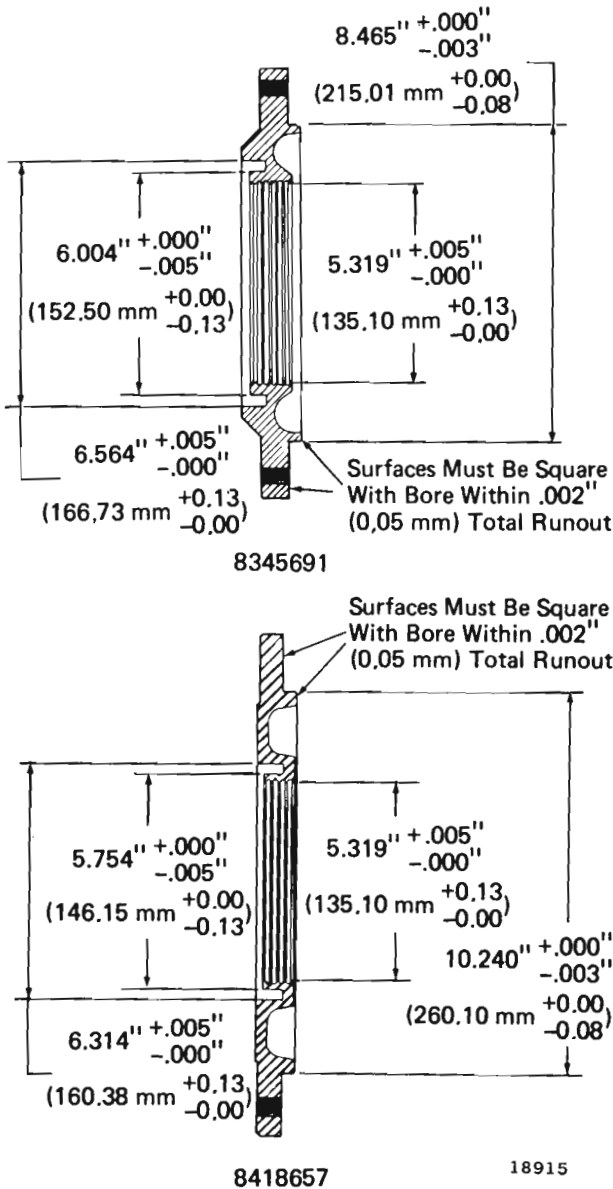


Fig. 2 - Bearing Cap

BEARING COVER INSPECTION, Fig. 3

1. Check pilot diameter.
2. Check counterbore inside and outside diameters.

3. Check labyrinth bore diameter.

4. Inspect the labyrinth lands for wear and broken lands, and reject if found. Small nicks should be blended.

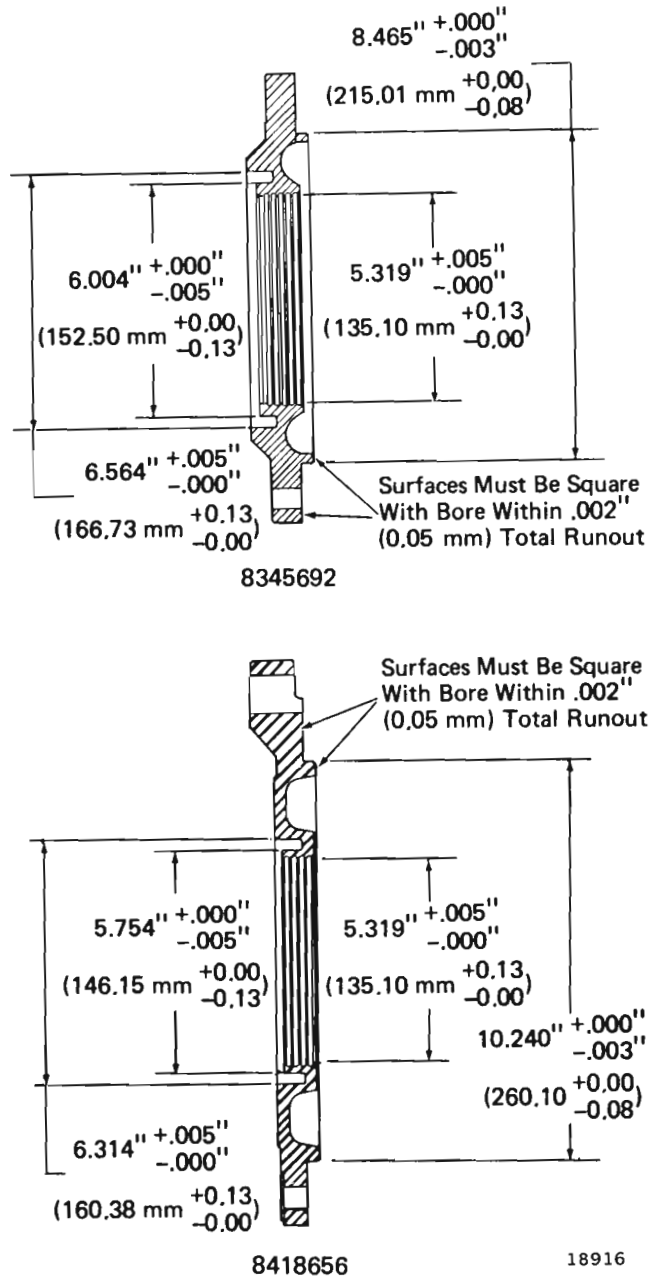
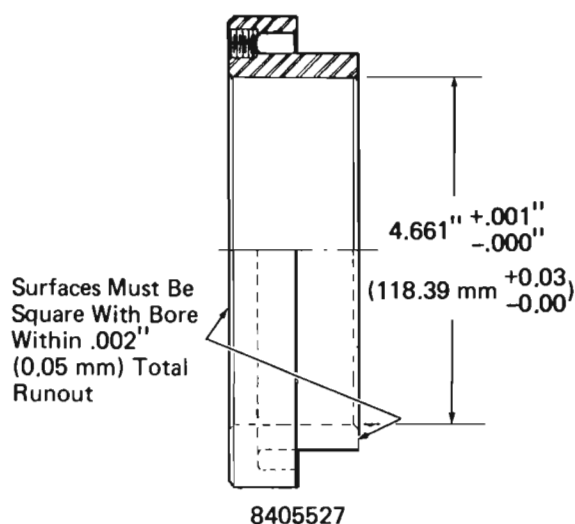
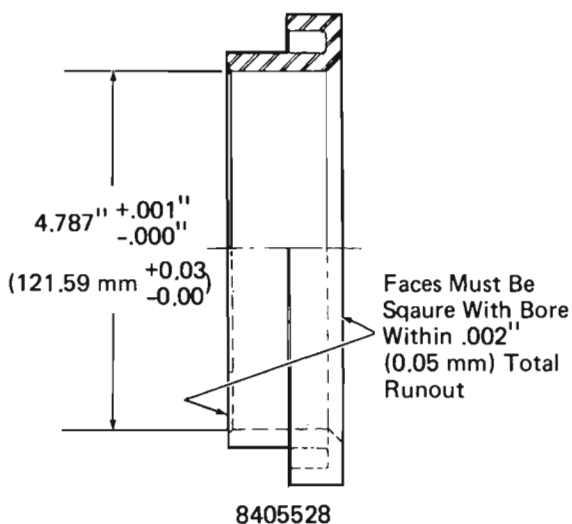
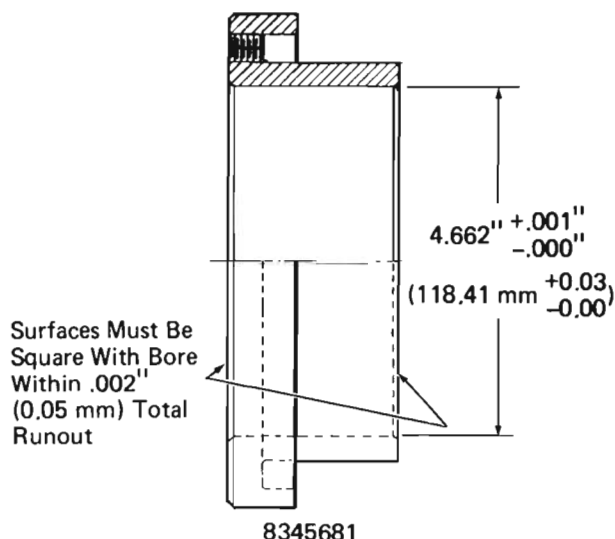
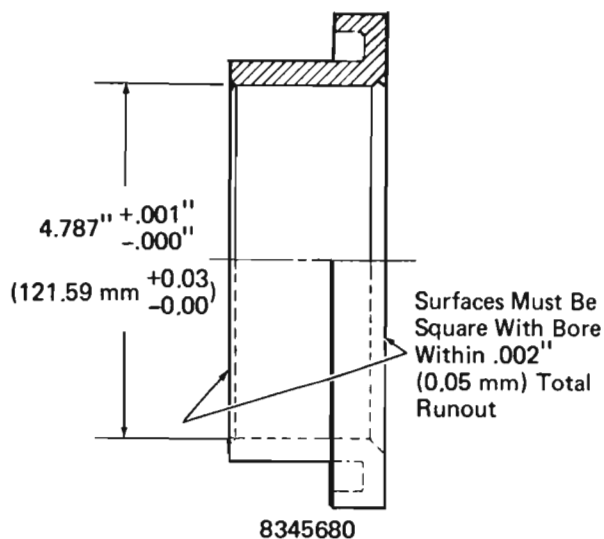


Fig. 3 - Bearing Cover

INNER AND OUTER SEAL

INSPECTION Fig. 4 and 5

1. Inspect the bore diameter.
2. Inspect all diameters for wear and rubbing, and reject if found.
3. Flatness and squareness must conform to dimensions shown. If not, the seal must be replaced.



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Fig. 4 - Inner Seal

Fig. 5 - Outer Seal

ROLLER BEARINGS

CLEANING

Upon disassembly of the traction generator, the bearings should have been kept together as an assembly and protected from dirt or damage by wrapping in clean noncorrosive paper. After unwrapping for cleaning and inspection, every care should be taken to keep the bearings clean and to handle them carefully.

Bearings should be washed with clean Stoddards solvent (ASTM D474-40) or some similar noncorrosive solvent with flash point of 115° F. or higher. Apply solvent with a brush or rag, being careful that bristles and threads do not become loose in bearings. Cotton waste should never be

used. A tank with small motor driven pump with hose and nozzle connection will be found advantageous in reaching inaccessible spots in the bearing.

INSPECTION PROCEDURE

Roller bearing assemblies should be carefully inspected with the aid of adequate light and a magnifying glass of two (2X) power to prevent eye strain. Bearings should be handled with clean hands adequately protected by lanolin to prevent staining and corrosion.

In order to keep the details of each inspection as clear and concise as possible, a glossary of terms follows.

GLOSSARY OF TERMS

Cracks -- Separations of the bearing material resulting in jagged dark lines or chasms, caused by material defects, severe mishandling, overheating, overstressing, or fatiguing.

Craters -- Small deformities in the normal surface with ragged edges, molten, discolored, bright bottoms, and a contrasting edge. They are formed by the passage of electrical currents through the bearing and are dangerous when the area is large enough to increase the unit load, or when the depth indicates a large electrical discharge and subsequent tempering of the bearing metal.

Dents -- Shallow deformations in the normal surface. They are caused by smoothedge particles being forced or rolled into the surface. If severe, they may rupture the surface, cause a protrusion, or if large, act as a flat.

Flaking -- Small areas of the normal surface where the steel has been freed, revealing a "fish-scale" appearance. Flaking is usually the next stage after pitting (but sometimes is the first apparent indication of fatigue) which has developed from a pit formed since the last inspection.

Flats -- Sections of the normal surface with bright bottoms which have been reduced from the original diameter. They can be caused by grinding, severe denting due to handling, skidding of a roller when held in the loaded area, by faulty reduction of a protrusion, and by severe denting from static load (brinnelling). Flats cause the bearing parts to be stressed abnormally.

Galling -- Transfer of metal from one part onto another. This is caused by relative motion under extremely high pressures without lubrication, generally accompanied by heating.

Nicks -- Sharp-bottomed deformations in normal surface of some depth, but relatively little width. They are caused by a sharp edge being forced into the surface. If severe, they may rupture the surface or cause a protrusion.

Operating Surfaces -- The areas of the rollers and races which contact each other under load.

Pits -- Small holes in the normal surface with ragged edges and dark bottoms. They are caused by extended corrosion, fatigue cracking, and minute flaking. Those due to fatiguing will generally be accomplished by indentation or imprinting

of the material freed from the surface and then rolled between the rollers and races. Those due to corrosion will be localized to those sections originally stained or etched. It can be seen that fatigue pits are the initial signal of failure and the end of useful life, and therefore demand scrapping of the parts involved. Corrosion pits, if isolated and arrested in growth, are dangerous only in that they reduce the contact area and increase the unit load, thereby increasing the rate at which the part is fatiguing.

Protrusions -- Metal displaced above normal surface. On operating surfaces, this results in stress concentrations at protrusions and hastens fatigue. They are found around some dents, nicks, scratches, scores, and craters.

Roller Path -- That section of the race which the rollers contacted in service. This can be detected from the normal surface by the wearing of the original grinding nap.

Ruptures -- Separations of the normal surface generally leaving sharp corners, jagged edges, or cracked sections at their bottoms. They are found in some dents, scratches, nicks, and scores. Ruptures are the focal points for fatigue stresses and so can be the origin of the cracks, pits, flaking, spalling, and the ultimate failure.

Scores -- Axial deformations of heavy character with a rough or torn bottom. They are caused by gouging a bearing surface while forcing a roller over a race under load and while slightly cocked.

Scratches -- Deformations of the normal surface with bright bottoms caused by forcing hard sharp objects over the surface in long, narrow, sharp-bottomed gouges. Scratches are generally of little danger so long as they have no protruding edges, do not rupture the normal surface, and do not constitute a flat.

Seams -- Inclusions of foreign material in the bearing metal which are exposed on the normal surface. They are harmful only when too large or numerous.

Shelling -- Areas on the normal surface where the material has broken loose, leaving jagged edges with a rough "washboard" bottom which is sometimes bright. This is caused by advanced fatiguing beyond the pitting state, in which large sections of the surface are freed by extensive subsurface cracking.

GENERAL

On all bearings which have seen appreciable service, some dents, nicks, pits, and craters will be found. If these are small and scattered, they should not cause rejection; however, they must be evaluated with good judgment and with reference to the overall condition of the bearing. All doubtful parts should be discarded to be on the safe side.

Failed parts should be replaced with either new or acceptable reconditioned parts. It must be remembered that if one part of an assembly has been under any extended or excessive stresses which result in a visible defect severe enough to scrap the part, then the rest of the assembly requires a detailed inspection and evaluation before use.

The inspection procedure which follows is divided into four parts as follows: (1) Operating surfaces, (2) Non-operating surfaces, (3) Cages, and (4) Dimensional.

OPERATING SURFACES

All exposed operating surfaces must be inspected visually to ensure that they contain none of the following defects which will be cause for rejection:

1. Protrusions above the normal surface.

NOTE: Protrusions should be reduced to the normal surface by light circumferential honing with Arkansas stone or grade 240 abrasive cloth. Likewise, the sharp edges should be smoothed. Care must be taken to work down to the normal surface only, to prevent reduction of contact area, and to work circumferentially so as to prevent the formation of flats.

2. Cracks and flats.

3. Ruptures, tears or seams (3/32" or more in length, or more than hairline width).

4. Scores, or deep scratches which extend more than 3/4 the length of the operating surface and are inclined at less than 10° to the axis.
5. Corrosion pits. (1/32" or more in diameter.)
6. Craters or pits from electrical arcing. (1/32" or more in diameter.)
7. Profuse denting or cratering.
8. Overheating.
9. Circumferential pattern of pits or dents at the ends of the roller path.
10. Fatigue pits, flaking, shelling or galling.

NON-OPERATING SURFACES

All non-operating surfaces are to be visually inspected for:

Rust -- Remove by rubbing with a grade 240 abrasive cloth. If rust pits of great depth are encountered they must be cleaned.

Galling -- Smooth down by rubbing with a grade 240 abrasive cloth. Care must be taken not to reduce the normal surface. (See Dimensional.)

Cracks -- Reject bearing.

Severe Physical Abuse -- Evaluate to determine whether it is heavy enough to affect the operating surfaces. In addition, each such location must be reduced by light honing with an Arkansas stone.

Overheating -- Reject bearing.

CAGES

Cages must be inspected to ensure that they are free from cracks and burrs.

DIMENSIONAL Fig. 6

Bearing parts must be checked dimensionally so

as to maintain the proper fits and to determine the change in internal clearance due to wear.

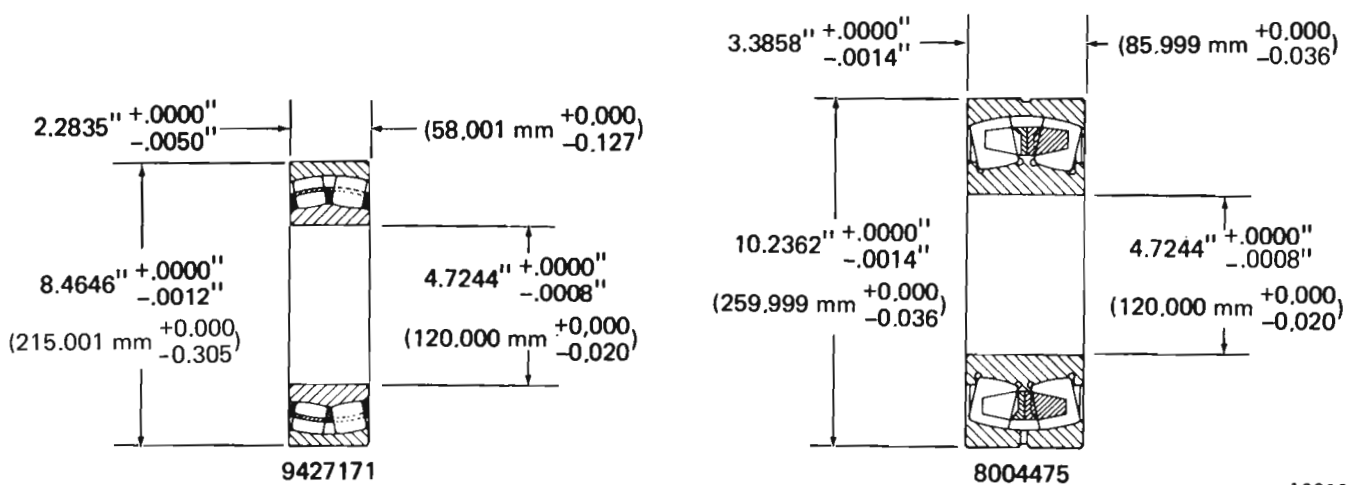


Fig. 6 - Roller Bearing Dimensions

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