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GM Locomotive Group

M.I. 1552
MAINTENANCE INSTRUCTION

*Rev. C

CYLINDRICAL ROLLER OIL LUBRICATED JOURNAL BOX

DESCRIPTION

Cylindrical roller oil lubricated journal boxes are available in the following three sizes:

	Size		Usage
	mm	(inch)	
Group I	165 mm x 305 mm	6-1/2" x 12"	Dom./Exp.
Group II	140 mm x 254 mm	5-1/2" x 10"	Exp. Only
Group III	152 mm x 279 mm	6" x 11"	Exp. Only

Group I, Fig. 1, Group II, Fig. 2, and Group III journal boxes are available with a plain front cover or a combination front cover. The combination front cover is used to mount drive units for speed recorders, shock absorbers or train control devices. The following data will pertain to all three journal boxes unless specifically identified.

Each journal box has a serial number stamped on one of the front housing flanges or on the lower front portion of the casting body.

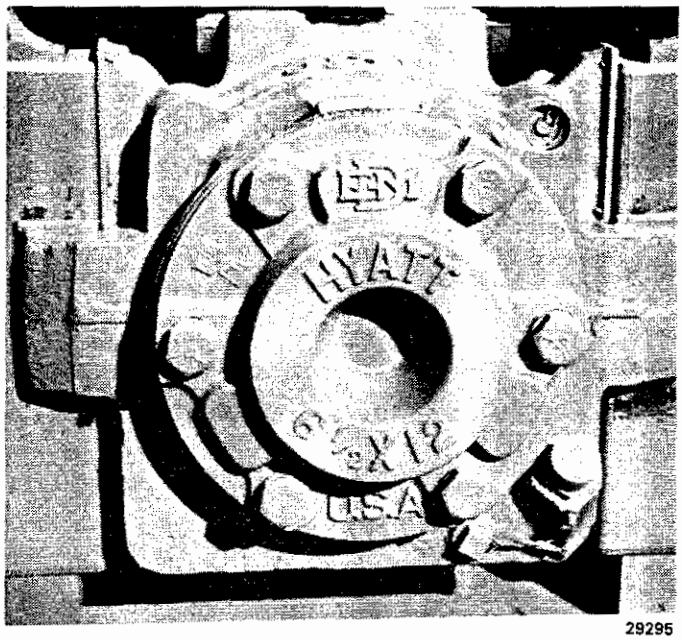
The journal box housing is a carbon steel casting. Flanges cast on the sides of the housing retain the journal box laterally within the truck frame pedestals, but allow the box to move freely in a vertical direction. Carbon steel or (optional) manganese steel wear plates are welded to both flanges and to both driving faces of the housing. The plates welded to flanges are referred to as strip liners and the plates welded to the driving faces are referred to as driving face liners.

The lower portion of the housing forms an oil reservoir into which any foreign matter will settle away from the bearing operating surfaces. The reservoir is baffled to reduce surging of oil when the locomotive is in motion. On current model journal boxes, oil is applied to the reservoir through a spring loaded oil filler assembly. On some former models, oil is applied through a filler plug. The oil inlet is positioned so that the oil will overflow when the maximum desirable level is reached. A drain plug for draining the oil sump is located below the filler plug.

This Maintenance Instruction will cover inspection, maintenance, and rebuild of the current JEM (journal extended maintenance) journal box which has been in service since 1971. Former journal boxes are similar to the current journal box. The basic differences are the rear cover, the bearing rollers (current bearings have crowned rollers), and a new-style bearing retainment ring. All parts of the current journal box are interchangeable with former configurations.

Refer to Fig. 3 for a cutaway view of a Group I journal box with a plain front cover.

*This publication is revised and supersedes previous issues of this number.



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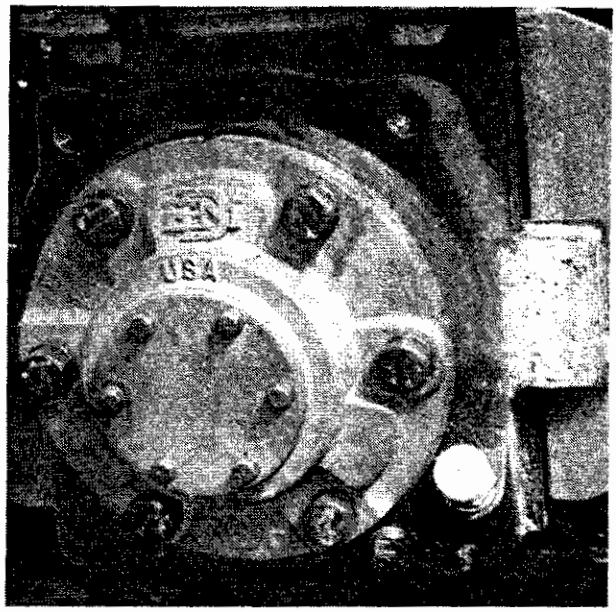
Plain Front Cover



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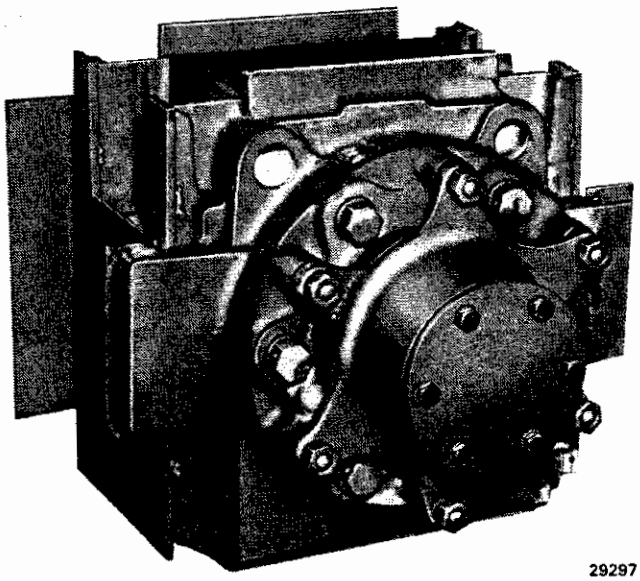
Combination Front Cover

Fig.1 – Group I Journal Boxes



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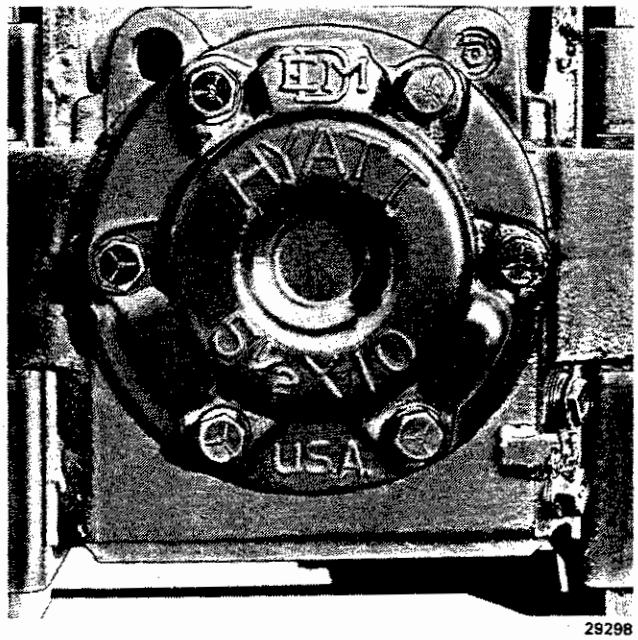
Combination Cover



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Plain Cover

Fig.2 – Group II Journal Boxes

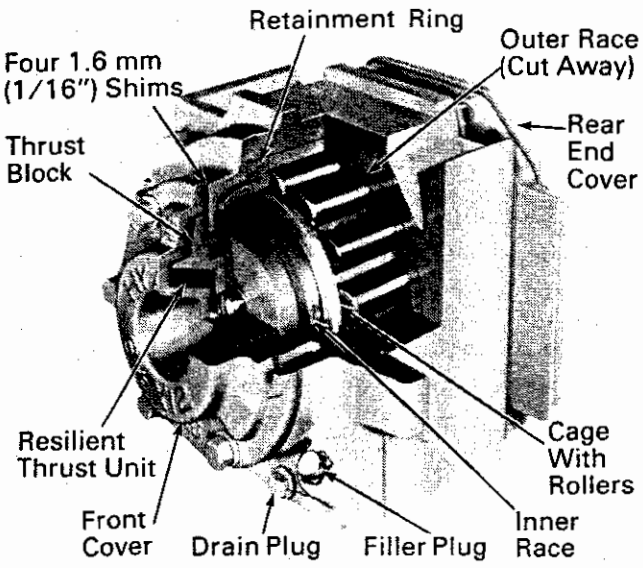

Fig.3 – Group I Journal Box With Plain Front Cover

The bearing as assembled in the housing consists of cylindrical inner and outer races and two separate rows of solid rollers. The rollers operate in two one-piece bronze cages separated by a spacer ring as shown in Fig. 4. Races, spacer ring, and rollers are of specially selected alloy steel. An inner race, Fig. 5, is shrunk on both end journals of the axle. It provides the inner path for the rollers to travel on.

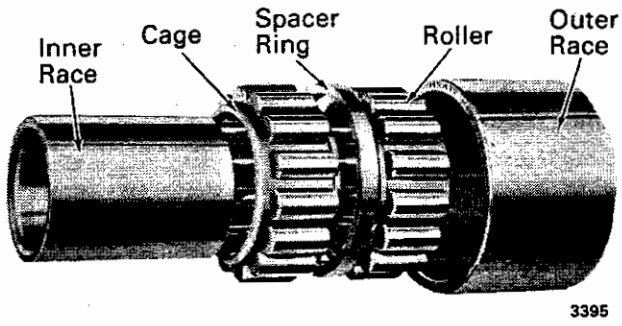

Fig.4 – Journal Bearing

The inner end of the inner race is designed with a special feature which prevents stress concentration as a result of the shrink fit. This is accomplished by tapering the inner end of the race bore, Fig. 6, for the amount of the shrink fit allowance, which gradually reduces the shrink fit to zero. This prevents an abrupt change in the surface stress of the axle and thereby removes the possibility of progressive fracture. This is especially important when it is considered that the rapidly rotating journal is subjected to stress reversals and severe impacts.

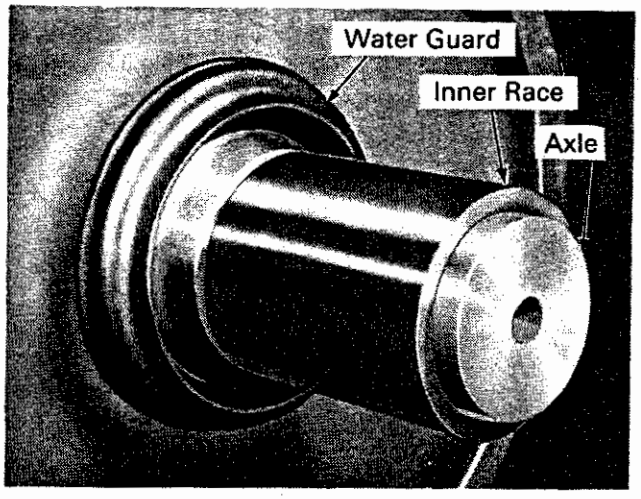

Fig.5 – Inner Race And Water Guard

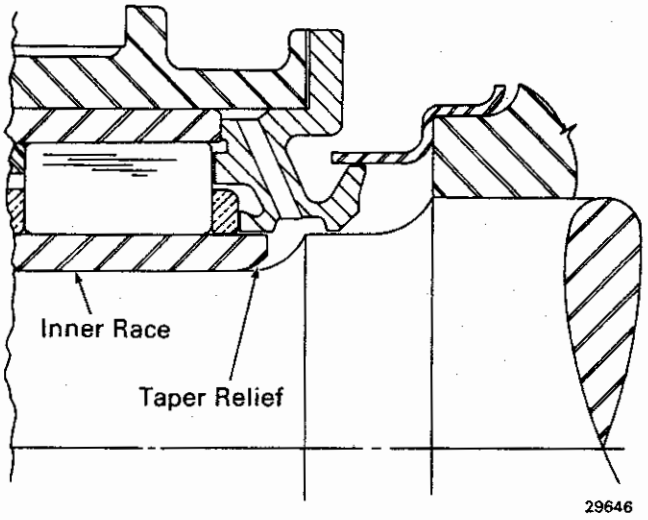

Fig.6 – Inner Race Taper Relief

The outer race provides the outer path on which the rollers travel. Two types of rollers have been used. Prior to December 1967 the rollers were plain straight solid cylinders and were straight up to the ends. Since December 1967 "crowned" rollers with a relief ground in on each end, Fig. 7, have been used. "Crowning" increases roller life by reducing high stresses on the the extremities of the roller path, and producing a more uniform stress distribution under load conditions. Both types of rollers are ground to close limits to secure uniformity of diameters, length, and end squareness. These are two identical rows of rollers in each bearing. The rollers carry radial loads only.

There are two one-piece cages or separators per bearing. The cage bars are integral with the end rings at both ends, so that the cage is similar to a cylindrical ladder.

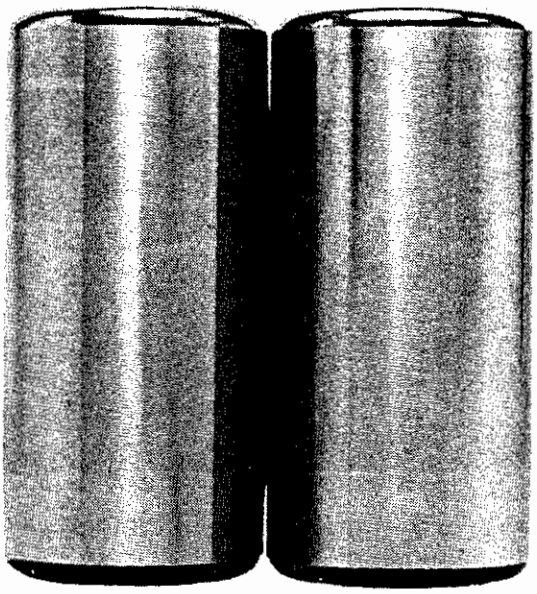

Fig.7 – Crowned Rollers

In operation, the cages are suspended slightly above the inner race. The cages serve to separate the rollers and keep them in proper alignment with the races. The cages do not come in contact with each other or any parts except the rollers, so normally it will not be necessary to make cage replacements before changing out entire bearing assembly. The spacer ring, which separates the two rows of rollers laterally, is of hardened and ground alloy steel. It is a floating ring, centered in the bore of the outer race, directly contacting the roller ends. The spacer is of sufficient width to prevent the cages from touching at the center of the bearing.

The rollers are retained in proper longitudinal position by hardened surfaces on the retainment ring spacer and rear end cover. These retainment surfaces contact the ends of the rollers and do not come in contact with the cages.

The resilient thrust unit consists of a neoprene rubber cone which is bonded to an inner and outer cone of steel. The purpose of the rubber cone is to cushion and absorb the lateral movement of the axle. The resilient thrust unit is shown in cutaway in Fig. 3.

The thrust block, Fig. 3, provides a means for transmitting lateral thrust to the resilient thrust unit. The thrust block can consist of either steel backing and a bronze thrust face or an all bronze thrust block. A lubricating oil groove is cut into the bronze face. Thrust blocks for current Group I journal boxes have a shoulder undercut 6 mm (1/4") from the bearing face. Thrust blocks for Group II and Group III journal boxes have a 3 mm (1/8") wear limit witness groove machined on the circumference of the bronze thrust block. Using the shoulder undercut or witness groove as a reference point, the wear on the bronze face can be determined.

A hole is provided in the center of the thrust block to admit the drive shaft of any accessory devices used with the combination cover.

With the exception of the front covers, the plain box and combination box are identical. The plain box may be identified by the recessed center portion of the cover, while the combination box may be identified by the thicker center section furnished to accommodate various accessory drives.

For convenience and safety when handling, the thrust block and resilient thrust unit are held in the front cover by a socket-head screw. When the front cover is removed, the thrust block with the resilient thrust unit and cover can be withdrawn as an assembly without disturbing any other part of the journal box.

MAINTENANCE

DISASSEMBLY

Drain lubricant by clipping lockwire and removing drain plug.

Journal boxes and components should be completely disassembled, inspected, and cleaned at intervals specified in the applicable Scheduled Maintenance Program.

Excessive dirt should be removed from the exterior of the journal box housing prior to the disassembly operation. The journal box should be completely disassembled prior to cleaning of individual components.

Place the journal box on a bench with the open end up and remove the rear cover. The roller assemblies and spacer ring can then be removed. To prevent the rollers from falling out of the cage, a wire hoop or heavy rubber band should be placed around the rollers before they are completely withdrawn from the outer race.

Remove the front cover, taking care not to damage the shims between the cover and housing. After loosening the socket-head screw, the thrust block and resilient rubber thrust unit can be removed from the cover.

To remove outer race and retainment ring, use a threaded puller bar as shown in Fig. 8. Bolt the backing bar in position across the front face of the box. Then, while holding the puller bar in position against the retainment ring, thread the screw through the puller bar until it contacts the backing bar. Continued rotation of the screw will remove both the outer race and retainment ring from the housing. If screw is rotated with an air motor, considerable time and effort will be saved. The part number for the threaded puller bar is given on the Service Data page.

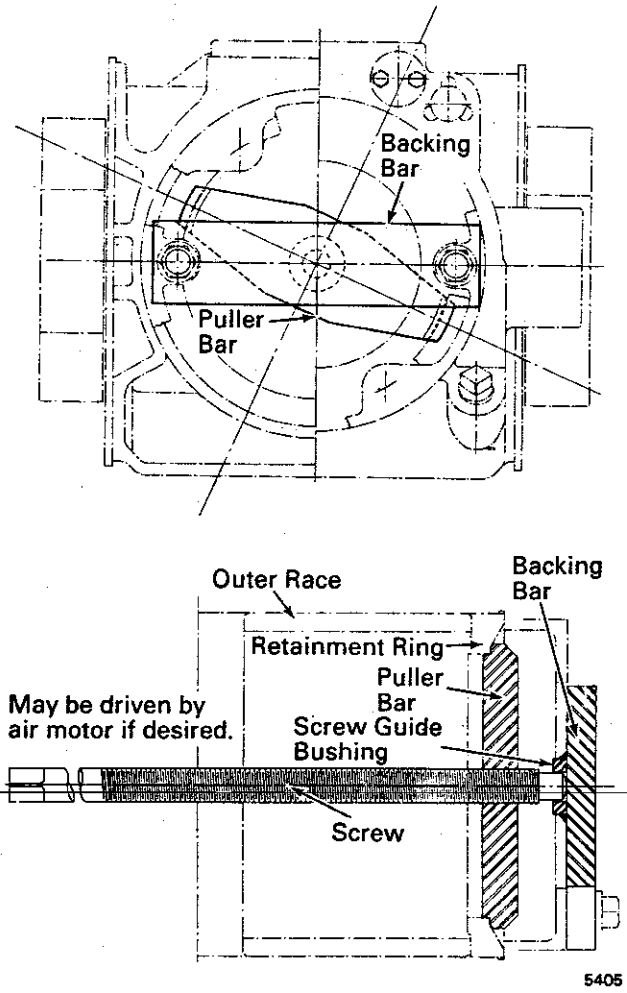

Fig.8 – Puller For Removing Outer Race And Retainment Ring

CLEANING

In maintaining roller bearings, the first consideration is cleanliness. It is imperative that the bearing and inside of the housing be kept free from moisture, grit and dirt. Hands should be clean when handling bearing components. Clean wiping towels should be used to wipe the various parts. The use of waste or rags is not recommended because the lint will adhere to the metal surfaces.

The loose bearing parts should be placed in a wash basket for cleaning. A petroleum solvent should be used as a cleaning medium.

CAUTION

When cleaning resilient thrust unit, remove from cleaning solution promptly, flush with clean water and allow to dry.

Housings should be cleaned separately. The wash operation should remove all visible loose chips, dirt and other foreign material from the inside and outside. It may be necessary to repeat the wash operation to obtain satisfactory results.

After the parts are washed and inspected, they must be kept clean until they are reassembled. Cleaned parts should be placed on clean paper and covered until needed. If they are to remain unused for any length of time, they should be oiled to prevent rust and washed again before being reassembled for service.

INSPECTION AND COMPONENT REBUILD

COMMON BEARING DEFECTS

Bearing components including the outer race and rollers should be carefully and individually inspected for the following common defects.

STAINS AND DISCOLORATION

Surface discoloration, Fig. 9, caused by moisture or acidity in the lubricant is not considered detrimental if it has no depth and can be removed by polishing with a wire wheel and polishing rouge or 320 grit abrasive cloth, Fig. 10.

ETCHING

Etching is gray or grayish black in color, caused by water or acidity in the lubricant. Superficial etching, Fig. 9, is acceptable after surfaces have been polished.

CORROSION PITTING AND RUST

Rust is a build-up of iron oxide, sometimes due to finger prints and is a form of advanced etching. Corrosion pitting or rusting which has advanced to severe pitting, Fig. 9, and which cannot be removed by polishing with a wire wheel and polishing rouge, Fig. 10, should be considered cause for rejection of the parts affected.

Stains And Discoloration

Etching

Corrosion, Pitting And Rust

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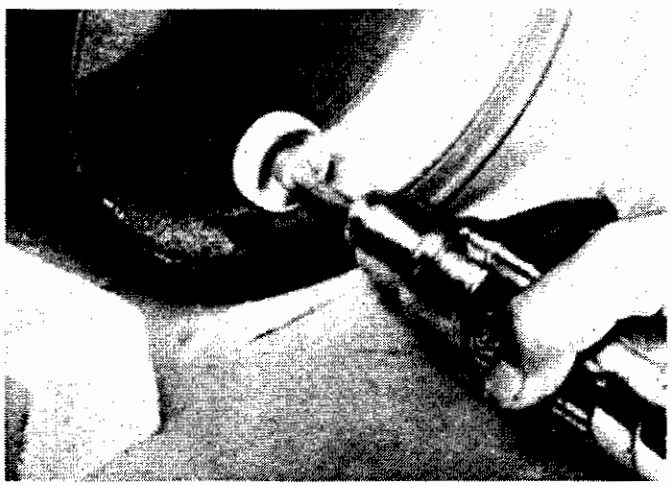
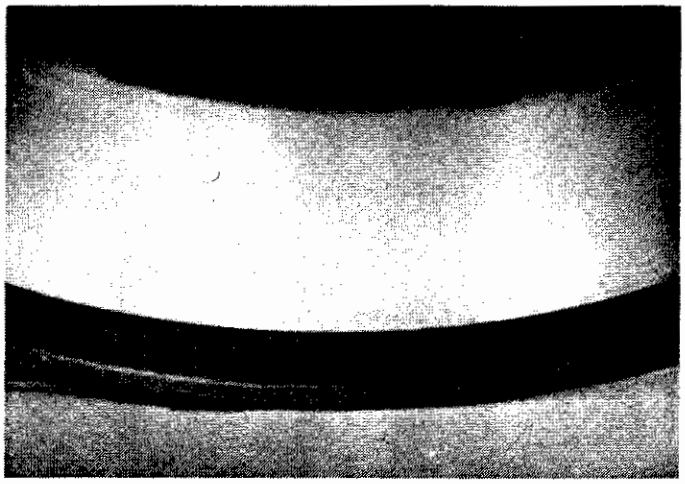
Fig.9 – Stains, Etching, And Corrosion Pitting And Rust



Polishing



After Polishing

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Fig.10 – Polishing With Wire Wheel And Polishing Rouge

HEAT DISCOLORATION

Bearing parts discolored by heat (faint straw color to dark blue) indicate the hardness of the metal has been affected and the parts must be scrapped. Ensure discoloration is not lubricant staining.

BRINELLING

Brinelling indentations are caused by the bearing rollers being forced into the surface of the race while the bearing was subjected to heavy impact loading beyond the capability of the bearing. Faint brinell marks are not cause for rejection. Moderate to heavy brinell marks are cause for rejection.

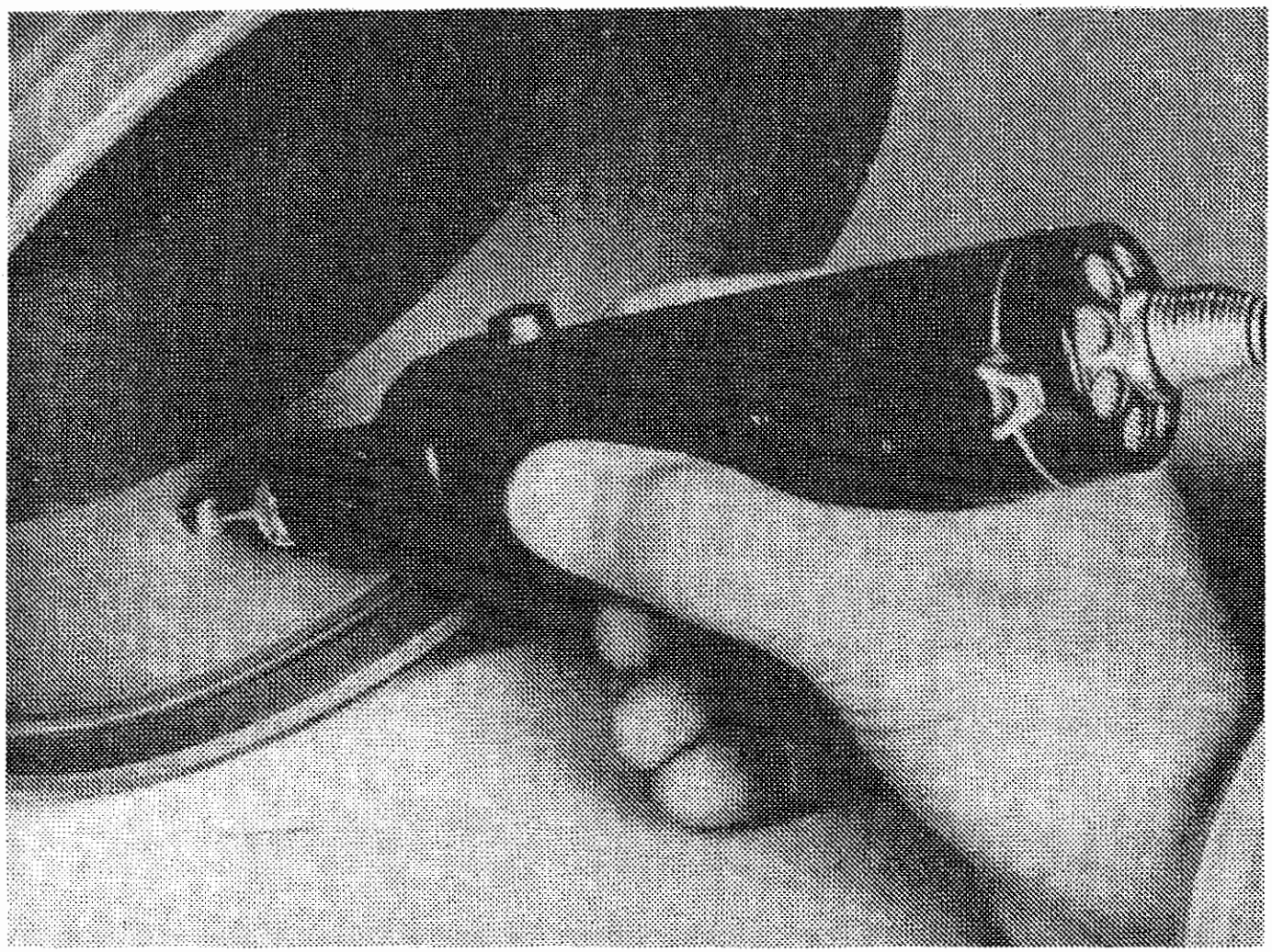

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Fig. 11 - Grinding Spall with Pencil Grinder

FATIQUE SPALLING

Indications of fatigue spalling on rollers shall be cause for rejection.

Indications of moderate or heavy spalling of the outer race bearing surface shall be cause for rejection. Minor spalling may be repaired with a small portable hand grinder as outlined in the A.A.R. Roller Bearing Manual.

FRAGMENT INDENTATIONS

Fragment indentations are usually caused by contaminants in the lubricant passing through the bearing while the bearing is loaded. Moderate surface damage, Fig. 12, is not considered sufficient cause for rejection unless roughness can be detected when bearing is rotated by hand. The roughness is caused by metal protrusions above the normal operating surface of the bearing as shown in Fig. 12.

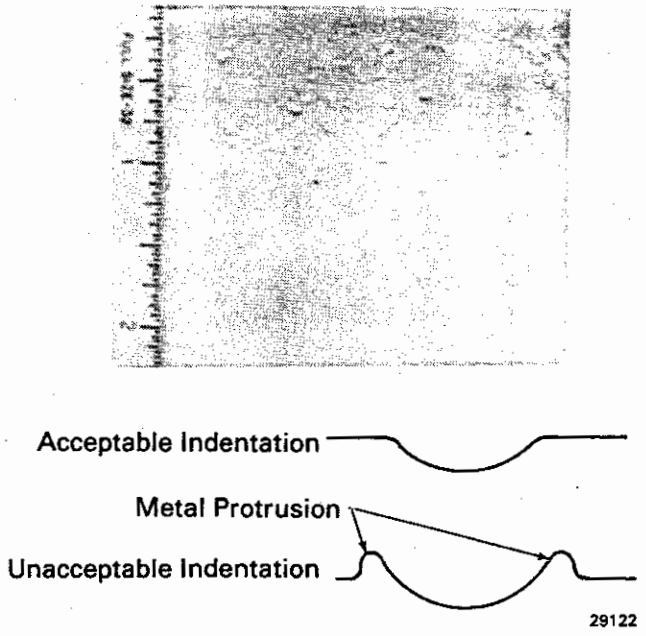


Fig. 12 - Fragment Indentations

ELECTRIC BURNS

Electric burns are caused by passage of electric current through the bearings causing craters, pits, fluting, or corrugation. The pitting shown in Fig. 13 could be the result of heavy electrical failure or by the connection of a ground cable from an arc-welder to the rail or wheel. Although only one pit is shown, pitting may occur at several points on the bearing.

The fluting or corrugations shown in Fig. 14 are caused by electrical current passing through the rotating bearing.

Bearing parts affected by electric burns (craters, pits, fluting or corrugation) must be scrapped.

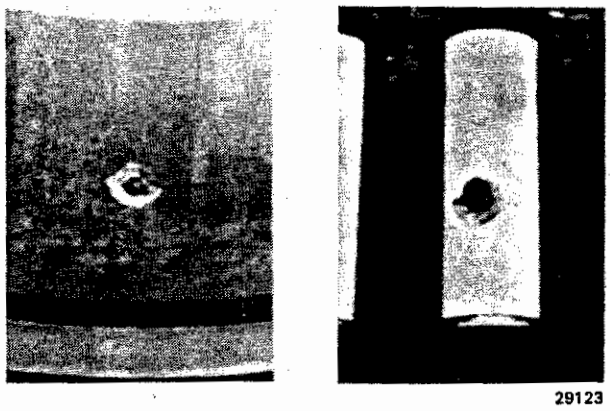


Fig. 13 - Electric Burns

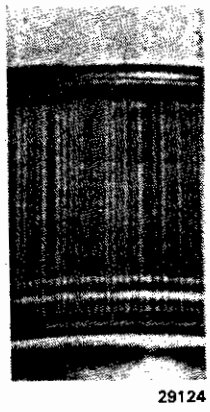


Fig. 14 - Fluting Or Corrugation

BEARING COMPONENTS

Refer to Fig. 15.

1. INNER RACE. The inner race, which is mounted on the axle, should be inspected with the axle as outlined in Maintenance Instruction 1518.

2. ROLLERS. All rollers should be inspected on the ends as well as the rolling surface for any of the described common bearing defects. It is permissible to lap used rollers, providing the minimum rebuild tolerances listed in Service Data are maintained. Rollers should be demagnetized if the magnetic field exceeds two gauss units (equivalent to picking up one paper clip).

   New and used rollers should not be used in the same journal box. Crowned rollers should be segregated and not mixed in the same journal

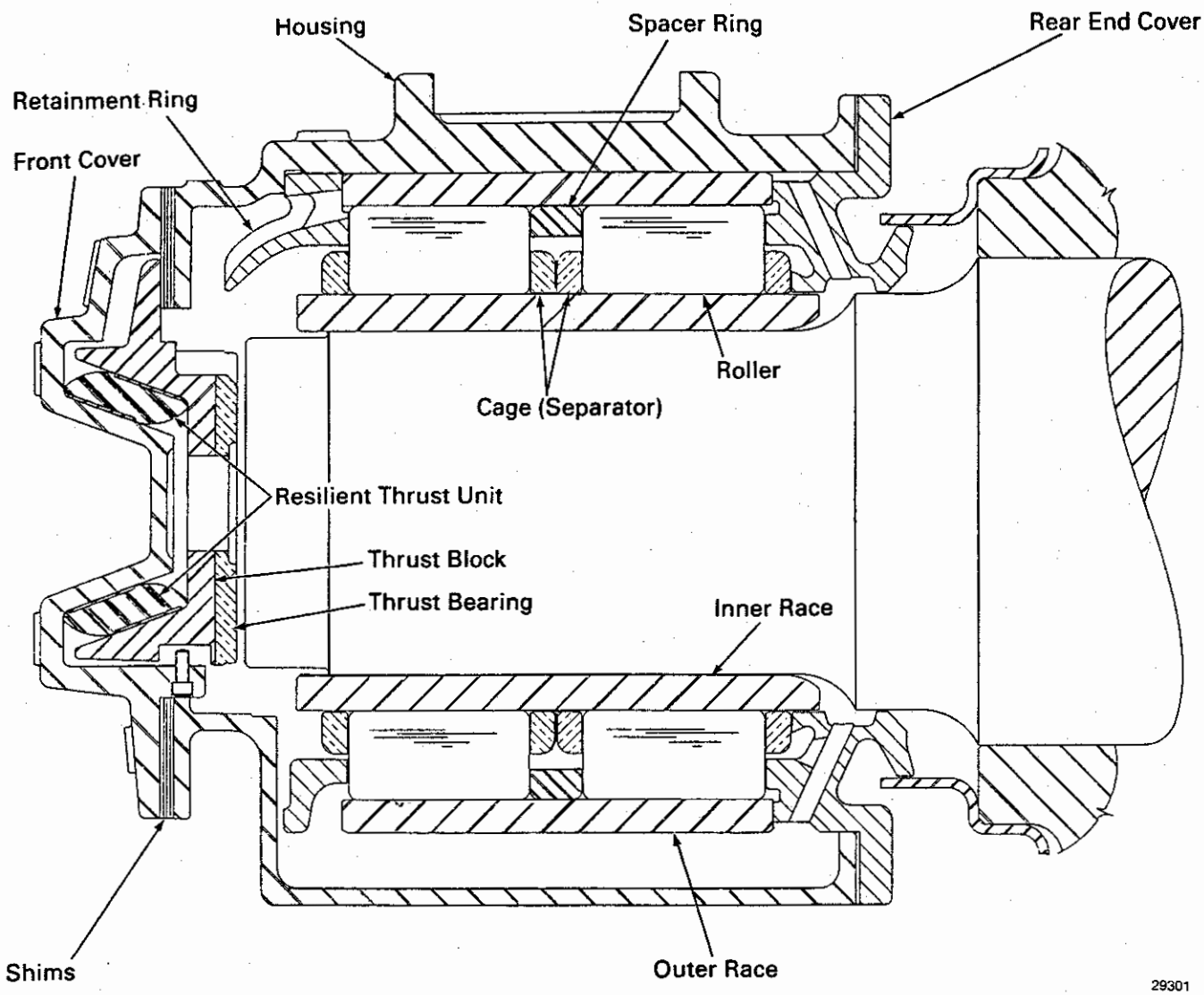


Fig. 15 - Journal Box Nomenclature

box with uncrowned rollers. Use only rollers that meet dimension requirements and have a definite crown.

A dimensional inspection should be made of the diameters of all rollers in the center section of each roller. Refer to Service Data for new and rebuild tolerances. It is recommended that all rebuild rollers be matched into groups with the diameters not varying more than 0.008 mm (.0003″) from the balance of the rollers in the group. Rollers should then be applied into journal boxes in matched sets so that all rollers in one journal box are from the same group.

3. OUTER RACE. Outer races should be inspected on the rolling contact surfaces on the inside diameter for any of the described common bearing defects. Refer to Service Data for outer race dimensional tolerances.

The top of the outer race inside diameter will receive the wear and can be identified by a wear groove. Check the depth of the wear groove. If the groove is less than 0.038 mm (.0015″), the outer race can be assembled in the housing in the same position from which it was removed. If the wear groove is over 0.038 mm (.0015″), and the surface is not ruptured, the outer race can be rotated 90° or 180° when applying to the housing. If all positions, every 90°, have been used, the outer race should be scrapped.

The outer race should be demagnetized if the magnetic field exceeds two gauss units.

It is recommended that only outer races meeting the specifications of EMD be used when rebuilding journal boxes.

4. RETAINMENT RING. The bearing contact surface of the retainment ring should be inspected for any of the described common bearing defects.

   Refer to Service Data for retainment ring dimensional tolerances. For JEM journal boxes, only use the newer style (curved tongue) retainment ring. If the pattern number is not M4162A, check to ensure a definite downhill slope exists in the spout.

5. SPACER RING. The bearing contact surfaces of the spacer ring should be inspected for any of the described common bearing defects.

   Check spacer rings for cracks by visual inspection and by ringing. Refer to Service Data for dimensional tolerances.

   The spacer ring should be demagnetized if the magnetic field exceeds two gauss units.

6. CAGE (SEPARATOR). Cages should be checked for cracks by visual inspection and ringing. They also may be checked by other methods such as Zy-glo. However, it should be noted that small shrink cracks, often detected in the pocket corners, are inherent in this part and are considered acceptable. Large cracks or cracks through any section are cause for rejection.

   Refer to Service Data for dimensional tolerances.

HOUSING COMPONENTS

Refer to Fig. 15.

1. REAR END COVER. The bearing contact surface of the rear end cover should be inspected for any of the described common bearing defects.

   The rear end cover is designed with sufficient rear seal clearance, but extreme lateral conditions caused by improper maintenance can result in wear at the seal. Inspect the rear seal for wear. Refer to Service Data for dimensional tolerances.

   The finished surface that fits against the housing should be clean and flat within 0.25 mm (.010″). All gasket material or compound that may have adhered to this surface should be removed with care so as not to damage the finished surface.

2. FRONT COVER. Inspect the front cover for cracks and other casting defects.

   The finished surface that fits against the housing should be clean and flat within 0.25 mm (.010″).

   A dimensional check should be made. New tolerances apply.

3. SPEED RECORDER DRIVE ADAPTER. Finished surfaces are to be clean, free of gasket material or compound, and flat within 0.25 mm (.010″).

   A dimensional check should be made. New tolerances apply.

HOUSING

SPRING SEAT

The top of the housing is the spring seat surface. The surface is machined flat within 0.25 mm (.010″).

SPRING SEAT WIDTH

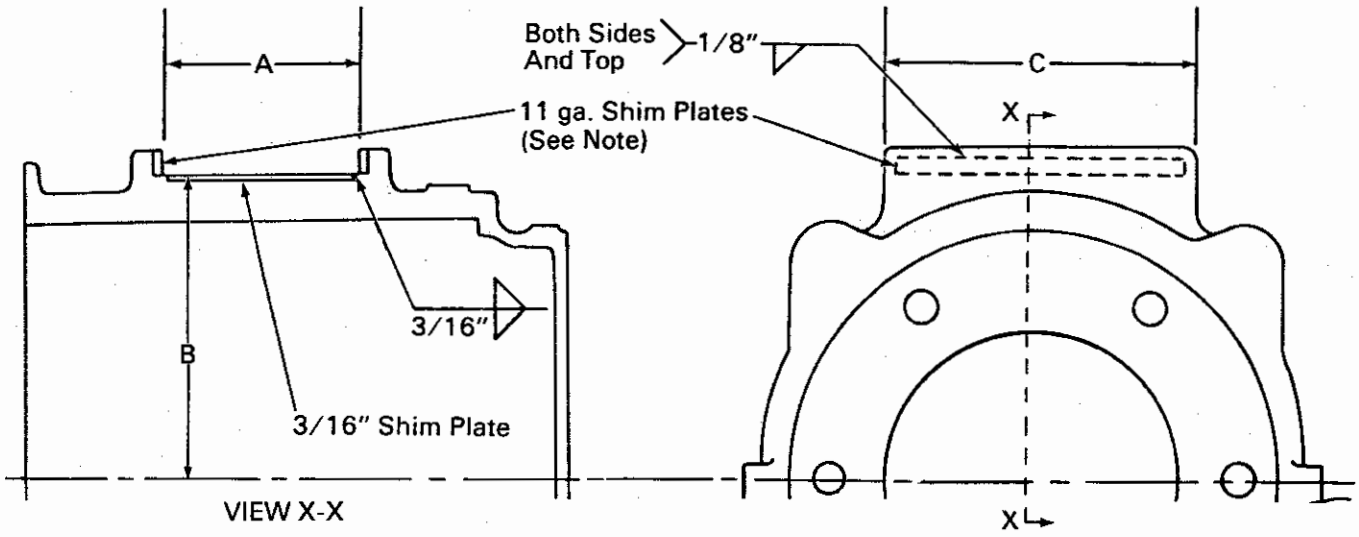
If the retainer lugs of the spring seat are worn, resulting in a spring seat width which exceeds the rebuild limit of Fig. 16 or 17, the lugs may be built up with weld and machined or ground smooth or the lugs may be machined to increase the opening and shim plates installed. Install shim plates to the retaining lugs as follows:

On Group I housing, the opening should be machined to 127.4 mm + 0.4, -0 (5-1/64″ + 1/64, -0) and a shim plate of 3 mm (11 ga.) steel applied to each lug to restore the opening to 120.6 mm + 0.8, -0 (4-3/4″ + 1/32, -0) as shown in Fig. 16.

On Group II and III housings the opening should be machined to 145.6 mm + 0.4, -0 (5-47/64″ + 1/64, -0) and a shim plate of 3 mm (11 ga.) steel applied to restore the opening to 152.4 mm + 0.8, -0 (6″ + 1/32, -0) as shown in Fig. 17. Weld the shim plates to the lugs as shown. In making a weld buildup or welding shim plates, care must be taken to maintain minimum heat input to prevent distortion of the housing bore.

SPRING SEAT LENGTH

If the ends of the spring seat are worn, resulting in a spring seat length which is less than the rebuild limits of Fig. 16 or 17, the ends of the spring seat



METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.008	0.20	7-5/16	185.7
1/32	0.8	7-3/8	187.3
3/32	2.4	7-7/16	188.9
1/8	3.2	7-7/8	200.0
3/16	4.8	7-63/64	202.8
4-3/4	120.6	8	203.2
4-25/32	121.4		

Dim.	New	Rebuild
A	4-3/4" $^{+1/32}_{-0}$	4-3/4"- 4-25/32"
B	7-3/8" ±0.008	7-5/16" - 7-7/16"
C	7-63/64" $^{+0}_{-3/32}$	7-7/8" - 8"

NOTE
Retainer lugs may be restored to 4-3/4" $^{+1/32}_{-0}$ dimension with weld buildup. Machine smooth after welding.

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Fig. 16 - Group I Journal Box Spring Seat Repair

may be built up with weld and machined. Machine Group I seat length to 202.8 mm +0, -2.4 (7-63/64" +0, -3/32). Machine Group II and III seat length to 206.4 mm +1.5, -0 (8-1/8" +1/16, -0). In welding care must be taken to maintain minimum heat input to prevent distortion of the housing bore.

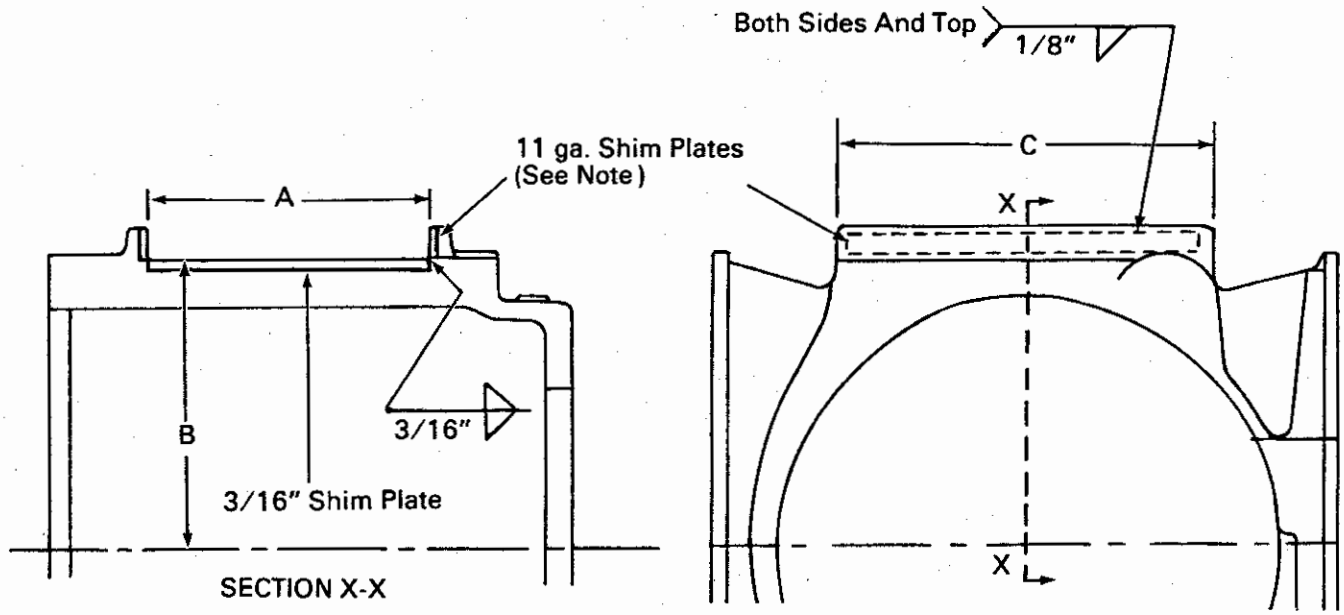
SPRING SEAT SURFACE

If the spring seat surface has a high spot it may be removed by grinding or machining. If the seat surface is crowned to the extent that removal of the crown will bring the seat below the minimum dimension to the centerline of the bore as shown in Fig. 16 or 17, the seat may be reworked by machining the seating surface undersize 4.8 mm (3/16") and applying a 4.8 mm (3/16") shim plate as shown in Fig. 16 or 17. Do not restore the spring seat surface by welding because the housing bore may become distorted.

DRIVING FACE LINERS AND STRIP LINERS

All housings should be inspected for worn or defective wear liners. Refer to Fig. 18 or 19 for dimension across new and rebuild strip liners. Before replacing both liners of either set, verify that the wear is on both liners and not totally on one liner.

Driving face liners worn beyond 378.6 mm (14-29/32") limit for Group I journal boxes and 335.0 mm (13-3/16") limit for Group II and III journal boxes across driving face liner surfaces, or cracked liners should be removed and replaced with new liners. Measure driving face liners for wear at a distance of 51 mm (2") from the bottom and 51 mm (2") from the top of the liner.



METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.008	0.20	6-3/4	171.4
1/32	0.8	6-13/16	173.0
1/16	1.5	6-7/8	174.6
6	152.4	8	203.2
6-1/8	155.6	8-1/8	206.4
6-3/16	157.2	8-3/16	208.0
6-5/16	160.3		

Dim.	New	Limit
A	6" $^{+1/32"}_{-0}$	6" - 6-1/8"
Group II B	6-5/16" ±0.008	6-3/16" - 6-5/16"
Group III B	6-13/16" ±0.008	6-3/4" - 6-7/8"
C	8-1/8" $^{+1/16}_{-0}$	8" - 8-3/16"

NOTE
Retainer lugs may be restored to 6" $^{+1/32}_{-0}$ dimension with weld buildup. Machine smooth after welding.

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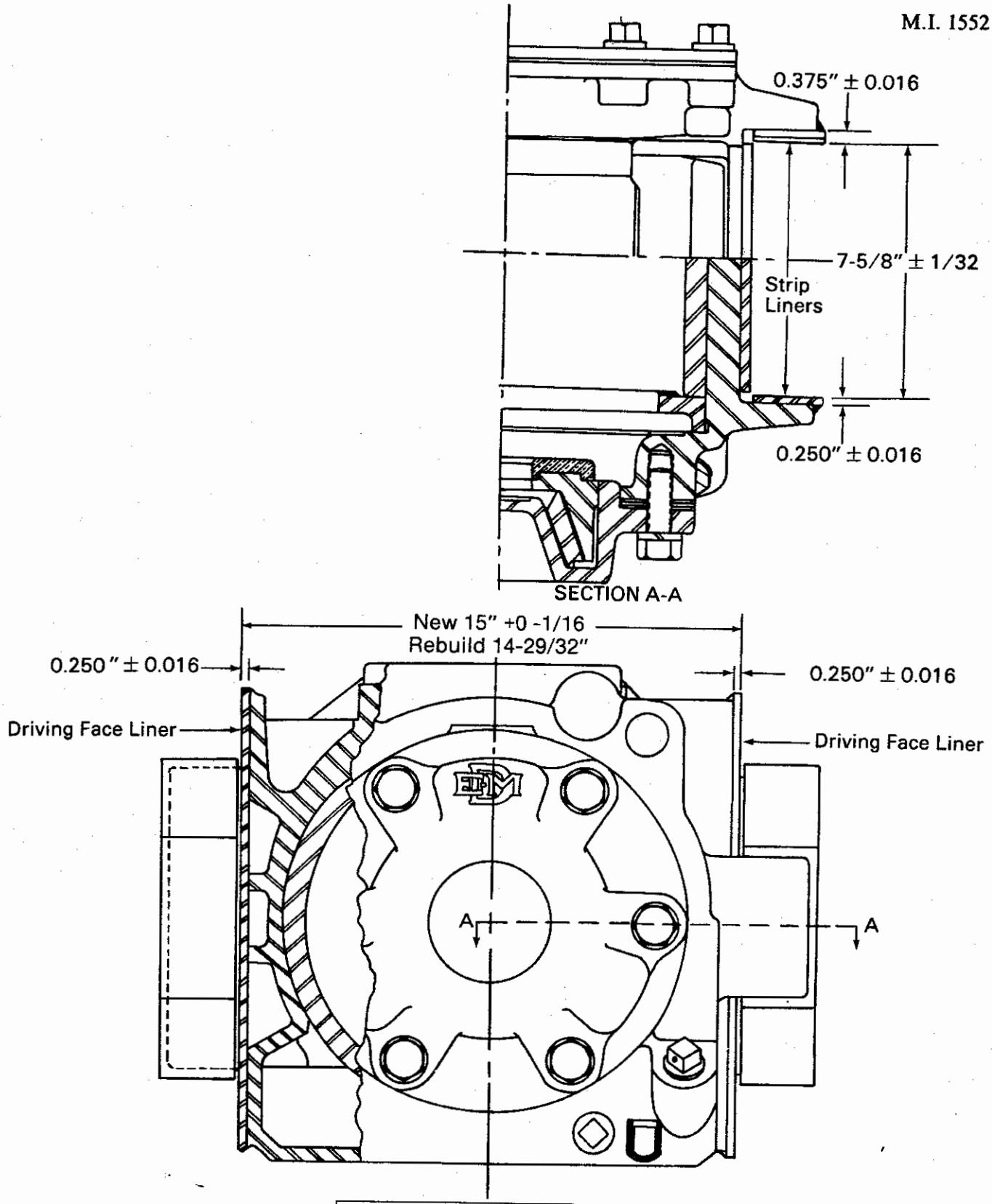
Fig. 17 - Group II And III Journal Box Spring Seat Repair

In order to maintain total free lateral clearance, the space between the strip liners should be to new journal box tolerance of 193.7 mm ± 8 mm (7-5/8" ± 1/32") for Group I, Group II, and Group III boxes. New strip liners will be required in most cases.

LINER REMOVAL

If worn driving face liners or strip liners are to be replaced with new liners, perform the following procedure:

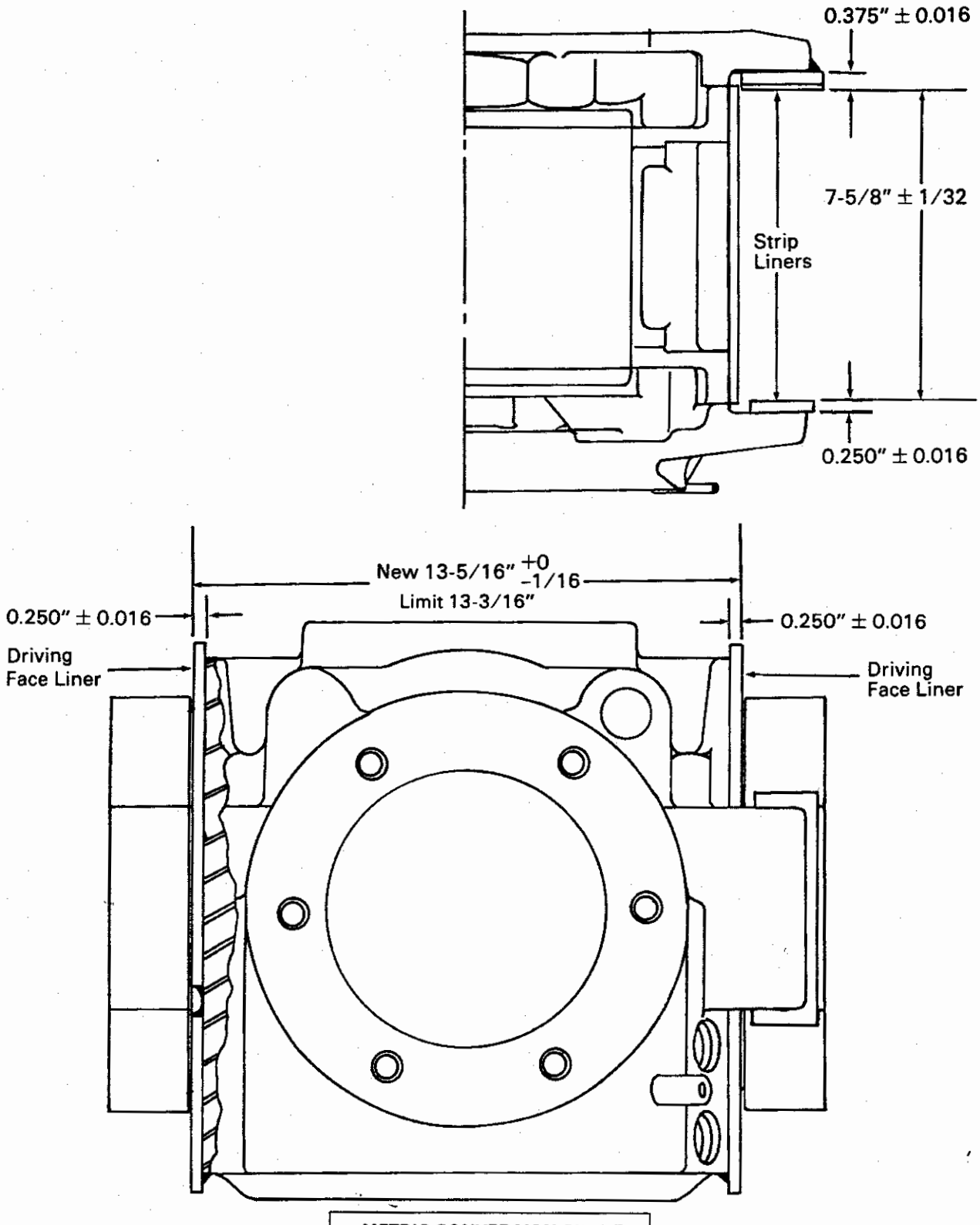
1. Remove the bearing from the housing before welding.
2. Remove the used liner by chipping, grinding, or by metal cutting electrode process. Removal should not be attempted with an acetylene torch because of distortion which could result from intense heat. The metal cutting electrode process is recommended because of the speed and ease of operation; and when reasonable care is exercised, the low heat developed will not distort the housing bore. If the metal cutting electrode process is to be used, refer to the Metal Cutting Electrode Process procedure which follows. Prepare the liner surface by grinding flat and parallel within 0.38 mm (.015") of the opposite side. Wire brush liner surface of the housing.



METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.016	0.41	0.375	9.52
1/32	0.8	7-5/8	193.7
1/16	1.6	14-29/32	378.6
0.250	6.35	15	381

29304

Fig. 18 - Group I Journal Box Wear Liners



METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.016	0.41	0.375	9.52
1/32	0.8	7-5/8	193.7
1/16	1.6	13-3/16	335.0
0.250	6.35	13-5/16	338.1

29305

Fig. 19 - Group II and Group III Journal Box Wear Liners

METAL CUTTING ELECTRODE PROCESS

To remove liner from housing with the metal cutting electrode process requires no special equipment other than a metal cutting electrode and standard DC weld equipment. Use the following:

Carbon Electrode (or equivalent).
3 mm (1/8″) Electrode for 6.5 mm (1/4″) fillet weld.
4 mm (5/32″) Electrode for larger fillets.
DC Straight Polarity.
325 Amps (approx.) for 3 mm (1/8″) electrode.
375 Amps (approx.) for 4 mm (5/32″) electrode.

Perform the following procedure to remove welds.

1. Clamp electrode in regular welding rod holder of a DC welding machine.

2. Position electrode at a shallow angle directed at the weld to be removed. Push the molten material ahead of the electrode, pulling back and pushing forward to prevent a puddle forming in back of the electrode tip.

3. After cutting all the welds, the liner can be removed by striking with a hammer.

DRIVING FACE LINER HOUSING SURFACE INSPECTION

After removal of worn driving face liners, the housing should be thoroughly inspected before applying new liners.

Each driving face liner surface should be clean and flat within 0.38 mm (.015″). On Group I journal boxes, new housing limits between driving face liner surfaces are 367.59 mm to 367.33 mm (14.472″ to 14.462″). On rebuilt housings the limits are 367.59 mm to 366.78 mm (14.472″ to 14.440″).

On Groups II and III journal boxes, new housing limits between driving face liner surfaces are 324.71 mm to 324.46 mm (12.784″ to 12.774″). On rebuilt housings the limits are 324.71 mm to 323.95 mm (12.784″ to 12.754″). The limits of the housing bore centerline-to-driving face liner surface are 183.79 mm to 183.39 mm (7.236″ to 7.220″). The surfaces must be parallel to within 0.51 mm (.020″).

If the surfaces are out-of-flat or out-of-parallel with each other, they may be reworked by machining within allowable limits. If the surfaces cannot be cleaned up within limits, the housing of Group I journal boxes can be machined undersize to an overall dimension of 364.49 mm to 364.24 mm (14.350″ to 14.340″) and 7.9 mm (5/16″) thick liners 8446072 may be applied to obtain the over-liner dimension of 381.0 mm +0, -1.6 (15″ +0, -1/16″). When a Group I housing requires machining, the surfaces must be parallel within 0.25 mm (.010″) to vertical centerline of the housing and the centerline-to-driving face surface limits are 182.25 mm to 182.12 mm (7.175″ to 7.170″).

Rebuilt Groups II and III housings can be machined undersize to an overall dimension of 321.66 mm to 321.41 mm (12.664″ to 12.654″) and heavy liners applied to obtain the over-liner dimension of 338.14 mm +0, -1.6 (13-5/16″ +0, -1/16″). When a Group II or Group III housing requires machining, the surfaces must be parallel within 0.25 mm (.010″) to the vertical centerline of the housing and the centerline-to-driving face surface limits of 160.81 mm to 160.68 mm (6.331″ to 6.326″).

LINER APPLICATION

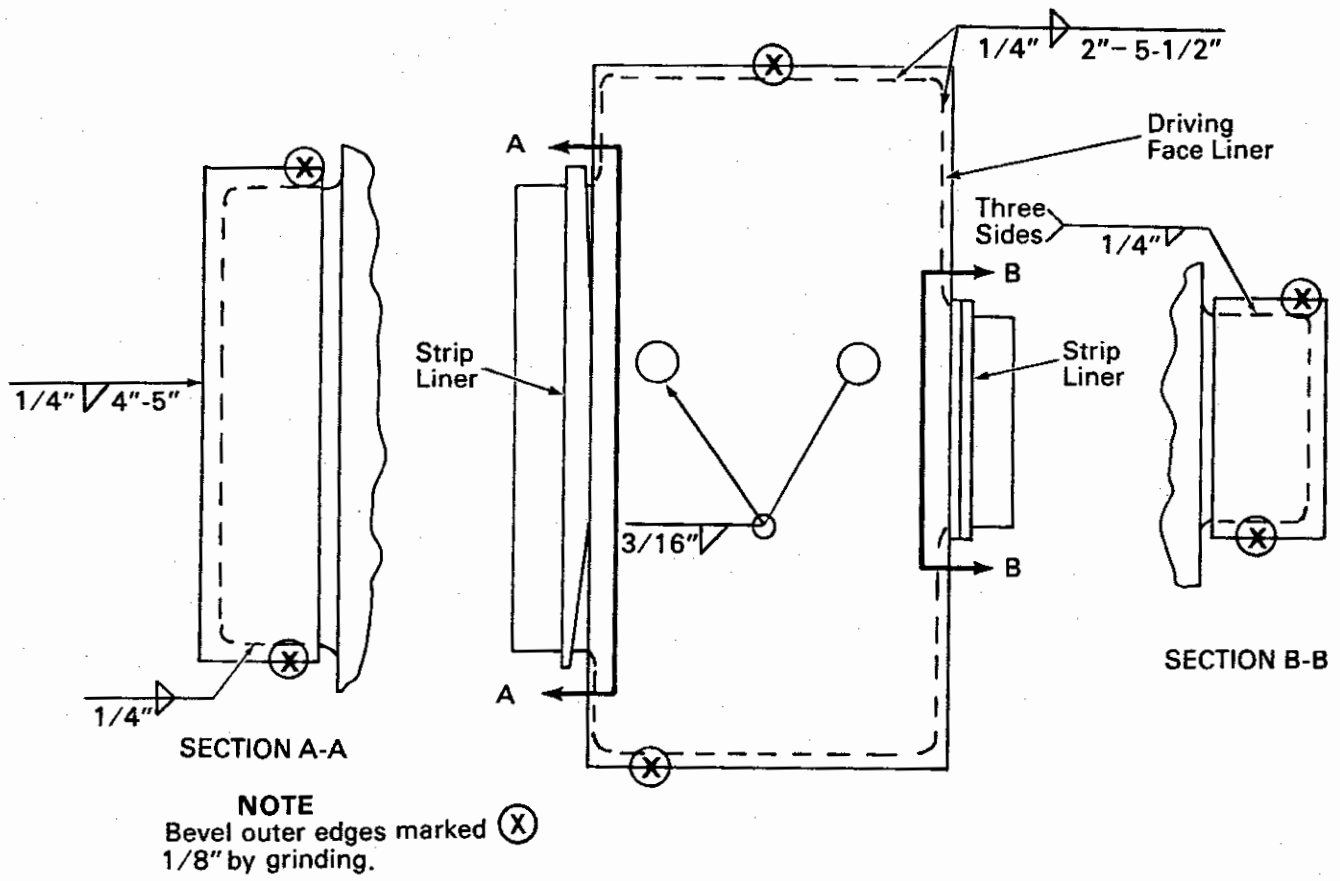
CAUTION

When applying new driving face liners to a housing which is at the low dimension limit of 366.78 mm (14.440″) it is very important to use liners with a thickness more than 6.4 mm (.250″) to achieve the desired new dimension over the liners of 381 mm +0, -1.6 (15″ +0, -1/16).

1. Place the liner on the housing surface to which it will be welded. Ensure no bumps interfere with the liner laying flat. Use clamps to hold liner flat and tight during welding. All liners must be applied with a minimum of 50% contact area and the maximum gap in non-contact areas should not exceed 0.64 mm (.025″). These areas should be restricted so that the permissible 50% non-contact area does not occur in one place.

2. In welding the liner to the housing, refer to Fig. 20 and observe the following procedure:

   a. Liners with concave condition should be applied with the convex side against the housing and forced until the outer edges maintain contact.



METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
1/8	3	4	101
3/16	5	5	127
1/4	6	5-1/2	140
2	51		

29306

Fig. 20 - Welding Of Journal Box Liners

b. Liners with a twist should be applied by first forcing the non-contacting areas to the mating surface until contact in obtained.

c. Driving face liners with holes provided should be welded at the holes before the outer edges are secured. This will prevent buckling and ensure contact at the center.

d. The sequence of the welding should originate at the center and progress outward.

e. Liners and mating surfaces must be free from oil and other foreign matter.

f. Ensure that no weld beads extend above the wear surface of the liner. Grinding to level off the surface is recommended.

g. Welding electrode:

When applying SAE 1060 heat-treated steel liners, use AWS Class E-7016, E-7018, E-310-16 stainless steel electrode, or EMS-878 flux-cored wire.

When applying manganese wear resistant liners, use AWS E-Fe Mn-A, E-308-16, or E-310-16 stainless steel electrode.

When applying SAE 1095 heat treated steel plates use AWS E-308-16 or E-310-16 stainless steel welding electrode.

CAUTION

When applying manganese plates, observe the following:

Use only one pass welding. Multiple pass welding, including over tack welds, will cause the plate to crack.

Ensure manganese plates are fully annealed. Hardened plates will crack upon welding. Plates can be checked with a magnet. Hardened plates are magnetic. Annealed plates are non-magnetic.

3. Chip off weld scale and allow housing to cool. Inspect welds for cracks.

4. The top and bottom outer edges of driving face liners should be ground to a 3 mm (1/8″) radius to prevent galling of the truck pedestal liners.

5. RESILIENT THRUST UNIT AND THRUST BEARING ASSEMBLY. All resilient rubber thrust units should be inspected for visible cracks or tears in the rubber and in the rubber-to-metal bond. Cracks or tears in the rubber or metal-to-rubber separation at the bond line are causes for rejection. Any indication of heat damage is also cause for rejection.

   The thrust bearing surface should be free of cracks, galling and excessive heat indications.

   Current Group I thrust blocks have a shoulder undercut 6.3 mm (1/4″) from the bearing face. Using the shoulder as a reference point, the wear on the bronze face can be determined. The rebuild limit for the thrust bearing is 1.6 mm (1/16″) and the condemning limit is 4.8 mm (3/16″).

   Groups II and III thrust blocks have a 3.2 mm (1/8″) wear limit witness groove machined on the circumference of the bronze thrust block. The rebuild limit of wear on the block is 1.6 mm (1/16″) and the condemning limit is 2.4 mm (3/32″).

   The maximum rebuild wear limit on thrust block support ears is 0.8 mm (1/32″).

HOUSING INSPECTION

The housing bore should be carefully inspected for defects that could impose undue stress on the bearing outer race.

The centerline of the bore and each projected roller path should be inspected over the top 120° of the load zone area, using a Chordal gauge. Refer to Service Data for a File Drawing number of the Chordal gauge.

The limiting acceptable bore variation from the mean reading over the top 120°, as read on the Chordal gauge, shall be –0.08 mm (–.003″) (indicating a surface depression) and +0.02 mm (+.001″) (indicating a surface rise or high spot).

Any steps in the top 120° of the housing bore at each end of the race, resulting from a pounding out condition and thereby leaving an imprint or step in the bore greater than 0.13 mm (.005″) and less than 0.38 mm (.015″), shall be carefully blended out. Steps greater than 0.38 mm (.015″) can result in end cap to axle interference and are not acceptable.

If housing is distorted and the outer race does not press smoothly into the bore it is recommended that no attempts be made to straighten the housing, but rather that it be scrapped. Distorted housings are generally the result of long service life, both in time and mileage, and because great care and skill, as well as special tools, are required it is not believed to be economically feasible to attempt straightening.

The threaded holes in the housing for the front and rear covers are a Class 2B quality. The holes should be inspected for thread damage and wear. The wear on the threads must not exceed the limits for a Class 1B thread. The thread can be reworked by welding, redrilling and tapping to 2B quality or drilled oversize and a threaded insert applied. Insert part numbers and details are given in the Service Data pages.

Provision is made in the housing for the application of heat indicators, such as a stench or smoke bomb, at customer request. If used, they should be removed from the housing prior to cleaning.

ASSEMBLY

1. OUTER RACE AND RETAINMENT RING. The outer race and retainment ring should be pressed carefully into the housing.

CAUTION

Do not drive them in.

2. ROLLERS. The rollers should be assembled into the two cages in matched sets. To prevent rollers from falling out of the cage, place a wire hoop or heavy rubber band around the rollers, Fig. 21, prior to application into the outer race. Apply a light coating of oil to the outer race and rollers prior to assembly.

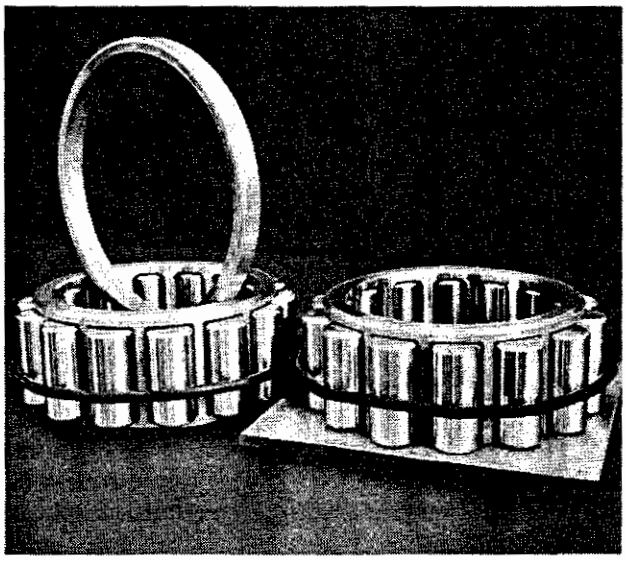


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Fig. 21 - Assembling Rollers

3. FRONT AND REAR COVERS. A light coating of oil should be applied over the thrust block after the assembly is applied to the front cover. Front cover shims should be coated with a light coating of grease just prior to assembly between the front cover and the housing. Only non-stick type gaskets should be used on the rear cover of all boxes.

4. BOLTS AND LOCKWASHERS. Only SAE Grade 5 bolts should be used along with deflected end lockwashers on front and rear covers. Refer to Service Data for bolts and lockwashers part numbers and for torque values.

5. OIL FILLER ASSEMBLY AND DRAIN PLUGS. Drain plugs and fill plugs (if used) must be of the solid type listed in the Service Data.

   For ease in filling, an oil filler assembly, Fig. 22, is available. This assembly is used in place of the fill plug. Refer to Service Data for part number.

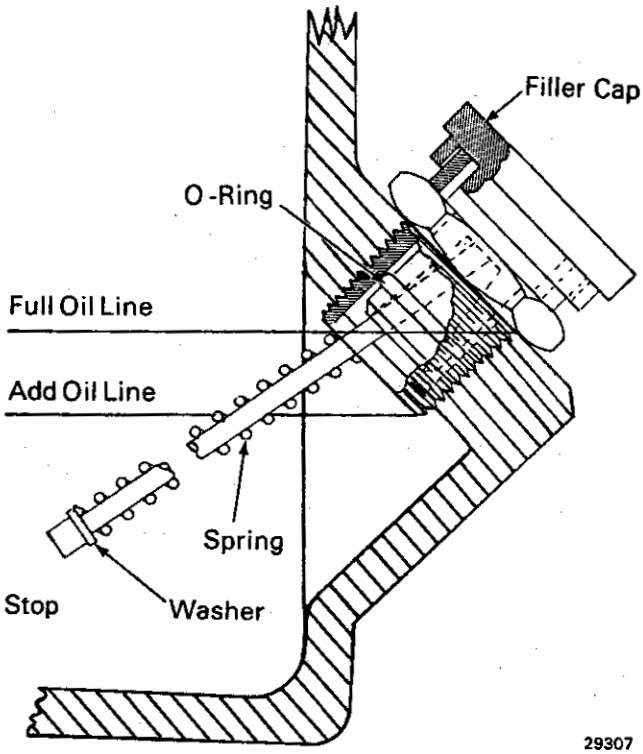


Fig. 22 - Oil Filler Assembly

6. PLUG GAUGE. With the roller assembly and rear end cap in position, each journal box should be checked with a plug gauge:

   Group I plug gauge - O.D. 200.523 mm +0.000, -0.005 (7.8946″ +.0000, -.0002).

   Group II plug gauge - O.D. 169.537 mm +0.000, -0.005 (6.6747″ +.0000, -.0002).

   Group III plug gauge - O.D. 181.772 mm +0.000, -0.005 (7.1564″ +.0000, -.0002).

   The plug assembly must pass through the roller assemblies easily and should rotate with a minimum of force.

7. STORAGE PROTECTION. The rear opening of assembled journal boxes should be covered with a suitable paper or cardboard cover to keep out dirt and foreign material until ready for application. Assembled journal boxes should be stored inside and on a pallet with the rear opening in a down position.

8. APPLICATION TO AXLE. The inner race should be washed and oiled before the journal box is applied on the axle. If the assembled journal box will not slide on the axle easily, the box should be removed and reinspected for

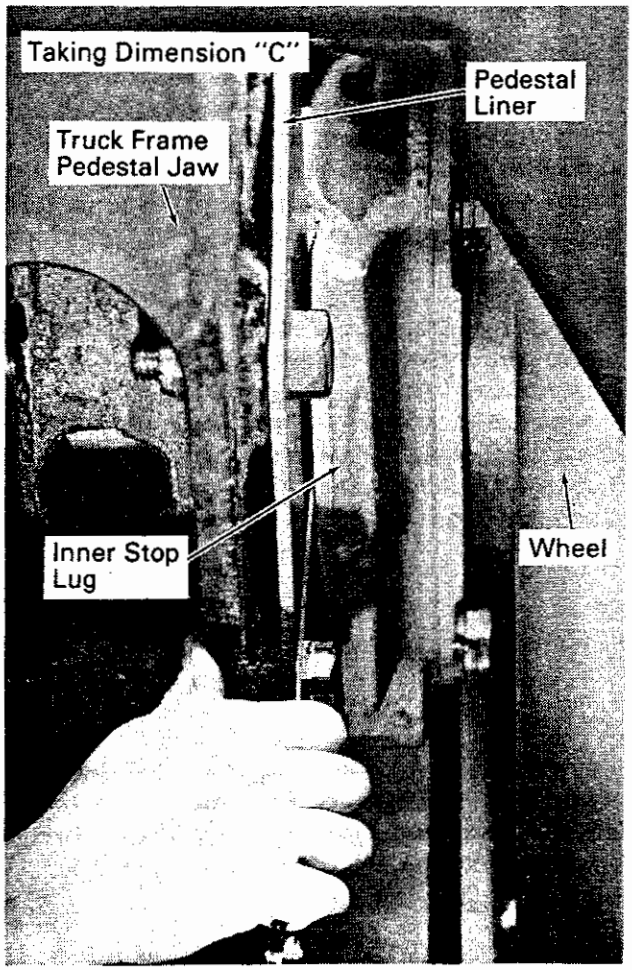
out-of-roundness of the outer race. Journal boxes should never be forced onto the inner race.

MEASURING LATERAL CLEARANCE

Four major points affect or control axle lateral clearance. Lateral is controlled at the two ends of the axle at the point of contact with the thrust blocks, and at the inner stop lugs on each journal box where the lugs contact the truck pedestal jaws.

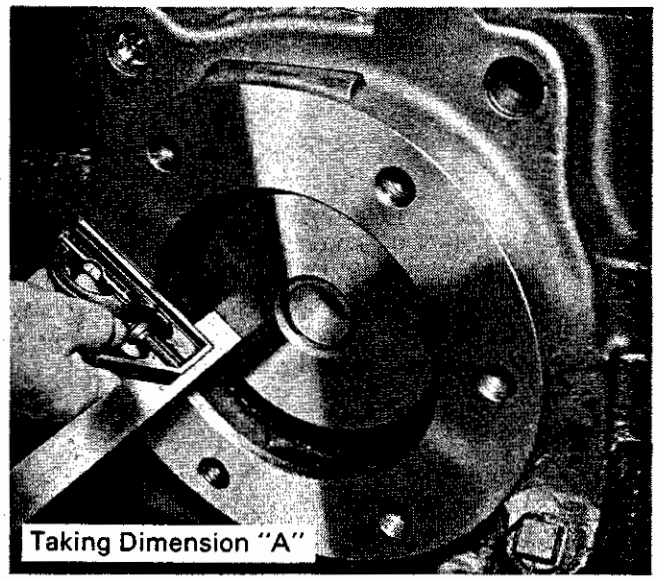
When checking for lateral clearance all four points must be considered.

Axle-to-thrust block clearance can be measured readily with a small machinist's combination square, Fig. 23, after the front cover has been removed from the journal box. Measure from the machined cover seat on the housing inward to the axle end surface. Add the thickness of the shims. Consider this as dimension A. Measure from the wear face of the thrust block back to one of the stop lugs on the block. This is dimension B.



NOTE
Journal box rear wear plate has a taper on the ends. Ensure taper is not mistaken for clearance.

29308



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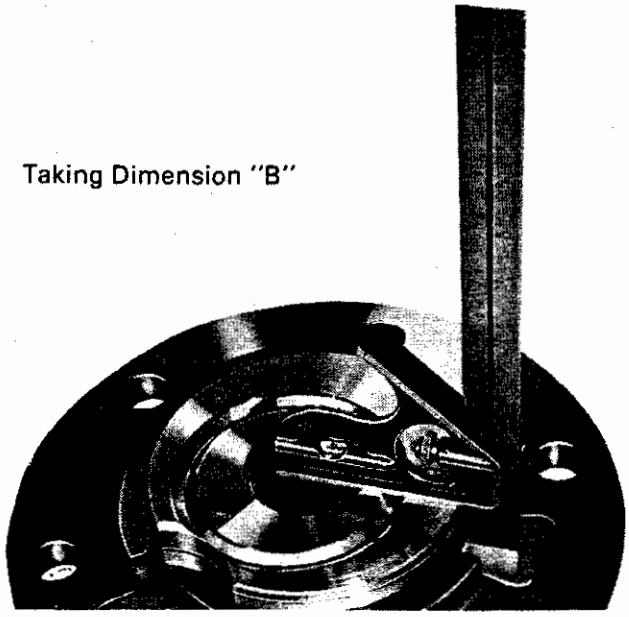

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Fig. 23 - Measuring For Axle Lateral Clearance

To determine the actual clearance between the axle end and thrust block when the thrust block and cap are in place on the housing, subtract B from A.

The clearance between the inner stop lug on the journal box housing and the truck pedestal jaw (dimension C) can be measured by means of feeler gauges. Four gauges, 0.4 mm (1/64"), 0.8 mm (1/32"), 1.6 mm (1/16"), and 3.2 mm (1/8") in thickness are sufficient and these should be approximately 25.4 mm (1") wide and 305 mm (12") long. Care should be exercised in making this measurement to see that the gauge is inserted vertically into the clearance, and fits into the wearing area of the pedestal liner so that a true reading of the clearance is obtained. Note that the rear journal box wear plate has a taper on the ends. Ensure taper is not mistaken for clearance.

Take the same measurements (A, B, and C) at the journal box on the other end of the axle. Add measurements A and C from both ends. Subtract from this total, the total of the two B measurements. The result is the total free lateral of that particular axle, Fig. 24.

The dimension A minus B gives the clearance between the wear face on the thrust block and the end of the axle, Fig. 25. If the axle is against the thrust block to the extent that the resilient thrust unit is compressed, the sum A minus B will be a negative number. If this situation exists, this measurement should be subtracted from the measurement C. If the sum of A minus B plus C is still negative, this measurement should be subtracted from the corresponding total sum of A minus B plus C for the journal box at the other end of the axle to obtain the total lateral clearance for the axle.

Allowable limits of wear are 3.2 mm (1/8") on each journal box driving face liner and 1.6 mm (1/16") on each journal box front and rear strip liner.

Thrust blocks for Group I journal boxes have a shoulder undercut 6 mm (1/4") from the bearing surface. Thrust blocks for Group II and III journal boxes have a 3 mm (1/8") wear limit witness groove machined on the circumference of the bronze thrust block.

Using the shoulder undercut or witness groove as a reference point, determine the wear on the thrust block.

Replace Group I thrust block when the block is worn 4.8 mm (3/16") or when the B dimension is 32.5 mm (1-9/32"). New thrust block dimension B is 37.3 mm (1-15/32").

Replace Group II thrust block when the block is worn 3.2 mm (1/8") or when the B dimension is 30.2 mm (1-3/16"). New thrust block dimension B is 33.3 mm (1-5/16").

Replace Group III thrust block when the block is worn 3.2 mm (1/8") or when the B dimension is 33.3 mm (1-5/16"). New thrust block dimension B is 36.5 mm (1-7/16").

Allowable limits of total free lateral for all groups, 19 mm (3/4") for driving axles and 25.4 mm (1") for idler axles may require the replacement of individual parts before they reach their individual limit of wear.

Keeping in mind the desire to make each box completely interchangeable without checking lateral every time it is applied to a truck, and at the same time maintain as little variation in lateral as possible, shims may be removed as the thrust block wears. This adjustment affects the internal lateral of the box, maintaining it at or near its original proportions.

When removing shims, maintain the same number of shims on each side of the axle.

For each 1.6 mm (1/16") wear of the Group I thrust block one shim may be removed. When the thrust block has worn 4.8 mm (3/16") and only one shim is left, the block should be replaced and all four shims reapplied between the cover and the housing.

For each 0.8 mm (1/32") wear of Group II or III thrust block one shim may be removed. When the thrust block has worn 3.2 mm (1/8") and only one shim is left on boxes using five shims or three shims on boxes using seven shims, the block should be replaced and all shims reapplied between the cover and the housings.

Lateral adjustment for wear on the pedestal liners by removal of shims is NOT recommended.

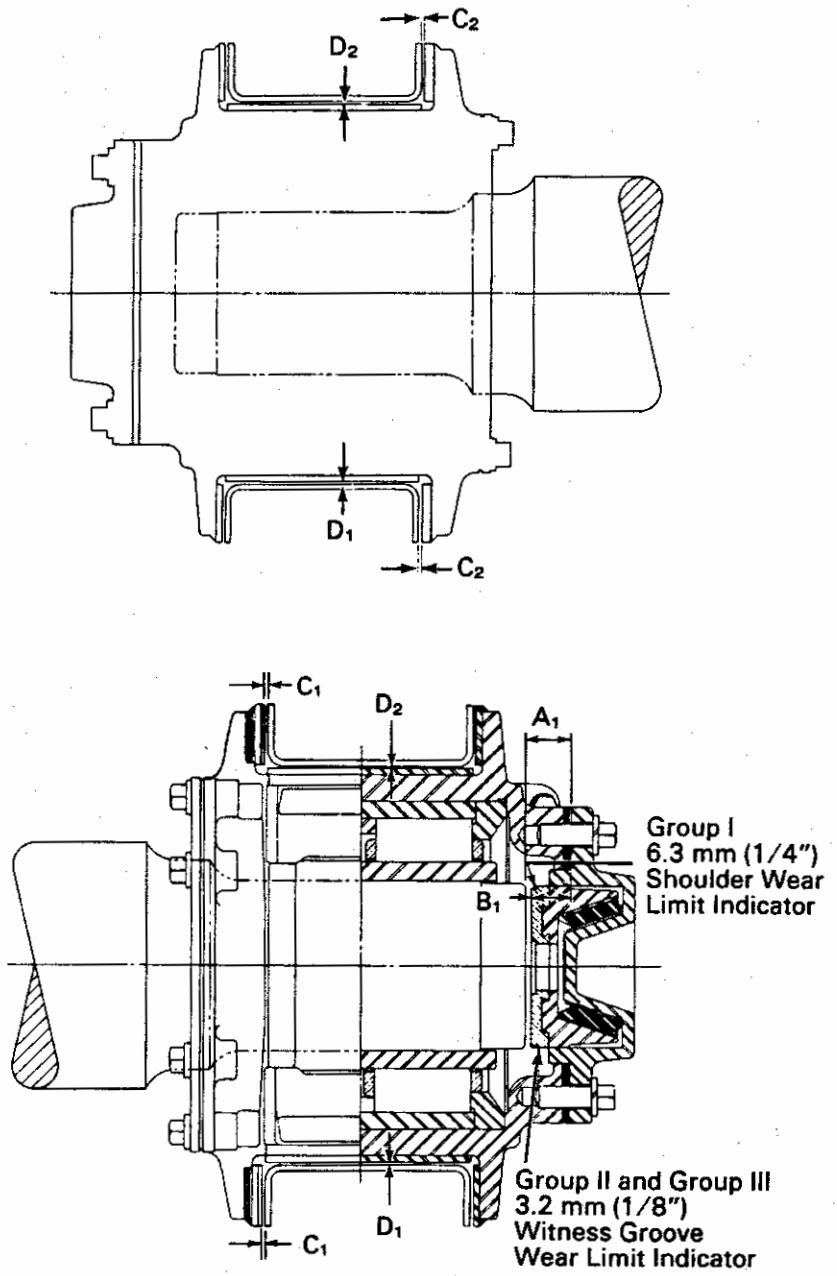


Fig. 24 - Method For Figuring Total Free Lateral Clearance

GROUP I

	Left Side			Right Side		
	A_1	B_1	C_1	A_2	B_2	C_2
Minimum Tolerance	1-19/32"	1-15/32"	1/16"	1-19/32"	1-15/32"	1/16"
Maximum Tolerance	1-21/32"	1-15/32"	1/16"	1-21/32"	1-15/32"	1/16"

Total Free Lateral equals $A_1 - B_1 + C_1 + A_2 - B_2 + C_2$

Minimum New Total Free Lateral from example is 3/8"

Maximum New Total Free Lateral from example is 1/2"

The above example is for drive axles only with four 1/16" shims installed.

METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
1/16	1.6	1-15/32	37.3
3/8	9.5	1-19/32	40.5
1/2	12.7	1-21/32	42.1

GROUP II

	Left Side			Right Side		
	A_1	B_1	C_1	A_2	B_2	C_2
Minimum Tolerance	1-13/32"	1-5/16"	1/16"	1-13/32"	1-5/16"	1/16"
Maximum Tolerance	1-15/32"	1-5/16"	1/16"	1-15/32"	1-5/16"	1/16"

Total Free Lateral equals $A_1 - B_1 + C_1 + A_2 - B_2 + C_2$

Minimum New Total Free Lateral from example is 5/16"

Maximum New Total Free Lateral from example is 7/16"

The above example is for drive axles only with five 1/32" shims installed.

METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
1/32	0.8	1-5/16	33.3
1/16	1.6	1-13/32	35.7
5/16	7.9	1-15/32	37.3
7/16	11.1		

Although a wear limit of 1.6 mm (1/16") is allowable on all pedestal and journal box liners, this wear accumulates fastest in a lateral direction and liners will usually be replaced because of excessive wear on the lateral faces. However, the total longitudinal clearance between the journal box and pedestal liners due to wear of any of the four liners involved should not exceed 6.4 mm (1/4") (D_1 plus D_2, Fig. 24.)

In checking lateral, while the weight of the locomotive is on the trucks, all measurements should be taken with the journal boxes in position as they are when the locomotive is stopped. No attempt should be made to shift the journal boxes on the axles while the locomotive is standing with its weight on the boxes.

	GROUP I		GROUP II and GROUP III	
	New Clearance Nominal	New Clearance Plus Wear Limit	New Clearance Nominal	New Clearance Plus Wear Limit
Total box lateral free play.	1/8"	3/8"	1/8"	3/8"
Axle end to thrust bearing clearance each box with shims installed (Dimension A - B).	5/32" (four 1/16" shims)	11/32" (four 1/16" shims)	3/32" (five 1/32" shims) 5/32" (seven 1/32" shims)	7/32" (five 1/32" shims) 9/32" (seven 1/32" shims)
Total lateral clearance - both sides (A - B + C one side) (A - B + C other side) showing use of shims to compensate for thrust block wear.	7/16" (four 1/16" shims each side)	11/16" (one 1/16" shim each side)	5/16" (five 1/32" shims each side) 7/16" (seven 1/32" shims each side)	5/16" (one 1/32" shim each side) 9/16" (five 1/32" shims each side) 11/16" (seven 1/32" shim each side)
Longitudinal pedestal way clearance, each box (Dimension $D_1 + D_2$).	1/8	1/4"	1/8"	1/4"
Compression of resilient thrust unit, each box.	1/4		1/4"	

METRIC CONVERSION CHART					
(inch)	mm	(inch)	mm	(inch)	mm
1/32	0.8	5/32	4.0	11/32	8.7
1/16	1.6	7/32	5.6	3/8	9.5
3/32	2.4	1/4	6.4	7/16	11.1
1/8	3.2	9/32	7.1	11/16	17.5

29310

Fig. 25 - Lateral Clearance And Wear Limits

REPLACEMENT OF PARTS

There are two basic rules which apply to the replacement of cylindrical roller bearing and journal box parts for railway journals.

1. New inner races, outer races, separators (cages), center rings or any journal box parts with the exception of rollers can be applied either individually or collectively at any time without affecting the operation of the bearing to which they are applied. Individual replacements of new or used rollers may be made providing their diameter does not vary more than 0.008 mm (.0003") from the balance of rollers in the assembly. Only crowned rollers should be used in an assembly.

2. When roller replacements are necessary, the new rollers should never be mated with a worn outer race surface. Either turn the outer race 90° or 180° in the housing bore to present a fresh surface, or, if this has been done, a new outer race should be installed with the new rollers.

STORAGE OF SPARE PARTS

With the exception of bronze cages, all bearing parts and all machined surfaces of journal box parts should be kept greased to prevent rusting while in storage. Occasional inspection of parts in storage is also recommended. Bearings should not be stored in the assembled condition. Rollers, races and cages should be kept separate. Always store material in a dry place as dampness may ruin it in a short time. Care should be taken to prevent "finger rust" on finished surfaces (while handling) due to moisture on the hands and fingers.

Parts should be thoroughly washed and lubricated before application.

It is permissible to store spare axles with journal boxes mounted on them for short periods of time if proper attention is given to prevent corrosion by following the following conditions. The journal box must be fully lubricated and fully pushed on the axle to the proper position. The top of the journal box is heavier than the bottom of the box so the box should

be blocked to prevent rotation which could result in oil loss. The journal box should be rotated around the axle journal a few times every few days to lubricate the bearings and to prevent the parts from remaining in the same position for any appreciable period of time.

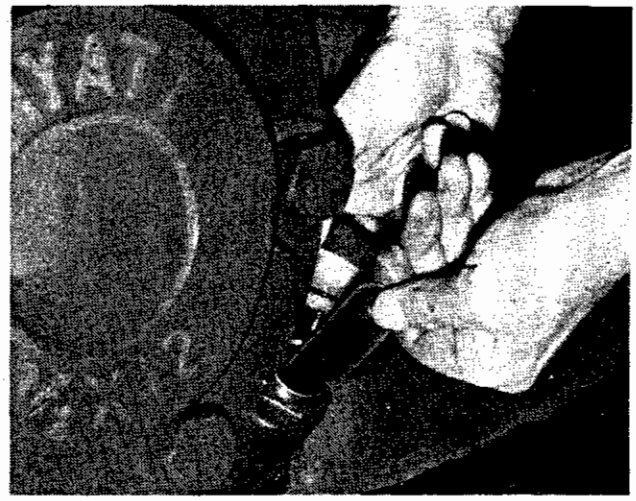
AXLE AND INNER RACE

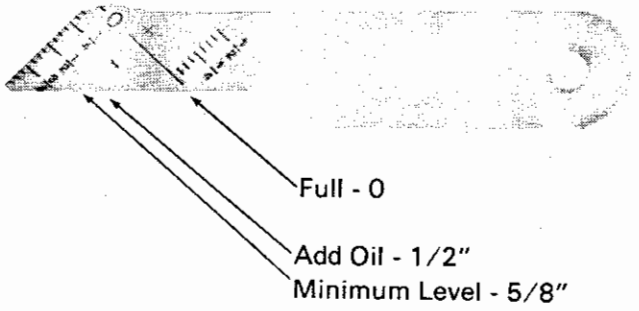
Refer to Maintenance Instruction M.I. 1518 or M.I. 1519 for proper handling and maintenance procedures for the axle and inner race.

Axles in storage should be protected by a heavy coating of rust preventative applied over the entire machined portion.

The lateral may be measured with the trucks removed from the locomotive and right side up. The proper method is to pry the journal boxes toward the outside by placing a wedge between the pedestal liners and outside stop lug on the journal box. This will remove all of the lateral between the journal boxes and pedestals and the total lateral will be the sum of the clearance between the thrust blocks and the ends of the axle. The clearance between the thrust block and the axle should be measured as described in Measuring Lateral Clearance section of this instruction.

The lateral may be measured with the truck upside down. This may be done by forcing the wheel set towards one side and measuring the distance between a machined surface on the wheel and a machined surface on the truck frame. Then the wheel set is forced over to the other side and the distance between the same machined surfaces measured again. The difference between the two measurements will be the total lateral.





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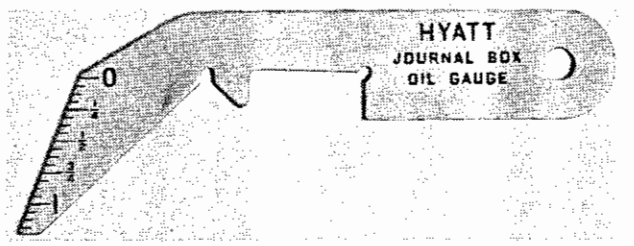
GROUP I GAUGE



7557

GROUP II AND GROUP III GAUGE

Fig. 26 - Checking Oil Level

LUBRICATION

At the time of assembly to the axles the journal boxes should be filled to the overflow level at the filler plug or to the full level on the oil fill cup, Fig. 26. Group I boxes have a capacity of 3.8 liters (8 pints) and Group II and III boxes have a capacity of 3.3 liters (7 pints).

Refer to Maintenance Instruction M.I. 1756 for journal box oil specifications. Oil containing fillers, graphite, etc. should not be used. When filling the boxes the locomotive should be on level track. Be sure the cap is reapplied to the oil fill cup or that the drain plug is replaced securely and wired. Always use clean containers for roller bearing oil.

The length of time between oil level inspections will vary according to mileages and speeds. It is best to add oil after each trip for a time until sufficient experience has been established to indicate the proper oiling intervals. Before removing the cap of the oil fill cup or the oil fill plug, clean away all dust and dirt.

On journal boxes with filler plugs the oil level should be checked with an oil level gauge. Remove the filler plug and insert oil gauge through hole, Fig. 26. If the oil marking on the gauge reads 13 mm (1/2") or more, oil should be added. Minimum low oil level is 16 mm (5/8") on the gauge for Group I boxes and 17 mm (11/16") on the gauge for Group II and III boxes. Refer to Service Data for gauge part number.

SERVICE DATA

REFERENCES

Wheels, Axles, Axle Gears And Pinions . . . . . (Domestic) M.I. 1518
(Export) M.I. 1519

Lubrication Specifications . . . . . M.I. 1756

TOLERANCES

Rollers (O.D.)	NEW		REBUILD	
	mm	(inch)	mm	(inch)
Group I	42.062 - 42.055	1.6560 - 1.6557	42.062 - 42.034	1.6560 - 1.6549
Group II	35.572 - 35.565	1.4005 - 1.4002	35.572 - 35.545	1.4005 - 1.3994
Group III	38.148 - 38.141	1.5019 - 1.5016	38.148 - 38.120	1.5019 - 1.5008

Rebuild rollers for Group I, II & III boxes should be matched to within .0003 inch according to roller diameter ranges as shown.

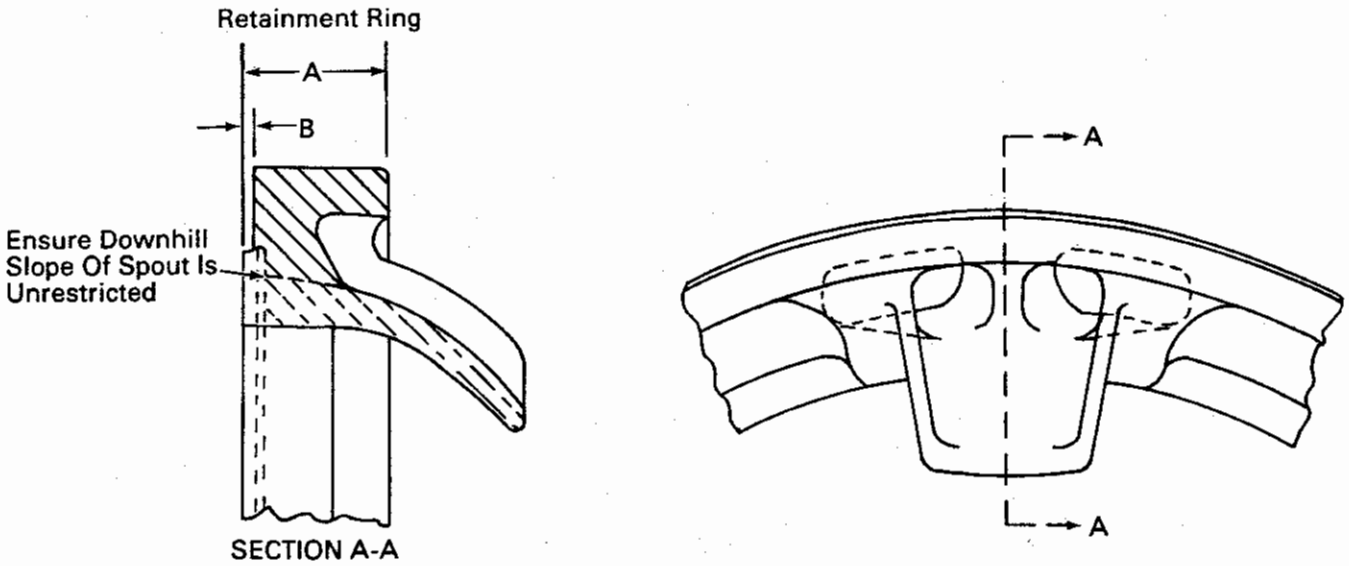
Group I		Group II		Group III	
mm	(inch)	mm	(inch)	mm	(inch)
42.034 - 42.042	1.6549 - 1.6552	35.545 - 35.552	1.3994 - 1.3997	38.120 - 38.128	1.5008 - 1.5011
42.044 - 42.052	1.6553 - 1.6556	35.555 - 35.562	1.3998 - 1.4001	38.130 - 38.138	1.5012 - 1.5015
42.054 - 42.062	1.6557 - 1.6560	35.565 - 35.572	1.4002 - 1.4005	38.141 - 38.148	1.5016 - 1.5019

Rollers should be applied in matched sets so that all 28 rollers in one journal box are selected from one of the above three groups.

Outer Race O.D.	NEW		REBUILD	
	mm	(inch)	mm	(inch)
Group I	317.538 - 317.500	12.5015 - 12.5000	317.538 - 317.462	12.5015 - 12.4985
Group II	269.913 - 269.875	10.6265 - 10.6250	269.913 - 269.837	10.6265 - 10.6235
Group III	288.963 - 288.900	11.3765 - 11.3740	288.963 - 288.861	11.3765 - 11.3725
Spacer Ring (O.D.)				
Group I	284.38 - 284.15	11.196 - 11.187	284.38 - 283.97	11.196 - 11.180
Group II	240.41 - 240.18	9.465 - 9.456	240.41 - 240.00	9.465 - 9.449
Group III	257.84 - 257.58	10.151 - 10.141	257.84 - 257.40	10.151 - 10.134
Out-Of-Round Groups I, II, III	0.00	0.000	0.38 (Max)	0.015 (Max)

SERVICE DATA (CONT'D)

Spacer Ring (Width)	NEW		REBUILD	
	mm	(inch)	mm	(inch)
Group I	25.02 – 24.89	0.985 – 0.980	25.02 – 24.13	0.985 – 0.950
Group II	19.96 – 19.84	0.786 – 0.781	19.96 – 19.20	0.786 – 0.756
Group III	19.96 – 19.71	0.786 – 0.776	19.96 – 19.08	0.786 – 0.751
Cages (I.D.)				
Group I	200.79 – 201.17	7.905 – 7.920	200.79 – 201.42	7.905 – 7.930
Group II	169.80 – 170.05	6.685 – 6.695	169.80 – 170.43	6.685 – 6.710
Group III	182.07 – 182.45	7.168 – 7.183	182.07 – 182.83	7.168 – 7.198
Out-Of-Round Groups I, II, III	0.00	0.000	0.38 (Max)	0.015 (Max)



GROUP I

DIM.	NEW		CONDEMNING LIMIT	
	mm	(inch)	mm	(inch)
A	31.37 - 31.12	1.235 - 1.225	28.80	1.134
B	3.05 - 2.54	0.120 - 0.100	0.25	0.010

GROUP II

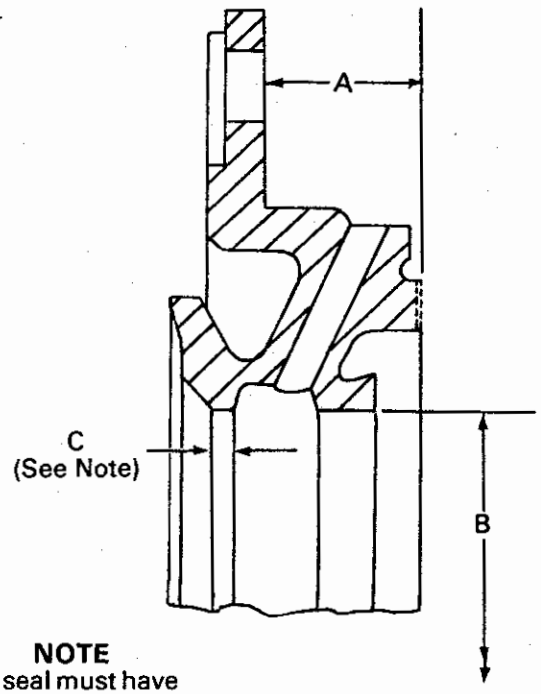
A	25.04 - 24.92	0.986 - 0.981	22.50	0.886
B	3.20 - 2.95	0.126 - 0.116	0.66	0.026

GROUP III

A	23.39 - 23.27	0.921 - 0.916	20.85	0.821
B	3.12 - 2.87	0.123 - 0.113	0.58	0.023

29312

Rear End Cover



NOTE
Oil seal must have 3 mm (1/8") flat, minimum.

GROUP I

DIM.	NEW		CONDEMNING LIMIT	
	mm	(inch)	mm	(inch)
A	45.21 - 44.96	1.780 - 1.770	42.60	1.677
B	201.45 - 201.32	7.931 - 7.926	201.70	7.941
C	5.6	7/32	3	1/8

GROUP II

A	54.76 - 54.64	2.156 - 2.151	52.15	2.053
B	184.63 - 184.51	7.269 - 7.264	57.89	2.279
C	Not Applicable			

GROUP III

A	45.21 - 45.08	1.780 - 1.775	42.60	1.677
B	198.78 - 198.65	7.826 - 7.821	201.70	7.941
C	Not Applicable			

29313

SERVICE DATA (CONT'D)

SPRING SEAT

GROUP I	NEW		REBUILT	
	mm	(inch)	mm	(inch)
Length	202.8 - 200.4	7-63/64 - 7-57/64	203.2 - 200.0	8 - 7-7/8
Width	121.4 - 120.6	4-25/32 - 4-3/4	123.8 - 120.6	4-7/8 - 4-3/4
Seat Surface To Bore Center	187.3 ± 0.20	7-3/8 ± 0.008	188.9 - 185.7	7-7/16 - 7-5/16
GROUP II	NEW		REBUILT	
	mm	(inch)	mm	(inch)
Length	208.0 - 206.4	8-3/16 - 8-1/8	208.0 - 203.2	8-3/16 - 8
Width	153.2 - 152.4	6-1/32 - 6	155.6 - 152.4	6-1/8 - 6
Seat Surface To Bore Center	161.9 - 158.8	6-3/8 - 6-1/4	160.34 - 157.2	6-5/16 - 6-3/16
GROUP III	NEW		REBUILT	
	mm	(inch)	mm	(inch)
Length	208.0 - 206.4	8-3/16 - 8-1/8	208.0 - 203.2	8-3/16 - 8
Width	153.2 - 152.4	6-1/32 - 6	155.6 - 152.4	6-1/8 - 6
Seat Surface To Bore Center	174.6 - 171.4	6-7/8 - 6-3/4	173.0 - 169.9	6-13/16 - 6-11/16

THREAD INSERT DATA

Bolt Size	Insert Part No.	Tap Drill Size	Countersink Diameter +.010" -.000"	Depth	Thread Tap Size UNC-2B	Min. Depth
7/8-9	8446294	1.187"	1.270"	.010"/.030"	1-1/4-12	1.44"
3/4-10	8446293	1.062"	1.145"	.010"/.030"	1-1/8-12	1.31"
5/8-11	8446292	.828"	.885"	.010"/.030"	7/8-14	.56"

METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.010	0.25	1.270	32.26
0.030	0.76	1.145	29.08
0.56	14.2	1.31	33.3
0.885	22.48	1.44	36.58

PART NUMBERS

	MANGANESE STEEL	CARBON STEEL
Driving Face Liner –		
Group I	8304890	8102853
Group II	---	7493646
Group III	---	7493647
Front Strip Liner –		
Group I	8304891	8034116
Group II	7493672	7493667
Group III	---	7493667
Rear Strip Liner –		
Group I	8305974	8077336
Group II	7493813	7493726
Group III	---	7493726

Front Cover Shim –	
Group I - 1.6 mm (1/16″)	8148708
Group II - 0.8 mm (1/32″)	7498210
Group III - 0.8 mm (1/32″)	7498209
Non-Stick Rear End Cover Gasket –	
Group I	8102014
Group II	7492208
Group III	7492206

Front Cover Parts (Plain & Combination Boxes) –

Group I and Group III

Bolt - 7/8″-9	271657
Lockwasher - 7/8″	8137717

NOTE

The recommended lubricated* torque for 280M 7/8″-9 bolts is 414 N·m (305 ft-lbs) ± 5%.

Group II

Bolt - 3/4″-10	271609
Lockwasher - 3/4″	8133335

NOTE

The recommended lubricated* torque for 280M 3/4″-10 bolts is 278 N·m (205 ft-lbs) ± 5%.

*Threads slightly lubricated and not dry.

Rear Cover Parts (Plain & Combination Boxes) –

Group I

Bolt – 3/4″-10	271609
Lockwasher – 3/4″	8133335

NOTE

The recommended lubricated* torque for 280M 3/4″-10 bolts is 278 N·m (205 ft-lbs) ± 5%.

Groups II And III

Bolt – 5/8″-11	271558
Lockwasher – 5/8″	8133334

NOTE

The recommended lubricated* torque for 280M 5/8″-11 bolts is 156 N·m (115 ft-lbs) ± 5%.

SERVICE DATA (CONT'D)

Combination Journal Box (Adapter Cover Parts) –
Groups II and III
Capscrew – 5/8″–11 271558
Lockwasher – 5/8″ 8133334

NOTE

The recommended lubricated* torque for 280M 5/8″-11 bolts is 156 N·m (115 ft-lbs) ± 5%.

*Threads slightly lubricated and not dry.

Drain And Fill Plugs (Solid Type) –
Groups I, II, And III 8102042
Apply with 142 N·m (105 ft-lbs) torque and wire to box.

Oil Fill Cup –
Group I 9324109

TOOLS

	Part Or File Drawing No.
Outer Race And Retainment Ring Puller	8160928
Chordal Gauge	File No. 765
Oil Level Gauge (Group I)	9317668
Oil Level Gauge (Group II And Group III)	8229173

NOTE

File number represents a facility drawing that is available (at no charge) from EMD Service Department. This drawing includes construction details of tooling that can be manufactured by the customer.