

MAINTENANCE INSTRUCTION

TRACTION MOTOR GEAR CASE INSPECTION AND REPAIR

INTRODUCTION

This Maintenance Instruction provides gear case inspection and dimensional checks and a recommended repair procedure. When a gear case is removed from a traction motor/wheel axle assembly, the case should be cleaned and qualified prior to reassembly to ensure that only those gear cases which are capable of satisfactory performance will be reused. The inspection procedure is not complicated and can prevent a defective gear case from being reassembled. The following instructions apply to all models of gear cases.

DESCRIPTION

The gear case houses the traction motor pinion and mating axle gear, protecting them from dirt or damage and also carries the gear lubricant. The case is made of two close fitting halves with seals to provide complete contact and closure.

NOTE

Previous model gear cases were equipped with removable gutters over the upper cover axle bores to divert the flow of grease away from the seal surfaces.

The current gear case (manufactured after mid 1982) is equipped with plastic seals at the axle bore, Fig. 1. The previous gear case is equipped with metal-backed felt seals at the axle bore, Fig. 2.

NOTE

The current plastic gear case seals at the axle bore reduce lubricant leakage, extend maintenance intervals, and substantially decrease the occurrence of dry gear cases. Electro-Motive recommends that a gear case designed

for metal-backed felt seals at the axle bore be modified to receive the new plastic seals. Refer to M.I. 9656, Gear Case Modification And Application Of Plastic Gear Case Seals.

This modification does not apply to gear cases 8301946 and 8302645 due to the small axle bore for use on 36" wheels with 12" hubs.

CLEANING

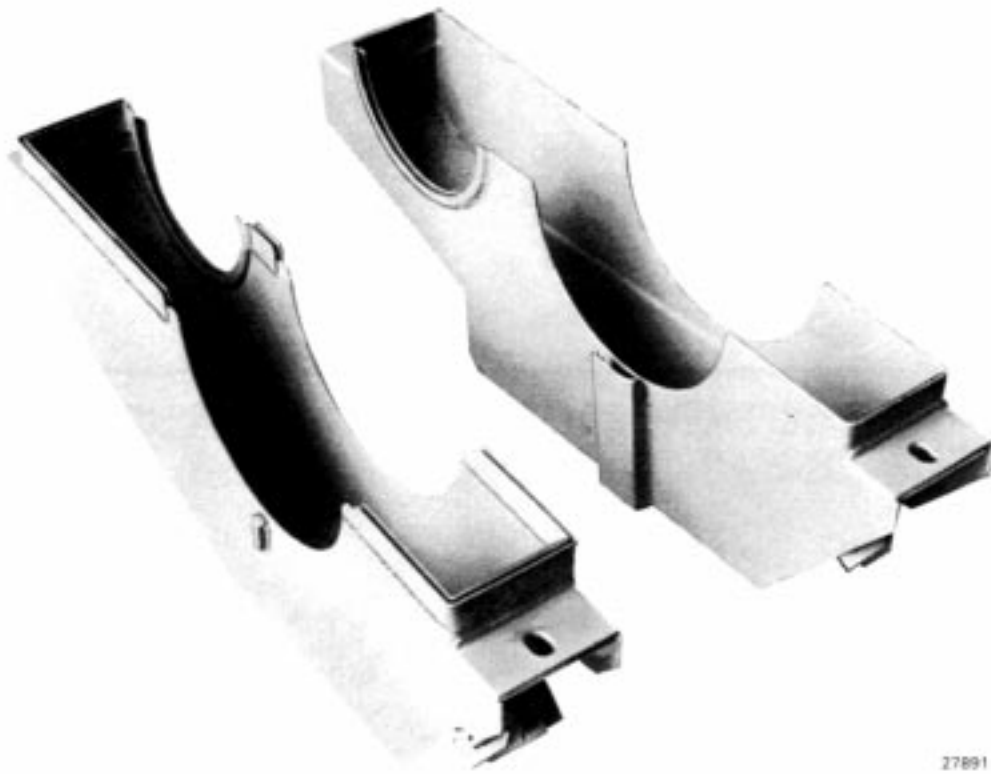
1. Remove and discard old seal assemblies. Remove cotton cording from parting line channels of upper gear case and discard.
2. Clean out seal retainer(s) and parting line channels of all dirt, gasket compound, or any foreign material.
3. Thoroughly clean gear case of all dirt and grease by immersing in a hot water/caustic solution. Never remove grease by burning, as heat may distort the gear case to the extent that the gear case halves will not fit properly when installed, and leakage will occur.

INSPECTION AND DIMENSIONAL CHECKS

This procedure applies to both upper and lower halves of the gear case and to current and previous models unless specifically identified. During procedure, refer to Figs. 3 and 4 for current model gear cases and to Figs. 5 and 6 for previous model gear cases. If repair is required, refer to Repair Procedure of this Maintenance Instruction.

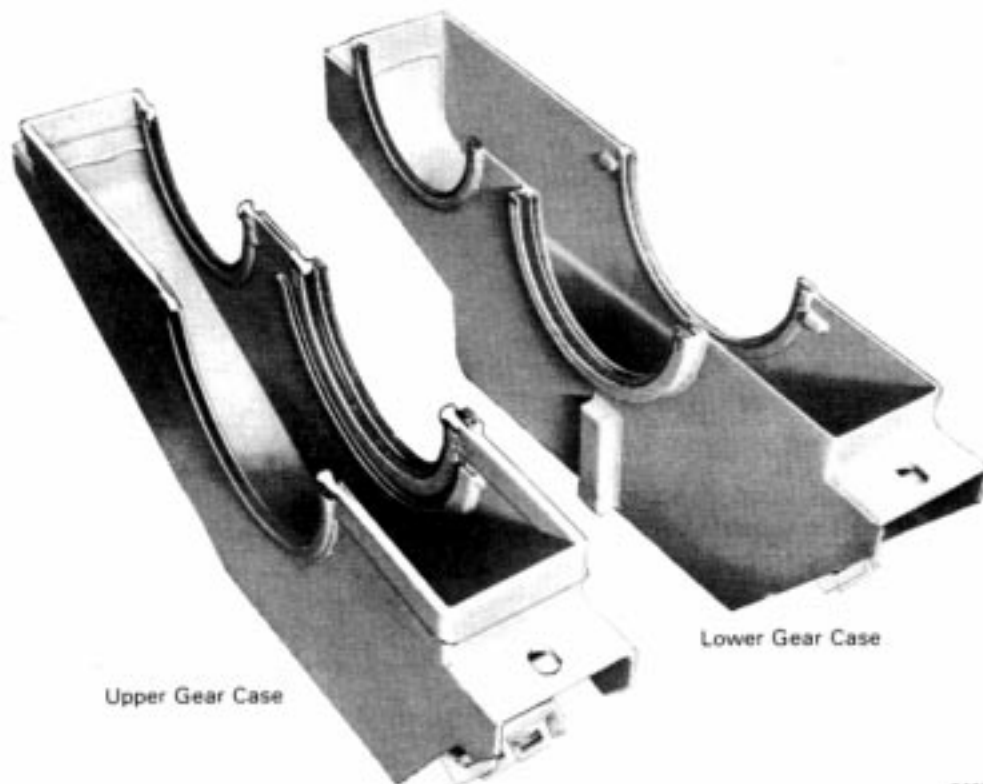
1. Visually inspect the case for damage such as, cracked welds and broken or damaged seal

*This bulletin is revised and supersedes previous issues of this number.
 Areas of change are indicated by vertical bars in the margins.



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Fig. 1 - Current (Plastic Seal) Gear Case



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Fig. 2 - Previous (Metal-Backed Felt Seal) Gear Case

METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.015	0.38	1.929	49.00
1/64	0.4	1.969	50.01
1/32	0.8	1.985	50.42
0.040	1.02	2-15/16	74.6
3/64	1.2	3-5/16	84.1
1/16	1.6	5-11/32	135.7
3/32	2.4	5-9/16	141.3
1/8	3.2	5-7/8	149.2
3/16	4.8	6-1/2	165.1
1/4	6.4	17.111	434.62
5/16	7.9	25-27/32	656.4
3/8	9.5	39-1/16	992.2
25/32	19.8	42-7/8	1089.0

NOTE

1. Parting line shall not be bowed up or down more than 1/64".
2. Maintain this width, +1/32", -0, for a distance of 6" from both extreme ends. A bow out of 3/32" is permissible per side between these points.
3. Inside of parting line seals and pinion side seal retainer must be free of weld spatter.

Inside of gear case must be free of scale, shot, slag, and all foreign material except firmly fused weld spatter.

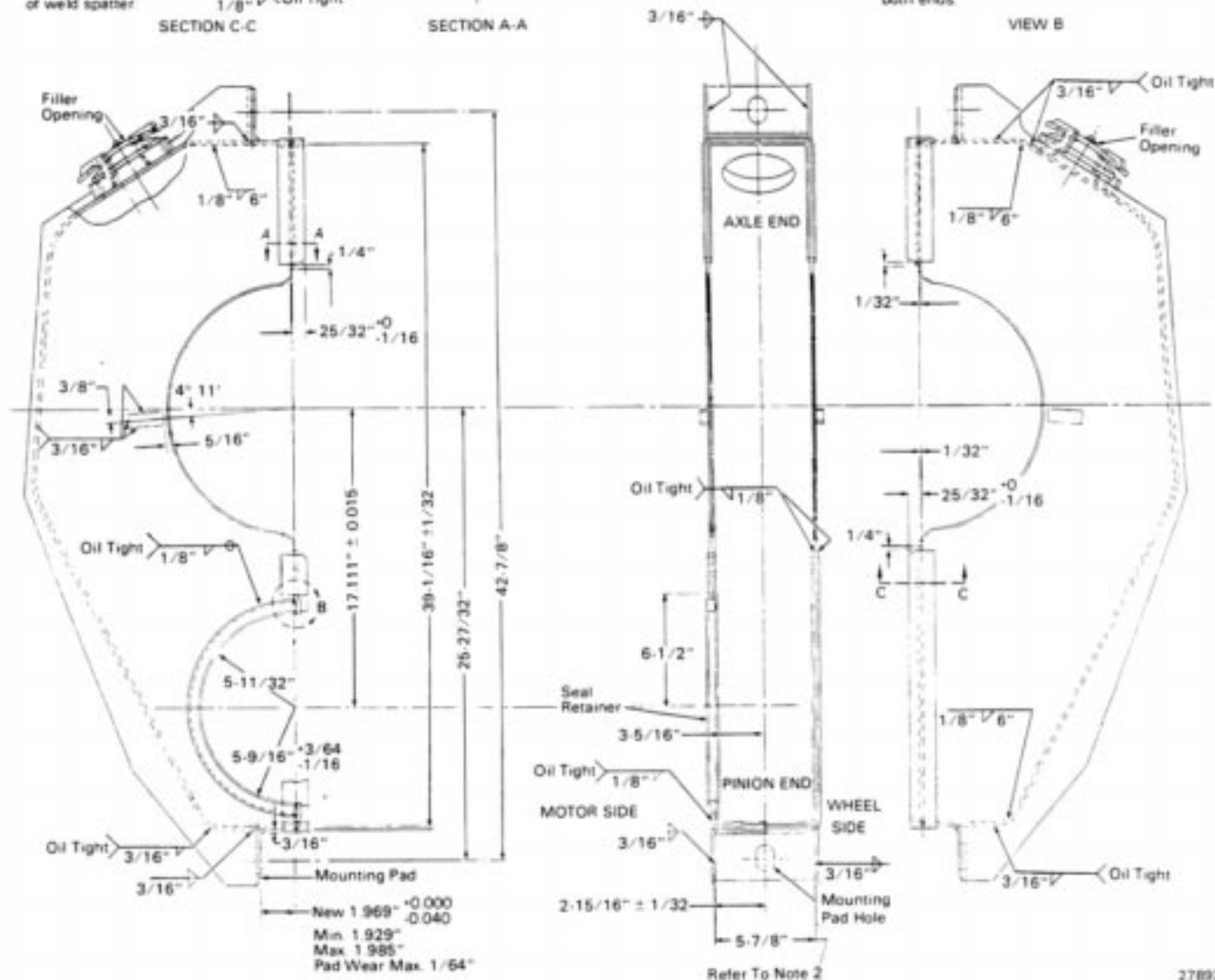
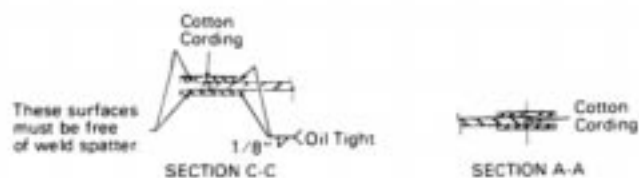
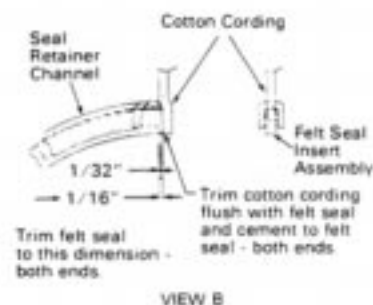


Fig. 3 - Current (Plastic Seal) Upper Gear Case

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METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.015	0.38	1.985	50.42
1/64	0.4	2-15/16	74.6
1/32	0.8	5-9/16	141.3
0.040	1.02	5-7/8	149.2
3/64	1.2	171.111	434.62
1/16	1.6	23-15/16	608.0
1/8	3.2	25-27/32	656.4
3/16	4.8	39-1/16	999.2
9/32	7.1	42-7/8	1089.0
0.437	11.10		
3-3/8	85.7		
1-3/16	30.2		
1.929	49.00		
1.969	50.01		

NOTE

1. Parting line shall not be bowed up or down more than 1/64".
2. Maintain this width, +1/32", -0, for a distance of 6" from both extreme ends. A bow out of 3/32" is permissible per side between these points.
3. Inside of parting line seals and pinion side seal retainer must be free of weld spatter.

Inside of gear case must be free of scale, shot, slag, and all foreign material except firmly fused weld spatter.

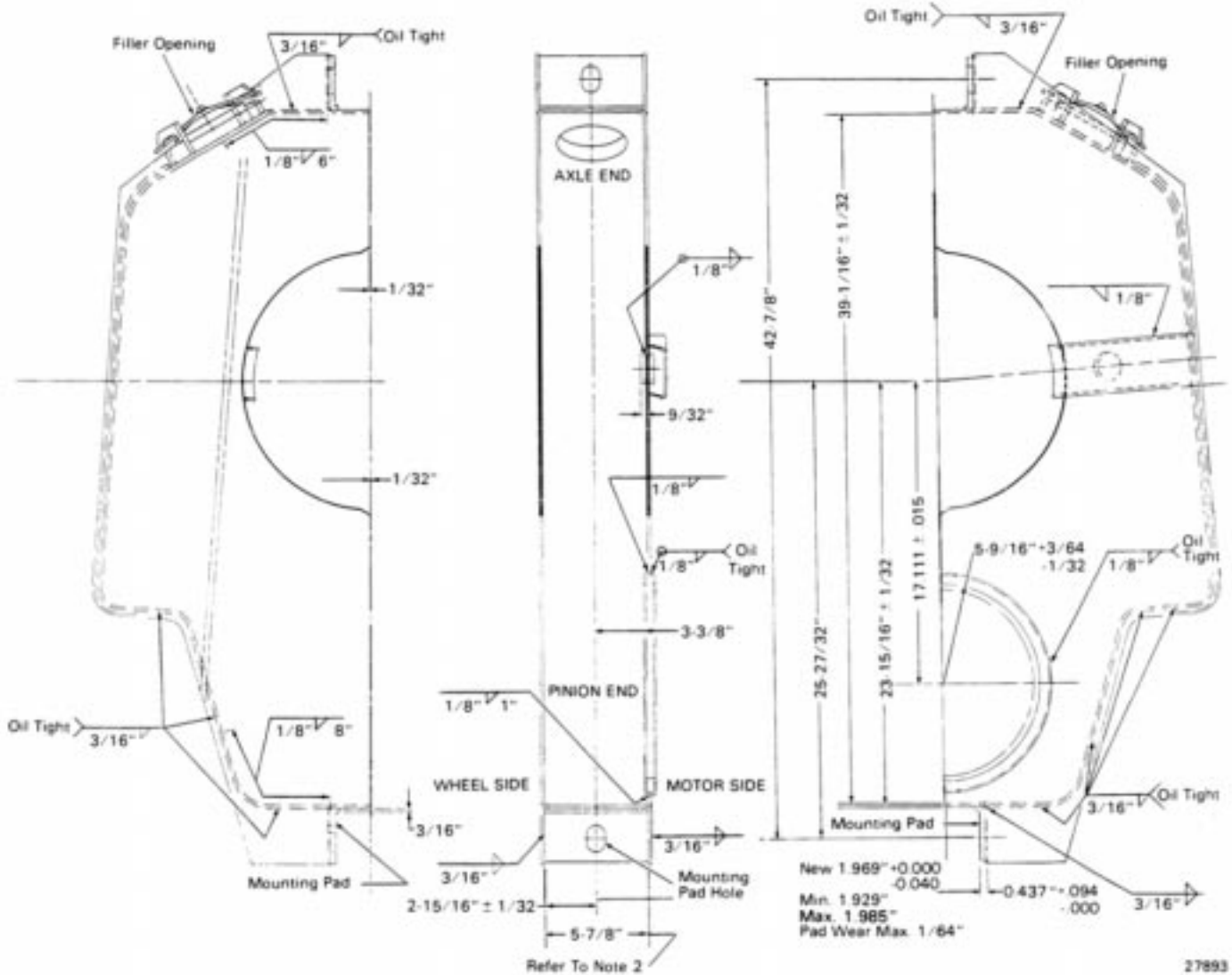


Fig.4 - Current (Plastic Seal) Lower Gear Case

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METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.015	0.38	1.985	50.42
1/64	0.4	2-15/16	74.6
1/32	0.8	5-9/16	141.3
0.040	1.02	5-7/8	149.2
3/64	1.2	6-3/16	157.2
1/16	1.6	6-11/16	169.9
1/8	3.2	17.111	434.62
3/16	4.8	23-15/16	608.0
1-3/16	30.2	25-27/32	656.4
1.929	49.00	39-1/16	992.2
1.969	50.01	42-7/8	1089.0

NOTE

1. Parting line shall not be bowed up or down more than 1/64".
2. Maintain this width, +1/32", -0, for a distance of 6" from both extreme ends. A bow out of 3/32" is permissible per side between these points.
3. Inside of parting line seals, gutter and seal retainers must be free of weld spatter.

Inside of gear case must be free of scale, shot, slag, and all foreign material except firmly fused weld spatter.

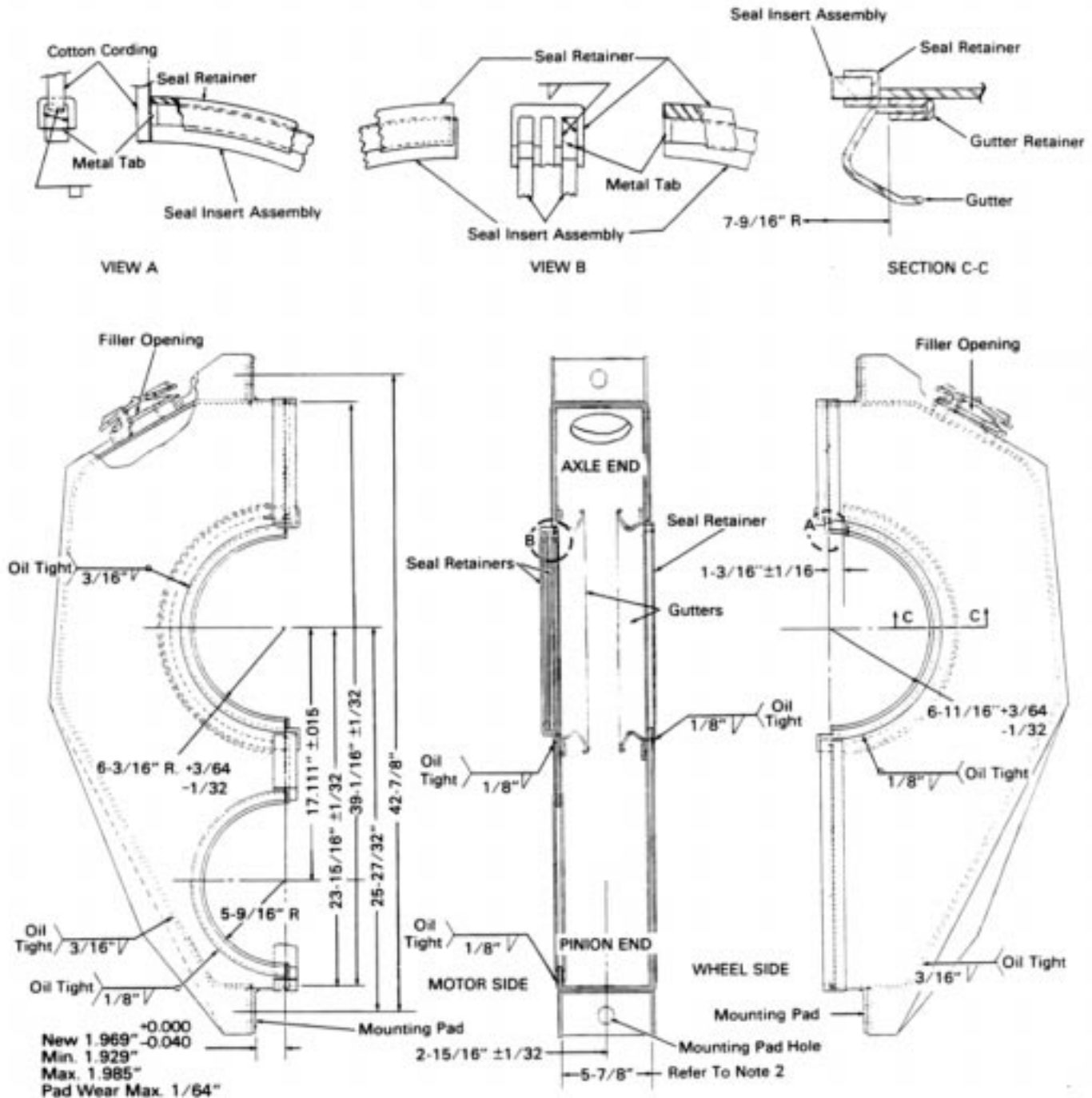


Fig.5 - Previous (Metal-Backed Felt Seal) Upper Gear Case

METRIC CONVERSION CHART			
(inch)	mm	(inch)	mm
0.015	0.38	2-15/16	74.6
1/64	0.4	3-7/16	87.3
1/32	0.8	4-1/16	103.2
0.040	1.02	5-9/16	141.3
3/64	1.2	5-7/8	149.2
1/16	1.6	6-3/16	157.2
1/8	3.2	6-11/16	169.9
3/16	4.8	7-3/8	187.3
7/8	22.2	17.111	434.62
1-3/16	30.2	23-15/16	608.0
1.929	49.00	25-27/32	656.4
1.969	50.01	39-1/16	992.2
1.985	50.42	42-7/8	1089.0

NOTE

1. Parting line shall not be bowed up or down more than 1/64".
2. Maintain this width, +1/32", -0, for a distance of 6" from both extreme ends. A bow out of 3/32" is permissible per side between these points.
3. Inside of parting line seals, gutter and seal retainers must be free of weld spatter.

Inside of gear case must be free of scale, shot, slag, and all foreign material except firmly fused weld spatter.

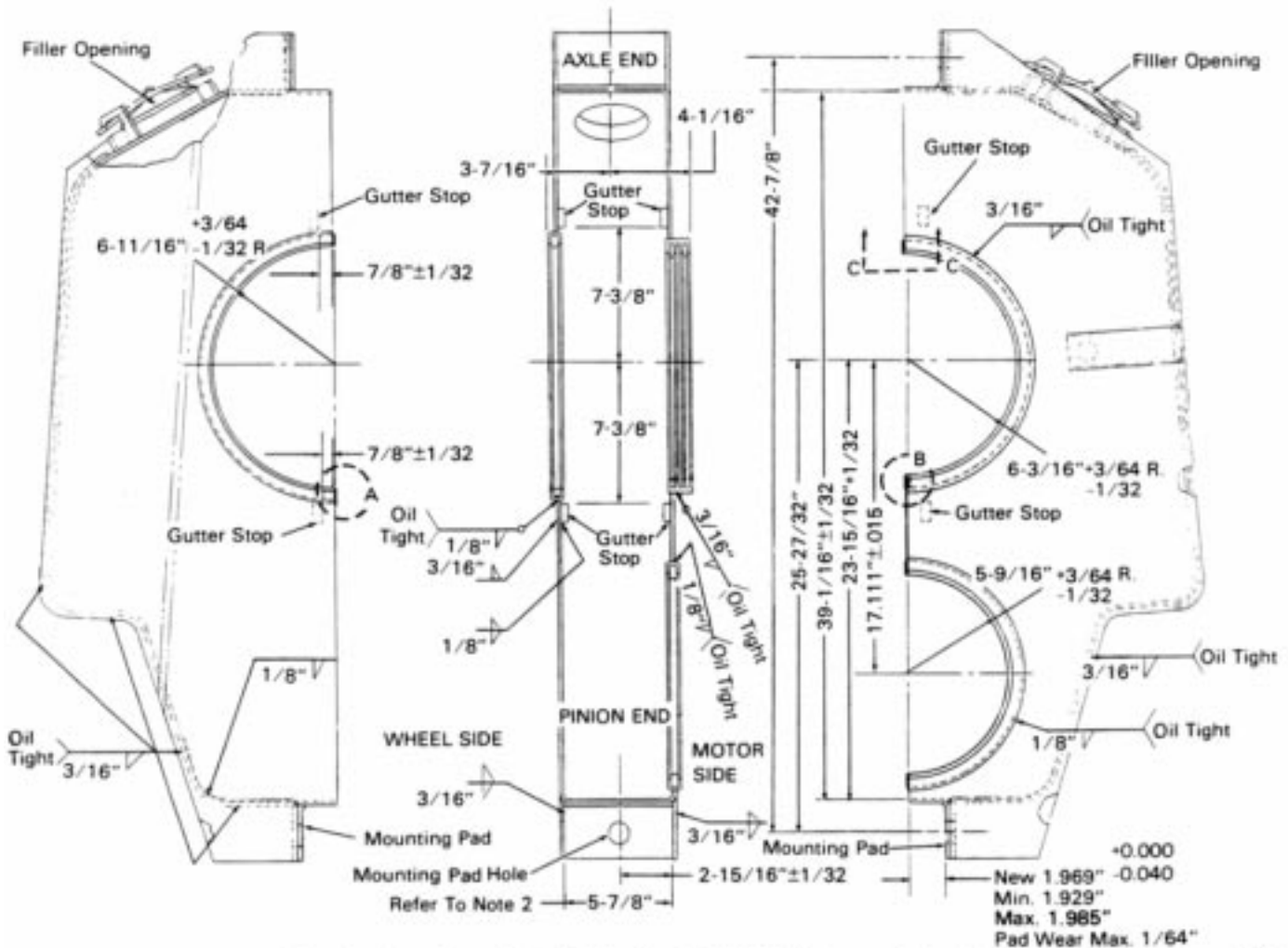
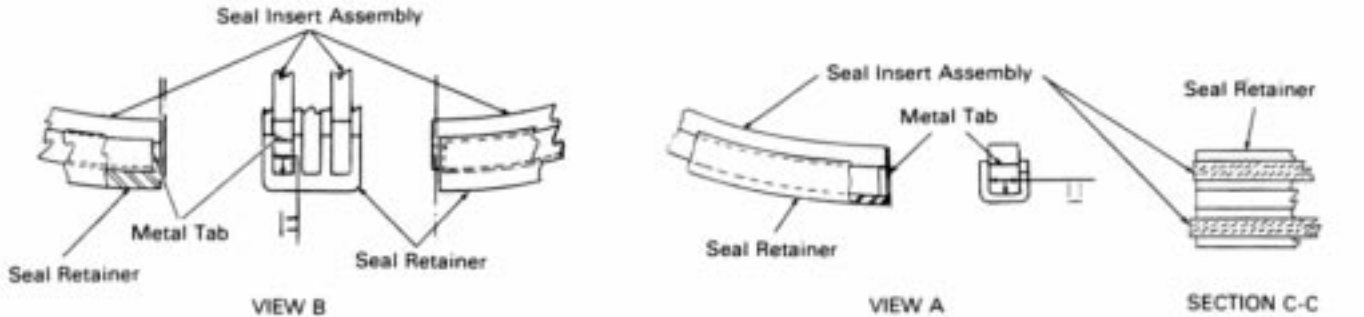


Fig.6 - Previous (Metal-Backed Felt Seal) Lower Gear Case

retainer(s). Visually inspect the parting line channels of upper case and, if applicable, gutter retainers and gutter stops for damage.

2. Magnaflux all gear cases. Inspect for fatigue cracks which often originate near welds.
3. Check the distance between the two 27 mm (1-1/16") mounting pad hole centers. The distance should be 1089 mm \pm 0.25 mm (42-7/8" \pm .010").
4. Check each mounting pad hole center in relation to the side openings of the case as shown in Figs. 3 and 4 or 5 and 6, as applicable.
5. Check the distance from the parting line to the mounting pad surface. The distance shall be not less than 49.00 mm (1.929") nor more than 50.42 mm (1.985"). Maximum pad wear is 0.4 mm (1/64").
6. Check the straightness of the parting line. Parting line shall not be bowed up or down more than 0.4 mm (1/64").
7. Check the side bowing at the parting line. The parting line width shall be +0.8 mm, -0 (+1/32", -0) for a distance of 152 mm (6") from both extreme ends. A bow out of 2.4 mm (3/32") is permissible per side between these points.
8. Check filler opening covers for damage and broken springs.

PAINTING

A clean qualified gear case should be repainted.

Ensure the inside of the gear case is free of scale, shot, slag, and all foreign material except firmly fused weld spatter.

When gear is thoroughly clean and dry, repaint with buff primer. On previous models, do not paint the upper gear case gutters or the inside surface of the gutter retainers.

REPAIR PROCEDURE

This procedure applies to both upper and lower halves of the gear case and to current and previous models unless specifically identified. During procedure, refer to Figs. 3 and 4 for current model gear cases and to Figs. 5 and 6 for previous model gear cases. If repair is required, refer to Repair Procedure of this Maintenance Instruction.

1. All gear cases should have the mounting holes elongated to facilitate the mounting of the gear case on the motor/wheel axle assembly. If the mounting holes are not elongated, elongate the

two 27 mm (1-1/16") mounting holes to 35 mm (1-3/8"). Elongation to be on the centerline that joins the two holes and shall extend 17 mm (11/16") on each side of the hole center line. Ensure the center line dimensions adhere strictly to the dimensions of Figs. 3 and 4 or 5 and 6, as applicable.

2. When mounting pads show excessive wear and the dimension to the parting line is beyond acceptable limits of Figs. 3 and 4 or 5 and 6, as applicable, the pad surface should be built up with weld. Weld pad surface using electrode A.W.S. E-6012. Machine pad to the new dimensions.

NOTE

When the gear case is badly damaged or distorted, the most economical means of repair should be considered. In some instances it may be more economical to cut out the damaged section and replace it with new material, rather than try to straighten the damaged area.

3. When the seal retainer(s) and parting line seal channels are distorted or welds are broken, straighten or replace retainer(s) or channels with new retainer(s) or channels and reweld as required. Ensure new and welded retainer(s) or channels adhere strictly to the dimensions of Figs. 3 and 4 or 5 and 6, as applicable. The seal retainer(s) and parting line channels must be straightened so that they can accept the seal assemblies and cotton cording without binding.
4. Check welding of entire gear case. Reweld any cracked welds. Most welds must be oil tight. Refer to Figs. 3 and 4 or 5 and 6, as applicable.
5. Replace filler opening covers with new covers if required.
6. When gear case is in an acceptable condition, refer to Painting and Application Of Gear Seals sections of this Maintenance Instruction.

GEAR CASE PREPARATION FOR SEAL APPLICATION

NOTE

Electro-Motive recommends that a gear case manufactured prior to mid 1982 be modified to use the current plastic seal at the axle bore. Refer to M.I. 9656 Modernization Recommendation for modification procedure.

This modification does not apply to gear cases 8301946 and 8302645 due to the small axle bore for use on 36" wheels with 12" hubs.

If the gear is in an acceptable condition, perform the following prior to installing seal assemblies and string covered cotton cording in the parting line channels of the upper cover. If repair is required, refer to Repair Procedure of this Maintenance Instruction.

1. Remove and discard old seal assemblies. Remove cotton cording from parting line channels of upper gear case and discard.
2. Clean out seal retainer(s) and parting line channels of all dirt, gasket compound, or any foreign material.
3. Straighten and size the seal retainer(s) so that retainer(s) can accept the seal insert assembly without the seal insert binding. Ensure the width of the seal retainer groove is maintained at the section mating with the inner parting line seals.

NOTE

On older model gear cases, metal tabs should be welded to one end of the axle bore seal retainers on both sides of the upper and lower case. Refer to Figs. 5 and 6 for placement of metal tabs. The metal tabs prevent the seal insert assemblies from turning. This will tend to prevent the excessive loss of lubricant that occurred when the older model seals would move in the channels due to the turning forces imposed.

Ensure there is no weld metal protruding above the end of the channel and no weld spatter in the seal retainer(s).

4. Straighten the gutter retainers, if applicable, so that retainers can accept the gutters without binding. Do not install gutters at this time. Gutters are installed during assembly to the traction motor/wheel axle assembly.

APPLICATION OF METAL-BACKED FELT SEALS

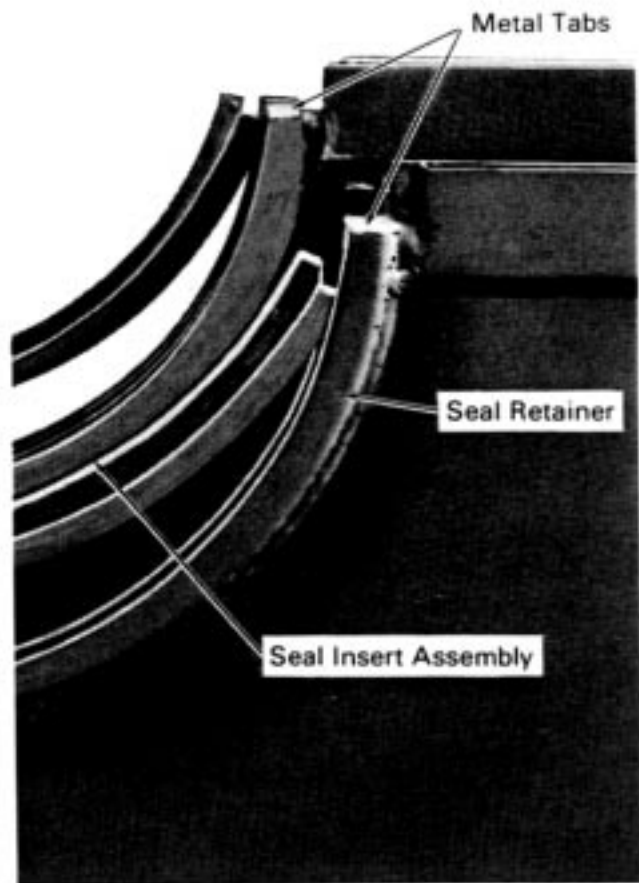
NOTE

The current gear case utilizes plastic seals at the gear case axle bore and metal-backed felt seals at the gear case pinion bore.

The previous gear case utilizes metal-backed felt seals at both gear case bores.

1. On previous models, notch the felt of the four seal insert assemblies that butt into the metal tabs of the axle bore seal retainers, so that the

felt extends 1.6 mm (1/16") above the gear case parting line and parallel to the parting line as shown in Fig. 7.



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Fig.7 – Felt Notched For Seal Retainer Metal Tab

2. Cut the felt of the pinion bore seal insert assemblies so that the felt extends 1.6 mm (1/16") above the gear case parting line and parallel to the parting line.
3. Soak the seal insert assemblies in lubricating oil.
4. Install the seal insert assemblies in their respective seal retainers. Use a hammer to tap seal insert assemblies into seal retainers and also to flatten out felt at parting.

APPLICATION OF PLASTIC SEALS

The plastic axle bore seals, Fig. 8, are installed around the locomotive axle after assembly of the motor/axle/wheel assembly, prior to the assembly of the gear case.

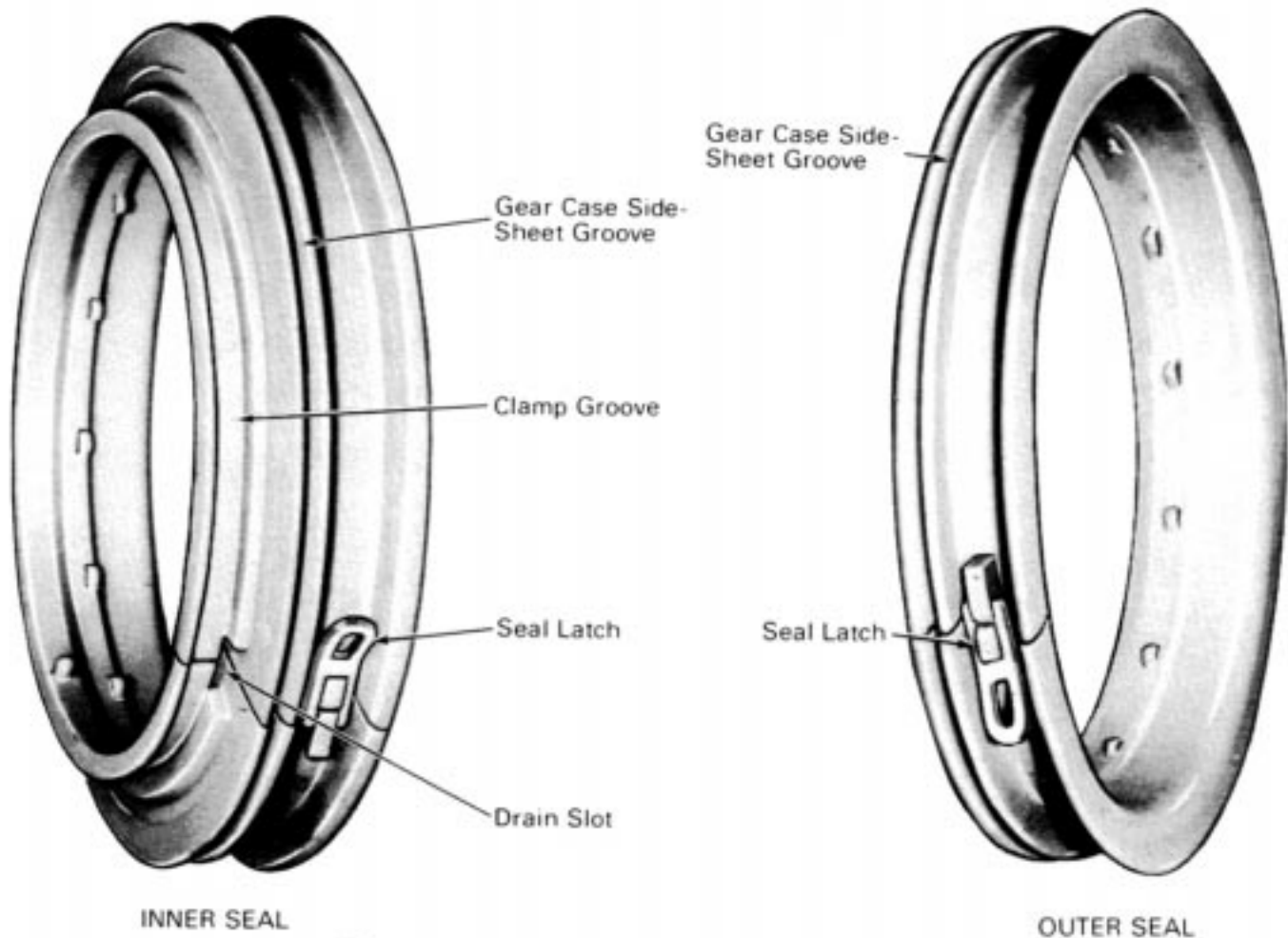


Fig.8 - Axle Bore Plastic Gear Case Seals

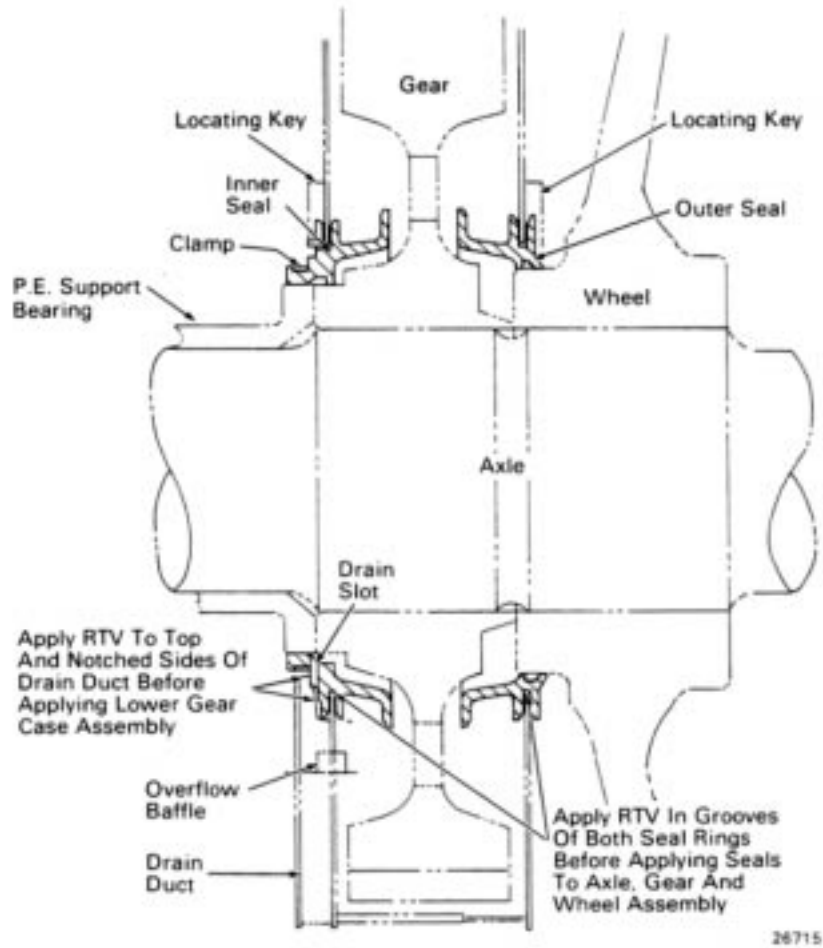
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1. On the lower gear case, apply RTV around the edge of the drain duct that mates with the drain slot of the inner seal, Fig. 9. This will prevent contaminants from entering drain slot.
2. Apply RTV into the gear case side-sheet groove of each seal ring, Fig. 8.
3. Install seals around the axle of the motor/axle assembly with outer seal between the gear and wheel and inner seal between the gear and support bearing, Fig. 10. The seals are flexible and can be twisted or "snaked" into position.
4. Position the seal latches at the 6 o'clock position, Fig. 11. The pins on the inner seal should be engaged with the holes in the support bearing flange. The notch on each seal should engage with the locating keys on the upper gear case when the case is installed. Ensure the lip on the outer seal will ride on the wheel hub and not folded under. Fasten the seal latches.
5. Apply seal clamp to the inner seal, holding the seal to the support bearing flange. Ensure the worm gear of the seal clamp is positioned as shown in Fig. 11 and tighten clamp. The clamp is tightened down completely after the gear case is installed.

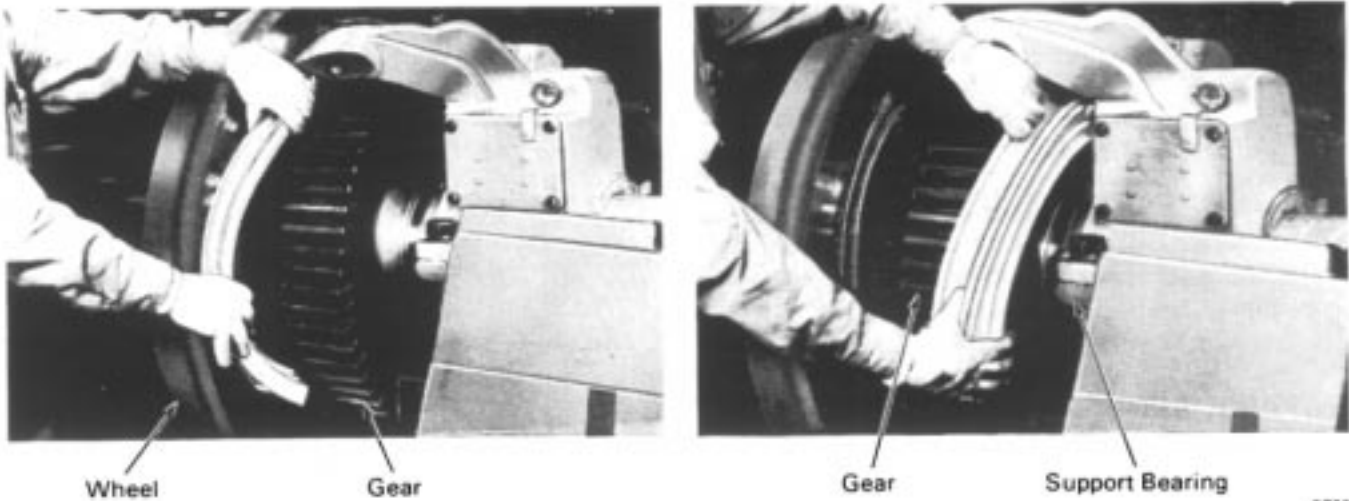
TRACTION MOTOR AXLE CAP SUPPORT ARM

The horizontal centerline of the axle cap support arm is determined by a line from the centerpoint of the armature bore through the centerpoint of the axle bore. Refer to Fig. 12.

The vertical centerline of the support pad should be $434.98 \text{ mm} \pm 0.25$ ($17.125" \pm .010$) from the axle bore centerline. This line is used to check the position of the 27 mm (1-1/16") gear case mounting hole, Figs. 3 and 4 or 5 and 6, as applicable.



■ Fig.9 - Gear Case And Plastic Seal, Cross-Section



■ Fig.10 - Installing Plastic Seals

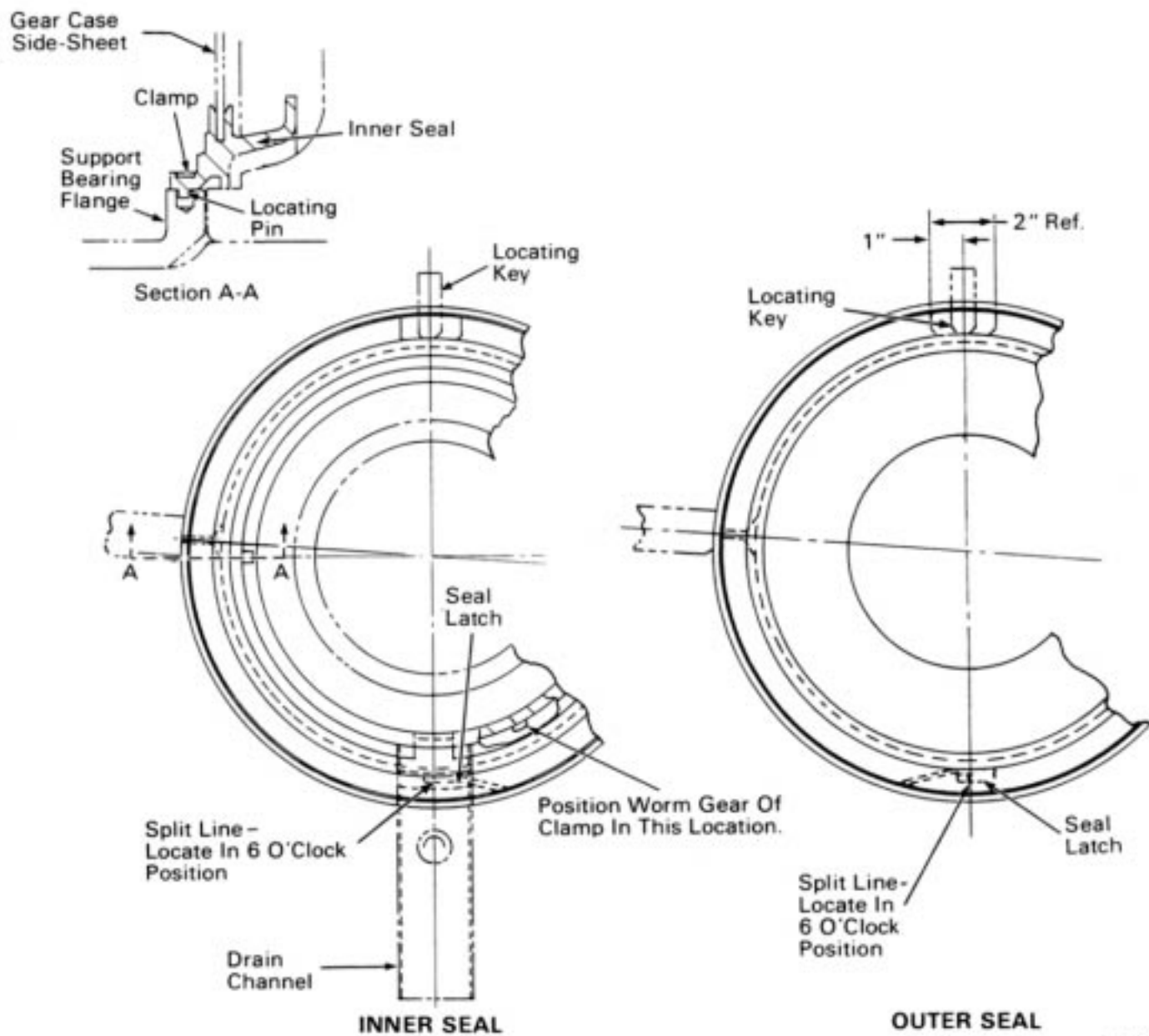


Fig.11 - Plastic Seal Position On Gear Case

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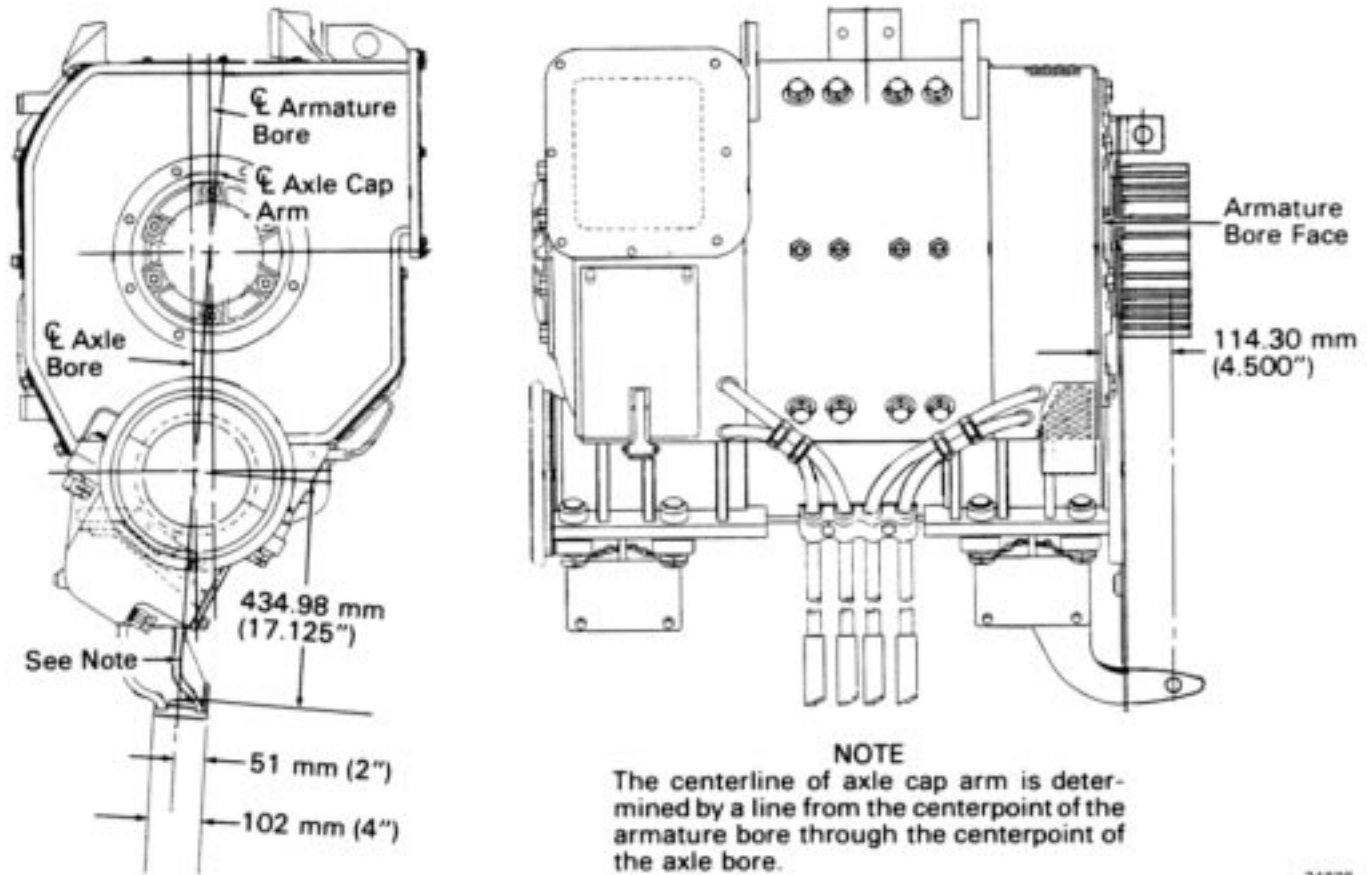


Fig.12 - Axle Support Arm Gear Case Mounting

The dimension 114.30 mm ± 0.05 (4.500" ± .002) from the pinion end armature bore face and parallel to the bore face will provide the second intersecting line necessary to check the position of the 27 mm (1-1/16") mounting hole in the axle cap support arm. Refer to Fig. 12.

BEARING HOUSING GEAR CASE SUPPORT ARM

Check the location of the 27 mm (1-1/16") gear mounting hole in the gear case support arm on the pinion end bearing housing as shown in Fig. 13.

TRACTION MOTOR AXLE CAP SUPPORT ARM AND BEARING HOUSING SUPPORT ARM POSITION

Prior to reassembly of the gear case to the traction motor/wheel axle assembly, the location of the 27 mm (1-1/16") gear case mounting hole should be checked on the traction motor axle cap support arm and the pinion end bearing housing support arm.

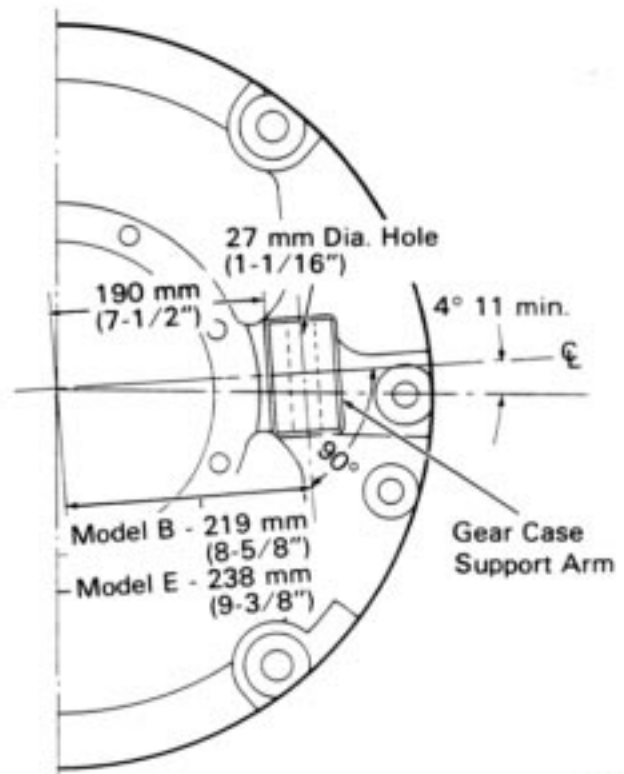


Fig.13 - Pinion End Bearing Housing Gear Case Support

GEAR CASE ASSEMBLY

1. Apply RTV to the corners of all the bore openings of the upper cover as shown in Fig. 14.
 2. Insert string covered cotton cording into the parting line channels of the upper cover as shown in Fig. 14. Trim cotton cording flush with the seal assemblies. Ensure all the ends of the cotton cording are cemented to the gear case by the RTV applied in Step 1.
 3. On previous model gear case, carefully install upper and lower gear case, ensuring metal-backed felt seals are fully in contact with the axle. Carefully slide the gutters into the gutter channels in the upper cover.
 4. On current model gear case, carefully install upper gear case, making sure the locating keys engage the slots in the plastic seals, as shown in Fig. 11. Ensure the gear case side-sheets engage the circumferential groove in each seal. If the gear case side-sheet falls outside the groove, the gutter of the seal will be pushed against the gear web, causing severe leakage.
- Install the lower gear case, again making sure the gear case side-sheets engage the circumferential groove in each seal. Apply additional RTV around the joint between the drain duct of the gear case and the drain slot of the seal to ensure a good seal.
5. Apply safety straps to gear case mounting flanges and fasten in the normal manner.

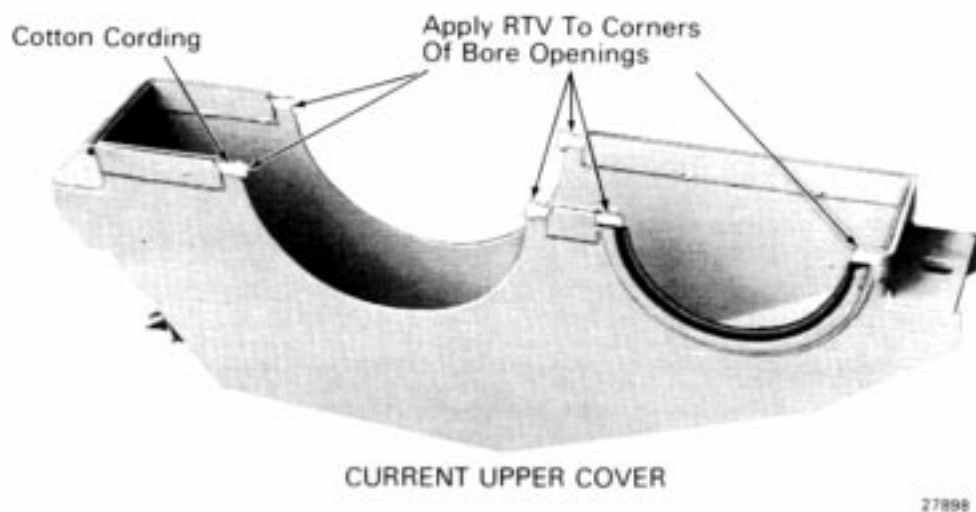
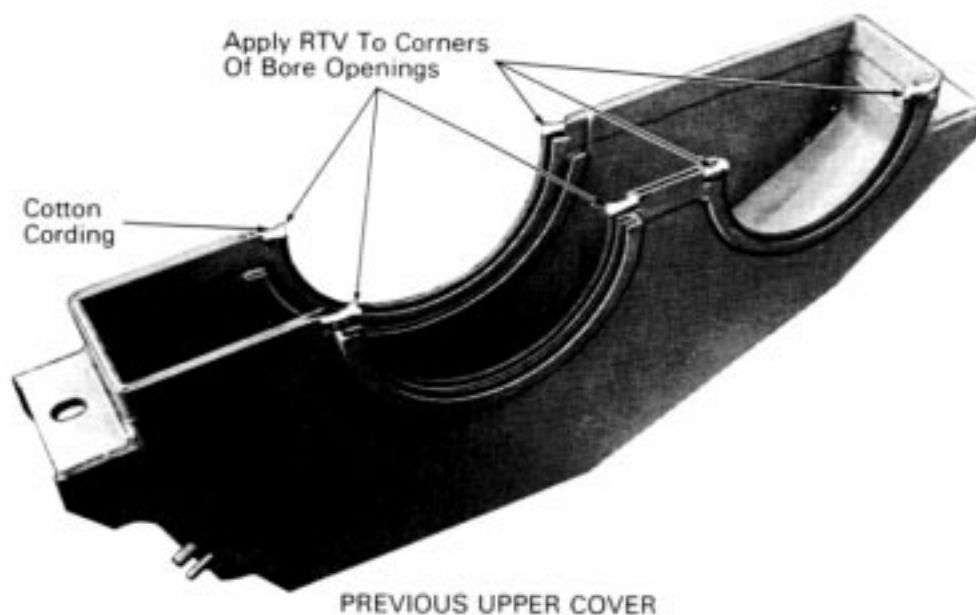


Fig. 14 - Upper Gear Case RTV And Cotton Cording Application

SERVICE DATA

Plastic Gear Case Seals		
Outer Seal	9535375
Inner Seal	9535376
Inner Seal Clamp	8407505

Gear Cases

Previous (Felt Seal) Models	Replacement (Plastic Seal) Models	Application
Upper Half		
8301948, 8435250, 9326600	9540598	D77/D87
8494235	9540582	D77/D87
8301947	9540579	D77E
Lower Half		
9310002, 9315714, 9315715, 9315716	9540306	D77/D87
9315717, 9315718, 9315719, 9315720	9540307	D77/D87
9094425, 8302646	9541129	D77E

RTV, 12 oz. Caulking Cartridge	8366747
Cotton Cording, 1 lb Ball (166 ft), 1/4" dia.	8310818

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