



## AP™ Bearing Installation and Maintenance Instructions



*Diesel Locomotive, Passenger Car  
and Freight Car Applications*



## **Introduction**

This instruction book represents the recommendations of The Timken Company. It is a guide to the proper care and procedure that should be followed for the installation, lubrication and maintenance of Timken® tapered roller bearings as applied to diesel locomotives, passenger cars and freight cars.

A Timken tapered roller bearing correctly applied and properly lubricated\* should perform reliably.

The periodic attention recommended should be scheduled for convenience with other phases of equipment maintenance.

General information from any railroad governing body should take precedence over and supplement this instructional booklet for roller bearings operated under the jurisdiction of that governing body.

### **WARNING:**

**Proper bearing maintenance and handling practices are critical. Failure to follow correct installation instructions can result in equipment failure, creating a risk of serious bodily harm or death.**

*\*Timken® AP™ bearings are prelubricated at the factory. No additional lubrication should be required. Please contact your Timken representative if specialized equipment is used that may require additional lubricant or subsequent lubricant in service.*





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# General Information

## Nomenclature

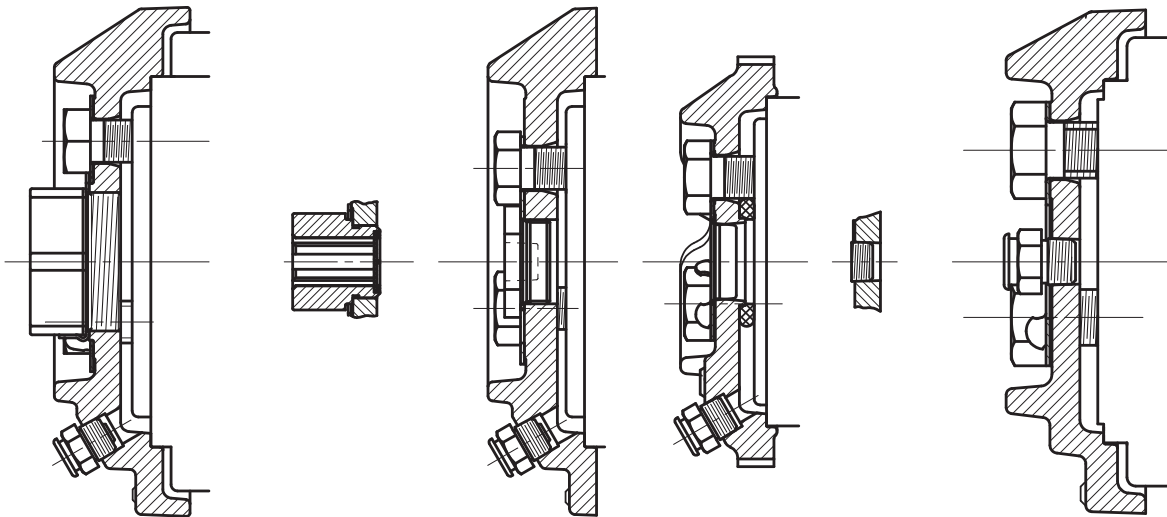
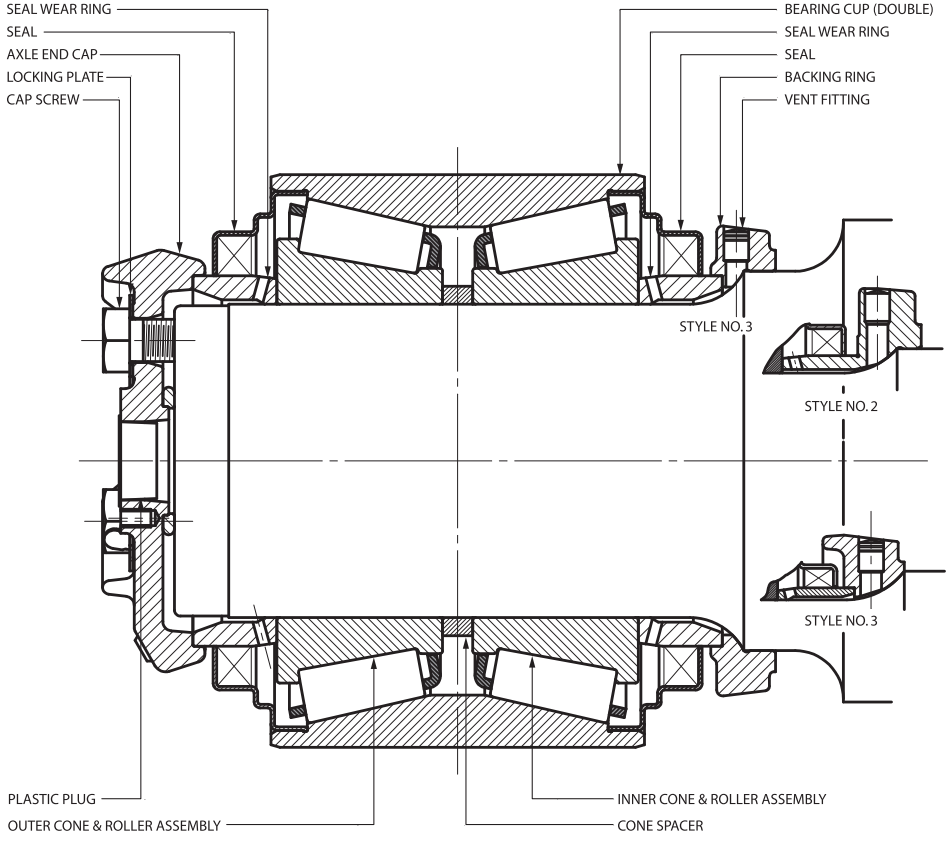


Figure 1 – Timken® AP™ bearing assembly and typical axle end caps. Application dependent on whether field lubrication is required. Contact your Timken representative.



**Figure 2 – Narrow frame adapter.**



**Figure 3 – Wide frame adapter.**

## General Information

### Frame Adapters

Frame adapters are used to fit the Timken® AP™ roller bearing assembly to the various types and sizes of truck frames.

The narrow adapter, shown in Figure 2, is used to adapt the Timken AP roller bearing assembly to the standard narrow pedestal jaw side frame and the integral box type side frame. The narrow adapter also is used with an additional adapter for the Andrews or arch bar truck side frame.

The wide adapter, shown in Figure 3, is used to adapt the Timken AP roller bearing assembly to the wide pedestal jaw frame.

Similar frame adapters are available or may be designed to adapt the Timken AP roller bearing assembly to all types of trucks.

Frame adapters may be ordered from The Timken Company or directly from the manufacturing foundries or machining companies.

Adapters must be clean and free from dirt, dust, metal chips and foreign material that may prevent proper seating of the adapters on the roller bearings.

It is not necessary to remove the coating of rust preventive from the machined surfaces of adapters before adapters are applied to the bearings.

## Bearing Installation and Removal

### Equipment

Timken AP bearings may be installed or removed with a bearing press, wheel press or with portable fixtures, depending on production requirements.

To ensure that bearings are properly seated, bearing or wheel presses should be equipped with relief valves so that the specified pressure can be maintained for a short interval. Bearings may not be properly seated if the required pressure is obtained during the surge of the press, when the backing ring of the bearing contacts the axle fillet.

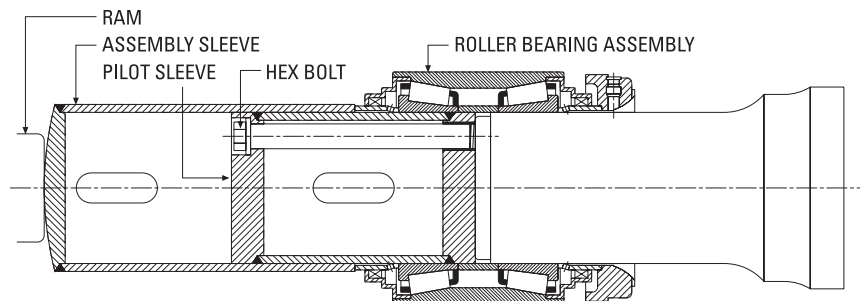
### Bearing or Wheel Presses

Bearing presses or wheel presses should be checked with a load cell to be sure that the ram pressure, as indicated by the gauge, is correct in the tonnage range and for the piston travel required for applying roller bearings to axles.

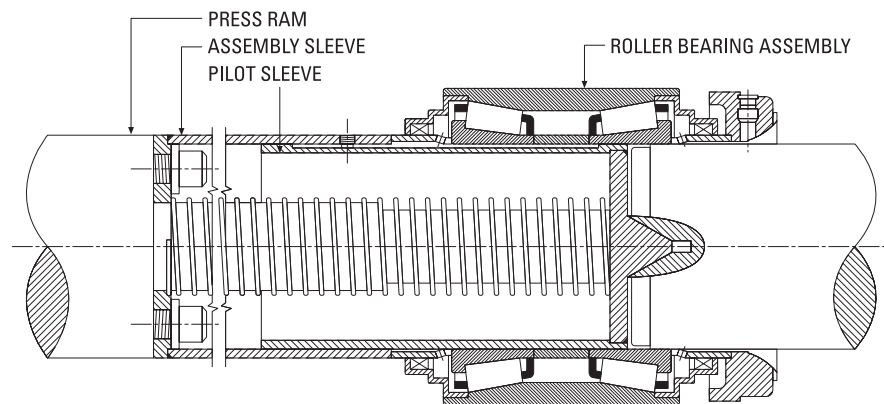
When roller bearings are applied in a bearing or wheel press, pilot sleeves fastened to the end of the axle and separate assembly sleeves (Figure 4), or telescoping pilot and assembly sleeves fastened directly to the ram of the press (Figure 5), may be used.

Details of separate pilot and assembly sleeves are shown in Figure 7.

Bearing presses may be double-ended to apply bearing assemblies to both ends of the axle at the same time (Figure 6).

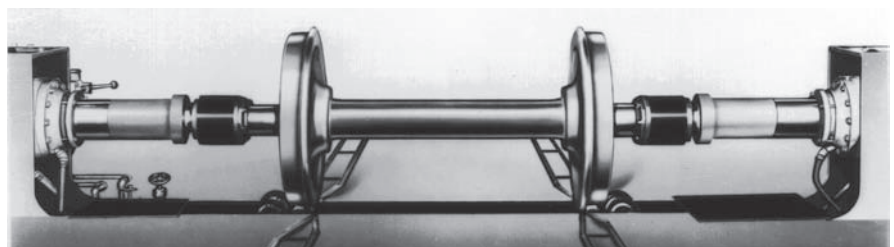


**Figure 4 – Separate sleeve method of applying roller bearings to an axle.**

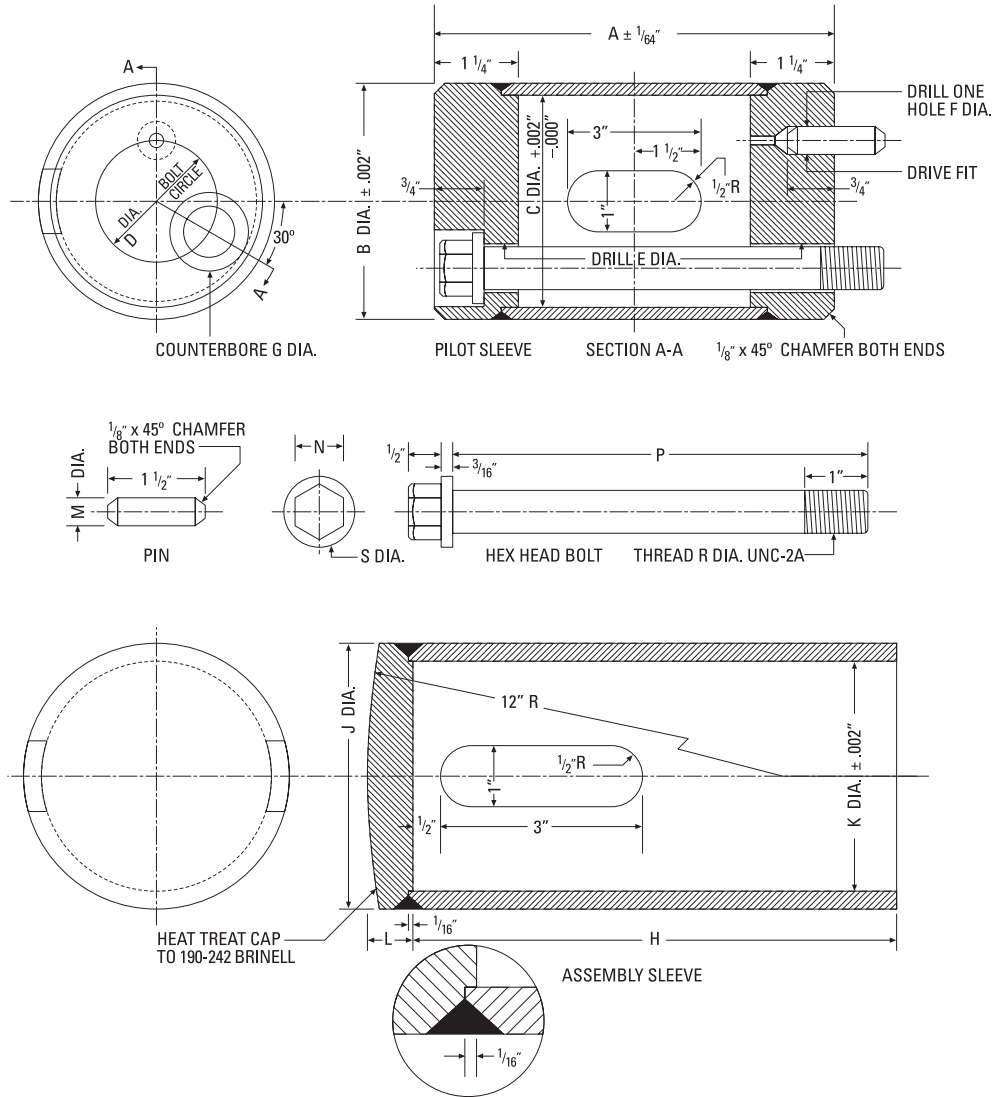


**Figure 5 – Telescoping sleeve method of applying roller bearings to an axle.**

**Figure 6 – Applying bearing assemblies to both ends of an axle at the same time.**



# Bearing Installation and Removal



**Figure 7 – Details of the pilot sleeve and assembly sleeve used for applying roller bearing assemblies to an axle with a wheel press or bearing press.**

CLASS SIZE	PILOT SLEEVE							ASSEMBLY SLEEVE				PIN	HEX HEAD BOLT			
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S
B (4 1/4 x 8)	7 1/4	3.978	3.500	2 7/16	25/32	5/8	1 3/16	9	4 9/16	4.011	3/4	5/8	13/16	7 1/4	3/4 - 10	1 1/8
C (5 x 9)	8 1/2	4.665	4.187	3	29/32	47/64	1 5/16	10	5 1/4	4.698	3/4	47/64	7/8	8 1/2	7/8 - 9	1 1/4
D (5 1/2 x 10)	8 1/2	5.165	4.687	3 1/2	29/32	47/64	1 5/16	10 1/4	5 3/4	5.198	3/4	47/64	7/8	8 1/2	7/8 - 9	1 1/4
E (6 x 11)	9 3/8	5.665	5.187	3 7/8	1 5/32	27/32	1 7/16	11	6 1/4	5.698	3/4	27/32	15/16	9 3/8	1 - 8	1 3/8
F (6 1/2 x 12)	10 1/4	6.165	5.687	4 1/4	1 5/32	61/64	1 9/16	11	6 3/4	6.198	1	61/64	1	10 1/4	1 1/8 - 7	1 1/2
EE (6 AXLE)	8 3/4	5.978	5.500	3 1/2	29/32	47/64	1 5/16	9 9/16	6 13/16	6.010	1	47/64	7/8	8 3/4	7/8 - 9	1 1/4
EE (6 AXLE)	8 3/4	5.978	5.500	4 1/4	1 5/32	61/64	1 9/16	9 9/16	6 13/16	6.010	1	61/64	1	8 3/4	1 1/8 - 7	1 1/2
EE (5 1/2 AXLE)	8 3/4	5.478	5.000	3	29/32	47/64	1 5/16	9 9/16	6 13/16	5.510	1	47/64	7/8	8 3/4	7/8 - 9	1 1/4
G (6 3/16 AXLE)	10 1/4	6.165	5.687	3 7/8	29/32	47/64	1 5/16	11 1/8	7 1/4	6.198	1	47/64	7/8	10 1/4	7/8 - 9	1 1/4
G (6 1/2 AXLE)	9 3/4	6.478	6.000	3 7/8	29/32	47/64	1 5/16	10 3/4	7 9/16	6.512	1	47/64	7/8	9 3/4	7/8 - 9	1 1/4
GG (6 1/2 AXLE)	9 3/4	6.478	6.000	5	29/32	47/64	1 5/16	10 3/4	7 9/16	6.512	1	47/64	7/8	9 3/4	7/8 - 9	1 1/4
G (7 x 12)	10 1/4	6.978	6.500	4 5/8	1 9/32	1 5/64	1 11/16	11 1/8	7 9/16	7.012	1 1/4	1 5/64	1 1/8	10 1/4	1 1/4 - 7	1 5/8
G (7 x 14)	10 1/4	6.978	6.500	4 5/8	1 9/32	1 5/64	1 11/16	11 1/8	7 9/16	7.012	1 1/4	1 5/64	1 1/8	10 1/4	1 1/4 - 7	1 5/8
GG (6 7/8 AXLE)	9 3/4	6.853	6.375	5	29/32	47/64	1 5/16	10 13/16	7 15/16	6.887	1	47/64	7/8	9 3/4	7/8 - 9	1 1/4

**Table 1**

The fixtures required for removing a bearing in a bearing press or in a wheel press, without removing the wheel, are shown in Figure 8.

The adapter shoe and reach rods required to attach the fixture to the bearing press or wheel press should be designed to suit the specific press conditions. The pulling shoe insert adapter must be held down in position behind the backing ring until the initial pressure has been applied to ensure proper contact with the backing ring.

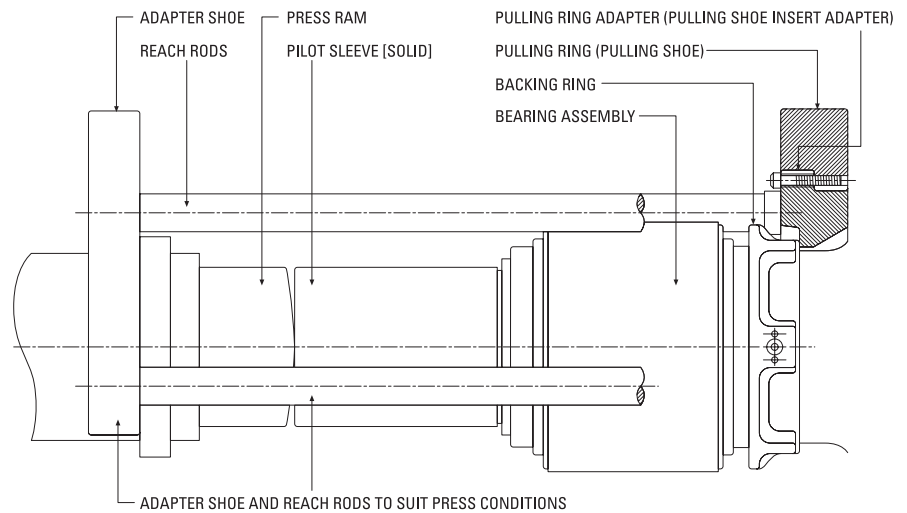
## Portable Fixtures

Portable fixtures consisting of a pilot sleeve, assembly sleeve, pulling shoe, reach rods and a base plate may be used for bearing installation and removal.

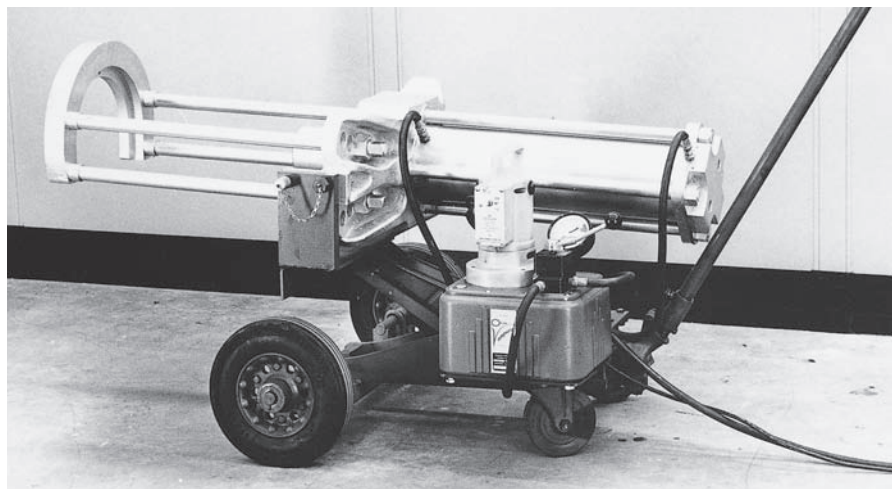
These fixtures can be operated by hand, air or electrically-operated pumps and jacks, which are available commercially to suit production requirements.

The hydraulic ram or jack used should have sufficient travel to install or remove the bearings in one operation without the use of intermediate blocking. Portable fixtures may be supported on a dolly or shop truck.

A self-contained portable machine equipped with an electrically operated pump for installing or removing roller bearings is shown in Figure 9.



**Figure 8 – Fixture for removing a bearing with a bearing press or wheel press.**



**Figure 9**

## Bearing Installation and Removal

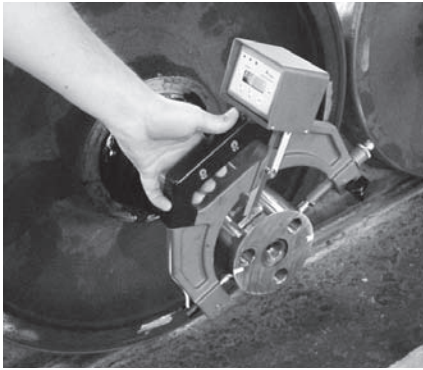


Figure 10

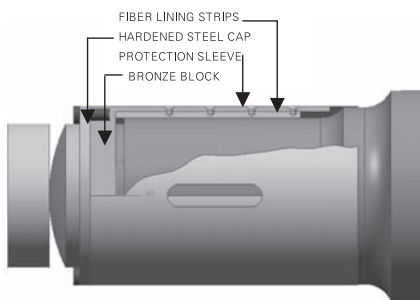


Figure 11 – Axle protection sleeve.

### Axles

Before proceeding with the bearing installation, the axles should be checked to make sure that the bearings can be applied without difficulty.

Axle bearing seat diameters, shoulders and radii should have a smooth machined, smooth machined and rolled, or a ground finish and must be free of sharp corners, burrs, nicks, tool marks, scratches or corrosion.

Axle bearing seat diameters should be concentric with the wheel seat diameters.

Various instruments exist for measuring bearing seat diameters on axles. Two instruments are dial or digital snap gauges, as shown in Figure 10, and micrometers. All instruments must be calibrated using a master disc. It is not acceptable to use pin-type standards to calibrate

micrometers. Master gauges must be the same temperature as the axle being measured unless appropriate compensation is made for the temperature difference between the master disc and the journal being measured. Axle diameters should not be checked while axles are heated from machining. Gauges, disc standards and axles should be of the same temperature.

The bearing seat diameters, dust guard diameter, shoulders and radii should be checked to ensure that the finished axle dimensions are within prescribed tolerances to obtain proper fit of the bearing assemblies.

A self-aligning pressure block and pin (axle protection sleeve), similar to that shown in Figure 11, must be used to eliminate upsetting the ends of axles and to prevent high spots on the bearing seats that result when uneven pressure is applied to the ends of axles. This can occur when either new or service-worn wheels are applied or removed. Plastic protective sleeves also are available.

The bearing seat diameters should be carefully measured after the wheels have been applied to the axles to determine whether any high spots exist on the bearing seats.

Any roller bearing axle found with high spots should be carefully reground for the full circumference and length of the bearing seats. The refinished axle must be within the prescribed tolerance limits.

All steel chips, dirt and white lead must be cleaned out of the lathe center holes and cap screw holes in the ends of the axle before applying the bearings.

Axles that have become magnetized must be demagnetized before bearings are applied.

### Applying Bearings

Roller bearing work should be confined to a specific area.

Machines and tools designed for roller bearing installation and removal should be used.

Bearing assemblies should be stored in a clean, dry place and should be protected from moisture until they are installed on the axle.

Bearing assemblies should not be removed from the shipping package nor should the protective wrapping be removed until time of application.

Do not remove the cardboard insert from the bore of the bearing assembly. This insert is required to hold the cone spacer in alignment with the bearing cones when installing the bearing assembly.

The bearing assemblies are shipped with a protective coating of grease over the vent fitting, if so equipped. Care should be taken that the grease is not wiped off when the bearings are applied to the axles.

Timken roller bearings must be pressed on the axle. Heat must not be applied to the bearing cone assemblies to facilitate installation.

The bore of bearing cones that have had previous service should be checked to ensure an interference fit on the axle.

The amount of press fit of the bearing on the axle is predetermined by the dimensional tolerances of the axle and bearing mounting parts. Neither the bearings nor the axle need to be selected for fit for any given class.

A pilot sleeve must be used to keep the cone spacer in alignment with the bores of the cones and to guide the bearing assembly on the axle. The pilot sleeve may be fastened to the end of the axle (Figure 4) or may be guided by the lathe center hole in the end of the axle (Figure 5).

A thin coating of a lead-free rust preventing material must be applied to the journal fillet and the portion of the axle between the wheel hub and journal fillet. The coating must be uniform and must not be applied more than 30 minutes before the bearings are applied to the axle. Coating materials must be maintained at the same consistency during use.

Coat the bearing seats of the axle with castor oil, heavy mineral oil or a molybdenum-disulfide and oil mixture. **Do not use white lead.** Lead compounds may be detrimental to lubricating greases by acting as an oxidation catalyst.

When the bearing assembly is slipped onto the pilot sleeve and the cardboard insert is ejected, the outer seal wear ring should be held in place to prevent it from riding out of the enclosure seal.

If the seal wear ring slips out of the assembly, it must be inserted into the enclosure seal correctly and carefully, chamfered end first, so that the outer lip of the seal does not turn under when the seal lips are expanded over the seal wear ring.

**Do not insert any tool or other instrument between the seal element lips and seal wear ring.** This may damage the seal element lips or scratch the seal wear ring, resulting in bearing lubricant leakage.

A small lift or other bearing-handling device may be used for handling larger bearing sizes.

## Pressing the Bearing Assemblies on Axles

An assembly sleeve, which contacts the seal wear ring outer face and telescopes over the pilot sleeve, is used to press the bearing on the axle (Figures 4 and 5).

To make sure that the bearing is firmly seated against the axle fillet, the pressures shown in Table 2 should be applied to the bearings after the surge of the pressure gauge indicates that the bearings have contacted the axle fillet.

Rotate the bearing assembly to make sure that it will turn. Due to the rubbing-type seals, the bearing assembly will not rotate freely at initial application. New bearing assemblies are preadjusted at the factory, no adjustment is necessary at installation. However, if the bearing is equipped with HDL™ seals, the bearing may rotate freely.

## Applying the Axle End Cap

Remove the axle end cap assembly from the carton. If the bearing is not NFL (non-field lubricated), it will be necessary to remove the cardboard cap screw retainer.

Apply the axle end cap, locking plate and cap screws to the end of the axle as a unit.

A ratchet wrench or an impact wrench may be used to run up the cap screws. A stop should be placed in the socket when impact wrenches are used, to prevent flattening the tabs of the locking plates.

Tighten the cap screws with a torque wrench to the torque specified in Table 2. Recheck each cap screw several times until the cap screw does not turn when the specified torque is applied.

High-strength cap screws are identified by three radial marks on their heads.

Lock the cap screws by bending all tabs of the locking plate flat against the sides of the cap screw heads, using adjustable rib-joint pliers. Do not tighten or loosen a cap screw after the specified torque has been obtained to position the cap screw head flats relative to the locking plate tabs.

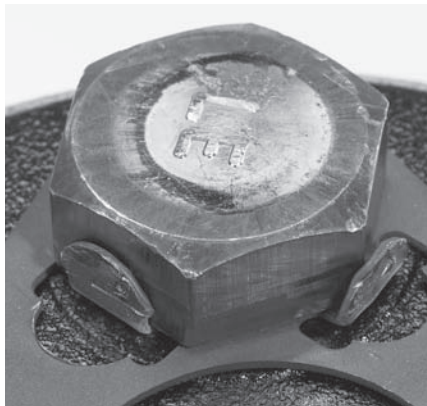
A cap screw tightened to the specified torque may have a corner of the cap screw head centered on one of the locking plate tabs as shown in Figure 12 (page 10).

BEARING		CAP SCREWS	
Class and Size	Seating Tonnage	Size	*Torque Ft. - Lbs.
B (4 1/4 x 8)	30-40	3/4" - 10	115
C (5 x 9)	30-40	7/8" - 9	145
D (5 1/2 x 10)	45-55	7/8" - 9	160
E (6 x 11)	45-55	1" - 8	290
F (6 1/2 x 12)	45-55	3/4" - 10 High Strength	210
F (6 1/2 x 12)	45-55	1 1/8" - 7	420
G (7 x 12)	60-70	1 1/4" - 7	490
*GG (6 1/2" x 12)	60-70	7/8" - 9 High Strength	315
*GG (6 7/8" x 12)	60-70	7/8" - 9 High Strength	315

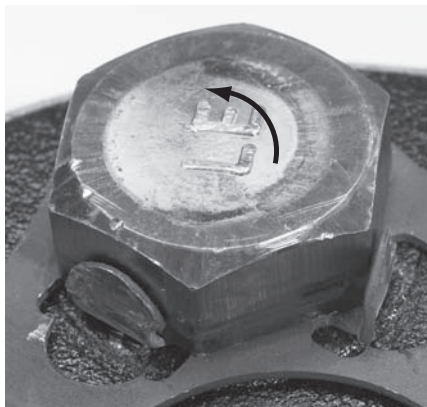
**Table 2 – Bearing installation pressure and cap screw torque.**

\*Torque wrench must be accurate within ± 4%.

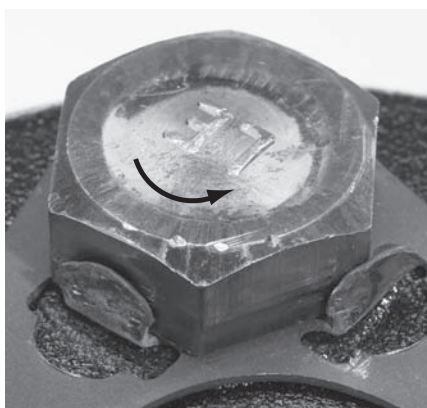
\*Bearing lateral maximum value is .015.



**Figure 12 – Cap screw head centered on a locking plate tab.**



**Figure 13 – Correct position of tab against cap screw head flat to resist loosening of the cap screw.**



**Figure 14 – Incorrect position – will not resist loosening.**

Bend that tab against the cap screw head flat as shown in Figure 13, so that the tab will resist loosening of the cap screw. (Arrow indicates loosening direction.)

If the tab is bent against the flat shown in Figure 14, it will not resist loosening of the cap screw. (Arrow indicates loosening direction.)

### Plugs and Lubricant Fittings

If equipped, plugs and lubricant fittings should be applied to the torque values specified in Table 3.

SIZE	TORQUE IN FOOT-POUNDS
<b>Lubricant Fittings or Pipe Plugs</b>	
3/8" - 18 NPT	30-40
1/2" - 14 NPT	40-50
<b>Plugs</b>	
1 1/2" - 18 NEF	90-110
1 3/4" - 16 NEF	125- 150
2 7/8" - 16 N	250-275

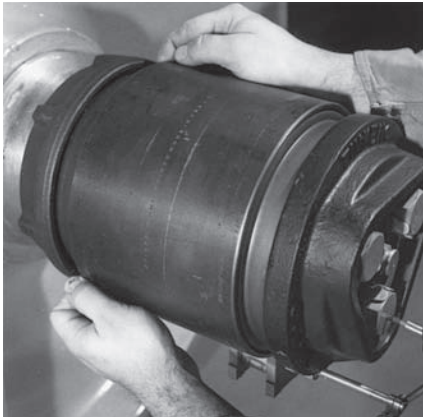
**Table 3 – Tightening torque for plugs and lubricant fittings.**

### 2 7/8" Plug Installation

After the axle end cap is applied and the locking plate tabs have been bent up against the cap screw heads, place the plug locking plate on the 2 7/8" plug. Apply the plug by hand, making sure that the plug locking plate is not binding. Tighten the plug with a torque wrench to the torque shown in Table 3. Do not back off the plug to obtain locking plate tab alignment with the flats on the plug. A slightly higher torque is acceptable if necessary. Bend the tabs of the plug locking plate up against at least two of the flats on the plug. Drive down the two tabs that are along the side of the axle end cap triangle so that they are tight against the side of the triangle, to prevent the plug locking plate from turning. If additional installation instructions are needed, contact your Timken representative.

### Checking Bearing Running Lateral

Check the bearing running lateral play with a dial indicator mounted on a magnetic base. Rotate the bearing a few times while forcing the bearing cup laterally toward the wheel hub. Place the magnetic base on the outside surface of the bearing cup and position the indicator stem against the surface of a cap screw head or on the lubricant fitting as shown in Figure 15 (page 11). Oscillate the cup slightly while forcing the cup toward the wheel hub then pull the cup away from the wheel hub while slightly oscillating the bearing cup.



**Figure 15**

The bearing lateral end play, as indicated by the dial indicator, should be 0.001" to 0.020". If a bearing rotates freely by hand, but measures less than 0.001" lateral on the dial indicator, the application is satisfactory for service. If the bearing end play does not meet the requirements, remove the bearing assembly from the axle.

The bearing lateral may be corrected by one of the following methods to fall within the specified limits:

1. Check the bearing seat on the axle for size and condition. If the size or condition of the axle is not according to specification, correct any undesired condition and reapply the bearing. If a bearing was applied to an oversized axle, check the size of the cone bores before reapplying the bearing.
2. If the size and condition of the axle are satisfactory, but the lateral indicated is less than 0.001" and will not rotate freely by hand, apply the bearing to an axle having a bearing seat diameter closer to the minimum dimensions, but within the specified tolerance.

3. If the size and condition of the axle are satisfactory, but the lateral indicated was more than 0.020", apply the bearing to an axle having a bearing seat diameter nearer the maximum dimension, but within the specified tolerance.

If the bearing running lateral play is still not within the specified limits of 0.001" to 0.020", remove the bearing from the axle. A Timken representative should be consulted for the disposition of new bearings removed from axles.

Prior-service bearings removed from axles because of improper running lateral should be sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS). The bench lateral play and the bore of both cone assemblies should be rechecked. Also, the bearing seat diameter of the axle from which the bearing was removed should be checked for size.

### Vent Fittings

A protective coating of grease is applied to the vent fittings of new bearing assemblies, if equipped, to prevent the vent from becoming clogged when the equipment is painted.

A protective coating of grease should be applied to the vent fittings of reassembled bearings to protect the vent through the painting operation.

It is not necessary to wipe the grease off the vent fitting before the car is released for service. The grease will be disposed of by centrifugal force after the car is placed in service.

### Lubricant Fittings

If the bearing assembly is equipped with a lubricant fitting, the cap covering the fitting must not be

removed until after the equipment is painted. This cap may be left on the lubricant fitting after the equipment has been painted to protect the lubricant fitting from the accumulation of road dirt.

### Initial Lubrication

Timken AP bearings are prelubricated at the factory. No additional lubricant is to be added after the bearing is applied to the axle.

Some AP bearing assemblies operating in industrial or other service under specialized equipment may require additional lubricant. A Timken representative should be consulted.

### Subsequent Lubrication in Service

Many Timken AP bearings do not require field lubrication and are designed as NFL (non-field lubricated) bearings. These bearings do not have lubricant fittings or the fittings have been replaced with non-removable plugs. Where field lubrication is desired, bearings should be relubricated according to Timken instructions A-31243 or A-31874. If applicable, AAR Roller Bearing Manual covers relubrication of passenger car bearings.

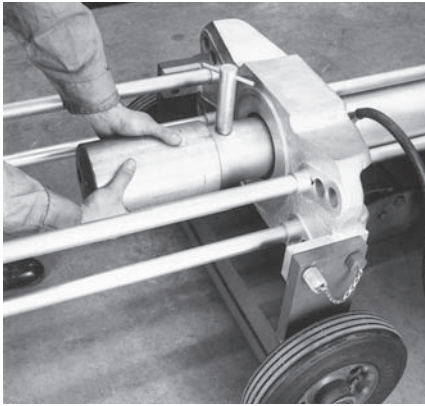


Figure 16

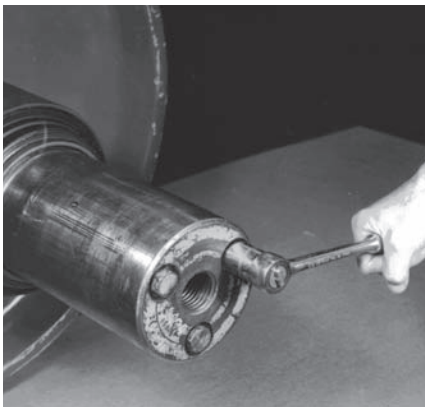


Figure 17

### Bearing Removal

Bearings are normally removed from the axle only when wheels are removed.

When bearing assemblies that have been in service are removed from the axles, the bearings should be shipped to the nearest Rail Bearing Service (RBS) or Timken Rail Services (TRS) center for proper cleaning, inspection and repair.

The bearing assemblies may be removed with a bearing press, wheel press or with portable fixtures. Forty to 60 tons of pressure is normally required to break the bearing fit.

***If bearings are to be removed along with the wheels, a suitable shoe must be used to make contact between the wheel hub and backing ring.***

When bearings are removed from the axle, a pilot sleeve or guide tube should be fastened to the end of the axle or to the press ram to keep the bearing parts together and protect them from damage. Do not drop the bearing when removing it from the pilot sleeve.

After the assembly is removed from the pilot sleeve, a cardboard insert or a similar device should be inserted in the bore of the bearing assembly to hold the internal bearing parts in place.

Particular attention should be given to keeping the seal wear rings in place in the enclosure seals.

### Removing the Bearing

After removing the wheel and axle assemblies from the truck, remove the adapters or housings from the bearings.

Stop blocks, or cap screws and nuts used as stop blocks, must be removed from adapters so equipped, prior to removing the adapters from the bearings.

If difficulty is experienced in removing bearing housings, it may be desirable to modify the bores of the housings to eliminate this difficulty at subsequent housing removals (contact your Timken representative). Otherwise, thoroughly clean the bores of the housings, remove all rust or corrosion and apply a heavy coating of grease to the bores of the housings.

If a 2 7/8" plug, retained with a locking plate, is used in the axle end cap, it must be removed before removing the cap screws.

Bend the tabs of the cap screw locking plate away from the heads of the cap screws.

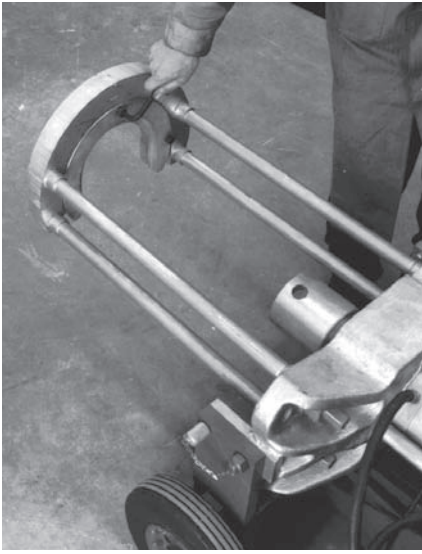
Remove the cap screws, locking plate and axle end cap. It may be necessary to tap the end cap lightly for removal.

If more than one bearing assembly is to be removed, the guide tube should be fastened to the hydraulic ram, if possible. Usually, a guide tube that is a size smaller than the axle size is used to eliminate alignment problems.

If portable machines are used, be sure to tighten the guide tube against the ram head so the pressure required to remove the bearing will not shear or bend the connector pin (Figure 16).

When portable machines are used and only one bearing is to be removed from an axle, and a bearing is to be immediately applied, fasten the guide tube of the proper size to the axle. It will then be in place for installing the bearing (Figure 17).

A pulling shoe and pulling shoe insert adapter, similar to that shown in Figure 18 (page 13), which fits behind the backing ring as shown in Figures 8 (page 7) and 19 (page 13), is used to remove the bearings when it is desirable to remove the bearings without removing the wheels.



**Figure 18**

Make sure that the pulling shoe is of the correct size for the bearing to be removed. Proper contact with the backing ring and puller alignment are necessary for efficient bearing removal.

Position the pulling shoe behind the backing ring. The pulling shoe contact surface of the backing ring is very narrow. Therefore, it is necessary to hold the pulling shoe down in position behind the backing ring as shown in Figure 19. This must be done until the initial pressure has been applied, to ensure proper contact with the backing ring and to prevent distorting or bending the backing ring. Extend the ram to remove the bearing from the axle.

**Figure 19**



### Truck Assembly and Disassembly for Locomotive and Passenger Car Applications

#### General

Bearing housings or frame adapters are used to adapt Timken roller bearing assemblies to bed-type truck frames of locomotives and passenger cars. Bearing housings and frame adapters are available for various designs of truck suspensions.

External wear surfaces of bearing housings and frame adapters are machined and hardened. However, liners may be applied if desired.

Bearing housings are designed to include the installation of control devices. Control devices are applied to the front face of bearing housings as shown in Figure 20. Figure 21 shows the front face of the bearing housing with no control devices applied.

Trucks should be maintained in good operating condition to obtain efficient roller bearing performance. Worn or defective parts should be repaired or replaced.

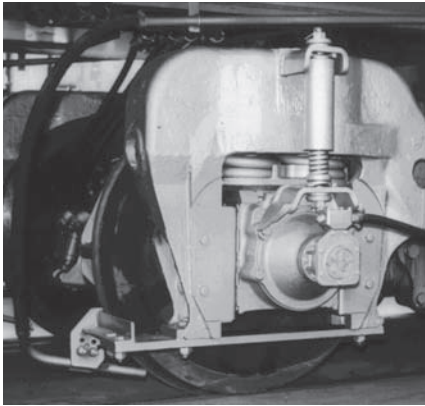


Figure 20

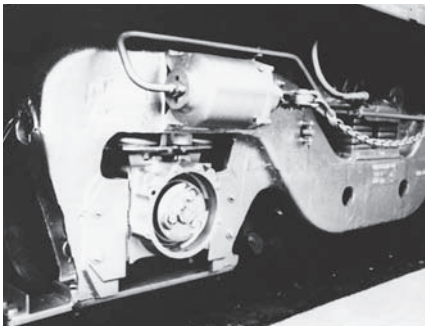


Figure 21

#### Truck Assembly

Standard procedure should be followed in assembling trucks. Care should be exercised in handling the truck frames to prevent damage caused by striking the bearings with the truck frames.

Bearing housing bores, adapter bearing seats and the outside surfaces of bearing cups must be clean and free of dirt or corrosion.

When full-bore bearing housings are applied to bearing assemblies, coat the bore of the housings and the outside surface of the bearings with grease.

Be sure that the housings or adapters are applied to the bearings correctly. The word "FRONT" is cast on the housings and adapters to identify their outer face.

If the bearing assembly has had previous service, the original load zone may be recognized by the imprint of the adapter or housing contact on the bearing cup. A new load zone location may have been indicated with a mark on the outside of the bearing cup when the bearing was disassembled and inspected. Position the housing or adapter on the bearing so that a new wear surface in the bearing cup will be in the load zone.

Make sure that the bearing housings or adapters are properly seated on the bearing assemblies.

Apply cap screws, lockwashers and nuts or stop blocks to adapters that have a hole provided in the bottom. These cap screw nuts or stop blocks are required to prevent the adapters from disengaging from the bearing assemblies.

#### Truck Disassembly

Remove control devices from the bearing housings.

Standard procedures should be followed in disassembling trucks. Care should be exercised in removing truck frames to prevent damage by striking the bearings with the truck frames.

Whenever a truck is disassembled, the roller bearings and associated parts should be inspected as outlined under service inspection, found on page 16 of this manual, and in accordance with shop practice truck disassembly instructions, found on page 18 of this manual.

**CAUTION:**  
When handling axle assemblies with bearing housings on the bearings, care should be exercised to prevent the housings from slipping off the bearings.

### Truck Assembly and Disassembly for Freight Car Applications

#### General

Care should be exercised in applying or removing truck frames to prevent damage to the bearings that may be caused by striking the bearings with the truck frames.

After the truck frames have been removed from the wheel and axle assemblies, the adapters should be removed from the bearings for cleaning and inspection.

Truck frames, bolsters and other truck parts should be inspected and repaired before the trucks are reassembled. Excessively worn frame roofs must be repaired.

The side frames of each truck must be a “matched pair.” Mismatched side frames are detrimental to roller bearing performance.

The bearing seats of adapters and the outside surfaces of bearing cups must be free of dirt or other foreign matter that may prevent the adapters from seating properly on the bearings.

It is not necessary to remove the coating of rust preventive from the machined surfaces of the adapters before the adapters are applied to the bearings.

Wheel and axle assemblies should only be installed in side frames of the size for which they were designed.

#### Narrow Pedestal Frame Trucks

Timken recommends the use of frame keys on all cars. The frame key acts as a retaining device to prevent the bearing from disengaging from the adapter under dynamic conditions. Please contact your Timken representative for additional information.

#### Integral Box Frame Trucks

See instruction A-32914 for integral box frame truck assembly and disassembly.

### Service Inspection

#### General

Roller bearings should be given a visual inspection at terminals, lubrication intervals and when equipment is on repair track or in the shop for any reason. Inspect for overheating, excessive lubricant leakage, broken, loose or missing parts such as cap screws, control devices, plugs, seals, cups, end caps, housings or adapters. **For detailed information on bearing inspection, visit [www.timken.com/rail](http://www.timken.com/rail). You will be able to access resources such as our *Trackside Bearing Inspection* booklet and other maintenance literature.** Examine the housings or adapters for proper seating on the bearing and for excessive wear. Defective parts must be repaired or replaced before the equipment is returned to service.

The required tools, facilities and spare parts should be available at terminals for inspection, lubrication and maintenance.

#### Loose Seals

If a seal can be moved using a suitable probe, the bearing must be removed from the axle for inspection and repair.

#### Loose or Missing Cap Screws

If one cap screw is found to be loose or missing, remove all of the cap screws, apply a new locking plate, properly torque all three cap screws and bend all tabs against the flats of the cap screw heads.

If two or more cap screws are found loose or missing, the wheel set must be removed from the truck. Remove the end cap. If there is any evidence that the bearing is not

properly seated or if the lateral play is 0.030" or more, remove the bearing from the axle for a complete inspection to determine the cause and possible resulting damage.

#### Bearing Running Temperature

Running temperatures up to 100° F (37.7° C) above atmosphere may be expected under normal operating conditions.

Various types of thermo scanners are used to check bearing operating temperatures. The device manufacturers should be consulted for the operation of these devices with respect to roller bearing temperature detection.

200° F (93.3° C) heat-indicating crayons or a pyrometer should be used to check bearing temperatures after electronic detectors have shown indications of an overheated bearing. The front of the housing or adapter should be used for heat indication instead of the axle end cap.

If an overheated bearing is found, no lubricant other than approved\* roller bearing grease should be applied, unless the bearing has obviously been damaged. A hot box coolant or other suitable lubricant may then be used to enable the car to be moved to the setoff point.

When a bearing is damaged to the extent that the wheel and axle must be removed, the **housing or adapter** must be sent to the shop with the wheel and axle assembly to determine the cause of the damage.

#### Grease Leakage

A small amount of grease leakage around the seals may be expected during the initial run-in period. This leakage will reduce to normal "weeping" after this period.

When grease is added to a bearing assembly at relubrication intervals, the space between the axle end cap and the end of the axle and the space between the seal and cone assembly, are filled with grease.

In service, centrifugal force due to bearing rotation will move some grease out from between the end cap and axle into the bearing. When the space between the cone and seal is full of grease, this action may cause a seal to leak temporarily following relubrication.

When a bearing is found that appears to be leaking excessively, check for loose seals.

If the seals are not loose, verify the date the equipment was built and the last lubrication. If grease has been added within the last six months, the leakage may be attributed to the recent relubrication. If grease has been added two or more times, the leakage may be caused by excessive grease in the bearing. Grease should not be added. Adding grease will increase the leakage. Wipe the bearing clean.

Subsequent inspections will determine if further attention is required.

Overlubrication should be avoided because it will cause the bearing running temperature to increase. This increased running temperature along with the increased churning action will break down and deteriorate the grease.

\*Grease must meet approval of railroad governing body such as American Association of Railroads (AAR).

### Lubricant Contamination

Lubricant containing water is destructive to roller bearings, causing rapid wear. All possible precautions should be taken to prevent water from entering the bearing assembly.

If the equipment has been submerged or operated in water of such a depth that the water could have entered the bearings, the bearing assemblies must be removed from the axles and sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS).

Drain pipes or holes must be located so that drainage will not be directed at the bearing assemblies.

When cleaning the exterior of equipment, the stream of water should not be directed at the bearing enclosure seals.

When sandblast or shotblast cleaning, for repainting or for any reason, a shield should be provided to protect both the front and rear of the bearing assembly from sand or shot.

Sandblast or shotblast cleaning of roller-bearing-equipped axle assemblies is not recommended. Sand or shot may damage the seal elements or seal wear rings.

If the plug in the axle end cap is to be removed for any reason, the area around the plug must be cleaned before the plug is removed.

Grease for roller bearing lubrication must be kept covered and in the container in which it is shipped

to prevent contamination. Pumping devices must be used to dispense the grease directly from the shipping container into the roller bearings.

When adding grease to AP bearings at the periodic lubrication intervals, the delivery nozzle or coupling must be kept clean to prevent the possibility of foreign material pumping into the bearing with the grease.

### Displaced Adapters

An adapter out of position causes a load concentration on the bearing and, if continued in service for any length of time, may result in serious bearing damage.

If, for any reason, the truck frames are raised to the extent that the adapters could disengage from the bearings, each assembly should be inspected to make sure that the adapters are properly seated on the bearings. This should not occur if frame keys are used and properly applied.

### Accidental Damage

Roller bearing assemblies under equipment involved in derailment or collision, or subject to damage by fire, floods or other cause, must be shipped for inspection before being returned to service.

Bearings must be removed from the axles and sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS).

After the removal of the bearings, all axles must be checked for bent condition in an axle lathe or with other suitable equipment. A bent axle will cause premature bearing damage due to the oscillating movement and uneven load distribution in the bearing.

Bearing housings or adapters must be inspected for distortion or other damage before being returned to service. If a damaged adapter or housing is returned to service, it could cause damage to the replacement bearing due to concentration of load.

Truck frames also should be inspected to see that they are not bent or distorted. Truck frames that are bent or distorted will impose undesirable loads on the bearings, which can cause premature bearing damage.

## Shop Practice

### Truck Disassembly

Truck frames must not strike the roller bearings when the frames are removed from wheel and axle assemblies.

Remove the housings or adapters and clean the outside surface of the bearings. Sandblast or shotblast cleaning of roller-bearing-equipped axle assemblies is not recommended.

The outside surface of the bearing cup should be marked to indicate a new load zone to initiate a new wear surface in the bearing cup when the housing or adapter is applied to the bearing.

Adapters or housings should be cleaned and inspected for excessive wear. Adapters or housings worn to the extent that proper load distribution of the bearing is affected should be repaired or replaced.

Rotate the bearing assemblies to detect any abnormal condition and visually check the outside of the bearing assembly for broken, loose or missing parts (see service inspection instructions on page 16).

Check the bearing running lateral play with a dial indicator mounted on a magnetic base. Force the bearing cup laterally toward the wheel hub then pull the cup away from the wheel hub while oscillating the bearing. Place the magnetic base on the outside surface of the bearing cup and the stem of the indicator against a surface near the center of the bearing (see Figure 15 on page 11).

If the bearing lateral play is 0.030" or more, or if any roughness is detected when the bearing is rotated, the bearing assembly should be removed from the axle.

Whenever the bearing assemblies are removed from the axle, the bearings should be sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS).

### Wheel Turning

Wheel-turning lathes or wheel-truing machines may be used for turning wheels.

When wheel and axle assemblies are removed from the truck for wheel turning, the bearing assemblies should be inspected in accordance with preceding instructions for truck disassembly on this page.

If the lathe centers of the axles are accessible by removing the plug in the end caps, do not remove the end caps (see Figure 1 on page 3).

If it is necessary to remove the end caps, protective caps as shown in Figure 22, O-rings or other suitable wrapping should be used to prevent steel chips from entering the bearing or damaging the seals.

The opening between the backing ring and bearing cup also should be closed by wrapping with suitable material such as masking tape to protect the inner enclosure seal from being damaged by turnings or chips.

Heavy grease must be used to lubricate the lathe centers. **Do not use white lead.**

If the end caps were removed, clean the end faces, center holes and bolt holes of the axles after the wheel turning operation has been completed. Reapply the end caps, using new locking plates and torque-tighten the cap screws in accordance with installation instructions.

**Caution: Do not move any piece of equipment without end cap in place. Failure to comply can result in equipment failure or personal injury.**

If the end caps were not removed, reapply the plugs and tighten to the specified torque (see Table 3). Use a new locking plate or lockwire as required.

When wheels are trued under a car or locomotive using wheel truing machines, and if the axle end cap must be removed, a special set of axle end caps with center access holes must be maintained at the wheel truing machine. An axle end cap with center plugs removed, a special axle cap prepared by providing an access hole in the available axle end cap, or a retaining plate may be used.

### Wheel Renewal

When worn or defective wheels are removed from wheel and axle assemblies, the roller bearings may be removed separately using portable fixtures. They also may be removed along with the wheels.

If bearings are to be removed along with the wheels, a suitable shoe must be used to ensure proper contact of the wheel hub with the backing ring.

### Electric Welding

When it is necessary to do any electric welding on cars or wheel and axle assemblies, the ground cable must be clamped to or near the part being welded so that **no current will pass through the bearings.**

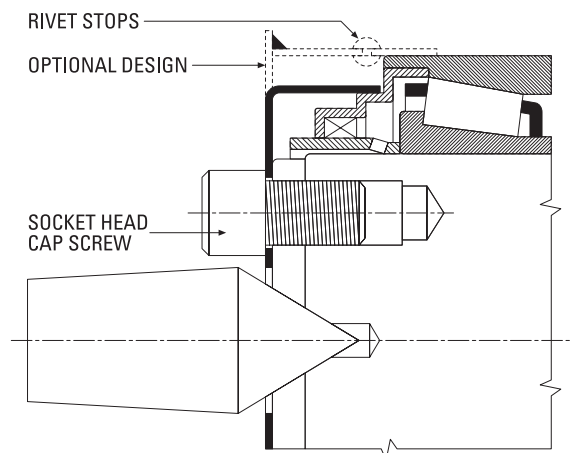


Figure 22

## Heat Indicators

Heat indicators detect abnormal operating conditions before serious damage can occur.

A heat indicator is a cylindrical metal cartridge containing a liquid and sealed with a fusible plug that melts when the temperature inside the bearing exceeds 250° F (121.1° C).

There are two types of heat indicators. One emits an extremely pungent and penetrating odor when the liquid is exposed to the atmosphere. The other emits a dense white smoke for several minutes.

When the fusible plug melts, the liquid in the cartridge is vaporized and discharged into the atmosphere.

When the resultant odor or smoke is detected, ***the train should be stopped at once*** and the overheated bearing located. An examination should then be made to determine the cause of the overheating. Proper precautions should be taken before operating the equipment further. If this procedure is followed, no material damage should ensue.

When the equipment reaches the shop, all parts of the bearing assembly should be thoroughly examined and the necessary repairs made. This discharged heat indicator must be replaced with a new heat indicator before the housing or adapter is returned to service.

The heat indicator should be applied by hand and must not be driven into position with a hammer or other means as this will rupture the fusible plug, causing the heat indicator to discharge prematurely.

The snap-type retainer ring should be applied to the groove in the heat indicator hole carefully by grasping one tang of the retainer ring with needle-nose pliers. Angle the free end of the ring into the groove of the hole and depress the ring just enough to clear the hole. If both tangs of the retainer ring are grasped between the jaws of the pliers, the retainer ring may be depressed beyond its elastic limit. This may result in a loose retainer ring that may vibrate out of the retainer ring groove, causing the heat indicator to be lost.

All heat indicators should be checked periodically for damage or leakage. A leaking condition is indicated by a slight odor or a grayish brown deposit at the fusible plug. If a defective heat indicator is found, it should be reported and replaced as soon as possible.

Masking tape that was applied over heat indicators for protection during the painting of equipment must be removed before the equipment is released for service.

### CAUTION:

**Heat indicators should be removed during cleaning, welding or other operations that may subject the heat indicators to higher than normal temperatures. Failure to do so can result in personal injury.**

*Service limit charts are available from your Timken representative or by visiting [www.timken.com/rail](http://www.timken.com/rail).*

## Storage

### Equipment with Roller Bearings Applied

When cars and locomotives with roller bearings applied are placed in storage, the brakes should be set or the wheels chocked to prevent the equipment from moving.

It is not necessary to move the equipment periodically to distribute lubricant over the bearing surfaces of Timken AP bearings for up to one year. However, if equipment has remained stationary for one year or more, it should be moved one car length.

If the equipment has been submerged in flood water of such a depth that the water could have entered the bearings, the bearings should be sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS).

### Wheel and Axle Assemblies with Roller Bearings Applied

Wheel and axle assemblies with roller bearings applied must be handled with care. Damage may result if the bearings are permitted to strike objects.

Car wheel and axle assemblies with roller bearings applied may be stored on single storage track, overlapped as shown in Figure 23 to conserve storage space. With this storage track arrangement, the flanges of the wheels will not contact either the roller bearing assemblies or axle bodies of adjacent wheel and axle assemblies.

When wheel and axle assemblies with roller bearings applied are not stored on track, the wheels should be flange to flange and not overlapped.

Timken AP bearings applied to wheel and axle assemblies do not have to be periodically revolved while in storage to distribute lubricant over the bearing surfaces for up to one year. However, if the bearings have remained stationary for one year, the bearings should be rotated several revolutions.

If wheel and axle assemblies with roller bearings applied have been submerged in flood water of such a depth that the water could have entered the bearings, the bearings should be removed from the axle and sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS).

Wheel and axle assemblies with roller bearings applied should be used in the order in which they were stored, oldest stock first.

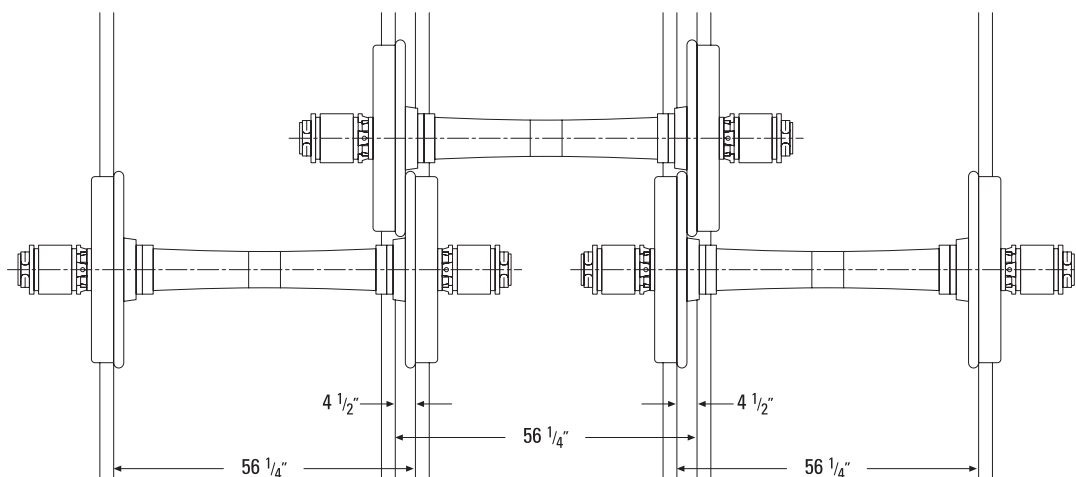


Figure 23 – Overlapping storage for axle assemblies.

**Roller Bearing Assemblies and Component Parts**

Unmounted roller bearings and component parts must be stored in an area that is clean and free from moisture.

A periodic inspection of stored roller bearings should be made. Any undesired condition should be corrected immediately.

Stored roller bearing assemblies or component parts that have been subjected to moisture must be cleaned and inspected. Roller bearing assemblies that show evidence of moisture having entered the bearing must be sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS).

Roller bearings that are placed in storage, whether they are new or used, should be used in the order in which they were stored, oldest stock first.

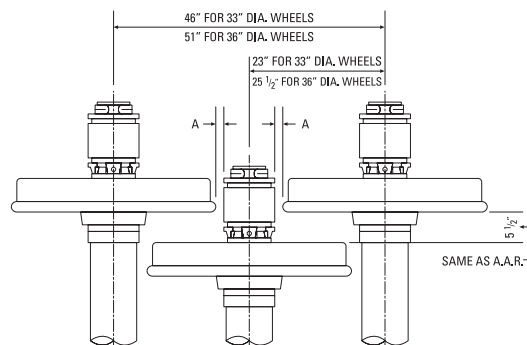
New roller bearings and component parts should not be removed from the shipping package until they are ready to be installed on an axle or assembled as a unit assembly.

When new roller bearing parts are removed from storage, it is not necessary to clean the protective coating of lubricant from parts that have been retained in their original shipping package.

Individual bearing parts that have had previous service that are to be placed in storage should be dipped in a suitable rust preventive, such as light oil and adequately protected from dirt and moisture.

When roller bearing parts that have had previous service are removed from stock, they must be cleaned before they are placed on an axle.

**Figure 24 – Wheel rack wheel spacing dimensions for shipping passenger car wheel and axle assemblies with Timken AP bearings applied.**



CLASS	WHEEL DIA.	A	CLASS	WHEEL DIA.	A
B (4 1/4" x 8")	33"	2 7/32"	F (6 1/2" x 12")	33"	1/2"
C (5" x 9")	33"	1 5/8"	F (6 1/2" x 12")	36"	1 1/2"
D (5 1/2" x 10")	33"	1 3/8"	G	36"	1 1/32"
E (6" x 11")	33"	1 1/8"	GG	36"	17/32"
EE	36"	1 1/32"			

**Table 4**

### Shipping

#### Wheel and Axle Assemblies with Roller Bearings Applied

When wheel and axle assemblies with roller bearings applied are shipped by rail, the wheel car should be equipped with a wheel rack that prevents objects or other wheel axle assemblies from striking bearings.

Certain wheel racks for plain bearing axles cannot be used because the wheel flange of adjacent wheel and axle assemblies will contact and damage the roller bearing assembly. To verify clearance and provide clearance between the wheel flanges and the bearing assemblies, the wheel spacing dimensions shown in Figure 24 on page 21 should be used.

Wheel racks for wheel sizes other than those shown in Figure 24 should provide a minimum clearance of 1/2" (see dimension A in Figure 24) between the wheel flanges and bearing assemblies on adjacent axle assemblies.

When loading or unloading wheel and axle assemblies with roller bearings applied, wooden boards should be placed between the bearing cups and the wheel flanges of adjacent wheel and axle assemblies, to protect the bearings from damage.

#### Roller Bearing Assemblies and Component Parts

When roller bearing assemblies and

component parts are shipped, they must be protected from dirt, dust and moisture. Care also must be taken to prevent the possibility of damage to the bearings during shipment.

New roller bearing assemblies and component parts should be shipped in their original shipping packages.

Roller bearing assemblies and component parts that have had previous service should be wrapped in oil paper or other suitable protective wrapping and packed in sturdy cartons for shipment.

### Overseas Shipping Instructions

#### Below-Deck Cargo

When Timken AP bearing equipped locomotives or cars are shipped overseas, it is preferable that roller bearing equipped trucks or axle assemblies be loaded separately below deck.

Trucks should be blocked up under the truck frames to remove the weight of the truck from the bearings.

#### Deck Cargo

Heavy grease or car journal compound that is not water soluble or affected by heat (150° F/65.5° C) should be applied completely around exposed seal cases on both ends of each bearing, between the face of the cup and axle end cap and between the face of the cup and backing ring.

The grease used should be either a calcium or lithium soap grease of not less than a number 2 consistency with a penetration of 265-295.

Cars and locomotives with trucks applied must be blocked up under the truck frames to remove the weight of the truck as well as the load on the center plate from the bearings. Individual trucks also must be blocked up to remove the weight of the truck from the bearings.

#### General

After the equipment has been unloaded at the destination point, each bearing assembly must be examined to make sure that the adapter is properly seated on the bearing cup before the equipment is placed in service.

Bearing assemblies showing evidence of direct contact with sea water should be further examined by removing the axle end caps. If evidence of sea water is found inside the axle end cap, the bearing should be sent to a qualified bearing reconditioning facility such as Rail Bearing Service (RBS) or Timken Rail Services (TRS) for disassembly and inspection.

Timken AP bearings are prelubricated at the factory. It is not necessary to add additional grease to these bearing assemblies for shipment as "deck cargo" or "below-deck cargo."



For more information, visit [timken.com/rail](http://timken.com/rail) or call:

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800.964.2626

Reconditioning services

800.368.4401

### Outside North America

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