

DIESEL MECHANIC



MINING QUALIFICATIONS AUTHORITY

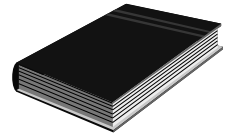
CODE: BRR-1

MOUNT A BEARING MANUALLY

INDEX

The following elements are contained in this learning guide:

TOPIC	PAGE NUMBER
Index	2
Source reference	3
Objective	4
Hazard Identification and Control (HIAC) form	5
Dictionary	6
General information	7
Practice	8
Remove the bearing from the housing	9 – 10
Practice	11
Remove the bearing from the shaft	12
Practice	13
Cleaning and examining bearings (Part 1)	14 – 15
Practice	16
Cleaning and examining bearings (Part 2)	17
Practice	18
Replacing a bearing (Part 1)	19
Practice	20
Replacing a bearing (Part 2)	21 – 22
Practice	23
Standard bearing checklists	24 – 27



SOURCE REFERENCES

Bearing display board in the training centre.

Audio-visual aids.

OBJECTIVE

You will be learning towards the outcome “Mount a bearing manually”. Whilst learning towards the outcome you will be required to achieve the following:

- Enable you to mount and dismount bearings manually.

On completion of this module, the learner must be able to:

- Dismount a bearing from a shaft and a housing manually.
- Clean and examine bearings correctly for serviceability.
- Mount a bearing on a shaft or in a housing manually.

During this process you must adhere to certain specified requirements as listed in the Module.

ASSESSMENT AND EVALUATION CRITERIA

You will be assessed, when you are confident that you are able to achieve the outcomes as listed, to determine your competence as measured against the required criteria. This assessment will be in line with accepted best practices regarding assessment.

- A practical test and practical test will be set at the end of the module and must be completed without using references.
- The learner will be given a shaft assembly containing a bearing that must be removed, cleaned, inspected and fitted again manually.

The following standards must be achieved:

- Precautions must be taken to prevent contamination of the bearing.
- The bearing must be removed manually without damage to the bearing, housing or shaft.
- Correct procedures must be followed to clean and examine the bearing for serviceability.
- The bearing must be mounted again manually, without damage to, or contamination of the bearing.
- Bearing must be square on the shaft and housing and located in the correct position.

All safety procedures must be adhered to.

HAZARD IDENTIFICATION AND CONTROL (HIAC) FORM**BRR-1****MOUNT A BEARING MANUALLY**

STEPS IN OPERATION / PROCESS	POTENTIAL ACCIDENT / INCIDENT	CONTROLS (BY RESPONSIBLE PERSON)
1. Use hand tools.	<ul style="list-style-type: none"> Using damaged tools or wrong tools for the job can cause injury and damage to equipment. 	<ul style="list-style-type: none"> Always use the correct tool for the job. Ensure tools are in good condition. Use tools correctly. Wear appropriate PPE where necessary. Always take good care of tools. Maintain, clean and store it properly.

NOTE: Before doing the practical work contained in this module, the learner must study the content of the above HIAC form again and then sign the statement below.

The above risks, which will be encountered in this module, are fully understood and will be controlled during the practical work.

Signature of learner:

Signature of Training Officer:

Date:



DICTIONARY

Bearing	:	A supporting part of a machine that bears the friction, especially between rotating shaft and its housing.
Swarf	:	Fine chips or filings of stone, metal, etc.
Lint	:	Bits of thread or fluff.
Housing	:	Casing for moving mechanism.
Burr	:	Rough edge on worn, cut or punched metal.
Shaft	:	Revolving bar transferring force in a motor.
Vice	:	Instrument with two jaws between which things may be gripped by operation of a screw so as to leave the hands free for working on it.
Receptacle	:	A container or something that holds things.
Mallet	:	A hammer made of soft material such as wood or rubber.
Dolly	:	Tool to fit a bearing.

1. GENERAL INFORMATION

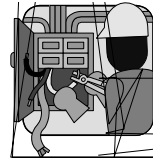


ITEM / TASK: Introduction.

DESCRIPTION:

- A. When working underground or in an open pit mine, the maintenance person will often be expected to replace bearings without using pullers or a press.
- B. These notes describe how to handle and replace a bearing with a hammer, a dolly and a punch without causing any damage and while ensuring a long bearing life. (Fig 1)

ITEM / TASK: Preparation to remove a bearing.



DESCRIPTION:

- A. When possible, mounting should take place in a dry and dust-free environment.
 - Even if a suitable working place is not available, the bearings must not be allowed to become contaminated by, for example, metal particles, swarf, sawdust, sand, and cement or corrosive fluids.
- B. A proper workbench, correct mounting methods and tools ensure the best results.
 - If a complete machine cannot be moved easily to a suitable environment, it is often necessary to remove the part of the machine, which is to be fitted with bearings.
 - In this way, it is possible to carry out the major part of the mounting process on a workbench under more suitable conditions.
- C. The majority of bearing failures are caused by faulty mounting and the intrusion of foreign matter into the bearing.

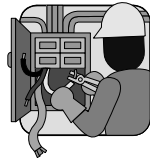
Use this method:

- Remove the part that is to be fitted with bearings, if the environment is not suitable for mounting bearings.
- Remove the outside dirt from the part and the housing before you expose the bearing.
- Clean the workbench.
- Select the proper tools and clean them.
- Clean your hands



NB:

When working with bearings, only use lint- free cloth for cleaning. Do not use cotton waste.

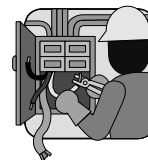


PRACTICE

Go to the bearing section in the workshop and clean the housing and the shaft, which is fitted with bearings, using a lint-free cloth. Prepare them so that the bearings can be removed.

Call your Training Officer to check your work and ask him to sign below when it is correct and then continue with the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



2. REMOVE THE BEARING FROM THE HOUSING

ITEM / TASK: Steps for removing the bearing from the housing.

DESCRIPTION:

A. Measure the depth of the bearing in the housing and record it. (Fig 1)

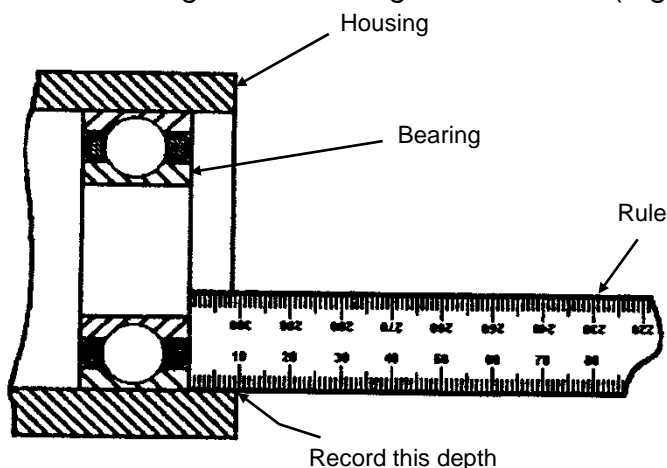


FIG 1.

- B. Remove any burrs from the inside bore of the housing with the point of a half round file.
- C. Remove any rust from the inside bore of the housing with emery tape.
- D. Support the housing firmly on two hard wooden blocks. (Fig 2)

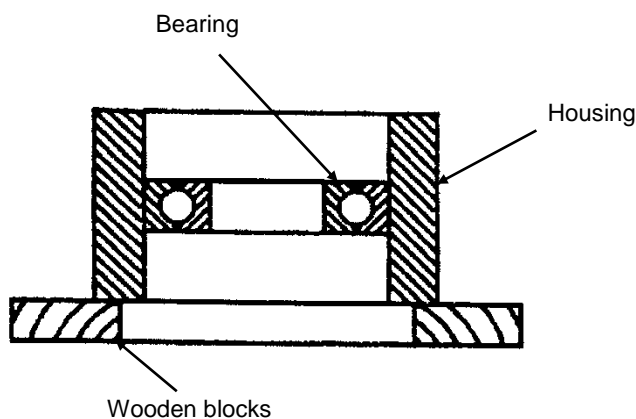
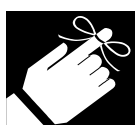


FIG 2.

E. Select a mild steel punch to tap out the bearing.

NB:



Do not use hardened drifts, brass or centre punches (See the display board). The hardened bar or centre punch may damage the bearing or shaft and the brass bar will splinter or chip easily. These chips may get into the bearing or housing.

Tap the punch lightly with evenly distributed blows, alternatively on the opposite side, right around the outer ring of the bearing with an ordinary hammer. (Fig 3)

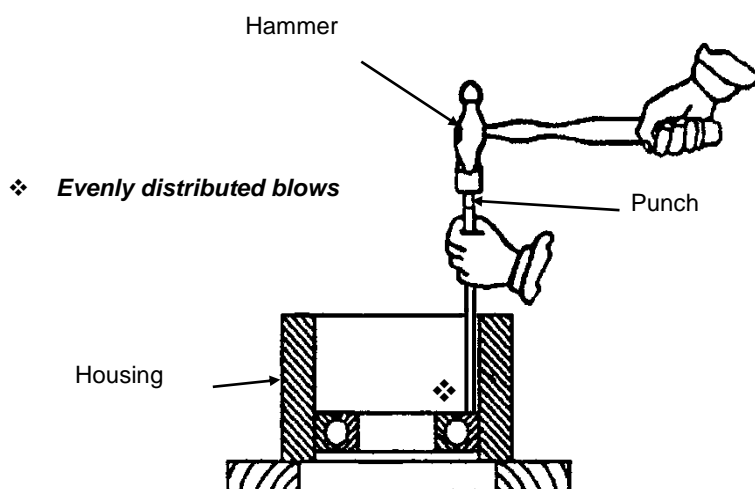


FIG 3.

NB:

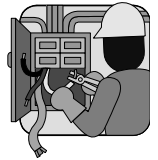
An ordinary steel hammer should be used. Hammers with soft metal heads (e.g. brass or copper) are unsuitable as fragments of the metal from the hammer head may break off and enter the bearing.

Note:



Remember that when removing or replacing a bearing, the force must always be exerted against the ring with the interference fit, i.e. the outer ring for a bearing fitted in a housing and the inner rings for a bearing fitted on a shaft.

**DO THE PRACTICE ON THE NEXT PAGE BEFORE
CONTINUING WITH THE REST OF THE MODULE.**

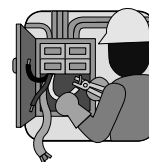


PRACTICE

Take the housing, which you have prepared previously and remove the bearing by following the steps described.

Ask your Training Officer to sign you off when you have completed the task correctly and achieved the required standards and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



3. REMOVE THE BEARING FROM THE SHAFT

ITEM / TASK: Steps for removing bearing from the shaft.

DESCRIPTION:

A. Measure the position of the bearing on the shaft and record it. (Fig 4)

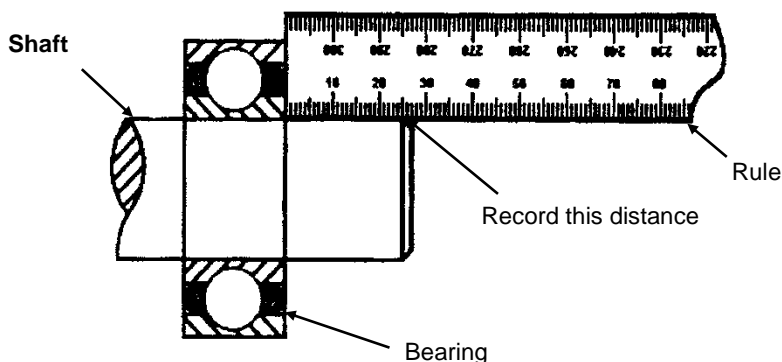


FIG 4.

B. Remove any burrs from the shaft with a smooth file.

C. Remove any rust from the shaft with emery tape.

D. Fit the shaft into a vice.

E. Select a mild steel punch.

F. Tap the punch lightly with evenly distributed blows right around the inner ring of the bearing with an ordinary hammer. (Fig 5)

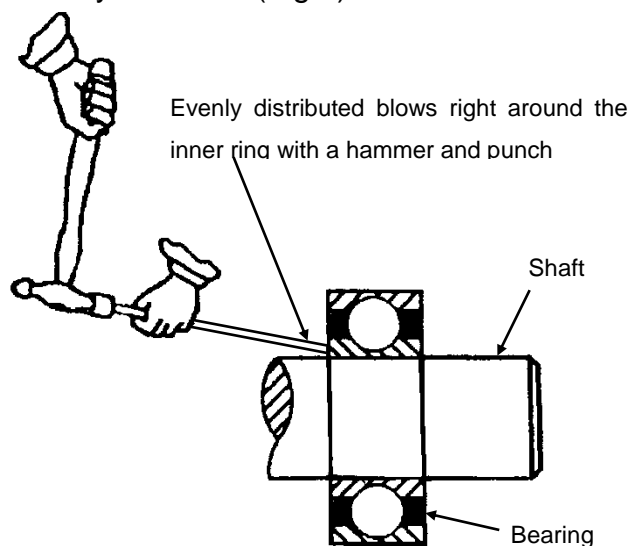
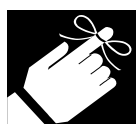
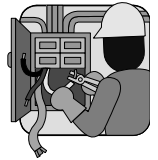


FIG 5.



Note:

Remember to always apply the force against the inner ring when removing a bearing from a shaft.

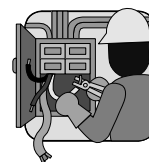


PRACTICE

Take the shaft, which you have prepared previously and remove the bearing following the steps described.

Ask your Training Officer to check your work and to sign below when it is correct and then continue with the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



4. CLEANING AND EXAMINING BEARINGS

ITEM / TASK: Cleaning bearings.

DESCRIPTION:

A. A bearing, which has been removed from a machine, should first be washed in clean paraffin / degreasing fluid or a similar fluid. Steam or water is not recommended for cleaning bearings because they usually cause rust to be formed in a very short time.

- Pour the paraffin / degreasing fluid into a receptacle and use a paintbrush to get the fluid into the bearing whilst slowly rotating it in the fluid so that all surfaces are cleaned. (Fig 6)

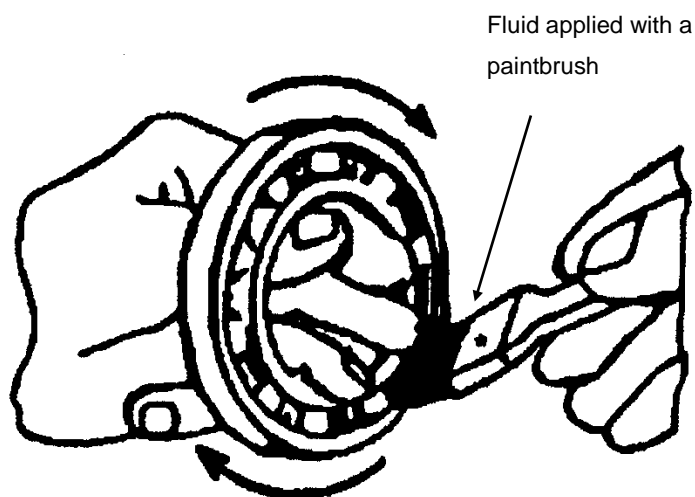


FIG 6.

NB:

Use two receptacles. One for the initial wash and one for the final rinse.

- Allow the paraffin / degreasing fluid to drain off the bearing.
- Blow the bearing dry with compressed air, **not allowing it to spin**.
- Make sure that there is no water in the airline by directing the air at a cloth for a few seconds to eliminate any moisture that could be present.

- B. The compressed air should be directed at the bearing so that it blows through it, from one end of the roller or balls to the other (Fig 7). **Do not spin the bearing with compressed air at any time, as this will damage the rolling elements of the bearing.**

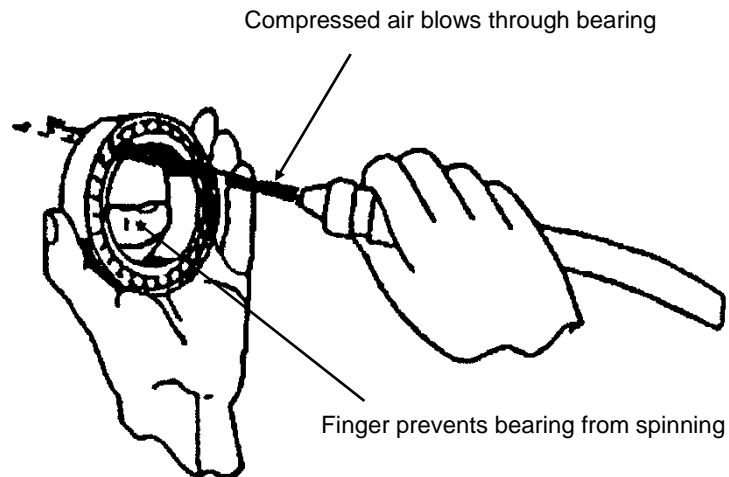
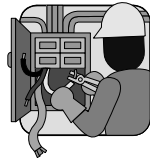


FIG 7.

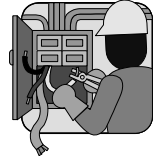


PRACTICE

Take both the bearings you have removed from the shaft and housing and clean them with paraffin / degreasing fluid.

Ask your Training Officer to check your work and to sign below when it is correct and then continue with the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



ITEM / TASK: Examining bearings.

DESCRIPTION:

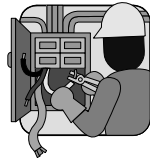
- A. It is neither necessary nor desirable to break down any equipment solely for the purpose of bearing inspection. If a unit is broken down for a routine overhaul or general inspection the bearings should be inspected at that time. You will have to decide then if the bearing should be re-used or replaced.
- B. You should check:
- **Rust on the rolling elements or bearing race:**
Characteristic: Spots and / or pits on the surfaces. (See display board)
 - **Discolouring of the rolling elements or bearing race:**
Characteristic: A brownish or bluish discoloration of the races and the rolling elements. (See display board)
 - **Wear on the bearing seating on the shaft or in the housing:**
Characteristic: Wear marks on the shaft or in the housing, having the same width as the inner or outer ring of the bearing. (See the display board)
 - **Clearance:**
This is only applicable to spherical roller bearings and taper roller bearings and will be dealt with in module BRR-3.
 - **Flaking:**
Characteristic: Material removed from a surface in the form of flakes or scaly particles. (See the display board)

NB:

A bearing found to be satisfactory should be dipped in oil and wrapped in clean grease paper if it is not to be used immediately.

Note:

Use the Standard Bearing Checklist included at the end of the module when you examine bearings.

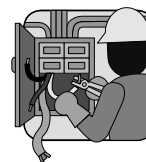


PRACTICE

Examine the bearings provided, and record your findings on a standard checklist for each one.

Ask your Training Officer to sign you off when you have completed the task correctly and achieved the required standards, then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



5. REPLACING A BEARING

ITEM / TASK: Preparations for replacing bearings.

DESCRIPTION:

A. To avoid wear from any source, all parts and assemblies coming into contact with, or operating together with a bearing should be thoroughly cleaned.

Use this method:

- Clean the shaft and the housing with emery tape.
- Remove any burrs from the shaft and the housing with a smooth file.

Note:

Any burrs or chips not removed may prevent the bearing from seating properly, thus causing misalignment. The burrs or chips formed, may damage the bearings whilst in operation.

- Clean the shaft and the housing with white spirits.
- Dry them with compressed air.

B. If a bearing has to be replaced, check that the number on the new bearing corresponds with the one on the old bearing.

Note:

All bearings have numbers and names stamped on the inner or outer race (Fig 8). They are the names of the maker (e.g. SKF or TIMKEN) and the maker's number for the specific type and size of bearing. If you must replace the bearing with a different make, then you must measure the inside and outside diameters to check if it is the correct size bearing.

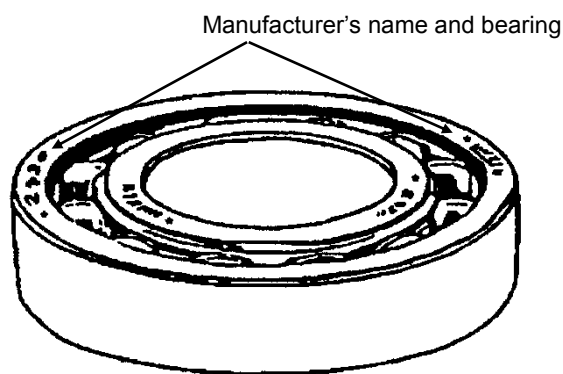
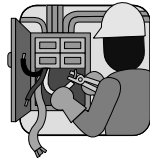


FIG 8.

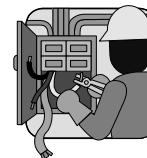


PRACTICE

Practice preparing the shaft, the housing and the bearings for reassembly.

Ask your Training Officer to sign you off when you have completed the task correctly and achieved the required standards, then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



ITEM / TASK: Replacing the bearing on the shaft.

DESCRIPTION:

- A. Coat the shaft with a film of light, clean oil.
- B. Align the bearing with the shaft and initially fit it by hand. (Fig 9)

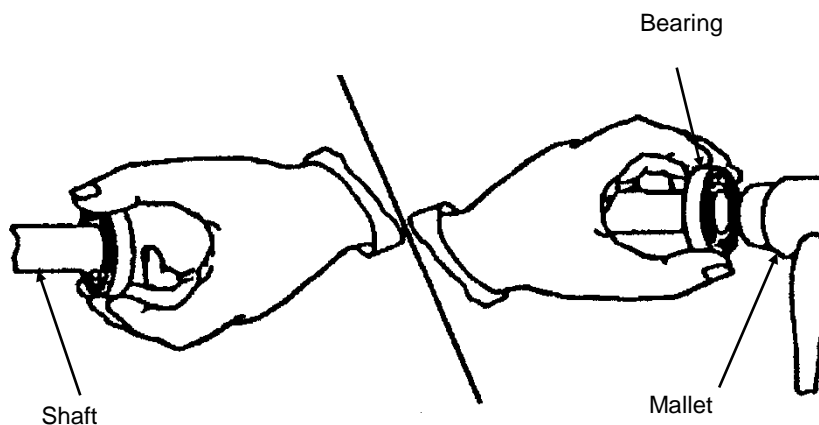


FIG 9.

- C. Check that the bearing is square with the shaft. A soft mallet may be used if necessary. (Fig 9)
- D. Select a dolly that will fit **on the inner ring** of the bearing.
- E. Place the mild steel dolly on top of the inner ring and drive it on slowly with a hammer. (Fig 10)

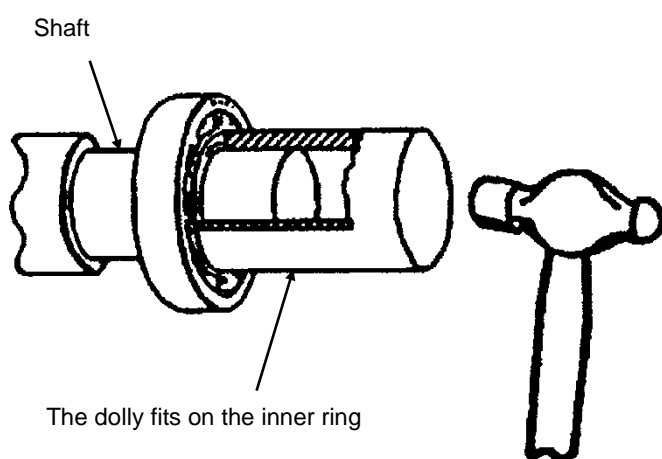


FIG 10.



- F. Tap the bearing gently, stopping frequently to check that it is still square.

ITEM / TASK: Replacing the bearing in the housing.



DESCRIPTION:

- A. Coat the bore of the housing with a film of clean light oil.
- B. Align the bearing with the bore and initially fit it by hand. A soft mallet may be used if necessary. (Fig 11)

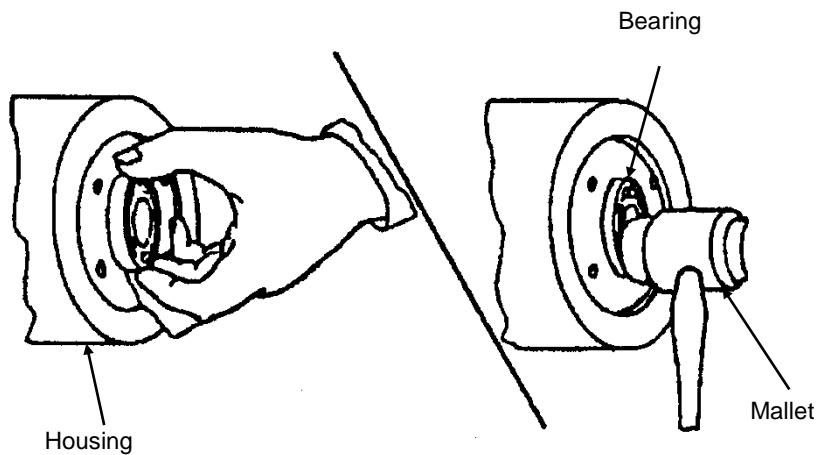


FIG 11.

- C. Select a dolly that will fit on the **outer ring** of the bearing.
- D. Place the dolly on top of the outer ring and drive it in slowly. (Fig 12)

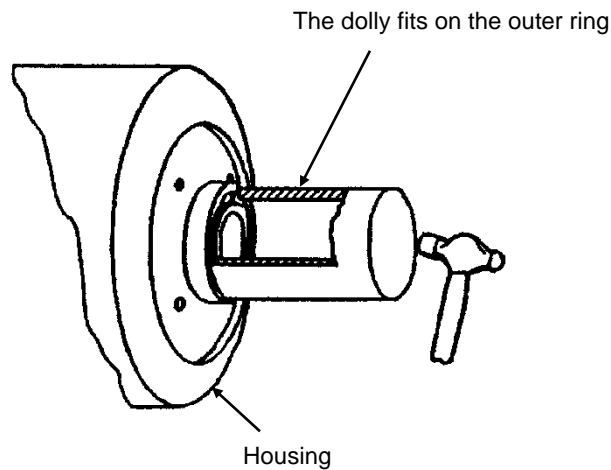
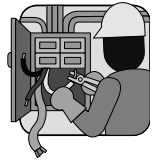


FIG 12.

- E. Tap the bearing gently, stopping frequently to check that it is still square.



PRACTICE

Practice replacing bearings onto shafts and into housings.

Ask your Training Officer to sign you off when you have completed the task correctly and achieved the required standards.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



REMEMBER ALWAYS WORK SAFE

Once you have passed the entire practice, you are now at liberty to request a Formative Assessment from your Assessor.

STANDARD BEARING CHECKLIST.

Bearing type
(Identification) : _____

CHECK FOR :	YES	NO
Bearing rusty.		
Bearing discoloured.		
Bearing fractured.		
Bearing cracked.		
Bearing pitted.		
Bearing flaking.		
Bearing brinelling.		
Bearing scratched.		
Lack of lubrication.		
Seals damaged.		
Cage damaged.		
Bearing loose in housing.		
Housing worn.		
Bearing loose on shaft.		
Shaft worn.		
* Bearing overheating.		
* Bearing vibration.		
BEARING ACCEPTABLE		

* For in service inspection only.

REASONS FOR BEARING NOT ACCEPTABLE.

STANDARD BEARING CHECKLIST.

Bearing type
(Identification) : _____

CHECK FOR :	YES	NO
Bearing rusty.		
Bearing discoloured.		
Bearing fractured.		
Bearing cracked.		
Bearing pitted.		
Bearing flaking.		
Bearing brinelling.		
Bearing scratched.		
Lack of lubrication.		
Seals damaged.		
Cage damaged.		
Bearing loose in housing.		
Housing worn.		
Bearing loose on shaft.		
Shaft worn.		
* Bearing overheating.		
* Bearing vibration.		
BEARING ACCEPTABLE		

* For in service inspection only.

REASONS FOR BEARING NOT ACCEPTABLE.

STANDARD BEARING CHECKLIST.

Bearing type
(Identification) : _____

CHECK FOR :	YES	NO
Bearing rusty.		
Bearing discoloured.		
Bearing fractured.		
Bearing cracked.		
Bearing pitted.		
Bearing flaking.		
Bearing brinelling.		
Bearing scratched.		
Lack of lubrication.		
Seals damaged.		
Cage damaged.		
Bearing loose in housing.		
Housing worn.		
Bearing loose on shaft.		
Shaft worn.		
* Bearing overheating.		
* Bearing vibration.		
BEARING ACCEPTABLE		

* For in service inspection only.

REASONS FOR BEARING NOT ACCEPTABLE.

STANDARD BEARING CHECKLIST.

Bearing type
(Identification) : _____

CHECK FOR :	YES	NO
Bearing rusty.		
Bearing discoloured.		
Bearing fractured.		
Bearing cracked.		
Bearing pitted.		
Bearing flaking.		
Bearing brinelling.		
Bearing scratched.		
Lack of lubrication.		
Seals damaged.		
Cage damaged.		
Bearing loose in housing.		
Housing worn.		
Bearing loose on shaft.		
Shaft worn.		
* Bearing overheating.		
* Bearing vibration.		
BEARING ACCEPTABLE		

* For in service inspection only.

REASONS FOR BEARING NOT ACCEPTABLE.
