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CARRIER**

Commercial Division  
Carrier Corporation

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## SERVICE BULLETIN

SUBJECT:

19C BEARINGS

SUPERSEDE

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### PURPOSE:

The purpose of this bulletin is to outline the changes in the bearings used on the 19C centrifugal since its inception. This bulletin includes sketches and information describing the installation of all bearing arrangements used to date.

### MACHINES AFFECTED:

19C Hermetic Centrifugal

NOTE: These instructions apply to 50 and 60 cycle machines. However, part numbers listed apply to 60 cycle machines only. For 50 cycle bearing parts, consult PSD. Part numbers are not included with each sketch but some are included to make the bulletin more complete or if part numbers are not presently included in the parts catalog. Since part numbers are subject to change, the current Service Parts Catalog should always be consulted before ordering bearing parts.

Because of the length of this bulletin, a quick reference table of contents is included to enable you to quickly locate a particular bearing.



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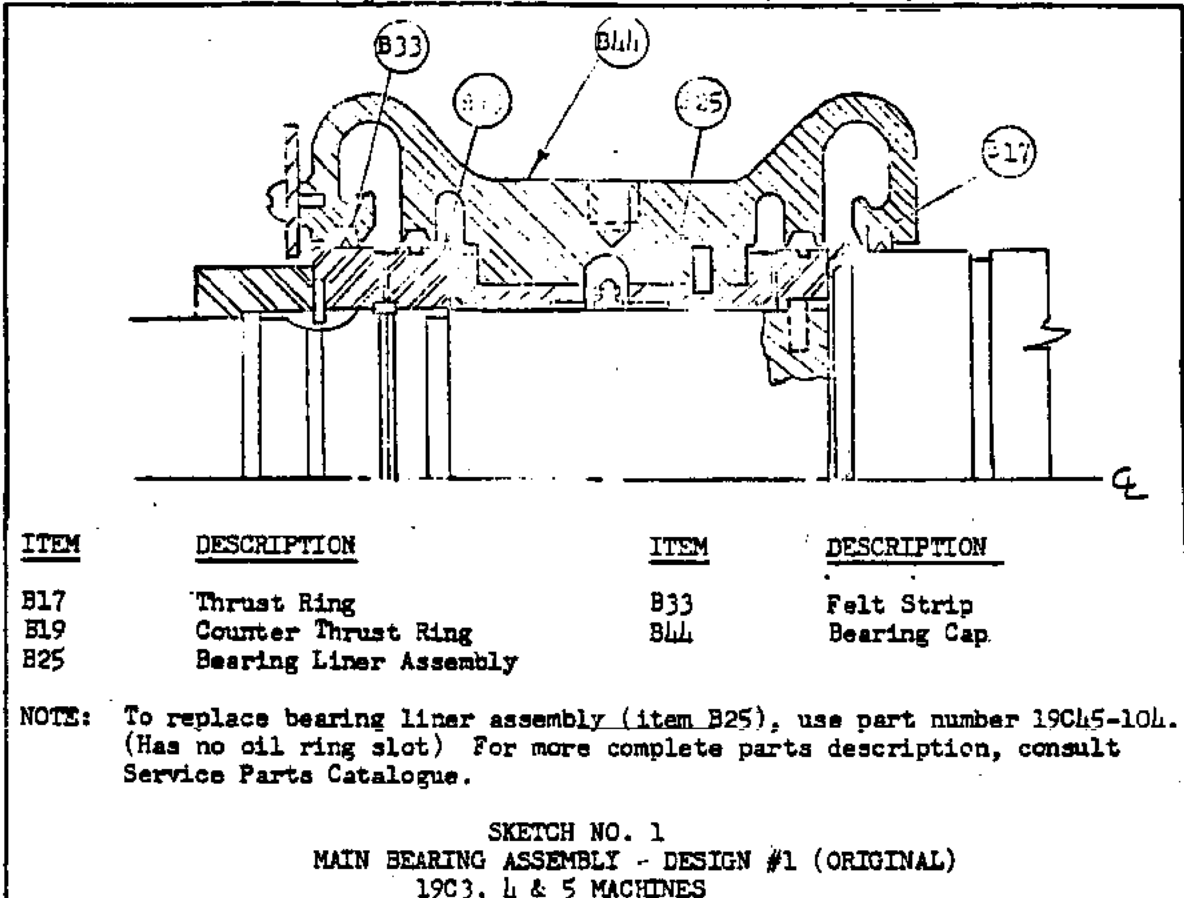
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### I. Main Bearing

#### A. Refrigerant 113 machine (19C3,4 and 5)

##### 1. Main bearing changes

- a. Sketch No. 1 shows the design #1 (original) main bearing assembly which was used on all refrigerant 113 machines shipped prior to March 1958. Note that the bearing assembly contains a slot in the top journal half for an oil ring. When opening a machine





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with this bearing, the oil ring should be removed if in a worn condition. These oil rings are not required and are no longer carried in parts stock. When replacing this bearing, replace with a bearing liner assembly as shown in design #2, sketch No.2.

- b. Sketch No. 2 shows the design #2 main bearing assembly used from March 1958 to approximately March 1960 (see page 6 for exact cut-off by machine serial number). Note that the bearing liner assembly no longer includes a slot in the top journal half for an oil ring. In addition, a portion of the babbitt has been removed from the lower half of the bearing liner (not shown) to reduce the effective shaft overhang and improve the bearing loading, resulting in a more stable bearing. The two babbitted bearing surfaces on the upper bearing half have also been moved toward the compressor end as shown in sketch No. 2.



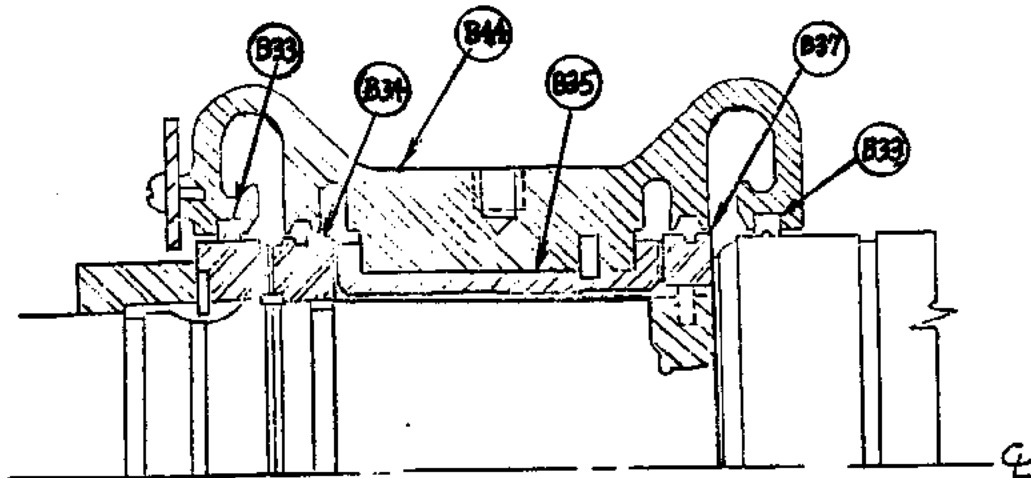
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<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ITEM</u>	<u>DESCRIPTION</u>
B33	Felt Strip	B37	Thrust Ring
B34	Counter Thrust Ring	B39	Bearing Cap
B35	Bearing Liner Assembly		

NOTE: For more complete parts description, consult Service Parts Catalogue.

SKETCH NO. 2  
MAIN BEARING ASSEMBLY - DESIGN #2  
19C3, 4 & 5 MACHINES



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On machines shipped after June 1959, the number of thrust shoes on this bearing was increased from 12 to 16 resulting in more thrust bearing area and consequently the thrust load which the bearing can withstand is increased. The bearing liner assembly with 16 thrust shoes is interchangeable with the 12 shoe bearing and carries the same part number. Only bearings with 16 thrust shoes are carried in Service Parts stock.

- c. Sketch No. 3 shows the main bearing assembly design #3 presently being installed on all 19C3, 4 and 5 size compressors. The bearing and bearing pedestal are similar to design #2 refrigerant 11 bearing but not interchangeable with design #2 or any other machines. This bearing assembly has separate journal and thrust assemblies. It has the oil orifice on the return oil side and therefore is a "flooded type bearing". The babbitted seal ring (item 12) permits flooding of the thrust bearing area.

On machines shipped after October 1960, the oil groove and drain holes have been eliminated from this seal ring. Seal rings with or without the oil groove and drain holes are interchangeable and have the same part number. Sketch No. 3 shows the seal ring with oil groove and drain holes. There are no babbitted counter-thrust shoes on this type bearing.



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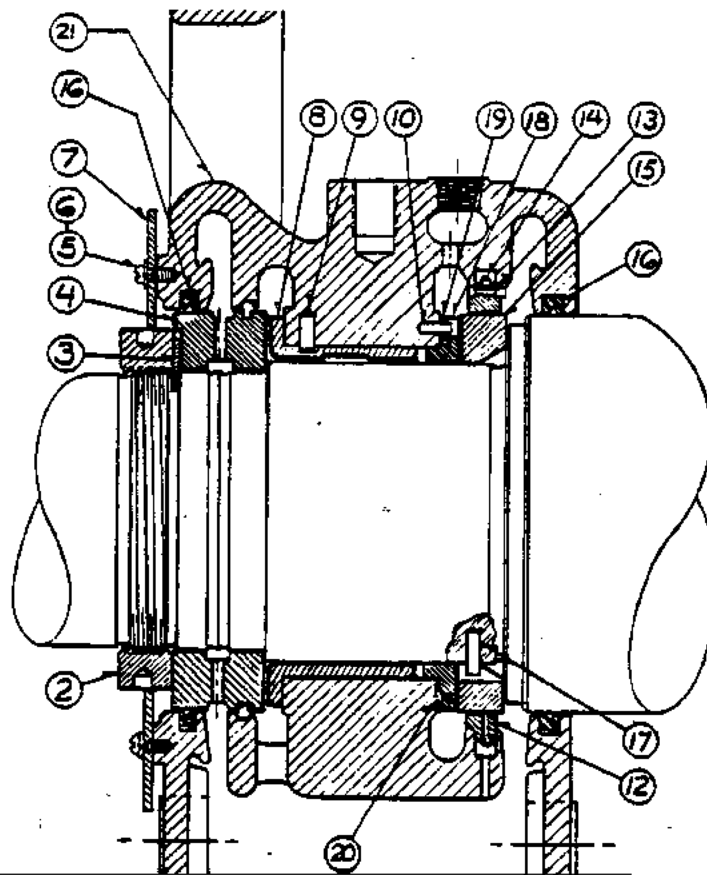
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<u>ITEM</u>	<u>Q</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>ITEM</u>	<u>Q</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
2	1	19C35-1052	Thrust ring nut	14	1	19C67-1001	Garter spring
3	1	19C47-1021	Key(thrust ring)	15	1	19C35-1032	Thrust ring
4	1	19C35-1042	Counter-thrust ring	16	4	19C67-2711	Felt strip
5	6	AU11AR-131	#10 Lockwasher	17	1	AX27AB-168	Pin 1/4 x 3/4 lg.
6	6	AC15AA-125	#10-24 x 7/16 Screw	18	1	19C35-553	Thrust bearing assy.
7	1	19C47-102	Windage Baffle	19	2	19C35-3922	Shim
8	1	19C35-104	Bearing liner Assy.	20	8	AC26AA-058	#5-40 x 1/4 screw
9	1	AX27AB-197	Pin 5/16 x 3/4 lg.	21	1	19C35-1079	Bearing Cap
10	1	AX27AB-122	Pin 3/16 x 1/2 lg.				
12	1	19C35-513	Seal Ring Assy.				
		includes:					
13	1	19C67-4281	Pin				

**SKETCH NO.3**  
**MAIN BEARING ASSEMBLY-DESIGN #3**  
**19C3,4 & 5 MACHINES**

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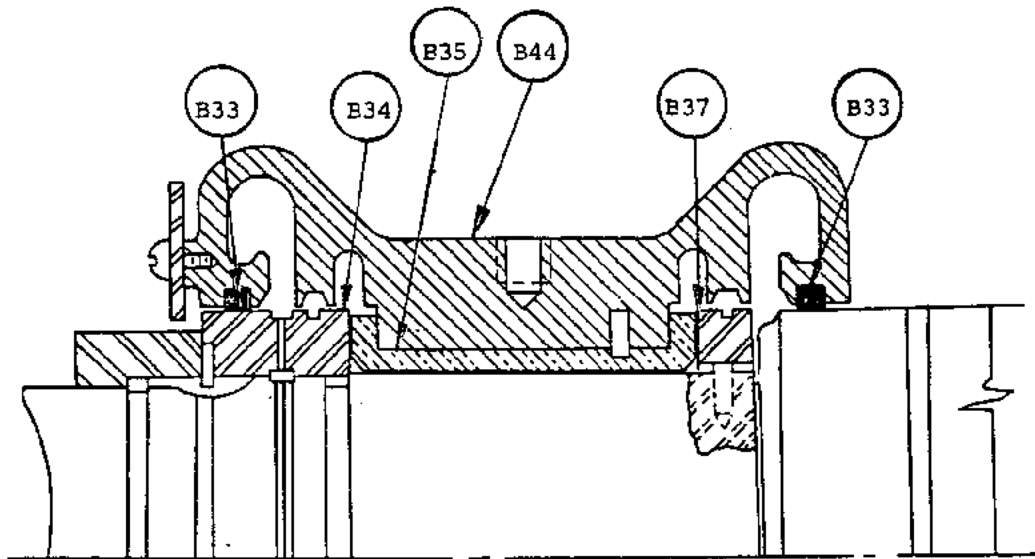
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## HERMETIC CENTRIFUGAL CHILLER

# 19C



Main Bearing 3, 4, & 5 Size Machines, Design #2



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Design #2 Bearing is installed in the 3, 4, and 5 Size machines with serial numbers lower than 4999 except for the following:

4758	4924	4959	4975	4992
4759	4926	4962	4978	4993
4837	4929	4968	4980	4994
4846	4930	4969	4987	4996
4851	4933	4973	4988	4997
4859	4957	4974	4989	4998
4916	4958			

Design #2 Bearing is also installed in the following machines with serial numbers higher than 4999:

5008	5022	5039	5087	5197
5019	5029	5064	5094	5256

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All refrigerant 113 machines with machine serial number 5000 and higher plus the following machines are fitted with the bearing shown in sketch No. 3.

4758	4916	4957	4973	4989
4759	4924	4958	4974	4992
4837	4926	4959	4975	4993
4846	4929	4962	4978	4994
4851	4930	4968	4980	4996
4859	4933	4969	4987	4997
			4988	4998

EXCEPTION - The following machines with serial number above 5000 are fitted with the Design #2 bearing liner assembly as shown on sketch No. 2:

5008	5022	5039	5087	5197
5019	5029	5064	5094	5256



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### 2. Installation of Main Bearing - Design #1 (Original)

The installation of this bearing is identical as design #2 outlined below with the exception of the oil ring. The oil ring is not required when replacing this bearing liner assembly.

### 3. Installation of Main Bearing - Design #2

- a. Install bearing assembly as received. (Do not scrape).

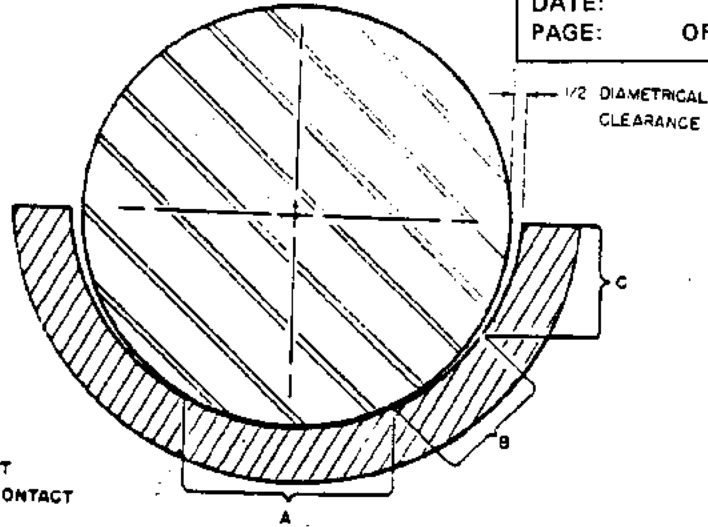
NOTE: Normally, replacement bearings can be fitted with a minimum of scraping. Therefore extensive scraping should be avoided.

- b. With only the lower liner installed, apply a light uniform coat of Prussian blue to the shaft. Rotate the shaft and then carefully remove and inspect the lower bearing liner. There should be good contact at the bottom of the lower liner gradually decreasing at the sides with no contact near the split line. (See sketch No. 4). Some babbitt material may have to be removed from the sides of the liner to get proper clearance.
- c. Check journal clearance with "Plastigage". (Perfect Circle plastigage can be purchased at most automotive supply companies). Lay two strips of "Plastigage" over the shaft directly below the two babbitted surfaces of the top bearing liner half. Install the top liner half and bearing cap and tighten bearing cap hold down bolts. Remove bearing cap and top liner half carefully. (The "Plastigage" may stick to either the shaft or the bearing liner). With "Plastigage" still in place, measure the flattened "Plastigage" with the graduated scale on the wrapper. The journal clearance is .005" - .012". If less than .005" remove babbitt from the top half of the bearing liner until the clearance falls within tolerance. Care should be taken to insure that there are no high or low spots on the babbitt.



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A - GOOD CONTACT  
B - DECREASING CONTACT  
C - NO CONTACT

SKETCH NO. 4

"EXAGGERATED VIEW OF SHAFT AND LOWER BEARING  
JOURNAL SHOWING CONTACT SURFACES"

**NOTE:** When removing babbitt with a scraping tool, apply a light coat of Prussian blue on the babbitted surface to be scraped. Scrape the blue babbitt surface carefully and evenly. Repeat if necessary to arrive at proper journal clearance.

If the clearance exceeds .012", the bearing liner should be replaced with a new bearing. If a new bearing is not available, the clearance can be corrected by lowering the top half bearing liner. This can be accomplished by removing material from the top half bearing liner at the split line and carefully sizing and placing shims between the bearing cap and the top of the bearing liner. The top and bottom halves of the bearing liner should be within .005" of contact with each other at the split line when the bearing cap is tightened. After the bearing cap is tightened, check the bearing housing split line with a feeler gage. Be sure that the cap is not "hanging up" on the bearing liner.

- d. Check the thrust clearance with the bearing installed by floating the shaft and measuring the float with a depth micrometer or a dial indicator at the motor end bearing where the end of the shaft is accessible. This clearance must be .010" to .018". If the clearance is less than .010", material should be removed from the counter-thrust shoes until the desired clearance is obtained. The thrust shoes should never be scraped on new bearings since scraping will destroy the machined taper.
- e. If the bearing is being replaced because of a journal and thrust bearing failure, make a thorough inspection of the thrust ring and shaft journal. It may be necessary to touch up these areas with a fine honing stone and crocus cloth.



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- f. After the bearing is fitted properly, check the impeller clearance as outlined in the Impeller Spacing service bulletin.

NOTE: If bearing pedestal braces are installed, fit the bearings with the pedestal braces in place. Refer to the Service Bulletin on Bearing Pedestal Braces.

- g. When all the above steps are completed and the bearing is installed, run the oil pump and carefully check the split line with a mirror for oil leakage.



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### 4. Installation of Main Bearing - Design #3

#### a. Journal bearing liner assembly.

- (1) Fit and install the journal bearing liner as outlined in paragraph A-3, item a, b and c page 6 and 7.

#### b. Thrust bearing assembly.

- (1) Install the lower half of the thrust bearing assembly. Rotate the lower half of the thrust bearing until its split line matches that of the bearing pedestal.
- (2) Install the top half of the thrust bearing assembly and rotate the assembly sufficiently to line up the slot with the pin (item 10 sketch No. 3) and the bearing cap.
- (3) Install the lower half of the babbitted seal ring (item 12). Install the top half of the ring and secure the halves with the garter spring. Rotate the seal ring assembly until the pin (item 14, sketch No. 3) lines up with the slot in the lower half of the bearing pedestal. When installed properly, the clearance between the seal ring and thrust ring is between .004" - .006".
- (4) Check the thrust clearance with the thrust and journal bearing installed by floating the shaft and measuring the float with a depth micrometer or dial indicator at the motor end bearing where the end of the shaft is accessible. The thrust clearance is between .010" - .018". Two shims with .003" laminations are installed on the thrust bearing to permit adjustment of the thrust clearance.

NOTE: Do not remove babbitt from the thrust shoes as this will destroy the machined taper.

- (5) If the bearing is being replaced because of a journal and thrust bearing failure, a thorough inspection should be made of the thrust ring and shaft journal. It may be necessary to touch up these areas with a fine honing stone and crocus cloth.
- (6) After the bearing has been properly fitted, the impeller clearance should be checked as outlined in the Impeller Spacing bulletin.

CAUTION: After installing the bearing cap, but before tightening the hold-down bolts, force the shaft toward the compressor end. This will prevent the thrust bearing shoulder from "hanging up" on the cap.



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7. When all the above steps are completed and the bearing installed, run the oil pump manually and carefully check the pedestal split line for oil leakage.

**B. Refrigerant 11 Machines (19C6, 7 and 8)**

**1. Main Bearing Changes**

- a. The main bearing assembly - design #1 is shown on sketch No. 5. This bearing arrangement was used on the following 40 R-11 machines only:

<u>Machine Serial No.</u>	<u>Machine Serial No.</u>
L008	L076
L009	L077
3720	L083
3721	L105
3775	L086
3858	L085
3805	L084
3806	L090
3891	L091
3763	L118
3824	L119
3992	L134
L036	L128
L040	L129
3909	L183
3910	L159
3948	L170
3980	L221
3979	L200
3950	
3952	

Sketch No. 5 shows the top journal liner containing a slot for an oil ring. The oil ring should be omitted. Note that there is no babbitt on the counter-thrust face. This bearing has the oil orifice on the entering side. All machines with this bearing arrangement have bearing pedestal jacks installed. Note also that the base ring assembly (item 3) as shown on sketch No. 6 has babbitt "dams" between shoes. These "dams" are necessary on the listed 40 machines for proper lubrication. The base ring assembly, part number 19C67-363 MUST be used as a replacement on these machines.



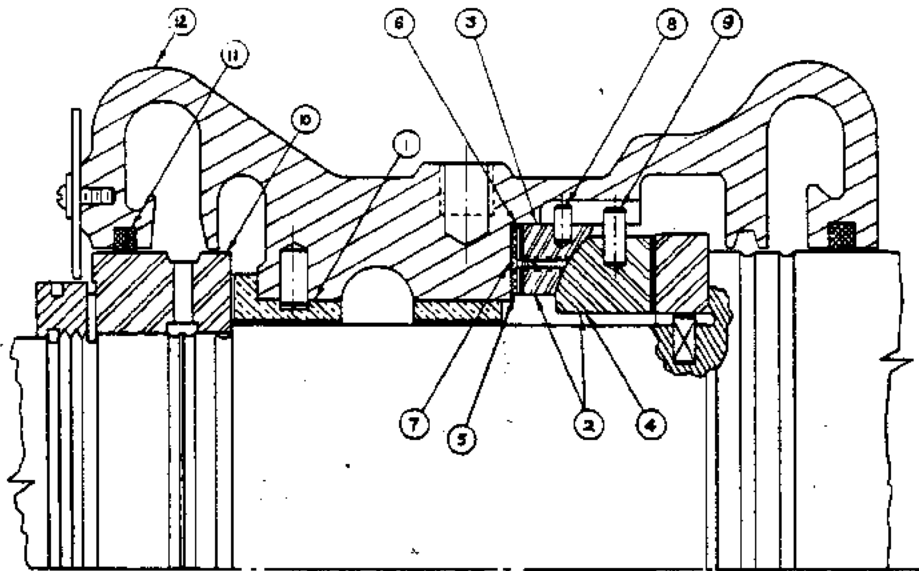
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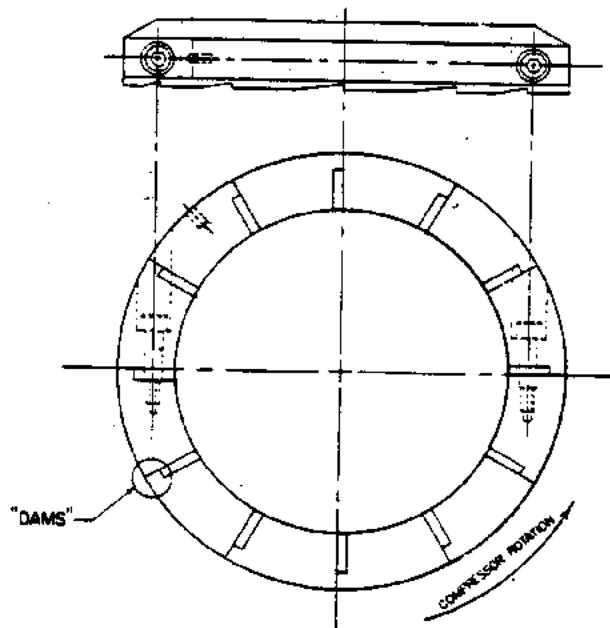
ITEM	Q	PART NUMBER	DESCRIPTION	ITEM	Q	PART NUMBER	DESCRIPTION
1	1	19C67-104*	Journal Liner	6	2	19C67-3081	Brass Shim
2	1	19C67-373	Thrust Brg. Assbly. (Includes items 3 thru 7)	7	4	AD26AA124	#10-32x3/8 Screw
3	1	19C67-353	Thrust Brg.Seat Assbly.	8	1	AX27AB-122	3/16 X 3/4 Pin
4	1	19C67-363	Base Ring Assbly.	9	1	AX27A9168	1/4 X 3/4 Pin
5	2	19C67-2622	Backing Ring Half	10	1	19C47-1042	Counter Thr.Ring
				11	4	19C67-2711	Felt Strip
				12	1	19C67-1434	Bearing Cap

\* Use this part number for replacement. (Has no oil ring slot.)

SKETCH NO. 5  
MAIN BEARING ASSEMBLY - DESIGN #1 (ORIGINAL)  
FIRST 40 19C6 & 19C7 MACHINES

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SKETCH NO.6  
BASE RING ASSEMBLY



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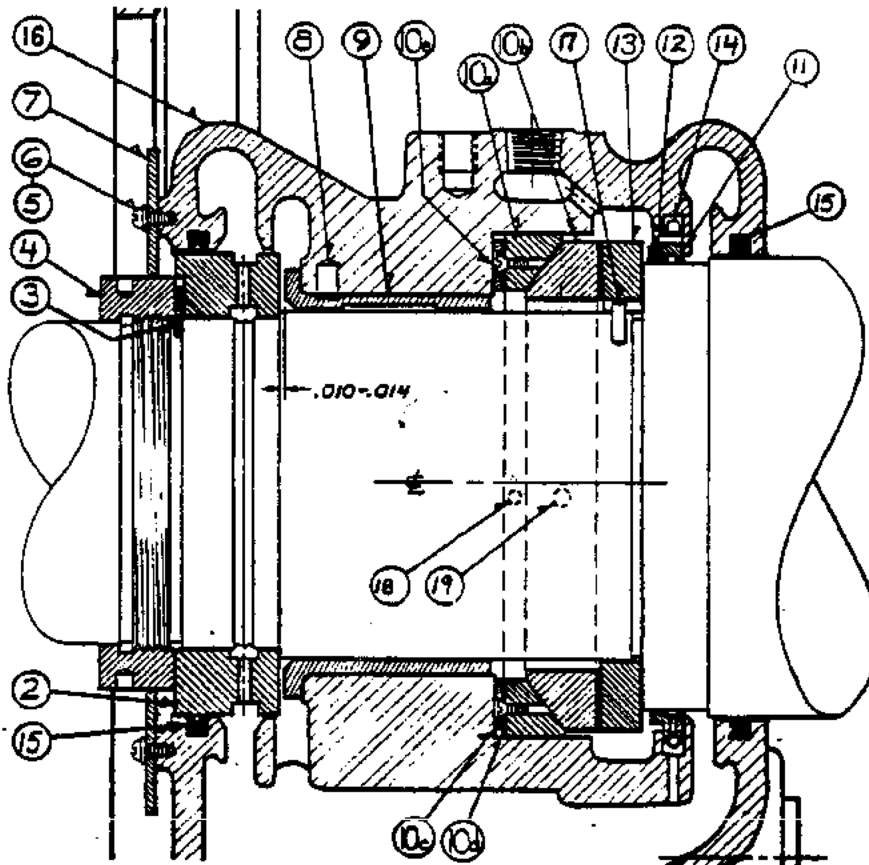
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- b. All other R-11 machines have main bearing assemblies as shown on sketch No. 7.





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ITEM	DESCRIPTION	ITEM	DESCRIPTION
2	Thrust Ring	11	Seal Ring Assembly
3	Key-thrust Ring		Includes item 12.
4	Nut-thrust Ring	12	Pin
5	#10 Lockwasher	13	Thrust Ring
6	Rd.Hd.Screw #10 - 2 1/2 x 7/16	14	Garter Spring
7	Windage baffle	15	Felt Packing
8	Driv-Lok Pin 1/4 x 5/8	16	Bearing Cap
9	Bearing Liner Assbly.	17	Driv-Lok Pin 1/4 x 3/4
10	Thrust Bearing Assbly.	18	Driv-Lok Pin 3/16 x 1/2
	Consisting of:	19	Driv-Lok Pin 1/4 x 3/4
10a	Thrust Br. Seat Assbly.		
10b	Base Ring Assbly		
10c	Backing Ring Half		
10d	Brass Shim		
10e	Flat Hd.Screw #10 - 3/2 X 3/8		

NOTE: Consult Service Parts Catalogue for part numbers. Base ring assembly (item 10b) 19C66-363 (no babbitted "dams") must be used with this bearing.

SKETCH NO. 7  
MAIN BEARING ASSEMBLY - DESIGN #2  
19C6, 7 & 8 MACHINES



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This arrangement is commonly known as the "Flooded Thrust" and has the oil orifice on the leaving side.

IMPORTANT NOTE: A few machines not listed on page 9 were modified and have a bearing assembly as shown in sketch No. 7 installed in a housing as shown in sketch No. 5. On these machines the parts as listed on sketch No. 7 apply. Base ring assembly 19C66-363 must be used.

- c. Referring to sketch No. 7, a babbitted seal ring, (item 11) is provided since the thrust bearing area is at oil pump discharge pressure. With this arrangement, base ring assembly part number 19C66-363 without "dams" between the thrust shoes is used. It is extremely important that this base ring with no dams be used in this arrangement to obtain proper lubrication.
- d. In June 1959, the number of thrust shoes on this bearing was increased from 12 to 16 which results in more bearing area and consequently the thrust load which the bearing can withstand is increased. The part numbers of the 16 shoe bearing is the same as the 12 shoe bearing and completely interchangeable. Only 16 shoe bearings are carried in Parts Stock.
- e. The journal liner assembly shown on sketch No. 7 (item #9) does not have a slot for an oil ring. This journal is now supplied as a replacement for both the Design #1 (Original) as shown on sketch No. 5, and the Design #2 shown on sketch No. 7. The journal liner with oil ring slot is no longer available.



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### 2. Installation of Main Bearing - Design #1 - (Original)

The journal liner assembly and thrust bearing assembly is installed similar to the Design #2 bearing described below with the exception that it does not have a babbitted seal ring.

### 3. Installation of Main Bearing - Design #2

#### a. Journal liner assembly

- (1) Fit and install the journal bearing assembly as outlined in Paragraph A-3, item a, b and c page 6 and 7.

#### b. Thrust Bearing Assembly

- (1) Install lower half of the base ring assembly, rotating it around the shaft until its split line matches that of the bearing pedestal.
- (2) Install the upper half of the base ring assembly and secure both halves with the Allen head capscrews. Rotate the entire base ring assembly in the direction of the compressor rotation until the "Driv-Lok" pin (item 19) engages in the slot at the pedestal split line.



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- (3) Install the lower half of the seat assembly, rotating it around the shaft until its split line matches that of the pedestal.
- (4) Install the upper half of the seat assembly. The upper half is pinned at the split line and both halves can be readily attached by pressing the upper half onto the lower half. Rotate the seat assembly in the direction of compressor rotation until the "Drive-Lok" pin (item 18) engages in its slot at the pedestal split line.
- (5) The thrust bearing clearance is .010" to .018". The thrust clearance is adjustable. Two .079" shims consisting of .003" laminations are used. Check the thrust clearance with the bearing installed by floating the shaft and measuring the float with a depth micrometer or dial indicator at the motor bearing where the end of the shaft is accessible. It should never be necessary to remove material from the thrust shoes as this will destroy the machined taper. The R-11 thrust bearing is self-aligning and extensive bluing to check thrust contact is not required.
- (6) Install the babbitted seal ring (item 11, sketch No. 7 on Design #2 only). The two halves of this ring are held together by a garter spring and care is to be taken when installing these parts. This seal ring is prevented from rotating with the shaft by a pin (item 12 sketch No. 7) which engages in a slot at the pedestal split line.  

.CAUTION: After installing the bearing cap, but before tightening the hold-down bolts, force the shaft toward the compressor end. This will prevent the thrust bearing shoulder from "hanging up" on the cap.
- (7) After the bearing has been properly fitted, the impeller clearance should be checked as outlined in Service Bulletin on Impeller Spacing.
- (8) When all the above steps are completed and the bearing installed, run the oil pump manually and carefully check the bearing split line for oil leakage.



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II. Motor End Bearing

A. Bearing Changes

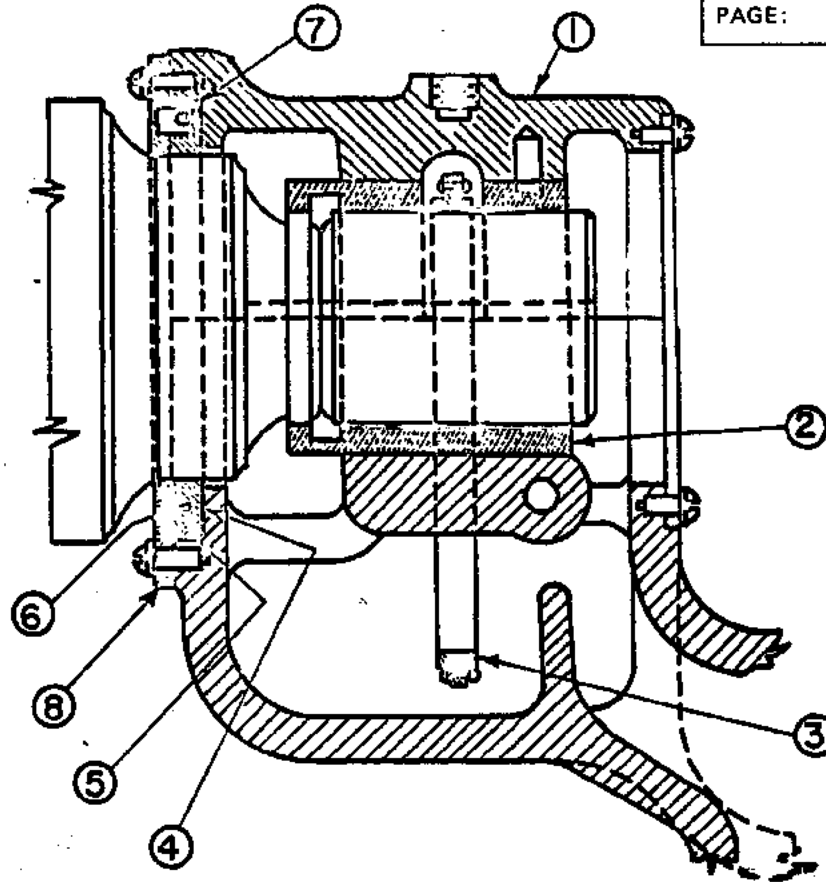
1. Sketch No. 8 shows the split bearing - Design #1 (original) which was used until approximately 6-1-58. This bearing is installed on all 19C machines with machine serial number 4358 and lower except the following:

4107	4159	4185	4205	4218	4236
4108	4160	4187	4207	4219	4238
4114	4162	4191	4208	4220	4239
4115	4165	4193	4209	4221	4240
4130	4173	4194	4211	4226	4241
4131	4177	4195	4213	4227	4243
4134	4178	4196	4214	4229	4245
4151	4179	4197	4216	4230	
4152	4184	4201	4217	4233	



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ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Bearing Cap	5	Carbon Ring Garter Spring
2	Bearing Liner Assembly	6	Carbon Ring Insert Spring
3	Oil Ring	7	Carbon Ring Key
4	Carbon Ring	8	Carbon Ring Retainer

NOTE: Oil Ring (item #3) no longer required or stocked in Service Parts. For part numbers, consult Service Parts Catalogue.

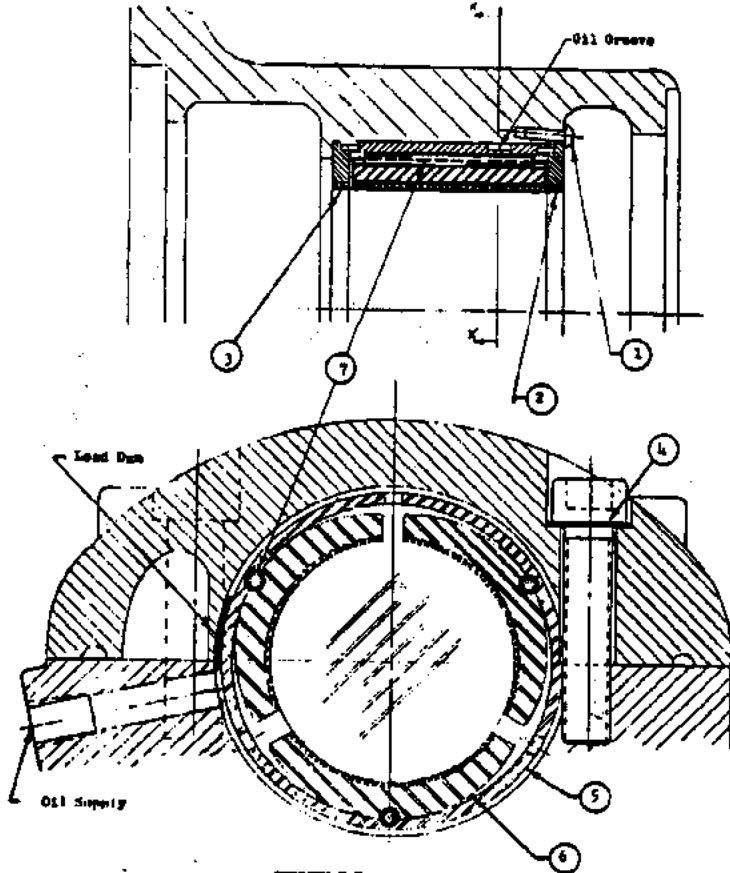
SKETCH NO. 8  
MOTOR END SPLIT BEARING - DESIGN #1 (ORIGINAL)

This bearing contained a carbon ring seal to restrict refrigerant gas from entering the bearing housing and was provided with an oil ring. The oil ring was omitted after 1-1-58. It is no longer required or carried in service stock.

2. A few 19C machines were fitted with a Service Replacement 3-shoe bearing Design #2 as shown in sketch No. 9. This bearing consisted of a 3-shoe bearing installed in a split bearing end bell. The bearing shoes are identical with the design #3 bearing shoes but have special round keys. The retaining ring and insert ring are special but are carried in Service Parts stock.

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SECTION I-A

ITEM	Q	DESCRIPTION	PART NUMBER
1.	3	#10-24 X 7/16 Lg. Rd. Hd. Screw	---
2.	1	Oil retaining ring (back)	19CL7-3192
3.	1	Oil retaining ring (front)	19CL7-3182
4.	2	Copper washer	19CL7-3202
5.	1	Insert ring	19CL7-3162
6.	1*	Shoe and key package	19CL6-101
*Package includes 3 shoes and 3 keys. Discard the 3 keys and order <u>special round</u> keys as follows:			
7.	3	Keys	See note

Note: Order 3 of each of following keys:

Part No.	Diameter	Part No.	Diameter
19CL7-3691	.180	19CL7-3731	.188
19CL7-3701	.182	19CL7-3741	.191
19CL7-3711	.185	19CL7-3751	.194
19CL7-3712	.1875		

SKETCH NO. 9  
MOTOR END SERVICE REPLACEMENT 3 SHOE BEARING - DESIGN #2



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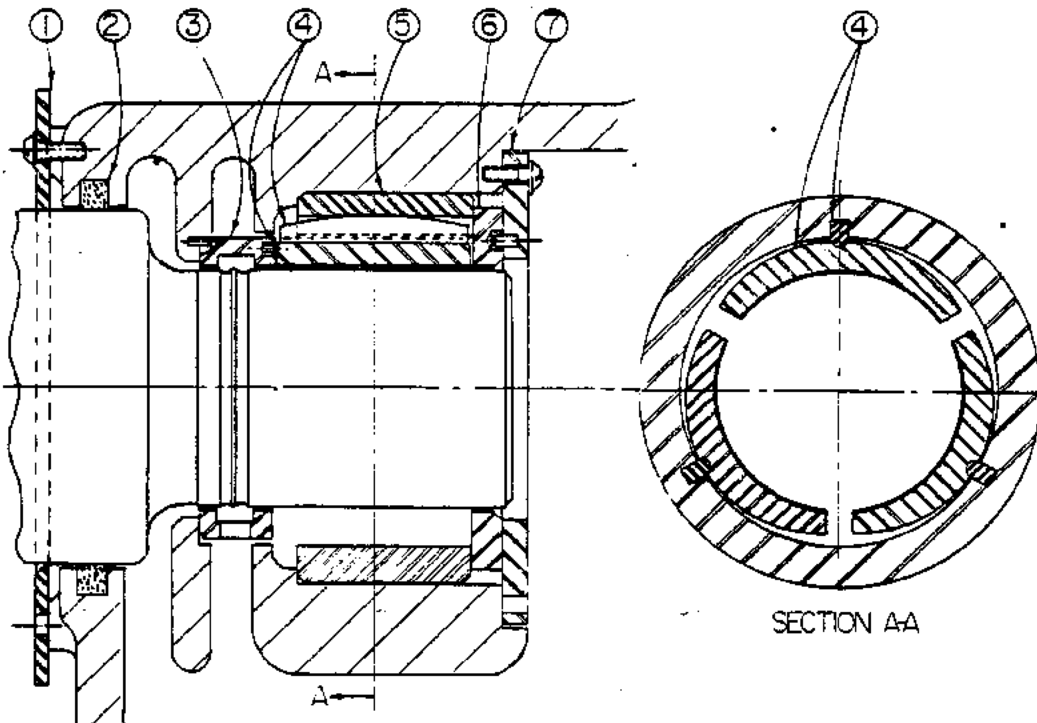
19C machines having this Service Replacement 3-shoe bearing are as follows:

<u>Machine Serial Number</u>	<u>Machine Serial Number</u>
3502 or 3503	3800
3576	3849
3589 or 3590	3864
3637	3874
3750	3889
3769	3893
3780	3943 or 3944
3782 ;	3975

3. 19C3, 4, 5, 6 and 7 machines shipped after approximately 6-1-58 are fitted with a 3-shoe bearing - Design #3 as shown in sketch No. 10. To be more

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ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Windage Baffle	5	Shoe Brg. Insert Ring
2	Felt Ring	6	Oil Retaining Ring(back)
3	Oil Retaining Ring(front)	7	Retaining Ring & Pin Assbly.
4	* Shoe and Key Package (* Includes 3 of each)		
		NOTE: Consult Service Parts Catalogue for part numbers.	

**SKETCH NO.10**  
**MOTOR END 3 SHOE BEARING — DESIGN#3**



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exact, this bearing was installed on all 19C machines with machine serial number 4107 and higher except for the following:

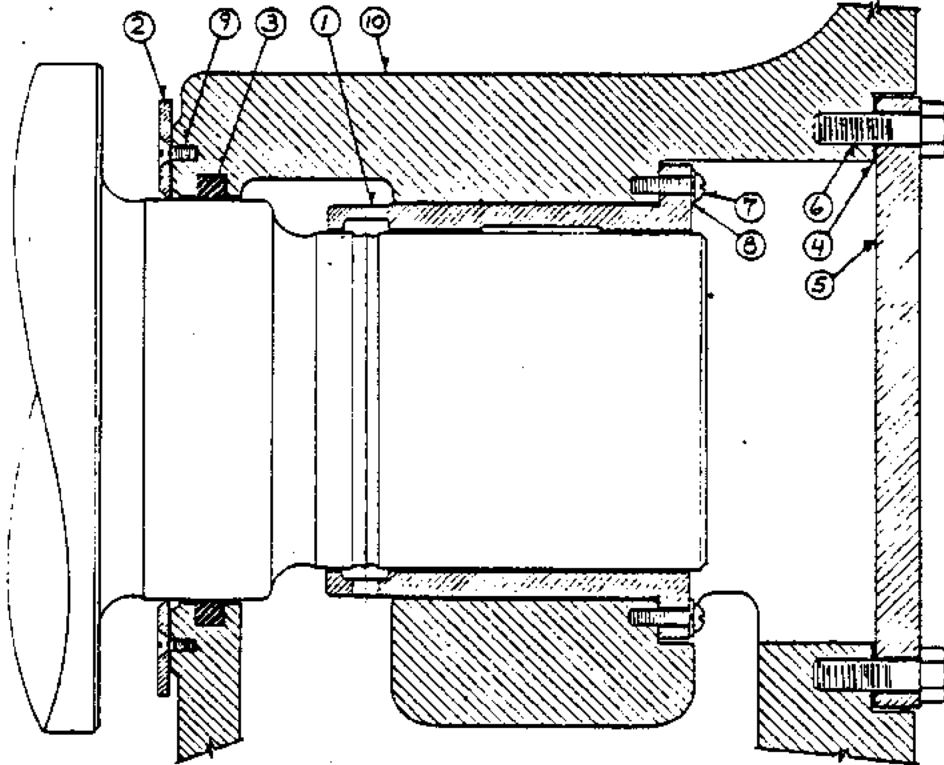
4251	4261	4280	4290	4316	4336	4358
4255	4266	4281	4296	4317	4337	
4256	4267	4282	4297	4319	4339	And all 19C8
4257	4268	4283	4301	4321	4343	machines.
4258	4271	4284	4311	4331	4344	
4259	4275	4287	4314	4332	4345	
4260	4279	4289	4315	4333	4357	

This bearing has a one piece felt sealing ring to restrict refrigerant gas from entering the bearing housing and oil retaining rings to insure proper lubrication.

4. All 19C8 machines have a Sleeve Bearing - Design #4 as shown in sketch No. 11. This one piece bearing has a one piece felt sealing ring to restrict refrigerant gas from entering the bearing housing.

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ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Bearing Liner	6	Hex.Hd.Cap Screw 3/8-16 X 1
2	Windage Baffle	7	RD. HD. Mach. Screw #10-24 X 3/4
3	Felt Ring	8	Lockwasher #10
4	Gasket	9	Flat Hd.Mach.Screw #10-24 X 7/16
5	Cover Plate	10	End Bell

NOTE: For part numbers, consult Service Parts Catalogue.

SKETCH #11  
MOTOR END SLEEVE BEARING - DESIGN #4  
1908 MACHINES



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### B. Installation of Split Bearing - Design #1 (Original)

1. Before installing a new bearing, inspect the carbon ring making sure it fits properly and is not broken. The 3 insert springs and garter spring must be in place and the clearance between carbon ring and shaft between .001" - .005". There must be no clearance between the ends of the ring segments. The clearance between ring and shaft can be changed if incorrect by adding paper shims or removing material from the carbon segment ends.
2. Install the lower bearing half.
3. With only the lower half installed, apply a light uniform coating of Prussian Blue to the shaft. Rotate the shaft while holding the lower bearing half in place. Remove the bearing half and inspect for proper contact. When properly fitted, there should be good contact at the bottom of the lower liner gradually decreasing up the sides with no contact at the split line. (see sketch No. 4 page 7).
4. Check bearing clearance with "Plastigage". Lay two pieces of "Plastigage" on the shaft under the two babbitted surfaces. Install the top bearing half and bearing cap and tighten the bearing cap hold down bolts. Remove bearing cap and top bearing half carefully. ("Plastigage" may stick to either the shaft or top bearing half.) With "Plastigage" still in place, measure flattened "Plastigage" with the graduated scale on the wrapper. Clearance must be .0025" - .004". If less than .0025", remove babbitt from top half of bearing liner until the clearance falls within tolerance.

**NOTE:** When removing babbitt with a scraping tool, coat the babbitt area with Prussian Blue and scrape off the blue carefully and evenly. Be sure there are no high or low spots on the babbitt.

If the clearance exceeds .004", replace with a new bearing. If one is not readily available, remove bronze material with a fine file from the upper bearing liner split line and carefully size and place shims between the bearing cap and the top of the bearing liner. The top and bottom bearing halves should be within .005" of contact with each other at the split line when the bearing cap is tightened.

### C. Installation of Service Replacement 3 shoe bearing - Design #2

1. Before installing a new bearing, inspect the carbon ring making sure it fits properly and is not broken. The 3 insert springs and garter spring must be in place and the clearance between carbon ring and shaft between .001" - .005". There should be no clearance between the ends of the ring segments. The clearance between ring and shaft can be changed if incorrect by adding paper shims or removing material from the carbon segment ends.
2. The front oil retaining ring is installed nearest the motor. It can easily be identified because it has a flat on one side. The clearance between the front retaining ring and shaft side is .010" to .012".



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3. Install the insert ring in the bearing housing. Pins are installed on both ends of this insert ring and line-up with both the front and back retaining rings. The insert ring requires no dowel pin as it will be prevented from rotating by the bearing cap hold-down bolts which fit into the slots cut in the side of the insert ring.

NOTE: Be sure the oil groove around the outside of the insert ring is in line with the oil supply hole in the bearing housing. The lead dam in the oil groove on the outside of the insert ring must be located as shown in sketch No. 9.

4. Lift the shaft sufficiently and insert the lower bearing shoe and key.
5. Install the two upper bearing shoes and keys. Check shaft concentricity by installing a shaft extension (see sketch No. 12) on the end of the shaft. With dial indicator installed on the shaft extension, rotate the dial around the machined end bell surface. The shaft must be concentric with the machined end bell surface within .002" on the diameter. Use keys of different diameters (indicated on sketch No. 9) to arrive at proper shaft concentricity.
6. Check bearing clearance by raising shaft with lifting bar and dial indicator installed on shaft extension with its button against the end bell flange. Total bearing clearance is .002" - .004".

CAUTION: Do not lift shaft by prying under shaft extension containing dial indicator. This would only bend the shaft extension and give false reading.

7. Install the back oil retaining ring. This ring is held in place with 3 retaining screws.
  8. Be sure copper washers are in place before tightening bearing cap hold-down bolts. The washers prevent leakage through the bolt holes.
- D. Installation of 3-shoe Bearing - Design #3
1. Sketch No. 12 page 20 shows the tools required to properly install the 3-shoe bearing.
  2. The inner oil retaining ring is installed nearest the motor. The pin installed in the housing should fit into its matching hole in the retaining ring. The clearance between the inner retaining ring and the shaft is .010" to .012".
  3. Using the shaft extension and jack, raise the shaft sufficiently to install the two lower shoes and keys.



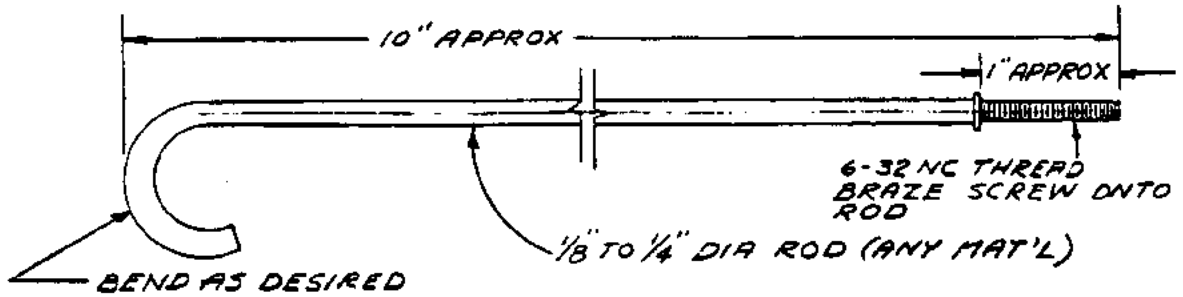
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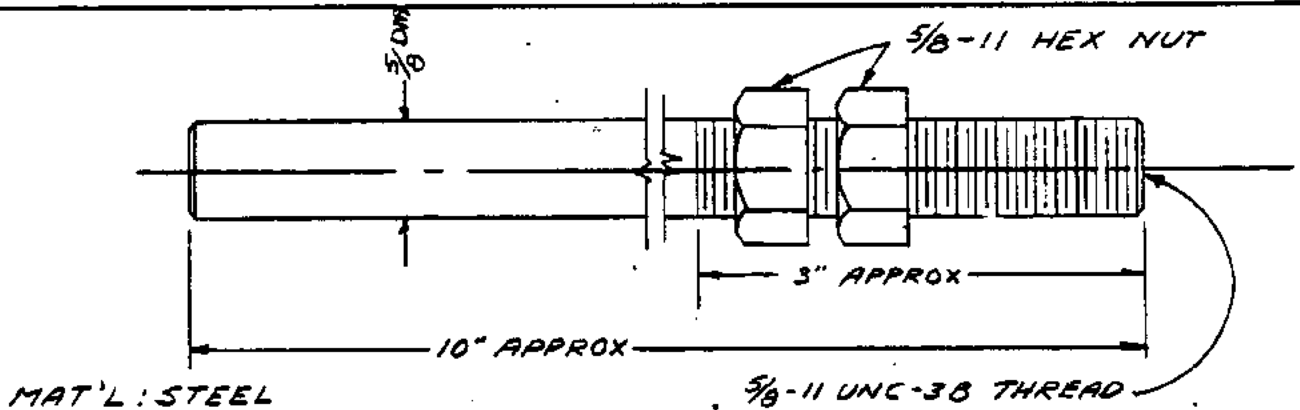
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### PULLER

CAN BE USED TO INSTALL THE SHOE BEARINGS  
AND BOTH FRONT & BACK OIL RETAINING RINGS

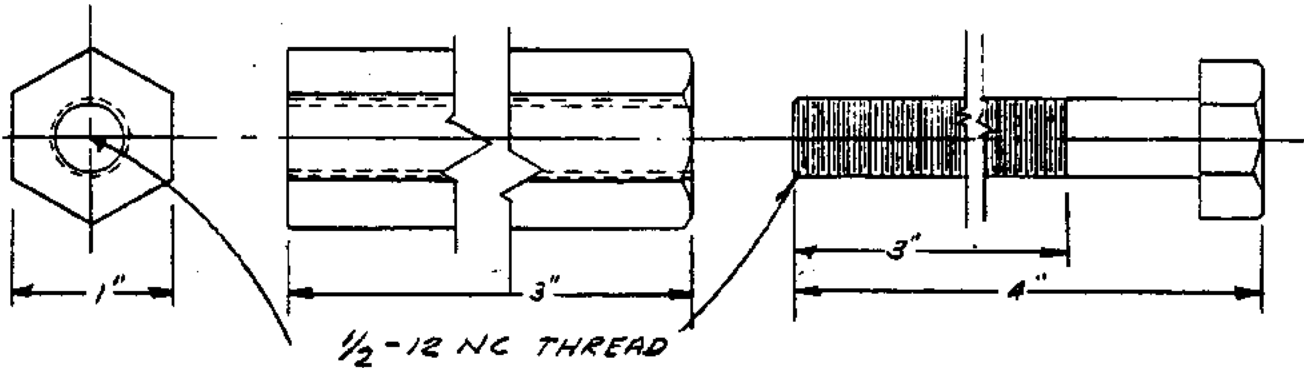


### SHAFT EXTENSION

INSERT IN THREADED HOLE IN END OF COMPRESSOR SHAFT

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**JACK**

PLACE BOLT IN LARGE NUT - THIS JACK IS TO BE USED TO LIFT THE COMPRESSOR SHAFT AGAINST THE SHAFT EXTENSION TO FACILITATE THE INSTALLATION OF THE 2 LOWER SHOE BEARINGS.

**SKETCH NO. 12  
3 SHOE BEARING-INSTALLATION TOOLS**



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4. Check shaft concentricity with end bell. To do this, install a dial indicator on the shaft extension and rotate around end bell cover plate shoulder. The shaft can be rotated by the second stage impeller drain holes accessible through the main bearing inspection cover.

NOTE: Before rotating shaft, apply a little oil to the shaft to make rotating easier and to prevent damage to bearing shoes.

5. Shaft concentricity must be within .002" on the diameter. The shaft can be moved up and down and from side to side by adjusting the shoe keys.

NOTE: The shoe keys are purposely oversized. Therefore, in most cases, material from the flat portion of the key will have to be removed with a few light strokes of a fine file.

6. When the bottom shoes and keys have been properly fitted to bring shaft concentricity within tolerance, fit the top shoe and key to give .0025"-.004" clearance between top shoe and shaft. Check by installing dial indicator on shaft extension with its button on end bell flange and by lifting shaft with a bar.

NOTE: Do not lift shaft by prying under shaft extension containing dial indicator. This would only bend the extension rod and give false reading.

7. Install the back oil retaining ring. The clearance between this ring and shaft is .010" to .012".
8. Install retaining ring and pin assembly. Line up the pin and the retaining ring hole.

### E. Installation of 19C8 Sleeve Bearing - Design #4

1. Install the sleeve bearing as received. The shaft extension can be used to lift the shaft while installing the sleeve over the shaft. Secure the bearing with the six machine screws and lock washers.
2. Check clearance by lifting the shaft with dial indicator installed on the shaft extension. (See sketch No. 12). Bearing clearance is .003" to .006".
3. If clearance is less than .003", remove babbitt material carefully with scraping tool from top of bearing. If clearance is more than .006", replace the bearing.

NOTE: Do not lift shaft by prying under shaft extension containing dial indicator. This would only bend the extension and give false reading.



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### III. Table of Bearing Clearances

#### A. Main Bearing

Description	Dia. or Radius	Clearance	
		Min.	Max.
Bearing orifice,(R-11 - Design #1)	Dia. of Orifice	.262"	.270"
Bearing Orifices (R-113 Design #1 and Design #2)	Dia. of Orifice	.210"	.219"
Journal Bearing (R-113 - Design #1, #2 and #3. R-11 Design #1 and #2.)	Dia.	.006"	.012"
Thrust Bearing Clearance (R-113 Design #1, #2 and #3 and R-11 Design #1 and #2.)	- -	.010"	.018"
Babbitted seal ring to shaft (R-113 Design#3 and R-11 Design #2.)	Dia.	.004"	.006"

#### B. Motor End Bearing

Description	Dia. or Radius	Clearance	
		Min.	Max.
3-Shoe Bearing to journal (Design #3)	Dia.	.0025"	.004"
Service Replacement 3 shoe Bearing (Design #2)	Dia.	.002"	.004"
Split Bearing to journal (Design #1)	Dia.	.0025"	.004"
Sleeve Bearing - 1908 (Design #4)	Dia.	.003"	.006"
Carbon Ring to Shaft (Design #1 and #2)	Dia.	.001"	.005"
Shaft Concentricity 3 shoe Bearing	Dia.	- -	.002"
Oil Retaining Ring to Shaft (Design #2 and #3)	Dia.	.010"	.012"