

# TM 9-2990-201-45

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

---

General Support and  
Depot Maintenance Manual  
(Including Repair Parts and Special Tools List)

for

**TURBOCHARGER, ENGINE ASSEMBLY**

2990-074-8930 (SCHWITZER MODEL 4-456)

2990-974-7583 (SCHWITZER MODEL 4D-554)

2990-967-9909 (SCHWITZER MODEL 4D-454C)

2990-999-2275 (SCHWITZER MODEL 4LE-354)

AND

2950-178-1245 (SCHWITZER MODEL 4LE-456)

This copy is a reprint which includes current  
pages from Changes 1 and 2.

---

*HEADQUARTERS, DEPARTMENT OF THE ARMY  
SEPTEMBER 1964*



## TECHNICAL MANUAL

No. 9-2990-201-45

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D. C., 20025, 30 September 1964

## TURBOCHARGER, ENGINE, ASSEMBLY

2990-860-2332 (SCHWITZER MODEL 4-450)

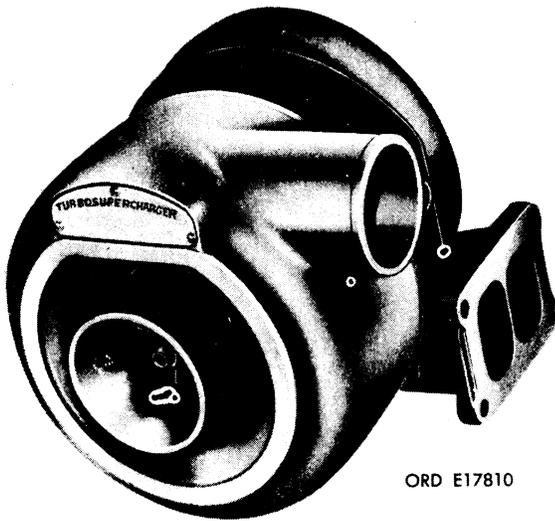
2990-074-8930 (SCHWITZER MODEL 4-456)

2990-974-7583 (SCHWITZER MODEL 4D-554)

2990-976-9909 (SCHWITZER MODEL 4D-454C)

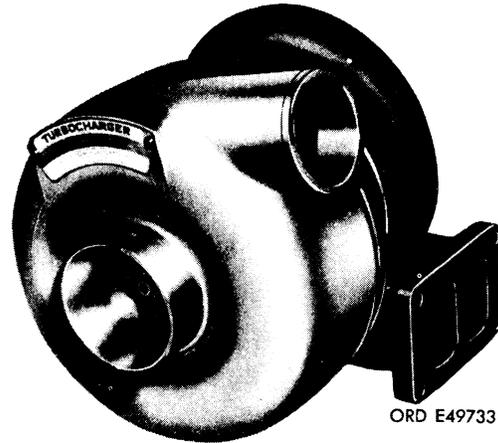
		Paragraph	Page
CHAPTER 1	INTRODUCTION -----		1
Section I	General -----	1-3	1
II	Description and data -----	4-5	1
CHAPTER 2	PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR GENERAL SUPPORT AND DEPOT MAINTENANCE ---	6-9	6
CHAPTER 3	TROUBLESHOOTING -----		8
Section I	General -----	10-11	8
II	Troubleshooting procedures -----	12-13	8
CHAPTER 4	REPAIR AND REBUILD -----		12
Section I	General -----	14-15	12
II	Disassembly -----	16-31	12
III	Cleaning, inspection, and repair -----	32-33	23
IV	Assembly -----	34-50	28
V	Test and adjustment -----	51-52	39
VI	Repair and rebuild standards -----	53-67	39
APPENDIX I	REFERENCES -----		43
APPENDIX II	REPAIR PARTS LIST -----		44
Section I	Preface -----		44
II	General support and depot maintenance repair parts ---		47
Figure 62	Turbocharger assembly (7748900) - exploded view -----		48
63	Turbocharger assembly (10935279) - exploded view -----		50
64	Turbocharger assemblies (10912638 and 53591-C-139552)- exploded view -----		52
Section III	General support and depot special tools -----		53
Figure 65	General support and depot special tools -----		54
INDEXES	-----		56
	Alphabetical -----		56
	Federal stock number -----		60
	Materiel agency and manufacturer's part number -----		61

\*This manual supersedes TM 9-2990-201-35P, 8 January 1962; TM 9-2990-201-35, 21 February 1962; the turbocharger portion of TM 9-2815-207-35, 19 July 1963; and TM 9-2815-207-35P, 23 May 1963.



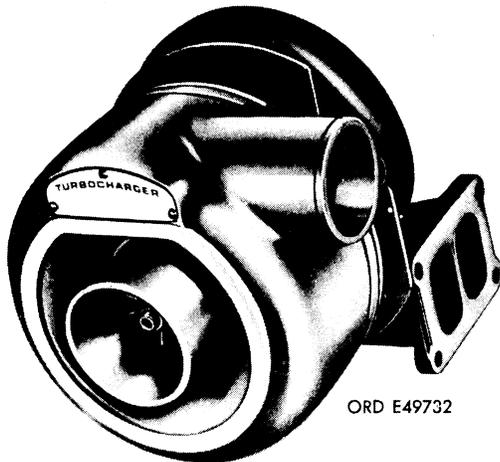
ORD E17810

FIGURE 1. SCHWITZER MODEL 4-450 (7748900) TURBOCHARGER.



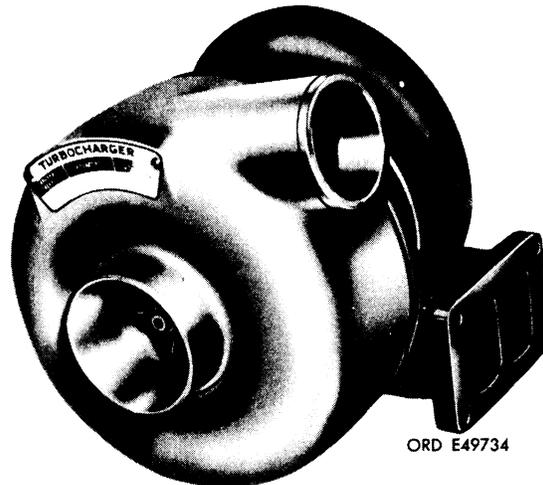
ORD E49733

FIGURE 3. SCHWITZER MODEL 4D-554 (53591-C-139552) TURBOCHARGER.



ORD E49732

FIGURE 2. SCHWITZER MODEL 4-456 (10935279) TURBOCHARGER.



ORD E49734

FIGURE 4. SCHWITZER MODEL 4D-454C (10912638) TURBOCHARGER.

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 9-2990-201-45

CHANGES No. 1



HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C. 20025

**TURBOCHARGER, ENGINE ASSEMBLY**  
**2990-074-8930 (SCHWITZER MODEL 4-456)**  
**2990-974-7583 (SCHWITZER MODEL 4D-554)**  
**2990-967-9909 (SCHWITZER MODEL 4D-454C)**  
**2990-999-2275 (SCHWITZER MODEL 4LE)**

	Paragraph	Page
CHAPTER 1. INTRODUCTION		
Section I. General .....	1-3	1
II. Description and data .....	4-5	1
CHAPTER 2. PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR GENERAL SUPPORT AND DEPOT MAINTENANCE .....	6-9	6
3. TROUBLESHOOTING		
Section I. General .....	10-11	8
II. Troubleshooting procedures .....	12-13	8
CHAPTER 4. REPAIR AND REBUILD		
Section I. General .....	14-15	12
II. Disassembly .....	16-31	12
III. Cleaning, inspection and repair .....	32-33	23
IV. Assembly .....	34-50	28
V. Test and adjustment .....	51-52	39
VI. Repair and rebuild standards .....	53-66	39
CHAPTER 5. INTRODUCTION		
Section I. General .....	67-68	43
II. Description and Data .....	69-70	44
CHAPTER 6. REPAIR AND REBUILD		
Section I. Disassembly .....	71-84	46
II. Cleaning, Inspection and repair .....	85-86	52
III. Assembly .....	87-99	53
APPENDIX I. REFERENCES .....		55
II. REPAIR PARTS LIST		
Section I. Introduction .....		56
II. General support and depot maintenance repair parts .....		59
Figure 79. Turbocharger assembly (10935279)—exploded view .....		60
Figure 80. Turbocharger assemblies (10912638) and 53591-C-139552- exploded view .....		63
Figure 81. Turbocharger assembly (10945184) exploded view .....		66
Section III. General support and depot special tools .....		69
Figure 82. General support and depot special tools .....		68
Section IV. Federal Stock Number and Manufacturers Part Number Index .....		71
Alphabetical .....		73

\*This manual supersedes TM 9-2990-201-35P, 8 January 1962; TM 9-2990-201-35, 21 February 1962.



# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1. Scope

a. This technical manual contains instructions for general support and depot maintenance of the Schwitzer Model 4-450 (7748900), 4-456 (10935279), 4D-554 (53591-C-139552), and 4D-454C (10912638) turbochargers (figs. 1 through 4). The manual contains description of and procedures for troubleshooting, disassembly, inspection, repair, and assembly.

b. Appendix I contains a list of current references applicable to the turbochargers.

c. Appendix II contains an illustrated list of repair parts allocated to general support and depot maintenance.

d. Notice of discrepancies, or recommended changes, should be forwarded on DA Form 2028 direct to Commanding General, U. S. Army Tank Automotive Center, ATTN: SMOTA-M, Warren, Michigan 48090.

e. This technical manual differs from TM 9-2990-201-35, dated 21 February 1962, TM 9-2990-201-35P, dated 8 January 1962, and the turbocharger portion of TM 9-2815-207-35, dated 19 July 1963, and TM 9-2815-207-35P, dated 23 May 1963 as follows:

- (1) Combines general support and depot maintenance instructions and repair parts lists in one manual.
- (2) Revises information on engine turbocharger assembly, Model 4-450 (7748900), for early Continental Model LDS-427-2 engines.

(3) Includes information on engine turbocharger assembly, Model 4D-454C (10912638), for late Continental Model LDS-427-2 engines.

(4) Includes information on engine turbocharger assembly, Model 4-456 (10935279), for Military Model LDS-465-1 engines.

(5) Revises information on engine turbocharger assembly, Model 4D-554 (53591-C-139552) for Mack Model ENDT-673 engines.

f. The pertinent vehicle operator's manuals contain operating instructions and maintenance operations allocated to the operator in performing maintenance work within his scope.

g. The pertinent vehicle organizational maintenance manuals contain instructions for maintenance within their scope.

#### 2. General Support and Depot Maintenance Allocation

Refer to the pertinent vehicle organizational maintenance technical manual for the maintenance allocation chart.

#### 3. Forms, Records, and Reports

For current and complete listing of all authorized forms, refer to current issue of DA Pamphlet 310-2. TM 38-750 contains instructions on the use of maintenance forms pertaining to components covered in this manual.

### Section II. DESCRIPTION AND DATA

#### 4. Description

a. General. The turbochargers (figs. 1 through 4) are adapted for gasoline and diesel (multifuel) engine installations. Turbochargers make use of heat energy that is normally lost

in engine exhaust gases. Exhaust gases, forced out of the engine, drive a shaft and turbine wheel (figs. 5 and 6) which drives the compressor wheel. The compressor is basically a centrifugal blower that increases velocity of air entering engine intake manifold.

b. Operation (fig. 7). Operation of the four models of turbochargers is as follows:

- (1) Exhaust gases from the engine enter turbine housing through the exhaust inlet on the housing. Gas flows around the turbine housing and radially inward through a set of nozzles on the nozzle assembly. These nozzles increase the velocity of the exhaust gas before it enters the turbine wheel.
- (2) Pressure of the exhaust gas is converted into kinetic energy which acts

upon and drives the turbine wheel. Exhaust gas then exits through exhaust outlet of the turbine housing and through the conventional exhaust system of the vehicle.

- (3) The turbine wheel shaft, in turn, drives the compressor wheel. Air enters at the center of the compressor wheel and flows radially outward through a diffuser section and into the compressor housing. Compressed air leaves through a tangential outlet in the compressor housing and enters engine intake manifold.

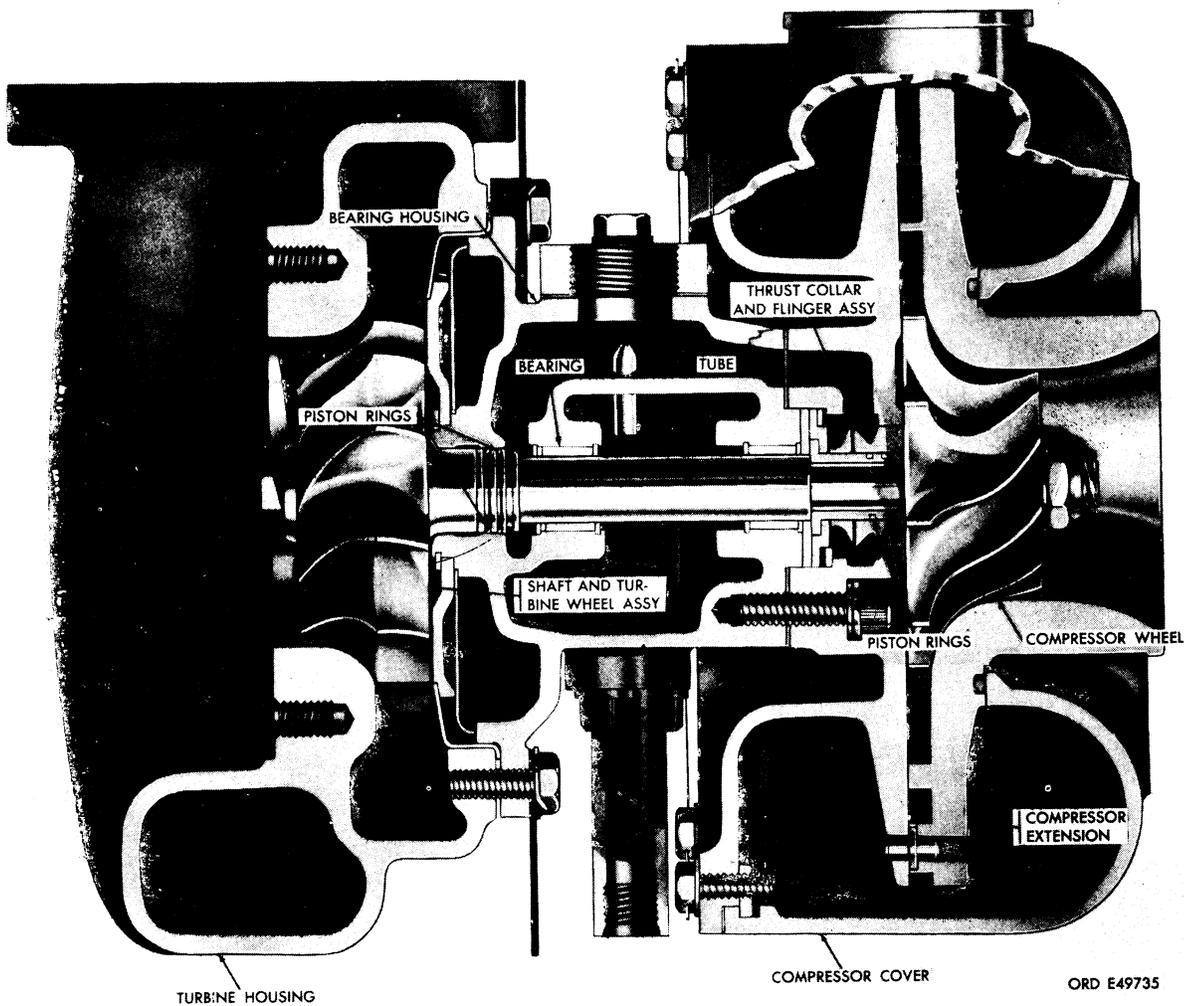


FIGURE 5. TYPICAL TURBOCHARGERS 7748900 AND 10935279 - SECTIONAL VIEW.

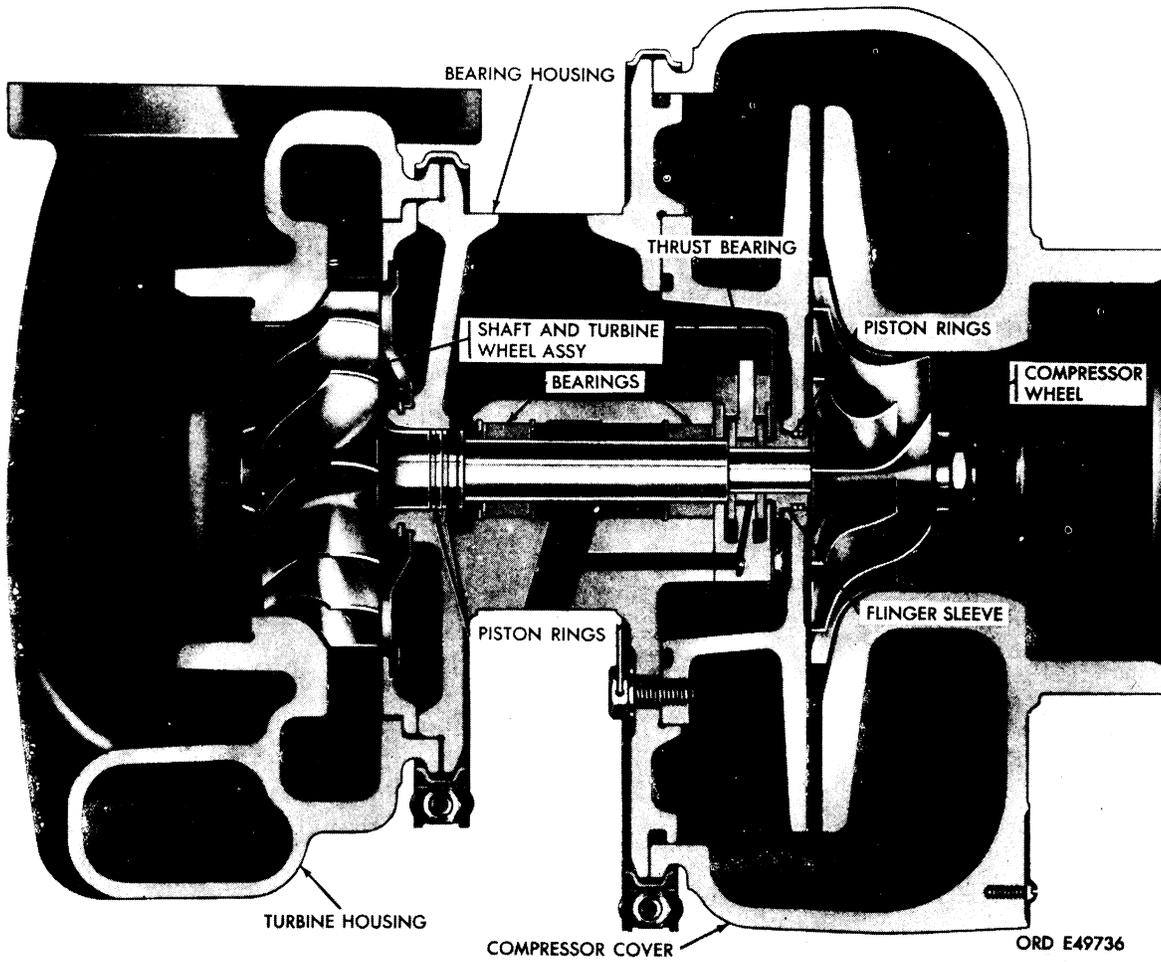


FIGURE 6. TYPICAL TURBOCHARGERS 10912638 AND 53591-C-139552 - SECTIONAL VIEW.

c. Lubrication (fig. 8). Lubrication of the four models of turbochargers is basically the same. They are pressure lubricated from the engine lubricating system through external piping from the engine oil gallery to the turbocharger oil inlet. Oil flows into the bearing housing and then to the sleeve bearings and returns to the engine crankcase through an external line. On turbochargers 10912638 and 53591-C-139552, oil also flows directly to the thrust bearing. Two piston rings, located on the shaft and turbine wheel prevent oil from en-

tering the turbine housing. Two piston rings, located on the thrust collar on turbochargers 7748900 and 10935279, or located on flinger sleeve on turbochargers 10912638 and 53591-C-139552, prevent oil from entering the compressor housing. These piston rings are not positive type seals. Piston ring type oil seals are used at each end of the shaft and turbine wheel utilizing air pressure from the compressor directed behind the rings to effectively seal off the oil.

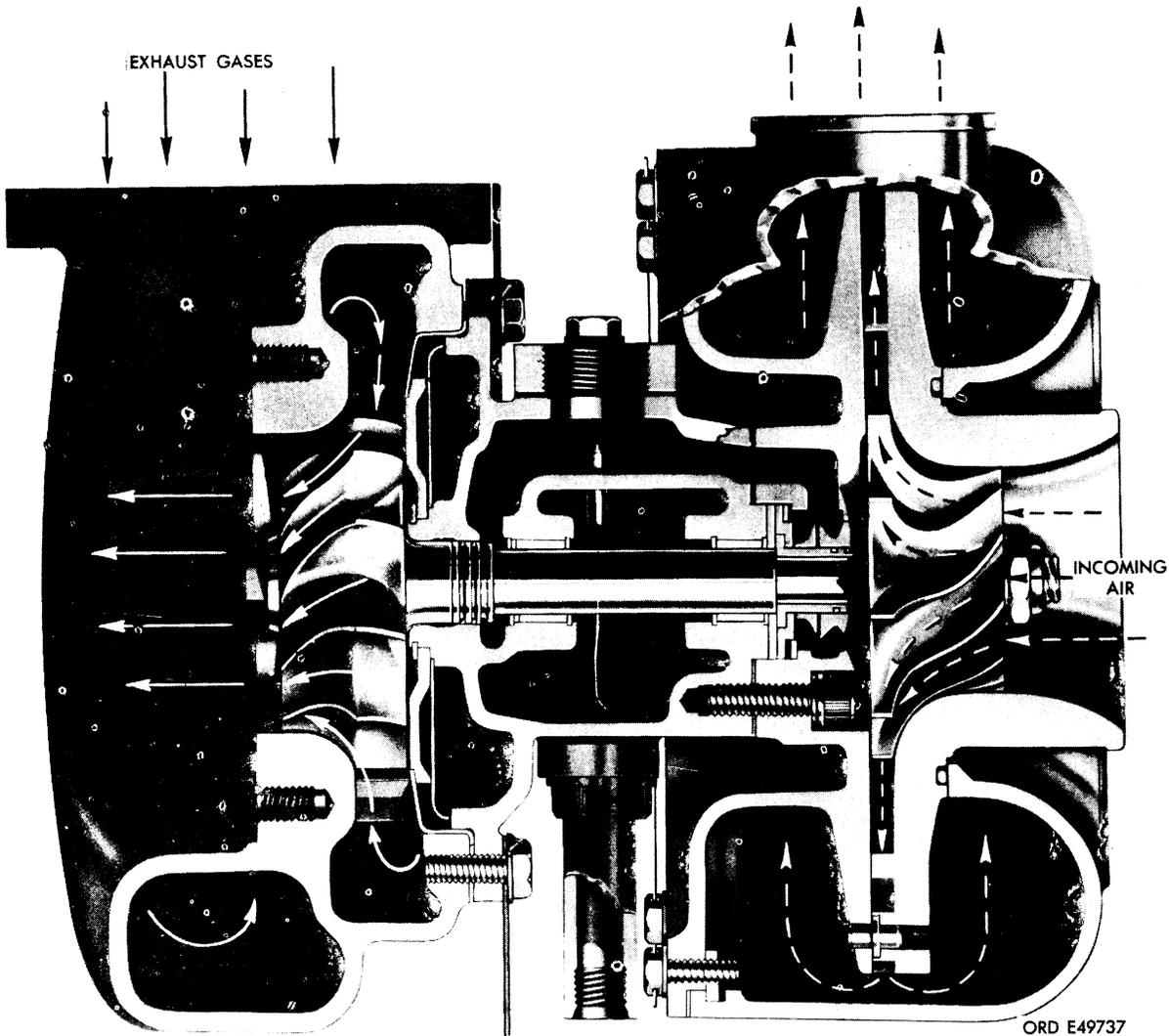


FIGURE 7. TYPICAL TURBOCHARGER - AIR FLOW DIAGRAM.

**5. Data**

Manufacturer.....	Schwitzer Div.
Models and engine applications:	
<i>Model</i> .....	<i>Engine Application</i>
4-456.....	Model LDS-465-1
4D-554.....	Mack Model ENDT-673
4D-454C.....	Model LDS-427-2
4LE-354.....	Model LDS 465-1A
4LE-456.....	Model LDS 465-2
Outside diameter of compressor	
air inlet opening.....	3 1/2 in.

Outside diameter of compressor	
air outlet opening.....	3 in.
Turbine exhaust inlet openings:	
Models 4-456, 4D-554, 4LE-354 and 4LE-456 ((2) openings) .....	1 5/8 x 2 3/8
Model 4D-454C-((1) opening) .....	2 3/8 x 3-7/16
Inside diameter of turbine exhaust outlet opening	
Models 4-456, 4D-554 and 4D-454C .....	3.278 in.
4LE-354 and 4LE-456 .....	3.328 in.
Oil inlet pressure to bearing housing:	
Idle .....	15 psi min
Full throttle .....	30 psi min

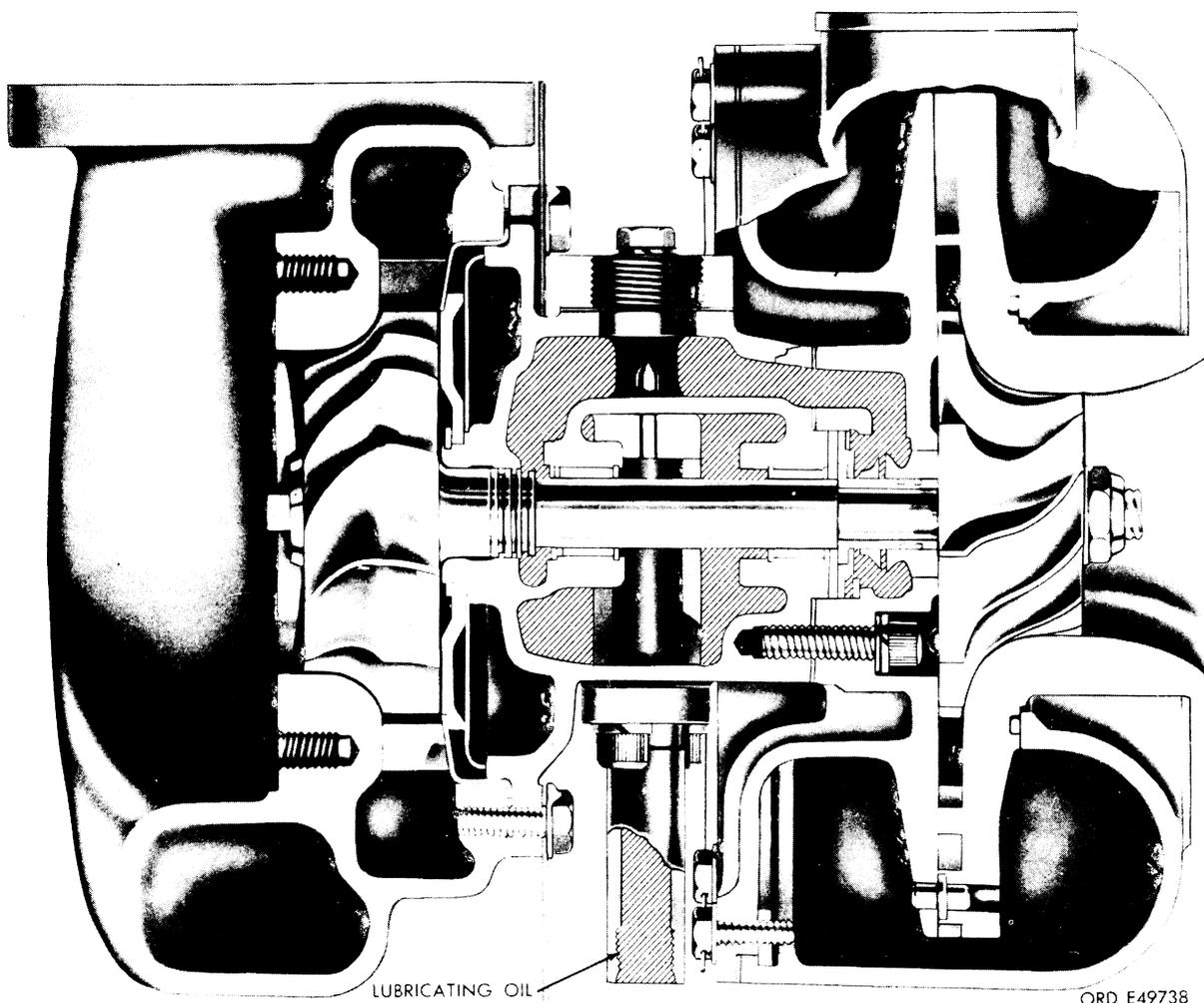


Figure 8. Typical turbocharger lubrication diagram.

## CHAPTER 2

### PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR GENERAL SUPPORT AND DEPOT MAINTENANCE

#### 6. General

Special tools and equipment and maintenance parts over and above those available to the using organization are supplied to Ordnance general support maintenance units and depot shops for maintaining and/or repairing the material.

#### 7. Repair Parts

Repair parts are listed in Appendix II which is the authority for requisitioning replacement parts for general support and depot maintenance.

#### 8. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are listed in DA Supply Manuals SM 9-4-4910-A57, A59, A65, and A66; SM 9-4-4940-A08; SM 9-4-5180-A01, A17, A20, A58, A81, and A82; and are authorized for replacement by TA and TOE.

#### 9. Special Tools and Equipment

Special tools illustrated in figure 82 and listed in table 1 are those tools necessary to perform the operations described in this technical manual.

*Table 1. Special Tools and Equipment for General Support and Depot Maintenance*

Item	Identifying Number	Figure Reference	Use
GAGE, nozzle van spacing .....	4910-977-8972 (10951060)	41 and 82	Measure space between vanes on nozzle ring on turbocharger 10935279 only.
PLIERS, bearing retaining ring ....	(10935598)	82	Compress the bearing housing sleeve bearing retaining ring for removal and/or installation.
REPLACER, collar and compressor wheel.	5120-870-6924 (10899147)	51, 59, and 82	Replacing thrust collar or compressor wheel.
SLEEVE, shaft ring expander .....	4910-885-3465 (10899148)	55 and 82	Install piston rings on shaft and turbine wheel.
SLEEVE, thrust collar ring .....	4910-870-2122 (10899149)	52 and 82	Install piston rings on thrust collar on turbocharger 10935279 only.
SOCKET, wrench attachment, compressor housing.	5120-654-3629 (8755594)	54 and 82	Used with torque wrench to tighten compressor, housing-to-bearing housing cap on turbochargers, 10935279 only.

Table 1—Continued.

Item	Identifying Number	Figure Reference	Use
SPACER, sleeve, clearance checking.	4910-870-2123 (10899150)	58 and 82	Used as a dummy wheel when determining the compressor wheel back clearance.
SUPPORT, compressor wheel dis-assembly.	4910-870-2124 (10899152)	23 and 82	Support bearing housing when pressing shaft and turbine wheel assembly out of compressor wheel and thrust collar.
SUPPORT, turbine wheel	4910-870-3759 (10899151)	40, 41, 55, 59, and 82	Support turbine wheel when pressing thrust collar and compressor wheel on turbine shaft.

## CHAPTER 3

### TROUBLESHOOTING

#### Section I. GENERAL

##### 10. Purpose

a. Information in this chapter is for use of maintenance personnel in conjunction with and as a supplement to the troubleshooting section in the pertinent vehicle organizational maintenance manual. It provides continuation of instructions where a remedy in the organizational maintenance manual refers to general support maintenance personnel for corrective action.

b. Operation of a deadlined vehicle without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and troubleshooting, such damage and injury can be avoided. In addition, the causes of faulty operation of a vehicle or component can often be determined without extensive disassembly.

##### 11. General Instructions and Procedures

a. This chapter contains inspection and troubleshooting procedures to be performed after a disabled turbocharger has been removed from the vehicle.

b. The inspections made while the component is mounted in the vehicle are for the most part visual and are to be performed before attempting to operate the vehicle. The object

of these inspections is to determine the condition of the component, and if found defective, to take precautions to prevent any further damage.

c. The troubleshooting performed while the component is mounted in the vehicle is that which is beyond the normal scope of the using organization. Check the troubleshooting section of the pertinent vehicle organizational maintenance manual, then proceed as outlined in this chapter.

d. Inspection after the component is removed from the vehicle is performed to verify the diagnosis made when the component was in the vehicle, to uncover further defects, or to determine malfunctions if the component alone is received by the maintenance establishment. This inspection is particularly important in the last case because it is often the only means of determining the malfunction without completely disassembling the component.

e. Troubleshooting a disabled component after it has been removed from the vehicle consists of subjecting it to certain specified tests. This chapter discusses those symptoms which can be diagnosed and interprets the results in terms of probable causes.

#### Section II. TROUBLESHOOTING PROCEDURES

##### 12. Troubleshooting Before Disassembly

a. *General.* Troubleshooting the turbocharger before disassembly is essential in determining what parts are unserviceable and must be repaired or replaced during overhaul. The shaft and turbine wheel (figs. 5 and 6), sleeve bearings, and thrust washers are parts likely to show the most wear. Figures 9 and 10 below, show the necessary steps in determining excessively worn parts.

b. *Check Shaft and Turbine Wheel Radial Movement.* Clamp the exhaust inlet flange of the turbine housing in a soft-jawed vise. At-

tach a dial indicator to turbocharger with a clamp or magnetic base holder. Position dial indicator point against flat of square end of turbine shaft as shown in figure 9. Check shaft and turbine wheel radial movement as follows:

- (1) Push both wheels sideways in directions shown by white arrows and note lowest reading while rotating wheels in alternate directions. Take readings from four sides of square end of the shaft.
- (2) Push both wheels sideways as shown by black arrows and note lowest

reading while rotating wheels in alternate directions. Take readings from four sides of square end of shaft.

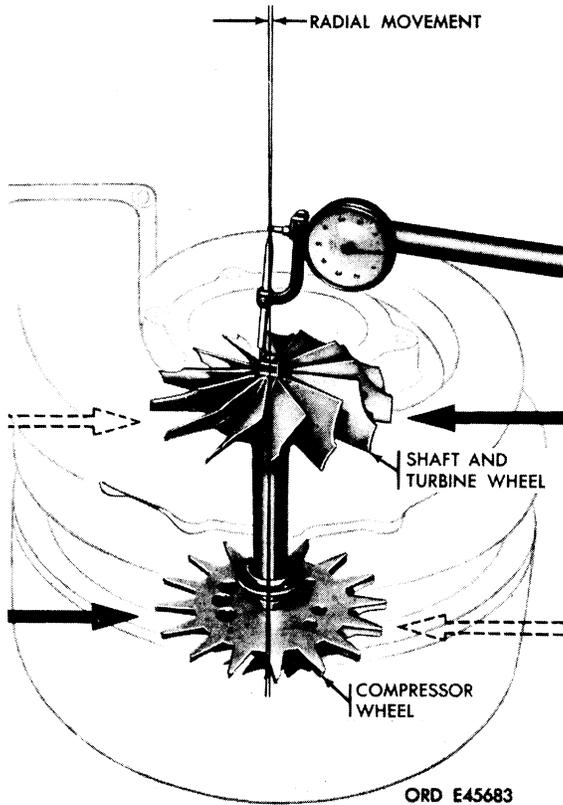


FIGURE 9. CHECKING SHAFT AND TURBINE WHEEL AND COMPRESSOR WHEEL RADIAL MOVEMENT.

**Note.** To obtain total radial movement of the compressor wheel, reverse position of turbocharger and follow the same procedure. Maximum permissible movement is 0.023-inch for turbochargers 7748900 and 10935279 and 0.035-inch for turbochargers,

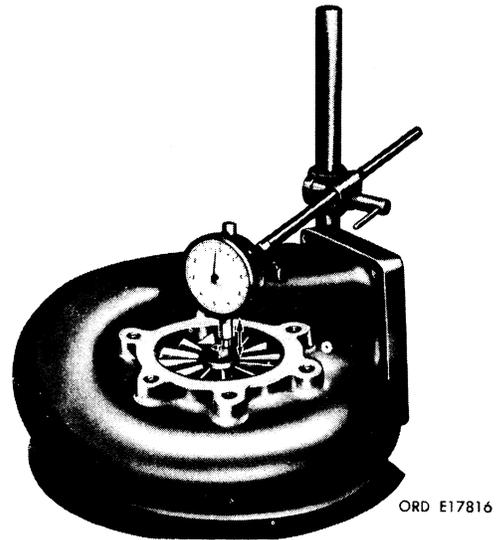


FIGURE 10. CHECKING TOTAL END PLAY.

10912638 and 53591-C-139552. Refer to table 2 for corrective procedure.

- (3) Subtract lowest reading from highest reading to obtain total radial movement. Maximum permissible shaft and turbine wheel movement is 0.023-inch. Refer to table 2 for corrective procedure.

c. Check End Play. Clamp exhaust inlet flange of turbine housing in a soft-jawed vise. Attach a dial indicator to turbocharger with a clamp or magnetic base holder. Position dial indicator point on end of turbine shaft and wheel as shown in figure 10. Move shaft and turbine wheel to extreme up and down positions to check total end play. Total end play should be within 0.004 and 0.008-inch.

### 13. Troubleshooting After Disassembly

Troubleshooting after disassembly is basically an inspection of internal parts. Refer to troubleshooting table (table 2) for malfunctions, probable causes, and their corrections.

Table 2. Troubleshooting

**Note.** The procedures necessary to accomplish the instructions provided in the "Corrective action" column of table 2 are contained in their respective paragraphs of this manual: i. e., disassembly instructions are contained in paragraphs 16 through 31; cleaning instructions in paragraph 32; inspection, repair, and replacement instructions in paragraph 33; and assembly instructions in paragraphs 34 through 50.

Malfunction	Probable causes	Corrective action
1. Compressor and turbine wheels drag	<p><u>a.</u> Carbon build-up behind turbine wheel.</p> <p><u>b.</u> Dirt accumulation behind compressor wheel.</p> <p><u>c.</u> Dirt causing drag in bearings.</p>	<p><u>a.</u> Disassemble and clean unit. Assemble unit.</p> <p><u>b.</u> Disassemble and clean unit. Assemble unit.</p> <p><u>c.</u> Disassemble and clean unit and replace damaged parts. Assemble unit.</p>
2. Shaft and turbine wheel and compressor wheel radial movement exceeds high limit (fig. 9)	<p><u>a.</u> Worn bearings.</p> <p><u>b.</u> Shaft worn.</p> <p><u>c.</u> Bore in bearing housing worn.</p>	<p><u>a.</u> Disassemble unit, replace bearings, and assemble unit.</p> <p><u>b.</u> Disassemble unit, replace compressor wheel and shaft and turbine wheel, and assemble unit.</p> <p><u>c.</u> Disassemble unit, replace bearing housing.</p>
3. End play exceeds 0.008-inch (fig. 10)	Thrust faces of thrust collar on turbochargers 774-8900 and 10935279, thrust bearing on turbochargers 10912638 and 53591-C-139552, or thrust washers worn.	Disassemble unit, replace thrust collar, bearing or washers, and assemble unit.
4. End play less than 0.004-inch (fig. 7)	<p><u>a.</u> Carbon build-up behind turbine wheel.</p> <p><u>b.</u> Dirt accumulation behind compressor wheel.</p>	<p><u>a.</u> Disassemble unit, clean wheel, assemble unit.</p> <p><u>b.</u> Disassemble unit, clean wheel, assemble unit.</p>
5. Compressor end of turbine dirty	<u>a.</u> Excessive intake restriction.	<u>a.</u> Check for clogged air cleaner (refer to pertinent vehicle operators manual). Replace the air cleaner element and clean the entire air intake system thoroughly. Check for collapsed intake tube and replace if necessary.

Table 2. Troubleshooting - Continued

Malfunction	Probable causes	Corrective action
5. Compressor end of turbine dirty - Continued	<u>b.</u> Insufficient air filtration due to leaks in air intake piping between air cleaner and turbocharger.  <u>c.</u> Operating under long idle periods in dusty areas.	<u>b.</u> Disassemble, clean, and assemble unit. Refer to pertinent vehicle operators manual.  <u>c.</u> Disassemble, clean, and assemble unit.
6. Turbine wheel blades broken off, tips missing, or bent	<u>a.</u> Failed engine parts entering turbine housing.  <u>b.</u> Wheel striking turbine housing after bearing has become damaged or worn.	<u>a.</u> Clean entire exhaust system (refer to pertinent engine maintenance and repair manual). Disassemble unit, replace compressor and turbine wheels. Assemble unit.  <u>b.</u> Disassemble, clean, and replace unserviceable parts as necessary. Assemble unit.
7. Compressor wheel blades either worn or broken off	Foreign material entering air intake system and striking wheel.	Clean complete air intake system (refer to pertinent engine maintenance and repair manual). Disassemble unit, replace shaft and turbine wheel and compressor wheel. Assemble unit.
8. Vanes of nozzle ring peened reducing opening between vanes	Foreign material entering turbine housing from engine exhaust manifold or failed engine parts.	Clean entire exhaust system (refer to pertinent engine maintenance and repair manual). Disassemble unit, replace nozzle ring, and assemble unit.
9. Oil entering compressor housing from bearing housing	<u>a.</u> Piston rings worn or broken.  <u>b.</u> Excessively worn ring lands on thrust collar.	<u>a.</u> Disassemble unit, replace the thrust collar piston rings, and assemble unit.  <u>b.</u> Disassemble unit, replace thrust collar and piston rings, and assemble unit.
10. Oil entering turbine housing from bearing housing	<u>a.</u> Shaft and turbine wheel piston rings worn or broken.  <u>b.</u> Ring lands on shaft excessively worn.	<u>a.</u> Disassemble unit, replace piston rings, and assemble unit.  <u>b.</u> Disassemble unit, replace shaft and turbine wheel and piston rings, and assemble unit.

## CHAPTER 4

### REPAIR AND REBUILD

#### Section I. GENERAL

##### 14. Purpose

a. This chapter provides instructions for disassembly, cleaning, inspection, repair, rebuild, assembly and test and adjustment of the turbochargers after being removed from the engine.

b. Removal and installation procedures for the turbochargers are covered in pertinent vehicle maintenance manuals or engine general support and depot maintenance manuals.

##### 15. Disassembly and Assembly Instructions

a. Disassembly Instructions. Paragraphs 16 through 31 provide disassembly procedures

for the turbochargers. The sequence of instructions ((1), (2), and (3)) for figures 11 through 39 indicates the sequence of instructions to be followed for disassembly operations.

b. Assembly Instructions. Paragraphs 36 through 50 describe only those assembly operations which cannot be accomplished by merely reversing the sequence of and procedures for disassembly. Where the assembly instructions are the reverse of disassembly instructions, reference is made to the pertinent disassembly instructions. The sequence of disassembly instructions ((1), (2), and (3)) for each illustration should be performed in reverse order ((3), (2), and (1)) in order to perform the assembly procedure.

#### Section II. DISASSEMBLY

##### 16. General

Disassembly of the turbocharger should be performed by following the paragraph instructions and using illustrations as descriptive references.

Note. Disassembly procedures for all turbochargers are the same unless indicated otherwise by the use of their part number.

##### 17. Cleaning Before Disassembly

Before beginning disassembly, thoroughly wash the exterior of the turbocharger with dry-cleaning solvent or volatile-mineral-spirits paint thinner. Thoroughly dry with compressed air or a clean dry cloth.

Warning: Particles blown by compressed air are hazardous. Make certain the air stream is not directed at the user or any other person in the area.

##### 18. Removing Oil Inlet Adapter and Oil Outlet Cover—Turbocharger, 7748900 Only

Remove oil inlet adapter and oil outlet cover

from the turbocharger as follows:

a. Oil Inlet Adapter. Refer to figure 11.

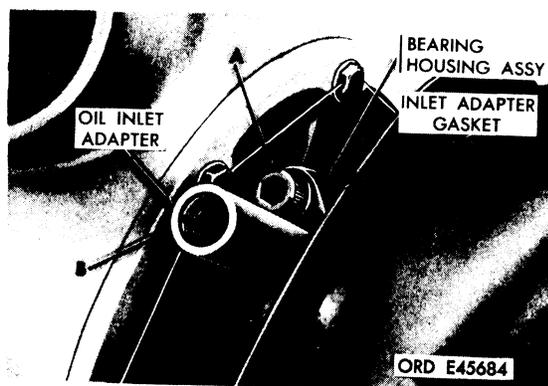


FIGURE 11. REMOVING OR INSTALLING OIL INLET ADAPTER - TURBOCHARGER 7748900

- (1) Remove two screws and lock washers (A) attaching oil inlet adapter (B) to bearing housing assembly.
- (2) Remove oil inlet adapter (B) and adapter gasket. Discard gasket.

**b. Oil Outlet Cover.** Refer to figure 12.

- (1) Remove two hex head cap screws and lock washers (A) attaching the oil outlet cover (B) to the bearing housing assembly.
- (2) Remove oil outlet cover (B) and cover gasket. Discard gasket.

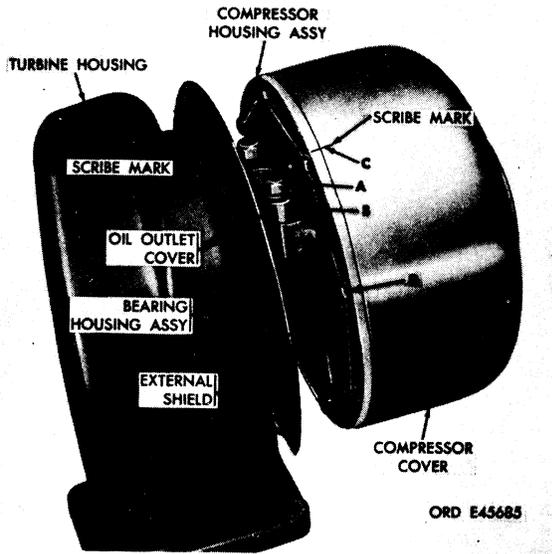


FIGURE 12. REMOVING OR INSTALLING OIL OUTLET COVER AND COMPRESSOR CAP SCREWS - TURBOCHARGER 7748900.

- (3) Scribe alinement marks (C) on compressor cover, compressor housing assembly, bearing housing assembly, and turbine housing to ensure correct positioning during assembly.
- (4) Remove lockwire from compressor cover cap screws (D). Remove eight cap screws and sealing washers securing the compressor cover to compressor housing assembly. Discard sealing washers and lockwires.

**19. Removing Compressor Cover**

**a. Turbocharger 7748900.** Refer to figure 13.

- (1) Compress compressor cover lock

ring (A) using retaining ring pliers - 10899175 until lock ring can be removed from groove in compressor cover (B).

- (2) Remove compressor cover (B).

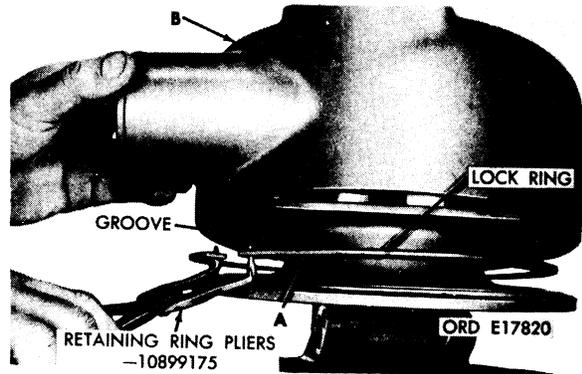


FIGURE 13. REMOVING OR INSTALLING COMPRESSOR COVER - TURBOCHARGER 7748900.

**b. Turbochargers 10935279, 10912638, and 53591-C-139552.** Refer to figures 14 and 15.

- (1) Scribe alinement marks on compressor cover and bearing housing as shown in figure 14.



FIGURE 14. SCRIBING ALINEMENT MARKS ON COMPRESSOR COVER AND BEARING HOUSING - TURBOCHARGERS 10935279, 10912638, AND 53591-C-139552.

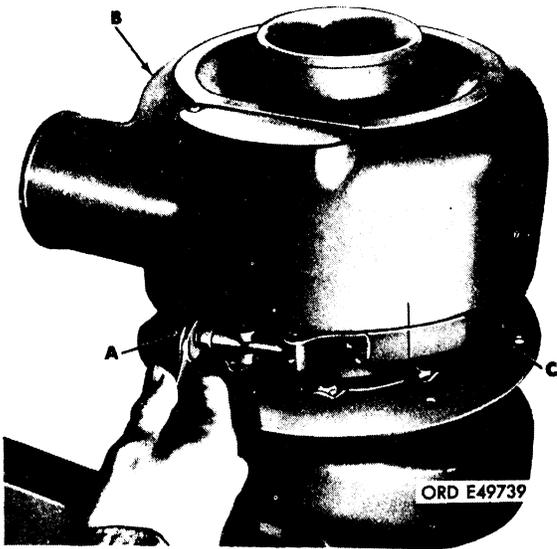


FIGURE 15. REMOVING OR INSTALLING COMPRESSOR COVER - TURBOCHARGERS 10935279, 10912638, AND 53591-C-139552

- (2) Remove clamp nut (A, fig. 15).
- (3) Remove compressor cover (B, fig. 15) with clamp (C). Remove and discard compressor housing packing from bearing housing on 10912638 and 53591-C-139552.

**20. Removing Compressor Extension Assembly**

Remove compressor extension assembly on turbochargers 7748900 and 10935279. Refer to figure 16.

**Note.** Compressor extension on turbochargers 10912638 and 53591-C-139552, is an integral part of the compressor cover and is removed in paragraph 19.

- a. Remove and discard preformed packing (A).
- b. Carefully pry compressor extension (B) free from dowel pin holes in compressor housing assembly and remove compressor extension.
- c. Remove compressor cover lock ring (C).
- d. Remove and discard cover gasket (D).

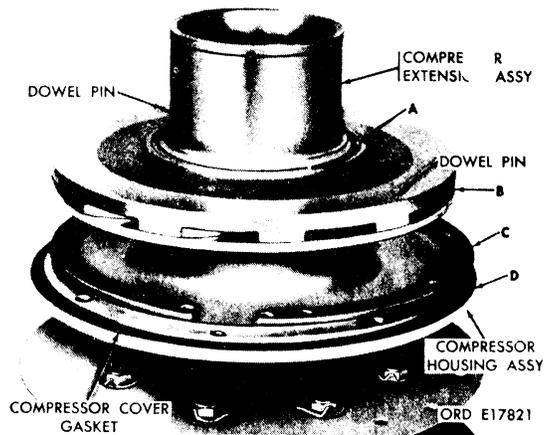


FIGURE 16. REMOVING OR INSTALLING COMPRESSOR EXTENSION ASSEMBLY - TURBOCHARGERS, 7748900 AND 10935279.

**21. Checking Shaft and Turbine Wheel and Compressor Wheel Total Radial Movement**

a. General. Check total wheel radial movement using a dial indicator before disassembling further. This check is important at this point during disassembly in order to determine how badly the turbine shaft and sleeve bearings are worn. This procedure will assist during the inspection (par. 33) in determining what parts will need replacement.

b. Checking Total Radial Movement. Refer to figure 17.

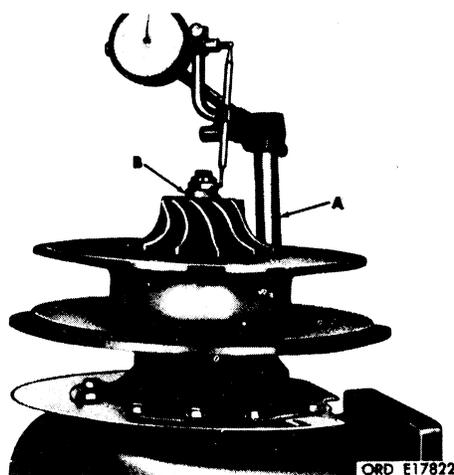


FIGURE 17. CHECKING COMPRESSOR WHEEL TOTAL RADIAL MOVEMENT.

- (1) Mount a dial indicator (A) on housing assembly and position indicator point against flat side of compressor wheel nut.
- (2) Check total wheel radial movement (B) in the same manner as directed in paragraph 12b.

**Note.** Total radial movement must not exceed 0.023-inch on turbochargers 7748900 and 10935279, and 0.035-inch on turbochargers 10912638 and 53591-C-139552. If radial movement exceeds this limit, check tolerances of turbine shaft, bearings surfaces, bearing housing base, and sleeve bearings during inspection (par. 33).

## 22. Removing Bearing Housing Assembly

### a. Turbochargers 7748900 and 10935279.

- (1) Refer to figure 18: Position eight point, 3/8-inch socket wrench (A) on square extension of shaft and turbine wheel. Position 3/4-inch socket wrench (B) on compressor wheel lock nut. Hold wrenches firmly to prevent slippage, and possible damage to wheel blades (C). Remove compressor wheel lock nut.

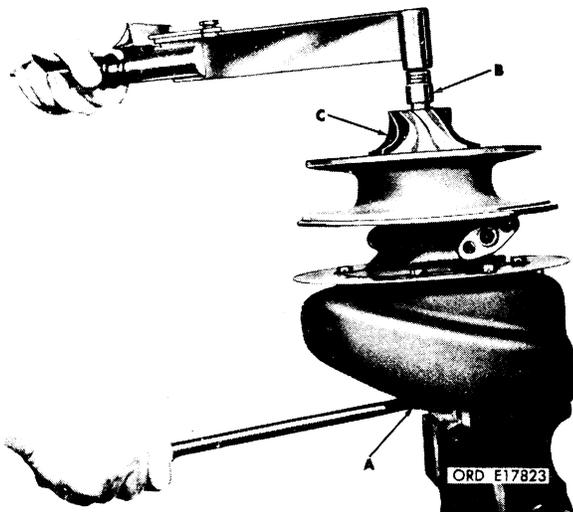


FIGURE 18. REMOVING COMPRESSOR WHEEL LOCK NUT.

- (2) Refer to figure 19. Straighten tabs

(A) on four lock plates. Remove eight cap screws (B) and four lock plates.

**Note.** On turbocharger 1093-5279, scribe alinement marks on bearing housing assembly and turbine housing as shown in figure 14. Scribing the alinement marks will ensure correct positioning during assembly.

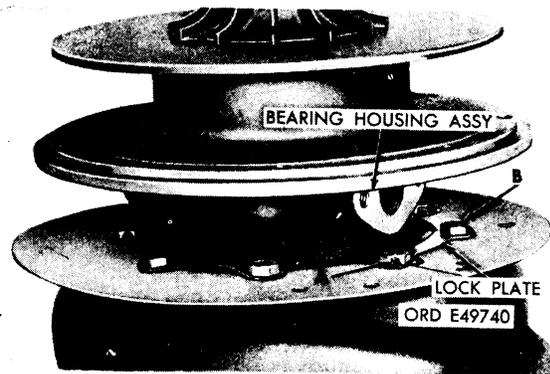


FIGURE 19. PREPARING TO REMOVE BEARING HOUSING ASSEMBLY AND RELATED PARTS - TURBOCHARGERS 7748900 AND 10935279.

- (3) Refer to figure 20. Lift bearing housing assembly and related parts (A) from turbine housing (B). If tight, insert two screwdrivers on opposite sides between bearing and turbine housings and pry upward.

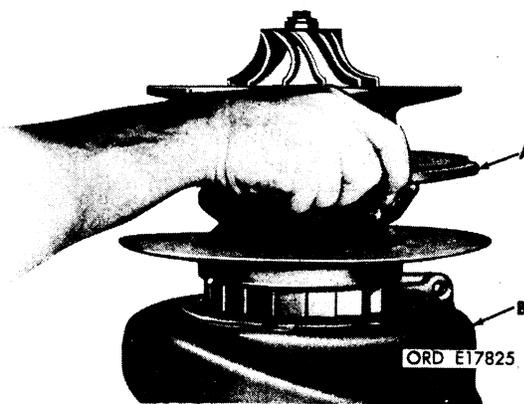


FIGURE 20. REMOVING BEARING HOUSING ASSEMBLY AND RELATED PARTS - TURBOCHARGERS 7748900 AND 10935279.

**Caution:** Immediately after removing the bearing housing assembly place it on the compressor wheel disassembly support - 10899152, as shown in figure 23, to eliminate the possibility of damaging compressor wheel blades.

**b. Turbochargers 10912638 and 53591-C-139552.** Refer to figure 21.

- (1) Remove compressor wheel lock nut as instructed in paragraph 22a(1).
- (2) Remove clamp nut (A) and position clamp (B) to center of bearing housing being careful not to move bearing housing assembly.
- (3) Scribe alinement marks (C) on turbine housing (D) and bearing housing (E) to ensure correct positioning during assembly.
- (4) Lift bearing housing (E) and related parts from turbine housing (D).

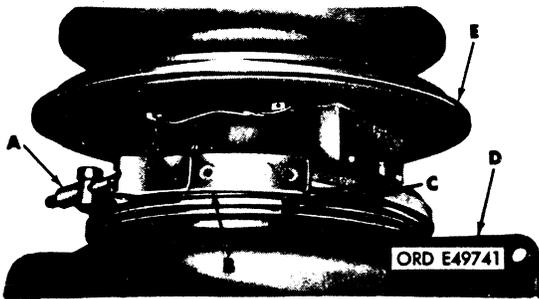


FIGURE 21. REMOVING BEARING HOUSING ASSEMBLY AND RELATED PARTS - TURBOCHARGERS 10912638 AND 53591-C-139552.

**Caution:** Immediately after removing the bearing housing assembly place it on the compressor wheel disassembly support - 10899152, as shown in figure 23, to eliminate the possibility of damaging compressor wheel blades.

**23. Removing Compressor Wheel and Shaft and Turbine Wheel**

a. Turbocharger 7748900, refer to figure 22. Check alinement marks on shaft and turbine wheel and compressor wheel. If the marks are

not visible, proceed with subparagraph b(1), below, and then make new marks before proceeding with any further disassembly.

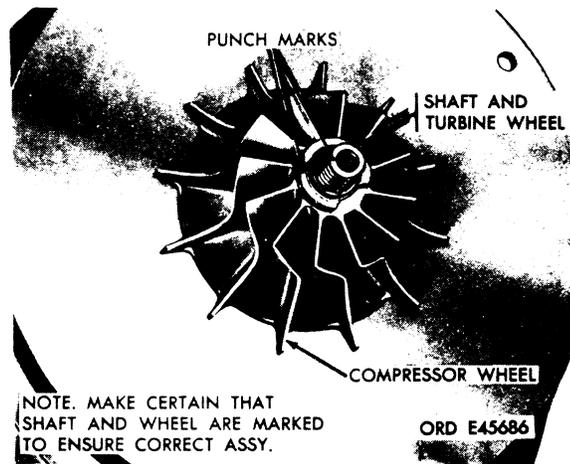


FIGURE 22. CHECKING ALINEMENT MARKS ON SHAFT AND TURBINE WHEEL AND COMPRESSOR WHEEL - TURBOCHARGER 7748900.

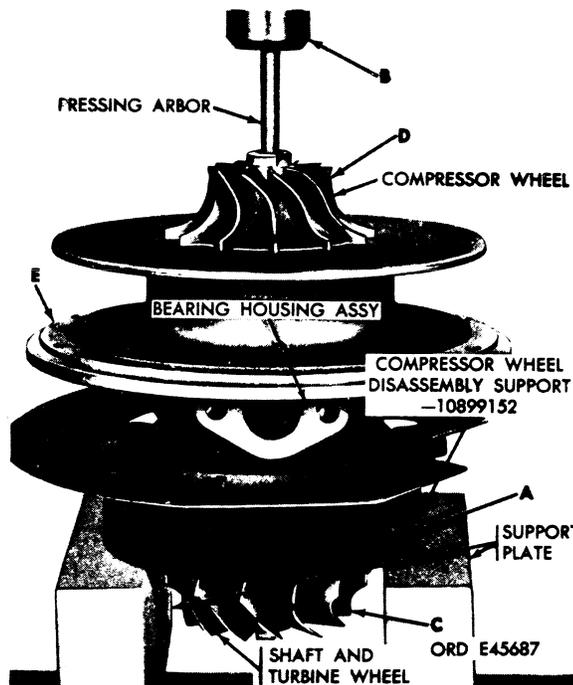


FIGURE 23. PRESSING SHAFT AND TURBINE WHEEL OUT OF COMPRESSOR WHEEL AND BEARING HOUSING.

b. Refer to figure 23.

- (1) Mount the turbine side of bearing housing on compressor wheel disassembly support - 10899152 (A) and support plates.
- (2) Press shaft and turbine wheel (C) out of compressor wheel thrust collar assembly and bearing housing assembly using an arbor press (B).

**Caution:** Hold hand under shaft and turbine wheel when pressing out to prevent shaft and turbine wheel from falling.

- (3) Remove shaft and turbine wheel (C).
- (4) Remove compressor wheel (D) and shims from behind wheel. Note thickness of shims and record for use during assembly.
- (5) Remove bearing housing (E) from arbor press and disassembly support - 10899152.

bor press and disassembly support - 10899152.

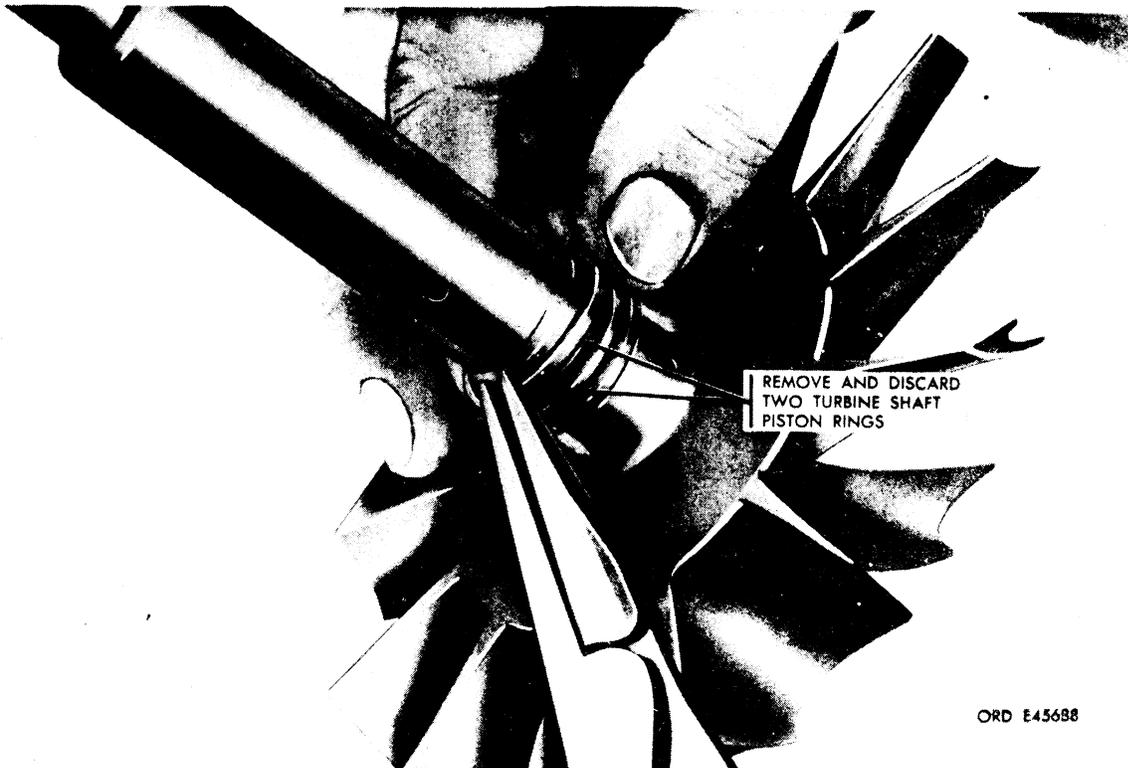
**Note.** On turbocharger 774-8900, compressor wheel and shaft and turbine wheel form a balanced unit and must be maintained as a matched set.

- (6) Remove clamp from bearing housing on turbochargers 10912638 and 53591-C-139552.

#### 24. Removing Shaft and Turbine Wheel Piston Rings

Remove piston rings from shaft and turbine wheel using snapping pliers. Refer to figure 24.

**Note.** After all disassembly has been performed relating to the compressor wheel and shaft and turbine wheel so that these parts can be safely stored to prevent damaging their blades, the turbine housing should be removed from the vise.



ORD E45688

FIGURE 24. REMOVING PISTON RINGS FROM SHAFT AND TURBINE WHEEL.

**25. Removing Compressor Housing Assembly or Compressor Back Plate**

a. Removing Compressor Housing and Thrust Collar Assembly - Turbochargers 7748900 and 10935279.

- (1) Refer to figure 25. Remove four socket-head cap screws, lock washers, and flat washers (A) attaching compressor housing assembly to bearing housing assembly. Separate compressor housing (B) from bearing housing assembly.
- (2) Refer to figure 26. Remove flat thrust washer (A), thrust collar assembly (B), and spring washer (C).

**Note.** On turbocharger 774-8900, the thrust collar assembly is an inseparable unit; whereas, on turbocharger 10935279, it consists of three separate parts. Refer to figure 26.

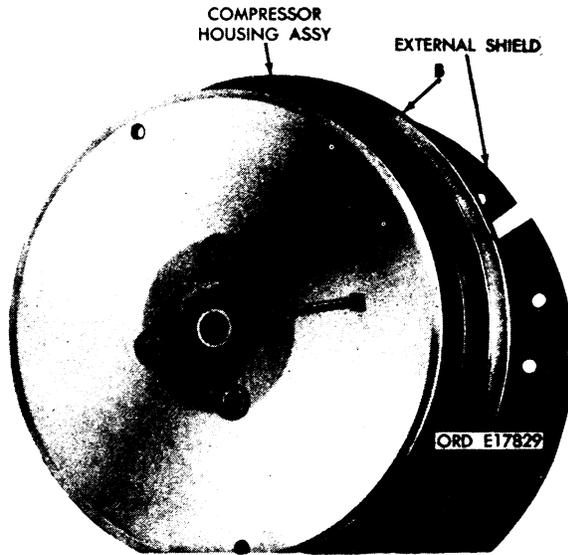


FIGURE 25. REMOVING COMPRESSOR HOUSING ASSEMBLY - TURBOCHARGERS 7748900 AND 10935279.

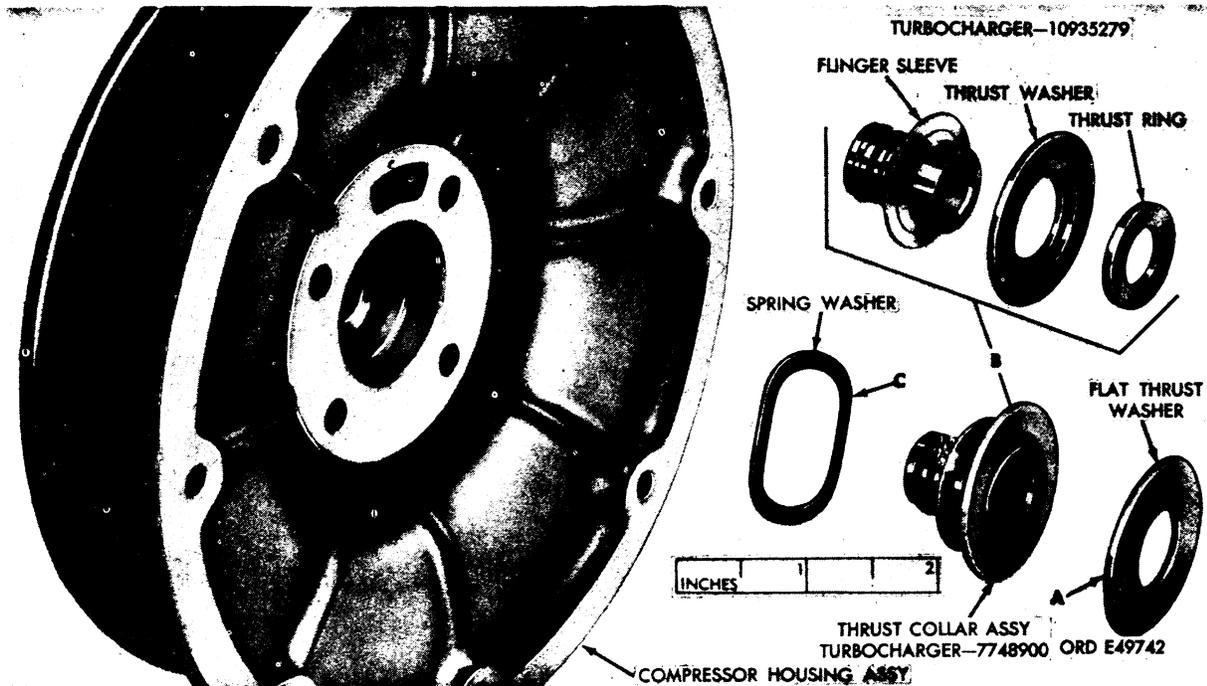
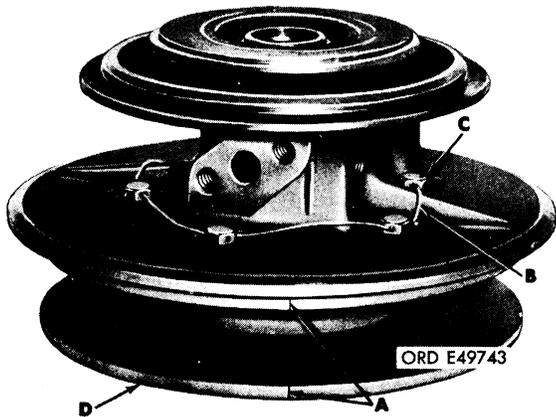


FIGURE 26. REMOVING THRUST COLLAR ASSEMBLY AND RELATED PARTS - TURBOCHARGERS 7748900 AND 10935279.

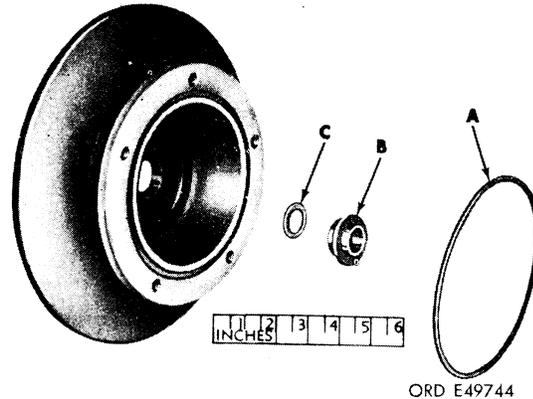
**b. Remove Compressor Back Plate Assembly - Turbochargers 10912638 and 53591-C-139552.**

- (1) Turbocharger 53591-C-139552. Refer to figure 27. Scribe alignment marks (A) on compressor back plate and bearing housing to ensure correct positioning during assembly. Remove lockwire (B) from compressor back plate cap screws (C) and remove five cap screws and sealing washers (C). Discard sealing washers and lockwire. Remove compressor back plate (D).



**FIGURE 27. REMOVING COMPRESSOR BACK PLATE ASSEMBLY - TURBOCHARGERS 10912638 AND 53591-C-139552.**

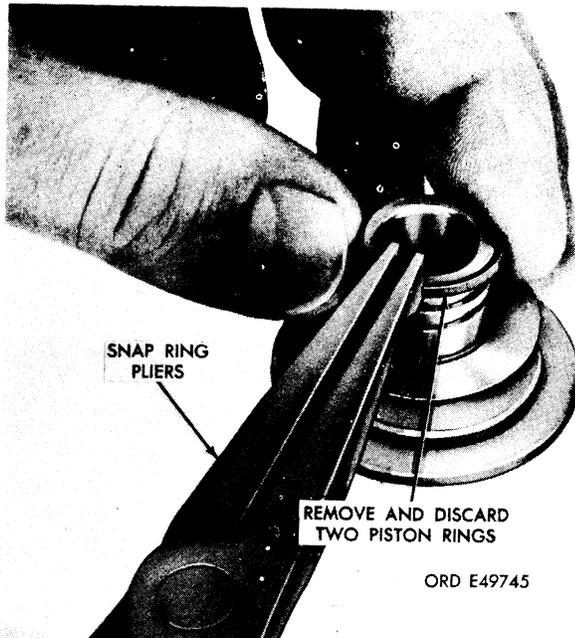
- (2) Turbocharger 10912638. The procedure for removing the compressor back plate assembly for this unit is the same as in subparagraph b(1), above, except that this unit utilizes four cap screws and two lock plates in place of the five cap screws and sealing washers, and the lockwire. Straighten the lock plate tabs and then remove the cap screws and lock plates to remove the back plate.
- (3) Turbochargers 10912638 and 53591-C-139552. Refer to figure 28. Remove compressor housing packing (A), flinger sleeve (B), and shims (C).



**FIGURE 28. REMOVING FLINGER SLEEVE ASSEMBLY AND ASSOCIATED PARTS FROM COMPRESSOR BACK PLATE - TURBOCHARGERS 10912638 AND 53591-C-139552.**

**26. Removing Thrust Collar or Flinger Sleeve Piston Rings**

Remove piston rings from thrust collar or flinger sleeve using snap ring pliers. Refer to figure 29.



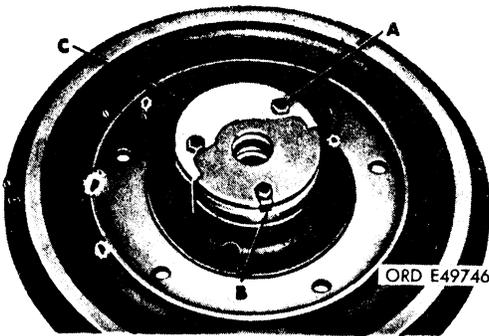
**FIGURE 29. REMOVING PISTON RINGS.**

**27. Removing Front and Rear Oil Retainers and Associated Parts**

Remove the front and rear oil retainers and associated parts on turbochargers 10912638 and 53591-C-139552.

**Note.** Turbochargers 7748900 and 1093-5279 do not have oil retainers.

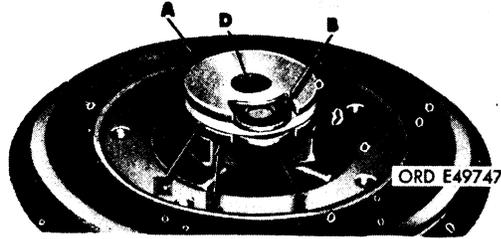
a. Refer to figure 30. Straighten tabs securing three capscrews (A) and remove screws. Remove lock plate (B) and oil deflector (C).



**FIGURE 30. REMOVING OIL DEFLECTOR - TURBOCHARGERS 10912638 AND 53591-C-139552.**

b. Refer to figure 31. Remove front oil retainer (A), thrust ring (B), thrust bearing

(C), spacer sleeve (D), thrust ring (E), and rear oil retainer (F).

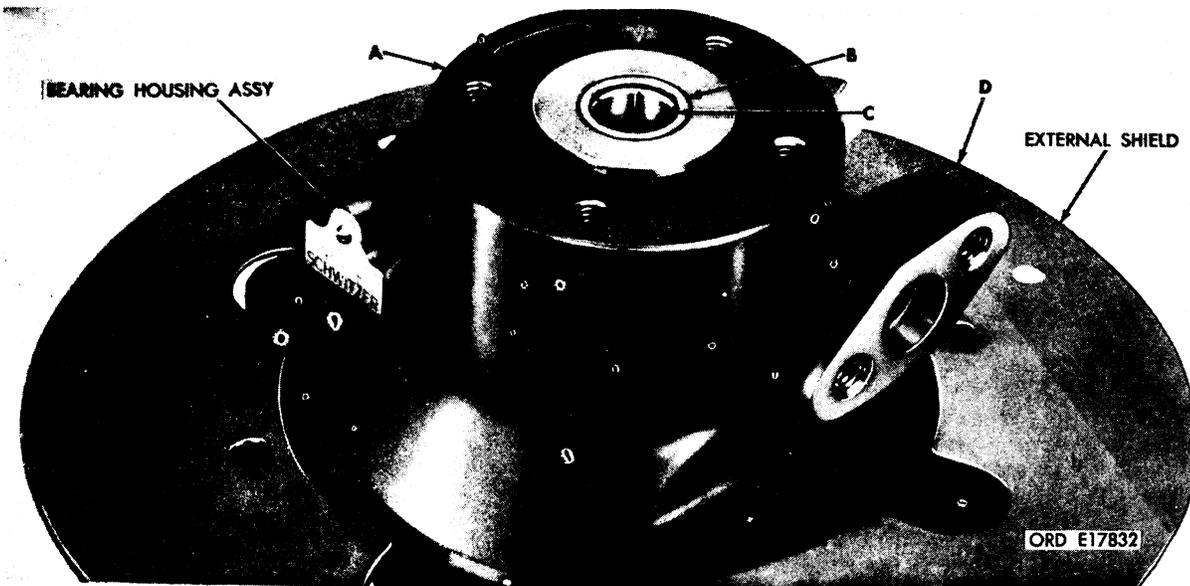


**FIGURE 31. REMOVING FRONT AND REAR OIL RETAINERS AND ASSOCIATED PARTS - TURBOCHARGERS 10912638 AND 53591-C-139552.**

**28. Removing Rotor Shaft Sleeve Bearings and Associated Parts—Turbochargers 7748900 and 10935279**

a. Turbochargers 7748900 and 10935279. Refer to figure 32.

- (1) Remove and discard compressor housing gasket (A).
- (2) Remove sleeve bearing thrust washer (B) and sleeve bearing (C).
- (3) Remove external shield (D).



**FIGURE 32. REMOVING OR INSTALLING COMPRESSOR HOUSING GASKET, THRUST WASHER, SLEEVE BEARING, AND EXTERNAL SHIELD - TURBOCHARGERS 7748900 AND 10935279.**

b. Turbocharger 7748900. Refer to figure 33.

- (1) Remove retaining ring (A) from compressor end of bearing housing assembly using retaining ring pliers - 10935598.
- (2) Remove retaining ring (B) from turbine end of bearing housing assembly using retaining ring pliers - 10935598 and then remove thrust washer (C) and sleeve bearing (D). Using the same pliers remove the last retaining ring (E).

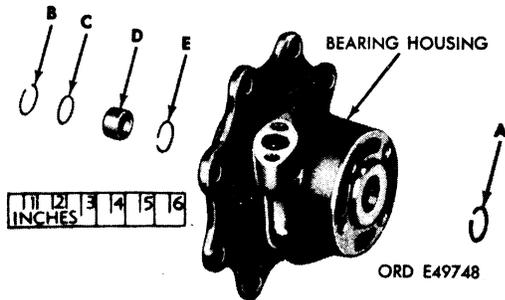


FIGURE 33. REMOVING OR INSTALLING RETAINING RINGS, SLEEVE BEARING, AND THRUST WASHER - TURBOCHARGER 7748900.

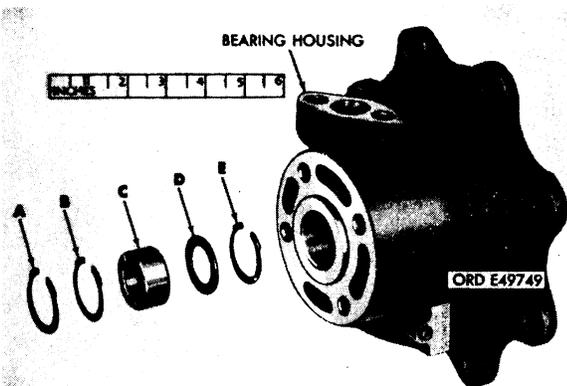


FIGURE 34. REMOVING OR INSTALLING RETAINING RINGS, SLEEVE BEARING, AND THRUST WASHER - TURBOCHARGER 10935279.

c. Turbocharger 10935279. Refer to figure 34.

- (1) Remove retaining rings (A and B) using retaining ring pliers - 10935598

and then remove sleeve bearing (C) and thrust washer (D).

- (2) Using the same pliers, remove the last retaining ring (E).

**29. Removing Rotor Shaft Sleeve Bearings and Associated Parts—Turbochargers 10912638 and 53591-C-139552**

a. Refer to figure 35. Remove rotor shaft sleeve bearing (A). Remove retaining ring (B) using bearing retaining ring pliers - 10935598.

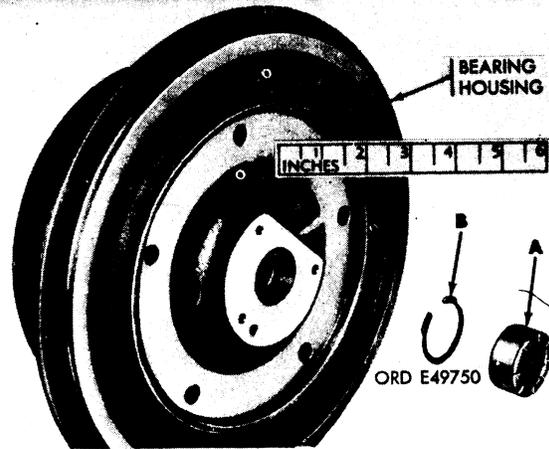


FIGURE 35. REMOVING OR INSTALLING COMPRESSOR END SLEEVE BEARING AND RETAINING RING - TURBOCHARGERS 10912638 AND 53591-C-139552.

b. Refer to figure 36. Remove retaining ring (A), rotor shaft sleeve bearing (B), bearing thrust washer (C), and retaining ring (D). Use pliers - 10935598 to remove retaining rings (A and D).

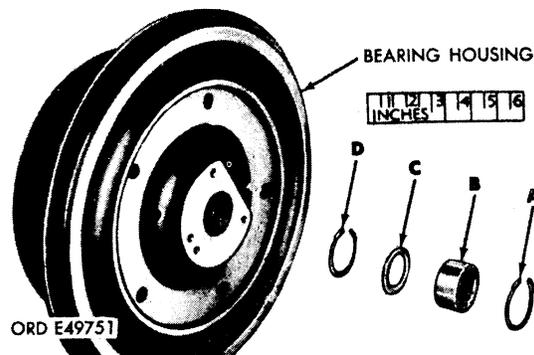


FIGURE 36. REMOVING OR INSTALLING TURBINE END SLEEVE BEARING, THRUST WASHER, AND RETAINING RINGS - TURBOCHARGERS 10912638 AND 53591-C-139552.

### 30. Removing Nozzle Ring

Remove nozzle ring from bearing housing as shown in figure 37 for turbochargers 7748900 and 10935279. If ring is tight on housing, insert a sharp edge blade under the ring flange. Tap blade lightly, going completely around ring, until gap is sufficient to receive screwdrivers. Insert two screwdrivers on opposite sides of ring and pry upwards against flange until able to remove the ring. On turbocharger 7748900, the nozzle ring is not piloted on the bearing housing and is to be removed from the turbine housing.

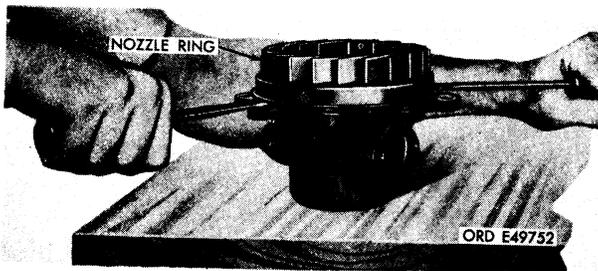


FIGURE 37. REMOVING NOZZLE RING.

**Note.** Turbocharger 10912638, is not equipped with a nozzle ring.

### 31. Removing Retaining Ring, Nozzle Back Plate, and Internal Shield

a. Remove retaining ring, nozzle back plate, and internal shield - turbochargers 7748900 and 10935279. Refer to figure 38.

- (1) Remove retaining ring (A) using snap ring pliers - 10935598.
- (2) Remove nozzle back plate (B).
- (3) Remove internal shield (C) on turbocharger 7748900 only.

b. Remove retaining ring and turbine back plate - turbochargers 10912638 and 53591-C-139552. Refer to figure 39.

- (1) Remove retaining ring (A) using snap ring pliers - 10935598.
- (2) Remove turbine back plate (B).

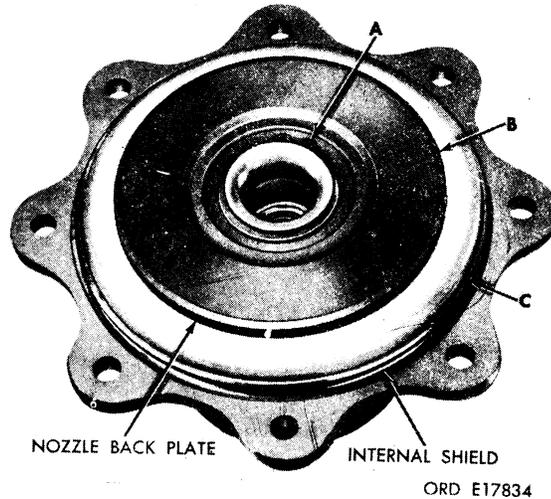


FIGURE 38. REMOVING OR INSTALLING RETAINING RING, NOZZLE BACK PLATE, AND INTERNAL SHIELD - TURBOCHARGERS 7748900 AND 10935279.

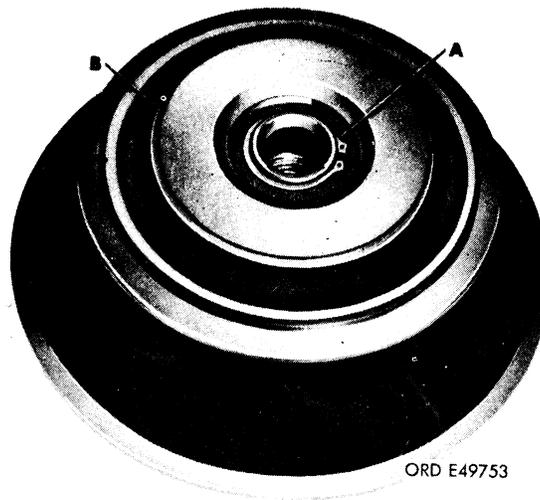


FIGURE 39. REMOVING OR INSTALLING RETAINING RING AND TURBINE BACK PLATE - TURBOCHARGERS 10912638 AND 53591-C-139552.

### Section III. CLEANING, INSPECTION, AND REPAIR

#### 32. Cleaning

After disassembly and before inspection, all parts must be thoroughly cleaned and dried by cleaning procedures used at the unit performing the repair operations. Clean all metal parts with volatile-mineral-spirits paint thinner or dry-cleaning solvent. Refer to TM 9-247 for other related materials.

**Note.** Never use a caustic solution, wire brush, or steel blade scraper. Use bristle brush or plastic scraper only.

#### 33. Inspection and Repair

**a. General.** All parts must be thoroughly examined and inspected to determine if they are suitable for rebuild of the assembly or if they must be discarded and new parts substituted. Some types of wear or damage may be detected by visual inspection and other types require the use of suitable measuring instruments. All parts must meet the repair and rebuild standards set up in paragraphs 54 through 66.

##### b. Compressor Cover.

- (1) Carefully inspect compressor cover for cracks, distorted flange, and damaged mating surfaces.
- (2) When compressor cover shows signs of distorted mating surfaces of flange, cover must be replaced. Slight nicks on mating surfaces can be removed using a fine mill file.

##### c. Compressor Extension.

- (1) Inspect compressor extension assembly for cracks, broken vanes, and loose dowel pins. Make sure preformed packing fits properly in groove and that retaining groove is not damaged.
- (2) Nicks or slight scratches on mating surfaces of compressor extension can be removed using a fine mill file or crocus cloth. Replace dowel pins that are damaged.
- (3) If dowel pin holes in extension are oversize and pins fit loosely, replace

compressor extension assembly.

##### d. Compressor Wheel.

- (1) Inspect compressor wheel for bent, cracked, or missing blades. It is important to check closely for cracked blades. Cracked blades will break during operation and cause severe damage to the compressor extension and housing.
- (2) Check shaft bore in compressor wheel against limits specified in the repair and rebuild standards (par. 55). If the compressor wheel, on turbocharger 7748900, is damaged, it will be necessary to replace the compressor wheel and the shaft and turbine wheel as a unit because they are only available in a balanced assembly.

##### e. Compressor Housing Assembly or Back Plate.

- (1) Inspect the compressor housing or back plate for cracks and damaged mating surfaces. Inspect face behind compressor wheel for excessive wear or scoring. Check bore of compressor back plate against limits specified in repair and rebuild standards (par. 63). Check bore of insert in compressor housing against limits specified in repair and rebuild standards (par. 54).
- (2) Replace compressor housing assembly or back plate when piston ring bore surfaces are scored or not within specified limits.

**Note.** Never attempt to weld a cracked or damaged compressor housing or back plate as this may distort the mating surfaces and cause the turbocharger to malfunction when assembled. When cracks or distortions are evident, replace compressor housing or back plate.

- (3) Remove slight scratches and scoring from face of compressor housing or back plate using crocus cloth. Re-

move all raised metal from compressor cover gasket surface and compressor housing gasket surface.

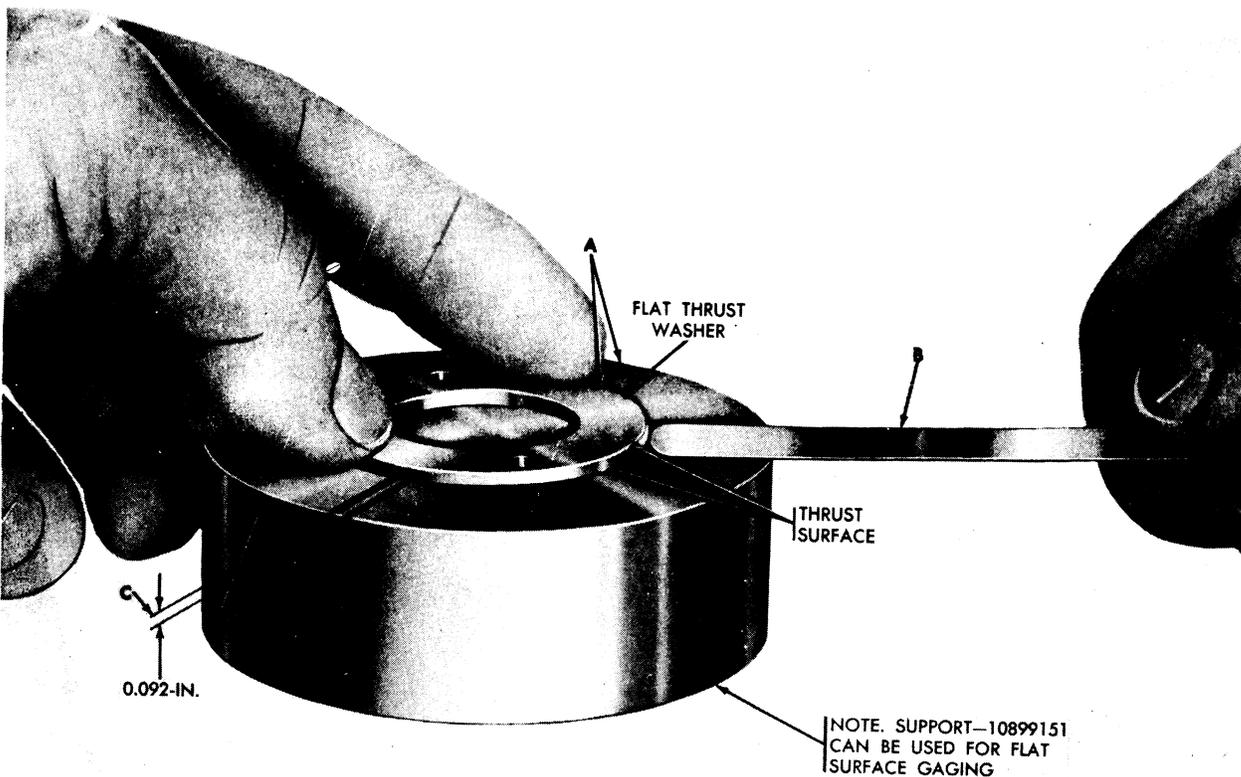
- (4) When the insert in the compressor housing of turbochargers 7748900 and 10935279, does not meet specification indicated in repair and rebuild standards (par. 54), replace the compressor housing.

f. Flat Thrust Washer - Turbochargers 7748900 and 10935279. (Refer to figure 40.)

- (1) Inspect flat thrust washer for scored surfaces and distorted condition. Check flat thrust washer against limits specified in repair and rebuild standards (par. 57). Examine thrust faces for scores or deep scratches. Check thrust washer for distortion.

- (a) Place flat thrust washer (A) on a flat machined surface.
- (b) Attempt to insert a 0.002-inch feeler gage (B) between thrust surface of thrust washer and flat machined surface. Gage should not enter between washer and flat surface when washer is pressed lightly against the flat surface.
- (c) Measure flat thrust washer with a micrometer. Thickness should not be less than 0.092-inch and be parallel within 0.002-inch (C).

- (2) The flat thrust washer must be replaced when found unserviceable. Slight scratches and scores can be removed by using crocus cloth. Thrust washer must conform to tolerances shown in figure 40.



ORD E45692

FIGURE 40. CHECKING FLAT THRUST WASHER FOR DISTORTION AND PROPER THICKNESS - TURBOCHARGERS 7748900 AND 10935279.

g. Spacer Sleeve, Thrust Bearing, and Thrust Rings - Turbochargers 10912638 and 53591-C-139552.

- (1) Inspect the thrust bearing and thrust rings for scored or scratched surfaces. Check spacer sleeve bore diameter and length against limits specified in repair and rebuild standards (par. 61). Check thrust bearing length between bearing surfaces against limits specified in repair and rebuild standards (par. 62). Check thrust ring bore diameters and thicknesses against limits specified in repair and rebuild standards (par. 60). Replace spacer sleeve, thrust bearing, or thrust rings when not within specifications.
- (2) Replace thrust bearing or thrust rings if there are deep scores or scratches. Slight scratches can be removed from thrust rings by using crocus cloth.

h. Thrust Collar Assembly - Turbocharger 748900.

- (1) Inspect thrust collar assembly for worn or scored thrust surfaces. Inspect outside diameter in ring groove area for burned spots or evidence of rubbing against bore in compressor housing. If so damaged, replace thrust collar. Make sure thrust surfaces on flanged thrust washer and thrust collar are smooth. Slight scratches are permissible. Check collar assembly against limits specified in repair and rebuild standards (par. 58).
- (a) Check thickness of thrust washer against limits specified in repair and rebuild standards (par. 58). Check this dimension at several positions around washer. The thrust surface in the cupped portion of the washer cannot be measured unless washer is removed. Disassembly of the thrust collar assembly is not recommended. When thrust surface in cupped portion of washer appears to be worn, replace the assembly.

(b) Check piston ring grooves for wear. A thrust collar assembly having worn piston ring grooves must be replaced.

- (2) Check shaft bore in thrust collar against limits specified in repair and rebuild standards (par. 58). Replace assembly when bore size is not within specifications.

i. Flinger Sleeve - Turbochargers 1091-2638 and 53591-C-139552.

- (1) Inspect flinger sleeve for scored or scratched surfaces. Inspect outside diameter in ring groove area for burned spots or evidence of rubbing against bore in compressor housing. If so damaged, replace thrust collar. Slight scratches are permissible. Replace sleeve if grooves are damaged.
- (2) Check shaft bore in flinger sleeve against limits specified in repair and rebuild standards (par. 63). Replace flinger sleeve when bore size is not within specifications.

j. Sleeve Bearings and Thrust Washers.

- (1) Inspect rotor shaft sleeve bearings and sleeve bearing thrust washers for scratches and worn surfaces. When sleeve bearings and thrust washers show evidence of wear, they must be replaced. Check sleeve bearing bore diameters against limits specified in repair and rebuild standards (par. 56 for turbochargers 7748900 and 10935279, or par. 66 for turbochargers 10912638 and 53591-C-139552). Check thrust washers against limits specified in repair and rebuild standards (par. 59 for turbochargers 7748900 and 10935279, par. 64 for turbocharger 53591-C-139552, or par. 65 for turbocharger 10912638).
- (2) Replace sleeve bearing and thrust washers if inspection shows excessive wear or they do not meet specifications of the repair and rebuild

standards. Slight scratches can be removed from thrust washers using crocus cloth.

**k. Bearing Housing.**

- (1) Inspect bearing housing for cracks and damaged or scored bore. Check bore in housing against limits specified in repair and rebuild standards (par. 56 for turbochargers 7748900 and 10935279, or par. 66 for turbochargers 10912638 and 53591-C-139552). Piston ring bore in bearing housing must not exceed 0.877-inch. Replace bearing housing if damaged.
- (2) Remove all raised metal on machined surfaces using a fine mill file. Do not attempt welding a cracked housing. When cracked, replace housing.

**l. Nozzle Ring.**

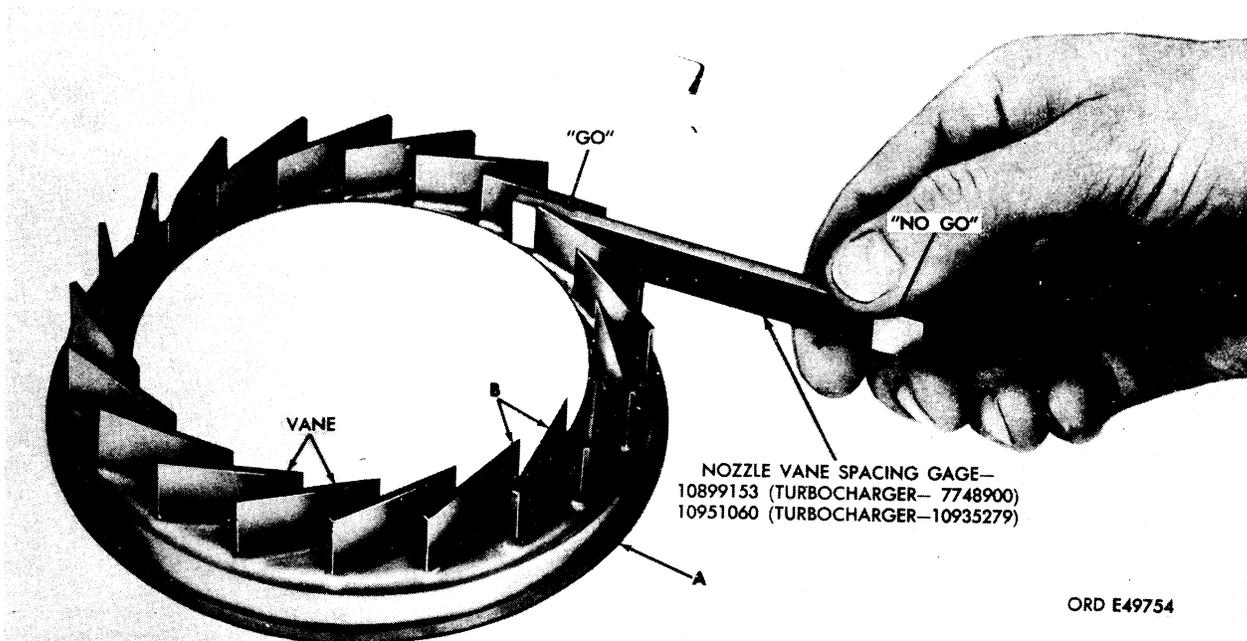
- (1) Inspect nozzle ring for distortion and broken weld joints. Make sure vanes are not bent or out of alignment with each other. Check spacing of nozzle

ring vanes on turbochargers 7748900 and 10935279. Refer to figure 41.

- (a) Position nozzle ring (A) on a flat surface.
- (b) Check spacing of vanes (B). Use nozzle vane spacing gage - 1089-9153 on turbocharger 7748900. Use nozzle vane spacing gage - 10951060 on turbocharger 1093-5279. The "no go" end of gage should not enter space between vanes. The "go" end of gage should enter space.
- (c) On turbochargers 7748900 and 10935279, correct slight variation of spacing using pliers. Straightening vanes is not recommended when severely bent.

**Note.** Nozzle vanes on turbocharger 53591-C-139552, are cast and cannot be straightened.

- (2) When the vanes are severely bent or damaged, replace nozzle ring.



ORD E49754

FIGURE 41. CHECKING SPACING OF NOZZLE RING VANES - TURBOCHARGERS 7748900 AND 10935279.

m. Shaft and Turbine Wheel.

**Note.** On turbocharger 7748900, the shaft and turbine wheel and the compressor wheel form a balanced assembly. The complete assembly must be replaced if either part requires replacement.

- (1) Inspect shaft and turbine wheel for broken, bent, or missing blades. Repairs are not recommended on shaft and turbine wheel. Therefore, if any broken, bent, or missing blades are found, the shaft and turbine wheel should be replaced. Inspect piston ring groove walls for scoring. Minor scratches are acceptable. Inspect the piston ring grooves for wear.
- (2) Check diameter of shaft against limits specified in repair and rebuild standards (par. 55 for turbochargers 7748900 and 10935279, or par. 66 for turbochargers 10912638 and 53591-C-139552). Replace shaft and turbine wheel when specifications are not met.

n. Turbine Housing.

- (1) Inspect turbine housing for cracks, distorted exhaust outlet flange, and damaged mating surface. Make sure any threads are in good condition. Check interior of housing for evidence of turbine wheel blades contacting concave surface. When this condition exists, check sleeve bearings for wear as directed in paragraph 33j.
- (2) Repair any damaged threads in housing with a used tap. Remove raised metal and slight scratches on mating surface using a fine mill file. Do not attempt to weld or braze the housing. Replace housing when it cannot be repaired.

o. Internal Shield - Turbocharger 7748900.

- (1) Inspect internal shield for cracks,

distortion, or other damage. Position shield on a flat surface and inspect for warped flange. Replace shield when distorted or warped.

- (2) Slight raised metal on mating surfaces can be removed using a fine mill file. Do not weld or braze cracks. Replace internal shield when cracked.

p. Nozzle or Turbine Back Plate.

- (1) Inspect nozzle or turbine back plate for cracks, distortion, or other damage. Position back plate on a flat surface and inspect for warpage. Replace back plate when distorted or warped.

Slight raised metal on mating surfaces can be removed using a fine mill file. Do not weld or braze cracks. Replace nozzle back plate when cracked.

q. External Shield - Turbochargers 774-8900 and 10935279. Examine the external shield for bends or damage. Straighten bends as required.

r. Clamp Assembly - Turbochargers 1093-5279, 10912638, and 53591-C-139552. Inspect clamp assemblies for stripped threads and damaged "V" bands. Replace clamp assembly if any damage exists.

s. Oil Deflectors - Turbochargers 1091-2638 and 53591-C-139552. Inspect the oil deflector for cracked, broken, or mutilated locking tabs. Replace oil deflector if tabs cannot be used to lock tabs.

t. Oil Retainers - Turbochargers 10912638 and 53591-C-139552. Check mating surfaces of oil retainers for burs. Burs on these surfaces can be removed by lapping on fine emery cloth. The area adjacent to the hole on flat surface of the rear oil retainer is a bearing area. Inspect it for nicks, scratches, and burs. Minor scratches or burs can be removed by lapping this surface on crocus cloth. If surface is excessively scored or scratched, replace rear oil retainer.

## Section IV. ASSEMBLY

### 34. General

a. Assembly Instructions. Paragraphs 36 through 50 are supplemented with illustrations, figures 42 through 61, that depict only those assembly operations which cannot be accomplished by merely reversing the sequence of and procedures for disassembly. Where the assembly instructions are the reverse of the disassembly instructions, reference is made to the pertinent disassembly instructions. The sequence of disassembly instructions ((1), (2), and (3)) for each paragraph should be performed in the reverse order ((3), (2), and (1)) to accomplish the assembly procedure.

Note. Assembly procedures for all models of the turbochargers are the same unless indicated otherwise by the inclusion of their respective model numbers.

b. Cleanliness During Assembly. The turbocharger is a precision product and extreme care and cleanliness must be exercised in all phases of assembly operations to ensure satisfactory engine performance. Dirt and dust, even in minute quantities, are abrasive. After cleaning and inspection and just before each part is assembled, coat sleeve bearings, shaft journals, and all contact surfaces with engine oil (OE). This will ensure sufficient lubrication of moving parts when unit is first put into operation.

### 35. Replacement Kits

Many of the components of the turbochargers are supplied in the form of kits. These kits and their components are listed in Appendix II. Whenever a turbocharger is rebuilt, the kits should be obtained and all of the kit contents should be used.

### 36. Installing Rotor Shaft Sleeve Bearings and Associated Parts—Turbochargers 7748900 and 10935279

Refer to paragraph 28b and c and reverse the sequence of instructions to install the rotor shaft sleeve bearings, thrust washers, and retaining rings. Do not install the parts covered in paragraph 28a at this time. These parts will be installed later.

Note. When installing retaining rings, make certain flat side of each ring faces its respective bearing and that the rings are properly seated in their grooves.

### 37. Installing Rotor Shaft Sleeve Bearings and Associated Parts—Turbochargers 10912638 and 53591-C-139552

Refer to paragraph 29b and reverse the sequence of instructions to install the rotor shaft sleeve bearing, thrust washer, and retaining rings.

Note. When installing retaining rings, make certain flat side of each ring faces its respective bearing and that the rings are properly seated in their grooves.

### 38. Installing Internal Shield, Turbine and Nozzle Back Plates, and Retaining Ring

a. Install Internal Shield on Turbocharger 7748900 Only, Nozzle Back Plate and Retaining Ring on Turbochargers 7748900 and 10935279. Refer to paragraph 31a and reverse the sequence of instructions.

b. Install Turbine Back Plate and Retaining Ring on Turbochargers 10912638 and 53591-C-139552. Refer to paragraph 31b and reverse the sequence of instructions.

### 39. Installing Nozzle Ring in Turbine Housing

Install nozzle ring in the turbine housing in turbochargers 7748900, 10935279, and 53591-C-139552. Refer to figure 42.

### 40. Installing Shaft and Turbine Wheel and Piston Rings in Turbine Housing

Install the shaft and turbine wheel and piston rings in the turbine housing. The procedure is the same for all model turbochargers. Refer to figure 43 which illustrates the procedure on turbocharger, 7748900.

a. Clamp turbine housing (A) in vise.

b. Place shaft and turbine wheel (B) in turbine housing (A).

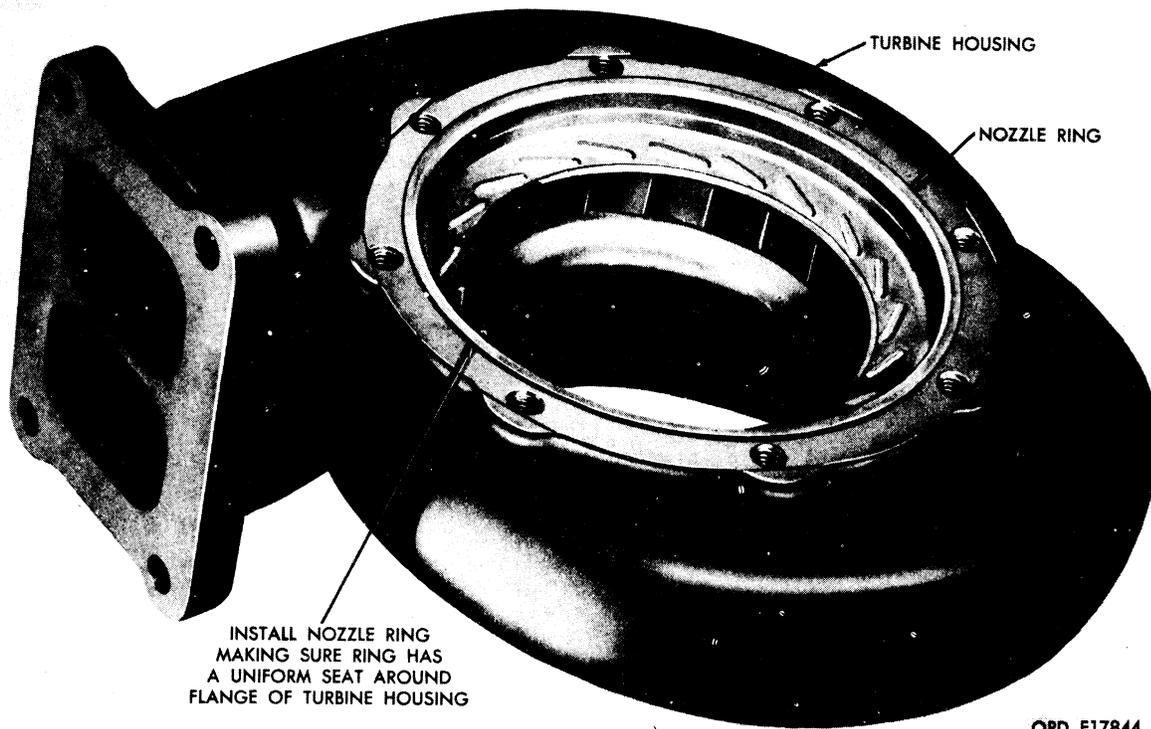


FIGURE 42. INSTALLING NOZZLE RING IN TURBINE HOUSING - TURBOCHARGERS 7748900, 10935279, AND 53591-C-139552.

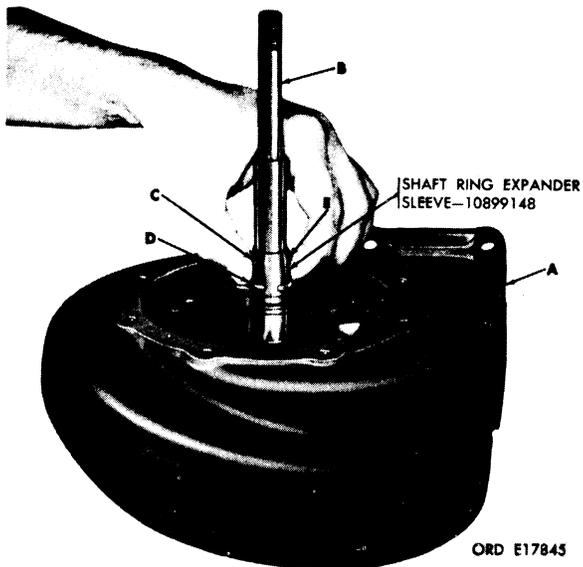


FIGURE 43. INSTALLING SHAFT AND TURBINE WHEEL AND PISTON RINGS ON TURBINE HOUSING.

c. Place shaft ring expander sleeve - 10899148 (C) over shaft.

d. Install two new piston rings (D) into grooves of shaft. Rotate rings until gaps are 180 degrees apart.

e. Remove expander sleeve - 10899148 (E).

#### 41. Installing Bearing Housing on Turbine Housing

a. Turbochargers 7748900 and 10935279.

(1) Refer to figure 44.

(a) Apply a light coat of engine oil (OE) to shaft and piston rings (A). Make certain the piston ring gaps are 180 degrees apart and they are centered on shaft and turbine wheel.

- (b) Place bearing housing (B) over shaft and position on turbine housing. Make sure alinement marks made during disassembly on turbocharger 7748900, (fig. 12) are alined.



FIGURE 44. POSITIONING BEARING HOUSING ON TURBINE HOUSING - TURBOCHARGERS 7748900 AND 10935279.

**Note.** If piston rings do not enter bearing housing easily, remove housing and recenter rings.

- (2) Refer to figure 45.

- (a) Position external shield (A) so that alinement mark agrees with mark on bearing housing made during disassembly (fig. 12).

**Note.** The cut-out portion of the external shield must clear the turbine housing mounting flange.

- (b) Secure external shield and bearing housing with four lock plates and eight cap screws (B).

**Note.** The added length of the box wrench adapter - 872-2922 will increase effective lever arm and thereby decrease the above torque value by approximately 1.5 pound-feet. Therefore, tighten cap screw under oil inlet boss to 15.5 pound-feet torque.

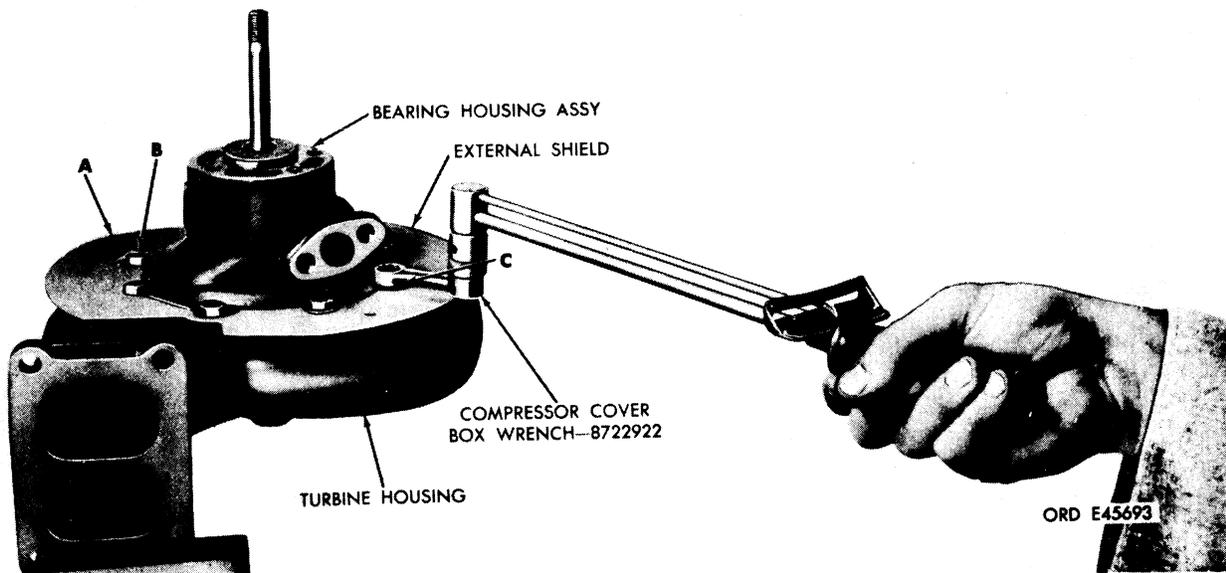


FIGURE 45. SECURING BEARING HOUSING AND EXTERNAL SHIELD ON TURBINE HOUSING - TURBOCHARGERS 7748900 AND 10935279.

- (c) Tighten cap screws to 17 pound-foot torque. Use box wrench adapter - 8722922 (C) only to tighten cap screw under oil inlet boss.
- (d) Install bearing (C, fig. 32) and thrust washer (B) in bearing housing. In some instances only one end of the bearing is grooved, if this is the case the grooved end must be facing out.

b. Turbochargers, 10912638 and 53591-C-139552.

- (1) Refer to figure 46.
  - (a) Apply a light coat of engine oil (OE) to shaft and piston rings (A). Make certain the piston ring gaps are 180 degrees apart and centered on shaft and turbine wheel.
  - (b) Position clamp (B) at the center of bearing housing (C).
  - (c) Place bearing housing (C) over shaft and position on turbine housing making certain alignment marks (D) are aligned.

Note. If piston rings do not enter bearing housing easily, remove housing and recenter rings.

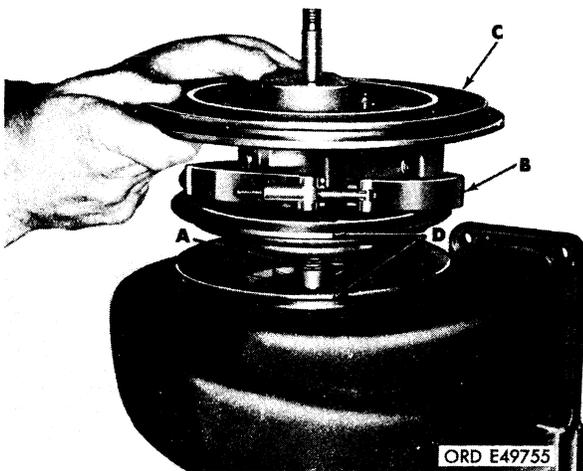


FIGURE 46. POSITIONING BEARING HOUSING ON TURBINE HOUSING - TURBOCHARGERS 10912638 AND 53591-C-139552.

- (2) Refer to figure 47. Position clamp (A) on bearing and turbine housing flanges. Using a suitable grease, lubricate back face and threads of clamp nut (B). Install nut and tighten to a torque of 10 pound-feet. Lubricate and install bearing (A, fig. 35) at compressor end of bearing housing.

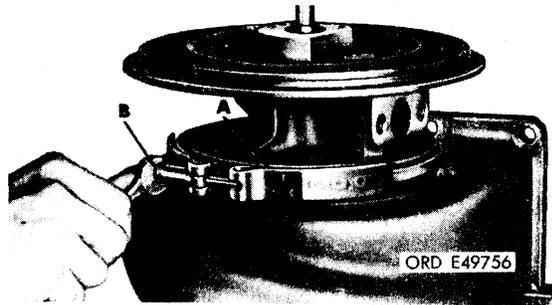


FIGURE 47. SECURING BEARING HOUSING ON TURBINE HOUSING - TURBOCHARGERS 10912638 AND 53591-C-139552.

**42. Installing Front and Rear Oil Retainers—Turbochargers 10912638 and 53591-C-139552**

Note. Turbochargers 7748900 and 1093-5279, do not have oil retainers.

- a. Refer to figure 48. Position rear oil retainer (A) on bearing housing with plain face against housing making certain the three screw holes are aligned. Place thrust ring (B) and spacer sleeve (C) over rear oil retainer. Lubricate thrust face only.



FIGURE 48. PLACING REAR OIL RETAINER, THRUST RING, AND SPACER SLEEVE OVER BEARING HOUSING - TURBOCHARGERS 10912638 AND 53591-C-139552.

b. Refer to figure 49. Position thrust bearing (A) over spacer sleeve with oil passage hole facing retainer. Place thrust ring (B) over thrust bearing. Position front oil retainer (C) over thrust ring with recessed face towards thrust bearing. Make certain the three screw holes are aligned.

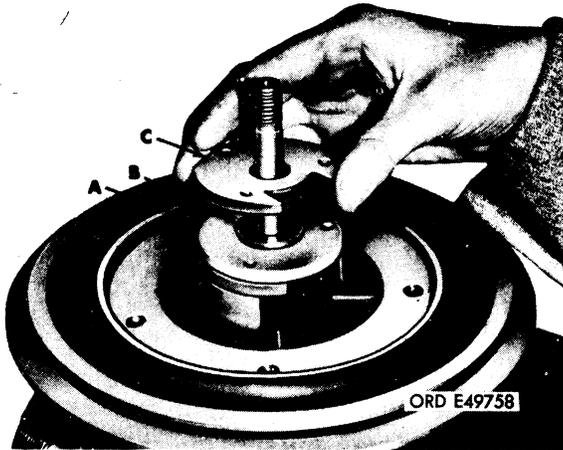


FIGURE 49. PLACING THRUST BEARING, THRUST RING, AND FRONT OIL RETAINER OVER SPACER SLEEVE - TURBOCHARGERS 10912638 AND 53591-C-139552.

**Note.** When properly positioned, cutaway portion of both retainers will be on oil drain side of bearing housing.

c. Refer to figure 50.

(1) Position oil deflector (A) over cut-

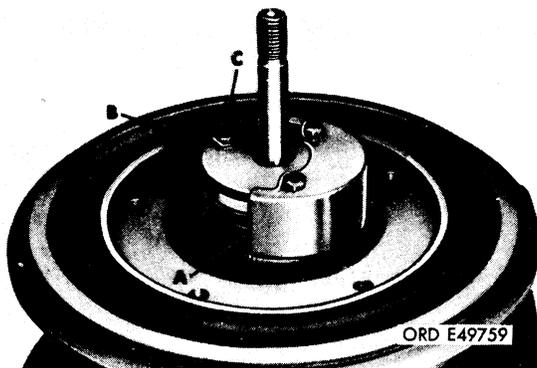


FIGURE 50. INSTALLING OIL DEFLECTOR, LOCK PLATE, AND CAP SCREWS - TURBOCHARGERS 10912638 AND 53591-C-139552.

away portion of oil retainers and align screw holes. Position lock plate (B) over remaining screw hole.

(2) Secure assembly with three cap screws (C). Torque tighten screws to five pound-feet. Bend tabs against cap screws.

#### 43. Installing Compressor Housing or Compressor Back Plate and Associated Parts

a. Install thrust collar assembly, piston rings, and compressor housing on turbochargers 7748900 and 10935279.

(1) Refer to figure 51.

(a) Install flat thrust washer (A) over shaft with machined thrust face up. Lubricate thrust face with engine oil (OE).

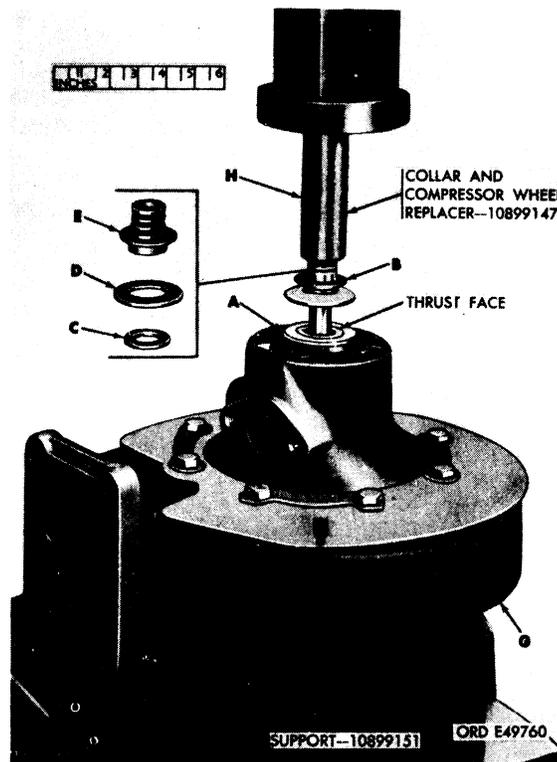


FIGURE 51. PRESSING THRUST COLLAR ASSEMBLY OR FLINGER SLEEVE ON SHAFT AND TURBINE WHEEL - TURBOCHARGERS 7748900 AND 10935279.

- (b) On turbocharger 7748900, lubricate thrust face of thrust collar assembly (B) with engine oil (OE) and place assembly with thrust flange down over shaft.
- (c) On turbocharger 10935279, place thrust ring (C) over thrust washer (A). Lubricate thrust face of thrust washer (D) and position over thrust ring with machined face down. Install flinger sleeve and shaft with piston seal ring grooved end up.
- (d) Position turbine wheel support - 10899151 (F) on arbor press.
- (e) If flinger sleeve is tight on shaft, place bearing housing assembly (G) in arbor press with square extension of shaft and turbine wheel resting on support - 1089951 (F).

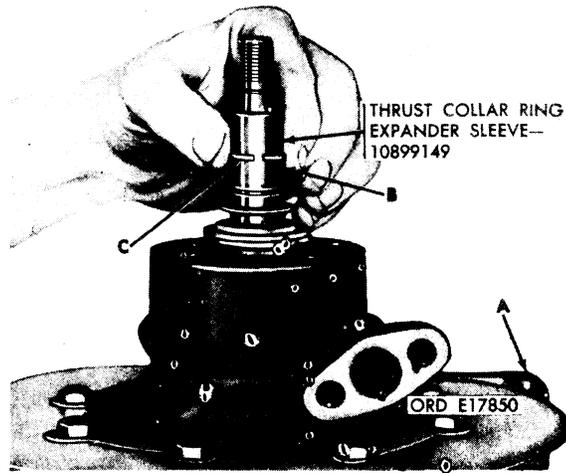


FIGURE 52. INSTALLING PISTON RINGS ON THRUST COLLAR ASSEMBLY OR FLINGER SLEEVE - TURBOCHARGERS 7748900 AND 10935279.

**Caution:** Do not press turbine wheel vanes against contour in turbine housing.

- (f) Position collar and compressor wheel replacer - 10899147 (H) over thrust collar assembly.
- (g) Press thrust collar assembly (B) for turbocharger 7748900, or flinger sleeve (E) for turbocharger 10935279, on shaft until it bottoms against shoulder on shaft.

(2) Refer to figure 52.

- (a) Clamp unit in a vise on turbine housing mounting flange (A).
- (b) Place collar ring expander sleeve - 10899149 (B) over thrust collar assembly or flinger sleeve.
- (c) Install two new thrust collar piston rings (C) into two grooves of thrust collar assembly or flinger sleeve. Rotate rings until gaps are 180 degrees apart. Lubricate rings with engine oil (OE).
- (d) Remove collar ring expander - 10899149 (B).

(3) Refer to figure 53.

- (a) Bend tabs on four lock plates securely against the heads of eight cap screws (A).
- (b) Position new compressor housing gasket (B) on mating surface of bearing housing. Make certain screw holes and oil drain passage in gasket and housing are alined.

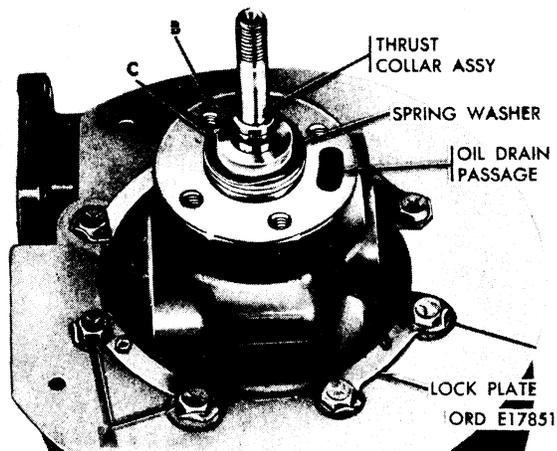


FIGURE 53. INSTALLING COMPRESSOR HOUSING GASKET AND SPRING WASHER ON THRUST COLLAR ASSEMBLY - TURBOCHARGERS 7748900 AND 10935279.

- (c) Position spring washer (C) over thrust collar assembly and against flanged thrust washer.

(4) Refer to figure 54.

- (a) Center piston rings on thrust collar and make certain ring gaps are 180 degrees apart.
- (b) Position compressor housing (A) over shaft and turbine wheel and against compressor housing gasket. Make certain scribe marks (fig. 12) are alined.

**Note.** If piston rings do not enter compressor housing easily, remove housing and re-center rings.

- (c) Secure compressor housing to bearing housing with four flat washers, lock washers, and socket-head cap screws (C). Torque tighten cap screws to 20 pound-feet using torque wrench (B) and wrench attachment socket - 8755594.

b. Install piston rings, compressor back plate preformed packing, and compressor back plate on turbochargers 10912638 and 53591-C-139552.

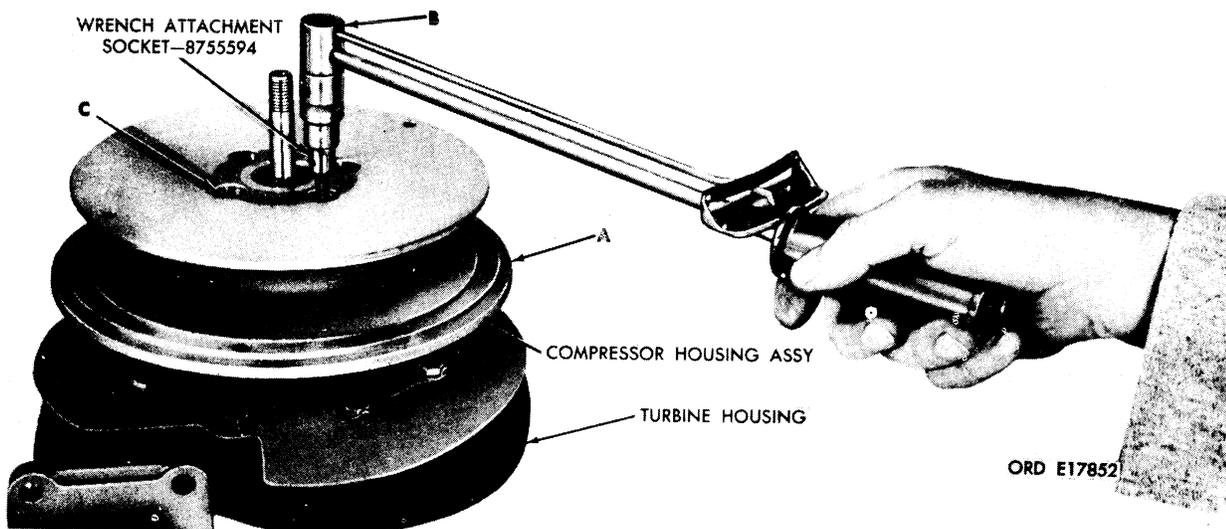


FIGURE 54. INSTALLING COMPRESSOR HOUSING ON TURBOCHARGERS 7748900 AND 10935279.

(1) Refer to figure 55.

- (a) Position flinger sleeve (A) over oil deflector with piston ring groove end up.

**Note.** If sleeve is tight on shaft, place unit in an arbor press and press sleeve on shaft as shown in figure 55. Remove tool and replace unit in vise.

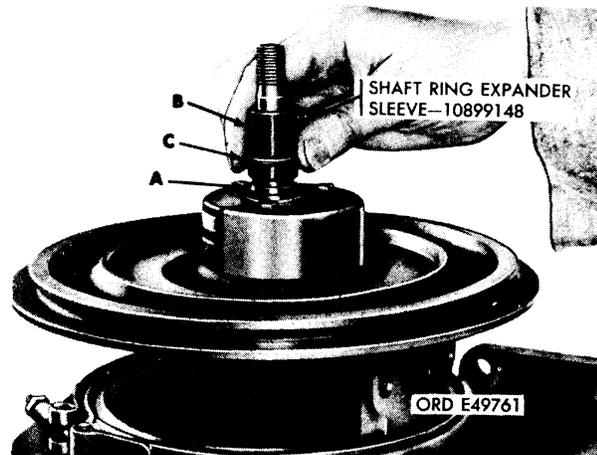


FIGURE 55. INSTALLING FLINGER SLEEVE AND PISTON RINGS - TURBOCHARGERS 10912638 AND 53591-C-139552.

- (b) Place collar ring expander sleeve - 10899147 (B) over flinger sleeve.
  - (c) Install two new piston rings (C) into groove of flinger sleeve (A). Rotate rings until gaps are 180 degrees apart. Lubricate rings with engine oil (OE).
  - (d) Remove collar ring expander sleeve (B).
- (2) Refer to figure 56.

- (a) Place packing in mating surface groove of compressor back plate (A).
- (b) Center piston rings on flinger sleeve and make certain the ring gaps are 180 degrees apart.
- (c) Position compressor back plate over shaft and turbine wheel and against bearing housing. Make certain scribe marks (B) are aligned.

**Note.** If piston rings do not enter compressor housing easily, remove back plate and recenter rings.

- (d) On turbocharger 53591-C-139552, secure compressor back plate to bearing housing with five sealing washers and cap screws (C).

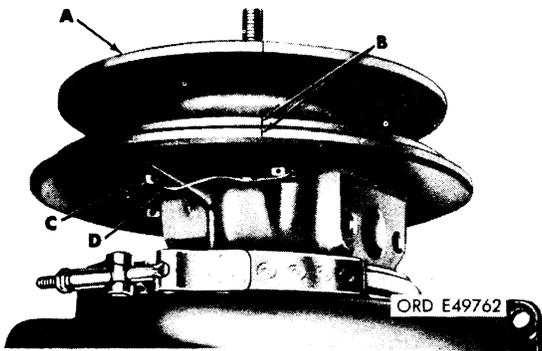


FIGURE 56. INSTALLING COMPRESSOR BACK PLATE AND PERFORMED PACKING ON BEARING HOUSING - TURBOCHARGERS 10912638 AND 53591-C-139552.

Torque tighten cap screws to 17 pound-feet and secure with locking wire (D).

- (e) On turbocharger 10912638, secure compressor housing to bearing housing with four cap screws (C) and two lock plates. Torque tighten cap screws to 17 pound-feet and secure by bending tabs against screw heads. Make certain tab is against flat side of screw head.

#### 44. Checking Shaft and Turbine Wheel End Play

Check shaft and turbine wheel end play. Refer to figure 57.

a. Position shim or shims (A) of equal thickness, removed during disassembly, over shaft and turbine wheel.

b. Install clearance checking spacer - 10899150 (B) over shaft.

c. Apply film of grease to back face and threads of compressor wheel lock nut (C). Install lock nut and tighten to a torque of 30 pound-feet. Tighten lock nut in the same manner as removed (fig. 18) using a 3/8-inch square socket to hold opposite end of shaft and turbine wheel.

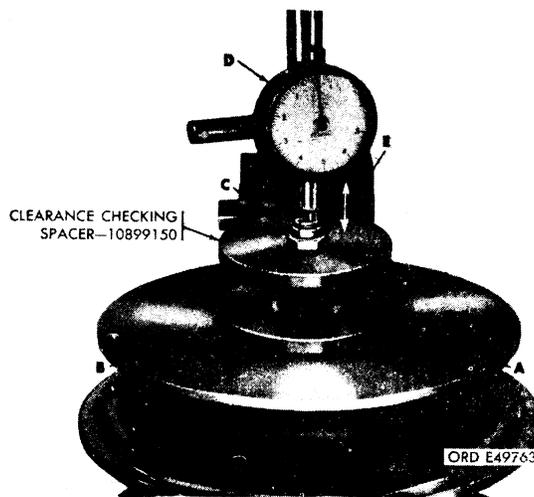


FIGURE 57. CHECKING SHAFT AND TURBINE WHEEL END PLAY.

d. Mount dial indicator (D) on compressor housing or compressor back plate and position indicator pointer against end of the shaft and turbine wheel.

e. Move shaft and turbine wheel to extreme up and down positions (E). Check total shaft end play. Total end play should be between 0.004- to 0.008-inch on turbochargers 7748900 and 10935279, and between 0.004- to 0.006-inch on turbochargers 10912638 and 53591-C-139552.

**Note.** When end play is not within above limits, disassemble turbocharger. The thrust surfaces of the thrust collar with assembled flanged thrust washer and flat thrust washer are the only means of controlling end play on turbochargers 7748900 and 10935279. The spacer sleeve, thrust ring, and thrust bearing are the only means of controlling end play on turbochargers 10912638 and 53591-C-139552. Check the above parts and any that have worn surfaces must be replaced. Reassemble the turbocharger and recheck shaft and turbine wheel end play.

**45. Checking Compressor Wheel Back Clearance**

Check compressor wheel back clearance. Refer to figure 58.

a. Check compressor wheel back clearance

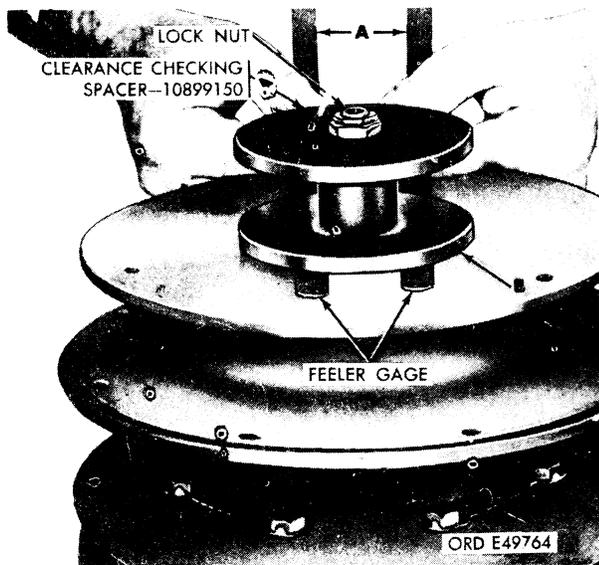


FIGURE 58. CHECKING COMPRESSOR WHEEL BACK CLEARANCE.

using feeler gages (A) as shown. Clearance should be between 0.020- to 0.022-inch. When clearance is not within specifications, add or subtract shims as necessary until desired clearance is obtained.

**Note.** Shims are available in thicknesses of 0.002-, 0.005-, and 0.010-inch for turbochargers 7748900 and 10935279, or 0.003-, 0.005-, and 0.010-inch for turbochargers 10912638 and 53591-C-139552.

b. Remove clearance checking spacer - 10899150 (B) after correct clearance has been established.

**46. Installing Compressor Wheel**

Install the compressor wheel. Refer to figure 59.

a. Apply a light coat of lubriplate to bore in compressor wheel (A). Remove all lubriplate from back face of compressor wheel.

b. Remove unit from vise and position shaft and turbine wheel of unit on support - 10899151

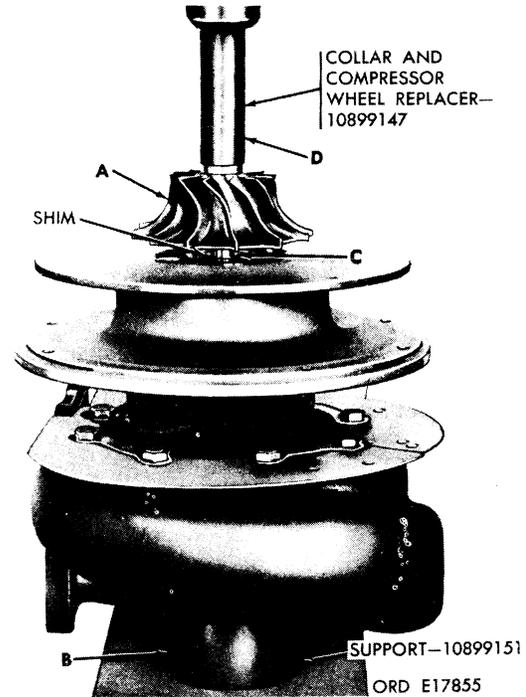


FIGURE 59. PRESSING COMPRESSOR WHEEL ON SHAFT AND TURBINE WHEEL.

(B) making certain square end of shaft is centered on support.

c. Make certain proper thickness of shim (C) is installed as directed in paragraph 45.

d. Press compressor wheel on shaft and turbine wheel using collar and compressor wheel replacer—10899147 (D) until it bottoms.

#### 47. Installing Compressor Wheel Lock Nut

Install compressor wheel lock nut. Refer to figure 60.

- a. Mount turbocharger in vise (A).
- b. Hold shaft and turbine wheel with an

eight point 3/8-inch socket (B) to prevent damage to the square end of shaft.

c. Apply a film of grease to back face and threads of compressor wheel lock nut.

d. Install compressor wheel lock nut using 3/4-inch socket wrench (C). Tighten lock nut to a torque of 30 pound-feet.

*Note.* Place a 0.020- to 0.022-inch thick feeler gage under compressor wheel blades. Rotate wheel over blades to check for bent blades. If blades are bent replace turbocharger.

#### 48. Installing Compressor Extension

Refer to paragraph 20 and reverse the sequence of instructions to install the compressor extension on turbocharger 10935279.

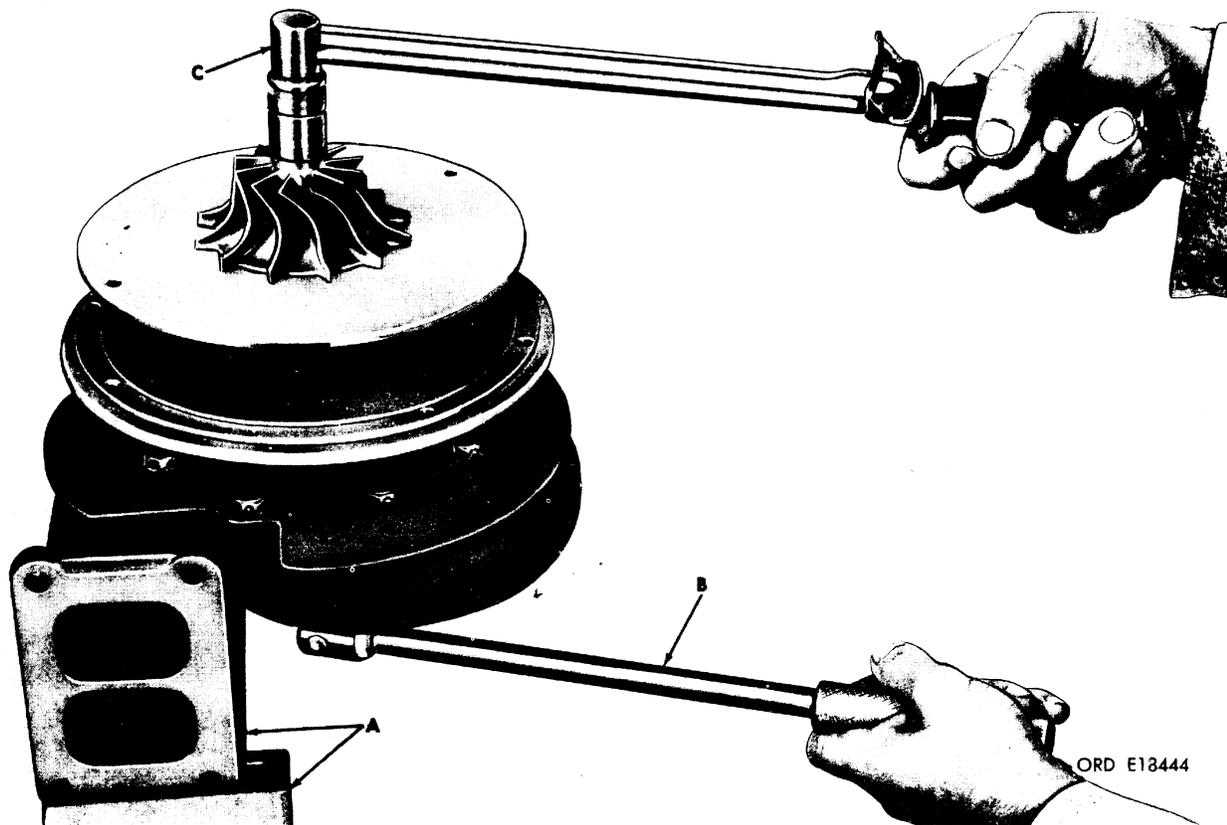


Figure 60. Tightening compressor wheel lock nut.

#### 49. Installing Compressor Cover and Associated Parts

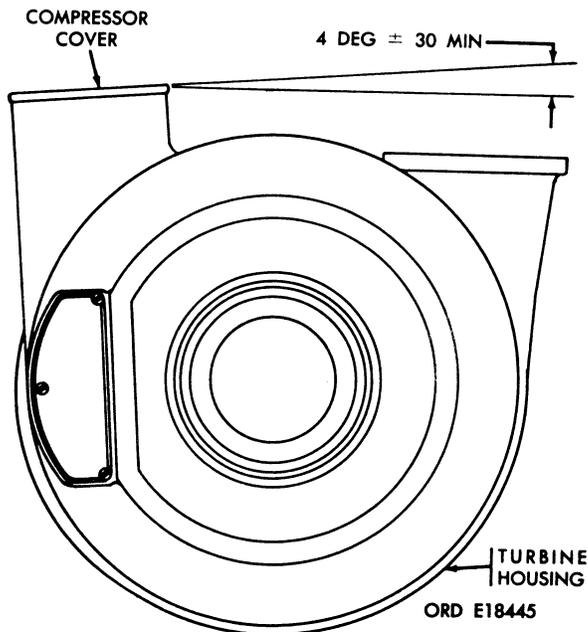


Figure 61. Correct position of compressor cover.

a. Place clamp assembly over bearing housing.

b. On turbocharger 10935279 only, install new gasket on compressor housing flange and a new preformed packing on compressor extension.

c. On turbochargers 10912638 and 53591-C-139552, install a new preformed packing in groove in bearing housing.

d. Make certain the alignment mark on cover aligns with mark on compressor housing. Refer to figure 61 for correct positioning of cover.

e. Position clamp assembly over compressor cover and bearing housing flanges.

**Caution:** If lock nut is not lubricated, torque reading will be incorrect and the lock nut could become loose in service and cause serious damage.

f. Apply a film of grease to back face and threads of clamp lock nut. Install lock nut and tighten to a torque of 10 pound-feet.

#### 50. Installing Oil Outlet Cover and Oil Inlet Adapter (Rescinded)

## Section V. TEST AND ADJUSTMENT

### 51. Test

Since the turbocharger performance depends upon engine performance, it cannot be tested unless it is installed on an engine. Therefore, testing a dismantled turbocharger will consist only of checking the shaft and turbine wheel for free rotation and making certain that shaft and turbine wheel radial movement and end play does not exceed tolerances pointed out in paragraph 12. If the turbocharger passes these tests, it shall perform satisfactorily when installed on an en-

gine.

**Caution:** Test stand operation of turbocharged engines without air cleaner or shop filter systems installed on the engine is prohibited.

The only adjustments necessary to the turbochargers are adjustments made during overhaul.

### 52. Adjustment

These adjustments are shaft and turbine wheel end play (para 44) and compressor wheel back clearance (para 45).

## Section VI. REPAIR AND REBUILD STANDARDS

### 53. General

The repair and rebuild standards included herein give the minimum, maximum, and key clearances of new or rebuilt parts. They also give wear limits which indicate that point to which a part or parts may be worn before replacement, in order to receive maximum service with minimum replacement. Normally, all parts which have not been worn beyond the dimensions shown in the "Wear limits" column or damaged

from corrosion will be approved for service. An asterisk (\*) in the "Wear limits" column indicates that the part or parts should be replaced when worn beyond the limits given in the "Sizes and fits of new parts" column. In the "Sizes and fits of new parts" column, the letter "L" indicates a loose fit (clearance) and the letter "T" indicates a tight fit (interference).

*Note.* Paragraphs 54 through 59 refer to turbocharger 1093F279, whereas paragraphs 60 through 66, refer to turbochargers 10912638 and 53591-C-139552.

Fig. No.	Ref. letter	Point of measurement	Sizes and fits	Wear limits	
				Gen. sup	Depot maint
<b>54. Compressor Housing Assembly and Bearing</b>					
79	a	Diameter of bearing housing pilot bore .....	1.6490 to 1.6500	*	*
	b	Inside diameter of bushing-type bearing .....	0.719 to 0.720	*	*
<b>55. Shaft and Turbine Wheel and Compressor Wheel</b>					
79	c	Inside diameter of compressor wheel .....	0.4996 to 0.4999	*	*
	d	Diameter of shaft at bearing surface .....	0.6862 to 0.6865	*	*
	e	Diameter of shaft at thrust collar .....	0.4997 to 0.5000	*	*
	c-e	Fit of shaft in compressor wheel .....	0.0002T to 0.0004T	*	*

Fig. No.	Ref. letter	Point of measurement	Sizes and fits	Wear limits	
				Gen. sup	Depot maint
<b>56. Bearing Housing Assembly and Bearings</b>					
<i>Turbocharger 10935279.</i>					
79	f	Outside diameter of sleeve bearing .....	1.0585 to 1.0590	1.0584	*
	g	Inside diameter of sleeve bearing .....	0.6880 to 0.6883	0.6884	*
	d-g	Fit of shaft and turbine wheel in sleeve bearings ....	0.0012L to 0.0018L	*	*
	h	Diameter of sleeve bearing bore in bearing housing ..	1.0625 to 1.0630	*	*
	f-h	Fit of sleeve in bearing housing .....	0.0035L to 0.0045L	*	*
	j	Diameter of bearing housing pilot .....	1.6475 to 1.6485	*	*
	a-j	Fit of bearing housing pilot in compressor housing ..	0.0005L to 0.0025L	*	*
<b>57. Flat Thrust Washer</b>					
79	k	Outside diameter of thrust washer .....	1.6415 to 1.6465	*	*
	a-k	Fit of thrust washer in pilot bore of compressor housing .....	0.0025L to 0.0085L	*	*
	l	Inside diameter of thrust washer .....	0.711 to 0.716	*	*
		Thickness of thrust washer .....	0.093 to 0.095	0.092	*
	d-l	Fit of thrust washer on shaft and turbine wheel .....	0.0245L to 0.0298L	*	*
<b>58. Thrust Collar Assembly</b>					

Fig. No.	Ref. letter	Point of measurement	Sizes and fits	Wear limits	
				Gen. sup	Depot maint
79	m	Inside diameter of flinger sleeve .....	0.5003 to 0.5006	*	*
	e-m	Fit of flinger sleeve on shaft and turbine wheel .....	0.0003L to 0.0009L	*	*
	n	Outside diameter of thrust collar .....	0.698 to 0.700	*	*
	p	Thickness of thrust washer .....	0.093 to 0.095	0.092	*
	a-p	Outside diameter of thrust washer .....	1.6415 to 1.6465	*	*
		Fit of thrust washer in pilot bore of compressor housing .....	0.0025L to 0.0085L	*	*

## 59. Bearing Thrust Washers and Thrust Ring

### a. Bearing Thrust Washers—Turbocharger 10935279.

79	r	Inside diameter of thrust washer .....	0.705 to 0.710	*	*
		Outside diameter of thrust washer .....	1.0585 to 1.0595	*	*
		Thickness of thrust washer .....	0.048 to 0.052	0.046	*

### b. Thrust Ring—Turbocharger 10935279.

79	q	Inner diameter of thrust ring .....	0.5001 to 0.5004	*	*
		Thickness of thrust ring .....	0.100 to 0.101	*	*

## 60. Thrust Rings

80	a	Inside diameter of thrust ring .....	0.5002 to 0.5005	*	*
	b	Thickness of thrust ring .....	0.099 to 0.100	*	*

## 61. Spacer Sleeve

80	c	Inside diameter of spacer sleeve .....	0.5002 to 0.5005	*	*
	d	Length of spacer sleeve .....	0.230 to 0.231	*	*

## 62. Thrust Bearing

80	e	Thickness between bearing surfaces of thrust bearing .....	0.225 to 0.226	*	*
----	---	--	----------------	---	---

## 63. Compressor Back Plate, Flinger Sleeve, and Compressor Wheel

80	f	Inside diameter of flinger sleeve .....	0.5003 to 0.5006	*	*
	g	Outside diameter of flinger sleeve .....	0.848 to 0.850	*	*
	h	Diameter of back plate bore .....	0.875 to 0.876	0.877	*
	g-h	Fit of flinger sleeve in bore of back plate .....	0.025 to 0.028	*	*
	j	Inside diameter of compressor wheel .....	0.4996 to 0.4999	*	*

Fig. No.	Ref. letter	Point of measurement	Sizes and fits	Wear limits	
				Gen. sup	Depot maint
<b>64. Bearing Thrust Washer</b>					
80	k	Inside diameter of thrust washer .....	0.705 to 0.710	*	*
	l	Outside diameter of thrust washer .....	1.0585 to 1.0595	*	*
	m	Thickness of thrust washer .....	0.048 to 0.052	0.046	*
<b>65. Bearing Housing Assembly and Bearings</b>					
80	n	Outside diameter of sleeve bearings .....	1.0585 to 1.0590	1.0584	*
	p	Inside diameter of sleeve bearings .....	0.6880 to 0.6883	0.6884	*
	q	Diameter of sleeve bearing bore in bearing housing ..	1.0625 to 1.0630	*	*
	n-q	Fit of sleeve bearing in bearing housing .....	0.0035L to 0.0045L	*	*
<b>66. Shaft and Turbine Wheel and Compressor Wheel</b>					
80	r	Diameter of shaft at compressor wheel, spacer sleeve, and flinger sleeve surfaces .....	0.4997 to 0.5000	*	*
	f-r	Fit of flinger sleeve on shaft and turbine wheel .....	0.0005L to 0.0009L	*	*
	j-r	Fit of shaft in compressor wheel .....	0.0002T to 0.0004T	*	*
	s	Diameter of shaft at bearing surfaces .....	0.6862 to 0.6865	*	*
	s-p	Fit of shaft and turbine wheel in sleeve bearings ..	0.0012L to 0.0018L	*	*

## CHAPTER 5 INTRODUCTION

### Section 1. GENERAL

#### 67. Scope

a. Chapters 5 and 6 contain instructions for general support and depot maintenance of the Schwitzer Model 4 LE354 (10945184) (figs. 62 and 63) and 4LE-456 (11641831) (figs. 63.1 and 63.2) Turbochargers.

The chapters contain descriptions and procedures for disassembly, inspection, repair and assembly.

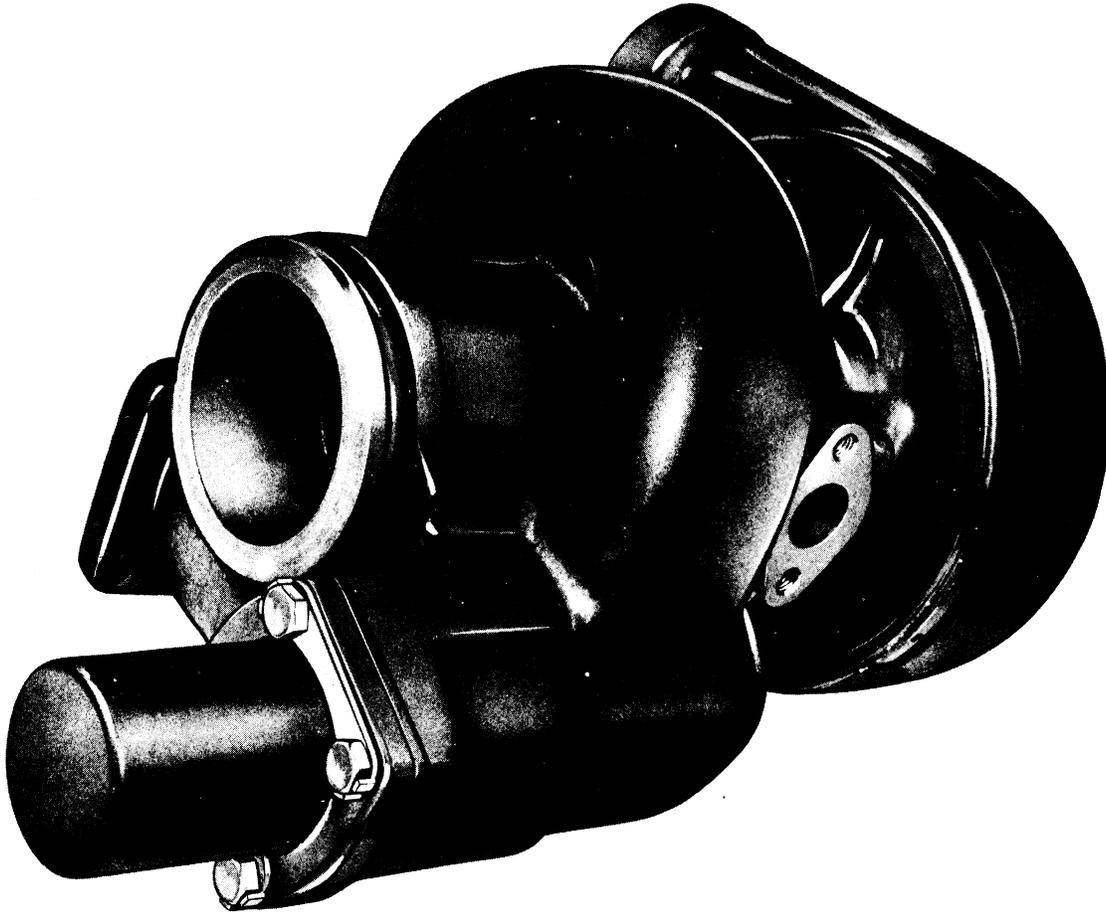
b. The procedures covered in this change will

cover only those items peculiar to the Model 4 LE series turbochargers. For complete maintenance procedures, references will be made to applicable paragraphs and/or illustrations in the basic manual. The chapters, paragraphs, and illustrations in this change follow in succession to those in the basic manual. Refer to the basic manual for Special Tools and Equipment and troubleshooting procedures.



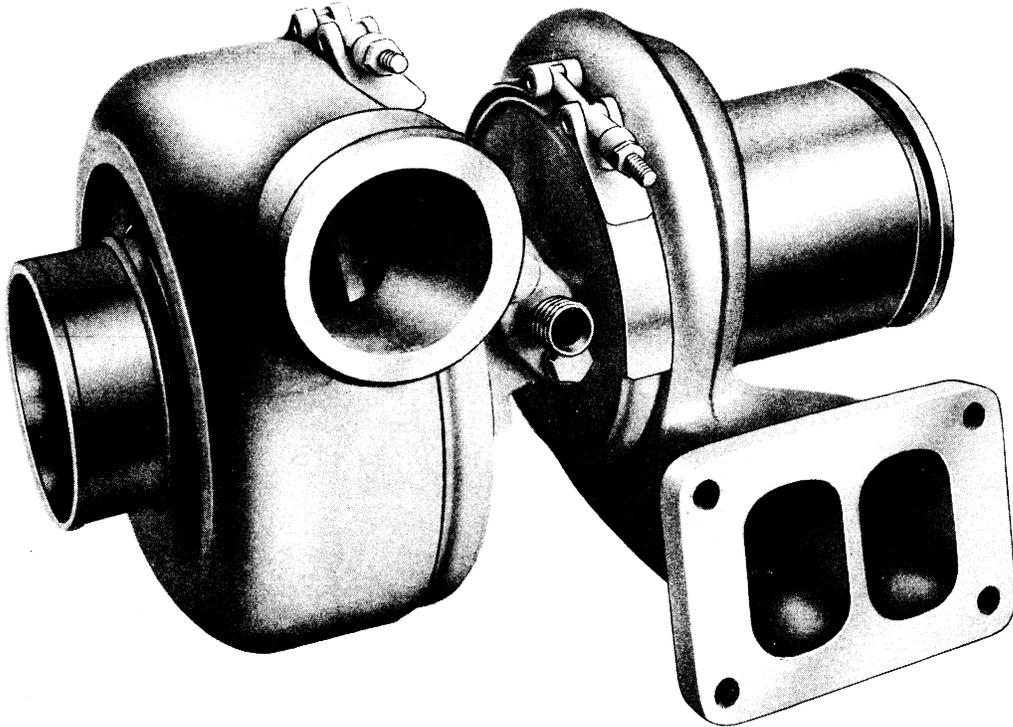
ORD E75500

Figure 62. Schwitzer Model 4 LE-354 (10945184) Turbocharger —  $\frac{3}{4}$  view.



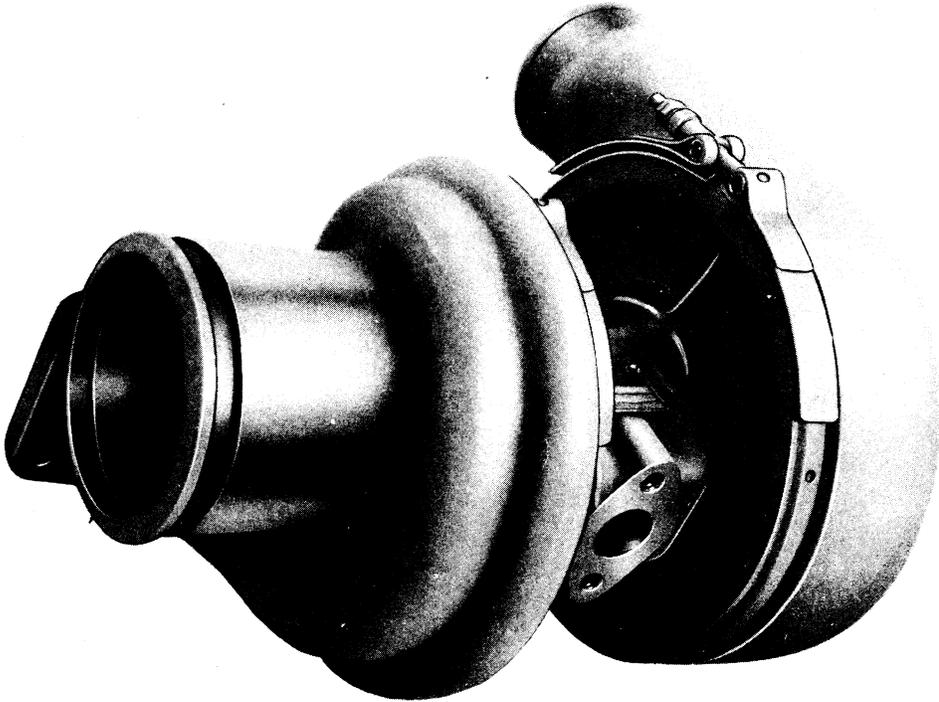
ORD E75501

*Figure 63. Schwitzer Model 4 LE-354 (10945184) Turbocharger — ¾ view.*



AT 19832

Figure 63.1. Schwitzer Model 4LE-456 (11641831) Turbocharger.



AT 19833

Figure 63.2. Schwitzer Model 4LE-456 (11641831) Turbocharger.

### 68. Difference Between Models

The following describes the differences between the Schwitzer Model 4 LE-354 and 4 LE-456 turbochargers and the models covered in the basic manual.

a. The model 4 LE-354 turbocharger incorporates a waste gate assembly to regulate maximum rpm of turbocharger operation.

b. The model 4 LE-456 turbocharger does not

use a waste gate nor does it require a nozzle ring.

The turbine housing is dual chambered and was designed to provide proper air flow at all engine speeds.

c. Engineering changes have been incorporated into the turbocharger to provide easier maintenance by eliminating press fits, utilization of fewer parts, and lighter weight.

## Section 11. DESCRIPTION AND DATA

### 69. Description

Refer to paragraph 4 and add paragraph b. (4) and (5) below.

(4) The purpose of the waste gate mechanism is to prevent overspeeding of the turbocharge rotating assembly.

Exhaust gases from the engine are circulated through the turbine housing mounted on the exhaust manifold. The velocity of the exhaust is directed on the turbine wheel by nozzle vanes in the turbine housing. The gap between nozzle ring vanes serves as the speed control for the unit. If the exhaust gas pressures build beyond a maximum point, the gas velocity increases through the nozzle ring and cause turbocharger to over-speed.

(5) The waste gate is an automotive type valve seated against an orifice in the turbine housing passage, upstream from the nozzle ring.

The valve is held against its seat by a coil spring which is pre-loaded against the waste gate cover. When excessive pressure builds up in the turbine housing, sufficient to overcome the spring pressure against the valve, the valve opens and allows the exhaust gas pressure to be relieved directly into the discharge of the turbine housing, and thereby, prevents turbocharger over-speeding.

**70. Data**

Refer to paragraph 5.

## CHAPTER 6

### REPAIR AND REBUILD

#### Section I. DISASSEMBLY

#### 71. General

Refer to paragraph 16.

#### 72. Cleaning Before Disassembly

Refer to paragraph 17.

#### 73. Removing Compressor Cover

Refer to paragraph 19*b*. (1) and (2) and paragraph (3), below.

(3) Remove compressor cover (B, fig. 15) with clamp (C, fig. 15). Remove and discard O-ring from bearing housing (fig. 64).

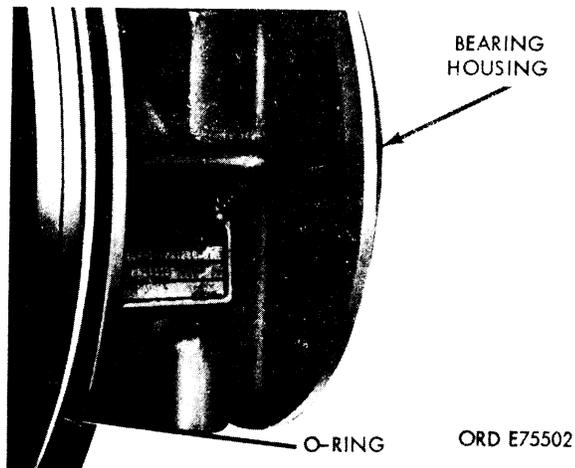


Figure 64. Removing bearing housing O-ring.

#### 74. Removing Nozzle Ring (Turbocharger 10945184)

Lift nozzle ring from bearing housing following removal of compressor cover.

#### 75. Checking Shaft and Turbine Wheel and Compressor Wheel Total Radial Movement

Refer to paragraph 21 *a*, and *b*, except *b* (2) which is changed as follows:

(2) Check total wheel radial movement (B) in the same manner as directed in paragraph 12*b*.

*Note.* Total radial movement must not exceed 0.023 inch. If radial movement exceeds this limit, check tolerance of turbine shaft, bearing surfaces, bearing housing base, and sleeve bearings during inspection (par. 86).

#### 76. Removing Bearing Housing Assembly

*a.* Refer to Figure 21. Remove clamp nut (A) and position clamp (B) to center of bearing housing being careful not to move bearing housing assembly.

*b.* Scribe alinement marks (C) on turbine housing (D) and bearing housing (E) to insure correct positioning during assembly.

*c.* Lift bearing housing (E) from turbine housing (D). Remove nozzle ring from bearing housing.

*Caution:* Immediately after removing the bearing housing assembly place it on the compressor wheel disassembly support 10899152, as shown in figure 23, to eliminate the possibility of damaging compressor wheel blades.

#### 77. Removing Compressor Wheel and Shaft, and Turbine Wheel

*a.* Refer to figure 65. Remove compressor wheel lock nut (A), and remove compressor wheel (B).

*Note.* This is a "slip-fit" not a "press-fit," and does not require use of an arbor press.

b. Refer to figure 66. Remove shaft and turbine wheel (A) from the bearing housing assembly.

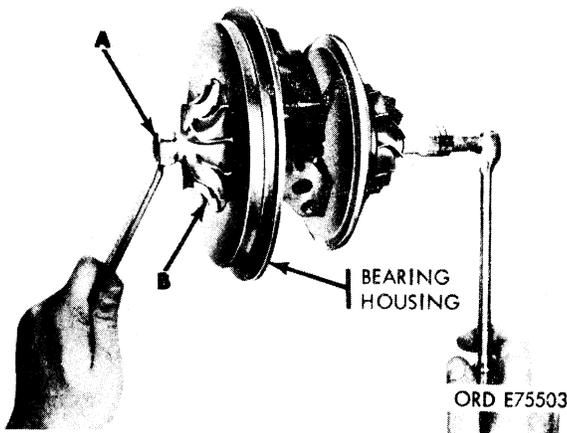


Figure 65. Removing compressor wheel.

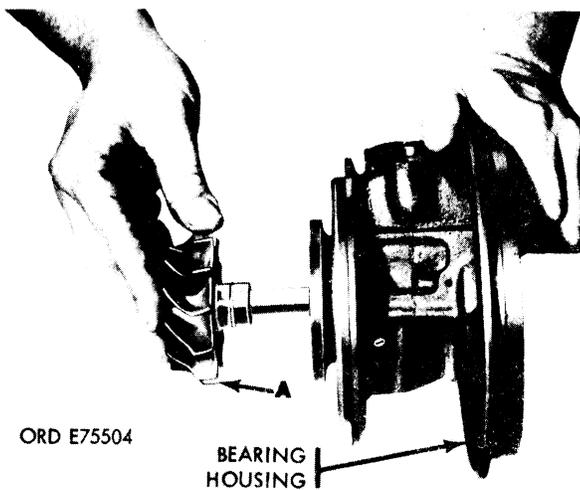


Figure 66. Removing shaft and turbine wheel.

### 78. Removing Waste Gate Assembly (Turbocharger 10945184)

a. Refer to figure 67. Secure waste gate cover with a suitable jack-clamp. Remove four 3/8—16 x 1-inch cap screws (A) and two lock plates (B), attaching waste gate cover (C), to turbine housing (D). Slowly release jack-clamp until spring tension is relieved.

**Warning:** Cover is under spring pressure, hold cover securely during removal of cap screws, re-

lease slowly to prevent injury to personnel and damage to assembly.

b. Refer to figure 68. Remove cover (H), gasket (G), spring (F), spring cup (E), valve guide (D), gasket (B), and valve (C), from turbine housing (A). Discard gaskets (B and G).

### 79. Removing Shaft and Turbine Wheel Piston Rings

Refer to figure 69. Remove piston ring from shaft and turbine wheel using suitable ring expander.

**Caution:** Over expansion of piston ring will cause a permanent set or break the ring. After complete disassembly, to prevent blade damage, store the turbine wheel and compressor wheel in a protected area.

### 80. Removing Compressor Insert, O-Ring and Flinger Sleeve

a. *Snap Ring.* Refer to figure 70. Using suitable snap ring pliers, remove snap ring (A) securing compressor insert (C) in bearing housing (B).

b. *Compressor Insert.* Refer to figure 71. Remove compressor insert (A) from bearing housing (B) by gently prying with two screwdrivers.

c. *O-Ring and Flinger Sleeve.* Refer to figure 72. Remove and discard O-ring (A) from compressor insert. Remove flinger sleeve (C) from compressor insert (B).

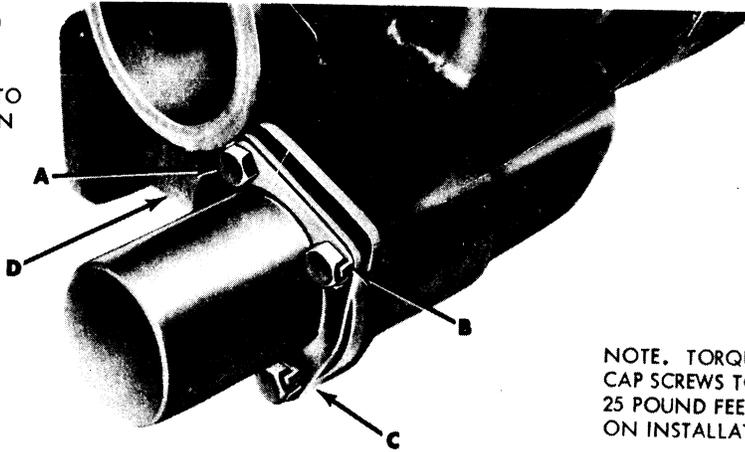
### 81. Removing Flinger Sleeve Piston Ring

Refer to figure 73. Remove cast iron piston ring (A) from flinger sleeve (B), using suitable ring expander.

### 82. Removing Oil Deflector, Thrust Ring, Spacer Sleeve, Thrust Bearing, and Thrust Ring

Refer to figure 74. Remove oil deflector (E), thrust ring (B), spacer sleeve (D), thrust bearing (C), and thrust ring (B), from bearing housing, (A).

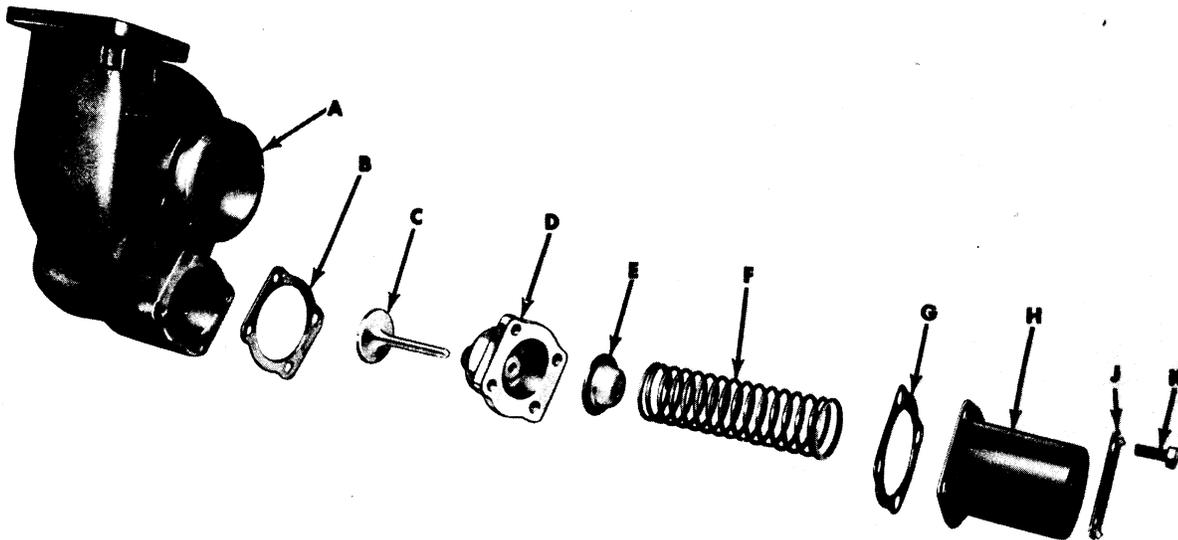
WARNING: HOLD COVER SECURELY ON REMOVAL TO PREVENT INJURY TO PERSONNEL, WHEN LAST CAPSCREW IS REMOVED.



NOTE. TORQUE CAP SCREWS TO 25 POUND FEET ON INSTALLATION.

ORD E75505

Figure 67. Removing waste gate assembly cover (Turbocharger 10945184).



ORD E75506

Figure 68. Removing waste gate assembly components (Turbocharger 10945184).

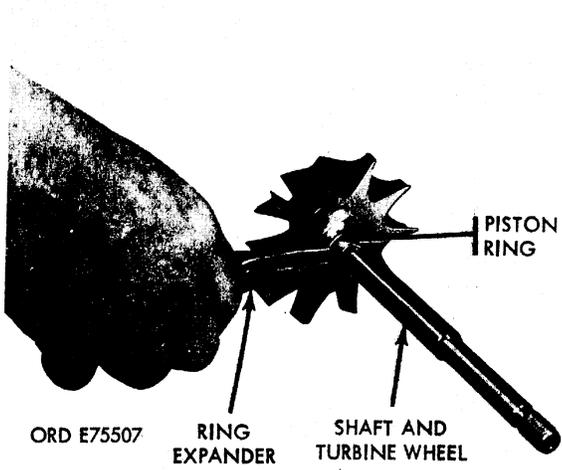


Figure 69. Removing shaft and turbine wheel piston ring.



Figure 70. Removing compressor insert retaining snap ring.

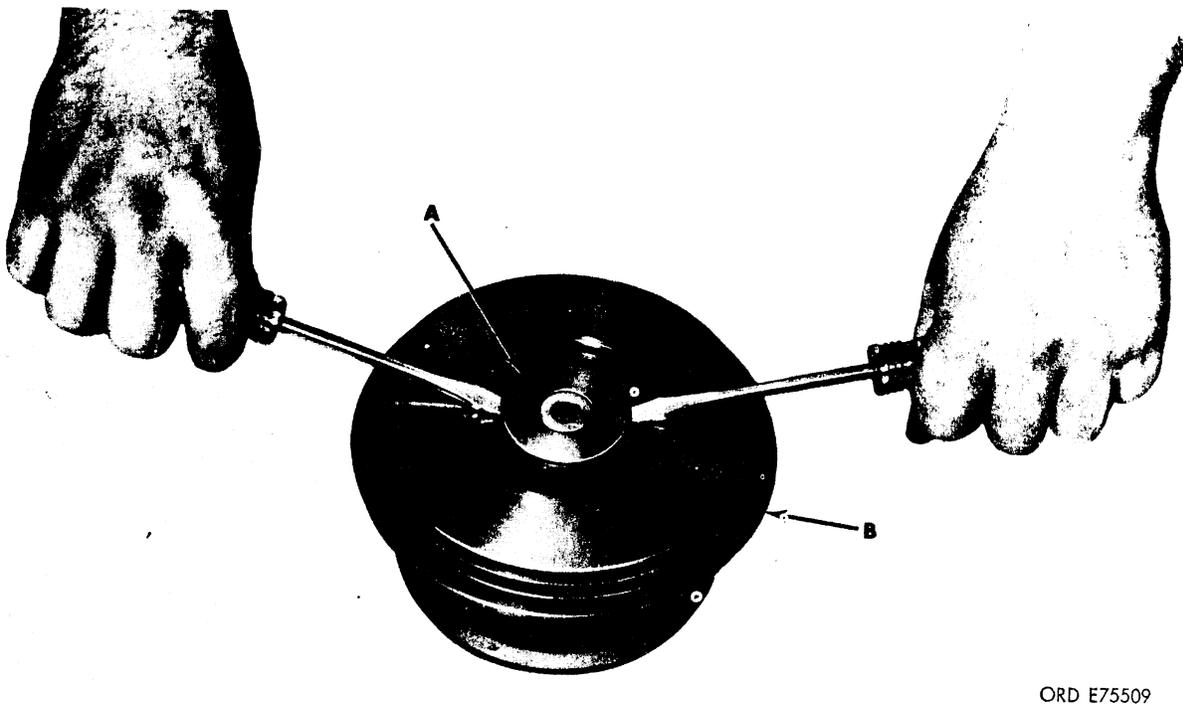


Figure 71. Removing compressor insert.

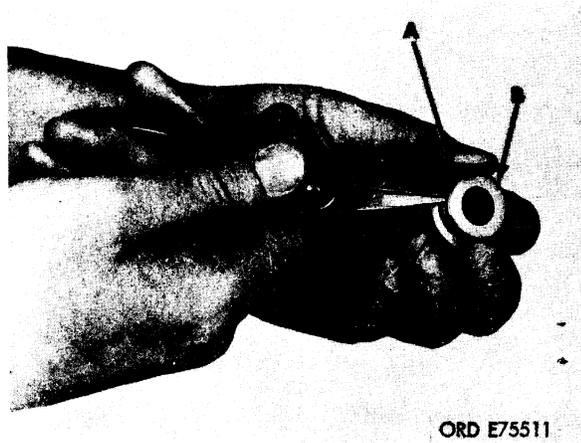
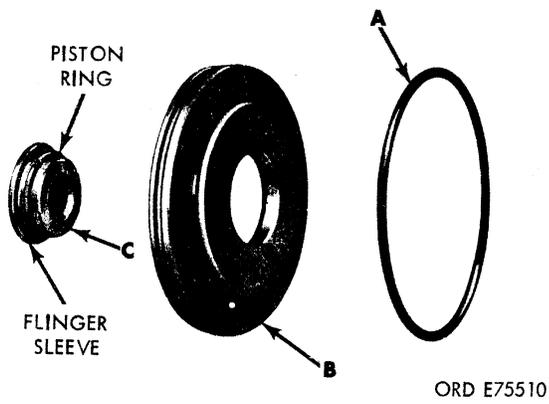


Figure 72. Removing compressor insert O-Ring and flinger sleeve.

Figure 73. Removing flinger sleeve piston ring.

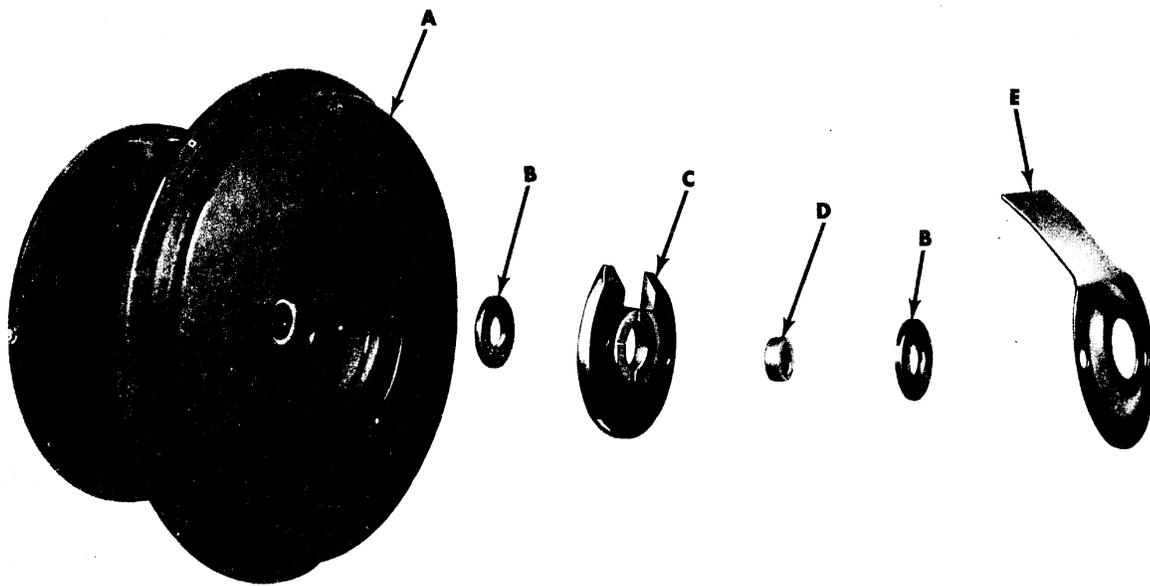


Figure 74. Removing oil deflector, thrust ring, spacer sleeve, thrust bearing, and thrust ring.

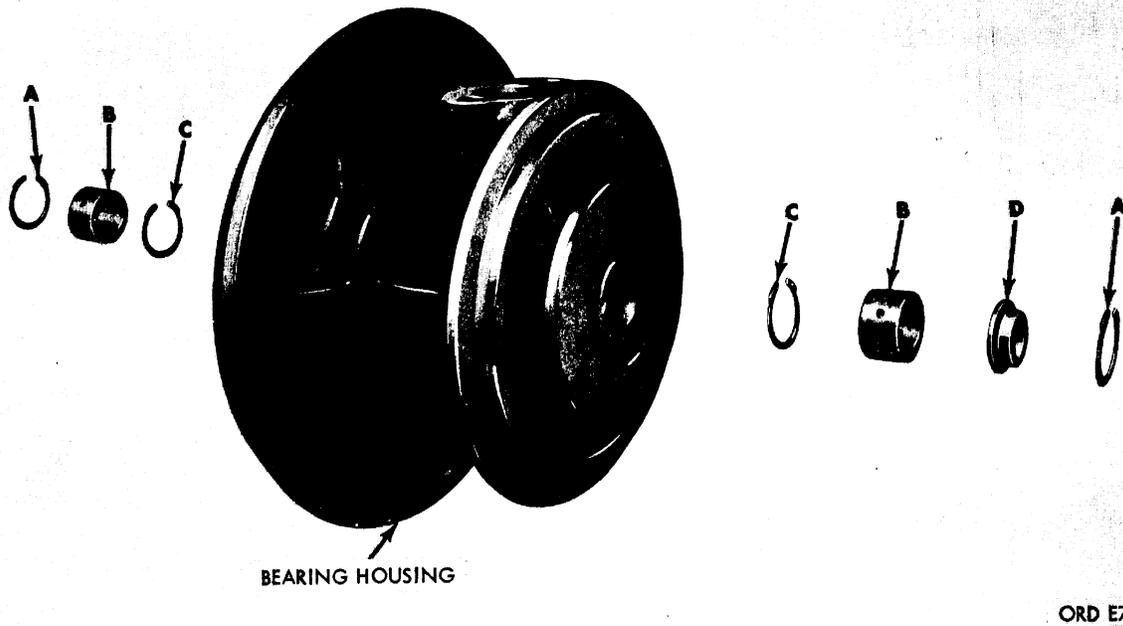


Figure 75. Removing oil control sleeve and bearings.

### 83. Removing Bearings and Oil Control Sleeve

Refer to figure 75. Using snap ring pliers—10935598 (fig. 82), remove outer snap rings (A) from recess in bearing housing. Remove oil control sleeve (D) and bearings (B). Remove inner snap rings (C).

### 84. Removing Name Plate

Refer to figure 76. Remove two self-tapping screws (A) and remove name plate (C) from bearing housing (B).

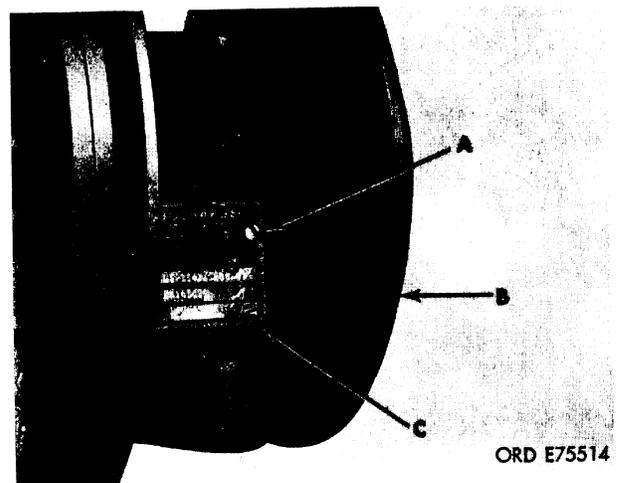


Figure 76. Removing name plate.

## Section II. CLEANING, INSPECTION, AND REPAIR

**85. Cleaning**

Refer to paragraph 32.

**86. Inspection and Repair**

*a. General.* All parts must be thoroughly examined and inspected to determine if they are suitable for rebuild of the assembly or if they must be discarded and new parts substituted. Some types of wear or damage may be detected by visual inspection and other types require the use of suitable measuring instruments.

*b. Compressor Cover.* Refer to paragraph 33b.

*c. Compressor Wheel.* Refer to paragraph 33d.

*d. Turbine Housing.* Refer to paragraph 33e.

*e. Thrust Ring.*

- (1) Inspect thrust rings for scored surfaces and distorted condition. Examine thrust faces for scores or deep scratches. Check thrust ring for distortion as follows:

*Note.* Key letters in (a) through (c) below refer to figure 40. Components shown in figure 40 are similar and the checking procedure is the same.

- (a) Place thrust ring (A) on a flat machined surface.
- (b) Attempt to insert an 0.002-inch feeler gage (B) between thrust surface of thrust ring and flat machined surface. Gage should not enter between ring and flat surface when ring is pressed lightly against the flat surface.
- (c) Measure the thrust ring with a micrometer. Thickness should not be less than 0.092-inch and be parallel within 0.002-inch (C).
- (2) The thrust rings must be replaced when found unserviceable. Slight scratches and scores can be removed by using crocus cloth.

*f. Spacer Sleeve and Thrust Bearing.*

- (1) Inspect the thrust bearing for scored or scratched surfaces. Check spacer sleeve bore diameter and length against limits specified in repair and rebuild standards (par. 61). Check thrust bearing length between bearing surfaces against limits specified in repair and rebuild standards (par. 62). Replace spacer sleeve or thrust bearing when not within specifications.

- (2) Replace thrust bearing if there are deep scores or scratches. Slight scratches can be removed by using crocus cloth.

*g. Flinger Sleeve.* Refer to paragraph 33i.

*h. Bearings.*

- (1) Inspect shaft sleeve-type bearings for scratches and worn surfaces. When bearings show evidence of wear, they must be replaced.
- (2) Replace bearings if tin plate is worn off of inside or outside diameter.

*i. Bearing Housing and Compressor Insert.*

- (1) Inspect bearing housing and insert for cracks and damaged or scored bore. Replace housing and insert if damaged.
- (2) Remove all raised metal on machined surfaces using a fine mill file. Do not attempt welding a cracked housing. When cracked, replace housing.

*j. Nozzle Ring.* Refer to paragraph 33l.

*k. Shaft and Turbine Wheel.* Refer to paragraph 33m.

*l. Turbine Housing.* Refer to paragraph 33n.

*m. Waste Gate Assembly.*

- (1) *Waste gate cover.* Inspect waste gate cover for cracks, dents, or internal damage that could cause spring wear or impair proper operation. Inspect cover mounting surfaces for nicks or burs. Remove minor dents and use

crocus cloth to remove burs. Replace cover if cracked, excessively bent, or otherwise damaged.

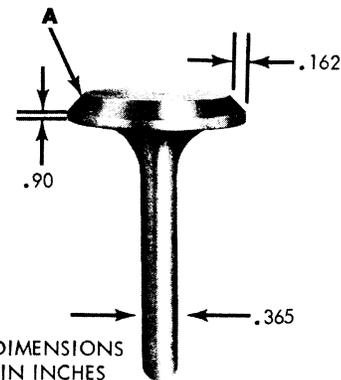
(2) *Spring*. Inspect spring for resiliency and proper operation.

(3) *Spring cup*. Inspect spring cup for excessive wear, cracks, distorted mating surface, and general condition. If worn, cracked, or distorted, replace cup.

(4) *Valve guide and valve*. Refer to figure 77. Inspect valve stem outside diameter. Check valve seat for smoothness and angle of face. Replace unserviceable valve.

n. *Clamp Assembly*. Refer to paragraph 33r.

o. *Oil Deflector and Oil Control Sleeve*. Refer to paragraph 33s.



ORD E75515

Figure 77. Inspecting waste gate valve.

### Section III. ASSEMBLY

#### 87. General

a. *Assembly Instructions*. Paragraphs 89 through 99 are supplemented with illustrations, figures 77 and 78, that depict only those assembly operations which cannot be accomplished by merely reversing the sequence of and procedures for disassembly. Where the assembly instructions are the reverse of the disassembly instructions, reference is made to the pertinent disassembly instructions. Where applicable, reference will be made to the basic manual for appropriate assembly procedures. The sequence of disassembly instructions ((1), (2), and (3)), for each paragraph should be performed in the reverse order ((3), (2), and (1)), to accomplish the assembly procedure.

b. *Cleanliness During Assembly*. Refer to paragraph 34b.

#### 88. Replacement Kits

Refer to paragraph 35 and appendix II.

#### 89. Installing Bearings and Oil Control Sleeve

Refer to paragraph 83 and reverse the sequence

of instructions to install the bearings and oil control sleeve. Be certain beveled edge of snap rings are toward center of bearing housing. Bearings must seat against flat side of snap rings. Flange of oil control sleeve must be against bearing on turbine end of bearing housing. Flat side of outer snap rings must be against bearings.

#### 90. Installing Shaft and Turbine Wheel Piston Ring

Refer to figure 32. Using shaft ring expander sleeve—10899148, install chrome piston ring on shaft.

#### 91. Installing Shaft and Turbine Wheel

Refer to paragraph 77b and reverse the sequence of instructions to install shaft and turbine wheel in bearing housing.

*Caution:* Use suitable ring compressor to allow piston ring to enter bearing housing.

#### 92. Installing Thrust Ring, Thrust Bearing, Spacer Sleeve, Thrust Ring, and Oil Deflector

Refer to paragraph 82 and reverse the se-

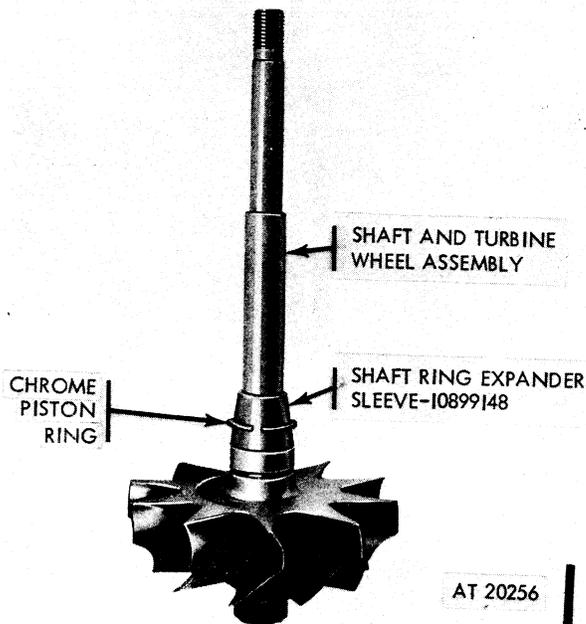


Figure 78. Installing piston ring on shaft and turbine wheel.

quence of instructions to install the thrust ring, thrust bearing, spacer sleeve, thrust ring and oil deflector.

### 93. Installing Flinger Sleeve Piston Ring

Refer to paragraph 81. Install cast iron piston ring on flinger sleeve using suitable piston ring expander.

### 94. Installing Flinger Sleeve, O-Ring, and Compressor Insert

a. *Flinger Sleeve and O-Ring.* Refer to paragraph 80c, and reverse the sequence of instructions to install flinger sleeve, and O-ring on compressor insert.

b. *Compressor Insert.* Refer to paragraph 80b, and reverse the sequence of instructions to install compressor insert.

c. *Snap Ring.* Refer to paragraph 80a and reverse the sequence of instructions. to install snap ring. Beveled edge of snap ring must be away from insert.

### 95. Installing Compressor Wheel

Refer to paragraph 77a, and reverse the sequence of instructions to install compressor wheel and lock nut. Coat shaft threads and face of lock nut with graphite grease. Torque tighten to 10-12 pound-feet.

### 96. Installing Waste Gate Assembly

a. Refer to paragraph 78b, and reverse the sequence of instructions to install new gaskets, valve, valve guide, spring cup, and spring.

b. Refer to paragraph 78a and reverse the sequence of instructions to install cover using new lockplates, and cap screws.

### 97. Installing Nozzle Ring

Install nozzle ring over turbine wheel on bearing housing.

### 98. Installing Bearing Housing Assembly

a. Refer to figure 21. Place bearing housing (E) in turbine housing (D) and aline scribe marks (C).

b. Position clamp (B) and install clamp nut (A). Apply thin coat of graphite grease to bearing housing flange. Tighten clamp nut to 10-pound-foot torque.

### 99. Installing Compressor Cover

Refer to paragraph 73 and reverse sequence of instructions to install compressor cover. Apply thin coat of graphite grease to bearing housing flange before installation.

**Caution:** Be sure alinement scribe marks match prior to tightening clamp nut to 10 pound-foot torque.

## APPENDIX I—REFERENCES

### 1. Indexes

#### Military Publications:

Index of Administrative Publications .....	DA Pam 310-1
Index of Army Motion Pictures, Film Strips, Slides, and Phono Recordings .....	DA Pam 108-1
Index of Blank Forms .....	DA Pam 310-2
Index of Graphic Training Aids and Devices .....	DA Pam 310-5
Index of Supply Manuals—Ordnance Corps .....	DA Pam 310-29
Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders .....	DA Pam 310-4
Index of Training Publications .....	DA Pam 310-3

### 2. Forms

DA Form 2028, Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9 is used to report publication errors or omissions. For use of maintenance forms, refer to TM 38-750, The Army Equipment Record Systems and Procedures. Forms pertaining to the Army Safety Program are prescribed in SR 385- 10-40.

### 3. Other Publications

The following publications contain information pertinent to major item materiel and associated equipment.

#### a. Supply Manuals.

Engine, Assembly w/Accessories (2815-980-7092) .....	TM 9-2815-207-35P
Engine, Diesel (Multi-fuel): 6-cylinder, Military Model LDS-465-1 .....	TM 9-2815-210-35P
Engine, Diesel (Multi-fuel): Turbosupercharged, Fuel Injected, Water Cooled, 6-cylinder, Assembly (Continental Model LDS-427-2) .....	TM 9-2815-204-35P
Field Maintenance, Consolidated Authorized Field Stockage List of Repair Parts for Tank Automotive Materiel .....	TM 9-2300-223-34P
Shop Equipment: Motor Vehicle, Field Maintenance, Motor Vehicle Assembly Company .....	SM 9-4-4910-A59
Shop Set, Mechanical Emergency Repair (4910-672-2608) .....	SM 9-4-4910-A66
Shop Set, Mechanical Emergency Repair, Basic (4910-672-2607) .....	SM 9-4-4910-A65
Tool Kit: Auto Fuel and Electrical System Repairman (4910-754-0655) .....	SM 9-4-4910-A57
Tool Kit, Electrician's No. 1 (FSN 5180-313-3045) .....	SM 9-4-5180-A81
Tool Kit, Electrician's No. 2 (5180-545-8645) .....	SM 9-4-5180-A82
Tool Kit: General Mechanic's (FSN 5180-754-0641) .....	SM 9-4-5180-A58
Tool Kit, General Mechanic's: Organizational Maintenance, No. 1 Common (5180-754-0654) .....	SM 9-4-5180-A01
Tool Kit, Organizational Maintenance: No. 2, Supplemental (4940-754-0743) .....	SM 9-4-4940-A08
Tool Kit: Organizational Maintenance, Set A, Supplemental (5180-754-0653) .....	SM 9-4-5180-A17
Tool Set, General Mechanic's: Organizational Maintenance, Set No. 2, Common (FSN 5180-754-0650) .....	SM 9-4-5180-A20

#### b. Repair and Rebuild.

Engine, Assembly w/Accessories (2815-980-7092) .....	TM 9-2815-207-35
Engine, Diesel (Multi-fuel); 6-cylinder, Military Model LDS-465-1 .....	TM 9-2815-210-35
Engine, Diesel (Multi-fuel): Turbosupercharged, Fuel Injected, Water Cooled, 6-cylinder, Assembly (Continental Model LDS-427-2) .....	TM 9-2815-204-35
Materials used for Cleaning, Preserving, Abrading, and Cementing, Ordnance Materiel; and Related Materials, Including Chemicals .....	TM 9-247

## APPENDIX II

### GENERAL SUPPORT AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

#### Section I. INTRODUCTION

#### 1. Scope

This appendix lists repair parts and special tools required for the performance of General Support and Depot Maintenance of the Schwitzer Model 4-456, 4D-454C, 4D-554 and 4LE turbochargers.

#### 2. General

This Repair Parts and Special Tools List is divided into the following sections:

*a. Introduction—Section I.*

*b. Repair Parts—Section II.* A list of repair parts authorized for the performance of maintenance at the general support and depot level in alphabetical sequence.

*c. Special Tools—Section III.* A list of special tools authorized for the performance of maintenance at the general support and depot level.

*d. Federal Stock Number and Reference Number Index—Section IV.* A list of Federal Stock Numbers followed by reference numbers in ascending alpha-numeric sequence, cross referenced to figure number and item number.

#### 3. Explanation of Columns

The following provides an explanation of columns in the tabular lists in sections II, III and IV.

*a. Source, Maintenance and Recoverability Codes (SMR) column (1).*

- (1) *Source code, column 1a.* Indicates the selection status and source for the listed item. Source codes used are:

<i>Code</i>	<i>Explanation</i>
P	Applied to repair parts which are stocked in or supplied from the GSA/DSC, or Army Supply System, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of next higher assembly or component.

- (2) *Maintenance Level, Column 1b.* Indicates the lowest category of maintenance authorized to install the listed item. The maintenance level codes are:

<i>Code</i>	<i>Explanation</i>
O	Organizational Maintenance.
F	Direct Support Maintenance.
H	General Support Maintenance.
D	Depot Maintenance.

- (3) *Recoverability code Column 1c.* Indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability Codes are:

<i>Code</i>	<i>Explanation</i>
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and normally are furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings or castings.

*Note:* When no code is indicated in the recoverability column the part will be considered expendable.

*b. Federal Stock Number, Column 2.* This column indicates the Federal Stock Number for the item.

*c. Description, Column 3.* This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

*d. Unit of Issue, Column 4.* This column indicates the units used as a basis for issue, e.g., ea, pr, ft, yd, etc.

*e. Quantity Incorporated in Unit Pack, Column 5.* This column indicates the actual quantity contained in the unit pack.

*f. Quantity Incorporated in Unit, Column 6.* This column indicates the quantity of the item used in the functional group.

*g. 30-Day DS/GS Maintenance Allowances, Columns 7 and 8.*

(1) The allowance columns are divided into three subcolumns. Indicated in each sub-column, opposite the first appearance of each item, is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have no entry in the allowance column but will have in the description column a reference to the first appearance of the item. Items authorized for use as required but not for initial stockage are identified with an asterisk (\*) in the allowance column.

(2) The quantitative allowances for DS/GS levels of maintenance will represent initial stockage for a 30-day period for the number of equipment supported.

*h. 1-Year Allowances Per 100 Equipments/Contingency Planning Purposes, Column 9.* This column indicates opposite the first required for distribution and contingency planning purposes. The range of items indicates

total quantities of all authorized items required to provide for adequate support of 100 equipments for one year.

*i. Depot Maintenance Allowance Per 100 Equipments, Column 10.* This column indicates opposite the first appearance of each item the total quantity authorized for depot maintenance of 100 equipments. Subsequent appearances of the same item will have no entry in this column, but will have in the description column a reference to the first appearance of the item. Items authorized for use but not for initial stockage are identified with an asterisk (\*) in the allowance column.

*j. Illustration, Column 11.* This column is divided as follows:

- (1) *Figure Number, Column 11a.* Indicates the figure number of the illustration in which the item is shown.
- (2) *Item Number, Column 11b.* Indicates the callout number used to reference the item in the illustration.

#### 4. Special Information

*a.* Identifications of the usable on codes included in column 3 of this publication are:

<i>Code</i>	<i>Used On:</i>
A	Model 4D-454C (10912638)
B	Model 4D-554 (53591-C-139552)
C	Model 4-456 (10935279)

*b.* The basis of issue for authorized special tools, test and support equipment is the number of end items of equipment supported and the number of maintenance personnel allocated to perform the required maintenance operations.

#### 5. How to Locate Repair Parts

*a. When Federal Stock number or reference number is unknown:*

- (1) *First.* Using the table of contents, determine the assembly group, i.e., model number of turbocharger, within which the repair part belongs. This is necessary since illustrations are prepared by assembly groups for each turbocharger and listings are divided into the same groups.

- (2) *Second.* Find the illustration covering the assembly group to which the repair part belongs.
- (3) *Third.* Identify the repair part of the illustration and note the illustration figure and item number of the repair part.
- (4) *Fourth.* Using the repair parts listing, find the assembly group to which the repair part belongs and locate the illustration figure and item number noted on the illustration.

b. *When Federal stock numbers or reference number is known:*

- (1) *First.* Using the index of Federal Stock Numbers and Reference Numbers, find the pertinent Federal stock number of reference number. This index is in ascending alpha-numeric sequence cross-referenced to illustration figure and item number.
- (2) *Second.* Using the Repair Parts Listing, find the assembly group of the repair part and the illustration figure and item number referenced in the Index of Federal Stock Numbers and Reference Numbers.

## 6. Abbreviations

<i>Abbreviations</i>	<i>Explanation</i>
assy .....	assembly
alw .....	allowance
cd-pltd .....	cadmium plated
cntgcy .....	contingency
dia .....	diameter
ea .....	each
ds .....	direct support
equip .....	equipment
fig .....	figure
gs .....	general support
hex.-hd .....	hexagon head
id .....	inside diameter
inc .....	incorporated
lg .....	long
lt .....	light (weight)
maint .....	maintenance
NC .....	American National Coarse Thread
no .....	number
od .....	outside diameter
qty .....	quantity
recov .....	recoverability
s .....	steel
thk .....	thick

## 7. Federal Supply Codes for Manufacturers

<i>Code</i>	<i>Manufacturer</i>
53591	Schwitzer Corporation
96906	Military Standards

**Section II. REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE**

(1) Source, maint. and recov. code			(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) 30-days DS maint. alw.			(8) 30-days GS maint. alw.			(9) 1-yr. alw. per 100 equip. cntgcy planning	(10) Depot maint. alw. per 100 equip.	(11) Illustration			
(a) Source	(b) Maint.	(c) Recov.						(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100			(a) Fig. No.	(b) Item of sym. No.		
P	F	R	2990-074-8930	TURBOCHARGER ASSEMBLY: Schwitzer Model 4-456 10935279 (19207)	ea	1	1	1-20	21-50	51-100	1-20	21-50	51-100	12	2				
P	F	R	2990-967-9909	TURBOCHARGER ASSEMBLY: Schwitzer Model 4D-454C 10912638 (19207)	ea	1	1							12	3				
P	F	R	2990-974-7583	TURBOCHARGER ASSEMBLY: Schwitzer Model 4D-554 C-139552 (53591)	ea	1	1							12	4				
P	F	R	2990-999-2275	TURBOCHARGER ASSEMBLY: Schwitzer Model 4-LE 354 10945184 (19207)	ea	1	1							10	62				
P	F	R	2950-178-1245	TURBOCHARGER ASSEMBLY: Schwitzer Model 4-LE 456 11641831 (19207)	ea	1	1							63.1					
				Refer to the following applicable maintenance repair parts manual for listing of turbocharger assembly attaching and associated parts and their issue allowances: Turbocharger Engine      Applicable FSN      Model No.      Tech Manual 2990-967-9909      LDS-427-2      9-2815-204-35P 2990-074-8930      LDS-465-1      9-2815-210-35P 2990-974-7583      ENDT-673      9-2815-207-35P 2990-999-2275      LDS-465-1A      9-2815-210-35P 2950-178-1245      LDS-465-2      9-2815-210-35P Group 03															
X1				0305 — TURBOCHARGER ASSEMBLY 10935279 (4-456) (Fig. 79)	ea		‡								79	1			
P	H		2990-572-8728	SHIELD (A-129113) (53591) PARTS KIT: Turbocharger (5702698) Composed of:				*			*			10	2				
P	H		2990-797-6181	1 GASKET (10921785) SHIM: end play adjusting	ea		1	*			*			10	2				
X1																	2.1		
																	2.2		

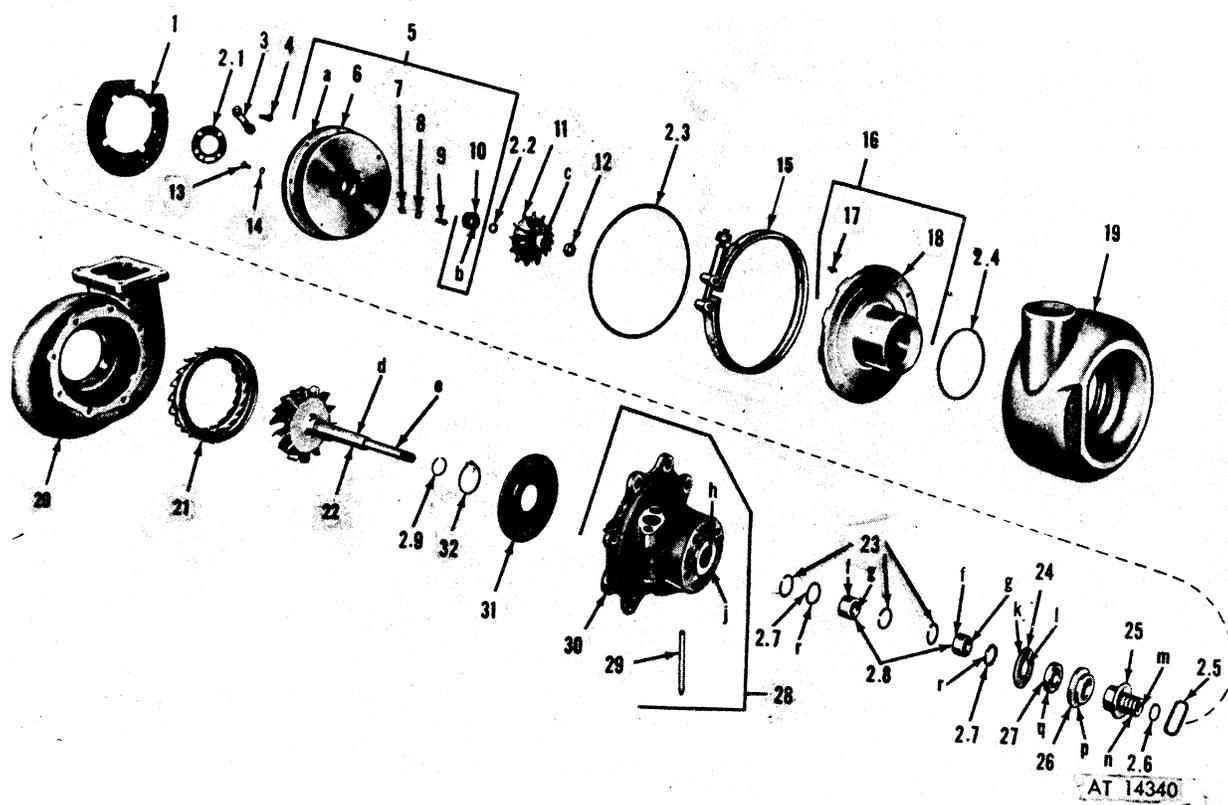
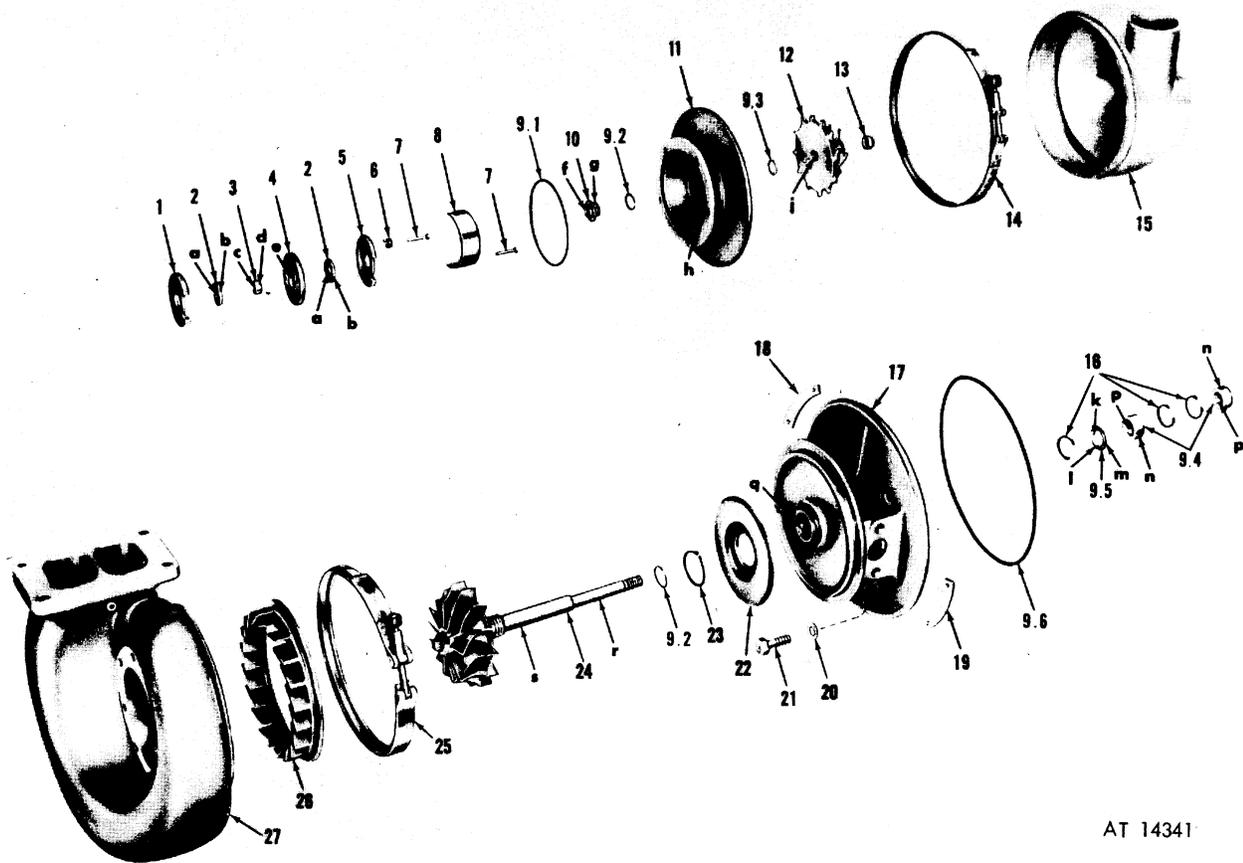


Figure 79. Turbocharger assembly 10935279 (4-456) — exploded view.

REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE

(1) Source, Maint. And Recov. Code	(2) Federal Stock Number		(3) Description	(4) Unit of issue	(5) Qty. Inc. In Unit Pack	(6) Qty. Inc. In Unit	(7) 30-Days DS Maint. Alw.			(8) 30-Days GS Maint. Alw.			(9) 1-Xr. Alw. Per 100 Equlp. Cntry. Planning	(10) Per 100 Equlp. Alw.	(11) Illustration		
	(a) Source	(b) Maint.					(c) Recov.	(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50			(c) 51-100	(a) Fig. No.	(b) Item or Syn. No.
P	H		2-0.002 in. thk (10921791-1)	ea	≠	≠	1-20	21-50	51-100	*	*	*	10				
P	H	2990-851-9030	2-0.005 in. thk (10921791-2)	ea	≠	≠							10				
P	H	2990-851-9031	1-0.010 in. thk (10921791-3)	ea	≠	≠							10				
X1	H	2990-851-9029	1-GASKET (A-132263) (53591)	ea									100			2.3	
P	H	5330-579-6860	1-PACKING, PREFORMED (28775-242) (96906).	ea	1	1	3	6	11								2.4
P	H	5310-853-0212	1-WASHER, SPRING TENSION (109-21790).	ea	1	1	*	2	2				10				2.5
P	H	2990-858-6205	2-RING, PISTON (10921789)	ea	2	2	2	2	3				24				2.6
X1	H		2-WASHER, THRUST (B-135620) (53591).	ea													2.7
X1	H		2-BEARING, SLEEVE (B-135619) (53591).	ea													2.8
P	H	2990-767-1744	2-RING, PISTON (7383439)	ea	2	2	2	2	3				20				2.9
P	H	2990-767-1743	PLATE, LOCKING, BOLT & NUT: Bearing housing to turbine housing (876-4889)	ea	4	4	2	3	6				40			79	3
P	H	5306-021-3626	BOLT, MACHINE: Bearing housing to turbine housing (35307-33) (96906).	ea									40				4
X1	H		HOUSING ASSY (B-132255) (53591)	ea													5
X1	H		HOUSING (L-132248) (53591)	ea													6
P	H	5310-753-4104	WASHER, FLAT: S, 11/32 id, 9/16 od, 0.050 in. thk, compressor housing to bearing housing (7383438).	ea	4	4	2	2	3				20				7
P	H	5310-011-2723	WASHER, LOCK: Split, helical, lt, S, cd-pltd, 1/16 thk, 5/16 screw size (112723) (53591).	ea	4	4	2	3	6				40				8
P	H	5305-285-5202	SCREW, CAP, SOCKET HEAD: 5/16-18nc -3x, 1 1/4 in. lg (35457-50) (96906).	ea	4	4	2	3	6				40				9
X1	H		INSERT (B-131816) (53591)	ea													10
X1	H		IMPELLER L-128565) (53591)	ea													11
P	H	5310-763-1867	NUT, LOCK: compressor wheel (C-125-638) (53591).	ea	1	1	*	2	2				10				12
X1	H		SCREW (C-136485) (53591)	ea												79	13



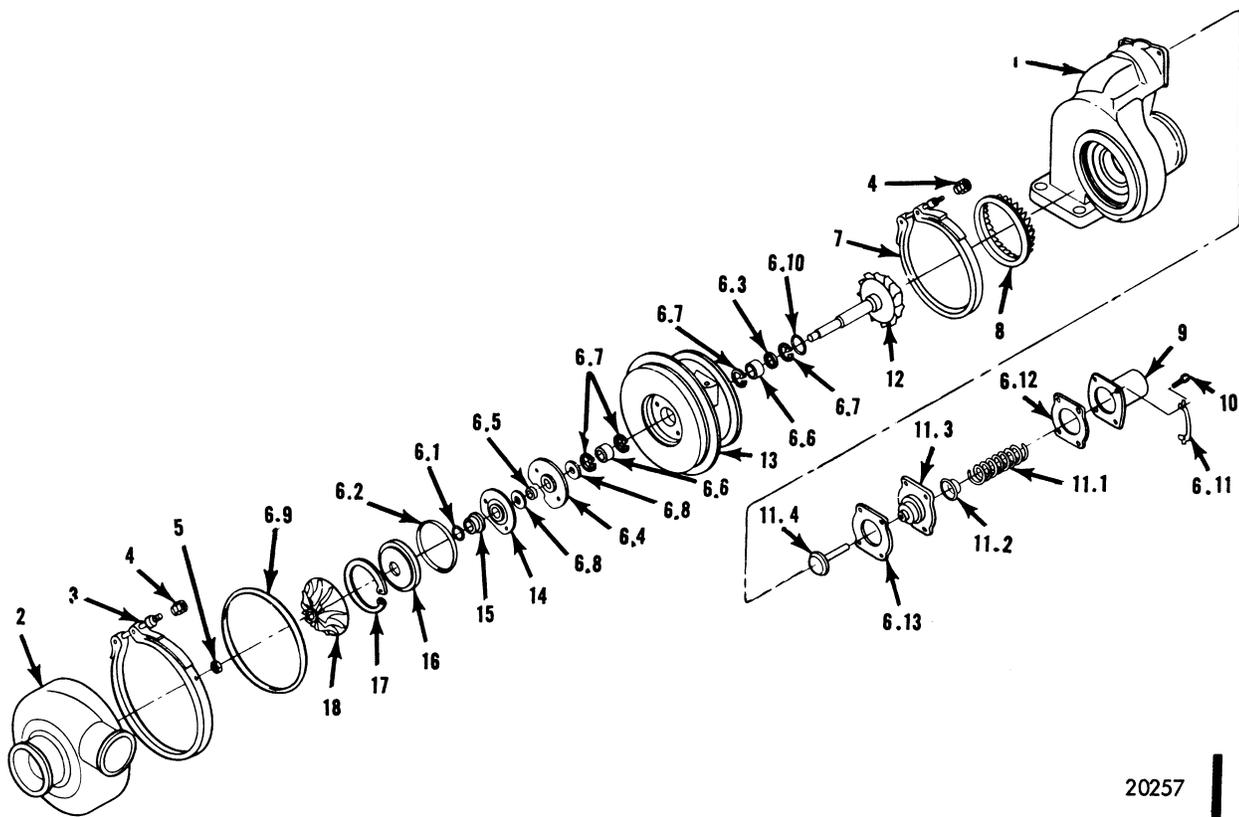


AT 14341

Figure 80. Turbocharger assemblies 10912638 (4D-454C) and 53591-C-139552 (4D-554)—exploded view.





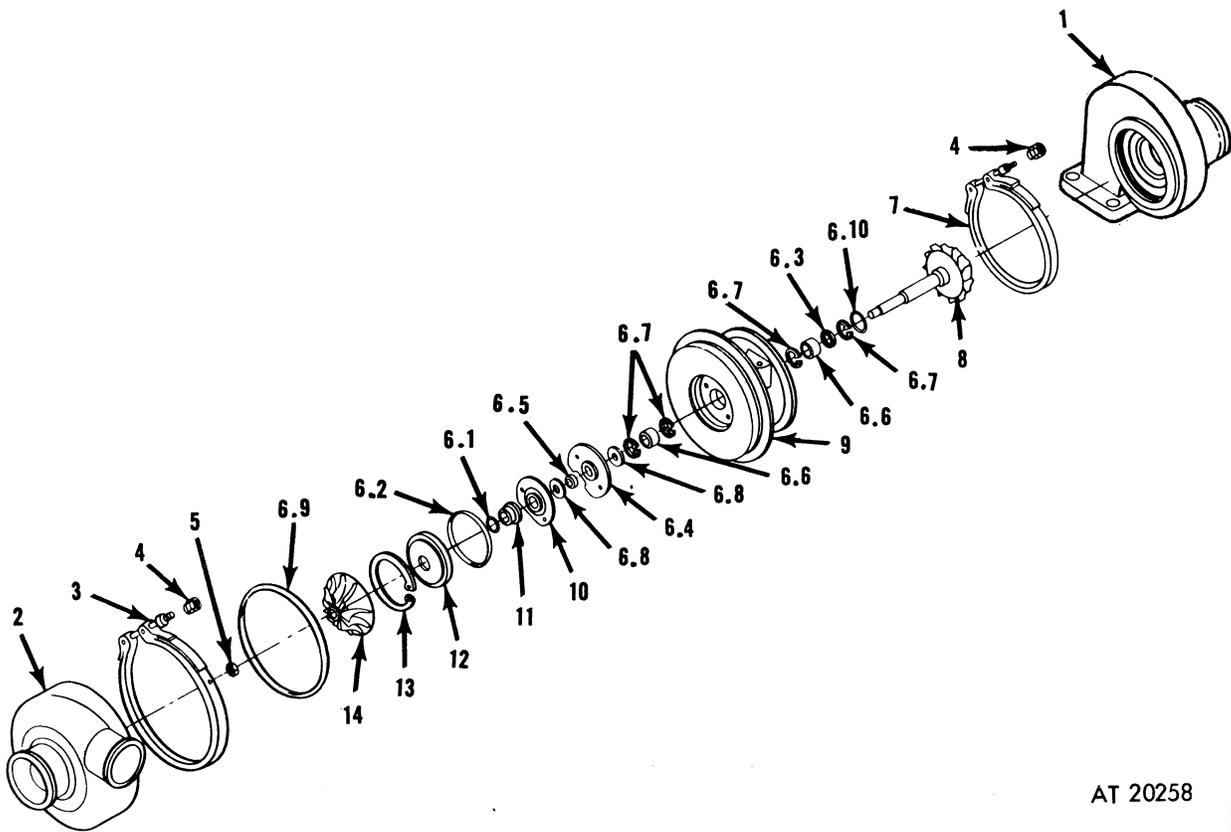


20257

Figure 81. Turbocharger assembly 10945184 (4LE 354) — exploded view.

REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE

(1) Source, maint. and recov. code			(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) 30-days DS maint. alw.			(8) 30-days GS maint. alw.			(9) 1-yr. alw. per 100 equip. cntgcy planning	(10) Depot maint. alw. per 100 equip.	(11) Illustration	
								(a)	(b)	(c)	(a)	(b)	(c)			(a)	(b)
X1				V-CLAMP (139794) (53591)				1-20	21-50	51-100					81	7	
X1				RING, NOZZLE (C-140145) (53591)												8	
X1				COVER, WASTE GATE (B-140132) (53591).												9	
X1				SCREW, CAP (L35177) (53591)												10	
P	H		2990-930-4420	PARTS KIT, WASTE GATE VALVE (turbocharger 10945184) (5702742). Composed of: 1 — SPRING HELICAL COMPRESSION (11602693). 1 — SEAT, SPRING (11602691) 1 — GUIDE, VALVE (11602689) 1 — VALVE, POPPET (11602692) 2 — PLATE, LOCKING (11602697) 1 — GASKET (11602690) 1 — GASKET (11602696) SHAFT & TURBINE WHEEL ASSEMBLY (D-144587) (53591). HOUSING, BEARING (144881) (53591) DEFLECTOR, OIL (B-143331) (53591) SLEEVE, FLINGER (B-139817) (53591) INSERT (B-142066) (53591) RING, SNAP (C-127305) (53591) WHEEL, COMPRESSOR (A-139868) (53591).	ea		†		*			2	20		11		
X1																11.1	
X1																11.2	
X1																11.3	
X1																11.4	
X1																6.11	
X1																6.12	
X1																6.13	
X1																12	
X1																13	
X1																14	
X1																15	
X1																16	
X1																17	
X1																18	



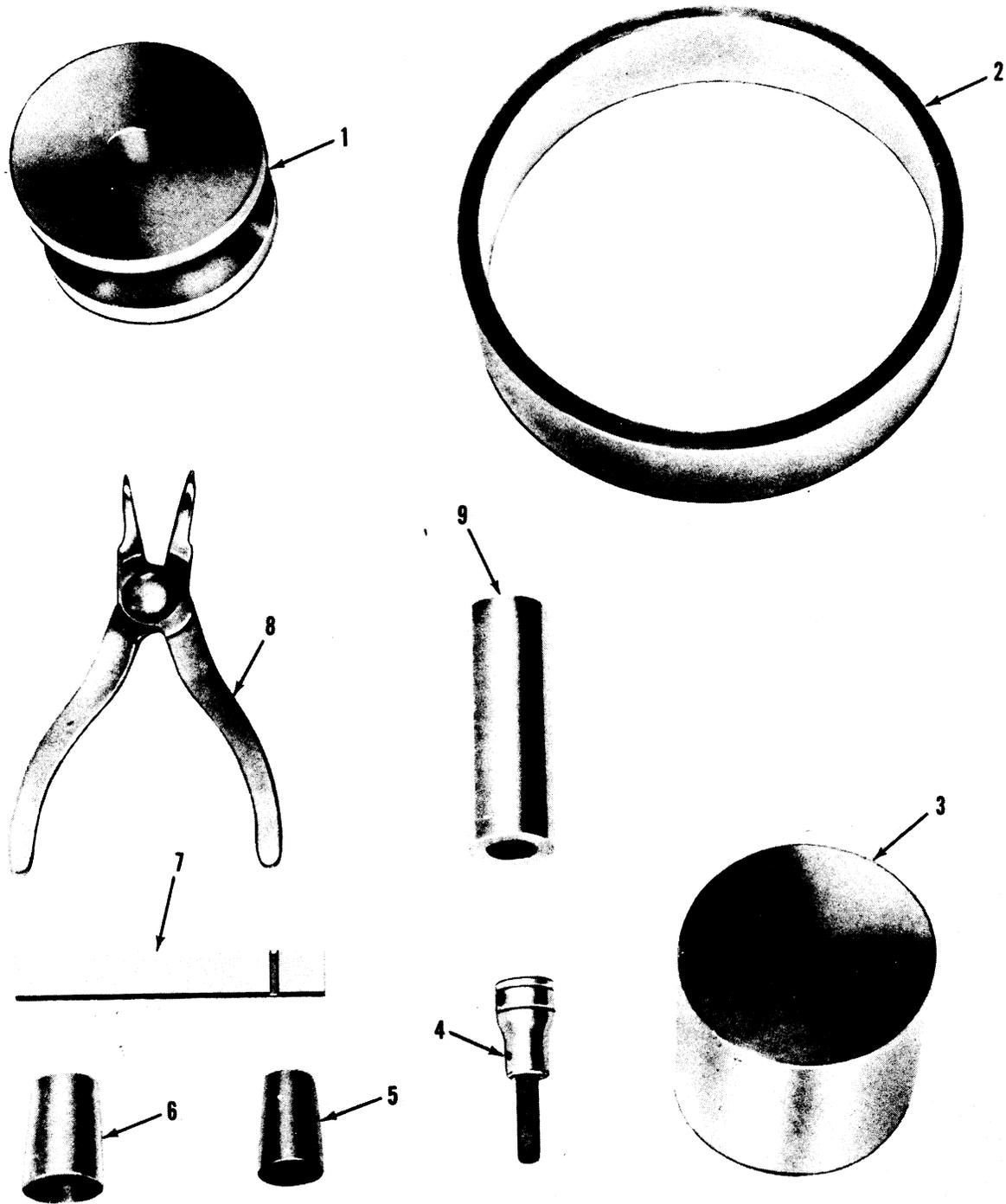
AT 20258

Figure 81.1. Turbocharger assembly 11641831 (4LE-456) — exploded view.



REPAIR PARTS FOR DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE

(1) Source, maint. and recov. code			(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) 30-days DS maint. alw.			(8) 30-days GS maint. alw.			(9) 1-yr. alw. per 100 equip. cntry planning	(10) Depot maint. alw. per 100 equip.	(11) Illustration	
								(a)	(b)	(c)	(a)	(b)	(c)			(a)	(b)
Source	Maint.	Recov.		DEFLECTOR, OIL (B143331) (53591) SLEEVE, FLINGER (B-139817) (53591) INSERT (B-142066) (53591) RING, SNAP (C-127305) (53591) WHEEL, COMPRESSOR (A-142230) (53591) (* ) Not used on this turbocharger.				1-20	21-50	51-100	1-20	21-50	51-100			Fig. No.	Item or sym. No.
X1																	10
X1																	11
X1																	12
X1																	13
X1																	14



AT 19834

Figure 82. Special tools.



**Section III. SPECIAL TOOLS, TEST AND SUPPORT EQUIPMENT FOR DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE**

(1) Source, maint. and recov. code			(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) 30-days DS maint. alw.			(8) 30-days GS maint. alw.			(9) 1-yr. alw. per 100 equip. cntlgy planning	(10) Depot maint. alw. per 100 equip.	(11) Illustration	
(a) Source	(b) Maint.	(c) Recov.						(a) 1-20	(b) 21-50	(c) 51-100	(a) 1-20	(b) 21-50	(c) 51-100			(a) Fig. No.	(b) Item or sym. No.
P	H		4910-870-2123	<p><b>NOTE:</b> The special tools listed herein are required for general support and depot maintenance. The quantities listed in column 6 are not authorized per vehicle or component but constitute the basic allowance that the Ordnance unit or ship must have on hand to provide the required support. Tools may not be duplicated, if on hand, for maintenance of vehicles equipped with the same components unless justified for expanded operations. <b>SPACER, CLEARANCE CHECKING:</b> sleeve (10899150) <b>SUPPORT:</b> compressor wheel disassembly (10899152) <b>SUPPORT:</b> (used w/REPLACER-5120-870-6924) (10899-51) <b>SOCKET, WRENCH, ATTACHMENT,</b> (8755-594) (turbocharger, 10935279) <b>SLEEVE:</b> shaft ring expander (10899148) <b>SLEEVE, INSTALLING:</b> collar ring expander (10899149) (turbocharger 10935279) <b>GAGE, SPACING:</b> nozzle vane (10951060) (turbocharger, 10935279) <b>PLIERS, SNAP RING:</b> bearing retaining ring (10935598) <b>REPLACER, THRUST COLLAR OR COMPRESSOR WHEEL:</b> collar and compressor wheel (10899147).</p>	ea		1	1-20	21-50	51-100	1-20	21-50	51-100			82	1
P	H		4910-870-2124		ea		1	1-20	21-50	51-100	1-20	21-50	51-100			82	2
P	H		4910-870-3759		ea		1	1-20	21-50	51-100	1-20	21-50	51-100				3
P	H		5120-654-3629		ea		1	1-20	21-50	51-100	1-20	21-50	51-100				4
P	H		4910-885-3465		ea		1	1-20	21-50	51-100	1-20	21-50	51-100				5
P	H		4910-870-2122		ea		1	1-20	21-50	51-100	1-20	21-50	51-100			82	6
P	H		4910-977-8972		ea		1	1-20	21-50	51-100	1-20	21-50	51-100				7
P	H		5120-870-6924		ea		1	1-20	21-50	51-100	1-20	21-50	51-100				8
P	H				ea		1	1-20	21-50	51-100	1-20	21-50	51-100				9



**Section IV. INDEX—FEDERAL STOCK NUMBER AND REFERENCE  
NUMBER CROSS-REFERENCE TO FIGURE AND ITEM NUMBER**

<i>Stock Number</i>	<i>Figure Number</i>	<i>Item Number</i>	<i>Stock Number</i>	<i>Figure Number</i>	<i>Item Number</i>
2990-074-8930	2		125648	53591	80 9.3
2990-572-8728	79	2	125649	53591	80 9.3
2990-763-1868	80	9	125650	53591	80 9.3
2990-767-1743	79	3	C-125693	53591	80 13
2990-767-1744	79	2.9	C-127305	53591	81 17
	80	9.2	L-128565	53591	79 11
	81	6.1	L-128846	53591	79 18
2990-797-6181	79	2.1	C-128918	52591	79 29
2990-851-9029	79	2.2	A-129113	53591	79 1
2990-851-9030	79	2.2	BL-129114	53591	79 20
2990-851-9031	79	2.2	B-130071	53591	79 16
2990-858-6205	79	2.6	C-130665	53591	81 4
2990-930-4419	81	6	C-130890	53591	79 17
2990-930-4420	81	11	B-131816	53591	79 10
2990-967-9909	3		L-132247	53591	79 19
2990-974-7583	4		L-132248	53591	79 6
2990-999-2275	62		B-132255	53591	79 5
5305-285-5202	79	9	132256	53591	79 15
5306-021-3626	79	4	A-132263	53591	79 2.3
5310-011-2723	79	8	C-132826	53591	79 27
5310-753-4104	79	7	133125	53591	80 14
5310-763-1867	79	12	L-134466	53591	79 22
	80	13	B-134793	53591	79 24
	79	2.5	B-134794	53591	79 26
5310-853-0212	79	2.4	135177	53591	81 10
5330-579-6860	79	23	B-135619	53591	79 2.8
5340-579-6696	80	16			80 9.4
	79	32	B-135620	53591	79 2.7
5340-664-2079	80	23			80 9.5
	79	15	L-135667	53591	79 30
5340-763-1865	79	20	B-135668	53591	79 25
C-102528	53591	80	C-135669	53591	79 31
10912638	19207	3	B-135673	53591	79 28
10921785	19207	79 2.1	B-135796	53591	80 10
10921789	19207	79 2.6	B-135915	53591	80 4
10921790	19207	79 2.5	BL-135924	53591	80 17
10921791-1	19207	79 2.2	B-135947	53591	80 22
10921791-2	19207	79 2.2	L-135954	53591	80 11
10921791-3	19207	79 2.2	B-135955	53591	80 2
10935279	19207	2	C-136435	53591	79 13
10945184	19207	62	A-136700	53591	80 25
112723	53591	79 8	C-136890	53591	80 9.6
11602686	19207	81 6.5	C-137008	53591	80 7
11602687	19207	81 6.8	C-137016	53591	80 3
11602688	19207	81 6.6	C-137017	53591	80 6
11602689	19207	81 11.3	B-137095	53591	80 5
11602690	19207	81 6.11	B-137124	53591	80 1
11602691	19207	81 11.2	B-137126	53591	80 8
11602692	19207	81 11.4	A-137217	53591	80 15
11602693	19207	81 11.1	BL-137517	53591	80 27
11602694	19207	81 6.3	A-138178	53591	80 26
11602695	19207	81 6.4	138714	53591	79 21
11602696	19207	81 6.12	A-138991	53591	80 24
11602697	19207	81 6.10	B-139137	53591	80 18
C-125638	53591	79 12	B-139139	53591	80 19
		80 13			

**C 1, TM 9-2990-201-45**

<i>Stock Number</i>	<i>Figure Number</i>	<i>Item Number</i>	<i>Stock Number</i>	<i>Figure Number</i>	<i>Item Number</i>
139265	53591	80	28772-242	96906	79
C-139552	53591	4	35307-33	96906	79
139677	53591	81	35457-50	96906	79
A-139777	53591	80	35769-2	96906	79
139794	53591	81	5702698	19207	79
B-139817	53591	81	5702699	19207	80
A-139868	53591	81	5702741	19207	81
B-140132	53591	81	5702742	19207	81
C-140145	53591	81	586325	21450	79
L-140238	53591	80			80
L-140283	53591	80	591335	21450	79
BL-140284	53591	80			80
L-140301	53591	80	592	53591	80
L-140334	53591	81	C-6218	53591	80
A-140357	53591	80	7383438	19207	79
C-141073	53591	81	7383439	19207	79
B-142066	53591	81			80
B-143331	53591	81			81
D-144587	53591	81	8764889	19207	79
144881	53591	81	9068-145	96906	81
L-145089	53591	81	9068-262	96906	81
16627-87	96906	81			



C 1, TM 9-2990-201-45

Item	Paragraph	Figure	Page
Cover, compressor—continued			
Installation .....	49	13-15, 61	38
Removal .....	19	13-15	13
Repair .....	33b		23
Cover, oil outlet:			
Cleaning .....	32		23
Installation .....	50	11	38
Removal .....	18	11	12
Data .....	5		5
Depot maintenance wear limits (See Wear limits)			
Description .....	4		1
Disassembly .....	16		12
End play, shaft and turbine wheel .....	12c, 44	10, 57	9, 35
Exhaust flow .....	4b	7	2
Extension, compressor:			
Cleaning .....	32		23
Inspection .....	33c		23
Installation .....	48	16	37
Removal .....	20	16	14
Repair .....	33c		23
Flinger sleeve (See Sleeve, finger)			
Forms, records, and reports .....	3		1
General support wear limits (See Wear limits)			
Housing, bearing:			
Cleaning .....	32		23
Inspection .....	33k		26
Installation .....	41	44-47	29
Removal .....	22	18-21	15
Repair .....	33k		26
Housing, compressor:			
Cleaning .....	32		23
Inspection .....	33e		23
Installation .....	43a	53, 54	28
Removal .....	25a	25	18
Repair .....	33e		23
Housing, turbine:			
Cleaning .....	32		23
Inspection .....	33n		27
Repair .....	33n		27
Inspection .....	33		23
Instructions:			
Assembly .....	15b, 34a		12, 28
Disassembly .....	15a		12
Introduction (See Scope)			
Lubrication .....	4c	8	4
Maintenance allocation (See Allocation, maintenance)			
Malfunction (Table 2) .....	13		9

Item	Paragraph	Figure	Page
Nozzle ring (See Ring, nozzle)			
Operation .....	4b	7	2
Parts identification (See Appendix II)			
Parts repair .....	7		6
Piston rings (See Rings, collar piston)			
Plate, compressor back:			
Cleaning .....	32		23
Inspection .....	33e		23
Installation .....	43b	56	35
Removal .....	25b	27	19
Repair .....	33e		23
Plate, nozzle back:			
Cleaning .....	32		23
Inspection .....	33p		27
Repair .....	33p		27
Plate, turbine back:			
Cleaning .....	32		23
Inspection .....	33p		27
Repair .....	33p		27
Radial movement, turbine shaft and wheel .....	12b, 21	9, 17	9, 14
References .....	1b		1
Repair .....	33		23
Repair and rebuild standards .....	53-66	79-80	39-42
Repair parts .....	7		6
Ring, nozzle:			
Checking spacing of vanes .....	33l	41	26
Cleaning .....	32		23
Inspection .....	33l		26
Installation .....	39	42	28
Removal .....	30	37	22
Repair .....	33l		26
Rings, collar piston:			
Cleaning .....	32		23
Installation .....	43a	52	33
Removal .....	26	29	17
Rings, finger sleeve:			
Cleaning .....	32		23
Installation .....	43b	55	34
Removal .....	26	29	17
Rings, shaft and wheel piston:			
Cleaning .....	32		23
Installation .....	40	43	28
Removal .....	24	24	17
Scope .....	1		1
Shaft and turbine wheel:			
Checking end play .....	12c, 44	19, 57	9, 35
Checking total radial movement .....	12b, 21	9, 17	9, 14
Cleaning .....	32		23
Inspection .....	33m		27
Shaft and turbine wheel—continued			
Installation .....	40	43	28
Removal .....	23	22, 23	16
Repair .....	33m		27
Shield, internal:			
Cleaning .....	32		23
Inspection .....	33o		27
Repair .....	33o		27

Item	Paragraph	Figure	Page
Sleeve, finger:			
Cleaning .....	32		23
Inspection .....	33i		25
Installation .....	43a		32
Removal .....	25b	28	19
Repair .....	33i		25
Special tool table .....	9		6
Special tools .....	9	65	6
Specifications (See Data)			
Tables (See specific item)			
Test .....	51		39
Thrust collar (See Collar, thrust)			
Thrust washer (See Washer, bearing or flat thrust)			
Tools and equipment, common .....	8		6
Tools, special .....	9	82	6
Troubleshooting:			
After disassembly .....	13		9
Before disassembly .....	12		8
Checking end play .....	12c	10	9
Checking shaft and turbine wheel radial movement .....	12b	9	9
General instructions and procedures .....	11		8
Purpose .....	10		8
Table II .....			10
Turbine wheel (See Shaft and turbine wheel)			
Unsatisfactory equipment report .....	1d		1
Washer, bearing thrust:			
Cleaning .....	32		23
Inspection .....	33j		25
Repair .....	33j		25
Washer, flat thrust:			
Checking for distortion and proper thickness .....	33f	40	24
Cleaning .....	32		23
Inspection .....	33f		24
Repair .....	33f		24
Wear limits, general support and depot maintenance .....	53-66	79-80	39-42
Wheel, compressor:			
Checking back clearance .....	45	58	36
Cleaning .....	32		23
Inspection .....	33d		23
Installation .....	46	59	36
Removal .....	23	22, 23	16
Repair .....	33d		23



By Order of the Secretary of the Army:

W. C. WESTMORELAND,  
*General, United States Army,*  
*Chief of Staff.*

OFFICIAL:

KENNETH G. WICKHAM,  
*Major General, United States Army,*  
*The Adjutant General.*

Distribution:

To be distributed in accordance with DA Form 12-38, Direct and General Support requirements for Truck, 2½-Ton, Cargo, M35A2, M36; Repair Shop, M185; Tanker M49C, M50, Tractor, M275, M52/M246 Van; 292A1, M109A1; Truck 5-Ton, 6X6, Cargo, M54, M55, Chassis M61, M63, M139D, Dump, M51, Wrecker, M543.

1

2

3

4

5

6

7

8

**TM 9-2990-201-45**

**TURBOCHARGER, ENGINE, ASSEMBLY**

**SEPTEMBER 1964**