

**TOOL CATALOG**  
**for**  
**WRIGHT ENGINES**



**CYCLONE "F"**  
**CYCLONE "F-50"**  
**CYCLONE "G"**  
**CYCLONE "G-100"**  
**WHIRLWIND J-6 (E Series)**

**WRIGHT AERONAUTICAL CORPORATION**

**Paterson, N. J., U. S. A.**

## **IMPORTANT**

**Do not use reference numbers for ordering tools. Specify tool numbers and names on mail orders and code words on telegraph orders.**

*JOHN M. WOLGAST*

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## GENERAL INFORMATION

### Description of Catalog

This catalog lists and describes the tools for overhauling and reconditioning Wright Whirlwind J-6E Series, Cyclone F, F-50, G and G-100 engines. The catalog is divided into eleven main groups, such as Crankcase Tools, Oil Pump Tools, Cam and Cam Drive Tools, etc. Each main group lists the disassembly and reassembly tools and the reconditioning tools for that particular group. Some of the main groups also list the inspection tools. For instance, the connecting rod group includes the tools required to disassemble or reassemble the master and articulated rod assembly, the tools required for reconditioning the rods and the inspection tools. All types of each tool are listed together. The columnar arrangement of models on each page indicates the models for which the tool is used.

Tool numbers are used exclusively in the catalog to identify tools. Tool numbers are used exclusively in the factory to identify tools and customers are requested to identify tools on their orders by TOOL NUMBERS.

The Code Words appearing in the catalog are arranged alphabetically and are to be used only when ordering tools by telegraph or cable.

The "R" or reference numbers appearing on the illustrations are numerically arranged in the text and are used to assist in locating a part in the text after it has been found in an illustration. As a cross reference, the illustration figure numbers, on which the various tools or reference numbers are shown, are listed in the text next to the tool number.

The illustrations used in this catalog show the general appearance of the tools and are not in every instance according to scale. In some cases, a single illustration has been used to cover a number of tools similar in appearance and the same reference number has been applied to these tools in the text. It is therefore necessary, when ordering tools, to read carefully the descriptions in the text.

The table of contents at the front of the book shows the method of grouping the tools and the sequence of the groups. A comprehensive index is at the back of the book.

A numerical tool list containing all of the tools listed in the catalog, their code words, and the page numbers on which they are listed is also included in the back of the book. This list will be revised periodically to include the latest replacement tools and should be referred to when ordering tools.

Owners of Wright engines will be supplied with catalogs at no charge provided the owners write direct to the factory giving the serial numbers of their engines. To non-owners, the catalogs will be supplied at \$.60 each.

### Prices

This catalog does not contain prices. A separate numerically arranged PARTS AND TOOLS PRICE LIST for Wright Aircraft Engines is available and will be supplied to owners of Wright engines upon request.

### Terms

Except to customers with established credit, tools are shipped by C.O.D. Express, C.O.D. Parcel Post or by Freight with Sight Draft attached to Bill of Lading.

### How to Order

Tools must, whenever possible, be ordered by or through a Wright Distributor.

A tool must be designated by a TOOL NUMBER together with a name sufficiently descriptive to give the factory a check on the accuracy of the Tool Number. IT IS NOT NECESSARY TO WRITE THE FULL CATALOG DESCRIPTION OF THE TOOL. Do not enter the price of the tool on the order. Be sure to give definite shipping instructions. If shipping instructions on domestic orders are omitted, we shall ship by express or parcel post.

### "Right" and "Left"

The terms "Right" and "Left" in connection with tools listed in this catalog refer to the viewpoint from the rear of the engines.

### Cylinder Numbers

Viewing the engine from the rear, cylinders are numbered in the clockwise rotation, the top cylinder being number one.

**TELEGRAPH OR CABLE ORDERS**

**Use of Code**

Code words are for telegraphic or cable orders only. Begin telegram with shipping code as per table below.

Use plain English to designate quantity wanted.

**Example of Proper Code Order**

Original message:

Ship to us by express one 83714 knuckle pin removing and installing puller for Whirlwind J-6E engines.

Coded message:

YOWBA ONE VUBCA

**Shipping Code**

YOVUK Ship to us by Air Mail

YOWAR Ship to us by Air Express

YOWAZ Ship to us by Air Freight

YOWBA Ship to us by Express or Parcel Post

YOWDO Ship to us by Parcel Post Special Handling

YOWEF Ship to us by Freight

YOWFI Ship to . . . . . by Air Express and charge to us

YOWFU Ship to . . . . . by Air Freight and charge to us

YOWGA Ship to . . . . . by Express or Parcel Post and charge to us

YOWIN Ship to . . . . . by Parcel Post Special Handling and charge to us

YOWME Ship to . . . . . by Freight and charge to us

YOWOB Ship to . . . . . by Air Express C.O.D.

YOWRU Ship to . . . . . by Express or Parcel Post C.O.D.

YOWUL Ship to . . . . . by Parcel Post Special Handling C.O.D.

YOXAL Ship to . . . . . by Freight C.O.D.

YOXBO Advise date of shipment of our order number (or date). . . . .

YOXEN Acknowledge receipt of this order and give shipping date

**Confirmation**

Always send a confirmation of telegram or cable by mail. Confirmation should contain both coded telegram or cable and translation.

**Telegraphic Reply**

If a telegraphic or cable acknowledgment of an order is required, be sure to add the code word YOXEN to your order. The above shipping code words are also used by the factory in telegrams and cables advising method of shipment.



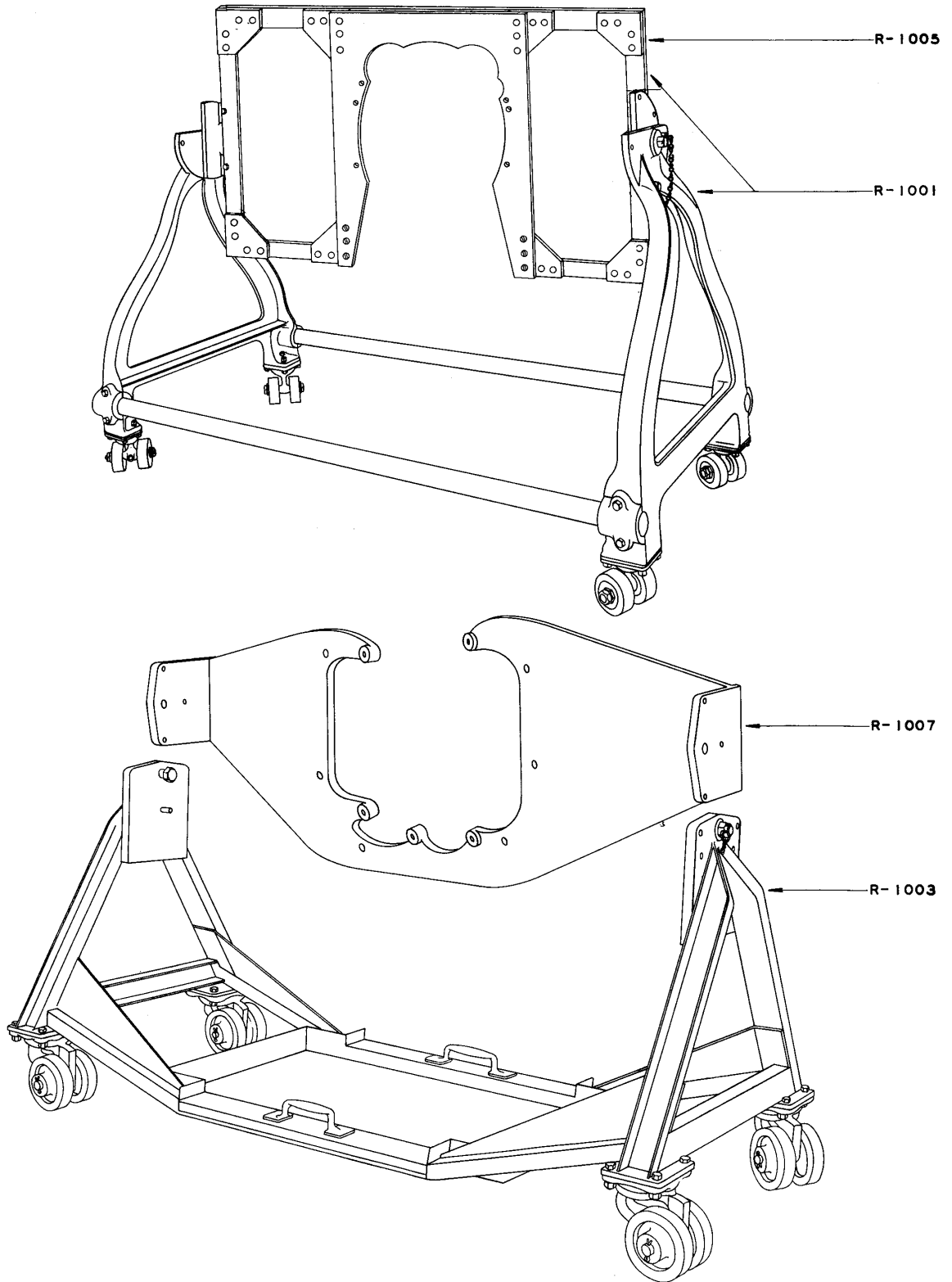
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ILLUSTRATIONS



DISASSEMBLY AND REASSEMBLY TOOLS

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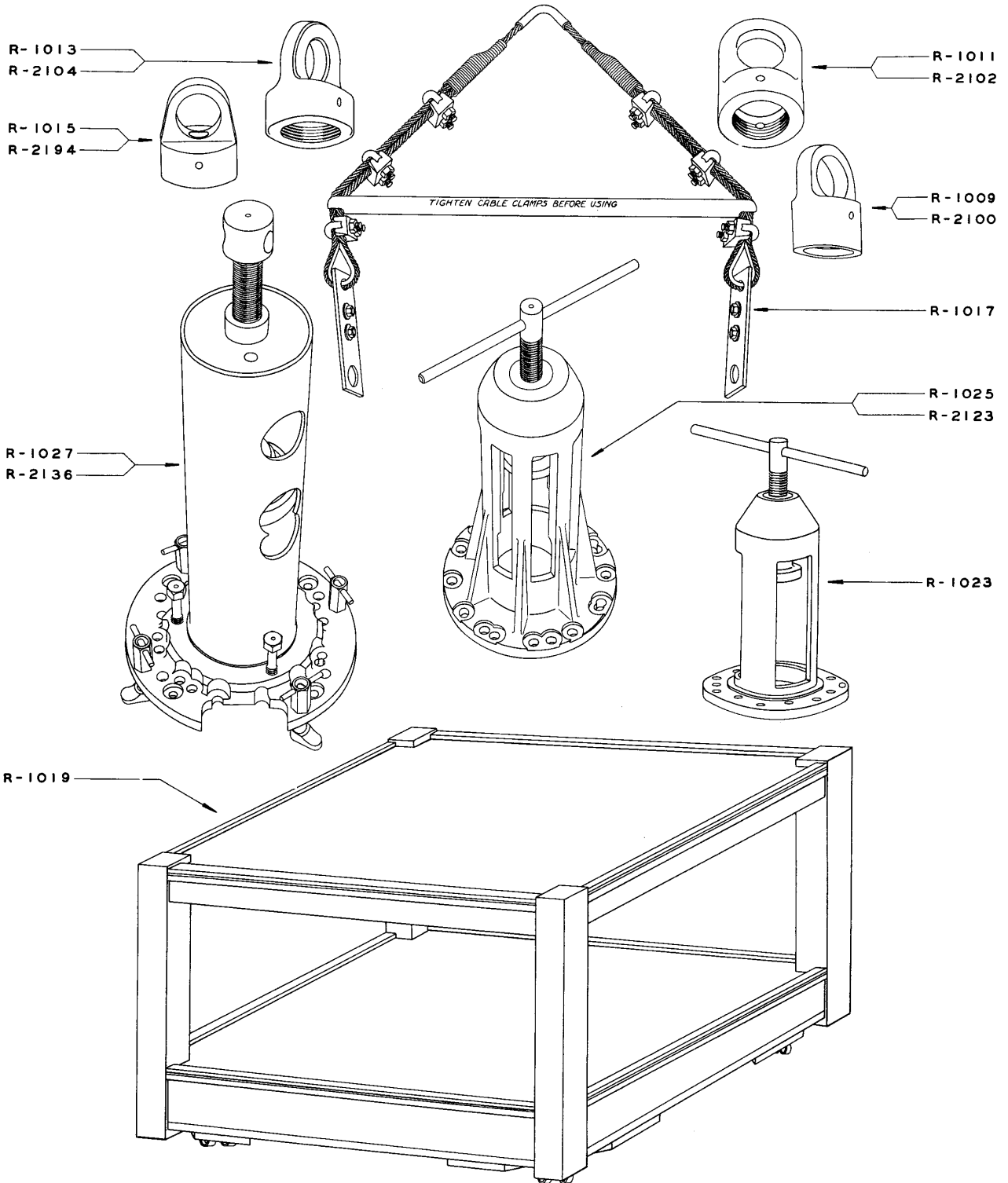


Figure 2

DISASSEMBLY AND REASSEMBLY TOOLS

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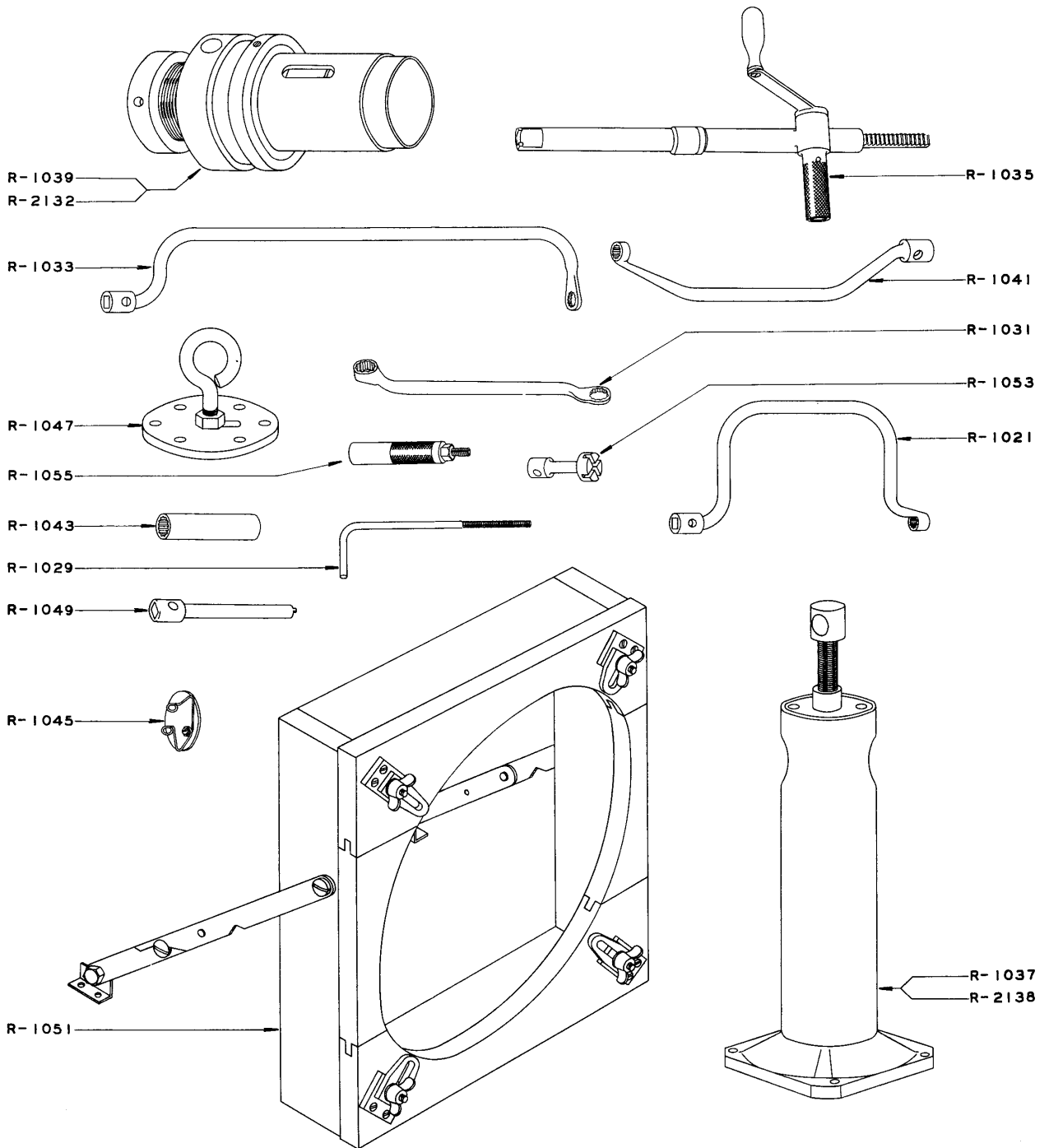


Figure 3

DISASSEMBLY AND REASSEMBLY TOOLS

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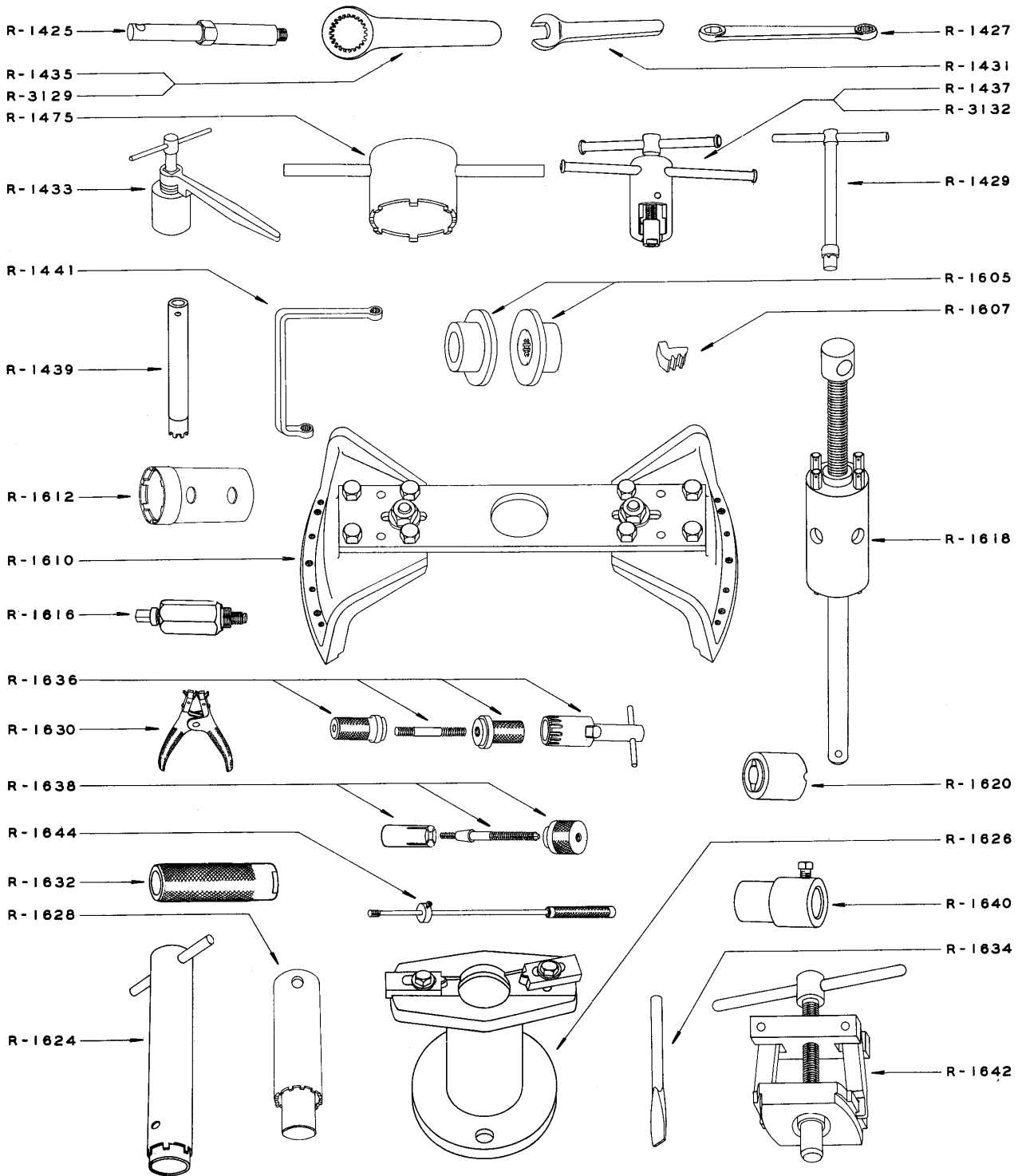


Figure 4

DISASSEMBLY AND REASSEMBLY TOOLS

ILLUSTRATIONS - Cont'd

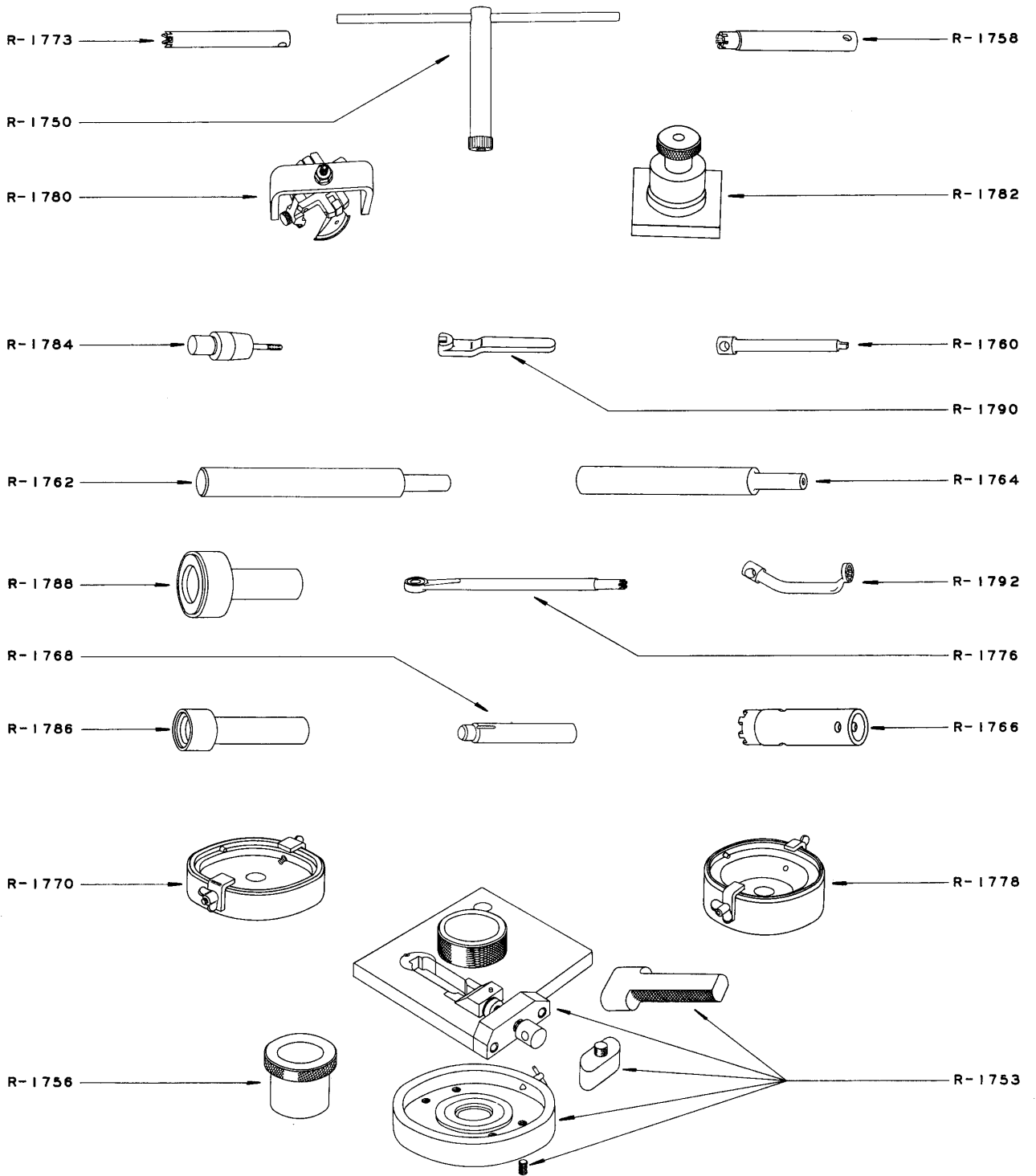


Figure 5

DISASSEMBLY AND REASSEMBLY TOOLS

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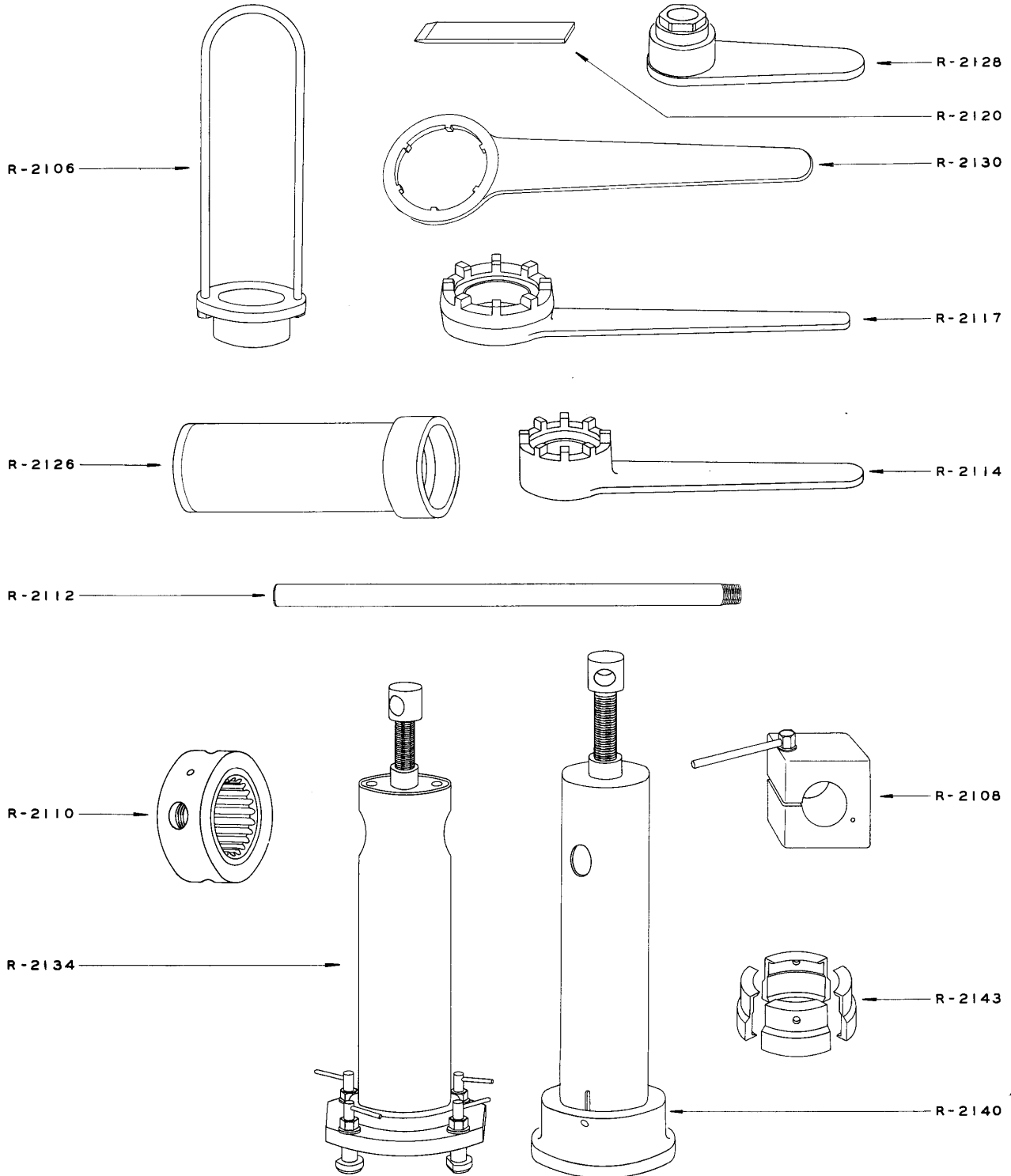


Figure 6

DISASSEMBLY AND REASSEMBLY TOOLS



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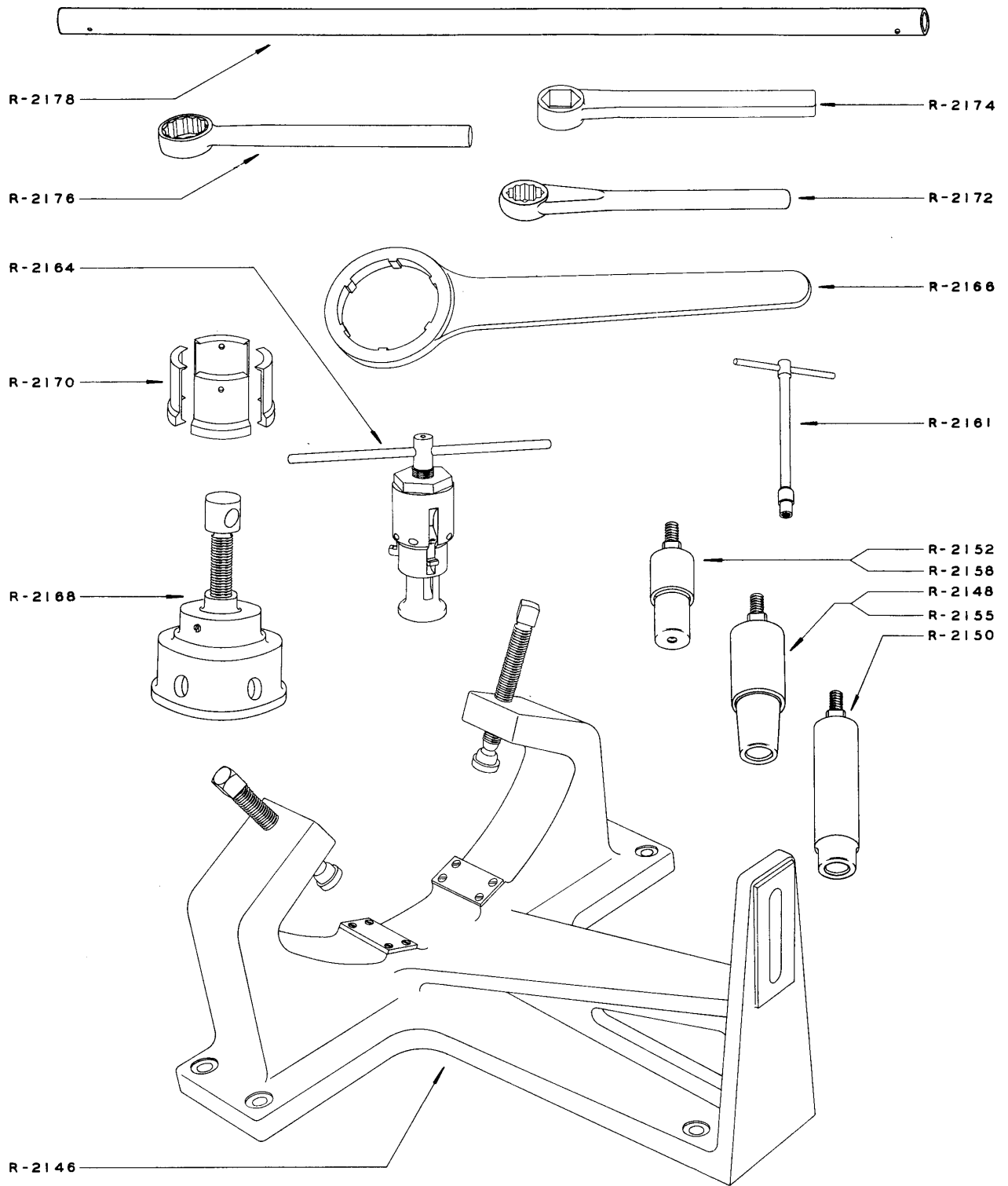


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DISASSEMBLY AND REASSEMBLY TOOLS

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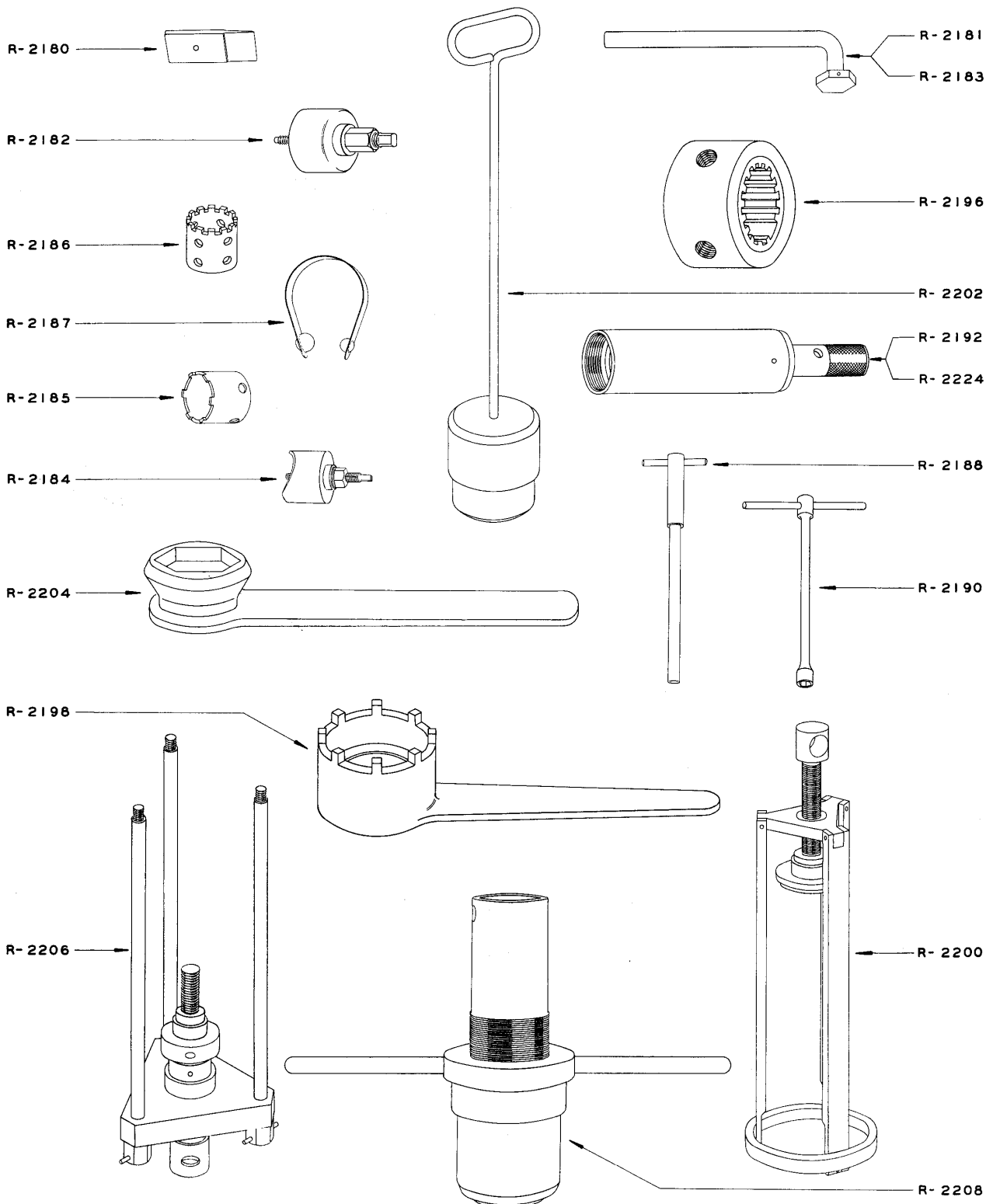


Figure 8

DISASSEMBLY AND REASSEMBLY TOOLS

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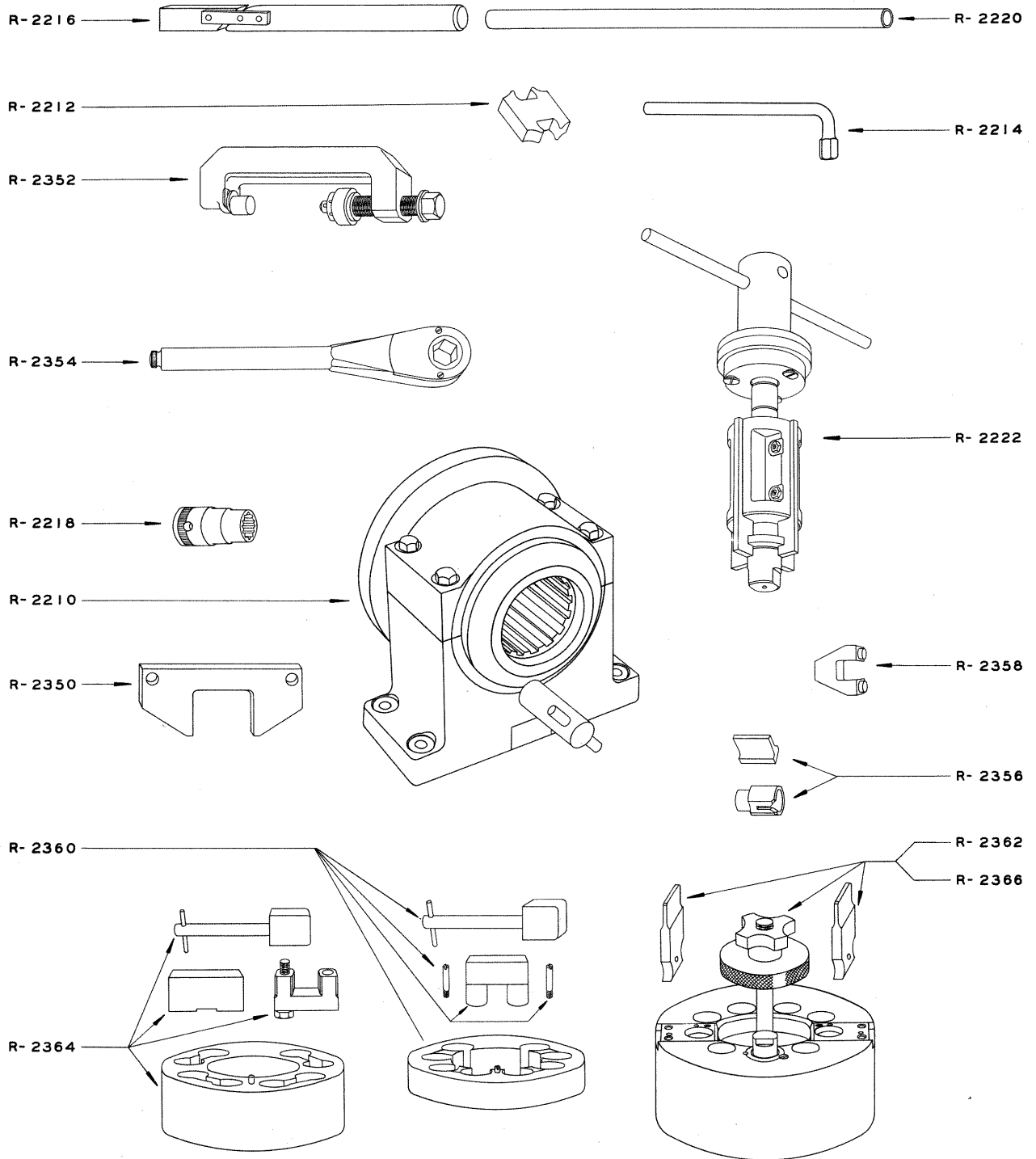


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DISASSEMBLY AND REASSEMBLY TOOLS

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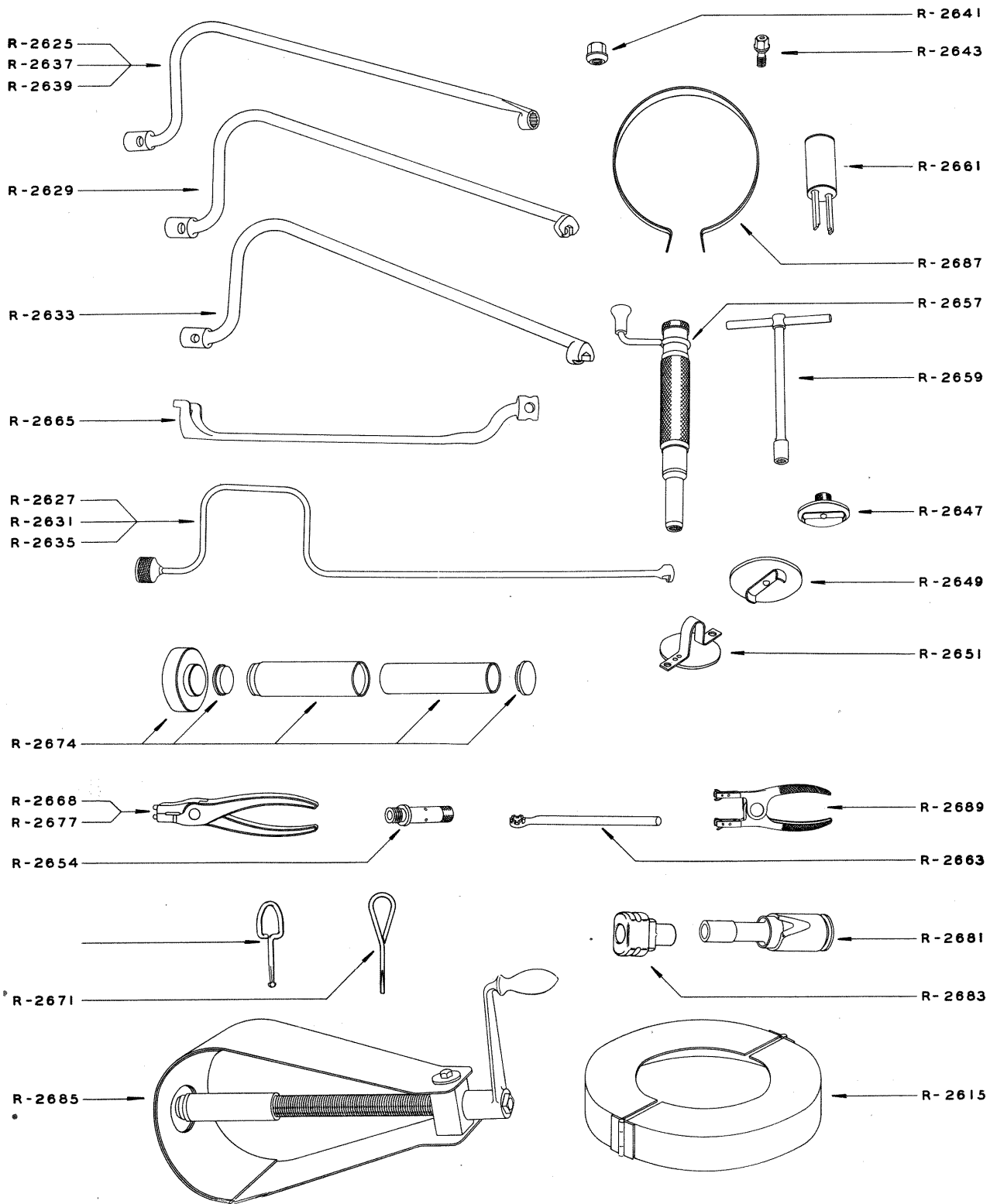


Figure 10

DISASSEMBLY AND REASSEMBLY TOOLS

ILLUSTRATIONS - Cont'd

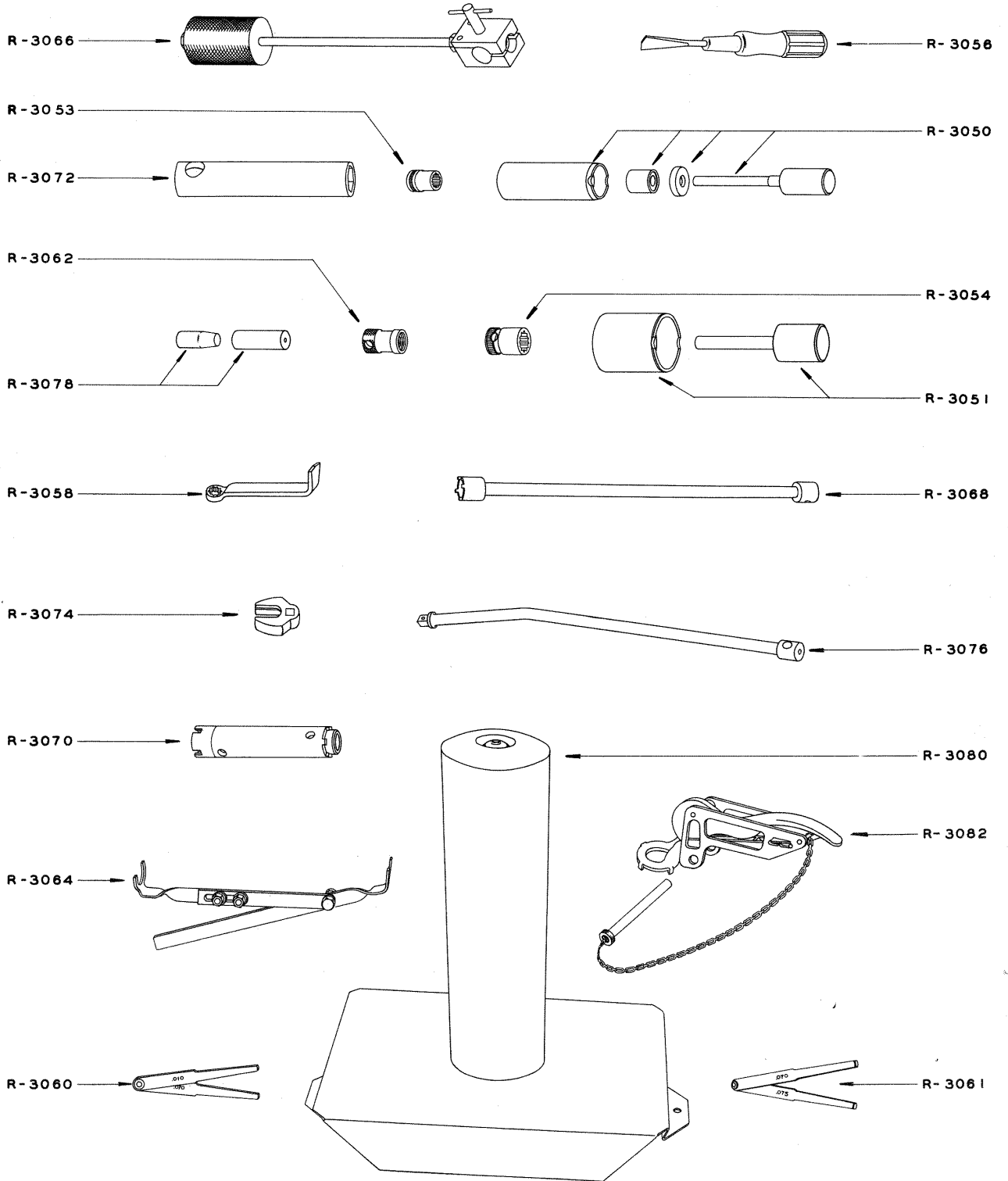


Figure 11

DISASSEMBLY AND REASSEMBLY TOOLS

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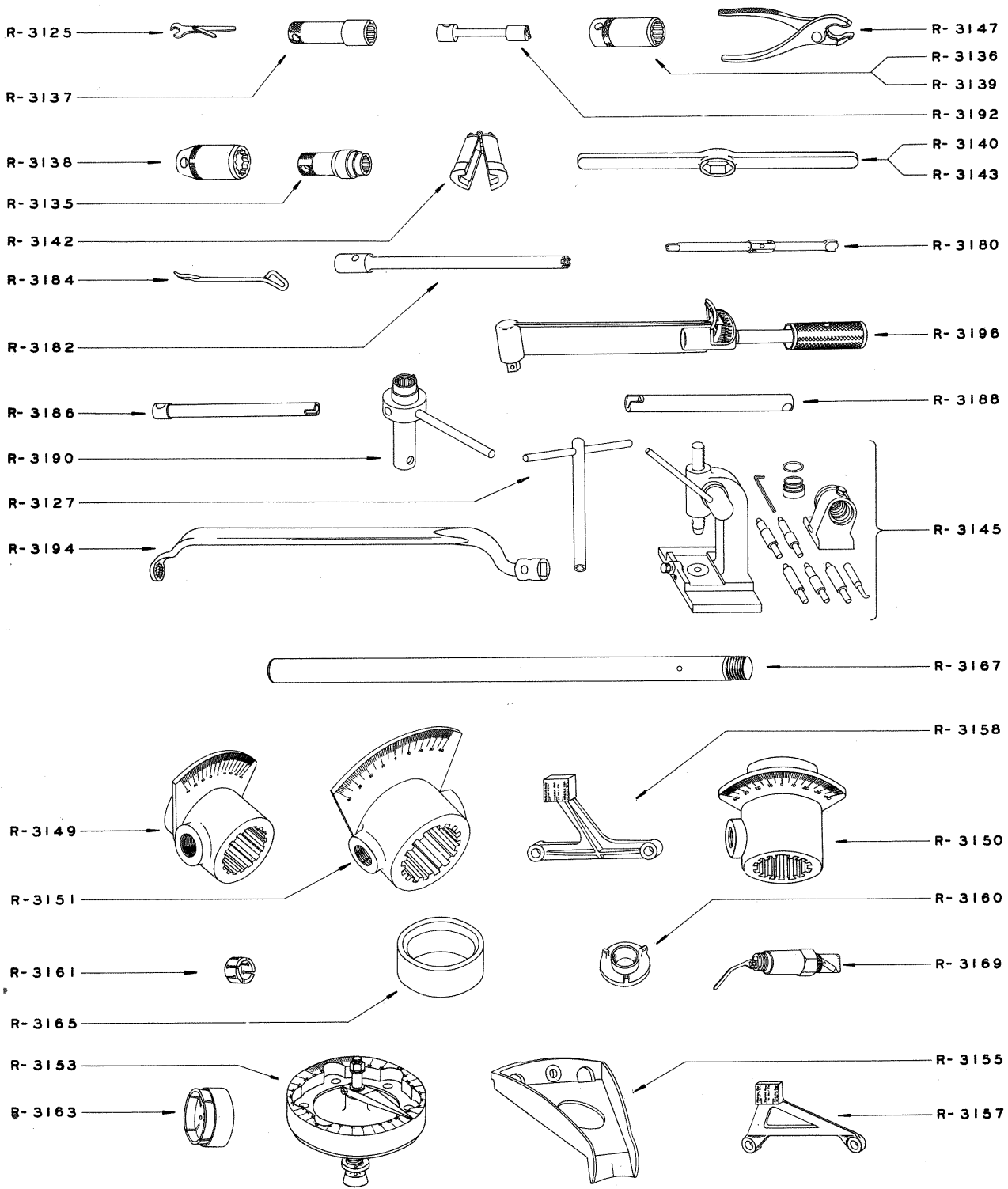


Figure 12

DISASSEMBLY AND REASSEMBLY TOOLS

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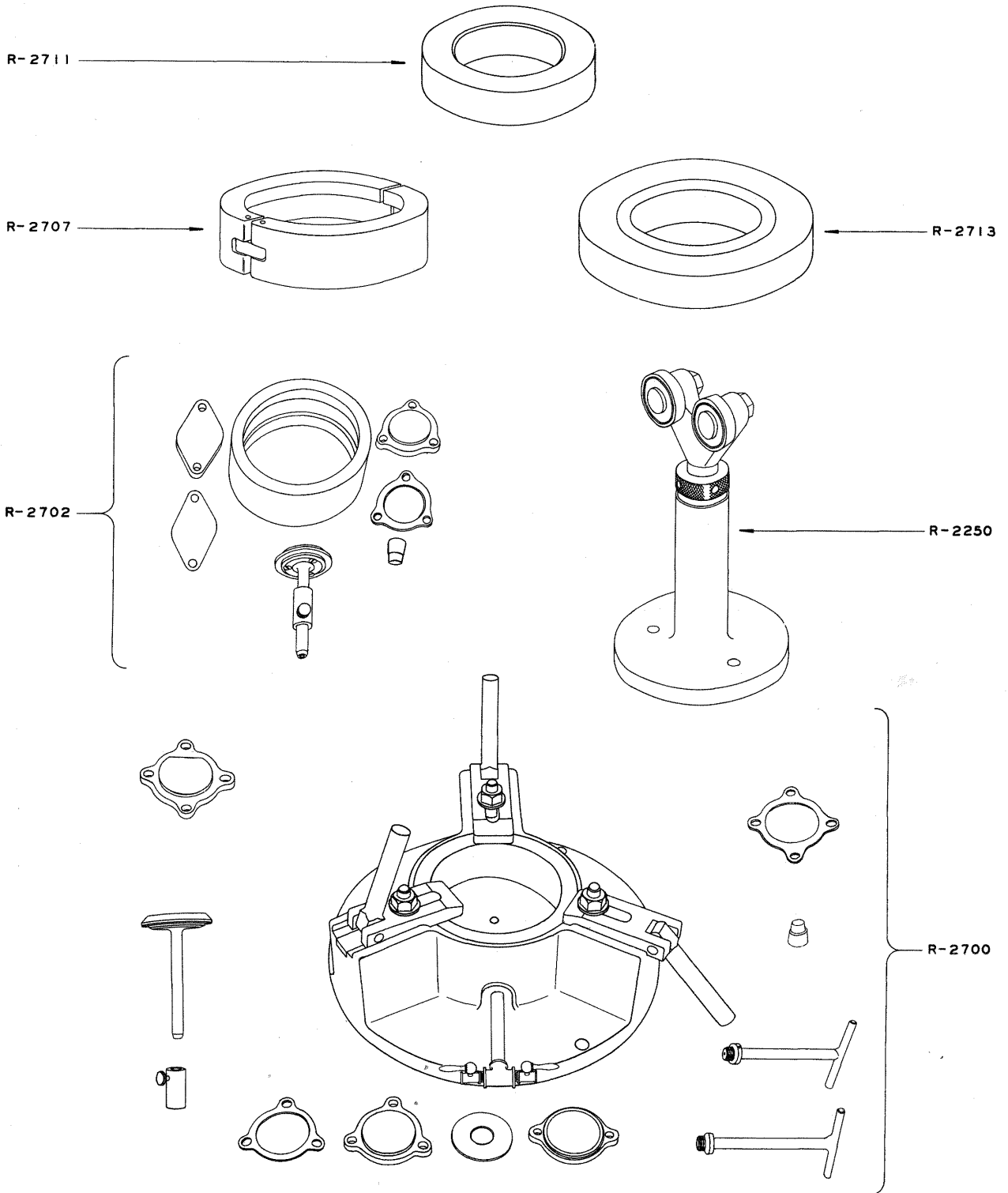


Figure 13

INSPECTION TOOLS

ILLUSTRATIONS - Cont'd

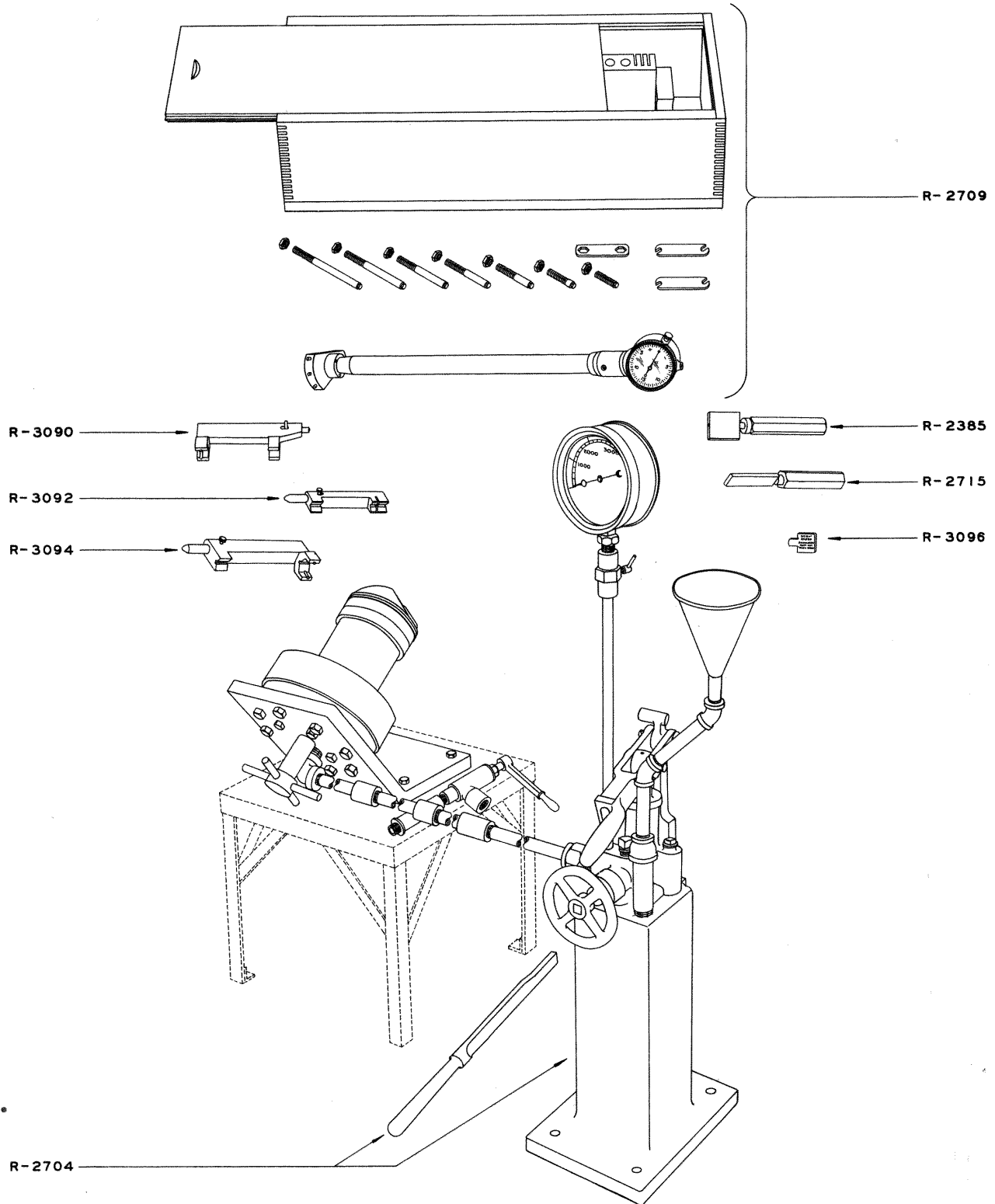


Figure 14

INSPECTION TOOLS



ILLUSTRATIONS - Cont'd

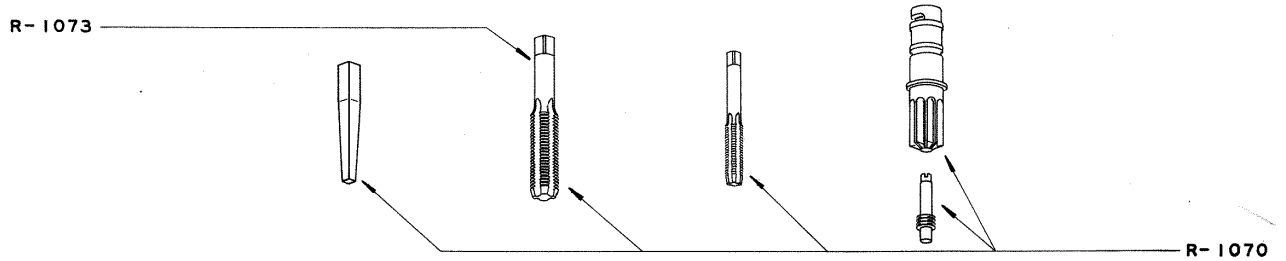


Figure 15

PROPELLER GOVERNOR ATTACHING STUD SCREW BUSHING REPLACEMENT TOOLS  
(WHIRLWIND, CYCLONE F-50, G, G-100)

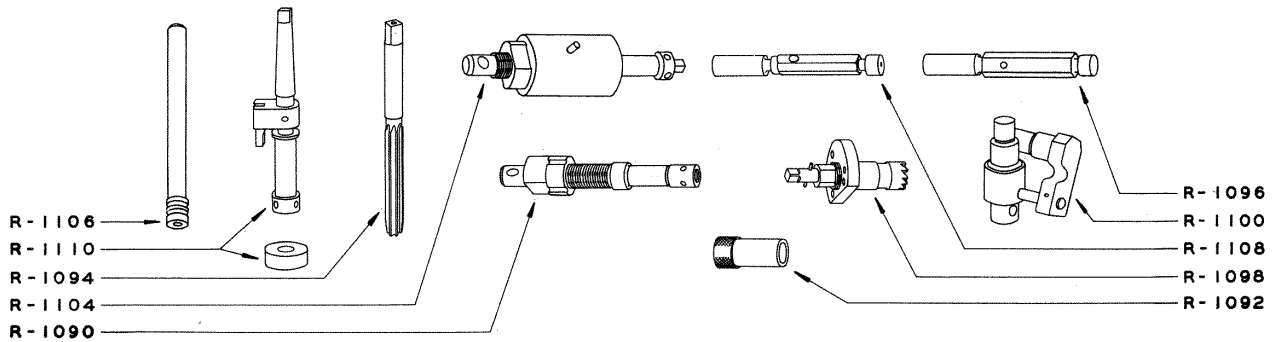


Figure 16

GOVERNOR DRIVE WORM SHAFT AND GEAR SHAFT BUSHING REPLACEMENT TOOLS  
(CYCLONE F-50, G, G-100, 16:11 REDUCTION GEARED ENGINES)

ILLUSTRATIONS - Cont'd

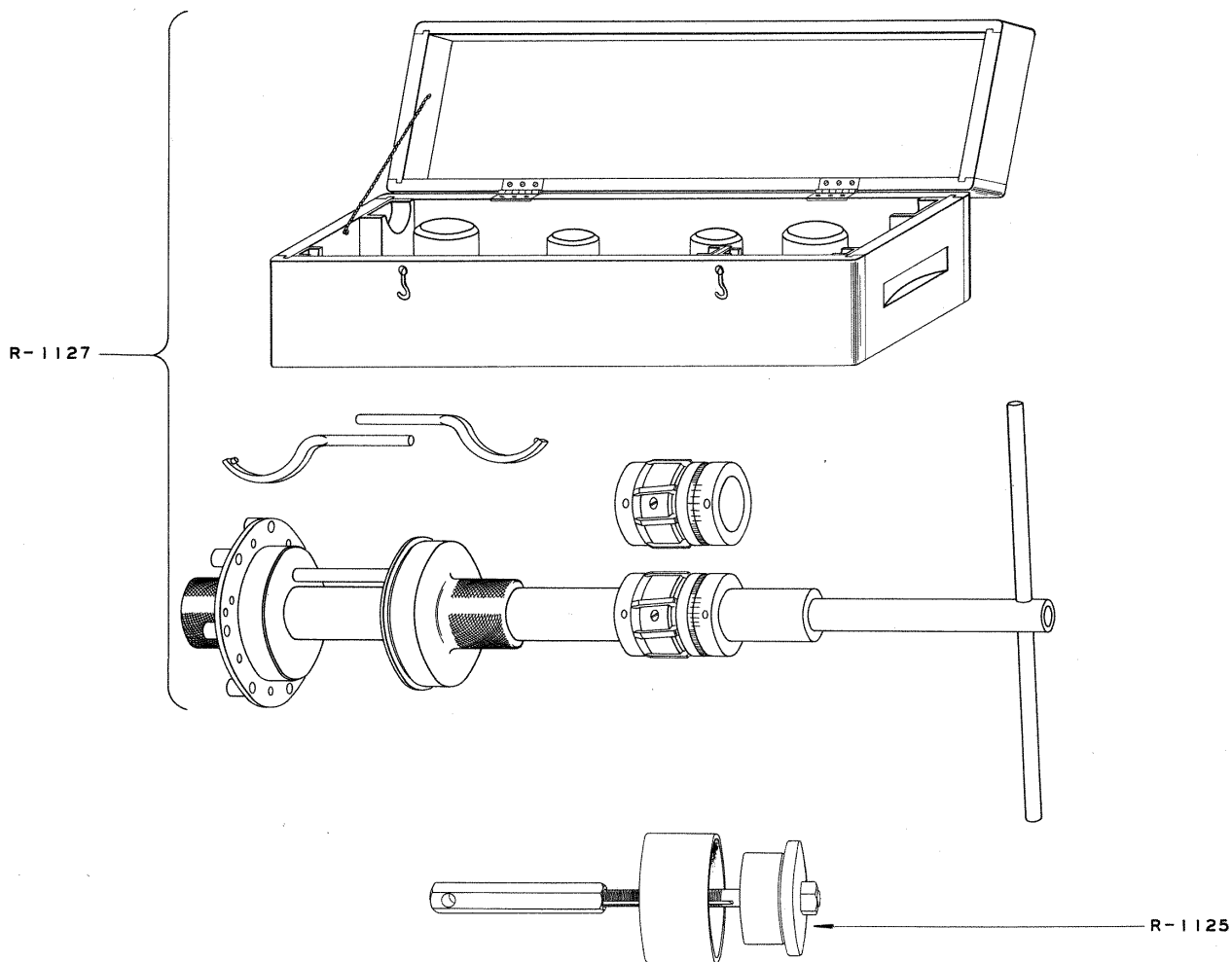


Figure 17

CRANKSHAFT REAR BEARING REPLACEMENT TOOLS (WHIRLWIND)

ILLUSTRATIONS - Cont'd

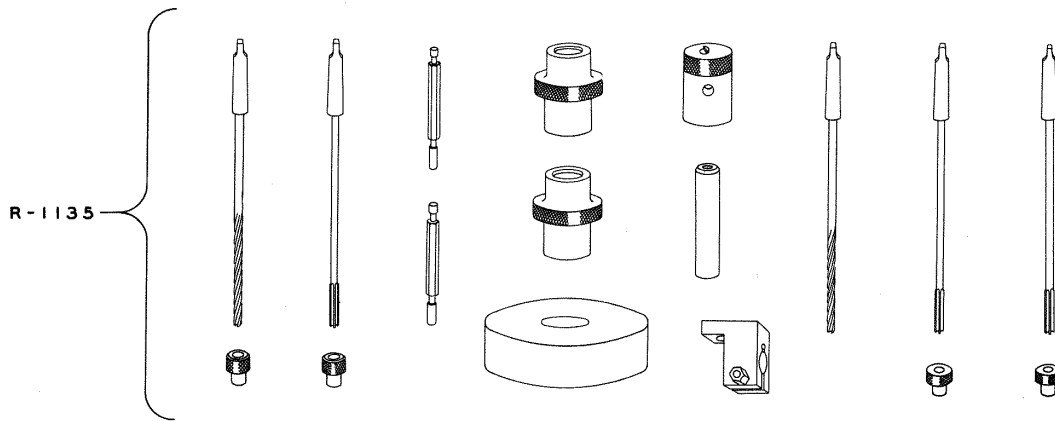


Figure 18

CAM DRIVE GEAR SHAFT REPLACEMENT TOOLS (CYCLONE G-100)

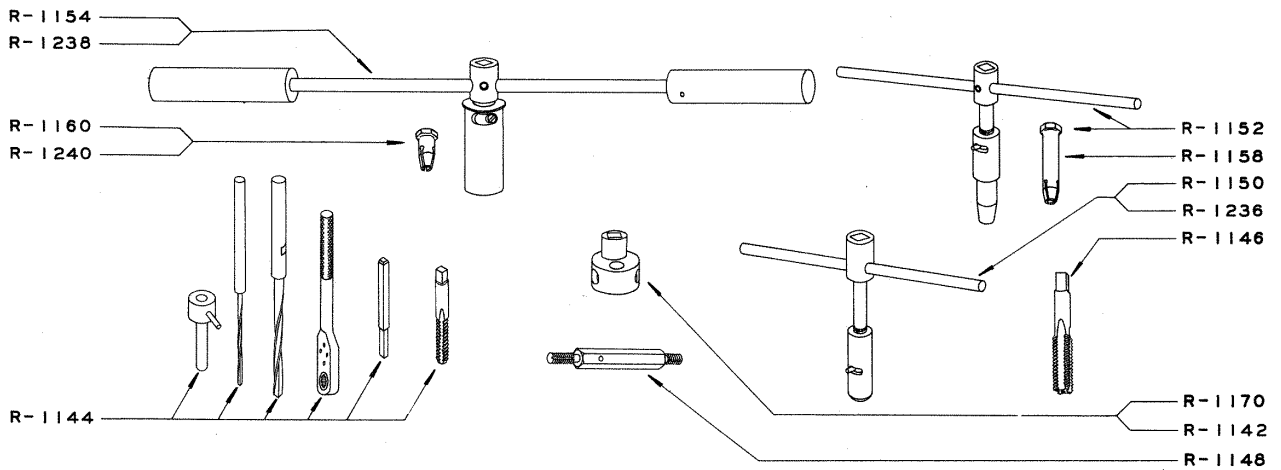


Figure 19

STUD REPLACEMENT TOOLS (EXCEPT CYLINDER HOLD-DOWN STUDS)  
(WHIRLWIND AND CYCLONE)

ILLUSTRATIONS - Cont'd

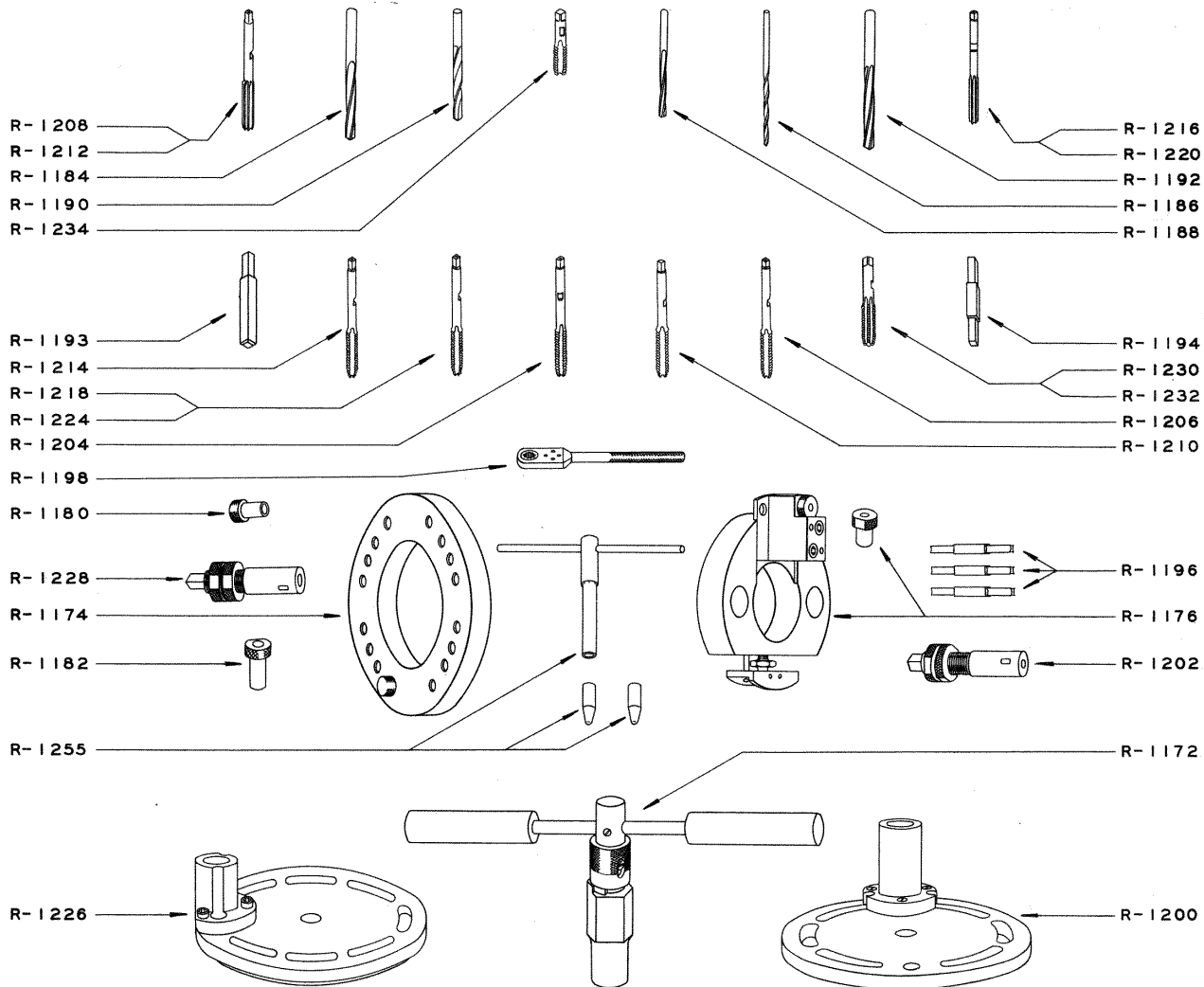


Figure 20

CYLINDER HOLD-DOWN STUD REPLACEMENT TOOLS (CYCLONE)  
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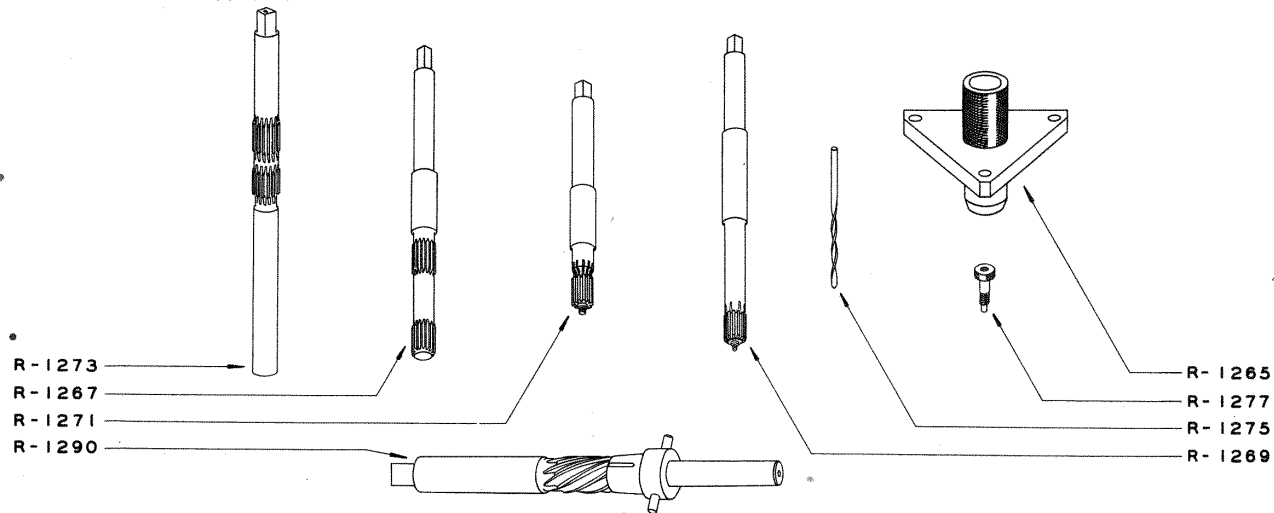


Figure 21

DIFFUSER AND CRANKCASE REAR SECTION ACCESSORY DRIVE SHAFT  
BUSHING FINISHING TOOLS (WHIRLWIND)

ILLUSTRATIONS - Cont'd

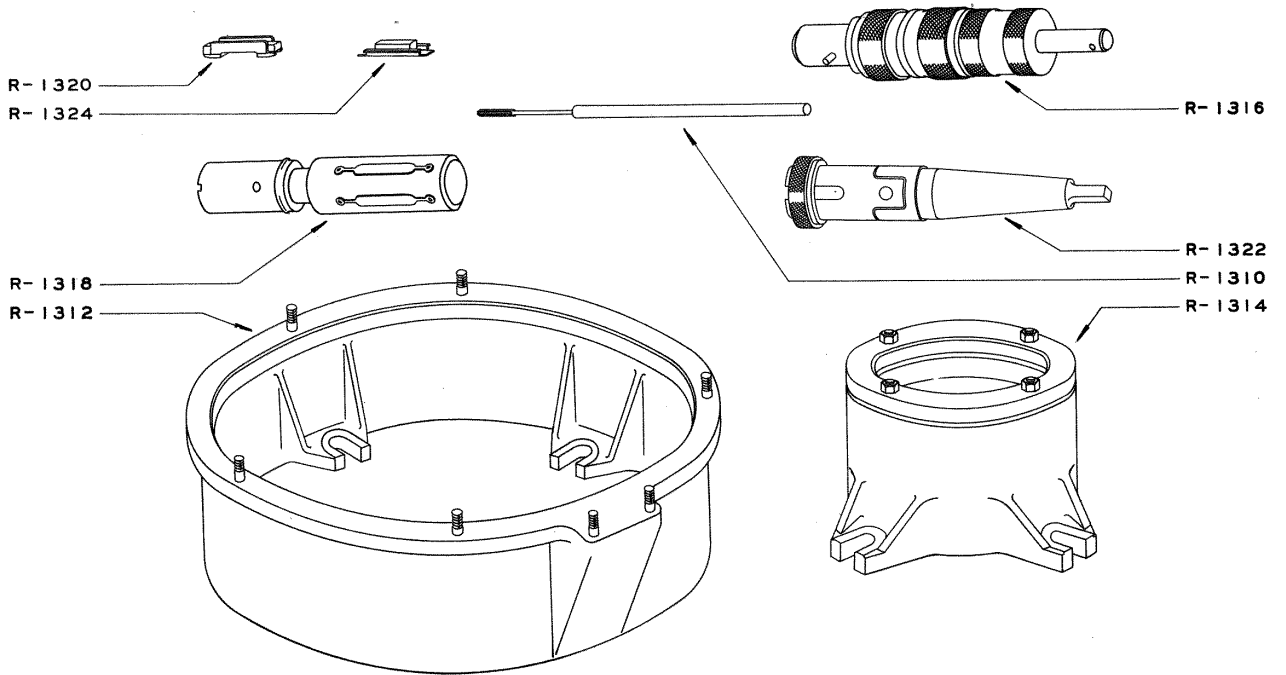


Figure 22

IMPELLER SHAFT SUPPORT SLEEVE AND SUPERCHARGER REAR HOUSING IMPELLER  
SHAFT SLEEVE REPLACEMENT TOOLS (CYCLONE)

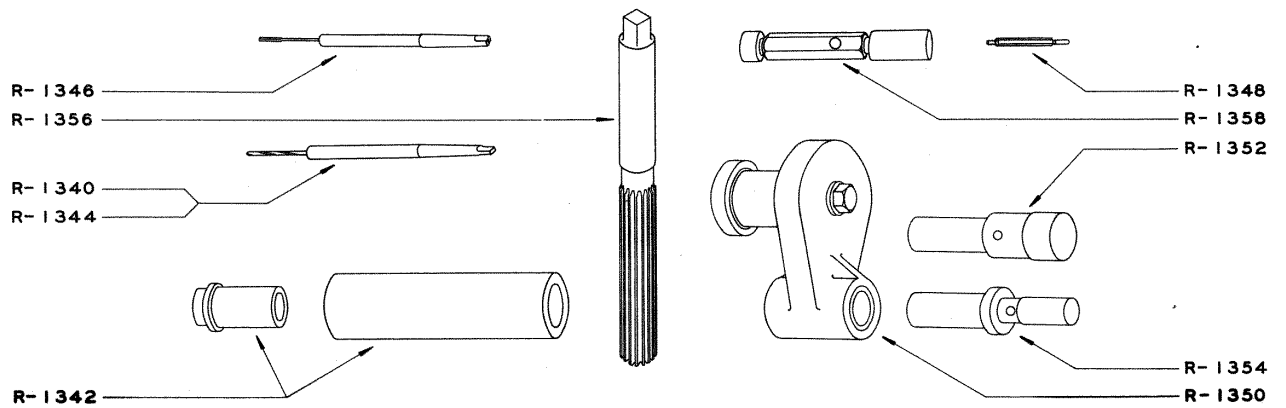


Figure 23

REAR SUPERCHARGER HOUSING IMPELLER DRIVE GEAR SHAFT OUTER BUSHING OR  
IMPELLER DRIVE MULTI-PLATE CLUTCH GEAR BUSHING  
REPLACEMENT TOOLS (CYCLONE G, G-100)

ILLUSTRATIONS - Cont'd

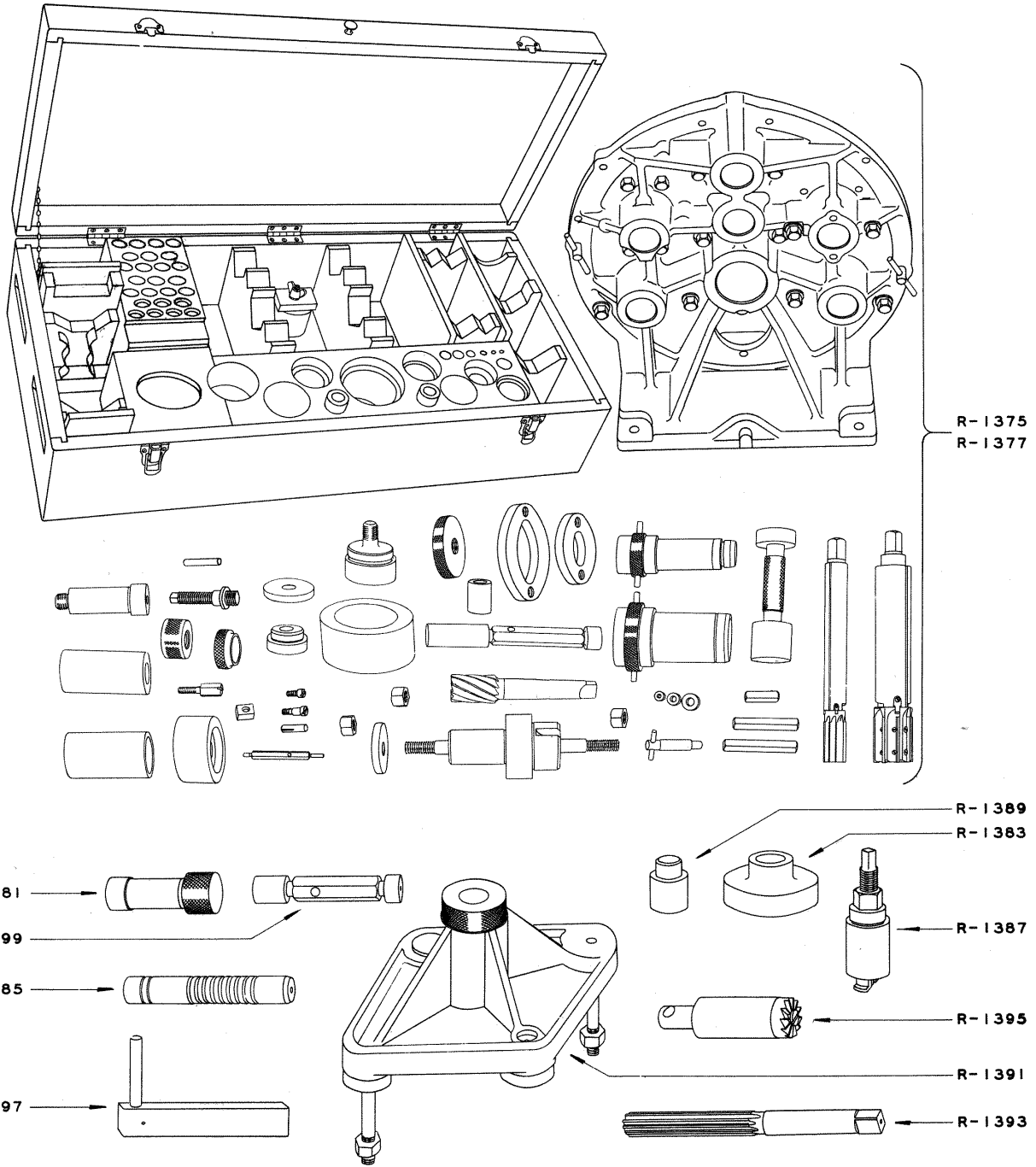
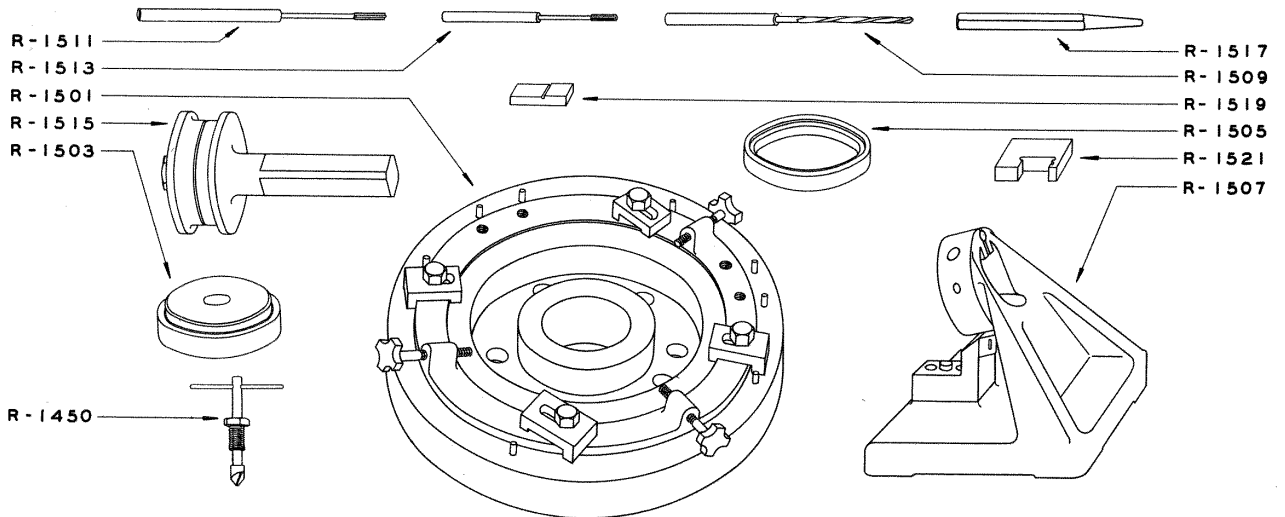


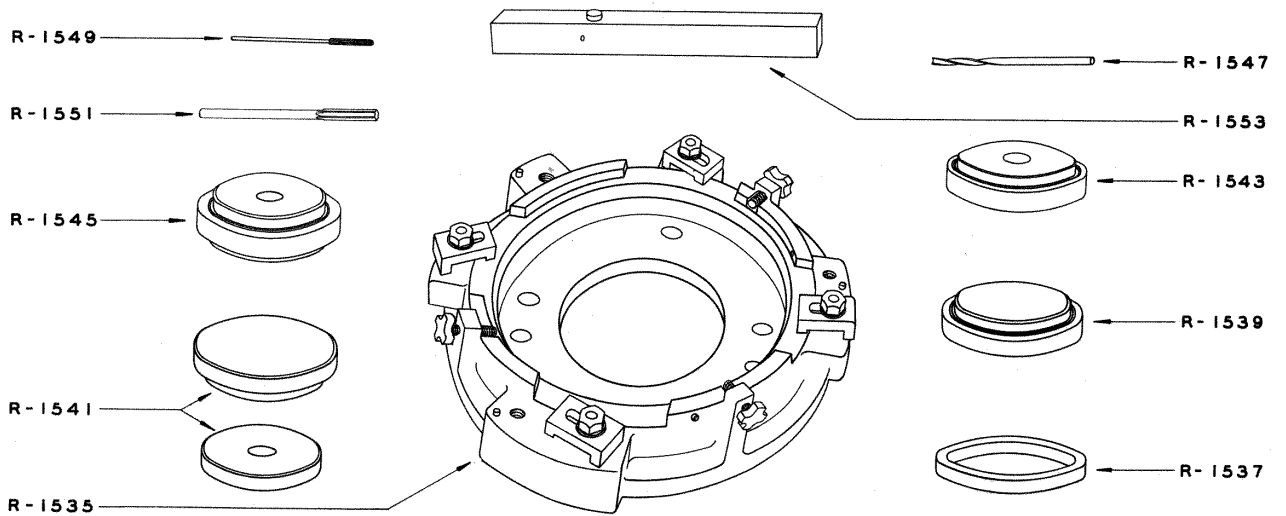
Figure 24

SUPERCHARGER REAR COVER BUSHING REPLACEMENT TOOLS (CYCLONE)

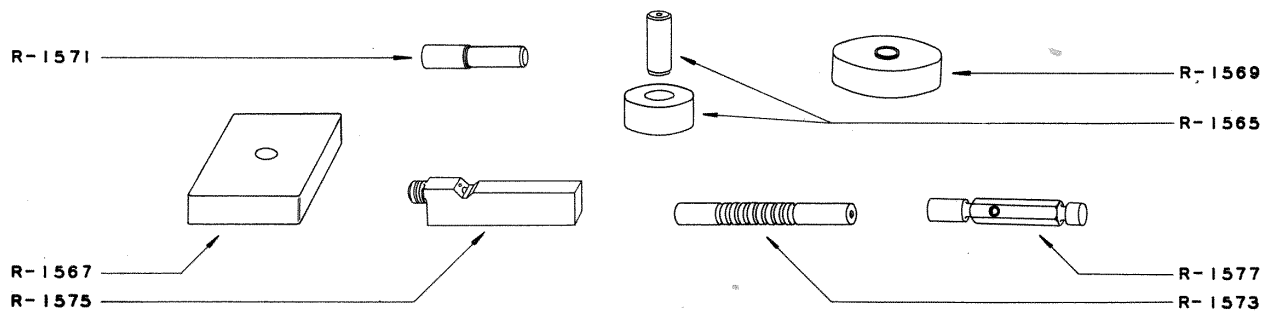
ILLUSTRATIONS - Cont'd



**Figure 25**  
CAM HUB BEARING REPLACEMENT TOOLS (WHIRLWIND)  
OIL PUMP PRESSURE RELIEF VALVE SEAT ANGLE CUTTING TOOL (WHIRLWIND)



**Figure 26**  
CAM HUB BEARING REPLACEMENT TOOLS (CYCLONE)



**Figure 27**  
CAM DRIVE GEAR AND PINION BUSHING REPLACEMENT TOOLS (CYCLONE F-50, G, G-100)

ILLUSTRATIONS - Cont'd

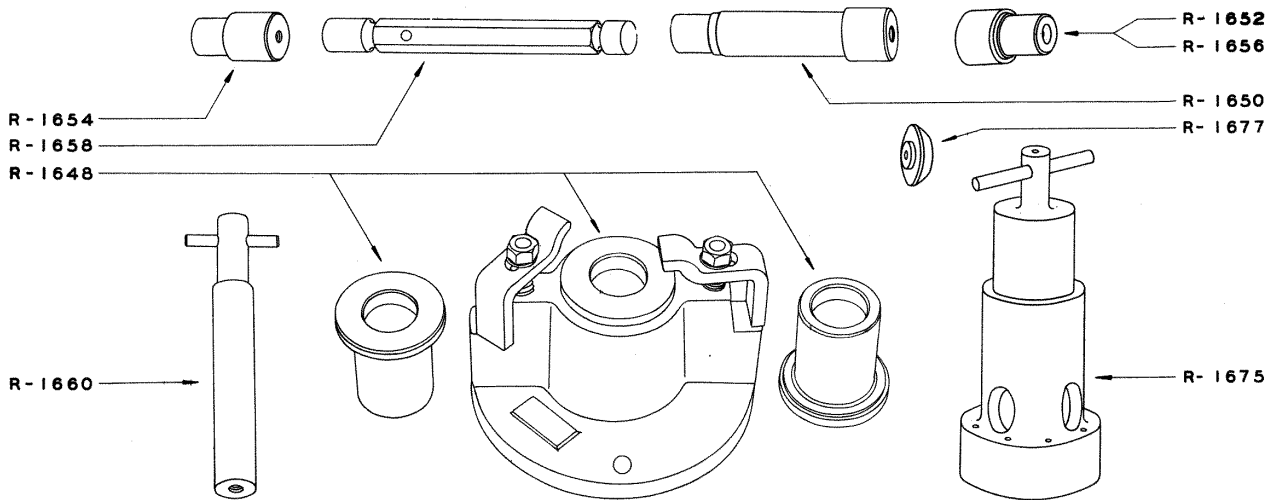


Figure 28

IMPELLER SHAFT BUSHING REPLACEMENT TOOLS (CYCLONE)

IMPELLER SHAFT RETAINER AND CENTERING RING LAPPING TOOLS (CYCLONE)

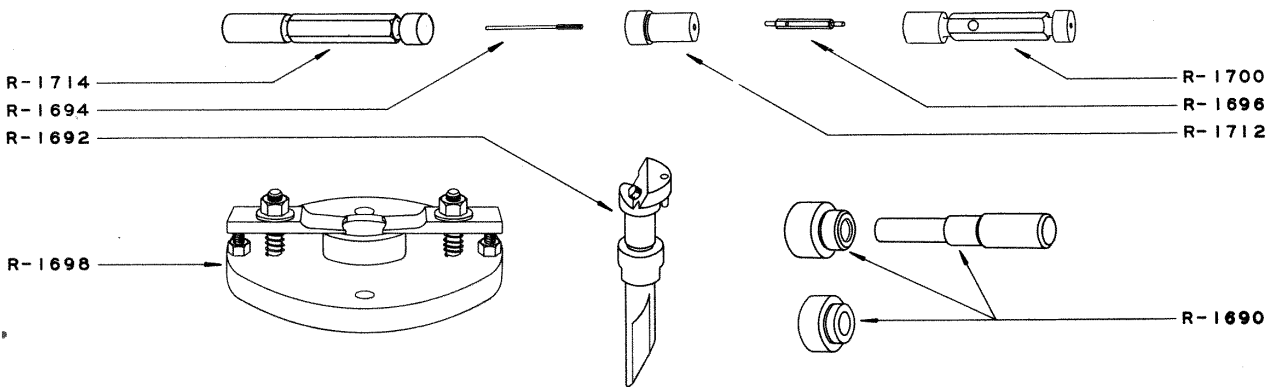


Figure 29

INTERMEDIATE IMPELLER DRIVE GEAR BUSHING REPLACEMENT TOOLS  
(FOR ENGINES EQUIPPED WITH TWO SPEED SUPERCHARGER  
IMPELLER DRIVE) (CYCLONE G, G-100)

IMPELLER DRIVE PINION BUSHING REPLACEMENT TOOLS (FOR ENGINES  
EQUIPPED WITH SINGLE SPEED SUPERCHARGER  
IMPELLER DRIVE) (CYCLONE)



ILLUSTRATIONS - Cont'd

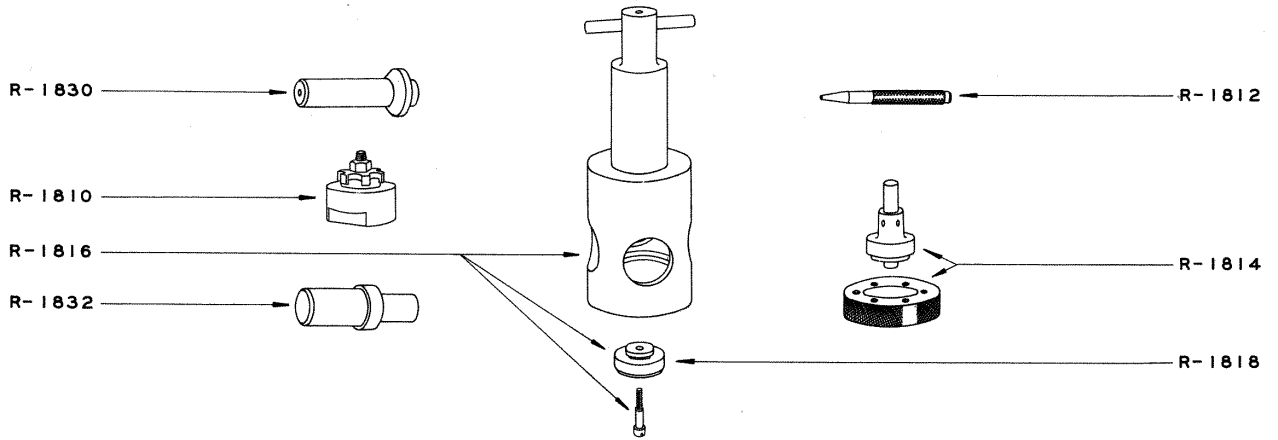


Figure 30

MAGNETO, GENERATOR AND ACCESSORY DRIVE SHAFT OIL SEAL REPLACEMENT TOOLS (WHIRLWIND AND CYCLONE)  
 GENERATOR DRIVE GEAR PLUG REPLACEMENT TOOLS (CYCLONE)

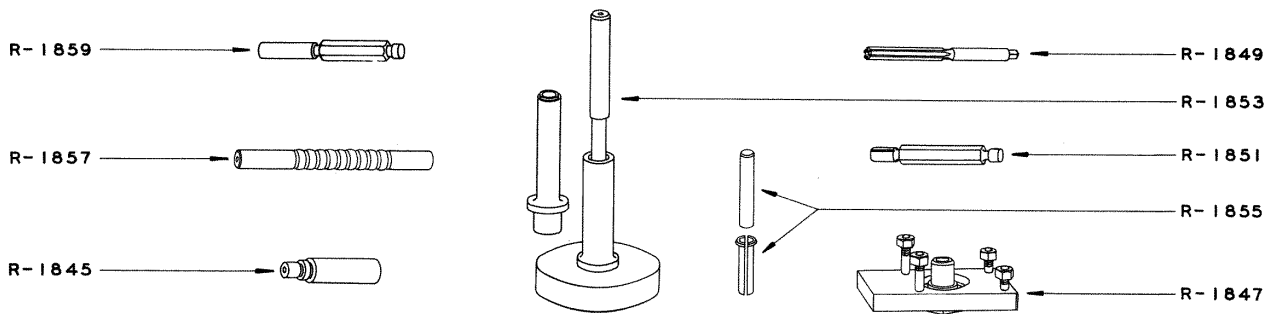


Figure 31

TACHOMETER DRIVE HOUSING BUSHING REPLACEMENT TOOLS (CYCLONE)

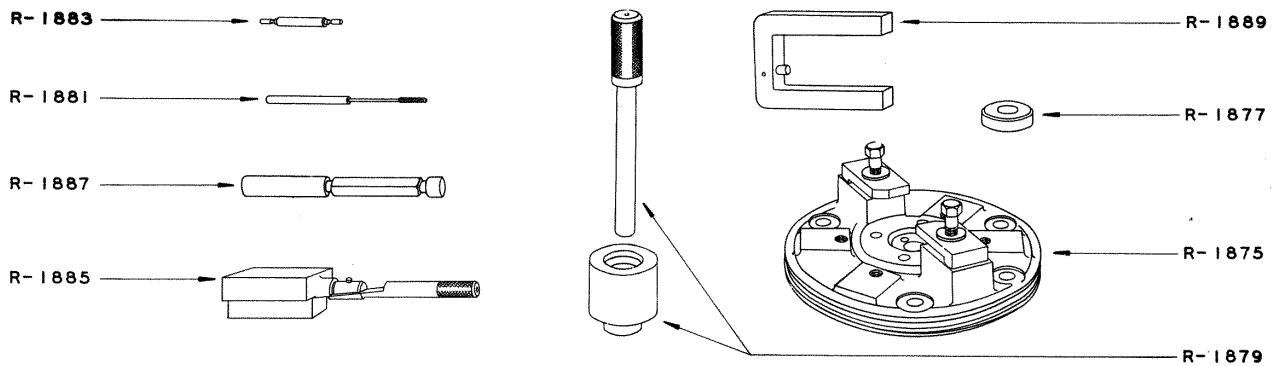


Figure 32

TACHOMETER AND FUEL PUMP DRIVE SHAFT SUPPORT BUSHING REPLACEMENT TOOLS (CYCLONE)

ILLUSTRATIONS - Cont'd

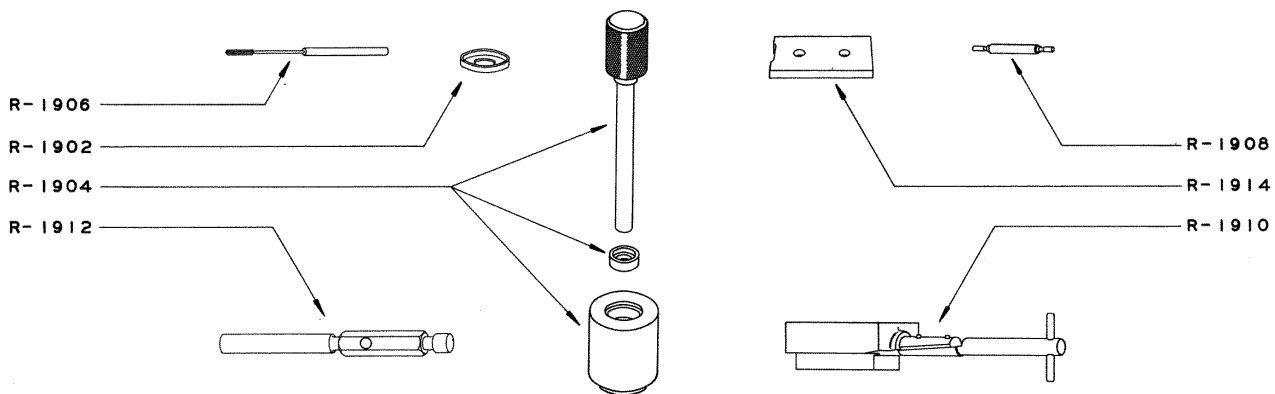


Figure 33

TACHOMETER DRIVE SHAFT SUPPORT BUSHING REPLACEMENT TOOLS  
(CYCLONE F, F-50)

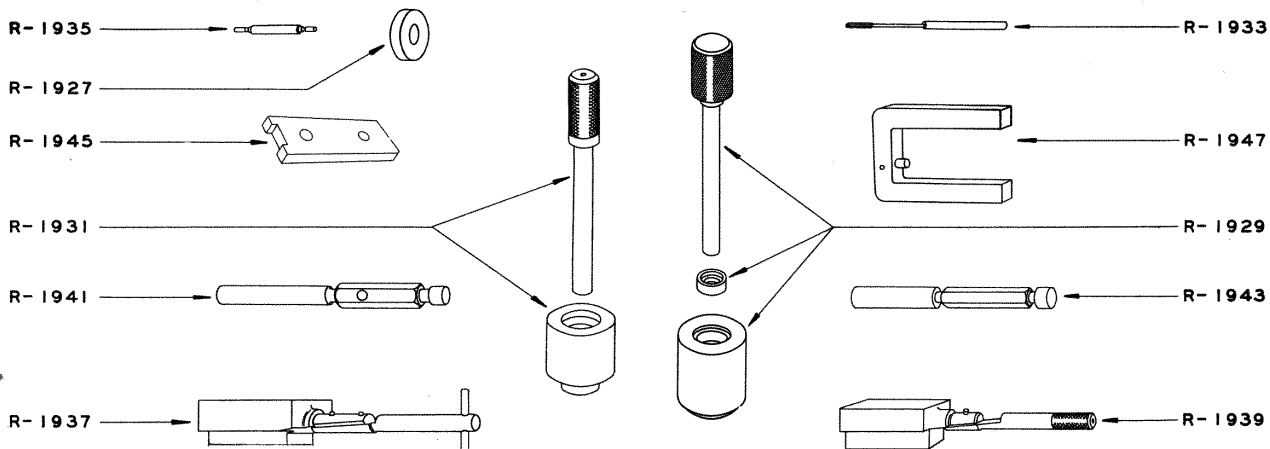


Figure 34

FUEL PUMP DRIVE SHAFT SUPPORT BUSHING REPLACEMENT TOOLS  
(CYCLONE F, F-50)

ILLUSTRATIONS - Cont'd

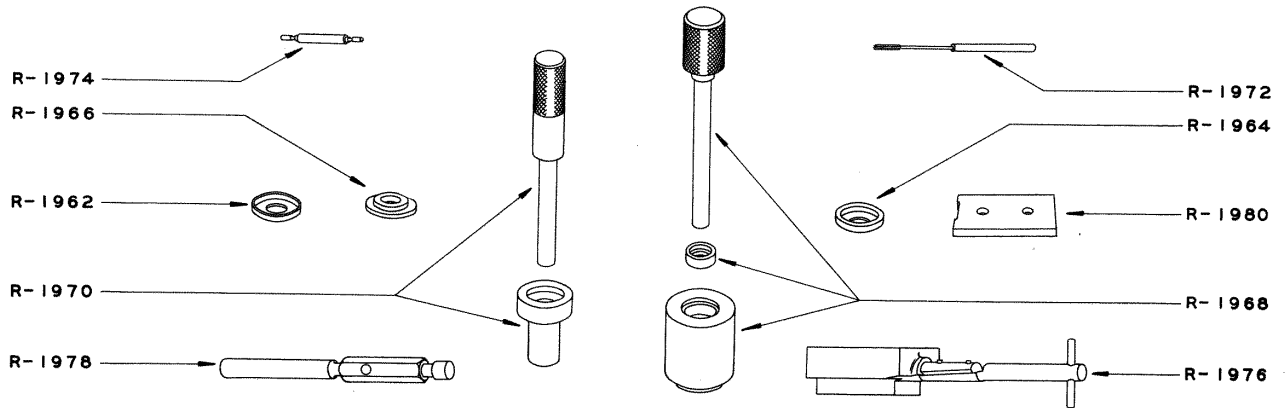


Figure 35

GUN SYNCHRONIZER DRIVE SHAFT SUPPORT BUSHING REPLACEMENT TOOLS (CYCLONE)

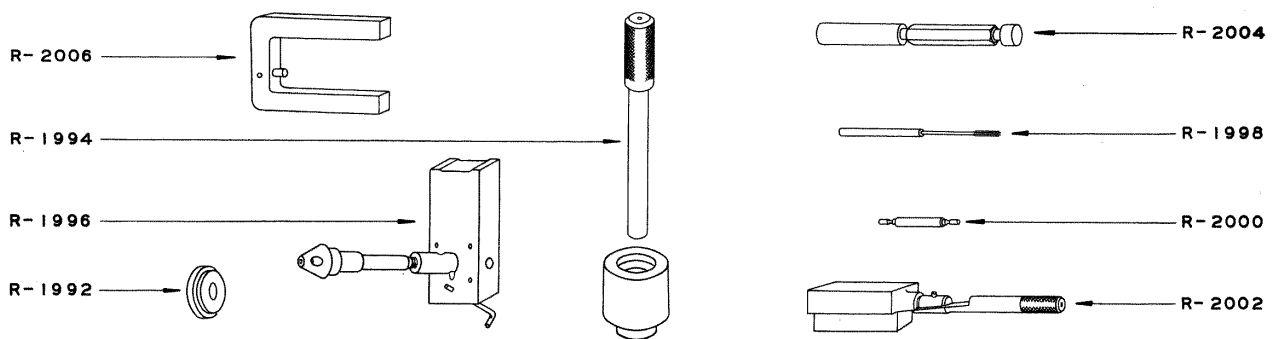


Figure 36

ROCKER LUBRICATING VALVE DRIVE SHAFT SUPPORT BUSHING REPLACEMENT TOOLS (CYCLONE F, F-50)

ILLUSTRATIONS - Cont'd

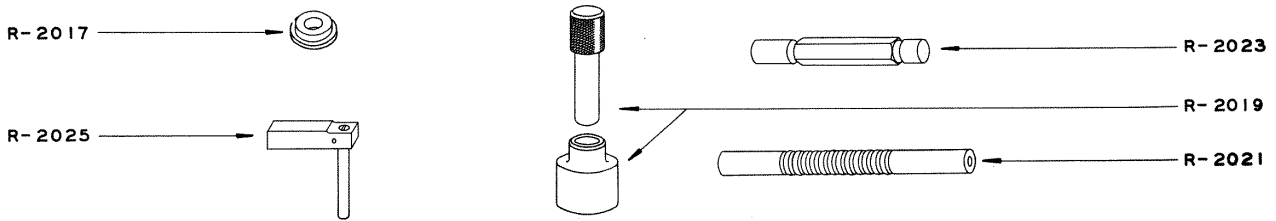


Figure 37

GOVERNOR DRIVE PINION ADAPTER BUSHING REPLACEMENT  
TOOLS (CYCLONE F, F-50 DIRECT  
DRIVE ENGINES)

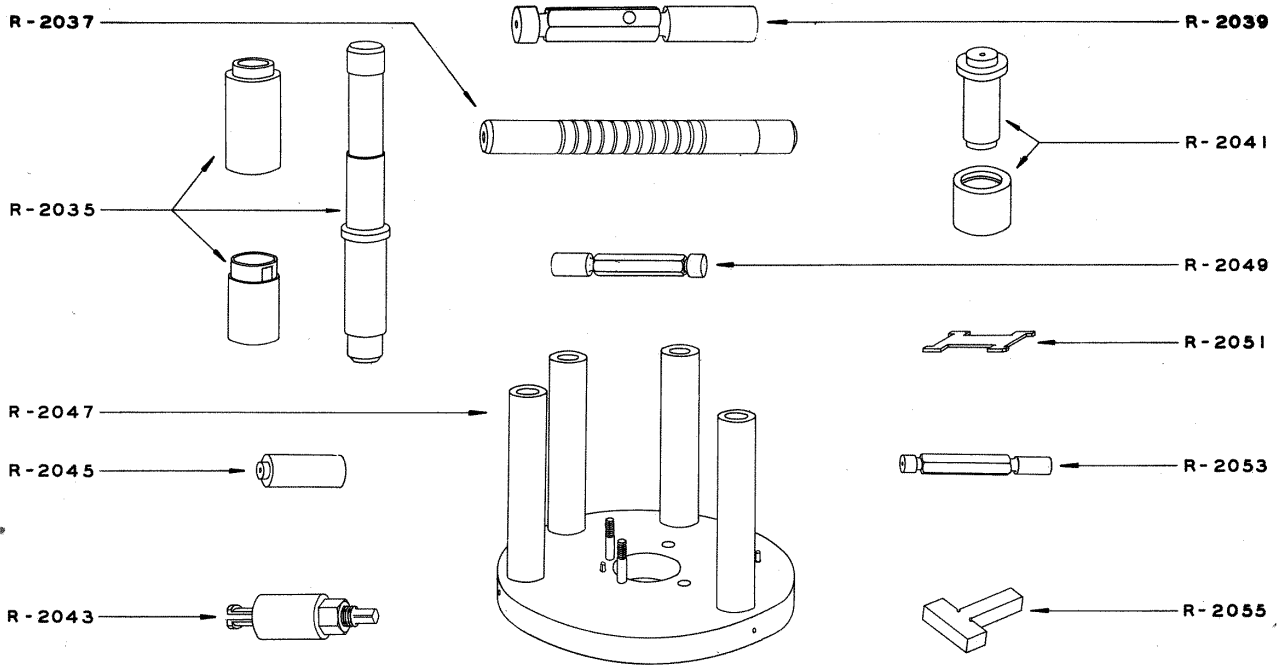


Figure 38

ANGLE ACCESSORY DRIVE HOUSING AND ADAPTER BUSHING REPLACEMENT  
TOOLS (CYCLONE F, F-50, G)

ILLUSTRATIONS - Cont'd

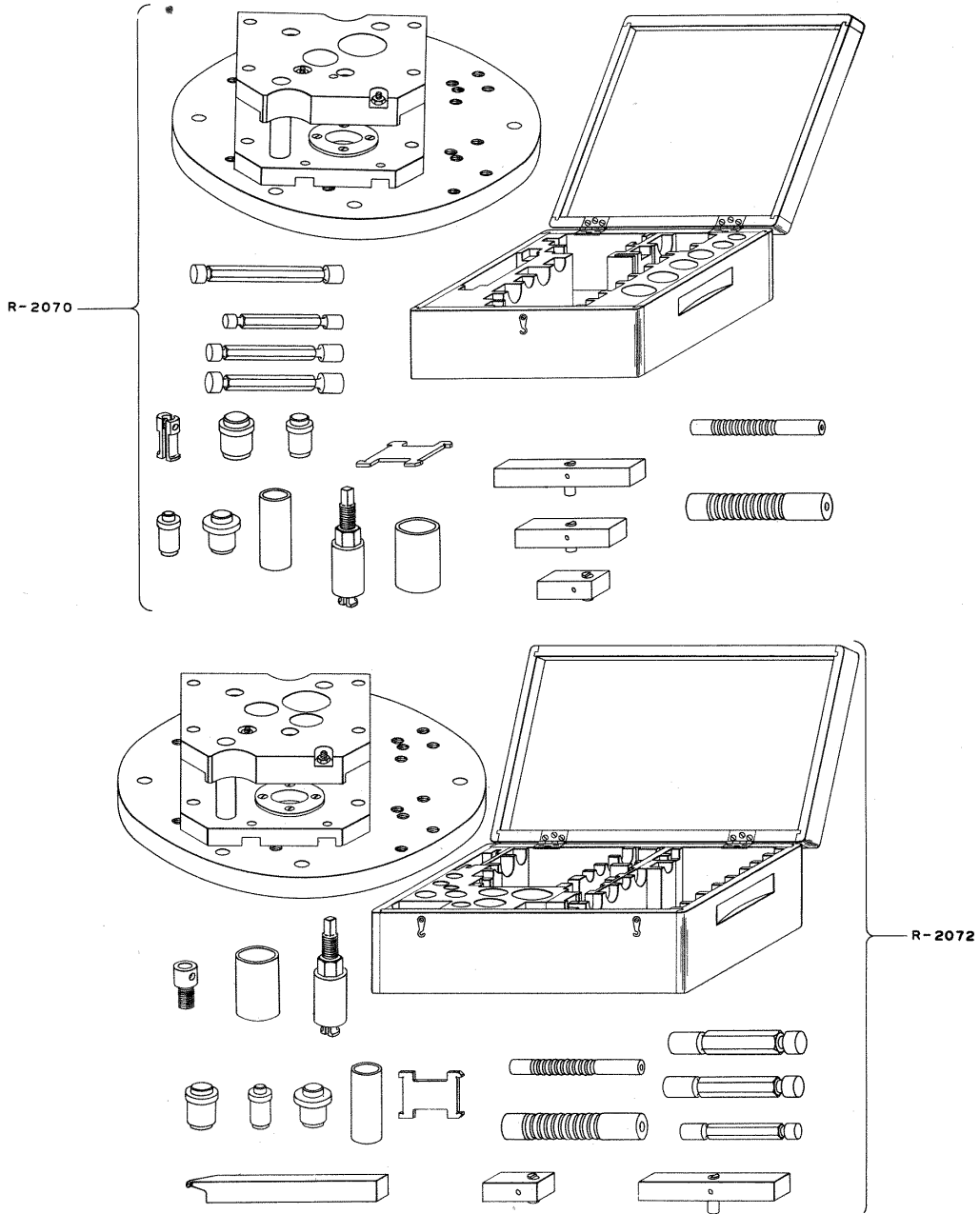


Figure 39

DUAL ACCESSORY DRIVE HOUSING BUSHING REPLACEMENT TOOLS (CYCLONE)

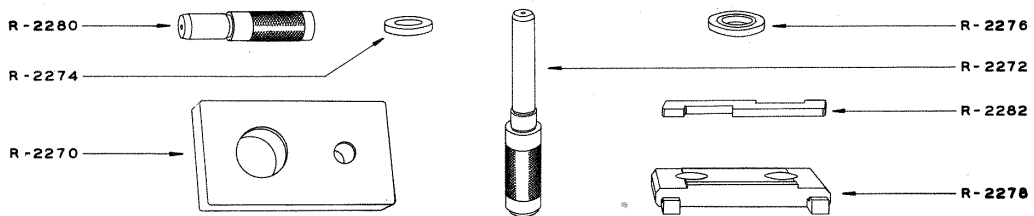


Figure 40

CRANKSHAFT REAR END BUSHING AND REAR COUNTERWEIGHT BUSHING REPLACEMENT TOOLS (FOR DYNAMIC DAMPER REAR COUNTERWEIGHT TYPE CRANKSHAFT) (WHIRLWIND AND CYCLONE)



ILLUSTRATIONS - Cont'd

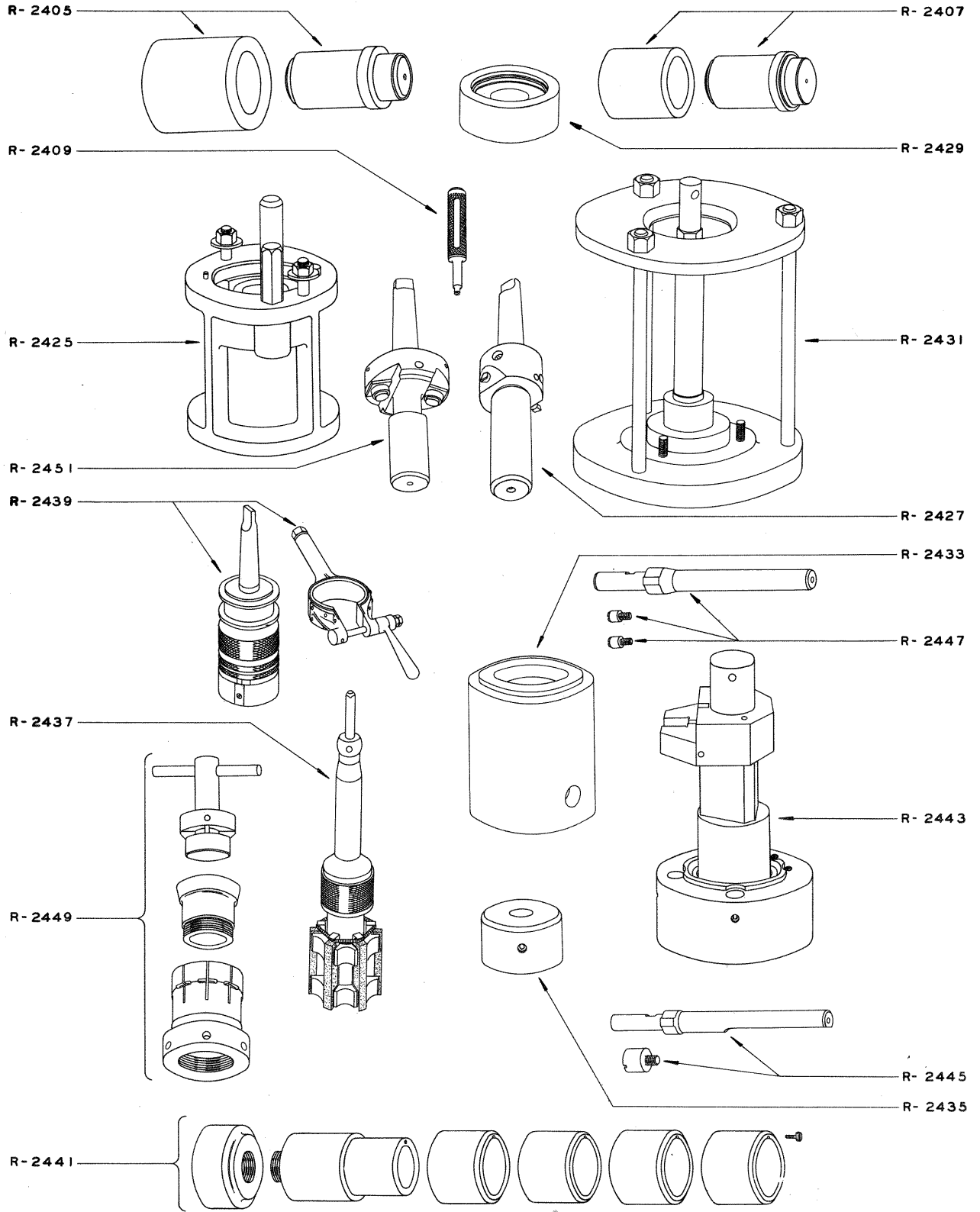


Figure 42

CONNECTING ROD BEARING REPLACEMENT TOOLS (WHIRLWIND AND CYCLONE)

ILLUSTRATIONS - Cont'd

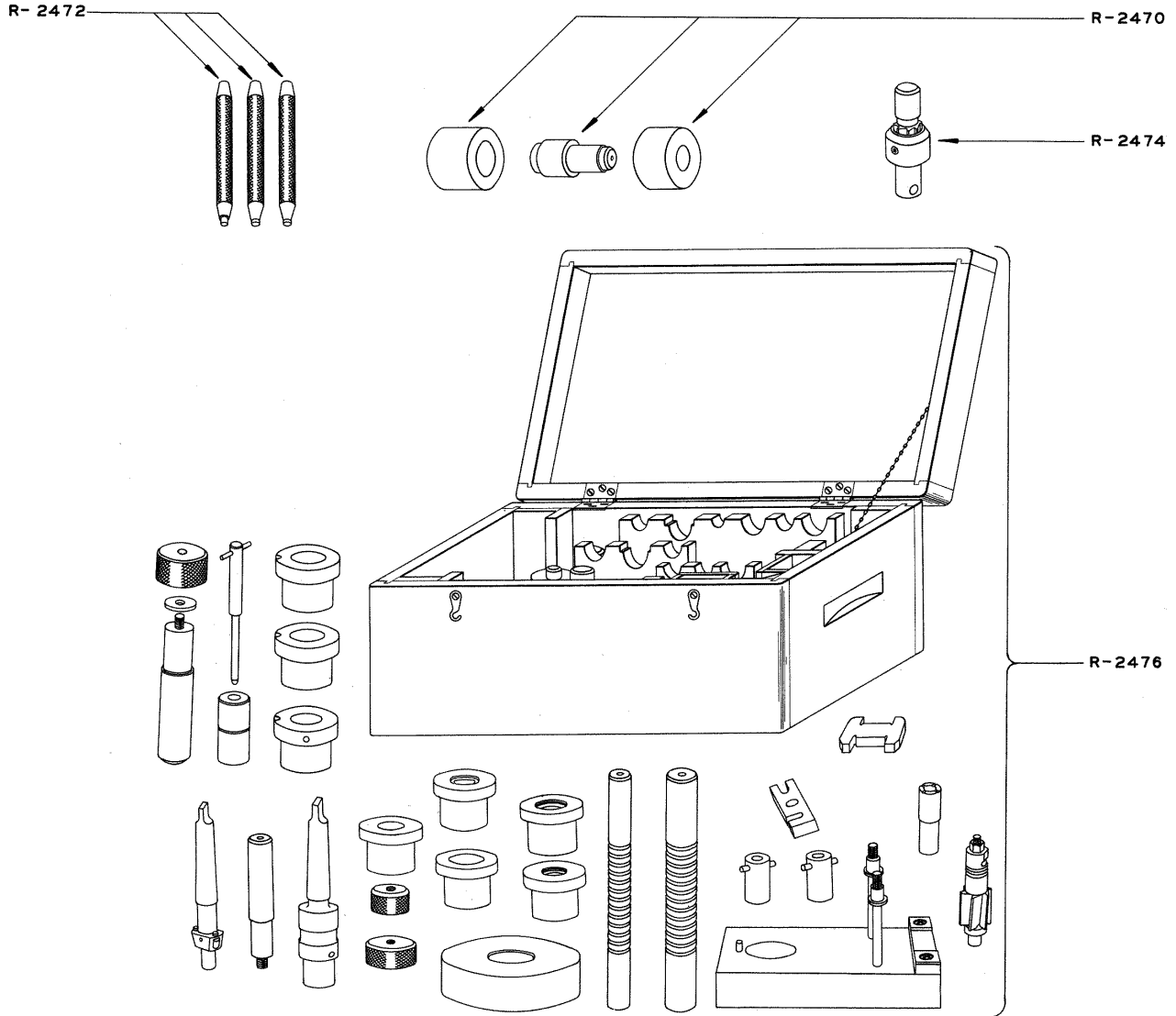


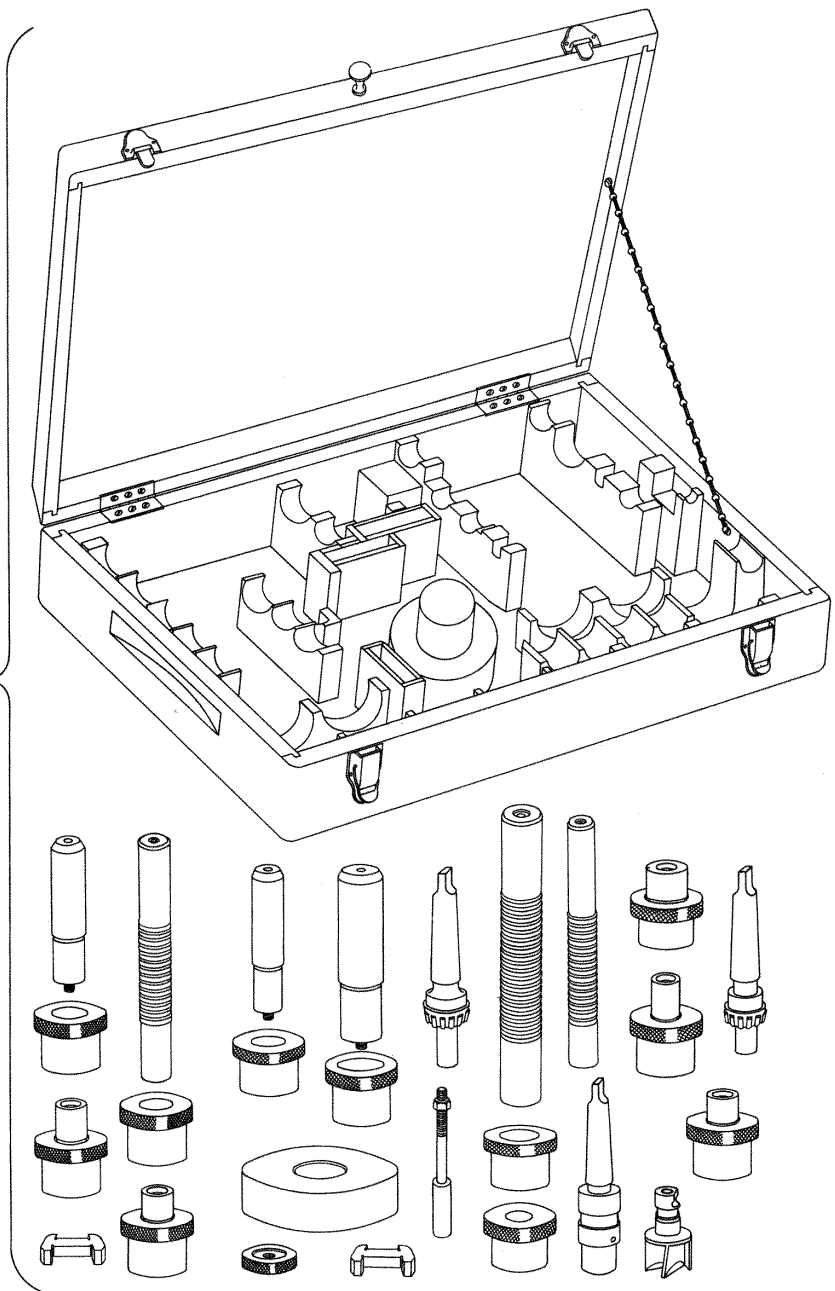
Figure 43

CONNECTING ROD BUSHING REPLACEMENT TOOLS (WHIRLWIND AND CYCLONE)



ILLUSTRATIONS - Cont'd

R-2478



R-2480

Figure 44

CONNECTING ROD BUSHING REPLACEMENT TOOLS (WHIRLWIND AND CYCLONE)

ILLUSTRATIONS - Cont'd

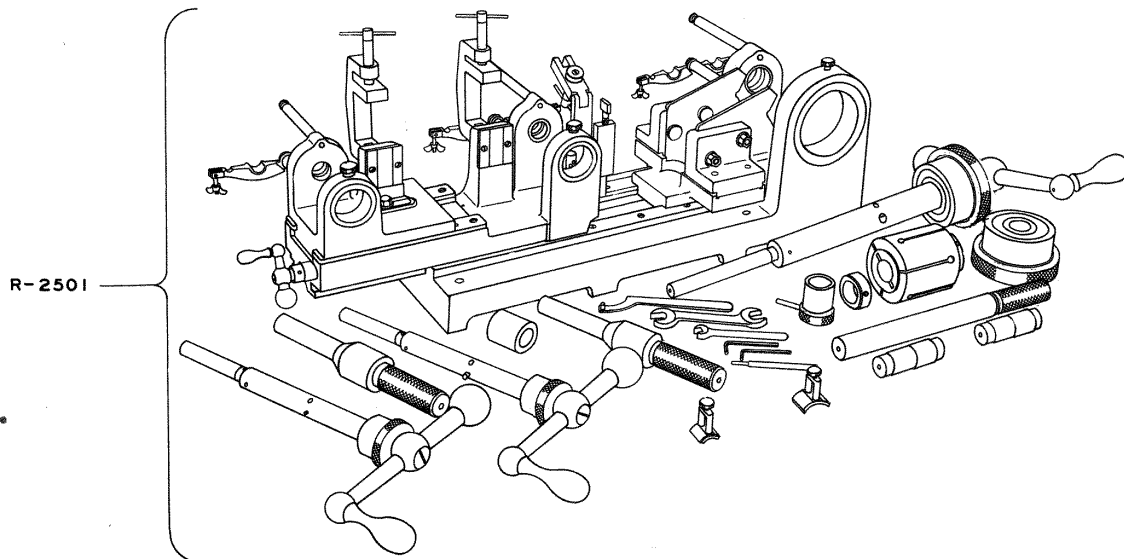
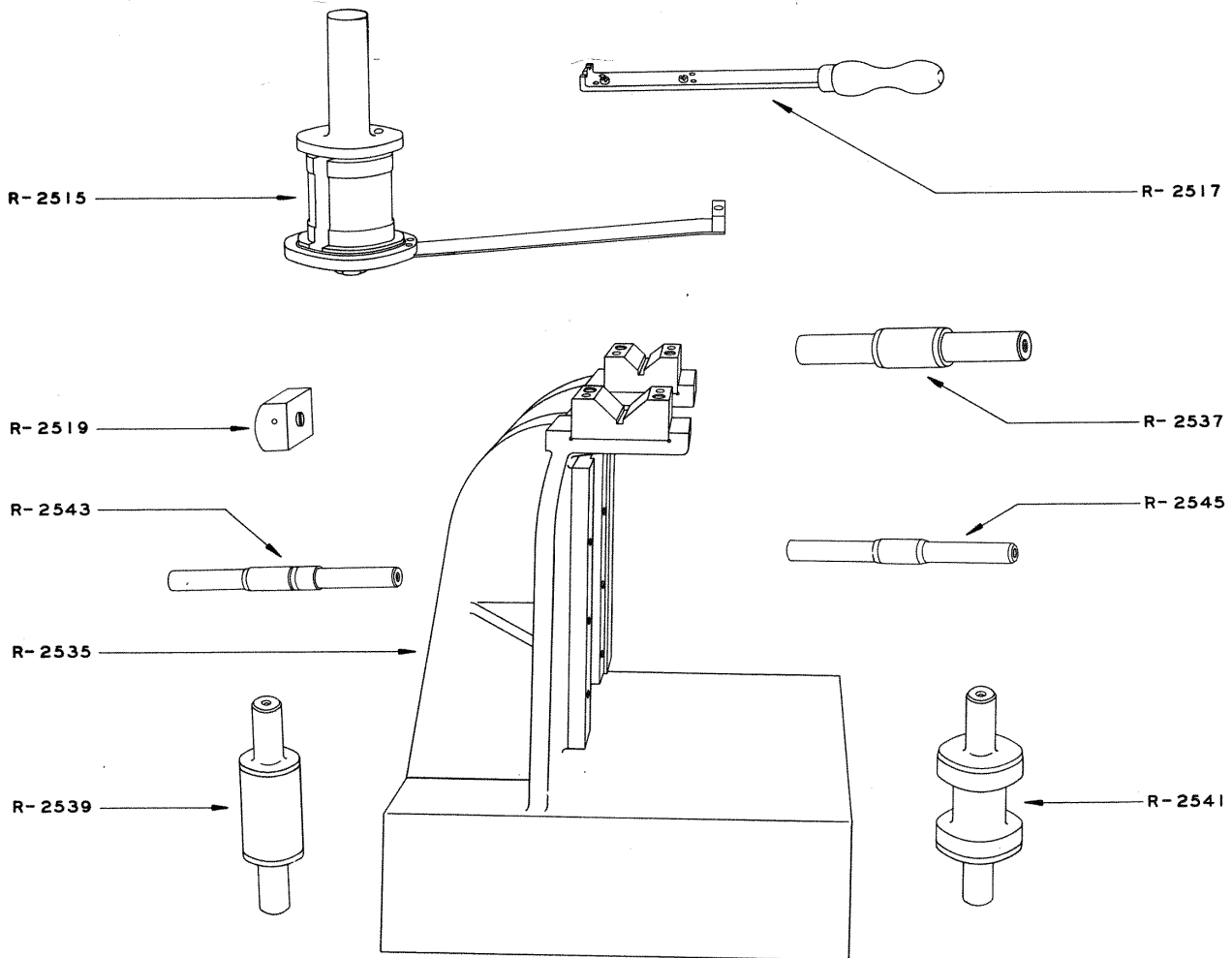


Figure 45

CONNECTING ROD BEARING AND BUSHING REPLACEMENT TOOLS  
(WHIRLWIND AND CYCLONE)

ILLUSTRATIONS - Cont'd

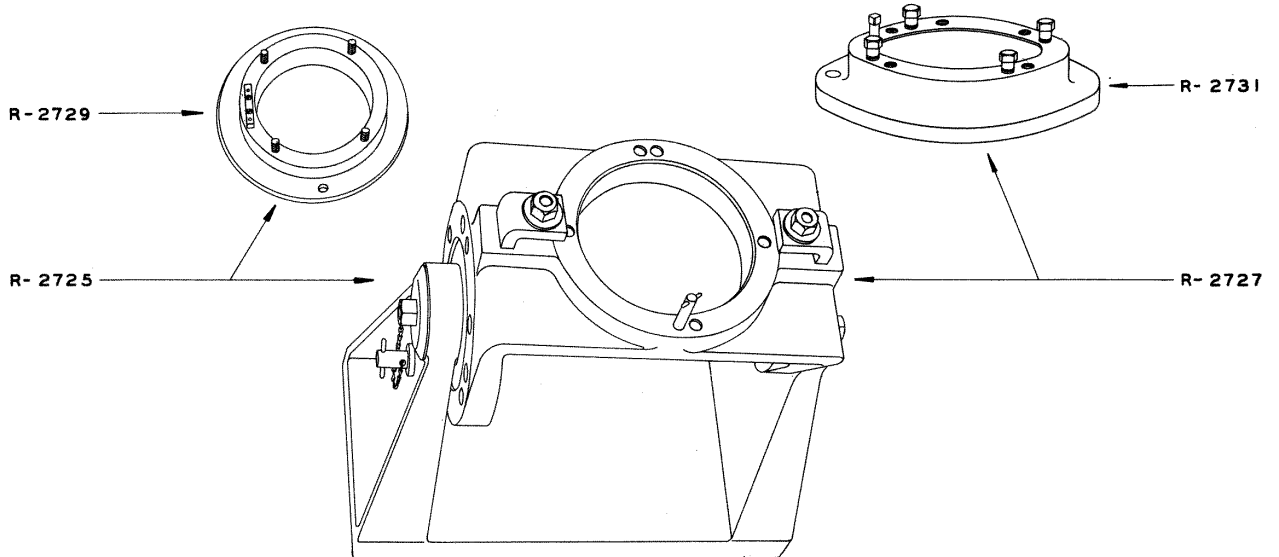


Figure 46

CYLINDER RECONDITIONING FIXTURES (WHIRLWIND AND CYCLONE)

ILLUSTRATIONS - Cont'd

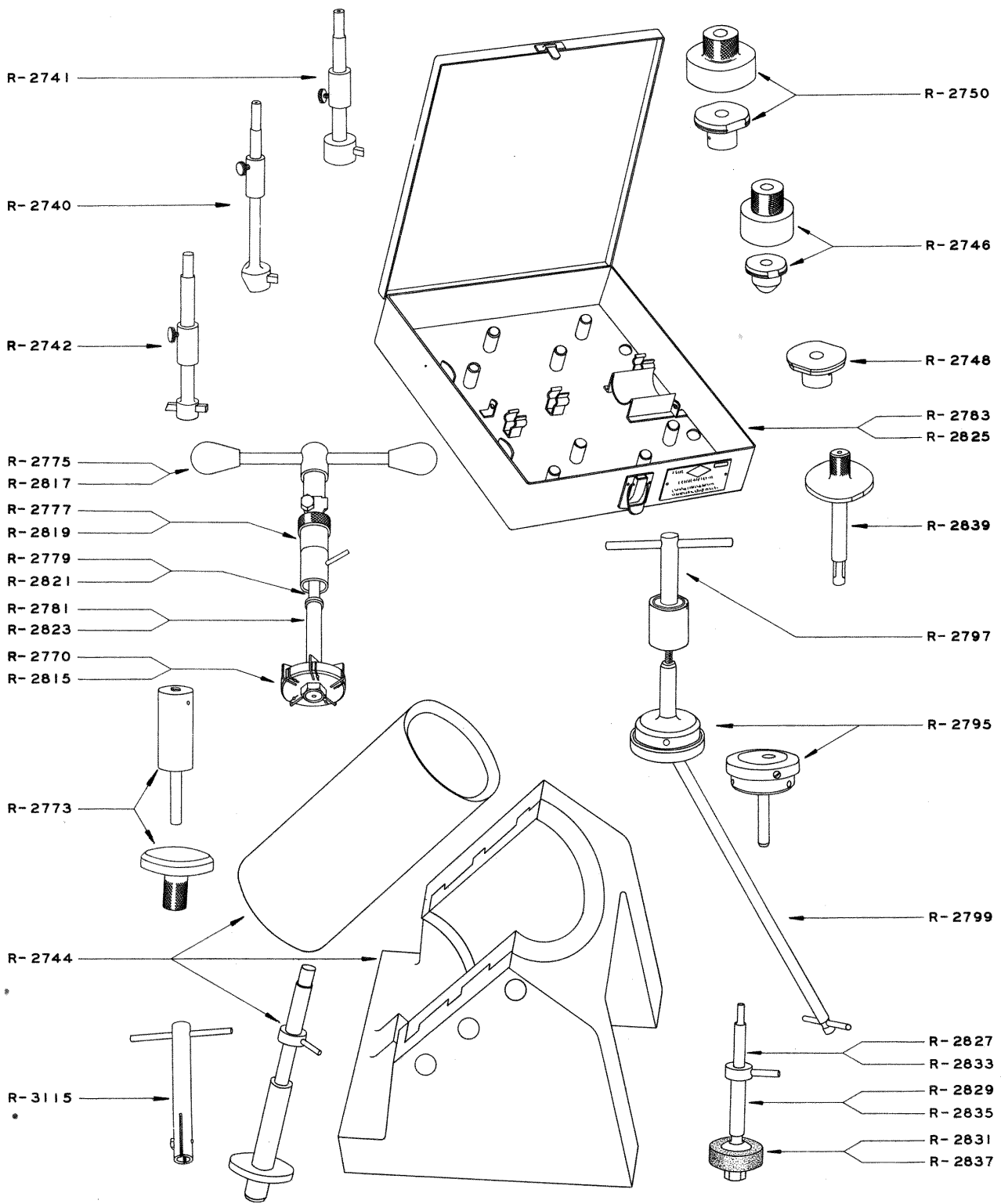


Figure 47

VALVE SEAT REPLACEMENT AND REFINISHING TOOLS  
(WHIRLWIND AND CYCLONE)

ILLUSTRATIONS - Cont'd

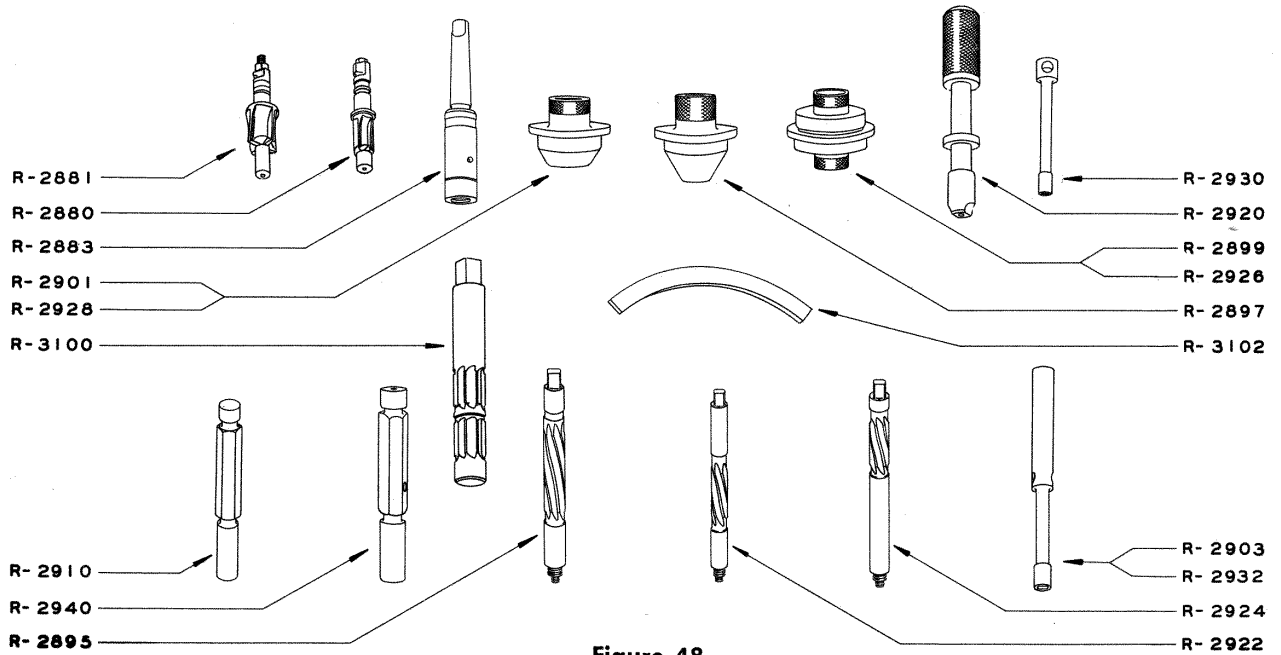


Figure 48

VALVE GUIDE REPLACEMENT TOOLS (WHIRLWIND AND CYCLONE)  
VALVE TAPPET GUIDE REPLACEMENT TOOLS (WHIRLWIND)

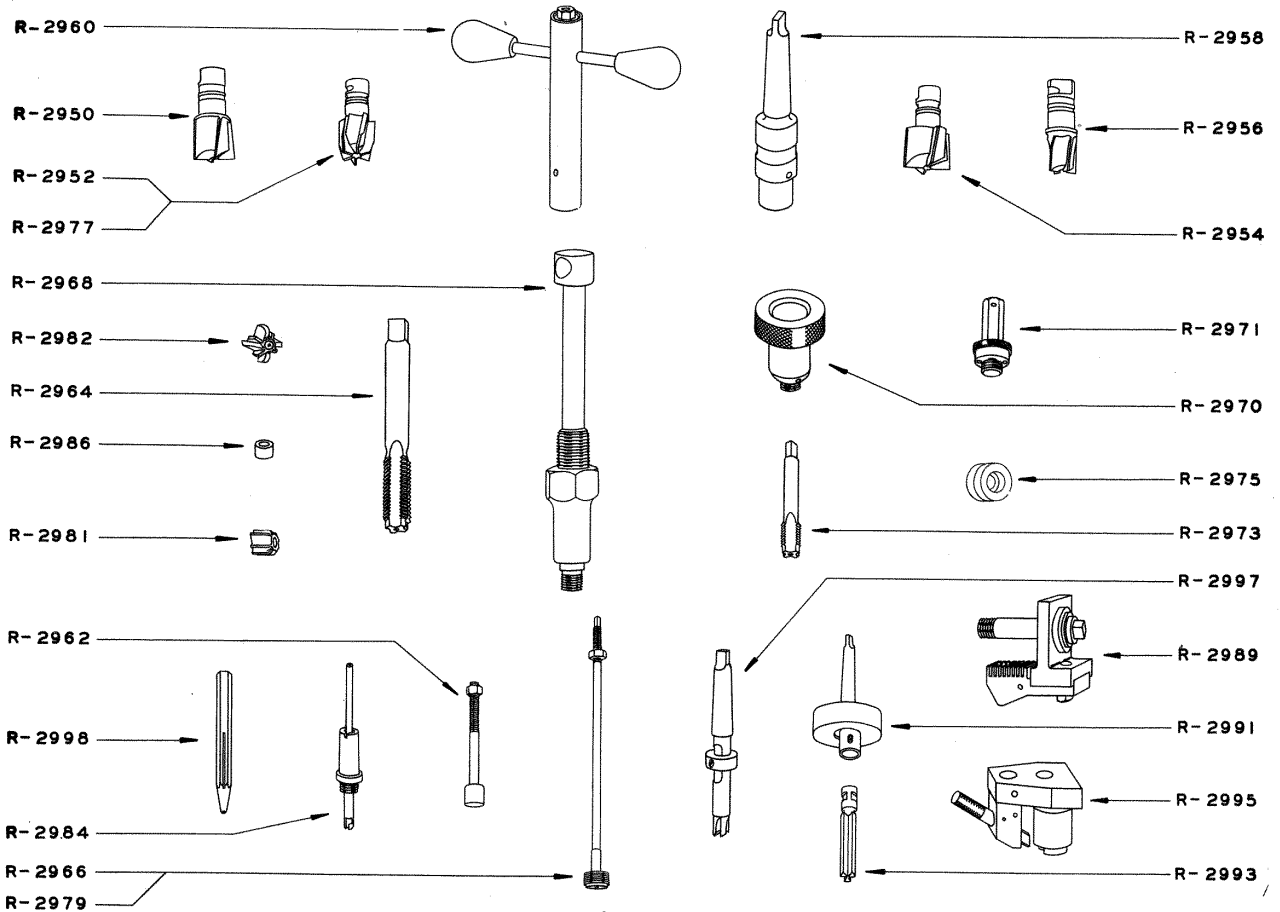


Figure 49

SPARK PLUG COOLER AND SPARK PLUG INSERT REPLACEMENT TOOLS  
(WHIRLWIND AND CYCLONE)

## ILLUSTRATIONS - Cont'd

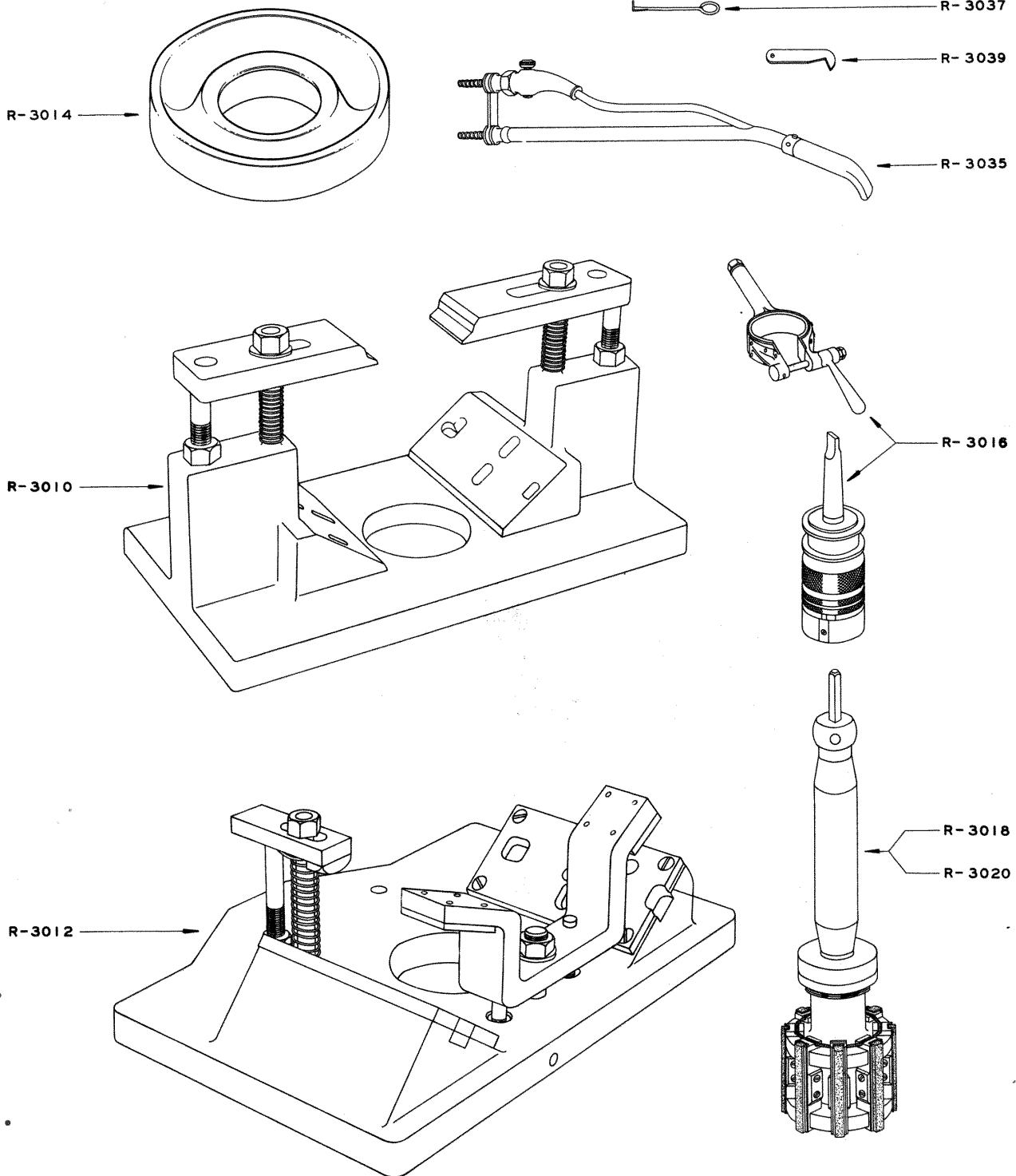


Figure 50

CYLINDER BORE HONING AND LAPPING TOOLS (WHIRLWIND AND CYCLONE)

CYLINDER INSIDE GROOVE CLEANING TOOLS. (WHIRLWIND AND CYCLONE)

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS**

**DISASSEMBLY AND REASSEMBLY**

VAABO	R-1001	1	80391	Stand - Engine disassembling and assembling, floor. . . . . Used for R-760 engines. Includes plate 82099. Early Cyclone stand 81907 may be adapted for use on Whirlwind R-760 engines by procuring plate 82099.	1	-	-	-	-
VAACU	R-1003	1	83678	Stand - Engine disassembling and assembling, floor. . . . . Used with mounting plate 83679 which is not included with this stand. This is a heavy-duty type stand designed to accommodate both Cyclone engines and Whirlwind R-975 engines. It supersedes an earlier type Cyclone stand 81907 which is no longer supplied.	1	1	1	1	1
VAADE	R-1005	1	82099	Plate - Engine disassembling and assembling floor stand, mounting. . . . . Detail of stand 80391. Used for R-760 engines and also used to adapt early Cyclone stand 81907 for use on Whirlwind R-760 engines.	1	-	-	-	-
VAAEN	R-1007	1	83679	Plate - Engine disassembling and assembling floor stand, mounting. . . . . Used with stand 83678.	1	1	1	1	1
VAAFO	R-1009	2	83766	Eye - Crankshaft and engine hoist . . . . . Used for R-760 engines equipped with S.A.E. No. 20 propeller hub spline crankshafts. Attaches to propeller hub nut threads on crankshaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
VAAGI	R-1011	2	80131	Eye - Crankshaft and engine hoist . . . . . Used for R-760 and R-975 engines equipped with S.A.E. No. 30 propeller hub spline crankshafts. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
VAAHA	R-1013	2	80601	Eye - Crankshaft and engine hoist . . . . . Used for direct drive engines. Attaches to propeller hub nut threads on crankshaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	-
VAAID	R-1015	2	83761	Eye - Propeller shaft and engine hoist. . . . . Used for 16:11 and 3:2 reduction geared engines. Attaches to propeller hub nut threads on propeller shaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VAAJY	R-1017	2	83291	Sling - Engine hoist. . . . . Used for R-760 engines not equipped with internal valve gear lubricating system. Shipped with engines.	1	-	-	-	-
VABAB	R-1017	2	800037	Sling - Engine hoist. . . . . Used for R-760 engines equipped with internal valve gear lubricating system. Shipped with engines.	1	-	-	-	-

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6E	clone F	clone F-50	clone G	clone G-100
VABBE	R-1017	2	83285	Sling - Engine hoist. . . . . Used for R-975 engines. Shipped with engines.	1	-	-	-	-
VABCY	R-1017	2	83287	Sling - Engine hoist. . . . . Shipped with engines.	-	1	1	1	-
VABEM	R-1017	2	83297	Sling - Engine hoist. . . . . Shipped with engines.	-	-	-	-	1
VABFO	R-1019	2	83186	Stand - Engine parts holding. . . . . This is a portable wooden floor stand for holding engine parts after they have been disassembled from engines. It is not sold but details for its construction will be supplied upon request.	2	3	3	3	3
VABGU	R-1021	3	84932	Wrench - Crankcase front section and front supercharger housing to crankcase main section attaching nut or screw, box (9/16" hex.) . . . . .	-	-	-	-	1
VABHY	R-1023	2	82887	Puller - Crankcase front section removing . . . . . This puller can be used for engines equipped with or without hydro-controllable pitch propeller mechanism. Supersedes puller 80640 designed only for engines not equipped with hydro-controllable pitch propeller mechanism. Puller 80640 is no longer supplied.	1	-	-	-	-
VABIB	R-1025	2	83595	Puller - Crankcase front section and crankshaft thrust ball bearing removing . . . . . Used only for direct drive engines. Multiple purpose puller 82683 can also be used for this purpose. Supersedes earlier puller 82647 which can only be used on F and F-50 engines. Puller 82647 is no longer supplied. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	-
VABJA	R-1027	2	82683	Puller - Crankcase sections, front main bearings and reduction driving gear, multiple purpose removing . . . . . Used for crankcase front section including crankshaft thrust ball bearing on direct drive engines. Single purpose puller 83595 can also be used for this purpose. Used for crankshaft non-demountable front main roller bearings on F and F-50 direct drive engines. Single purpose puller 82657 can also be used for this purpose. Used for crankcase main section (front half) including non-demountable front main roller bearing on F and F-50 16:11 reduction geared engines. Single purpose puller 82649 can also be used for this purpose. Used for reduction driving gear on 16:11 and 3:2 reduction geared engines. Single purpose puller 82571 can also be used for this purpose. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

VABLI	R-1029	3	83648	<p>Pullers - Crankcase sections removing . . . . .</p> <p>Used for crankcase main bearing support and diffuser section on Whirlwind engines.</p> <p>Used for crankcase front section including propeller shaft and stationary reduction gear on Cyclone 16:11 and 3:2 reduction geared engines. Chain hoist should be used for supporting front section while using pullers.</p> <p>Used for supercharger rear cover on Cyclone engines.</p> <p>Supersedes and is interchangeable with earlier puller 80924 which is no longer supplied.</p>	3	3	3	3	3
VABMO	R-1031	3	84454	<p>Wrench - Crankcase front main section to rear main section bolt and nut, offset box, 3/4" hex . . . . .</p> <p>Used for loosening bolt and nut.</p> <p>Use wrench 84934 and torque wrench with one of the above wrenches for tightening nut.</p>	-	2	2	2	2
VABOF	R-1033	3	84934	<p>Wrench - Crankcase front main section to rear main section bolt nut. . . . .</p> <p>Used with torque wrench and wrench 84454 for tightening nut.</p>	-	1	1	1	1
VABRU	R-1035	3	82095	<p>Puller - Crankcase front main section to rear main section bolt removing . . . . .</p>	-	1	1	1	1
VABTI	R-1037	3	82649	<p>Puller - Crankcase front main section and crankshaft front main non-demountable roller bearing removing. . . . .</p> <p>Used for 16:11 reduction geared engines.</p> <p>Multiple purpose puller 82683 can also be used for this purpose.</p> <p>Refer to Numerical Tool List for other sections of catalog in which this tool is listed.</p>	-	1	1	-	-
VABUL	R-1039	3	82953	<p>Puller - Crankshaft front main roller bearing and crankcase front main section installing . . . . .</p> <p>Used for direct drive crankshaft front main roller bearing (non-demountable type).</p> <p>Used for crankcase front main section including crankshaft front main non-demountable type roller bearing on 16:11 reduction geared engines.</p> <p>Refer to Numerical Tool List for other sections of catalog in which this tool is listed.</p>	-	1	1	-	-
VABWN	R-1041	3	84931	<p>Wrench - Crankcase main section to rear section nut, box (1/2" hex.) . . . . .</p> <p>Used with torque wrench.</p>	1	-	-	-	-
VABYM	R-1043	3	84948	<p>Wrench - Crankcase main section to front supercharger housing nut, socket (3/4" hex.) . . . . .</p> <p>Used for engines equipped with 3/4" hex. nuts for attaching the main section to the front supercharger housing.</p> <p>For use with torque wrench.</p>	-	-	1	1	1
VACAB	R-1043	3	84947	<p>Wrench - Crankcase main section to front supercharger housing nut, socket (9/16" hex.) . . . . .</p> <p>Used for engines equipped with 9/16" hex. nuts for attaching the main section to the front supercharger housing.</p> <p>For use with torque wrench.</p>	-	-	-	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

VACCE	R-1045	3	84841	Cover - Front supercharger housing intake port . . . . .	-	9	9	9	9
VACED	R-1045	3	84846	Cover - Crankcase rear section intake port. . . . . The quantity specified is for R-975 engines. Seven are used for R-760 engines.	9	-	-	-	-
VACGA	R-1047	3	83863	Eye - Supercharger rear housing and cover hoist. . . . . Used for removing and installing assembled supercharger rear housing and cover.	-	1	1	1	1
VACIP	R-1049	3	83381	Wrench - Supercharger rear cover to rear supercharger housing slotted round nut, lug. . . . . Used for the three lower slotted round head nuts installed in the counterbored recesses of the generator mounting pad. This tool is for use only on engines equipped with supercharger rear cover having raised generator mounting pad.	-	-	-	1	1
VACKE	R-1051	3	83187	Stand - Supercharger rear housing and cover disassembling and assembling, bench. . . . . Blue prints for the construction of this stand will be supplied upon request.	-	1	1	1	1
VACMI	R-1053	3	82058	Wrench - Oil sump strainer and rear cover oil cleanout plug. . . . . Included in engine tool kit.	-	1	1	1	1
VACOX	R-1055	3	83785	Puller - Oil check valve removing . . . . . Used for engines equipped with an oil check valve in supercharger rear cover oil passage.	-	1	1	1	1

**RECONDITIONING**

**PROPELLER GOVERNOR ATTACHING STUD SCREW BUSHING REPLACEMENT (WHIRLWIND, CYCLONE F-50, G, G-100)**

VAEBA	R-1070	15	84839	Removing and Installing Tools - Propeller governor attaching stud screw bushing. . . . . Used for engines equipped with crankcase front section having provision for mounting a propeller governor. Used for replacing a standard size bushing with a bushing oversize on the O.D. Only a .003" oversize tap is included. A .007" and .012" oversize tap is available under tool numbers 83639 and 84610 respectively. Supersedes 83589 which included a .007" oversize tap only and also supersedes 84613 which included a .007" and .012" oversize tap.	1	-	1	1	1
VAEDF	R-1073	15	84840	Tap - Propeller governor attaching stud screw bushing hole, .003" oversize . . . . . Detail of 84839. Read note under 84839 listed above. This tap can be used with early installing and removing tools 83589 and 84613 which did not include a .003" oversize tap.	1	-	1	1	1
VAEFE	R-1073	15	83639	Tap - Propeller governor attaching stud screw bushing hole, .007" oversize . . . . . Read note under removing and installing tools 84839.	1	-	1	1	1
VAEHN	R-1073	15	84610	Tap - Propeller governor attaching stud screw bushing hole, .012" oversize . . . . . Read note under removing and installing tools 84839. This tap can be used with early removing and installing tool 83589 which did not include a .012" oversize tap.	1	-	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**GOVERNOR DRIVE WORM SHAFT AND GEAR SHAFT  
BUSHING REPLACEMENT (CYCLONE F-50, G AND  
G-100, 16:11 REDUCTION GEARED ENGINES)**

The tools listed in this group are for use only on 16:11 and 3:2 reduction geared engines equipped with crankcase front section having provision for a propeller governor drive.

Two types of the above mentioned front sections have been used; an early type which is cast and can be identified as having an integrally cast governor drive housing and a late type which is forged and has a separate governor drive housing.

Unless otherwise specified, the tools listed below are for use on both the cast and the forged front sections.

VAFAD	R-1090	16	83061	Fuller - Governor drive worm shaft bushing removing and installing. . . . .	-	-	1	1	1
VAFCA	R-1092	16	83058	Bushing - Governor drive worm shaft bushing, hand reamer. . . . .	-	-	1	1	1
VAFEF	R-1094	16	83059	Reamer - Governor drive worm shaft bushing, hand . . . . .	-	-	1	1	1
VAFGE	R-1096	16	83057	Gauge - Governor drive worm shaft bushing, limit plug . . . . .	-	-	1	1	1
VAFIG	R-1098	16	83056	Cutter - Governor drive worm shaft bushing shoulder facing, counterbore . . . . .	-	-	1	1	1
VAFKI	R-1100	16	83060	Gauge - Governor drive worm shaft bushing shoulder flush pin . . . . .	-	-	1	1	1
VAFMU			83053	Fuller - Governor drive gear shaft bushing removing and installing. . . . .	-	-	1	1	1
Used only for 16:11 reduction geared engines equipped with cast crankcase front section.									
VAFOL	R-1104	16	83578	Fuller - Governor drive gear shaft bushing removing and installing. . . . .	-	-	1	1	1
Used for 16:11 and 3:2 reduction geared engines equipped with forged crankcase front section.									
VAFRY	R-1106	16	83054	Broach - Governor drive gear shaft bushing burnishing, arbor press. . . . .	-	-	1	1	1
VAFTA	R-1108	16	83055	Gauge - Governor drive gear shaft bushing, limit plug . . . . .	-	-	1	1	1
VAFUM	R-1110	16	83513	Cutter and Bar - Governor drive gear shaft bushing, drill press . . . . .	-	-	1	1	1
Used for 16:11 and 3:2 reduction geared engines equipped with forged crankcase front section.									
Used for finishing O.D. of bushing shoulder.									

**CRANKSHAFT REAR BEARING REPLACEMENT  
(WHIRLWIND)**

VAHBE	R-1125	17	81014	Fuller - Crankshaft rear bearing removing and installing. . . . .	1	-	-	-	-
VAHDO	R-1127	17	84245	Fixture - Crankshaft rear bearing, hand reaming. . . . .	1	-	-	-	-
Used for finishing bearing bore.									

**CAM DRIVE GEAR SHAFT REPLACEMENT  
(CYCLONE G-100)**

VAHUD	R-1135	18	84315	Fixture and Tools - Cam drive gear shaft removing and installing, drill press and arbor press. . . . .	-	-	-	-	1
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Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
<b>CRANKCASE TOOLS, ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>STUD REPLACEMENT (EXCEPT CYLINDER HOLD-DOWN STUDS) (WHIRLWIND AND CYCLONE)</b>									
VAHVE	R-1142	19	81905	Remover - Stud. . . . . Used for removing studs 1/4" to 1/2" in diameter. See also 84743 listed below. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VAHZI	R-1144	19	84743	Removing Tools - Crankcase main section to front section stud . . . . . Used for removing broken studs. Used for engines equipped with crankcase main section having studs for attaching the crankcase front section.	-	-	-	-	1
VAJAF	R-1146	19	84848	Tap - 1/4" - 20 U.S.F. (.003" oversize) . . .	1	1	1	1	1
VAJCY	R-1146	19	84231	Tap - 1/4" - 20 U.S.F. (.007" oversize) . . .	1	1	1	1	1
VAJEN	R-1146	19	84232	Tap - 1/4" - 20 U.S.F. (.012" oversize) . . .	1	1	1	1	1
VAJGO	R-1146	19	84849	Tap - 5/16" - 18 U.S.F. (.003" oversize) . . .	1	1	1	1	1
VAJIR	R-1146	19	84233	Tap - 5/16" - 18 U.S.F. (.007" oversize) . . .	1	1	1	1	1
VAJKU	R-1146	19	84234	Tap - 5/16" - 18 U.S.F. (.012" oversize) . . .	1	1	1	1	1
VAJMA	R-1146	19	84850	Tap - 3/8" - 16 U.S.F. (.003" oversize) . . .	1	1	1	1	1
VAJOP	R-1146	19	84505	Tap - 3/8" - 16 U.S.F. (.007" oversize) . . .	1	1	1	1	1
VAJRE	R-1146	19	84506	Tap - 3/8" - 16 U.S.F. (.012" oversize) . . .	1	1	1	1	1
VAJTI	R-1148	19	84851	Gauge - Straight thread plug (1/4" - 20) .003" oversize . . . . .	1	1	1	1	1
VAJVY	R-1148	19	84538	Gauge - Straight thread plug (1/4" - 20) .007" oversize . . . . .	1	1	1	1	1
VALBA	R-1148	19	84539	Gauge - Straight thread plug (1/4" - 20) .012" oversize . . . . .	1	1	1	1	1
VALDE	R-1148	19	84852	Gauge - Straight thread plug (5/16" - 18) .003" oversize . . . . .	1	1	1	1	1
VALFI	R-1148	19	84452	Gauge - Straight thread plug (5/16" - 18) .007" oversize . . . . .	1	1	1	1	1
VALGO	R-1148	19	84453	Gauge - Straight thread plug (5/16" - 18) .012" oversize . . . . .	1	1	1	1	1
VALHU	R-1148	19	84853	Gauge - Straight thread plug (3/8" - 16) .003" oversize . . . . .	1	1	1	1	1
VALJA	R-1148	19	84540	Gauge - Straight thread plug (3/8" - 16) .007" oversize . . . . .	1	1	1	1	1
VALLE	R-1148	19	84541	Gauge - Straight thread plug (3/8" - 16) .012" oversize . . . . .	1	1	1	1	1
VALMI	R-1150	19	80402	Driver - Stud (1/4" - 28) . . . . . Recommended for moderate use. See 84430 for extensive use.	1	1	1	1	1
VALOP	R-1150	19	80403	Driver - Stud (5/16" - 24) . . . . . Recommended for moderate use. See 84431 for extensive use.	1	1	1	1	1
VALRU	R-1150	19	80404	Driver - Stud (3/8" - 24) . . . . . Recommended for moderate use. See 84431 and 84432 for extensive use.	1	1	1	1	1
VALST	R-1150	19	80442	Driver - Stud (7/16" - 20) . . . . . Recommended for moderate use. See 84432 for extensive use. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VANAN	R-1152	19	84430	Driver - Stud (1/4" - 28) . . . . . Includes adapter. Recommended for extensive use. See 80402 for moderate use.	1	1	1	1	1
VANCA	R-1154	19	84431	Driver - Stud (5/16" - 24 & 3/8" - 24) . . . . . Used with adapter 84433 for driving 5/16" - 24 studs and adapter 84434 for driving 3/8" - 24 studs. Recommended for extensive use. See 80403 and 80404 for moderate use.	1	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**STUD REPLACEMENT (EXCEPT CYLINDER HOLD-DOWN STUDS) (WHIRLWIND AND CYCLONE) - Cont'd**

VANEB	R-1154	19	84432	Driver - Stud (3/8" - 24 & 7/16" - 20). . . . . Used with adapter 84435 for driving 3/8" - 24 studs and adapter 84436 for driving 7/16" - 20 studs. Recommended for extensive use. See 80404 and 80442 for moderate use. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VANGA	R-1158	19	84433	Adapter - Stud driver (5/16" - 24). . . . . Used with driver 84431.	1	1	1	1	1
VANID	R-1158	19	84434	Adapter - Stud driver (3/8" - 24) . . . . . Used with driver 84431.	1	1	1	1	1
VANKE	R-1160	19	84435	Adapter - Stud driver (3/8" - 24) . . . . . Used with driver 84432.	1	1	1	1	1
VANMI	R-1160	19	84436	Adapter - Stud driver (7/16" - 20). . . . . Used with driver 84432. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1

**CYLINDER HOLD-DOWN STUD REPLACEMENT (CYCLONE)**

VAPAB	R-1170	19	81905	Remover - Stud. . . . . Used for removing unbroken studs. Not recommended for G and G-100 engines due to inadequate space between studs. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VAPGE	R-1172	20	800293	Remover - Stud (7/16" - 20) . . . . . Used for removing unbroken studs on all G and G-100 engines. Can also be used on Cyclone F and F-50 engines in place of 81905.	-	1	1	1	1
VAPER	R-1174	20	800263	Jig - Cylinder hold-down stud removing and tap drilling, drill. . . . . Used for removing broken studs and for drilling stud hole deeper to accommodate the .0025" tapered stud. Used for F and F-50 engines and early G engines equipped with crankcase having cylinder hold-down studs unequally spaced around the pad.	-	1	1	1	-
VAPGI	R-1176	20	800262	Jig - Cylinder hold-down stud removing, drill Used for removing broken studs on engines equipped with crankcase main section having studs equally spaced around the pad. This type crankcase main section is installed on late G engines and all G-100 engines.	-	-	-	1	1
VAPIF	R-1180	20	84903	Bushing - Cylinder hold-down stud hole tap drill (for 23/64" diameter drill). . . . . Used with jig 800263.	-	1	1	1	-
VAPJO	R-1182	20	84890	Bushing - Cylinder hold-down stud removing, drill (for 25/64" diameter drill). . . . . Used with jig 800262.	-	-	-	1	-
VAPLU	R-1182	20	84891	Bushing - Cylinder hold-down stud removing, drill (for 27/64" diameter drill). . . . . Used with jig 800262.	-	-	-	-	1
VAPNL	R-1184	20	84203	Drill - Cylinder hold-down stud hole tap, 23/64" diameter. . . . . Used with jig 800263.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
<b>CRANKCASE TOOLS, ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>CYLINDER HOLD-DOWN STUD REPLACEMENT (CYCLONE) - Cont'd</b>									
VAPOG	R-1186	20	84276	Drill - Cylinder hold-down stud removing (1/8" diameter). . . . . Used with jigs 800262 and 800263.	-	1	1	1	1
VAPPY	R-1188	20	84277	Drill - Cylinder hold-down stud removing (1/4" diameter). . . . . Used with jigs 800262 and 800263.	-	1	1	1	1
VAPRA	R-1190	20	84904	Drill - Cylinder hold-down stud removing (9/32" diameter). . . . . Used with jig 800263.	-	1	1	1	-
VAPTH	R-1192	20	84278	Drill - Cylinder hold-down stud removing (25/64" diameter). . . . . Used with jig 800262.	-	-	-	1	-
VAPUK	R-1192	20	84279	Drill - Cylinder hold-down stud removing (27/64" diameter). . . . . Used with jig 800262.	-	-	-	-	1
VAPVE	R-1193	20	84905	Removing Tools - Cylinder hold-down stud. . . Used with jig 800263 for removing broken studs.	-	1	1	1	-
VAPYS	R-1194	20	83760	Removing Tools - Cylinder hold-down stud. . . Used with jig 800262 for removing broken studs.	-	-	-	1	-
VAPZO	R-1196	20	83758	Removing Tools - Cylinder hold-down stud. . . Used with jig 800262 for removing broken studs.	-	-	-	-	1
VARAV	R-1198	20	83759	Wrench - Cylinder hold-down stud removing tools, ratchet . . . . .	-	1	1	1	1
VARCA	R-1200	20	83085	Fixture - Cylinder hold-down stud hole tapping and reaming. . . . . Used for engines equipped with crankcase main sections having straight cut or slightly tapered (.0025") cylinder hold-down studs unequally spaced around the cylinder pad. This type crankcase main section is installed on F and F-50 engines and early G engines.	-	1	1	1	-
VAREW	R-1202	20	83087	Holder - Cylinder hold-down stud hole tap and reamer . . . . . Used with fixture 83085.	-	1	1	1	-
VARGE	R-1204	20	83088	Tap - Cylinder hold-down stud hole (7/16" - 14) standard size. . . . . Used with fixture 83085.	-	1	1	1	-
VARIX	R-1204	20	84836	Tap - Cylinder hold-down stud hole (7/16" - 14) .003" oversize (.3941" P.D.) . . . . . Used with fixture 83085.	-	1	1	1	-
VARKI	R-1206	20	83582	Tap - Cylinder hold-down stud hole, root (7/16" - 14) . . . . . Used with fixture 83085.	-	1	1	1	-
VASEO	R-1208	20	84507	Reamer - Cylinder hold-down stud hole, hand (.366" diameter) . . . . . Used with fixture 83085 for reaming stud hole before tapping with .007" oversize tap.	-	1	1	1	1
VASDU	R-1210	20	83089	Tap - Cylinder hold-down stud hole (7/16" - 14) .007" oversize (.3989" P.D. - Selective Fit No. 1) . . . . . Used with fixture 83085.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100

**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**CYLINDER HOLD-DOWN STUD REPLACEMENT (CYCLONE)  
- Cont'd**

VASER	R-1210	20	83090	Tap - Cylinder hold-down stud hole (7/16" - 14) .007" oversize (.3999" P.D. - Selective Fit No. 2) . . . . .	-	1	1	1	-
Used with fixture 83085.									
VASGY	R-1212	20	84508	Reamer - Cylinder hold-down stud hole, hand (.371" diameter) . . . . .	-	1	1	1	-
Used with fixture 83085 for reaming stud hole before tapping with .012" oversize tap.									
VASIT	R-1214	20	83581	Tap - Cylinder hold-down stud hole (7/16" - 14) .012" oversize (.4039" P.D. - Selective Fit No. 1) . . . . .	-	1	1	1	-
Used with fixture 83085.									
VASKA	R-1214	20	800389	Tap - Cylinder hold-down stud hole (7/16" - 14) .012" oversize (.4049" P.D. - Selective Fit No. 2) . . . . .	-				
Used with fixture 83085.									
VATAF	R-1216	20	83597	Reamer - Cylinder hold-down stud hole, hand (.376" diameter) . . . . .	-	1	1	1	-
Used with fixture 83085 for reaming stud hole before tapping with .017" oversize tap.									
VATCE	R-1218	20	83545	Tap - Cylinder hold-down stud hole (7/16" - 14) .017" oversize (.4089" P.D. - Selective Fit No. 1) . . . . .	-	1	1	1	-
Used with fixture 83085.									
VATEB	R-1218	20	84837	Tap - Cylinder hold-down stud hole (7/16" - 14) .017" oversize (.4099" P.D. - Selective Fit No. 2) . . . . .	-	1	1	1	-
Used with fixture 83085.									
VATGO	R-1220	20	83598	Reamer - Cylinder hold-down stud hole, hand (.381" diameter) . . . . .	-	1	1	1	-
Used with fixture 83085 for reaming stud hole before tapping with .022" oversize tap.									
VATIZ	R-1224	20	83546	Tap - Cylinder hold-down stud hole (7/16" - 14) .022" oversize (.4139" P.D. - Selective Fit No. 1) . . . . .	-	1	1	1	-
Used with fixture 83085.									
VATKU	R-1224	20	84838	Tap - Cylinder hold-down stud hole (7/16" - 14) .022" oversize (.4149" P.D. - Selective Fit No. 2) . . . . .	-	1	1	1	-
Used with fixture 83085.									
VATMI	R-1226	20	83654	Fixture - Cylinder hold-down tapered thread stud hole tapping. . . . .	-	-	-	1	1
Used for engines equipped with crankcase main sections having the cylinder hold-down studs equally spaced around the pad. This type crankcase main section is installed on late G engines and all G-100 engines.									
Used with holder 83653, taps 83143 and 83144 and 83652 for cleaning up tapped hole before installing new stud.									
VATOS	R-1228	20	83653	Holder - Cylinder hold-down tapered thread stud hole taper tap. . . . .	-	-	-	1	1
Used with fixture 83654.									
VATRA	R-1230	20	83143	Tap - Cylinder hold-down stud hole, taper finish (1/2" - 11) (.015" taper per inch). . . . .	-	-	-	1	-
Used with fixture 83654.									

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**CYLINDER HOLD-DOWN STUD REPLACEMENT (CYCLONE)  
- Cont'd**

VATTY	R-1232	20	83144	Tap - Cylinder hold-down stud hole, root (1/2" - 11) (.015" taper per inch) . . . . . Used with fixture 83654.	-	-	-	1	-
VATVE	R-1234	20	83652	Tap - Cylinder hold-down stud hole, taper finish (1/2" - 16) (.015" taper per inch). Used with fixture 83654.	-	-	-	-	1
VATYL	R-1236	19	80442	Driver - Stud (7/16" - 20) . . . . . Recommended for moderate use. See 84432 for extensive use. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VAUBD	R-1238	19	84432	Driver - Stud (3/8" - 24 & 7/16" - 20) . . . . . Used with adapter 84436 for driving 7/16" - 20 studs. Studs with 3/8" diameter not used as cylinder hold-down studs. Recommended for extensive use. See 80404 and 80442 for moderate use. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VAUDG	R-1240	19	84436	Adapter - Stud driver (7/16" - 20) . . . . . Used with driver 84432. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1

**CYLINDER HOLD-DOWN STUD PACKING REPLACEMENT (CYCLONE G)**

VAWBA	R-1255	20	84764	Installing Tool - Cylinder hold-down stud counterbore packing. . . . .	-	-	-	1	-
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**DIFFUSER AND CRANKCASE REAR SECTION ACCESSORY DRIVE SHAFT BUSHING FINISHING (WHIRLWIND)**

VAWUY	R-1265	21	82687	Fixture - Accessory drive shaft bushings and diffuser section and crankcase rear section holes, line reaming, bench. . . . . Used for early engines having 1 7/8" diameter magneto pilot recesses in crankcase rear section. Designed for use with both standard and under-size reamers 83519, 83520, 83521 and 82688. Supersedes fixtures 81555 (designed only for standard size reamer 81556) and 82680 (designed only for .005" undersize reamers 82678 and 82679) which are no longer supplied.	1	-	-	-	-
VAWWI	R-1265	21	83522	Fixture - Accessory drive shaft bushings and diffuser section and crankcase rear section holes, line reaming, bench. . . . . Used for late engines having 3" diameter magneto pilot recesses in the crankcase rear section.	1	-	-	-	-
VAWYL	R-1267	21	83519	Reamer - Accessory drive shaft short and long bushing, hand line (standard size) . . . . . Used with fixtures 82687 and 83522. Read note under fixture 82687.	1	-	-	-	-
VAXAY	R-1269	21	83520	Reamer - Accessory drive shaft long bushing, hand line (.005" undersize I.D.) . . . . . Used with fixtures 82687 and 83522. Read note under fixture 82687.	1	-	-	-	-
VAXDA	R-1271	21	83521	Reamer - Accessory drive shaft short bushing, hand line (.005" undersize I.D.) . . . . . Used with fixtures 82687 and 83522. Read note under fixture 82687.	1	-	-	-	-



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-5E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**DIFFUSER AND CRANKCASE REAR SECTION ACCESSORY DRIVE SHAFT BUSHING FINISHING (WHIRLWIND) - Cont'd**

VAXEB	R-1273	21	82688	Reamer - Diffuser and crankcase rear sections accessory drive shaft short and long bushing holes, hand line (.010" oversize O.D.). . . . . Used with fixtures 82687 and 83522.	1	-	-	-	-
VAXGO	R-1275	21	84442	Drill - Accessory drive shaft long bushing oil hole (3/16" diameter). . . . .	1	-	-	-	-
VAXIT	R-1277	21	84773	Bushing - Accessory drive shaft long bushing oil hole (for 3/16" drill). . . . .	1	-	-	-	-

**DIFFUSER AND CRANKCASE REAR SECTION STARTER SHAFT AND STARTER DRIVE GEAR BUSHINGS FINISHING (WHIRLWIND)**

VAZBA	R-1290	21	83043	Reamer and Bushing - Starter shaft and starter drive gear bushings, hand line . .	1	-	-	-	-
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**IMPELLER SHAFT SUPPORT SLEEVE AND SUPERCHARGER REAR HOUSING IMPELLER SHAFT SLEEVE REPLACEMENT (CYCLONE)**

The tools listed in this group are used for engines equipped with the piston ring type impeller oil seal. This type of seal is installed on all Cyclone F-50, G and G-100 engines and late Cyclone F engines.

VEBAK	R-1310	22	82486	Reamer - Impeller shaft support sleeve and supercharger rear housing impeller shaft sleeve lock pin hole, machine extension. .	-	1	1	1	1
VEBCU	R-1312	22	84294	Fixture - Supercharger rear housing impeller shaft sleeve, honing . . . . .	-	1	1	1	1
VEBED	R-1314	22	84295	Fixture - Impeller shaft support sleeve, honing . . . . .	-	1	1	1	1
VEBGA	R-1316	22	84398	Head - Impeller shaft support sleeve and supercharger rear housing impeller shaft sleeve bore finishing hone . . . . .	-	1	1	1	1
VEBIC	R-1318	22	84395	Body - Impeller shaft support sleeve and supercharger rear housing impeller shaft sleeve bore finishing hone . . . . .	-	1	1	1	1
VEBKE	R-1320	22	84391	Holder - Impeller shaft support sleeve and supercharger rear housing impeller shaft sleeve bore finishing hone stone. . . . .	-	6	6	6	6
VEBML	R-1322	22	84290	Driver - Micromatic hone (Quickloc, 1 1/2" socket). . . . .	-	1	1	1	1
VEBOX	R-1324	22	84297	Stone - Impeller shaft support sleeve and supercharger rear housing impeller shaft sleeve bore finishing hone . . . . .	-	6	6	6	6

**REAR SUPERCHARGER HOUSING IMPELLER DRIVE GEAR SHAFT OUTER BUSHING OR IMPELLER DRIVE MULTI-PLATE CLUTCH GEAR BUSHING REPLACEMENT (CYCLONE G, G-100)**

VEDEM	R-1340	23	83790	Drill - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing pin hole, extension (#31). . . . . Used to drill out metal peined over lock pin and to spot drill new bushing.	-	-	-	1	1
VEDGO	R-1342	23	83865	Plug and Collar - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing removing and installing, arbor press. . . . .	-	-	-	1	1
VEDID	R-1344	23	83791	Drill - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing pin hole, extension (7/64" diameter). . . . . Used to drill pin hole in new bushing.	-	-	-	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					J-6	F	F-50	G	G-100

**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**REAR SUPERCHARGER HOUSING IMPELLER DRIVE GEAR  
SHAFT OUTER BUSHING OR IMPELLER DRIVE MULTI-  
PLATE CLUTCH GEAR BUSHING REPLACEMENT  
(CYCLONE G, G-100) - Cont'd**

VEDKU	R-1346	23	83792	Reamer - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing pin hole, machine (.1245" diameter) . . . . .	-	-	-	1	1
VEDMN	R-1348	23	83793	Gauge - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing and intermediate impeller drive gear bushing pin hole, limit plug (.1235" - .1245" diameter) . . . . .	-	-	-	1	1
				Refer to Numerical Tool List for other sections of catalog in which this tool is listed.					
VEDOK	R-1350	23	84854	Fixture - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing, hand line reaming . . . . . Used for all G and G-100 engines. Supersedes fixture 83050 which is no longer supplied but which can be used in place of fixture 84854 and adapter 84856 for G and G-100 engines equipped only with supercharger rear cover having all accessory mounting pads on the same plane. Fixture 83050 can not be used with supercharger rear cover having the generator and starter mounting pads raised 7/8" above the other accessory mounting pads.	-	-	-	1	1
VEDPY	R-1352	23	84856	Adapter - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing, hand line reaming fixture . . . . . Used with fixture 84854 for engines equipped with supercharger rear cover having all accessory mounting pads on the same plane.	-	-	-	1	1
VEDST	R-1354	23	84855	Adapter - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing, hand line reaming fixture . . . . . Used with fixture 84854 for engines equipped with supercharger rear cover having the generator and starter mounting pads raised 7/8" above the other accessory mounting pads.	-	-	-	-	1
VEDUR	R-1356	23	83051	Reamer - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing, hand line . . . . .	-	-	-	1	1
VEDYM	R-1358	23	83052	Gauge - Impeller drive gear shaft outer, or impeller drive multi-plate clutch gear bushing, limit plug (1.3155" - 1.3165" diameter) . . . . .	-	-	-	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6	clone F	clone F-50	clone G	clone G-100

**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd**

**RECONDITIONING - Cont'd**

**SUPERCHARGER REAR COVER BUSHING REPLACEMENT  
(CYCLONE)**

Two fixture and tool assemblies are supplied, 82206 and 83871. Fixture 82206 is used for replacement of bushings in rear covers which do not have the generator and starter mounting pads raised seven-eighths (7/8) of an inch above the other accessory mounting pads. This type rear cover is used on Cyclone F, F-50, G and early G-100 engines. Fixture 83871 is used for replacement of bushings in rear covers having generator and starter mounting pads raised seven-eighths (7/8) of an inch above the other pads. This type cover is used on late Cyclone G-100 engines.

Certain details of the above tool numbers are identical, therefore, operators who have either 82206 or 83871 and wish to purchase the necessary detail tools to convert one to the other may secure a list of such detail tools by communicating with the Service Division of the Wright Aeronautical Corporation.

VEFAB	R-1375	24	82206	<p>Fixture and Tools - Supercharger rear cover bushings removing, installing and finishing, line reaming. . . . .</p> <p>Read note under heading.</p> <p>Does not include tools for replacement of generator drive gear oilite bushing. Tools 82760, 82761 and 82762 listed below will be required in addition to 82206 for this replacement.</p> <p>Does not include tools for replacement of impeller drive gear and pinion shaft bushing. Tools 83992, 83993, 82895, 82896, 82897, 82898 and 82899 will be required in addition to 82206 for this replacement. This bushing is installed on F and F-50 engines and G engines equipped with supercharger rear cover having generator mounting pad raised 1/4" above the other pads.</p>	-	1	1	1	1
VEFCO	R-1377	24	83871	<p>Fixture and Tools - Supercharger rear cover bushings removing, installing and finishing, line reaming. . . . .</p> <p>Read note under heading.</p>	-	-	-	-	1
VEFER	R-1381	24	82760	<p>Plug - Generator drive gear bushing removing and installing, arbor press. . . . .</p> <p>Used with fixture and tools 82206. Read note under 82206.</p>	-	1	1	1	1
VEFIC	R-1383	24	82761	<p>Base - Generator drive gear bushing burnishing, arbor press. . . . .</p> <p>Used with fixture and tools 82206. Read note under 82206.</p>	-	1	1	1	1
VEFKA	R-1385	24	82762	<p>Broach - Generator drive gear bushing, burnishing. . . . .</p> <p>Used with fixture and tools 82206. Read note under 82206.</p>	-	1	1	1	1
VEFMD	R-1387	24	83992	<p>Puller - Impeller drive gear and pinion shaft bushing removing. . . . .</p> <p>Used with fixture and tools 82206. Read note under 82206.</p>	-	1	1	1	-
VEFOZ	R-1389	24	83993	<p>Plug - Impeller drive gear and pinion shaft bushing installing, arbor press. . . . .</p> <p>Used with fixture and tools 82206. Read note under 82206.</p>	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6	clone F	clone F-50	clone G	clone G-100

**CRANKCASE TOOLS,  
ENGINE STANDS, HOIST EYES AND SLINGS - Cont'd  
RECONDITIONING - Cont'd**

**SUPERCHARGER REAR COVER BUSHING REPLACEMENT  
(CYCLONE) - Cont'd**

VEFPT	R-1391	24	82895	Fixture - Impeller drive gear and pinion shaft bushing reaming and facing . . . . . Used with fixture and tools 82206. Read note under 82206.	-	1	1	1	-
VEFRN	R-1393	24	82896	Reamer - Impeller drive gear and pinion shaft bushing, hand. . . . . Used with fixture and tools 82206. Read note under 82206.	-	1	1	1	-
VEFUR	R-1395	24	82897	Cutter - Impeller drive gear and pinion shaft bushing facing, counterbore. . . . . Used with fixture and tools 82206. Read note under 82206.	-	1	1	1	-
VEFWM	R-1397	24	82898	Gauge - Impeller drive gear and pinion shaft bushing, flush pin . . . . . Used with fixture and tools 82206. Read note under 82206.	-	1	1	1	-
VEFYL	R-1399	24	82899	Gauge - Impeller drive gear and pinion shaft bushing, limit plug. . . . . Used with fixture and tools 82206. Read note under 82206.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
VEHBY	R-1425	4	82906	Removing and Installing Tool - Oil pressure relief valve body. . . . . Used for early type oil pressure relief valve body having a 1" hex. and required only with oil pumps which have provision for driving a vacuum pump. A wrench is supplied in the engine tool kit for the late type oil pressure relief valve body which has a 7/8" hex.	1	-	-	-	-
VEHDE	R-1427	4	83472	Wrench - Oil pressure relief valve body, 9/16" and 7/8" hex. . . . . Included in engine tool kit. Also see 82906 listed above.	1	-	-	-	-
VEHEL	R-1429	4	83660	Wrench - Oil pressure relief valve body, lug. Included in engine tool kit. Used for removing and installing body of piston type relief valve.	-	-	-	1	1
VEHFI	R-1431	4	82147	Wrench - Oil pressure relief valve body, 1 1/8" hex. . . . . Included in engine tool kit. Used for removing and installing body of ball type relief valve.	-	1	1	1	1
VEHIV	R-1433	4	84504	Wrench and Screwdriver - Oil pressure relief valve nut adjusting, socket. . . . . Used for engines equipped with piston type relief valve.	-	-	1	1	1
VEHKO	R-1435	4	80076	Wrench - Oil pump drive shaft front gear and magneto gear (30 teeth). . . . . Used to hold gear when removing or installing nut. Used on Whirlwind engines for magneto gear and on Cyclone F engines equipped with early type magneto gear and oil pump drive shaft front gear having 30 teeth. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	-	-	-
VEHMU	R-1435	4	82676	Wrench - Oil pump drive shaft front gear and magneto gear (17 teeth). . . . . Used to hold gear when removing or installing nut. Used for all F-50, G and G-100 engines and for F engines equipped with late type magneto gear and oil pump drive shaft front gear having 17 teeth. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VEHOB	R-1437	4	80736	Puller - Oil pump drive shaft front gear and magneto gear removing. . . . . Used for magneto gear on Whirlwind engines. Used for magneto gears or oil pump drive shaft front gears on Cyclone engines. Can be used to remove either 30 or 17 tooth gears. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VEHSA	R-1439	4	82047	Wrench - Oil pump shaft packing gland, lug. . . . . Included in engine tool kit.	-	1	1	1	1
VEHUN	R-1441	4	82972	Wrench - Oil pump to crankcase rear section attaching stud nut, 7/16" hex. . . . . Included in engine tool kit.	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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OIL PUMP TOOLS - Cont'd

RECONDITIONING

OIL PUMP PRESSURE RELIEF VALVE SEAT ANGLE CUTTING (WHIRLWIND)

VEJAT	R-1450	25	81599	Cutting Tool - Oil suction pump body oil pressure relief valve seat angle . . . . . Used for engines equipped with pump not having provision for driving vacuum pump.	1	-	-	-	-
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CAM AND CAM DRIVE TOOLS**

**DISASSEMBLY AND REASSEMBLY**

VELAN	R-1475	4	80351	Wrench - Cam hub bearing support, lug . . . .	1	-	-	-	-
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**RECONDITIONING**

**CAM HUB BEARING REPLACEMENT (WHIRLWIND)**

VEMAB	R-1501	25	83573	Fixture - Cam hub bearing removing and bore finishing, lathe . . . . .	1	-	-	-	-
VEMCA	R-1503	25	84471	Plug - Cam hub bearing installing, arbor press. . . . .	1	-	-	-	-
VEMEN	R-1505	25	84470	Collar - Cam hub bearing installing, arbor press. . . . .	1	-	-	-	-
VEMGE	R-1507	25	83683	Jig - Cam hub bearing pin hole, drill and ream . . . . .	1	-	-	-	-
				Used for R-760 and R-975 engines equipped with late type cam having a one-piece bearing. Not required for early cams having a two-piece front and rear bearing.					
VEMIP	R-1509	25	84455	Drill - Cam hub bearing pin hole, extension (11/64" diameter). . . . .	1	-	-	-	-
				Used for jig 83683 for R-760 and R-975 engines equipped with late type cam having a one-piece bearing.					
VEMKS	R-1511	25	84477	Reamer - Cam hub bearing pin hole, machine extension (.183" diameter) . . . . .	1	-	-	-	-
				Used with jig 83683 for R-760 and R-975 engines equipped with late type cam having a one-piece bearing.					
VEMMI	R-1513	25	84474	Reamer - Cam hub bearing pin hole, machine extension (standard size). . . . .	1	-	-	-	-
				Used for all Whirlwind R-540 and for R-760 and R-975 engines equipped with early type cam having a two-piece bearing.					
VEMOW	R-1513	25	84475	Reamer - Cam hub bearing pin hole, machine extension (.010" oversize) . . . . .	1	-	-	-	-
				See note under reamer 84474.					
VEMRY	R-1513	25	84476	Reamer - Cam hub bearing pin hole, machine extension (.015" oversize) . . . . .	1	-	-	-	-
				See note under reamer 84474.					
VEMTO	R-1515	25	83220	Fixture - Cam hub bearing pin hole peening, bench. . . . .	1	-	-	-	-
VEMUV	R-1517	25	83219	Punch - Cam hub bearing pin hole peening. . .	1	-	-	-	-
VENBU	R-1519	25	84472	Gauge - Cam hub bearing shoulder, feeler (.313" - .323"). . . . .	1	-	-	-	-
VENDI	R-1521	25	84473	Gauge - Cam hub bearing shoulder facing, snap (1.155" - 1.159"). . . . .	1	-	-	-	-

**CAM HUB BEARING REPLACEMENT (CYCLONE)**

VEPAY	R-1535	26	82368	Fixture - Cam hub bearing removing and bore finishing, lathe . . . . .	-	1	1	1	1
VEPEW	R-1537	26	82204	Collar - Cam hub bearing installing, arbor press. . . . .	-	1	1	1	1
VEPIV	R-1539	26	82198	Plug - Cam hub bearing installing, arbor press. . . . .	-	1	1	-	-
				Used for direct drive engines equipped with hydro-controllable pitch propeller mechanism and either a three or five oil seal ring type cam.					
VEPLU	R-1541	26	83988	Plug and Base - Cam hub bearing installing, arbor press. . . . .	-	-	1	1	-
				Used for direct drive engines equipped with hydro-controllable pitch propeller mechanism and six oil seal ring type cam.					

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100
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## CAM AND CAM DRIVE TOOLS - Cont'd

## RECONDITIONING - Cont'd

CAM HUB BEARING REPLACEMENT (CYCLONE) -  
Cont'd

VEPNO	R-1543	26	84270	Plug - Cam hub bearing installing, arbor press. . . . . Used for Cyclone F, F-50, G and G-100 16:11 reduction geared engines equipped with early type cam measuring .457" - .461" from face of hub (not bearing) to front face of cam ring.	-	1	1	1	1
VEPRL	R-1545	26	82203	Plug - Cam hub bearing installing, arbor press. . . . . Used for F direct drive engines not equipped with hydro-controllable pitch propeller mechanism; used for F, F-50, G and G-100 16:11 and 3:2 reduction geared engines equipped with late type cam measuring .432" - .436" from face of hub (not bearing) to front face of cam ring.	-	1	1	1	1
VEPUP	R-1547	26	83989	Drill - Cam hub bearing pin hole, flat end (13/64" diameter). . . . . Used for direct drive engines equipped with hydro-controllable pitch propeller mechanism and either a three or five oil seal ring type cam.	-	1	1	-	-
VEPYS	R-1549	26	82370	Reamer - Cam hub bearing pin hole, machine (.156" diameter) . . . . . Used for direct drive engines equipped with hydro-controllable pitch propeller mechanism and either a three or five oil seal ring type cam.	-	1	1	-	-
VERBA	R-1551	26	82365	Reamer - Cam hub bearing pin hole, machine (.183" diameter) . . . . . Used for F direct drive engines not equipped with hydro-controllable pitch propeller mechanism. Used for all 16:11 and 3:2 reduction geared engines.	-	1	1	1	1
VERDE	R-1553	26	84269	Gauge - Cam hub bearing, flush pin (.107" - .117") . . . . . Used for 16:11 and 3:2 reduction geared engines. Used for checking dimension from back face of cam to back face of bearing.	-	1	1	1	1

CAM DRIVE GEAR AND PINION BUSHING REPLACEMENT  
(CYCLONE F-50, G AND G-100)

VETEM	R-1565	27	83940	Plug and Collar - Cam drive gear and pinion bushing removing, arbor press. . . . . Used for F-50 engines equipped with late type cam drive gear and pinion having spun-in type bushing; used for all G engines; used for G-100 engines equipped with cam drive gear shaft .779" in diameter at the pinion end.	-	-	1	1	1
VETFI	R-1567	27	83943	Base - Cam drive gear and pinion bushing installing and burnishing, arbor press . . . . . Used for F-50 engines equipped with late type cam drive gear and pinion having spun-in type bushing; used for all G engines; used for G-100 engines equipped with cam drive gear which is integral with cam drive pinion.	-	-	1	1	1
VETHO	R-1569	27	84386	Base - Cam drive pinion bushing installing and burnishing, arbor press. . . . . Used for G-100 engines equipped with cam drive gear shaft .779" in diameter at the pinion end and cam drive gear which is splined to cam drive pinion.	-	-	-	-	1



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CAM AND CAM DRIVE TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**CAM DRIVE GEAR AND PINION BUSHING REPLACEMENT (CYCLONE F-50, G AND G-100) - Cont'd**

VEVIK	R-1571	27	84385	<p>Plug - Cam drive gear and pinion bushing installing, arbor press. . . . .</p> <p>Used for F-50 engines equipped with late type cam drive gear and pinion having spun-in type bushing; used for all G engines; used for G-100 engines equipped with cam drive gear shaft .779" in diameter at the pinion end.</p>	-	-	1	1	1
VEVJU	R-1573	27	83942	<p>Broach - Cam drive gear and pinion bushing burnishing, arbor press. . . . .</p> <p>Used for F-50 engines equipped with late type cam drive gear and pinion having spun-in type bushing; used for all G engines; used for G-100 engines equipped with cam drive gear shaft .779" in diameter at the pinion end.</p>	-	-	1	1	1
VEVLY	R-1575	27	83944	<p>Spinning Tool - Cam drive gear and pinion bushing, lathe . . . . .</p> <p>Used for F-50 engines equipped with late type cam drive gear and pinion having spun-in type bushing; used for all G engines; used for early G-100 engines equipped with cam drive gear which is integral with cam drive pinion.</p>	-	-	1	1	1
VEVOG	R-1577	27	83945	<p>Gauge - Cam drive gear and pinion bushing, limit plug (.7805" - .7815") . . . . .</p> <p>Used for F-50 engines equipped with late type cam drive gear and pinion having spun-in type bushing; used for all G engines; used for G-100 engines equipped with cam drive gear shaft .779" in diameter at the pinion end.</p>	-	-	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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IMPELLER AND IMPELLER DRIVE TOOLS

DISASSEMBLY AND REASSEMBLY

VEXUL	R-1605	4	84558	Locking Tool - Impeller shaft . . . . . Used to lock impeller shaft when removing and installing impeller shaft front and rear nuts.	1	-	-	-	-
VEXWN	R-1607	4	82030	Locking Tool - Impeller shaft (5.95:1 ratio). Used to lock impeller shaft when removing and installing impeller shaft front nut. Nut recommended for extensive use. See 84533.	-	1	1	1	-
VEXYF	R-1607	4	81972	Locking Tool - Impeller shaft (7.00:1 ratio). Used to lock impeller shaft when removing and installing impeller shaft front nut. Not recommended for extensive use. See 84533.	-	1	1	1	1
VEYAB	R-1607	4	82015	Locking Tool - Impeller shaft (8.31:1 ratio). Used to lock impeller shaft when removing and installing impeller shaft front nut. Not recommended for extensive use. See 84533.	-	1	1	1	-
VEYCA	R-1607	4	82952	Locking Tool - Impeller shaft (8.83:1 ratio). Used to lock impeller shaft when removing and installing impeller shaft front nut. Not recommended for extensive use. See 84533.	-	-	1	1	-
VEYED	R-1607	4	82031	Locking Tool - Impeller shaft (10.00:1 ratio) . . . . . Used to lock impeller shaft when removing and installing impeller shaft front nut. Not recommended for extensive use. See 84533.	-	1	1	1	1
VEYGE	R-1610	4	84533	Locking Tool - Impeller . . . . . Used to lock impeller and impeller shaft when removing and installing impeller shaft front nut. Can be used for all impeller ratios on Cyclone engines. Recommended for extensive use. See 82030, 81972, 82015, 82952 and 82031, listed above.	-	1	1	1	1
VEYIL	R-1612	4	81897	Wrench - Impeller shaft front nut, lug. . . . . Used for engines equipped with early type nut having an outside diameter of 1 29/32".	-	1	-	-	-
VEYKI	R-1612	4	82267	Wrench - Impeller shaft front nut, lug. . . . . Used for all F-50, G and G-100 engines; used for F engines equipped with late type nut having an outside diameter of 2 3/32".	-	1	1	1	1
VEYMO	R-1616	4	80350	Puller - Supercharger impeller removing . . . . .	1	-	-	-	-
VEYOR	R-1618	4	800304	Puller - Supercharger impeller removing and installing . . . . . See adapters 800305 and 800306.	-	1	1	1	1
VEYTU	R-1620	4	800305	Adapter - Supercharger impeller removing and installing puller. . . . . Used with puller 800304 for engines equipped with impeller shaft 6 7/8" in overall length.	-	1	1	1	-
VEYUV	R-1620	4	800306	Adapter - Supercharger impeller removing and installing puller. . . . . Used with puller 800304 for engines equipped with impeller shaft 6 1/4" or 6 11/32" in overall length.	-	1	1	1	1
VEZDT	R-1624	4	80457	Wrench - Impeller shaft front ball bearing retainer nut, lug. . . . .	1	-	-	-	-
VEZFN	R-1626	4	82363	Fixture - Impeller shaft holding. . . . . Used for all F and F-50 engines; used only for early G engines equipped with impeller shaft 6 1/4" in overall length. Late "G" engines equipped with impeller shaft 6 7/8" in overall length have no rear nut and therefore do not require this fixture. Used to hold impeller shaft when removing the impeller shaft rear nut and locking rivet and when re-riveting.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**IMPELLER AND IMPELLER DRIVE TOOLS - Cont'd****DISASSEMBLY AND REASSEMBLY - Cont'd**

VEZHB	R-1628	4	81779	Wrench - Impeller shaft rear nut, lug . . . . Used with fixture 82363.	-	1	1	1	-
VIABA	R-1630	4	84415	Removing and Installing Tool - Impeller oil seal ring. . . . .	-	1	1	1	1
VIADE	R-1632	4	81952	Mandrel - Impeller shaft rear nut riveting. . Used with fixture 82363.	-	1	1	1	-
VIAFS	R-1634	4	84463	Punch - Impeller shaft support screw hole, and impeller shaft retainer screw, staking Used for all engines for impeller shaft support screw hole; used for impeller shaft retainer screw on all G-100 engines and only G engines equipped with impeller shaft 6 1/4" in overall length.	-	1	1	1	1
VIAHL	R-1636	4	84380	Installing Tool - Two speed supercharger impeller drive . . . . . Used for engines equipped with supercharger rear cover having all the accessory mounting pads on the same plane.	-	-	-	1	1
VIAJO	R-1638	4	84692	Installing Tool - Two speed supercharger impeller drive . . . . . Used for engines equipped with supercharger rear cover having the generator and starter mounting pads raised 7/8" above the other accessory mounting pads.	-	-	-	1	1
VIALT	R-1640	4	84668	Fixture - Impeller drive multi-plate clutch (10:1) disassembling and assembling, vise.	-	-	-	1	1
VIANZ	R-1642	4	800244	Puller - Impeller drive multi-plate clutch sleeve and piston removing . . . . . Used for late two-speed supercharger impeller drive engines equipped with supercharger rear cover having the generator and starter mounting pads raised 7/8" above the other accessory mounting pads.	-	-	-	-	1
VIAPH	R-1644	4	84762	Adapter - Intermediate impeller drive shaft end play checking indicator. . . . . Used for late two-speed supercharger impeller drive engines equipped with supercharger rear cover having the generator and starter mounting pads raised 7/8" above the other accessory mounting pads, and also having the pipe tap entrance hole offset from the centerline of the intermediate impeller drive shaft. Used with standard dial indicator for checking end play in the intermediate impeller drive shaft.	-	-	-	-	1
VIARN	R-1644	4	84761	Adapter - Intermediate impeller drive shaft end play checking indicator. . . . . Used for late two-speed supercharger impeller drive engines equipped with supercharger rear cover having the generator and starter mounting pads raised 7/8" above the other accessory mounting pads, and also having the pipe tap entrance hole on the centerline of the intermediate impeller drive shaft. Used with standard dial indicator for checking end play in intermediate impeller drive shaft.	-	-	-	-	1

**RECONDITIONING****IMPELLER SHAFT BUSHING REPLACEMENT (CYCLONE)**

VICBY	R-1648	28	82273	Fixture - Impeller shaft front and rear bushing removing and bore finishing, lathe . .	-	1	1	1	1
VICEV	R-1650	28	82359	Plug - Impeller shaft front bushing installing, arbor press . . . . . Used with impeller shaft 6 7/8" in overall length.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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IMPELLER AND IMPELLER DRIVE TOOLS - Cont'd

RECONDITIONING - Cont'd

IMPELLER SHAFT BUSHING REPLACEMENT (CYCLONE) - Cont'd

VICFO	R-1650	28	83356	Plug - Impeller shaft front bushing installing, arbor press . . . . . Used with impeller shaft 6 1/4" in overall length.	-	1	1	1	1
VICHU	R-1650	28	84868	Plug - Impeller shaft front bushing installing, arbor press . . . . . Used with impeller shaft 6 11/32" in overall length.	-	1	1	1	1
VICIG	R-1652	28	82360	Plug - Impeller shaft rear bushing installing; arbor press . . . . . Used with impeller shaft 6 7/8" in overall length.	-	1	1	1	-
VICJA	R-1654	28	83357	Plug - Impeller shaft rear bushing installing, arbor press . . . . . Used with impeller shaft 6 1/4" or 6 11/32" in overall length which has either a splined shouldered rear bushing or a plain rear bushing installed flush with the anti-propeller end of shaft.	-	1	1	1	1
VICLE	R-1656	28	800053	Plug - Impeller shaft rear bushing installing, arbor press . . . . . Used with impeller shaft 6 11/32" in overall length which has a plain rear bushing pressed .100" into the shaft from the anti-propeller end.	-	-	-	1	-
VICNI	R-1658	28	82371	Gauge - Impeller shaft front and rear bushing, limit plug (1.312" - 1.313" diameter)	-	1	1	1	1
VICOL	R-1660	28	82361	Bar - Impeller shaft front and rear bushing aligning . . . . .	-	1	1	1	1

IMPELLER SHAFT RETAINER AND CENTERING RING LAPPING (CYCLONE)

VIDAF	R-1675	28	83870	Fixture - Impeller shaft retainer and centering ring lapping, hand . . . . . Used for F and F-50 engines equipped with impeller shaft centering ring; used for all G and G-100 engines.	-	1	1	1	1
VIDCA	R-1677	28	83892	Lap - Impeller shaft retainer . . . . . Used for all F and F-50 engines equipped with impeller shaft centering ring; used for G engines equipped with impeller shaft centering ring 1 61/64" I.D.	-	1	1	1	-
VIDED	R-1677	28	83891	Lap - Impeller shaft retainer . . . . . Used for G engines equipped with impeller shaft centering ring 1 23/64" I.D.; used for all G-100 engines.	-	-	-	1	1

INTERMEDIATE IMPELLER DRIVE GEAR BUSHING REPLACEMENT (FOR ENGINES EQUIPPED WITH TWO-SPEED SUPERCHARGER IMPELLER DRIVE) (CYCLONE G, G-100)

VIFBY	R-1690	29	83019	Plug and Collar - Intermediate impeller drive gear bushing removing and installing, arbor press. . . . .	-	-	-	1	1
VIFDO	R-1692	29	84321	Jig - Intermediate impeller drive gear bushing pin hole, drill, ream and pin driving.	-	-	-	1	1
VIFEK	R-1694	29	84322	Reamer - Intermediate impeller drive gear bushing pin hole, machine (.1243" diameter). . . . .	-	-	-	1	1
VIFFI	R-1696	29	83793	Gauge - Intermediate impeller drive gear bushing pin hole, limit plug (.1235"-.1245" diameter) . . . . .	-	-	-	1	1

## ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100
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## IMPELLER AND IMPELLER DRIVE TOOLS - Cont'd

## RECONDITIONING - Cont'd

INTERMEDIATE IMPELLER DRIVE GEAR BUSHING RE-  
PLACEMENT (FOR ENGINES EQUIPPED WITH TWO-  
SPEED SUPERCHARGER IMPELLER DRIVE) (CYCLONE  
G; G-100) - Cont'd.

VIFHN	R-1698	29	83961	Fixture - Intermediate impeller drive gear bushing finish boring, lathe. . . . .	-	-	-	1	1
VIFIF	R-1700	29	83023	Gauge - Intermediate impeller drive gear bushing, limit plug (1.1245" - 1.1255" diameter). . . . .	-	-	-	1	1

IMPELLER DRIVE PINION BUSHING REPLACEMENT  
(FOR ENGINES EQUIPPED WITH SINGLE SPEED  
SUPERCHARGER IMPELLER DRIVE) (CYCLONE)

VIGAW	R-1712	29	82813	Plug - Impeller drive pinion bushing installing, arbor press . . . . . Not used for late G-100 engines which have the impeller shaft integral with the impeller drive gear and pinion.	-	1	1	1	1
VIGCO	R-1714	29	82949	Gauge - Impeller drive pinion bushing, limit plug (1.096" - 1.0965"). . . . . Not used for late G-100 engines which have the impeller shaft integral with the impeller drive gear and pinion.	-	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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ACCESSORY DRIVES TOOLS

DISASSEMBLY AND REASSEMBLY

VIJBY	R-1750	5	81953	Turning Tool - Accessory drive (30 teeth) . . Used for early engines. Fits in splines of magneto drive shaft and is used for turning accessory drive when assembling supercharger rear housing and cover assembly on engine to aid in the proper meshing of the splined end of the accessory drive and starter shaft with the splined coupling in the crankshaft.	-	1	-	-	-
VIJDA	R-1750	5	82809	Turning Tool - Accessory drive (17 teeth) . . Used for late F engines and all F-50, G and G-100 engines. Fits in splines of magneto drive shaft and is used for turning accessory drive when assembling supercharger rear housing and cover assembly on engine to aid in the proper meshing of the splined end of the accessory drive and starter shaft with the splined coupling in the crankshaft.	-	1	1	1	1
VIJER	R-1753	5	800360	Assembling Tool - Accessory drive and starter shaft gear . . . . . See adapter 800361 listed below.	-	1	1	1	1
VIJFZ	R-1756	5	800361	Adapter - Accessory drive and starter shaft gear, spring and pin assembling fixture. . . Used with fixture 800360 for all F and F-50 engines; used for G engines equipped with supercharger rear cover having the generator mounting pad raised 1/4" above the other accessory mounting pads; used for G and G-100 engines equipped with supercharger rear cover having all accessory pads on the same plane. Adapter is not required for G-100 engines equipped with supercharger rear cover having the starter and generator pads raised 7/8" above the other pads.	-	1	1	1	1
VIJHX	R-1758	5	83893	Wrench - Accessory drive and starter shaft coupling bolt nut and coupling retainer to coupling nut, lug . . . . . Used for accessory drive and starter shaft coupling retainer nut on F, F-50 and G engines equipped with detachable starter jaw type accessory drive shaft. Used for accessory drive and starter shaft coupling bolt nut on G and G-100 engines equipped with crankshaft having the rear counterweight stop integral with the accessory drive and starter shaft coupling.	-	1	1	1	1
VIJIP	R-1760	5	82905	Wrench - Idler accessory drive gear retainer. Used for retainer having a 5/16" square recess in the head. This retainer is installed only on R-975 engines equipped with the late type idler accessory drive. The retainer for the early type idler accessory has a 1/16" slot in the head and does not require a special wrench.	1	-	-	-	-
VIJJO	R-1762	5	82202	Bar - Generator drive gear installing . . . . Used for guiding generator drive gear when assembling supercharger rear cover to rear supercharger housing on engines equipped with generator drive gear having six generator shaft splines.	-	1	1	1	1
VIJLS	R-1764	5	83656	Bar - Generator drive gear installing . . . . Used for guiding generator drive gear when assembling supercharger rear cover to rear supercharger housing on engines equipped with generator drive gear having sixteen generator shaft splines.	-	1	-	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
<b>ACCESSORY DRIVES TOOLS - Cont'd</b>									
<b>DISASSEMBLY AND REASSEMBLY - Cont'd</b>									
VIJNG	R-1766	5	82445	Wrench - Generator drive oil seal packing retainer nut, lug. . . . . Used for early engines equipped with gland type oil seals.	-	1	-	-	-
VIJOK	R-1768	5	84992	Drift - Generator drive oil seal collar removing . . . . .	-	-	-	-	1
VIJPE	R-1770	5	84657	Fixture - Tachometer, fuel pump & dual accessory drive gear & shaft assembling, vise . . . . .	-	1	1	1	1
VIJRI	R-1773	5	82129	Wrench - Gun synchronizer drive gear nut, lug Used for R-760 engines equipped with a late type slotted nut which is round and has an outside diameter of 3/4".	1	-	-	-	-
VIJWL	R-1773	5	82128	Wrench - Gun synchronizer drive gear nut, lug Used for R-975 engines equipped with a late type slotted nut which is round and has an outside diameter of 1".	1	-	-	-	-
VIJYF	R-1776	5	83667	Wrench - Gun synchronizer and tachometer drive housing attaching nut, lug . . . . . Used for the 1/4" slotted nuts used to attach the tachometer drive housing and the gun synchronizers on Whirlwind engines. Used for the 1/4" slotted nuts used to attach the gun synchronizer plunger upper housing to lower housing on Cyclone engines.	1	1	1	1	1
VIKAB	R-1778	5	800096	Fixture - Magneto & gun synchronizer drive gear & shaft assembling, vise . . . . .	-	1	1	1	1
VIKCA	R-1780	5	82971	Puller - Magneto, generator and accessory drive shaft leather oil seal and magneto pilot spacer removing. . . . . Used for 3" O.D. accessory drive shaft leather oil seal or magneto pilot spacer on Whirlwind engines. Used for 3" O.D. magneto drive leather oil seal on Cyclone F and F-50 engines. Used for generator drive leather oil seal on Cyclone F, F-50, G and G-100 engines.	1	1	1	1	1
VIKED	R-1782	5	84786	Fixture - Magneto, generator and accessory drive shaft leather oil seal shaping, bench. . . . . Used for accessory drive shaft leather oil seal on Whirlwind engines. Used for magneto and generator drive oil seals on Cyclone F and F-50 engines. Used for generator drive leather oil seal on Cyclone G and early G-100 engines.	1	1	1	1	1
VIKGE	R-1784	5	84897	Installing Tool - Magneto and accessory drive shaft leather oil seal . . . . . Used for accessory drive shaft leather oil seal on Whirlwind engines equipped with either 1 7/8" O.D. or 3" O.D. leather oil seals. Used for magneto drive leather oil seal on Cyclone F engines equipped with magneto and gun synchronizer drive shaft having 30 magneto gear teeth. Used to install oil seal on shaft. See installing tools 84787 and 84788, listed below, which are used to drive oil seal in place.	1	1	-	-	-
VIKIL	R-1784	5	84895	Installing Tool - Generator drive leather oil seal . . . . . Used for engines equipped with generator drive shaft having 16 splines. Used to install oil seal on shaft. See installing tool 84787 listed below, which is used to drive oil seal in place.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**ACCESSORY DRIVES TOOLS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

VIKKI	R-1784	5	84896	Installing Tool - Magneto drive leather oil seal . . . . . Used for F engines equipped with magneto and gun synchronizer drive shafts having 17 magneto gear teeth; used for all F-50 engines. Used to install oil seal on shaft. See installing tool 84787, listed below, which is used to drive oil seal in place.	-	1	1	-	-
VIKMO	R-1784	5	84894	Installing Tool - Generator drive leather oil seal . . . . . Used for engines equipped with generator drive shaft having 6 splines. Used to install oil seal on shaft. See installing tool 84787, listed below, which is used to drive oil seal in place.	-	1	1	1	1
VIKOR	R-1786	5	84788	Installing Tool - Accessory drive shaft leather oil seal . . . . . Used to drive oil seal in place after installing it on shaft with installing tool 84897, listed above.	1	-	-	-	-
VIKTU	R-1788	5	84787	Installing Tool - Magneto, generator and accessory drive shaft leather oil seal . . . . . Used for 3" O.D. accessory drive shaft leather oil seals on Whirlwind engines; used for all F and F-50 engines for magneto and generator drive leather oil seals; used for G and G-100 engines for generator drive leather oil seal. Used to drive oil seal in place after installing it on shaft with installing tools 84894, 84895, 84896 and 84897, listed above.	1	1	1	1	1
VIKUV	R-1790	5	82914	Wrench - Dual accessory drive idler gear to intermediate gear screw. . . . .	-	1	1	1	1
VIKVV	R-1792	5	82913	Wrench - Dual accessory drive housing to supercharger rear cover nut, box (5/8" hex.) . . . . . Used for nut 11/32" in length.	-	1	1	1	1

**RECONDITIONING**

**MAGNETO, GENERATOR AND ACCESSORY DRIVE SHAFT OIL SEAL REPLACEMENT (WHIRLWIND AND CYCLONE)**

VIMAB	R-1810	30	82376	Fixture - Magneto, generator and accessory drive shaft leather oil seal riveting, bench. . . . . Used for accessory drive shaft leather oil seal on Whirlwind engines; magneto and generator drive oil seal on Cyclone F and F-50 engines; generator drive leather oil seal on Cyclone G and early G-100 engines.	1	1	1	1	1
VIMCA	R-1812	30	82374	Punch - Magneto, generator and accessory drive shaft leather oil seal rivet heading	1	1	1	1	1
VIMED	R-1814	30	83711	Fixture - Magneto and generator drive oil seal packing and ring lapping, lathe . . . . . Used for magneto drive oil seal on G and G-100 engines and for generator drive oil seal (bronze spherical washer type) on late G-100 engines. A hand lapping fixture is also available for this purpose. See 83146 listed below.	-	-	-	1	1
VIMGE	R-1816	30	83146	Fixture - Magneto and generator drive oil seal packing and ring lapping, hand. . . . . Includes lap. Used for magneto drive oil seal on G and G-100 engines and for generator drive oil seal (bronze spherical washer type) on late G-100 engines. A lathe lapping fixture is also available for this purpose. See 83711 listed above.	-	-	-	1	1



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6E	clone F	clone F-50	clone G	clone G-100

**ACCESSORY DRIVES TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**MAGNETO, GENERATOR AND ACCESSORY DRIVE SHAFT OIL SEAL REPLACEMENT (WHIRLWIND AND CYCLONE) - Cont'd**

VIMIL	R-1818	30	83188	Lap - Magneto and generator drive oil seal retaining ring . . . . . Detail of fixture 83146.	-	-	-	1	1
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**GENERATOR DRIVE GEAR PLUG REPLACEMENT (CYCLONE)**

VINBS	R-1830	30	84871	Plug - Generator drive gear plug installing, arbor press. . . . . Used for all F, F-50 and G engines; used for early G-100 engines equipped with generator drive gear 3 13/16" in overall length.	-	1	1	1	1
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VINDT	R-1832	30	84680	Plug - Generator drive gear plug installing, arbor press. . . . . Used for late G-100 engines equipped with generator drive gear 4 5/32" in overall length.	-	-	-	-	1
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**TACHOMETER DRIVE HOUSING BUSHING REPLACEMENT (CYCLONE)**

VIOBY	R-1845	31	82378	Plug - Tachometer drive gear shaft drive shaft bushing installing, arbor press. . . . . Used for the short center bushing in tachometer drive housing which is mounted on the supercharger rear cover.	-	1	1	-	-
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VIODO	R-1847	31	82377	Fixture - Tachometer drive gear shaft drive shaft bushing hand line reaming, bench . . . . . Used for the short center bushing in tachometer drive housings which are mounted on the supercharger rear cover.	-	1	1	-	-
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VIOEN	R-1849	31	82475	Reamer - Tachometer drive gear shaft drive shaft bushing, hand line (.4375" diameter). . . . . Used for the short center bushing in tachometer drive housings which are mounted on the supercharger rear cover.	-	1	1	-	-
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VIOFI	R-1851	31	83846	Gauge - Tachometer drive gear shaft drive shaft bushing, limit plug (.4365" - .4375" diameter) . . . . . Used for the short center bushing in tachometer drive housings which are mounted on the supercharger rear cover.	-	1	1	-	-
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VIOHU	R-1853	31	82946	Plug and Base - Tachometer drive shaft bushings removing, installing and burnishing, arbor press. . . . . Used for the two long bushings in tachometer drive housings which are mounted on the supercharger rear cover, the left hand gun synchronizer pad or the right side of the rear supercharger housing. When removing bushings in tachometer drive housing (supercharger rear cover mounting type) in which the bushings do not project beyond the housing, it will be necessary to also use plug and collar 83848.	-	1	1	1	1
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VIOIK	R-1855	31	83848	Plug and Collar - Tachometer drive shaft bushings removing. . . . . Used with plug and base 82946 for removing the two long bushings in tachometer drive housing (supercharger rear cover mounting type) in which the bushings do not project beyond the housing.	-	1	-	-	-
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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ACCESSORY DRIVES TOOLS - Cont'd

RECONDITIONING - Cont'd

TACHOMETER DRIVE HOUSING BUSHING REPLACEMENT (CYCLONE) - Cont'd

VIOJE	R-1857	31	82380	Broach - Tachometer drive housing bushing burnishing . . . . . Used with plug and base 82946.	-	1	1	1	1
VIOLA	R-1859	31	82488	Gauge - Tachometer drive housing bushing, limit plug (.502" - .503") . . . . . Used with plug and base 82946.	-	1	1	1	1

TACHOMETER AND FUEL PUMP DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE)

The tools listed in this group are used for all G and G-100 engines and only for F and F-50 engines equipped with combination tachometer and fuel pump drive installed in side of rear supercharger housing.

VIRAX	R-1875	32	83826	Fixture - Tachometer and fuel pump drive shaft support bushing removing and finishing, lathe . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIRCI	R-1877	32	83827	Adapter - Tachometer and fuel pump drive shaft support bushing removing and finishing fixture. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIREP	R-1879	32	83833	Plug and Base - Tachometer and fuel pump drive shaft support bushing installing, arbor press. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIRGS	R-1881	32	83794	Reamer - Tachometer and fuel pump drive shaft support bushing pin hole, machine (.1234" diameter). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIRIV	R-1883	32	83795	Gauge - Tachometer and fuel pump drive shaft support bushing pin hole, limit plug (.1225" - .1235" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIRKO	R-1885	32	83796	Installing Tool - Tachometer and fuel pump drive shaft support bushing pin. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIRMA	R-1887	32	82810	Gauge - Tachometer and fuel pump drive shaft support bushing, limit plug (.7495" - .7505" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIROF	R-1889	32	82811	Gauge - Tachometer and fuel pump drive shaft support bushing, flush pin (3.732" - 3.734" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1

TACHOMETER DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE F, F-50)

The tools listed in this group are used only for F and F-50 engines having the tachometer drive installed in the gun synchronizer location.

VITBY			83826	Fixture - Tachometer drive shaft support bushing removing and finishing, lathe. . . See Figure 32, R-1875 for illustration. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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## ACCESSORY DRIVES TOOLS - Cont'd

## RECONDITIONING - Cont'd

## TACHOMETER DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE F, F-50) - Cont'd

VITDT	R-1902	33	83828	Adapter - Tachometer drive shaft support bushing removing and finishing fixture . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VITEK	R-1904	33	83832	Plug and Base - Tachometer drive shaft support bushing installing, arbor press . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VITFS	R-1906	33	83794	Reamer - Tachometer drive shaft support bushing pin hole, machine (.1234" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VITGN	R-1908	33	83795	Gauge - Tachometer drive shaft support bushing pin hole, limit plug (.1225" - .1235" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VITIL	R-1910	33	83837	Installing Tool - Tachometer drive shaft support bushing pin. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VITOP	R-1912	33	82364	Gauge - Tachometer drive shaft support bushing, limit plug (.6255" - .6265" diameter) Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VITUX	R-1914	33	83838	Gauge - Tachometer drive shaft support bushing, length (3.632" - 3.628") . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-

## FUEL PUMP DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE F, F-50)

The tools listed in this group are used only for F and F-50 engines equipped with fuel pump drive installed in side of rear supercharger housing.

VIVAZ			83826	Fixture - Fuel pump drive shaft support bushing removing and finishing, lathe. . . . . See Figure 32, R-1875 for illustration. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VIVEL	R-1927	34	83827	Adapter - Fuel pump drive shaft support bushing removing and finishing fixture . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VIVIB	R-1929	34	83832	Plug and Base - Fuel pump drive shaft support bushing installing, arbor press. . . . . Used for early supports having 5/8" I.D. bushings. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VIVOH	R-1931	34	83833	Plug and Base - Fuel pump drive shaft support bushing installing, arbor press. . . . . Used for late supports having 3/4" I.D. bushings. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VIVUD	R-1933	34	83794	Reamer - Fuel pump drive shaft support bushing pin hole, machine (.1234" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-wind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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ACCESSORY DRIVES TOOLS - Cont'd

RECONDITIONING - Cont'd

FUEL PUMP DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE F, F-50) - Cont'd									
VIWBA	R-1935	34	83795	Gauge - Fuel pump drive shaft support bushing pin hole, limit plug (.1225" - .1235" diameter) . . . . .	-	1	1	-	-
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIWDE	R-1937	34	83837	Installing Tool - Fuel pump drive shaft support bushing pin . . . . .	-	1	1	-	-
Used for early supports having 5/8" I.D. bushings.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIWFS	R-1939	34	83796	Installing Tool - Fuel pump drive shaft support bushing pin . . . . .	-	1	1	-	-
Used for late supports having 3/4" I.D. bushings.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIWHL	R-1941	34	82364	Gauge - Fuel pump drive shaft support bushing, limit plug (.6255" - .6265" diameter) . . . . .	-	1	1	-	-
Used for early supports having 5/8" I.D. bushings.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIWJO	R-1943	34	82810	Gauge - Fuel pump drive shaft support bushing, limit plug (.7495" - .7505" diameter) . . . . .	-	1	1	-	-
Used for late supports having 3/4" I.D. bushings.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIWLT	R-1945	34	82373	Gauge - Fuel pump drive shaft support bushing, length (4.201" - 4.203" diameter) . . . . .	-	1	1	-	-
Used for early supports having 5/8" I.D. bushings.									
VIWUG	R-1947	34	82811	Gauge - Fuel pump drive shaft support bushing, flush pin (3.732" - 3.734") . . . . .	-	1	1	-	-
Used for late supports having 3/4" I.D. bushings.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									

GUN SYNCHRONIZER DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE)

The tools listed in this group are used only for engines equipped with gun synchronizers.									
VIYAB			83826	Fixture - Gun synchronizer drive shaft support bushing removing and finishing, lathe. . . . .	-	1	1	1	1
See Figure 32, R-1875 for illustration.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIYDI	R-1962	35	83828	Adapter - Gun synchronizer drive shaft support bushing removing and finishing fixture. . . . .	-	1	1	1	1
Used for 3 and 5 hole mounting flange type supports.									
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									
VIYEF	R-1964	35	83829	Adapter - Gun synchronizer drive shaft support bushing removing and finishing fixture. . . . .	-	1	-	1	-
Used for 4 hole mounting flange type support.									

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**ACCESSORY DRIVES TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**GUN SYNCHRONIZER DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE) - Cont'd**

VIYGA	R-1966	35	83830	Adapter - Gun synchronizer drive shaft support bushing removing and finishing fixture. . . . . Used for 7 hole mounting flange type support.	-	-	-	1	-
VIYHU	R-1968	35	83832	Plug and Base - Gun synchronizer drive shaft support bushing installing, arbor press. . . . . Used for 3, 4 and 5 hole mounting flange type supports. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIYJO	R-1970	35	83834	Plug and Base - Gun synchronizer drive shaft support bushing installing, arbor press. . . . . Used for 7 hole mounting flange type support.	-	-	-	1	-
VIYMY	R-1972	35	83794	Reamer - Gun synchronizer drive shaft support bushing pin hole, machine (.1234" diameter). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIYOL	R-1974	35	83795	Gauge - Gun synchronizer drive shaft support bushing pin hole, limit plug (.1225" - .1235" diameter). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIYPN	R-1976	35	83837	Installing Tool - Gun synchronizer drive shaft support bushing pin. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIYST	R-1978	35	82364	Gauge - Gun synchronizer drive shaft support bushing, limit plug (.6255" - .6265" diameter). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VIYUM	R-1980	35	83838	Gauge - Gun synchronizer drive shaft support bushing, length (3.632" - 3.628"). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1

**ROCKER LUBRICATING VALVE DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE F, F-50)**

The tools listed in this group are used only for F and F-50 engines equipped with rocker lubricating tubes and full automatic type rocker lubricating valve mounted in gun synchronizer location.

VOBAC			83826	Fixture - Rocker lubricating valve drive shaft support bushing removing and finishing, lathe . . . . . See Figure 32, R-1875 for illustration. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOBCO	R-1992	36	83831	Adapter - Rocker lubricating valve drive shaft support bushing removing and finishing fixture. . . . .	-	1	1	-	-
VOBEJ	R-1994	36	83833	Plug and Base - Rocker lubricating valve drive shaft support bushing installing, arbor press. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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ACCESSORY DRIVES TOOLS - Cont'd

RECONDITIONING - Cont'd

ROCKER LUBRICATING VALVE DRIVE SHAFT SUPPORT BUSHING REPLACEMENT (CYCLONE F, F-50) - Cont'd

VOBGT	R-1996	36	83836	Jig - Rocker lubricating valve drive shaft support, drill . . . . . Used for drilling and reaming pin hole in bushing at mounting flange end of support only.	-	1	1	-	-
VOBIV	R-1998	36	83794	Reamer - Rocker lubricating valve drive shaft support bushing pin hole, machine (.1234" diameter). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOBKA	R-2000	36	83795	Gauge - Rocker lubricating valve drive shaft support bushing pin hole, limit plug (.1225" - .1235" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOBME	R-2002	36	83796	Installing Tool - Rocker lubricating valve drive shaft support bushing pin. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOBRI	R-2004	36	82810	Gauge - Rocker lubricating valve drive shaft support bushing, limit plug (.7495" - .7505" diameter) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOBTS	R-2006	36	83839	Gauge - Rocker lubricating valve drive shaft support bushing, flush pin (3.159" - 3.161" diameter) . . . . .	-	1	1	-	-

GOVERNOR DRIVE PINION ADAPTER BUSHING REPLACEMENT (CYCLONE F AND F-50 DIRECT DRIVE ENGINES)

The tools listed in this group are used only for F-50 and G engines equipped with governor drive in the crankcase front section.

VODAJ			83826	Fixture - Governor drive pinion adapter bushing removing and finishing, lathe. . . . . See Figure 32, R-1875 for illustration. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	-	1	1	-
VODCY	R-2017	37	83862	Adapter - Governor drive pinion adapter bushings removing and finishing fixture. . . . .	-	-	1	1	-
VODEC	R-2019	37	83867	Plug and Base - Governor drive pinion adapter bushings installing and burnishing, arbor press. . . . .	-	-	1	1	-
VODGA	R-2021	37	83868	Broach - Governor drive pinion adapter bushings, burnishing, arbor press. . . . .	-	-	1	1	-
VODIF	R-2023	37	83847	Gauge - Governor drive pinion adapter bushings, limit plug (.8745" - .8755" diameter). . . . .	-	-	1	1	-
VODKL	R-2025	37	83869	Gauge - Governor drive pinion adapter outer bushing face, flush pin (2.649" - 2.651" diameter). . . . .	-	-	1	1	-

ANGLE ACCESSORY DRIVE HOUSING AND ADAPTER BUSHING REPLACEMENT (CYCLONE F, F-50, G)

VOFEW	R-2035	38	82982	Plug and Collars - Angle accessory drive intermediate shaft sleeve bushing removing, installing and burnishing, arbor press . . . . . Used for large bushing in angle accessory drive housing.	-	1	1	1	-
VOFFO	R-2037	38	82983	Broach - Angle accessory drive intermediate shaft sleeve bushing burnishing. . . . . Used for large bushing in angle accessory drive housing.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**ACCESSORY DRIVES TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**ANGLE ACCESSORY DRIVE HOUSING AND ADAPTER BUSHING REPLACEMENT (CYCLONE F, F-50, G) - Cont'd**

VOFHU	R-2039	38	82984	Gauge - Angle accessory drive intermediate shaft sleeve bushing, limit plug (1.280" - 1.281") . . . . . Used for large bushing in angle accessory drive housing.	-	1	1	1	-
VOFIV	R-2041	38	83134	Plug and Collar - Angle accessory drive intermediate shaft front bushing removing and installing, arbor press. . . . . Used for bushing in angle accessory drive housing adapter.	-	1	1	1	-
VOFJR	R-2043	38	83135	Puller - Angle accessory drive intermediate shaft rear bushing . . . . . Used for small bushing in angle accessory drive housing.	-	1	1	1	-
VOFLP	R-2045	38	83136	Plug - Angle accessory drive intermediate shaft rear bushing installing, arbor press. . . . . Used for small bushing in angle accessory drive housing.	-	1	1	1	-
VOFNE	R-2047	38	83133	Fixture - Angle accessory drive intermediate shaft front and rear bushings finish boring, lathe. . . . . Used for bushing in angle accessory drive housing adapter and small bushing in angle accessory drive housing.	-	1	1	1	-
VOFOS	R-2049	38	83140	Gauge - Angle accessory drive intermediate shaft front bushing, limit plug (1.125" - 1.126" diameter) . . . . . Used for bushing in angle accessory drive housing adapter.	-	1	1	1	-
VOFPA	R-2051	38	83138	Gauge-Angle accessory drive intermediate shaft front bushing shoulder, snap (1.779" - 1.781") . . . . . Used for bushing in angle accessory drive housing adapter. Also detail of fixture and tools 83168 listed under "Dual Accessory Drive Housing Bushing Replacement".	-	1	1	1	-
VOFRI	R-2053	38	83139	Gauge- Angle accessory drive intermediate shaft rear bushing, limit plug (.646" - .647" diameter) . . . . . Used for small bushing in angle accessory drive housing.	-	1	1	1	-
VOFUF	R-2055	38	83137	Gauge - Angle accessory drive intermediate shaft rear bushing, depth (.719" - .721") . . . . . Used for small bushing in angle accessory drive housing.	-	1	1	1	-

**DUAL ACCESSORY DRIVE HOUSING BUSHING REPLACEMENT (CYCLONE)**

Certain details of fixture and tools 83168 and 84205 listed below, are identical. Should it be desired to convert one set of tools to the other, a list of such details may be obtained by communicating with the Service Division of the Wright Aeronautical Corporation.

VOHAZ	R-2070	39	83168	Fixture and Tools - Dual accessory drive housing and cover bushing replacement, arbor press and lathe. . . . . Used for dual accessory drives with gear ratios of 1.125:1, 1.370:1 and 1.687:1 (These drives have four gear shaft bushings in both the housing and the cover).	-	1	1	1	1
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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ACCESSORY DRIVES TOOLS - Cont'd

RECONDITIONING - Cont'd

DUAL ACCESSORY DRIVE HOUSING BUSHING REPLACEMENT (CYCLONE) - Cont'd

VOHCI	R-2072	39	84205	Fixture and Tools - Dual accessory drive housing and cover bushing replacement, arbor press and lathe. . . . .	-	1	1	1	1
Used for dual accessory drives with a gear ratio of 1.636:1. (These drives have five gear shaft bushings in both the housing and the cover.)									



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS**

**DISASSEMBLY AND REASSEMBLY**

VOJAX	R-2100	2	83766	Eye - Crankshaft and engine hoist . . . . . Used for R-760 engines equipped with S.A.E. No. 20 propeller hub spline crankshafts. Attached to propeller hub nut threads on crankshaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
VOJCO	R-2102	2	80131	Eye - Crankshaft and engine hoist . . . . . Used for R-760 and R-975 engines equipped with S.A.E. No. 30 propeller hub spline crankshafts. Attached to propeller hub nut threads on crankshaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
VOJGY	R-2104	2	80601	Eye - Crankshaft and engine hoist . . . . . Used for direct drive engines. Attaches to propeller nut threads on crankshaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	-
VOJID	R-2106	6	82151	Eye - Crankshaft hoist. . . . . Used for 16:11 and 3:2 reduction geared engines. Attaches to the reduction driving gear nut threads on crankshafts for lifting crankshaft and connecting rod assembly from the crankcase rear main section.	-	1	1	1	1
VOJKA	R-2108	6	82666	Turning Tool - Crankshaft . . . . . Used for 16:11 and 3:2 reduction geared engines. Attaches to front end of crankshaft. Used with handle 80292 which is not included with this tool. A turning tool which fits over the reduction gear splines on crankshafts having twenty-four (24) reduction gear splines is also available. See 83864 listed below.	-	1	1	1	1
VOJME	R-2110	6	83864	Turning Tool - Crankshaft . . . . . Used for 16:11 and 3:2 reduction geared engines. Fits over reduction gear splines on crankshaft having twenty-four (24) reduction gear splines. Used with handle 80292 which is not included with this tool. A turning tool which attaches to the front end of the crankshaft is also available. See 82666 above.	-	1	1	1	1
VOJOC	R-2112	6	80292	Handle - Crankshaft and propeller shaft turning tool . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	2	2	2	2
VOJSR	R-2114	6	82932	Wrench - Crankshaft thrust ball bearing nut, lug. . . . . Used for R-760 engines equipped with S.A.E. No. 20 propeller hub spline crankshafts. Included in tool kit supplied with Commercial engines.	1	-	-	-	-

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100
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## CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd

### DISASSEMBLY AND REASSEMBLY - Cont'd

VOJTU	R-2114	6	82933	Wrench - Crankshaft thrust ball bearing nut, lug. . . . . Used for engines (except R-760-4 Navy engines) equipped with S.A.E. No. 30 propeller hub spline crankshafts but not equipped with hydro-controllable pitch propeller mechanism. Included in tool kit supplied with Commercial engines.	1	-	-	-	-
VOJUG	R-2114	6	82934	Wrench - Crankshaft thrust ball bearing nut, lug. . . . . Used for engines equipped with S.A.E. No. 30 propeller hub spline crankshafts and hydro-controllable pitch propeller mechanism. Also used for R-760-4 Navy engines which have S.A.E. No. 30 spline crankshafts but are not equipped with hydro-controllable pitch propeller mechanism. Included in tool kit supplied with Commercial engines.	1	-	-	-	-
VOJWL	R-2117	6	82902	Wrench - Crankshaft thrust ball bearing nut, lug. . . . . Used for direct drive engines. Included in tool kit supplied with Commercial engines.	-	1	1	1	-
VOJYN	R-2120	6	84923	Installing Tool - Crankshaft thrust bearing nut oil seal ring. . . . . Used for engines equipped with hydro-controllable pitch propeller mechanism.	1	-	-	-	-
VOKBA	R-2123	2	83595	Puller - Crankcase front section and crankshaft thrust ball bearing removing . . . . Used for direct drive engines. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	-
VOKDI	R-2126	6	83994	Installing Tool - Crankshaft thrust ball bearing. . . . . Used for tamping crankshaft thrust ball bearing in place on direct drive engines.	-	1	1	1	-
VOKEB	R-2128	6	82195	Wrench - Crankshaft breather tube nut, plug, 21/32" hex . . . . . Used for 16:11 and 3:2 reduction geared engines. This wrench is used to remove the breather tube before any other engine disassembling operation in order to avoid the possibility of damaging the tube when removing the crankcase front section and propeller shaft sub-assembly.	-	1	1	1	1
VOKIC	R-2130	6	80372	Wrench - Crankshaft front main bearing lock nut, lug . . . . .	1	-	-	-	-
VOKOX	R-2132	3	82953	Puller - Crankshaft front main roller bearing and crankcase front main section installing . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOKUK	R-2134	6	82657	Puller - Crankshaft front main non-demountable roller bearing removing . . . . . Used for direct drive engines. Multiple purpose puller 82683 listed below can also be used for this purpose.	-	1	1	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

VOLBY	R-2136	2	82683	Puller - Crankcase sections, front main bearings and reduction driving gear, multiple purpose removing . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VOLCA	R-2138	3	82649	Puller - Crankcase front main section and crankshaft front main non-demountable roller bearing removing. . . . . Used for 16:11 reduction geared engines. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	-	-
VOLDT	R-2140	6	83985	Puller - Crankshaft front main bearing inner race removing. . . . . Used with adapters 83986 and 83987.	-	1	1	1	1
VOLEF	R-2143	6	83987	Adapter - Crankshaft front main bearing inner race removing puller . . . . . Used with puller 83985. Used for F and F-50 engines equipped with demountable type bearing; used for early G 16:11 reduction geared engines equipped with bearing having shoulder of inner race measuring 4.728" on outside diameter. Non-demountable type roller bearings of F and F-50 engines are removed with combination puller 82683 or single purpose pullers 82657 or 82649 for direct drive and 16:11 reduction geared engines respectively. These tools are listed under Crankcase "Disassembly and Reassembly" tools.	-	1	1	1	-
VOLFI	R-2143	6	83986	Adapter - Crankshaft front main bearing inner race removing puller . . . . . Used with puller 83985.	-	-	-	1	1
VOLGM	R-2146	7	83749	Stand - Crankshaft disassembling and assembling, bench. . . . . Used with adapters 83750, 83751, 83752, 83753, 83754 and 83755. Used to hold crankshaft by the crankshaft front counterweight and the front end inside diameter by means of the proper adapter during the disassembling and assembling of the crankshaft and master rod sub-assembly.	1	1	1	1	1
VOLHE	R-2148	7	83750	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for engines equipped with S.A.E. No. 30 propeller hub spline crankshafts but not equipped with hydro-controllable pitch propeller mechanism. Not used for R-975-EC (Tank) engines. See 800225 listed below.	1	-	-	-	-
VOLIK	R-2150	7	800225	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for R-975-EC (Tank) engines only.	1	-	-	-	-
VOLJT	R-2152	7	83751	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for R-760 engines equipped with hydro-controllable pitch propeller mechanism and S.A.E. No. 20 propeller hub spline crankshafts.	1	-	-	-	-
VOLLO	R-2152	7	83752	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for engines equipped with hydro-controllable pitch propeller mechanism and S.A.E. No. 30 propeller hub spline crankshafts.	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
<b>CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd</b>									
<b>DISASSEMBLY AND REASSEMBLY - Cont'd</b>									
VOLNU	R-2155	7	83753	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for direct drive F, F-50 and G engines equipped with hydro-controllable pitch propeller mechanism.	-	1	1	1	-
VOLOR	R-2155	7	83754	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for direct drive engines not equipped with hydro-controllable pitch propeller mechanism.	-	1	-	-	-
VOLPN	R-2158	7	83755	Adapter - Crankshaft disassembling and assembling bench stand . . . . . Used with stand 83749 for 16:11 and 3:2 reduction geared engines.	-	1	1	1	1
VOLRY	R-2161	7	82904	Wrench - Crankshaft gear hub screw, socket, 5/16" square . . . . . Used for engines equipped with spring drive type crankshaft gears which are bolted to the crankshaft.	1	-	-	-	-
VOLTL	R-2164	7	80651	Puller - Crankshaft gear removing . . . . . Used for engines equipped with crankshaft gears which are keyed to the crankshaft.	1	-	-	-	-
VOLUX	R-2166	7	80409	Wrench - Crankshaft rear main bearing retainer nut, lug. . . . .	-	1	1	1	1
VOLYN	R-2168	7	84559	Puller - Crankshaft rear main roller bearing inner race removing. . . . . Used with adapter 84560. Used for demountable type bearings having 16 rollers on late F, F-50, and G engines; used for all G-100 engines.	-	1	1	1	1
VOMAP	R-2170	7	84560	Adapter - Crankshaft rear main roller bearing inner race removing puller . . . . . Used with puller 84559.	-	1	1	1	1
VOMCO	R-2172	7	80196	Wrench - Crankshaft cheek cap screw (12 point) . . . . . Optional for use in place of 84930.	1	-	-	-	-
VOMEF	R-2174	7	84930	Wrench - Crankshaft cheek capscrew (6 point). Optional for use in place of 80196.	1	-	-	-	-
VOMGU	R-2176	7	80309	Wrench - Crankshaft cheek capscrew. . . . .	-	1	1	1	1
VOMIB	R-2178	7	80198	Extension - Crankshaft cheek capscrew wrench. . . . .	1	1	1	1	1
VOMKY	R-2180	8	80392	Wedge - Crankshaft disassembling and assembling . . . . . Used to spread crankshaft rear half at crankpin to permit its removal from the front half.	1	1	1	1	1
VOMMA	R-2181	8	80634	Wrench - Crankpin large oil retaining plug, 1" hex . . . . . Used for plugs having a 1" internal hex. on engines not equipped with hydro-controllable pitch propeller mechanism.	1	-	-	-	-
VOMOD	R-2182	8	82907	Puller - Crankshaft rear end rear plug removing . . . . . Used for engines equipped with crankshaft gears which are bolted to the crankshaft.	1	-	-	-	-
VOMRE	R-2183	8	81902	Wrench - Crankpin front plug. . . . . Used for F, F-50 and early G engines for plug which has a hex. socket and is a screw fit in the shaft. See puller 84512 below for removing front plug on late G engines.	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6E	clone F	clone F-50	clone G	clone G-100

**CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

VOMTI	R-2184	8	84512	<p>Puller - Crankpin front plug removing . . . . .</p> <p>Used for late G and all G-100 engines for front plug which is held in position with a lockscrew.</p>	-	-	-	1	1
VOMUG	R-2185	8	82196	<p>Wrench - Crankshaft breather support, lug (For 6 lug support) . . . . .</p> <p>Used for early F 16:11 reduction geared engines.</p>	-	1	-	-	-
VOMYL	R-2186	8	82635	<p>Wrench - Crankshaft breather support, lug (For 12 lug support) . . . . .</p> <p>Used for late F, all F-50, early G and G-100 16:11 reduction geared engines.</p> <p>The breather support on late G and G-100 16:11 and 3:2 reduction geared engines is removed with long fibre drift.</p>	-	1	1	1	1
VONBN	R-2187	8	82200	<p>Measuring Tool - Crankshaft cheek cap screw stretch. . . . .</p> <p>Used in connection with standard outside micrometer caliper to measure the stretch of the cap screw and to maintain the specified cap screw stretch limits as it is tightened during crankshaft assembling.</p>	1	1	1	1	1
VONDF	R-2188	8	80336	<p>Bar - Crankshaft aligning (.4995" diameter - selective fit No. 1) . . . . .</p> <p>Used to align the front and rear halves of the crankshaft during assembling.</p>	1	-	-	-	-
VONEM	R-2188	8	83574	<p>Bar - Crankshaft aligning (.4997" diameter - selective fit No. 2) . . . . .</p> <p>Used to align the front and rear halves of the crankshaft during assembling.</p>	1	-	-	-	-
VONGO	R-2188	8	83575	<p>Bar - Crankshaft aligning (.4999" diameter - selective fit No. 3) . . . . .</p> <p>Used to align the front and rear halves of the crankshaft during assembling.</p>	1	-	-	-	-
VONID	R-2188	8	80443	<p>Bar - Crankshaft aligning (.6246" diameter - selective fit No. 1) . . . . .</p> <p>Used to align the front and rear halves of the crankshaft during assembling.</p>	-	1	1	1	1
VONKU	R-2188	8	83576	<p>Bar - Crankshaft aligning (.6248" diameter - selective fit No. 2) . . . . .</p> <p>Used to align the front and rear halves of the crankshaft during assembling.</p>	-	1	1	1	1
VONOK	R-2188	8	83577	<p>Bar - Crankshaft aligning (.6250" diameter - selective fit No. 3) . . . . .</p> <p>Used to align the front and rear halves of the crankshaft during assembling.</p>	-	1	1	1	1
VONPY	R-2190	8	83947	<p>Wrench - Crankpin front plug metering screw, socket, 1/2" hex . . . . .</p> <p>Used for changing metering screws to determine proper oil flow when engine is mounted on test stand. By removing a lower cylinder, screw can be reached with this wrench.</p>	-	-	-	1	1
VONST	R-2192	8	84520	<p>Protector - Crankshaft thread . . . . .</p> <p>Used for R-760 engines equipped with S.A.E. No. 20 propeller hub spline crankshaft.</p> <p>Used for protecting the propeller hub nut threads on crankshaft when installing propeller.</p>	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	3y- clone G	Cy- clone G-100
VONUR	R-2192	8	84519	Protector - Crankshaft thread . . . . . Used for engines equipped with S.A.E. No. 30 propeller hub spline crankshaft. Used for protecting the propeller hub nut threads on crankshaft when installing propeller.	1	-	-	-	-
VONYM	R-2192	8	84518	Protector - Crankshaft thread . . . . . Used for direct drive engines. Used for protecting the propeller hub nut threads on crankshaft when installing propeller.	-	1	1	1	-
VOOBA	R-2194	2	83761	Eye - Propeller shaft and engine hoist. . . . . Used for 16:11 and 3:2 reduction geared engines. Attaches to propeller hub nut threads on propeller shaft. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VOODE	R-2196	8	82284	Turning Tool - Propeller shaft. . . . . Used for 16:11 and 3:2 reduction geared engines. Does not include handles. Used with two handles 80292.	-	1	1	1	1
VOOFI	R-2198	8	82889	Wrench - Propeller shaft thrust ball bearing nut, lug . . . . . Used for 16:11 and 3:2 reduction geared engines. Included in engine tool kit supplied with Commercial engines.	-	1	1	1	1
VOOHO	R-2200	8	84517	Puller - Propeller shaft thrust bearing spacer removing. . . . . Used for removing spacer from propeller shaft on 16:11 and 3:2 reduction geared engines when spacer is a tight fit on shaft.	-	1	1	1	1
VOOJU	R-2202	8	800310	Installing Tool - Propeller shaft thrust bearing spacer heating . . . . .	-	1	1	1	1
VOOLY	R-2204	8	82670	Wrench - Reduction driving gear nut . . . . . Used for 16:11 and 3:2 reduction geared engines.	-	1	1	1	1
VOPMA	R-2206	8	82571	Puller - Reduction driving gear removing. . . . . Used for 16:11 and 3:2 reduction geared engines. Multiple purpose puller 82683, listed under Crankcase "Disassembly and Reassembly" tools, can also be used for this purpose.	-	1	1	1	1
VOPOD	R-2208	8	82714	Puller - Reduction driving gear installing. . . . . Used for 16:11 reduction geared engines equipped with early type gears having fifteen square spline teeth. Late type gears having twenty-three involute spline teeth are heated before assembling and no puller is required. Early type gears must not be heated.	-	1	-	-	-
VOPTI	R-2210	9	82258	Stand - Propeller shaft holding, bench. . . . . Used for 16:11 and 3:2 reduction geared engines to hold propeller shaft when removing and installing reduction gear drive pinions.	-	1	1	1	1
VOPUG	R-2212	9	82311	Locking Tool - Reduction gear drive pinion. . . . . Used for 16:11 reduction geared engines to lock reduction gear drive pinions when removing and installing drive pinion lock nuts.	-	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

VOPYL	R-2212	9	83308	Locking Tool - Reduction gear drive pinion. . . . . Used for 3:2 reduction geared engines to lock reduction gear drive pinions when removing and installing drive pinion lock nuts.	-	-	-	-	1
VOREM	R-2214	9	82065	Wrench - Reduction gear drive pinion lock nut, plug, 11/16" hex. . . . . Used for 16:11 reduction geared engines equipped with early type lock nuts having a 11/16" hex.	-	1	1	1	-
VORGO	R-2214	9	82812	Wrench - Reduction gear drive pinion lock nut, plug, 9/16" hex. . . . . Used for 16:11 and 3:2 reduction geared engines equipped with late type lock nuts having a 9/16" hex.	-	1	1	1	1
VORID	R-2216	9	83936	Block - Reduction gear drive pinion lock nut cotter pin bending (45 degrees). . . . . Used for 16:11 and 3:2 reduction geared engines.	-	1	1	1	1
VORKU	R-2218	9	84217	Wrench - Stationary reduction gear to crankcase front section stud nut, socket, 9/16" hex. . . . . Used for all G and G-100 16:11 and 3:2 reduction geared engines and only for F-50 16:11 reduction geared engines equipped with crankcase front section having provision for governor drive.	-	-	1	1	1
VORMN	R-2220	9	81402	Wrench - Propeller hub nut. . . . . Not included in Commercial engine tool kits unless specified by customer.	1	1	1	1	1
VOROK	R-2222	9	83935	Arbor - Propeller hub rear centering ring to propeller hub, lapping . . . . . Used for R-760 engines equipped with S.A.E. No. 20 propeller hub spline crankshaft.	1	-	-	-	-
VORPY	R-2222	9	81910	Arbor - Propeller hub rear centering ring to propeller hub, lapping . . . . . Used for engines equipped with S.A.E. No.30 propeller hub spline crankshaft.	1	-	-	-	-
VORST	R-2222	9	81901	Arbor - Propeller hub rear centering ring to propeller hub, lapping . . . . . Used for direct drive engines.	-	1	1	1	-
VORUR	R-2222	9	82197	Arbor - Propeller hub rear centering ring to propeller hub, lapping . . . . . Used for 16:11 and 3:2 reduction geared engines.	-	1	1	1	1
VORYM	R-2224	8	83922	Protector - Propeller shaft thread. . . . . Used for 16:11 and 3:2 reduction geared engines. Used for protecting the propeller hub nut threads on propeller shaft when installing propeller.	-	1	1	1	1

**INSPECTION**

VOTAL	R-2250	13	82658	Rollers - Crankshaft alignment. . . . . Used for checking allowable run out of crankshaft.	2	2	2	2	2
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Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100
<b>CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd</b>									
<b>RECONDITIONING</b>									
CRANKSHAFT REAR END BUSHING AND REAR COUNTERWEIGHT BUSHING REPLACEMENT (FOR DYNAMIC DAMPER REAR COUNTERWEIGHT TYPE CRANKSHAFT) (WHIRLWIND AND CYCLONE)									
VOVBY	R-2270	40	83523	Base - Crankshaft rear end bushing and crankshaft rear counterweight bushing removing and installing, arbor press. . . . .	1	1	1	1	1
VOVDE	R-2272	40	83528	Plug - Crankshaft rear end bushing and crankshaft rear counterweight bushing removing and installing, arbor press. . . . . Used for R-760 engines.	1	-	-	-	-
VOVEL	R-2272	40	83527	Plug - Crankshaft rear end bushing and crankshaft rear counterweight bushing removing and installing, arbor press. . . . . Used for R-975 engines.	1	-	-	-	-
VOVFI	R-2272	40	83524	Plug - Crankshaft rear end bushing and crankshaft rear counterweight bushing removing and installing, arbor press. . . . . Used for F and F-50 engines and only for early G engines equipped with crankshaft rear end bushings 29/32" long and crankshaft rear counterweight bushings 21/32" long.	-	1	1	1	-
VOVIV	R-2272	40	83525	Plug - Crankshaft rear end bushing and crankshaft rear counterweight bushing removing and installing, arbor press. . . . . Used for all G-100 engines and only for G engines equipped with crankshaft rear end bushings 13/16" long and crankshaft rear counterweight bushings 37/64" long.	-	-	-	1	1
VOVKO	R-2274	40	83529	Collar - Crankshaft rear end bushing installing, arbor press. . . . .	1	-	-	-	-
VOVMU	R-2276	40	83526	Collar - Crankshaft rear end bushing installing, arbor press. . . . .	-	1	1	1	1
VOWAT	R-2278	40	83458	Stop - Crankshaft rear counterweight bushing installing, arbor press. . . . .	1	-	-	-	-
VOWCE	R-2278	40	83063	Stop - Crankshaft rear counterweight bushing installing, arbor press. . . . . Used for F and F-50 engines and only for early G engines equipped with crankshaft rear counterweight bushing 21/32" long.	-	1	1	1	-
VOWEX	R-2278	40	83445	Stop - Crankshaft rear counterweight bushing installing, arbor press. . . . . Used for all G-100 engines and only for G engines equipped with crankshaft rear counterweight bushing 37/64" long.	-	-	-	1	1
VOWGY	R-2280	40	83462	Bar - Crankshaft rear counterweight bushing hole alignment checking. . . . . Used for R-760 engines.	1	-	-	-	-
VOWIC	R-2280	40	83463	Bar - Crankshaft rear counterweight bushing hole alignment checking. . . . . Used for R-975 engines.	1	-	-	-	-
VOWKU	R-2280	40	83065	Bar - Crankshaft rear counterweight bushing hole alignment checking. . . . . Used for F and F-50 engines and only for G engines equipped with crankshaft rear counterweight bushing 21/32" long.	-	1	1	1	-
VOWLL	R-2280	40	83448	Bar - Crankshaft rear counterweight bushing hole alignment checking. . . . . Used for all G-100 engines and only for late G engines equipped with crankshaft rear counterweight bushing 37/64" long.	-	-	-	1	1
VOWNZ	R-2282	40	83461	Gauge - Crankshaft rear counterweight bushing locating, snap (1.656" - 1.666") . . . . .	1	-	-	-	-



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CRANKSHAFT, REDUCTION GEAR AND PROPELLER HUB ATTACHING PARTS TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**CRANKSHAFT REAR END BUSHING AND REAR COUNTER-WEIGHT BUSHING REPLACEMENT (FOR DYNAMIC DAMPER REAR COUNTERWEIGHT TYPE CRANKSHAFT) (WHIRLWIND AND CYCLONE) - Cont'd**

VOWOR	R-2282	40	83062	Gauge - Crankshaft rear counterweight bushing locating, snap (2.228" - 2.238") . . . . . Used for F and F-50 engines and only for early G engines equipped with crankshaft rear counterweight bushing 21/32" long.	-	1	1	1	-
VOWTI	R-2282	40	83447	Gauge - Crankshaft rear counterweight bushing locating, snap (1.995" - 2.005") . . . . . Used for all G-100 engines and only for late G engines equipped with crankshaft rear counterweight bushing 37/64" long.	-	-	-	1	1

**PROPELLER SHAFT BUSHING REPLACEMENT (16:11 AND 3:2 REDUCTION GEARED ENGINES)**

VOYBM			84307	Fixture and Tools - Propeller shaft bushings replacement, drill press and arbor press . . . . . Used for 16:11 reduction geared engines. Similar in appearance to 800526 listed below. This fixture cannot be adapted for use on G-100 3:2 reduction geared engines. See 800525 listed below.	-	1	1	1	1
VOYCA	R-2301	41	800525	Fixture and Tools - Propeller shaft bushings replacement, drill press and arbor press . . . . . Used for 16:11 reduction geared engines. This fixture and tools can be adapted for use on G-100 3:2 reduction geared engines by using adapter 800527.	-	1	1	1	1
VOYDB	R-2301	41	800526	Fixture and Tools - Propeller shaft bushings replacement, drill press and arbor press . . . . . Used for 3:2 reduction geared engines. This fixture and tools can be adapted for use on F, F-50, G and G-100 16:11 reduction geared engines by using adapter 800528.	-	-	-	-	1
VOYFE			82435	Gauge - Propeller shaft front bushing removing, cutter setting. . . . . Used with fixture and tools 84307 for F, F-50, G and G-100 engines equipped with non-hydromatic type propeller shaft. (The non-hydromatic type propeller shaft does not have a steel sleeve installed in the I.D. of the shaft and is not adapted for use with hydromatic full feathering propeller.)	-	1	1	1	1
VOYHD			84311	Adapter - Propeller shaft bushings replacement fixture and tools . . . . . Used with fixture and tools 84307 for F-50, G and G-100 engines equipped with hydromatic type propeller shaft. (The hydromatic type propeller shaft has a steel sleeve 8 41/64" long installed in the I.D. of the propeller shaft and is adapted for use with hydromatic full feathering propeller.)	-	-	1	1	1
VOYIM			800527	Adapter - Propeller shaft bushings replacement fixture and tools . . . . . Used to adapt fixture and tools 800525 (16:11) for use on 3:2 reduction geared engines.	-	-	-	-	1
VOYJI	R-2203	41	800528	Adapter - Propeller shaft bushings replacement fixture and tools . . . . . Used to adapt fixture and tools 800526 (3:2) for use on 16:11 reduction geared engines.	-	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CONNECTING ROD TOOLS**

**DISASSEMBLY AND REASSEMBLY**

VUBAN	R-2350	9	83596	Plate - Master and articulated rod, guide . . . One required per cylinder. Attaches to crankcase main section cylinder pad. Used to prevent damage to rod or crankcase when cylinder is off engine.	-	9	9	9	9
VUBCA	R-2352	9	83714	Puller - Knuckle pin removing and installing. Used with ratchet wrench 82146, adapters 83539 and 83537 for R-760 engines. Used with ratchet wrench 82146, adapters 83539 and 83538 for R-975 engines. This puller supersedes single purpose removing puller 80339, drift 82652 and master rod support block 80390 which are no longer recommended. Puller 82665 which is no longer supplied, can be used in place of puller 83714 and adapters 83537, 83538 and 83539.	1	-	-	-	-
VUBET	R-2354	9	82146	Wrench - Knuckle pin puller, ratchet. . . . . Used with puller 83714.	1	-	-	-	-
VUBGE	R-2356	9	83539	Adapter - Knuckle pin removing and installing puller . . . . . Used with puller 83714 for all R-760 and R-975 engines.	1	-	-	-	-
VUBID	R-2358	9	83537	Adapter - Knuckle pin removing and installing puller . . . . . Used with puller 83714 for R-760 engines.	1	-	-	-	-
VUBLB	R-2358	9	83538	Adapter - Knuckle pin removing and installing puller . . . . . Used with puller 83714 for R-975 engines.	1	-	-	-	-
VUBNI	R-2360	9	83343	Base and Tools - Knuckle pin removing and installing, arbor press. . . . . Used for all F and F-50 engines; used for G engines equipped with plain bearing type (non-end seal type) master rod having 1 1/16" diameter knuckle pin holes. Supersedes puller and screw set 82052 designed for F and F-50 engines having knuckle pins with a threaded hole. Also supersedes puller and tools 82265 designed for F, F-50 and G engines having master rod with scalloped contour at knuckle pin section.	-	1	1	1	-
VUBOF	R-2362	9	84429	Fixture - Knuckle pin removing and installing, arbor press. . . . . Used for late G engines equipped with end seal type master rod having 1 1/16" diameter knuckle pin holes.	-	-	-	1	-
VUBRO	R-2364	9	83379	Base and Tools - Knuckle pin removing and installing, arbor press. . . . . Used for G and G-100 engines equipped with plain bearing type (non-end seal type) master rod having 1 3/16" diameter knuckle pin holes.	-	-	-	1	1
VUBSY	R-2366	9	83913	Fixture - Knuckle pin removing and installing, arbor press. . . . . Used for G and G-100 engines equipped with end seal type master rod having 1 3/16" diameter knuckle pin holes.	-	-	-	1	1

**INSPECTION**

VUBUK	R-2385	14	81256	Gauge - Knuckle pin bushing maximum wear, flat plug (.8785" diameter). . . . .	1	-	-	-	-
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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## CONNECTING ROD TOOLS - Cont'd

## INSPECTION - Cont'd

VUBWU	R-2385	14	82042	Gauge - Knuckle pin bushing maximum wear, flat plug (1.065" diameter). . . . . Used for all F and F-50 engines; used for G engines equipped with master rod having 1 1/16" diameter knuckle pin holes.	-	1	1	1	-
VUCAB	R-2385	14	83269	Gauge - Knuckle pin bushing maximum wear, flat plug (1.193" diameter). . . . . Used for all G-100 engines; used for G engines equipped with master rod having 1 3/16" diameter knuckle pin holes.	-	-	-	1	1
VUDCA	R-2385	14	81257	Gauge - Piston pin bushing maximum wear, flat plug (1.253" diameter). . . . .	1	-	-	-	-
VUDEN	R-2385	14	82043	Gauge - Piston pin bushing maximum wear, flat plug (1.5065" diameter). . . . .	-	1	1	1	1

## RECONDITIONING

MASTER ROD CRANKSHAFT BEARING REPLACEMENT  
(EXCEPT BORE FINISHING) (WHIRLWIND)

VUDTO	R-2405	42	80799	Plug and Collar - Master rod crankshaft bearing removing and installing, arbor press . Used for shouldered type bearing.	1	-	-	-	-
VUDUV	R-2407	42	83045	Plug and Collar - Master rod crankshaft bearing removing and installing, arbor press . Used for non-shouldered type bearing.	1	-	-	-	-
VUDYE	R-2409	42	83583	Punch - Master rod crankshaft bearing dowel staking. . . . . Used for non-shouldered type bearing.	1	-	-	-	-

MASTER ROD CRANKSHAFT BEARING REPLACEMENT  
(EXCEPT BORE FINISHING) (CYCLONE)

VUEGE	R-2425	42	82356	Fixture - Master rod crankshaft bearing removing, spinning and facing, drill press. . . . . Used for all F and F-50 engines; used only for G engines equipped with master rods having 1 1/16" diameter knuckle pin holes. This fixture has been supplied in two distinct types, an early square type which is no longer supplied, and the present round type, Only the round type can be used where spinning of bearing is necessary.	-	1	1	1	-
VUEKY	R-2425	42	83396	Fixture - Master rod crankshaft bearing removing, spinning and facing, drill press . Used for G engines equipped with master rods having 1 3/16" diameter knuckle pin holes; used for all G-100 engines.	-	-	-	1	1
VUEMO	R-2427	42	82355	Boring Tool - Master rod crankshaft bearing removing and facing, drill press . . . . .	-	1	1	1	1
VUEOZ	R-2429	42	82814	Gauge - Master rod crankshaft bearing removing and facing boring tool, cutter setting	-	1	1	1	1
VUERU	R-2431	42	83819	Fixture - Master rod crankshaft bearing hole honing . . . . .	-	1	1	1	1
VUEST	R-2433	42	84246	Spacer - Master rod crankshaft bearing hole honing fixture . . . . .	-	1	1	1	1
VUEUM	R-2435	42	84250	Plug - Master rod crankshaft bearing hole honing fixture, locating . . . . . Used for F engines equipped with master rod having a 3.500" diameter bearing hole.	-	1	-	-	-
VUFAF	R-2435	42	84248	Plug - Master rod crankshaft bearing hole honing fixture, locating . . . . . Used for F and F-50 engines equipped with master rod having a 3.390" diameter bearing hole.	-	1	1	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6E	clone F	clone F-50	clone G	clone G-100

CONNECTING ROD TOOLS - Cont'd

RECONDITIONING - Cont'd

MASTER ROD CRANKSHAFT BEARING REPLACEMENT (EXCEPT BORE FINISHING) (CYCLONE) - Cont'd

VUFEQ	R-2435	42	84249	Plug - Master rod crankshaft bearing hole honing fixture, locating . . . . . Used for F and F-50 engines equipped with master rod having a 3.468" diameter bearing hole; used for all G and G-100 engines.	-	1	1	1	1
VUFIK	R-2437	42	800079	Body - Master rod crankshaft bearing hole finishing hone . . . . . Used for F engines equipped with master rod having either a 3.500" or 3.468" diameter bearing hole; used for F-50 engines equipped with master rod having a 3.468" diameter bearing hole; used for all G and G-100 engines.  This body can be adapted for use on F and F-50 engines equipped with master rod having a 3.390" diameter bearing hole by using holder 800080 listed below.  Includes one set (6) of holders and one set (6) of stone and shells.	-	1	1	1	1
VUFOP	R-2439	42	800041	Head and Brake - Master rod crankshaft bearing hole finishing hone. . . . .	-	1	1	1	1
VUFUR			800080	Holder - Master rod crankshaft bearing hole finishing hone, stone. . . . . Six (6) required per set. Used to adapt body 800079 for use on F and F-50 engines equipped with master rod having a 3.390" diameter bearing hole.	-	6	6	-	-
VUFYL			800081	Stone and Shell - Master rod crankshaft bearing hole finishing hone. . . . . Six (6) required per set. Detail of body 800079.	-	6	6	6	6
VUGAY	R-2441	42	82929	Plug - Master rod crankshaft bearing installing, arbor press . . . . . Used for holding bearing in position until rod shrinks. Used for all-F and F-50 engines; used for G and G-100 engines equipped with master rod having spun-in type bearing.	-	1	1	1	1
VUGEW	R-2443	42	84400	Plug and Base - Master rod crankshaft bearing installing, arbor press. . . . . Used for Cyclone G and G-100 engines equipped with end seal master rod.	-	-	-	1	1
VUGFE	R-2445	42	84402	Adapter - Master rod crankshaft bearing installing plug and base . . . . . Used with plug and base 84400 for Cyclone G engines equipped with end seal type master rod having 1 1/16" diameter knuckle pin holes.	-	-	-	1	-
VUGHD	R-2447	42	84401	Adapter - Master rod crankshaft bearing installing plug and base . . . . . Used with plug and base 84400 for G engines equipped with end seal type master rod having 1 3/16" diameter knuckle pin holes; used with plug and base 84400 for G-100 engines equipped with end seal type master rod.	-	-	-	1	1
VUGJI	R-2449	42	82713	Plug and Wrench - Master rod crankshaft bearing spinning fixture . . . . . Used for engines equipped with spun-in type bearings. Identical to plug and wrench included with fixture 82707 which is no longer supplied.	-	1	1	1	1

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CONNECTING ROD TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**MASTER ROD CRANKSHAFT BEARING REPLACEMENT (EXCEPT BORE FINISHING (CYCLONE) - Cont'd**

VUGLF	R-2451	42	82489	Spinning Tool - Master rod crankshaft bearing, drill press . . . . . Includes two rollers 82606 listed below. Used for F and F-50 engines equipped with spun-in type bearings having an outside diameter of 3.393". By using rollers 82802, this tool can be used for F and F-50 engines equipped with spun-in type bearings having an outside diameter of 3.471" and G and G-100 engines equipped with spun-in type bearings.	-	1	1	-	-
VUGNO	R-2451	42	82815	Spinning Tool - Master rod crankshaft bearing, drill press . . . . . Includes two rollers 82802 listed below. Used for F and F-50 engines equipped with spun-in type bearings having an outside diameter of 3.471"; used for G and G-100 engines equipped with spun-in type bearings. By using rollers 82606, this tool can be used for F and F-50 engines equipped with spun-in type bearings having an outside diameter of 3.393".	-	1	1	1	1
VUGPN			82606	Roller - Master rod crankshaft bearing spinning tool. . . . . Two (2) required. Detail of 82489 listed above. Read note under spinning tool 82815.	-	2	2	-	-
VUGRB			82802	Roller - Master rod crankshaft bearing spinning tool. . . . . Two (2) required. Detail of 82815 listed above. Read note under spinning tool 82489.	-	2	2	2	2
<b>MASTER AND ARTICULATED ROD BUSHING REPLACEMENT (EXCEPT BORE FINISHING) (WHIRLWIND AND CYCLONE)</b>									
VUICE	R-2470	43	80763	Plug and Collars - Piston pin bushing and knuckle pin bushing removing and installing, arbor press . . . . . Used for engines equipped with pinned-in type bushings.	1	-	-	-	-
VUIED	R-2470	43	80762	Plug and Collars - Piston pin bushing and knuckle pin bushing removing and installing, arbor press . . . . . Used for F and F-50 engines equipped with pinned-in type bushings.	-	1	1	-	-
VUIGA	R-2472	43	82485	Punch Set - Piston pin bushing and knuckle pin bushing dowel, staking . . . . . Used for engines equipped with pinned-in type bushings. Includes starting, staking and finishing punches.	1	1	1	-	-
VUIKE	R-2474	43	82981	Cutter - Knuckle pin bushing relief, counter-bore . . . . . Used for engines equipped with pinned-in type bushings. Used after bore finishing.	1	-	-	-	-

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirlwind J-8E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100

CONNECTING ROD TOOLS - Cont'd

RECONDITIONING - Cont'd

MASTER AND ARTICULATED ROD BUSHING REPLACEMENT (EXCEPT BORE FINISHING) (WHIRLWIND AND CYCLONE) - Cont'd

VUIMI	R-2476	43	84366	<p>Base and Tools - Piston pin bushing and knuckle pin bushing replacement, arbor press and drill press. . . . .</p> <p>Includes all special tools for removing, installing, burnishing, spinning in and facing new bushings in connecting rods on R-760 and R-975 engines equipped with master rod and articulated rods having spun-in type piston pin and knuckle pin bushings.</p>	1	-	-	-	-
VIUOX	R-2478	44	82893	<p>Base and Tools - Piston pin bushing and knuckle pin bushing replacement, arbor press and drill press. . . . .</p> <p>Includes all special tools required for removing spun-in type bushings and installing, burnishing, spinning-in and facing new bushings in connecting rods. Also suitable for facing pinned-in knuckle pin bushings on F and F-50 engines.</p> <p>Used for engines equipped with knuckle pin bushings 1 1/16" I.D. and connecting rods having early spinning angles (10° for piston pin and 19° for knuckle pin.)</p> <p>Early tools of this part number included a facing cutter not of sufficient diameter to face the thick shell piston pin bushing. If it is desired to adapt this tool for use with the thick shell bushing (.070" thick), replace 1 5/8" diameter cutter with the larger (1 11/16") diameter cutter 83208.</p> <p>This base and tools may be adapted for use with other types of spun-in bushings by the use of adapters 83500, 83501 and 83502 listed on page 706.</p>	-	1	1	1	-
VUIPO	R-2478	44	83344	<p>Base and Tools - Piston pin bushing and knuckle pin bushing replacement, arbor press and drill press. . . . .</p> <p>Includes all special tools required for removing spun-in type bushings and installing, burnishing, spinning in and facing new spun-in bushings in connecting rods. Also suitable for facing pinned-in knuckle pin bushings on F and F-50 engines. Base and tools 83426 listed below can also be used.</p> <p>Used for engines equipped with knuckle pin bushings 1 1/16" I.D. and connecting rods having late spinning angles (19° for piston pin and 25° for knuckle pin).</p> <p>This base and tools may be adapted for use with other types of spun-in bushings. See adapters 83503 and 83504 listed on pages 706 and 707 respectively.</p>	-	1	1	1	-
VUIRU	R-2478	44	83402	<p>Base and Tools - Piston pin bushing and knuckle pin bushing replacement, arbor press and drill press. . . . .</p> <p>Includes all special tools required for removing spun-in type bushings and installing, burnishing, spinning-in and facing new bushings in connecting rods. Base and tools 83426 listed below can also be used.</p> <p>Used for all G-100 engines; used only for G engines equipped with knuckle pin bushings 1 3/16" I.D. and connecting rods having late spinning angles (19° for piston pin and 25° for knuckle pin).</p> <p>This base and tools may be adapted for use with other types of spun-in bushings by the use of adapters 83505 and 83506 listed on page 707. May also be adapted for use with pinned-in type bushings on F and F-50 engines by using base and tools 83584. See note under base and tools 83584, listed on page 706.</p> <p>See also base and tools 83426, listed below, which is for use with both the 1 1/16" and 1 3/16" I.D. knuckle pin bushings and connecting rods having late spinning angles.</p>	-	-	-	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind	clone	clone	clone	clone
					J-6E	F	F-50	G	G-100

CONNECTING ROD TOOLS - Cont'd

RECONDITIONING - Cont'd

MASTER AND ARTICULATED ROD BUSHING REPLACEMENT (EXCEPT BORE FINISHING) (WHIRLWIND AND CYCLONE) - Cont'd

VUITT	R-2478	44	83426	<p>Base and Tools - Piston pin bushing and knuckle pin bushing replacement, arbor press and drill press. . . . .</p> <p>Includes all special tools required for removing spun-in type bushings and installing, burnishing, spinning in and facing new spun-in bushings in connecting rods. Also suitable for facing pinned-in knuckle pin bushings on F and F-50 engines.</p> <p>Used for engines equipped with either 1 1/16" or 1 3/16" I.D. knuckle pin bushings and connecting rods having late spinning angles.</p> <p>This tool is the same as 83344 and 83402 listed above except that it includes additional details to adapt it for use with both 1 1/16" and 1 3/16" I.D. bushings.</p> <p>Base and tools 83426 may be adapted for use with other types of spun-in bushings. See adapter 83503 listed below.</p>	-	1	1	1	1
VUIUP			83584	<p>Base and Tools - Knuckle pin bushing facing, drill press. . . . .</p> <p>Used for engines equipped with pinned-in type bushings.</p> <p>Used after bore finishing.</p> <p>Some or all of the details comprising this tool are included in each of the following knuckle pin bushing replacement tools: 82893, 83344, 83426, 83402, 83500, 83502, 83505 and 83506.</p> <p>Overhaul bases having any of the aforementioned tools will be supplied upon request of the necessary tools required to make 83584. It is essential that we be notified of the tools on hand so that a direct comparison can be made with 83584.</p>	-	1	1	-	-
VUIWA			83500	<p>Adapter - Piston pin bushing and knuckle pin bushing replacement, arbor press and drill press base and tools . . . . .</p> <p>Used to adapt base and tools 82893 for use with 1 1/16" I.D. knuckle pin bushings and connecting rods having 19° spinning angles for the piston pin bushings and 25° spinning angles for the knuckle pin bushings.</p>	-	1	1	1	-
VUIZE			83501	<p>Adapter - Piston pin bushing and knuckle pin bushing replacement arbor press and drill base and tools . . . . .</p> <p>Used to adapt base and tools 82893 for use with 1 3/16" I.D. knuckle pin bushings and connecting rods having 19° spinning angles for the piston pin bushings and 25° spinning angles for the knuckle pin bushings.</p>	-	-	-	1	1
VUJAF			83502	<p>Adapter - Piston pin bushing and knuckle pin bushing replacement arbor press and drill press base and tools . . . . .</p> <p>Used to adapt base and tools 82893 for use with both 1 1/16" and 1 3/16" I.D. knuckle pin bushings and connecting rods having 19° spinning angles for the piston pin bushings and 25° spinning angles for the knuckle pin bushings.</p>	-	1	1	1	1
VUJBA			83503	<p>Adapter - Piston pin bushing and knuckle pin bushing replacement arbor press and drill press base and tools . . . . .</p> <p>Used to adapt base and tools 83344 or 83426 for use with 1 1/16" I.D. knuckle pin bushings and connecting rods having 10° spinning angles for the piston pin bushings and 19° angles for the knuckle pin bushings.</p>	-	1	1	1	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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CONNECTING ROD TOOLS - Cont'd

RECONDITIONING - Cont'd

MASTER AND ARTICULATED ROD BUSHING REPLACEMENT (EXCEPT BORE FINISHING) (WHIRLWIND AND CYCLONE) - Cont'd

VUJDE			83504	Adapter - Piston pin bushing and knuckle pin bushing replacement arbor press and drill press base and tools . . . . . Used to adapt base and tools 83344 for use with 1 3/16" I.D. knuckle pin bushings and connecting rods having 19° spinning angles for the piston pin bushings and 25° spinning angles for the knuckle pin bushings.	-	-	-	1	1
VUJEG	R-2480	44	83505	Adapter - Piston pin bushing and knuckle pin bushing replacement arbor press and drill press base and tools . . . . . Used to adapt base and tools 83402 for use with 1 1/16" I.D. knuckle pin bushings and connecting rods having 19° spinning angles for the piston pin bushings and 25° spinning angles for the knuckle pin bushings.	-	1	1	1	-
VUJFI			83506	Adapter - Piston pin bushing and knuckle pin bushing replacement arbor press and drill press base and tools . . . . . Used to adapt base and tools 83402 for use with 1 1/16" I.D. knuckle pin bushings and connecting rods having 10° spinning angles for the piston pin bushings and 19° spinning angles for the knuckle pin bushings.	-	1	1	1	-

MASTER AND ARTICULATED ROD BEARING AND BUSHING BORE FINISHING (WHIRLWIND AND CYCLONE)

VULBA	R-2501	45	83431	Fixture and Tools - Master and articulated rod bearing and bushing bore finishing hand boring. . . . . This is a combination fixture for finish boring both master rod and articulated rod bearings and bushings for all current models of Wright Whirlwind engines. It can be adapted for boring any make of aircraft connecting rods by the procurement of a few additional parts. A complete chart showing finishing bearing bore dimensions and cutting tool settings is furnished with each fixture.	1	-	-	-	-
VULFE			83432	Fixture and Tools - Master and articulated rod bearing and bushing bore finishing hand boring. . . . . This is a combination fixture for finish boring both master rod and articulated rod bearings and bushings for all current models of Wright Cyclone engines. It can be adapted for boring any make of aircraft connecting rods by the procurement of a few additional parts. A complete chart showing finished bearing bore dimensions and cutting tool settings is furnished with each fixture.	-	1	1	1	1
VULHN			83433	Fixture and Tools - Master and articulated rod bearing and bushing bore finishing hand boring. . . . . This is a combination fixture for finish boring both master rod and articulated rod bearings and bushings for all current models of Wright Whirlwind and Cyclone engines. It can be adapted for boring any make of aircraft connecting rods by the procurement of a few additional parts. A complete chart showing finished bearing bore dimensions and cutting tool settings is furnished with each fixture.	1	1	1	1	1



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
<b>CONNECTING ROD TOOLS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>MASTER ROD CRANKSHAFT BEARING REPLACEMENT (GROOVING BEARING AFTER FINISHING BORE) (CYCLONE)</b>									
The tools listed in this group are used only for engines equipped with spun-in type bearings.									
VULPT	R-2515	45	83205	Fixture - Master rod crankshaft bearing oil grooving, vise . . . . .	-	1	1	1	1
VULRU	R-2517	45	83397	Scraper - Master rod crankshaft bearing oil grooving . . . . .	-	1	1	1	1
VULTI	R-2519	45	83185	Gauge - Master rod crankshaft bearing oil groove depth, flush pin. . . . .	-	1	1	1	1
<b>ALIGNMENT CHECKING OF CONNECTING ROD BEARING AND BUSHINGS (WHIRLWIND AND CYCLONE)</b>									
VUMAD	R-2535	45	83552	Stand - Master and articulated rod holes alignment checking, bench. . . . .	1	1	1	1	1
Used to check alignment of master rod crankshaft bearing, piston pin bushings, knuckle pin bushings and master rod knuckle pin holes.									
VUMCA	R-2537	45	83570	Bar - Master rod and articulated rod piston pin bushing finished bore alignment checking (1.2495" diameter) (Selective Fit No. 1) . . . . .	1	-	-	-	-
VUMEF	R-2537	45	84299	Bar - Master rod and articulated rod piston pin bushing finished bore alignment checking (1.250" diameter) (Selective Fit No. 2) . . . . .	1	-	-	-	-
VUMGE	R-2537	45	83561	Bar - Master rod and articulated rod piston pin bushing finished bore alignment checking (1.500" diameter) (Selective Fig No. 1) . . . . .	-	1	1	1	-
VUMIM	R-2537	45	83568	Bar - Master rod and articulated rod piston pin bushing finished bore alignment checking (1.5005" diameter). . . . .	-	1	1	1	1
Bar 83568 is Selective Fit No. 1 for rods having a bushing bore of (1.5005" - 1.5015") and Selective Fit No. 2 for rods having a bushing bore of (1.500" - 1.501")									
VUMKU	R-2537	45	84302	Bar - Master rod and articulated rod piston pin bushing finished bore alignment checking (1.501" diameter) (Selective Fit No. 2) . . . . .	-	1	1	1	1
VUMMI	R-2539	45	83557	Bar - Master rod crankshaft bearing finished bore alignment checking (2.2520" diameter) (Selective Fit No. 1) . . . . .	1	-	-	-	-
VUMOL	R-2539	45	83571	Bar - Master rod crankshaft bearing finished bore alignment checking (2.2525" diameter) . . . . .	1	-	-	-	-
Bar 83571 is Selective Fit No. 1 for master rods having a bearing bore of (2.2525" - 2.2530") and Selective Fit No. 2 for master rods having a bearing bore of (2.252" - 2.2525").									
VUMRY	R-2539	45	83572	Bar - Master rod crankshaft bearing finished bore alignment checking (2.2530" diameter) . . . . .	1	-	-	-	-
Bar 83572 is Selective Fit No. 1 for master rods having a bearing bore of (2.2530" - 2.2535") and Selective Fit No. 2 for rods having a bearing bore of (2.2525" - 2.2530")									
VUMTA	R-2539	45	84252	Bar - Master rod crankshaft bearing finished bore alignment checking (2.2535" diameter) (Selective Fit No. 2) . . . . .	1	-	-	-	-
VUMUM	R-2541	45	84253	Bar - Master rod crankshaft bearing finished bore alignment checking (3.2535" diameter) (Selective Fit No. 1) . . . . .	-	1	1	1	-
VUMVE	R-2541	45	83562	Bar - Master rod crankshaft bearing finished bore alignment checking (3.254" diameter). . . . .	-	1	1	1	1
Bar 83562 is Selective Fit No. 1 for master rods having a bearing bore of (3.2540" - 3.2545") and Selective Fit No. 2 for master rods having a bearing bore of (3.2535" - 3.2540")									

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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CONNECTING ROD TOOLS - Cont'd

RECONDITIONING - Cont'd

ALIGNMENT CHECKING OF CONNECTING ROD BEARING AND BUSHINGS (WHIRLWIND AND CYCLONE) - Cont'd

VUMYT	R-2541	45	84254	Bar - Master rod crankshaft bearing finished bore alignment checking (3.2545" diameter) (Selective Fit No. 2) . . . . .	-	-	-	1	1
VUOBE	R-2543	45	83558	Bar - Master rod knuckle pin hole alignment checking (.8735" - .8785" diameter) (Selective Fit No. 1) . . . . .	1	-	-	-	-
VUODO	R-2543	45	84301	Bar - Master rod knuckle pin hole alignment checking (.874" - .879" diameter) (Selective Fit No. 2) . . . . .	1	-	-	-	-
VUOFI	R-2543	45	83559	Bar - Master rod knuckle pin hole alignment checking (1.0585" - 1.0635" diameter) (Selective Fit No. 1) . . . . .	-	1	1	1	-
				Used for all F and F-50 engines; used for G engines equipped with master rods having 1 1/16" diameter knuckle pin holes.					
VUOHA	R-2543	45	84303	Bar - Master rod knuckle pin hole alignment checking (1.059" - 1.064" diameter) (Selective Fit No. 2) . . . . .	-	1	1	1	-
				Used for all F and F-50 engines; used for G engines equipped with master rods having 1 1/16" diameter knuckle pin holes.					
VUOJU	R-2543	45	83560	Bar - Master rod knuckle pin hole alignment checking (1.1465" - 1.1965" diameter) (Selective Fit No. 1) . . . . .	-	-	-	1	1
				Used for G engines equipped with master rods having 1 3/16" diameter knuckle pin holes; used for all G-100 engines.					
VUOLT	R-2543	45	84306	Bar - Master rod knuckle pin hole alignment checking (1.147" - 1.197" diameter) (Selective Fit No. 2) . . . . .	-	-	-	1	1
				Used for G engines equipped with master rods having 1 3/16" diameter knuckle pin holes; used for all G-100 engines.					
VUONL	R-2545	45	83556	Bar - Articulated rod knuckle pin bushing finished bore alignment checking (.8764" diameter) (Selective Fit No. 1) . . . . .	1	-	-	-	-
VUOOM	R-2545	45	84300	Bar - Articulated rod knuckle pin bushing finished bore alignment checking (.8769" diameter) (Selective Fit No. 2) . . . . .	1	-	-	-	-
VUOPY	R-2545	45	83563	Bar - Articulated rod knuckle pin bushing finished bore alignment checking (1.062" diameter) (Selective Fit No. 1) . . . . .	-	1	1	1	-
				Used for all F and F-50 engines; used for G engines equipped with master rods having 1 1/16" diameter knuckle pin holes.					
VUORS	R-2545	45	84305	Bar - Articulated rod knuckle pin bushing finished bore alignment checking (1.0625" diameter) (Selective Fit No. 2) . . . . .	-	1	1	1	-
				Used for all F and F-50 engines; used for G engines equipped with master rods having 1 1/16" diameter knuckle pin holes.					
VUOTA	R-2545	45	83569	Bar - Articulated rod knuckle pin bushing finished bore alignment checking (1.190" diameter) (Selective Fit No. 1) . . . . .	-	-	-	1	1
				Used for G engines equipped with master rods having 1 3/16" diameter knuckle pin holes; used for all G-100 engines.					
VUOUD	R-2545	45	84304	Bar - Articulated rod knuckle pin bushing finished bore alignment checking (1.1905" diameter) (Selective Fit No. 2) . . . . .	-	-	-	1	1
				Used for G engines equipped with master rods having 1 3/16" diameter knuckle pin holes; used for all G-100 engines.					

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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CYLINDER, INTAKE PIPE AND PISTON TOOLS

DISASSEMBLY AND REASSEMBLY

VUOWE	R-2625	10	82860	Wrench - Cylinder hold-down nut, 1/2" hex . . . Used for engines equipped with 1/2" hex. cylinder hold-down nuts. Included in engine tool kit.	1	-	-	-	-
VUOZI	R-2627	10	83130	Wrench - Cylinder hold-down nut, speed, 1/2" hex . . . . . Used for engines equipped with 1/2" hex. cylinder hold-down nuts. Used to quickly spin the cylinder hold-down nuts but is not heavy enough for tightening nuts.	1	-	-	-	-
VUPAF	R-2629	10	82883	Wrench - Cylinder hold-down nut, 9/16" hex. . . Used for engines equipped with 9/16" hex. cylinder hold-down nuts. Included in engine tool kit.	1	-	-	-	-
VUPCY	R-2631	10	83207	Wrench - Cylinder hold-down nut, speed, 5/8" hex . . . . . Used for engines equipped with 5/8" hex. cylinder hold-down nuts. Used to quickly spin the cylinder stud nuts but is not heavy enough for tightening nuts.	-	1	1	-	-
VUPEN	R-2633	10	82844	Wrench - Cylinder hold-down nut, 5/8" hex . . . Used for engines equipped with 5/8" hex. cylinder hold-down nuts. Included in engine tool kit.	-	1	1	-	-
VUPGO	R-2635	10	83131	Wrench - Cylinder hold-down nut and cap screw, speed, 9/16" hex. . . . . Used for engines equipped with 9/16" hex. cylinder hold-down nuts or cap screws. Used to quickly spin the cylinder hold-down nuts or cap screws but is not heavy enough for tightening.	1	1	1	1	1
VUPIR	R-2637	10	82839	Wrench - Cylinder hold-down nut, 9/16" hex. . . Used for engines equipped with 9/16" hex. cylinder hold-down nuts and cylinders having flat washer seats on attaching flange. Included in engine tool kit.	-	1	1	-	-
VUPKU	R-2639	10	82750	Wrench - Cylinder hold-down nut and cap screw, 9/16" hex . . . . . Used for engines equipped with 9/16" hex. cylinder hold-down nuts or cap screws and cylinders having spherical washer seats on the attaching flange. Included in engine tool kit.	-	-	-	1	1
VURBA	R-2641	10	83780	Nut - Cylinder to crankcase locating. . . . . Used for all G engines and early G-100 engines. For late G-100 engines using screws instead of studs for attaching cylinders, see 84501 below. Two of these special nuts are first tightened on opposite hold-down studs as each cylinder is put on crankcase in order to locate the cylinder properly before installing the standard hold-down nuts and washers.	-	-	-	2	2
VURDE	R-2643	10	84501	Screw - Cylinder to crankcase locating. . . . . Used for late G-100 engines. Two of these special screws are first tightened on opposite sides of cylinder as each cylinder is put on crankcase in order to locate the cylinder properly before installing the standard hold-down screws and washers.	-	-	-	-	2

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100
<b>CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd</b>									
<b>DISASSEMBLY AND REASSEMBLY - Cont'd</b>									
VURFI	R-2645	10	800259	Protectors - Cylinder head fin. . . . . One (1) required per cylinder. Used to prevent damage to lower cylinder head fins when cylinders are off engines.	-	-	-	9	9
VURGO	R-2647	10	84844	Cover - Cylinder intake port. . . . . The quantity specified is for R-975 engines. Seven (7) are used for R-760 engines.	9	-	-	-	-
VURLE	R-2649	10	84843	Cover - Cylinder intake port. . . . .	-	9	9	9	9
VUROP	R-2651	10	84845	Cover - Cylinder exhaust port . . . . . The quantity specified is for R-975 engines. Seven (7) are used for R-760 engines.	9	-	-	-	-
VURRU	R-2651	10	84842	Cover - Cylinder exhaust port . . . . .	-	9	9	9	9
VURST	R-2654	10	800223	Plug - Cylinder spark plug hole. . . . . The quantity specified in the Whirlwind engine column is for R-975 engines. Fourteen (14) are used for R-760 engines.	18	18	18	18	18
VURUD	R-2657	10	84566	Wrench - Rocker box cover nut, socket, speed, 7/16" hex. . . . . Used only for engines which have the rocker box covers secured to cylinder with nuts. These covers are installed on late Whirlwind and Cyclone F engines, all Cyclone F-50, G and G-100 engines. Used to quickly remove the rocker box cover nuts.	1	1	1	1	1
VURWO	R-2659	10	80449	Wrench - Rocker box cover nut, socket, 7/16" hex. . . . . Used for all engines equipped with rocker box covers attached with nuts. Included in engine tool kit. See also socket speed wrench 84566 listed above.	1	-	1	1	1
VURYS	R-2661	10	84770	Removing Tool - Rocker box cover washer, magnetic . . . . . Used only for engines which have the rocker box covers secured to cylinder with nuts. These covers are installed on late Whirlwind and Cyclone F engines, all Cyclone F-50, G and G-100 engines.	1	1	1	1	1
VUSAN	R-2663	10	82973	Wrench - Exhaust elbow to cylinder attaching stud nut . . . . . Included in engine tool kit.	1	-	-	-	-
VUSCA	R-2665	10	80171	Wrench - Intake pipe packing nut, lug . . . . . Included in engine tool kit.	1	-	-	-	-
VUSEB	R-2665	10	83925	Wrench - Intake pipe packing nut, lug . . . . . Used to clear mounting plate on early type disassembling and assembling stand 81907 when removing or installing the intake pipe packing nut at cylinders 3 and 8 (F and F50 engines) or cylinders 2 and 7 (G and G-100 engines). When engine is mounted on late type stand 83678, engine tool kit wrench 84216 is used.	-	1	1	1	1
VUSGA	R-2665	10	84216	Wrench - Intake pipe packing nut, lug . . . . . Included in engine tool kit. Also see wrench 83925 above.	-	1	1	1	1
VUSIC	R-2668	10	83965	Pliers - Piston pin retaining lock ring removing and installing. . . . . Included in engine tool kit.	1	-	-	-	-
VUSKE	R-2671	10	82454	Removing Tool - Piston pin retaining lock ring . . . . .	-	1	1	-	-
VUSML	R-2674	10	82394	Installing Tool - Piston pin retaining lock ring . . . . .	-	1	1	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd

DISASSEMBLY AND REASSEMBLY - Cont'd

VUSOX	R-2677	10	83800	Pliers - Piston pin retaining lock ring removing and installing. . . . . Included in engine tool kit. For use when lock rings are used for retaining the piston pins.	-	-	-	1	1
VUSRI	R-2679	10	84377	Removing Tool - Piston pin retaining spring . Included in engine tool kit. For use when coil springs are used for retaining piston pins.	-	-	-	-	1
VUSST	R-2681	10	84861	Installing Tool - Piston pin retaining spring . . . . . Included in engine tool kit. Used with adapter 800197. For use when coil springs are used for retaining piston pins.	-	-	-	-	1
VUSUV	R-2683	10	800197	Adapter - Piston pin retaining spring installing tool. . . . . Included in engine tool kit. Used with installing tool 84861.	-	-	-	-	1
VUSYN	R-2685	10	83243	Removing Tool - Piston pin. . . . .	1	1	1	1	1
VUTAP	R-2687	10	80124	Clamp - Piston ring . . . . .	1	-	-	-	-
VUTCO	R-2687	10	80440	Clamp - Piston ring . . . . .	-	1	1	1	1
VUTEF	R-2689	10	81752	Removing and Installing Tool - Piston ring. .	1	1	1	1	1

INSPECTION

VUVAF	R-2700	13	82346	Stand - Cylinder air test, bench. . . . . Used to test cylinder for leaks between head and sleeve and around exhaust port. This stand is the same as Cyclone stand 82310, except that 82346 has a different dummy valve, different exhaust port plates and gaskets and includes an adapter bushings. These parts are listed under assembly 82614 below.	1	-	-	-	-
VUVEG	R-2700	13	82310	Stand - Cylinder air test, bench. . . . . Used to test cylinder for leaks between head and sleeve and around exhaust port.	-	1	1	1	1
VUVIK	R-2702	13	82614	Adapter - Cylinder air test bench stand . . . Detail of stand 82346. Used to adapt Cyclone stand 82310 for use on Whirlwind engines.	1	-	-	-	-
VUVOP	R-2704	14	34640	Stand - Cylinder hydraulic test bench . . . . Used for testing cylinder head for cracks or leaks under hydraulic pressure. Used with adapter 84417 for F and F-50 engines; 84418 for G engines and 84419 for G-100 engines.	-	-	1	1	1
VUVUR	R-2707	13	84417	Adapter - Cylinder hydraulic test bench stand. . . . . Used with stand 84640.	-	-	1	-	-
VUVYL	R-2707	13	84418	Adapter - Cylinder hydraulic test bench stand. . . . . Used with stand 84640.	-	-	-	1	-
VUWBY	R-2707	13	84419	Adapter - Cylinder hydraulic test bench stand. . . . . Used with stand 84640.	-	-	-	-	1
VUWLU			84428	Gasket - Cylinder hydraulic test bench stand, small . . . . . Detail of stand 84640.	-	-	1	1	1

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd**

**INSPECTION - Cont'd**

VUWNO			84420	Gasket - Cylinder hydraulic test bench stand, large. . . . . Detail of stand 84640. This gasket is 1/4" thick and is the only type supplied. For replacement of 1" thick gasket used with stand 83393, it will be necessary to rework early stand 83393 in accordance with instructions on Service Division Sketch No. 172, a copy of which will be furnished upon request.	-	-	1	1	1
VUWRL	R-2709	14	800048	Gauge - Cylinder bore . . . . .	1	1	1	1	1
VUWSE	R-2711	13	84756	Gauge - Cylinder bore gauge setting, master ring . . . . .	1	-	-	-	-
VUWTA	R-2713	13	84757	Gauge - Cylinder bore gauge setting, master ring . . . . .	-	1	1	1	1
VUWUM	R-2715	14	80602	Gauge - Intake valve guide valve stem hole, flat plug. . . . . Used to check valve stem holes for maximum wear.	1	1	1	1	1
VUWWP	R-2715	14	80603	Gauge - Exhaust valve guide valve stem hole, flat plug. . . . . Used to check valve stem holes for maximum wear.	1	-	-	-	-
VUWYS	R-2715	14	82664	Gauge - Exhaust valve guide valve stem hole, flat plug. . . . . Used to check valve stem holes for maximum wear.	-	1	1	1	1

**RECONDITIONING**

**CYLINDER RECONDITIONING FIXTURES (WHIRLWIND AND CYCLONE)**

VUYLY	R-2775	46	82341	Fixture - Cylinder reconditioning, drill press Includes adapter 82342. Cyclone fixture 82955 can be adapted for use on Whirlwind engines by using adapter 82342. Fixture 82341 can be adapted for use on Cyclone F, F-50, G and G-100 engines by using adapter 82954.	1	-	-	-	-
VUYND	R-2727	46	82955	Fixture - Cylinder reconditioning, drill press Includes adapter 82954. Whirlwind fixture 82341 can be adapted for use on Cyclone F, F-50, G and G-100 engines by using adapter 82954. Fixture 82955 can be adapted for use on Whirlwind engines by using adapter 82342.	-	1	1	1	1
VUYOG	R-2729	46	82342	Adapter - Cylinder reconditioning, drill press fixture. . . . . Detail of fixture 82341. Read notes under fixtures 82341 and 82955.	1	-	-	-	-
VUYPN	R-2731	46	82954	Adapter - Cylinder reconditioning, drill press fixture. . . . . Detail of fixture 82955. Read notes under fixtures 82341 and 82955.	-	1	1	1	1

**VALVE SEAT REPLACEMENT (VALVE SEAT REMOVAL) (WHIRLWIND AND CYCLONE)**

Cylinders for both Whirlwind and Cyclone F engines have been supplied with either bronze or steel exhaust valve seats. It is recommended that steel exhaust valve seats be used to replace bronze seats in all Whirlwind engines having a compression ratio of 6.1:1 or higher, and all Cyclone engines.

VUZED	R-2740	47	81493	Boring Tool - Intake valve seat removing, drill press. . . . .	1	1	1	1	1
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**VALVE SEAT REPLACEMENT (VALVE SEAT REMOVAL)  
(WHIRLWIND AND CYCLONE) - Cont'd**

VUZGE	R-2741	47	81495	Boring Tool - Exhaust valve seat removing, drill press. . . . . Used only for engines equipped with bronze exhaust valve seats.	1	-	-	-	-
VUZIL	R-2741	47	81497	Boring Tool - Exhaust valve seat removing, drill press. . . . . Used for engines equipped with bronze exhaust valve seats.	-	1	-	-	-
VUZKI	R-2742	47	84601	Boring Tool - Cylinder exhaust port . . . . . Used for engines equipped with steel exhaust valve seats. Used to bore 1/64" on a side out of the cylinder exhaust port behind the seat for the removing tool at the time of initial replacement only.	1	-	-	-	-
VUZMO	R-2742	47	83473	Boring Tool - Cylinder exhaust port . . . . . Used for engines equipped with steel exhaust valve seats. Used to bore 1/64" on a side out of the cylinder exhaust port behind the seat for the removing tool at the time of initial replacement only.	-	1	1	1	1
VUZOR	R-2744	47	84602	Stand and Tools - Exhaust valve seat removing, bench. . . . . Used for engines equipped with steel exhaust valve seats.	1	-	-	-	-
VUZTU	R-2744	47	83452	Stand and Tools - Exhaust valve seat removing, bench. . . . . Used for engines equipped with steel exhaust valve seats.	-	1	1	1	1
VUZUV	R-2746	47	84603	Drift and Gauge - Exhaust valve seat removing Used for engines equipped with steel exhaust valve seats.	1	-	-	-	-
VUZVA	R-2748	47	83453	Drift - Exhaust valve seat removing . . . . . Used for engines equipped with steel seats having an inside diameter of 2.593".	-	1	-	-	-
VUZWI	R-2750	47	83454	Drift and Gauge - Exhaust valve seat removing Used for F, F-50 and early G engines equipped with steel seats having an inside diameter of 2.563".	-	1	1	1	-
VUZYL	R-2750	47	83455	Drift and Gauge - Exhaust valve seat removing Used for late G engines equipped with steel seats having an inside diameter of 2.437"; used for all G-100 engines.	-	-	-	1	1

**VALVE SEAT REPLACEMENT (CUTTING OVERSIZE  
VALVE SEAT RECESS IN CYLINDER) (WHIRLWIND  
AND CYCLONE)**

VYAAB	R-2770	47	84478	Cutter - Intake valve seat recess, counter-bore (.010" oversize). . . . .	1	-	-	-	-
VYACE	R-2770	47	84479	Cutter - Intake valve seat recess, counter-bore (.020" oversize). . . . .	1	-	-	-	-
VYAED	R-2770	47	84480	Cutter - Intake valve seat recess, counter-bore (.030" oversize). . . . .	1	-	-	-	-
VYAGI	R-2770	47	84481	Cutter - Intake valve seat recess, counter-bore (.040" oversize). . . . .	1	-	-	-	-
VYAHL	R-2770	47	83981	Cutter - Intake valve seat recess, counter-bore (.010" oversize). . . . .	-	1	1	1	1
VYAJY	R-2770	47	83982	Cutter - Intake valve seat recess, counter-bore (.020" oversize). . . . .	-	1	1	1	1
VYAKA	R-2770	47	83983	Cutter - Intake valve seat recess, counter-bore (.030" oversize). . . . .	-	1	1	1	1

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
<b>CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>VALVE SEAT REPLACEMENT (CUTTING OVERSIZE VALVE SEAT RECESS IN CYLINDER) (WHIRLWIND AND CYCLONE) - Cont'd</b>									
VYAMN	R-2770	47	83984	Cutter - Intake valve seat recess, counter-bore (.040" oversize). . . . .	-	1	1	1	1
VYAOE	R-2770	47	82993	Cutter - Exhaust valve seat recess, counter-bore (.010" oversize). . . . .	1	-	-	-	-
VYARI	R-2770	47	82994	Cutter - Exhaust valve seat recess, counter-bore (.020" oversize). . . . .	1	-	-	-	-
VYATO	R-2770	47	84482	Cutter - Exhaust valve seat recess, counter-bore (.030" oversize). . . . .	1	-	-	-	-
VYBLS	R-2770	47	84483	Cutter - Exhaust valve seat recess, counter-bore (.040" oversize). . . . .	1	-	-	-	-
VYBNU	R-2770	47	82741	Cutter - Exhaust valve seat recess, counter-bore (.010" oversize). . . . .	-	1	1	1	1
VYBUB	R-2770	47	82766	Cutter - Exhaust valve seat recess, counter-bore (.020" oversize). . . . .	-	1	1	1	1
VYBWA	R-2770	47	82767	Cutter - Exhaust valve seat recess, counter-bore (.030" oversize). . . . .	-	1	1	1	1
VYCAN	R-2770	47	82768	Cutter - Exhaust valve seat recess, counter-bore (.040" oversize). . . . .	-	1	1	1	1
VYCCO	R-2773	47	82758	Gauge - Exhaust valve seat recess, depth. . . . . Used when replacing bronze exhaust valve seats with steel seats on early F engines.	-	1	-	-	-
VYCEG	R-2775	47	82519	Handle - Intake and exhaust valve seat recess cutters, turning . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VYCGH	R-2777	47	82522	Jack - Intake and exhaust valve seat recess cutters, turning handle. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VYCIC	R-2779	47	82531	Pilot - Intake and exhaust valve seat recess cutters. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
VYDBE	R-2779	47	82532	Pilot - Intake and exhaust valve seat recess cutters. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VYDDI	R-2781	47	82535	Bushing - Exhaust valve seat recess cutters, pilot. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
VYDFO	R-2781	47	82536	Bushing - Exhaust valve seat recess cutters, pilot. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
VYDHU	R-2783	47	82518	Box - Valve seat recess and angle cutters, turning handle, jack, pilot and bushing. . . . . Used as a container for valve seat oversize recess and valve seat angle cutting tools. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
<b>VALVE SEAT REPLACEMENT (INSTALLING VALVE SEAT) (WHIRLWIND AND CYCLONE)</b>									
VYFAB	R-2795	47	81172	Installing Tool - Intake valve seat . . . . .	1	-	-	-	-
VYFDI	R-2795	47	81173	Installing Tool - Exhaust valve seat. . . . . Used for either bronze or steel seats.	1	-	-	-	-
VYFEF	R-2795	47	81686	Installing Tool - Intake valve seat . . . . . Used for early engines equipped with intake valve seats having an inside diameter of 2.719".	-	1	-	-	-



ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**VALVE SEAT REPLACEMENT (INSTALLING VALVE SEAT) (WHIRLWIND AND CYCLONE) - Cont'd**

VYFGA	R-2795	47	83353	Installing Tool - Intake valve seat . . . . . Used for engines equipped with intake valve seats having a 7/32" wide valve seating surface and an I.D. of 2.375". This type seat is installed in late F, all F-50 and early G engines.	-	1	1	1	-
VYFHU	R-2795	47	83354	Installing Tool - Intake valve seat . . . . . Used for late G engines equipped with intake valve seats having a 1/8" wide valve seating surface and an I.D. of 2.50"; used for all G-100 engines.	-	-	-	1	1
VYFJO	R-2795	47	81691	Installing Tool - Exhaust valve seat. . . . . Used for early type F engines equipped with exhaust valve seats having an inside diameter of 2.593"; used for late F, all F-50 and early G engines equipped with exhaust valve seats having an inside diameter of 2.563".	-	1	1	1	-
VYFMY	R-2795	47	83355	Installing Tool - Exhaust valve seat. . . . . Used for late G engines equipped with exhaust valve seats having an inside diameter of 2.437"; used for all G-100 engines.	-	-	-	1	1
VYFOL	R-2797	47	81171	Puller - Intake and exhaust valve seat installing tool. . . . .	1	1	1	1	1
VYFPN	R-2799	47	81174	Handle - Intake and exhaust valve seat installing tool. . . . .	1	1	1	1	1

**VALVE SEAT REPLACEMENT (VALVE SEAT ANGLE FINISHING) (WHIRLWIND AND CYCLONE)**

See page 810 for alternate machine grinder method for finishing steel exhaust valve seat angles.

VYIAC	R-2815	47	82552	Cutter - Intake valve seat angle, inside narrowing (2 3/8" - 70°) . . . . .	1	-	-	-	-
VYIEJ	R-2815	47	82547	Cutter - Intake valve seat angle, finishing (2 1/2" - 45°) . . . . .	1	-	-	-	-
VYIGT	R-2815	47	82540	Cutter - Intake valve seat angle, top narrowing (2 5/8" - 20°) . . . . .	1	-	-	-	-
VYIIV	R-2815	47	82551	Cutter - Exhaust valve seat angle, inside narrowing (2 1/8" - 70°) . . . . . Used only for engines equipped with bronze exhaust valve seats. Read note under "Valve Seat Removal" on page 804.	1	-	-	-	-
VYIKA	R-2815	47	82546	Cutter - Exhaust valve seat angle, finishing (2 1/4" - 45°) . . . . . Used only for engines equipped with bronze exhaust valve seats. Read note under "Valve Seat Removal" on page 804.	1	-	-	-	-
VYIME	R-2815	47	82539	Cutter - Exhaust valve seat angle, top narrowing (2 3/8" - 20°) . . . . . Used only for engines equipped with bronze exhaust valve seats. Read note under "Valve Seat Removal" on page 804.	1	-	-	-	-
VYIOW	R-2815	47	82556	Cutter - Intake valve seat angle, inside narrowing (3" - 70°) . . . . . Used for engines equipped with intake valve seats having an inside diameter of 2.719".	-	1	-	-	-
VYIRI	R-2815	47	83466	Cutter - Intake valve seat angle, inside narrowing (3" - 5/8" radius) . . . . . Used for engines equipped with intake seats having a 7/32" wide valve seating surface and an I.D. of 2.375". This type seat is installed in late F, all F-50 and early G engines.	-	1	1	1	-

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd

RECONDITIONING - Cont'd

VALVE SEAT REPLACEMENT (VALVE SEAT ANGLE FINISHING) (WHIRLWIND AND CYCLONE) - Cont'd

VYITS	R-2815	47	83467	Cutter - Intake valve seat angle, inside narrowing (3" - 3/4" radius) . . . . . Used for late G engines equipped with intake valve seats having a 1/8" wide valve seating surface and an I.D. of 2.50"; used for all G-100 engines.	-	-	-	1	1
VYIUB	R-2815	47	82544	Cutter - Intake valve seat angle, finishing (3 1/8" - 30°) . . . . .	-	1	1	1	1
VYIVL	R-2815	47	82542	Cutter - Intake valve seat angle, top narrowing (3 1/8" - 20°) . . . . .	-	1	1	1	1
VYIXU	R-2817	47	82519	Handle - Intake and exhaust valve seat angle cutters turning. . . . . Used for bronze seats only. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
VYIZY	R-2819	47	82522	Jack - Intake and exhaust valve seat angle cutters, turning handle. . . . . Used for bronze seats only. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
WAABA	R-2821	47	82531	Pilot - Intake and exhaust valve seat angle cutters. . . . . Used for bronze seats only. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
WAACE	R-2821	47	82532	Pilot - Intake and exhaust valve seat angle cutters. . . . . Used for bronze seats only. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
WAADI	R-2823	47	82535	Bushing - Exhaust valve seat angle cutters, pilot. . . . . Used for bronze seats only. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
WAAEB	R-2825	47	82518	Box - Valve seat recess and angle cutters, turning handle, jack, pilot and bushing. . . . . Used as a container for valve seat oversize recess and angle cutting tools. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
WAAFO	R-2827	47	84271	Pilot, Washer and Nut - Exhaust valve seat angle grinding wheel . . . . . Used for engines equipped with steel exhaust valve seats. Used with standard portable motor driven flexible shaft equipment.	1	-	-	-	-
WAAGU	R-2829	47	84272	Bushing - Exhaust valve seat angle grinding wheel pilot (.625" O.D.) (Selective Fit No. 1) . . . . . Used for engines equipped with steel exhaust valve seats. This bushing is subject to rapid wear and is the selective fit most frequently used. In order to avoid delays incidental to reordering replacements for this bushing, it is recommended that a quantity of six or more spare bushings be purchased on initial order.	1	-	-	-	-
WAAHY	R-2829	47	84273	Bushing - Exhaust valve seat angle grinding wheel pilot (.627" O.D.) (Selective Fit No. 2) . . . . . Used for engines equipped with steel exhaust valve seats.	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd

RECONDITIONING - Cont'd

VALVE SEAT REPLACEMENT (VALVE SEAT ANGLE FINISHING) (WHIRLWIND AND CYCLONE) - Cont'd

WAAID	R-2829	47	84274	Bushing - Exhaust valve seat angle grinding wheel pilot (.629" O.D.) (Selective Fit No. 3) . . . . . Used for engines equipped with steel exhaust valve seats.	1	-	-	-	-
WAAJA	R-2831	47	82990	Wheel - Exhaust valve seat angle finishing. . . . . Used for engines equipped with steel exhaust valve seats. This wheel is subject to rapid wear and in order to avoid delays incidental to reordering replacements for this wheel, it is recommended that a quantity of twelve or more spare wheels be purchased on initial order.	1	-	-	-	-
WAAKE	R-2833	47	83767	Pilot, Washer and Nut - Exhaust valve seat angle grinding wheel . . . . . Used for engines equipped with steel exhaust valve seats. Used with standard portable motor driven flexible shaft equipment.	-	1	1	1	1
WAA LI	R-2835	47	83768	Bushing - Exhaust valve seat angle grinding wheel pilot (.686" O.D.) (Selective Fit No. 1) . . . . . Used for engines equipped with steel exhaust valve seats. This bushing is subject to rapid wear and is the selective fit most frequently used. In order to avoid delays incidental to reordering replacements for this bushing, it is recommended that a quantity of six or more spare bushings be purchased on initial order.	-	1	1	1	1
WAAMO	R-2835	47	83769	Bushing - Exhaust valve seat angle grinding wheel pilot (.688" O.D.) (Selective Fit No. 2) . . . . . Used for engines equipped with steel exhaust valve seats.	-	1	1	1	1
WAAOF	R-2835	47	83770	Bushing - Exhaust valve seat angle grinding wheel pilot (.690" O.D.) (Selective Fit No. 3) . . . . . Used for engines equipped with steel exhaust valve seats.	-	1	1	1	1
WAARU	R-2837	47	82672	Wheel - Exhaust valve seat angle finishing. . . . . Used for engines equipped with steel exhaust valve seats. This wheel is subject to rapid wear and in order to avoid delays incidental to reordering replacements for this wheel, it is recommended that a quantity of twelve or more spare wheels be purchased on initial order.	-	1	1	1	1
WAATI	R-2839	47	82991	Gauge - Exhaust valve seat angle, bluing and limit. . . . . Used for engines equipped with steel exhaust valve seats.	1	-	-	-	-
WAAUL	R-2839	47	82738	Gauge - Exhaust valve seat angle, bluing and limit. . . . . Used for engines equipped with steel exhaust valve seats.	-	1	1	1	1

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
<b>CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>VALVE SEAT REPLACEMENT (ALTERNATE METHOD FOR FINISHING STEEL EXHAUST VALVE SEAT ANGLES) (WHIRLWIND AND CYCLONE)</b>									
An alternate machine grinder method for finishing steel exhaust valve seat angles has been developed and is now available to replace tools for the motor driven flexible shaft method previously listed under "Valve Seat Angle Finishing". These tools, while naturally more expensive, will give quicker and better results in this important reconditioning operation.									
Illustrative and descriptive data on this grinder will be furnished upon request.									
WACAB			83115	Grinder - Valve seat angle. . . . . Includes vacuum cleaning equipment. Does not include cylinder locating plate nor attachments. When ordering specify whether A.C. or D.C. current is available and specify voltage, cycle or phase.	1	1	1	1	1
WACCE			83117	Plate - Valve seat angle grinder, cylinder locating . . . . .	1	1	1	1	1
WACED			83719	Attachments - Valve seat angle grinder. . . . . Includes one grinding wheel, two grinding wheel spindles, four valve guide sleeves and one bluing gauge.	1	-	-	-	-
WACGA			83720	Attachments - Valve seat angle grinder. . . . . Includes one grinding wheel, two grinding wheel spindles, four valve guide sleeves and one bluing gauge.	-	1	1	1	1
WACIP			83120	Wheel - Exhaust valve seat grinding . . . . . Detail of 83719. This wheel is subject to rapid wear and in order to avoid delays incidental to reordering replacements for this wheel, it is recommended that a quantity of twelve or more spare wheels be purchased on initial order.	1	-	-	-	-
WACKE			83121	Wheel - Exhaust valve seat grinding . . . . . Detail of 83720. This wheel is subject to rapid wear and in order to avoid delays incidental to reordering replacements for this wheel, it is recommended that a quantity of twelve or more spare wheels be purchased on initial order.	-	1	1	1	1
WACMI			83362	Diamond - Grinding wheel dressing . . . . . Detail of 83115. In order to avoid delays incidental to reordering replacements for this diamond, it is recommended that a quantity of three or more spare diamonds be purchased on initial order.	1	1	1	1	1
WACOX			83363	Belts - Driving (complete set). . . . . Detail of 83115.	1	1	1	1	1
WACPO			83723	Draw Bars - Grinding spindle and dressing spindle. . . . . Detail of 83115.	1	1	1	1	1
WACRU			83309	Spindle - Grinding wheel, complete. . . . . Detail of 83719. One extra supplied with each set of attachments.	1	-	-	-	-
WACTT			83310	Spindle - Grinding wheel, complete. . . . . Detail of 83720. One extra supplied with each set of attachments.	-	1	1	1	1
WACUM			83721	Sleeve - Grinding wheel spindle eccentric . . . . . Detail of spindle 83309.	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd

RECONDITIONING - Cont'd

VALVE SEAT REPLACEMENT (ALTERNATE METHOD FOR FINISHING STEEL EXHAUST VALVE SEAT ANGLES) (WHIRLWIND AND CYCLONE) - Cont'd

WACVA			83722	Sleeve - Grinding wheel spindle eccentric . . . Detail of spindle 83310.	-	1	1	1	1
WACZE			83317	Sleeve - Exhaust valve guide, standard size . . . Detail of 83719.	1	-	-	-	-
WADAF			83319	Sleeve - Exhaust valve guide, .001" oversize. Detail of 83719.	1	-	-	-	-
WADBA			83321	Sleeve - Exhaust valve guide, .002" oversize. Detail of 83719.	1	-	-	-	-
WADDE			83323	Sleeve - Exhaust valve guide, .003" oversize. Detail of 83719.	1	-	-	-	-
WADEG			83318	Sleeve - Exhaust valve guide, standard size . . . Detail of 83720.	-	1	1	1	1
WADFI			83320	Sleeve - Exhaust valve guide, .001" oversize. Detail of 83720.	-	1	1	1	1
WADHO			83322	Sleeve - Exhaust valve guide, .002" oversize. Detail of 83720.	-	1	1	1	1
WADIK			83324	Sleeve - Exhaust valve guide, .003" oversize. Detail of 83720.	-	1	1	1	1
WADJU			83337	Gauge - Exhaust valve seat angle bluing . . . Detail of 83719.	1	-	-	-	-
WADLM			83338	Gauge - Exhaust valve seat angle bluing . . . Detail of 83720.	-	1	1	1	1

VALVE GUIDE REPLACEMENT (REMOVAL OF VALVE GUIDES) (WHIRLWIND AND CYCLONE)

WAFAD	R-2880	48	82292	Cutter, Pilot and Nut - Intake valve guide removing, counterbore, drill press . . . . .	1	1	1	1	1
WAFCA	R-2881	48	82659	Cutter, Pilot and Nut - Exhaust valve guide removing, counterbore, drill press . . . . .	1	-	-	-	-
WAFEF	R-2881	48	82291	Cutter, Pilot and Nut - Exhaust valve guide removing, counterbore, drill press . . . . .	-	1	1	1	1
WAFGE	R-2883	48	82297	Holder - Intake and exhaust valve guide removing counterbore cutter, pilot and nut, drill press . . . . .	1	1	1	1	1

VALVE GUIDE REPLACEMENT (REAMING INTAKE AND EXHAUST VALVE GUIDE HOLES OVERSIZE IN CYLINDER) (WHIRLWIND AND CYCLONE)

WAFTA	R-2895	48	80753	Reamer - Intake valve guide cylinder hole, hand expansion (.005" oversize). . . . .	1	-	-	-	-
WAFUM	R-2895	48	80742	Reamer - Intake valve guide cylinder hole, hand expansion (.010" oversize). . . . .	1	-	-	-	-
WAFVE	R-2895	48	84493	Reamer - Intake valve guide cylinder hole, hand expansion (.020" oversize). . . . .	1	-	-	-	-
WAFYT	R-2895	48	84494	Reamer - Intake valve guide cylinder hole, hand expansion (.030" oversize). . . . .	1	-	-	-	-
WAGBE	R-2895	48	84495	Reamer - Intake valve guide cylinder hole, hand expansion (.040" oversize). . . . .	1	-	-	-	-
WAGDO	R-2895	48	82764	Reamer - Intake valve guide cylinder hole, hand expansion (.005" oversize). . . . .	-	1	1	1	1
WAGEB	R-2895	48	80746	Reamer - Intake valve guide cylinder hole, hand expansion (.010" oversize). . . . .	-	1	1	1	1
WAGFI	R-2895	48	80849	Reamer - Intake valve guide cylinder hole, hand expansion (.020" oversize). . . . .	-	1	1	1	1
WAGHA	R-2895	48	81478	Reamer - Intake valve guide cylinder hole, hand expansion (.030" oversize). . . . .	-	1	1	1	1
WAGJU	R-2895	48	81480	Reamer - Intake valve guide cylinder hole, hand expansion (.040" oversize). . . . .	-	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6E	clone F	clone F-50	clone G	clone G-100
<b>CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>VALVE GUIDE REPLACEMENT (REAMING INTAKE AND EXHAUST VALVE GUIDE HOLES OVERSIZE IN CYLINDER) (WHIRLWIND AND CYCLONE) - Cont'd</b>									
WAGLT	R-2895	48	83008	Reamer - Exhaust valve guide cylinder hole, hand expansion (.005" oversize). . . . .	1	-	-	-	-
WAGNL	R-2895	48	83009	Reamer - Exhaust valve guide cylinder hole, hand expansion (.010" oversize). . . . .	1	-	-	-	-
WAGOM	R-2895	48	83011	Reamer - Exhaust valve guide cylinder hole, hand expansion (.020" oversize). . . . .	1	-	-	-	-
WAGPY	R-2895	48	83013	Reamer - Exhaust valve guide cylinder hole, hand expansion (.030" oversize). . . . .	1	-	-	-	-
WAGRS	R-2895	48	83015	Reamer - Exhaust valve guide cylinder hole, hand expansion (.040" oversize). . . . .	1	-	-	-	-
WAGTA	R-2895	48	83477	Reamer - Exhaust valve guide cylinder hole, hand expansion (.005" oversize). . . . .	-	1	1	1	1
WAGUD	R-2895	48	83478	Reamer - Exhaust valve guide cylinder hole, hand expansion (.010" oversize). . . . .	-	1	1	1	1
WAGVE	R-2895	48	83479	Reamer - Exhaust valve guide cylinder hole, hand expansion (.020" oversize). . . . .	-	1	1	1	1
WAGZI	R-2895	48	83480	Reamer - Exhaust valve guide cylinder hole, hand expansion (.030" oversize). . . . .	-	1	1	1	1
WAHAF	R-2895	48	83481	Reamer - Exhaust valve guide cylinder hole, hand expansion (.040" oversize). . . . .	-	1	1	1	1
WAHCY	R-2897	48	82048	Bushing - Intake valve guide cylinder hole, hand expansion oversize reamer, pilot. . . Used for early engines equipped with intake valve seats having an inside diameter of 2.719".	-	1	-	-	-
WAHEN	R-2897	48	82820	Bushing - Intake valve guide cylinder hole, hand expansion oversize reamer, pilot. . . Used for engines equipped with intake valve seats having a 7/32" wide valve seating surface and an I.D. of 2.375". This type seat is installed in late F, all F-50 and early G engines.	-	1	1	1	-
WAHGO	R-2897	48	83423	Bushing - Intake valve guide cylinder hole, hand expansion oversize reamer, pilot. . . Used for late G engines equipped with intake valve seats having a 1/8" wide valve seating surface and an I.D. of 2.50"; used for all G-100 engines.	-	-	-	1	1
WAHIR	R-2897	48	80741	Bushing - Intake valve guide cylinder hole, hand expansion oversize reamer, pilot. . .	1	-	-	-	-
WAHKU	R-2899	48	83005	Bushing - Exhaust valve guide cylinder hole, hand expansion reamer, pilot. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	-	-	-	-
WAHMA	R-2899	48	83474	Bushing - Exhaust valve guide cylinder hole, hand expansion reamer, pilot. . . . . Used for F engines equipped with steel exhaust valve seats; used for all F-50 engines; used for early G engines equipped with steel exhaust valve seats having an I.D. of 2.563". Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	-
WAHOP	R-2901	48	83475	Bushing - Exhaust valve guide cylinder hole, hand expansion reamer, pilot. . . . . Used for late G engines equipped with steel exhaust valve seats having an I.D. of 2.437"; used for all G-100 engines. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	-	-	1	1
WAHRE	R-2903	48	83006	Wrench - Intake and exhaust valve guide cylinder hole, hand expansion reamer, socket (11/32" & 1/2" square). . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd

RECONDITIONING - Cont'd

VALVE GUIDE REPLACEMENT (CHECKING VALVE GUIDE HOLES IN CYLINDER) (WHIRLWIND AND CYCLONE)

WAJBA	R-2910	48	80755	Gauge - Intake valve guide cylinder hole, limit plug (.005" oversize) . . . . .	1	-	-	-	-
WAJDE	R-2910	48	80108	Gauge - Intake valve guide cylinder hole, limit plug (.010" oversize) . . . . .	1	-	-	-	-
WAJFI	R-2910	48	84496	Gauge - Intake valve guide cylinder hole, limit plug (.020" oversize) . . . . .	1	-	-	-	-
WAJGO	R-2910	48	84497	Gauge - Intake valve guide cylinder hole, limit plug (.030" oversize) . . . . .	1	-	-	-	-
WAJHU	R-2910	48	84498	Gauge - Intake valve guide cylinder hole, limit plug (.040" oversize) . . . . .	1	-	-	-	-
WAJJA	R-2910	48	82765	Gauge - Intake valve guide cylinder hole, limit plug (.005" oversize) . . . . .	-	1	1	1	1
WAJLE	R-2910	48	80433	Gauge - Intake valve guide cylinder hole, limit plug (.010" oversize) . . . . .	-	1	1	1	1
WAJMI	R-2910	48	80851	Gauge - Intake valve guide cylinder hole, limit plug (.020" oversize) . . . . .	-	1	1	1	1
WAJOP	R-2910	48	81479	Gauge - Intake valve guide cylinder hole, limit plug (.030" oversize) . . . . .	-	1	1	1	1
WAJRU	R-2910	48	81481	Gauge - Intake valve guide cylinder hole, limit plug (.040" oversize) . . . . .	-	1	1	1	1
WAJST	R-2910	48	80756	Gauge - Exhaust valve guide cylinder hole, limit plug (.005" oversize) . . . . .	1	-	-	-	-
WAJUD	R-2910	48	80109	Gauge - Exhaust valve guide cylinder hole, limit plug (.010" oversize) . . . . .	1	-	-	-	-
WAJWO	R-2910	48	83016	Gauge - Exhaust valve guide cylinder hole, limit plug (.020" oversize) . . . . .	1	-	-	-	-
WAJYS	R-2910	48	83017	Gauge - Exhaust valve guide cylinder hole, limit plug (.030" oversize) . . . . .	1	-	-	-	-
WAKAN	R-2910	48	83018	Gauge - Exhaust valve guide cylinder hole, limit plug (.040" oversize) . . . . .	1	-	-	-	-
WAKCA	R-2910	48	82755	Gauge - Exhaust valve guide cylinder hole, limit plug (.005" oversize) . . . . .	-	1	1	1	1
WAKED	R-2910	48	80431	Gauge - Exhaust valve guide cylinder hole, limit plug (.010" oversize) . . . . .	-	1	1	1	1
WAKGA	R-2910	48	80852	Gauge - Exhaust valve guide cylinder hole, limit plug (.020" oversize) . . . . .	-	1	1	1	1
WAKID	R-2910	48	81473	Gauge - Exhaust valve guide cylinder hole, limit plug (.030" oversize) . . . . .	-	1	1	1	1
WAKKE	R-2910	48	81475	Gauge - Exhaust valve guide cylinder hole, limit plug (.040" oversize) . . . . .	-	1	1	1	1

VALVE GUIDE REPLACEMENT (INSTALLING NEW VALVE GUIDES AND REAMING VALVE STEM HOLES IN VALVE GUIDES TO SIZE) (WHIRLWIND AND CYCLONE)

WAMBE	R-2920	48	80430	Arbor - Intake valve guide installing . . . . .	1	1	1	1	1
WAMED	R-2920	48	80354	Arbor - Exhaust valve guide installing . . . . .	1	-	-	-	-
WAMGL	R-2920	48	82125	Arbor - Exhaust valve guide installing . . . . .	-	1	1	1	1
WAMHN	R-2922	48	80612	Reamer - Intake valve guide valve stem hole, hand expansion . . . . .	1	-	-	-	-
WAMJA	R-2922	48	80618	Reamer - Intake valve guide valve stem hole, hand expansion . . . . .	-	1	1	1	1
WAMLL	R-2924	48	83007	Reamer - Exhaust valve guide valve stem hole, hand expansion . . . . .	1	-	-	-	-
WAMNT	R-2924	48	83476	Reamer - Exhaust valve guide valve stem hole, hand expansion . . . . .	-	1	1	1	1
WAMPS	R-2924	48	84500	Reamer - Exhaust valve guide valve stem hole, hand expansion (.005" undersize) . . . . .	-	1	1	1	1
For use when the valve stems are ground .005" undersize.									
WAMRN	R-2926	48	83005	Bushing - Exhaust valve guide valve stem hole, hand expansion reamer, pilot . . . . .	1	-	-	-	-
Refer to Numerical Tool List for other sections of catalog in which this tool is listed.									

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**VALVE GUIDE REPLACEMENT (INSTALLING NEW VALVE GUIDES AND REAMING VALVE STEM HOLES IN VALVE GUIDES TO SIZE) (WHIRLWIND AND CYCLONE) - Cont'd**

WAMSE	R-2926	48	83474	Bushing - Exhaust valve guide valve stem hole, hand expansion reamer, pilot . . . . . Used for F engines equipped with steel exhaust valve seats; used for all F-50 engines; used for early G engines equipped with steel exhaust valve seats having an I.D. of 2.563". Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	-
WAMTI	R-2928	48	83475	Bushing - Exhaust valve guide valve stem hole, hand expansion reamer, pilot . . . . . Used for late G engines equipped with steel exhaust valve seats having an I.D. of 2.437"; used for all G-100 engines. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	-	-	1	1
WAMVO	R-2930	48	83169	Wrench - Intake valve guide valve stem hole, hand expansion reamer, socket (5/16" square) . . . . .	1	1	1	1	1
WAMWF	R-2932	48	83006	Wrench - Exhaust valve guide valve stem hole, hand expansion reamer, socket (11/32" & 1/2" square) . . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1

**VALVE GUIDE REPLACEMENT (CHECKING VALVE STEM HOLES IN VALVE GUIDES) (WHIRLWIND AND CYCLONE)**

WAOAB	R-2940	48	80604	Gauge - Intake valve guide valve stem hole, limit plug (.500" - .501" diameter) . . . . .	1	-	-	-	-
WAOCE	R-2940	48	80610	Gauge - Intake valve guide valve stem hole, limit plug (.4995" - .5005") . . . . .	-	1	1	1	1
WAOER	R-2940	48	80605	Gauge - Exhaust valve guide valve stem hole, limit plug (.625" - .626" diameter) . . . . .	1	-	-	-	-
WAOGI	R-2940	48	82641	Gauge - Exhaust valve guide valve stem hole, limit plug (.686" - .687") . . . . .	-	1	1	1	1
WAOIF	R-2940	48	84499	Gauge - Exhaust valve guide valve stem hole, limit plug (.005" underside) (.681" - .682") . . . . . For use when the valve stems are ground .005" undersize.	-	1	1	1	1

**SPARK PLUG COOLER AND SPARK PLUG INSERT REPLACEMENT (WHIRLWIND AND CYCLONE)**

WAPAV	R-2950	49	81360	Cutter - Spark plug cooler and insert, counterbore . . . . . Used for Whirlwind engines for removing detachable cooler and shoulder of insert in detachable cooler and for spotfacing cylinder for insert seat. Used for early Cyclone F engines equipped with cylinders having both the front and rear coolers integrally cast for removing shoulder of insert and spotfacing cylinder insert seat. Used for early Cyclone F engines equipped with cylinders having an integrally cast front cooler and detachable rear cooler for removing detachable cooler and shoulder of early inserts which have the shoulder raised slightly above the cylinder surface. Also used for spotfacing cylinder for these insert seats. Used for all engines for spotfacing the spark plug seat of insert.	1	1	1	1	1
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ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
<b>CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd</b>									
<b>RECONDITIONING - Cont'd</b>									
<b>SPARK PLUG COOLER AND SPARK PLUG INSERT REPLACEMENT (WHIRLWIND AND CYCLONE) - Cont'd</b>									
WAPCA	R-2952	49	82776	Cutter - Spark plug insert, counterbore . . . Used for all F-50, G and G-100 engines for removing shoulder of insert and spotfacing cylinder for insert seat. Used for F engines equipped with cylinders having an integrally cast front cooler and detachable rear cooler only for removing shoulder of late inserts which have the shoulder flush with the cylinder surface. Also used for spotfacing cylinder for these insert seats.	-	1	1	1	1
WAPEW	R-2954	49	83208	Cutter - Spark plug cooler spotfacing counterbore. . . . . Used for all Whirlwind engines; used for Cyclone engines equipped with detachable coolers for spotfacing spark plug cooler seat on cylinder. This cutter is also a detail of base and tools 82893, 83344, 83402, 83426 and 83584 listed on pages 705 and 706.	1	1	-	-	-
WAPGE	R-2956	49	81359	Cutter - Spark plug cooler and insert thread removing, counterbore. . . . .	1	1	1	1	1
WAPIX	R-2958	49	81362	Holder - Spark plug cooler and insert counterbore cutter, drill press. . . . . Used with cutters 81360, 82776 and 81359. This holder is also a detail of base and tools 82893, 83344, 83402, 83426 and 84366 listed on pages 705 and 706.	1	1	1	1	1
WAPKI	R-2960	49	83047	Holder - Spark plug cooler and insert counterbore cutter, hand turning . . . . . Used with cutters 83160, 82776, 83208 and 83048.	1	1	1	1	1
WARBO	R-2962	49	81363	Pilot and Nut - Spark plug cooler and insert, counterbore cutter . . . . . Used with cutters 81360, 82776 and 81359. This pilot and nut is also a detail of base and tools 82893 listed on page 705.	1	1	1	1	1
WARDU	R-2964	49	81356	Tap - Spark plug insert cylinder hole (1" - 14) standard size. . . . .	1	1	1	1	1
WARER	R-2964	49	81357	Tap - Spark plug insert cylinder hole (1" - 14) .015" oversize . . . . .	1	1	1	1	1
WARGY	R-2964	49	82567	Tap - Spark plug insert cylinder hole (1" - 14) .030" oversize . . . . .	1	1	1	1	1
WARIT	R-2966	49	83029	Pilot and Nut - Spark plug cooler and insert counterbore cutter, threaded (1" - 14) standard size. . . . . Used with cutters 81360, 82776 and 83208.	1	1	1	1	1
WARKA	R-2966	49	83031	Pilot and Nut - Spark plug cooler and insert counterbore cutter, threaded (1" - 14) .015" oversize . . . . . Used with cutters 81360, 82776 and 83208.	1	1	1	1	1
WASAF	R-2966	49	83032	Pilot and Nut - Spark plug cooler and insert counterbore cutter, threaded (1" - 14) .030" oversize . . . . . Used with cutters 81360, 82776 and 83208.	1	1	1	1	1
WASCE	R-2968	49	81328	Installing Tool - Spark plug cooler and insert . . . . .	1	1	1	1	1
WASEB	R-2970	49	81350	Jig - Spark plug cooler dowel hole, drill . .	1	1	-	-	-
WASGO	R-2971	49	81323	Jig - Spark plug insert dowel hole, drill . .	1	1	1	1	1
WASIZ	R-2973	49	81355	Tap - Spark plug insert spark plug hole (18 m/m - 1.5 m/m pitch) . . . . .	1	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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## CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd

## RECONDITIONING - Cont'd

## SPARK PLUG COOLER AND SPARK PLUG INSERT REPLACEMENT (WHIRLWIND AND CYCLONE) - Cont'd

WASKU	R-2975	49	81358	Bushing - Spark plug insert spark plug hole tap. . . . .	1	1	-	-	-
Used for all Whirlwind engines; used for Cyclone F engines equipped with detachable spark plug coolers.									
WASMI	R-2977	49	83048	Cutter - Spark plug cooler spark plug seat spotfacing, counterbore. . . . .	1	1	-	-	-
Used for all Whirlwind engines; used for Cyclone F engines equipped with detachable spark plug coolers.									
WASOS	R-2979	49	83049	Pilot and Nut - Spark plug cooler and insert spark plug seat spotfacing counterbore cutter, threaded (18 m/m - 1.5 m/m pitch). . . . .	1	1	1	1	1
Used with cutters 83048 and 81360.									
WASRA	R-2981	49	83514	Cutter - Spark plug insert and cooler insert back spotfacing, countersink (3/32" radius). . . . .	-	1	1	-	-
Used for late F and F-50 engines for back spotfacing inserts to blend with radius inside of cylinder head and to chamfer the thread end of the insert at the same time. Early F and F-50 engines were not back spotfaced.									
WASTY	R-2982	49	82793	Cutter - Spark plug insert back spotfacing, countersink (3/8" radius). . . . .	-	-	-	1	1
Used for back spotfacing insert to blend with radius inside of cylinder head and to chamfer the insert at the same time.									
WASVE	R-2984	49	82794	Pilot - Spark plug insert and cooler insert back spotfacing countersink cutter, drill press. . . . .	-	1	1	1	1
WASYL	R-2986	49	83861	Collar - Spark plug cooler insert back spotfacing countersink cutter, spacing . . . . .	-	1	-	-	-
Used with cutter 83514 for engines equipped with detachable spark plug coolers.									
WATBD	R-2986	49	82796	Collar - Spark plug insert back spotfacing countersink cutter, spacing. . . . .	-	1	1	1	1
Used with cutters 83514 and 82793 for back spotfacing spark plug inserts only.									
WATHN	R-2989	49	82487	Jig - Spark plug cooler thermocouple wire hole, drill. . . . .	1	1	-	-	-
WATJA	R-2991	49	82494	Chuck - Spark plug cooler thermocouple wire hole, drill. . . . .	1	1	-	-	-
WATLD	R-2993	49	82495	Drill - Spark plug cooler thermocouple wire hole (7/16" square) . . . . .	1	1	-	-	-
WATNY	R-2995	49	82491	Fixture - Spark plug cooler thermocouple wire hole spotfacing. . . . .	1	1	-	-	-
WATPT	R-2997	49	82493	Cutter - Spark plug cooler thermocouple wire hole spotfacing, counterbore . . . . .	1	1	-	-	-
WATSM	R-2998	49	83906	Punch - Cylinder base thermocouple wire retainer bushing staking . . . . .	1	1	1	1	1

## HONING CYLINDER BORES (WHIRLWIND AND CYCLONE)

WAVAZ	R-3010	50	83465	Fixture - Cylinder honing . . . . .	1	-	-	-	-
WAVCA	R-3012	50	83450	Fixture - Cylinder honing . . . . .	-	1	1	1	1
WAVEF	R-3014	50	84709	Guide - Cylinder hone . . . . .	1	-	-	-	-
WAVGE	R-3014	50	84710	Guide - Cylinder hone . . . . .	-	1	1	1	1
WAVIV	R-3016	50	800040	Head and Brake - Cylinder hone. . . . .	1	1	1	1	1
WAVKI	R-3018	50	800043	Body - Cylinder hone. . . . .	1	-	-	-	-

Includes one set (8) of holders 800045 and one set (8) of stone and shell assemblies 800047.

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cyclone F	Cyclone F-50	Cyclone G	Cyclone G-100
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**CYLINDER, INTAKE PIPE AND PISTON TOOLS - Cont'd**

**RECONDITIONING - Cont'd**

**HONING CYLINDER BORES (WHIRLWIND AND CYCLONE)  
- Cont'd**

WAVMU	R-3020	50	800042	Body - Cylinder hone. . . . . Includes one set (8) of holders 800044 and one set (8) of stone and shell assemblies 800046.	-	1	1	1	1
WAVOH			800045	Holder - Cylinder hone, stone . . . . . Detail of body 800043. Eight (8) required per set.	8	-	-	-	-
WAVRN			800044	Holder - Cylinder hone, stone . . . . . Detail of body 800042. Eight (8) required per set.	-	8	8	8	8
WAVTS			800050	Stone and Shell - Cylinder hone, roughing . . . . . Eight (8) required per set. Used with body 800043.	8	-	-	-	-
WAVUG			800049	Stone and Shell - Cylinder hone, roughing . . . . . Eight (8) required per set. Used with body 800042.	-	8	8	8	8
WAVYM			800047	Stone and Shell - Cylinder hone, finishing. . . . . Detail of body 800043. Eight (8) required per set.	8	-	-	-	-
WAVZO			800046	Stone and Shell - Cylinder hone, finishing. . . . . Detail of body 800042. Eight (8) required per set.	-	8	8	8	8

**CLEANING INSIDE GROOVE IN CYLINDER  
(WHIRLWIND AND CYCLONE)**

WAXBA	R-3035	50	84411	Gun - Cylinder inside groove cleaning . . . . . Used to remove carbon accumulation from groove in cylinder at section where head attaches to barrel.	1	1	1	1	1
WAXDS	R-3037	50	84525	Scraper - Cylinder inside groove cleaning . . . . .	1	-	-	-	-
WAXEP	R-3039	50	84524	Scraper - Cylinder inside groove cleaning . . . . .	-	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
<b>VALVE MECHANISM TOOLS</b>									
<b>DISASSEMBLY AND REASSEMBLY</b>									
WAZAK	R-3050	11	82775	Plug and Collars - Rocker arm roller bearing removing and installing, arbor press . . . . . Used for all F, F-50 and G engines; used only for G-100 engines equipped with bearing having the shoulder 1.58" on the outside diameter.	-	1	1	1	1
WAZCU	R-3051	11	83444	Plug and Collars - Rocker arm roller bearing removing and installing, arbor press . . . . . Used for engines equipped with bearing having the shoulder 1.843" on the outside diameter.	-	-	-	-	1
WAZED	R-3053	11	84957	Wrench - Rocker arm hub bolt nut, socket, 11/16" hex . . . . . *Used only for Navy G-133 engines.	1	1	1	1	*1
WAZGA	R-3054	11	800060	Wrench - Rocker arm hub bolt nut, socket, 7/8" hex . . . . . Not used for Navy G-133 engines. See 84957 above.	-	-	-	-	1
WAZIC	R-3056	11	81132	Wrench - Valve clearance adjusting screw. . . . . Included in engine tool kit.	1	1	1	1	1
WAZKE	R-3058	11	81900	Wrench - Valve clearance adjusting screw and rocker arm clamp screw . . . . . Included in engine tool kit.	1	1	1	1	1
WAZML	R-3060	11	80180	Gauge - Feeler (.010" & .070"). . . . . Included in engine tool kit. Used to adjust valve clearance and check valve timing.	1	-	-	-	-
WAZOX	R-3061	11	81405	Gauge - Feeler (.010" & .075"). . . . . Included in engine tool kit. Used to adjust valve clearance and check valve timing.	-	1	1	1	1
WAZRI	R-3062	11	82703	Removing Tool - Push rod. . . . . Attaches to valve clearance adjusting screw. Used to depress rocker arm when removing push rods.	1	1	1	1	1
WAZST	R-3064	11	83182	Assembling Tool - Push rod housing rubber oil seal . . . . . Used for early F-50 and G engines equipped with a rubber oil seal ring installed at the cylinder end of the push rod housing. Late engines have an aluminum push rod housing hose connection screwed into the cylinder head and therefore do not require this tool.	-	1	1	1	-
WAZUV	R-3066	11	84802	Puller - Valve tappet guide removing. . . . . Used for F and F-50 engines equipped with late type valve mechanism having the push rod housing hose connection integral with the valve tappet guide; used for all G and G-100 engines.	-	1	1	1	1
WAZWN	R-3068	11	80626	Wrench - Valve tappet packing nut, lug. . . . . Used only for early engines having the packing retained in the valve tappet retainer nut by means of a packing nut. This wrench is for use only when push rods and housings are removed from engine.	1	-	-	-	-
WAZYZ	R-3070	11	84522	Wrench - Valve tappet retainer nut, lug . . . . . Used for engines equipped with two piece push rod housing when push rods and housings are removed from engine. Used as an alternate to the wrench supplied in the engine tool kit.	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
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**VALVE MECHANISM TOOLS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

WEBAP	R-3072	11	84370	Wrench - Valve tappet retainer nut, socket, 1 1/8" hex . . . . . Used for engines equipped with one piece push rod housing when push rods and housings are removed from engine. Used as an alternate to the wrench supplied in the engine tool kit.	1	-	-	-	-
WEFCO	R-3074	11	81507	Wrench - Valve tappet retainer nut, crowfoot. Included in engine tool kit.	1	-	-	-	-
WEBEF	R-3076	11	81253	Extension - Valve tappet retainer nut, crow-foot wrench. . . . . Used with wrench 81507.	1	-	-	-	-
WEBGU	R-3078	11	83813	Installing Tool - Valve tappet circlet. . . .	-	1	1	1	1
WEBIB	R-3080	11	80262	Stand - Valve removing and installing, bench. Used in connection with valve spring compressor included in engine tool kit.	1	1	1	1	1
WEBKY	R-3082	11	81409	Compressor - Valve spring . . . . . Included in engine tool kit.	1	1	1	1	1

**INSPECTION**

WEDAB	R-3090	14	82998	Gauge - Intake valve. . . . . Used to check valve for minimum diameter of valve face when refacing and maximum amount of material which can be removed when refacing tip.	-	1	1	1	1
WEDCO	R-3092	14	82886	Gauge - Exhaust valve . . . . . Used to check valve for maximum permissible stretch, minimum diameter of valve face when refacing and maximum amount of material which can be removed when refacing tip.	1	-	-	-	-
WEDER	R-3094	14	82281	Gauge - Exhaust valve . . . . . Used to check valve for maximum permissible stretch, minimum diameter of valve face when refacing and maximum amount of material which can be removed when refacing tip.	-	1	1	1	1
WEDIC	R-3096	14	82880	Gauge - Valve clearance adjusting screw socket . . . . . Used for checking depth of socket in adjusting screw and valve tappet for maximum wear.	1	1	1	1	1

**RECONDITIONING**

**VALVE TAPPET GUIDE REPLACEMENT (WHIRLWIND)**

WEEBY	R-3100	48	81456	Reamer - Valve tappet guide crankcase hole, hand line, .010" oversize. . . . .	1	-	-	-	-
WEEFI	R-3102	48	81411	Bar - Valve tappet guide aligning . . . . . Used for inserting new guides.	1	-	-	-	-

**VALVE LAPPING (WHIRLWIND AND CYCLONE)**

WEEOB	R-3115	47	81515	Handle - Intake valve lapping . . . . .	1	1	1	1	1
WEESA	R-3115	47	82885	Handle - Exhaust valve lapping. . . . .	1	-	-	-	-
WEEUN	R-3115	47	81513	Handle - Exhaust valve lapping. . . . .	-	1	1	1	1

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	Whirl-	Cy-	Cy-	Cy-	Cy-
					wind J-6E	clone F	clone F-50	clone G	clone G-100

MAGNETO, SPARK PLUG, IGNITION WIRING AND TIMING TOOLS

DISASSEMBLY AND REASSEMBLY

WEGAT	R-3125	12	80133	Wrench - Magneto adjusting, with gauge. . . . . Included in engine tool kit. For use with VAG and MN type magnetos.	2	2	2	2	2
WEGCE	R-3127	12	84926	Wrench - Magneto drain plug, socket . . . . .	1	1	1	1	1
WEGEX	R-3129	4	80076	Wrench - Magneto gear and oil pump drive shaft front gear (30 teeth). . . . . Used to hold gear when removing or installing nut. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	-	-	-
WEGGY	R-3129	4	82676	Wrench - Magneto gear and oil pump drive shaft front gear (17 teeth). . . . . Used to hold gear when removing or installing nut. Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	-	1	1	1	1
WEGIC	R-3132	4	80736	Puller - Magneto gear and oil pump drive shaft front gear removing. . . . . Refer to Numerical Tool List for other sections of catalog in which this tool is listed.	1	1	1	1	1
WEGKU	R-3135	12	84449	Wrench - Spark plug, socket, 11/16" hex . . . . . Included in engine tool kit.	1	1	1	-	-
WEGLL	R-3136	12	84458	Wrench - Spark plug, socket, 7/8" hex . . . . . Included in engine tool kit for Army engines.	1	1	1	1	1
WEGNZ	R-3137	12	84450	Wrench - Spark plug, socket, 7/8" hex . . . . . Included in engine tool kit for Navy and Commercial engines.	1	1	1	1	1
WEGOR	R-3138	12	84414	Wrench - Spark plug, socket, 1" hex . . . . . Included in engine tool kit for Navy and Commercial engines.	1	1	1	1	1
WEGPI	R-3139	12	84457	Wrench - Spark plug, socket, 1" hex . . . . . Included in engine tool kit for Army engines.	1	1	1	1	1
WEGRA	R-3140	12	83204	Wrench - Spark plug disassembling and assembling, double handle box, 11/16" hex. . . . . Used for B.G. unfinned spark plugs.	1	1	1	-	-
WEGTS	R-3142	12	82881	Wrench - Spark plug disassembling and assembling, vise socket, 7/8" hex. . . . . Used with wrench 83203 for B.G. finned spark plugs.	1	1	1	1	1
WEGUL	R-3143	12	83203	Wrench - Spark plug disassembling and assembling, double handle box, 1" hex. . . . . Used with wrench 82881 for B.G. finned spark plugs.	1	1	1	1	1
WEGWT	R-3145	12	84639	Gap and Form Tool - Spark plug electrode (For B.G. spark plugs). . . . .	1	1	1	1	1
WEHBM	R-3147	12	84275	Pliers - Radio-shielded ignition wiring harness coupling nut, copper lined . . . . .	1	1	1	1	1
WEHFE	R-3149	12	82831	Disc - Timing . . . . . Slides over front end of crankshaft. Used for R-760 engines equipped with S.A.E. No. 20 propeller hub spline crankshaft. Also used as crankshaft turning tool when removing and installing cylinders.	1	-	-	-	-

ENGINE MODEL AND QUANTITY REQUIRED

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirlwind J-6E	Cy-clone F	Cy-clone F-50	Cy-clone G	Cy-clone G-100
WEHJI	R-3150	12	80412	Disc - Timing . . . . . Slides over front end of crankshaft. Used for engines equipped with S.A.E. No. 30 propeller hub spline crankshaft. Also used as crankshaft turning tool when removing and installing cylinders.	1	-	-	-	-
WEHLF	R-3151	12	80293	Disc - Timing . . . . . Slides over front end of crankshaft. Used for direct drive engines. Also used on direct drive engines as crankshaft turning tool when removing and installing cylinders.	-	1	1	1	-
WEHNO	R-3153	12	83517	Disc - Timing . . . . . Attaches to supercharger rear cover. Used for 16:11 and 3:2 reduction geared engines.	-	1	1	1	1
WEHPN	R-3155	12	80414	Pointer - Timing disc . . . . .	1	-	-	-	-
WEHRB	R-3157	12	81954	Pointer - Timing disc . . . . . Used for direct drive engines equipped with crankcase front cover having thrust bearing nut hole measuring 4.145" in diameter.	-	1	-	-	-
WEHTS	R-3157	12	84515	Pointer - Timing disc . . . . . Used for direct drive F engines equipped with crankcase front cover having thrust bearing nut hole measuring 4.562" in diameter; used for direct drive F-50 engines equipped with crankcase front section not having provision for governor drive.	-	1	1	-	-
WEIAN	R-3158	12	84511	Pointer - Timing disc . . . . . Used with timing disc 80293 and spacer 84516. Used for direct drive engines equipped with crankcase front section having provision for governor drive.	-	-	1	1	-
WEICA	R-3160	12	83530	Adapter - Timing disc . . . . . Used with timing disc 83517 for 16:11 reduction geared engines equipped with the non-detachable starter jaw type accessory drive and starter shaft having three slots in addition to the three starter jaw teeth.	-	1	-	-	-
WEIET	R-3161	12	83531	Adapter - Timing disc . . . . . Used with timing disc 83517 for F 16:11 reduction geared engines equipped with the three tooth non-detachable starter jaw type accessory drive and starter shaft which does not have slots between the starter jaw teeth. Used with timing disc 83517 for F-50, G and G-100 16:11 and 3:2 reduction geared engines equipped with either the three or twelve tooth non-detachable starter jaw type shafts.	-	1	1	1	1
WEIGE	R-3161	12	83533	Adapter - Timing disc . . . . . Used with timing disc 83517 for engines equipped with detachable starter jaw type accessory drive and starter shaft having a three starter jaw tooth coupling.	-	1	1	1	1
WEIID	R-3163	12	83532	Adapter - Timing disc . . . . . Used with timing disc 83517 for engines equipped with detachable starter jaw type accessory drive and starter shaft having a twelve starter jaw tooth coupling.	-	1	1	1	1

Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100

**MAGNETO, SPARK PLUG, IGNITION WIRING AND TIMING TOOLS - Cont'd**

**DISASSEMBLY AND REASSEMBLY - Cont'd**

WEILB	R-3165	12	84516	Spacer - Timing disc. . . . . Used with timing disc 80293. Used for direct drive engines.	-	1	1	1	-
WEINI	R-3167	6,12	80292	Handle - Timing disc bar. . . . . One handle is required for timing disc 80412 and 82831 and two are required for timing disc 80293. Refer to Numerical Tool List for other sec- tions of catalog in which this tool is listed.	1	2	2	2	-
WEIOF	R-3169	12	80932	Indicator - Top dead center . . . . .	1	1	1	1	1



Code Word	Ref. No.	Fig. No.	Tool No.	Description of Tool	ENGINE MODEL AND QUANTITY REQUIRED				
					Whirl- wind J-6E	Cy- clone F	Cy- clone F-50	Cy- clone G	Cy- clone G-100

MISCELLANEOUS

DISASSEMBLY AND REASSEMBLY

WEKAB	R-3180	12	81680	Screw Driver - Carburetor jet . . . . . Included in engine tool kit.	1	1	1	1	1
WEKCA	R-3182	12	80376	Wrench - Carburetor adapter and hot spot connection nut, lug (for 5/16" and 3/8" slotted nuts). . . . . Used on Whirlwind rear exhaust engines for the 5/16" - 24 slotted nuts which attach the hot spot connection flange to the exhaust elbow. Used on Cyclone engines for the 5/16" - 24 or 3/8" - 24 slotted nuts which attach the Bendix Stromberg carburetor adapter to the supercharger rear housing.	1	1	1	1	1
WEKEN	R-3184	12	84920	Removing and Installing Tool - Exhaust manifold clamp spring. . . . . Used for engines equipped with Pollak seg- mental type exhaust manifold.	1	-	-	-	-
WEKGE	R-3186	12	84513	Wrench - Priming tube elbow, socket . . . . . Used for elbows for 1/8" O.D. priming tube.	1	1	1	1	1
WEKIP	R-3188	12	84521	Wrench - Priming tube elbow, socket . . . . . Used for elbows for 1/4" O.D. priming tube.	1	1	1	1	1
WEKKS	R-3190	12	82848	Wrench - Gun synchronizer cam adjustment. . . Included in engine tool kit only when engine is equipped with gun synchronizer.	-	1	1	1	1
WEKMI	R-3192	12	82199	Wrench - Fuel pump packing gland, lug . . . . . Used for engines equipped with W.A.C.-3 or W.A.C.-5 fuel pumps or Romec cork seal type fuel pumps.	1	1	1	1	-
WEKOW	R-3194	12	84654	Wrench - Starter and generator attaching nut, box (9/16" hex.) . . . . .	1	1	1	1	1
WEKRY	R-3196	12	84922	Wrench - Torque . . . . .	1	1	1	1	1

NUMERICAL TOOL LIST

Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
80076	Wrench. . . . .	{ 201	VEHKO	80756	Gauge . . . . .	813	WAJST
		1001	WEGEX	80762	Plug and Collars. . . . .	704	VUIED
80108	Gauge . . . . .	813	WAJDE	80763	Plug and Collars. . . . .	704	VUICE
80109	Gauge . . . . .	813	WAJUD	80799	Plug and Collar . . . . .	702	VUDTO
80124	Clamp . . . . .	803	VUTAP	80849	Reamer. . . . .	811	WAGFI
		{ 101	VAAGI	80851	Gauge . . . . .	813	WAJMI
80131	Eye . . . . .	601	VOJCO	80852	Gauge . . . . .	813	WAKGA
80133	Wrench. . . . .	1001	WEGAT	80932	Indicator . . . . .	1003	WEIOF
80171	Wrench. . . . .	802	VUSCA	81014	Puller. . . . .	105	VAHBE
80180	Gauge . . . . .	901	WAZML	81132	Wrench. . . . .	901	WAZIC
80196	Wrench. . . . .	604	VOMCO	81171	Puller. . . . .	807	VYFOL
80198	Extension . . . . .	604	VOMIB	81172	Installing Tool . . . . .	806	VYFAB
80262	Stand . . . . .	902	WEBIB	81173	Installing Tool . . . . .	806	VYFDI
		{ 601	VOJOC	81174	Handle. . . . .	807	VYFFN
80292	Handle. . . . .	1003	WEINI	81253	Extension . . . . .	902	WEBEF
80293	Disc. . . . .	1002	WEHLF	81256	Gauge . . . . .	701	VUBUK
80309	Wrench. . . . .	604	VOMGU	81257	Gauge . . . . .	702	VUDCA
80336	Bar . . . . .	605	VONDF	81323	Jig . . . . .	815	WASGO
80350	Puller. . . . .	401	VEYMO	81328	Installing Tool . . . . .	815	WASCE
80351	Wrench. . . . .	301	VELAN	81350	Jig . . . . .	815	WASEB
80354	Arbor . . . . .	813	WAMED	81355	Tap . . . . .	815	WASIZ
80372	Wrench. . . . .	602	VOKIC	81356	Tap . . . . .	815	WARDU
80376	Wrench. . . . .	2101	WEKCA	81357	Tap . . . . .	815	WARER
80391	Stand . . . . .	101	VAABO	81358	Bushing . . . . .	816	WASKU
80392	Wedge . . . . .	604	VOMKY	81359	Cutter. . . . .	815	WAPGE
	Use 801039 for Whirlwind engines. Use 1 each of 84765 and 84699 for Cyclone engines.			81360	Cutter. . . . .	814	WAPAV
				81362	Holder. . . . .	815	WAPIX
				81363	Pilot and Nut . . . . .	815	WARBO
				81402	Wrench. . . . .	607	VORMN
					Use 801497 for Cyclone G100 engines.		
80402	Driver. . . . .	106	VALMI	81405	Gauge . . . . .	901	WAZOX
80403	Driver. . . . .	106	VALOP	81409	Compressor. . . . .	902	WEBKY
80404	Driver. . . . .	106	VALRU	81411	Bar . . . . .	902	WEEFI
80409	Wrench. . . . .	604	VOLUX	81456	Reamer. . . . .	902	WEEBY
80412	Disc. . . . .	1002	WEHJI	81473	Gauge . . . . .	813	WAKID
80414	Pointer . . . . .	1002	WEHPN	81475	Gauge . . . . .	813	WAKKE
80430	Arbor . . . . .	813	WAMBE		No longer supplied.		
80431	Gauge . . . . .	813	WAKED	81478	Reamer. . . . .	811	WAGHA
80433	Gauge . . . . .	813	WAJLE	81479	Gauge . . . . .	813	WAJOP
80440	Clamp . . . . .	803	VUTCO	81480	Reamer. . . . .	811	WAGJU
		{ 106	VALST		No longer supplied.		
80442	Driver. . . . .	110	VATYL	81481	Gauge . . . . .	813	WAJRU
80443	Bar . . . . .	605	VONID		No longer supplied.		
80449	Wrench. . . . .	802	VURWO	81493	Boring Tool . . . . .	804	VUZED
80457	Wrench. . . . .	401	VEZDT	81495	Boring Tool . . . . .	805	VUZGE
		{ 101	VAAHA	81497	Boring Tool . . . . .	805	VUZIL
80601	Eye . . . . .	601	VOJGY	81507	Wrench. . . . .	902	WEBCO
80602	Gauge . . . . .	804	VUWUM	81513	Handle. . . . .	902	WEEUN
80603	Gauge . . . . .	804	VUWWP	81515	Handle. . . . .	902	WEEOB
80604	Gauge . . . . .	814	WAOAB	81599	Cutting Tool. . . . .	202	VEJAT
80605	Gauge . . . . .	814	WAOER	81680	Screw Driver. . . . .	2101	WEKAB
80610	Gauge . . . . .	814	WAOCE	81686	Installing Tool . . . . .	806	VYFFE
80612	Reamer. . . . .	813	WAMHN	81691	Installing Tool . . . . .	807	VYFJO
80618	Reamer. . . . .	813	WAMJA	81752	Removing and Installing Tool. . . . .	803	VUTEF
	Use 1 each of 800339 reamer and 800569 bushing for Cyclone F engines equipped with straight bore valve seat. Use 800339 reamer and 800569 bushing for Cyclone F, F50, G engines with spherical valve seat bore and valve seat having a minimum I.D. of 2.370". Use 800339 reamer and 800335 bushing for Cyclone G, G100 engines equipped with spherical valve seat bore and valve seat having a minimum I.D. of 2.248".			81779	Wrench. . . . .	402	VEZHB
80626	Wrench. . . . .	901	WAZWN	81897	Wrench. . . . .	401	VEYIL
80634	Wrench. . . . .	604	VOMMA	81900	Wrench. . . . .	901	WAZKE
80651	Puller. . . . .	604	VOLTL	81901	Arbor . . . . .	607	VORST
		{ 201	VEHOB	81902	Wrench. . . . .	604	VOMRE
80736	Puller. . . . .	1001	WEGIC	81905	Remover . . . . .	{ 106	VAHVE
80741	Bushing . . . . .	812	WAHIR			107	VAPAB
80742	Reamer. . . . .	811	WAFUM	81910	Arbor . . . . .	607	VORPY
80746	Reamer. . . . .	811	WAGEB	81952	Mandrel . . . . .	402	VIAD E
80753	Reamer. . . . .	811	WAFWA	81953	Turning Tool. . . . .	501	VIJBY
80755	Gauge . . . . .	813	WAJBA	81954	Pointer . . . . .	1002	WEHRB
				81972	Locking Tool. . . . .	401	VEYXF
				82015	Locking Tool. . . . .	401	VEYAB
				82030	Locking Tool. . . . .	401	VEXWN
				82031	Locking Tool. . . . .	401	VEYED
				82042	Gauge . . . . .	702	VUBNU
				82043	Gauge . . . . .	702	VUDEN
				82047	Wrench. . . . .	201	VEHSA
				82048	Bushing . . . . .	812	WAHGY
				82058	Wrench. . . . .	104	VACMI
				82065	Wrench. . . . .	607	VOREM
				82095	Puller. . . . .	103	VABRU
					Use 800581.		

NUMERICAL TOOL LIST - Cont'd

Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
82099	Plate . . . . .	101	VAADE	82539	Cutter. . . . .	807	VYIME
82125	Arbor . . . . .	813	WAMGL	82540	Cutter. . . . .	807	VYIGT
82128	Wrench. . . . .	502	VIJWL	82542	Cutter. . . . .	808	VYIVL
82129	Wrench. . . . .	502	VIJRI	82544	Cutter. . . . .	808	VYIUB
82146	Wrench. . . . .	701	VUBET	82546	Cutter. . . . .	807	VYIKA
82147	Wrench. . . . .	201	VEHFI	82547	Cutter. . . . .	807	VYIEJ
82151	Eye . . . . .	601	VOJID	82551	Cutter. . . . .	807	VYIIV
82195	Wrench. . . . .	602	VOKEB	82552	Cutter. . . . .	807	VYIAC
82196	Wrench. . . . .	605	VOMUG	82556	Cutter. . . . .	807	VYIOW
82197	Arbor . . . . .	607	VORUR	82567	Tap . . . . .	815	WARGY
82198	Plug. . . . .	301	VEPIV	82571	Puller. . . . .	606	VOPMA
82199	Wrench. . . . .	2101	WEKMI		Use 1 of 84857 puller, and 3 of 84858 adapter.		
82200	Measuring Tool. . . . .	605	VONBN				
82202	Bar . . . . .	501	VIJJO	82606	Roller. . . . .	704	VUGPN
82203	Plug. . . . .	302	VEPRL	82614	Adapter . . . . .	803	VUVIK
82204	Collar. . . . .	301	VEPEW	82635	Wrench. . . . .	605	VOMYL
82206	Fixture and Tools . . . . .	113	VEFAB	82641	Gauge . . . . .	814	WAOGI
82258	Stand . . . . .	606	VOPTI			103	VABTI
82267	Wrench. . . . .	401	VEYKI	82649	Puller. . . . .	603	VOLCA
82273	Fixture . . . . .	402	VICBY	82657	Puller. . . . .	602	VOKUK
82281	Gauge . . . . .	902	WEDER	82658	Rollers . . . . .	607	VOTAL
82284	Turning Tool. . . . .	606	VOODE	82659	Cutter, Pilot and Nut . . . . .	811	WAFCA
82291	Cutter, Pilot and Nut . . . . .	811	WAFEF		Use 80347 puller for removing steel exhaust valve guides.		
82292	Cutter, Pilot and Nut . . . . .	811	WAFAD				
82297	Holder. . . . .	811	WAFGE				
82310	Stand . . . . .	803	VUVEG	82664	Gauge . . . . .	804	VUWYS
82311	Locking Tool. . . . .	606	VOPUG	82666	Turning Tool. . . . .	601	VOJKA
82341	Fixture . . . . .	804	VUYLY	82670	Wrench. . . . .	606	VOOLY
82342	Adapter . . . . .	804	VUYOG	82672	Wheel . . . . .	809	WAARU
82346	Stand . . . . .	803	VUVAF		Use 800606.		
82355	Boring Tool . . . . .	702	VUEMO	82676	Wrench. . . . .	201	VEHMU
	Use 1 each of 82636 boring tool, 82637 tool bit and 82638 tool bit.					1001	WEGGY
82356	Fixture . . . . .	702	VUEGE	82683	Puller. . . . .	102	VABJA
82359	Plug. . . . .	402	VICEV			603	VOLBY
82360	Plug. . . . .	403	VICIG	82687	Fixture . . . . .	110	VANUY
82361	Bar . . . . .	403	VICOL	82688	Reamer. . . . .	111	VAXEB
82363	Fixture . . . . .	401	VEZFN	82703	Removing Tool . . . . .	901	WAZRI
		506	VITOP	82713	Plug and Wrench . . . . .	703	VUGJI
82364	Gauge . . . . .	507	VIWHL	82714	Puller. . . . .	606	VOPOD
		508	VIYST	82738	Gauge . . . . .	809	WAAUL
82365	Reamer. . . . .	302	VERBA	82741	Cutter. . . . .	806	VYBNU
82368	Fixture . . . . .	301	VEPAY	82750	Wrench. . . . .	801	VUPKU
82370	Reamer. . . . .	302	VEPAY	82755	Gauge . . . . .	813	WAKCA
82371	Gauge . . . . .	403	VEPNI	82758	Gauge . . . . .	806	VYCCO
82373	Gauge . . . . .	507	VIWLT	82760	Plug. . . . .	113	VEFER
82374	Punch . . . . .	503	VIMCA	82761	Base. . . . .	113	VEFCI
82376	Fixture . . . . .	503	VIMAB	82762	Broach. . . . .	113	VEFKA
82377	Fixture . . . . .	504	VIODO	82764	Reamer. . . . .	811	WAGDO
82378	Plug. . . . .	504	VIOBY	82765	Gauge . . . . .	813	WAJJA
82380	Broach. . . . .	505	VIOJE	82766	Cutter. . . . .	806	VYBUB
82394	Installing Tool . . . . .	802	VUSML	82787	Cutter. . . . .	806	VYBWA
82435	Gauge . . . . .	609	VOYFE	82788	Cutter. . . . .	806	VYCAN
82445	Wrench. . . . .	502	VIJNG	82775	Plug and Collars. . . . .	901	WAZAK
82454	Removing Tool . . . . .	802	VUSKE	82776	Cutter. . . . .	815	WAPCA
82475	Reamer. . . . .	504	VIOEN	82793	Cutter. . . . .	816	WASTY
82485	Punch Set . . . . .	704	VUIGA	82794	Pilot . . . . .	816	WASVE
82486	Reamer. . . . .	111	VEBAK	82796	Collar. . . . .	816	WATBD
82487	Jig . . . . .	816	WATHN	82802	Roller. . . . .	704	VUGRB
82488	Gauge . . . . .	505	VIOLA	82809	Turning Tool. . . . .	501	VIJDA
82489	Spinning Tool . . . . .	704	VUGLF			505	VIRMA
82491	Fixture . . . . .	816	WATNY			507	VIWJO
82493	Cutter. . . . .	816	WATPT			509	VOBRI
82494	Chuck . . . . .	816	WATJA	82811	Gauge . . . . .	505	VIROF
82495	Drill . . . . .	816	WATLD			507	VIWUG
		806	VYDHU	82812	Wrench. . . . .	607	VORGO
82518	Box . . . . .	808	WAAEB	82813	Plug. . . . .	404	VIGAW
		806	VYCEG	82814	Gauge . . . . .	702	VUECZ
82519	Handle. . . . .	808	VYIXU	82815	Spinning Tool . . . . .	704	VUGNO
		806	VYCGH	82820	Bushing . . . . .	812	WAHEN
82522	Jack. . . . .	806	VYIZY	82831	Disc. . . . .	1001	WEHFE
		808	VYICZ	82839	Wrench. . . . .	801	VUPIR
82531	Pilot . . . . .	806	VYCIC	82844	Wrench. . . . .	801	VUPEN
		808	WABBA	82848	Wrench. . . . .	2101	WEKKS
82532	Pilot . . . . .	806	VYDBE	82860	Wrench. . . . .	801	VUOWE
		808	WAAAE	82880	Gauge . . . . .	902	WEDIC
82535	Bushing . . . . .	806	WYDDI	82881	Wrench. . . . .	1001	WEGTS
		808	WAAADI		Use 801211.		
82536	Bushing . . . . .	806	VYDFO	82883	Wrench. . . . .	801	VUPAF
				82885	Handle. . . . .	902	WEESA

NUMERICAL TOOL LIST - Cont'd

Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
82886	Gauge . . . . .	902	WEDCO	83062	Gauge . . . . .	609	VOWOR
82887	Puller . . . . .	102	VABHY	83063	Stop . . . . .	608	VOWCE
	Use 801088.			83065	Bar . . . . .	608	VOWKU
82889	Wrench . . . . .	606	VOOFI	83085	Fixture . . . . .	108	VARCA
82893	Base and Tools . . . . .	705	VUIOX	83087	Holder . . . . .	108	VAREW
82895	Fixture . . . . .	114	VEFPT	83088	Tap . . . . .	108	VARGE
82896	Reamer . . . . .	114	VEFRN	83089	Tap . . . . .	108	VASDU
82897	Cutter . . . . .	114	VEFUR	83090	Tap . . . . .	109	VASER
82898	Gauge . . . . .	114	VEFWM	83115	Grinder . . . . .	810	WACAB
82899	Gauge . . . . .	114	VEFYL	83117	Plate . . . . .	810	WACCE
82902	Wrench . . . . .	602	VOJWL	83120	Wheel . . . . .	810	WACIP
82904	Wrench . . . . .	604	VOLRY	83121	Wheel . . . . .	810	WACKE
82905	Wrench . . . . .	501	VIJIP	83130	Wrench . . . . .	801	VUOZI
82906	Removing and Installing Tool . . . . .	201	VEHBY	83131	Wrench . . . . .	801	VUOGO
82907	Puller . . . . .	604	VOMOD	83133	Fixture . . . . .	510	VOFNE
82913	Wrench . . . . .	503	VIKVV	83134	Plug and Collar . . . . .	510	VOFIV
82914	Wrench . . . . .	503	VIKUV	83135	Puller . . . . .	510	VOFJR
82929	Plug . . . . .	703	VUGAY	83136	Plug . . . . .	510	VOFLP
82932	Wrench . . . . .	601	VOJSR	83137	Gauge . . . . .	510	VOFUF
82933	Wrench . . . . .	602	VOJTU	83138	Gauge . . . . .	510	VOFPA
82934	Wrench . . . . .	602	VOJUG	83139	Gauge . . . . .	510	VOFRI
82946	Plug and Base . . . . .	504	VIOHU	83140	Gauge . . . . .	510	VOFCS
82949	Gauge . . . . .	404	VIGCO	83143	Tap . . . . .	109	VATRA
82952	Locking Tool . . . . .	401	VEYCA		Use 800479.		
82953	Puller . . . . .	103	VABUL	33144	Tap . . . . .	110	VATTY
		602	VOKOX	83146	Fixture . . . . .	503	VIMGE
82954	Adapter . . . . .	804	VUYPN		Use 83711.		
82955	Fixture . . . . .	804	VUYND	83168	Fixture and Tools . . . . .	510	VOHAZ
82971	Puller . . . . .	502	VIKCA	83169	Wrench . . . . .	814	WAMVO
82972	Wrench . . . . .	201	VEHUN	83182	Assembling Tool . . . . .	901	WAZST
82973	Wrench . . . . .	802	VUSAN	83185	Gauge . . . . .	708	WULTI
82981	Cutter . . . . .	704	VUIKE	83186	Stand . . . . .	102	VABFO
82982	Plug and Collars . . . . .	509	VOFEW	83187	Stand . . . . .	104	VACKE
82983	Broach . . . . .	509	VOFFO	83188	Lap . . . . .	504	VIMIL
82984	Gauge . . . . .	510	VOFHU	83203	Wrench . . . . .	1001	WEGUL
82990	Wheel . . . . .	809	WAAJA	83204	Wrench . . . . .	1001	WEGRA
82991	Gauge . . . . .	809	WAATI	83205	Fixture . . . . .	708	VULPT
82993	Cutter . . . . .	806	VYAOF	83207	Wrench . . . . .	801	VUPCY
82994	Cutter . . . . .	806	VYARI	83208	Cutter . . . . .	815	WAFEW
82998	Gauge . . . . .	902	WEDAB	83219	Punch . . . . .	301	VEMUV
83005	Bushing . . . . .	812	WAHCU	83220	Fixture . . . . .	301	VEMTO
		813	WAMRN	83243	Removing Tool . . . . .	803	VUSYN
		812	WAHRE	83269	Gauge . . . . .	702	VUCAB
83006	Wrench . . . . .	814	WAMWF	83285	Sling . . . . .	102	VABBE
		813	WAMLL	83287	Sling . . . . .	102	VABCY
83007	Reamer . . . . .	812	WAGLT	83291	Sling . . . . .	101	VAAJY
83008	Reamer . . . . .	812	WAGNL	83297	Sling . . . . .	102	VABEM
83009	Reamer . . . . .	812	WAGOM	83308	Locking Tool . . . . .	607	VOFYL
83011	Reamer . . . . .	812	WAGOP	83309	Spindle . . . . .	810	WACRU
83013	Reamer . . . . .	812	WAGPY	83310	Spindle . . . . .	810	WACTT
83015	Reamer . . . . .	812	WAGRS	83317	Sleeve . . . . .	811	WACZE
83016	Gauge . . . . .	813	WAWJO	83318	Sleeve . . . . .	811	WADWG
83017	Gauge . . . . .	813	WAWYS	83319	Sleeve . . . . .	811	WADAF
83018	Gauge . . . . .	813	WAKAN	83320	Sleeve . . . . .	811	WADFI
83019	Plug and Collar . . . . .	403	VIFBY	83321	Sleeve . . . . .	811	WADBA
83023	Gauge . . . . .	404	VIFIF	83322	Sleeve . . . . .	811	WADHO
83029	Pilot and Nut . . . . .	815	WARIT	83323	Sleeve . . . . .	811	WADDE
83031	Pilot and Nut . . . . .	815	WARKA	83324	Sleeve . . . . .	811	WADIK
83032	Pilot and Nut . . . . .	815	WASAF	83337	Gauge . . . . .	811	WADJU
83043	Reamer and Bushing . . . . .	111	VAZBA	83338	Gauge . . . . .	811	WADLM
83045	Plug and Collar . . . . .	702	VUDUV	83343	Base and Tools . . . . .	701	VUBNI
83047	Holder . . . . .	815	WAPKI	83344	Base and Tools . . . . .	705	VUIPO
83048	Cutter . . . . .	816	WASMI	83353	Installing Tool . . . . .	807	VYFHA
83049	Pilot and Nut . . . . .	816	WASOS	83354	Installing Tool . . . . .	807	VYFGU
83051	Reamer . . . . .	112	VEDUR	83355	Installing Tool . . . . .	807	VYFMY
83052	Gauge . . . . .	112	VEDYM	83356	Plug . . . . .	403	VICFO
83053	Puller . . . . .	105	VAFMU	83357	Plug . . . . .	403	VICJA
83054	Broach . . . . .	105	VAFRY	83362	Diamond . . . . .	810	WACMI
83055	Gauge . . . . .	105	VAFYA	83363	Belts . . . . .	810	WACOX
83056	Cutter . . . . .	105	VAFYG	83379	Base and Tools . . . . .	701	VUBRO
83057	Gauge . . . . .	105	VAFGE	83381	Wrench . . . . .	104	VACIP
83058	Bushing . . . . .	105	VAFCA	83396	Fixture . . . . .	702	VUEKY
83059	Reamer . . . . .	105	VAFEF	83397	Scraper . . . . .	708	VULRU
83060	Gauge . . . . .	105	VAFKI	83402	Base and Tools . . . . .	705	VUIRU
83061	Puller . . . . .	105	VAFAD	83423	Bushing . . . . .	812	WAHGO
	Use 800879 to install governor drive worm shaft bushing, part number 63710.			83426	Base and Tools . . . . .	706	VUITT
				83431	Fixture and Tools . . . . .	707	VULBA
				83432	Fixture and Tools . . . . .	707	VULFE
				83433	Fixture and Tools . . . . .	707	VULHN

## NUMERICAL TOOL LIST - Cont'd

Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
83444	Plug and Collars. . . . .	901	WAZCU	83576	Bar . . . . .	605	VONKU
83445	Stop. . . . .	608	VOWEX	83577	Bar . . . . .	605	VONOK
83447	Gauge . . . . .	609	VOWTI	83578	Puller. . . . .	105	VAFOL
83448	Bar . . . . .	608	VOWLL	83581	Tap . . . . .	109	VASIT
83450	Fixture . . . . .	816	WAVCA	83582	Tap . . . . .	108	VARKI
83452	Stand and Tools . . . . .	805	VUZTU	83583	Punch . . . . .	702	VUDYE
83453	Drift . . . . .	805	VUZVA	83584	Base and Tools. . . . .	706	VUIUP
83454	Drift and Gauge . . . . .	805	VUZVI				
83455	Drift and Gauge . . . . .	805	VUZYL	83595	Puller. . . . .	102	VABIB
83458	Stop. . . . .	608	VOWAT			602	VOKBA
83461	Gauge . . . . .	608	VOWNZ	83596	Plate . . . . .	701	VUBAN
83462	Bar . . . . .	608	VOWGY	83597	Reamer. . . . .	109	VATAF
83463	Bar . . . . .	608	VOWIC	83598	Reamer. . . . .	109	VATGO
83465	Fixture . . . . .	816	WAVAZ	83639	Tap . . . . .	104	VAEFE
83466	Cutter. . . . .	807	VYIRI	83648	Puller. . . . .	103	VABLI
83467	Cutter. . . . .	808	VYITS	83652	Tap . . . . .	110	VATVE
83472	Wrench. . . . .	201	VEHDE	83653	Holder. . . . .	109	VATOS
83473	Boring Tool . . . . .	805	VUZMO	83654	Fixture . . . . .	109	VATMI
83474	Bushing . . . . .	812	WAHMA	83656	Bar . . . . .	501	VIJLS
		814	WAMSE	83660	Wrench. . . . .	201	VEHEL
83475	Bushing . . . . .	812	WAHOP		Use 801312.		
		814	WAMTI	83667	Wrench. . . . .	502	VIJYF
83476	Reamer. . . . .	813	WAMPT	83678	Stand . . . . .	101	VACU
83477	Reamer. . . . .	812	WAGTA	83679	Plate . . . . .	101	VAAEN
83478	Reamer. . . . .	812	WAGUD	83683	Jig . . . . .	301	VEMGE
83479	Reamer. . . . .	812	WAGVE	83711	Fixture . . . . .	503	VIMED
83480	Reamer. . . . .	812	WAGZI	83714	Puller. . . . .	701	VUBCA
83481	Reamer. . . . .	812	WAHAF	83719	Attachments . . . . .	810	WACED
83500	Adapter . . . . .	706	VUIWA	83720	Attachments . . . . .	810	WACGA
83501	Adapter . . . . .	706	VUIZE	83721	Sleeve. . . . .	810	WACUM
83502	Adapter . . . . .	706	VUJAF	83722	Sleeve. . . . .	811	WACVA
83503	Adapter . . . . .	706	VUJBA	83723	Draw Bars . . . . .	810	WACPO
83504	Adapter . . . . .	707	VUJDE	83749	Stand . . . . .	603	VOLGM
83505	Adapter . . . . .	707	VUJEG	83750	Adapter . . . . .	603	VOLHE
83506	Adapter . . . . .	707	VUJFI	83751	Adapter . . . . .	603	VOLJT
83513	Cutter and Bar. . . . .	105	VAFUM	83752	Adapter . . . . .	603	VOLLO
83514	Cutter. . . . .	816	WASRA	83753	Adapter . . . . .	604	VOLNU
83517	Disc. . . . .	1002	WEHNO	83754	Adapter . . . . .	604	VOLOR
	Use 1 each of 801082			83755	Adapter . . . . .	604	VOLPN
	adapter and 801083			83758	Removing Tools. . . . .	108	VAPZO
	disc.			83759	Wrench. . . . .	108	VARAV
83519	Reamer. . . . .	110	VAWYL	83760	Removing Tool . . . . .	108	VAPYS
83520	Reamer. . . . .	110	VAXAY	83761	Eye . . . . .	101	VAAID
83521	Reamer. . . . .	110	VAXDA			606	VOOBA
83522	Fixture . . . . .	110	VAWMI	83766	Eye . . . . .	101	VAAFO
83523	Base. . . . .	608	VOVBY			601	VOJAX
83524	Plug. . . . .	608	VOVFI	83767	Pilot . . . . .	809	WAAKE
83525	Plug. . . . .	608	VOVIV	83768	Bushing . . . . .	809	WAALI
83526	Collar. . . . .	608	VOVMU	83769	Bushing . . . . .	809	WAAMO
83527	Plug. . . . .	608	VOVEL	83770	Bushing . . . . .	809	WAAOF
83528	Plug. . . . .	608	VOVDE	83780	Nut . . . . .	801	VURBA
83529	Collar. . . . .	608	VOVKA	83785	Puller. . . . .	104	VACOX
83530	Adapter . . . . .	1002	WEICA	83790	Drill . . . . .	111	VEDEM
83531	Adapter . . . . .	1002	WEIET	83791	Drill . . . . .	111	VEDID
83532	Adapter . . . . .	1002	WEIID	83792	Reamer. . . . .	112	VEDKU
83533	Adapter . . . . .	1002	WEIGE			112	VEDMN
83537	Adapter . . . . .	701	VUBID	83793	Gauge . . . . .	403	VIFFI
	Use 801068.					505	VIRGS
83538	Adapter . . . . .	701	VUBLE			506	VIVUD
83539	Adapter . . . . .	701	VUBGE	83794	Reamer. . . . .	506	VITFS
83545	Tap . . . . .	109	VATCE			508	VIYMY
83546	Tap . . . . .	109	VATIZ			509	VOBIV
83552	Stand . . . . .	708	VUMAD			505	VIRIV
83556	Bar . . . . .	709	VUONL			506	VITGN
83557	Bar . . . . .	708	VUMMI	83795	Gauge . . . . .	507	VIWBA
83558	Bar . . . . .	709	VUOBE			508	VIYOL
83559	Bar . . . . .	709	VUOFI			509	VOBKA
83560	Bar . . . . .	709	VUOJU			505	VIRKO
83561	Bar . . . . .	708	VUMGE	83796	Installing Tool . . . . .	507	VIWFS
83562	Bar . . . . .	708	VUMVE			509	VOBME
83563	Bar . . . . .	709	VUOPY	83809	Pliers. . . . .	803	VUSOX
83568	Bar . . . . .	708	VUMIM	83813	Installing Tool . . . . .	902	WEBGU
83569	Bar . . . . .	709	VUOTA	83819	Fixture . . . . .	702	VUERU
83570	Bar . . . . .	708	VUMCA			505	VIRAX
83571	Bar . . . . .	708	VUMOL			505	VITBY
83572	Bar . . . . .	708	VUMRY	83826	Fixture . . . . .	506	VIVAZ
83573	Fixture . . . . .	301	VENAB			507	VIYAB
83574	Bar . . . . .	605	VONEM			508	VOBAC
83575	Bar . . . . .	605	VONGO			509	VODAJ

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83827	Adapter . . . . .	{ 505	VIRCI	84254	Bar . . . . .	709	VUMYT
		506	VIVEL	84269	Gauge . . . . .	302	VERDE
83828	Adapter . . . . .	506	VITDT	84270	Plug . . . . .	302	VEPNO
		507	VIYDI	84271	Pilot . . . . .	808	WAAFO
83829	Adapter . . . . .	507	VIYEF	84272	Bushing . . . . .	808	WAGU
83830	Adapter . . . . .	508	VIYGA	84273	Bushing . . . . .	808	WAAHY
83831	Adapter . . . . .	508	VOBCO	84274	Bushing . . . . .	809	WAAID
		506	VITEK	84275	Pliers . . . . .	1001	WEHBM
83832	Plug and Base . . . . .	506	VIVIB	84276	Drill . . . . .	108	VAPOG
		508	VIYHU	84277	Drill . . . . .	108	VAPPY
		505	VIREP	84278	Drill . . . . .	108	VAPTH
83833	Plug and Base . . . . .	506	VIVOH	84279	Drill . . . . .	108	VAPUK
		508	VOBEJ	84290	Driver . . . . .	111	VEBML
83834	Plug and Base . . . . .	508	VIYJO	84294	Fixture . . . . .	111	VEBCU
83836	Jig . . . . .	509	VOBGT	84295	Fixture . . . . .	111	VEBED
		506	VITIL	84297	Stone . . . . .	111	VEBOX
83837	Installing Tool . . . . .	507	VIWDE	84299	Bar . . . . .	708	VUMEF
		508	VIYPN	84300	Bar . . . . .	709	VUOOM
83838	Gauge . . . . .	506	VITUX	84301	Bar . . . . .	709	VUODO
		508	VIYUM	84302	Bar . . . . .	708	VUMKU
83839	Gauge . . . . .	509	VOBTS	84303	Bar . . . . .	709	VUOHA
83846	Gauge . . . . .	504	VIOPF	84304	Bar . . . . .	709	VUOUD
83847	Gauge . . . . .	509	VODIF	84305	Bar . . . . .	709	VUORS
83848	Plug and Collar . . . . .	504	VIQIK	84306	Bar . . . . .	709	VOULT
83861	Collar . . . . .	816	WASYL	84307	Fixture and Tools . . . . .	609	VOYBM
83862	Adapter . . . . .	509	VODCY	84311	Adapter . . . . .	609	VOYDH
83863	Eye . . . . .	104	VACGO	84315	Fixture and Tools . . . . .	105	VAHUD
83864	Turning Tool . . . . .	601	VOJME		Use 1 each of 800594 jig and tools and 801829 adapter.		
83865	Plug and Collar . . . . .	111	VEDGO	84321	Jig . . . . .	403	VIFDO
83867	Plug and Base . . . . .	509	VODEC	84322	Reamer . . . . .	403	VIFEK
83868	Broach . . . . .	509	VODGA	84366	Base and Tools . . . . .	705	VUIMI
83869	Gauge . . . . .	509	VODKL	84370	Wrench . . . . .	902	WEBAP
83870	Fixture . . . . .	403	VIDAF	84377	Removing Tool . . . . .	803	VUSRI
83871	Fixture and Tools . . . . .	113	VEFCO	84380	Installing Tool . . . . .	402	VIAHL
83891	Lap . . . . .	403	VIDED	84385	Plug . . . . .	303	VETIK
83892	Lap . . . . .	403	VIDCA	84386	Base . . . . .	302	VETHO
83893	Wrench . . . . .	501	VIJHK	84391	Holder . . . . .	111	VEBKE
83906	Punch . . . . .	816	WATSM	84395	Body . . . . .	111	VEBIC
83913	Fixture . . . . .	701	VUBSY	84398	Head . . . . .	111	VEBGA
83922	Protector . . . . .	607	VORYM	84400	Plug and Base . . . . .	703	VUGEW
83925	Wrench . . . . .	802	VUSEB	84401	Adapter . . . . .	703	VUGHD
83935	Arbor . . . . .	607	VOROK	84402	Adapter . . . . .	703	VUGFE
83936	Lock . . . . .	607	VORID	84411	Gun . . . . .	817	WAXBA
	Use 800735.			84414	Wrench . . . . .	1001	WEGOR
83940	Plug and Collar . . . . .	302	VETEM	84415	Removing and Installing Tool . . . . .	402	VIABA
83942	Broach . . . . .	303	VETJU	84417	Adapter . . . . .	803	VUVUR
83943	Base . . . . .	302	VETPI	84418	Adapter . . . . .	803	VUVYL
83944	Spinning Tool . . . . .	303	VEVLY	84419	Adapter . . . . .	803	VUWBY
83945	Gauge . . . . .	303	VEVOG	84420	Gasket . . . . .	804	VUWNO
83947	Wrench . . . . .	605	VONPY	84428	Gasket . . . . .	803	VUWLU
83961	Fixture . . . . .	404	VIFHN	84429	Fixture . . . . .	701	VUBOF
83965	Pliers . . . . .	802	VUSIC	84430	Driver . . . . .	106	VANAN
83981	Cutter . . . . .	805	VYAHL	84431	Driver . . . . .	106	VANCA
83982	Cutter . . . . .	805	VYAJY	84432	Driver . . . . .	{ 107	VANEB
83983	Cutter . . . . .	805	VYAKA	84433	Adapter . . . . .	110	VAUBD
83984	Cutter . . . . .	806	VYAMN	84434	Adapter . . . . .	107	VANGA
83985	Puller . . . . .	603	VOLDT	84435	Adapter . . . . .	107	VANID
83986	Adapter . . . . .	603	VOLFI	84436	Adapter . . . . .	107	VANKE
83987	Adapter . . . . .	603	VOLEF	84436	Adapter . . . . .	{ 107	VANMI
83988	Plug and Base . . . . .	301	VEPLU	84442	Drill . . . . .	110	VAUDG
83989	Drill . . . . .	302	VEPUP	84449	Wrench . . . . .	111	VAXGO
83992	Puller . . . . .	113	VEFMD	84450	Wrench . . . . .	1001	WEGKU
83993	Plug . . . . .	113	VEFOZ	84452	Gauge . . . . .	106	WEGNZ
83994	Installing Tool . . . . .	602	VOKDI	84453	Gauge . . . . .	106	VALFI
84203	Drill . . . . .	107	VAPNL	84454	Wrench . . . . .	103	VALGO
84205	Fixture and Tools . . . . .	511	VOHCI	84455	Drill . . . . .	301	VABMO
84216	Wrench . . . . .	802	VUSGA	84457	Wrench . . . . .	1001	VEMIP
84217	Wrench . . . . .	607	VORKU	84458	Wrench . . . . .	1001	WEGPI
84231	Tap . . . . .	106	VAJCY	84463	Punch . . . . .	402	WEGLL
84232	Tap . . . . .	106	VAJEN	84470	Collar . . . . .	301	VIAFS
84233	Tap . . . . .	106	VAJIR	84471	Plug . . . . .	301	VEMEN
84234	Tap . . . . .	106	VAJKU	84472	Gauge . . . . .	301	VEMCA
84245	Fixture . . . . .	106	VAHDO	84473	Gauge . . . . .	301	VENBU
84246	Spacer . . . . .	702	VUEST	84474	Reamer . . . . .	301	VENDI
84248	Plug . . . . .	703	VUFAF	84475	Reamer . . . . .	301	VEMMI
84249	Plug . . . . .	703	VUFEG	84475	Reamer . . . . .	301	VEMOW
84250	Plug . . . . .	702	VUEUM				
84252	Bar . . . . .	708	VUMTA				
84253	Bar . . . . .	708	VUMUM				

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84477	Reamer . . . . .	301	VMKS	84843	Cover . . . . .	802	VURLE
84478	Cutter . . . . .	805	VYAAB	84844	Cover . . . . .	802	VURGO
84479	Cutter . . . . .	805	VYACE	84845	Cover . . . . .	802	VURQP
84480	Cutter . . . . .	805	VYAED	84846	Cover . . . . .	104	VACED
84481	Cutter . . . . .	805	VYAGI	84848	Tap . . . . .	106	VAJAF
84482	Cutter . . . . .	806	VYATO	84849	Tap . . . . .	106	VAJGO
84483	Cutter . . . . .	806	VYBLS	84850	Tap . . . . .	106	VAJMA
84493	Reamer . . . . .	811	WAFVE		Use 800455.		
84494	Reamer . . . . .	811	WAFYT	84851	Gauge . . . . .	106	VAJTI
84495	Reamer . . . . .	811	WAGBE	84852	Gauge . . . . .	106	VALDE
84496	Gauge . . . . .	813	WAFJI	84853	Gauge . . . . .	106	VALHU
84497	Gauge . . . . .	813	WAGJO	84854	Fixture . . . . .	112	VEDOK
84498	Gauge . . . . .	813	WAGJU	84855	Adapter . . . . .	112	VEDST
84499	Gauge . . . . .	814	WAOIF	84856	Adapter . . . . .	112	VEDPY
84500	Reamer . . . . .	813	WAMPS	84861	Installing Tool . . . . .	803	VUSST
84501	Screw . . . . .	801	VURDE	84868	Plug . . . . .	403	VICHU
84504	Wrench and Screwdriver . . . . .	201	VEHIV	84871	Plug . . . . .	504	VINBS
84505	Tap . . . . .	106	VAJOP	84890	Bushing . . . . .	107	VAPJO
	Use 800456.			84891	Bushing . . . . .	107	VAPLU
84506	Tap . . . . .	106	VAJRE	84894	Installing Tool . . . . .	503	VIKMO
	Use 800457.			84895	Installing Tool . . . . .	502	VIKIL
84507	Reamer . . . . .	108	VASBO	84896	Installing Tool . . . . .	503	VIKKI
84508	Reamer . . . . .	109	VASGY	84897	Installing Tool . . . . .	502	VIKGE
84511	Pointer . . . . .	1002	WEIAN	84903	Bushing . . . . .	107	VAPIF
84512	Puller . . . . .	605	VOMTI	84904	Drill . . . . .	108	VAPRA
84513	Wrench . . . . .	2101	WEKGE	84905	Removing Tool . . . . .	108	VAPVE
84515	Pointer . . . . .	1002	WEHTS	84920	Removing and Installing Tool . . . . .	2101	WEKEN
84516	Spacer . . . . .	1003	WEILB	84922	Wrench . . . . .	2101	WEKRY
84517	Puller . . . . .	606	VOOHO	84923	Installing Tool . . . . .	602	VOJYL
84518	Protector . . . . .	606	VONYM	84926	Wrench . . . . .	1001	WEGCE
84519	Protector . . . . .	606	VONUR	84930	Wrench . . . . .	604	VOMEF
84520	Protector . . . . .	605	VONST	84931	Wrench . . . . .	103	VABWN
84521	Wrench . . . . .	2101	WEKIP	84932	Wrench . . . . .	102	VABGU
84522	Wrench . . . . .	901	WAZYZ	84934	Wrench . . . . .	103	VABOF
84524	Scraper . . . . .	817	WAXEP	84947	Wrench . . . . .	103	VACAB
84525	Scraper . . . . .	817	WAXDS	84948	Wrench . . . . .	103	VABYM
84533	Locking Tool . . . . .	401	VEYGE	84957	Wrench . . . . .	901	WAZED
84538	Gauge . . . . .	106	VAJVV	84992	Drift . . . . .	502	VIJOK
84539	Gauge . . . . .	106	VALBA	800037	Sling . . . . .	101	VABAB
84540	Gauge . . . . .	106	VALJA	800040	Head and Brake . . . . .	816	VABIV
84541	Gauge . . . . .	106	VALLE	800041	Head and Brake . . . . .	703	VUFOP
84558	Locking Tool . . . . .	401	VEXUL	800042	Body . . . . .	817	WAVMU
84559	Puller . . . . .	604	VOLYN	800043	Body . . . . .	816	WAVKI
84560	Adapter . . . . .	604	VOMAP	800044	Holder . . . . .	817	WAVRN
84566	Wrench . . . . .	802	VURUD	800045	Holder . . . . .	817	WAVOH
84601	Boring Tool . . . . .	805	VUZKI	800046	Stone and Shell . . . . .	817	WAVZO
84602	Stand and Tools . . . . .	805	VUZOR	800047	Stone and Shell . . . . .	817	WAVYM
84603	Drift and Gauge . . . . .	805	VUZUV	800048	Gauge . . . . .	804	VUWRL
84610	Tap . . . . .	104	VAEHN		Use 800641.		
84639	Gap and Form Tool . . . . .	1001	WEGWT	800049	Stone and Shell . . . . .	817	WAVUG
84640	Stand . . . . .	803	VUVOP	800050	Stone and Shell . . . . .	817	WAVTS
84654	Wrench . . . . .	2101	WEKOW	800053	Plug . . . . .	403	VICLE
84657	Fixture . . . . .	502	VIJPE	800060	Wrench . . . . .	901	WAZGA
84668	Fixture . . . . .	402	VIALT	800079	Body . . . . .	703	VUFIK
84680	Plug . . . . .	504	VINDT	800080	Holder . . . . .	703	VUFUR
84692	Installing Tool . . . . .	402	VIAJO	800081	Stone and Shell . . . . .	703	VUFYL
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84743	Removing Tools . . . . .	106	VAHZI	800223	Plug . . . . .	802	VURST
84756	Gauge . . . . .	804	VUWSE	800225	Adapter . . . . .	603	VOLIK
84757	Gauge . . . . .	804	VUWTA	800244	Puller . . . . .	402	VIANZ
84761	Adapter . . . . .	402	VIARN	800259	Protectors . . . . .	802	VURFI
84762	Adapter . . . . .	402	VIAPH	800262	Jig . . . . .	107	VAPGI
84764	Installing Tool . . . . .	110	VAWBA	800263	Jig . . . . .	107	VAPER
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84773	Bushing . . . . .	111	VAXIT	800304	Puller . . . . .	401	VEYOR
84786	Fixture . . . . .	502	VIKED	800305	Adapter . . . . .	401	VEYTU
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84802	Puller . . . . .	901	WAZUV	800360	Assembling Tool . . . . .	501	VIJER
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84837	Tap . . . . .	109	VATEB	800389	Tap . . . . .	109	VASKA
84838	Tap . . . . .	109	VATKU	800525	Fixture and Tools . . . . .	609	VOYCA
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REVISED

NUMERICAL TOOL LIST

FOR TOOL CATALOG COVERING CYCLONE F, F50, G, G100 & J6  
(E Series) ENGINES TOOLS

Please destroy old pages 2301 to 2306 inclusive  
dated April 8, 1940.

NUMERICAL TOOL LIST

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80109	Gauge . . . . .	813	WAJDE	81355	Tap . . . . .	815	WASIZ
80124	Clamp . . . . .	813	WAJUD	81356	Tap . . . . .	815	WARDU
80131	Eye . . . . .	803	VUTAP	81357	Tap . . . . .	815	WARER
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80180	Gauge . . . . .	1001	WEGAT	81360	Cutter. . . . .	814	WAPAV
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80198	Extension . . . . .	901	WAZNL	81363	Pilot and Nut . . . . .	815	WARBO
80262	Stand . . . . .	604	VOMCO	81402	Wrench. . . . .	607	VORMN
80292	Handle. . . . .	604	VOMIB	81405	Gauge . . . . .	901	WAZOX
80293	Disc. . . . .	902	WEBIB	81409	Compressor. . . . .	902	WEBKY
80309	Wrench. . . . .	601	VOJOC	81411	Bar . . . . .	902	WEEFI
80336	Bar . . . . .	1003	WEINI	81456	Reamer. . . . .	902	WEEBY
80350	Puller. . . . .	1002	WEHLF	81473	Gauge . . . . .	813	WAKID
80351	Wrench. . . . .	604	VOMGU	81475	Gauge . . . . .	813	WAKKE
80354	Arbor . . . . .	605	VONDF	81478	Reamer. . . . .	811	WAGHA
80372	Wrench. . . . .	401	VEYMO	81479	Gauge . . . . .	813	WAJOP
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80392	Wedge . . . . .	602	VOKIC	81493	Boring Tool . . . . .	804	VUZED
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80603	Gauge . . . . .	802	VURWO	81910	Arbor . . . . .	107	VAPAB
80604	Gauge . . . . .	401	VEZOT	81910	Mandrel . . . . .	607	VORPY
80605	Gauge . . . . .	101	VAAHA	81952	Turning Tool. . . . .	402	VIADK
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80618	Reamer. . . . .	804	VUWWP	81972	Locking Tool. . . . .	401	VEXYF
80626	Wrench. . . . .	814	WAOAB	82015	Locking Tool. . . . .	401	VEYAB
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80753	Reamer. . . . .	604	VOLTI	82058	Wrench. . . . .	104	VACMI
80755	Gauge . . . . .	201	VEHOB	82065	Wrench. . . . .	607	VOREM
80756	Gauge . . . . .	1001	WEGIC	82095	Puller. . . . .	103	VABRU
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80852	Gauge . . . . .	813	WAJST	82147	Wrench. . . . .	201	VEHFI
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82311	Locking Tool . . . . .	606	VOPUG	82713	Plug and Wrench . . . . .	703	VUGJI
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		506	VITOP	82764	Reamer . . . . .	811	WAGDO
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82635	Wrench . . . . .	605	VOMYL	82946	Plug and Base . . . . .	404	VIGCO
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82994	Cutter . . . . .	806	VYARI	83291	Sling . . . . .	101	VAAJY
82998	Gauge . . . . .	902	WEDAB	83297	Sling . . . . .	102	VABEM
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83023	Gauge . . . . .	815	WARKA	83354	Installing Tool . . . . .	807	VYFHU
83029	Pilot and Nut . . . . .	815	WASAF	83355	Installing Tool . . . . .	807	VYFMY
83031	Pilot and Nut . . . . .	111	VAZBA	83356	Plug . . . . .	403	VICFO
83032	Pilot and Nut . . . . .	702	VUDUV	83357	Plug . . . . .	403	VICJA
83043	Reamer and Bushing . . . . .	815	WAPKI	83362	Diamond . . . . .	810	WACMI
83045	Plug and Collar . . . . .	816	WASMI	83363	Belts . . . . .	810	WACOX
83047	Holder . . . . .	816	WASOS	83379	Base and Tools . . . . .	701	VUBRO
83048	Cutter . . . . .	112	VEDUR	83381	Wrench . . . . .	104	VACIP
83049	Pilot and Nut . . . . .	112	VEDYM	83396	Fixture . . . . .	702	VUEKY
83051	Reamer . . . . .	105	VAFMU	83397	Scraper . . . . .	708	VULRU
83052	Gauge . . . . .	105	VAFRY	83402	Base and Tools . . . . .	705	VUIRU
83053	Puller . . . . .	105	VAFTA	83423	Bushing . . . . .	812	WAHGO
83054	Broach . . . . .	105	VAFIG	83426	Base and Tools . . . . .	706	VUITT
83055	Gauge . . . . .	105	VAFGE	83431	Fixture and Tools . . . . .	707	VULBE
83056	Cutter . . . . .	105	VAFCA	83432	Fixture and Tools . . . . .	707	VULFE
83057	Gauge . . . . .	105	VAFEF	83433	Fixture and Tools . . . . .	707	VULHN
83058	Bushing . . . . .	105	VAFKI	83444	Plug and Collars . . . . .	901	WAZCU
83059	Reamer . . . . .	105	VAFAD	83445	Stop . . . . .	608	VOWEX
83060	Gauge . . . . .	609	VOWOR	83447	Gauge . . . . .	609	VOMTI
83061	Puller . . . . .	608	VOWCE	83448	Bar . . . . .	608	VOWLL
83062	Gauge . . . . .	608	VOWKU	83450	Fixture . . . . .	816	WAVCA
83063	Stop . . . . .	108	VARCA	83452	Stand and Tools . . . . .	805	VUZTU
83065	Bar . . . . .	108	VAREW	83453	Drift . . . . .	805	VUZVA
83085	Fixture . . . . .	108	VARGE	83454	Drift and Gauge . . . . .	802	VUSKE
83087	Holder . . . . .	108	VASDU	83455	Drift and Gauge . . . . .	805	VUZWI
83088	Tap . . . . .	109	VASER	83458	Stop . . . . .	805	VUZYL
83089	Tap . . . . .	810	WACAB	83461	Gauge . . . . .	608	VOWAT
83090	Tap . . . . .	810	WACCE	83462	Bar . . . . .	608	VOWNZ
83115	Grinder . . . . .	810	WACIP	83463	Bar . . . . .	608	VOMGY
83117	Plate . . . . .	801	WACKE	83466	Fixture . . . . .	608	VOMIC
83120	Wheel . . . . .	801	VUOZI	83465	Cutter . . . . .	816	WAVAZ
83121	Wheel . . . . .	801	VUPGO	83466	Cutter . . . . .	807	VYIRI
83130	Wrench . . . . .	510	VOFNE	83467	Cutter . . . . .	808	VYITS
83131	Wrench . . . . .	510	VOFIV	83472	Wrench . . . . .	201	VEHDE
83133	Fixture . . . . .	510	VOFJR	83473	Boring Tool . . . . .	805	VUZMO
83134	Plug and Collar . . . . .	510	VOFLP	83474	Bushing . . . . .	812	WAHMA
83135	Puller . . . . .	510	VOFUF	83475	Bushing . . . . .	814	WAMSE
83136	Plug . . . . .	510	VOFPA	83476	Reamer . . . . .	812	WAHOP
83137	Gauge . . . . .	510	VOFRI	83477	Reamer . . . . .	812	WAMTI
83138	Gauge . . . . .	510	VOFOS	83478	Reamer . . . . .	812	WAGTA
83139	Gauge . . . . .	109	VATRA	83479	Reamer . . . . .	812	WAGUD
83140	Gauge . . . . .	110	VATY	83481	Reamer . . . . .	812	WAGVE
83143	Tap . . . . .	503	VIMGE	83480	Reamer . . . . .	812	WAGZI
83144	Tap . . . . .	510	VOHAZ	83500	Adapter . . . . .	706	WAHAF
83146	Fixture . . . . .	814	WAMVO	83501	Adapter . . . . .	706	VUIWA
83168	Fixture and Tools . . . . .	901	WAZST	83502	Adapter . . . . .	706	VUIZE
83169	Wrench . . . . .	708	VULTI	83503	Adapter . . . . .	706	VUJAF
83182	Assembling Tool . . . . .	102	VABFO	83504	Adapter . . . . .	707	VUJBA
83185	Gauge . . . . .	104	VACKE	83505	Adapter . . . . .	707	VUJDE
83186	Stand . . . . .	504	VIMIL	83506	Adapter . . . . .	707	VUJEG
83187	Stand . . . . .	1001	WEGUL	83507	Adapter . . . . .	707	VUJFI
83188	Lap . . . . .	1001	WEGRA	83508	Adapter . . . . .	105	VAFUM
83203	Wrench . . . . .	708	VULPT	83513	Cutter and Bar . . . . .	816	WASRA
83204	Wrench . . . . .	801	VUPCY	83514	Cutter . . . . .	1002	WEHNO
83205	Fixture . . . . .	815	WAPFW	83517	Disc . . . . .	110	WAWYL
83207	Wrench . . . . .	301	VENUV	83520	Reamer . . . . .	110	VAXAY
83208	Cutter . . . . .	301	VEMTO	83521	Reamer . . . . .	110	VAXDA
83219	Punch . . . . .	803	VUSYN				
83220	Fixture . . . . .						
83243	Removing Tool . . . . .						

## NUMERICAL TOOL LIST - Cont'd

Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
83522	Fixture . . . . .	110	VAWWI	83768	Bushing . . . . .	809	WAALI
83523	Base . . . . .	608	VOVBY	83769	Bushing . . . . .	809	WAAMO
83524	Plug . . . . .	608	VOVFI	83770	Bushing . . . . .	809	WAAOF
83525	Plug . . . . .	608	VOVIV	83780	Nut . . . . .	801	VURBA
83526	Collar . . . . .	608	VOVMU	83785	Puller . . . . .	104	VACOX
83527	Plug . . . . .	608	VOVEL	83790	Drill . . . . .	111	VEDEM
83528	Plug . . . . .	608	VOVDE	83791	Drill . . . . .	111	VEDID
83529	Collar . . . . .	608	VOVKO	83792	Reamer . . . . .	112	VEDKU
83530	Adapter . . . . .	1002	WEICA	83793	Gauge . . . . .	112	VEDMN
83531	Adapter . . . . .	1002	WEIET			403	VIFFI
83532	Adapter . . . . .	1002	WEIID			505	VIRGS
83533	Adapter . . . . .	1002	WEIGE			506	VIVUD
83537	Adapter . . . . .	701	VUBID	83794	Reamer . . . . .	506	VITFS
83538	Adapter . . . . .	701	VUBLB			508	VIYMY
83539	Adapter . . . . .	701	VUBGE			509	VOBIV
83545	Tap . . . . .	109	VATCE			509	VIRIV
83546	Tap . . . . .	109	VATIZ			506	VITGN
83552	Stand . . . . .	708	VUMAD	83795	Gauge . . . . .	507	VIWBA
83556	Bar . . . . .	709	VUONL			508	VIYOL
83557	Bar . . . . .	708	VUMMI			509	VOBKA
83558	Bar . . . . .	709	VUOBE			505	VIRKO
83559	Bar . . . . .	709	VUOFI	83796	Installing Tool . . . . .	507	VIWFS
83560	Bar . . . . .	709	VUOJU			509	VOBME
83561	Bar . . . . .	708	VUMGE	83800	Pliers . . . . .	803	VUSOX
83562	Bar . . . . .	708	VUMVE	83813	Installing Tool . . . . .	902	WEBGU
83563	Bar . . . . .	709	VUOPY	83819	Fixture . . . . .	702	VUERU
83568	Bar . . . . .	708	VUMIM			505	VIRAX
83569	Bar . . . . .	709	VUOTA			505	VITBY
83570	Bar . . . . .	708	VUMCA	83826	Fixture . . . . .	506	VIVAZ
83571	Bar . . . . .	708	VUML			507	VIYAB
83572	Bar . . . . .	708	VUMRY			508	VOBAJ
83573	Fixture . . . . .	301	VEMAB			509	VODAJ
83574	Bar . . . . .	605	VONEM	83827	Adapter . . . . .	505	VIRGI
83575	Bar . . . . .	605	VONGO			506	VIVEL
83576	Bar . . . . .	605	VONKU			506	VITDT
83577	Bar . . . . .	605	VONOK	83828	Adapter . . . . .	507	VIYDI
83578	Puller . . . . .	105	VAFOL	83829	Adapter . . . . .	507	VIYEF
83581	Tap . . . . .	109	VASIT	83830	Adapter . . . . .	508	VIYGA
83582	Tap . . . . .	108	VARKI	83831	Adapter . . . . .	508	VOBCO
83583	Punch . . . . .	702	VUDIY			506	VITEK
83584	Base and Tools . . . . .	706	VUIUT	83832	Plug and Base . . . . .	506	VIVIB
83595	Puller . . . . .	102	VABIB			508	VIYHU
		602	VOKBA			505	VIREP
83596	Plate . . . . .	701	VUBAN	83833	Plug and Base . . . . .	506	VIVOH
83597	Reamer . . . . .	109	VATAF			508	VOBEJ
83598	Reamer . . . . .	109	VATGO	83834	Plug and Base . . . . .	508	VIYJO
83639	Tap . . . . .	104	VAEFE	83836	Jig . . . . .	509	VOBGT
83648	Puller . . . . .	103	VABLI			506	VITIL
83652	Tap . . . . .	110	VATVE	83837	Installing Tool . . . . .	507	VIWDE
83653	Holder . . . . .	109	VATOS			508	VIYPN
83654	Fixture . . . . .	109	VATMI			506	VITUX
83656	Bar . . . . .	501	VIJLS	83838	Gauge . . . . .	508	VIYUM
83660	Wrench . . . . .	201	VEHEL	83839	Gauge . . . . .	509	VOBTS
83667	Wrench . . . . .	502	VIJYF			104	VACED
83678	Stand . . . . .	101	VAAUC	83846	Gauge . . . . .	504	VIOFI
83679	Plate . . . . .	101	VAAEN			509	VODIF
83683	Jig . . . . .	301	VEMGE	83847	Gauge . . . . .	509	VODIF
83711	Fixture . . . . .	503	VIMED	83848	Plug and Collar . . . . .	504	VIOIK
83714	Puller . . . . .	701	VUBCA	83861	Collar . . . . .	816	WASYL
83719	Attachments . . . . .	810	WACED	83862	Adapter . . . . .	509	VODCY
83720	Attachments . . . . .	810	WACGA	83863	Eye . . . . .	104	VACGO
83721	Sleeve . . . . .	810	WACUM	83864	Turning Tool . . . . .	601	VOJME
83722	Sleeve . . . . .	811	WACVA	83865	Plug and Collar . . . . .	111	VEDGO
83723	Draw Bars . . . . .	810	WACPO	83867	Plug and Base . . . . .	509	VODEC
83749	Stand . . . . .	603	VOLGM	83868	Broach . . . . .	509	VODGA
83750	Adapter . . . . .	603	VOLHE	83869	Gauge . . . . .	509	VODKL
83751	Adapter . . . . .	603	VOLJT	83870	Fixture . . . . .	403	VIDAF
83752	Adapter . . . . .	603	VOLLO	83871	Fixture and Tools . . . . .	113	VEFCO
83753	Adapter . . . . .	604	VOLNU	83891	Lap . . . . .	403	VIDED
83754	Adapter . . . . .	604	VOLOR	83892	Lap . . . . .	403	VIDCA
83755	Adapter . . . . .	604	VOLPN	83893	Wrench . . . . .	501	VIJHX
83758	Removing Tools . . . . .	108	VAPZO	83906	Punch . . . . .	816	WATSM
83759	Wrench . . . . .	108	VARAV	83913	Fixture . . . . .	701	VUBSY
83760	Removing Tools . . . . .	108	VAPYS	83922	Protector . . . . .	607	VORYM
		101	VAAID	83925	Wrench . . . . .	802	VUSEB
83761	Eye . . . . .	606	VOOBA	83935	Arbor . . . . .	607	VOROK
		101	VAAFO	83936	Lock . . . . .	607	VORID
83766	Eye . . . . .	601	VOJAX	83940	Plug and Collar . . . . .	302	VETEM
83767	Pilot . . . . .	809	WAAKE	83942	Broach . . . . .	303	VETJU
				83943	Base . . . . .	302	VETFI

NUMERICAL TOOL LIST - Cont'd

Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
83944	Spinning Tool . . . . .	303	VEVLY	84420	Gasket. . . . .	804	VUWNO
83945	Gauge . . . . .	303	VEVOG	84428	Gasket. . . . .	803	VUWLU
83947	Wrench. . . . .	605	VONPY	84429	Fixture . . . . .	701	VUBOF
83961	Fixture . . . . .	404	VIFHN	84430	Driver. . . . .	106	VUNAN
83965	Pliers. . . . .	802	VUSIC	84431	Driver. . . . .	106	VANCA
83981	Cutter. . . . .	805	VYABL	84432	Driver. . . . .	107	VANEB
83982	Cutter. . . . .	805	VYAJY			110	VAUBD
83983	Cutter. . . . .	805	VYAKA	84433	Adapter . . . . .	107	VANGA
83984	Cutter. . . . .	806	VYAMN	84434	Adapter . . . . .	107	VANID
83985	Puller. . . . .	603	VOLDT	84435	Adapter . . . . .	107	VANKE
83986	Adapter . . . . .	603	VOLFI	84436	Adapter . . . . .	107	VANMI
83987	Adapter . . . . .	603	VOLEF			110	VAUDG
83988	Plug and Base . . . . .	301	VEPLU	84442	Drill . . . . .	111	VAXGO
83989	Drill . . . . .	302	VEPUP	84449	Wrench. . . . .	1001	WEGKU
83992	Puller. . . . .	113	VEFMD	84450	Wrench. . . . .	1001	WEGNZ
83993	Plug. . . . .	113	VEFOZ	84452	Gauge . . . . .	106	VALFI
83994	Installing Tool . . . . .	602	VOKDI	84453	Gauge . . . . .	106	VALGO
84203	Drill . . . . .	107	VAPNL	84454	Wrench. . . . .	103	VABMO
84205	Fixture and Tools . . . . .	511	VOHCI	84455	Drill . . . . .	301	VEMIP
84216	Wrench. . . . .	802	VUSGA	84457	Wrench. . . . .	1001	WEGPI
84217	Wrench. . . . .	607	VORKU	84458	Wrench. . . . .	1001	WEGLL
84231	Tap . . . . .	106	VAJCY	84463	Punch . . . . .	402	VIAFS
84232	Tap . . . . .	106	VAJEN	84470	Collar. . . . .	301	VEMEN
84233	Tap . . . . .	106	VAJIR	84471	Plug. . . . .	301	VEMCA
84234	Tap . . . . .	106	VAJKU	84472	Gauge . . . . .	301	VENBU
84245	Fixture . . . . .	105	VAHDO	84473	Gauge . . . . .	301	VENDI
84246	Spacer. . . . .	702	VUEST	84474	Reamer. . . . .	301	VEMMI
84248	Plug. . . . .	703	VUFAP	84475	Reamer. . . . .	301	VEMOW
84249	Plug. . . . .	703	VEFEG	84476	Reamer. . . . .	301	VEMRY
84250	Plug. . . . .	702	VUEUM	84477	Reamer. . . . .	301	VEMKS
84252	Bar . . . . .	708	VUMTA	84478	Cutter. . . . .	805	VYAAB
84253	Bar . . . . .	708	VUMUM	84479	Cutter. . . . .	805	VYACE
84254	Bar . . . . .	709	VUMYT	84480	Cutter. . . . .	805	VYABD
84269	Gauge . . . . .	302	VERDE	84481	Cutter. . . . .	805	VYAGI
84270	Plug. . . . .	302	VEPNO	84482	Cutter. . . . .	806	VYATO
84271	Pilot . . . . .	808	WAAFO	84483	Cutter. . . . .	806	VYBLS
84272	Bushing . . . . .	808	WAAFU	84493	Reamer. . . . .	811	WAFWE
84273	Bushing . . . . .	808	WAAHY	84494	Reamer. . . . .	811	WAFYT
84274	Bushing . . . . .	809	WAAID	84495	Reamer. . . . .	811	WAGBE
84275	Pliers. . . . .	1001	WEHBM	84496	Gauge . . . . .	813	WAFJI
84276	Drill . . . . .	108	VAPOG	84497	Gauge . . . . .	813	WAJGO
84277	Drill . . . . .	108	VAPPY	84498	Gauge . . . . .	813	WAJHU
84278	Drill . . . . .	108	VAPTH	84499	Gauge . . . . .	814	WAOIF
84279	Drill . . . . .	108	VAPUK	84500	Reamer. . . . .	813	WAMPS
84290	Driver. . . . .	111	VEBML	84501	Screw . . . . .	801	VURDE
84294	Fixture . . . . .	111	VEBCU	84504	Wrench and Screwdriver. . . . .	201	VEHIV
84295	Fixture . . . . .	111	VEBED	84505	Tap . . . . .	106	VAJOP
84297	Stone . . . . .	111	VEBOX	84506	Tap . . . . .	106	VAJRE
84299	Bar . . . . .	708	VUMEF	84507	Reamer. . . . .	108	VASBO
84300	Bar . . . . .	709	VUOOM	84508	Reamer. . . . .	109	VASGY
84301	Bar . . . . .	709	VUODO	84511	Pointer . . . . .	1002	WEIAN
84302	Bar . . . . .	708	VUMKU	84512	Puller. . . . .	605	VOMTI
84303	Bar . . . . .	709	VUOHA	84513	Wrench. . . . .	2101	WEKGE
84304	Bar . . . . .	709	VUOUD	84515	Pointer . . . . .	1002	WEHTS
84305	Bar . . . . .	709	VUORS	84516	Spacer. . . . .	1003	WEILB
84306	Bar . . . . .	709	VUOLT	84517	Puller. . . . .	606	VOOHO
84307	Fixture and Tools . . . . .	609	VOYBM	84518	Protector . . . . .	606	VONYM
84311	Adapter . . . . .	609	VOYHD	84519	Protector . . . . .	606	VONUR
84315	Fixture and Tools . . . . .	105	VAHUD	84520	Protector . . . . .	605	VONST
84321	Jig . . . . .	403	VIFDO	84521	Wrench. . . . .	2101	WEKIP
84322	Reamer. . . . .	403	VIFEK	84522	Wrench. . . . .	901	WAZYZ
84366	Base and Tools. . . . .	705	VUIMI	84524	Scraper . . . . .	817	WAXEP
84370	Wrench. . . . .	902	WEBAP	84525	Scraper . . . . .	817	WAXDS
84377	Removing Tool . . . . .	803	VUSRI	84533	Locking Tool. . . . .	401	VEYGE
84380	Installing Tool . . . . .	402	VIAHL	84538	Gauge . . . . .	106	VAJVV
84385	Plug. . . . .	303	VETIK	84539	Gauge . . . . .	106	VALBA
84386	Base. . . . .	302	VETHO	84540	Gauge . . . . .	106	VALJA
84391	Holder. . . . .	111	VEBKE	84541	Gauge . . . . .	106	VALLE
84395	Body. . . . .	111	VEBIC	84558	Locking Tool. . . . .	401	VEXUL
84398	Head. . . . .	111	VEBGA	84559	Puller. . . . .	604	VOLYN
84400	Plug and Base . . . . .	703	VUGEN	84560	Adapter . . . . .	604	VOMAP
84401	Adapter . . . . .	703	VUGHD	84566	Wrench. . . . .	802	VURUD
84402	Adapter . . . . .	703	VUGFE	84601	Boring Tool . . . . .	805	VUZKI
84411	Gun . . . . .	817	WAXBA	84602	Stand and Tools . . . . .	805	VUZOR
84414	Wrench. . . . .	1001	WEGOR	84603	Drift and Gauge . . . . .	805	VUZUV
84415	Removing and Installing Tool. . . . .	402	VIABA	84610	Tap . . . . .	104	VAEHN
84417	Adapter . . . . .	803	VUVUR	84639	Gap and Form Tool . . . . .	1001	WEGWT
84418	Adapter . . . . .	803	VUVYL	84640	Stand . . . . .	803	VUVOP
84419	Adapter . . . . .	803	VUWBY	84654	Wrench. . . . .	2101	WEKOW

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Tool Number	Description of Tool	Page Number	Code Word	Tool Number	Description of Tool	Page Number	Code Word
84657	Fixture . . . . .	502	VIJPE	84920	Removing and Installing Tool . . . . .	2101	WEKEN
84668	Fixture . . . . .	402	VIALT	84922	Wrench . . . . .	2101	WEKRY
84680	Plug . . . . .	504	VINDT	84923	Installing Tool . . . . .	602	VOJYL
84692	Installing Tool . . . . .	402	VIAJO	84926	Wrench . . . . .	1001	WEGCE
84709	Guide . . . . .	816	WAVEF	84930	Wrench . . . . .	604	VOMEF
84710	Guide . . . . .	816	WAVEG	84931	Wrench . . . . .	103	VABWN
84743	Removing Tools . . . . .	106	VAHZI	84932	Wrench . . . . .	102	VABGU
84756	Gauge . . . . .	804	VUWSE	84934	Wrench . . . . .	103	VABOF
84757	Gauge . . . . .	804	VUWTA	84947	Wrench . . . . .	103	VACAB
84761	Adapter . . . . .	402	VIARN	84948	Wrench . . . . .	103	VABYM
84762	Adapter . . . . .	402	VIAPH	84957	Wrench . . . . .	901	WAZED
84764	Installing Tool . . . . .	110	VAWBA	84992	Drift . . . . .	502	VIJOK
84770	Removing Tool . . . . .	802	VURYS	800037	Sling . . . . .	101	VABAB
84773	Bushing . . . . .	111	VAXIT	800040	Head and Brake . . . . .	816	WAVIV
84786	Fixture . . . . .	502	VIKED	800041	Head and Brake . . . . .	703	VUFOP
84787	Installing Tool . . . . .	503	VIKTU	800042	Body . . . . .	817	WAVMU
84788	Installing Tool . . . . .	503	VIKOR	800043	Body . . . . .	816	WAVKI
84802	Puller . . . . .	901	WAZUV	800044	Holder . . . . .	817	WAVRN
84836	Tap . . . . .	108	VARIX	800045	Holder . . . . .	817	WAVOH
84837	Tap . . . . .	109	VATEB	800046	Stone and Shell . . . . .	817	WAVZO
84838	Tap . . . . .	109	VATKU	800047	Stone and Shell . . . . .	817	WAVYM
84839	Removing and Installing Tools . . . . .	104	VAEBA	800048	Gauge . . . . .	804	VUWRL
84840	Tap . . . . .	104	VAEDF	800049	Stone and Shell . . . . .	817	WAVUG
84841	Cover . . . . .	104	VACCE	800050	Stone and Shell . . . . .	817	WAVTS
84842	Cover . . . . .	802	VURRU	800053	Plug . . . . .	403	VICLE
84843	Cover . . . . .	802	VURLE	800060	Wrench . . . . .	901	WAZGA
84844	Cover . . . . .	802	VURGO	800079	Body . . . . .	703	VUFIK
84845	Cover . . . . .	802	VUROF	800080	Holder . . . . .	703	VUFUR
84846	Cover . . . . .	104	VACED	800081	Stone and Shell . . . . .	703	VUFYL
84848	Tap . . . . .	106	VAJAF	800096	Fixture . . . . .	502	VIKAB
84849	Tap . . . . .	106	VAJGO	800197	Adapter . . . . .	803	VUSUV
84850	Tap . . . . .	106	VAJMA	800223	Plug . . . . .	802	VURST
84851	Gauge . . . . .	106	VAJTI	800225	Adapter . . . . .	603	VOLIK
84852	Gauge . . . . .	106	VALDE	800244	Puller . . . . .	402	VIANZ
84853	Gauge . . . . .	106	VALHU	800259	Protectors . . . . .	802	VURFI
84854	Fixture . . . . .	112	VEDOK	800262	Jig . . . . .	107	VAPGI
84855	Adapter . . . . .	112	VEDST	800263	Jig . . . . .	107	VAPER
84856	Adapter . . . . .	112	VEDPY	800293	Remover . . . . .	107	VAPGE
84861	Installing Tool . . . . .	803	VUSST	800304	Puller . . . . .	401	VEYOR
84868	Plug . . . . .	403	VICHU	800305	Adapter . . . . .	401	VEYTU
84871	Plug . . . . .	504	VINBS	800306	Adapter . . . . .	401	VEYUV
84890	Bushing . . . . .	107	VAPJO	800310	Installing Tool . . . . .	606	VOOJU
84891	Bushing . . . . .	107	VAPLU	800360	Assembling Tool . . . . .	501	VIJER
84894	Installing Tool . . . . .	503	VIKMO	800361	Adapter . . . . .	501	VIJFZ
84895	Installing Tool . . . . .	502	VIKIL	800389	Tap . . . . .	109	VASKA
84896	Installing Tool . . . . .	503	VIKIK	800525	Fixture and Tools . . . . .	609	VOYCA
84897	Installing Tool . . . . .	502	VIKGE	800526	Fixture and Tools . . . . .	609	VOYDB
84903	Bushing . . . . .	107	VAPIF	800527	Adapter . . . . .	609	VOYIM
84904	Drill . . . . .	108	VAPRA	800528	Adapter . . . . .	609	VOYJI
84905	Removing Tool . . . . .	108	VAPVE				